



Watching Our Watersheds (WOW) Regional Trash Monitoring Project Funded through USEPA WQIF Grant

Trash Receiving Water Monitoring Progress Report

Water Year 2024 (October 2023 – September 2024)

Final March 31, 2025

Prepared on behalf of:

- Alameda Countywide Clean Water Program
- Contra Costa Clean Water Program
- San Mateo Countywide Water Pollution Prevention Program
- Santa Clara Valley Urban Runoff Pollution Prevention Program
- Solano Stormwater Alliance



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LIST OF ACRONYMS

ACCWP	Alameda Countywide Clean Water Program
BAMSC	Bay Area Municipal Stormwater Collaborative
CCCWP	Contra Costa Clean Water Program
CDFW	California Department of Fish and Wildlife
EO	Executive Officer
FTC	Full Trash Capture
GIS	Geographic Information System
MP	Monitoring Plan
MQO	Measurement Quality Objective
MRP	Municipal Regional Permit
MS4	Municipal Separate Storm Sewer System
NPDES	National Pollutant Discharge Elimination System
OMP	Orange Memorial Park
POP	Probability of Precipitation
QAPP	Quality Assurance Project Plan
QAPrP	Quality Assurance Program Plan
QA/QC	Quality Assurance/Quality Control
QPF	Quantitative Precipitation Forecast
SCVURPPP	Santa Clara Valley Urban Runoff Pollution Prevention Program
SFBRWQCB	San Francisco Bay Regional Water Quality Control Board
SFEI	San Francisco Estuary Institute
SMCWPPP	San Mateo Countywide Water Pollution Prevention Program
SSA	Solano Stormwater Alliance
SSF	(City of) South San Francisco
SWAMP	(California) Surface Water Ambient Monitoring Program
SWRCB	State Water Resources Control Board
TAG	Technical Advisory Group
UCMR	Urban Creeks Monitoring Report
USACE	United State Army Corps of Engineers
USEPA	United States Environmental Protection Agency
WQIF	Water Quality Improvement Fund
WOW	Watching Our Watersheds
WY	Water Year

1.0 INTRODUCTION

On behalf of all public agencies (i.e., Permittees) subject to the Municipal Regional Stormwater National Pollutant Discharge Elimination System (NPDES) Permit (MRP; Order No. R2-2022-0018) issued by the San Francisco Bay Regional Water Quality Control Board (SFBRWQCB or Regional Water Board) this *Annual Trash Receiving Water Monitoring Status Report, Water Year¹ (WY) 2024* was prepared for the Bay Area Municipal Stormwater Collaborative (BAMSC) Trash Monitoring Workgroup. Members of the BAMSC Trash Monitoring Workgroup include representatives from the following Countywide Stormwater Programs:

- Alameda Countywide Clean Water Program (ACCWP)
- Contra Costa Clean Water Program (CCCWP)
- Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP)
- San Mateo Countywide Water Pollution Prevention Program (SMCWPPP)
- Solano Stormwater Alliance (SSA)

This report was prepared as a task defined under the Watching Our Watersheds (WOW) Regional Trash Monitoring Project, which is funded by a grant from the United States Environmental Protection Agency (USEPA) Water Quality Improvement Fund (WQIF). The WOW project addresses several MRP provision C.8.e requirements for trash monitoring, including development of Regional Trash Monitoring Progress Reports.

This report was prepared by Balance Hydrologics, Inc and EOA, Inc. (WOW Project Team) in coordination with BAMSC.

This report fulfills the requirements of provision C.8.h.iii.(2) of the MRP for describing receiving water trash monitoring accomplishments from the preceding water year (i.e., WY 2024) conducted in compliance with provision C.8.e (Trash Monitoring) of the MRP. The annual Trash *Receiving Water* Monitoring Progress Report is presented herein; the annual Trash *Outfall* Monitoring Progress Report will be sent to the Regional Water Board as a separate report.

Consistent with the requirements of provision C.8.e, receiving water trash monitoring will begin on October 1, 2024. This report summarizes the planning and preparation for monitoring that occurred during WY 2024.

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 2024 (WY 2024) began on October 1, 2023 and concluded on September 30, 2024.

2.0 TRASH MONITORING REQUIREMENTS

The level of trash in California's receiving waters has increased substantially over the past few decades, causing one of the state's most significant water quality issues (SWRCB 2015). Over the last decade, MRP Permittees have invested substantial public resources to implement source controls and stormwater infrastructure improvement/upgrades to reduce the amount of trash discharged from their municipal separate storm sewer systems (MS4s) to receiving waters. Many of these actions are prescribed by Provision C.10 of the MRP which mandates that Permittees achieve a 100% reduction of trash in stormwater discharges from baseline (2009) levels by June 2025.

With the adoption of the current MRP in 2022, the Regional Water Board also added trash monitoring requirements. Provision C.8.e directs Permittees to conduct trash monitoring at MS4 outfalls and in receiving waters, and prescribes specific monitoring location criteria, methods, and frequencies that must be achieved to address the management questions and monitoring questions listed below. Provision C.8.e.v requires that Permittees submit a "collective" (i.e., regional) Trash Monitoring Plan that demonstrates how the requirements in Provision C.8.e will be met. The Trash Outfall Monitoring Plan was submitted to the Regional Water Board EO for approval on July 31, 2023, and trash outfall monitoring began in WY 2024. The Trash Receiving Water Monitoring Plan was designed to address Management Question 2 and Monitoring Question 2 from the MRP:

Management Questions:

1. Have Permittees' trash management actions effectively prevented trash from their jurisdictions from discharging to receiving waters?
2. Are discharges of trash from areas within Trash Management Areas controlled to a low trash generation level causing and/or contributing to adverse trash impacts in receiving water?

Monitoring Questions:

1. What is the trash condition and approximate level of trash (volume, type, and size) within and discharging into receiving waters in areas that receive MS4 runoff controlled to a low trash generation via the installation of full trash capture devices, or the implementation of other trash management actions equivalent to full trash capture systems?
2. Does the level of trash in the receiving water correlate strongly with the conditions of the tributary drainage area of the MS4?

Provisions C.8.e.ii – iii of the MRP prescribe trash monitoring methods, sites, events, frequency, and intervals.

The MRP mandates that a pilot receiving water monitoring program to directly sample sections of receiving waters that receive runoff primarily from MS4 outfalls that drain tributary areas controlled to the low trash generation level must begin October 1, 2024. At least six receiving water sites regionwide must be monitored during at least three wet weather events per year. The required allocation of sites for each County is listed in Table 1. Targeted storm events should be likely to result in discharges of trash from the MS4 system, and targeted receiving water monitoring locations should not be downstream of direct discharge sites (e.g., homeless

encampments, illegal dumping sites). Provision C.8.e.ii also requires direct measurement of flow at or near the monitoring station (to calculate loading) and collection of data on the type of material collected.

Table 1. Number of MRP-required Trash Monitoring Sites for each County.

County	# of Receiving Water Sites
ACCWP	2
CCCWP	1
SCVURPPP	2
SMCWPPP	1
SSA	0
Totals	6

2.1 Technical Advisory Group

To assist in the development and implementation of a scientifically sound Trash Monitoring Plan, Provision C.8.e.iv requires Permittees to form and convene a Technical Advisory Group (TAG) composed of impartial science advisors and Regional Water Board staff. The Trash TAG was asked to review and provide input on site selection, monitoring methods, permitting, and methods of analyses. The Trash TAG convened on March 4th and May 15th, 2024, prior to the submission of the Trash Monitoring Plan. Meeting summaries for Trash TAG meetings that occurred during WY 2024 are provided in Appendix A.

In addition to Trash TAG input, the WOW Project Management Team (PMT) and Permittees from each of the Stormwater Programs provided guidance to the consultant team during the planning process and comments during the review of both Receiving Water Monitoring Plan and QAPP.

Meeting #5 is planned to take place in early 2025 and will focus on providing results and analyses from the first year of trash outfall monitoring (i.e., WY 2024) and TAG review of potential adaptations to future monitoring approaches. Subsequent meetings will be held at least annually to provide continued feedback regarding the implementation of both Trash Monitoring Plans.

Provision C.8.e.v also requires Permittees to provide opportunities for input on development of the Trash Monitoring Plan(s) by interested parties and scientific experts other than those participating in the Trash TAG. As described in the trash outfall and receiving water monitoring plans, this requirement was satisfied by seeking input from stakeholders that participate in the BAMSC Trash Subcommittee (which include California Department of Transportation [Caltrans], local watershed groups, USEPA, university professors and academics, and Save the Bay) and other organizations, such as San Francisco Bay Keeper.

2.2 Reporting Requirements

Provision C.8.h.iii.(2) of the MRP requires Permittees to annually submit a single collective regionwide Trash Monitoring Annual Progress Report no later than March 31 in the year following the water year being reported with each Urban Creeks Monitoring Report which includes the following information listed below:

- a) Narrative description of monitoring conducted, including the number of sites monitored and the number of monitoring events completed;
- b) Description of storm events that were sampled, including the date(s) and times when samples were collected, intensity and duration of the storm event, a description of where along the hydrograph the storm event was sampled, and justification used to determine the storm event was of appropriate size to displace and/or mobilize the transport of trash through the MS4 system;
- c) Narrative description, including maps of any MS4 contributing areas, homeless encampments and illegal dumping sites, located upstream of each Receiving Water sample site;
- d) Description and the results of data analysis methods, including statistical analyses performed on the data collected, to compare the difference in the level of trash measured from MS4 outfalls to the level of trash measured in receiving waters;
- e) Results and lessons learned from the data collected;
- f) Data quality assurance procedures that were implemented for samples collected;
- g) Monitoring events (including locations and methods) planned for the subsequent fiscal year(s); and
- h) Updates of required Initial Trash Monitoring Plan elements.

By no later than March 31, 2026, Permittees shall collectively submit a comprehensive Trash Monitoring Report coincident with the Integrated Monitoring Report, which at a minimum, includes all items listed above, but for all prior water years.

3.0 WY 2024 RECEIVING WATER TRASH MONITORING ACCOMPLISHMENTS

During WY 2024, the BAMSC Trash Monitoring Workgroup convened the Trash TAG and participated in two TAG meetings, developed monitoring methods, selected Receiving Water monitoring sites, developed a Regional Trash Receiving Water Monitoring Plan and associated Quality Assurance Project Plan (QAPP) that meet the requirements of Provision C.8.e, procured monitoring equipment, and commenced setup of the six selected regionwide receiving water monitoring locations.

3.1 Technical Advisory Group

3.1.1 TAG Members

During WY 2024, the BAMSC Trash Monitoring Workgroup convened two Trash TAG meetings. The Trash TAG members include monitoring experts from throughout California:

- **Tony Hale, PhD** - Director of the Environmental Informatics Program at the San Francisco Estuary Institute (SFEI).
- **Shelly Moore** - Executive Director of the Moore Institute for Plastic Pollution Research.
- **Tom Mumley, PhD²** - Assistant Executive Officer at the San Francisco Bay Regional Water Board.
- **Dawn Petschauer** - Stormwater Program Administrator at the City of Pasadena.
- **Ted Von Bitner, PhD** - Assistant Vice President at WSP USA.

3.1.2 TAG Meetings

During WY 2024, the BAMSC Trash Monitoring Workgroup hosted two virtual Trash TAG meetings. The primary goal for both meetings was to leverage the combined expertise of the TAG members to inform the development of the Trash Receiving Water Monitoring Plan and QAPP. Trash TAG members that are not associated with public agencies were financially compensated for their time and effort. The focus and outcomes of the two WY 2024 Trash TAG meetings are described below. Please note that TAG meetings #1 and #2 occurred during WY 2023.

