Pollutants of Concern Monitoring Data Report

Water Year 2017

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

SAN MATEO COUNTYWIDE
Water Pollution Prevention Program

A Program of the City/County Association of Governments

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CREDITS

This report is submitted by the participating agencies in the

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Water Pollution
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BASMAA	Bay Area Stormwater Management Agency Association
BMP	Best Management Practice
CEC	Chemicals of Emerging Concern
CEDEN	California Environmental Data Exchange Network
CSCI	California Stream Condition Index
CW4CB	Clean Watersheds for Clean Bay
DTSC	California Department of Toxic Substances Control
ECWG	Emerging Contaminants Work Group of the RMP
MRP	Municipal Regional Permit
NPDES	National Pollution Discharge Elimination System
PBDEs	Polybrominated Diphenyl Ethers
PCBs	Polychlorinated Biphenyls
PFAS	Perfluoroalkyl Sulfonates
PFOS	Perfluorooctane Sulfonates
POC	Pollutant of Concern
RMC	Regional Monitoring Coalition
RMP	San Francisco Estuary Regional Monitoring Program
RWSM	Regional Watershed Spreadsheet Model
SAP	Sampling and Analysis Plan
SMCWPPP	San Mateo Countywide Water Pollution Prevention Program (Countywide Program)
SFEI	San Francisco Estuary Institute
SPoT	Statewide Stream Pollutant Trend Monitoring
SSC	Suspended Sediment Concentration
STLS	Small Tributary Loading Strategy
TOC	Total Organic Carbon
UCMR	Urban Creeks Monitoring Report
USEPA	US Environmental Protection Agency
WY	Water Year

1.0 INTRODUCTION

This Pollutants of Concern (POC) Monitoring Data Report (POC Data Report) was prepared by the San Mateo Countywide Water Pollution Prevention Program (SMCWPPP or Countywide Program) 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 (Regional Water Board, 2015). This report fulfills the requirements of MRP Provision C.8.h.iii for reporting a summary of Provision C.8.f POC Monitoring conducted during Water Year (WY) 2017[1].

This POC Data Report builds on the POC Monitoring Report dated October 10, 2017. In accordance with MRP Provision C.8.h.iv, the POC Monitoring Report included POC monitoring locations, number and types of samples collected, purpose of sampling (i.e., Management Questions addressed), and analytes measured (SMCWPPP 2017b). The October 15, 2017 POC Monitoring Report also described the allocation of sampling effort for POC monitoring planned for WY 2017.

This POC Data Report is included as an appendix to the WY 2017 Urban Creeks Monitoring Report (UCMR). In addition, consistent with MRP Provision C.8.h.ii, POC monitoring data generated from sampling of receiving waters (e.g., creeks) were submitted to the San Francisco Bay Area Regional Data Center for upload to the California Environmental Data Exchange Network (CEDEN)[2].

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[3], and nutrients. POC monitoring is conducted on a Water Year (WY) basis. Provision C.8.f specifies yearly (i.e., WY) 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;

[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 2017 (WY 2017) began on October 1, 2016 and concluded on September 30, 2017.

[2] CEDEN has historically only accepted and shared data collected in streams, lakes, rivers, and the ocean (i.e., receiving waters). In late-2016, we were notified that there were changes to the types of data that CEDEN would accept and share. However, pending further clarification, SMCWPPP will continue to submit only receiving water data to CEDEN.

[3] 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 constituents of emerging concern (CECs) in stormwater and will address at least PFOS, PFAS, and alternative flame retardants being used to replace PBDEs.

4. **Loads and Status** – providing information on POC loads, concentrations or presence in local tributaries or urban stormwater discharges; and
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 for each POC that must address each Management Question. For example, over the first five years of the permit, a minimum total of 80 PCBs samples must be collected and analyzed. At least eight PCB samples must be collected each year. By the end of year four[4] of the permit term, each of the five Management Questions must be addressed with at least eight PCB samples. It is possible that a single sample can address more than one information need. POC Monitoring requirements are summarized in Table 1.

Data gathering needed to comply with MRP provisions C.11 (Mercury Controls) and C.12 (PCBs controls) is partly addressed through Provision C.8.f (i.e., POC Monitoring). Similarly, certain samples collected per C.11 and C.12 count towards POC monitoring requirements. The specific provisions and their associated timelines are:

- Provisions C.11.a.iii and C.12.a.iii require that Permittees provide a list of management areas in which new PCBs and mercury control measures will be implemented during the permit term. These management areas are designated "Watershed Management Areas" (WMAs) in this report. Progress toward developing the list was initially submitted in a report dated April 1, 2016 (SMCWPPP 2016b). The initial list was expanded upon in the Countywide Program's September 2016 Annual Report by designating all catchments with high interest parcels (i.e., with land uses associated with PCBs such as old industrial, electrical and recycling) and/or existing or planned PCBs and mercury controls as WMAs (SMCWPPP 2016c). The WMA list was further updated in the Countywide Program's September 2017 Annual Report (SMCWPPP 2017a) and will be further updated with each subsequent Annual Report, per MRP Provision C.11.a.iii(3). MRP Provision C.8.f (POC Monitoring) supports C.11/12.a requirements by requiring monitoring directed toward source identification (i.e., identifying which WMAs have source areas and provide the greatest opportunities for implementing cost-effective controls that reduce loads of PCBs in urban stormwater runoff).
- 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 Countywide Program is participating in a Bay Area Stormwater Management Agencies Association (BASMAA) regional project to address this requirement. Development of the monitoring plan is anticipated in 2017 with implementation in Fiscal Year 2017/18.

[4] Note that the minimum sampling requirements addressing information needs must be completed by the end of year four of the permit (i.e., WY 2019); whereas, the minimum number of total samples does not need to be met until the end of year five of the permit (i.e., WY 2020).

1.2. Third-Party Data

The Countywide Program strives to work collaboratively with water quality monitoring partners to develop mutually beneficial monitoring approaches. 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), Clean Watersheds for a Clean Bay (CW4CB, a recently completed project that was funded by a grant from USEPA), and the State's Stream Pollution Trends (SPoT) Monitoring Program may supplement the Countywide Program's efforts towards achieving Provision C.8.f monitoring requirements. Third party monitoring conducted by the RMP, SPoT, and CW4CB also provides context for reviewing and interpreting Countywide Program monitoring results.

Table 1. MRP Provision C.8.f pollutants of concern monitoring requirements.

Pollutant of Concern	Media	Total Samples by the End of Year Five[d]	Yearly Minimum	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	8	8	8	8	8
Total Mercury	Water or sediment	80	8	8	8	8	8	8
Total & Dissolved Copper	Water	20	2	--	--	--	4	4
Nutrients[a]	Water	20	2	--	--	--	20	--
Emerging Contaminants[b]	--	--	--	--	--	--	--	--
Ancillary Parameters[c]	--	--	--	--	--	--	--	--

[a.] Ammonium[5], 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 Chemicals of Emerging Concern (CECs) in stormwater and would address at least PFOS, PFAS, and alternative flame retardants being used to replace 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 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.

[5] 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.

2.0 POC MONITORING RESULTS

In compliance with Provision C.8.f of the MRP, the Countywide Program conducted POC monitoring for PCBs, mercury, copper, and nutrients in WY 2017. General methods employed for POC monitoring and quality assurance/quality control (QA/QC) procedures were similar to previous years (SMCWPPP 2016a). The MRP-required yearly minimum number of samples was met or exceeded for all POCs. The total number of samples collected for each POC, the agency conducting the monitoring, and the Management Questions addressed are shown in Table 2. Specific monitoring stations are shown in Table 3 and mapped in Figure 1. The sections below describe the results of the WY 2017 monitoring. Compliance with applicable water quality standards is discussed in Section 3.0.

2.1. Statement of Data Quality

A comprehensive QA/QC program was implemented by the Countywide Program covering all aspects of POC monitoring with similar protocols to previous years. SMCWPPP (2016a) provides further details and references the CW4CB Quality Assurance Project Plan (QAPP; AMS 2012) and the BASMAA Regional Monitoring Coalition (RMC) QAPP (BASMAA 2016) as bases for QA/QC procedures.

Overall, the results of the QA/QC review suggested that most of the POC monitoring data generated during WY 2017 were of sufficient quality for the purposes of the project. Although some data were flagged in the project database, none was rejected according to Measurement Quality Objectives (MQOs) or Data Quality Objectives (DQOs). However, most of the concentrations of mercury in stormwater runoff samples reported in WY 2017 were lower than prior years by about an order of magnitude. These data were rejected by the project QA/QC officer based on comparison to the results of similar sampling of the same population of urban catchments in recent years by SMCWPPP and other Bay Area countywide stormwater programs. Additional details about the QA/QC review are provided in Attachment 1.

It should be noted that although the WY 2017 mercury stormwater runoff sample results were rejected, these samples still count towards meeting the yearly (i.e., WY) and total (i.e., permit term) minimum numbers of samples for mercury specified in Provision C.8.f (see Table 1). The Countywide Program will consider collecting additional stormwater runoff mercury samples in future years if an evaluation of the San Mateo County and overall Bay Area datasets were to suggest that such additional data were essential for addressing relevant Management Questions (see Section 1.1).

Table 2. Countywide Program and third-party POC monitoring accomplishments, WY 2016 and WY 2017.

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 2017							
SMCWPPP	17	17	17	--	17	--	Stormwater runoff samples to characterize WMAs
SMCWPPP	67	67	--	--	--	--	Sediment samples to identify source areas
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]	104 / 80	103 / 8	36 / 8	3 / 8	36 / 8	1 / 8	
Copper							
WY 2017							
SMCWPPP	1	NA	NA	NA	1	--	Copper analyzed on a subset of PCBs/Hg stormwater runoff samples
SMCWPPP	5[c]	NA	NA	NA	5	2	Creek water samples collected during storm event and following spring base flows
WY 2016							
SMCWPPP	3	NA	NA	NA	3	--	Copper analyzed on a subset of PCBs/Hg stormwater runoff samples
Total / MRP Minimum[b]	9 / 20	NA	NA	NA	9 / 4	2 / 4	

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	
Nutrients							
WY 2017							
SMCWPPP	5	NA	NA	NA	5	NA	Creek water samples collected during storm event and following spring base flows
WY 2016							
SMCWPPP	2	NA	NA	NA	2	NA	Creek water samples collected from bottom-of-the-watershed stations
Total / MRP Minimum[b]	7 / 20	NA	NA	NA	7 / 20	NA	

NA = The MRP does not require sampling to address the management question.

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

[b] The 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.

[c] The number of creek water samples analyzed for copper was incorrectly reported as four in SMCWPPP (2017b).

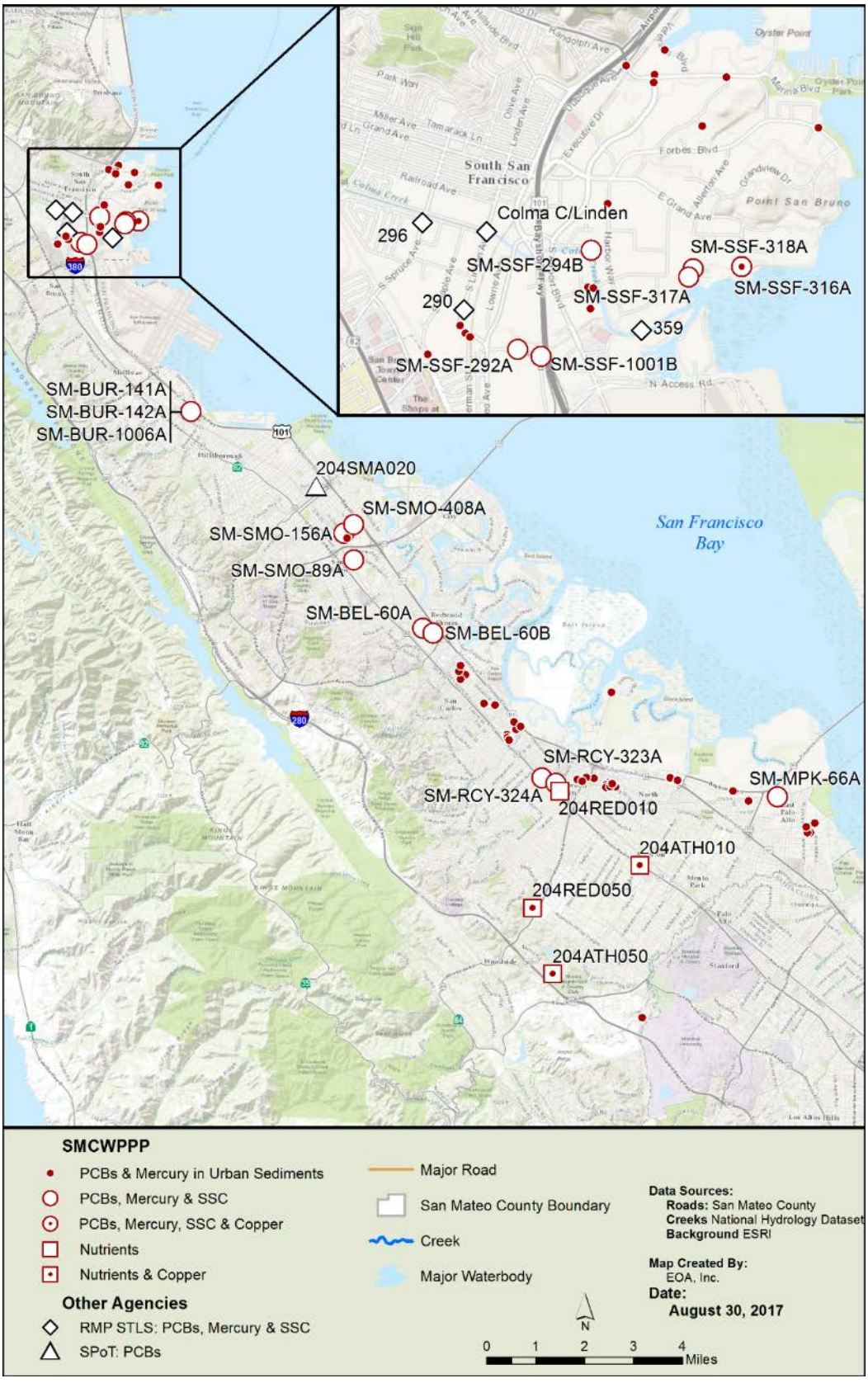

Figure 1. WY 2017 POC monitoring stations in San Mateo County.

Table 3. POC monitoring stations in San Mateo County, WY 2017.

Organization	Station Code	Sample Date	Latitude	Longitude	Matrix	PCBs	Mercury	Suspended Sediment	Total Copper	Dissolved Copper	Hardness as CaCO3	Nutrients[a]
SMCWPPP												
SMCWPPP	SM-SSF-316A	12/10/2016	37.64795	-122.38726	water	x	x	x	x	x	x	
SMCWPPP	SM-SSF-317A	12/10/2016	37.64771	-122.39193	water	x	x	x				
SMCWPPP	SM-SSF-318A	12/10/2016	37.64707	-122.39234	water	x	x	x				
SMCWPPP	SM-SSF-292A	12/15/2016	37.64126	-122.40866	water	x	x	x				
SMCWPPP	SM-SSF-1001B	12/15/2016	37.64077	-122.40637	water	x	x	x				
SMCWPPP	SM-SSF-294B	12/15/2016	37.64896	-122.40178	water	x	x	x				
SMCWPPP	SM-BUR-141A	12/15/2016	37.59184	-122.36627	water	x	x	x				
SMCWPPP	SM-BUR-142A	12/15/2016	37.59183	-122.36626	water	x	x	x				
SMCWPPP	SM-BUR-1006A	12/15/2016	37.59186	-122.36628	water	x	x	x				
SMCWPPP	SM-RCY-323A	1/8/2017	37.48505	-122.23276	water	x	x	x				
SMCWPPP	SM-RCY-324A	1/8/2017	37.48355	-122.22763	water	x	x	x				
SMCWPPP	SM-SMO-89A	1/10/2017	37.54878	-122.30455	water	x	x	x				
SMCWPPP	SM-BEL-60A	2/9/2017	37.52884	-122.27823	water	x	x	x				
SMCWPPP	SM-BEL-60B	2/9/2017	37.52746	-122.27438	water	x	x	x				
SMCWPPP	SM-SMO-156A	2/20/2017	37.55662	-122.30845	water	x	x	x				
SMCWPPP	SM-SMO-408A	2/20/2017	37.55916	-122.30476	water	x	x	x				
SMCWPPP	SM-MPK-66A	3/24/2017	37.48074	-122.14501	water	x	x	x				
SMCWPPP	67 samples, including 6 duplicates. See Appendix A				sediment	x	x					
SMCWPPP	204ATH010	1/9/2017	37.45973	-122.19573	water				x	x	x	x
SMCWPPP	204ATH050[b]	1/9/2017	37.42707	-122.22752	water				x	x	x	x
SMCWPPP	204RED010	1/9/2017	37.48130	-122.22620	water				x	x	x	x
SMCWPPP	204RED010	5/22/2017	37.48130	-122.22620	water				x	x	x	x
SMCWPPP	204RED050[b]	1/9/2017	37.44652	-122.23541	water				x	x	x	x
Third Party Organizations												
RMP STLS	290	1/8/2017	37.6442	-122.4139	water	x	x	x				
RMP STLS	296	1/8/2017	37.6508	-122.4181	water	x	x	x				
RMP STLS	Colma C/Linden	2/7/2017	37.6502	-122.4119	water	x	x	x				
RMP STLS	359	2/7/2017	37.6429	-122.3968	water	x	x	x				
SPoT	204SMA020	June 2017	37.5703	-122.3186	sediment	x						

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

[b]204ATH050 and 204RED050 were also sampled for nutrients as part of the spring bioassessment monitoring program.

2.2. PCBs and Mercury

The Countywide Program's PCBs and mercury monitoring focuses on San Mateo County WMAs (see Section 1.1) containing high interest parcels with land uses potentially associated with PCBs such as old industrial, electrical and recycling. During WY 2017 the Countywide Program collected 17 composite samples of stormwater runoff from outfalls at the bottom of WMAs and 67 grab sediment samples (of which 6 were duplicates) within the WMAs. As part of continuing to develop strategies for reducing PCBs and mercury loads in stormwater runoff, the Countywide Program evaluated all of these data, additional WY 2017 stormwater runoff sample data collected through the RMP's Small Tributary Loading Strategy (STLS), and data from previous water years collected by the Countywide Program and through the STLS. Objectives include attempting to identify source properties within WMAs, identifying which WMAs provide the greatest opportunities for implementing cost-effective PCBs controls, and prioritizing WMAs for future investigations.

2.2.1. Stormwater Runoff Monitoring

During WY 2017, the Countywide Program collected 17 composite samples of stormwater runoff from outfalls at the bottom of WMAs that contain high interest parcels. An additional four stormwater runoff samples were collected in San Mateo County through the RMP's STLS, also from WMAs with high interest parcels. These combined 21 samples address Management Questions #1 (Source Identification) and #2 (Contributions to Bay Impairment). Data will 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).

WMAs were identified and prioritized for stormwater runoff sampling by evaluating several types of data, including: land use data, PCBs and mercury concentrations from prior sediment and stormwater runoff sampling efforts, municipal storm drain data showing pipelines and access points (e.g., manholes, outfalls, pump stations), and logistical/safety considerations. 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 40 PCBs congeners designated by the RMP as those most likely to be found in the Bay[6] (method EPA 1668C, total PCBs were calculated as the sum of these 40 congeners), total mercury (method EPA 1631E), and suspended sediment concentration (SSC; method ASTM D3977-97). One of these samples was also analyzed for total and dissolved copper (method EPA 200.8) and hardness (method SM 2340C). See Section 2.3 for a discussion of the copper results.

The RMP's STLS team typically conducts annual monitoring for POCs on a region-wide basis. The Countywide Program 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 meeting both short- and long-term municipal stormwater permit requirements. During WY 2013 – WY 2014 POC monitoring activities by the STLS focused on pollutant loading monitoring at six region-wide stations, including one station in San Mateo County. In WY 2015, the loading stations were discontinued and STLS monitoring shifted to wet weather characterization in WMAs. 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 the Countywide Program. Seven WMAs (i.e., seven storm composite

[6] PCBs congeners 8, 18, 28, 31, 33, 44, 49, 52, 56, 60, 66, 70, 74, 87, 95, 97, 99, 101, l05, 110, 118, 128, 132, 138, 141, 149, l51, 153, 156, 158, 170, 174, 177, 180, 183, 187, 194, 195, 201, 203.

samples) were sampled for PCBs and mercury by the RMP's STLS in San Mateo County in WY 2016, six WMAs were sampled in WY 2015, and four were sampled in WY 2017.

Table 4 summarizes PCBs, mercury, and SSC monitoring results for samples collected by the Countywide Program and RMP in WYs 2015 - 2017. "Total PCBs" was calculated as the sum of the RMP 40 congeners. The PCBs particle ratio concentration is calculated by dividing Total PCBs by SSC; likewise, the Hg particle ratio concentration is calculated by dividing mercury concentrations by SSC. The particle ratio concentrations, which are sometimes referred to as particle concentrations, estimate the concentration of pollutant on the suspended sediment within the water sample. Since PCBs and mercury are hypothesized to primarily be bound to sediment, particle ratio concentrations may be used to normalize pollutant concentrations in samples with varying levels of suspended sediment.

Table 4. PCB, mercury, and suspended sediment concentrations in stormwater runoff samples collected by SMCWPPP and the RMP, WYs 2015 - 2017.

