Thea Foss and Wheeler-Osgood Waterways

2024 Source Control and Water Year 2024 Stormwater Monitoring Report

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Prepared by
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LIST OF ABBREVIATIONS

ANOVA	Analysis of Variance
BEL	Biological Effects Level
BMPs	Best Management Practices
BNSF	Burlington Northern Santa Fe
BTEX	A mix of Benzene, Toluene, Ethylbenzene, and Xylenes found in petroleum and petroleum products
CD	Consent Decree
CDF	Controlled Density Fill
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CHB	Community for a Healthy Bay
City	City of Tacoma
CIPP	Cured-In-Place Pipe
COCs	Contaminants of Concern
CRM	Certified Reference Material
DEHP	Di(2-ethylhexyl) phthalate or Bis(2-ethylhexyl) phthalate
DMMP	Dredged Material Management Program
Ecology	Washington State Department of Ecology
EC	Environmental Compliance
EPA	Environmental Protection Agency
ER	Exceedance Ratio
Foss Waterway	Thea Foss and Wheeler-Osgood Waterways
FWDA	Foss Waterway Development Authority
GOF	Goodness-of-fit
HPAHs	High Molecular Weight PAHs
IDDE	Illicit Discharge Detection and Elimination
ISWGP	Industrial General Stormwater Permit issued by Ecology
LCS	Laboratory Control Sample
LPAHs	Low Molecular Weight PAHs
LTMP	Long Term Monitoring Plan
LUST	Leaking Underground Storage Tank
MLLW	Mean Lower Low Water
MS4	Municipal Separate Storm Sewer System
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NPDES Phase I Permit	NPDES Phase I Municipal Stormwater Permit dated August 1, 2012
NWDC	Northwest Detention Center
OF	Outfall
OMMP	Operations, Maintenance, and Monitoring Plan
PAHs	Polycyclic Aromatic Hydrocarbons

LIST OF ABBREVIATIONS - CONTINUED

PCBs	Polychlorinated biphenyls
Permit	State Waste Discharge General Permit for Discharges from Large and Medium Municipal Separate Storm Sewer Systems
PIC	Pierce County Code Enforcement Officers Group
PSD	Particulate Size Distribution
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
ROW	Right-of-way
SSPM	Stormwater Suspended Particulate Matter
SAP	Sampling and Analysis Plan
SQOs	Sediment Quality Objectives
SQS	State Sediment Quality Standards
SR	State Route
SAM	Stormwater Action Monitoring
STRAP	Stormwater Rapid Assessment Program
SWMP	Stormwater Management Program
SWPPP	Stormwater Pollution Prevention Plan
TNT	The News Tribune
TPCHD	Tacoma Pierce County Health Department
TPH	Total Petroleum Hydrocarbons
TSS	Total Suspended Solids
Twin 96ers	Outfall 237A and 237B
UCL	Upper Control Limit
USGS	United States Geological Survey
UST	Underground Storage Tank
Utilities	Group of Private Utilities who performed cleanup in the Head of the Thea Foss Waterway
WASP	Water Quality Analysis Simulation Program
WRDA	Water Resources Development Act
WSDOT	Washington State Department of Transportation
WY	Water Year

EXECUTIVE SUMMARY

Under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), also referred to as Superfund, contaminated bottom sediments were remediated in the Thea Foss and Wheeler-Osgood Waterways (Waterways or Foss Waterway) in Tacoma, Washington, under the oversight of the Environmental Protection Agency (EPA) at a cost of $105 million. In 2022, EPA initiated the process of deleting the waterway from the National Priorities List as part of the Commencement Bay Superfund site.

The Waterways are located in a highly urbanized basin with a variety of land uses and transportation corridors. Sources of contaminants of concern (COCs) continue to exist in the drainage basins and are conveyed to the waterway via stormwater (municipal and private), aerial deposition, marinas, and groundwater discharges. The contaminants identified as having the greatest potential to affect sediment quality following the cleanup action include polycyclic aromatic hydrocarbons (PAHs) and phthalates.

Stormwater draining the Foss Waterway Watershed has potential to transport these contaminants from upland sources, therefore the City of Tacoma (City) has implemented a comprehensive monitoring and source control strategy in the since 2001. This program is used to meet stormwater monitoring requirements under a Stormwater Work Plan Addendum to the Thea Foss Waterway Consent Decree (CD) issued by EPA and Section S8 of the Phase I National Pollutant Discharge Elimination System (NPDES) and State Waste Discharge General Permit for Discharges from Large and Medium Municipal Separate Storm Sewer Systems (Permit) issued by the Washington State Department of Ecology (Ecology), which supersedes previous NPDES requirements.

The Thea Foss Post-Remediation Source Control Strategy implemented under the CD uses a multifaceted approach consisting of aggressive source control efforts, continuation of the comprehensive monitoring program, a computer model (used during the first ten years) to predict impacts, and a decision matrix to identify the need for additional source controls. This monitoring information was used to guide City decisions to control of contaminant sources in the drainage basins. The strategy intends to provide long-term protection of sediment quality in the waterways and to fulfill NPDES requirements. Implementation of the requirements of the CD remain in effect until CD performance standards in the waterway are met.

The City implements a comprehensive monitoring program to evaluate effectiveness of the City's source control efforts, and to provide early warning of any new problems which arise in the drainages. Monitoring includes annual baseflow, stormwater, and stormwater suspended particulate matter (SSPM) of the stormwater discharges from seven outfalls to the Thea Foss Waterway. After ten years of baseflow monitoring, monitoring was discontinued at the end of Water Year (WY)2011. Baseflow quantity and quality were determined to be well characterized by the 10-year monitoring record. Some additional baseflow monitoring was performed in WY2016, WY2019 and WY2024 to determine whether there had been changes in recent years.

The requirements of the monitoring program and the approach to the evaluation of results were originally outlined in the 2001 Sampling and Analysis Plan (SAP) for the Thea Foss and Wheeler-Osgood Waterways dated September 2001 (Tacoma 2001) and approved by EPA on September 13, 2001. A revised Thea Foss and Wheeler-Osgood Waterways Stormwater Monitoring Quality Assurance Project Plan (2023 QAPP) for monitoring was completed and approved by EPA and Ecology in December 2023.

This annual report outlines the City's existing programs accomplishments completed in WY2024, a status update on ongoing source control investigations, and the need for any new stormwater management actions. Annual source control evaluations are completed for each of the seven major outfalls discharging to the waterways. The evaluations include a drain-by-drain assessment incorporating the review of ongoing studies, source control investigations, water quality data, and SSPM data for that outfall/basin. A summary of this evaluation is included in Section 5.0 of this report.

Each annual report adds the current water year's data to the results from the prior years of outfall monitoring conducted under the City's comprehensive monitoring program for the Waterways. This report reviews results from 23 years (August 2001-September 2024) of outfall monitoring.

WY2024 STORMWATER QUALITY STATISTICAL ANALYSIS

Stormwater and stormwater sediments have been sampled at the seven major outfalls that discharge into the Thea Foss and Wheeler-Osgood Waterways since 2001. In addition, baseflow was sampled at the same seven outfalls for the first ten years of the program and confirmed with additional sampling in subsequent years. Over the last 23 years, 2,483 samples have been collected, with 370 baseflow and 1,588 stormwater samples collected at the outfalls, and 141 outfall and 384 upline SSPM samples collected in pipeline sediment traps deployed throughout the watershed. This long and rich data record provides the basis for meaningful statistical evaluation of the trends over the program period.

Stormwater Time Trend Analysis Forty-eight statistically significant time trends (48 out of 49 tests or approximately 98 percent of the tests) were shown in Year 23 using simple linear regression. All trends were in the direction of decreasing concentrations. This is the same number of trends and constituents with trends as were observed in recent years.

The time trends were modeled with best-fit regression equations to estimate percent reductions over the 23-year monitoring period for these constituents and outfalls:

- **Total Suspended Solids (TSS)**: Approximately 43-73 percent reduction all seven outfalls
- **Copper:** Approximately 25-41 percent reduction in OF235, OF237B, and OF245
- **Lead**: Approximately 69-85 percent reduction in all seven outfalls
- **Zinc**: Approximately 49-72 percent reduction in all seven outfalls
- **PAHs**: Approximately 56-90 percent in all outfalls with the exception of indeno(1,2,3-c,d)pyrene at OF237A
- **Di(2-ethylhexyl) phthalate or Bis(2-ethylhexyl) phthalate (DEHP)**: Approximately 46-80 percent reduction in all seven outfalls.

ONGOING EFFORTS TO IMPROVE STORWMATER QUALITY

The cumulative effect of municipal, state, and federal source control efforts has resulted in observed improvements in stormwater quality. The City has directed numerous source control efforts in this watershed focused on these COCs. Refer to Sections 2.0 and 5.0 for more detail regarding specific efforts.

The City implements aggressive source control activities that comply with or exceed the requirements of the Permit requirements. Many of these activities have been developed specifically to respond to sources of contaminants found during various investigations.

Stormwater Management Program The 2019 Permit, effective August 1, 2019, through July 31, 2024, required the City to implement a Stormwater Management Program (SWMP) which is divided into 11 components, including stormwater outfall sampling, stormwater planning, source control, maintenance, inspections, capital projects, and program development and implementation for the municipal separate storm sewer system (MS4). The City integrates these NPDES program elements with the ongoing Thea Foss Waterway Stormwater Monitoring program (Thea Foss Program). Ecology issued the most recent Permit on July 1, 2024, with an effective date of August 1, 2024, and an expiration date of July 31, 2029.

In 2024, City staff performed numerous field activities within the Foss Waterway Watershed, including the following:

- Responded to 213 spills/complaints including conducting investigations
- Provided technical assistance on source control and best management practices (BMPs)
- Conducted 233 business inspections and follow-ups

Enhanced Maintenance The City has conducted several special studies over time to better understand the distribution of DEHP and PAHs in the urban environment and how those and other COCs might best be controlled with enhanced maintenance. The following enhanced maintenance elements are currently being implemented in the City:

- Basin-wide sewer line cleaning program to remove residual sediments in the storm drains and sediment-bound contaminants. Currently, the City has implemented a 20-year cycle for cleaning of the storm system throughout the City as a part of routine maintenance. The City is continuing to evaluate the need to increase the frequency in this sensitive area.
- An enhanced street sweeping program has been implemented in an attempt to reduce sediment buildup in the storm sewer system. Under the enhanced program, the sweeping frequency was increased, air regenerative sweepers replaced mechanical sweepers, and the City has also increased communications with residents, which helped raise awareness of the importance of the street sweeping program.
- Finally, in industrial areas, the City is currently conducting a pilot program to evaluate the effectiveness of further increasing the frequency of street sweeping in the industrial areas around the Thea Foss Waterway in reducing the levels of metals in stormwater.

Results of statistical analyses using WY2024 data are included in Section 2.0 of this report.

THEA FOSS WATERWAY SEDIMENT QUALITY

The sediments in the waterway are the true barometer of whether additional source controls are needed for compliance with regulatory requirements. In the early 2000s, when the waterway sediment remediation projects were completed, the majority of the sediment surface had no, or very low, concentrations of contaminants present since the surface was either dredged to clean sediments or covered with new, clean capping materials. It was known that source contributions to the waterway would initially cause concentrations of contaminants above the remediation to increase. Over time, the goal is to ensure the sediment concentrations equilibrate at a level below the sediment cleanup standards set by the EPA. In December 2020, EPA determined that the City had fully performed the sediment remedial action in the Thea Foss and Wheeler-Osgood Waterways.

STATUS OF SOURCE CONTROL EFFORTS

Long term sediment monitoring will continue and was last performed by the City in 2023show results are generally consistent with, or better than, previous monitoring results indicating that the risk of wide-scale recontamination in the waterway remains low. At this time, it appears that waterway sediment concentrations have largely equilibrated with modern sources since the completion of the remedial action in 2006. As a result, the risk of recontamination is not expected to be substantially higher in the future unless there is a change in the nature, strength, or distribution of waterway sources. The next scheduled sediment monitoring event will occur in 2028.

The waterway sediments have reached equilibrium with modern sources at levels generally below EPA's required cleanup levels for the Superfund site, there is not currently a need to initiate new source control actions. Several source control investigations and actions are underway at this time and will be carried out to completion. The status of these activities is described in Sections 2.0 and 5.0 and Appendix A. In addition, if future monitoring identifies the potential of a new source that may be affecting sediment quality in the waterway, additional source control actions will be undertaken.

In addition, the City believes some minor additional improvements in stormwater quality may be realized in the future with ongoing Permit programs and continuing improvements in source control implementation. Sediment trap results are valuable in that they provide an early warning of potential stormwater sources to the waterway sediments that can be investigated and addressed before Sediment Quality Objective (SQO) exceedances requiring action are identified in the waterways.

2025 Source Control Work Plan A considerable amount of source control work has taken place in the Foss Waterway Watershed over the last 23 years. With the significant improvements realized, fewer source control issues remain and as described above, no new investigations are needed at this time. The Source Control Work Plan for 2025 is included in Section 6.0 of this report that identifies specific activities for the watershed and for each basin that are currently underway.

CONCLUSION

Through the City's implementation of its Permit required SWMP, as well as through the control of other sources, reduction of contaminant loads to the Thea Foss and Wheeler-Osgood Waterways over the years has been substantial. The improvement in stormwater quality since the mid-1990s indicates that the City's efforts (driven primarily by source control efforts) in the Foss Waterway Watershed have been effective in reducing chemical concentrations in stormwater. Tests performed over the entire project period show 98 percent statistically significant time trends, all in the direction of decreasing concentrations. This result is significant and a testament to the City's ongoing comprehensive source control program.

1.0 INTRODUCTION

Stormwater discharge monitoring in the Thea Foss Waterway Watershed is conducted to satisfy requirements under the Thea Foss Waterway Consent Decree (CD or Foss CD) with the Environmental Protection Agency (EPA) and Section S8.B of the Phase I National Pollutant Discharge Elimination System (NPDES) and State Waste Discharge General Permit for Discharges from Large and Medium Municipal Separate Storm Sewer Systems Phase I Permit (Permit) issued by the Washington State Department of Ecology (Ecology). The Thea Foss and Wheeler-Osgood Waterways are two connected narrow estuarine water bodies on the southeastern margin of Commencement Bay that receive stormwater discharges from 13 municipal outfalls as well as numerous private outfalls. The City of Tacoma's (City) stormwater discharge monitoring program that satisfies the CD and Permit includes year-round monitoring at seven outfalls draining to the Thea Foss Waterway and includes collection of three types of samples for chemical analysis; event-based composite stormwater, grab stormwater, and storm system suspended sediment samples.

This Thea Foss and Wheeler-Osgood Waterways: 2024 Source Control and WY2024 Stormwater Monitoring Report (WY2024 Report) describes both the prior year's findings and accomplishments and summarizes findings to date on this long-term monitoring program.

1.1 THEA FOSS CONSENT DECREE OVERVIEW AND MONITORING REQUIREMENTS

Under the CD with EPA dated May 9, 2003, the City completed remediation of marine sediments in the majority of the Thea Foss and Wheeler-Osgood Waterways in Tacoma, Washington in March 2006. Remediation of the southernmost 1,000 feet of the Thea Foss Waterway was completed in 2004 by a group of private utilities (Utilities) under a separate CD with EPA.

With the completion of the remedial actions in 2006 the Thea Foss and Wheeler-Osgood Waterways, the City was required by the CD to continue monitoring and source control activities to ensure sediment quality is protected in the dredged, capped, and natural recovery areas. The City and EPA initially defined the schedule and workplan for stormwater source control work in the CD's Statement of Work, a letter addendum dated November 1, 2001 (Stormwater Work Plan Addendum, Attachment 1 to the CD). Annually the City produces a report (this report) on the stormwater source control work completed in the Foss Waterway Watershed to protect the remedial actions, reduce contaminant discharges, and protect the marine sediments. This report also describes the next year's workplan and adaptations to best implement source control actions. Work plan actions include unique source trace monitoring, unique studies of importance, source control efforts, enforcement actions, and remediation of sources.

1.2 PHASE I PERMIT OVERVIEW AND MONITORING REQUIREMENTS

Phase 1 Permit Section S8 – Monitoring and Assessment includes two separate components with multiple compliance options for municipalities to meet stormwater discharge monitoring requirements. Ecology issued the most recent Permit on July 1, 2024, with an effective date of August 1, 2024, and an expiration date of July 31, 2029. The City is required by the Permit to select the monitoring option and the City chose, consistent with the prior Permit, to meet the obligations as outlined below:

- **S8.A Regional Status and Trends Monitoring –**The City selected the option to make the annual payments into the Stormwater Action Monitoring (SAM), a collective fund to implement regional small streams and marine nearshore areas in Puget Sound to satisfy S8.A.
- **S8.B Stormwater Management Program Effectiveness Monitoring and Source Identification Studies –** The City selected the option to conduct stormwater discharge monitoring per the requirements under S8.B, in accordance with the requirements outlined in S8.C.
- **S8.C Stormwater Discharge Monitoring –** By selecting this option under S8.B, the City is required to conduct stormwater discharge monitoring at five locations following an Ecology approved Quality Assurance Project Plan (QAPP) and report results annually with the Permit required annual report due in March each year. The City monitors the same five locations that were monitored under prior Permits and the Foss Consent Decree.

Ecology requires under S8.C.1 that the City submit data and a final report for the stormwater discharge monitoring that was conducted in the prior Permit period (August 1, 2019 – July 31, 2024). This report satisfies that requirement as it is a summary of the data for the final year of the prior year and a compilation of the stormwater monitoring program's result over time. Tables and Figures of findings include the prior year's data as well as all prior years for these outfalls.

Ecology requires an updated QAPP be submitted to Ecology by February 1, 2025, that is developed in accordance with Section S8.C and Appendix 9 of the Permit and provide details on the stormwater discharge monitoring program. The City provided an updated QAPP to Ecology on January 31, 2025, for review. Until the 2025 updated QAPP is approved, stormwater monitoring is still occurring under the existing QAPP approved under the 2019-2024 Permit approved by EPA and Ecology in December 2023 and was in effect for the WY2024 monitoring discussed in this Report (Tacoma 2023).

1.3 GOALS AND OBJECTIVES

The goal of the stormwater characterization monitoring is to meet the requirements of the Foss CD and the Phase I Permit. The goals of both programs generally involve:

- Measuring the effectiveness of stormwater source control actions, confirming that reductions in concentrations of target analytes have been realized, and confirming that recontamination from stormwater sources is not occurring. This is achieved by gathering data to identify trends in the quality of the stormwater.
- Providing an early indication of any new water or sediment quality problems associated with the storm system.
- Informing decision-making regarding additional source controls.
- Tracing sources of contamination to outfalls using sediment traps.

The objectives are accomplished through performance of the following:

- Provide Ecology and EPA with data characterizing the quality of the stormwater and sediments discharging into the Thea Foss and Wheeler-Osgood Waterways.

- Collect and submit for analysis representative composite and grab stormwater samples during stormflow events from all seven outfalls.
- Collect and submit for analysis representative annual sediment samples at specified locations.
- Produce an annual report documenting activities associated with the sampling and analysis effort, a quality assurance review of field and laboratory data, and an evaluation data relative to continuing source control efforts and report to Ecology and EPA.

1.4 BACKGROUND

1.4.1 Remedial Action Description

In 2006, the City completed remediation of marine sediments in the Thea Foss and Wheeler-Osgood Waterways. The remedy for the waterway included a combination of natural recovery, dredging, and capping. The dredged material was disposed of in a nearshore confined disposal facility in the nearby St. Paul Waterway.

In general, the remedy included the following elements:

- No action at the mouth of the waterway, an area of clean sediments.
- Natural recovery north of East 11th Street, an area where low-level contamination was expected to recover to below the sediment quality objectives (SQOs) within the first 10 years following remediation, and which is currently below required navigational depths.
- Some combination of dredging (complete or partial) followed by capping over any residual contaminated sediment in the area from the East 11th Street Bridge to just north of the State Route (SR) 509 Bridge. Note that the authorized channel depth requirements are generally maintained in this area.
- Capping (by others, referred to herein as the Utilities) from just north of the SR509 Bridge to the head of the waterway to maintain a depth of 10 feet Mean Lower Low Water (MLLW). Deauthorization of the federal navigation channel in this area was required to eliminate the need to maintain authorized channel depths and was approved as part of the Water Resources Development Act (WRDA) Bill of 2007.

Other remedy features included:

- Construction of intertidal habitat as mitigation for construction impacts
- Dredging to maintain authorized depths in the active navigation channel
- Capping of about 20 acres of sediments in channel and harbor areas
- New slopes and erosion protection on about 10,000 feet of shoreline

In December 2019, EPA determined that the remedial actions the City was required to perform under the Consent Decree with EPA had been officially completed and EPA initiated the process to delist the waterway from the Commencement Bay Superfund Site. Even if this site is delisted, long-term monitoring and maintenance work for containment and mitigation areas will continue under the Long-Term Monitoring Plan as the only remaining work under the Consent Decree.

1.4.2 Representativeness of WY2024 Laboratory Analyses

The WY2024 laboratory quality assurance/quality control (QA/QC) review included 74 stormwater samples and 15 SSPM samples; detection limit performance samples; laboratory and field blanks; laboratory, matrix, and field duplicates; spiked surrogates; laboratory control and matrix samples; and certified reference materials (CRM). Overall, 12,684 sample and QA/QC results were analyzed in WY2024. Data was reviewed, verified, and validated using a Tier II data review level or higher.

This type of analysis is helpful in identifying issues to be addressed when the majority of data quality is acceptable yet may still be improved. In WY2024, 97 percent of stormwater and baseflow and 94 percent of SSPM data met measurement quality objectives. Only 0.5 percent of the data was classified as censored or rejected. Stormwater and SSPM samples are therefore considered representative. This review is provided in Appendix B.

1.4.3 Drainage Basin Description

The Thea Foss and Wheeler-Osgood Waterways are estuarine waterways on the southeastern margin of Commencement Bay. In Commencement Bay and the waterways, average tidal fluctuations vary from 0 feet MLLW to 11 feet MLLW. Extreme tides, which generally occur in June and December, range from approximately –4.0 feet MLLW to 14.5 feet MLLW. The Thea Foss Waterway lies generally north-south along the City's downtown corridor. The Wheeler-Osgood Waterway lies west-east and connects to the east side of the Thea Foss Waterway just south of the Murray Morgan (11th Street) Bridge. The Thea Foss and Wheeler-Osgood Waterways are commonly referred to as the Thea Foss or Foss Waterway and are referred to herein as the Foss Waterway.

The Foss Waterway watershed is one of nine watersheds in the City (see Figure 1-2). This watershed covers approximately 5,864 acres and is comprised of drainage basins located in the south-central portion of Tacoma. The area borders the North Tacoma Watershed on the north, Lawrence Street on the west, and East "F" to East "K" Streets on the east. The area extends as far south as South 86th Street and includes portions of the Tideflats on the east side of the Foss Waterway.

The primary municipal outfalls to the Foss Waterway monitored under the Thea Foss Waterway Stormwater Monitoring program (Thea Foss Program) are OF237A and OF237B (the twin 96ers), OF230A, OF235, OF243, OF245, and OF254. These seven outfalls covered 5,750 acres (98 percent) of the watershed. There are also several other smaller outfalls that discharge to the waterway. Construction of OF230A was completed in December 2002 and 98 percent of the flow from OF230 was transferred to OF230A as well as approximately 26 percent of the stormwater previously discharging to OF235. The City has actually monitored eight outfalls for this unique period of time from water years WY2023-WY2024 to capture the transition from 230 to 230A. Beginning in WY2025, OF230 is only monitored for sediment.

Primary land uses in the basins draining to each of the major outfalls and the changes with this new outfall configuration are reflected in the table below.

Outfall	Historic Area (Ac)	Current Area (Ac)	Land Use
230	558	24.2	Commercial
230A	-	583	Residential and Commercial
235	166	109	Commercial
237A	2,813	2813	Residential and Commercial
237B	1979	1,979	Residential and Commercial
243	59	59	Industrial and Commercial
245	39	39	Industrial
254	127	127	Industrial

Overall, land use in the watershed is predominately residential and commercial business, with much of downtown Tacoma included (see Figure 1-3). There are some industrial uses, which are concentrated mainly in the eastern Tideflats areas and Nalley Valley portions of the watershed.

The City is evaluating the existing flow data at all three monitoring locations and will evaluate sampling data from the OF230A monitoring location as it becomes available. This data will be used to: 1) determine changes in flow/chemistry in the existing OF235, 2) establish flow/chemistry metrics at the new outfall (OF230A), and 3) evaluate data to assess if past conditions are representative of the newly changed conditions.

Any changes to the statistical analysis, rainfall to runoff relationships and flow regime changes will be discussed in the City's annual report update. Additional details describing the drainage area changes and the new OF230A drainage area details are discussed in Appendix B, Section B.2.2 Monitoring Locations.

Several of the outfalls discharging to Foss Waterway are tidally influenced, meaning portions of the pipe are inundated with marine water twice a day depending on the pipe elevations and the tide height. Continuous or tidal baseflow is also present in some of the outfalls. Baseflow in OF230A, OF235, OF237A, and OF237B is continuous. In OF237A and OF237B, this baseflow is derived from old creeks and seeps that were piped and/or infiltrating groundwater. In OF230A and OF235, this baseflow consists of groundwater and/or noncontact cooling water. Baseflow in eastside outfalls OF243, OF245, and OF254 is seasonal (i.e., higher in the winter and lower in the summer) and is believed to be due to groundwater infiltration due to the high-water tables in the Tideflats area.

Since 2001, the City has performed a significant amount of sampling and analysis of the storm drains entering the Foss Waterway. Over the last 23 years, 2,483 samples have been collected, with 370 baseflow and 1,588 stormwater samples collected at the outfalls, and 141 outfall and 384 upline SSPM samples. The purpose of the sampling efforts is to evaluate the quality of stormwater discharges to the Foss Waterway and the effect of those discharges on sediment quality. From 2001 to 2005, the results of these efforts were used in an overall evaluation of source loadings to the waterway to predict whether municipal stormwater discharges would be protective of sediment quality following remedial clean up actions. EPA determined that sufficient source control was in place to complete the remedial action work in 2006. Since then, results of stormwater monitoring are used to evaluate the effectiveness of source control efforts, and to provide early warning of any new problems which may arise in the drainages. In addition, the City uses the results stormwater quality to document the improvements that have been realized over time due to source control, BMP, line cleaning, and other stormwater program efforts.

1.4.4 Contaminants of Concern

Contaminants of Concern (COCs) are those contaminants that were defined through sediment monitoring and model predictions to have the greatest potential to compromise sediment quality in the waterways following remediation in the Foss Waterway. They were, therefore, the primary target for source control activities for the municipal storm drains as well as for other potential sources that are largely not in the City's control. DEHP and various PAHs are the primary COCs for the Foss Waterway CD and have therefore been the primary focus of source control activities to date. In addition, residual concentrations of other legacy COCs for which sources have largely been controlled through regulatory bans or restrictions are continuing to be monitored. These legacy COCs include mercury and polychlorinated biphenyls (PCBs). Source control activities have also been conducted for these COCs.

1.5 THEA FOSS POST-REMEDIATION SOURCE CONTROL STRATEGY

For ongoing evaluation of the municipal stormwater discharges and their relation to future sediment conditions in the waterway, the City established a source control strategy. This strategy is set forth in Figure 1-1.

The City is continuing to implement a comprehensive stormwater monitoring program in the Foss Waterway Watershed. The results of these efforts have been used over time to focus source control efforts and to assess the source control program's effectiveness. The various components of the post-remediation source control strategy are described in more detail throughout this report.

The City is committed to an ongoing program of stormwater source control to maintain and enhance stormwater quality in the Foss Waterway Watershed. The City will implement all "reasonable and practicable" controls necessary to improve stormwater quality and comply with regulatory standards. "Reasonable and practicable" shall take into consideration maintenance requirements, flood control, and cost in comparison to the effectiveness achieved or expected in reducing contaminant loads to the Foss Waterway.

The remainder of this report is as follows:

- Section 2.0 provides a summary of the source control activities performed during 2024 in the Foss Waterway Watershed.
- Section 3.0 presents the results of the Water Year 2001-2024 stormwater and storm sediment monitoring.
- Section 4.0 presents the results of the Foss Waterway sediment monitoring.
- Section 5.0 provides an update on the evaluation of program effectiveness of the Thea Foss Source Control Strategy.
- Section 6.0 presents a summary of the conclusions, pollutant loading analysis, and recommendations.

2.0 SUMMARY OF SOURCE CONTROL ACTIVITIES

The Permit requires the City to develop and implement source control as part of their SWMP. While the City has implements source control activities citywide, additional efforts have been made to implement this Permit program element with the ongoing Thea Foss Program to protect the sediment remedy in place in the waterway.

Each year this report is used to describe the source control activities performed in the prior water year, for 2024 these are summarized in Section 2.1, and state the intended future water year's actions in the section called Source Control Work Plan. This work is done to meet the source control intent of the CD, the City's SWMP, and adapt as necessary to protect water and sediment quality in the waterways. Section 2.2 discusses overall requirements of the Permit, and finally, Section 2.3 presents a summary of the special studies that have been conducted under the Thea Foss Program relevant to source control within the Foss Waterway Watershed.

2.1 SOURCE CONTROL ACTIVITIES COMPLETED IN WY2024

This section provides a summary of source control activities performed in 2024 in the Foss Waterway Watershed. These activities are further detailed in Appendix A, and where relevant, in the specific outfall work plan sections.

Results from WY2024 sediment trap monitoring used in source control investigations is described below in Section 2.1.1 and a status update on source control activities performed under the 2024 Source Control Work Plan is provided in Section 2.2.2.

2.1.1 Stormwater Suspended Particulate Matter (SSPM) Monitoring

SSPM monitoring is used to characterize the concentrations in the solids fraction of stormwater and is used to track down and identify upstream problem areas in sub-drainage systems. Multi-year sampling is used to confirm an ongoing problem area or to confirm control/resolution of an issue. Between WY2002 and WY2024, upstream monitoring has been performed in most of the Foss drainage basins. Table 2-1 lists the upstream monitoring locations as well as the end of pipe sediment trap locations for each of these years.

The drainage basins and SSPM data are shown graphically in Figures 2-1.1 through 2-1.4 for four COCs (i.e., mercury, total PAHs, total phthalates, and total PCBs). These figures show each outfall and upline sediment trap locations and the relative level of concentrations. The levels of concentrations are color-coded as low, medium, and high concentration ranges with each additional year stacked on the previous year. These levels are set without regulatory basis, but rather were set at the beginning of the sampling program at concentrations based on the data collected to allow for meaningful comparison between monitoring locations and identify areas that were different from others, requiring follow up action.

Low concentration ranges (green) represent concentrations that are similar to other locations with no need for additional source control efforts currently. Medium concentration ranges (yellow) represent concentration levels that are slightly higher than other locations. For locations with medium levels, additional source control actions were initiated in some areas but were at a lower priority in comparison to other locations with higher levels that were determined to be of greater impact. High concentration ranges (red) represent concentration levels above and beyond other locations in the Foss Waterway Watershed, and the need for additional source control was greater in comparison to other locations.

In WY2024, SSPM data for the most part remained similar to prior year's results. However, a few locations increased and a few decreased in concentration as summarized below:

- **Mercury**: Consistent with the past several years, no locations were measured in the high-level range during this monitoring year. One location, FD-6 (OF235), was in the moderate range in WY2024 (see Figure 2-1.1). Other locations with current or recent concentrations in the moderate range are described further below:
    - At FD3A/FD3C (OF230A), concentrations were in the low range since WY2015. The WY2021 concentration was 0.232 mg/kg, just above the 0.20 mg/kg level that was established to evaluate relative concentrations on Figure 2-1.1. No sample was obtained in WY2022 due to ongoing construction activities in the area. The WY2023 results were 0.3550 mg/kg. Due to these moderate concentrations, the City conducted a source tracing investigation in 2024 (Appendix A. Section A.2.2.1). Samples collected during the investigation indicated a continued source of mercury in this basin. The WY2024 the sediment trap sample for the FD3C basin showed a significant decrease in mercury concentrations, exhibiting medium concentrations in WY2023 to low concentrations in WY2024. This location will continue to be monitored to determine whether these moderate level detections resolve and during 2025 staff will investigate the source of elevated mercury concentration in the catch basins sampled during 2024.
    - At MH390 (OF245), concentrations were in the low range since the beginning of the monitoring period in WY2002. The WY2022 concentration of 0.211 mg/kg was just above the 0.20 mg/kg level established to evaluate relative concentrations on Figure 2-1.1. In WY2023 and WY2024, mercury concentrations were back in the low range at 0.0683 mg/kg and 0.1260 mg/kg, respectively. WY2025 sediment trap results will be reviewed to confirm the WY2022 result was an anomaly.
    - At location FD23 (OF243), levels were consistently in the moderate range between WY2007 and WY2022. Concentrations during this period ranged from 0.206 mg/kg to 0.661 mg/kg. No analysis was performed at this location in WY2023 due to low sample volume. Considerable source control activities for mercury were performed in this basin during this timeframe and potential sources removed. The WY2024 results were in the low range for the first time in the monitoring record at 0.1780 mg/kg. Staff will continue to review sediment trap results to determine if there is an ongoing issue. No additional investigations are planned in WY2025.

- **PAHs**: Since 2021, there have been no locations with PAH concentration above the level established for medium or high-level relative concentrations as shown on Figure 2-1.2. Until 2021, PAH concentrations in sediment trap FD13B New (OF237A) had fluctuated between the medium and the high range since it was installed in WY2013. The WY2021 concentration of total PAHs detected at this location dropped to the low range with a concentration of 159,944 µg/kg, down from a concentration of 282,110 µg/kg detected in WY2020. Levels reduced further in WY2022 with a measured concentration of 142,919 µg/kg, and in WY2023 with a concentration of 58,296 µg/kg. WY2024 concentrations remained relatively low at 83,470 µg/kg. A source control investigation was initiated in this area in WY2014 and continued as additional sources were identified and at this time there are no active investigations for PAHs in this basin.

The City will continue to monitor sediment trap results in FD13B-new to determine if there are any additional sources of PAHs in this drainage area. Additional discussion of this work is included in Section 5.3.

- **Total Phthalates**: All sediment trap concentrations have been in the low range since WY2014 (see Figure 2-1.3).
- **Total PCBs**: One location, FD3A/FD3C (OF230A) was in the high-level range during WY2024 sampling (see Figure 2-1.4). Locations with current or recent concentrations in the moderate range are described further below:
    - Concentrations at FD3A/FD3C (OF230A) have been in the high-level range since WY2013. Detected concentrations between WY2017 and WY2021 ranged from 550 µg/kg to 3,600 µg/kg. No sample was obtained from FD3A in WY2022 due to ongoing construction activities. The sediment trap was installed at a slightly different location in March 2023, and sample collected in August 2023 had a high-level PCB concentration of 485 µg/kg. The WY2024 sediment trap results exhibited an increased concentration of 1380 µg/kg. A source control investigation has been underway in this area for the last several years. Several sources have been identified and some are in the process of being removed. The City is continuing to work with the property owners and regulatory agencies to complete source control actions at these properties (see Section 5.1 and Appendix A Section A.2.2.1).
    - Concentrations in FD16 (OF230A) fluctuated between low and medium levels from WY2007 to WY2021. The WY2022 concentration of 663 µg/kg was more than double the WY2021 concentration of 170 µg/kg. A source control investigation was conducted in this area between 2017 and 2019, leading to the cleaning of public and private storm systems in the vicinity. With the increasing concentrations in WY2022, additional source control actions were initiated in 2023 and PCBs were not detected in the sediment trap at this location in WY2023 or WY2024. See Section 5.1.
    - FD10C (OF237A) concentrations fluctuated between medium and high levels from WY2013 to WY2022, ranging from 130 µg/kg to 1300 µg/kg. WY2022 concentration of 165 µg/kg was the third year of a decreasing trend at this location following source control efforts, and PCBs were not detected at this location in WY2023 or WY2024. The source control investigation for this basin has been completed and sediment trap data will continue to be reviewed and additional investigations will be conducted if concentrations increase. Additional information can be found in Section 5.3.
    - FD18 (OF230A) concentrations varied between moderate and high concentrations since WY2011. The lines were cleaned in 2015 and a source control investigation was conducted and identified a source which was removed in WY2020. The WY2021 concentration dropped to 780 µg/kg, a significant drop, but still in the high range. WY2022 results dropped further to a moderate level concentration of 225 µg/kg, and PCBs were not detected at this location in WY2023 or WY2024. There are no further investigations planned for this basin. The outfall sediment trap data will continue to be reviewed and additional investigations will be conducted if concentrations increase. (see Section 5.1).

- WY2020 concentrations in FD2 (OF237A) were measured in the medium range (390 µg/kg) for the first time since WY2015. In WY2021, results decreased to 180 µg/kg, still in the medium range. PCBs were not detected in FD2 in WY2022, WY2023 or WY2024.There is no known cause for the intermittent increases in concentration.
- Concentrations at FD3-New (OF230A) were at medium levels between WY2015 and WY2017 but were not detected at this location in WY2018. In WY2019, concentrations returned to medium levels (350 µg/kg) and in WY2020, more than doubled to an elevated level of 910 µg/kg. In WY2021, concentrations returned once again to medium levels at 300 µg/kg, in WY2022 were at the low-level concentration of 64 µg/kg and were not detected in WY2023 or WY2024. FD3-New previously had relatively high levels measured between WY2004 and WY2007, but those decreased to low levels between WY2008 and WY2013 following cleaning of the lines in the drainage basin. The lines were cleaned again in early 2015.
- Due to rerouting of the drainage area for the new OF230A, the FD3-New Sediment trap no longer receives discharges from the FD18, FD3A/FD3C, and FD16 drainage areas. These areas discharge to the new OF230A and the new FD7 sediment trap. The WY2024 results for FD7 were non-detect for PCBs and in the lower concentrations range for mercury, PAHs, and phthalates.

Over the 23-year monitoring period, the number of sites with concentrations at the medium and high levels has decreased significantly. This is a good indicator of the effectiveness of the source control program. A few sediment traps results show medium and high-level fluctuation as compared to the other sites in the Foss Waterway Watershed and are therefore still have ongoing source control work.

Detailed data results by basin are discussed in Section 5.0 of this report. The City will continue to conduct SSPM monitoring using sediment traps at the outfalls and at selected upstream locations in several drainage basins where needed for ongoing source control investigations.

2.1.2 2024 Source Control Work Plan

Tacoma submitted the 2023 Stormwater Source Control Report and Water Year 2023 Stormwater Monitoring Report on March 31, 2024 (Tacoma 2024). In this report, the City recommended several source control activities in the 2024 Source Control Work Plan (referred to herein as the 2024 Work Plan). A majority of the recommended tasks from the 2024 Work Plan were completed or are ongoing at this time. Detailed descriptions of current investigations are included in Appendix A. Activities from the 2024 Work Plan and their status are as follows:

- **OF230A:** Continue follow-up on private property cleanups performed, and complete ongoing system cleaning and monitoring for PCBs and PAHs as appropriate in the areas draining to FD3A/FD3C

  Status: Significant work has been underway in this area since 2012, and several Mercury, PCB, phthalate, and PAH sources have been identified and controlled. Several areas of concern have been the subject of ongoing work:

  - <u>South 12th Street and Pacific Avenue (PCBs)</u>: Due to construction in the area, the FD3A sediment trap was removed in WY2022 and has been permanently replaced with the FD3C sediment trap. While FD3C is in a slightly upstream location, it is considered representative of the same drainage area as FD3A. Despite a significant decrease, WY2021 sediment trap results for FD3A had continued to show elevated PCB concentrations (550 µg/kg). Source control actions are continuing in this area and additional catch basin sampling performed in the area indicated either a continued source, or insufficient cleaning performed post source control actions previously performed. The City cleaned the catch basins in this area at the end of 2022. After insufficient sediments for sampling were noted in 2023, City staff were able to sample most of the catch basins surrounding the Wells Fargo complex and 1123 Pacific Avenue in 2024. All collected samples were non-detect for PCBs indicating that the remediation efforts at these locations were successful. Two catch basins did not have sufficient sediment for sample collected. These locations will be targeted for sampling in 2025.

- South 9th Street and Fawcett Avenue (PCBs): Following completion of building remediation in 2020, the storm system was cleaned. In September 2021, sediment samples were taken from adjacent catch basins, and elevated PCB concentrations were detected. At the City's request, the property owner pressure washed the sidewalks to remove residual materials. In 2022, a construction project began at this location, which involved the removal and replacement of all of the curb/gutter and sidewalk at this intersection. The project also removed one of the catch basins sampled during this investigation. Sediment trap PCB concentrations in FD18 have continued to decrease since remediation work was completed in 2020. PCB concentrations dropped to from high to medium levels for the first time since 2017 in this basin and were below detection limits in the WY2023 and WY2024 FD18 sediment trap samples (see Figure 2-1.4). There are no further investigations planned for this basin at this time. Sediment trap data will continue to be reviewed and additional investigations will be conducted if concentrations increase.
- South 13th Street and Commerce Street (PCBs): The catch basins were cleaned and resampled during 2024. One catch basin sample contained a PCB concentration of 4,380 µg/kg. Based on these results follow-up sampling was completed on suspected PCB-containing caulking on the sidewalk to the north of this catch basin. Sample concentrations ranged from non-detect to 16,100 µg/kg. The catch basin with the elevated concentration will be placed on a yearly maintenance schedule for cleaning. In addition, the City's Department responsible for sidewalk maintenance has been notified of the PCB issue and will take appropriate measures if replacement or repair of these sidewalks occur.
- South 10th Street and Pacific Avenue (PCBs): The City is continuing to work with the EPA to develop a remediation plan for the Park Plaza North parking structure. The City made progress during 2024 towards remediation of this site. The City has hired a consultant to develop a cleanup action plan in coordination with EPA. Once the cleanup action plan is completed (anticipated 2025), the City will move to remediate this site.

- South 14th Street and “A” Street (PAHs): Throughout 2022, the City continued to work with the property owner to fix a damaged drainage pipe that was allowing sediments to enter the system. The property owner obtained a permit from Ecology in 2022 and the repair was completed in October 2022. Both the municipal and private systems were cleaned in November 2022. Public catch basins were targeted for sampling in 2024, however no samples were collected due to insufficient sediment accumulation. These basins will be sampled in 2025 is sufficient sediment is present for sampling.

- **OF230A/OF235:** Continue to evaluate potential sources of spring/summer outliers for copper to stormwater.

  Status: Figure F-5 shows four moderate copper outliers detected in OF230/230A (WY2017-2019) and six moderate outliers in OF235 (WY2011, 2012, 2015, 2017, 2018, 2024) for the 23-year data set. All the outliers were detected in May - October. Figure G-5, the year by year comparison, shows five moderate outliers detected in OF230/230A (WY2015, 2017, WY2019, and WY2021-22) and multiple moderate outliers in OF235 throughout the monitoring period, including two extreme outliers in WY2015 and WY2021). The City will continue to watch for these outliers and is investigating potential sources. One potential source was identified as discussed in Appendix A.

  The City worked with the property manager at the Union Station to clean their private drainage system and will resample these catch basins when sufficient sediment has accumulated.

- **OF235:** Evaluate the need for additional source control work for lead, copper, and DEHP in stormwater following completion of construction activities in this area. These construction activities are expected to have a positive impact on controlling the flow of potentially contaminated groundwater into the storm drainage system.

  Status: The referenced construction project in this basin is called the Tacoma Town Center Project and is located between Jefferson Avenue South and Tacoma Avenue South at 21st Street. While construction on this site began in 2018, the develop of the proposed Tacoma Town Center project has not been completed and the property is currently in foreclosure. Stormwater discharge for this construction project is currently managed under a construction stormwater general permit through the Department of Ecology. The permit for Tacoma Town Center (#WAR306067) is currently active and is set to expire on December 31, 2025, (Paris - Facility Summary). Through 2024, the City monitored the site in this area to ensure proper BMPs were maintained. Upon project completion, it will be determined whether construction in this area will eliminate runoff from possible contaminated groundwater in this drainage basin. This project was on hold until the new Thea Foss Waterway outfall was constructed in 2022. The property is currently for sale and the City will continue to ensure the on-site stormwater pond is functioning as designed.

- **FD13B-New:** Evaluate whether source control work done to date in this area has been successful in eliminating this source.

  Status: This investigation has been ongoing for several years, with medium range PAH concentrations present in FD13B-New through WY2020, before dropping to the low range in WY2021 where they remained in WY2022. In 2021, staff discovered an additional property that has stormwater discharge to this system. Catch basins from that property showed high concentrations of PAHs, and the property owner was asked to clean their entire system. In 2023, EC staff received confirmation that all parking lot repairs were completed, and that the private stormwater system had been cleaned post-construction. WY2023 and WY2024 Sediment trap results exhibited a significant decrease in PAH concentrations with a concentration of 58,330 µg/kg and 83,470 µg/kg, respectively which is significantly lower than what is classified as relative low levels of contamination (<164,000 µg/kg) (see Figure 2-1.2). Based on these results, no investigations are planned in this basin for 2025. The City will continue to monitor the sediment trap results for one additional year to determine if there are any additional sources of PAHs in this drainage area.

- **OF237A:** Monitor upcoming SSPM results for PCBs to FD10C.

  Status: During 2021, additional sampling showed no apparent sources of PCBs. In 2022, an additional investigation was performed to confirm that there were no errors in the mapping that might lead to identification of a potential source. With that mapping information confirmed, the City continued the investigation with installation of short-term sediment traps at two new locations in attempt to isolate the source. Results from these short-term traps exhibited non-detectable levels of PCBs. Additionally, the FD10C sediment trap had non-detectable levels of PCBs for WY2023 and WY2024. It is possible that the source of PCBs was historical contamination, and the system cleaning removed this contamination. No investigations are planned in this basin for 2025. The City will continue to monitor the sediment trap results for one additional year to determine if there are any additional sources of PCBs in this drainage area.

- **OF237A:** Evaluate potential sources and seasonality of occasional outliers of indeno(1,2,3-cd)pyrene and other PAHs in stormwater.

  Status: Periodic high outlier concentrations of indeno(1,2,3-cd)pyrene have been detected in this basin over time (see Figure G-6). Overall concentrations are significantly reduced over concentrations identified early in the 23-year monitoring record. However, because of these occasional elevated concentrations, the City will initiate review of potential unidentified sources of indeno(1,2,3-c,d)pyrene and other PAHs in this drainage basin.

- **OF243:** Perform follow-up work with the business owner and system cleaning work in the area where elevated mercury concentrations were identified in catch basins in the FD23 drainage area.

  Status: Staff resampled the identified catch basin with elevated concentrations of mercury to determine if there is an ongoing mercury issue at that location. The catch basin was sampled on June 21, 2022, and the results were 1.38 mg/kg. Based on prior investigations, there are no other probable sources to investigate in this drainage basin. During 2024, EC staff requested to have the catch basin re-cleaned and attempted sediment accumulates to determine if there is a continued source or residual contamination from the previously remediated source. EC Staff attempted to work with the business leasing the property to ensure the private stormwater system at this location is cleaned and maintained. Due to a lack of response from this business the request for cleaning was elevated to the property owner. WY2023 had insufficient sediment to analyze for mercury in the sediment trap. WY2024 sediment trap results were in the low range for mercury the first time in the monitoring record.

- **OF243/OF245/OF254:** Continue evaluation of the effectiveness of the street sweeping pilot project on lead and zinc concentrations in the industrial area as additional data becomes available.

  Status: The City initiated a pilot program in WY2014 that continued through WY2024 to determine whether an increased frequency of street sweeping in this area would influence elevated lead and zinc concentrations in stormwater and baseflow in this area. Starting on October 1, 2013, the City began sweeping the right-of-way (ROW) within the OF243 and OF245 drainage basins at a frequency of once every two weeks rather than the usual frequency of once per month for industrial areas. An evaluation of the effectiveness of this increased sweeping frequency on metals reductions has been performed since WY2017 and is discussed in more detail in Section 2.3.2. Due to the effectiveness of the program, the OF254 drainage basin was swept at the increased frequency beginning in 2019. Note that while initial results appear promising, the statistical analysis will be more robust in future monitoring years as more data becomes available. The pilot project is continuing in WY2025.

Other tasks conducted under the Source Control Program are:

- Continue Foss Stormwater Monitoring for WY2024.

  Status: WY2024 stormwater monitoring was completed on September 30, 2024, and WY2025 stormwater monitoring is currently underway.

- Review WY2024 SSPM data in all areas when available to evaluate the effectiveness of treatment systems installed and confirm the effectiveness of source control actions that have been taken over time.

  Status: Data review completed. An evaluation of these results is included in Sections 3.0 and 5.0 and summarized above. Generally, stormwater facilities are inspected once per year and maintenance performed as indicated by inspection results. The City has a twenty-year cleaning cycle for drainage systems throughout the City. Determination of whether a more frequent maintenance schedule is needed in the Foss Basins will continue to be statistically evaluated as additional data become available.

- Monitor the major construction activities throughout the watershed including the Washington State Department of Transportation (WSDOT) Nalley Valley Viaduct/SR-16 rebuild.

  Status: Ongoing. Major construction projects occurring in each basin are discussed in Section 5.0 as applicable.

- Monitor and conduct inspections at new developments as completed to review appropriate BMPs for each site.

  Status: Inspections at new developments continue, including the inspection/approval of new BMP treatment devices.

- Implement the City's Stormwater Management Manual, 2021 Edition.

  Status: The 2021 Stormwater Management Manual is currently being implemented for projects with applications submitted on or after July 1, 2021.

- Continue NPDES business inspections program and document the inspections using the business inspections database. Respond and track all complaints/spills in the complaints database.

  Status: Business inspections and spill/complaint response is continuing, and activities are tracked in the database. A summary is provided in Appendix A.

- Monitor Tacoma-Pierce County Health Department (TPCHD) and Ecology underground storage tank/leaking underground storage tank (UST/LUST) removal projects along with any other remediation projects in the watershed.

  Status: Ongoing. A summary of UST/LUST work performed under TPCHD oversight in 2024 is included in Appendix A.

2.2 City of Tacoma Phase I Municipal Stormwater Permit

The Permit regulates the discharge of stormwater to surface waters and groundwaters of the state from the City's MS4. The Permit is designed to protect and improve the water quality of receiving waters by implementing stormwater management activities. Tacoma's SWMP describes the City of Tacoma's plan for meeting goals and managing stormwater in compliance with the Permit.

The Permit includes a requirement that a new Stormwater QAPP be developed for this sampling program. Data reported in this monitoring report was performed in compliance with the 2020 QAPP and the updated 2023 QAPP developed under the 2019-2024 Permit.

The City's SWMP progress are summarized in an NPDES Annual Report. The NPDES Annual Report is used as a tool to assess the City's progress and to determine whether any changes to the SWMP procedures or priorities are needed to fulfill the Permit obligations. The SWMP is evaluated annually, and updated, when necessary, based on the annual report and program assessment.

2.2.1 City of Tacoma Stormwater Management Program

The City's has pioneered source tracing via stormwater and storm sediment testing to identify pollutants in stormwater runoff since 1980. The CD and stormwater workplan required the City to conduct investigations and source control enforcement, sample analysis, and develop novel approaches to reduce stormwater pollutants like phthalates and PAHs where treatment standards do not exist in stormwater manuals. The Tacoma City Council and Tacoma's Surface Water Utility ratepayers have supported substantial rate increases in recognition of the importance of protecting and enhancing the water quality in Commencement Bay. Beyond clean up goals, they also recognize that our work on stormwater is critical to protect and restore our freshwater lakes, wetlands, and streams in the face of increasing stormwater runoff and pollutant loads from urban development, increased traffic, and population pressure.

The City’s established goals further emphasize its commitment to meeting the water quality goals under the Permit. These priorities include the following:

- Manage stormwater to minimize flooding, erosion, and contamination
- Mitigate the impacts of increased runoff from urbanization
- Manage runoff from developed properties and those under development
- Protect the health, safety, and welfare of the public
- Correct or mitigate existing water quality problems
- Restore and maintain the chemical, physical, and biological integrity of waters in the City for the protection of beneficial uses
- Develop and put into place a cost-effective, affordable SWMP
- Educate the public about what they can do to help keep our waters clean

Several different sections of Tacoma’s Environmental Services Department administer the City’s SWMP: Science and Engineering Division, Operations and Maintenance Division, Asset Management Division, and Environmental Compliance. Staffing and budget are designed to meet the program goals and challenges described above. Current work includes:

- Inspecting business activities and educating businesses about BMPs to reduce stormwater impacts
- Collecting and evaluating stormwater and sediment quality monitoring data
- Implementing a source control and illicit discharge screening program throughout the City’s nine watersheds
- Mapping, maintaining, and cleaning the City’s stormwater system that includes approximately 500 miles of storm pipe, 10,000 manholes, 19,000 catch basins, 450 outfalls, four pump stations, and over 130 stormwater ponds and other treatment and flow control facilities
- Managing the City’s tree canopy cover and open spaces to maximize stormwater benefits
- Rehabilitating and replacing aging infrastructure and improving the storm system with capital projects to address identified flow control and water quantity issues; infrastructure assessment of areas in need of attention is done using crawler cameras
- Providing public education about the impacts of polluted runoff and practices to reduce those impacts to create behavior change in target audiences ranging from school-age children and homeowners to property managers and builders
- Coordinating our activities regionally through watershed councils, MS4 Permittee committees, and others
- Permitting and inspecting new and redevelopment construction projects to help them comply with stormwater requirements including erosion control, maximizing onsite management, use of Local Improvement Districts, stormwater treatment, flow control, wetlands protection, and ongoing maintenance

- Provide staff training to ensure the City activities and operations minimize impacts to stormwater and receiving waters

City-wide activities are expected to benefit the quantity and quality of stormwater discharges to the Foss Waterway as well as discharges to other receiving waters throughout the City. The SWMP is updated based on the annual report and program assessment that will continue to supplement and enhance the City's existing program activities.

2.2.2 2024 Business Inspections/Spills/Complaints

The City began conducting stormwater business inspections prior to 1984 as part of its delegated responsibility to implement Ecology's NPDES sanitary sewer pretreatment program. Subsequently, the inspection program was intensified in the Foss Waterway Watershed in response to EPA's identification of municipal outfalls as a potential source of contaminants to the Foss Waterway, which had been identified as a problem area within the Commencement Bay Superfund Site. In 2002, under the CD with the EPA for the Foss Waterway Superfund Cleanup, the City further expanded its comprehensive source control program in the Foss Waterway Watershed. The City expanded its Source Control Program city-wide to fulfill the 2007 Permit requirements.

The current source control program includes the following:

- Inspecting multi-family units (i.e., those that include four or more residential units) in addition to businesses and industries. Inspections address both stormwater and sanitary compliance.
- Providing information on BMPs and program literature directly to businesses during site visits (which are available in the City's Stormwater Management Manual).
- Educating the general public and businesses on BMPs and City environmental programs.
- Inspecting and signing off on commercial drainage facilities. This inspection also provides an educational opportunity for Environmental Compliance (EC) inspectors to review operation and maintenance requirements with the builder or owner.
- Continuing to implement the City's Illicit Discharge Detection and Elimination (IDDE) Program that includes investigation and termination of illicit connections. The IDDE Program uses the City's database to track the complete process of screening, investigation, referral to responsible agencies (if other than the City), and enforcement.
- Use of a SQL database, the Environmental Services Spills and Complaints Database, to track spills, complaints, business inspections and flooding claims since 2003. Regular updates and refinements have been made to facilitate advanced data management for tracking inspections. Investigating potential illicit or historic contamination discharges based on complaints, business inspection reports and stormwater monitoring information and responding to potential and confirmed illicit discharges using the same procedures applied to potential illicit connections. Out of all the 2024 business inspections/spill and complaints responses (736 business inspections,664 spill/complaint responses, and 1,384 treatment device inspections), only 21 formal enforcement action letters (16 Warning letters, 1 Notice of Violation, 3 Notice of Violations with Corrective Action order and 1 Notice of Violation with Civil Penalty) were sent City-wide. Seven of these were in the Foss Waterway Watershed. City-wide, only a small percentage of all inspections led

to formal warnings or enforcement which shows that the City's education-based source control program continues to be very successful, and that the business community and City's residents are very supportive and engaged in protecting stormwater quality. Thus far, since the first NPDES Permit was issued in 2007, Tacoma has canvassed/inspected 100 percent of the City, inspecting both sanitary and stormwater compliance. The vast majority of the inspections found catch basins that had never been cleaned. These inspection efforts have resulted in tons of catch basin sediment removal, drainage repair, sewer protection, and customer education.

- Per the CD, the primary COCs in waterway sediments are DEHP and PAHs. Both of these contaminants are ubiquitous in urban runoff and are present in many consumer products. Over the years, high sources of these contaminants have been managed and the City's source control goal is to reduce the high concentrations. Phthalates, in particular, are widespread in the urban environment. Because of challenges faced by the City and others in addressing phthalate contamination, a Phthalate Work Group comprised of the City, EPA, Ecology, King County/Metro, and Seattle Public Utilities was formed in 2006 to research the sources, pathways, and treatment options for phthalates and other ubiquitous compounds in stormwater. The group developed a Summary of Findings and Recommendations document[1] which is currently in the process of being implemented by the regulatory agencies. Ecology worked with the Washington State Department of Health, along with industry and environmental stakeholders including the City, to develop a Phthalate Action Plan that identifies sources of phthalates, and recommends actions to reduce the use, release, and exposure to phthalates in Washington (Ecology 2023).

In addition, the City is continuing to employ enhanced maintenance in the municipal stormwater conveyance system as described further below. Maintenance area sub-basins are shown on Figure 2-2.

2.2.3 Storm Line Cleaning

The City evaluated the effectiveness of a thorough and systematic maintenance practice for aging pipe systems. Between 2006 and 2008, the City completed basin-wide sewer line cleaning of three entire drainage basins (OF254, OF235, and OF230)[2] and part of a fourth basin (OF237A). In 2010 to 2011, a fifth basin (OF237B) was cleaned and in 2021 a first cleaning occurred in OF243 and OF245. The objective of the sewer line cleaning program was to remove residual sediments in the storm drains, some of which may contain legacy contamination from past years that may continue to contaminate stormwater or baseflow through resuspension and/or dissolution. Second cleanings have been performed in portions of OF237A and OF254.

This effectiveness evaluation was included in past annual reports and results are updated here with the WY2024 data. Results of the analysis are presented in Tables 2-2.1 and 2-2.2 and

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[1] Document is available on the Washington State Department of Ecology's website. To view the document copy and paste this link into your web browser: http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.592.1779&rep=rep1&type=pdf

[2] The drainages areas of 235 and 230 were changed with the construction of Outfall 230A (230A represents 98 percent of 230 and 26 percent of 235 drainage areas). The stormwater data for WY2024 was include in this statistical analysis and compared to the original 235 and 230 drainage areas.

shown graphically on Figures 2-3.1 through 2-3.7. A summary of significant reductions observed for each outfall is discussed in Section 5.0. The City's Asset Management group has established a City-wide schedule of line cleaning approximately every twenty years. The Foss data will be evaluated statistically to determine whether more frequent cleaning is needed due to the sensitivity of the receiving water body. As additional wide-scale cleaning in the Foss Basin is performed, the statistical approach will be reviewed and modified, if applicable, to provide the most meaningful analysis of effectiveness of this enhanced maintenance practice over time.

2.2.4 Enhanced Street Sweeping

In January 2007, the City's street sweeping program was transferred from the Streets and Grounds division to the Sewer Transmission Maintenance section for continued implementation. The program schedule was increased at that time in an attempt to reduce sediment buildup in the storm sewer system. The schedule was set to sweep all areas of the City twice per year, with more frequent sweeping in the business districts and on major arterials. Each of the 12 primary business districts in the City are swept at night twice per month on average and arterials are swept on a nine-week rotation. The City also increased communications with residents and business owners, which helped raise awareness of the importance of the street sweeping program.

In 2008, the City started the transition from mechanical sweepers to regenerative air machines. In mid-2018, due to the end of usable life of one of the City's regenerative air sweepers and a staff retirement, Tacoma temporarily reduced its street sweeping program. This resulted in Tacoma reducing the frequency of arterial sweeping to quarterly and residential streets to annually.

The City received an Ecology grant in 2021 to purchase an additional street sweeper which will allow staff to return to the higher sweeping frequency. The new schedule increased the frequency of sweeping at arterials from every 12 weeks to every six weeks and increased residential sweeping to twice per year City-wide. Global Positioning System (GPS) is used to track the number of miles swept and the amount of material removed is recorded.

Similar to line cleaning, the effectiveness of the program was evaluated, and results are presented in Table 2-3.1. The results are discussed in more detail in Section 5.0 and Appendix A. This effectiveness evaluation will continue to be updated as more post-enhanced sweeping data becomes available.

In addition, in response to relatively elevated concentrations of lead and zinc in both stormwater and baseflow in the industrial basins OF243 and OF245, the City initiated a pilot program in WY2014 to determine whether an increased frequency of street sweeping in this area would have an effect on these results. Starting on October 1, 2013, the City began sweeping the ROW within these drainage basins at a frequency of once every two weeks rather than the usual frequency of once per month for industrial areas. The pilot project continued in WY2024 and is ongoing at this time.

With several years of data available, statistical analysis of the effectiveness of this enhanced sweeping schedule was done, although results will be more statistically robust as additional data becomes available. Evaluation of the change in concentrations before and after implementation of the pilot project in these basins is presented in Table 2-3.2. The results are discussed in more detail in Section 5.0. This effectiveness evaluation will continue to be updated as more data becomes available.

With the promising results shown from the pilot project in the basins for OF243 and OF245, a portion of the majority of the OF254 drainage basin was added to the pilot project starting in January 2019.

3.0 STORMWATER AND STORM SEDIMENT MONITORING RESULTS

A major component of the Thea Foss Post-Remediation Source Control Strategy is the stormwater monitoring program. To address these monitoring requirements, stormwater monitoring is conducted at seven outfalls in the Foss Waterway and includes collection of event-based composite and grab stormwater samples as well as annual sediment trap samples for chemical analysis.

The goals and objectives of the stormwater characterization monitoring done to meet the requirements of the Foss CD and the Permit are provided in this section. The goals in common for both programs generally involve:

- Measuring the effectiveness of stormwater source control actions, confirming that reductions in concentrations of target analytes have been realized, and confirming that recontamination from stormwater sources is not occurring; this is achieved by gathering data to identify trends in the quality of the water
- Providing an early indication of any new water or sediment quality problems associated with the storm drains
- Informing decision-making regarding additional source controls
- Tracing sources of contamination in outfalls as needed using sediment traps

The objectives will be accomplished through performance of the following:

- Provide Ecology and EPA with data characterizing the quality of the water and sediments discharging into the Thea Foss and Wheeler-Osgood Waterways
- Collect and submit for analysis representative composite and grab stormwater samples during stormflow events from all seven outfalls
- Collect and submit for analysis representative annual sediment samples at specified manholes
- Produce an annual report documenting activities associated with the sampling and analysis effort, a quality assurance review of field and laboratory data, and an evaluation of the data relative to continuing source control efforts and deliver the report to Ecology and EPA

The whole-water and SSPM concentrations discharged to the waterway are affected by a number of factors. Some of these factors include:

- Weather conditions and rainfall amounts and distributions which cannot be controlled by the City
- Inherent variability of chemical concentrations in stormwater runoff which are addressed using statistically based sampling designs
- Source activities and land use within the basin
- Illicit discharges

Section 3.1, Sample Representativeness, is a summary of the Data Validation Report that is presented in Appendix B. WY2024 analytical data for stormwater and SSPM are presented in Appendix D.

3.1 SAMPLE REPRESENTATIVENESS

Representativeness evaluates field sampling approximation of actual (true) stormwater and SSPM water quality and quantity of the Foss Waterway Watershed. Representative sampling results are used to identify trends in stormwater quality, provide an early indication of new contaminant sources, and trace sources of contamination within the municipal outfalls (Tacoma 2023).

3.1.1 Monitoring Design

Stormwater comprises the majority of freshwater discharge from municipal outfalls and is a direct result of precipitation that produces stormwater runoff and is not a direct result of tidal fluctuations. Baseflow represents the continuous daily discharge from the municipal outfalls that is not a direct result of precipitation and is not a direct result of tidal fluctuations. Sources of baseflow may originate from seeps, creeks, groundwater infiltration, and illicit connections (see Appendix B).

Annual sampling goals for WY2024 include (from each monitoring outfall):[3]

- To meet Permit Section S8.C requirements:
  - A minimum of 55 composite stormwater samples combined from the seven outfalls.
  - Sediment trap sampling at six of the outfalls (all but OF254). Five of these locations are collected using in-line sediment traps placed to collect SSPM from stormwater only. The other SSPM location, MH390 (OF245), is a sump manhole and the sediment it collects represents a combination of stormwater and baseflow.
- To meet the Foss CD:
  - A minimum of eight stormwater samples from OF230A, OF235, OF237A, and OF237B
  - A minimum of three stormwater samples from OF243, OF245[4], and OF254
  - One SSPM sample from each outfall, except for OF254, as described above

[3] Prior to WY2013, the annual sampling goal was to collect ten samples from each of the seven monitored outfalls. In October 2012, EPA and Ecology approved a reduction in sampling frequency beginning in WY2013.

[4] Note that to achieve the target of 55 samples per year required under the Permit, OF245 is included in the list of outfalls with a target of eight samples per year.

Stormwater monitoring was conducted at seven of the 14 City outfalls discharging to the Foss Waterway. These seven outfalls comprise approximately 5,733 acres, or 98 percent of the total Foss Waterway Watershed drainage (5,709 acres, see Section 1.2.2). Monitored outfalls for WY2023 include OF230A, OF235, OF237A, OF237B, OF243, OF245, and OF254. Primary land uses within the Foss Waterway Watershed include residential, commercial, and industrial.

Contaminant source tracing is further executed through sampling of SSPM (see Section 2.1.1). One station is located within the stormwater distribution system, near each outfall that represents the entire basin. It was not possible to locate an SSPM station within OF254 because of tidal influence. Additional upstream stations have been established throughout the Foss Waterway Watershed to evaluate and isolate contaminant sources. Over the years of the program, up to 34 SSPM locations have been sampled annually strictly for source tracing purposes. Sites are removed when it is determined that further source tracing in that area are not needed. In WY2024, eight upline sediment traps were sampled for source tracing purposes in addition to the seven outfall sites. A sediment trap (FD7) was added for the new OF230A and the City will continue to monitor the OF230 (FD3New) sediment trap for WY2025.

3.1.2 Rainfall Summary for WY2024

For each Water Year, 2002 through 2024, monthly and annual rainfall totals are presented in Table 3-1. The total rainfall for WY2024 was 32.79 inches, approximately six inches less than the recent historic average of 38.95 inches (Tacoma No. 1 National Oceanic and Atmospheric Administration (NOAA) site). Wet season rainfall was 27.96 inches, which was 4.3 inches below the historical average. The dry season was almost two inches less than normal rainfall totals with 4.83 inches of rainfall. Table 3-1 shows that the average monthly rainfall for each month during the monitoring period.

3.1.3 Baseflow

In OF230A, OF235, OF237A, and OF237B, the baseflow is continuous and derived from creeks that were historically piped, seeps or groundwater infiltration, and some amount of non-contact cooling water. Tides have minimal effect on baseflow in these drainages. A summary of baseflow sources to these outfalls is provided in Appendix B.

OF243, OF245, and OF254 do not have any creeks or other sources that provide constant baseflow. These drains do, however, have tidal backflushing year-round and during the wet season there is evidence of groundwater infiltration due to the high-water table in the Tideflats area. The groundwater table is comprised of a bottom layer, which is influenced by tides, and an upper fresher water lens. In the wet season, the upper lens is freshened by rain recharge and salinity effects (e.g., conductivity) are less.

Baseflow sampling was conducted during the first ten years of the monitoring program but was discontinued after WY2011 when it was determined that the baseflow had been well characterized. Additional baseflow monitoring was performed in WY2016 and WY2019 to determine whether there had been changes since WY2011. Based on the results of the samples taken, it can be concluded that baseflow concentrations remain fairly consistent or have decreased over time.

The City collected baseflow samples WY2024 to characterize the baseflow discharging from the new OF230A and the baseflow representing the new drainage area of OF235. In general, baseflow concentrations in both WY2016, WY2019 and WY2024 were similar to or less than the

2001-2011 baseflow concentrations. Baseflow sampling for OF230A and OF235 will continue in WY2025.

3.1.4 Stormwater

The intent of stormwater sampling is to identify trends in stormwater quality, to measure the effectiveness of source control actions, and to provide early warning of any new problems that arise in the watershed. Stormwater representativeness is a function of seasonal and individual storm characteristics.

Individual storms, historic averages, and seasonal effects Storm events are variable in nature by runoff volume, flow rate, antecedent rainfall, and season. Each year, this variability is evaluated by comparing the magnitude and intensity of the runoff hydrographs (see Figures 3-2.1 and 3-2.2), where samples were collected on the hydrographs, time between storm events, and time of year the samples were collected, to determine whether a representative range of storm types were included in the monitoring program.

The distribution of WY2024 storm depths sampled varied somewhat from what is typically seen in both the historical average and the monitoring record. As shown in Figure 3-3, the majority of the storms accepted in WY2024 were greater than 0.9 inches (33.3 percent) and 0.15-0.29 inch (27.8 percent). The variations are discussed in detail in Appendix B, Section 4.4.4. Despite the differences observed when comparing WY2024 storm size to the historical trends, the growing overall monitoring record completed under this program generally continues to reflect storm patterns similar to the historical record (Figure 3-1) except for an ongoing trend toward larger storms seen in more recent years.

Based on the historical record (1982-2009), 84 percent of annual precipitation occurs during the wet season and 16 percent during the dry season (see Figure 3-4). Storms sampled under this monitoring program are distributed across seasons; with 23 percent (WY2002-WY2024) of sampled storms occurring during the dry season and 77 percent during the wet season. This difference between occurrence of storms versus the sampling success is likely due to the fact that antecedent periods are easier to meet in the dry season as compared to the wet season, which provides more opportunities for sampling. WY2024 sampling was distributed with 22 percent of sampled storms from the dry season and 78 percent from the wet season.

Numeric goals Stormwater sampling representativeness criteria are stated in the 2023 QAPP and summarized as follows:

- To meet the requirements of the Permit, a target of 55 composite samples are collected from the seven monitored outfalls.
- Targets to meet the requirements of the Foss CD:
    - Eight samples collected annually at four sites (230A, OF235, OF237A, and OF237B).
    - Three samples collected annually from three sites (OF243, OF245[5], and OF254).

[5] As indicated above, to achieve the target of 55 samples per year, OF245 is included in the list of outfalls with a target of eight samples per year.

- Precipitation:
  - Proportional to storm seasonality.
  - During storm flow conditions, defined as:
    - Total precipitation of at least 0.2 inches, and
    - Antecedent periods of less than or equal to 0.05 inch of precipitation in the previous 24 hours during the wet season and less than or equal to 0.02 inch of precipitation in the previous 48 hours during the dry season.
- Storm, sampling, and tidal influence including:
  - Flow composite samples representing 75 percent of the total storm volume (OF237A[6] and OF237B), or
  - Conductivity (tidal influence) of ≤ 2,000 µS/cm (≤ 5,000 µS/cm at OF243 and OF254), and
  - A minimum of ten aliquots composited at all sites.
- A dry period of six hours provides delineation between individual storms.

In WY2024, composite samplers were deployed during 25 different events at the various outfalls, resulting in 146 sample deployments at all monitoring locations (see Appendix B, Table B4-2). Seventy-five stormwater samples were submitted for analysis during WY2024, and all but one sample was accepted. The sample collected from OF237A on the December 19 event was rejected due to the sample not representing a significant portion of the runoff. The annual sampling goal of eight storms per year for OF230A, OF235, OF237A, OF237B, and OF245 and three storms per year for OF243 and OF254 was met. As a result, the sampling goal of 55 samples was successfully met in WY2024 with 74 composite samples accepted. See Appendix B Section B.4 for additional details.

A minimum of two qualifying events were sampled at OF230A, OF235, OF237B, and OF245 during the dry season. There was one successful dry season at the remaining outfalls of OF237A, OF243, and OF254. The remainder of the samples were collected in the wet season.

For each sampling event during WY2024, the City reviewed the flow hydrograph, the discrete sampling times relative to tidal stage, rainfall, and the conductivity (salinity) of the discrete samples to determine which of these samples should be composited to best represent the runoff event. The level, velocity, and flow data for every storm event was evaluated and determined to be representative of stormwater runoff conditions. Most of the stormwater criteria were met for conductivity, tidal window, rainfall, and required number of aliquots, and if not, were evaluated and the samples determined to be representative. Field and analytical data for all the samples collected and analyzed are included in Appendices C and D of the WY2024 Report. Rejected

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[6] OF237A, which is now monitored at the 237A New manhole, has some tidal influence so this criterion does not strictly apply.

data were not included in any of the statistical analyses. Additional details regarding data validation and sample representativeness are included in Appendix B, Section 4.0.

Stormwater Representativeness Over the course of the City's 23-year monitoring record, a representative range of storm events has been characterized considering the following hydrological variables (see Figures 3-2.1 and 3-2.2):

- Total rainfall
- Runoff hydrograph
- Intensity
- Antecedent period
- Season

3.1.5 Stormwater Suspended Particulate Matter (SSPM) Monitoring

SSPM monitoring is a key aspect of the monitoring program. Sample volumes available at each site vary considerably due to land use activities and weather. Despite being deployed for a long period of time the traps often have insufficient volumes that preclude laboratory analysis for all intended parameters. In WY2024, seven samples from the seven outfalls[7] locations (FD1, FD2, FD3 New, FD6, FD7, FD23, and MH390) were submitted to the City laboratory for analysis. Eight additional upline sediment traps were also placed for source tracing purposes. In all, samples were collected from a total of 15 SSPM locations in WY2024, including the outfall and upline locations.

3.1.6 Representativeness of WY2024 Laboratory Analyses

The WY2024 laboratory quality assurance/quality control (QA/QC) review included
Four baseflow, 75 stormwater samples and 16 SSPM samples; detection limit performance samples; laboratory and field blanks; laboratory, matrix, and field duplicates; spiked surrogates; laboratory control and matrix samples; and certified reference materials (CRM). Overall, 8,309 sample and QA/QC results were analyzed in WY2024. Data was reviewed, verified, and validated using a Tier II data review level or higher.

This type of analysis is helpful in identifying issues to be addressed when the majority of data quality is acceptable yet may still be improved. In WY2024, 97 percent of stormwater and 94 percent of SSPM data met measurement quality objectives. Quality Assurance review censored

[7] OF254 does not have a sediment trap because of tidal influences. A SSPM sample was collected at both OF230 and OF230A during WY2024.

or rejected only 0.5 percent of WY2024 data; therefore it is considered representative and useable for the purposes of this report.

The review of laboratory data is provided in Appendix B. WY2023 sediment samples were not analyzed for PBDEs until August 2024 due to a contracting issue with the laboratory. The City froze the samples and the holding time was met. WY2024 sediment samples were sent to the contract lab for analysis in September 2024, PBDE results from the laboratory were received late in the reporting process, and will not be included in the WY2024 Report. The City will submit a technical memo with the IM results in June which will include the validated WY2022, WY2023 and WY2024 PBDE data.

3.2 MONITORING RESULTS: WY2002-WY2024 (YEARS 1 THROUGH 23)

This section presents a qualitative and quantitative description of spatial and temporal patterns in stormwater and storm sediment quality in Monitoring Years 1 through 23 which occurred in WY2002 through WY2024. The qualitative analysis is derived from visual inspection of summary tables and box plots appended to this report (see Appendices E through H). The quantitative analysis includes statistical test procedures described in Section 14.3 of the Thea Foss Stormwater QAPP.

The objective of the statistical evaluation is to test the magnitude and significance of spatial and temporal trends in the monitoring data. Spatial trend analysis includes identification of particular municipal storm drains that may be significantly higher or lower in concentration compared to other storm drains in the Foss Waterway Watershed. Temporal trend analysis includes identification of increases or decreases in stormwater concentrations over time that may be caused by source control actions, construction activities, changes in source strength, land use, or other characteristics of the drainage basins over time.

In the past, temporal trend analysis has also included an evaluation of seasonality and whether significantly higher stormwater concentrations were observed during certain parts of the year. Conventional wisdom suggests higher concentrations might be expected during dry season conditions because there is more time for contaminants to accumulate on drainage basin surfaces between runoff events. There are two sampling seasons in the Water Year, as defined in the Phase I Permit; the wet season runs from October 1 through April 30, and the dry season runs from May 1 through September 30.

3.2.1 Summary Statistics

For each detected chemical at each outfall, the following summary statistics are calculated for baseflow, stormwater, and sediment trap data sets (see Appendix E):

- Number of samples analyzed
- Number and percentage of samples with detected chemical concentrations
- Arithmetic mean concentration
- Median concentration (50th percentile)
- Minimum and maximum concentrations
- 10th and 90th percentile concentrations
- Standard deviation of the arithmetic mean concentration

- Coefficient of variation
- Standard error of the arithmetic mean concentration
- 95th percentile upper and lower confidence limits on the arithmetic mean and median concentrations

Global summary statistics averaged over all municipal outfalls in the Foss Waterway drainage basin and all available monitoring years (WY2002-WY2024: Years 1 through 23) are provided in Tables 3-2.1, 3-2.2, 3-3.1, and 3-3.2 for baseflow[8], stormwater and sediment trap data, respectively. The global summary statistics include:

- Total number of samples
- Percentage of samples with detected concentrations
- Minimum and maximum detected concentrations for each outfall
- Mean and median concentrations for each outfall
- Global weighted-mean concentrations for the entire Thea Foss basin (weighted by number of samples per outfall)
- Overall maximum concentration for all outfalls, and sampling date of maximum concentration

Summary statistics are generated using the R and Python programming languages. When computing statistics that characterize the distribution of pollutant concentrations (e.g., mean, standard deviation), non-detected concentrations were imputed via Monte Carlo Imputation as described in stormwater statistical recommendations report provided to the City by Herrera & MacStat (Herrera 2022). In instances where the value of individual observations were being considered (e.g., time series analysis), half reporting limit values were used as specified in the 2023 QAPP (Tacoma 2023).

3.2.2 Contaminants of Concern

COCs are those contaminants that were identified through sediment monitoring and model predictions to have the greatest potential to compromise sediment quality in the waterways following remediation. They are, therefore, the primary target for source control activities for the municipal storm drains as well as for other potential sources that are largely not in the City's control. DEHP and PAHs are the primary COCs for the Foss CD and have therefore been the focus of source control activities to date. In addition, residual concentrations of other legacy COCs for which sources have largely been controlled through regulatory bans or restrictions are

[8] Baseflow results for WY2002 to WY2011 are presented in Table 3-2.1. Some additional baseflow monitoring was performed in WY2016 and WY2019 to determine whether there have been changes in recent years. WY2016 and WY2019 baseflow results are included in Table 3-2.2. Only four baseflow samples were collected in WY2024 and several more to be collected in WY2025. Summary data for 2024-2025 will be added to the WY2025 Report. Additional discussion about baseflow monitoring and a comparison of results is included in Appendix B.

continuing to be monitored. These legacy COCs include mercury and PCBs. Source control activities have also been conducted for these COCs.

The Permit identifies stormwater quality analytes as parameters of concern based on the analytes that have a history of association with stormwater discharges and are expected to be found in urban environments. These analytes include conventional parameters, nutrients, metals, selected organics (including PAHs and DEHP), fecal coliforms, and total petroleum hydrocarbons.

Tables B2-7 and B2-9 contain lists of all parameters that have been analyzed under either the Thea Foss CD or the Permit. If either the Permit or the Foss CD requirements are discontinued for any of the monitoring activities at some point in the future, these tables will be used to determine which analyses are required under the remaining regulations.

The Table 3-2.1 and 3-2.2 summary charts for baseflow were prepared and statistical tests performed on the following parameters:

- Total Suspended Solids (TSS) (initial baseflow and WY2016/WY2019)
- Conventionals (MBAS, BOD and Turbidity) (WY2016/WY2019)
- Nutrients (Nitrate+Nitrite as N, Orthophosphate, Total Phosphorus, and Total Nitrogen) (WY2016/WY2019)
- Total and Dissolved Metals (lead, mercury, and zinc) (initial baseflow and WY2016/WY2019)
- Total and Dissolved Metals (cadmium and copper) (WY2016/WY2019)
- Chlorpyrifos (WY2016/WY2019)
- PAHs (initial baseflow and WY2016/WY2019)
- Phthalates (initial baseflow and WY2016/WY2019)
- Herbicides (2,4-D and Dichlobenil) (WY2016/WY2019)
- TPH (NWTPH-Diesel, NWTPH-Gasoline and NWTPH-Heavy Oil) (WY2016/WY2019)
- Fecal Coliform (WY2016/WY2019)
- BTEX (WY2016/WY2019)

The Table 3-3.1 summary chart for stormwater was prepared and statistical tests performed on the following indicator parameters:

- TSS
- Conventional parameters (MBAs, BOD, Chloride, Conductivity, Hardness, pH, and Turbidity)
- Fecal Coliform, E.Coli, and Enterococci
- Nutrients (Nitrate+Nitrite as N, Orthophosphate, Total Phosphorus, and Total Nitrogen)
- Insecticides (2,4-D, Carbaryl, Chlorpyrifos and Bifenthrin)
- Herbicides (Dichlorobenil)

- Total and Dissolved Metals (copper[9], cadmium, lead, mercury, and zinc)
- PAHs
- Phthalates
- Total Petroleum Hydrocarbons (TPH-Oil, TPH-Gasoline, and TPH-Diesel)
- BTEX

The Table 3-3.2 summary chart for SSPM was prepared and statistical tests performed on the following indicator parameters:

- Conventional parameters (Grain Size, Total Organic Carbon (TOC), Total Solids, and Total Volatile Solids)
- Nutrients (Total Phosphorus)
- Metals (cadmium, copper, lead, mercury, and zinc)
- Total Petroleum Hydrocarbons (TPH-Oil and TPH-Diesel)
- PAHs
- Phthalates
- Bifenthrin
- PCBs
- Phenolics
- Dichlobenil

Graphical presentations and trending statistics are performed for key constituents of interest. For whole-water, key constituents include the following analytes:

- TSS
- Metals (total copper, total lead, and total zinc)
- Phenanthrene (a low-molecular weight PAH)
- Pyrene and Indeno(1,2,3-c,d)pyrene (high-molecular weight PAHs)
- Bis(2-ethylhexyl)phthalate) DEHP

For sediment, key constituents include the following analytes:

- Metals (total copper, total lead, total mercury, and total zinc)
- TPH-Oil

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[9] Analysis for copper in stormwater occurred from WY2010 – WY2012 for OF235, OF237B, and OF245, and was added to the 2014 QAPP for all outfalls for both stormwater and SSPM.

- Bifenthrin
- Phenanthrene (a low-molecular weight PAH)
- Pyrene and Indeno(1,2,3-c,d)pyrene (high-molecular weight PAHs)
- Total PCBs
- Butylbenzylphthalate, DEHP, and total phthalates

3.2.3 Statistical Test Methods

The stormwater monitoring data were subjected to the following statistical tests as further discussed in the 2023 QAPP and in the MacStat & Herrera Report (Herrera 2022):

- Qualitative Assessment of Spatial and Temporal Trends
- Statistical Distribution Testing
- Analysis of Variance (ANOVA) and Post-Hoc Comparison Tests:
    - Parametric ANOVA and Tukey HSD Test (Stormwater Data) (Table 3-4)
    - Nonparametric ANOVA (Kruskal-Wallis Test) and Dunn Test (Baseflow and SSPM Data); and (Table 3-5)
- Time Trend Analysis (Lognormal Linear Regression) (Table 3-6)

The ANOVA, Kruskal-Wallis, Tukey, and t-tests, and lognormal regression analyses are performed using SYSTAT Python version 3.11 Version 13 or equivalent with SciPy version 1.11. The lognormal regressions and nonparametric post-hoc tests (Dunn Test) are performed in Microsoft Excel and the same version of Python using the equations in Zar (1999). Graphical data presentations were prepared for key constituents. Box and whisker plots provide a graphical representation of spatial and temporal trends in stormwater quality and include:

- Outfall-to-outfall comparison – stormwater (land use differences, Appendix F of the WY2024 Report)
- Year-by-year comparisons within a given outfall (long-term trends, Appendix G of the WY2024 Report)
- Wet season versus dry season comparison (seasonal differences, Appendix H of the WY2024 Report)

Box and whisker plots are generated using Python version 3.11 and wqio version 0.6[10] from the International Stormwater BMP Performance Database. The wqio library is a python library that uses SciPy (version 1.11) and other statistical libraries to analyze and visualizing water and sediment quality data. These plots display the following characteristics of the data distributions:

- Interquartile range, or IQR (data between the 25th and 75th percentile)

[10] https://github.com/International-BMP-Database/wqio

- Median and arithmetic mean
- Moderate outliers (more than 1.5 x IQR above the 75th percentile, or below the 25th percentile)
- Extreme outliers (more than 3 x IQR above the 75th percentile, or below the 25th percentile).

In addition, time-series scatter plots of the key constituents (Figures 3-5.1 through 3-5.8) in stormwater are prepared with annotation to delineate the different monitoring years. Time-series plots, as well as box plots, include comparable data collected back to August 2001.

3.3 SPATIAL ANALYSIS

This section presents a qualitative and quantitative spatial analysis of differences in stormwater and SSPM quality between municipal storm drains. It should be noted that there are similarities as well as differences in the spatial patterns of exceedances observed in stormwater and SSPM, as discussed in the following sections and as shown on Tables 3-4 and 3-5.

Qualitative analysis includes inspection of drain-by-drain summary statistics and box plots. Quantitative analysis includes lognormal parametric ANOVA and post-hoc comparison (Tukey HSD Test) for stormwater data, and nonparametric ANOVA (Kruskal-Wallis test) and post-hoc comparison (Dunn Test) for SSPM data. Note that this information is used to guide stormwater source control activities that are discussed further in Section 5.0.

3.3.1 Baseflow Quality

Routine baseflow sampling was discontinued at the end of Year 10 since baseflow quality was well characterized. Refer to the WY2012 report (Tacoma 2013) for a detailed description of the baseflow characteristics in each of the outfalls.

Since 2011, detection limits for some analytes have changed and are lower than those in the 2001 SAP. The WY2011 baseflow concentrations, many of which were not detected, biased the baseflow pollutant loadings and overestimated the resulting loads. To more accurately estimate the baseflow loadings, baseflow samples were collected in WY2016, WY2019 and WY2024 (data set for OF230A and OF235); and analyzed for the stormwater analytes listed in the QAPP.

Most of the WY2016/WY2019 data results are similar or less than the 2001-2011 data results. In a few instances the WY2016/2019 arithmetic mean or median results were slightly higher than the 2001-2011 data results; however, in the majority of cases, the maximum WY2016/2019 results for that analyte were within the 2001-2011 data range for that analyte. The four WY2024 baseflow concentrations were similar to the WY2016/WY2019 data set for OF 230/OF230A and OF235 and were used in the baseflow loadings calculations.

The WY2016/2019 results further support the conclusion that baseflow concentrations in the Foss outfalls have remained fairly consistent or are improving over time. The City plans to evaluate the OF230A and OF235 baseflow data collected in WY2024 and additional samples collected in WY2025 in the WY2025 Report. The new baseflow data will be compared to the historic data to determine if the baseflow data for the historic drainage areas can continue to be utilized to characterize baseflow.

3.3.2 Stormwater Quality

Qualitative Outfall Comparisons Inspection of summary tables and box plots of stormwater quality among the various Foss Waterway storm drains suggests the following generalized conclusions (see Table 3-3.1 and Appendices D, E, F, and G):

- **TSS** Overall, comparatively higher TSS concentrations are observed in OF254 (see Figures F-1). OF235 and OF237A had elevated maximum concentrations (441 and 668 mg/L), while OF254 had the highest mean (88.8 mg/L) and median (68.3 mg/L) concentrations, with OF243 next highest with a mean concentration of 62mg/L. OF230/230A, OF237B, and OF237A had the lowest means (47.6, 47.1, and 49.1 mg/L, respectively) and median (30.3, 34.6, and 34.3 mg/L, respectively) TSS concentrations.

- **Metals** Comparatively higher mean and median lead concentrations were observed in OF235 (53.6 µg/L and 41.2, respectively); while OF243 also showed some evidence of elevated lead concentrations, including the highest overall lead concentration (379 µg/L) in September 2009, as well as the second highest mean and median lead concentrations (31.9 µg/L and 15.80 µg/L). The highest mean mercury concentrations were observed at OF254 (0.0260 µg/L), while the maximum mercury concentration (0.8700 µg/L) was observed in OF245 in 2008. The highest mean (128.1 µg/L) and median (102.0 µg/L) zinc concentrations were found at OF245 while the maximum zinc concentration (1,170 µg/L) was observed in OF243, with the maximum concentration detected in 2004.[11] The highest mean, median, and maximum copper concentrations were observed at OF235 (28.92 µg /L, 22.90 µg/L, and 162 µg /L, respectively) with the maximum concentration occurring in 2015.

- **Phthalates** DEHP is the phthalate compound with most frequent detections (88 percent detection) and the highest mean and median concentrations. The highest mean, median and maximum concentrations of DEHP were observed in OF235 (3.82 µg/L, 1.92 µg/L, and 97.0 µg/L respectively). The second highest mean and maximum concentrations were observed in OF230/230A (3.12 µg/L and 44.1 µg/L). Unusually elevated DEHP concentrations were also found in OF245 in Year 2 (October 2002 through April 2003), and in OF230 and OF243 in Year 7, but these appear to be isolated occurrences (see Appendices F and G). Certain other phthalates, though less frequently detected, peaked at higher concentrations. Elevated diethylphthalate concentrations were measured in 2002 in OF237A (230 µg/L), OF235 (590 µg/L), OF245 (430 µg/L), and OF254 (120 µg/L). The peak butylbenzylphthalate concentration was measured in OF245 (290 µg/L) in 2003. However, diethylphthalate and butylbenzylphthalate have been detected in less than half the samples (28 percent and 34 percent detections, respectively). Peak concentrations of dimethyl phthalate, di-n-butyl phthalate, and di-n-octyl phthalate occurred at OF230/230A, OF237A, and OF254, respectively, although these concentrations were one to two orders of magnitude lower than the peak concentrations of the other phthalates. The fact that the peak concentrations of various phthalates occur in different outfalls indicates that

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[11] While elevated zinc values of 4570 ug/l total and 4430 ug/l dissolved were measured on February 1, 2018, these values were nearly 4 times higher than the previously identified extreme outliers with no apparent cause, so these values were not included in the summary statistics

the phthalate composition is somewhat variable across the Foss Waterway drainage basins. All peak concentrations occurred in 2005 or earlier, indicating improvement over time.

- **PAHs** OF245 contains the highest maximum concentrations of several of the lighter-weight PAH compounds including acenaphthene, acenaphthylene, fluorene, and phenanthrene, while OF235 contained the highest maximum concentrations of several other the lighter-weight PAH compounds including naphthalene, 2-methylnaphthalene, and total Low Molecular Weight PAHs (LPAHs). Comparatively higher mean and median concentrations of a number of LPAHs and the maximum concentration of anthracene were observed in OF254. The maximum concentrations observed in OF245 occurred in 2004, while the maximum concentrations observed in OF235 were in 2002. Comparatively higher mean, median, and maximum concentrations of HPAHs were generally observed in OF237A and OF254. The only exception is that the maximum concentration for dibenz(a,h)anthracene of 0.684 µg/L occurred in OF243 in 2016. The elevated concentrations in OF237A occurred in 2007, while the elevated concentrations in OF254 occurred in 2002. In general, PAH concentrations over the last fifteen years (Years 8 through 23) were relatively low compared to previous monitoring years.

Parametric ANOVA Results ANOVA was performed to determine whether there are statistically significant differences between outfalls. The ANOVA test helps to determine whether stormwater quality in the Foss Waterway Watershed is relatively uniform across drainages (i.e., all outfalls are drawn from a single statistical population), or whether there is reason to believe that certain drainages are unique (i.e., characterized by unusually high or low concentrations).

Goodness of fit tests show that practically all stormwater analytes in all outfalls may be characterized by lognormal or nearly lognormal statistical distributions (Tacoma 2009a, Tacoma 2012). Therefore, lognormal parametric ANOVA tests were conducted. The ANOVA test statistic is the F statistic with 6 (n-1) degrees of freedom (n = 7 outfalls in the monitoring program).

ANOVA and post-hoc comparison tests were performed using: (1) all 23 years of monitoring data, and (2) only the last two years of monitoring data[12]. ANOVA tests using the entire 23-year monitoring record have significantly more power to discriminate between drains due to a much larger sample size. ANOVA tests using only the most recent monitoring data have lower statistical power but provide information on the most current conditions in the storm drains, to better determine whether the City's source control actions have resulted in recent improvements in stormwater quality and to guide future source control activity prioritization.

[12] Earlier annual reports presented only the last year of monitoring data. However, due to the reduction in sampling numbers starting with WY2013, the ANOVA analysis was changed to include the last two years of data. Without this change, very few statistically significant differences would be observed.

Following are the results of the parametric ANOVA test using all 23 years of stormwater[13] monitoring data:

Parameter	F Statistic	Probability	Significant?
TSS	13.5	<0.001	Yes
Total Copper	43.5	<0.001	Yes
Total Lead	93.4	<0.001	Yes
Total Zinc	19.4	<0.001	Yes
Phenanthrene	4.17	<0.001	Yes
Pyrene	10.2	<0.001	Yes
Indeno(1,2,3-c,d)pyrene	20.6	<0.001	Yes
DEHP	8.82	<0.001	Yes

Following are the results of the parametric ANOVA test using only the last two years of monitoring data:

Parameter	F Statistic	Probability	Significant?
TSS	5.4	<0.001	Yes
Total Copper	16.0	<0.001	Yes
Total Lead	42.6	<0.001	Yes
Total Zinc	8.3	<0.001	Yes
Phenanthrene	8.4	<0.001	Yes
Pyrene	10.8	<0.001	Yes
Indeno(1,2,3-c,d)pyrene	23.5	<0.001	Yes
DEHP	13.3	<0.001	Yes

The parametric ANOVA test results indicate there is greater than or equal to 99.9 percent probability ($p \leq 0.001$) that one or more outfalls are significantly different from the norm, either higher or lower, for every one of the index constituents. The ANOVA test results indicate it is possible in all cases to differentiate stormwater quality between outfalls in the Foss Waterway Watershed for the index constituents using the entire data set, or only the last two years of data. As a result, post-hoc tests were performed to identify which specific outfalls contain unusually high or low stormwater concentrations.

Parametric Post-Hoc Comparison (Tukey Test) Because the ANOVA test showed statistically significant differences ($p < 0.05$) between stormwater quality in the various municipal drainages, post-hoc tests were performed to determine which specific drains are higher or lower than normal. The Tukey Test is an appropriate post-hoc test for parametric ANOVA. The results of the parametric post-hoc tests are summarized in Table 3-4. On this table, the top portion provides the results for the evaluation of the 23-year data set, while the bottom portion provides the results when looking at only the last two years of data. Since this data set is smaller, there is

[13] Stormwater analysis for copper found in OF235, OF237B, and OF245 was performed between WY2010 and WY2012, discontinued, and then began for all outfalls in WY2015. Therefore, with less data available, statistics performed for copper are not fully comparable to those performed for other parameters.

somewhat less confidence in the results, however, it does provide some indication of the current source control status and priorities.

Drainages and constituents exhibiting significant differences in stormwater quality, based on the entire 23-year monitoring record, include the following (see Table 3-4):

- **TSS.** When looking at the 23-year monitoring data, TSS concentrations are significantly higher in OF254 (+6) with other outfalls exhibiting relatively similar concentrations (-1). When looking at the last two years of data, TSS concentrations are moderately higher in OF254 (+4), moderately lower (-3) in OF237B, and generally neutral in the other outfalls.
- **Total Copper**[14]. When looking at all of the monitoring data, copper concentrations are significantly higher in OF235 (+6) and moderately higher in OF243 (+3). Concentrations are slightly lower in OF230/230A (-2), OF237A (-3) and significantly lower in OF237B (-4). When looking at only the last two years of data for copper, concentrations are significantly higher at OF235 (+6), while the concentration at OF237B moderately lower (-3) and generally neutral in the other outfalls.
- **Total Lead.** OF237B (-3), OF245 (-3), OF237A (-2), and OF254 (-2) contain lead concentrations that are moderately below average when looking at the entire monitoring period while OF243 (+4) and OF235 (+6) are moderately to significantly elevated compared to other outfalls during this same time period. When looking at only the last two years of data, concentrations are generally more neutral, with the exception of OF235, which remains significantly elevated relative to other outfalls (+6).
- **Total Zinc.** Zinc concentrations in OF237B are significantly lower (-6) and concentrations in OF243 and OF237A are slightly lower (-1) than all other outfalls during the full monitoring period. OF254 (+3) and OF245 (+3) are moderately elevated in zinc when looking at the 23-year monitoring period. When looking at only the last two years of data, zinc concentrations are generally more neutral but remain significantly lower than other outfalls (-5) in OF237B.
- **DEHP.** When looking at data from the entire monitoring period, OF235 (+5) exhibits significantly elevated DEHP concentrations relative to other outfalls while OF237A, OF237B and OF243 has exhibited relatively lower concentrations (-2). DEHP concentrations in OF245 and 254 are relatively low and largely indistinguishable from one another. The significantly higher concentrations are less apparent at OF230/230A (+3), OF237A (+3) and OF235 (+3) when looking at only the last two years of data when compared other outfalls. DEHP concentrations are moderately lower (-3) at OF243 and OF237B and OF243 (-4) based on the last two years of data.
- **PAHs.** OF237B (-2), OF243 (-2) and OF245 (-3) has slightly and moderately lower concentrations of pyrene (-2) and OF237B has moderately lower levels of phenanthrene (-3) when looking at the 23-year monitoring record. Additionally, OF245 has significantly lower indeno(1,2,3-c,d)pyrene (-5). Conversely, OF254 has moderately higher

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[14] Outfalls OF235, OF237B, and OF245 have more data available for evaluation with a total of ten years of monitoring completed. OF230, OF237A, OF243, and OF254 have seven years of data available. In general, the statistical evaluation for copper is not fully comparable to outfalls with different amounts of data available.

concentrations of pyrene (+5) and slightly higher concentrations of phenanthrene (+1) and OF237A has moderately higher concentrations of pyrene (+3) and significantly higher concentrations of indeno(1,2,3-c,d)pyrene (+6) during this same 23-year period. When looking at only the last two years of data, OF237A contains significantly higher indeno(1,2,3-c,d)pyrene (+6), pyrene (+6) phenanthrene (+6) relative to other outfalls. All other PAHs are relatively neutral and largely indistinguishable from one another over the last two years at all other outfalls.

In summary, when looking at the entire monitoring period, results indicate that OF235 (copper, lead, DEHP), OF237A (indeno(1,2,3-c,d)pyrene and pyrene), OF243 (copper and lead), OF245 (zinc), and OF254 (TSS, zinc, and pyrene), have the highest number or most extreme positive pair comparisons; therefore, source control activities, as needed, are best focused for these constituents in these drainages. OF237B, and to a lesser extent OF243, OF237A, and OF245 have the highest number of negative pair comparisons relative to other drains, and therefore exhibit the best overall stormwater quality. With 23 years of monitoring data, very good statistical power has been achieved (with exception for copper), and the spatial patterns in stormwater are relatively stable and generally consistent from one monitoring year to the next.

When looking at only the last two years of monitoring data, results generally show more neutral conditions in all the outfalls, although the statistical power of this analysis is lower. The only exceptions are PAHs in OF237A, which become more elevated when looking at only the last two years, and lead and copper in OF235, which remains significantly elevated. A few samples with relatively higher concentrations of indeno(1,2,3-c,d)pyrene detected in since WY2021 in OF237A are likely causing the higher relative level shown in Table 3-4 (see also Figure G-6).

3.3.3 Baseflow Versus Stormwater Quality

Summary statistics for baseflow[15][16] for WY2002-2011 and WY2016/2019 are provided in Table 3-2.1 and Table 3-2.2, respectively. Summary statistics for stormwater quality are provided in Table 3-3.1. These tables include mean concentrations averaged across all seven outfalls in the Foss Waterway Watershed. The arithmetic mean concentrations in baseflow and stormwater are summarized below for the Thea Foss index chemicals.

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[15] Baseflow results are presented for WY2002 to WY2011 since baseflow monitoring was discontinued after WY2011. Some additional baseflow monitoring was performed in WY2016 and WY2019 to determine whether significant differences had been realized since initial comprehensive baseflow monitoring was discontinued.

[16] The City plans to evaluate and report the OF230A and OF235 baseflow data collected in WY2024 and WY2025 in the WY2025 Report. The new baseflow data will be compared to the historic data to determine if the baseflow data for the historic drainage areas can continue to be utilized to characterize baseflow.

Constituent	Units	**Mean Baseflow** WY01-11/WY16 &19	**Mean Stormwater**	**Ratio** WY01-11/WY16 &19 to WY2024
TSS	mg/L	12 / 4.8	58.3	21% / 8%
Lead	µg/L	5.5 / 1.7	21.1	26% / 8 %
Zinc	µg/L	47 / 11	100.6	47% / 11%
Phenanthrene	µg/L	0.013 / 0.009	0.064	20% / 14%
Pyrene	µg/L	0.026 / 0.008	0.134	20% / 6%
Indeno(1,2,3-c,d)pyrene	µg/L	0.006 / 0.005	0.035	17% / 14%
DEHP	µg/L	1.1 / 0.536	2.39	46% / 22%

Inspection of these summary statistics indicates the following:

- Baseflow concentrations are consistently lower than stormwater concentrations. WY2001-11 average baseflow concentrations range from approximately 1/5 to 2/5 (17 – 46 percent) of stormwater concentrations. WY2016 & 2019 average baseflow concentrations range from approximately 1/20 to 1/5 (6 – 21 percent) of stormwater concentrations.
- In addition to lower mean concentrations, baseflow samples are generally characterized by lower maximum values and less frequent detections.
- Because TSS is approximately five (2001-11) to 12 (2016 and 2019) times higher in stormwater, the increased chemical concentrations that are observed during storm events is likely caused in part by suspended sediments entrained in the runoff.

3.3.4 Storm Sediment Quality

SSPM samples were collected in pipeline sediment traps and in the MH390 sump (representing OF245). These samples include suspended particulate matter in transport through the storm drains. OF254 does not have a sediment trap because of tidal influences. SSPM data helps to provide information on hydrophobic constituents such as mercury, HPAHs, DDT, and PCBs, which have a strong affinity for sediments but are poorly soluble and often undetected in whole-water samples. In conjunction with baseflow and stormwater data, SSPM data is used to help the City, EPA, and Ecology identify and trace unusually elevated sources of contaminants in the municipal drainages.

Summary statistics for SSPM for WY2002-WY2024 are provided in Table 3-3.2. This table includes weighted mean concentrations averaged across the six outfall sediment traps in the Foss Waterway Watershed (weighted by sample size for each location). The weighted mean concentrations are summarized below for the Thea Foss index chemicals.

Due to the limited dataset available for review (only one sample per year), the assumption was made in early reports that the SSPM data would follow a lognormal distribution similar to the stormwater data. This assumption was tested in WY2011 and it was determined that the sediment traps were generally not well described by a lognormal distribution. Therefore, nonparametric statistical tests were used.

ANOVA was performed to identify storm drains with significantly higher or lower sediment concentrations compared to other drains in the Foss Waterway Watershed. A nonparametric

ANOVA (Kruskal-Wallis Test) was performed, with 5 (n-1) degrees of freedom (n = 6 outfalls in the sediment trap monitoring program).

Following are the results of the nonparametric ANOVA test using all 23 years of storm sediment data:

Parameter[1]	F Statistic	Probability	Significant?
Copper	37.1	<0.001	Yes, 99.9%
Lead	34.3	<0.001	Yes, 99.9%
Zinc	10.8	<0.001	Yes, 99.9%
Mercury	13.4	<0.001	Yes, 99.9%
TPH-Heavy Oil	9.3	<0.001	Yes, 99.9%
Phenanthrene	16.4	<0.001	Yes, 99.9%
Pyrene	9.4	<0.001	Yes, 99.9%
Indeno(1,2,3-c,d)pyrene	21.7	<0.001	Yes, 99.9%
Bifenthrin	3.2	0.013	Yes, 98.7%
Total PCBs	9.3	<0.001	Yes, 99.9%
DEHP	6.4	<0.001	Yes, 99.9%
BBP	10.5	<0.001	Yes, 99.9%
Total Phthalates	6.2	<0.001	Yes, 99.9%

[1] Note that analysis for DDT was discontinued in WY2013 and analysis for Bifenthrin and copper began in WY2015

The nonparametric ANOVA test results indicate there is a high probability (All but one was equal or greater than 99 percent confidence; p ≤ 0.01, Bifenthrin is equal or greater than 98.7 percent confidence) that storm sediment concentrations in one or more outfalls are significantly different from the norm, either higher or lower, for all analytes.

Following are the results of the nonparametric ANOVA test using only the last five years of monitoring data:

Parameter[1]	F Statistic	Probability	Significant?
Copper	13.7	<0.001	Yes, 99.9%
Lead	60.6	<0.001	Yes, 99.9%
Zinc	6.8	<0.001	Yes, 99.9%
Mercury	5.9	0.001	Yes, 99.9%
TPH-Heavy Oil	2.1	0.095	No
Phenanthrene	2.8	0.039	Yes, 96.1%
Pyrene	7.3	<0.001	Yes, 99.9%
Indeno(1,2,3-c,d)pyrene	7.4	<0.001	Yes, 99.9%
Bifenthrin	3.4	0.018	Yes, 98.2%
Total PCBs	1.2	0.366	No
DEHP	2.0	0.122	No
BBP	3.1	0.026	Yes, 97.4%
Total Phthalates	1.7	0.182	No

[1] Note that analysis for DDT was discontinued in WY2013. Analysis for Bifenthrin and copper began in WY2015.

The nonparametric ANOVA test results indicate it is possible to differentiate SSPM quality for most of these analytes between outfalls in the Foss Waterway Watershed using only the last five years of data. Only Total PCBs and TPH-Oil show no significant differences between the outfalls as shown on Table 3-5. DEHP and Total Phthalates show no significant differences between all outfalls except for one pair, as shown on Table 3-5.

Pair-comparison tests were performed using the Dunn method, as summarized in Table 3-5. Each outfall is compared to a maximum of five other outfalls in the storm sediment monitoring program (six outfalls total). Outfalls and constituents that exhibit a higher number of significant pair comparisons help to identify drainages that are increasingly unique (either higher or lower concentrations) compared to the other drains in the Foss Waterway Watershed. On Table 3-5, the top portion provides the results for the evaluation of the 23-year data set, while the bottom portion provides the results when looking at only the last five years of data. Since this data set is smaller, there is somewhat less confidence in the results, however, it does provide some indication of the current source control status and priorities.

Following is a summary of observations regarding spatial patterns in SSPM quality based on the 23-year monitoring record. The spatial patterns observed in the SSPM data are sometimes but not always consistent with the patterns observed in stormwater data (compare Table 3-5 and Table 3-4). Discrepancies between these two data sets are included below and may be caused by differential transport of pollutants in dissolved and particulate phases.

- **Metals.** SSPM in OF243 is moderately elevated in copper (+3), lead (+4), mercury (+4), and zinc (+4). OF230A and OF235 are slightly elevated in some metals, but to a lesser degree than OF243. OF237B has moderately lower copper, lead, and mercury concentrations (all at -3), and significantly lower zinc (-5) relative to other outfalls, while OF245 contains moderately lower lead concentrations (-3).

  Some of these patterns found in SSPM are contrary to those observed in stormwater. For example, lead and copper concentrations in OF235 are significantly elevated in stormwater (both at +6), but at most only slightly elevated in SSPM (+2 and +1, respectively); zinc concentrations in OF243 are moderately elevated in SSPM (+4) but not in stormwater (-1). Conversely, zinc concentrations in OF245 are moderately elevated in stormwater (+3) but are neutral (0) in SSPM.

- **Total Petroleum Hydrocarbons (TPH-Oil).** SSPM in OF237B is significantly lower in TPH-Oil (-5) relative to the other outfalls while levels at other outfalls are generally similar throughout the drainage basin.

- **Pesticides.** No significant differences in DDT concentrations were observed among the six outfalls during the time it was monitored. It is no longer analyzed under the 2014 QAPP. Bifenthrin was added as a constituent in the 2014 QAPP, and in general all outfalls appear to be generally similar throughout the basin based on available data, although it is slightly elevated in OF237A.

- **PAHs.** Storm sediment in OF245 contains moderately to significantly lower concentrations of PAHs (-4 to -5) relative to all other outfalls. SSPM in OF230/230A and OF237A are slightly to moderately enriched in all three PAHs (+2 to +4). The remaining outfalls are generally neutral for PAHs (+1 to -2). These patterns are generally consistent with those observed in stormwater except for OF230/230A where, as indicated above, the SSPM is slightly to moderately enriched (+2 to +3) in all three indicator PAHs while the stormwater is generally more neutral (0 to +2).

- **Total PCBs** Storm sediment shows no significant differences for PCBs between the outfalls when looking at the 23-years of data and when looking at the last five years of data. SSPM concentrations at all locations are relatively neutral (-1 to +1).
- **Phthalates** DEHP is fairly consistent in concentrations in storm sediment throughout the various drainages; only OF237B (-4) shows a moderately lower concentration in DEHP. This pattern is not altogether consistent with that observed in stormwater. DEHP in OF230/230A and OF235 was significantly elevated in stormwater (+3 and+5, respectively), but not in SSPM (+2 and +1). OF245 continues to exhibit notably different phthalate compositions that is dominated by butylbenzylphthalate (++4 for 23-years data and +2, at a slightly higher concentration in the last two years). In particular, OF245 have the majority of the highest butylbenzylphthalate concentrations in the monitoring program (see Figure F-20).

When looking at only the last five years of monitoring data, fewer spatial patterns are observed, and the patterns are generally consistent with the 23-year monitoring record results (Table 3-5). The differences between outfalls are less pronounced when looking at only the more recent data when compared with the 23-year monitoring record.

3.4 SEASONAL ANALYSIS

This section presents a qualitative evaluation of seasonality in baseflow and stormwater quality by inspection of seasonal box plots (see Appendix H). As per the City's NPDES Phase I Permit, the wet season is defined as October 1st through April 30th, and the dry season is defined as May 1st through September 30th.

It might be expected that dry season conditions would generate higher contaminant concentrations in both baseflow and stormwater. This might be caused by more isolated storms and longer antecedent dry periods between storms, resulting in longer periods of contaminant accumulation on the surfaces of the drainage basin. The seasonal effect on runoff quality found through the City's monitoring program is evaluated below.

3.4.1 Seasonal Analysis of Stormwater Quality

Inspection of box plots comparing stormwater quality between the wet and dry seasons for the 23-year monitoring record suggests the following (see Appendix H):

- Evidence of seasonal effects in TSS concentrations is weak in all outfalls.
- Metals (lead and zinc) in stormwater showed occasional evidence of seasonality (i.e., higher median, mean, and/or peak concentrations during dry season months).
- Evidence of seasonal effects was generally not observed in organics data.
- Similar patterns were observed in baseflow data (i.e., inorganic constituents exhibit stronger evidence of seasonality), whereas evidence of seasonality for organic constituents is weak or absent. This analysis was performed based on the first 10 years of baseflow monitoring performed from WY2002-WY2011 and presented in the WY2011 report (Tacoma 2012).

3.5 TIME TREND ANALYSIS

This section presents a qualitative and quantitative analysis of time trends in stormwater quality. The objective of time trend analysis is to identify specific drains and constituents that show evidence of significant improvement or degradation in stormwater quality over time. The changes can be a result of source control actions in the drainage basins that help to curtail pollutant concentrations, or alternatively, changes or disturbances in the watersheds that may cause concentrations to increase, (e.g., temporary construction activities or increased urban density and traffic).

3.5.1 Stormwater Time Trends

Qualitative Analysis of Time Trends Inspection of box plots comparing stormwater quality from one monitoring year to the next suggests the following (see Appendix G):

- Time trends can be difficult to discern by visual inspection of the year-to-year box plots due to the generally high degree of variability in stormwater data. Time trends are evaluated using more quantitative statistical tests later in this section.
- Despite the inherent variability of the data, there nevertheless appears to be across-the-board reductions in most metals, PAH compounds, and DEHP in most drains since about Year 10 of the monitoring program. Having generally stabilized at low levels for several consecutive years, these trends may be indicative of the effectiveness of the City's source control and enhanced maintenance programs, and additional reductions will be difficult to achieve. Note that apparent higher organics concentrations are present in the last eight years, however, this increase in concentrations was seen consistently in all the outfalls. After extensive investigation, it appears that rather than these concentrations being higher, past concentrations may have been biased low. While this observed slight increase in organic concentrations is present, concentrations remain substantially lower than the concentrations present early in the monitoring program (see boxplots in Appendix G).
- Unusually dry (Years 2, 4 and 22) and unusually wet (Years 6, 12, 15, and 16) monitoring years are summarized in Table 3-1. WY2017 was the wettest year in the monitoring record, while WY2023 is the driest year of the 23-year monitoring record. Despite the variability over time, there has been no discernible relationship between these unusual water years and stormwater quality. Reliable correlations between stormwater quality and other hydrologic parameters (i.e., rain depth, rainfall intensity, and antecedent period; see Figures 3-2.1 and 3-2.2) are not discernible either.

Simple Linear Regression Analysis of Time Trends The simple linear regression is performed using the logarithms (base 10) of the stormwater concentrations. This is equivalent to an exponential decay model, which is a typical decay profile for environmental data. No seasonal effects were modeled with the regression given that such effects are not consistently observed and are especially weak for organic compounds.

The relevant regression statistics are summarized in Table 3-6. Scatterplots of the time-series data and best-fit lognormal regression models are presented on Figures 3-5.1 (TSS), 3-5.2 (copper), 3-5.3 (lead), 3-5.4 (zinc), 3-5.5 (phenanthrene), 3-5.6 (pyrene), 3-5.7 (indeno(1,2,3-c,d)pyrene), and 3-5.8 (DEHP). These plots show all significant cases of the simple linear regression test.

The regression analysis confirms that reducing trends are statistically significant in 48 of 49 cases at or greater than 95 percent confidence for the seven original key constituents (i.e., all but copper). This is the same number of trends that was observed in WY2023. A decreasing trend for TSS in OF254 was observed for the first time in WY2021. While a significant decreasing trend for indeno(1,2,3-c,d)pyrene in OF237A has been present for many years, it was not observed in WY2021 through WY2024. All other trends were for the same locations and constituents previously observed.

In addition to the 49 temporal trend tests that have been evaluated in past years, the 2014 QAPP required the City to analyze and evaluate total copper. For three outfalls, OF235, OF237B, and OF245, the data collected since WY2015 has been added to data previously collected under the NPDES program between WY2010 and WY2012. With more data available, an evaluation of time trends has been performed for these outfalls for the last several years. In WY2019, it was determined that sufficient data was available for all seven outfalls to perform an evaluation of time trends, although with less data available, the statistical results will not be fully comparable to data for the remaining constituents. With these seven tests added, there are 51 statistically significant time trends (51 out of 56 tests, or approximately 91 percent of the tests) shown in Year 23, with all trends in the direction of decreasing concentrations. As additional data becomes available, time trends for copper will become more comparable to remaining tests.

The best fit regression equations are used to estimate percent reductions over the 23-year monitoring period for these constituents and outfalls:

- TSS: Approximately 43-74 percent reduction in all seven outfalls
- Copper: Approximately 27-41 percent reduction in OF235, OF237B, and OF245
- Lead: Approximately 69-86 percent reduction in all seven outfalls
- Zinc: Approximately 51-72 percent reduction in all seven outfalls
- PAHs: Approximately 63-90 percent reduction in phenanthrene and pyrene in all seven outfalls, and approximately 56-83 percent reduction in indeno(1,2,3-c,d)pyrene in all outfalls except OF237A
- DEHP: Approximately 46-80 percent reduction in all seven outfalls

3.5.2 Analytical Results Follow Up

In review of the analytical results and trends over time, two anomalies were identified which the City evaluated on a comprehensive basis. The first is the organics uptick that was identified in WY2014 and has been discussed in past reports. The second is the frequent and dispersed higher levels of PCBs in sediment traps that were identified during WY2020. A discussion of each of these issues and a summary of the completed evaluations is provided below.

Organics Uptick Review of the scatterplots (Figures 3-5.1 through 3-5.8) showed that while results for TSS and metals generally appear to fall within the range of expected concentrations, there has been an apparent slight uptick in concentrations of organics realized at all outfalls in recent years. A number of different lines of inquiry were pursued focused on laboratory reporting and performance (see Tacoma 2021 for a complete summary of these efforts). It appears that rather than these concentrations being higher, past concentrations may have been biased low. At this time, organics data appears to be leveling out at the recently observed concentrations, leading to the conclusion that these concentrations are representative of the stormwater quality and remain substantially lower than the concentrations present early in the monitoring program (see boxplots in Appendix G).

Investigations are completed at this time; however, the City will continue to monitor this as additional data becomes available to identify any ongoing anomalies.

Increased PCB levels in Sediment Traps Review of WY2020 SSPM results showed consistently higher levels of PCBs wherever they were detected. Because these higher concentrations were dispersed across several locations and drainage basins, it did not appear to be caused by a specific event or source. Sampling methods remained the same as prior years. Based on this observation of elevated levels, significant investigation into potential causes was initiated as described in the WY2020 report (Tacoma 2021). Following a thorough analysis, no cause for the increased PCB levels was identified. WY2021 and WY2022 SSPM concentrations returned to expected levels. Therefore, it was determined that WY2020 results were not accurate and will not be used to determine steps forward in source tracing investigations.

3.6 CONCLUSIONS

The City has been performing outfall monitoring in the Thea Foss Basin for 23 years. Most of the COCs have undergone significant reductions in concentrations and loads compared to past monitoring efforts in the late 1980s through mid-1990s. The cumulative effect of federal, state, and municipal source control efforts has likely caused the observed improvements in stormwater quality. The City has directed many source control efforts in this watershed, including control of potential TSS, metals, PAH, and DEHP sources. In particular, PAH and DEHP concentrations in the last 13 years have decreased significantly in all the outfalls. Having generally stabilized now for several consecutive monitoring years, the observed concentration reductions are likely an indication of source control effectiveness. The City will continue to evaluate remaining known source(s) of the COCs in the Foss Waterway Watershed. The COCs for each basin and source control priorities are discussed in Section 5.0.

Many significant reductions have been observed in the City's 23-year monitoring record. Forty-eight time trends were shown to be statistically significant in Year 22 (48 out of 49 tests, or approximately 98 percent of the tests) using simple linear regression. All trends were in the direction of decreasing concentrations. As shown below, this is the same number of trends observed WY2020. While the overall number of trends was the same, it should be noted that statistically significant decreasing trend for TSS in OF254 was identified for the first time in WY2021, while the ongoing decreasing trend for indeno(1,2,3-c,d)pyrene in OF237A fell below the level of significance in WY2021 where it remains through WY2024.

Year	No. of Significant time trends	Percent of 49 tests
23	48	98%
22	48	98%
21	48	98%
20	48	98%
19	48	98%
18	47	96%
17	47	96%

16	47	96%
15	47	96%
14	46	94%
13	46	94%
12	44	90%
11	41	84%
10	37	76%
9	26	53%
8	10	20%
7	4	8%

With sufficient copper data now available, analysis shows statistically significant improvement for the three outfalls with the most data, OF235, OF237B, and OF245. In conclusion, the stormwater drainages in the Foss Waterway Watershed are well characterized given the 23-year record of sampling of storm events and ten full years of sampling baseflow events[17]. Strong downward trends are observed, including statistically significant reductions in PAHs, TSS, lead, zinc, copper, and DEHP concentrations in all or a majority of the drains where sufficient data is available, attesting to the effectiveness of the City's stormwater management program.

Year	No. of Significant time trends	Percent of tests
23	51	91%
22	51	91%
21	51	91%
20	50	89%
19	51	91%
18[18]	50	89%
17[19]	49	94%
16	49	94%
15	48	92%
14	47	90%
1-13	Not applicable	

[17] Comprehensive baseflow sampling was discontinued at the end of WY2011, so there is a ten-year record for baseflow. Stormwater sampling has continued and currently has 23 years of monitoring data. Additional baseflow monitoring was completed in WY2016. WY2019 and WY2024.

[18] Beginning of trend analysis for all seven outfalls for a total of 56 tests going forward.

[19] Includes trend analysis for three outfalls (OF235, OF237B, and OF245) for a total of 52 tests.

4.0 THEA FOSS WATERWAY SEDIMENT MONITORING

The purpose of this section is to evaluate trends in marine sediment quality in the Thea Foss Waterway over the post-remediation monitoring period. When new sediment analytical results are available, they are compared to cleanup standards to determine if sediment quality in the waterway is being protected from ongoing sources.

4.1 BACKGROUND

When the waterway sediment remediation projects were completed, the sediment surface had no, or very low concentrations of contaminants present since the surface was either dredged to clean sediments or covered with new, clean capping materials. It was anticipated that ongoing source contributions to the waterway would cause concentrations of contaminants to increase gradually. Over time, the goal is to have the contaminant concentrations equilibrate at a level below the sediment cleanup standards set by the EPA. The City developed a predictive model so that actual sediment monitoring results could be compared to model predictions during the first ten years post-cleanup to determine areas where additional source controls may be needed to remain in compliance. When comparisons were made at Year 10 (2016), the waterway sediments were found to be generally in equilibrium with the current sources, so it was determined that further comparisons to computer model predictions were no longer needed.

4.2 SEDIMENT MONITORING UNDER LONG TERM MONITORING PLANS

Consistent with past reporting, the City is responsible for collecting post-construction sediment quality data in the middle and outer portions of the Thea Foss Waterway and in the Wheeler-Osgood Waterway. In addition, in accordance with the 2022 addendum to the Long-Term Monitoring Plan (2022 LTMP Addendum), the City now collects, post-construction surface sediment quality data in the Head of Thea Foss Waterway for the utilities. During WY2023, monitoring of the marine sediments was performed by the City in accordance with the 2022 LTMP Addendum. These results were presented in the WY2023 report (Tacoma 2024). Sediment analytical results are generally compared to Commencement Bay SQOs, established by the CD, to determine if the waterway is being protected from recontamination, whether any trends of concern are being observed, or if additional source controls may need to be implemented. Marine sediment concentrations are also compared to the Washington State Sediment Quality Standards (SQS) per EPA's request for DEHP throughout the waterway, and for HPAHs only at the head of the waterway.

Based on the results from Year 17 (2023) waterway sediment monitoring, no response actions are proposed at this time. No metals exceeded the SQOs at the Waterway Source Monitoring Sample Stations (Stations). One HPAH (pyrene) was detected just exceeding its SQO at Station WC-8, but no HPAHs exceeded the SQOs or the total HPAH SQS at the Head of the Thea Foss Waterway Stations. There were DEHP SQO and/or SQS exceedances at four of the Stations and at three of the Head of the Thea Foss Stations, but these results were generally consistent with or lower than the DEHP results from the previous monitoring samples collected at these stations. DEHP is a known ongoing urban and waterway operational contaminant and will continue to be monitored at these stations during the next LTMP monitoring event. Waterway source monitoring will continue to occur at the 17 monitoring stations during the next LTMP monitoring event, occurring in Year 22 (2028).

5.0 THEA FOSS PROGRAM EFFECTIVENESS: WY2001 TO WY2024

In this section, program effectiveness of the Thea Foss Source Control Strategy is evaluated by linking source control activities, long-term outfall monitoring results, and post-construction sediment monitoring, as applicable (see Figure 1-1).

Long-term outfall monitoring is used to measure the effectiveness of Tacoma's SWMP and on-the-ground source control activities. Monitoring also provides information for evaluation of the need for any new source control activities. Monitoring tools used to achieve this are temporal trend analysis and spatial trend analysis. Temporal trend analysis provides a measure of changes in the characteristics of the drainage basins over time by identifying increases or decreases of contaminant concentrations. These changes can be the result of source control activities, construction activities, or other impacts in the basin that alter land use. Spatial trend analysis identifies municipal storm drains that may be significantly higher or lower in contaminant concentrations compared to other storm drains in the Foss Waterway Watershed and guides source control prioritization.

Each subsection below includes a presentation of stormwater and SSPM data. Table 3-4 summarizes this analysis for stormwater, while Table 3-5 summarizes the analysis for SSPM. On each of these tables, the top portion provides the results for the evaluation of the 23-year data set, while the bottom portion provides the results when looking at only the more recent data. For stormwater the last two years of data are evaluated, while for SSPM the last five years are evaluated since there is only one data point for each year. The two- or five-year data sets provide some indication of the current source control status and priorities. SSPM data helps to provide information on extremely hydrophobic constituents such as mercury, HPAHs, pesticides, and PCBs, which have a strong affinity for sediments but are poorly soluble and often not detectable in whole-water samples. In conjunction with baseflow and stormwater data, SSPM data is used to identify areas of unusually elevated contaminants in the municipal drainages and to determine the need for focused source control work.

It should be noted that the spatial patterns observed in stormwater are not always consistent with those observed in SSPM. Discrepancies between these data sets may be caused by differential transport of pollutants in dissolved and particulate phases or how the source is introduced into the system (e.g., below ground leak, illicit connection, contact with stormwater).

Post-construction surface sediment data from the waterway is used as another tool to evaluate the effectiveness of existing source controls in the Foss Waterway Watershed, whether additional source controls and BMPs for municipal stormwater discharges or other sources are necessary and appropriate, and if so, where and how they might best be implemented. As discussed in Section 4.0, there were no recontamination issues requiring follow-up identified the most recent in-waterway monitoring performed in 2023. The next sediment monitoring event will be performed in summer 2028 and a summary of results will be presented in the WY2028 report.

Although the recommendations presented in this section are intended specifically for municipal outfalls and activities within their respective drainage basins, stormwater discharges must also be evaluated in the context of other source loads to the waterway. It is anticipated that chemical loads from other sources will be appropriately monitored and managed under other federal, state, and local regulatory programs.

5.1 OUTFALL 230/230A

As indicated in Section 3.0, OF230A was constructed in 2022 and discharges approximately 98 percent of the stormwater previously discharging to OF230 and approximately 26 percent of the stormwater previously discharging to OF235.

Many activities have occurred in OF230A (historically OF230) drainage basin, some of which have contributed to improvements in the quality of baseflow, stormwater, and SSPM. Statistically significant improvements in all index COCs (TSS, lead, zinc, PAHs, and DEHP) have been observed in stormwater in OF230/230A (Table 3-6). Figure 5-1.1 shows the annual average concentrations for stormwater, baseflow, and SSPM.

This section provides a summary of water and sediment quality results within the OF230A drainage basin and compares the results with the major source control and other activities that have occurred within the basin. A more comprehensive description of source control activities performed to date is provided in Appendix A.

Due to construction of OF230A, the FD3A was removed in December 2021 and was not reinstalled until January 2023 (now FD3C) after construction was complete. Therefore, there are no results for this sediment trap in WY2022. Since the sediment trap was not reinstalled until after the start of WY2023, the WY2023 results that are reported reflect deployment for a partial year.

5.1.1 Water and SSPM Quality

Annual and seasonal data for stormwater and SSPM for the COCs and other parameters is used to identify ongoing areas of concern. The following paragraphs summarize the WY2001-WY2024 monitoring results for OF230/230A, where COCs in this outfall are different from other Foss drainage basins, and where source control activities may be focused.

5.1.1.a TSS and Metals

Stormwater. TSS concentrations in OF230/230A stormwater remain among the lowest mean and median observed in all the drainages (see Table 3-3.1 and Figures F-1). Stormwater TSS concentrations in OF230/230A are neutral or average (-1) during the 23-year monitoring period and when looking at data for the last two years (see Table 3-4). As shown in Figure 3-5.1 and Table 3-6, TSS has shown a statistically significant improvement in stormwater quality from 2001 to present. The best-fit regression equations result in an estimated 51 percent reduction in TSS concentrations in OF230/230A in the 23-year monitoring period.

As shown in Figure G-2 and G-3, lead and zinc concentrations in stormwater have remained consistent over the last 23 years, although decreasing somewhat in the last eleven to twelve years. Stormwater quality in OF230/230A for the 23-year data set is roughly the same as other outfalls (0, +1) for lead and zinc, respectively. The last two years is slightly decreased in lead (-1) and slightly increased in zinc (1) as compared to the other outfalls (see Table 3-4).

Analysis for copper at this outfall began in WY2015 so more limited data is currently available for complete and comparable statistical analysis. When looking at the ten years of data available or an analysis of the last two years, OF230/230A is slightly lower in copper as compared to other outfalls (-2 and -1, respectively). While the regression analysis showed a statistically significant increase for several monitoring years since WY2020. When looking at the entire monitoring record, copper levels are generally relatively low compared to other outfalls, and this apparent increasing trend may have been a result of several outliers measured in the spring or summer of WY2017 and WY2019 (see Figures G-5 and G-15). These outliers have more influence in the smaller data set. No outliers were identified in WY2024.

SSPM. Storm sediment in OF230/230A is slightly elevated in lead, mercury, and zinc (all at +1) as compared to most other outfalls when looking at the 23-year monitoring record (see Table 3-5 and Figures F-11 to F-13). When looking at only the last five years of data, SSPM quality in OF230/230A is generally similar to the other basins for lead, mercury, and zinc (all at 0). Copper also appears to be slightly lower (-1) based on all available data, and neutral (0) over the last five years compared to other outfalls.

In WY2015, mercury concentrations at FD3A increased from low levels back to medium levels, and then returned to low levels in WY2016, where they remained through WY2020 (see Figure 2-1.1). In WY2021, mercury concentrations increased back to medium levels at 0.232 mg/kg, just above the threshold used on the figure to define medium level concentrations. There was no sample available for FD3A in WY2022 due to construction of the new outfall in this area. The sediment trap was removed in December 2021 and was installed in January 2023 after construction was complete. This sediment trap was moved to an upstream manhole due to the construction (now FD3C) and is considered representative of the FD3A drainage area. Mercury concentrations during WY2023 remained at medium levels with a slight increase from WY2021 concentrations at 0.355 mg/kg. Due to the increased mercury concentrations in the WY2023 FD3A/FD3C sediment traps the City evaluated the need for additional source tracing for mercury in this basin. Based on a prior investigation, samples were collected from the catch basins at the corner of South 12th and Court A. While cleanup efforts and resampling occurred at this location, results indicate a continued source of mercury contamination in this area (Attachment A.2 OF230A (FD3C) 2024 Source Tracing Investigation). During 2025, the City will investigate the source of elevated mercury concentration in the catch basins sampled during 2024. Of note, the sediment trap sample for the FD3C basin showed a significant decrease in mercury concentrations during WY2024.

As shown in Figures 2-1.1 and 5-2.1, mercury concentrations at all these locations generally decreased somewhat from WY2004 to WY2009, which is believed to be a result of the storm line cleaning project and removal of a point source (see Section 5.1.2 below). Due to increasing or variable contamination levels in sediment traps in recent years (after point source removal and storm line cleaning), source(s) of mercury were determined to still be present, and this led to additional investigation and removal of additional sources. The general stabilization of concentrations at lower levels indicates that sources have likely been controlled at this time. In WY2020, FD18B was removed, and based on results from WY2021, mercury was removed from the analyte list for FD18. Mercury continues to be a monitored analyte in FD3C.

5.1.1.b PAHs

Stormwater. OF230/230A had similar to slightly higher levels of phenanthrene, pyrene, and indeno(1,2,3-c,d)pyrene in stormwater as compared to other outfalls (+1, -1, and +2) when looking at the 23-year monitoring record (see Table 3-4 and figures in

Appendix F). When looking at only the most recent two-year monitoring record, OF230/230A is slightly lower (-1) relative to other outfalls for indeno(1,2,3-c,d)pyrene, pyrene, and phenanthrene.

Most PAH concentrations in stormwater appear to have decreased following line cleaning (see Section 5.1.2) and stayed fairly constant from WY2009 (Year 8) to WY2014 (see Figure 5-1.1 and figures in Appendix G). The apparent uptick in organics concentrations observed in recent years of monitoring was determined not to be an "uptick" but the earlier data was likely biased low. As shown in Table 3-6 and Figures 3-5.5, 3-5.6, and 3-5.7, PAHs (phenanthrene, pyrene and indeno(1,2,3-c,d)pyrene) show a statistically significant improvement in stormwater quality from 2001 to present. The best-fit regression equations result in an estimated 78 to 84 percent reduction in PAHs in OF230/230A in the 23-year monitoring period.

SSPM. Compared to the other outfalls, SSPM quality in OF230/230A is slightly enriched in phenanthrene and pyrene (both at +2) and moderately enriched in indeno(1,2,3-c,d)pyrene (+3) when looking at the 23-year monitoring period (see Table 3-5 and figures in Appendix F). When looking at just the last five years, all three indicator PAHs are neutral relative to other outfalls. As shown in Figure 5-1.1, SSPM PAH concentrations increased slightly between WY2005 to WY2009. SSPM PAH concentrations remained fairly consistent with a slight increase in 2014 but generally decreasing concentrations since that time, with an increase observed in WY2020 and a decrease in concentrations in WY2021. Earlier data had indicated a possible ongoing source(s) of PAHs in the FD3A area that was present in the stormwater sediments but wasn't seen in stormwater concentrations. Source control investigations identified a potential source in this area and cleanup was completed and post-cleanup monitoring is underway. Additional investigation identified another possible source in this area and has been addressed by the property owner. As stated above, there was no sample from FD3A available in WY2022 due to construction in the areas, but the WY2023 and WY2024 sediment trap samples from the new FD3C location exhibited a further decreased in PAH concentrations in this basin. Ongoing monitoring will confirm whether control of the identified sources has been successful (see Section 5.1.2 below).

As shown in Figure 5-2.1, all the OF230/230A sub-basins appear to have also remained relatively consistent over the last 23 years. Overall, PAH concentrations throughout this basin are considered to be relatively low level (see Figure 2-1.2); however, because PAHs have been an ongoing priority for sediment recontamination throughout the waterway, they have been a priority for source control in this basin and others since the beginning of the monitoring program.

5.1.1.c Phthalates

Stormwater. The second highest mean, maximum, median concentrations of DEHP in stormwater were observed in OF230/OF230A (3.12, 44.1, and 1.84 µg/L, respectively) (see Table 3.3.1 and Figures F-8). An unusually high peak concentration of DEHP was observed in Year 7 (WY2008) in OF230, but this appears to be an isolated occurrence (see Figures G-8). OF230/OF230A contains moderately elevated DEHP concentrations (+3) in stormwater when reviewing both the 23-year monitoring record and the last two years of data (see Table 3-4).

As shown in Table 3-6 and on Figure 3-5.8, DEHP shows a statistically significant improvement in stormwater quality from 2001 to present. The best-fit regression equations result in an estimated 71 percent reduction in DEHP in OF230/230A in the 23-year period. In particular, there was a consistent decrease in total phthalate concentrations from WY2008 to WY2014 (see Figures 5-1.1, G-8) that occurred following cleaning of the storm lines (see Section 5.1.2). The apparent uptick in organics concentrations observed in recent years of monitoring was determined not to be an "uptick" but the earlier data was likely biased low. While this slight increase in organic concentrations is observed, concentrations remain substantially lower than the concentrations present early in the monitoring program (see boxplots in Appendix G).

SSPM. OF230/230A SSPM quality is slightly enriched in DEHP and total phthalates (+2 and +1, respectively), and slightly lower in butylbenzylphthalate (-1) relative to other outfalls when looking at the entire 23-year monitoring record (see Table 3-5 and figures in Appendix F). Concentrations of DEHP and total phthalates are neutral (0) and butylbenzylphthalate is slightly lower (-1) relative to other outfalls when looking at the last five years of data.

Within the OF230/230A basin, some of the higher concentrations of total phthalates were found early in the monitoring program in FD3A (max of 161,500 µg/kg in WY2004), in FD3B (max of 130,590 µg/kg in WY2005), in FD16 (max of 161,860 µg/kg in WY2010), and in FD18 (max of 100,520 µg/kg in WY2004) (see Figures 2-1.3 and 5-2.1). Concentrations have generally been much lower since cleaning of the storm drainage system, although intermittent medium level concentrations were noted in FD18 and FD18B in WY2010 and WY2012. Concentrations have been in the low range since WY2012 throughout this basin.

5.1.1.d Pesticides

Stormwater Analysis for bifenthrin in stormwater began in WY2021 under the 2020 QAPP. Statistical analysis will be performed when sufficient data is available.

SSPM Analysis for bifenthrin in SSPM began in WY2015 under the 2014 QAPP. Although there are fewer data points available for statistical analysis, the results are significant ($p<0.05$) and there are only slight discernible differences between outfalls. . Storm sediment in OF230/230A is slightly elevated in bifenthrin (+1) as compared to most other outfalls when looking at the 23-year monitoring record (see Table 3-5 and Figures F-11 to F-13). When looking at only the last five years of data, SSPM quality in OF230/230A is generally similar to the other basins for bifenthrin (0). The highest maximum concentration of bifenthrin was found in OF230/230A (142 µg/kg) with the maximum concentration detected in 2015 (Table 3-3.2).

5.1.1.e PCBs

Stormwater. PCBs are not a COC tested for in stormwater under the 2023 QAPP.

SSPM. Many of the highest concentrations in SSPM PCBs during the monitoring period have been found in the OF230/230A drainage basin (see Figure F-21). WY2017 concentrations at FD3A were less than half the concentration measured in WY2016, however they increased each year between WY2018 and WY2020. Following a thorough analysis, no cause for the across-the-board elevated PCB levels in WY2020 was identified. Therefore, as discussed in Section 3.5.2, it was determined that the WY2020 results were not accurate, and they will not be used to make decisions in source tracing investigations. The WY2021 concentration at FD3A was the lowest observed since 2005, however it remained in the high range relative to other outfalls (Figure 2-1.4). There is no data available for WY2022 due to the construction project in the area, but sampling resumed in WY2023 (FD3C) and WY2023 and WY2024 results remained in the relatively higher range when compared to other drainage areas. Concentrations at FD3-New have fluctuated between low and high levels since WY2014, with WY2022 concentrations returning to the low range relative to other outfalls (Figure 2-1.4).

Concentrations at FD18 decreased from high levels to moderate levels in WY2014, where they remained through WY2017. In WY2018, concentrations increased back to the high range, nearly double the WY2017 concentration, where they remained through WY2021 (Figure 2-1.4). Source control activities have taken place in this area as further described in Section 5.1.2 below. The WY2022 concentration at FD18 returned to the medium range and were below detection limits in the WY2023 and WY2024 FD18 sediment trap samples.

PCB concentrations at FD16 fluctuated between low and medium levels relative to other outfalls since WY2013. The WY2022 concentration was in the high range, however, the WY2023 and WY2024 sediment PCB concentrations were back down below detection limits. Total PCBs in SSPM in OF230/230A were slightly elevated (+1) relative to other outfalls when looking at the entire 23-year monitoring record, but there are no significant differences between outfalls when looking at the last five years of data (see Table 3-5).

As shown on Figure 2-1.4, PCBs concentrations at FD3A, FD3 New, FD18, and FD16 were intermittently at high levels before the 2007 cleaning project and were at low levels immediately following the cleaning (also see Figure 5-2.1 and Section 5.1.2). However, PCB concentrations at all these locations have been fluctuating between low, medium, and high levels since pipe cleaning, with moderate to high levels detected since WY2012. Over the last several years, additional sources of PCBs in the OF230/230A drainage basin have been identified and are in various stages of source control actions. The status of this work is further described below.

5.1.2 Source Control Program Activities

Mercury Source Tracing Investigation. Several source control investigations for mercury have been performed, and actions taken to eliminate identified sources. Additional information can be found in Appendix A.

Due to the likely presence of a remaining source or sources in this drainage basin, specifically the FD18 and FD3A/FD3C areas, a source tracing investigation was launched to further investigate potential sources of mercury in this area.

Results from the mercury investigation and business inspections of the surrounding area indicated that sources of mercury were likely present in two primary areas: one in the sidewalk roof drains draining to a catch basin at the corner of South 12th and Court A, and one found at a lower concentration level at South 11th and Broadway. The South 12th and Court A area was subsequently resolved as described in the WY2020 report. At the South 11th and Broadway location, mercury concentrations continued to trend downward but remained higher than normal catch basin concentrations. The basins were cleaned in November 2018 and resampled in

June 2020. While mercury concentrations continue to trend downward at this location, higher than normal basin concentrations remained present in 2021.

There were no sediment trap results for WY2022 at FD3A due to construction activities in the area. Due to construction of the new outfall (OF230A) this sediment trap was removed in December 2021 and was replaced in a slightly upstream location with the FD3C sediment trap in January 2023, after construction was complete. The FD3C drainage area is considered representative of the FD3A drainage area. WY2021 sediment trap sampling results had increased slightly to medium levels, however the measured concentration of 0.023 mg/kg was just over the 0.20 mg/kg used in Figure 2-1.1 to differentiate low and medium levels. WY2023 sediment trap results continued to exhibit medium concentrations with an increase to 0.355 mg/kg. The WY2024 sediment trap sample for the FD3C basin showed a significant in mercury concentrations during WY2024 with a concentration of 0.1980 mg/kg. The City will evaluate additional source control investigations in this based during 2024. Based on the prior investigation, during 2024 samples were collected from the catch basins at the corner of South 12th and Court A. While cleanup efforts and resampling occurred at this location, results indicate a continued source of mercury contamination in this area (Attachment A.2 OF230A (FD3C) 2024 Source Tracing Investigation). During 2025, the City will investigate the source of elevated mercury concentration in the catch basins sampled during 2024.

PCBs Source Tracing Investigation. Since the inception of the sediment trap monitoring program, intermittently high levels of PCBs have been identified in some of the OF230/OF230A sediment traps (see Figure 2-1.4). After the lines were cleaned in 2007, concentrations decreased, but over time increased back to moderate to high levels. Because of the likely presence of a remaining intermittent source or sources, a source tracing investigation was launched in 2012 in conjunction with the mercury source tracing work described above, to further investigate potential sources of PCBs in this drainage basin.

In 2013, the investigation indicated that elevated levels of PCBs were present in the caulking materials from two properties: the Wells Fargo and Sound Physicians (now known as 1123 Pacific Partners) properties located in the vicinity of South 12th and South 13th Streets, between Pacific Avenue and Court A in downtown Tacoma. It was determined likely that these materials were the source of PCB contamination found in the nearby catch basins in the targeted drainage areas. To ensure that the contamination did not reach the waterway, the system was cleaned in early 2015.

Significant remediation work has been performed at both properties. The catch basins in the area were cleaned and during 2022, the City resampled the catch basins adjacent to the Wells Fargo building and found that there appears to be a continuing source of contamination at the southeast corner of the property. The catch basin in the southeast corner of the site showed a concentration of 0.9 mg/kg in 2016 and 1.8 mg/kg in 2017, and as a result the system was cleaned in 2017. Following this cleaning, this same catch basin continued to exhibit elevated PCB concentrations.

At the 1123 Pacific Partners site during 2022, the City attempted to resample three adjacent catch basins. One of the locations did not have enough sediment to sample and the two other catch basin samples exhibited concentrations that were reduced from 2020 levels but were still considered elevated concentrations. It was discovered that the property was purchased by new owners in 2022 and they were unaware of the PCB remediation at this location. During discussions with the property owners/managers of the Wells Fargo and 1123 Pacific Partners sites, it was agreed that the City would clean and resample the surrounding catch basins in 2023 to determine if this was an ongoing issue.

Subsequently the City cleaned the stormwater system to determine if the sources of PCBs are ongoing or if the remediation efforts at these locations were successful. Insufficient sediments for sampling were noted during 2023 but City staff were able to sample most of the catch basins surrounding the Wells Fargo complex and 1123 Pacific Avenue in 2024. All collected samples were non-detect for PCBs indicating that the remediation efforts at these locations were successful. Two of the catch basins still did not have sufficient sediment to collect a sample and these locations will be retargeted in 2025 for sample collection.

As indicated above, WY2022 SSPM results were not available for FD3A due to construction activities. The new sediment trap at this location (FD3C) was replaced in January 2023, so WY2023 results only represents a partial year.

SSPM PCB concentrations during WY2023 in the FD3C sediment trap remained at high levels with a slight decrease from WY2021 concentrations at 485 µg/kg. Concentrations during WY2023 were the lowest seen since the initial investigation begin in this basin. However, the WY2024 sediment trap results increased with a concentration of 1380 µg/kg. During 2025 the City will continue to follow-up on private property cleanups performed, and complete ongoing system cleaning and monitoring for PCBs in this drainage basin.

While the areas discussed above were identified as the highest priority, several other areas with lower levels of PCB contamination were also identified through the initial investigation. These areas were initially assigned lower priority ratings since contaminant levels were lower. Storm drains throughout this area were cleaned in February 2015, and the area resampled in March/April 2016. Results indicated ongoing lower-level sources of PCBs in several areas, leading to additional investigation. Updates on each of these PCB investigations are provided below, and more information can be found in Appendix A of prior monitoring reports.

- South 9th and Fawcett St. in the FD18 area. Investigation led to the identification of the CenturyLink building as the likely source of PCB contamination found in the nearby catch basins and the City worked with the business and regulatory agencies to work towards a remediation solution at this site. The property owner completed the encapsulation project for the building in 2020. Following completion of building remediation in 2020, the storm system was cleaned. In September 2021, sediment samples were taken from adjacent catch basins, and elevated PCB concentrations were detected. At the City's request, the property owner pressure washed the sidewalks to remove residual materials. In 2022, a construction project began at this location, which involved the removal and replacement of all of the curb/gutter and sidewalk at this intersection. The project also removed one of the catch basins sampled during this investigation. Sediment trap PCB concentrations in FD18 have continued to decrease since remediation work was completed in 2020. PCB concentrations dropped to from high to medium levels for the first time since 2017 in this basin and were below detection limits in the WY2023 and WY2024 FD18 sediment trap sample (see Figure 2-1.4). There are no further investigations planned at this time. Sediment trap data will continue to be reviewed and additional investigations will be conducted if concentrations increase.

- South 13th and Commerce. Initial source tracing efforts did not turn up a likely source. The catch basins were cleaned and resampled during 2024 and one catch basin sediment sample exhibited elevated PCB concentrations. Based on these results follow-up sampling was completed on suspected PCB-containing caulking on the sidewalk to the north of this catch basin. Sample concentrations ranged from non-detect to 16,100 µg/kg, below any actionable concentration (Ecology 2024). The catch basin with the elevated concentration will be placed on a yearly maintenance schedule for cleaning. In addition, the City's Department responsible for sidewalk maintenance has been notified of the PCB issue and will take appropriate measures if replacement of this sidewalk occurs.

- Finally, the Park Plaza parking garage located at South 10th and Pacific Avenue was identified in 2016 as having exposed caulking, sealant, and sediment materials that are likely the source of PCBs in the storm system. The City, as property owner, continues to work with EPA to assess the extent of contamination and develop a remediation plan.

The City is continuing to coordinate efforts to keep contaminants out of the municipal stormwater collection system. Sediment trap results for WY2025 will be assessed to monitor the ongoing conditions in this basin as additional sources are controlled. More detailed information regarding these investigations can be found in Appendix A.

PAH Source Tracing Investigation. Based on sediment monitoring in OF230/230A, the FD3A/FD3C drainage area was identified as having ongoing issues with PAH sediment contamination. A source control investigation identified elevated levels of PAHs in a specific segment of the FD3A drainage area leading to identification of a parking area at the corner of Court A and South 14th Street as having the presence of elevated PAH concentrations.

With the source was identified, the City worked cooperatively with the property owner to clean and repair their private onsite storm system. Repair of the private system was completed in October 2022, and the municipal catch basins that the private systems connect to were cleaned in November 2022. Public catch basins will be resampled in 2025 when sufficient sediment has accumulated.

PAH concentrations in FD3A decreased over time from 111,295 µg/kg in WY2016 to 68,868 µg/kg in WY2024. This overall decrease in concentrations indicates that efforts to date have been successful. There are no new PAH investigations are planned in this basin for 2024. Staff will review the 2025 sediment trap data for FD3C (Formerly FD3A) when it becomes available to see if the PAH contamination has returned or remains at reduced levels. More detailed information regarding this investigation can be found in Appendix A.

FD16 PCB Source Tracing Investigation. Composite catch basin samples were taken in the FD16 drainage basin during 2017 to investigate the ongoing presence of PCBs is this area. Through this sampling, the City discovered elevated PCBs in catch basin sediments from three segments in the FD16 drainage basin. Following continued investigation in 2018, five discrete catch basin locations were cleaned, and resampling suggested that the relatively low-level concentrations of PCBs were emanating from building materials located at 1301 and 1331 Tacoma Avenue South. PCBs were not detected in FD16 in WY2019 orWY2020 However, PCB concentrations then rebounded to higher levels in WY2022 with a concentration of 430 µg/kg, and then in WY2023 and WY2024 sediment PCB concentrations were back down below detection limits.

During 2023, short term sediment traps were installed in multiple locations within the FD16 sub basin to try and narrow down the source of PCB contamination within the basin. The traps were deployed during October 2023 in drainage areas that had previously exhibited elevated concentrations of PCBs. No PCBs were detected in these sediment samples. The city will continue to monitor the sediment trap results to determine if this is an ongoing issue requiring further investigation.

Storm System Cleaning. In 2007, the municipal storm system in OF230/OF230A was cleaned and video inspected. The objective of this project was to remove residual sediments in the storm drains that may contain legacy contaminants. As discussed in detail in the WY2011 report, storm system cleaning contributed to significant reductions in stormwater concentrations. Storm line cleaning is an important component of the City's source control program, and the City is currently on a schedule of cleaning each storm system area on a 20-year cycle. Additional cleaning is performed on an as-needed basis to address specific maintenance needs. In combination with other source control activities, storm system cleaning appears to have been effective at removing all seven of the compounds tested. The City is statistically evaluating the results to determine whether a maintenance schedule different from the City-wide schedule for pipe cleaning projects is needed within this sensitive basin.

Statistically significant reductions were evident for TSS, lead, zinc, PAHs, and DEHP (see Table 2-2). Line cleaning, along with other source control activities, resulted in reductions of TSS at 30 percent, lead at 53 percent, zinc at 29 percent, DEHP at 59 percent, and PAHs (phenanthrene, pyrene, and indeno(1,2,3-c,d)pyrene) at 77-82 percent.

Enhanced Street Sweeping Program. In January 2007, the City's street sweeping program was enhanced in an attempt to reduce sediment buildup in the storm sewer system. Under the enhanced program, the sweeping frequency was increased, air regenerative sweepers replaced mechanical sweepers, and the City also increased communications with residents, which helped raise awareness of the importance of the street sweeping program.

Statistically significant reductions were evident for TSS, lead, zinc, PAHs, and DEHP (see Table 2-3.1). Street sweeping, along with other source control activities, resulted in reductions of TSS at 34 percent, lead at 54 percent, zinc at 31 percent, DEHP at 58 percent, and PAHs (phenanthrene, pyrene, and indeno(1,2,3-c,d)pyrene) at 75-81 percent. PAH concentrations shown in Figure 5-1.1 show a fairly consistent decrease and then leveling off between WY2007 and WY2015 that occurred following the start of street sweeping and the cleaning of the storm lines. An apparent uptick in organics concentrations observed in the last eight years of monitoring was evaluated by the City, as discussed in Section 3.5.2. Recent results were determined to be representative, while earlier results were likely biased low. While this slight increase in organic concentrations is observed, concentrations remain substantially lower than the concentrations present early in the monitoring program (see boxplots in Appendix G).

General Source Control Activities. In addition to the ongoing investigation and maintenance activities described above, the City continues to implement other source control program elements in the OF230A drainage basin, which are described in more detail in Appendix A.

5.1.3 Outfall 230A 2024 Work Plan

As shown in Table 3-6 and Figures 3-5.1 to 3-5.8, TSS, lead, zinc, PAHs (phenanthrene, pyrene, and indeno(1,2,3-c,d)pyrene), and DEHP all show statistically significant improvement in OF230/230A stormwater quality from 2001 to present with an estimated 47 percent reduction for TSS, 82 percent for total lead, 51 percent for total zinc, 79-84 percent reduction for the three index PAHs (phenanthrene, pyrene, and indeno(1,2,3-c,d)pyrene), and 69 percent for DEHP in the 23-year period. While there is not a statistically significant trend for copper in WY2023, mean copper concentrations in OF230A are among the lowest relative to the other Foss outfalls (Figure F-5). In looking at box plots for individual years, there are several outliers identified dating back to WY2017 (Figure G-5). However, when looking at the entire monitoring record (Figure F-5), there are four outliers identified: two in WY2017, one in WY2018 and one in WY2019. There were no copper outliers identified during WY2024 based on this year's data or the entire monitoring record and copper in this basin is moderately lower when compared to other basins as described below.

As described in detail above, OF230A monitoring results generally show:

- Stormwater – Slightly lower TSS and Pyrene (-1), moderately lower copper (-2) and moderately higher DEHP and indeno(1,2,3-cd)Pyrene (+2) concentrations compared to other outfalls when evaluating the 23-year monitoring record (see Table 3-4). DEHP is moderately higher (+2) when looking at only the last two years of data. Copper (-2) is moderately lower in concentration compared to other outfalls based both on the last eight years of data that are available and over the last two monitoring years. Concentrations of other COCs are generally similar to concentrations found in other outfalls.

- SSPM – Outfall results show moderately higher indeno(1,2,3-c,d)pyrene (+3), phenanthrene (+2), and pyrene (+2) compared to other sediment trap locations (see Table 3-5) when evaluating the entire 23-year monitoring record. When looking only at more recent data, indeno(1,2,3,cd)pyrene, phenanthrene and pyrene have relatively neutral concentrations when compared to other outfalls (0 for all). Over time, upline sediment traps have shown possible areas of concern primarily for mercury and PCBs, and to a lesser extent PAHs and phthalates. Source control efforts have either been completed or are ongoing as described above and in Appendix A.

Therefore, the following recommendations are included in the 2025 Work Plan for OF230A:

- Continue follow-up on private property cleanups performed, and complete ongoing system cleaning and monitoring for mercury, PCBs, and PAHs as appropriate in the areas draining to FD3C.
- Continue evaluation of potential sources of spring/summer outliers for copper to stormwater.
- Review the WY2025 SSPM data to evaluate the potential for ongoing sources in the various investigation areas.

5.2 OUTFALL 235

Many activities have occurred in the OF235 drainage basin during the monitoring period, some of which are contributing to improvements in stormwater and SSPM quality. Statistically significant improvements in all index COCs (TSS, lead, zinc, PAHs, and DEHP) have been observed in stormwater in OF235 (Table 3-6). In addition, copper has shown significant improvement in stormwater based on a more limited data set. It is, therefore, likely that the City's source control efforts have helped to reduce these constituents in OF235. Figure 5-1.2 shows the annual average concentrations for stormwater, baseflow, and SSPM.

This section provides a summary of water and sediment quality results within the OF235 drainage basin and compares the water and sediment data results with the major source control and other activities that have occurred within the basin. A more comprehensive description of source control activities performed is provided in Appendix A.

As indicated in Section 3, due to the construction of the stormwater interceptor along Jefferson Street, a portion of the historic OF235 drainage area now drains to the new OF230A and the final rerouting of the drainage system was completed on December 15, 2022. OF230A receives approximately 98 percent of the stormwater previously discharging to OF230 and approximately 26 percent of the stormwater previously discharging to OF235.

5.2.1 Water and SSPM Quality

Annual and seasonal data for stormwater and SSPM for the COCs and other parameters is used to identify ongoing areas of concern. The following paragraphs summarize the WY2001-WY2024 monitoring results for OF235, where COCs in this outfall are different from other Foss drainage basins, and where any subsequent source control activities may be focused.

5.2.1.a TSS and Metals

Stormwater Moderate TSS concentrations have been observed in stormwater from OF235 with mean and median TSS concentrations of 54.8 and 39.3 mg/L, respectively. The second highest maximum TSS concentration (441 mg/L) during the monitoring program was observed at OF235 in WY2001 (see Table 3-3.1 and Figure F-1).

TSS in OF235 is similar (-1) compared to other outfalls when looking at the entire 23-year monitoring record in the Foss Waterway Watershed (see Table 3-4). As shown in Table 3-6 and Figure 3-5.1, TSS shows a statistically significant improvement in stormwater quality from 2001 to present with an estimated 74 percent reduction of TSS in 23 years. The trend is gradual over time and does not lend itself to be a direct result of any one action. Figures 5-1.2 and G-1 also show the gradual downward trend of TSS over the last 23 years.

The highest mean and median concentrations of copper (28.92 and 22.90 µg/L, respectively) and lead (53.60 and 41.15 µg/L, respectively) were observed in OF235 stormwater. In addition, the highest overall copper concentration (162 µg/L) occurred in OF235 in 2015 (Table 3-3.1). This event appears to be relatively isolated, although other high and moderate outliers are present throughout available data. OF235 is significantly elevated in lead (+6) and copper (+6) compared to all other outfalls when looking at the 23-year monitoring record (see Table 3-4). It should be noted that the data set for copper is smaller and the statistical analysis less robust than for other constituents. When only the last two years of monitoring data for OF235 is evaluated, lead (+6) and copper (+6) are still significantly. Zinc remains slightly elevated relative to other drains for the full monitoring record (+1) and the past two years (+2).

As shown in Table 3-6 and Figures 3-5.3 and 3-5.4, lead and zinc show a statistically significant improvement in stormwater quality from 2001 to present, with an estimated 70 percent and 60 percent reduction respectively in 23 years. OF235 also shows a statistically significant improvement in stormwater quality for copper based on available data, with an estimated 32 percent reduction in concentrations. The trends are gradual over time and do not lend themselves to be a direct result of any one action. Figure 5-1.2 shows the gradual decreasing trend of zinc over the last 23 years, and the boxplots in Appendix G also show this decreasing trend for both lead and zinc. It is, therefore, possible that the City's source control efforts have helped to reduce lead and zinc in OF235. However, the continuing relatively higher stormwater concentrations indicate that there may be a source(s) of lead and copper in OF235 since levels are greater than those found throughout the Foss Waterway Watershed.

SSPM Consistent with stormwater results, total lead in SSPM is slightly elevated in OF235 (+2) during the last 23 years (see Table 3-5). Results for all other metals are the same or only slightly different relative to other outfalls with copper, mercury, and zinc at -1, 0, and 0, respectively. When looking at only the last five years, all metals are neutral or slightly elevated (copper, lead, and zinc all at +1, and mercury at 0) in OF235 SSPM compared to other outfalls.

5.2.1.b PAHs

Stormwater OF235 stormwater contained the highest mean and maximum concentrations of the very light end compounds naphthalene and 2-methylnaphthalene, with the maximum concentrations detected early in the monitoring program (see Table 3-3.1). ANOVA results show that OF235 is neutral to slightly lower than average for PAHs (phenanthrene and indeno(1,2,3-c,d)pyrene at 0, and pyrene at -1) when looking at the entire 23-year monitoring record (see Table 3-4 and boxplots in Appendix F).

As shown in Figure 5-1.2 and in the boxplots in Appendix G, LPAH and HPAH concentrations in stormwater generally decreased between 2007 and 2009-2010 and remained fairly consistent until WY2014. These decreases are believed to be due in large part to the storm line cleaning project (see Section 5.2.2). Concentrations have remained fairly consistent over the last eight years. When only the last two years of monitoring data are evaluated, phenanthrene, indeno(1,2,3-c,d)pyrene, and pyrene concentrations are slightly lower (-1) compared to other outfalls.

As shown in Table 3.6 and Figures 3-5.5, 3-5.6, and 3-5.7, PAHs (phenanthrene, pyrene and indeno(1,2,3-c,d)pyrene) show statistically significant improvement in stormwater quality from 2001 to present. The best-fit regression equations result in an estimated 70-84 percent reduction in each of these PAHs in OF235 in the 23-year monitoring period. The apparent uptick in organics concentrations observed in the last eight years of monitoring was evaluated by the City, as discussed in Section 3.5.2, and recent results were determined to be representative while earlier results were likely biased low. While this observed slight increase in organic concentrations is observed, concentrations remain substantially lower than the concentrations present early in the monitoring program (see boxplots in Appendix G).

SSPM PAH concentrations are relatively neutral for SSPM at OF235 compared to the other outfalls during both the 23-year monitoring period (-1 to +1) and the last five years (all at 0). As shown in Figure 2-1.2, PAH concentrations in storm sediment are considered low level and are similar to other outfall and upland locations. In fact, LPAH and HPAH concentrations in storm sediment have remained fairly consistent in this basin over the last 23 years (see Figure 5-1.2).

5.2.1.c Phthalates

Stormwater The highest mean and maximum stormwater concentrations of DEHP during the 23-year monitoring period were observed in OF235 (3.82 and 97 µg/L). Unusually high peak concentrations of DEHP were observed in WY2003 (Year 2) in OF235, but these appear to be isolated occurrences (October 2002 and December 2002) and are not evident in recent years (see Table 3-3.1, Figure 5-1.2 and boxplots in Appendices F and G). The cause of the outliers during WY2003 is unknown.

DEHP is usually the phthalate compound with the most frequent detections and the highest median concentrations. However, the maximum concentration of diethylphthalate was also detected in OF235 stormwater (590 µg/L) in December 2002. The cause of this occurrence is also unknown and may be related to the high concentrations of DEHP in October and December 2002. OF235 contains significantly elevated DEHP concentrations (+5) relative to other outfalls when looking at the entire 23-year monitoring period (see Table 3-4). When only the last two years of monitoring data are evaluated, DEHP concentrations in OF235 are only moderately elevated (+3) compared to other outfalls. The relatively elevated level of DEHP in the entire 23-year monitoring period is likely a result of several high outliers observed in this basin over time (see Figure G-8).

As shown in Table 3-6 and Figure 3-5.8, DEHP shows a statistically significant improvement in stormwater quality from 2001 to present. The best-fit regression equations result in an estimated 80 percent reduction in DEHP in OF235 in the 23-year monitoring period. In particular, there is a consistent decrease in phthalate concentrations from the highest concentrations in WY2003 (Year 2) to WY2013 (Year 12) (see Figures 5-1.2, G-8, and G-18) which is believed to be due to the storm line cleaning project and other source control activities (see Section 5.2.2). The apparent uptick in organics concentrations observed in the last seven years of monitoring was evaluated by the City, as discussed in Section 3.5.2, and recent results were determined to be representative while earlier results were likely biased low. While this observed slight increase in organic concentrations is observed, concentrations remain substantially lower than the concentrations present early in the monitoring program (see boxplots in Appendix G).

SSPM Even though DEHP in OF235 was significantly elevated in stormwater (+5), in storm sediment, the average concentration is only slightly elevated (+1) compared to the other outfalls in the 23-year monitoring period and in the last five years (see Table 3-5 and Figure F-19). As shown in Figure 2-1.3, phthalate concentrations are at low levels in OF235, and concentrations are similar to other outfall and upland locations. Discrepancies between the stormwater and storm sediment data sets may be caused by differential transport of pollutants in dissolved and particulate phases.

5.2.1.d Pesticides

Stormwater Analysis for bifenthrin in stormwater began in WY2021 under the 2023 QAPP. Statistical analysis will be performed when sufficient data is available.

SSPM Analysis for bifenthrin began in WY2015 under the 2014 QAPP and while there are fewer data points available for statistical analysis, the results are significant ($p<0.05$), and concentrations are neutral (0) in OF235 relative to other outfalls based on available data.

5.2.1.e PCBs

Stormwater PCBs are not a COC tested for under the 2023 QAPP.

SSPM Of 235 was neutral (0) relative to other outfalls when looking at the entire 23-year monitoring record. There were no significant differences between outfalls when looking at the last five years of data (see Table 3-5).

At FD6, concentrations increased to medium levels for the first time in WY2019, with a concentration of 280 µg/kg and further increased to high levels WY2020 with a concentration of 420 µg/kg (see Figure 2-1.4). PCBs have not been detected at this location since WY2020. Following a thorough analysis, no cause for the increased PCB levels that were consistently present in WY2020 results was identified. Therefore, it was determined that WY2020 results were not accurate and will not be used to determine steps forward in source tracing investigations.

5.2.2 Source Control Program Activities

Outfall 235 Stormwater and Baseflow Lead, PAHs, and Phthalates Source Investigation Based on stormwater monitoring in OF235, this basin was identified as having ongoing issues with lead in stormwater. In August 2014, staff began an investigation to identify possible sources of the elevated lead concentrations in stormwater. Elevated concentrations of phthalates and PAHs were also observed in historic baseflow discharges. The intent of this work was to identify specific problem areas within the drainage basin for further investigation.

Through these investigations, three locations were identified where potentially contaminated groundwater was seeping from the hillside and discharging to the City's stormwater system. Construction activities are ongoing in two of these areas which will likely provide some level of control.

Through 2024, the City monitored the Tacoma Town Center Project located between Jefferson Avenue South and Tacoma Avenue South at 21st Street to ensure proper BMPs were maintained. Stormwater discharge for this construction project is currently managed under a construction stormwater general permit through the Department of Ecology. The permit for Tacoma Town Center (#WAR306067) is currently active and is set to expire on December 31, 2025. The property is currently for sale and the City will continue to ensure the on-site stormwater pond is functioning as designed.

Outfall 230A/235 Copper Outlier Investigation Copper was newly identified as a contaminant of concern within OF235 and to a lesser extent OF230/OF230A in WY2021 due to intermittent elevated concentrations in stormwater with other potential outliers beginning in WY2015. All of these outliers as well as those detected since that time have been detected in the spring and summer. Due to the seasonal and intermittent nature of the outlier copper concentrations showing up in stormwater samples, it was theorized that it is possible that excess copper is caused by a seasonal commercial cleaning or maintenance operation taking place in the drainage basin. Copper is used as a moss killer on roofs and sidewalks as well as being present in some herbicides.

City staff identified buildings with copper exteriors as possible contributors including Tacoma's Union Station due to its large copper roof. On April 27, 2022, the City sampled five private catch basins around the property of Union Station, multiple of which had roof drain connections. The copper results ranged from 86 ppm to 4,360 ppm and all of the catch basins were heavily impacted with sediment. The stormwater leaving this site splits with approximately half going to OF230A and half going to OF235.

Based on these results, in June 2022, EC staff reached out to the property manager for this facility and requested that they clean their catch basins and connecting laterals. The City received confirmation that the catch basins were cleaned on March 27, 2023, and it was confirmed that roof cleaning is conducted using a “light solution of laundry detergent” and only in moss affected areas. As a federal building they are required to Safer-Choice (EPA) or Biobased (USDA) products. EC staff resampled the catch basins in 2024 at this site and several catch basins exhibited elevated concentration of copper in the catch basin sediment. After subsequent letters and meetings with Union Station staff, it was determined that this property will increase the catch basin maintenance to bi-annual and provide the environmental compliance group with proof of cleaning. The City will continue to look for other potential sources of copper within this drainage basin if needed based on future sampling results.

More information regarding this investigation can be found in Appendix A.3

Storm System Cleaning In 2007, the municipal storm system in OF235 was cleaned and video inspected. The objective of this project was to remove residual sediments in the storm drains that may contain legacy contaminants. As discussed in detail in the WY2011 report, storm system cleaning contributed to significant reductions in stormwater concentrations. Sewer line cleaning is an important component of the City’s source control program, and the City is currently on a schedule of cleaning each storm system area on a 20-year cycle. Additional cleaning is performed on an as needed basis to address specific maintenance needs. In combination with other source control activities, storm system cleaning appears to have been effective at removing all seven of the compounds tested. The City is statistically evaluating the results to determine whether a maintenance schedule different from the City-wide schedule for pipe cleaning projects is needed within this sensitive basin.

Statistically significant reductions were evident for TSS, lead, zinc, PAHs and DEHP (see Table 2-2). Line cleaning, along with other source control activities, resulted in reductions of TSS at 60 percent, lead at 57 percent, zinc at 43 percent, DEHP at 77 percent, and PAHs (phenanthrene, pyrene, and indeno(1,2,3-c,d)pyrene) at 75-78percent.

Enhanced Street Sweeping Program In January 2007, the City’s street sweeping program was enhanced in an attempt to reduce sediment buildup in the storm sewer system. Under the enhanced program, the sweeping frequency was increased, air regenerative sweepers replaced mechanical sweepers, and the City also increased communications with residents, which helped raise awareness of the importance of the street sweeping program.

Statistically significant reductions were evident for TSS, lead, zinc, PAHs and DEHP (see Table 2-3.1). Street sweeping, along with other source control activities, resulted in reductions of TSS at 60 percent, lead at 56 percent, zinc at 42 percent, DEHP at 76 percent, and PAHs (phenanthrene, pyrene, and indeno(1,2,3-c,d)pyrene) at 73-77 percent.

General Source Control Activities In addition to the ongoing maintenance activities described above, the City is continuing to implement other source control program elements in the OF235 drainage basin which are summarized here and described in more detail in Appendix A. Several other source control actions have been completed or are currently underway in this basin.

5.2.3 Outfall 235 2025 Work Plan

TSS, lead, zinc, DEHP, and PAHs have all shown a statistically significant improvement in stormwater quality from 2001 to present (see Table 3-6 and Figures 3-5.1 to 3-5.8). As shown in Table 3-6, TSS shows an estimated 74 percent reduction over 23 years, lead at 74 percent, zinc at 59 percent, DEHP at 80 percent and PAHs (both light and heavy PAH fractions) at 70-84 percent reductions. In addition, with eleven years of copper data now available for OF235 an overall evaluation of the source control program can include trends for this outfall. Copper concentrations in stormwater at OF235 show statistically significant improvement during this period with an estimated 32 percent reduction.

As described in detail above, OF235 results generally show:

- Stormwater – Slightly lower TSS and pyrene (-1) and slightly higher zinc (+1), and significantly higher lead (+6), copper (+6) and DEHP (+5) as compared to other outfalls when evaluating available data from the 23-year monitoring record (see Table 3-4). When looking at only the last two years of data, copper (+6) and lead (+6) are significantly elevated, zinc (+2) is slightly elevated, and DEHP (+3) is only moderately elevated.

- SSPM – Slightly higher lead (+2) compared to other sediment trap locations when evaluating the entire 23-year monitoring record but very little notable difference in SSPM quality at OF235 when looking at only the last five years (see Table 3-5).

Therefore, the following recommendation is included in the 2025 Work Plan for the OF235 drainage basin:

- Evaluate the need for additional source control work for lead, copper and DEHP in stormwater and follow-up on major construction activities (Tacoma Town Center) in this area. Once completed, these construction activities are expected to have a positive impact on controlling the flow of potentially contaminated groundwater into the storm drainage system.

- Continue evaluation of potential sources of spring/summer outliers for copper to stormwater.

5.3 OUTFALL 237A

Many source control efforts have been targeted in the OF237A drainage basin and have resulted in improvements in stormwater and SSPM quality. TSS, lead, zinc, phenanthrene, pyrene, and DEHP concentrations have all shown a statistically significant improvement in stormwater quality from 2001 to present. Indeno(1,2,3-c,d)pyrene showed statistically significant improvement for many years, however that trend was not present in WY2021, WY2022, WY2023 or WY2024 possibly due to several higher concentrations or outliers detected in recent years. It is likely that the City's source control efforts have helped to reduce concentrations of the key constituents in OF237A. Figure 5-1.3 shows the annual average concentrations for stormwater, baseflow, and SSPM.

This section provides a summary of water and sediment quality results within the OF237A drainage basin and compares the water and sediment data results with the major source control and other activities that have occurred within the basin. A more detailed description of source control activities is provided in Appendix A of prior reports.

5.3.1 Water and SSPM Quality

Annual and seasonal data for baseflow, stormwater and SSPM for the COCs and other parameters is used to identify ongoing areas of concern. The following paragraphs summarize the WY2002-WY2024 monitoring results for OF237A[20], where COCs in this outfall are different from other Foss drainage basins, and where subsequent source control activities may be focused.

5.3.1.a TSS and Metals

Stormwater TSS, lead and zinc concentrations at OF237A (-1, -2 and -1, respectively) are slightly below average in the 23-year monitoring period (see Table 3-4). Concentrations are more neutral to slightly higher when looking at only the last two years of data for the same constituents (+1, -1, and +1, respectively). Analysis for copper at this outfall began in WY2015 so less data is currently available for a comprehensive statistical analysis. Based on available data, copper has moderately lower concentrations than other outfalls (-3) when looking at all eight years of and slightly lower concentrations (-1) when looking at only the last two years of data.

In stormwater, OF237A has the among the second lowest mean and median TSS concentrations at 49.1 and 34.3 mg/L, respectively (see Table 3-3.1 and Figure F-1), despite having the highest TSS concentration detected during the monitoring period in WY2017 (668 mg/L in May 2017). The reason for this outlier is unknown but appears to be an anomalous event.

As shown in Figures 3-5.1, 3-5.3, 3-5.4 and Table 3-6, TSS, lead, and zinc have all shown statistically significant improvement, with TSS showing a 43 percent reduction, lead showing a 69 percent reduction, and zinc showing a 53 percent reduction in stormwater quality from 2001 to present. A statistically significant reduction is not yet realized for copper with a more limited data set.

SSPM OF237A exhibits lower concentrations of lead and mercury in SSPM compared to the smaller drains OF230/OF230A, OF235 and OF243, and is lower for copper and zinc in these same outfalls as well as OF245, (see boxplots in Appendix F). ANOVA statistical tests on SSPM showed that OF237A is slightly lower in metals concentrations (copper, lead, and mercury at -1, and zinc at 0) compared to other outfalls for the 23-year monitoring record (see Table 3-5). When looking at only the last five years of monitoring data, OF237A is neutral (0) for lead, mercury, and zinc in comparison to other outfalls. Analysis for copper at this outfall began in WY2015 so less data is currently

[20] As described in Section 3.2.4 of the WY2012 report, the OF237A (for data prior to February 26, 2006) and OF237A New data sets (for data after February 26, 2006) were merged in 2012. While the data sets are generally the same, the box plots in Appendix G appear to show a change in the data in between WY2006 (Year 5) and WY2007 (Year 6). This suggests that there are small differences in the two sampling locations. The OF237A New monitoring location measures contributions from the entire basin whereas the OF237A monitoring location was upstream of the smaller FD2A branch of OF237A storm drain system

available for a comprehensive statistical analysis. Copper is neutral (0) compared to other outfalls when looking at the full nine years of data and when considering just the past 5 years.

5.3.1.b PAHs

Stormwater OF237A stormwater quality shows evidence of being somewhat enriched in HPAHs with higher max, mean and median concentrations of several HPAHs observed (see Table 3-3.1 and boxplots in Appendix F) compared to other drains. The maximum concentrations occurred in 2007. PAH concentrations over WY 8 through 21 are relatively low compared to the previous monitoring years (see boxplots in Appendix G).

ANOVA results show that OF237A is significantly higher than average for indeno(1,2,3-c,d)pyrene (+6), moderately higher for pyrene (+3), and slightly higher for phenanthrene (+1) relative to other drainages over the 23-year monitoring record (see Table 3-4). When looking at only the most recent two-year monitoring record, OF237A slightly higher in TSS, zinc, and DEHP (+1, +1, and +2, respectively), is significantly higher in concentration for phenanthrene, pyrene, and indeno(1,2,3-c,d)pyrene (+6 for all three). High outliers have been identified periodically throughout the monitoring period, including a moderate outlier for indeno(1,2,3-c,d)pyrene in WY2022, and these are likely contributing to this observation (see Figure G-6). The City is evaluating potential causes and seasonality for these outlier concentrations.

As shown in Table 3-6 and Figures 3-5.5, 3-5.6, and 3-5.7, phenanthrene and pyrene show a statistically significant improvement in stormwater quality from 2001 to present. There is an estimated 63 and 73 percent reduction in these PAHs, respectively in 23 years. This is likely due to a combination of actions including the point source removals and sewer line cleaning projects. While there has been a statistically significant improvement in indeno(1,2,3-c,d)pyrene concentrations in past years, this trend was not present in WY2021 through WY2024, likely due to several higher concentrations detected during these monitoring years. Boxplots in Appendix G also show the decreasing trends of PAHs in stormwater. A summary of the City's evaluation of the cause of the slight uptick in results over the past several years is included in Section 3.5.2.

SSPM As shown in Table 3-5, storm sediment in OF237A is slightly to moderately enriched in the indicator PAHs phenanthrene, indeno(1,2,3-c,d)pyrene and pyrene (+2, +4, and +2, respectively) during the 23-year monitoring period. When looking at just the last five years, all three indicator PAHs remain slightly elevated (+1, +1 and +2, respectively). PAHs in SSPM have remained fairly stable over the last 23 years (see Figure 5-1.3) with the exception of WY2009 which had slightly lower concentrations, immediately after the cleaning project.

Figure 2-1.2 shows that PAH concentrations at FD13B were elevated at high or medium levels from WY2003 to WY2011 but dropped to low levels in WY2012 and have remained there since that time. Because the FD13B sediment trap was submerged since construction of the stormwater treatment vault in this area, a new sediment trap (FD13B New) was placed in a location one manhole upstream from the FD13B trap, and the new trap is not affected by the backwater from the treatment vault. FD13B is no longer deployed as of WY2019. Between WY2013, when it was installed through WY2020, FD13B New fluctuated between medium and high levels of PAHs, with high levels detected in WY2017 and medium levels detected in WY2018 through WY2020. These results led to a source control investigation and identification of source(s) which are described further below. While source control work is completed at this time, actions to date led to the concentrations at FD13B New being detected at relatively low levels in WY2021 for the first time since this sediment trap was installed and they remained at these lower levels in WY2024. In WY2024, all other sediment traps in the OF237A basin were at low levels (see Figure 2-1.2).

5.3.1.c Phthalates

Stormwater As shown in Table 3-6 and Figure 3-5.8, DEHP shows a statistically significant improvement in stormwater quality from 2001 to present. There is an estimated 46 percent reduction in 23 years. The trend is gradual over time and does not lend itself to be a direct result of any one action (see boxplots in Appendix G and Figure 5-1.3) although concentrations did decrease somewhat immediately following the basin cleaning effort.

In comparison to other outfalls, DEHP in OF237A is of slightly better quality (-1) over the entire 23-year monitoring record and slightly higher (+2) when looking at only the last two years (see Table 3-4).

SSPM DEHP concentrations in OF237A is slightly elevated to neutral (+1 to 0, respectively) when looking at the 23-year monitoring record and the last five years of monitoring (see Table 3-5). Butylbenzylphthalate is slightly lower in concentration (-1) and total phthalates are slightly higher (+1) relative to other outfalls when looking at the 23-year monitoring period. Butylbenzylphthalate, DEHP, and total phthalates are both neutral (0) relative to other outfalls based on the last five years of data.

All sediment trap locations in this basin have consistently had low level concentrations since at least WY2014, and phthalates are no longer analyzed at any of the upland sediment traps located up in the basin for source control purposes.

5.3.1.d Pesticides

Stormwater Analysis for bifenthrin in stormwater began in WY2021 under the 2020 QAPP. Statistical analysis will be performed when sufficient data is available.

SSPM Analysis for bifenthrin began in WY2015 under the 2014 QAPP and while there are fewer data points available for statistical analysis, the results are significant ($p<0.05$). OF237A concentrations of bifenthrin are slightly higher relative to other locations in the 23-year monitoring record and the last two years (+2 and +1, respectively) (see Table 3-5). The highest average and median concentrations of bifenthrin are present in OF237A (29 and 30 µg/kg, respectively) (Table 3-3.2).

5.3.1.e PCBs

Stormwater PCBs are not a COC tested for under the 2023 QAPP.

SSPM PCB concentrations at OF237A are neutral (0) relative to other outfalls when looking at the entire 23-year monitoring record, and there are no significant differences between outfalls when looking at just the last five years of data (see Table 3-5).

After the pipe cleaning project in 2007, PCB concentrations in SSPM at FD10 and FD10C decreased in concentration from previous medium to low levels. In WY2013, however, PCB concentrations increased back to medium levels at both locations (see Figure 2-1.4). Concentrations at FD10 generally decreased to low levels since WY2013, with the exception of one medium level detection in WY2016. This detection was right at the limit between the low and medium levels shown on Figure 2-1.4 (120 µg/kg). As a result, this sediment trap has been removed at this time. Concentrations at FD10C, however, have fluctuated between medium and high levels since WY2013. The FD10C sediment trap had non-detectable levels of PCBs for WY2023 and WY2024. A source control investigation was completed in this area as further described below and in Appendix A.

At FD2A, concentrations increased to medium levels for the first time in WY2016, with a concentration of 170 µg/kg, but returned to low levels in WY2017 with a concentration of 99 µg/kg. In WY2018, concentrations returned to the medium range where they remained through WY2020. Concentrations during these three years ranged in concentration from 210 to 280 µg/kg. In WY2021, concentrations returned to the low range with a concentration of 100 µg/kg and in WY2022 and WY2023 they were not detected. At FD2, concentrations measured at the medium level in WY2015 and WY2020 with concentrations during those years measuring at 150 and 390 µg/kg, respectively. In WY2021, the concentration remained in the medium range with a concentration of 180 µg/kg and in WY2022, WY2023 and WY2024, PCBs were not detected. Following a thorough analysis, no cause for the across-the-board increased PCB levels in WY2020 was identified (see Section 3.5.2). WY2021 SSPM concentrations returned to expected levels where they have remained since. Therefore, it was determined that WY2020 results were not accurate and will not be used to determine steps forward in source tracing investigations.