Trash TAG Meeting #3 (March 3, 2024). At the third TAG meeting, the BAMSC Trash Monitoring Workgroup presented information to the TAG members on proposed approaches for the Trash Receiving Water Monitoring Program, including summaries of the monitoring goals and permit requirements, the site selection criteria and process, and a description of the regionally consistent receiving water monitoring methods. The BAMSC Trash Monitoring Workgroup also provided TAG members an update on the Outfall Monitoring Program.

TAG members were supportive of the proposed receiving water monitoring approaches and site selection (described in Section 3.2.2 below). BAMSC documented the details in the Draft

² Dr. Mumley retired from his position at the Regional Water Board in June 2024. His replacement on the TAG is currently under discussion.

Regional Trash Receiving Water Monitoring Plan and QAPP that was sent to TAG members for review prior to the second TAG meeting.

Trash TAG Meeting #4 (May 15, 2024). At the second TAG meeting, the BAMSC Trash Monitoring Workgroup presented key sections of the Draft Regional Trash Receiving Water Monitoring Plan and QAPP, including sampling design, site selection, sample event selection criteria, field methods for trash collection and flow monitoring, sampling handling, trash characterization methods, quality control and quality assurance (QA/QC), and data evaluation and reporting procedures.

TAG members were supportive of the proposed receiving water monitoring approaches. The TAG members provided written comments on the Draft Regional Trash Receiving Water Monitoring Plan and QAPP in June 2024.

The BAMSC Trash Monitoring Workgroup also summarized the preliminary results from Trash Outfall Monitoring conducted during WY 2024.

3.2 Trash Receiving Water Monitoring Plan Development

In WY 2024, the BAMSC Trash Monitoring Workgroup developed a final Regional Trash Receiving Water Monitoring Plan (MP) (BAMSC 2024) and QAPP (AMS 2024) that meet the requirements of Provision C.8.e of the MRP. The MP and QAPP were submitted to the Regional Water Board for EO approval on July 31, 2024, in compliance with the deadline required in Provision C.8.e.v of the MRP. On January 30, 2025, the Regional Water Board sent a letter to the BAMSC formally approving both the Regional Trash Receiving Water MP and QAPP.

The sections below briefly summarize the BAMSC Regional Trash Receiving Water MP and QAPP. These documents can be reviewed for specific details on the process used to select monitoring sites, monitoring approach, field methods for collecting trash and flow data, trash characterization, data evaluation and reporting procedures.

3.2.1 Site Selection Process

On behalf of the Alameda, Contra Costa, Santa Clara and San Mateo County Stormwater Programs that are required to conduct Trash Receiving Water Monitoring, the WOW Project Team went through the process of identifying potential trash receiving water monitoring locations, and collaborating with the Programs throughout the selection process to select sites with upstream watersheds that represent a variety of settings and types of trash control measures. In general, the Stormwater Programs implemented a three-step process to evaluate potential monitoring locations. The selection criteria categories used to select receiving water sites for trash monitoring are listed below:

1. **GIS/Desktop Analysis:** Identify creeks that do not support steelhead populations to minimize sampling constraints associated with regulatory permit requirements. For those creeks that do not support steelhead, bridge locations near existing stream gages were identified and then further evaluated on Google Earth and Google Street View for their suitability to conduct sampling using trawls. The upstream drainage areas for all suitable sampling locations were then evaluated to assess whether the area has been controlled to low trash generation level (i.e., < 5 gallons/acre/year).

2. **Logistical Considerations:** All potential sites identified during Step 1 were assessed in the field for logistical considerations (e.g., suitability for deploying trawls, expected ranges of water velocity, physical access, and safety).
3. **Other Factors:** Following Steps 1 and 2, all remaining sites were prioritized for monitoring. The high priority sites were then evaluated for the presence of direct discharge sources of trash. Existing information on the extent and magnitude of direct discharge sources (e.g., illegal dumping and encampments) near creeks upstream of the potential monitoring sites were obtained from Permittee staff. Highest priority was assigned to sites with no or minimal direct discharge sources of trash. Final criterion applied to site selection was to select sites that were geographically representative of the types of urban areas in the four Counties.

All Stormwater Programs were able to identify the minimum number of sites required for stormwater receiving water monitoring by the MRP. Table 2 lists the selected sites within each county. Figure 1 shows the selected sites with their contributing watersheds.

Table 2. Trash Receiving Water Monitoring Locations.

County	Station ID	Creek	Cross Street	Municipality	Latitude	Longitude	Drainage Area (acres)	Percent Urban Area
AC	AC-ALM	Alamo Canal	Dublin Blvd	Dublin	37.705013	-121.918495	18,362	58
AC	AC-CRA	Crandall Cr.	Bonanza Dr	Fremont	37.56947	-122.06081	2,769	91
CC	CC-ROD	Rodeo Cr.	Hawthorne Dr	Rodeo	38.024699	-122.263018	6,252	32
SM	SM-COL	Colma Cr.	W Orange Ave	South San Francisco	37.653296	-122.425782	7,834	83
SC	SC-ADO	Adobe Cr.	Middlefield Rd	Palo Alto	37.421769	-122.111659	6,752	59
SC	SC-LPA	Lower Penitencia Cr.	Machado Ave	Milpitas	37.421761	-121.906768	2,748	100

AC = Alameda County, CC = Contra Costa County, SC = Santa Clara County, SM = San Mateo County

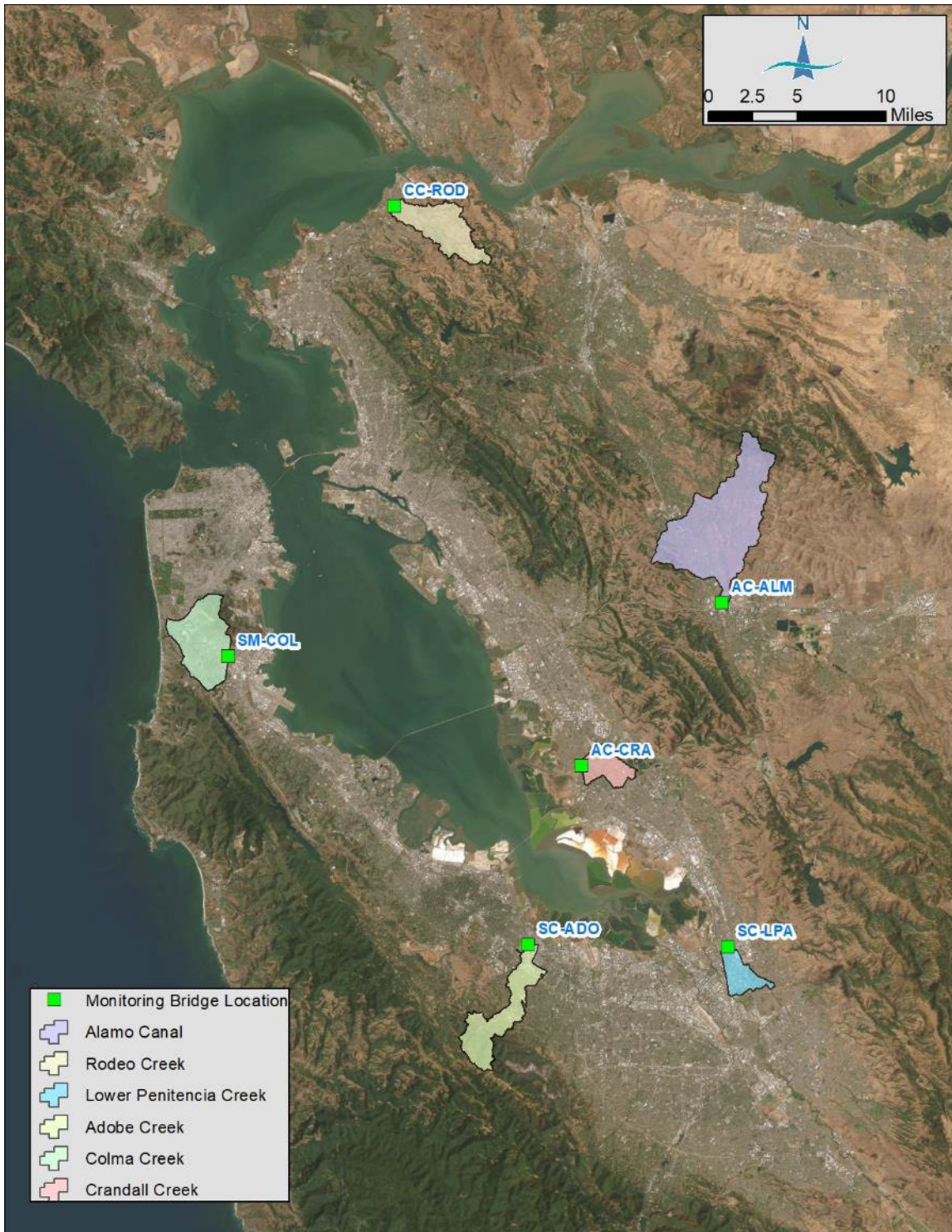


Figure 1. Trash Receiving Water Monitoring Sites.

3.2.2 Overall Monitoring Approach

The BAMSC Trash Monitoring Workgroup developed a regionally consistent approach for receiving water monitoring and data evaluation, informed by TAG member recommendations.

Sampling Equipment: The primary piece of equipment used will be a Modified Box Trawl with 5 mm mesh net, developed by 5 Gyres. During most sampling events, the trawl will be deployed using a USGS Type A bridge crane and A-55 reel (or similar). Trawls may also be manually deployed (i.e., without a crane) when field crews can safely access the channel during low flows.

The trawl will be deployed in such a way as to capture as much of a storm hydrograph as is feasible. Flow data from streamflow gages operated by other public agencies will be downloaded for the entire water year, with the exception of the Adobe Creek station (SC-ADO) and the Rodeo Creek station (CC-ROD). At Adobe Creek, the stream gage operated by Valley Water was recently moved approximately 5500 feet upstream. As a result, a pressure transducer was installed for this project at the former Valley Water streamflow gage location which is co-located with the project monitoring station near Middlefield Road. This water level record will be used to calibrate and validate the streamflow record from the new Valley Water streamflow station upstream, as needed. At CC-ROD, only stage data is collected by Contra Costa County Flood Control. Prior to the end of WY 2025, the monitoring team will collect topographic data at the site and create a HEC-RAS model to develop a stage-to-streamflow rating curve which will be used to convert stage data into discharge data.

Sampling Events: Trash will be monitored at each receiving water site during three storm events each water year over the duration of the MRP (WY 2025 – WY 2028). The type of storm that is targeted for a particular sampling event may vary based on the characteristics of the catchment, the prior storms monitored at a given location, information gained through previous monitoring, or other factors, but in general, will follow these guidelines:

- Quantitative precipitation forecast (QPF) of approximately 0.25 inches or greater over a 6-hour period, even if the prior 6-hour contiguous period has precipitation, but less than 0.25 inches;
- Probability of precipitation (POP) of 70% or greater; and
- Antecedent dry period of approximately 48 hours or greater (defined as no separate event exceeding 0.1 inches of cumulative rainfall within a 24-hour period).

Using these guidelines, the WOW project team will attempt to meet the MRP suggested criteria of monitoring the following types of storms:

- Storms that trigger trash discharge and trash transport through the MS4 (0.25 inches of rain over 6-hour period³); and
- The first significant storm event of each water year; and
- One storm per year that is forecasted to exceed the full capture design standard storm (i.e., the one-year, one-hour storm event).

³ The MRP suggests storms that discharge trash through MS4 are at least 0.25 inches over 24-hour period. However the WOW Project Team analyzed rainfall-streamflow relationships at the selected sites and found that the threshold in the MRP is likely too low to capture trash transport within receiving waters because the lower percentage of impervious surface. Therefore a storm that is at least 0.25 inch over 6 hours will be used for trash monitoring. The receiving water QPF threshold value may be adjusted based on observations during WY 2025.