Station Code	Permittee	Sample Date	SSC (mg/L)	Total PCBs (ng/L)[a]	PCBs Particle Ratio Concentration (ng/g)[b]	Hg (ng/L)	Hg Particle Ratio Concentration (ng/g)
SMCWPPP Samples							
SM-BEL-60A	Belmont	2/9/2017	34	6.1	178	(c)	(c)
SM-BEL-60B	Belmont	2/9/2017	36	37.2	1022	(c)	(c)
SM-BUR-1006A	Burlingame	12/15/2016	52	18.9	365	(c)	(c)
SM-BUR-141A	Burlingame	12/15/2016	51	8.5	165	(c)	(c)
SM-BUR-142A	Burlingame	12/15/2016	52	34.5	670	(c)	(c)
SM-MPK-238A	Menlo Park	3/5/2016	80	3.2	40	13	159
SM-MPK-238B	Menlo Park	3/5/2016	51	6.2	121	9	173
SM-MPK-66A	Menlo Park	3/24/2017	21	8.4	390	(c)	(c)
SM-MPK-71A	Menlo Park	2/17/2016	14	0.6	43	7	496
SM-RCY-254A	Redwood City	3/5/2016	14	1.6	113	10	712
SM-RCY-323A	Redwood City	1/8/2017	8	1.6	191	(c)	(c)
SM-RCY-324A	Redwood City	1/8/2017	44	7.4	169	(c)	(c)
SM-RCY-327A	Redwood City	2/17/2016	44	5.7	130	15	341
SM-RCY-379A	Redwood City	3/5/2016	123	13.0	106	18	149
SM-RCY-379B	Redwood City	3/5/2016	43	7.9	182	11	252
SM-RCY-388A	Redwood City	2/17/2016	50	2.5	50	15	311
SM-SMO-156A	San Mateo	2/20/2017	91	18.5	204	(c)	(c)
SM-SMO-408A	San Mateo	2/20/2017	29	55.3	1900	(c)	(c)
SM-SMO-89A	San Mateo	1/10/2017	28	4.0	145	(c)	(c)
SM-SSF-1001B	South San Francisco	12/15/2016	32	55.2	1714	(c)	(c)
SM-SSF-292A	South San Francisco	12/15/2016	719	7.9	11	(c)	(c)
SM-SSF-294A	South San Francisco	12/15/2016	29	10.5	367	(c)	(c)
SM-SSF-316A	South San Francisco	12/10/2016	44	4.3	96	(c)	(c)
SM-SSF-317A	South San Francisco	12/10/2016	6	2.6	450	(c)	(c)
SM-SSF-318A	South San Francisco	12/10/2016	9	2.3	266	(c)	(c)

Station Code	Permittee	Sample Date	SSC (mg/L)	Total PCBs (ng/L)[a]	PCBs Particle Ratio Concentration (ng/g)[b]	Hg (ng/L)	Hg Particle Ratio Concentration (ng/g)
RMP Samples							
SM-SCS-210A (Pulgas South)	San Carlos[d]	33 Samples (Results are Averaged)	54	448.0	8222		
SM-SCS-31A (Pulgas North)	San Carlos[d]	4 Samples (Results are Averaged)	68	60.3	893		
SM-BRI-1004A	Brisbane	3/5/2016	96	10.5	109	71	741
SM-BRI-17A	Brisbane	3/5/2016	96	10.4	109	27	276
SM-EPA-70A	East Palo Alto	2/6/2015	265	28.5	108	52	194
SM-EPA-72A	East Palo Alto	2/6/2015	82	6.5	79	35	427
SM-RCY-267A	Redwood City	12/2/2014	148	9.2	62	55	372
SM-RCY-337A	Redwood City	12/15/2014	29	3.5	121	14	469
SM-SCS-32A	San Carlos	3/11/2016	25	4.2	169	29	1156
SM-SCS-75A	San Carlos	3/11/2016	26	159.6	6139	14	535
SM-SSF-291A	South San Francisco	1/8/2017	16	11.8	736	12	775
SM-SSF-293A	South San Francisco	2/6/2015	45	5.2	117	20	436
SM-SSF-296A	South San Francisco	1/8/2017	111	3.4	30	39	350
SM-SSF-306A	South San Francisco	2/6/2015	43	7.8	182	29	679
SM-SSF-314A	South San Francisco	3/5/2016	10	8.6	859	6	562
SM-SSF-315A	South San Francisco	3/5/2016	33	5.8	175	10	315
SM-SSF-319A	South San Francisco	3/5/2016	23	1.8	80	15	639
SM-SSF-359A	South San Francisco	2/7/2017	43	33.9	788	9	210

[a] Total PCBs calculated as sum of RMP 40 congeners.
[b] PCB and Hg Particle Ratios calculated by dividing Total PCBs and Hg concentrations by SSC.
[c] SMCWPPP WY 2017 mercury data were rejected by SMCWPPP's QA/QC Officer (see Section 2.1).
[d] Pulgas Pump Station watershed data were collected during Water Years 2011-2014.

2.2.2. Evaluation of Region-wide Stormwater Runoff Sampling Results

This section evaluates data collected by the Countywide Program to-date on PCBs concentrations in stormwater runoff in the context of similar data collected throughout the Bay Area. The analysis included data from RMP STLS monitoring (Gilbreath et al. 2018 DRAFT). The stormwater runoff sample dataset includes samples collected from 107 municipal separate storm water sewer system (MS4) catchments and 20 natural waterways throughout the Bay Area. The MS4 catchment sites included storm drain manholes, outfalls, pump stations, and artificial channels.[7] Many of the sites have been sampled more than once and/or have multiple sample results reported for individual storm events. Nine of the 107 MS4 sites have multiple sample results (sample counts of 4 to 80) and 15 of the 20 natural waterway sites have multiple sample results (sample counts of 3 to 125). For sites with more than one sample, the particle ratio concentration was calculated by dividing the sum of PCBs concentrations by the sum of suspended sediment concentrations. This averaging is essentially equivalent to compositing

[7] Stormwater runoff samples have also been collected from inlets and/or treatment systems (e.g., bioretention) during special studies. However, those are not included in this analysis.

all the individual samples that have been collected at a site. This is consistent with the RMP STLS approach to data evaluation (Gilbreath et al. 2018 DRAFT).

PCBs concentrations in stormwater runoff samples for the Bay Area dataset (n=127) are plotted in Figure 2. PCBs particle ratio concentrations are plotted in Figure 3. Figures 2 and 3 identify sites by location (i.e., County) and sample type (i.e., MS4 or natural waterway/creek). There are 46 sites in San Mateo County. Seventeen of the sites were sampled by the Countywide Program in WY 2017, sixteen sites were sampled by the RMP STLS in WY 2015-2017, and four sites were sampled multiple times by the RMP in prior water years.

Two of the top three highest PCB concentrations in the dataset were for samples collected in San Mateo County, with Pulgas Creek Pump Station South having the highest concentration (average 448 ng/L) and SM-SCS-75A (Industrial Rd Ditch) having the third highest concentration (160 ng/L). The 33 samples collected at Pulgas Creek Pump Station South station had consistently very elevated PCBs concentrations. The site has had by far the two highest PCBs concentrations (6,669 ng/L and 4,084 ng/L) measured out of 647 total individual samples and the four highest PCB particle ratio concentrations (37,363 ng/g, 20,733 ng/g, 15,477 ng/g, and 14,744 ng/g).

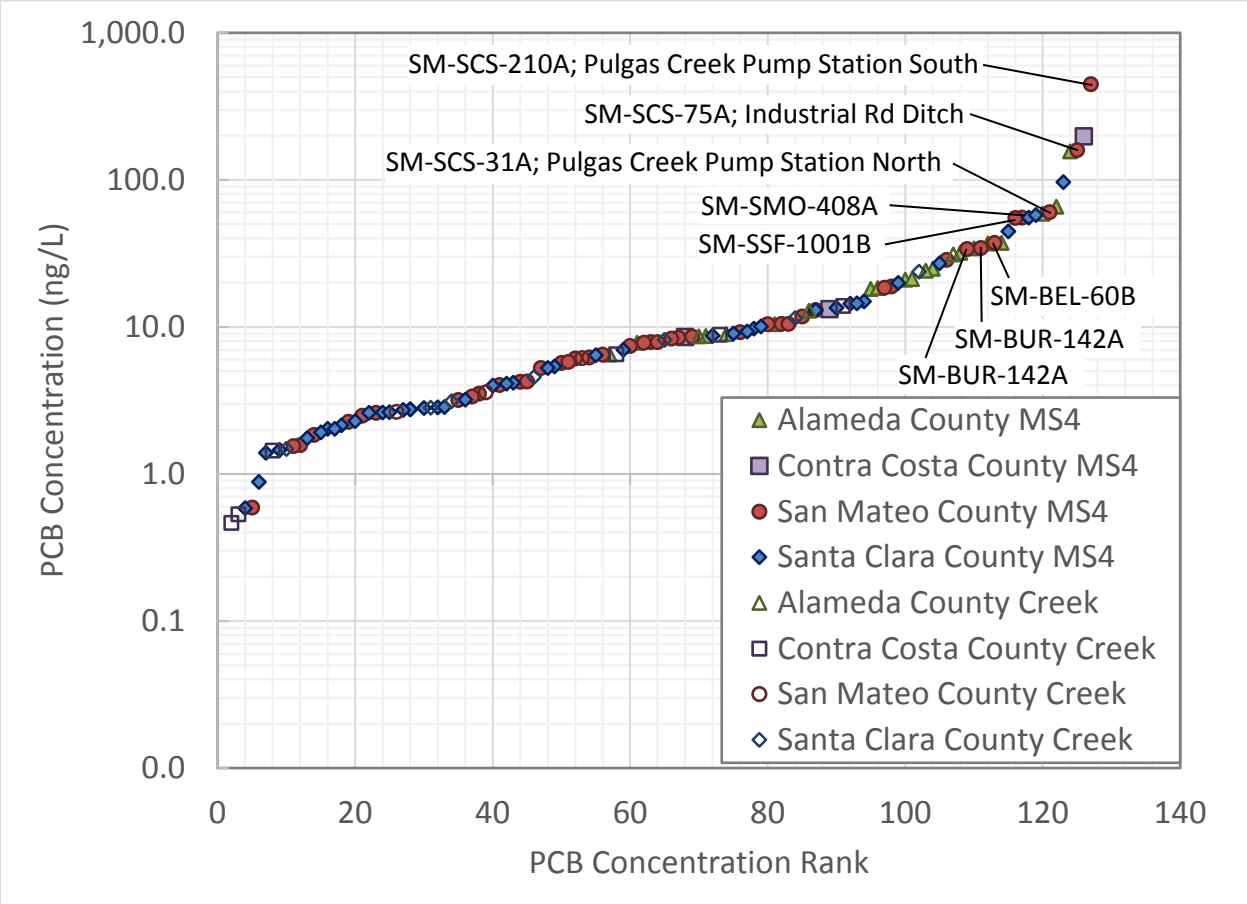

Figure 2. PCBs concentrations for stormwater runoff samples collected in MS4s and creeks in the Bay Area.

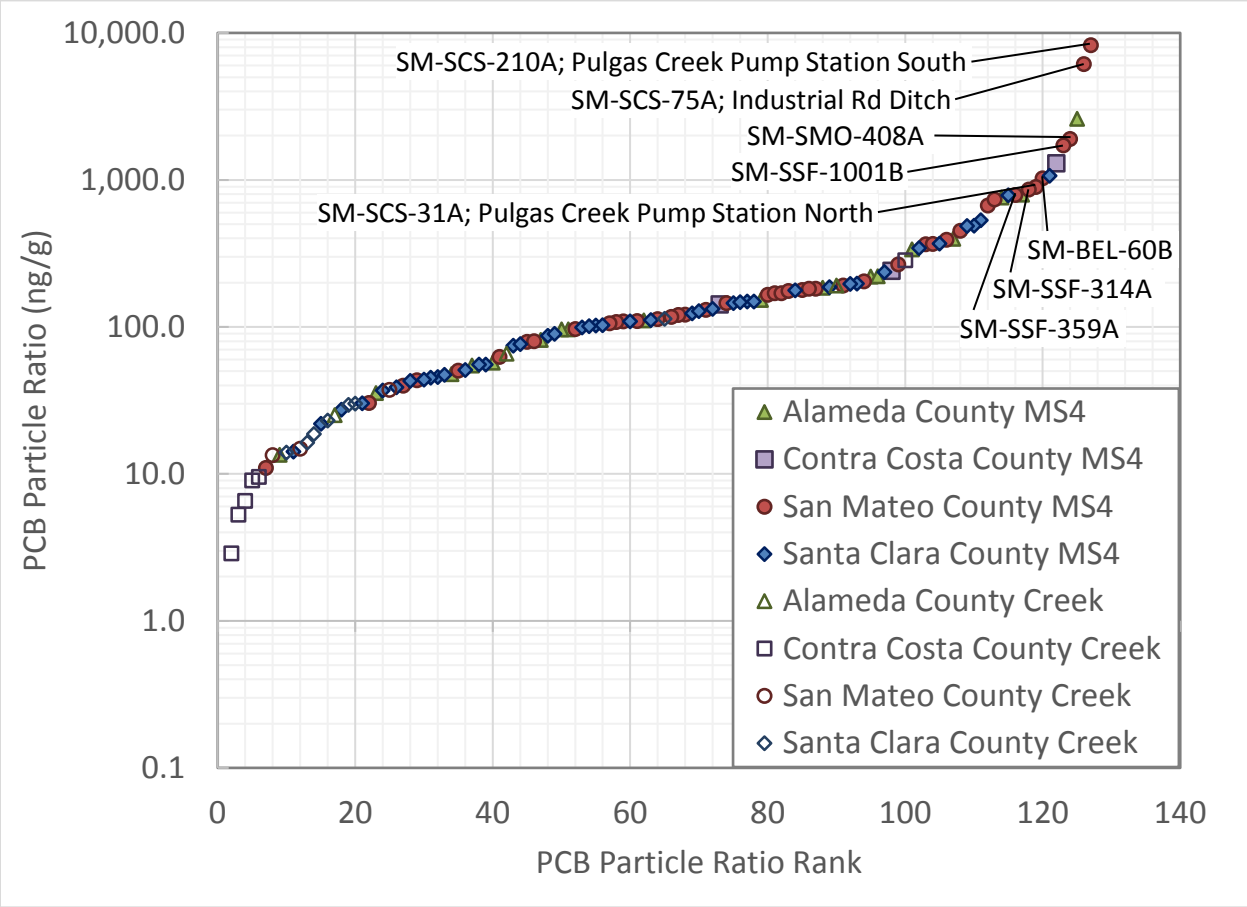

Figure 3. PCBs particle ratio concentrations for stormwater runoff samples collected in large MS4s in the Bay Area.

Table 5 provides descriptive statistics for PCBs and mercury concentrations in the Bay Area stormwater runoff dataset (n=127). The median PCB concentration in stormwater runoff samples is 7.89 ng/L and the mean is 20.5 ng/L. The median PCB particle ratio concentration is 113 ng/g and the mean is 350 ng/g. As can be seen in Figures 2 and 3, which are plotted on a log scale, there are a few catchments with highly elevated in PCBs (such as the Pulgas Creek Pump Station) that greatly influence the mean concentration statistic but have less impact on the median (i.e., 50th percentile) statistic. Both the Countywide Program and the RMP are collecting more stormwater runoff composite samples in WY 2018 which will expand this dataset. In future years, it may be informative to correlate measured concentrations to various factors such as storm size, rainfall intensity, antecedent dry weather, and land use characteristics.

Table 5. Descriptive statistics – Bay Area stormwater runoff sample concentrations of PCBs and mercury

	PCBs (ng/L)[a]	Hg (ng/L)	SSC (mg/L)	PCBs Particle Ratio Concentration (ng/g)[b]	Hg Particle Ratio Concentration (ng/mg)[b]
Number of Samples	127	71	127	127	71
Min	ND	3.90	5.80	ND	0.045
10th Percentile	1.71	6.65	19.2	16.0	0.155
25th Percentile	2.84	11.5	35.0	45.6	0.215
50th Percentile	7.89	22.9	58.0	113	0.346
75th Percentile	18.4	42.5	131	221	0.557
90th Percentile	46.8	85.7	296	784	0.896
Max	448	1,050	2,630	8,220	5.29
Mean	20.5	54.7	146	350	0.505

[a] Total PCBs calculated as sum of RMP 40 congeners.

[b] PCB and Hg Particle Ratios calculated by dividing Total PCBs and Hg concentrations by SSC.

2.2.3. WY 2017 Sediment Sampling by the Countywide Program

During WY 2017 the Countywide Program collected 67 grab sediment samples (of which 6 were duplicates) as part of the program to attempt to identify source properties within WMAs, potentially for referral to the Regional Water Board for further investigation and potential abatement. These samples were collected in the public right-of-way (ROW), including locations adjacent to high interest parcels with land uses associated with PCBs such as old industrial, electrical and recycling and/or other characteristics potentially associated with pollutant discharge (e.g., poor housekeeping, unpaved areas). Individual and composite sediment samples were collected from manholes, storm drain inlets, driveways, streets, and sidewalks.

Each sample was analyzed for total mercury and for the 40 PCBs congeners designated by the RMP as those most likely to be found in the Bay (see Section 2.2.1). Total PCBs were calculated as the sum of the 40 congeners. The laboratory sieved all samples to 2 mm prior to analysis. Attachment 2 summarizes WY 2017 sediment monitoring locations and analytical results. The results are discussed by WMA in the following section, along with sediment data from previous water years and the stormwater runoff data collected to-date.

2.2.4. Watershed Management Area Prioritization and Descriptions

The Countywide Program evaluated PCBs stormwater runoff and sediment monitoring data to help prioritize WMAs for further investigation and control measure implementation. Based upon the data collected in San Mateo County to-date by the Countywide Program and other parties (e.g., the RMP's STLS), WMAs with one or more sediment and/or stormwater runoff samples with PCBs concentrations (particle ratio concentrations for stormwater runoff) greater than 0.5 mg/kg (or 500 ng/g) were provisionally designated as higher priority. WMAs with samples in the 0.2 – 0.5 mg/kg (200 – 500 ng/g) range were designated medium priority. WMAs with stormwater runoff sample PCBs particle ratio concentrations less than 0.2 mg/kg (200 ng/g) were designated lower priority. Sediment sample results were not used to designate a WMA lower priority due to the high potential for false negatives. Figure 4 is a map illustrating the current status of WMAs in San Mateo County, based on this provisional

prioritization scheme and sediment and stormwater runoff monitoring results to-date.[8] Only WMAs with high interest parcels of were included in Figure 4.

Attachment 3 provides a summary of PCBs and mercury monitoring results for San Mateo county WMAs. For each WMA, Attachment 3 includes:

- The WMA area, the area of high interest parcels in the WMA, and the percent of the total WMA area that is comprised of high interest parcels;
- A summary of the number of stormwater runoff and sediment samples collected to-date in the WMA; and
- The median and range of PCBs concentrations in the samples collected to-date in the WMA (particle ratio concentration for stormwater runoff samples).

Of the 41 stormwater runoff samples collected in San Mateo County from WY 2015-2017 by the Countywide Program and the RMP, eight samples had PCBs particle ratio concentrations over 0.5 mg/kg, six were between 0.2 and 0.5 mg/kg, and the remainder were below 0.2 mg/kg. WMAs with PCBs particle ratio concentrations over 0.2 mg/kg, elevated concentrations of PCBs in sediment samples, and/or other features relevant to PCBs investigations are described in more detail below.[9]

[8] Where sediment and stormwater runoff particle ratio concentration analysis results conflict, the higher result was conservatively applied.

[9] The WMA IDs in San Mateo County are numerical (1 – 1017). Sample names consist of a prefix for the county (SM), followed by a three-letter prefix for the Permittee where the sample was collected (e.g., SSF for South San Francisco, SCS for San Carlos), followed by the WMA ID, and followed by a letter (e.g., A, B, C) to distinguish the sampling site from the WMA in which that sample was collected. Samples collected previously may have a different sample naming convention.

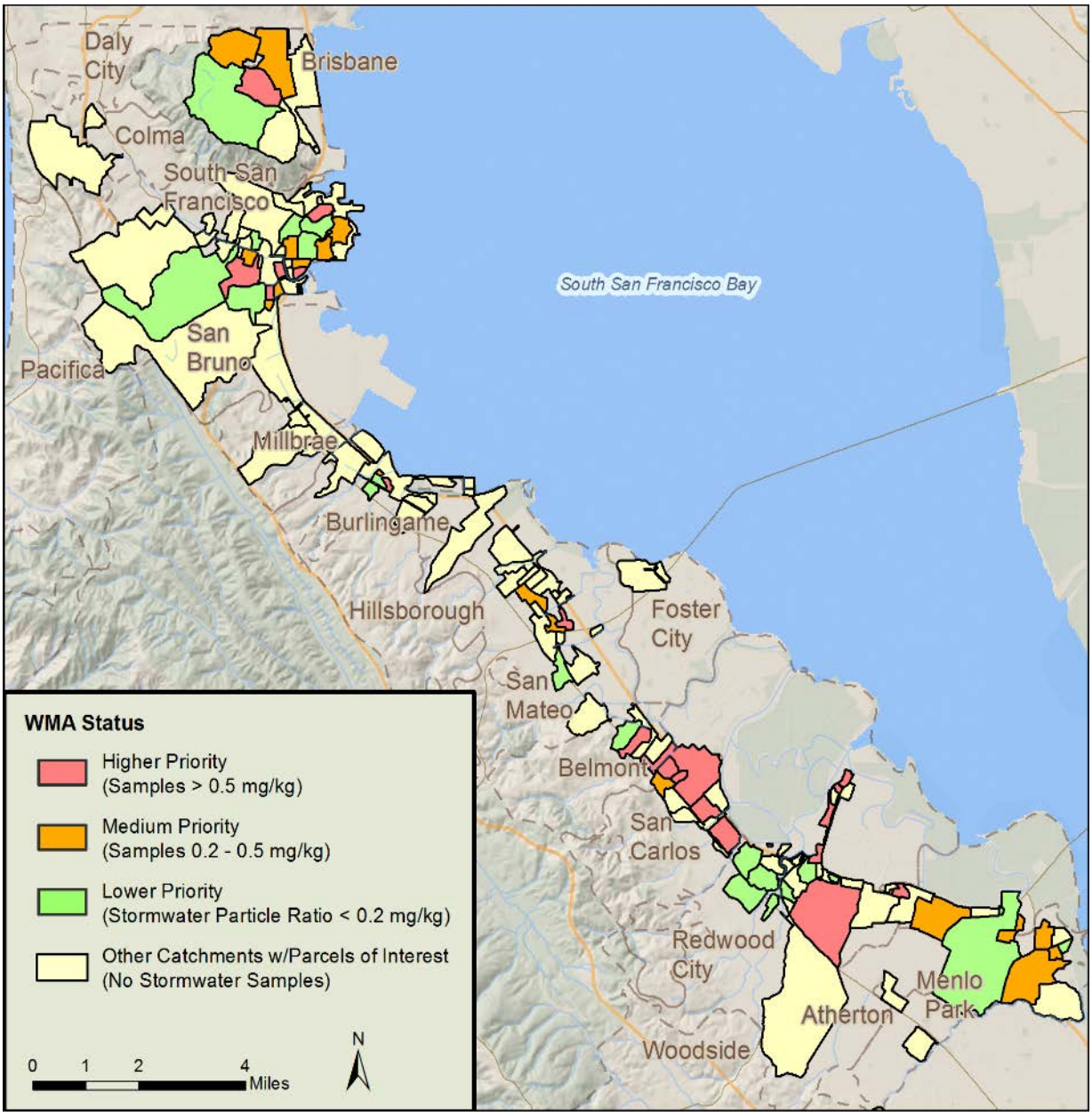

Figure 4. San Mateo County WMA status based on sediment and stormwater runoff data collected through WY 2017.

City of Brisbane

WMAs in the City of Brisbane with PCBs particle ratio concentrations over 0.2 mg/kg in stormwater runoff samples, elevated concentrations of PCBs in sediment samples, and/or other features relevant to investigating sources of PCBs are shown in Figure 5 and briefly described below. It should be noted that the industrial area in the northeast corner of Figure 5 drains to San Francisco's combined sewer and is therefore considered non-jurisdictional.

WMA 17

WMA 17 is a large catchment that corresponds to the watershed of the now underground Guadalupe Creek. It contains a large industrial area developed mostly in the 1960s and buildings of the type that would be expected to potentially have PCBs in building materials. Several old railroad lines used to support the industries. A sediment sample in one of the two main lines under Valley Drive had elevated levels of PCBs (1.22 mg/kg) despite potential dilution due to the large size of the watershed. Additional followup samples have not yet been collected. A stormwater runoff sample collected by the RMP in WY 2016 (SM-BRI-17A or Valley Dr SD) had a PCBs particle ratio concentration of 109 ng/g, a relatively moderate level of PCBs for the Bay Area.

