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2017 MRSWMP Dry Run & First Flush Monitoring Report

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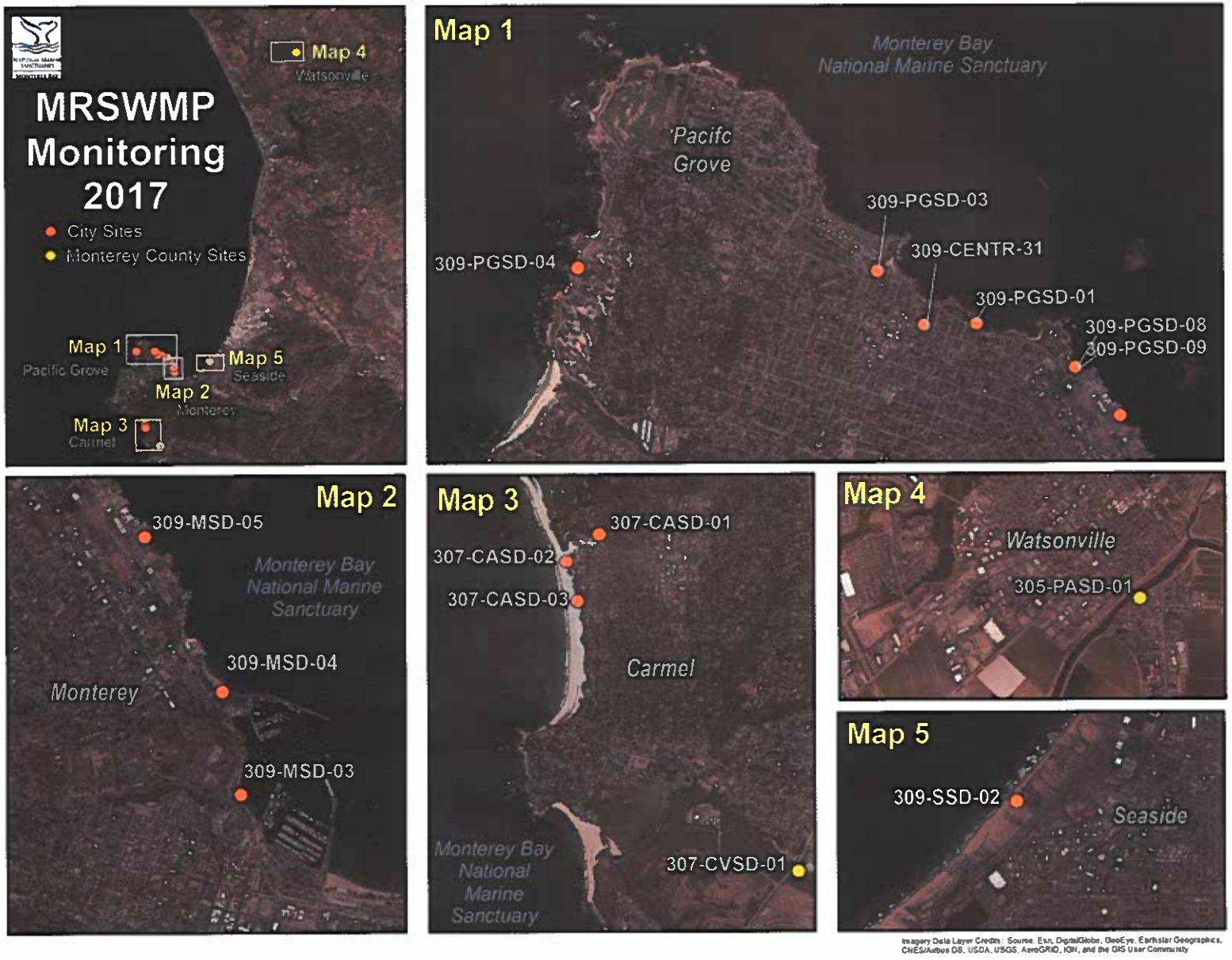

Figure 1. Monterey Regional Storm Water Management Program (MRSWMP) sites monitored for the 2017 Dry Run and First Flush.

Introduction

The Monterey Regional Storm Water Management Program's (MRSWMP) water quality monitoring program is modeled after the Monterey Bay National Marine Sanctuary's (MBNMS) Dry Run/First Flush monitoring program, for which volunteers collect water samples which are analyzed for common urban pollutants. This monitoring program design promotes volunteer participation, stewardship and environmental education while providing important data regarding the quality of water flowing into Monterey Bay National Marine Sanctuary.

The 2017 MRSWMP monitoring program collected water samples prior to the first major rainstorm of the year (Dry Run), and during the first major rainstorm of the winter season (First Flush). Samples collected during dry weather provide information regarding pollutants of concern and can give an indication of urban water uses (car washing, pressure washing, irrigation or illicit discharges), or groundwater base flow. In some cases, dry weather flows can be more concentrated than those of wet weather flows due to less dilution. Water samples collected during the first major storm of the winter season provide information on the concentration of contaminants in storm water after months of dry weather accumulation of pollutants on land in urban areas. All runoff from the Monterey region eventually flows into MBNMS except in Pacific Grove where some dry and wet weather flows are diverted to the sanitary sewer. It is hoped that this data provided by the MRSWMP water quality monitoring program provides local cities with the information to implement best management practices to improve water quality.

This monitoring program is designed to meet E.8.ii requirements under the Phase II Stormwater Permit of the MRSWMP, satisfying public involvement and participation elements of the permit. This monitoring program does not fulfill the E.13 requirements pertaining to ASBS Monitoring, TMDL Monitoring, 303(d) Monitoring or Receiving Water Monitoring, which are completed by permittees individually or through regional programs. For additional information regarding the Central Coast ASBS Regional Monitoring Program, please visit: http://ccasbsrmp.stanford.edu/

Methods

The same protocols and laboratory analyses are used for all of the MRSWMP water quality monitoring events. Volunteers take field measurements (water temperature, pH, electrical conductivity, and transparency), and collect water samples for lab analysis of nutrients (nitrate, orthophosphate, ammonia, and urea), bacteria (*Eschericia coli* and enterococcus), metals (copper, lead and zinc) and total suspended solids, color, Methylene Blue Active Substances (MBAS) detergents, fluoride, hardness (as CaCO3), potassium and turbidity.

Most results (lab and field) in this study are compared to receiving water standards established for beneficial uses in a stream, lake, or the ocean (see Table 1). These receiving water quality standards are not meant for end of pipe monitoring, such as for this MRSWMP water quality monitoring program, except for the analytes that refer to the MS4 General Permit. However, lacking many standards for end-of-pipe monitoring these receiving water standards are used for comparison. MBAS detergents and metal results are compared to the Water Quality Control Plan for the Central Coast Basin (Basin Plan) Water Quality Objectives (WQO) set by the Regional Water Quality Control Board (RWQCB) for the protection of marine aquatic life. Because there are no numerical water quality objectives in the Basin Plan for *E. coli*, enterococcus, nitrate, orthophosphate, and total

suspended solids (TSS), those results are compared with the U.S. Environmental Protection Agency (U.S. EPA) WQO and Central Coast Ambient Monitoring Program's (CCAMP) Action Levels. The U.S. EPA objectives are for the protection of human health while CCAMP's Action Levels are benchmarks that are set for receiving water concentrations at which pollutants may impact cold-water fish. Action Levels typically represent existing regulatory standards, levels derived from the literature or other agency references, or from data that shows levels are elevated relative to the data distribution for that parameter on the Central Coast. It is important to reiterate that both RWQCB Basin Plan water quality objectives and CCAMP Action Levels are established for receiving waters and not for end of pipe discharges such as is collected for the MRSWMP monitoring. There are no end of pipe objectives for most of the monitored analytes of the MRSWMP monitoring program, however, the State Water Resources Control Board (SWRCD) National Pollution Discharge and Elimination System (NPDES) MS4 General Permit does provide end of pipe water quality standards or Action Levels for: ammonia, color, hardness, potassium and turbidity. For turbidity, the SWRCB NPDES MS4 Action Level has been supplanted by CCAMP Action Level that is more protective of water quality. No Action Level was provided in the SWRCB NPDES MS4 General Permit for fluoride.

Dry Run monitoring entails collecting a single grab sample from each site with flowing water. Sites that did not have water flowing were documented as "no flow" on a field data sheet. Greenwood Park (Pacific Grove) is monitored for the Dry Run despite the flow being diverted into the sanitary sewer. This information is valuable as it identifies if there are contaminants in the runoff that did not flow to the ocean. During the First Flush event, grab samples were collected 30 minutes apart for two time series, results were averaged. In this report, averaged First Flush results are reported by analyte, individual time series results are reported by jurisdiction in Appendix 3. Samples for urea were collected only during the first time series, and are not an average but a single sample result from each event.

Grab sample results are reported as concentration, consistent with how the water quality objectives are defined. However, this does not give an indication of the load of pollutants being discharged. Flow was measured by filling a container of known volume (a bucket), timing how fast the container filled, and estimating how much of the flow was captured while filling the container. First Flush instantaneous flow calculations are an average of two time series samples, while the Dry Run instantaneous flow calculations are from a single sample (Table 2).

Figure 2. Volunteers gather at Twins (Monterey) for training during the Dry Run.
Photo: C. Mann.

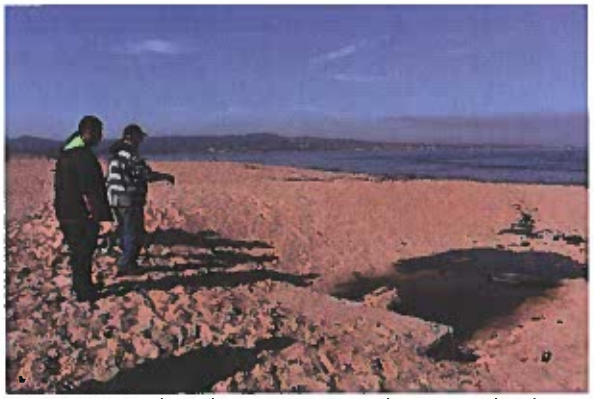

Figure 3. During the Dry Run, volunteers check First Flush sites for flowing water at Bay Street (Seaside). Photo: C. Mann.

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Results

Two monitoring events took place during the 2017 MRSWMP permit year:

- The Dry Run was conducted on September 16th, 2017 at 15 sites with the help of 18 volunteers. Only 5 of the 15 sites had enough flowing water to be sampled.
- The first major storm of the rainy season hit the central Monterey Bay on the morning of November 16th, 2017. Volunteers for Pajaro (Monterey County) were mobilized at 12:00 pm when the front slid south (Figure 4) and came ashore. Monterey Peninsula volunteers were mobilized a few hours later at 2:00 pm when the front inched closer to the Monterey Peninsula (Figure 5). A total of 27 volunteers assisted with the collection of field data and samples at all 15 sites.

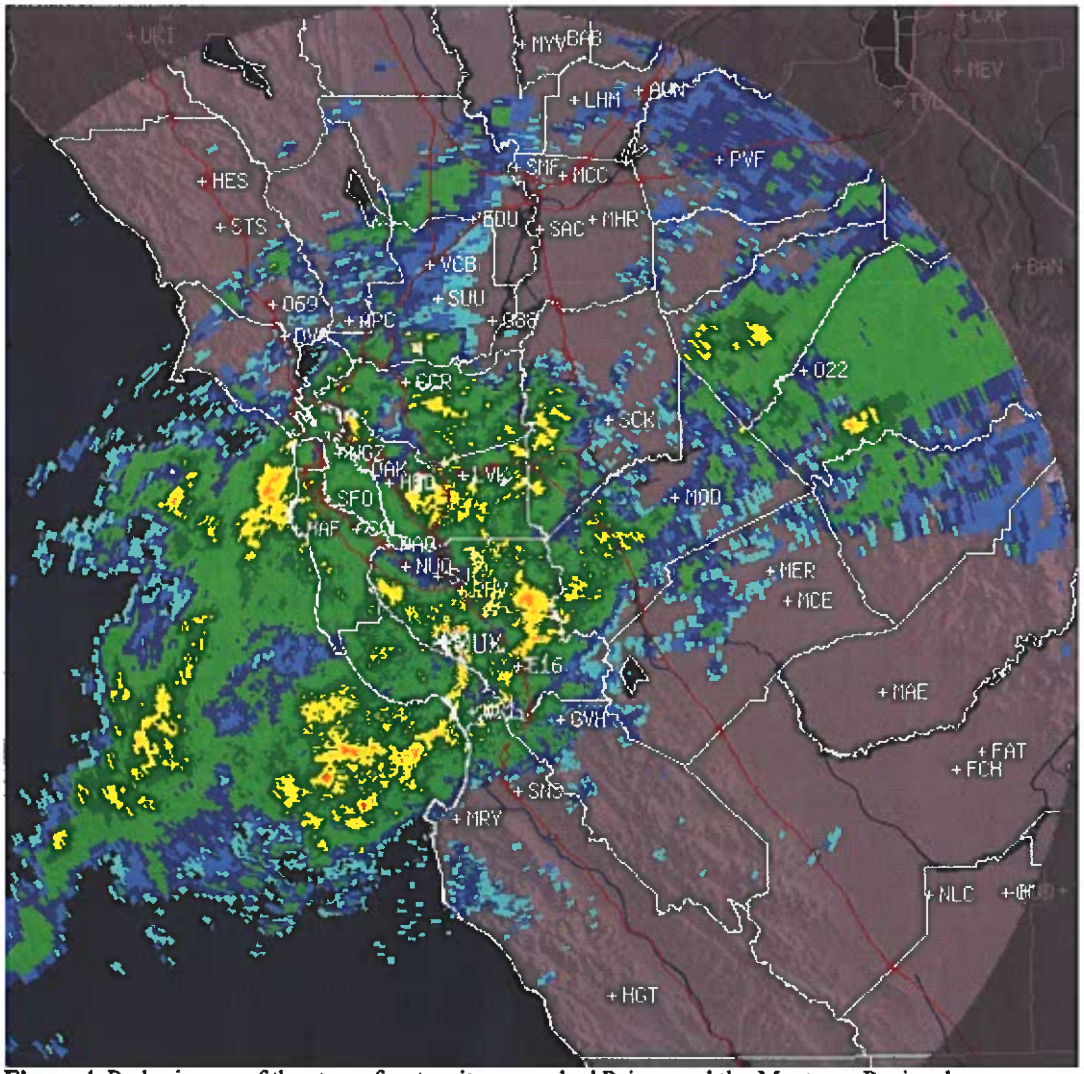


Figure 4. Radar image of the storm front as it approached Pajaro and the Monterey Peninsula on November 16, 2017 at 20:49:27 UTC, retrieved on November 20, 2017 at 1:16 pm.
Image: National Weather Service.

Flow was measured by volunteers at the time of sampling except at the following sites: Bay Street (Seaside and Sand City), and Lovers (Pacific Grove) due to the end of pipe inaccessibility; Pajaro (Monterey County) and Crossroads (Monterey County) due to flap gates at the end of the outfall that impedes natural flow. HopkinsMon First Flush flow measurements were based upon just one measurement by the team. All other instantaneous flow estimates are listed in Table 2. First Flush flow estimates are averages of the first and second sample collections.

Analyte descriptions below are listed alphabetically and include box and whisker graphs showing the data divided into dry weather monitoring (DR) and wet weather monitoring (FF) by site. Dry Weather monitoring events include Dry Run and any historical Spring Run and Summer Run events; wet weather monitoring is inclusive of First Flush and historical Second Flush events. Box and whisker graphs show a distribution of the dataset in a convenient format for making comparisons. The box represents the range of 50% of the data with a point in the middle that represents the median value. The upper and lower whiskers represent the remaining upper and lower 25% of the data. The end point of the whiskers show the maximum and minimum result for that analyte at that location and gives an indication of best and worst case results. Each graph includes a marker (open circle) for the most recent year's result to gain insight into pollutant concentrations for the current year and how it compares to historical results.

Table 2: Instantaneous flow estimates in gallons per minute (gpm). NA= data not available due to issues with pipe and/or accessibility, NR= Not recorded, NF= No flow.

Sites	Dry Run	First Flush
Pajaro (Monterey County)	NF	NA
Bay Street (Seaside and Sand City)	NF	NA
Twins (Monterey)	NR	540
San Carlos Beach (Monterey)	NF	240
Steinbeck (Monterey)	NF	59
HopkinsMon (Pacific Grove)	0.47	11
HopkinsPG (Pacific Grove)	NF	120
8th Street (Pacific Grove)	NF	260
Greenwood Park (Pacific Grove)	0.28	1200
Lover's (Pacific Grove)	NF	NA
Pico (Pacific Grove)	22.4	475
4th Avenue (Carmel)	NF	14
Ocean Avenue (Carmel)	NF	56
8th Avenue (Carmel)	1.9	39
Crossroads (Monterey County)	NF	NA

NR= Not Recorded.

Table 3. The range of results for field measurements and lab samples. Dry Run samples are a single sample, First Flush range results are not averaged, with both time series samples taken into account.

Parameter	Units	Dry Run	First Flush
Ammonia as N	mg/L	ND – 1.1	0.11 – 6.00
Color	color units	14 - 100	150 - 1750
Conductivity	µS	1840 - 3800	70 - 950
Copper- total	µg/L	8 - 32	12.78 – 606.71
Escherichia coli (E. coli)	MPN/ 100 ml	880 – 242,000	626 - >241960
Enterococcus	MPN/ 100 ml	74 – 112000	4412 - 173289
Fluoride	mg/L	0.1 – 0.5	0.06 – 0.54
Hardness	mg/L	223 - 626	12.91 – 1098.99
Lead- total	µg/L	ND - 1	1.33 – 32.79
MBAS Detergents	mg/L	0.08 – 0.59	0.38 – 1.85
Nitrate as N	mg-N/L	ND – 1.1	0.14 – 4.00
Orthophosphate as P	mg-P/L	ND – 0.32	0.07 – 4.29
pH	pH units	6.5 – 7.5	5 - 9
Potassium	mg/L	6 - 15	1.44 – 64.77
Total Suspended Solids	mg/L	ND - 10	6.0 – 808.0
Transparency	cm	48.2 - >120	1 - 88
Turbidity	NTU	3.8 - 10	15.0 – 732.0
Urea	µg/L	15 - 139	ND – 754.0
Water temperature	°C	16.8 – 19.5	16.5 – 18.6
Zinc- total	µg/L	ND - 106	64.56 – 458.01

Ammonia as N

Ammonia, in conjunction with other analytes, can assist in identifying a discharge of sewage, industrial, or commercial liquid wastes. The SWRCB NPDES MS4 General Permit Action Level for ammonia as N is 50 mg/L; the MDL was 0.05 mg/L for both the Dry Run and the First Flush. Figure 5 represents all MRSWMP ammonia as N data since 2013 for both dry weather (DR) and wet weather (FF) All results are listed in Appendix 2.

- **2017 Dry Run** and **First Flush** results for all sites were below the Action Level.

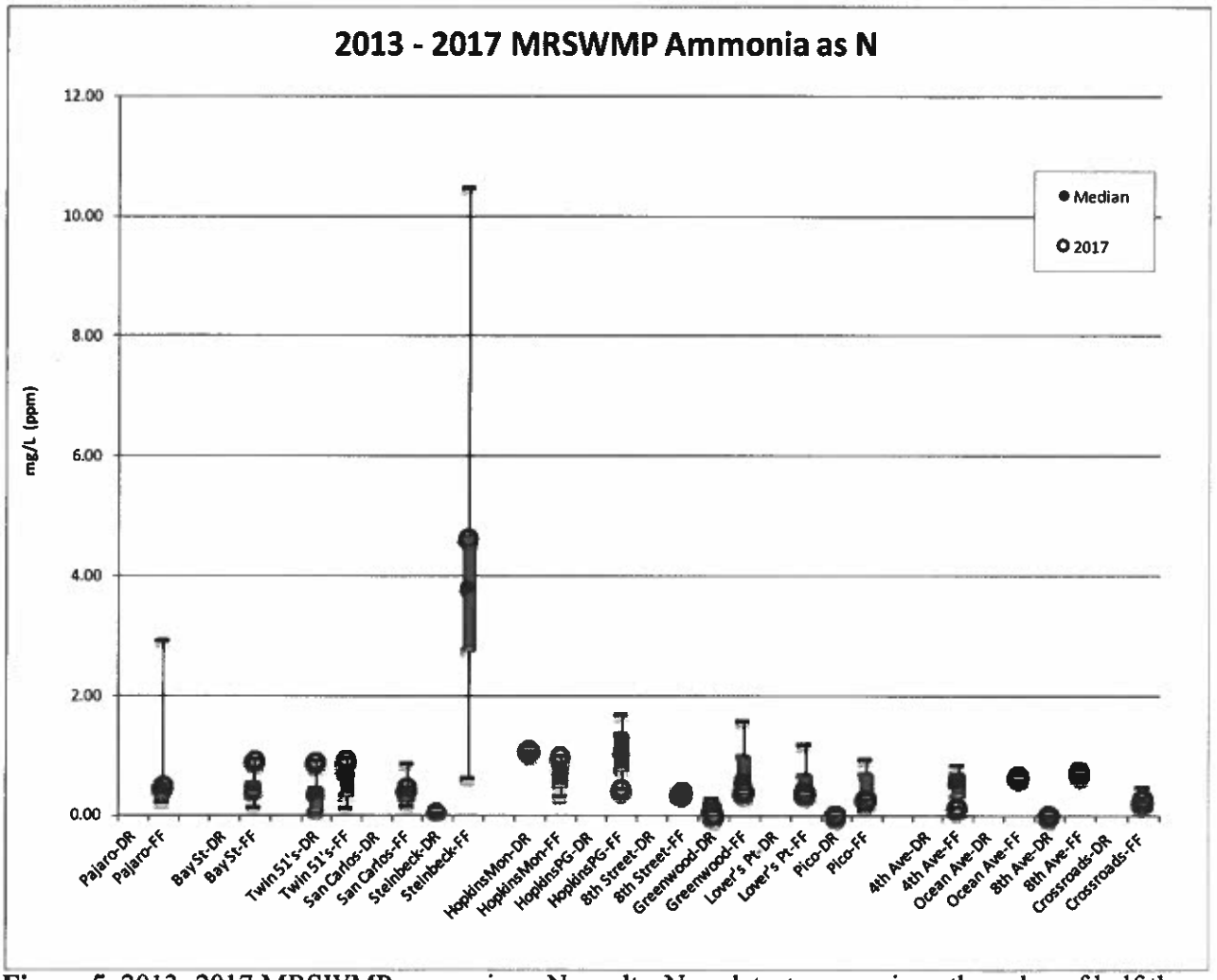


Figure 5. 2013- 2017 MRSWMP ammonia as N results. Non-detects were given the value of half the Minimum Detection Limit (MDL) but their true value lies between the zero and the MDL. Sites are listed north to south.