The uncertainties related to weather forecasting may preclude collection of these events on an annual basis. Similarly, the first seasonal flush event may occur before the start of a given water year and may fall outside of the monitoring window or occur when field staff are unavailable to mobilize (e.g., a holiday).

Sample/Data Collection: The receiving water sampling procedure is described in detail in the Trash Receiving Water MP. To summarize the procedure, sampling teams will be mobilized to:

- Target storms that allow for collection of samples to assess variability in trash transport across different phases of the storm hydrograph (e.g., the rising hydrograph, the peak and the falling hydrograph).
- Individual samples varying in time from approximately 10-30 minutes will be collected during the sampling event.
- Sampling will occur at the center of the channel, and when flow is deep enough, samples will be collected from the surface and midway through the water column.
- Samples will be transferred to mesh transport bags which will be labeled.
- Following each monitoring event, samples will be transported to a storage facility.
- Following a dewatering period, the material will be removed from the transportation bags and placed on a large table that will be used to separate trash from organic debris (e.g., soil, sand, leaves, branches). Organic debris will be disposed of appropriately.
- Trash will be placed into storage bags (e.g., garbage bags or mesh bags) and later characterized.

Trash Characterization: Each trash sample will be characterized by measuring the volume of collected trash following protocols defined in the *Standard Operating Procedure for Trash Characterization* (Appendix E of BAMSC 2024) which describes the 13 categories for characterization. Trash will be sorted into different containers ranging in size from a 50 mL graduated cylinder to 5-gallon bucket. The total volume of trash items that do not fit into a 5-gallon bucket will be estimated and noted in the data collection form.

3.2.3 Data Evaluation

Data evaluation will consist of a combination of graphics and statistical methods to calculate and assess trash capture rates and trash types across sites and across time. The parameters to be evaluated include trash discharge rates during monitored storm events, stormwater runoff volumes and flow rates, and the types of trash observed in stormwater discharges.

The annual trash load (in gallons/acre/year) for each monitored catchment will be calculated by extrapolating trash volumes collected from single storm events to the annual hydrograph. Information about the magnitude and duration of each storm event throughout the year, including monitored events, will be used in these calculations. Based on the findings from each monitoring year, a streamflow-trash rating curve (or other conceptual model) based on storm characteristics (e.g., intensity, duration, antecedent dry period) may be developed for each monitoring site, and updated as new data are collected.

Initial findings from the trash outfall monitoring demonstrated a wide range of trash transport rates, even during similar flow rates. Therefore, we will be evaluating if streamflow-trash-based

rating curves will be the most effective tool (conceptual model) to calculate estimates of annual trash loading at receiving water sites. We may alternatively consider using average storm loading rates to calculate estimates of annual trash totals as described in Cowger et al. (2022).

Annual trash loading data will be evaluated within the context of the size of the contributing catchment area, as well as types of trash control measures present, trash generation rates, land use, etc.

3.2.4 Quality Assurance Project Plan

A key element of any monitoring program is a comprehensive QAPP. The QAPP is a written document that describes the procedures that the monitoring project will use to ensure the data it collects and analyzes meet the project requirements. In this case, all data must be comparable to the California Surface Water Ambient Monitoring Program (SWAMP). This means that the project Measurement Quality Objectives (MQOs) (i.e., acceptance criteria for the data) must be equivalent to or exceed SWAMP MQOs which are described in the SWAMP Quality Assurance Program Plan (QAPrP).⁴ In the interest of achieving regional consistency among Trash Monitoring conducted by MRP Permittees, the WOW Project Team developed a common QAPP for Trash Receiving Water Monitoring (AMS 2024). The QAPP is SWAMP comparable to the extent practical, including requirements for QA/QC samples (e.g., replicates/duplicates), documentation, MQOs, and sampling and handling protocols. The QAPP was formally approved by the USEPA on July 24, 2024 and Regional Water Board on January 30, 2025.

3.3 Trash Receiving Water Monitoring

Trash monitoring in receiving waters began in WY 2025 (October 2024), therefore no monitoring data were collected in WY 2024. However, in WY 2024, all six regional sites were prepared for trash monitoring by purchasing and organizing most of the required sampling equipment and preparing for site setup. The process included varying levels of notifications, permissions and permits depending on the municipality where receiving water sampling is located and the potential threats to special status species. Site setup was completed in early WY 2025 prior to substantive early season rainfall and consisted of adding staff gauges or maintaining existing staff gauges (where appropriate and with the owner's permission), performing detailed inspections and planning for equipment staging. Early WY 2025 site setup also included adding a pressure transducer adjacent to the sampling location on Adobe Creek in Santa Clara County (SC-ADO) as described in Appendix A. Specific details on the accomplishments within each BAMSC Countywide Program area during WY 2024 and early WY 2025 to prepare for trash receiving water monitoring are summarized in Appendix A.

Future Trash Receiving Water Monitoring Progress Reports will include the elements listed in Section 2.4, including monitoring results, data analysis methods, modeling and statistical analysis results, data quality assurance procedures that were implemented for samples collected, and any lessons learned from monitoring conducted to date.

3.4 Investigation of Trash Generation Based on Monitoring Results

There was no data collected in WY 2024 to address this reporting requirement. Future Trash Monitoring Progress Reports will describe the scope and status of any investigations underway

⁴ The current version of the SWAMP QAPrP is available here:
https://www.waterboards.ca.gov/water_issues/programs/swamp/docs/swamp-qaprp-2022.pdf

or planned to identify and address trash sources that may be contributing to trash loading from other sources which could be contributing to high levels of trash to monitored receiving waters.

3.5 Planned Tasks and Refinements for the Next Water Year

In response to Regional Water Board comments, the WOW Project team will ensure that during the three years of receiving water trash monitoring, a replicate sample will be collected for 5% of all samples each year. Additional comments related to clarification on methodology and site characteristics will be included in Version 2 of the Receiving Water Trash Monitoring Plan.

4.0 CONCLUSIONS AND RECOMMENDATIONS

In WY 2024, members of the BAMSC Trash Monitoring Workgroup prepared for Receiving Water Trash Monitoring to begin at the start of WY 2025 by implementing the following Provision C.8.3 planning tasks:

- Convened the Trash TAG and participated in two Trash TAG meetings.
- Developed and submitted a final Regional Trash Receiving Water Monitoring Plan (BAMSC 2024) and a final QAPP (AMS 2024) by July 31, 2024.
- Received approval of the Monitoring Plan and QAPP from the Regional Water Board EO on January 30, 2025.
- Obtained the necessary permits/permissions and installed monitoring equipment at five of the six regionwide receiving water monitoring locations. The remaining permit for the Adobe Creek station in Santa Clara County was issued in early WY 2025.

Specific WY 2025 tasks will include:

- The WOW Project Team will work with Permittees to conduct trash monitoring at six regionwide receiving water sampling sites according to the methods and procedures described in the Regional Trash Receiving Water Monitoring Plan (BAMSC 2024) and Regional QAPP (AMS 2024). A minimum of three monitoring events will be conducted at each receiving water monitoring site. In addition, flow will be recorded (by others) throughout the WY 2025 wet season.
- The Trash TAG will meet at least once in WY 2025 to update the TAG and, if needed, inform updates to the Trash Receiving Water Monitoring Plan and QAPP.
- The BAMSC Trash Monitoring Workgroup and WOW project team will continue to meet, as needed, to facilitate TAG input on monitoring plans, discuss monitoring issues that may arise, and generally support regional trash monitoring consistency across the four participating counties.

5.0 REFERENCES

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Appendix A

Trash TAG Meeting Summaries

**Trash Monitoring Technical Advisory Group (TAG)
Meeting #3
Monday, March 4, 2024, 9:00 am – 11:30 am**

Attendees:

- TAG Members:
 - Tom Mumley (RWQCB)
 - Dawn Petschauer (City of Pasadena)
 - Tony Hale (SFEI)
 - Shelly Moore (Moore Institute for Plastic Pollution Research)
 - Ted Von Bitner (WSP)
- Other Attendees:
 - Chris Sommers, Bonnie de Berry, Paul Randall, Helek Rutten, Vishakha Atre (EOA)
 - Zach Rokeach (RWQCB)
 - Erica Yelensky and Luisa Valiela (USEPA)
 - Paul Salop (Applied Marine Sciences)
 - Emily Corwin (Solano Stormwater Alliance)
 - James Scanlin (City of Newark)
 - Martin Bailey and Michelle Sim (City of Fremont)
 - Simret Yigzaw (City of San Jose)
 - Eric Donaldson and Jonathan Owens (Balance Hydrologics)
 - Lisa Austin and Lisa Welsh (Geosyntec Consultants)
 - Rinta Perkins (CCCWP)
 - Nicole Wilson (LWA)
 - Reid Bogert (C/CAG)
 - Carolynn Box (private consultant)

Introductions

Attendees introduced themselves and stated their role within the TAG.

Review of TAG purpose and scope of work; Administrative Items

Chris Sommers (EOA) reviewed the meeting agenda and provided an overview of the WOW grant tasks and deliverables. The WOW grant funding will be primarily used for complying with the Receiving Water (RW) Monitoring requirements in the Stormwater Municipal Regional Permit (MRP). Additional tasks that will be funded by the grant include a litter source control study, a litter outreach campaign, OVTA data analysis, a methods guidance document, development of a trash data portal and a trash symposium to share results. Tom Mumley (RWQCB) asked whether grant funding could cover Receiving Water (RW) monitoring beyond that level that is required by the MRP. Chris clarified that the main purpose of the grant funding is to complete the MRP required monitoring, but the grant supports additional tasks that will support trash control measure implementation and address additional information gaps related to trash monitoring. The WOW consultant team will keep the TAG posted if cost-efficiencies are experienced as the monitoring funded by the WOW project is conducted, and if these efficiencies make grant funding available to expand our planned monitoring.

Methods for Sampling Trash Transported in Receiving Waters

Eric Donaldson (Balance Hydrologics) provided information on the RW trash monitoring methods previously used by researchers and recommendations for RW monitoring for the WOW Project. Based on the literature review, the WOW Team recommends using weighted box trawl to conduct sampling. The

sampling will be conducted from bridge-based locations and will be vertically stratified through the water column with a focus on sampling surface and mid-water-columns positions at the thalweg. Video will also be used to document surface trash. The collected trash will be transported, dewatered, and stored at designated locations for characterization. The sampling method will be re-evaluated each year and modified, if needed. The TAG members discussed the sampling methods. Highlights of the discussion are provided below:

- The quantity of trash flowing in the thalweg and margins of a channel could be different. Consider setting up a camera to capture a wide view of the channel since there will be trash bypass in the margins. A selfie-stick could be set to look down on the sampling crew, bridge surface, and creek in one sustained view.
- Have more than one box trawl at each location to ensure a quick sampling procedure since it will take time to drop, sample, raise, and clean each sampler.
- Consider setting a maximum capacity for the trawl to establish QA/QC parameters and assist with identifying "extreme" conditions.
- For staff safety reasons, sampling will be done during daytime hours. However, sampling will start early in the morning and continue into the evening hours.