WMA 1004

WMA 1004 is located along Tunnel Avenue in the Brisbane Baylands area. Sample SM-BRI-1004A (Tunnel Avenue Ditch) was collected by the RMP in WY 2016 and (as with the above WMA 17 sample) had a PCBs particle ratio concentration of 109 ng/g, a relatively moderate level of PCBs for the Bay Area. The catchment contains all of the Brisbane Baylands old railyard and a large PG&E property on Geneva Avenue. The Baylands area is an active cleanup site (although not for PCBs) and will eventually be redeveloped. Several sediment samples collected in past years in the vicinity of the PG&E property and historical railroad lines had relatively low PCBs concentrations.

WMA 350

WMA 350 is upstream of WMA 1004, and contains a PCBs cleanup site Bayshore Elementary which was redeveloped in 2017. The PCBs were associated with the original building materials and it therefore appears unlikely that there is an ongoing source of PCBs to the MS4.

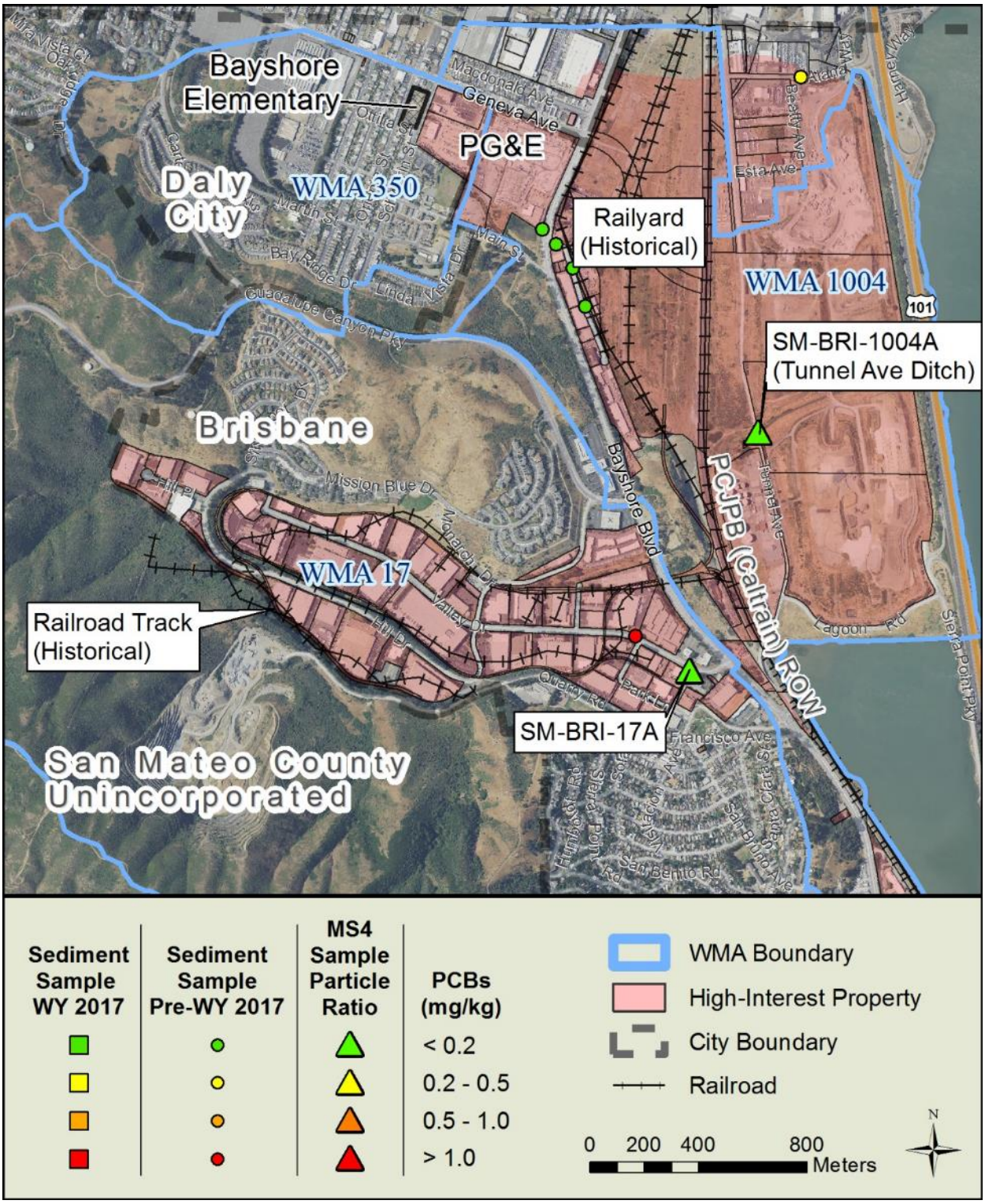

Figure 5. WMAs 17, 350, and 1004.

City of South San Francisco

WMAs in the City of South San Francisco with PCBs particle ratio concentrations over 0.2 mg/kg in stormwater runoff samples, elevated concentrations of PCBs in sediment samples, and/or other features relevant to investigating sources of PCBs are shown in Figures 6 through 10 and briefly described below.

WMA 291

WMA 291 is a relatively large catchment that is comprised almost entirely of old industrial land uses. A stormwater runoff sample collected by the RMP in WY 2017 had an elevated PCB particle ratio concentration (736 ng/g). A 2002 sediment sample at 245 S. Spruce Avenue had an elevated PCBs concentration of 2.72 mg/kg. Samples in WY 2015 and WY 2017 on Linden Avenue near Dollar Avenue were also moderately elevated for PCBs (0.48 and 0.44 mg/kg).

WMA 294

WMA 294 is a 67 acre catchment that drains into Colma Creek at Mitchell Avenue. Within the WMA is 166 Harbor Way, also known in the DTSC Envirostor database as "Caltrans/SSF Maintenance Station." This property was purchased by Caltrans which tested the soil and found several contaminants including PCBs. The contaminated soil has been capped since at least 2005 and the property is currently mostly vacant with a small portion devoted to k-rail storage. A sediment sample was collected in the driveway of this property in WY 2017 had a moderate PCBs concentration of 0.28 mg/kg. A stormwater runoff sample collected in WY 2017 had a moderately elevated PCBs particle ratio concentration (367 ng/g).

WMA 314

WMA 314 is a 66 acre catchment located near Oyster Point that is comprised of light industrial land uses along with an old railroad right-of-way. Site SM-SSF-314A (Gull Dr. SD) was sampled by the RMP in WY 2016 and had an elevated PCBs particle ratio concentration (859 ng/g), with a relatively low suspended sediment concentration (SSC) of 10 mg/L. Two sediment samples collected in WY 2017 both had relatively low (urban background) concentrations of PCBs, with the highest concentration being 0.15 mg/kg.

WMA 319

WMA 319 is also located near Oyster Point. Sample SM-SSF-319A (Forbes Blvd Outfall) was collected by the RMP in WY 2016 and had a relatively low PCBs particle ratio concentration of 80 ng/g. Although the catchment was historically industrial, it is now mostly redeveloped and composed of biotechnology corporations. A sediment sample in WY 2017 also had a relatively low (urban background) PCBs concentration.

WMA 358

WMA 358 is a small 32 acre catchment that drains into Colma Creek at Utah Avenue. A sediment sample in WY 2015 had elevated concentrations of PCBs (1.46 mg/kg). Three followup samples in WY 2017 all had relatively low (urban background) levels of PCBs, with the highest concentration being 0.09 mg/kg.

WMA 359

WMA 359 is a small 23 acre catchment that drains into Colma Creek behind 222 Littlefield Avenue. In WY 2017 the RMP collected a storm sample elevated in PCBs that had an elevated PCBs particle ratio

concentration of 788 ng/g. The catchment is composed of all old industrial land uses including an old railroad.

WMA 1001

WMA 1001 is a large catchment that is composed of all the non-contiguous small catchments along Colma Creek that have outfall diameters of 18-inches and smaller. In WY 2017 a stormwater runoff sample collected on Shaw Road near the catchment outfall (SM-SSF-1001B) had an elevated PCBs particle ratio (1,710 ng/g). The catchment for this sample is very small and only drains about five light industrial properties along Shaw Road. A sediment sample collected from a storm drain inlet just south of the catchment in WY 2015 had a PCBs concentration of 0.46 mg/kg, providing more evidence that there is a PCBs source(s) in the area.