Color

Color, in conjunction with other analytes, can assist in identifying a discharge of sewage, wash water, or industrial or commercial liquid wastes. The SWRCB NPDES MS4 General Permit Action Level for color is 500 units; the MDL for color for both the dry and wet results varies based upon the turbidity of the sample water from 3 to 750 color units. Figure 6 represents all MRSWMP color data since 2013, for both dry weather (DR) and wet weather (FF). All results are listed in Appendix 2.

- **Dry Run** results: In 2017, all sites were below the Action Level.
- **First Flush** results: All sites were below the Action Level, except for one site, Pajaro (Monterey County) which had an average result of 1125 color units in 2017.

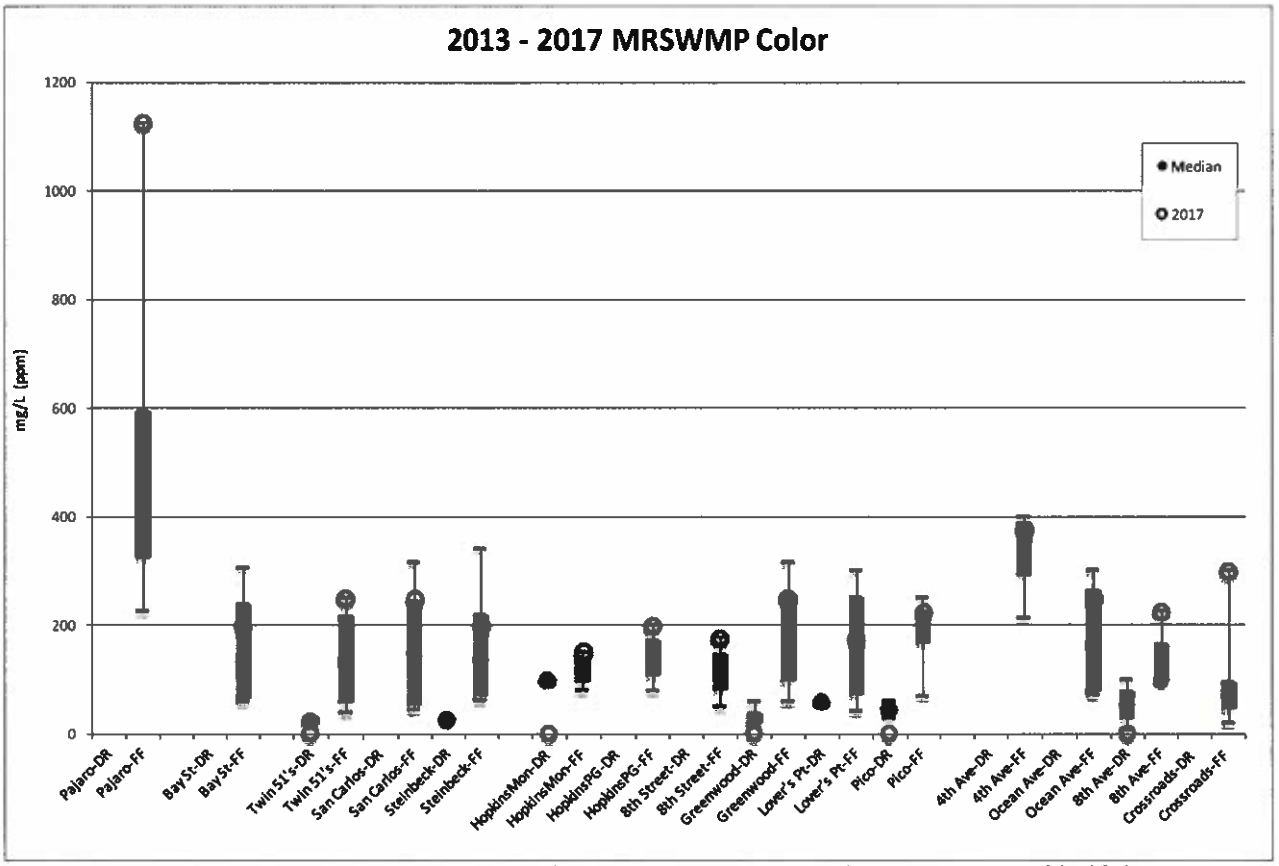


Figure 6. 2013 - 2017 MRSWMP color results. Non-detects were given the value of half the Minimum Detection Limit (MDL) but their true value lies between the zero and the MDL. Sites are listed north to south.

Copper

Copper is toxic to marine organisms causing reduced reproduction, developmental deformities, reduced photosynthesis, and mortality. Copper and other heavy metal toxicity can be mitigated by the presence of sediment or other binding compounds that may reduce the metal's bioavailability. Copper is present in some brake pads, pesticides, wood preservatives, roofing materials, and architectural structures such as gutters and downspouts.

The Basin Plan WQO established for total copper is 30 µg/L; the MDL for copper was 2 µg/L for both the Dry Run and First Flush. Figure 7 represents all MRSWMP copper data since 2006, for both dry weather (DR) and wet weather (FF). All results are listed in Appendix 2.

- **Dry Run** results: Copper concentrations were below the WQO, except for one site, HopkinsMon (Pacific Grove) with a result of 32 µg/L in 2017.

- **First Flush** results: Thirteen of the sites monitored (87%) were above the WQO in 2017. The highest average result was from Steinbeck (Monterey) with a value of 499 µg/L.

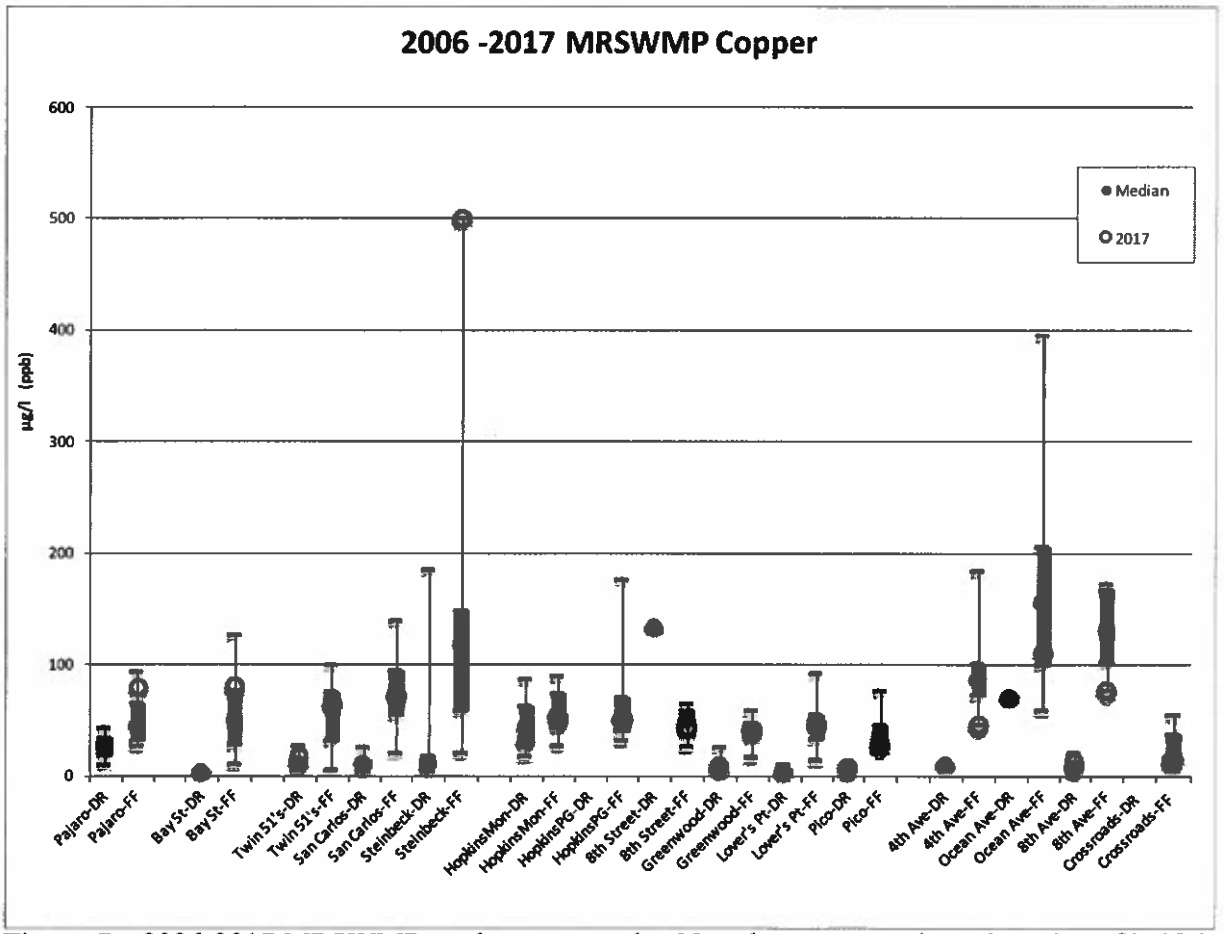


Figure 7. 2006-2017 MRSWMP total copper results. Non-detects were given the value of half the Minimum Detection Limit (MDL) but their true value lies between the zero and the MDL. Sites are listed north to south.

Escherichia coli (E. coli)

Escherichia coli (*E. coli*) and enterococcus are types of indicator bacteria found in warm-blooded animals. While *E. coli* and enterococcus do not cause disease in humans, they are pollutants of concern because they indicate the potential presence of pathogens that do cause disease in humans and wildlife.

The U.S. EPA Ambient Water Quality Criteria for *E. oli* is 235 MPN 100 ml. The MDL for *E. coli* was 1 MPN 100 ml for the Dry Run, and 100 MPN 100 ml for the First Flush. Figure 8 represents all MRSWMP *E. coli* data since 2006, for both dry weather (DR) and wet weather (FF). All results are listed in Appendix 2.

- **Dry Run** results: In 2017, all of the sites were above the WQO for *E. coli*. The highest *E. coli* result was 242,000 MPN 100 ml from HopkinsMon (Pacific Grove).
- **First Flush** results: In 2017, all of the sites were above the WQO. The highest average result was from Greenwood Park (Pacific Grove) with a value of 146,841 MPN 100 ml.

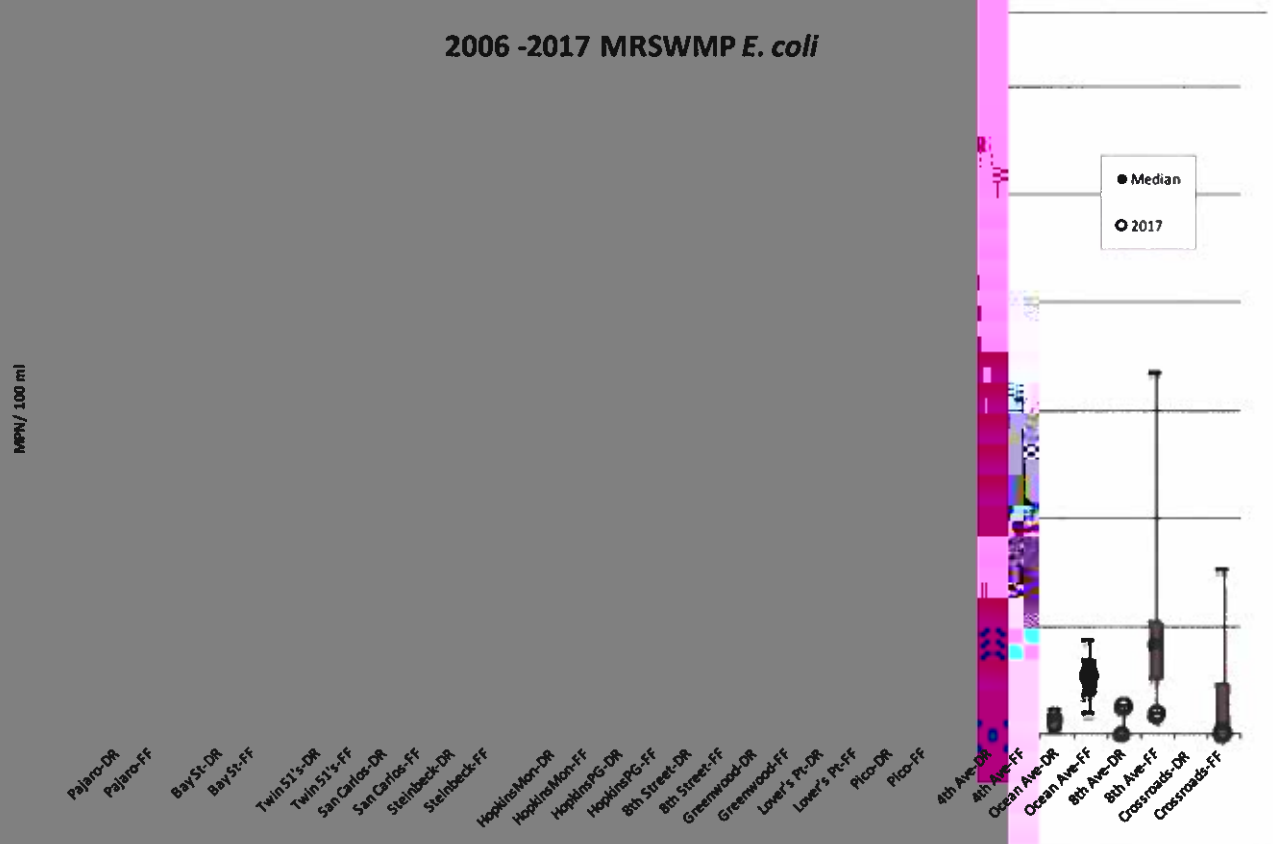


Figure 8. 2006-2017 MRSWMP *E. coli* results. Non-detects were given the value of half the Minimum Detection Limit (MDL) but their true value lies between the zero and the MDL. Sites are listed north to south.

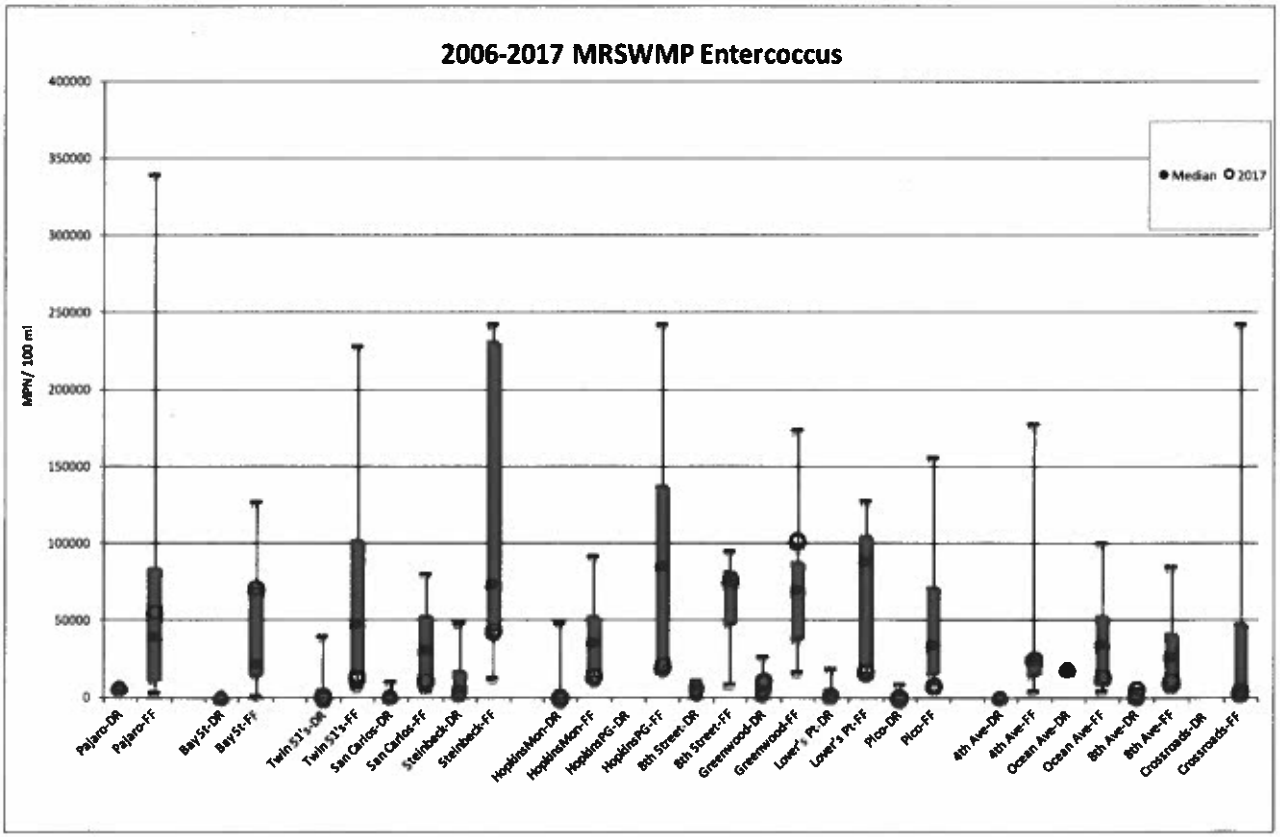


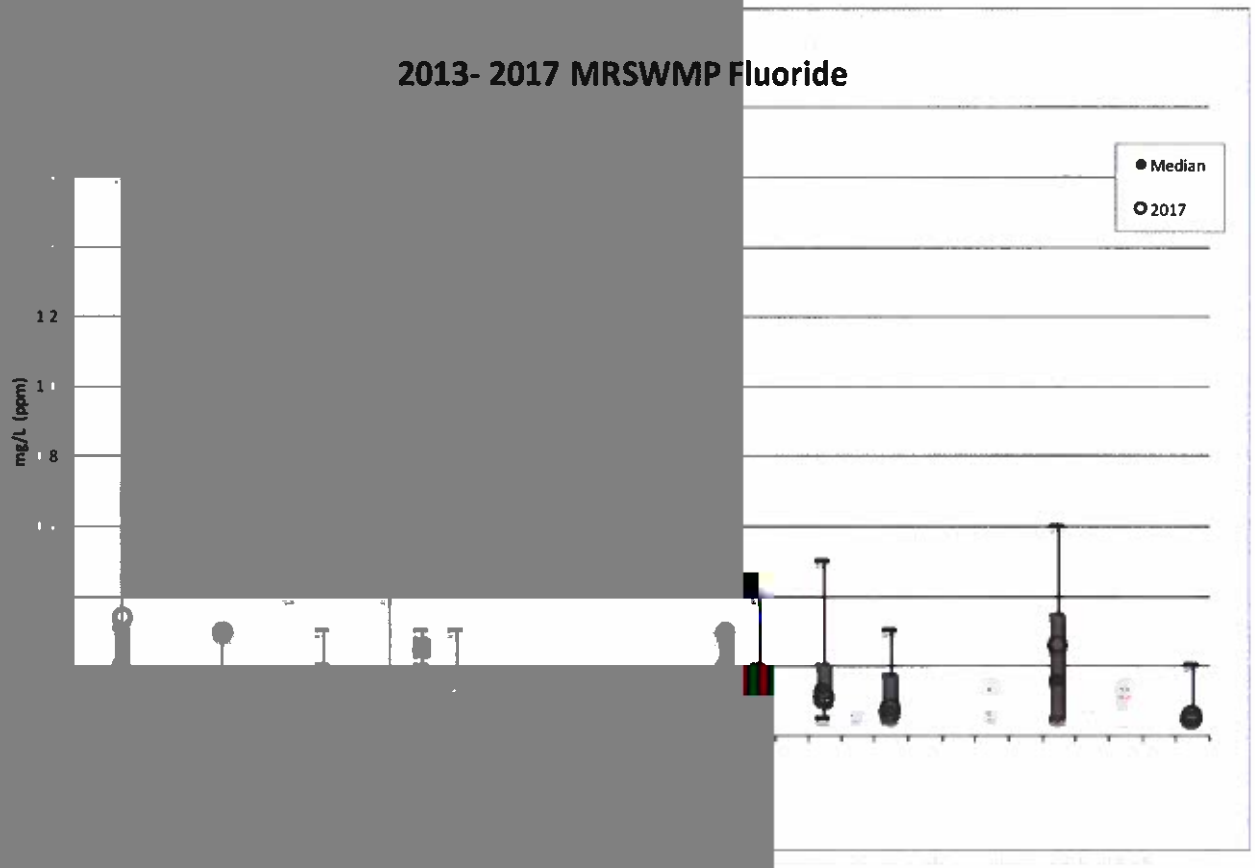
Figure 9. 2006-2017 MRSWMP enterococcus results. Non-detects were given the value of half the Minimum Detection Limit (MDL) but their true value lies between the zero and the MDL. Sites are listed north to south.

Fluoride

Fluoride, in conjunction with other analytes, can assist in identifying a discharge of sewage, wash water, tap water, or industrial or commercial iquid wastes. However, California American Water, the local water provider for Monterey Peninsula cities, does not add fluoride to local tap water and reports that tap water on the Monterey Peninsula contains from 0.25 - 0.60 mg/L of fluoride from natural sources. Sunny Mesa Community Services District provides water for the Pajaro (Monterey County) area and reports that fluoride is not added to the water supply which contains 0.20 mg/L from natural sources. There is no Action Level for fluoride. The MDL for fluoride for the Dry Run was 0.1 mg/L, and for the First Flush was 0.02 m L. Figure 10 represents all MRSWMP fluoride data since 2013, for both dry weather (DR) and wet weather (FFAl results are listed in Appendix 2.

- **Dry Run** results: The highest fluoride result was from HopkinsMon (Pacific Grove) with a value of 0.9 mg/L in 2017.