Site Selection Process

Paul Randall (EOA) presented an overview of the site selection process and the preliminary list of monitoring sites selected. The site selection process is based on MRP requirements, avoidance of waterbodies with a migratory (MIGR) beneficial use, location of bridges, co-location with existing stream gauges, channel conditions at feasible bridge sites, upstream trash generation rates, existing trash controls, upstream direct discharges, and geographical/spatial distribution. Paul asked if RWQCB staff could help coordinate permits from the CA Department of Fish and Wildlife (CDFW). Zach Rokeach (RWQCB) responded that CDFW will need to be involved early in the process. Paul will reach out to RWQCB staff with information on the sites. The TAG discussed the site selection process and asked some clarifying questions. Highlights of the discussion are provided below:

- Tony Hale (SFEI) asked if any of the RW sites align with the outfall monitoring sites. Paul responded that one RW monitoring site is directly upstream of an existing outfall monitoring site on Alamo Canal.
- Some TAG members recommended conducting a pre-season sampling/observation creek walk to document sources of direct discharges of trash (e.g., encampments). They also recommended documenting sites that do not have barriers to prevent wind-blown trash from entering receiving waters.
- Tony recommended utilizing satellite imagery timed with monitoring events to make some determination about potential trash sources, especially if there are anomalies observed. He also asked if there were more sites for backup in case direct discharges become an issue for some channels.

Outfall Monitoring Update

Paul provided a summary of trash outfall monitoring efforts and preliminary results for Water Year 2023. All but one of the eleven outfall monitoring locations were equipped with nets (Solano has had construction delays). Three sampling events have been completed at ten sites. There were some challenges with accurately monitoring flow during large storm events due to water backing up. The first flush was successfully sampled except for one location in San Jose due to vandalism. Larger storms exerted a lot of force on full nets and led to some equipment failures. Preliminary estimates indicate that

the first flush had the most trash. Samples had between <0.1% to 26% of trash and <0.01 to 0.25 gallons/acre of trash. The trash characterization will be done in spring/summer of 2024. TAG member discussion topics include:

- Zach asked if failed sampling events had data collected on the timing of the failure and net release during the storm. Paul responded that depth flow sensor data indicates timing of net release, which can be compared to rain gage data to determine timing of net release in relation to magnitude of rainfall.
- Tom mentioned that caution be used on the interpretation of trash results with regards to trash generation rates that were estimated using OVTA data. He requested that trash generation rates be supported with empirical data.

Chris mentioned the plan for BAMSC to develop a scope to conduct a literature review of alternative methods for monitoring trash in stormwater discharges/outfalls. The scope will be further discussed at the next TAG meeting.

Action Items

The following action items were identified at the meeting:

- Plan and organize the next TAG meeting in May 2024.
- Distribute Draft RW Trash Monitoring Plan and QAPP to the TAG for review prior to the May TAG meeting.

**Trash Monitoring Technical Advisory Group (TAG)
Meeting #4
Wednesday, May 15, 2024, 9:00 am – 12:00 pm**

Attendees:

- TAG Members:
 - Tom Mumley (RWQCB)
 - Dawn Petschauer (City of Pasadena)
 - Tony Hale (SFEI)
 - Shelly Moore (Moore Institute for Plastic Pollution Research)
 - Ted Von Bitner (WSP)
- Other Attendees:
 - Chris Sommers, Bonnie de Berry, Paul Randall, Helek Rutten, Vishakha Atre (EOA)
 - Zach Rokeach, Imtiaz-Ali Kalyan (RWQCB)
 - Erica Yelensky (USEPA)
 - Paul Salop (Applied Marine Sciences)
 - Simret Yigzaw (City of San Jose)
 - Eric Donaldson and Jonathan Owens (Balance Hydrologics)
 - Lisa Austin and Lisa Welsh (Geosyntec Consultants)
 - Nicole Wilson (LWA)
 - Reid Bogert (C/CAG)
 - Carolynn Box (private consultant)
 - Sean Noble, Kevin Lewis (KEI)

Introductions

Attendees introduced themselves and stated their role within the TAG.

Action Items and Key Outcomes from Meeting #3

Chris Sommers (EOA) reviewed the meeting agenda and provided an overview of the Action Items from the previous meeting.

- *Action Item 1 - Plan and organize the next TAG meeting in May 2024* – Today's meeting is the 4th TAG meeting. The next TAG meeting will be held in early 2025.
- *Action Item 2 - Distribute Draft Receiving Water Trash Monitoring Plan and QAPP to the TAG for review prior to the May TAG meeting* – The Draft Receiving Water Trash Monitoring Plan and QAPP was distributed to the TAG for review. A spreadsheet has been created for submitting comments.

Draft Receiving Water (RW) Trash Monitoring Plan (v.1.0) and QAPP

Chris and Paul Randall (EOA) provided an overview of the sampling design and site selection, including an overview of the Municipal Regional Permit (MRP) requirements and the management questions. Eric Donaldson (Balance) described the field characterization methods and QA/QC. Eric and Paul talked about data interpretation and reporting. Attendees discussed the RW Trash Monitoring Plan and QAPP. Highlights of the discussion are provided below:

- Tony Hale (SFEI) provided feedback on the site selection criteria. He noted that the final criterion concerns the identification of a "range of urban conditions". He asked whether it would be important to select areas based on a range of management actions (e.g., trash capture devices, education, green infrastructure, signage, etc.) since the first MRP management question focuses

on the efficacy of management actions. This data might be helpful to determine whether some management actions are more effective than others. Chris said that management actions are being considered in site selection.

- Tom Mumley (Regional Water Board) noted that most of the selected sites have a have a substantial amount of low trash generation drainage areas. In addition, a large percentage of upstream significant trash generating areas for the selected sites are addressed by “other trash controls”. He recommended documenting these other trash controls. Chris said that this information is available and will be documented. Tom and Ali expressed concerns that less trash may be observed in these areas.
- Zach noted that the Water Board has not yet approved the use of bioretention areas as full capture systems.
- Tony asked if avoiding streams with migration was the biggest factor in the site selection process. Paul noted that it was an important factor; however, there were enough streams without migration so eliminating the streams with migration was not an issue.
- Dawn asked about coordinating with Caltrans regarding BMPs they are implementing to address trash. Chris said that this is being done. Caltrans staff may attend the BAMSC Monitoring Committee meetings.
- Add bolt/cable cutters to the list of safety equipment in case the trawl nets get entangled with trees floating downstream.
- Consider lowering the 0.25 inches storm size criteria for sites in Santa Clara County.
- Erica asked for more information on the trash characterization process and whether any brand identification will be done. Tony added it might be important to handle expanded polystyrene (EPS) and other fragile materials carefully to avoid post-collection fracturing, which would inflate counts. Paul clarified that all trash items are not being tallied. Large items are being tallied by volume. Brand names are not being identified.
- Consider having the video at sites focus on the team as well as the water surface. This will help capture any anomalies in the trash collection process.
- Some attendees felt that it would be useful to conduct duplicate sampling, i.e., bringing another team to do side-by-side sampling. Others felt that increasing the frequency might be more beneficial. It was agreed that these approaches would be considered in Year 2. Tom recommended documenting all decisions and discussing when the TAG meets next year.

Chris reminded attendees to submit their comments on the RW Monitoring Plan and QAPP by May 27, 2024.

Stormwater Outfall Trash Monitoring Preliminary Results (WY 2024)

Paul provided a summary of trash outfall monitoring efforts, preliminary trash characterization results, and flow measurements and calculations for Water Year 2023. Three sampling events have been completed at ten sites. All collected trash has been characterized. Both reusable and single-use plastic bags are being counted. This will help identify how the reduction in single-use plastic bags correlates with municipal ordinances mandating bag bans.

- Three different methods will need to be used to calculate flow across all 10 sites. At most sites, flow will be calculated using depth sensors installed in pipe upstream of trash nets. The three sites in Santa Clara, the depth sensors did not accurately record depth during each monitoring event as result of net backing up flow into the pipe. For these sites, rating curves will be

developed using flows measured during non-sampling events. At the San Carlos site in San Mateo, the flow sensor did not accurately record depth of flow due to tidal influence. For this site, modelling will be used to estimate flows to develop an annual hydrograph.

- Zach asked if depth sensor at the San Carlos site could be installed further upstream the extent of tidal influence. The upstream locations are at manholes along Industrial Av; access to depth sensors would not be very feasible. Alternative locations at selected sites will be investigated.

Adaptations/Revisions to Outfall Trash Monitoring Plan and QAPP (V.2.0)

Chris summarized the adaptation/revisions to the Outfall Trash Monitoring Plan based on Water Board comments. At least one outfall monitoring site in Alameda is being changed to improve geographical coverage. He asked for the TAG's initial input on Water Board's request to look for alternative methods to measure trash from MS4 discharges. The discussion is summarized below:

- Some attendees noted that outfall nets are the best option.
- Consider using inlet covers as trash capture devices. Chris noted that this cannot be done as it could lead to flooding.
- Consider installing camera-based sensors attached to poles to track trash. SFEI explored this approach, but resources were not available to implement.

Attendees discussed ways to prevent vandalism of outfall nets. Suggestions included working closely with the surrounding community to explain the project, signage, and increasing patrolling by rangers in the areas prone to vandalism.

Action Items

The following action items were identified at the meeting:

- Plan and organize the next TAG meeting in 2025.
- Address TAG comments and submit Receiving Water Monitoring Plan and QAPP to the Water Board on July 31, 2024.

Appendix B

Preparation for Trash Receiving Water Monitoring – County Reports

Alameda Countywide Clean Water Program (ACCWP)

Contra Costa Clean Water Program (CCCWP)

San Mateo Countywide Water Pollution Prevention Program (SMCWPPP)

Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP)

Alameda Countywide Clean Water Program (ACCWP)

Preparations and Accomplishments During WY 2024

In WY 2024, the WOW Project Team on behalf of ACCWP went through a start-up process to support WY 2025 implementation of the receiving water trash monitoring component in collaboration with the BAMSC and consistent with MRP 3 Provision C.8.e requirements. This effort included a two-step process run concurrently to (1) review potentially viable monitoring approaches, and (2) identify potential monitoring locations.

The WOW Project Team, in conjunction with BAMSC collaborators, reviewed literature, talked to regional experts and selected the Weighted Box Trawl suspended from public access bridges via USGS style bridge cranes as the best option to support monitoring efforts.

The WOW Project Team next reviewed and identified potential monitoring locations using the criteria developed in conjunction with BAMSC collaborators and compiled within the Receiving Water Trash Monitoring Plan (BAMSC 2024). As part of this process, ACCWP performed a GIS analysis of catchment areas controlled to a low trash generation rate within the county and locations of current outfall trash monitoring locations. Identification of potential bridge locations that could support trash monitoring included desktop analysis and field verification. The desktop analysis incorporated available storm drain information (i.e., pipes, inlets, outfalls), GIS data, satellite imagery, and Google Street View to review numerous potential receiving water monitoring sites countywide.

The WOW Project Team assessed 18 potential receiving water monitoring locations throughout the county in desktop and/or field reconnaissance. From the 18 locations considered, ACCWP identified priority locations that were viewed as safe, likely feasible to monitor, and able to be permitted within the project constraints. Field visits eliminated all but four monitoring locations. Eliminated monitoring locations were removed from the site selection list if they had incompatible or insufficient guardrails/handrails to support a bridge crane, were too high above the water, had vegetation that could obstruct sampling, were within reaches subject to high-velocity supercritical flow, or posed basic safety risk to field personnel (e.g. narrow sidewalks). From the list of four candidate sites, ACCWP prioritized two locations, one in western Alameda county and one in eastern Alameda County.

The WOW Project Team next conducted outreach to relevant agencies that could potentially require permits or agreements for site access (e.g., encroachment permits) and for potential alterations to habitat that could affect fish and wildlife resources (e.g., Scientific Collection Permit). To secure site access at Alamo Canal (AC-ALM), the WOW Project Team worked with the Zone 7 Water Agency (Zone 7) and the City of Dublin for encroachment permits to support suspending the sampling trawl in the waterway. To secure site access at Crandall Creek (AC-CRA), the ACCWP worked with the City of Fremont and Alameda County Flood Control, but no encroachment permits were required.