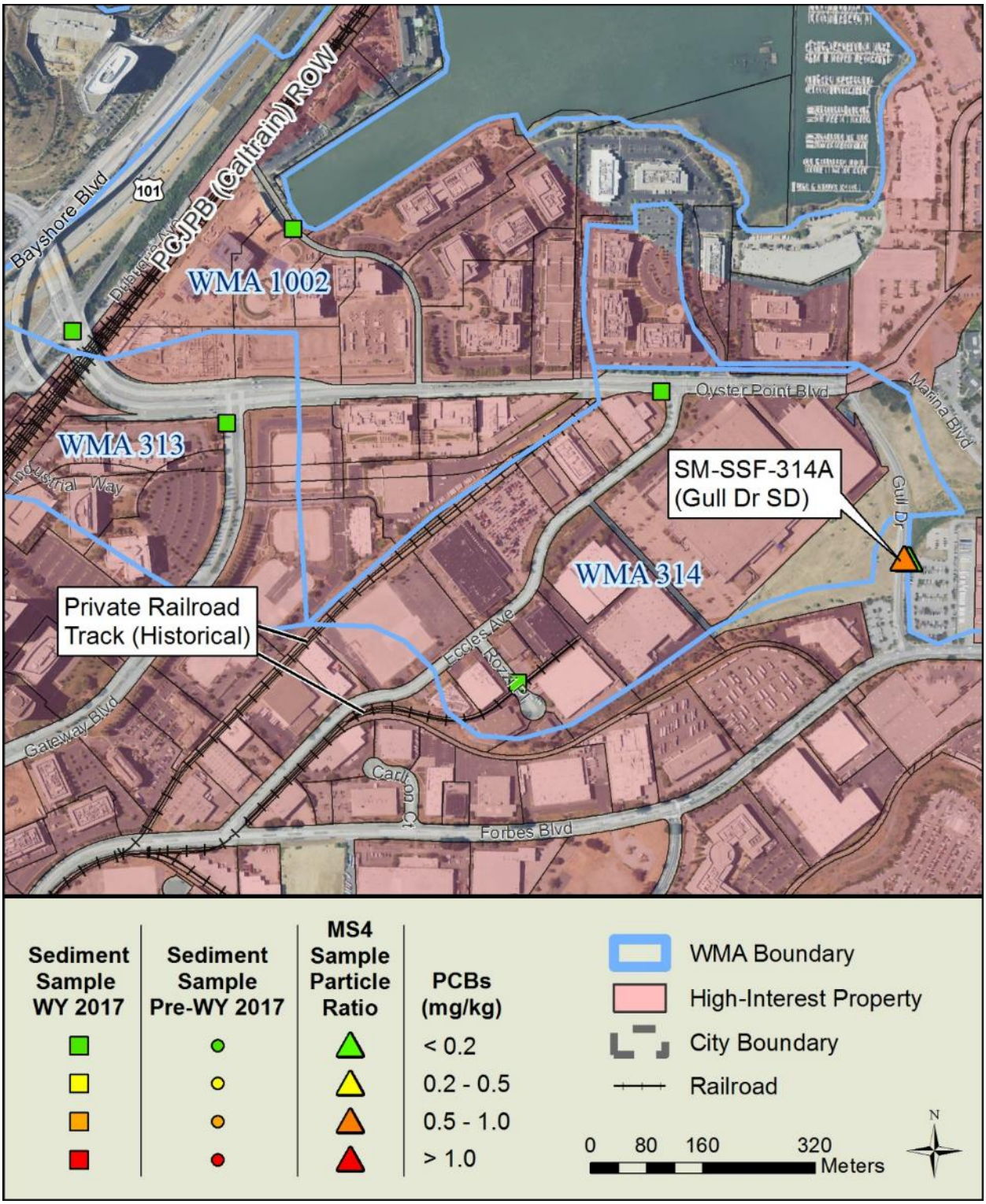

Figure 6. WMAs 313, 314, and 1002

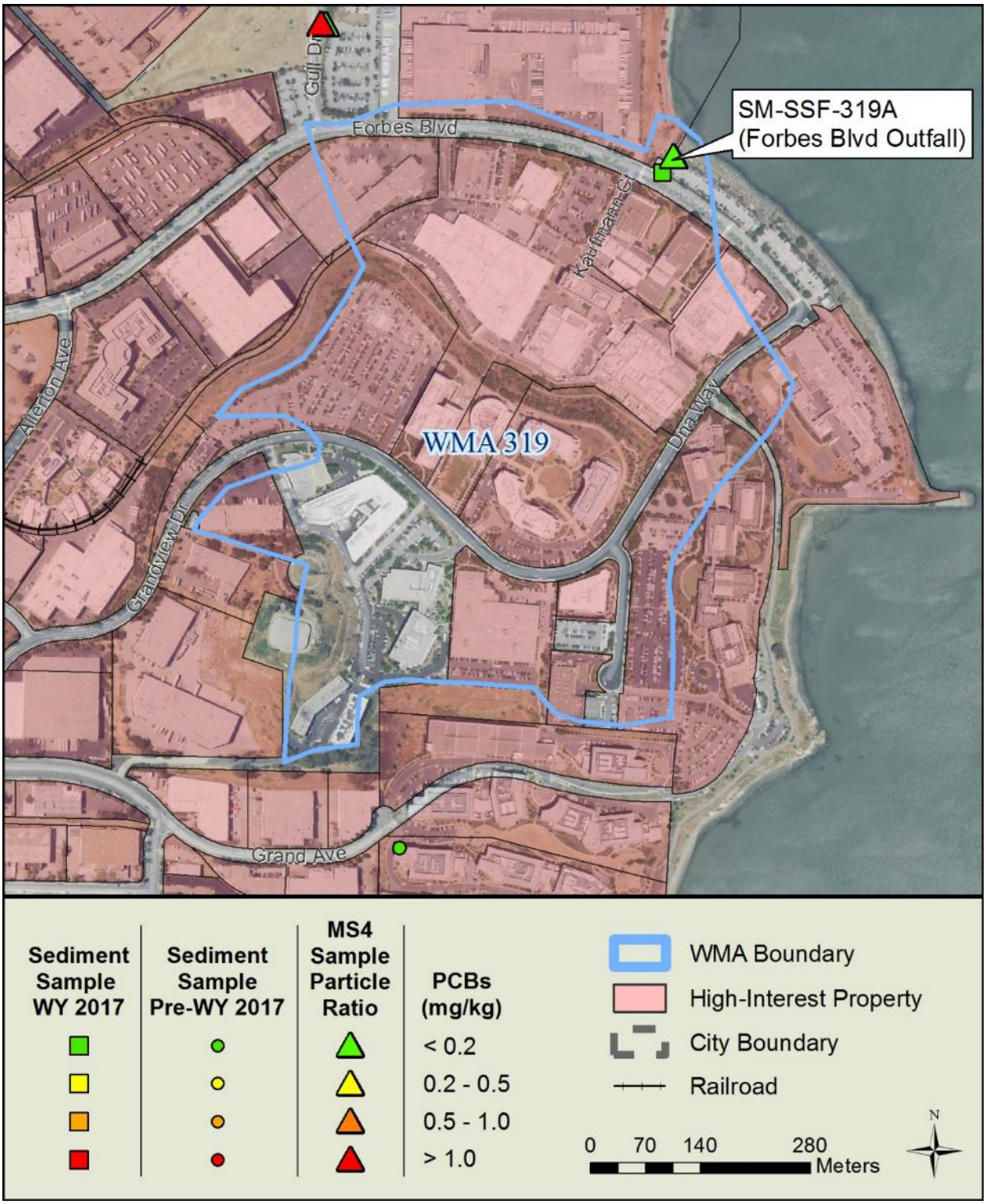

Figure 7. WMA 319

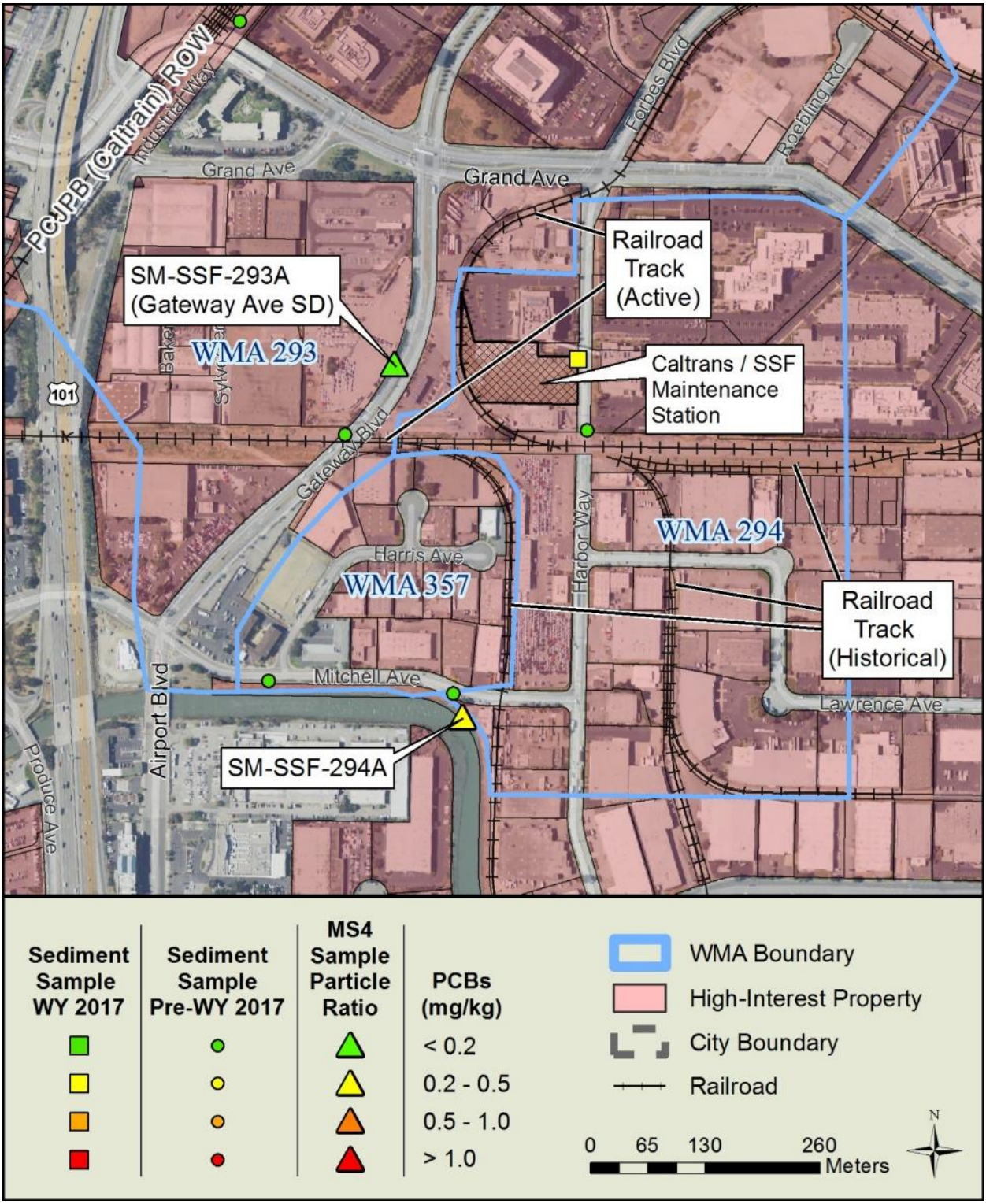

Figure 8. WMAs 293, 294, and 357

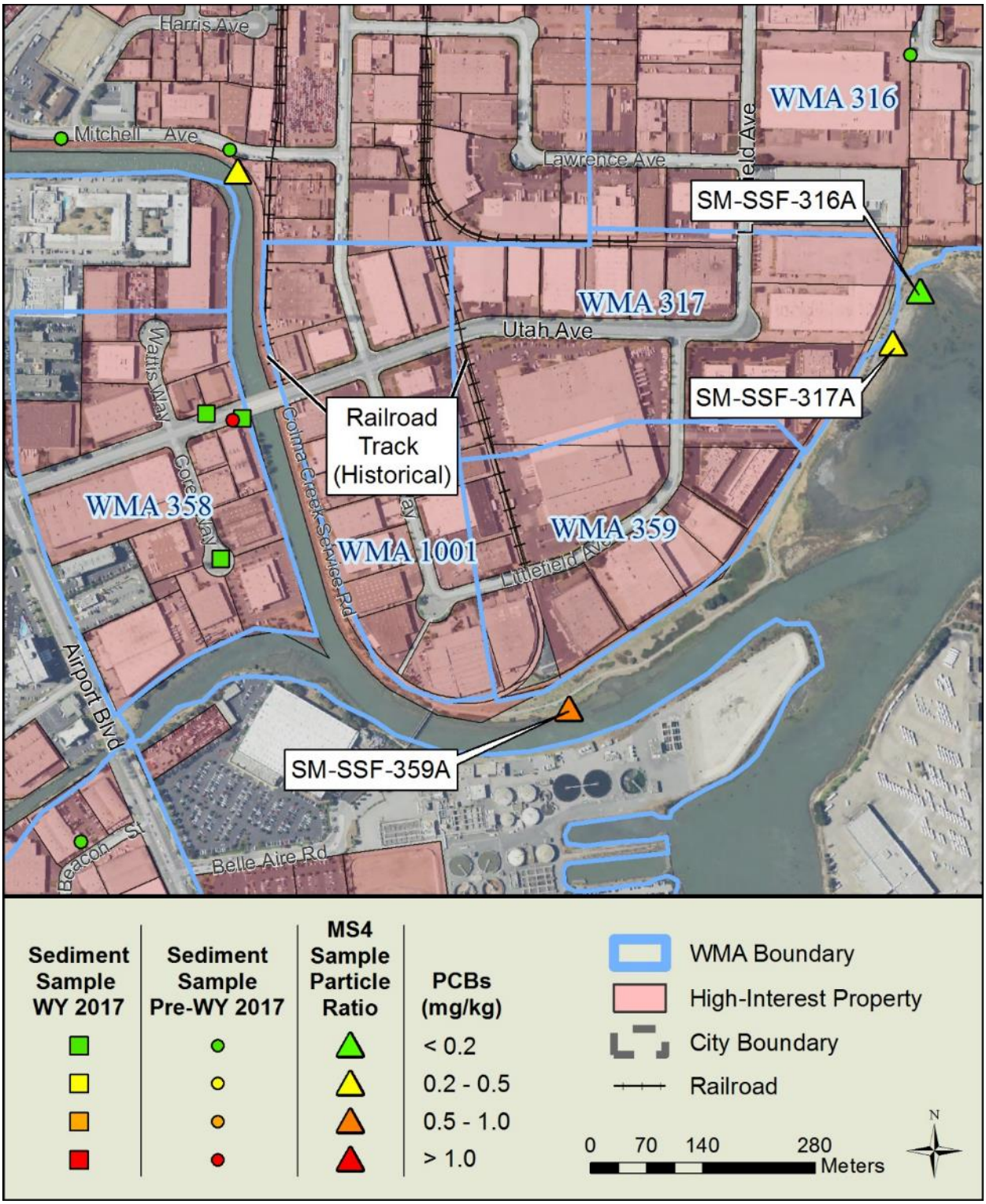

Figure 9. WMAs 316, 317, 358, 359, and 1001

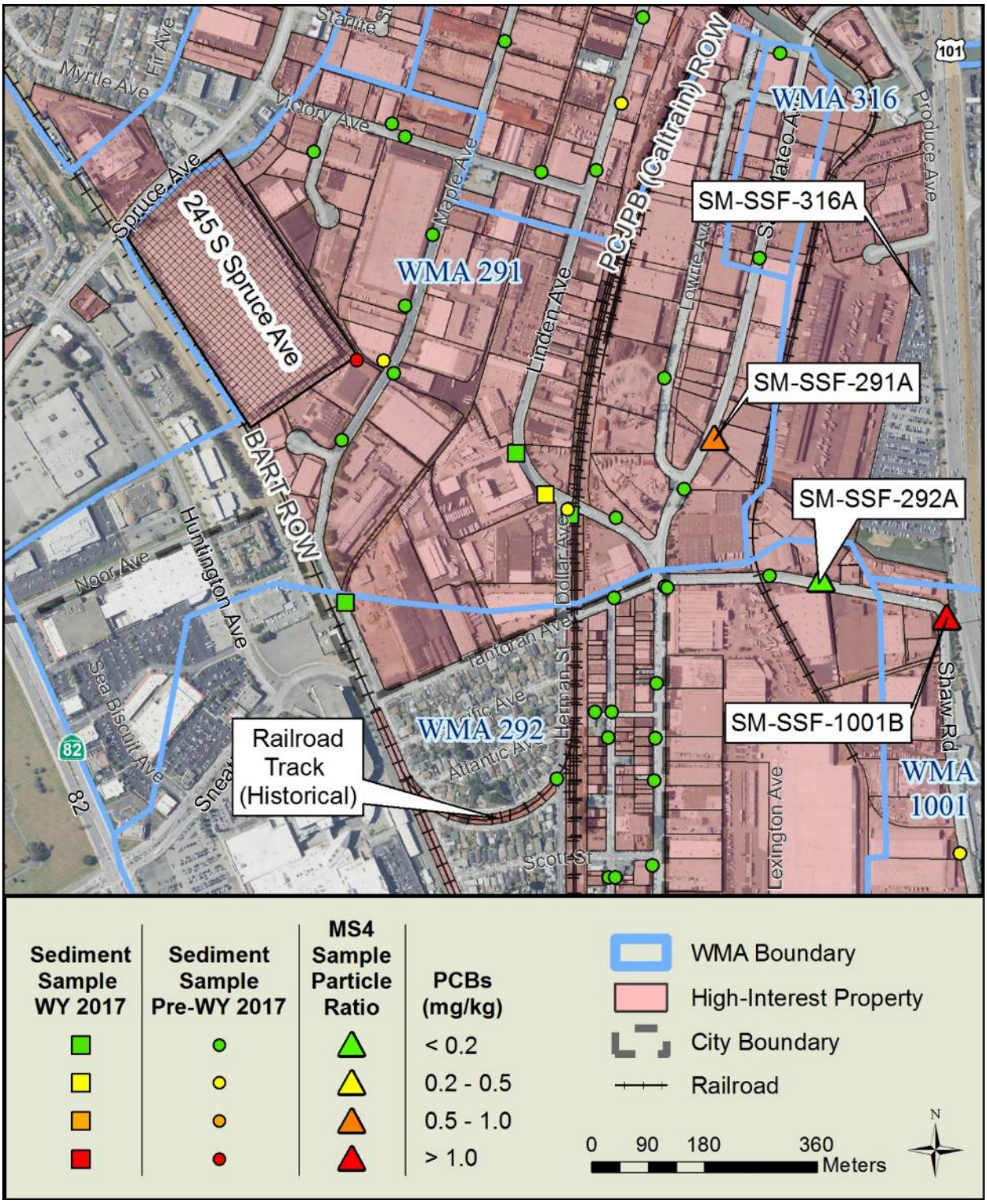

Figure 10. WMAs 291, 292, 316, and 1001

City of Burlingame

WMAs in the City of Burlingame with PCBs particle ratio concentrations over 0.2 mg/kg in stormwater runoff samples, elevated concentrations of PCBs in sediment samples, and/or other features relevant to investigating sources of PCBs are shown in Figure 11 and briefly described below. The PCBs concentrations in fourteen previous sediment samples in the industrial parts of Burlingame have all been relatively low. The larger industrial WMAs in Burlingame, WMAs 85 and 164, were both sampled in WY 2018 but the results are not yet available.

WMA 142

WMA 142 is a small 20 acre catchment that is comprised mostly of industrial land uses. Sample SM-BUR-142A was part of a trio of stormwater runoff samples collected at the forebay of the Marsten Road pump station. It had a relatively high PCBs particle ratio concentration (670 ng/g). SM-BUR-1006A, which was collected at the same location but drains adjacent WMA 1006, had a moderately elevated PCBs particle ratio concentration (365 ng/g). A sediment sample collected in WY 2015 in WMA 142 had a PCBs concentration of 0.15 mg/kg, which falls within the range considered urban background.

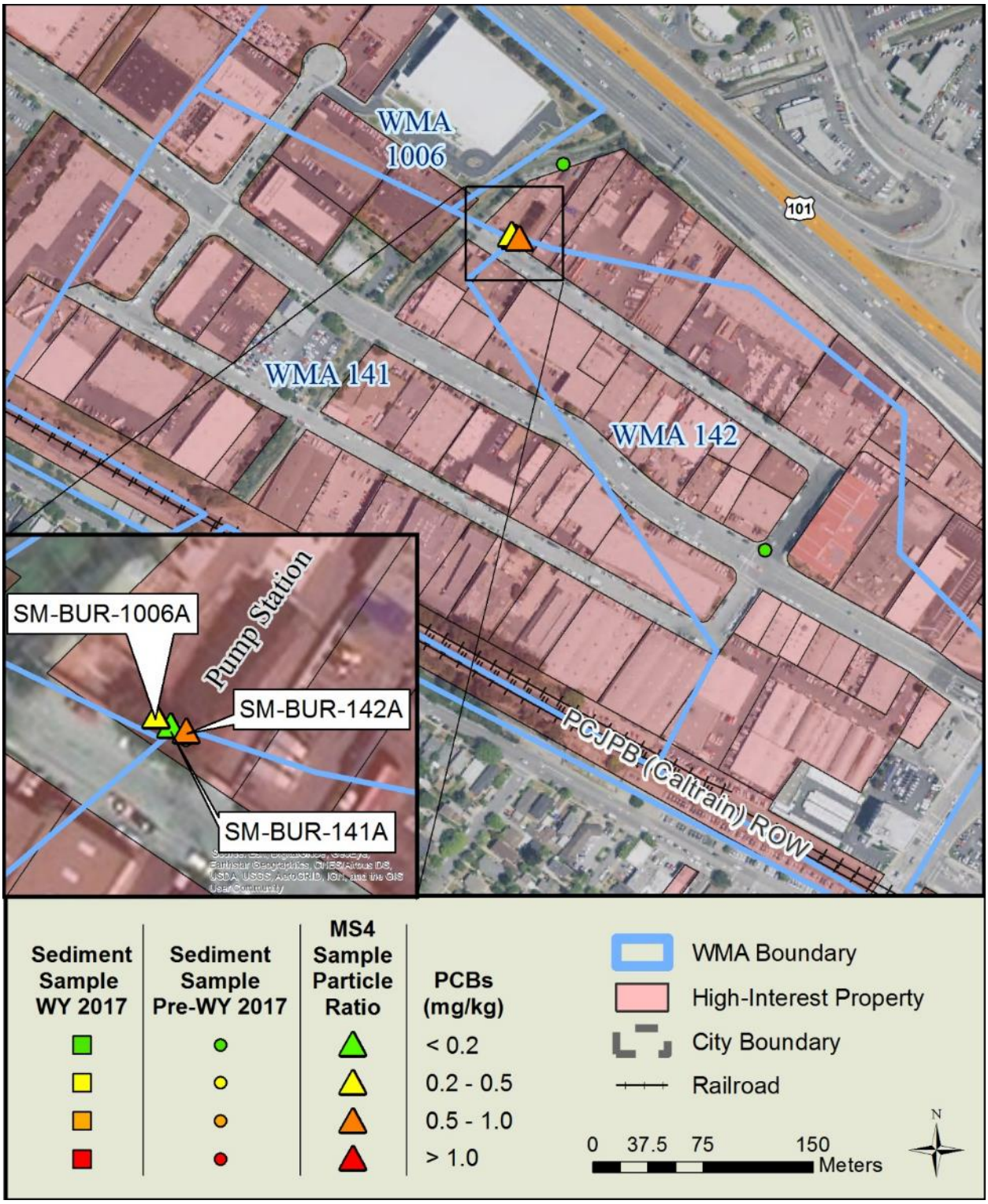

Figure 11. WMAs 141, 142, and 1006

City of San Mateo

WMAs in the City of San Mateo with PCBs particle ratio concentrations over 0.2 mg/kg in stormwater runoff samples, elevated concentrations of PCBs in sediment samples, and/or other features relevant to investigating sources of PCBs are shown in Figure 12 and briefly described below.

WMA 156

WMA 156 is a 40 acre catchment that flows north into the 16th Street Channel at Delaware Street. Historically it contained old industrial land uses. It drains Caltrain property including the Hayward Park Station. There is a major retail redevelopment project currently underway in the WMA. A stormwater runoff sample collected in WY 2017 near the catchment outfall had a moderately elevated PCB particle ratio concentration (204 ng/g) but a sediment sample collected upstream did not have an elevated PCBs concentration.

WMA 408

WMA 408 is a 43 acre catchment next to WMA 156. It does not contain any old industrial land uses and is a mix of retail, commercial and residential land uses, with a relatively low proportion (16%) of high interest parcels (see Attachment 3). A stormwater runoff sample collected in WY 2017 had a relatively high PCB particle ratio concentration (1,900 ng/g). This result is notable given the lack of industrial land uses and low percentage of high interest parcels.

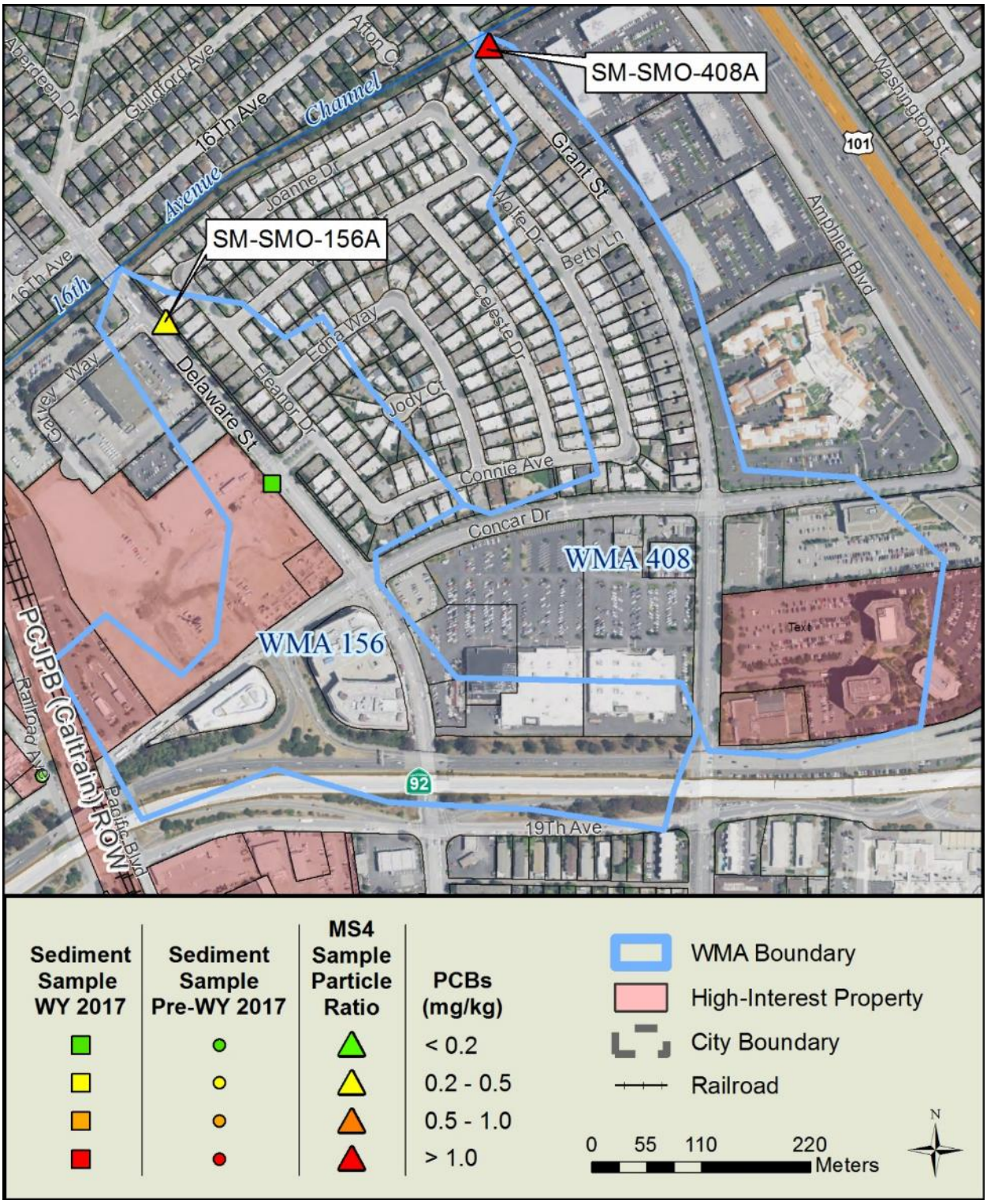

Figure 12. WMAs 156 and 408

City of Belmont

WMAs in the City of Belmont with PCBs particle ratio concentrations over 0.2 mg/kg in stormwater runoff samples, elevated concentrations of PCBs in sediment samples, and/or other features relevant to investigating sources of PCBs are shown in Figure 13 and briefly described below.

WMA 60

WMA 60 is a 298 acre catchment that drains north into Laurel Creek. Two stormwater runoff samples were collected in the catchment in WY 2017 (SM-BEL-60A and SM-BEL-60B). Sample SM-BEL-60A was not elevated but SM-BEL-60B had a relatively high PCBs particle ratio concentration (1022 ng/g). This result was notable since the sample catchment is mostly residential with few high interest parcels.

Figure 13. WMA 60

City of San Carlos

WMAs in the City of San Carlos with PCBs particle ratio concentrations over 0.2 mg/kg in stormwater runoff samples, elevated concentrations of PCBs in sediment samples, and/or other features relevant to investigating sources of PCBs are shown in Figure 14 – 17 and briefly described below.

WMA 75

WMA 75 is a 66 acre catchment comprised entirely of old industrial land uses. Sample SM-SCS-75A (Industrial Rd Ditch) was collected by the RMP in WY 2016 and had a PCBs particle ratio concentration of 6,140 ng/g, which is among the highest levels found in Bay Area stormwater samples collected to-date. The sample station is located where the MS4 daylights into a ditch on the east side of Industrial Road downstream of the adjacent Delta Star and Tiegel Manufacturing properties. The Countywide Program collected seven sediment samples in WY 2017 in the area. Two of these samples were collected near the Delta Star and Tiegel properties. One was collected in the storm drain line directly downstream of both properties and had a very elevated PCBs concentration (49.4 mg/kg). The other was also elevated, with a PCBs concentration of 1.20 mg/kg, and was collected from surface sediments at the location where the Tiegel property drains into the public right-of-way. The remaining samples were not elevated, suggesting that there are no other sources of PCBs in this WMA other than these two properties (Figure 14).

Delta Star manufactures transformers, including transformers with PCBs historically (from 1961 to 1974). This is a cleanup site with elevated PCBs found in on-site soil and groundwater samples. PCBs migrated to the adjacent Tiegel property at 495 Bragato Road, a roughly three acre site that is largely unpaved. A “Removal Action” under DTSC oversight was implemented between June 1989 and January 1991 to remove soil impacted with PCBs exceeding 25 ppm. The Delta Star and Tiegel properties are currently determined to be in compliance with public health, safety, and the environmental cleanup goals based on exposure at the site. However, based on the PCBs concentrations in the sediment and stormwater runoff samples, the site appears to be a source of PCBs to the MS4 and San Francisco Bay at levels that are a concern from the standpoint of the Bay PCBs TMDL (i.e., contribute to bioaccumulation in Bay fish and other wildlife). The Countywide Program is currently working with the City of San Carlos to prepare the documentation to refer this property to the Regional Water Board for potential additional abatement.

WMA 31 (Pulgas Creek Pump Station North)

WMA 31 is a 99 acre catchment that drains to the Pulgas Creek pump station from the north. The RMP collected four stormwater runoff samples from this catchment during two storms in WY 2011. The samples were all elevated, with an average PCBs particle ratio concentration of 893 ng/g. In addition, street dirt and sediment samples with elevated PCBs have been collected in front of and in the vicinity of 977 Bransten Road, a property within WMA 31 (Figure 15). The current occupant of this property is GC Lubricants. 977 Bransten Road is a DTSC cleanup site due to soil and groundwater contamination with PCBs and other pollutants associated with activities at GC Lubricants and California Oil Recyclers, Inc., a previous tenant at the site. 1007/1011 Bransten Road is the property located adjacent to and immediately north of 977 Bransten Road and designated the “Estate of Robert E. Frank.” A DTSC “Site Screening Form” describes PCBs in the subsurface on both sides of border between the two properties and states there may have been a historic source on both sides of the property line. Abatement measures have been implemented to reduce movement of contaminated soils from the properties, including a concrete cap over contaminated areas. However, the available information suggest that

soils/sediments with PCBs are migrating from these properties into the public ROW, including the street and the MS4. The Countywide Program is currently working with the City of San Carlos to prepare the documentation to refer this property to the Regional Water Board for potential additional abatement.

WMA 210 (Pulgas Creek Pump Station South)

WMA 210 drains to the Pulgas Creek pump station from the south (Figures 16 and 17). The RMP has collected 33 storm samples from this catchment with an average PCBs particle ratio concentration of 8,220 ng/g, the highest of any stormwater runoff sampling location in the Bay Area. There appear to be several sources of PCBs within this WMA.

The best documented of these sites is the property at 1411 Industrial Road. A sediment sample with a very elevated PCBs concentration (193 mg/kg) was previously collected from a storm drain inlet located in the parking lot of this about 1.3 acre property. The property drains to the MS4 at a sidewalk manhole where other elevated sediment samples have been collected. Since 2012 the occupant of this property has been a Habitat for Humanity Re-Store. Before that the property was occupied by an auto body shop and an automotive paint company. Between 1958 and 1994, Adhesive Engineering / Master Builders, Inc. was the occupant and conducted manufacturing, research and development of construction grade epoxy resin and products. Adhesive Engineering / Master Builders, Inc. had a history of violations for leaky wastewater drums and improper storage of hazardous wastes in the late 1980s and early 1990s, and PCBs were reportedly used on the site in the past. An environmental assessment report conducted as part of a business closure in 1994 revealed that 93 mg/kg PCBs was found in a soil sample collected in 1987. The soil sample was collected beneath an aboveground tank that was heated by oil-containing PCBs circulating in coils around the tank. The report also described the removal in 1987 of 44 cubic yards of contaminated soil from the area where the tank was located. As part of the 1994 environmental assessment, a soil sample was collected from the same area and PCBs were not detected at that time, but soil samples from other areas on the property were not collected and tested for PCBs. The above information suggests that the 1411 Industrial Road property is a source of PCBs to the MS4. The Countywide Program is currently working with the City of San Carlos to prepare the documentation to refer this property to the Regional Water Board for potential additional abatement.

In WY 2017, the Countywide Program collected ten sediment samples from the WMA 210 to better delineate the sources of PCBs in this catchment. Three samples were collected in the vicinity of 1411 Industrial Road to help rule out that neighboring properties are PCBs sources. All three of these samples had relatively low PCBs concentrations, with the highest having a PCBs concentration of 0.07 mg/kg, which helps to verify that the properties to the east and south are not also sources. Multiple sediment samples previously collected around the PG&E substation across the street also had relatively low levels of PCBs, suggesting that this property is not a source. PCBs from unknown sources were previously found in inlets and manholes in the vicinity of Center, Washington and Varian Streets and Bayport Avenue (Figure 17). The PCBs in these samples could have originated from any of about 20 small industries on these streets. During WY 2017, seven additional samples were collected in this area. The results suggest that three small properties may be PCBs sources. Two samples collected from the driveways of 1030 Washington Street, a construction business, had elevated PCBs (1.29 and 3.73 mg/kg). A sample from the driveway of 1029 Washington Street was also elevated with a concentration of 5.64 mg/kg. In addition, samples from the driveway of 1030 Varian Street, an unpaved lot used for storage, had an elevated PCBs concentration of 1.84 mg/kg. It should be noted that all of the buildings in this area appear to be of the type and age that may have PCBs in building materials. The Countywide Program is currently working with the City of San Carlos to determine next steps for these properties.