- **First Flush** results: The highe t average fluoride result was 0.34 mg/L from Pajaro (Monterey County) in 2017.



Hardness (as CaCO3)

Hardness (as CaCO3) in conjunction with other analytes, can assist in identifying a discharge of sewage, wash water, tap water, or industrial or commercial liquid wastes. Additionally, when hardness increases the amount of dissolved metals biologically available to aquatic and marine life decreases, resulting in a decrease in the toxicity of the metal.

The SWRCB NPDES MS4 General Permit Action Level for hardness is not less than or equal to 10 mg/L or greater than or equal to 2,000 mg/L; the MDL for hardness (as CaCO3) was 10 mg/L for both the Dry Run and First Flush. Figure 11 represents all MRSWMP hardness data since 2013, for both dry weather (DR) and wet weather (FF). All results are listed in Appendix 2.

- **2017 Dry Run** and **First Flush** results: All sites were within the acceptable range.

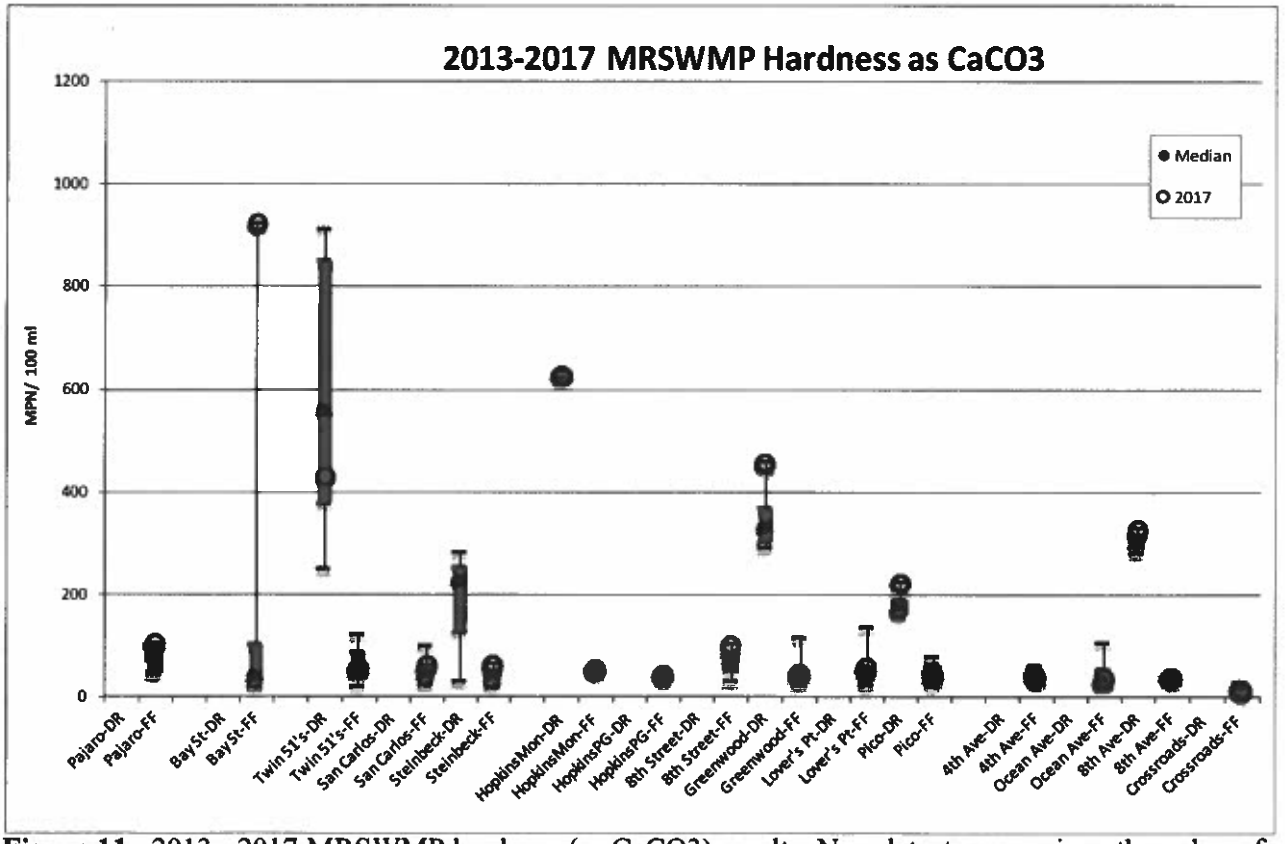


Figure 11. 2013 - 2017 MRSWMP hardness (as CaCO3) results. Non-detects were given the value of half the Minimum Detection Limit (MDL) but their true value lies between the zero and the MDL. Sites are listed north to south.

Lead

Lead is toxic to marine organisms causing reduced reproduction, developmental deformities, reduced photosynthesis, and mortality. Lead and other heavy metal toxicity can be mitigated by the presence of sediment or other binding compounds that may reduce the metal's bioavailability. Lead is present in some types of paint, water distribution systems, and auto emissions. It can be passed through the food web through uptake by plants that are grown in lead contaminated soils.

The Basin Plan WQO established for total lead is 30 µg/L; the MDL for lead was 1 µg/L for both the Dry Run and First Flush. Figure 12 represents all MRSWMP lead data since 2006, for both dry weather (DR) and wet weather (FF). All results are listed in Appendix 2.

- **Dry Run** results: All lead results were below the WQO in 2017 and three sites had non-detects: Twins (Monterey), Greenwood Park (Pacific Grove), and Pico (Pacific Grove).

- **First Flush** results: Only one of the monitored sites was above the WQO in 2017. Pajaro (Monterey County) had an average result of 32 µg/L.

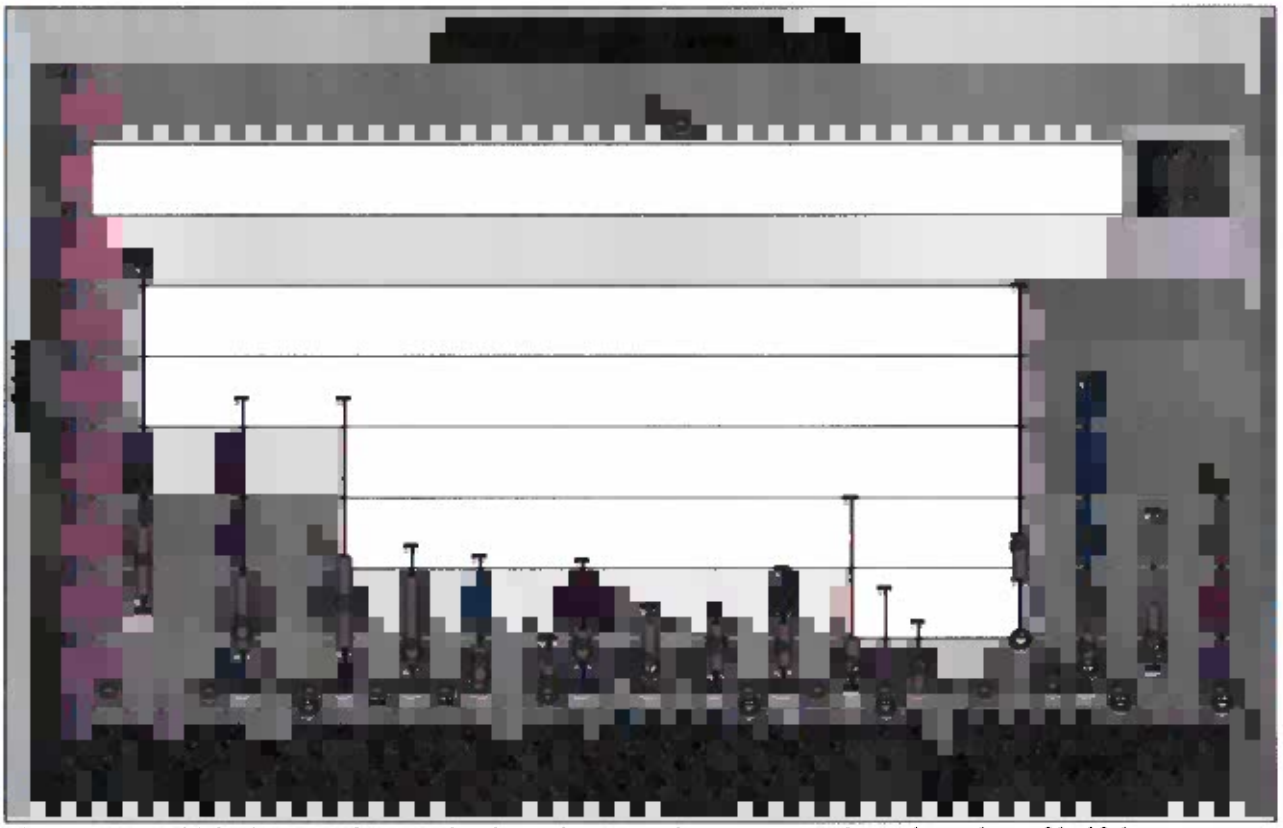


Figure 12. 2006-2017 MRSWMP lead results. Non-detects were given the value of half the Minimum Detection Limit (MDL) but their true value lies between the zero and the MDL. Sites are listed north to south.

MBAS Detergents

MBAS detergents in sample water can determine if a discharge is from sewage or wash water, and in conjunction with other analytes, can assist in identifying a discharge of industrial or commercial liquid wastes.

The Basin Plan's WQO established for MBAS detergents is 0.2 mg/L; the MDL for MBAS detergents was 0.1 for the Dry Run, and 0.05 mg/L for the First Flush. Figure 13 represents all MRSWMP MBAS detergent data since 2013, for both dry weather (DR) and wet weather (FF). All results are listed in Appendix 2.

- **Dry Run** results: In 2017, MBAS concentrations were below the WQO for all but one site, HopkinsMon (Pacific Grove), with a result of 0.59 mg/L.

- **First Flush** results: In 2017, all of the sites monitored (100%) were above the WQO. The highest average result was from San Carlos (Monterey) with a concentration of 1.54 mg/L.

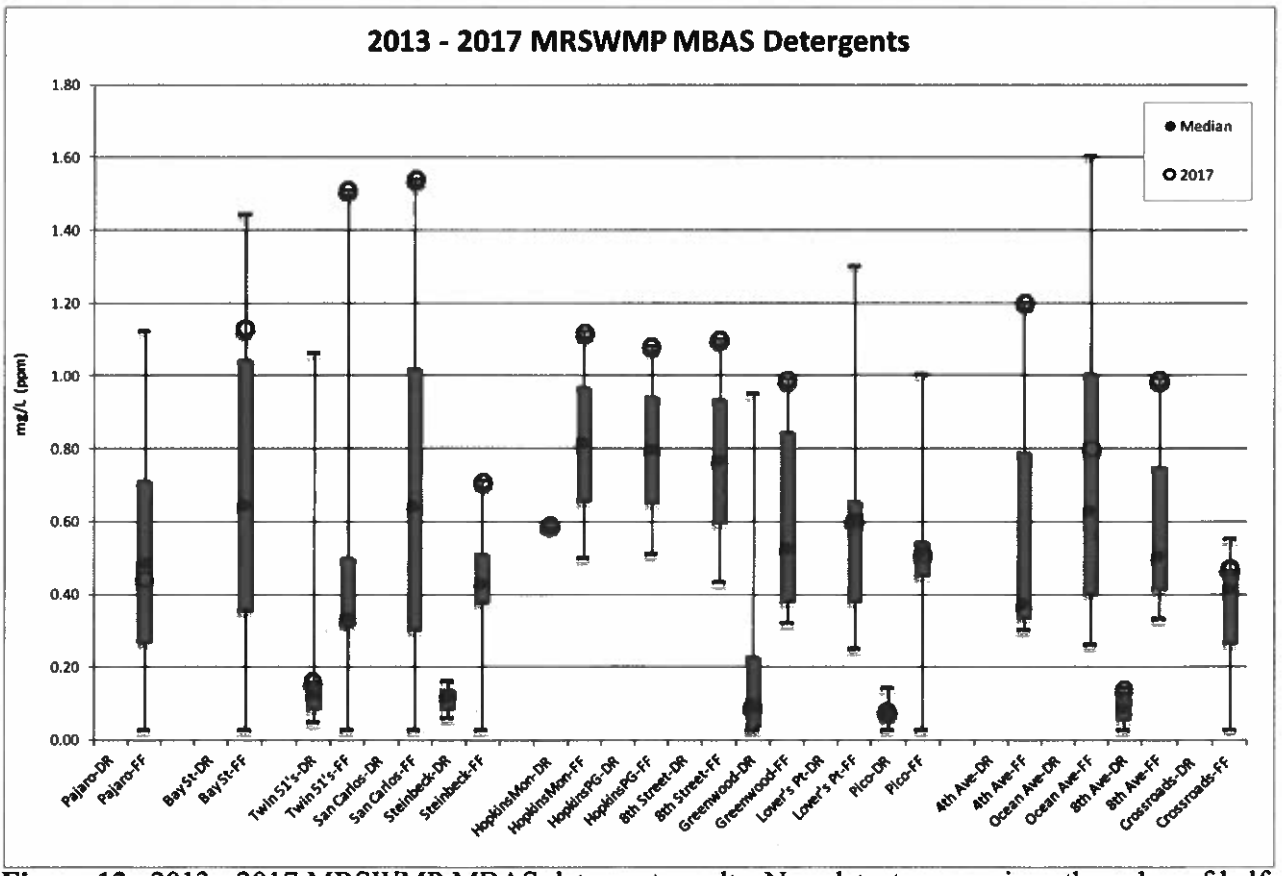


Figure 13. 2013 - 2017 MRSWMP MBAS detergent results. Non-detects were given the value of half the Minimum Detection Limit (MDL) but their true value lies between the zero and the MDL. Sites are listed north to south.

Nitrate as N

Nitrogen is an element needed for plant growth. Primary sources of nitrate include runoff from fertilized lawns, agricultural and pasture lands, construction sites and septic or sewer system leachate. Nitrate in runoff can lead to excessive nitrate in groundwater or increased growth of algal blooms that degrade water quality as those plants die off and consume oxygen in their decomposition.

The CCAMP Action Level for nitrate as N (NO_3-N) is 2.25 mg-N/L. The MDL was 0.1 mg-N/L for the Dry Run, and 0.01 mg-N/L for the First Flush. Figure 14 represents all MRSWMP nitrate as N data since 2006, for both dry weather (DR) and wet weather (FF). All results are listed in Appendix 2.

- **Dry Run** results: In 2017, all sites were below the Action Level, and one site, 8th Avenue (Carmel) had a non-detect.
- **First Flush** results: In 2017, all but one site was below the Action Level. Steinbeck (Monterey) had an average result of 2.78 mg/L.

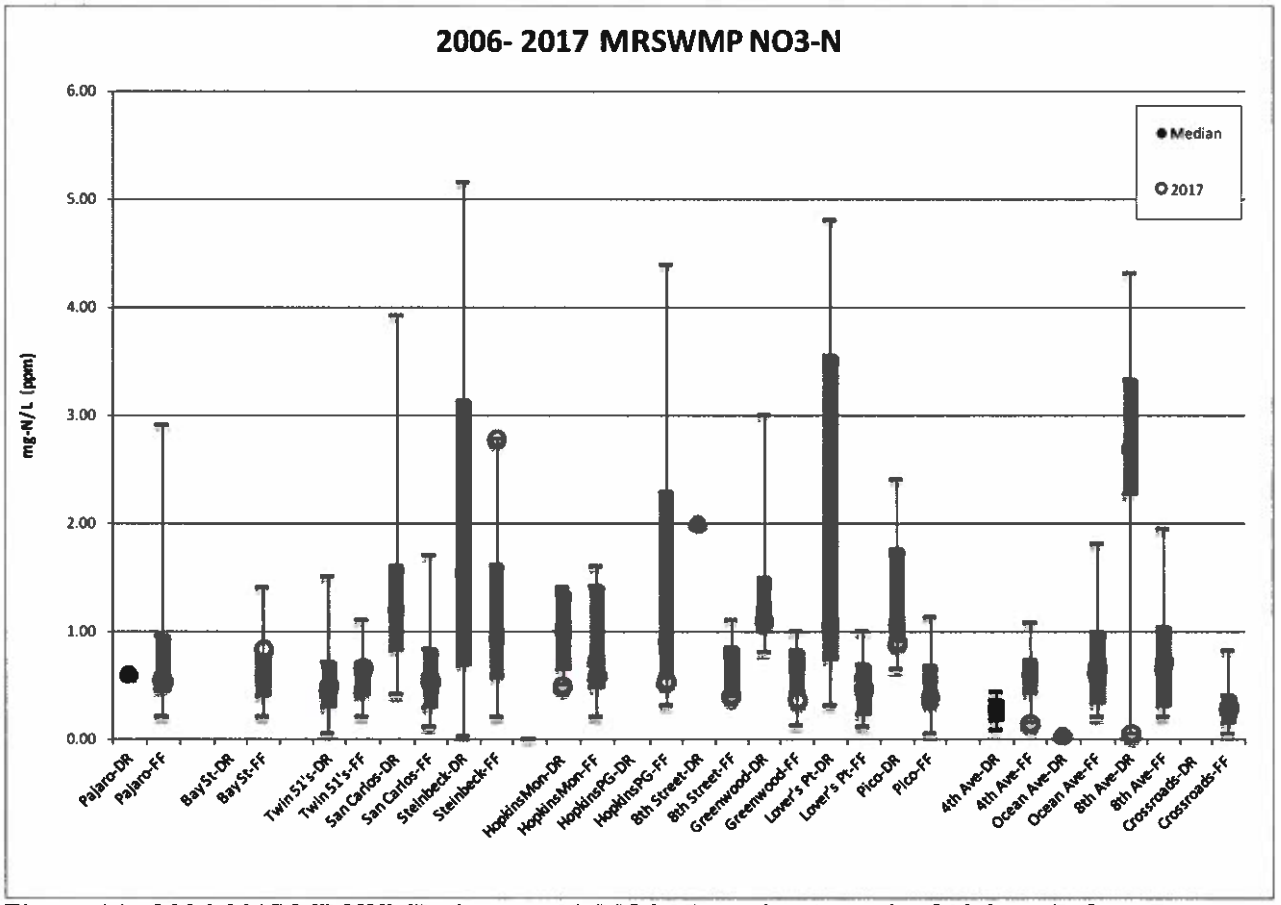


Figure 14. 2006-2017 MRSWMP nitrate as N (NO3-N) results. A result of 13.2 mg/L from Bay Street (Seaside) during the FF in 2006 was removed from the graph to better illustrate all other results. Non-detects were given the value of half the Minimum Detection Limit (MDL) but their true value lies between the zero and the MDL. Sites are listed north to south.

Orthophosphate as P

Phosphorus is an essential element for plant growth. Orthophosphate is a form of phosphorus commonly found bound to soil particles, in sewage, fertilizers, and in detergents that contain phosphates. In aquatic systems, orthophosphate is rapidly taken up by algae and aquatic plants. With excessive amounts present, large algal blooms can occur which can lead to degraded water quality conditions toxic to aquatic life.

The CCAMP Action Level for orthophosphate as P (PO_4-P) is 0.12 mg-P/L. The MDL was 0.1 mg-P/L for the Dry Run, and 0.02 mg P/L for the First Flush. Figure 15 represents all MRSWMP orthophosphate as P data since 2006, for both dry weather (DR) and wet weather (FF). All results are listed in Appendix 2.

- **Dry Run** results: In 2017, three of the sites monitored had results above the WQO, the highest result was 0.30 from Twins (Monterey). Greenwood Park (Pacific Grove) and Pico (Pacific Grove) had non-detects.

- **First Flush** results: In 2017, all results were above the Action Level. The highest average result was from Steinbeck (Monterey) with a value of 2.54 mg-P/ L.

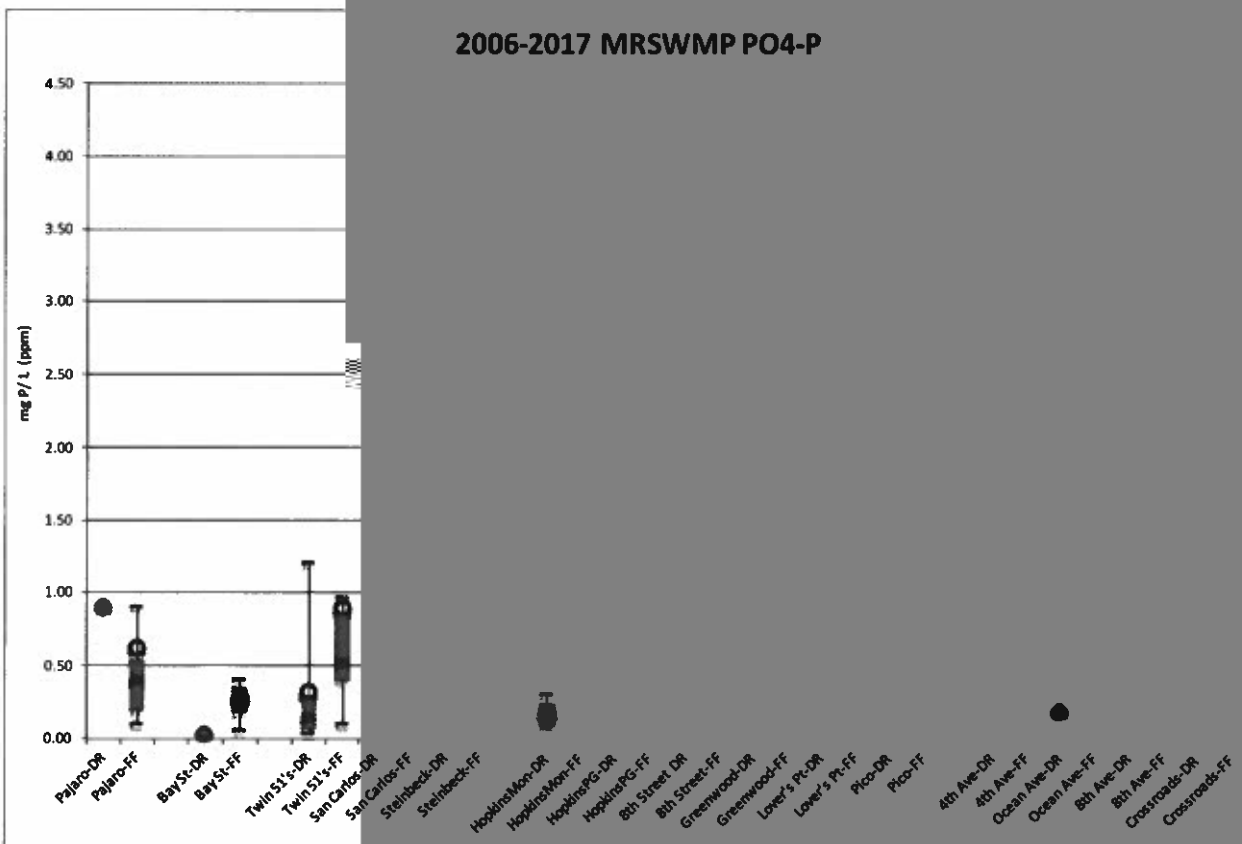


Figure 15. 2006-2017 MRSWMP orthophosphate as P (PO4-P) results. A result of 7.01 mg/L from Steinbeck (Monterey) during the FF in 2010 was removed from the graph to better illustrate all other results. Non-detects were given the value of half the Minimum Detection Limit (MDL) but their true value lies between the zero and the MDL. Sites are listed north to south.