Regarding habitat impacts, the WOW Project Team coordinated with the BAMSC Trash Workgroup, Water Board, California Department of Fish and Wildlife (CDFW), and United States Army Corps of Engineers (USACE) permitting staff to determine the need for specific permits. USACE reviewed potential monitoring locations and confirmed that no USACE permits were required at the ACCWP target locations. The WOW Project Team coordinated with CDFW to confirm that all required site construction and monitoring efforts could be conducted under a Scientific Collection Permit.

The WOW Project Team next initiated procurement of monitoring equipment. Equipment was ordered between May and September 2024, with the bridge cranes and cable-winch reels ordered first because of long lead times, but due to supply chain issues, bridge cranes and reels were not received until December 2024. The WOW Project team was able to borrow three bridge cranes and reels to help commence sampling during the early season, WY 2025.⁵

The WOW Project Team conducted a pre-sampling hydrologic analysis of the Alameda County sampling sites using hydrologic data provided to us by Alameda County Flood Control and Zone 7. The analysis was focused on evaluating the rainfall-runoff relationship at AC-ALM and AC-CRA including the relationship between the magnitude of rainfall and the magnitude of flows, the lag between initiation of rainfall and initiation of flow and the typical duration of storm flow hydrographs. These data will be used to guide when sampling should occur. During sampling, this dataset will be expanded to help improve mobilization decisions.

Planned Refinements to Monitoring Plan

None at this time.

Monitoring Site Descriptions

Site AC-ALM

Site AC-ALM is located on the Alamo Canal, which, at the site, drains approximately 18,362-acres (28.7 sq mi) watershed area that includes small area of City of Dublin in Alameda County and City of San Ramon in Contra Costa County. The upper watershed includes undeveloped areas within unincorporated Contra Costa County (Figure AC-1). The watershed area is 58% urban land uses. For just the urban portion of the watershed area, the baseline trash generation rates are approximately 97% low, 2% moderate, and 1% very high (BAMSC 2024). Approximately 54% of the trash generation rates greater than low are located in non-jurisdictional areas. A total of 10% of the watershed area is controlled to a low trash generation rate using full trash capture (FTC) systems; less than 1% is controlled by high-flow capacity systems, 3% controlled by catch basin inserts, and 6% controlled by multi-benefit stormwater treatment systems (BAMSC 2024). All FTC treated areas are within the jurisdictional area. Trash generation and FTC treated areas within the drainage area are illustrated in Figure AC-2.

The sampling location is located on the Dublin Boulevard bridge supported by 4 pier bents, two of which are located at the toe of the bank-channel transition. At the sample location, the stream is a natural bed, trapezoidal flood control channel that is approximately 35 feet wide during a 1- to 2-year recurrence flow event. The low-flow channel is roughly flat-bottomed. The channel is straight in the vicinity of the sampling location. The channel can be accessed on foot from the trail/access road on either side of the channel. Equipment loading and unloading can occur to the east of the site along the access road to the Dublin Civic offices, then vehicles should be moved to parking on the north side of Dublin Boulevard for the duration of sampling.

The sampling location is approximately 1,600 feet upstream of the nearest flow gage, Alamo Canal near Pleasanton, which is operated by Zone 7 Water Agency. The Zone 7 Water Agency also operates a gage on a major tributary, J Line, which enters Alamo Canal between the

⁵ Two cranes and reels were borrowed from the San Francisco Estuary Institute. Balance Hydrologics is also loaning the project a bridge crane and cable reel.

sampling location at Dublin Boulevard and the Alamo Canal near Pleasanton gage. Flows at the sampling location will be estimated by subtracting flow measured at the J Line gage from the flow measured at the Alamo Canal near Pleasanton gage.

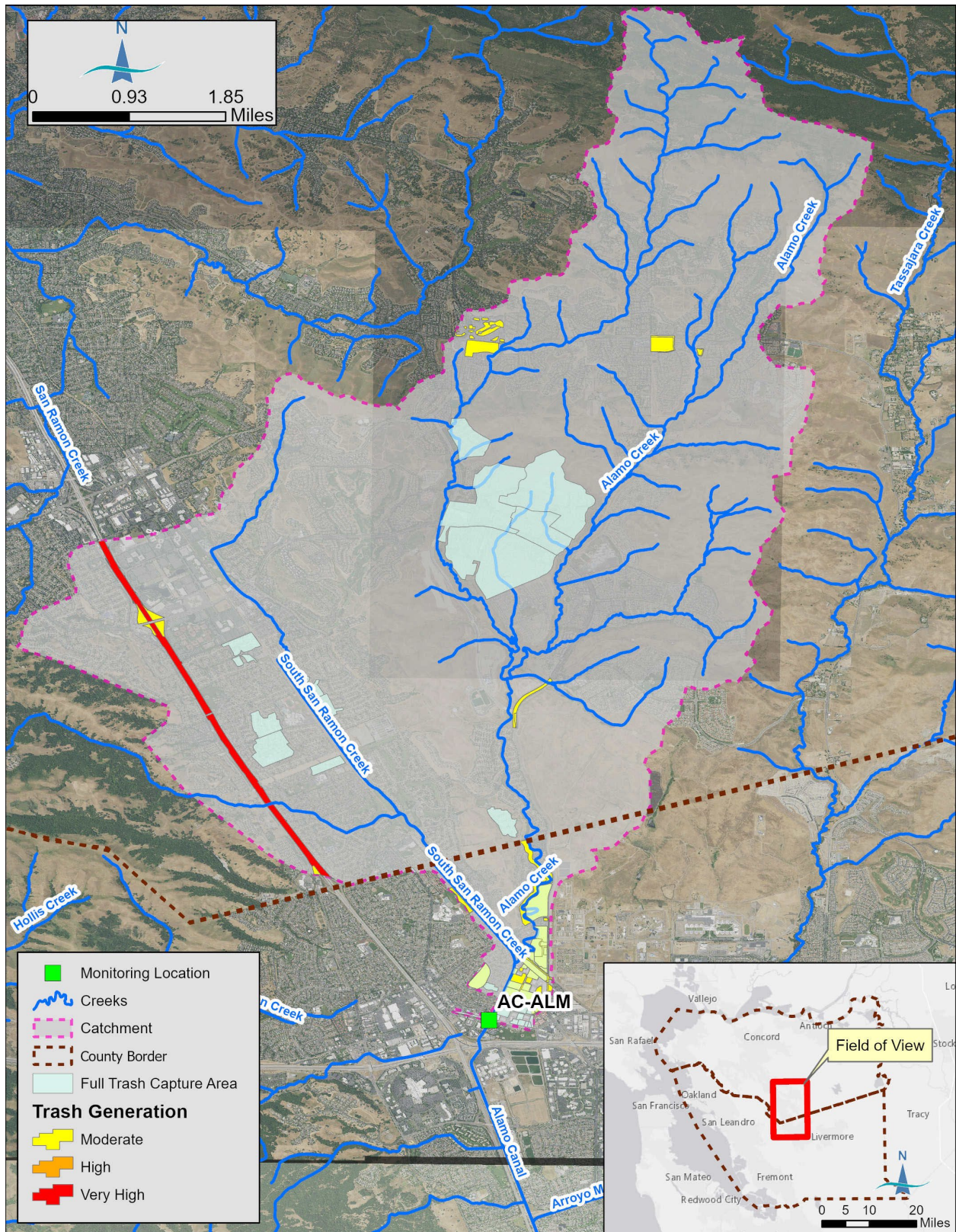


Figure AC-1. Receiving water monitoring location (site AC-ALM) at Alamo Canal, Alameda County (Contra Costa County is to the north).

Site AC-CRA

Site AC-CRA is located on Crandall Creek which, at the sample location, drains an approximately 2,769-acre (4.3 sq mi) watershed just south of Alameda Creek (Figure AC-4). Land use in the watershed area comprises 91% urban land use by area. For just the urban portion of the watershed area, the baseline trash generation rates are approximately 81% low, 13% moderate, 3% high and 3% very high. Approximately 47% of the trash generation rates greater than low are located in non-jurisdictional areas. A total of 15% of the watershed area is controlled to a low trash designation using full trash capture systems; 100% of full trash capture is controlled by catch basin inserts. All FTC areas are within jurisdictional area. Trash generation and FTC treated areas within the drainage area are illustrated in Figure AC-2.

The sampling location is located on Bonanza Drive bridge over Crandall Creek. At the sample location, the stream is a natural bed, trapezoidal flood control channel that is approximately 60 feet wide during a 1- to 2-year recurrence flow event. The low-flow channel is a compound channel with a low flow channel and vegetated floodplain. The channel is straight in the vicinity of the sampling location. The channel can be accessed on foot from the levees on either side of the channel. Parking and staging is available on the curb along the Bonanza Drive bridge.

The sampling location is approximately 2,900 feet downstream of the nearest flow gage, Crandall Creek at Deep Creek Road, which is operated by the Alameda County Flood Control District. If needed, a scaling factor will be applied to flow measured at the Alameda County Flood Control District gage by analyzing the difference in watershed size.

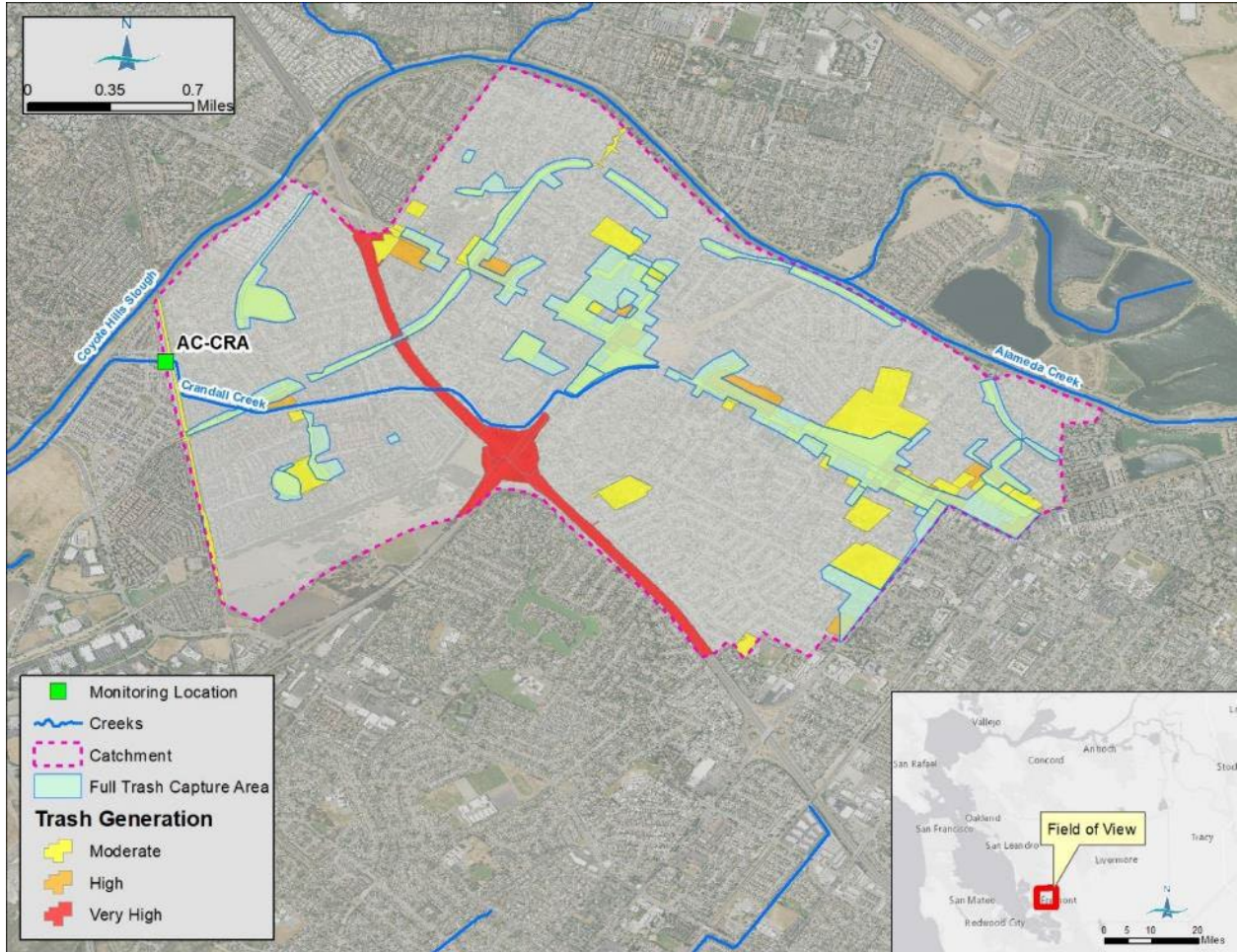


Figure AC-2. Moderate, high and very high trash generation area and full trash capture area in tributary drainage area for site AC-CRA.