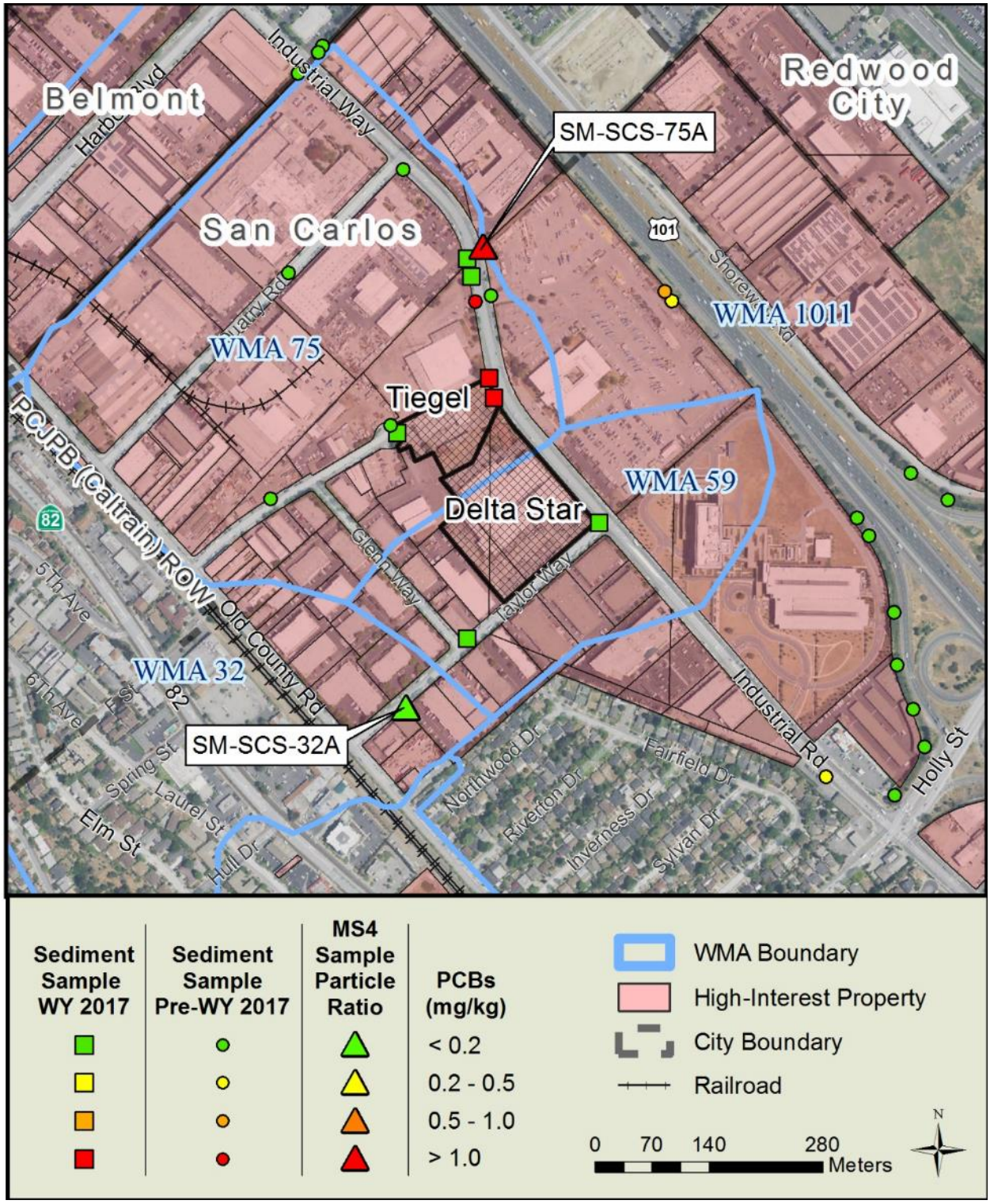

Figure 14. WMAs 59, 75, and 1011

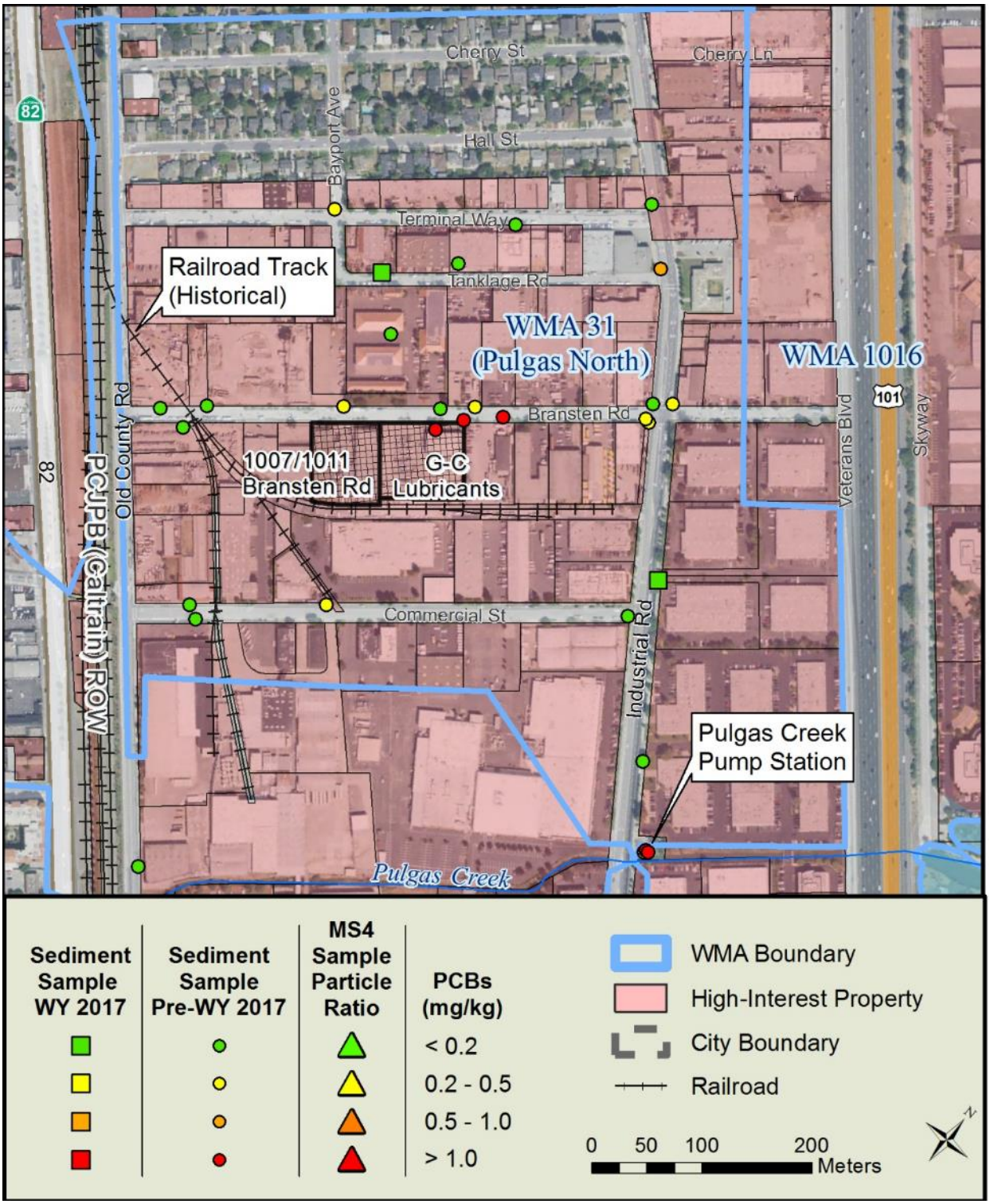

Figure 15. WMA 31

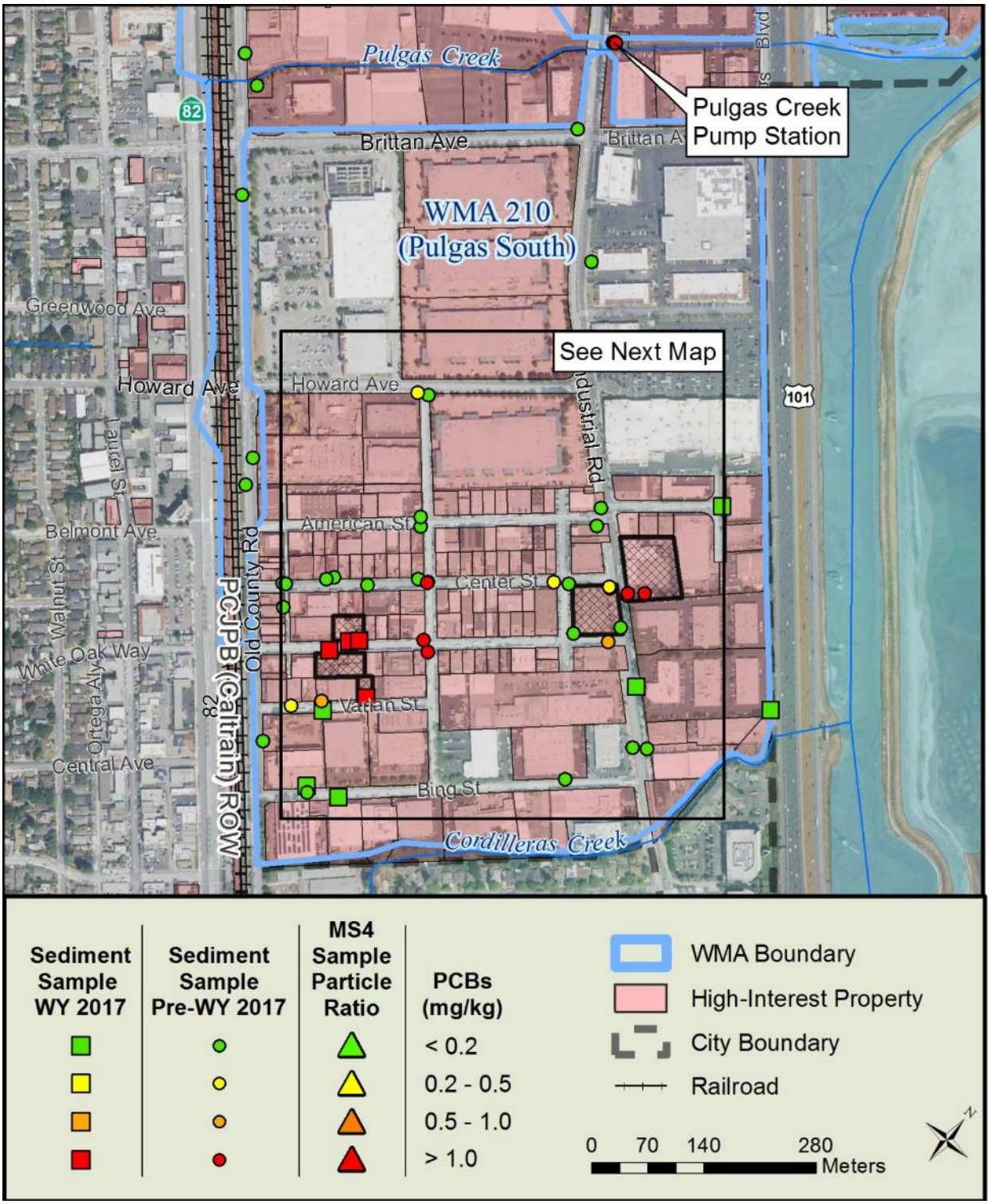

Figure 16. WMA 210

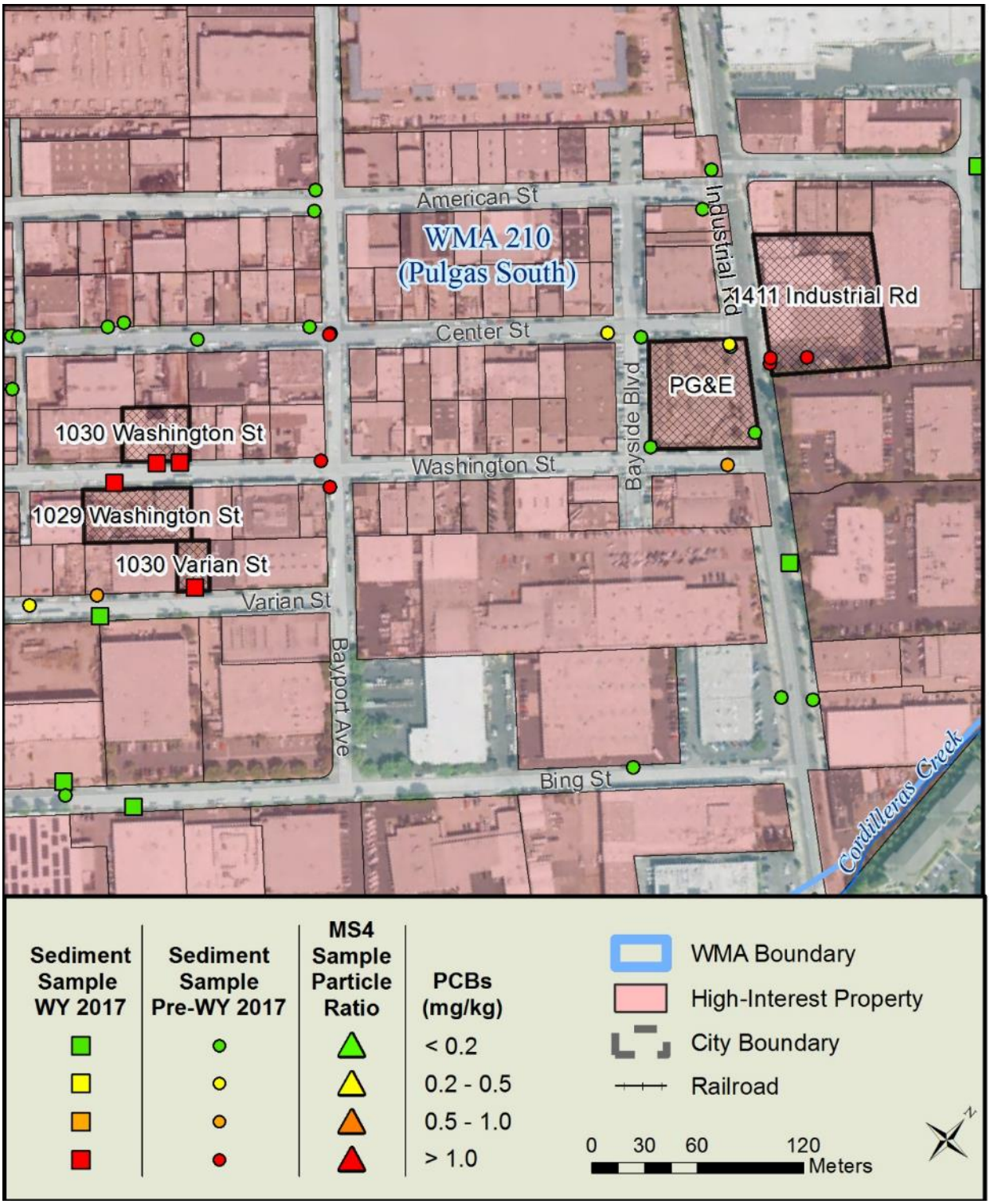

Figure 17. WMA 210 – Enlargement of Sampled Area

City of Redwood City

WMAs in the City of Redwood City with PCBs particle ratio concentrations over 0.2 mg/kg in stormwater runoff samples, elevated concentrations of PCBs in sediment samples, and/or other features relevant to investigating sources of PCBs are shown in Figure 18 – 21 and briefly described below.

WMA 239

WMA 239 (Figure 21) is a 36 acre mostly industrial catchment that is half in Redwood City and half in Menlo Park. In WY 2015 SMCWPPP collected a sediment sample that had an elevated PCBs concentration of 0.57 mg/kg. Five additional sediment samples were collected in WY 2017, all of which had relatively low (urban background) PCBs concentrations, with the highest concentration being 0.16 mg/kg. Currently in this WMA there is a large housing redevelopment that is almost complete. One of the industries that was redeveloped (Haven Avenue Industrial Condominiums) at 3633 Haven Ave is in Geotracker and was remediated for PCBs contamination in 2006. Stormwater runoff sampling has not been conducted in this catchment and would be challenging since there is no public access to the catchment outfall (which discharges to the Bay).

WMA 379

WMA 379 (Figures 18 and 19) is an 802 acre catchment located in Redwood City and the unincorporated North Fair Oaks census-designated place (CDP). The catchment is divided into a northerly half (A) and a southerly half (B), each with a distinct MS4 outfall. Both were sampled by the Countywide Program in WY 2016. Sample SM-RCY-379A had a relatively low PCBs particle ratio concentration (105 ng/g). Sample SM-RCY-379B also had a relatively low PCBs particle ratio concentration (182 ng/g). In WY 2017, the Countywide Program collected fifteen samples in WMA 379 in an attempt to identify PCBs source along Bay Road and Spring Street, in follow-up to elevated sediment samples collected during previous years. None of nine samples collected in the Bay Road near Hurlingame Avenue area was elevated, with the highest PCBs concentration being 0.14 mg/kg. A single sample collected from an inlet at the back of the sidewalk in front of 2201 Bay Road had a PCBs concentration of 1.97 mg/kg. This site is the location of two properties on Geotracker listed for PCBs: Tyco Engineering Products and the railroad spur next to the property. The Tyco site was remediated and redeveloped (MRP Provision C.3 compliant) and is currently a parking lot for Stanford Hospital. Four sediment samples were collected on Spring Street in WY 2017. None was elevated, with the highest PCBs concentration being 0.08 mg/kg.

WMA 405

WMA 405 (Figure 20) consists almost entirely of SIMS Metal Management at the Port of Redwood City. A sample from the driveway of SIMS in WY 2017 was moderately elevated with a PCBs concentration of 0.75 mg/kg. The site has recently made efforts to prevent metal fluff potentially containing a variety of contaminants (including PCBs) from entering the Bay.