Potassium

Potassium, in conjunction with other analytes, can assist in identifying a discharge of sewage, industrial, or commercial liquid wastes.

The SWRCB NPDES MS4 General Permit Action Level for potassium is 20 mg/L; the MDL was 0.5 mg/L for the Dry Run, and 1.0 mg/L for the First Flush. Figure 16 represents all MRSWMP potassium data since 2013, for both dry weather (DR) and wet weather (FF). All results are listed in Appendix 2.

- **Dry Run** results: In 2017, all sites were below the Action Level.
- **First Flush** results: In 2017, all sites were below the Action Level except for one site, Bay Street (Seaside), with an average result of 55 mg/L.

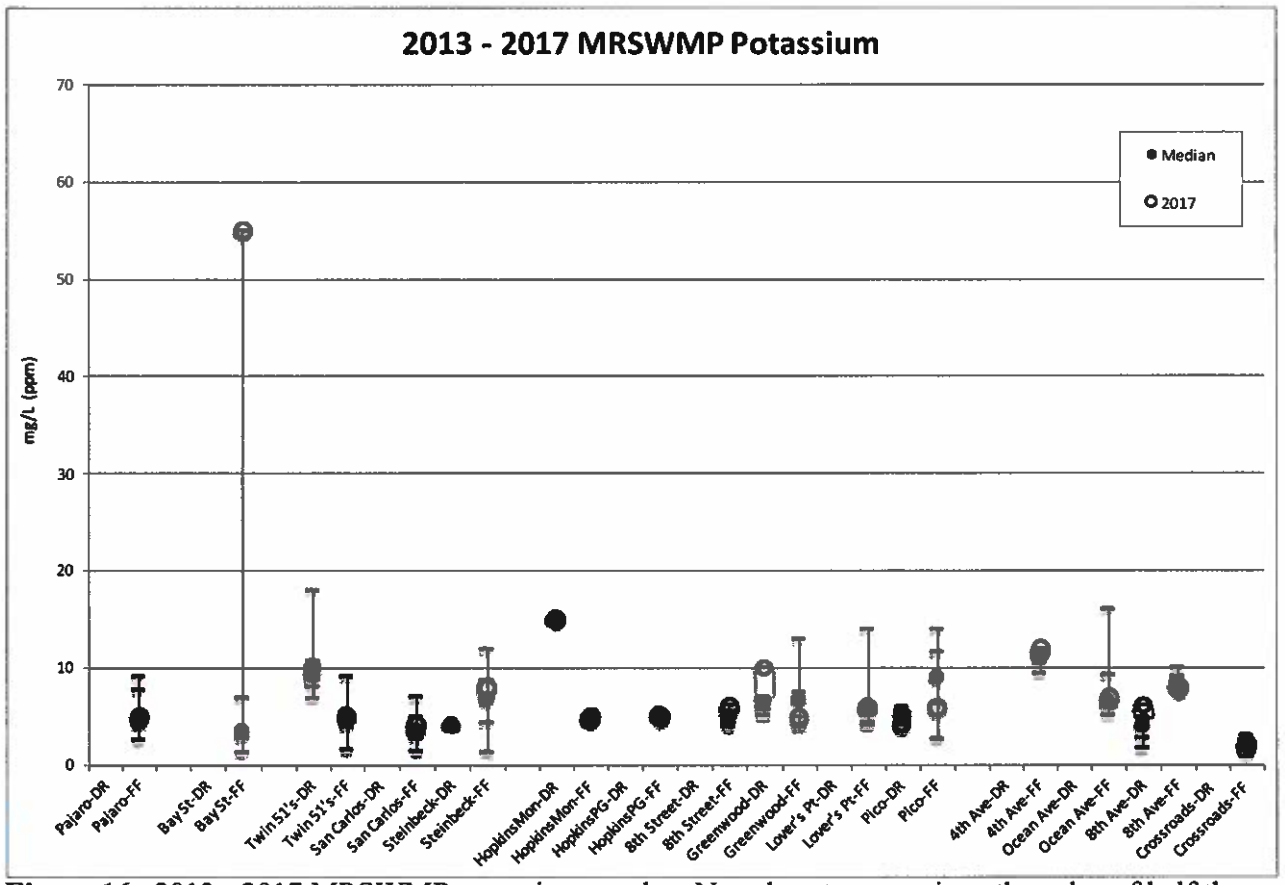


Figure 16. 2013 - 2017 MRSWMP potassium results. Non-detects were given the value of half the Minimum Detection Limit (MDL) but their true value lies between the zero and the MDL. Sites are listed north to south.

Total Suspended Solids

Total suspended solids (TSS) are measured because high amounts of sediment can destroy habitat, suffocate eggs in fresh water systems, limit the food supply, clog gills or impair an organism's vision when feeding.

The CCAMP Action Level for TSS is 500 mg/L; the MDL was 2 mg/L for both the Dry Run and First Flush. Figure 17 represents all MRSWMP TSS data since 2006, for both dry weather (DR) and wet weather (FF). All results are listed in Appendix 2.

- **Dry Run** results: In 2017, all sites were below the Action Level and one site, Pico (Pacific Grove), had a non-detect.
- **First Flush** results: In 2017, all sites except one were below the Action Level. Pajaro (Monterey County) had an average result of 652 mg/L.

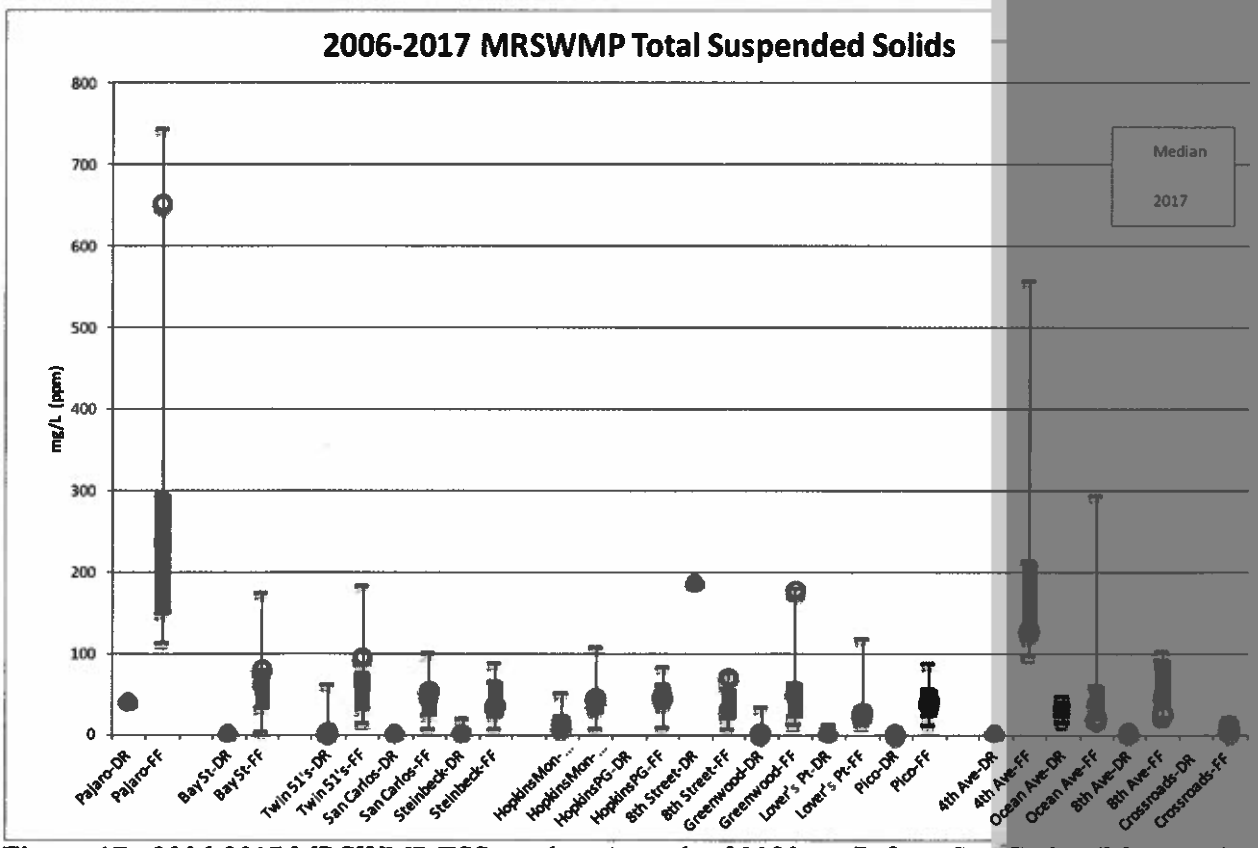


Figure 17. 2006-2017 MRSWMP TSS results. A result of 3080 mg/L from San Carlos (Monterey) during the DR in 2007 was removed from the graph to better illustrate all other results. Non-detects were given the value of half the Minimum Detection Limit (MDL) but their true value lies between the zero and the MDL. Sites are listed north to south.

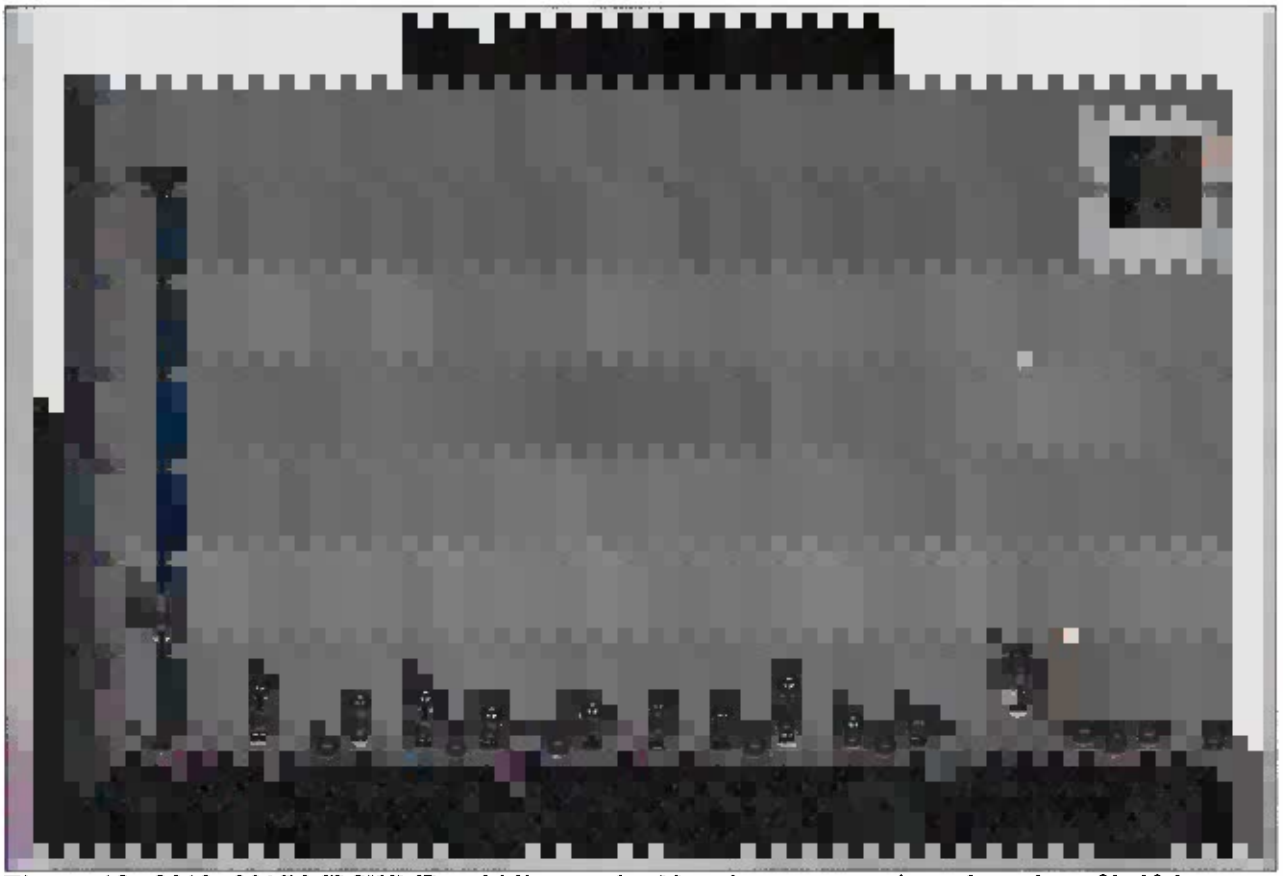


Figure 18. 2013- 2017 MRSWMP turbidity results. Non-detects were given the value of half the Minimum Detection Limit (MDL) but their true value lies between the zero and the MDL. Sites are listed north to south.

Urea

Urea is an organic compound that is often used in agricultural and urban fertilizers. While there is not an established Action Level, urea concentrations are compared between sites. The MDL for urea was 10 µg/L for the Dry Run, and 8 µg/L for the First Flush. Figure 20 represents all MRSWMP urea data since 2006, for both dry weather (DR) and wet weather (FF). During the First Flush urea was collected during the first time series only; results shown in Figure 19 are not averaged. All results are listed in Appendix 2.

- **Dry Run** results: In 2017, the highest urea result was from Twins (Monterey) with a value of 139 µg/L.
- **First Flush** results: In 2017, the highest result was from HopkinsMon (Monterey) with a value of 754 µg/L.

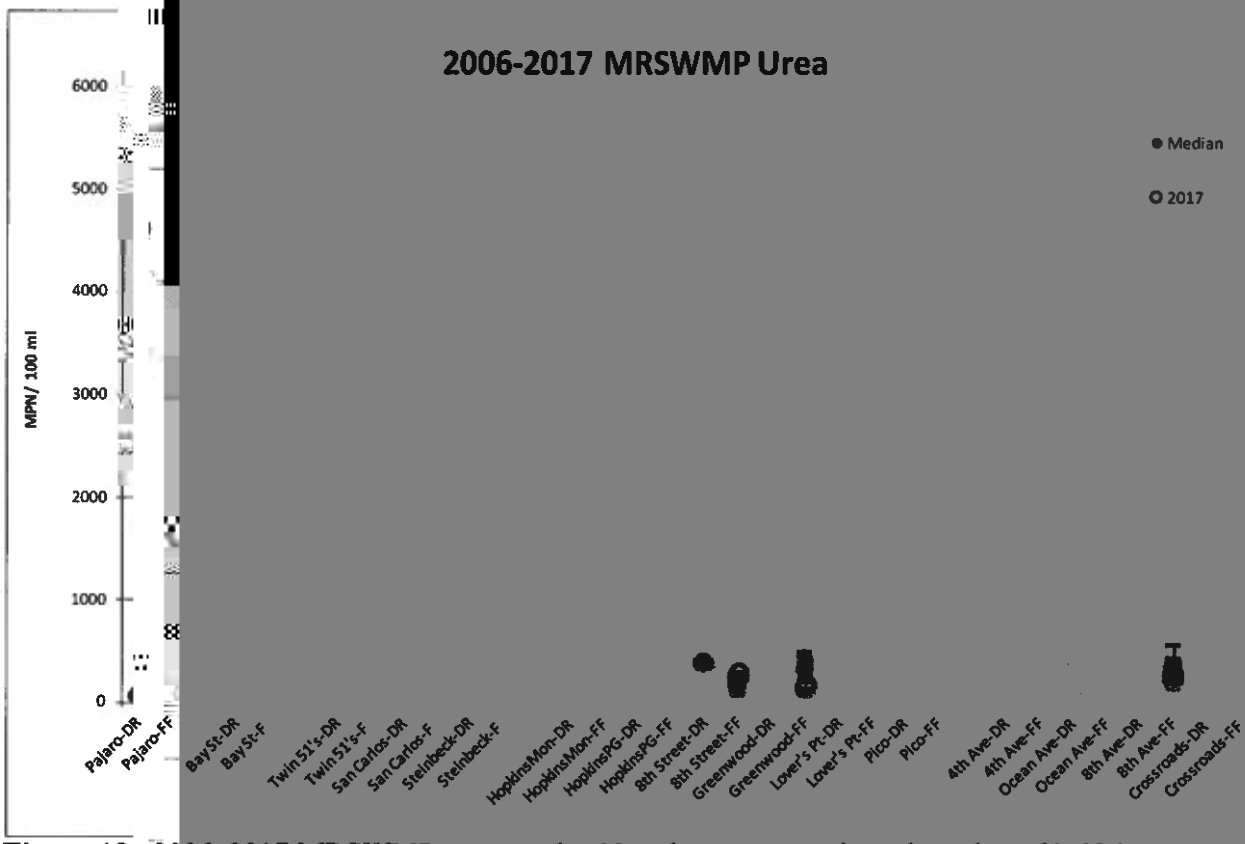


Figure 19. 2006–2017 MRSWMP urea results. Non-detects were given the value of half the Minimum Detection Limit (MDL) but their true value lies between the zero and the MDL. Sites are listed north to south.

Zinc

Zinc is toxic to marine organisms causing reduced reproduction, developmental deformities and mortality. Zinc and other heavy metal toxicity can be mitigated by the presence of sediment or other binding compounds that may reduce the metal's bioavailability. Zinc sources in urban runoff include tires, paint, and outdoor zinc surfaces such as galvanized surfaces.

The Basin Plan WQO for total zinc is 200 µg/L. The zinc MDL was 10 µg/L for both the Dry Run and First Flush. Figure 20 represents all MRSWMP zinc data since 2006, for both dry weather (DR) and wet weather (FF). All results are listed in Appendix 2.

- **Dry Run** results: In 2017, all sites were below the Action Level, and one site, Pico (Pacific Grove) had a non-detect.
- **First Flush** results: In 2017, one site was above the WQO with an average result of 424 µg/L at Pajaro (Monterey County).

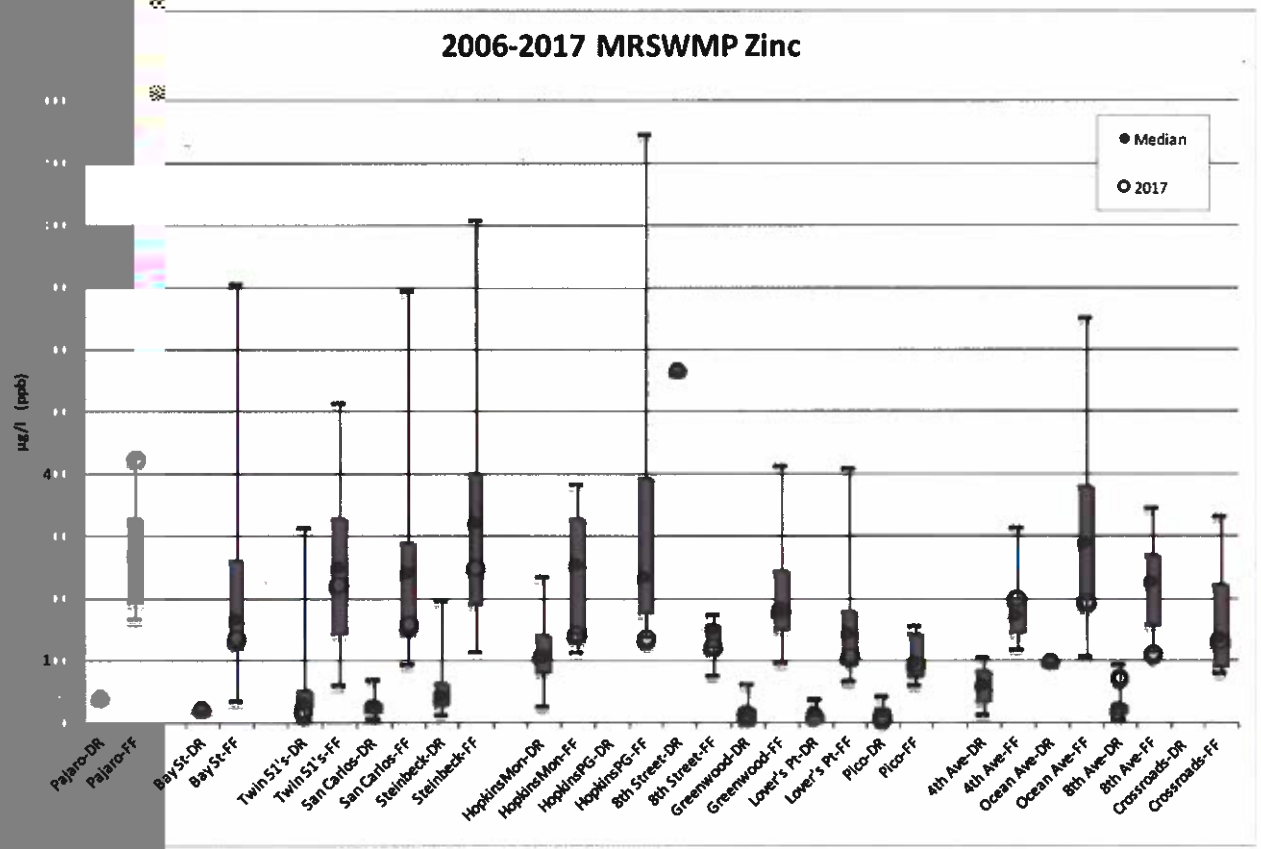


Figure 20. 2006-2017 MRSWMP zinc results. Non-detects were given the value of half the Minimum Detection Limit (MDL) but their true value lies between the zero and the MDL. Sites are listed north to south.