Contra Costa Clean Water Program (CCCWP)

Accomplishments during WY 2024

In WY 2024, the WOW Project Team on behalf of CCCWP went through a start-up process to support WY 2025 implementation of the receiving water trash monitoring component in collaboration with the BAMSC and collaborators and consistent with MRP 3 Provision C.8.e requirements. This effort included a two-step process run concurrently to (1) review potentially viable monitoring approaches, and (2) identify potential monitoring locations.

The WOW Project Team, in conjunction with BAMSC collaborators, reviewed literature, talked to regional experts and selected the Weighted Box Trawl suspended from public access bridges via USGS style bridge cranes as the best option to support monitoring efforts.

The WOW Project Team next reviewed and identified potential monitoring locations using the criteria developed in conjunction with BAMSC collaborators and compiled within the Receiving Water Trash Monitoring Plan (BAMSC 2024). As part of this process, CCCWP performed a GIS analysis of catchment areas controlled to a low trash generation rate within the county and locations of current outfall trash monitoring locations. Identification of potential bridge locations that could support trash monitoring included desktop analysis and field verification. The desktop analysis incorporated available storm drain information (i.e., pipes, inlets, outfalls), GIS data, satellite imagery, and Google Street View to review numerous receiving water monitoring sites countywide.

The WOW Project Team assessed eight potential receiving water monitoring locations throughout the county in desktop and/or field reconnaissance. From the eight locations considered, CCCWP identified priority locations that were viewed as safe, likely feasible to monitor, and able to be permitted within the project constraints. Field visits eliminated all but five monitoring locations. Eliminated monitoring locations were removed from the site selection list if they had incompatible or insufficient guardrails/handrails to support a bridge crane, were too high above the water, had vegetation that could obstruct sampling, were within reaches subject to high-velocity supercritical flow, or posed basic safety risk to field personnel (e.g. narrow sidewalks). From the list of five candidate sites, CCCWP prioritized one location on Rodeo Creek at Hawthorne Drive.

The WOW Project Team next conducted outreach to relevant agencies that could potentially require permits or agreements for site access (e.g., encroachment permits) and for potential alterations to habitat that could affect fish and wildlife resources (e.g., Scientific Collection Permit). To secure site access at Rodeo Creek site (CC-ROD), the WOW Project Team worked with the Contra Costa County Flood Control District (CCCFCD) to secure encroachment permits to support suspending of the sampling trawl in the waterway. Only a permit from CCCFCD was required.

Regarding habitat impacts, the WOW Project Team coordinated with the BAMSC trash workgroup, Water Board, California Department of Fish and Wildlife (CDFW), and United States Army Corps of Engineers (USACE) permitting staff to determine the need for specific permits. USACE reviewed potential monitoring locations and confirmed that no USACE permits were required at the CCCWP target location. The WOW Project Team coordinated with CDFW to confirm that all required site construction and monitoring efforts could be conducted under a Scientific Collection Permit.

The WOW Project Team next initiated procurement of monitoring equipment. Equipment was ordered between May and September 2024, with the bridge cranes and reels ordered first because of long lead times, but due to supply chain issues, bridge cranes and reels were not received until December 2024. The WOW Project Team was able to borrow three bridge cranes and reels to help commence sampling during the early season, WY 2025⁶.

The WOW Project Team conducted a pre-sampling hydrologic analysis of Contra Costa County sampling sites using hydrologic data available from Contra Costa County Flood Control. The analysis was focused on evaluating the rainfall-runoff relationship at CC-ROD including the relationship between the magnitude of rainfall and the magnitude of flows, the lag between initiation of rainfall and initiation of flow and the typical duration of storm flow hydrographs. These data will be used to guide when sampling should occur. During sampling, this dataset will be expanded to help improve mobilization decisions.

Planned Refinements to Monitoring Plan

None at this time.

Monitoring Site Descriptions

Site CC-ROD

Site CC-ROD is located on Rodeo Creek at Hawthorne Drive, which, at the sampling location, drains an approximately 6,252-acre (9.8 sq mi) watershed area in Rodeo and the surrounding open space to the east (Figure CC-1). The watershed area is 32% urban land uses. For the urban portion of the watershed area, the baseline trash generation rates are approximately 89% low, 2% moderate, 1% high and 8% very high (BAMSC, 2024). Approximately 72% of the trash generation rates greater than low are located in non-jurisdictional areas (BAMSC 2024). Less than 1% of the watershed area is controlled to a low trash designation using full trash capture systems; 100% of full trash capture is controlled by catch basin inserts and connector pipe screens. All FTC areas are within jurisdictional area (BAMSC 2024). Trash generation and FTC treated areas within the drainage area are illustrated in Figure CC-1.

The sampling location is the Hawthorne Drive bridge with two pier bents, each located near the toe of the channel bank. At the sample location, the stream is a pseudo-natural bed, trapezoidal flood control channel that is approximately 50-feet wide during a 1- to 2-year recurrence flow event. The channel is a compound channel with a low flow channel and vegetated floodplain. The channel is straight in the vicinity of the sampling location. The channel can be accessed on foot from either side of the channel. Parking and staging is available along Hawthorne Drive.

The sampling location is co-located with the Rodeo Creek flow gage at Hawthorne Drive operated by CCCFCD.

⁶ Two cranes and reels were borrowed from the San Francisco Estuary Institute. Balance is also loaning the project a bridge crane and reel.

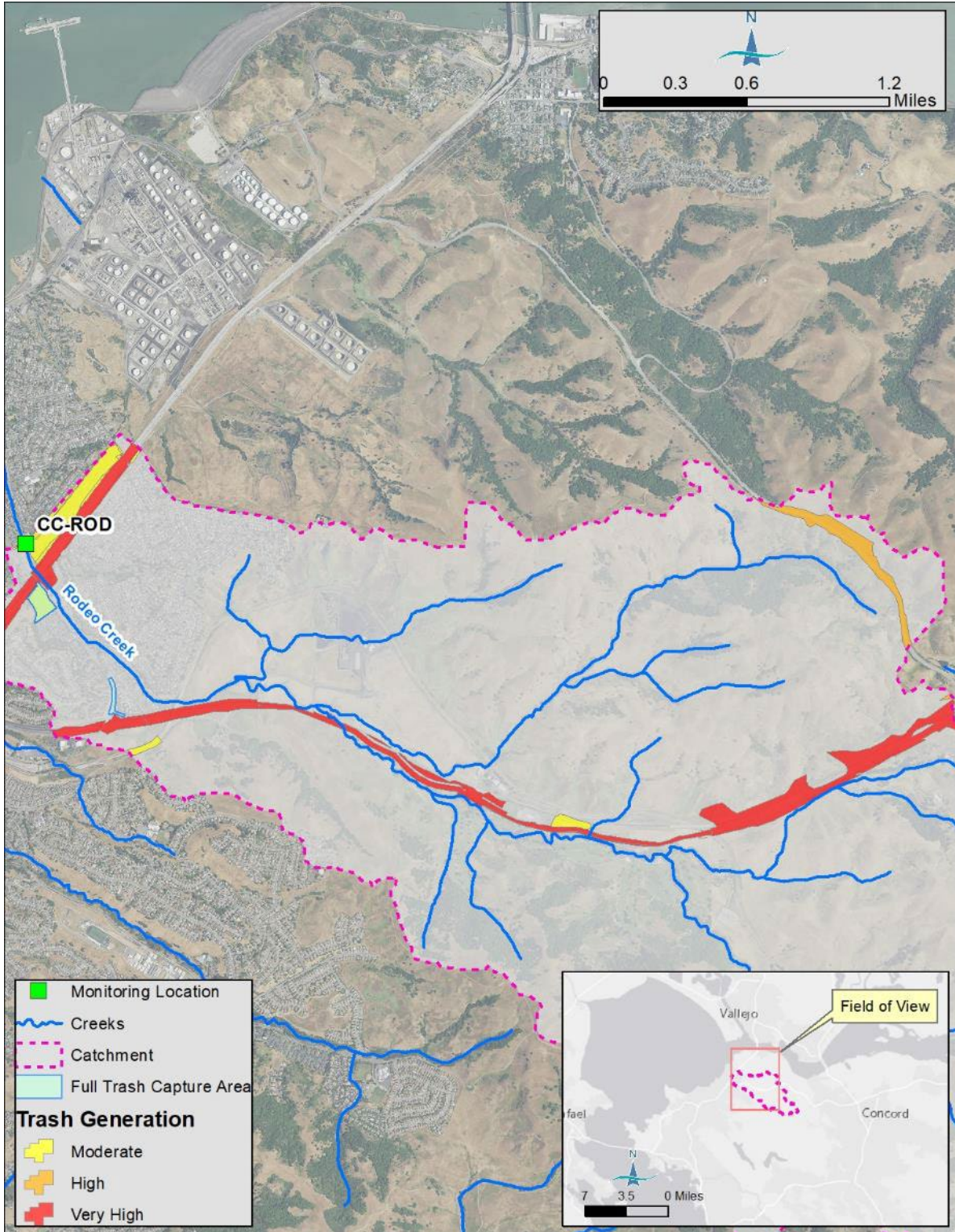


Figure CC-1. Moderate, high and very high trash generation area and full trash capture area in tributary drainage area for site CC-ROD.

San Mateo Countywide Water Pollution Prevention Program (SMCWPPP)

Accomplishments During WY 2024

In WY 2024, the WOW Project Team on behalf of SMCWPPP went through a start-up process to support WY 2025 implementation of the receiving water trash monitoring component in collaboration with the BAMSC and collaborators and consistent with MRP 3 Provision C.8.e requirements. This effort included a two-step process run concurrently to (1) review potentially viable monitoring approaches, and (2) identify potential monitoring locations.

The WOW Project Team, in conjunction with BAMSC collaborators, reviewed literature, talked to regional experts and selected the Weighted Box Trawl suspended from public access bridges via USGS style bridge cranes as the best option to support monitoring efforts.

The WOW Project Team next reviewed and identified potential monitoring locations using the criteria developed in conjunction with BAMSC collaborators and compiled within the Receiving Water Trash Monitoring Plan (BAMSC 2024). As part of this process, SMCWPPP performed a GIS analysis of catchment areas controlled to a low trash generation rate within the county and locations of current outfall trash monitoring locations. Identification of potential bridge locations that could support trash monitoring included desktop analysis and field verification. The desktop analysis incorporated available storm drain information (i.e., pipes, inlets, outfalls), GIS data, satellite imagery, and Google Street View to review numerous receiving water monitoring sites countywide.