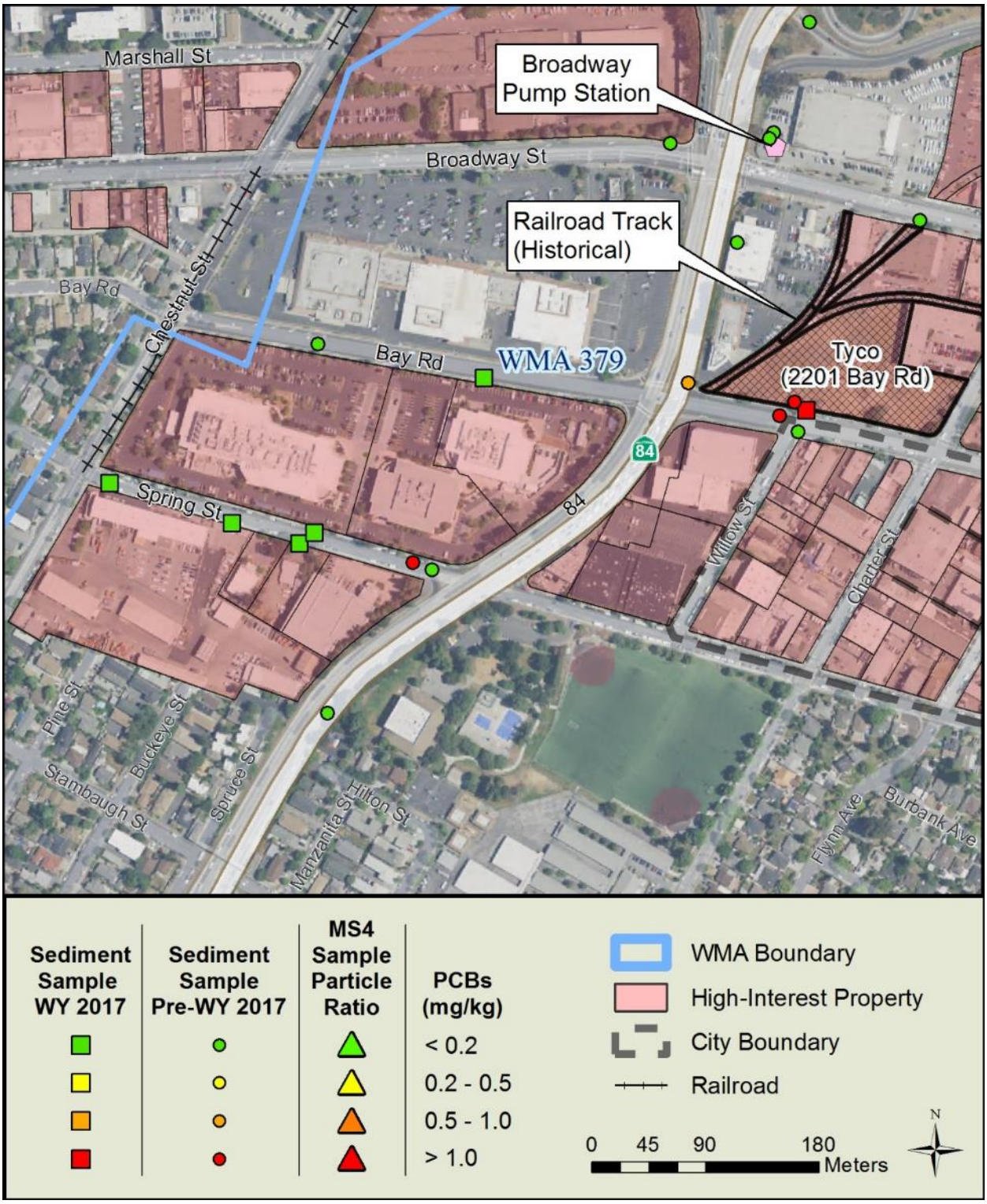

Figure 18. WMA 379 northwest

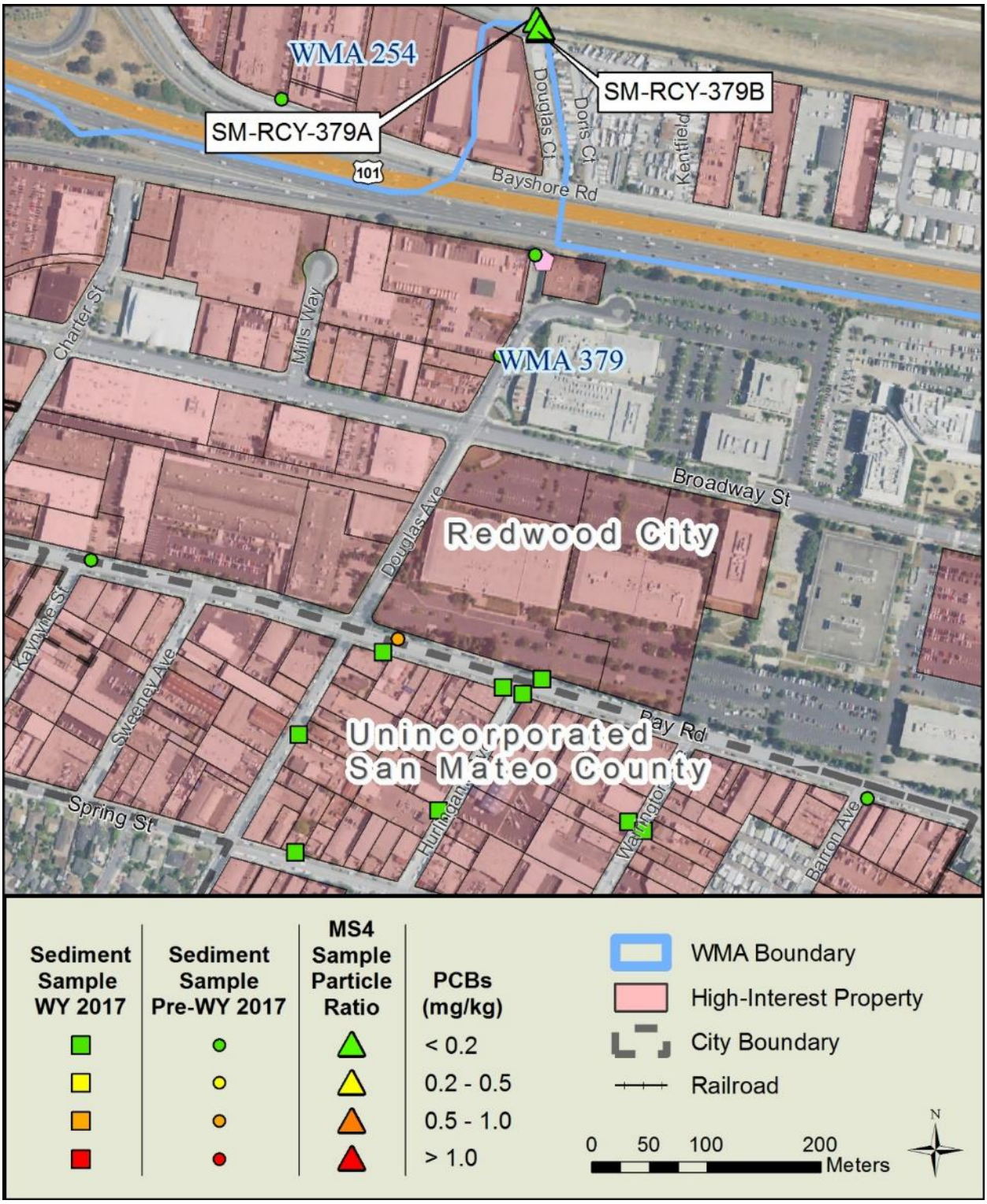

Figure 19. WMAs 254 and 379 southeast

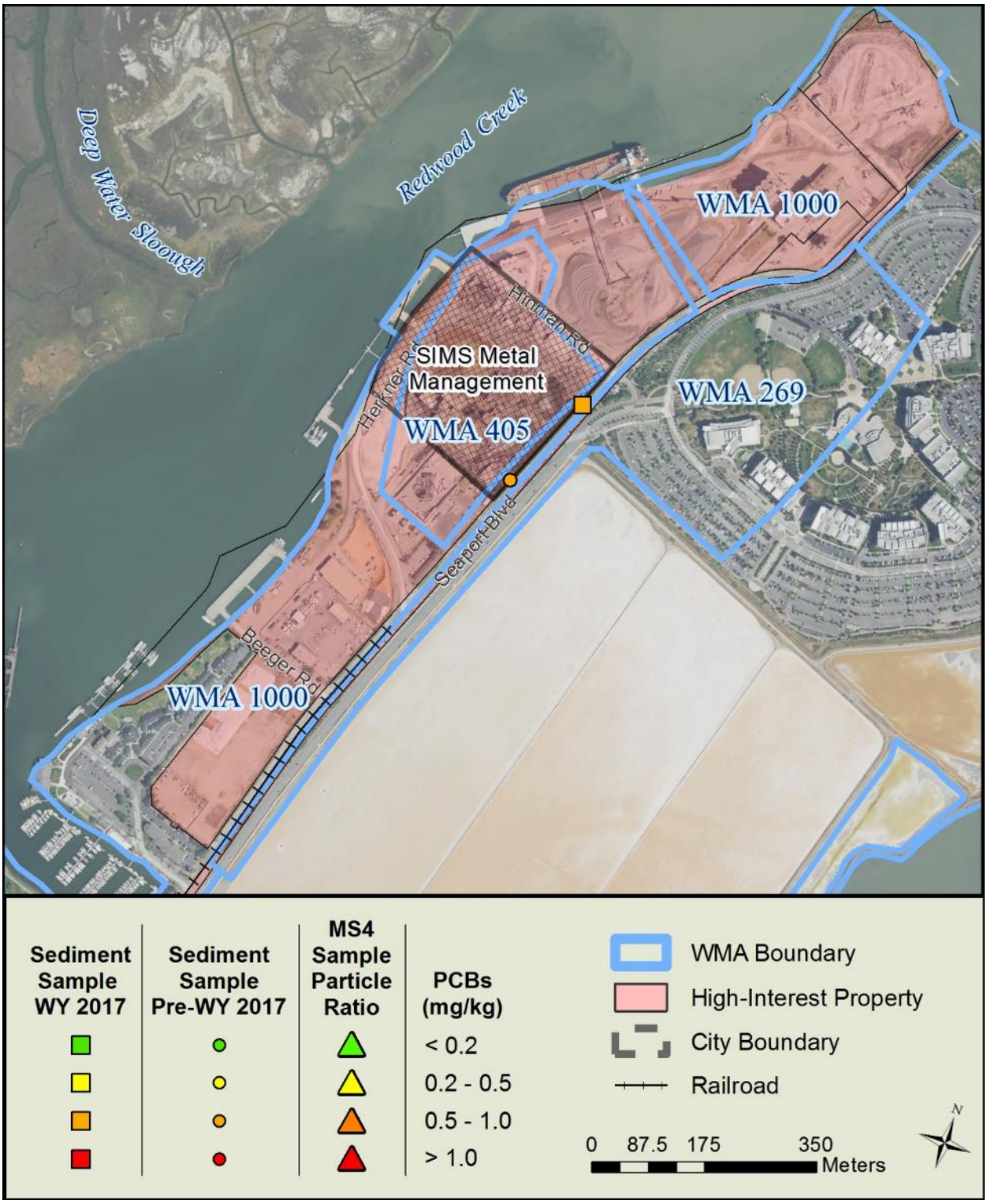

Figure 20. WMAs 269, 405, 1000

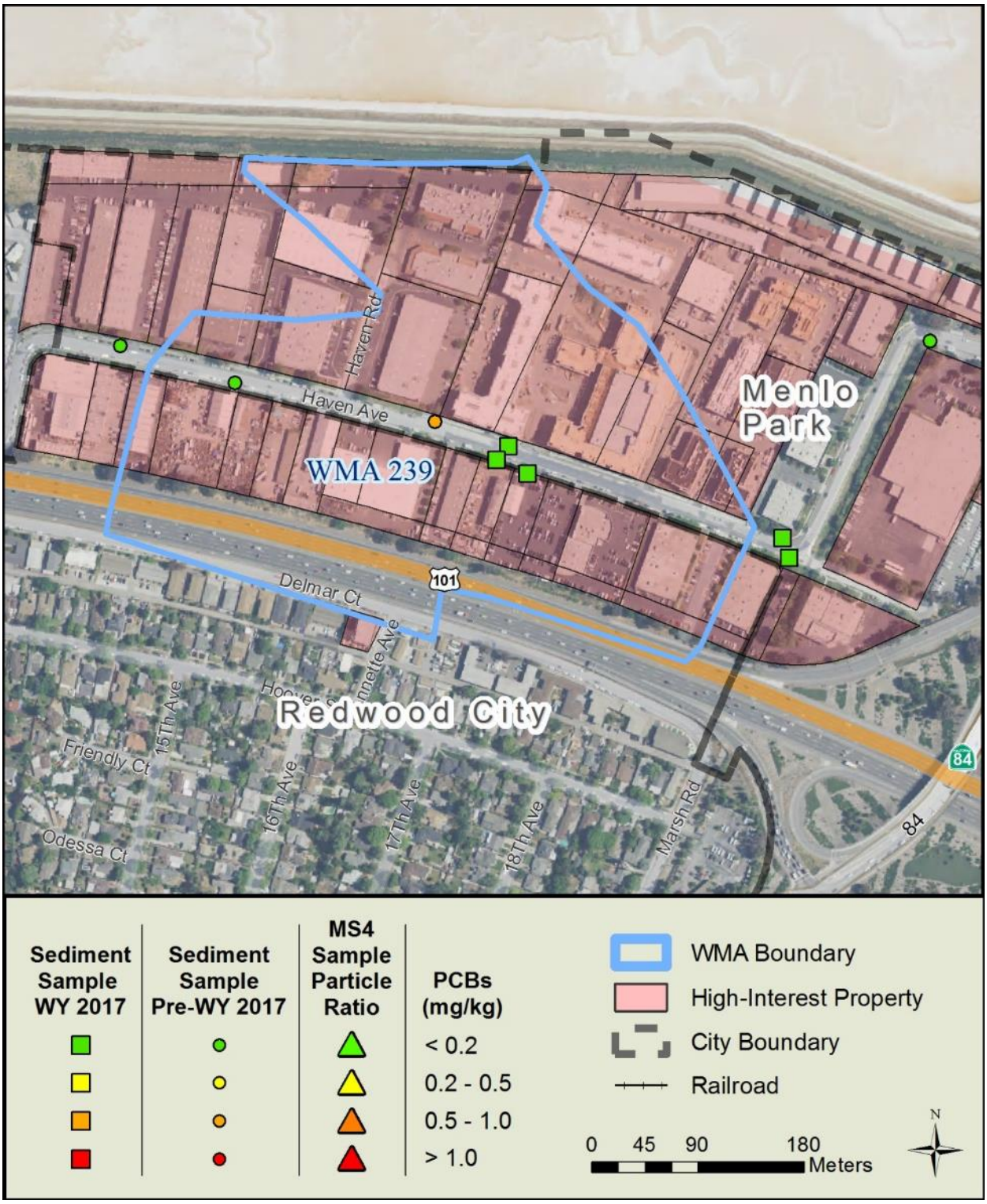

Figure 21. WMA 239

City of East Palo Alto

WMAs in the City of East Palo Alto with PCBs particle ratio concentrations over 0.2 mg/kg in stormwater runoff samples, elevated concentrations of PCBs in sediment samples, and/or other features relevant to investigating sources of PCBs are shown in Figure 22 and briefly described below.

WMA 70

WMA 70 is a 490 acre catchment in the City of East Palo Alto. A storm sample collected by the RMP in WY 2015 had a relatively high PCBs concentration (28.5 ng/L) and a relative average PCB particle ratio (108 ng/g). Three samples were collected in the area in WY 2017 with the highest having a concentration of 0.03 mg/kg.

WMA 1015

WMA 1015 consists of multiple catchments in the City of East Palo Alto. The WMA contains Romic Environmental Technologies Corporation, a property that is known to be contaminated with PCBs and has been vacant for many years. A stormwater sample (SM-EPA-72A) and two sediment samples near the driveway to Romic have all been low in PCBs. However, the property drains directly to the Bay and the outfall is inaccessible. The WMA also contains 391, a landfill that is also known to be contaminated with PCBs. The site is expected to be redeveloped in the future. This property also drains directly to the Bay and is not possible to sample since it is all private property and inaccessible. A sediment sample from an inlet at the north end of Demeter Street was moderately elevated in PCBs with a concentration of 0.21 mg/kg.

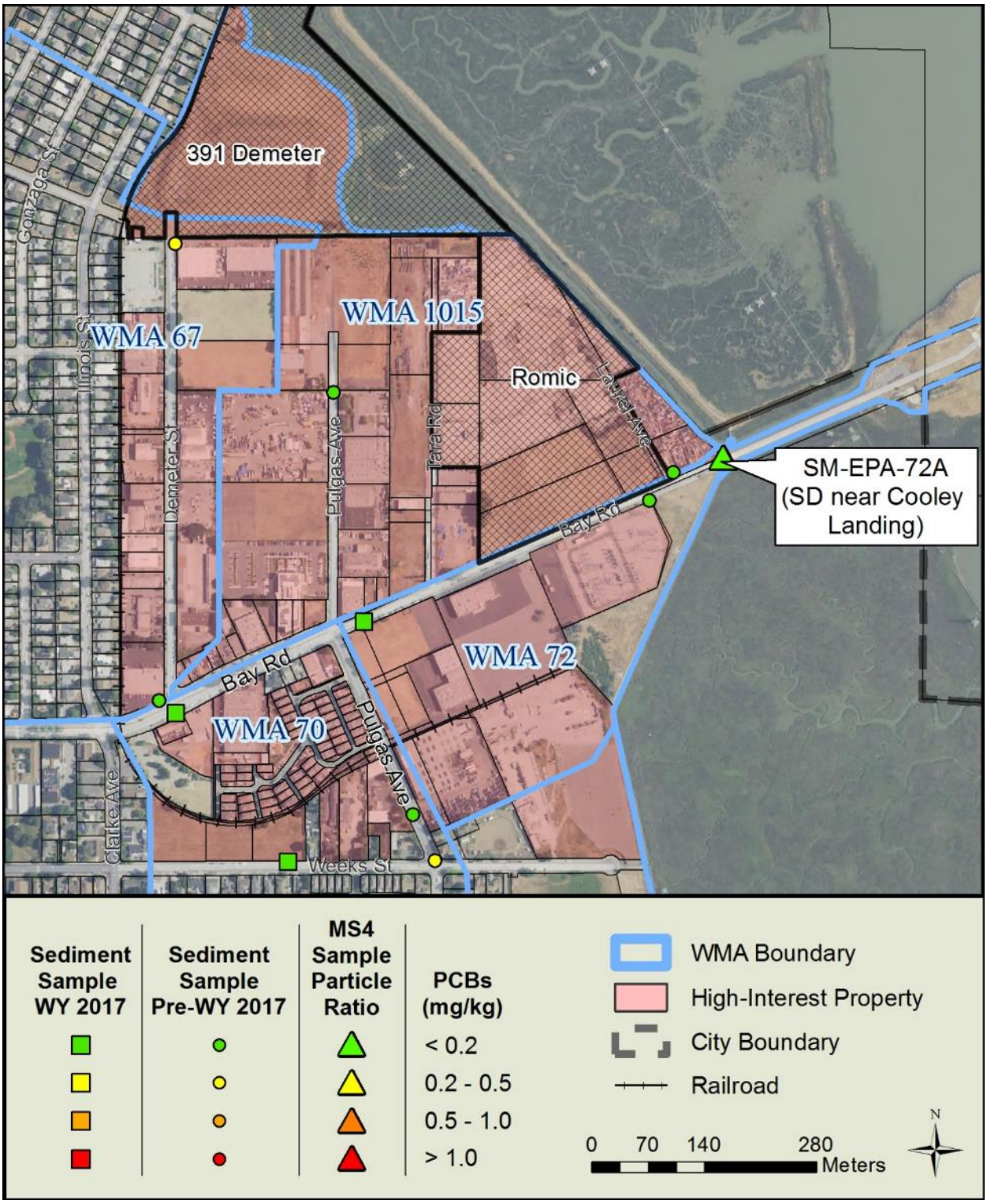

Figure 22. WMAs 70, 72, 1015

2.3. Copper

In WY 2017, the Countywide Program collected a total of six samples for copper analysis[10]:

- One stormwater runoff sample analyzed for copper was collected from a storm drain outfall (SM-SSF-316A) concurrently with one of the PCBs and mercury storm composite samples. The goal of this sample was to address Management Question #4 (Loads and Status) by characterizing copper concentrations in stormwater runoff from highly urban catchments.
- A total of four creek water samples were collected during a large storm event, two samples at upstream and two samples at downstream locations in two creeks: Atherton Creek (samples 204ATH050 and 204ATH010) and Redwood Creek (samples 204RED050 and 204RED010). The goal of this approach was to address Management Question #4 (Loads and Status) by characterizing copper concentrations at upstream and downstream locations in creeks in mixed land-use catchments during a storm event (i.e., while stormwater runoff was being discharged to the creeks).
- The downstream Redwood Creek station (204RED010) was also sampled for copper in May. The goal of this sample (along with the sample collected during a storm event at the same location) was to address Management Question #5 (Trends) by comparing spring baseflow concentrations to stormwater event concentrations measured at this bottom-of-the-watershed location. A similar approach was planned in Atherton Creek but could not be conducted due to dry conditions at the downstream station in the spring (204ATH010).

All samples were analyzed for total copper, dissolved copper[11], and hardness. Results are summarized in Table 6. Comparisons to freshwater water quality objectives are described in Section 3.0.

Table 6. Total and dissolved copper concentrations in water samples collected by the Countywide Program, WY 2017.

Station Code	Description	Sample Date	Total Copper (µg/L)	Dissolved Copper (µg/L)	Hardness as $CaCO_3$ (mg/L)
SM-SSF-316A	Stormwater runoff in urban catchment	12/10/2016	12.7	6.5	34.8
204ATH010	Atherton Creek – downstream station	1/9/2017	12	9.8	260
204ATH050	Atherton Creek – upstream station	1/9/2017	8.4	6.2	200
204RED010	Redwood Creek – downstream station	1/9/2017	13	11	260
204RED010	Redwood Creek – downstream station (spring)	5/22/2017	14	12	380
204RED050	Redwood Creek – upstream station	1/9/2017	8.1	6.4	260

[10] The October 10, 2017 POC Monitoring Report (SMCWPPP 2017b) incorrectly reported that five copper samples were collected in WY 2017. The report inadvertently omitted that the spring sample collected at 204RED010 was analyzed for copper.

[11] In order to simplify the field effort and reduce the risk of sample contamination, SMCWPPP requested that the analytical laboratory conduct the sample filtration required for dissolved copper analysis.

Based on the laboratory results, the following findings were noted:

- As expected, dissolved copper concentrations are lower than total copper concentrations.
- Copper concentrations reported for the stormwater outfall (SM-SSF-316A) were comparable to concentrations measured in creeks. However, the hardness of the outfall water was an order of magnitude less than the creek water.
- Copper concentrations during the January storm event were higher at bottom-of-the-watershed stations in both Atherton and Redwood Creeks (204ATH010 and 204RED010) compared to the upstream stations (204ATH050 and 204RED050), suggesting an influence by stormwater runoff.
- Copper concentrations at the bottom-of-the-watershed station in Redwood Creek (204RED010) were similar between spring baseflow conditions and during the January storm event. However, the higher water hardness during spring baseflows reduces the bioavailability of the copper (see Section 3.0).

2.4. 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 "San Francisco Bay Nutrient Management Strategy" (NMS) is part of a statewide initiative to address nutrient over-enrichment in State waters (Regional Water Board 2012). Its goal is to lay out a well-reasoned and cost-effective program to generate the scientific understanding needed to fully support major management decisions such as establishing/revising objectives for nutrients and dissolved oxygen, developing/implementing a nutrient monitoring program, and specifying nutrient limits in NPDES permits. The NMS monitoring program currently focuses on stations located within San Francisco Bay.

MRP Provision C.8.f requires monitoring for a suite of nutrients (i.e., ammonium, nitrate, nitrite, total Kjeldahl nitrogen (TKN), orthophosphate, and total phosphorus). This list 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 - WY 2014. The prior data collected in freshwater tributaries to San Francisco Bay 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, concurrent with the copper monitoring described in the previous section. Follow-up monitoring at all four stations was attempted during the dry season concurrent with bioassessment monitoring; however, the downstream Atherton Creek station 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. These were stations 204ATH050 (bioassessment station 204R03240) and 204RED050 (bioassessment station 20403496). Nutrient POC monitoring addresses Management Question #4 (Loads and Status). Results are summarized in Table 7. Comparisons to applicable freshwater water quality objectives are described in Section 3.0.

Table 7. Nutrient concentrations in POC water samples collected by the Countywide Program, WY 2017.

Station	Date	Nitrate as N	Nitrite as N	Total Kjeldahl Nitrogen (TKN)	Ammonia as N	Un-ionized Ammonia as N[1]	Ammonium[2]	Total Nitrogen[3]	Dissolved Orthophosphate as P	Phosphorus as P	Upstream (u/s) Station or Downstream (d/s) Station
Atherton Creek											
204ATH010	1/9/2017	2.2	0.006	1.7	0.057	0.0013	0.06	3.91	0.19	0.29	d/s
204ATH050	1/9/2017	1.5	0.006	1.8	0.064	0.0007	0.06	3.31	0.1	0.24	u/s
204ATH050	5/23/2017	ND[4]	0.002	1.2	0.034	0.0005	0.03	1.21	0.05	0.06	u/s
Redwood Creek											
204RED010	1/9/2017	1.5	0.005	1.6	0.046	0.0017	0.04	3.11	0.27	0.36	d/s
204RED010	5/22/2017	0.57	0.028	1.3	0.069	0.0122	0.06	1.9	0.11	0.16	d/s
204RED050	1/9/2017	1.2	0.004	1.4	0.038	0.0011	0.04	2.6	0.2	0.27	u/s
204RED050	5/22/2017	0.37	0.034	0.83	0.093	0.0027	0.09	1.23	0.14	0.16	u/s

Notes:
All constituents reported as mg/L.
[1] Un-ionized ammonia calculated using formula provided by the American Fisheries Society Online Resources.
[2] Ammonium = ammonia – un-ionized ammonia.
[3] Total nitrogen = TKN + nitrate + nitrite. Non-detects valued at ½ method detection limit in calculation
[4] ND - Not Detected.

Based on the laboratory results, the following findings are noted:

- Nutrient concentrations in Atherton Creek were generally slightly higher than nutrient concentrations in Redwood Creek.
- In Redwood Creek, concentrations of all nutrients measured were higher at the downstream station (204RED010) compared to the upstream station (204RED050) during both storm flows and spring baseflows.
- In Atherton Creek, nitrate, total nitrogen, dissolved orthophosphate and phosphorus concentrations were higher at the downstream station (204ATH010) compared to the upstream station (204ATH050). However, TKN and ammonia concentrations were lower at the downstream station. This suggests an organic source of nitrogen in the upper watershed.
- Nutrient concentrations in both creeks were higher during the January storm runoff sampling event compared to the spring baseflow event. This finding is consistent with the draft conceptual model developed by the NMS which suggests that nutrient loads to San Francisco Bay from creeks are highest during the wet season, although considerably less than loads from publicly owned wastewater treatment works (POTWs) (Senn and Novick 2014).

2.5. Emerging Contaminants

Emerging contaminant monitoring is being addressed through Countywide Program's participation in the RMP. The RMP has been investigating Chemicals of Emerging Concern (CECs) since 2001 and established the RMP Emerging Contaminants Work Group (ECWG) in 2006. The goal 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 CECs and minimize their 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. PFOS compounds 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. PFAS compounds and alternative flame retardants (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). The RMP is currently reviewing data available on AFRs to help inform a conceptual model that will be developed in the future.

3.0 COMPLIANCE WITH APPLICABLE WATER QUALITY STANDARDS

MRP provision C.8.h.i requires RMC participants to assess all data collected pursuant to Provision C.8 for compliance with applicable water quality standards. In compliance with this requirement, POC monitoring water sampling data collected in WY 2017 by the Countywide Program were compared to applicable numeric water quality objectives (WQOs). There were no exceedances of applicable WQOs. The comparison to applicable WQOs accounted for the following:

- **Discharge vs. Receiving Water** – WQOs apply to receiving waters, not discharges. WQOs are designed to represent the maximum amount of pollutants that can remain in the water column without causing any adverse effect on organisms using the aquatic system as habitat, on people consuming those organisms or water, and on other current or potential beneficial uses. Only nutrient and most of the copper data were collected in receiving waters. PCB, mercury, and one copper sample were collected within the engineered storm drain network. Dilution is likely to occur when the MS4 discharges urban stormwater (and non-stormwater) runoff into the local receiving water. Therefore, it is unknown whether discharges that exceed WQOs result in exceedances in the receiving water itself, the location where there is the potential for exposure by aquatic life.
- **Freshwater vs. Saltwater** - POC monitoring data were collected in freshwater, above tidal influence and therefore comparisons were made to freshwater WQOs.
- **Aquatic Life vs. Human Health** - Comparisons were primarily made to WQOs for the protection of aquatic life, not WQOs for the protection of human health to support the consumption of water or organisms. This decision was based on the assumption that water and organisms are not likely being consumed from the stations monitored.
- **Acute vs. Chronic Objectives/Criteria** – All monitoring of water for PCBs and mercury and a portion of the copper and nutrient monitoring was conducted during episodic storm events and the results likely do not represent long-term concentrations of the monitored constituents. Storm monitoring data should therefore compared to acute WQOs for aquatic life that represent the highest concentrations of a pollutant to which an aquatic community can be exposed briefly (e.g., 1-hour) without resulting in an unacceptable effect. Spring baseflow monitoring data should be compared to chronic WQOs.

Of the WY 2017 POC monitoring station analytes, WQOs for the protection of aquatic life have only been promulgated for total mercury, dissolved copper, and unionized ammonia.