5.3.2 Source Control Program Activities

Storm System Cleaning Targeted areas in the northern portion of the OF237A system were cleaned in 2008. The objective of this project was to remove residual sediments in the storm drains that may contain legacy contaminants. As discussed in detail in the WY2011 report, storm system cleaning contributed to significant reductions in stormwater concentrations. Sewer line cleaning is an important component of the City's source control program, and the City is currently on a schedule of cleaning each storm system area on a 20-year cycle. A second cleaning of approximately 17 percent of the OF237A system occurred in 2021. Additional cleaning is performed on an as needed basis to address specific maintenance needs. The City is statistically evaluating the results to determine whether a maintenance schedule different from the City-wide schedule for pipe cleaning projects is needed within this sensitive basin.

In combination with other source control activities, the original storm system cleaning was effective at reducing all seven of the compounds tested. With less post-cleaning data available following the second cleaning, statistics are not as robust, however reductions were observed for TSS, lead and zinc, while an increase was seen for indeno(1,2,3-c,d)pyrene.

Following the first cleaning, statistically significant reductions were evident for TSS, lead, zinc, PAHs, and DEHP (see Table 2-2). Line cleaning, along with other source control activities, resulted in reductions of TSS at 17 percent, lead at 32 percent, zinc at 30 percent, DEHP at 59 percent and PAHs (phenanthrene, pyrene and indeno(1,2,3-c,d)pyrene) at 66-76 percent. The second cleaning, along with other ongoing source control activities resulted in further approximate reductions of lead at 32 percent and zinc at 20 percent.

Enhanced Street Sweeping Program In January 2007, the City's street sweeping program was enhanced in an attempt to reduce sediment buildup in the storm sewer system. Under the enhanced program, the sweeping frequency was increased, air regenerative sweepers replaced mechanical sweepers, and the City also increased communications with residents, which helped raise awareness of the importance of the street sweeping program.

Statistically significant reductions were evident for lead, zinc, PAHs, and DEHP (see Table 2-3.1). Street sweeping, along with other source control activities, resulted in reductions of TSS at 9 percent, lead at 29 percent, zinc at 30 percent, DEHP at 54 percent and PAHs (phenanthrene, pyrene and indeno(1,2,3-c,d)pyrene) at 55-68 percent.

FD13 PAH Investigation / Media Filtration System Installation In 2010, the City installed a media filtration system that treats stormwater from the FD13 sub-basin, approximately 50 acres in size. Upstream of FD13, the FD13B sediment trap had been submerged since construction of this stormwater treatment vault. As a result, a new sediment trap (FD13B New) was placed in a location one manhole upstream from the FD13B trap, and the new trap is not affected by the backwater from the treatment vault. Since WY2013 when this new trap was installed, levels of PAHs have fluctuated between medium and high levels at FD13B-New, leading to the initiation of a source control investigation in this area. FD13B is no longer deployed as of WY2019.

During the investigation, City staff identified a significant concentration of PAHs discharging to the City's stormwater collection system from The News Tribune (TNT) employee parking lot. As a result of this finding, the City worked with the business owner and Ecology implement a cleanup plan and the City followed up with a plan for inspecting their private stormwater system quarterly.

Follow-up sampling indicated that the source was not yet eliminated, as PAH results at FD13B-New remained in the high range. Further investigative work led to additional cleanup at the TNT site. In addition, the City performed additional investigative work in the drainage area and determined that more sources were likely present at other private properties. The City continued to investigate with property owners in this area to clean and maintain their private drainage systems and monitor the sediment trap results to determine whether these efforts have been successful or if there are any additional sources of PAHs in this drainage area. WY2021 results showed a significant decrease in PAH concentrations (from 282,110 µg/kg in WY2020 to 159,944 µg/kg in WY2021), and the downward trend continued in WY2022 with a concentration of 142,919 µg/kg, indicating the success of source control actions performed to date. WY2023 and WY2024 sediment trap data continued to show a significant decrease in PAH concentrations with a concentration of 58,330 µg/kg and 83,471 µg/k respectively, which is significantly lower than what is classified as relative low levels of contamination (<164,000 µg/kg) (see Figure 2-1.2). Based on these results, no new investigations are planned in this basin for 2025. The City will continue to monitor the sediment trap results to determine if there are any additional sources of PAHs in this drainage area.

More detailed information regarding this investigation can be found in Appendix A.

FD10C Source Investigation The FD10C sediment trap drainage area was initially tracked for several years as a potential phthalate concern due to sediment trap monitoring results that showed moderately elevated phthalate levels since monitoring of this trap began in 2003. Starting in 2011, phthalate concentrations began decreasing, coinciding with a large business in the basin moving out, while mercury and PCB levels remained slightly elevated. Therefore, the tracking in this area continued with a focus on PCBs, and starting in 2015, on the moderately elevated mercury concentrations.

The stormwater system was cleaned in January 2014 to remove residual contamination. Following cleaning of the system, FD10C continued to show moderately elevated PCBs as well as mercury. As a result of these detections, an investigation was initiated in 2016 including sampling of catch basins in the drainage area as well as performance of business inspections. Through this work, the area for additional investigation was narrowed down to a smaller area.

Ongoing inspections and sampling have not identified a source for this contamination. In 2022, an additional investigation was performed to confirm that there were no errors in the mapping that might lead to identification of a potential source. With that mapping information confirmed, the City continued the investigation with installation of short-term sediment traps at two new locations in attempt to isolate the source. Results from these short-term traps exhibited non-detectable levels of PCBs. Additionally, the FD10C sediment trap had non-detectable levels of PCBs for WY2023 and WY2024. It is possible that the source of PCBs was historical contamination, and the system cleaning removed this contamination. No investigations are planned in this basin for 2025. The City will continue to monitor the sediment trap results to determine if there are any additional sources of PCBs in this drainage area.

More detailed information regarding this investigation can be found in Appendix A.

General Source Control Activities In addition to the ongoing investigation and maintenance activities described above, the City is continuing to implement other source control program elements in the OF237A drainage basin which are summarized here and described in more detail in Appendix A.

5.3.3 Outfall 237A 2025 Work Plan

In Basin 237A, TSS, lead, zinc, phenanthrene, pyrene and DEHP concentrations have all shown a statistically significant improvement in stormwater quality from 2001 to present with an estimated 43 percent reduction in TSS concentration, 69 percent reduction in lead, 53 percent reduction of zinc, 46 percent reduction in DEHP, 63 percent reduction in phenanthrene, and 73 percent reduction in pyrene concentrations over the 23 years of monitoring (Table 3-6 and Figures 3-5.1 to 3-5.8). The decrease in these concentrations appears to have resulted not only from removal/control of point sources, but also from the combination of many other activities.

As described in detail above, OF237A results generally show:

- Stormwater – Slightly to moderately lower levels of TSS (-1), copper (-3), lead (-2), zinc (-1), and DEHP (-1) compared to other outfalls, and slightly to significantly higher phenanthrene (+1), pyrene (+3) and indeno(1,2,3-c,d)pyrene (+6) when evaluating the 23-year monitoring record (see Table 3-4). These levels are generally the same or more neutral when looking at only the last two years of data, except zinc and DEHP becomes slightly higher (+1 and +2), phenanthrene, indeno(1,2,3-c,d)pyrene and pyrene become significantly elevated (+6).

- SSPM – Slightly lower copper, lead, mercury and butylbenzylphthalate (all -1), neutral zinc, total PCBs, and total phthalates, slightly higher DEHP (+1), slightly higher bifenthrin, pyrene and phenanthrene (all at +2), and moderately higher indeno(1,2,3-c,d)pyrene (+4) compared to other sediment trap locations (see Table 3-5) when evaluating the entire 23-year monitoring record. Levels are more only slightly higher or neutral when looking at only the last five years of data, including indeno(1,2,3-c,d)pyrene (+1).

Therefore, the following recommendations are included in the 2025 Work Plan for OF237A:

- Monitor upcoming SSPM results and catch basin sample results near FD13B-New to evaluate whether source control work done to date in this area has been successful in eliminating the PAH source.

- Monitor upcoming SSPM results and catch basin sample results near FD10C to evaluate whether source control work done to date in this area has been successful in eliminating the PCB source.

- Evaluate potential sources and seasonality of occasional outliers of indeno(1,2,3-cd)pyrene and other PAHs in stormwater.

5.4 OUTFALL 237B

OF237B exhibits the best overall baseflow and stormwater quality with some of the lowest median concentrations for the COCs in baseflow, stormwater and stormwater SSPM found during the monitoring program (see figures in Appendix F). Figure 5-1.4 shows the annual average concentration for stormwater, baseflow and SSPM. All indicator parameters (TSS, metals, PAHs and DEHP) have shown a statistically significant improvement in stormwater concentrations through WY2024.

This section provides a summary of water and sediment quality results within the OF237B drainage basin and compares the results with the major source control and other activities that have occurred within the basin. A more comprehensive description of source control activities performed to date is provided in Appendix A.

5.4.1 Water and SSPM Quality

Annual and seasonal data for stormwater and SSPM for the COCs and other parameters is used to identify ongoing areas of concern. The following paragraphs summarize the WY2001-WY2024 monitoring results for OF237B, where COCs in this outfall are different from other Foss drainage basins, and where subsequent source control activities may be focused.

5.4.1.a TSS and Metals

Stormwater As shown in Table 3-6 and Figures 3-5.1, 3-5.3 and 3-5.4, TSS, lead and zinc concentrations show a statistically significant improvement in stormwater quality from 2001 to present. The best-fit regression equations result in an estimated 71 percent reduction in TSS, 83 percent reduction in lead, and 63 percent reduction in zinc concentrations in OF237B in the 23-year period. In addition, copper analysis was performed between WY2010 and WY2012 for stormwater at this outfall, and then began again in WY2015. Since trends have been assessed for copper with less data than other COCs, they are not fully comparable to the trends assessed for the other constituents. OF237B showed statistically significant improvement during this time period, and the best-fit regression equation resulted in an estimated 41 percent reduction in copper.

In comparison to the other outfalls, TSS concentrations are slightly better (-1) while copper (-4), lead (-3) and zinc (-6) concentrations are moderately to significantly lower than other outfalls when looking at the 23-year monitoring record (12 years for copper) (see Table 3-4). When only the last two years of monitoring data are evaluated, OF237B results are moderately to significantly less than other outfalls with TSS at --3, copper at -3, lead at -1, and zinc at -5.

SSPM As shown in Table 3-5, SSPM in OF237B contains moderately to significantly lower concentrations of lead, mercury, and zinc (-3, -3 and -5) (also see boxplots in Appendix F). In addition, copper was added as an analyte in the 2014 QAPP. While statistical evaluation of this constituent will become more comparable in future years, based on available data, concentrations of copper are moderately better in SSPM in OF237B compared to other outfalls (-3). Within the OF237B drainage basin, there were no areas with elevated mercury concentrations in the upline sediment traps since WY2013 and is no longer analyzed at the one remaining upline trap (see Figure 2-1.1).

5.4.1.b PAHs

Stormwater As shown in Table 3-4, stormwater in OF237B contains moderately lower concentrations of phenanthrene (-3) and slightly lower concentrations of pyrene and indeno(1,2,3-c,d)pyrene (-2 and -1, respectively) when looking at the 23-year monitoring record. When looking only at the last two years of monitoring data, concentrations are more neutral for all three indicator PAHs (-1) when compared to other outfalls.

PAH concentrations in stormwater have shown a statistically significant improvement from WY2002 through WY2024 with an 78-83 percent reduction in pyrene, phenanthrene and indeno(1,2,3-c,d)pyrene in 23 years (see Table 3-6).

SSPM As shown in Table 3-5, PAH concentrations in SSPM in OF237B are slightly lower for the indicator PAHs, phenanthrene, pyrene and indeno(1,2,3-c,d)pyrene (-2, -2, and -1, respectively) when looking at both the 23-year monitoring period or only the last five years (0 to -1).

5.4.1.c Phthalates

Stormwater As shown in Table 3-6 and Figure 3-5.8, DEHP concentrations have shown a statistically significant improvement in stormwater quality from 2001 to present. The best fit regression equations result in an estimated 74 percent reduction in the 23-year monitoring period.

In comparison to other outfalls, DEHP in OF237B is slightly better in quality over both the entire 23-year monitoring record and in only the last two years of monitoring (-2 and -3, respectively) (see Table 3-4).

SSPM DEHP (-4), butylbenzylphthalate (-3) and total phthalate (-4) concentrations in SSPM are moderately lower than observed in other locations over the entire 23-year monitoring record (see Table 3-5 and boxplots in Appendix F). These results are generally similar, but much less pronounced when looking at only the last five years (-1). No new areas of concern have been identified in the upline sediment traps and phthalates have been removed as an analyte from all upline locations.

5.4.1.d Pesticides

Stormwater Analysis for bifenthrin in stormwater began in WY2021 under the 2023 QAPP. Statistical analysis will be performed when sufficient data is available.

SSPM Analysis for bifenthrin began in WY2015 under the 2014 QAPP and while there are fewer data points available for statistical analysis, the results are significant ($p<0.05$). OF237B concentrations were slightly lower (-1) to neutral (0) relative to other outfalls for bifenthrin when looking either all available data or only the last five years, respectively.

5.4.1.e PCBs

Stormwater PCBs are not a COC tested for under the 2023 QAPP.

SSPM PCB concentrations at OF237B were slightly lower (-1) relative to other outfalls when looking at the entire 23-year monitoring record and there were no significant differences between outfalls when looking at only the last five years of data (see Table 3-5).

5.4.2 Source Control Program Activities

PCB Source Tracing in FD34 and FD35. PCBs were found intermittently over time in the sub-basins draining to FD34 and FD35 (see Figure 2-1.4). In an attempt to remove any legacy contamination, the City completed a stormline cleaning project in the summer of 2011 that covered the majority of the OF237B drainage basin, including the FD34/FD35 area. In WY2011, concentrations in both sediment traps dropped to below levels of concern. However, in WY2012 and WY2013, the PCB concentrations in FD35 increased back to high levels, while the concentrations in FD34 remained low. A source tracing investigation to narrow the source of PCBs in this area was initiated in 2012.

Ultimately it was determined that the source of the contamination was one of the materials used during construction of a roadway in the area in 1975 likely contained PCBs, specifically the sealant used to seal the roadway at the curb line. The City completed replacement of this roadway to remove this source in summer 2016. The WY2018 sample at FD35 was the first representing a full year of the area in its remediated condition, and the concentration was in the low range (92 µg/kg). WY2019 PCB concentrations in FD35 remained in the low range (94 µg/kg), however WY2020 concentrations increased back to the medium range (250 µg/kg). Following a thorough data analysis, no cause for the increased PCB levels in WY2020 was identified. Because results were higher than usual at all locations where PCBs were detected, it was determined that these results were not accurate and will not be used to determine steps forward in source tracing investigations. However, to ensure that the PCB source in this area had been removed, SSPM was again monitored in WY2021 and WY2022, and PCBs were not detected. Therefore, the source control action is considered successful and the sediment trap at this location was removed in 2023.

More information on this investigation is included in Appendix A of historic reports.

Storm System Cleaning In 2010-2011, the majority of the OF237B system was cleaned and video inspected. The objective of this project was to remove residual sediments in the storm drains that may contain legacy contaminants. As discussed in detail in the WY2011 report, storm system cleaning contributed to significant reductions in stormwater concentrations. Sewer line cleaning is an important component of the City's source control program, and the City is currently on a schedule of cleaning each storm system area on a 20-year cycle. Additional cleaning is performed on an as needed basis to address specific maintenance needs. In combination with other source control activities, storm system cleaning appears to have been effective at removing all seven of the compounds tested. The City is statistically evaluating the results to determine whether a maintenance schedule different from the City-wide schedule for pipe cleaning projects is needed within this sensitive basin.

Statistically significant reductions were evident for TSS, lead, zinc, PAHs and DEHP (see Table 2-2). Line cleaning, along with other source control activities, resulted in reductions of TSS at 56 percent, lead at 64 percent, zinc at 46 percent, DEHP at 68 percent and PAHs (phenanthrene, pyrene and indeno(1,2,3-c,d)pyrene) at 76-80 percent.

Enhanced Street Sweeping Program. In January 2007, the City's street sweeping program was enhanced in an attempt to reduce sediment buildup in the storm sewer system. Under the enhanced program, the sweeping frequency was increased, air regenerative sweepers replaced mechanical sweepers, and the City also increased communications with residents, which helped raise awareness of the importance of the street sweeping program.

Statistically significant reductions were evident for TSS, lead, zinc, PAHs and DEHP (see Table 2-3.1). Street sweeping, along with other source control activities, resulted in reductions of TSS at 48 percent, lead at 59 percent, zinc at 45 percent, DEHP at 67 percent, and PAHs (phenanthrene, pyrene, and indeno(1,2,3-c,d)pyrene) at 72-77 percent.

General Source Control Activities. In addition to the ongoing investigation and maintenance activities described above, the City is continuing to implement other source control program elements in the OF237B drainage basin which are summarized here and described in more detail in Appendix A.

5.4.3 Outfall 237B 2025 Work Plan

TSS, metals (copper, lead, and zinc), PAHs and DEHP concentrations in stormwater have shown a statistically significant improvement from WY2002 through WY2024 (see Figures 3-5.1 to 3-5.8). There has been an estimated 71 percent reduction in TSS, 83 percent reduction in lead, 63 percent reduction in zinc, and a 74 percent reduction of DEHP concentrations in the 23-year monitoring period (see Table 3-6). PAHs showed an 78-83 percent reduction in 23 years for the index PAHs (phenanthrene, pyrene, and indeno(1,2,3-c,d)pyrene).. Based on available data (12 years), OF237B shows a statistically significant improvement in stormwater quality for copper during this period with an estimated 41 percent reduction.

These improvements are believed to be the result of the combination of all source control activities within the basin, including business and multi-family inspections, source control actions, maintenance activities and public education.

OF237B exhibits the best overall baseflow and stormwater quality with some of the lowest median concentrations for the COCs in stormwater (see Table 3-3.1 and Table 3-4, and Appendix F). SSPM quality in OF237B is also generally of better quality than other Foss basins (see Table 3-5).

As described in detail above, OF237B results generally show:

- Stormwater – Slightly lower TSS (-1), DEHP (-2) pyrene (-2) and indeno(1,2,3-c,d) (-2), moderately lower lead(-3), copper (-4), and phenanthrene (-3), and significantly lower zinc (-6) compared to other outfalls when evaluating the 23-year monitoring record (see

Table 3-4). These levels are generally similar leaning more towards moderately lower concentrations when looking at only the last two years of data.

- SSPM – Moderately to significantly lower copper (-3), lead (-3), mercury (-3), zinc (-5), TPH-Heavy Oil (-5), DEHP (-4), butylbenzylphthalate (-3), and total phthalates (-4), and slightly lower phenanthrene and pyrene (both at -2) and slightly lower bifenthrin, indeno(1,2,3-cd)pyrene, and Total PCBs (all at -1) compared to other sediment trap locations (see Table 3-5) when evaluating the entire 23-year monitoring record. These levels are generally similar but less pronounced when looking at only the last five years of data.

Therefore, there are no source control activities included in the 2025 Work Plan for the OF237B drainage basin.

5.5 OUTFALL 243

Many activities have occurred in OF243 drainage basin in recent years. Some of these activities have resulted in improvements in stormwater and SSPM quality. Figure 5-1.5 shows the annual average contaminant concentrations for stormwater, baseflow and SSPM. TSS, lead, zinc, PAHs and DEHP concentrations have shown a statistically significant improvement in stormwater quality since the beginning of the monitoring program (see Table 3-6).

This section provides a summary of water and sediment quality results within the OF243 drainage basin and compares the results with the major source control and other activities that have occurred within the basin. A more comprehensive description of source control activities performed to date is provided in Appendix A.

5.5.1 Water and SSPM Quality

Annual and seasonal data for stormwater and SSPM for the COCs and other parameters is used to identify ongoing areas of concern. The following paragraphs summarize the WY2001-WY2024 monitoring results for OF243, where COCs in this outfall are different from other Foss drainage basins, and where any subsequent source control activities may be focused.

5.5.1.a TSS and Metals

Stormwater TSS and total zinc are slightly lower in concentration (-1) while total copper and lead are moderately elevated (+3 and +4, respectively) in concentration at OF243 as compared to other outfalls when looking at the 23-year monitoring period. When looking at just the last two years, each of these is the same or more neutral with TSS, lead, and zinc at -1 and copper at +1 (see Table 3-4 and boxplots in Appendix F). Analysis for copper at this outfall began in WY2015 so statistical analysis is less robust compared to other outfalls. The highest overall total lead concentration (379 µg/L) occurred in OF243 in 2009 (Table 3-3.1). This outlier appears to be relatively isolated occurrence, although additional high and moderate outliers have occurred throughout the monitoring program (see Figure G-2). In addition, the highest overall zinc concentration (1,170 µg/L) occurred at OF243 in 2004 (Table 3-3.1). This outlier also appears to be relatively isolated occurrence (see Figure G-3).

As shown in Figure 5-1.5, TSS concentrations in stormwater have fluctuated some over the last 23years, in particular since 2012. TSS showed statistically significant improvement since WY2022 with a 57 percent reduction measured for WY2024. Lead and zinc also show statistically significant improvement, with lead showing a 79 percent reduction, and zinc showing a 59 percent reduction in stormwater concentrations from 2001 to present (Table 3-6).

SSPM Storm sediment in OF243 is moderately elevated in lead (+4), mercury (+4) and zinc (+4) when looking at the 23-year monitoring record (see Table 3-5). When only looking at the most recent five-year data set, concentrations are generally similar or only slightly elevated with lead zinc, and mercury (all at +1). Analysis for copper at this outfall began in WY2015 so less data is currently available for a comprehensive statistical analysis. Based on available data, copper is moderately elevated (+3) when looking at all available data, and slightly elevated compared to other outfalls (+1) when looking at just the last five years.

Most of the highest SSPM concentrations of lead, mercury, and zinc have been detected at FD23 (see Figures F-11 through F-13). As shown on Table 3-3.2, the highest mean and median concentrations of all metals are found in this drainage basin. Figures 5-1.5 and 5-2.5 show that zinc concentrations in SSPM samples have remained fairly consistent over the last 23 years while mercury concentrations appeared to have decreased early in the program and generally remained at the lower levels until WY2018, when the detected concentration increased back to nearly the highest level seen in FD23 (see Figure 2-1.1). The concentration returned to the reduced level in WY2019 where it remained since that time. During WY2024, sediment trap concentrations dropped to the lower concentration range for the first time during the monitoring record.

The source control investigation in this area is continuing. Additional information is available in Appendix A.

While somewhat elevated relative to other outfalls, lead and zinc are not currently of concern for recontamination in the Thea Foss Waterway sediments, but additional source control work may be considered when additional results are available. As described further below and in Appendix A, a street sweeping pilot project is ongoing and results show that an increased sweeping frequency is helping to reduce metals concentrations in industrial areas. This analysis of the effectiveness of this program is described further below.

5.5.1.b PAHs

Stormwater PAH concentrations in OF243 are neutral to slightly lower (phenanthrene at 0, pyrene at -2, and indeno(1,2,3-c,d)pyrene at -2 in comparison to other outfalls when looking at the entire 23-year monitoring period. When looking at only the last two years all three compounds are slightly lower (-1) relative to other locations (see Table 3-4 and boxplots in Appendix F). The highest dibenz(a,h)anthracene concentration (0.684 µg/L) detected at any location during the monitoring period occurred at OF243 in WY2017. This outlier appears to be an isolated occurrence with no apparent explanation and subsequent sample results are in the more typical range.

As shown in Table 3-6 and Figures 3-5.5, 3-5.6 and 3-5.7, PAHs (phenanthrene, pyrene, and indeno(1,2,3-c,d)pyrene) are showing a statistically significant improvement in stormwater quality from 2001 to present. The best-fit regression equations result in an estimated 56-69 percent reduction in PAHs in OF243 in the 23-year monitoring period. As shown in Figure 5-1.5, PAH concentrations in stormwater were fairly stable from

WY2002 until WY2007. From WY2007 to WY2009 the concentrations decreased, and they remained fairly stable between WY2009 and WY2012. Gradual but consistent increases were noted after the minimum concentrations were detected in 2012. This is likely partially if not fully explained by the apparent uptick seen since implementation of the 2014 QAPP began. This apparent uptick in organics concentrations observed was evaluated by the City, as discussed in Section 3.5.2 and recent results were determined to be representative while earlier results were likely biased low. While this observed slight increase in organic concentrations is observed, concentrations remain substantially lower than the concentrations present early in the monitoring program (see boxplots in Appendix G).

SSPM In SSPM, phenanthrene, indeno(1,2,3-c,d)pyrene and pyrene concentrations at OF243 are similar (+1, 0 and +1) compared to other outfalls when looking at the entire 23-year monitoring period (see Table 3-5). PAH concentrations are neutral compared to other outfalls when looking at only the last five years (all three indicator PAHs at 0).

5.5.1.c Phthalates

Stormwater DEHP concentrations in OF243 were moderately or slightly lower when looking at both the 23-year monitoring period and the last two years (-2 and -3, respectively) (see Table 3-4). DEHP generally appears to be relatively consistent among all outfalls except OF235 which is significantly higher, as discussed above. Figure 5-1.5 shows total phthalate concentrations in stormwater at OF243 were fairly stable from WY2002 to WY2008 and then decreased in WY2009. One unusually high peak concentration of DEHP (41 µg/L) was observed in 2008 stormwater in OF243 (see Table 3-3.1 and boxplots in Appendix G), but this appears to be an isolated occurrence and the source is unknown. Concentrations from WY2009 to WY2024 have fluctuated somewhat, but concentrations remain relatively low with the lowest mean concentration overall (see Figure 3-3.1 and Figure F-8).

As shown in Table 3-6 and Figure 3-5.8, DEHP is showing a statistically significant improvement in stormwater quality from 2001 to present. The best-fit regression equations result in an estimated 76 percent reduction in the 23-year monitoring period.

SSPM OF243 is slightly enriched in DEHP, butylbenzylphthalate, and total phthalates (+1) when looking at the entire 23-year monitoring period, while all are neutral (0) between outfalls when looking at only the last five years (see Table 3-5). OF243, along with OF245, exhibit a notably different phthalate composition compared to other outfalls that has higher relative concentrations of butylbenzylphthalate. Figure F-20 show butylbenzylphthalate average, median and maximum concentrations in SSPM at OF243 well above all outfalls except OF245.

In Figure 2-1.3, total phthalate concentration levels at FD23 were at medium levels in WY2002 and WY2003. Since WY2004, total phthalate concentration levels at FD23 have been low relative to the threshold concentration set on this figure.

5.5.1.d Pesticides

Stormwater Analysis for bifenthrin in stormwater began in WY2021 under the 2020 QAPP. Statistical analysis will be performed when sufficient data is available.

SSPM Analysis for bifenthrin began in WY2015 under the 2014 QAPP and while there are fewer data points available for statistical analysis, the results are significant ($p<0.05$). OF243 is neutral (0) relative to other outfalls during the monitoring period.

5.5.1.e PCBs

Stormwater PCBs are not a COC tested for under the 2023 QAPP.

SSPM Concentrations of PCBs in OF243 were neutral (0) compared to other outfalls when reviewing the entire 23-year monitoring record or when looking at only the last five years of data (see Table 3-5).

As shown in Figure 5-1.5, from WY2009 to WY2012 PCBs were not detected at this location. PCBs were not required analytes at FD23 in WY2013 and WY2014. PCBs were in the medium range at FD23 in WY2015, just over the threshold concentration distinguishing low and medium levels on Figure 2-1.4. Since WY2016, PCBs have not been detected in FD23, indicating that the WY2015 results were likely an anomaly.

5.5.2 Source Control Program Activities

Enhanced Street Sweeping Program In January 2007, the City's street sweeping program was enhanced in an attempt to reduce sediment buildup in the storm sewer system. Under the enhanced program, the sweeping frequency was increased, air regenerative sweepers replaced mechanical sweepers, and the City also increased communications with residents, which helped raise awareness of the importance of the street sweeping program.

When comparing the standard sweeping schedule in place prior to 2006 to the enhanced schedule implemented from January 2007 through September 2013, statistically significant reductions were evident for zinc, PAHs and DEHP (see Table 2-3.1). Street sweeping, along with other source control activities, resulted in reductions of zinc at 36 percent, DEHP at 42 percent and PAHs (phenanthrene, pyrene, and indeno(1,2,3-c,d)pyrene) at 53-70 percent.

Street Sweeping Pilot Project Because OF243 and OF245 have shown somewhat elevated levels of lead and zinc in both stormwater and baseflow relative to other drains, it was theorized the increased amount of trucking in this industrial area may be the cause. Based on these results, the City initiated a pilot program in WY2014 to determine whether an increased frequency of street sweeping in this area would have an effect on these results. Starting on October 1, 2013, the City began sweeping the ROW within the OF243 and OF245 drainage basins at a frequency of once every two weeks rather than the usual frequency of once per month for industrial areas. The pilot project continued in WY2024 and is ongoing at this time.

With several years of data available, statistical analysis of the effectiveness of this pilot sweeping schedule was done, although results will be more statistically robust as additional data becomes available. Based on this analysis, a statistically significant reduction was evident for TSS, lead, and zinc (see Table 2-3.2). When comparing data from the enhanced street sweeping program that was implemented between 2007 and 2013 to the more frequent street sweeping schedule which began in WY2013, it was found that this increased street sweeping, along with other source control activities, resulted in an additional 38 percent reduction in TSS, 69 percent reduction in lead concentrations and a 35 percent reduction in zinc concentrations.

Outfall 243 Mercury Source Tracing Mercury has been found in the medium to high range of concentrations in all samples analyzed from FD23 since WY2002 (see Figure 2-1.1). Some source tracing work was completed in 2008 and 2009, but no likely point-source of mercury was identified. After working with BNSF in 2009-2010 to gain access to the BNSF yard, the City completed focused business inspections for most of the yard. A follow up inspection, including the inspection of onsite ditches and swales, was conducted in 2012.

As moderately increased concentrations of mercury persisted, additional investigations of the right-of-way, the WSDOT pond, the LRI and BNSF sites, and other businesses were completed over the next several years. While several other actions were required at the sites to bring them into compliance (including cleaning and maintaining onsite drainage systems, cleanup of spilled material and a regular inspection process), no significant sources of mercury were detected.

In 2019, while reviewing past investigations and the extents of the drainage basin it was discovered that a small portion of this drainage basin was not included in previous investigations. Through additional investigation, a roof drain from a specific property was identified as being a likely source of mercury contamination. During 2021, the City worked with the property owner to ensure the roof drains from their property were adequately cleaned and subsequently re-cleaned the City's catch basin and the curbline adjacent to the property.

During 2022 staff resampled the identified catch basin to determine if there is an ongoing mercury issue at that location. The catch basin was sampled on June 21, 2022, and the results were 1.38 mg/kg. Catch basin concentrations continue to trend downward and there are no other probable sources to investigate at this location. During 2024, EC staff requested to have the catch basin re-cleaned and will re-sample after sediment accumulates to determine if there is a continued source or residual contamination from the previously remediated source. Catch basin concentrations continue to trend downward and there are no other probable sources to investigate at this location.

While the FD23 sediment trap results showed a very slight uptick in mercury concentrations within the basin during 2022, concentrations have shown an overall decrease from 2018 to 2022. The 2018 sediment trap concentrations were 0.6610 mg/kg, which have decreased significantly in 2021 and 2022 with concentrations of 0.206 mg/kg and 0.214 mg/kg, respectively. During 2023 there was insufficient sediment to analyze for mercury. The WY2024 sediment trap concentrations dropped to the lower concentration range of 0.1780 mg/kg for the first time during the monitoring record. Mercury will continue to be evaluated at this location.

A summary of the ongoing investigation is provided in Appendix A.

General Source Control Activities In addition to the ongoing investigation and maintenance activities described above, the City is continuing to implement other source control program elements in the OF243 drainage basin which are summarized here and described in more detail in Appendix A.

5.5.3 Outfall 243 2025 Work Plan

TSS, lead, zinc, PAHs and DEHP concentrations in stormwater have shown a statistically significant improvement in OF243 from WY2002 through WY2024 (see Figures 3-5.3 through 3-5.8). There has been an estimated 57 percent reduction in TSS, 79 percent reduction in lead, 59 percent reduction in zinc, and 75 percent reduction in concentration for DEHP in 23 years (see Table 3-6). PAHs have shown a 56-69 percent reduction in 23 years for the index PAHs (phenanthrene, pyrene and indeno(1,2,3-c,d)pyrene).

As described in detail above, OF243 results generally show:

- Stormwater – Moderately higher lead (+4) and copper (+3, based on a smaller data set), slightly lower zinc (-1), and DEHP (-2) compared to other outfalls when evaluating the 23-year monitoring record. When looking at only the last two years copper remains slightly elevated (+1) relative to other outfalls while DEHP remains moderately lower (-3) (see Table 3-4).
- SSPM – Moderately higher lead (+4), copper (+3), based on a smaller data set), mercury (+4) and zinc (+4) compared to other sediment trap locations (see Table 3-5) when evaluating the entire 23-year monitoring record. These differences are less pronounced, but still present when looking at only the last five years of data +1 for all). Butylbenzylphthalate, DEHP and total phthalates are slightly elevated (+1) when looking at the entire 23-year monitoring record but neutral in the last five years (0).

Therefore, the following recommendations are included in the 2025 Work Plan for OF243:

- Perform follow-up work with business owner and worker-sample catch basins in the area where elevated mercury concentrations were identified in catch basins in the FD23 drainage area.
- Review WY2025 sediment trap results for FD23 to evaluate the need for further work in this area.
- Continue evaluation of the effectiveness of the street sweeping pilot project on lead and zinc concentrations in the industrial area as additional data become available.

5.6 OUTFALL 245

A number of source control activities have occurred in the OF245 drainage basin since the beginning of the monitoring program. Some of these activities have resulted in statistically significant improvements in stormwater quality. Figure 5-1.6 shows the annual average contaminant concentrations for stormwater, baseflow, and SSPM. Several of the businesses in the area not only discharge stormwater to OF245 but discharge stormwater to the adjacent outfalls, OF248 and OF249.

This section provides a summary of water and sediment quality results within the OF245 drainage basin and compares the results with the major source control and other activities that have occurred within the basin. A more comprehensive description of source control activities performed to date is provided in Appendix A.

5.6.1 Water and SSPM Quality

Annual and seasonal data for stormwater and SSPM for the COCs and other parameters is used to identify ongoing areas of concern. The following paragraphs summarize the WY2001-WY2024 monitoring results for OF245, where COCs in this outfall are different from other Foss drainage basins, and where subsequent source control activities may be focused.

5.6.1.a TSS and Metals

Stormwater Stormwater TSS concentrations are close to average in OF245 when looking at the entire 23-year monitoring record or the most recent two-year data set (-1 and +1, respectively) (see Table 3-4).

Lead concentrations are moderately or slightly better than average in OF245 when looking at either the entire 23-year monitoring record or at only the most recent two-year data set (-3 and -1, respectively) (see Table 3-4). Copper concentrations in OF245 are slightly lower when looking at all of the available data and only the last two years (-1 for both).

The highest maximum mercury and cadmium concentrations found in stormwater during the monitoring program were found in OF245 in WY2008 and WY2011, respectively (see Table 3-3.1). In addition, the highest mean and median cadmium in stormwater were found in OF245 with concentrations of 0.281 µg/L and 0.189 µg/L, respectively.

The highest mean and median stormwater zinc concentrations are also found in OF245 with concentrations of 128.1 µg/L and 102.0 µg/L, respectively (see Table 3-3.1). Zinc is moderately elevated (+3) in OF245 in the 23-year monitoring record, while the two-year record shows that the outfall is only slightly elevated (+1) (see Table 3-4). Several high outliers for zinc have been detected throughout the 23-year monitoring period, particularly early in the program.

As shown in Table 3-6 and Figures 3-5.1, 3-5.3, and 3-5.4, TSS, lead, and zinc all show a statistically significant improvement in stormwater quality from 2001 to present. The best-fit regression equations result in an estimated 51 percent reduction in TSS, 79 percent reduction in lead, and a 64 percent reduction in zinc in the 23-year monitoring period. In addition, copper shows a statistically significant improvement based on available data with an estimated 27 percent reduction.

SSPM When looking at the entire 23-year monitoring program, zinc is neutral (0) compared to the other outfalls, while lead (-3) and mercury (-1) are moderately and slightly lower than the other outfalls, respectively (see Table 3-5 and boxplots in Appendix F). When looking at only the last five years, these differences are still present but somewhat less pronounced with zinc, lead, and mercury all neutral (0). Available copper data indicates that concentrations in OF245 are slightly elevated (+1) based on all available data, and neutral (0) relative to other outfalls over the last five years.

Within the basins for OF 245/248, mercury has been detected at medium concentrations periodically at FD22 (WY2002, WY2010, WY2014, WY2015, and WY2016) (see Figure 2-1.1). When looking at the data for these moderate level concentrations, all are just over the concentration (0.20 mg/kg) which was set to differentiate the levels on Figure 2-1.1, ranging from 0.208 to 0.257 mg/kg). WY2017 concentrations returned to the low range where they remained through WY2021. Other sediment trap/sump locations in these basins have had low levels. As a result, mercury is no longer analyzed in FD22.

5.6.1.b PAHs

Stormwater OF245 is neutral for phenanthrene (0) and moderately to significantly lower for other index PAHs (pyrene at -2 and indeno(1,2,3-c,d)pyrene at -5) in comparison to other outfalls (see Table 3-4 and boxplots in Appendix F) when looking at the entire 23-

year monitoring record. When looking at only the last two years of data, the results are more neutral with all three indicator PAHs at -1.

In stormwater, the highest maximum concentrations for several LPAHs including acenaphthene, acenaphthylene, fluorene, and phenanthrene were observed in OF245 (see Table 3-3.1). These maximum concentrations were all detected in 2004. The high concentrations have not been observed since the Northern Pacific Rail yard oil pipeline area was remediated in 2008 (see Appendix A).

As shown in Table 3-6 and Figures 3-5.5, 3-5.6 and 3-5.7, PAHs (phenanthrene, pyrene, and indeno(1,2,3-c,d)pyrene) are showing a statistically significant improvement in stormwater quality from 2001 to present. The best-fit regression equations result in an estimated 65-73 percent reduction in PAHs in the 23-year monitoring period. As shown in Figure 5-1.6, PAH concentrations in stormwater were fairly stable from WY2002 until WY2007. From WY2008 to WY2009 the concentrations decreased when the Northern Pacific Rail Line was remediated and have remained generally stable from WY2009 to present. The apparent uptick in organics concentrations observed in the last eight years of monitoring was evaluated by the City, as discussed in Section 3.5.2 and recent results were determined to be representative while earlier results were likely biased low. While this observed slight increase in organic concentrations is observed, concentrations remain substantially lower than the concentrations present early in the monitoring program (see boxplots in Appendix G).

SSPM OF245 SSPM has moderately to significantly lower concentrations of phenanthrene (-4), pyrene (-4) and indeno(1,2,3-c,d)pyrene (-5) relative to all other outfalls (see Table 3-5 and boxplots in Appendix F) when looking at the 23-year monitoring period. All three indicator PAHs remain slightly lower than other outfalls (-1) when looking at only the last five years of data. All three sediment traps/sumps throughout the OF245/OF248 basin have had low levels of PAHs throughout the 23-year monitoring period and as a result, PAHs have been removed from the analyte list for the source tracing sediment traps (FD21 and FD22) (see Figure 2-1.2).

5.6.1.c Phthalates

Stormwater DEHP appears to be relatively consistent among outfalls (except OF235 as discussed above), with mean concentrations slightly lower (-1) in OF245 when looking at the entire 23-year monitoring record, and the last two years of data (see Table 3-4).

Unusually elevated DEHP concentrations were found in OF245 stormwater in WY2003 (Year 2) (see total phthalates in Figure 5-1.6 and Figure G-8). A possible source of phthalates in this drain is believed to be the former bulk liquid phthalate transloading facility located in the basin. This source is believed to be controlled since the water quality is improving and most of the peak phthalate concentrations occurred earlier in the monitoring program (2002 through 2005) (see Figure 5-1.6 and boxplots in Appendix G) and have remained relatively consistent since that time.

Like OF243, OF245 exhibits a notably different phthalate composition that contains higher relative concentrations of butylbenzylphthalate in both stormwater and SSPM. The highest maximum butylbenzylphthalate stormwater concentration found in the monitoring program (290 µg/L) was found in OF245 in 2003. Overall, the OF245 mean butylbenzylphthalate concentration is 8.24 µg/L as compared to approximately

0.3-0.9 µg/L in the other outfalls. An elevated concentration of diethylphthalate in stormwater (430 µg/L) was also detected at OF245 in 2002.

As shown in Table 3-6 and Figure 3-5.8, DEHP is showing a statistically significant improvement in stormwater quality from 2001 to present. The best-fit regression equations result in an estimated 71 percent reduction in DEHP in OF245 in the 23-year monitoring period.

SSPM OF245 is slightly lower (-1) for DEHP, moderately enriched in butylbenzylphthalate (+4), and slightly enriched in total phthalates (+1) when looking at the 23-year monitoring period (see Table 3-5). As with stormwater, SSPM composition is dominated by butylbenzylphthalate. Butylbenzylphthalate and total phthalates remain slightly higher (+2 and +1, respectively) relative to other outfalls when looking at only the last five years. DEHP is slightly lower (-1) or neutral (0) over the same time periods. Figure F-20 show OF245 butylbenzylphthalate average, median and maximum concentrations in SSPM well above all other outfalls. This could be due to an elevated value of 160,000 µg/kg for butylbenzylphthalate detected at OF245 in 2003.

Within OF245 and the adjacent OF248, additional sediment traps were located around a suspected source of phthalates, the former MPS site (see Section 5.6.2). At FD21 (OF245) total phthalate concentrations were in the high range in WY2002 and WY2003, decreased to medium range in WY2004, and have been in the low range since that time (see Figure 2-1.3). At FD22 (OF248), total phthalate concentrations fluctuated for many years between high (WY2003, WY2004, WY2005, and WY2010) and medium concentrations (WY2006 through WY2009, W2011, and WY2013). WY2012 and WY2014 through WY2024 concentrations have been in the low range. As discussed in Section 5.6.2, source control investigation and monitoring at the Truck Rail Handling (TRH) site (formerly MPS) has been an ongoing issue for many years due to the historically different phthalate signature for this area and the general ongoing observation of phthalates in waterway sediments. The City will continue to monitor work at this site to identify any ongoing issues.

5.6.1.d Pesticides

Stormwater Analysis for bifenthrin in stormwater began in WY2021 under the 2023 QAPP. Statistical analysis will be performed when sufficient data is available. The highest maximum bifenthrin stormwater concentration found in the monitoring program (0.089 µg/L) was found in OF245 in WY2024.

SSPM Analysis for bifenthrin began in WY2015 under the 2014 QAPP and while there are fewer data points available for statistical analysis, the results are significant ($p<0.05$). Based on available data, bifenthrin concentrations are slightly lower (-2) in OF245.

5.6.1.e PCBs

Stormwater PCBs are not a COC tested for under the 2023 QAPP.

SSPM PCB levels in all of the outfalls are fairly equivalent when looking at the entire 23-year monitoring record with levels ranging from -1 to +1. PCB concentrations at OF245 were neutral (0) relative to all other outfalls in the entire monitoring period and there were no significant differences between outfalls when looking at only the last five years of data (see Table 3-5).

5.6.2 Source Control Program Activities

Enhanced Street Sweeping Program In January 2007, the City's street sweeping program was enhanced in an attempt to reduce sediment build-up in the storm sewer system. Under the enhanced program, the sweeping frequency was increased, air regenerative sweepers replaced mechanical sweepers, and the City also increased communications with residents and business owners, which helped raise awareness of the importance of the street sweeping program.

When comparing the standard sweeping schedule in place prior to 2006 to the enhanced schedule implemented from January 2007 through September 2013, statistically significant reductions were evident for TSS, lead, PAHs, and DEHP (see Table 2-3.1). Street sweeping, along with other source control activities, resulted in reductions of TSS at 31 percent, lead at 22 percent, DEHP at 73 percent, and PAHs (phenanthrene, pyrene, and indeno(1,2,3-c,d)pyrene) at 63-68 percent.

Street Sweeping Pilot Project Because OF243 and OF245 showed somewhat elevated levels of lead and zinc in both stormwater and baseflow relative to other drains, it was thought that the increased amount of trucking in this industrial area may be the cause. Based on these results, the City initiated a pilot program in WY2014 to determine whether an increased frequency of street sweeping in this area would have an effect on these results. Starting on October 1, 2013, the City began sweeping the ROW within the OF243 and OF245 drainage basins at a frequency of once every two weeks rather than the usual frequency of once per month for industrial areas. The pilot project continued in WY2024 and is ongoing at this time.

With several years of data available, statistical analysis of the effectiveness of this pilot sweeping schedule was completed, although results will be more statistically robust as additional data becomes available. Based on this analysis, a statistically significant reduction was evident for lead, zinc, and pyrene (see Table 2-3.2). When comparing data from the enhanced street sweeping program that was implemented between 2007 and 2013 to the more frequent street sweeping schedule which began in WY2013, it was found that this increased street sweeping, along with other source control activities, resulted in an additional reduction in concentration of TSS at 16 percent, lead at 51 percent, and zinc at 46 percent.

Former MPS Site Investigation The investigation at this site has been ongoing through the years of this program. Additional information on this work can be found in Appendix A. With decreased phthalate levels in the sediment traps, it appears that efforts to date have been effective in addressing the issues at this site. However, the City will continue coordination with the property owner, and sediment traps will continue to be monitored to ensure that levels remain at the reduced levels.

General Source Control Activities In addition to the ongoing investigation and maintenance activities described above, the City is continuing to implement other source control program elements in the OF245 drainage basin which are summarized here and described in more detail in Appendix A.

5.6.3 Outfall 245 2025 Work Plan

TSS, metals (lead and zinc), PAHsc, and DEHP concentrations in stormwater have shown a statistically significant improvement from WY2002 through WY2024 (see Table 3-6 and Figures 3-5.1 to 3-5.8). There has been an estimated 51 percent reduction in TSS, 79 percent reduction in lead, and 64 percent reduction in zinc concentrations in the 23-year monitoring program. Based on more limited data, there has also been a 27 percent reduction in copper concentrations. In addition, there has been an estimated 71 percent reduction in concentration for DEHP, and PAHs showed an 65-73 percent reduction in 23 years for the index PAHs (phenanthrene, pyrene, and indeno(1,2,3-c,d)pyrene).

As described in detail above, OF245 results generally show:

- Stormwater – Moderately higher zinc (+3), moderately lower lead (-3) and pyrene (-2), and significantly lower indeno(1,2,3-c,d)pyrene (-5) compared to other outfalls when evaluating the 23-year monitoring record (see Table 3-4). When looking at only the last two years of data, zinc and TSS are slightly higher (+1), and all other COCs are slightly lower (-1) when compared to the other outfalls.
- SSPM – Moderately higher butylbenzylphthalate (+4) and moderately to significantly lower lead (-3), phenanthrene (-4), indeno(1,2,3-c,d)pyrene (-5), and pyrene (-4) compared to other sediment trap locations (see Table 3-5) when evaluating the entire 23-year monitoring record. When looking at only the last five years of data, butylbenzylphthalate and total phthalates remains slightly higher (+2 and +1, respectively) while PAHs and bifenthrin remain slightly lower (-1) compared to other outfalls.

Therefore, the following recommendations are included in the 2025 Work Plan for OF245:

- Continue evaluation of the effectiveness of the street sweeping pilot project on lead and zinc concentrations in the industrial area as additional data become available.

5.7 OUTFALL 254

Several source control activities have occurred in the OF254 drainage basin since the beginning of the monitoring program. Some of these activities have resulted in statistically significant improvements in stormwater quality. Figure 5-1.7 shows the annual average contaminant concentrations for stormwater and baseflow. Note that there are no sediment traps in the OF254 drainage basin due to tidal influence.

This section provides a summary of stormwater quality results within the OF254 drainage basin and compares these results with the major source control and other activities that have occurred within the basin. A more comprehensive description of source control activities performed to date is provided in Appendix A.

5.7.1 Water Quality

Annual and seasonal data for stormwater for the COCs and other parameters is used to identify ongoing areas of concern. The following paragraphs summarize the WY2001-WY2024 monitoring results for OF254, where COCs in this outfall are different from other Foss drainage basins, and where subsequent source control activities may be focused.

5.7.1.a TSS and Metals

Stormwater TSS concentrations in OF254 stormwater are significantly above average when looking at the entire 23-year monitoring record (+6) but only moderately higher when looking at the last two years of data (+4) (see Table 3-4). OF254 has the highest mean TSS (88.8 mg/L) and median (68.3. mg/L) of all the basins (see Table 3-3.1 and Figure F-1). Considerable amounts of unpaved industrial area are present in this drainage basin, likely leading to these elevated concentrations. As shown on Figure 5-1.7, TSS concentrations have remained fairly consistent during the monitoring period with a slight decrease in WY2019 and WY2020 coinciding with an increased level of sweep that began in a portion of this drainage basin in January 2019 generally stabilizing since that time.

Analysis for copper at this outfall began in WY2015. Based on available data, copper appears slightly elevated in OF254 compared to other outfalls (+1). Copper is neutral (0), when looking at only the last two years of data.

Lead concentrations are slightly lower (-2) in OF254 when looking at the entire 23-year monitoring record and slightly lower (-1) when looking at only the most recent two-year data set (see Table 3-4).

Zinc is moderately elevated (+3) in OF254 when looking at the 23-year monitoring record, while the two-year record shows that the outfall is only slightly elevated (+1) (Table 3-4 and Figure F-3). Since OF245 is similarly elevated in zinc, this indicates that there may be a source(s) of zinc present in the industrialized basins. As discussed in Section 5.6.2, truck traffic is a source of zinc but may not be the only source.

As shown in Table 3-6 and Figures 3-5.3 and 3-5.4, lead and zinc are showing statistically significant improvements in stormwater quality from 2001 to present. The best-fit regression equations result in an estimated 81 percent reduction in lead and 72 percent reduction in zinc in the 23-year monitoring period.

SSPM No sediment traps are installed in OF254.

5.7.1.b PAHs

Stormwater. PAHs in OF254 are neutral to moderately elevated (phenanthrene at +1, pyrene at +5, and indeno(1,2,3-c,d)pyrene at 0) in comparison to other outfalls when looking at the entire 23-year monitoring record (see Table 3-4 and boxplots in Appendix F). When looking at only the last two years of data, all three indicator PAHs are slightly lower than other outfalls (-1).

OF254 has had some relatively higher concentrations of PAHs in water quality in the Thea Foss Basin (see boxplots in Appendix F), but these concentrations have generally improved since WY2008 (see boxplots in Appendix G). The highest mean, median, and or maximum concentrations of several LPAHs and HPAHs in stormwater were reported at OF254 including acenaphthylene, anthracene, fluorene, phenanthrene, total LPAHs, chrysene, benzo(a)anthracene, fluoranthene, pyrene, and total HPAHs (see Table 3-3.1), but the maximum concentrations occurred in 2002 and concentrations are much lower in more recent sampling.

As shown in Table 3-6 and Figures 3-5.5, 3-5.6, and 3-5.7, PAHs (phenanthrene, pyrene, and indeno(1,2,3-c,d)pyrene) show a statistically significant improvement in stormwater quality from 2001 to present. The best-fit regression equations result in an estimated 80-90 percent reduction in the indicator PAHs in the 23-year monitoring period. In particular, there was a consistent decrease from WY2007 to WY2011 (see Figure 5-1.7) that occurred following cleaning of the storm lines, with a slight increasing trend observed since that time in part due the organics uptick described above.
The apparent uptick in organics concentrations observed in the last seven years of

monitoring was evaluated by the City, as discussed in Section 3.5.2 and recent results were determined to be representative while earlier results were likely biased low. While this observed slight increase in organic concentrations is observed, concentrations remain substantially lower than the concentrations present early in the monitoring program (see boxplots in Appendix G).

SSPM No sediment traps are installed in OF254.

5.7.1.c Phthalates

Stormwater DEHP appears to be relatively consistent among outfalls (with the exception of OF230/OF230A and OF235 as discussed above) (see Table 3-4). OF254 is slightly lower in concentration for DEHP when looking at the 23-year monitoring record (-1) and slightly elevated (1) when looking at only the last two years. Figure 5-1.7 shows total phthalate concentrations in stormwater were fairly stable from WY2002 to WY2009 when they decreased.

As shown in Table 3-6 and Figure 3-5.8, DEHP shows a statistically significant improvement in stormwater quality from 2001 to present. The best-fit regression equations result in an estimated 55 percent reduction in the 23-year monitoring period.

SSPM No sediment traps are installed in OF254.

5.7.1.d Pesticides

Stormwater Analysis for bifenthrin in stormwater began in WY2021 under the 2023 QAPP. Statistical analysis will be performed when sufficient data is available.

SSPM No sediment traps are installed in OF254.

5.7.1.e PCBs

Stormwater PCBs are not a COC tested for under the 2023 QAPP.

SSPM No sediment traps are installed in OF254.

5.7.2 Source Control Program Activities

Storm System Cleaning. In 2006, the municipal storm system in OF254 was cleaned and video inspected. The objective of this project was to remove residual sediments in the storm drains that may contain legacy contaminants. As discussed in detail in the WY2011 report, storm system cleaning contributed to significant reductions in stormwater concentrations. Sewer line cleaning is an important component of the City's source control program, and the City is currently on a schedule of cleaning each storm system area on a 20-year cycle. A second cleaning of approximately 82 percent of the OF254 system occurred in 2021. Additional cleaning is performed on an as needed basis to address specific maintenance needs. The City is statistically evaluating the results to determine whether a maintenance schedule different from the City-wide schedule for pipe cleaning projects is needed within this sensitive basin.

In combination with other source control activities, initial storm system cleaning was effective at removing all seven of the compounds tested. With less post-cleaning data available following the second cleaning, statistics are not as robust, however reductions were observed for lead and zinc.

Following the first cleaning statistically significant reductions were evident for lead, zinc, and PAHs (see Table 2-2). Line cleaning, along with other source control activities, resulted in reductions of lead at 32 percent, zinc at 42 percent, and PAHs (phenanthrene, pyrene and indeno(1,2,3-c,d)pyrene) at 68-82 percent. The second cleaning, along with other ongoing source control activities resulted in further reductions of lead at 56 percent, zinc at 41 percent, DEHP at 54 percent, and a TSS reduction of 44 percent.

Enhanced Street Sweeping Program In January 2007, the City's street sweeping program was enhanced in an attempt to reduce sediment buildup in the storm sewer system. Under the enhanced program, the sweeping frequency was increased, air regenerative sweepers replaced mechanical sweepers, and the City also increased communications with residents and business owners, which helped raise awareness of the importance of the street sweeping program.

Statistically significant reductions were evident for lead, zinc, and PAHs (see Table 2-3.1). Street sweeping, along with other source control activities, resulted in reductions of lead at 26 percent, zinc at 40 percent, and PAHs (phenanthrene, pyrene, and indeno(1,2,3-c,d)pyrene) at 69-82 percent.

As described above, a pilot study has been underway in the drainage basins for OF243 and OF245 since WY2014. This pilot study has shown that an increased level of street sweeping in industrial areas has been effective in further reducing concentrations of some indicator constituents. The City has expanded the reach of the pilot study into OF254 drainage basin in beginning in WY2021 and this additional enhanced street sweeping continued during WY2024. Based on enhanced sweeping performed to date in a portion of this basin, additional statistically significant reductions were evident for TSS, lead, zinc and DEHP (see Table 2-3.2). Enhanced street sweeping, along with other source control activities, resulted in reductions of TSS at 45 percent, lead at 61 percent, zinc at 41 percent and DEHP at 44%.

General Source Control Activities In addition to the ongoing investigation and maintenance activities described above, the City is continuing to implement other source control program elements in the OF254 drainage basin which are summarized here and described in more detail in Appendix A.

5.7.3 Outfall 254 2025 Work Plan

TSS, lead, zinc, PAHs and DEHP concentrations in stormwater have shown a statistically significant improvement in OF254 from WY2002 through WY2024 (see Table 3-6 and Figures 3-5.3 to 3-5.8). There has been an estimated 46 percent reduction in TSS, 81 percent reduction for lead, and a 72 percent reduction in zinc concentration in 23 years. DEHP concentration reductions are estimated at 55 percent and index PAHs (phenanthrene, pyrene, and indeno(1,2,3-c,d)pyrene) showed a 80-90 percent reduction in the 23-year monitoring period.

As described in detail above, OF254 results generally show:

- Stormwater – Significantly higher TSS (+6) and pyrene (+5) and moderately elevated zinc (+3) compared to other outfalls when evaluating the 23-year monitoring record (see Table 3-4). When evaluating only the last two years of data, TSS is moderately elevated (+4), while other constituents are relatively neutral (+1 to -1) compared to other outfalls.

Therefore, the following recommendation is included in the 2025 Work Plan for the OF254 drainage basin:

- Continue to work toward expansion of the area of increased street sweeping frequency to the remainder of basin as resources become available.

5.8 SUMMARY OF CONSTITUENTS OF CONCERN BY OUTFALL

While overall trends show decreasing concentrations, analytical data has identified some areas where relatively higher concentrations of certain contaminants remain present in the drainage basins and source control investigations are currently underway as described above. Source control efforts are focused on the COCs for each basin and whether it is found in stormwater or SSPM at the outfall as follows:

Constituents of Interest in Each Basin

		230A	235	237A	237B	243	245	254
TSS	Baseflow							
	Stormwater							✓
Copper[1]	Stormwater		✓					
	SSPM							n/a
Mercury	Baseflow							
	Stormwater	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	SSPM					✓		n/a
Zinc	Baseflow							
	Stormwater						✓	✓
	SSPM					✓		n/a
Lead	Baseflow							
	Stormwater		✓			✓		
	SSPM					✓		n/a
LPAHs[2]	Baseflow							
	Stormwater			✓				
	SSPM	✓						n/a
HPAHs[3]	Baseflow							
	Stormwater			✓				
	SSPM							n/a
Phthalates	Baseflow							
	Stormwater	✓	✓					
	SSPM							n/a
PCBs	SSPM	✓						n/a

✓ chemical of concern.
[1] For OF230/OF230A, OF237A, OF243, and OF254, evaluation is based on only eight years of data
[2] As represented by indicator COC phenanthrene
[3] As represented by indicator COCs indeno(1,2,3-c,d)pyrene and pyrene
shows statistically significant improvement.
n/a – not applicable

The 2025 Source Control Work Plan is included in Section 6.

The City believes some minor additional improvements in stormwater quality may be realized in the future with ongoing NPDES Permit programs and continuing improvements in source control implementation. Sediment trap results are valuable in that they provide an early warning of potential stormwater sources to the waterway sediments that can be investigated and addressed before SQO exceedances requiring action are identified in the waterways.
The City is continuing to move forward with ongoing source tracing investigations.

6.0 POLLUTANT LOADING ESTIMATES AND 2025 WORK PLAN

The improvements in stormwater quality since the mid-1990s indicate that source control efforts in the Foss Waterway Watershed have been effective in the reduction of chemical concentrations in stormwater. With the City's comprehensive 23-year monitoring data set, updated statistical analyses have been completed. Forty-eight statistically significant time trends (48 out of 49 tests or approximately 98 percent of the tests) were observed in Tacoma's stormwater monitoring record. All trends were in the direction of decreasing concentrations. This is the same number of and constituents with significant reductions that was observed in WY2023, when a trend was added for TSS at OF254, while the previously observed significant decreasing trend for indeno(1,2,3-c,d)pyrene was not observed.

In addition to the 49-time trend tests that have been evaluated in past years, the NPDES Permit requires the City to analyze and evaluate total copper. For three outfalls, OF235, OF237B, and OF245, the data collected from WY2015 through WY2024 has been added to data previously collected under the NPDES program between WY2010 and WY2012. With more data available, an evaluation of time trends has been performed for these outfalls for the last several years. Although with less data available, the statistical results are not fully comparable to data for the remaining constituents. With these seven tests added, there are 51 statistically significant time trends (51 out of 56 tests, or approximately 91 percent of the tests) shown in Year 23, with all trends in the direction of decreasing concentrations. As additional data becomes available, time trends for copper will become somewhat more comparable to remaining tests.

Overall, these results are significant and a testament to the City's ongoing comprehensive source control program. Source control activities currently being implemented by the City include business inspections, response to spills and illicit discharges, mapping/maintenance/cleaning of the stormwater system, pollutant source tracing, and implementation of the City's Surface Water Management Manual through our stormwater ordinance. With continued monitoring, enhanced maintenance, and ongoing source control actions, coupled with implementation of Phase 1 NPDES Permit programs, further improvements in stormwater quality may be realized.

It should be noted, however, that while considerable improvements to stormwater quality have been made, the largest changes were realized in the earlier years of the program when major sources were identified and eliminated. Because the source control program has been so effective through the years, fewer major issues remain, and the program is beginning to approach an equilibrium or maintenance mode. In other words, the concentrations of contaminants of concern in the stormwater in the Foss Waterway Watershed are reaching a level where the opportunities for large reductions are more limited. While this may over time lead to the appearance of fewer decreasing trends in contaminant concentrations if looking only at results from more recent years, the fact remains that the City's stormwater source control and monitoring program have been very effective in reducing contaminant levels in stormwater and SSPM.

Reduction of overall contaminant loads to the Foss Waterway has been achieved through the City's implementation of these stormwater source controls. Control of other sources, many of which are outside the City's jurisdiction and must be coordinated by other federal, state, and local authorities, have also led to reduction in contaminant loads. Reductions of air and marina pollution are achieved through Ecology's Air Program and through the Marina Source Control Program which was developed specifically for the Foss Waterway. Reductions in air pollution will decrease not only the direct loads from atmospheric fallout to the surface of the waterway but will also decrease the pollutant loads washed off upland surfaces and entrained in stormwater runoff. The marina improvements implemented by the Foss Waterway Marina, Foss Landing Marina, Johnny's Dock Marina, and Delin Docks, including installation of facility improvements, have undoubtedly translated into reduced source loads for marinas. Finally, upland and in-water remedial actions implemented by Ecology and the Utilities in 2003 and 2004 were directed at controlling tar seeps in the head of the waterway. The effectiveness of these combined actions will continue to be verified through long-term monitoring of stormwater, storm sediment, and marine sediment, and supplemented by source monitoring programs conducted by other parties.

6.1 THEA FOSS WATERWAY SEDIMENT MONITORING PROGRAM

When the waterway sediment remediation projects were completed, the majority of the sediment surface had no, or very low concentrations of contaminants present since the surface was for the most part either dredged to clean sediments or covered with new, clean capping materials. It was anticipated that ongoing low level source contributions to the waterway would cause concentrations of contaminants to increase gradually. Over time, the goal is to have the contaminant concentrations equilibrate at a level below the sediment cleanup standards set by the EPA.

The sediments in the waterway are the true barometer, however, of whether additional source controls are needed for compliance with regulatory requirements. The last sediment monitoring was performed by the City in 2023. An analysis of the results shows that the concentrations have generally stabilized and that the risk of wide scale recontamination appears low. In many cases, sediment concentrations remained relatively stable between the Year 7 and Year 17 monitoring events, indicating that waterway sediment concentrations appear to have largely equilibrated with modern sources since the completion of the remedial action in 2006. As a result, the risk of recontamination is not expected to be substantially higher in the future unless there is a change in the nature, strength, or distribution of waterway sources. EPA has initiated the process of deleting the waterway from the Commencement Bay Superfund site.

Long Term Monitoring Plans (LTMPs) are in place for the waterway for continued monitoring of site. In the City's work area, the LTMP covers monitoring to be performed through 2028, and for the Utilities' work area, the LTMP covers monitoring through 2037. New LTMP's are expected to be prepared for EPA approval when work under the existing plans is completed. The intent is that sediment monitoring results will be available from throughout the waterway to support EPA's development of each of their Five-Year Review reports. The next in-waterway sediment monitoring in both work areas will take place in 2028.

6.2 POLLUTANT LOAD ANALYSIS

As indicated in the 2023 QAPP, basin specific rainfall-runoff correlations were developed in WY2016 based on continuous flow data. Based on this information, mass loading calculations were done for WY2024 as described below. A summary of annual mass loadings for each outfall is compiled in Tables 6-1.1 through 6-1.7. The mass loading calculations were performed as described in the Pollutant Loading SOP (Thornburg and Lowe 2009), as modified per the procedures described below to incorporate the basin-specific rainfall-runoff relationship.

- The rain record was separated into discrete storm events based on previously established criteria for threshold rain amounts and antecedent dry periods.

- The five minute rainfall amounts were summed to provide a total rain depth for each storm. The corresponding runoff depth was then estimated from the rainfall-runoff correlations.
- The runoff depths (in inches) were converted to discharge volumes (in acre-feet) by multiplying by the basin area (in acres), with appropriate unit conversions. These were then converted to event mean flow rates by dividing the event discharge volume by the duration of the storm. The storm fraction was calculated as the ratio of the storm flow to the combined storm plus baseflow for each event. The total wet season, dry season, and annual discharge volumes were calculated by summing over the appropriate storm events. Mean seasonal storm flow rates were calculated by dividing the total discharge volume (wet season or dry season volume) by the time period of interest.
- Stormwater concentrations were "unmixed" from the combined flow concentrations (i.e., "as measured" concentrations) using the mass balance equations described in the Pollutant Load SOP. In a few instances, negative concentrations resulted from the "unmixing" calculation. Typically, these instances occurred when there were higher concentrations in baseflow, such that baseflow accounted for all (and more) of the combined storm flow concentration, and in some instances, they were an artifact of undetected concentrations with variable detection limits. In any instance where negative "unmixed" stormwater concentrations were calculated, these values were replaced with half the detection limit values (essentially, they are equivalent to undetected stormwater concentrations).
- Mean annual stormwater concentrations were calculated as volume-weighted average concentrations. The estimated storm volumes were paired with their corresponding analytical results and provided the weighting functions for calculating a volume-weighted concentration. A volume-weighted mean rather than a flow weight mean will be used because it is believed to provide a better statistic since it captures the significance of a storm event in terms of both flow and duration.
- The mean seasonal and annual baseflow and storm flow rates, the storm fraction in the combined discharges, and the mean annual baseflow and stormwater concentrations were input to the pollutant load worksheet provided in the Pollutant Load SOP. The worksheet calculated the seasonal and annual baseflow and stormwater pollutant loads as per the Pollutant Load SOP.
- In WY2016 and WY2019, baseflow characterization data were collected at all outfalls to collect data for new parameters and new lower method detection limits. Four baseflow samples were collected in WY2024 at OF230A (2) and OF235 (2) to characterize baseflow at these locations due to the change in drainage area. the WY2016-WY2024 baseflow data were used in the loading calculator.

Tables 6-1.1 through 6-1.7 include the following information:

- Mean annual stormwater and baseflow[21] concentrations for stormwater COCs and stormwater/baseflow concentration ratios; the mean annual concentrations are based on volume-weighted averages;
- Mean annual pollutant loads (in pounds), as well as itemized loads for baseflow and stormwater components, and wet season and dry season components; and
- Mean annual pollutant load densities (pounds per acre), as well as itemized load components as described above.

Stormwater mass loadings were not calculated for analytical parameters with fewer than 10 percent detected concentrations or only one detected sample in stormwater. Many of the constituents with low detection frequencies in stormwater were never detected in baseflow samples. Mass loadings were not calculated for grab sample parameters, since these parameters represent a single moment in time and are not average concentrations for the sampled volume.

It is further noted that constituents with less than 25 percent detections and/or less than five detected results (or less than three detected results in baseflow) will generate estimated mass loads with a high degree of uncertainty, even though mass loads may still be calculated. Cells are highlighted in Tables 6-1.2 through 6-1.6 to identify constituents that are confounded by low detection frequencies to identify mass loading estimates which are more uncertain.

6.2.1 Rainfall-Runoff Correlations

The City installed flow meters in its three NPDES drainage basins (OF235, OF237B, and OF245) and collected continuous flow data during all of WY2010, as required by the Phase I Permit. During WY2011, the flow records from WY2010 were analyzed to develop rainfall-runoff correlations for the three basins. The rainfall-runoff correlations for these basins are shown on Figures B2-8, B2-11, and B2-16 in Appendix B. The runoff has been normalized to basin size, such that both rainfall and runoff are presented in depth units, and the slope of the regression line is the runoff coefficient. Separate correlations were developed for wet season and dry season conditions. The estimated runoff parameters are presented in Tables B9-1.2, B9-1.4, and B9-1.6, and summarized in Table B9-2 in Appendix B.

During WY2016, the flow records from WY2015 and WY2016 were analyzed to develop rainfall-runoff correlations for OF230 (now OF230A), OF237A, OF243, and OF254. The rainfall-runoff correlations are shown on Figures B2-6, B2-10, B2-13, and B2-18 in Appendix B. The runoff has been normalized to basin size, such that both rainfall and runoff are presented in depth units, and the slope of the regression line is the runoff coefficient. Separate correlations were developed for wet season and dry season conditions. The estimated runoff parameters are presented in Tables B9-1.1, B9-1.3, B9-1.5, and B9-1.7 and summarized in Table B9-2 in Appendix B. Due to the OF230A construction and resulting altered drainage areas for OF230A and OF235, the City is in the process of collecting flow data to develop a new rainfall-runoff

[21] WY2016, WY2019, and WY2024 baseflow concentrations were used in the calculations as an approximation of WY2024 baseflow quality.

correlation for OF235 and OF230A. OF230 only monitored for flow in WY2024 (discontinued WY2025) and stormwater sampling was discontinued from this location in WY2023.

Basin Comparisons Higher runoff coefficients were observed in OF235 compared to the larger basins OF230A, OF237A, and OF237B. This was expected given the smaller basin size in comparison, the steeper slopes and higher percentage of impervious area in the OF235 basin, which is comprised of a large portion of downtown Tacoma.

The highest runoff coefficients were observed in OF245 and OF254, 0.99 and 0.84, respectively. This may be caused by the relatively small size and prevalence of hardened surfaces in these industrial drainages. However, the coefficients in this low-gradient and tidally influenced drain may also be artificially inflated to some degree by back-flushing tidal water. Separating tidal flows and storm flows was difficult in the eastside outfalls (OF243, OF245, and OF254) and complicated the analysis of the flow record.

Seasonal Comparisons The runoff coefficients for dry season conditions are consistently the same or lower than the coefficients for wet season conditions. This may be an indication that the ground is more saturated during the wet season and has less capacity for infiltration, leading to a higher percentage of runoff. The coefficient of determination (r^2) for the regression models shows a distinct seasonal effect, as shown in Appendix B on Figures B2-6, B2-8, B2-10, B2-11, B2-13, B2-16, and B2-18 (OF230/OF230A, OF235, OF237A, OF237B, OF243, OF245, and OF254, respectively). Specifically, the rainfall-runoff relationship is better defined in the wet season, as evidenced by significantly higher r^2 values. The lower correlations during the dry season may be indicative of more erratic and variable runoff conditions.

Seasonal comparison is limited for OF230/230A, OF237A, OF243, and OF254 because of the low number of dry weather storm events that weren't tidally influenced in WY2015 and WY2016.

Rain Threshold In the large basin for OF237B, there is a threshold of precipitation of a few hundredths of an inch, below which no runoff occurs. This is a large, primarily residential basin (see Appendix B, Figure B2-3) with more vegetated cover and soft shoulders on streets, and thus has more capacity to infiltrate compared to the other basins. The threshold is determined by the intercept of the regression line (see Figure B2-11) and indicates a capacity for the basin to assimilate some amount of rain before runoff occurs. As expected, the threshold is higher during the dry season (i.e., the dry ground has a greater capacity to assimilate incipient rainfall).

Historic results indicate that this might also be the case for the large mixed-use basin for OF237A, although it is difficult to discern at this time. In addition to OF235 and OF230A, the City has plans to refine rainfall runoff correlations for all outfalls to better determine the conditions in this basin.

6.2.2 Residential Pollutant Loading – OF237B

The following constituents were excluded from loading calculations because they were detected only once or not at all in this outfall during the WY2024 monitoring year: total and dissolved cadmium, total and dissolved mercury, acenaphthene, dibenz(a,h)anthracene, butylbenzylphthalate, diethylphthalate, dimethlyphthalate, di-n-octylphthalate, and bifenthrin. Baseflow values were estimated as average concentrations from the WY2016 and WY2019 baseflow data for OF237B. Following are the key results of the mass loading calculations for OF237B:

- As shown on Appendix B, Table B9-2, baseflow accounts for over four-fifths (83 percent) of the total discharge from OF237B.
- Stormwater concentrations are substantially higher than baseflow concentrations for a majority of the constituents (see Table 6-1.4). Concentration ratios are especially high for TSS and some metals: TSS (38 times higher in stormwater compared to baseflow), total copper (69 times higher), total zinc (35 times higher) and total lead (136 times higher). Dissolved copper, dissolved zinc, and dissolved lead exhibited slightly lower ratios with concentrations ranging from 11 to 21 times higher than baseflow concentrations. Concentrations of organic constituents ranged from 1 to 15 times higher in stormwater (a value of one is where all concentrations are not detected or just above the detection limit).
- Even though baseflow accounts for 83 percent of the discharge from OF237B, because stormwater can exhibit substantially higher concentrations than those seen in baseflow, stormwater accounts for a large majority of the mass loading. Specifically, stormwater accounts for 89 percent of the TSS load, 70-97 percent of the total and dissolved metals loads, and 17-75 percent of the loads from organic compounds.
- When a large number of stormwater and baseflow concentrations are non-detected and where OF237B baseflow accounts for 81 percent of the discharge, the largest contribution of mass loadings is estimated from baseflow. This is seen for a few constituents with less than 25 percent detections and/or less than five detected results that generate estimated mass loads with a high degree of uncertainty, even though mass loads may still be calculated using one-half the detection limit for that non-detected value (four PAHs, one phthalate and dichlobenil).
- Because approximately 90 percent of the storm flow in OF237B occurs during the wet season, significantly higher mass loadings occur during the wet season. Specifically, the wet season accounts for 88 percent of the TSS load, 59-71 percent of the nutrient loads, 81-90 percent of the total and dissolved metals loads, and 64-83 percent of the loads from organic compounds.
- MBAS, BOD_5, and nutrients appear to be similar in quality or higher in baseflow when comparing stormwater and baseflow concentrations. BOD_5 is confounded by one detection (low detection frequencies) in baseflow that have generated estimated mass loads with a high degree of uncertainty. During WY2024, stormwater concentrations are approximately two-three times higher than baseflow concentrations for MBAS, BOD_5, and for total phosphorus. The remaining nutrients exhibit either similar concentrations or higher concentrations in baseflow, than in stormwater. Baseflow accounts for 65-71 percent of the MBAS, BOD_5, and total phosphorus load, and approximately 90 percent of the nutrient loads.

6.2.3 Commercial Pollutant Loading – OF235

The following constituents were excluded from loading calculations because they were detected only once or not at all in this outfall during the WY2024 monitoring year: dissolved mercury, acenaphthene, fluorene, butylbenzylphthalate, diethlyphthalate, dimethlyphthalate, di-n-octylphthalate and bifenthrin. Baseflow values were estimated as average concentrations from WY2016, WY2019 and WY2024 baseflow data for OF235.

Following are the key results of the mass loading calculations for OF235 based the new drainage area:

- As shown on Appendix B, Table B9-2, baseflow accounts for approximately 55 percent of the total discharge from OF235.
- Stormwater concentrations are higher than baseflow concentrations for a majority of the constituents (see Table 6-1.2). The concentration ratio is especially high for TSS (24 times higher in stormwater compared to baseflow). The concentration ratio for the majority of metals ranges from one to 24 times higher for stormwater. Concentrations of many other constituents, both inorganic and organic, are from one time to 14 times higher in stormwater (a value of one is where all concentrations are not detected or just above the detection limit). The main exceptions are nutrients which exhibit higher concentrations in baseflow (see discussion below).
- Because storm flow accounts for a higher percentage of the discharge from OF235, and because stormwater concentrations are typically higher than baseflow concentrations, stormwater accounts for a large majority of the mass loading for most constituents. Specifically, stormwater accounts for 95 percent of the TSS load, 81 percent of the BOD_5 load, and the majority of loads for most dissolved and total metal and organic compound loads.
- Because 87 percent of the storm flow in OF235 occurs during the wet season, significantly higher mass loadings occur during the wet season. Specifically, the wet season accounts for 85 percent of the TSS load, 62-71 percent of the nutrient loads, 71- 85 percent of the total and dissolved metals loads, and 71-84 percent of the loads from organic compounds.
- Nutrient concentrations (total phosphorous, orthophosphorous, total nitrogen and nitrate/nitrite) appear to be either similar in quality or higher in baseflow. These nutrients are 1 to 6 times higher in baseflow than stormwater concentrations for these nutrients. Specifically, baseflow accounts for 54 percent of the total phosphorus loads and 65 percent to 86 percent of the other nutrient loads.

6.2.4 Industrial Pollutant Loading – OF245

The following constituents were excluded from loading calculations because they were detected only once or not at all in this outfall during the WY2024 monitoring year: total and dissolved mercury, dibenz(a,h)anthracene, butylbenzylphthalate, diethyl-phthalate, dimethlyphthalate, di-n-octyl phthalate, and bifenthrin. Following are the key results of the mass loading calculations for OF245:

- As shown on Appendix B, Table B9-2 there is no measurable baseflow component in the discharge from OF245. Therefore, 100 percent of the mass loading from OF245 is attributed to stormwater.

- Because approximately 87 percent of the storm flow in OF245 occurs during the wet season, significantly higher mass loadings occur during the wet season (see Table 6-1.6). Specifically, the wet season accounts for 88 percent of the loadings for all stormwater COCs. This percentage does not vary because the same average COC concentrations were assumed for both wet season and dry season discharges; there is not yet enough data to determine whether there are statistically significant seasonal effects in stormwater quality.
- The estimated runoff coefficients are quite high for this basin (78-99 percent runoff in dry and wet seasons, respectively; see Appendix B, Figure B2-16). Therefore, it is suspected that the predicted runoff, and thus the resultant pollutant loads, may be overestimated due to the inclusion of some amount of backflushing tidal water in the discharge estimate.

There is a greater degree of uncertainty associated with the mass loadings from OF245 because this storm sewer has a low slope and elevation and is strongly influenced by tidal inundations. Significant portions of the flow record are obscured by tidal fluctuations. Tidal fluctuations also make it more difficult to sample this drain and estimate event mean concentrations. Tidal inundations have been estimated using WISKI programming. Refinements will be made in WISKI and will be used over time to estimate tidal inundations and recalculate runoff coefficients for OF245.

6.2.5 Overall Pollutant Loading

Annual flow was calculated and pollutant loadings were calculated for all seven major outfalls in WY2024. Some of these annual flows may be artificially inflated due to tidally induced flows (see Section 6.2.1). Annual total flow for stormwater and baseflow are presented in Appendix B, Table B9-2. In WY2024, the total combined annual flow was 18,890 acre-feet, with the fraction of stormwater at 28 percent (5,268 acre-feet). Most of the annual flows are from OF237A and OF237B and the percentages are follows:

OF237A and 237B Flow Summary	OF237A	OF237B	237A and 237B
% of Foss Basin Acreage	49.1%	34.7%	83.8%
Annual flow	33%	59%	92%
Baseflow	29%	67%	95%
Storm	46%	38%	84%
Pollutant Loadings for OF237A and 237B (TSS Pounds per Year)			
Annual	56%	31%	87%
Baseflow	39%	53%	92%
Storm	57%	30%	87%

Consistent with having the highest flow, the highest pollutant loadings for TSS and for most other constituents are from 237A and 237B (all but total and dissolved cadmium and acenaphthene). When a large number of stormwater and baseflow concentrations are non-detected and where OF237A and OF237B baseflow accounts for the majority of the overall annual discharge, the largest contribution of mass loadings is estimated from baseflow. This can be seen at times with constituents with less than 25 percent detections and/or less than five detected results that generate estimated mass loads with a high degree of uncertainty, even though mass loads may still be calculated using one-half the detection limit for that non-detected value (see Table 6-4).

Pollutant loadings were also normalized to pounds per acre for each outfall. These results are shown in Table 6-3. Normalizing the loadings per acre illustrates where more pounds of constituents are found in an acre. This metric can be used to direct source control efforts where these efforts may result in a larger reduction of pollutants. In general, a greater number of constituents with maximum pounds per acre were found in OF235 and OF245 with 15 and 14 different constituents, respectively. As shown on Table 6-3, other outfalls with maximum pounds per acre were OF230A with one constituent, OF237A with four constituents, OF237B with five constituents, and OF254 with three constituents.

OF235 exhibited the maximum pounds per acre for total phosphorus, orthophosphorus, total and dissolved copper, dissolved zinc, total mercury, total and dissolved lead, four HPAHS, total HPAHs, one phthalate and dichlobenil. OF245 exhibited the maximum pounds per acre for TSS, total zinc and cadmium, all but one LPAHs including total LPAHs, two phthalates and total phthalates.

Similar to previous years, the residential area discharging to OF237B discharged the highest loads per acre for BOD_5, and both nitrogen constituents in addition to MBAs and one LPAH (2-Methylnaphthalene).

6.2.6 Water Year Comparison – 237B, 235, and 245

Table 6-2.1 presents a summary of estimated pollutant loads (normalized on a per-acre basis) for WY2010-2012 and WY2015-2024 in the three monitoring basins (237B, 235, and 245), and the percent difference in the estimated loads for WY2024 compared to the previous water years. The majority of the estimated mass load comparisons for each WY to WY2024 were relatively consistent and within a factor of two of each other (i.e., the percent difference ranged from -75 percent to +100 percent from each WY to WY2024). Such differences are not unexpected given the inherent variability in stormwater quality from year to year and from storm to storm. The statistical confidence in the estimated mass loads for these three basins will improve as more monitoring years are collected and included in the analysis.

The majority of the estimated mass load comparisons for each WY to WY2024 were within a factor of two of each other. Annual Rainfall in WY2024 (32.79 inches) was significantly less than the average (39.98 inches) for all water years (WY2002-WY2024) (see Table 3-1). WY2016 and WY2017 had the greatest rainfall amount for all the years with 50.11 inches and 51.73 inches, respectively. Not all constituent loads showed a consistent load increase in direct response to greater rainfall amounts. Lower concentrations would offset an increase due to rainfall volumes and/or rainfall intensities.

6.2.7 Water Years 2016 through 2024 Comparison

Tables 6-2.1 and 6-2.2 presents a summary of estimated pollutant loads (normalized on a per-acre basis) for WY2016 through WY2024 and the percent difference in the estimated loads for WY2016-21 compared to WY2023. The majority of the estimated mass load comparisons for WY2016 to WY2024 were relatively consistent and within a factor of two of each other (i.e., the percent difference ranged from – 75 percent to +100 percent from WY2016-22 to WY2024). Such differences are not unexpected given the inherent variability in stormwater quality from year to year and from storm to storm. The statistical confidence in the estimated mass loads for these basins will improve as more monitoring years are collected and included in the analysis.

6.2.8 Pollutant Loading Summary – WY2024

WY2024 discharge volume and chemical loadings are presented in Table 6-5. In WY2024, 72 percent of the freshwater volume discharging to the waterways is from baseflow, mainly from OF237A and OF237B (see Appendix B, Table B9-2).

For WY2024, baseflow was characterized by reduced maximum values and less frequent detections than in stormwater. When a large number of stormwater and baseflow concentrations are identified as non-detected and in OF237A and OF237B where baseflow accounts for 70 percent of the overall annual discharge, the largest contribution of mass loadings is estimated from baseflow. This is seen for a few constituents with less than 25 percent detections and/or less than five detected results that generate estimated mass loads with a high degree of uncertainty, even though mass loads may still be calculated using one-half the detection limit for that non-detected value (see Table 6-4). The proportion of the WY2024 contaminant load attributed to baseflow for the following indicator parameters is (see Table 6-4 and Table 6-5):

- 31 percent of the load for phenanthrene
- 12 percent of the load for pyrene
- 42 percent for dibenz(a,h)anthracene
- 39 percent of the total load for DEHP

The largest proportion of chemicals discharging into the waterways from municipal outfalls is from stormwater. The WY2024 contaminant loading from stormwater is:

- 69 percent of the total load for phenanthrene
- 88 percent of the total load for pyrene
- 58 percent for dibenz(a,h)anthracene
- 61 percent of the total load for DEHP

As shown in Table 6-3, a greater number of constituents with maximum pounds per acre were found in two outfalls: OF235 (15 different constituents) and OF245 (14 different constituents). Maximum pounds per acre for the remaining constituents were found in, 237B (5 different constituents), OF237A (4 different constituents), OF254 (3 different constituents), and OF230A (1 constituent).

6.3 2025 WORK PLAN

In December 2020, EPA determined that the City had fully performed the sediment remedial action in the Thea Foss and Wheeler-Osgood. In agreement with EPA the City adapts the Source Control Work Plan annually as part of this report to find and address any new sources of contaminants regulated under the CD to the waterways. For the last several years fewer and fewer locations are found that need remediation. Also, because the waterway sediments have reached equilibrium with modern sources at levels generally below EPA's required cleanup levels for the Superfund site, no new source control investigations are slated to begin at this time. There are still several source control investigations and actions that are underway and will be carried out to completion. Monitoring will continue and if future monitoring identifies the potential of a new source that may be affecting sediment quality in the waterway, additional source control actions will be undertaken by the City.

The WY2025 source control work plan specific to the Foss Waterway Watershed is provided below:

- **OF230A:** Continue follow-up on private property cleanups performed, and complete ongoing system cleaning and monitoring for PCBs, PAHs, and mercury as appropriate in the areas draining to FD3C, FD16 and FD6. Evaluate the need for a new source tracing investigation in the FD3C basin for PCBs.
- **OF230A/235:** Evaluate baseflow sources to determine if the baseflow sources for the new OF230A and OF235 drainage areas have changed.
- **OF235:** Continue to evaluate potential sources of spring/summer outliers for copper to stormwater.
- **OF235:** Evaluate the need for additional source control work for lead, copper, and DEHP in stormwater following completion of construction activities in this area. While construction activities are expected to have a positive impact on controlling the flow of potentially contaminated groundwater into the storm drainage system, the City will move forward with evaluating other potential sources of lead, copper and DEHP in this basin.
- **OF237A:** Continue to monitor sediment trap results in FD13B-new to determine if there are any additional sources of PAHs in this drainage area.
- **OF237A:** Continue to monitor sediment trap results in FD10C to determine if there are any additional sources of PCBs in this drainage area.
- **OF237A**: Evaluate potential sources and seasonality of occasional outliers of indeno(1,2,3-cd)pyrene and other PAHs in stormwater.
- **OF243:** Perform follow-up work with the business owner and system cleaning work in the area where elevated mercury concentrations were identified in catch basins in the FD23 drainage area.
- **OF243:** Work with WSDOT on repair and cleaning of the large stormwater pond discharging to OF243.
- **OF254:** Evaluate the need for additional business inspections in this basin to focus on TSS.
- **OF243/OF245/OF254:** Continue evaluation of the effectiveness of the street sweeping pilot project on lead and zinc concentrations in the industrial area as additional data become available.

The City will continue to implement routine Permit required programs in the Foss Waterway Watershed that sometimes have a nexus with the source control and source investigation work. These tasks include:

- Continue Foss Stormwater Monitoring for WY2025.
- Review WY2025 SSPM data in all areas when available to evaluate the effectiveness of treatment systems installed and confirm the effectiveness of source control actions that have been taken over time.
- Monitor and conduct inspections at new developments as completed to review appropriate BMPs for each site.
- Implement the City's Stormwater Management Manual, 2021 Edition.
- Continue NPDES business inspections program and document the inspections using the business inspections database. Respond and track all complaints/spills in the complaints database.
- Monitor TPCHD and Ecology UST/LUST removal projects along with any other remediation projects in the watershed.

It should be noted that there are other sources that could also potentially affect sediment quality in the waterways, including groundwater seeps, marinas, atmospheric fallout, NPDES-permitted industrial discharges, and other private stormwater discharges. These sources are outside the scope of the City's Source Control Strategy for municipal stormwater, and largely outside the City's jurisdiction.

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TABLES

Table 2-1
Sediment Trap Monitoring Locations for 2002-2024

Dates Deployed		WY2002	WY2003	WY2004	WY2005	WY2006	WY2007	WY2008	WY2009	WY2010	WY2011	WY2012	WY2013	WY2014	WY2015	WY2016	WY2017	WY2018	WY2019	WY2020	WY2021	WY2022	WY2023	WY2024
		8/31/01 3/25/02-3/26/02	8/27/02-8/29/02 4/28/03	8/27/03 4/8/04	8/24/04- 8/26/04 4/05	8/26/05- 8/30/05 4/06/06	8/21/06- 8/23/06 3/1/07-4/20/07	8/21/07- 8/24/07 4/3/08-4/4/08	8/28/2008 5/4/09-5/8/09	8/27/2009 8/23/10- 8/24/10	8/2310- 8/24/10 8/25/11- 8/26/11	8/24/11- 8/25/11 8/14/12- 8/23/12	8/13/12- 8/23/12 8/30/13	7/10/13- 8/23/13 8/25/14- 8/27/14	8/26/14- 9/3/14 8/10/15- 8/14/15	8/10/15- 8/17/15 8/15/16- 8/26/16	8/15/16 - 8/26/16 8/21/17- 8/23/17	8/21/17 - 8/23/17 8/17/18 - 8/21/18	8/17/18 - 8/21/18 8/19/19 - 8/21/19	8/19/19 - 8/21/19 8/17/20 - 8/18/20	8/17/20 - 8/18/20 8/24/21- 8/25/21	8/24/21 - 8/25/21 8/22/22- 8/23/22	8/22/22 - 8/23/22 8/22/23- 8/24/23	8/21/23- 8/24/23- 8/20/24- 8/22/24
OF237A	FD2	X	X	X	X	X 9/26/05	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	FD2A	X	Pulled 3/10/03	Site gone	X	X 1/9/06	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	FD5	X	X	X	X	X	X	X	X	X	X	X	X											
	FD10		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	pulled				
	FD10B		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	pulled				
	FD10C		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	FD13		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	pulled				
	FD13B		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X						
	FD13B NEW												X	X	X	X	X 10/4/16	X	X	X	X	X	X	X
OF237B	FD1	X	X	X	X	X 9/26/05	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	FD30		X		X			X	X															
	FD31		X		X			X	X	X	X	X	X	X	X	X	X	X	X	X	pulled			
	FD32		X		X			X	X															
	FD33		X		X			X	X															
	FD34		X		X			X	X	X	X	X	X	X	X	X	X	X	X	pulled				
	FD35		X		X			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	pulled	
	FD36		X		X			X	X															
	FD37		X		X			X	X															
	FD38		X		X			X	X															
OF230	FD3NEW	X	X	X	X	X	X *	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	FD3	X	X	X	X	X	X *	X	X	X	X	X	X											
	FD3A/FD3C	X	X	X	X	X	X *	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X*	X*	X*
	FD3B	X	Pulled	X	X	X	X *	X	X	X	X	X	X	X	X	X	X	X	X	pulled				
	FD16		Lost	X	X	X	X *	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	FD16B		X	X	X	X	X *	X	X	X	X	X	X											
	FD18		X	X	X	X	X *	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	FD18B		X	X	X	X	X *	X	X	X	X 1/24/11	X	X	X	X	X	X	X	X	X	pulled			
OF235	FD6	X	X	X	X	X	X *	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	FD6-A					X 10/7/05	X *	X	X	X	X	X	X											
	FD6-B					X 10/6/05	X *	X	X	X	X	X	X											
OF243	FD23	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
OF245	MH390	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	FD21	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
OF248	FD22	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

**FD3A removed on December 17, 2021 due to construction of new OF230A. Replace during WY2023 with FD3C in an upstream location but representing the same drainage basin.*

Table 2-2
Stormwater Summary Statistics, Before and After Line Cleaning

	Total Suspended Solids (mg/L)		Lead (ug/L)		Zinc (ug/L)		Phenanthrene (ug/L)		Pyrene (ug/L)		Indeno(1,2,3-cd) pyrene (ug/L)		Di(2-ethylhexyl) phthalate (ug/L)	
	Pre-Cleaning	Post-Cleaning	Pre-Cleaning	Post-Cleaning	Pre-Cleaning	Post-Cleaning	Pre-Cleaning	Post-Cleaning	Pre-Cleaning	Post-Cleaning	Pre-Cleaning	Post-Cleaning	Pre-Cleaning	Post-Cleaning
OF230* / OF230A*														
Count	49	154	50	159	50	159	50	159	50	159	50	159	49	159
Arithmetic Mean	61	43	29	14	137	99	0.181	0.039	0.368	0.066	0.110	0.025	5.7	2.3
Maximum	232	322	125	229	721	670	0.653	0.235	1.2	0.467	0.346	0.161	24.9	44.1
Median	49.5	26.6	22.6	7.7	120	71.2	0.143	0.026	0.307	0.041	0.102	0.015	4.9	1.5
Minimum	13.9	4.8	7.8	2.1	53.6	31.8	0.011	0.000	0.035	0.0030	0.006	0.000127	0.10	0.15
Pct Reduction in Mean	**30%**		**52%**		**28%**		**79%**		**82%**		**77%**		**59%**	
Significant?	**Yes**		**Yes**		**Yes**		**Yes**		**Yes**		**Yes**		**Yes**	
Standard Deviation	43.3	52.4	20.0	21.2	98	81.1	0.150	0.039	0.276	0.077	0.083	0.031	4.2	3.7
Standard Error	6.2	4.2	2.8	1.7	13.9	6.4	0.021	0.003	0.039	0.0061	0.012	0.002429	0.60	0.30
p-value	0.015		<0.001		0.003		<0.001		<0.001		<0.001		<0.001	
ttest_greater	2.192		4.465		2.751		10.859		12.440		10.846		5.303	
OF235*														
Count	54	195	54	201	54	200	54	202	54	202	54	202	53	202
Arithmetic Mean	101	42	96	42	165	96	0.170	0.037	0.339	0.080	0.080	0.020	9.7	2.3
Maximum	441	247	368	204	475	598	0.479	0.689	1.0	0.854	0.280	0.145	97.0	19.3
Median	78.0	33.8	80.0	32.7	138	78.7	0.138	0.024	0.328	0.056	0.073	0.015	6.1	1.6
Minimum	10.4	5.6	23.2	2.5	37.3	34.3	0.001	0.000	0.034	0.0000	0.003	0.000003	0.37	0.37
Pct Reduction in Mean	**58%**		**56%**		**42%**		**78%**		**76%**		**75%**		**76%**	
Significant?	**Yes**		**Yes**		**Yes**		**Yes**		**Yes**		**Yes**		**Yes**	
Standard Deviation	77.8	33.1	57.0	26.6	95	64.3	0.109	0.056	0.215	0.087	0.056	0.021	13.4	2.3
Standard Error	10.6	2.4	7.8	1.9	13.0	4.5	0.015	0.004	0.029	0.0061	0.008	0.001494	1.84	0.17
p-value	<0.001		<0.001		<0.001		<0.001		<0.001		<0.001		<0.001	
ttest_greater	8.261		9.910		6.260		12.309		13.537		12.389		7.458	
OF237B*														
Count	92	125	92	136	92	137	92	138	92	138	92	138	91	138
Arithmetic Mean	69	30	15	6	82	44	0.080	0.019	0.180	0.037	0.054	0.012	3.2	1.0
Maximum	278	107	64	24	243	285	0.838	0.078	1.5	0.190	0.546	0.046	12.0	3.0
Median	53.3	23.5	11.9	4.1	63	36.1	0.052	0.017	0.127	0.031	0.039	0.011	2.7	0.9
Minimum	3.6	7.8	1.5	1.3	15.0	15.9	0.002	0.000	0.010	0.0046	0.000	0.000064	0.10	0.01
Pct Reduction in Mean	**56%**		**64%**		**46%**		**76%**		**79%**		**77%**		**69%**	
Significant?	**Yes**		**Yes**		**Yes**		**Yes**		**Yes**		**Yes**		**Yes**	
Standard Deviation	51.2	20.2	11.5	4.3	50	29.3	0.104	0.012	0.210	0.026	0.071	0.010	2.6	0.6
Standard Error	5.3	1.8	1.2	0.4	5.2	2.5	0.011	0.001	0.022	0.0023	0.007	0.000861	0.27	0.05
p-value	<0.001		<0.001		<0.001		<0.001		<0.001		<0.001		<0.001	
ttest_greater	7.604		9.092		7.231		6.767		7.883		6.817		9.380	
OF243* First Cleaning in 2021. Pre-cleaning: 2001 through August 29, 2021. Post-cleaning: November 25, 2021 to present														
Count	126	19	129	19	129	19	129	19	129	19	129	19	128	19
Arithmetic Mean	66	34	35	13	95	53	0.051	0.034	0.098	0.055	0.029	0.018	2.0	0.7
Maximum	300	84	379	46	1170	95	0.221	0.113	0.6	0.187	0.620	0.048	41.0	1.5
Median	42.7	28.3	17.2	9.1	69	47.9	0.033	0.029	0.057	0.040	0.016	0.014	1.0	0.6
Minimum	4.4	6.2	0.1	2.3	12.3	28.3	0.000	0.012	0.012	0.0145	0.000	0.001436	0.04	0.19
Pct Reduction in Mean	**49%**		**63%**		**44%**		**33%**		**44%**		**39%**		**64%**	
Significant?	**Yes**		**Yes**		**No**		**No**		**Yes**		**No**		**No**	
Standard Deviation	60.1	23.6	52.7	12.0	111	20.4	0.046	0.023	0.102	0.041	0.059	0.012	3.8	0.4
Standard Error	5.4	5.4	4.6	2.8	9.8	4.7	0.004	0.005	0.009	0.0093	0.005	0.002824	0.34	0.08
p-value	0.011		0.036		0.053		0.060		0.035		0.205		0.079	
ttest_greater	2.329		1.811		1.623		1.566		1.826		0.827		1.419	
OF245* First Cleaning in 2021. Pre-cleaning: 2001 through September 20, 2021. Post-cleaning: October 1, 2021 to present														
Count	182	33	188	34	187	34	186	34	186	34	186	34	184	34
Arithmetic Mean	63	39	10	4	138	72	0.064	0.033	0.085	0.040	0.014	0.008	2.4	1.0
Maximum	296	119	60	17	585	148	1.650	0.075	1.3	0.113	0.058	0.042	31.0	1.9
Median	51.5	31.6	8.2	2.8	112	58.9	0.035	0.029	0.050	0.036	0.010	0.006	1.4	1.0
Minimum	6.2	10.5	0.8	0.8	27.7	30.2	0.001	0.001	0.001	0.0138	0.000	0.000095	0.04	0.47
Pct Reduction in Mean	**38%**		**62%**		**48%**		**49%**		**53%**		**45%**		**59%**	
Significant?	**Yes**		**Yes**		**Yes**		**No**		**Yes**		**Yes**		**Yes**	
Standard Deviation	44.6	25.1	8.6	3.0	98	31.2	0.134	0.017	0.121	0.022	0.014	0.008	3.6	0.3
Standard Error	3.3	4.4	0.6	0.5	7.1	5.4	0.010	0.003	0.009	0.0037	0.001	0.001353	0.27	0.05
p-value	0.001		<0.001		<0.001		0.090		0.016		0.004		0.011	
ttest_greater	3.025		4.260		3.921		1.345		2.168		2.671		2.291	
First Cleaning in 2008. OF237A* Pre-cleaning: 2001 through April 28, 2008. Post-cleaning: August 8, 2008 through July 7, 2021														
Count	60	126	60	128	60	128	60	127	60	127	60	127	59	127
Arithmetic Mean	57	47	15	10	117	82	0.162	0.048	0.423	0.102	0.126	0.043	3.4	1.4
Maximum	281	668	43	81	361	352	0.893	0.831	2.9	1.730	0.680	0.578	13.7	5.5
Median	49.0	27.0	12.7	6.6	106	62.7	0.125	0.025	0.326	0.048	0.096	0.021	3.3	1.2
Minimum	3.5	5.3	1.5	1.4	41.8	30.6	0.001	0.001	0.035	0.0014	0.000	0.000138	0.00	0.07
Pct Reduction in Mean	**17%**		**32%**		**30%**		**71%**		**76%**		**66%**		**58%**	
Significant?	**No**		**Yes**		**Yes**		**Yes**		**Yes**		**Yes**		**Yes**	
Standard Deviation	41.0	72.6	8.4	11.5	53	58.1	0.160	0.093	0.446	0.197	0.130	0.071	2.5	0.9
Standard Error	5.3	6.5	1.1	1.0	6.8	5.1	0.021	0.008	0.058	0.0174	0.017	0.006269	0.33	0.08
p-value	0.166		0.002		<0.001		<0.001		<0.001		<0.001		<0.001	
ttest_greater	0.971		2.860		3.930		6.149		6.845		5.677		7.820	
Second Cleaning in 2021. OF237A* Pre-cleaning: August 8, 2008 through July 7, 2021. Post-cleaning: September 21, 2021 to present														
Count	126	27	128	29	128	29	127	29	127	29	127	29	127	29
Arithmetic Mean	47	44	10	7	82	66	0.048	0.048	0.102	0.105	0.043	0.061	1.4	1.4
Maximum	668.0	156.0	80.6	25.4	352.0	158.0	0.831	0.199	1.730	0.542	0.578	0.313	5	3.73
Median	27.0	33.2	6.6	5.5	62.7	58.0	0.025	0.037	0.048	0.079	0.021	0.044	1.18	1.34
Minimum	5.3	10.8	1.4	1.7	30.6	33.4	0.001	0.014	0.001	0.005	0.0001	0.014	0.07	0.53
Pct Reduction in Mean	7%		32%		20%		-1%		-3%		-43%		4%	
Significant?	No		No		No		No		No		No		No	
Standard Deviation	72.6	32.8	11.5	5.2	58.1	29.3	0.093	0.038	0.197	0.099	0.071	0.060	0.92	0.60
Standard Error	6.5	6.3	1.0	1.0	5.1	5.4	0.008	0.007	0.017	0.018	0.006	0.01108	0.08	0.11
p-value	0.413		0.071		0.071		0.515		0.527		0.902		0.381	
ttest_greater	0.219		1.479		1.474		-0.037		-0.069		-1.300		0.304	
First Cleaned in 2006: OF254* Pre-cleaning: 2001 through Jan 26, 2006. Post-cleaning: June 15 2006 through September 23, 2021														
Count	37	112	37	115	37	115	37	114	37	114	37	114	37	114
Arithmetic Mean	83	94	20	14	182	105	0.159	0.051	0.572	0.103	0.071	0.018	2.6	2.0
Maximum	240	354	50	68	427	334	0.657	0.283	4.1	0.773	0.239	0.110	6.6	10.2
Median	77.0	69.2	16.7	8.8	157	81.7	0.133	0.039	0.402	0.063	0.060	0.014	2.4	1.3
Minimum	5.2	14.3	4.2	1.5	73.7	38.9	0.018	0.001	0.086	0.0023	0.012	0.000309	0.06	0.00
Pct Reduction in Mean	**-13%**		**32%**		**42%**		**68%**		**82%**		**74%**		**23%**	
Significant?	**No**		**Yes**		**Yes**		**Yes**		**Yes**		**Yes**		**No**	
Standard Deviation	48.2	74.4	10.7	12.7	83	62.8	0.116	0.047	0.654	0.130	0.042	0.020	1.8	2.0
Standard Error	7.9	7.0	1.8	1.2	13.7	5.9	0.019	0.004	0.108	0.0122	0.007	0.001889	0.30	0.19
p-value	0.799		0.003		<0.001		<0.001		<0.001		<0.001		0.062	
ttest_greater	-0.840		2.845		5.923		8.174		7.270		10.383		1.549	
Second Cleaning in 2021. OF254* Pre-cleaning: June 15 2006 through September 23, 2021. Post-cleaning: October 7, 2021 to present														
Count	112	17	115	17	115	17	114	17	114	17	114	17	114	17
Arithmetic Mean	94	53	14	6	105	63	0.051	0.034	0.103	0.063	0.018	0.016	2.0	0.9
Maximum	354	106	68	22.6	334	147	0.283	0.063	0.773	0.156	0.110	0.044	10	1.93
Median	69.2	44.3	8.8	5.4	81.7	60.1	0.039	0.033	0.063	0.047	0.014	0.015	1.31	0.95
Minimum	14.3	11.5	1.5	1.2	38.9	27.6	0.001	0.005	0.002	0.020	0.000309	0.005	0.00	0.30
Pct Reduction in Mean	**44%**		**57%**		**41%**		33%		39%		11%		**53%**	
Significant?	**Yes**		**Yes**		**Yes**		No		No		No		**Yes**	
Standard Deviation	74.4	29.6	12.7	4.9	62.8	26.1	0.047	0.015	0.130	0.037	0.020	0.009	2.03	0.42
Standard Error	7.0	7.2	1.2	1.2	5.9	6.3	0.004	0.004	0.012	0.009	0.002	0.00221	0.19	0.10
p-value	0.012		0.007		0.003		0.071		0.105		0.344		0.017	
ttest_greater	2.282		2.509		2.772		1.474		1.259		0.402		2.150	

Notes:

**Following are the dates of the City's sewer-line cleaning activities:*

OF230: March 12 through May 14, 2007.

OF230A: In 2023 OF230 was updated to OF230A.

OF235: May 15 through June 25, 2007

OF237A: April 28 through August 8, 2008 (only the northern half of this drainage basin was cleaned), July 8 through Sept 20, 2021 (FS08 and FS04 497 acres cleaned (17%)).

OF237B: November 7, 2010 to February 24, 2011

OF243: August 31 through October 12, 2021.

OF245: September 21 through 23, 2021.

OF254: January 26 through June 14, 2006. September 24 through October 6, 2021.

**Any monitoring events within the window of cleaning activities were excluded from the analysis.*

OF237A location includes data from OF237A New sampling location for all data collected after to 2/26/06.

Table 2-3.1
Stormwater Summary Statistics, Before and After Street Sweeping

	Total Suspended Solids (mg/L)		Lead (ug/L)		Zinc (ug/L)		Phenanthrene (ug/L)		Pyrene (ug/L)		Indeno(1,2,3-cd) pyrene (ug/L)		Di(2-ethylhexyl) phthalate (ug/L)	
	Pre-Sweeping	Post-Sweeping	Pre-Sweeping	Post-Sweeping	Pre-Sweeping	Post-Sweeping	Pre-Sweeping	Post-Sweeping	Pre-Sweeping	Post-Sweeping	Pre-Sweeping	Post-Sweeping	Pre-Sweeping	Post-Sweeping
Outfall 230/ OF 230A*														
Count	41	156	41	162	41	162	41	162	41	162	41	162	40	162
Arithmetic Mean	65	43	30	14	141	99	0.192	0.041	0.383	0.072	0.112	0.028	5.7	2.4
Maximum	232	322	125	229	721	670	0.653	0.235	1.2	0.553	0.346	0.228	24.9	44.1
Median	49.5	26.6	24.4	8.1	122	72.5	0.157	0.026	0.316	0.042	0.102	0.015	4.6	1.5
Minimum	13.9	4.8	7.8	2.1	53.6	31.8	0.011	0.000	0.035	0.0030	0.006	0.000127	0.10	0.15
Pct Reduction in Mean	**33%**		**54%**		**30%**		**79%**		**81%**		**75%**		**58%**	
Significant?	**Yes**		**Yes**		**Yes**		**Yes**		**Yes**		**Yes**		**Yes**	
Standard Deviation	45.6	52.1	21.4	21.1	106	80.7	0.161	0.043	0.296	0.089	0.089	0.036	4.6	3.7
Standard Error	7.1	4.2	3.3	1.7	16.6	6.3	0.025	0.003	0.046	0.0070	0.014	0.002827	0.73	0.29
p-value	0.008		<0.001		0.003		<0.001		<0.001		<0.001		<0.001	
ttest_greater	2.414		4.423		2.800		10.551		11.550		9.442		4.776	
Outfall 235*														
Count	44	198	44	204	44	203	44	205	44	205	44	205	43	205
Arithmetic Mean	108	43	99	43	170	97	0.178	0.041	0.359	0.088	0.083	0.022	10.1	2.3
Maximum	441	247	368	204	475	598	0.479	0.776	1.0	1.164	0.280	0.338	97.0	19.3
Median	81.8	34.5	81.5	33.5	135	79.0	0.147	0.024	0.355	0.058	0.078	0.015	6.2	1.6
Minimum	10.4	5.6	23.2	2.5	37.3	34.3	0.001	0.000	0.034	0.0000	0.003	0.000003	0.37	0.37
Pct Reduction in Mean	**60%**		**57%**		**43%**		**77%**		**75%**		**73%**		**77%**	
Significant?	**Yes**		**Yes**		**Yes**		**Yes**		**Yes**		**Yes**		**Yes**	
Standard Deviation	82.6	34.3	61.1	26.7	103	64.3	0.115	0.077	0.224	0.119	0.058	0.032	14.7	2.4
Standard Error	12.5	2.4	9.2	1.9	15.5	4.5	0.017	0.005	0.034	0.0083	0.009	0.002240	2.25	0.17
p-value	<0.001		<0.001		<0.001		<0.001		<0.001		<0.001		<0.001	
ttest_greater	8.279		9.692		6.025		9.675		11.412		9.708		7.197	
Outfall 237A*														
Count	44	166	44	169	44	169	44	168	44	168	44	168	43	168
Arithmetic Mean	53	48	15	10	119	83	0.163	0.056	0.405	0.130	0.117	0.053	3.4	1.6
Maximum	120	668	32	81	361	352	0.893	0.831	1.8	2.930	0.669	0.680	13.7	7.9
Median	51.7	29.8	13.4	6.6	106	63.1	0.126	0.028	0.341	0.056	0.100	0.024	2.6	1.2
Minimum	13.1	3.5	5.0	1.4	41.8	30.6	0.001	0.001	0.041	0.0014	0.003	0.000138	0.00	0.07
Pct Reduction in Mean	**9%**		**29%**		**30%**		**66%**		**68%**		**55%**		**54%**	
Significant?	**No**		**Yes**		**Yes**		**Yes**		**Yes**		**Yes**		**Yes**	
Standard Deviation	23.4	68.2	6.8	11.3	56	55.1	0.147	0.105	0.324	0.290	0.115	0.087	2.7	1.1
Standard Error	3.5	5.3	1.0	0.9	8.4	4.2	0.022	0.008	0.049	0.0223	0.017	0.006740	0.41	0.09
p-value	0.329		0.010		<0.001		<0.001		<0.001		<0.001		<0.001	
ttest_greater	0.444		2.335		3.845		5.486		5.481		4.044		6.855	
Outfall 237B*														
Count	45	171	45	182	45	183	45	184	45	184	45	184	44	184
Arithmetic Mean	76	39	18	7	93	51	0.102	0.028	0.238	0.055	0.066	0.019	3.9	1.3
Maximum	278	211	64	55	232	285	0.423	0.838	1.0	1.493	0.277	0.546	12.0	8.7
Median	60.3	29.2	14.3	5.0	71	40.7	0.091	0.017	0.242	0.032	0.061	0.011	3.2	0.9
Minimum	7.5	3.6	3.8	1.3	31.3	15.0	0.005	0.000	0.028	0.0006	0.000	0.000064	0.20	0.01
Pct Reduction in Mean	**48%**		**58%**		**45%**		**73%**		**77%**		**72%**		**67%**	
Significant?	**Yes**		**Yes**		**Yes**		**Yes**		**Yes**		**Yes**		**Yes**	
Standard Deviation	55.1	35.0	12.5	7.4	54	36.6	0.071	0.065	0.174	0.121	0.052	0.045	3.0	1.2
Standard Error	8.2	2.7	1.9	0.6	8.0	2.7	0.011	0.005	0.026	0.0089	0.008	0.003294	0.46	0.09
p-value	<0.001		<0.001		<0.001		<0.001		<0.001		<0.001		<0.001	
ttest_greater	5.520		7.320		6.243		6.730		8.323		6.181		9.093	
Outfall 243[*ab] Note: Includes comparison of Standard Sweeping schedule in place prior to 2006 to enhanced schedule implemented from January 2007 through September 2013. New, increased street sweeping frequency in this area started in October 2013 at locations 243 and 245 and a comparison of those results is provided on Table 2-3.2.														
Count	32	37	32	38	32	38	32	38	32	38	32	38	31	38
Arithmetic Mean	69	79	47	52	147	95	0.100	0.030	0.180	0.070	0.041	0.019	3.3	2.0
Maximum	220	300	353	379	1170	392	0.221	0.116	0.6	0.452	0.121	0.113	8.4	41.0
Median	58.4	49.0	27.1	28.3	100	67.7	0.098	0.019	0.163	0.039	0.033	0.006	3.1	0.6
Minimum	10.7	4.4	9.7	1.4	51.1	19.6	0.023	0.006	0.033	0.0120	0.001	0.000557	0.10	0.04
Pct Reduction in Mean	**-13%**		**-12%**		**36%**		**70%**		**61%**		**53%**		**41%**	
Significant?	**No**		**No**		**No**		**Yes**		**Yes**		**Yes**		**No**	
Standard Deviation	50.2	72.3	61.5	70.0	194	76.1	0.055	0.028	0.124	0.096	0.029	0.031	2.2	6.6
Standard Error	8.9	11.9	10.9	11.4	34.3	12.3	0.010	0.004	0.022	0.0156	0.005	0.004973	0.39	1.07
p-value	0.730		0.636		0.064		<0.001		<0.001		0.002		0.141	
ttest_greater	-0.615		-0.350		1.537		6.944		4.147		3.020		1.083	
Outfall 245[*a] Note: Includes comparison of Standard Sweeping schedule in place prior to 2006 to enhanced schedule implemented from January 2007 through September 2013. New, increased street sweeping frequency in this area started in October 2013 at locations 243 and 245 and a comparison of those results is provided on Table 2-3.2.														
Count	41	57	41	61	41	60	41	60	41	60	41	60	40	59
Arithmetic Mean	84	58	15	11	187	160	0.136	0.043	0.162	0.056	0.026	0.010	5.6	1.5
Maximum	243	186	39	60	585	498	1.650	0.477	1.3	0.295	0.057	0.051	31.0	6.9
Median	72.4	51.2	12.2	9.2	146	135.0	0.083	0.025	0.123	0.026	0.025	0.005	3.4	0.9
Minimum	17.6	6.2	2.7	0.8	54.8	27.7	0.019	0.001	0.026	0.0008	0.002	0.000061	0.04	0.05
Pct Reduction in Mean	**31%**		**22%**		**14%**		**68%**		**65%**		**61%**		**73%**	
Significant?	**Yes**		**Yes**		**No**		**Yes**		**Yes**		**Yes**		**Yes**	
Standard Deviation	52.9	39.4	8.5	10.1	123	107.6	0.256	0.065	0.200	0.070	0.014	0.012	6.6	1.5
Standard Error	8.3	5.2	1.3	1.3	19.2	13.9	0.040	0.008	0.031	0.0091	0.002	0.001605	1.04	0.19
p-value	0.004		0.045		0.128		0.004		<0.001		<0.001		<0.001	
ttest_greater	2.752		1.711		1.142		2.686		3.777		5.803		4.609	
Outfall 254[*] Note: Includes comparison of Standard Sweeping schedule in place prior to 2019. New, increased street sweeping frequency in a portion of the 254 basin started in January 2019 and a comparison of those results is provided on Table 2-3.2.														
Count	35	88	35	90	35	90	35	90	35	90	35	90	35	90
Arithmetic Mean	86	103	21	16	187	112	0.161	0.051	0.584	0.104	0.073	0.019	2.6	2.2
Maximum	240	354	50	68	427	334	0.657	0.283	4.1	0.773	0.239	0.110	6.6	10.2
Median	78.8	80.8	17.3	11.0	179	89.3	0.133	0.034	0.402	0.059	0.060	0.013	2.4	1.3
Minimum	5.2	14.3	8.6	1.5	73.7	38.9	0.018	0.001	0.086	0.0023	0.012	0.000309	0.06	0.01
Pct Reduction in Mean	**-19%**		**26%**		**40%**		**69%**		**82%**		**74%**		**16%**	
Significant?	**No**		**Yes**		**Yes**		**Yes**		**Yes**		**Yes**		**No**	
Standard Deviation	48.0	80.2	10.6	13.6	83	65.1	0.118	0.050	0.670	0.143	0.042	0.022	1.9	2.2
Standard Error	8.1	8.6	1.8	1.4	14.0	6.9	0.020	0.005	0.113	0.0151	0.007	0.002311	0.32	0.23
p-value	0.873		0.019		<0.001		<0.001		<0.001		<0.001		0.161	
ttest_greater	-1.144		2.107		5.324		7.341		6.455		9.413		0.995	

Notes:

**Street sweeping program started in January 2006 and was in full swing by January 2007. Any monitoring events within the startup window (1/1/06 to 1/1/07) were excluded from the analysis.*

237A location includes data from 237A New sampling location for all data collected after to 2/26/06.

[a] *Includes comparison of Standard Sweeping schedule to enhanced schedule implemented from January 2007 through September 2013. New increased street sweeping frequency started in October 2013 at locations 243 and 245 and those results are shown on Table 2-3.2.*

[b] *Indeno(1,2,3-cd)pyrene value of 0.62 ug/l on 11/15/2016 was excluded from this analysis as an outlier.*

Table 2-3.2

Stormwater Summary Statistics, Before and After Street Sweeping - Enhanced[a]

	Total Suspended Solids (mg/L)		Lead (ug/L)		Zinc (ug/L)		Phenanthrene (ug/L)		Pyrene (ug/L)		Indeno(1,2,3-cd) pyrene (ug/L)		Di(2-ethylhexyl) phthalate (ug/L)	
	Sweeping	Enh Sweeping	Sweeping	Enh Sweeping	Sweeping	Enh Sweeping	Sweeping	Enh Sweeping	Sweeping	Enh Sweeping	Sweeping	Enh Sweeping	Sweeping	Enh Sweeping
Outfall 243[ab]														
Count	37	74	38	76	38	76	38	76	38	76	38	76	38	76
Arithmetic Mean	79	49	52	16	95	61	0.030	0.033	0.070	0.059	0.019	0.024	2.0	1.0
Maximum	300.0	289.0	379.0	115.0	392.0	233.0	0.116	0.113	0.452	0.293	0.113	0.620	41	3.95
Median	49.0	33.2	28.3	10.2	67.7	52.3	0.019	0.029	0.039	0.047	0.006	0.015	0.64	0.78
Minimum	4.4	6.2	1.4	0.1	19.6	12.3	0.006	0.000	0.012	0.012	0.0006	0.000	0.04	0.19
Pct Reduction in Mean	**38%**		**69%**		**35%**		-11%		17%		-28%		49%	
Significant?	**Yes**		**Yes**		**Yes**		No		No		No		No	
Standard Deviation	72.3	50.2	70.0	18.8	76.1	32.1	0.028	0.018	0.096	0.043	0.031	0.070	6.57	0.71
Standard Error	11.9	5.8	11.4	2.2	12.3	3.7	0.004	0.002	0.016	0.005	0.005	0.00805	1.07	0.08
p-value	0.006		<0.001		<0.001		0.785		0.187		0.670		0.103	
ttest_greater	2.544		4.191		3.295		-0.791		0.894		-0.441		1.271	
Outfall 245[a]														
Count	57	108	61	111	60	111	60	110	60	110	60	110	59	110
Arithmetic Mean	58	49	11	6	160	87	0.043	0.033	0.056	0.049	0.010	0.009	1.5	1.3
Maximum	186	296	60	33.8	498	306	0.477	0.105	0.295	0.173	0.051	0.042	7	3.39
Median	51.2	41.4	9.2	4.8	135.0	82.4	0.025	0.031	0.026	0.044	0.005	0.008	0.93	1.12
Minimum	6.2	10.0	0.8	0.8	27.7	29.4	0.001	0.001	0.001	0.011	0.000061	0.000	0.05	0.07
Pct Reduction in Mean	16%		**51%**		**46%**		24%		13%		12%		14%	
Significant?	No		**Yes**		**Yes**		No		No		No		No	
Standard Deviation	39.4	37.5	10.1	4.3	107.6	46.2	0.065	0.018	0.070	0.028	0.012	0.007	1.48	0.63
Standard Error	5.2	3.6	1.3	0.4	13.9	4.4	0.008	0.002	0.009	0.003	0.002	0.00066	0.19	0.06
p-value	0.073		<0.001		<0.001		0.060		0.172		0.209		0.099	
ttest_greater	1.462		5.310		6.188		1.562		0.948		0.810		1.291	
Outfall 254[c]														
Count	88	39	90	40	90	40	90	39	90	39	90	39	90	39
Arithmetic Mean	103	56	16	6	112	67	0.051	0.040	0.104	0.075	0.019	0.015	2.2	1.2
Maximum	354	128	68.0	23	334	147	0.283	0.106	0.773	0.203	0.110	0.044	10.2	3.2
Median	80.8	55.7	11.0	5.4	89.3	63.5	0.034	0.038	0.059	0.066	0.013	0.015	1.33	1.08
Minimum	14.3	11.5	1.5	1.2	38.9	27.6	0.001	0.005	0.002	0.0200	0.000	0.00044	0.01	0.11
Pct Reduction in Mean	**45%**		**60%**		**40%**		20%		28%		18%		**45%**	
Significant?	**Yes**		**Yes**		**Yes**		No		No		No		**Yes**	
Standard Deviation	80.2	28.0	13.6	3.8	65.1	23.6	0.050	0.020	0.143	0.040	0.022	0.008	2.22	0.64
Standard Error	8.6	4.5	1.4	0.6	6.9	3.7	0.005	0.003	0.015	0.006	0.002	0.00128	0.23	0.10
p-value	<0.001		<0.001		<0.001		0.112		0.104		0.170		0.004	
ttest_greater	3.516		4.321		4.188		1.223		1.268		0.956		2.672	

Notes:

[a] *Provides a comparison of sweeping schedule in place from January 2007 through September 2013 to the new street sweeping frequency started in October 2013 at locations 243 and 245 and continuing through 2023.*

[b] *Indeno(1,2,3-cd)pyrene value of 0.62 ug/l on 11/15/2016 was excluded from this analysis as an outlier.*

[c] *Provides a comparison of sweeping schedule in place from January 2007 through December 2019 to the new street sweeping frequency started in January 2019 in a portion of 254 Basin and continuing through 2023.*

Table 3-1
Total Rain Depth (Inches) During Past and Present Monitoring Years

		WY2002	WY2003	WY2004	WY2005	WY2006	WY2007	WY2008	WY2009	WY2010	WY2011	WY2012	WY2013	WY2014	WY2015	WY2016	WY2017	WY2018	WY2019	WY2020	WY2021	WY2022	WY2023	WY2024	WY2002 -WY2024 Average	Historical Monthly Mean NCDC 1971-2000	Historical Monthly Mean NCDC 1981 - 2010
WET	October	3.32	0.41	8.88	3.61	3.00	1.28	3.64	2.36	4.18	4.64	3.39	5.97	1.57	6.20	5.92	10.57	5.60	3.89	3.66	3.06	5.03	2.03	2.93	4.14	3.39	3.70
	November	10.13	2.96	6.15	2.81	6.25	15.81	2.64	7.61	7.74	5.37	5.98	7.12	3.40	6.53	8.22	7.57	9.38	4.15	1.85	5.41	10.54	5.64	4.74	6.43	6.10	6.68
	December	6.82	6.58	4.65	4.03	6.28	8.05	8.36	4.03	2.67	6.83	6.44	8.33	1.91	4.88	12.22	3.66	5.74	6.93	7.36	5.64	5.55	6.98	7.91	6.17	5.89	5.52
	January	6.68	8.5	6.79	4.71	11.93	6.92	4.63	7.15	7.40	5.17	7.02	3.31	4.29	3.98	7.20	2.99	7.90	3.70	9.66	8.65	7.28	2.80	6.60	6.32	5.38	5.93
	February	3.56	1.71	2.55	0.79	2.59	4.09	2.84	1.61	3.95	3.54	3.19	1.58	7.68	4.61	5.55	9.24	2.75	4.19	3.35	4.00	3.56	1.79	2.41	3.53	4.44	3.86
	March	4.16	5.08	2.18	3.14	1.91	6.09	4.16	4.68	4.91	6.57	7.11	2.50	8.81	3.89	5.80	8.27	2.15	1.86	3.47	2.06	3.10	2.52	1.61	4.18	4.18	4.06
	April	3.64	3.3	0.91	4.74	2.46	1.34	1.76	3.31	2.90	5.13	3.74	4.52	4.22	1.56	1.37	4.67	5.81	2.65	1.24	0.85	3.34	3.49	1.76	2.99	2.87	3.00
DRY	May	1.14	0.55	2.56	3.34	1.56	1.31	1.01	3.03	4.15	3.77	2.33	2.86	3.23	0.74	0.58	2.02	0.09	0.46	2.49	1.29	3.04	0.62	1.24	1.89	2.01	2.11
	June	1.36	0.36	0.64	1.26	2.25	1.44	1.26	0.33	3.05	1.40	2.54	1.85	0.94	0.22	1.41	1.54	0.69	0.19	1.90	1.85	2.72	0.32	1.27	1.34	1.58	1.57
	July	0.42	0.13	0.00	1.16	0.11	1.30	0.26	0.00	0.78	0.74	0.87	0.01	0.57	0.47	0.61	0.00	0.02	0.77	0.20	0.00	0.19	0.11	0.04	0.38	0.86	0.68
	August	0.06	0.29	2.75	0.04	0.00	0.90	2.32	1.04	0.24	0.27	0.00	1.05	1.72	2.21	0.10	0.09	0.10	1.19	0.42	0.05	0.57	0.26	1.14	0.73	0.83	0.82
	September	0.36	0.69	3.26	0.92	0.74	2.22	0.39	2.82	3.93	0.96	0.02	8.29	2.26	1.12	1.13	1.11	1.54	2.69	2.30	3.20	0.00	2.49	1.14	1.89	1.42	1.29
	Wet Season	38.31	28.54	32.11	23.83	34.42	43.58	28.03	30.75	33.75	37.25	36.87	33.33	31.88	31.65	46.28	46.97	39.33	27.37	30.59	29.67	38.40	25.25	27.96	33.74	32.25	32.75
	Dry Season	3.34	2.02	9.21	6.72	4.66	7.17	5.24	7.22	12.15	7.14	5.76	14.06	8.72	4.76	3.83	4.76	2.44	5.30	7.31	6.39	6.52	3.80	4.83	6.23	6.70	6.47
	Total	41.65	30.56	41.32	30.55	39.08	50.75	33.27	37.97	45.90	44.39	42.63	47.39	40.60	36.41	50.11	51.73	41.77	32.67	37.90	36.06	44.92	29.05	32.79	39.98	38.95	39.22

Key:

	Months	*Seasons/Years*
	> 2" above historical monthly average	*> 8" above historical seasonal/yearly average*
	> 1" above historical monthly average	*> 4" above historical seasonal/yearly average*
	≤ 1" above/below historical monthly average	*≤ 4" above/below historical seasonal/yearly average*
	> 1" below historical monthly average	*> 4" below historical seasonal/yearly average*
	> 2" below historical monthly average	*> 8" below historical seasonal/yearly average*

Table 3-1 Total Rain Depth (Inches) During Past and Present Monitoring Years

Table 3-2.1
Summary Statistics for WY2001-WY2011 Baseflow

	Overall Data						OF230				OF235				OF237A			
	Overall Detections	% Detections	Arithmetic Mean	Weighted Mean	Max	Date of Max	Min	Max	Arithmetic Mean	Median	Min	Max	Arithmetic Mean	Median	Min	Max	Arithmetic Mean	Median
Conventionals																		
Hardness (mg/L as CaCO3)	281/281	100		N/A	N/A	N/A	27.9	249	144	142	123	199	155	149	85.4	134	105	105
pH (pH units)	296/296	100		N/A	N/A	N/A	6.8	9.0	7.7	7.7	7.1	8.0	7.7	7.7	6.8	7.8	7.4	7.4
TSS (mg/L)	273/295	93	12.29	12.2	319	3/12/09	0.26	319	15.8	5.90	0.31	258	25.4	6.85	0.26	16.3	3.08	2.1
Metals in ug/L																		
Lead	209/289	72	5.52	5.53	112	8/7/06	0.97	29.8	5.56	4.0	1.64	112	14.29	6.5	0.06	6.11	1.21	0.70
Mercury	18/293	6	0.03	0.03	0.38	7/26/04	0.025	0.250	0.036	0.025	0.025	0.38	0.041	0.025	0.025	0.196	0.031	0.025
Zinc	283/286	99	46.55	47.5	1,950	8/28/07	19.3	108	46.6	34.0	6.6	355	41.9	17.20	1.65	27.0	9.5	9.3
Dissolved Lead	169/288	59	2.88	2.86	47.2	8/28/07	0.140	5.5	1.52	1.25	0.210	6.0	1.56	1.10	0.051	4.5	0.81	0.60
Dissolved Mercury	9/289	3	0.028	0.03	0.193	7/27/04	0.025	0.059	0.031	0.025	0.025	0.025	0.025	0.025	0.025	0.135	0.031	0.025
Dissolved Zinc	274/286	96	25.3	25.9	1,220	8/28/07	6.42	95.0	29.15	24.4	3.80	29.9	10.78	9.24	2.30	12.6	7.7	7.4
PAHs in ug/L																		
2-Methylnaphthalene	55/297	19	0.015	0.015	2.100	2/12/02	0.002	0.122	0.013	0.005	0.002	0.023	0.006	0.005	0.002	2.100	0.063	0.005
Acenaphthene	124/297	42	0.014	0.014	0.103	11/21/02	0.002	0.013	0.005	0.005	0.002	0.032	0.011	0.012	0.002	0.031	0.005	0.005
Acenaphthylene	7/297	2	0.004	0.004	0.019	7/17/08	0.002	0.005	0.004	0.005	0.002	0.005	0.004	0.005	0.002	0.016	0.004	0.005
Anthracene	36/297	12	0.006	0.006	0.077	7/17/05	0.002	0.012	0.004	0.005	0.002	0.031	0.006	0.005	0.002	0.005	0.004	0.005
Fluorene	56/291	19	0.006	0.006	0.086	2/12/02	0.002	0.012	0.005	0.005	0.002	0.060	0.009	0.005	0.002	0.086	0.007	0.005
Naphthalene	139/297	47	0.023	0.023	3.000	2/12/02	0.005	0.228	0.026	0.014	0.003	0.054	0.011	0.009	0.002	3.000	0.088	0.010
Phenanthrene	134/297	45	0.013	0.013	0.684	7/17/05	0.002	0.060	0.012	0.011	0.002	0.115	0.014	0.005	0.002	0.149	0.011	0.005
Total LPAHs[1,2]	496/1776	28	0.066	0.011	3.276	N/A	0.016	0.270	0.056	0.043	0.013	0.206	0.056	0.045	0.010	3.276	0.119	0.031
Benzo(a)anthracene	72/297	24	0.012	0.012	1.110	1/13/09	0.001	0.066	0.007	0.005	0.001	0.114	0.013	0.005	0.001	0.022	0.006	0.005
Benzo(a)pyrene	42/297	14	0.007	0.007	0.142	1/24/06	0.002	0.057	0.006	0.005	0.002	0.142	0.013	0.005	0.002	0.020	0.006	0.005
Benzo(g,h,i)perylene	52/297	18	0.007	0.007	0.166	8/7/06	0.002	0.023	0.007	0.005	0.002	0.166	0.012	0.005	0.002	0.022	0.006	0.005
Benzo(b,k)fluoranthenes	115/297	39	0.015	0.015	0.376	7/17/05	0.002	0.113	0.013	0.007	0.002	0.344	0.026	0.006	0.002	0.047	0.011	0.005
Chrysene	76/297	26	0.011	0.011	0.362	3/12/09	0.002	0.087	0.010	0.005	0.002	0.199	0.018	0.005	0.002	0.026	0.006	0.005
Dibenz(a,h)anthracene	14/297	5	0.005	0.005	0.028	8/7/06	0.002	0.011	0.005	0.005	0.002	0.028	0.005	0.005	0.002	0.010	0.005	0.005
Fluoranthene	177/297	60	0.021	0.021	1.140	3/12/09	0.003	0.133	0.017	0.011	0.003	0.295	0.029	0.012	0.002	0.046	0.010	0.005
Indeno(1,2,3-c,d)pyrene	32/297	11	0.006	0.006	0.115	8/7/06	0.002	0.019	0.005	0.005	0.002	0.115	0.009	0.005	0.002	0.018	0.005	0.005
Pyrene	234/297	79	0.026	0.026	0.879	7/17/05	0.004	0.173	0.021	0.015	0.003	0.253	0.034	0.018	0.002	0.056	0.013	0.005
Total HPAHs[1]	814/2673	30	0.112	0.012	3.287	N/A	0.025	0.671	0.091	0.060	0.025	1.639	0.162	0.068	0.022	0.249	0.067	0.045
Total PAHs[1]	1310/4449	29	0.178	0.012	4.185	N/A	0.041	0.840	0.147	0.121	0.038	1.845	0.217	0.116	0.034	3.464	0.186	0.087
Phthalates in ug/L																		
Bis(2-ethylhexyl)phthalate	85/290	29	1.07	1.06	33.0	3/23/10	0.26	33.00	2.00	0.50	0.20	21.30	1.84	0.72	0.20	1.60	0.56	0.50
Butylbenzylphthalate	29/297	10	0.56	0.56	16.0	7/28/04	0.09	0.70	0.39	0.50	0.09	1.60	0.44	0.50	0.09	0.50	0.37	0.50
Diethylphthalate	65/297	22	0.92	0.92	32.0	2/5/03	0.07	8.40	0.69	0.50	0.04	15.00	0.91	0.50	0.04	32.00	1.99	0.50
Dimethylphthalate	2/297	1	0.36	0.36	0.5	N/A	0.02	0.50	0.36	0.50	0.02	0.50	0.36	0.50	0.02	0.50	0.35	0.50
Di-n-butylphthalate	59/297	20	0.43	0.43	4.3	3/23/10	0.10	0.50	0.40	0.50	0.05	0.50	0.40	0.50	0.05	0.50	0.41	0.50
Di-n-octyl phthalate	5/297	2	0.38	0.38	3.9	7/26/04	0.04	2.00	0.40	0.50	0.04	3.90	0.44	0.50	0.04	0.50	0.35	0.50
Total Phthalates[3]	245/1782	14			33.4	N/A	0.23	33.40	4.44	0.94	0.12	22.90	4.06	1.60	0.20	32.00	4.60	1.00

	OF237B				OF243				OF245				OF254			
	Min	Max	Arithmetic Mean	Median	Min	Max	Arithmetic Mean	Median	Min	Max	Arithmetic Mean	Median	Min	Max	Arithmetic Mean	Median
Conventionals																
Hardness (mg/L as CaCO3)	61	129	111	113	463	2,310	1418	1,345	136	2,880	874	808	386	4,410	2799	3,030
pH (pH units)	5.9	8.0	7.2	7.3	6.6	7.8	7.1	7.1	7.1	8.0	7.4	7.4	6.7	7.6	7.1	7.2
TSS (mg/L)	0.26	16.9	2.54	1.3	1.5	42.7	13.6	10.7	0.3	78.9	9.6	6.40	1.8	140	16.1	7.7
Metals in ug/L																
Lead	0.07	6.6	0.99	0.60	0.385	43.9	7.56	3.99	0.13	18.2	3.30	1.65	0.24	39.0	5.75	2.9
Mercury	0.025	0.025	0.025	0.025	0.025	0.075	0.029	0.025	0.025	0.125	0.029	0.025	0.025	0.055	0.026	0.025
Zinc	1.05	14.2	4.43	3.7	5.3	73.6	21.60	15.4	11.8	1,950	174.1	52.3	7.24	95.2	27.7	23.6
Dissolved Lead	0.016	4.0	0.83	0.65	0.013	35.6	5.38	2.13	0.007	18.9	2.80	0.80	0.013	47.2	7.26	2.10
Dissolved Mercury	0.025	0.025	0.025	0.025	0.025	0.193	0.030	0.025	0.025	0.125	0.029	0.025	0.025	0.114	0.028	0.025
Dissolved Zinc	0.60	14.3	4.6	3.7	0.130	45.8	12.3	8.9	0.600	1,220	91.4	20.9	0.325	54.7	21.3	16.3
PAHs in ug/L																
2-Methylnaphthalene	0.002	0.019	0.005	0.005	0.002	0.006	0.004	0.005	0.002	0.018	0.005	0.005	0.002	0.022	0.006	0.005
Acenaphthene	0.002	0.005	0.004	0.005	0.005	0.069	0.030	0.028	0.002	0.103	0.031	0.026	0.002	0.096	0.012	0.005
Acenaphthylene	0.002	0.005	0.004	0.005	0.002	0.005	0.004	0.005	0.002	0.008	0.004	0.005	0.002	0.019	0.005	0.005
Anthracene	0.002	0.005	0.004	0.005	0.002	0.022	0.007	0.005	0.002	0.014	0.006	0.005	0.002	0.077	0.008	0.005
Fluorene	0.002	0.005	0.004	0.005	0.002	0.013	0.005	0.005	0.002	0.017	0.006	0.005	0.002	0.060	0.008	0.005
Naphthalene	0.002	0.025	0.007	0.005	0.001	0.017	0.007	0.006	0.003	0.057	0.011	0.009	0.002	0.034	0.008	0.005
Phenanthrene	0.002	0.008	0.004	0.005	0.002	0.057	0.011	0.005	0.002	0.028	0.011	0.008	0.002	0.684	0.028	0.005
Total LPAHs[1,2]	0.011	0.050	0.028	0.030	0.025	0.151	0.065	0.061	0.013	0.181	0.068	0.064	0.010	0.898	0.068	0.030
Benzo(a)anthracene	0.001	0.045	0.005	0.005	0.001	0.055	0.008	0.005	0.001	0.021	0.006	0.005	0.001	1.110	0.043	0.005
Benzo(a)pyrene	0.002	0.041	0.005	0.005	0.002	0.042	0.007	0.005	0.002	0.048	0.006	0.005	0.002	0.131	0.010	0.005
Benzo(g,h,i)perylene	0.002	0.044	0.006	0.005	0.002	0.046	0.008	0.005	0.002	0.033	0.006	0.005	0.002	0.055	0.008	0.005
Benzo(b,k)fluoranthenes	0.002	0.107	0.008	0.005	0.002	0.105	0.013	0.005	0.002	0.062	0.009	0.005	0.002	0.376	0.027	0.013
Chrysene	0.002	0.060	0.005	0.005	0.002	0.098	0.011	0.005	0.002	0.063	0.008	0.005	0.002	0.362	0.020	0.005
Dibenz(a,h)anthracene	0.002	0.011	0.005	0.005	0.002	0.012	0.005	0.005	0.002	0.013	0.005	0.005	0.002	0.017	0.005	0.005
Fluoranthene	0.003	0.088	0.007	0.005	0.003	0.133	0.022	0.015	0.003	0.046	0.013	0.011	0.003	1.140	0.051	0.013
Indeno(1,2,3-c,d)pyrene	0.002	0.039	0.005	0.005	0.002	0.034	0.006	0.005	0.002	0.018	0.005	0.005	0.002	0.053	0.007	0.005
Pyrene	0.002	0.078	0.007	0.005	0.005	0.116	0.030	0.021	0.004	0.081	0.024	0.023	0.002	0.879	0.051	0.022
Total HPAHs[1]	0.022	0.513	0.052	0.045	0.031	0.606	0.109	0.072	0.029	0.368	0.081	0.073	0.024	3.287	0.222	0.078
Total PAHs[1]	0.033	0.543	0.081	0.075	0.055	0.757	0.174	0.133	0.042	0.436	0.149	0.141	0.034	4.185	0.290	0.116
Phthalates in ug/L																
Bis(2-ethylhexyl)phthalate	0.20	0.80	0.50	0.50	0.20	16.00	1.03	0.50	0.20	3.30	0.72	0.50	0.08	10.00	0.82	0.50
Butylbenzylphthalate	0.05	0.50	0.36	0.50	0.09	1.80	0.43	0.50	0.09	16.00	1.49	0.50	0.09	1.40	0.41	0.50
Diethylphthalate	0.04	17.00	0.99	0.50	0.05	10.00	0.71	0.50	0.04	4.40	0.65	0.50	0.04	3.80	0.48	0.50
Dimethylphthalate	0.02	0.50	0.35	0.50	0.02	0.50	0.38	0.50	0.02	0.50	0.35	0.50	0.02	0.50	0.36	0.50
Di-n-butylphthalate	0.05	0.50	0.39	0.50	0.05	4.30	0.55	0.50	0.15	1.30	0.46	0.50	0.05	0.50	0.40	0.50
Di-n-octyl phthalate	0.04	0.50	0.35	0.50	0.04	0.50	0.37	0.50	0.04	0.50	0.36	0.50	0.04	0.50	0.36	0.50
Total Phthalates[3]	0.20	32.10	5.28	1.21	0.10	22.87	3.14	1.10	0.21	18.70	3.91	1.30	0.22	13.80	2.21	1.27

Notes:

1 = PAH summations based on 1/2 detection limit for nondetects.

2 = Calculation of Total LPAHs does not include 2-Methylnaphthalene.

3 = Phthalate summations exclude nondetect values.

OF237Anew isn't included in the count of samples.

Highest average or highest median concentration detected in Years 1-10 monitoring.

Highest maximum concentration detected in Years 1-10 monitoring.

Results in italics indicate nondetected values.

Table 3-2.2
Summary Statistics for WY2016 and WY2019 Baseflow

	Overall Data						OF230					OF235				
	Overall Detections	% Detections	Arithmetic Mean	Weighted Mean	Max	Date of Max	Min	Max	Arithmetic Mean	Weighted Mean	Median	Min	Max	Arithmetic Mean	Weighted Mean	Median
Conventionals																
Anionic Surfactants - MBAS (ug/L)	30/40	75	0.03	0.0	0.0962	7/26/16	0.0125	0.0464	0.0302	0.151	0.0327	0.005	0.054	0.0309	0.216	0.029
BOD (mg/L)	3/39	8	1.24	1.0	6.20	6/21/19	1.0	4.9	1.8	8.9	1.0	1.0	1.0	1.0	7.0	1.0
Chloride (mg/L)	38/38	100	N/A	N/A	N/A	N/A	13.3	44.4	21.6	108	17.2	15.8	50.4	27.3	163.9	22.3
Conductivity (uS/cm)	44/44	100	N/A	N/A	N/A	N/A	126	20900	3202	22413	248	323	714	419	2934	337
Hardness (mg CaCO3/L)	44/44	100	N/A	N/A	N/A	N/A	67.0	150	103	722	97.1	129	155	139	972	136
pH (pH units)	44/44	100	N/A	N/A	N/A	N/A	7.0	8.1	7.7	53.7	7.9	6.9	8.1	7.7	54.1	7.8
TSS (mg/L)	36/44	82	4.80	4.2	21.8	10/2/19	1.7	12.7	5.3	37.4	2.7	0.50	4.27	1.98	13.9	1.80
Turbidity (NTU)	40/40	100	5.49	4.5	27.3	10/2/19	1.84	15.5	6.5	32.6	5.39	0.80	9.53	3.17	22.22	1.74
Nutrients																
Nitrate+Nitrite as N (mg/L)	42/42	100	1.56	1.4	3.68	3/31/16	0.513	1.57	0.998	6.0	0.934	0.980	1.280	1.160	8.120	1.210
Phosphate, Ortho (mg/L)	41/42	98	0.283	0.240	1.280	8/14/19	0.057	0.165	0.116	0.7	0.113	0.980	1.280	1.160	8.120	1.210
Phosphorus, Total (mg/L)	41/41	100	0.124	0.106	0.595	10/2/19	0.070	0.184	0.128	0.8	0.126	0.093	0.143	0.119	0.716	0.125
Total Nitrogen (mg/L)	42/42	100	1.66	1.5	3.35	10/2/19	0.600	2.00	1.09	6.6	1.06	1.080	1.630	1.337	9.360	1.350
Metals (ug/L)																
Cadmium (ug/L)	10/44	23	0.14	0.1	2.50	9/13/16	0.017	0.062	0.036	0.252	0.031	0.009	0.250	0.054	0.380	0.030
Cadmium, Dissolved (ug/L)	7/44	16	0.12	0.1	1.25	9/13/16	0.013	0.040	0.024	0.166	0.0250	0.011	0.250	0.119	0.836	0.025
Copper (ug/L)	37/43	86	2.89	2.4	23.7	7/31/19	2.89	10.1	5.00	35.0	4.04	1.34	6.00	3.20	22.4	2.60
Copper, Dissolved (ug/L)	43/43	100	1.49	1.2	7.06	6/21/19	1.78	7.06	3.19	22.3	2.68	1.02	4.50	2.03	14.20	1.73
Lead (ug/L)	37/44	84	1.748	1.523	25.4	10/2/19	0.380	3.55	1.25	8.76	0.748	0.51	4.79	1.88	13.1	1.65
Dissolved Lead (ug/L)	26/44	59	0.264	0.219	2.73	6/21/19	0.010	0.386	0.202	1.42	0.232	0.08	2.73	0.74	5.16	0.39
Mercury (ug/L)	12/44	27	0.0024	0.0021	0.004	8/23/19	0.0008	0.004	0.002	0.014	0.001	0.0008	0.004	0.0027	0.0189	0.0025
Dissolved Mercury (ug/L)	1/44	2	0.0028	0.0024	0.0045	6/21/19	0.0009	0.0045	0.0026	0.0180	0.0025	0.0009	0.0045	0.0028	0.0199	0.0025
Zinc (ug/L)	43/43	100	11.01	9.1	125	8/23/19	10.3	85.7	29.4	206	15.0	5.00	10.5	6.60	46.2	5.93
Dissolved Zinc (ug/L)	43/43	100	5.65	4.7	74.9	6/21/19	6.47	34.2	14.3	100.4	11.3	3.64	5.38	4.27	29.9	4.11
Insecticides																
Chlorpyrifos (ug/L)	0/44	0	0.027	0.023	0.031	N/A	0.026	0.030	0.027	0.19	0.026	0.026	0.030	0.027	0.19	0.026
PAHs																
LPAHs																
2-Methylnaphthalene (ug/L)	7/44	16	0.006	0.005	0.029	10/2/19	0.005	0.013	0.007	0.049	0.005	0.0015	0.015	0.006	0.042	0.005
Acenaphthene (ug/L)	11/44	25	0.011	0.009	0.132	10/20/19	0.0025	0.007	0.005	0.035	0.005	0.0025	0.005	0.005	0.033	0.005
Acenaphthylene (ug/L)	2/44	5	0.005	0.004	0.007	8/6/16	0.0015	0.005	0.004	0.031	0.005	0.0015	0.005	0.005	0.032	0.005
Anthracene (ug/L)	13/44	30	0.007	0.007	0.053	10/2/19	0.003	0.008	0.005	0.034	0.005	0.003	0.008	0.005	0.034	0.005
Fluorene (ug/L)	5/44	11	0.005	0.004	0.013	8/23/16	0.004	0.007	0.006	0.039	0.005	0.003	0.005	0.004	0.031	0.005
Naphthalene (ug/L)	10/44	23	0.009	0.007	0.026	10/2/19	0.005	0.026	0.015	0.107	0.015	0.005	0.02	0.008	0.056	0.005
Phenanthrene (ug/L)	23/44	52	0.009	0.008	0.037	10/2/19	0.008	0.026	0.017	0.118	0.017	0.005	0.020	0.008	0.055	0.005
Total LPAHs	28/44	64	0.040	0.034	0.223	10/2/19	0.035	0.07	0.047	0.3	0.046	0.012	0.06	0.027	0.187	0.019
HPAHs in ug/L																
Benzo(a)anthracene (ug/L)	4/44	9	0.005	0.004	0.008	3/31/16	0.003	0.008	0.005	0.034	0.005	0.003	0.005	0.004	0.030	0.005
Benzo(a)pyrene (ug/L)	5/44	14	0.005	0.004	0.010	3/31/16	0.002	0.01	0.005	0.035	0.005	0.002	0.005	0.004	0.029	0.005
Benzo(g,h,i)perylene (ug/L)	4/44	9	0.009	0.008	0.026	3/31/16	0.005	0.026	0.011	0.078	0.01	0.005	0.011	0.008	0.058	0.01
Benzo(b,k)fluoranthenes (ug/L)	9/44	20	0.005	0.004	0.011	8/6/19	0.003	0.01	0.005	0.034	0.004	0.003	0.005	0.004	0.029	0.005
Chrysene (ug/L)	7/44	16	0.005	0.004	0.018	6/20/19	0.002	0.007	0.005	0.034	0.005	0.002	0.005	0.004	0.026	0.005
Dibenz(a,h)anthracene (ug/L)	1/44	2	0.004	0.004	0.005	6/21/19	0.002	0.005	0.004	0.030	0.005	0.002	0.005	0.004	0.029	0.005
Fluoranthene (ug/L)	16/44	36	0.007	0.006	0.032	10/2/19	0.004	0.015	0.008	0.058	0.007	0.003	0.005	0.004	0.030	0.005
Indeno(1,2,3-cd)pyrene (ug/L)	2/44	5	0.005	0.004	0.013	3/31/16	0.003	0.013	0.006	0.040	0.005	0.003	0.005	0.005	0.032	0.005
Pyrene (ug/L)	19/44	43	0.008	0.007	0.053	10/2/19	0.004	0.016	0.007	0.049	0.005	0.003	0.011	0.005	0.038	0.005
Total HPAHs	20/44	45	0.037	0.032	0.131	10/2/19	0.023	0.107	0.042	0.295	0.034	0.022	0.04	0.027	0.187	0.024
Total PAHs	29/44	66	0.076	0.066	0.353	10/2/19	0.061	0.143	0.089	0.624	0.084	0.036	0.09	0.05	0.374	0.041
Phthalates																
bis(2-Ethylhexyl)phthalate (ug/L)	8/44	18	0.536	0.469	5.60	5/11/16	0.188	0.820	0.484	3.39	0.515	0.188	0.515	0.37	2.59	0.483
Butyl benzyl phthalate (ug/L)	0/44	0	0.413	0.358	0.525	N/A	0.213	0.520	0.429	3.00	0.51	0.213	0.520	0.390	2.73	0.505
Diethylphthalate (ug/L)	10/44	23	0.438	0.381	1.20	3/31/16	0.139	1.20	0.600	4.20	0.52	0.139	0.520	0.364	2.54	0.505
Dimethyl phthalate (ug/L)	0/44	0	0.397	0.345	0.525	N/A	0.134	0.520	0.414	2.90	0.51	0.134	0.520	0.370	2.59	0.505
Di-n-butylphthalate (ug/L)	10/44	23	0.343	0.294	0.521	8/23/16	0.138	0.521	0.359	2.52	0.51	0.140	0.520	0.374	2.62	0.505
Di-n-Octyl phthalate (ug/L)	0/44	0	0.405	0.351	0.525	N/A	0.174	0.520	0.421	2.95	0.51	0.174	0.520	0.380	2.66	0.505
Total Phthalates	10/44	23	0.420	0.377	5.81	5/11/16	--	2.26	0.716	5.01	--	--	0.5	0.11	0.766	--
Herbicides																
2,4-D (ug/L)	12/42	29	0.088	0.073	0.970	8/14/19	0.044	0.970	0.211	1.26	0.05	0.017	0.061	0.044	0.305	0.050
Dichlobenil (ug/L)	2/44	5	0.045	0.039	0.0525	3/31/16	0.020	0.052	0.043	0.302	0.0505	0.010	0.052	0.039	0.274	0.046
TPH																
NWTPH-Diesel (mg/L)	0/27	0	0.022	0.020	0.050	N/A	0.015	0.050	0.022	0.11	0.015	0.015	0.050	0.022	0.110	0.015
NWTPH-Gasoline (ug/L)	0/27	0	6.87	6.4	25.0	N/A	2.3	25.0	6.9	34.4	2.34	2.3	25.0	6.87	34.4	2.34
NWTPH-Heavy Oil (mg/L)	0/27	0	0.101	0.094	0.105	N/A	0.100	0.105	0.102	0.51	0.10	0.100	0.105	0.102	0.510	0.10
Bacteria																
Coliform, Fecal (CFU/100 ml)	23/27	85	1,237.5	1,145.8	16,000	2/1/19	10	2,400	669	3,343	110	110	16,000	5,062	25,310	2400
BTEX																
Benzene (ug/L)	5/27	19	0.32	0.30	1.00	7/26/16	0.100	0.250	0.220	1.10	0.250	0.500	1.000	0.740	3.70	0.700
Ethylbenzene (ug/L)	3/278	11	0.21	0.20	0.250	N/A	0.100	0.250	0.220	1.10	0.250	0.100	0.250	0.190	0.95	0.200
m,p-Xylene (ug/L)	1/27	4	0.82	0.76	1.00	N/A	0.200	1.000	0.840	4.20	1.00	0.200	1.000	0.720	3.60	1.00
o-Xylene (ug/L)	0/27	0	0.22	0.20	0.250	N/A	0.100	0.250	0.220	1.10	0.250	0.100	0.250	0.220	1.10	0.250
Toluene (ug/L)	4/27	15	0.21	0.20	0.250	N/A	0.100	0.250	0.220	1.10	0.250	0.100	0.250	0.190	0.95	0.200

	OF237A					OF237B					OF243					OF245/254				
	Min	Max	Arithmetic Mean	Weighted Mean	Median	Min	Max	Arithmetic Mean	Weighted Mean	Median	Min	Max	Arithmetic Mean	Weighted Mean	Median	Min	Max	Arithmetic Mean	Weighted Mean	Median
Conventionals																				
Anionic Surfactants - MBAS (ug/L)	0.0048	0.0466	0.02	0.194	0.0125	0.0125	0.0299	0.02	0.112	0.0169	0.0267	0.0962	0.06	0.424	0.0586	0.0251	0.0553	0.043	0.2	0.0468
BOD (mg/L)	1.0	1.0	1.0	9.0	1.0	1.0	3.6	1.4	8.6	1.0	1.0	1.0	1.0	7.0	1.0	1.0	6.2	2.0	10.2	1.0
Chloride (mg/L)	11.5	21.3	16.3	163.3	15.95	8.6	90.6	25.3	126.3	9.13	2490	13100	8143	57000	8080	18.2	13900	4485	22,423.1	3980
Conductivity (uS/cm)	304	423	347.6	3476	334.5	261	281	272.0	1632	273	8080	35300	22685	181480	23200	6170	38100	22695	136,170.0	22950
Hardness (mg CaCO3/L)	126	141	130.8	1308	131	109	124	116.7	700	117.5	808	3770	2215	17718	1915	728	4430	2581.3	15,488.0	2600
pH (pH units)	7.1	8.1	7.7	77.3	7.9	7.1	7.7	7.4	44.5	7.4	7	7.5	7.3	58.1	7.3	7.3	7.6	7.5	44.8	7.45
TSS (mg/L)	0.5	2.94	1.7	17.3	1.68	0.5	2.8	1.2	7.4	0.91	4.92	21.8	13.7	109.7	14.9	2.0	20.8	8.4	50.3	7.0
Turbidity (NTU)	0.53	2	1.1	10.80	1.01	0.74	2.49	1.3	8.09	1.23	7.36	27.3	15.3	107.18	14.8	2.75	13.8	7.1	35.5	5.06
Nutrients																				
Nitrate+Nitrite as N (mg/L)	2.160	2.560	2.369	23.7	2.395	2.900	3.480	3.107	18.6	3.06	0.046	0.306	0.161	1.3	0.151	0.196	3.68	0.962	4.8	0.334
Phosphate, Ortho (mg/L)	0.028	0.042	0.034	0.3	0.0335	0.028	0.051	0.034	0.2	0.030	0.003	0.139	0.070	0.5	0.063	0.037	0.176	0.096	0.5	0.097
Phosphorus, Total (mg/L)	0.023	0.037	0.029	0.3	0.0295	0.028	0.037	0.033	0.2	0.034	0.181	0.566	0.310	2.2	0.267	0.080	0.595	0.254	1.0	0.171
Total Nitrogen (mg/L)	2.180	2.450	2.299	23.0	2.270	2.940	3.150	3.042	18.3	3.035	0.420	0.790	0.541	4.3	0.480	0.430	3.35	1.522	7.6	0.980
Metals (ug/L)																				
Cadmium (ug/L)	0.0105	0.25	0.1	1.153	0.030	0.007	0.25	0.1	0.597	0.030	0.0215	2.5	0.4	3.013	0.0705	0.072	1.1	0.3	1.8	0.151
Cadmium, Dissolved (ug/L)	0.0	0.25	0.2	1.600	0.250	0.0	0.25	0.1	0.348	0.025	0.0	1.25	0.2	1.807	0.055	0.0	0.183	0.1	0.6	0.1
Copper (ug/L)	0.1835	1.060	0.466	4.7	0.4455	0.1235	0.677	0.325	1.9	0.28075	2.53	10.5	5.456	38.2	4.89	1.43	23.7	11.977	71.9	12.85
Copper, Dissolved (ug/L)	0.2	0.538	0.3	3.13	0.3	0.0	0.284	0.2	1.06	0.2	0.3	3.42	1.7	12.04	1.6	0.6	3.63	1.7	10.0	1.3
Lead (ug/L)	0.037	0.520	0.152	1.5	0.079	0.014	0.092	0.044	0.3	0.039	0.788	25.4	5.416	43.3	2.655	0.201	2.230	0.849	5.093	0.678
Dissolved Lead (ug/L)	0.007	0.080	0.029	0.29	0.019	0.006	0.070	0.031	0.19	0.026	0.017	1.810	0.322	2.58	0.088	0.017	0.083	0.061	0.363	0.083
Mercury (ug/L)	0.0008	0.004	0.0028	0.0278	0.0025	0.0008	0.004	0.0027	0.0163	0.0025	0.0010	0.004	0.0017	0.0138	0.0012	0.0008	0.004	0.0035	0.0208	0.0040
Dissolved Mercury (ug/L)	0.0009	0.0045	0.0029	0.0294	0.0025	0.0009	0.0045	0.0029	0.0174	0.0025	0.0025	0.0045	0.0028	0.0220	0.0025	0.0009	0.0045	0.0039	0.0234	0.0045
Zinc (ug/L)	0.99	4.090	2.585	25.9	2.775	0.9	2.760	1.635	9.8	1.545	4.33	30.300	14.839	103.9	13.4	9.39	125	50.448	302.7	28.7
Dissolved Zinc (ug/L)	0.7	3.39	1.9	19.3	2.0	0.8	1.83	1.3	7.9	1.3	2.5	11.9	6.4	44.8	5.3	4.3	74.9	28.7	172.1	23.2
Insecticides																				
Chlorpyrifos (ug/L)	0.026	0.030	0.027	0.27	0.026	0.026	0.030	0.028	0.17	0.02775	0.026	0.0305	0.026	0.21	0.026	0.030	0.0305	0.030	0.2	0.030
PAHs																				
LPAHs																				
2-Methylnaphthalene (ug/L)	0.004	0.005	0.005	0.049	0.005	0.005	0.005	0.005	0.030	0.005	0.005	0.005	0.005	0.040	0.005	0.0015	0.029	0.008	0.1	0.005
Acenaphthene (ug/L)	0.0025	0.005	0.005	0.048	0.005	0.0025	0.023	0.008	0.047	0.005	0.005	0.132	0.032	0.254	0.00925	0.0025	0.035	0.015	0.1	0.012
Acenaphthylene (ug/L)	0.0015	0.005	0.005	0.047	0.005	0.0015	0.005	0.004	0.027	0.005	0.005	0.007	0.005	0.042	0.005	0.0015	0.005	0.004	0.0	0.005
Anthracene (ug/L)	0.003	0.005	0.004	0.042	0.005	0.003	0.005	0.004	0.024	0.004	0.005	0.053	0.019	0.153	0.013	0.003	0.017	0.009	0.1	0.008
Fluorene (ug/L)	0.003	0.005	0.005	0.045	0.005	0.003	0.005	0.004	0.026	0.0045	0.005	0.005	0.005	0.040	0.005	0.003	0.013	0.005	0.0	0.004
Naphthalene (ug/L)	0.004	0.01	0.006	0.064	0.006	0.005	0.01	0.007	0.042	0.007	0.003	0.01	0.006	0.049	0.005	0.006	0.022	0.010	0.1	0.009
Phenanthrene (ug/L)	0.004	0.016	0.007	0.065	0.005	0.004	0.013	0.006	0.039	0.005	0.005	0.019	0.008	0.061	0.006	0.004	0.037	0.016	0.1	0.012
Total LPAHs	0.019	0.04	0.024	0.244	0.020	0.019	0.05	0.028	0.167	0.024	0.019	0.2225	0.072	0.579	0.045	0.026	0.122	0.057	0.3	0.049
HPAHs in ug/L																				
Benzo(a)anthracene (ug/L)	0.004	0.006	0.005	0.047	0.005	0.003	0.005	0.004	0.025	0.004	0.003	0.006	0.005	0.038	0.005	0.00	0.0035	0.0031667	0.019	0.004
Benzo(a)pyrene (ug/L)	0.004	0.006	0.005	0.047	0.005	0.002	0.005	0.004	0.024	0.004	0.004	0.007	0.005	0.041	0.005	0.002	0.009	0.004	0.024	0.004
Benzo(g,h,i)perylene (ug/L)	0.006	0.011	0.009	0.090	0.01	0.005	0.011	0.008	0.047	0.008	0.006	0.018	0.011	0.085	0.010	0.005	0.019	0.008	0.046	0.006
Benzo(b,k)fluoranthenes (ug/L)	0.003	0.005	0.004	0.042	0.005	0.003	0.005	0.004	0.024	0.004	0.003	0.011	0.006	0.047	0.005	0.003	0.008	0.004	0.023	0.003
Chrysene (ug/L)	0.002	0.006	0.004	0.042	0.005	0.002	0.005	0.004	0.021	0.004	0.005	0.014	0.007	0.054	0.005	0.002	0.018	0.005	0.031	0.002
Dibenz(a,h)anthracene (ug/L)	0.002	0.005	0.004	0.044	0.005	0.002	0.005	0.004	0.024	0.004	0.004	0.005	0.005	0.039	0.005	0.002	0.004	0.003	0.019	0.004
Fluoranthene (ug/L)	0.004	0.009	0.005	0.050	0.005	0.004	0.005	0.004	0.026	0.004	0.008	0.032	0.013	0.103	0.009	0.004	0.020	0.007	0.042	0.004
Indeno(1,2,3-cd)pyrene (ug/L)	0.003	0.005	0.005	0.046	0.005	0.003	0.005	0.004	0.027	0.005	0.005	0.008	0.005	0.043	0.005	0.003	0.005	0.004	0.023	0.005
Pyrene (ug/L)	0.003	0.010	0.005	0.048	0.005	0.003	0.005	0.004	0.025	0.004	0.007	0.053	0.018	0.141	0.012	0.008	0.038	0.016	0.097	0.009
Total HPAHs	0.022	0.05	0.029	0.289	0.025	0.022	0.03	0.026	0.158	0.025	0.036	0.1305	0.060	0.480	0.044	0.030	0.110	0.054	0.324	0.039
Total PAHs	0.040	0.08	0.05	0.533	0.045	0.041	0.08	0.05	0.325	0.047	0.059	0.353	0.13	1.059	0.095	0.060	0.19	0.111	0.667	0.092
Phthalates																				
bis(2-Ethylhexyl)phthalate (ug/L)	0.189	0.515	0.37	3.75	0.472	0.190	0.515	0.35	2.11	0.352	0.197	5.60	1.10	8.81	0.508	0.189	2.820	0.63	3.79	0.194
Butyl benzyl phthalate (ug/L)	0.213	0.515	0.398	3.98	0.505	0.215	0.515	0.369	2.21	0.372	0.238	0.525	0.478	3.82	0.510	0.214	0.239	0.228	1.37	0.233
Diethylphthalate (ug/L)	0.265	0.575	0.430	4.30	0.488	0.140	0.510	0.328	1.97	0.315	0.182	0.525	0.471	3.77	0.510	0.140	0.183	0.167	1.00	0.178
Dimethyl phthalate (ug/L)	0.134	0.515	0.381	3.81	0.505	0.135	0.515	0.346	2.07	0.357	0.207	0.525	0.474	3.79	0.510	0.135	0.208	0.182	1.09	0.203
Di-n-butylphthalate (ug/L)	0.139	0.515	0.303	3.03	0.218	0.138	0.515	0.326	1.96	0.327	0.142	0.515	0.352	2.81	0.365	0.142	0.507	0.232	1.39	0.145
Di-n-Octyl phthalate (ug/L)	0.174	0.515	0.389	3.89	0.505	0.175	0.515	0.357	2.14	0.364	0.222	0.525	0.476	3.81	0.510	0.174	0.224	0.205	1.23	0.218
Total Phthalates	--	1.0	0.36	3.646	0.334	--	0.5	0.08	0.452	--	--	5.81	0.84	6.699	0.099	--	3.1	0.61	3.636	0.000
Herbicides																				
2,4-D (ug/L)	0.009	0.093	0.048	0.428	0.050	0.009	0.050	0.031	0.185	0.034	0.009	0.570	0.110	0.879	0.050	0.009	0.026	0.014	0.081	0.0085
Dichlobenil (ug/L)	0.020	0.052	0.046	0.464	0.051	0.020	0.052	0.044	0.265	0.048	0.047	0.0525	0.051	0.405	0.051	0.020	0.047	0.037	0.224	0.046
TPH																				
NWTPH-Diesel (mg/L)	0.015	0.050	0.022	0.110	0.015	0.015	0.050	0.022	0.110	0.015	0.015	0.050	0.022	0.110	0.015	0.050	0.050	0.050	0.100	0.050
NWTPH-Gasoline (ug/L)	2.3	25.0	6.87	34.4	2.34	2.3	25.0	6.87	34.4	2.34	2.3	25.0	6.87	34.4	2.34	25.0	25.0	25.0	50.0	25.0
NWTPH-Heavy Oil (mg/L)	0.095	0.105	0.101	0.505	0.10	0.100	0.105	0.101	0.505	0.10	0.100	0.105	0.101	0.505	0.10	0.100	0.100	0.100	0.200	0.100
Bacteria																				
Coliform, Fecal (CFU/100 ml)	40	490	257	1,285	220	10	68	31	156	20	10	790	169	843	13	20	45	33	65	33
BTEX																				
Benzene (ug/L)	0.100	0.250	0.220	1.10	0.250	0.100	0.250	0.220	1.10	0.250	0.100	0.250	0.220	1.10	0.250	0.100	0.100	0.100	0.20	0.100
Ethylbenzene (ug/L)	0.100	0.250	0.220	1.10	0.250	0.100	0.250	0.220	1.10	0.250	0.100	0.250	0.220	1.10	0.250	0.100	0.100	0.100	0.20	0.100
m,p-Xylene (ug/L)	0.200	1.000	0.840	4.20	1.00	0.200	1.000	0.840	4.20	1.00	0.200	1.000	0.840	4.20	1.00	0.200	0.200	0.200	0.40	0.200
o-Xylene (ug/L)	0.100	0.250	0.220	1.10	0.250	0.100	0.250	0.220	1.10	0.250	0.100	0.250	0.220	1.10	0.250	0.100	0.100	0.100	0.20	0.100
Toluene (ug/L)	0.100	0.250	0.210	1.05	0.250	0.100	0.250	0.220	1.10	0.250	0.100	0.250	0.220	1.10	0.250	0.100	0.100	0.100	0.20	0.100

Highest average or highest median concentration detected in WY2016 and WY2019 monitoring.
Highest maximum concentration detected in WY2016 and WY2019 monitoring.
Results in italics indicate nondetected values.