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- Nitrate as N exceeded the CCAMP Action Level only at Steinbeck. The highest average of all MRSWMP sites was at Steinbeck with an average result of 2.78 mg-N/L.
- Orthophosphate exceeded the CCAMP Action Level in all samples at all Monterey sites. Steinbeck had the highest average of all MRSWMP 2017 sites with a result of 2.54 mg-P/L.
- Turbidity exceeded the CCAMP Action Level for all samples at all sites
- Zinc exceeded the RWQCB Basin Plan WQO for all samples at Steinbeck, and in the first time series samples at Twins.
- Ammonia, color, hardness, lead, potassium, and total suspended solids were all below WQOs and Action Levels for both time series samples at all sites.

All 2017 results can be found in Appendix 2 and by jurisdiction in Appendix 3.

Monterey County

For the 2017-2018 permit year, two sites were monitored: Pajaro and Crossroads. There was no flow at either site during the Dry Run monitoring event.

During the First Flush:

- *E. coli* exceeded the U.S. EPA WQO in all samples at both Monterey County sites.
- Enterococcus exceeded the U.S. EPA WQO in all samples at both Monterey County sites.
- Color exceeded the WQO listed in the NPDES MS4 permit for Pajaro with an average result of 1125 color units, the highest average for all MRSWMP 2017 sites, and the highest result for color since the start of MRSWMP color measurements in 2013.
- Copper exceeded the RWQCB Basin Plan WQO in both samples at Pajaro.
- Lead exceeded the RWQCB Basin Plan WQO in both samples at Pajaro. Pajaro had the highest average result for all MRSWMP 2017 sites with an average of 32 µg/L.
- MBAS surfactants exceeded the RWQCB Basin Plan WQO in all samples at both Monterey County sites.
- Orthophosphate exceeded the CCAMP Action Level in all samples at both Monterey County sites.
- Total Suspended Solids exceeded the CCAMP Action Level at Pajaro with an average result of 652 mg/L, which is also the highest average result for all MRSWMP 2017 sites.
- Turbidity exceeded the CCAMP Action Level at Pajaro with an average result of 605.5 NTU, which is also the highest average result for all MRSWMP 2017 sites.
- Zinc exceeded the RWQCB Basin Plan WQO for Pajaro with an average result of 424 µg/L, which is also the highest average result for all MRSWMP 2017 sites.
- Ammonia, hardness, nitrate as N, and potassium results did not exceed WQOs or Action Levels for any samples during the First Flush.

All 2017 results can be found in Appendix 2 and by jurisdiction in Appendix 3.

Pacific Grove

For the 2017-2018 permit year, six sites were monitored: HopkinsMon, HopkinsPG, 8th Street, Greenwood Park, Lovers, and Pico. Hopkins Mon, Hopkins PG, 8th Street, Greenwood Park, and Lovers are upstream of a dry weather diversion that diverts dry weather urban runoff usually from April to October, to the Monterey Regional Water Pollution Control Agency (now called Monterey

One Water) for treatment. Even though Greenwood Park water is diverted during dry weather, we continue to sample it because it flows into an urban park and is indicative of dry weather flows that are not entering the ocean. Due to the operation of the dry weather diversion, Lovers and 8th Street were not flowing for the Dry Run. Despite minimal flow, a team of volunteers persevered and collected samples at HopkinsMon for the Dry Run. During the First Flush, the HopkinsPG outfall stopped flowing due to the lack of upstream flow after the first set of samples were collected, therefore only one set of samples was collected at this site.

For the Dry Run (Pico, Greenwood Park, HopkinsMon):

- *E. coli* was above the U.S. EPA WQO at all sites. The highest *E. coli* result for all MRSWMP 2017 sites of 242,000 MPN/100 ml was from HopkinsMon.
- Enterococcus was above the U.S. EPA WQO at all sites. The highest result for all MRSWMP 2017 sites of 11,200 MPN/100 ml was from Greenwood Park.
- Copper exceeded the RWQCB Basin Plan WQO for HopkinsMon with a result of 32 µg/L, and was the highest for all MRSWMP 2017 sites.
- MBAS surfactants exceeded the RWQCB Basin Plan WQO. HopkinsMon was the only MRSWMP site above the WQO with a result of 0.59 mg/L.
- Orthophosphate exceeded the CCAMP Action Level at HopkinsMon, but was not detected at either Greenwood Park and Pico.

During the First Flush:

- *E. coli* was over the U.S. EPA WQO in all samples at all sites. Greenwood Park had the highest average result for all MRSWMP 2017 sites at 146,841 MPN/100 ml.
- Enterococcus was over the U.S. EPA WQO in all samples at all sites. Greenwood Park had the highest average result of 102,024 MPN/100 ml for all MRSWMP 2017 sites.
- Copper exceeded the RWQCB Basin Plan WQO at all sites for all samples, except the second time series sample at Pico.
- MBAS surfactants exceeded the RWQCB Basin Plan WQO for all samples at all sites.
- Orthophosphate exceeded the CCAMP Action Level in all samples at all sites.
- Turbidity exceeded the CCAMP Action Level for all samples, except the second time series sample at Lovers.
- Zinc exceeded the RWQCB Basin Plan WQO only during the first time series sample at Greenwood Park.
- Ammonia, color, hardness, lead, nitrate as N, potassium, and total suspended solids were all below WQOs and Action Levels for both time series samples at all sites.

All 2017 results can be found in Appendix 2 and by jurisdiction in Appendix 3.

Seaside and Sand City

For the 2017-2018 permit year, Bay Street was the only site monitored, and as in past years, this site had no flow for the Dry Run monitoring event.

During the First Flush:

- *E. coli* and enterococcus exceeded the U.S. EPA WQO for all samples.
- Copper exceeded the RWQCB Basin Plan WQO for all samples.
- MBAS surfactants exceeded the RWQCB Basin Plan WQO for all samples.

- Orthophosphate exceeded the CCAMP Action Level for all samples.
- Potassium exceeded the WQO listed in the NPDES MS4 permit for all MRSWMP 2017 sites with an average result of 54.67 mg/L.
- Turbidity exceeded the CCAMP Action Level for all samples.
- Ammonia, color, hardness, lead, nitrate as N, total suspended solids, and zinc results did not exceed any WQOs or Action Levels for any samples.

All 2017 results can be found in Appendix 2 and by jurisdiction in Appendix 3.

Conclusion

Since 2006, the MRSWMP program has utilized the MBNMS' Dry Run and First Flush programs to ascertain what concentrations of pollutants are found in both dry and wet weather flows through storm drains discharging into the ocean. The sites monitored as part of the MRSWMP program are sites that can provide a good representation of water quality throughout a jurisdiction and in some cases have been monitored for many years. For 2017- 2018 permit year, fifteen sites were monitored for Dry Run and the First Flush in six jurisdictions: Monterey County, Seaside/Sand City, Monterey, Pacific Grove and Carmel.

In past years, approximately half of the MRSWMP sites did not flow during the dry weather months. This year, five (30%) of the storm drains had flow for the Dry Run: Twins (Monterey), HopkinsMon (Pacific Grove), Greenwood Park (Pacific Grove), Pico (Pacific Grove), and 8th Avenue (Carmel). Dry weather data is useful for identifying stormdrain catchments with running water containing pollutants that should otherwise be dry. First Flush samples may indicate the worst-case scenario of high pollutant concentrations discharging into the ocean after months of accumulating on the land. The data allows comparison of pollutant concentrations to water quality objectives and relative concentrations compared to other drainages. Combined with dry weather data, it informs managers whether additional source tracking is warranted.

The 2017 First Flush event occurred latest in the year compared to all of the First Flushes since the start of the program in 2000. Prior to 2017, the record was November 7th, 2002. There were several other smaller storms in Fall 2017 but they did not generate enough runoff long enough to mobilize for the First Flush. The November 16th storm dropped almost a half an inch of rain on the region in one day. Despite the smaller storms that might have washed some pollutants off hard surfaces, many sites exceeded WQOs or Action Levels for the First Flush. While results exceeded WQOs and Action Levels, the concentrations were generally lower than previous years, except for MBAS Detergents and Orthophosphate.

The First Flush event provides an understanding of the types of pollutants flowing into Monterey Bay National Marine Sanctuary after months of dry weather during which contaminants build up on streets, roofs and parking lots. By coupling First Flush with the Dry Run and source tracking within each watershed, a better understanding of each watershed's specific characteristics and problem areas can be achieved, providing needed information for decision making and effective storm water programs. We thank the local cities and Monterey County for supporting this effort and to the many volunteers for which this event would not be possible.

Appendix 1: MRSWMP Monitoring sites- listed from north to south

Jurisdiction	Site ID	Site Name	Drainage Area (acres)	Primry Land Use	MRSWMP Outfall #	Pipe ID (Inches)
Monterey County	PASD-01	Pajaro	30	70% residential 30% commercial	MC-1	
Seaside & Sand City	SSD-02	Bay Street	1200	80% residential 10% commercial 10% public/ other	SC-1	90
Monterey	MSD-03	Twin 51's	291	63% residential 15% commercial 22% public/ other	M-15	51" (x2)
Monterey	MSD-04	San Carlos	22	12% commercial 38% residential 50% public/ other	M-7	24"
Monterey	MSD-05	Steinbeck	37	66% commercial 12% residential 22% public/ other	M-3	36"
Pacific Grove	PGSD-09	HopkinsMon	40.7	45% residential 30% commercial 25% public /other	PG-41	
Pacific Grove	PGSD-08	HopkinsPG			PG-40	
Pacific Grove	PGSD-01	8th Street	35	100% residential	PG-32	
Pacific Grove	CENTR-31	Greenwood Park	238.3	71% residential 25% public/ other 5% commercial	PG-28	36"
Pacific Grove	PGSD-03	Lover's Point	240	54% residential 1% commercial 20% other	PG-22	54"
Pacific Grove	PGSD-04	Pico	17.56	60% residential 40% public	PG-03	40"
Carmel	CASD-01	4th Avenue	128.0	86% residential 7% comm/ res 7% public/ other	C-1	36"x60" box culvert
Carmel	CASD-02	Ocean Avenue	115.2	22% commercial 71% residential 7% comm/ res	C-2	24"
Carmel	CAS-03	8th Avenue	44.8	58% residential 27% comm/ res 13% commercial 1% public/ other	C-3	24"
Monterey County	CVSD-01	Crossroads	21	100% commercial		

Ammonia as N

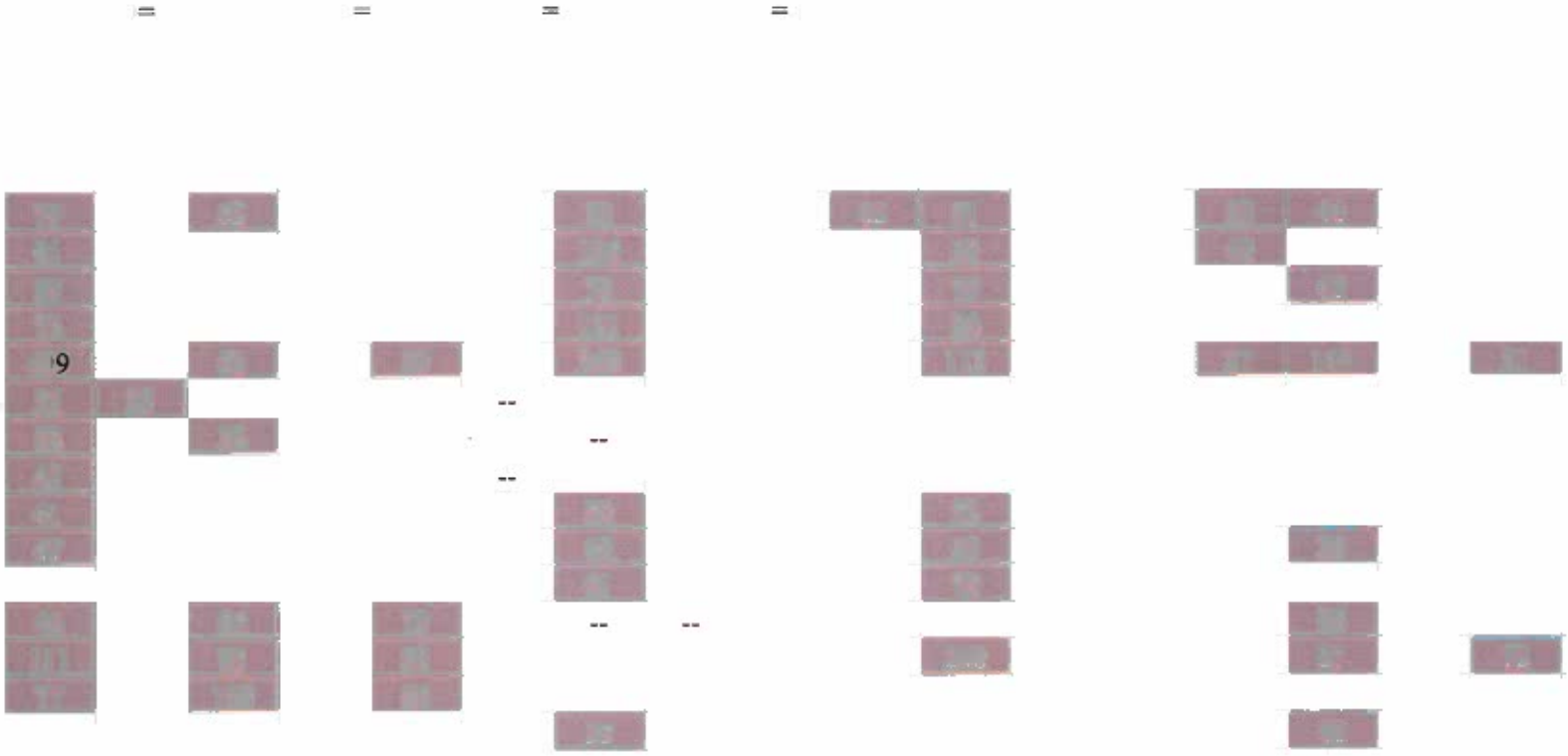
Comparison of ammonia results for MRSWMP monitoring and reported in mg/L. Shaded boxes indicate that the General Permit Action Level of 50 mg/L was exceeded; NA= Not Analyzed; ND= Non-detect; NF= No Flow; NS= Not Sampled; -- = Not included in MRSWMP monitoring for this analyte.

Site Name	FF 2017	DR 2017	FF 2016	DR 2016	FF 2015	DR 2015	FF 2014	DR 2014	SuR 2014	SF 2014	FF 2013	DR 2013
Pajaro	0.51	NF	2.90	NF	0.31	NF	0.44	NF	NF	0.23	NA	NF
Bay St	0.93	NF	0.39	NF	0.53	NF	0.37	NF	NF	0.13	NA	NF
Twin 51's	0.92	0.9	0.32	0.44	0.69	0.34	0.72	0.07	0.06	0.10	NA	NA
San Carlos	0.47	NF	0.26	NF	0.35	NF	0.86	NF	NF	0.14	NA	NF
Steinbeck	4.63	NF	2.76	NF	3.79	NF	10.46	0.09	0.08	0.61	NA	NF
HopkinsMon	0.98	1.1	0.33	NF	--	--	--	--	--	--	--	--
HopkinsPG	0.45	NF	1.66	NF	--	--	--	--	--	--	--	--
8th Street	0.41	NF	0.32	NF	--	--	--	--	--	--	--	--
Greenwood	0.41	ND	0.36	0.26	0.78	ND	1.57	0.21	0.11	NS	NA	NA
Lover's	0.39	NF	0.33	NF	0.49	NF	1.18	NF	NF	NS	NA	NF
Pico	0.29	ND	0.29	ND	0.68	ND	0.94	ND	ND	0.11	NA	NA
4th Avenue	0.13	NF	0.84	NF	0.53	NF	--	--	NF	NS	NS	NF
Ocean	0.65	NF	0.73	NF	0.59	NF	--	--	NF	NS	NA	NF
8th Avenue	0.71	ND	0.84	NF	0.73	NF	--	--	NF	NS	NS	NA
Crossroads	0.29	NF	0.18	NF	0.18	NF	0.46	NF	NF	0.12	NA	NF

Color

Comparison of color results for MRSWMP monitoring, reported in Color Units. Shaded boxes indicate that the General Permit action level of 500 color units was exceeded. ND= Non-detect; NF= No Flow; NS= Not Sampled; -- = Not included in MRSWMP monitoring of this analyte.

Site Name	FF 2017	DR 2017	FF 2016	DR 2016	FF 2015	DR 2015	FF 2014	SuR 2014	SF 2014	FF 2013	DR 2013
Pajaro	1125	NF	255	NF	400	NF	300	NF	500	625	NF
Bay St	200	NF	60	NF	65	NF	305	NF	70	250	NF
Twin 51's	250	19	40	24	85	30	185	30	50	225	24
San Carlos	250	NF	44	NF	50	NF	315	NF	70	225	NF
Steinbeck	200	NF	75	NF	63	NF	[illegible]	[illegible]	70	225	NF
HopkinsMon	150	32	80	NF	--	--	--	--	--	--	--
HopkinsPG	200	NF	80	NF	--	--	--	--	--	--	--
8th Street	175	NF	50	NF	--	--	--	--	--	--	--
Greenwood	250	10	60	30	100	25	315	20	NS	250	60
Lover's	175	NF	42	NF	75	NF	250	NF	NS	300	NF
Pico	225	8	70	60	175	50	225	40	167	250	44
4th Avenue	375	NF	213	NF	400	NF	--	NF	NS	NS	NF
Ocean	250	NF	80	NF	73	NF	--	NF	NS	300	NF
8th Avenue	225	14	100	NF	100	NF	--	NF	NS	NS	7
Crossroads	300	NF	40	NF	20	NF	100	NF	70	75	NF



Copper continued

Site Name	FF 2011	DR 2011	SuR 2011	SpR 2011	FF 2010	DR 2010	SuR 2010	SpR 2010	FF 2009	DR 2009	FF 2008	DR 2008	FF 2007	DR 2007	FF 2006	DR 2006
Pajaro	28	NF	NF	NF	73	NF	NF	NF	44	9	93	NF	--	--	--	--
Bay St	52	NF	NF	4	65	NF	NF	NF	126	NF	42	NF	50	NF	ND	NF
Twin 51's	52	9	5	11	99	12	20	6	78	11	69	7	60	5	92	ND
San Carlos	65	8	4	8	124	26	10	7	77	16	84	18	73	11	139	ND
Steinbeck	7	9	8	18	352	15	12	10	148	6	26	185	83	17	125	ND
HopkinsMon	27	NF	9	16	72	18	24	25	79	86	49	54	57	NF	89	NF
HopkinsPG	35	NF	NF	NF	7	NF	NF	NF	77	NF	63	NF	47	NF	--	--
8th Street	NF	NF	17	13	[illegible]	134	NF	NF	5	NF	49	NF	55	NF	49	NF
Greenwood	[illegible]	10	17	13	5	5	9	25	44	6	44	17	4	3	41	ND
Lover's	0	NF	4	10	14	5	5	7	54	ND	5	4	48	ND	57	NF
Pico	3	6	ND	10	6	7	11	9	45	5	37	12	44	ND	33	ND
4th Avenue	[illegible]	11	NF	10	10	NF	NF	NF	183	NF	53	NF	152	NF	--	--
Ocean	1	NF	NF	NF	3 5	NF	69	NF	184	NF	148	NF	2 2	NF	--	--
8th Avenue	1	6	4	8	72	5	7	5	1 [illegible]	ND	170	6	148	14	--	--
Crossroads	11	NF	NF	NF	55	NF	NF	NF	44	NF	--	--	--	--	--	--

E. coli

Comparison of *E. coli* results for MRSWMP monitoring reported in MPN/ 100 ml. Shaded boxes indicate that the EPA Water Quality Objective of 235 MPN/ 100 ml was exceeded; NA= Not Analyzed; ND= Non-detect; NF= No Flow; NS= Not Sampled; -- = Not included in MRSWMP monitoring. The table is broken into two sections to facilitate printing.