The WOW Project Team assessed two potential receiving water monitoring locations throughout the county in desktop and/or field reconnaissance. From the two locations considered, SMCWPPP identified the priority location that was viewed as safe, feasible to monitor, and able to be permitted within the project constraints. Field visits eliminated all but one site; the location on Colma Creek at West Orange Avenue. The eliminated monitoring location was removed from the site selection list because it had insufficient guardrails to support the bridge cranes, and had vegetation that could obstruct sampling.

The WOW Project Team next conducted outreach to relevant agencies that could potentially require permits or agreements for site access (e.g., encroachment permits) and for potential alterations to habitat that could affect fish and wildlife resources (e.g., Scientific Collection Permit). To secure site access at Colma Creek (SM-COL), the WOW Project Team worked with the City of South San Francisco for an encroachment permit to support suspending of the sampling trawl in the waterway.

Regarding habitat impacts, the WOW Project Team coordinated with the BAMSC trash workgroup, Water Board, California Department of Fish and Wildlife (CDFW), and United States Army Corps of Engineers (USACE) permitting staff to determine the need for specific permits. USACE reviewed potential monitoring locations and confirmed that no USACE permits were required at the SMCWPPP target locations. The WOW Project Team coordinated with CDFW to confirm that all required site construction and monitoring efforts could be conducted under a Scientific Collection Permit.

The WOW Project Team next initiated procurement of monitoring equipment. Equipment was ordered between May and September 2024, with the bridge cranes and reels ordered first

because of long lead times, but due to supply chain issues, bridge cranes and reels were not received until December 2024. The WOW Project Team was able to borrow three bridge cranes and reels to help commence sampling during the early season, WY 2025⁷.

The WOW Project Team conducted a pre-sampling hydrologic analysis of the San Mateo County sampling sites using hydrologic data available from the City of South San Francisco. The analysis was focused on evaluating the rainfall-runoff relationship at SM-COL including the relationship between the magnitude of rainfall and the magnitude of flows, the lag between initiation of rainfall and initiation of flow and the typical duration of storm flow hydrographs. These data will be used to guide when sampling should occur. During sampling, this dataset will be expanded to help improve mobilization decisions.

Planned Refinements to Monitoring Plan

None at this time.

Monitoring Site Descriptions

Site SM-COL

Site SM-COL is located on Colma Creek at Orange Avenue in South San Francisco. The upstream drainage area, approximately 7,834-acres (12.2 sq mi), drains portions of South San Francisco, Colma, Daly City and San Bruno Mountain (Figure SM-1). The watershed area is 83% urban land uses. For just the urban portion of the watershed area, the baseline trash generation rates are approximately 74% low, 14% moderate, 7% high and 5% very high (BAMSC 2024). Approximately 43% of the trash generation rates greater than low are located in non-jurisdictional areas (BAMSC 2024). A total of 13% of the watershed area is controlled to a low trash designation using full trash capture systems; less than 1% is controlled by high-flow capacity systems, 12% controlled by catch basin inserts, and less than 1% controlled by multi-benefit stormwater treatment systems⁸ (BAMSC 2024). All FTC areas are within jurisdictional area. Trash generation and FTC treated areas within the drainage area are illustrated in Figure SM-1.

The sampling location is located on West Orange Avenue Bridge, a bridge with one pier bent in the middle of the channel. Sampling will need to occur at one side or the other of the pier bent. At the sample location, the stream is a concrete trapezoidal channel that is approximately 32-foot-wide during the 1- to 2-year recurrence flow event. The channel is flat-bottomed. The channel is straight in the vicinity of the sampling location. The channel can be accessed on foot via a maintenance ramp on the right side of the channel. Parking and staging are located at the maintenance ramp entry. Additional parking and staging are available at Orange Memorial Park, just upstream. The sampling site is just upstream of the tidally influenced reach of Colma Creek.

⁷ Two cranes and reels were borrowed from the San Francisco Estuary Institute. Balance is also loaning the project a bridge crane and reel.

⁸ The City of South San Francisco (SSF) has constructed the Orange Memorial Park (OMP) Regional Stormwater Capture Project just upstream of the proposed sampling location. The OMP was constructed to meet MRP requirements to implement green infrastructure improvements to reduce the amount of mercury and polychlorinated biphenyls (PCBs) in stormwater discharges to the San Francisco Bay. The OMP will also provide trash reductions (potentially 100% of the drainage area for RW sampling location). The City of SSF, however, has not requested the project get credit as a FTC from the Water Board.

The sampling location is located 300 feet downstream of the West Orange Avenue flow gage operated by the City of South San Francisco. This station was formerly operated by the USGS between 1963 and 1996 as stream gage number 11162720.

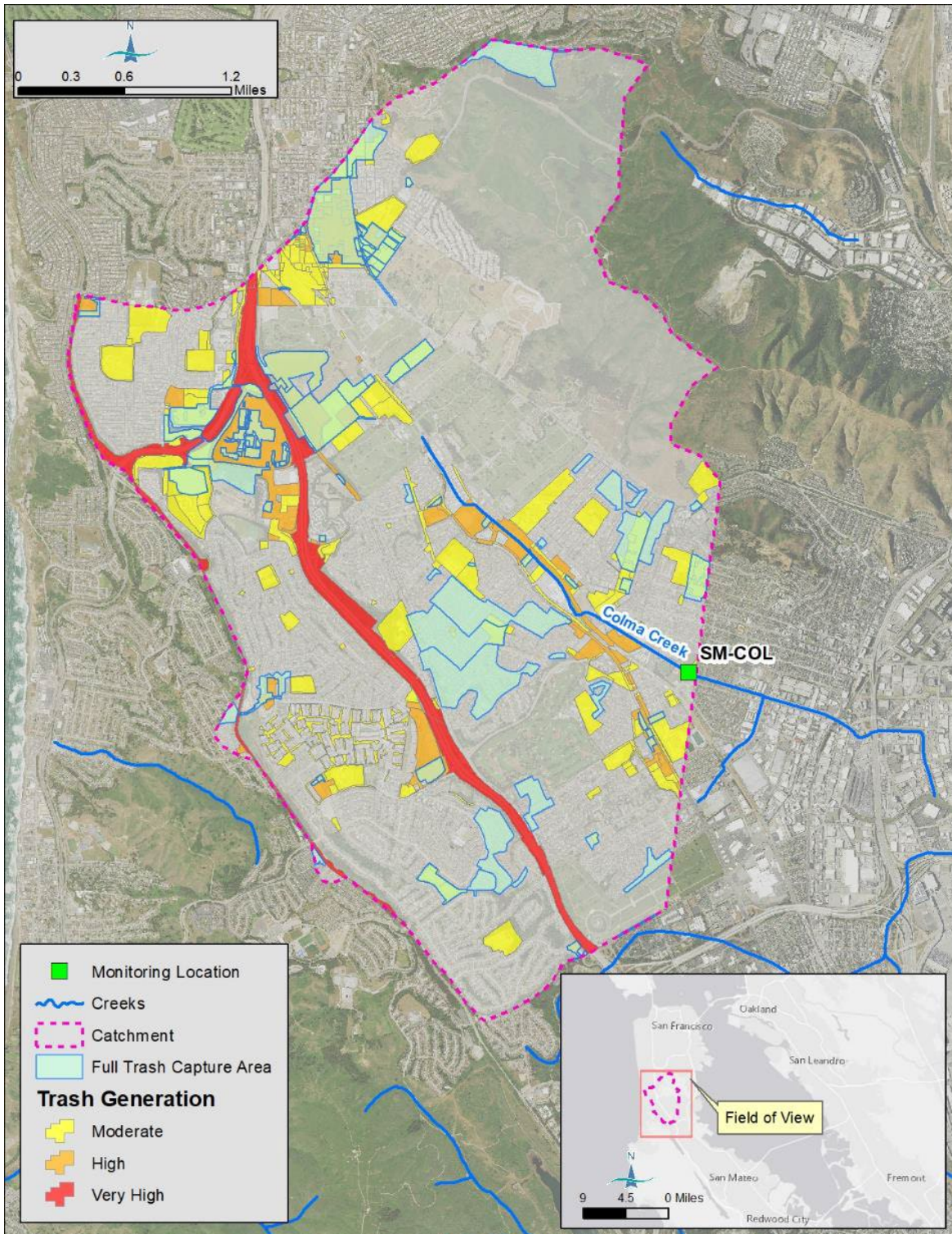


Figure SM-1. Moderate, high and very high trash generation area and full trash capture area in tributary drainage area for site SM-COL.

Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP)

Accomplishments During WY 2024

In WY 2024, the WOW Project Team on behalf of SCVURPPP went through a start-up process to support WY 2025 implementation of the receiving water trash monitoring component in collaboration with the BAMSC and collaborators and consistent with MRP 3 Provision C.8.e requirements. This effort included a two-step process run concurrently to (1) review potentially viable monitoring approaches, and (2) identify potential monitoring locations.

The WOW Project Team, in conjunction with BAMSC collaborators, reviewed literature, talked to regional experts and selected the Weighted Box Trawl suspended from public access bridges via USGS style bridge cranes as the best option to support monitoring efforts.

The WOW Project Team next reviewed and identified potential monitoring locations using the criteria developed in conjunction with BAMSC collaborators and compiled within the Receiving Water Trash Monitoring Plan (BAMSC 2024). As part of this process, SCVURPPP performed a GIS analysis of catchment areas controlled to a low trash generation rate within the county and locations of current outfall trash monitoring locations. Identification of potential bridge locations that could support trash monitoring included desktop analysis and field verification. The desktop analysis incorporated available storm drain information (i.e., pipes, inlets, outfalls), GIS data, satellite imagery, and Google Street View to review numerous receiving water monitoring sites countywide.

The WOW Project Team assessed 14 potential receiving water monitoring locations throughout the county in desktop and/or field reconnaissance. From the 14 locations considered, SCVURPPP identified priority locations that were viewed as safe, likely feasible to monitor, and able to be permitted within the project constraints. Field visits eliminated all but six monitoring locations. Eliminated monitoring locations were removed from the site selection list if they had incompatible or insufficient guardrails/handrails to support a bridge crane, were too high above the water, had vegetation that could obstruct sampling, were within reaches subject to high-velocity supercritical flow, or posed basic safety risk to field personnel (e.g. narrow sidewalks). From the list of six candidate sites, SCVURPPP prioritized two locations, one on Adobe Creek (SC-ADO), and one on Lower Penitencia Creek (SC-LPA).

The WOW Project Team next conducted outreach to relevant agencies that could potentially require permits or agreements for site access (e.g., encroachment permits) and for potential alterations to habitat that could affect fish and wildlife resources (e.g., Scientific Collection Permit). To secure site access at Adobe Creek (SC-ADO), SCVURPPP worked with the Valley Water and the City of Palo Alto for encroachment permits to support suspending of the sampling trawl in the waterway. To secure site access at Lower Penitencia Creek (SC-LPA), SCVURPPP worked with the City of Milpitas to procure encroachment permits.

Regarding habitat impacts, the WOW Project Team coordinated with the BAMSC trash workgroup, Water Board, California Department of Fish and Wildlife (CDFW), and United States Army Corps of Engineers (USACE) permitting staff to determine the need for specific permits. USACE reviewed potential monitoring locations and confirmed that no USACE permits were required at the SCVURPPP target locations. The WOW Project Team coordinated with CDFW

to confirm that all required site construction and monitoring efforts could be conducted under a Scientific Collection Permit.

The WOW Project Team next initiated procurement of monitoring equipment. Equipment was ordered between May and September 2024, with the bridge cranes and reels ordered first because of long lead times, but due to supply chain issues, bridge cranes and reels were not received until December 2024. The WOW Project Team was able to borrow three bridge cranes and reels to help commence sampling during the early season, WY 2025⁹.