Table 3-3.1
Summary Statistics for Stormwater

	Overall Data						OF230/230A[8]				
	Overall Detections	% Detections	Arithmetic Mean[4]	Weighted Mean[5]	Max	Date of Max	Min	Max	Arithmetic Mean	Weighted Mean	Median
Conventionals											
Anionic Surfactants - MBAS (ug/L)	527/552	95	0.054	0.055	0.665	8/22/11	0.000	0.199	0.046	2.844	0.037
BOD (mg/L)	400/500	80	3.4	3.4	69.0	6/8/17	0.5	9.7	4.0	251.4	3.2
Chloride (mg/L)	526/545	97	N/A	N/A	25400	10/7/16	0.82	551	21.6	1406.10	4.50
Conductivity (uS/cm)	1035/1035	100	N/A	N/A	23000	2/21/22	14.9	2260	121	17801.8	57.7
Hardness (mg CaCO3/L)	1464/1464	100	N/A	N/A	3150	N/A	8.7	206	21.2	4471.1	16.0
TSS (mg/L)	1424/1424	100	58.3	57.1	668	5/4/17	4.8	322	47.6	9766.0	30.3
Turbidity (NTU)	474/474	100	33.4	32.6	216	N/A	5.5	85.2	18.0	1136.9	13.5
pH (pH units)	1464/1464	100	N/A	N/A	10.6	N/A	5.0	10.6	7.0	1467.8	7.0
Nutrients											
Nitrate+Nitrite as N (mg/L)	679/679	100	0.388	0.438	2.720	3/21/15	0.062	0.526	0.165	13.204	0.133
Phosphorus, Ortho (mg/L)	683/690	99	0.029	0.029	3.680	9/17/21	0.004	0.104	0.029	2.532	0.024
Phosphate, Total (mg/L)	673/674	100	0.177	0.163	0.689	10/26/18	0.042	0.688	0.123	9.850	0.088
Total Nitrogen (mg/L)	658/671	98	0.79	0.83	3.28	8/22/11	0.13	2.10	0.57	41.25	0.46
Metals in ug/L											
Cadmium (ug/L)	535/795	67	0.155	0.152	2.410	3/12/11	2.31E-03	0.466	0.082	7.700	0.066
Cadmium, Dissolved (ug/L)	374/795	47	0.062	0.060	1.850	3/12/11	0.000	0.125	0.025	2.314	0.022
Copper (ug/L)	793/793	100	15.75	16.25	162	7/26/15	3.72	66.40	11.16	1049.19	8.31
Copper, Dissolved (ug/L)	785/789	99	4.71	5.32	79.10	8/22/11	0.84	18.10	4.21	391.41	3.14
Lead (ug/L)	1454/1463	99	21.11	21.53	379	9/5/09	2.09	229	17.55	3702.32	10.70
Lead, Dissolved (ug/L)	1125/1464	77	1.705	1.800	145	8/6/04	0.027	9.05	0.850	178.572	0.479
Mercury (ug/L)	498/1466	34	0.0212	0.0209	0.870	5/20/08	7.101E-05	0.1300	0.0202	4.2553	0.0076
Mercury, Dissolved (ug/L)	113/1464	8	0.0151	0.0148	0.552	7/23/14	6.771E-05	0.1550	0.0142	2.9919	0.0076
Zinc (ug/L)[6]	1462/1462	100	100.6	100.4	1170	8/6/04	31.8	721	107.9	22771.9	80.3
Zinc, Dissolved (ug/L)[6]	1460/1462	100	42.4	42.5	910	8/6/04	11.5	543	55.6	11669.9	42.3
Insecticides											
2,4-D (ug/L)	223/395	56	0.240	0.283	12.0	4/5/17	0.001	1.700	0.178	7.816	0.050
Bifenthrin (ug/L)	12/284	4	0.006	0.006	0.089	2/29/24	8.02E-05	0.013	0.005	0.187	0.006
Carbaryl (ug/L)	0/184	0	0.16	0.16	0.49	10/15/16	0.001	0.47	0.12	3.07	0.04
Chlorpyrifos (ug/L)	13/541	2	0.026	0.025	1.420	2/23/20	1.97E-05	1.420	0.039	2.741	0.009
PAHs in ug/L											
LPAHs in ug/L											
2-Methylnaphthalene (ug/L)	970/1462	66	0.021	0.021	4.130	3/16/02	2.21E-04	0.469	0.024	5.061	0.013
Acenaphthene (ug/L)	563/1462	39	0.012	0.011	0.855	8/6/04	9.84E-06	0.080	0.006	1.352	0.004
Acenaphthylene (ug/L)	408/1462	28	0.007	0.007	0.095	8/6/04	2.94E-05	0.060	0.006	1.205	0.005
Anthracene (ug/L)	677/1462	46	0.016	0.015	0.389	2/21/02	2.08E-05	0.122	0.010	2.155	0.005
Fluorene (ug/L)	735/1462	50	0.013	0.013	0.928	8/6/04	6.20E-06	0.246	0.011	2.378	0.006
Naphthalene (ug/L)	992/1451	68	0.028	0.029	4.430	3/16/02	4.81E-04	0.528	0.033	6.862	0.022
Phenanthrene (ug/L)	1370/1462	94	0.064	0.064	1.650	8/6/04	3.60E-04	0.653	0.074	15.552	0.035
Total LPAHs[1,2]	1454/1454	100	0.136	0.134	4.930	3/16/02	0.008	0.923	0.135	28.328	0.079
HPAHs in ug/L											
Benzo(a)anthracene (ug/L)	1105/1462	76	0.040	0.040	0.915	2/21/02	2.97E-05	0.439	0.045	9.464	0.016
Benzo(a)pyrene (ug/L)	1093/1462	75	0.042	0.042	0.865	2/18/07	7.72E-05	0.563	0.053	11.245	0.020
Benzo(b,k)fluoranthenes (ug/L)	1239/1462	85	0.117	0.117	2.430	9/4/07	7.45E-04	1.396	0.146	30.891	0.049
Benzo(g,h,i)perylene (ug/L)	1289/1462	88	0.047	0.048	0.794	9/4/07	1.58E-05	0.457	0.060	12.754	0.028
Chrysene (ug/L)	1301/1462	89	0.083	0.082	1.906	2/21/02	1.94E-04	0.860	0.096	20.361	0.031
Dibenz(a,h)anthracene (ug/L)	559/1462	38	0.011	0.010	0.684	11/15/16	5.10E-05	0.088	0.013	2.683	0.006
Fluoranthene (ug/L)	1434/1462	98	0.134	0.133	3.964	2/21/02	8.34E-04	1.687	0.150	31.714	0.051
Indeno(1,2,3-cd)pyrene (ug/L)	1146/1462	78	0.035	0.036	0.680	9/4/07	1.27E-04	0.346	0.047	9.821	0.022
Pyrene (ug/L)	1427/1462	98	0.134	0.134	4.120	2/21/02	3.01E-03	1.200	0.140	29.615	0.052
Retene (ug/L)	232/275	84	0.012	0.012	0.222	11/4/21	1.69E-03	0.031	0.010	0.342	0.008
Total HPAHs[1]	1461/1461	100	0.642	0.640	13.56	2/21/02	0.025	6.680	0.750	158.223	0.279
Total PAHs[1]	2915/2915	100	0.777	0.388	14.68	2/21/02	0.037	7.494	0.884	186.599	0.364
Phthalates in ug/L											
Butyl benzyl phthalate (ug/L)	497/1462	34	1.640	1.697	290	2/15/03	0.002	8.400	0.465	98.1	0.279
bis(2-Ethylhexyl)phthalate (ug/L)	1123/1283	88	2.39	2.79	97	10/3/02	0.10	44.10	3.12	656.1	1.84
Di-n-butylphthalate (ug/L)	545/1462	37	0.374	0.375	4.8	6/12/04	0.001	1.600	0.383	80.9	0.348
Di-n-Octyl phthalate (ug/L)	336/1454	23	0.349	0.352	4.5	8/6/04	0.012	3.200	0.480	100.2	0.330
Diethylphthalate (ug/L)	406/1462	28	1.404	1.491	590	12/10/02	0.003	9.300	0.544	114.9	0.281
Dimethyl phthalate (ug/L)	107/1456	7	0.181	0.183	4.7	9/29/05	3.07E-04	4.700	0.271	57.2	0.139
Total Phthalates[3]	1238/1456	85	5.27	5.50	596.4	12/10/02	0.00	44.10	4.12	870	2.61
Herbicides											
Dichlobenil (ug/L)	467/726	64	0.052	0.063	3.39	3/21/15	0.002	0.730	0.069	7.287	0.049
Total Petroleum Hydrocarbons											
NWTPH-Diesel (mg/L)	41/405	10	0.06	0.06	0.34	1/24/12	1.8E-04	0.13	0.06	3.38	0.06
NWTPH-Gasoline (mg/L)	59/381	15	18.8	18.6	395	1/24/12	9.E-01	47.8	15.7	723	12.9
NWTPH-Heavy Oil (mg/L)	355/442	80	0.5	0.5	4.2	12/15/20	0.01	1.90	0.61	32.3	0.53
Bacteria											
Coliform, Fecal (CFU/100 ml)	385/385	100	16,705	18,563	1,300,000	9/17/21	80	1300000	40877	2,370,880	5000
E.Coli (CFU/100 ml)	157/157	100	20,748	15,837	280,000	10/21/22	90	230000	41672	750,090	13000
Enterococci (CFU/100 ml)	115/122	94	48,478	48,718	820,000	9/17/21	1	210000	47200	849,603	12900
BTEX											
Benzene (ug/L)	34/278	12	0.1	0.1	1.2	5/5/15	4.E-03	1.2	0.1	6.4	0.1
Ethylbenzene (ug/L)	27/278	10	0.1	0.1	0.8	11/21/14	4.E-03	0.4	0.1	5.5	0.1
Toluene (ug/L)	35/304	12	0.2	0.2	4.0	11/21/14	7.E-03	1.2	0.2	7.5	0.1
m,p-Xylene (ug/L)	10/261	4	0.2	0.3	3.5	11/21/14	8.E-03	1.1	0.3	11.7	0.2
o-Xylene (ug/L)	5/305	2	0.1	0.1	1.6	11/21/14	3.E-04	0.5	0.1	5.6	0.1

	OF235[9]					OF237A New[7]				
	Min	Max	Arithmetic Mean	Weighted Mean	Median	Min	Max	Arithmetic Mean	Weighted Mean	Median
Conventionals										
Anionic Surfactants - MBAS (ug/L)	0.001	0.665	0.061	6.555	0.048	0.003	0.096	0.042	2.831	0.040
BOD (mg/L)	0.1	9.7	3.8	334	3.4	0.0	9.2	3.2	204	2.9
Chloride (mg/L)	3.E-03	114	9.79	979	4.48	1.79	154	14.19	951	7.31
Conductivity (uS/cm)	7.2	1590	123.7	23495	81.1	7.5	1190	116	18028	91.5
Hardness (mg CaCO3/L)	9.8	63.9	30.0	7681	27.9	14.5	68.8	30.6	6662	28.5
TSS (mg/L)	5.6	441	54.8	13712	39.3	3.5	668	49.1	10564	34.3
Turbidity (NTU)	5.1	79.5	18.6	1430	16.5	6.1	57.1	20.1	1365	18.1
pH (pH units)	5.4	8.6	7.0	1799	7.1	5.3	8.3	6.9	1490	6.9
Nutrients										
Nitrate+Nitrite as N (mg/L)	0.028	1.650	0.338	45.00	0.254	0.161	1.090	0.411	36.54	0.388
Phosphorus, Ortho (mg/L)	1.40E-05	0.143	0.028	3.81	0.025	0.009	0.069	0.023	2.035	0.021
Phosphate, Total (mg/L)	0.019	0.706	0.128	16.813	0.097	0.041	1.150	0.112	9.950	0.086
Total Nitrogen (mg/L)	7.0E-03	3.28	0.82	108.61	0.67	0.18	2.03	0.71	63.06	0.64
Metals in ug/L										
Cadmium (ug/L)	7.84E-04	0.960	0.132	22.51	0.097	0.004	0.615	0.081	7.989	0.067
Cadmium, Dissolved (ug/L)	4.32E-04	0.379	0.047	8.03	0.033	5.97E-04	0.098	0.027	2.644	0.025
Copper (ug/L)	3.45	162	28.92	4945	22.90	4.09	69.10	10.36	1025	8.09
Copper, Dissolved (ug/L)	1.79	79.10	12.18	2095	9.83	1.51	12.10	3.31	328	2.82
Lead (ug/L)	2.46	368	53.60	13721	41.15	1.40	80.60	11.22	2447	8.11
Lead, Dissolved (ug/L)	0.156	28.00	6.14	1577	4.670	0.003	3.460	0.551	120.1	0.318
Mercury (ug/L)	1.984E-06	0.1900	0.0224	5.76	0.0089	2.806E-05	0.098	0.0174	3.7908	0.0078
Mercury, Dissolved (ug/L)	1.834E-06	0.0500	0.0135	3.48	0.0067	6.567E-05	0.150	0.0148	3.2071	0.0076
Zinc (ug/L)[6]	34.3	598	110.7	28231	86.6	30.6	361.0	90.1	19648	71.9
Zinc, Dissolved (ug/L)[6]	9.7	347	42.8	10911	33.5	16.9	289.0	45.0	9811	33.8
Insecticides										
2,4-D (ug/L)	0.002	12.0	0.583	49.00	0.125	9.63E-04	2.500	0.296	14.80	0.115
Bifenthrin (ug/L)	7.75E-04	0.010	0.005	0.296	0.006	7.70E-05	0.054	0.008	0.339	0.007
Carbaryl (ug/L)	1.0E-03	0.45	0.13	4.15	0.04	6.9E-03	0.49	0.17	5.26	0.12
Chlorpyrifos (ug/L)	9.57E-05	0.707	0.024	2.675	0.009	1.12E-04	0.365	0.024	1.722	0.009
PAHs in ug/L										
LPAHs in ug/L										
2-Methylnaphthalene (ug/L)	1.71E-04	4.130	0.032	8.15	0.009	2.24E-04	0.104	0.015	3.329	0.011
Acenaphthene (ug/L)	5.74E-05	0.086	0.009	2.19	0.006	1.11E-04	0.532	0.009	1.988	0.004
Acenaphthylene (ug/L)	1.14E-05	0.060	0.006	1.65	0.005	5.50E-05	0.061	0.005	1.151	0.004
Anthracene (ug/L)	7.68E-05	0.138	0.013	3.35	0.007	2.13E-05	0.225	0.012	2.555	0.005
Fluorene (ug/L)	7.62E-05	0.083	0.011	2.77	0.006	6.87E-05	0.110	0.009	2.014	0.006
Naphthalene (ug/L)	5.74E-04	4.430	0.041	10.29	0.015	3.47E-04	0.150	0.024	5.254	0.019
Phenanthrene (ug/L)	1.67E-04	0.776	0.068	17.4	0.028	6.06E-04	0.893	0.079	17.16	0.037
Total LPAHs[1,2]	0.009	4.93	0.143	36.5	0.069	0.003	1.087	0.134	28.90	0.081
HPAHs in ug/L										
Benzo(a)anthracene (ug/L)	1.36E-05	0.555	0.040	10.35	0.018	9.47E-05	0.902	0.061	13.17	0.022
Benzo(a)pyrene (ug/L)	1.45E-05	0.498	0.042	10.92	0.020	9.99E-05	0.865	0.068	14.83	0.029
Benzo(b,k)fluoranthenes (ug/L)	8.57E-05	1.199	0.107	27.5	0.052	1.04E-03	2.430	0.212	46.09	0.088
Benzo(g,h,i)perylene (ug/L)	3.24E-05	0.410	0.050	12.9	0.030	1.19E-04	0.794	0.077	16.81	0.041
Chrysene (ug/L)	9.50E-05	0.678	0.079	20.4	0.032	2.29E-05	1.490	0.128	27.71	0.052
Dibenz(a,h)anthracene (ug/L)	4.41E-05	0.154	0.010	2.47	0.005	1.50E-05	0.305	0.017	3.72	0.006
Fluoranthene (ug/L)	0.000	1.550	0.134	34.5	0.053	0.008	2.640	0.208	45.24	0.082
Indeno(1,2,3-cd)pyrene (ug/L)	2.96E-06	0.338	0.034	8.68	0.019	1.38E-04	0.680	0.068	14.75	0.034
Pyrene (ug/L)	0.000	1.164	0.139	35.7	0.066	0.001	2.930	0.191	41.41	0.080
Retene (ug/L)	0.001	0.115	0.014	0.7	0.010	0.004	0.222	0.021	0.82	0.012
Total HPAHs[1]	0.027	6.50	0.634	163	0.304	0.029	12.263	1.030	223.4	0.450
Total PAHs[1]	0.045	7.55	0.776	199	0.364	0.033	13.295	1.163	252.4	0.517
Phthalates in ug/L										
Butyl benzyl phthalate (ug/L)	0.001	7.93	0.847	218	0.440	0.000	5.570	0.403	87.4	0.298
bis(2-Ethylhexyl)phthalate (ug/L)	0.37	97.0	3.82	979	1.92	0.00	13.70	1.96	423.0	1.39
Di-n-butylphthalate (ug/L)	0.001	1.6	0.326	83.8	0.289	0.000	4.800	0.369	80.0	0.305
Di-n-Octyl phthalate (ug/L)	0.004	3.2	0.409	104.6	0.231	0.003	2.500	0.337	72.6	0.251
Diethylphthalate (ug/L)	0.003	590	2.714	698	0.244	0.000	230	1.767	383.3	0.265
Dimethyl phthalate (ug/L)	0.000	2.4	0.246	62.8	0.151	0.001	0.145	0.067	14.4	0.061
Total Phthalates[3]	0.0	596.40	7.34	1886	2.69	0.00	230	3.85	835.0	1.87
Herbicides										
Dichlobenil (ug/L)	3.07E-04	3.390	0.097	15.59	0.031	2.82E-04	1.080	0.063	6.898	0.044
Total Petroleum Hydrocarbons										
NWTPH-Diesel (mg/L)	1.5E-03	0.31	0.05	4.25	0.04	2.2E-03	0.32	0.05	2.95	0.04
NWTPH-Gasoline (mg/L)	7.E-02	50.0	19.9	1330	16.6	0.7	49.7	20.1	925.1	20.0
NWTPH-Heavy Oil (mg/L)	9.4E-03	1.70	0.63	50.69	0.54	0.00	2.10	0.56	33.83	0.54
Bacteria										
Coliform, Fecal (CFU/100 ml)	80	160000	11471	860,340	3500	130	80000	6833	396,320	2200
E.Coli (CFU/100 ml)	1300	160000	21844	349,500	4950	130	24000	4563	82,130	2350
Enterococci (CFU/100 ml)	1	350000	54042	918,718	6500	0	110000	16039	288,701	4450
BTEX										
Benzene (ug/L)	7.E-03	1.2	0.3	11.7	0.2	1.E-03	0.2	0.1	4.6	0.1
Ethylbenzene (ug/L)	8.E-03	0.4	0.1	5.2	0.1	4.E-03	0.2	0.1	5.0	0.1
Toluene (ug/L)	3.E-03	1.2	0.2	8.6	0.2	3.E-03	0.8	0.1	5.8	0.1
m,p-Xylene (ug/L)	9.E-03	0.6	0.2	10.3	0.2	3.E-03	0.4	0.2	8.0	0.1
o-Xylene (ug/L)	7.E-03	0.2	0.1	4.2	0.1	8.E-03	0.2	0.1	4.8	0.1

	OF237B					OF243				
	Min	Max	Arithmetic Mean	Weighted Mean	Median	Min	Max	Arithmetic Mean	Weighted Mean	Median
Conventionals										
Anionic Surfactants - MBAS (ug/L)	0.001	0.357	0.051	4.957	0.042	1.18E-02	0.158	0.048	2.849	0.043
BOD (mg/L)	0.1	9.8	3.1	257	2.7	0.1	8.5	2.9	170.5	2.4
Chloride (mg/L)	2.9E-03	68.60	5.62	534	4.42	261	25400	1809	108544	1145
Conductivity (uS/cm)	39.5	708	134	22386	125	942	13300	4987	523602	4200
Hardness (mg CaCO3/L)	20.7	1220	54.8	12769	48.6	59.3	3150	507	76630	417
TSS (mg/L)	3.6	278	47.1	10411	34.6	4.4	300	61.5	9099	41.0
Turbidity (NTU)	6.5	50.2	19.1	1334	18.2	0.2	202	47.6	2810	33.3
pH (pH units)	5.7	8.8	6.9	1623	7.0	6.1	7.9	7.0	1063	7.1
Nutrients										
Nitrate+Nitrite as N (mg/L)	0.190	2.720	1.213	154.01	1.170	0.089	0.799	0.252	16.85	0.222
Phosphorus, Ortho (mg/L)	1.72E-05	0.128	0.022	2.781	0.021	0.009	0.138	0.035	2.34	0.032
Phosphate, Total (mg/L)	0.017	0.564	0.102	12.904	0.088	0.043	3.680	0.427	28.609	0.213
Total Nitrogen (mg/L)	0.09	3.19	1.36	172.33	1.31	0.26	2.11	0.74	49.73	0.73
Metals in ug/L										
Cadmium (ug/L)	0.001	0.455	0.081	11.63	0.067	0.005	1.250	0.235	16.92	0.188
Cadmium, Dissolved (ug/L)	1.74E-04	0.106	0.032	4.62	0.029	0.004	0.173	0.083	5.98	0.083
Copper (ug/L)	2.93	66.30	8.16	1159	6.35	3.22	110.00	21.03	1514	17.20
Copper, Dissolved (ug/L)	0.15	8.06	2.57	357	2.18	0.95	9.19	4.07	293	3.86
Lead (ug/L)	1.31	64.20	9.56	2217	6.39	0.12	379	31.93	4822	15.80
Lead, Dissolved (ug/L)	0.000	11.400	0.511	119	0.240	0.000	145.0	2.445	369	0.349
Mercury (ug/L)	6.541E-05	0.2160	0.0185	4.32	0.0080	2.136E-04	0.1880	0.0233	3.52	0.0104
Mercury, Dissolved (ug/L)	1.764E-05	0.0750	0.0143	3.35	0.0076	1.199E-04	0.5520	0.0174	2.63	0.0074
Zinc (ug/L)[6]	15.0	285.0	59.5	13859	44.6	12.3	1170	89.1	13452	64.9
Zinc, Dissolved (ug/L)[6]	6.8	260.0	24.1	5634	18.6	5.6	910	33.3	5022	22.8
Insecticides										
2,4-D (ug/L)	0.002	2.100	0.337	24.27	0.150	1.14E-03	0.190	0.047	1.556	0.038
Bifenthrin (ug/L)	1.01E-05	0.036	0.005	0.246	0.005	2.37E-04	0.010	0.005	0.152	0.004
Carbaryl (ug/L)	3.1E-04	0.41	0.12	3.18	0.05	0.00	0.49	0.25	4.46	0.23
Chlorpyrifos (ug/L)	2.12E-05	0.043	0.013	1.201	0.010	0.000	0.443	0.026	1.292	0.010
PAHs in ug/L										
LPAHs in ug/L										
2-Methylnaphthalene (ug/L)	2.65E-05	0.250	0.012	2.843	0.008	1.42E-05	0.136	0.012	1.867	0.009
Acenaphthene (ug/L)	2.45E-05	0.063	0.006	1.302	0.004	3.75E-04	0.105	0.020	3.041	0.018
Acenaphthylene (ug/L)	6.84E-05	0.064	0.005	1.193	0.004	4.62E-05	0.064	0.009	1.299	0.007
Anthracene (ug/L)	1.98E-05	0.097	0.007	1.669	0.004	6.23E-04	0.079	0.029	4.378	0.028
Fluorene (ug/L)	3.06E-05	0.078	0.007	1.716	0.005	9.37E-05	0.098	0.013	2.034	0.010
Naphthalene (ug/L)	1.31E-05	0.130	0.017	3.960	0.014	1.81E-05	0.135	0.021	3.218	0.018
Phenanthrene (ug/L)	0.000	0.838	0.043	10.088	0.021	0.000	0.221	0.048	7.318	0.032
Total LPAHs[1,2]	0.006	1.134	0.079	18.418	0.055	0.030	0.473	0.139	20.855	0.120
HPAHs in ug/L										
Benzo(a)anthracene (ug/L)	4.90E-06	0.685	0.028	6.504	0.010	1.58E-04	0.615	0.032	4.846	0.016
Benzo(a)pyrene (ug/L)	1.80E-04	0.690	0.033	7.668	0.013	3.57E-04	0.654	0.033	4.967	0.016
Benzo(b,k)fluoranthenes (ug/L)	7.84E-05	1.763	0.091	21.210	0.034	1.54E-04	1.430	0.086	12.969	0.041
Benzo(g,h,i)perylene (ug/L)	8.09E-05	0.614	0.040	9.423	0.018	4.37E-05	0.503	0.035	5.260	0.020
Chrysene (ug/L)	2.77E-05	0.965	0.059	13.697	0.020	1.70E-05	0.788	0.060	9.030	0.026
Dibenz(a,h)anthracene (ug/L)	5.22E-06	0.143	0.008	1.937	0.004	9.43E-06	0.684	0.011	1.646	0.004
Fluoranthene (ug/L)	0.000	1.835	0.089	20.932	0.034	0.002	0.444	0.086	13.004	0.053
Indeno(1,2,3-cd)pyrene (ug/L)	6.44E-05	0.546	0.029	6.747	0.014	4.40E-05	0.620	0.028	4.153	0.016
Pyrene (ug/L)	6.42E-04	1.493	0.093	21.724	0.039	0.012	0.620	0.091	13.795	0.054
Retene (ug/L)	2.44E-04	0.029	0.007	0.335	0.007	0.002	0.023	0.009	0.277	0.009
Total HPAHs[1]	0.019	8.734	0.468	109.022	0.185	0.031	5.835	0.458	69.181	0.248
Total PAHs[1]	0.028	9.868	0.547	127.455	0.251	0.065	6.048	0.596	90.067	0.374
Phthalates in ug/L										
Butyl benzyl phthalate (ug/L)	0.000	2.80	0.327	76.4	0.241	0.000	9.200	0.783	118.2	0.295
bis(2-Ethylhexyl)phthalate (ug/L)	0.01	12.00	1.83	425.5	1.07	4.4E-02	41.00	1.76	264.7	0.83
Di-n-butylphthalate (ug/L)	1.69E-04	1.000	0.318	74.4	0.281	0.007	1.270	0.317	47.8	0.243
Di-n-Octyl phthalate (ug/L)	0.006	2.300	0.297	69.3	0.205	5.24E-04	1.490	0.297	44.2	0.214
Diethylphthalate (ug/L)	0.002	52.00	0.894	209.2	0.217	0.007	7.600	0.409	61.8	0.226
Dimethyl phthalate (ug/L)	1.77E-04	0.190	0.080	18.6	0.073	1.25E-04	0.100	0.047	7.0	0.042
Total Phthalates[3]	0.00	66.20	2.72	630.7	1.32	0.00	41.00	2.61	391.3	1.30
Herbicides										
Dichlobenil (ug/L)	0.002	1.380	0.064	8.784	0.038	3.01E-04	0.042	0.016	1.272	0.015
Total Petroleum Hydrocarbons										
NWTPH-Diesel (mg/L)	1.2E-03	0.34	0.05	4.49	0.05	2.4E-03	0.19	0.05	2.28	0.04
NWTPH-Gasoline (mg/L)	0.1	395.0	24.8	1714.3	16.0	1.E+00	47.1	18.2	637.4	18.5
NWTPH-Heavy Oil (mg/L)	0.01	1.30	0.48	39.11	0.42	3.9E-03	0.96	0.33	15.73	0.32
Bacteria										
Coliform, Fecal (CFU/100 ml)	130	280000	8358	643,580	2400	170	80000	8007	360,320	2400
E.Coli (CFU/100 ml)	790	140000	11705	198,990	3000	50	50000	6785	108,560	1050
Enterococci (CFU/100 ml)	0.60886265	220000	23367	420,602	5800	1800	110000	22929	389,800	5000
BTEX										
Benzene (ug/L)	3.E-03	0.3	0.1	4.6	0.1	2.E-03	0.2	0.1	3.3	0.1
Ethylbenzene (ug/L)	2.E-03	0.8	0.1	5.5	0.1	4.E-03	0.2	0.1	3.3	0.1
Toluene (ug/L)	1.E-02	4.0	0.2	9.2	0.1	2.E-03	0.5	0.1	4.4	0.1
m,p-Xylene (ug/L)	2.E-02	3.5	0.3	13.2	0.2	9.E-03	0.6	0.2	7.9	0.3
o-Xylene (ug/L)	2.E-03	1.6	0.1	6.4	0.1	6.E-05	0.2	0.1	3.6	0.1

	OF245					OF254				
	Min	Max	Arithmetic Mean	Weighted Mean	Median	Min	Max	Arithmetic Mean	Weighted Mean	Median
Conventionals										
Anionic Surfactants - MBAS (ug/L)	0.000	0.434	0.067	6.582	0.056	0.003	0.175	0.065	3.967	0.052
BOD (mg/L)	2.E-01	8.8	3.2	282.6	2.8	0.0	69.0	3.6	195.6	2.4
Chloride (mg/L)	0.01	1260	148.5	14255	80.4	493	8000	2253	139707	2145
Conductivity (uS/cm)	46.8	6360	605	94979	363	4.9	23000	6291	717166	5565
Hardness (mg CaCO3/L)	14.0	626	75.2	16684	52.8	49.5	2380	592	102369	499
TSS (mg/L)	6.2	296	59.1	12708	49.8	5.2	354	88.8	15099	68.3
Turbidity (NTU)	9.9	139.0	42.9	3263	36.3	0.5	216	67.8	4137	55.2
pH (pH units)	5.6	8.4	7.0	1543	7.0	6.2	8.1	7.0	1220	7.0
Nutrients										
Nitrate+Nitrite as N (mg/L)	0.034	1.010	0.195	22.21	0.142	0.036	0.355	0.142	9.821	0.125
Phosphorus, Ortho (mg/L)	1.55E-05	0.689	0.038	4.51	0.025	0.007	0.100	0.029	2.057	0.024
Phosphate, Total (mg/L)	0.033	1.510	0.180	20.19	0.140	0.051	1.090	0.167	11.547	0.120
Total Nitrogen (mg/L)	0.02	2.90	0.74	84.56	0.60	0.03	1.95	0.58	40.17	0.48
Metals in ug/L										
Cadmium (ug/L)	0.016	2.410	0.281	39.87	0.189	0.015	0.543	0.192	13.98	0.168
Cadmium, Dissolved (ug/L)	3.63E-03	1.850	0.124	17.55	0.070	0.010	0.273	0.095	6.86	0.088
Copper (ug/L)	3.00	50.10	13.83	1964	12.45	3.94	70.90	16.82	1228	13.40
Copper, Dissolved (ug/L)	0.02	26.10	3.69	520	3.00	0.53	11.30	2.93	214.1	2.27
Lead (ug/L)	0.79	60.00	9.26	2057	6.81	1.16	68.0	14.67	2537	10.40
Lead, Dissolved (ug/L)	0.010	6.270	0.441	97.8	0.208	0.000	12.20	1.003	172	0.230
Mercury (ug/L)	1.386E-04	0.8700	0.0203	4.51	0.0074	5.258E-05	0.3070	0.0261	4.51	0.0140
Mercury, Dissolved (ug/L)	2.193E-05	0.1080	0.0133	2.96	0.0067	2.893E-05	0.2110	0.0178	3.07	0.0082
Zinc (ug/L)[6]	27.7	585	128.1	28300	102.0	27.6	427	118.8	20553	92.3
Zinc, Dissolved (ug/L)[6]	0.8	335	52.0	11483	36.1	5.1	239	43.9	7596	31.8
Insecticides										
2,4-D (ug/L)	0.001	1.500	0.151	10.85	0.040	0.001	1.000	0.090	3.596	0.028
Bifenthrin (ug/L)	2.11E-04	0.089	0.007	0.328	0.006	0.000	0.010	0.005	0.142	0.005
Carbaryl (ug/L)	0.01	0.45	0.16	4.43	0.05	9.0E-03	0.49	0.17	4.00	0.14
Chlorpyrifos (ug/L)	1.36E-05	0.754	0.027	2.491	0.009	0.000	0.320	0.028	1.494	0.011
PAHs in ug/L										
LPAHs in ug/L										
2-Methylnaphthalene (ug/L)	5.65E-05	1.143	0.029	6.34	0.010	6.13E-04	0.435	0.022	3.77	0.013
Acenaphthene (ug/L)	6.00E-07	0.855	0.016	3.45	0.009	2.47E-05	0.352	0.016	2.76	0.009
Acenaphthylene (ug/L)	2.23E-06	0.095	0.008	1.79	0.005	1.01E-05	0.070	0.010	1.73	0.007
Anthracene (ug/L)	3.99E-06	0.289	0.011	2.38	0.006	1.77E-05	0.389	0.030	5.17	0.010
Fluorene (ug/L)	3.38E-05	0.928	0.021	4.54	0.009	3.91E-04	0.159	0.019	3.28	0.010
Naphthalene (ug/L)	2.29E-04	0.795	0.036	7.83	0.021	1.57E-03	0.126	0.025	4.27	0.021
Phenanthrene (ug/L)	0.001	1.650	0.059	13.02	0.034	0.001	0.657	0.077	13.19	0.044
Total LPAHs[1,2]	0.007	4.612	0.146	32.05	0.085	0.005	1.244	0.173	29.62	0.101
HPAHs in ug/L										
Benzo(a)anthracene (ug/L)	3.60E-06	0.247	0.017	3.72	0.008	1.06E-04	0.915	0.057	9.87	0.019
Benzo(a)pyrene (ug/L)	5.00E-05	0.133	0.017	3.78	0.010	6.58E-05	0.428	0.050	8.63	0.025
Benzo(b,k)fluoranthenes (ug/L)	1.35E-04	0.414	0.043	9.51	0.025	4.30E-05	1.662	0.135	23.3	0.063
Benzo(g,h,i)perylene (ug/L)	2.04E-04	0.112	0.024	5.30	0.017	9.31E-05	0.253	0.045	7.76	0.029
Chrysene (ug/L)	1.94E-05	0.420	0.038	8.26	0.016	2.17E-04	1.906	0.119	20.5	0.041
Dibenz(a,h)anthracene (ug/L)	4.98E-06	0.027	0.005	1.11	0.004	7.29E-05	0.071	0.010	1.73	0.005
Fluoranthene (ug/L)	0.001	1.720	0.062	13.71	0.033	2.67E-03	3.964	0.205	35.3	0.075
Indeno(1,2,3-cd)pyrene (ug/L)	6.15E-05	0.058	0.013	2.91	0.009	3.09E-04	0.239	0.031	5.28	0.019
Pyrene (ug/L)	0.001	1.310	0.078	17.26	0.047	0.002	4.120	0.208	35.9	0.078
Retene (ug/L)	0.002	0.021	0.010	0.47	0.009	0.001	0.034	0.014	0.4	0.012
Total HPAHs[1]	0.011	4.393	0.294	64.61	0.167	0.027	13.558	0.860	148	0.360
Total PAHs[1]	0.020	9.005	0.439	96.68	0.258	0.040	14.681	1.032	177	0.455
Phthalates in ug/L										
Butyl benzyl phthalate (ug/L)	0.006	290	8.235	1811.7	0.268	0.003	6.10	0.420	72.2	0.259
bis(2-Ethylhexyl)phthalate (ug/L)	0.04	31.00	2.20	479.6	1.27	0.00	10.20	2.04	351	1.39
Di-n-butylphthalate (ug/L)	0.002	2.360	0.525	115.5	0.416	2.21E-03	1.300	0.379	65.1	0.354
Di-n-Octyl phthalate (ug/L)	5.85E-04	4.100	0.303	66.7	0.198	0.000	4.500	0.321	54.6	0.192
Diethylphthalate (ug/L)	5.19E-03	430	2.296	505.1	0.228	3.17E-03	120.0	1.206	207	0.210
Dimethyl phthalate (ug/L)	1.09E-04	1.100	0.242	53.1	0.176	0.008	3.200	0.313	53.8	0.188
Total Phthalates[3]	0.00	593	12.75	2791	2.02	0.00	123.20	3.52	602	1.87
Herbicides										
Dichlobenil (ug/L)	3.18E-05	0.167	0.026	3.573	0.019	4.24E-04	0.263	0.028	2.230	0.017
Total Petroleum Hydrocarbons										
NWTPH-Diesel (mg/L)	1.4E-04	0.33	0.06	4.39	0.05	1.2E-03	0.16	0.07	3.83	0.06
NWTPH-Gasoline (mg/L)	0.1	62.3	16.8	1058.9	9.6	0.1	49.7	15.9	685.65	10.0
NWTPH-Heavy Oil (mg/L)	0.00	1.10	0.36	26.65	0.34	2.2E-02	4.20	0.79	43.68	0.55
Bacteria										
Coliform, Fecal (CFU/100 ml)	50	240000	15586.528	1,122,230	2700	220	800000	25801	1393260.00	2700
E.Coli (CFU/100 ml)	5	240000	29240	526,314	4250	1.4985128	280000	29429	470857.50	2500
Enterococci (CFU/100 ml)	0.542405	820000	88056	1,585,001	10350	270	820000	87715	1491160.00	6900
BTEX										
Benzene (ug/L)	2.E-03	0.2	0.1	4.5	0.1	3.E-03	0.2	0.1	4.39	0.1
Ethylbenzene (ug/L)	3.E-03	0.2	0.1	3.8	0.1	2.E-03	0.2	0.1	4.34	0.1
Toluene (ug/L)	5.E-04	0.5	0.1	5.5	0.1	1.E-02	1.0	0.2	7.14	0.1
m,p-Xylene (ug/L)	3.E-03	0.4	0.2	7.9	0.2	8.E-03	0.4	0.2	7.93	0.2
o-Xylene (ug/L)	2.E-03	0.2	0.1	3.4	0.1	2.E-03	0.2	0.1	4.31	0.1

Notes:
[1] PAH summations based on 1/2 detection limit for nondetects.
[2] Calculation of Total LPAHs does not include 2-Methylnaphthalene.
[3] Phthalate summations exclude nondetect values.
[4] Overall data arithmetic mean is average of individual outfall means.
[5] Overall data weighted mean is average of all sample results.
[6] While elevated zinc values of 4570 ug/l total and 4430 ug/l dissolved were measured on 2/1/18, these values were nearly 4 times higher than the previously identified extreme outliers with no apparent cause so these values were not included in the summary statistics
[7] OF237A New location includes data from old OF 237A sampling location for all data collected prior to 2/26/06.
[8] OF230A- Includes data from the historic OF230 drainage area for all samples collected before 12/2023. 98% of the historic
[9] OF235 - Includes data from the historic OF235 drainage area of 163 acres for all samples collected before 12/2023 and the

Highest average or highest median concentration detected in Years 1-23 monitoring. (green)
Highest maximum concentration detected in Years 1-23 monitoring. (orange)

Table 3-3.2
Summary Statistics for SSPM

	Overall Data							
	Overall Detections	% Detections	Arithmetic Mean	Weighted Mean	Highest Mean	Highest Median	Max	Date of Max
Conventionals								
Total Organic Carbon (mg/Kg)	134/134	100	N/A	N/A	8	8	17	2021
Total Solids (%)	139/139	100	N/A	N/A	70	68	92	2021
Total Volatile Solids (%)	60/60	100	N/A	N/A	22	21	33	2024
Nutrients								
Phosphorus, Total (mg/Kg)	55/55	100	2091	1811	7926	8840	13700	2021
Metals in ug/L								
Cadmium (mg/Kg dry)	64/66	97	1.0	1.0	3.2	2.9	5.6	2011
Copper (mg/Kg dry)	67/67	100	116.0	114.8	229.8	229.0	288.0	2011
Lead (mg/Kg dry)	133/133	100	174.9	161.1	512.1	441.0	1420.0	2006
Mercury (mg/Kg dry)	132/134	99	0.2	0.1	0.4	0.3	1.4	2008
Zinc (mg/Kg dry)	133/133	100	470.5	458.0	763.1	765.0	3200.0	2007
TPH								
NWTPH-Diesel (mg/Kg)	103/138	75	177	178	325	185	2400	2001
NWTPH-Heavy Oil (mg/Kg)	138/138	100	3060	3053	4290	4090	10000	2001
PAHs								
LPAHs								
2-Methylnaphthalene (ug/Kg)	93/138	67	72	72	115	107	355	2001
Acenaphthene (ug/Kg)	89/138	64	68	68	118	120	350	2009
Acenaphthylene (ug/Kg)	57/138	41	30	30	62	59	179	2010,11,12
Anthracene (ug/Kg)	122/137	89	223	223	324	304	1660	2001
Fluorene (ug/Kg)	105/138	76	101	101	167	150	577	2020
Naphthalene (ug/Kg)	102/138	74	101	100	182	170	480	2020
Phenanthrene (ug/Kg)	135/137	99	1244	1247	2232	2400	5400	2009
Total LPAHs[1]	66/138	48	1498	1494	3454	2871	16513	
HPAHs								
Benzo(a)anthracene (ug/Kg)	133/138	96	883	881	1722	1600	3740	2001
Benzo(a)pyrene (ug/Kg)	132/138	96	908	904	1720	1700	5870	2014
Benzo(b,k)fluoranthenes (ug/Kg)	134/138	97	2295	2284	4499	4210	17900	2010
Benzo(g,h,i)perylene (ug/Kg)	136/138	99	836	833	1642	1230	9300	2021
Chrysene (ug/Kg)	137/138	99	1369	1363	2577	2200	6900	2004
Dibenz(a,h)anthracene (ug/Kg)	103/138	75	224	223	463	355	2800	2005
Fluoranthene (ug/Kg)	136/137	99	1942	1946	3634	3680	7700	2005
Indeno(1,2,3-c,d)pyrene (ug/Kg)	126/138	91	646	644	1317	1300	4260	2014
Pyrene (ug/Kg)	136/137	99	2395	2396	4063	4020	12100	2001
Retene	23/24	96	140	140	303	300	475	2022
Total HPAHs[2]	66/138	48	8232	8190	18723	14319	45680	
Total PAHs[3]	66/138	48	9730	9685	21554	18101	49053	
Phthalates								
Butyl benzyl phthalate (ug/Kg)	135/138	98	6236	6372	26433	11000	160000	2003
bis(2-Ethylhexyl)phthalate (ug/Kg)	137/138	99	11290	11251	17031	15300	43000	2008
Di-n-butylphthalate (ug/Kg)	116/137	85	388	389	1075	250	15000	2003
Di-n-octyl phthalate (ug/Kg)	89/138	64	850	846	1550	895	9290	2014
Diethylphthalate (ug/Kg)	37/138	27	48	48	75	37	820	2001
Dimethyl phthalate (ug/Kg)	86/137	63	246	247	484	110	9810	2001
Total Phthalates[4]	138/138	100	18970	19071	38029	17970	207260	
Insecticides								
Bifenthrin (ug/Kg)	57/60	95	16	16	29	30	142	2015
PCBs								
Aroclor-1016 (ug/Kg)	6/132	5	1.0	1.0	1.5	1	4	2015
Aroclor-1221 (ug/Kg)	6/131	5	2.8	2.9	10.4	4	49	2006
Aroclor-1232 (ug/Kg)	6/131	5	2.5	2.6	9.1	3	74	2006
Aroclor-1242 (ug/Kg)	7/131	5	7.0	7.2	28.7	4	420	2020
Aroclor-1248 (ug/Kg)	5/131	4	1.5	1.5	4.2	2	14	2015
Aroclor-1254 (ug/Kg)	45/131	34	54.0	54.9	174.4	98	581	2005
Aroclor-1260 (ug/Kg)	28/131	21	29.0	29.7	78.3	12	910	2020
TOTAL PCBs[5]	58/129	45	77.2	79.9	252.3	160	910	2021
Herbicides								
Dichlobenil (ug/L)	24/24	100	16.1	16.1	44.1	47	76	2023
Phenolics								
2-Methylphenol (ug/Kg dry)	9/31	29	17.6	19.5	34.6	27	119	8/25/2011
4-Methylphenol (ug/Kg dry)	39/49	80	560.0	496.1	1072.6	485	5400	4/28/2003
Pentachlorophenol (ug/Kg dry)	18/29	62	633.0	737.8	3035.6	228	17800	8/15/2012

	OF230/230A					OF235				
	Min	Max	Arithmetic Mean	Weighted Mean	Median	Min	Max	Arithmetic Mean	Weighted Mean	Median
Conventionals										
Total Organic Carbon (mg/Kg)	0.67	16.4	6.8	155.9	6	3.45	10	6	134.8	6
Total Solids (%)	29.4	65	50	1,157.1	51	54.5	73	63	1,448.7	62
Total Volatile Solids (%)	6.1	33	14	142.2	11	10.4	15	13	127.7	13
Nutrients										
Phosphorus, Total (mg/Kg)	543	1560	1045	8,359	1115	549	1180	837	8,367	811
Metals in ug/L										
Cadmium (mg/Kg dry)	0.286	0.926	0.549	4.937	0.534	0.000	0.819	0.395	4.737	0.406
Copper (mg/Kg dry)	48.2	132	82	738.6	81	84.4	199	137	1,646	138
Lead (mg/Kg dry)	28.2	1420	197.4	4,341.9	139.0	88.2	286	161.5	3,714	148.0
Mercury (mg/Kg dry)	0.0328	0.827	0.174	3.825	0.124	0.0479	1.35	0.146	3.347	0.081
Zinc (mg/Kg dry)	219	3200	619	13,624.0	440	219	789	458	10,545	396
TPH										
NWTPH-Diesel (mg/Kg)	6.00403	960	165	3,796.5	120	12.62865	1000	156	3,587.5	120
NWTPH-Heavy Oil (mg/Kg)	25	8300	3579	82,325	3300	1600	4700	2995	68,880	2600
PAHs										
LPAHs										
2-Methylnaphthalene (ug/Kg)	5.085975	310	88	2022.66829	60	11.5238	150	77	1,770	75
Acenaphthene (ug/Kg)	4.743854	350	118	2704.20277	120	3.949001	270	66	1,517	58
Acenaphthylene (ug/Kg)	6.028529	93	44	1001.27067	40	1.764547	179	30	693	23
Anthracene (ug/Kg)	26.6282	640	280	6443.6282	283	35	430	174	4,006	170
Fluorene (ug/Kg)	18.08775	577	167	3838.62093	150	9.228657	270	88	2,032	74
Naphthalene (ug/Kg)	8.697916	480	131	3017.69792	120	8.178994	251	91	2,094	87
Phenanthrene (ug/Kg)	238	5400	2232	51336	2400	263	2400	1010	23,225	960
Total LPAHs[1]	406	5991	2830	65093	2871	151.5135	2034	1202	27,636	1119
HPAHs										
Benzo(a)anthracene (ug/Kg)	128	3400	1490	34269	1600	120	1300	581	13,374	520
Benzo(a)pyrene (ug/Kg)	253	5870	1700	39106	1550	184	1100	574	13,202	540
Benzo(b,k)fluoranthenes (ug/Kg)	641	17900	4499	103488	4030	439	2700	1288	29,617	1250
Benzo(g,h,i)perylene (ug/Kg)	78	3000	1349	31021	1180	176	1600	500	11,494	343
Chrysene (ug/Kg)	283	5000	2160	49690	2130	297	1800	898	20,659	880
Dibenz(a,h)anthracene (ug/Kg)	13.1	2700	408	9392.29925	323	0.056404	900	119	2,744	82
Fluoranthene (ug/Kg)	368	6800	3432	78934	3270	432	2650	1323	30,433	1160
Indeno(1,2,3-c,d)pyrene (ug/Kg)	122	4260	1317	30280	1290	153	930	348	8,015	284
Pyrene (ug/Kg)	388	9400	3889	89447	4000	560	4200	1768	40,653	1790
Retene	31	218	107	427	89	73	327	179	715	158
Total HPAHs[2]	2416.247	45680	18723	430637.286	14319	487.9859	11478	6452	148,402	6604
Total PAHs[3]	3030.5	49053	21554	495730.632	16853	2466.327	13486	7654	176,039	7904
Phthalates										
Butyl benzyl phthalate (ug/Kg)	42	4700	1138	26173.7446	850	12.21305	3800	1158	26,631	1150
bis(2-Ethylhexyl)phthalate (ug/Kg)	3530	43000	17031	391710	15300	1600	22000	12460	286,580	12500
Di-n-butylphthalate (ug/Kg)	8.283418	2400	419	9635.31854	250	41	392	204	4,701	190
Di-n-octyl phthalate (ug/Kg)	0.230015	9290	1550	35645.1337	895	0.79624	2800	803	18,471	750
Diethylphthalate (ug/Kg)	0.388534	170	48	1109.58342	37	0.514833	89	28	635	21
Dimethyl phthalate (ug/Kg)	1.052116	1200	141	3235.48215	73	15.6813	569	145	3,326	93
Total Phthalates[4]	3603	48810	20221	465074	17970	2960	28880	14749	339,233	14842
Insecticides										
Bifenthrin (ug/Kg)	0.376173	142	28	284.576173	20	6	24	14	137	14
PCBs										
Aroclor-1016 (ug/Kg)	0.05	4	1	34.46	1	0.089975	2	1	17.0	1
Aroclor-1221 (ug/Kg)	0.20	49	10	240.07	4	0.045569	2	1	22.0	1
Aroclor-1232 (ug/Kg)	0.00	74	9	209.45	3	0.159653	2	1	19.7	1
Aroclor-1242 (ug/Kg)	0.04	4	1	33.05	1	0.080258	420	29	661.1	4
Aroclor-1248 (ug/Kg)	0.02	4	1	33.37	1	0.077098	2	1	19.2	1
Aroclor-1254 (ug/Kg)	0.25	581	174	4010.55	98	0.165546	280	32	742.3	10
Aroclor-1260 (ug/Kg)	0.15	910	78	1800.81	6	0.349898	44	12	271.2	5
TOTAL PCBs[5]	0.00	910	252	5802.90	160	0	420	49	1,134	0
Herbicides										
Dichlobenil (ug/L)	0.74	33	16	62.74	15	6	76	44	176.40	47
Phenolics										
2-Methylphenol (ug/Kg dry)	6.73	36	20	81.13	19	9.59	67	35	242	27
4-Methylphenol (ug/Kg dry)	17.21	2300	719	4311.21	485	44	440	207	2072	175
Pentachlorophenol (ug/Kg dry)	19.28	830	326	1304.28	228	19.19831	17800	3036	18214	108

	OF237A New					OF237B				
	Min	Max	Arithmetic Mean	Weighted Mean	Median	Min	Max	Arithmetic Mean	Weighted Mean	Median
Conventionals										
Total Organic Carbon (mg/Kg)	2.86	17	7	162.2	6	0.572	11	3	70.1	2
Total Solids (%)	48.6	92	61	1,407.8	61	54.5	83	70	1,603.9	68
Total Volatile Solids (%)	8.8	19	14	137.3	14	3.1	15	6	57.9	5
Nutrients										
Phosphorus, Total (mg/Kg)	575	1880	944	9,440	790	375	662	526	5,262	520
Metals in ug/L										
Cadmium (mg/Kg dry)	0.278	0.853	0.536	5.901	0.500	0.034	2.030	0.462	5.542	0.341
Copper (mg/Kg dry)	57.7	100	80	879	71	30.9	64	44	524	41
Lead (mg/Kg dry)	50.9	114.0	81.9	1,883	80.1	20.6	129.0	46.7	1,073	39.5
Mercury (mg/Kg dry)	0.029	0.129	0.066	1.529	0.066	0.014982	0.162	0.046	1.057	0.040
Zinc (mg/Kg dry)	220	540	358	8,233	344	123	280	200	4,595	198
TPH										
NWTPH-Diesel (mg/Kg)	10.04211	780	132	3,033	120	1.701322	780	77	1,773	39
NWTPH-Heavy Oil (mg/Kg)	1400	4300	2841	65,350	2600	520	3000	1309	30,100	1380
PAHs										
LPAHs										
2-Methylnaphthalene (ug/Kg)	3.082013	184	71	1,637	58	0.822822	120	28	649	22
Acenaphthene (ug/Kg)	11	300	88	2,031	65	1.036271	170	41	950	13
Acenaphthylene (ug/Kg)	0.452755	29	15	348	15	1.424453	32	14	321	11
Anthracene (ug/Kg)	43	890	324	7,454	304	0.603855	500	115	2,656	40
Fluorene (ug/Kg)	18	270	134	3,093	120	0.11981	240	62	1,418	24
Naphthalene (ug/Kg)	7.852932	220	99	2,272	108	0.339917	160	35	798	26
Phenanthrene (ug/Kg)	247	4600	2163	49,746	2100	36	3500	874	20,094	394
Total LPAHs[1]	81.32167	16513	3454	79,451	2300	11.31217	555	223	5,131	182
HPAHs										
Benzo(a)anthracene (ug/Kg)	194	3700	1722	39,604	1580	52	2200	553	12,724	301
Benzo(a)pyrene (ug/Kg)	260	3300	1720	39,559	1700	62	2200	541	12,446	328
Benzo(b,k)fluoranthenes (ug/Kg)	721	8500	4246	97,648	4210	147	7300	1608	36,980	848
Benzo(g,h,i)perylene (ug/Kg)	180	9300	1642	37,773	1230	47	2900	659	15,154	260
Chrysene (ug/Kg)	305	6900	2577	59,274	2200	68	3000	793	18,243	460
Dibenz(a,h)anthracene (ug/Kg)	37	2800	463	10,640	355	7.087285	410	120	2,764	64
Fluoranthene (ug/Kg)	671	7700	3634	83,591	3680	77	4700	1338	30,776	795
Indeno(1,2,3-c,d)pyrene (ug/Kg)	205	2800	1286	29,575	1300	65	1600	423	9,725	255
Pyrene (ug/Kg)	551	9500	4063	93,451	4020	73	7400	1501	34,514	832
Retene	138	475	303	1,212	300	2.006814	87	39	156	34
Total HPAHs[2]	357.7245	24035	13695	314,990	14104	6.420335	4174	1571	36,133	1373
Total PAHs[3]	1723.532	30731	17150	394,442	18101	510.8627	4729	1794	41,264	1473
Phthalates										
Butyl benzyl phthalate (ug/Kg)	140	2200	799	18,378	650	15.80716	1700	281	6,460	141
bis(2-Ethylhexyl)phthalate (ug/Kg)	1300	24000	9321	214,380	6900	1360	17000	4042	92,960	3040
Di-n-butylphthalate (ug/Kg)	7.007606	1100	300	6,907	232	1.20759	490	103	2,370	62
Di-n-octyl phthalate (ug/Kg)	3.134724	4800	886	20,376	770	0.812647	2000	473	10,883	410
Diethylphthalate (ug/Kg)	1.377095	250	54	1,253	37	2.99449	190	35	804	23
Dimethyl phthalate (ug/Kg)	9.142578	2200	249	5,717	110	1.0982	7200	361	8,302	25
Total Phthalates[4]	1664	31210	11549	265,629	10054	1568	21060	5237	120,449	3713
Insecticides										
Bifenthrin (ug/Kg)	12	44	29	287	30	2	21	9	91	7
PCBs										
Aroclor-1016 (ug/Kg)	0.055383	2	1	20	1	0.085819	2	1	19	1
Aroclor-1221 (ug/Kg)	0.127081	2	1	17	1	0.061083	2	1	18	1
Aroclor-1232 (ug/Kg)	0.091379	2	1	19	1	0.195935	2	1	18	1
Aroclor-1242 (ug/Kg)	0.01071	2	1	17	1	0.053999	2	1	22	1
Aroclor-1248 (ug/Kg)	0.027152	2	1	22	1	0.010084	2	1	19	1
Aroclor-1254 (ug/Kg)	0.167888	390	45	1032	7	0.042508	43	8	182	3
Aroclor-1260 (ug/Kg)	0.112836	150	39	898	12	0.040215	45	11	262	4
TOTAL PCBs[5]	0	390	74	1,695	63	0	88	8	171	0
Herbicides										
Dichlobenil (ug/L)	0.732	38	21	82.73	22	0.745	7	3	12	2
Phenolics										
2-Methylphenol (ug/Kg dry)	1.112651	8	4	13	5	1.375105	8	6	40	5
4-Methylphenol (ug/Kg dry)	56	4700	1073	7508	479	9.185868	900	274	2739	150
Pentachlorophenol (ug/Kg dry)	52.4	326	182	726	174	0.045183	204	48	285	19

	OF243					OF245				
	Min	Max	Arithmetic Mean	Weighted Mean	Median	Min	Max	Arithmetic Mean	Weighted Mean	Median
Conventionals										
Total Organic Carbon (mg/Kg)	3.71	14	8	147.9	8	0.933	14	5	126.3	4
Total Solids (%)	18.6	47	31	714.4	31	43.8	81	65	1,568.5	67
Total Volatile Solids (%)	17	26	22	215.4	21	3	31	13	134.7	12
Nutrients										
Phosphorus, Total (mg/Kg)	1900	13700	7926	55,480	8840	587	3290	1272	12,715	967
Metals in ug/L										
Cadmium (mg/Kg dry)	1.790	5.550	3.240	32.40	2.915	0.541	1.800	0.995	11.94	0.796
Copper (mg/Kg dry)	174	288	230	2,298	229	45.2	276	124	1,607	114
Lead (mg/Kg dry)	343.0	913.0	512.1	9,218	441.0	8.3	98.4	50.1	1,202	48
Mercury (mg/Kg dry)	0.178	0.972	0.406	7.718	0.309	0.012804	0.211	0.071	1.709	0.058
Zinc (mg/Kg dry)	440	936	763	13,735	765	80.9	679	424	10,188	439
TPH										
NWTPH-Diesel (mg/Kg)	0.7148537	670	209	4,587	185	0.201877	2400	325	7,793	120
NWTPH-Heavy Oil (mg/Kg)	1700	7400	4290	94,380	4090	230	10000	3343	80,230	2950
PAHs										
LPAHs										
2-Methylnaphthalene (ug/Kg)	29	260	115	2,531	107	0.192725	355	54	1,291	40
Acenaphthene (ug/Kg)	0.1811153	211	55	1,217	42	2.803782	248	40	971	27
Acenaphthylene (ug/Kg)	6.44	130	62	1,373	59	0.982636	29	14	339	13
Anthracene (ug/Kg)	40	1000	304	6,690	295	1.722631	1660	141	3,245	37
Fluorene (ug/Kg)	15	330	109	2,404	90	4.586429	260	46	1,099	25
Naphthalene (ug/Kg)	52	393	182	4,013	170	11.11227	150	67	1,597	56
Phenanthrene (ug/Kg)	134	2900	928	20,410	680	1.958439	1410	259	5,962	145
Total LPAHs[1]	97.664027	1931	870	19,146	883	14.445	1050	408	9,782	361
HPAHs										
Benzo(a)anthracene (ug/Kg)	64.244657	1700	666	14,661	569	4.81	3740	287	6,888	82
Benzo(a)pyrene (ug/Kg)	112	1200	695	15,286	650	7.696986	2240	217	5,205	109
Benzo(b,k)fluoranthenes (ug/Kg)	287	4200	1785	39,260	1725	29.81004	1870	344	8,260	223
Benzo(g,h,i)perylene (ug/Kg)	157	2100	660	14,530	515	32.86514	1660	206	4,955	126
Chrysene (ug/Kg)	184	2400	1287	28,320	1125	15.86677	6490	497	11,924	161
Dibenz(a,h)anthracene (ug/Kg)	8.1793076	1700	175	3,857	93	4.341923	616	57	1,372	31
Fluoranthene (ug/Kg)	186	3770	1496	32,906	1330	52	3840	432	9,928	220
Indeno(1,2,3-c,d)pyrene (ug/Kg)	33.94481	950	400	8,801	374	6.086941	608	102	2,446	70
Pyrene (ug/Kg)	316	5700	2194	48,272	1750	91.52591	12100	953	21,913	334
Retene	70	240	167	666	178	22	79	44	174	37
Total HPAHs[2]	1537	13102	7321	161,067	6897	203.6425	4704	1627	39,046	1301
Total PAHs[3]	1801.5	15033	8191	180,212	7870	515	5754	2034	48,828	1487
Phthalates										
Butyl benzyl phthalate (ug/Kg)	150	51000	7607	167,353	2250	2500	160000	26433	634,390	11000
bis(2-Ethylhexyl)phthalate (ug/Kg)	1830	41000	15100	332,190	12600	1220	34000	9784	234,824	4865
Di-n-butylphthalate (ug/Kg)	16.181884	725	225	4,954	180	4.37325	15000	1075	24,714	220
Di-n-octyl phthalate (ug/Kg)	1.5470426	4000	1002	22,043	665	6.479734	4250	386	9,273	72
Diethylphthalate (ug/Kg)	5.7341315	180	49	1,072	32	0.175466	820	75	1,794	31
Dimethyl phthalate (ug/Kg)	6.2610828	390	99	2,172	58	5.006704	9810	484	11,139	52
Total Phthalates[4]	1993	96420	24035	528,767	17131	5333	207260	38029	912,705	14662
Insecticides										
Bifenthrin (ug/Kg)	2	29	14	144	15	0.017191	9	3	34	3
PCBs										
Aroclor-1016 (ug/Kg)	0.1619065	2	1	14.2	1	0.018905	4	1	30.8	1
Aroclor-1221 (ug/Kg)	0.0803556	2	1	13.0	0	0.198698	13	3	67.5	2
Aroclor-1232 (ug/Kg)	0.0206731	2	1	14.7	1	0.641424	11	3	58.8	2
Aroclor-1242 (ug/Kg)	0.0196988	2	1	15.3	1	0.253988	120	9	196.9	2
Aroclor-1248 (ug/Kg)	0.1519661	2	1	19.0	1	0.009982	14	4	87.7	2
Aroclor-1254 (ug/Kg)	0.1420721	220	46	823.8	4	0.11429	140	19	394.4	3
Aroclor-1260 (ug/Kg)	0.1742586	96	14	252.8	3	0.035797	180	19	403.7	3
TOTAL PCBs[5]	0	220	43	736	0	0	440	37	773	0
Herbicides										
Dichlobenil (ug/L)	0.746	7	4	15.7	4	0.733	18	9	36.7	9
Phenolics										
2-Methylphenol (ug/Kg dry)	4.7911831	11	7	30	7	0.354621	119	33	199	21
4-Methylphenol (ug/Kg dry)	14	5400	1056	7389	157	2.203141	100	32	290	11
Pentachlorophenol (ug/Kg dry)	106	226	172	687	178	0.90271	111	36	178	10

Notes:

[1] *Total LPAHs is the sum of the concentration or non-detected calculated value of the following compounds: Naphthalene, acenaphthene, acenaphthylene, anthracene, fluorene, and phenanthrene.*

[2] *Total HPAHs is the sum of the concentration of non-detected calculated value of the following compounds: Fluoranthene, pyrene, benzo(a)anthracene, chrysene, benzo(b,k)fluoranthene,*

[3] *Total PAHs is the sum of the LPAHs and HPAHs.*

[4] *Total phthalates is the sum of detected values only.*

[5] *Total value for PCBs is the sum of detected values only.*

Highest average or highest median concentration detected in Years 1-23 monitoring.

Highest maximum concentration detected in Years 1-23 monitoring.

OF237A New location includes data from old OF 237A sampling location for all data collected prior to 2/26/06.
OF230 stormwater discharge was rerouted to the new OF230A in December 2023. FD3ANew represents the historic OF230 drainage and FD7 now represents the new OF230A drainage area. Data from the FD7 sediment trap has been added to the FD3ANew Data for stats analysis representing the OF230/230A drainage area.

Table 3-4
Spatial Analysis of Stormwater Quality (ANOVA Results)

A. Parametric Outfall Pair Comparisons, Years 1-23							
Analyte	**OF230/230A**	**OF235**	**OF237A**	**OF237B**	**OF243**	**OF245**	**OF254**
TSS	-1	-1	-1	-1	-1	-1	6
Total Copper [1]	-2	6	-3	-4	3	-1	1
Total Lead	0	6	-2	-3	4	-3	-2
Total Zinc	1	1	-1	-6	-1	3	3
DEHP	3	5	-2	-2	-2	-1	-1
Phenanthrene	1	0	1	-3	0	0	1
Pyrene	-1	0	3	-2	-2	-3	5
Indeno(1,2,3-c,d)pyrene	2	0	6	-1	-2	-5	0

B. Parametric Outfall Pair Comparisons, Year 22-23							
Analyte	**OF230/230A**	**OF235**	**OF237A**	**OF237B**	**OF243**	**OF245**	**OF254**
TSS	-1	-1	1	-3	-1	1	4
Total Copper	-1	6	-1	-3	0	-1	0
Total Lead	-1	6	-1	-1	-1	-1	-1
Total Zinc	1	2	1	-5	-1	1	1
DEHP	3	3	3	-3	-4	-3	1
Phenanthrene	-1	-1	6	-1	-1	-1	-1
Pyrene	-1	-1	6	-1	-1	-1	-1
Indeno(1,2,3-c,d)pyrene	-1	-1	6	-1	-1	-1	-1

[1] Stormwater analysis for copper was performed initially for OF235, OF237B and OF245 from WY2010 to WY2012, and began again in WY2015. Therefore, the ANOVA data set for these outfalls includes eleven years of non-sequential data. Stormwater analysis for OF230/230A, OF237A, OF243 and OF254 began in WY2015 and have eight years of data. Therefore, copper results are not comparable to other results.

Key:
- *Well Below Average (-6 to -3)*
- *Below Average (-2 to -1)*
- *Neutral (0)*
- *Above Average (1 to 2)*
- *Well Above Average (3 to 6)*

Table 3-5
Spatial Analysis of Storm Sediment Quality (ANOVA Results)

A. Nonparametric Outfall Pair Comparisons, Years 1-23						
Analyte	**OF230/230A**	**OF235**	**OF237A**	**OF237B**	**OF243**	**OF245**
Copper	-1	1	-1	-3	3	1
Lead	1	2	-1	-3	4	-3
Mercury	1	0	-1	-3	4	-1
Zinc	1	0	0	-5	4	0
TPH-OIL	1	1	1	-5	1	1
Bifenthrin	1	0	2	-1	0	-2
Phenanthrene	2	1	2	-2	1	-4
Indeno(1,2,3-cd)pyrene	3	-1	4	-1	0	-5
Pyrene	2	1	2	-2	1	-4
Total PCBs	1	0	0	-1	0	0
DEHP	2	1	1	-4	1	-1
Butylbenzylphthalate	-1	0	-1	-3	1	4
Total Phthalates	1	1	0	-4	1	1

B. Nonparametric Outfall Pair Comparisons, Years 18-23						
Analyte	**OF230/230A**	**OF235**	**OF237A**	**OF237B**	**OF243**	**OF245**
Copper	0	1	0	-2	1	0
Lead	0	1	0	-2	1	0
Mercury	0	0	0	-1	1	0
Zinc	0	1	0	-2	1	0
TPH-OIL	No Significant Differences					
Bifenthrin	0	0	1	0	0	-1
Phenanthrene	0	0	1	0	0	-1
Indeno(1,2,3-cd)pyrene	0	0	1	0	0	-1
Pyrene	0	0	2	-1	0	-1
Total PCBs	No Significant Differences					
DEHP	0	1	0	-1	0	0
Butylbenzylphthalate	-1	0	0	-1	0	2
Total Phthalates	0	0	0	-1	0	1

Key:
- *Well Below Average (-6 to -3)*
- *Below Average (-2 to -1)*
- *Neutral (0)*
- *Above Average (1 to 2)*
- *Well Above Average (3 to 6)*

Table 3-5 Spatial Analysis of Storm Sediment Quality (ANOVA Results)

Table 3-6
Regression Statistics of Stormwater Time Trends

Analyte	Outfall Number	Sample Count	S_x	S_y^2	slope	y-intercept	R^2	R^2 Adj.	t - statistic	Significance Level	Year 1 Concentration (log)	Present Year Concentration (log)	Year 1 Concentration	Present Year Concentration (log)	Est % Reduction Over Study Period
Total Suspended Solids	OF230A*	205	2438	0.122	-0.00004	1.67	0.066	0.061	-3.78	100.0%	1.67	1.37	47.3	23.3	51%
	OF235*	250	2450	0.115	-0.00007	1.89	0.235	0.232	-8.73	100.0%	1.89	1.33	78.2	21.4	73%
	OF237A*	215	2425	0.100	-0.00003	1.68	0.049	0.044	-3.31	99.9%	1.68	1.43	47.4	27.1	43%
	OF237B	221	2485	0.113	-0.00006	1.81	0.224	0.220	-7.94	100.0%	1.81	1.27	64.1	18.6	71%
	OF243	148	2561	0.135	-0.00004	1.82	0.097	0.091	-3.96	100.0%	1.82	1.45	66.4	28.4	57%
	OF245	215	2534	0.096	-0.00004	1.83	0.092	0.088	-4.66	100.0%	1.83	1.52	67.1	32.8	51%
	OF254	170	2432	0.099	-0.00003	1.96	0.061	0.055	-3.29	99.9%	1.96	1.70	92.2	50.0	46%
Copper [1]	OF235*	171	1699	0.052	-0.00002	1.45	0.028	0.022	-2.22	97.2%	1.45	1.33	28.5	21.5	25%
	OF237B	142	1687	0.045	-0.00004	0.97	0.109	0.103	-4.14	100.0%	0.97	0.74	9.2	5.5	41%
	OF245	142	1664	0.054	-0.00002	1.15	0.031	0.024	-2.11	96.4%	1.15	1.02	14.1	10.4	27%
Lead	OF230A*	211	2414	0.139	-0.00010	1.47	0.394	0.391	-11.65	100.0%	1.47	0.65	29.2	4.5	85%
	OF235*	256	2436	0.077	-0.00006	1.92	0.322	0.319	-10.98	100.0%	1.92	1.38	82.9	23.9	71%
	OF237A*	218	2440	0.098	-0.00006	1.18	0.223	0.219	-7.88	100.0%	1.18	0.67	15.2	4.7	69%
	OF237B	232	2472	0.131	-0.00009	1.21	0.402	0.399	-12.44	100.0%	1.21	0.44	16.4	2.7	83%
	OF243	151	2543	0.235	-0.00008	1.59	0.188	0.183	-5.88	100.0%	1.59	0.90	38.5	8.0	79%
	OF245	222	2516	0.120	-0.00008	1.18	0.348	0.345	-10.83	100.0%	1.18	0.50	15.1	3.2	79%
	OF254	173	2419	0.126	-0.00009	1.37	0.344	0.340	-9.47	100.0%	1.37	0.65	23.2	4.4	81%
Zinc	OF230A*	211	2414	0.056	-0.00004	2.10	0.128	0.124	-5.55	100.0%	2.10	1.81	126.2	64.0	49%
	OF235*	255	2438	0.058	-0.00004	2.15	0.170	0.166	-7.19	100.0%	2.15	1.81	140.3	63.9	54%
	OF237A*	218	2440	0.048	-0.00004	2.06	0.192	0.188	-7.15	100.0%	2.06	1.73	114.4	53.6	53%
	OF237B	233	2467	0.064	-0.00005	1.91	0.248	0.245	-8.74	100.0%	1.91	1.48	81.1	30.2	63%
	OF243	151	2543	0.069	-0.00005	2.04	0.202	0.197	-6.14	100.0%	2.04	1.66	110.8	45.7	59%
	OF245	221	2522	0.072	-0.00005	2.25	0.254	0.251	-8.64	100.0%	2.25	1.80	177.9	63.2	64%
	OF254	173	2419	0.061	-0.00007	2.26	0.422	0.419	-11.17	100.0%	2.26	1.71	183.4	51.2	72%
Phenanthrene	OF230A*	211	2414	0.220	-0.00009	-1.02	0.221	0.217	-7.70	100.0%	-1.02	-1.79	0.095	0.016	83%
	OF235*	257	2435	0.246	-0.00010	-1.05	0.223	0.220	-8.56	100.0%	-1.05	-1.85	0.090	0.014	84%
	OF237A*	217	2445	0.266	-0.00005	-1.18	0.060	0.056	-3.72	100.0%	-1.18	-1.62	0.066	0.024	63%
	OF237B	234	2467	0.195	-0.00009	-1.25	0.237	0.233	-8.48	100.0%	-1.25	-1.98	0.056	0.010	81%
	OF243	151	2543	0.133	-0.00005	-1.23	0.146	0.140	-5.05	100.0%	-1.23	-1.68	0.059	0.021	65%
	OF245	220	2522	0.149	-0.00006	-1.18	0.163	0.159	-6.52	100.0%	-1.18	-1.70	0.066	0.020	70%
	OF254	172	2419	0.161	-0.00008	-0.98	0.250	0.245	-7.52	100.0%	-0.98	-1.67	0.104	0.021	80%
Pyrene	OF230A*	211	2414	0.286	-0.00010	-0.79	0.187	0.183	-6.93	100.0%	-0.79	-1.59	0.163	0.026	84%
	OF235*	257	2435	0.200	-0.00008	-0.76	0.178	0.175	-7.43	100.0%	-0.76	-1.41	0.174	0.039	78%
	OF237A*	217	2445	0.265	-0.00007	-0.76	0.101	0.097	-4.93	100.0%	-0.76	-1.32	0.176	0.048	73%
	OF237B	234	2467	0.238	-0.00009	-0.94	0.215	0.211	-7.96	100.0%	-0.94	-1.71	0.114	0.020	83%
	OF243	151	2543	0.144	-0.00006	-0.95	0.177	0.172	-5.67	100.0%	-0.95	-1.47	0.112	0.034	70%
	OF245	220	2522	0.165	-0.00006	-1.07	0.117	0.113	-5.37	100.0%	-1.07	-1.53	0.084	0.029	65%
	OF254	172	2419	0.281	-0.00012	-0.54	0.297	0.293	-8.48	100.0%	-0.54	-1.54	0.287	0.029	90%
Indeno(1,2,3-c,d)pyrene	OF230A*	211	2414	0.357	-0.00008	-1.36	0.101	0.097	-4.84	100.0%	-1.36	-2.02	0.043	0.009	78%
	OF235*	257	2435	0.274	-0.00006	-1.49	0.083	0.079	-4.79	100.0%	-1.49	-2.01	0.032	0.010	70%
	OF237B	234	2467	0.288	-0.00008	-1.54	0.129	0.125	-5.85	100.0%	-1.54	-2.19	0.029	0.006	78%
	OF243	151	2543	0.235	-0.00004	-1.66	0.052	0.045	-2.85	99.5%	-1.66	-2.02	0.022	0.010	56%
	OF245	220	2522	0.190	-0.00007	-1.79	0.158	0.154	-6.38	100.0%	-1.79	-2.37	0.016	0.004	73%
	OF254	172	2419	0.253	-0.00009	-1.41	0.193	0.188	-6.38	100.0%	-1.41	-2.17	0.039	0.007	83%
Bis(2-ethylhexyl)phthalate	OF230A*	210	2407	0.149	-0.00006	0.57	0.160	0.156	-6.29	100.0%	0.57	0.04	3.7	1.1	71%
	OF235*	256	2428	0.154	-0.00008	0.71	0.260	0.257	-9.45	100.0%	0.71	0.02	5.2	1.1	80%
	OF237A *	216	2438	0.113	-0.00003	0.29	0.054	0.050	-3.50	99.9%	0.29	0.02	2.0	1.1	46%
	OF237B	233	2460	0.148	-0.00007	0.37	0.195	0.192	-7.49	100.0%	0.37	-0.21	2.3	0.6	74%
	OF243	150	2533	0.171	-0.00007	0.32	0.208	0.202	-6.23	100.0%	0.32	-0.29	2.1	0.5	76%
	OF245	218	2519	0.132	-0.00007	0.44	0.204	0.201	-7.45	100.0%	0.44	-0.11	2.7	0.8	72%
	OF254	172	2419	0.150	-0.00004	0.32	0.072	0.067	-3.64	100.0%	0.32	-0.04	2.1	0.9	56%

[1] Copper was added as a key constituent for stormwater and SSPM in the 2014 QAPP. Analysis for copper in stormwater began for OF235, OF237B and OF245 in WY2010 under the NPDES program, and continued through WY2012. Under the 2014 QAPP, analysis began for all of the outfalls in WY2015.

230A - Includes data from the historic OF230 drainage area for all samples collected before 12/2023. 98% of the historic flow from OF230 was transferred to OF230A after 12/2023.*

235 - Includes data from the historic OF235 drainage area of 163 acres for all samples collected before 12/2023 and the new drainage area of 109 acres for OF235 after 12/2023*

237A - Includes data from 237A New site for all samples collected after 2/26/06.*

Table 6-1.1
Mass Loading Summary for OF230A

	Conventals/Nutrients							Metals						LPAHs			
	TSS (mg/L)	MBAS (mg/L)	BOD_5 (mg/L)	Total P (mg/L)	Ortho-P (mg/L)	TN (mg/L)	Nitrate/ Nitrite (mg/L)	Total Cu (ug/L)	Dissolved Cu (ug/L)	Total Zn (ug/L)	Dissolved Zn (ug/L)	Total Pb (ug/L)	Dissolved Pb (ug/L)	2-Methyl-naphthalene (ug/L)	Naphthalene (ug/L)	Phenanthrene (ug/L)	Total LPAHs (ug/L)
Baseflow																	
Mean WY'11,'16,'19&'24 Conc.	4.34	0.06	1.56	0.13	0.12	1.11	0.94	4.69	3.08	24.40	12.35	1.42	0.24	0.007	0.015	0.013	0.047
Number of Detects	8	6	1	8	8	8	8	9	9	9	9	9	8	2	7	8	8
Number of Samples	9	7	7	8	8	8	8	9	9	9	9	9	9	9	9	9	9
Detection Frequency	89%	86%	14%	100%	100%	100%	100%	100%	100%	100%	100%	100%	89%	22%	78%	89%	89%
Stormwater																	
Mean Annual Concentration	23.36	0.06	4.56	0.10	0.02	0.73	0.17	8.96	4.32	87.52	54.00	4.65	0.37	0.014	0.034	0.022	0.074
Number of Detects	9	8	7	9	9	9	9	9	9	9	9	9	9	5	6	7	9
Number of Samples	9	8	7	9	9	9	9	9	9	9	9	9	9	9	9	9	9
Detection Frequency	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	56%	67%	78%	100%
Stormwater / Baseflow Concentration	5.38	0.857	2.93	0.77	0.20	0.66	0.18	1.91	1.40	3.59	4.37	3.27	1.54	2.13	2.23	1.68	1.58
Wet Season Load (Pounds)																	
Baseflow	1,747	25.88	626	52.4	48.0	445	377	1.9	1.2	9.8	5.0	0.6	0.1	0.003	0.006	0.005	0.019
Stormwater	26,203	61.85	5,115	112.2	26.8	814	190.3	10.1	4.8	98.2	60.6	5.2	0.4	0.016	0.038	0.024	0.083
Subtotal:	27,951	87.73	5,741	165	75	1,259	567	11.9	6.1	108.0	65.5	5.8	0.5	0.018	0.044	0.029	0.102
Dry Season Load (Pounds)																	
Baseflow	1,261	18.68	452	37.8	34.6	321	272	1.4	0.9	7.1	3.6	0.4	0.1	0.002	0.004	0.004	0.014
Stormwater	4,566	10.78	891	19.6	4.7	141.9	33.2	1.8	0.8	17.1	10.6	0.9	0.1	0.003	0.007	0.004	0.014
Subtotal:	5,827	29.45	1,343	57.4	39.3	463	305	3.1	1.7	24.2	14.1	1.3	0.1	0.005	0.011	0.008	0.028
Total Annual Load (Pounds)																	
Baseflow	3,009	44.55	1,078	90.2	82.6	766	649	3.2	2.1	16.9	8.6	1.0	0.2	0.005	0.011	0.009	0.033
Stormwater	30,770	72.63	6,006	131.8	31.5	956	223	11.8	5.7	115.3	71.1	6.1	0.5	0.018	0.045	0.028	0.098
Grand Total: (Pounds)	33,778	117.18	7,084	222.0	114.1	1,722	872	15.1	7.8	132.2	79.7	7.1	0.7	0.023	0.055	0.037	0.130
Stormflow Percent of Annual Load	91%	62%	85%	59%	28%	56%	26%	78%	73%	87%	89%	86%	75%	80%	81%	76%	75%
Wet Season Percent of Annual Load	83%	75%	81%	74%	66%	73%	65%	79%	78%	82%	82%	81%	78%	80%	80%	79%	78%
Wet Season Load Density (Pounds per Acre)																	
Baseflow	3.0	0.044	1.1	0.09	0.08	0.76	0.65	0.0032	0.0021	0.0168	0.0085	0.0010	0.0002	0.000005	0.000010	0.000009	0.000032
Stormwater	44.9	0.106	8.8	0.19	0.05	1.40	0.33	0.0172	0.0083	0.1684	0.1039	0.0089	0.0007	0.000027	0.000065	0.000042	0.000143
Subtotal:	47.9	0.150	9.8	0.28	0.13	2.16	0.97	0.0205	0.0104	0.1852	0.1124	0.0099	0.0009	0.000031	0.000076	0.000050	0.000175
Dry Season Load Density (Pounds per Acre)																	
Baseflow	2.2	0.032	0.8	0.06	0.06	0.55	0.47	0.0023	0.0015	0.0121	0.0062	0.0007	0.0001	0.000003	0.000008	0.000006	0.000023
Stormwater	7.8	0.018	1.5	0.03	0.01	0.24	0.06	0.0030	0.0014	0.0293	0.0181	0.0016	0.0001	0.000005	0.000011	0.000007	0.000025
Subtotal:	10.0	0.051	2.3	0.10	0.07	0.79	0.52	0.0053	0.0030	0.0415	0.0243	0.0023	0.0002	0.000008	0.000019	0.000014	0.000048
Total Annual Load Density (Pounds per Acre)																	
Baseflow	5.2	0.076	1.8	0.15	0.14	1.31	1.11	0.0056	0.0037	0.0290	0.0147	0.0017	0.0003	0.000008	0.000018	0.000015	0.000056
Stormwater	52.8	0.125	10.3	0.23	0.05	1.64	0.38	0.0202	0.0098	0.1977	0.1220	0.0105	0.0008	0.000031	0.000076	0.000049	0.000168
Grand Total: (Pounds per Acre)	57.9	0.201	12.2	0.38	0.20	2.95	1.50	0.0258	0.0134	0.2267	0.1367	0.0122	0.0011	0.000039	0.000095	0.000064	0.000223

Note: Stormwater mass loadings were not calculated for analytical parameters with fewer than 10 percent detected concentrations or only one detected sample in stormwater.

Drainage Area: 583 Acres

Baseflow Detects <3

Stormwater Detects <5

<25% Detection Frequency

	Wet Season	Dry Season
Mean Annual Baseflow (gpm)	157	157
Mean Annual Stormwater (gpm)	439	106

Table 6-1.1
Mass Loading Summary for OF230A

	HPAHs										Phthalates					Herbicide
	Benzo(a)-anthracene (ug/L)	Benzo(a) pyrene (ug/L)	Benzo(g,h,i) perylene (ug/L)	Benzo(b,k)-fluoranthenes (ug/L)	Chrysene (ug/L)	Fluoranthene (ug/L)	Indeno(1,2,3-c,d)pyrene (ug/L)	Pyrene (ug/L)	Retene (ug/L)	Total HPAHs (ug/L)	DEHP (ug/L)	Butylbenzyl-phthalate (ug/L)	Diethyl-phthalate (ug/L)	Di-n-butyl-phthalate (ug/L)	Total Phthalates (ug/L)	Dichlobenil (ug/L)
Baseflow																
Mean WY'11,'16,'19&'24 Conc.	0.004	0.004	0.005	0.012	0.005	0.008	0.005	0.007	0.004	0.042	0.417	0.379	0.503	0.313	1.252	0.035
Number of Detects	1	2	2	3	2	5	1	2	0	5	3	0	4	2	4	2
Number of Samples	9	9	9	9	9	9	9	9	3	9	9	9	9	9	9	9
Detection Frequency	11%	22%	22%	33%	22%	56%	11%	22%	0%	56%	33%	0%	44%	22%	44%	22%
Stormwater																
Mean Annual Concentration	0.009	0.016	0.022	0.039	0.018	0.034	0.018	0.043	0.007	0.204	1.215	0.547	0.327	0.187	1.961	0.042
Number of Detects	5	6	8	9	9	9	9	9	7	9	9	3	6	2	9	9
Number of Samples	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
Detection Frequency	56%	67%	89%	100%	100%	100%	100%	100%	78%	100%	100%	33%	67%	22%	100%	100%
Stormwater / Baseflow Concentration	2.12	3.70	4.66	3.31	3.92	4.34	3.63	5.83	1.76	4.85	2.92	1.44	0.65	0.60	1.57	1.22
Wet Season Load (Pounds)																
Baseflow	0.002	0.002	0.002	0.005	0.002	0.003	0.002	0.003	0.002	0.017	0.17	0.15	0.20	0.13	0.50	0.014
Stormwater	0.011	0.017	0.025	0.044	0.021	0.038	0.020	0.048	0.008	0.229	1.36	0.61	0.37	0.21	2.20	0.047
Subtotal:	0.012	0.019	0.027	0.048	0.022	0.042	0.022	0.051	0.010	0.246	1.53	0.77	0.57	0.34	2.70	0.061
Dry Season Load (Pounds																
Baseflow	0.001	0.001	0.001	0.003	0.001	0.002	0.001	0.002	0.001	0.012	0.12	0.11	0.15	0.09	0.36	0.010
Stormwater	0.002	0.003	0.004	0.008	0.004	0.007	0.004	0.008	0.001	0.040	0.24	0.11	0.06	0.04	0.38	0.008
Subtotal:	0.003	0.004	0.006	0.011	0.005	0.009	0.005	0.011	0.003	0.052	0.36	0.22	0.21	0.13	0.75	0.018
Total Annual Load (Pounc																
Baseflow	0.003	0.003	0.003	0.008	0.003	0.005	0.003	0.005	0.003	0.029	0.29	0.26	0.35	0.22	0.87	0.024
Stormwater	0.012	0.021	0.029	0.051	0.024	0.045	0.024	0.057	0.009	0.269	1.60	0.72	0.43	0.25	2.58	0.055
Grand Total: (Pounds)	0.015	0.023	0.032	0.059	0.027	0.051	0.027	0.062	0.012	0.298	1.89	0.98	0.78	0.46	3.45	0.079
Stormflow Percent of Annual Load	80%	88%	90%	86%	88%	89%	87%	92%	77%	90%	85%	73%	55%	53%	75%	70%
Wet Season Percent of Annual Load	80%	82%	82%	81%	82%	82%	82%	83%	79%	83%	81%	78%	73%	72%	78%	77%
Wet Season Load Density (Pounds per Acre)																
Baseflow	0.000003	0.000003	0.000003	0.000008	0.000003	0.000005	0.000003	0.000005	0.000003	0.000029	0.0003	0.0003	0.0003	0.0002	0.0009	0.00002
Stormwater	0.000018	0.000030	0.000042	0.000075	0.000035	0.000066	0.000035	0.000083	0.000014	0.000392	0.0023	0.0011	0.0006	0.0004	0.0038	0.00008
Subtotal:	0.000021	0.000033	0.000046	0.000083	0.000038	0.000071	0.000038	0.000088	0.000016	0.000421	0.0026	0.0013	0.0010	0.0006	0.0046	0.00010
Dry Season Load Density (Pounds per Acre)																
Baseflow	0.000002	0.000002	0.000002	0.000006	0.000002	0.000004	0.000002	0.000004	0.000002	0.000021	0.0002	0.0002	0.0003	0.0002	0.0006	0.00002
Stormwater	0.000003	0.000005	0.000007	0.000013	0.000006	0.000011	0.000006	0.000014	0.000002	0.000068	0.0004	0.0002	0.0001	0.0001	0.0007	0.00001
Subtotal:	0.000005	0.000007	0.000010	0.000019	0.000008	0.000015	0.000009	0.000018	0.000004	0.000089	0.0006	0.0004	0.0004	0.0002	0.0013	0.00003
Total Annual Load Density (Pounds per Acre)																
Baseflow	0.000005	0.000005	0.000006	0.000014	0.000006	0.000009	0.000006	0.000009	0.000005	0.000050	0.0005	0.0005	0.0006	0.0004	0.0015	0.00004
Stormwater	0.000021	0.000035	0.000050	0.000088	0.000041	0.000077	0.000041	0.000097	0.000016	0.000461	0.0027	0.0012	0.0007	0.0004	0.0044	0.00009
Grand Total: (Pounds per Acre)	0.000027	0.000040	0.000055	0.000102	0.000047	0.000087	0.000047	0.000106	0.000021	0.000511	0.0032	0.0017	0.0013	0.0008	0.0059	0.00014

Note: Stormwater mass loadings were not calculated for analytical parameters with fewer than 10 percent detected concentrations or only one detected sample in stormwater.

Drainage Area: 557 Acres

<3 Detects

<5 Detects

<25% Detection Frequency

	Wet Season	Dry Season
Mean Annual Baseflow (gpm)	157	157
Mean Annual Stormwater (gpm)	439	106

Table 6-1.2
Mass Loading Summary for OF235

	Conventals/Nutrients							Metals									LPAHs					
	TSS (mg/L)	MBAS (mg/L)	BOD_5 (mg/L)	Total P (mg/L)	Ortho-P (mg/L)	TN (mg/L)	Nitrate/ Nitrite (mg/L)	Total Cu (ug/L)	Dissolved Cu (ug/L)	Total Zn (ug/L)	Dissolved Zn (ug/L)	Total Cd (ug/L)	Dissolved Cd (ug/L) Est	Total Hg (ug/L) Est	Total Pb (ug/L)	Dissolved Pb (ug/L)	2-Methyl-naphthalene (ug/L)	Acenaphthylene (ug/L)	Anthracene (ug/L)	Naphthalene (ug/L)	Phenanthrene (ug/L)	Total LPAHs (ug/L)
Baseflow																						
Mean WY'11,'16&'24 Concentration	1.70	0.031	1.00	0.13	0.12	1.29	1.07	3.29	2.18	6.64	4.51	0.05	0.03	0.0026	1.94	0.67	0.006	0.005	0.005	0.010	0.006	0.029
Number of Detects	7	8	0	8	8	8	9	9	9	9	9	1	0	1	9	9	1	0	2	1	2	2
Number of Samples	8	9	9	8	8	8	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	7
Detection Frequency	88%	89%	0%	100%	100%	100%	100%	100%	100%	100%	100%	11%	0%	11%	100%	100%	11%	0%	22%	11%	22%	29%
Stormwater																						
Mean Annual Concentration	40.45	0.049	5.13	0.13	0.02	0.82	0.25	32.84	13.86	106.12	42.68	0.09	0.03	0.0066	47.34	6.27	0.007	0.007	0.013	0.015	0.029	0.075
Number of Detects	15	11	10	12	15	12	12	15	15	15	15	7	2	3	15	15	2	3	7	3	14	15
Number of Samples	15	11	10	12	15	12	12	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Detection Frequency	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	47%	13%	20%	100%	100%	13%	20%	47%	20%	93%	100%
Stormwater / Baseflow Concentration	24	2	5	0.99	0.19	0.63	0.23	10	6	16	9	2	1	2	24	9	1	2	3	2	5	3
Wet Season Load (Pounds)																						
Baseflow	478	9	281	36	34	364	300	0.9	0.6	1.9	1.3	0.015	0.01	0.0007	0.54	0.19	0.002	0.001	0.001	0.003	0.002	0.008
Stormwater	14,573	18	1,847	46	8	295	89	11.8	5.0	38.2	15.4	0.032	0.01	0.0024	17.05	2.26	0.002	0.003	0.005	0.005	0.010	0.027
Subtotal:	15,050	26	2,128	83	43	659	389	12.8	5.6	40.1	16.6	0.047	0.02	0.0031	17.60	2.45	0.004	0.004	0.006	0.008	0.012	0.035
Dry Season Load (Pounds)																						
Baseflow	345	6	203	26	25	262	217	0.7	0.4	1.3	0.9	0.011	0.01	0.0005	0.39	0.14	0.001	0.001	0.001	0.002	0.001	0.006
Stormwater	2,238	3	284	7	1	45	14	1.8	0.8	5.9	2.4	0.005	0.00	0.0004	2.62	0.35	0.000	0.000	0.001	0.001	0.002	0.004
Subtotal:	2,582	9	486	33	26	308	230	2.5	1	7	3	0.016	0.01	0.0009	3.01	0.48	0.002	0.001	0.002	0.003	0.003	0.010
Total Annual Load (Pounds)																						
Baseflow	823	15	484	63	59	626	517	1.6	1.1	3.2	2.2	0.026	0.014	0.001	0.9	0.3	0.003	0.002	0.002	0.005	0.003	0.014
Stormwater	16,810	20	2,131	54	10	340	102	13.6	5.8	44.1	17.7	0.037	0.012	0.003	19.7	2.6	0.003	0.003	0.006	0.006	0.012	0.031
Grand Total: (Pounds)	17,633	35	2,614	116	69	967	620	15.2	6.8	47.3	19.9	0.062	0.026	0.004	20.6	2.9	0.005	0.005	0.008	0.011	0.015	0.045
Stormflow Percent of Annual Load	95%	58%	81%	46%	14%	35%	17%	90%	85%	93%	89%	59%	47%	68%	95%	89%	50%	58%	70%	58%	81%	69%
Wet Season Percent of Annual Load	85%	75%	81%	71%	62%	68%	63%	84%	82%	85%	84%	75%	71%	78%	85%	84%	72%	75%	78%	75%	81%	78%
Wet Season Load Density (Pounds per Acre)																						
Baseflow	4.4	0.08	2.6	0.33	0.31	3.34	2.76	0.0085	0.0056	0.0171	0.0116	0.0001	0.0001	0.0000068	0.0050	0.0017	0.000015	0.000012	0.000013	0.000025	0.000015	0.000075
Stormwater	133.7	0.16	16.9	0.43	0.08	2.71	0.81	0.1085	0.0458	0.3507	0.1411	0.0003	0.0001	0.0000217	0.1565	0.0207	0.000022	0.000024	0.000044	0.000050	0.000095	0.000247
Subtotal:	138.1	0.24	19.5	0.76	0.39	6.04	3.57	0.1170	0.0514	0.3678	0.1527	0.0004	0.0002	0.0000285	0.1615	0.0224	0.000036	0.000036	0.000057	0.000075	0.000110	0.000322
Dry Season Load Density (Pounds per Acre)																						
Baseflow	3.2	0.06	1.9	0.24	0.23	2.41	1.99	0.0061	0.0041	0.0124	0.0084	0.0001	0.0001	0.0000049	0.0036	0.0012	0.000011	0.000008	0.000009	0.000018	0.000011	0.000054
Stormwater	20.5	0.02	2.6	0.07	0.01	0.42	0.12	0.0167	0.0070	0.0539	0.0217	0.0000	0.0000	0.0000033	0.0240	0.0032	0.000003	0.000004	0.000007	0.000008	0.000015	0.000038
Subtotal:	23.7	0.08	4.5	0.31	0.24	2.82	2.11	0.0228	0.0111	0.0662	0.0301	0.0001	0.0001	0.0000082	0.0276	0.0044	0.000014	0.000012	0.000016	0.000025	0.000025	0.000092
Total Annual Load Density (Pounds per Acre)																						
Baseflow	7.5	0.14	4.4	0.58	0.54	5.74	4.75	0.0146	0.0097	0.0295	0.0200	0.0002	0.0001	0.0000117	0.0086	0.0030	0.000025	0.000020	0.000022	0.000042	0.000025	0.000129
Stormwater	154.2	0.19	19.5	0.49	0.09	3.12	0.94	0.1252	0.0529	0.4046	0.1627	0.0003	0.0001	0.0000250	0.1805	0.0239	0.000025	0.000028	0.000051	0.000058	0.000110	0.000285
Grand Total: (Pounds per Acre)	161.8	0.32	24.0	1.07	0.63	8.87	5.68	0.1398	0.0625	0.4341	0.1827	0.0006	0.0002	0.0000367	0.1891	0.0269	0.000050	0.000048	0.000073	0.000100	0.000135	0.000414

Note: Stormwater mass loadings were not calculated for analytical parameters with fewer than 10 percent detected concentrations or only one detected sample in stormwater.

[1] Effective 12/15/2022, the drainage area for OF235 was modified. All calculations are based on new drainage area.

Drainage Area: 109 *Acres* [1]

<3 Detects

<5 Detects

<25% Detection Frequency

	Wet Season	Dry Season
Mean Annual Baseflow (gpm)	110	110
Mean Annual Stormwater (gpm)	141	30

Table 6-1.2
Mass Loading Summary for OF235

	HPAHs											Phthalates			Herbicide
	Benzo(a)-anthracene (ug/L)	Benzo(a)-pyrene (ug/L)	Benzo(g,h,i)-perylene (ug/L)	Benzo(b,k)-fluoranthenes (ug/L)	Chrysene (ug/L)	Dibenz(a,h)-anthracene (ug/L)	Fluoranthene (ug/L)	Indeno(1,2,3-c,d)pyrene (ug/L)	Pyrene (ug/L)	Retene (ug/L)	Total HPAHs (ug/L)	Di(2-eh)-phthalate (ug/L)	Di-n-butyl-phthalate (ug/L)	Total Phthalates (ug/L)	Dichlobenil (ug/L)
Baseflow															
Mean WY'11,'16&'24 Concentration	0.004	0.004	0.005	0.009	0.004	0.004	0.005	0.004	0.006	0.004	0.028	0.236	0.173	0.674	0.031
Number of Detects	0	0	1	1	0	0	1	0	2	1	1	1	1	2	1
Number of Samples	9	9	9	9	9	9	9	9	9	3	7	9	9	7	9
Detection Frequency	0%	0%	11%	11%	0%	0%	11%	0%	22%	33%	14%	11%	11%	29%	14%
Stormwater															
Mean Annual Concentration	0.024	0.028	0.034	0.062	0.034	0.005	0.061	0.024	0.086	0.011	0.359	1.457	0.177	1.462	0.100
Number of Detects	12	11	14	13	15	3	14	14	15	12	15	15	3	15	12
Number of Samples	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Detection Frequency	80%	73%	93%	87%	100%	20%	93%	93%	100%	80%	100%	100%	20%	100%	80%
Stormwater / Baseflow Concentration	6	8	7	7	9	1	13	6	14	3	13	6	1	2	3
Wet Season Load (Pounds)															
Baseflow	0.001	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.002	0.001	0.008	0.066	0.049	0.189	0.009
Stormwater	0.008	0.010	0.012	0.023	0.012	0.002	0.022	0.008	0.031	0.004	0.129	0.525	0.064	0.527	0.036
Subtotal:	0.010	0.011	0.014	0.025	0.013	0.003	0.023	0.010	0.033	0.005	0.137	0.591	0.112	0.716	0.045
Dry Season Load (Pounds)															
Baseflow	0.001	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.006	0.048	0.035	0.137	0.006
Stormwater	0.001	0.002	0.002	0.003	0.002	0.000	0.003	0.001	0.005	0.001	0.020	0.081	0.010	0.081	0.006
Subtotal:	0.002	0.002	0.003	0.005	0.003	0.001	0.004	0.002	0.006	0.001	0.026	0.128	0.045	0.218	0.012
Total Annual Load (Pounds)															
Baseflow	0.002	0.002	0.002	0.004	0.002	0.002	0.002	0.002	0.003	0.002	0.014	0.114	0.084	0.326	0.015
Stormwater	0.010	0.011	0.014	0.026	0.014	0.002	0.025	0.010	0.036	0.004	0.149	0.605	0.074	0.608	0.041
Grand Total: (Pounds)	0.012	0.013	0.016	0.030	0.016	0.004	0.028	0.012	0.039	0.006	0.163	0.720	0.157	0.934	0.057
Stormflow Percent of Annual Load	84%	87%	85%	86%	89%	51%	92%	83%	92%	70%	92%	84%	47%	65%	73%
Wet Season Percent of Annual Load	82%	83%	82%	83%	83%	73%	84%	82%	84%	78%	84%	82%	71%	77%	79%
Wet Season Load Density (Pounds per Acre)															
Baseflow	0.000010	0.000009	0.000013	0.000023	0.000010	0.000010	0.000012	0.000010	0.000016	0.000010	0.000073	0.0006	0.0004	0.0017	0.00008
Stormwater	0.000078	0.000091	0.000111	0.000207	0.000113	0.000015	0.000202	0.000078	0.000285	0.000036	0.001186	0.0048	0.0006	0.0048	0.00033
Subtotal:	0.000088	0.000100	0.000124	0.000229	0.000123	0.000026	0.000215	0.000088	0.000301	0.000046	0.001259	0.0054	0.0010	0.0066	0.00041
Dry Season Load Density (Pounds per Acre)															
Baseflow	0.000007	0.000007	0.000009	0.000016	0.000007	0.000007	0.000009	0.000008	0.000011	0.000007	0.000052	0.0004	0.0003	0.0013	0.00006
Stormwater	0.000012	0.000014	0.000017	0.000032	0.000017	0.000002	0.000031	0.000012	0.000044	0.000005	0.000182	0.0007	0.0001	0.0007	0.00005
Subtotal:	0.000019	0.000021	0.000026	0.000048	0.000024	0.000010	0.000040	0.000019	0.000055	0.000013	0.000235	0.0012	0.0004	0.0020	0.00011
Total Annual Load Density (Pounds per Acre)															
Baseflow	0.000017	0.000016	0.000022	0.000039	0.000017	0.000017	0.000021	0.000018	0.000027	0.000018	0.000125	0.0010	0.0008	0.0030	0.00014
Stormwater	0.000090	0.000105	0.000128	0.000238	0.000131	0.000018	0.000233	0.000090	0.000328	0.000041	0.001369	0.0056	0.0007	0.0056	0.00038
Grand Total: (Pounds per Acre)	0.000107	0.000121	0.000150	0.000277	0.000148	0.000035	0.000255	0.000108	0.000356	0.000059	0.001493	0.0066	0.0014	0.0086	0.00052

Note: Stormwater mass loadings were not calculated for analytical parameters with fewer than 10 percent detected concentrations or only one detected sample in stormwater.

[1] *Effective 12/15/2022, the drainage area for OF235 was modified. All calculations are based on new drainage area.*

Drainage Area: 109 *Acres* [1]

Baseflow Detects <3

Stormwater Detects <5

<25% Detection Frequency

	Wet Season	Dry Season
Mean Annual Baseflow (gpm)	110	110
Mean Annual Stormwater (gpm)	116	21

Table 6-1.3
Mass Loading Summary for OF237A

	Conventals/Nutrients							Metals							LPAHs					
	TSS (mg/L)	MBAS (mg/L)	BOD_5 (mg/L)	Total P (mg/L)	Ortho-P (mg/L)	TN (mg/L)	Nitrate/ Nitrite (mg/L)	Total Cu (ug/L)	Dissolved Cu (ug/L)	Total Zn (ug/L)	Dissolved Zn (ug/L)	Total Cd (ug/L)	Total Pb (ug/L)	Dissolved Pb (ug/L)	2-Methyl-naphthalene (ug/L)	Anthracene (ug/L)	Fluorene (ug/L)	Naphthalene (ug/L)	Phenanthrene (ug/L)	Total LPAHs (ug/L)
Baseflow																				
Mean WY2011&2016 Concentration	1.73	0.02	1.00	0.03	0.03	2.30	2.37	0.48	0.31	2.49	1.93	0.12	0.13	0.03	0.005	0.004	0.005	0.006	0.006	0.019
Number of Detects	7	4	0	10	10	10	10	7	10	10	10	0	7	6	1	0	0	1	4	4
Number of Samples	10	10	9	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Detection Frequency	70%	40%	0%	100%	100%	100%	100%	70%	100%	100%	100%	0%	70%	60%	10%	0%	0%	10%	40%	40%
Stormwater																				
Mean Annual Concentration	61.04	0.04	4.40	0.13	0.02	0.55	0.01	10.80	3.35	71.88	30.42	0.07	8.56	0.35	0.019	0.008	0.007	0.030	0.037	0.094
Number of Detects	7	3	4	8	8	7	8	8	8	8	8	2	8	8	5	2	2	5	8	8
Number of Samples	7	3	5	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Detection Frequency	100%	100%	80%	100%	100%	88%	100%	100%	100%	100%	100%	25%	100%	100%	63%	25%	25%	63%	100%	100%
Stormwater / Baseflow Concentration	35.37	2.1	4.40	4.38	0.51	0.24	0.00	22.28	10.71	28.91	15.74	0.59	66.11	12.13	3.95	1.86	1.60	4.75	6.52	4.98
Wet Season Load (Pounds)																				
Baseflow	10,826	117	6,272	184.4	213.3	14,420	14,859	3.0	2.0	15.6	12.1	0.72	0.8	0.2	0.031	0.026	0.028	0.040	0.036	0.118
Stormwater	337,806	217	24,375	711.9	96.3	3,068	36.2	59.8	18.5	397.8	168.3	0.38	47.4	1.9	0.107	0.043	0.040	0.167	0.206	0.519
Subtotal:	348,633	334	30,647	896	310	17,488	14,896	62.8	20.5	413.4	180.5	1.10	48.2	2.1	0.138	0.069	0.068	0.207	0.242	0.637
Dry Season Load (Pounds)																				
Baseflow	7,813	85	4,527	133.1	153.9	10,407	10,724	2.2	1.4	11.3	8.8	0.52	0.6	0.1	0.022	0.019	0.020	0.029	0.026	0.085
Stormwater	46,823	30	3,379	98.7	13.3	425.2	5.0	8.3	2.6	55.1	23.3	0.05	6.6	0.3	0.015	0.006	0.006	0.023	0.029	0.072
Subtotal:	54,636	115	7,905	231.8	167.3	10,832	10,729	10.5	4.0	66.4	32.1	0.57	7.2	0.4	0.037	0.025	0.026	0.052	0.054	0.157
Total Annual Load (Pounds)																				
Baseflow	18,639	202	10,799	317.5	367.2	24,827	25,583	5.2	3.4	26.9	20.9	1.24	1.4	0.3	0.053	0.045	0.049	0.069	0.062	0.203
Stormwater	384,629	247	27,753	810.6	109.6	3,493	41	68.1	21.1	452.9	191.7	0.43	54.0	2.2	0.122	0.049	0.045	0.190	0.234	0.591
Grand Total: (Pounds)	403,269	448	38,552	1,128.1	476.8	28,320	25,625	73.3	24.5	479.8	212.5	1.67	55.4	2.5	0.175	0.094	0.094	0.259	0.296	0.794
Stormflow Percent of Annual Load	95%	55%	72%	72%	23%	12%	0%	93%	86%	94%	90%	26%	97%	88%	70%	52%	48%	73%	79%	74%
Wet Season Percent of Annual Load	86%	74%	79%	79%	65%	62%	58%	86%	84%	86%	85%	66%	87%	84%	79%	74%	72%	80%	82%	80%
Wet Season Load Density (Pounds per Acre)																				
Baseflow	3.8	0.042	2.2	0.07	0.08	5.13	5.28	0.0011	0.0007	0.0055	0.0043	0.0003	0.0003	0.0001	0.000011	0.000009	0.000010	0.000014	0.000013	0.000042
Stormwater	120.1	0.077	8.7	0.25	0.03	1.09	0.01	0.0213	0.0066	0.1414	0.0598	0.0001	0.0168	0.0007	0.000038	0.000015	0.000014	0.000059	0.000073	0.000185
Subtotal:	123.9	0.119	10.9	0.32	0.11	6.22	5.30	0.0223	0.0073	0.1470	0.0642	0.0004	0.0171	0.0008	0.000049	0.000025	0.000024	0.000073	0.000086	0.000227
Dry Season Load Density (Pounds per Acre)																				
Baseflow	2.8	0.030	1.6	0.05	0.05	3.70	3.81	0.0008	0.0005	0.0040	0.0031	0.0002	0.0002	0.0000	0.000008	0.000007	0.000007	0.000010	0.000009	0.000030
Stormwater	16.6	0.011	1.2	0.04	0.00	0.15	0.00	0.0029	0.0009	0.0196	0.0083	0.0000	0.0023	0.0001	0.000005	0.000002	0.000002	0.000008	0.000010	0.000026
Subtotal:	19.4	0.041	2.8	0.08	0.06	3.85	3.81	0.0037	0.0014	0.0236	0.0114	0.0002	0.0025	0.0001	0.000013	0.000009	0.000009	0.000018	0.000019	0.000056
Total Annual Load Density (Pounds per Acre)																				
Baseflow	6.6	0.072	3.8	0.11	0.13	8.83	9.09	0.0019	0.0012	0.0095	0.0074	0.0004	0.0005	0.0001	0.000019	0.000016	0.000017	0.000024	0.000022	0.000072
Stormwater	136.7	0.088	9.9	0.29	0.04	1.24	0.01	0.0242	0.0075	0.1610	0.0681	0.0002	0.0192	0.0008	0.000043	0.000017	0.000016	0.000068	0.000083	0.000210
Grand Total: (Pounds per Acre)	143.4	0.159	13.7	0.40	0.17	10.07	9.11	0.0261	0.0087	0.1706	0.0756	0.0006	0.0197	0.0009	0.000062	0.000034	0.000033	0.000092	0.000105	0.000282

Note: Stormwater mass loadings were not calculated for analytical parameters with fewer than 10 percent detected concentrations or only one detected sample in stormwater.

Drainage Area: 2,813 Acres

Baseflow Detects <3

Stormwater Detects <5

<25% Detection Frequency

	Wet Season	Dry Season
Mean Annual Baseflow (gpm)	2455	2455
Mean Annual Stormwater (gpm)	2166	416

Table 6-1.3
Mass Loading Summary for OF237A

	HPAHs											Phthalates			Herbicide
	Benzo(a)-anthracene (ug/L)	Benzo(a)-pyrene (ug/L)	Benzo(g,h,i)-perylene (ug/L)	Benzo(b,k)-fluoranthenes (ug/L)	Chrysene (ug/L)	Dibenz(a,h)-anthracene (ug/L)	Fluoranthene (ug/L)	Indeno(1,2,3-c,d)pyrene (ug/L)	Pyrene (ug/L)	Retene (ug/L)	Total HPAHs (ug/L)	Di(2-eh)-phthalate (ug/L)	Di-n-butyl-phthalate (ug/L)	Total Phthalates (ug/L)	Dichlobenil (ug/L)
Baseflow															
Mean WY2011&2016 Concentration	0.005	0.005	0.004	0.009	0.004	0.004	0.005	0.005	0.005	0.003	0.024	0.375	0.303	0.365	0.046
Number of Detects	1	1	1	0	1	0	1	0	2	0	2	2	2	6	0
Number of Samples	10	10	10	10	10	10	10	10	10	1	10	10	10	10	10
Detection Frequency	10%	10%	10%	0%	10%	0%	10%	0%	20%	0%	20%	20%	20%	60%	0%
Stormwater															
Mean Annual Concentration	0.027	0.048	0.060	0.121	0.054	0.010	0.086	0.055	0.089	0.011	0.553	1.060	0.191	1.184	0.025
Number of Detects	6	6	8	8	8	4	8	8	8	8	8	8	3	8	8
Number of Samples	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Detection Frequency	75%	75%	100%	100%	100%	50%	100%	100%	100%	100%	100%	100%	38%	100%	100%
Stormwater / Baseflow Concentration	5.85	10.33	14.26	13.96	13.24	2.18	18.69	11.93	19.38	4.43	23.02	2.83	0.63	3.25	0.54
Wet Season Load (Pounds)															
Baseflow	0.029	0.029	0.026	0.054	0.026	0.027	0.029	0.029	0.029	0.016	0.151	2.35	1.90	2.29	0.291
Stormwater	0.151	0.266	0.331	0.668	0.300	0.053	0.476	0.304	0.491	0.061	3.058	5.86	1.06	6.55	0.138
Subtotal:	0.180	0.295	0.358	0.722	0.326	0.080	0.505	0.332	0.519	0.077	3.208	8.22	2.96	8.84	0.429
Dry Season Load (Poun															
Baseflow	0.021	0.021	0.019	0.039	0.019	0.020	0.021	0.021	0.021	0.011	0.109	1.70	1.37	1.65	0.210
Stormwater	0.021	0.037	0.046	0.093	0.042	0.007	0.066	0.042	0.068	0.009	0.424	0.81	0.15	0.91	0.019
Subtotal:	0.042	0.058	0.065	0.132	0.060	0.027	0.087	0.063	0.089	0.020	0.532	2.51	1.52	2.56	0.229
Total Annual Load (Pour															
Baseflow	0.050	0.050	0.045	0.093	0.044	0.047	0.050	0.050	0.049	0.027	0.259	4.05	3.27	3.94	0.501
Stormwater	0.171	0.303	0.377	0.761	0.342	0.060	0.542	0.346	0.559	0.070	3.481	6.68	1.20	7.46	0.158
Grand Total: (Pounds)	0.222	0.353	0.423	0.854	0.386	0.107	0.591	0.395	0.608	0.097	3.741	10.72	4.47	11.40	0.658
Stormflow Percent of Annual Load	77%	86%	89%	89%	89%	56%	92%	87%	92%	72%	93%	62%	27%	65%	24%
Wet Season Percent of Annual Load	81%	84%	85%	85%	84%	75%	85%	84%	85%	80%	86%	77%	66%	78%	65%
Wet Season Load Density (Pounds per Acre)															
Baseflow	0.000010	0.000010	0.000009	0.000019	0.000009	0.000010	0.000010	0.000010	0.000010	0.000006	0.000054	0.0008	0.0007	0.0008	0.00010
Stormwater	0.000054	0.000095	0.000118	0.000238	0.000107	0.000019	0.000169	0.000108	0.000174	0.000022	0.001087	0.0021	0.0004	0.0023	0.00005
Subtotal:	0.000064	0.000105	0.000127	0.000257	0.000116	0.000028	0.000179	0.000118	0.000185	0.000027	0.001140	0.0029	0.0011	0.0031	0.00015
Dry Season Load Density (Pounds per Acre)															
Baseflow	0.000007	0.000007	0.000007	0.000014	0.000007	0.000007	0.000007	0.000007	0.000007	0.000004	0.000039	0.0006	0.0005	0.0006	0.00007
Stormwater	0.000007	0.000013	0.000016	0.000033	0.000015	0.000003	0.000023	0.000015	0.000024	0.000003	0.000151	0.0003	0.0001	0.0003	0.00001
Subtotal:	0.000015	0.000021	0.000023	0.000047	0.000021	0.000010	0.000031	0.000022	0.000032	0.000007	0.000189	0.0009	0.0005	0.0009	0.00008
Total Annual Load Density (Pounds per Acre)															
Baseflow	0.000018	0.000018	0.000016	0.000033	0.000016	0.000017	0.000018	0.000018	0.000018	0.000010	0.000092	0.0014	0.0012	0.0014	0.00018
Stormwater	0.000061	0.000108	0.000134	0.000270	0.000122	0.000021	0.000193	0.000123	0.000199	0.000025	0.001238	0.0024	0.0004	0.0027	0.00006
Grand Total: (Pounds per Acre)	0.000079	0.000125	0.000150	0.000304	0.000137	0.000038	0.000210	0.000141	0.000216	0.000034	0.001330	0.0038	0.0016	0.0041	0.00023

Note: Stormwater mass loadings were not Note: Stormwater mass loadings were not calculated for analytical parameters with fewer than 10 percent detected concentrations or only one detected sample in stormwater.

Drainage Area: 2,823 Acres *Drainage Area: 2,813 Acres*

<3 Detects *Baseflow Detects <3*

<5 Detects *Stormwater Detects <5*

<25% Detection Frequency *<25% Detection Frequency*

	Wet Season	Dry Season
Mean Annual Baseflow (gpm)	2455	2455
Mean Annual Stormwater (gpm)	2166	416

Table 6-1.4
Mass Loading Summary for OF237B

	Conventals/Nutrients							Metals						LPAHs						
	TSS (mg/L)	MBAS (mg/L)	BOD_5 (mg/L)	Total P (mg/L)	Ortho-P (mg/L)	TN (mg/L)	Nitrate/ Nitrite (mg/L)	Total Cu (ug/L)	Dissolved Cu (ug/L)	Total Zn (ug/L)	Dissolved Zn (ug/L)	Total Pb (ug/L)	Dissolved Pb (ug/L)	2-Methyl-naphthalene (ug/L)	Acenaphthylene (ug/L)	Anthracene (ug/L)	Fluorene (ug/L)	Naphthalene (ug/L)	Phenanthrene (ug/L)	Total LPAHs (ug/L)
Baseflow																				
Mean WY2011&2016 Concentration	0.98	0.019	1.43	0.03	0.03	3.04	3.11	0.32	0.18	1.51	1.18	0.04	0.02	0.004	0.003	0.003	0.003	0.007	0.005	0.025
Number of Detects	2	4	1	6	6	6	6	3	6	6	6	2	4	1	0	0	0	0	0	3
Number of Samples	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Detection Frequency	33%	67%	17%	100%	100%	100%	100%	50%	100%	100%	100%	33%	67%	17%	0%	0%	0%	0%	0%	50%
Stormwater																				
Mean Annual Concentration	37.58	0.049	2.80	0.10	0.02	1.11	0.56	22.43	3.34	53.11	24.61	4.93	0.26	0.042	0.006	0.006	0.009	0.038	0.022	0.09
Number of Detects	13	9	7	13	13	13	13	14	14	14	14	14	14	5	2	2	4	7	12	14
Number of Samples	13	9	9	13	13	13	13	14	14	14	14	14	14	14	14	14	14	14	14	14
Detection Frequency	100%	100%	78%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	36%	14%	14%	29%	50%	86%	100%
Stormwater / Baseflow Concentration	38	3	1.95	2.89	0.72	0.37	0.18	69	19	35	21	136	11	11	2	2	3	6	4	3
Wet Season Load (Pounds)																				
Baseflow	14,631	280	21,417	493.1	500.6	45,450	46,421	4.9	2.6	22.6	17.7	0.5	0.3	0.057	0.050	0.044	0.046	0.100	0.075	0.374
Stormwater	183,446	241	13,646	466.1	117.4	5,420	2,710.9	109.5	16.3	259.3	120.2	24.0	1.3	0.203	0.029	0.029	0.044	0.187	0.108	0.418
Subtotal:	198,077	521	35,063	959	618	50,869	49,132	114.3	19.0	281.9	137.8	24.6	1.6	0.261	0.079	0.072	0.090	0.287	0.182	0.793
Dry Season Load (Pounds)																				
Baseflow	10,559	202	15,457	355.9	361.3	32,801	33,502	3.5	1.9	16.3	12.8	0.4	0.3	0.041	0.036	0.031	0.033	0.072	0.054	0.270
Stormwater	16,721	21.94	1,244	42.5	10.7	494.0	247.1	10.0	1.5	23.6	11.0	2.2	0.1	0.019	0.003	0.003	0.004	0.017	0.010	0.038
Subtotal:	27,280	224	16,701	398	372	33,295	33,749	13.5	3.4	39.9	23.7	2.6	0.4	0.060	0.039	0.034	0.037	0.089	0.064	0.308
Total Annual Load (Pounds)																				
Baseflow	25,190	482	36,874	849.0	861.8	78,250	79,923	8.4	4.5	38.9	30.4	0.9	0.6	0.099	0.086	0.075	0.079	0.172	0.129	0.644
Stormwater	200,167	263	14,889	508.6	128.1	5,914	2,958	119.5	17.8	282.9	131.1	26.2	1.4	0.222	0.032	0.031	0.048	0.205	0.117	0.457
Grand Total: (Pounds)	225,358	745	51,764	1,358	990	84,164	82,881	127.8	22.3	321.8	161.5	27.2	2.0	0.320	0.117	0.106	0.127	0.376	0.246	1.101
Stormflow Percent of Annual Load	89%	35%	29%	37%	13%	7%	4%	93%	80%	88%	81%	97%	70%	69%	27%	29%	38%	54%	48%	41%
Wet Season Percent of Annual Load	88%	70%	68%	71%	62%	60%	59%	89%	85%	88%	85%	90%	81%	81%	67%	68%	71%	76%	74%	72%
Wet Season Load Density (Pounds per Acre)																				
Baseflow	7.4	0.141	10.8	0.25	0.25	22.97	23.46	0.0025	0.0013	0.0114	0.0089	0.0003	0.0002	0.000029	0.000025	0.000022	0.000023	0.000050	0.000038	0.000189
Stormwater	92.7	0.122	6.9	0.24	0.06	2.74	1.37	0.0553	0.0082	0.1310	0.0607	0.0121	0.0006	0.000103	0.000015	0.000015	0.000022	0.000095	0.000054	0.000211
Subtotal:	100.1	0.263	17.7	0.48	0.31	25.70	24.83	0.0578	0.0096	0.1424	0.0696	0.0124	0.0008	0.000132	0.000040	0.000037	0.000045	0.000145	0.000092	0.000401
Dry Season Load Density (Pounds per Acre)																				
Baseflow	5.3	0.102	7.8	0.18	0.18	16.57	16.93	0.0018	0.0010	0.0082	0.0064	0.0002	0.0001	0.000021	0.000018	0.000016	0.000017	0.000036	0.000027	0.000136
Stormwater	8.4	0.011	0.6	0.02	0.01	0.25	0.12	0.0050	0.0008	0.0119	0.0055	0.0011	0.0001	0.000009	0.000001	0.000001	0.000002	0.000009	0.000005	0.000019
Subtotal:	13.8	0.113	8.4	0.20	0.19	16.82	17.05	0.0068	0.0017	0.0202	0.0120	0.0013	0.0002	0.000030	0.000019	0.000017	0.000019	0.000045	0.000032	0.000156
Total Annual Load Density (Pounds per Acre)																				
Baseflow	12.7	0.244	18.6	0.43	0.44	39.54	40.39	0.0042	0.0023	0.0197	0.0154	0.0005	0.0003	0.000050	0.000043	0.000038	0.000040	0.000087	0.000065	0.000326
Stormwater	101.1	0.133	7.5	0.26	0.06	2.99	1.49	0.0604	0.0090	0.1429	0.0662	0.0133	0.0007	0.000112	0.000016	0.000016	0.000024	0.000103	0.000059	0.000231
Grand Total: (Pounds per Acre)	113.9	0.376	26.2	0.69	0.50	42.53	41.88	0.0646	0.0113	0.1626	0.0816	0.0137	0.0010	0.000162	0.000059	0.000054	0.000064	0.000190	0.000124	0.000556

Note: Stormwater mass loadings were not calculated for analytical parameters with fewer than 10 percent detected concentrations or only one detected sample in stormwater.

Drainage Area: 1,979 Acres

Baseflow Detects <3

Stormwater Detects <5

<25% Detection Frequency

	Wet Season	Dry Season
Mean Annual Baseflow (gpm)	5711	5711
Mean Annual Stormwater (gpm)	1866	236

Table 6-1.4
Mass Loading Summary for OF237B

	HPAHs										Phthalates			Herbicide
	Benzo(a)-anthracene (ug/L)	Benzo(a)-pyrene (ug/L)	Benzo(g,h,i)-perylene (ug/L)	Benzo(b,k)-fluoranthenes (ug/L)	Chrysene (ug/L)	Fluoranthene (ug/L)	Indeno(1,2,3-c,d)pyrene (ug/L)	Pyrene (ug/L)	Retene (ug/L)	Total HPAHs (ug/L)	Di(2-eh)-phthalate (ug/L)	Di-n-butyl-phthalate (ug/L)	Total Phthalates (ug/L)	Dichlobenil (ug/L)
Baseflow														
Mean WY2011&2016 Concentration	0.003	0.003	0.002	0.005	0.002	0.003	0.003	0.003	0.003	0.026	0.194	0.167	0.452	0.022
Number of Detects	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Number of Samples	6	6	6	6	6	6	6	6	1	6	6	6	6	6
Detection Frequency	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	17%	0%
Stormwater														
Mean Annual Concentration	0.010	0.014	0.020	0.035	0.015	0.033	0.016	0.044	0.007	0.192	0.787	0.161	0.787	0.036
Number of Detects	9	9	12	12	11	13	12	14	9	14	13	2	13	14
Number of Samples	14	14	14	14	14	14	14	14	14	14	14	14	14	14
Detection Frequency	64%	64%	86%	86%	79%	93%	86%	100%	64%	100%	93%	14%	93%	100%
Stormwater / Baseflow Concentration	4	5	9	7	7	11	6	15	3	7	4	1	2	2
Wet Season Load (Pounds)														
Baseflow	0.041	0.044	0.035	0.078	0.031	0.046	0.044	0.045	0.037	0.393	2.91	2.50	6.75	0.335
Stormwater	0.051	0.070	0.097	0.170	0.075	0.159	0.079	0.215	0.036	0.939	3.84	0.79	3.84	0.175
Subtotal:	0.092	0.113	0.132	0.248	0.106	0.205	0.122	0.260	0.074	1.332	6.75	3.29	10.60	0.510
Dry Season Load (Pounds)														
Baseflow	0.030	0.031	0.025	0.057	0.022	0.033	0.031	0.032	0.027	0.284	2.10	1.80	4.87	0.242
Stormwater	0.005	0.006	0.009	0.015	0.007	0.015	0.007	0.020	0.003	0.086	0.35	0.07	0.35	0.016
Subtotal:	0.034	0.038	0.034	0.072	0.029	0.048	0.039	0.052	0.030	0.370	2.45	1.88	5.22	0.258
Total Annual Load (Pounds)														
Baseflow	0.071	0.075	0.060	0.135	0.054	0.079	0.075	0.077	0.064	0.677	5.00	4.30	11.63	0.577
Stormwater	0.055	0.076	0.106	0.185	0.082	0.174	0.086	0.235	0.040	1.024	4.19	0.86	4.19	0.191
Grand Total: (Pounds)	0.126	0.151	0.166	0.320	0.135	0.253	0.161	0.312	0.104	1.702	9.20	5.16	15.82	0.768
Stormflow Percent of Annual Load	44%	50%	64%	58%	60%	69%	53%	75%	38%	60%	46%	17%	27%	25%
Wet Season Percent of Annual Load	73%	75%	80%	77%	78%	81%	76%	83%	71%	78%	73%	64%	67%	66%
Wet Season Load Density (Pounds per Acre)														
Baseflow	0.000021	0.000022	0.000018	0.000040	0.000016	0.000023	0.000022	0.000023	0.000019	0.000199	0.0015	0.0013	0.0034	0.00017
Stormwater	0.000026	0.000035	0.000049	0.000086	0.000038	0.000080	0.000040	0.000109	0.000018	0.000474	0.0019	0.0004	0.0019	0.00009
Subtotal:	0.000046	0.000057	0.000067	0.000125	0.000054	0.000104	0.000062	0.000131	0.000037	0.000673	0.0034	0.0017	0.0054	0.00026
Dry Season Load Density (Pounds per Acre)														
Baseflow	0.000015	0.000016	0.000013	0.000029	0.000011	0.000017	0.000016	0.000016	0.000014	0.000143	0.0011	0.0009	0.0025	0.00012
Stormwater	0.000002	0.000003	0.000004	0.000008	0.000003	0.000007	0.000004	0.000010	0.000002	0.000043	0.0002	0.0000	0.0002	0.00001
Subtotal:	0.000017	0.000019	0.000017	0.000036	0.000015	0.000024	0.000020	0.000026	0.000015	0.000187	0.0012	0.0009	0.0026	0.00013
Total Annual Load Density (Pounds per Acre)														
Baseflow	0.000036	0.000038	0.000030	0.000068	0.000027	0.000040	0.000038	0.000039	0.000032	0.000342	0.0025	0.0022	0.0059	0.00029
Stormwater	0.000028	0.000039	0.000054	0.000094	0.000041	0.000088	0.000043	0.000119	0.000020	0.000518	0.0021	0.0004	0.0021	0.00010
Grand Total: (Pounds per Acre)	0.000064	0.000076	0.000084	0.000162	0.000068	0.000128	0.000081	0.000158	0.000053	0.000860	0.0046	0.0026	0.0080	0.00039

Note: Stormwater mass loadings were not calculated for analytical parameters with fewer than 10 percent detected concentrations or only one detected sample in stormwater.

Drainage Area: 2,147 Acres

<3 Detects
<5 Detects
<25% Detection Frequency

	Wet Season	Dry Season
Mean Annual Baseflow (gpm)	5711	5711
Mean Annual Stormwater (gpm)	1866	236

Table 6-1.5
Mass Loading Summary for OF243

	TSS (mg/L)	MBAS (mg/L)	BOD5 (mg/L)	Total P (mg/L)	Ortho-P (mg/L)	TN (mg/L)	Nitrate/ Nitrite (mg/L)
	Conventals/Nutrients						
Baseflow							
Mean WY2011&2016 Concentration	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Number of Detects	8	7	0	7	6	8	8
Number of Samples	8	7	7	7	7	8	8
Detection Frequency	100%	100%	0%	100%	86%	100%	100%
Stormwater							
Mean Annual Concentration	47.04	0.042	3.04	0.46	0.036	0.65	0.23
Number of Detects	7	6	6	7	7	7	7
Number of Samples	7	6	6	7	7	7	7
Detection Frequency	100%	100%	100%	100%	100%	100%	100%
Stormwater / Baseflow Concentration	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Wet Season Load (Pounds)							
Baseflow	0	0	0	0	0	0	0
Stormwater	5,736	5	371	56.6	4.3	79.9	27.9
Subtotal:	5,736	5	371	56.6	4.3	79.9	27.9
Dry Season Load (Pounds)							
Baseflow	0	0	0	0	0	0	0
Stormwater	462	0	30	4.6	0.3	6.4	2.3
Subtotal:	462	0	30	4.6	0.3	6.4	2.3
Total Annual Load (Pounds)							
Baseflow	0	0	0	0	0	0	0
Stormwater	6,198	6	401	61.1	4.7	86.3	30.2
Grand Total: (Pounds)	6,198	6	401	61.1	4.7	86.3	30.2
Stormflow Percent of Annual Load	100%	100%	100%	100%	100%	100%	100%
Wet Season Percent of Annual Load	93%	93%	93%	93%	93%	93%	93%
Wet Season Load Density (Pounds per Acre)							
Baseflow	0	0	0	0	0	0	0
Stormwater	97.2	0.09	6.3	0.96	0.07	1.35	0.47
Subtotal:	97.2	0.09	6.3	0.96	0.07	1.35	0.47
Dry Season Load Density (Pounds per Acre)							
Baseflow	0	0	0	0	0	0	0
Stormwater	7.8	0.01	0.5	0.08	0.01	0.11	0.04
Subtotal:	7.8	0.01	0.5	0.08	0.01	0.11	0.04
Total Annual Load Density (Pounds per Acre)							
Baseflow	0	0	0	0	0	0	0
Stormwater	105.0	0.09	6.8	1.04	0.08	1.46	0.51
Grand Total: (Pounds per Acre)	105.0	0.09	6.8	1.04	0.08	1.46	0.51

	Total Cu (ug/L)	Dissolved Cu (ug/L)	Total Zn (ug/L)	Dissolved Zn (ug/L)	Total Cd (ug/L)	Dissolved Cd (ug/L)	Total Hg (ug/L)	Total Pb (ug/L)	Dissolved Pb (ug/L)
	Metals								
Baseflow									
Mean WY2011&2016 Concentration	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Number of Detects	7	7	7	7	3	2	6	8	3
Number of Samples	7	7	7	7	8	8	8	8	8
Detection Frequency	100%	100%	100%	100%	38%	25%	75%	100%	38%
Stormwater									
Mean Annual Concentration	22.51	4.55	64.12	23.42	0.28	0.09	0.01	18.41	0.49
Number of Detects	7	7	7	7	7	6	5	7	7
Number of Samples	7	7	7	7	7	7	7	7	7
Detection Frequency	100%	100%	100%	100%	100%	86%	71%	100%	100%
Stormwater / Baseflow Concentration	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Wet Season Load (Pounds)									
Baseflow	0	0	0	0	0	0	0	0	0
Stormwater	2.7	0.6	7.8	2.9	0.0344	0.0105	0.001150	2.24	0.0597
Subtotal:	2.7	0.6	7.8	2.9	0.0344	0.0105	0.001150	2.24	0.0597
Dry Season Load (Pounds)									
Baseflow	0	0	0	0	0	0	0	0	0
Stormwater	0.2	0.045	0.6	0.2	0.0028	0.0008	0.000093	0.18	0.0048
Subtotal:	0.2	0.045	0.6	0.2	0.0028	0.0008	0.000093	0.18	0.0048
Total Annual Load (Pounds)									
Baseflow	0	0	0	0	0	0	0	0	0
Stormwater	3.0	0.6	8.4	3.1	0.0372	0.0114	0.00124	2.43	0.06
Grand Total: (Pounds)	3.0	0.6	8.4	3.1	0.0372	0.0114	0.00124	2.43	0.06
Stormflow Percent of Annual Load	100%	100%	100%	100%	100%	100%	100%	100%	100%
Wet Season Percent of Annual Load	93%	93%	93%	93%	93%	93%	93%	93%	93%
Wet Season Load Density (Pounds per Acre)									
Baseflow	0	0	0	0	0	0	0	0	0
Stormwater	0.047	0.009	0.133	0.048	0.00058	0.00018	0.000019	0.0380	0.0010
Subtotal:	0.047	0.009	0.133	0.048	0.00058	0.00018	0.000019	0.0380	0.0010
Dry Season Load Density (Pounds per Acre)									
Baseflow	0	0	0	0	0	0	0	0	0
Stormwater	0.004	0.001	0.011	0.004	0.00005	0.00001	0.0000016	0.0031	0.00008
Subtotal:	0.004	0.001	0.011	0.004	0.00005	0.00001	0.0000016	0.0031	0.00008
Total Annual Load Density (Pounds per Acre)									
Baseflow	0	0	0	0	0	0	0	0	0
Stormwater	0.050	0.010	0.143	0.052	0.0006	0.0002	0.000021	0.0411	0.0011
Grand Total: (Pounds per Acre)	0.050	0.010	0.143	0.052	0.0006	0.0002	0.000021	0.0411	0.0011

	2-Methyl-naphthalene (ug/L)	Acenaphthene (ug/L)	Acenaphthylene (ug/L)	Anthracene (ug/L)	Fluorene (ug/L)	Naphthalene (ug/L)	Phenanthrene (ug/L)	Total LPAHs (ug/L)
	LPAHs							
Baseflow								
Mean WY2011&2016 Concentration	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Number of Detects	0	5	1	6	1	1	5	7
Number of Samples	8	8	8	8	8	8	8	8
Detection Frequency	0%	63%	13%	75%	13%	13%	63%	88%
Stormwater								
Mean Annual Concentration	0.016	0.013	0.008	0.023	0.009	0.026	0.040	0.118
Number of Detects	3	3	3	5	4	5	7	7
Number of Samples	7	7	7	7	7	7	7	7
Detection Frequency	43%	43%	43%	71%	57%	71%	100%	100%
Stormwater / Baseflow Concentration	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Wet Season Load (Pounds)								
Baseflow	0	0	0	0	0	0	0	0
Stormwater	0.002	0.002	0.001	0.003	0.001	0.003	0.005	0.014
Subtotal:	0.002	0.002	0.001	0.003	0.001	0.003	0.005	0.014
Dry Season Load (Pounds)								
Baseflow	0	0	0	0	0	0	0	0
Stormwater	0.00015	0.00013	0.00008	0.00023	0.00009	0.00025	0.00039	0.00116
Subtotal:	0.00015	0.00013	0.00008	0.00023	0.00009	0.00025	0.00039	0.00116
Total Annual Load (Pounds)								
Baseflow	0	0	0	0	0	0	0	0
Stormwater	0.002	0.002	0.001	0.003	0.001	0.003	0.005	0.016
Grand Total: (Pounds)	0.002	0.002	0.001	0.003	0.001	0.003	0.005	0.016
Stormflow Percent of Annual Load	100%	100%	100%	100%	100%	100%	100%	100%
Wet Season Percent of Annual Load	93%	93%	93%	93%	93%	93%	93%	93%
Wet Season Load Density (Pounds per Acre)								
Baseflow	0	0	0	0	0	0	0	0
Stormwater	0.000032	0.000027	0.000017	0.000048	0.000019	0.000053	0.000082	0.000243
Subtotal:	0.000032	0.000027	0.000017	0.000048	0.000019	0.000053	0.000082	0.000243
Dry Season Load Density (Pounds per Acre)								
Baseflow	0	0	0	0	0	0	0	0
Stormwater	0.000003	0.000002	0.000001	0.000004	0.000002	0.000004	0.000007	0.000020
Subtotal:	0.000003	0.000002	0.000001	0.000004	0.000002	0.000004	0.000007	0.000020
Total Annual Load Density (Pounds per Acre)								
Baseflow	0	0	0	0	0	0	0	0
Stormwater	0.000035	0.000029	0.000018	0.000051	0.000020	0.000057	0.000089	0.000263
Grand Total: (Pounds per Acre)	0.000035	0.000029	0.000018	0.000051	0.000020	0.000057	0.000089	0.000263

Note: Stormwater mass loadings were not calculated for analytical parameters with fewer than 10 percent detected concentrations or only one detected sample in stormwater.

Drainage Area: 59 *Acres*

Baseflow Detects <3

Stormwater Detects <5

<25% Detection Frequency

	Wet Season	Dry Season
Mean Annual Baseflow (gpm)	0	0
Mean Annual Stormwater (gpm)	46.6	5.2

Table 6-1.5
Mass Loading Summary for OF243

	HPAHs										Phthalates		Herbicide
	Benzo(a)-anthracene (ug/L)	Benzo(a)-pyrene (ug/L)	Benzo(g,h,i)-perylene (ug/L)	Benzo(b,k)-fluoranthenes (ug/L)	Chrysene (ug/L)	Fluoranthene (ug/L)	Indeno(1,2,3-c,d)pyrene (ug/L)	Pyrene (ug/L)	Retene (ug/L)	Total HPAHs (ug/L)	Di(2-eh)-phthalate (ug/L)	Total Phthalates (ug/L)	Dichlobenil (ug/L)
Baseflow													
Mean WY2011&2016 Concentration	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Number of Detects	2	2	1	5	2	8	1	8	0	8	2	0	0
Number of Samples	8	8	8	8	8	8	8	8	1	8	8	8	8
Detection Frequency	25%	25%	13%	63%	25%	100%	13%	100%	0%	100%	25%	0%	0%
Stormwater													
Mean Annual Concentration	0.018	0.025	0.023	0.060	0.030	0.062	0.024	0.068	0.009	0.313	0.510	0.573	0.013
Number of Detects	5	6	7	7	7	7	7	7	6	7	6	6	4
Number of Samples	7	7	7	7	7	7	7	7	7	7	7	7	7
Detection Frequency	71%	86%	100%	100%	100%	100%	100%	100%	86%	100%	86%	86%	57%
Stormwater / Baseflow Concentration	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Wet Season Load (Pounds)													
Baseflow	0	0	0	0	0	0	0	0	0	0	0	0	0
Stormwater	0.002	0.003	0.003	0.007	0.004	0.008	0.003	0.008	0.001	0.038	0.06	0.070	0.002
Subtotal:	0.002	0.003	0.003	0.007	0.004	0.008	0.003	0.008	0.001	0.038	0.06	0.070	0.002
Dry Season Load (Pounds)													
Baseflow	0	0	0	0	0	0	0	0	0	0	0.000	0	0
Stormwater	0.00017	0.00025	0.00022	0.00059	0.00029	0.00061	0.00023	0.00067	0.00009	0.00307	0.005	0.006	0.0001
Subtotal:	0.00017	0.00025	0.00022	0.00059	0.00029	0.00061	0.00023	0.00067	0.00009	0.00307	0.005	0.006	0.0001
Total Annual Load (Pounds)													
Baseflow	0	0	0	0	0	0	0	0	0	0	0	0	0
Stormwater	0.002	0.003	0.003	0.008	0.004	0.008	0.003	0.009	0.001	0.041	0.07	0.076	0.002
Grand Total: (Pounds)	0.002	0.003	0.003	0.008	0.004	0.008	0.003	0.009	0.001	0.041	0.07	0.076	0.002
Stormflow Percent of Annual Load	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Wet Season Percent of Annual Load	93%	93%	93%	93%	93%	93%	93%	93%	93%	93%	93%	93%	93%
Total Annual Load (Pounds)													
Baseflow	0	0	0	0	0	0	0	0	0	0	0	0	0
Stormwater	0.000036	0.000053	0.000047	0.000125	0.000062	0.000129	0.000049	0.000141	0.000019	0.000647	0.0011	0.00118	0.00003
Subtotal:	0.000036	0.000053	0.000047	0.000125	0.000062	0.000129	0.000049	0.000141	0.000019	0.000647	0.0011	0.00118	0.00003
Dry Season Load Density (Pounds per Acre)													
Baseflow	0	0	0	0	0	0	0	0	0	0	0	0	0
Stormwater	0.000003	0.000004	0.000004	0.000010	0.000005	0.000010	0.000004	0.000011	0.000002	0.000052	0.0001	0.00010	0.00000
Subtotal:	0.000003	0.000004	0.000004	0.000010	0.000005	0.000010	0.000004	0.000011	0.000002	0.000052	0.0001	0.00010	0.00000
Total Annual Load Density (Pounds per Acre)													
Baseflow	0	0	0	0	0	0	0	0	0	0	0	0	0
Stormwater	0.000039	0.000057	0.000050	0.000135	0.000067	0.000140	0.000053	0.000153	0.000020	0.000699	0.0011	0.00128	0.00003
Grand Total: (Pounds per Acre)	0.000039	0.000057	0.000050	0.000135	0.000067	0.000140	0.000053	0.000153	0.000020	0.000699	0.0011	0.00128	0.00003

Note: Stormwater mass loadings were not calculated for analytical parameters with fewer than 10 percent detected concentrations or only one detected sample in stormwater.

Drainage Area: 59 Acres

<3 Detects

<5 Detects

<25% Detection Frequency

	Wet Season	Dry Season
Mean Annual Baseflow (gpm)	0	0
Mean Annual Stormwater (gpm)	46.6	5.2

Table 6-1.6
Mass Loading Summary for OF245

	Conventals/Nutrients							Metals								LPAHs							
	TSS (mg/L)	MBAS (mg/L)	BOD5 (mg/L)	Total P (mg/L)	Ortho-P (mg/L)	TN (mg/L)	Nitrate/ Nitrite (mg/L)	Total Cu (ug/L)	Dissolved Cu (ug/L)	Total Zn (ug/L)	Dissolved Zn (ug/L)	Total Cd (ug/L)	Dissolved Cd (ug/L)	Total Pb (ug/L)	Dissolved Pb (ug/L)	2-Methyl-naphthalene (ug/L)	Acenaphthene (ug/L)	Acenaphthylene (ug/L)	Anthracene (ug/L)	Fluorene (ug/L)	Naphthalene (ug/L)	Phenanthrene (ug/L)	TotalLPAHs (ug/L)
Baseflow																							
Mean WY2016 & 2019 Concentration	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Number of Detects	6	5	1	5	6	5	5	6	6	6	6	4	3	6	0	2	3	0	5	1	1	5	6
Number of Samples	6	5	5	5	6	5	5	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Detection Frequency	100%	100%	20%	100%	100%	100%	100%	100%	100%	100%	100%	67%	50%	100%	0%	33%	50%	0%	83%	17%	17%	83%	100%
Stormwater																							
Mean Annual Concentration	42.08	0.05	3.35	0.13	0.03	0.61	0.13	14.11	2.948	74.27	24.83	0.135	0.059	4.14	0.13	0.015	0.013	0.011	0.014	0.014	0.030	0.037	0.119
Number of Detects	14	10	8	14	14	13	14	14	14	14	14	13	6	14	14	5	5	3	6	5	7	13	14
Number of Samples	14	10	10	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
Detection Frequency	100%	100%	80%	100%	100%	93%	100%	100%	100%	100%	100%	93%	43%	100%	100%	36%	36%	21%	43%	36%	50%	93%	100%
Stormwater / Baseflow Concentration	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Wet Season Load (Pounds)																							
Baseflow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stormwater	10,007	11.82	797	31.0	6.6	144.6	31.6	3.4	0.7	17.7	5.9	0.0322	0.0140	0.98	0.030	0.004	0.003	0.003	0.003	0.003	0.007	0.009	0.028
Subtotal:	10,007	11.82	797	31.0	6.6	144.6	31.6	3.4	0.7	17.7	5.9	0.0322	0.0140	0.98	0.030	0.004	0.003	0.003	0.003	0.003	0.007	0.009	0.028
Dry Season Load (Pounds)																							
Baseflow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stormwater	1,373	1.62	109	4.3	0.9	19.9	4.3	0.5	0.096	2.4	0.8	0.0044	0.0019	0.14	0.004	0.00049	0.00043	0.00036	0.00046	0.00046	0.00097	0.00120	0.00388
Subtotal:	1,373	1.62	109	4.3	0.9	19.9	4.3	0.5	0.096	2.4	0.8	0.0044	0.0019	0.14	0.004	0.00049	0.00043	0.00036	0.00046	0.00046	0.00097	0.00120	0.00388
Total Annual Load (Pounds)																							
Baseflow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stormwater	11,380	13.44	907	35.3	7.5	164.5	36.0	3.8	0.8	20.1	6.7	0.0366	0.0160	1.12	0.03	0.004	0.004	0.003	0.004	0.004	0.008	0.010	0.032
Grand Total: (Pounds)	11,380	13.44	907	35.3	7.5	164.5	36.0	3.8	0.8	20.1	6.7	0.0366	0.0160	1.12	0.03	0.004	0.004	0.003	0.004	0.004	0.008	0.010	0.032
Stormflow Percent of Annual Load	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Wet Season Percent of Annual Load	88%	88%	88%	88%	88%	88%	88%	88%	88%	88%	88%	88%	88%	88%	88%	88%	88%	88%	88%	88%	88%	88%	88%
Wet Season Load Density (Pounds per Acre)																							
Baseflow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stormwater	257	0.303	20.4	0.80	0.17	3.71	0.81	0.086	0.018	0.453	0.151	0.00083	0.00036	0.0253	0.001	0.000091	0.000080	0.000067	0.000087	0.000086	0.000180	0.000224	0.000724
Subtotal:	257	0.303	20.4	0.80	0.17	3.71	0.81	0.086	0.018	0.453	0.151	0.00083	0.00036	0.0253	0.001	0.000091	0.000080	0.000067	0.000087	0.000086	0.000180	0.000224	0.000724
Dry Season Load Density (Pounds per Acre)																							
Baseflow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stormwater	35.2	0.042	2.8	0.11	0.02	0.51	0.11	0.012	0.002	0.062	0.021	0.00011	0.00005	0.0035	0.00011	0.000012	0.000011	0.000009	0.000012	0.000012	0.000025	0.000031	0.000099
Subtotal:	35.2	0.042	2.8	0.11	0.02	0.51	0.11	0.012	0.002	0.062	0.021	0.00011	0.00005	0.0035	0.00011	0.000012	0.000011	0.000009	0.000012	0.000012	0.000025	0.000031	0.000099
Total Annual Load Density (Pounds per Acre)																							
Baseflow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stormwater	292	0.345	23.2	0.90	0.19	4.22	0.92	0.098	0.020	0.515	0.172	0.0009	0.0004	0.0287	0.0009	0.000104	0.000091	0.000077	0.000099	0.000098	0.000205	0.000255	0.000824
Grand Total: (Pounds per Acre)	292	0.345	23.2	0.90	0.19	4.22	0.92	0.098	0.020	0.515	0.172	0.00094	0.0004	0.0287	0.183926	0.000104	0.000091	0.000077	0.000099	0.000098	0.000205	0.000255	0.000824

Note: Stormwater mass loadings were not calculated for analytical parameters with fewer than 10 percent detected concentrations or only one detected sample in stormwater.

Drainage Area: 39 Acres

Baseflow Detects <3

Stormwater Detects <5

<25% Detection Frequency

	Wet Season	Dry Season
Mean Annual Baseflow (gpm)	0	0
Mean Annual Stormwater (gpm)	90.9	17.3

Table 6-1.6
Mass Loading Summary for OF245

	HPAHs										Phthalates			Herbicide
	Benzo(a)-anthracene (ug/L)	Benzo(a)-pyrene (ug/L)	Benzo(g,h,i)-perylene (ug/L)	Benzo(b,k)-fluoranthenes (ug/L)	Chrysene (ug/L)	Fluoranthene (ug/L)	Indeno(1,2,3-c,d)pyrene (ug/L)	Pyrene (ug/L)	Retene (ug/L)	Total HPAHs (ug/L)	Di(2-eh)-phthalate (ug/L)	Di-n-butyl-phthalate (ug/L)	Total Phthalates (ug/L)	Dichlobenil (ug/L)
Baseflow														
Mean WY2011&2016 Concentration	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Number of Detects	0	1	1	1	2	2	0	6	0	5	1	2	2	0
Number of Samples	6	6	6	6	6	6	6	6	1	6	6	6	6	6
Detection Frequency	0%	17%	17%	17%	33%	33%	0%	100%	0%	83%	17%	33%	33%	
Stormwater														
Mean Annual Concentration	0.013	0.014	0.018	0.023	0.013	0.031	0.009	0.038	0.009	0.163	1.009	0.796	1.588	0.027
Number of Detects	5	8	11	11	8	13	7	13	10	14	13	12	13	7
Number of Samples	14	14	14	14	14	14	14	14	14	14	14	14	14	14
Detection Frequency	36%	57%	79%	79%	57%	93%	50%	93%	71%	100%	93%	86%	93%	50%
Stormwater / Baseflow Concentration	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Wet Season Load (Pounds)														
Baseflow	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stormwater	0.003	0.003	0.004	0.006	0.003	0.007	0.002	0.009	0.002	0.039	0.24	0.19	0.378	0.006
Subtotal:	0.003	0.003	0.004	0.006	0.003	0.007	0.002	0.009	0.002	0.039	0.24	0.19	0.378	0.006
Dry Season Load (Pounds)														
Baseflow	0	0	0	0	0	0	0	0	0	0	0.000	0	0	0
Stormwater	0.00043	0.00045	0.00059	0.00076	0.00043	0.00100	0.00029	0.00125	0.00030	0.00533	0.033	0.026	0.052	0.0009
Subtotal:	0.00043	0.00045	0.00059	0.00076	0.00043	0.00100	0.00029	0.00125	0.00030	0.00533	0.033	0.026	0.052	0.0009
Total Annual Load (Pounds)														
Baseflow	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stormwater	0.004	0.004	0.005	0.006	0.004	0.008	0.002	0.010	0.003	0.044	0.27	0.22	0.429	0.007
Grand Total: (Pounds)	0.004	0.004	0.005	0.006	0.004	0.008	0.002	0.010	0.003	0.044	0.27	0.22	0.429	0.007
Stormflow Percent of Annual Load	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Wet Season Percent of Annual Load	88%	88%	88%	88%	88%	88%	88%	88%	88%	88%	88%	88%	88%	88%
Total Annual Load (Pounds)														
Baseflow	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stormwater	0.000081	0.000085	0.000111	0.000143	0.000080	0.000186	0.000053	0.000234	0.000057	0.000996	0.0062	0.0049	0.00968	0.00016
Subtotal:	0.000081	0.000085	0.000111	0.000143	0.000080	0.000186	0.000053	0.000234	0.000057	0.000996	0.0062	0.0049	0.00968	0.00016
Dry Season Load Density (Pounds per Acre)														
Baseflow	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stormwater	0.000011	0.000012	0.000015	0.000020	0.000011	0.000026	0.000007	0.000032	0.000008	0.000137	0.0008	0.0007	0.00133	0.00002
Subtotal:	0.000011	0.000012	0.000015	0.000020	0.000011	0.000026	0.000007	0.000032	0.000008	0.000137	0.0008	0.0007	0.00133	0.00002
Total Annual Load Density (Pounds per Acre)														
Baseflow	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stormwater	0.000092	0.000097	0.000126	0.000162	0.000091	0.000212	0.000061	0.000267	0.000065	0.001133	0.0070	0.0055	0.01101	0.00018
Grand Total: (Pounds per Acre)	0.000092	0.000097	0.000126	0.000162	0.000091	0.000212	0.000061	0.000267	0.000065	0.001133	0.0070	0.0055	0.01101	0.00018

Note: Stormwater mass loadings were not calculated for analytical parameters with fewer than 10 percent detected concentrations or only one detected sample in stormwater.

Drainage Area: 38 *Acres*

<3 Detects

<5 Detects

<25% Detection Frequency

	Wet Season	Dry Season
Mean Annual Baseflow (gpm)	0	0
Mean Annual Stormwater (gpm)	90.9	**17.3**

Table 6-1.7
Mass Loading Summary for OF254

	Conventals/Nutrients							Metals									LPAHs					
	TSS (mg/L)	MBAS (mg/L)	BOD5 (mg/L)	Total P (mg/L)	Ortho-P (mg/L)	TKN (mg/L)	Nitrate/ Nitrite (mg/L)	Total Cu (ug/L)	Dissolved Cu (ug/L)	Total Zn (ug/L)	Dissolved Zn (ug/L)	Total Cd (ug/L)	Dissolved Cd (ug/L)	Total Hg (ug/L)	Total Pb (ug/L)	Dissolved Pb (ug/L)	2-Methyl-naphthalene (ug/L)	Anthracene (ug/L)	Fluorene (ug/L)	Naphthalene (ug/L)	Phenanthrene (ug/L)	Total LPAHs (ug/L)
Baseflow																						
Mean WY2011&2016 Concentration	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Number of Detects	6	5	1	4	5	5	5	6	6	6	6	4	3	0	6	0	2	5	1	1	5	6
Number of Samples	6	5	5	4	5	5	5	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Detection Frequency	100%	100%	20%	100%	100%	100%	100%	100%	100%	100%	100%	67%	50%	0%	100%	0%	33%	83%	17%	17%	83%	100%
Stormwater																						
Mean Annual Concentration	39.75	0.05	1.94	0.10	0.03	0.40	0.11	14.50	2.32	61.23	31.73	0.15	0.10	0.01	5.26	0.46	0.025	0.014	0.008	0.030	0.035	0.099
Number of Detects	7	7	3	7	5	6	7	7	7	7	7	5	4	3	7	7	7	5	3	4	7	7
Number of Samples	7	7	6	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
Detection Frequency	100%	100%	50%	100%	71%	86%	100%	100%	100%	100%	100%	71%	57%	43%	100%	100%	100%	71%	43%	57%	100%	100%
Stormwater / Baseflow Concentration	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Wet Season Load (Pounds)																						
Baseflow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stormwater	24,009	29.99	1,171	63.2	18.9	241.5	68.3	8.8	1.4	37.0	19.2	0.0877	0.0626	0.003903	3.18	0.2780	0.015	0.008	0.005	0.018	0.021	0.059
Subtotal:	24,009	29.99	1,171	63.2	18.9	241.5	68.3	8.8	1.4	37.0	19.2	0.0877	0.0626	0.003903	3.18	0.2780	0.015	0.008	0.005	0.018	0.021	0.059
Dry Season Load (Pounds)																						
Baseflow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stormwater	1,459	1.822	71	3.8	1.2	14.7	4.2	0.5	0.085	2.2	1.2	0.0053	0.0038	0.000237	0.19	0.0169	0.00090	0.00051	0.00029	0.00110	0.00130	0.00361
Subtotal:	1,459	1.822	71	3.8	1.2	14.7	4.2	0.5	0.085	2.2	1.2	0.0053	0.0038	0.000237	0.19	0.0169	0.00090	0.00051	0.00029	0.00110	0.00130	0.00361
Total Annual Load (Pounds)																						
Baseflow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stormwater	25,467	31.8	1,242	67.0	20.1	256.1	72.5	9.3	1.5	39.2	20.3	0.0930	0.0664	0.00414	3.37	0.29	0.016	0.009	0.005	0.019	0.023	0.063
Grand Total: (Pounds)	25,467	31.8	1,242	67.0	20.1	256.1	72.5	9.3	1.5	39.2	20.3	0.0930	0.0664	0.00414	3.37	0.29	0.016	0.009	0.005	0.019	0.023	0.063
Stormflow Percent of Annual Load	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Wet Season Percent of Annual Load	94%	94%	94%	94%	94%	94%	94%	94%	94%	94%	94%	94%	94%	94%	94%	94%	94%	94%	94%	94%	94%	94%
Wet Season Load Density (Pounds per Acre)																						
Baseflow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stormwater	202	0.252	9.8	0.53	0.16	2.03	0.57	0.074	0.012	0.311	0.161	0.00074	0.00053	0.000033	0.0267	0.0023	0.000124	0.000070	0.000040	0.000152	0.000180	0.000500
Subtotal:	202	0.252	9.8	0.53	0.16	2.03	0.57	0.074	0.012	0.311	0.161	0.00074	0.00053	0.000033	0.0267	0.0023	0.000124	0.000070	0.000040	0.000152	0.000180	0.000500
Dry Season Load Density (Pounds per Acre)																						
Baseflow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stormwater	12.3	0.015	0.6	0.03	0.01	0.12	0.03	0.004	0.001	0.019	0.010	0.00004	0.00003	0.0000020	0.0016	0.00014	0.000008	0.000004	0.000002	0.000009	0.000011	0.000030
Subtotal:	12.3	0.015	0.6	0.03	0.01	0.12	0.03	0.004	0.001	0.019	0.010	0.00004	0.00003	0.0000020	0.0016	0.00014	0.000008	0.000004	0.000002	0.000009	0.000011	0.000030
Total Annual Load Density (Pounds per Acre)																						
Baseflow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stormwater	214	0.267	10.4	0.56	0.17	2.15	0.61	0.078	0.012	0.330	0.171	0.0008	0.0006	0.000035	0.0283	0.0025	0.000132	0.000074	0.000042	0.000161	0.000191	0.000530
Grand Total: (Pounds per Acre)	214	0.267	10.4	0.56	0.17	2.15	0.61	0.078	0.012	0.330	0.171	0.0008	0.0006	0.000035	0.0283	0.0025	0.000132	0.000074	0.000042	0.000161	0.000191	0.000530

Note: Stormwater mass loadings were not calculated for analytical parameters with fewer than 10 percent detected concentrations or only one detected sample in stormwater.

Drainage Area: 119 Acres

Baseflow Detects <3

Stormwater Detects <5

<25% Detection Frequency

	Wet Season	Dry Season
Mean Annual Baseflow (gpm)	0	0
Mean Annual Stormwater (gpm)	236.4	**19.9**

Table 6-1.7
Mass Loading Summary for OF254

	HPAHs										Phthalates				Herbicide
	Benzo(a)-anthracene (ug/L)	Benzo(a)-pyrene (ug/L)	Benzo(g,h,i)-perylene (ug/L)	Benzo(b,k)-fluoranthenes (ug/L)	Chrysene (ug/L)	Fluoranthene (ug/L)	Indeno(1,2,3-c,d)pyrene (ug/L)	Pyrene (ug/L)	Retene (ug/L)	Total HPAHs (ug/L)	Di(2-eh)-phthalate (ug/L)	Diethyl-phthalate (ug/L)	Di-n-butyl-phthalate (ug/L)	Total Phthalates (ug/L)	Dichlobenil (ug/L)
Baseflow															
Mean WY2011&2016 Concentration	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Number of Detects	0	1	1	1	2	2	0	6	0	5	1	0	2	2	0
Number of Samples	6	6	6	6	6	6	6	6	1	6	6	6	6	6	6
Detection Frequency	0%	17%	17%	17%	33%	33%	0%	100%	0%	83%	17%	0%	33%	33%	
Stormwater															
Mean Annual Concentration	0.009	0.016	0.015	0.039	0.023	0.050	0.013	0.054	0.008	0.223	0.661	0.992	0.187	1.676	0.014
Number of Detects	3	6	6	7	7	7	7	7	5	7	6	7	2	7	5
Number of Samples	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
Detection Frequency	43%	86%	86%	100%	100%	100%	100%	100%	71%	100%	86%	100%	29%	100%	71%
Stormwater / Baseflow Concentration	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Wet Season Load (Pounds)															
Baseflow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stormwater	0.006	0.010	0.009	0.024	0.014	0.030	0.008	0.032	0.005	0.135	0.40	0.60	0.11	1.012	0.009
Subtotal:	0.006	0.010	0.009	0.024	0.014	0.030	0.008	0.032	0.005	0.135	0.40	0.60	0.11	1.012	0.009
Dry Season Load (Pounds)															
Baseflow	0	0	0	0	0	0	0	0	0	0	0.000	0	0	0	0
Stormwater	0.00035	0.00059	0.00056	0.00144	0.00083	0.00184	0.00049	0.00197	0.00028	0.00819	0.024	0.036	0.007	0.061	0.0005
Subtotal:	0.00035	0.00059	0.00056	0.00144	0.00083	0.00184	0.00049	0.00197	0.00028	0.00819	0.024	0.036	0.007	0.061	0.0005
Total Annual Load (Pounds)															
Baseflow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stormwater	0.006	0.010	0.010	0.025	0.014	0.032	0.009	0.034	0.005	0.143	0.42	0.64	0.12	1.074	0.009
Grand Total: (Pounds)	0.006	0.010	0.010	0.025	0.014	0.032	0.009	0.034	0.005	0.143	0.42	0.64	0.12	1.074	0.009
Stormflow Percent of Annual Load	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Wet Season Percent of Annual Load	94%	94%	94%	94%	94%	94%	94%	94%	94%	94%	94%	94%	94%	94%	94%
Total Annual Load (Pounds)															
Baseflow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stormwater	0.000048	0.000082	0.000078	0.000199	0.000115	0.000254	0.000068	0.000273	0.000039	0.001133	0.0034	0.0050	0.0010	0.00851	0.00007
Subtotal:	0.000048	0.000082	0.000078	0.000199	0.000115	0.000254	0.000068	0.000273	0.000039	0.001133	0.0034	0.0050	0.0010	0.00851	0.00007
Dry Season Load Density (Pounds per Acre)															
Baseflow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stormwater	0.000003	0.000005	0.000005	0.000012	0.000007	0.000015	0.000004	0.000017	0.000002	0.000069	0.0002	0.0003	0.0001	0.00052	0.00000
Subtotal:	0.000003	0.000005	0.000005	0.000012	0.000007	0.000015	0.000004	0.000017	0.000002	0.000069	0.0002	0.0003	0.0001	0.00052	0.00000
Total Annual Load Density (Pounds per Acre)															
Baseflow	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stormwater	0.000051	0.000087	0.000083	0.000211	0.000122	0.000270	0.000072	0.000289	0.000042	0.001202	0.0036	0.0053	0.0010	0.00902	0.00008
Grand Total: (Pounds per Acre)	0.000051	0.000087	0.000083	0.000211	0.000122	0.000270	0.000072	0.000289	0.000042	0.001202	0.0036	0.0053	0.0010	0.00902	0.00008

Note: Stormwater mass loadings were not calculated for analytical parameters with fewer than 10 percent detected concentrations or only one detected sample in stormwater.

Drainage Area: 119 Acres

<3 Detects

<5 Detects

<25% Detection Frequency

	Wet Season	Dry Season
Mean Annual Baseflow (gpm)	0	0
Mean Annual Stormwater (gpm)	236.4	**19.9**

Table 6-2.1
Pollutant Loading Summary Comparison - WY2010-12 and WY2015-2024

	OF235 - Commercial																								
														Percent Difference											
	WY2010	WY2011	WY2012	WY2015	WY2016	WY2017	WY2018	WY2019	WY2020	WY2021	WY2022	WY2023	WY2024	WY2010 to WY2024	WY2011 to WY2024	WY2012 to WY2024	WY2015 to WY2024	WY2016 to WY2024	WY2017 to WY2024	WY2018 to WY2024	WY2019 to WY2024	WY2020 to WY2024	WY2021 to WY2024	WY2022 to WY2024	WY2023 to WY2024
Conventionals (lbs per acre)																									
TSS	278	319	200	193	178	166	187	164	109	114	126	188	162	-42%	-49%	-19%	-16%	-9%	-2%	-14%	-1%	48%	42%	29%	-14%
MBAS	0.33	0.52	0.51	0.39	0.29	0.39	0.28	0.30	0.29	0.21	0.32	0.39	0.32	-3%	-38%	-36%	-16%	10%	-17%	17%	9%	13%	58%	3%	-17%
BOD_5	21	20	25	14	27	16	13	18	19	16	15	29	24	12%	21%	-4%	73%	-10%	53%	80%	35%	26%	50%	64%	-17%
Total Phosphorus	0.83	0.78	0.62	0.61	1.05	0.82	0.87	0.89	0.76	0.70	0.95	1.16	1.07	29%	36%	73%	74%	2%	30%	22%	20%	40%	52%	12%	-8%
Orthophophorus	0.37	0.27	0.26	0.31	0.41	0.43	0.40	0.46	0.42	0.44	0.59	0.69	0.63	72%	131%	146%	103%	53%	46%	58%	37%	50%	44%	7%	-8%
TN	6.5	4.7	4.0	3.2	5.2	5.3	4.9	6.4	6.5	6.2	6.6	9.5	8.9	36%	90%	120%	177%	72%	69%	82%	38%	36%	44%	34%	-7%
Nitrate/Nitrite -Total	5.7	3.7	3.4	4.8	4.5	4.7	4.4	4.4	4.1	4.5	4.3	6.0	5.7	0%	54%	65%	18%	26%	21%	29%	29%	38%	28%	33%	-6%
Metals (lbs/1000 per acre)																									
Cu - Total	173	181	170	124	148	129	120	103	96	91	90	131	140	-19%	-23%	-18%	13%	-6%	8%	16%	36%	46%	54%	56%	6%
Cu - Dissolved	65	64	60	60	62	59	43	50	47	40	43	58	63	-4%	-2%	3%	4%	0%	7%	44%	24%	32%	57%	45%	8%
Zn - Total	547	567	551	369	444	406	380	334	316	282	308	456	434	-21%	-23%	-21%	18%	-2%	7%	14%	30%	38%	54%	41%	-5%
Zn - Dissolved	225	208	193	194	194	201	156	161	149	119	143	181	183	-19%	-12%	-6%	-6%	-6%	-9%	17%	13%	23%	54%	27%	1%
Cd - Total	1.3	1.6	1.2	0.53	0.64	0.57	0.70	0.43	0.38	0.39	0.46	0.65	0.57	-54%	-64%	-54%	7%	-11%	0%	-19%	32%	52%	45%	24%	-12%
Cd - Dissolved	0.6	0.6	0.5	0.23	0.25	0.25	0.30	--	--	--	--	0.20004	0.2391	-57%	-62%	-52%	5%	-4%	-5%	-21%	--	--	--	--	20%
Hg - Total[1]	0.304	0.214	0.208	0.050	0.038	0.038	0.033	0.039	--	--	--	0.020	0.037	-88%	-83%	-82%	-27%	-3%	-4%	12%	-6%	--	--	--	79%
Hg - Dissolved[1]	--	--	--	--	0.012	0.015	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pb - Total	307	293	253	144	208	166	155	116	126	156	117	201	189	-38%	-35%	-25%	32%	-9%	14%	22%	63%	50%	21%	61%	-6%
Pb - Dissolved	38.7	30.6	30.9	23.1	28.0	22.2	17.6	21.8	22.5	23.1	20.4	26.8	26.9	-31%	-12%	-13%	16%	-4%	21%	53%	23%	20%	16%	32%	0%
LPAHs (lbs/1000 per acre)																									
2-Methylnaphthalene	0.070	0.075	0.065	0.047	0.156	0.082	0.097	0.069	0.053	0.052	0.099	0.103	0.050	-28%	-33%	-23%	7%	-68%	-39%	-48%	-28%	-5%	-4%	-49%	-51%
Acenaphthene	0.040	0.035	0.032	--	0.062	0.046	0.029	--	0.042	0.047	--	0.052	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthylene	0.026	0.029	0.026	--	--	0.056	0.050	0.048	--	--	--	0.050	0.048	88%	67%	82%	--	--	-15%	-4%	0%	--	--	--	-4%
Anthracene	0.035	0.044	0.033	0.047	0.061	0.090	0.081	0.090	0.058	0.065	0.085	0.055	0.073	110%	66%	119%	55%	19%	-19%	-10%	-19%	27%	13%	-14%	32%
Fluorene	0.040	0.067	0.065	--	0.053	0.068	0.047	0.043	--	--	--	0.064	--	--	--	--	--	--	--	--	--	--	--	--	--
Naphthalene	0.086	0.094	0.076	0.060	0.298	0.106	0.179	0.130	0.100	0.085	0.113	0.121	0.100	16%	6%	31%	68%	-66%	-6%	-44%	-23%	0%	18%	-12%	-17%
Phenanthrene	0.161	0.158	0.180	0.109	0.197	0.202	0.171	0.220	0.119	0.130	0.155	0.198	0.135	-16%	-14%	-25%	25%	-31%	-33%	-21%	-39%	14%	4%	-12%	-32%
LPAH - Total	0.395	0.436	0.378	0.351	0.737	0.556	0.545	0.560	0.345	0.371	0.453	0.517	0.414	5%	-5%	9%	18%	-44%	-26%	-24%	-26%	20%	11%	-9%	-20%
HPAHs (lbs/1000 per acre)																									
Benzo(a)anthracene	0.033	0.066	0.066	0.066	0.066	0.269	0.253	0.254	0.081	0.077	0.131	0.085	0.107	224%	63%	63%	63%	63%	-60%	-58%	-58%	32%	40%	-18%	27%
Benzo(a)pyrene	0.057	0.050	0.064	0.064	0.064	0.043	0.046	0.036	0.096	0.088	0.119	0.071	0.121	111%	141%	91%	91%	91%	183%	162%	234%	26%	37%	2%	71%
Benzo(g,h,i)perylene	0.090	0.100	0.106	0.106	0.106	0.393	0.395	0.419	0.162	0.142	0.154	0.165	0.150	68%	51%	43%	43%	43%	-62%	-62%	-64%	-7%	6%	-2%	-9%
Benzo(b,L)fluoranthenes	0.147	0.132	0.158	0.170	0.446	0.415	0.436	0.371	0.260	0.247	0.326	0.255	0.277	89%	111%	76%	63%	-38%	-33%	-36%	-25%	7%	12%	-15%	9%
Chrysene	0.127	0.118	0.102	0.130	0.302	0.271	0.256	0.257	0.183	0.162	0.199	0.126	0.148	16%	25%	44%	14%	-51%	-46%	-42%	-43%	-19%	-9%	-26%	17%
Dibenz(a,h)anthracene	--	--	0.021	0.037	0.052	0.044	0.047	0.039	0.028	--	--	0.032	0.035	--	--	70%	-4%	-33%	-20%	-26%	-9%	24%	--	--	9%
Fluoranthene	0.281	0.274	0.270	0.204	0.417	0.385	0.388	0.407	0.255	0.234	0.294	0.296	0.255	-9%	-7%	-6%	25%	-39%	-34%	-34%	-37%	0%	9%	-13%	-14%
Indeno(1,2,3-c,d)pyrene	0.054	0.053	0.066	0.092	0.158	0.141	0.158	0.144	0.102	0.089	0.101	0.092	0.108	99%	104%	64%	18%	-32%	-23%	-32%	-25%	6%	22%	7%	17%
Pyrene	0.309	0.313	0.279	0.251	0.574	0.476	0.464	0.476	0.322	0.261	0.374	0.369	0.356	15%	14%	28%	42%	-38%	-25%	-23%	-25%	11%	36%	-5%	-4%
Retene	--	--	--	--	--	--	--	--	--	0.041	0.077	0.081	0.059	--	--	--	--	--	--	--	--	--	43%	-24%	-28%
HPAH - Total	1.14	1.12	1.10	1.18	2.54	2.21	2.25	2.162	1.445	1.282	1.680	1.425	1.493	31%	33%	36%	27%	-41%	-32%	-34%	-31%	3%	16%	-11%	5%
Phthalates (lbs/1000 per acre)																									
DEHP	10.7	8.2	7.2	8.6	18.3	13.5	10.4	10.0	6.7	5.6	6.4	11.3	6.6	-38%	-20%	-8%	-23%	-64%	-51%	-37%	-34%	-2%	17%	4%	-42%
Butylbenzyl-phthalate	2.0	3.08	2.30	3.72	3.76	4.49	2.59	5.28	5.20	3.07	3.78	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Diethyl-phthalate	1.9	--	1.13	1.33	1.80	1.60	1.47	2.07	1.95	2.51	1.75	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dimethyl-phthalate	0.29	--	--	1.24	2.11	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-n-butyl-phthalate	1.8	1.5	2.0	1.5	2.2	1.9	1.4	1.4	1.4	1.3	1.8	1.7	1.4	-19%	-2%	-27%	-1%	-34%	-23%	1%	0%	0%	11%	-21%	-16%
Di-n-octylphthalate	--	0.8	--	1.4	3.5	2.0	1.5	1.7	--	--	--	--	0.52	--	-39%	--	-63%	-85%	-74%	-66%	-70%	--	--	--	--
Phthalates - Total	16.2	11.9	10.0	13.1	25.5	19.0	13.4	17.4	13.7	10.4	11.5	12.7	8.6	-47%	-28%	-14%	-35%	-66%	-55%	-36%	-51%	-37%	-18%	-25%	-33%
Pesticides (lbs/1000 per acre)																									
Bifenthrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dichlobenil	4.22	0.74	0.26	0.67	0.50	0.39	0.26	0.30	0.25	0.24	0.58	1.20	0.52	-88%	-30%	104%	-23%	4%	32%	101%	74%	111%	115%	-10%	-57%

Note: Mass loadings were not calculated for parameters with fewer than 10 percent detected concentrations or only one detected sample in stormwater.

[1] *In WY2015, total and dissolved mercury detection limits were lowered by a factor of 1,000 from parts per billion to part per trillion. The WY2012 loadings are based on ppb and may be a factor of 1000 higher than actual loadings.*

The estimated mass load comparisons to WY2024 are greater than a factor of two of each other (i.e., the percent difference greater than 100%).

The estimated mass load comparisons to WY2024 are less than a factor of two of each other (i.e., the percent difference less than – 75%).

Table 6-2.1
Pollutant Loading Summary Comparison - WY2010-12 and WY2015-2024

	OF237B - Residential																								
														Percent Difference											
	WY2010	WY2011	WY2012	WY2015	WY2016	WY2017	WY2018	WY2019	WY2020	WY2021	WY2022	WY2023	WY2024	WY2010 to WY2024	WY2011 to WY2024	WY2012 to WY2024	WY2015 to WY2024	WY2016 to WY2024	WY2017 to WY2024	WY2018 to WY2024	WY2019 to WY2024	WY2020 to WY2024	WY2021 to WY2024	WY2022 to WY2024	WY2023 to WY2024
Conventionals (lbs per acre)																									
TSS	270	494	144	131	209	161	178	105	133	96	117	95	114	-58%	-77%	-21%	-13%	-45%	-29%	-36%	8%	-14%	19%	-3%	19%
MBAS	0.38	0.65	0.43	0.19	0.41	0.13	0.43	0.34	0.42	0.32	0.40	0.40	0.38	-1%	-42%	-13%	102%	-9%	192%	-12%	12%	-10%	18%	-6%	-7%
BOD_5	21	24	31	16	52	8	46	20	27	25	26	30	26	24%	10%	-17%	60%	-50%	215%	-43%	33%	-2%	3%	0%	-13%
Total Phosphorus	0.91	1.40	0.86	0.89	0.89	0.42	0.83	0.66	0.81	0.76	0.73	0.68	0.69	-24%	-51%	-20%	-23%	-23%	64%	-17%	4%	-16%	-10%	-6%	1%
Orthophophorus	0.50	0.37	0.48	0.41	0.44	0.06	0.45	0.39	0.36	0.44	0.44	0.50	0.50	0%	35%	4%	21%	12%	706%	11%	29%	38%	15%	13%	1%
TN	5.1	7.7	4.5	6.4	36.9	2.1	38.5	35.7	36.8	37.3	38.1	41.4	42.5	731%	450%	837%	568%	15%	1945%	10%	19%	15%	14%	12%	3%
Nitrate/Nitrite -Total	36.4	36.7	32.2	37.2	36.8	1.2	38.0	35.0	34.8	37.3	37.4	40.5	41.9	15%	14%	30%	13%	14%	3511%	10%	20%	20%	12%	12%	3%
Metals (lbs/1000 per acre)																									
Cu - Total	52	94	61	36	48	35	27	20	29	28	28	26	65	25%	-31%	5%	82%	34%	87%	136%	218%	122%	134%	129%	153%
Cu - Dissolved	19	25	25	13	14	11	10	7	11	10	12	10	11	-39%	-54%	-55%	-12%	-21%	3%	15%	63%	4%	11%	-5%	15%
Zn - Total	276	511	278	216	278	264	174	125	188	162	151	146	163	-41%	-68%	-42%	-25%	-42%	-39%	-7%	30%	-14%	0%	8%	11%
Zn - Dissolved	123	222	126	105	119	147	85	57	79	69	74	64	82	-33%	-63%	-35%	-22%	-31%	-44%	-4%	42%	3%	18%	10%	27%
Cd - Total	1.6	1.5	1.1	0.67	0.61	0.23	0.30	0.15	0.24	0.23	--	0.23	--	--	--	--	--	--	--	--	--	--	--	--	--
Cd - Dissolved	1.6	0.8	0.8	0.61	0.25	0.09	--	--	--	--	--	0.16	--	--	--	--	--	--	--	--	--	--	--	--	--
Hg - Total [1]	0.585	--	--	0.043	0.046	0.035	0.023	0.060	--	--	--	0.036	--	--	--	--	--	--	--	--	--	--	--	--	--
Hg - Dissolved [1]	--	--	--	0.015	0.017	0.012	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pb - Total	53	107	52	37	50	28	21	13	19	18	17	15	14	-74%	-87%	-74%	-63%	-73%	-52%	-34%	9%	-26%	-24%	-17%	-7%
Pb - Dissolved	2.1	2.5	2.5	1.4	4.5	0.8	1.0	1.1	1.3	1.0	1.3	1.1	1.0	-53%	-61%	-59%	-30%	-78%	22%	-3%	-12%	-23%	3%	-22%	-11%
LPAHs (lbs/1000 per acre)																									
2-Methylnaphthalene	0.072	0.070	0.225	0.055	0.079	0.031	0.065	0.096	0.096	0.064	0.080	0.061	0.162	125%	132%	-28%	195%	104%	429%	151%	68%	69%	152%	102%	164%
Acenaphthene	0.045	--	--	--	--	--	0.077	--	0.061	0.108	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthylene	0.044	--	--	--	0.056	0.017	0.049	0.031	--	--	--	0.056	0.059	33%	--	--	--	7%	247%	22%	91%	--	--	--	6%
Anthracene	0.041	--	--	--	--	0.016	--	--	--	--	--	0.043	0.054	32%	--	--	--	--	243%	--	--	--	--	--	24%
Fluorene	0.049	0.052	0.060	0.051	0.043	0.018	0.045	0.043	--	--	--	--	0.064	30%	24%	8%	25%	48%	265%	44%	50%	--	--	--	--
Naphthalene	0.149	0.136	0.223	0.122	0.174	0.056	0.161	0.147	0.138	--	0.144	0.121	0.190	27%	40%	-15%	55%	9%	242%	18%	29%	38%	--	32%	58%
Phenanthrene	0.117	0.146	0.137	0.111	0.243	0.155	0.152	0.130	0.120	0.121	0.104	0.133	0.124	6%	-15%	-9%	12%	-49%	-20%	-18%	-4%	4%	3%	19%	-7%
LPAH - Total	0.364	0.523	0.534	0.501	0.638	0.267	0.510	0.430	0.451	0.475	0.481	0.467	0.556	53%	6%	4%	11%	-13%	108%	9%	29%	23%	17%	16%	19%
HPAHs (lbs/1000 per acre)																									
Benzo(a)anthracene	0.052	0.102	0.053	0.062	0.145	0.081	0.078	0.062	0.068	0.051	0.065	0.067	0.064	22%	-37%	20%	3%	-56%	-22%	-19%	3%	-6%	26%	-2%	-5%
Benzo(a)pyrene	0.062	0.087	0.053	0.068	0.200	0.112	0.121	0.076	0.076	0.068	0.084	0.072	0.076	24%	-12%	45%	13%	-62%	-32%	-37%	1%	0%	13%	-9%	6%
Benzo(g,h,i)perylene	0.103	0.143	0.053	0.085	0.185	0.131	0.115	0.116	0.124	0.091	0.091	0.085	0.084	-19%	-41%	58%	-1%	-55%	-36%	-27%	-28%	-32%	-8%	-8%	-1%
Benzo(b,L)fluoranthenes	0.155	0.230	0.075	0.118	0.469	0.259	0.285	0.179	0.198	0.178	0.228	0.189	0.162	5%	-30%	115%	37%	-66%	-38%	-43%	-10%	-18%	-9%	-29%	-14%
Chrysene	0.090	0.142	0.051	0.073	0.279	0.175	0.140	0.104	0.113	0.092	0.099	0.067	0.068	-24%	-52%	34%	-6%	-75%	-61%	-51%	-34%	-40%	-26%	-31%	2%
Dibenz(a,h)anthracene	--	--	--	0.045	0.063	0.027	0.040	0.033	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluoranthene	0.159	0.233	0.125	0.133	0.373	0.252	0.200	0.169	0.182	0.139	0.171	0.163	0.128	-19%	-45%	3%	-4%	-66%	-49%	-36%	-24%	-30%	-8%	-25%	-22%
Indeno(1,2,3-c,d)pyrene	0.068	0.091	0.041	0.066	0.159	0.110	0.098	0.084	0.086	0.071	0.084	0.076	0.081	19%	-11%	99%	23%	-49%	-26%	-17%	-3%	-6%	14%	-3%	7%
Pyrene	0.181	0.286	0.144	0.150	0.450	0.285	0.224	0.190	0.226	0.148	0.198	0.169	0.158	-13%	-45%	9%	5%	-65%	-45%	-30%	-17%	-30%	6%	-20%	-7%
Retene	--	--	--	--	--	--	--	--	--	--	0.047	0.059	0.053	--	--	--	--	--	--	--	--	--	--	11%	-10%
HPAH - Total	0.793	1.354	0.534	0.800	2.32	1.43	1.30	1.01	1.11	0.87	1.06	0.92	0.86	8%	-36%	61%	8%	-63%	-40%	-34%	-15%	-22%	-1%	-19%	-6%
Phthalates (lbs/1000 per acre)																									
DEHP	9.6	8.4	5.5	6.0	11.5	8.1	5.6	6.5	6.2	5.1	5.7	5.3	4.6	-52%	-45%	-16%	-23%	-60%	-43%	-17%	-29%	-25%	-9%	-19%	-12%
Butylbenzyl-phthalate	2.1	--	--	2.25	2.99	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Diethyl-phthalate	2.0	--	--	3.33	12.66	0.21	--	4.24	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dimethyl-phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-n-butyl-phthalate	3.2	2.4	3.7	2.4	1.8	1.0	1.6	2.3	2.6	2.6	3.0	2.5	2.6	-19%	8%	-29%	10%	46%	150%	62%	16%	1%	-1%	-12%	5%
Di-n-octylphthalate	--	1.2	0.9	1.3	3.6	1.1	--	2.6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phthalates - Total	13.5	14.8	11.2	12.8	26.9	9.7	9.3	12.7	9.9	8.3	9.5	9.0	8.0	-41%	-46%	-28%	-37%	-70%	-17%	-14%	-37%	-19%	-4%	-15%	-11%
Pesticides (lbs/1000 per acre)																									
Bifenthrin	0.45	0.79	1.14	--	--	--	0.00			--	--	0.08	--	--	--	--	--	--	--	--	--	--	--	--	--
Dichlobenil	0.45	0.79	1.14	0.31	2.97	0.23	0.28	0.38	0.45	0.40	0.53	0.40	0.39	-13%	-51%	-66%	26%	-87%	69%	37%	3%	-15%	-4%	-27%	-2%

Note: Mass loadings were not calculated for parameters with fewer than 10 percent detected concentrations or only one detected sample in stormwater.

[1] *In WY2015, total and dissolved mercury detection limits were lowered by a factor of 1,000 from parts per billion to part per trillion. The WY2012 loadings are based on ppb and may be a factor of 1000 higher than actual loadings.*

The estimated mass load comparisons to WY2024 are greater than a factor of two of each other (i.e., the percent difference greater than 100%).

The estimated mass load comparisons to WY2024 are less than a factor of two of each other (i.e., the percent difference less than – 75%).

Table 6-2.1
Pollutant Loading Summary Comparison - WY2010-12 and WY2015-2024

	OF245 - Industrial																								
														Percent Difference											
	WY2010	WY2011	WY2012	WY2015	WY2016	WY2017	WY2018	WY2019	WY2020	WY2021	WY2022	WY2023	WY2024	WY2010 to WY2024	WY2011 to WY2024	WY2012 to WY2024	WY2015 to WY2024	WY2016 to WY2024	WY2017 to WY2024	WY2018 to WY2024	WY2019 to WY2024	WY2020 to WY2024	WY2021 to WY2024	WY2022 to WY2024	WY2023 to WY2024
Conventionals (lbs per acre)																									
TSS	392	323	181	278	637	462	362	504	247	410	184	210	292	-26%	-10%	61%	5%	-54%	-37%	-19%	-42%	18%	-29%	59%	39%
MBAS	0.59	0.66	0.77	0.30	0.35	0.57	0.31	0.31	0.48	0.27	0.48	0.35	0.34	-42%	-48%	-55%	13%	-3%	-40%	13%	13%	-29%	27%	-29%	0%
BOD_5	24	18	13	14	28	35	25	25	25	20	20	18	23	-4%	29%	76%	67%	-16%	-33%	-8%	-5%	-6%	16%	19%	30%
Total Phosphorus	1.22	1.16	0.59	1.67	2.49	2.31	1.24	1.44	1.25	1.08	0.92	0.87	0.90	-26%	-22%	53%	-46%	-64%	-61%	-27%	-37%	-27%	-16%	-1%	4%
Orthophophorus	0.19	0.09	0.11	0.41	0.26	0.57	0.25	0.30	0.25	0.18	0.24	0.25	0.19	2%	115%	83%	-53%	-27%	-66%	-22%	-35%	-22%	8%	-20%	-22%
TN	6.9	5.2	2.7	3.6	6.6	7.4	7.0	5.3	5.3	3.7	3.9	3.4	4.2	-39%	-19%	56%	16%	-36%	-43%	-40%	-20%	-20%	15%	8%	26%
Nitrate/Nitrite -Total	2.4	0.9	0.9	1.0	1.5	1.5	1.9	1.8	1.4	0.8	0.9	0.9	0.9	-61%	1%	-2%	-6%	-40%	-40%	-52%	-48%	-33%	11%	5%	-1%
Metals (lbs/1000 per acre)																									
Cu - Total	101	118	94	71	181	126	84	110	71	84	60	62	98	-3%	-17%	4%	38%	-46%	-22%	17%	-11%	37%	16%	62%	57%
Cu - Dissolved	24	27	32	21	41	29	--	26	23.239	18.904	20	17	20	-15%	-24%	-36%	-3%	-50%	-29%	--	-22%	-12%	8%	1%	20%
Zn - Total	639	880	734	430	1116	796	694	787	607	556	399	424	515	-19%	-41%	-30%	20%	-54%	-35%	-26%	-35%	-15%	-7%	29%	21%
Zn - Dissolved	300	491	368	181	338	290	324	210	291	176	184	145	172	-43%	-65%	-53%	-5%	-49%	-41%	-47%	-18%	-41%	-2%	-7%	19%
Cd - Total	2.2	6.6	2.5	0.96	4.62	2.69	1.22	4.23	1.15	1.31	1.06	0.79	0.94	-58%	-86%	-62%	-2%	-80%	-65%	-23%	-78%	-19%	-28%	-12%	20%
Cd - Dissolved	0.8	4.2	1.4	0.36	1.98	1.04	0.49	1.35	0.47	0.44	0.52	0.31	0.41	-48%	-90%	-71%	15%	-79%	-61%	-17%	-70%	-13%	-8%	-21%	33%
Hg - Total[1]	0.247	--	--	0.030	0.067	0.047	0.023	0.030	0.040	0.035	--	0.020	--	--	--	--	--	--	--	--	--	--	--	--	--
Hg - Dissolved[1]	--	--	--	0.008	0.016	--	--	0.031	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pb - Total	61	69	44	34	106	74	41	50	25	35	18	20	29	-53%	-58%	-35%	-14%	-73%	-61%	-30%	-43%	14%	-17%	57%	43%
Pb - Dissolved	3.5	2.5	2.0	0.9	2.7	1.2	1.2	1.7	1.2	1.1	1.0	0.9	0.9	-75%	-65%	-56%	-8%	-68%	-29%	-25%	-48%	-25%	-18%	-12%	-2%
LPAHs (lbs/1000 per acre)																									
2-Methylnaphthalene	0.075	0.061	0.045	0.136	0.144	0.182	0.130	0.076	0.058	0.149	0.202	0.053	0.104	37%	70%	130%	-24%	-28%	-43%	-20%	36%	79%	-31%	-49%	97%
Acenaphthene	0.065	0.064	0.063	0.066	0.189	0.314	0.064	0.062	0.096	0.077	--	0.032	0.091	39%	42%	45%	38%	-52%	-71%	42%	46%	-6%	18%	--	185%
Acenaphthylene	0.041	0.034	0.042	0.051	0.096	0.075	0.040	0.047	--	--	--	0.028	0.077	87%	125%	80%	49%	-20%	2%	91%	64%	--	--	--	170%
Anthracene	0.033	0.036	0.032	0.044	0.103	0.109	0.049	0.073	0.038	--	--	0.019	0.099	201%	174%	205%	122%	-5%	-10%	100%	36%	162%	--	--	424%
Fluorene	0.066	0.059	0.052	0.076	0.102	0.282	0.051	0.074	0.040	--	0.066	0.049	0.098	48%	66%	89%	29%	-4%	-65%	92%	33%	144%	--	48%	102%
Naphthalene	0.177	0.105	0.098	0.173	0.176	0.260	0.209	0.249	0.140	0.277	0.589	0.106	0.205	16%	95%	109%	19%	17%	-21%	-2%	-18%	46%	-26%	-65%	93%
Phenanthrene	0.245	0.138	0.161	0.247	0.403	0.605	0.224	0.264	0.183	0.204	0.173	0.210	0.255	4%	85%	58%	3%	-37%	-58%	14%	-3%	39%	25%	47%	21%
LPAH - Total	0.637	0.436	0.407	0.657	1.139	1.645	0.638	0.768	0.531	0.693	0.981	0.444	0.824	29%	89%	102%	25%	-28%	-50%	29%	7%	55%	19%	-16%	85%
HPAHs (lbs/1000 per acre)																									
Benzo(a)anthracene	0.048	0.042	0.025	0.078	0.153	0.131	0.061	0.069	0.039	0.034	--	0.024	0.092	93%	120%	268%	19%	-40%	-29%	52%	33%	137%	174%	--	284%
Benzo(a)pyrene	0.044	0.035	--	0.081	0.212	0.149	0.086	0.095	0.050	0.076	0.047	0.023	0.097	117%	176%	--	19%	-54%	-35%	13%	1%	94%	26%	106%	313%
Benzo(g,h,i)perylene	0.087	0.059	0.050	0.149	0.224	0.205	0.149	0.172	0.089	0.159	0.094	0.076	0.126	45%	114%	153%	-15%	-43%	-38%	-15%	-27%	42%	-21%	34%	66%
Benzo(b,L)fluoranthenes	0.112	0.080	--	0.137	0.456	0.326	0.208	0.222	0.129	0.171	0.141	0.109	0.162	45%	103%	--	18%	-64%	-50%	-22%	-27%	26%	-5%	15%	49%
Chrysene	0.092	0.067	0.039	0.166	0.219	0.272	0.113	0.151	0.074	0.118	0.089	0.055	0.091	-1%	36%	134%	-45%	-58%	-66%	-19%	-40%	23%	-23%	2%	65%
Dibenz(a,h)anthracene	--	--	--	0.052	0.053	0.044	0.030	0.028	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluoranthene	0.203	0.142	0.121	0.168	0.529	0.519	0.257	0.356	0.198	0.249	0.186	0.180	0.212	4%	49%	75%	26%	-60%	-59%	-18%	-41%	7%	-15%	14%	18%
Indeno(1,2,3-c,d)pyrene	0.044	0.031	0.025	0.095	0.147	0.134	0.081	0.158	0.046	0.052	0.043	0.032	0.061	38%	96%	145%	-36%	-59%	-55%	-25%	-61%	32%	17%	42%	90%
Pyrene	0.242	0.203	0.153	0.344	0.853	0.617	0.372	0.512	0.295	0.470	0.277	0.209	0.267	10%	31%	75%	-22%	-69%	-57%	-28%	-48%	-10%	-43%	-4%	27%
Retene	--	--	--	--	--	--	--	--	--	0.086	0.071	0.064	0.065	--	--	--	--	--	--	--	--	--	-25%	-9%	1%
HPAH - Total	0.906	0.676	0.393	1.269	2.843	2.40	1.36	1.67	0.94	1.35	0.94	0.73	1.13	25%	68%	188%	-11%	-60%	-53%	-16%	-32%	20%	-16%	21%	56%
Phthalates (lbs/1000 per acre)																									
DEHP	5.0	4.3	5.4	12.7	26.7	16.7	9.0	10.4	7.6	7.6	8.8	6.3	7.0	40%	65%	29%	-45%	-74%	-58%	-23%	-33%	-8%	-8%	-21%	11%
Butylbenzyl-phthalate	1.8	--	1.34	2.27	3.33	2.30	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Diethyl-phthalate	1.3	--	--	--	3.96	2.13	--	3.03	--	--	--	0.931	--	--	--	--	--	--	--	--	--	--	--	--	--
Dimethyl-phthalate	0.23	--	--	--	1.82	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-n-butyl-phthalate	2.3	2.1	2.1	2.7	2.3	2.8	1.5	2.5	2.3	5.6	11.8	7.2	5.5	138%	163%	159%	102%	137%	97%	264%	118%	145%	-1%	-53%	-24%
Di-n-octylphthalate	--	--	--	1.1	2.9	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phthalates - Total	11.1	7.2	6.7	17.3	35.9	21.5	9.7	14.6	9.6	13.1	21.0	13.4	11.0	-1%	53%	64%	-36%	-69%	-49%	14%	-24%	14%	-16%	-48%	-18%
Pesticides (lbs/1000 per acre)																									
Bifenthrin	0.24	0.14	0.16	--	--	--	--		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dichlobenil	0.24	0.14	0.16	0.40	0.46	0.22	0.22	0.33	0.34	0.11	0.20	0.08	0.18	-22%	31%	16%	-54%	-60%	-15%	-16%	-43%	-46%	65%	-9%	140%

Note: Mass loadings were not calculated for parameters with fewer than 10 percent detected concentrations or only one detected sample in stormwater.

[1] *In WY2015, total and dissolved mercury detection limits were lowered by a factor of 1,000 from parts per billion to part per trillion. The WY2012 loadings are based on ppb and may be a factor of 1000 higher than actual loadings.*

The estimated mass load comparisons to WY2020 are greater than a factor of two of each other (i.e., the percent difference greater than 100%).

The estimated mass load comparisons to WY2020 are less than a factor of two of each other (i.e., the percent difference less than – 75%).