- **Total Mercury**. Most of the concentrations of mercury in water reported in WY 2017 were lower than prior years by about an order of magnitude. These data were rejected by the Countywide Program QA/QC Officer (see Section 2.1). In addition, these stormwater runoff sample data (discharge, not receiving water) are not directly comparable to WQOs, as described above. However, all of the WY 2017 and prior water year (see Table 4) mercury concentrations were well below the freshwater acute objective for mercury of 2.4 µg/L.
- **Dissolved Copper.** Acute (1-hour average) and chronic (4-day average) WQOs for copper are expressed in terms of the dissolved fraction of the metal in the water column and are hardness dependent[12]. The copper WQOs were calculated using the measured hardness values and are compared to the measured dissolved copper concentrations in Table 8. For the station located within the MS4 (SM-SSF-316A), hardness was not measured in the receiving water and it is unknown whether the same calculated WQO would apply to the receiving water. This is the only station with a dissolved copper concentration that exceeded the calculated WQO (Table 8). However, as stated above, the sample was collected in the MS4, not the receiving water. Dilution of the MS4 discharge would occur in the receiving water and it is unknown whether the discharge would result in an exceedance of the copper WQO in the receiving water. Furthermore, it is unknown whether the receiving water has the same hardness as the discharge. If the hardness in the receiving water was higher, a higher WQO would be applicable.
- **Nutrients**. The un-ionized ammonia concentrations measured in Countywide Program samples (see Table 7) were well below the annual median objective for un-ionized ammonia of 0.025 mg/L.

Table 8. Comparison of WY 2017 Copper Monitoring Data to WQOs.

Station Code	Sample Date	Hardness as $CaCO_3$ (mg/L)	Acute WQO for Dissolved Copper at Measured Hardness (µg/L)	Chronic WQO for Dissolved Copper at Measured Hardness (µg/L)	Dissolved Copper (µg/L)
SM-SSF-316A	12/10/2016	34.8	5.0	3.6	**6.5**
204ATH010	1/9/2017	260	33	20	9.8
204ATH050	1/9/2017	200	26	16	6.2
204RED010	1/9/2017	260	33	20	11
204RED010	5/22/2017	380	47	28	12
204RED050	1/9/2017	260	33	20	6.4

[12] The current copper standards for freshwater in California do not account for the effects of pH or natural organic matter and can be overly stringent or under-protective (or both, at different times). Therefore, the California Stormwater Quality Association (CASQA) has asked the USEPA to considering updating the California Toxics Rule for copper using the Biotic Ligand Model (BLM) which accounts for the effect of water chemistry in addition to hardness (i.e., temperature, pH, dissolved organic carbon, major cations and anions).

4.0 CONCLUSIONS

In WY 2017, the Countywide Program collected and analyzed POC samples in compliance with Provision C.8.f of the MRP. Yearly minimum requirements were met for all monitoring parameters. In addition, the Countywide Program continued helping the RMP's STLS to select its WY 2017 PCBs and mercury monitoring stations that are located in in San Mateo County. The data from those stations was evaluated along with PCBs and mercury data collected directly by the Countywide Program. Conclusions from WY 2017 POC monitoring included the following:

- The Countywide Program's PCBs and mercury monitoring focuses on San Mateo County WMAs containing high interest parcels with land uses potentially associated with PCBs such as old industrial, electrical and recycling. During WY 2017 the Countywide Program collected 17 composite samples of stormwater runoff from outfalls at the bottom of WMAs and 67 grab sediment samples (of which 6 were duplicates) within the WMAs. The Countywide Program evaluated the PCBs stormwater runoff and sediment monitoring data to help prioritize WMAs for further investigation and identify which WMAs provide the greatest opportunities for implementing cost-effective PCBs controls.
- Based on the sediment and stormwater runoff monitoring data collected to-date in San Mateo County by the Countywide Program and other parties (e.g., the RMP's STLS), WMAs were provisionally designated as higher, medium, or lower priority. Figure 4 is a map illustrating the current status of WMAs in San Mateo County, based on this provisional prioritization scheme.
- The WY 2017 grab sediment samples and other data collected to-date informed identification of source properties within WMAs, potentially for referral to the Regional Water Board for further investigation and potential abatement. The sediment samples were collected from manholes, storm drain inlets, driveways, streets, and sidewalks in the public right-of-way (ROW), including locations adjacent to high interest parcels with land uses associated with PCBs such as old industrial, electrical and recycling and/or other characteristics potentially associated with pollutant discharge (e.g., poor housekeeping, unpaved areas). Based on the data gathered to-date, the Countywide Program is working with the City of San Carlos to develop referrals for three properties, and evaluating next steps at several other potential source properties.
- One of the 17 composite samples of stormwater runoff from outfalls at the bottom of WMAs was also analyzed for total and dissolved copper. An additional four creek water samples were collected for copper analysis from upstream and downstream locations in two creeks (Atherton and Redwood Creeks) during a large January 2017 storm event. One of the downstream stations was also sampled for copper during spring baseflow conditions. Copper concentrations were higher at bottom-of-the-watershed stations in both creeks compared to stations higher in the watersheds), suggesting an influence by stormwater runoff.
- The upstream and downstream stations in Atherton and Redwood Creeks were concurrently sampled for nutrients during the large January 2017 storm event. Three of these stations were also sampled for nutrients during spring baseflow conditions. In Atherton Creek, nitrate, total nitrogen, dissolved orthophosphate and phosphorus concentrations were higher at the downstream station compared to the upstream station. However, TKN and ammonia concentrations were lower at the downstream station, suggesting an organic source of nitrogen in the upper watershed. Nutrient concentrations in both creeks were higher during the January storm sampling event compared to the spring baseflow event, suggesting that nutrient loads to San Francisco Bay from these creeks is higher during storm events.

- With one exception, none of the WY 2017 water samples exceeded applicable water quality objectives (WQOs). The exception was the stormwater runoff sample analyzed for copper. However, WQOs generally are applied to receiving waters, not stormwater runoff, and it is likely that mixing in the receiving water downstream of the outfall would have diluted the copper. In addition, higher hardness in the creek compared to the stormwater runoff would have reduced the bioavailability of the copper in the receiving water.

5.0 NEXT STEPS

In WY 2018, the Countywide Program will continue to collect and analyze POC samples in compliance with Provision C.8.f of the MRP. Yearly minimum requirements will be met for all monitoring parameters. In addition, the Countywide Program will continue helping the RMP's STLS to select its WY 2017 PCBs and mercury monitoring stations that are located in in San Mateo County. POC monitoring activities in WY 2018 will include the following:

- The Countywide Program, in coordination with the RMP STLS, will continue conducting PCBs and mercury monitoring that focuses on San Mateo County WMAs containing high interest parcels with land uses potentially associated with PCBs such as old industrial, electrical and recycling. This will include collecting additional composite samples of stormwater runoff from outfalls at the bottom of WMAs and grab sediment samples within the WMAs. Objectives will include attempting to identify source properties within WMAs, identifying which WMAs provide the greatest opportunities for implementing cost-effective PCBs controls, and prioritizing WMAs for potential future investigations.
- At least eight PCBs and mercury samples that address Management Question #3 (Management Action Effectiveness) must be collected by the end of year four of the permit (i.e., by 2020). The Countywide Program is currently working with BASMAA to implement a regional project that addresses POC Management Action Effectiveness. The study design, approved in August 2017 by the BASMAA Project Management Team (which includes representatives from the Countywide Program), addresses the effectiveness of hydrodynamic separator (HDS) units and various types of biochar-amended bioretention soil media (BSM) at removing PCBs and mercury from stormwater. Findings from the regional project will be reported in the WY 2018 UCMR which will be submitted by March 31, 2019. Findings will also be used to support the Countywide Program's Reasonable Assurance Analysis (RAA).
- At least eight samples that address Management Question #5 (Trends) must be collected by the end of year four of the permit (i.e., 2020). The Countywide Program will continue to participate in the STLS Trends Strategy Team to help meet this requirement. The STLS Trends Strategy Team, initiated in WY 2015, is currently developing a regional monitoring strategy 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. Analysis of recent and historical data collected at region-wide loadings stations suggests that PCB concentrations are highly variable. Therefore, a monitoring design to detect trends with statistical confidence may require more samples than is feasible with current financial resources. The STLS Trends Strategy Team is continuing to evaluate available data from the Guadalupe River watershed to explore more economical monitoring opportunities. The Team is also considering modeling options that could be used in concert with monitoring to detect and predict trends in POC loadings. A Trends Strategy Road Map is currently being developed.
- The Countywide Program will also continue to work with work with the State's Stream Pollution Trends (SPoT) Monitoring Program to help address Management Question #5 (Trends). SPoT conducts annual dry season monitoring (subject to funding constraints) of sediments collected from a statewide network of large rivers. The goal of the SPoT Monitoring Program is to investigate long-term trends in water quality. 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, sediment analytes include PCBs, mercury, toxicity, pesticides (Phillips et al. 2014).

- The Countywide Program will collect two copper and two nutrient water samples concurrently with its MRP Provision C.8.g.iii, Wet Weather Pesticides and Toxicity Monitoring, which targets two bottom-of-the-watershed stations during storm events. An additional two copper and nutrient samples will be collected at the same stations during the spring season when hydrographs are receding.
- The Countywide Program will continue to participate in the RMP, including the RMP's STLS and CEC Strategy (see Section 2.5).

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Attachment 1

Quality Assurance / Quality Control Report

Pollutants of Concern Monitoring - Quality Assurance/Quality Control Report, WY 2017

1.0 INTRODUCTION

The San Mateo Countywide Pollution Prevention Program (SMCWPPP) conducted Pollutants of Concern (POC) Monitoring in Water Year (WY) 2017 to comply with Provision C.8.f (Pollutants of Concern Monitoring) of the National Pollutant Discharge Elimination Program (NPDES) Municipal Regional Permit for the San Francisco Bay Area (i.e., MRP). Monitoring included analysis for polychlorinated biphenyls (PCBs), total mercury, total and dissolved copper, suspended sediment concentration (SSC), and nutrients (i.e., ammonia, nitrate, nitrite, total Kjeldahl nitrogen, orthophosphate, and total phosphorus).

This project utilized the Clean Watersheds for Clean Bay Project (CW4CB) Quality Assurance Project Plan (QAPP; BASMAA 2013) as a basis for Quality Assurance and Quality Control (QA/QC) procedures. Missing components were supplemented by the Bay Area Stormwater Management Agencies Association (BASMAA) Regional Monitoring Coalition (RMC) QAPP (BASMAA 2016) and the QAPP for the California Surface Water Ambient Monitoring Program (SWAMP), specifically for nutrient and copper samples, respectively. Data were assessed for seven data quality attributes, which include (1) Representativeness, (2) Comparability, (3) Completeness, (4) Sensitivity, (5) Contamination, (6) Accuracy, and (7) Precision. These seven attributes are compared to Data Quality Objectives (DQOs), which were established to ensure that data collected are of adequate quality and sufficient for the intended uses. DQOs address both quantitative and qualitative assessment of the acceptability of data – representativeness and comparability are qualitative while completeness, sensitivity, precision, accuracy, and contamination are quantitative assessments. Specific DQOs are based on Measurement Quality Objectives (MQOs) for each analyte.

The MQOs for each of the POC analytes are summarized in Table 1 for water and Table 2 for sediment. As there was no reporting limit listed in the QAPP for copper, results were compared the SWAMP recommended reporting limits for inorganic analytes in freshwater. Overall, the results of the QA/QC review suggest that the data generated during this study were of sufficient quality for the purposes of the project. Further details regarding the QA/QC review are provided in the sections below. While some data were flagged in the project database, none of the data was rejected based on the MQOs or DQOs identified in the QAPPs. However, mercury data collected in water were later rejected by the project QA/QC officer based on comparison of results to similar data collected in recent years by SMCWPPP and other programs sampling the same population of urban catchments. Mercury concentrations were generally about an order-of-magnitude lower than expected. There was no reason to expect these lower concentrations, since the population of catchments and storms monitored was generally similar to the previous years based upon factors such as geography, land use, and storm size. Thus, the WY 2017 data were rejected due to the low probability that the WY 2017 sample results were representative of the population that they were collected from.

Table 1. Measurement quality objectives for analytes in water from the Clean Watersheds for a Clean Bay (CW4CB) Quality Assurance Project Plan (BASMAA 2013) and BASMAA RMC Quality Assurance Project Plan (BASMAA 2016)

Sample	Nutrients[1]	Hardness[1]	SSC[2]	Copper[2]	Mercury[2]	PCBs[2]
Laboratory Blank	< RL	<RL	< RL	< RL	< RL	< RL
Reference Material (Laboratory Control Sample) Recovery	90-110%	80-120%	NA	75-125%	75-125%	50-150%
Matrix Spike Recovery	80-120%	80-120%	NA	75-125%	75-125%	50-150%
Duplicates (Matrix Spike, Field, and Laboratory)[3]	RPD < 25%	RPD < 25%	RPD < 25%	RPD < 25%	RPD < 25%	RPD < 25%
Reporting Limit	0.01mg/L for all except: Ammonia (0.02mg/L) TKN[4] (0.5mg/L)	1 mg/L[5]	0.5 mg/L	0.10 µg/L[6]	0.0002 µg/L (0.2 ng/L)	0.002 µg/L (2000 pg/L)

RL = Reporting Limit; RPD = Relative Percent Difference

[1] From the BASMAA QAPP

[2] From the CW4CB QAPP

[3] NA if native concentration for either sample is less than the reporting limit

[4] TKN = Total Kjeldahl Nitrogen

[5] No hardness RL listed in either QAPP. Value is from SWAMP-recommended reporting limits for conventional analytes in freshwater. (https://www.waterboards.ca.gov/water_issues/programs/swamp/docs/tools/19_tables_fr_water/1_conv_fr_water.pdf)

[6] No copper RL listed in either QAPP. Value is from SWAMP-recommended reporting limits for inorganic analytes in freshwater. (http://www.waterboards.ca.gov/water_issues/programs/swamp/docs/tools/19_tables_fr_water/4_inorg_fr_water.pdf)

Table 2. Measurement quality objectives for analytes in sediment from the Clean Watersheds for a Clean Bay (CW4CB) Quality Assurance Project Plan (BASMAA 2013).

Sample	Total Solids	Mercury	PCBs
Laboratory Blank	< RL	< RL	< RL
Reference Material (Laboratory Control Sample) Recovery	N/A	75-125%	50-150%
Matrix Spike Recovery	N/A	75-125%	50-150%
Duplicates [1] (Matrix Spike, Field, and Laboratory)	RPD < 25%	RPD < 25%	RPD < 25%[2]
Reporting Limit	0.1%[3]	30 µg/kg 0.03 mg/kg 30,000 ng/kg	0.2 µg/kg 0.0002 mg/kg 200 ng/kg

RL = Reporting Limit; RPD = Relative Percent Difference

[1] NA if native concentration for either sample is less than the reporting limit

[2] Only applicable for matrix spike duplicates. Method specific for field and laboratory duplicates

[3] RL for total solids in water

2.0 REPRESENTATIVENESS

Data representativeness assesses whether the data were collected so as to represent actual conditions at each monitoring location. For this project, all samples are assumed to be representative if they are collected and analyzed according to protocols specified in the CW4CB QAPP and RMC QAPP. All field and laboratory personnel received and reviewed the QAPPs, and followed prescribed protocols including laboratory methods.

3.0 COMPARABILITY

The QA/QC officer ensures that the data may be reasonably compared to data from other programs producing similar types of data. For POC monitoring, individual stormwater programs try to maintain comparability within in RMC. The key measure of comparability for all RMC data is the California Surface Water Ambient Monitoring Program.

Electronic data deliverables (EDDs) are submitted to the San Francisco Regional Water Quality Control Board (SFRWQCB) in Microsoft Excel templates developed by SWAMP, to ensure data comparability with SWAMP. In addition, data entry follows SWAMP documentation specific to each data type, including the exclusion of qualitative values that do not appear on SWAMP's look up lists[1]. Completed templates are reviewed using SWAMP's online data checker[2], further ensuring SWAMP-comparability.

[1] Look up lists available online at http://swamp.waterboards.ca.gov/swamp_checker/LookUpLists.php.

[2] Checker available online at http://swamp.waterboards.ca.gov/swamp_checker/SWAMPUpload.php

4.0 COMPLETENESS

Completeness is the degree to which all data were produced as planned; this covers both sample collection and analysis. For chemical data and field measurements an overall completeness of greater than 90% is considered acceptable for RMC chemical data and field measurements.

During WY 2017, SMCWPPP collected over 100% of planned samples. Nutrients (ammonia, nitrate, nitrite, total Kjeldahl nitrogen, phosphorus, and orthophosphate), copper, and hardness were collected during two events – four samples were collected in January and one was collected in May 2017. A total of 17 aqueous samples were collected in WY 2017 and analyzed for PCBs, mercury, and SSC. Two additional aqueous samples were collected for copper and six additional samples were collected for hardness. Sixty-one (61) sediment samples were also collected in WY 2017 and analyzed for PCBs and mercury. A comparison of the total and actual samples collected for POC monitoring in WY 2017 is shown in Table 2.

Table 2. Comparison of the targeted number of samples with the actual number of samples collected during POC monitoring in WY 2017

Analyte	Matrix	Target	Actual
Nutrients[1]	Water	2	5
Suspended Sediment Concentration	Water	10-20	17
Hardness	Water	2	11
Copper	Water	2	7
Mercury	Water	10-20	17
PCBs	Water	10-20	17
Mercury	Sediment	40-60	61
PCBs	Sediment	40-60	61
Total Solids	Sediment	40-60	67

[1] Nutrients include ammonia, nitrate, nitrite, total Kjeldahl nitrogen, phosphorus, orthophosphate.

5.0 SENSITIVITY

5.1. Water

Sensitivity analysis determines whether the methods can identify and/or quantify results at low enough levels. For the aqueous chemical analyses in this project, sensitivity is considered to be adequate if the reporting limits (RLs) comply with the specifications in RMC QAPP Appendix E (RMC Target Method Reporting Limits) and the CW4CB QAPP Appendix B (CW4CB Target Method Reporting Limits).

A summary of the target and actual reporting limits for each analyte is shown in Table 3. Nutrient analysis, except for nitrate, and PCB analysis met their respective target reporting limits listed in the RMC QAPP and CW4CB QAPP. However, the reporting limits for all nitrate, suspended sediment concentration (SSC), hardness, and mercury samples exceeded their respective target reporting limits. Additionally, all but one copper sample exceeded the target reporting limit for copper.

Table 3. Target and actual reporting limits for SMCWPPP pollutants of concern monitoring in water in WY 2017

Analyte	Unit	Target	Actual	Exceeds Target RL?
Ammonia	mg/L	0.02	0.02	No
Nitrate	mg/L	0.01	0.1	Yes
Nitrite	mg/L	0.01	0.005	No
Total Kjeldahl Nitrogen	mg/L	0.5	0.1	No
Phosphorus	mg/L	0.01	0.01	No
Orthophosphate	mg/L	0.01	0.01	No
Suspended Sediment Concentration	mg/L	0.5	0.95-1.6	Yes
Copper	µg/L	0.1	0.1-0.5	Yes
Hardness	mg/L	1	5-10	Yes
Mercury	ng/L	0.2	0.5-12.5	Yes
PCBs	pg/L	2000	18.8-316	No

5.2. Sediment Analysis

The project manager identified 0.5 mg/kg as an elevated/high total PCBs concentration threshold for sites to be considered for additional investigation. Because a different analytical method was used in this project for PCBs congeners (i.e., 8082M) compared to the CW4CB project (i.e., 1668A), a reporting limit requirement had to be developed. To maintain a conservative approach, QA/QC goals for this project focused on concentrations greater than 1/5 of the high concentration threshold (i.e., 0.1 mg/kg), and applied a reporting limit requirement of 10 µg/kg (i.e., 0.01 mg/kg), or 1/10 of this new lower threshold, for each of the forty PCB congeners analyzed.

Approximately 5% of congener samples (145 of 2680) did not meet the reporting limit requirement of 10 µg/kg. However, the majority of these exceedances are explained by dilutions, necessary to conduct the analysis, resulting in elevated reporting limits. Only one sample that did not meet the reporting limit requirements (PCB 101 at SM-SSF-02-D) was not diluted, and therefore, did not have a justification for the elevated reporting limits. However, the reporting limit for this sample was 13 µg/kg, only slightly higher than the project reporting limit of 10 µg/kg.

The target reporting limit for mercury (0.3 mg/kg) was met for all but two samples. The two samples that were greater than the target limit were slightly higher at 0.0304 and 0.0507 mg/kg. The analysis for total solids also met the target reporting limit (0.1%) for all samples.

6.0 CONTAMINATION

For chemical data, contamination is assessed as the presence of analytical constituents in blank samples.

6.1. Water Analysis

Several laboratory and equipment (filter) blanks were run during the nutrient, copper, and hardness analyses. All blanks were non-detect, except for one hardness blank. However, this blank was below the reporting limit, and therefore met the measurement quality objectives for hardness. Similarly, analytes were detected in laboratory blanks for mercury and several PCBs above the

method detection limit, but below the reporting limit. The PCBs that were detected in laboratory blanks include the following:

- PCB 008
- PCB 011
- PCB 015
- PCB 052
- PCB 044/047/065
- PCB 068
- PCB 070/061/074/076
- PCB 126
- PCB 155
- PCB 152
- PCB 136
- PCB 153/168
- PCB 129/138/163
- PCB 167
- PCB 156/157
- PCB 169
- PCB 188
- PCB 187
- PCB 180/193
- PCB 202
- PCB 198/199

6.2. Sediment Analysis

Several laboratory blanks were analyzed during sediment analysis. Mercury was detected in several blanks above the method detection limit, but below the reporting limit. Similarly, PCB 49 was detected in a laboratory blank, but was detected at a concentration below the reporting limit. Since concentrations were detected below the reporting limit, all laboratory blanks met the MQOs.

7.0 ACCURACY

Accuracy is assessed as the percent recovery of samples spiked with a known amount of a specific chemical constituent. The analytical laboratory evaluated and reported the Percent Recovery (PR) of Laboratory Control Samples (LCS; in lieu of reference materials) and Matrix Spikes (MS)/Matrix Spike Duplicates (MSD), which were recalculated and compared to the target ranges in the RMC and CW4CB QAPPs. If a QA sample did not meet MQOs, all samples in that batch for that analyte were flagged.

7.1. Water Analysis

All laboratory LCS and MS/MSD samples for nutrients, hardness, copper, and mercury were within their respective MQOs, except for one total copper matrix spike in May. The May copper sample was consequently flagged. Thirty-three (33) laboratory control samples and 14 MS/MSD samples exceeded the MQOs for PCBs. All associated samples were flagged.

7.2. Sediment Analysis

All mercury and total solids laboratory control samples met their corresponding MQOs, but 23 LCS for PCB did not meet their MQOs. Additionally, 23 MS/MSD samples for PCBs did not meet their MQO. The list of congeners that exceeded LCS MQOs differed slightly from the list of PCBs that exceeded the MS/MSD MQOs. One mercury MS/MSD did not meet the MQO.