Site Name	FF 2017	DR 2017	FF 2016	DR 2016	FF 2015	DR 2015	FF 2014	DR 2014	SuR 2014	SF 2014	FF 2013	DR 2013	SuR 2013	SF 2013	FF 2012	DR 2012	SuR 2012	SpR 2012
Pajaro	15112		20660	NF	4693	NF	7617	NF	NF	860	3163	NF	NF	618	8766	NF	NF	NF
Bay St	72839		21026	NF	38969	NF	94500	NF	NF	6488	148335	NF	NF	241960	43518	NF	NF	NF
Twin 51's	9267	1610	42755	141361	53713	198629	60200	6152	3106	9208	67265	4978	2878	4962	72294	296	2289	17329
San Carlos	10148		8044	NF	13973	NF	138000	NF	NF	4106	3475	NF	5206	NS	NS	NF	20	20
Steinbeck	20999		27860	NF	25024	NF	65300	3836	196	21870	88662	NF	34658	241960	130847	2500	653	218
HopkinsMon	25589	242000	12246	NF	--	--	--	--	--	--	--	--	3316	NS	NS	NS	169	NS
HopkinsPG	29093		36606	NF	--	--	--	--	--	--	--	--	NF	NS	NS	NS	NF	NS
8th Street	33673		12885	NF	--	--	--	--	--	--	--	--	NF	NS	NS	NF	NF	456
Greenwood	146841	2920	19105	1153	41922	28272	36590	6152	5510	NS	19585	39726	1980	NS	35076	31062	6511	1253
Lover's	8712		14634	NF	28761	NF	60200	NF	NF	NS	30745	NF	NF	NS	42288	NF	NF	5510
Pico	7121	880	35076	30	25572	<20	42603	402	2092	4884	58030	244	40	3214	37769	1720	20	40
4th Avenue	49134		38799	NF	46181	NF	--	--	NF	NS	NS	NF	NF	NS	45645	NF	NF	NF
Ocean	27508		23084	NF	32817	NF	--	--	NF	NS	16250	NF	NF	NS	28322	NF	1918	NF
8th Avenue	9462	13200	15252	NF	43788	NF	--	--	NF	NS	NS	<20	82	NS	NS	NF	<20	20
Crossroads	743		2020	NF	14265	NF	94500	NF	NF	703	1095	NF	NF	296	76395	NF	NF	NF

E. coli continued

Site Name	FF 2011	DR 2011	SuR 2011	SpR 2011	FF 2010	DR 2010	SuR 2010	SpR 2010	FF 2009	DR 2009	FF 2008	DR 2008	FF 2007	DR 2007	FF 2006	DR 2006
Pajaro	16075	NF	NF	NF	2050	NF	NF	NF	4681	40	15186	NF	--	--	--	--
Bay St	44059	NF	NF	672	64900	NF	NF	NF	34162	NF	20277	NF	46464	NF	856	NF
Twin 51's	65081	7746	6152	19608	61300	13340	48384	12263	229170	296	83819	6150	165301	25993	185536	50
San Carlos	41525	20	40	20	40400	13734	244	149	8770	8212	17484	40	16304	218	14749	798
Steinbeck	241960	6511	194	126	145400	1974	398	220	90824	4494	112738	48400	40925	9768	158848	2602
HopkinsMon	39726	NF	20	3912	29650	104	20	3912	19735	48392	3741	312	82782	NF	196179	NF
HopkinsPG	207625	NF	NF	NF	40300	NF	NF	NF	25994	NF	27742	NF	27742	NF	--	--
8th Street	NF	NF	NF	456	20976	39726	4283	6511	77979	NF	26485	NF	14636	NF	50978	--
Greenwood	116644	6896	12976	10950	32700	1814	8212	2966	44059	1976	31528	13000	16767	11588	73322	20529
Lovers	3 1	NF	52	220	07	82	82	3870	59	170	2491	1390	[illegible]	3	2534	NF
Pico	[illegible]	802	80	61	15 50	410	40	148	17063	104	20462	0	155 3	5 18	43926	60
4th Avenue	5013	<20	NF	126	[illegible]	NF	NF	NF	73916	NF	11413	NF	4 590	NF	--	--
Ocean	25	NF	NF	NF	950	NF	10950	NF	34 58	NF	214	NF	43374	NF	--	--
8th Avenue	16 021	263	104	20	38450	520	20	20	NA	80	3 119	126	590 7	82	--	--
Crossroads	59	NF	NF	NF	25950	NF	NF	NF	NA	NF	--	--	--	--	--	--

Enterococcus

Comparison of enterococcus results for MRSWMP monitoring reported in MPN/ 100 ml. Shaded boxes indicate that the EPA Water Quality Objective of 104 MPN/ 100 ml was exceeded; NA= Not Analyzed; ND= Non-detect; NF= No Flow; NS= Not Sampled; -- = Not included in MRSWMP monitoring. The table is broken into two sections to facilitate printing.

Site Name	FF 2017	DR 2017	FF 2016	DR 2016	FF 2015	DR 2015	FF 2014	DR 2014	SuR 2014	SF 2014	FF 2013	DR 2013	SuR 2013	SF 2013	FF 2012	DR 2012	SuR 2012	SpR 2012
Pajaro	55711	NF	25545	NF	12311	NF	20013	NF	NF	7541	3163	NF	NF	6260	92342	NF	NF	NF
Bay St	70697	NF	18458	NF	17265	NF	126500	NF	NF	17329	23415	NF	NF	12229	82392	NF	NF	NF
Twin 51's	13590	74	14298	1470	25867	7746	37150	1417	1760	8164	21000	22398	942	6896	79326	492	431	1587
San Carlos	10884	NF	7921	NF	18471	NF	79650	NF	NF	8164	4825	NF	374	NS	NS	NF	20	313
Steinbeck	43561	NF	13667	NF	56518	NF	54200	4962	270	34480	88662	NF	48392	43517	241957	1587	16328	4494
HopkinsMon	14088	300	19241	NF	--	--	--	--	--	--	--	--	12976	NS	NS	NS	242	NS
HopkinsPG	21426	NF	18168	NF	--	--	--	--	--	--	--	--	NF	NS	NS	NS	NF	NS
8th St	76523	NF	8704	NF	--	--	--	--	--	--	--	--	NF	NS	NS	NF	NF	218
Greenwood	102024	11200	16001	40	40794	20925	41950	4374	2290	NS	20880	8704	1226	NS	81461	14540	25993	1024
Lover's	17090	NF	18572	NF	119844	NF	20768	NF	NF	NS	127750	NF	NF	NS	95634	NF	NF	1352
Pico	7980	328	13415	416	29926	<20	23118	83	3978	15650	9005	322	746	7308	70697	583	40	61
4th Avenue	24825	NF	7039	NF	22801	NF	--	--	NF	NS	NS	NF	NF	NS	14554	NF	NF	NF
Ocean	13744	NF	11051	NF	14901	NF	--	--	NF	NS	9665	NF	NF	NS	55607	NF	17329	NF
8th Avenue	11072	5480	7607	NF	25451	NF	--	--	NF	NS	NS	104	974	NS	NS	NF	20	20
Crossroads	4892	NF	2607	NF	8083	NF	1530	NF	NF	1434	1095	NF	NF	559	241960	NF	NF	NF

Enterococcus continued

Site Name	FF 2011	DR 2011	SuR 2011	SpR 2011	FF 2010	DR 2010	SuR 2010	SpR 2010	FF 2009	DR 2009	FF 2008	DR 2008	FF 2007	DR 2007	FF 2006	DR 2006
Pajaro	8 1	NF	NF	NF	00	NF	NF	NF	9		100612	NF	--	--	--	--
Bay St	47396	NF	NF	20		NF	NF	NF	90327	NF	13650	NF	13435	NF	341	--
Twin 51's	67477	346	8 9	06	1 81	9	498	2669	1			8700	57609			--
San Carlos			40									62		20		--
Steinbeck												48400				--
HopkinsMon		NF						917				292		NF	--	--
HopkinsPG		NF	NF	NF		NF	NF	NF	157330	NF	84778	NF		NF	--	--
8th St	NF	NF					NF	NF		NF		NF	29202	NF		--
Greenwood							2792	1188	111501			5820	29372			--
Lover's		NF				82	104	10950	88435	104	87231	4130				--
Pico		126	20	20			512	220	33310			8210		1760		--
4th Avenue		20	NF	20		NF	NF	NF	40438	NF		NF	3328	NF	--	--
Ocean		NF	NF	NF		NF		NF	48392	NF		NF	3381	NF	--	--
8th Avenue			82	187		100	40	40	NA	220		942	6168	436	--	--
Crossroads		NF	NF	NF	60200	NF	NF	NF	NA	NF	--	--	--	--	--	--

Fluoride

Comparison of fluoride results for MRSWMP monitoring reported in mg/L. There is no water quality objective for fluoride; ND= Non-detect; NF= No Flow; NS= Not Sampled; -- = Not included in MRSWMP monitoring of this analyte.

Site Name	FF 2017	DR 2017	FF 2016	DR 2016	FF 2015	DR 2015	FF 2014	DR 2014	SuR 2014	SF 2014	FF 2013	DR 2013
Pajaro	0.34	NF	1.60	NF	0.20	NF	0.2	NF	NF	ND	0.2	NF
Bay St	0.30	NF	0.10	NF	ND	NF	0.1	NF	NF	ND	ND	NF
Twin 51's	0.10	0.5	0.20	0.70	ND	0.5	0.3	0.4	0.6	ND	0.2	0.5
San Carlos	0.10	NF	ND	NF	ND	NF	0.2	NF	NF	ND	0.4	NF
Steinbeck	0.12	NF	ND	NF	ND	NF	0.3	0.2	0.3	ND	0.1	NF
HopkinsMon	0.09	0.5	0.10	NF	--	--	--	--	--	--	--	--
HopkinsPG	0.10	NF	ND	NF	--	--	--	--	--	--	--	--
8th Street	0.10	NF	0.10	NF	--	--	--	--	--	--	--	--
Greenwood	0.08	0.3	ND	0.20	0.13	0.2	0.2	0.2	0.3	NS	0.4	0.2
Lover's	0.11	NF	ND	NF	0.13	NF	0.2	NF	NF	NS	0.5	NF
Pico	0.08	0.1	ND	0.10	ND	0.1	0.3	ND	0.1	ND	0.2	0.1
4th Avenue	0.14	NF	0.10	NF	ND	NF	--	--	NF	NS	NS	NF
Ocean	0.26	NF	ND	NF	ND	NF	--	--	NF	NS	0.6	NF
8th Avenue	0.14	0.1	ND	NF	ND	NF	--	--	NF	NS	NS	0.1
Crossroads	0.06	NF	ND	NF	ND	NF	0.2	NF	NF	ND	ND	NF

Hardness

Comparison of hardness results for MRSWMP monitoring reported in mg/L. Shaded boxes indicate that the General Permit Action Level of less than or equal to 10 mg/L or greater than or equal to 2000 mg/L was exceeded; ND= Non-detect; NF= No Flow; NS= Not Sampled; -- = Not included in MRSWMP monitoring.

Site Name	FF 2017	DR 2017	FF 2016	DR 2016	FF 2015	DR 2015	FF 2014	DR 2014	SuR 2014	SF 2014	FF 2013	DR 2013
Pajaro	103	NF	101	NF	41	NF	45	NF	NF	50	102	NF
Bay St	922	NF	23	NF	28	NF	48	NF	NF	21	120	NF
Twin 51's	55	429	39	905	53	248	93	910	682	19	119	360
San Carlos	64	NF	32	NF	34	NF	57	NF	NF	23	100	NF
Steinbeck	64	NF	33	NF	29	NF	47	224	281	17	52	NF
HopkinsMon	54	626	51	NF	--	--	--	--	--	--	--	--
HopkinsPG	43	NF	42	NF	--	--	--	--	--	--	--	--
8th Street	102	NF	31	NF	--	--	--	--	--	--	--	--
Greenwood	46	456	23	376	35	298	45	314	289	NS	114	341
Lover's	57	NF	31	NF	20	NF	48	NF	NF	NS	135	NF
Pico	39	223	36	179	62	161	60	161	192	18	75	163
4th Avenue	36	NF	58	NF	44	NF	--	--	NF	NS	NS	NF
Ocean	36	NF	25	NF	25	NF	--	--	NF	NS	105	NF
8th Avenue	38	326	40	NF	40	NF	--	--	NF	NS	NS	277
Crossroads	14	NF	20	NF	9	NF	18	NF	NF	9	28	NF

Lead

Comparison of total lead results for MRSWMP monitoring reported in µg/L. Shaded boxes indicate that the Basin Plan Objective of 30 µg/L was exceeded; NA= Not Analyzed; ND= Non-detect; NF= No Flow; NS= Not Sampled; -- = Not included in MRSWMP. The table below is broken into two sections to facilitate printing.

Site Name	FF 2017	DR 2017	FF 2016	DR 2016	FF 2015	DR 2015	FF 2014	DR 2014	SuR 2014	SF 2014	FF 2013	DR 2013	SuR 2013	SF 2013	FF 2012	DR 2012
Pajaro	32	NF	14	NF	16	NF	14	NF	NF	24	16	NF	NF	22	20	NF
Bay St	11	NF	8	NF	7	NF	44	NF	NF	10	20	NF	NF	9	8	NF
Twin 51's	15	ND	15	ND	15	ND	12	ND	ND	ND	31	ND	ND	ND	23	ND
San Carlos	8	NF	ND	NF	5	NF	23	NF	NF	10	8	NF	ND	NS	NS	NF
Steinbeck	5	NF	ND	NF	ND	NF	15	ND	ND	8	ND	NF	ND	ND	7	ND
HopkinsMon	8	2	ND	NF	--	--	--	--	--	--	--	--	ND	NS	NS	NA
HopkinsPG	6	NF	ND	NF	--	--	--	--	--	--	--	--	NF	NS	NS	NF
8th St	9	NF	ND	NF	--	--	--	--	--	--	--	--	NF	NS	NS	NF
Greenwood	15	ND	ND	ND	9	ND	11	ND	ND	NS	8	ND	ND	NS	4	ND
Lover's	6	NF	4	NF	6	NF	11	NF	NF	NS	6	NF	NF	NS	6	NF
Pico	6	ND	ND	ND	5	ND	ND	ND	17	8	6	ND	ND	ND	ND	ND
4th Avenue	10	NF	24	NF	32	NF	--	--	NF	NS	NS	NF	NF	NS	23	NF
Ocean	6	NF	ND	NF	11	NF	--	--	NF	NS	9	NF	NF	NS	11	NF
8th Avenue	9	1	9	NF	28	NF	--	--	NF	NS	NS	ND	ND	NS	NS	NF
Crossroads	1	NF	ND	NF	ND	NF	ND	NF	NF	31	ND	NF	NF	ND	ND	NF

Lead Continued

Site Name	SuR 2012	SpR 2012	FF 2011	DR 2011	SuR 2011	SpR 2011	FF 2010	DR 2010	SuR 2010	SpR 2010	FF 2009	DR 2009	FF 2008	DR 2008	FF 2007	DR 2007	FF 2006	DR 2006
Pajaro	NF	NF	17	NF	NF	NF	34	NF	NF	NF	24	ND	63	NF	--	--	--	--
Bay St	NF	NF	16	NF	NF	ND	28	NF	NF	NF	33	NF	14	NF	15	NF	ND	NF
Twin 51's	ND	ND	ND	ND	ND	ND	44	ND	ND	ND	8	ND	17	5	36	5	13	ND
San Carlos	ND	ND	22	ND	ND	ND	22	1	ND	ND	6	ND	6	5	18	5	11	ND
Steinbeck	ND	ND	13	ND	ND	ND	9	1	ND	ND	7	ND	6	5	22	5	7	ND
HopkinsMon	ND	NS	14	NF	ND	ND	9	ND	ND	ND	21	10	7	5	9	NF	10	NF
HopkinsPG	NF	NS	13	NF	NF	NF	11	NF	NF	NF	7	NF	ND	NF	15	NF	--	--
8th St	NF	ND	NF	NF	6	ND	8	83	NF	NF	14	NF	ND	NF	12	NF	12	NF
Greenwood	ND	ND	20	ND	ND	ND	11	ND	ND	ND	6	ND	6	5	18	5	8	ND
Lover's	NF	ND	30	NF	ND	ND	3	ND	ND	ND	10	ND	7	5	16	5	9	NF
Pico	ND	ND	7	ND	ND	ND	6	ND	ND	ND	ND	ND	8	5	12	5	5	ND
4th Avenue	NF	NF	60	ND	NF	ND	22	NF	NF	NF	25	NF	15	NF	18	NF	--	--
Ocean	ND	NF	26	NF	NF	NF	8	NF	5	NF	ND	NF	6	NF	47	NF	--	--
8th Avenue	ND	ND	19	ND	ND	ND	11	ND	ND	ND	9	ND	6	5	13	5	--	--
Crossroads	NF	NF	ND	NF	NF	NF	ND	NF	NF	NF	ND	--	--	--	--	--	--	--

MBAS Detergents

Comparison of MBAS surfactant results for MRSWMP monitoring reported in mg/L. Shaded boxes indicate that the Basin Plan Water Quality Objective of 0.2 mg/L was exceeded; ND= Non-detect; NF= No Flow; NS= Not Sampled; -- = Not included in MRSWMP monitoring.

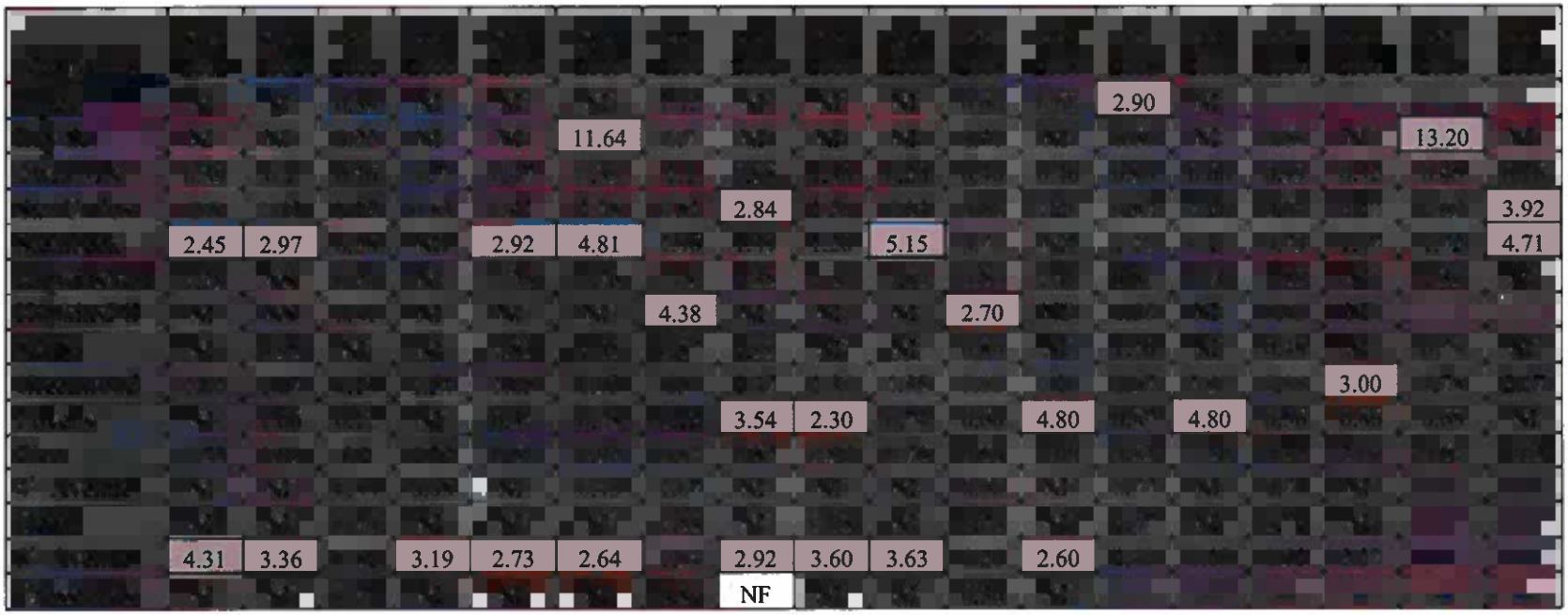
Site Name	FF 2017	DR 2017	FF 2016	DR 2016	FF 2015	DR 2015	FF 2014	DR 2014	SuR 2014	SF 2014	FF 2013	DR 2013
Pajaro	0.44	NF	0.77	NF	0.21	NF	0.52	NF	NF	ND	1.12	NF
Bay St	1.13	NF	0.51	NF	0.30	NF	0.77	NF	NF	ND	1.44	NF
Twin 51's	1.51	0.16	0.33	0.14	0.33	1.06	0.55	0.08	0.1	ND	0.31	0.05
San Carlos	1.54	NF	0.33	NF	0.29	NF	0.94	NF	NF	ND	1.04	NF
Steinbeck	0.71	NF	0.43	NF	0.36	NF	0.53	0.16	0.06	ND	0.42	NF
HopkinsMon	1.12	0.59	0.50	NF	--	--	--	--	--	--	--	--
HopkinsPG	1.08	NF	0.51	NF	--	--	--	--	--	--	--	--
8th Street	1.10	NF	0.43	NF	--	--	--	--	--	--	--	--
Greenwood	0.99	0.09	0.38	0.08	0.32	0.95	0.84	0.27	ND	NS	0.52	ND
Lover's	0.60	NF	0.38	NF	0.25	NF	1.30	NF	NF	NS	0.65	NF
Pico	0.51	0.08	0.43	0.08	0.51	0.14	1.00	ND	0.06	ND	0.55	0.06
4th Avenue	1.20	NF	0.37	NF	0.30	NF	--	--	NF	NS	NS	NF
Ocean	0.80	NF	0.45	NF	0.26	NF	--	--	NF	NS	1.6	NF
8th Avenue	0.99	0.14	0.50	NF	0.33	NF	--	--	NF	NS	NS	ND
Crossroads	0.47	NF	0.55	NF	0.22	NF	0.39	NF	NF	ND	0.43	NF

Nitrate as N

Comparison of nitrate as N (NO3-N) results for 2006-2014 MRSWMP monitoring reported in mg-N/ L. Shaded boxes indicate that the Basin Plan Objective of 2.25 mg-N/ L was exceeded; ND= Non-detect; NF= No Flow; NS= Not Sampled; -- = Not included in MRSWMP monitoring. The table below is broken into two sections to facilitate printing.

Site Name	FF 2017	DR 2017	FF 2016	DR 2016	FF 2015	DR 2015	FF 2014	DR 2014	SuR 2014	SF 2014	FF 2013	DR 2013	SuR 2013	SF 2013	FF 2012	DR 2012
Pajaro	0.53	NF	0.9	NF	0.35	NF	0.5	NF	NF	0.2	1.2	NF	NF	0.6	0.47	NF
Bay St	0.83	NF	0.3	NF	0.45	NF	0.4	NF	NF	0.2	1.4	NF	NF	1.0	0.74	NF
Twin 51's	0.66	0.5	0.3	0.40	0.45	1.5	0.7	0.3	0.3	0.2	0.7	0.8	ND	0.2	0.44	0.73
San Carlos	0.53	NF	0.3	NF	0.30	NF	0.6	NF	NF	0.2	0.9	NF	1.6	NS	NS	NF
Steinbeck	2.78	NF	0.5	1.10	0.55	NF	1.1	0.4	1.7	0.2	1.3	NF	3.6	0.6	2.67	0.78
HopkinsMon	0.59	0.5	0.4	NF	--	--	--	--	--	--	--	--	1.2	NS	NS	NS
HopkinsPG	0.53	NF	0.9	NF	--	--	--	--	--	--	--	--	NF	NS	NS	NF
8th St	0.41	NF	0.4	NF	--	--	--	--	--	--	--	--	NF	NS	NS	NF
Greenwood	0.37	1.1	0.2	NF	0.45	1.4	0.7	0.9	0.8	NS	1.0	1.0	1.4	NS	0.79	2.09
Lover's	0.47	NF	0.2	NF	0.25	NF	0.7	NF	NF	NS	1.0	NF	NF	NS	0.59	NF
Pico	0.39	0.9	0.2	0.90	0.35	0.9	0.7	2.4	1.9	ND	0.6	2.2	1.7	0.3	1.13	1.91
4th Avenue	0.15	NF	0.5	NF	0.60	NF	--	--	NF	NS	NS	NF	NF	NS	0.43	NF
Ocean	0.66	NF	0.3	NF	0.45	NF	--	--	NF	NS	1.8	NF	NF	NS	0.51	NF
8th Avenue	0.72	ND	0.3	NF	0.55	NF	--	--	NF	NS	NS	2.2	2.5	NS	NS	NF
Crossroads	0.30	NF	0.2	NF	0.20	NF	0.3	NF	NF	ND	0.5	NF	NF	0.05	0.59	NF

Nitrate as N continued



Orthophosphate as P

Comparison of orthophosphate as P results for MRSWMP monitoring reported as mg-P/ L. Shaded boxes indicate that the Basin Plan Objective of 0.12 mg-P/ L was exceeded; ND= Non-detect; NF= No Flow; NS= Not Sampled; -- = Not included in MRSWMP monitoring. The table below is broken into two sections to facilitate printing.