Table 6-2.1 Pollutant Loading Summary Comparison

Table 6-2.2
Pollutant Loading Summary Comparison - WY2016-WY2024

	OF230 (WY2016-WY2022); WY2023 Transition; OF230A WY2024 - Commercial														
									Percent Difference						
	WY2016	WY2017	WY2018	WY2019	WY2020	WY2021	WY2022	WY2024	WY2016 to WY2024	WY2017 to WY2024	WY2018 to WY2024	WY2019 to WY2024	WY2020 to WY2024	WY2021 to WY2024	WY2022 to WY2024
Conventionals (lbs per acre)															
TSS	108	150	188	120	146	84	110	58	-46%	-61%	-69%	-52%	-60%	-31%	-47%
MBAS	0.12	0.25	0.11	0.17	0.21	0.15	0.20	0.20	69%	-19%	86%	19%	-3%	34%	0%
BOD$_5$	10.85	12.14	13.63	10.70	12.80	9.49	9.57	12.15	12%	0%	-11%	14%	-5%	28%	27%
Total Phosphorus	0.43	0.53	0.44	0.39	0.45	0.40	0.45	0.38	-11%	-28%	-13%	-4%	-15%	-5%	-16%
Orthophosphorus	0.16	0.19	0.20	0.19	0.19	0.19	0.22	0.20	24%	1%	0%	5%	3%	1%	-10%
TN	1.82	2.67	2.48	2.20	3.35	2.30	2.66	2.95	62%	10%	19%	34%	-12%	28%	11%
Nitrate/Nitrite -Total	1.31	1.53	1.38	1.42	1.49	1.39	1.54	1.50	14%	-2%	9%	6%	0%	7%	-3%
Metals (lbs/1000 per acre)															
Cu - Total	35	38	36	31	35	25	31	26	-25%	-32%	-29%	-16%	-27%	2%	-18%
Cu - Dissolved	13	15	13	12	16	11	13	13	0%	-12%	6%	16%	-16%	24%	1%
Zn - Total	253	279	266	222	252	186	237	227	-10%	-19%	-15%	2%	-10%	22%	-4%
Zn - Dissolved	125	144	113	100	124	96	116	137	9%	-5%	21%	37%	10%	43%	18%
Cd - Total	0.33	0.24	0.31	0.20	0.25	0.19	0.22	--	--	--	--	--	--	--	--
Cd - Dissolved	0.13	0.09	0.10	0.09	0.09	0.09	--	--	--	--	--	--	--	--	--
Hg - Total[1]	0.023	0.016	0.012	0.024	0.020	0.017	--	--	--	--	--	--	--	--	--
Hg - Dissolved[1]	0.008	0.009	0.012	--	--	--	--	--	--	--	--	--	--	--	--
Pb - Total	35.1	35.7	30.0	25.8	23.2	19.2	25.7	12.2	-65%	-66%	-59%	-53%	-47%	-36%	-53%
Pb - Dissolved	1.23	1.49	1.30	1.27	1.33	1.04	1.73	1.12	-9%	-25%	-14%	-12%	-16%	7%	-35%
LPAHs (lbs/1000 per acre)															
2-Methylnaphthalene	0.053	0.046	0.054	0.041	0.040	0.054	0.117	0.039	-26%	-16%	-27%	-5%	-2%	-28%	-66%
Acenaphthene	--	0.021	0.014	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthylene	0.019	0.022	0.024	0.014	0.020	--	--	--	--	--	--	--	--	--	--
Anthracene	--	0.029	0.023	0.023	0.020	--	0.024	--	--	--	--	--	--	--	--
Fluorene	0.027	0.029	0.022	0.026	0.020	--	--	--	--	--	--	--	--	--	--
Naphthalene	0.102	0.077	0.103	0.078	0.070	0.095	0.170	0.095	-7%	23%	-8%	22%	35%	-1%	-44%
Phenanthrene	0.150	0.184	0.170	0.093	0.121	0.090	0.154	0.064	-57%	-65%	-62%	-31%	-47%	-29%	-58%
LPAH - Total	0.334	0.354	0.348	0.246	0.280	0.255	0.413	0.223	-33%	-37%	-36%	-9%	-20%	-13%	-46%
HPAHs (lbs/1000 per acre)															
Benzo(a)anthracene	0.091	0.112	0.101	0.041	0.060	0.039	0.061	0.027	-71%	-76%	-74%	-36%	-56%	-32%	-57%
Benzo(a)pyrene	0.120	0.148	0.131	0.066	0.082	0.054	0.077	0.040	-66%	-73%	-69%	-39%	-51%	-25%	-48%
Benzo(g,h,i)perylene	0.138	0.156	0.118	0.078	0.110	0.073	0.100	0.055	-60%	-65%	-53%	-29%	-50%	-25%	-45%
Benzo(b,k)fluoranthenes	0.303	0.397	0.330	0.156	0.202	0.140	0.100	0.102	-66%	-74%	-69%	-35%	-50%	-28%	2%
Chrysene	0.174	0.228	0.196	0.086	0.130	0.083	0.124	0.047	-73%	-79%	-76%	-45%	-64%	-44%	-62%
Dibenz(a,h)anthracene	0.034	0.038	0.028	0.017	0.020	--	--	0.012	--	--	--	--	-0.399	--	--
Fluoranthene	0.214	0.296	0.288	0.131	0.192	0.136	0.207	0.087	-59%	-71%	-70%	-34%	-55%	-36%	-58%
Indeno(1,2,3-c,d)pyrene	0.117	0.139	0.099	0.059	0.081	0.054	0.078	0.047	-60%	-66%	-53%	-21%	-42%	-13%	-40%
Pyrene	0.252	0.297	0.287	0.139	0.215	0.131	0.214	0.106	-58%	-64%	-63%	-24%	-51%	-19%	-50%
Retene	--	--	--	--	--	0.018	0.027	0.021	--	--	--	--	--	15%	-22%
HPAH - Total	1.424	1.790	1.556	0.758	1.070	0.710	1.070	0.511	-64%	-71%	-67%	-33%	-52%	-28%	-52%
Phthalates (lbs/1000 per acre)															
DEHP	7.71	8.75	7.24	4.80	5.99	4.20	4.60	3.24	-58%	-63%	-55%	-33%	-46%	-23%	-30%
Butylbenzyl-phthalate	1.43	1.54	1.22	--	--	--	--	1.69	--	--	--	--	--	--	--
Diethyl-phthalate	6.83	1.80	--	2.74	1.15	--	1.30	1.34	--	--	--	--	0.162	--	3%
Dimethyl-phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-n-butyl-phthalate	1.27	1.46	1.10	1.08	1.53	1.17	1.11	0.79	-37%	-46%	-28%	-26%	-48%	-32%	-29%
Di-n-octylphthalate	2.34	2.45	2.04	1.21	1.11	--	--	--	--	--	--	--	--	--	--
Phthalates - Total	16.62	12.99	9.60	8.54	8.29	5.62	6.15	5.92	-64%	-54%	-38%	-31%	-29%	5%	-4%
Pesticides (lbs/1000 per acre)															
Bifenthrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dichlobenil	0.27	0.19	0.27	0.20	0.37	0.36	0.30	0.14	-50%	-28%	-49%	-31%	-63%	-62%	-54%

	OF237A - Residential																
										Precent Difference							
	WY2016	WY2017	WY2018	WY2019	WY2020	WY2021	WY2022	WY2023	WY2024	WY2016 to WY2024	WY2017 to WY2024	WY2018 to WY2024	WY2019 to WY2024	WY2020 to WY2024	WY2021 to WY2024	WY2022 to WY2024	WY2023 to WY2024
Conventionals (lbs per acre)																	
TSS	97.7	130.8	118	68	55	145	113	95	143	47%	10%	21%	110%	163%	-1%	27%	51%
MBAS	0.19	0.22	0.17	0.14	0.17	0.18	0.21	0.17	0.16	-14%	-26%	-7%	15%	-5%	-12%	-23%	-9%
BOD$_5$	11.46	10.33	11.69	8.58	9.64	16.37	14.69	13.61	13.70	20%	33%	17%	60%	42%	-16%	-7%	1%
Total Phosphorus	0.46	0.41	0.37	0.26	0.31	0.40	0.37	0.35	0.40	-13%	-3%	8%	57%	31%	-1%	8%	14%
Orthophosphorus	0.22	0.21	0.18	0.15	0.18	0.17	0.16	0.19	0.17	-24%	-18%	-6%	10%	-8%	0%	4%	-12%
TN	9.93	9.91	9.82	9.15	9.81	9.37	9.72	9.82	10.07	1%	2%	3%	10%	3%	7%	4%	3%
Nitrate/Nitrite -Total	9.90	9.67	9.40	9.06	9.14	9.35	8.70	9.13	9.11	-8%	-6%	-3%	1%	0%	-3%	5%	0%
Metals (lbs/1000 per acre)																	
Cu - Total	37	31	27	15	20	34	26	25	26	-30%	-17%	-4%	70%	30%	-24%	1%	2%
Cu - Dissolved	15	11	8	5	11	9	10	9	9	-43%	-22%	6%	68%	-23%	-6%	-13%	-1%
Zn - Total	355	247	172	107	134	207	178	180	171	-52%	-31%	-1%	60%	28%	-18%	-4%	-5%
Zn - Dissolved	220	134	74	50	75	78	90	83	76	-66%	-44%	2%	52%	1%	-4%	-16%	-9%
Cd - Total	0.88	0.74	0.84	0.53	0.51	0.65	0.58	0.57	0.59	-32%	-19%	-29%	12%	16%	-9%	3%	5%
Cd - Dissolved	0.91	0.09	--	--	--	--	--	0.15	--	--	--	--	--	--	--	--	--
Hg - Total[1]	0.043	0.027	0.023	0.020	--	--	--	0.019	--	--	--	--	--	--	--	--	--
Hg - Dissolved[1]	0.014	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pb - Total	25.2	25.3	22.5	10.8	11.1	25.1	17.6	16.5	19.7	-22%	-22%	-12%	83%	78%	-22%	12%	19%
Pb - Dissolved	1.15	0.98	0.88	0.52	0.89	0.75	0.87	1.09	0.89	-22%	-8%	1%	72%	0%	19%	3%	-18%
LPAHs (lbs/1000 per acre)																	
2-Methylnaphthalene	0.063	0.041	0.057	0.519	0.048	0.058	0.056	0.087	0.062	-1%	52%	10%	-88%	29%	6%	12%	-29%
Acenaphthene	--	--	0.028	0.047	0.032	0.058	--	--	--	--	--	--	--	--	--	--	--
Acenaphthylene	0.036	0.027	0.031	0.025	--	0.044	0.044	--	--	--	--	--	--	--	--	--	--
Anthracene	--	0.039	0.048	0.028	--	0.038	--	0.044	0.034	--	-14%	-30%	20%	--	-11%	--	-23%
Fluorene	0.032	0.034	0.036	0.025	--	0.038	0.044	0.031	0.033	4%	-3%	-8%	33%	--	-12%	-23%	7%
Naphthalene	0.116	0.070	0.101	0.029	0.075	0.096	0.093	0.097	0.092	-21%	31%	-9%	221%	23%	-4%	-1%	-5%
Phenanthrene	0.158	0.202	0.233	0.072	0.108	0.240	0.178	0.151	0.105	-33%	-48%	-55%	45%	-3%	-56%	-41%	-30%
LPAH - Total	0.383	0.364	0.440	0.091	0.263	0.475	0.391	0.338	0.282	-26%	-22%	-36%	209%	7%	-41%	-28%	-16%
HPAHs (lbs/1000 per acre)																	
Benzo(a)anthracene	0.127	0.193	0.181	0.069	0.065	0.149	0.113	0.114	0.079	-38%	-59%	-56%	14%	22%	-47%	-30%	-31%
Benzo(a)pyrene	0.175	0.277	0.266	0.101	0.086	0.219	0.173	0.093	0.125	-28%	-55%	-53%	24%	45%	-43%	-28%	34%
Benzo(g,h,i)perylene	0.168	0.254	0.251	0.111	0.124	0.239	0.300	0.140	0.150	-10%	-41%	-40%	35%	22%	-37%	-50%	8%
Benzo(b,k)fluoranthenes	0.488	0.812	0.662	0.250	0.232	0.601	1.025	0.446	0.304	-38%	-63%	-54%	21%	31%	-49%	-70%	-32%
Chrysene	0.261	0.425	0.343	0.130	0.138	0.307	0.358	0.191	0.137	-47%	-68%	-60%	6%	0%	-55%	-62%	-28%
Dibenz(a,h)anthracene	0.052	0.072	0.069	0.031	0.028	0.051	0.212	0.027	0.038	-26%	-47%	-45%	21%	37%	-26%	-82%	39%
Fluoranthene	0.334	0.542	0.510	0.193	0.185	0.509	0.409	0.321	0.210	-37%	-61%	-59%	9%	14%	-59%	-49%	-35%
Indeno(1,2,3-c,d)pyrene	0.162	0.257	0.268	0.107	0.108	0.226	0.321	0.140	0.141	-13%	-45%	-48%	32%	31%	-38%	-56%	0%
Pyrene	0.371	0.487	0.459	0.182	0.198	0.424	0.400	0.281	0.216	-42%	-56%	-53%	19%	9%	-49%	-46%	-23%
Retene	--	--	--	--	--	0.055	0.176	0.052	0.034	--	--	--	--	--	-37%	-80%	-34%
HPAH - Total	2.053	3.224	2.916	1.101	1.093	2.657	3.245	1.688	1.330	-35%	-59%	-54%	21%	22%	-50%	-59%	-21%
Phthalates (lbs/1000 per acre)																	
DEHP	9.45	8.91	6.24	3.84	4.76	5.23	5.78	4.97	3.81	-60%	-57%	-39%	-1%	-20%	-27%	-34%	-23%
Butylbenzyl-phthalate	2.41	2.64	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Diethyl-phthalate	3.17	2.22	--	2.92	1.96	--	--	1.92	--	--	--	--	--	--	--	--	--
Dimethyl-phthalate	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-n-butyl-phthalate	2.24	2.40	2.31	1.70	1.59	1.65	2.26	1.78	1.59	-29%	-34%	-31%	-7%	0%	-4%	-30%	-11%
Di-n-octylphthalate	3.66	3.09	2.46	1.87	--	--	--	--	--	--	--	--	--	--	--	--	--
Phthalates - Total	13.36	10.50	6.60	5.93	5.72	5.71	7.64	7.05	4.05	-70%	-61%	-39%	-32%	-29%	-29%	-47%	-43%
Pesticides (lbs/1000 per acre)																	
Bifenthrin	--	--	--	--	--	0.04	0.07	0.03	--	--	--	--	--	--	--	--	--
Dichlobenil	0.41	0.35	0.33	0.30	0.35	0.37	0.34	0.26	0.23	-44%	-33%	-29%	-22%	-34%	-37%	-31%	-11%

Note: Mass loadings were not calculated for parameters with fewer than 10 percent detected concentrations or only one detected sample in stormwater.

OF230 and OF254 are not reported due to change in basin area and limited qualifying storm events or accepted samples for WY2023.

The estimated mass load comparisons to WY2020 are greater than a factor of two of each other (i.e., the percent difference greater than 100%).

The estimated mass load comparisons to WY2020 are less than a factor of two of each other (i.e., the percent difference less than – 75%).

Table 6-2.2
Pollutant Loading Summary Comparison - WY2016-WY2024

OF243 - Industrial	WY2016	WY2017	WY2018	WY2019	WY2020	WY2021	WY2022	WY2023	WY2024	Percent Difference: WY2016 to WY2024	WY2017 to WY2024	WY2018 to WY2024	WY2019 to WY2024	WY2020 to WY2024	WY2021 to WY2024	WY2022 to WY2024	WY2023 to WY2024
Conventionals (lbs per acre)																	
TSS	101	366	143	211	70	80	80	51	105	4%	-71%	-27%	-50%	50%	31%	32%	106%
MBAS	0.16	0.21	0.11	0.11	0.07	0.08	0.12	0.12	0.09	-42%	-55%	-15%	-17%	33%	16%	-21%	-20%
BOD_5	6.17	12.02	9.65	12.29	2.92	8.10	7.36	2.84	6.80	10%	-43%	-30%	-45%	133%	-16%	-8%	139%
Total Phosphorus	1.30	1.94	1.41	2.56	0.41	0.51	0.68	0.32	1.04	-20%	-47%	-27%	-59%	155%	103%	52%	221%
Orthophosphorus	0.15	0.09	0.09	0.06	0.05	0.07	0.08	0.07	0.08	-46%	-14%	-16%	37%	49%	14%	0%	14%
TN	1.74	1.95	2.22	2.46	1.51	1.42	1.54	1.38	1.46	-16%	-25%	-34%	-41%	-3%	3%	-5%	6%
Nitrate/Nitrite -Total	0.83	0.98	0.60	0.68	0.46	0.47	0.65	0.47	0.51	-39%	-48%	-15%	-25%	11%	8%	-21%	9%
Metals (lbs/1000 per acre)																	
Cu - Total	58	154	67	78	36	38	39	36	50	-13%	-67%	-25%	-35%	39%	33%	28%	39%
Cu - Dissolved	10	16	9	14	6	9	12	10	10	-1%	-36%	8%	-26%	81%	14%	-13%	4%
Zn - Total	219	361	204	217	106	124	133	95	143	-35%	-60%	-30%	-34%	35%	16%	8%	51%
Zn - Dissolved	93	80	52	64	34	48	57	48	52	-44%	-35%	1%	-19%	52%	10%	-9%	9%
Cd - Total	0.98	1.45	1.01	0.75	0.41	0.56	0.62	0.37	0.63	-36%	-56%	-38%	-16%	53%	12%	2%	70%
Cd - Dissolved	0.48	0.29	0.31	0.24	0.14	0.20	0.21	0.18	0.19	-60%	-33%	-38%	-21%	35%	-4%	-7%	8%
Hg - Total[1]	0.026	0.151	0.031	0.074	0.011	0.010	--	0.009	0.021	-19%	-86%	-33%	-72%	99%	110%	--	130%
Hg - Dissolved[1]	0.006	0.005	--	0.012	--	--	--	--	--	--	--	--	--	--	--	--	--
Pb - Total	36.7	125.2	51.3	76.1	17.6	27.0	24.8	23.5	41.1	12%	-67%	-20%	-46%	134%	52%	66%	75%
Pb - Dissolved	0.19	0.22	0.30	0.98	0.28	0.56	0.84	0.86	1.09	462%	393%	259%	11%	294%	94%	31%	27%
LPAHs (lbs/1000 per acre)																	
2-Methylnaphthalene	0.060	0.013	0.023	0.028	0.028	0.027	0.034	0.014	0.035	-42%	159%	51%	24%	26%	28%	2%	156%
Acenaphthene	0.162	0.026	0.047	0.050	0.081	0.053	0.042	0.030	0.029	-82%	11%	-38%	-42%	-64%	-45%	-30%	-2%
Acenaphthylene	0.041	0.033	0.023	0.030	0.011	0.016	0.021	0.029	0.018	-56%	-45%	-21%	-39%	69%	16%	-15%	-36%
Anthracene	0.095	0.130	0.098	0.124	0.107	0.086	0.103	0.075	0.051	-46%	-60%	-47%	-59%	-52%	-41%	-50%	-32%
Fluorene	0.075	0.036	0.026	0.035	0.015	0.016	0.023	0.017	0.020	-73%	-44%	-21%	-42%	35%	29%	-11%	21%
Naphthalene	0.104	0.027	0.063	0.072	0.054	0.054	0.057	0.033	0.057	-45%	112%	-8%	-21%	6%	6%	0%	76%
Phenanthrene	0.154	0.099	0.087	0.098	0.064	0.068	0.072	0.074	0.089	-42%	-10%	3%	-10%	40%	30%	23%	21%
LPAH - Total	0.631	0.351	0.342	0.409	0.331	0.292	0.333	0.256	0.263	-58%	-25%	-23%	-36%	-21%	-10%	-21%	3%
HPAHs (lbs/1000 per acre)																	
Benzo(a)anthracene	0.085	0.318	0.060	0.041	0.028	0.029	0.032	0.032	0.039	-54%	-88%	-34%	-4%	42%	35%	23%	21%
Benzo(a)pyrene	0.092	0.352	0.078	0.050	0.031	0.036	0.038	0.034	0.057	-38%	-84%	-27%	15%	84%	59%	51%	65%
Benzo(g,h,i)perylene	0.076	0.312	0.073	0.067	0.039	0.038	0.041	0.030	0.050	-33%	-84%	-31%	-25%	28%	31%	22%	66%
Benzo(b,k)fluoranthenes	0.224	0.772	0.179	0.122	0.076	0.090	0.104	0.101	0.135	-40%	-82%	-25%	11%	78%	51%	30%	33%
Chrysene	0.142	0.448	0.101	0.081	0.050	0.054	0.054	0.040	0.067	-53%	-85%	-34%	-17%	35%	24%	23%	67%
Dibenz(a,h)anthracene	0.021	0.310	0.016	0.008	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluoranthene	0.223	0.269	0.174	0.162	0.097	0.094	0.094	0.102	0.140	-37%	-48%	-20%	-14%	45%	49%	48%	37%
Indeno(1,2,3-c,d)pyrene	0.068	0.342	0.063	0.045	0.031	0.033	0.042	0.032	0.053	-23%	-85%	-16%	18%	69%	57%	27%	63%
Pyrene	0.280	0.335	0.180	0.189	0.113	0.091	0.110	0.115	0.153	-45%	-54%	-15%	-19%	36%	68%	39%	33%
Retene	--	--	--	--	--	0.016	0.026	0.018	0.020	--	--	--	--	--	26%	-21%	11%
HPAH - Total	1.210	3.457	0.924	0.764	0.472	0.471	0.519	0.493	0.699	-42%	-80%	-24%	-9%	48%	48%	35%	42%
Phthalates (lbs/1000 per acre)																	
DEHP	4.24	7.74	3.28	4.04	1.58	1.12	2.01	1.63	1.14	-73%	-85%	-65%	-72%	-28%	1%	-43%	-30%
Butylbenzyl-phthalate	0.66	1.05	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Diethyl-phthalate	0.72	0.38	--	0.83	0.63	0.55	1.80	0.45	--	--	--	--	--	--	--	--	--
Dimethyl-phthalate	0.75	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-n-butyl-phthalate	0.58	0.95	0.66	0.77	0.47	0.53	0.51	0.37	--	--	--	--	--	--	--	--	--
Di-n-octylphthalate	0.93	1.58	0.67	1.09	--	--	--	--	--	--	--	--	--	--	--	--	--
Phthalates - Total	5.11	10.87	3.90	5.93	2.41	1.59	3.98	1.81	1.28	-75%	-88%	-67%	-78%	-47%	-19%	-68%	-29%
Pesticides (lbs/1000 per acre)																	
Bifenthrin	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dichlobenil	0.041	0.042	0.06	0.09	0.07	--	0.05	0.02	0.03	-33%	-35%	-56%	-69%	-63%	--	-39%	17%

OF254 - Industrial	WY2016	WY2017	WY2018	WY2019	WY2020	WY2021	WY2022	WY2024	Percent Difference: WY2016 to WY2024	WY2017 to WY2024	WY2018 to WY2024	WY2019 to WY2024	WY2020 to WY2024	WY2021 to WY2024	WY2022 to WY2024
Conventionals (lbs per acre)															
TSS	530	511	647	330	242	338	377	214	-60%	-58%	-67%	-35%	-12%	-37%	-43%
MBAS	0.40	0.63	0.26	0.23	0.34	0.32	0.48	0.27	-34%	-58%	4%	15%	-22%	-17%	-44%
BOD_5	11.34	26.85	19.99	13.60	13.41	12.21	15.16	10.44	-8%	-61%	-48%	-23%	-22%	-15%	-31%
Total Phosphorus	0.95	1.27	0.97	0.77	0.61	0.67	0.73	0.56	-41%	-56%	-42%	-27%	-7%	-17%	-22%
Orthophosphorus	0.17	0.20	0.20	0.11	0.12	0.25	0.13	0.17	0%	-14%	-17%	51%	46%	-33%	28%
TN	2.93	4.18	4.79	2.45	3.09	2.58	2.26	2.15	-27%	-48%	-55%	-12%	-30%	-17%	-5%
Nitrate/Nitrite -Total	1.29	0.99	0.93	0.63	0.76	0.63	0.70	0.61	-53%	-39%	-34%	-4%	-19%	-4%	-13%
Metals (lbs/1000 per acre)															
Cu - Total	132	119	114	78	58	74	99	78	-41%	-35%	-32%	0%	34%	6%	-21%
Cu - Dissolved	19	17	14	12	16	15	16	12	-34%	-25%	-10%	8%	-22%	-18%	-23%
Zn - Total	662	519	528	391	342	386	404	330	-50%	-37%	-38%	-16%	-4%	-15%	-18%
Zn - Dissolved	292	212	182	175	171	167	191	171	-41%	-20%	-6%	-2%	0%	2%	-11%
Cd - Total	2.81	1.09	1.30	0.92	0.77	0.99	0.84	0.78	-72%	-28%	-40%	-15%	1%	-21%	-7%
Cd - Dissolved	1.69	0.68	0.62	0.45	0.43	0.38	0.42	0.56	-67%	-18%	-10%	23%	31%	47%	32%
Hg - Total[1]	0.077	0.051	0.059	0.081	0.024	0.038	--	0.035	-0.546	-0.321	-0.406	-0.573	0.420	-9%	--
Hg - Dissolved[1]	0.008	0.014	--	--	--	--	--	--	--	--	--	--	--	--	--
Pb - Total	102.7	57.0	65.8	37.2	25.8	35.2	31.9	28.3	-72%	-50%	-57%	-24%	10%	-19%	-11%
Pb - Dissolved	1.53	0.83	0.95	0.73	0.79	0.60	4.52	2.48	62%	200%	160%	239%	214%	311%	-45%
LPAHs (lbs/1000 per acre)															
2-Methylnaphthalene	0.093	0.162	0.073	0.189	0.125	0.053	0.136	0.132	42%	-19%	80%	-30%	5%	150%	-3%
Acenaphthene	0.085	0.052	0.027	0.046	0.068	0.051	0.039	--	--	--	--	--	--	--	--
Acenaphthylene	0.033	0.060	0.061	0.033	0.027	0.064	0.042	--	--	--	--	--	--	--	--
Anthracene	0.067	0.067	0.078	0.059	0.056	0.040	0.049	0.074	11%	11%	-4%	25%	33%	87%	51%
Fluorene	0.078	0.064	0.058	0.091	0.035	0.034	0.044	0.042	-46%	-34%	-28%	-54%	22%	22%	-4%
Naphthalene	0.220	0.131	0.176	0.160	0.181	0.120	0.177	0.161	-27%	23%	-8%	0%	-11%	34%	-9%
Phenanthrene	0.327	0.291	0.360	0.250	0.204	0.212	0.250	0.191	-42%	-34%	-47%	-24%	-6%	-10%	-24%
LPAH - Total	0.811	0.664	0.760	0.639	0.571	0.520	0.555	0.530	-35%	-20%	-30%	-17%	-7%	2%	-4%
HPAHs (lbs/1000 per acre)															
Benzo(a)anthracene	0.141	0.164	0.143	0.088	0.072	0.091	0.115	0.051	-64%	-69%	-65%	-42%	-29%	-44%	-56%
Benzo(a)pyrene	0.240	0.248	0.231	0.148	0.101	0.188	0.140	0.087	-64%	-65%	-62%	-41%	-13%	-53%	-38%
Benzo(g,h,i)perylene	0.188	0.245	0.193	0.177	0.139	0.185	0.176	0.083	-56%	-66%	-57%	-53%	-40%	-55%	-53%
Benzo(b,k)fluoranthenes	0.485	0.409	0.598	0.314	0.251	0.498	0.504	0.211	-56%	-48%	-65%	-33%	-16%	-58%	-58%
Chrysene	0.286	0.210	0.411	0.180	0.213	0.561	0.292	0.122	-57%	-42%	-70%	-32%	-43%	-78%	-58%
Dibenz(a,h)anthracene	0.060	0.080	0.055	0.035	0.021	--	0.025	--	--	--	--	--	--	--	--
Fluoranthene	0.461	0.401	0.620	0.385	0.368	0.507	0.451	0.270	-42%	-33%	-57%	-30%	-27%	-47%	-40%
Indeno(1,2,3-c,d)pyrene	0.122	0.154	0.119	0.099	0.080	0.047	0.116	0.072	-41%	-53%	-40%	-28%	-10%	53%	-38%
Pyrene	0.635	0.528	0.774	0.473	0.422	0.544	0.538	0.289	-54%	-45%	-63%	-39%	-32%	-47%	-46%
Retene	--	--	--	--	--	0.117	0.115	0.042	--	--	--	--	--	-64%	-64%
HPAH - Total	2.619	2.440	3.144	1.898	1.667	2.636	2.358	1.202	-54%	-51%	-62%	-37%	-28%	-54%	-49%
Phthalates (lbs/1000 per acre)															
DEHP	20.14	16.34	14.62	7.52	5.95	7.17	7.65	3.56	-82%	-78%	-76%	-53%	-40%	-50%	-53%
Butylbenzyl-phthalate	2.06	1.57	--	--	1.74	--	--	--	--	--	--	--	--	--	--
Diethyl-phthalate	1.81	1.11	--	--	--	1.49	1.22	5.34	195%	381%	--	--	--	259%	337%
Dimethyl-phthalate	1.55	0.57	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-n-butyl-phthalate	3.31	2.86	2.55	1.82	2.27	2.45	1.83	1.01	-70%	-65%	-60%	-44%	-56%	-59%	-45%
Di-n-octylphthalate	2.85	1.19	1.62	1.10	--	--	--	--	--	--	--	--	--	--	--
Phthalates - Total	26.76	20.69	17.80	9.43	8.73	10.24	8.92	9.02	-66%	-56%	-49%	-4%	3%	-12%	1%
Pesticides (lbs/1000 per acre)															
Bifenthrin	--	--	--		--	--	--	--	--	--	--	--	--	--	--
Dichlobenil	0.26	0.86	--	0.25	0.20	0.11	0.16	0.08	-70%	-91%	--	-69%	-61%	-30%	-53%

Note: Mass loadings were not calculated for parameters with fewer than 10 percent detected concentrations or only one detected sample in stormwater.

Loadings for OF230 and OF254 were not calculated in WY2023 due to change in basin area and limited qualifying storm events or accepted samples for WY2023.

The estimated mass load comparisons to WY2020 are greater than a factor of two of each other (i.e., the percent difference greater than 100%).

The estimated mass load comparisons to WY2020 are less than a factor of two of each other (i.e., the percent difference less than – 75%).

Table 6-3
Pollutant Loading per Acre - WY2024

Conventionals	OF230A Commercial	OF235 Commercial	OF237A Residential	OF237B Residential	OF243 Industrial	OF245 Industrial	OF254 Industrial
TSS	58	162	143	114	105	292	214
MBAS	0.20	0.32	0.16	0.38	0.09	0.34	0.27
BOD_5	12.2	24.0	13.7	26.2	6.8	23.2	10.4
Total Phosphorus	0.38	1.068	0.40	0.686	1.036	0.905	0.563
Orthophosphorus	0.20	0.63	0.17	0.500	0.079	0.194	0.169
TN	3.0	8.9	10.1	42.5	1.5	4.2	2.2
Nitrate/Nitrite -Total	1.5	5.7	9.1	41.9	0.5	0.9	0.6
Metals (lbs/1000 per acre)							
Cu - Total	26	140	26	65	50	98	78
Cu - Dissolved	13	63	9	11	10	20	12
Zn - Total	227	434	171	163	143	515	330
Zn - Dissolved	137	183	76	82	52	172	171
Cd - Total	--	0.57	0.59	--	0.63	0.94	0.78
Cd - Dissolved	--	0.24	--	--	0.19	0.41	0.56
Hg - Total	--	0.037	--	--	0.021	--	0.03
Hg - Dissolved	--	--	--	--	--	--	--
Pb - Total	12	189	20	14	41	29	28
Pb - Dissolved	1.1	26.9	0.9	1.0	1.1	0.9	2.5
LPAHs (lbs/1000 per acre)							
2-Methylnaphthalene	0.039	0.050	0.062	0.162	0.035	0.104	0.132
Acenaphthene	--	--	--	--	0.029	0.091	--
Acenaphthylene	--	0.048	--	0.059	0.018	0.077	--
Anthracene	--	0.073	0.034	0.054	0.051	0.099	0.074
Fluorene	--	--	0.033	0.064	0.020	0.098	0.042
Naphthalene	0.095	0.100	0.092	0.190	0.057	0.205	0.161
Phenanthrene	0.064	0.135	0.105	0.124	0.089	0.255	0.191
LPAH - Total	0.223	0.414	0.282	0.556	0.263	0.824	0.530
HPAHs (lbs/1000 per acre)							
Benzo(a)anthracene	0.027	0.107	0.079	0.064	0.039	0.092	0.051
Benzo(a)pyrene	0.040	0.121	0.125	0.076	0.057	0.097	0.087
Benzo(g,h,i)perylene	0.055	0.150	0.150	0.084	0.050	0.126	0.083
Benzo(b,k)fluoranthenes	0.102	0.277	0.304	0.162	0.135	0.162	0.211
Chrysene	0.047	0.148	0.137	0.068	0.067	0.091	0.122
Dibenz(a,h)anthracene	--	0.035	0.038	--	--	--	--
Fluoranthene	0.087	0.255	0.210	0.128	0.140	0.212	0.270
Indeno(1,2,3-c,d)pyrene	0.047	0.108	0.141	0.081	0.053	0.061	0.072
Pyrene	0.106	0.356	0.216	0.158	0.153	0.267	0.289
Retene	0.021	0.059	0.034	0.053	0.020	0.065	0.042
HPAH - Total	0.511	1.493	1.330	0.860	0.699	1.133	1.202
Phthalates (lbs/1000 per acre)							
DEHP	3.24	6.60	3.81	4.65	1.14	6.99	3.56
Butylbenzyl-phthalate	1.69	--	--	--	--	--	--
Diethyl-phthalate	1.34	--	--	--	--	--	5.34
Dimethyl-phthalate	--	--	--	--	--	--	--
Di-n-butyl-phthalate	0.794	1.44	1.59	2.61	--	5.52	1.01
Di-n-octylphthalate	--	0.520	--	--	--	--	--
Phthalates - Total	5.92	8.57	4.05	7.99	1.28	11.01	9.02
Pesticides (lbs/1000 per acre)							
Bifenthrin	--	--	--	--	--	--	--
Dichlobenil	0.14	0.52	0.23	0.39	0.03	0.18	0.08

Note: Mass loadings were not calculated for parameters with fewer than 10 percent detected concentrations or only one detected sample in stormwater.

Maximum Pollutant Loading per Acre Value

Table 6-3 Pollutant Loading per Acre - WY2024

Table 6-4
WY2024 Annual Pollutant Loading

Pounds per Year

	OF230A - Commercial			OF235 - Commercial			OF237A - Residential			OF237B - Residential		
Conventionals	Baseflow	Stormwater	Grand Total	Baseflow	Stormwater	Grand Total	Baseflow	Stormwater	Grand Total	Baseflow	Stormwater	Grand Total
TSS	3,009	30,770	33,778	823	16,810	17,633	18,639	384,611	403,250	25,190	200,167	225,358
MBAS	44.55	72.63	117.18	14.94	20.42	35.36	201.72	246.51	448.23	481.94	262.69	744.63
BOD$_5$	1,078	6,006	7,084	484	2,131	2,614	10,799	27,752	38,551	36,874	14,889	51,764
Total Phosphorus	90	132	222	63	54	116	317	811	1,128	849	509	1,358
Orthophosphorus	82.6	31.5	114	59	10	69	367	110	477	862	128	990
TN	766	956	1,722	626	340	967	24,826	3,493	28,319	78,250	5,914	84,164
Nitrate/Nitrite -Total	649	223	872	517	102	620	25,582	41	25,623	79,923	2,958	82,881
Metals												
Cu - Total	3.25	11.80	15.05	1.59	13.65	15.24	5.24	68.06	73.30	8.35	119.46	127.81
Cu - Dissolved	2.13	5.70	7.83	1.05	5.76	6.82	3.38	21.10	24.48	4.53	17.81	22.35
Zn - Total	16.90	115.27	132.16	3.21	44.10	47.31	26.85	452.90	479.75	38.89	282.89	321.78
Zn - Dissolved	8.55	71.12	79.67	2.18	17.74	19.92	20.87	191.66	212.53	30.44	131.11	161.55
Cd - Total	--	--	--	0.026	0.037	0.062	1.245	0.429	1.673	--	--	--
Cd - Dissolved	--	--	--	0.014	0.012	0.026	--	--	--	--	--	--
Hg - Total	--	--	--	0.001	0.003	0.004	--	--	--	--	--	--
Hg - Dissolved	--	--	--	--	--	--	--	--	--	--	--	--
Pb - Total	0.984	6.121	7.105	0.936	19.674	20.610	1.399	53.959	55.358	0.933	26.235	27.168
Pb - Dissolved	0.166	0.486	0.652	0.325	2.605	2.930	0.311	2.201	2.512	0.600	1.379	1.979
LPAHs												
2-Methylnaphthalene	0.005	0.018	0.023	0.003	0.003	0.005	0.053	0.122	0.175	0.099	0.222	0.320
Acenaphthene	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthylene	--	--	--	0.002	0.003	0.005	--	--	--	0.086	0.032	0.117
Anthracene	--	--	--	0.002	0.006	0.008	0.045	0.049	0.094	0.075	0.031	0.106
Fluorene	--	--	--	--	--	--	0.049	0.045	0.094	0.079	0.048	0.127
Naphthalene	0.011	0.045	0.055	0.005	0.006	0.011	0.069	0.190	0.259	0.172	0.205	0.376
Phenanthrene	0.009	0.028	0.037	0.003	0.012	0.015	0.062	0.234	0.296	0.129	0.117	0.246
LPAH - Total	0.033	0.098	0.130	0.014	0.031	0.045	0.203	0.591	0.794	0.644	0.457	1.101
HPAHs												
Benzo(a)anthracene	0.003	0.012	0.015	0.002	0.010	0.012	0.050	0.171	0.222	0.071	0.055	0.126
Benzo(a)pyrene	0.003	0.021	0.023	0.002	0.011	0.013	0.050	0.303	0.353	0.075	0.076	0.151
Benzo(g,h,i)perylene	0.003	0.029	0.032	0.002	0.014	0.016	0.045	0.377	0.423	0.060	0.106	0.166
Benzo(b,k)fluoranthenes	0.008	0.051	0.059	0.004	0.026	0.030	0.093	0.761	0.854	0.135	0.185	0.320
Chrysene	0.003	0.024	0.027	0.002	0.014	0.016	0.044	0.342	0.386	0.054	0.082	0.135
Dibenz(a,h)anthracene	--	--	--	0.002	0.002	0.004	0.047	0.060	0.107	--	--	--
Fluoranthene	0.005	0.045	0.051	0.002	0.025	0.028	0.050	0.542	0.591	0.079	0.174	0.253
Indeno(1,2,3-c,d)pyrene	0.003	0.024	0.027	0.002	0.010	0.012	0.050	0.346	0.395	0.075	0.086	0.161
Pyrene	0.005	0.057	0.062	0.003	0.036	0.039	0.049	0.559	0.608	0.077	0.235	0.312
Retene	0.003	0.009	0.012	0.002	0.004	0.006	0.027	0.070	0.097	0.064	0.040	0.104
HPAH - Total	0.029	0.269	0.298	0.014	0.149	0.163	0.259	3.481	3.740	0.677	1.024	1.702
Phthalates												
DEHP	0.29	1.60	1.89	0.11	0.61	0.72	4.05	6.68	10.72	5.00	4.19	9.20
Butylbenzyl-phthalate	0.26	0.72	0.983	--	--	--	--	--	--	--	--	--
Diethyl-phthalate	0.348	0.431	0.779	--	--	--	--	--	--	--	--	--
Dimethyl-phthalate	--	--	--	--	--	--	--	--	--	--	--	--
Di-n-butyl-phthalate	0.217	0.25	0.463	0.084	0.074	0.157	3.271	1.202	4.472	4.305	0.858	5.163
Di-n-octylphthalate	--	--	--	--	--	--	--	--	--	--	--	--
Phthalates - Total	0.87	2.58	3.450	0.33	0.61	0.93	3.94	7.46	11.40	11.63	3.64	15.27
Pesticides												
Bifenthrin	--	--	--	--	--	--	--	--	--	--	--	--
Dichlobenil	0.024	0.055	0.079	0.015	0.041	0.057	0.501	0.158	0.658	0.577	0.191	0.768

Note: Mass loadings were not calculated for parameters with fewer than 10 percent detected concentrations or only one detected sample in stormwater.
Highlighted cells are the highest loadings values for baseflow, stormwater and total.

Table 6-4
WY2024 Annual Pollutant Loading

Pounds per Year

	OF243 - Industrial			OF245 - Industrial			OF254 - Industrial			Overall Total		
Conventionals	Baseflow	Stormwater	Grand Total	Baseflow	Stormwater	Grand Total	Baseflow	Stormwater	Grand Total	Baseflow	Stormwater	Grand Total
TSS	0	6,198	6,198	0	11,380	11,380	0	25,467	25,467	47,660	675,404	723,064
MBAS	0	5.50	5.50	0	13.44	13.44	0	31.82	31.82	743	653	1,396
BOD_5	0	401	401	0	907	907	0	1,242	1,242	49,235	53,328	102,563
Total Phosphorus	0	61	61	0	35	35	0	67	67	1,319	1,668	2,987
Orthophosphorus	0	5	5	0	8	8	0	20	20	1,371	311	1,682
TN	0	86	86	0	164	164	0	256	256	104,469	11,210	115,679
Nitrate/Nitrite -Total	0	30	30	0	36	36	0	72	72	106,671	3,464	110,134
Metals												
Cu - Total	0	2.97	2.97	0	3.82	3.82	0	9.29	9.29	18.43	229.05	247.47
Cu - Dissolved	0	0.60	0.60	0	0.80	0.80	0	1.48	1.48	11.10	53.25	64.35
Zn - Total	0	8.45	8.45	0	20.09	20.09	0	39.23	39.23	85.85	962.92	1048.77
Zn - Dissolved	0	3.09	3.09	0	6.71	6.71	0	20.33	20.33	62.05	441.75	503.80
Cd - Total	0	0.037	0.037	0	0.037	0.037	0	0.093	0.093	1.27	0.63	1.90
Cd - Dissolved	0	0.011	0.011	0	0.016	0.016	0	0.066	0.066	0.014	0.106	0.12
Hg - Total	0	0.001	0.001	--	--	--	0	0.004	0.004	0.0013	0.0081	0.009
Hg - Dissolved	--	--	--	--	--	--	--	--	--	--	--	--
Pb - Total	0	2.425	2.425	0	1.120	1.120	0	3.372	3.372	4.25	112.91	117.16
Pb - Dissolved	0	0.065	0.065	0	0.034	0.034	0	0.295	0.295	1.40	7.06	8.47
LPAHs												
2-Methylnaphthalene	0	0.002	0.002	0	0.004	0.004	0	0.016	0.016	0.159	0.387	0.545
Acenaphthene	0	0.002	0.002	0	0.004	0.004	--	--	--	0.000	0.005	0.005
Acenaphthylene	0	0.001	0.001	0	0.003	0.003	--	--	--	0.088	0.039	0.127
Anthracene	0	0.003	0.003	0	0.004	0.004	0	0.009	0.009	0.123	0.102	0.225
Fluorene	0	0.001	0.001	0	0.004	0.004	0	0.005	0.005	0.128	0.103	0.231
Naphthalene	0	0.003	0.003	0	0.008	0.008	0	0.019	0.019	0.255	0.476	0.731
Phenanthrene	0	0.005	0.005	0	0.010	0.010	0	0.023	0.023	0.202	0.430	0.632
LPAH - Total	0	0.016	0.016	0	0.032	0.032	0	0.063	0.063	0.894	1.287	2.181
HPAHs												
Benzo(a)anthracene	0	0.002	0.002	0	0.004	0.004	0	0.006	0.006	0.126	0.261	0.387
Benzo(a)pyrene	0	0.003	0.003	0	0.004	0.004	0	0.010	0.010	0.130	0.428	0.558
Benzo(g,h,i)perylene	0	0.003	0.003	0	0.005	0.005	0	0.010	0.010	0.111	0.544	0.655
Benzo(b,k)fluoranthenes	0	0.008	0.008	0	0.006	0.006	0	0.025	0.025	0.241	1.063	1.304
Chrysene	0	0.004	0.004	0	0.004	0.004	0	0.014	0.014	0.103	0.484	0.587
Dibenz(a,h)anthracene	--	--	--	--	--	--	--	--	--	0.049	0.062	0.111
Fluoranthene	0	0.008	0.008	0	0.008	0.008	0	0.032	0.032	0.137	0.834	0.971
Indeno(1,2,3-c,d)pyrene	0	0.003	0.003	0	0.002	0.002	0	0.009	0.009	0.130	0.479	0.609
Pyrene	0	0.009	0.009	0	0.010	0.010	0	0.034	0.034	0.135	0.940	1.075
Retene	0	0.001	0.001	0	0.003	0.003	0	0.005	0.005	0.096	0.132	0.228
HPAH - Total	0	0.041	0.041	0	0.044	0.044	0	0.143	0.143	0.979	5.152	6.131
Phthalates												
DEHP	--	0.07	0.07	--	0.27	0.27	--	0.42	0.42	9.45	13.84	23.29
Butylbenzyl-phthalate	--	--	--	--	--	--	--	--	--	--	--	--
Diethyl-phthalate	--	--	--	--	--	--	--	0.635	0.635	0.35	1.07	1.41
Dimethyl-phthalate	--	--	--	--	--	--	--	--	--	--	--	--
Di-n-butyl-phthalate	--	--	--	--	0.215	0.215	--	0.12	0.12	7.88	2.71	10.59
Di-n-octylphthalate	--	--	--	--	--	--	--	--	--	--	--	--
Phthalates - Total	--	0.08	0.08	--	0.43	0.43	--	1.07	1.07	16.76	15.87	32.63
Pesticides												
Bifenthrin	--	--	--	--	--	--	--	--	--	--	--	--
Dichlobenil	0	0.002	0.002	0	0.007	0.007	0	0.009	0.009	1.12	0.46	1.580

Note: Mass loadings were not calculated for parameters with fewer than 10 percent detected concentrations or only one detected sample in stormwater.
Highlighted cells are the highest loadings values for baseflow, stormwater and total.

Table 6-4 cont'd
WY2024 Annual Pollutant Loading

Percentage of Total Pounds per Year

	OF230A - Commercial			OF235 - Commercial			OF237A - Residential			OF237B - Residential		
Conventionals	Baseflow	Stormwater	Grand Total	Baseflow	Stormwater	Grand Total	Baseflow	Stormwater	Grand Total	Baseflow	Stormwater	Grand Total
TSS	6%	5%	5%	2%	2%	2%	39%	57%	56%	53%	30%	31%
MBAS	6%	11%	8%	2%	3%	3%	27%	38%	32%	65%	40%	53%
BOD_5	2%	11%	7%	1%	4%	3%	22%	52%	38%	75%	28%	50%
Total Phosphorus	7%	8%	7%	5%	3%	4%	24%	49%	38%	64%	30%	45%
Orthophosphorus	6%	10%	7%	4%	3%	4%	27%	35%	28%	63%	41%	59%
TN	1%	9%	1%	1%	3%	1%	24%	31%	24%	75%	53%	73%
Nitrate/Nitrite -Total	1%	6%	1%	0%	3%	1%	24%	1%	23%	75%	85%	75%
Metals												
Cu - Total	18%	5%	6%	9%	6%	6%	28%	30%	30%	45%	52%	52%
Cu - Dissolved	19%	11%	12%	10%	11%	11%	30%	40%	38%	41%	33%	35%
Zn - Total	20%	12%	13%	4%	5%	5%	31%	47%	46%	45%	29%	31%
Zn - Dissolved	14%	16%	16%	4%	4%	4%	34%	43%	42%	49%	30%	32%
Cd - Total	--	--	--	2%	6%	3%	98%	68%	88%	--	--	--
Cd - Dissolved	--	--	--	100%	12%	22%	--	--	--	--	--	--
Hg - Total	--	--	--	100%	34%	43%	--	--	--	--	--	--
Hg - Dissolved	--	--	--	--	--	--	--	--	--	--	--	--
Pb - Total	23%	5%	6%	22%	17%	18%	33%	48%	47%	22%	23%	23%
Pb - Dissolved	12%	7%	8%	23%	37%	35%	22%	31%	30%	43%	20%	23%
LPAHs												
2-Methylnaphthalene	3%	5%	4%	2%	1%	1%	33%	32%	32%	62%	57%	59%
Acenaphthene	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthylene	--	--	--	2%	8%	4%	--	--	--	98%	82%	93%
Anthracene	--	--	--	2%	5%	4%	37%	48%	42%	61%	31%	47%
Fluorene	--	--	--	--	--	--	38%	44%	41%	62%	46%	55%
Naphthalene	4%	9%	8%	2%	1%	1%	27%	40%	35%	67%	43%	51%
Phenanthrene	4%	7%	6%	1%	3%	2%	30%	54%	47%	64%	27%	39%
LPAH - Total	4%	8%	6%	2%	2%	2%	23%	46%	36%	72%	35%	50%
HPAHs												
Benzo(a)anthracene	2%	5%	4%	2%	4%	3%	40%	66%	57%	56%	21%	33%
Benzo(a)pyrene	2%	5%	4%	1%	3%	2%	39%	71%	63%	58%	18%	27%
Benzo(g,h,i)perylene	3%	5%	5%	2%	3%	3%	41%	69%	65%	54%	19%	25%
Benzo(b,k)fluoranthenes	3%	5%	5%	2%	2%	2%	39%	72%	66%	56%	17%	25%
Chrysene	3%	5%	5%	2%	3%	3%	43%	71%	66%	52%	17%	23%
Dibenz(a,h)anthracene	--	--	--	4%	3%	3%	96%	97%	97%	--	--	--
Fluoranthene	4%	5%	5%	2%	3%	3%	36%	65%	61%	58%	21%	26%
Indeno(1,2,3-c,d)pyrene	3%	5%	4%	2%	2%	2%	38%	72%	65%	58%	18%	26%
Pyrene	4%	6%	6%	2%	4%	4%	37%	59%	57%	57%	25%	29%
Retene	3%	7%	5%	2%	3%	3%	28%	53%	42%	67%	30%	46%
HPAH - Total	3%	5%	5%	1%	3%	3%	26%	68%	61%	69%	20%	28%
Phthalates												
DEHP	3%	12%	8%	1%	4%	3%	43%	48%	46%	53%	30%	39%
Butylbenzyl-phthalate	--	--	--	--	--	--	--	--	--	--	--	--
Diethyl-phthalate	100%	40%	55%	--	--	--	--	--	--	--	--	--
Dimethyl-phthalate	--	--	--	--	--	--	--	--	--	--	--	--
Di-n-butyl-phthalate	3%	9%	4%	1%	3%	1%	42%	44%	42%	55%	32%	49%
Di-n-octylphthalate	--	--	--	--	--	--	--	--	--	--	--	--
Phthalates - Total	5%	16%	11%	2%	4%	3%	23%	47%	35%	69%	23%	47%
Pesticides												
Bifenthrin	--	--	--	--	--	--	--	--	--	--	--	--
Dichlobenil	2%	12%	5%	1%	9%	4%	45%	34%	42%	52%	41%	49%

Note: Mass loadings were not calculated for parameters with fewer than 10 percent detected concentrations or only one detected sample in stormwater.
Highlighted cells are the highest loadings values for baseflow, stormwater and total.

Table 6-4 cont'd
WY2024 Annual Pollutant Loading

Percentage of Total Pounds per Year

	OF243 - Industrial			OF245 - Industrial			OF254 - Industrial			Overall Total		
Conventionals	Baseflow	Stormwater	Grand Total	Baseflow	Stormwater	Grand Total	Baseflow	Stormwater	Grand Total	Baseflow	Stormwater	Grand Total
--	0%	1%	1%	0%	2%	2%	0%	4%	4%	7%	93%	100%
MBAS	0%	1%	0%	0%	2%	1%	0%	5%	2%	53%	47%	100%
BOD_5	0%	1%	0%	0%	2%	1%	0%	2%	1%	48%	52%	100%
Total Phosphorus	0%	4%	2%	0%	2%	1%	0%	4%	2%	44%	56%	100%
Orthophosphorus	0%	2%	0%	0%	2%	0%	0%	6%	1%	81%	19%	100%
TN	0%	1%	0%	0%	1%	0%	0%	2%	0%	90%	10%	100%
Nitrate/Nitrite -Total	0%	1%	0%	0%	1%	0%	0%	2%	0%	97%	3%	100%
Cu - Total	0%	1%	1%	0%	2%	2%	0%	4%	4%	7%	93%	100%
Cu - Dissolved	0%	1%	1%	0%	1%	1%	0%	3%	2%	17%	83%	100%
Zn - Total	0%	1%	1%	0%	2%	2%	0%	4%	4%	8%	92%	100%
Zn - Dissolved	0%	1%	1%	0%	2%	1%	0%	5%	4%	12%	88%	100%
Cd - Total	0%	6%	2%	0%	6%	2%	0%	15%	5%	67%	33%	100%
Cd - Dissolved	0%	11%	9%	0%	15%	13%	0%	63%	55%	12%	88%	100%
Hg - Total	0%	15%	13%	--	--	--	0%	51%	44%	14%	86%	100%
Hg - Dissolved	--	--	--	--	--	--	--	--	--	--	--	--
Pb - Total	0%	2%	2%	0%	1%	1%	0%	3%	3%	4%	96%	100%
Pb - Dissolved	0%	1%	1%	0%	0%	0%	0%	4%	3%	17%	83%	100%
2-Methylnaphthalene	0%	1%	0%	0%	1%	1%	0%	4%	3%	29%	71%	100%
Acenaphthene	--	33%	33%	--	67%	67%	--	--	--	0%	100%	100%
Acenaphthylene	0%	3%	1%	0%	8%	2%	--	--	--	69%	31%	100%
Anthracene	0%	3%	1%	0%	4%	2%	0%	9%	4%	55%	45%	100%
Fluorene	0%	1%	1%	0%	4%	2%	0%	5%	2%	55%	45%	100%
Naphthalene	0%	1%	0%	0%	2%	1%	0%	4%	3%	35%	65%	100%
Phenanthrene	0%	1%	1%	0%	2%	2%	0%	5%	4%	32%	68%	100%
LPAH - Total	0%	1%	1%	0%	2%	1%	0%	5%	3%	41%	59%	100%
Benzo(a)anthracene	0%	1%	1%	0%	1%	1%	0%	2%	2%	33%	67%	100%
Benzo(a)pyrene	0%	1%	1%	0%	1%	1%	0%	2%	2%	23%	77%	100%
Benzo(g,h,i)perylene	0%	1%	0%	0%	1%	1%	0%	2%	2%	17%	83%	100%
Benzo(b,k)fluoranthenes	0%	1%	1%	0%	1%	0%	0%	2%	2%	18%	82%	100%
Chrysene	0%	1%	1%	0%	1%	1%	0%	3%	2%	18%	82%	100%
Dibenz(a,h)anthracene	--	--	--	--	--	--	--	--	--	44%	56%	100%
Fluoranthene	0%	1%	1%	0%	1%	1%	0%	4%	3%	14%	86%	100%
Indeno(1,2,3-c,d)pyrene	0%	1%	1%	0%	0%	0%	0%	2%	1%	21%	79%	100%
Pyrene	0%	1%	1%	0%	1%	1%	0%	4%	3%	13%	87%	100%
Retene	0%	1%	1%	0%	2%	1%	0%	4%	2%	42%	58%	100%
HPAH - Total	0%	1%	1%	0%	1%	1%	0%	3%	2%	16%	84%	100%
DEHP	--	0%	0%	--	2%	1%	--	3%	2%	41%	59%	100%
Butylbenzyl-phthalate	--	--	--	--	--	--	--	--	--	--	--	--
Diethyl-phthalate	--	--	--	--	--	--	--	60%	45%	25%	75%	100%
Dimethyl-phthalate	--	--	--	--	--	--	--	--	--	--	--	--
Di-n-butyl-phthalate	--	--	--	--	8%	2%	--	4%	1%	74%	26%	100%
Di-n-octylphthalate	--	--	--	--	--	--	--	--	--	--	--	--
Phthalates - Total	--	0%	0%	--	3%	1%	--	7%	3%	51%	49%	100%
Bifenthrin	--	--	--	--	--	--	--	--	--	--	--	--
Dichlobenil	0%	0%	0%	0%	2%	0%	0%	2%	1%	71%	29%	100%

Note: Mass loadings were not calculated for parameters with fewer than 10 percent detected concentrations or only one detected sample in stormwater.

Highlighted cells are the highest loadings values for baseflow, stormwater and total.

Table 6-5
Percent of Annual Loading Rates by Outfall

Stormwater Outfalls		Phenanthrene			Pyrene			Dibenz(ah)anthracene			Bis(2-ethylhexyl)phthalate			Volume, ac-ft/yr	% of Total Volume
		Contaminant Load in Kg/Year	% of Total SW Load	% of Total Load	Contaminant Load in Kg/Year	% of Total SW Load	% of Total Load	Contaminant Load in Kg/Year	% of Total SW Load	% of Total Load	Contaminant Load in Kg/Year	% of Total SW Load	% of Total Load		
OF237A	SW	0.106	35.8%	4.8%	0.253	49.1%	7.0%	0.027	51.0%	9.9%	3.03	27.7%	12.7%	2,320	12.3%
	BF	0.028	9.4%	1.3%	0.022	4.3%	0.6%	0.021	40.0%	7.8%	1.84	16.8%	7.7%	3,970	21.0%
OF237B[2]	SW	0.053	17.9%	2.4%	0.106	20.6%	2.9%	0.000	0.0%	0.0%	1.90	17.4%	8.0%	1,915	10.1%
	BF	0.058	19.7%	2.7%	0.035	6.8%	1.0%	0.000	0.0%	0.0%	2.27	20.7%	9.5%	9,218	48.8%
OF230A	SW	0.013	4.4%	0.6%	0.026	5.0%	0.7%	0.000	0.0%	0.0%	0.73	6.6%	3.0%	255	1.3%
	BF	0.004	1.4%	0.2%	0.002	0.4%	0.1%	0.000	0.0%	0.0%	0.13	1.2%	0.5%	485	2.6%
OF235	SW	0.005	1.8%	0.2%	0.016	3.1%	0.4%	0.001	1.7%	0.3%	0.27	2.5%	1.2%	152	0.8%
	BF	0.001	0.4%	0.1%	0.001	0.3%	0.0%	0.001	1.6%	0.3%	0.05	0.5%	0.2%	178	0.9%
OF245[2]		0.005	1.5%	0.2%	0.005	0.9%	0.1%	0.000	0.0%	0.0%	0.12	1.1%	0.5%	97	0.5%
OF243[2]		0.002	0.8%	0.1%	0.004	0.8%	0.1%	0.000	0.0%	0.0%	0.03	0.3%	0.1%	47	0.2%
OF254		0.010	3.5%	0.5%	0.016	3.0%	0.4%	0.000	0.0%	0.0%	0.19	1.8%	0.8%	252	1.3%
All Other SW Outfalls[1]		0.010	3.4%	0.5%	0.029	5.6%	0.8%	0.003	5.6%	1.1%	0.38	3.5%	1.6%	72	0.4%
BF Total		**0.092**	**31%**	**4%**	**0.061**	**12%**	**2%**	**0.022**	**42%**	**8%**	**4.29**	**39%**	**18%**	**13,851**	**73%**
SW Total		**0.205**	**69%**	**9%**	**0.455**	**88%**	**13%**	**0.031**	**58%**	**11%**	**6.66**	**61%**	**28%**	**5,038**	**27%**
Loading values for SW Outfalls and Other Sources (Total Loadings) were based on the WASP2006 Model Update														**Total 2024 Volume**	
Total Outfall Loadings		**0.297**		**13.5%**	**0.516**		**14.2%**	**0.053**		**19.5%**	**10.94**		**45.9%**	**18,889**	**ac-ft/yr**
Total Loadings		**2.192**		**100.0%**	**3.624**		**100.0%**	**0.273**		**100.0%**	**23.86**		**100.0%**		

[1] *Loading values for SW Outfalls and Other Sources (Total Loadings) were based on the WASP2006 Model Update*

[2] *As the concentrations of stormwater and baseflow converge and where baseflow accounts for >65 of the discharge, the largest contribution of mass loadings is estimated from baseflow. This is seen for a few constituents with less than 25 percent detections and/or less than five detected results that generate estimated mass loads with a high degree of uncertainty, even though mass loads may still be calculated using one-half the detection limit for that non-detected value*

SW - Stormwater
BF- Baseflow

FIGURES

Figure 1-1
Thea Foss Post-Remediation Source Control Strategy

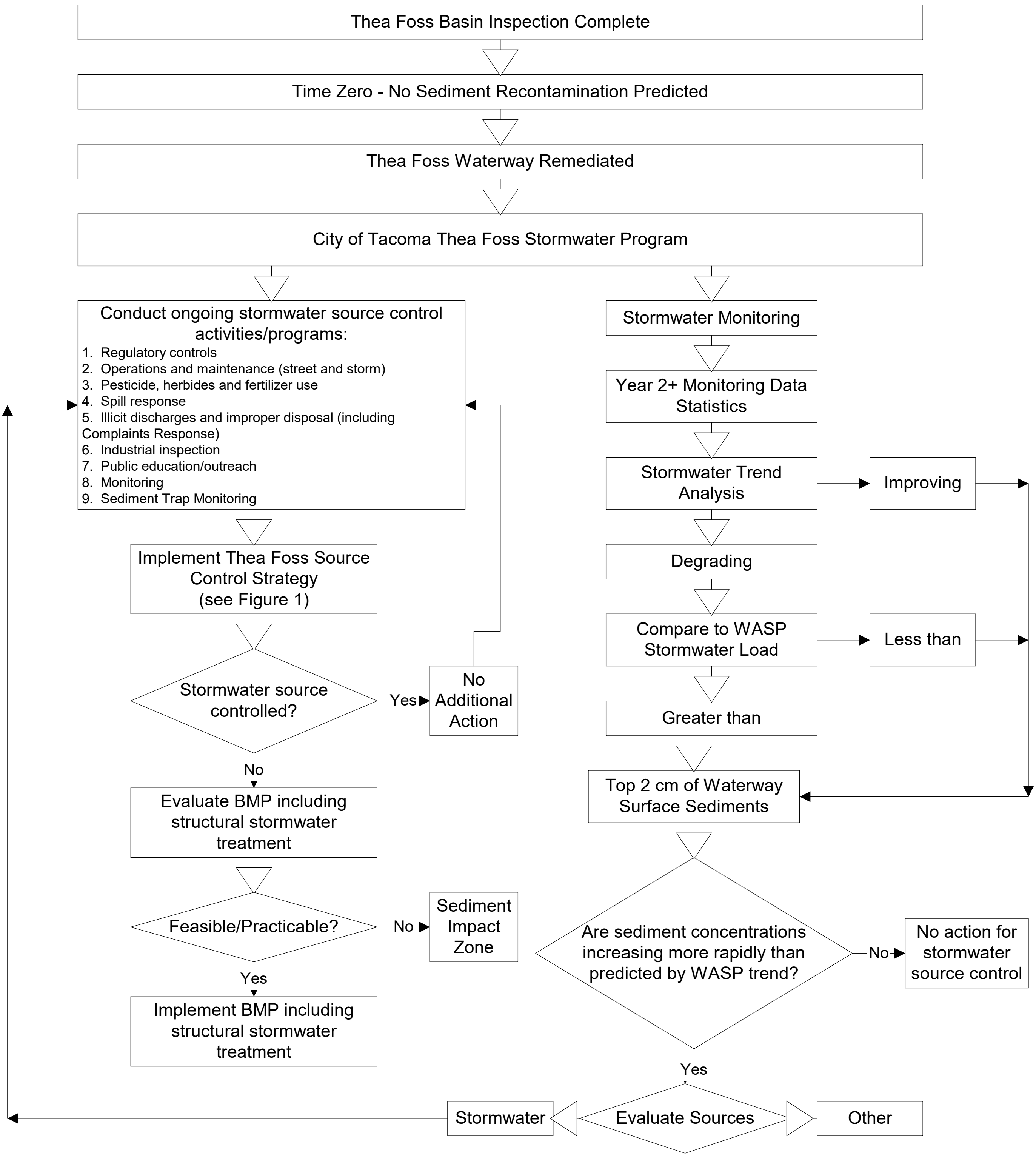
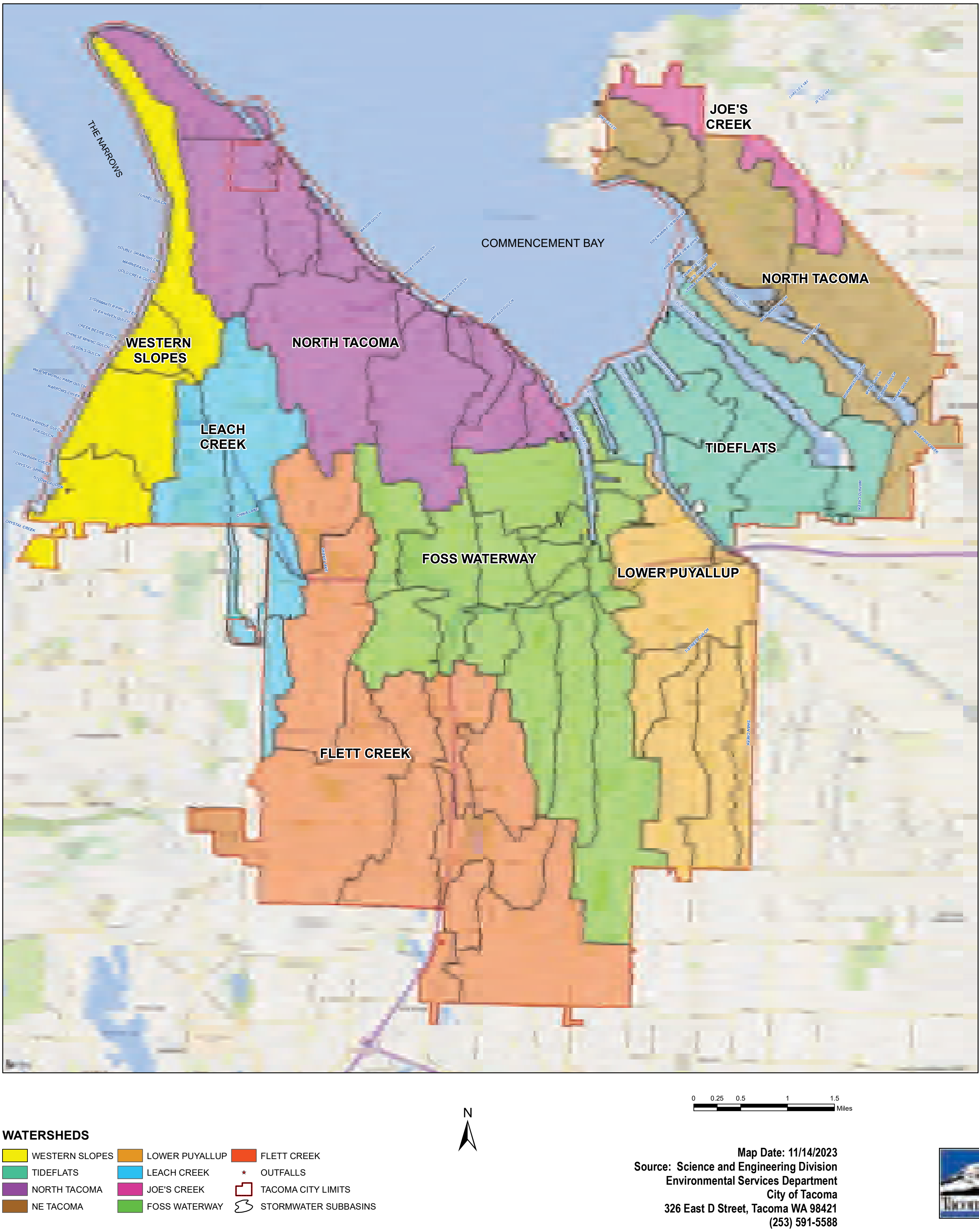


Figure 1-1 Source Control Strategy

Figure 1-2
City of Tacoma Watersheds



Map Date: 11/14/2023
Source: Science and Engineering Division
Environmental Services Department
City of Tacoma
326 East D Street, Tacoma WA 98421
(253) 591-5588

Figure 1-3
Thea Foss Basins Land use

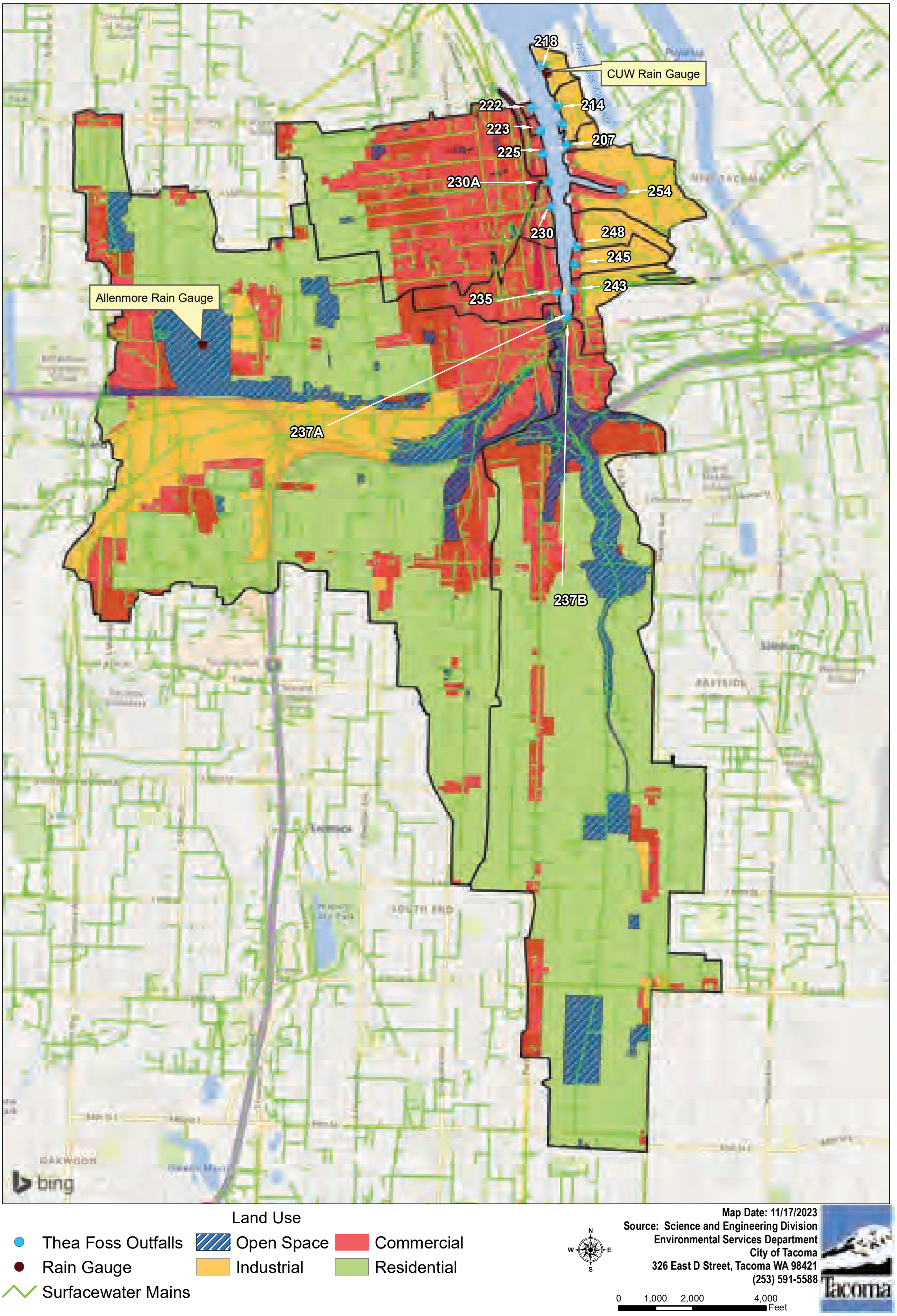


Figure 2-1.1
Sediment Trap Results - Mercury

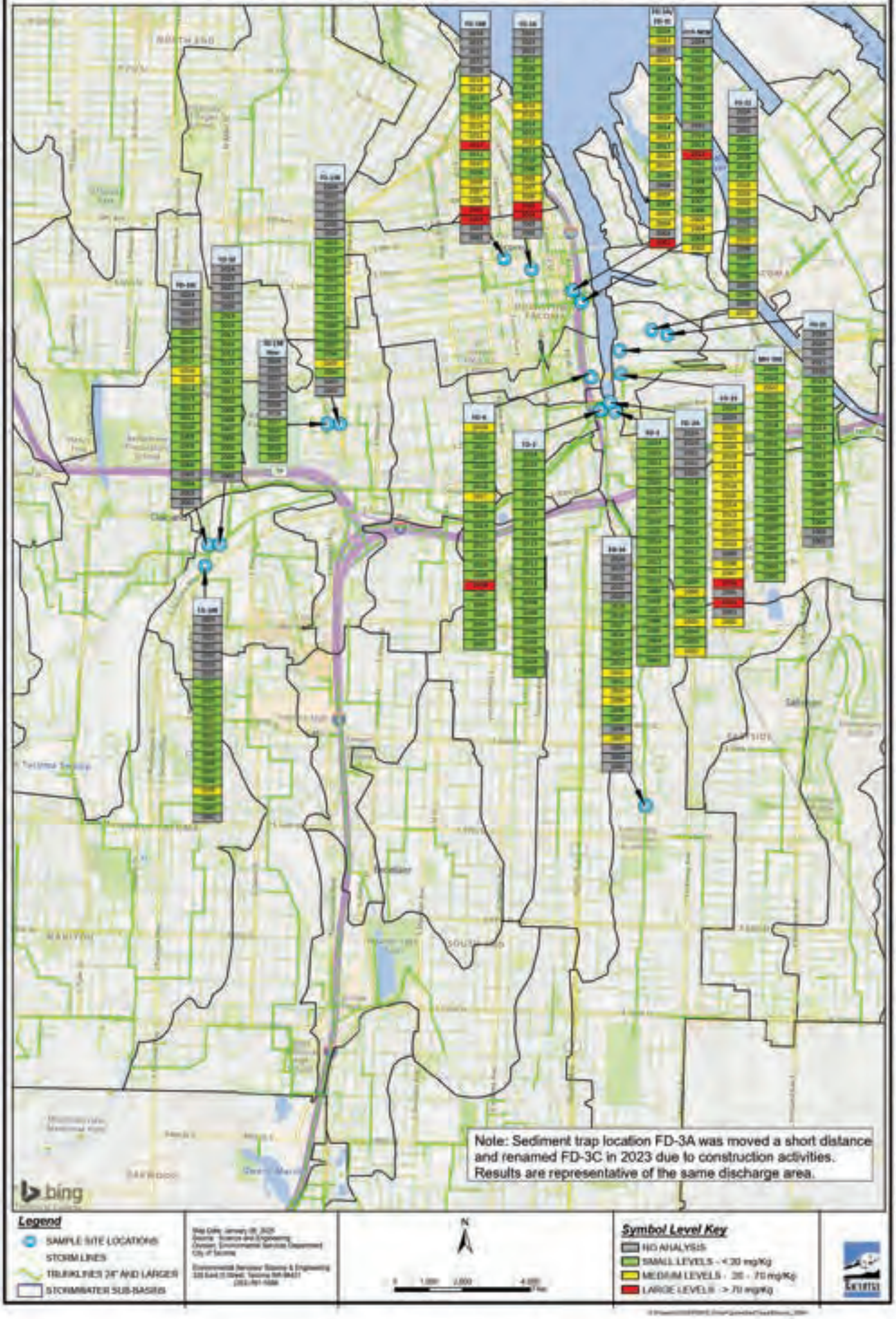


Figure 2-1.2
Sediment Trap Results - PAHs

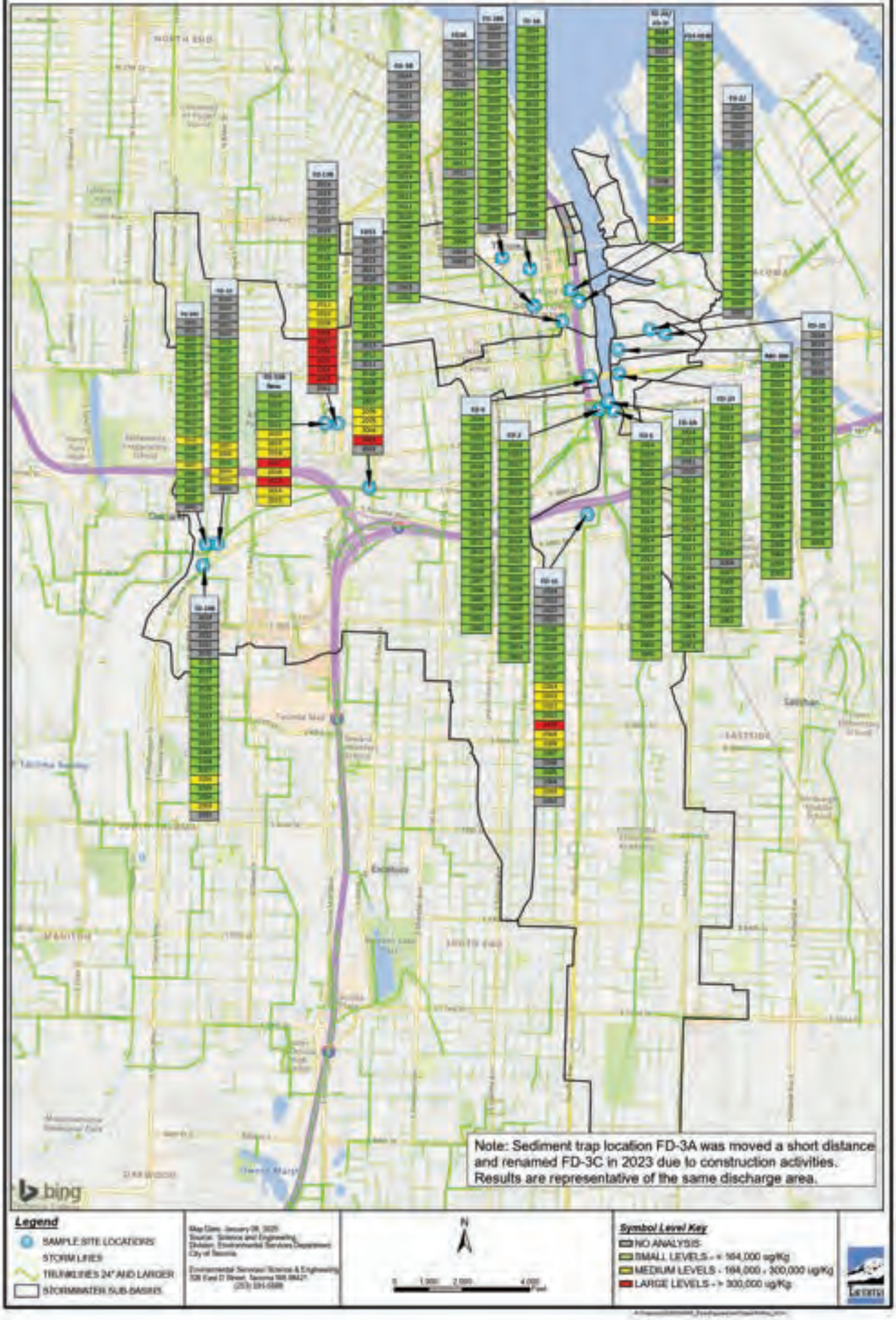


Figure 2-1.3
Sediment Trap Results - Phthalates

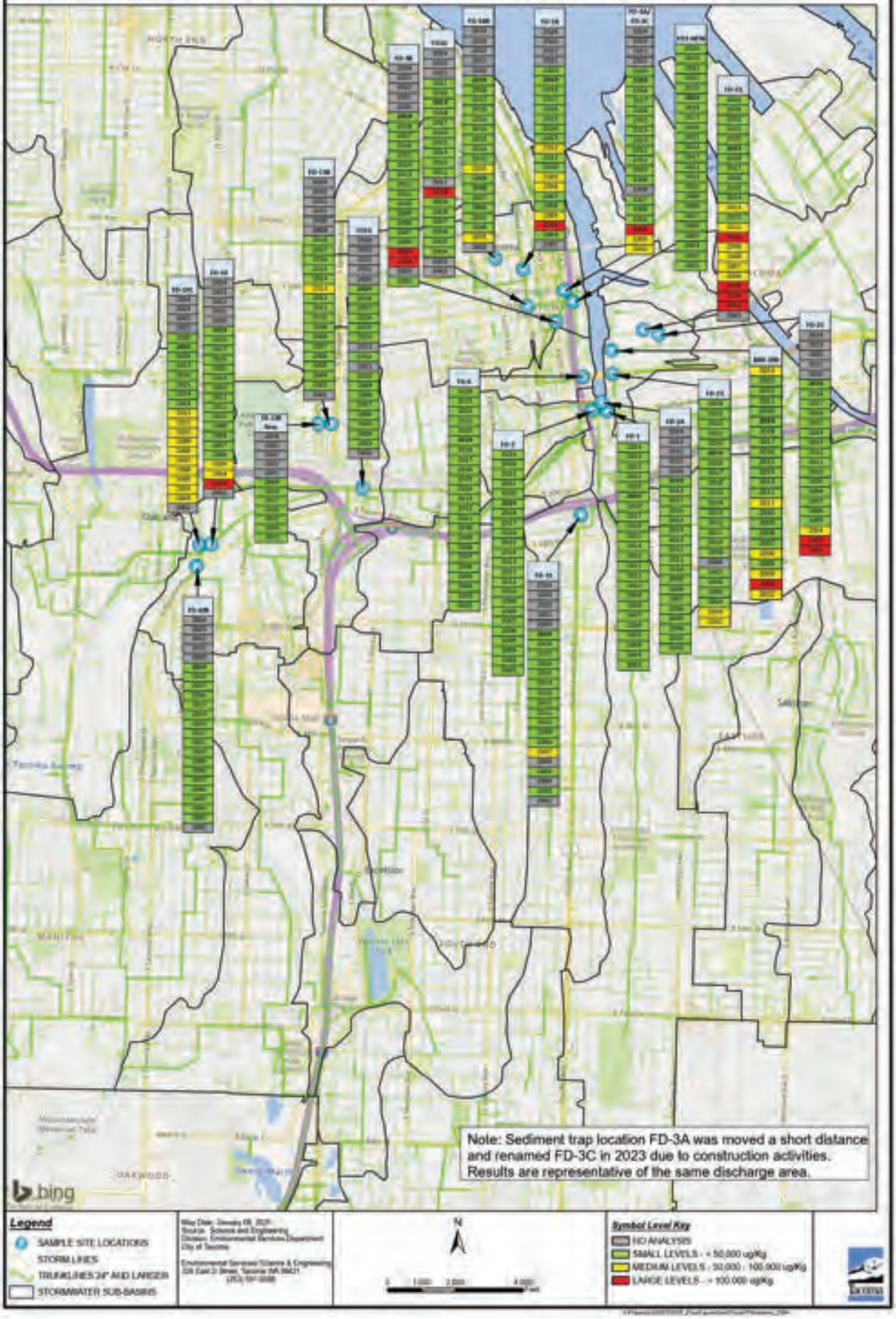


Figure 2-1.4
Sediment Trap Results - PCBs

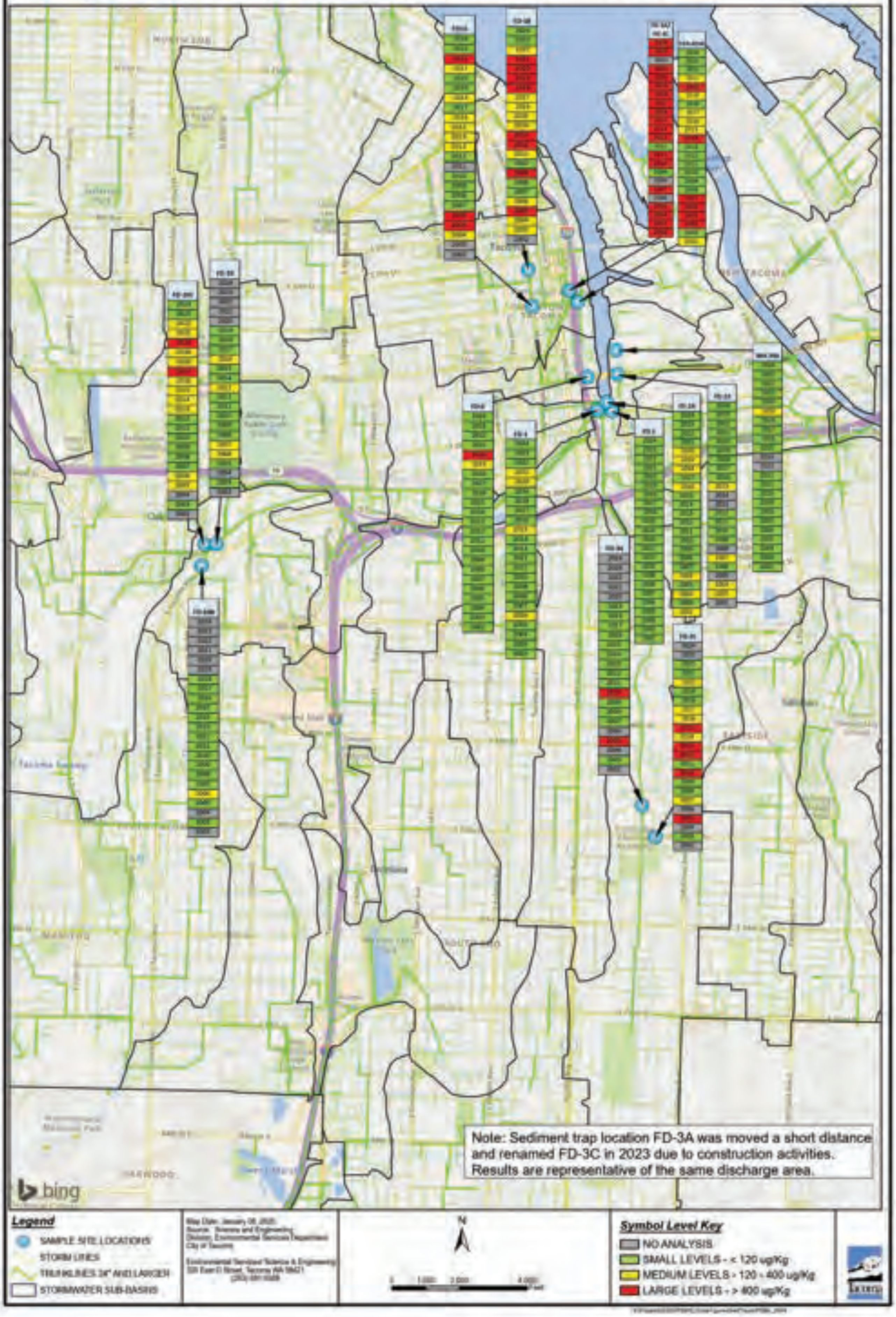
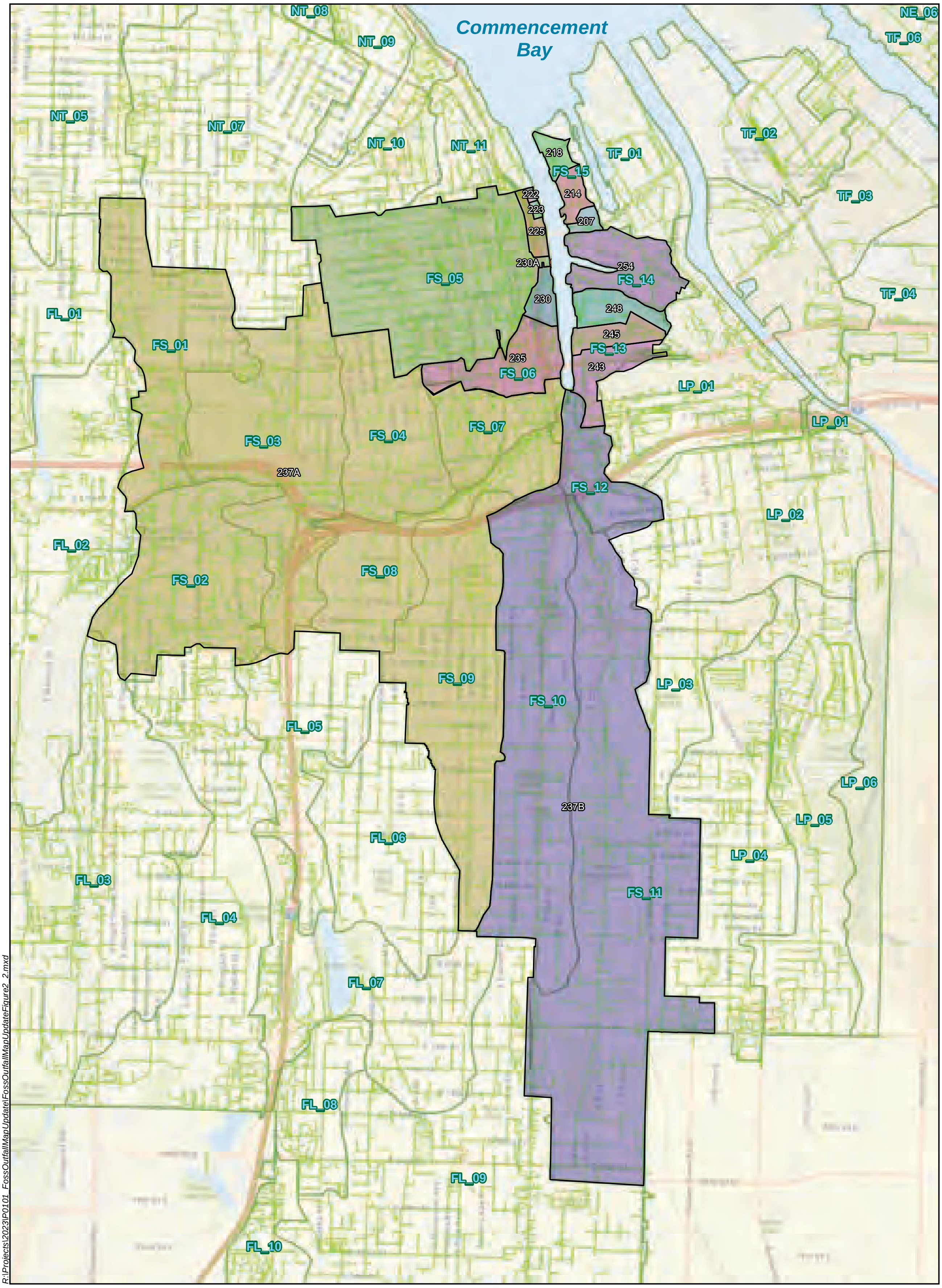


Figure 2-2
Foss Outfall Map Update



R:\Projects\2023\P0101_FossOutfallMapUpdate\FossOutfallMapUpdateFigure2_2.mxd

Legend

NEW OUTFALL 230A

SURFACEWATER SUBBASINS

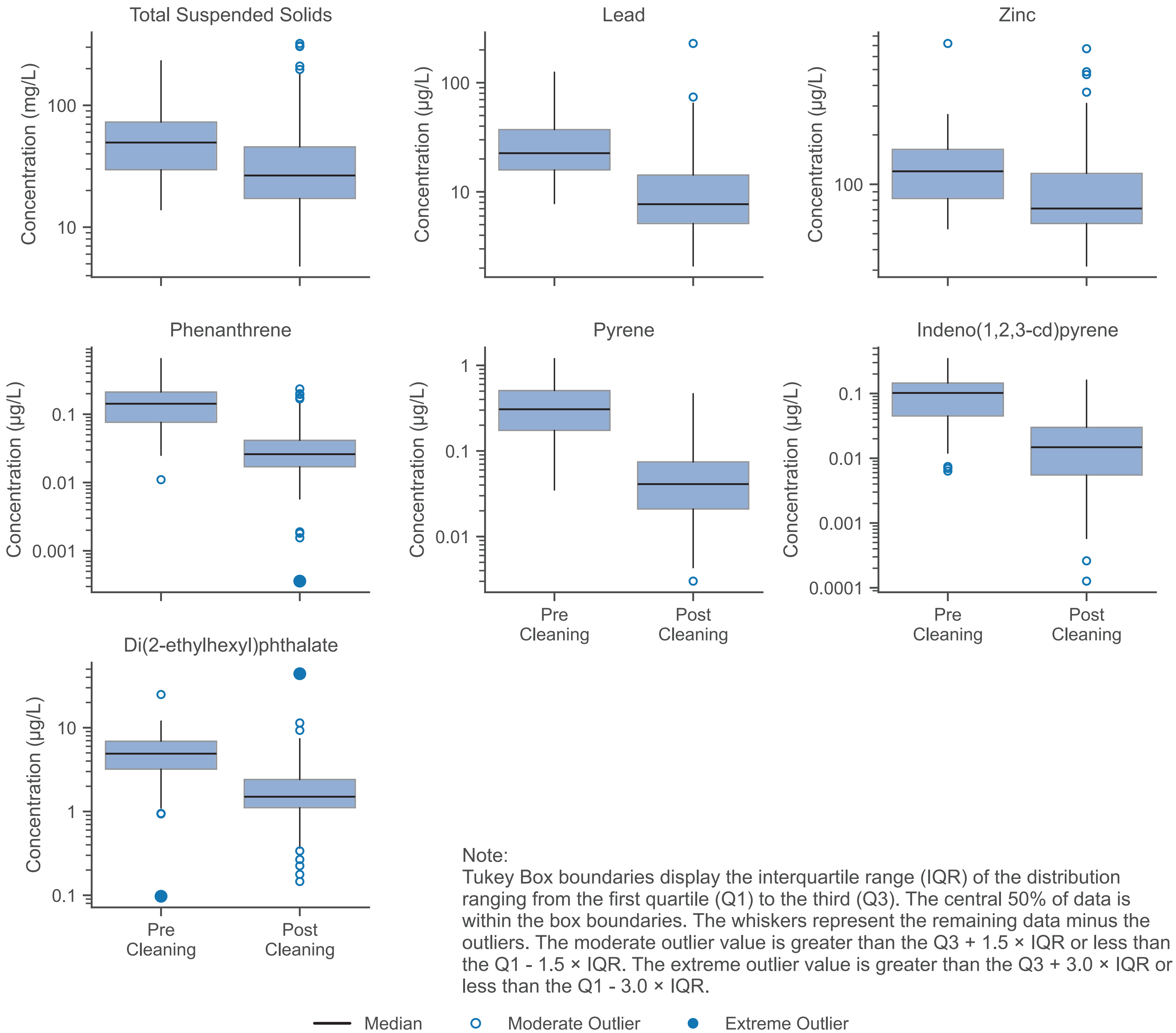
0 1,250 2,500 5,000 Feet

Map Date: 12/4/2023
Source: Science and Engineering Division
Environmental Services Department
City of Tacoma
326 East D Street, Tacoma WA 98421
(253) 591-5588

Tacoma

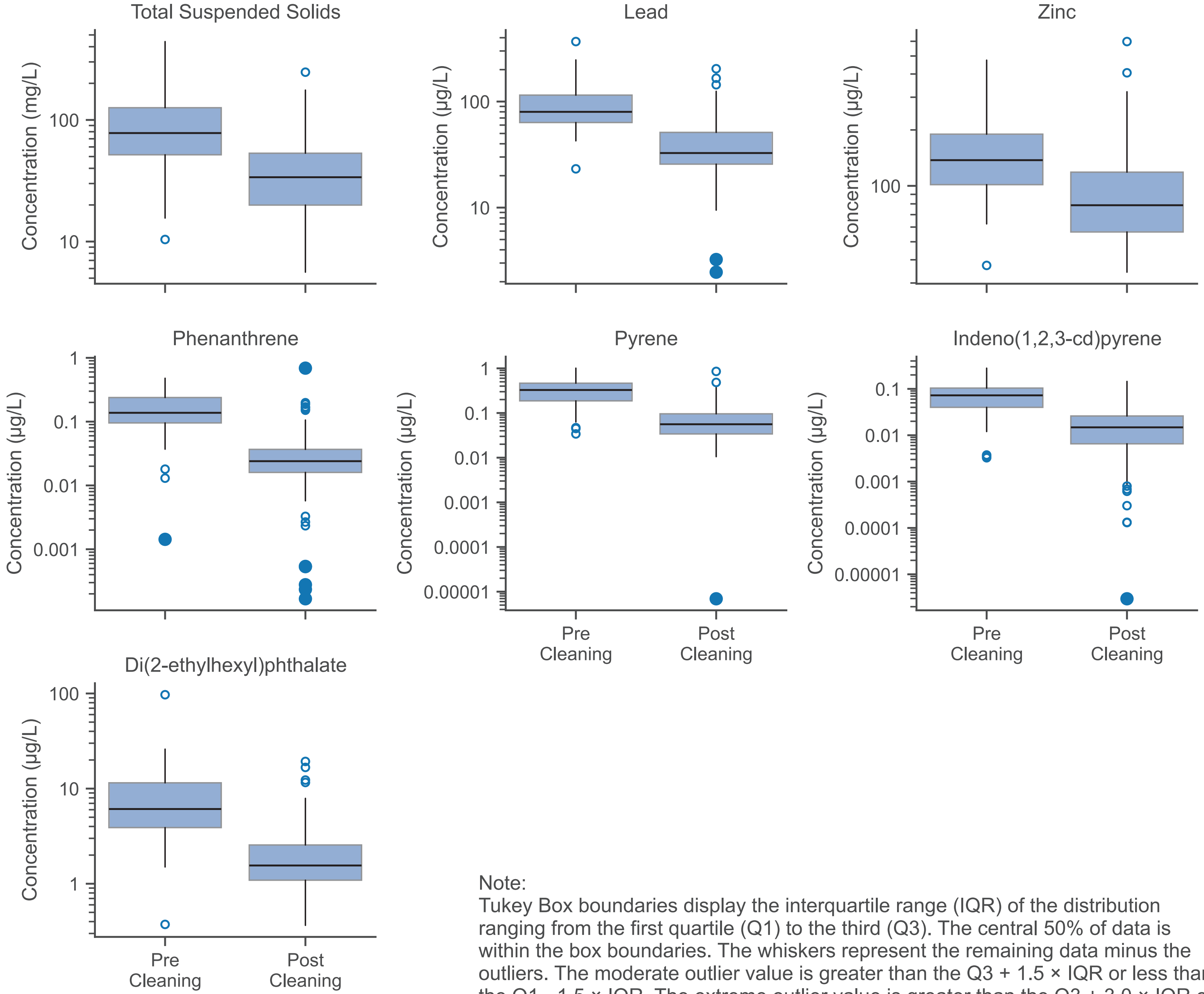
Figure 2-3.1

OF230/230A Storm Line Cleaning Comparison [Log Scale] October 2001 - September 2024



Note:
Tukey Box boundaries display the interquartile range (IQR) of the distribution ranging from the first quartile (Q1) to the third (Q3). The central 50% of data is within the box boundaries. The whiskers represent the remaining data minus the outliers. The moderate outlier value is greater than the Q3 + 1.5 × IQR or less than the Q1 - 1.5 × IQR. The extreme outlier value is greater than the Q3 + 3.0 × IQR or less than the Q1 - 3.0 × IQR.

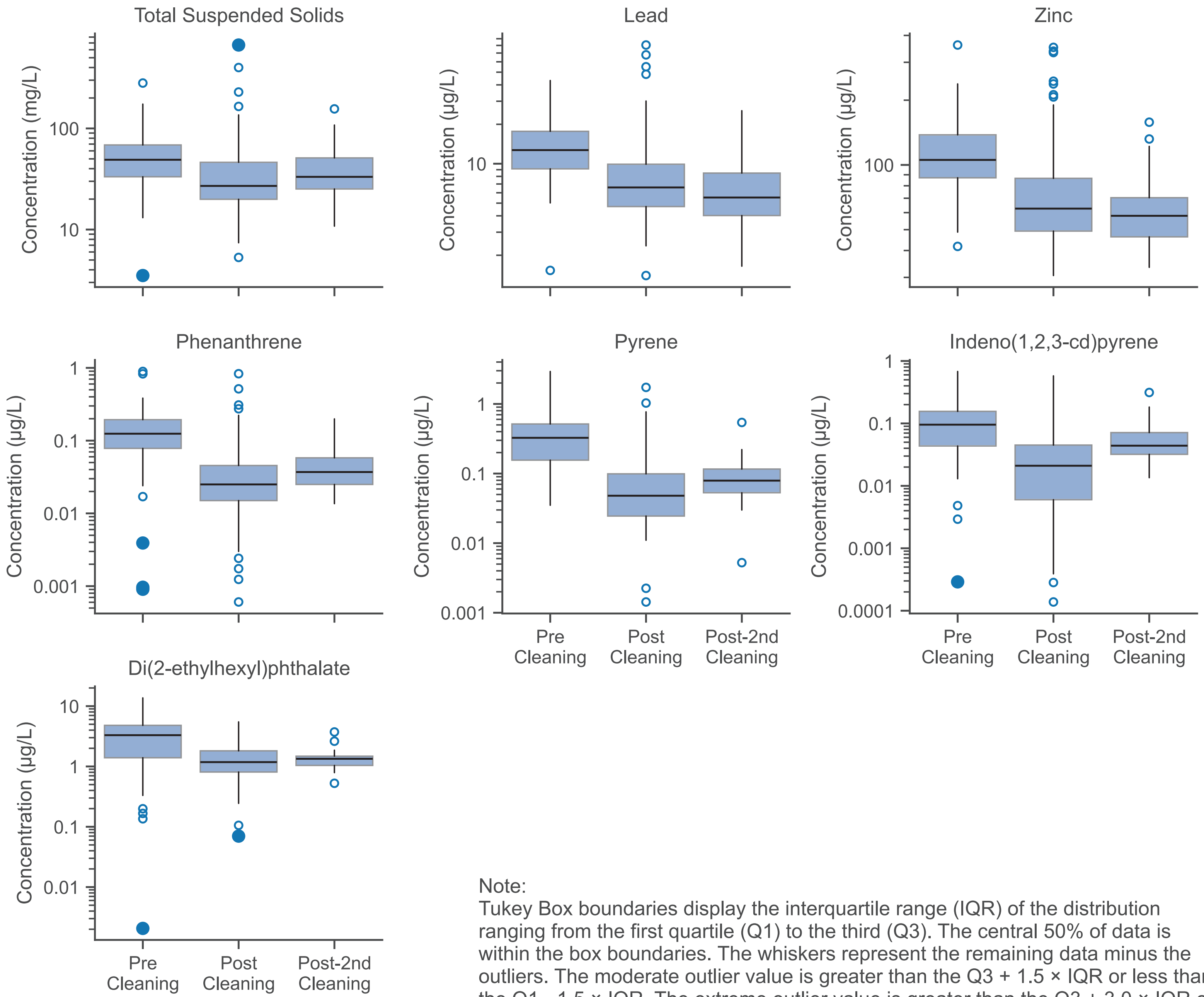
Figure 2-3.2
OF235 Storm Line Cleaning Comparison [Log Scale]
October 2001 - September 2024



Note:
Tukey Box boundaries display the interquartile range (IQR) of the distribution ranging from the first quartile (Q1) to the third (Q3). The central 50% of data is within the box boundaries. The whiskers represent the remaining data minus the outliers. The moderate outlier value is greater than the Q3 + 1.5 × IQR or less than the Q1 - 1.5 × IQR. The extreme outlier value is greater than the Q3 + 3.0 × IQR or less than the Q1 - 3.0 × IQR.

Median　Moderate Outlier　Extreme Outlier

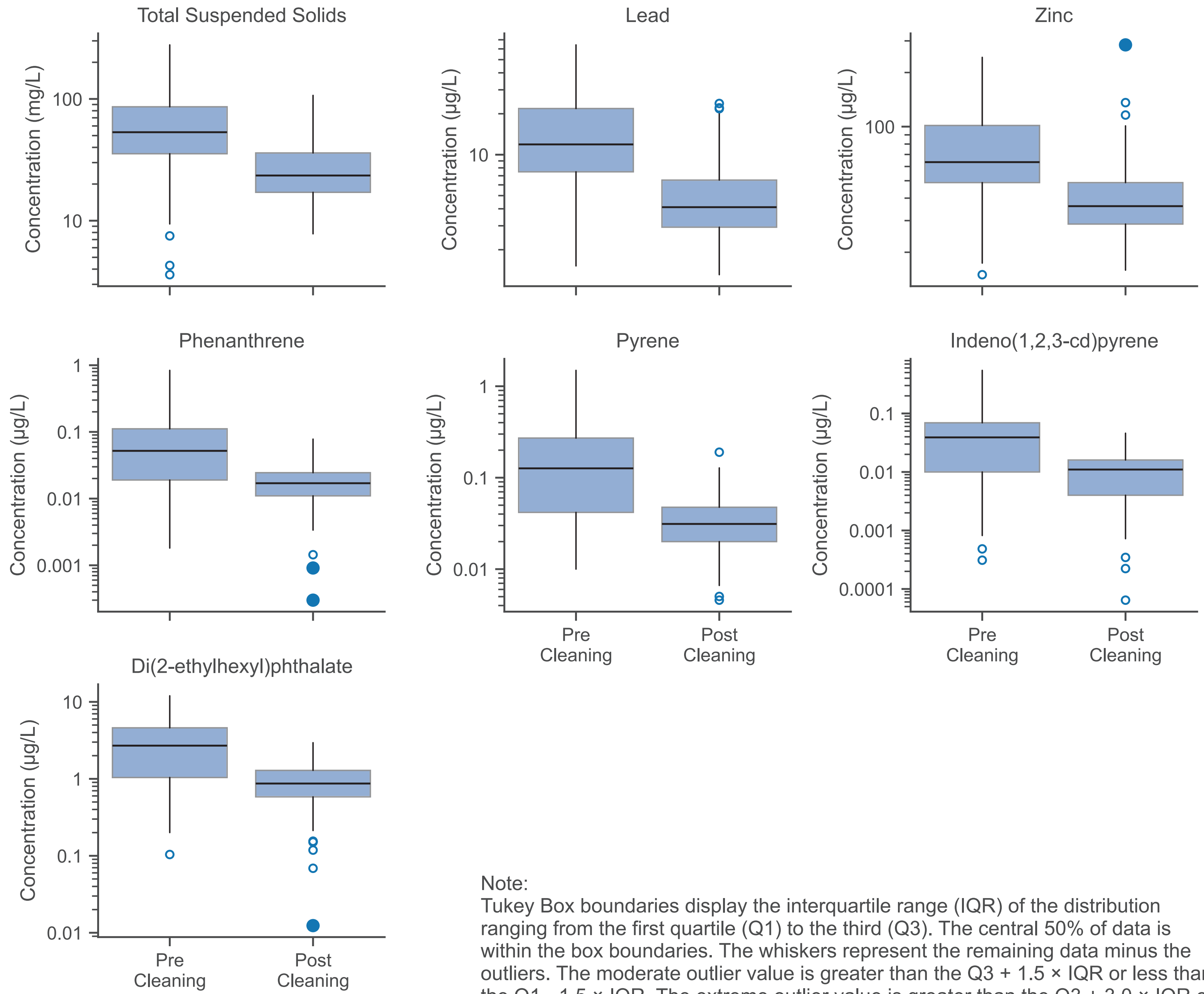
Figure 2-3.3
OF237A New Storm Line Cleaning Comparison [Log Scale]
October 2001 - September 2024



Note:
Tukey Box boundaries display the interquartile range (IQR) of the distribution ranging from the first quartile (Q1) to the third (Q3). The central 50% of data is within the box boundaries. The whiskers represent the remaining data minus the outliers. The moderate outlier value is greater than the Q3 + 1.5 × IQR or less than the Q1 - 1.5 × IQR. The extreme outlier value is greater than the Q3 + 3.0 × IQR or less than the Q1 - 3.0 × IQR.

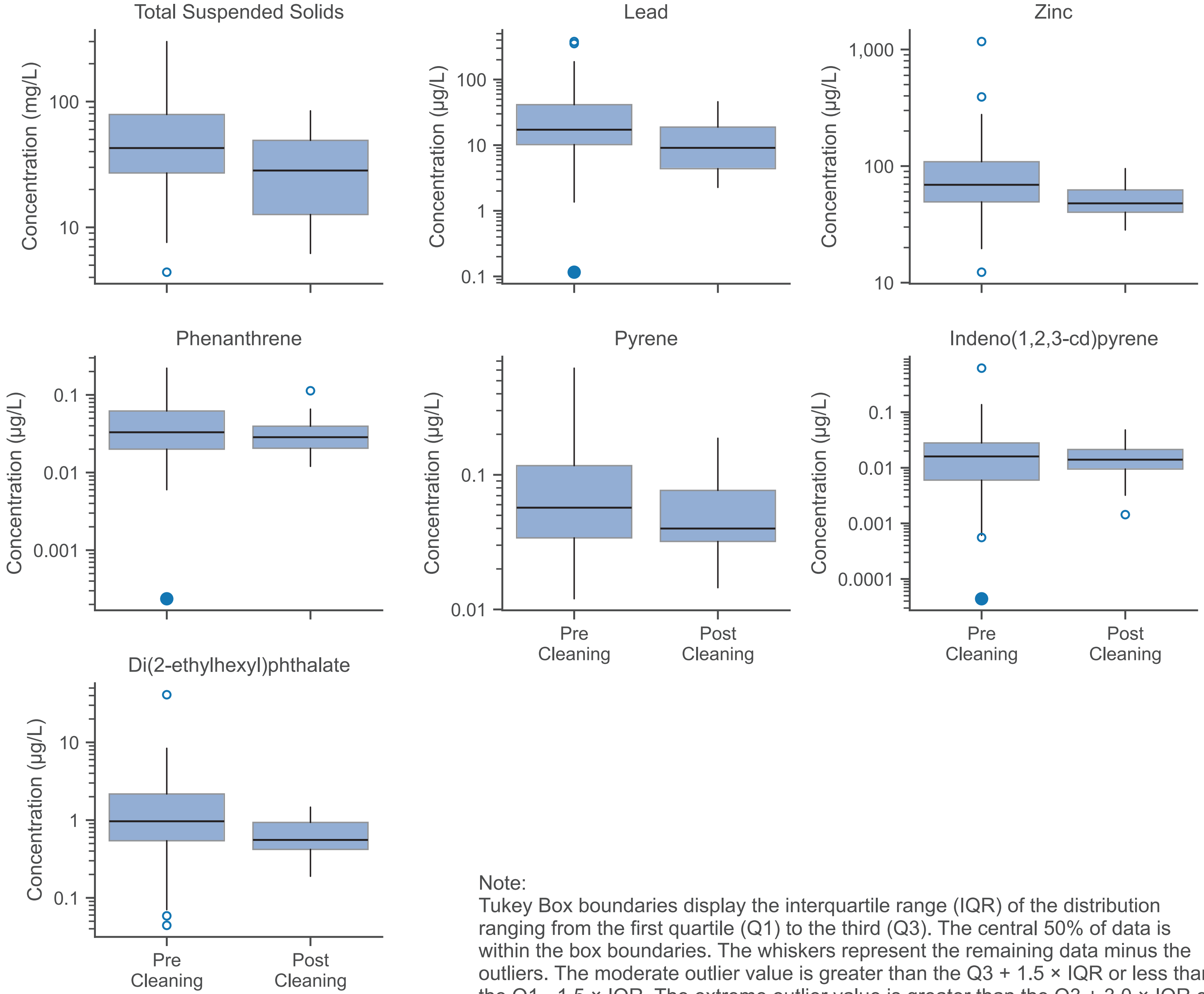
Median Moderate Outlier Extreme Outlier

Figure 2-3.4
OF237B Storm Line Cleaning Comparison [Log Scale]
October 2001 - September 2024



Note:
Tukey Box boundaries display the interquartile range (IQR) of the distribution ranging from the first quartile (Q1) to the third (Q3). The central 50% of data is within the box boundaries. The whiskers represent the remaining data minus the outliers. The moderate outlier value is greater than the Q3 + 1.5 × IQR or less than the Q1 - 1.5 × IQR. The extreme outlier value is greater than the Q3 + 3.0 × IQR or less than the Q1 - 3.0 × IQR.

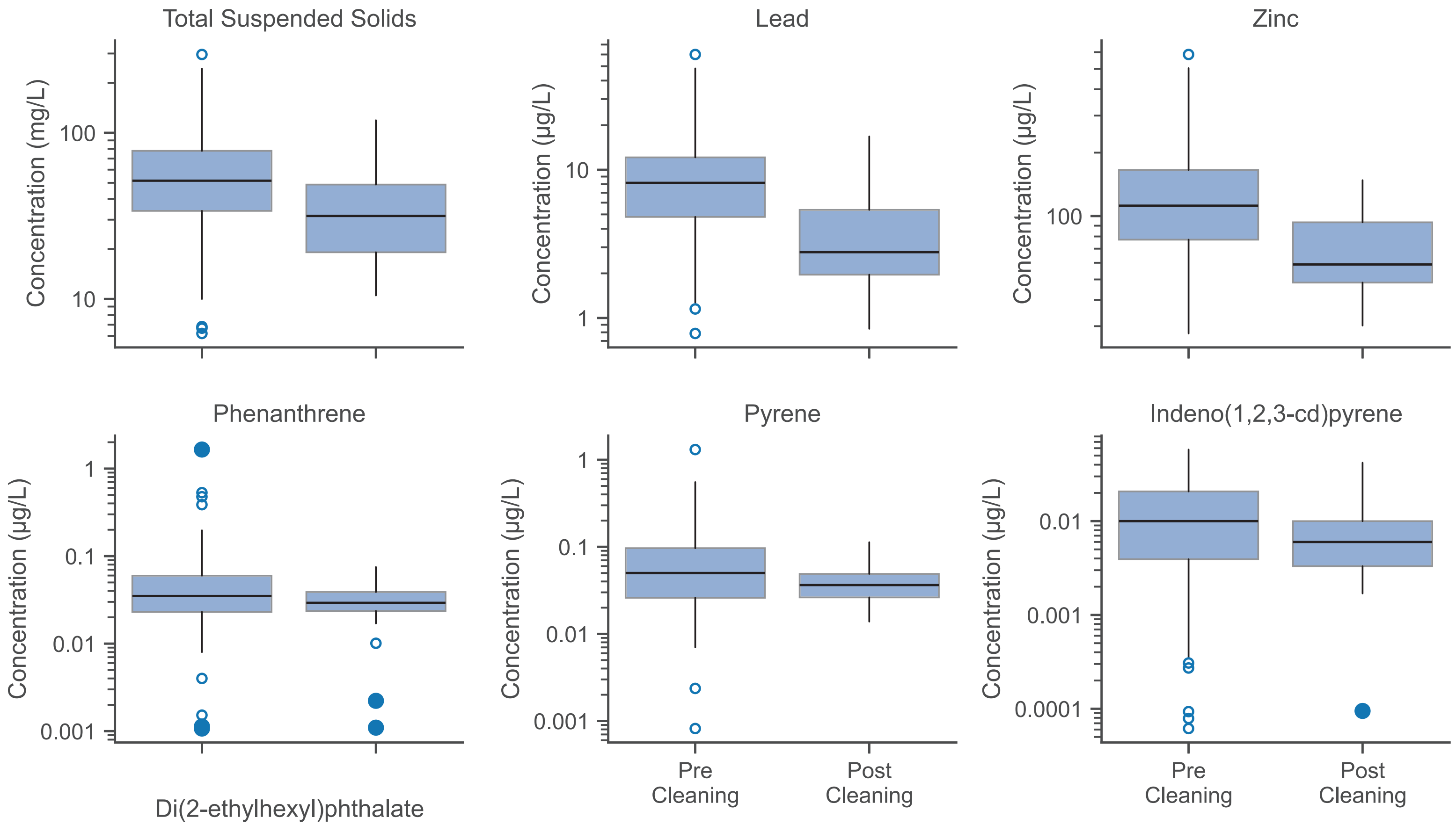
Figure 2-3.5
OF243 Storm Line Cleaning Comparison [Log Scale]
October 2001 - September 2024

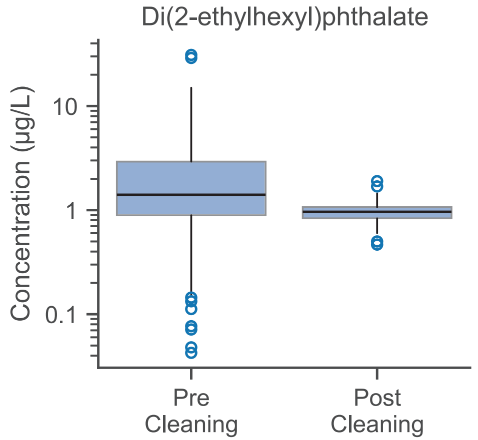


Note:
Tukey Box boundaries display the interquartile range (IQR) of the distribution ranging from the first quartile (Q1) to the third (Q3). The central 50% of data is within the box boundaries. The whiskers represent the remaining data minus the outliers. The moderate outlier value is greater than the Q3 + 1.5 × IQR or less than the Q1 - 1.5 × IQR. The extreme outlier value is greater than the Q3 + 3.0 × IQR or less than the Q1 - 3.0 × IQR.

Median   Moderate Outlier   Extreme Outlier

Figure 2-3.6
OF245 Storm Line Cleaning Comparison [Log Scale]
October 2001 - September 2024

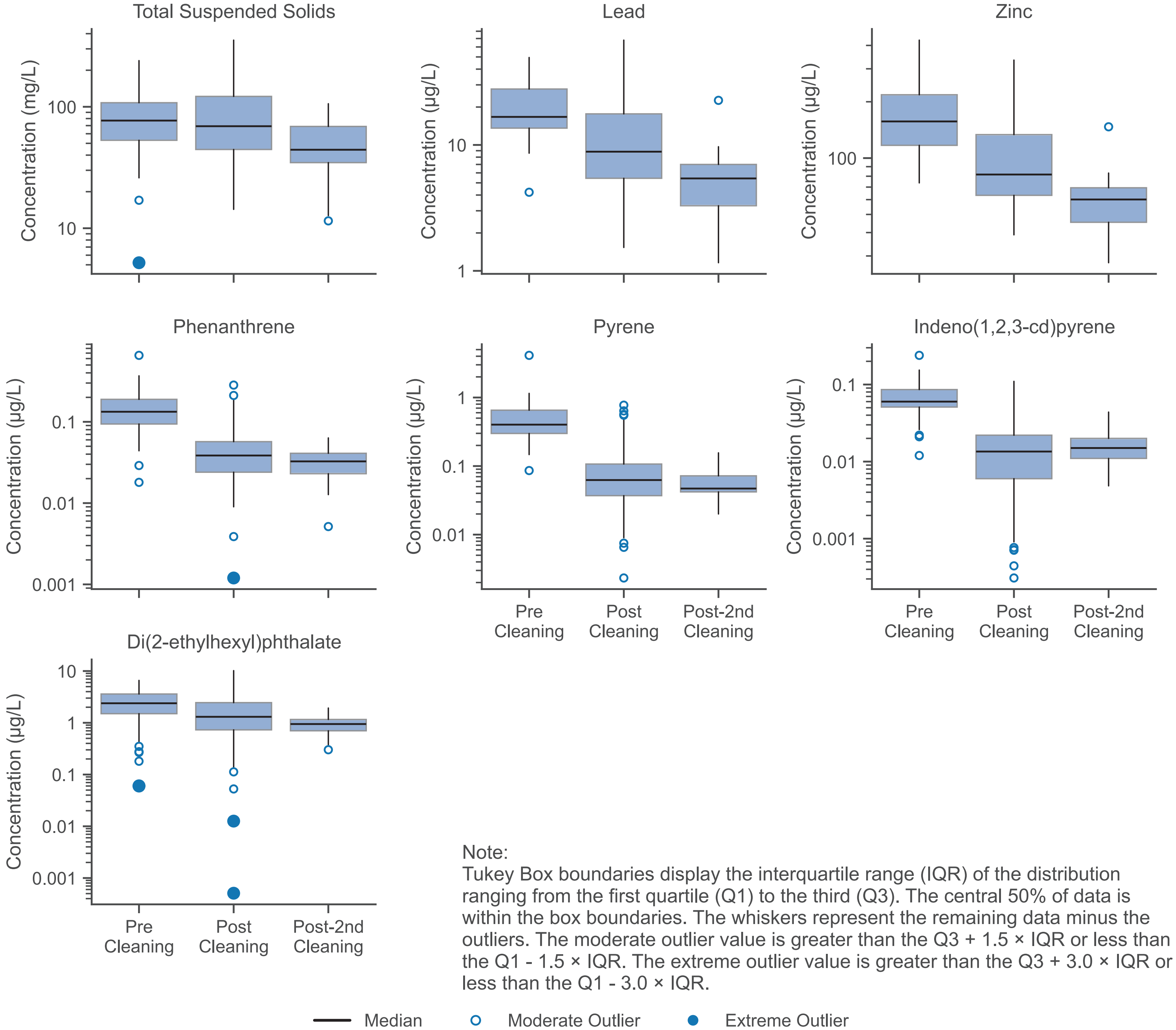




Note:
Tukey Box boundaries display the interquartile range (IQR) of the distribution ranging from the first quartile (Q1) to the third (Q3). The central 50% of data is within the box boundaries. The whiskers represent the remaining data minus the outliers. The moderate outlier value is greater than the Q3 + 1.5 × IQR or less than the Q1 - 1.5 × IQR. The extreme outlier value is greater than the Q3 + 3.0 × IQR or less than the Q1 - 3.0 × IQR.

Median Moderate Outlier Extreme Outlier

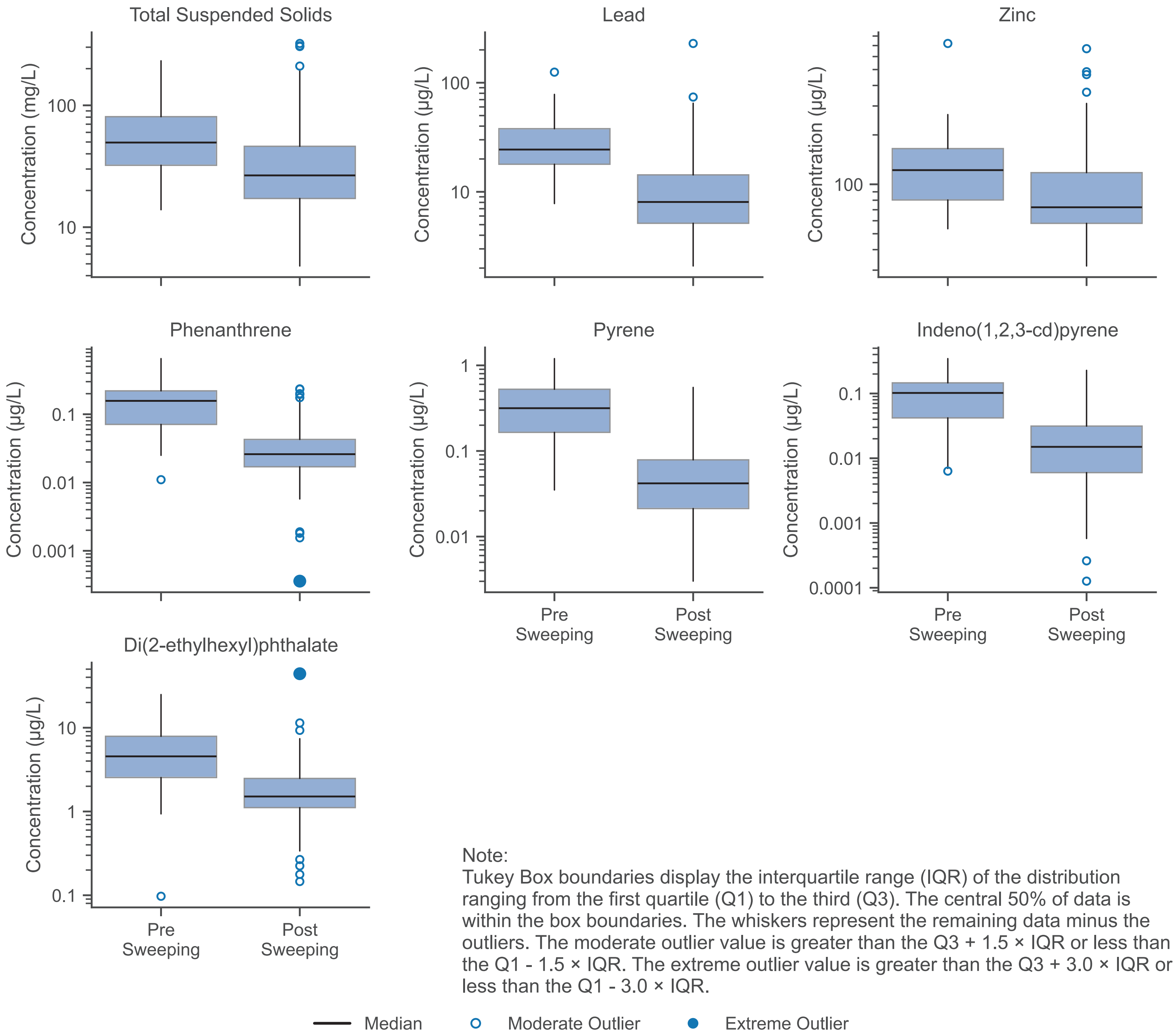
Figure 2-3.7
OF254 Storm Line Cleaning Comparison [Log Scale]
October 2001 - September 2024



Note:
Tukey Box boundaries display the interquartile range (IQR) of the distribution ranging from the first quartile (Q1) to the third (Q3). The central 50% of data is within the box boundaries. The whiskers represent the remaining data minus the outliers. The moderate outlier value is greater than the Q3 + 1.5 × IQR or less than the Q1 - 1.5 × IQR. The extreme outlier value is greater than the Q3 + 3.0 × IQR or less than the Q1 - 3.0 × IQR.

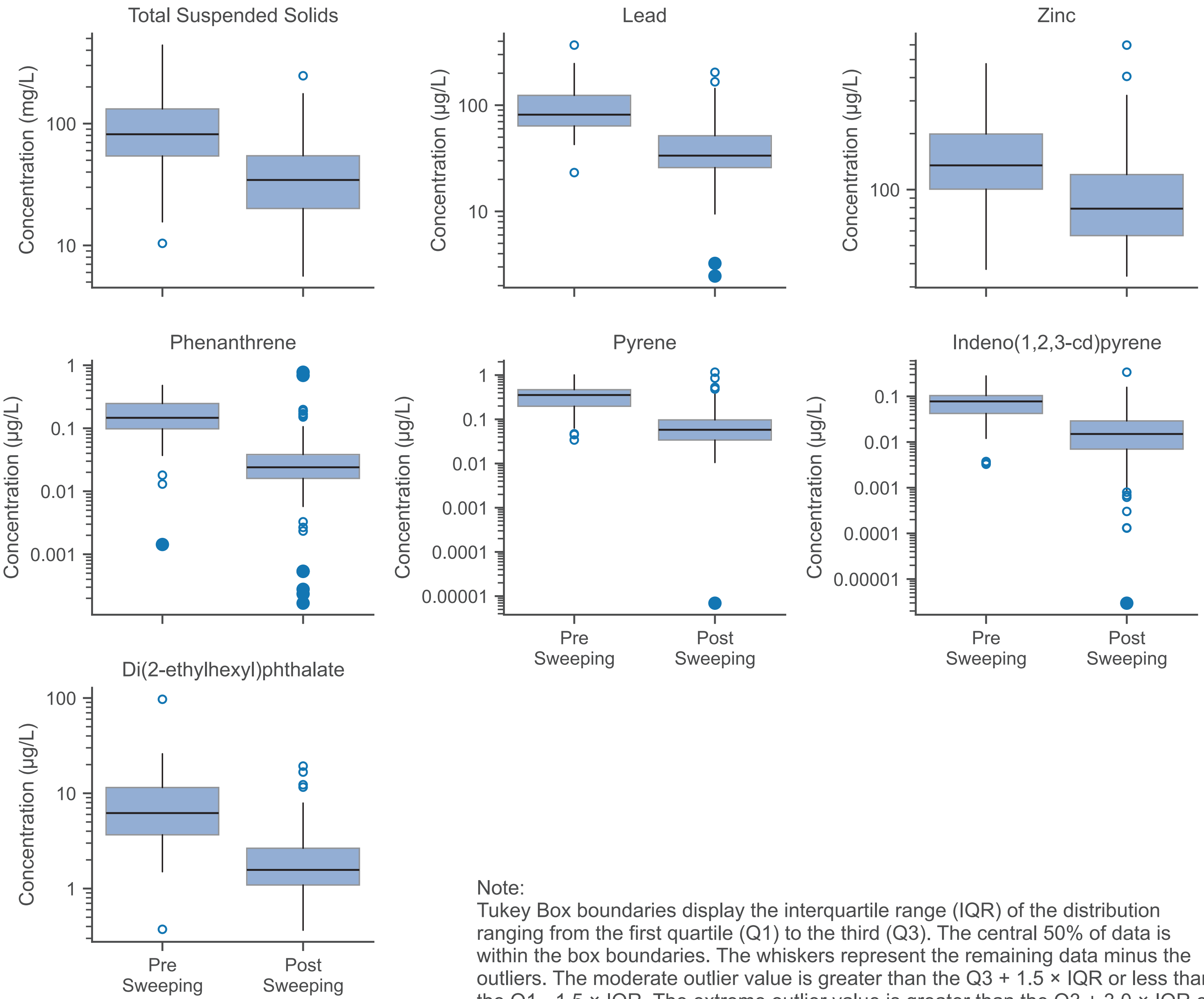
Figure 2-4.1

OF230/230A Street Sweeping Comparison [Log Scale] October 2001 - September 2024



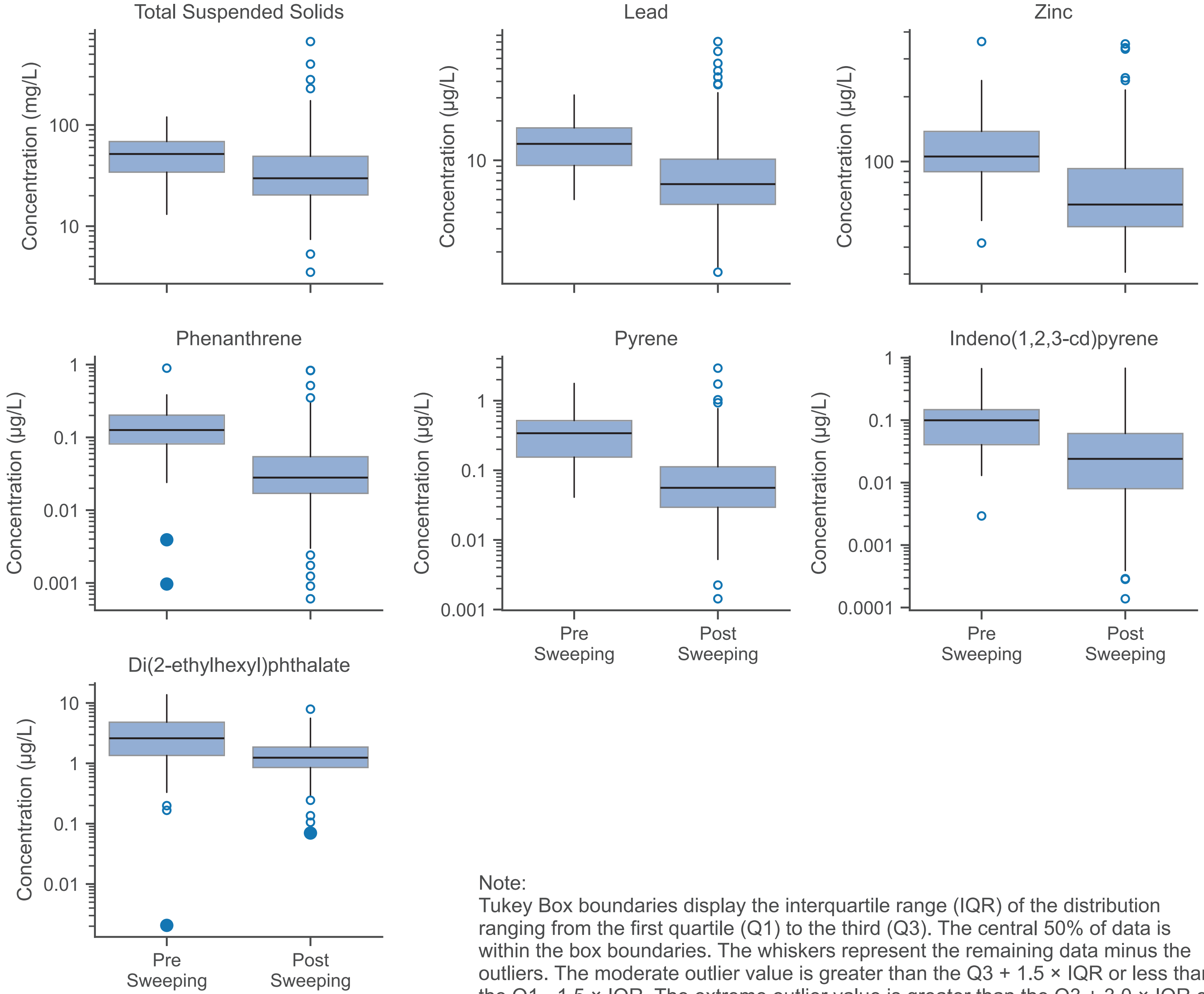
Note:
Tukey Box boundaries display the interquartile range (IQR) of the distribution ranging from the first quartile (Q1) to the third (Q3). The central 50% of data is within the box boundaries. The whiskers represent the remaining data minus the outliers. The moderate outlier value is greater than the Q3 + 1.5 × IQR or less than the Q1 - 1.5 × IQR. The extreme outlier value is greater than the Q3 + 3.0 × IQR or less than the Q1 - 3.0 × IQR.

Figure 2-4.2
OF235 Street Sweeping Comparison [Log Scale]
October 2001 - September 2024



Note:
Tukey Box boundaries display the interquartile range (IQR) of the distribution ranging from the first quartile (Q1) to the third (Q3). The central 50% of data is within the box boundaries. The whiskers represent the remaining data minus the outliers. The moderate outlier value is greater than the Q3 + 1.5 × IQR or less than the Q1 - 1.5 × IQR. The extreme outlier value is greater than the Q3 + 3.0 × IQR or less than the Q1 - 3.0 × IQR.

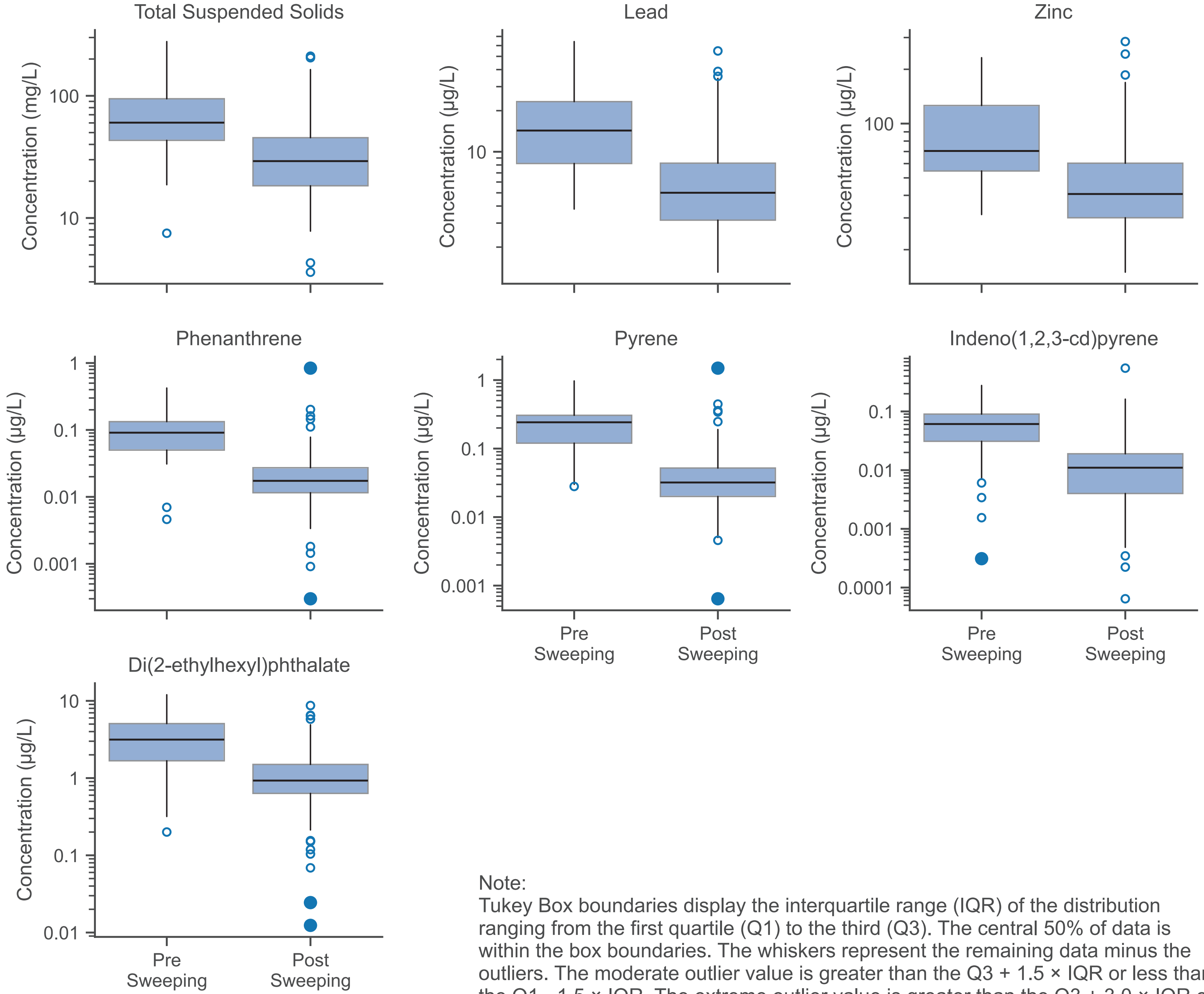
Figure 2-4.3
OF237A New Street Sweeping Comparison [Log Scale]
October 2001 - September 2024



Note:
Tukey Box boundaries display the interquartile range (IQR) of the distribution ranging from the first quartile (Q1) to the third (Q3). The central 50% of data is within the box boundaries. The whiskers represent the remaining data minus the outliers. The moderate outlier value is greater than the Q3 + 1.5 × IQR or less than the Q1 - 1.5 × IQR. The extreme outlier value is greater than the Q3 + 3.0 × IQR or less than the Q1 - 3.0 × IQR.

Median   Moderate Outlier   Extreme Outlier

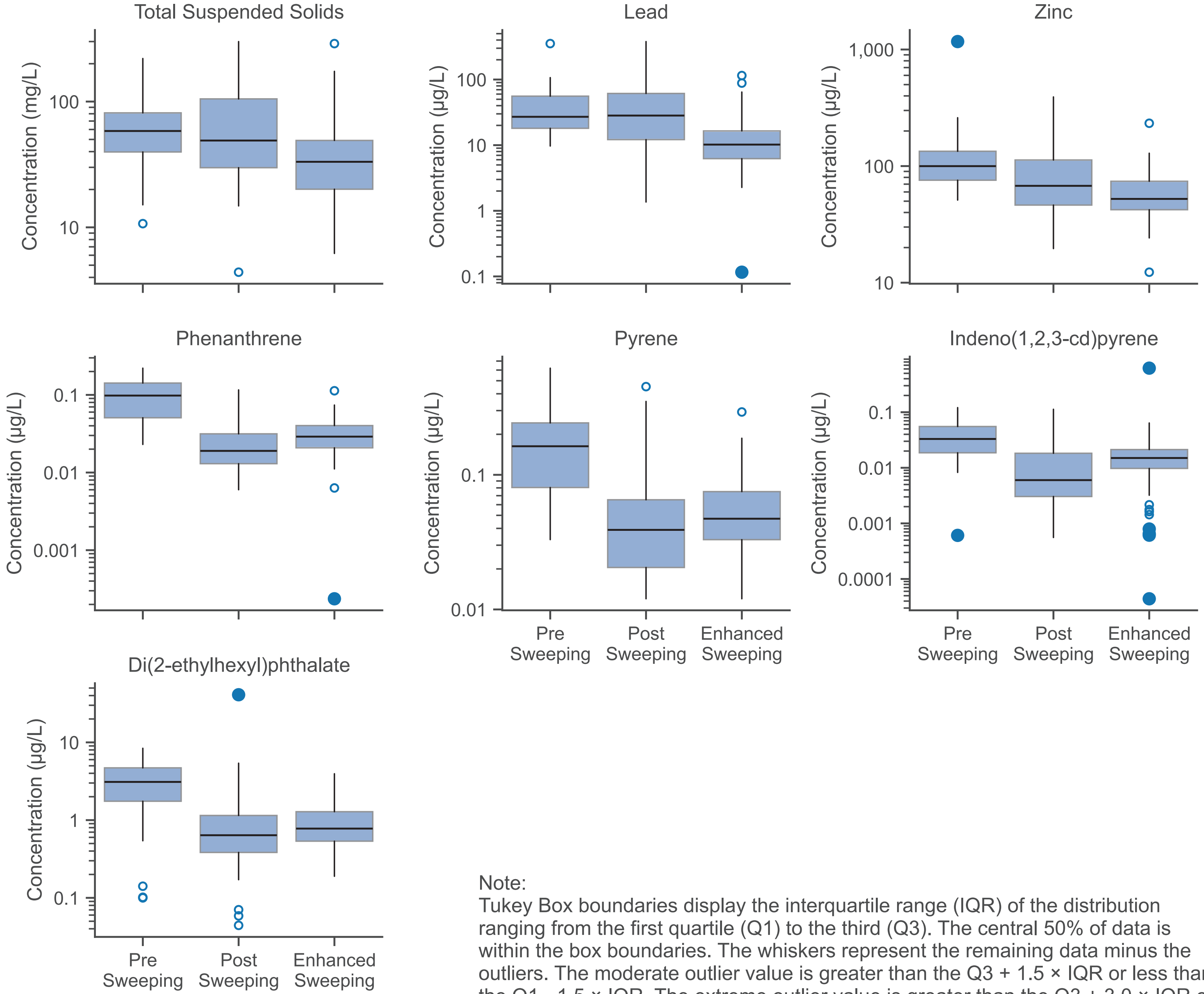
Figure 2-4.4
OF237B Street Sweeping Comparison [Log Scale]
October 2001 - September 2024



Note:
Tukey Box boundaries display the interquartile range (IQR) of the distribution ranging from the first quartile (Q1) to the third (Q3). The central 50% of data is within the box boundaries. The whiskers represent the remaining data minus the outliers. The moderate outlier value is greater than the Q3 + 1.5 × IQR or less than the Q1 - 1.5 × IQR. The extreme outlier value is greater than the Q3 + 3.0 × IQR or less than the Q1 - 3.0 × IQR.

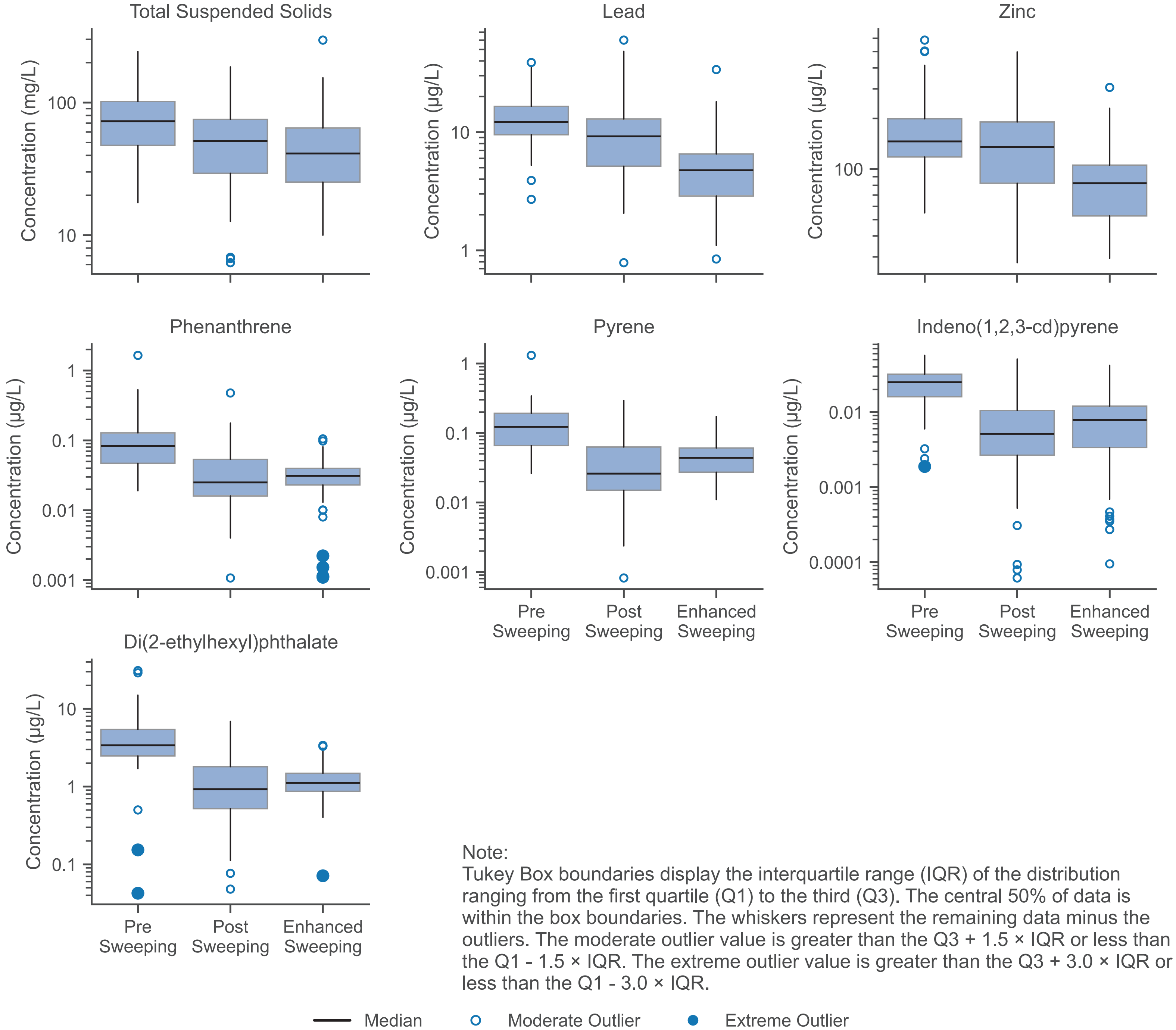
Median Moderate Outlier Extreme Outlier

Figure 2-4.5
OF243 Street Sweeping Comparison [Log Scale]
October 2001 - September 2024



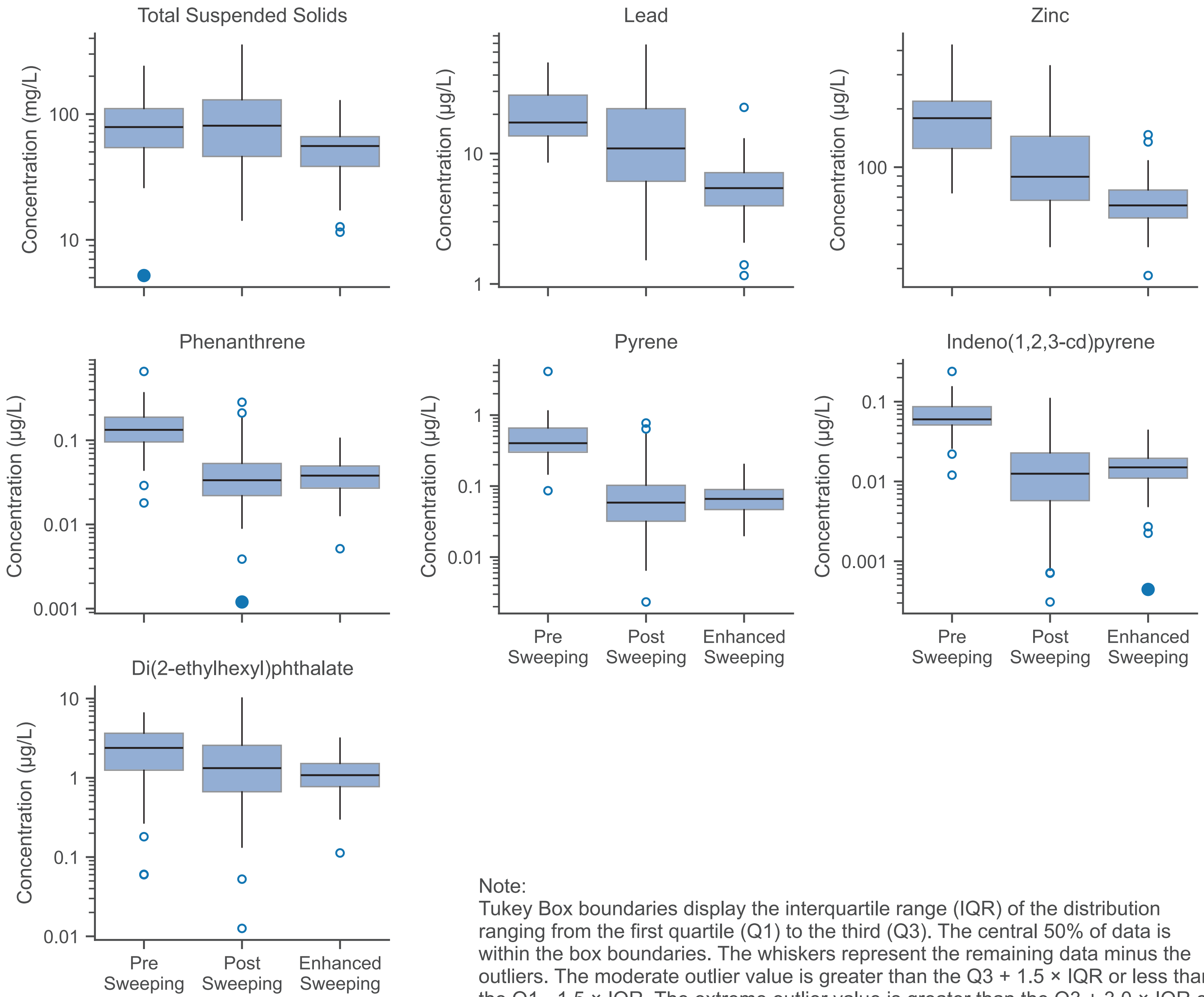
Note:
Tukey Box boundaries display the interquartile range (IQR) of the distribution ranging from the first quartile (Q1) to the third (Q3). The central 50% of data is within the box boundaries. The whiskers represent the remaining data minus the outliers. The moderate outlier value is greater than the Q3 + 1.5 × IQR or less than the Q1 - 1.5 × IQR. The extreme outlier value is greater than the Q3 + 3.0 × IQR or less than the Q1 - 3.0 × IQR.

Figure 2-4.6
OF245 Street Sweeping Comparison [Log Scale]
October 2001 - September 2024



Note:
Tukey Box boundaries display the interquartile range (IQR) of the distribution ranging from the first quartile (Q1) to the third (Q3). The central 50% of data is within the box boundaries. The whiskers represent the remaining data minus the outliers. The moderate outlier value is greater than the Q3 + 1.5 × IQR or less than the Q1 - 1.5 × IQR. The extreme outlier value is greater than the Q3 + 3.0 × IQR or less than the Q1 - 3.0 × IQR.

Figure 2-4.7
OF254 Street Sweeping Comparison [Log Scale]
October 2001 - September 2024



Note:
Tukey Box boundaries display the interquartile range (IQR) of the distribution ranging from the first quartile (Q1) to the third (Q3). The central 50% of data is within the box boundaries. The whiskers represent the remaining data minus the outliers. The moderate outlier value is greater than the Q3 + 1.5 × IQR or less than the Q1 - 1.5 × IQR. The extreme outlier value is greater than the Q3 + 3.0 × IQR or less than the Q1 - 3.0 × IQR.

Median   Moderate Outlier   Extreme Outlier

Figure 3-1
Daily Rainfall - Monthly Averages WY2002-2024

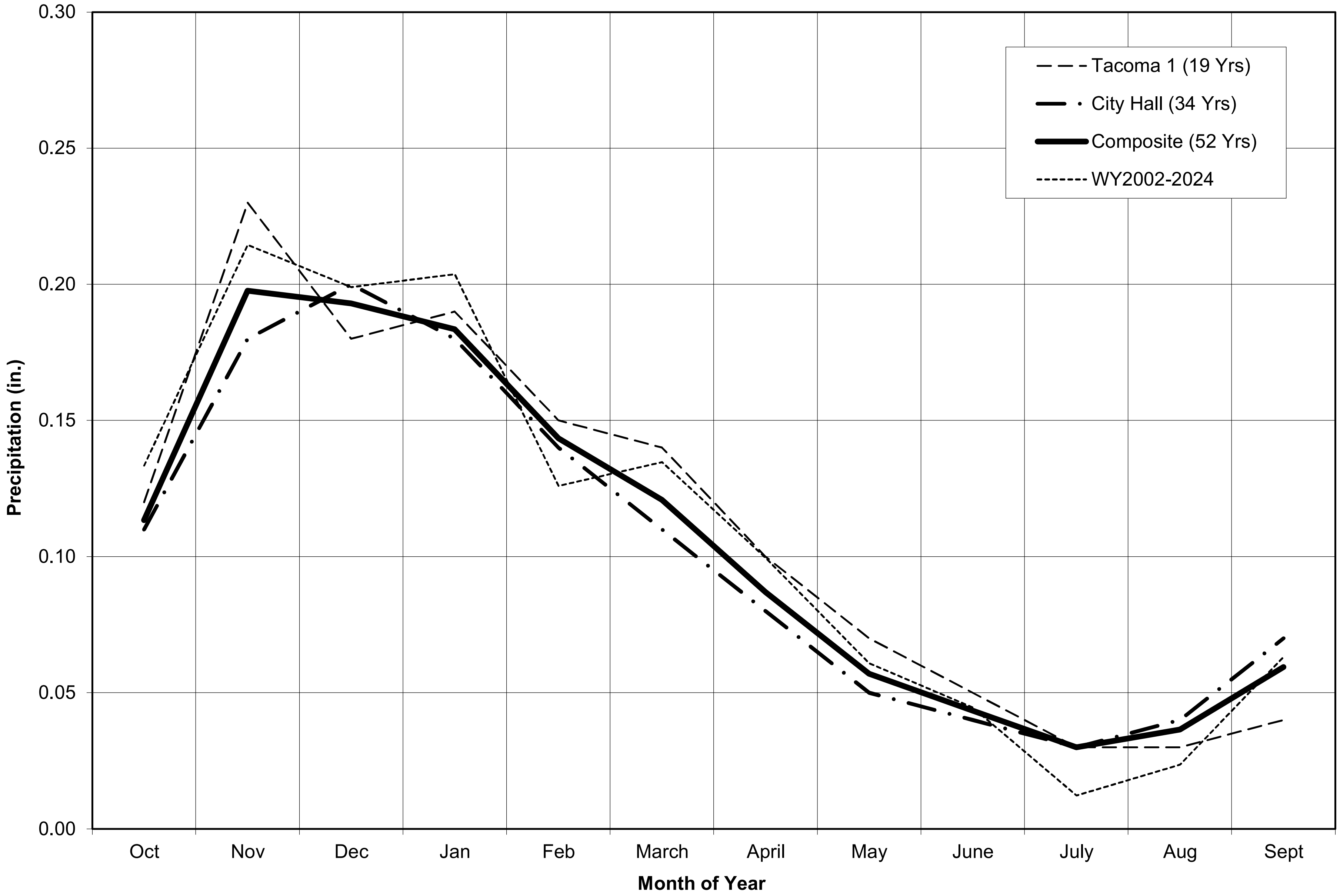


Figure 3-1 Daily Rainfall - Monthly Averages WY2002-2024

Figure 3-2.1
Storm Event Hydrologic Parameters, October 2001 - September 2024

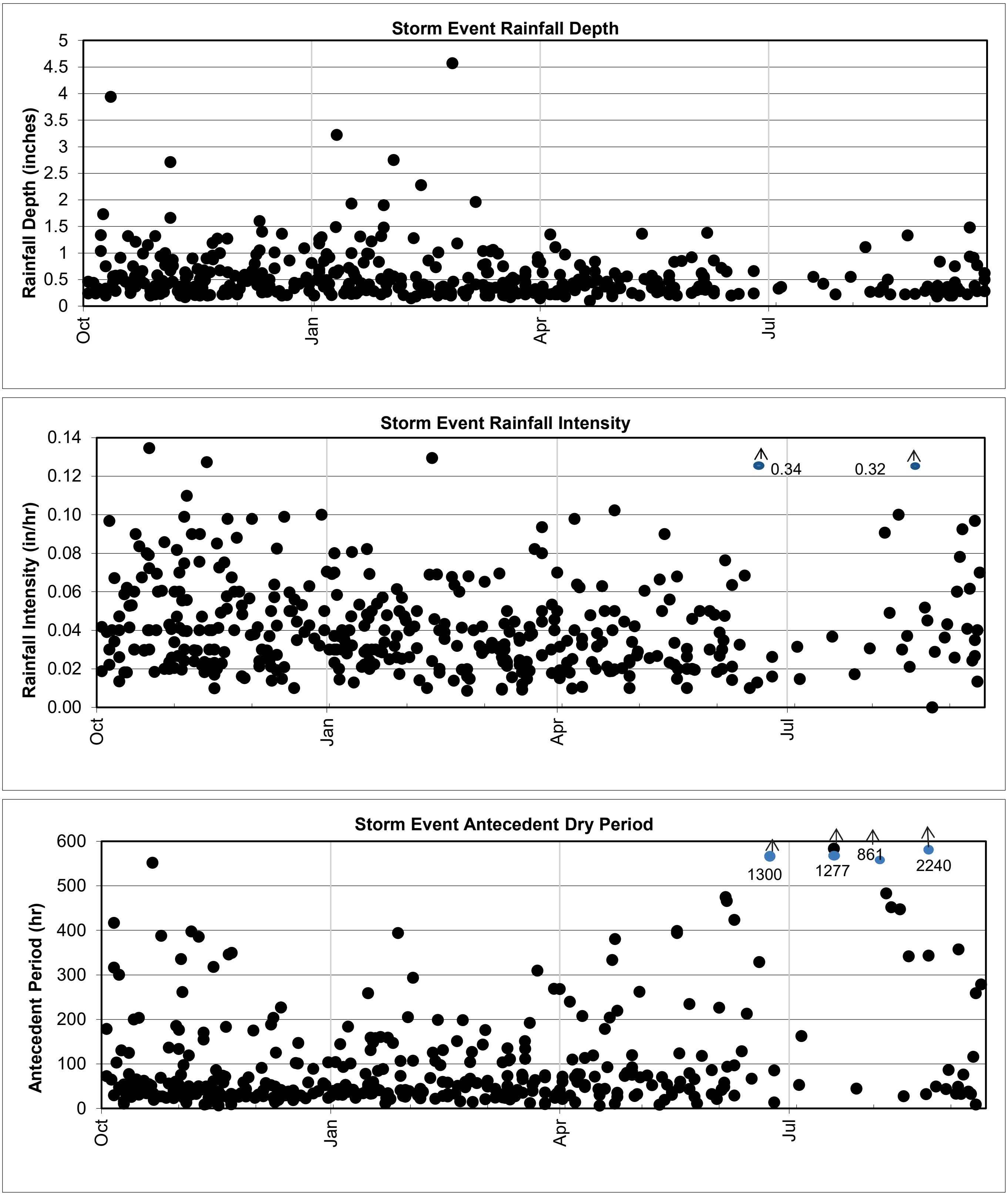


Figure 3-2.1 Storm Event Hydrologic Parameters_WY2024

Figure 3-2.2
Storm Event Hydrologic Parameters, October 2001 - September 2024

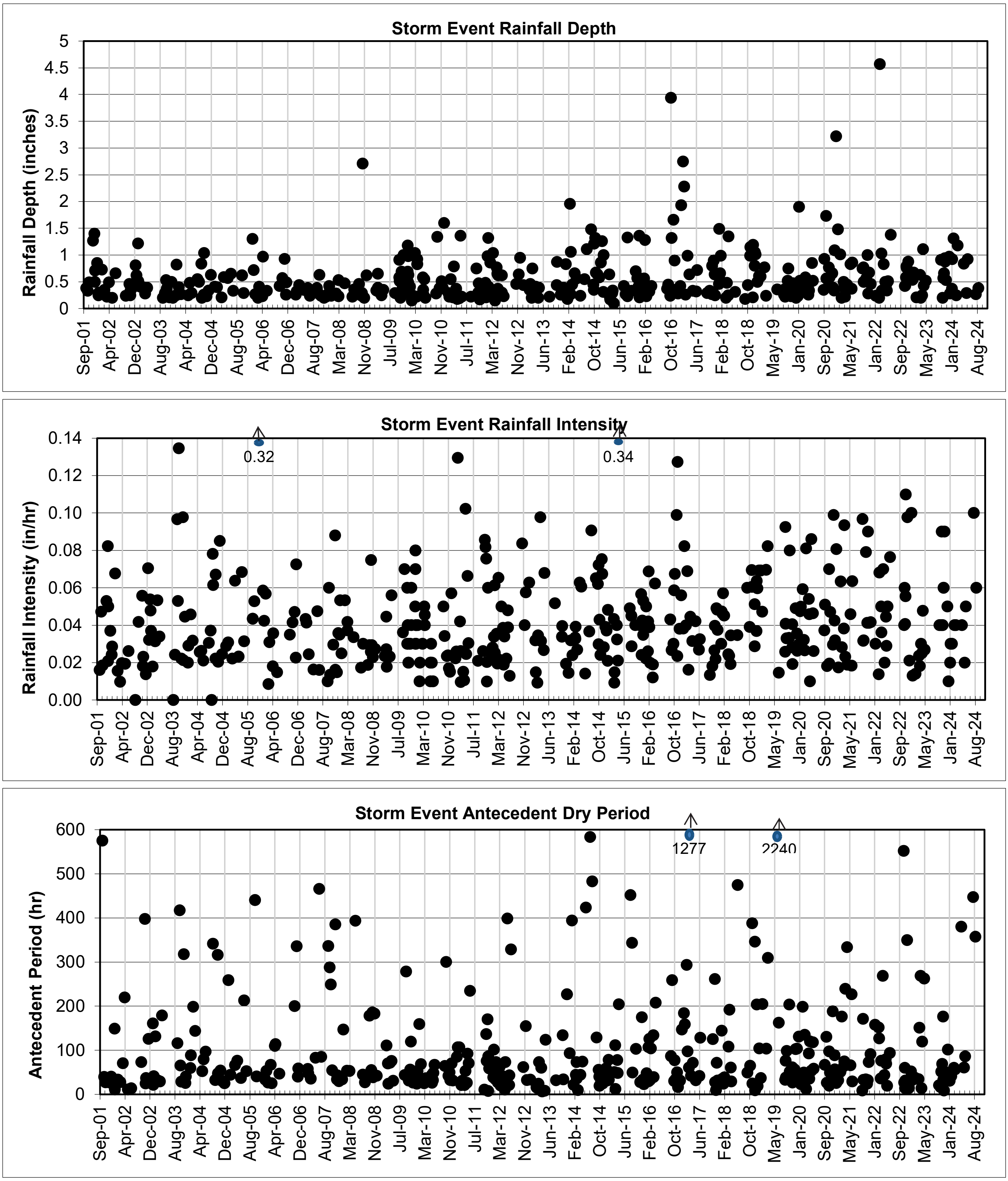
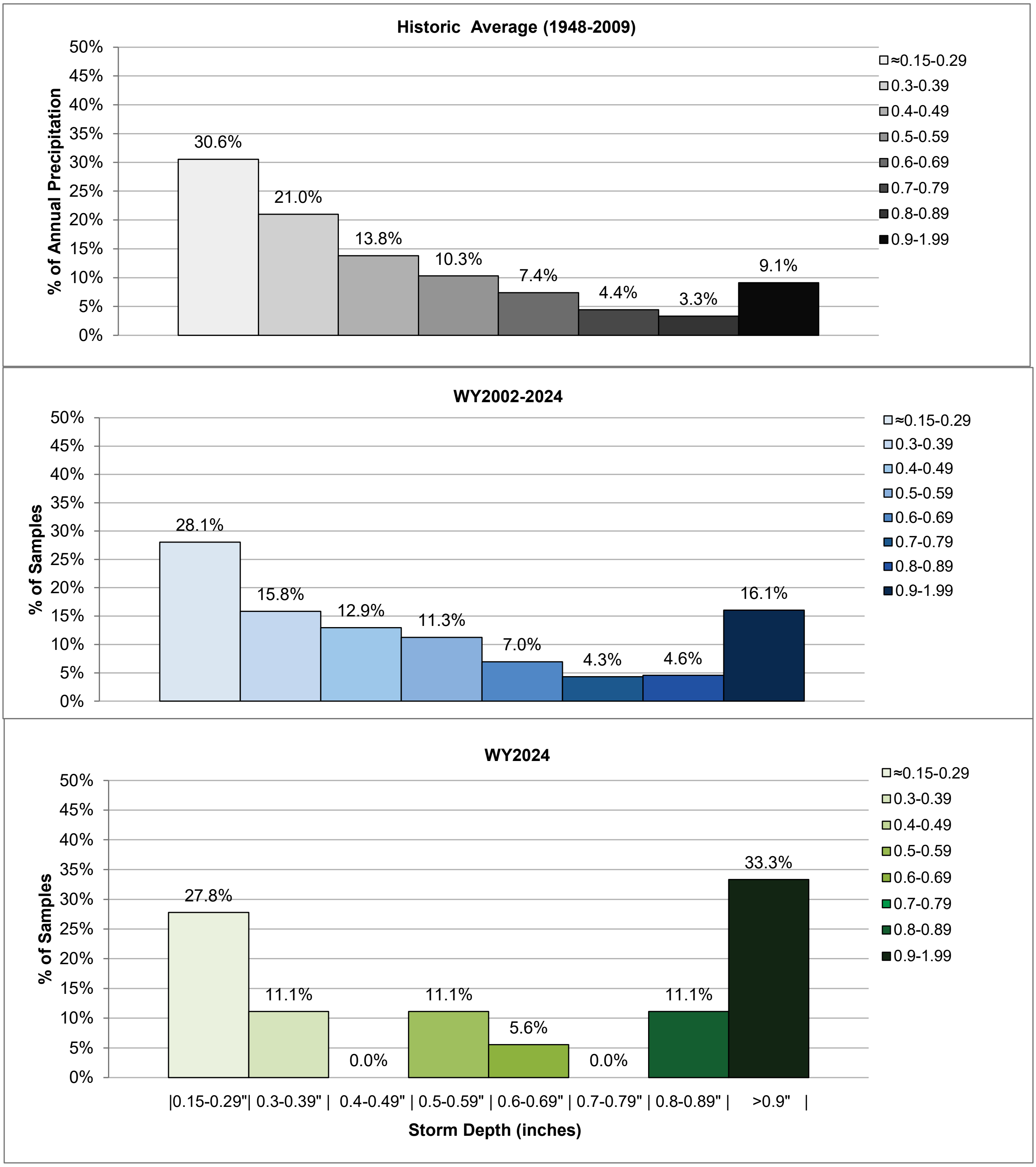


Figure 3-2.2 Storm Event Hydrologic Parameters_WY2024

Figure 3-3
Representativeness of Sampled Storm Sizes



Note: Data for OF237A is from the original OF237A site through WY2011. Data for OF230A is from the original OF230 site through WY2023.