The WOW Project Team conducted a pre-sampling hydrologic analysis of the Santa Clara County sampling sites using hydrologic data provided to us by Valley Water. The analysis was focused on evaluating the rainfall-runoff relationship at SC-ADO and SC-LPA including the relationship between the magnitude of rainfall and the magnitude of flows, the lag between initiation of rainfall and initiation of flow and the typical duration of storm flow hydrographs. These data will be used to guide when sampling should occur. During sampling, this dataset will be expanded to help improve mobilization decisions.

Planned Refinements to Monitoring Plan

None at this time.

Monitoring Site Descriptions

Site SC-LPA

Site SC-LPA is located on Lower Penitencia Creek at Machado Avenue, which, at the sampling location drains an approximately 2,748-acre (4.3 sq mi) watershed area in Milpitas and Northern San Jose (Figure SC-1). The watershed area is 100% urban land uses. For just the urban portion of the watershed area, the baseline trash generation rates are approximately 69% low, 25% moderate, 2% high and 3% very high (BAMSC 2024). Approximately 23% of the trash generation rates greater than low are located in non-jurisdictional areas (BAMSC 2024). A total of 6% of the watershed area is controlled to a low trash designation using full trash capture systems; 5% controlled by catch basin inserts and 1% controlled by multi-benefit stormwater treatment systems (BAMSC 2024). All FTC areas are within jurisdictional area. Trash generation and FTC treated areas within the drainage area are illustrated in Figure SC-1.

Site SC-LPA is located on the Machado Avenue bridge, which has one pier bent in the middle of the channel. The optimal sampling location is on either side of the pier bent. At this location, the stream is a natural bed, trapezoidal flood control channel with concrete sack (sakrete) bank protection that is approximately 30 feet wide during a 1- to 2-year recurrence flow event. The low-flow channel appears to be a flat-bottom channel with a mix of bare sediment and vegetation. The channel is straight in the vicinity of the sampling location. The channel can be accessed on foot from either side of the channel. Parking and staging are available on Machado Avenue and along the trail that runs along the left bank downstream of the crossing.

The sampling location is co-located with the Valley Water flow gage Lower Penitencia Creek at Machado (Sensor 5000.1), which is operated by Valley Water. Valley Water states that the

⁹ Two cranes and reels were borrowed from the San Francisco Estuary Institute. Balance is also loaning the project a bridge crane and reel.

rating curve is accurate above approximately 15 cfs; flows below that may be less reliable for evaluating annual trash loading during low flow periods. We do not anticipate this being an issue because the vast majority of trash is transported at high flows.

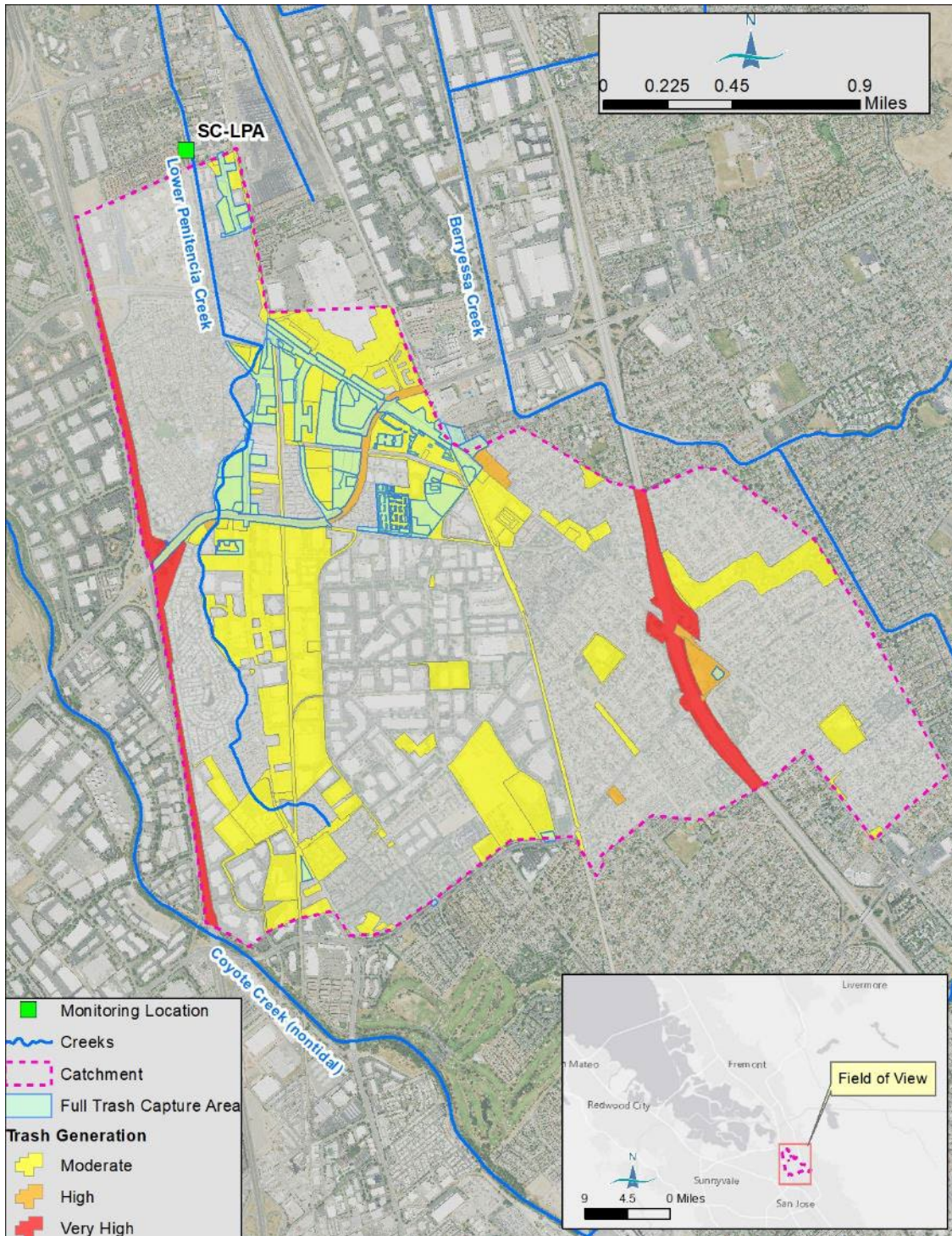


Figure SC-1. Moderate, high and very high trash generation area and full trash capture area in tributary drainage area for site SC-LPA.

Site SC-ADO

Site SC-ADO is located on Adobe Creek at Middlefield Road, which, at the sampling location drains an approximately 6,854-acre (10.7 sq mi) watershed area in Palo Alto and the Santa Cruz Mountains to the south (Figure SC-4). The watershed area is 60% urban land uses. For just the urban portion of the watershed area, the baseline trash generation rates are approximately 84% low, 11% moderate, 4% high and 2% very high. Approximately 34% of the trash generation rates greater than low are located in non-jurisdictional areas. A total of 7% of the watershed area is controlled to a low trash designation using full trash capture systems; 6% is controlled by high-flow capacity systems, less than 1% controlled by catch basin inserts, and less than 1% controlled by multi-benefit stormwater treatment systems. All FTC areas are within jurisdictional area. Trash generation and FTC treated areas within the drainage area are illustrated in Figure SC-2.

The sampling location is located on Middlefield Road bridge, which is a free-span bridge. At the sample location, the stream is an approximately 30-feet-wide concrete rectangular flood control channel with concrete bed and vertical banks. The channel is flat-bottomed, and at the time of the reconnaissance had a veneer of sediment over the concrete bed. The channel is straight in the vicinity of the sampling location. The channel can be accessed on foot via a Valley Water maintenance ramp on the right side of the channel. Staging and parking are available on the street, and on the Valley Water access.

The sampling location is located 5500 feet downstream of the Adobe Creek at El Camino flow gage (Sensor 5135) which is operated by Valley Water. A scaling factor will be applied to flow measured at the Valley Water gage by analyzing the difference in watershed size.

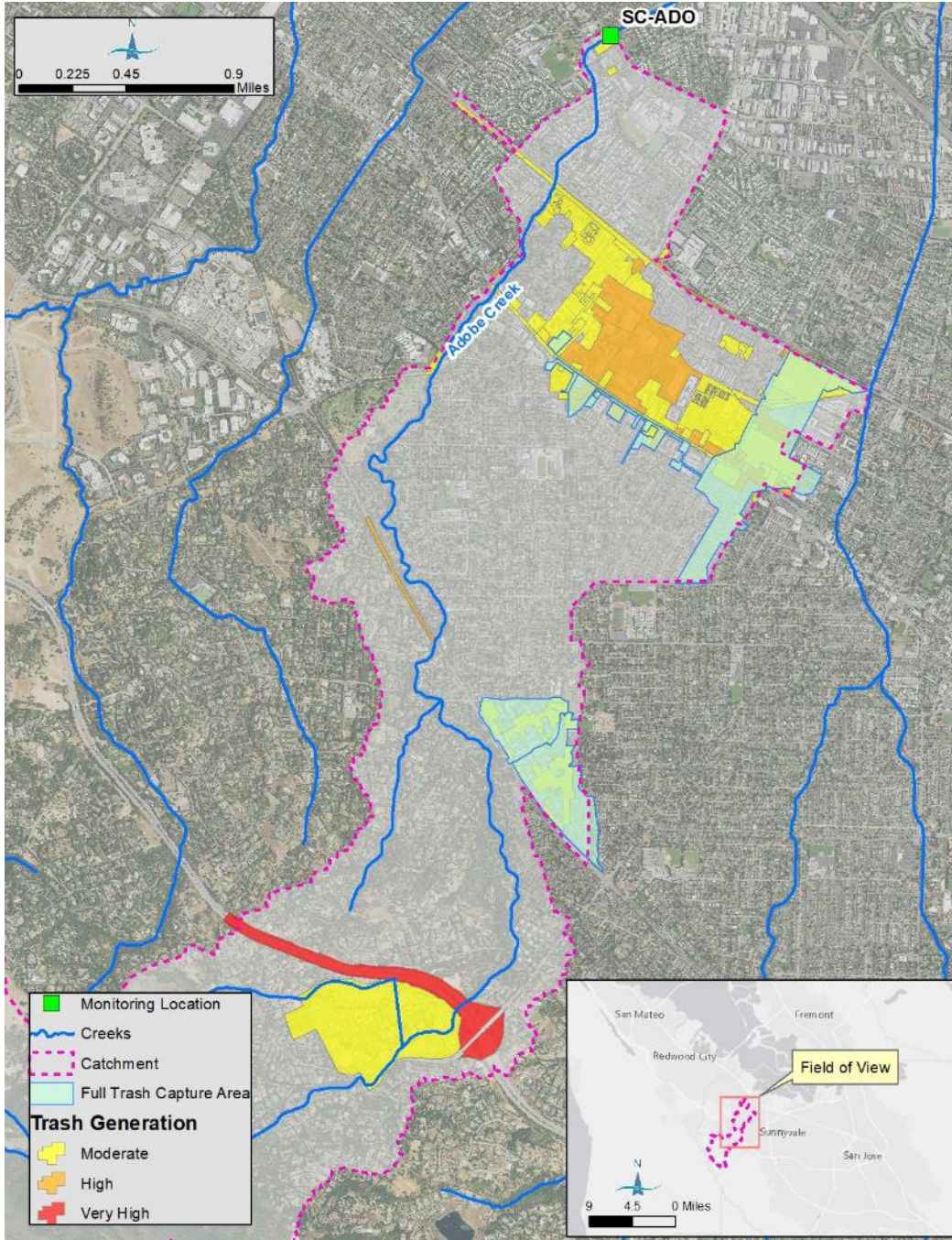


Figure SC-2. Moderate, high and very high trash generation area and full trash capture area in tributary drainage area for site SC-ADO.