								DR 2014	SuR 2014	SF 2014	FF 2013	DR 2013	SuR 2013	SF 2013	FF 2012	DR 2012
	0.62		0.9		0.2		0.4	NF	NF	0.20	0.70	NF	NF	0.10	0.46	NF
	0.27		0.4		0.2		0.2	NF	NF	0.10	0.40	NF	NF	ND	0.23	NF
	0.90	0.32	0.4	0.3	0.4	1.2	0.5	ND	ND	0.20	0.40	ND	0.20	0.10	0.31	0.11
	0.49		0.3		0.2		0.3	NF	NF	ND	0.40	NF	ND	NS	NS	NF
	2.54		1.2		1.4		2.8	0.2	0.10	0.50	4.20	NF	0.40	0.50	1.82	0.14
	0.74	0.16	0.3					--	--	--	--	--	ND	NS	NS	NS
	0.61		0.9					--	--	--	--	--	NF	NS	NS	NS
	0.55		0.4					--	--	--	--	--	NF	NS	NS	NF
	0.48		0.4		0.7		0.8	ND	ND	NS	0.70	ND	0.30	NS	0.37	0.13
	1.66		0.5		0.3		0.8	NF	NF	NS	1.10	NF	NF	NS	0.63	NF
	0.64		0.5		0.7		1.0	ND	ND	0.10	0.90	ND	ND	ND	0.41	ND
	0.60		1.0		0.6			--	NF	NS	NS	NF	NF	NS	0.19	NF
	1.15		0.7		0.4			--	NF	NS	2.00	NF	NF	NS	0.67	NF
	1.23	0.20	1.1		0.6			--	NF	NS	NS	ND	ND	NS	NS	NF
	0.38		0.2				0.3	NF	NF	ND	0.20	NF	NF	ND	0.37	NF

Orthophosphate as P continued

Site Name	SuR 2012	SpR 2012	FF 2011	DR 2011	SuR 2011	SpR 2011	FF 2010	DR 2010	SuR 2010	SpR 2010	FF 2009	DR 2009	FF 2008	DR 2008	FF 2007	DR 2007	FF 2006	DR 2006
Pajaro	NF	NF	0.17	NF	NF	NF	0.38	NF	NF	NF	0.31	0.90	0.50	NF	--	--	--	--
Bay St	NF	NF	0.17	NF	NF	ND	0.34	NF	NF	NF	0.31	NF	0.40	NF	0.09	NF	0.32	NF
Twin 51's	0.13	0.11	0.52	0.09	NF	0.11	0.94	ND	0.20	0.25	0.92	0.30	0.97	0.20	0.72	ND	0.56	0.35
San Carlos	ND	0.10	0.19	ND	ND	0.15	0.33	0.17	0.10	0.19	0.18	0.20	0.60	0.20	0.38	ND	0.46	ND
Steinbeck	0.31	0.15	0.98	ND	ND	0.10	7.01	0.32	0.30	0.35	2.48	0.30	3.77	3.10	2.69	0.09	3.01	0.38
HopkinsMon	ND	NS	0.22	NF	ND	ND	0.60	0.11	0.10	0.18	0.34	0.30	0.73	0.20	3.38	NF	2.37	NF
HopkinsPG	NF	NS	0.54	NF	NF	NF	1.79	NF	NF	NF	1.60	NF	1.80	NF	0.51	NF	--	--
8th St	NF	0.21	NF	NF	ND	0.12	0.46	0.60	NF	NF	0.56	NF	0.90	NF	0.52	NF	0.49	NF
Greenwood	ND	0.10	0.35	ND	ND	0.10	0.68	0.08	0.20	0.18	0.51	0.10	1.40	0.20	0.65	0.07	0.53	ND
Lover's	NF	0.13	0.41	NF	ND	0.18	0.18	0.12	0.20	0.32	0.70	0.10	1.30	0.20	0.93	ND	1.38	NF
Pico	ND	0.10	0.37	ND	ND	ND	0.58	ND	0.05	0.13	0.40	0.10	0.70	0.20	0.73	ND	0.44	ND
4th Avenue	NF	NF	0.32	ND	NF	ND	0.54	NF	NF	NF	0.78	NF	0.70	NF	1.24	NF	--	--
Ocean	0.19	NF	0.77	NF	NF	NF	1.18	NF	2.70	NF	0.81	NF	0.93	NF	0.77	NF	--	--
8th Avenue	ND	0.10	0.65	ND	1.44	ND	0.92	ND	ND	0.24	0.75	0.20	1.37	0.20	0.99	ND	--	--
Crossroads	NF	NF	0.16	NF	NF	NF	0.64	NF	NF	NF	0.31	NF	--	--	--	--	--	--

Potassium

Comparison of potassium results for MRSWMP monitoring reported as mg/L. Shaded boxes indicate that the General Permit Action Level of 20 mg/L was exceeded; ND= Non-detect; NF= No Flow; NS= Not Sampled; -- = Not included in MRSWMP monitoring.

Site Name	FF 2017	DR 2017	FF 2016	DR 2016	FF 2015	DR 2015	FF 2014	DR 2014	SuR 2014	SF 2014	FF 2013	DR 2013
Pajaro	5.0	NF	8.5	NF	3.8	NF	4.6	NF	NF	2.5	9	NF
Bay St	55.0	NF	2.8	NF	4.0	NF	3.0	NF	NF	1.3	8	NF
Twin 51's	5.0	10	3.5	8.3	5.2	8	5.4	18.0	11	1.5	9	6.9
San Carlos	4.0	NF	2.5	NF	3.0	NF	5.2	NF	NF	1.3	7	NF
Steinbeck	8.0	NF	4.1	NF	5.5	NF	8.9	4.2	4.1	1.4	12	NF
HopkinsMon	5.0	15	4.4	NF	--	--	--	--	--	--	--	--
HopkinsPG	5.0	NF	5.4	NF	--	--	--	--	--	--	--	--
8th Street	6.0	NF	3.8	NF	--	--	--	--	--	--	--	--
Greenwood	5.0	10	4.0	7.3	7.5	5.1	6.6	6.7	5.6	NS	13	6.4
Lover's	6.0	NF	4.5	NF	4.2	NF	6.2	NF	NF	NS	14	NF
Pico	6.0	6	7.4	4.6	14.0	5.2	10.5	5.9	5.5	2.6	12	5.1
4th Ave.	12.0	NF	11.3	NF	9.5	NF	--	--	NF	NS	NS	NF
Ocean Ave.	7.0	NF	6.3	NF	5.1	NF	--	--	NF	NS	16	NF
8th Ave	8.0	6	10.0	NF	8.2	NF	--	--	NF	NS	NS	1.6
Crossroads	2.0	NF	1.9	NF	1.5	NF	2.5	NF	NF	0.8	3	NF

Total Suspended Solids (TSS)

Comparison of Total Suspended Solids (TSS) results for MRSWMP monitoring reported in mg/L. Shaded boxes indicate that the CCAMP Action Level of 500 mg/L was exceeded; NA= Not Analyzed; ND= Non-detect; NF= No Flow; NS= Not Sampled; -- = Not included in MRSWMP monitoring. The table below is broken into two sections to facilitate printing.

Site Name	FF 2017	DR 2017	FF 2016	DR 2016	FF 2015	DR 2015	FF 2014	DR 2014	SuR 2014	SF 2014	FF 2013	DR 2013	SuR 2013	SF 2013	FF 2012	DR 2012
Pajaro	652	NF	111	NF	191	NF	152	NF	NF	244	132	NF	NF	276	140	NF
Bay St	82	NF	32	NF	35	NF	173	NF	NF	33	66	NF	NF	63	33	NF
Twin 51's	96	4	28	2	59	3	73	ND	ND	14	69	3	6	19	74	ND
San Carlos	54	NF	6	NF	25	NF	91	NF	NF	44	13	NF	3	NS	NS	NF
Steinbeck	38	NF	7	NF	24	NF	84	ND	ND	34	21	NF	4	8	30	7
HopkinsMon	46	10	7	NF	--	--	--	--	--	--	--	--	35	NS	NS	NS
HopkinsPG	48	NF	9	NF	--	--	--	--	--	--	--	--	NF	NS	NS	NS
8th St	71	NF	7	NF	--	--	--	--	--	--	--	--	NF	NS	NS	NF
Greenwood	178	2	12	2	50	6	59	3	8	NS	36	4	3	NS	17	2
Lover's	29	NF	20	NF	20	NF	33	NF	NF	NS	11	NF	NF	NS	21	NF
Pico	41	ND	14	ND	61	ND	27	ND	ND	68	32	ND	2	12	10	ND
4th Ave.	129	NF	96	NF	312	NF	--	--	NF	NS	NS	NF	NF	NS	139	NF
Ocean Ave.	22	NF	18	NF	62	NF	--	--	NF	NS	20	NF	NF	NS	57	NF
8th Ave	26	4	36	NF	101	NF	--	--	NF	NS	NS	ND	ND	NS	NS	NF
Crossroads	6	NF	6	NF	20	NF	12	NF	NF	20	7	NF	NF	5	11	NF

Total Suspended Solids (TSS) continued

Site Name	SuR 2012	SpR 2012	FF 2011	DR 2011	SuR 2011	SpR 2011	FF 2010	DR 2010	SuR 2010	SpR 2010	FF 2009	DR 2009	FF 2008	DR 2008	FF 2007	DR 2007	FF 2006	DR 2006
Pajaro	NF	NF	230	NF	NF	NF	348	NF	NF	NF	270	42	743	NF	--	--	--	--
Bay St	NF	NF	59	NF	NF	ND	173	NF	NF	NF	123	NF	66	NF	38	NF	3	NF
Twin 51's	ND	ND	15	ND	ND	ND	183	61	5	ND	44	6	74	5	137	3	41	2
San Carlos	ND	ND	100	ND	ND	ND	69	3	ND	ND	22	ND	32	5	47	3080	46	ND
Steinbeck	18	2	88	ND	ND	ND	56	6	ND	ND	68	8	49	8	66	4	14	12
HopkinsMon	ND	NS	57	NF	8	ND	30	ND	8	7	106	51	34	12	36	NF	29	NF
HopkinsPG	NF	NS	75	NF	NF	NF	82	NF	NF	NF	45	NF	25	NF	43	NF	--	--
8th St	NF	2	NF	NF	20	ND	26	188	NF	NF	31	NF	15	NF	75	NF	39	
Greenwood	ND	4	174	ND	ND	7	50	5	6	0	60	0	19	14	71	3	23	33
Lover's	NF	ND	118	NF	9	12	20	3	ND	ND	52	ND	25	1.9	35	5	24	NF
Pico	ND	ND	57	ND	ND	ND	36	ND	6	ND	20	ND	45	ND	86	5	40	ND
4th Ave.	NF	NF	557	ND	NF	ND	212	NF	NF	NF	121	NF	116	NF	103	NF	--	--
Ocean Ave.	14	NF	292	NF	NF	NF	42	NF	45	NF	28	NF	34	NF	59	NF	--	--
8th Ave	ND	ND	99	ND	ND	ND	36	3	ND	ND	57	ND	20	5	89	4	--	--
Crossroads	NF	NF	11	NF	NF	NF	15	NF	NF	NF	21	NF	--	--	--	--	--	--

Turbidity

Comparison of turbidity results for MRSWMP monitoring reported in NTU. Shaded boxes indicate that the CCRWQCB Action Level of 25 NTU was exceeded; NA= Not Analyzed; ND= Non-detect; NF= No Flow; NS= Not Sampled; -- = Not included in MRSWMP monitoring.

Site Name	FF 2017	DR 2017	FF 2016	DR 2016	FF 2015	DR 2015	FF 2014	DR 2014	SuR 2014	SF 2014	FF 2013	DR 2013
Pajaro	606	NF	2.3	NF	140.0	NF	140.0	NF	NF	120.0	175.0	NF
Bay St	69	NF	12.3	NF	19.0	NF	41.0	NF	NF	20.0	40.0	NF
Twin 51's	52	3.8	16.5	6.1	33.0	3.4	21.0	2.0	1.6	12.0	50.0	3.8
San Carlos	57	NF	5.2	NF	14.0	NF	37.0	NF	NF	16.0	17.3	NF
Steinbeck	39	NF	5.0	NF	14.0	NF	32.0	0.7	0.7	16.0	13.0	NF
HopkinsMon	44	5.3	4.4	NF	--	--	--	--	--	--	--	--
HopkinsPG	50	NF	3.9	NF	--	--	--	--	--	--	--	--
8th St	40	NF	4.6	NF	--	--	--	--	--	--	--	--
Greenwood	71	4.7	10.1	4.5	25.0	5.0	25.0	4.0	2.1	NS	24.0	1.5
Lover's	30	NF	12.3	NF	10.0	NF	20.0	NF	NF	NS	7.1	NF
Pico	28	6.7	7.9	10.0	32.0	3.3	21.0	7.2	2.1	18.0	18.0	3.0
4th Ave.	91	NF	44.5	NF	103.0	NF	--	--	NF	NS	NS	NF
Ocean Ave.	20	NF	21.5	NF	14.0	NF	--	--	NF	NS	24.0	NF
8th Ave	19	10.0	11.0	NF	26.0	NF	--	--	NF	NS	NS	1.1
Crossroads	19	NF	4.7	NF	9.0	NF	12.0	NF	NF	13.0	7.0	NF

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Urea continued

Site Name	SuR 2012	SpR 2012	FF 2011	DR 2011	SuR 2011	SpR 2011	FF 2010	DR 2010	SuR 2010	SpR 2010	FF 2009	DR 2009	FF 2008	DR 2008	FF 2007	DR 2007	FF 2006	DR 2006
Pajaro	NF	NF	44	NF	NF	NF	609	NF	NF	NF	241	74	98	NF	--	--	--	--
Bay St	NF	NF	143	NF	NF	ND	284	NF	NF	NF	62	NF	108	NF	205	NF	60	NF
Twin 51's	87	61	179	35	53	16	520	21	16	258	920	250	753	45	560	116	724	53
San Carlos	ND	5	73	ND	10	ND	326	878	15	10	331	ND	336	15	440	35	370	13
Steinbeck	127	5	393	30	42	ND	2234	11	10	213	1547	11	740	1	1965	1028	4777	152
HopkinsMon	ND	NS	55	NF	30	ND	160	ND	ND	36	456	193	38	173	2495	NF	3263	NF
HopkinsPG	NF	NS	378	NF	NF	NF	1628	NF	NF	NF	1671	NF	840	NF	275	NF	--	--
8th St	NF	1861	NF	NF	83	ND	192	389	NF	NF	141	NF	267	NF	210	NF	139	NF
Greenwood	11	5	168	12	44	70	280	5	636	31	120	14	470	71	455	428	348	485
Lover's	NF	57	97	NF	12	ND	54	5	ND	13	118	20	41	57	320	23	217	NF
Pico	ND	5	25	ND	10	20	96	5	24	13	35	15	104	69	240	10	150	ND
4th Ave.	NF	NF	46	ND	NF	ND	225	NF		NF	393	NF	84	NF	195	NF	--	--
Ocean Ave.	31	NF	47	NF	NF	NF	417	NF	400	NF	105	NF	250	NF	280	NF	--	--
8th Ave	ND	5	547	ND	10	ND	426	ND	ND	ND	419	ND	331	10	345	10	--	--
Crossroads	NF	NF	52	NF	NF	NF	519	NF	NF	NF	321	NF	--	--	--	--	--	--

Zinc

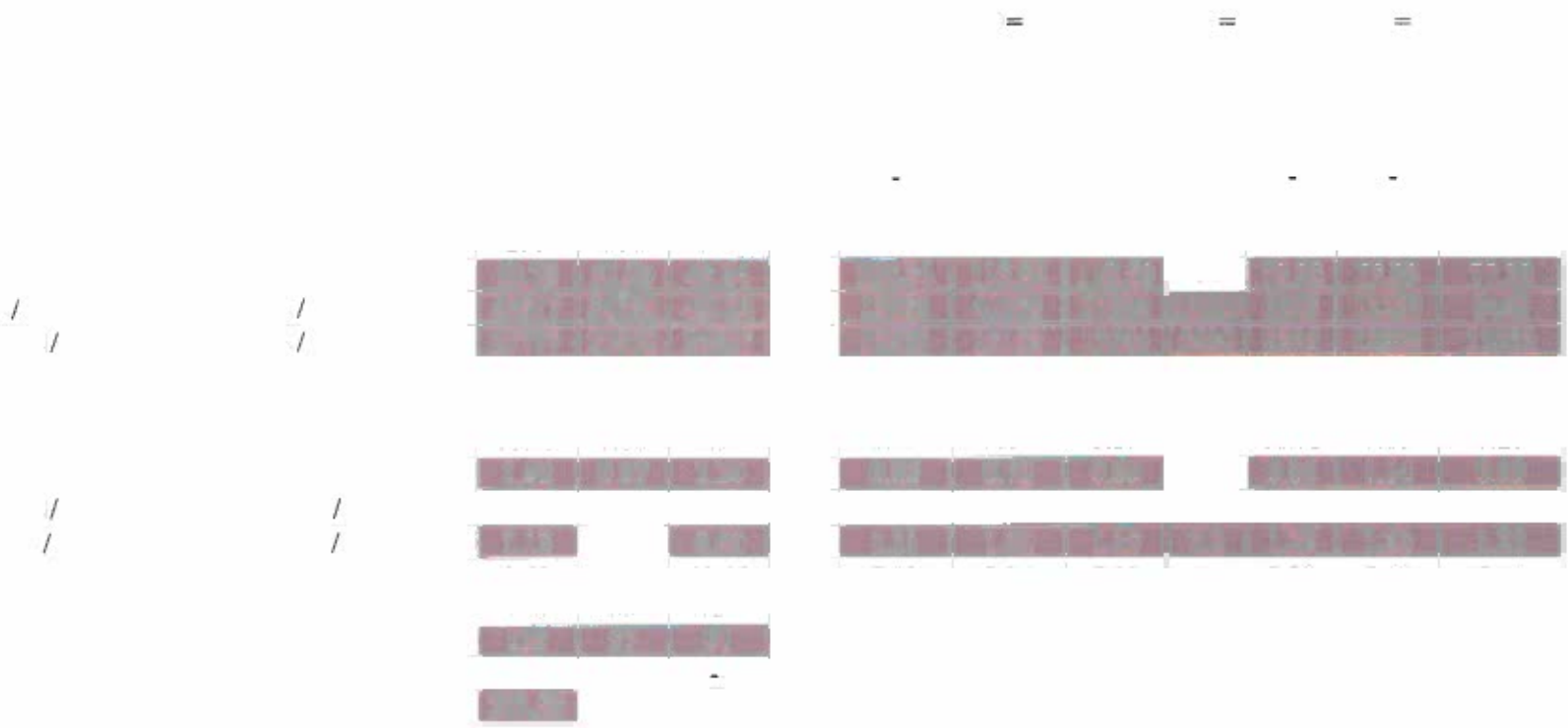
Comparison of total zinc results for MRSWMP monitoring reported in µg/L. Shaded boxes indicate that the Basin Plan Objective of 200 µg/L was exceeded; NA= Not Analyzed; ND= Non-detect; NF= No Flow; NS= Not Sampled; -- = Not included in MRSWMP monitoring. The table below is broken into two sections to facilitate printing.