Figure 3-4
Representativeness of Seasonal Sampling Distribution

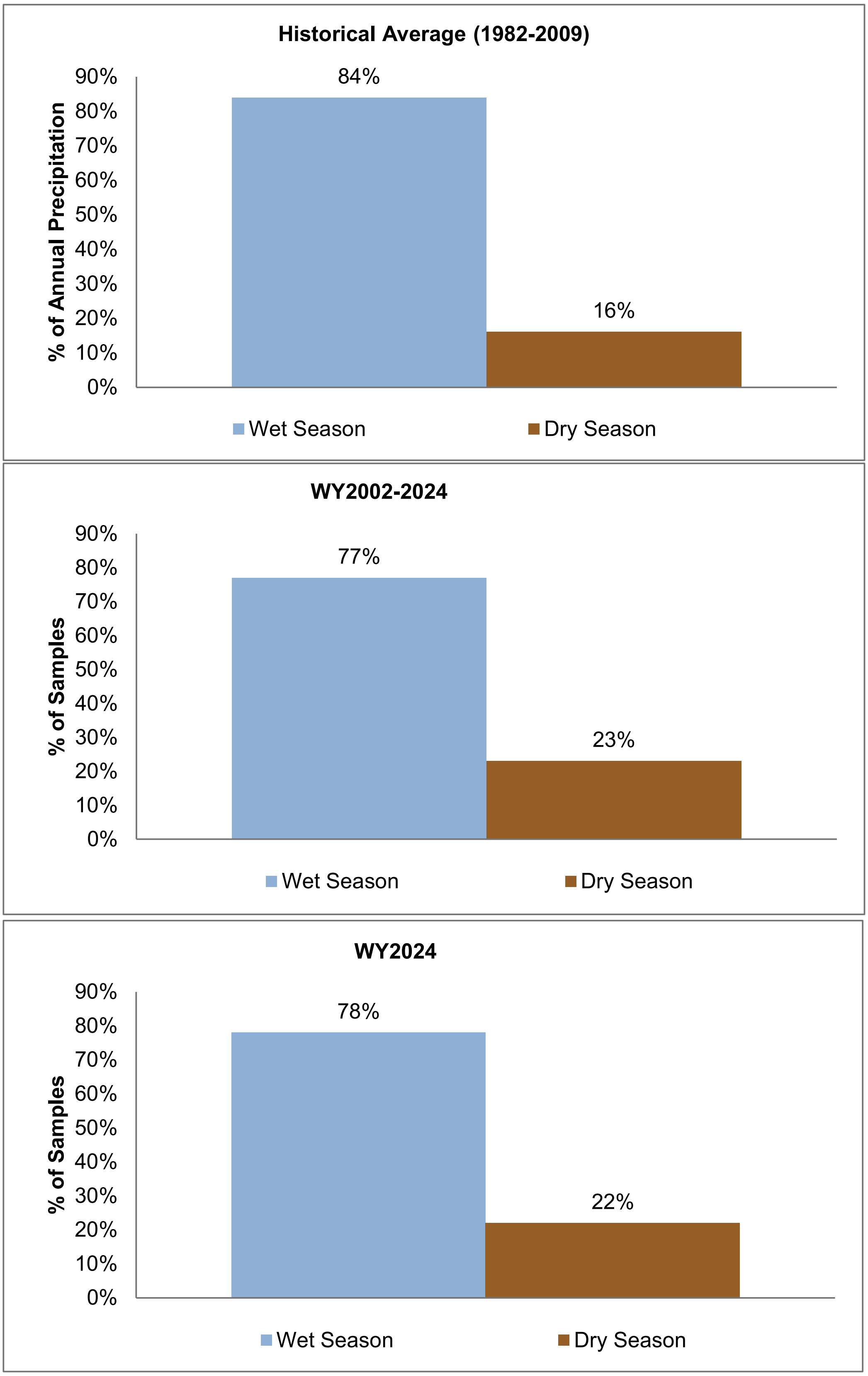


Figure 3-4 Seasonal Representativeness_WY2024

Figure 3-5.1
Linear Regression Analysis of Stormwater Time Trends
Time Series for Total Suspended Solids
September 2001 - September 2024

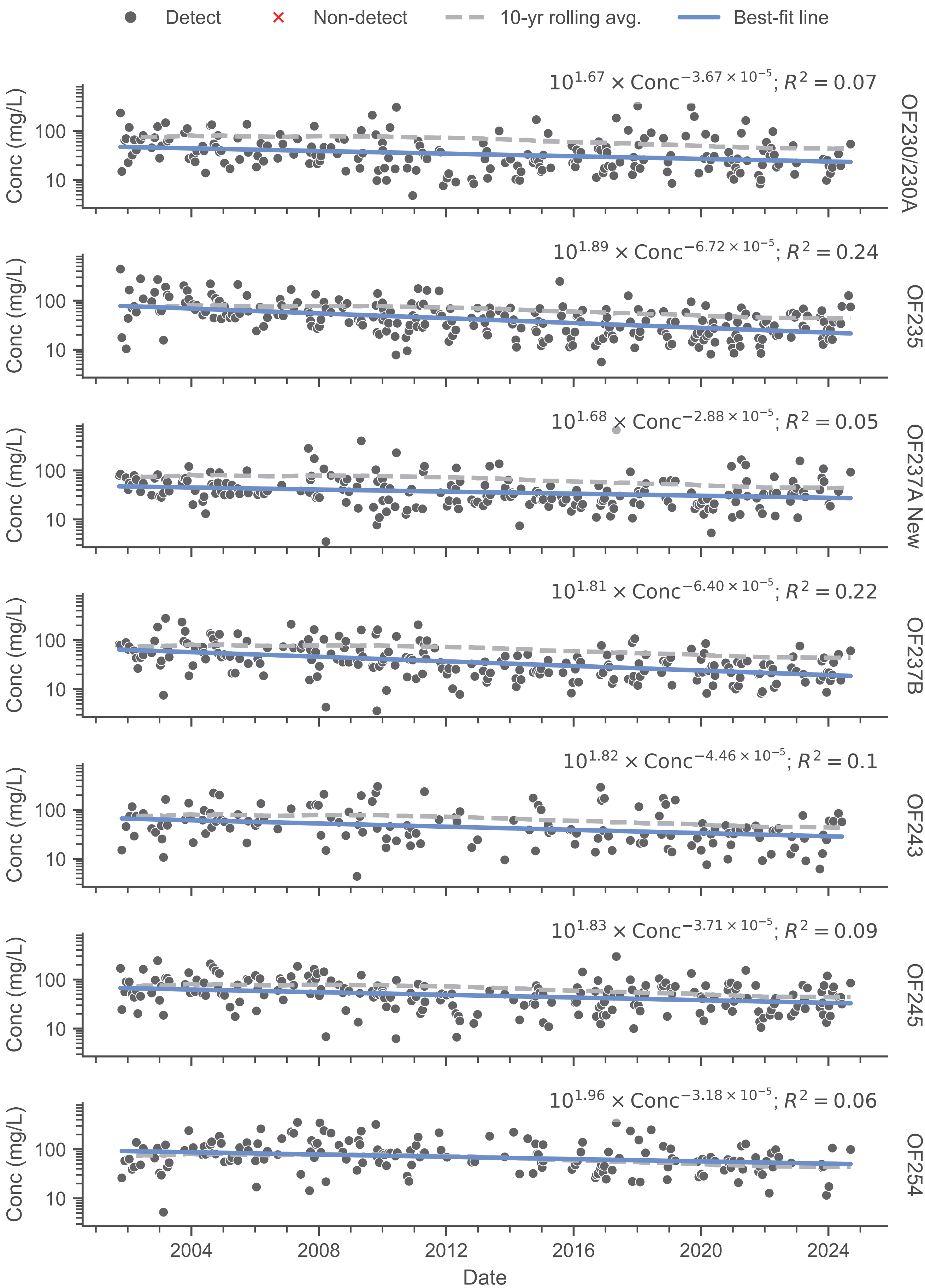


Figure 3-5.2
Linear Regression Analysis of Stormwater Time Trends
Time Series for Copper
September 2001 - September 2024

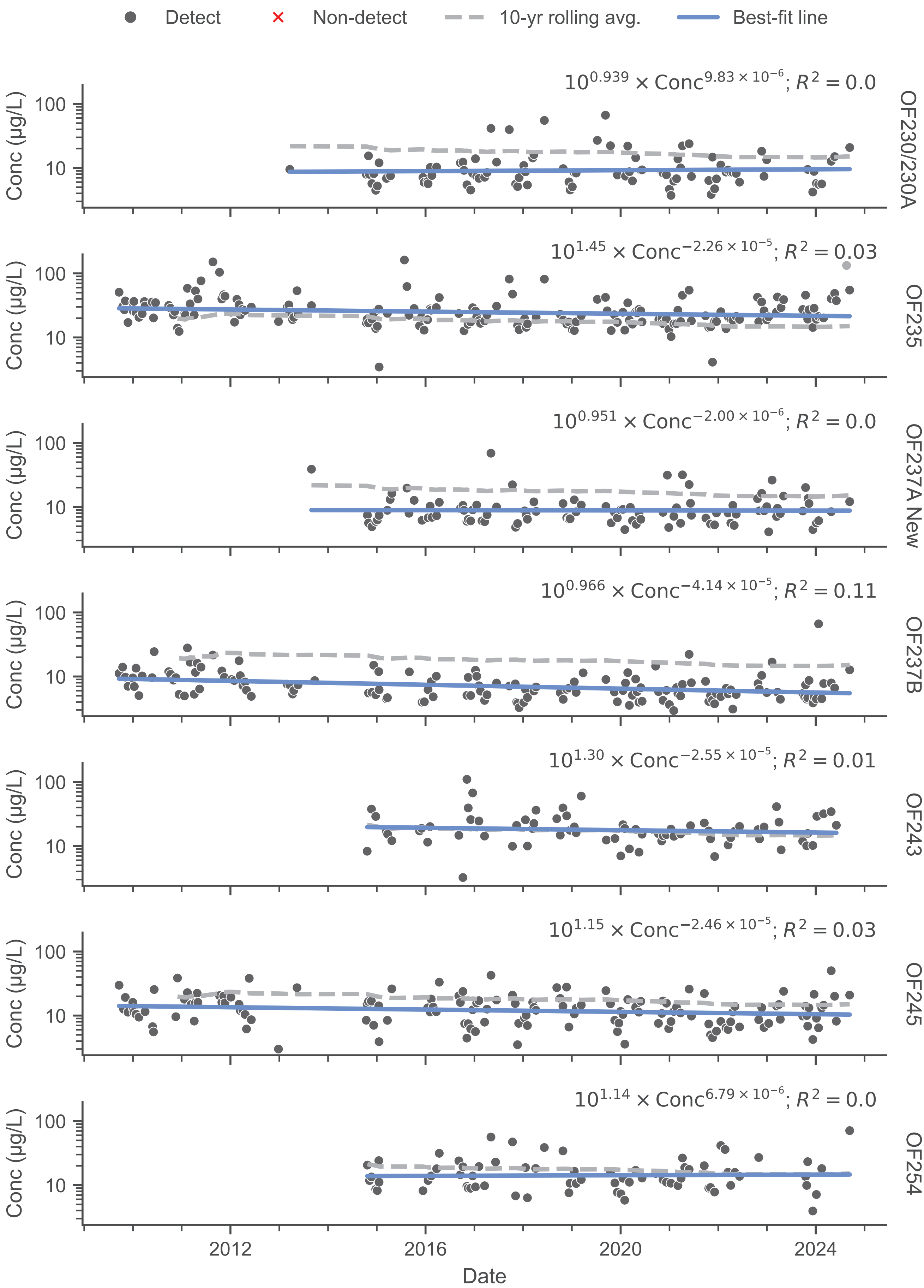


Figure 3-5.3
Linear Regression Analysis of Stormwater Time Trends
Time Series for Lead
September 2001 - September 2024

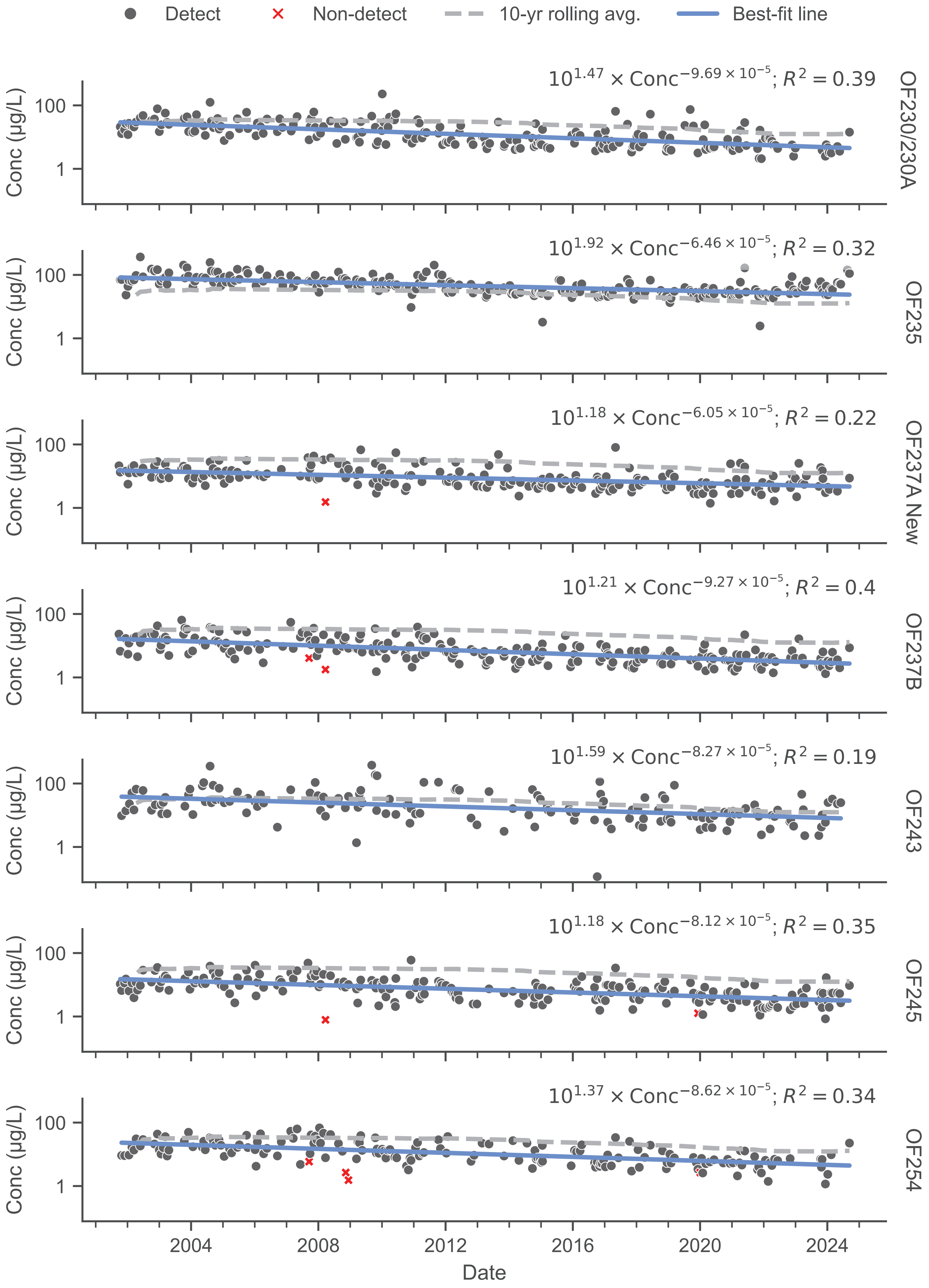


Figure 3-5.4
Linear Regression Analysis of Stormwater Time Trends
Time Series for Zinc
September 2001 - September 2024

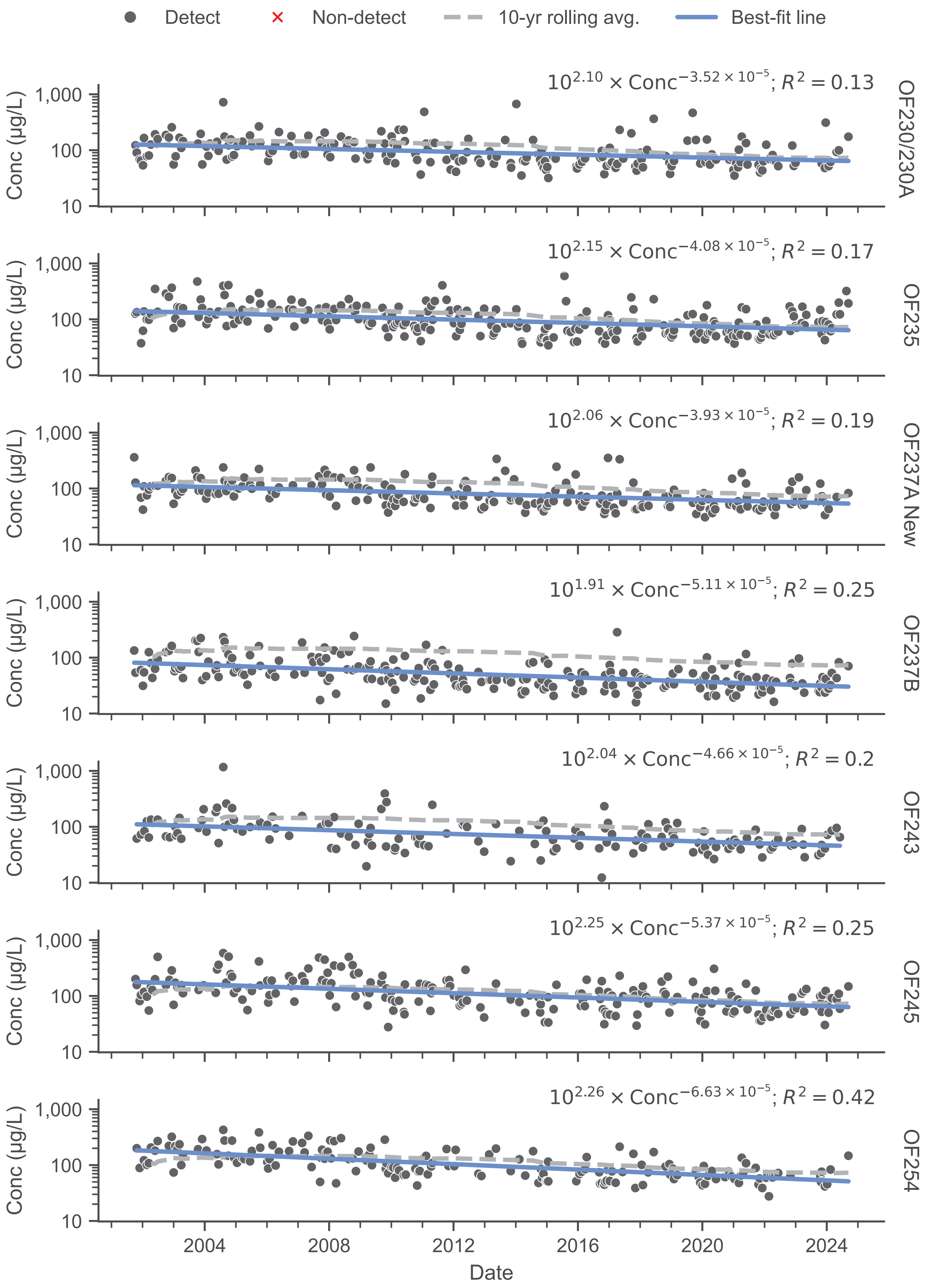


Figure 3-5.5
Linear Regression Analysis of Stormwater Time Trends
Time Series for Phenanthrene
September 2001 - September 2024

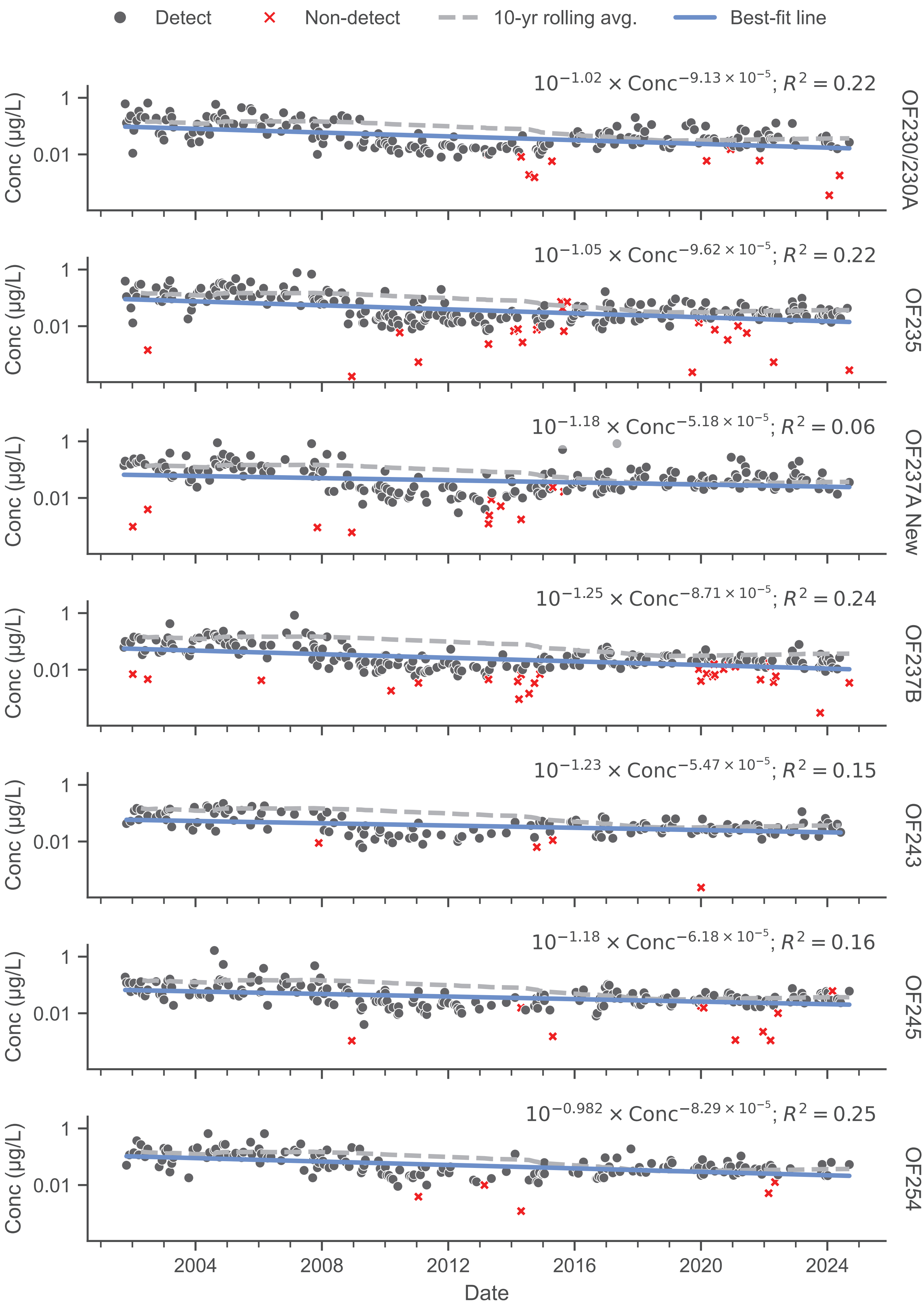


Figure 3-5.6
Linear Regression Analysis of Stormwater Time Trends
Time Series for Pyrene
September 2001 - September 2024

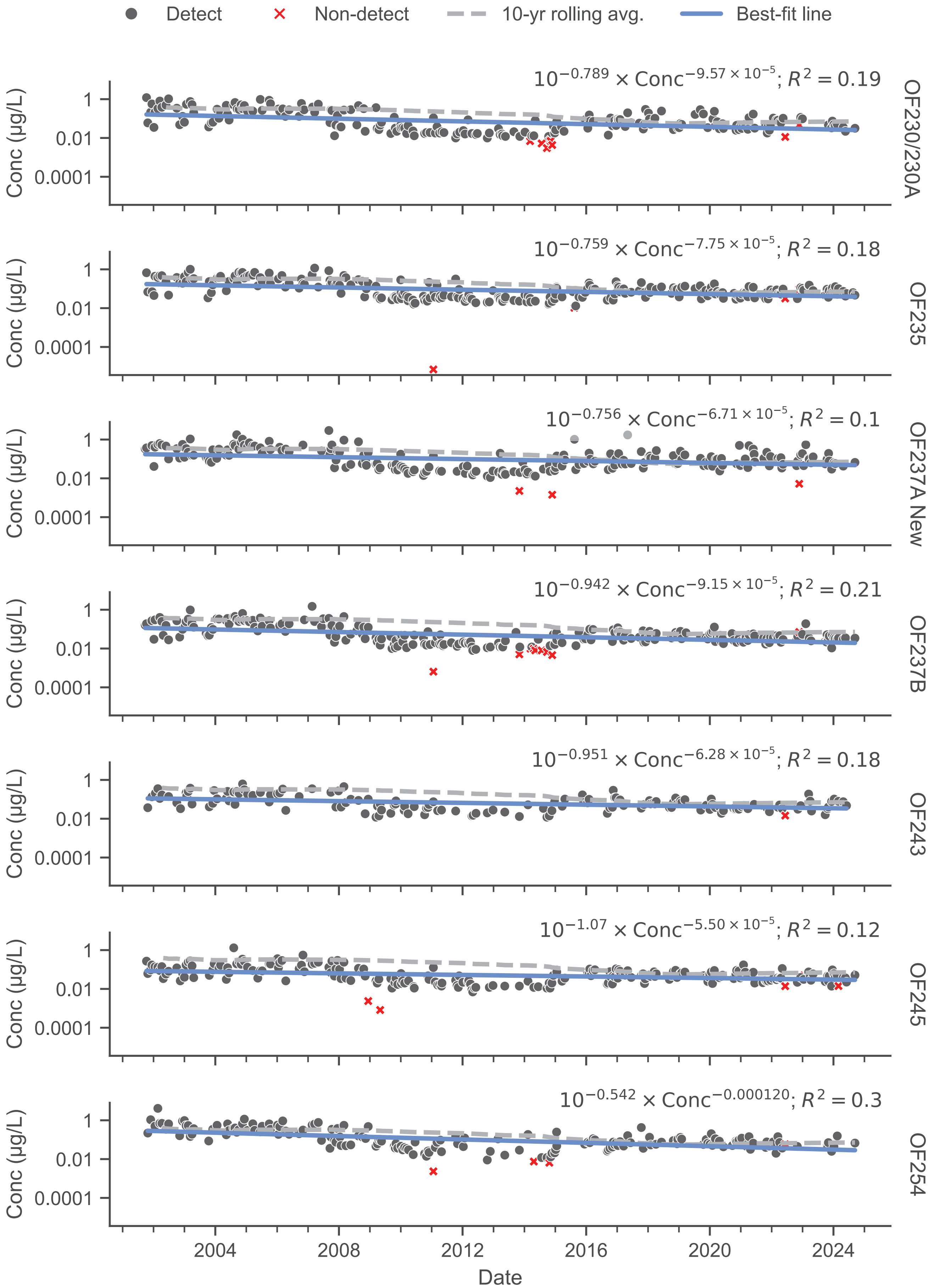


Figure 3-5.7
Linear Regression Analysis of Stormwater Time Trends
Time Series for Indeno(1,2,3-cd)pyrene
September 2001 - September 2024

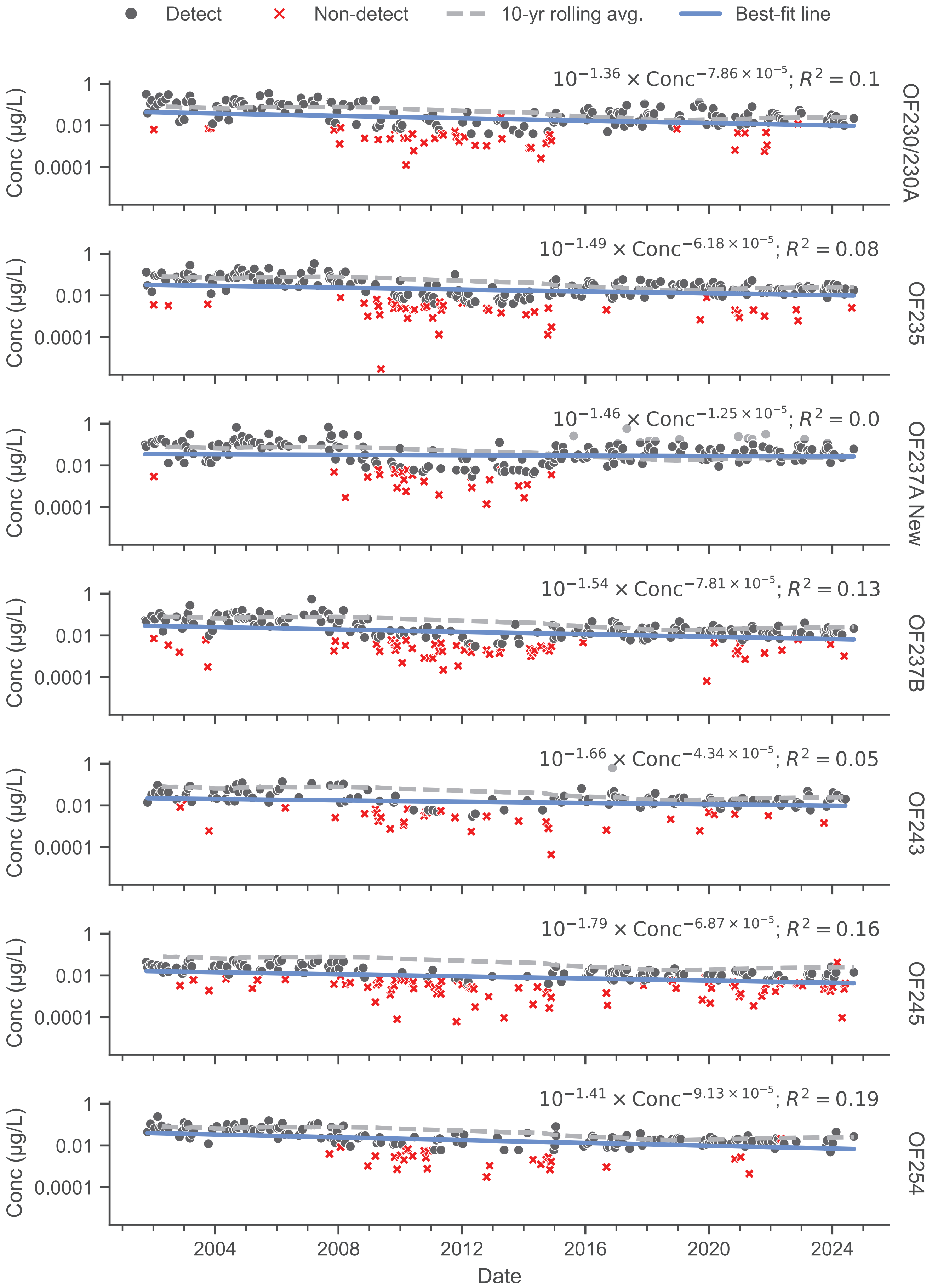


Figure 3-5.8
Linear Regression Analysis of Stormwater Time Trends
Time Series for Di(2-ethylhexyl)phthalate
September 2001 - September 2024

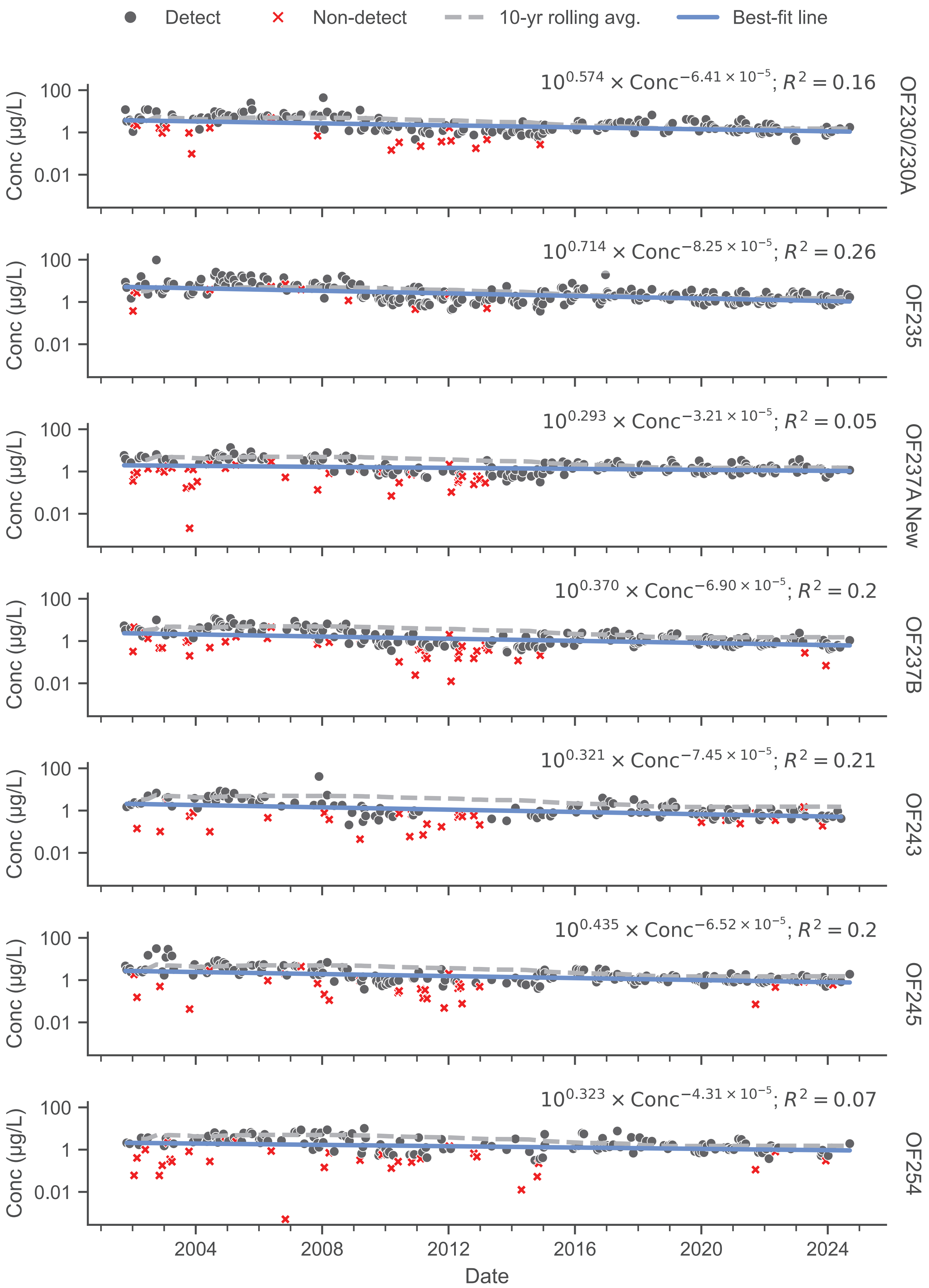
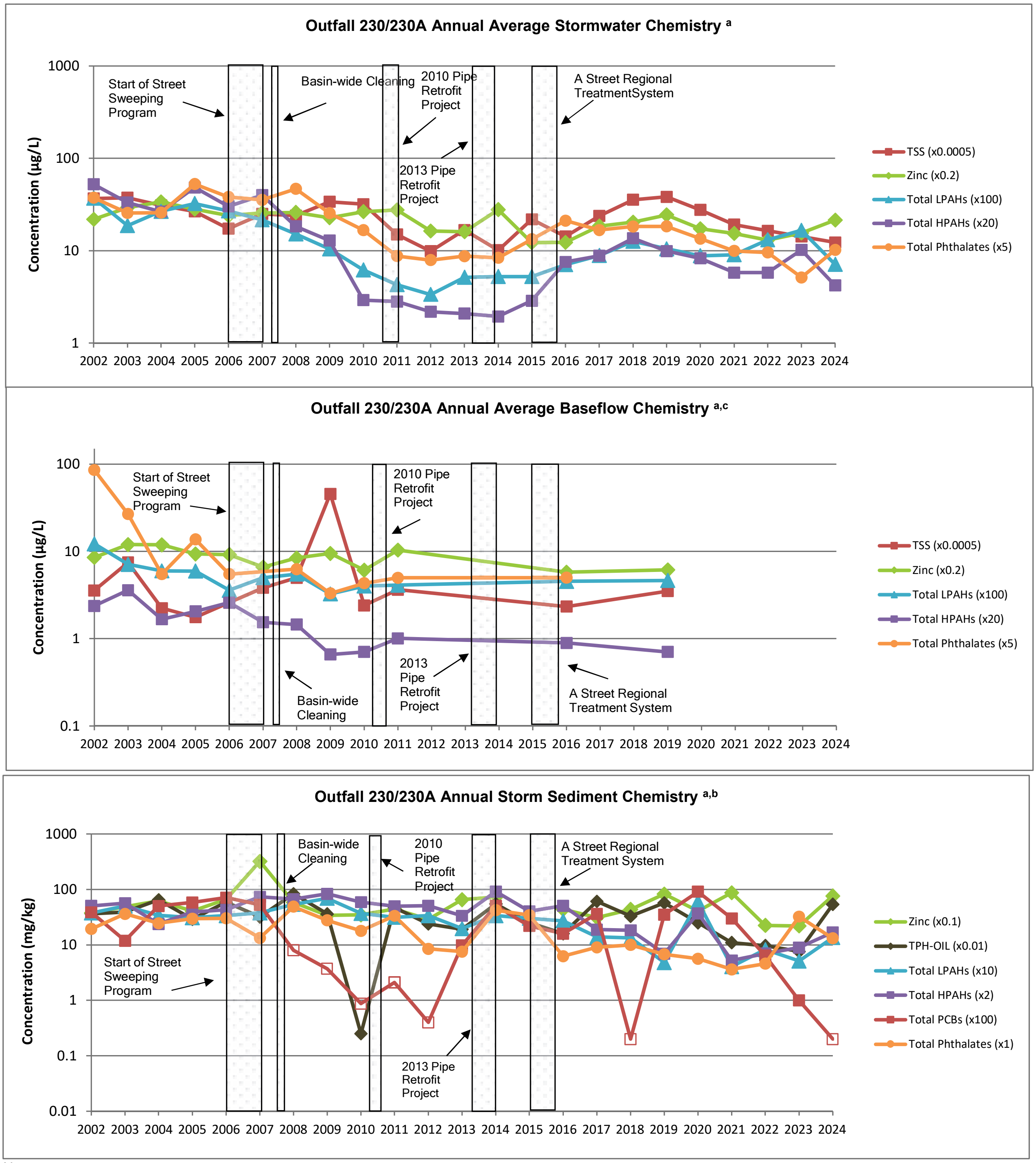


Figure 5-1.1
Analysis of Monitoring Trends in Stormwater, Baseflow, and Storm Sediment OF230/230A



Notes:

[a] Results shown are a product of chemistry data and an analyte-specific multiplier in order to display results on a common scale

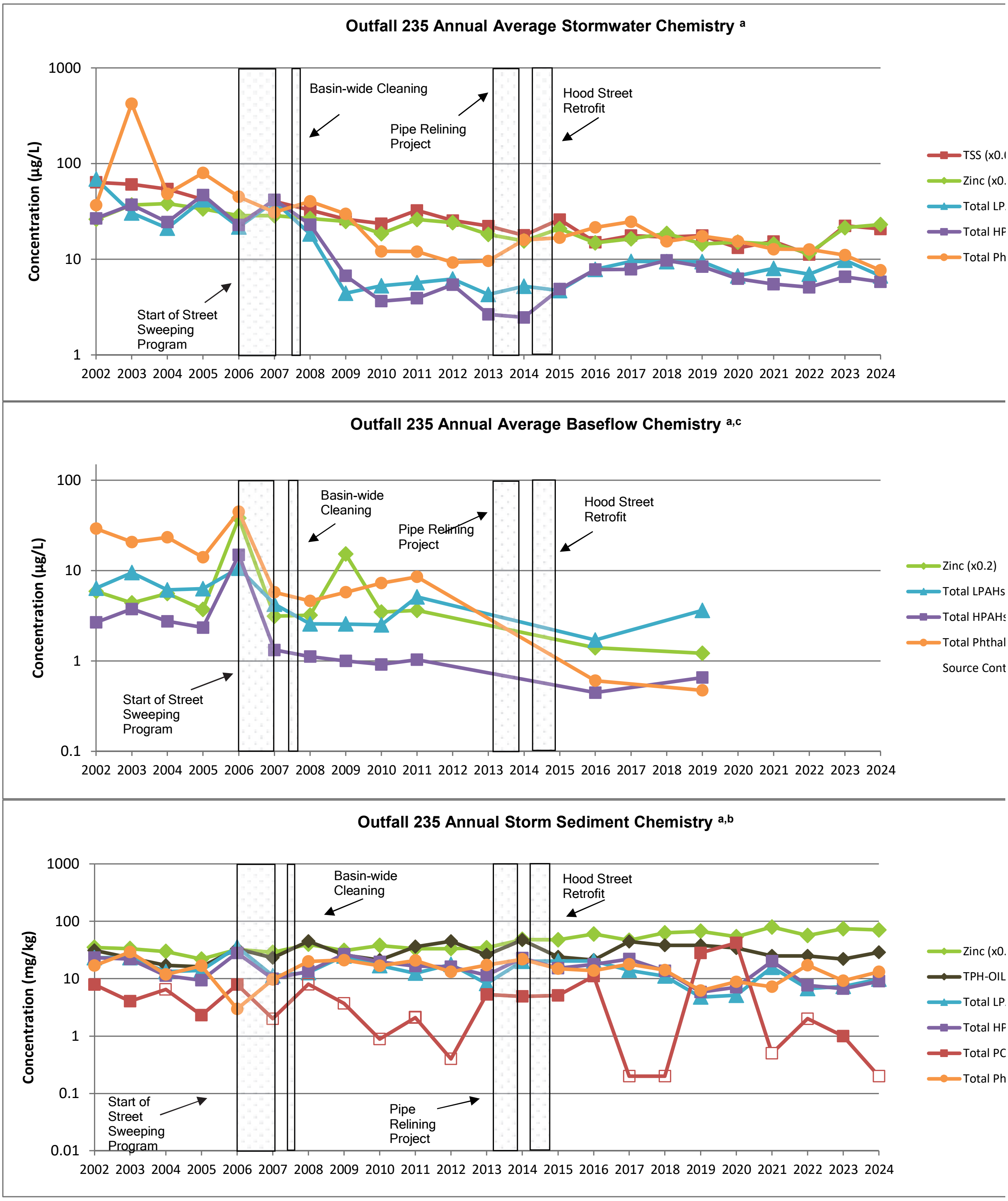
[b] Open symbols denote censored data; highest detection limit posted as value

[c] Baseflow sampling was discontinued after WY2011.

[d] 98% of stormwater discharge to OF230 was rerouted to OF230A in December 2023.

Figure 5-1.1 Analysis of Monitoring Trends in Stormwater, Baseflow, and Storm Sediment OF230/230A

Figure 5-1.2
Analysis of Monitoring Trends in Stormwater, Baseflow, and Storm Sediment
OF235



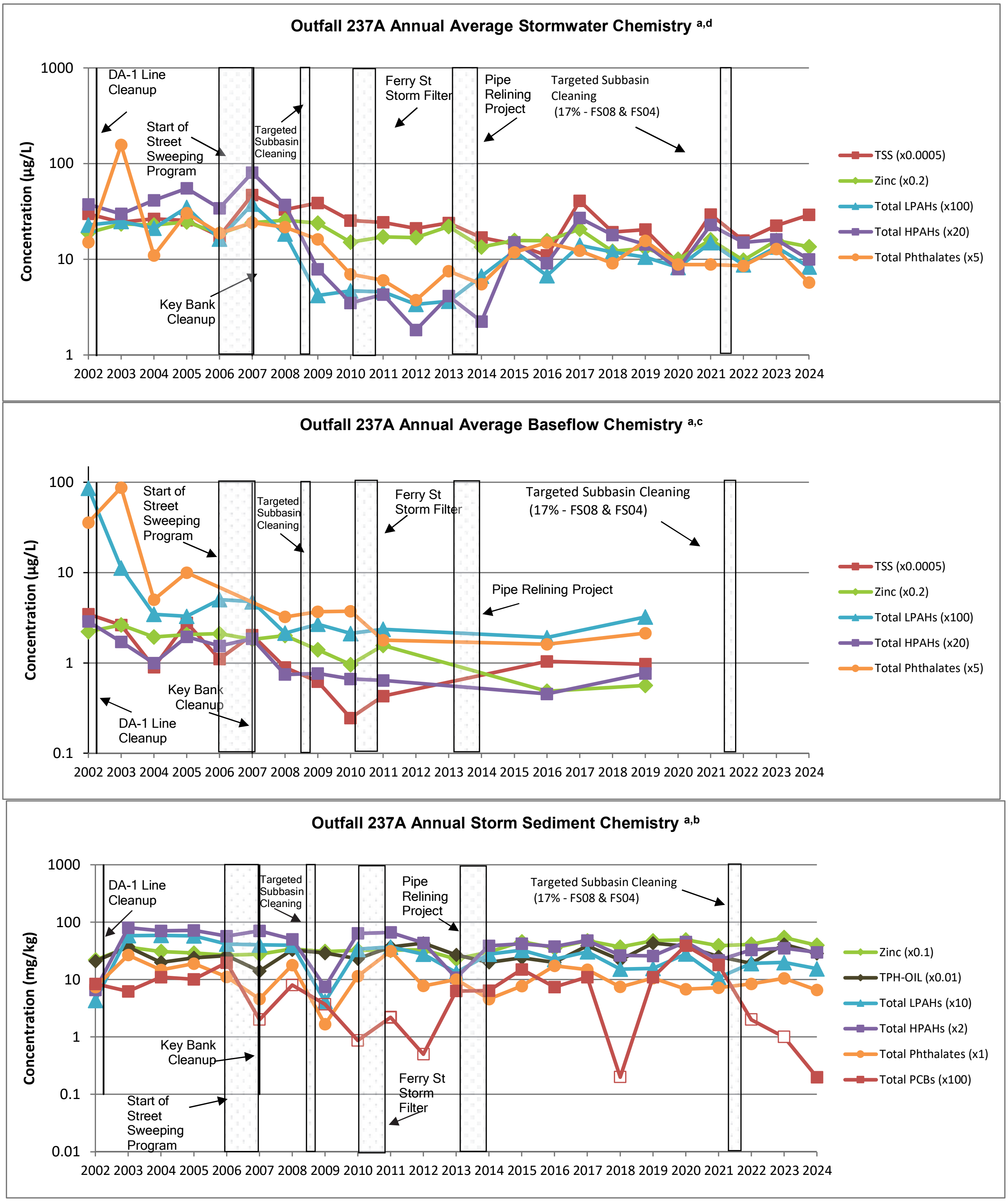
Notes:

[a] Results shown are a product of chemistry data and an analyte-specific multiplier in order to display results on a common scale

[b] Open symbols denote censored data; highest detection limit posted as value

[c] Baseflow sampling was discontinued after WY2011.

Figure 5-1.3
Analysis of Monitoring Trends in Stormwater, Baseflow, and Storm Sediment
OF237A



Notes:

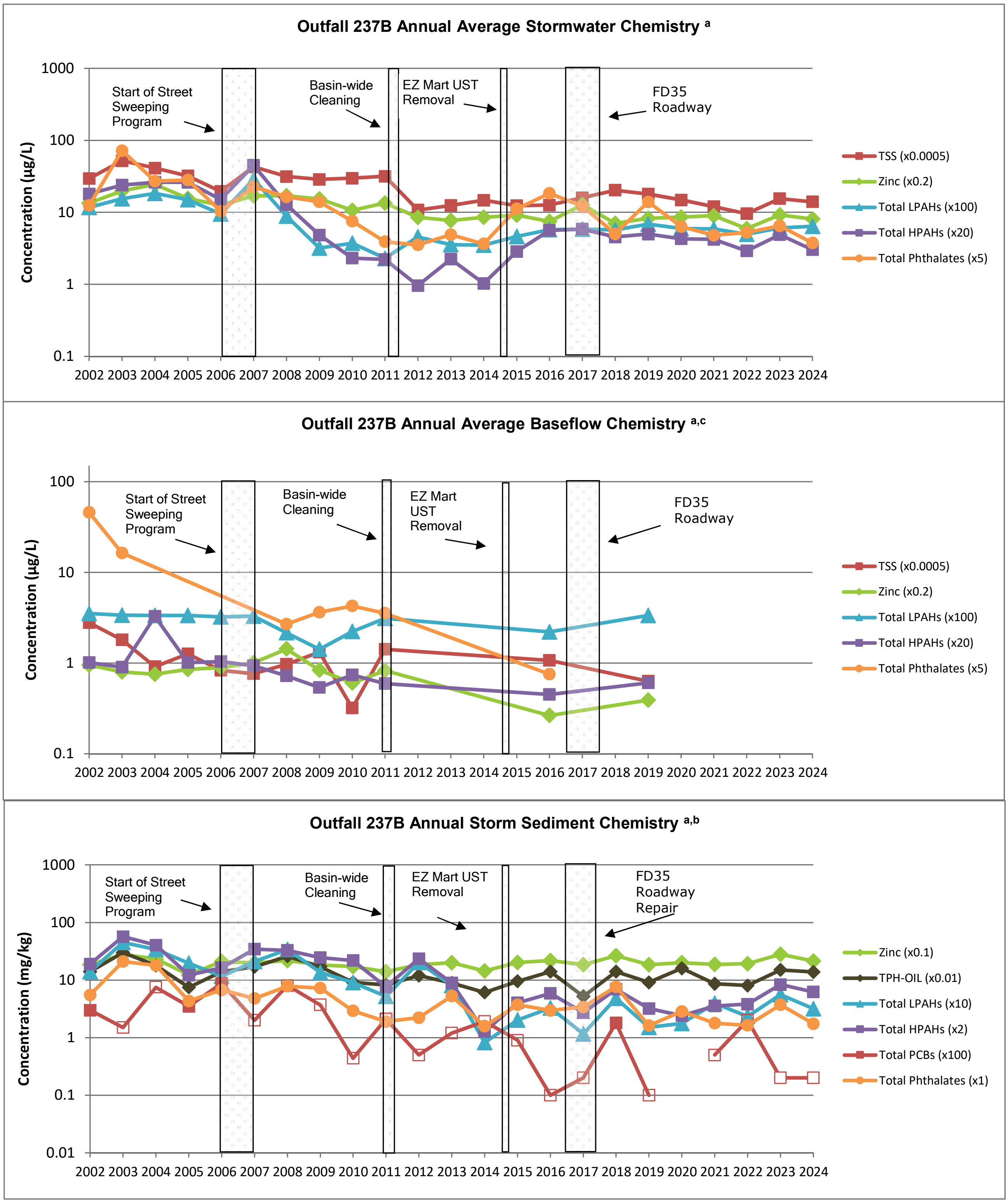
[a] Results shown are a product of chemistry data and an analyte-specific multiplier in order to display results on a common scale

[b] Open symbols denote censored data; highest detection limit posted as value

[c] Baseflow sampling was discontinued after WY2011.

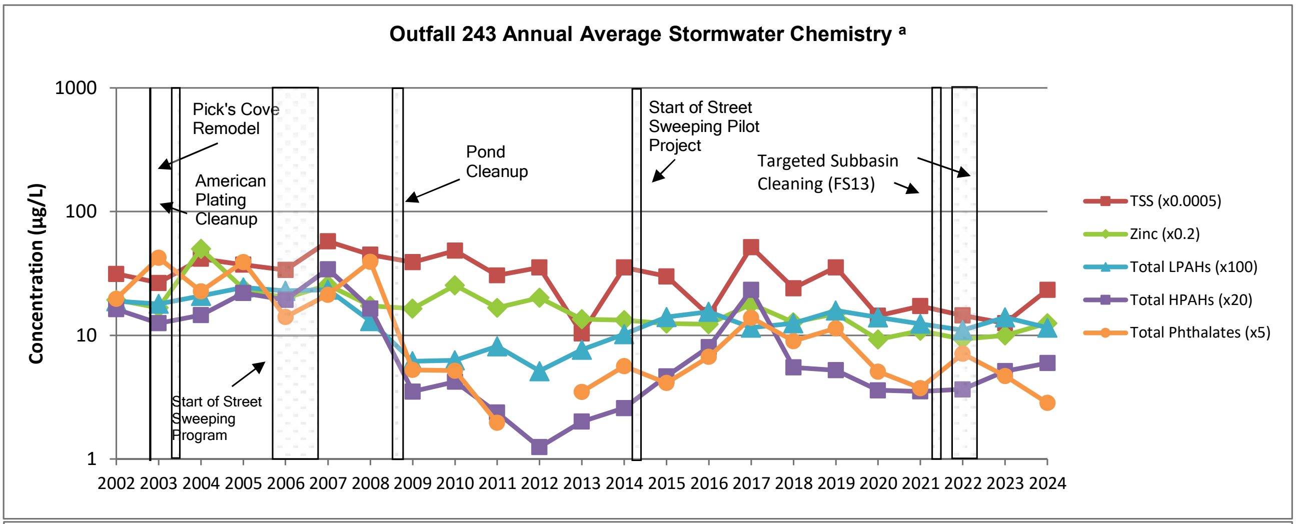
[d] 237A data Includes data from the old 237A site for events prior collected prior to 2/26/06. Events after 2/26/06 were from the 237A New site.

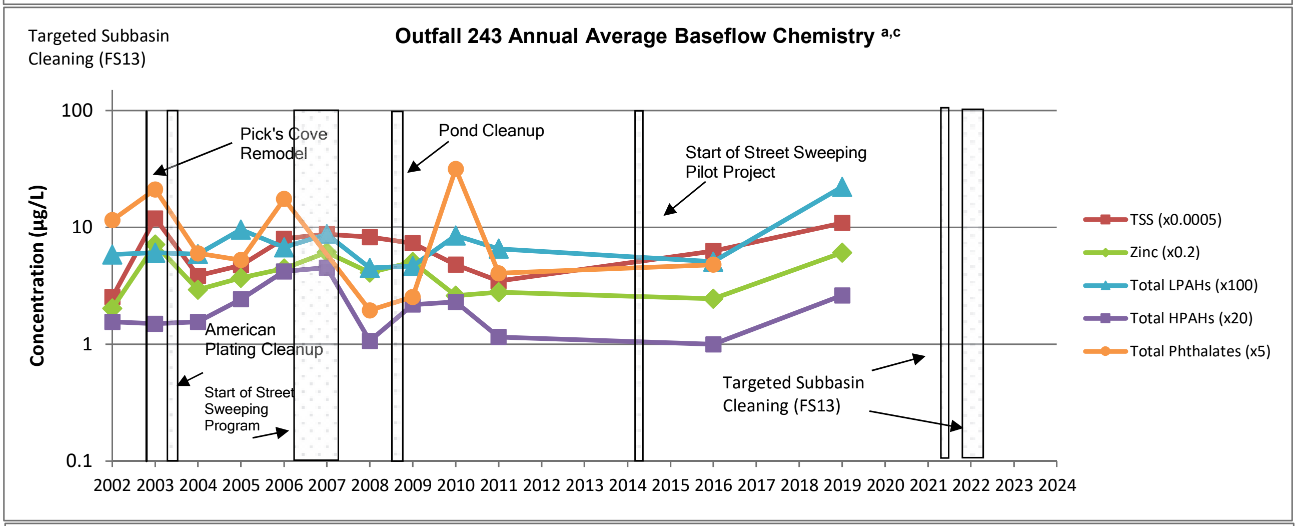
Figure 5-1.4
Analysis of Monitoring Trends in Stormwater, Baseflow, and Storm Sediment
OF237B

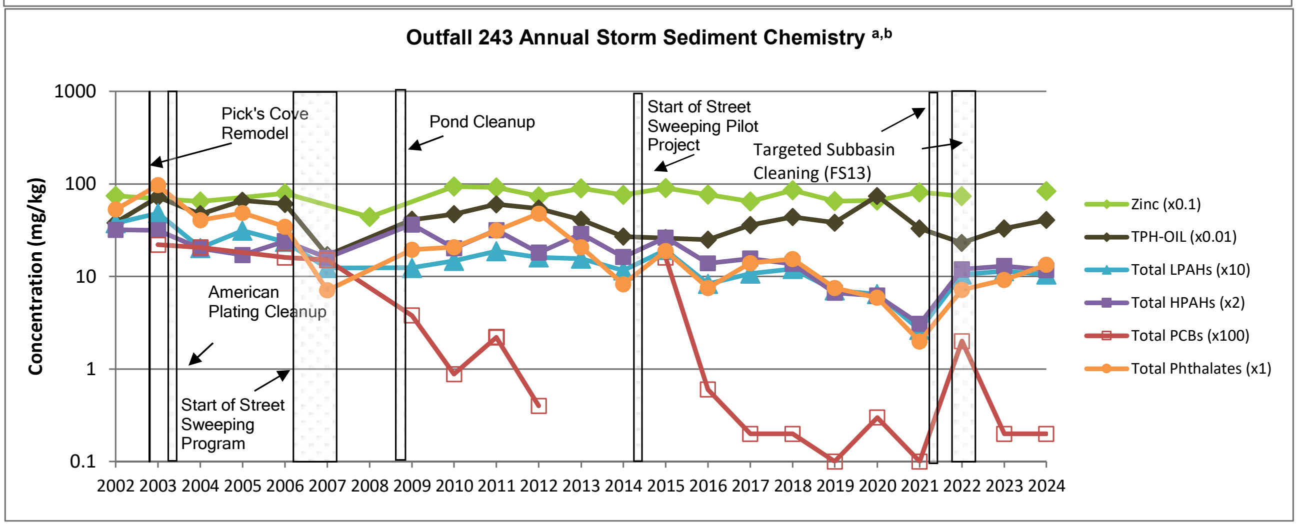


Notes:
[a] Results shown are a product of chemistry data and an analyte-specific multiplier in order to display results on a common scale
[b] Open symbols denote censored data; highest detection limit posted as value
[c] Baseflow sampling was discontinued after WY2011.

Figure 5-1.5
Analysis of Monitoring Trends in Stormwater, Baseflow, and Storm Sediment
OF243

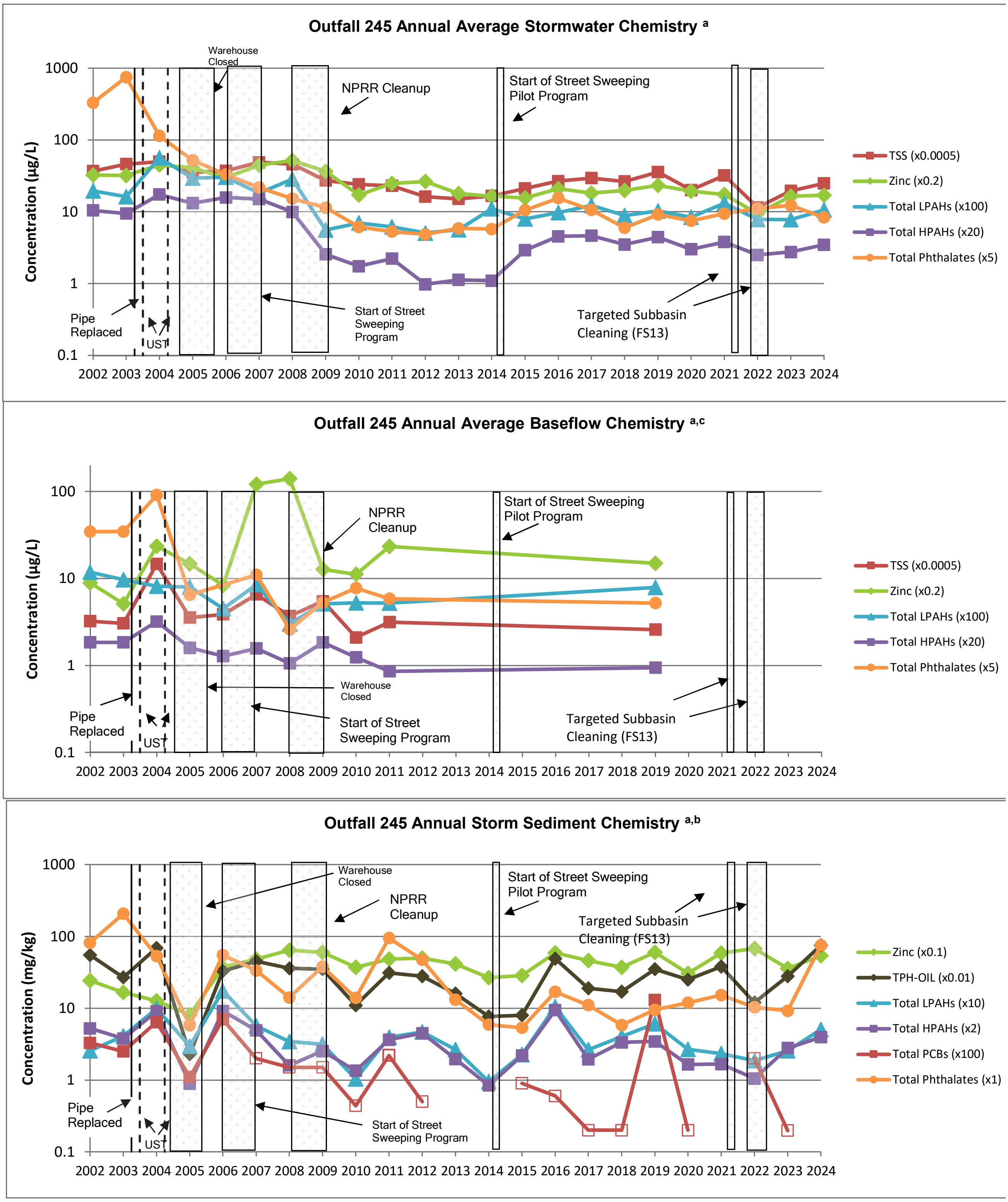






Notes:
[a] Results shown are a product of chemistry data and an analyte-specific multiplier in order to display results on a common scale
[b] Open symbols denote censored data; highest detection limit posted as value
[c] Baseflow sampling was discontinued after WY2011.

Figure 5-1.6
Analysis of Monitoring Trends in Stormwater, Baseflow, and Storm Sediment
OF245



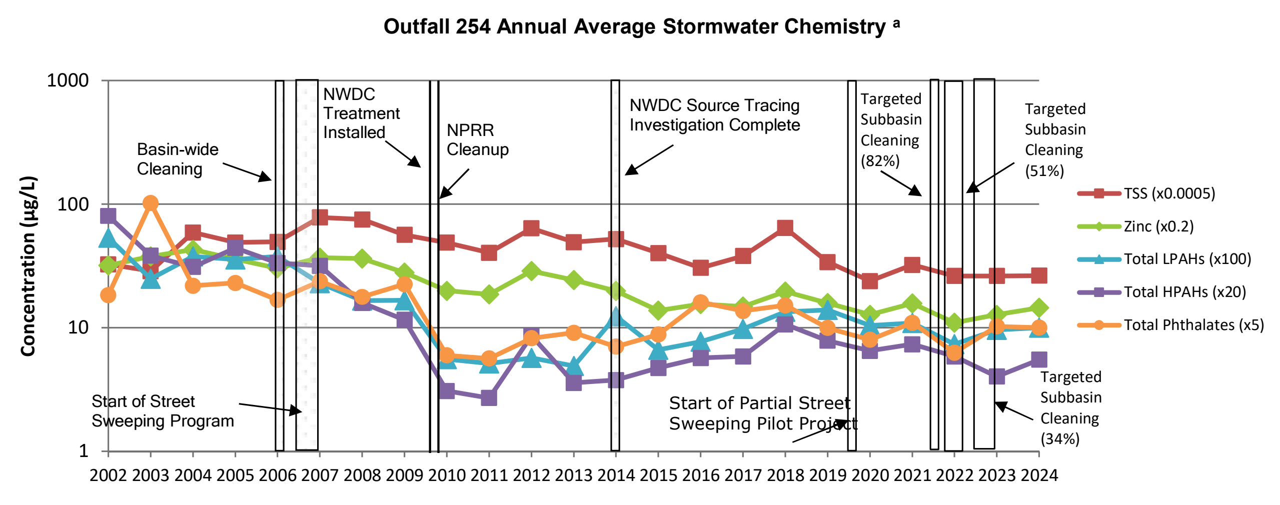
Notes:

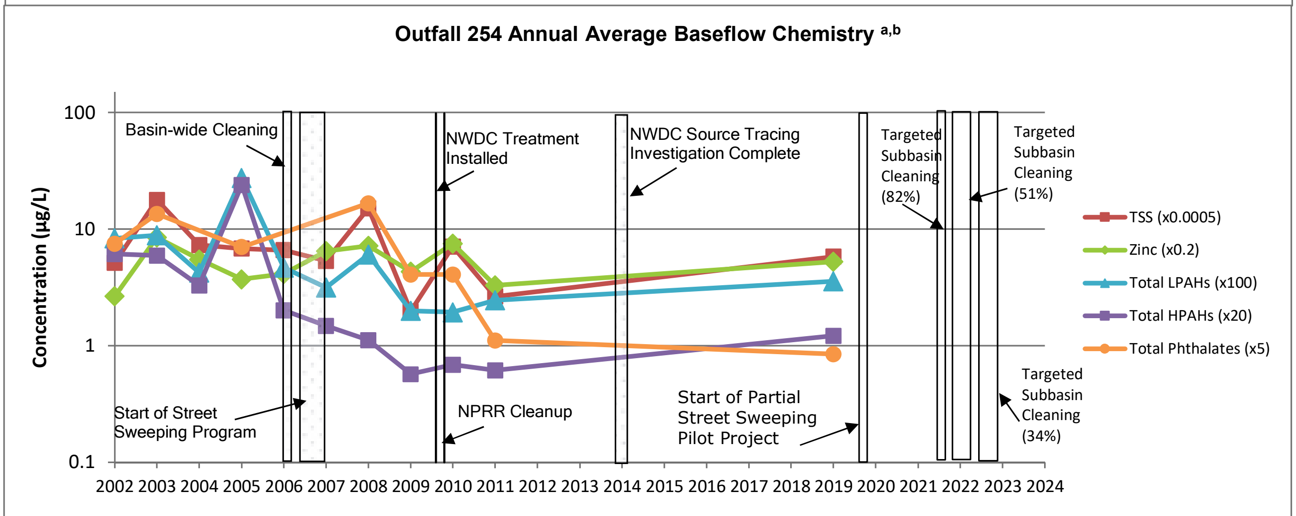
[a] Results shown are a product of chemistry data and an analyte-specific multiplier in order to display results on a common scale

[b] Open symbols denote censored data; highest detection limit posted as value

[c] Baseflow sampling was discontinued after WY2011.

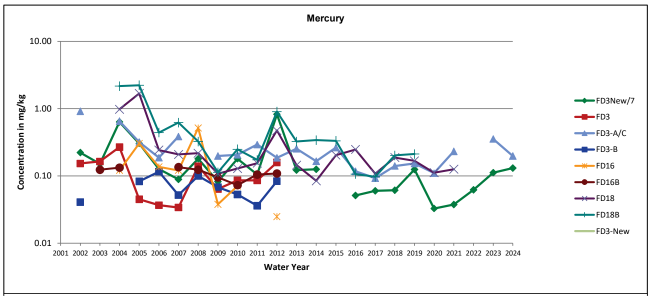
Figure 5-1.7
Analysis of Monitoring Trends in Stormwater and Baseflow, and Storm Sediment
OF254

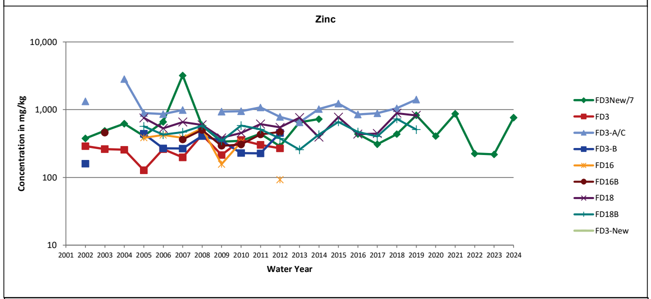


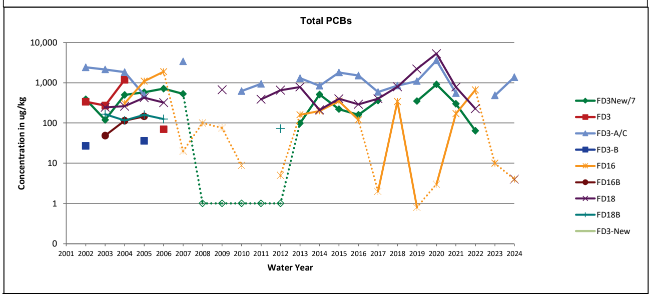


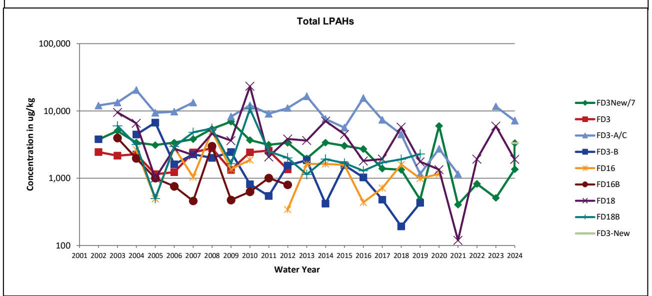
Notes:
[a] Results shown are a product of chemistry data and an analyte-specific multiplier in order to display results on a common scale
[b] Baseflow sampling was discontinued after WY2011.

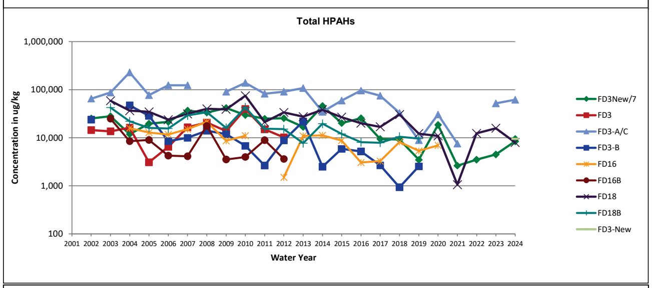
Figure 5-2.1
Analysis of Monitoring Trends in Storm Sediment in OF230/230A

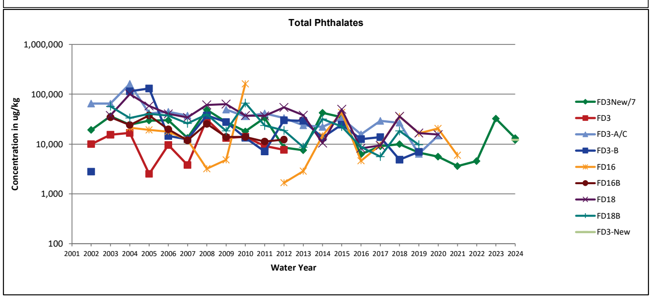












Notes:
1.The upline FD3A sediment trap was removed due to the construction of the new OF230A on 12/17/2021 and no sediment was analyzed for WY2022. FD3C was installed upstream and represents the previous FD3A drainage area.

2. OF230 stormwater discharge was rerouted to the new OF230A in December 2023. FD3ANew represents the historic OF230 drainage and FD7 now represents the new OF230A drainage area. Data from the FD7 sediment trap has been added to the FD3ANew Data for stats analysis representing the OF230/230A drainage area.

Figure 5-2.2
Analysis of Monitoring Trends in Storm Sediment in OF235

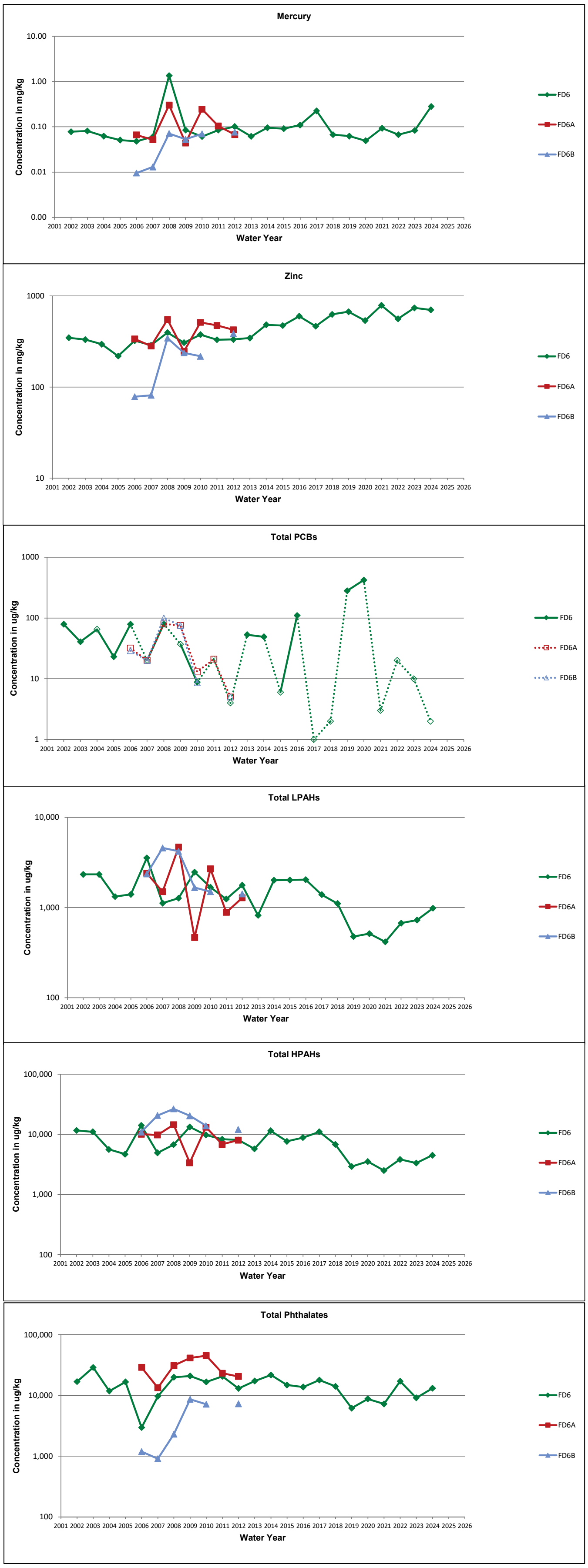
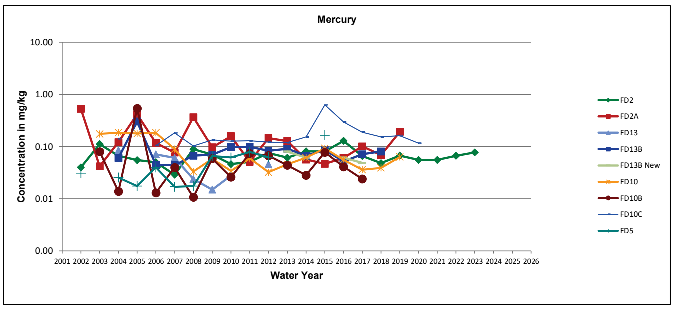
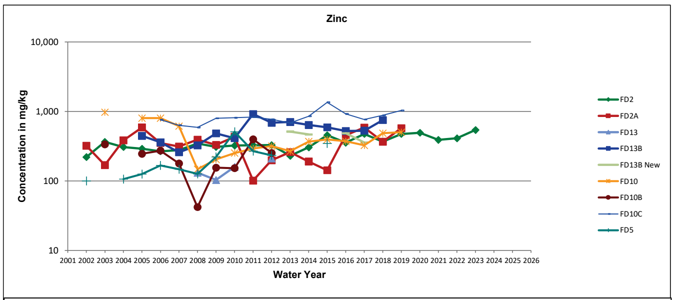
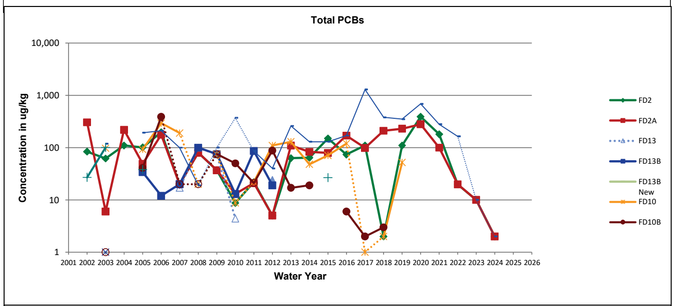
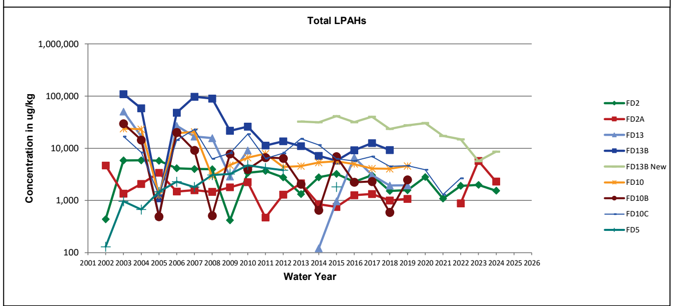


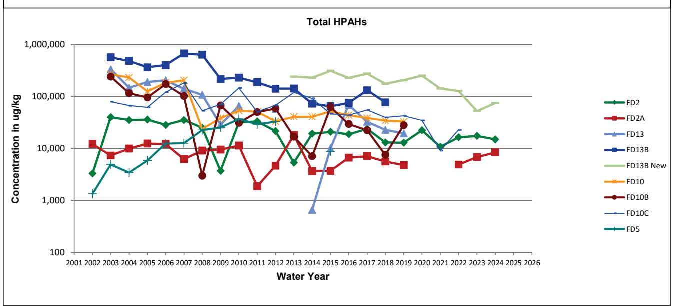
Figure 5-2.3
Analysis of Monitoring Trends in Storm Sediment in OF237A











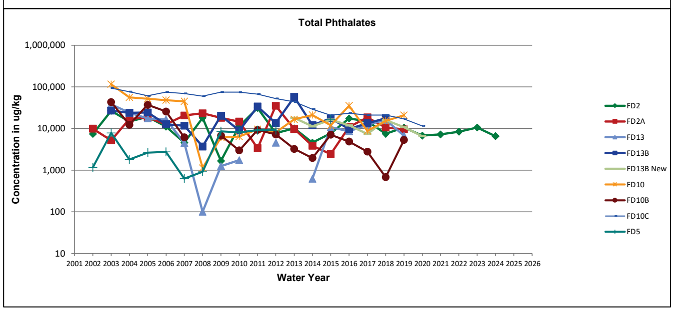


Figure 5-2.4
Analysis of Monitoring Trends in Storm Sediment in OF237B

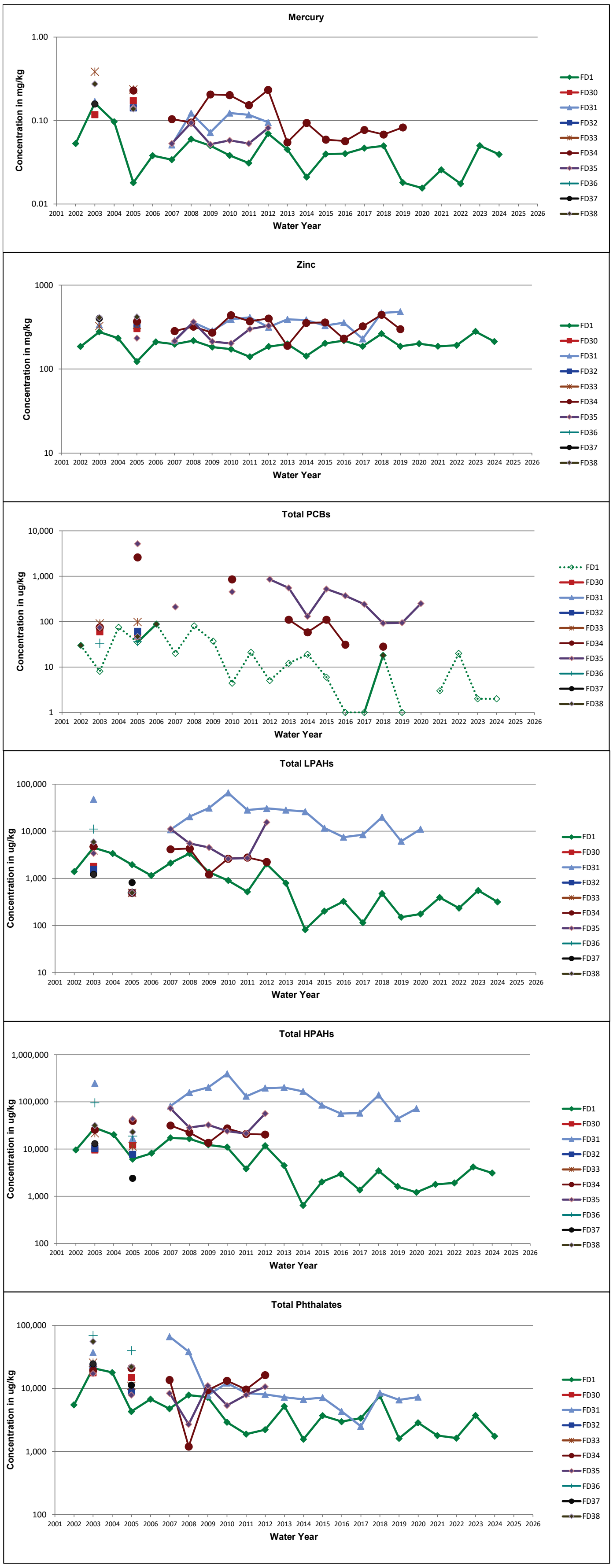
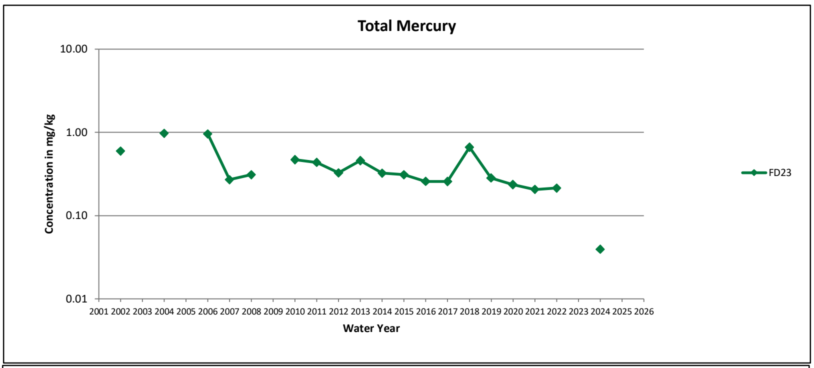
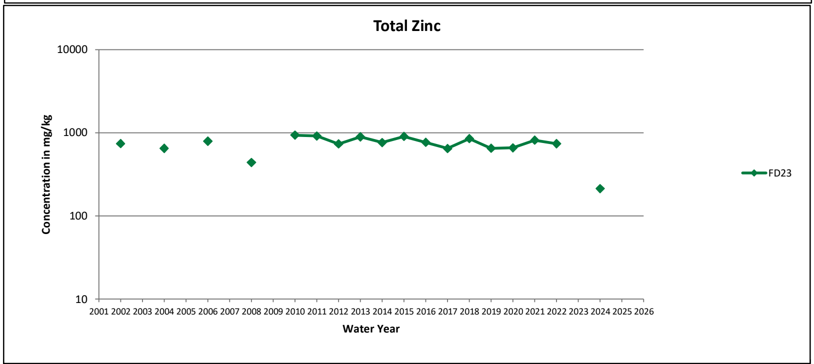
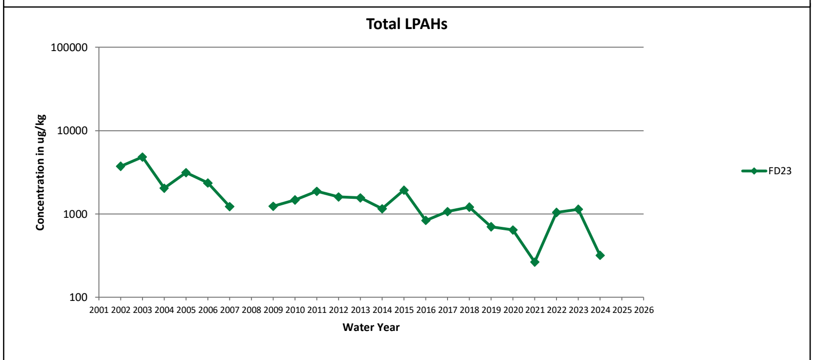
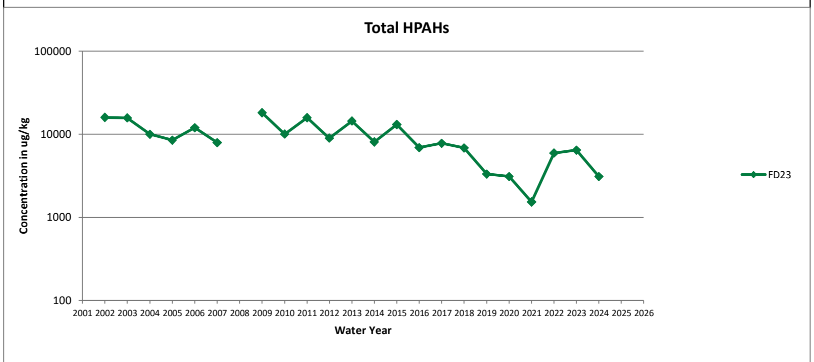


Figure 5-2.5
Analysis of Monitoring Trends in Storm Sediment OF-243









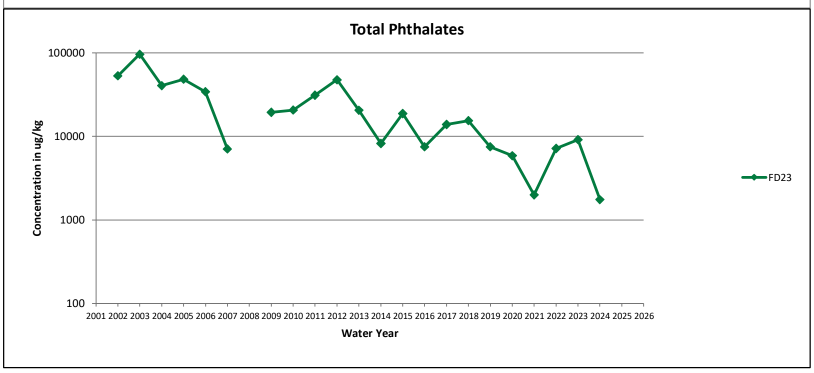
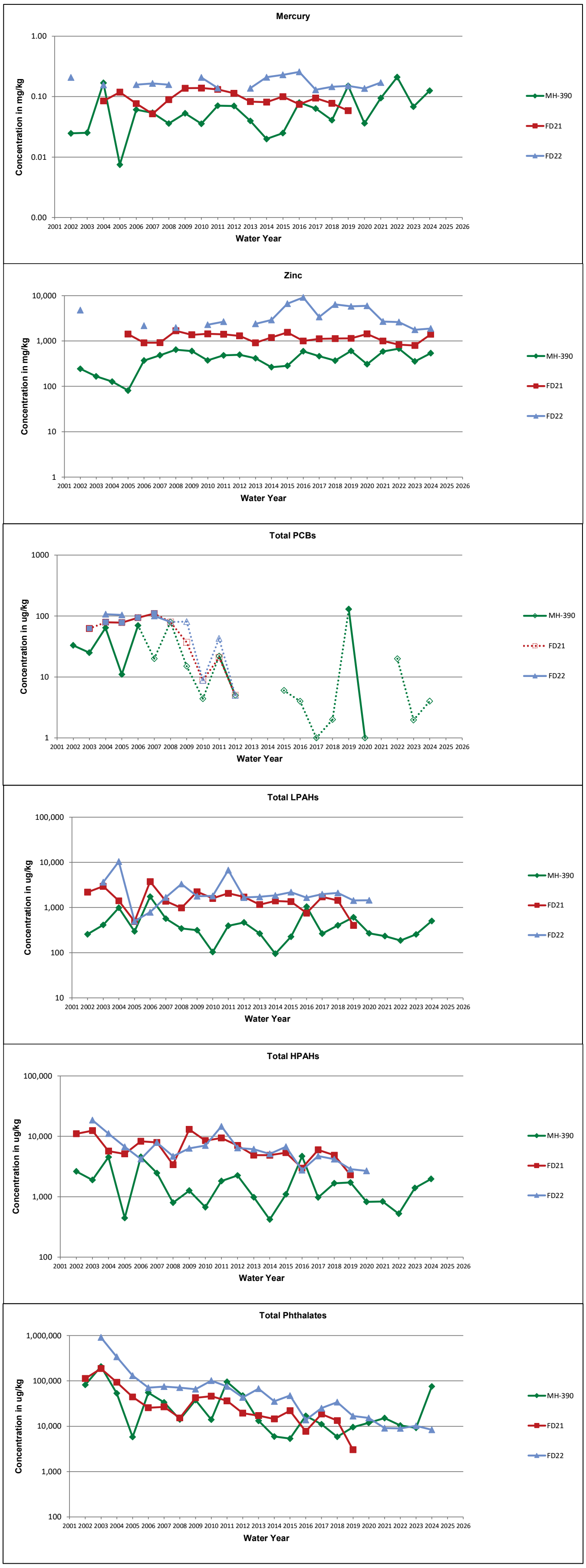


Figure 5-2.6
Analysis of Monitoring Trends in Storm Sediment in OF245

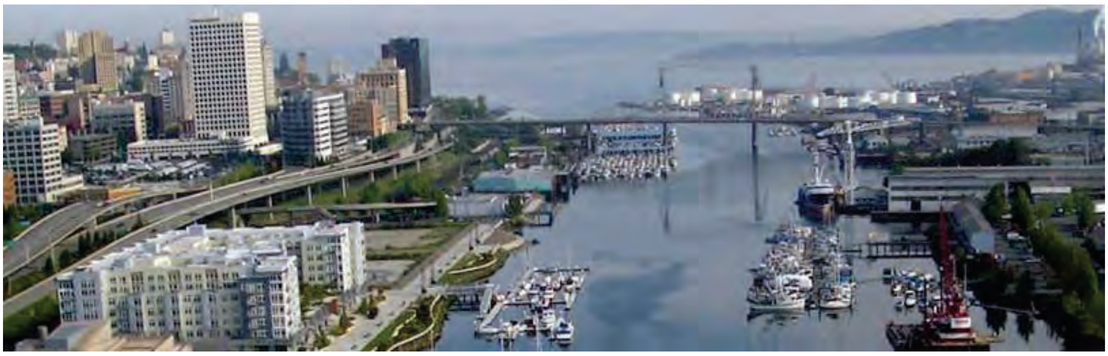


APPENDIX A

Thea Foss and Wheeler-Osgood Waterways
2024 Source Control and WY2024 Stormwater Monitoring Report

Appendix A – Analysis of Source Control Activities by Drainage Area



March 2025

Prepared for

Washington State Department of Ecology and

U.S. Environmental Protection Agency

Prepared by

City of Tacoma

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A.1 SOURCE CONTROL SUMMARY

This appendix presents the source control summary for the major outfalls discharging to the Thea Foss and Wheeler-Osgood Waterways. For each of the outfalls, the following Sections A.2 through A.8 provide a review of current and completed source control investigations, major actions conducted, and other studies performed under the program. Information presented in this appendix includes a description of the action, the end results of the action, the status of actions that are still underway, and identification of any follow up needed.

In the 2015-2019 Commencement Bay Five Year Review Report, the Environmental Protection Agency (EPA) found that the remedial action goals for the Thea Foss Waterway have been achieved. While waterway source monitoring requirements are ongoing to ensure continued protection of the waterway sediments, efforts by the City of Tacoma and others have been effective in reducing sediment concentrations to levels which meet regulatory compliance. On December 11, 2021, the EPA approved the City's Remedial Action Report, initiating the process of partial delisting of the Thea Foss and Wheeler-Osgood Waterways from the National Priorities List as part of the Commencement Bay Superfund Site.

With the success of the City's source control efforts to date, there are fewer sites in the watershed that require ongoing active source control work. Ongoing investigations and activities that occurred during 2024 are described in detail below. The City has removed upline sediment traps in areas that no longer exhibit ongoing issues with pollutants of concern. Traps will remain in areas with ongoing investigations until work is complete. The sediment traps located at the end of the outfall pipes are required by the National Pollutant Discharge Elimination System (NPDES) Phase I Municipal Separate Storm Sewer System Permit (Phase I MS4 Permit) and will remain throughout the monitoring period.

A.2 OUTFALL 230/230A

A.2.1 DRAINAGE BASIN(S) DESCRIPTION

Prior to 2023, the source control activities in this basin were related to the historic OF230 drainage basin. The City began re-routing the stormwater drainage system from portions of OF230 and OF235 to the new OF230A on October 20, 2022, and completed the re-routing transition in mid-December 2022. With construction of the new OF230A, the size of the OF230 drainage basin was substantially reduced from 582 to 24 acres. There is now minimal baseflow and/or stormwater flow discharging from OF230. These changes are described in detail in Appendix B, Section B.2.2.1. The discussion herein for activities during 2024 are based on the new OF230A.

The OF230A drainage basin is located on the mid-portion of the west side of the Foss Waterway and covers 98 percent of the historic OF230 drainage basin. The basin boundaries are shown on Figure B2-3. The area is approximately 583 acres and discharges to the waterway through a 60-inch outfall pipe (Table B2-2). The general basin boundaries are South 8th Street to the north, South 19th Street to the south, South Ainsworth Avenue to the west, and Dock Street to the east. Most of the storm drainage discharges to South 15th Street via a main trunk line along Market Street and then to the new Jefferson Street Interceptor. Storm lines along Dock Street are susceptible to saltwater intrusion from high tides.

The OF230A drainage basin is heavily developed throughout with primarily commercial land use and some residential use on the west side of the basin (Figure B2-3). The northern portion of the University of Washington–Tacoma (UWT) and the St. Joseph Medical Center Complex discharges to OF230A. The drainage area for UWT is bounded by Pacific Avenue, South 21st Street, Tacoma Avenue, and South 17th Street. Also included in the basin is Tacoma Link light rail, the Greater Tacoma Convention and Trade Center, downtown revitalization (condos and retail), and a portion of Dock Street redevelopment. The whole water and sediment monitoring site locations are shown on Figure B2-5.

A.2.2 OF230A SOURCE CONTROL ACTIVITIES

As part of the City-wide inspection program, 44 business inspections were completed in the OF230/230A basins in 2024. Business inspections provide source control through education and through implementation of non-structural Best Management Practices (BMPs). These actions help prevent rainfall and stormwater from coming into contact with surfaces or materials that may pollute the runoff, and help promote activities and behaviors to keep stormwater cleaner. Stormwater treatment devices (structural BMPs) currently in place remove solids and the associated particulate-bound chemicals from stormwater. The locations of private and public stormwater treatment devices in the OF230A drainage basin are shown on Figure A-1a and A-1b, respectively. In 2024, three new treatment BMP were installed on private property in this drainage basin (see Table A.1-1 and Figure A-1a). A bioretention facility and two trenches were installed as part of a park project near the new OF230A outfall. With future redevelopment in the OF230A drainage basin, more of these onsite treatment systems will be installed, and over time they will help to decrease the solids load and the associated particulate chemical load to the waterway.

The City continues to work with the regulatory agencies and businesses throughout this drainage area to eliminate the sources of contaminants in the stormwater drainage system through routine source control efforts.

A.2.2.1 2024 Source Tracing Investigations

Since 2002, significant work has been accomplished in the OF230A[1] drainage basin, including intense business inspections, complete line cleaning, significant pipe relining projects and identification, and removal of point sources.

Previously, there were many source tracing investigations in the historic OF230 (now OF230A) drainage basin since 2012 to identify possible sources of intermittent mercury, polycyclic aromatic hydrocarbons (PAHs), and polychlorinated biphenyls (PCBs) discovered during annual sediment monitoring. Additional details for specific investigations can be found in Appendix A of prior Source Control and Stormwater Monitoring Reports.

Mercury:

FD3C: Results from the mercury portion of the investigation and business inspections of the surrounding area indicated that the mercury sources were attributed to the presence of contaminated sediments in two areas: a catch basin located at South 11th Street and Broadway, and two sidewalk roof drains draining to a catch basin at the corner of South 12th Street and Court “A” in downtown Tacoma. Both areas drain to FD3C (historic FD3A). Investigations and remediation of these areas removed the source of mercury at these locations. During 2023, there were no investigations for mercury in OF230A. However, due to the increased mercury concentrations in the FD3A/FD3C sediment traps the City evaluated the need for additional source tracing for mercury in this basin. Samples were collected from the catch basins at the corner of South 12th Street and Court “A”. While cleanup efforts and resampling occurred at this location, results indicate a continued source of mercury contamination in this area (Attachment A.2 OF230A (FD3C) 2024 Source Tracing Investigation). During 2025, the City will investigate the source of elevated mercury concentration in the catch basins sampled during 2024. Of note, the sediment trap sample for the FD3C basin showed a significant decrease in mercury concentrations during WY2024.

FD6: During WY2024, the OF235 or FD6 sediment trap exhibited medium concentrations of mercury with a concentration of 0.281 mg/kg. While mercury concentrations at this location are varied, results typically exhibit relatively lower concentrations in WY2018 to WY2023 ranging from 0.04 mg/kg to 0.09 mg/kg. A slightly higher concentration for mercury was seen for FD6 in 2017 with a concentration of 0.2240 mg/kg. The City will continue to monitor the sediment trap results at this location to determine if this is an ongoing issue at this location or an isolated incident.

PCBs:

2024 FD3C Update: Results from the initial PCB portion of the investigation indicated that elevated levels of PCBs were present in the vicinity of South 12th and South 13th Streets, between Pacific Avenue and Court “A” in downtown Tacoma. Storm drains throughout this area were cleaned in February 2015, and the area was resampled in March/April 2016. Results indicated ongoing lower-level sources of PCBs, leading to additional investigation beginning in

[1] Drainage area changes for OF230, OF230A, and OF235 are discussed in detail in Appendix B, Section B.2.2.

2016 that continued through 2024. Updates on each of these PCB investigations are provided below.

South 12th Street and Pacific Avenue: Previous investigations indicate that caulking materials were the source of PCB contamination discovered during this investigation. The business owners and the regulatory agencies were notified of the PCB discovery and were provided a copy of the sampling results. To ensure that the contamination did not reach the waterway, the system was cleaned in early 2015. Significant work was completed in 2018 by the property owner at 1123 Pacific Avenue and at the Wells Fargo building in 2017. It was expected that this work would reduce the PCB contributions from this site. During 2022, the City resampled the catch basins adjacent to this location and found elevated PCBs in the catch basin located at the southeast corner of this location. Subsequently the City cleaned the stormwater system to determine if the sources of PCBs are ongoing or if the remediation efforts at these locations were successful. Insufficient sediments for sampling were noted in 2023 but City staff were able to sample most of the catch basins surrounding the Wells Fargo complex and 1123 Pacific Avenue in 2024. All collected samples were non-detect for PCBs indicating that the remediation efforts at these locations were successful. Two of the catch basins still did not have sufficient sediment to collect a sample and these locations will be retargeted in 2025 for sample collection.

South 13th Street and Commerce Street: During the 2013 investigation, catch basins in this drainage area exhibited detectable levels of PCBs. These catch basins receive drainage from two parking garages and retail businesses on Commerce Street. Subsequent sampling of catch basins in 2016 exhibited even higher concentrations, therefore in 2017, City staff resampled the catch basins in this drainage area and collected samples from the right of way (ROW) caulking to determine if this was the source of ongoing PCB contamination. A source of PCB contamination was not found during those sampling efforts.

In August 2019, catch basins were inspected for sediment loading to determine whether sampling could occur. Some were found to have insufficient sediment and others were found to have not been cleaned due to coordination needed to de-energize the adjacent light rail. Due to staffing issues during COVID-19, the system cleaning scheduled for 2020 was not completed and was instead completed in May of 2021.

On July 31, 2023, EC staff sampled the targeted catch basins and found them heavily impacted with sediment. Due to the amount of material in the basins staff could not determine when the basins were previously cleaned. The catch basins were cleaned and resampled during 2024. One catch basin sample contained a PCB concentration of 4,380 ug/kg. Based on these results follow-up sampling was completed on suspected PCB-containing caulking on the sidewalk to the north of this catch basin. Sample concentrations ranged from non-detect to 16,100 ug/kg, below any actionable concentration (Ecology 2024). The catch basin with the elevated concentration will be placed on a yearly maintenance schedule for cleaning. In addition, the City's Department responsible for sidewalk maintenance has been notified of the PCB issue and will take appropriate measures if replacement of this sidewalks occurs.

South 10th Street and Pacific Avenue: The presence of PCBs and ongoing investigation at the Park Plaza parking garage at South 10th Street and Pacific Avenue were discussed in the WY2016 Source Control Report. In 2016, staff collected samples of roof top material, including caulking, sealant, and sediment, for PCB analysis. All the samples collected from the roof of the parking garage exhibited elevated concentrations of PCBs. Additional sampling was performed in 2017 to determine the specific building materials that were the source of the PCBs. The property owner (the City of Tacoma) and regulatory agencies were notified in writing of the PCB discovery and were provided a copy of the sampling results. The City worked with the EPA to finalize a sampling plan in July 2020 to assess the extent of contamination at the site to assist in the development of a remediation plan. Sampling was subsequently performed, and the City submitted a PCB Sampling Results Report to the EPA in January 2022. In that document, the City proposed an iterative remediation plan. The City made progress during 2024 towards remediation of this site. The City has hired a consultant to develop a cleanup action plan in coordination with EPA. Once the cleanup action plan is completed (anticipated 2025), the City will move to remediate this site.

FD16: Several source tracing investigations over the last few years resulted in cleaning of several private and public storm collection systems in the FD16 branch. The PCB concentrations for the FD16 sediment trap once again exhibited non-detect results. The City will continue to monitor the sediment trap results to determine if this is an ongoing issue requiring further investigation.

Phthalates

There was a significant decrease in sediment concentrations from 2018 and no further sampling is planned in the OF230A drainage area.

PAHs

There are no PAH investigations are planned in this basin for 2024. After many years of investigations, cleaning and repairs in this drainage area, EC suspects that repairs made in 2022 have eliminated the significant sources of PAH contamination within this drainage basin. Staff reviewed the 2024 sediment trap data for FD3C (Formerly FD3A) and it continued to exhibit lower concentrations. The City will continue to monitor the sediment trap results to determine if the PAH contamination has returned or remains at reduced levels.

A copy of the OF230A (FD3A/FD3C) 2024 Source Tracing Report is included in Attachment A.2.

A.2.2.2 Enforcement Actions

Notice of Violation and Warning Letters

Two warning letters and one Notice of Violation (NOV) were issued in the OF230A drainage basin in 2024:

- A warning letter was issued on January 19, 2024, to Luke Corporation for the illicit discharge of waste cooking oil. This issue was resolved.
- A warning letter was on December 5, 2024, to Republic Parking for failure to maintain their oil water separator. This issue was resolved.
- A Notice of Violation (NOV) was issued on January 31, 2024, to Drip House Coffee, LLC, for the illicit discharge of wash water to the City's storm system. Wash water is considered a wastewater and cannot be discharged to the stormwater system. This issue was resolved.

Copies of these letters are included in Attachment A.2.

Underground Storage Tank (UST) and Leaking UST (LUST) Removal

The Tacoma-Pierce County Health Department (TPCHD) is overseeing the removal of USTs at four active sites in the drainage basin (see Attachment A.1) including:

- UST at the Seven Eleven store located at 4635 South Yakima Avenue. There is soil contamination at this site and this permit remains active.
- UST at the parking garage located at 1114 Pacific Avenue. There are two tanks at this site and this permit remains active.
- UST at Bryant Montessori School at 717 South Grant Avenue. This permit became active during 2023.
- UST at Olympic Building at 1222 Tacoma Avenue South. There is one tank at this site and this permit became active during 2023.

A.2.2.3 Stormwater Maintenance Activities

Storm System Cleaning

In 2007, at a cost of $300,000, the entire municipal storm drainages for OF230/230A and OF235 were cleaned and video inspected by the City's Transmission Maintenance crews. One hundred years of accumulated historical stormwater particulate matter in the trunk lines and laterals (totaling approximately 220 cubic yards) was removed. Eighty thousand feet of 8- to 56-inch lines were cleaned between March 12 and June 25, 2007. Throughout the duration of the project, standardized cleaning practices were used (i.e., plugs downstream of vactor truck) to prevent any mobilized materials from entering the Thea Foss Waterway. The decant water from the vactor trucks was diverted to settling tanks prior to discharge to the sanitary sewer.

Since the time of the complete cleaning of the OF230/OF230A drainage basin, additional cleaning has been performed in isolated areas. These cleaning and video inspection activities have been done for a variety of reasons, including areas identified as needing maintenance through pending projects, complaints, business inspection follow ups, etc. A summary of pipe cleaning and maintenance activities completed during 2024 in the OF230A drainage basin is provided in Table A.2-1 in Attachment A.2.

Enhanced Street Sweeping

In January 2007, the City's street sweeping program was transferred from the Streets and Grounds Division to the Sewer Transmission Maintenance Division for continued implementation. The program was enhanced at that time to reduce sediment buildup in the storm sewer system. The schedule was set to sweep all areas of the City twice per year, with more frequent sweeping in the business districts and on major arterials. The City also increased communications with residents and business owners, which helped raise awareness of the importance of the street sweeping program.

In 2007, when the work was transferred over, sweeping was done with a combination of mechanical and vacuum sweepers. In 2008, the City started the transition from mechanical sweepers to regenerative air machines. At this point in the program, the City used four regenerative air sweepers. In mid-2018, due to the end of usable life of one of the City's regenerative air sweepers and a staff retirement, Tacoma temporarily reduced its street sweeping program. This resulted in Tacoma reducing the frequency of arterial sweeping to quarterly and residential streets to annually.

The City received a grant from the Washington State Department of Ecology (Ecology) in 2021 to purchase an additional street sweeper which allowed staff to return to the higher sweeping frequency. The new schedule increases the frequency of sweeping at arterials to every six weeks and increases residential sweeping to twice per year City-wide. Operations of the new sweeper began in March 2023. Global Positioning System (GPS) is used to track the number of miles swept and the amount of material removed is recorded.

‘A’ Street Treatment System

Construction of the “A” Street regional treatment system was completed in January 2015. The project is located in the area with historically higher levels of PCBs and mercury, along with lower levels of PAHs and phthalates. The project included replacement of approximately 1,100 feet of pipe and construction of two underground treatment vaults with Baysaver treatment units sized to treat the water quality design storm event for the 34-acre tributary area. The City’s work toward removal of sources of PCBs and mercury to this system, along with PAHs and phthalates, is continuing as described above, but the line replacement and treatment project help to ensure that these contaminants do not get to the waterway. The treatment system was funded from a $1,000,000 fiscal year Statewide Stormwater Grant from Ecology.

A.3 OUTFALL 235

A.3.1 DRAINAGE BASIN

The OF235 drainage basin encompasses a section of downtown between the OF230 and OF237A drainage basins (see WY2024 Report, Figure 1-3). The OF235 drainage basin is heavily developed and covers an area of approximately 109 acres which drains through a 42-inch outfall pipe located on the west bank of the Thea Foss Waterway at South 21st Street and Dock Street under the State Route (SR) 509 bridge. The general basin boundaries are South 18th Street to the north, South 23rd Street to the south, South “L” Street to the west, and Dock Street to the east.

Commercial land use accounts for the majority of the area in this basin, with a small residential area on the western side (see WY2024 Report, Figure 1-3). A small portion of freeway ROWs in the lower part of this basin, including Interstate-705 (I-705) and the entire I-705 and SR 509 interchange. Most of the stormwater runoff from freeways discharges to a Washington State Department of Transportation (WSDOT) infiltration pond and not to the City-owned storm drains.

The southern portion of the UWT and a portion of the St. Joseph Medical Complex discharges to OF235. The drainage area for UWT is bounded by Pacific Avenue, South 21st Street, Tacoma Avenue, and South 17th Street. Also included in the basin is Tacoma Link Light Rail, downtown revitalization, Dock Street redevelopment, and the Thea Foss Waterway Public Esplanade from South 21st Street to South 17th Street.

The new outfall OF230A did not change the nature, strength, or amount of stormwater entering the waterway and receives stormwater from approximately 26 percent (42 acres) of the area historically discharging to OF235.

A.3.2 SOURCE CONTROL ACTIVITIES

Since 2002, significant work has been accomplished in the OF235 drainage basin, including intense business inspections, complete stormline cleaning, and identification and removal of point sources. A discussion of specific major source control activities is provided in the following paragraphs.

As part of the City-wide inspection program, ten business inspections were completed in the OF235 drainage basin in 2024. Business inspections provide source control through education and through implementation of nonstructural BMPs. These actions help prevent materials from coming into contact with stormwater and help promote activities that reduce pollutants in stormwater.

Structural BMPs, also called stormwater treatment devices, currently in place remove solids and the associated particulate-bound chemicals from stormwater. The locations of private and public stormwater treatment devices in the OF235 drainage basin are shown on Figures A-1a and A-1b, respectively. No new treatment BMP was installed on private property in this drainage basin in 2024 (see Table A.1-1 and Figure A-1a). With future redevelopment in the OF235 drainage basin, private treatment systems will be installed and over time they will help to decrease the solids load and the associated particulate-bound chemical load to the waterway.

A.3.2.1 2024 Source Tracing Investigations

There is one active source tracing investigation for copper in this drainage basin. The following is a discussion of the current mercury investigation for the OF243 drainage area and any significant historic investigations.

2024 Copper Investigation Update

Copper was newly identified as a contaminant of concern within OF235 and to a lesser extent OF230 in WY2021 due to intermittent elevated concentrations in stormwater with other potential outliers beginning in WY2016. All of these outliers, as well as those detected since that time, have been detected in the spring and summer. Due to the seasonal and intermittent nature of the outlier copper concentrations showing up in stormwater samples, it was theorized that it is possible that excess copper is caused by a seasonal commercial cleaning or maintenance operation taking place in the drainage basin. Copper is used as a moss killer on roofs and sidewalks as well as being present in some herbicides.

Downtown Tacoma Business Improvement Area (BIA): maintenance activities for large portions of the downtown area (i.e., pressure washing buildings, sidewalks, etc.) were evaluated. In August of 2022, Environmental Compliance (EC) staff contacted the BIA asking what, if any, products they use to assist with their cleaning activities. It was learned that the BIA does not use anything other than water (pressure washers) to perform their cleaning and maintenance activities. In addition, City staff identified buildings with copper exteriors as possible contributors. Tacoma's Union Station was identified as a possible source due to its large copper roof. On April 27, 2022, EC staff sampled five private catch basins around the property of Union Station, multiple of which had roof drain connections. The copper results ranged from 86 ppm to 4,360 ppm and the catch basins were heavily impacted with sediment. The stormwater leaving this site splits, with approximately half going to OF230A and half going to OF235.

Based on these results, in June 2022, EC staff reached out to the property manager and requested that they clean their catch basins and connecting laterals. In November 2022, the property manager confirmed that they had procured funding for the cleaning and the City received confirmation that the catch basins were cleaned on March 27, 2023. Additionally, it was confirmed that roof cleaning is conducted using a "light solution of laundry detergent" and only in moss-affected areas. As a federal building they are required to use Safer-Choice (EPA) or Biobased (USDA) products.

EC staff resampled the catch basins in May and June 2024 at this site. Several catch basins sediment samples had elevated copper concentrations, with one catch basin exceeding sediment standards. After subsequent letters and meetings with Union Station staff, it was determined that this property will increase the catch basin maintenance to bi-annual and provide the environmental compliance group with proof of cleaning. In 2025, EC staff will continue to look for additional sources of copper in this basin. A copy of the OF235 Copper Source Tracing Investigation is included in Attachment A.3.

Historic Lead, PAHs, and Phthalates Investigation

Based on stormwater monitoring in OF235, this basin was identified in the Thea Foss Work Plan as having ongoing issues with lead in stormwater. In August 2014, staff began an investigation to identify possible sources of the elevated lead concentrations in stormwater. Elevated concentrations of phthalates and PAHs were also observed in baseflow discharges (Tacoma 2013). Because of this, the focus of the investigation began with an investigation of baseflow in the OF235 basin. The intent of this work was to identify specific problem areas within the drainage basin for further investigation.

Due to lack of baseflow during sample collection, staff was unable to target the entire drainage basin. The preceding summer yielded very little precipitation and it is possible that the baseflow was not fully charged during this sampling event. The results of this investigation initiated in 2014 did not identify a specific segment or drainage area in this basin for additional source tracing.

Staff continued this investigation of the drainage basin in 2015. Nine locations were targeted for baseflow sampling in March 2015, and samples were collected at six of the nine locations. Three of these areas showed relatively higher concentrations of lead, and one of these locations also had relatively higher phthalates. Based on the results of this phase of the investigation, these three locations were targeted for additional source tracing. Due to lack of baseflow during sample collection, staff were unable to complete the investigation in these specific areas in 2015. Again, the preceding winter and summer yielded very little precipitation and it is possible that the baseflow was not fully charged during the Round 2 sampling event.

Staff conducted Round 3 of this investigation in spring 2016 when baseflow was flowing at its peak, with additional investigation of the three drainage areas where higher concentrations were found. While progress was made during 2016, specific sources of lead, PAHs, and phthalates were still not identified. Investigations continued in 2017 to further trace sources of these contaminants of concern (COCs) as well as copper and zinc, which were identified in WY2016 as potential COCs.

During the 2017 investigation, no specific sources of lead, phthalates, PAHs, copper, or zinc were identified. Instead, it appears that there are three locations where potentially contaminated groundwater is seeping from the hillside and discharging to the City's stormwater system. Construction activities planned in this area in 2018 were expected to provide some level of appropriate control of the groundwater.

The referenced construction project in this basin is called the Tacoma Town Center Project and is located between Jefferson Avenue South and Tacoma Avenue South at 21st Street. While construction on this site began in 2018, the develop of the proposed Tacoma Town Center project has not been completed and the property is currently in foreclosure. Stormwater discharge for this construction project is currently managed under a construction stormwater general permit through the Department of Ecology. The permit for Tacoma Town Center (#WAR306067) is currently active and is set to expire on December 31, 2025 (Paris - Facility Summary). Through 2024, the City monitored the site in this area to ensure proper BMPs were maintained. Upon project completion, it will be determined whether construction in this area will eliminate runoff from possible contaminated groundwater in this drainage basin. This project was on hold until the new Thea Foss Waterway outfall was constructed. The construction for the new outfall and the re-routing of the stormwater system was completed in December 2022. The property is currently for sale and the City will continue to ensure the on-site stormwater pond is functioning as designed.

A.3.2.1 Enforcement Actions

Notice of Violation and Warning Letters

There were no Warning or Notice of Violation letters issued in this drainage basin in 2024.

2024 UST and LUST Removal

TPCHD is overseeing the removal of USTs at two sites in the drainage basin (see Attachment A.1):

- UST at Heidelberg Brewery at 2120 South "C" Street, the permit remains active.
- Valeo Vocation at 1222 Tacoma Avenue South, this permit is active.

Historic Heidelberg Brewery Remediation

In January 2012, five USTs were located on the Former Heidelberg Brewery site located at 2120 South "C" Street. Four of the five were uncovered and removed in January 2012, and two areas were found to be contaminated with possible diesel and/or heavy oil. TPCHD worked with the property owner to remove the tanks and complete the remediation of the contamination. Final documentation of the site actions was presented to TPCHD. Based on this review it was determined that the soil remediation project appeared to have been successful in removing petroleum-contaminated soil at the site, but PAH-contaminated soil remained at the eastern property line and the extent of PAH contamination into the ROW was unknown.

The site was entered into Ecology's Voluntary Cleanup Program (TPCHD maintains oversight during this interaction), and Ecology issued their determination dated January 28, 2013, reiterating that the site didn't meet minimum cleanup standards, as the PAH and the groundwater condition of the site needed further investigation. In 2017, following additional cleanup work, the site received a 'property specific' No Further Action determination, acknowledging that, while contamination within the site's property boundary was cleaned up, contamination remained outside the property within the "C" Street ROW

TPCHD had previously issued a notice to the site owner requiring further action and attached a Certificate of Non-Compliance onto the property title in 2015, which will remain on the title until amended with a Notice of Compliance once cleanup is complete.

In 2018, the owners hired a new consultant and in 2021 renewed their Site Cleanup permit with TPCHD, which is required along with further work leading to a completed cleanup. The permit is currently in place, and as of the end of 2023, the site remains 'open'. The site owner complied with one of the TPCHD's requirements to maintain and annually renew their Site Cleanup permit. However, they failed to comply with the second requirement to continue with the cleanup action identified for the ROW and eastern property line. Residual contamination remains towards and within the ROW and will need to be completed before issuing satisfactory Site Closure letter.

A.3.2.2 Stormwater Maintenance Activities

Enhanced Street Sweeping

The City received a grant from Ecology in 2021 to purchase an additional street sweeper which allowed staff to return to the higher sweeping frequency. The new schedule increases the frequency of sweeping at arterials to every six weeks and increases residential sweeping to twice per year City-wide. GPS is used to track the number of miles swept and the amount of material removed is recorded.

Storm System Cleaning

In 2007, at a cost of $300,000, the entire municipal storm drainages for OF230 and OF235 were cleaned, and video inspected by the City's Transmission Maintenance crews. One hundred years of accumulated historical stormwater particulate matter in the trunk lines and laterals, 220 cubic yards, was removed. Eighty thousand feet of 8- to 56-inch lines were cleaned between March 12 and June 25, 2007. Throughout the duration of the project, standardized cleaning practices were used (i.e., plugs downstream of vactor truck) to prevent any mobilized materials from entering the Thea Foss Waterway. The decant water from the vactor trucks was diverted to settling tanks prior to discharge to the sanitary sewer.

The 2007 video inspection revealed eroded pipe segments and other pipes drilled through the storm lines in some areas. The 2007 video inspections and resulting pipe conditions are tracked as part of the City's maintenance program. A number of relining or replacement projects were added to the City's list of Capital Improvement Projects (CIP). One of the relining projects, which included pipes in portions of OF235 and several other drainage basins, was completed in 2013 as discussed below.

Since the 2007 complete cleaning of the OF235 basin, additional cleaning has been performed in the basin in isolated areas. These cleaning and video inspection activities have been done for a variety of reasons, including areas identified as needing maintenance through complaints, business inspection follow ups, etc. There were no additional pipe cleaning activities completed during 2024 in the OF235 drainage basin.

2013 Stormwater Pipe Retrofit Project

From July 26 through November 13, 2013, 5,479 linear feet of existing storm sewer main, 32 segments, was structurally rehabilitated in asset management area FS06. The segments that were rehabilitated in OF235 ranged in size from eight inches to 18 inches in diameter. Defects (cracks, holes, etc.) in the aging system could allow groundwater and soil (potentially contaminated from historic "hot spots") to enter the system and ultimately discharge to the Thea Foss Waterway. Rehabilitation of the existing main segments was accomplished by means of cured in place pipe (CIPP) construction technologies. Resin impregnated liners were inserted into the main segments through existing manholes and the liner was then pressurized, causing it to expand and form to the inside of the existing main segment. A source of heat was then applied which caused the resins to catalyze. The result was a new pipe within the existing pipe that has similar strength and durability characteristics of PVC pipe. It is anticipated that these projects will also result in improvements in water and stormwater suspended particulate matter (SSPM) quality.

When properly installed, the CIPP liner results in continuous stormwater pipe segments with no joints (except for manhole connections), that are free of leaks associated with structural defects. The resulting reduction in inflow and infiltration may reduce the contaminant load to waters of the state if contaminated groundwater is present. Final project costs are approximately $1,048,158, which includes all work completed in asset management areas FS05, FS06, and FS07.

Prior to installation of the CIPP liner, the main line is thoroughly cleaned to remove all debris and to verify if a segment can be retrofitted using the CIPP construction technology. In FS06, 34 segments, 5,738 linear feet of pipe, were cleaned and video inspected from July 12 through October 7, 2013. During cleaning, the main line was plugged, and the cleaning water and material was removed from the main using a vactor truck. The cleaning water and entrained sediment was pumped into a sediment removal system to separate the solids from the water. After filtration the water was discharged into the sanitary sewer. Approximately 10 tons of material was removed from the main segments cleaned in asset management areas FS05, FS06, and FS07.

Hood Street Treatment Retrofit Project

The City was awarded a $1,000,000 fiscal year 2011 Stormwater Retrofit and Low Impact Development (LID) Competitive Grant from Ecology for a $2,100,000 regional stormwater treatment facility in the Hood Street Corridor through the Brewery District (South 21st Street to South 19th Street). This modified bioretention facility provides regional treatment for stormwater runoff discharged from 42 acres of the FS06 drainage basin in Tacoma’s downtown area. The water quality facility has been operational since fall 2014. The Hood Street Treatment Retrofit project was built in cooperation with the development of the Prairie Line Trail-UWT Station by the University of Washington Tacoma. The project is a rail-to-trail conversion of Tacoma’s historic freight corridor through the heart of downtown. The Prairie Line Trail is a landmark urban trail for pedestrians and bicyclists.

A.4 OUTFALL 237A

A.4.1 DRAINAGE BASIN

The OF237A drainage basin is approximately 2,813 acres and drains to the Thea Foss Waterway through the west 96-inch outfall located in the 2300 block of East Dock Street at the head of the waterway. As shown in Figure 1-3 of the WY2024 Report, the drainage basin generally extends in the south and west directions from the outfall. The general boundaries are South 19th Street to the north, South 40th Street to the south, Lawrence Street to the west, and Tacoma Avenue to the east.

The OF237A drainage basin contains residential, commercial, and industrial land uses. In addition, freeway ROW for I-5, SR 16, the entire I-5/SR 16 interchange, and a portion of the I-5/I-705 interchange are located within this drainage basin.

During periods of increased precipitation, the Leach Creek Holding Basin located to the west of the drainage basin is pumped to the OF237A storm drainage system. The Leach Creek Holding Basin is located within the city limits of Fircrest (west of Tacoma) and has functioned as a stormwater facility since 1961, when a dike was constructed along the southern edge of the current site. Several storm pipelines feed the holding basin, draining approximately 2,450 acres of residential, commercial, highways, and other high-use developed properties in Tacoma and Fircrest. The primary outflow from the holding basin is a gated 42-inch outlet pipe which conveys stormwater to Leach Creek.

The pump station was constructed in 1991 and consists of four pumps, each with a capacity of 24 cfs and maximum combined capacity of 96 cfs. During more intense rain events, stormwater from the Leach Creek Holding Basin is pumped through a 42-inch pipe to the Nalley Valley trunk line and discharged into the Thea Foss Waterway through OF237A. The number of pumps operating depends on the intensity of a given storm event, with any number of the four pumps potentially operating at a given time. At low levels of precipitation, no pumps operate and the water discharges to Leach Creek. At increased levels of precipitation[2], pumps sequentially engage up to a maximum of four pumps. The range of flow to the Nalley Valley system from the Leach Creek Holding Basin is from zero to 96 cfs. Emergency overflow from the holding basin is provided by a 40-foot-wide emergency spillway which discharges to Leach Creek.

In 2005, 60 feet of the OF237A outfall pipe was replaced by Burlington Northern Railroad as part of their rail track realignment project. Construction included extending the outfall, constructing a new manhole structure, and replacing pipe from the City's sanitary pump station yard (known as Dock Street) to the outfall. The new manhole was constructed downstream of the current stormwater sampling location and FD2 and FD2A. The 23rd Street lateral (FD2A) was rerouted to the new manhole structure in the OF237A main trunk line. Since 2023, this manhole is now used as the end-of-pipe stormwater sampling location and is designated as OF237A New. This sampling location represents discharge from the entire drainage basin.

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[2] According to the City's best estimation, this occurs when greater than ¾-inch of precipitation falls within a 24-hour period.

A.4.2 SOURCE CONTROL ACTIVITIES

Since 2002, significant work has been accomplished in the OF237A drainage basin, including intense business inspections, complete line cleaning in many sub-basins, and identification and removal of point sources. A discussion of specific major source control activities is provided in the following paragraphs.

As part of the City-wide inspection program, 123 business inspections were completed in the OF237A drainage basin in 2024. Business inspections provide source control through education and through implementation of nonstructural BMPs. These actions help prevent materials from coming into contact with stormwater and help promote activities that reduce pollutants in stormwater.

Stormwater treatment devices currently in place also remove solids and the associated particulate-bound chemicals from stormwater. The locations of private and public stormwater treatment devices in the OF237A drainage basin are shown on Figures A-1a and A-1b, respectively. In 2024, the following two new BMPs were installed on private properties in this drainage basin (see Table A.1-1):

- Eleven media filters were installed at a commercial warehouse property on South Pine Street;

- One Infiltration trench was installed at a single-family dwelling on South K Street.

With future redevelopment in the OF237A drainage basin, more onsite stormwater treatment systems will be installed and over time these will help to decrease flow, suspended solids, and the associated particulate-bound chemicals to the waterway.

A.4.2.1 2024 Source Tracing Investigations

There are no active source tracing investigations in the OF237A drainage basin. The following is a discussion regarding significant historic investigations.

Historic FD10C Source Investigation

The FD10C sediment trap drainage area was initially tracked for several years as a potential phthalate concern. The annual sediment trap monitoring results showed moderately elevated phthalate levels since monitoring of this trap began in 2003. In addition, this trap had intermittent moderate- to high-level PCB concentrations since 2013, and moderately elevated mercury concentrations in 2015 and 2016. Starting in 2011, phthalate concentrations began decreasing, coinciding with a large business closing in this area.

Due to these historic phthalate concentrations as well as the PCB detections, the stormwater system was cleaned in January 2014 to remove residual contamination. Following cleaning of the system, FD10C continued to show moderately elevated PCBs and mercury concentrations. As a result of these detections, an investigation was initiated in 2016 that included sampling of catch basins in the drainage area as well as performance of business inspections. Through this work, the area for additional investigation was narrowed down to a smaller area.

Two additional business inspections were conducted in 2017 to further explore the potential for ongoing source contributions. In addition, sediment samples were collected from private catch basins discharging to the City's stormwater collection system. This phase of the source tracing investigation was intended to identify possible sources of PCB and mercury contamination as well as PAHs and phthalates, which were included based on the annual sediment trap monitoring results.

Although a specific source of the contamination was not identified through this investigation, some private stormwater systems and City catch basins upstream from the sediment trap were cleaned with a plan to resample in 2018 to determine if there was a historical component to the contamination.

During 2018, one additional business inspection was conducted, and sediment samples were collected and analyzed from one private catch basin and one City catch basin. The analytical results indicated detectable concentrations for PAHs and phthalates and minor concentrations for PCBs and mercury. Sediment was cleaned from all the City's collection pipes in 2018 to remove historical sediment from the lines.

In 2019 the City continued efforts to get permission from the private property owner at 3033 South Lawrence Street to collect sediment from their private stormwater oil/water separator. Since these efforts were not successful, short-term sediment traps were redeployed to try to get a sample of material leaving the site. These results showed moderately high levels of PAHs and low levels of phthalates and PCBs. The City wrote a letter on February 28, 2020, to the owner of 3035 South Lawrence Street requesting that they clean their oil/water separator, and a follow-up inspection on July 6, 2020, confirmed that it had been cleaned.

In 2021, a short-term sediment trap was installed at the connection point of the 3035 South Lawrence Street private system and oil/water separator. The purpose was to determine if the source of contaminants entering the municipal system had been removed after the cleaning of the oil/water separator at this location. Those results show small concentrations of PAHs, but no PCBs were detected. Additionally, four private catch basins were sampled along Lawrence Street that had previously shown low concentrations of PCBs. These catch basins continue to exhibit relatively low concentrations of PCBs compared to annual sediment trap concentrations, and it is unlikely that this property is the source of the contamination.

Since the sediment trap results in this basin continued to exhibit medium-level PCB concentrations, there was determined to be a possibility of unknown discharges to the storm system. During 2022, staff reviewed the private systems in this basin and confirmed that they are accurately represented on the City's mapping system. Additionally, short-term sediment traps were installed at two new locations along South Lawrence Street upstream from FD10C in attempt to identify the source of PCBs in the larger drainage area. These locations isolated several private drainage systems that discharge to South Lawrence Street. The short-term trap towards the north end of South Lawrence Street exhibited a concentration of 65 mg/kg, while the downstream sediment trap exhibited a concentration of 230 mg/kg, which more closely aligns with our historic data for the FD10C sediment trap. The municipal storm system where the sediment traps were installed was heavily impacted by sediment, making it difficult to determine if the contamination is ongoing or historic. There were several construction projects on South Lawrence Street completed in 2022, so it is possible that the sediment impacting the storm main could be from those activities. The City cleaned the entire storm system in this drainage basin, and the sediment traps were re-installed in December 2022.

The short-term sediment traps were retrieved and submitted to the lab on July 11, 2023. Results showed that both sediment traps had non-detectable levels of PCBs. Additionally, the FD10c sediment trap had non-detectable levels of PCBs for the past two monitoring years (WY2023 and WY2024). It is possible that the source of PCBs was historical contamination, and the system cleaning removed this contamination. No investigations are planned in this basin for

2025. The City will continue to monitor the sediment trap results during 2025 to determine if there are any additional sources of PCBs in this drainage area.

A copy of the OF237A Source Tracing Status Update – FD10C Source Tracing Investigation Report is included in Attachment A.4 of the 2023 Report.

DA-1 Line/Coal Gas Site Cleanup

During construction of I-705, WSDOT installed a French drain to pick up surfacing groundwater that was affecting their construction of a road near South 23rd Street and South “A” Street. In 1992, it was determined that this drain was picking up coal tar-contaminated groundwater and conveying it to the City’s storm drain system, and subsequently to the waterway. The DA-1 line was thus believed to be a source of PAHs discharging to OF237A in the FD2A branch. With Ecology oversight, DA-1 line was sealed and disconnected from OF 237A by WSDOT in 2003. The sealed drain system is under the South A Street and does not provide a pathway to the waterway.

In 2018, Puget Sound Energy (PSE), PacifiCorp, City of Tacoma, and WSDOT entered into Agreed Order No. DE 13972 (AO) with Ecology as the Potentially Liable Parties for the Coal Gas Clean-up Site; Tacoma Coal Gasification - (3675). The AO requires that the PLPs complete the work necessary to generate a remedial investigation (RI) report for finalization in accordance with Ecology and public comment. It is anticipated that the PLPs will submit the RI to Ecology in April 2025. Once the RI is accepted the PLPs will develop and submit a Feasibility Study (FS) to determine cleanup options for this site.

Historic FD13 PAH Investigation / Media Filtration System/ Source Tracing

The FD13 sub-basin, which is approximately 50 acres in size is a portion of the OF237A drainage basin that has had various source investigation since 2005 to identify possible sources of PAHs using sediment trap monitoring.

In 2010, the City installed a media filtration system that treats stormwater from the This CIP was funded by a grant from Ecology. When initially installed, this media filtration system appeared to remove almost all the SSPM from the stormwater as evidenced by the fact that insufficient accumulation prevented enough for a sample to be collected from FD13, which is located downstream of the treatment BMP in WY2011. When the treatment system was installed, it caused the upstream sediment trap (FD13B) to become submerged. In August 2012, when the sediment traps were redeployed for WY2013, a new sediment trap was installed further upstream of the prior location. This new location is designated FD13B-New. The sediment trap FD13B was removed in 2018 and was not redeployed, so only results through WY2018 are provided for that location.

City staff investigated potential sources of PAHs in the FD13B-New basin from 2015 to 2023. The first phase of the 2015 investigation was to determine whether the ROW drainage area was a potential source of PAHs and to attempt to identify a specific area or private drainage system for additional source tracing efforts. Results from this phase showed an area with significantly higher PAH concentrations and subsequent sampling confirmed the presence of significant concentrations of PAHs throughout a parking lot on the Tacoma News Tribune (TNT) property.

The City worked with the business owner and Ecology to develop a plan to address the contamination. In July 2016, it was confirmed that the cleanup plan had been implemented, and the City followed up with an outline for a plan for inspecting their private stormwater system quarterly. In October 2016, the municipal stormwater conveyance system from the TNT property to the FD13B–New sediment trap was cleaned. The sediment trap was then reinstalled on October 4, 2016, after the cleaning was completed.

WY2017 sediment trap results showed PAH results at FD13B-New remained in the high range, indicating an ongoing source of PAHs in this area. On October 31, 2017, City staff resampled several ROW catch basins in the FD13B-New drainage area that exhibited relatively elevated concentrations for PAHs during the 2015 investigation. While two of the 2017 samples exhibited only slightly higher concentrations than measured in 2015, another sample located immediately adjacent to the TNT property exhibited a concentration more than double the concentration of the 2015 sample.

After subsequent investigations and sampling events, results indicated a continued source of PAHs on the TNT property. The City met with their representatives in early 2018 to discuss next steps. Additional maintenance of their onsite system was performed, and the property owner has committed to additional efforts as needed to control any ongoing issues. In addition, the City cleaned the stormwater system downstream from the TNT to remove historical pollutants, and the City continued to monitor PAH concentrations in ROW catch basins downstream from the property when sufficient sediment has accumulated to determine whether source control strategies have been successful.

During the same time of the TNT investigation in 2018, City staff determined through the use of two short-term sediment traps in the FD13B-New drainage basin that other areas of the basin were also sources of PAHs in stormwater pipes discharging from the south/west (sediment trap A) and flow discharging from the north (Sediment trap B). Monitoring of the private storm systems upstream of two of the short-term traps continued in 2021 and City staff discovered that an additional property has stormwater drainage that connects to the stormwater system. In June 2021, EC staff sampled all the catch basins located on the CHI Franciscan Education and Support Center complex (2420 South State Street) in addition to resampling the three catch basins at General Mechanical, Inc., (2316 South State Street) that were not accessible during the previous investigation. Elevated concentrations of PAHs were found in the catch basins at the southernmost parking lot on the CHI Franciscan Education and Support Center complex property and the City required the property owner to clean the entire storm system at this site. This cleaning was completed on September 22, 2021. A quick inspection on November 19, 2021, showed that the cleaning was thorough and sediment levels were in these catch basins was insufficient for resampling.

During 2022, City staff resampled the CHI Franciscan properties catch basins to ensure that the contamination has been effectively removed. The catch basin sediment concentrations were in the higher range for PAHs, ranging from 709,230 - 5,424,490 µg/kg. EC staff sent CHI Franciscan a 30-day letter to submit a written plan of action and timeline to effectively eliminate the discharge of PAHs from its facility to the City's stormwater system. CHI Franciscan hired a consulting firm that determined that the failing asphalt in the parking lot was likely the source of PAH contamination. During 2023, CHI Franciscan completed work to resurface the parking lot and on August 18, 2023, EC staff received confirmation that all parking lot repairs were completed, and that the private stormwater system had been cleaned post-construction.
WY2023 and WY2024

PAH concentrations in the sediment trap have shown fluctuations since 2018, with a steady decrease since removing identified sources of PAHs in this basin. The WY2018 PAH concentration at FD13B-New was in the medium range at 200,735 µg/kg, a decrease from the high range concentration of 316,529 µg/kg detected in WY2017. In WY2019 and WY2020, the concentrations increased slightly to 233,444 µg/kg and 282,110 µg/kg, respectively. Concentrations exhibited a downward trend in WY2021 and WY2022 to 159,994 µg/kg and 142,919 µg/kg, respectively. In WY2023 and WY2024, sediment trap results exhibited a significant decrease in PAH concentrations with a concentration of 58,330 µg/kg and 83,470 µg/kg, respectively, which is significantly lower than what is classified as relative low levels of contamination (<164,000 µg/kg) (see Figure 2-1.2).

No investigations were completed in this basin for 2024. The City will continue to monitor the sediment trap results to determine if there are any additional sources of PAHs in this drainage area. A copy of the OF237A 2023 Source Tracing Status Update – FD13B Polyaromatic Hydrocarbons Investigation report is included in Attachment A.4 of the 2023 Report.

A.4.2.2 Enforcement Actions

Notice of Violation and Warning Letters

No Notice of Violation letter issued in this drainage basin in 2024.

UST and LUST Removal

TPCHD is currently overseeing the removal of USTs at 15 sites in the drainage basin (see Attachment A.1).

- Following identification of a LUST, the owner of this site completed a voluntary cleanup under Ecology oversight in 2007. A return fuel line from a back-up generator had ruptured and leaked diesel into surrounding soils and eventually seeped into a catch basin that drains to FD13B.

South Tacoma Groundwater Protection District

The South Tacoma Groundwater Protection District also falls within this basin and the TPCHD conducts industrial/business inspections in this basin. As part of their inspection program, stormwater treatment devices and other onsite BMPs are inspected for proper installation, maintenance, and operations. Improvements to stormwater quality discharging from these sites may be realized with proper maintenance and implementation of these BMPs. During this reporting period, TPCHD did note several violations during routine inspections and they've either been resolved or they're working to resolve with the facilities.

A.4.2.3 Stormwater Maintenance Activities

Storm Line Cleaning

Between April 28 and August 8, 2008, targeted areas of the storm sewer system, including trunk lines, laterals, and catch basins, were cleaned and video inspected at a cost of $374,000. Approximately 320 cubic yards of historical SSPM which had accumulated over 100 years was removed from 157,200 feet of lines and 754 catch basins using Tacoma's standardized cleaning practices (i.e., plugs downstream of vactor truck). The video inspections revealed a large void in the pipe at the intersection of South 26th Street and Jefferson Avenue. The City's Sewer Transmission Maintenance Division and Streets and Grounds Division repaired the storm pipe at this location.

The City's asset management program is designed to inspect and rank the entire City storm conveyance system. The City maintains a map-based asset management database that helps guide our CIP. Over time, video inspections have revealed eroded pipe segments, root intrusion, and poorly constructed tap-in connections. A number of relining or replacement projects have been added the City's list of CIPs.

Since the time of the cleaning project in the OF237A basin, additional cleaning and maintenance has been performed in the basin in isolated areas. These cleaning and video inspection activities have been done for a variety of reasons, including areas identified as needing maintenance through the STRAP program, complaints, business inspection follow ups, etc. A summary of pipe cleaning and maintenance projects completed in the OF237A drainage basin during 2024 is provided in Table A.4-1 of Attachment A.4.

Enhanced Street Sweeping

In January 2007, the City's street sweeping program was transferred from the Streets and Grounds Division to the Sewer Transmission Maintenance Division for continued implementation. The program was enhanced at that time in an attempt to reduce sediment buildup in the storm sewer system. The schedule was set to sweep all areas of the City twice per year, with more frequent sweeping in the business districts and on major arterials. The City also increased communications with residents and business owners, which helped raise awareness of the importance of the street sweeping program.

In 2007, when the work was transferred over, sweeping was done with a combination of mechanical and vacuum sweepers. In 2008, the City started the transition from mechanical sweepers to regenerative air machines. At this point in the program, the City used four regenerative air sweepers. In mid-2018, due to the end of usable life of one of the City's regenerative air sweepers and a staff retirement, Tacoma temporarily reduced its street sweeping program. This resulted in Tacoma reducing the frequency of arterial sweeping to quarterly and residential streets to annually.

The City received a grant from Ecology in 2021 to purchase an additional street sweeper which allowed staff to return to the higher sweeping frequency. The new schedule increases the frequency of sweeping to every six weeks and increased residential sweeping to twice per year City-wide. GPS is used to track the number of miles swept and the amount of material removed is recorded.

2013 Stormwater Pipe Retrofit Project

From July 18 through November 15, 2013, 5,126 linear feet of existing storm sewer main, 31 segments, was structurally rehabilitated in asset management area FS07. The segments that were rehabilitated in OF237A ranged in size from eight inches to 18 inches in diameter. Defects (cracks, holes, etc.) in the aging system could allow groundwater and soil (potentially contaminated from historic "hot spots") to enter the system and ultimately discharge to the Thea Foss Waterway. Rehabilitation of the existing main segments was accomplished by means of CIPP construction technologies. Resin impregnated liners were inserted into the main segments through existing manholes and the liner was then pressurized, causing it to expand and form to the inside of the existing main segment. A source of heat was then applied which caused the resins to catalyze. The result was a new pipe within the existing pipe that has similar strength and durability characteristics of PVC pipe. It is anticipated that these projects will also result in improvements in water and SSPM quality.

When properly installed, the CIPP liner results in continuous stormwater pipe segments with no joints (except for manhole connections), that are free of leaks associated with structural defects.

The resulting reduction in inflow and infiltration may reduce the contaminant load to waters of the state if contaminated groundwater is present. Final project costs are approximately $1,048,158, which includes all work completed in asset management areas FS05, FS06, and FS07.

Prior to installation of the CIPP liner, the main line was thoroughly cleaned to remove all debris and to verify if the segment could be retrofitted using the CIPP construction technology. In FS07, 34 segments, 5,666 linear feet of pipe, were cleaned and video inspected between July 11 and October 28, 2013. During cleaning, the main line was plugged, and the cleaning water and material was removed from the main using a vactor truck. The cleaning water and entrained sediment was pumped into a sediment removal system to separate the solids from the water. After filtration the water was discharged into the sanitary sewer. Approximately ten tons of material was removed from the main segments cleaned in asset management areas FS05, FS06, and FS07.

A.5 OUTFALL 237B

A.5.1 DRAINAGE BASIN

The OF237B drainage basin encompasses 1979 acres of south and east Tacoma. This area drains to the Thea Foss Waterway through a 96-inch outfall pipe located on East Dock Street at the head of the waterway. The general basin boundaries are East 23rd Street and East Dock Street to the north, East 84th Street to the south, South Fawcett Avenue to the west, and McKinley Avenue to the east. Most of the storm drainage is channeled to the main trunk line, which flows south to north along East “D” Street.

Primary land use in this drainage basin is residential with some commercial and a very small industrial area (see WY2024 Report, Figure 1-3). Commercial areas are mostly linear and spread out in strips along Pacific Avenue and McKinley Avenue with some areas around I-5 to the Thea Foss Waterway. Freeway ROW makes up a small percentage of this basin, and includes a portion of the I-5, I-705, SR 7 interchange, and SR 7. This ROW area may increase slightly with the expansions and HOV lanes on I-5. Streets, parks, and open or undeveloped property account for the remaining land use in the basin.

As part of the Burlington Northern Santa Fe Railway (BNSF) railroad realignment project, OF237B was reconstructed between July and September 2005. This work included installation of a new manhole structure downstream of the whole-water and SSPM (FD1) sampling location and included extension of the outfall pipe through installation of 60 feet of new concrete pipe. The SSPM and the whole-water monitoring station remained at the same location since that location captures contributions from the entire basin.

A.5.2 SOURCE CONTROL ACTIVITIES

Since 2002, significant work has been accomplished in the OF237B drainage basin, including intense business inspections, targeted line cleaning, and identification and removal of point sources. A discussion of specific major source control activities is provided in the following paragraphs.

As part of the City-wide inspection program, 24 inspections were completed in the OF237B drainage basin in 2023. Business inspections provide source control through education and through implementation of nonstructural BMPs. These actions help prevent materials from coming into contact with stormwater and help promote activities that reduce pollutants in stormwater.

Stormwater treatment devices currently in place also remove solids and the associated particulate-bound chemicals from stormwater. The locations of private and public onsite stormwater treatment devices in the OF237B drainage basin are shown on Figures A-1a and A-1b, respectively. In 2024, there were seven new treatment devices installed on private properties in this drainage basin, including two oil water separators, four infiltration facilities, , and a Media Filter facility (see Table A.1-1). With future redevelopment in the OF237B drainage basin, more of these private treatment systems will be installed and over time they will help to decrease the solids load and the associated particulate-bound chemical load to the waterway.

A.5.2.1 2024 Source Control Investigations

There are no active source tracing investigations in the OF237B drainage basin. The following is a discussion regarding significant historic investigations.

Historic FD31 PAH Investigation

HPAHs were found in baseflow in WY2004 (see WY2012 Report, Figures G-19a and G-39a). As shown in Figure 2-1.2 of the WY2023 Report, FD31 PAH concentrations in SSPM in WY2003 were considered to be in the medium range (yellow). In 2004-2005, source control inspectors performed a source tracing investigation and identified two sources of PAHs in the FD31 branch of the OF237B drainage: an existing 1950s UST for heating fuels at Tacoma Public Schools Willard Early Learning Center, and a neighborhood fueling station which had recently closed. The City cleaned and video inspected the FD31 branch as part of the PAH source tracing investigation. Source control inspectors worked with the school district's maintenance staff to implement proper BMPs for the site.

Because of these efforts, PAH concentrations decreased in FD31 to the low range of concentrations in WY2005 (see WY2023 Report, Figure 2-1.2). However, PAH concentrations at FD31 increased back to medium range starting in WY2008 and to the high range in WY2010. As a result of the known presence of USTs, these sites were referred to TPCHD for follow up.

In December 2011, the UST at Tacoma Public Schools Willard Early Learning Center was removed in accordance with a TPCHD permit. TPCHD considered the work completed and closed on October 22, 2012. In response to the elevated PAH concentrations at the former fueling station at 3402 Pacific Avenue (EZ Food Mart), TPCHD initiated a Phase I/II assessment in 2011. TPCHD determined that the site had improperly abandoned USTs which needed to be removed. They began working with the property owner to remove these USTs, but the work was delayed for two years until cleanup was finally completed in 2014. The Site Closure determination was issued by TPCHD on August 6, 2014.

Because sediment trap concentrations were in the medium range at this location in WY2013, and due to the lack of progress in removing the USTs at the EZ Food Mart site, the City initiated additional source tracing efforts for PAHs in this sub-basin in 2014 to identify any other sources of PAHs present in this area (Figure 2-1.2). The approach for this investigation was to sample individual catch basins in the targeted drainage area in an attempt to identify any specific catch basins with elevated levels of PAHs. During the initial investigation, it was discovered that the stormwater collection system in this area was cleaned in February 2014. Because of this, insufficient sediment was present for sampling until September 2014. Five catch basins were sampled at that time, and none showed detectable levels of PAHs.

As shown in Figure 2-1.2, PAH concentrations in FD31 were in the medium range in WY2014 but decreased to low levels in WY2015, where they have remained through WY2019. With the cleaning of the drainage system and the removal of the USTs at the EZ Food Mart site, it appears that the elevated PAH levels found in the stormwater system were the result of these historic sources at the Willard Early Learning Center and EZ Food Mart, and that control of these sources has eliminated this source. While in the low range, the WY2018 concentration at FD31 of 159,791 µg/kg represented an increase from the WY2017 concentration of 66,262 µg/kg. Concentrations have continued to fluctuate at this sampling location with a decrease in PAH concentration to 50,323 µg/kg in WY2019 and a slight increase in concentration to 91,139 µg/kg in WY2020. Despite the fluctuations, concentrations have remained comparatively low, indicating that source control work was effective. Therefore, the FD31 sediment trap was removed in WY2020.

Historic PCB Source Tracing in FD34 and FD35

Since 2005, PCBs were found intermittently at high-range concentrations in the south-central portion of the OF237B drainage basin at FD34 and FD35 (see WY2023 Report, Figure 2-1.4). Through the years, numerous source control activities were undertaken in attempt to identify the source of this ongoing intermittent issue. In the summer of 2011, source control inspectors initiated an investigation to isolate possible source(s) of PCBs in the area. Sediment and soil samples were also collected from a catch basin and from the ground adjacent to a transformer on the property of the former Globe Ticket Facility. PCBs were not detected in any of these samples.

In an attempt to remove any legacy contamination, the City completed a stormline cleaning project in the summer of 2011 that covered the majority of the OF237B drainage basin, including the FD35 area. In WY2011, concentrations in both sediment traps dropped to below levels of concern. However, in WY2012 and WY2013, the PCB concentrations in FD35 increased back to high levels, while the concentrations in FD34 remained low. In WY2014, concentrations at FD35 decreased to medium levels, but increased back to the high range in WY2015, while remaining in the low range in FD34.

Another source tracing investigation to try to narrow the source of PCBs in this area was initiated in late 2012. Initial results narrowed the source to one leg of the drainage system leading to FD35. The results from this investigation were included in the WY2012 Report. Substantial additional work was performed in 2013 to further isolate the source of the contamination in this leg of the drainage system. Ultimately it was determined that the source of the contamination was a material used during construction of the roadway in the area in 1975, specifically the sealant used to seal the roadway at the curbline that likely contained PCBs. The final report on this investigation was included in the WY2013 report.

On May 22, 2013, the City sent formal letters of notification to Ecology outlining the discovery of the PCBs in the City's stormwater conveyance system. In 2015, the City completed the first phase of roadway repair to eliminate this source of PCBs and completed the second and final phase in fall 2016. FD34 remained in the low range in WY2019, and that sediment trap was removed. FD35 decreased from the medium range in WY2017 to the low range in WY2018, where it remained in WY2019. FD35 was in place in the pipe during the time that the remediation project was being completed. Therefore, the WY2018 sample was the first representing a full year of the area in its remediated condition. WY2019 PCB concentrations in FD35 remained in the low range (94 µg/kg), however WY2020 concentrations increased back to the medium range (250 µg/kg). FD35 remained in place during WY2021 and WY2022, and no PCBs were detected. Since concentrations have remained low and the WY2020 results were considered inaccurate[3], the source control action is considered successful and the sediment trap at this location will be removed.

A.5.2.2 Enforcement Actions

Notice of Violation and Warning Letters

One Warning letter was issued to the following party in this drainage basin in 2024:

- A warning letter was issued on December 13, 2023, to a Tacoma Resident at 3725 E “E” Street. The resident was notified of a vehicle oil spill in the ROW in front of their property and was required to immediately cleanup and cease discharge.

A copy of this letter is included in Attachment A.5.

UST and LUST Removal

TPCHD is currently overseeing the removal of USTs at the following properties in this drainage basin (see Attachment A.1):

- UST at Erickson Autobody Repair/Hi Tech Erickson LLC located at 4006 Pacific Avenue.
- Pacific Grocery and Deli located at 6329 Pacific Avenue has an active LUST permit.

A.5.2.3 Stormwater Maintenance Activities

Storm System Cleaning

At a cost of $274,200, the majority of the municipal storm drainage basin for OF237B was cleaned and video inspected by the City’s Transmission Maintenance crews between November 7, 2010, and February 24, 2011. Fifty to 100 years of accumulated historical stormwater particulate matter was present in the trunk lines and laterals. During the cleaning project, 175 cubic yards were removed from 144,199 feet of lines and laterals and 1,072 catch basins. The cleaning was performed using Tacoma’s standardized cleaning practices (i.e., plugs downstream of vactor truck).

The 2011 video inspection also revealed eroded pipe segments and other pipes drilled through the storm lines in some areas. These issues will be addressed as part of future CIPs. Since the time of the complete cleaning of the OF237B basin, additional cleaning has been performed in the basin in isolated areas. These cleaning and video inspection activities have been done for a variety of reasons, including areas identified as needing maintenance through the STRAP program, complaints, and business inspection follow ups.

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[3] During WY2020 SSPM results showed consistently higher levels of PCBs wherever they were detected. Because these higher concentrations were dispersed across several locations and drainage basins, it did not appear to be caused by a specific event or source. While a cause for these elevated concentrations was not identified during the investigation, based on the lower expected results exhibited during WY2021 it was determined that WY2020 results were not accurate.

A summary of pipe cleaning and maintenance projects completed in the OF237B drainage basin during 2024 is provided in Table A.5-1 in Attachment A.5.

Enhanced Street Sweeping

In January 2007, the City's street sweeping program was transferred from the Streets and Grounds Division to the Sewer Transmission Maintenance Division for continued implementation. The program was enhanced at that time to reduce sediment buildup in the storm sewer system. The schedule was set to sweep all areas of the City twice per year, with more frequent sweeping in the business districts and on major arterials. The City also increased communications with residents and business owners, which helped raise awareness of the importance of the street sweeping program.

In 2007, when the work was transferred over, sweeping was done with a combination of mechanical and vacuum sweepers. In 2008, the City started the transition from mechanical sweepers to regenerative air machines. At this point in the program, the City used four regenerative air sweepers. In mid-2018, due to the end of usable life of one of the City's regenerative air sweepers and a staff retirement, Tacoma temporarily reduced its street sweeping program. This resulted in Tacoma reducing the frequency of arterial sweeping to quarterly and residential streets to annually.

The City received a grant from Ecology in 2021 to purchase an additional street sweeper which allowed staff to return to the higher sweeping frequency. The new schedule increases the frequency of sweeping at arterials to every six weeks and increases residential sweeping to twice per year City-wide. GPS is used to track the number of miles swept and the amount of material removed is recorded.

A.6 OUTFALL 243

A.6.1 DRAINAGE BASIN

The OF243 drainage basin is 59 acres and discharges to the east side of the waterway at East 21st Street through a 42-inch outfall (see WY2023 Report, Figure 1-3). The storm drainage is carried in two main laterals, one south to north on East "D" Street from East 26th Street to East 21st Street and the second east to west on East 21st Street. The majority of runoff in this basin is from BNSF property and the portion of SR 509 between Portland Avenue and the Thea Foss Waterway. Land uses in the basin are primarily industrial, with some commercial at the west side of the basin and some highway with SR 509.

The outfall has a tide valve which was originally installed in 1999 then re-installed in 2001 when the outfall pipe was extended. In 2008, "D" Street was raised over the BNSF main line increasing the drainage area by half an acre. The stormwater runoff from the new half-acre is treated through a VortFilter unit which then discharges to OF243 through a new 15-inch pipe.

A.6.2 SOURCE CONTROL ACTIVITIES

Since 2002, significant work has been accomplished in the OF243 drainage basin, including removal of significant sources. A discussion of specific major source control activities is provided in the following paragraphs.

As part of the City-wide inspection program, eight business inspections were completed in the OF243 drainage basin in 2024. Business inspections provide source control through education and through implementation of nonstructural BMPs. These actions help prevent materials contact with stormwater and help promote activities that reduce pollutants in stormwater.

Stormwater treatment devices currently in place also remove solids and the associated particulate-bound chemicals from stormwater. The locations of private and public stormwater treatment devices in the OF243 drainage basin are shown on Figures A-1a and A-1b, respectively. No new public or private treatment BMPs were installed in this drainage basin in 2024. With future re-development in the OF243 drainage basin, more onsite treatment systems will be installed, and over time they will help to decrease the solids load and the associated particulate-bound chemical load to the waterway.

A.6.2.1 2024 Source Control Investigations

There is one active source tracing investigation for mercury in this OF243 drainage area and significant historic investigations.

Outfall 243 Mercury Source Tracing

Mercury has been found in the medium to high range of concentrations in all samples analyzed from FD23 since WY2002 (see WY2021 Report, Figure 2-1.1). Results have been in the medium range since WY2007, and the WY2018 concentration was 0.661 mg/kg, which was the highest concentration detected at this location since WY2006. The WY2019 concentration decreased to 0.2830 mg/kg.

A source control investigation was initiated in 2008 using stormwater sediment samples collected at several locations in the basin and analyzed for Foss parameters. On May 28, 2009, four sediment samples were collected from portions of the system that represent independent and comingled branches of the storm sewer system. Mercury concentrations found in these samples (0.129-0.54 mg/kg) are comparatively similar to the mid-range of concentrations (yellow in color) as represented in Figure 2-1.1 with no likely single point-source of mercury for any one of the branches.

Over the next ten years, the City continued investigations with a focus on WSDOT's pond and the three main businesses discharging to the FD23 sediment trap: BNSF property, Land Recovery, Inc. (LRI) properties and Berg. Work to clean and map their drainage systems was done and while detectable mercury was found, the levels did not suggest a significant source.

In 2019, while reviewing past investigations and the extent of the drainage basin, it was discovered that a small portion of this drainage basin was not included in previous investigations. The City sampled various catch basins in May 2019 and found minimal concentrations of mercury with the exception of one catch basin which was further investigated in June 2019. Samples were collected from the gutter-lines, curb drains, and roof drains discharging to the contaminated catch basin. These sample results for mercury ranged from 1 mg/kg to 12.8 mg/kg, the highest of which came from the roof drain coming from 414 Puyallup Avenue. This roof drain was blocked with debris which allowed sediment buildup. The catch basin, curb-line, and roof drain were cleaned in October 2019. However, the catch basin sediment continued to exhibit elevated concentrations of mercury. During 2021, the City worked with the property owner to ensure the roof drains were adequately cleaned, as well as re-cleaned the catch basin and the curbline on October 8, 2021, and the subsequent sediment sampling on June 21, 2022, for mercury was 1.38 mg/kg. Since then results at this location show a continued trend downward and no other probable sources were investigated.

In parallel with the source tracing investigations and cleanup actions, the FD23 sediment trap results showed an overall decrease from WY2018 to WY2022. The WY2018 sediment trap concentrations were 0.6610 mg/kg, which decreased significantly in WY2021 and WY2022 with concentrations of 0.206 mg/kg and 0.214 mg/kg, respectively. During WY2023, there was insufficient sediment to analyze for mercury. During WY2024, sediment trap concentrations dropped to the lower concentration range of 0.1780 mg/kg for the first time during the monitoring record.

A copy of the OF243 Source Tracing Status Update – FD23 Mercury Investigation is included in Attachment A.6.

Foss Landing Marina

In 2002 and 2003, Pick's Cove Marina (now Foss Landing Marina) and American Plating were remediated. These sites were sources of mercury and bis(2-ethylhexyl) phthalate (DEHP) (Pick's Cove) and metals (American Plating). In addition, the "D" Street Grade separation/bridge was completed in 2008 and stormwater from the new impervious surfaces (0.49 acres) were routed through a treatment system.

SR 509 WSDOT Pond Black Oil/Tar Releases

Historically, black oil/tar emanating from the old Northern Pacific Rail yard oil pipeline was found in the SR 509 WSDOT stormwater treatment pond located within this drainage basin. In 2002, the pond was rebuilt to remediate the black oil/tar. In 2009, the pond was again remediated as directed by Ecology when the entire length of the Northern Pacific Rail yard oil pipeline along East "D" Street and East 19th Street was cleaned up.

A.6.2.2 Enforcement Actions

Notice of Violation and Warning Letters

There were no Warning or Notice of Violation letters issued in this drainage basin in 2024.

UST and LUST Removal

TPCHD is currently overseeing the removal a UST at the following location in this drainage basin (see Attachment A.1):

- UST at Industrial Tire Service located at 423 Puyallup Avenue. Permits were renewed in July 2024.

A.6.2.3 Stormwater Maintenance Activities

Enhanced Street Sweeping

In January 2007, the City's street sweeping program was transferred to the Sewer Transmission Maintenance Division for continued implementation. The program was enhanced at that time to reduce sediment buildup in the storm sewer system. The schedule was set to sweep all areas of the City twice per year, with more frequent sweeping in the business districts and on major arterials. The City also increased communications with residents and business owners, which helped raise awareness of the importance of the street sweeping program.

In 2008, the City started the transition from mechanical and vacuum sweepers to more regenerative air machines. At this point in the program, the City used four regenerative air sweepers. In mid-2018, due to the end of usable life of one of the City's regenerative air sweepers and a staff retirement, Tacoma temporarily reduced its street sweeping program. This resulted in Tacoma reducing the frequency of arterial sweeping to quarterly and residential streets to annually.

Using Ecology 2021 grant funds, the City purchased another street sweeper to return to the higher sweeping frequency. The new schedule increases the frequency of sweeping at arterials to every six weeks and increases residential sweeping to twice per year City-wide. GPS is used to track the number of miles swept and the amount of material removed is recorded.

Street Sweeping Pilot Project

OF243 and OF245 have shown somewhat elevated levels of lead and zinc in both stormwater and baseflow relative to other drains. It is theorized that this may be due to the increased amount of trucking in this industrial area. Based on these results, the City initiated a pilot program in WY2014 to determine whether an increased frequency of street sweeping in this area would have an effect on these results. Starting on October 1, 2013, the City began sweeping the ROW within the OF243 and OF245 drainage basins at a frequency of once every two weeks rather than the usual frequency of once per month for industrial areas.

The pilot project continued in WY2024 and has now become a permanent change in street sweeping frequency for this area. With several years of data available, statistical analysis of the effectiveness of this enhanced sweeping schedule was done for the first time in WY2017 and is included again in this report. Results will be more statistically robust as additional data becomes available. Results of this analysis are presented in Section 5 of the WY2024 Stormwater Monitoring Report.

A.7 OUTFALL 245

A.7.1 DRAINAGE BASIN

The OF245 drainage basin is located in the Tideflats of Tacoma on the southern portion of the east side of the waterway. Basin boundaries are shown on Figure 1-3 in the WY2023 Report. The outfall is located at East 19th Street, just south of Johnny's Dock Restaurant. The drainage area is approximately 39 acres in size and the main trunkline of the storm drainage system extends east from the Thea Foss Waterway, down East 19th Street to East "I" Street.

Because of the low basin elevation, the entire storm system is influenced by saltwater at high tide. Baseflow from OF245 is continuous at approximately 0.1 cfs (see Appendix B, Table B2-2) and originates primarily from tidal backflushing. Sources of baseflow are discussed in more detail in Appendix B.

Land use in this basin is primarily industrial with the restaurants providing a small commercial area at the west side of the basin. Most facilities in the drainage basin are engaged in storage, transloading and warehousing of materials and products, and manufacturing.

Directly upstream of the outfall is a deep bottom sump manhole known as MH390 (see Appendix B, Figure B2-4). MH390 is 60 inches (inside diameter) and approximately 18 feet in depth, with the inlet pipe and outlet pipe at 55.5 inches above the bottom. A plastic tide gate (swing valve) is located on the inlet pipe. Even with the tide gate some tidal water can get into the upper reaches of the system. In fall 2004, the last 24 feet of pipe from MH390 to the waterway was replaced with HPDE. Drainage from MH390 was improved with the new slope of the outfall pipe, which replaced the old line that had a sag in it.

In August 2004, Tacoma replaced a 300-foot segment of the stormwater line and associated laterals in East 19th Street. This action sealed this segment from groundwater, sediment, and product migration from the surrounding contaminated soil that remained in place after an interim action remediation project was completed in this area.

Several of the businesses in the area not only discharge stormwater to OF245, but also discharge stormwater to adjacent outfalls, OF248 and OF249. Source control activities for all these basins are discussed in the following subsections.

A.7.2 SOURCE CONTROL ACTIVITIES

Since 2002, significant work has been accomplished in the OF245 drainage basin, including removal of significant sources. A discussion of major source control activities associated with these areas is provided in the following paragraphs.

As part of the City-wide inspection program, three business inspections were completed in the OF245/OF248 drainage basin in 2024. Business inspections provide source control through education and through implementation of non-structural BMPs. These actions help prevent materials from coming into contact with stormwater and help promote activities that reduce pollutants in stormwater.

Stormwater treatment devices currently in place also remove solids and the associated particulate-bound chemicals from stormwater. The locations of private and public stormwater treatment devices in Basins 245/248/249 are shown on Figures A-1a and A-1b, respectively. No new public or private treatment BMPs were installed in this drainage basin in 2024. With future redevelopment in the OF245 drainage basin, more of these onsite treatment systems will be installed and over time they will help to decrease the solids load and the associated particulate-bound chemical load to the waterway.

A.7.2.1 2024 Source Control Investigations

There are no active source tracing investigations in the OF245 drainage basin. The following is a discussion regarding significant historic investigations.

Historic MH390/Outfall 245 Black Oil/Tar Releases

At the beginning of the monitoring program, black oil and tar-blobs were observed seeping into the storm drains through joints and cracks. Before the extent of the contamination was understood, Tacoma completed three maintenance projects (two line replacements and one re-lining) to alleviate this issue. After these projects were complete, seeps continued to leak into the storm drain system. Further investigations found contamination along the entire length of the old Northern Pacific Rail yard oil pipeline area along East “D” Street and East 19th Street. Ecology ordered remediation of the pipeline in 2008 and 2009. During this period, five UST/LUSTs were also removed or filled.

After completion of all these activities, oil-absorbent snares placed in the storm lines remained clean. Use of the oil snares in this basin was discontinued in 2010.

Former MPS Site Investigation

OF245 (as evidenced by sediments in MH390) exhibited a notably different phthalate composition in the stormwater sediments in comparison to other outfalls and has relatively higher concentrations of butylbenzylphthalate. This difference is much less pronounced when looking at only the last five years of data. Early in the monitoring program, butylbenzylphthalate concentrations in OF245 were among the highest of any reported phthalates (see Tables 3-3.1 and 3-3.2 and boxplots in Appendix F of the WY2023 Report), although levels are much reduced at this time. WY2012 through WY2019 SSPM results for FD21 and WY2012 through WY2023 results for MH390 showed that phthalates were in the low range, while for FD22 they were in the medium range in WY2013 but returned to the low range in WY2014 and have remained there since that time. FD21 was removed after WY2019.

This site has operated under the name of MPS, Quality Transport, Inc., and currently as Truck-Rail Handling, Inc. In 1997 and in 2000, Quality Transport, Inc., the owner at the time, cleaned a majority of their system with no effect on the sediment trap phthalate concentrations downstream of their facility. Average total phthalate concentrations show a peak in WY2003 with a decline in stormwater and baseflow chemistry in WY2004 and WY2005 (see WY2023 Report, Figure 5-1.6). Baseflow concentrations appeared to remain generally stable between WY2005 and WY2011[4], while stormwater concentrations decreased or remained stable until WY2014, with slight intermittent increases in subsequent years.

Because of the intermittent medium to high SSPM concentrations at FD22 until WY2013, this site was referred to Ecology and TPCHD for follow-up while the City continued to monitor the site for wastewater discharges. The site was re-mapped in 2012 as a result of that work. Through that mapping and inspection effort, the presence of a dry well was identified onsite.

[4] Baseflow monitoring was discontinued in WY2011 since baseflow was well characterized.

Additional follow up from all involved agencies is needed to fully assess the operations and site conditions at this property. Joint inspections at the property have occurred and follow-up actions were required. While some work was completed in 2015, there were delays in fully addressing the environmental concerns due to issues with ‘in-lieu of’ assessment fees.

In 2016, City EC staff revisited the site, now operating as Truck-Rail Handling, Inc., along with the City’s wastewater pretreatment permit manager, to conduct an additional in-depth inspection and collect additional samples. Several issues with both the wastewater and stormwater systems on the site were identified. While many of these issues were successfully resolved during 2016, the City continues to work with the property owner to develop and implement a long-term maintenance plan for the facility, site BMPs, and an accurate map of the private stormwater and wastewater systems to prevent future discharges of contaminants from the site. With decreased phthalate levels in the sediment traps, it appears that efforts to date have been effective in addressing the issues at this site. The City will continue coordination with the property owner, and sediment traps will continue to be monitored for now to ensure that levels remain at the reduced levels.

Historic Petroleum Spills in Basins 245, 248, and 249

One of the trucking warehouses in the basin, SuperValu, was fined for repeated petroleum spills to the waterway in 2007 through OF245, OF248, and OF249. As a result, they are under an order from Ecology to implement BMPs. In 2010, SuperValu installed three oil/water separators and have implemented spill response BMPs as required by Ecology. Another oil/water separator was installed in 2011. In 2013, SuperValu installed a StormFilter treatment system on their property. These actions should reduce contributions of total petroleum hydrocarbons and other petroleum-related chemicals from this facility.

As a result of several inspections performed at the site in recent years, SuperValu reached a settlement with the EPA under which it was issued a penalty in 2015 of $120,000 in part for violations at two sites discharging to the Thea Foss Waterway through OF248 and OF249. The enforcement action was based on SuperValu’s failure to comply with the conditions of their NPDES Phase I MS4 Permit.

Historic Anhydrous Ammonia Spill in Basin 245

On June 7, 2017, there was a spill of anhydrous ammonia at the SuperValu site in this drainage basin. The release resulted from a leak from a valve and piping of a system used to keep a food warehouse refrigerated. When the leak was discovered by the business owner, the leak was isolated by closing valves upstream and downstream of the leak site. The leaking ammonia valve was connected, via a hose, outside the facility to allow the charged pipe to purge the leaking ammonia. Purging the ammonia was necessary to allow repair to the leaking valve. The ammonia purge hose was connected to a mixing valve which was also connected to a water source. The ammonia and water were then mixed and allowed to flow over an asphalt parking lot to an onsite storm drain. The storm drain is connected to an oil water separator and then to a sand filter designed to remove oil and zinc. After the water and ammonia mixture flowed through the sand filter, the solution was discharged directly to the City of Tacoma storm sewer which leads to MH390 and OF245. The volume of discharged ammonia and/or ammonia/water solution was estimated at 24 gallons, but the amount entering the waterway is unknown. The system was pumped to remove solids and liquids from the drainage system.

A.7.2.2 Enforcement Actions

Notice of Violation and Warning Letters

There were no Warning or Notice of Violation letters issued in this drainage basin in 2024.

UST and LUST Removal

There were no active UST or LUST permits in this drainage basin during 2024 (see Attachment A.1):

A.7.2.3 Stormwater Maintenance Activities

Street Sweeping Pilot Project

OF243 and OF245 have shown somewhat elevated levels of lead and zinc in both stormwater and baseflow relative to other drains. It is theorized that this may be due to the increased amount of trucking in this industrial area. Based on these results, the City initiated a pilot program in WY2014 to determine whether an increased frequency of street sweeping in this area would have an effect on these results. Starting on October 1, 2013, the City began sweeping the ROW within the OF243 and OF245 drainage basins at a frequency of once every two weeks rather than the usual frequency of once per month for industrial areas.

The pilot project continued in WY2024 and has now become a permanent change in street sweeping frequency for this area. With several years of data available, statistical analysis of the effectiveness of this enhanced sweeping schedule was done for the first time in WY2017 and is included again in this report. Results will be more statistically robust as additional data becomes available. Results of this analysis are presented in Section 5 of the WY2024 Stormwater Monitoring Report.

A.8 OUTFALL 254

A.8.1 DRAINAGE BASIN

The OF254 drainage basin is located on the Tideflats and is the fifth largest basin in the Foss Waterway Watershed (see WY2024 Report, Figure 1-3). It is approximately 127 acres and drains through a 42-inch outfall pipe located at the head of the Wheeler-Osgood Waterway on East “F” Street just north of East 15th Street. The drainage area includes East 15th Street from East “D” Street to St. Paul Avenue, East “J” Street from East 15th Street to the 1600 block, and St. Paul Avenue from East 11th Street to Portland Avenue.

The majority of the OF254 drainage basin is zoned for industrial use, but small commercial areas are present near the shoreline.

Because of the low basin elevation, the entire storm system is influenced by saltwater at high tide. Baseflow from OF254 is continuous at approximately 0.4 cfs (see Appendix B, Table B2-2) and originates primarily from tidal backflushing. Sources of baseflow are discussed in more detail in Appendix B.

Several of the businesses in the area not only discharge stormwater to OF254 but also discharge stormwater to adjacent northern outfalls, OF207, OF214, and OF218 (See Figure 2-2 in WY2023 Report). Source control activities for all these basins are discussed in the following subsections.

A.8.2 SOURCE CONTROL ACTIVITIES

Since 2002, significant work has been accomplished in the OF254 drainage basin, including intense business inspections, complete line cleaning, and identification and removal of point sources. A discussion of specific major source control activities is provided in the following paragraphs.

As part of the City-wide inspection program, 15 business inspections were completed in the OF254 drainage basin in 2024. In addition, one business inspection was completed in the OF207 drainage basin, two inspections were completed in the OF214 drainage area, and twelve inspections were completed in the OF218 drainage area. Business inspections provide source control through education and through implementation of nonstructural BMPs. These actions help prevent materials from coming into contact with stormwater and help promote activities that reduce pollutants in stormwater.

Stormwater treatment devices currently in place also remove solids and the associated particulate-bound chemical from stormwater. The locations of private and public stormwater treatment devices in the OF254 drainage basin are shown on Figures A-1a and A-1b, respectively. No new public or private treatment BMPs were installed in this drainage basin in 2024. With future redevelopment in the basin, more onsite treatment systems will be installed and over time they will help to decrease the solids load and the associated particulate chemical load to the waterway.

A.8.2.1 2024 Source Control Investigations

There are no active source tracing investigations in the OF254 drainage basin. The following is a discussion regarding significant historic investigations.

Northern Pacific Rail Yard Oil Pipeline and Standard Oil Site Cleanup

A possible source of PAHs in the OF254 drainage basin may have been associated with the Northern Pacific Rail yard oil pipeline area along East “D” Street to the old Standard Oil site. In 2009, the Northern Pacific Rail yard oil pipeline area along East “D” Street and East 19th Street was remediated as directed by Ecology. In 2010, the final phase of this cleanup within the OF254 drainage basin was completed. Ecology provided oversight of this remediation project.

Northwest Detention Center DEHP Investigation

The Northwest Detention Center (NWDC, formerly known as INS), a private immigration-related prison, was constructed at the former Hygrade Meat site. Previous sediment results collected from the City’s storm system showed that NWDC was a point source of DEHP. In WY2006 through WY2008, DEHP was found in the inlet pipe to the stormwater pond at concentrations up to 790,000 µg/kg.

In 2009, NWDC was remodeled, and media filtration stormwater treatment devices were installed. In 2010, Tacoma confirmed that the DEHP-laden sediments were retained in the stormwater treatment devices. DEHP was less than 1,500 µg/kg immediately downstream in the City system. However, DEHP-laden sediment remained at levels up to 2.7M µg/kg in one part of the private drainage. Further sampling and source tracing identified one source of the DEHP to be laundry lint that accumulated on the open ground and eventually washed into the private storm drain system. Filters were placed in the catch basins, and EC required the property owner to provide regular maintenance of these devices. In 2012, inspectors returned to the facility for the annual inspection and found the filters to be impacted. The City submitted a corrective action letter and subsequently confirmed compliance during a follow-up inspection. During facility inspections in 2013, it was found that the filters continued to be impacted but the stormfilter system appeared to be effective in keeping the material on site. It was also determined that the lint collection system had not been properly installed. This system has now been repaired. Inspections performed at the site in 2015 indicated that the filters were continuing to be properly maintained and no concerns were noted. Annual inspections will continue, however, at this time it appears that NWDC has a good maintenance plan and is following their operation and maintenance requirements.

Outfall 254 Source Tracing

In response to the somewhat elevated levels of total suspended solids (TSS) and zinc in stormwater in this area, the City conducted a concentrated source control effort in the OF254 drainage basin. This is a highly industrial area and many of the businesses here do not have paved yards with private collection systems, which leads to high amounts of track out onto the public ROW in the OF254 drainage basin.

In 2019, the City did an initial visual assessment of the drainage basin, noting which businesses had unpaved driveways and storage yards, as well as which businesses appeared to have the possibility of contributing contaminants to the municipal stormwater system. Inspections were completed in 2020 at identified businesses, and all passed with no issues noted. This area will continue to be evaluated over time to determine whether increased street sweeping leads to a reduction in TSS and zinc in the stormwater.

In January 2020, the City increased street sweeping in a portion of this basin to help limit the amount of sediment entering the municipal stormwater system. During 2023, the City continued with enhanced street sweeping in this basin.

Baseflow Quality in WY2007 and WY2008

In two different years for several different chemicals, baseflow quality was above average. In WY2008 (Year 7), TSS and DEHP were detected at higher concentrations in the dry weather events, well above all the other years (see boxplots in Appendix G in the WY2012 Report). In WY2007 (Year 6), lead was detected at higher concentrations in the dry weather events, well above all the other years (see boxplots in Appendix G in the WY2012 Report). The dry-weather DEHP and lead concentrations for those years were at the same levels as the average stormwater concentrations for OF254. In contrast, these TSS baseflow concentrations were well below TSS stormwater concentrations. The source of the dry-weather concentrations is unknown. These concentrations were not repeated in the following baseflow monitoring years, WY2009 through WY2011.

A.8.2.2 Enforcement Actions

Notice of Violation and Warning Letters

The following warning letters and one Notice of Violation was issued during 2024 for the OF218 drainage basin (north of OF254).

- A Warning Letter was issued to Jackson Energy located at 510 East 3rd Street for an illicit discharge to the stormwater system on November 20, 2024. EC staff observed turbid water flowing from the property and entering the City's storm system. Immediate BMP controls were required to cease discharge from the site.

- A Notice of Violation was issued to Capital Lumber Company located at 304 East "F" Street for discharge of silt and sediment laden stormwater to the City's stormwater system. The event occurred on April 10, 2023, and the letter was issued on April 14, 2023. Work was done at this site to improve drainage in 2023. On February 28, 2024, EC staff observed turbid water discharging into the receiving waters from the municipal stormwater outfall located near the NE corner of 326 East D Street. The source of the turbid water was found to be stormwater runoff from the lumber yard at 304 and 320 East "F" Street. The discharge was reported to the Ecology under S4.F. Further details are provided in Appendix A.8.

UST and LUST Removal

TPCHD is currently overseeing the removal of one UST in the drainage basin (see Attachment A.1):

- UST at Rainier Plywood located at 624 15th Street East. Contaminated soils and contaminated groundwater are present at the site and monitoring wells are in place. The permit remains active at this time.

A.8.2.3 Stormwater Maintenance Activities

Storm System Cleaning

Between January and June 2006, the entire storm sewer system in the OF254 drainage basin was cleaned, including laterals and catch basins. Sweeping and installation of onsite treatment systems are expected to reduce the solids load and associated PAHs load to the waterway.

Since the time of the complete cleaning of the OF254 basin, additional cleaning has been performed in the basin in isolated areas. These cleaning and video inspection activities have been done for a variety of reasons, including areas identified as needing maintenance through the STRAP program, complaints, and business inspection follow ups.

Enhanced Street Sweeping and Street Sweeping Pilot Project

OF243 and OF245 have shown somewhat elevated levels of lead and zinc in both stormwater and baseflow relative to other drains. It is theorized that this may be due to the increased amount of trucking in this industrial area. Based on these results, the City initiated a pilot program in WY2014 to determine whether an increased frequency of street sweeping in this area would have an effect on these results. Starting on October 1, 2013, the City began sweeping the ROW within the OF243 and OF245 drainage basins at a frequency of once every two weeks rather than the usual frequency of once per month for industrial areas. The pilot project continued in WY2024. With several years of data available, statistical analysis of the effectiveness of this enhanced sweeping schedule was done for the first time in WY2017 and is included again in this report. Results will be more statistically robust as additional data becomes available. Results of this analysis are presented in Section 5 of the WY2024 Stormwater Monitoring Report. As discussed above, the pilot project was expanded into a portion of OF254 in January 2019. In 2021, staff began sweeping the entire basin at the increased frequency and this enhanced maintenance schedule was continued through 2024.

ATTACHMENTS

Attachment A.1 – Citywide
- Table A.1-1 Thea Foss Waterway New Treatment Device Information by Outfall
- Figure A-1a Private Stormwater Treatment Facilities - 2024
- Figure A-1b Public Stormwater Treatment Facilities - 2024
- 2024 Foss Business Inspections and Spills/Complaints
- 2024 Year End Complaints/Spills and Inspections Data for Thea Foss Watershed
- 2024 Enforcement Report
- 2024 UST List from Tacoma Pierce County Health Department

Attachment A.2 – OF230/OF230A
- Table A.2-1 2024 Pipe Maintenance Activities for OF230/OF230A
- OF230 (FD3C) 2024 Source Tracing Investigations
- 1901 MLK Jr Way Warning Letter – Luke Corporation
- 1901 MLK Jr Way Notice of Violation – Drip Coffee
- 1505 Fawcett Avenue Warning Letter – Republic Parking

Attachment A.3 – OF235
- OF235 Copper Source Tracing Investigation

Attachment A.4 – OF237A
- Table A.4-1 2024 Pipe Maintenance Activities for OF237A

Attachment A.5 – OF237B
- Table A.5-1 2024 Pipe Maintenance Activities for OF237B
- 3725 East E Street Warning Letter

Attachment A.6 – OF243
- OF243 Source Tracing Status Update – Mercury Investigation in FD23

Attachment A.7 – OF245
- No 2024 Attachments

Attachment A.8 – OF254
- 510 E 3rd Street Warning Letter
- Capital Lumber Notice of Violation Letter with Corrective Action

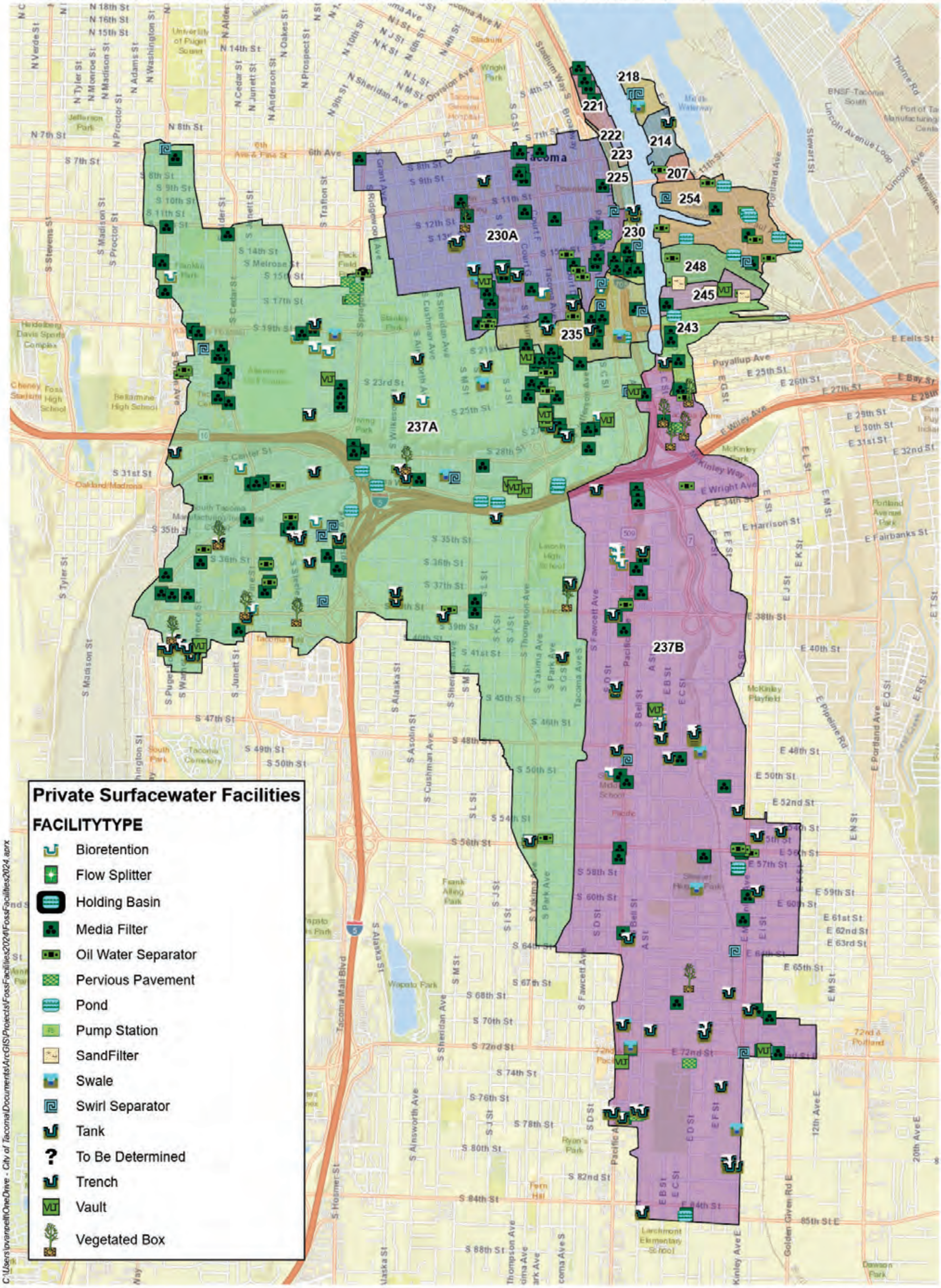
ATTACHMENT A.1 - CITYWIDE

Table A.1-1

Thea Foss Waterway New Treatment Device Information by Outfall

Outfall Location	Subbasin	Date	Approved Permits	Land Use	Address	Treatment Device	#Devices	Owned By
230A	FS_05	9/1/2024	SDEV21-0303	COMM VAC LAND	1137 DOCK ST	Bioretention	0	Other Government
230A	FS_05	9/1/2024	SDEV21-0303	PARKS	1147 DOCK ST	Trench	0	Other Government
230A	FS_05	9/1/2024	SDEV21-0303	COMM VAC LAND	1137 DOCK ST	Trench	0	Other Government
237A	FS_02	1/1/2024	SDEV21-0386	GEN WAREHOUSING STORAGE	3111 S PINE ST	Media Filter - 11	11	Private
237A	FS_09	4/1/2024	SDEV22-0162	SINGLE FAMILY DWELLING	3304 S K ST	Trench	0	Private
237B	FS_11	1/1/2024	SDEV17-0091	GAS STATION MINI MART	5522 MCKINLEY AVE	Oil Water Separator	0	Private
237B	FS_11	1/1/2024	SDEV17-0091	GAS STATION MINI MART	5520 MCKINLEY AVE	Oil Water Separator	0	Private
237B	FS_10	8/1/2024	SDEV23-0306	SINGLE FAMILY DWELLING	4628 E B ST	Trench	0	Private
237B	FS_10	8/1/2024	SDEV23-0306	SINGLE FAMILY DWELLING	4628 E B ST	Trench	0	Private
237B	FS_11	8/1/2024	SDEV17-0091	GAS STATION MINI MART	5520 MCKINLEY AVE	Media Filter	0	Private
237B	FS_11	11/1/2024	SDEV23-0434	SINGLE FAMILY DWELLING	930 E 54TH ST	Trench	0	Private
237B	FS_11	12/1/2024	SDEV22-0414	SINGLE FAMILY DWELLING	116 E 70TH ST	Trench	0	Private

Figure A-1a
Private Treatment Facilities in the Thea Foss Watershed

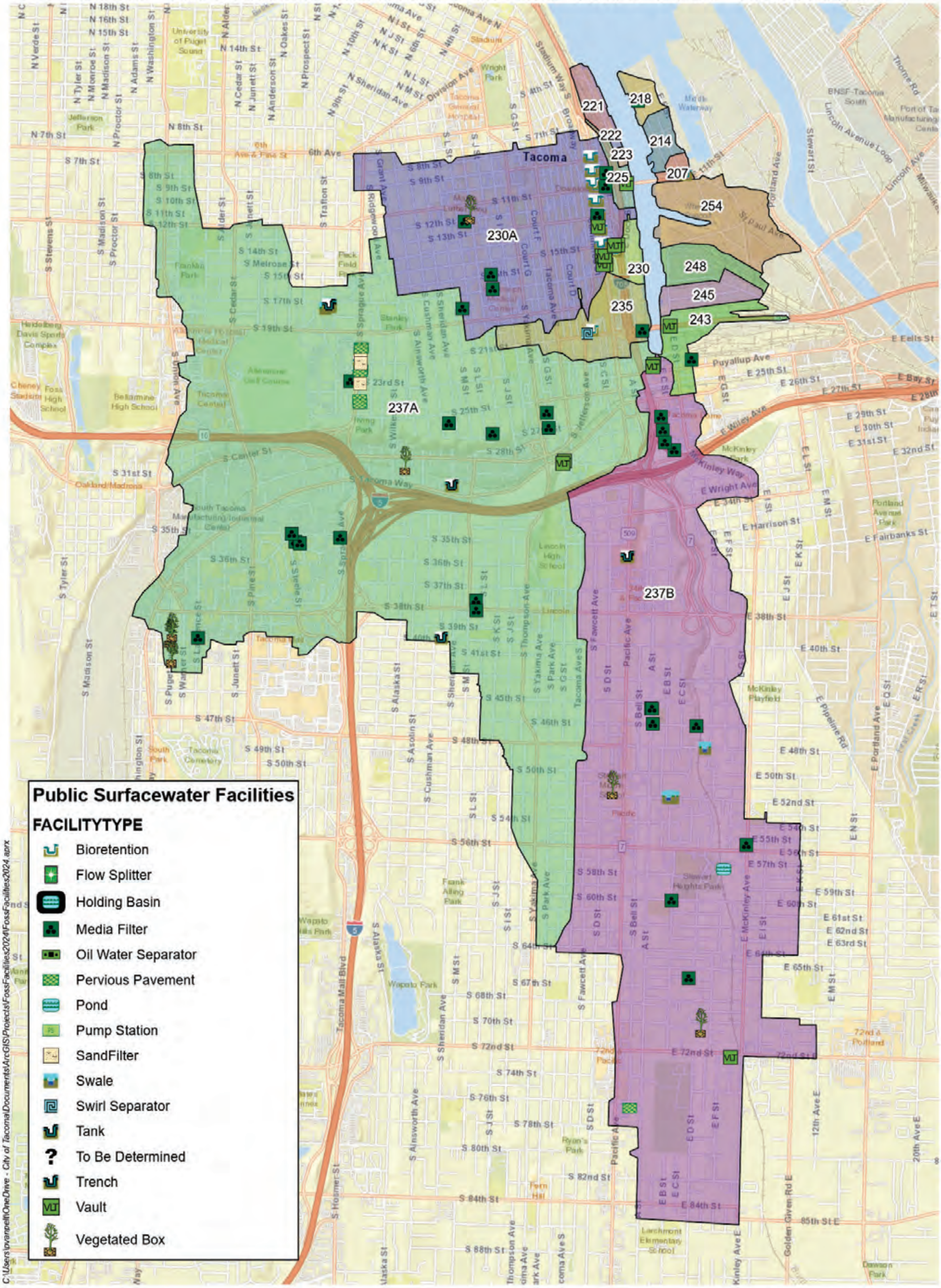


0 1,000 2,000 4,000
Feet

Map Date: 1/16/2025
Source: Science and Engineering Division
Environmental Services Department
City of Tacoma
326 East D Street, Tacoma WA 98421
(253) 591-5588

Tacoma

Figure A-1b
Public Treatment Facilities in the Thea Foss Watershed



0 1,000 2,000 4,000 Feet

Map Date: 1/16/2025
Source: Science and Engineering Division
Environmental Services Department
City of Tacoma
326 East D Street, Tacoma WA 98421
(253) 591-5588

Tacoma

City of Tacoma
Environmental Services Memorandum

To: Laura Nokes

From: AMG

Date: February 14, 2025

Re: Foss Business Inspections and Spills/Complaints from 2024

Below are the summary tables for the 2024 Business Inspections and Spills/Complaints that took place in the Thea Foss drainage basin.