8.0 PRECISION

Precision is the repeatability of a measurement and is quantified by the Relative Percent Difference (RPD) of two duplicates samples. Three measures of precision were used for this project – matrix spikes duplicates, laboratory duplicates, and field duplicates. The MQO for RPD specified by both the CW4CB QAPP and the BASMAA QAPP is <25%.

8.1. Water Analysis

8.1.1. Laboratory Duplicates

Matrix spike duplicates and laboratory control sample duplicates for nutrients, copper, and hardness were well below the targeted range of < 25%. One MS/MSD pair did not meet the MQO for PCB 121.

Laboratory duplicates were analyzed for PCBs, and most of the duplicates (99 of 162 congeners) exceeded the MQO (RPD < 25%). The PCB samples associated with these QA samples were flagged.

8.1.2. Field Duplicates

Two nutrient field duplicates were collected during WY 2017 creek status monitoring, and are considered representative of nutrient sampling for POC monitoring. The field duplicate samples met the MQO for RPD for all analytes except for total Kjeldahl nitrogen and ammonia. Refer to the SMCWPPP Creek Status Monitoring QA/QC Report for more information.

One field duplicate was collected for copper and hardness during the January event, and all RPDs met the MQO. However, no field duplicate was collected in WY 2017 in San Mateo County for mercury, PCBs, or SSC in water.

8.2. Sediment Analysis

8.2.1. Laboratory Duplicates

Seven mercury matrix spike duplicates and 40 PCB matrix spike duplicates exceeded the corresponding MQO. Eight laboratory duplicates were run for total solids and were well below the MQO (<25%). No mercury or PCB laboratory duplicates were run during the sediment analysis.

8.2.2. Field Duplicates

Six sediment field blind duplicates were collected in WY 2017. The field duplicates exceed the RPD MQO for mercury and 17 PCBs. Most duplicates exceeded the MQO for two to three analytes, but the sample at SM-SMC-06-E exceeded the MQO for 13 analytes. The analytes that exceeded the MQO include the following (the number of samples that exceeded the MQO for that analyte are included in parentheses:

- Mercury (3)
- PCB 52 (1)
- PCB 60 (3)

- PCB 70 (1)
- PCB 87 (1)
- PCB 101 (1)
- PCB 110 (2)
- PCB 118 (1)
- PCB138 (1)
- PCB149 (2)
- PCB 153 (1)
- PCB 174 (1)
- PCB 177 (1)
- PCB 180 (1)
- PCB 187 (1)
- PCB 194 (1)
- PCB 201 (1)
- PCB 203 (2)

9.0 REFERENCES

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Bay Area Stormwater Management Agency Association (BASMAA) Regional Monitoring Coalition. 2016. Creek Status Monitoring Program Quality Assurance Project Plan, Final Draft Version 3. Prepared for BASMAA by EOA, Inc. on behalf of the Santa Clara Urban Runoff Pollution Prevention Program and the San Mateo Countywide Water Pollution Prevention Program, Applied Marine Sciences on behalf of the Alameda Countywide Clean Water Program and the Contra Costa Clean Water Program. 128 pp.

Surface Water Ambient Monitoring Program (SWAMP). 2017. Quality Assurance Program Plan. May 2017. 140 pp.

Attachment 2

WY 2017 Sediment Monitoring Locations and Analytical Results

Permittee	WMA	WY 2017 Sample ID	Date Collected	Latitude	Longitude	Total PCBs (mg/kg)	Mercury (mg/kg)
East Palo Alto	70	SM-EPA-02-G	3/27/2017	37.47029	-122.13244	0.03	0.05
		SM-EPA-02-H	3/27/2017	37.47194	-122.13406	0.01	0.05
	72	SM-EPA-02-F	3/27/2017	37.47300	-122.13143	0.02	0.08
Menlo Park	71	SM-MPK-05-B	3/27/2017	37.47939	-122.15569	0.01	0.13
	239	SM-MPK-02-D	3/27/2017	37.48592	-122.18493	0.01	0.06
		SM-MPK-02-F (Dup)				0.02	0.28
	1012	SM-MPK-05-A	3/27/2017	37.48209	-122.16096	0.06	0.10
	1014	SM-MPK-02-E	3/27/2017	37.48525	-122.18228	0.03	0.04
Redwood City	239	SM-RCY-10-C	3/27/2017	37.48581	-122.18504	0.16	0.05
		SM-RCY-10-D	3/27/2017	37.48571	-122.18474	0.02	0.04
	379	SM-RCY-07-D	3/28/2017	37.48532	-122.21334	1.97	0.14
		SM-RCY-12-A	3/28/2017	37.48444	-122.21848	0.02	0.07
		SM-RCY-12-B	3/28/2017	37.48430	-122.21787	0.08	0.09
		SM-RCY-12-C	3/30/2017	37.48438	-122.21774	0.00	0.01
		SM-RCY-12-E	3/28/2017	37.48471	-122.21958	0.01	0.05
		SM-RCY-12-F	3/28/2017	37.48551	-122.21624	0.01	0.08
	1000	SM-RCY-05-C	4/5/2017	37.51096	-122.20742	0.75	0.35
	1014	SM-RCY-10-E	3/27/2017	37.48510	-122.18221	0.01	0.05
San Carlos	31	SM-SCS-05-A	4/3/2017	37.50645	-122.25071	0.12	0.06
		SM-SCS-05-C (Dup)				0.11	0.06
		SM-SCS-05-B	4/3/2017	37.50686	-122.25492	0.14	0.07
	59	SM-SCS-01-L	3/30/2017	37.51528	-122.26202	0.18	0.17
		SM-SCS-01-M	3/30/2017	37.51397	-122.26382	0.04	2.36
	75	SM-SCS-01-G	3/30/2017	37.51664	-122.26351	1.20	0.11
		SM-SCS-01-H	4/3/2017	37.51623	-122.26485	0.06	0.14
		SM-SCS-01-I	4/3/2017	37.51798	-122.26386	0.02	0.05
		SM-SCS-01-J	4/3/2017	37.51818	-122.26392	0.09	0.09
		SM-SCS-01-N	3/30/2017	37.51686	-122.26358	49.40	0.80
	210	SM-SCS-06-A	3/30/2017	37.49628	-122.24492	0.01	0.17
		SM-SCS-06-B	3/30/2017	37.49690	-122.24589	0.03	0.08
		SM-SCS-06-C	3/30/2017	37.49746	-122.24638	5.64	0.04
		SM-SCS-06-J (Dup)				5.44	0.09
		SM-SCS-06-D	3/30/2017	37.49733	-122.24555	1.84	3.93
		SM-SCS-06-E	3/30/2017	37.49614	-122.24537	0.00	0.02
		SM-SMC-06-M (Dup)				0.03	0.04
		SM-SCS-06-F	3/30/2017	37.49768	-122.24626	3.73	0.12
		SM-SCS-06-G	3/30/2017	37.49776	-122.24615	1.29	0.07
		SM-SCS-06-H	3/30/2017	37.49942	-122.24278	0.07	0.06
		SM-SCS-06-I	3/30/2017	37.50158	-122.24354	0.03	0.27

Permittee	WMA	WY 2017 Sample ID	Date Collected	Latitude	Longitude	Total PCBs (mg/kg)	Mercury (mg/kg)
		SM-SCS-06-L	4/5/2017	37.50021	-122.24113	0.06	0.13
San Mateo	156	SM-SMO-07-C	4/5/2017	37.55516	-122.30717	0.01	0.05
South San Francisco	291	SM-SSF-06-F	4/5/2017	37.64299	-122.41425	0.04	0.08
		SM-SSF-06-H	4/5/2017	37.64240	-122.41370	0.44	0.08
		SM-SSF-06-I	4/5/2017	37.64212	-122.41325	0.04	0.24
		SM-SSF-06-J (Dup)				0.05	0.23
	292	SM-SSF-06-G	4/5/2017	37.64079	-122.41729	0.15	0.06
	294	SM-SSF-03-D	4/5/2017	37.65253	-122.40021	0.28	0.47
	313	SM-SSF-02-F	4/5/2017	37.66189	-122.39608	0.01	0.05
	314	SM-SSF-01-E	4/3/2017	37.65864	-122.39130	0.15	0.19
		SM-SSF-01-G	4/3/2017	37.66241	-122.38908	0.05	0.03
	319	SM-SSF-01-I	4/3/2017	37.65870	-122.38012	0.06	0.22
	358	SM-SSF-04-C	4/3/2017	37.64613	-122.40198	0.01	0.08
		SM-SSF-04-F (Dup)				0.01	0.09
		SM-SSF-04-D	4/3/2017	37.64450	-122.40173	0.09	0.11
		SM-SSF-04-E	4/3/2017	37.64608	-122.40147	0.05	0.07
	1002	SM-SSF-02-C	4/5/2017	37.66440	-122.39508	0.02	0.05
		SM-SSF-02-D	4/5/2017	37.66303	-122.39861	0.08	0.15
Unincorporated San Mateo County	247	SM-SMC-01-A	3/27/2017	37.41451	-122.19379	0.00	0.04
	379	SM-SMC-06-D	3/28/2017	37.48389	-122.20673	0.05	0.06
		SM-SMC-06-E	3/28/2017	37.48384	-122.20653	0.01	0.07
		SM-SMC-06-F	3/28/2017	37.48291	-122.20734	0.02	0.07
		SM-SMC-06-G	3/28/2017	37.48285	-122.20546	0.05	0.30
		SM-SMC-06-H	3/28/2017	37.48278	-122.20531	0.03	0.07
		SM-SMC-06-I	3/28/2017	37.48415	-122.20792	0.14	3.15
		SM-SMC-06-J	3/28/2017	37.48349	-122.20874	0.08	0.09
		SM-SMC-06-K	3/28/2017	37.48396	-122.20634	0.02	0.04
		SM-SMC-06-L	3/28/2017	37.48256	-122.20875	0.03	0.10

Attachment 3

Summary of PCBs and Mercury Monitoring Results To-date for San Mateo County WMAs

WMA ID	Permittee	Area (acres)	Area High Interest Parcels (acres)	Percent High Interest Parcels	Sediment Samples			Water Samples		
					n	[PCBs] Median (ppm)	[PCBs] Range (ppm)	n	[PCBs] Particle Ratio Median (ppm)	[PCBs] Particle Ratio Range (ppm)
210	San Carlos	141	33	23.2%	45	0.12	0 - 192.91	33	1.78	0.20 - 373.36
17	Brisbane	1,639	55	3.4%	1	1.22	1.22 - 1.22	1	--	0.1
142	Burlingame	20	9	44.3%	2	0.10	0.06 - 0.15	1	--	0.7
359	South San Francisco	23	12	51.2%	0	--	--	1	--	1.4
408	San Mateo	43	7	16.3%	0	--	--	1	--	1.9
60	Belmont	298	6	1.9%	0	--	--	2	0.60	0.18 - 1.02
379	Redwood City	802	110	13.7%	41	0.06	0 - 6.93	2	0.14	0.11 - 0.18
291	South San Francisco	194	64	33.1%	17	0. 06	0 - 2.72	1	--	0.7
1000	Redwood City	148	108	73.0%	3	0.57	0.02 - 0.75	0	--	--
75	San Carlos	66	38	58.3%	11	0.09	0.02 - 49.4	1	--	6.1
31	San Carlos	99	27	27.2%	26	0.19	0 - 1.61	4	1.12	0.41 - 2.15
1016	San Carlos	142	27	19.0%	8	0.54	0 - 6.19	0	--	--
239	Menlo Park	36	11	29.1%	5	0.04	0.01 - 0.57	0	--	--
358	South San Francisco	32	7	21.8%	4	0.07	0.01 - 1.46	0	--	--
70	East Palo Alto	490	16	3.3%	4	0.04	0.01 - 0.34	1	--	0.11
314	South San Francisco	66	4	5.4%	2	0.10	0.05 - 0.15	1	--	0.94
294	South San Francisco	67	21	31.2%	3	0.19	0.07 - 0.28	1	--	0.37
1001	South San Francisco	413	107	26.0%	11	0.04	0.01 - 0.43	1	--	1.71
407	Redwood City	18	10	52.9%	1	0.01	0.01 - 0.01	0	--	--
85	Burlingame	121	13	10.4%	2	0.03	0.03 - 0.03	0	--	--
164	Burlingame	241	79	32.6%	4	0.07	0.04 - 0.09	0	--	--
336	Redwood City	66	4	6.6%	0	--	--	0	--	--
1011	Redwood City	507	63	12.3%	25	0.03	0 - 0.72	0	--	--
25	San Mateo	219	6	2.9%	1	0.03	0.03 - 0.03	0	--	--
149	Burlingame	480	5	1.1%	2	0.13	0.07 - 0.19	0	--	--

WMA ID	Permittee	Area (acres)	Area High Interest Parcels (acres)	Percent High Interest Parcels	Sediment Samples			Water Samples		
					n	[PCBs] Median (ppm)	[PCBs] Range (ppm)	n	[PCBs] Particle Ratio Median (ppm)	[PCBs] Particle Ratio Range (ppm)
266	Redwood City	91	4	4.1%	0	--	--	0	--	--
77	Belmont	86	4	4.7%	0	--	--	0	--	--
59	San Carlos	28	9	32.1%	2	0.11	0.04 - 0.18	0	--	--
356	South San Francisco	10	2	18.0%	2	0.02	0 - 0.03	0	--	--
333	Redwood City	15	4	29.4%	1	0.02	0.02 - 0.02	0	--	--
111	San Mateo	95	5	4.8%	2	0.06	0.05 - 0.06	0	--	--
1008	San Mateo	111	1	0.5%	0	--	--	0	--	--
139	Burlingame	63	2	3.0%	0	--	--	0	--	--
181	Daly City	75	12	15.6%	0	--	--	0	--	--
298	South San Francisco	122	3	2.7%	0	--	--	0	--	--
307	Daly City	1,277	5	0.4%	0	--	--	0	--	--
401	Millbrae	52	7	12.6%	0	--	--	0	--	--
238	Menlo Park	345	84	24.2%	4	0.14	0.01 - 0.29	2	0.08	0.04 - 0.12
67	East Palo Alto	95	11	12.0%	2	0.12	0.02 - 0.21	0	--	--
114	San Mateo	85	8	9.3%	1	0.23	0.23 - 0.23	0	--	--
295	South San Francisco	25	3	11.7%	3	0.30	0 - 0.33	0	--	--
362	South San Francisco	18	9	51.6%	1	0.46	0.46 - 0.46	0	--	--
350	Daly City	317	15	4.8%	0	--	--	0	--	--
32	Belmont	67	2	3.3%	0	--	--	1	--	0.48
317	South San Francisco	32	9	27.1%	0	--	--	1	--	0.45
66	Menlo Park	64	19	29.8%	1	0.06	0.06 - 0.06	1	--	0.39
1006	Burlingame	306	49	15.9%	5	0.10	0.01 - 0.14	1	--	0.36
319	South San Francisco	99	31	31.2%	1	0.06	0.06 - 0.06	1	--	0.36
318	South San Francisco	70	32	45.4%	1	0.01	0.01 - 0.01	1	--	0.27
1004	Brisbane	804	507	63.0%	4	0.02	0.01 - 0.04	1	--	0.25

WMA ID	Permittee	Area (acres)	Area High Interest Parcels (acres)	Percent High Interest Parcels	Sediment Samples			Water Samples		
					n	[PCBs] Median (ppm)	[PCBs] Range (ppm)	n	[PCBs] Particle Ratio Median (ppm)	[PCBs] Particle Ratio Range (ppm)
156	San Mateo	40	7	17.0%	1	0.01	0.01 - 0.01	1	--	0.20
323	Redwood City	185	2	0.9%	0	--	--	1	--	0.19
306	South San Francisco	37	7	18.4%	0	--	--	1	--	0.18
315	South San Francisco	108	34	31.8%	1	0.12	0.12 - 0.12	1	--	0.17
324	Redwood City	44	1	2.0%	0	--	--	1	--	0.17
141	Burlingame	62	4	6.9%	0	--	--	1	--	0.17
89	San Mateo	98	10	10.3%	1	0.01	0.01 - 0.01	1	--	0.14
327	Redwood City	126	7	5.1%	3	0.05	0 - 0.08	1	--	0.13
337	Redwood City	138	16	11.5%	4	0.04	0.02 - 0.08	1	--	0.12
293	South San Francisco	654	58	8.9%	2	0.04	0.01 - 0.07	1	--	0.12
254	Redwood City	39	4	9.9%	1	0.09	0.09 - 0.09	1	--	0.11
316	South San Francisco	117	26	21.9%	2	0.01	0 - 0.02	1	--	0.10
72	East Palo Alto	26	12	44.4%	2	0.02	0.02 - 0.02	1	--	0.08
267	Redwood City	75	16	20.9%	1	0.01	0.01 - 0.01	1	--	0.06
388	Redwood City	42	1	1.4%	0	--	--	1	--	0.05
71	Menlo Park	1,394	22	1.6%	1	0.01	0.01 - 0.01	1	--	0.04
296	South San Francisco	1,272	7	0.6%	0	--	--	1	--	0.03
292	San Bruno	220	37	16.9%	19	0.12	0 - 0.18	1	--	0.01
313	South San Francisco	77	11	14.3%	1	0.01	0.01 - 0.01	0	--	--
1005	Millbrae	791	59	7.4%	1	0.01	0.01 - 0.01	0	--	--
1007	San Mateo	87	7	8.4%	1	0.01	0.01 - 0.01	0	--	--
1014	Menlo Park	176	18	10.3%	3	0.02	0.01 - 0.03	0	--	--
354	South San Francisco	10	4	44.7%	1	0.02	0.02 - 0.02	0	--	--
403	San Mateo	48	1	1.4%	1	0.02	0.02 - 0.02	0	--	--
332	Menlo Park	17	1	5.1%	1	0.03	0.03 - 0.03	0	--	--

WMA ID	Permittee	Area (acres)	Area High Interest Parcels (acres)	Percent High Interest Parcels	Sediment Samples			Water Samples		
					n	[PCBs] Median (ppm)	[PCBs] Range (ppm)	n	[PCBs] Particle Ratio Median (ppm)	[PCBs] Particle Ratio Range (ppm)
1009	San Mateo	175	43	24.3%	2	0.03	0.03 - 0.04	0	--	--
1015	East Palo Alto	52	48	92.7%	2	0.04	0.02 - 0.06	0	--	--
253	Redwood City	280	16	5.8%	1	0.05	0.05 - 0.05	0	--	--
16	Burlingame	24	8	31.4%	1	0.05	0.05 - 0.05	0	--	--
1012	Menlo Park	54	42	79.4%	1	0.06	0.06 - 0.06	0	--	--
101	San Mateo	221	10	4.3%	1	0.08	0.08 - 0.08	0	--	--
1002	South San Francisco	316	66	20.9%	3	0.08	0.02 - 0.12	0	--	--
357	South San Francisco	17	3	18.5%	1	0.09	0.09 - 0.09	0	--	--
1010	Foster City	273	8	3.1%	0	--	--	0	--	--
1013	Redwood City	40	4	8.9%	0	--	--	0	--	--
1017	San Mateo	19	4	21.1%	0	--	--	0	--	--
120	San Mateo	10	1	4.9%	0	--	--	0	--	--
138	Burlingame	15	5	29.9%	0	--	--	0	--	--
207	San Carlos	82	7	8.2%	0	--	--	0	--	--
247	Menlo Park	239	20	8.5%	0	--	--	0	--	--
252	Menlo Park	108	5	4.9%	0	--	--	0	--	--
261	Atherton	1,679	3	0.2%	0	--	--	0	--	--
269	Redwood City	45	4	9.2%	0	--	--	0	--	--
290	San Bruno	2,017	9	0.4%	0	--	--	0	--	--
297	South San Francisco	30	2	6.7%	0	--	--	0	--	--
311	South San Francisco	111	3	2.8%	0	--	--	0	--	--
325	Redwood City	21	1	4.8%	0	--	--	0	--	--
329	Colma	806	4	0.5%	0	--	--	0	--	--
334	Redwood City	19	4	18.3%	0	--	--	0	--	--
335	Redwood City	24	0	0.0%	0	--	--	0	--	--

WMA ID	Permittee	Area (acres)	Area High Interest Parcels (acres)	Percent High Interest Parcels	Sediment Samples			Water Samples		
					n	[PCBs] Median (ppm)	[PCBs] Range (ppm)	n	[PCBs] Particle Ratio Median (ppm)	[PCBs] Particle Ratio Range (ppm)
352	South San Francisco	40	7	16.7%	0	--	--	0	--	--
378	Menlo Park	138	4	2.9%	0	--	--	0	--	--
395	Millbrae	480	8	1.6%	0	--	--	0	--	--
399	San Mateo	32	1	4.6%	0	--	--	0	--	--
405	Redwood City	22	22	100.0%	0	--	--	0	--	--
57	San Carlos	63	4	5.6%	0	--	--	0	--	--
68	East Palo Alto	317	0.5	0.2%	0	--	--	0	--	--
80	San Carlos	21	1	4.7%	0	--	--	0	--	--
90	San Mateo	21	0.3	1.4%	0	--	--	0	--	--
92	San Mateo	136	4	2.7%	0	--	--	0	--	--
Other -	Unincorporated	10,917	343	3.1%	3	0.00	0 - 0.04	0	--	--
Other -	Woodside	7,286	5	0.1%	1	0.00	0 - 0	0	--	--
Other -	Menlo Park	2,487	25	1.0%	1	0.02	0.02 - 0.02	0	--	--
Other -	Colma	1,139	5	0.4%	4	0.03	0 - 16.81	0	--	--
Other -	San Carlos	2,517	2	0.1%	1	0.06	0.06 - 0.06	0	--	--
Other -	East Palo Alto	274	4	1.4%	1	0.07	0.07 - 0.07	0	--	--
Other -	Redwood City	6,030	6	0.1%	6	0.07	0.01 - 0.34	0	--	--
Other -	San Mateo	5,800	55	0.9%	1	0.09	0.09 - 0.09	0	--	--
Other -	South San Francisco	1,554	3	0.2%	1	0.19	0.19 - 0.19	0	--	--
Other -	Atherton	2,315	1	0.0%	0	--	--	0	--	--
Other -	Belmont	2,511	5	0.2%	0	--	--	0	--	--
Other -	Brisbane	245	0.4	0.2%	0	--	--	0	--	--
Other -	Burlingame	1,827	9	0.5%	0	--	--	0	--	--
Other -	Daly City	1,131	11	1.0%	0	--	--	0	--	--
Other -	Foster City	2,065	0	0.0%	0	--	--	0	--	--

WMA ID	Permittee	Area (acres)	Area High Interest Parcels (acres)	Percent High Interest Parcels	Sediment Samples			Water Samples		
					n	[PCBs] Median (ppm)	[PCBs] Range (ppm)	n	[PCBs] Particle Ratio Median (ppm)	[PCBs] Particle Ratio Range (ppm)
Other -	Hillsborough	3,974	3	0.1%	0	--	--	0	--	--
Other -	Millbrae	1,309	3	0.2%	0	--	--	0	--	--
Other -	Portola Valley	5,790	0	0.0%	0	--	--	0	--	--
Other -	San Bruno	542	0	0.0%	0	--	--	0	--	--