Site Name	FF 2017	DR 2017	FF 2016	DR 2016	FF 2015	DR 2015	FF 2014	DR 2014	SuR 2014	SF 2014	FF 2013	DR 2013	SuR 2013	SF 2013	FF 2012	DR 2012
Pajaro	424	NF	317	NF	167	NF	231	NF	NF	264	297	NF	NF	182	198	NF
Bay St	136	NF	138	NF	141	NF	703	NF	NF	119	402	NF	NF	187	94	NF
Twin 51's	220	17	93	56	167	114	513	313	48	58	504	93	46	70	147	28
San Carlos	157	NF	92	NF	118	NF	692	NF	NF	96	269	NF	36	NS	NS	NF
Steinbeck	249	NF	149	NF	170	NF	764	53	25	112	293	NF	43	158	392	38
HopkinsMon	142	106	112	NF	--	--	--	--	--	--	--	--	60	NS	NS	NS
HopkinsPG	136	NF	189	NF	--	--	--	--	--	--	--	--	NF	NS	NS	NS
8th St	121	NF	74	NF	--	--	--	--	--	--	--	--	NF	NS	NS	NF
Greenwood	180	13	93	ND	129	ND	410	60	48	NS	263	20	14	NS	102	ND
Lover's Pt	107	NF	80	NF	87	NF	406	NF	NF	NS	204	NF	NF	NS	114	NF
Pico	92	ND	68	23	150	ND	144	39	ND	63	129	37	ND	70	58	21
4th Avenue	198	NF	133	NF	148	NF	--	--	NF	NS	NS	NF	NF	NS	145	NF
Ocean	194	NF	144	NF	106	NF	--	--	NF	NS	395	NF	NF	NS	203	NF
8th Avenue	111	71	125	NF	169	NF	--	--	NF	NS	NS	24	92	NS	NS	NF
Crossroads	130	NF	134	NF	78	NF	229	NF	NF	81	185	NF	NF	79	211	NF

Zinc continued

Site Name	SuR 2012	SpR 2012	FF 2011	DR 2011	SuR 2011	SpR 2011	FF 2010	DR 2010	SuR 2010	SpR 2010	FF 2009	DR 2009	FF 2008	DR 2008	FF 2007	DR 2007	FF 2006	DR 2006
Pajaro	NF	NF	170	NF	NF	NF	351	NF	NF	NF	273	41	368	NF	--	--	--	--
Bay St	NF	NF	219	NF	NF	22	272	NF	NF	NF	345	NF	124	NF	185	NF	33	NF
Twin 51's	ND	40	142	20	25	25	385	46	52	20	313	29	273	28	330	25	295	ND
San Carlos	ND	43	264	17	29	67	351	28	28	25	213	19	157	18	269	10	342	ND
Steinbeck	21	60	258	19	31	62	808	31	29	40	400	196	347	110	384	130	411	ND
HopkinsMon	ND	NS	138	NF	36	24	322	24	22	35	341	234	194	99	382	NF	307	NF
HopkinsPG	NF	NS	166	NF	NF	NF	945	NF	NF	NF	477	NF	305	NF	231	NF	--	--
8th St	NF	22	NF	NF	88	15	156	567	NF	NF	147	NF	121	NF	173	NF	153	
Greenwood	ND	21	300	ND	16	12	232	5	ND	14	167	ND	156	35	236	11	180	27
Lover's Pt	NF	14	182	NF	16	36	65	5	ND	14	166	ND	123	10	175	13	158	NF
Pico	ND	12	86	ND	11	34	139	17	16	11	87	ND	96	12	154	10	142	ND
4th Avenue	NF	NF	312	11	NF	104	195	NF	NF	NF	226	NF	116	NF	170	NF	--	--
Ocean	98	NF	354	NF	NF	NF	650	NF	439	NF	288	NF	225	NF	361	NF	--	--
8th Avenue	ND	26	214	20	19	ND	344	15	14	17	256	19	237	20	303	61	--	--
Crossroads	NF	NF	97	NF	NF	NF	330	NF	NF	NF	303	NF	--	--	--	--	--	--

Appendix 3: Results by Jurisdiction (listed alphabetically)



Monterey 2017 MRSWMP monitoring results.

Table results include the Dry Run (DR), First Flush time series (FF-A and FF-B) and FF results averaged for the two time series (FF-Avg). Shaded boxes indicate that a Water Quality Objective (WQO) or Action Level was exceeded. ND= Non-detect; NF= No Flow; -- = Not included in MRSWMP monitoring.

	WQO or Action Level	Twins				San Carlos				Steinbeck			
Analytes		DR	FF- A	FF - B	FF Avg	DR	FF- A	FF - B	FF Avg	DR	FF- A	FF - B	FF Avg
Ammonia (mg/L)	50 mg/L	0.9	0.7	1.13	0.92	NF	0.43	0.50	0.47	NF	6	3.25	4.63
Color (Color Units)	500 color units	14	150	350	250	NF	250	250	250	NF	250	150	200
Copper (ug/L)	30 ug/L	19	70.42	59.05	64.73	NF	69.35	74.33	71.84	NF	391.89	606.71	499.30
E. coli (MPN/100 ml)	235 MPN/ 100 ml	1610	4798	13735	9267	NF	5908	14387	10148	NF	19179	22818	20999
Enterococcus (MPN/100 ml)	104 MPN/ 100 ml	74	9326	17853	13590	NF	7380	14387	10884	NF	43604	43517	43561
Fluoride (mg/L)	None currently	0.5	0.12	0.09	0.10	NF	0.09	0.11	[illegible]	NF	[illegible]	0.12	0.12
Hardness mg/L	<10 and >2000 mg/L	429	62.03	47.87	54.95	NF	56.47	71.11	63.79	NF	50.08	76.98	63.53
Lead (ug/L)	30 ug/L	ND	18.47	12.13	15.30	NF	9.83	6.36	8.10	NF	5.15	4.90	5.02
MBAS Surfactants	0.2 mg/L	0.16	.85	1.16	1.51	NF	1.	1.43	1.54	NF	0.61	0.80	0.
NO3-N (mg-N/ L)	2.25 mg-N/ L	0.5	0.69	0.64	0.66	NF	0.46	0.60	0.53	NF	4.00	1.57	2.
PO4-P (mg-P/ L)	0.12 mg-P/ L	0.32	0.70	1.10	0.90	NF	0.48	0.49	0.4	NF	3.11	1.97	2.54
Potassium (mg/L)	20 mg/ L	10	4.60	5.72	5.16	NF	3.98	4.52	4.25	NF	6.96	9.69	8.32
TSS (mg/L)	500 mg/L	4	132	60	96	NF	81	27	54	NF	34	42	38
Turbidity (NTU)	25 NTU	3.8	69	4	52	NF	60	53	57	NF	37	41	39
Urea (ug/L)	None currently	139	ND	--	--	NF	ND	--	--	NF	ND	--	--
Zinc (ug/L)	200 ug/L	17	247.88	192.92	220.40	NF	172.47	141.64	157.06	NF	210.67	287.09	248.88

Monterey County 2017 MRSWMP monitoring results.

Table results include the Dry Run (DR), First Flush time series (FF A and FF B) and FF results averaged for the two time series (FF Avg). Shaded boxes indicate that a Water Quality Objective (WQO) or Action Level was exceeded. ND Non-detect; NF No Flow, -- Not included in MRSWMP monitoring.

		Pajaro				Crossroads			
Analytes	**WQO or Action Level**	DR	FF- A	FF- B	FF-Avg	DR	FF- A	FF- B	FF-Avg
Ammonia (mg/L)	50 mg/L	NF	0.72	0.30	0.51	NF	0.29	0.28	0.29
Color (Color Units)	500 color units	NF	1750	500	1125	NF	350	250	300
Copper (ug/L)	30 ug/L	NF	88.01	70.67	79.34	NF	17.69	12.28	14.98
E. coli (MPN/ 100 ml)	235 MPN/ 100 ml	NF	20122	10101	15112	NF	860	626	743
Enterococcus (MPN/ 100 ml)	104 MPN/ 100 ml	NF	77010	34411	55711	NF	5371	4412	4892
Fluoride (mg/L)	None currently	NF	0.54	0.14	0.34	NF	0.06	0.06	0.06
Hardness mg/L	<10 and >2000 mg/L	NF	134.49	72.23	103.36	NF	12.91	15.03	13.97
Lead (ug/L)	30 ug/L	NF	32.79	30.43	31.61	NF	1.43	1.33	1.38
MBAS Surfactants (mg/L)	0.2 mg/L	NF	0.38	0.50	0.44	NF	0.40	0.53	0.47
NO3-N (mg-N/ L)	2.25 mg-N/ L	NF	0.74	0.31	0.53	NF	0.28	0.31	0.30
PO4-P (mg-P/ L)	0.12 mg-P/ L	NF	0.78	0.50	0.62	NF	0.38	0.37	0.38
Potassium (mg/L)	20 mg/ L	NF	6.35	4.31	5.33	NF	1.44	1.50	1.47
TSS (mg/L)	500 mg/L	NF	496	808	652	NF	6	6	6
Turbidity (NTU)	25 NTU	NF	732	479	605.5	NF	19	19	19
Urea (ug/L)	None currently	NF	434	--	--	NF	150	--	--
Zinc (ug/L)	200 ug/L	NF	458.01	390.79	424.40	NF	122.91	137.96	130.43

Pacific Grove 2017 MRSWMP Monitoring results.

Table results include the Dry Run (DR), First Flush time series (FF-A and FF-B) and FF results averaged for the two time series (FF-Avg). Shaded boxes indicate that a Water Quality Objective (WQO) or Action Level was exceeded. ND= Non-detect; NF= No Flow; -- = Not included in MRSWMP monitoring.

Analytes	WQO or Action Level	HopkinsMon				HopkinsPG				8th Street			
		DR	FF- A	FF - B	FF Ave	DR	FF- A	FF - B	FF Ave	DR	FF- A	FF - B	FF Ave
Ammonia (mg/L)	50 mg/L	1.1	1.52	0.43	0.98	NF	0.45	--	--	NF	0.37	0.45	0.41
Color (Color Units)	500 color units	100	150	150	150	NF	200	--	--	NF	200	150	175
Copper (ug/L)	30 ug/L	32	49.99	54.33	52.16	NF	52.26	--	--	NF	36.53	48.91	42.72
E. coli (MPN/100 ml)	235 MPN/ 100 ml	242000	2334	48844	25589	NF	29093	--	--	NF	18501	48844	33673
Enterococcus (MPN/100 ml)	104 MPN/ 100 ml	300	5940	22236	14088	NF	21425	--	--	NF	41058	111987	76523
Fluoride (mg/L)	None currently	0.5	0.06	0.12	0.09	NF	0.10	--	--	NF	0.10	0.09	0.10
Hardness mg/L	<10 and >2000 mg/L	626	45.48	62.96	54.22	NF	48.38	--	--	NF	154.41	48.50	101.45
Lead (ug/L)	30 ug/L	2	11.43	4.62	8.02	NF	6.05	--	--	NF	8.60	9.89	9.25
MBAS Surfactants	0.2 mg/L	0.59	1.20	1.04	1.12	NF	1.08	--	--	NF	0.99	1.20	1.10
NO3-N (mg-N/ L)	2.25 mg-N/ L	0.5	0.57	0.61	0.59	NF	0.53	--	--	NF	0.38	0.44	0.41
PO4-P (mg-P/ L)	0.12 mg-P/ L	0.16	0.89	0.58	0.74	NF	0.61	--	--	NF	0.50	0.61	0.55
Potassium (mg/L)	20 mg/ L	15	4.92	5.63	5.27	NF	5.25	--	--	NF	6.03	4.90	5.46
TSS (mg/L)	500 mg/L	10	66	26	46	NF	48	--	--	NF	59	83	71
Turbidity (NTU)	25 NTU	5.3	42	46	44	NF	50	--	--	NF	38	41	40
Urea (ug/L)	None currently	95	754	--	--	NF	278	--	--	NF	280	--	--
Zinc (ug/L)	200 ug/L	106	168.99	115.36	142.18	NF	135.90	--	--	NF	96.67	145.90	121.29

Pacific Grove 2017 MR WMP Monitoring results continued

Analytes	WQO or Action Level	Greenwood Park				Lovers				Pico			
		DR	FF- A	FF - B	FF Ave	DR	FF- A	FF - B	FF Ave	DR	FF- A	FF - B	FF Ave
Ammonia (mg/L)	50 mg/L	ND	0.43	0.38	0.41	NF	0.41	0.37	0.39	ND	0.29	0.28	0.29
Color (Color Units)	500 color units	40	150	350	250	NF	150	200	175	60	250	200	225
Copper (ug/L)	30 ug/L	10	49.91			NF			46.73	8		21.83	27.11
E. coli (MPN/100 ml)	235 MPN/ 100 ml					NF							7 21
Enterococcus (MPN/100 ml)	104 MPN/ 100 ml					NF						7136	7 80
Fluoride (mg/L)	None currently	0.3	0.07	0.08	0.08	NF	0.10	0.12	0.11	0.1	0.08	0.08	0.08
Hardness mg/L	<10 and >2000 mg/L	456	55.78	36.50	46.14	NF	45.53	67.69	56.61	223	36.45	41.89	39.17
Lead (ug/L)	30 ug/L	ND	19.85	9.65	14.75	NF	6.47	5.68	6.07	ND	7.03	3.95	5.49
MBAS Surfactants	0.2 mg/L	0.09			0.99	NF	0.64			0.08			
NO3-N (mg-N/ L)	2.25 mg-N/ L	1.1	0.38	0.35	0.37	NF	0.47	0.48	0.47	0.9	0.37	0.41	0.39
PO4-P (mg-P/ L)	0.12 mg-P/ L	ND				NF		1.84	1.66	ND			0.
Potassium (mg/L)	20 mg/ L	10	4.96	4.54	4.75	NF	5.82	6.48	6.15	6	6.24	6.05	6.14
TSS (mg/L)	500 mg/L	2	276	80	178	NF	32	25	29	ND	52	30	41
Turbidity (NTU)	25 NTU	4.7	97		71	NF	34	25		6.7	29	27	
Urea (ug/L)	None currently	124	177	--	--	NF	249	--	--	15	140	--	--
Zinc (ug/L)	200 ug/L	13		129.09	180.19	NF	112.40	101.97	107.18	ND	119.72	64.56	92.14

Seaside and Sand City 2017 MRSWMP Monitoring results.

Table results include the Dry Run (DR), First Flush time series (FF-A and FF-B) and FF results averaged for the two time series. Shaded boxes indicate that a Water Quality Objective (WQO) or Action Level was exceeded. ND– Non-detect; NF No Flow; -- Not included in MRSWMP monitoring.

Analytes	WQO or Action Level	Bay Street			
		Dry Run	First Flush-A	First Flush - B	FF Average
Ammonia (mg/L)	50 mg/L	NF	0.96	0.89	0.93
Color (Color Units)	500 color units	NF	250	150	200
Copper (ug/L)	30 ug/L	NF	89.13	73.08	81.11
E. coli (MPN/ 100 ml)	235 MPN/ 100 ml	NF	77010	68667	7283
Enterococcus (MPN/ 100 ml)	104 MPN/ 100 ml	NF	54750	8 644	70697
Fluoride (mg/L)	None currently	NF	0.40	0.20	0.30
Hardness mg/L	<10 and >2000 mg/L	NF	1098.99	744.90	921.94
Lead (ug/L)	30 ug/L	NF	10.54	11.23	10.89
MBAS Surfactants (mg/L)	0.2 mg/L	NF	1.12	1.13	1.13
NO3-N (mg-N/ L)	2.25 mg-N/ L	NF	0.72	0.93	0.83
PO4-P (mg-P/ L)	0.12 mg-P/ L	NF	0.26	0. 8	0.27
Potassium (mg/L)	20 mg/ L	NF	64.77	44.56	54.67
TSS (mg/L)	500 mg/L	NF	85	78	82
Turbidity (NTU)	25 NTU	NF	66	71	69
Urea (ug/L)	None currently	NF	ND	--	--
Zinc (ug/L)	200 ug/L	NF	146.18	125.34	135.76

Appendix 4: Receiving Water Sampling

Appendix 4. Receiving Water Monitoring

Introduction

The 2016-2017 MRSWMP monitoring program added the collection and analysis of receiving water samples from two sites in Pacific Grove during the First Flush which was continued into the 2017-2018 program. Collecting receiving water samples and discharge samples can provide a more complete understanding of the fate of common urban pollutants once they flow into the ocean during a major rainstorm. Specific receiving water sites were selected based upon ease of sample collection and to compliment previous Areas of Special Biological Significance (ASBS) monitoring that was done at the end of pipe and in receiving water in Pacific Grove. The original plan was for receiving water sampling to be conducted at 8th Street and Lovers, however due to the low flow of the First Flush storm and a concern that the dry weather diversion was still on which would prevent flow from the Lovers outfall, samples were taken instead at 8th Street and HopkinsMon.

Methods

Sample collection protocols were the same as those used for all of the MRSWMP water quality monitoring events. Receiving water samples were collected and analyzed for the same parameters as those for the MRSWMP outfall monitoring (Table 1). Receiving water grab samples are single samples, collected from the ocean as close to the point where the outfall water flowed into the ocean.

All results from this receiving water study are compared to actual receiving water standards established for beneficial uses in the ocean. All Water Quality Objectives and Action Levels and their accompanying sources are listed in Table A1. In cases where the Ocean Plan provided more protection of receiving water quality than those water quality objectives used for end of pipe monitoring, the Ocean Plan water quality objectives are used and noted.

Results

Samples were collected using the same equipment as that used for the Dry Run and First Flush, however no field measurements were collected. The 8th Street and HopkinsMon samples were collected using a bucket from the beach approximately 30 feet from the outfall.

Receiving water results are presented for each site along with that site's average results from First Flush as a comparison. Receiving water samples are from a single grab sample. First Flush average results are from two samples collected 30 minutes apart. Because of safety concerns, receiving water samples were collected by MBNMS and CMSF staff about two hours after the last outfall sample was collected at 8th Street (Pacific Grove) and about 45 minutes after the last sample at HopkinsMon (Pacific Grove).

Table A1: Receiving Water Quality Objectives

Parameter (reporting units)	Water Quality Objectives	Source of Objective
Ammonia	Not to exceed 50 mg/L	SWRCB NPDES MS4 General Permit
Color	Not to exceed 500	SWRCB NPDES MS4 General Permit
Copper (µg/L)	Not to exceed 30	California Ocean Plan 2015
E. coli (MPN/100ml)	Not to exceed 235 [1]	EPA Ambient Water Quality Criteria
Enterococcus (MPN/100ml)	Not to exceed 104	EPA Ambient Water Quality Criteria
Fluoride (mg/L)	NA	NA
Hardness as CaCO3 (mg/L)	Not less than or = to10 or greater than or = to 2,000	SWRCB NPDES MS4 General Permit
Lead (µg/L)	Not to exceed 20	California Ocean Plan 2015
MBAS Detergents (mg/L)	Not to exceed 0.2	Water Quality Control Plan for the Central Coast
Nitrate as N (mg/L)	Not to exceed 2.25 [2]	Central Coast Ambient Monitoring Program (CCAMP)
Orthophosphate as P (mg/L)	Not to exceed 0.12 [3]	Central Coast Ambient Monitoring Program (CCAMP)
Potassium (mg/L)	Not to exceed 20	SWRCB NPDES MS4 General Permit
Total Suspended Solids (TSS) (mg/L)	Not to exceed 500 [4]	Central Coast Ambient Monitoring Program (CCAMP)
Turbidity (NTU)	Not to exceed 225	California Ocean Plan 2015
Urea (µg/L)	NA	NA
Zinc (µg/L)	Not to exceed 200 [1]	California Ocean Plan 2015

[1] Environmental Protection Agency, Updated WQO.
[2] Central Coast Ambient Monitoring Program, Pajaro River Watershed Characterization Report 1998, rev 2003.
[3] Williamson, The Establishment of Nutrient Objectives, Sources, Impacts and Best Management Practices for the Pajaro River and Llagas Creek, 1994.
[4] Central Coast Ambient Monitoring Program, Salinas River Watershed Characterization Report 1999, rev. 2000.

8th Street Outfall and Receiving Water Monitoring

The 8th street beach is a small pocket beach with a drainage area of 35 acres. The watershed area is all residential. The 8th Street 2017 outfall and receiving water results are listed in Table A2.

Table A2. 8th Street outfall and receiving water results for First Flush samples.

Parameter	Units	Outfall Monitoring		Receiving Water Monitoring	
		FF Ave	MDL	Result	MDL
Ammonia	mg/L	0.41	0.05	0.20	0.05
Color	color units	175	150	40	6
Copper- total	µg/L	42.72	2.00	ND	2.00
Escherichia coli (E. coli)	MPN/ 100 ml	33,673	100	27,230	100
Enterococcus	MPN/ 100 ml	76,523	100	10,122	100
Fluoride	mg/L	0.10	0.02	0.93	0.02
Hardness	mg/L	101.45	10.00	4513.53	10.00
Lead- total	µg/L	9.25	1.00	ND	1.00
MBAS Detergents	mg/L	1.10	0.20	0.21	0.05
Nitrate as N	mg-N/L	0.41	0.01	0.27	0.01
Orthophosphate as P	mg-P/L	0.55	0.02	0.87	0.02
Potassium	mg/L	5.46	1.00	257.23	20.00
Total Suspended Solids	mg/L	71	2	138	2
Turbidity	NTU	40.00	0.50	10.00	0.05
Urea (single sample)	µg/L	280	8	22	8
Zinc- total	µg/L	121.29	10.00	446.96	8.00

Overall constituent concentrations decreased in seawater except fluoride, hardness, orthophosphate, potassium, total suspended solids, and zinc. Hardness and potassium were above the Action Levels, however the ocean contains quite a bit of calcium carbonate and potassium, so much so that calcium and potassium are within the top six constituents in seawater. Bacteria and detergents were still over the Water Quality Objectives (WQO) for receiving water samples, however the concentrations are lower in the receiving water. Zinc concentrations increased over three times in receiving water over what they were in the outfall samples.

HopkinsMon Outfall and Receiving Water Montioring

The HopkinsMon watershed is one of the smaller watersheds in Pacific Grove at 41 acres. The watershed consists of a mix of residential and commercial, with some public land uses (Appendix 1). HopkinsMon 2017 outfall and receiving water results are listed in Table A3.

Table A3. HopkinsMon outfall and receiving water results for First Flush samples.

Parameter	Units	Outfall Monitoring		Receiving Water Monitoring	
		Result	MDL	Result	MDL
Ammonia	mg/L	0.98	0.05	ND	0.05
Color	color units	150	150	10	6
Copper- total	µg/L	52.16	2.00	43.48	2.00
Escherichia coli (E. coli)	MPN/ 100 ml	25,589	100	1,100	100
Enterococcus	MPN/ 100 ml	14,088	100	413	100
Fluoride	mg/L	0.09	0.02	0.77	0.02
Hardness	mg/L	54.22	10.00	5283.84	10.00
Lead- total	µg/L	8.02	1.00	ND	1.00
MBAS Detergents	mg/L	1.12	0.20	0.06	0.05
Nitrate as N	mg-N/L	0.59	0.01	0.19	0.01
Orthophosphate as P	mg-P/L	0.74	0.02	0.90	0.02
Potassium	mg/L	5.27	1.00	306.40	20.00
Total Suspended Solids	mg/L	46	2	12	2
Turbidity	NTU	44.00	0.50	3.20	0.05
Urea	µg/L	754	8	ND	8
Zinc- total	µg/L	142.18	10.00	308.22	10.00

As with 8th Street, overall constituent concentrations decreased in seawater except hardness and potassium. Hardness and potassium were above the Action Levels, however the ocean contains quite a bit of calcium carbonate and potassium so much so that calcium and potassium were within the top six constituents in seawater. *E. coli* and enterococcus results were over the Water Quality Objectives (WQO) for both end of pipe and receiving water samples.