	Business inspections	Spills/Complaints
Foss Drainage Basin	233	213
Citywide	736	664

2024 Foss business inspections	
Outfall	**# of inspections**
237A	123
237B	24
214	1
218	3
221	1
225	1
230/230A	44
235	10
243	8
245	1
248	2
254	15
Total	**233**

2024 Thea Foss Drainage Area Business Inspections

Outfall	Inspection Date	Company Name	Address
214	8/28/2024	PHILLIPS 66 COMPANY	520 E D ST
218	2/12/2024	CASCADE CAPITAL	230 E F ST
218	2/28/2024	CASCADE CAPITAL	230 E F ST
218	11/13/2024	JACKSON ENERGY	510 E 3RD ST
221	12/3/2024	ROCK THE DOCK PUB & GRILL	535 DOCK ST
225	1/23/2024	TRUE BLUE - LABOR READY CAFETERIA	1015 A ST
230	8/29/2024	THEA'S LANDING	1705 DOCK ST
230	8/29/2024	BOBALUST	1701 DOCK ST
235	4/5/2024	CARLSON FORMETEC - OMADA	2202 A ST
235	4/10/2024	INNOVATIVE MANUFACTURING GROUP LLC	2202 A ST
235	4/19/2024	ABELLA PIZZERIA	1946 PACIFIC AVE
235	5/8/2024	METRO COFFEE	1901 JEFFERSON AVE
235	5/16/2024	ST JOHN INT CHURCH - DOTZ ALLERGY FRIENDLY BAKED G	2001 S J ST
235	6/14/2024	ST JOHN INT CHURCH - DOTZ ALLERGY FRIENDLY BAKED G	2001 S J ST
235	6/17/2024	ANTHEM COFFEE & TEA	1911 PACIFIC AVE
235	6/17/2024	STARBUCK'S COFFEE #3226	1748 PACIFIC AVE
235	6/17/2024	SUBWAY UW TACOMA	1910 PACIFIC AVE
235	8/22/2024	SCHOOL OF THE ARTS	1950 PACIFIC AVE
243	1/19/2024	FREIGHTHOUSE SQUARE	2501 E D ST
243	3/27/2024	FREIGHTHOUSE SQUARE	2501 E D ST
243	4/3/2024	FREIGHTHOUSE SQUARE	2501 E D ST
243	7/12/2024	FREIGHTHOUSE SQUARE	2501 E D ST
243	8/30/2024	FREIGHTHOUSE SQUARE	2501 E D ST
243	9/20/2024	GOLDENFINCH	2501 E D ST
243	10/16/2024	FREIGHTHOUSE SQUARE	2501 E D ST
243	11/21/2024	FREIGHTHOUSE SQUARE	2501 E D ST
245	8/29/2024	TACOMA FIXTURE CO INC	1815 E D ST
248	9/3/2024	SUPERVALU	1525 E D ST
248	9/3/2024	PCC LOGISTICS EAST D ST	1525 E D ST
254	2/29/2024	SPECIALTY FOREST PRODUCT	1616 ST PAUL AVE
254	5/1/2024	ELDER LOGISTICS, INC	1519 ST PAUL AVE
254	5/2/2024	ELDER LOGISTICS, INC	1519 ST PAUL AVE
254	6/14/2024	ELDER LOGISTICS, INC	1519 ST PAUL AVE
254	6/14/2024	TEACHERS INSURANCE & ANNUITY ASSOCIATION	1519 ST PAUL AVE
254	6/14/2024	AIRVAN NORTH AMERICAN	1519 ST PAUL AVE
254	6/14/2024	RAINIER PLYWOOD CO	624 E 15TH ST

254	6/14/2024	ROADTEX	1519 ST PAUL AVE
254	7/18/2024	ELDER LOGISTICS, INC	1519 ST PAUL AVE
254	8/9/2024	KLEEN BLAST	1448 ST PAUL AVE
254	8/9/2024	PETRICH MARINE	1118 E D ST
254	8/15/2024	BERRY GLOBAL PLASTICS	635 E 15TH ST
254	9/5/2024	NORTHWEST PROCESSING CENTER	1623 E J ST
254	9/11/2024	REVALESIO	1202 E D ST
254	10/31/2024	REVALESIO	1202 E D ST
237A	1/23/2024	SLAVIC CHRISTIAN CENTER	2014 S 15TH ST
237A	1/31/2024	MJM AUTO BODY	3101 S 36TH ST
237A	2/9/2024	SOULBERRY COFFEE HOUSE LLC	2310 A ST
237A	2/9/2024	YAKI RAKI	3202 S 23RD ST
237A	2/22/2024	HERNANDEZ AUTO	5631 YAKIMA AVE
237A	2/22/2024	KIM VIET JEWELRY	756 S 38TH ST
237A	2/26/2024	AUTOZONE #4108	1217 S 38TH ST
237A	2/27/2024	HALLADAYS AUTO REPAIR	601 S 38TH ST
237A	2/27/2024	VERNS TRANSMISSION	3401 S G ST
237A	2/28/2024	GENERAL MECHANICAL CONTRACTOR	2316 S STATE ST
237A	3/5/2024	BILL'S DYNAMOMETER TUNE UP CENTER	3599 S G ST
237A	3/6/2024	WHITE CAP CONSTRUCTION SUPPLY	3037 CENTER ST
237A	3/6/2024	COMMENCEMENT BAY ANIMAL HOSPITAL	3511 6TH AVE
237A	3/6/2024	PACIFIC CATARACT AND LASER INSTITUTE	2915 S ALDER ST
237A	3/6/2024	SAFEWAY #1594	707 S 56TH ST
237A	3/6/2024	COT PUBLIC WORKS - EQUIPMENT SHOP	2308 HOLGATE ST
237A	3/7/2024	PUGET SOUND DENTURES	601 N PUGET SOUND AVE
237A	3/29/2024	COT FIRE STATION #2	2701 TACOMA AVE S
237A	4/2/2024	G & S AUTO SALES	2911 SOUTH TACOMA WAY
237A	4/5/2024	GOOFY GOOSE	3702 6TH AVE
237A	4/5/2024	PEAK DENTAL	3602 6TH AVE
237A	4/5/2024	LIGHT DENTAL STUDIOS - 6 AVE	3602 6TH AVE
237A	4/5/2024	MOCAMBO COFFEE & CHAI BAR	3518 6TH AVE
237A	4/5/2024	STANLEY ELEMENTARY	1712 S 17TH ST
237A	4/5/2024	STORAGE COURT	3310 S SPRAGUE AVE
237A	4/10/2024	AMB TOOLS & EQUIPMENT	1215 CENTER ST
237A	4/11/2024	RSG	2701 S J ST
237A	4/18/2024	LIQUOR AND WINE TACOMA CENTRAL	3202 S 23RD ST
237A	4/18/2024	TARGET STORE #T0341	3320 S 23RD ST
237A	4/23/2024	POLYMER INDUSTRIES-ULTRA POLY DIV	2404 CENTER ST

237A	4/23/2024	PAPA JOHN'S	3411 6TH AVE
237A	4/29/2024	E-Z INTERFACE	2725 S HOSMER ST
237A	5/7/2024	INTENSE PROCESS TECHNOLOGIES	2304 JEFFERSON AVE
237A	5/16/2024	POLYMER INDUSTRIES-ULTRA POLY DIV	2404 CENTER ST
237A	5/17/2024	DRAGON'S CRAWFISH	750 S 38TH ST
237A	5/17/2024	URBAN ELK	2013 S CEDAR ST
237A	5/20/2024	BROADCAST SUPPLY WORLDWIDE	2237 S 19TH ST
237A	5/31/2024	HAPPY TERIYAKI # 7	4027 TACOMA MALL BLVD
237A	5/31/2024	BRIGHT NOW DENTAL 4027	4027 TACOMA MALL BLVD
237A	5/31/2024	FIVE GUYS BURGERS & FRIES	4027 TACOMA MALL BLVD
237A	5/31/2024	RP3 BP ASSOCIATES LLC	4027 TACOMA MALL BLVD
237A	6/11/2024	HALLADAYS AUTO REPAIR	601 S 38TH ST
237A	6/12/2024	COCINA MEXICANA	3802 S CEDAR ST
237A	6/12/2024	CHILI THAI RESTAURANT	3213 S 38TH ST # D
237A	6/12/2024	MARTIN HENRY ESPRESSO	3121 S 38TH ST
237A	6/12/2024	HONG KONG SUPERMARKET	3828 YAKIMA AVE
237A	6/12/2024	BAMBU	773 S 38TH ST
237A	6/12/2024	LUNAR'S PHO	757 S 38TH ST
237A	6/12/2024	AF INVESTMENTS LLC	3213 S 38TH ST
237A	6/13/2024	THO TUONG BBQ	715 S 38TH ST
237A	6/14/2024	LOS 3 HERMANOS TAQUERIA #1	2728 S 12TH ST
237A	6/14/2024	WAL-MART #4137	1965 S UNION AVE
237A	6/17/2024	GRUNDFOS	3113 S PINE ST
237A	6/21/2024	AFFORDABLE DENTURES TACOMA	3801 S STEELE ST
237A	6/21/2024	19TH ST GROCERY & DELI	1750 S PROSPECT ST
237A	6/21/2024	TAQUERIA HERMANOS CARDONA	1750 S PROSPECT ST
237A	6/24/2024	MARLENE'S MARKET & DELI	2951 S 38TH ST
237A	6/24/2024	AIR SYSTEMS ENGINEERING INC	3602 S PINE ST
237A	6/24/2024	SUMO JAPANESE RESTAURANT	2919 S 38TH ST
237A	7/1/2024	NORTHWEST AUTOWORK LLC	3424 SOUTH TACOMA WAY
237A	7/1/2024	AUTO OUTLET OF TACOMA	3430 SOUTH TACOMA WAY
237A	7/2/2024	CEDAR PLAZA	3635 S LAWRENCE ST
237A	7/2/2024	TACOMA CEDAR DENTAL	3712 S CEDAR ST
237A	7/2/2024	CLARK DENTAL GROUP	3402 S 38TH ST
237A	7/2/2024	MIDTOWN 15	1801 S 15TH ST
237A	7/3/2024	GOODWILL OUTLET STORE (SWENSEN WAREHOUSE PROPERTY)	3120 S PINE ST
237A	7/5/2024	TACOMA HOUSING AUTHORITY - HILLSIDE TERRACE	2318 S G ST
237A	7/8/2024	TITUS WILL TOYOTA	3506 S SPRAGUE AVE
237A	7/9/2024	ELIZA MCCABE TOWNHOUSES	2315 YAKIMA AVE
237A	7/9/2024	MULTI-UNIT RETAIL - BROOKS	1201 S UNION AVE

237A	7/10/2024	YAKIMA VILLAS	2380 COURT G
237A	7/11/2024	VUE 25	2368 YAKIMA AVE
237A	7/11/2024	LEXINGTON SQUARE TOWNHOMES	2301 S G ST
237A	7/11/2024	TACOMA GLASSBLOWING STUDIO	114 S 23RD ST
237A	7/16/2024	BERG EQUIPMENT & SCAFFOLDING-STW	2219 SOUTH TACOMA WAY
237A	7/29/2024	AROMAX AUTO SERVICES	5602 S PARK AVE
237A	7/29/2024	EV ENTERPRISE	1321 CENTER ST
237A	8/1/2024	COT FIRE STATION #2	2701 TACOMA AVE S
237A	8/2/2024	NW YAMAHA GOLF CARTS	1106 CENTER ST
237A	8/2/2024	R&R FOUNDATION SPECIALISTS	2718 PACIFIC AVE
237A	8/6/2024	MEGA METAL RECYCLING	3011 S FIFE ST
237A	8/9/2024	ACT ENVIRO	1002 S 30TH ST
237A	8/12/2024	ATAMAN USA - TRUCKING	3012 S FIFE ST
237A	8/12/2024	CARS OF TACOMA INC.	2501 SOUTH TACOMA WAY
237A	8/12/2024	AXLE TRANSMISSION INC	2940 S M ST
237A	8/21/2024	KMH HOUSING LLC	3801 S UNION AVE
237A	8/22/2024	WALSH TRUCKING CO LTD	2916 SOUTH TACOMA WAY
237A	8/22/2024	ALLSTATE TRUCK REPAIR	2916 SOUTH TACOMA WAY
237A	8/23/2024	CFN-APP SOUTH TACOMA WAY	3224 SOUTH TACOMA WAY
237A	8/23/2024	TORRES AND TORRES ROOFING AND SHEETMETAL	2710 YAKIMA AVE
237A	8/27/2024	THE R.I.S.E. CENTER	2136 MARTIN LUTHER KING JR WAY
237A	8/29/2024	TACOMA 35TH STREET, LLC	3303 S 35TH ST
237A	8/29/2024	G & S AUTO SALES	2911 SOUTH TACOMA WAY
237A	8/30/2024	MIDTOWN 15	1801 S 15TH ST
237A	9/3/2024	TACOMA HYDRAULICS INC.	2101 SOUTH TACOMA WAY
237A	9/4/2024	AUTO CARE AND REPAIR	1717 SOUTH TACOMA WAY
237A	9/6/2024	FOUNDER'S CHOICE	1517 SOUTH TACOMA WAY
237A	9/10/2024	THE AIRSOFT CENTER	1517 SOUTH TACOMA WAY
237A	9/11/2024	CITY CENTER COLLISION	2620 PACIFIC AVE
237A	9/12/2024	SERV PRO	1016 S 30TH ST
237A	9/17/2024	JOHNSON'S MILLWORK	2319 SOUTH TACOMA WAY
237A	9/20/2024	NEW COMMUNITY CHURCH OF TACOMA	3102 S 23RD ST
237A	9/24/2024	STARBUCK'S COFFEE #19673	3401 S 23RD ST
237A	9/24/2024	JIMMY JOHN'S WALMART	3411 S 23RD ST
237A	9/24/2024	SUBWAY WALMART TACOMA	1965 S UNION AVE
237A	10/1/2024	MEGA METAL RECYCLING	3011 S FIFE ST
237A	10/8/2024	OASIS CAFE	1949 S STATE ST
237A	10/8/2024	THE AIRSOFT CENTER	1517 SOUTH TACOMA WAY

237A	10/8/2024	TACOMA 35TH STREET, LLC	3303 S 35TH ST
237A	10/16/2024	TACOMA HYDRAULICS INC.	2101 SOUTH TACOMA WAY
237A	10/16/2024	THE R.I.S.E. CENTER	2136 MARTIN LUTHER KING JR WAY
237A	10/17/2024	JOHNSON'S MILLWORK	2319 SOUTH TACOMA WAY
237A	10/29/2024	STANLEY ELEMENTARY	1712 S 17TH ST
237A	10/31/2024	SERV PRO	1016 S 30TH ST
237A	11/6/2024	MOCAMBO COFFEE & CHAI BAR	3518 6TH AVE
237A	11/6/2024	THE 15 PERCENT BOARD GAME CAFE	3518 6TH AVE
237A	11/8/2024	TACOMA 35TH STREET, LLC	3303 S 35TH ST
237A	11/19/2024	THE R.I.S.E. CENTER	2136 MARTIN LUTHER KING JR WAY
237A	11/21/2024	PHO GARDEN	3202 S 23RD ST
237A	11/22/2024	7 ELEVEN #35012A	2632 SOUTH TACOMA WAY
237A	12/3/2024	FREEDOM MARINE SALES AND SERVICE	2620 SOUTH TACOMA WAY
237A	12/5/2024	THE R.I.S.E. CENTER	2136 MARTIN LUTHER KING JR WAY
237A	12/5/2024	PETER'S GROCERY	1307 S 38TH ST
237B	1/31/2024	COUNTRY BOY MARKET	5522 MCKINLEY AVE
237B	1/31/2024	YUMMY PHO & TERIYAKI	5522 MCKINLEY AVE
237B	2/2/2024	THE SWAP SHOP	116 E 35TH ST
237B	2/5/2024	HERON MOBILE	122 E 74TH ST
237B	2/15/2024	JASONS MOBILE REPAIR LLC	216 S 55TH ST
237B	2/21/2024	LUBBESMEYER CONSTRUCTION INC	4845 PACIFIC AVE
237B	2/27/2024	MCKINLEY TIRES	7234 MCKINLEY AVE
237B	2/28/2024	BURNS TOWING	6454 MCKINLEY AVE
237B	2/29/2024	CARBURETION TECHNOLOGY	5638 S BELL ST
237B	3/1/2024	CHEVRON MCKINLEY #207280	805 E 72ND ST
237B	4/18/2024	CHEVRON MCKINLEY #207280	805 E 72ND ST
237B	4/18/2024	LITTLE CEASARS PIZZA - 101	101 S 38TH ST
237B	4/19/2024	ZIP MART	522 S 38TH ST
237B	5/1/2024	CUSTOM CRANKSHAFT	4319 A ST
237B	5/9/2024	PHO TAI	3814 PACIFIC AVE
237B	7/10/2024	HILLSDALE LUMBER COMPANY LLC	628 E 60TH ST
237B	7/12/2024	AVAMERE HERITAGE REHAB	7411 PACIFIC AVE
237B	7/15/2024	DOMINOS PIZZA #7024	3840 PACIFIC AVE
237B	7/23/2024	TAQUERIA EL RINCONSITO	5415 PACIFIC AVE
237B	7/29/2024	DETWEILER AUTO SERVICE & REPAIR	310 S WRIGHT AVE
237B	8/29/2024	AVAMERE HERITAGE REHAB	7411 PACIFIC AVE
237B	9/19/2024	AVAMERE HERITAGE REHAB	7411 PACIFIC AVE
237B	10/29/2024	PREMIER MONUMENT LLC	5414 PACIFIC AVE

237B	12/9/2024	ERICA'S WORLD'S BEST MEXICAN DESSERTS	4710 PACIFIC AVE
230A	1/10/2024	SHELL FOOD MART	1901 MARTIN LUTHER KING JR WAY
230A	1/10/2024	DRIP HOUSE COFFEE	1901 MARTIN LUTHER KING JR WAY
230A	1/19/2024	PITA PIT	921 PACIFIC AVE
230A	1/25/2024	TRA MEDICAL IMAGING STAFF PARKING GARAGE	1150 FAWCETT AVE
230A	2/21/2024	OFFICE BAR & GRILL	813 PACIFIC AVE
230A	2/26/2024	SPEED E MART / VP RACING FUELS	1101 S 19TH ST
230A	3/6/2024	TRA MEDICAL IMAGING STAFF PARKING GARAGE	1150 FAWCETT AVE
230A	3/7/2024	HOUSE OF SCOTT FUNERAL & CRMTN SVCS	1215 MARTIN LUTHER KING JR WAY
230A	3/25/2024	PACIFIC MOTOR COMPANY INC	1408 MARTIN LUTHER KING JR WAY
230A	3/29/2024	POSTAL SERVICE PARKING LOT	1320 A ST
230A	4/2/2024	DRIP HOUSE COFFEE	1901 MARTIN LUTHER KING JR WAY
230A	4/4/2024	BRYANT MONTESSORI, ELEMENTARY	717 S GRANT AVE
230A	4/5/2024	GRIT CITY CIDERWORKS	1016 MARTIN LUTHER KING JR WAY
230A	5/1/2024	COT CONVENTION CENTER PARKING	1516 COMMERCE ST
230A	5/1/2024	JOHNSON CANDY CO	924 MARTIN LUTHER KING JR WAY
230A	5/1/2024	LEROY JEWELERS	940 BROADWAY
230A	5/7/2024	T-TOWN TIRES	1115 EARNEST S BRAZILL ST
230A	5/8/2024	SMART STOP FOOD MART	1501 MARTIN LUTHER KING JR WAY
230A	5/10/2024	HILLTOP REGIONAL HEALTH CENTER	1202 MARTIN LUTHER KING JR WAY
230A	5/10/2024	THAI AND AUDREY NGUYEN DENTAL	1212 S 11TH ST
230A	5/14/2024	DR HOUSE	303 S 9TH ST
230A	5/30/2024	GO PHILLY CHEESESTEAKS & WINGS	1524 TACOMA AVE S
230A	6/12/2024	LUXURY AUTO DETAILING	1115 EARNEST S BRAZILL ST
230A	6/14/2024	COOKS CONCRETE CONSTRUCTION CO., INC.	1521 S GRANT AVE
230A	7/2/2024	LAST DAYS CHRISTIAN COMMUNITY CENTER	1103 S J ST
230A	7/5/2024	OLYMPUS HOTEL INC	815 PACIFIC AVE
230A	7/5/2024	GUADALUPE VISTA	1305 S G ST
230A	7/10/2024	BROADWAY PARK & PIERCE TRANSIT GARAGE	915 BROADWAY

230A	7/11/2024	TACOMA MUNICIPAL BUILDING PARKING LOT	728 MARKET ST
230A	7/11/2024	HILLSIDE GARDENS	1708 S G ST
230A	7/12/2024	ATRIUM COURT OFFICE CONDOS	705 S 9TH ST
230A	7/15/2024	BELLEVUE HEALTH CARE	1007 S J ST
230A	8/21/2024	LIFT BRIDGE COFFEE	1102 A ST
230A	8/30/2024	TACOMA MUNICIPAL BUILDING PARKING LOT	728 MARKET ST
230A	9/3/2024	ICE CREAM SOCIAL - PRODUCTION FACILITY	1110 MARTIN LUTHER KING JR WAY
230A	10/9/2024	UNIVERSITY SWISS INN	1904 JEFFERSON AVE
230A	10/18/2024	TACOMA MUNICIPAL BUILDING PARKING LOT	728 MARKET ST
230A	10/30/2024	STEEL CREEK AMERICAN WHISKEY CO	1114 BROADWAY
230A	11/6/2024	PHO KING HILLTOP	1020 MARTIN LUTHER KING JR WAY
230A	11/19/2024	TACOMA MUNICIPAL BUILDING PARKING LOT	728 MARKET ST
230A	12/3/2024	PHO BAC CAFE	1115 S 11TH ST
230A	12/6/2024	SIMPLY PANINI	1135 BROADWAY

March 7, 2025

Memorandum

Tacoma

To: Laura Nokes

From: AMG

Date: January 2025

Re: 2024 Year end complaints/spills and inspections data for Thea Foss Watershed

In 2020, asset management restructured the Spills and Complaints program to better comply with new permit requirements. The program no longer records the complaint material. Instead, a spill or complaint call is classified as environmental, flooding, or sewer. Below is the breakdown of incident type for 2020-2024 spills documented in the Foss basin.

Incident Type	2020	2021	2022	2023	2024
Environmental Issue	91	129	179	183	183
Flooding Issue	17	10	12	8	3
Sewer Issue	40	27	42	26	27
Total	**148**	**166**	**233**	**217**	**213**

Date: 1/21/25

To: Laura Nokes, Foss Watershed Planning, Science and Engineering

CC: Cassandra Moore, MES; Assistant Division Manager – Environmental Compliance, Business Operations

From: Kevin Brennan, Principal Regulatory Compliance Analyst – Environmental Compliance, Business and Operations

Subject: 2024 Enforcement Memorandum

Introduction

This memorandum summarizes the enforcement actions taken by Environmental Compliance in 2024, under Tacoma Municipal Code Subchapter 12.08D General Stormwater Requirements to enforce Best Management Practices (BMPs) and control illicit discharges.

Summary

In 2024 Environmental Compliance issued 21 total enforcement actions (16 Warning letters, 1 Notice of Violation, 3 Notice of Violations with Corrective Action Order and 1 Notice of Violation with Civil Penalty) Of the 21 enforcement actions, 7 were issued for violations within the Thea Foss Waterway drainage basin. Copies of the enforcement letters can be found in: G:\EnviroCompliance\Enforcement\2024 Enforcement Memo

The enforcement actions are listed in table 1. on the second page. Please note, those enforcement actions issued for violations in the Thea Foss drainage basin are highlighted in yellow below.

Table 1. 2024 Enforcement Actions

Action	Recipient	Date Issued	Address of Incident	Subbasin	Issue	Resolution
Warning Letter	Tacoma Rugby Club	1/8/2024	3511 East R ST	LP_02	Illicit Discharge - Encampment Debris	Resolved
Warning Letter	Luke Corporation	1/19/2024	1901 Martin Luther King Jr Way	FS_05	Illicit Discharge - Waste Cooking Oil	Resolved
Notice of Violation	Driphouse Coffee Company LLC	1/31/2024	1901 Martin Luther King Jr Way	FS_05	Illicit Discharge - Greywater	Resolved
Warning Letter	Taqueria El Antojo #2, Inc	2/12/2024	6104 6th Ave	LC_01	Illicit Discharge - Mop Water	Resolved
Warning Letter	Peninsula Properties LLC	2/22/2024	8820 Pacific Avenue	FL_09	Illicit Discharge - Wastewater	Resolved
Warning Letter	Peninsula Properties LLC	2/22/2024	8820 Pacific Avenue	FL_09	Stormwater Catch Basin Cleaning	Resolved
Notice of Violation with Corrective Action	Resident	2/28/2024	1641 East 35th ST	LP_02	Illicit Discharge - Wastewater	Resolved
Notice of Violation with Corrective Action	Capital Lumber Company	3/25/2024	304 & 320 East F ST	FS_15	Illicit Discharge - Turbid Water	Resolved
Warning Letter	Resident	4/5/2024	3725 East E ST	FS_11	Illicit Discharge - Vehicle Oil Spill	Resolved
Warning Letter	Loyalty One Inc	4/8/2024	6409 6th Ave	LC_01	Illicit Discharge - Waste Cooking Oil	Resolved
Warning Letter	The Painting Panda Pottery Studio LLC	4/30/2024	602 East 25th ST	LP_01	Illicit Discharge - Greywater	Resolved
Warning Letter	Elder Logistics, Inc	5/3/2024	1519 ST Paul Ave	FS_14	Illicit Discharge - Motor Oil Spill	Resolved
Notice of Violation with Civil Penalty	Resident	5/24/2024	1641 E 35th ST	LP_02	Illicit Discharge - Wastewater	Resolved
Warning Letter	KD Kitchen & Bath	7/3/2024	2313 Fremont St	WS_02	Illicit Discharge - Cutting Slurry	Resoloved
Warning Letter	Hughes Fire Equipment	8/14/2024	5011 S Burlington Way	FL_03	Illiciit Discharge - Wash Water	Resolved
Warning Letter	Time In Space LLC	9/4/2024	2501 East D ST	LP_01	Illicit Discharge - Waste Cooking Oil	Resolved
Warning Letter	Hoodz of the Greater South Sound	9/4/2024	8606 6th Ave	WS_04	Illicit Discharge - Restaurant Hood Cleaning	Resolved
Warning Letter	Jackson Energy Logisitics LLC	11/20/2024	510 E 3rd ST	FS_15	Illicit Discharge - Turbid Stormwater	Resolved
with Corrective Action Order	Time In Space LLC	11/26/2024	2501 East D ST	LP_01	Illicit Discharge - Waste Cooking Oil	Resolved
Warning Letter	Resident	12/3/2024	1710 E 63rd ST	LP_04	Illicit Discharge - RV Wastewater	Resolved
Warning Letter	Republic Parking	12/5/2024	1505 Fawcett Ave	FS_05	Oil Water Separator Maintenance	Resolved

2024 UST and LUST List from TPCHD

Business	Site Address	Outfall	Permit Date	Permit Type	Contaminated Soil?	Soil Disposed?	Groundwater Contaminated?	Monitoring Wells?	# Tanks Removed	Removal Date	Closed	Status
7-11 Store	4635 S YAKIMA AVE	230A	10/4/2024	R	Y							Open-Active Permit
Bryant Montessori School	717 S Grant AVE	230A	5/9/2024	R								Open-Active Permit
Olympic Building	1222 Tacoma AVE S	230A	4/17/2024	R					1			Open-Active Permit
Parking Garage	1114 Pacific AVE	230A	9/8/2024	R					2			Open-Active Permit
Heidelberg Brewery	2120 S C ST	235	6/9/2024	R								Open-Active Permit
Valeo Vocation	1222 Tacoma AVE S	235	4/17/2024	R					1			Open-Active Permit
Industrial Tire Service	423 PUYALLUP AVE	243	7/25/2024	R	Y							Open-Active Permit
RAINIER PLYWOOD CO	624 E 15TH ST	254	10/7/2024	R	Y		Y	Y				Open-Active Permit
56th & Park LLC	5602 S PARK AVE	237A	5/17/2024	R	Y							Open-Active Permit
Bradken Inc.	3000 S Alaska ST	237A	3/10/2024	R					1	3/26/1993		Open-Active Permit
Brooks and Jessberger	1201 S UNION AVE	237A	7/14/2024	R	Y	N	Y	Y		10/8/1991		Open-Active Permit
Former Chevron Service Station No.211579	601 S 38th ST	237A	9/5/2024				Y	Y				Open-Active Permit
Former Foremost Dairy	2413 Pacific AVE S	237A	11/7/2024	R								Open-Active Permit
Former Nalleys Fine Foods / Bird's Eye Site	3403 S 35th ST	237A	8/8/2024	R	Y		Y	Y		10/2/1990		Open-Active Permit
Goodwill of the Olympics and Rainier Region	714 S 27th ST	237A	11/22/2024	R								Open-Active Permit
Roger Smith	2718 PACIFIC AVE	237A	11/2/2024	R								Open-Active Permit
Shell-405	2631 38th ST S	237A	5/23/2024		Y		Y	Y	3			Open-Active Permit
SUPERIOR LINEN SERVICE	1012 CENTER ST	237A	5/16/2024	R	Y	N	Y	Y				Open-Active Permit
Tacoma CFN	3224 South Tacoma WAY	237A	9/25/2024	R	Y		Y	Y				Open-Active Permit
Tacoma Housing Authority	602 S Wright AVE	237A	3/31/2024	R								Open-Active Permit
WA-4230	1222 S 38TH ST	237A	1/31/2024	R	Y		Y	Y				Open-Active Permit
Time Oil 01-325	1501 UNION S	237A	7/11/2024	LUST	Y							Open-Active Permit
Tacoma Goodwill Industries	714 S 27TH ST	237A	03/01/2024	LUST						10/24/2022	Yes	Closed
Hi-Tech Erickson LLC	4006 Pacific AVE	237B	1/29/2024	R					3			Open-Active Permit

ATTACHMENT A.2 - OF230A

Table A.2-1
2024 Pipe Maintenance Activities for OF230A

Date	Location	Type of Work	Outfall	Sub-Basin
12/03/2024	6252283 - AMG REQ - CLEAN	CLEAN ASSET	230A	FS_05
12/05/2024	6252295 - AMG REQ - CLEAN	CLEAN ASSET	230A	FS_05
12/05/2024	6254901 - AMG REQ - CLEAN	CLEAN ASSET	230A	FS_05
01/26/2024	BC 1 SEG YEARLY, 1214 YAKIMA AVE - CLEAN	CLEAN ASSET	230A	FS_05
12/05/2024	6256596 - AMG REQ - CLEAN	CLEAN ASSET	230A	FS_05
11/27/2024	6269080 - PDS CROSSBORE - CLEAN	CLEAN ASSET	230A	FS_05
11/27/2024	6269993 - PDS CROSSBORE - CLEAN	CLEAN ASSET	230A	FS_05
12/03/2024	6271374 - AMG REQ - CLEAN	CLEAN ASSET	230A	FS_05
06/17/2024	1140 BROADWAY - STORM MAIN - CLEAN	CLEAN ASSET	230A	FS_05
06/17/2024	1142 BROADWAY - STORM MAIN - CLEAN	CLEAN ASSET	230A	FS_05
06/17/2024	1148 BROADWAY - STORM MAIN - CLEAN	CLEAN ASSET	230A	FS_05
05/31/2024	723 S AINSWORTH - SINKHOLE - CLEAN	CLEAN ASSET	230A	FS_05
05/30/2024	737 FAWCETT - CLEAN 6" STM MAIN	CLEAN ASSET	230A	FS_05

MEMORANDUM

Date: January 7, 2024
To: Laura Nokes
cc: Kurt Fremont and Cassandra Moore
From: Tony Miller
Subject: OF230 (FD3C) 2024 Source Tracing Investigation

INTRODUCTION

The City of Tacoma (City) is tasked with source tracing contaminants of concern identified through annual sediment trap sampling in the Thea Foss Watershed. There has been an ongoing investigation in a portion of the Outfall (OF) 230 drainage basin since 2012 to identify possible sources of PCBs discovered during annual sediment monitoring.

SOURCE CONTROL HISTORY

OF230 was one of the primary outfalls discharging into the Thea Foss Waterway. In December 2022, the majority of stormwater discharges from OF230 were redirected to a new outfall identified as OF230A. The land use for the OF230A drainage basins is primarily commercial downtown with pockets of residential areas. Based on ongoing sediment monitoring in OF230A (historic OF230), specific sections of this drainage basin were identified as having continuing issues with Thea Foss Waterway contaminants of concern, including PCBs and mercury. FD3C is an upland drainage area in the larger OF230A drainage basin.

For further details of the historic investigations in this basin please review the reports from previous years (Tacoma 2015-2023).

SITE SPECIFIC INVESTIGATIONS SUMMARY

PCBs - South 12th & Pacific

During 2024:

Environmental Compliance (EC) staff sampled the majority (two did not contain enough sediment to sample) of the catchbasins surrounding the Wells Fargo complex and 1123 Pacific Avenue on June 17, 2024. All samples were non-detect for PCBs (analysis available upon request). Two catchbasins came back with elevated mercury concentrations, catchbasins 6516375 (1.65 ppm Hg) and 6524028 (0.604 ppm Hg). These catchbasins are located at the intersection of S 12th St. and Ct. A. This location previously contained roof drain outlets containing mercury contamination. While cleanup efforts and resampling occurred at this location the City will revisit this area to determine if a Mercury issue is still present. Additionally, during the investigation another catchbasin was discovered that was completely impacted and was not mapped. This catchbasin was cleaned and mapped (6528640).

2025 Plan:

PCBs. Sample the catchbasins in this area that couldn't be sampled in 2024 due to lack of sediment and analyze for PCBs.

Mercury. Investigate the source of elevated mercury concentrations in the catchbasins sampled during 2024.

PCBs - South 13th Street & Commerce Street

During 2024:

On June 17, 2024, EC staff sampled catchbasin 6521525; it had a DEHP concentration of 9,550 ug/Kg and a PCB concentration of 4,380 ug/Kg (analysis available upon request). Based on these results follow-up sampling was completed on suspected PCB-containing caulking on the sidewalk to the north of this catchbasin (Figure 1). These samples contained PCBs but all below the action level of 50 ppm. EC met with Planning and Development Services and Streets and Grounds to see if they would remediate the sidewalk but since the levels are below action levels a remediation project cannot be justified.

2025 Plan:

EC will request that catchbasin 6521525 be placed on a yearly maintenance schedule to limit the PCBs leaving the basin and entering the rest of the system.

Summary

The FD3C sediment trap exhibited an increase in PCBs concentrations in 2024 (available upon request) despite the remediation of several areas of concern to removed PCB contamination. Science and Engineering Programs and EC will discuss next potential steps to possibly include a basin-wide stormwater cleaning project and/or developing a new source tracing investigation over to find any possible sources that may have been missed or have occurred since the initial screening process.

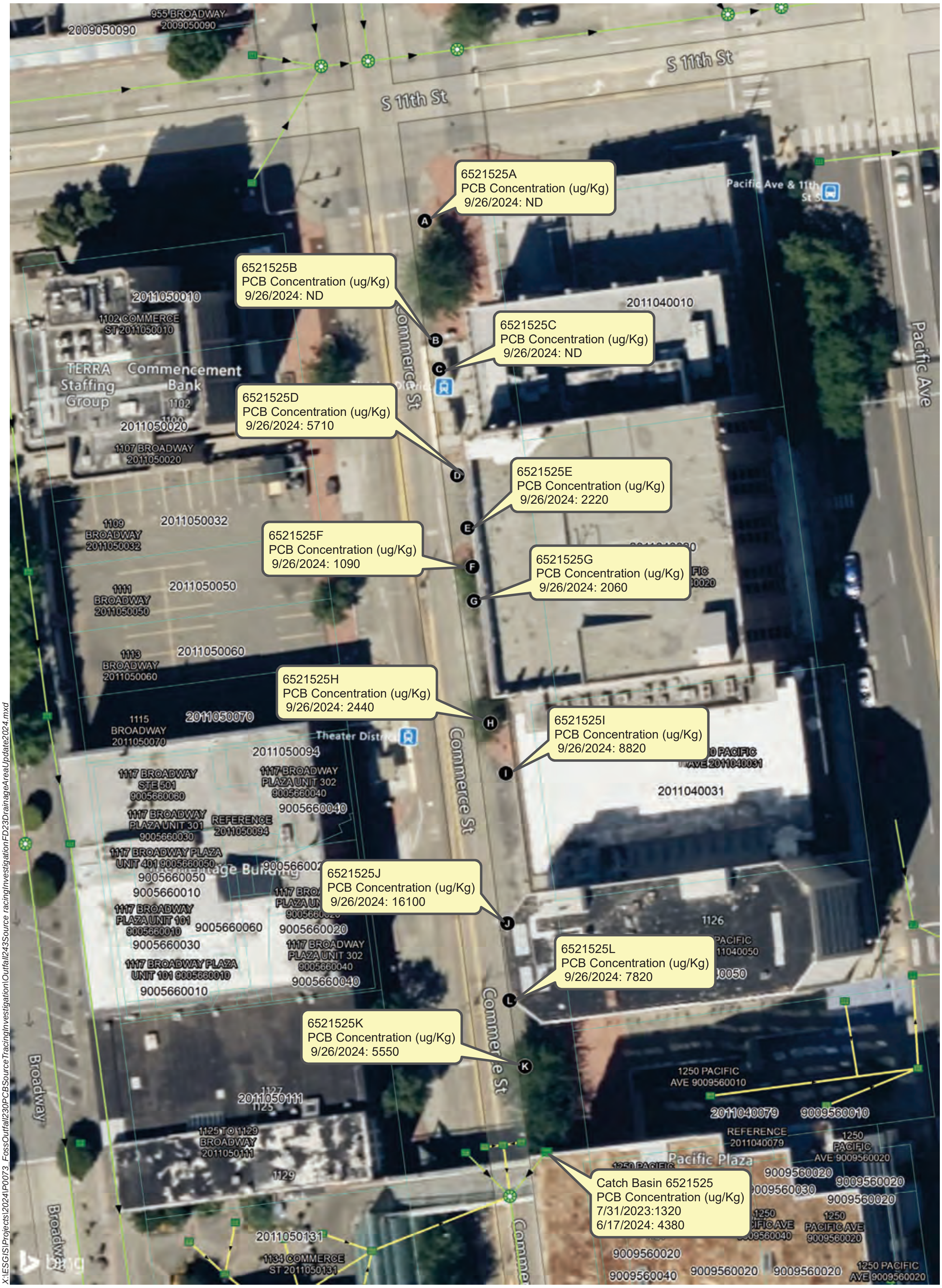
EC will continue the mercury investigation to the North of 12th and Ct.A.

Please let me know if you have any questions or concerns.

Enclosures:

Figure 1: 13th and Commerce PCB Sampling Result

Outfall 230 Source Tracing Investigation
FD-3C 13th and Commerce



X:\ESG\GIS\Projects\2024\P0073_FossOutfall230PCBSourceTracing\Investigation\Outfall243SourceTracingInvestigationFD23DrainageAreaUpdate2024.mxd

Sample Locations

Catch Basin 6521525

Pierce County Tax Parcels

Map Date: 1/7/2025
Source: Science and Engineering Division
Environmental Services Department
City of Tacoma
326 East D Street, Tacoma WA 98421
(253) 591-5588

0 15 30 60 Feet

Tacoma

City of Tacoma
Environmental Services Department

January 19, 2024

SENT VIA CERTIFIED MAIL

Eun Ki & Kwang Oh
Luke Corporation
1901 Martin Luther King Jr Way
Tacoma, WA 98405-3835

Subject: Warning Letter – Spilled Cooking Oil at 1901 Martin Luther King Jr Way, Tacoma WA

Dear Eun Ki & Kwang Oh:

On January 10, 2024, Environmental Compliance (EC) staff responded to a complaint at the subject property regarding food waste impacting the private stormwater system. While onsite, EC staff observed spilled cooking oil and grease on the ground around the designated waste oil bins located on the east side of the property. See enclosed photo and map. Also, a secondary containment pallet was found full of water under one of the 55-gallon drums. Containment pallets should only be used when properly covered to prevent collection of rainwater.

The waste oil collection area should be inspected frequently to ensure spills or leaks can be addressed immediately. Absorbent material such as kitty litter can be used to recover spilled oil if it is swept up and disposed of in solid waste.

The City of Tacoma has a National Pollutant Discharge and Elimination System (NPDES) permit, issued by the Washington State Department of Ecology. This NPDES permit requires the City to implement a Source Control Program to protect the municipal stormwater sewer system from pollutants that could discharge to surface waters such as Puget Sound, Commencement Bay, or any of the City's lakes, creeks, streams, or ponds.

As identified in **Tacoma Municipal Code (TMC) Subchapter 12.08D.110.C *Prohibited Discharges***:

> *No person shall throw, drain, spill, or otherwise discharge, cause, or allow others under their control to throw, drain, spill, or otherwise discharge any substance not specifically allowed or conditionally allowed into the municipal stormwater system or receiving waters.*

Required Actions

Within fourteen (14) days of receipt of this letter, please complete the required maintenance:

- Clean oil and grease from the ground and remove secondary containment pallet.
- Take the necessary measures to prevent spills in the collection area.

Failure to adequately address this concern with City of Tacoma Environmental Services may result in escalating enforcement actions, including, but not limited to, Notices of Violation with Civil Penalties of up to $10,000 per day for each violation of TMC 12.08.

If you have any questions regarding this matter, please contact Source Control Representative, Michael Sanders at (253) 651-3298 or email at msanders2@cityoftacoma.org.

Sincerely,

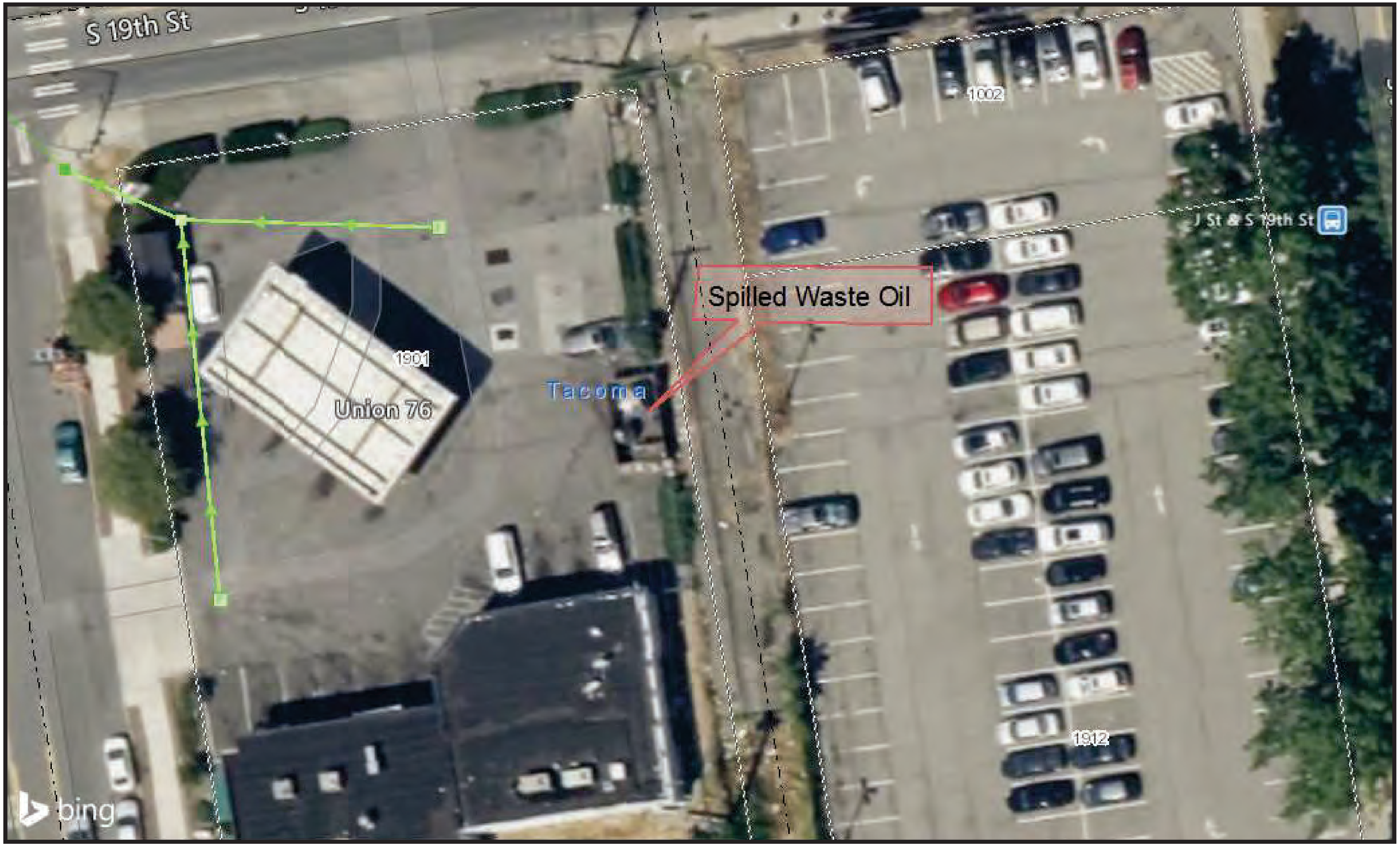
DocuSigned by:
Kevin Brennan
D7DC20BFE3524FD...

Kevin Brennan
Prin. Regulatory Compliance Analyst
Environmental Compliance

Enclosures: Map, Photo, BMP S103, S110, S104
Sent by First Class and Certified Mail: 7022 2410 0003 0426 8074


ED COOKING OIL ONLY
NO SOLIDS, NO GARBAGE
SeQuential
REFINED
BIODIESEL
SeQuential

Access ES Map



AccessES
Always there, Virtually Everywhere

Map Date: 1/17/2024

0 0.0025 0.005 0.01 0.015 0.02
mi

Tacoma SURFACEWATER SOLIDWASTE WASTEWATER
ENVIRONMENTAL SERVICES DEPARTMENT
Science and Engineering Division
326 East D Street, Tacoma WA 98421

N

1.4 BMP S103: Preventive Maintenance / Good Housekeeping

1.4.1 Applicability

This BMP applies to properties and activities in the ROW. Preventative maintenance and good housekeeping practices reduce the potential for stormwater to come into contact with pollutants and can reduce maintenance intervals for the stormwater and wastewater system.

1.4.2 Required BMPs

- Prevent the discharge of unpermitted liquid or solid wastes, process wastewater, and sewage to ground or surface water, or to the stormwater system that discharges to surface water, or to the ground. Conduct all oily parts cleaning, steam cleaning, or pressure washing of equipment or containers inside a building, or on an impervious contained area, such as a concrete pad. Direct contaminated stormwater from such an area to the wastewater system, or to other approved treatment. Pretreatment may be required, see https://www.cityoftacoma.org/government/city_departments/environmentalservices/wastewater/wastewater_permits_and_manuals for additional information.
- Promptly contain and clean up solid and liquid pollutant leaks and spills including oils, solvents, fuels, and dust from manufacturing operations on an exposed soil, vegetation, or paved area.
- If a contaminated surface must be pressure washed, collect the resulting washwater for proper disposal (usually involves plugging stormwater inlets, or otherwise preventing discharge and pumping or vactoring up washwater, for discharge to wastewater system or for vactor truck transport to a wastewater treatment plant for disposal).
- Do not hose down pollutants from any area to the ground, into the stormwater system, or into receiving waters. Convey pollutants before discharge to a treatment system approved by the local jurisdiction.
- Sweep all appropriate surfaces with vacuum sweepers quarterly, or more frequently as needed, for the collection and disposal of dust and debris that could contaminate stormwater. Use mechanical sweepers, and manual sweeping as necessary to access areas that a vacuum sweeper can't reach to ensure that all surface contaminants are routinely removed.
- Do not pave over contaminated soil unless it has been determined that groundwater has not been and will not be contaminated by the soil. Call Ecology for assistance.
- Construct impervious areas that are compatible with the materials handled. Portland cement concrete, asphalt, or equivalent material may be considered.
- Use drip pans to collect leaks and spills from industrial/commercial equipment such as cranes at ship/boat building and repair facilities, log stackers, industrial parts, trucks and other vehicles stored outside.
- At industrial and commercial facilities, drain oil and fuel filters before disposal. Discard empty oil and fuel filters, oily rags, and other oily solid waste into appropriately closed and properly labeled containers, and in compliance with the Uniform Fire Code or International Building Code.
- For the storage of liquids, use containers, such as steel and plastic drums, that are rigid and durable, corrosion resistant to the weather and fluid content, non-absorbent, water tight, rodent-proof, and equipped with a close fitting cover.

- For the temporary storage of solid wastes contaminated with liquids or other potential polluted materials, use dumpsters, garbage cans, drums, and comparable containers, which are durable, corrosion resistant, non-absorbent, non-leaking, and equipped with either a solid cover or screen cover to prevent littering. If covered with a screen, the container must be stored under a roof or other form of adequate cover.
- Where exposed to stormwater, use containers, piping, tubing, pumps, fittings, and valves that are appropriate for their intended use and for the contained liquid.
- Clean oils, debris, sludge, etc. from all stormwater facilities regularly, including catch basins, settling/detention basins, oil/water separators, boomed areas, and conveyance systems to prevent the contamination of stormwater. Contact the Washington State Department of Ecology's Hazardous Waste and Toxics Reduction Program for information on how handle potentially dangerous waste.
- Promptly repair or replace all substantially cracked or otherwise damaged paved secondary containment, high-intensity parking, and any other areas subject to stormwater and surface water, subjected to pollutant material leaks or spills. Promptly repair or replace all leaking connections, pipes, hoses, valves, etc., which can contaminate stormwater.
- Do not connect floor drains in potential pollutant source areas to the stormwater system, surface water, or to the ground.

1.4.3 Recommended Additional BMPs

- Where feasible, store potential stormwater pollutant materials inside a building or under a cover and/or containment.
- Minimize use of toxic cleaning solvents, such as chlorinated solvents, and other toxic chemicals.
- Use environmentally safe raw materials, products, additives, etc. such as substitutes for zinc used in rubber production.
- Recycle waste materials such as solvents, coolants, oils, degreasers, and batteries to the maximum extent feasible. Contact Ecology's Hazardous Waste & Toxics Reduction Program at https://ecology.wa.gov/About-us/Get-to-know-us/Our-Programs/Hazardous-Waste-Toxics-Reduction for recommendations on recycling or disposal of vehicle waste liquids and other waste materials.
- In uncovered areas, empty drip pans immediately after a spill or leak is collected.
- Use solid absorbents, e.g., clay and peat absorbents and rags for cleanup of liquid spills/ leaks, where practicable.
- Promptly repair/replace/reseal damaged paved areas at industrial facilities.
- Recycle materials, such as oils, solvents, and wood waste, to the maximum extent practicable.

Note: Evidence of stormwater contamination by oils and grease can include the presence of visible sheen, color, or turbidity in the runoff, or present or historical operational problems at the facility. Operators can use simple pH tests, for example with litmus or pH paper. These tests can screen for high or low pH levels (anything outside a 6.5-8.5 range) due to contamination in stormwater.

2.1.3 BMP S110: Cleaning or Washing of Cooking Equipment

2.1.3.1 Applicability

This activity applies to businesses that clean cooking equipment such as grills, vent filters, exhaust hoods, grease traps, floors and floor mats.

Pollutants of concern consist of pH, oil and grease, nutrients, suspended solids, and biochemical oxygen demand (BOD).

2.1.3.2 Required BMPs

- Clean and wash cooking equipment indoors whenever possible.
- If washing cannot occur indoors, washing must take place on a designated wash pad.
- All washwater shall be discharged to the wastewater system.
    - Washwater may be used in a closed loop recycle system before ultimate disposal in the wastewater system.
    - Washwater can be temporarily stored before it is ultimately discharged to the wastewater system.
- Washwater shall not discharge to the stormwater system.
- Remove and properly dispose of greasy buildup on cooking equipment prior to washing.

2.1.3.3 Recommended Additional BMPs

- Discharge greasy washwater to the building's grease interceptor if one is available.
- Install grease protection if none is available.
- If washing must take place outdoors, provide a cover over the designated wash pad.

1.5 BMP S104: Spill Prevention and Cleanup

1.5.1 Applicability

This BMP applies to all spills and leaks that may happen on any parcel and in the ROW. Spills and leaks can damage public infrastructure, interfere with sewage treatment, and cause a threat to human health or the environment. Spills are often preventable if appropriate chemical and waste handling techniques are practiced effectively and the spill response plan is immediately implemented. Additional spill control requirements may be required based on the specific activity occurring on site.

1.5.2 Required BMPs

Spill Prevention

- Clearly label or mark all containers that contain potential pollutants.
- Store and transport liquid materials in appropriate containers with tight-fitting lids.
- Place drip pans underneath all containers, fittings, valves, and where materials are likely to spill or leak. Empty spill pans immediately after material is collected.
- Use tarpaulins, ground cloths, or drip pans in areas where materials are mixed, carried, and applied to capture any spilled materials.
- Train employees on the safe techniques for handling materials used on the site and to check for leaks and spills.

Spill Plan

See www.cityoftacoma.org/stormwatermanual_templates for a template that can be used.

- Develop and implement a spill plan and update it annually or whenever there is a change in activities or staff responsible for spill cleanup. Post a written summary of the plan at areas with a high potential for spills, such as loading docks, product storage areas, waste storage areas, and near a phone. The spill plan may need to be posted at multiple locations.
- Describe the facility, including the owner's name, address, and telephone number; the nature of the facility activity; and the general types of chemicals and oils used at the facility.
- Designate spill response employees to be on-site during business activities. Provide a current list of the names and telephone numbers (home and office) of designated spill response employees who are responsible for implementing the spill plan.
- Provide a site plan showing the locations of storage areas for chemicals and oils, inlets/ catch basins, spill kits and other relevant infrastructure or materials information.
- Describe the emergency cleanup and disposal procedures. Note the location of all spill kits in the spill plan.
- List the names and telephone numbers of public agencies to contact in the event of a spill.
- Train key personnel in the implementation of the Spill Plan.

Spill Cleanup Kits

- Store all cleanup kits near areas with a high potential for spills so that they are easily accessible in the event of a spill. The contents of the spill kit must be appropriate to the types and quantities of materials stored or otherwise used at the facility, and refilled when the materials are used. Spill kits must be located within 25 feet of all fueling/fuel transfer areas, including onboard mobile fuel trucks.

Note: Ecology recommends that the kit(s) include salvage drums or containers, such as high density polyethylene, polypropylene or polyethylene sheet-lined steel; polyethylene or equivalent disposal bags; an emergency response guidebook; safety gloves/clothes/equipment; shovels or other soil removal equipment; and oil containment booms and absorbent pads; all stored in an impervious. container.

Spill Cleanup and Proper Disposal of Waste

- Stop, contain, and clean up all spills immediately upon discovery.
- Implement the spill plan immediately.
- Contact the designated spill response employees.
- Block off and seal nearby inlets/catch basins to prevent materials from entering the stormwater system.
- Use the appropriate material to clean up the spill.
- Do not use emulsifiers or dispersants such as liquid detergents or degreasers unless disposed of properly. Emulsifiers and dispersants are not allowed to be used on surface water, or in a place where they may enter the stormwater system, surface waters, treatments systems, or the wastewater system.
- Immediately notify Ecology (https://ecology.wa.gov/Regulations-Permits/Reporting-requirements/Spills-If-you-spill) and the City of Tacoma at 311 if a spill has reached or may reach the wastewater or stormwater system, groundwater, or surface water. Notification must comply with state and federal spill reporting requirements.
- Do not wash absorbent material into interior floor drains or stormwater system inlets/ catch basins.
- Place used spill control materials in appropriate containers and dispose of according to regulations.

City of Tacoma
Environmental Services Department

January 31, 2024

SENT VIA CERTIFIED MAIL

Derkach, Alina
Driphouse Coffee Company LLC
11806 8th ST E
Edgewood, WA 98372-1470

Subject: Notice of Violation 2024-001

Dear Alina Derkach:

Under the legal authority granted in Tacoma Municipal Code (TMC) Subchapter 12.08D, the Environmental Services Department hereby issues Driphouse Coffee Company LLC, located at 1901 Martin Luther King Jr Way in Tacoma WA, the enclosed Notice of Violation for violations of TMC Subchapter 12.08D.

The Notice of Violation does not include a monetary penalty or compliance order. Additional prohibited discharges to the City's municipal stormwater system may lead to escalating enforcement.

This Notice of Violation represents a determination by the Environmental Services Department Compliance Officer that a violation of TMC Subchapter 12.08D has occurred, which is final unless you appeal this Notice of Violation to the City of Tacoma's Hearing Examiner and request a hearing.

If you decide to file an appeal, you must do so in accordance with procedures set forth in TMC 1.84.020 within ten (10) days of this Notice.

Service shall be deemed complete upon the third day following the day upon which the notice is placed in the mail, unless the third day falls on a Saturday, Sunday, or federal legal holiday, in which event service shall be deemed complete on the first day other than a Saturday, Sunday, or legal holiday following the third day.

Appeals must be directed to:

City of Tacoma
Tacoma Municipal Building
Office of the Hearing Examiner
747 Market Street
Tacoma, WA 98402

If you have any questions, please contact Source Control Representative, Michael Sanders at 253-651-3298 or msanders2@cityoftacoma.org.

Sincerely,

DocuSigned by:
Kurt Fremont
39440F5C064248A...

Division Manager, Compliance Officer
Environmental Compliance, Business Operations Division
2201 Portland Avenue
Tacoma, WA 98421
253-502-2238

cc: Eun Ki & Kwang Oh, Property Owner(s), 1901 Martin Luther King Jr Way, Tacoma, WA 98405

Enclosure: Notice of Violation
Sent by First Class and Certified Mail: 7022 2410 0003 0426 8098

CITY OF TACOMA
Department of Environmental Services

IN THE MATTER OF	)	
NOTICE OF VIOLATION	)	No. 2024 - 001

RESPONSIBLE PERSON[1]
Driphouse Coffee Company LLC
11806 8th Street East
Edgewood WA, 98372-1470

I. Location of Violations

1901 Martin Luther King Jr Way, Tacoma, WA 98405

II. Legal Authority and Notice of Violations

In accordance with Tacoma Municipal Code (TMC) Subchapter 12.08D.400 and TMC Chapter 1.82, the City of Tacoma (City), Environmental Services Department (ES), is issuing this Notice of Violation to Driphouse Coffee Company LLC, at 1901 Martin Luther King Jr Way, Tacoma, WA 98405 for the following violation:

> The prohibited discharge of gray water to the private stormwater system which ultimately discharges to the City's stormwater system, located at 1901 Martin Luther King Jr Way on Jan 10, 2024, in violation of **Tacoma Municipal Code (TMC) Subchapter 12.08D.110.C**[2] and TMC Subchapter 12.08D.400.D.1.

The Notice of Violation does not include a monetary penalty or compliance order. Additional prohibited discharges to the City's municipal stormwater system may lead to escalating enforcement.

III. Background

1901 Martin Luther King Jr Way, collectively makes up a 0.597-acre commercial lot owned by Luke Corporation and occupied by multiple retail tenants, including Driphouse Coffee Company LLC. On multiple occasions, listed below, City of Tacoma Environmental Service (Control Authority) staff observed gray water from Driphouse Coffee Company LLC discharging to a private stormwater catchbasin in the parking lot that is directly connected to the City's municipal stormwater system located along South 19th Street and Martin Luther King Jr Way, which discharges into the Thea Foss Waterway.

---

[1] ***TMC 1.82.010 Responsible Person,*** *states, in part: A developer, builder, business operator, or owner who is developing, building, or operating a business on the building, premises, structure, or land that is subject to the regulation alleged to have been violated.*

[2] ***TMC Subchapter 12.08D.110.C Prohibited Discharges,*** *states, in part: No person shall throw, drain, spill, or otherwise discharge, cause, or allow others under their control to throw, drain, spill, or otherwise discharge any substance not specifically allowed or conditionally allowed into the municipal stormwater system or receiving waters. By way of example and not limitation, discharges that are contaminated with the following substances are prohibited: sewage, and any other material that is regulated as a hazardous substance by federal, state, or local laws and regulations.*

- On March 17, 2023, Control Authority staff observed gray water from Driphouse Coffee Company LLC, discharging directly into a private catchbasin in the parking lot of 1901 Martin Luther King Jr Way.
- On March 22, 2023, a warning letter was sent to the responsible person (Driphouse Coffee Company LLC) for the illicit discharge that occurred on March 17, 2023, to the private stormwater system located at 1901 Martin Luther King Jr Way.
- On January 10, 2024, Control Authority staff observed gray water discharging through a hose and two 300-gallon gray water tanks that were full and spilling over with food particles into the catch basin that connects to the City stormwater system. Additionally, the tray on the espresso machine had a direct connection to the ice maker drainpipe which drains directly to the ground.

IV. <u>Appeal Process</u>

This Notice of Violation represents a determination that violations of TMC Subchapter 12.08D have occurred, which determination is final unless you appeal this Notice of Violation to the City of Tacoma's Hearing Examiner and request a hearing as provided in TMC 1.82.050.J. If you decide to file an appeal, you must do so within 10 days from the date of service of this Notice, pursuant to TMC 1.84.020.

Be advised that pursuant to TMC 1.84.020.B.2, if the final day to file a notice of appeal is on a weekend or holiday, the appeal will be timely if filed before the close of business on the next business day following the holiday or weekend. For purposes of this section, holiday shall mean those weekdays during which the City offices are closed for established holidays.

The procedures for filing appeal are set forth in TMC 1.82.050.J and TMC 1.84.020. Appeals must be directed to:

City of Tacoma
Tacoma Municipal Building
Office of the Hearing Examiner
747 Market Street
Tacoma, WA 98402

By Order of the Undersigned Environmental Services Department Compliance Officer:

Signed this 31st day of January, 2024, at Tacoma, Washington

DocuSigned by:
Kurt Fremont
39440F5C064248A...

Kurt Fremont
Division Manager, Compliance Officer (Control Authority)
Business Operations Division
326 East D Street
Tacoma, WA 98421
253-502-2238

City of Tacoma
Environmental Services Department

December 5, 2024

Republic Parking
c/o Registered Agent Jeffrey Helsdon
PO BOX 1219
Gig Harbor WA, 98335

Subject: **Warning Letter – Oil Water Separator Inspection at Republic Parking, located at 1505 Fawcett Ave, Tacoma WA**

The private stormwater system referenced in the subject line was recently inspected[1] and found to be in need of maintenance. Specifically, the private stormwater system for the parking lot includes an oil water separator (Figure 1 & 2) that requires cleaning. Best management practices require cleaning when sediment levels exceed 20% of the total working depth of the device. Please complete the following corrective maintenance actions:

Corrective Maintenance Actions

Within fifteen (15) days of receipt of this letter, please complete the required maintenance:

- Clean Oil Water Separator

As identified in **Tacoma Municipal Code (TMC) Subchapter 12.08D Maintenance and Inspection:**

All private stormwater systems shall be maintained by the owner, or the homeowner and/or homeowner association or similar organization, if one is established as part of a residential or commercial development. All private stormwater systems shall be regularly inspected by the owner or other responsible person to ensure proper operation and monitored as required or as set forth in the SWMM or O&M manual approved by the control authority.

Failure to maintain your private stormwater system may result in civil penalties.

If you have any questions regarding this matter, please contact Source Control Representative, Christopher Dearth at (253) 625-4125 or cdearth@cityoftacoma.org

Sincerely,

DocuSigned by:
Cassandra Moore
F7F79691EFFA489...
Cassandra Moore, MES
Assistant Division Manager
Environmental Compliance

Enclosure: Oil Water Separator Maintenance Guide
Sent by First Class and Certified Mail: 7022 2410 0003 0426 8814

[1] The City's National Pollutant Discharge Elimination System (NPDES) Permit issued by the Washington State Department of Ecology requires the implementation of a Source Control Program. The goal of this program is to protect the municipal stormwater sewer system from pollutants that could discharge to surface waters such as the Puget Sound, Commencement Bay, or any of the City's lakes, creeks, streams, or ponds.

Figure 1: Inside of the oil water separator.

Figure 2: Top photo of oil water separator in parking lot.

ATTACHMENT A.3 - OF235

MEMORANDUM

Date:	January 7, 2025
To:	Laura Nokes
cc:	Kurt Fremont and Cassandra Moore
From:	Tony Miller
Subject:	OF230/235 2024 Source Tracing Investigation

INTRODUCTION

The City of Tacoma (City) is tasked with source tracing contaminants of concern identified through annual sediment trap and stormwater sampling in the Thea Foss Watershed. Copper was newly identified as a contaminant of concern within Outfalls (OF) 230 and 235 in WY2019 due to some intermittent elevated concentrations in stormwater with other potential outliers starting in 2016. All of these outliers, as well as those detected since that time have been detected in the spring and summer. Due to a large construction project which rerouted the municipal stormwater system in this area, source tracing efforts were focused on business inspections rather than sampling of the municipal storm system until this project was completed.

SOURCE CONTROL HISTORY

OF230 and 235 are two of the primary outfalls discharging into the Thea Foss Waterway. It should be noted that as of December 2022, drainage areas have been revised and stormwater discharges in this area are primarily directed to new OF230A and OF235, with only minor discharges continuing from OF230. The land use for these drainage basins is primarily commercial downtown with pockets of residential areas. Based on ongoing stormwater monitoring, OF230A and 235 were exhibiting elevated copper concentrations in the spring and summer, outside of the normal concentrations seen in the basin. In 2022 Environmental Compliance (EC) began investigating surface water catchbasins at Union Station due to their large copper roof.

2024 Actions:

EC performed two sampling events in 2024, catchbasin sediments on May 29, 2024, and surface water on June 26 (analytical results available upon request). Sediment sampling results showed Copper (Cu) levels exceeded cleanup levels in one catchbasin, but historically there are three that contain excessive Cu (Figure 1). Based on these results EC sent a 30-Day Enforcement Letter to Union Station to provide a plan to remedy the Cu issue (Appendix B). EC staff exchanged several emails (Appendix A) with Union Station and held a virtual meeting on December 12, 2024, to discuss their remediation plans. Union Station will increase their CB maintenance to bi-annually and provide EC with proof of cleaning (Appendix C). No further sampling is anticipated for Union Station.

2025 Plan:

EC Staff will continue to look for other potential sources of copper within the OF230 and 235 drainage basins, firstly the stormwater runoff from Hwy 705.

Please let me know if you have any questions or concerns.

Enclosures:

Appendix A:	Email Correspondence
Appendix B:	30 Day Enforcement Letter
Appendix C:	Actions to be Taken by Union Station
Figure 1:	2024 Copper Source Tracing Map

Appendix A
Email Correspondence

Petty, Cassie

From: Kyle Wyman - 10PMAC <kyle.wyman@gsa.gov>
Sent: Tuesday, November 19, 2024 8:44 AM
To: Miller, Tony
Cc: Nokes, Laura; Moore, Cassandra; Sunich, John; Bob Bliss - 10PMEA; Emily Grimes - 10PMEA; Brett Reagan; John Salguero - 10PMEA; Jennifer Mayo - 10PPTA; Kristopher Young - 10PRAC
Subject: Re: FW: TUS/City Drain Basins - Source Tracing high copper/lead samples at Union Station
Attachments: GSA.gov Mail - FW_ TUS_City Drain Basins - Source Tracing high copper_lead samples at Union Station.pdf

Excellent,

Thanks Tony.
I set up a meeting for us on Dec. 12th. Please forward this along to anyone else that might be interested, or have insight.
I also attached a response to questions from a few months ago, which will hopefully jog our memories.

Sincerely,
Kyle Wyman (he/him)
Building Services Specialist
Tacoma Union Station
Cell- 253-310-6925
Service Calls: 1-800-806-8145

On Tue, Nov 19, 2024 at 8:24 AM Miller, Tony <TMiller@cityoftacoma.org> wrote:

> Kyle, Thank you for your reply. The proposed date and time works well for most of us here. Just a quick reply to the 2nd bullet in your letter…The City of Tacoma does not normally make recommendations for remediation actions, in this case cleaning frequency. That being said, it took your system 2 years to accumulate enough sediment for me to obtain a sample after it was initially cleaned. We will be happy to discuss remedial options with you so that you can make the best decision for all parties involved.
>
> Thank you very much for all your work on this!
>
> Tony Miller
>
> City of Tacoma
>
> Environmental Services
>
> Desk: (253) 502-2195 Mobile: (253) 355-8955

tmiller@cityoftacoma.org

From: Kyle Wyman - 10PMAC <kyle.wyman@gsa.gov>
Sent: Monday, November 18, 2024 2:11 PM
To: Miller, Tony <TMiller@cityoftacoma.org>; Nokes, Laura <LNokes@cityoftacoma.org>; Moore, Cassandra <CMoore1@cityoftacoma.org>; Sunich, John <JSunich@cityoftacoma.org>
Cc: Bob Bliss - 10PMEA <robert.bliss@gsa.gov>; Emily Grimes - 10PMEA <emily.grimes@gsa.gov>; Brett Reagan <brett.reagan@gsa.gov>; John Salguero - 10PMEA <john.salguero@gsa.gov>
Subject: Re: FW: TUS/City Drain Basins - Source Tracing high copper/lead samples at Union Station

Mr. Miller,

See attached action plan for TUS catch Basins.

Our team would like to get together virtually to discuss what else GSA can do in detail. **I'd like to propose Dec. 12th 2-3pm.**

Let me know if this date works for everyone. If most people concur, I will set up a google meeting for us.

Thanks,

Kyle Wyman (he/him)

Building Services Specialist

Tacoma Union Station

Cell- 253-310-6925

Service Calls: 1-800-806-8145

On Mon, Nov 4, 2024 at 12:06 PM Miller, Tony <TMiller@cityoftacoma.org> wrote:

Good afternoon Kyle, can you provide me with a status update?

Thank you!

Tony Miller

City of Tacoma

Environmental Services

Desk: (253) 502-2195 Mobile: (253) 355-8955

tmiller@cityoftacoma.org

From: Kyle Wyman - 10PMAC <kyle.wyman@gsa.gov>
Sent: Thursday, September 5, 2024 8:20 AM
To: Miller, Tony <TMiller@cityoftacoma.org>
Cc: Emily Grimes - 10PMEA <emily.grimes@gsa.gov>; Bob Bliss - 10PMEA <robert.bliss@gsa.gov>; John Salguero - 10PMEA <john.salguero@gsa.gov>; Brett Reagan <brett.reagan@gsa.gov>; Nokes, Laura <LNokes@cityoftacoma.org>; Moore, Cassandra <CMoore1@cityoftacoma.org>; Sunich, John <JSunich@cityoftacoma.org>
Subject: Re: FW: TUS/City Drain Basins - Source Tracing high copper/lead samples at Union Station

Appreciate the response. Our team will get back to you with a meeting time.

Thank you,

Kyle Wyman (he/him)

Building Services Specialist

Tacoma Union Station

Cell- 253-310-6925

Service Calls: 1-800-806-8145

On Wed, Sep 4, 2024 at 2:49 PM Miller, Tony <TMiller@cityoftacoma.org> wrote:

Good afternoon Kyle,

The City is fine with your solution taking longer than 30 days. You have reached out to us and have shown that you are addressing the issues and that is sufficient for us. We would be happy to meet with you to discuss the copper issue and try to address any questions or concerns you may have. I am on PTO until September 16 so it would need to be after that. But for now we have answered your bulleted questions below:

- Comment 1. The water samples appear to have been measured in units of micrograms per liter (ug/L), so if they are using EPA drinking water levels then the MCL for Cu is 1,300 ug/L. None of the water samples were above this, but I need to make sure that is what they measured the samples with.

  Response: The water samples are below any action levels; we only included the results for your knowledge since we obtained the samples. This data is strictly informative.

- Comment 2. WA Ecology conducted a two Phase study (2017 and 2019) where it was found that brake wear and roofing materials contributed to the majority of Cu found in the stormwater systems. It was also found that the majority of roof materials contributing to Cu in wash-off came from <5 years old asphalt shingle roofs with algae resistant granules.

- Phase I: https://apps.ecology.wa.gov/publications/documents/1703018.pdf

  Phase II: https://apps.ecology.wa.gov/publications/documents/1903008.pdf

  Response: The City is not ruling out any contributors.

  Comment 3. It would help to know if the City of Tacoma considered the freeway and the traffic behind TUS, in addition to TUS being along a main street. Especially due to the location of the three catch basins and the storm drains.

  Response: The City is not ruling out any contributors.

- Comment 4. It is unclear if the City also collected wash-off from the roof via the gutters or if they only sampled directly from the catch basins. If they didn't collect wash-off from the roof, then that is something that should be considered.

  Response: All samples were obtained from catchbasins. One of the catchbasins that was sampled did have a direct connection from a roof drain. We did not actively sample during a rain event from downspouts.

- Comment 5. It would be helpful to know if they sampled any other buildings catch basins or wash-off in the area that are connected to the City's system and Thea Foss Waterway. I know they conducted a source tracing investigation, but it would be good to have them summarize this.

  Response: The City has not sampled any other private catch basins at this time. . Sampling began at Union Station due to the roof material and due to the stormwater discharging to both of the Thea Foss Outfalls with elevated copper concentrations. While the majority of the catchbasins at Union Station were sampled, only the three catch basins referenced showed elevated levels of Copper.

- Comment 6. Referencing the study below, a future solution may be a filtration system added to our catch basins. If this is the case, an important question would be what materials are our drain systems made of? Can the City help with this or do we need to find as-builts? https://www.sciencedirect.com/science/article/abs/pii/S0043135409005351
-
- Response: A filtration system is a possibility but may not be necessary, increased maintenance of the catchbasins should ensure that any Copper contamination is not leaving the site. It does not appear that your system captures large amounts of sediments so yearly cleaning should be sufficient. Catchbasin composition would need to come from any as-builts you may have.

Please let me know if you have need anything further.

Thank you!

Tony Miller

City of Tacoma

Environmental Services

Desk: (253) 502-2195 Mobile: (253) 355-8955

tmiller@cityoftacoma.org

From: Kyle Wyman - 10PMAC <kyle.wyman@gsa.gov>
Sent: Tuesday, August 27, 2024 11:18 AM
To: Miller, Tony <TMiller@cityoftacoma.org>
Cc: Emily Grimes - 10PMEA <emily.grimes@gsa.gov>; Bob Bliss - 10PMEA <robert.bliss@gsa.gov>; John Salguero - 10PMEA <john.salguero@gsa.gov>; Brett Reagan <brett.reagan@gsa.gov>
Subject: Re: FW: TUS/City Drain Basins - Source Tracing high copper/lead samples at Union Station

Tony,

I received the City's letter last week, and had a meeting with our internal subject matter experts (SME). I'm hoping we can do 2 things here.

We will need an extension on our written plan of action. I believe we could give you one by 9/12, but it won't have any long term solutions, nor would it be very well informed.

The second is to set up a meeting with the City and GSA's SMEs so we can gather more information and understand the City's expectations going forward. GSA is committed to addressing all environmental liabilities, at our facilities, to the highest standard. Please forward this along to your team, and anyone else you would like included and let's find a time where we can all sit down in person, or virtually to collaborate.

See the list of questions and statements below. None of these are an attempt to pass on liability, but food for thought and information to help guide our future decisions.

- The water samples appear to have been measured in units of micrograms per liter (ug/L), so if they are using EPA drinking water levels then the MCL for Cu is 1,300 ug/L. None of the water samples were above this, but I need to make sure that is what they measured the samples with.
- WA Ecology conducted a two Phase study (2017 and 2019) where it was found that brake wear and roofing materials contributed to the majority of Cu found in the stormwater systems. It was also found that the majority of roof materials contributing to Cu in wash-off came from <5 years old asphalt shingle roofs with algae resistant granules.

  Phase I: https://apps.ecology.wa.gov/publications/documents/1703018.pdf

  Phase II: https://apps.ecology.wa.gov/publications/documents/1903008.pdf

- It would help to know if the City of Tacoma considered the freeway and the traffic behind TUS, in addition to TUS being along a main street. Especially due to the location of the three catch basins and the storm drains.
- It is unclear if the City also collected wash-off from the roof via the gutters or if they only sampled directly from the catch basins. If they didn't collect wash-off from the roof, then that is something that should be considered.
- It would be helpful to know if they sampled any other buildings catch basins or wash-off in the area that are connected to the City's system and Thea Foss Waterway. I know they conducted a source tracing investigation, but it would be good to have them summarize this.
- Referencing the study below, a future solution may be a filtration system added to our catch basins. If this is the case, an important question would be what materials are our drain systems made of? Can the City help with this or do we need to find as-builts? https://www.sciencedirect.com/science/article/abs/pii/S0043135409005351

Thank you,

Kyle Wyman (he/him)

Building Services Specialist

Tacoma Union Station

Cell- 253-310-6925

Service Calls: 1-800-806-8145

On Wed, Aug 7, 2024 at 9:52 AM Kyle Wyman - 10PMAC <kyle.wyman@gsa.gov> wrote:

> Thank you for the update, Mr. Miller.

Kyle Wyman (he/him)

Building Services Specialist

Tacoma Union Station

Cell- 253-310-6925

Service Calls: 1-800-806-8145

On Wed, Aug 7, 2024 at 8:36 AM Miller, Tony <TMiller@cityoftacoma.org> wrote:

Good morning Kyle, I just wanted to give you a heads up with the samples that I've taken. The samples of the water inside of the catchbasins came back with low levels of copper. However the sediment samples I took had levels higher than what is allowable to discharge to marine waters. I'll be sending a letter asking for a plan to mitigate this. At this time I do not believe you need treatment of any kind but possibly develop a cleaning plan with a contractor for once a year. Your sediment levels do not fill up very fast so that should be sufficient. We just don't want the sediments leaving your system and entering ours. Please reach out with any questions. You can probably expect the letter from me next week.

Thank you!

Tony Miller

City of Tacoma

Environmental Services

Desk: (253) 502-2195 Mobile: (253) 355-8955

tmiller@cityoftacoma.org

From: Kyle Wyman - 10PMAC <kyle.wyman@gsa.gov>
Sent: Wednesday, June 26, 2024 12:12 PM
To: Miller, Tony <TMiller@cityoftacoma.org>
Subject: Re: FW: TUS/City Drain Basins - Source Tracing high copper/lead samples at Union Station

Yes, see you then.

Kyle Wyman (he/him)

Building Services Specialist

Tacoma Union Station

Cell- 253-310-6925

Service Calls: 1-800-806-8145

On Wed, Jun 26, 2024 at 10:33 AM Miller, Tony <TMiller@cityoftacoma.org> wrote:

Good morning Kyle, I just wanted to confirm that 2 o'clock today is still ok for me to get some catchbasin samples.

Thank you!

Tony Miller

City of Tacoma

Environmental Services

Desk: (253) 502-2195 Mobile: (253) 355-8955

tmiller@cityoftacoma.org

From: Kyle Wyman - 10PMAC <kyle.wyman@gsa.gov>
Sent: Monday, June 17, 2024 9:04 AM
To: Miller, Tony <TMiller@cityoftacoma.org>
Subject: Re: FW: TUS/City Drain Basins - Source Tracing high copper/lead samples at Union Station

Yes, I do.

24th and 27th are the only days that are not ideal.

Kyle Wyman (he/him)

Building Services Specialist

Tacoma Union Station

Cell- 253-310-6925

Service Calls: 1-800-806-8145

On Fri, Jun 14, 2024 at 2:51 PM Miller, Tony <TMiller@cityoftacoma.org> wrote:

I will be out. Do you have availability the following week?

From: Kyle Wyman - 10PMAC <kyle.wyman@gsa.gov>
Sent: Friday, June 14, 2024 2:04 PM
To: Miller, Tony <TMiller@cityoftacoma.org>
Subject: Re: FW: TUS/City Drain Basins - Source Tracing high copper/lead samples at Union Station

Absolutely,

Next Friday works great for me, if that works for you.

Kyle Wyman (he/him)

Building Services Specialist

Tacoma Union Station

Cell- 253-310-6925

Service Calls: 1-800-806-8145

On Fri, Jun 14, 2024 at 9:51 AM Miller, Tony <TMiller@cityoftacoma.org> wrote:

> Kyle, after discussing this with the Project Manager they would like me to come out and sample the water in the catchbasin sumps as well. Is there a time in the next couple of weeks that would work for you?
>
> Thank you!
>
> Tony Miller
>
> City of Tacoma

Environmental Services

Desk: (253) 502-2195 Mobile: (253) 355-8955

tmiller@cityoftacoma.org

From: Kyle Wyman - 10PMAC <kyle.wyman@gsa.gov>
Sent: Monday, June 10, 2024 10:11 AM
To: Miller, Tony <TMiller@cityoftacoma.org>
Subject: Re: FW: TUS/City Drain Basins - Source Tracing high copper/lead samples at Union Station

Understood, thanks Tony.

Kyle Wyman (he/him)

Building Services Specialist

Tacoma Union Station

Cell- 253-310-6925

Service Calls: 1-800-806-8145

On Mon, Jun 10, 2024 at 7:27 AM Miller, Tony <TMiller@cityoftacoma.org> wrote:

> Good morning Kyle, please see the copper results from my latest sampling event. I put them on a map with the previous sampling results as reference. There are still some elevated levels of copper at this site. You can expect a letter from me in the next week or 2 with some next steps. I'm trying to decipher the regulations for

clean-up levels. It is a little convoluted because it is soil samples in surface water, so I need to make sure I'm quoting the correct regulations. But I believe some form of treatment will be required at this site. Please let me know if you have any further questions prior to me sending the letter.

Thank you!

Tony Miller

City of Tacoma

Environmental Services

Desk: (253) 502-2195 Mobile: (253) 355-8955

tmiller@cityoftacoma.org

CITY OF Tacoma STORMWATER SOLIDWASTE WASTEWATER ENVIRONMENTAL SERVICES DEPARTMENT

From: Kyle Wyman - 10PMAC <kyle.wyman@gsa.gov>
Sent: Wednesday, May 29, 2024 7:39 AM
To: Miller, Tony <TMiller@cityoftacoma.org>
Subject: Re: FW: TUS/City Drain Basins - Source Tracing high copper/lead samples at Union Station

Apologies Tony, I was sure I accepted.

Thanks.

On Wed, May 29, 2024, 7:05 AM Miller, Tony <TMiller@cityoftacoma.org> wrote:

> Good morning Kyle, I sent an invite for today at 1, but I didn't see a reply. Does today at 1 work to sample the catchbasins behind Union Station?

Thank you.

Tony Miller

City of Tacoma

Environmental Services

Desk: (253) 502-2195 Mobile: (253) 355-8955

tmiller@cityoftacoma.org

From: Kyle Wyman - 10PMAC <kyle.wyman@gsa.gov>
Sent: Tuesday, May 21, 2024 8:45 AM
To: Miller, Tony <TMiller@cityoftacoma.org>
Cc: Sanders, Michael <msanders2@cityoftacoma.org>
Subject: Re: FW: TUS/City Drain Basins - Source Tracing high copper/lead samples at Union Station

Absolutely,

Send me an invite sometime in the next few weeks, and I will make it happen!

Cheers,

Kyle Wyman (he/him)

Building Services Specialist

Tacoma Union Station

Cell- 253-310-6925

Service Calls: 1-800-806-8145

On Tue, May 21, 2024 at 8:39 AM Miller, Tony <TMiller@cityoftacoma.org> wrote:

Good morning Kyle, I was hoping I could set up a time in the next couple of weeks to grab a couple of catchbasin samples at Union Station. Is there a day in the next week or two that would work for you?

Thank you!

Tony Miller

City of Tacoma

Environmental Services

Desk: (253) 502-2195 Mobile: (253) 355-8955

tmiller@cityoftacoma.org

From: Kyle Wyman - 10PMAC <kyle.wyman@gsa.gov>
Sent: Friday, April 14, 2023 8:44 AM
To: Miller, Tony <TMiller@cityoftacoma.org>
Cc: Sanders, Michael <msanders2@cityoftacoma.org>; Brett Reagan - 10PMAC <brett.reagan@gsa.gov>; Dwayne Smith - 10PMAC <dwayne.smith@gsa.gov>
Subject: Re: FW: TUS/City Drain Basins - Source Tracing high copper/lead samples at Union Station

Tony,

Not sure if this was a typo or not. We have Hydronics loops, not Hydroponics. Heating, cooling, and condenser water loops.

As for roof treatment, in the past we've always used a light solution of laundry detergent, and only in moss affected areas. The new contractor may have changed the roof treatment chemical, but they are required in their contract to use Safer-Choice (EPA) or Biobased (USDA) products. As a Federal Facility, it is understood that nothing except rain water should be running into our storm water system. Our contracted partners are following these rules as well.

Let me know if there are any other questions I can answer.

Thank you,

Kyle Wyman

Building Services Specialist

Cell- 253-310-6925

Tacoma Union Station

Service Calls: 1-800-806-8145

On Wed, Apr 12, 2023 at 2:40 PM Miller, Tony <TMiller@cityoftacoma.org> wrote:

Kyle, thank you for getting these drains cleaned. In the coming months we would like to come out and probe to see if there is any new sediment accumulation and sample accordingly. Additionally, could you elaborate on any cleaning or maintenance processes for you roof or sidewalks? Also the hydroponics system you have onsite (mentioned below), what fertilizers are used where that system discharges to. Any additional information you have on cleaning or maintenance activities that may affect your storm water system would be a huge benefit.

Thank you!

Tony Miller

City of Tacoma

Environmental Services

Desk: (253) 502-2195 Mobile: (253) 355-8955

tmiller@cityoftacoma.org

From: Kyle Wyman - 10PMAC <kyle.wyman@gsa.gov>
Sent: Monday, March 27, 2023 1:25 PM
To: Sanders, Michael <msanders2@cityoftacoma.org>
Cc: Miller, Tony <TMiller@cityoftacoma.org>; Brett Reagan - 10PMAC <brett.reagan@gsa.gov>; Nokes, Laura <LNokes@cityoftacoma.org>; Henley, Mary <mhenley@cityoftacoma.org>; Brennan, Kevin <KBRENNAN@cityoftacoma.org>; Magoon, Stuart <SMagoon@cityoftacoma.org>; r.tillich@mase-usa.com; s.crespo@masepr.com
Subject: Re: FW: TUS/City Drain Basins - Source Tracing high copper/lead samples at Union Station

Michael,

Drain basin cleaning on this property was completed today!

Sincerely,

Kyle Wyman

Building Services Specialist

Cell- 253-310-6925

Tacoma Union Station

Service Calls: 1-800-806-8145

On Thu, Aug 25, 2022 at 6:56 AM Sanders, Michael <msanders2@cityoftacoma.org> wrote:

> Kyle, Thanks for taking my call this morning. As I understand you are waiting on the new fiscal year to address the storm drains.

Additionally as you stated please re-address this matter with the powers to be, as we want to find the contributing factors of high copper/lead effecting our open waters.

Vr

Mike Sanders

From: Sanders, Michael
Sent: Tuesday, June 7, 2022 12:16 PM
To: Kyle Wyman <k.wyman@mase-usa.com>
Cc: Brett Reagan - 10PMAC <brett.reagan@gsa.gov>; r.tillich@mase-usa.com; s.crespo@masepr.com; Miller, Tony <TMiller@cityoftacoma.org>; Nokes, Laura <LNokes@cityoftacoma.org>; Henley, Mary <mhenley@cityoftacoma.org>; Brennan, Kevin <KBRENNAN@cityoftacoma.org>; Magoon, Stuart <SMagoon@cityoftacoma.org>
Subject: RE: TUS/City Drain Basins - Source Tracing high copper/lead samples at Union Station

Kyle, nice to meet you today as per your summary, it is spot on. At this time I would request the cleaning of the private storm drains located at 1717 Pacific Ave as per the map provided. I would recommend to have the private drains pressure washed, sediment removal and jet the leads. Once complete please notify myself and we will continue to sample to see if any changes.

As per our discussion, is it possible to find out what month(s) moss treatment is typically applied on the roof or sidewalks and amounts. Additionally schedule a time where we can dye test your hydroponics discharge point for your cooling towers to confirm connection to wastewater Vs stormwater.

On our attached map the light green indicates private storm system the darker green is City and the red is the wastewater. The squares are the catch basins (storm drains) and the round icon indicate manhole structures. I also attached a contractors list (if needed) and the sample report.

Any questions or concerns please feel free to call me.

Mike Sanders

Source Control Representative

Business Operations/Environmental Services

2201 Portland Ave, P-1, Tacoma, WA 98421

Cell: (253) 651-3298

msanders2@cityoftacoma.org

"If it hits the ground, it hits the Sound."

From: Kyle Wyman <k.wyman@mase-usa.com>
Sent: Tuesday, June 7, 2022 10:42 AM
To: Sanders, Michael <msanders2@cityoftacoma.org>
Cc: Brett Reagan - 10PMAC <brett.reagan@gsa.gov>; r.tillich@mase-usa.com; s.crespo@masepr.com
Subject: TUS/City Drain Basins - High copper/iron samples

Mr. Sanders,

Per our conversation today; City of Tacoma has tested the sediment in/and around the Union Station property and found high copper/iron deposits. The city would like to find the exact source of this problem, and possibly change our current practices to keep these levels down. Your first suggestion is to have these drain basins pumped out and the connecting pipes cleaned. Please send along the diagrams we spoke about, and any pertinent information I left out.

Let's continue dialogue on this subject, and let me know if there is any documentation I can share with you to help us reach a conclusion.

Respectfully,

--

Kyle Wyman

Chief Engineer - Multi Air Services Engineers

Tacoma Union Station

Appendix B
30-day Enforcement Letter

City of Tacoma
Environmental Services Department

August 12, 2024

SENT VIA CERTIFIED MAIL

Kyle Wyman
Tacoma Union Station Federal Courthouse
1301 A Street Suite 610
Tacoma, WA 98402

Subject: Copper Source Control Investigation - 1717 Pacific Avenue, Tacoma, WA 98421

Dear Tacoma Union Station Federal Courthouse:

The City is obligated, under permit from the Washington Department of Ecology and a Consent Decree with the Environmental Protection Agency, to implement a Stormwater Management Program that requires the identification of sources of pollutants that may be impacting the City's stormwater system and receiving waters. The City must ensure the sources of pollutants, when found, are remediated to prevent further contamination from entering the City's system.

In 2022, the Source Control team began a source-tracing investigation to find a source of copper in the stormwater drainage basins where Tacoma Union Station is located. The project was based on data collected from stormwater monitoring showing elevated levels of Copper in the City's stormwater system. During 2024, the investigation further identified elevated levels (>390 ppm) of copper in sediments in the private stormwater system at Tacoma Union Station in the three catch basins (6518719, 6518720, and 6518721) located on the Southeast corner of 1717 Pacific Avenue which discharge stormwater to the City's system and to the Thea Foss Waterway. The discharge of a pollutant to the City's system is prohibited by Tacoma Municipal Code (TMC) 12.08D.110.5.C

Required Actions

Within thirty (30) days of receipt of this letter you are required to:

- Submit a written plan of action and timeline to eliminate the discharge of Copper from Tacoma Union Station Federal Courthouse facilities to the City's stormwater system.

Tacoma Municipal Code (TMC) Chapter 12.08D.110.5.C Prohibited Discharges says, in part, "*No person shall throw, drain, spill, or otherwise discharge, cause, or allow others under their control to throw, drain, spill, or otherwise discharge any substance not specifically allowed or conditionally allowed into the municipal stormwater system or receiving waters. By way of example and not limitation, discharges that are contaminated with the following substances are prohibited. 3. Metals in either particulate or dissolved form.*"

If you have any questions regarding this matter, please contact Regulatory Compliance Analyst, Tony Miller at (253) 355-8955 or tmiller@cityoftacoma.org.

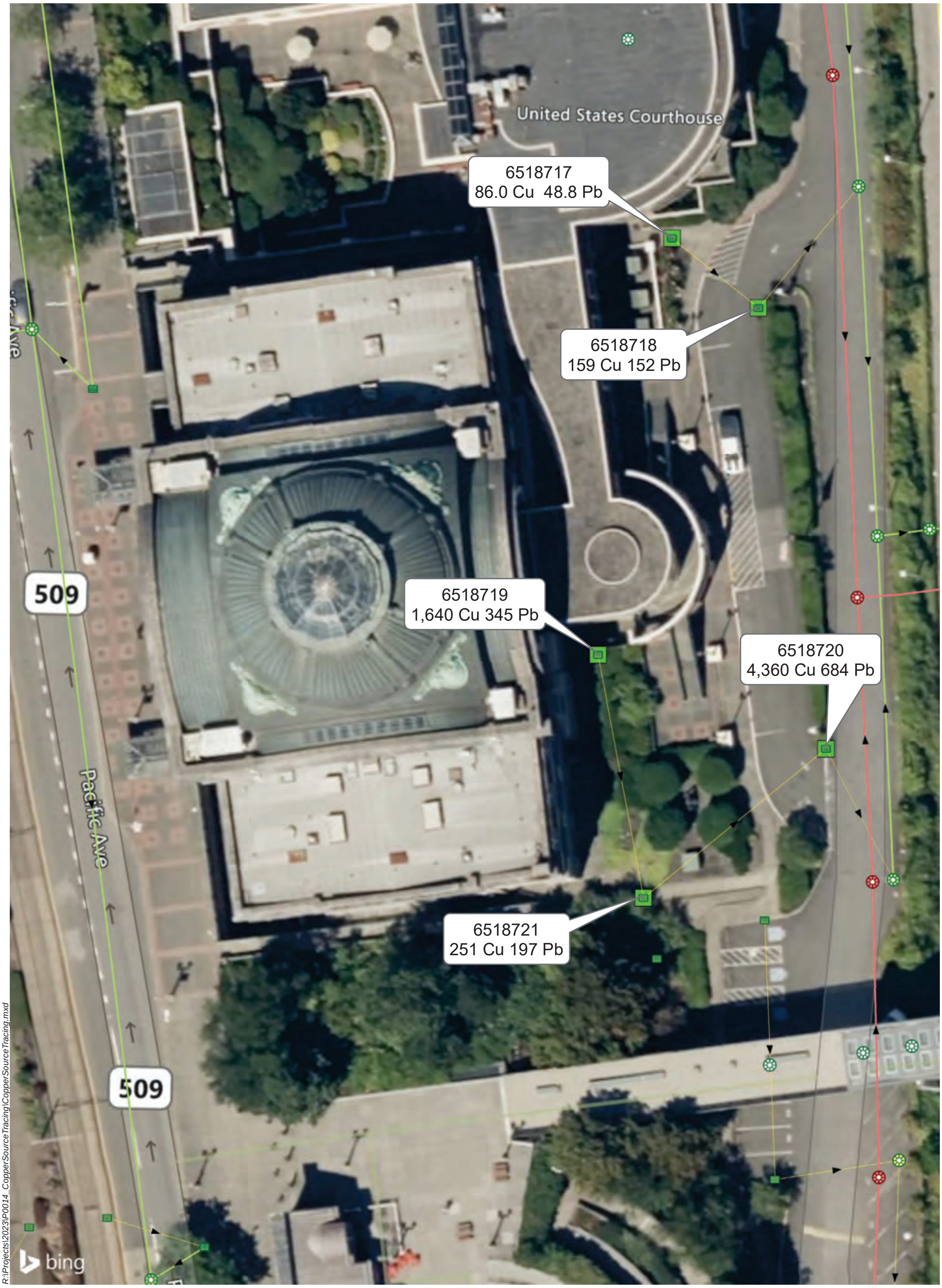
Sincerely,

DocuSigned by:
Cassandra Moore
F7F79691EFFA489...

Cassandra Moore, MES
Assistant Division Manager
Business Operations

Enclosures: Map with concentrations and lab reports
Sent by First Class and Certified Mail: 7022 1670 0003 0339 4654

Figure 1 (2022) Outfalls 230 & 235 Copper Source Tracing



Note: Concentrations are in mg/Kg (ppm)

Sampling locations and concentrations at 1717 Pacific Ave. (Union Station).

Map Date: 1/30/2023
Source: Science and Engineering Division
Environmental Services Department
City of Tacoma
326 East D Street, Tacoma WA 98421
(253) 591-5588

0 12.5 25 50 Feet

Appendix C
Actions to be taken by Union Station

U.S. General Services Administration

November 11th, 2024

FROM: KYLE N WYMAN, TUS BUILDING MANAGER

SUBJECT: TACOMA UNION STATION STORM WATER CATCH BASIN MITIGATION PLAN

The below letter is in response to a requested action plan by the City of Tacoma to keep copper and lead levels found in catch basin sediment from entering the City's storm water system.

- Sufficiently clean and vacuum sediment and water out of the 3 affected catch basins immediately (locations attached)

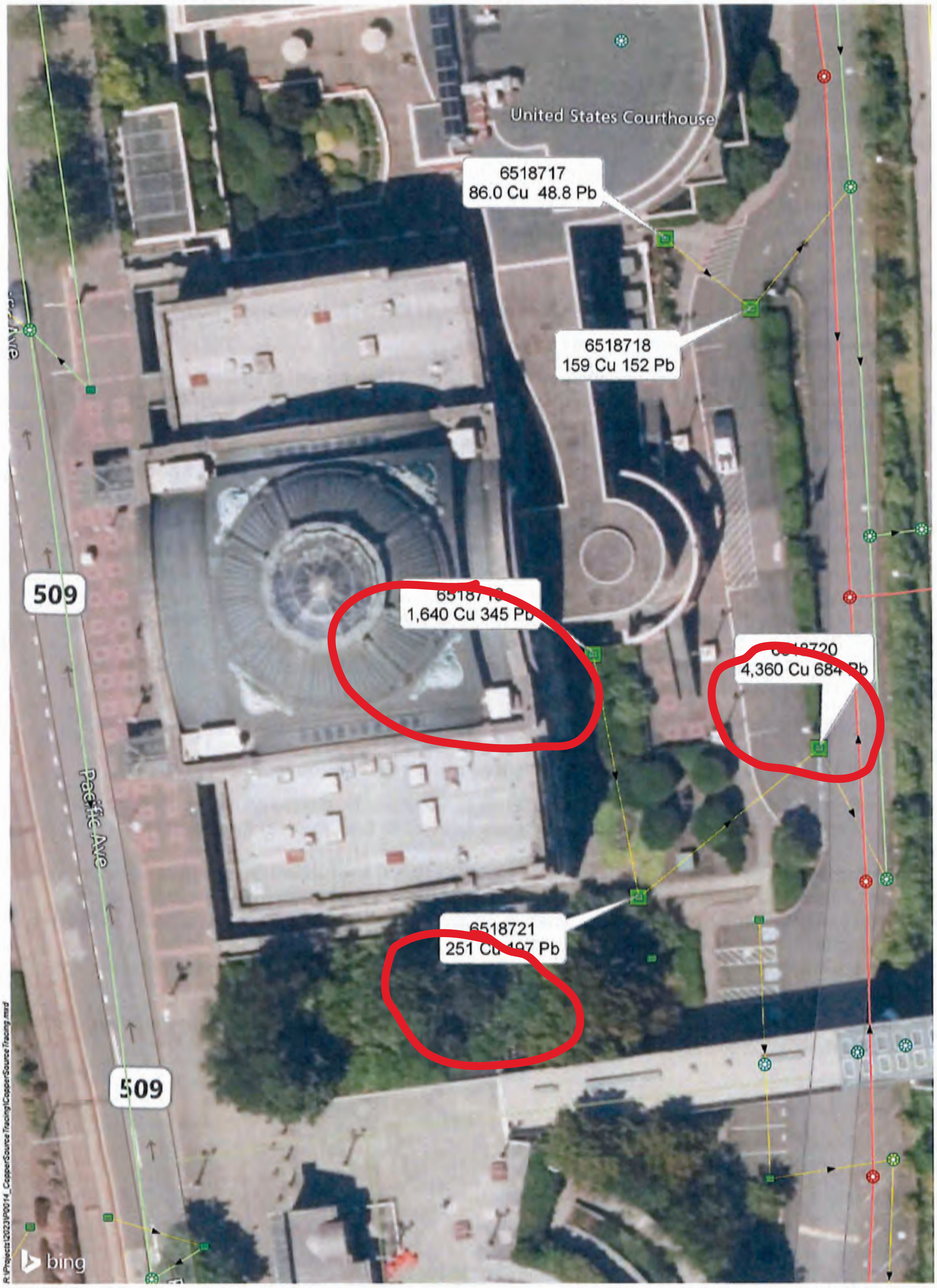
- Future cleaning frequency to be advised by City of Tacoma Environmental Services team

GSA is committed to addressing all environmental liabilities to the highest standard. The last few years, this issue has been addressed with a reactionary solution. GSA would like to discuss more preventative solutions. A meeting with GSA subject matter experts and the City of Tacoma will be proposed along with this letter. Provided our opinions on treatment of this issue change, this action plan will be updated accordingly.

Sincerely,
Kyle N. Wyman
Building Services Specialist
GSA Northwest/Arctic Region
Public Building Service
Western Field Office 10 PMAC
Tacoma Union Station Courthouse

1717 Pacific Avenue
Tacoma, WA 98402
www.gsa.gov

Figure 1 (2022) Outfalls 230 & 235 Copper Source Tracing



Note: Concentrations are in mg/Kg (ppm)

Sampling locations and concentrations at 1717 Pacific Ave. (Union Station).

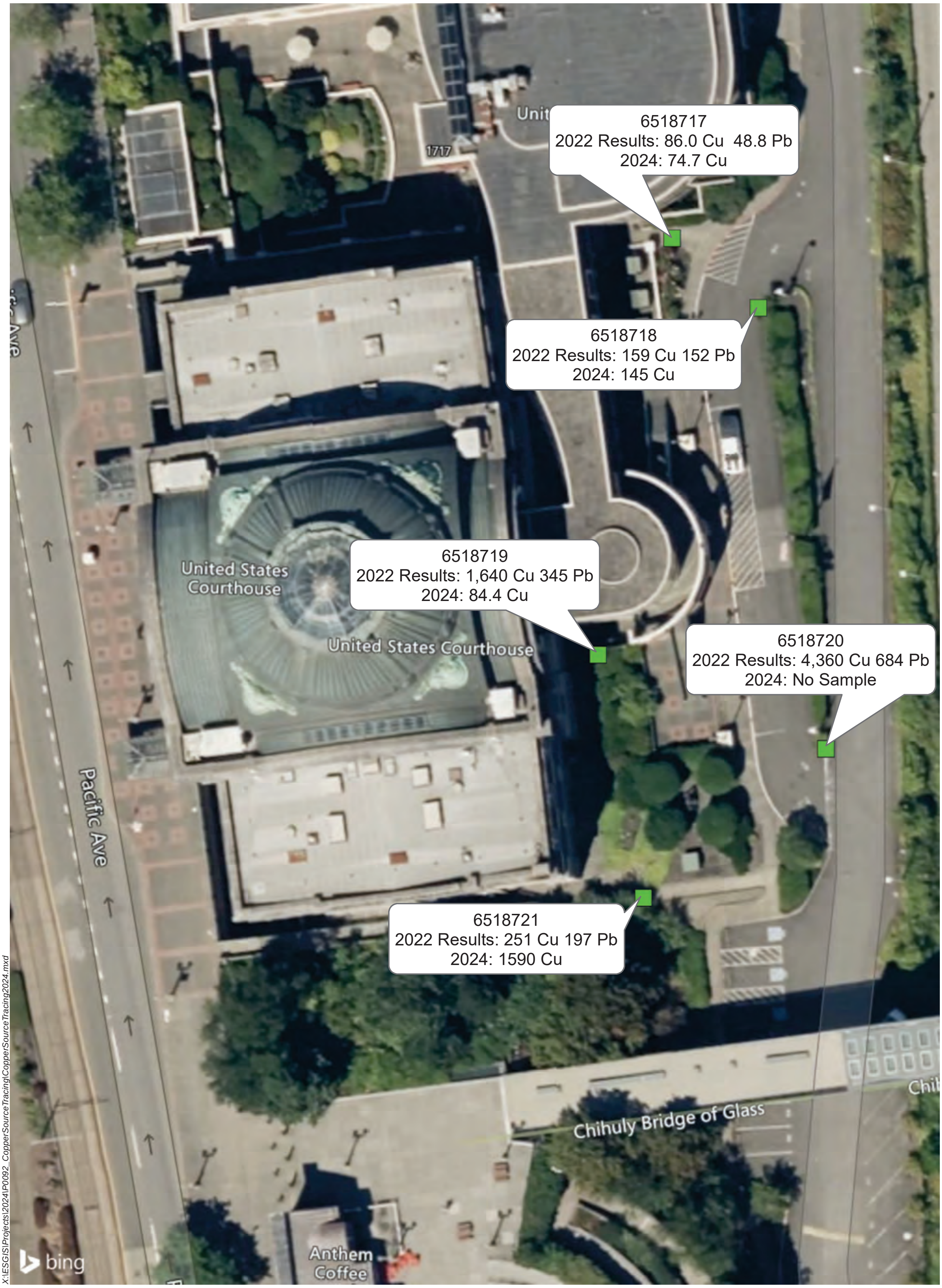
Map Date: 1/30/2023
Source: Science and Engineering Division
Environmental Services Department
City of Tacoma
326 East D Street, Tacoma WA 98421
(253) 591-5588

0 12.5 25 50 Feet

Tacoma

Figure 1
Copper Source Tracing Map

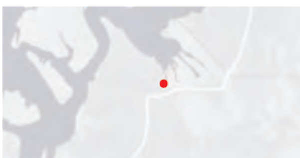
Figure 1 (2024) Outfalls 230 & 235 Copper Source Tracing



X:\ESG\GIS\Projects\2024\P0092_CopperSourceTracing\CopperSourceTracing2024.mxd

Note: Concentrations are in mg/Kg (ppm)

Sampling locations and concentrations at 1717 Pacific Ave. (Union Station).



Map Date: 1/6/2025
Source: Science and Engineering Division
Environmental Services Department
City of Tacoma
326 East D Street, Tacoma WA 98421
(253) 591-5588

0 12.5 25 50
Feet

Tacoma

ATTACHMENT A.4 - OF237A

Table A.4-1
2024 Pipe Maintenance Activities for OF237A

Date	Location	Type of Work	Outfall	Sub-Basin
8/7/2024	1752 S TACOMA WAY	CLEAN ASSET	237A	FS_03
4/29/2024	1425 S STATE	CLEAN ASSET	237A	FS_03
9/12/2024	FS_04 6257658	CLEAN ASSET	237A	FS_04
2/15/2024	1937 S SHERIDAN ST	CLEAN ASSET	237A	FS_04
2/15/2024	1937 S SHERIDAN ST	CLEAN ASSET	237A	FS_04
9/6/2024	1605 S TACOMA WAY	CLEAN ASSET	237A	FS_04
9/16/2024	FS_04 RECLEAN 6282851 8''	CLEAN ASSET	237A	FS_04
9/19/2024	FS_04 6286644 10''	CLEAN ASSET	237A	FS_04
9/20/2024	FS_04 6288730 10''	CLEAN ASSET	237A	FS_04
9/20/2024	FS_04 6298470 10''	CLEAN ASSET	237A	FS_04
3/20/2024	INSP & CLN 730 S TACOMA WAY	CLEAN ASSET	237A	FS_08
2/20/2024	3602 S Asotin	CLEAN ASSET	237A	FS_08
5/7/2024	3502 S ALASKA - CLN CULVERT	CLEAN ASSET	237A	FS_08

ATTACHMENT A.5 - OF 237B

Table A.5-1
2024 Pipe Maintenance Activities for OF237B

Date	Location	Type of Work	Outfall	Sub-Basin
1/8/2024	302 S LN	CLEAN ASSET	237B	FS_11
1/2/2024	602 E 57TH ST	CLEAN ASSET	237B	FS_11
6/10/2024	5522 MCKINLEY AVE	CLEAN ASSET	237B	FS_11
9/4/2024	5507 MCKINLEY AVE	CLEAN ASSET	237B	FS_11
8/14/2024	6313615 - ENGINEER REQ - CLEAN	CLEAN ASSET	237B	FS_11
8/14/2024	6313616 - ENGINEER REQ - CLEAN	CLEAN ASSET	237B	FS_11
8/14/2024	6313617 - ENGINEER REQ - CLEAN	CLEAN ASSET	237B	FS_11
8/14/2024	6313618 - ENGINEER REQ - CLEAN	CLEAN ASSET	237B	FS_11
3/27/2024	INSP & CLN 216 PUYALLUP AVE	CLEAN ASSET	237B	FS_12

City of Tacoma
Environmental Services Department

April 5, 2024

SENT VIA CERTIFIED MAIL

Angelique Martinez
3725 East E Street
Tacoma, WA 98404

Subject: Warning Letter – Prohibited Discharge of Petroleum Oil Located at 3725 East E Street

Dear Angelique Martinez:

Environmental Compliance received a complaint on April 1, 2024, of oil spilled onto the right-of-way at the subject address. When staff arrived onsite, they discovered heavy oil staining in the planting strip near a municipal storm drain (Figure 1 & 2). During heavy rains, the water flowing into the storm drain can carry oil and other pollutants, untreated, into waters of the state.

Tacoma Municipal Code (TMC) Chapter 12.08D.110.C states, in part:

> *no person shall throw, drain, spill, or otherwise discharge, cause, or allow others under their control to throw, drain, spill, or otherwise discharge any substance not specifically allowed or conditionally allowed into the municipal stormwater system.*

Required Actions

Within thirty (30) days of receipt of this letter, please complete the required actions:

- Remove any oil or dirt that has been contaminated with oil from the right-of-way in front of your property and dispose of it properly.
- Cease the discharge of pollutants, including oil, to the ground around your property.

Failure to adequately address this concern with City of Tacoma Environmental Services may result in escalating enforcement actions, including, but not limited to, Notices of Violation with Civil Penalties of up to $10,000 per day for each violation of TMC 12.08.

If you have any questions about the proper disposal of hazardous wastes, please contact Tacoma's Household Hazardous Waste program at (253) 591-5418. If you have any other questions regarding this matter, please contact Sr. Source Control Representative, Braden Price at (253) 502-2221 or email at bprice@cityoftacoma.org.

Sincerely,

Cassandra Moore, MES
Assistant Division Manager
Environmental Compliance

cc: Matthey A Kraft, PO Box 24052, Federal Way, WA 98093-1052

Enclosure: Photo, 4 C's BMP, Residential BMP's
Sent by First Class and Certified Mail: 7022 2410 0003 0426 8531

Figure 1 – Oil staining in gravel.

Figure 2 – Liquid oil in pan with no protection from the environment.

We Keep it Clean Using the 4Cs

Cover

Cover outdoor work and storage areas

Capture

Capture fluids before they run to the drain

Clean

Clean up spills before they reach the drain

Contain

Contain stored fluids to capture leaks

Tacoma

SURFACEWATER SOLIDWASTE WASTEWATER

ENVIRONMENTAL SERVICES DEPARTMENT

y Rain Down the Drain

Dil • No Suds • No Paint • No Chemicals

n small amounts can pollute our waterways

Chapter 3 BMP S168: BMPs for Homeowners

3.1 Applicability

This BMP applies to all single family homeowners in the City of Tacoma. There may be additional BMPs within Volume 6 - Source Control Best Management Practices that apply to your property. The BMPs in this section are intended to cover typical use of single family homes and are actions that should be taken when performing the associated activities.

3.1.1 Washing

Washing activities might include washing tools, buckets, dishes, automobiles, bicycles, boats, windows, siding, and any other washing activity.

- All washwater must drain to the wastewater system. For a typical single family home this means that washing cannot occur outside the home unless all washwater can be collected for disposal into the wastewater system.
- Wash items inside in a sink that drains to the wastewater system when possible.
- Remove any grease and oil before washing. Properly dispose of oils and grease.
- Sweep or otherwise wipe down items to remove the bulk of dirt of grit. Properly dispose of any removed material in the trash.
- Take automobiles and boats to a commercial carwash.
- Do not wash any material into the street.
- Do not pour any washwater into the street, into a stormwater inlet, or into a surface water.

3.1.2 General Home Maintenance

- Maintenance activities might include things like painting and fixing household items.
- Obtain appropriate City of Tacoma Permits for large maintenance projects. See tacomapermits.org to see if a permit is required for the type of maintenance being performed.
- Conduct maintenance in such a way that no pollutants will enter the street, a stormwater inlet or a surface water.
- Regularly sweep or vacuum. Properly dispose of debris in the trash.
- Do not pour or dispose of anything into the street, a stormwater inlet, or a surface water.
- Dispose of waste materials at the end of each day.

3.1.3 Automobile and Bicycle Maintenance

- When possible conduct all vehicle and bike maintenance activities indoors or undercover.
- If maintenance cannot be conducted indoors or undercover, place a tarp over the activity and place drip pads under the area to ensure no pollutants reach the ground.
- Recycle all oils, antifreeze, solvents, and batteries. The Household Hazardous Waste facility at the Tacoma Recovery and Transfer Center accepts many items that may be associated with vehicle maintenance. See: www.cityoftacoma.org/solidwaste for additional information.

- Never dump new or used automotive fluids or solvents on the ground, into the street, into a stormwater inlet, or into surface waters.
- Do not mix wastes. Always keep your wastes in separate containers which are properly labeled and store them under cover.
- Fix leaks to ensure materials stay off the streets and out of the stormwater system and local waterways.

3.1.4 Solid Waste, Recycling, and Yard Waste

- City of Tacoma residents shall use the City of Tacoma Solid Waste Management waste containers. The containers shall have lids that can fully close and be free from damage. If the containers are damaged contact Solid Waste. See: www.cityoftacoma.org/solidwaste or call (253) 502-2100 for questions about Setout Guidelines, damaged containers, and what can go into each container.
- For bulky items use Tacoma Call-2-Haul program. See www.cityoftacoma.org/solidwaste for additional information. Do not let bulky items sit outside for extended period of time unless they are covered by a tarp.
- Do not blow yard waste into the street, into a stormwater inlet, or into a surface water. Collect all yard waste and dispose in the yard waste bin (brown bin).

3.1.5 Vegetation Management

- Use natural yard care practices to the maximum extent practicable. These include practices such as planting appropriate vegetation for the site, building healthy soil by using compost amendments, watering sparingly, eliminating or minimizing the use of fertilizers, pesticides, and herbicides, and mowing grass higher.
- Store yard care tools and amendments inside and under cover.
- Do not dispose of yard clippings in the street, into a stormwater inlet, or into a surface water. Collect all yard waste and dispose in the yard waste bin.
- Do not apply moss removal powders or chemicals if there is a chance of rain within 1 week of application. Remove excess chemicals and moss by use of vacuum or sweeper. If pressure washing is used, all washwater must be collected and discharged to the wastewater system. Washwater shall not discharge onto the ground, into a stormwater inlet, into the street, or into a surface water.

3.1.6 Swimming Pools, Hot Tubs, and Fountains

- Clean the pool, spa, hot tub, or fountain regularly. Maintain the filtration system and water chemistry. Regular maintenance will limit the need to drain the facility.
- Store chemicals inside a building or in a container under cover.
- Properly dispose of spent chemicals. Do not dump or pour any chemicals into the stormwater system or receiving waters.
- When the facility needs to be drained, drain all water to the wastewater system when feasible. This may require the use of a pump. A Special Approved Discharge Permit may be required - see https://www.cityoftacoma.org/government/city_departments/environmentalservices/surface_water/surface_water_and_wastewater_permits for additional information.
- If discharge to the wastewater system is not possible, discharge to the stormwater system may be possible provided discharge water is:

  - Dechlorinated/debromiated to 0.1 ppm or less.
  - Free from sodium chloride
  - pH-adjusted
  - Reoxygenated if necessary
  - Free of color, dirt, suds, or algae
  - Free of filter media
  - Free of acid cleaning wastes
  - Thermally controlled to prevent an increase in temperature of the receiving water.
  - Volumetrically and velocity controlled to prevent resuspension of sediments
- Ensure the pool, spa, hot tub, or fountain system is free of leaks and operates within the design parameters.
- Do not connect the pool, spa, hot tub, or fountain system to the stormwater system.

3.1.7 Material Storage

- Store all materials indoors or under cover. Materials left outside can degrade and pollutants can enter the stormwater system.

3.1.8 Roofs and Building Drains

- Bare galvanized metal shall not used for materials that convey stormwater, such as roofs, canopies, siding, gutters, downspouts, roof drains and pipes. Any galvanized materials shall have an inert, non-leachable finish. Acrylic paint, polyester paint, field-applied, and part zinc coating area not acceptable.

ATTACHMENT A.6 - OF243

MEMORANDUM

Date: January 7, 2025

To: Laura Nokes

cc: Kurt Fremont and Cassandra Moore

From: Tony Miller

Subject: OF243 Source Tracing Status Update – Mercury Investigation in FD23

INTRODUCTION

The City of Tacoma (City) is tasked with source tracing contaminants of concern identified through annual sediment trap sampling in the Thea Foss Waterway. Based on sediment monitoring in Outfall 243 (OF243), the FD23 drainage area of this basin was identified as having ongoing issues with mercury sediment contamination. Historic investigations in this basin are available for review in Appendix A of the previous Foss Stormwater Source Control Reports (Tacoma 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023).

2024 ACTIONS

No sampling took place in 2024. EC staff spoke with Bullseye Shooting Range Staff (414 Puyallup Avenue) on February 2, 2024, about accessing their roof drain catchment device located within the building. Staff stated that the tank is located behind their trap and can only be accessed when the trap is being serviced. EC requested via email (available upon request) on February 7, 2024, to be contacted when the maintenance took place so that the stormwater system could be inspected and sampled if possible. EC was never contacted by Bullseye in 2024 to do so and Bullseye has not replied to any emails. EC staff will escalate this request to the property owner.

2025 WORK PLAN

During 2025, no catchbasin sampling is scheduled. Instead, samples will be obtained from the stormwater device located within 414 Puyallup Avenue if possible. EC Staff will contact the property owner for 414 Puyallup Avenue to get access to the stormwater device located inside of the Bullseye Shooting Range. Once access is gained the device will be inspected and sampled if possible. FD23 sediment trap results for 2024 (available upon request) show that mercury concentrations in the basin have decreased to “low” levels.

Please let me know if you have any questions or concerns.

ATTACHMENT A.7 - OF245

THERE WERE NO ADDITIONAL SOURCE CONTROL ACTIVITIES IN OF245 DURING WY2024

ATTACHMENT A.8 - OF254

City of Tacoma
Environmental Services Department

November 20, 2024

SENT VIA CERTIFIED MAIL

Registered Agent Solutions, Inc.
Registered Agent for, Jackson Energy Logistics LLC
3400 Capitol BLVD. SE, STE 101
Tumwater, WA 98501

Subject: Warning Letter – Prohibited Discharge of turbid stormwater at 510 E 3rd ST in Tacoma, WA

Dear Registered Agent:

On November 13, 2024, City of Tacoma (City) Environmental Compliance (EC) staff observed turbid stormwater runoff at 510 East 3rd ST flowing from the property and onto the neighboring property 303 East D ST (Figure 1), ultimately impacting the public stormwater system and the Thea Foss Waterway. Silt and sediment laden water is a prohibited discharge. The map (Figure 2) below shows the location where turbid water pooled and entered the public stormwater system (green line).

Tacoma Municipal Code (TMC) Subchapter 12.08D Prohibited Discharges, states, in part:

> *No person shall throw, drain, spill, or otherwise discharge, cause, or allow others under their control to throw, drain, spill, or otherwise discharge any substance not specifically allowed or conditionally allowed into the municipal stormwater system or receiving waters. By way of example and not limitation, discharges of silt and sediment.*

The illicit discharge was reported to Washington State Department of Ecology (Ecology) in accordance with the City of Tacoma's National Pollutant Discharge Elimination System (NPDES) Permit[1] issued by Ecology.

<u>Required Actions</u>

Immediately:

- Implement Best Management Practices (BMPs) controls to cease the discharge of turbid water from 510 E 3rd ST.

Failure to adequately address this concern with City of Tacoma Environmental Services may result in escalating enforcement actions, including, but not limited to, Notices of Violation with Civil Penalties of up to $10,000 per day for each violation of TMC 12.08.D.

If you have any questions regarding this matter, please contact Source Control Representative Erik Harrison (253) 348-1921 or email at eharrison@cityoftacoma.org.

Sincerely,

DocuSigned by:
Cassandra Moore
F7F79691EFFA489...
Cassandra Moore, MES
Assistant Division Manager
Environmental Compliance

Enclosures: BMP S142
Cc: Property Owner – Portland at ST Paul LLC, Ernie Vasquez – Jackson Energy Logistics
Sent by First Class and Certified Mail: 7022 2410 0003 0426 8791

---

[1] This NPDES Permit requires the City to implement a Source Control Program to protect the municipal stormwater sewer system from pollutants that could discharge to surface waters such as Puget Sound, Commencement Bay, or any of the City's lakes, creeks, streams and ponds.

Environmental Compliance/Source Control
2201 Portland Avenue, P-1 Tacoma, WA 98421
www.cityoftacoma.org

Figure 1. Turbid stormwater flowing from the SW corner of 510 E 3rd ST (left of fence) and impacting stormwater drains (under vehicles).

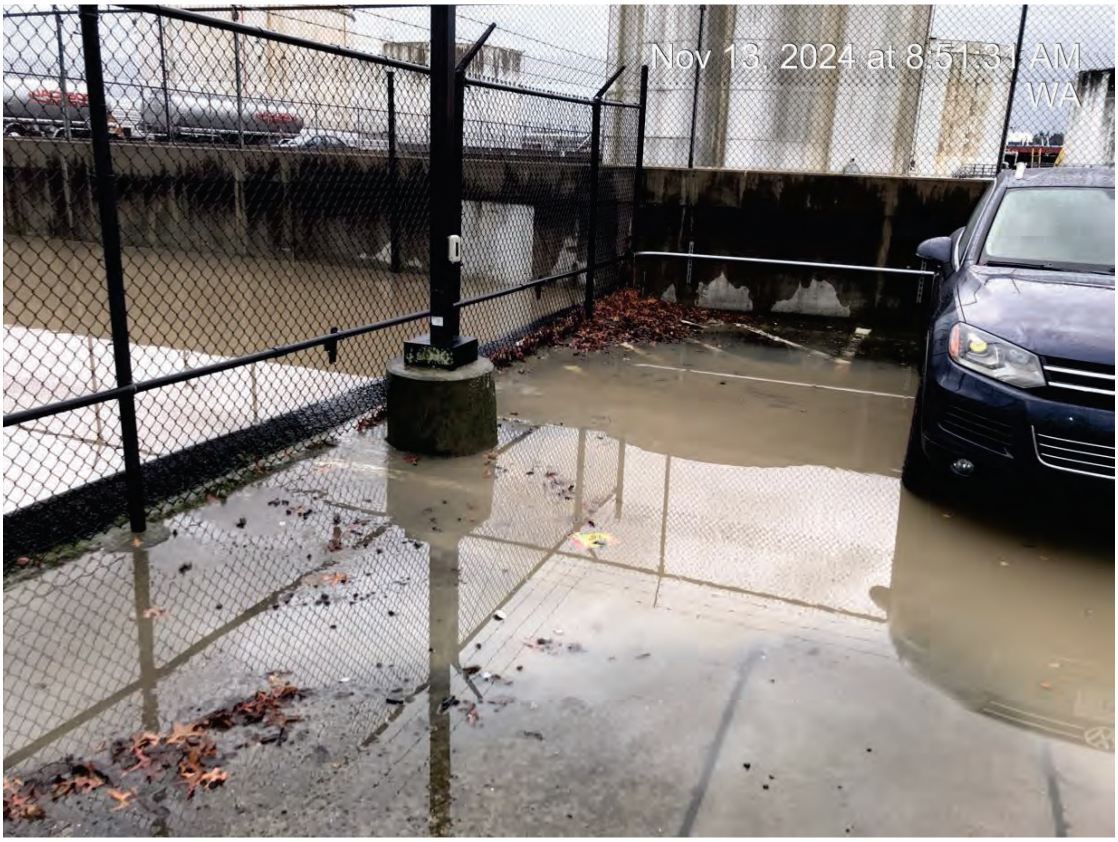


Figure 2. Map highlighting area where water pooled and entered the public stormwater system.

City of Tacoma
Environmental Services Department

March 25, 2024

SENT VIA CERTIFIED MAIL

Capitol Corporate Services, Inc.
Registered agent for, Capital Lumber Company
1780 Barnes Blvd SW
Tumwater, WA 98512

Subject: Notice of Violation with Corrective Action Order 2024-003

Dear Registered Agent:

The Environmental Services Department hereby issues Capital Lumber Company, located at 2525 East Arizona Biltmore Cir Suite A116 in Phoenix AZ, the enclosed Notice of Violation with Corrective Action Order representing a determination by the Environmental Services Department Compliance Officer that a violation of Tacoma Municipal Code (TMC) Subchapter 12.08D has occurred.

This Notice of Violation does not include a monetary penalty. However, failure to comply with deadlines and additional prohibited discharges to the City's municipal stormwater system may lead to escalating enforcement with civil penalties of up to $10,000 per offense.

This Notice of Violation is final unless you appeal this Notice of Violation with Corrective Action Order to the City of Tacoma's Hearing Examiner and request a hearing.

If you decide to file an appeal, you must do so in accordance with procedures set forth in TMC 1.84.020 within ten (10) days of service of this Notice[1].

Appeals must be directed to:

City of Tacoma
Tacoma Municipal Building
Office of the Hearing Examiner
747 Market Street
Tacoma, WA 98402

If you have any questions, please contact Regulatory Compliance, Kevin Brennan at 253-405-7248 or Kbrennan@cityoftacom.org.

Sincerely,

DocuSigned by:
Kurt Fremont
39440F5C064248A...

Kurt Fremont
Division Manager, Compliance Officer
Environmental Compliance, Business Operations Division
326 East D Street
Tacoma, WA 98421
253-502-2238

cc: Darren Henderson, Capital Lumber Co., 230 East F Street, Tacoma, WA 98421
Ray Schuler, Property Owner, 1201 Pacific Avenue, Suite 1400, Tacoma, WA 98402
Shauna Hansen, City Environmental Programs

Enclosure: Notice of Violation with Corrective Action Order
Sent by First Class and Certified Mail: 7022 2410 0003 0426 8265

[1] Service shall be deemed complete upon the third day following the day upon which the notice is placed in the mail, unless the third day falls on a Saturday, Sunday, or federal legal holiday, in which event service shall be deemed complete on the first day other than a Saturday, Sunday, or legal holiday following the third day.

CITY OF TACOMA
Department of Environmental Services

IN THE MATTER OF	)	
NOTICE OF VIOLATION WITH	)	No. 2024 – 003
CORRECTIVE ACTION ORDER	)	

RESPONSIBLE PERSON[1]
Capital Lumber Company
2525 E Arizona Biltmore Cir, Suite A116
Phoenix, AZ 85016

In care of:
Capitol Corporate Services, Inc.
Registered agent for Capital Lumber Company
1780 Barnes Blvd SW
Tumwater, WA, 98512

I. Location of Violations

304 & 320 East F Street, Tacoma, WA 98421

II. Legal Authority and Notice of Violations

In accordance with Tacoma Municipal Code (TMC) Subchapter 12.08D.400 and TMC Chapter 1.82, the City of Tacoma (City), Environmental Services Department (ES), is issuing this Notice of Violation with a Corrective Action Order to Capital Lumber Company, at 2525 East Arizona Biltmore Cir, Suite A116 Phoenix, AZ 85016 for the following violation:

> The prohibited discharge of silt and sediment laden stormwater to the municipal stormwater system on February 28, 2024, in violation of **TMC Subchapter 12.08D.110.C**[2] and TMC **Subchapter 12.08D.400.D.1**[3].

The Notice of Violation with Corrective Action Order does not include a monetary penalty. Additional prohibited discharges to the City's municipal stormwater system may lead to escalating enforcement.

[1] ***TMC Subchapter 1.82.010 Responsible Person,*** *states, in part: A developer, builder, business operator, or owner who is developing, building, or operating a business on the building, premises, structure, or land that is subject to the regulation alleged to have been violated.*

[2] ***TMC Subchapter 12.08D.110.C Prohibited Discharges,*** *states, in part: No person shall throw, drain, spill, or otherwise discharge, cause, or allow others under their control to throw, drain, spill, or otherwise discharge any substance not specifically allowed or conditionally allowed into the municipal stormwater system or receiving waters. By way of example and not limitation, discharges that are contaminated with the following substances are prohibited: Silt and Sediment.*

[3] ***TMC Subchapter 12.08D.400.D.1 Violations,*** *states, in part: Discharging stormwater contaminated with any of the substances prohibited under TMC 12.08D.110.*

III. Background

304 & 320 East F Street collectively make up a 2.67- acre unimproved dirt lot currently occupied by Cascade Capital and owned by Portland at St. Paul LLC (Property Owner). The lot is used for lumber inventory where there is heavy forklift traffic. During periods of rain, there is reoccurring turbid stormwater runoff on the east side of the property impacting the City of Tacoma's municipal stormwater system located along East F Street and East 3rd Street, which ultimately discharges into the Thea Foss Waterway.

- On April 10, 2023, Environmental Compliance staff observed turbid water discharging into the Thea Foss Waterway (receiving waters) from the municipal stormwater outfall located near the NE corner of Pierce County parcel 6375000181 (326 East D Street). The source of the turbid water was found to be stormwater runoff from 304 & 320 East F Street, that was impacting the municipal stormwater collection system located on East 3rd Street. The discharge was reported to the Washington State Department of Ecology (Ecology) in accordance with the City of Tacoma's National Pollutant Discharge Elimination System (NPDES) permit.

- On April 14, 2023, City of Tacoma Environmental Services Control Authority issued a Notice of Violation (No.2023-001) to Capital Lumber Company for the turbid water discharge that occurred on April 10, 2023.

- On May 18, 2023, Site inspection with Capital Lumber to document the completed construction of a silt fence inside the lumber yard at 304 & 320 East F Street. The silt fence has a 1' x 1' rock filled trench spanning almost the entire length of the property along East F Street.

- On September 26, 2023, Environmental Compliance staff observed, and documented turbid stormwater runoff, flowing off the lumber yard along East F Street, impacting the municipal stormwater system. Photos of this event were emailed to both Darren Henderson at Capital Lumber and the property owner.

- On November 1, 2023, City of Tacoma completed the construction of a municipal stormwater bioswale system along East F Street. The bioswale runs 400' south from the corner of East 3rd Street on the west side of the street.

- On December 5, 2023, Environmental Compliance staff observed turbid water discharging into the receiving waters from the municipal stormwater outfall located near the NE corner of 326 East D Street. The source of the turbid water was found to be stormwater runoff from the lumber yard at 304 & 320 East F Street. The discharge was reported to the Ecology, as required by the City of Tacoma NPDES permit.

- On December 20, 2023, Site inspection with Capital Lumber to discuss reoccurring turbid discharges and establish what additional sediment and erosion control measures will be taken to prevent impacts to the municipal stormwater system. Rock ground cover will be placed between the lumber storage and the fence line along the east side of the property.

- On February 12, 2024, Capital Lumber completed installation of a rock ground cover between the lumber storage and the fence on the east side of the property. Straw waddles have been purchased and will be strategically placed where there is runoff.

- On February 28, 2024, Environmental Compliance staff observed turbid water discharging into the receiving waters from the municipal stormwater outfall located near the NE corner of 326 East D Street. The source of the turbid water was found to be stormwater runoff from the lumber yard at 304 & 320 East F Street. The discharge was reported to the Ecology, as required by the City of Tacoma NPDES permit.

IV. Corrective Action Order

On or before May 31, 2024, Capital Lumber shall retain a consulting engineer to prepare a report that will identify recommended Best Management Practices (BMPs) to prevent turbid discharges to the municipal stormwater system. Recommended BMPs shall be implemented by Capital Lumber.

Required BMPs are outlined in the City of Tacoma 2021 Stormwater Management Manual (SWMM) Volume 6, Chapter 2.7.3, **BMP S142: Soil and Erosion Control at Commercial and Industrial Sites** (Figure 1).

V. Appeal Process

This Notice of Violation with Corrective Action Order represents a determination that violations of TMC Subchapter 12.08D have occurred, which determination is final unless you appeal this Notice of Violation with Corrective Action Order to the City of Tacoma's Hearing Examiner and request a hearing as provided in TMC 1.82.050.J and TMC 1.82.060.M. If you decide to file an appeal, you must do so within 10 days from the date of service of this Notice, pursuant to TMC 1.84.020.

Be advised that pursuant to TMC 1.84.020.B.2, if the final day to file a notice of appeal is on a weekend or holiday, the appeal will be timely if filed before the close of business on the next business day following the holiday or weekend. For purposes of this section, holiday shall mean those weekdays during which the City offices are closed for established holidays.

The procedures for filing appeal are set forth in TMC 1.82.050.J, TMC 1.82.060.M and TMC 1.84.020. Appeals must be directed to:

City of Tacoma
Tacoma Municipal Building
Office of the Hearing Examiner
747 Market Street
Tacoma, WA 98402

By Order of the Undersigned Environmental Services Department Compliance Officer:

Signed this 25th day of March, 2023, at Tacoma, Washington

DocuSigned by:
Kurt Fremont
39440F5C064248A...

Kurt Fremont
Division Manager, Compliance Officer
Business Operations Division
326 East D Street
Tacoma, WA 98421
253-502-2238

Figure 1: City of Tacoma 2021 SWMM Required BMPs for Soil Erosion and Sediment Control at Commercial and Industrial Sites

July 2021 SWMM City of Tacoma

2.7.3 BMP S142: Soil Erosion and Sediment Control at Commercial and Industrial Sites

2.7.3.1 Applicability

This BMP applies to properties whose operations may cause erosion. Industrial activities on soil areas, exposed and disturbed soils, steep grades, etc. can be sources of sediments that can contaminate stormwater.

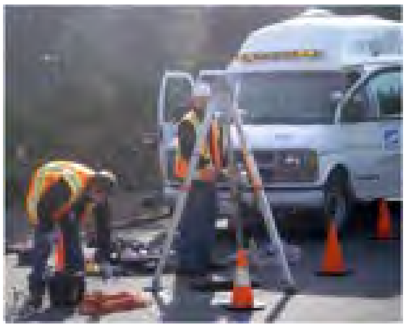
2.7.3.2 Required BMPs

- Limit the exposure of erodible soil.
- Stabilize entrances/exits to prevent track-out.
- Stabilize or cover erodible soil to prevent erosion. Cover practice options include:
  - Use vegetative cover such as grass, trees, shrubs, or erodible soil areas.
  - Cover exposed areas with mats such as clear plastic, jute, or synthetic fiber. See BMP C122: Nets and Blankets and BMP C123: Plastic Covering.
  - Preserve natural vegetation including grass, trees, shrubs, and vines when possible. See BMP C101: Preserving Natural Vegetation.
- If stabilizing or covering the erodible soil is not possible, then structural controls must be implemented which might include:
  - Vegetated swales
  - BMP C200: Interceptor Dike and Swale
  - BMP C233: Silt Fence
  - BMP C207: Check Dams
  - BMP C232: Gravel Filter Berm
  - Sedimentation Basin
  - Proper Grading
  - Paving

APPENDIX B

Thea Foss and Wheeler-Osgood Waterways
2024 Source Control and Water Year 2024 Stormwater Monitoring Report

Appendix B – Data Validation Report
Water Year 2024



March 2025

Prepared for
Washington State Department of Ecology and
U.S. Environmental Protection Agency

Prepared by
City of Tacoma

Acknowledgment

This annual report is the result of over two decades of dedication and expertise from the Environmental Services – Science and Engineering (ESSE) staff. I extend my deepest appreciation for their unwavering commitment to producing high-quality, legally defensible data for the interpretation and reporting of the Thea Foss Waterway Program.

Dana de Leon, Assistant Division Manager, Environmental Programs Group (EPG)

A special acknowledgment goes to:

The EPG Sampling Crew, whose efforts included:

- Maintaining flow meters, samplers, and probes at seven monitoring stations.
- Deploying sediment traps at 24 sites, with an additional 72 site visits.
- Setting up sampling sites 146 times for sample collection.
- Analyzing 365 days of five-minute rainfall and flow data at seven locations.
- Collecting 140 samples and compositing 91 samples.
- Submitting 1,121 sample containers.
- Preparing 20 field reports.
- Generating 3,072 additional field data points.

The ESSE Laboratory, which:

- Managed and processed over 1,121 sample containers.
- Analyzed and interpreted more than 20,000 data points.
- Prepared 29 laboratory reports.

The EPG Staff, who ensured data accuracy through rigorous validation, including:

- Validating 140 samples using 3,072 additional field data points.
- 12,684 sample and QA/QC results were analyzed against quality control criteria.

The EPG and Administration Staff, who were instrumental in compiling, analyzing, and interpreting vast amounts of data, resulting in a comprehensive and well-structured report spanning over 1,700 formatted pages of text, tables, and figures.

Their collective dedication and meticulous work have been instrumental in upholding the integrity of this program.

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Attachment B.3 – Storm Lab Reports – Available upon request
Attachment B.4 – SSPM Lab Reports – Available upon request

LIST OF ABBREVIATIONS

2024 Report	2024 Source Control and WY2024 Stormwater Monitoring Report for Thea Foss and Wheeler-Osgood Waterways
2001 SAP	2001 Sampling and Analysis Plan: Thea Foss/Wheeler-Osgood Waterways
CUW	Center for Urban Waters
CTP	Central Treatment Plant
CD	Consent Decree
City	City of Tacoma
CRM	Certified Reference Material
COC	Contaminants of Concern
CFS	Cubic Feet per Second
DEHP	Bis(2-ethylhexyl) phthalate
DQI	Data Quality Indicator
DQO	Data Quality Objective
DLG	Detection Limit Goal
Ecology	Washington State Department of Ecology
EPA	Environmental Protection Agency
LCS	Laboratory Control Sample
MH	Manhole
MLLW	Mean Lower Low Water
MQO	Measurement Quality Objective
MS	Matrix Spike
MSD	Matrix Spike Duplicate
NPDES	National Pollutant Discharge Elimination System
NPDES Phase I Permit	NPDES Phase I Municipal Stormwater Permit
NWTPH-Dx	Northwest Total Petroleum Hydrocarbon for Diesel Range Organics
OF	Outfall
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PI	Prediction Interval
Permit	State Waste Discharge General Permit for Discharges from Large and Medium Municipal Separate Storm Sewer Systems
pMDL	Performance Method Detection Limit
PBDE	Polybrominated Diphenyl Ether
QAPP	Quality Assurance Project Plan
QA	Quality Assurance
QC	Quality Control
ROW	Right-of-way
RLG	Reporting Limit Goals
RPD	Relative Percent Difference
SSPM	Stormwater Suspended Particulate Matter
SWMP	Stormwater Management Plan
SOP	Standard Operating Procedure
TOC	Total Organic Carbon
TSS	Total Suspended Solids
WY2024	Water Year: Oct 1, 2023 – Sept 30, 2024
WISKI	Water Management Information System, KISTERS Pioneering Technologies

B.1 INTRODUCTION

Stormwater monitoring is required to be conducted under the Thea Foss Waterway Consent Decree (CD) with the Environmental Protection Agency (EPA) and by Section S8.C of the Phase I Municipal Stormwater National Pollutant Discharge Elimination System (NPDES) and State Waste Discharge General Permit for Discharges from Large and Medium Municipal Separate Storm Sewer Systems (Permit).[1] This report documents and validates field and laboratory procedures outlined in the 2023 Quality Assurance Project Plan (QAPP) and data collected and analyzed during WY2024.

B.1.1 STORMWATER MONITORING PROGRAM

Monitoring required by the NPDES Phase I Permit and the Stormwater Work Plan Addendum was performed by the City in accordance with the 2023 QAPP and any revisions as outlined in Section B8. The study area and sampling procedures are described in Section B2.0 and Section 7.1 of the 2023 QAPP.

The WY2024 sampling period for the Foss Program is October 1, 2023, through September 30, 2024. For reporting purposes, each water year includes the period between October 1st and September 30th, with the wet season defined as October through April and the dry season as May through September. The water year is designated by the calendar year in which it ends. Thus, the year ending September 30, 2024, is called WY2024. Using water years provides consistency with other water quality studies such as those conducted by the United States Geological Survey (USGS).

Stormwater and Stormwater Suspended Particulate Matter (SSPM) were monitored in seven municipal stormwater outfalls. Data collected in WY2024 under the Thea Foss Monitoring Program measured the quality of stormwater and SSPM associated with stormwater discharging to the waterway. Representativeness of the data was assessed using both qualitative and quantitative methods. Qualitative analysis includes review of sampling methods and field data, which is discussed in Sections B.4 (stormwater), B.5 (SSPM), and B.6 (Baseflow).

An evaluation of the data relative to continuing source control efforts and a spatial analysis performed for the contaminants of concern are discussed in Sections 3 and 5 of the 2024 Report (Tacoma 2025), respectively.

B.1.1.1 Data Usability and Quality Assessment

The Quality Assurance and Quality Control (QA/QC) approach for the project evaluates the project as a whole and this analysis is presented in Sections B.3 through B.7.

The usability assessment includes assessment of potential outliers, confirmation that the data are comparable and representative, and calculation of the completeness, including:

- identification of outliers from the previous year's data collection efforts;
- confirmation of outliers from previous data collection efforts when sufficient data are available to complete the outlier test;
- confirmation of the comparability of the data;

[1] The Permit requires that the City either pay into a regional stormwater monitoring fund for effectiveness monitoring or conduct stormwater discharge monitoring at five locations. The City has elected to conduct discharge monitoring to fulfill the Permit requirements.

- confirmation of the representativeness of the data; and
- calculation of the completeness for each dry and wet season for the water year to date.

The data quality assessment process determines whether the sampling and analytical program has fulfilled the project objectives, including the Data Quality Objectives (DQO) established in Section 6.1 of the QAPP, and whether the data can be used to support project management decisions with the desired level of confidence.

Data quality assessment is a professional judgment based on several lines of evidence:

- **Laboratory Data Validation Results**. This metric evaluates laboratory data quality, i.e., the extent to which Measurement Quality Objectives (MQOs) for accuracy, precision, sensitivity, and bias have been met during laboratory analysis, as determined by the data validation process (see Section B.7).
- **Field and Laboratory Completeness**. This metric evaluates data quantity, i.e., the extent to which the QAPP-specified number of valid field and laboratory measurements have been obtained, and whether field and laboratory completeness goals have been achieved.
- **Sample Representativeness**. The degree to which the monitoring program provides a representative sample of the physical-chemical characteristics of baseflow, stormwater, and sediment in space and time will be evaluated. An assessment as to whether the data are suitably representative of the spatial characteristics of the drainage area (i.e., land use, gradient, ground cover, etc.) will be performed, as well as the time-varying characteristics of stormwater within an individual storm event (i.e., adequate sampling of the runoff hydrograph, and time of concentration) and between storm events (i.e., seasonal changes throughout the monitoring year, and baseflow versus storm flow), and the representativeness of the weather and hydrology during the monitored year(s) compared to an average or "normal" year (see Sections B.3 through B.7).

B.1.2 REPORT ORGANIZATION

The remainder of the report includes the following discussions of the representativeness of monitoring conducted in WY2024 and of the WY2024 results:

- Rainfall and flow events
- Stormwater sampling events
- SSPM sampling events
- Laboratory data review
- Recommendations for QAPP revisions

Field reports and summary hydrographs for each event are presented in the following attachments:

- Attachment B.1, Stormwater Field Reports
- Attachment B.2, SSPM Field Reports

Laboratory reports for each event are presented in the following attachments:

- Attachment B.3: Stormwater and Baseflow Lab Reports - Available upon request
- Attachment B.4: SSPM Lab Reports - Available upon request

Summaries of field and laboratory data for each sampling event and summary statistics for WY2024 and the entire monitoring record are presented the following WY2024 Report appendices:

- Appendix C: Supporting Field and Hydrologic Data
- Appendix D: Analytical Data for Baseflow, Stormwater, and Storm Sediment Data

B.2 MONITORING PROGRAM DESCRIPTION

In order to address representativeness of stormwater, the City selected sampling locations, methods, and times so that the data describes various stormwater runoff over the range of land use conditions in the drainage basins, the varying hydrologic conditions within an individual storm event (i.e., rising and falling portions of the hydrograph), and a representative cross-section of storm types during the year. Stormwater and SSPM sampling locations for NPDES and CD compliance are located as near to the end of the seven outfalls as possible to represent the entire drainage basins. Additional SSPM sampling is done upline in the drainage basins for source tracing purposes.

Comparison of results from source tracing sediment traps help to prioritize source control efforts among the sub-basins in the Thea Foss Watershed. It is inappropriate, however, to evaluate SSPM data using sediment quality criteria because the storm drains provide neither habitat nor a point of compliance for aquatic life. The remainder of this section presents a summary of the monitoring locations and sampling procedures used during WY2024.

B.2.1 SAMPLE LOCATIONS

B.2.1.1 Drainage Basin Description

The Thea Foss and Wheeler-Osgood Waterways are estuarine waterways on the southeastern margin of Commencement Bay. In Commencement Bay and the waterways, average tidal fluctuations vary from zero feet Mean Lower Low Water (MLLW) to 11 feet MLLW. Extreme tides, which generally occur in June and December, range from approximately –4.0 feet MLLW to 14.5 feet MLLW. The Thea Foss Waterway lies north-south along the City's downtown corridor. The Wheeler-Osgood Waterway lies west-east and connects to the east side of the Thea Foss Waterway just south of the 11th Street Bridge. The Thea Foss and Wheeler-Osgood Waterways are commonly referred to as the Thea Foss or Foss Waterway and are referred to herein as the Foss Waterway. The drainage area tributary to the Foss Waterway is referred to herein as the Foss Waterway Watershed.

The Foss Waterway Watershed is one of nine watersheds in the City (Figure B2-1). This watershed covers approximately 5,800 acres and is comprised of drainage basins located in the south-central portion of Tacoma. The area borders the North Tacoma Watershed on the north, Lawrence Street on the west, and East "F" to East "K" Streets on the east. The area extends as far south as 86th Street and includes portions of the Tideflats on the east side of the Foss Waterway (Figure B2-1).

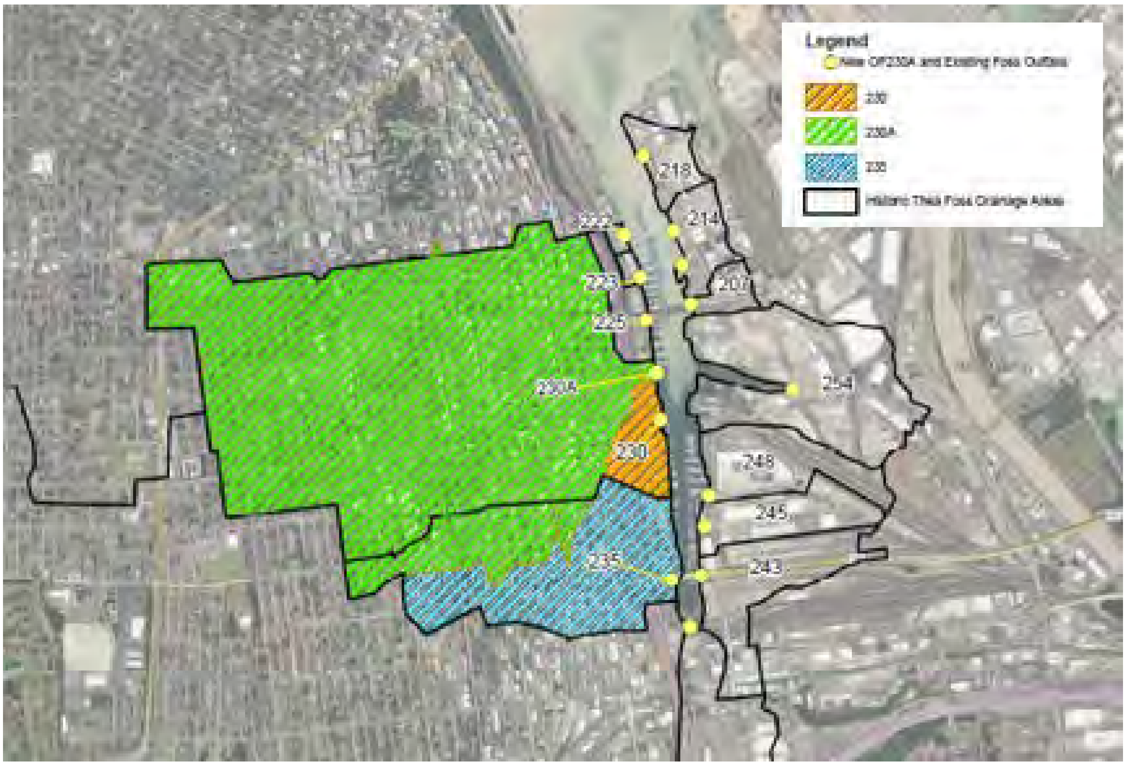
B.2.2 MONITORING LOCATIONS

In accordance with Section S8.C of the Permit and the Foss CD, Tacoma is monitoring seven outfalls in the Foss Monitoring Program. All seven outfalls have been monitored for more than 20 years under the Foss Monitoring Program. The selection of these outfalls is discussed in detail in the QAPP (Tacoma 2023). Due to the construction of OF230A and subsequent re-routing 98 percent of the OF230 stormwater collection system to OF230A, OF230 is no longer monitored for water quality under this program (described in Section 3.1 and the QAPP). OF230A is monitored under the Foss Monitoring Program in lieu of OF230. With this change, Tacoma is still monitoring the major seven outfalls which discharge most of the freshwater to the Thea Foss Waterway.

The sampling locations for each outfall were selected to be as close to the end-of-pipe as practical. In general, samples are collected at the first manhole upstream from the end of the outfall pipe. Drainage basin characteristics for each site are presented in Table B2-1. All Foss Waterway outfalls are influenced to a certain degree by tidal inundation and portions of the pipe are inundated with marine water twice a day depending on the pipe elevations and the tide height. Table B2-2 lists each outfall, the invert elevation, whether the pipe is tidally influenced, and baseflow conditions, whether continuous or tidal (including flow rates, if available). Baseflow sources are presented in Figure B2-2 and are described in the outfall-specific sections below.

B.2.2.1 Outfall 230

With construction of OF230A, the size of the drainage basin for OF230 was substantially reduced in December 2020. The new OF230 drainage basin is a small area located on the west side of the Foss Waterway. The drainage area is approximately 24 acres, a fraction of the 582 acres previously draining to this outfall (see figure below).



This outfall is no longer monitored for water quality under the Foss Monitoring Program. OF230 water quality and SSPM data will be included for historical statistical evaluations. From WY2002 to WY2023, the OF230 whole water sampling site was in a job-box at South 15th and Dock Street in a landscaped area next to the City-owned parking lot (Figure B2-4). In addition, Figure B2-4 shows the OF230 sediment trap sampling site.

B.2.2.2 Outfall 230A

The OF230A drainage basin is located on the mid-portion of the west side of the Foss Waterway. The basin boundaries are shown in Figure B2-3. The area is approximately 583 acres and discharges to the waterway through a 60-inch outfall pipe (Table B2-2). The general basin boundaries are South 8th Street to the north, South 19th Street to the south, South Ainsworth Avenue to the west, and Dock Street to the east. The OF230A drainage basin is heavily developed throughout with primarily commercial land use and some residential use on the west side of the basin (Figure B2-3). Most of the storm drainage is channeled to South 15th Street via a main trunk line along Market Street and then to the new Jefferson Street Interceptor. Storm lines along Dock Street are susceptible to saltwater intrusion from high tides.

OF230A baseflow (estimated as continuous at approximately 0.25 cubic feet per second (cfs) at 2.0 -inch depth) consists of groundwater from footing drains being pumped into several catch basins and potentially non-contact cooling water. Baseflow conditions will be re-evaluated during WY2025. Confirmed baseflow sources are shown in Figure B2-2.

The whole water sampling site is located in manhole (MH) #6783474 on “A” Street (Figure B2-5). Confined space entry is needed to maintain the sample line and flow sensor. The sediment monitoring trap (FD7) is installed in MH# 6783605 as reflected on Figure B2-5.

A rainfall to runoff relationship has not been developed for OF230A at this time. Due to this outfall receiving most of the flow from OF230 and the similarity in land use and basin size, the City is including the rainfall to runoff relationship developed for OF230 that was based on WY2015-2016 continuous flow data. This relationship is presented in Figure B2-6. The runoff has been normalized to basin size, such that both rainfall and runoff are presented in depth units, and the slope of the regression line is the runoff coefficient (0.3209). The rainfall to runoff relationship for OF230A will be updated once sufficient flow monitoring data is collected at the monitoring site. The rainfall-runoff correlation for the historic OF230 was:

OF230A Estimated Runoff (inches) = 0.3209 X Rainfall (inches)

The City anticipates that the rainfall to runoff relationship representing the new drainage area will be updated in the WY2025 Annual Report.

B.2.2.3 Outfall 235

The OF235 drainage basin was historically the fourth largest basin in the Foss Waterway Watershed, with 166 acres encompassing a section of downtown between the OF230 and OF237A drainage basins (Figure B2-3). In December 2020, a portion of OF235’s drainage area was rerouted to OF230A. This heavily developed basin is now 109 acres which still drains through the 42-inch outfall pipe located on the west bank of the Foss Waterway at South 21st and Dock Streets under the State Route (SR)-509 bridge. Commercial land use accounts for the majority of the area in this basin (Figure B2-3).

OF235 baseflows sources were and are located in the 109 acres drainage basin. Baseflow conditions will be re-evaluated during WY2025. Confirmed baseflow sources are shown in Figure B2-2.

The whole water sampling site is located at South 21st Street and Dock Street in a private parking lot along the Thea Foss Waterway. The equipment is sited in MH465 (MH# 6767530) (Figure B2-7). The sediment trap sampling device is located in the next upstream manhole, MH463 (MH# 6767511).

A rainfall to runoff relationship that represents the historic outfall drainage area conditions was developed as a part of the 2007-2012 NPDES Phase I Permit S8.D monitoring. This relationship is presented in Figure B2-8. Separate correlations were developed for wet season and dry season conditions. The runoff has been normalized to changes in basin size, such that both rainfall and runoff are presented in depth units, and the slope of the regression line is the runoff coefficient. The rainfall-runoff correlation for OF235, December 2020 to present is:

OF235 Wet Season Runoff (inches) = 0.548 X Rainfall (inches)
OF235 Dry Season Runoff (inches) = 0.479 X Rainfall (inches)

The City anticipates that the rainfall to runoff relationship representing the new drainage area, 109 acres, will be updated in the WY2025 Annual Report.

B.2.2.4 Outfall 237A

The OF237A drainage basin is approximately 2,823 acres and drains to the Foss Waterway through the west 96-inch outfall located in the 2300 block of East Dock Street at the head of the waterway. As shown in Figure B2-3, the drainage basin generally extends in the south and west directions from the outfall. The general boundaries are South 19th Street on the north, South 40th Street on the south, Lawrence Street on the west, and Tacoma Avenue on the east.

The OF237A drainage basin contains residential, commercial, and industrial land uses. In addition, freeway ROW for I-5, SR-16, the entire I-5/SR-16 interchange, and a portion of the I-5/I-705 interchange are located within this drainage basin. Baseflow in OF237A is continuous at approximately 4.4 cfs (Table B2-2)

The whole water and sediment trap sampling sites (Figure B2-9) are located in the City's Dock Street Pump Station Yard, in the 2300 block of East "C" Street. The equipment is sited within MH# 6777413, which is located in the northwest section of the asphalt-paved yard.

A rainfall to runoff relationship for OF237A was developed based on WY2015 and WY2016 continuous flow data. This relationship is presented in Figure B2-10. Separate correlations were developed for wet season and dry season conditions. The runoff has been normalized to basin size, such that both rainfall and runoff are presented in depth units, and the slope of the regression line is the runoff coefficient. The rainfall-runoff correlation for OF237A is:

OF237A Wet Season Runoff (inches) = 0.301 X Rainfall (inches) + 0.0083
OF237A Dry Season Runoff (inches) = 0.479 X Rainfall (inches) +0.0035

As described below for OF237B, there is a threshold of precipitation of a few hundredths of an inch, below which no runoff occurs. In WY2016, results indicated that this might also be the case for the large, mixed-use basin for OF237A, although it is difficult to discern at this time. Based on the similarities, the threshold was assumed to be the same as the other large basin OF237B. During the dry season, the dry ground has a greater capacity to assimilate incipient rainfall and the basin assimilates some amount of rain before runoff occurs increases (i.e., the threshold is higher during the dry season).

B.2.2.5 Outfall 237B

The OF237B drainage basin encompasses 1,991 acres of south and east Tacoma. This area drains to the Foss Waterway through a 96-inch outfall pipe located on East Dock Street at the head of the waterway. The general basin boundaries are East 23rd Street and East Dock Street to the north, East 84th Street to the south, South Fawcett Avenue to the west, and McKinley Avenue to the east. Most of the storm drainage is channeled to the main trunk line, which flows south to north along East "D" Street.

Primary land use in this drainage basin is residential with some commercial and a very small amount of industrial (Figure B2-3). Baseflow from OF237B is continuous at approximately 8.3 cfs (Table B2-2 and Figure B2-2). The whole water and sediment trap sampling sites are shown in Figure B2-9.

A rainfall to runoff relationship based on one year of continuous flow data was developed as a part of the 2007-2012 NPDES S8.D monitoring. This relationship is presented in Figure B2-11. Separate correlations were developed for wet season and dry season conditions. The runoff has been normalized to basin size, such that both rainfall and runoff are presented in depth units, and the slope of the regression line is the runoff coefficient. The rainfall-runoff correlation for OF237B is:

OF237B Wet Season Runoff (inches) = 0.4423 X Rainfall (inches) + 0.0145
OF237B Dry Season Runoff (inches) = 0.3025 X Rainfall (inches) + 0.0173

In the large basin for OF237B, there is a threshold of precipitation of a few hundredths of an inch, below which no runoff occurs. This is a large, primarily residential basin (see Figure B2-3) with more vegetated cover and soft shoulders on streets, and thus has more capacity to infiltrate compared to the other basins. The threshold is determined by the intercept of the regression line (see Figure B2-11) and indicates a capacity for the basin to assimilate some amount of rain before runoff occurs. As expected, the threshold is higher during the dry season (i.e., the dry ground has a greater capacity to assimilate incipient rainfall).

B.2.2.6 Outfall 243

The OF243 drainage basin is 59 acres and discharges to the east side of the waterway at East 21st Street through a 48-inch outfall (Figure B2-3 and Table B2-2). Land uses in the basin are primarily industrial, with some commercial at the west side of the basin and some highway with SR-509.

OF243 does not have any creeks or other sources that provide constant baseflow but does have tidal backflushing year-round, and during the wet season there is evidence of groundwater infiltration due to the high-water tables in the Tideflats area. The groundwater table is comprised of a bottom layer, which is influenced by tides, and an upper fresher water lens. In the wet season, the upper lens is freshened by rain recharge and salinity effects (e.g., conductivity) are less.

The stormwater sampling site (Figure B2-12) is located at East 21st Street and "D" Street in a private parking lot along the Foss Waterway. The equipment is sited in MH# 6761877. The manhole is located in the middle of the parking lot under the SR-509 bridge. Two sediment trap sampling devices (Figure B2-12) are located within the sump just downstream of the stormwater sample location.

A rainfall to runoff relationship based on WY2015 and WY2016 continuous flow data was developed based on rainfall-runoff correlations for OF243. This relationship is presented in Figure B2-13. Separate correlations were developed for wet season and dry season conditions. The runoff has been normalized to basin size, such that both rainfall and runoff are presented in depth units, and the slope of the regression line is the runoff coefficient. The rainfall-runoff correlation for OF243 is:

OF243 Wet Season Runoff (inches) = 0.3357 X Rainfall (inches)
OF243 Dry Season Runoff (inches) = 0.156 X Rainfall (inches)

B.2.2.7 Outfall 245

The OF245 drainage basin is located in the Tideflats of Tacoma on the southern portion of the east side of the waterway. Basin boundaries are shown on Figure B2-3. Land use in this basin is primarily industrial with the restaurant providing a small commercial area at the west side of the basin. Most facilities in the drainage basin are engaged in storage, transloading and warehousing of materials and products, and manufacturing.

Directly upstream of the outfall is a deep bottom sump manhole known as MH390, which is the stormwater and sediment sampling site, located in a private parking lot, East 19th Street, and "D" Street. The equipment is sited in MH390 (Figure B2-14 and B2-15). MH390 is 60 inches inside diameter and approximately 18 feet in depth with the inlet pipe and outlet pipe at 55.5 inches above the bottom (Table B2-2).

Similar to OF243, OF245 does not have any creeks or other sources that provide constant baseflow but does have tidal backflushing year-round, and during the wet season there is evidence of groundwater infiltration due to the high-water tables in the Tideflats area. The groundwater table is comprised of a bottom layer, which is influenced by tides, and an upper fresher water lens. In the wet season, the upper lens is freshened by rain recharge and salinity effects (e.g., conductivity) are less.

A rainfall to runoff relationship based on one year of continuous flow data was developed as a part of the 2007-2012 NPDES S8.D monitoring. This relationship is presented in Figure B2-16. Separate correlations were developed for wet season and dry season conditions. The runoff has been normalized to basin size, such that both rainfall and runoff are presented in depth units, and the slope of the regression line is the runoff coefficient. The rainfall-runoff correlation for OF245 is:

OF245 Wet Season Runoff (inches) = 0.990 X Rainfall (inches)
OF245 Dry Season Runoff (inches) = 0.777 X Rainfall (inches)

B.2.2.8 Outfall 254

The OF254 drainage basin is located on the Tideflats and is the fifth largest basin in the Foss Waterway Watershed (Figure B2-3). It is approximately 119 acres and drains through a 36-inch outfall pipe located at the head of Wheeler-Osgood Waterway on East “F” Street just north of East 15th Street (Table B2-2). The stormwater sampling site (Figure B2-17) is located near the southwest corner of the property at 625 East 15th Street next to the railroad tracks. The equipment is sited in MH# 6761601.

The majority of the OF254 drainage basin is zoned for industrial use, but small commercial areas are present near the shoreline. Similar to OF243 and OF245, OF254 does not have any creeks or other sources that provide constant baseflow but does have tidal backflushing year-round, and during the wet season there is evidence of groundwater infiltration due to the high-water tables in the Tideflats area.

A rainfall to runoff relationship based on WY2015 and WY2016 continuous flow data was used to develop rainfall-runoff correlations for OF254. This relationship is presented in Figure B2-18. Separate correlations were developed for wet season and dry season conditions. The runoff has been normalized to basin size, such that both rainfall and runoff are presented in depth units, and the slope of the regression line is the runoff coefficient:

OF254 Wet Season Runoff (inches) = 0.8442 X Rainfall (inches)
OF254 Dry Season Runoff (inches) = 0.2946 X Rainfall (inches)

B.2.2.9 Upstream Sediment Trap Monitoring

For source control tracing purposes, the City has installed sediment traps upstream of the outfalls in several of the drainage basins. These traps will be used to identify potential problem areas in sub-drainages. The locations of the sediment traps are provided in Table B2-3 and on Figure B2-19. The analytes that these sediment trap samples will be analyzed for are listed in Table B2-3.

B.2.3 SAMPLING PROCEDURES

City field staff performed all weather tracking, flow monitoring, and stormwater and sediment sampling activities. A summary of the sampling procedures used by field staff to ensure that representative samples were collected throughout the monitoring period is included below.

In order to address representativeness of storm flows, the City selected sampling locations, methods, and times so that the data describes stormwater runoff over the range of land use conditions in the drainage basins, the varying hydrologic conditions within an individual storm event (i.e., rising and falling portions of the hydrograph), various times throughout the year, and a representative cross-section of storm types.

B.2.3.1 Weather Tracking/Storm Criteria

Weather was continuously monitored using multiple forecasts and using radar and satellite imagery to ensure that targeted storms met the precipitation criteria outlined in the QAPP. For this project, the monitoring year is divided into a wet and a dry season, each with specific precipitation criteria. The wet season is defined from October 1st through April 30th during the monitoring year. The following criteria define a qualifying wet season event:

- ≥ 0.20 inches of rainfall
- rainfall duration: No fixed minimum or maximum[2]
- ≤0.05 inches of rainfall in the previous 24-hour antecedent dry period
- < 6-hour inter-event dry period

The dry season is defined from May 1st through September 30th during the monitoring year. The following criteria define a qualifying dry season event:

- ≥ 0.20 inches of rainfall
- rainfall duration: No fixed minimum or maximum
- ≤0.02 inches of rainfall in the previous 48-hour antecedent dry period
- < 6-hour inter-event dry period

B.2.3.2 Sampling Equipment

Center for Urban Waters (CUW) and Central Treatment Plant (CTP) rain gauges (Texas Electronics Model TR-525 tipping buckets) are used to represent rainfall in the Thea Foss Basin. Both rain gauges collect five-minute data. The CUW rain gauge is located 0.6 to 1.2 miles north of the Foss stormwater monitoring locations on the CUW building located at 326 East “D” Street. The CTP rain gauge is the backup rain gauge and is located one mile east of the Foss on the roof of the Operations building at the City of Tacoma’s CTP (2201 Portland Avenue).

Flow is recorded at five-minute intervals based on measured level and velocity data and site-specific data (i.e., round concrete pipe) using the continuity equation. Specific equipment for each monitoring location is listed below:

[2] The QAPP states that the storm event criteria minimum duration sampling period shall be greater than two times the time of concentration for each outfall.

Location	Number of Samplers	Flow Module	Additional Sensors
OF230A	1	ISCO 750	N/A
OF235	1	ISCO 750	N/A
OF237A	1	ISCO 750	N/A
OF237B	1	ISCO 750	N/A
OF243	1	ISCO 750	Conductivity Probe
OF245	1	ISCO 750	N/A
OF254	1	ISCO 750	Conductivity Probe

B.2.3.3 Stormwater Monitoring Protocols

Automatic flow-weighted composite samples using ISCO 6712 Samplers were collected at OF230A, OF235, OF237A, and OF237B for analytical chemistry. The samplers were programmed to activate once stormwater runoff was detected and to trigger the sampler to collect a sample (aliquot) every time a specified volume passed, based on the predicted storm conditions. These programming protocols are in Table B2-4. These protocols were evaluated and adjusted as necessary to meet the required sample volumes for the Foss and NPDES parameters.

At OF243, OF245, and OF254, sampling was completed using an ISCO 6712 sampler programmed for automatic time-weighted composite samples instead of the flow-weighted composite sample. The sampler was programmed to activate once stormwater runoff was detected and to trigger the sampler to collect an aliquot after a set amount of time (see Table B2-4).

Manual grab samples are collected for total petroleum hydrocarbons and bacteria.

B.2.3.4 Storm Event Sampling Criteria

The sampling frequency as outlined in the QAPP[3] is minimum of 55 composite samples per year. The number of samples targeted per outfall is outlined in Table B2-5. Representative storm event criteria and sampling frequency are defined in Table B2-6. Qualifying storm events must be distributed throughout the year. The goal is to collect 60 to 80 percent of samples during the wet season and 20 to 40 percent of samples during the dry season, representing normal regional rainfall distributions. In addition to the 55 samples per year, all attempts will be made to sample the seasonal first flush event (first significant event that occurs after the summer dry period).

The sample collection criteria defined in the QAPP (outlined below and in Table B2-6) ensure that the composite sample collected is representative of the storm event sampled. For storm events lasting less than 24 hours, samples shall be collected for at least 75 percent of the storm event hydrograph. For storm events lasting longer than 24 hours, samples shall be collected for at least 75 percent of the hydrograph of the first 24 hours of the storm.

[3] Effective October 1, 2012, EPA and Ecology approved a reduction in the number of samples collected per year. The 2001 SAP goal of ten stormwater samples per year for all seven outfalls, was reduced to eight samples per year for OF230, OF235, OF237A, and OF237B, and three samples per year for OF243, OF245, and OF254. To meet the NPDES Permit requirement of 55 samples per year, the approved QAPP requires eight minimum to 11 maximum samples for OF230, OF235, OF237A, OF237B, and OF245, and zero to 11 samples per year for OF243 and OF254.

Storm Event Duration	<24 hours	>24 hours
Minimum storm volume to sample	75% of the storm event hydrograph[c]	75% of the hydrograph of the first 24 hours of the storm[c]
Number of aliquots	≥10: 7-to-9 accepted[b]	≥10: 7-to-9 accepted[b]
Minimum duration to program ISCO for sampling (hours)[a]	2 x time of concentration	2 x time of concentration

a - "Time of Sampling" in Appendix 9 of the Permit requires the sampler to be programmed to continue sampling past the longest estimated time of concentration.
b - Composite samples with seven to nine aliquots are acceptable if they meet the other sampling criteria and help achieve a representative balance of wet season/dry season events and storm sizes.
c - Applies to non-tidally influenced outfalls (OF237B) only. Tidally influenced drains shall be sampled to include only the portion of runoff that is not affected by tides.

The goal is for each composite sample to consist of at least 10 aliquots. Composite samples with seven to nine aliquots are acceptable if they meet the other sampling criteria and help achieve a representative balance of wet season/dry season events and storm sizes.

The sampling of tidally influenced drains (all outfalls except OF237B) is further limited to those periods when the drains are not affected by tides; therefore, they may include only a portion of the runoff hydrograph. Over the course of the monitoring year(s), it is expected that the tidal sampling window will randomly overlap with different portions of the runoff hydrograph, and that a representative range of rising, peak, and falling runoff conditions will be captured during multiple sampling events, if not during a single event.

The parameters analyzed for each stormwater sampling event are listed in Table B2-7[4]. Priority order for analyses for stormwater composite samples is listed in Table B2-8. The Foss Monitoring Program requires the statistical evaluation of parameters over the Foss 23-year monitoring period; results are discussed in Sections 3 and 5 of the WY2024 Report (Tacoma 2025).

B.2.3.5 Sediment Monitoring Protocols

Annual sediment quality is determined through the collection of sediment accumulated at each monitoring location for a period of 12 months[5]. During this monitoring period, collection devices are deployed prior to the seasonal “first flush” on August 27th, based on Tacoma’s historical 52-year rainfall record.

In OF230, OF230A, OF235, OF237A, OF237B, and OF243, sediment samples are collected using sediment traps. In these locations, two sediment traps are placed near the flow monitoring location and mounted onto the wall of the pipe using stainless steel screws. A typical installation is shown in Figure B2-21.

WY2024 SSPM sampling was performed in general accordance with the QAPP prepared by Dale Norton of Ecology, 1997. Gloves are worn at all times when collecting samples. The sample bottles were capped in place with a clean Teflon lid, removed from the bracket, stored in a cooler on ice, and transported directly to the analytical laboratory. Clean Teflon bottles were immediately deployed for the next monitoring period. Throughout the monitoring period, traps were inspected

[4] If any chemicals are non-detected for two years, that chemical may be removed from the list of analytes in the QAPP.

[5] Ecology approved the City’s request to continue annual sediment monitoring as part of the 2020 QAPP and all subsequent revisions.

regularly and after significant events to evaluate their condition (e.g., damage and sediment volume).

In OF245, sediment is captured in the MH390, which functions similar to a sediment trap or catch basin (Figure B2-14). A representative stormwater sediment sample is collected from the sump using procedures developed during the Foss Monitoring Program and outlined in the QAPP.

Priority order for analyses for SSPM samples is listed in Table B2-8. The parameters analyzed under the Foss Monitoring Program for SSPM samples are listed in Table B2-9. The Foss Monitoring Program requires the statistical evaluation of parameters over the entire Foss monitoring record; results are discussed in Sections 3 and 5 of the WY2024 Report (Tacoma 2025).

B.3 RAINFALL AND FLOW VALIDATION

This section evaluates the representativeness of the field sampling conducted for this project during WY2024. The QA/QC evaluation for rainfall and flow data are summarized in Section 3.1 of the WY2024 Report and discussed in detail herein.

B.3.1 RAINFALL DATA VALIDATION

The following is a summary of rainfall and weather conditions during the current monitoring year (WY2024). Routine rain gauge maintenance visits were performed on a monthly basis or as needed for data review. Each maintenance visit included visual inspection and cleaning of the rain gauge as necessary.

For WY2024, the daily and monthly rainfall and the average daily rainfall for each month are shown in Table B3-1 and Figure B3-1 and Figure B3-2. The monthly rainfall and the rainfall summary for the entire monitoring record are shown in Table B3-1.

B.3.1.1 Year 23: Water Year 2024 (October 2023–September 2024)

The total rainfall for WY2024 was 32.79 inches, presenting a significant deviation from recent historic averages of 38.95 inches. October had 2.93 inches which fell within normal range only slightly lower than average by 0.46 inches. November's rainfall of 4.74 inches was below normal range by 1.36 inches. December and January recorded elevated levels with December’s 7.91 inches surpassing the monthly average by 2.02 inches, and January’s 6.60 inches surpassing the monthly average by 1.22 inches. February and March exhibited a significant variance from normal rainfall conditions. February experienced precipitation below normal by approximately 2.03 inches. March’s 1.61 inches continued in a similar pattern recording 2.57 inches below the average. April’s 1.76 inches was 1.11 inches below the historic mean. Conditions returned to normal in May (1.24 inches) and June (1.27 inches); and continued through the end of the water year with July (0.04 inches), August (1.14 inches), and September (1.14 inches) observing near normal rainfall conditions (see Table B3-1).

The wet season for WY2024 exhibited drier than normal conditions, recording a total rainfall of 27.96 inches, 4.29 inches below the historical average. Four months (November, February, March, and April) showed significantly lower rainfall compared to historical averages (see Table B3-1).

The dry season in WY2024 was slightly drier than usual, with 1.87 inches less than normal rainfall totals. There was slightly below-average precipitation seen May, June, July, and September; while August was slightly wetter than average by 0.31 inches (see Table B3-1).

Total rainfall for WY2024 was 32.79 inches, 7.19 inches below recent averages and 6.16 inches less than the average over the 23-year monitoring record. The rainfall during WY2024 is now the 5th driest year since monitoring began in 2002 (see Table B3-1).

The overall rainfall pattern during WY2024 consistently leaned towards drier than typical rainfall patterns. February and March were significantly drier than seen in during the entire monitoring record. November and April also recorded drier conditions than typical patterns; while December and January skewed wetter than average, January significantly so. The remaining months fell within normal rainfall patterns when compared to the monthly average of the 23-year monitoring period (see Table B3-2).

B.3.1.2 Water Year Seasons: Monitoring Period to Historic Rainfall Comparison (October 2002 to September 2024)

As shown in Figure B3-1, average monthly rainfall for December, January, and August are above normal while October, November, February, March, April, May, June, July, and September are below normal for WY2024 relative to the historical monthly means. The average annual rainfall for the 23-year monitoring period is 39.98 inches, which is near normal conditions based on the historical average annual rainfall of 38.95 inches. As shown in Figure B3-3, average monthly rainfall for October, November, December, January, March, and April are above normal while February, July, and August are below normal for the 23-year period relative to the historical monthly means. The average rainfall amounts for dry season precipitation for the 23-year period are near normal; while the wet season at 33.74 inches is wetter compared to a historical of 32.25 inches and the dry season at 6.23 inches is drier compared to a historical of 6.70 inches (see Table B3-1). The rainfall events sampled during the entire 2002-2024 (23-year) monitoring program are similar to the historical distribution of rainfall in the City, however the number of sampled events greater than 0.9 inches (16 percent) is greater than the historical average of 9.1 percent (Figure B4-2 and Table C-16).

B.3.2 FLOW DATA VALIDATION PROTOCOLS

The continuous flow data from each monitoring location is verified (i.e., does the flow volume look appropriate based on the rainfall total). If necessary, the flow data is edited to account for drift, lost signals, or other anomalies. Routine flow monitoring maintenance visits were performed during the sampling event setup and periodically throughout the year when data review indicated potential equipment issues. Each maintenance visit included visual inspection and cleaning of the sensors, calibration checks and level calibration if necessary. Velocity data, as recorded by the ISCO 750 or 2150 Area Velocity Sensors, can be validated in the field using a portable flow meter (Marsh McBirney).

Data drifts or anomalies are accounted for and corrected using Flowlink Pro 5.1® and proprietary data management software. The City is continuing to develop a rain and flow data management system using solar power, telemetry, and WISKI[6].

B.3.2.1 Water Year 2024 Flow Data

In order to reduce staff time associated with sampler programming and to improve sampling efficiency, the City conducted a pilot telemetry setup over the last few years using Campbell Scientific telemetry equipment at the OF237B and OF237A NEW monitoring locations. This Campbell Scientific equipment controls the ISCO 6712 sampler and data can be collected via cellular modem as needed. Due to programming, equipment, and coding issues at these locations the City has moved away from using telemetry at these locations. While the 2150 & Campbell Scientific configuration offered some advantages outlined above; in practice this configuration was overly complicated for its intended use. Converting all sites to ISCO 750 has simplified the sampling set-up and post-processing of data at these locations.

All rain and flow data are managed in Flowlink and WISKI. Data dropouts or drifts were corrected using linear interpolation to create an edited dataset used for final flow calculations. Any corrupted flow data is edited or completely removed as warranted using WISKI or Flowlink.

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[6] WISKI – Water Management Information System, KISTERS Pioneering Technologies. This software is used for data validation and correction. The City is continuing to develop programs to generate rainfall to runoff curves and to generate annual pollutant loadings for each monitoring location.

All sampling events have flow data to accompany the chemistry data. The flow volume data for each event is based on the edited dataset (see Appendix C Tables C-1 to C-7 for stormwater and Tables C-8 to C-14 for baseflow). Flow data results for each sampling event are discussed in Section B.4 for stormwater events and in Section B.6 for baseflow events.

B.4 STORMWATER SAMPLING EVENTS

This section presents information about the stormwater sampling events (composite samples and grab samples) and sediment samples collected during WY2024.

B.4.1 STORMWATER COMPOSITE SAMPLING EVENTS

City staff targeted forecasted qualifying storm events during WY2024 (Monitoring Year 23 of the Foss Monitoring Program). The goal is to collect storm events distributed throughout the year with 60 to 80 percent of samples in the wet season and 20 to 40 percent of samples in the dry season.

In WY2024, 30 precipitation events met the NPDES storm event goals. The evaluation of the qualifying events for WY2024 is presented in Table B4-1. Of the 30 potential events, 25 events were forecasted that met the required NPDES storm event goals, 20 occurred during the wet season, and five during the dry season.

The dates of each storm event sampled in WY2024 are shown in Table B4-2. Summary tables for each storm event, and the field and hydrologic data for each sample taken at each outfall are presented in the WY2024 Report, Appendix C, Tables C-1 through C-7. The following hydrologic parameters are tabulated for each sampled storm event:

- Rain depth (inches)
- Rainfall duration (hours)
- Antecedent dry period (hours)
- Event-average and peak flow (cfs)
- Total runoff volume (cubic feet)

Complete field and laboratory data packets for these events are presented in Attachments B.1 and B.3 of this appendix. The stormwater analytical data for each event is listed in Appendix D and Tables D-1.1 through D-7.1. Seventy-one composite samples were submitted to the laboratory for analysis.

Twenty-eight storm samples had insufficient volumes to analyze for the full list of analytes in Table B2-7. All of the Foss Parameters except for TSS were analyzed in the stormwater samples collected. Total Suspended Solids (TSS) was missing in two samples due to insufficient volumes: OF237A on December 10, 2023, and OF237B on October 10, 2023. NPDES parameters, metals, polycyclic aromatic hydrocarbon (PAHs), phthalates, and pesticides were analyzed in every stormwater sample collected. The parameters that weren't analyzed due to insufficient volumes are highlighted on Tables D-1.1 through D-7.1.

The field and hydrological data for each event sampled were reviewed to evaluate the representativeness of individual storm events, storm types, and criteria goals. Sections B.4.3 and B.4.4 describe the sampling protocols and evaluate the field and hydrologic data and storm event criteria. In addition, these sections provide a discussion about whether these events are believed to be representative of stormwater discharges.

B.4.2 STORMWATER GRAB SAMPLING EVENTS

The goal is to collect grab samples from OF230A, OF235, OF237A, OF237B, and OF245 during targeted, qualifying storm events. As discussed in the QAPP, grab samples may not be collected during every qualifying storm event due to logistical and safety issues. These issues include the beginning of the storm event occurring during the night or during a high tidal period when the site is tidally influenced. In these situations, if a sample is not collected during a qualifying storm event then every attempt is made to collect a grab sample from the next qualifying event. The goal is to collect a minimum of eight manual grab samples from each monitoring location.

During WY2024, the City successfully collected six manual grab samples from the targeted monitoring locations with the exception of OF254. Five manual grab samples were collected from OF254 monitoring location. The specific dates of each event and location successfully sampled are listed in Table B4-3. The antecedent period for the December 4, 2023, event was less than 24 hours. The antecedent period for this event was 22.25 hours. The flow had returned to baseline conditions and the samples are considered representative of the storm event. Complete field (including summary graphs) and laboratory data packets for these events are presented in Attachments B.1 and B.3 of this appendix.

During WY2024, the goal to collect a total of 55 grab samples during storm conditions wasn't met, with only 41 grab samples collected (Table B4-3). The City did not meet the wet/dry season goals at all outfalls with 83 percent of the grab samples collected during the wet season at all sampling locations except for OF254. 100 percent of the grab samples collected at OF254 were collected during the wet season.

City staff sampled whenever conditions presented themselves[7], with a goal of collecting 60-80 percent of the stormwater samples in the wet season and 20-40 percent in the dry season. Of the 104 rain events that occurred in WY2024, only 30 events met QAPP criteria, and 25 of those events were forecasted (see Table B4-1). Grab samples were collected at each location when possible, during WY2024.

Sampling opportunities were limited in the months where no grab samples were collected. The following provides details on the grab sampling attempts during the WY2024 monitoring period:

- October: Grab samples were collected for the October 16, 2023, event. The October 24, 2023, event was missed as it occurred at night. There were no other acceptable storm events for the month of October.
- November: No grab samples were collected during the month of November. There were multiple acceptable events during this month, however, the majority of these events began at night and were not sampled. The event on November 6, 2023, was a missed sampling opportunity. This event began unexpectedly early on a Monday morning.
- December: One grab sample was collected on December 4, 2023. The December 18, 2023, event was missed as it occurred at night. There were no other acceptable storm events for the month of December.
- January: A grab samples was collected on January 8, 2024. There were three other acceptable storm events during this month. The event on January 5, 2024, began at night and was not sampled. The event on January 21, 2024, was a missed sampling opportunity. The event on January 21, 2024, began during weekend hours and was not sampled. The event on January 17, 2024, was not targeted due to snow on the ground and did not qualify.

[7] According to the QAPP, staff availability for grab sampling may not be feasible due to timing of storm events, such as the middle of the night, on weekends, or during holidays.

- February: One grab sample was collected on February 28, 2024. There was one additional acceptable storm event during this month, but a sample was not collected as the event occurred at night.
- March: No grab samples were collected during March. There was one acceptable event that met criteria. A sample was not collected as the event occurred at night.
- April: There was one acceptable event which was sampled on April 25, 2024.
- May: There were two qualifying events forecasted in May. A sample was collected during the May 21, 2024, event. The May 4, 2024, event was not collected due to a sampling break due to a successful sampling event on April 25, 2024.
- June: There was only one qualifying event forecasted during June. The event was missed as it began in the early morning hours. The other qualifying event began at night and was not sampled.
- July: There were no qualifying predicted events during July and no grab samples were collected.
- August: There were no grab samples collected during August. There was one qualifying event during August that was forecasted, but the event began at night and was not sampled.
- September: There were no grab samples collected during September. There was one qualifying event on September 10, 2024, but the event began at night and was not sampled.

The outlined QAPP goal of 55 grab samples wasn't met with a total of 41 grab samples successfully collected in WY2024. The wet/dry season goals were met during WY2024. The City believes that the overall sampling program was successful in sampling the precipitation events that met storm criteria and every attempt was made to sample and meet the requirements. The City will continue collecting grab samples when practicable in WY2025 in order to meet the goal of 55 grab samples.

B.4.3 SAMPLING CRITERIA AND FREQUENCY

The sampling frequency as outlined in the QAPP[8] is 55 samples per year with a minimum of eight samples at five of the seven outfalls (230A, OF235, OF237A, OF237B, and OF245). During the WY2024 monitoring period, City staff sampled whenever conditions presented themselves, with a goal of collecting 60-80 percent of the stormwater samples in the wet season and 20-40 percent in the dry season. Attempts were made to evenly distribute the samples throughout the year, but samples were collected in subsequent storms with the goal of obtaining the total number of required samples per year. The storms that were sampled during WY2024 were collected to the extent practicable throughout the year. The storms that were sampled are generally representative of fall, winter, spring, and late summer storms (see Figure B3-1). There were no qualifying events and no samples collected during the month of July.

Rainfall in WY2024 during the wet season was approximately four inches below the average wet rainfall conditions based on recent history, while during the dry season was almost two inches less

[8] Effective October 1, 2012, EPA and Ecology approved a reduction in the number of samples collected per year. The 2001 SAP goal of ten stormwater samples per year for all seven outfalls was reduced to eight samples per year for OF230, OF235, OF237A, and OF237B, and to three samples per year for OF243, OF245, and OF254. To meet the NPDES Permit requirement of 55 samples per year, the approved QAPP requires eight minimum to eleven maximum samples for OF230, OF235, OF237A, OF237B, and OF245, and three to eleven samples per year for OF243 and OF254.

(Table B3-1). There were no events in July that were forecasted, or which met storm event criteria (Table B4-1). This resulted in no samples being collected during July.

At the tidally influenced outfalls (OF235, OF237A, OF243, OF245, and OF254), the composite sample must contain a minimum of ten aliquots collected over the tidal window for each event, with no tidally influenced samples composited. Sampler pacing is set to attempt to collect storm samples throughout the entire tidal window to capture as much of the event as possible. Tidal charts are reviewed and conductivity for each container is measured in the laboratory to minimize tidal water contamination. The goal is to composite containers with a conductivity of ≤ 2,000 µmhos/cm (conductivity ≤ 5,000 µmhos/cm for OF243 and OF254). The composite samples must be collected for a total duration of at least two times the time of concentration for that outfall.

Each event sampled was evaluated in meeting these goals, but circumstances did arise at times where some of the criteria could not be met. The justification for accepting composite samples that deviated from these criteria is provided in the field reports (Attachment B.1) and in Section B.4.4 below.

B.4.4 REPRESENTATIVENESS OF WY2024 STORMWATER EVENTS

City staff targeted a total of 25 storm events (see Tables B4-2 and B4-4) for a total of 146 individual deployments. Of the 25 storm events where deployments occurred at one or more outfall, the following occurred for the five of seven outfalls (OF230A, OF235, OF237A, OF237B, and OF245) that require a minimum of eight samples per year:

- Five events did not produce sufficient runoff for collection at any sites due to inadequate rainfall.
- Up to ten events at the following locations were unsuccessful due to deployment, equipment, forecasting, and processing issues: nine at OF230A, ten at OF237A, three at OF235, four at OF237B, and four at OF245.
- There were nine unpredicted storm events during WY2024 (see Table B4-2).
- The storm events successfully collected during WY2024 are nine at OF230A, fifteen at OF235, fourteen at OF245; eight at OF237A; and fourteen at OF237B.
    - Wet season – Twelve storm events were successfully sampled at one or more of the monitoring locations.
    - Dry season – Four storm events were successfully sampled at one or more monitoring locations.

All of the rainfall events were successfully tracked by the City (see Table B4-2).

Of the 25 events, up to 17 events were deployed for the remaining two outfalls, OF243 and OF254, during WY2024. The following occurred at OF243 and OF254, which require a minimum of three samples per year:

- Five events at OF243 and five events at OF254 were unsuccessful events due to deployment, equipment, and forecasting issues. There were two unsuccessful deployments due to tidal influence at OF243. Additionally, there were two missed sampling opportunities at OF243 in August and September 2024 due to vandalism at the site. The equipment job box locking mechanism was destroyed and the equipment stolen.

- The storm events successfully collected during WY2024 are seven for both OF243 and OF254:
  - Wet season – Six storm events at OF243 and OF254 were successfully sampled.
  - Dry season – One storm event was successfully sampled at OF243 and OF254.

The outlined QAPP goal of 55 samples was met in WY2024 with 74 composite samples accepted. The minimum number of samples were met at all of the outfalls during WY2024. A minimum of two qualifying events were sampled at OF230A, OF235, OF237B, and OF245 during the dry season. There was one successful dry season sample at OF237A, OF243, and OF254. The remainder of the samples were collected in the wet season. The following sections describe the composite events that met all QAPP criteria as well as those that did not meet all criteria.

B.4.4.1 Events Meeting all QAPP Criteria

Twenty of the 25 targeted events met storm criteria. City staff successfully sampled 75 of the 112 sampling opportunities meeting storm event goals, a success rate of 65 percent. The sampling success rate ranged from 44 percent to 88 percent for individual sampling locations. The dates and distribution of the sampled events are shown in Table B4-2 and Figure B3-1.

B.4.4.2 Events Not Meeting all NPDES Criteria

Events Not Meeting Antecedent Goals The antecedent dry period during the wet season is 0.05 inches in the previous 24 hours and during the dry season (May to October) is 0.02 inches of rainfall in the previous 48 hours. All but two sampled events met the NPDES antecedent goals set forth in the 2023 QAPP.

The antecedent period for the October 10, 2023, event (0.20 inches) was 16.3 hours (see Table B4-6). While there was 0.07 inches of rainfall in the previous 24 hours prior to the sampling event, all sampling locations had returned to baseflow conditions prior to the start of the event.

The antecedent period for the November 11, 2023, event (0.53 inches) was 9.1 hours (see Table B4-6). While there was 0.11 inches of rainfall in the previous 24 hours prior to the sampling event, most of this rainfall fell at a lower intensity and all sampling locations had returned to baseflow conditions prior to the start of the event.

The samples not meeting antecedent conditions were accepted since all sampling locations returned to baseflow conditions prior to the storm event.

Events Not Meeting Duration of Sampling Goal This criteria states that the sample should be representative of the duration of the event, and the duration of sampling may be the addition of two separate runoff peaks as long as the peaks are less than six hours apart, end to beginning. If the storm peaks are more than six hours apart, only the first peak was used for analysis. During WY2024, the following samples did not meet this criteria (see Tables B4-2 and B4-6):

> 12/9/2023 Event – The samplers at OF230A and OF254 were programmed for a 1.79 inches event (actual event was 0.97 inches). The samplers at these locations were paced for a larger event which caused the samplers to finish prior to the end of the event. Samplers at the OF230A and OF254 locations successfully sampled runoff for the rising limb portion of the event and the samples are considered representative of the partial event. The representative duration and rainfall for each outfall are shown in Table B4-6.

12/19/2023 Event – While the sample at OF237A for the December 19, 2023, event was originally accepted, further review of the flow calculation showed that this sample did not represent a significant portion of the total storm runoff (24 percent). Due to heavy tidal influence during the event, a large portion of the event was not sampled. The OF237A sample represented approximately 0.1 inches of rainfall and did not represent the most intense portion of the event. With such minimal runoff sampled this event was rejected and not accepted as a partial event.

Events Not Meeting Spacing Events This criterion sets a goal of a minimum of one week spacing between events to allow some build-up of pollutants during the dry weather intervals, and no more than two samples per month. During WY2024, all samples met this criterion (see Tables B4-2 and B4-4).

Events Not Meeting Composited Aliquots All composite samples included more than 10 aliquots. During WY2024, ten composite samples were collected which had a few aliquots that were considered not representative of that sampling event. If the percentage of the aliquots composited that are considered not representative of that sampling event is relatively low (typically 12 percent or less), the City believes that the analytical results are representative of the stormwater runoff that occurred during that event, and it was included in all calculations.

The following samples included aliquots not representative of the sampling event, but samples were not rejected (<12 percent of the total):

- OF230A 9/11/2024. One of 18 aliquots (6 percent) composited was not representative of the sampling event but was included in the sample composite submitted to the lab.
- OF235 12/18/2023. One of 33 aliquots (3 percent) composited was not representative of the sampling event but was included in the sample composite submitted to the lab.
- OF235 1/5/2024. One of 28 aliquots (4 percent) composited was not representative of the sampling event but was included in the sample composite submitted to the lab.
- OF235 1/20/2024. Three of 40 aliquots (8 percent) composited was not representative of the sampling event but was included in the sample composite submitted to the lab.
- OF237A 11/11/2023. Two of 22 aliquots (9 percent) composited was not representative of the sampling event but was included in the sample composite submitted to the lab.
- OF237A 12/9/2023. One of 15 aliquots (7 percent) composited was not representative of the sampling event but was included in the sample composite submitted to the lab.
- OF237A 1/5/2024. One of 16 aliquots (6 percent) composited was not representative of the sampling event but was included in the sample composite submitted to the lab.
- OF237A 1/20/2024. One of 41 aliquots (2 percent) composited was not representative of the sampling event but was included in the sample composite submitted to the lab.
- OF237B 10/16/2023. One of 28 aliquots (4 percent) composited were not representative of the sampling event but were included in the sample composite submitted to the lab.
- OF237B 11/11/2023. One of 39 aliquots (3 percent) composited was not representative of the sampling event but was included in the sample composite submitted to the lab.
- OF245 11/11/2023. Two of 26 aliquots (8 percent) composited was not representative of the sampling event but was included in the sample composite submitted to the lab.

During WY2024, two composite samples had aliquots that were considered representative of that sampling event and weren't added to the composite of that sampling event. If the percentage of the missing aliquots that are considered not representative of that sampling event is relatively low (less than 12 percent), the City believes that the analytical results are representative of the stormwater runoff that occurred during that event, and it was included in all calculations. The following samples were believed to be representative of that sampling event:

- OF237B 1/5/2024. One of 21 aliquots (5 percent) was not included in the composite. The last aliquot in Jar 1 was part of the event. The other three aliquots were collected before the start of the event. Jar 1 wasn't included since three of four weren't representative of the event.
- OF245 11/1/2023. Three of 47 aliquots (6 percent) were excluded but was representative of the storm event. Jar 12 should have been included in the composite sample.

Events Not Meeting Conductivity Goal To confirm tidal exclusion from the composited samples, aliquots composited from OF243 and OF254 are to be less than 5,000 µmhos/cm and the remainder of the outfalls is to be less than 2,000 µmhos/cm. During WY2024, several samples at OF243, OF245, and OF254 did not meet this criterion. The remaining monitoring locations met the event conductivity goals (Tables D1-D7). The following is a general discussion regarding the samples that did not meet this criterion:

- Conductivity measurements of the aliquots composited for OF243 were greater than 5,000 µmhos/cm for four of the seven composite samples. The composite samples conductivities above 5,000 µmhos/cm ranged from 5,410 to 14,150 µmhos/cm (see WY2024 Report, Appendix C, Table C-5, and Appendix D, Table D-5.1). Although the samples collected were above the 5,000 µS/cm goal, all of the samples were believed to be representative of runoff conditions[9].
- Conductivity measurements of the aliquots composited for OF254 were greater than 5,000 umhos/cm for all seven composite samples. The composite samples conductivities above 5,000 µmhos/cm ranged from 6,350 to 18,130 µmhos/cm (see WY2024 Report, Appendix C, Table C-7 and Appendix D, Table D-7.1). Although the samples collected were above the 5,000 µmhos /cm goal, the samples were believed to be representative of runoff conditions.
- Conductivity measurements of the aliquots composited for OF245 were greater than 2,000 µmhos/cm for six of the fourteen samples. The composite samples conductivities above 2,000 µmhos/cm ranged from 2,197 to 16,700 µmhos/cm (see WY2024 Report, Appendix C, Table C-6 and Appendix D, Table D-6.1). Although the samples collected were above the 2,000 µmhos/cm goal, the samples were believed to be representative of runoff conditions.

B.4.4.3 Representativeness of Individual Storm Events

Stormwater samples were flow-weighted (OF230A, OF235, OF237A, and OF237B) or time (OF243, OF245, and OF254) composite samples representing the range of discharge conditions during the sampling event, including, where possible, the rising and falling portions of the runoff hydrograph.

Over the course of the last 23 years, the tidal sampling windows randomly overlapped with different portions of the runoff hydrograph. Table B4-5 identifies the number of storms sampled in each basin

[9] Since the conductivity for non-storm conditions prior to the events were very high, these samples are believed to be representative of storm runoff conditions.

over the 23-year monitoring period of the Foss Monitoring Program that fall in each portion of the runoff hydrograph. All of the monitoring locations had 87-100 percent of the events sampled represent the majority of runoff conditions in WY2024. For the remainder of the events sampled over the course of the monitoring period, a range of rising, peak, and falling runoff conditions were captured during multiple sampling events. A variety of runoff conditions were sampled in the tidally influenced drains for these individual storm events in an attempt to address the QAPP, which recognizes the fact that storm events are variable by nature.

B.4.4.4 Representativeness of Storm Types

Storm events are highly variable in nature by runoff volume, flow rate, antecedent rainfall, and season. This variability was evaluated by comparing the magnitude and intensity of the runoff hydrographs, where samples were collected on the hydrographs, the time between storm events, and the time of year the samples were collected to determine whether a representative range of storm types was included in the monitoring program. A summary of each of these evaluations is included in the following paragraphs.

B.4.4.4.1 Total Rainfall

A variety of storm types were successfully sampled during WY2024. Figure B4-1.1 shows the variability in the total rainfall sampled for the entire monitoring program. The storm intensity and antecedent dry periods were similar for each monitoring year, however the rainfall depths sampled is generally higher starting in October 2009 to present than in the September 2001 through September 2009 period (see Figure B4-1.2). There are nine events greater than 0.9 inch in September 2001 through September 2009 and 61 events greater than 0.9 inch from October 2009 through September 2024. Seven of the highest rainfall depths (1.90 – 4.57 inches) were sampled in WY2017, WY2021, and WY2022. There were five events during WY2021, four events during WY2022, and six events in WY2024 greater than 0.9 inches (see Figure B4-1.2). The highest rainfall sampled during the monitoring record occurred during WY2022 (4.57 inches).

As shown in Figure B4-2, the majority of the storms accepted in WY2024 were greater than 0.9 inches (33.3 percent) and 0.15-0.29 inch (27.8 percent). The distribution of WY2024 storm depths sampled varied somewhat from what is typically seen in both the historical average and the monitoring record. The following are the variations seen during the WY2024 monitoring period:

- 0.3-0.39 inch. Historically these storms represent approximately 21 percent of the storms sampled and during WY2024 these storm events represented approximately eleven percent of the total.
- 0.4-0.49 inch and 0.5-0.59 inch. Historically these storms represent approximately 24 percent of storms sampled. During WY2024 there were no storm events represented the 0.4-0.49 inch storm event and eleven percent of the events represented events ranging from 0.5 to 0.59 inch.
- 0.7-0.79 and 0.8-0.89 inch. Historically these storms represented a lower percentage of storms sampled (approximately eight percent). During WY2024, while no storm events represented events ranging from 0.7-0.79 inch, 11 percent of the events represented events ranging from 0.8-0.89 inch.
- >0.9 inch. Sampled storms during WY2024 were much larger than the historical record of nine percent for these large events with 33 percent of the storms falling in this bracket. The historical monitoring record shows a higher number of these events with 16 percent total.

The total rainfall of the sampled storm events in WY2024 varied from 0.20 inch to 1.31 inches (Table B4-6). 61 percent of the storms sampled in WY2024 were greater than 0.5 inch in depth.

In WY2024, there were 104 storm events. Table B4-1 lists the total number of the 104 storm events, and further provides analysis to determine those events that met the QAPP criteria for qualifying sampling events. Sixty-eight storm events for WY2024 met antecedent conditions, and of these, 30 events had greater than 0.2 inch of rainfall[10]. Only 25 of these 30 events were forecasted. The City sampled two events that did not meet antecedent conditions as described in Section B.4.4.2. Of those sampled events, seven were greater than 0.9 inch (33 percent). The storms sampled in WY2024 were representative of the rainfall events and sampling opportunities for the water year (≥0.2 inch, met antecedent or returned to baseflow conditions and forecasted).

The annual and overall monitoring program's rainfall distribution for the events sampled is compared to the historic distribution of rainfall to determine whether the distribution sampled is representative of the historic distribution. The rainfall events sampled during the entire 2002-2024 monitoring program are similar to the historical distribution of rainfall in the City; however, the number of smaller events (less than 0.4 inch) is eight percent less than historic conditions and the number of events greater than 0.9 inch (16 percent) is greater than the historical average of 9 percent (Figure B4-2).

B.4.4.4.1 Storm Duration and Intensity

WY2024 durations ranged from 2.8 to 44 hour storms (see Table B4-6). WY2024 antecedent periods are:

- Two less than 24 hours
- Five between 24 and 49.9 hours
- Six between 50 and 99.9 hours
- Five at 100 hours and greater

Average rainfall intensities (total rainfall/duration) also showed a variety of storm types in WY2024. The average rainfall intensities for WY2024 were 0.01 inch per hour to 0.10 inch per hour (see Table B4-6). The distribution of average rainfall intensities for each year is shown below.

Figure B4-1.1 shows the variability in the rainfall duration and antecedent for each event sampled in WY2024 and for the entire monitoring program. With the growing monitoring record, it can be seen that a representative cross-section of storm types is being sampled (Figure B4-1.2).

	Average Rainfall Intensities						
Number of events	≤ 0.02"/hr	0.03"/hr	0.04"/hr	0.05"/hr	0.06"/hr	0.07"/hr	≥0.08"/hr
Year 1	6	3	2	2	0	1	1
Year 2	4	3	2	3	1	1	0
Year 3	5	5	2	2	0	0	3
Year 4	5	3	0	0	2	2	2
Year 5	2	1	1	1	2	1	2
Year 6	5	3	4	2	1	1	1
Year 7	6	3	3	3	1	0	1
Year 8	5	5	2	0	2	1	0
Year 9	9	8	7	4	2	1	2
Year 10	9	4	2	0	0	1	2
Year 11	9	5	3	2	2	1	3
Year 12	2	5	1	1	2	1	2
Year 13	4	5	3	0	2	1	1
Year 14	4	4	4	3	1	2	2
Year 15	5	3	6	2	2	1	0
Year 16	2	4	6	0	2	1	0
Year 17	5	4	2	5	2	0	0
Year 18	1	6	3	3	2	1	2
Year 19	2	8	3	7	1	0	3
Year 20	6	5	2	2	2	1	5
Year 21	2	2	5	3	0	2	3
Year 22	5	3	3	1	2	0	3
Year 23	3	2	5	2	3	0	3
Totals	109	93	70	50	34	21	41

B.4.4.4.2 Seasonal Distribution

In WY2024, the number of precipitation events accepted per season is as follows (see Figure B4-3):

- Fourteen during the wet season (October through April) – 78 percent of the total
- Four during the dry season (May through September) – 22 percent of the total

The seasonal distribution for WY2024 is similar to the Monitoring record average of 77 percent in the wet season and 23 percent in the dry season. The historical average is 84 percent of the acceptable events in the wet season. The City believes the wet season percentage of accepted events is representative of the monitoring year, where the wet season rainfall was:

- Eighty-five percent of the annual precipitation (27.96 inches of the annual 32.79 inches of rainfall) (Table B3-1)
- Seventy-four percent of the number of storm events (77 wet season events of the 104 events) (Table B4-1)

Table B4-7 lists the number of wet and dry season storms sampled per water year and for the entire monitoring record for each monitoring location. For WY2024 and the entire monitoring record, the wet and dry season totals are:

# Storms Sampled per Season by Monitoring Location				
Monitoring Locations	**WY2024**		**Years 1-23**	
	Wet	**Dry**	**Wet**	**Dry**
Total	**14**	**4**	**307**	**90**
OF237A	88%	13%	77%	23%
OF237B	79%	21%	76%	24%
OF230A	78%	22%	77%	23%
OF235	73%	27%	77%	23%
OF243	86%	14%	78%	22%
OF245	79%	21%	79%	21%
OF254	86%	14%	78%	22%

Stormwater sampling under the overall monitoring program remains slightly biased toward the dry season, with 23 percent (WY2002-WY2024) of sampled storms occurring during the dry season and 77 percent during the wet season (Figure B4-3). This is likely due to the fact that antecedent periods are easier to meet in the dry season as compared to the wet season, which provides more opportunities for sampling.

The yearly and overall monitoring program's seasonal distributions for the events sampled are believed to be representative of the historic seasonal distribution.

Seasonal First Flush In comparison with the historical monthly averages, the dry season of WY2024 was slightly drier than average. The seasonal first flush events (i.e., first major events after summer dry periods) are shown in Figure B3-1 and were:

- July 2024: No qualifying events occurred in July. There was 0.1 inches of rainfall on July 29, 2024, after a month of no rainfall.

- August 2024: There were four rainfall events in August, but only three events were over 0.2 inches. The first qualifying event in August was on August 17, 2024, with 0.27 inches of rainfall. There were three other events between August 20 and August 23, 2024.

- September 2024: There were three events with significant rainfall in September. The first event was on September 10, 2024, with 0.38 inches of rainfall after almost 450 hours of no rain. There were two other events on September 14, 2024, and August 21, 2024, with 0.27 inches and 0.21 inches of rainfall, respectively.

Two first flush events following dry periods in the dry season met the QAPP criteria. The sampled events on August 17, 2024, and September 10, 2024, that met the QAPP criteria are considered representative of a seasonal first flush and both events occurred after the summer dry period.

- The August 17, 2024, event was 0.0.27 inches after 447 hours. Prior to this rainfall there was 0.15 inches of rainfall in the previous 1500 hours or 62 days. Unfortunately, while all sites except OF243 and OF254 were deployed, samples were only accepted from OF235 due to pacing errors. The predicted event was 0.43 inches which was higher than the actual rainfall of 0.27 inches. The sampling equipment at OF243 was vandalized and this site was inactive. The sampler at OF254 was not deployed due to equipment issues. The sample collected at OF235 is considered representative of seasonal first flush conditions.

- The September 10, 2024, event was 0.38 inches with a 351.42 hours antecedent dry period. Samples were accepted at all sampling locations with the exception of OF243 which was still inactive due to vandalism. These samples are considered to be representative of this first flush event.

As shown on Figure B3-1, no qualifying events occurred in July, or the first half of August. The City successfully collected a flush event sample from all sites except OF243 due to the equipment theft and vandalism at this site. All attempts were made by the City to collect samples during these first flush events.

B.4.4.4.3 Storm Flow Rates

The ranges of magnitude and intensity of the runoff hydrographs are shown in Table B4-8 for baseflow and Table B4-9 for stormwater. The individual runoff data for each event is listed in Appendix C, Tables C-1 through C-14, as volume of storm or baseflow runoff and flow rate for each outfall. The total runoff volumes sampled were variable for WY2024 (Year 23) at each outfall (Table B4-8 and B4-9). A variety of average flow rates were also sampled over the course of the year. The WY2024 runoff data was within the ranges of the entire monitoring record.

B.4.4.4.4 Overall Representativeness of Storm Types

During WY2024 monitoring, a wide variety of storm types were sampled. Each storm was defined by the following variables:

- Total rainfall
- Intensity
- Antecedent period
- Season
- Runoff hydrograph

For the most part, WY2024 values were similar to the values reported for Years 1 through 23 (Tables B4-6 and B4-9, and Table C-15). Based on an evaluation of the storm criteria, the City was able to incorporate a large amount of variability in our sampling results and the storm types sampled are considered to be representative.

B.4.4.5 Sampling Success

To evaluate sampling success, precipitation data for each year was reviewed to assess the following:

- The number of precipitation events per year
- The number of precipitation events that met antecedent criteria and were equal to or greater than 0.2 inches in 24 hours
- The number of these events that were sampled
- The number of these events that were not sampled and why they were not sampled

As shown in Table B4-1, WY2024 had 104 precipitation events, 25 of which were forecasted and met storm criteria of antecedent conditions and minimum rainfall requirements. Of these 25 events, 16 were successfully sampled at one or more outfalls. Two additional events were sampled that did not meet antecedent conditions but was considered representative of storm conditions.

Stormwater sampling is inherently difficult due to several factors: the variability in storm forecasting and subsequent sampler programming verses the actual rainfall total, mechanical failures, and human errors. Sampling in tidally influenced drains is also limited to those periods when the drains are not affected by tides. Despite these inherent difficulties in stormwater sampling, the City made every attempt to meet the goals of this program. Sampling crews reviewed weather forecasts seven days a week, so that weekend events would not be missed if the forecast changed after Friday. Almost all of the rainfall events were successfully tracked by the City, with three events missed for a sampling opportunity at OF230A in November.

The most significant challenges in WY2024 included:

- Actual rainfall different from the precipitation predictions and sampler programming was not accurate
- Tidal influences
- Snow on the ground or in the forecast
- Sensor malfunctions
- A few with pump count errors, battery failure, programming errors, and sample processing errors
- Vandalism and theft at the OF243 site

The outlined QAPP goal of 55 samples was met with a total of 74 composite samples successfully collected in WY2024. The wet/dry season goals were not met at OF237A, OF237B, OF243 and OF254 (see Table B4-7); however, the City believes this to be representative of the sampling conditions for WY2024[11]. The majority of outfalls had a minimum of two qualifying events collected during the dry season, with the exception of OF237A, OF243 and OF254. This is due to limited sampling opportunity with only five qualifying forecasted events during the dry season. There were two seasonal first flush samples collected during WY2024 on August 17, 2024, and September 10, 2024. The City believes that the overall sampling program was successful in sampling the precipitation events that met storm criteria and every attempt was made to sample and meet the requirements.

B.4.4.6 Summary

For each sampling event during WY2024, the City reviewed the flow hydrograph, the discrete sampling times relative to tidal stage, rainfall, and the conductivity (salinity) of the samples to determine which of the discrete samples should be composited to best represent the runoff event. The level, velocity, and flow data for every storm event was representative of stormwater runoff conditions. Most of the stormwater criteria were met (conductivity, tidal window, rainfall, and aliquots) and if not, were evaluated and the samples believed to be representative. Field and analytical data for all the samples collected and analyzed are included in Appendices C and D of the WY2024 Report. Rejected data were not included in any of the statistical analyses.

[11] Eight-eight percent of the events that were forecasted and met QAPP criteria occurred in the wet season during the WY2024 monitoring year.

B.5 STORMWATER SUSPENDED PARTICULATE MATTER (SSPM) MONITORING

The SSPM data are useful tools for source tracing given the following considerations:

- Sample locations are selected at the end of the pipe in an attempt to represent the cumulative effect of sources in that particular drainage basin.
- Sediment traps and the manhole sump collect SSPM for an extended period of time (generally a year) and collect sediment from a variety of storms (i.e., a range of volume, duration, and intensity conditions).
- Sediment traps are generally installed before August 26 each year to include seasonal first flush.
- Comparison of results from source tracing sediment traps help to prioritize source control efforts among Thea Foss sub-basins.

It is inappropriate, however, to evaluate SSPM data using sediment quality criteria because the storm drains provide neither habitat nor a point of compliance for aquatic life.

The following subsections evaluate the field and hydrologic data for WY2024 and discuss whether the samples collected using sediment traps and the MH390 Sump are believed to be representative of SSPM and sediment quality, respectively.

B.5.1 SSPM – SEDIMENT TRAPS

Most WY2024 sediment traps were installed between August 21-24, 2023. The exceptions were as follows:

- The sediment traps at FD-23 were removed for WY2023 on August 22, 2023, due to cleaning and maintenance of the system the bottles were not replaced for WY2024 until September 14, 2023. Rainfall accumulation during this time period was 0.0 inches.
- The FD-7 Sediment trap was moved due to tidal inundation. The sediment trap was installed in the new location on November 30, 2023. Rainfall accumulation missed at this location between August 21, 2023, and November 30, 2023, was 9.38 inches.

Consistent with the requirements of the 2023 QAPP and prior years of sampling, the sediment traps were left in place for approximately 12 months. All sediment trap samples were collected August 20-22, 2024, approximately 12 months after deployment.

As shown in Table B5-1, 32.92 inches of rain fell during the Year 23 SSPM sampling period, which is approximately six inches less than the historic average of 38.95 inches with the majority of the discrepancy occurring during the wet season. During WY2024, the wet season exhibited four inches less rainfall compared to historic conditions while the dry season exhibited approximately two inches less rainfall. The estimated volume of stormwater runoff during the Year 23 SSPM sampling period is shown in Table B5-2.

SSPM sampling was performed in general accordance with the 2023 QAPP. SSPM sample processing was performed per the laboratory's revised standard operating procedure (SOP) Foss Waterway Sediment Trap Sample Handling.

B.5.1.1 SSPM Sample Protocols

Between August 21-24, 2023, prior to the September seasonal first flush, sediment traps were deployed at each of the sampling locations shown in Figures B2-5, B2-7, B2-9, and B2-12 and described in Table B2-3. Exceptions to this timing are identified above. The City installed two sediment traps at each outfall location to ensure that sufficient sample volume was collected for analyses.

The traps were installed near the bottom of the junction boxes wherever possible. The sediment traps were inspected quarterly starting in December until the samples were retrieved (see the SSPM Field Report in Attachment B-2). At the end of the deployment period, the collection bottles were capped with screw closures, removed from the mounting brackets, packaged, and placed on ice in coolers for transport to the City's laboratory for processing. The samples were collected and delivered to the City laboratory under chain-of-custody procedures in accordance with the 2023 QAPP.

B.5.1.2 SSPM Sample Processing

Analysis of the SSPM samples was performed on the solids fraction of the collected sample. In order to separate the liquid fraction, the SSPM samples were processed in accordance with the revised January 3, 2023, laboratory SOP 1027, Foss Waterway Sediment Trap Sample Handling. The process used was:

1. A portion of the overlying water was decanted and retained.
2. Remaining water and sediment were slurried and then dispensed into Teflon cups. The retained water from step 1 was used to wash out the remaining solids in the sample container.
3. The sample was centrifuged for fifteen minutes at 2000 RPM or until the decanted overlying water was visually clear. The overlying water was then decanted and discarded.
4. A volume sufficient for City laboratory analyses of the remaining solid portion was dried, cryo-milled to ensure sample homogeneity, and then submitted for analyses. Any extra sample volume was frozen and shipped to subcontract laboratories for Grain Size and PBDE analyses.

No part of the sample, in particular the liquid fraction, was discarded during this process without being centrifuged. All particles that could be removed were removed and retained with the solid fraction for analyses. Processing of the samples was accomplished using stainless steel utensils, which were decontaminated prior to use in accordance with the laboratory SOPs.

The SSPM sample analyses were conducted in accordance with the hierarchy listed in Table B2-8 depending on the volume of sediments collected. Once in the laboratory, the laboratory's SOP for sample handling and storage was followed. After analysis, the remaining sample was archived according to the laboratory's SOP. The remaining sample was kept frozen and retained for three months beyond issuance of the Quality Assurance Data Summary Package.

B.5.1.3 Representativeness – SSPM

The sampling plan design, sampling techniques, and sample handling protocols were developed to attempt to get representative samples. There were no deviations from the 2023 QAPP except as noted below:

- The sediment traps at FD-23 were removed for WY2023 on August 22,2023, due to cleaning and maintenance of the system the bottles were not replaced for WY2024 until September 14, 2023. Rainfall accumulation during this time period was 0.0 inches.

- The FD-7 Sediment trap was moved due to tidal inundation. The sediment trap was installed in the new location on November 30, 2023. Rainfall accumulation missed at this location between August 21, 2023, and November 30, 2023, was 9.38 inches. The rainfall for the sampling period was 23.54 inches.
- No traps were lost during the deployment period from August 2023 to August 2024. Three sediment trap checks were performed during the 2023 – 2024 sampling year in January 2024, March 2024, and June 2024, as per QAPP requirements.

Samples from sediment trap locations FD3-C, FD18, FD6, FD2, FD2-A, FD1, FD21, MH390, FD22, and FD7 were submitted for grain size analysis using the ASTM D2487 methods D-7928/D-6913 (hydrometer/sieve analysis methods). Samples from locations FD16, FD13-B New and FD10-C had insufficient sample volume for hydrometer/sieve analysis and were analyzed by method ASTM D6913 Sieve Only. Samples from sediment trap locations FD3-New, and FD23 had insufficient volume for any grain size or PBDE analysis. Additionally, the sample from location FD3-New had insufficient volume for PBDE, Total Cadmium, Total Copper, Total Lead, Total Mercury, Total Zinc, NWTPH-Dx, Total Organic Carbon, Total Phosphorous, and Polychlorinated Biphenyl (PCB) analyses. All other required analyses were completed for the sediment trap samples.

All SSPM samples collected and submitted for analysis during the WY2024 monitoring are believed to represent storm sediment conditions, as defined above, for each outfall.

B.5.2 STORMWATER SEDIMENTS – MH390 SUMP

A representative sediment sample is generally taken from the sump (MH390) located upstream of OF245 in August of each year. The MH390 sump is then cleaned following sampling to ensure that the subsequent sampling represents the discrete approximately August to the following August annual sampling period. The depth of accumulated sediment is also measured.

In WY2024, the MH390 sump above OF245 was sampled on August 20, 2024, represents sediment accumulation from the previous year, and results are reported in the WY2024 report. The accumulated sediment ranged from 0.0 – 1.5 inches in depth with an estimated volume of 0.35 cubic feet of material. Total rainfall for Year 23 SSPM monitoring period is 32.61 inches (see Table B5-1, as measured at NOAA[12] Station Tacoma 1 at the Central Wastewater Treatment Plant). This was slightly less than the historic average of 38.95 inches. Corresponding estimated runoff volumes for each area are presented on Table B5-2. The City believes that the WY2024 MH390 sample is representative of the September 1, 2023, to August 20, 2024, timeframe discussed above and comparable to previous year's data.

B.5.2.1 MH390 Sump Sample Collection and Cleaning Process

The WY2024 sample was collected in accordance with the 2023 QAPP procedure. A confined space entry was performed to measure the sediment depths and samples were collected from the top of the manhole using a Ponar sampling device. Random samples were obtained from the manhole sediment and composited into a large stainless-steel bowl. This sample was then well mixed into a slurry and then distributed in the lab into appropriate containers for analysis.

B.5.2.2 MH390 Sump Sample Process

Once in the laboratory, the laboratory's SOP for sample handling and storage was followed. The analytes tested are listed in Table B2-9. After analysis, the remaining sample was archived

[12] National Oceanic and Atmospheric Administration

according to the laboratory's SOP. The remaining sample was kept frozen and retained for three months beyond issuance of the Quality Assurance Data Summary Package.

B.5.2.3 Representativeness – MH390 Sump Sediments

Material captured by the manhole sump (MH390 sump) above OF245 is representative of SSPM and settleable solids which are transported by stormwater and to a small extent, baseflow. However, it should be noted that a portion of the SSPM and solids present in the sump might represent a source other than stormwater from this basin due to this sample station being tidally influenced. The actual sample was a composite of aliquots randomly taken from the sump (see Section B.5.2.1 and Attachment B-2).

It was the intent of the 2023 QAPP to sample the sump sediment so that the material sampled in the sump and that collected in the sediment traps in the other outfalls can be compared over the same time period. Cleaning and sampling of the sump generally coincided with placement and collection of the sediment traps in the other basins. This ensured that the sampling represents the current time period and included no residuals from previous discharges.

The MH390 sample is believed to be representative of the WY2024 sediments and a representative comparison with WY2024 SSPM samples collected in the sediment traps at other outfalls.

B.6 BASEFLOW MONITORING

Annual baseflow sampling was discontinued in WY2011. Since that year, detection limits for some analytes have changed and are lower than those in the 2001 Sampling Analysis Plan (SAP). The WY2011 baseflow concentrations, many of which were not detected, biased the baseflow pollutant loadings and overestimated the resulting loads. In order to more accurately estimate the baseflow loadings, baseflow samples were collected in subsequent years and analyzed for the stormwater analytes listed in the QAPP.

The determination of whether or not there are baseflow components in OF245, OF243, and OF254 is unclear, as the hydrographs are complicated by tidal inundations. Based on an analysis of the continuous flow record, it was determined that there is no substantive baseflow in OF245, OF243, and OF254. However, baseflow samples were collected at these sites for comparison of the predominately industrial land uses (OF245, OF243, and OF254) to the predominately commercial and residential land uses (OF230 (historic), OF235, OF237A, OF237B).

Baseflow samples were collected using the same procedures as are used for composite and grab sampling but with different event criteria. The baseflow event criteria were:

- 0.0 inches of precipitation in the previous 48 hours
- Sample duration of 24 hours
- Less than 0.02 inches of precipitation during the 24 period

B.6.1 WY2016 BASEFLOW

A total of 25 baseflow samples were collected in WY2016 at OF230, OF235, OF237A, OF237B, and OF243. For each sampling event during WY2016, the City reviewed the flow hydrograph, the discrete sampling times relative to tidal stage, rainfall, and the conductivity (salinity) of the samples to determine which of the discrete samples should be composited to best represent the baseflow event. The level, velocity, and flow data for every baseflow event were representative of baseflow conditions. Most of the baseflow criteria were met (tidal window, no rainfall, and aliquots) and if not, were evaluated and the samples believed to be representative. Field and analytical data for all the samples collected and analyzed are included in Appendices C and D of the WY2016 Report. Rejected data was not included in any of the statistical analyses or pollutant loading calculations.

B.6.2 WY2019 BASEFLOW SAMPLING EVENTS

A total of 19 baseflow samples were collected in WY2019 from all seven locations. For each sampling event during WY2019, the City reviewed the flow hydrograph, the discrete sampling times relative to tidal stage, rainfall, and the conductivity (salinity) of the samples to determine which of the discrete samples should be composited to best represent the baseflow event. The level, velocity, and flow data for every baseflow event were representative of baseflow conditions. Most of the baseflow criteria were met (tidal window, no rainfall, and aliquots) and if not, were evaluated and the samples believed to be representative. Field and analytical data for all the samples collected and analyzed are included in Appendices C and D of the WY2019 Report. Rejected data was not included in any of the statistical analyses or pollutant loading calculations.

B.6.3 WY2024 BASEFLOW SAMPLING EVENTS

A total of four dry season baseflow samples were collected in WY2024 from OF230A and OF235 to determine changes to the baseflow conditions in these new drainage areas. The dates of each baseflow event sampled in WY2024 are shown in Table B4-2. Summary tables for each baseflow event, and the field and hydrologic data for each sample taken at each outfall is presented in the 2024 Report, Appendix C, Tables C-8 and C-9. The following hydrologic parameters are tabulated for each sampled baseflow event:

- Rain depth (inches)
- Sampling duration
- Antecedent dry period (hours)
- Sampling event average and peak flow (cfs)
- Total baseflow volume (cubic feet)

Baseflow grab samples were collected whenever the samplers were deployed and tidal conditions were met (i.e., daylight conditions). Complete field and laboratory data packets for these events are presented in Attachments B-1 and B-3 (available upon request) of this appendix. The baseflow analytical data for each event is listed in Appendix D, Tables D-1 and D-2. All of the Foss and NPDES parameters were analyzed in the baseflow samples collected.

B.6.3.1 WY2024 Baseflow Sampling Representativeness

All events met the baseflow event criteria. Samples were collected over a 24 hour period and all samples represent baseflow conditions that weren't tidally inundated. All events had with less than 0.02 inch of precipitation during the 24 hours period. All events had 0 inches of precipitation in the previous 72 or more hours.

For each baseflow sampling event during WY2024, the City reviewed the flow hydrograph, the discrete sampling times relative to tidal stage, rainfall, and the conductivity (salinity) of the samples to determine which of the discrete samples should be composited to best represent the baseflow event. The level, velocity, and flow data for every baseflow event were representative of baseflow conditions. All of the baseflow criteria were met (tidal window, no rainfall, and aliquots) and the samples are believed to be representative. Field and analytical data for all the samples collected and analyzed are included in Appendix C, Tables C-8 and C-9, and Appendix D, Tables D-1 and D-2 of the WY2024 Report.

Rejected data will not be included in any of the statistical analyses or pollutant loading calculations.

B.7 LABORATORY DATA REVIEW

This section describes the procedures used to determine if the MQOs described in Section 6.3 of the 2023 QAPP (Tacoma 2023) are met. The intent is to obtain data of known and documented quality, and of sufficient quality and quantity to meet the use for which they are intended. The quality of the data is indicated by data qualifier codes, notations used by laboratories and data reviewers to briefly describe data and the systems producing it. Laboratory data qualification generally follows method specific criteria, EPA's National Functional Guidelines for Data Review (EPA 2020a,b) and EPA Contract Laboratory Program Statements of Work (EPA 2019a,b).

During data review, verification and validation results are accepted, rejected/unusable, or reported with data qualifiers or flags. Data that meet all quality control (QC) acceptance limits are usable and are not qualified. Data that fail one or more QC criteria are qualified as estimated (with the J flag) or unusable (with the R flag). The distinction between estimated and unusable data resides in the degree of the QC failure and is highly dependent upon the reviewer's understanding of the objectives of the study. A third term, censoring, applies to QC data that may be used to support qualification or rejection, yet are not conclusive when used alone.

This section discusses the review, verification, and validation of WY2024 monitoring data. Data are reviewed, verified, and validated using a Tier II data review level[13] or higher.

B.7.1 Overall Data Quality

Overall, 97 percent of all data in this study met MQOs, including 97 percent of stormwater and baseflow data, and 94 percent of SSPM data. All accepted data are representative of the constituent population. Performance is summarized by data quality indicators (DQI): sensitivity, bias, precision, technical consistency, completeness, and representativeness.

- **Sensitivity.** Ninety-six percent of stormwater and baseflow, and 99.8 percent of SSPM met MQOs. The magnitude of most stormwater exceedances was low, less than twice detection level goals (DLG).
- **Bias.** Ninety-eight percent of stormwater and baseflow, and 96 percent of SSPM met MQOs.
- **Precision and Comparability.** Ninety-six percent of stormwater and baseflow, and 100 percent of SSPM are precise and comparable according to MQOs. Precision is measured as duplicate relative percent difference for laboratory, matrix spike, and field duplicates.
- **Technical Consistency.** Eighty-six percent of stormwater and baseflow samples are technically consistent. That means dissolved metal and orthophosphate concentrations are generally less than their total counterparts. The 86 percent was solely due to method detection limit (MDL) for dissolved mercury (0.0011 µg/L) that were higher than the MDL for total mercury (0.0008 µg/L). All total mercury detections were greater than dissolved mercury detections or the MDL.
- **Completeness.** Ninety-nine point six percent of stormwater and baseflow data and 100 percent of the SSPM data were deemed useable. Forty of 8,309 (0.5 percent) QC data points fell within the rejection region (all but Detection Profile totals). Rejected data

[13] Tier II is equivalent to EPA Stage 2b data validation https://www.epa.gov/clp/staged-electronic-data-deliverable-sedd.

primarily includes organic compound detection limit exceedances from a single stormwater sample (19 rejections, relabeled U or UJ estimates of concentration) and rinse blank rejections (10 conventional, nutrients, and metals) from two stormwater samples. The WY2024 data set is sufficiently complete for study objectives.

Overall, sample results represent the target populations of interest. An exceedance of an MQO does not automatically lead to rejected data, though a datum is classified by its appropriate data qualifier flag. Data are censored or rejected if performance is within the rejection region, as defined in Figures B7-1 and B7-2 and justified by a weight of evidence approach.

The WY2024 laboratory quality assurance/ quality control (QA/QC) review included 75 stormwater, four baseflow, and up to 16 SSPM samples. Overall, 12,684 sample and QA/QC results were analyzed in WY2024. Forty of 8,309 QC data points (0.5 percent) are classified as censored or rejected. When possible, failing performance criteria or sample loss is noted and corrected (re-extraction or rerun of samples) within holding time restrictions, limiting the impact of a lost data point.

B.7.2 QUALITY ASSURANCE

Data quality is supported by quality assurance measures, such as standardization of sampling and analysis methods, and quality control is evaluated through performance criteria. Additionally, quality assurance is supported by adhering to guidelines established in the 2023 QAPP (Tacoma 2023), including:

- EPA National Functional Guidelines for Superfund Data Review: Organic (EPA 2020a) and Inorganic (EPA 2020b)
- EPA Contract Laboratory Program (CLP) Statements of Work (SOW) (2019a,b)
- EPA field sampler guidance (EPA 2020c); unfortunately, EPA National Functional Guidelines for High Resolution Gas Chromatography coupled with High Resolution Mass Spectrometry (HRGC/HRMS) data review does not contain PBDEs (EPA 2020d)

MQO and censor or reject criteria[14] are presented in Figure B7-1 and Figure B7-2 for stormwater and SSPM respectively. MQO and censor/reject criteria are modeled from and are generally more restrictive than the EPA Guidelines (EPA 2020a,b) and EPA CLP SOW (EPA 2019a,b). The purpose of more restrictive criteria is to inform project participants of trends in the data and to guide continual performance improvement. Federal guidance for this type of approach is presented in ACOE 2005 and DOD 2017.

Analytical methods and DLG are presented in Table B2-7 for stormwater and Table B2-9 for SSPM. All parameters are accredited and analyzed by the City (Accreditation #G682-24) except *E. coli, Enterococcus* and fecal coliform, particle size distribution/grain size, and PBDEs. Fecal coliform, *E. coli, and Enterococcus* are analyzed by Water Management Laboratories, Inc. (Accreditation C546-24, Tacoma, WA), and particulate size distribution and grain size are analyzed by Materials Testing and Consulting, Inc. (Accreditation #C1041-24). SGS-AXYS (Accreditation #C404-24) conducts PBDE testing. Note: Ecology approved discontinuation of testing PBDE 181 and 192 in 2022 and these compounds do not appear in the results. Additionally, the City received PBDE results from the laboratory late in the reporting process. The three-year PDBE data set will be analyzed in the WY2025 report.

[14] Data are not immediately rejected if performance falls in the rejection region. Weight of evidence of companion QC measures are considered prior to rejection.

B.7.3 QUALITY CONTROL PERFORMANCE REVIEW

The goal of quality control performance review is to determine representativeness of sample data through DQIs, including sensitivity, bias, precision, technical consistency, and completeness. MQOs provide the criteria to evaluate performance of quality control samples (duplicates, blanks, etc.) within each DQI and are presented in the section narrative and Figures B7-1 and B7-2. If data provide evidence of a quality concern, corrective actions to be executed in the following water year are described. Where possible, definitions are provided to explain criteria in each section (EPA 2015, EPA 2016).

The type and chemical makeup of a sample may significantly influence quality control performance (i.e., freshwater, marine water, sediment, etc.). Thus, evaluation criteria are divided into two groups: stormwater and SSPM. Generally, SSPM samples are more difficult to analyze as compared to stormwater due to matrix interferences.

This type of performance-based review has occurred for this program since WY2010 and has been utilized by certain federal agencies (ACOE 2005, DOD 2017). Where notable, performance differences between water years are discussed. WY2024 performance data are presented in Table B7-1 for stormwater and Table B7-2 for SSPM. These tables, as well as Figures B7-1 and B7-2, and detection profiles for stormwater (Table B7-3), baseflow (Table B7-4) and SSPM (Table B7-5) are referenced throughout the following sections. WY2024 review evaluates 4,375 sample results and the 8,309 quality control results of the study.

B.7.4 SENSITIVITY – REPORTING LIMIT PERFORMANCE

Sensitivity is the capability of a method or instrument to discriminate between measurement responses representing different levels of a variable of interest (EPA 2016). Sensitivity is measured through reporting limit performance (the pMDL). Performance evaluates the variability of reported method detection limits, on a per sample basis, due to background noise, analytical/matrix issues, sample size and procedural changes. A pMDL greater than the reporting limit goal, for non-detect data, represents a loss of information and an MQO exceedance. If a compound is detected and the pMDL is greater than the detection limit goal, then no information is lost. The pMDL is considered a rejected data point if the pMDL (for a non-detect result) is greater than five times the reporting limit goal, recognizing a substantial loss of information. Sample data are not rejected based on the pMDL. Rather, the data are reported with the appropriate pMDL and a 'UJ' classification. MQO and reject criteria constitute a sensitivity evaluation in the QC performance assessment. Reporting limit performance is presented in Table B7-6 for stormwater and Table B7-7 for SSPM.

Ninety-six percent of stormwater (3835 of 3991), and 99.8 percent of SSPM (481 of 482) detection limits (for non-detect tests) met MQOs for sensitivity. 0.5 percent of stormwater samples met rejection criteria and were relabeled U or UJ estimates of concentration. This was primarily organic compound detection limit exceedances from a single stormwater sample (19 data points on Table B7-6), and rinse blank rejections (ten data points: conventional, nutrients, and metals on Table B7-8) from two stormwater samples. No SSPM results met rejection criteria (Table B7-7).

B.7.4.1 Stormwater and Baseflow

Certain analytes have detection limits which are goals and are difficult to achieve. Others are based on the lower limit of quantitation. Detection limits were set very low to drive analytical performance, though that means some analytes will not meet objectives most of the time. Detection limits are described in detail within the Quality Assurance Project Plan – QAPP (Tacoma 2023). Stormwater and baseflow are presented together in Table B7-6 Sensitivity – Stormwater.

Baseflows were sampled in WY2024. Sampling baseflow allowed for calculation of total loads of pollutants to Thea-Foss receiving waters. Baseflow samples are dominated by non-detects for most pollutants. Five of seven baseflow sample locations are close to the marine water line and heavily influenced by saltwater. Saltwater interference increased sensitivity MQO exceedances for this data set. Most exceedances were very close to the DLG:

- The dissolved cadmium DLG is 0.03 µg/L while the pMDL median was 0.045 µg/L, leading to 63 MQO exceedances.
- The naphthalene DLG is 0.01 µg/L while the pMDL ranged from 0.015 to 0.03 µg/L, leading to 37 MQO exceedances.
- The NWTPH-Heavy Oil DLG is 0.1 µg/L while the pMDL ranged from 0.05 to 0.22 µg/L, leading to 12 MQO exceedances.

The remaining 44 exceedances were spread across all analyte types. One sample contained 19 exceedances and those exceedances were relabeled as UJ non-detections. Of the remaining 25, 15 were light PAHs: 2-methylnaphthalene (5), acenaphthene (5), and fluorene (5). Five of 60 samples for NWTPH-Diesel had a pMDL of 0.011 µg/L, slightly exceeding the DLG of 0.01 µg/L.

The DLG are very low and influenced by both stormwater and baseflow matrices. The City will continue to strive to meet the DLGs.

B.7.4.2 SSPM

Ninety-nine percent of SSPM met sensitivity goals (481 of 482) and no results exceeded rejection level criteria (Table B7-7). Bifenthrin DLG is 1 µg/kg dry and one value exceeded the DLG with a result of 1.21 µg/kg dry. Associated non-detect samples were labeled ‘UJ’ estimates of concentration.

B.7.5 BIAS

Bias is the systematic or persistent distortion of a measurement process which deprives the result of representativeness (i.e., the expected sample measurement is different from the sample's true value). Bias is evaluated through blanks, laboratory control sample (LCS), matrix spike/spike duplicate (MS/MSD) and CRM recovery. Recovery is the percent sample concentration compared to ‘true’ concentration. Bias is evaluated for both stormwater and baseflow, and SSPM.

B.7.5.1 Blanks

Blanks are used to evaluate positive (contamination) bias on sample results resulting from laboratory and field activities (EPA 2015, 2020a,b). Several types of blanks are obtained and discussed in relevant sections. In addition to established laboratory procedure, blanks are evaluated against the reporting limit goal, where an MQO exceedance indicates a blank detection greater than the reporting limit goal.

A sample rejection occurs where blank detection is greater than DLG and greater than ten percent of the sample result. The blank result is rejected in the QC analysis and the sample result is relabeled a non-detection (UJ) if exceeding rejection criteria. Sample results are only rejected due to laboratory method blank performance. Elevated blank results represent a loss of information due to positive bias (ACOE 2005, EPA 2020a,b). Laboratory, wash, bottle, trip, filter, ambient air, and rinse blanks are discussed and are a component of the weight of evidence bias evaluation for a set or series of data. This data is used to inform laboratory and field operations.

B.7.5.1.1 Stormwater and Baseflow Blank Results

Laboratory and field blanks were analyzed in WY2023 to evaluate bias (Table B7-1 and B7-8). Ninety-six percent (1,288 of 1,341) of blank results met MQOs and 15 (one percent) of blank results were rejected in the QC performance analysis. Stormwater and baseflow samples are not significantly biased due to blank contamination.

Laboratory Blanks: Laboratory blanks include wash, bottle, and laboratory method blanks. As presented in prior Data Validation reports (Tacoma 2023), the City lab transitioned from running bottle blanks to a more rigorous City dishwashing/testing process for all equipment (wash blank). The wash blank includes laboratory testing one of every 100 pieces of sampling equipment (including field bottles) for a list of common laboratory contaminants. The results of these tests are compared to the DLG. If no detections result, a green sticker is placed on all equipment and bottles as 'Ready to Use'. This is designed to provide the City greater quality assurance prior to taking bottles and equipment into the field. Bottle washing results with detected concentrations are re-washed and tested a second time.

Ninety-eight percent (479 of 487) wash blank tests did not result in an analyte detection and met measurement quality objectives. Seven of 16 total hardness ($CaCO_3$) bottle wash tests resulted in detections ranging from <0.05 mg/L to 0.21 mg/L. Hardness was detected in 100 percent (79) environmental samples and the lowest detection was 10.6 mg/L. The lowest environmental concentration is 50 times greater than the highest blank detection. Washing procedures do not influence the detection profile.

Bottle blanks are obtained by pouring clean water into a sample bottle and then decanting for analysis. Wash blanks have largely replaced the need for a bottle blank but it is occasionally necessary to double check the process. A grab sample bottle blank was run for NWTPH-Diesel and Heavy Oil and yielded zero detections.

Laboratory method blanks are prepared by lab analysts and run through all preparation, extraction, and analysis procedures as environmental samples. Five to thirteen blanks were run per analyte. Ninety-eight percent (434 of 445) laboratory method blank tests met MQOs. Four blanks met rejection criteria (1 percent):

- 11/2/23: Chloride was detected at a concentration above the MRL. All associated sample results were greater than ten times that of the blank detection, except for 2311014-01 (OF230A) and 2311014-09 (Outfall 555, Trip Blank). These affected results are reported as "not detected at or above the associated, estimated concentration" (UJ).
- 12/9/23: Chloride was detected at a concentration above the MDL. All associated sample results were greater than ten times that of the blank detection, except for 2312013-04 (OF237A). The affected result is reported as "not detected at or above the associated, estimated concentration" (UJ).
- 1/6/24: Chloride was detected at a concentration above the MDL in the method blank and sequence continuing calibration blanks (CCBs). OF230A, OF235, OF237A, and OF237B (2401017-01 through -04) had detections within 10 times that of the highest blank detection. The affected results are reported as "not detected at or above the associated, estimated concentration" (UJ).

- 1/23/24: Chloride was detected at a concentration above the MDL in the method blank and sequence CCBs. O230A, OF235, and OF237B (2401041-01, -02 and -04) had detections within 10 times that of the highest blank detection. The affected results are reported as "not detected at or above the associated, estimated concentration" (UJ).
- 2/15/24: Chloride was detected at a concentration above the MDL in the method blank and sequence CCBs. OF235, OF237B and Outfall 222 (2402024-02, -04 and -08, respectively) had detections within 10 times that of the highest blank detection. The affected results are reported as "not detected at or above the associated, estimated concentration" (UJ).
- 8/6/2024: Naphthalene was detected in the blank associated with preparation batch BHF0036 (0.0310 µg/L) at a concentration above the reporting limit. OF245 and Outfall 222 had no detected Naphthalene and those results are reported without qualification. OF235 (2406007-02) and OF243 (2406007-05) had detections of Naphthalene within 10 times that of the blank detection, and their Naphthalene results are reported as "not detected at the associated estimated concentration" (UJ).

<u>Field Blanks:</u> Field blanks represent increasing contamination potential due to transport conditions (trip blank), exposure to surroundings during sampling (ambient air blank), and equipment that remains onsite between sample events (rinse blank). Each subsequent blank contains the contamination potential of the preceding blank, and rinse blanks are considered the highest risk assessment of field contamination. Field blanks are evaluated for MQO exceedance and rejection, but do not result in rejection of sample results unless directly relatable to sample event and magnitude of detection. In WY2024, 373 of 407 field blank tests (92 percent) met MQOs, and eleven values (2.7 percent) exceeded rejection or censor criteria (Figure B7-1, Table B7-8). Blank performance is discussed in the following sections.

<u>Trip blanks</u> are obtained by pouring clean water into a sample bottle, placing it in the cooler with samples obtained during the field event, and analyzing for contaminants of interest. Two trip blanks were analyzed. Ninety-seven percent of trip blanks met MQOs (87 of 90) (Table B7-8). One detection of lead, total nitrogen and hardness exceeded MQOs. All three compounds were detected in 100% of the environmental samples:

- The total hardness detection of 0.13 mg$CaCO_3$/L is far less than the lowest detected concentration of 10.6 mg$CaCO_3$/L.
- Lead was detected at 0.229 µg/L and this is less than the lowest detected concentration of 0.845 µg/L.
- One total nitrogen result yielded 0.18 mg/L. Total nitrogen was detected as low as 0.21 mg/L in environmental samples. The nitrogen blank detection was greater than five times the detection limit goal and counts as a rejected blank.

No blanks exceeded the detection profile. The City will continue to perform blank sampling to guide clean techniques and continuous improvement.

<u>Ambient air (field) blanks</u> are obtained by removing the lids of sample bottles (filled with clean water) and storing the bottle exposed and onsite for the duration of sampling. A single ambient air blank was taken for the grab samples NWTPH-Diesel and Heavy Oil. There were no detections. All tests (two) met MQOs.

<u>Rinse blanks</u> are obtained by running clean water through the entire ISCO or grab sampling system (three system volumes), collecting the final rinsate in a sample jar in the field, and continuing the transport, storage, and analysis process as with any other sample. Rinse blank detections

represent the greatest level of potential contamination of the entire field and laboratory sampling process.

Ninety percent (284 of 315) of rinse blanks met MQOs and ten fell within the rejection region (Table 7-8). All rinse blank exceedances correspond to compounds which were detected in 100 percent of environmental samples. A number of blank samples exceeded the MQO. Ten samples (3.2 percent) exceeded rejection level criteria of five times the detection level goal including chloride, hardness, turbidity, total nitrogen, copper, dissolved copper, and lead. Only turbidity, total nitrogen and lead fell within the environmental sample detection profile.

- One of seven rinse blank turbidity results of 1.89 nephelometric turbidity unit (NTU) was greater than one of four baseflow detections at 1.27 NTU. The maximum rinse blank turbidity result did not exceed the environmental detection profile for stormwater samples.
- Two of seven rinse blank total nitrogen results of 0.27 mg/L and 0.42 mg/L exceeded the minimum (0.21 mg/L) and 10th percentile (0.40 mg/L) of the detection profile. These results are larger than seven (of 75) of the total nitrogen detections.
- One of seven lead rinse blanks results of 1.37 µg/L exceeded the lowest two baseflow results (of four) 0.93 µg/L and 1.29 µg/L and the lowest (of 75) stormwater results of 0.845 µg/L.

Rinse blanks evaluate maximum potential contamination occurring within the stormwater sampling system. Detections are expected. A preponderance of evidence occurs when the majority of blanks exceed the MQO or reject threshold at a level that is relevant to the environmental detection profile. While total nitrogen and lead results give pause, they are not sufficient to conclude positive bias. Rinse blank performance will improve through continual adherence to clean procedures and improvements to standard operating procedures.

Overall, 90 percent of rinse blank samples met MQOs, and ten values (3.2 percent) fell within the reject region (Tables B7-1 and B7-8).

B.7.5.1.2 SSPM Blank Results

One to two blanks were analyzed for each analyte, resulting in 77 blank tests. Blanks were analyzed at the required frequencies of the methods. Analytes were either not detected in the blanks, sample concentrations were greater than ten times the blank values, or the analytes detected in the blanks were not detected in associated samples, with the exception of diethyl phthalate, which was detected above the MDL in the Method Blank. The blank detection of diethyl phthalate resulted in raised detection limits above the project DLG of 70 µg/L for samples FD3-New (162 µg/L), FD2 (159 µg/L), MH-390 (87 µg/L), FD22 (91 µg/L), and FD7 (136 µg/L).

B.7.5.2 Laboratory Analyses Recovery

Recovery of ‘known’ concentrations of analytes is useful when estimating sample bias. Bias is reported as a percent of the true value. For instance, an analyte which has a low recovery (ideal is 100 percent, low is 25 percent) across most control samples will be classified as ‘biased low’. This means the reported sample result is likely an underestimate of the actual environmental concentration. Underestimation is more common for analyte recoveries than overestimation. Bias control samples take several forms:

- Blanks (discussed in Section B.7.5.1) – ‘pure’ water exposed to laboratory and sampling conditions. If the water becomes contaminated during the process, this infers a positive bias upon sample results.

- A surrogate is a pure substance with properties that mimic the analyte of interest. It is unlikely to be found in environmental samples (e.g., compounds with a tracer hydrogen added (deuterated) such as pyrene-d10) and is added to them for quality control purposes.
- The LCS is an uncontaminated sample matrix spiked with known amounts of analytes from a source independent from the calibration standards.
- The MS is a sample which is spiked with a known amount of an analyte. The difference in MS and LCS recoveries is a function of the sample matrix (chemistry). This is also called the matrix effect.
- A CRM is a type of LCS that has been tested and characterized by several certified laboratories (20 or more). CRMs are primarily run on SSPM for this project.

B.7.5.2.1 Stormwater and Baseflow Bias Results

Stormwater and baseflow bias analysis includes surrogates, LCS, and MS/MSDs. Ninety-nine percent (1264 of 1271) of stormwater bias recoveries met MQOs (Table B7-1). Stormwater and baseflow samples are not biased due to analytical recovery:

- Ninety-nine percent (336 of 340) surrogates met measurement quality objectives. Three detections of 2-fluorobiphenyl had recoveries below the MQO and one was recovered below the rejection cutoff. The recoveries of all other surrogates in the analytical run with the failing 2-fluorobiphenyl were within limits and the results were reported without qualification.
- All LCS recoveries (528) met MQOs.
- Ninety-nine percent (400 of 403) MS/MSD recoveries met MQOs. One recovery of benzo(g,h,i)perylene (41 percent), dibenz(a,h)anthracene (47 percent) and fluoranthene (46 percent) were slightly below the MS/MSD recovery MQO of 50 percent. No data were qualified based on MS/MSDs alone.

Results with close to 100 percent recovery are desired. Superfund Methods for Organic Data Review (EPA 2020a) generally only recommend rejection of detected compounds when recoveries of surrogate, LCS, or MS/MSD are less than 10 percent (LCS 30 percent), and the reviewer is often given the option not to reject. The City (Tacoma 2010 onward) set MQO criteria tighter than Superfund Methods and review all bias control criteria in combination in order to make an overall bias estimate (see Figure B7-1). This follows previously published protocols used by U.S. Army Corps of Engineers (2005).

Individual data points were evaluated within the laboratory reports and J-qualified (as appropriate) as estimates of concentration due to bias. In WY2024, weight of evidence did not support rejection of data beyond laboratory identified specific bias qualification on a single analytical run. Weight of evidence involves lining up the specific performance for each test – blank bias (positive bias), surrogate (positive or negative bias), LCS (positive or negative bias), and MS/MSD (positive or negative bias) and comparing magnitudes of exceedance.

The individual comparison may be extended to a single compound or class of compounds over the course of the water year. WY2024 stormwater and baseflow QC performance was excellent.

B.7.5.2.2 Stormwater Sediment Data

SSPM is a difficult matrix to analyze under any condition. To bolster estimates of bias, CRMs are added to the suite of control sample recoveries. SSPM biases are analyzed by a weight of evidence approach, considering results of all bias tests. Ninety-six percent of tests (282 of 294) met MQOs (Table B7-2, CRM presented in Table B7-9).

- Ninety-eight percent (73 of 74) surrogates met measurement quality objectives. One detection of pyrene-d10 was slightly less (49 percent) than the lower MQO of 50 percent. No data were qualified based on this detection.
- Eighty-seven percent (33 of 38) LCS recoveries met measurement quality objectives. Exceedances include 2-methylphenol (30.9 percent), 4-methylphenol (40 percent), pentachlorophenol (47 percent), dichlobenil (58 percent) and bifenthrin (48 percent) in the blank spike associated with preparation batch BHH0134-BS1. These recoveries fell below the 60 percent project lower control limit. Affected results were reported as estimated (J or UJ) in the associated samples.
- Ninety-five percent (72 of 76) MS/MSD recoveries met measurement quality objectives. 2-Methylphenol, 4-Methylphenol, and Pentachlorophenol fell below project control limits, and Butyl Benzyl Phthalate and Di-n-octyl phthalate, exceeded the upper project control limits in the MS and/or MSD associated with preparation batch BHH0134. Butyl Benzyl Phthalate is reported as estimated (J) in source sample FD6 (2408030-05). 2-Methylphenol, 4-Methylphenol, and Pentachlorophenol were within limits in the MS, the RPDs between the MS and MSD recoveries were within limits, therefore these results are reported without qualification in the source sample. Additionally, Heavy Oil fell below limits in BHI0013-MS3. As the MSD and RPD recoveries were within limits, Heavy Oil was reported without qualification.
- Ninety-seven percent (28 of 29) certified reference material recoveries fell within certified ranges and project measurement quality objectives. Pentachlorophenol had a recovery of 49 percent, within the certified range of 10 percent to 198 percent yet slightly less than the MQO of 50 percent. No data were qualified based on this recovery.

Weight of evidence for a bias conclusion is evaluated for all control tests and data points may be censored, if appropriate, instead of rejected. SSPM weight of evidence and trends are considered with respect to recoveries of surrogates, laboratory control samples, MS/MSD, CRM, and blank results. Surrogates are given a lower weight when specific analyte recovery data is available.

From a data user standpoint, the intent is to know which chemical results identify the compound correctly and that the magnitude of detection is close to ‘true’. In a general sense, this is done by comparing the percent recovery to a known standard.

Combining surrogate, LCS, MS/MSD, and CRM bias indicators provides the weight of evidence evaluation. A determination of bias is established if a majority of bias indicators are in the same direction for an analysis (such as semi-volatiles), specific chemical performance (e.g., pyrene), or a particular sample. Ninety-six percent of SSPM recovery results met MQOs (Table B7-2, CRM presented in Table B7-9).

B.7.6 PRECISION AND REPEATABILITY

Precision is an evaluation of agreement among replicate measurements of the same property under similar conditions (EPA 2015) and a measure of dispersion of random errors. Precision is measured through duplicates generated in the laboratory and field. Each of the following measures of precision incorporates the variability of the precision measure preceding it:

- Laboratory duplicates that evaluate the sample splitting process, as well as all steps from extraction through analysis internal to the laboratory.
- Matrix duplicates incorporate evaluation of the sample matrix effect.

- Field duplicates incorporate all variability of the system, including laboratory, matrix, preservation, transportation and storage, and the difficulty of obtaining samples under identical conditions.

In this study, precision is calculated as relative percent difference (RPD):

$$RPD = \left(\frac{(X_1 - X_2)}{(X_1 + X_2) \div 2}\right) \times 100 \text{ where,}$$

X_1 - Original sample
X_2 - Duplicate sample

Stated another way, RPD is the difference between samples divided by their average.

The MQO and rejection criteria for precision are listed in the data validation diagrams Figures B7-1 and B7-2. All detections are evaluated for MQOs. Results are only evaluated for rejection criteria if at least one result is greater than five times the DLG. This rule preserves the understanding that sample results close to the method detection limit have greater inherent variability.

B.7.6.1 Stormwater and Baseflow

Stormwater and baseflow precision is calculated from laboratory, MS/MSD, and field duplicate samples. The ability to replicate and quantify duplicate samples is increasingly difficult as other sources of variability (e.g., matrix effect, field conditions) are incorporated. These other sources of variability are controlled to the maximum extent practicable using standard operating procedures both in the laboratory and in the field, however, some matrix effects and field conditions are beyond our control. That's why precision is defined as a measurement of dispersion of random errors. Systemic errors are discovered by repeating patterns over the course of a large sample set. The MQO and rejection criteria are appropriately defined based on the ability to control source of variability in laboratory, MS/MSD, and field duplicates.

- Ninety-six percent (120 of 125) of laboratory duplicates met MQOs. Single pairs of turbidity, cadmium and dissolved lead exceeded the MQO of 20 percent. One pair of NWTPH-HO (41 percent RPD) slightly exceeded the MQO of 40 percent. One laboratory duplicate of cadmium (49 percent RPD) exceeded the rejection criteria of 50 percent RPD. Associated data was 'J' qualified as an estimate of concentration.
- One hundred percent of 139 MS/MSD pairs met MQOs.
- Ninety-one percent (113 of 124) field duplicates met MQOs. One total suspended solid duplicate pair yielded a 53 percent RPD and was 'J' qualified as an estimate of concentration. The remaining exceedances were for bacteria. Three *E. coli*, one *enterococci,* and three fecal coliform pairs exceeded rejection criteria of 100 percent RPD. All data pairs were labeled as unusable. Additionally, one of each bacteria pair exceeded MQO criteria of 50 percent and associated data pairs were 'J' qualified as estimates of concentration.

Ninety-six percent (372) of the 388 data pairs met MQOs (Table B7-1). Stormwater and baseflow met precision MQOs and are representative of the population of interest, as evidenced by meeting 96 percent of MQOs.

B.7.6.2 Stormwater Sediments

Precision for SSPM is calculated using field, laboratory, and matrix spike duplicates (Table B7-2). One hundred percent of duplicates met measurement quality objectives (72 of 72). All parameters are sufficiently precise for this study, as evidenced by 100 percent meeting MQOs.

B.7.7 TECHNICAL CONSISTENCY

The last check of data quality is derived from the question, “Do the results make sense?” This program uses the total versus dissolved fraction analysis. The total is the sum of the particulate and dissolved fractions of an analyte. The metals cadmium, copper, lead, mercury, and zinc, as well as the nutrient phosphorus, are analyzed in both their dissolved and total form.

The MQO is met if the dissolved concentration is greater than 120 percent of the total concentration. The performance method detection limit is substituted for non-detect values. The analysis pair is rejected if the dissolved concentration is greater than 120 percent of total and at least one value is greater than five times the reporting limit goal. The magnitude of values accounts for elevated variability at the level of the detection limit goal (MQO) and increasing stability of results as concentrations increase (5x rule for reject review).

At all statistic levels (percentile, min, median, max; Table B7-6 Sensitivity), dissolved mercury has a higher detection limit (0.0016-0.008 µg/L) than total mercury (0.0022-0.0111 µg/L) for stormwater and baseflow samples. This resulted in 67 MQO exceedances, 64 of which were due to non-detect pairs. None of the mercury results were greater than five times the detection limit goal (i.e., no rejections) (Table B7-1).

Eighty-six percent (403 of 470) data pairs met the MQOs and associated data are technically consistent for the purposes of this study**.**

B.7.8 COMPLETENESS

As noted in previous sections of this report, sampling and hydrologic results constitute a complete and representative data set for WY2024. Laboratory completeness includes the program elements from sample submission to results produced and may be further refined to include data quality. Deficiencies are noted in a timely manner and samples are re-processed and re-analyzed when possible. Ninety-six percent of quality control data met measurement project objectives and 0.5 percent fell within a censor or rejection region (Tables B7-1 and B7-2, 40 censored out of 8,309 data points – all but the Detection Profile totals). The WY2024 data set is sufficiently complete for study objectives.

B.7.9 QUALITY ASSURANCE AND CONTROL SUMMARY

Overall, data quality throughout the Foss/NPDES monitoring project is sufficient and sample results represent the target populations of interest. An exceedance of an MQO does not automatically lead to rejected data, though it is classified by its appropriate data qualifier flag. Data are censored or rejected if performance is within the rejection region, as described above. Only 40 out of 8,309 (0.5 percent) of performance data are classified as censored or rejected (Tables B7-1 and B7-2). Performance is summarized by the DQIs below.

- **Sensitivity.** Ninety-six percent of stormwater and baseflow, and 99.8 percent of SSPM met MQOs. The magnitude of most stormwater exceedances was low, less than twice DLG.

- **Bias.** Ninety-eight percent of stormwater and baseflow, and 96 percent of SSPM met MQOs.
- **Precision and Comparability.** Ninety-six percent of stormwater and baseflow, and 100 percent of SSPM are precise and comparable according to MQOs. Precision is measured as duplicate relative percent difference for laboratory, matrix spike, and field duplicates.
- **Technical Consistency.** Eighty-six percent of stormwater and baseflow samples are technically consistent. That means dissolved metal and orthophosphate concentrations are generally less than their total counterparts. The 14 percent was solely due to the MDL for dissolved mercury (0.0111 µg/L) that were higher than the MDL for total mercury (0.008 µg/L). Ninety-six percent of exceedances were for non-detect pairs.
- **Completeness.** Ninety-nine point seven percent of data were deemed useable. Forty of 8,309 (0.5 percent) quality control data points fell within the rejection region (all but Detection Profile totals). Rejected data primarily includes organic compound detection limit exceedances from a single stormwater sample (19 rejections, relabeled U or UJ estimates of concentration) and rinse blank rejections (10 - conventional, nutrients, and metals) from two stormwater samples. The WY2024 data set is sufficiently complete for study objectives.

B.7.9.1 Follow-Up Actions

Field Analysis Recommendations:

- Collect field blank and duplicate samples as per the schedule of the 2023 QAPP (Tacoma 2023). Provide seven rinse blanks for analysis, one from each sample site.
- Collect three or five field replicates for MH390.
- Continue clean techniques training, including one event conducted in the field and one in the sample receiving room, including field blank analysis.

B.8 RECOMMENDATIONS FOR QAPP REVISIONS

The new QAPP for this monitoring program was approved by EPA and Ecology in December 2023 and will be effective for WY2024. There have been no significant changes since that time.

This revised 2023 QAPP (V 1.2) included the following significant changes to the 2020 QAPP:

- Relocating a monitoring station (Section 3.1 and Section 7.1)
- Changes to Project Team Members (Section 5.1)
- Clarification of holding time procedures (Section 8.2.5)
- Changes in analytical methods (Section 9.1) and data analysis methods (Section 13)

B.9 DISCUSSION OF RESULTS

This section describes the analytical results from the stormwater (composite and grab), sediment, and baseflow (composite and grab) samples collected from the Foss monitoring locations.

B.9.1 ANNUAL FLOW DATA

A compilation of rainfall and runoff statistics for storm events occurring in each of the outfalls in WY2024 is presented in Tables B9-1.1 through B9-1.7.

Tables B9-1.1 through B9-1.7 include the following statistics:

- Storm event start date, time, and duration (hours), and whether a sample was collected during the event
- Storm event total precipitation (inches) and estimated runoff depth (inches)
- Estimated total discharge volume per event (acre-feet)
- Event mean storm flow and combined flow (gallons per minute); baseflow is assumed to be constant throughout the year
- Fraction of stormwater in the combined (baseflow + storm flow) discharge
- Total wet season, dry season, and annual storm period durations, rain depths, and runoff volumes
- Mean wet season, dry season, and annual storm flow rates

A summary of the estimated seasonal and annual discharge volumes at all outfalls for WY2024 is presented in Table B9-2. These volumes are used in conjunction with chemical analytical results to estimate seasonal and annual pollutant loadings, as presented in Section 6 of the WY2024 Report (Tacoma 2025).

The determination of whether or not there are baseflow components in OF245, OF243, and OF254 is unclear, as the hydrographs are complicated by tidal inundations. Based on an analysis of the continuous flow record, it was determined that there is no substantive baseflow in OF245, OF243, and OF254.

As discussed in Section B.2.2 and the 2023 QAPP, the drainage area changed for OF230 and OF235 during WY2023 with the addition of new OF230A. The majority of the flow from the historic OF230 now discharges to OF230A (98 percent). During WY2024, the City continued to monitor flow at OF230. Previous storm volume for OF230 from WY2016 to WY2022 ranged from 422 acre-feet to 701 acre-feet with 255 acre-feet of baseflow. Based on a review of the new drainage area and hydrology for OF230, the storm volume for WY2024 is a small fraction of the previous flow with a storm flow of 20 acre-feet and no recorded baseflow. Based on this analysis the City will report OF230A flow as a historical comparison for OF230 beginning in WY2024. WY2023 is considered a transition year as flow gradually transitioned to the new OF230A from October to December 2022.

While a portion of the drainage area for OF235 now discharges to OF230A, the City will continue to compare hydrology with the historic OF235 (Table B9-2).

B.9.2 Stormwater Sampling

For each sampled event, the following information is discussed in the WY2024 Report (Tacoma 2025), which contains historical sampling data for comparison and statistical inference (Section 3.2 Monitoring Results – WY2002-WY2024, Section 3.3 Spatial Analysis, Section 3.4 Seasonal Analysis, and Section 3.5 Time Trend Analysis):

- A statistical analysis of the event mean concentrations for each parameter (Appendix E of the WY2024 Report) and a narrative description of significant findings from this analysis
- Trend analyses (see Section B1.4.2) for each analyte or indicator compound with three or more years of data
- Any conclusions based on data from this study, including analysis of previously collected data from these discharge monitoring locations
- A description of stormwater management program/source control activities which occurred, are currently taking place, or are planned within the monitoring station's drainage area that may have affected or may potentially affect future monitoring results
- An evaluation of the data as it applies to the Stormwater Management Program (SWMP)
- Any stormwater management activities the Permittee has identified that can be adjusted to respond to the data

Statistical tests and comparisons between monitoring locations are presented in Section 3.0 of the WY2024 Report. Historical summary statistics and statistical tests for the entire monitoring record, WY2002-2024 for indicator parameters representing constituents of concern under the Foss Monitoring Program, are discussed in Sections 3.3 Spatial Analysis, 3.4 Seasonal Analysis, and 3.5 Time Trend Analysis, as well as in Tables 3-3.1, 3-4, and 3-6 of the WY2024 Report.

Program effectiveness of the Thea Foss Source Control Strategy and SWMP is evaluated by linking source control activities, stormwater and sediment long-term monitoring, post-construction sediment monitoring, and Water Quality Analysis Simulation Program (WASP) modeling (for the first 10 years post-remediation). The description, evaluation and response to activities and data are discussed in Section 5 of the WY2024 Report.

B.9.2.1 Non-Detected Data

If any chemicals are non-detected for two years, that chemical may be removed from the list of analytes in the QAPP.

Chlorpyrifos and NWTPH-Gasoline were non-detected at all outfalls in WY2018 and WY2019. Removal of these chemicals were discussed with Ecology and analyses are no longer required under the new 2023 QAPP.

B.9.3 Sediment Sampling

The results of the stormwater sediment sampling event for WY2024 are presented in the WY2024 Report Appendix D, Table D-8. For each SSPM sample, the following information is discussed in the WY2024 Report, which contains historical sampling data for comparison and statistical inference (Section 3.2 Monitoring Results – WY2002-WY2024 and Section 3.3 Spatial Analysis):

- A narrative analysis of the parameter concentrations

- Any conclusions based on trend data that may result from this study or from previously collected data from these sites
- A description of SWMP activities currently taking place or planned within the monitoring station's drainage area

The WY2024 Report provides a narrative summary of the Foss monitoring parameters. Sediment results for WY2024 are presented in the WY2024 Report Appendix D, Table D-8. Historical summary statistics and statistical tests for the entire monitoring record, WY2002-2023, for indicator parameters representing constituents of concern under the Foss Monitoring Program are discussed in Section 3.2 and in Table 3-3.2 of the WY2024 Report.

Program effectiveness of the Thea Foss Source Control Strategy and SWMP is evaluated by linking source control activities, long-term stormwater and sediment monitoring, post-construction sediment monitoring, and WASP modeling (for the first 10 years post-remediation). The description, evaluation, and response to activities and data are discussed in Section 5 of the WY2024 Report.

B.9.4 BASEFLOW SAMPLING

Baseflow sampling was discontinued in WY2011 with the approval of EPA and Ecology, as the baseflow quantity and quality were determined to be well characterized by the 10-year monitoring record. Since that year, detection limits for some analytes have changed and are lower than those in the 2001 SAP. The WY2011 baseflow concentrations, many of which were not detected, biased the baseflow pollutant loadings and overestimated the resulting loads. In order to more accurately estimate the baseflow loadings, baseflow samples were collected in WY2016 and WY2019 and analyzed for the stormwater analytes listed in the QAPP. Baseflow samples were collected in WY2024 at OF230A and OF235 to characterize baseflow at these locations due to the change in drainage area. Additional baseflow samples will be collected in WY2025 at these locations.

A total of 44 baseflow samples were collected in WY2016 and WY2019 at all seven outfalls and a total of four additional baseflow samples were collected from OF230A and OF235 during WY2024. In general, these baseflow concentrations were similar or less than the 2001-2011 baseflow concentrations, which had 297 samples collected during that time period. The four WY2024 baseflow concentrations were similar to the WY2016 and WY2019 data set for OF230A and OF235 and were used in the baseflow loadings calculations.

The City plans to evaluate and report the OF230A and OF235 baseflow data collected in WY2024 and WY2025 in the WY2025 Report. The new baseflow data will be compared to the historic data to determine if the baseflow data for the historic drainage areas can continue to be utilized to characterize baseflow.

B.9.5 RAINFALL-RUNOFF CORRELATIONS

The City installed flow meters in its three NPDES drainage basins (OF235, OF237B, and OF245) and collected continuous flow data during all of WY2010, as required by the Phase I Permit. During WY2011, the flow records from WY2010 were analyzed to develop rainfall-runoff correlations for the three basins. The rainfall-runoff correlations for these basins are shown on Figures B2-8, B2-11, and B2-16. The runoff has been normalized to basin size, such that both rainfall and runoff are presented in depth units, and the slope of the regression line is the runoff coefficient. Separate correlations were developed for wet season and dry season conditions. The estimated runoff parameters are presented in Tables B9-1.2, B9-1.4, and B9-1.6, and summarized in Table B9-2.

During WY2016, the flow records from WY2015 and WY2016 were analyzed to develop rainfall-runoff correlations for OF230, OF237A, OF243, and OF254. The rainfall-runoff correlations are shown on Figures B2-6, B2-10, B2-13, and B2-18. The runoff has been normalized to basin size, such that both rainfall and runoff are presented in depth units, and the slope of the regression line is the runoff coefficient. Separate correlations were developed for wet season and dry season conditions. The estimated runoff parameters are presented in Tables B9-1.1, B9-1.3, B9-1.5, and B9-1.7, and summarized in Table B9-2. Due to the change in drainage area for OF230 (now OF230A) and OF235, the City will develop new rainfall to runoff correlations for OF235 and OF230A once sufficient data is available.

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Tables

Table B2-1
Monitoring Site Basin Characterization Summary

	OF230	OF230A	OF235	OF237A	OF237B	OF243	OF245	OF254
Represented Land Use	N/A	N/A	Commercial	N/A	Residential	N/A	Industrial	N/A
Surface Area Distribution								
Total Area (acres)	24	583	109	2813	1979	59	39	127
Impervious Estimate (%)	78.5	70.1	72.8	59.4	48.0	90.7	93.1	82.2
Land Use Distribution Estimate [1, 2]								
Residential (%)	0%	24%	0%	47%	72%	0%	0%	0%
Industrial (%)	0%	0%	0%	17%	1%	65%	87%	81%
Commercial (%)	100%	76%	99%	25%	19%	35%	12%	16%
Open Space (%)	0%	1%	1%	11%	13%	0%	0%	0%
Hydrologic Information								
Time of Concentration (minutes)[3,4]	N/A	24	11	62	129	16	18	11
Rain Gauge	NOAA Station Tacoma No. 1							
	RG10							
	RG03							
Rain Gauge Location (latitude/longitude)	47.2472/ 122.4122							
	47.5000/ 122.2600							
	47.6481/122.3081							
Mean Annual Precipitation (in)[5]	38.09							
	34.3							
	35.6							

[1] City of Tacoma Zoning, Street, and Parcel Data using ESRI ArcGIS 9 for calculations – September 2019

[2] Land use is generally grouped into four categories: (1) residential which includes one family, two family, and low density multifamily and may include other/NA; (2) commercial which includes residential commercial, community commercial, downtown commercial, hospital medical, schools, government/public facility and may include other/NA; (3) industrial which includes light and heavy industrial and port maritime/industrial and may include vacant; and (4) open which includes parks/open space and may include vacant residential lots.

[3]The times of concentration were estimated using SBUH methodology (Tacoma 2000). This method is described in the City's Surface Water Management Manual (Tacoma 2003). The Time of Concentration, Tc, is defined as:

T c =L¸k×s 1/2

Where:

Tc = time of concentration (minutes)

L = flow length (ft)

k = velocity factor (ft/s) (value for sheet, shallow and channel flow)

s = slope of flow path (ft/ft)

[4] The time of concentration for OF230A is estimated based on the historic evaluation for OF230. There is a slight increase in flow length (514ft or <1%) and a slight descrease in slope (1%). Due to this change the City added 5% to the historic OF230 Tc.

[5] NOAA Station Tacoma No. 1 52-year record: 1948-1998 (2003).

Table B2-2
Mean Lower-Low Water (MLLW) Tidal Elevations

Outfall	Pipe Size	Baseflow	Flow Rate (cfs)	Outfall Pipe Elevation (ft)	Outfall Pipe Elevation (MLLW ft)	Sed Trap Location Elevation	Tidal Influence	Whole Water Location Elevation (MLLW ft.)	Tidal Influence
OF230A (Initial)[1]	60"	Cont.	0.12	-6.76	-0.44	17.3	No	0.2	Yes
OF230A	60"	Cont.	0.12	-6.76	-0.44	17.3	No	17.3	No
OF230	60"	Cont.	0.12		4.3	20+	No	7.0	Yes
OF235	41"	Cont.	0.4	-1.6	4.7	9.9	Minimal	9.8	Minimal
OF237A	72"	Cont.	2.8	0	6.3	15	No	15.0	No
OF237A New	96"	Cont.	4.4	0	6.3	--	--	11.7	Minimal
OF237B	72"	Cont.	8.3	0	6.3	16.5	No	13.6	No
DA-1 Line	--	--	--		--	--	--	14.6	No
OF243[2]	36"	Tidal	0.4	-0.73	5.6	5.0	Yes	5.2	Yes
OF245[2]	18"	Tidal	0.1	-2.7	3.6	3.5 (sump)	Yes	3.2	Yes
OF254	37.5"	Tidal	0.4	-2	4.3	--	--	4.4	Yes

Table B2-1 Monitoring Site Basin Characterization Summary

[1] Initial montioring location for OF230A from April 2023 to November 2023. The site moved to new location due to tidal conditions.

[2] OF243 is protected from direct saltwater influence from the waterway by a duckbill valve at the end of the outfall and OF 245 manhole sump has a tidal gate valve.

Notes:

1) All elevations are estimated based on review of plans and visual observations. Baseflow was measured in January and February 2001 for Outfalls 235, 243, 245, and 254. Baseflow for 237A and 237B was measured in October to December 1995 and site is tidally influenced when tide elevation is above the whole water location elevation.
2) 0 feet MLLW tidal Datum is equal to -6.32 feet City of Tacoma Datum.
3) Wholewater is no longer monitored at OF237A, OF230 and DA-1 Line. These are for historic reference.

Table B2-3
Sediment Traps - List of Analytes by Location

Outfall ID	Sediment Trap ID	Location	Grain Size	Total Solids	Total Volatile Solids	Total Organic Carbon	Total Phosphorus	NWTPH-Dx	Bifenthrin and dichlobenil	Copper and Cadmium	Lead	Mercury	Zinc	PAHs	Phthalates	PCBs	Phenols and PBDEs
OF230A	FD7[a]	Between South 15th & South 14th on A Street. MH 6783605 installed in downstream stormline.	Foss/ NPDES	Foss/ NPDES	NPDES	Foss/ NPDES	NPDES	Foss/ NPDES	NPDES	NPDES	Foss/ NPDES	Foss/ NPDES	Foss/ NPDES	Foss/ NPDES	Foss	Foss/ NPDES	NPDES
	FD3a	South 15th & Court "A;" MH 21 ft. east of FD3 in brick plaza, under SR 705 off-ramp															
	FD3	South 15th & Court "A;" MH in brick plaza , under SR 705 off-ramp															
	FD3b	Pacific Avenue & Hood Street; MH on sidewalk															
	FD3C	MH between crest of Hood st. and i705 off ramp in median triangle	Foss	Foss		Foss						Foss		Foss		Foss	
	FD16	South 15th and Market Streets (MH-226)	Foss	Foss		Foss										Foss	
	FD16b	Near 609 So. 15th (MH-422) (above Bates Tech. College)															
	FD18	1100 block of Market Street (MH-144) (downtown, near YMCA)	Foss	Foss		Foss								Foss		Foss	
	FD18b	Tacoma Ave. So. And So. 11th (MH-261) (near County City Bldg and WNG Armory)															
OF230	FD3 New[a,c]	South 15th & "A" Street; MH 262 at crest of bridge (31 ft. deep)	Foss/ NPDES	Foss/ NPDES	NPDES	Foss/ NPDES	NPDES	Foss/ NPDES	NPDES	NPDES	Foss/ NPDES	Foss/ NPDES	Foss/ NPDES	Foss/ NPDES	Foss	Foss/ NPDES	NPDES
OF235	FD6[a]	East 21st & Dock Street; MH on Dock Street under SR 509	Foss/ NPDES	Foss/ NPDES	NPDES	Foss/ NPDES	NPDES	Foss/ NPDES	NPDES	NPDES	Foss/ NPDES	Foss/ NPDES	Foss/ NPDES	Foss/ NPDES	Foss	Foss/ NPDES	NPDES
	FD6a	South 19th and Market; MH in the center of the intersection															
	FD6b	South 21st and Fawcett; MH at NW corner of the intersection															
OF237A	FD2[a]	Dock Street pump station; MH inside pump station yard	Foss/ NPDES	Foss/ NPDES	NPDES	Foss/ NPDES	NPDES	Foss/ NPDES	NPDES	NPDES	Foss/ NPDES	Foss/ NPDES	Foss/ NPDES	Foss/ NPDES	Foss	Foss/ NPDES	NPDES
	FD2a	E. 23rd & Dock Street; MH inside Dock Street Pump Station next to power control station.	Foss	Foss		Foss								Foss		Foss	
	FD13	Off Center Street, alley between Ash and Wilkenson Streets (MH-294)															
	FD13b	So. 23rd and Ferry St. (MH-104) (below major complexes, TNT, AT&T, DSHS)															
	FD13b New	In between So. 23rd and Ferry St. upstream from FD13-B (below major complexes, TNT, AT&T, DSHS	Foss	Foss		Foss								Foss			
	FD5	South 18th & Cedar Street; MH in intersection															
	FD10	BNSF right of way between Cedar and Lawrence Streets (MH-412) (near Nalley's Fine Foods warehouse yard, approximately 500 ft. NE of main office)															
	FD10c	Lawrence Street near Nalley's main Bldg 7, loading dock door (MH-303) (Nalley's processing and shipping yard)	Foss	Foss		Foss										Foss	
	FD10b	Near So. Tacoma way and Lawrence street (MH-022) (above Nalley's and picks up major car lots, dealerships, retail complexes, PSE yard) MH behind 3215 STW.															
OF237B	FD1[a]	Dock Street pump station; MH inside pump station yard	Foss/ NPDES	Foss/ NPDES	NPDES	Foss/ NPDES	NPDES	Foss/ NPDES	NPDES	NPDES	Foss/ NPDES	Foss/ NPDES	Foss/ NPDES	Foss/ NPDES	Foss	Foss/ NPDES	NPDES
	FD30	Tacoma Dome Parking Lot, SW section, (MH459)															
	FD31	East 50 feet at intersection of Pacific and So. 32nd (MH570)															
	FD32	Intersection of So. Wright and Pacific Ave (MH576) (main truck line check point)															
	FD33	In front of 5209 Pacific Ave (MH110)															
	FD34	In front of 402 E. 53rd (MH167)															
	FD35	500 Block of E. 56th (MH244)															
	FD36	E. 72nd and E. D Street (MH234)															
	FD37	7216 E. D street, backyard (MH262)															
	FD38	E. B Street and E. 72nd (MH229)															
OF243	FD23[a]	East 21st & "D" Street; MH in sidewalk on west side of "D" Street (under SR 509)	Foss/ NPDES	Foss/ NPDES	NPDES	Foss/ NPDES	NPDES	Foss/ NPDES	NPDES	NPDES	Foss/ NPDES	Foss/ NPDES	Foss/ NPDES	Foss/ NPDES	Foss	NPDES	NPDES
OF245	FD21	457 East 18th Street; CB on East 18th Street near main office (former MPS, now Quality Transport)	Foss	Foss		Foss					Foss		Foss				
	MH390[a]	SAP #6761877	Foss/ NPDES	Foss/ NPDES	NPDES	Foss/ NPDES	NPDES	Foss/ NPDES	NPDES	NPDES	Foss/ NPDES	Foss/ NPDES	Foss/ NPDES	Foss/ NPDES	Foss	NPDES	NPDES
OF248	FD22[a,b]	East 18th Street; CB downstream of site adjacent to Super Value (West Coast Grocery) warehouse (approximately 510 ft. west of FD21)	Foss	Foss		Foss					Foss		Foss		Foss		

a - Outfall sediment trap
b - Outfall is not a NPDES outfall. Therefore, NPDES analytes do not apply to this outfall trap.
c - The City will evaluate removal of this sediment trap at the end of WY2024.
[shaded] Not analyzed for this trap. Historical analyses that are no longer required are shown to indicate changes from 2001 Foss SAP. Incorporates changes from EPA April 23, 2013 letter.

Table B2-4
ISCO Site-Specific Settings and Enables

Storm 1.0	
Location	Pacing
OF230A	104,306
OF235	67,518
OF237A New	625,000
OF237B	750,000

Storm 0.5	
Location	Pacing
OF230A	51,786
OF235	32,669
OF237A New	275,000
OF237B	300,000

Storm 0.9	
Location	Pacing
OF230A	93,802
OF235	60,548
OF237A New	550,000
OF237B	650,000

Storm 0.2	
Location	Pacing
OF230A	20,274
OF235	11,759
OF237A New	75,000
OF237B	85,000

Storm 0.6	
Location	Pacing
OF230A	62,290
OF235	39,639
OF237A New	345,000
OF237B	400,000

All Storms	
Location	Pacing
OF243	10 Minutes
OF245	10 Minutes
OF254	10 Minutes

Storm 0.3	
Location	Pacing
OF230A	30,778
OF235	17,729
OF237A New	140,000
OF237B	150,000

Storm 0.7	
Location	Pacing
OF230A	72,794
OF235	46,609
OF237A New	412,000
OF237B	450,000

Storm Enables	
Location	Enable
OF230A	LEV > 0.30
OF235	LEV > 0.37, VEL > 0.8
OF237A New	LEV > 0.5, VEL > 6.0
OF237B	LEV > 0.6
OF243	CON < 3.0
OF245	FLOW > 200
OF254	CON < 7.0

Storm 0.4	
Location	Pacing
OF230A	41,282
OF235	25,699
OF237A New	210,000
OF237B	250,000

Storm 0.8	
Location	Pacing
OF230A	83,298
OF235	53,578
OF237A New	480,000
OF237B	525,000

Note: Pacing and enables may be adjusted at any time based on current site conditions.
Pacing and enbales are identified in the ISCO reports for each sampling event.
ISCO Reports are included in the field report for each event.

Table B2-5
Sampling Design Summary

	OF230/OF230A[f]	OF235	OF237A	OF237B	OF243	OF245	OF254	Total
	Composite Stormwater Samples per Year[e]							
# Samples/Year -Required by Foss CD	8[a]	8[a]	8[a]	8[a]	3[a]	3[a]	3[a]	N/A
# Samples/Year - Required by NPDES Permit	8 min 11 max[b]	8 min 11 max[b]	8 min 11 max[b]	8 min 11 max[b]	0 min 11 max[b]	8 min 11 max[b]	0 min 11 max[b]	55[b]
	Grab Samples per Year[e]							
# Samples/Year - Required by Foss CD	0	0	0	0	0	0	0	
# Samples/Year - Required by NPDES Permit	8 min 11 max[c]	8 min 11 max[c]	8 min 11 max[c]	8 min 11 max[c]	0 min 11 max[c]	8 min 11 max[c]	0 min 11 max[c]	55[c]
	Outfall Sediment Trap Samples per Year[e]							
# Samples/Year -Required by Foss CD	1	1	1	1	1	1	0[d]	
# Samples/Year - Required by NPDES Permit	1	1	1	1	0	1	0[d]	
	Upland Sediment Trap Samples per Year[e]							
# Samples/Year -Required by Foss CD	As described in Table B2-3							
# Samples/Year - Required by NPDES Permit	None							

a - Due to the statistical record associated with the Foss program, the number of samples required per outfall under the Foss program shall be increased or decreased based on the procedure outlined in Section 7.2.4 of the QAPP (2014). This increase or decrease in sampling frequency under the Foss CD shall not affect the number of samples required by the NPDES Permit (e.g., the NPDES requirements will not change even if fewer samples are required by the Foss CD).

b - The Permit requires a total of 55 composite samples (5 outfalls, 11 samples each). Since the City is monitoring 7 outfalls required to comply with the Foss CD requirements, the City will meet the NPDES requirements by collecting 55 total samples from all 7 outfalls with a minimum of 8 samples (maximum of 11) from 5 of the outfalls . All of the 55 samples collected will be sampled for the full Foss/NPDES analyte list (Table 3-1 of the QAPP (2014)). Since the City has a strong statistical record for all of the Foss analytes (analytes that have been monitored under the Foss program for over 12 years), the City would likely be able to provide Ecology with a statistical analysis (in accordance with Appendix 9 of the Permit) for all the Foss analytes that demonstrates that the number of samples per year can be reduced for these Foss analytes while still meeting the monitoring goals. For the new NPDES analytes where the City does not have a statistical record, the City feels that providing Ecology with information potentially from more outfalls representing a broader area with slightly fewer samples per outfall is more useful than providing more samples from fewer outfalls. These new NPDES analytes have very limited data available from other stormwater monitoring programs (especially in Washington state). Information about the spatial distribution and the associations with various land uses for these new analytes is more useful than gathering more samples from fewer outfalls since the goal for these new analytes is not necessarily to develop long term trends.

c - The Permit requires a total of 55 grab samples (5 outfalls, 11 samples each). Consistent with the approach for the composite samples, the City will collect 55 total grab samples from all 7 outfalls with a minimum of 8 samples (maximum of 11) from 5 of the outfalls and the remainder coming potentially from the other two Foss outfalls. This will provide Ecology with better information about the spatial distribution (i.e., the variability of these analytes in stormwater outfalls) of these NPDES analytes.

d - Due to tidal conditions, a sediment trap cannot be installed in OF254.

e - These numbers do not include QC samples.

f- Monitoring at OF230 was discontinued during WY2023 and OF230A now represents 98% of the flow previously discharging to OF230.

Table B2-6
Representative Storm Event Criteria and Sampling Frequency

Criteria	Wet season	Dry season
Period	October 1 through April 30	May 1 through September 30
Rainfall volume	0.20” minimum, no fixed maximum	0.20” minimum, no fixed maximum
Rainfall duration	No fixed minimum or maximum	No fixed minimum or maximum
Spacing between Sampling Events	Minimum 1 week spacing between events. No more than 2 samples per month.	Minimum 1 week spacing between events. No more than 2 samples per month.
Antecedent dry period	≤ 0.05” rain in the previous 24 hours	≤ 0.02” rain in the previous 48 hours
Inter-event dry period	6 hours	6 hours
% of samples per season	60% to 80%	20% to 40%

a - See Table B2-5 for total annual sample numbers

Table B2-7
Surface Water Methods and Detection Limit Goals

Analyte	Analysis Method	Detection Limit Goal[1]	Lower Limit of Quantitation[1]	Foss and/or NPDES Parameter[2]
Conventionals				
Anionic Surfactants (MBAS)	SM 5540C		25 µg/L	NPDES
BOD	SM 5210B		2 mg/L	NPDES
Chloride	SM 4500-Cl-E		0.2 mg/L	NPDES
Conductivity	SM 2510B		±1 µS/cm	Foss/NPDES
Hardness	SM 2340B		0.05 mg/L	Foss/NPDES
pH	SM 4500H+ B		0.1 std units	Foss/NPDES
TSS	SM 2540D		1 mg/L	Foss/NPDES
Turbidity	SM 2130B		±0.2 NTU	NPDES
Metals				
Cadmium	EPA 200.8		0.2 µg/L	NPDES
Copper	EPA 200.8		0.5 µg/L	NPDES
Lead	EPA 200.8		0.1 µg/L	Foss/NPDES
Mercury	EPA 245.7		0.1 µg/L	Foss
Zinc	EPA 200.8		5 µg/L	Foss/NPDES
Dissolved Cadmium	EPA 200.8	0.03 µg/L	0.1 µg/L	NPDES
Dissolved Copper	EPA 200.8	0.02 µg/L	0.1 µg/L	NPDES
Dissolved Lead	EPA 200.8	0.05 µg/L	0.1 µg/L	Foss/NPDES
Dissolved Mercury	EPA 245.7		0.1 µg/L	Foss
Dissolved Zinc	EPA 200.8		1 µg/L	Foss/NPDES
PAHs				
2-Methylnaphthalene	EPA 8270E SIM	0.01 µg/L	0.1 µg/L	Foss
Acenaphthene	EPA 8270E SIM	0.01 µg/L	0.1 µg/L	Foss/NPDES
Acenaphthylene	EPA 8270E SIM	0.01 µg/L	0.1 µg/L	Foss/NPDES
Anthracene	EPA 8270E SIM	0.01 µg/L	0.1 µg/L	Foss/NPDES
Benzo(a)anthracene	EPA 8270E SIM	0.01 µg/L	0.1 µg/L	Foss/NPDES
Benzo(a)pyrene	EPA 8270E SIM	0.01 µg/L	0.1 µg/L	Foss/NPDES
Benzo(g,h,i)perylene	EPA 8270E SIM	0.01 µg/L	0.1 µg/L	Foss/NPDES
Benzo(b,j,k)fluoranthenes[3]	EPA 8270E SIM	0.03 µg/L	0.3 µg/L	Foss/NPDES
Chrysene	EPA 8270E SIM	0.01 µg/L	0.1 µg/L	Foss/NPDES
Dibenz(a,h)anthracene	EPA 8270E SIM	0.01 µg/L	0.1 µg/L	Foss/NPDES
Fluoranthene	EPA 8270E SIM	0.01 µg/L	0.1 µg/L	Foss/NPDES
Fluorene	EPA 8270E SIM	0.01 µg/L	0.1 µg/L	Foss/NPDES
Indeno(1,2,3-cd)pyrene	EPA 8270E SIM	0.01 µg/L	0.1 µg/L	Foss/NPDES
Naphthalene	EPA 8270E SIM	0.01 µg/L	0.1 µg/L	Foss/NPDES
Phenanthrene	EPA 8270E SIM	0.01 µg/L	0.1 µg/L	Foss/NPDES
Pyrene	EPA 8270E SIM	0.01 µg/L	0.1 µg/L	Foss/NPDES
Retene	EPA 8270E SIM	0.01 µg/L	0.1 µg/L	NPDES
Phthalates				
Di(2-ethylhexyl)phthalate	EPA 8270E SIM	0.5 µg/L	1 µg/L	Foss/NPDES
Butylbenzylphthalate	EPA 8270E SIM	0.5 µg/L	1 µg/L	Foss/NPDES
Diethylphthalate	EPA 8270E SIM	0.5 µg/L	1 µg/L	Foss/NPDES
Dimethylphthalate	EPA 8270E SIM	0.5 µg/L	1 µg/L	Foss
Di-n-butylphthalate	EPA 8270E SIM	0.5 µg/L	1 µg/L	Foss/NPDES
Di-n-octyl phthalate	EPA 8270E SIM	0.5 µg/L	1 µg/L	Foss/NPDES
Pesticides				
Bifenthrin	EPA 8270E SIM	0.02 µg/L	0.05 µg/L	NPDES
Dichlobenil	EPA 8270E SIM	0.02 µg/L	0.05 µg/L	NPDES
Nutrients				
Total Nitrogen[4]	ATP (WM920550)	0.03 mg/L	0.3 mg/L	NPDES
Nitrate/Nitrite	EPA 353.2	0.007 mg/L	0.1 mg/L	NPDES
Total Phosphorus	SM 4500P-F	0.003 mg/L	0.01 mg/L	NPDES
Orthophosphate	SM 4500P F	0.003 mg/L	0.01 mg/L	NPDES
Total Petroleum Hydrocarbons				
NWTPH-Dx (Diesel)	Ecology97-602	0.1 mg/L	0.25 mg/L	Foss/NPDES
NWTPH-Dx (Heavy Oil)	Ecology97-602	0.1 mg/L	0.5 mg/L	Foss/NPDES
Bacteria[5]				
Fecal Coliform	SM 9221E		2 to 2E6 max	NPDES
E. Coli	SM 9221B+F+C (MPN)		2 to 2E6 max	NPDES
Enterococcus	SM 9230D Enterolert		2 to 2E6 max	NPDES

[1]Appendix 9 of the NPDES permit specified detection limit goals (DLG) as well as lower limits of quantitation (LLOQ). LLOQ is the lowest concentration at which the laboratory has demonstrated target analytes can be reliably measured and reported with a certain degree of confidence. LLOQ is greater than or equal to the lowest standard and results greater than LLOQ are normally reported without qualification. Nitrogen, mercury, and PAH DLGs are lower than NPDES and are City set. The detection limit goal and LLOQ are measures of sensitivity. If a DLG is not presented, the LLOQ is used for measurement quality objective.

[2]Parameter specified under Foss, NPDES, or both programs.

[3]Benzo (b), (-j) and (-k) fluoranthene coelute. All three contain the same 0.1 benzo(a)pyrene Toxicity Equivalence Factor (TEF) under WAC 173-340-708(8)(e), Tables 708 2, 708-3 for assessing human health criteria (Ecology 2015). Benzo(b,j,k)fluoranthene will be reported as it is a more accurate identification, more conservative for purposes of human health, and comparable to Foss stormwater data collected since 2001 (reported as (b,k) combined). Sensitivity has been adjusted to reflect a combined parameter.

[4]Total Kjeldahl Nitrogen (TKN) can be calculated as the difference between Total Nitrogen and Nitrate/Nitrite. Total Nitrogen will be calculated using an Alternative Test Procedure which was approved for use in determining nitrogen in stormwater (Ecology letter dated 9/16/13).

[5]Ecology specified Fecal Coliform Bacteria in Appendix 9 of the NPDES permit. The freshwater state standard will change from fecal coliform to E. coli 12/31/2020 (WAC 173-201A-200). The City will analyze for fecal coliform, E. coli and enterococcus (saltwater criteria) until 9/30/2021, then may revert to E. coli only for the remainder of the permit. Further discussion is provided in Attachment 1.

Table B2-8
Required Sample Analysis Priority Order

Required Whole-Water Composite Sample Analysis Priority Order

Order[a]	All Outfalls
1	Conductivity and pH
2	PAHs, phthalates, phenols, bifenthrin, dichlobenil
3	Mercury
4	Other metals and hardness
5	Dissolved mercury
6	Other dissolved metals
7	TSS
8	Nutrients, nitrogen then phosphorus
9	BOD5
10	Surfactants
11	Turbidity
12	Chloride

a - Order reflects a combination of the Foss CD (Section 8.1 of the 2001 SAP) and Appendix 9 of the Permit.

Required Sediment Sample Analysis Priority Order

Order[a,b]	All Outfalls
1	Total solids, total volatile solids
2	PAHs, phthalates, phenols, bifenthrin and dichlobenil
3	NWTPH-Dx
4	PCBs
5	Grain size
6	Total organic carbon
7	Mercury
8	Other Metals
9	Nutrients
10	PBDE

a - Order reflects Foss CD requirements (Table 6 of the 2001 SAP) plus NPDES analytes in Appendix 9 of the Permit. If an analyte is not required to be analyzed (see Table 3-3 of the QAPP (2020)), that analyte shall be skipped in the order listed above.

b - Order of analyses may be modified based on past sampling results. The goal of modifying the order is to ensure analyses are conducted for contaminants that have historically shown elevated concentrations.

Table B2-9
Sediment Methods and Detection Limit Goals

Analyte	Analysis Method	Lower Limit of Quantitation[1]	Foss and/or NPDES Parameter[2]
Conventionals			
Total Organic Carbon	9060 Mod	0.1%	Foss/NPDES
Grain Size	ASTM D422	NA	Foss/NPDES
Total Solids	SM 2540G	0.1%	Foss/NPDES
Total Volatile Solids	SM 2540G	0.1%	NPDES
Metals			
Total Cadmium	EPA 6020B	0.1 mg/kg	NPDES
Total Copper	EPA 6020B	0.1 mg/kg	NPDES
Total Lead	EPA 6020B	0.1 mg/kg	Foss/NPDES
Total Mercury	EPA 7471B	0.005 mg/kg	Foss
Total Zinc	EPA 6020B	0.5 mg/kg	Foss/NPDES
PAHs			
2-Methylnaphthalene	EPA 8270E	70 µg/kg dry	Foss
Acenaphthene	EPA 8270E	70 µg/kg dry	Foss/NPDES
Acenaphthylene	EPA 8270E	70 µg/kg dry	Foss/NPDES
Anthracene	EPA 8270E	70 µg/kg dry	Foss/NPDES
Benzo(a)anthracene	EPA 8270E	70 µg/kg dry	Foss/NPDES
Benzo(a)pyrene	EPA 8270E	70 µg/kg dry	Foss/NPDES
Benzo(g,h,i)perylene	EPA 8270E	70 µg/kg dry	Foss/NPDES
Benzo(b,j,k)fluoranthenes[3]	EPA 8270E	210 µg/kg dry	Foss/NPDES
Chrysene	EPA 8270E	70 µg/kg dry	Foss/NPDES
Dibenz(a,h)anthracene	EPA 8270E	70 µg/kg dry	Foss/NPDES
Fluoranthene	EPA 8270E	70 µg/kg dry	Foss/NPDES
Fluorene	EPA 8270E	70 µg/kg dry	Foss/NPDES
Indeno(1,2,3-cd)pyrene	EPA 8270E	70 µg/kg dry	Foss/NPDES
Naphthalene	EPA 8270E	70 µg/kg dry	Foss/NPDES
Phenanthrene	EPA 8270E	70 µg/kg dry	Foss/NPDES
Pyrene	EPA 8270E	70 µg/kg dry	Foss/NPDES
Retene	EPA 8270E	70 µg/kg dry	NPDES
Phthalates			
Di(2-ethylhexyl)phthalate	EPA 8270E	70 µg/kg dry	Foss/NPDES
Butylbenzylphthalate	EPA 8270E	70 µg/kg dry	Foss/NPDES
Diethylphthalate	EPA 8270E	70 µg/kg dry	Foss/NPDES
Dimethylphthalate	EPA 8270E	70 µg/kg dry	Foss
Di-n-butylphthalate	EPA 8270E	70 µg/kg dry	Foss/NPDES
Di-n-octyl phthalate	EPA 8270E	70 µg/kg dry	Foss/NPDES
Pesticides			
Bifenthrin	EPA 8270E SIM	1 µg/kg dry	NPDES
Dichlobenil	EPA 8270E SIM	1 µg/kg dry	NPDES
PCBs[4]			
Aroclors 1016, 1221, 1232, 1242, 1248, 1254 and 1260	EPA 8270E SIM	10 µg/kg dry	Foss/NPDES
Phenolics[5]			
Pentachlorophenol	EPA 8270E	270 µg/kg dry	NPDES
m,p-cresol (3,4-methylphenol)	EPA 8270E	70 µg/kg dry	NPDES
o-cresol (2-methylphenol)	EPA 8270E	70 µg/kg dry	NPDES
PBDEs			
PBDE 47, 49, 66, 71, 99, 100, 138, 153, 183, 184, 191	EPA 1614	10 ng/kg dry	NPDES
PBDE 209	EPA 1614	200 ng/kg dry	NPDES
Nutrients			
Total Phosphorus	SM4500P-F	0.01 mg/kg	NPDES
Total Petroleum Hydrocarbons			
NWTPH-Diesel	NWTPH-Dx	25 mg/kg dry	Foss/NPDES
NWTPH-Heavy Oil	NWTPH-Dx	100 mg/kg dry	Foss/NPDES

[1]Appendix 9 of the NPDES permit specified lower limits of quantitation (LLOQ). LLOQ is the lowest concentration at which the laboratory has demonstrated target analytes can be reliably measured and reported with a certain degree of confidence. LLOQ is greater than or equal to the lowest standard and results greater than LLOQ are normally reported without qualification. Mercury, di-n-octylphthalate and phenol values are detection limit goals, and lower than LLOQ set in Appendix 9. The detection limit goal and LLOQ are measures of sensitivity.

[2]Parameter specified under Foss, NPDES or both programs.

[3]Benzo (b), (-j) and (-k) fluoranthene coelute. All three contain the same 0.1 benzo(a)pyrene Toxicity Equivalence Factor (TEF) under WAC 173-340-708(8)(e), Tables 708-2, 708-3 for assessing human health criteria (Ecology 2015). Benzo(b,j,k)fluoranthene will be reported as it is a more accurate identification, more conservative for purposes of human health, and comparable to Foss stormwater data collected since 2001 (reported as (b,k) combined). Sensitivity has been adjusted to reflect a combined parameter.

[4]PCB Lower Limits of Quantitation. Since 2001, the Thea-Foss and NPDES sediment monitoring programs have used a detection limit goal of 80 µg/kg dry. In Appendix 9, Ecology requested a LLOQ of 0.005 to 0.195µg/kg dry. Current LLOQ performance of 10µg/kg meets the needs of the Thea Foss Consent Decree, source control and effectiveness monitoring programs, and this value has been entered as the LLOQ for this QAPP. Further discussion is provided in Attachment 1.

[5]3-and 4-methylphenol ions cannot be separated for quantitation so the combined parameter will be reported (EPA 2018) - https://www.epa.gov/sites/production/files/2019-01/documents/8270e_revised_6_june_2018.pdf, Table 1).

Table B3-1
Total Rain Depth (Inches) During Past and Present Monitoring Years

		WY2002	WY2003	WY2004	WY2005	WY2006	WY2007	WY2008	WY2009	WY2010	WY2011	WY2012	WY2013	WY2014	WY2015	WY2016	WY2017	WY2018	WY2019	WY2020	WY2021	WY2022	WY2023	WY2024	WY2002 -WY2024 Average	Historical Monthly Mean NCDC 1971-2000	Historical Monthly Mean NCDC 1981 - 2010
WET	October	3.32	0.41	8.88	3.61	3.00	1.28	3.64	2.36	4.18	4.64	3.39	5.97	1.57	6.20	5.92	10.57	5.60	3.89	3.66	3.06	5.03	2.03	2.93	4.14	3.39	3.70
	November	10.13	2.96	6.15	2.81	6.25	15.81	2.64	7.61	7.74	5.37	5.98	7.12	3.40	6.53	8.22	7.57	9.38	4.15	1.85	5.41	10.54	5.64	4.74	6.43	6.10	6.68
	December	6.82	6.58	4.65	4.03	6.28	8.05	8.36	4.03	2.67	6.83	6.44	8.33	1.91	4.88	12.22	3.66	5.74	6.93	7.36	5.64	5.55	6.98	7.91	6.17	5.89	5.52
	January	6.68	8.5	6.79	4.71	11.93	6.92	4.63	7.15	7.40	5.17	7.02	3.31	4.29	3.98	7.20	2.99	7.90	3.70	9.66	8.65	7.28	2.80	6.60	6.32	5.38	5.93
	February	3.56	1.71	2.55	0.79	2.59	4.09	2.84	1.61	3.95	3.54	3.19	1.58	7.68	4.61	5.55	9.24	2.75	4.19	3.35	4.00	3.56	1.79	2.41	3.53	4.44	3.86
	March	4.16	5.08	2.18	3.14	1.91	6.09	4.16	4.68	4.91	6.57	7.11	2.50	8.81	3.89	5.80	8.27	2.15	1.86	3.47	2.06	3.10	2.52	1.61	4.18	4.18	4.06
	April	3.64	3.3	0.91	4.74	2.46	1.34	1.76	3.31	2.90	5.13	3.74	4.52	4.22	1.56	1.37	4.67	5.81	2.65	1.24	0.85	3.34	3.49	1.76	2.99	2.87	3.00
DRY	May	1.14	0.55	2.56	3.34	1.56	1.31	1.01	3.03	4.15	3.77	2.33	2.86	3.23	0.74	0.58	2.02	0.09	0.46	2.49	1.29	3.04	0.62	1.24	1.89	2.01	2.11
	June	1.36	0.36	0.64	1.26	2.25	1.44	1.26	0.33	3.05	1.40	2.54	1.85	0.94	0.22	1.41	1.54	0.69	0.19	1.90	1.85	2.72	0.32	1.27	1.34	1.58	1.57
	July	0.42	0.13	0.00	1.16	0.11	1.30	0.26	0.00	0.78	0.74	0.87	0.01	0.57	0.47	0.61	0.00	0.02	0.77	0.20	0.00	0.19	0.11	0.04	0.38	0.86	0.68
	August	0.06	0.29	2.75	0.04	0.00	0.90	2.32	1.04	0.24	0.27	0.00	1.05	1.72	2.21	0.10	0.09	0.10	1.19	0.42	0.05	0.57	0.26	1.14	0.73	0.83	0.82
	September	0.36	0.69	3.26	0.92	0.74	2.22	0.39	2.82	3.93	0.96	0.02	8.29	2.26	1.12	1.13	1.11	1.54	2.69	2.30	3.20	0.00	2.49	1.14	1.89	1.42	1.29
Wet Season		38.31	28.54	32.11	23.83	34.42	43.58	28.03	30.75	33.75	37.25	36.87	33.33	31.88	31.65	46.28	46.97	39.33	27.37	30.59	29.67	38.40	25.25	27.96	33.74	32.25	32.75
Dry Season		3.34	2.02	9.21	6.72	4.66	7.17	5.24	7.22	12.15	7.14	5.76	14.06	8.72	4.76	3.83	4.76	2.44	5.30	7.31	6.39	6.52	3.80	4.83	6.23	6.70	6.47
Total		41.65	30.56	41.32	30.55	39.08	50.75	33.27	37.97	45.90	44.39	42.63	47.39	40.60	36.41	50.11	51.73	41.77	32.67	37.90	36.06	44.92	29.05	32.79	39.98	38.95	39.22

Key:

	Months	*Seasons/Years*
	> 2" above historical monthly average	*> 8" above historical seasonal/yearly average*
	> 1" above historical monthly average	*> 4" above historical seasonal/yearly average*
	≤ 1" above/below historical monthly average	*≤ 4" above/below historical seasonal/yearly average*
	> 1" below historical monthly average	*> 4" below historical seasonal/yearly average*
	> 2" below historical monthly average	*> 8" below historical seasonal/yearly average*

Table B3-1 Total Rain Depth (Inches) During Past and Present Monitoring Years

Table B4-1
Evaluation of Qualifying Storm Events During WY2024

Storm Event Criteria:	Total	Storms Sampled per Month											
		10/2023	11/2023	12/2023	1/2024	2/2024	3/2024	4/2024	5/2024	6/2024	7/2024	8/2024	9/2024
A: Total Number of Rainfall Events	104	9	11	12	15	11	11	8	8	5	1	5	8
B: Number of A Events Meeting Antecedent Conditions	68	6	9	8	11	7	6	5	5	4	1	4	2
C: Number of **B** Events with >=0.2" Rainfall[a]	30	3	7	3	7	2	0	2	2	1	0	2	1
D: Number of **C** Events Forecasted	25	2	6	3	5	2	1	1	2	1	0	1	1
Number of **D** Events Sampled	16	2	2	2	3	2	0	1	1	1	0	1	1
Number of Outfalls Sampled	--	6	7	7	7	6	--	6	4	3	--	1	6
Number of Outfalls with 2+ Samples per Month	--	4	4	4	5	3	0	0	0	0	0	0	0
Number of Event Sampled that didn't meet antecedent	2	1	1	--	--	--	--	--	--	--	--	--	--

Monitoring Location (Foss Outfalls)	Total	Storms Sampled per Month											
		10/2023	11/2023	12/2023	1/2024	2/2024	3/2024	4/2024	5/2024	6/2024	7/2024	8/2024	9/2024
OF230A	9	--	1	2	2	1	--	1	1	--	--	--	1
235	15	2	2	2	2	2	--	1	1	1	--	1	1
237A New[b]	8	1	2	1	2	--	--	1	--	--	--	--	1
237B	14	3	2	2	2	2	--	1	1	--	--	--	1
243	7	1	1	1	1	1	--	1	--	1	--	--	--
245	14	2	2	2	2	2	--	1	1	1	--	--	1
254	7	2	1	1	1	1	--	--	--	--	--	--	1

a - There was snow predicted or on the ground on January 17, 2024 which disqualified this potential events from meeting the sampling criteria. Samplers were not deployed during this time.

b- The OF237A stormwater sample for the 12/18/2023 event was rejected as it was not represenative of the duration of the event.

Sampling Issues by Month	Explanation/Issue for not meeting sampling goals
10/2023	No sample was collected at OF230A due to equipment issues. This issue was corrected and a this site was successfully sampled in November.
11/2023	Sampling goals were met for the month.
12/2023	Sampling goals were met for the month.
1/2024	Sampling goals were met for the month.
2/2024	Sampling goals were met for the month with the exception of OF237A due to equipment issues.
3/2024	No outfalls were sampled. Only one event met storm criteria but the rainfall was signficanly less than predicted resulting in low sample volumes.
4/2024	No sample was collected at OF254 due to equipment issues.
5/2024	No sample was collected at OF254 due to equipment issues. No samples were collected at OF237A and OF243 due to low volume. The rainfall was less that predicted during the one event that was forecasted and met all goals.
6/2024	No samples were collected at OF230A, OF237A New, OF237B or OF254. Only one event met storm criteria but the rainfall was signficanly less than predicted resulting in low sample volumes.
7/2024	No events met storm criteria.
8/2024	Only one outfall (OF235) was sampled. Only one event met storm criteria but the rainfall was signficanly less than predicted resulting in low sample volumes.
9/2024	Sampling goals were met for the month with the exception of OF243 due to equipment issues and vandalism at this site.

Table B4-2

Thea Foss/NPDES Surface Water Sampling Project 2023-2024 (WY2024) - Composite Sampling

Total Deployment	Storm Sampled	Event Type	Date	Rainfall Prediction in/24hours	Actual Rainfall (inches)	Storm Samples Accepted / Issues						
						Outfall 230A	Outfall 235	Outfall 237ANEW	Outfall 237B	Outfall 243	Outfall 245	Outfall 254
Wet Season 10/01/2023 - 04/30/2024												
		U	10/2/2023	0.09	0.4							
1	1	SA	10/10/2023	1.3	0.2	[1] E	[1] D	[1] D	[1] 1	[1] D	[1] D	[1] D
		A	10/11/2023	1.3	0.53							
2		N	10/13/2023	0.2	0.18	[2]	[2]	[2]	[2]	[2]	[2]	[2]
3	2	S	10/16/2023	0.81	0.57	[3] E	[3] 1	[3] 1	[3] 2	[3] D	[3] 1	[3] 1
4	3	S	10/24/2023	0.77	0.66	[4] D	[4] 2	[4] D	[4] 3	[4] 1	[4] 2	[4] 2
5	4	S	11/1/2023	1.65	0.94	[5] 1	[5] 3	[5] D	[5] 4	[5] 2	[5] 3	[5] 3
6	5	S	11/3/2023	0.8	0.88	SB	SB	[6] 2	SB	SB	SB	SB
		SB	11/5/2023	0.3	0.24	SB	SB	SB	SB	SB	SB	SB
		SB	11/6/2023	0.8	0.63	SB	SB	SB	SB	SB	SB	SB
7	6	SA	11/11/2023	0.48	0.53	[6] D	[6] 4	[7] 3	[6] 5	SB	[6] 4	SB
		M	11/12/2023	0.24	0.35		SB	SB	SB	SB	SB	SB
		M	11/182023	0.3	0.33		SB	SB	SB	SB	SB	SB
		M	11/21/2023	0.4	0.22							
		U	11/30/2023	0.11	0.45							
8		A	12/1/2023	2.46	0.83	[7] D	[7] D	[8] D	[7] D	[6] D	[7] D	[6] D
		A	12/3/2023	0.6	0.3							
		A	12/4/2023	2.5	2.92							
		A	12/6/2023	0.4	0.39							
9	7	S	12/9/2023	1.79	0.97	[8] 2	[8] 5	[9] 4	[8] 6	[7] 3	[8] 5	[7] 4
10	8	S	12/18/2023	0.24	0.28	[9] 3	[9] 6	[10] 5 R	[9] 7	SB	[9] 6	SB
		U	12/22/2023	0.14	0.23	SB	SB	SB	SB	SB	SB	SB
		SB	12/26/2023	0.8	0.52	SB	SB	SB	SB	SB	SB	SB
		U	1/2/2024	0.12	0.34							
11	9	S	1/5/2024	0.47	0.37	[10] 4	[10] 7	[11] 6	[10] 8	[8] T	[10] 7	[8] 5
12	10	S	1/8/2024	0.89	0.92	SB	SB	SB	SB	[9] 4	SB	SB
		Snow	1/17/2024	0.8	0.4					SB		SB
			1/18/2024	1.12	0.62							
13	11	S	1/20/2024	1.16	1.31	[11] 5	[11] 8	[12] 7	[11] 9	SB	[11] 8	SB
		SB	1/24/2024	0.6	0.58	SB	SB	SB	SB	SB	SB	SB
		SB	1/26/2024	1.7	1.16	SB	SB	SB	SB	SB	SB	SB
		U	2/11/2024	0.16	0.27							
14	12	S	2/14/2024	0.3	0.25	[12] 6	[12] 9	[13] E	[12] 10	[10] T	[12] 9	[9] 6
		A	2/20/2024	0.4	0.37							
15		N	2/25/2024	0.45	0.12	[13]	[13]	[14]	[12]	[11]	[13]	SB
16	13	S	2/28/2024	2.12	1.18	[14] D	[14] 10	[15] D	[13] 11	[12] 5	[14] 10	SB
		A	2/29/2024	2.12	0.36							
17		N	3/10/2024	1.02	0.07	[15]	[15]	[16]	[17]	[13]	[15]	SB
		A	3/11/2024	0.4	0.34							
		B	3/14/2024			Baseflow	Baseflow	Baseflow	Baseflow	Baseflow		
18		N	3/22/2024	0.5	0.16	[16]	[16]	[16]	[18]	ND	[16]	[10]
19		S	3/27/2024	0.55	0.23	[17] D	[17] D	[17] D	[19] D	[14] D	[17] D	[11] D
		U	4/8/2024	0.12	0.29							
20	14	S	4/25/2024	0.8	0.84	[18] 7	[18] 11	[18] 8	[20] 12	[15] 6	[18] 11	[11] E
		A	4/29/2024	0.3	0.29							
Dry Season 5/01/2024 - 09/30/2024												
		SB	5/4/2024	0.2	0.32	SB	SB	SB	SB	SB	SB	OUT
21	15	S	5/21/2024	0.42	0.29	[19] 8	[19] 12	[19] D	[21]13	[16] D	[19] 12	OUT
22	16	S	6/2/2024	1.45	0.92	[20] D	[20] 13	[20] D	[22]D	[17] 7	[20] 13	[12] E
		B	8/7/2024			Baseflow	Baseflow					
23	17	S	8/17/2024	0.43	0.27	[21] D	[21] 14	[21] D	[23] D	OUT	[21] D	ND
		U	8/20/2024	0.09	0.33							
24		N	8/22/2024	1	0.13	[22]	SB	[22]	[24]	OUT	[22]	ND
		A	8/23/2024	1	0.34							
25	18	S	9/10/2024	0.35	0.38	[23] 9	[22] 15	[23] 9	[25] 14	OUT	[23] 14	[13] 7
		U	9/14/2024	0.12	0.27							
		B	9/19-20/2024			Baseflow	Baseflow					
		U	9/27/2024	0.08	0.21							

	Outfall 230A	Outfall 235	Outfall 237ANEW	Outfall 237B	Outfall 243	Outfall 245	Outfall 254	Totals
Total Storms Deployed	23	22	23	25	17	23	13	**146**
Acceptable Storms Deployed	17	17	18	17	13	18	12	**112**
Total Samples Submitted for Analysis	9	15	9	14	7	14	7	**75**
Total Accepted Samples	9	15	8	14	7	14	7	**74**
Accepted Sample/Acceptable Storm Deployed	53%	88%	44%	82%	54%	78%	58%	**65%**
Cumulative Minimum	8	8	8	8	8	8	8	55
Maximum (allowed to contribute to 55)	11	11	11	11	11	11	11	**Met? Yes**

a - Monitoring of OF230 stopped in December 2022 due to lack of flow at this outfall. Flow monitoring at the new OF230A began in April 2023 and sample collection was attempted starting in June 2023.

Note: In order to ensure that storm samples are representative throughout the year, a one-week break in sampling is observed once a sample is accepted as denoted by SB (sample break).

KEY
Deployment # **[#]**
Successful sample number #
Grabs Collected
Snow
Baseflow

Event Type Description

U	Unpredicted Event: Less than 0.2" of rainfall was predicted and samplers were not deployed. Actual precipitation of 0.2" or greater was achieved.
UA	Unpredicted Antecedent: Rain was predicted within the antecedent period - rain did not fall as expected and antecedent conditions were met.
N	Non-qualifying Event: Greater than 0.2" of rainfall predicted and samplers were deployed. Actual precipitation was less than 0.2".
S	Storm Event: Precipitation met storm criteria - a minimum of 0.2" of rainfall was achieved. (antecedent = Y , Rainfall >= 0.2)
SA	Antecedent conditions were not met, but storm was still accepted.
Snow	Storm event predicted, however there is snow in the forecast and/or snow on the ground.
A	Antecedent conditions were not met, storm was not deployed.

Sampling Issues Description

T	Event occurred during high tide
B	Battery failure occurred
PE	Pumping errors occurred
P	Pacing Issues
E	Enable Issues
SP	Sample processing error
D	Deployment error - programming, tubing, jars, etc.
SE	Problem with sensor - debris, calibration, errors, etc.
ND	Sampler not deployed
OUT	Sampling equipment out due to maintenance, cleaning,
TB	Issues with Tubing
LV	Low volume collected samples not kept
SB	Sample break due to accepted samples within 7 days.
F	Forecast incorrect
R	Rejected Sample

Table B4-3
Grab Sampling Events for WY2024

Grab Sampling Summary WY2024										
Sample Date	Rainfall Prediction	Actual Rainfall	Antecedent Dry (hours)	OF230A	OF235	OF237A	OF237B	OF243	OF245	OF254
Wet Season										
10/16/2023	0.81	0.57	51.83	1	1	1	1	1	1	1
12/4/2023	2.5	2.92	22.45	1	1	1	1	1	1	1
1/8/2024	0.89	0.92	44.7	1	1	1	1	1	1	1
2/28/2024	2.12	1.35	57	1	1	1	1	1	1	1
4/25/2024	0.8	0.84	380.25	1	1	1	1	1	1	1
Dry Season										
5/21/2024	0.42	0.29	60.42	1	1	1	1	1	1	
Summary										
Number Sampled in Wet Season				5	5	5	5	5	5	5
Number Sample in Dry Season				1	1	1	1	1	1	
Total Number of Grab Samples collected for WY2024				6	6	6	6	6	6	5
Met 55 Goal?				No	No	No	No	No	No	No
WY2024 Minimum				6	6	6	6	6	6	5
Cumulative Minimum				41						
Maximum (allowed to contribute to 55)				6	6	6	6	6	6	5
Wet Season - Goal: 60-80%				83%	83%	83%	83%	83%	83%	100%
Met Wet Season Goal?				no	no	no	no	no	no	no

Table B4-4
Summary of Sampled Storm Events by Outfall

	Outfalls Sampled							
	237A New	237A	237B	235	230	243	245	254
9/25/01		1	1	-	-	-	-	-
Water Year 2002								
10/10/01	Site Not Active	1	1	1	1	1	1	1
10/24/01		-	-	2	2	2	2	2
11/28/01		-	-	-	3		3	3
12/12/01		2	2	-	4	3	4	-
12/15/01		-	-	3	-	-	-	-
01/06/02		3	3	4	5	-	-	-
01/18/02		4	4	5	6	-	5	4
01/23/02		-	-	-	-	4	-	-
02/20/02		5	-	6	7	5	6	5
03/16/02		6	5	7	8	6	7	6
04/09/02		7	6	8	9	7	8	7
04/26/02		-	7	-	-	-	9	-
05/28/02		8	8	9	10	-	10	8
06/28/02		9	9	10	11	8	11	9
Water Year 2003								
10/03/02	Site Not Active	1	1	1	1	1	1	-
11/06/02		2	2	2	2	-	-	2
11/13/02		-	-	-	-	-	2	-
11/17/02		-	-	-	-	2	-	-
12/10/02		3	3	3	3	-	3	3
01/01/03		4	-	4	4	-	4	4
01/11/03		-	4	-	-	-	-	-
01/21/03		5	5	5	-	3	5	5
01/25/03		-	-	-	5	-	-	-
01/29/03		-	-	-	-	4	-	-
02/15/03		6	6	6		5	6	6
03/11/03		7	7	7	6	6	7	7
04/01/03		8	8	8	7	7	8	8
04/21/03		9	9	9	8	-	9	9
09/16/03		10	10	-	-	-	-	-
Water Year 2004								
10/06/03	Site Not Active	1	1	1	-	-	-	-
10/15/03		-	-	-	1	-	-	1
10/22/03		2	2	2	-	1	1	-
11/15/03		3	3	3	2	-	-	-
12/02/03		4	-	4	-	2	2	2
12/4-5/03		-	4	-	3	-	-	-
12/20/03		-	-	-	-	3	3	-
01/18/04		5	5	-	-	-	-	-
01/22/04		-	-	5	4	4	-	3
02/13/04		6	6	6	5	-	4	-
03/03/04		-	-	7	6	-	5	-
05/10/04		7	7	8	7	5	6	4
05/25/04		8	8		8	6	7	5
06/12/04		9	9	9	9	7	8	6
08/06/04		10	10	10	10	8	9	7
08/21/04		11	11	11	11	9	-	8
09/10/04		12	12	-	-	10	10	9
09/15/04		-	-	12	12	-	-	-
Water Year 2005								
10/05/04	Site Not Active	1	1	1	-	-	1	1
10/08/04		-	-	-	1	1	-	-
11/01/04		2	2	2	2		2	2
11/17/04		3	3	3	3	2	3	3
12/09/04		4	4	4	4	3	4	4
01/15/05		5	5	5	5	4	5	5
02/06/05		6	6	6	-	-	-	-
03/19/05		7	7	7	6	5	6	6
04/10/05		8	8	8	-	-	-	7
05/17/05		-	9	9	-	-	7	-
06/16/05		9	10	10	7	6	8	8
07/08/05		10	11	11	8	-	9	9
09/29/05		11	12	12	9	7	10	10
Water Year 2006								
10/14/05	-	1	1	1	1	1	1	1
01/05/06	-	-	-	-	-	2	2	2
01/16/06	-	-	-	2	2	-	3	3
01/31/06	-	2	2	-	3	3	4	4
02/26/06	1	3	3	3	-	-	5	-
03/08/06	-	-	-	-	4	4	-	5
04/08/06	-	4	4	4	5	-	-	-
04/13/06	2	-	-	-	-	5	6	-
05/21/06	3	5	5	5	6	-	-	6
09/17/06	-	6	-	6	7	6	7	7
Water Year 2007								
10/14/06	-	1	-	1	1	-	1	-
11/02/06	1	2	-	2	-	-	2	1
11/15/06	-	-	-	-	2	-	-	-
11/19/06	-	-	1	3	-	-	3	-
02/17/07	-	-	2	4	-	1	4	2
02/24/07	-	3	-	-	3	-	-	-
03/19/07	-	4	3	5	4	-	5	3
05/02/07	-	5		6	5	-	6	4
06/09/07	2	6	4	-	-	-	-	5
06/28/07	-	-	5	-	-	-	-	-
09/03/07	3	7	6	7	-	-	7	-
09/16/07	4	8	7	8	6	-	-	6
09/27/07	5	9	8	9	7	2	8	7
Water Year 2008								
10/10/07	1	1	1	1	1	-	1	1
11/09/07	2	2	2	-	2	-	2	2
11/26/07	-	-	3	2	3	1	3	3
11/28/07	3	3	-	-	-	-	-	-
12/14/07	4	4	4	3	4		4	4
12/27/07	-	-	-	-	-	2	-	-
01/08/08	5	5	5	4	-	-	5	-
01/14/08	-	-	-	-	5	-	-	5
01/26/08	-	6	-	5	6	3	6	6
02/29/08	6	7	6	6	7	4	7	7
03/23/08	7	8	7	7		5	8	8
05/20/08	8	9	8	8	8	6	9	9
07/31/08	-	-	9	-	9	-	-	-
08/19/08	9	10	10	9	10	7	10	10
Water Year 2009								
10/03/08	1	1	1	1	-	-	1	1
10/20/08	-	-	2	-	1	-	2	-
10/31/08	2	2	-	2	-	-	-	-
11/05/08	-	-	3	-	2	1	3	-
11/10/08	3	-	-	-	-	-	-	2
11/20/08	4	-	-	3	-	-	-	-
12/12/08	5	3	4	4	-	2	4	3
03/14/09	6	4	5	5	3	3	5	4
03/28/09	7	5	6	6	4	-	6	-
04/01/09	-	-	-	-	-	4	-	5
04/17/09	8	6	7	7	5	5	7	6
05/02/09	9	7	8	8	6	6	8	7
05/18/09	-	8	9	9	7	7	-	8
09/05/09	-	9	10	-	8	8	9	-
09/19/09	10	10	11	10	-	-	10	-
Water Year 2010								
10/16/09	1	1	1	1	1	1	-	1
10/22/09	-	-	-	-	-	-	2	-
10/28/09	2	2	2	2	2	-	-	2
10/30/09	-	-	-	-	-	2	-	-
11/05/09	3	3	3	3	-	3	3	3
11/15/09	-	-	-	-	3	-	-	-
11/25/09	4	4	4	4	-	-	4	4
12/31/09	5	5	5	5	4	-	5	-
01/04/10	6	6	-	6	5	-	6	5
01/07/10	-	-	-	7	-	-	7	-
01/10/10	-	-	6	-	-	-	-	-
01/24/10	7	7	7	8	6	-	8	6
02/10/10	-	-	-	-	-	4	-	-
02/15/10	8	8	8	9	7	5	9	7
03/11/10	9	9	9	10	8	-	-	8
03/28/10	10	10	-	11	9	6	-	-
04/02/10	-	-	-	12	-	-	10	9
05/25/10	11	-	10	13	10	-	-	-
05/27/10	-	11	-	-	-	-	11	10
06/03/10	-	-	-	14	-	-	12	-
06/08/10	12	-	11		11	7	13	-
06/19/10	-	-	-	15	-	-	-	11
09/26/10	13	12	12	16	-	-	-	-
Water Year 2011								
10/09/10	1	1	1	1	1	1	-	1
10/30/10	2	-	2	2	2	2	-	2
11/09/10	-	-	-	3	-	-	-	-
11/17/10	-	2	3	-	-	3	1	3
11/30/10	3	-	-	4	-	4	2	4
12/11/10	-	3	4	5	3	-	-	-
01/21/11	4	4	5	6	4	5	3	5
01/29/11	-	-	-	7	-	-	-	-
02/12/11	-	5	6	8	5	-	4	6
03/04/11	-	6	7	9	6	-	-	7
03/12/11	-	-	-	-	-	6	5	-
04/04/11	5	7	8	10	7	-	6	-
04/13/11	6	8	9	11	-	-	7	8
04/26/11	7	9	10	-	-	7	8	9
05/02/11	-	-	-	12	8	-	9	-
05/14/11	-	10	11	-	-	-	-	-
05/25/11	-	11	12	13	9	-	-	-
08/22/11	-	12	13	14	-	-	-	-
Water Year 2012								
10/10/11	-	Site No Longer Active	-	1	1	1	1	1
10/28/11	1		1	2	2	-	2	-
11/02/11	-		-	-	-	-	-	2
11/11/11	-		-	3	-	-	3	-
11/16/11	-		2	-	-	-	-	-
11/21/11	-		-	4	-	-	4	-
11/27/11	-		-	-	3	-	-	-
01/05/12	-		-	5	-	-	5	-
01/09/12	2		3	-	4	-	-	3
01/24/12	-		-	-	-	-	-	4
01/29/12	-		4	-	5	-	-	-
02/01/12	3		-	6	-	-	-	-
02/18/12	-		-	7	-	-	-	-
02/24/12	4		-	-	-	-	-	-
03/05/12	-		5	8	6	-	6	-
03/14/12	-		6	9	-	-	7	-
04/03/12	-		7	10	7	-	8	-
04/19/12	5		8	11	-	2	9	-
04/25/12	6		-	-	-	-	-	-
04/30/12	7		9	-	-	-	10	-
05/03/12	-		-	-	-	3	-	-
05/20/12	8		-	-	-	-	11	-
06/05/12	-		10	12	-	-	12	-
06/07/12	9		-	-	8	4	-	-
06/22/12	-		-	-	9	-	-	-
Water Year 2013								
10/18/12	1	Site No Longer Active	1	1	1	1	-	1
11/11/12	-		-	2	2	2	1	-
11/22/12	2		2	-	-	-	-	2
12/25/12	3		-	3	-	3	2	-
02/22/13	-		-	-	-	-	-	3
02/27/13	4		3	4	3	-	-	-
03/12/13	-		-	5	-	-	-	-
03/19/13	5		4	6	4	-	-	-
04/05/13	6		5	-	-	-	-	-
04/10/13	7		6	7	5	-	-	-
04/12/13	8		7	8	-	-	-	-
04/19/13	9		8	9	6	-	-	-
05/13/13	10		-	10	-	4	3	4
05/21/13	11		9	11	7	-	-	-
08/28/13	12		-	12	8	-	-	-
09/21/13	-		10	-	-	-	-	-
Water Year 2014								
11/01/13	1	Site No Longer Active	1	1	1	1	1	1
11/06/13	2		2	-	2	-	-	-
12/12/13	3		-	-	-	-	-	-
01/06/14	4		-	2	3	-	-	-
01/28/14	5		-	3	-	-	-	-
02/12/14	6		-	4	-	2	2	2
03/08/14	-		3	5	4	-	-	-
03/13/14	-		4	-	-	-	-	-
03/15/14	-		-	6	-	-	-	-
03/28/14	-		5	-	5	-	-	-
04/21/14	7		6	7	6	-	3	3
05/08/14	8		7	8	7	-	-	-
06/12/14	-		8	-	-	-	4	-
07/22/14	-		9	-	8	-	-	4
08/12/14	9		-	-	-	3	-	-
09/23/14	-		10	-	9	4	5	5
Water Year 2015								
10/13/14	-	Site No Longer Active	-	1	1	-	1	-
10/20/14	-		-	2	-	1	2	-
10/22/14	1		-	-	-	-	3	1
10/30/14	2		1	3	2	-	-	-
11/05/14	-		-	-	3	-	-	2
11/21/14	-		-	-	-	2	4	3
11/24/14	3		2	4	4	-	-	-
12/08/14	-		3	5	5	-	5	-
12/23/14	4		4	6	6	3	-	4
01/04/15	5		-	7	7	-	-	5
01/15/15	6		5	8	-	-	6	6
01/17/15	7		6	9	8	-	7	7
03/13/15	-		7	-	9	4	-	-
03/20/15	8		8	10	-	-	8	-
03/23/15	-		-	-	-	5	-	-
04/10/15	9		-	-	-	-	-	-
04/13/15	10		-	11	10	-	-	-
04/23/15	11		-	-	11	6	9	-
07/26/15	-		-	12	-	-	-	-
08/14/15	12		-	13	-	-	-	-
08/29/15	13		-	14	-	-	-	-
09/01/15	-		9	-	-	-	-	-
Water Year 2016								
10/07/15	1	Site No Longer Active	1	1	-	-	-	-
11/08/15	-		-	2	-	-	-	-
11/13/15	-		-	-	-	1	-	-
11/16/15	-		-	3	-	2	-	-
12/01/15	-		-	4	-	3	-	-
12/05/15	2		2	-	-	-	-	-
12/12/15	-		-	-	1	-	-	1
12/21/15	-		-	5	2	-	-	-
12/23/15	-		3	-	-	-	-	-
01/16/16	3		-	6	3	4	1	-
01/19/16	4		4	-	4	-	-	2
02/03/16	5		5	7	-	5	2	-
02/06/16	-		-	-	5	-	-	-
02/12/16	-		6	8	-	-	3	3
02/17/16	6		-	-	6	-	-	-
02/27/16	-		7	-	-	-	4	-
03/21/16	-		8	9	-	-	5	-
03/24/16	7		-	-	7	-	-	4
04/12/16	8		-	10	-	-	6	5
09/06/16	-		-	11	-	6	7	6
09/17/16	9		-	-	8	-	8	7
Water Year 2017								
10/06/16	1	Site No Longer Active	-	-	1	1	1	1
10/12/16	2		1	1	2	-	-	-
10/19/16	-		-	-	-	-	2	-
11/05/16	3		2	-	3	2	3	2
11/13/16	-		-	2	-	-	-	-
11/14/16	4		3	-	4	3	4	3
12/03/16	5		4	3	5	4	5	4
12/19/16	6		-	4	6	5	6	5
01/08/17	-		5	5	7	-	7	6
01/17/17	7		6	6	8	-	8	-
02/03/17	-		7	7	9	6	9	7
02/14/17	-		8	8	-	-	-	-
02/26/17	8		-	-	-	-	-	-
03/17/17	9		9	9	10	7	10	8
04/04/17	10		10	10	11	-	11	-
05/04/17	11		-	-	12	-	12	9
06/07/17	-		-	-	-	-	-	10
06/15/17	12		11	11	13	-	13	-
09/18/17	-		12	12	14	-	-	-
Water Year 2018								
10/12/17	1	Site No Longer Active	1	1	-	1	1	1
11/02/17	-		2	2	-	-	2	-
11/04/17	2		-	-	1	-	-	2
11/12/17	-		3	-	-	2	-	-
11/19/17	3		4	3	2	-	3	-
11/28/17	-		-	-	-	-	4	-
12/01/17	-		5	4	3	-	-	-
01/04/18	-		6	-	4	3	-	3
01/10/18	4		-	5	-	-	5	-
01/17/18	-		7	-	5	4	-	4
01/23/18	5		-	6	-	-	6	-
02/01/18	6		8	7	6	5	7	5
03/13/18	-		-	-	7	6	8	-
03/21/18	7		9	-	8	7	9	-
04/04/18	-		-	-	-	-	-	6
04/07/18	8		10	8	-	8	10	-
06/08/18	-		-	9	9	-	-	7
09/09/18	-		-	-	-	9	11	-
Water Year 2019								
10/05/18	-	Site No Longer Active	1	1	-	1	1	-
10/25/18	1		-	-	-	2	2	1
10/27/18	-		2	2	1	-	-	-
11/21/18	-		-	-	-	-	3	-
11/22/18	2		3	3	-	3	-	-
12/09/18	3		-	4	2	-	4	2
12/11/18	-		4	-	-	-	-	-
12/17/18	4		-	-	3	4	-	3
01/03/19	-		-	5	4	5	-	4
01/18/19	5		5	6	5	6	5	5
02/01/19	6		6	7	6	7	6	6
03/11/19	7		-	8	7	8	7	7
03/25/19	-		7	-	-	-	-	-
07/09/19	-		-	9	8	-	-	-
09/09/19	-		-	10	9	-	-	-
09/12/19	8		8	-	-	-	8	-
09/14/19	-		-	-	-	9	-	-
09/22/19	-		-	11	-	-	-	-
Water Year 2020								
10/16/19	1	Site No Longer Active	-	-	-	-	1	1
10/21/19	-		1	1	-	1	-	-
11/15/19	-		2	2	1	-	-	-
11/17/19	-		-	-	-	-	2	-
11/18/19	-		-	-	-	2	-	2
12/06/19	2		3	3	2	-	3	3
12/18/19	-		-	-	-	3	4	-
12/31/19	-		4	4	3	4	5	-
01/02/20	-		-	-	-	-	-	4
01/17/20	-		5	5	4	5	6	5
01/30/20	-		6	6	-	6	7	6
02/06/20	3		-	-	5	-	-	-
02/23/20	4		7	-	6	-	8	-
03/05/20	5		8	-	7	7	-	7
03/13/20	-		-	7	-	-	-	-
03/28/20	6		9	8	8	-	-	-
04/22/20	7		10	-	9	8	9	8
04/26/20	-		-	9	-	-	-	-
05/02/20	-		11	-	10	-	-	-
05/16/20	-		12	10	11	9	10	9
05/30/20	8		13	11	12	-	11	-
06/08/20	9		14	-	13	10	12	10
09/18/20	-		-	-	14	-	13	-
09/23/20	-		-	-	-	11	-	11
Water Year 2021								
10/09/20	-	Site No Longer Active	-	-	1	1	1	-
10/13/20	-		1	-	-	-	-	-
11/03/20	-		-	-	-	2	2	1
11/04/20	1		2	-	-	-	-	-
11/12/20	2		3	1	2	3	3	2
12/08/20	3		4	-	3	4	4	3
12/15/20	-		-	2	-	-	-	-
12/25/20	-		5	3	-	-	5	-
12/29/20	4		-	-	4	-	-	-
01/11/21	5		6	-	-	5	6	4
01/29/21	6		7	4	5	6	7	-
02/21/21	7		8	5	6	-	8	
03/04/21	8		9	-	7	-	-	5
03/24/21	9		10	6	8	7	9	-
03/28/21	-		-	-	-	-	-	6
04/07/21	10		11	7	9	-	-	7
04/24/21	-		-	-	-	-	-	8
05/27/21	11		12	8	10	-	10	9
06/06/21	-		-	9	-	8	-	-
06/12/21	12		13	10	11	-	11	
09/17/21	-		14	-	12	9	12	10
09/26/21	-		15	-	13	-	-	-
09/29/21	-		-	11	-	-	-	-

	Outfalls Sampled							
	237A New	237A	237B	235	230/230A	243	245	254
Water Year 2022								
10/21/21	-	Site No Longer Active	1	1	1	1	1	1
11/03/21	1		2	2	-	2	2	2
11/08/21	-		-	-	2	-	-	-
11/18/21	-		3	3	3	-	3	-
12/04/21	2		4	4	4	3	4	3
12/17/21	3		5	5	5	-	5	-
01/19/22	-		6	6	6	-	6	4
02/20/22	-		-	-	-	-	-	5
02/26/22	-		7	7	7	-	7	-
03/14/22	4		8	-	8	4	8	6
03/18/22	-		-	8	-	-	-	-
04/03/22	5		9	9	9	5	9	7
04/18/22	6		10	10	10	-	10	-
04/29/22	7		-	-	-	-	-	-
05/05/22	-		-	-	-	6	11	8
05/15/22	8		11	11	11	-	-	-
06/09/22	-		-	12	12	7	12	9
Water Year 2023								
10/21/2022	1	Site No Longer Active	-	1	-	-	-	-
10/25/2022	-		1	-	-	1	-	-
10/30/2022	-		-	2	-	-	1	1
11/4/2022	2		2	-	-	-	-	-
11/6/2022	-		-	-	-	2	-	-
11/22/2022	3		3	3	1	-	2	-
12/9/2022	4		-	4	2	3	3	-
12/29/2022	5		4	5	3	-	-	-
1/11/2023	6		-	6	-	-	4	-
2/7/2023	7		5	-	-	-	-	-
3/12/2023	8		-	7	-	4	5	-
3/19/2023	9		6	8	-	-	-	-
3/31/2023	-		-	-	-	5	6	-
4/9/2023	10		7	-	-	6	7	-
4/16/2023	-		-	9	-	-	-	-
5/4/2023	11		-	10	-	-	8	-
9/24/2023	12		8	11	-	7	9	-
Water Year 2024								
10/10/2023	-	Site No Longer Active	1	-	-	-	-	-
10/16/2023	1		2	1	-	-	1	1
10/24/2023	-		3	2	-	1	2	2
11/1/2023	-		4	3	1	2	3	3
11/3/2023	2		-	-	-	-	-	-
11/11/2023	3		5	4	-	-	4	-
12/9/2023	4		6	5	2	3	5	4
12/18/2023	-		7	6	3	-	6	-
1/5/2024	5		8	7	4	-	7	5
1/8/2024	-		-	-	-	4	-	-
1/20/2024	6		9	8	5	-	8	-
2/14/2024	-		10	9	6	-	9	6
2/28/2024	-		11	10	-	5	10	-
4/25/2024	7		12	11	7	6	11	-
5/21/2024	-		13	12	8		12	-
6/2/2024	-		-	13	-	7	13	-
8/17/2024	-		-	14	-	-	-	-
9/10/2024	8		14	15	9	-	14	7

Table B4-4 Summary of Sampled Storm Events by Outfall

Table B4-5
Portion of Storm Event Sampled in Tidally Influenced Drains

Portion of storm sampled	Number of Events Sampled						Number of Events Sampled						Number of Events Sampled					
	230/ 230A	235	243	245	254	237A New	230/ 230A	235	243	245	254	237A New	230/ 230A	235	243	245	254	237A New
	Year 1						WY2010 (Year 9)						WY2017 (Year 16)					
Rising limb			2		1									1				
Rising and peak limb	1	1	1	1			2	2		3		1	1	3		2	1	1
Peak			1	1	1	Not Sampled			2		1				1			
Peak and falling limb					2		1				4	1			1		2	
Falling limb			3		1				2		2				1		1	
Most of the storm	10	9		9	3		8	14	3	9	5	11	12	8	4	11	6	11
Total Number	11	10	7	11	8		11	16	7	12	12	13	13	12	7	13	10	12
	Year 2						WY2011 (Year 10)						WY2018 (Year 17)					
Rising limb			1	1			1	1	1	1	1							
Rising and peak limb	1			2			1	1	1					1	1	3		
Peak			1			Not Sampled					2							
Peak and falling limb	3	1	1	1	1			1		1		2	1					
Falling limb					2		1		3	1	3				1			
Most of the storm	4	8	5	5	5		6	11	2	6	3	5	8	7	6	8	6	8
Total Number	8	9	8	9	8		9	14	7	9	9	7	9	8	8	11	6	8
	Year 3						WY2012 (Year 11)						WY2019 (Year 18)					
Rising limb			1		1													
Rising and peak limb	1	1	1		1		2	1		3								
Peak			1			Not Sampled		1			1							
Peak and falling limb	2	1	1	3	1		3		1		1	1		1		1	2	1
Falling limb					2				3						1			
Most of the storm	8	9	4	6	3		4	10		9	2	8	8	10	7	7	4	7
Total Number	11	11	8	9	8		9	12	4	12	4	9	8	11	8	8	6	8
	Year 4						WY2013 (Year 12)						WY2020 (Year 19)					
Rising limb																		
Rising and peak limb	2	1	1	2	1		1				1		1	1	2	1	1	1
Peak	1	2	1	1		Not Sampled											1	
Peak and falling limb			2	2	3		1										1	
Falling limb			2		1				2		1					1		
Most of the storm	6	9	1	5	4		6	11	1	3	2	12	9	12	6	9	6	11
Total Number	9	12	7	10	9		8	11	3	3	4	12	10	13	8	11	9	12
	Year 5						WY2014 (Year 13)						WY2021 (Year 20)					
Rising limb	1														1	1	1	
Rising and peak limb				2	1		2	1		1	1	1	1			1		
Peak	3		2		2	1			1								1	
Peak and falling limb	1	1	1	1	3	1				1	1	1			2	1	2	
Falling limb			1						1						1			
Most of the storm	2	5	1	4	2	1	7	6	2	3	3	7	11	14	5	9	6	11
Total Number	7	6	5	7	8	3	9	7	4	5	5	9	12	14	9	12	10	11
	Year 6						WY2015 (Year 14)						WY2022 (Year 21)					
Rising limb	1			1													1	
Rising and peak limb					1							1		1		1	1	2
Peak					2		2		1	1	2				1		1	
Peak and falling limb	1				1			1	2	2	2							
Falling limb																		
Most of the storm	4	7	2	6	2	2	8	12		4	3	9	12	11	6	10	6	6
Total Number	6	7	2	7	6	2	10	13	3	7	7	10	12	12	7	11	9	8
	Year 7						WY2016 (Year 15)						WY2023 (Year 22)					
Rising limb		1			1				1				1					
Rising and peak limb	2		1	1	2		2		1	1	1			1				1
Peak	2	2		1	2												1	
Peak and falling limb	1	1	4	2	3	1			1	1	2	2						1
Falling limb			1	1	1	1			1									
Most of the storm	7	8	2	7	3	10	5	10	1	6	4	6	2	10	7	9		10
Total Number	12	12	8	12	12	12	7	10	5	8	7	8	3	11	7	9	1	12
	WY2009 (Year 8)																	
Rising limb																		
Rising and peak limb																		
Peak			2	1	1													
Peak and falling limb			1		1	1												
Falling limb					1													
Most of the storm	8	10	5	9	5	9												
Total Number	8	10	8	10	8	10												

Totals	WY2024 (Year 23)					
Rising limb	1				1	
Rising and peak limb						
Peak						
Peak and falling limb						
Falling limb						
Most of the storm	8	15	7	14	6	8
Total Number	9	15	7	14	7	8

Totals	Years 1-23					
Rising limb	5	3	7	4	7	0
Rising and peak limb	20	15	9	24	12	8
Peak	8	5	14	5	18	1
Peak and falling limb	14	7	17	16	32	12
Falling limb	1	0	23	3	15	1
Most of the storm	163	226	77	168	89	152
Total Number	211	256	147	220	173	174

Table B4-6
Precipitation Summary of Storm Events Sampled

Year	Antecedent (hours)			Precip (in)			Duration (hours)			Avg Intensity (in/hour)		
	Min	Max	Annual Avg	Min	Max	Annual Avg	Min	Max	Annual Avg	Min	Max	Annual Avg
WY2002	11	220	52	0.20	1.40	0.57	7.00	27	18.5	0.01	0.08	0.03
WY2003	22	398	95	0.20	1.22	0.46	3.00	29	14.0	0.01	0.08	0.04
WY2004	26	1277	183	0.20	0.84	0.39	2.75	28	10.9	0.02	0.17	0.05
WY2005	25	440	128	0.20	1.04	0.48	4.00	26	13.3	0.02	0.09	0.04
WY2006	25	2240	276	0.20	1.30	0.51	2.45	27	16.1	0.01	0.11	0.04
WY2007	35	466	176	0.24	0.93	0.43	2.75	22	13.0	0.01	0.32	0.04
WY2008	28	394	99	0.20	0.53	0.30	2.25	18	10.9	0.01	0.09	0.03
WY2009	24	279	95	0.20	0.65	0.35	4.00	36	12.8	0.02	0.07	0.03
WY2010	24	159	50	0.15	1.18	0.53	4.75	39	17.9	0.01	0.08	0.03
WY2011	21	862	124	0.19	1.84	0.51	2.25	42	16.7	0.01	0.13	0.04
WY2012	11	399	82	0.15	1.32	0.49	2.25	48	15.7	0.01	0.09	0.04
WY2013	7	155	48	0.20	0.95	0.48	2.25	38	14.6	0.01	0.10	0.04
WY2014	10	584	175	0.18	1.96	0.71	4.00	59	19.2	0.01	0.09	0.04
WY2015	20	1301	142	0.21	1.33	0.63	1.25	34	16.6	0.01	0.34	0.05
WY2016	23	259	86	0.21	1.69	0.51	3.58	39	16.0	0.01	0.07	0.04
WY2017	16	859	125	0.24	3.94	1.02	5.00	69	21.7	0.01	0.13	0.05
WY2018	10	475	97	0.18	1.49	0.58	3.00	39	15.7	0.02	0.06	0.04
WY2019	9	309	125	0.21	1.19	0.61	2.92	32	15.7	0.01	0.09	0.05
WY2020	12	649	102	0.20	1.90	0.51	5.70	40	15.0	0.01	0.09	0.04
WY2021	24	334	96	0.20	3.22	0.79	4.17	85	19.6	0.01	0.15	0.05
WY2022	20	269	115	0.20	4.57	0.65	5.90	67	17.9	0.01	0.09	0.05
WY2023	14	552	120	0.20	1.11	0.58	6.92	52	19.4	0.01	0.11	0.04
WY2024	9	448	115	0.20	1.31	0.65	2.83	44	17.4	0.01	0.10	0.05
2001-2024												
min	7	155	48	0.15	0.53	0.30	1.25	18	10.9	0.01	0.06	0.03
max	35	2240	276	0.24	4.57	1.02	7.00	85	21.7	0.02	0.34	0.05
average	18	579	118	0.20	1.60	0.55	3.69	41	16.03	0.01	0.12	0.04

	Antecedent (hours)	Precip (in)	Duration (hours)	Avg Intensity (in/hour)
WY2024				
10/10/2023 (2)	16.3	0.20	4.7	0.04
10/16/2023 (3)	51.8	0.57	13.3	0.09
10/24/2023	69.2	0.66	18.3	0.04
11/1/2023	176.6	0.94	15.6	0.06
11/3/2023	33.1	0.88	16.0	0.06
11/11/2023 (2)	9.1	0.53	4.3	0.09
12/9/2023	49.5	0.97	20.3	0.05
Partial	49.5	0.56	7.7	0.07
Partial	49.5	0.64	10.3	0.06
12/18/2023	101.3	0.28	19.9	0.01
1/5/2024 (1)	30.8	0.37	19.9	0.02
1/8/2024	44.7	0.92	31.7	0.03
1/20/2024	41.1	1.31	43.8	0.03
2/14/2024	59.9	0.25	6.2	0.04
2/28/2024	57.0	1.18	31.2	0.04
4/25/2024	380.3	0.84	23.6	0.04
5/21/2024	60.4	0.29	15.6	0.02
6/2/2024	86.1	0.92	16.8	0.05
8/17/2024	447.7	0.27	2.8	0.10
9/10/2024 (3)	357.4	0.38	9.8	0.06
Annual Avg	**115**	**0.65**	**17.43**	**0.05**

Avg Intensity is total rainfall (in) for the event divided by duration of event (hr)

Minimum value for the monitoring year

Maximum value for the monitoring year

(1) =< 0.05 inches ocurred in the previous 24 hours of event and/or the resulting antecendent is believed to be a better representation of the event.

(2) The antecendent period is <24 hours. The flow at all sites returned to baseflow conditions and the samples collected are believed to be representative of the event.

(3) resulting Avg Intensity is believed to be a better representation of the event.

Partial - Event sampled represents only a part of the entire event. Rainfall characteristics reflect partial event sampled for that outfall.

Table B4-7
Number of Samples Collected by Season for WY2002-WY2024

	Wet 10/1- 4/30	Dry 5/1 - 9/30	Total
WY2002	**12**	**2**	**14**
OF237A	7	2	9
OF237B	7	2	9
OF230	9	2	11
OF235	8	2	10
OF243	7	1	8
OF245	9	2	11
OF254	7	2	9
WY2003	**14**	**1**	**15**
OF237A	9	1	10
OF237B	9	1	10
OF230	8	0	8
OF235	9	0	9
OF243	7	0	7
OF245	9	0	9
OF254	8	0	8
WY2004	**11**	**7**	**18**
OF237A	6	6	12
OF237B	6	6	12
OF230	6	6	12
OF235	7	5	12
OF243	4	6	10
OF245	5	5	10
OF254	3	6	9
WY2005	**9**	**4**	**13**
OF237A	8	3	11
OF237B	8	4	12
OF230	6	3	9
OF235	8	4	12
OF243	5	2	7
OF245	6	4	10
OF254	7	3	10
WY2006	**8**	**2**	**10**
OF237A	4	2	6
OF237B	4	1	5
OF230	5	2	7
OF235	4	2	6
OF243	5	1	6
OF245	6	1	7
OF254	5	2	7
WY2007	**7**	**6**	**13**
OF237A	4	4	8
OF237B	3	5	8
OF230	4	3	7
OF235	5	4	9
OF243	1	1	2
OF245	5	3	8
OF254	3	4	7
WY2008	**11**	**3**	**14**
OF237A	8	2	10
OF237B	7	3	10
OF230	7	3	10
OF235	7	2	9
OF243	5	2	7
OF245	8	2	10
OF254	8	2	10
WY2009	**11**	**4**	**15**
OF237A	6	4	10
OF237B	7	4	11
OF230	5	3	8
OF235	7	3	10
OF243	5	3	8
OF245	7	3	10
OF254	6	2	8
WY2010	**17**	**6**	**23**
OF237A	10	2	12
OF237B	9	3	12
OF230	9	2	11
OF235	12	4	16
OF243	6	1	7
OF245	9	3	12
OF254	9	2	11
WY2011	**13**	**3**	**16**
OF237A	9	3	12
OF237B	10	3	13
OF230	7	2	9
OF235	11	3	14
OF243	7	0	7
OF245	8	1	9
OF254	9	0	9
WY2012	**20**	**5**	**25**
OF237A New	7	2	9
OF237B	9	1	10
OF230	7	2	9
OF235	11	1	12
OF243	2	2	4
OF245	10	2	12
OF254	4	0	4
WY2013	**10**	**4**	**14**
OF237A New	7	3	10
OF237B	6	2	8
OF230	6	2	8
OF235	8	3	11
OF243	2	1	3
OF245	2	1	3
OF254	3	1	4

	Wet 10/1- 4/30	Dry 5/1 - 9/30	Total
WY2014	**11**	**5**	**16**
OF237A New	7	2	9
OF237B	6	4	10
OF230	6	3	9
OF235	6	1	7
OF243	2	2	4
OF245	3	2	5
OF254	3	2	5
WY2015	**15**	**4**	**19**
OF237A New	9	1	10
OF237B	7	1	8
OF230	10	0	10
OF235	10	3	13
OF243	3	0	3
OF245	7	0	7
OF254	7	0	7
WY2016	**16**	**2**	**18**
OF237A New	7	1	8
OF237B	7	0	7
OF230	6	1	7
OF235	9	1	10
OF243	4	1	5
OF245	6	2	8
OF254	5	2	7
WY2017	**15**	**4**	**19**
OF237A New	10	2	12
OF237B	9	2	11
OF230	10	3	13
OF235	10	2	12
OF243	7	0	7
OF245	11	2	13
OF254	8	2	10
WY2018	**16**	**2**	**18**
OF237A New	8	0	8
OF237B	9	0	9
OF230	8	1	9
OF235	7	1	8
OF243	7	1	8
OF245	10	1	11
OF254	5	1	6
WY2019	**13**	**5**	**18**
OF237A New	7	1	8
OF237B	7	1	8
OF230	6	2	8
OF235	8	3	11
OF243	7	1	8
OF245	7	1	8
OF254	6	0	6
WY2020	**18**	**6**	**24**
OF237A New	9	2	11
OF237B	9	5	14
OF230	7	2	9
OF235	10	4	14
OF243	6	2	8
OF245	9	2	11
OF254	8	2	10
WY2021	**17**	**6**	**23**
OF237A New[a]	7	4	11
OF237B	9	3	12
OF230	10	2	12
OF235	11	3	14
OF243	7	2	9
OF245	9	3	12
OF254	8	2	10
WY2022	**14**	**3**	**17**
OF237A New[a]	7	1	8
OF237B	10	1	11
OF230	10	2	12
OF235	10	2	12
OF243	5	2	7
OF245	10	2	12
OF254	7	2	9
WY2023	**15**	**2**	**17**
OF237A New[a]	10	2	12
OF237B	7	1	8
OF230[b]	3	0	3
OF235	9	2	11
OF243	6	1	7
OF245	7	2	9
OF254	1	0	1
WY2024	**14**	**4**	**18**
OF237A New[a]	7	1	8
OF237B	11	3	14
OF230A[b]	7	2	9
OF235	11	4	15
OF243	6	1	7
OF245	11	3	14
OF254	6	1	7
WY2002-2024	**307**	**90**	**397**
OF237A New[a]	173	51	224
OF237B	176	56	232
OF230/OF230A	162	48	210
OF235	198	59	257
OF243	116	33	149
OF245	174	47	221
OF254	136	38	174

a - OF237A was not sampled after 9/30/11 & location changed to OF237A New . Totals use OF237A New for WY2012 and later.

b - OF230 was not sampled after 12/30/2023 due to the flow being directed to the new OF230A.

Note: Numbers in shaded cells are the number of successful deployments (one or more sample) by season.

Table B4-7 cont'd
Number of Samples Collected by Season for WY2002-WY2024

	Wet 10/1- 4/30	Dry 5/1 - 9/30	Total
Year 1	**12**	**2**	**14**
OF237A	78%	22%	
OF237B	78%	22%	
OF230	82%	18%	
OF235	80%	20%	
OF243	88%	13%	
OF245	82%	18%	
OF254	78%	22%	
Year 2	**14**	**1**	**15**
OF237A	90%	10%	
OF237B	90%	10%	
OF230	100%	0%	
OF235	100%	0%	
OF243	100%	0%	
OF245	100%	0%	
OF254	100%	0%	
Year 3	**11**	**7**	**18**
OF237A	50%	50%	
OF237B	50%	50%	
OF230	50%	50%	
OF235	58%	42%	
OF243	40%	60%	
OF245	50%	50%	
OF254	33%	67%	
Year 4	**9**	**4**	**13**
OF237A	73%	27%	
OF237B	67%	33%	
OF230	67%	33%	
OF235	67%	33%	
OF243	71%	29%	
OF245	60%	40%	
OF254	70%	30%	
Year 5	**8**	**2**	**10**
OF237A	67%	33%	
OF237B	80%	20%	
OF230	71%	29%	
OF235	67%	33%	
OF243	83%	17%	
OF245	86%	14%	
OF254	71%	29%	
Year 6	**7**	**6**	**13**
OF237A	50%	50%	
OF237B	38%	63%	
OF230	57%	43%	
OF235	56%	44%	
OF243	50%	50%	
OF245	63%	38%	
OF254	43%	57%	
Year 7	**11**	**3**	**14**
OF237A	80%	20%	
OF237B	70%	30%	
OF230	70%	30%	
OF235	78%	22%	
OF243	71%	29%	
OF245	80%	20%	
OF254	80%	20%	
Year 8	**11**	**4**	**15**
OF237A	60%	40%	
OF237B	64%	36%	
OF230	63%	38%	
OF235	70%	30%	
OF243	63%	38%	
OF245	70%	30%	
OF254	75%	25%	
Year 9	**17**	**6**	**23**
OF237A	83%	17%	
OF237B	75%	25%	
OF230	82%	18%	
OF235	75%	25%	
OF243	86%	14%	
OF245	75%	25%	
OF254	82%	18%	
Year 10	**13**	**3**	**16**
OF237A	75%	25%	
OF237B	77%	23%	
OF230	78%	22%	
OF235	79%	21%	
OF243	100%	0%	
OF245	89%	11%	
OF254	100%	0%	
Year 11	**20**	**5**	**25**
OF237A New[a]	78%	22%	
OF237B	90%	10%	
OF230	78%	22%	
OF235	92%	8%	
OF243	50%	50%	
OF245	83%	17%	
OF254	100%	0%	
Year 12	**10**	**4**	**14**
OF237A New[a]	70%	30%	
OF237B	75%	25%	
OF230	75%	25%	
OF235	73%	27%	
OF243	67%	33%	
OF245	67%	33%	
OF254	75%	25%	

	Wet 10/1- 4/30	Dry 5/1 - 9/30	Total
Year 13	**11**	**5**	**16**
OF237A New[a]	78%	22%	
OF237B	60%	40%	
OF230	67%	33%	
OF235	86%	14%	
OF243	50%	50%	
OF245	60%	40%	
OF254	60%	40%	
Year 14	**15**	**4**	**19**
OF237A New[a]	90%	10%	
OF237B	88%	13%	
OF230	100%	0%	
OF235	77%	23%	
OF243	100%	0%	
OF245	100%	0%	
OF254	100%	0%	
Year 15	**16**	**2**	**18**
OF237A New[a]	88%	13%	
OF237B	100%	0%	
OF230	86%	14%	
OF235	90%	10%	
OF243	80%	20%	
OF245	75%	25%	
OF254	71%	29%	
Year 16	**15**	**4**	**19**
OF237A New[a]	83%	17%	
OF237B	82%	18%	
OF230	77%	23%	
OF235	83%	17%	
OF243	100%	0%	
OF245	85%	15%	
OF254	80%	20%	
Year 17	**16**	**2**	**18**
OF237A New[a]	100%	0%	
OF237B	100%	0%	
OF230	89%	11%	
OF235	88%	13%	
OF243	88%	13%	
OF245	91%	9%	
OF254	83%	17%	
Year 18	**13**	**5**	**18**
OF237A New[a]	88%	13%	
OF237B	88%	13%	
OF230	75%	25%	
OF235	73%	27%	
OF243	88%	13%	
OF245	88%	13%	
OF254	100%	0%	
Year 19	**18**	**6**	**24**
OF237A New[a]	82%	18%	
OF237B	64%	36%	
OF230	78%	22%	
OF235	71%	29%	
OF243	75%	25%	
OF245	82%	18%	
OF254	80%	20%	
Year 20	**17**	**6**	**23**
OF237A New[a]	64%	36%	
OF237B	75%	25%	
OF230	83%	17%	
OF235	79%	21%	
OF243	78%	22%	
OF245	75%	25%	
OF254	80%	20%	
Year 21	**14**	**3**	**17**
OF237A New[a]	88%	13%	
OF237B	91%	9%	
OF230	83%	17%	
OF235	83%	17%	
OF243	71%	29%	
OF245	83%	17%	
OF254	78%	22%	
Year 22	**15**	**2**	**17**
OF237A New[a]	83%	17%	
OF237B	88%	13%	
OF230	100%	0%	
OF235	82%	18%	
OF243	86%	14%	
OF245	78%	22%	
OF254	100%	0%	
Year 23	**14**	**4**	**18**
OF237A New[a]	88%	13%	
OF237B	79%	21%	
OF230A[b]	78%	22%	
OF235	73%	27%	
OF243	86%	14%	
OF245	79%	21%	
OF254	86%	14%	
Years 1-23	**307**	**90**	**397**
OF237A New[a]	77%	23%	
OF237B	76%	24%	
OF230/OF230A	77%	23%	
OF235	77%	23%	
OF243	78%	22%	
OF245	79%	21%	
OF254	78%	22%	

a - OF237A was not sampled after 9/30/11 & location changed to OF237A New . Totals use OF237A New for WY2012 and later.

b - OF230 was not sampled after 12/30/2023 due to the flow being directed to the new OF230A.

Note: Numbers in shaded cells are the number of successful deployments (one or more sample) by season.

Table B4-8
Ranges of Magnitude and Intensity - Years 1-10, 15, 18, and 23 Baseflow Hydrographs

Baseflow Volume Samples (cf)

Year	OF230		OF230A		OF235		OF237A		OF237A New		OF237B		OF243		OF245		OF254	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
1	32,620	98,660	--	--	8,580	14,750	261,820	326,050	--	--	1,036,410	1,724,400	40,160	40,160	3,080	62,900	28,180	50,100
2	1,740	3,960	--	--	102,720	150,140	287,650	344,620	--	--	705,090	1,039,630	34,770	34,770	7,010	17,610	15,580	43,960
3	1,390	3,580	--	--	109,290	160,050	181,280	954,660	--	--	594,600	782,500	24,550	24,550	6,750	12,520	4,970	6,170
4	1,590	28,220	--	--	82,110	121,740	195,730	261,520	--	--	603,280	856,300	25,840	25,840	21,030	39,840	12,960	39,840
5	21,180	38,420	--	--	117,330	225,290	275,600	614,370	459,080	1,376,260	518,020	698,350	33,220	33,220	18,710	34,610	5,500	21,650
6	30,680	84,690	--	--	200,020	280,700	93,080	311,870	463,870	1,332,120	574,140	828,980	53,990	53,990	14,370	85,880	6,950	19,860
7	33,264	112,226	--	--	63,350	209,190	99,530	264,760	1,083,500	1,339,700	809,200	1,384,460	81,330	81,330	13,240	19,570	12,540	19,720
8	31,740	72,580	--	--	40,210	79,800	59,040	2OF2458	361,650	1,656,900	1,143,100	1,524,620	14,660	29,400	6,740	16,000	4,570	40,670
9	51,680	115,300	--	--	87,500	144,600	201,900	363,700	225,280	441,000	1,444,300	1,226,020	3,730	13,240	3,130	9,420	15,300	42,120
10	10,307	36,026	--	--	66,108	154,606	204,647	389,815	203,646	443,460	1,145,213	1,422,762	9,356	26,735	11,397	17,789	16,097	63,234
11/14	Baseflow No Longer Sampled																	
15	15,096	54,980	--	--	89,742	117,861	--	--	346,582	449,401	677,609	1,021,464	74,995	126,479	--	--	--	--
18	46,323	57,534	--	--	48,399	68,019	--	--	148,968	437,427	646,453	887,602	--	113,610	9,994	130,843	1,604	3,902
23	--	--	20,453	20,911	6,057	14,348	--	--	--	--	--	--	--	--	--	--	--	--

Event Average Flow Rate (cfs)

Year	OF230		OF230A		OF235		OF237A		OF237A New		OF237B		OF243		OF245		OF254	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
1	0.83	2.81	--	--	0.17	0.29	3.03	3.81	--	--	14.21	19.26	1.72	6.61	0.14	2.8	1.74	3.12
2	0.1	0.2	--	--	1.9	2.5	3.4	4.4	--	--	8.5	12.8	1.5	1.8	0.5	1.1	0.7	2.0
3	0.1	0.1	--	--	2.2	3.0	2.1	12.5	--	--	6.5	8.4	1.4	14.6	0.4	0.6	0.3	0.4
4	0.06	1	--	--	1.4	1.8	2.5	2.9	--	--	6.9	9.7	1.4	1.6	1	1.7	0.6	2.8
5	0.8	1.2	--	--	3.6	4.8	3.6	7.0	6.3	8.4	6.3	7.7	1.8	46	0.8	2.2	0.2	1.0
6	1.1	2	--	--	3.4	3.9	2.3	3.3	5.3	24.4	6.6	9.5	3.7	4.5	0.9	3.5	0.3	0.8
7	0.7	2.6	--	--	0.9	3.8	1.1	2.8	14.2	16.3	8.9	15.2	3	7.2	0.8	1.0	0.5	1.3
8	0.9	1.7	--	--	0.7	1.2	0.7	2.8	5.2	25.8	13.6	17.6	1.1	1.3	0.6	1.0	0.6	3.0
9	1.7	2.8	--	--	1.6	2.5	2.7	5.2	3.2	6.3	13.4	15.8	0.2	1.1	0.2	0.4	1.1	2.9
10	0.4	1.3	--	--	1.4	2.7	2.6	4.6	2.7	6	14.1	19.4	0.5	1.2	1	1.2	1.5	3.2
11/14	Baseflow No Longer Sampled																	
15	0.6	0.85	--	--	0.42	1.76	--	--	6.13	8.26	8.33	11.34	3.73	4.58	--	--	--	--
18	0.72	2.09	--	--	1.09	1.26	--	--	3.26	5.73	6.88	8.53	--	3.46	0.48	0.8	0.08	0.1
23	--	--	0.24	0.29	0.11	0.11	--	--	--	--	--	--	--	--	--	--	--	--

Maximum Flow Rate (cfs)

Year	OF230	OF230A	OF235	OF237A	OF237A New	OF237B	OF243	OF245	OF254
1	3.4	--	0.35	5.7	--	25.3	14.2	3.3	3.2
2	0.2	--	2.7	6.1	--	15.4	2.8	1.1	4
3	0.2	--	3.3	16.6	--	10.7	17.1	0.7	0.5
4	0.2	--	2.7	6.1	--	15.4	2.8	1.1	4
5	1.3	--	6.3	9.5	10.2	9.4	53	3.3	1.2
6	2.6	--	5.4	5	29.7	12	15.3	3.6	1.1
7	2.9	--	14.5	4.3	19	19	8.6	1.3	1.6
8	2.2	--	2.9	4.1	29.1	20.7	1.3	1.1	3.3
9	5.7	--	3.6	6.9	7.5	19.3	1.1	0.5	3.1
10	3.3	--	2.7	8.1	7.3	22.5	1.2	1.2	3.2
11/14	Baseflow No Longer Sampled								
15	1.11	--	2.23	--	8.67	11.75	8.36	--	--
18	2.49	--	1.47	--	7.5	8.95	3.68	1.64	0.2
23	--	1.32	0.19	--	--	--	--	--	--

Baseflow event summaries are presented in Appendix B, Attachment B-1.

Table B4-9
Ranges of Magnitude and Intensity - Years 1 to 23 Stormwater Runoff Hydrographs

Year	230		230A		235		237A		237A New		237B		243		245		254	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Storm Volume Sampled (cf)																		
1	83,000	3,174,000	--	--	15,000	339,300	429,000	3,800,000	--	--	308,000	6,305,000	82,100	678,000	43,200	187,000	4,500	389,000
2	57,654	335,361	--	--	43,381	234,063	367,772	1,447,097	--	--	337,514	1,858,007	3,428	25,869	5,654	60,984	6,162	107,162
3	15,467	211,513	--	--	32,390	142,119	354,601	1,311,768	--	--	183,431	1,526,854	12,402	113,464	4,641	23,892	3,831	24,393
4	45,187	237,215	--	--	37,913	163,159	330,582	1,396,364	--	--	267,243	1,537,388	11,801	14,710	12,185	45,869	7,064	70,355
5	42,203	196,511	--	--	52,074	208,197	284,679	760,818	300,853	895,775	259,048	1,069,716	4,158	26,798	16,106	63,754	11,306	54,775
6	98,080	215,920	--	--	81,980	176,350	352,880	894,480	792,530	1,157,840	375,780	846,670	8,090	--	11,790	72,630	7,080	36,140
7	53,663	486,483	--	--	23,687	177,293	196,531	766,050	158,821	1,389,140	282,139	1,905,083	4,901	13,675	2,179	43,437	4,863	70,208
8	73,381	638,148	--	--	34,050	122,187	223,854	712,018	312,758	1,966,758	739,508	2,596,115	3,432	53,066	8,971	29,569	11,010	290,348
9	55,300	395,100	--	--	34,800	327,200	283,600	3,137,500	326,300	3,813,500	565,400	5,740,600	1,200	14,100	12,300	84,900	20,740	149,200
10	73,802	679,556	--	--	37,465	165,666	242,884	3,474,912	127,205	2,363,333	431,750	7,110,919	6,742	40,419	4,478	51,050	15,434	230,917
11	36,155	619,242	--	--	19,399	278,843	--	--	365,849	3,800,000	433,523	3,042,117	17,303	94,952	9,336	47,757	64,625	170,439
12	106,438	425,992	--	--	45,904	1,138,041	--	--	362,606	3,755,963	541,595	3,458,605	1,302	26,190	11,901	78,519	12,234	435,757
13	142,893	417,752	--	--	82,546	373,687	--	--	463,485	2,009,280	433,240	8,707,213	7,671	56,934	8,872	72,070	47,324	301,032
14	135,672	580,077	--	--	34,226	404,943	--	--	945,577	6,278,749	464,989	2,952,441	21,641	66,182	15,192	57,089	91,474	180,014
15	135,104	1,234,257	--	--	96,992	337,923	--	--	832,586	1,868,152	550,283	1,790,567	9,599	25,965	5,055	109,416	32,886	321,118
16	103,884	1,297,541	--	--	34,491	995,246	--	--	418,425	11,164,382	532,381	4,100,349	2,672	36,516	11,771	135,243	19,045	303,342
17	73,450	550,731	--	--	70,416	598,534	--	--	505,195	4,235,736	741,121	2,363,865	573	11,865	12,125	74,387	17,718	163,710
18	110,067	595,276	--	--	22,288	508,384	--	--	358,903	2,557,254	330,691	2,029,239	853	49,300	7,793	61,877	50,494	204,708
19	94,541	225,155	--	--	34,528	619,941	--	--	591,815	13,205,532	639,758	1,415,164	432	48,414	3,849	145,046	17,134	1,096,250
20	62,225	1,397,760	--	--	43,607	935,475	--	--	246,790	4,446,738	359,411	3,179,562	831	53,931	16,946	98,548	5,068	96,212
21	70,840	1,683,393	--	--	43,041	1,098,744	--	--	557,522	2,846,109	641,408	11,072,468	263	34,505	6,110	107,270	5,987	155,274
22	1,625	3,791	--	--	38,096	201,987	--	--	100,343	3,130,498	754,673	5,200,943	47	20,276	11,737	62,107	3,447	3,447
23	--	--	101,913	820,590	35,490	554,854	--	--	170,655	3,329,972	668,908	5,785,057	1,495	34,654	9,968	66,715	13,448	138,503
Event Average Flow Rate (cfs)																		
1	7	115	--	--	3	12	9	53	--	--	23	87	7	50	1.3	1.3	2	24
2	1.5	8.7	--	--	1.4	4	9.4	41	--	--	16	27	0.2	1.4	0.6	2.8	0.5	2.2
3	1.7	7.9	--	--	1.6	3.3	8.4	22	--	--	8.2	48	0.7	15.1	1.1	4.4	0.8	3.6
4	3	13.5	--	--	1.9	5.2	11.2	28.5	--	--	16.2	51	0.8	1.2	0.5	2	0.5	3.9
5	3.2	10.7	--	--	2.0	4.1	10.3	21.8	16.7	34	15.1	36.9	0.9	1.7	1.1	2.7	1.5	3.4
6	3.9	9.7	--	--	2.4	6.5	9.1	18	28.6	29.3	14.5	59.6	0.5	0.5	0.9	3.1	0.9	2.6
7	2.9	13	--	--	1.5	7.7	5.9	20.9	9.3	38.3	14.5	47.7	0.4	1.8	0.7	3.2	0.5	4.5
8	2.7	16.9	--	--	1.4	3.7	7.3	15.6	18.3	42.9	21.9	47.2	0.2	3.3	0.8	2.1	0.9	23.5
9	3.3	17.5	--	--	1.1	4.1	9.4	36.5	9.5	63	20	86.6	0.2	0.7	0.7	2.6	1.6	5.0
10	2.8	16.9	--	--	1.2	7.1	9.4	45	9.5	39.1	24.4	98.3	0.2	0.6	0.6	2.7	0.9	5.2
11	1.9	12.7	--	--	1.8	5.4	--	--	8.9	41.8	25.1	55.2	0.8	1.7	0.5	1.9	2.2	5.1
12	1.9	12.7	--	--	1.8	5.4	--	--	14.8	40.5	25.1	55.2	0.8	1.7	0.5	1.9	2.2	5.1
13	2.7	11.6	--	--	1.3	4.4	--	--	16.4	62.1	11.5	49.1	1.1	3.8	0.4	2.5	2.9	8.0
14	4.2	19.7	--	--	1.1	7.9	--	--	11.6	48.9	12.3	33.1	1.0	2.5	0.4	2.3	1.3	5.3
15	2.4	22.9	--	--	2.7	6.9	--	--	18.9	47.4	12.7	46.7	0.5	1.5	0.3	2.5	1.6	7.3
16	1.9	14.8	--	--	1.0	10.1	--	--	15.7	77.3	12.3	57.5	0.4	1.9	0.4	4.1	1.3	9.0
17	2.3	9.8	--	--	1.1	5.0	--	--	10.1	48.3	17.5	36.0	0.3	1.8	0.2	1.8	0.6	3.7
18	1.8	9.5	--	--	0.9	17.8	--	--	15.5	35.9	13.9	30.7	0.4	1.9	0.3	2.0	1.6	8.2
19	3.3	10.8	--	--	1.0	5.3	--	--	17.5	88.7	12.3	41.8	0.1	2.4	0.1	1.3	0.8	22.1
20	2.1	19.4	--	--	1.4	7.7	--	--	17.0	54.6	12.8	33.8	0.02	2.4	0.2	3.1	0.4	5.4
21	2.3	11.4	--	--	1.1	13.8	--	--	13.4	42.4	12.1	40.9	0.01	1.6	0.3	3.2	0.6	5.5
22	0.2	0.5	--	--	1.0	9.4	--	--	11.7	80.2	18.2	38.6	0.01	1.2	0.2	1.5	0.4	0.4
23	--	--	2.2	10.7	1.1	8.4	--	--	10.2	50.0	14.1	52.8	0.04	1.1	0.2	3.6	0.9	4.7
Maximum Flow Rate (cfs)																		
1	280		--	--	52		145		--		186		53		3.4		25	
2	35.5		--	--	26.9		83		--		154		3.1		8.1		7.5	
3	22.8		--	--	14.2		78		--		187		39.1		7		5.5	
4	37.5		--	--	21.7		105		--		172		2.7		6.3		8.6	
5	35.5		--	--	29.8		71		63		100		3.3		6.1		5.5	
6	29.9		--	--	25.2		37		72		81		0.9		6.9		6.3	
7	119		--	--	34.4		78		209		277		3		11		15.3	
8	43.7		--	--	11.9		113		178		145		8		4.8		25.3	
9	106		--	--	26.7		105		321		264		2.7		8.8		21.9	
10	85.8		--	--	19.1		110		152		219		2.4		11.1		20.0	
11	48.1		--	--	32.7		--		107		150		4.0		7.4		12.9	
12	60.9		--	--	49.0		--		163		148		3.8		5.5		13.6	
13	78.3		--	--	24.1		--		176		121		6.1		6.0		42.1	
14	82.4		--	--	47.8		--		211		123		3.6		6.4		12.4	
15	109		--	--	22.1		--		128		128		2.2		7.1		30.4	
16	136		--	--	18.2		--		324		274		4.8		10.5		35.4	
17	56.6		--	--	28.2		--		215		91		2.9		9.1		23.6	
18	133		--	--	29.0		--		207		98		3.2		8.6		23.4	
19	67.9		--	--	38.1		--		363		87		4.7		6.9		15.7	
20	153.4		--	--	41.4		--		194		181		6.1		10.4		16.6	
21	57.0		--	--	46.7		--		111		173		3.4		16.1		13.4	
22	4.2		--	--	17.7		--		199		140		3.9		8.6		2.3	
23	--		26.1		35.6		--		258		156		1.8		8.9		9.4	

Storm flow event summaries are presented in Appendix B, Attachment B-1.

Table B4-9 Ranges of Magnitude and Intensity-Years 1-23 for Baseflow and Stormwater Runoff Hydrographs

Table B5-1
Rainfall for the Stormwater SPM Sampling Periods

Sediment Trap Locations

Month	Average Monthly Rainfall (inches) Tacoma 1[1] 3/1982-12/1999	Average Monthly Rainfall (inches) Mean NCDC 1971-2000	Year 1 8/31/2001-3/26/2002 (inches)	Year 2 8/27/2002-4/28/2003 (inches)	Year 3 8/27/2003-4/8/2004 (inches)	Year 4 8/25/2004-4/8/2004 (inches)	Year 5 8/25/05-4/8/06 (inches)	Year 6 8/21/06-3/14/2007 (inches)	Year 7 8/22-31/07-4/3/08 (inches)	Year 8 8/28-29/08-4/4-8/09 (inches)	Year 9 8/27/09-8/23/10 (inches)	Year 10 8/23/10-8/24/11 (inches)	Year 11 8/24/11-8/23/12 (inches)	Year 12 8/23/12 - 8/20/13 (inches)	Year 13 8/20/13 - 8/27/14 (inches)	Year 14 8/20/14 - 8/27/15 (inches)	Year 15 8/10-17/15 - 8/15-26/16 (inches)	Year 16 8/15-26/16 - 8/21-23/17 (inches)	Year 17 8/21-23/17 - 8/17-21/18 (inches)	Year 18 8/17-23/18-8/19-21/19 (inches)	Year 19 8/19-21/19-8/17-18/20 (inches)	Year 20 8/17-20/20 - 8/24-25/21 (inches)	Year 21 8/24-31/21 - 8/22-23/22 (inches)	Year 22 8/22-8/23/22-8/22-8/24/23 (inches)	Year 23 8/21-24/23-8/20-22/24 (inches)
Date Deployed - September	1.14	1.42	0.46	0.36	0.69	3.26	0.92	0.74	2.29	0.55	2.41	4.12	0.96	0.02	9.07	2.76	3.33	1.14	1.11	1.54	3.57	2.68	3.25	0.00	1.14
October	3.49	3.39	3.32	0.41	8.88	3.61	3.00	1.28	3.64	2.36	0.53	4.64	3.39	5.97	1.57	6.20	5.92	10.57	5.60	3.89	3.66	3.06	5.03	2.03	2.93
November	6.73	6.1	10.13	2.96	6.15	2.81	6.25	15.81	2.64	7.61	7.74	5.37	5.98	7.12	3.40	6.53	8.22	7.57	9.38	4.15	1.85	5.41	10.54	5.64	4.74
December	5.65	5.89	6.82	6.58	4.65	4.03	6.28	8.05	8.26	4.17	2.67	6.83	6.44	8.33	1.91	4.88	12.22	3.65	5.74	6.93	7.36	5.64	5.55	6.98	7.91
January	6.01	5.38	6.68	8.50	6.79	4.71	11.93	6.92	4.63	7.13	7.40	5.17	7.02	3.31	4.29	3.98	7.20	2.99	7.90	3.70	9.66	8.65	7.28	2.80	6.60
February	3.63	4.44	3.56	1.71	2.55	0.79	2.59	4.09	2.79	1.60	3.95	3.54	3.19	1.58	7.68	4.61	5.55	9.24	2.75	4.19	3.35	4.00	3.56	1.79	2.41
March	4.09	4.18	4.10	5.08	2.18	3.14	1.90	6.09	4.16	4.68	4.91	6.57	7.11	2.50	8.81	3.89	5.80	8.27	2.15	1.86	3.47	2.06	3.10	2.52	1.61
April	2.96	2.87	--	5.08	0.01	4.74	0.32	1.12	0.00	3.31	2.90	5.13	3.74	4.52	4.22	1.56	1.37	4.67	5.81	2.65	1.24	0.85	3.34	3.49	1.76
May	1.93	2.01	--	--	--	1.49	--	--	--	0.27/2.05	4.15	3.77	2.33	2.86	3.23	0.74	0.58	2.02	0.09	0.46	2.49	1.29	3.04	0.62	1.24
June	1.56	1.58	--	--	--	--	--	--	--	--	3.05	1.40	2.54	1.85	0.94	0.22	1.41	1.54	0.69	0.19	1.90	1.85	2.72	0.32	1.27
July	0.73	0.86	--	--	--	--	--	--	--	--	0.78	0.74	0.87	0.01	0.57	0.47	0.61	0.00	0.02	0.77	0.20	0.00	0.19	0.11	0.40
August 1 to Date Retreived[2]	0.88	0.83	--	--	--	--	--	--	--	--	0.05	0.27	0.00	0.27	1.22	0.41	0.09	0.09	0.10	0.43	0.04	0.00	0.57	0.14	0.91
Total	38.80	38.95	35.07	30.68	31.90	28.58	33.19	44.10	28.41	31.64 / 33.42	40.54	47.55	43.57	38.34	46.91	36.25	52.30	51.75	41.34	30.76	38.79	35.49	48.17	26.44	32.92

Outfall 245 MH390 Sump Location

Month	Average Monthly Rainfall (inches) Tacoma 1[1] 3/1982-12/1999	Average Monthly Rainfall (inches) Mean NCDC 1971-2000	Year 1 2001-2002 (inches)	Year 2 2002-2003 (inches)	Year 3 2003-2004 (inches)	Year 4 2003-2004 (inches)	Year 5 2005-06 (inches)	Year 6 2006-07 (inches)	Year 7 2007-08 (inches)	Year 8 2008-09 (inches)	Year 9 2009-10 (inches)	Year 10 2010-11 (inches)	Year 11 8/25/11-8/14/12 (inches)	Year 12 8/13/12-8/20/13 (inches)	Year 13 8/20/13-8/27/14 (inches)	Year 14 8/20/14-8/27/15 (inches)	Year 15 10/27/15 - 8/16/16 (inches)	Year 16 8/16/16 - 8/22/17 (inches)	Year 17 8/22/17 - 8/22/18 (inches)	Year 18 8/24/18 - 8/19/19 (inches)	Year 19 9/9/2019 - 8/18/20 (inches)	Year 20 9/3/2020 - 8/25/21 (inches)	Year 21 9/3/2021 - 8/22/22 (inches)	Year 22 8/26/22 - 9/12/23 (inches)	Year 23 9/13/23-8/20/24 (inches)
Date Cleaned to August 31	--	--	2.23	0.03	0.00	0.00	0.01	0.07	0.90	1.51	0.38	0.19	0.00	0.00	9.07	0.50	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
September	1.14	1.42	0.46	0.36	0.69	3.26	0.92	0.74	2.22	0.39	2.04	3.93	0.96	0.02	1.57	2.26	0.00	1.13	1.11	1.54	2.57	2.30	3.20	0.00	1.14
October	3.49	3.39	3.32	0.41	8.88	3.61	3.00	1.28	3.64	2.32	0.53	4.64	3.39	5.97	3.40	6.20	3.43	10.57	5.60	3.89	3.66	3.06	5.03	2.03	2.93
November	6.73	6.1	10.13	2.96	6.15	2.81	6.25	15.81	2.64	7.61	7.74	5.37	5.98	7.12	1.91	6.53	8.22	7.57	9.38	4.15	1.85	5.41	10.54	5.64	4.74
December	5.65	5.89	6.82	6.58	4.65	4.03	6.28	8.05	8.26	4.17	2.67	6.83	6.44	8.33	4.29	4.88	12.22	3.65	5.74	6.93	7.36	5.64	5.55	6.98	7.91
January	6.01	5.38	6.68	8.50	6.79	4.71	11.93	6.92	4.63	7.13	7.40	5.17	7.02	3.31	7.68	3.98	7.20	2.99	7.90	3.70	9.66	8.65	7.28	2.80	6.60
February	3.63	4.44	3.56	1.71	2.55	0.79	2.59	4.09	2.79	1.60	3.95	3.54	3.19	1.58	8.81	4.61	5.55	9.24	2.75	4.19	3.35	4.00	3.56	1.79	2.41
March	4.09	4.18	4.16	5.08	4.16	3.14	1.90	6.09	4.16	4.68	4.91	6.57	7.11	2.50	4.22	3.89	5.80	8.27	2.15	1.86	3.47	2.06	3.10	2.52	1.61
April	2.96	2.87	3.64	3.30	0.91	4.74	2.47	1.34	1.75	3.31	2.90	5.13	3.74	4.52	3.23	1.56	1.37	4.67	5.81	2.65	1.24	0.85	3.34	3.49	1.76
May	1.93	2.01	1.14	0.55	2.56	3.34	1.56	1.31	1.00	3.03	4.15	3.77	2.33	2.86	0.94	0.74	0.58	2.02	0.09	0.46	2.49	1.29	3.04	0.62	1.24
June	1.56	1.58	1.36	0.36	0.64	1.26	2.25	1.44	1.26	0.33	3.05	1.40	2.54	1.85	0.57	0.22	1.41	1.54	0.69	0.19	1.90	1.85	2.72	0.32	1.27
July	0.73	0.86	0.42	0.13	0.00	1.16	0.11	1.30	0.26	0.00	0.78	0.74	0.87	0.01	1.22	0.47	0.61	0.00	0.02	0.77	0.20	0.00	0.19	0.11	0.40
August 1 to Date Cleaned	0.88	0.83	0.03	0.29	2.75	0.03	0.00	0.00	0.55	0.65	0.05	0.27	0.00	0.27	--	0.00	0.09	0.09	0.10	0.31	0.04	0.00	0.57	0.33	0.60
Total	38.80	38.95	43.95	26.96	40.73	32.88	37.37	47.14	34.06	36.73	40.55	47.55	43.57	35.84	43.51	29.14	33.48	51.75	41.34	26.94	37.79	35.11	48.12	26.63	32.61

[1]Rainfall data from Tacoma 1 - NOAA Station at Central Wastewater Treatment Plant, Tacoma, WA

[2] During sampling years 1-8 sediment traps were retrieved between March - May. The historic totals (Tacoma 1) for for March/April/May are 30.74/ 33.70/ 35.63.

Table B5-2
Estimated Runoff Volumes for Stormwater SPM Sampling Periods

				11/1998-8/2001	Year 1		Year 2		Year 3		Year 4		Year 5		Year 6		Year 7		Year 8		Year 9		Year 10		Year 11		Year 12	
					9/2001-3/2002	8/2001-8/2002	9/2002-4/2003	8/2002-8/2003	9/2003-4/2004	8/2003-8/2004	9/2004-5/2005	8/2004-8/2005	9/2005-5/2006	8/2005-8/2006	9/2006-3-4/2006	8/2006-8/2007	8/2007-4/2008	8/2007-8/2008	8/2008-4/2009	8/2008-8/2009	8/2009-8/2010		8/2010-8/2011		8/2011-8/2012		8/2012-8/2013	
Total Precipitation (inches)				199.05	35.07	43.95	28.9	35.07	31.9	38.75	28.54	32.88	33.19	39.27	36.89 / 44.1	48.44	28.41	34.06	31.64 / 33.42	36.73	40.54	40.55	47.55	47.55	43.57	43.57	38.34	38.34
Sampling Location ID No.	Basin ID No.	Contributing Area Acres	Factor for Correlating Precip with Runoff Depth*	Runoff Volume (ac-ft)																								
FD1	237B	1821	0.4		819		675		745		666		775		1030		663		739		946		1110		1017		895	
FD2	237A	2794	0.4		1256		1035		1143		1022		1189		1580		1018		1133		1452		1703		1561		1373	
FD2A	N/A	129	0.55		80		66		73		65		75		100		65		72		92		108		99		87	
FD3	230	513	0.4		231		190		210		188		218		243		187		208		267		313		287		252	
FD3A	230-7	146	0.55		90		74		82		73		85		95		73		81		104		122		112		99	
FD3B	230-1	82	0.72		66		55		60		54		63		70		54		63		77		90		82		73	
3NEW	230	741	0.4		333		275		303		271		315		350		270		301		385		452		414		364	
FD5	A6	230	0.55		142		117		129		116		135		179		115		128		164		193		177		155	
FD6	235	181	0.55		112		92		102		91		106		118		91		101		129		152		139		122	
FD23	N/A	50	0.72		40		33		37		33		38		51		33		39		47		55		50		44	
MH390	245	38	0.72	175		39		31		34		29		34		42		30		32		36		42		38		34

				11/1998-8/2001	Year 13		Year 14		Year 15		Year 16		Year 17		Year 18		Year 19		Year 20		Year 21		Year 22		Year 23	
					8/2013-8/2014		8/2014-8/2015		8/2015-8/2016		8/2016-8/2017		8/2017-8/2018		8/2018-8/2019		8/2019-8/2020		8/2020-8/2021		8/2021-9/2022		8/2022-9/2023		9/2023-8/2024	
Total Precipitation (inches)				199.05	46.91	46.91	36.25	35.84	52.30	46.48	51.75	51.75	41.34	41.34	30.76	30.64	38.79	37.79	35.49	35.11	48.17	48.12	26.44	26.63	32.92	32.61
Sampling Location ID No.	Basin ID No.	Contributing Area Acres	Factor for Correlating Precip with Runoff Depth*	Runoff Volume (ac-ft)																						
FD1	237B	1821	0.4		1095		846		1221		1208		965		718		905.6		829		1125		617		769	
FD2	237A	2794	0.4		1680		1298		1873		1854		1481		1102		1389		1271		1725		947		1179	
FD2A	N/A	129	0.55		107		82		119		118		94		70		88.21		81		110		60		75	
FD3	230	513	0.4		309		238		344		340		272		202		255.1		233		317		174		217	
FD3A	230-7	146	0.55		121		93		135		133		106		79		99.83		91		124		68		85	
FD3B	230-1	82	0.72		89		69		99		98		78		58		73.4		67		91		50		73	
3NEW	230	741	0.4		446		344		497		492		393		292		368.5		337		458		251		313	
FD5	A6	230	0.55		190		147		212		210		168		125		157.3		144		195		107		133	
FD6	235	181	0.55		150		116		167		165		132		98		123.8		113		154		84		105	
FD23	N/A	50	0.72		54		42		60		60		48		35		44.76		41		56		31		44	
MH390	245	38	0.72	175		41		31		41		45		36		27		33		31		42		23		29

** Refer to September 1999, Stormwater Control Feasibility Study, Appendix B, Table B-3*
Note: Runoff volumes shown are calculated using the formula as described in September 1999, Stormwater Source Control Feasibility Study, Appendix B.
All values shown are estimates.

Table B7-1
Stormwater Performance Measurement WY2024

Stormwater Performance Measurement		Evaluation Points	Measurement Quality Objective					
			Does not meet		Meets		Rejection or Censor	
Data Quality Indicator	**Evaluation**		**Number**	**%**	**Number**	**%**	**Number**	**%**
Bias	Blank, Laboratory	445	11	2.5%	434	97.5%	4	0.9%
Bias	Blank, Wash	487	8	1.6%	479	98.4%	0	0.0%
Bias	Blank, Bottle	2	0	0.0%	2	100.0%	0	0.0%
Bias	Blank, Trip	90	3	3.3%	87	96.7%	1	1.1%
Bias	Blank, Ambient Air	2	0	0.0%	2	100.0%	0	0.0%
Bias	Blank, Rinse	315	31	9.8%	284	90.2%	10	3.2%
Bias subtotal	*Blanks*	*1341*	*53*	*4.0%*	*1288*	*96.0%*	*15*	*1.1%*
Bias	Surrogate	340	4	1.2%	336	98.8%	1	0.3%
Bias	Laboratory Control Sample Recovery	528	0	0.0%	528	100.0%	0	0.0%
Bias	Matrix Spike/Duplicate (MS/MSD) Recovery	403	3	0.7%	400	99.3%	0	0.0%
Bias subtotal		*1271*	*7*	*0.6%*	*1264*	*99.4%*	*1*	*0.1%*
Bias Totals		**2612**	**60**	**2.3%**	**2552**	**97.7%**	**16**	**0.6%**
Comparability	Field Duplicate Relative Percent Difference (RPD)	124	11	8.9%	113	91.1%	4	3.2%
Comparability	Matrix Spike/Duplicate (MS/MSD) RPD	139	0	0.0%	139	100.0%	0	0.0%
Comparability	Lab Duplicate RPD	125	5	4.0%	120	96.0%	1	0.8%
Comparability Totals		**388**	**16**	**4.1%**	**372**	**95.9%**	**5**	**1.3%**
Sensitivity	Reporting limit for non-detect results	3991	156	3.9%	3835	96.1%	19	0.5%
Technical Consistency	Total and subcomponent (dissolved) fraction	470	67	14.3%	403	85.7%	0	0.0%
Detection Profile	Result substituted for 0 value.	3893	0	0.0%	3893	100.0%	0	0.0%
Stormwater Totals		**11354**	**299**	**2.6%**	**11055**	**97.4%**	**40**	**0.4%**

Table B7-2
Stormwater Sediment (SSPM) Quality Control Performance

			Measurement Quality Objective					
			Does not meet		Meets		Rejection or Censor	
Data Quality Indicator	**Evaluation**	**Evaluation Points**	**Number**	**%**	**Number**	**%**	**Number**	**%**
Bias	Blank, Laboratory	77	1	1.3%	76	98.7%	0	0.0%
Bias	Surrogate	74	1	1.4%	74	100.0%	0	0.0%
Bias	Laboratory Control Sample Recovery	38	5	13.2%	33	86.8%	0	0.0%
Bias	Matrix Spike/Duplicate (MS/MSD) Recovery	76	4	5.3%	72	94.7%	0	0.0%
Bias	Certified Reference Materials	29	0	0.0%	29	100.0%	0	0.0%
Recovery total		*217*	*10*	*4.6%*	*208*	*95.9%*	*0*	*0%*
Bias		**294**	**11**	3.7%	**284**	96.6%	**0**	0%
Comparability	Field Duplicate Relative Percent Difference (RPD)	25	0	0.0%	0	100.0%	0	0.0%
Comparability	Matrix Spike/Duplicate (MS/MSD) RPD	37	0	0.0%	0	100.0%	0	0.0%
Comparability	Lab Duplicate RPD	10	0	0.0%	0	100.0%	0	0.0%
Comparability Totals		**72**	**0**	**0.0%**	**0**	**100.0%**	**0**	**0.0%**
Sensitivity	Reporting limit for non-detect results	482	1	0.2%	481	99.8%	0	0.0%
Detection Profile	Result substituted for 0 value.	482	0	0.0%	482	100.0%	0	0.0%
Sediment Totals		**1330**	**12**	**0.9%**	**1247**	**93.8%**	**0**	**0.0%**

Table B7-3
Detection Profile Baseflow - WY2024

Flow Matrix	Class	Analyte	Detection Limit Goal		Tests			Detection profile, non-detections substituted at full value									Detection profile, non-detections substituted at 1/2 Method Detection Level									Detection profile, non-detections substituted as zero								
			Conc.	Units	Tests	ND	D	Min	5%	10%	25%	Md	75%	90%	95%	Max	Min	5%	10%	25%	Md	75%	90%	95%	Max	Min	5%	10%	25%	Md	75%	90%	95%	Max
Baseflow	Conventionals	Anionic Surfactants - MBAS	25	µg/L	4	0	4	19.	19.	19.	19.	33.	43.	68.	68.	68.	19.	19.	19.	19.	33.	43.	68.	68.	68.	19.	19.	19.	19.	33.	43.	68.	68.	68.
		BOD	2	mg/L	4	4	0	2.	2.	2.	2.	2.	2.	2.	2.	2.	1.	1.	1.	1.	1.	1.	1.	1.	1.	0.	0.	0.	0.	0.	0.	0.	0.	0.
		Chloride	0.2	mg/L	4	0	4	31.8	31.8	31.8	31.8	31.8	45.4	65.4	65.4	65.4	31.8	31.8	31.8	31.8	31.8	45.4	65.4	65.4	65.4	31.8	31.8	31.8	31.8	31.8	45.4	65.4	65.4	65.4
		Conductivity	1	µS/cm	4	0	4	364.	364.	364.	364.	372.	448.	540.	540.	540.	364.	364.	364.	364.	372.	448.	540.	540.	540.	364.	364.	364.	364.	372.	448.	540.	540.	540.
		Hardness, Total as CaCO3	0.05	mg CaCO3/L	4	0	4	133.	133.	133.	133.	135.	148.	161.	161.	161.	133.	133.	133.	133.	135.	148.	161.	161.	161.	133.	133.	133.	133.	135.	148.	161.	161.	161.
		pH	0.1	pH Units	4	0	4	7.8	7.8	7.8	7.8	8.1	8.2	8.2	8.2	8.2	7.8	7.8	7.8	7.8	8.1	8.2	8.2	8.2	8.2	7.8	7.8	7.8	7.8	8.1	8.2	8.2	8.2	8.2
		Total Suspended Solids	1	mg/L	4	2	2	1.	1.	1.	1.	1.02	1.21	3.1	3.1	3.1	0.5	0.5	0.5	0.5	0.51	1.21	3.1	3.1	3.1	0.	0.	0.	0.	0.	1.21	3.1	3.1	3.1
		Turbidity	0.2	NTU	4	0	4	1.27	1.27	1.27	1.27	2.17	2.31	4.34	4.34	4.34	1.27	1.27	1.27	1.27	2.17	2.31	4.34	4.34	4.34	1.27	1.27	1.27	1.27	2.17	2.31	4.34	4.34	4.34
	Nutrients	Nitrate+Nitrite as N	0.007	mg/L	4	0	4	0.646	0.646	0.646	0.646	0.86	1.54	1.82	1.82	1.82	0.646	0.646	0.646	0.646	0.86	1.54	1.82	1.82	1.82	0.646	0.646	0.646	0.646	0.86	1.54	1.82	1.82	1.82
		Phosphate, Ortho	0.003	mg/L	4	0	4	0.095	0.095	0.095	0.095	0.125	0.136	0.166	0.166	0.166	0.095	0.095	0.095	0.095	0.125	0.136	0.166	0.166	0.166	0.095	0.095	0.095	0.095	0.125	0.136	0.166	0.166	0.166
		Phosphorus, Total	0.003	mg/L	4	0	4	0.123	0.123	0.123	0.123	0.152	0.208	0.316	0.316	0.316	0.123	0.123	0.123	0.123	0.152	0.208	0.316	0.316	0.316	0.123	0.123	0.123	0.123	0.152	0.208	0.316	0.316	0.316
		Total Nitrogen	0.03	mg/L	4	0	4	1.13	1.13	1.13	1.13	1.16	1.82	2.42	2.42	2.42	1.13	1.13	1.13	1.13	1.16	1.82	2.42	2.42	2.42	1.13	1.13	1.13	1.13	1.16	1.82	2.42	2.42	2.42
	Metals	Cadmium	0.2	µg/L	4	4	0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.	0.	0.	0.	0.	0.	0.	0.	0.
		Cadmium, Dissolved	0.03	µg/L	4	4	0	0.086	0.086	0.086	0.086	0.086	0.086	0.086	0.086	0.086	0.043	0.043	0.043	0.043	0.043	0.043	0.043	0.043	0.043	0.	0.	0.	0.	0.	0.	0.	0.	0.
		Copper	0.5	µg/L	4	0	4	2.95	2.95	2.95	2.95	4.26	6.03	10.1	10.1	10.1	2.95	2.95	2.95	2.95	4.26	6.03	10.1	10.1	10.1	2.95	2.95	2.95	2.95	4.26	6.03	10.1	10.1	10.1
		Copper, Dissolved	0.02	µg/L	4	0	4	1.72	1.72	1.72	1.72	3.7	4.86	9.22	9.22	9.22	1.72	1.72	1.72	1.72	3.7	4.86	9.22	9.22	9.22	1.72	1.72	1.72	1.72	3.7	4.86	9.22	9.22	9.22
		Lead	0.1	µg/L	4	0	4	0.93	0.93	0.93	0.93	1.29	1.55	2.73	2.73	2.73	0.93	0.93	0.93	0.93	1.29	1.55	2.73	2.73	2.73	0.93	0.93	0.93	0.93	1.29	1.55	2.73	2.73	2.73
		Lead, Dissolved	0.05	µg/L	4	0	4	0.378	0.378	0.378	0.378	0.497	0.501	0.792	0.792	0.792	0.378	0.378	0.378	0.378	0.497	0.501	0.792	0.792	0.792	0.378	0.378	0.378	0.378	0.497	0.501	0.792	0.792	0.792
		Mercury	0.1	µg/L	4	4	0	0.0016	0.0016	0.0016	0.0016	0.0016	0.008	0.008	0.008	0.008	0.0008	0.0008	0.0008	0.0008	0.0008	0.004	0.004	0.004	0.004	0.	0.	0.	0.	0.	0.	0.	0.	0.
		Mercury, Dissolved	0.1	µg/L	4	4	0	0.0022	0.0022	0.0022	0.0022	0.0022	0.0111	0.0111	0.0111	0.0111	0.0011	0.0011	0.0011	0.0011	0.0011	0.00555	0.00555	0.00555	0.00555	0.	0.	0.	0.	0.	0.	0.	0.	0.
		Zinc	5	µg/L	4	0	4	6.77	6.77	6.77	6.77	6.82	27.5	34.9	34.9	34.9	6.77	6.77	6.77	6.77	6.82	27.5	34.9	34.9	34.9	6.77	6.77	6.77	6.77	6.82	27.5	34.9	34.9	34.9
		Zinc, Dissolved	1	µg/L	4	0	4	5.14	5.14	5.14	5.14	5.59	21.5	30.6	30.6	30.6	5.14	5.14	5.14	5.14	5.59	21.5	30.6	30.6	30.6	5.14	5.14	5.14	5.14	5.59	21.5	30.6	30.6	30.6
	Insecticides	Bifenthrin	0.02	µg/L	4	4	0	0.00977	0.00977	0.00977	0.00977	0.00989	0.00993	0.0102	0.0102	0.0102	0.00489	0.00489	0.00489	0.00489	0.00495	0.00497	0.0051	0.0051	0.0051	0.	0.	0.	0.	0.	0.	0.	0.	0.
	LPAHs	2-Methylnaphthalene	0.01	µg/L	4	4	0	0.00947	0.00947	0.00947	0.00947	0.00959	0.00963	0.00985	0.00985	0.00985	0.00474	0.00474	0.00474	0.00474	0.0048	0.00482	0.00493	0.00493	0.00493	0.	0.	0.	0.	0.	0.	0.	0.	0.
		Acenaphthene	0.01	µg/L	4	4	0	0.00957	0.00957	0.00957	0.00957	0.00969	0.00973	0.00995	0.00995	0.00995	0.00479	0.00479	0.00479	0.00479	0.00485	0.00487	0.00498	0.00498	0.00498	0.	0.	0.	0.	0.	0.	0.	0.	0.
		Acenaphthylene	0.01	µg/L	4	4	0	0.00918	0.00918	0.00918	0.00918	0.0093	0.00933	0.00954	0.00954	0.00954	0.00459	0.00459	0.00459	0.00459	0.00465	0.00467	0.00477	0.00477	0.00477	0.	0.	0.	0.	0.	0.	0.	0.	0.
		Anthracene	0.01	µg/L	4	2	2	0.00498	0.00498	0.00498	0.00498	0.00518	0.00794	0.0109	0.0109	0.0109	0.00249	0.00249	0.00249	0.00249	0.00259	0.00794	0.0109	0.0109	0.0109	0.	0.	0.	0.	0.	0.00794	0.0109	0.0109	0.0109
		Fluorene	0.01	µg/L	4	4	0	0.00947	0.00947	0.00947	0.00947	0.00959	0.00963	0.00985	0.00985	0.00985	0.00474	0.00474	0.00474	0.00474	0.0048	0.00482	0.00493	0.00493	0.00493	0.	0.	0.	0.	0.	0.	0.	0.	0.
		Naphthalene	0.01	µg/L	4	1	3	0.0264	0.0264	0.0264	0.0264	0.0287	0.0294	0.0328	0.0328	0.0328	0.01435	0.01435	0.01435	0.01435	0.0264	0.0294	0.0328	0.0328	0.0328	0.	0.	0.	0.	0.0264	0.0294	0.0328	0.0328	0.0328
		Phenanthrene	0.01	µg/L	4	3	1	0.00684	0.00684	0.00684	0.00684	0.00695	0.00711	0.00791	0.00791	0.00791	0.00342	0.00342	0.00342	0.00342	0.00348	0.00356	0.00791	0.00791	0.00791	0.	0.	0.	0.	0.	0.	0.00791	0.00791	0.00791
	HPAHs	Benzo(a)anthracene	0.01	µg/L	4	4	0	0.00586	0.00586	0.00586	0.00586	0.00593	0.00596	0.00609	0.00609	0.00609	0.00293	0.00293	0.00293	0.00293	0.00297	0.00298	0.00305	0.00305	0.00305	0.	0.	0.	0.	0.	0.	0.	0.	0.
		Benzo(a)pyrene	0.01	µg/L	4	4	0	0.00332	0.00332	0.00332	0.00332	0.00336	0.00338	0.00345	0.00345	0.00345	0.00166	0.00166	0.00166	0.00166	0.00168	0.00169	0.00173	0.00173	0.00173	0.	0.	0.	0.	0.	0.	0.	0.	0.
		Benzo(b,j,k)fluoranthene	0.03	µg/L	4	3	1	0.0106	0.0106	0.0106	0.0106	0.0108	0.0111	0.0228	0.0228	0.0228	0.0053	0.0053	0.0053	0.0053	0.0054	0.00555	0.0228	0.0228	0.0228	0.	0.	0.	0.	0.	0.	0.0228	0.0228	0.0228
		Benzo(g,h,i)perylene	0.01	µg/L	4	2	2	0.00508	0.00508	0.00508	0.00508	0.00514	0.00596	0.00609	0.00609	0.00609	0.00254	0.00254	0.00254	0.00254	0.00257	0.00596	0.00609	0.00609	0.00609	0.	0.	0.	0.	0.	0.00596	0.00609	0.00609	0.00609
		Chrysene	0.01	µg/L	4	4	0	0.00801	0.00801	0.00801	0.00801	0.00811	0.00814	0.00832	0.00832	0.00832	0.00401	0.00401	0.00401	0.00401	0.00406	0.00407	0.00416	0.00416	0.00416	0.	0.	0.	0.	0.	0.	0.	0.	0.
		Dibenz(a,h)anthracene	0.01	µg/L	4	4	0	0.00615	0.00615	0.00615	0.00615	0.00623	0.00626	0.0064	0.0064	0.0064	0.00308	0.00308	0.00308	0.00308	0.00312	0.00313	0.0032	0.0032	0.0032	0.	0.	0.	0.	0.	0.	0.	0.	0.
		Fluoranthene	0.01	µg/L	4	3	1	0.00713	0.00713	0.00713	0.00713	0.00722	0.00741	0.00993	0.00993	0.00993	0.00357	0.00357	0.00357	0.00357	0.00361	0.00371	0.00993	0.00993	0.00993	0.	0.	0.	0.	0.	0.	0.00993	0.00993	0.00993
		Indeno(1,2,3-cd)pyrene	0.01	µg/L	4	4	0	0.00479	0.00479	0.00479	0.00479	0.00485	0.00487	0.00497	0.00497	0.00497	0.0024	0.0024	0.0024	0.0024	0.00243	0.00244	0.00249	0.00249	0.00249	0.	0.	0.	0.	0.	0.	0.	0.	0.
		Pyrene	0.01	µg/L	4	3	1	0.0083	0.0083	0.0083	0.0083	0.00841	0.00863	0.0139	0.0139	0.0139	0.00415	0.00415	0.00415	0.00415	0.00421	0.00432	0.0139	0.0139	0.0139	0.	0.	0.	0.	0.	0.	0.0139	0.0139	0.0139
		Retene	0.01	µg/L	4	3	1	0.00508	0.00508	0.00508	0.00508	0.00514	0.00528	0.00695	0.00695	0.00695	0.00254	0.00254	0.00254	0.00254	0.00257	0.00264	0.00695	0.00695	0.00695	0.	0.	0.	0.	0.	0.	0.00695	0.00695	0.00695
	Phthalates	Bis(2-ethylhexyl) phthalate	0.5	µg/L	4	3	1	0.358	0.358	0.358	0.358	0.362	0.364	0.388	0.388	0.388	0.179	0.179	0.179	0.179	0.181	0.182	0.388	0.388	0.388	0.	0.	0.	0.	0.	0.	0.388	0.388	0.388
		Butyl benzyl phthalate	0.5	µg/L	4	4	0	0.406	0.406	0.406	0.406	0.411	0.413	0.422	0.422	0.422	0.203	0.203	0.203	0.203	0.2055	0.2065	0.211	0.211	0.211	0.	0.	0.	0.	0.	0.	0.	0.	0.
		Diethyl phthalate	0.5	µg/L	4	3	1	0.314	0.314	0.314	0.314	0.318	0.32	0.48	0.48	0.48	0.157	0.157	0.157	0.157	0.159	0.16	0.48	0.48	0.48	0.	0.	0.	0.	0.	0.	0.48	0.48	0.48
		Dimethyl phthalate	0.5	µg/L	4	4	0	0.342	0.342	0.342	0.342	0.346	0.348	0.355	0.355	0.355	0.171	0.171	0.171	0.171	0.173	0.174	0.1775	0.1775	0.1775	0.	0.	0.	0.	0.	0.	0.	0.	0.
		Di-n-butyl phthalate	0.5	µg/L	4	4	0	0.296	0.296	0.296	0.296	0.3	0.301	0.308	0.308	0.308	0.148	0.148	0.148	0.148	0.15	0.1505	0.154	0.154	0.154	0.	0.	0.	0.	0.	0.	0.	0.	0.
		Di-n-octyl phthalate	0.5	µg/L	4	4	0	0.362	0.362	0.362	0.362	0.367	0.369	0.377	0.377	0.377	0.181	0.181	0.181	0.181	0.1835	0.1845	0.1885	0.1885	0.1885	0.	0.	0.	0.	0.	0.	0.	0.	0.
	Herbicide	Dichlobenil	0.02	µg/L	4	3	1	0.0084	0.0084	0.0084	0.0084	0.00851	0.00854	0.0122	0.0122	0.0122	0.0042	0.0042	0.0042	0.0042	0.00426	0.00427	0.0122	0.0122	0.0122	0.	0.	0.	0.	0.	0.	0.0122	0.0122	0.0122
	TPH	NWTPH-Diesel	0.1	mg/L	15	15	0	0.02	0.02	0.03	0.03	0.05	0.1	0.11	0.11	0.11	0.01	0.01	0.015	0.015	0.025	0.05	0.055	0.055	0.055	0.	0.	0.	0.	0.	0.	0.	0.	0.
		NWTPH-Heavy Oil	0.1	mg/L	15	14	1	0.05	0.05	0.05	0.05	0.11	0.21	0.21	0.25	0.25	0.025	0.025	0.025	0.025	0.055	0.105	0.105	0.25	0.25	0.	0.	0.	0.	0.	0.	0.	0.25	0.25
	Bacteria	E. Coli	2	MPN/100mL	15	0	15	2.	2.	4.	13.	50.	130.	3000.	90000.	90000.	2.	2.	4.	13.	50.	130.	3000.	90000.	90000.	2.	2.	4.	13.	50.	130.	3000.	90000.	90000.
		Enterococci	2	MPN/100mL	15	0	15	10.	10.	20.	20.	66.	230.	430.	590.	590.	10.	10.	20.	20.	66.	230.	430.	590.	590.	10.	10.	20.	20.	66.	230.	430.	590.	590.
		Fecal Coliform	2	MPN/100mL	15	0	15	2.	2.	13.	30.	90.	170.	3000.	90000.	90000.	2.	2.	13.	30.	90.	170.	3000.	90000.	90000.	2.	2.	13.	30.	90.	170.	3000.	90000.	90000.

N = Tests, D = Detections, ND = Non-detections, Md = Median, Min = Minimum, Max = Maximum

Table B7-4
Detection Profile Stormwater - WY2024

Flow Matrix	Class	Analyte	Detection Limit Goal		Tests			Detection profile, non-detections substituted at full value									Detection profile, non-detections substituted at 1/2 Method Detection Level									Detection profile, non-detections substituted as zero								
			Conc.	Units	Tests	ND	D	Min	5%	10%	25%	Md	75%	90%	95%	Max	Min	5%	10%	25%	Md	75%	90%	95%	Max	Min	5%	10%	25%	Md	75%	90%	95%	Max
Storm	Conventionals	Anionic Surfactants - MBAS	25	µg/L	54	0	54	22.	23.	24.6	31.8	45.6	65.4	83.	105.	134.	22.	23.	24.6	31.8	45.6	65.4	83.	105.	134.	22.	23.	24.6	31.8	45.6	65.4	83.	105.	134.
		BOD	2	mg/L	53	8	45	2.	2.	2.	2.4	3.1	4.6	8.1	8.8	9.2	1.	1.	1.	2.4	3.1	4.6	8.1	8.8	9.2	0.	0.	0.	2.4	3.1	4.6	8.1	8.8	9.2
		Chloride	0.2	mg/L	54	0	54	2.58	3.36	3.91	5.98	18.9	561.	1020.	2400.	3730.	2.58	3.36	3.91	5.98	18.9	561.	1020.	2400.	3730.	2.58	3.36	3.91	5.98	18.9	561.	1020.	2400.	3730.
		Conductivity	1	µS/cm	75	0	75	42.8	52.1	59.9	86.3	141.	658.	3900.	7280.	11700.	42.8	52.1	59.9	86.3	141.	658.	3900.	7280.	11700.	42.8	52.1	59.9	86.3	141.	658.	3900.	7280.	11700.
		Hardness, Total as CaCO3	0.05	mg CaCO3/L	75	0	75	10.6	14.3	16.8	27.	48.4	83.2	407.	647.	1160.	10.6	14.3	16.8	27.	48.4	83.2	407.	647.	1160.	10.6	14.3	16.8	27.	48.4	83.2	407.	647.	1160.
		pH	0.1	pH Units	75	0	75	5.9	6.3	6.4	6.6	6.9	7.2	7.4	7.5	8.2	5.9	6.3	6.4	6.6	6.9	7.2	7.4	7.5	8.2	5.9	6.3	6.4	6.6	6.9	7.2	7.4	7.5	8.2
		Total Suspended Solids	1	mg/L	73	0	73	8.6	12.8	14.8	19.1	33.8	56.6	84.4	106.	127.	8.6	12.8	14.8	19.1	33.8	56.6	84.4	106.	127.	8.6	12.8	14.8	19.1	33.8	56.6	84.4	106.	127.
		Turbidity	0.2	NTU	54	0	54	6.47	7.75	8.69	12.9	18.1	34.2	53.	77.5	202.	6.47	7.75	8.69	12.9	18.1	34.2	53.	77.5	202.	6.47	7.75	8.69	12.9	18.1	34.2	53.	77.5	202.
	Nutrients	Nitrate+Nitrite as N	0.007	mg/L	71	0	71	0.053	0.075	0.102	0.135	0.26	0.504	1.21	1.42	2.4	0.053	0.075	0.102	0.135	0.26	0.504	1.21	1.42	2.4	0.053	0.075	0.102	0.135	0.26	0.504	1.21	1.42	2.4
		Phosphate, Ortho	0.003	mg/L	74	2	72	0.007	0.012	0.015	0.018	0.027	0.042	0.057	0.071	0.104	0.006	0.011	0.015	0.018	0.027	0.042	0.057	0.071	0.104	0.	0.011	0.015	0.018	0.027	0.042	0.057	0.071	0.104
		Phosphorus, Total	0.003	mg/L	71	0	71	0.033	0.049	0.055	0.072	0.112	0.195	0.324	0.456	1.01	0.033	0.049	0.055	0.072	0.112	0.195	0.324	0.456	1.01	0.033	0.049	0.055	0.072	0.112	0.195	0.324	0.456	1.01
		Total Nitrogen	0.03	mg/L	71	0	71	0.21	0.31	0.4	0.51	0.76	1.35	1.75	2.13	2.91	0.21	0.31	0.4	0.51	0.76	1.35	1.75	2.13	2.91	0.21	0.31	0.4	0.51	0.76	1.35	1.75	2.13	2.91
	Metals	Cadmium	0.2	µg/L	75	38	37	0.1	0.1	0.1	0.1	0.1	0.165	0.262	0.317	0.466	0.05	0.05	0.05	0.05	0.1	0.157	0.262	0.317	0.466	0.	0.	0.	0.	0.	0.157	0.262	0.317	0.466
		Cadmium, Dissolved	0.03	µg/L	75	56	19	0.045	0.045	0.045	0.045	0.045	0.086	0.094	0.12	0.352	0.0225	0.0225	0.0225	0.0225	0.0225	0.051	0.094	0.113	0.352	0.	0.	0.	0.	0.	0.049	0.09	0.111	0.352
		Copper	0.5	µg/L	75	0	75	3.87	4.23	4.49	6.62	12.7	21.1	40.3	54.9	133.	3.87	4.23	4.49	6.62	12.7	21.1	40.3	54.9	133.	3.87	4.23	4.49	6.62	12.7	21.1	40.3	54.9	133.
		Copper, Dissolved	0.02	µg/L	75	0	75	0.957	1.6	1.8	2.16	3.32	7.11	12.2	18.1	55.9	0.957	1.6	1.8	2.16	3.32	7.11	12.2	18.1	55.9	0.957	1.6	1.8	2.16	3.32	7.11	12.2	18.1	55.9
		Lead	0.1	µg/L	75	0	75	0.845	1.91	2.12	3.25	5.6	22.8	36.6	57.2	144.	0.845	1.91	2.12	3.25	5.6	22.8	36.6	57.2	144.	0.845	1.91	2.12	3.25	5.6	22.8	36.6	57.2	144.
		Lead, Dissolved	0.05	µg/L	75	0	75	0.072	0.083	0.12	0.159	0.242	0.77	5.26	7.98	20.2	0.072	0.083	0.12	0.159	0.242	0.77	5.26	7.98	20.2	0.072	0.083	0.12	0.159	0.242	0.77	5.26	7.98	20.2
		Mercury	0.1	µg/L	75	60	15	0.0016	0.0016	0.008	0.008	0.008	0.008	0.0118	0.0138	0.0334	0.0008	0.0008	0.004	0.004	0.004	0.004	0.0118	0.0138	0.0334	0.	0.	0.	0.	0.	0.	0.0118	0.0138	0.0334
		Mercury, Dissolved	0.1	µg/L	75	74	1	0.0022	0.0022	0.0111	0.0111	0.0111	0.0111	0.0111	0.0111	0.0146	0.0011	0.0011	0.00555	0.00555	0.00555	0.00555	0.00555	0.00555	0.0146	0.	0.	0.	0.	0.	0.	0.	0.	0.0146
		Zinc	5	µg/L	75	0	75	23.7	28.2	32.1	45.4	66.	92.7	147.	193.	321.	23.7	28.2	32.1	45.4	66.	92.7	147.	193.	321.	23.7	28.2	32.1	45.4	66.	92.7	147.	193.	321.
		Zinc, Dissolved	1	µg/L	75	0	75	9.5	13.4	16.	21.3	26.9	36.5	48.7	84.9	233.	9.5	13.4	16.	21.3	26.9	36.5	48.7	84.9	233.	9.5	13.4	16.	21.3	26.9	36.5	48.7	84.9	233.
	Insecticides	Bifenthrin	0.02	µg/L	75	73	2	0.00951	0.00954	0.00962	0.00976	0.00983	0.01	0.0104	0.0105	0.0967	0.00476	0.00477	0.00481	0.00488	0.00492	0.005	0.0052	0.00525	0.04835	0.	0.	0.	0.	0.	0.	0.	0.	0.0131
	LPAHs	2-Methylnaphthalene	0.01	µg/L	75	42	33	0.00922	0.00932	0.00942	0.00954	0.00975	0.0166	0.0332	0.0619	0.122	0.00461	0.00466	0.00471	0.00477	0.00505	0.0166	0.0332	0.0569	0.122	0.	0.	0.	0.	0.	0.0156	0.0315	0.0569	0.122
		Acenaphthene	0.01	µg/L	75	66	9	0.00932	0.0094	0.00946	0.00956	0.00965	0.0098	0.0116	0.018	0.0948	0.00466	0.0047	0.00473	0.00478	0.00483	0.00491	0.0116	0.018	0.0474	0.	0.	0.	0.	0.	0.	0.0108	0.0137	0.0328
		Acenaphthylene	0.01	µg/L	75	62	13	0.00894	0.00903	0.00907	0.00918	0.00929	0.00974	0.0124	0.0143	0.0909	0.00447	0.00452	0.00454	0.00459	0.00465	0.00487	0.0124	0.0143	0.04545	0.	0.	0.	0.	0.	0.	0.0118	0.0135	0.0157
		Anthracene	0.01	µg/L	75	47	28	0.00489	0.00491	0.00495	0.00501	0.0051	0.0177	0.034	0.0433	0.0615	0.00245	0.00246	0.00248	0.00251	0.00255	0.0177	0.0336	0.041	0.0615	0.	0.	0.	0.	0.	0.0118	0.0336	0.041	0.0615
		Fluorene	0.01	µg/L	75	55	20	0.00923	0.00934	0.00942	0.00951	0.00963	0.0101	0.0127	0.0172	0.0938	0.00462	0.00467	0.00471	0.00476	0.00484	0.00976	0.0127	0.0172	0.0469	0.	0.	0.	0.	0.	0.00964	0.0125	0.0157	0.02
		Naphthalene	0.01	µg/L	75	34	41	0.0153	0.0156	0.0157	0.0158	0.0231	0.0363	0.0419	0.0498	0.155	0.00765	0.0078	0.00785	0.0079	0.0188	0.0363	0.0419	0.0498	0.0796	0.	0.	0.	0.	0.0186	0.0358	0.0409	0.0494	0.0796
		Phenanthrene	0.01	µg/L	75	6	69	0.0069	0.007	0.0117	0.0205	0.0272	0.039	0.0531	0.0634	0.0771	0.00345	0.0035	0.0117	0.0205	0.0272	0.0384	0.0531	0.0603	0.0771	0.	0.	0.0106	0.0196	0.027	0.0384	0.0531	0.0603	0.0771
	HPAHs	Benzo(a)anthracene	0.01	µg/L	75	29	46	0.00572	0.00579	0.00585	0.006	0.00977	0.0187	0.0326	0.0383	0.0742	0.00286	0.0029	0.00293	0.003	0.00977	0.0187	0.0326	0.0383	0.0742	0.	0.	0.	0.	0.00977	0.0187	0.0326	0.0383	0.0742
		Benzo(a)pyrene	0.01	µg/L	75	22	53	0.00324	0.0033	0.00333	0.00342	0.0143	0.0269	0.0435	0.0605	0.128	0.00162	0.00165	0.00167	0.00171	0.0143	0.0269	0.0435	0.0605	0.128	0.	0.	0.	0.	0.0143	0.0269	0.0435	0.0605	0.128
		Benzo(b,j,k)fluoranthene	0.03	µg/L	75	7	68	0.0106	0.0113	0.0126	0.0246	0.0379	0.0611	0.0942	0.121	0.282	0.0053	0.00565	0.0126	0.0246	0.0379	0.0579	0.084	0.121	0.282	0.	0.	0.0114	0.0241	0.036	0.0579	0.084	0.121	0.282
		Benzo(g,h,i)perylene	0.01	µg/L	75	8	67	0.00504	0.00515	0.00858	0.014	0.0219	0.0309	0.0432	0.0584	0.128	0.00252	0.00258	0.00858	0.014	0.0219	0.0303	0.0416	0.0584	0.128	0.	0.	0.	0.0138	0.0215	0.0303	0.0416	0.0584	0.128
		Chrysene	0.01	µg/L	75	9	66	0.00782	0.00803	0.00862	0.0118	0.019	0.0317	0.0485	0.0634	0.125	0.00391	0.00402	0.00432	0.0118	0.019	0.0317	0.048	0.0634	0.125	0.	0.	0.	0.0117	0.018	0.0315	0.048	0.0634	0.125
		Dibenz(a,h)anthracene	0.01	µg/L	75	65	10	0.00599	0.00603	0.00607	0.00615	0.00621	0.00633	0.00787	0.0137	0.0609	0.003	0.00302	0.00304	0.00308	0.00311	0.00317	0.00787	0.0137	0.03045	0.	0.	0.	0.	0.	0.	0.00785	0.0119	0.0257
		Fluoranthene	0.01	µg/L	75	3	72	0.00709	0.0138	0.02	0.0263	0.039	0.0639	0.0812	0.0913	0.204	0.00355	0.0138	0.02	0.0263	0.039	0.0558	0.0812	0.0913	0.204	0.	0.0109	0.0196	0.0256	0.039	0.0558	0.0812	0.0913	0.204
		Indeno(1,2,3-cd)pyrene	0.01	µg/L	75	10	65	0.00467	0.0048	0.0049	0.01	0.0167	0.0246	0.0347	0.0605	0.114	0.00234	0.0024	0.00254	0.01	0.0167	0.0237	0.0346	0.0605	0.114	0.	0.	0.	0.01	0.015	0.0236	0.0346	0.0605	0.114
		Pyrene	0.01	µg/L	75	1	74	0.0107	0.022	0.026	0.0352	0.0473	0.0706	0.0946	0.109	0.193	0.0107	0.022	0.026	0.0352	0.0471	0.0671	0.0946	0.109	0.193	0.	0.0217	0.0252	0.0342	0.0471	0.0671	0.0946	0.109	0.193
		Retene	0.01	µg/L	75	17	58	0.00499	0.00507	0.00514	0.00582	0.00778	0.0117	0.015	0.0209	0.0503	0.0025	0.00254	0.00257	0.00582	0.00778	0.0117	0.015	0.0209	0.0341	0.	0.	0.	0.00581	0.00763	0.0117	0.0147	0.0174	0.0341
	Phthalates	Bis(2-ethylhexyl) phthalate	0.5	µg/L	75	4	71	0.348	0.408	0.5	0.642	0.962	1.27	1.79	2.07	3.54	0.174	0.408	0.5	0.642	0.962	1.27	1.77	1.93	2.79	0.	0.	0.446	0.634	0.957	1.21	1.75	1.93	2.79
		Butyl benzyl phthalate	0.5	µg/L	75	72	3	0.395	0.396	0.4	0.405	0.409	0.416	0.431	0.509	4.02	0.1975	0.198	0.2	0.2025	0.2045	0.208	0.2155	0.509	2.01	0.	0.	0.	0.	0.	0.	0.	0.	1.99
		Diethyl phthalate	0.5	µg/L	75	62	13	0.306	0.308	0.31	0.314	0.317	0.334	0.686	0.927	3.11	0.153	0.154	0.155	0.157	0.1585	0.167	0.686	0.927	1.555	0.	0.	0.	0.	0.	0.	0.646	0.878	1.35
		Dimethyl phthalate	0.5	µg/L	75	74	1	0.333	0.334	0.337	0.341	0.344	0.35	0.355	0.368	3.38	0.1665	0.167	0.1685	0.1705	0.172	0.175	0.1775	0.184	1.69	0.	0.	0.	0.	0.	0.	0.	0.	0.389
		Di-n-butyl phthalate	0.5	µg/L	75	51	24	0.288	0.292	0.294	0.297	0.303	0.345	0.652	0.941	2.93	0.144	0.146	0.147	0.1485	0.1515	0.345	0.652	0.941	1.48	0.	0.	0.	0.	0.	0.339	0.648	0.859	1.48
		Di-n-octyl phthalate	0.5	µg/L	75	74	1	0.353	0.354	0.357	0.362	0.365	0.371	0.377	0.391	3.59	0.1765	0.177	0.1785	0.181	0.1825	0.1855	0.1885	0.1955	1.795	0.	0.	0.	0.	0.	0.	0.	0.	0.514
	Herbicide	Dichlobenil	0.02	µg/L	75	14	61	0.00826	0.00842	0.00858	0.0105	0.0195	0.0303	0.0466	0.105	0.629	0.00413	0.00421	0.00429	0.0105	0.0195	0.0303	0.0466	0.105	0.629	0.	0.	0.	0.0105	0.0195	0.0303	0.0466	0.105	0.629
	TPH	NWTPH-Diesel	0.1	mg/L	41	38	3	0.09	0.09	0.09	0.1	0.1	0.1	0.11	0.12	0.15	0.045	0.045	0.045	0.05	0.05	0.05	0.055	0.12	0.15	0.	0.	0.	0.	0.	0.	0.	0.12	0.15
		NWTPH-Heavy Oil	0.1	mg/L	41	2	39	0.2	0.22	0.25	0.28	0.43	0.67	0.77	0.94	1.48	0.105	0.2	0.25	0.28	0.43	0.67	0.77	0.94	1.48	0.	0.2	0.25	0.28	0.43	0.67	0.77	0.94	1.48
	Bacteria	E. Coli	2	MPN/100mL	41	0	41	50.	130.	330.	800.	3000.	7000.	21000.	50000.	230000.	50.	130.	330.	800.	3000.	7000.	21000.	50000.	230000.	50.	130.	330.	800.	3000.	7000.	21000.	50000.	230000.
		Enterococci	2	MPN/100mL	41	0	41	270.	1100.	1700.	2500.	4400.	12000.	37000.	55000.	170000.	270.	1100.	1700.	2500.	4400.	12000.	37000.	55000.	170000.	270.	1100.	1700.	2500.	4400.	12000.	37000.	55000.	170000.
		Fecal Coliform	2	MPN/100mL	41	0	41	130.	330.	700.	1700.	4900.	13000.	24000.	50000.	230000.	130.	330.	700.	1700.	4900.	13000.	24000.	50000.	230000.	130.	330.	700.	1700.	4900.	13000.	24000.	50000.	230000.

N = Tests, D = Detections, ND = Non-detections, Md = Median, Min = Minimum, Max = Maximum

Table B7-5
Detection Profile - Stormwater Sediment SSPM - WY2024

Class	Analyte	Detection Limit Goal		Tests			Detection profile, non-detections substituted at full value									Detection profile, non-detections substituted at 1/2 Method Detection Level									Detection profile, non-detections substituted as zero								
		Conc.	Units	Tests	ND	D	Min	5%	10%	25%	Md	75%	90%	95%	Max	Min	5%	10%	25%	Md	75%	90%	95%	Max	Min	5%	10%	25%	Md	75%	90%	95%	Max
Phenols	Pentachlorophenol	270	µg/Kg dry	8	4	4	32.9	32.9	32.9	33.	52.4	110.	306.	306.	306.	16.45	16.45	16.45	16.5	48.45	110.	306.	306.	306.	0.	0.	0.	0.	0.	110.	306.	306.	306.
SVOA	2-Methylphenol	70	µg/Kg dry	8	6	2	7.54	7.54	7.54	7.55	7.67	9.59	36.4	36.4	36.4	3.77	3.77	3.77	3.775	3.835	9.59	36.4	36.4	36.4	0.	0.	0.	0.	0.	0.	36.4	36.4	36.4
	4-Methylphenol	70	µg/Kg dry	8	1	7	9.66	9.66	9.66	19.7	34.6	96.4	848.	848.	848.	4.83	4.83	4.83	19.7	34.6	96.4	848.	848.	848.	0.	0.	0.	19.7	34.6	96.4	848.	848.	848.
Conventionals	Total Organic Carbon	0.1	mg/Kg	15	0	15	26900.	26900.	56800.	66700.	164000.	193000.	197000.	198000.	198000.	26900.	26900.	56800.	66700.	164000.	193000.	197000.	198000.	198000.	26900.	26900.	56800.	66700.	164000.	193000.	197000.	198000.	198000.
	Total Solids	0.1	%	16	0	16	19.2	19.2	24.9	26.3	31.	52.8	63.9	65.	65.	19.2	19.2	24.9	26.3	31.	52.8	63.9	65.	65.	19.2	19.2	24.9	26.3	31.	52.8	63.9	65.	65.
	Total Volatile Solids	0.1	%	8	0	8	5.8	5.8	5.8	10.8	19.	24.4	32.6	32.6	32.6	5.8	5.8	5.8	10.8	19.	24.4	32.6	32.6	32.6	5.8	5.8	5.8	10.8	19.	24.4	32.6	32.6	32.6
Nutrients	Phosphorus, Total	0.01	mg/Kg dry	7	0	7	404.	404.	404.	563.	1120.	1740.	2130.	2130.	2130.	404.	404.	404.	563.	1120.	1740.	2130.	2130.	2130.	404.	404.	404.	563.	1120.	1740.	2130.	2130.	2130.
Metals	Cadmium	0.1	mg/Kg dry	7	2	5	0.0706	0.0706	0.0706	0.0708	0.659	0.801	2.96	2.96	2.96	0.0353	0.0353	0.0353	0.0354	0.659	0.801	2.96	2.96	2.96	0.	0.	0.	0.	0.659	0.801	2.96	2.96	2.96
	Copper	0.1	mg/Kg dry	7	0	7	40.3	40.3	40.3	70.5	156.	173.	275.	275.	275.	40.3	40.3	40.3	70.5	156.	173.	275.	275.	275.	40.3	40.3	40.3	70.5	156.	173.	275.	275.	275.
	Lead	0.1	mg/Kg dry	9	0	9	31.8	31.8	31.8	71.7	88.9	253.	449.	449.	449.	31.8	31.8	31.8	71.7	88.9	253.	449.	449.	449.	31.8	31.8	31.8	71.7	88.9	253.	449.	449.	449.
	Mercury	0.005	mg/Kg dry	8	0	8	0.0394	0.0394	0.0394	0.0543	0.131	0.178	0.281	0.281	0.281	0.0394	0.0394	0.0394	0.0543	0.131	0.178	0.281	0.281	0.281	0.0394	0.0394	0.0394	0.0543	0.131	0.178	0.281	0.281	0.281
	Zinc	0.5	mg/Kg dry	9	0	9	213.	213.	213.	539.	704.	837.	1890.	1890.	1890.	213.	213.	213.	539.	704.	837.	1890.	1890.	1890.	213.	213.	213.	539.	704.	837.	1890.	1890.	1890.
Insecticides	Bifenthrin	1	µg/Kg dry	8	3	5	0.412	0.412	0.412	0.413	9.96	17.1	31.2	31.2	31.2	0.206	0.206	0.206	0.2065	9.96	17.1	31.2	31.2	31.2	0.	0.	0.	0.	9.96	17.1	31.2	31.2	31.2
LPAHs	2-Methylnaphthalene	70	µg/Kg dry	12	1	11	12.	12.	13.5	42.6	104.	119.	139.	165.	165.	6.	6.	13.5	42.6	104.	119.	139.	165.	165.	0.	0.	13.5	42.6	104.	119.	139.	165.	165.
	Acenaphthene	70	µg/Kg dry	12	1	11	13.4	13.4	26.2	34.4	36.9	59.1	144.	224.	224.	6.7	6.7	26.2	34.4	36.9	59.1	144.	224.	224.	0.	0.	26.2	34.4	36.9	59.1	144.	224.	224.
	Acenaphthylene	70	µg/Kg dry	12	8	4	6.32	6.32	6.33	6.35	6.44	39.8	61.1	122.	122.	3.16	3.16	3.165	3.175	3.22	39.8	61.1	122.	122.	0.	0.	0.	0.	0.	39.8	61.1	122.	122.
	Anthracene	70	µg/Kg dry	12	0	12	39.6	39.6	73.5	93.4	165.	417.	1100.	1570.	1570.	39.6	39.6	73.5	93.4	165.	417.	1100.	1570.	1570.	39.6	39.6	73.5	93.4	165.	417.	1100.	1570.	1570.
	Fluorene	70	µg/Kg dry	12	1	11	5.41	5.41	14.2	44.3	71.9	106.	287.	384.	384.	2.705	2.705	14.2	44.3	71.9	106.	287.	384.	384.	0.	0.	14.2	44.3	71.9	106.	287.	384.	384.
	Naphthalene	70	µg/Kg dry	12	0	12	13.7	13.7	47.2	85.7	140.	179.	203.	398.	398.	13.7	13.7	47.2	85.7	140.	179.	203.	398.	398.	13.7	13.7	47.2	85.7	140.	179.	203.	398.	398.
	Phenanthrene	70	µg/Kg dry	12	0	12	242.	242.	260.	365.	978.	1370.	5500.	6990.	6990.	242.	242.	260.	365.	978.	1370.	5500.	6990.	6990.	242.	242.	260.	365.	978.	1370.	5500.	6990.	6990.
HPAHs	Benzo(a)anthracene	70	µg/Kg dry	12	2	10	4.81	4.81	4.83	267.	559.	858.	5830.	7170.	7170.	2.405	2.405	2.415	267.	559.	858.	5830.	7170.	7170.	0.	0.	0.	267.	559.	858.	5830.	7170.	7170.
	Benzo(a)pyrene	70	µg/Kg dry	12	1	11	11.1	11.1	153.	279.	434.	1010.	5410.	5600.	5600.	5.55	5.55	153.	279.	434.	1010.	5410.	5600.	5600.	0.	0.	153.	279.	434.	1010.	5410.	5600.	5600.
	Benzo(b,j,k)fluoranthene	210	µg/Kg dry	12	0	12	284.	284.	522.	567.	1100.	1640.	10000.	12100.	12100.	284.	284.	522.	567.	1100.	1640.	10000.	12100.	12100.	284.	284.	522.	567.	1100.	1640.	10000.	12100.	12100.
	Benzo(g,h,i)perylene	70	µg/Kg dry	12	0	12	258.	258.	326.	334.	573.	689.	2770.	3420.	3420.	258.	258.	326.	334.	573.	689.	2770.	3420.	3420.	258.	258.	326.	334.	573.	689.	2770.	3420.	3420.
	Chrysene	70	µg/Kg dry	12	0	12	112.	112.	245.	270.	751.	838.	6040.	7550.	7550.	112.	112.	245.	270.	751.	838.	6040.	7550.	7550.	112.	112.	245.	270.	751.	838.	6040.	7550.	7550.
	Dibenz(a,h)anthracene	70	µg/Kg dry	12	3	9	13.	13.	13.	13.1	137.	193.	1140.	1390.	1390.	6.5	6.5	6.5	6.55	137.	193.	1140.	1390.	1390.	0.	0.	0.	0.	137.	193.	1140.	1390.	1390.
	Fluoranthene	70	µg/Kg dry	12	0	12	482.	482.	674.	885.	1780.	2870.	16500.	21200.	21200.	482.	482.	674.	885.	1780.	2870.	16500.	21200.	21200.	482.	482.	674.	885.	1780.	2870.	16500.	21200.	21200.
	Indeno(1,2,3-cd)pyrene	70	µg/Kg dry	12	0	12	201.	201.	210.	316.	578.	699.	4450.	5620.	5620.	201.	201.	210.	316.	578.	699.	4450.	5620.	5620.	201.	201.	210.	316.	578.	699.	4450.	5620.	5620.
	Pyrene	70	µg/Kg dry	12	0	12	370.	370.	406.	662.	1180.	1490.	9380.	11000.	11000.	370.	370.	406.	662.	1180.	1490.	9380.	11000.	11000.	370.	370.	406.	662.	1180.	1490.	9380.	11000.	11000.
	Retene	70	µg/Kg dry	12	0	12	79.4	79.4	86.7	125.	136.	327.	489.	630.	630.	79.4	79.4	86.7	125.	136.	327.	489.	630.	630.	79.4	79.4	86.7	125.	136.	327.	489.	630.	630.
Phthalates	Bis(2-ethylhexyl) phthalate	70	µg/Kg dry	9	0	9	1550.	1550.	1550.	5090.	7180.	10100.	12400.	12400.	12400.	1550.	1550.	1550.	5090.	7180.	10100.	12400.	12400.	12400.	1550.	1550.	1550.	5090.	7180.	10100.	12400.	12400.	12400.
	Butyl benzyl phthalate	70	µg/Kg dry	9	0	9	105.	105.	105.	638.	1410.	4360.	104000.	104000.	104000.	105.	105.	105.	638.	1410.	4360.	104000.	104000.	104000.	105.	105.	105.	638.	1410.	4360.	104000.	104000.	104000.
	Diethyl phthalate	70	µg/Kg dry	9	2	7	35.3	35.3	35.3	35.4	86.8	136.	162.	162.	162.	17.65	17.65	17.65	35.4	86.8	136.	162.	162.	162.	0.	0.	0.	35.4	86.8	136.	162.	162.	162.
	Dimethyl phthalate	70	µg/Kg dry	9	1	8	5.61	5.61	5.61	43.6	69.8	231.	693.	693.	693.	2.805	2.805	2.805	43.6	69.8	231.	693.	693.	693.	0.	0.	0.	43.6	69.8	231.	693.	693.	693.
	Di-n-butyl phthalate	70	µg/Kg dry	9	1	8	30.7	30.7	30.7	179.	328.	353.	433.	433.	433.	15.35	15.35	15.35	179.	328.	353.	433.	433.	433.	0.	0.	0.	179.	328.	353.	433.	433.	433.
	Di-n-octyl phthalate	70	µg/Kg dry	9	9	0	13.9	13.9	13.9	13.9	14.	14.1	40.8	40.8	40.8	6.95	6.95	6.95	6.95	7.	7.05	20.4	20.4	20.4	0.	0.	0.	0.	0.	0.	0.	0.	0.
Herbicide	Dichlobenil	1	µg/Kg dry	8	6	2	0.732	0.732	0.732	0.733	0.74	0.746	53.4	53.4	53.4	0.366	0.366	0.366	0.3665	0.37	0.373	53.4	53.4	53.4	0.	0.	0.	0.	0.	0.	53.4	53.4	53.4
TPH	NWTPH-Diesel	25	mg/Kg dry	7	6	1	19.3	19.3	19.3	19.3	19.8	19.9	344.	344.	344.	9.65	9.65	9.65	9.65	9.9	9.95	344.	344.	344.	0.	0.	0.	0.	0.	0.	344.	344.	344.
	NWTPH-Heavy Oil	100	mg/Kg dry	7	0	7	1380.	1380.	1380.	2850.	4080.	7530.	9470.	9470.	9470.	1380.	1380.	1380.	2850.	4080.	7530.	9470.	9470.	9470.	1380.	1380.	1380.	2850.	4080.	7530.	9470.	9470.	9470.
PCBs	Aroclor-1016	10	µg/Kg dry	12	12	0	1.74	1.74	1.74	1.76	1.8	3.6	3.6	3.61	3.61	0.87	0.87	0.87	0.88	0.9	1.8	1.8	1.805	1.805	0.	0.	0.	0.	0.	0.	0.	0.	0.
	Aroclor-1221	10	µg/Kg dry	12	12	0	1.74	1.74	1.74	1.76	1.8	3.6	3.6	3.61	3.61	0.87	0.87	0.87	0.88	0.9	1.8	1.8	1.805	1.805	0.	0.	0.	0.	0.	0.	0.	0.	0.
	Aroclor-1232	10	µg/Kg dry	12	12	0	1.74	1.74	1.74	1.76	1.8	3.6	3.6	3.61	3.61	0.87	0.87	0.87	0.88	0.9	1.8	1.8	1.805	1.805	0.	0.	0.	0.	0.	0.	0.	0.	0.
	Aroclor-1242	10	µg/Kg dry	12	12	0	1.74	1.74	1.74	1.76	1.8	3.6	3.6	3.61	3.61	0.87	0.87	0.87	0.88	0.9	1.8	1.8	1.805	1.805	0.	0.	0.	0.	0.	0.	0.	0.	0.
	Aroclor-1248	10	µg/Kg dry	12	12	0	1.93	1.93	1.93	1.94	1.99	3.98	3.99	3.99	3.99	0.965	0.965	0.965	0.97	0.995	1.99	1.995	1.995	1.995	0.	0.	0.	0.	0.	0.	0.	0.	0.
	Aroclor-1254	10	µg/Kg dry	12	11	1	1.93	1.93	1.93	1.94	2.	3.98	3.99	1380.	1380.	0.965	0.965	0.965	0.97	1.	1.99	1.995	1380.	1380.	0.	0.	0.	0.	0.	0.	0.	1380.	1380.
	Aroclor-1260	10	µg/Kg dry	12	12	0	1.93	1.93	1.93	1.94	1.99	3.98	3.99	3.99	3.99	0.965	0.965	0.965	0.97	0.995	1.99	1.995	1.995	1.995	0.	0.	0.	0.	0.	0.	0.	0.	0.

N = Tests, D = Detections, ND = Non-detections, Md = Median, Min = Minimum, Max = Maximum

Table B7- 6
Sensitivity Stormwater - WY2024

Class	Analyte	Detection Limit Goal		Tests			Evaluations			Performance Method Detection Limit (MDL)									Performance Non-Detection MDL									Reporting Level (Lowest Standard = Practical Quantitation Limits)								
		Conc.	Units	Tests	ND	D	DL>DLG	MQO	Rej	Min	5%	10%	25%	Md	75%	90%	95%	Max	Min	5%	10%	25%	Md	75%	90%	95%	Max	Min	5%	10%	25%	Md	75%	90%	95%	Max
Conventionals	Anionic Surfactants - MBAS	25	µg/L	62		62				5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2	5.2										25.	25.	25.	25.	25.	25.	25.	25.	25.
	BOD	2	mg/L	61	14	47				2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
	Chloride	0.2	mg/L	62		62	62			0.73	0.73	0.73	0.73	0.73	3.65	36.5	73.	365.										1.	1.	1.	1.	1.	10.	50.	100.	500.
	Hardness, Total as CaCO3	0.05	mg CaCO3/L	84		84	2			0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.1										0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2
	Total Suspended Solids	1	mg/L	82	2	80	67	1		1.	1.	1.	1.25	1.9	2.	2.78	3.33	7.41	1.	1.	1.	1.	1.	1.02	1.02	1.02	1.02	1.	1.	1.	1.16	1.89	2.	2.78	3.33	7.41
	Turbidity	0.2	NTU	62		62	62			0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46	0.46										1.	1.	1.	1.	1.	1.	1.	1.	1.
Nutrients	Nitrate+Nitrite as N	0.007	mg/L	80		80	80			0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.048										0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.1
	Phosphate, Ortho	0.003	mg/L	83	2	81	83	2		0.004	0.004	0.004	0.006	0.008	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.012	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	Phosphorus, Total	0.003	mg/L	80		80	80			0.012	0.012	0.012	0.012	0.012	0.024	0.024	0.024	0.12										0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.4
	Total Nitrogen	0.03	mg/L	80		80	80			0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09										0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Metals	Cadmium	0.2	µg/L	84	44	40				0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1.
	Cadmium, Dissolved	0.03	µg/L	84	63	21	84	62	1	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.086	0.086	0.086	0.226	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	2.5
	Copper	0.5	µg/L	84		84	84			0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	1.6										0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	1.6
	Copper, Dissolved	0.02	µg/L	84		84	84			0.118	0.118	0.118	0.118	0.118	0.118	0.118	0.118	0.59										0.1	0.1	0.1	0.1	0.1	0.118	0.118	0.118	0.5
	Lead	0.1	µg/L	84		84	84			0.102	0.102	0.102	0.102	0.102	0.102	0.102	0.102	0.204										0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1.
	Lead, Dissolved	0.05	µg/L	84		84	2			0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.25										0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.5
	Mercury	0.1	µg/L	84	68	16				0.0016	0.0016	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.0016	0.0016	0.0016	0.008	0.008	0.008	0.008	0.008	0.008	0.005	0.005	0.005	0.025	0.025	0.025	0.025	0.025	0.025
	Mercury, Dissolved	0.1	µg/L	84	83	1				0.0111	0.0111	0.0111	0.0111	0.0111	0.0111	0.0111	0.0111	0.0111	0.0022	0.0022	0.0022	0.0111	0.0111	0.0111	0.0111	0.0111	0.0111	0.005	0.005	0.005	0.025	0.025	0.025	0.025	0.025	0.025
	Zinc	5	µg/L	84		84				0.64	0.64	0.64	1.68	1.68	1.68	1.68	1.68	3.36										5.	5.	5.	5.	5.	5.	5.	5.	10.
	Zinc, Dissolved	1	µg/L	84		84				0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.81										1.	1.	1.	1.	1.	1.	1.	1.	5.
Insecticides	Bifenthrin	0.02	µg/L	84	82	2	1	1		0.00977	0.00977	0.00977	0.00977	0.00977	0.0101	0.0101	0.0101	0.0101	0.00951	0.00954	0.00961	0.00976	0.00983	0.00998	0.0101	0.0104	0.0967	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.0967
LPAHs	2-Methylnaphthalene	0.01	µg/L	84	49	35	6	5	1	0.00923	0.00925	0.00926	0.0094	0.00948	0.0096	0.0097	0.00972	0.00985	0.00922	0.00929	0.00932	0.00948	0.00955	0.0097	0.0101	0.0102	0.0938	0.01	0.01	0.01	0.01	0.01	0.01	0.0101	0.0104	0.0967
	Acenaphthene	0.01	µg/L	84	74	10	6	5	1	0.00934	0.00934	0.00934	0.00935	0.00945	0.0098	0.0098	0.00985	0.00985	0.00932	0.00939	0.00944	0.00956	0.00964	0.00978	0.00995	0.0102	0.0948	0.01	0.01	0.01	0.01	0.01	0.01	0.0101	0.0104	0.0967
	Acenaphthylene	0.01	µg/L	84	71	13	1		1	0.00894	0.00894	0.00896	0.00906	0.00917	0.00925	0.00929	0.0094	0.0094	0.00894	0.009	0.00906	0.00917	0.00925	0.0094	0.00954	0.00979	0.0909	0.01	0.01	0.01	0.01	0.01	0.01	0.0101	0.0104	0.0967
	Anthracene	0.01	µg/L	84	52	32	1	1		0.00485	0.00485	0.00487	0.00492	0.00499	0.00503	0.00506	0.00528	0.00537	0.00489	0.0049	0.00492	0.00498	0.00502	0.0051	0.00518	0.00531	0.0493	0.0117	0.0117	0.0118	0.012	0.0121	0.0123	0.0124	0.0127	0.119
	Fluorene	0.01	µg/L	84	63	21	6	5	1	0.00922	0.00925	0.00926	0.00934	0.00946	0.00954	0.00958	0.0097	0.0097	0.00923	0.00931	0.0094	0.00947	0.00956	0.0097	0.00985	0.0101	0.0938	0.01	0.01	0.01	0.01	0.01	0.01	0.0101	0.0104	0.0967
	Naphthalene	0.01	µg/L	84	37	47	84	36	1	0.0152	0.0153	0.0153	0.0154	0.0157	0.016	0.0168	0.0223	0.0288	0.0153	0.0155	0.0156	0.0157	0.0157	0.0161	0.0261	0.0287	0.155	0.0253	0.0254	0.0256	0.026	0.0262	0.0266	0.0276	0.0287	0.257
	Phenanthrene	0.01	µg/L	84	9	75	1		1	0.00665	0.00668	0.00672	0.00681	0.00687	0.00693	0.00704	0.00725	0.00737	0.00684	0.00684	0.00684	0.00695	0.00699	0.00704	0.0677	0.0677	0.0677	0.0166	0.0167	0.0168	0.0171	0.0172	0.0175	0.0176	0.0181	0.169
HPAHs	Benzo(a)anthracene	0.01	µg/L	84	36	48	1			0.0057	0.00573	0.00576	0.00585	0.00589	0.00593	0.00609	0.00622	0.058	0.00572	0.00573	0.00577	0.00583	0.00591	0.006	0.00603	0.00625	0.00632	0.01	0.01	0.01	0.01	0.01	0.01	0.0101	0.0104	0.0967
	Benzo(a)pyrene	0.01	µg/L	84	29	55	1			0.00323	0.00324	0.00328	0.00332	0.00334	0.00337	0.0034	0.00352	0.0329	0.00324	0.00324	0.00325	0.00332	0.00336	0.0034	0.00352	0.00354	0.00358	0.01	0.01	0.01	0.01	0.01	0.01	0.0101	0.0104	0.0967
	Benzo(b,j,k)fluoranthene	0.03	µg/L	84	11	73	1	1		0.0104	0.0104	0.0105	0.0106	0.0107	0.0108	0.0109	0.011	0.0115	0.0104	0.0104	0.0106	0.0106	0.0109	0.0114	0.0115	0.105	0.105	0.03	0.03	0.03	0.03	0.03	0.03	0.0302	0.0311	0.29
	Benzo(g,h,i)perylene	0.01	µg/L	84	11	73	1		1	0.00494	0.00496	0.005	0.00507	0.00511	0.00516	0.00523	0.00528	0.00547	0.00497	0.00497	0.00504	0.00505	0.00514	0.00539	0.00547	0.0503	0.0503	0.01	0.01	0.01	0.01	0.01	0.01	0.0101	0.0104	0.0967
	Chrysene	0.01	µg/L	84	16	68	1		1	0.00779	0.00785	0.00789	0.008	0.00806	0.0082	0.00824	0.0085	0.00863	0.00782	0.00782	0.00782	0.0079	0.00803	0.00812	0.00863	0.0793	0.0793	0.01	0.01	0.01	0.01	0.01	0.01	0.0101	0.0104	0.0967
	Dibenz(a,h)anthracene	0.01	µg/L	84	74	10	1		1	0.00599	0.00599	0.00599	0.00615	0.00618	0.00623	0.00624	0.00633	0.00633	0.00599	0.00601	0.00605	0.00614	0.00619	0.0063	0.0064	0.00656	0.0609	0.01	0.01	0.01	0.01	0.01	0.01	0.0101	0.0104	0.0967
	Fluoranthene	0.01	µg/L	84	6	78	1		1	0.00694	0.00697	0.00701	0.00712	0.00717	0.00725	0.00734	0.00756	0.00768	0.00709	0.00709	0.00709	0.00713	0.00722	0.00741	0.0706	0.0706	0.0706	0.01	0.01	0.01	0.01	0.01	0.01	0.0101	0.0104	0.0967
	Indeno(1,2,3-cd)pyrene	0.01	µg/L	84	17	67	1	1		0.00466	0.00469	0.00472	0.00478	0.00482	0.00489	0.00492	0.00497	0.00516	0.00467	0.00467	0.00468	0.00476	0.00482	0.0049	0.00516	0.0474	0.0474	0.01	0.01	0.01	0.01	0.01	0.01	0.0101	0.0104	0.0967
	Pyrene	0.01	µg/L	84	4	80	1		1	0.00808	0.00811	0.00816	0.00828	0.00835	0.00844	0.00854	0.00881	0.00895	0.0083	0.0083	0.0083	0.0083	0.00841	0.00863	0.0822	0.0822	0.0822	0.01	0.01	0.01	0.01	0.01	0.01	0.0101	0.0104	0.0967
	Retene	0.01	µg/L	84	22	62	1		1	0.00494	0.00496	0.00498	0.00506	0.0051	0.00515	0.0052	0.00528	0.00547	0.00499	0.00501	0.00505	0.00508	0.00514	0.00523	0.00539	0.00542	0.0503	0.01	0.01	0.01	0.01	0.01	0.01	0.0101	0.0104	0.0967
Phthalates	Bis(2-ethylhexyl) phthalate	0.5	µg/L	84	7	77	1		1	0.349	0.35	0.352	0.357	0.36	0.366	0.368	0.38	0.386	0.348	0.348	0.348	0.355	0.358	0.364	3.54	3.54	3.54	0.951	0.954	0.961	0.976	0.983	0.998	1.01	1.04	9.67
	Butyl benzyl phthalate	0.5	µg/L	84	81	3	1		1	0.401	0.401	0.401	0.401	0.41	0.422	0.422	0.422	0.422	0.395	0.396	0.399	0.405	0.409	0.415	0.418	0.431	4.02	0.951	0.954	0.961	0.976	0.983	0.998	1.01	1.04	9.67
	Diethyl phthalate	0.5	µg/L	84	69	15	1		1	0.307	0.307	0.311	0.314	0.318	0.322	0.324	0.327	0.327	0.306	0.307	0.309	0.314	0.316	0.32	0.327	0.335	3.11	0.951	0.954	0.961	0.976	0.983	0.998	1.01	1.04	9.67
	Dimethyl phthalate	0.5	µg/L	84	83	1	1		1	0.351	0.351	0.351	0.351	0.351	0.351	0.351	0.351	0.351	0.333	0.334	0.336	0.341	0.344	0.349	0.352	0.363	3.38	0.951	0.954	0.961	0.976	0.983	0.998	1.01	1.04	9.67
	Di-n-butyl phthalate	0.5	µg/L	84	57	27	1		1	0.288	0.289	0.289	0.292	0.297	0.3	0.305	0.305	0.316	0.288	0.291	0.293	0.296	0.298	0.303	0.308	0.319	2.93	0.951	0.954	0.961	0.976	0.983	0.998	1.01	1.04	9.67
	Di-n-octyl phthalate	0.5	µg/L	84	83	1	1		1	0.365	0.365	0.365	0.365	0.365	0.365	0.365	0.365	0.365	0.353	0.354	0.356	0.362	0.365	0.371	0.373	0.385	3.59	0.951	0.954	0.961	0.976	0.983	0.998	1.01	1.04	9.67
Herbicide	Dichlobenil	0.02	µg/L	84	19	65	1			0.00817	0.00821	0.00825	0.00839	0.00845	0.00851	0.00864	0.00891	0.0832	0.00822	0.00822	0.00826	0.0084	0.00851	0.0086	0.00896	0.00905	0.00905	0.0475	0.0477	0.048	0.0488	0.0492	0.0499	0.0503	0.0518	0.484
TPH	NWTPH-Diesel	0.1	mg/L	63	60	3	5	5		0.09	0.09	0.09	0.09	0.1	0.1	0.1	0.1	0.1	0.02	0.03	0.05	0.09	0.1	0.1	0.1	0.11	0.11	0.02	0.03	0.05	0.09	0.1	0.1	0.1	0.11	0.11
	NWTPH-Heavy Oil	0.1	mg/L	63	18	45	56	12		0.1	0.18	0.18	0.2	0.2	0.21	0.21	0.21	0.22	0.05	0.05	0.05	0.05	0.11	0.21	0.21	0.22	0.22	0.05	0.05	0.1	0.19	0.2	0.21	0.21	0.21	0.22
Bacteria	E. Coli	2	CFU/100mL	63		63				1.	1.	1.	1.	1.	1.	1.	1.	1.										1.	1.	1.	5.	5.	5.	5.	5.	5.
	Enterococci	2	CFU/100mL	63		63				1.	1.	1.	1.	1.	1.	1.	1.	1.										1.	1.	1.	1.	1.	1.	1.	1.	1.
	Fecal Coliform	2	CFU/100mL	63		63				1.	1.	1.	1.	1.	1.	1.	1.	1.										1.	1.	1.	1.	1.	1.	1.	1.	1.

D = Detection, ND = Non-detection, Md = Median

Evaluation	Performance detection limit greater than the detection limit goal (DL>DLG).
Method Quality Objective	Performance detection limit greater than the detection limit goal, a result nondetection, and not a rejection. This is an exceedance of the Method Quality Objective.
Rejection	Non-detection greater than five times the method quality objective.

Table B7-7
Sensitivity Stormwater Sediments (SSPM)

Class	Analyte	Detection Limit Goal		Tests			Evaluations			Performance Method Detection Limit (MDL)									Performance Non-Detection MDL									Reporting Level (Lowest Standard = Practical Quantitation Limits)								
		Conc.	Units	Tests	ND	D	DL>DLG	MQO	Rej	Min	5%	10%	25%	Md	75%	90%	95%	Max	Min	5%	10%	25%	Md	75%	90%	95%	Max	Min	5%	10%	25%	Md	75%	90%	95%	Max
Phenols	Pentachlorophenol	270	µg/Kg dry	8	4	4				32.9	32.9	32.9	32.9	33.	33.2	33.5	33.5	33.5	32.9	32.9	32.9	32.9	33.	33.5	96.9	96.9	96.9	34.3	34.3	34.3	34.3	34.4	34.9	101.	101.	101.
SVOA	2-Methylphenol	70	µg/Kg dry	8	6	2				7.57	7.57	7.57	7.57	7.57	7.62	7.62	7.62	7.62	7.54	7.54	7.54	7.55	7.57	7.68	22.2	22.2	22.2	9.79	9.79	9.79	9.8	9.84	9.96	28.8	28.8	28.8
	4-Methylphenol	70	µg/Kg dry	8	1	7				9.69	9.69	9.69	9.75	9.82	48.2	48.4	48.4	48.4	9.66	9.66	9.66	9.66	9.66	9.66	9.66	9.66	9.66	9.8	9.8	9.8	9.84	9.96	28.8	49.2	49.2	49.2
Conventionals	Total Organic Carbon	0.1	mg/Kg	15		15	15			8.	8.	8.	8.	8.	8.	8.	8.	8.										200.	200.	200.	200.	200.	200.	200.	200.	200.
	Total Solids	0.1	%	16		16	16			1.	1.	1.	1.	1.	1.	1.	1.	1.										1.	1.	1.	1.	1.	1.	1.	1.	1.
	Total Volatile Solids	0.1	%	8		8	8			1.	1.	1.	1.	1.	1.	1.	1.	1.										1.	1.	1.	1.	1.	1.	1.	1.	1.
Nutrients	Phosphorus, Total	0.01	mg/Kg dry	7		7	7			194.	194.	194.	212.	218.	263.	799.	799.	799.										258.	258.	258.	281.	290.	349.	1060.	1060.	1060.
Metals	Cadmium	0.1	mg/Kg dry	7	2	5	5			0.176	0.176	0.176	0.176	0.176	0.177	0.178	0.178	0.178	0.0706	0.0706	0.0706	0.0706	0.0706	0.0708	0.0708	0.0708	0.0708	0.0992	0.0992	0.0992	0.0994	0.247	0.248	0.25	0.25	0.25
	Copper	0.1	mg/Kg dry	7		7	7			0.913	0.913	0.913	0.914	0.917	4.59	4.62	4.62	4.62										2.47	2.47	2.47	2.47	2.48	12.4	12.5	12.5	12.5
	Lead	0.1	mg/Kg dry	9		9	9			0.227	0.227	0.227	0.228	0.229	1.14	4.59	4.59	4.59										0.247	0.247	0.247	0.247	0.248	1.24	4.99	4.99	4.99
	Mercury	0.005	mg/Kg dry	8		8	8			0.0079	0.0079	0.0079	0.0184	0.019	0.0194	0.0201	0.0201	0.0201										0.0079	0.0079	0.0079	0.0184	0.019	0.0194	0.0201	0.0201	0.0201
	Zinc	0.5	mg/Kg dry	9		9	9			2.24	2.24	2.24	11.1	11.2	11.2	44.9	44.9	44.9										9.94	9.94	9.94	49.4	49.6	50.	200.	200.	200.
Insecticides	Bifenthrin	1	µg/Kg dry	8	3	5	1	1		0.411	0.411	0.411	0.413	0.416	0.418	0.419	0.419	0.419	0.412	0.412	0.412	0.412	0.413	1.21	1.21	1.21	1.21	0.979	0.979	0.979	0.98	0.984	0.996	2.88	2.88	2.88
LPAHs	2-Methylnaphthalene	70	µg/Kg dry	12	1	11				11.8	11.8	11.8	11.8	12.	59.1	59.9	60.	60.	12.	12.	12.	12.	12.	12.	12.	12.	12.	11.8	11.8	11.8	11.8	12.	34.7	59.9	60.	60.
	Acenaphthene	70	µg/Kg dry	12	1	11				13.2	13.2	13.2	13.2	13.4	13.4	38.8	67.2	67.2	13.4	13.4	13.4	13.4	13.4	13.4	13.4	13.4	13.4	13.2	13.2	13.2	13.2	13.4	13.4	38.8	67.2	67.2
	Acenaphthylene	70	µg/Kg dry	12	8	4				6.35	6.35	6.35	6.35	6.44	6.45	18.6	18.6	18.6	6.32	6.32	6.32	6.33	6.39	6.44	6.45	6.45	6.45	9.79	9.79	9.8	9.83	9.93	9.97	9.99	28.8	28.8
	Anthracene	70	µg/Kg dry	12		12				6.75	6.75	6.77	6.79	6.88	6.89	34.1	34.4	34.4										9.79	9.79	9.8	9.83	9.96	9.99	49.5	49.9	49.9
	Fluorene	70	µg/Kg dry	12	1	11				5.4	5.4	5.46	5.48	5.5	27.1	27.1	27.6	27.6	5.41	5.41	5.41	5.41	5.41	5.41	5.41	5.41	5.41	9.79	9.79	9.8	9.89	9.97	28.8	49.2	50.	50.
	Naphthalene	70	µg/Kg dry	12		12				13.4	13.4	13.4	13.5	13.7	39.5	68.3	68.4	68.4										13.4	13.4	13.4	13.5	13.7	39.5	68.3	68.4	68.4
	Phenanthrene	70	µg/Kg dry	12		12				4.88	4.88	4.89	4.91	4.95	4.98	24.9	49.9	49.9										9.79	9.79	9.8	9.83	9.93	9.97	49.9	99.9	99.9
HPAHs	Benzo(a)anthracene	70	µg/Kg dry	12	2	10				4.81	4.81	4.81	4.87	4.89	24.5	24.5	49.1	49.1	4.81	4.81	4.81	4.81	4.81	4.83	4.83	4.83	4.83	9.79	9.79	9.8	9.84	9.96	49.2	49.9	99.9	99.9
	Benzo(a)pyrene	70	µg/Kg dry	12	1	11				10.9	10.9	11.1	11.1	54.6	55.2	55.6	55.6	55.6	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.8	11.8	12.	12.	58.7	59.4	59.9	59.9	59.9
	Benzo(b,j,k)fluoranthene	210	µg/Kg dry	12		12	1			26.	26.	26.1	26.3	26.4	131.	132.	382.	382.										29.4	29.4	29.5	29.8	29.9	148.	150.	433.	433.
	Benzo(g,h,i)perylene	70	µg/Kg dry	12		12				6.67	6.67	19.3	32.7	33.1	33.3	33.4	65.8	65.8										9.97	9.97	28.8	48.9	49.5	49.8	50.	98.3	98.3
	Chrysene	70	µg/Kg dry	12		12				5.41	5.41	5.44	5.46	5.48	27.	27.5	54.9	54.9										9.83	9.83	9.89	9.93	9.97	49.	49.9	99.9	99.9
	Dibenz(a,h)anthracene	70	µg/Kg dry	12	3	9				13.	13.	13.	38.1	65.6	65.9	66.	66.	66.	13.	13.	13.	13.	13.	13.1	13.1	13.1	13.1	19.6	19.6	19.7	19.7	57.7	99.7	99.9	99.9	99.9
	Fluoranthene	70	µg/Kg dry	12		12	2			6.52	6.52	6.55	6.55	32.3	64.6	94.8	328.	328.										9.93	9.93	9.96	9.97	49.2	98.3	144.	500.	500.
	Indeno(1,2,3-cd)pyrene	70	µg/Kg dry	12		12	9			14.5	14.5	14.7	42.6	72.7	73.6	73.8	148.	148.										14.8	14.8	15.	43.3	73.8	74.7	74.9	150.	150.
	Pyrene	70	µg/Kg dry	12		12	3			7.46	7.46	7.48	7.49	7.59	37.9	76.	110.	110.										9.8	9.8	9.83	9.84	9.97	49.9	99.9	144.	144.
	Retene	70	µg/Kg dry	12		12				6.26	6.26	6.27	6.29	6.35	6.38	6.39	18.5	18.5										9.79	9.79	9.8	9.83	9.93	9.97	9.99	28.8	28.8
Phthalates	Bis(2-ethylhexyl) phthalate	70	µg/Kg dry	9		9	8			50.9	50.9	50.9	251.	254.	501.	737.	737.	737.										50.9	50.9	50.9	251.	254.	501.	737.	737.	737.
	Butyl benzyl phthalate	70	µg/Kg dry	9		9	2			13.4	13.4	13.4	13.7	67.4	68.1	674.	674.	674.										13.4	13.4	13.4	13.7	67.4	68.1	674.	674.	674.
	Diethyl phthalate	70	µg/Kg dry	9	2	7	1			34.6	34.6	34.6	34.7	34.8	35.2	102.	102.	102.	35.3	35.3	35.3	35.3	35.3	35.3	35.3	35.3	35.3	76.3	76.3	76.3	76.7	77.2	77.7	225.	225.	225.
	Dimethyl phthalate	70	µg/Kg dry	9	1	8				5.52	5.52	5.52	5.53	5.55	5.62	16.3	16.3	16.3	5.61	5.61	5.61	5.61	5.61	5.61	5.61	5.61	5.61	18.2	18.2	18.2	18.3	18.4	18.5	53.6	53.6	53.6
	Di-n-butyl phthalate	70	µg/Kg dry	9	1	8	3			30.3	30.3	30.3	30.4	30.8	89.1	152.	152.	152.	30.7	30.7	30.7	30.7	30.7	30.7	30.7	30.7	30.7	30.3	30.3	30.3	30.6	30.8	89.1	152.	152.	152.
	Di-n-octyl phthalate	70	µg/Kg dry	9	9														13.9	13.9	13.9	13.9	14.	14.1	40.8	40.8	40.8	14.7	14.7	14.7	14.8	14.8	14.9	43.3	43.3	43.3
Herbicide	Dichlobenil	1	µg/Kg dry	8	6	2	1			0.736	0.736	0.736	0.736	0.736	2.16	2.16	2.16	2.16	0.732	0.732	0.732	0.733	0.736	0.745	0.746	0.746	0.746	0.979	0.979	0.979	0.98	0.984	0.996	2.88	2.88	2.88
TPH	NWTPH-Diesel	25	mg/Kg dry	7	6	1				19.9	19.9	19.9	19.9	19.9	19.9	19.9	19.9	19.9	19.3	19.3	19.3	19.3	19.4	19.8	19.9	19.9	19.9	19.3	19.3	19.3	19.3	19.8	19.9	19.9	19.9	19.9
	NWTPH-Heavy Oil	100	mg/Kg dry	7		7	6			38.6	38.6	38.6	386.	395.	398.	399.	399.	399.										38.6	38.6	38.6	386.	395.	398.	399.	399.	399.
PCBs	Aroclor-1016	10	µg/Kg dry	12	12														1.74	1.74	1.74	1.76	1.8	3.6	3.6	3.61	3.61	7.71	7.71	7.72	7.78	7.94	15.9	15.9	16.	16.
	Aroclor-1221	10	µg/Kg dry	12	12														1.74	1.74	1.74	1.76	1.8	3.6	3.6	3.61	3.61	7.71	7.71	7.72	7.78	7.94	15.9	15.9	16.	16.
	Aroclor-1232	10	µg/Kg dry	12	12														1.74	1.74	1.74	1.76	1.8	3.6	3.6	3.61	3.61	7.71	7.71	7.72	7.78	7.94	15.9	15.9	16.	16.
	Aroclor-1242	10	µg/Kg dry	12	12														1.74	1.74	1.74	1.76	1.8	3.6	3.6	3.61	3.61	7.71	7.71	7.72	7.78	7.94	15.9	15.9	16.	16.
	Aroclor-1248	10	µg/Kg dry	12	12														1.93	1.93	1.93	1.94	1.99	3.98	3.99	3.99	3.99	7.71	7.71	7.72	7.78	7.94	15.9	15.9	16.	16.
	Aroclor-1254	10	µg/Kg dry	12	11	1				1.97	1.97	1.97	1.97	1.97	1.97	1.97	1.97	1.97	1.93	1.93	1.93	1.94	2.	3.98	3.99	3.99	3.99	7.71	7.71	7.72	7.78	7.94	15.9	15.9	16.	16.
	Aroclor-1260	10	µg/Kg dry	12	12														1.93	1.93	1.93	1.94	1.99	3.98	3.99	3.99	3.99	7.71	7.71	7.72	7.78	7.94	15.9	15.9	16.	16.

D = Detection, ND = Non-detection, Md = Median

Evaluation	Performance detection limit greater than the detection limit goal (DL>DLG).
Method Quality Objective	Performance detection limit greater than the detection limit goal, a result nondetection, and not a rejection. This is an exceedance of the Method Quality Objective.
Rejection	Non-detection greater than five times the method quality objective.

Table B7- 8
Bias Stormwater Blanks - WY2024

Laboratory Method Blanks

Class	Analyte	Detection Limit Goal Conc.	Units	Tests N	Tests D	Tests ND	Evaluations Detect	Evaluations MQO	Evaluations Rej	Min	5%	10%	25%	Md	75%	90%	95%	Max
Conventionals	Anionic Surfactants - MBAS	25	µg/L	9		9				0.	0.	0.	0.	0.	0.	0.	0.	0.
	BOD	2	mg/L	10		10				0.	0.	0.	0.	0.	0.	0.	0.	0.
	Chloride	0.2	mg/L	7	4	7			4	0.	0.	0.	0.	0.	0.975	1.03	1.58	1.58
	Hardness, Total as CaCO3	0.05	mg CaCO3/L	9	2	9	2			0.	0.	0.	0.	0.	0.	0.05	0.05	0.05
	Total Suspended Solids	1	mg/L	5		5				0.	0.	0.	0.	0.	0.	0.	0.	0.
	Turbidity	0.2	NTU	12		12				0.	0.	0.	0.	0.	0.	0.	0.	0.
Nutrients	Nitrate+Nitrite as N	0.007	mg/L	13		13				0.	0.	0.	0.	0.	0.	0.	0.	0.
	Phosphate, Ortho	0.003	mg/L	11		11				0.	0.	0.	0.	0.	0.	0.	0.	0.
	Phosphorus, Total	0.003	mg/L	6		6				0.	0.	0.	0.	0.	0.	0.	0.	0.
	Total Nitrogen	0.03	mg/L	11		11				0.	0.	0.	0.	0.	0.	0.	0.	0.
Metals	Cadmium	0.2	µg/L	10		10				0.	0.	0.	0.	0.	0.	0.	0.	0.
	Cadmium, Dissolved	0.03	µg/L	8		8				0.	0.	0.	0.	0.	0.	0.	0.	0.
	Copper	0.5	µg/L	10		10				0.	0.	0.	0.	0.	0.	0.	0.	0.
	Copper, Dissolved	0.02	µg/L	8		8				0.	0.	0.	0.	0.	0.	0.	0.	0.
	Lead	0.1	µg/L	10		10				0.	0.	0.	0.	0.	0.	0.	0.	0.
	Lead, Dissolved	0.05	µg/L	8		8				0.	0.	0.	0.	0.	0.	0.	0.	0.
	Mercury	0.1	µg/L	9		9				0.	0.	0.	0.	0.	0.	0.	0.	0.
	Mercury, Dissolved	0.1	µg/L	9		9				0.	0.	0.	0.	0.	0.	0.	0.	0.
	Zinc	5	µg/L	10		10				0.	0.	0.	0.	0.	0.	0.	0.	0.
	Zinc, Dissolved	1	µg/L	8	1	8	4			0.	0.	0.	0.	0.	0.	0.	0.	0.28
Insecticides	Bifenthrin	0.02	µg/L	10		10				0.	0.	0.	0.	0.	0.	0.	0.	0.
LPAHs	2-Methylnaphthalene	0.01	µg/L	10		10				0.	0.	0.	0.	0.	0.	0.	0.	0.
	Acenaphthene	0.01	µg/L	10		10				0.	0.	0.	0.	0.	0.	0.	0.	0.
	Acenaphthylene	0.01	µg/L	10		10				0.	0.	0.	0.	0.	0.	0.	0.	0.
	Anthracene	0.01	µg/L	10	1	10	1			0.	0.	0.	0.	0.	0.	0.	0.006	0.006
	Fluorene	0.01	µg/L	10		10				0.	0.	0.	0.	0.	0.	0.	0.	0.
	Naphthalene	0.01	µg/L	10	6	10		6		0.	0.	0.	0.	0.	0.	0.026	0.031	0.031
	Phenanthrene	0.01	µg/L	10		10				0.	0.	0.	0.	0.	0.	0.	0.	0.
HPAHs	Benzo(a)anthracene	0.01	µg/L	10		10				0.	0.	0.	0.	0.	0.	0.	0.	0.
	Benzo(a)pyrene	0.01	µg/L	10	6	10	6			0.	0.	0.	0.	0.	0.	0.	0.004	0.004
	Benzo(b,j,k)fluoranthene	0.03	µg/L	10	8	10	8			0.	0.	0.	0.	0.	0.	0.	0.011	0.011
	Benzo(g,h,i)perylene	0.01	µg/L	10		10				0.	0.	0.	0.	0.	0.	0.	0.	0.
	Chrysene	0.01	µg/L	10		10				0.	0.	0.	0.	0.	0.	0.	0.	0.
	Dibenz(a,h)anthracene	0.01	µg/L	10		10				0.	0.	0.	0.	0.	0.	0.	0.	0.
	Fluoranthene	0.01	µg/L	10	1	10		1		0.	0.	0.	0.	0.	0.	0.	0.038	0.038
	Indeno(1,2,3-cd)pyrene	0.01	µg/L	10		10				0.	0.	0.	0.	0.	0.	0.	0.	0.
	Pyrene	0.01	µg/L	10		10				0.	0.	0.	0.	0.	0.	0.	0.	0.
	Retene	0.01	µg/L	10		10				0.	0.	0.	0.	0.	0.	0.	0.	0.
Phthalates	Bis(2-ethylhexyl) phthalate	0.5	µg/L	10		10				0.	0.	0.	0.	0.	0.	0.	0.	0.
	Butyl benzyl phthalate	0.5	µg/L	10		10				0.	0.	0.	0.	0.	0.	0.	0.	0.
	Diethyl phthalate	0.5	µg/L	10		10				0.	0.	0.	0.	0.	0.	0.	0.	0.
	Dimethyl phthalate	0.5	µg/L	10		10				0.	0.	0.	0.	0.	0.	0.	0.	0.
	Di-n-butyl phthalate	0.5	µg/L	10		10				0.	0.	0.	0.	0.	0.	0.	0.	0.
	Di-n-octyl phthalate	0.5	µg/L	10		10				0.	0.	0.	0.	0.	0.	0.	0.	0.
Herbicide	Dichlobenil	0.02	µg/L	10		10				0.	0.	0.	0.	0.	0.	0.	0.	0.
TPH	NWTPH-Diesel	0.1	mg/L	6		6				0.	0.	0.	0.	0.	0.	0.	0.	0.
	NWTPH-Heavy Oil	0.1	mg/L	6		6				0.	0.	0.	0.	0.	0.	0.	0.	0.

Trip Blanks

Analyte	Tests N	Tests D	Tests ND	Evaluations Detect	Evaluations MQO	Evaluations Rej	Min	5%	10%	25%	Md	75%	90%	95%	Max
Anionic Surfactants - MBAS	2		2				0.	0.	0.	0.	0.	0.	0.	0.	0.
BOD	2		2				0.	0.	0.	0.	0.	0.	0.	0.	0.
Chloride	2		2				1.25	1.25	1.25	1.25	1.25	1.43	1.43	1.43	1.43
Hardness, Total as CaCO3	2	1	1		1		0.	0.	0.	0.	0.	0.13	0.13	0.13	0.13
Total Suspended Solids	2		2				0.	0.	0.	0.	0.	0.	0.	0.	0.
Turbidity	2		2				0.	0.	0.	0.	0.	0.	0.	0.	0.
Nitrate+Nitrite as N	2		2				0.	0.	0.	0.	0.	0.	0.	0.	0.
Phosphate, Ortho	2		2				0.	0.	0.	0.	0.	0.	0.	0.	0.
Phosphorus, Total	2		2				0.	0.	0.	0.	0.	0.	0.	0.	0.
Total Nitrogen	2	1	1			1	0.	0.	0.	0.	0.	0.18	0.18	0.18	0.18
Cadmium	2		2				0.	0.	0.	0.	0.	0.	0.	0.	0.
Cadmium, Dissolved	2		2				0.	0.	0.	0.	0.	0.	0.	0.	0.
Copper	2		2				0.	0.	0.	0.	0.	0.	0.	0.	0.
Copper, Dissolved	2		2				0.	0.	0.	0.	0.	0.	0.	0.	0.
Lead	2	1	1		1		0.	0.	0.	0.	0.	0.229	0.229	0.229	0.229
Lead, Dissolved	2		2				0.	0.	0.	0.	0.	0.	0.	0.	0.
Mercury	2		2				0.	0.	0.	0.	0.	0.	0.	0.	0.
Mercury, Dissolved	2		2				0.	0.	0.	0.	0.	0.	0.	0.	0.
Zinc	2		2				0.	0.	0.	0.	0.	0.	0.	0.	0.
Zinc, Dissolved	2	2		1			0.29	0.29	0.29	0.29	0.29	1.	1.	1.	1.
Bifenthrin	2		2				0.	0.	0.	0.	0.	0.	0.	0.	0.
2-Methylnaphthalene	2		2				0.	0.	0.	0.	0.	0.	0.	0.	0.
Acenaphthene	2		2				0.	0.	0.	0.	0.	0.	0.	0.	0.
Acenaphthylene	2		2				0.	0.	0.	0.	0.	0.	0.	0.	0.
Anthracene	2		2				0.	0.	0.	0.	0.	0.	0.	0.	0.
Fluorene	2		2				0.	0.	0.	0.	0.	0.	0.	0.	0.
Naphthalene	2		2				0.	0.	0.	0.	0.	0.	0.	0.	0.
Phenanthrene	2		2				0.	0.	0.	0.	0.	0.	0.	0.	0.
Benzo(a)anthracene	2		2				0.	0.	0.	0.	0.	0.	0.	0.	0.
Benzo(a)pyrene	2		2				0.	0.	0.	0.	0.	0.	0.	0.	0.
Benzo(b,j,k)fluoranthene	2		2				0.	0.	0.	0.	0.	0.	0.	0.	0.
Benzo(g,h,i)perylene	2		2				0.	0.	0.	0.	0.	0.	0.	0.	0.
Chrysene	2		2				0.	0.	0.	0.	0.	0.	0.	0.	0.
Dibenz(a,h)anthracene	2		2				0.	0.	0.	0.	0.	0.	0.	0.	0.
Fluoranthene	2		2				0.	0.	0.	0.	0.	0.	0.	0.	0.
Indeno(1,2,3-cd)pyrene	2		2				0.	0.	0.	0.	0.	0.	0.	0.	0.
Pyrene	2		2				0.	0.	0.	0.	0.	0.	0.	0.	0.
Retene	2		2				0.	0.	0.	0.	0.	0.	0.	0.	0.
Bis(2-ethylhexyl) phthalate	2		2				0.	0.	0.	0.	0.	0.	0.	0.	0.
Butyl benzyl phthalate	2		2				0.	0.	0.	0.	0.	0.	0.	0.	0.
Diethyl phthalate	2		2				0.	0.	0.	0.	0.	0.	0.	0.	0.
Dimethyl phthalate	2		2				0.	0.	0.	0.	0.	0.	0.	0.	0.
Di-n-butyl phthalate	2		2				0.	0.	0.	0.	0.	0.	0.	0.	0.
Di-n-octyl phthalate	2		2				0.	0.	0.	0.	0.	0.	0.	0.	0.
Dichlobenil	2		2				0.	0.	0.	0.	0.	0.	0.	0.	0.
NWTPH-Diesel															
NWTPH-Heavy Oil															

Rinse Blanks

Analyte	Tests N	Tests D	Tests ND	Evaluations Detect	Evaluations MQO	Evaluations Rej	Min	5%	10%	25%	Md	75%	90%	95%	Max
Anionic Surfactants - MBAS	7		7				0.	0.	0.	0.	0.	0.	0.	0.	0.
BOD	7		7				0.	0.	0.	0.	0.	0.	0.	0.	0.
Chloride	7	2	5		1	1	0.	0.	0.	0.	0.	0.965	1.66	1.66	1.66
Hardness, Total as CaCO3	7	7			5	2	0.09	0.09	0.09	0.11	0.14	0.34	1.06	1.06	1.06
Total Suspended Solids	7		7				0.	0.	0.	0.	0.	0.	0.	0.	0.
Turbidity	7	4	3		3	1	0.	0.	0.	0.	0.48	0.74	1.89	1.89	1.89
Nitrate+Nitrite as N	7	1	6		1		0.	0.	0.	0.	0.	0.	0.027	0.027	0.027
Phosphate, Ortho	7		7				0.	0.	0.	0.	0.	0.	0.	0.	0.
Phosphorus, Total	7	3	4		3		0.	0.	0.	0.	0.	0.008	0.008	0.008	0.008
Total Nitrogen	7	2	5			2	0.	0.	0.	0.	0.	0.27	0.42	0.42	0.42
Cadmium	7		7				0.	0.	0.	0.	0.	0.	0.	0.	0.
Cadmium, Dissolved	7		7				0.	0.	0.	0.	0.	0.	0.	0.	0.
Copper	7	2	5		1	1	0.	0.	0.	0.	0.	0.877	2.73	2.73	2.73
Copper, Dissolved	7	2	5			2	0.	0.	0.	0.	0.	0.124	0.222	0.222	0.222
Lead	7	2	5		1	1	0.	0.	0.	0.	0.	0.148	1.37	1.37	1.37
Lead, Dissolved	7		7				0.	0.	0.	0.	0.	0.	0.	0.	0.
Mercury	7		7				0.	0.	0.	0.	0.	0.	0.	0.	0.
Mercury, Dissolved	7		7				0.	0.	0.	0.	0.	0.	0.	0.	0.
Zinc	7	5	2	5			0.	0.	0.	0.	1.47	1.98	2.8	2.8	2.8
Zinc, Dissolved	7	7		2	5		0.38	0.38	0.38	0.84	1.16	1.2	2.35	2.35	2.35
Bifenthrin	7		7				0.	0.	0.	0.	0.	0.	0.	0.	0.
2-Methylnaphthalene	7	1	6		1		0.	0.	0.	0.	0.	0.	0.0108	0.0108	0.0108
Acenaphthene	7		7				0.	0.	0.	0.	0.	0.	0.	0.	0.
Acenaphthylene	7		7				0.	0.	0.	0.	0.	0.	0.	0.	0.
Anthracene	7		7				0.	0.	0.	0.	0.	0.	0.	0.	0.
Fluorene	7		7				0.	0.	0.	0.	0.	0.	0.	0.	0.
Naphthalene	7		7				0.0236	0.0236	0.0236	0.0257	0.0276	0.0304	0.0332	0.0332	0.0332
Phenanthrene	7		7				0.	0.	0.	0.	0.	0.	0.	0.	0.
Benzo(a)anthracene	7		7				0.	0.	0.	0.	0.	0.	0.	0.	0.
Benzo(a)pyrene	7		7				0.	0.	0.	0.	0.	0.	0.	0.	0.
Benzo(b,j,k)fluoranthene	7		7				0.	0.	0.	0.	0.	0.	0.	0.	0.
Benzo(g,h,i)perylene	7		7				0.	0.	0.	0.	0.	0.	0.	0.	0.
Chrysene	7		7				0.	0.	0.	0.	0.	0.	0.	0.	0.
Dibenz(a,h)anthracene	7		7				0.	0.	0.	0.	0.	0.	0.	0.	0.
Fluoranthene	7		7				0.	0.	0.	0.	0.	0.	0.	0.	0.
Indeno(1,2,3-cd)pyrene	7		7				0.	0.	0.	0.	0.	0.	0.	0.	0.
Pyrene	7		7				0.	0.	0.	0.	0.	0.	0.	0.	0.
Retene	7		7				0.	0.	0.	0.	0.	0.	0.	0.	0.
Bis(2-ethylhexyl) phthalate	7		7				0.	0.	0.	0.	0.	0.	0.	0.	0.
Butyl benzyl phthalate	7		7				0.	0.	0.	0.	0.	0.	0.	0.	0.
Diethyl phthalate	7		7				0.	0.	0.	0.	0.	0.	0.	0.	0.
Dimethyl phthalate	7		7				0.	0.	0.	0.	0.	0.	0.	0.	0.
Di-n-butyl phthalate	7		7				0.	0.	0.	0.	0.	0.	0.	0.	0.
Di-n-octyl phthalate	7		7				0.	0.	0.	0.	0.	0.	0.	0.	0.
Dichlobenil	7		7				0.	0.	0.	0.	0.	0.	0.	0.	0.
NWTPH-Diesel															
NWTPH-Heavy Oil															

N = Tests, D = Detections, ND = Non-detections, Md = Median, Min = Minimum, Max = Maximum

Detect — Detection in blank which does not exceed the reporting limit goal

MQO — Blank detection > reporting limit goal

Rejection — Blank detection > reporting limit goal and > 10% sample result, raise reporting limit and flag "UJ". Rejection of sample data based on blank results only applies to laboratory blanks, unless specific linkages and corroborating evidence are present to reject due to a field blank. Gross contamination is defined as a blank result greater than 5X the detection limit goal.

Table B7-9
Bias SSPM Certified Reference Material

Class	Analyte	Detection Limit Goal		Report Value		Ref Value	Recovery of Reference	MQO		Prediction Int.	
		Conc.	Units	V	F			<	>	<	>
Phenols	Pentachlorophenol	270	µg/Kg dry	2450		5040	49%	50%	150%	10%	198%
SVOA	2-Methylphenol	70	µg/Kg dry	3390		5750	59%	50%	150%	21%	179%
Nutrients	Phosphorus, Total	0.01	mg/Kg dry	455		526	87%	60%	140%	44%	156%
Metals	Cadmium	0.1	mg/Kg dry	103		117	88%	60%	140%	67%	112%
	Copper	0.1	mg/Kg dry	120		134	89%	60%	140%	69%	115%
	Lead	0.1	mg/Kg dry	142		154	92%	60%	140%	68%	110%
	Mercury	0.005	mg/Kg dry	5.22		6.29	83%	60%	140%	60%	140%
				5.25		6.29	83%	60%	140%	60%	140%
	Zinc	0.5	mg/Kg dry	375		403	93%	60%	140%	64%	118%
LPAHs	Acenaphthene	70	µg/Kg dry	4570		6240	73%	50%	150%	41%	159%
	Acenaphthylene	70	µg/Kg dry	2530		3890	65%	50%	150%	37%	163%
	Anthracene	70	µg/Kg dry	2940		4030	73%	50%	150%	45%	155%
	Fluorene	70	µg/Kg dry	1360		1720	79%	50%	150%	39%	161%
	Naphthalene	70	µg/Kg dry	5280		6220	85%	50%	150%	26%	174%
	Phenanthrene	70	µg/Kg dry	2190		3320	66%	50%	150%	45%	155%
HPAHs	Benzo(a)anthracene	70	µg/Kg dry	5880		6880	86%	50%	150%	49%	151%
	Benzo(a)pyrene	70	µg/Kg dry	6680		9840	68%	50%	150%	44%	156%
	Benzo(g,h,i)perylene	70	µg/Kg dry	2640		4060	65%	50%	150%	39%	161%
	Chrysene	70	µg/Kg dry	2010		2750	73%	50%	150%	48%	152%
	Dibenz(a,h)anthracene	70	µg/Kg dry	6310		6850	92%	50%	150%	40%	160%
	Fluoranthene	70	µg/Kg dry	4200		4740	89%	50%	150%	41%	159%
	Indeno(1,2,3-cd)pyrene	70	µg/Kg dry	5590		6660	84%	50%	150%	22%	178%
	Pyrene	70	µg/Kg dry	5100		5900	86%	50%	150%	38%	162%
Phthalates	Butyl benzyl phthalate	70	µg/Kg dry	6110		7190	85%	50%	150%	36%	164%
	Diethyl phthalate	70	µg/Kg dry	1680		1870	90%	50%	150%	39%	161%
	Dimethyl phthalate	70	µg/Kg dry	3210		3850	84%	50%	150%	40%	160%
	Di-n-octyl phthalate	70	µg/Kg dry	2730		2610	105%	50%	150%	25%	175%
TPH	NWTPH-Diesel	25	mg/Kg dry	1450		1620	89%	50%	150%	45%	116%
PCBs	Aroclor-1221	10	µg/Kg dry	8890		13500	66%	50%	150%	20%	116%

V = Value, F = Flag, PI = Prediction Interval - measurements should fall within the PI 19 of 20 times

< PI	Recovery less than prediction interval, may be used to reject sample data.
ML	Recovery below MQO and above rejection or censor range.
	Recovery within Measurement Quality Objective
ML	Recovery above MQO and below rejection or censor range.
> PI	Recovery greater than prediction interval, may be used to directly reject sample data.

Table B9-1.1
WY2024 Storm Event Hydrology for OF230A

Storm Event	Season	Sampled	Storm Start Date & Time	Storm Duration (hours)	Total Rain (inches)	Estimated Runoff (inches)	Estimated Storm Volume (acre-feet)	Estimated Mean Stormflow (gpm)	Estimated Combined Flow (gpm)	Storm Fraction (unitless)
Wet Season										
1	Wet		10/2/2023 10:40	13.00	0.4	0.13	6.22	2598	2755	0.94
2	Wet		10/9/2023 11:55	6.08	0.07	0.02	1.09	972	1129	0.86
3	Wet		10/10/2023 4:05	4.67	0.2	0.06	3.11	3616	3773	0.96
4	Wet		10/10/2023 17:00	21.17	0.53	0.17	8.24	2114	2271	0.93
5	Wet		10/13/2023 17:45	9.42	0.18	0.06	2.80	1613	1770	0.91
6	Wet		10/16/2023 7:00	13.33	0.57	0.18	8.86	3610	3767	0.96
7	Wet		10/17/2023 15:20	0.75	0.04	0.01	0.62	4503	4660	0.97
8	Wet		10/21/2023 16:55	1.00	0.08	0.03	1.24	6755	6912	0.98
9	Wet		10/24/2023 15:05	18.25	0.66	0.21	10.26	3053	3210	0.95
10	Wet	X	11/1/2023 17:55	15.58	0.94	0.30	14.61	5094	5251	0.97
11	Wet		11/3/2023 18:35	16.00	0.88	0.28	13.68	4644	4801	0.97
12	Wet		11/5/2023 17:05	5.75	0.24	0.08	3.73	3524	3681	0.96
13	Wet		11/6/2023 7:25	16.00	0.63	0.20	9.79	3324	3481	0.95
14	Wet		11/9/2023 15:50	2.58	0.14	0.04	2.18	4582	4739	0.97
15	Wet		11/10/2023 19:55	1.50	0.09	0.03	1.40	5066	5223	0.97
16	Wet		11/11/2023 5:45	4.33	0.53	0.17	8.24	10327	10484	0.99
17	Wet		11/12/2023 13:05	13.33	0.35	0.11	5.44	2217	2374	0.93
18	Wet		11/18/2023 19:55	3.92	0.33	0.11	5.13	7108	7265	0.98
19	Wet		11/21/2023 18:10	11.92	0.22	0.07	3.42	1558	1715	0.91
20	Wet		11/30/2023 14:10	17.17	0.45	0.14	7.00	2213	2370	0.93
21	Wet		12/1/2023 18:00	12.17	0.83	0.27	12.90	5758	5915	0.97
22	Wet		12/2/2023 13:05	1.17	0.04	0.01	0.62	2887	3044	0.95
23	Wet		12/3/2023 4:55	7.33	0.3	0.10	4.66	3456	3613	0.96
24	Wet		12/4/2023 6:40	52.00	2.92	0.93	45.40	4741	4898	0.97
25	Wet		12/6/2023 17:05	16.25	0.39	0.12	6.06	2026	2183	0.93
26	Wet	X	12/9/2023 10:50	20.25	0.97	0.31	15.08	4044	4201	0.96
27	Wet		12/14/2023 3:55	6.25	0.15	0.05	2.33	2026	2183	0.93
28	Wet	X	12/18/2023 15:25	19.92	0.28	0.09	4.35	1187	1344	0.88
29	Wet		12/22/2023 4:25	3.42	0.23	0.07	3.58	5678	5835	0.97
30	Wet		12/25/2023 8:20	20.00	0.52	0.17	8.08	2195	2352	0.93
31	Wet		12/27/2023 14:45	10.25	0.09	0.03	1.40	741	898	0.83
32	Wet		12/30/2023 9:25	5.50	0.09	0.03	1.40	1382	1539	0.90
33	Wet		1/2/2024 8:50	7.33	0.34	0.11	5.29	3916	4073	0.96
34	Wet		1/3/2024 13:05	17.67	0.12	0.04	1.87	573	730	0.79
35	Wet		1/5/2024 3:25	1.50	0.06	0.02	0.93	3377	3534	0.96
36	Wet	X	1/5/2024 13:30	19.92	0.37	0.12	5.75	1568	1725	0.91
37	Wet		1/7/2024 18:50	0.50	0.03	0.01	0.47	5066	5223	0.97
38	Wet		1/8/2024 4:05	31.67	0.92	0.29	14.30	2453	2610	0.94
39	Wet		1/10/2024 13:45	0.92	0.07	0.02	1.09	6424	6581	0.98
40	Wet		1/16/2024 19:40	16.83	0.4	0.13	6.22	2007	2164	0.93
41	Wet		1/18/2024 6:15	19.58	0.61	0.20	9.48	2630	2787	0.94
42	Wet	X	1/20/2024 18:55	43.83	1.31	0.42	20.37	2524	2681	0.94
43	Wet		1/24/2024 4:05	31.92	0.58	0.19	9.02	1534	1691	0.91
44	Wet		1/26/2024 15:50	36.92	1.16	0.37	18.03	2653	2810	0.94
45	Wet		1/30/2024 8:40	1.42	0.05	0.02	0.78	2973	3130	0.95
46	Wet		1/30/2024 22:55	14.50	0.1	0.03	1.55	582	739	0.79
47	Wet		1/31/2024 23:50	4.25	0.08	0.03	1.24	1589	1746	0.91
48	Wet		2/5/2024 15:55	14.58	0.18	0.06	2.80	1042	1199	0.87
49	Wet		2/8/2024 23:35	1.08	0.04	0.01	0.62	3127	3284	0.95
50	Wet		2/11/2024 5:40	4.50	0.09	0.03	1.40	1689	1846	0.91
51	Wet		2/11/2024 20:00	12.67	0.27	0.09	4.20	1799	1956	0.92
52	Wet	X	2/14/2024 20:35	6.17	0.25	0.08	3.89	3421	3578	0.96
53	Wet		2/19/2024 11:50	2.08	0.08	0.03	1.24	3247	3404	0.95
54	Wet		2/20/2024 1:05	10.75	0.13	0.04	2.02	1021	1178	0.87
55	Wet		2/20/2024 18:15	26.08	0.37	0.12	5.75	1198	1355	0.88
56	Wet		2/25/2024 10:40	6.00	0.12	0.04	1.87	1689	1846	0.91
57	Wet		2/28/2024 1:40	31.17	1.18	0.38	18.35	3196	3353	0.95
58	Wet		2/29/2024 15:00	10.58	0.36	0.12	5.60	2873	3030	0.95
59	Wet		3/3/2024 6:35	4.67	0.07	0.02	1.09	1266	1423	0.89
60	Wet		3/3/2024 19:25	5.58	0.08	0.03	1.24	1210	1367	0.89
61	Wet		3/10/2024 13:10	8.17	0.07	0.02	1.09	723	880	0.82
62	Wet		3/11/2024 14:00	24.92	0.34	0.11	5.29	1152	1309	0.88
63	Wet		3/20/2024 20:15	6.08	0.11	0.04	1.71	1528	1685	0.91
64	Wet		3/21/2024 17:15	4.67	0.03	0.01	0.47	542	699	0.78
65	Wet		3/22/2024 10:10	12.50	0.12	0.04	1.87	811	968	0.84
66	Wet		3/25/2024 13:10	2.08	0.03	0.01	0.47	1218	1375	0.89
67	Wet		3/27/2024 2:20	6.00	0.23	0.07	3.58	3237	3394	0.95
68	Wet		3/27/2024 15:30	0.42	0.06	0.02	0.93	12062	12219	0.99
69	Wet		3/28/2024 0:15	3.17	0.14	0.04	2.18	3729	3886	0.96
70	Wet		4/4/2024 10:20	1.33	0.04	0.01	0.62	2539	2696	0.94
71	Wet		4/7/2024 12:35	1.75	0.04	0.01	0.62	1930	2087	0.92
72	Wet		4/8/2024 18:05	14.17	0.29	0.09	4.51	1728	1885	0.92
73	Wet	X	4/25/2024 4:30	23.58	0.84	0.27	13.06	3008	3165	0.95
74	Wet		4/26/2024 17:30	4.75	0.05	0.02	0.78	889	1046	0.85
75	Wet		4/28/24 11:05 AM	8.92	0.11	0.04	1.71	1041	1198	0.87
76	Wet		4/29/24 2:30 AM	6.75	0.29	0.09	4.51	3627	3784	0.96
77	Wet		4/30/24 6:35 AM	1.75	0.04	0.01	0.62	1930	2087	0.92
			Total Wet Season	**885.94**	**26.59**	**8.51**	**413**			
			Mean Wet Season Flow					**439**		
Dry Season										
78	Dry		5/4/2024 13:05	18.67	0.32	0.10	4.97	1447	1604	0.90
79	Dry		5/6/2024 2:55	12.42	0.17	0.05	2.64	1156	1313	0.88
80	Dry		5/18/2024 15:10	2.25	0.05	0.02	0.78	1876	2033	0.92
81	Dry	X	5/21/2024 5:50	15.58	0.29	0.09	4.51	1572	1729	0.91
82	Dry		5/24/2024 11:05	1.67	0.04	0.01	0.62	2022	2179	0.93
83	Dry		5/28/2024 12:10	1.00	0.06	0.02	0.93	5066	5223	0.97
84	Dry		5/29/2024 8:30	0.67	0.06	0.02	0.93	7561	7718	0.98
85	Dry		5/29/2024 18:10	1.83	0.06	0.02	0.93	2768	2925	0.95
86	Dry		6/2/2024 10:05	16.83	0.92	0.29	14.30	4615	4772	0.97
87	Dry		6/3/2024 23:05	6.42	0.05	0.02	0.78	658	815	0.81
88	Dry		6/4/2024 12:30	0.50	0.06	0.02	0.93	10132	10289	0.98
89	Dry		6/15/2024 2:45	14.50	0.14	0.04	2.18	815	972	0.84
90	Dry		6/29/2024 18:35	3.08	0.05	0.02	0.78	1371	1528	0.90
91	Dry		7/29/2024 21:20	6.25	0.1	0.03	1.55	1351	1508	0.90
92	Dry		8/17/2024 19:15	2.83	0.27	0.09	4.20	8055	8212	0.98
93	Dry		8/20/2024 4:00	8.33	0.33	0.11	5.13	3345	3502	0.96
94	Dry		8/22/2024 22:25	4.67	0.13	0.04	2.02	2350	2507	0.94
95	Dry		8/23/2024 15:35	18.33	0.34	0.11	5.29	1566	1723	0.91
96	Dry		8/26/2024 23:35	0.25	0.03	0.01	0.47	10132	10289	0.98
97	Dry	X	9/10/2024 21:15	9.83	0.38	0.12	5.91	3264	3421	0.95
98	Dry		9/11/2024 23:45	0.17	0.04	0.01	0.62	19866	20023	0.99
99	Dry		9/12/2024 6:00	2.25	0.04	0.01	0.62	1501	1658	0.91
100	Dry		9/13/2024 17:25	8.17	0.09	0.03	1.40	930	1087	0.86
101	Dry		9/14/2024 14:10	5.08	0.27	0.09	4.20	4488	4645	0.97
102	Dry		9/15/2024 7:15	0.50	0.03	0.01	0.47	5066	5223	0.97
103	Dry		9/25/2024 12:05	4.17	0.08	0.03	1.24	1620	1777	0.91
104	Dry		9/26/2024 19:00	8.67	0.21	0.07	3.26	2045	2202	0.93
			Total Dry Season	**174.92**	**4.61**	**1.48**	**71.7**			
			Mean Dry Season Flow					**106**		
			Total Annual	**1,060.86**	**31.20**	**9.98**	**485**			
			Mean Annual Flow					**301**		

Notes: [1] Mean Annual Baseflow estimated based on rerouting of the drainage system to OF230A.
[2] Stormflow calculations are based on the historical rainfall to runoff relationship for the historic OF230 drainage area.The majority of the drainage area is now discharging to the new OF230A.
A new rainfall to runoff coefficient will be calculated once sufficient flow data is collected at the new monitoring location.

Drainage Area: 583 acres
Mean Baseflow: 157 gpm[1]
[1] Mean Annual Baseflow based on Water Year 2015 Record in Outfall 230

	Rain Threshold (in)	Runoff Coefficient
Wet Season	0.000	0.32
Dry Season	0.000	0.32

Table B9-1.2
WY2024 Storm Event Hydrology for OF235

Storm Event	Season	Sampled	Storm Start Date and Time	Storm Duration (hours)	Total Rain (inches)	Estimated Runoff (inches)	Estimated Storm Volume (acre-feet)	Estimated Mean Stormflow (gpm)	Estimated Combined Flow (gpm)	Storm Fraction (unitless)
					Wet Season					
1	Wet		10/2/2023 10:40	13.00	0.4	0.22	1.99	832	942	0.88
2	Wet		10/9/2023 11:55	6.08	0.07	0.04	0.35	311	421	0.74
3	Wet		10/10/2023 4:05	4.67	0.2	0.11	1.00	1158	1268	0.91
4	Wet		10/10/2023 17:00	21.17	0.53	0.29	2.64	677	787	0.86
5	Wet		10/13/2023 17:45	9.42	0.18	0.10	0.90	517	627	0.82
6	Wet	X	10/16/2023 7:00	13.33	0.57	0.31	2.84	1157	1267	0.91
7	Wet		10/17/2023 15:20	0.75	0.04	0.02	0.20	1443	1553	0.93
8	Wet		10/21/2023 16:55	1.00	0.08	0.04	0.40	2164	2274	0.95
9	Wet	X	10/24/2023 15:05	18.25	0.66	0.36	3.29	978	1088	0.90
10	Wet	X	11/1/2023 17:55	15.58	0.94	0.52	4.68	1632	1742	0.94
11	Wet		11/3/2023 18:35	16.00	0.88	0.48	4.38	1488	1598	0.93
12	Wet		11/5/2023 17:05	5.75	0.24	0.13	1.20	1129	1239	0.91
13	Wet		11/6/2023 7:25	16.00	0.63	0.35	3.14	1065	1175	0.91
14	Wet		11/9/2023 15:50	2.58	0.14	0.08	0.70	1468	1578	0.93
15	Wet		11/10/2023 19:55	1.50	0.09	0.05	0.45	1623	1733	0.94
16	Wet	X	11/11/2023 5:45	4.33	0.53	0.29	2.64	3308	3418	0.97
17	Wet		11/12/2023 13:05	13.33	0.35	0.19	1.74	710	820	0.87
18	Wet		11/18/2023 19:55	3.92	0.33	0.18	1.64	2277	2387	0.95
19	Wet		11/21/2023 18:10	11.92	0.22	0.12	1.10	499	609	0.82
20	Wet		11/30/2023 14:10	17.17	0.45	0.25	2.24	709	819	0.87
21	Wet		12/1/2023 18:00	12.17	0.83	0.46	4.13	1845	1955	0.94
22	Wet		12/2/2023 13:05	1.17	0.04	0.02	0.20	925	1035	0.89
23	Wet		12/3/2023 4:55	7.33	0.3	0.16	1.49	1107	1217	0.91
24	Wet		12/4/2023 6:40	52.00	2.92	1.60	14.54	1519	1629	0.93
25	Wet		12/6/2023 17:05	16.25	0.39	0.21	1.94	649	759	0.86
26	Wet	X	12/9/2023 10:50	20.25	0.97	0.53	4.83	1296	1406	0.92
27	Wet		12/14/2023 3:55	6.25	0.15	0.08	0.75	649	759	0.86
28	Wet	X	12/18/2023 15:25	19.92	0.28	0.15	1.39	380	490	0.78
29	Wet		12/22/2023 4:25	3.42	0.23	0.13	1.15	1819	1929	0.94
30	Wet		12/25/2023 8:20	20.00	0.52	0.29	2.59	703	813	0.86
31	Wet		12/27/2023 14:45	10.25	0.09	0.05	0.45	237	347	0.68
32	Wet		12/30/2023 9:25	5.50	0.09	0.05	0.45	443	553	0.80
33	Wet		1/2/2024 8:50	7.33	0.34	0.19	1.69	1255	1365	0.92
34	Wet		1/3/2024 13:05	17.67	0.12	0.07	0.60	184	294	0.63
35	Wet		1/5/2024 3:25	1.50	0.06	0.03	0.30	1082	1192	0.91
36	Wet	X	1/5/2024 13:30	19.92	0.37	0.20	1.84	502	612	0.82
37	Wet		1/7/2024 18:50	0.50	0.03	0.02	0.15	1623	1733	0.94
38	Wet		1/8/2024 4:05	31.67	0.92	0.50	4.58	786	896	0.88
39	Wet		1/10/2024 13:45	0.92	0.07	0.04	0.35	2058	2168	0.95
40	Wet		1/16/2024 19:40	16.83	0.4	0.22	1.99	643	753	0.85
41	Wet		1/18/2024 6:15	19.58	0.61	0.33	3.04	843	953	0.88
42	Wet	X	1/20/2024 18:55	43.83	1.31	0.72	6.52	808	918	0.88
43	Wet		1/24/2024 4:05	31.92	0.58	0.32	2.89	491	601	0.82
44	Wet		1/26/2024 15:50	36.92	1.16	0.64	5.78	850	960	0.89
45	Wet		1/30/2024 8:40	1.42	0.05	0.03	0.25	952	1062	0.90
46	Wet		1/30/2024 22:55	14.50	0.1	0.05	0.50	187	297	0.63
47	Wet		1/31/2024 23:50	4.25	0.08	0.04	0.40	509	619	0.82
48	Wet		2/5/2024 15:55	14.58	0.18	0.10	0.90	334	444	0.75
49	Wet		2/8/2024 23:35	1.08	0.04	0.02	0.20	1002	1112	0.90
50	Wet		2/11/2024 5:40	4.50	0.09	0.05	0.45	541	651	0.83
51	Wet		2/11/2024 20:00	12.67	0.27	0.15	1.34	576	686	0.84
52	Wet	X	2/14/2024 20:35	6.17	0.25	0.14	1.25	1096	1206	0.91
53	Wet		2/19/2024 11:50	2.08	0.08	0.04	0.40	1040	1150	0.90
54	Wet		2/20/2024 1:05	10.75	0.13	0.07	0.65	327	437	0.75
55	Wet		2/20/2024 18:15	26.08	0.37	0.20	1.84	384	494	0.78
56	Wet		2/25/2024 10:40	6.00	0.12	0.07	0.60	541	651	0.83
57	Wet	X	2/28/2024 1:40	31.17	1.18	0.65	5.88	1024	1134	0.90
58	Wet		2/29/2024 15:00	10.58	0.36	0.20	1.79	920	1030	0.89
59	Wet		3/3/2024 6:35	4.67	0.07	0.04	0.35	405	515	0.79
60	Wet		3/3/2024 19:25	5.58	0.08	0.04	0.40	388	498	0.78
61	Wet		3/10/2024 13:10	8.17	0.07	0.04	0.35	232	342	0.68
62	Wet		3/11/2024 14:00	24.92	0.34	0.19	1.69	369	479	0.77
63	Wet		3/20/2024 20:15	6.08	0.11	0.06	0.55	489	599	0.82
64	Wet		3/21/2024 17:15	4.67	0.03	0.02	0.15	174	284	0.61
65	Wet		3/22/2024 10:10	12.50	0.12	0.07	0.60	260	370	0.70
66	Wet		3/25/2024 13:10	2.08	0.03	0.02	0.15	390	500	0.78
67	Wet		3/27/2024 2:20	6.00	0.23	0.13	1.15	1037	1147	0.90
68	Wet		3/27/2024 15:30	0.42	0.06	0.03	0.30	3864	3974	0.97
69	Wet		3/28/2024 0:15	3.17	0.14	0.08	0.70	1195	1305	0.92
70	Wet		4/4/2024 10:20	1.33	0.04	0.02	0.20	813	923	0.88
71	Wet		4/7/2024 12:35	1.75	0.04	0.02	0.20	618	728	0.85
72	Wet		4/8/2024 18:05	14.17	0.29	0.16	1.44	554	664	0.83
73	Wet	X	4/25/2024 4:30	23.58	0.84	0.46	4.18	964	1074	0.90
74	Wet		4/26/24 5:30 PM	4.75	0.05	0.03	0.25	285	395	0.72
75	Wet		4/28/24 11:05 AM	8.92	0.11	0.06	0.55	334	444	0.75
76	Wet		4/29/24 2:30 AM	6.75	0.29	0.16	1.44	1162	1272	0.91
77	Wet		4/30/24 6:35 AM	1.75	0.04	0.02	0.20	618	728	0.85
			Total Wet Season	**885.94**	**26.59**	**14.58**	**132**			
			Mean Wet Season Flow					**141**		
					Dry Season					
78	Dry		5/4/2024 13:05	18.67	0.32	0.15	1.39	405	515	0.79
79	Dry		5/6/2024 2:55	12.42	0.17	0.08	0.74	323	433	0.75
80	Dry		5/18/2024 15:10	2.25	0.05	0.02	0.22	525	635	0.83
81	Dry	X	5/21/2024 5:50	15.58	0.29	0.14	1.26	440	550	0.80
82	Dry		5/24/2024 11:05	1.67	0.04	0.02	0.17	566	676	0.84
83	Dry		5/28/2024 12:10	1.00	0.06	0.03	0.26	1418	1528	0.93
84	Dry		5/29/2024 8:30	0.67	0.06	0.03	0.26	2116	2226	0.95
85	Dry		5/29/2024 18:10	1.83	0.06	0.03	0.26	775	885	0.88
86	Dry	X	6/2/2024 10:05	16.83	0.92	0.44	4.00	1292	1402	0.92
87	Dry		6/3/2024 23:05	6.42	0.05	0.02	0.22	184	294	0.63
88	Dry		6/4/2024 12:30	0.50	0.06	0.03	0.26	2836	2946	0.96
89	Dry		6/15/2024 2:45	14.50	0.14	0.07	0.61	228	338	0.67
90	Dry		6/29/2024 18:35	3.08	0.05	0.02	0.22	384	494	0.78
91	Dry		7/29/2024 21:20	6.25	0.1	0.05	0.44	378	488	0.77
92	Dry	X	8/17/2024 19:15	2.83	0.27	0.13	1.17	2254	2364	0.95
93	Dry		8/20/2024 4:00	8.33	0.33	0.16	1.44	936	1046	0.89
94	Dry		8/22/2024 22:25	4.67	0.13	0.06	0.57	658	768	0.86
95	Dry		8/23/2024 15:35	18.33	0.34	0.16	1.48	438	548	0.80
96	Dry		8/26/2024 23:35	0.25	0.03	0.01	0.13	2836	2946	0.96
97	Dry	X	9/10/2024 21:15	9.83	0.38	0.18	1.65	913	1023	0.89
98	Dry		9/11/2024 23:45	0.17	0.04	0.02	0.17	5560	5670	0.98
99	Dry		9/12/2024 6:00	2.25	0.04	0.02	0.17	420	530	0.79
100	Dry		9/13/2024 17:25	8.17	0.09	0.04	0.39	260	370	0.70
101	Dry		9/14/2024 14:10	5.08	0.27	0.13	1.17	1256	1366	0.92
102	Dry		9/15/2024 7:15	0.50	0.03	0.01	0.13	1418	1528	0.93
103	Dry		9/25/24 12:05 PM	4.17	0.08	0.04	0.35	453	563	0.80
104	Dry		9/26/24 7:00 PM	8.67	0.21	0.10	0.91	572	682	0.84
			Total Dry Season	**174.92**	**4.61**	**2.21**	**20.1**			
			Mean Dry Season Flow					**30**		
			Total Annual	**1,060.86**	**31.20**	**16.79**	**152**			
			Mean Annual Flow					**95**		

Note: [1] Mean Annual Baseflow based on Water Year 2010 Record in Outfall 235
[2] Stormflow calculations are based on the historical rainfall to runoff relationship for the historic OF235 drainage area.

Drainage Area: 109 acres
Mean Baseflow: 110 gpm[1]

	Rain Threshold (in)	Runoff Coefficient
Wet Season	0	0.55
Dry Season	0	0.48

Table B9-1.3
WY2024 Storm Event Hydrology for OF237A

Storm Event	Season	Sampled?	Storm Start Date & Time	Storm Duration (hours)	Total Rain (inches)	Estimated Runoff (inches)	Estimated Storm Volume (acre-feet)	Estimated Mean Stormflow (gpm)	Estimated Combined Flow (gpm)	Storm Fraction (unitless)
Wet Season										
1	Wet		10/2/2023 10:40	13.00	0.4	0.13	30.34	12675	15130	0.84
2	Wet		10/9/2023 11:55	6.08	0.07	0.03	7.06	6303	8758	0.72
3	Wet		10/10/2023 4:05	4.67	0.2	0.07	16.23	18873	21328	0.88
4	Wet		10/10/2023 17:00	21.17	0.53	0.17	39.51	10137	12592	0.81
5	Wet		10/13/2023 17:45	9.42	0.18	0.06	14.82	8543	10998	0.78
6	Wet	X	10/16/2023 7:00	13.33	0.57	0.18	42.34	17248	19703	0.88
7	Wet		10/17/2023 15:20	0.75	0.04	0.02	4.94	35765	38220	0.94
8	Wet		10/21/2023 16:55	1.00	0.08	0.03	7.76	42152	44607	0.94
9	Wet		10/24/2023 15:05	18.25	0.66	0.21	48.69	14488	16943	0.86
10	Wet		11/1/2023 17:55	15.58	0.94	0.29	68.44	23858	26313	0.91
11	Wet	X	11/3/2023 18:35	16.00	0.88	0.27	64.21	21794	24249	0.90
12	Wet		11/5/2023 17:05	5.75	0.24	0.08	19.05	17994	20449	0.88
13	Wet		11/6/2023 7:25	16.00	0.63	0.20	46.57	15807	18262	0.87
14	Wet		11/9/2023 15:50	2.58	0.14	0.05	12.00	25249	27704	0.91
15	Wet		11/10/2023 19:55	1.50	0.09	0.04	8.47	30656	33111	0.93
16	Wet	X	11/11/2023 5:45	4.33	0.53	0.17	39.51	49521	51976	0.95
17	Wet		11/12/2023 13:05	13.33	0.35	0.11	26.81	10924	13379	0.82
18	Wet		11/18/2023 19:55	3.92	0.33	0.11	25.40	35192	37647	0.93
19	Wet		11/21/2023 18:10	11.92	0.22	0.08	17.64	8037	10492	0.77
20	Wet		11/30/2023 14:10	17.17	0.45	0.14	33.87	10713	13168	0.81
21	Wet		12/1/2023 18:00	12.17	0.83	0.26	60.68	27079	29534	0.92
22	Wet		12/2/2023 13:05	1.17	0.04	0.02	4.94	22926	25381	0.90
23	Wet		12/3/2023 4:55	7.33	0.3	0.10	23.28	17252	19707	0.88
24	Wet		12/4/2023 6:40	52.00	2.92	0.89	208.15	21739	24194	0.90
25	Wet		12/6/2023 17:05	16.25	0.39	0.13	29.63	9904	12359	0.80
26	Wet	X	12/9/2023 10:50	20.25	0.97	0.30	70.56	18923	21378	0.89
27	Wet		12/14/2023 3:55	6.25	0.15	0.05	12.70	11036	13491	0.82
28	Wet	X	12/18/2023 15:25	19.92	0.28	0.09	21.87	5963	8418	0.71
29	Wet		12/22/2023 4:25	3.42	0.23	0.08	18.35	29132	31587	0.92
30	Wet		12/25/2023 8:20	20.00	0.52	0.17	38.81	10538	12993	0.81
31	Wet		12/27/2023 14:45	10.25	0.09	0.04	8.47	4486	6941	0.65
32	Wet		12/30/2023 9:25	5.50	0.09	0.04	8.47	8361	10816	0.77
33	Wet		1/2/2024 8:50	7.33	0.34	0.11	26.11	19343	21798	0.89
34	Wet		1/3/2024 13:05	17.67	0.12	0.05	10.58	3253	5708	0.57
35	Wet		1/5/2024 3:25	1.50	0.06	0.03	6.35	22992	25447	0.90
36	Wet	X	1/5/2024 13:30	19.92	0.37	0.12	28.22	7695	10150	0.76
37	Wet		1/7/2024 18:50	0.50	0.03	0.02	4.23	45984	48439	0.95
38	Wet		1/8/2024 4:05	31.67	0.92	0.29	67.03	11495	13950	0.82
39	Wet		1/10/2024 13:45	0.92	0.07	0.03	7.06	41652	44107	0.94
40	Wet		1/16/2024 19:40	16.83	0.4	0.13	30.34	9791	12246	0.80
41	Wet		1/18/2024 6:15	19.58	0.61	0.19	45.16	12525	14980	0.84
42	Wet	X	1/20/2024 18:55	43.83	1.31	0.40	94.55	11715	14170	0.83
43	Wet		1/24/2024 4:05	31.92	0.58	0.18	43.04	7323	9778	0.75
44	Wet		1/26/2024 15:50	36.92	1.16	0.36	83.97	12351	14806	0.83
45	Wet		1/30/2024 8:40	1.42	0.05	0.02	5.64	21589	24044	0.90
46	Wet		1/30/2024 22:55	14.50	0.1	0.04	9.17	3436	5891	0.58
47	Wet		1/31/2024 23:50	4.25	0.08	0.03	7.76	9918	12373	0.80
48	Wet		2/5/2024 15:55	14.58	0.18	0.06	14.82	5519	7974	0.69
49	Wet		2/8/2024 23:35	1.08	0.04	0.02	4.94	24837	27292	0.91
50	Wet		2/11/2024 5:40	4.50	0.09	0.04	8.47	10219	12674	0.81
51	Wet		2/11/2024 20:00	12.67	0.27	0.09	21.17	9073	11528	0.79
52	Wet		2/14/2024 20:35	6.17	0.25	0.08	19.76	17390	19845	0.88
53	Wet		2/19/2024 11:50	2.08	0.08	0.03	7.76	20265	22720	0.89
54	Wet		2/20/2024 1:05	10.75	0.13	0.05	11.29	5703	8158	0.70
55	Wet		2/20/2024 18:15	26.08	0.37	0.12	28.22	5877	8332	0.71
56	Wet		2/25/2024 10:40	6.00	0.12	0.05	10.58	9580	12035	0.80
57	Wet		2/28/2024 1:40	31.17	1.18	0.36	85.38	14876	17331	0.86
58	Wet		2/29/2024 15:00	10.58	0.36	0.12	27.52	14125	16580	0.85
59	Wet		3/3/2024 6:35	4.67	0.07	0.03	7.06	8206	10661	0.77
60	Wet		3/3/2024 19:25	5.58	0.08	0.03	7.76	7554	10009	0.75
61	Wet		3/10/2024 13:10	8.17	0.07	0.03	7.06	4690	7145	0.66
62	Wet		3/11/2024 14:00	24.92	0.34	0.11	26.11	5690	8145	0.70
63	Wet		3/20/2024 20:15	6.08	0.11	0.04	9.88	8824	11279	0.78
64	Wet		3/21/2024 17:15	4.67	0.03	0.02	4.23	4923	7378	0.67
65	Wet		3/22/2024 10:10	12.50	0.12	0.05	10.58	4598	7053	0.65
66	Wet		3/25/2024 13:10	2.08	0.03	0.02	4.23	11054	13509	0.82
67	Wet		3/27/2024 2:20	6.00	0.23	0.08	18.35	16605	19060	0.87
68	Wet		3/27/2024 15:30	0.42	0.06	0.03	6.35	82114	84569	0.97
69	Wet		3/28/2024 0:15	3.17	0.14	0.05	12.00	20550	23005	0.89
70	Wet		4/4/2024 10:20	1.33	0.04	0.02	4.94	20168	22623	0.89
71	Wet		4/7/2024 12:35	1.75	0.04	0.02	4.94	15328	17783	0.86
72	Wet		4/8/2024 18:05	14.17	0.29	0.10	22.58	8654	11109	0.78
73	Wet	X	4/25/2024 4:30	23.58	0.84	0.26	61.39	14138	16593	0.85
74	Wet		4/26/2024 17:30	4.75	0.05	0.02	5.64	6454	8909	0.72
75	Wet		4/28/2024 11:05	8.92	0.11	0.04	9.88	6014	8469	0.71
76	Wet		4/29/24 2:30 AM	6.75	0.29	0.10	22.58	18166	20621	0.88
77	Wet		4/30/24 6:35 AM	1.75	0.04	0.02	4.94	15328	17783	0.86
			Total Wet Season	**885.94**	**26.59**	**8.70**	**2,039**			
			Mean Wet Season Flow					**2166**		
Dry Season										
78	Dry		5/4/2024 13:05	18.67	0.32	0.08	19.73	5739	8194	0.70
79	Dry		5/6/2024 2:55	12.42	0.17	0.05	11.94	5222	7677	0.68
80	Dry		5/18/2024 15:10	2.25	0.05	0.00	0.00	0	2455	0.00
81	Dry		5/21/2024 5:50	15.58	0.29	0.08	18.17	6335	8790	0.72
82	Dry		5/24/2024 11:05	1.67	0.04	0.00	0.00	0	2455	0.00
83	Dry		5/28/2024 12:10	1.00	0.06	0.03	6.23	33839	36294	0.93
84	Dry		5/29/2024 8:30	0.67	0.06	0.03	6.23	50505	52960	0.95
85	Dry		5/29/2024 18:10	1.83	0.06	0.03	6.23	18491	20946	0.88
86	Dry		6/2/2024 10:05	16.83	0.92	0.22	50.88	16420	18875	0.87
87	Dry		6/3/2024 23:05	6.42	0.05	0.00	0.00	0	2455	0.00
88	Dry		6/4/2024 12:30	0.50	0.06	0.03	6.23	67677	70132	0.96
89	Dry		6/15/2024 2:45	14.50	0.14	0.04	10.38	3889	6344	0.61
90	Dry		6/29/2024 18:35	3.08	0.05	0.00	0.00	0	2455	0.00
91	Dry		7/29/2024 21:20	6.25	0.1	0.04	8.31	7219	9674	0.75
92	Dry		8/17/2024 19:15	2.83	0.27	0.07	17.13	32882	35337	0.93
93	Dry		8/20/2024 4:00	8.33	0.33	0.09	20.25	13202	15657	0.84
94	Dry		8/22/2024 22:25	4.67	0.13	0.04	9.87	11473	13928	0.82
95	Dry		8/23/2024 15:35	18.33	0.34	0.09	20.77	6154	8609	0.71
96	Dry		8/26/2024 23:35	0.25	0.03	0.00	0.00	0	2455	0.00
97	Dry	X	9/10/2024 21:15	9.83	0.38	0.10	22.85	12622	15077	0.84
98	Dry		9/11/2024 23:45	0.17	0.04	0.00	0.00	0	2455	0.00
99	Dry		9/12/2024 6:00	2.25	0.04	0.00	0.00	0	2455	0.00
100	Dry		9/13/2024 17:25	8.17	0.09	0.03	7.79	5177	7632	0.68
101	Dry		9/14/2024 14:10	5.08	0.27	0.07	17.13	18318	20773	0.88
102	Dry		9/15/2024 7:15	0.50	0.03	0.00	0.00	0	2455	0.00
103	Dry		9/25/2024 12:05	4.17	0.08	0.03	7.27	9467	11922	0.79
104	Dry		9/26/2024 19:00	8.67	0.21	0.06	14.02	8782	11237	0.78
			Total Dry Season	**174.92**	**4.61**	**1.20**	**281**			
			Mean Dry Season Flow					**416**		
			Total Annual	**1,060.86**	**31.20**	**9.90**	**2,321**			
			Mean Annual Flow					**1439**		

Notes:
[1] Mean Annual Baseflow based on Water Year 2015 Record in Outfall 237A

Drainage Area:	2,813	acres
Mean Baseflow:	2,455	gpm[1]

	Rain Threshold (in)	Runoff Coefficient
Wet Season	0.030	0.30
Dry Season	0.060	0.22

Table B9-1.4
WY2024 Storm Event Hydrology for OF237B

Storm Event	Season	Sampled?	Storm Start Date & Time	Storm Duration (hours)	Total Rain (inches)	Estimated Runoff (inches)	Estimated Storm Volume (acre-feet)	Estimated Mean Stormflow (gpm)	Estimated Combined Flow (gpm)	Storm Fraction (unitless)
Wet Season										
1	Wet		10/2/2023 10:40	13.00	0.4	0.16	26.79	11190	16900	0.66
2	Wet		10/9/2023 11:55	6.08	0.07	0.02	2.71	2425	8135	0.30
3	Wet		10/10/2023 4:05	4.67	0.2	0.07	12.20	14184	19895	0.71
4	Wet	X	10/10/2023 17:00	21.17	0.53	0.22	36.27	9304	15015	0.62
5	Wet		10/13/2023 17:45	9.42	0.18	0.07	10.74	6191	11901	0.52
6	Wet	X	10/16/2023 7:00	13.33	0.57	0.24	39.19	15965	21676	0.74
7	Wet		10/17/2023 15:20	0.75	0.04	0.00	0.53	3812	9522	0.40
8	Wet		10/21/2023 16:55	1.00	0.08	0.02	3.44	18705	24415	0.77
9	Wet	X	10/24/2023 15:05	18.25	0.66	0.28	45.75	13615	19325	0.70
10	Wet	X	11/1/2023 17:55	15.58	0.94	0.40	66.17	23067	28778	0.80
11	Wet		11/3/2023 18:35	16.00	0.88	0.37	61.80	20976	26687	0.79
12	Wet		11/5/2023 17:05	5.75	0.24	0.09	15.11	14276	19987	0.71
13	Wet		11/6/2023 7:25	16.00	0.63	0.26	43.56	14786	20497	0.72
14	Wet		11/9/2023 15:50	2.58	0.14	0.05	7.82	16462	22173	0.74
15	Wet		11/10/2023 19:55	1.50	0.09	0.03	4.17	15111	20821	0.73
16	Wet	X	11/11/2023 5:45	4.33	0.53	0.22	36.27	45454	51165	0.89
17	Wet		11/12/2023 13:05	13.33	0.35	0.14	23.14	9427	15138	0.62
18	Wet		11/18/2023 19:55	3.92	0.33	0.13	21.68	30036	35746	0.84
19	Wet		11/21/2023 18:10	11.92	0.22	0.08	13.66	6222	11932	0.52
20	Wet		11/30/2023 14:10	17.17	0.45	0.18	30.43	9626	15336	0.63
21	Wet		12/1/2023 18:00	12.17	0.83	0.35	58.15	25950	31660	0.82
22	Wet		12/2/2023 13:05	1.17	0.04	0.00	0.53	2443	8154	0.30
23	Wet		12/3/2023 4:55	7.33	0.3	0.12	19.49	14441	20152	0.72
24	Wet		12/4/2023 6:40	52.00	2.92	1.28	210.60	21995	27706	0.79
25	Wet		12/6/2023 17:05	16.25	0.39	0.16	26.06	8708	14419	0.60
26	Wet	X	12/9/2023 10:50	20.25	0.97	0.41	68.36	18334	24045	0.76
27	Wet		12/14/2023 3:55	6.25	0.15	0.05	8.55	7430	13140	0.57
28	Wet	X	12/18/2023 15:25	19.92	0.28	0.11	18.03	4916	10627	0.46
29	Wet		12/22/2023 4:25	3.42	0.23	0.09	14.39	22844	28554	0.80
30	Wet		12/25/2023 8:20	20.00	0.52	0.22	35.54	9650	15361	0.63
31	Wet		12/27/2023 14:45	10.25	0.09	0.03	4.17	2211	7922	0.28
32	Wet		12/30/2023 9:25	5.50	0.09	0.03	4.17	4121	9832	0.42
33	Wet		1/2/2024 8:50	7.33	0.34	0.14	22.41	16603	22314	0.74
34	Wet		1/3/2024 13:05	17.67	0.12	0.04	6.36	1955	7666	0.26
35	Wet		1/5/2024 3:25	1.50	0.06	0.01	1.99	7188	12898	0.56
36	Wet	X	1/5/2024 13:30	19.92	0.37	0.15	24.60	6706	12417	0.54
37	Wet		1/7/2024 18:50	0.50	0.03	0.00	0.00	0	5711	0.00
38	Wet		1/8/2024 4:05	31.67	0.92	0.39	64.72	11098	16808	0.66
39	Wet		1/10/2024 13:45	0.92	0.07	0.02	2.71	16025	21736	0.74
40	Wet		1/16/2024 19:40	16.83	0.4	0.16	26.79	8643	14354	0.60
41	Wet		1/18/2024 6:15	19.58	0.61	0.26	42.10	11678	17389	0.67
42	Wet	X	1/20/2024 18:55	43.83	1.31	0.56	93.16	11544	17254	0.67
43	Wet		1/24/2024 4:05	31.92	0.58	0.24	39.92	6791	12502	0.54
44	Wet		1/26/2024 15:50	36.92	1.16	0.50	82.22	12095	17805	0.68
45	Wet		1/30/2024 8:40	1.42	0.05	0.01	1.26	4803	10514	0.46
46	Wet		1/30/2024 22:55	14.50	0.1	0.03	4.90	1836	7547	0.24
47	Wet		1/31/2024 23:50	4.25	0.08	0.02	3.44	4401	10112	0.44
48	Wet		2/5/2024 15:55	14.58	0.18	0.07	10.74	4000	9710	0.41
49	Wet		2/8/2024 23:35	1.08	0.04	0.00	0.53	2647	8358	0.32
50	Wet		2/11/2024 5:40	4.50	0.09	0.03	4.17	5037	10747	0.47
51	Wet		2/11/2024 20:00	12.67	0.27	0.10	17.30	7417	13127	0.56
52	Wet	X	2/14/2024 20:35	6.17	0.25	0.10	15.84	13946	19657	0.71
53	Wet		2/19/2024 11:50	2.08	0.08	0.02	3.44	8993	14703	0.61
54	Wet		2/20/2024 1:05	10.75	0.13	0.04	7.09	3582	9293	0.39
55	Wet		2/20/2024 18:15	26.08	0.37	0.15	24.60	5122	10833	0.47
56	Wet		2/25/2024 10:40	6.00	0.12	0.04	6.36	5758	11469	0.50
57	Wet	X	2/28/2024 1:40	31.17	1.18	0.51	83.68	14580	20291	0.72
58	Wet		2/29/2024 15:00	10.58	0.36	0.14	23.87	12252	17962	0.68
59	Wet		3/3/2024 6:35	4.67	0.07	0.02	2.71	3157	8867	0.36
60	Wet		3/3/2024 19:25	5.58	0.08	0.02	3.44	3352	9063	0.37
61	Wet		3/10/2024 13:10	8.17	0.07	0.02	2.71	1805	7515	0.24
62	Wet		3/11/2024 14:00	24.92	0.34	0.14	22.41	4884	10594	0.46
63	Wet		3/20/2024 20:15	6.08	0.11	0.03	5.63	5031	10742	0.47
64	Wet		3/21/2024 17:15	4.67	0.03	0.00	0.00	0	5711	0.00
65	Wet		3/22/2024 10:10	12.50	0.12	0.04	6.36	2764	8475	0.33
66	Wet		3/25/2024 13:10	2.08	0.03	0.00	0.00	0	5711	0.00
67	Wet		3/27/2024 2:20	6.00	0.23	0.09	14.39	13021	18731	0.70
68	Wet		3/27/2024 15:30	0.42	0.06	0.01	1.99	25671	31381	0.82
69	Wet		3/28/2024 0:15	3.17	0.14	0.05	7.82	13398	19109	0.70
70	Wet		4/4/2024 10:20	1.33	0.04	0.00	0.53	2150	7860	0.27
71	Wet		4/7/2024 12:35	1.75	0.04	0.00	0.53	1634	7344	0.22
72	Wet		4/8/2024 18:05	14.17	0.29	0.11	18.76	7191	12901	0.56
73	Wet	X	4/25/2024 4:30	23.58	0.84	0.36	58.88	13561	19272	0.70
74	Wet		4/26/2024 17:30	4.75	0.05	0.01	1.26	1436	7146	0.20
75	Wet		4/28/2024 11:05	8.92	0.11	0.03	5.63	3429	9140	0.38
76	Wet		4/29/2024 2:30	6.75	0.29	0.11	18.76	15095	20806	0.73
77	Wet		4/30/2024 6:35	1.75	0.04	0.00	0.53	1634	7344	0.22
			Total Wet Season	**885.94**	**26.59**	**10.65**	**1,756**			
			Mean Wet Season Flow					**1866**		
Dry Season										
78	Dry		5/4/2024 13:05	18.67	0.32	0.08	13.11	3814	9524	0.40
79	Dry		5/6/2024 2:55	12.42	0.17	0.03	5.63	2461	8171	0.30
80	Dry		5/18/2024 15:10	2.25	0.05	0.00	0.00	0.00	5711	0.00
81	Dry	X	5/21/2024 5:50	15.58	0.29	0.07	11.61	4048	9759	0.41
82	Dry		5/24/2024 11:05	1.67	0.04	0.00	0.00	0.00	5711	0.00
83	Dry		5/28/2024 12:10	1.00	0.06	0.00	0.14	761	6472	0.12
84	Dry		5/29/2024 8:30	0.67	0.06	0.00	0.14	1136	6847	0.17
85	Dry		5/29/2024 18:10	1.83	0.06	0.00	0.14	416	6127	0.07
86	Dry		6/2/2024 10:05	16.83	0.92	0.26	43.04	13890	19600	0.71
87	Dry		6/3/2024 23:05	6.42	0.05	0.00	0.00	0.00	5711	0.00
88	Dry		6/4/2024 12:30	0.50	0.06	0.00	0.14	1523	7233	0.21
89	Dry		6/15/2024 2:45	14.50	0.14	0.03	4.13	1547	7258	0.21
90	Dry		6/29/2024 18:35	3.08	0.05	0.00	0.00	0.00	5711	0.00
91	Dry		7/29/2024 21:20	6.25	0.1	0.01	2.14	1856	7566	0.25
92	Dry		8/17/2024 19:15	2.83	0.27	0.06	10.62	20373	26084	0.78
93	Dry		8/20/2024 4:00	8.33	0.33	0.08	13.61	8873	14584	0.61
94	Dry		8/22/2024 22:25	4.67	0.13	0.02	3.63	4224	9935	0.43
95	Dry		8/23/2024 15:35	18.33	0.34	0.09	14.11	4180	9891	0.42
96	Dry		8/26/2024 23:35	0.25	0.03	0.00	0.00	0.00	5711	0.00
97	Dry	X	9/10/2024 21:15	9.83	0.38	0.10	16.10	8897	14608	0.61
98	Dry		9/11/2024 23:45	0.17	0.04	0.00	0.00	0.00	5711	0.00
99	Dry		9/12/2024 6:00	2.25	0.04	0.00	0.00	0.00	5711	0.00
100	Dry		9/13/2024 17:25	8.17	0.09	0.01	1.64	1088.03	6799	0.16
101	Dry		9/14/2024 14:10	5.08	0.27	0.06	10.62	11350	17060	0.67
102	Dry		9/15/2024 7:15	0.50	0.03	0.00	0.00	0.00	5711	0.00
103	Dry		9/25/2024 12:05	4.17	0.08	0.01	1.14	1482	7193	0.21
104	Dry		9/26/2024 19:00	8.67	0.21	0.05	7.62	4775	10486	0.46
			Total Dry Season	**174.92**	**4.61**	**0.97**	**159**			
			Mean Dry Season Flow					**236**		
			Total Annual	**1,060.86**	**31.20**	**11.61**	**1,915.33**			
			Mean Annual Flow					**1187**		

Notes:

[1] *Mean Annual Baseflow based on Water Year 2010 Record in Outfall 237B*

Drainage Area: 1,979 acres

Mean Baseflow: 5,711 gpm[1]

	Rain Threshold (in)	Runoff Coefficient
Wet Season	0.033	0.44
Dry Season	0.057	0.30

Table B9-1.5
WY2024 Storm Event Hydrology for OF243

Storm Event	Season	Sampled	Storm Start Date and Time	Storm Duration (hours)	Total Rain (inches)	Estimated Runoff (inches)	Estimated Storm Volume (acre-feet)	Estimated Mean Stormflow (gpm)	Estimated Combined Flow (gpm)	Storm Fraction (unitless)
Wet Season										
1	Wet		10/2/2023 10:40	13.00	0.4	0.13	0.66	276	276	1.00
2	Wet		10/9/2023 11:55	6.08	0.07	0.02	0.12	103	103	1.00
3	Wet		10/10/2023 4:05	4.67	0.2	0.07	0.33	384	384	1.00
4	Wet		10/10/2023 17:00	21.17	0.53	0.18	0.87	224	224	1.00
5	Wet		10/13/2023 17:45	9.42	0.18	0.06	0.30	171	171	1.00
6	Wet		10/16/2023 7:00	13.33	0.57	0.19	0.94	383	383	1.00
7	Wet		10/17/2023 15:20	0.75	0.04	0.01	0.07	478	478	1.00
8	Wet		10/21/2023 16:55	1.00	0.08	0.03	0.13	717	717	1.00
9	Wet	X	10/24/2023 15:05	18.25	0.66	0.22	1.09	324	324	1.00
10	Wet	X	11/1/2023 17:55	15.58	0.94	0.32	1.55	541	541	1.00
11	Wet		11/3/2023 18:35	16.00	0.88	0.30	1.45	493	493	1.00
12	Wet		11/5/2023 17:05	5.75	0.24	0.08	0.40	374	374	1.00
13	Wet		11/6/2023 7:25	16.00	0.63	0.21	1.04	353	353	1.00
14	Wet		11/9/2023 15:50	2.58	0.14	0.05	0.23	486	486	1.00
15	Wet		11/10/2023 19:55	1.50	0.09	0.03	0.15	538	538	1.00
16	Wet		11/11/2023 5:45	4.33	0.53	0.18	0.87	1096	1096	1.00
17	Wet		11/12/2023 13:05	13.33	0.35	0.12	0.58	235	235	1.00
18	Wet		11/18/2023 19:55	3.92	0.33	0.11	0.54	755	755	1.00
19	Wet		11/21/2023 18:10	11.92	0.22	0.07	0.36	165	165	1.00
20	Wet		11/30/2023 14:10	17.17	0.45	0.15	0.74	235	235	1.00
21	Wet		12/1/2023 18:00	12.17	0.83	0.28	1.37	611	611	1.00
22	Wet		12/2/2023 13:05	1.17	0.04	0.01	0.07	306	306	1.00
23	Wet		12/3/2023 4:55	7.33	0.3	0.10	0.50	367	367	1.00
24	Wet		12/4/2023 6:40	52.00	2.92	0.98	4.82	503	503	1.00
25	Wet		12/6/2023 17:05	16.25	0.39	0.13	0.64	215	215	1.00
26	Wet	X	12/9/2023 10:50	20.25	0.97	0.33	1.60	429	429	1.00
27	Wet		12/14/2023 3:55	6.25	0.15	0.05	0.25	215	215	1.00
28	Wet		12/18/2023 15:25	19.92	0.28	0.09	0.46	126	126	1.00
29	Wet		12/22/2023 4:25	3.42	0.23	0.08	0.38	603	603	1.00
30	Wet		12/25/2023 8:20	20.00	0.52	0.17	0.86	233	233	1.00
31	Wet		12/27/2023 14:45	10.25	0.09	0.03	0.15	79	79	1.00
32	Wet		12/30/2023 9:25	5.50	0.09	0.03	0.15	147	147	1.00
33	Wet		1/2/2024 8:50	7.33	0.34	0.11	0.56	416	416	1.00
34	Wet		1/3/2024 13:05	17.67	0.12	0.04	0.20	61	61	1.00
35	Wet		1/5/2024 3:25	1.50	0.06	0.02	0.10	359	359	1.00
36	Wet		1/5/2024 13:30	19.92	0.37	0.12	0.61	166	166	1.00
37	Wet		1/7/2024 18:50	0.50	0.03	0.01	0.05	538	538	1.00
38	Wet	X	1/8/2024 4:05	31.67	0.92	0.31	1.52	260	260	1.00
39	Wet		1/10/2024 13:45	0.92	0.07	0.02	0.12	682	682	1.00
40	Wet		1/16/2024 19:40	16.83	0.4	0.13	0.66	213	213	1.00
41	Wet		1/18/2024 6:15	19.58	0.61	0.20	1.01	279	279	1.00
42	Wet		1/20/2024 18:55	43.83	1.31	0.44	2.16	268	268	1.00
43	Wet		1/24/2024 4:05	31.92	0.58	0.19	0.96	163	163	1.00
44	Wet		1/26/2024 15:50	36.92	1.16	0.39	1.91	282	282	1.00
45	Wet		1/30/2024 8:40	1.42	0.05	0.02	0.08	316	316	1.00
46	Wet		1/30/2024 22:55	14.50	0.1	0.03	0.17	62	62	1.00
47	Wet		1/31/2024 23:50	4.25	0.08	0.03	0.13	169	169	1.00
48	Wet		2/5/2024 15:55	14.58	0.18	0.06	0.30	111	111	1.00
49	Wet		2/8/2024 23:35	1.08	0.04	0.01	0.07	332	332	1.00
50	Wet		2/11/2024 5:40	4.50	0.09	0.03	0.15	179	179	1.00
51	Wet		2/11/2024 20:00	12.67	0.27	0.09	0.45	191	191	1.00
52	Wet		2/14/2024 20:35	6.17	0.25	0.08	0.41	363	363	1.00
53	Wet		2/19/2024 11:50	2.08	0.08	0.03	0.13	345	345	1.00
54	Wet		2/20/2024 1:05	10.75	0.13	0.04	0.21	108	108	1.00
55	Wet		2/20/2024 18:15	26.08	0.37	0.12	0.61	127	127	1.00
56	Wet		2/25/2024 10:40	6.00	0.12	0.04	0.20	179	179	1.00
57	Wet	X	2/28/2024 1:40	31.17	1.18	0.40	1.95	339	339	1.00
58	Wet		2/29/2024 15:00	10.58	0.36	0.12	0.59	305	305	1.00
59	Wet		3/3/2024 6:35	4.67	0.07	0.02	0.12	134	134	1.00
60	Wet		3/3/2024 19:25	5.58	0.08	0.03	0.13	129	129	1.00
61	Wet		3/10/2024 13:10	8.17	0.07	0.02	0.12	77	77	1.00
62	Wet		3/11/2024 14:00	24.92	0.34	0.11	0.56	122	122	1.00
63	Wet		3/20/2024 20:15	6.08	0.11	0.04	0.18	162	162	1.00
64	Wet		3/21/2024 17:15	4.67	0.03	0.01	0.05	58	58	1.00
65	Wet		3/22/2024 10:10	12.50	0.12	0.04	0.20	86	86	1.00
66	Wet		3/25/2024 13:10	2.08	0.03	0.01	0.05	129	129	1.00
67	Wet		3/27/2024 2:20	6.00	0.23	0.08	0.38	344	344	1.00
68	Wet		3/27/2024 15:30	0.42	0.06	0.02	0.10	1281	1281	1.00
69	Wet		3/28/2024 0:15	3.17	0.14	0.05	0.23	396	396	1.00
70	Wet		4/4/2024 10:20	1.33	0.04	0.01	0.07	270	270	1.00
71	Wet		4/7/2024 12:35	1.75	0.04	0.01	0.07	205	205	1.00
72	Wet		4/8/2024 18:05	14.17	0.29	0.10	0.48	183	183	1.00
73	Wet	X	4/25/2024 4:30	23.58	0.84	0.28	1.39	319	319	1.00
74	Wet		4/26/2024 17:30	4.75	0.05	0.02	0.08	94	94	1.00
75	Wet		4/28/2024 11:05	8.92	0.11	0.04	0.18	111	111	1.00
76	Wet		4/29/2024 2:30	6.75	0.29	0.10	0.48	385	385	1.00
77	Wet		4/30/2024 6:35	1.75	0.04	0.01	0.07	205	205	1.00
			Total Wet Season	**885.94**	**26.59**	**8.93**	**43.9**			
			Mean Wet Season Flow					**46.6**		
Dry Season										
78	Dry		5/4/2024 13:05	18.67	0.32	0.05	0.25	71	71	1.00
79	Dry		5/6/2024 2:55	12.42	0.17	0.03	0.13	57	57	1.00
80	Dry		5/18/2024 15:10	2.25	0.05	0.01	0.04	93	93	1.00
81	Dry		5/21/2024 5:50	15.58	0.29	0.05	0.22	78	78	1.00
82	Dry		5/24/2024 11:05	1.67	0.04	0.01	0.03	100	100	1.00
83	Dry		5/28/2024 12:10	1.00	0.06	0.01	0.05	250	250	1.00
84	Dry		5/29/2024 8:30	0.67	0.06	0.01	0.05	373	373	1.00
85	Dry		5/29/2024 18:10	1.83	0.06	0.01	0.05	137	137	1.00
86	Dry	X	6/2/2024 10:05	16.83	0.92	0.14	0.71	228	228	1.00
87	Dry		6/3/2024 23:05	6.42	0.05	0.01	0.04	32	32	1.00
88	Dry		6/4/2024 12:30	0.50	0.06	0.01	0.05	500	500	1.00
89	Dry		6/15/2024 2:45	14.50	0.14	0.02	0.11	40	40	1.00
90	Dry		6/29/2024 18:35	3.08	0.05	0.01	0.04	68	68	1.00
91	Dry		7/29/2024 21:20	6.25	0.1	0.02	0.08	67	67	1.00
92	Dry		8/17/2024 19:15	2.83	0.27	0.04	0.21	397	397	1.00
93	Dry		8/20/2024 4:00	8.33	0.33	0.05	0.25	165	165	1.00
94	Dry		8/22/2024 22:25	4.67	0.13	0.02	0.10	116	116	1.00
95	Dry		8/23/2024 15:35	18.33	0.34	0.05	0.26	77	77	1.00
96	Dry		8/26/2024 23:35	0.25	0.03	0.00	0.02	500	500	1.00
97	Dry		9/10/2024 21:15	9.83	0.38	0.06	0.29	161	161	1.00
98	Dry		9/11/2024 23:45	0.17	0.04	0.01	0.03	980	980	1.00
99	Dry		9/12/2024 6:00	2.25	0.04	0.01	0.03	74	74	1.00
100	Dry		9/13/2024 17:25	8.17	0.09	0.01	0.07	46	46	1.00
101	Dry		9/14/2024 14:10	5.08	0.27	0.04	0.21	221	221	1.00
102	Dry		9/15/2024 7:15	0.50	0.03	0.00	0.02	250	250	1.00
103	Dry		9/25/2024 12:05	4.17	0.08	0.01	0.06	80	80	1.00
104	Dry		9/26/2024 19:00	8.67	0.21	0.03	0.16	101	101	1.00
			Total Dry Season	**174.92**	**4.61**	**0.72**	**3.5**			
			Mean Dry Season Flow					**5.2**		
			Total Annual	**1060.86**	**31.20**	**9.65**	**47.4**			
			Mean Annual Flow					**29.4**		

Note:
[1] Mean Annual Baseflow based on Water Year 2010 Record in Outfall 245 HSPF Modeling

Drainage Area: 59 acres
Mean Baseflow: 0 gpm[1]

	Rain Threshold (in)	Runoff Coefficient
Wet Season	0	0.34
Dry Season	0	0.16

Table B9-1.5 WY2024 Storm Event Hydrology for OF243

Table B9-1.6
WY2024 Storm Event Hydrology for OF245

Storm Event	Season	Sampled	Storm Start Date and Time	Storm Duration (hours)	Total Rain (inches)	Estimated Runoff (inches)	Estimated Storm Volume (acre-feet)	Estimated Mean Stormflow (gpm)	Estimated Combined Flow (gpm)	Storm Fraction (unitless)
						Wet Season				
1	Wet		10/2/2023 10:40	13.00	0.4	0.40	1.29	538	538	1.0
2	Wet		10/9/2023 11:55	6.08	0.07	0.07	0.23	201	201	1.0
3	Wet		10/10/2023 4:05	4.67	0.2	0.20	0.64	748	748	1.0
4	Wet		10/10/2023 17:00	21.17	0.53	0.52	1.71	437	437	1.0
5	Wet		10/13/2023 17:45	9.42	0.18	0.18	0.58	334	334	1.0
6	Wet	X	10/16/2023 7:00	13.33	0.57	0.56	1.83	747	747	1.0
7	Wet		10/17/2023 15:20	0.75	0.04	0.04	0.13	932	932	1.0
8	Wet		10/21/2023 16:55	1.00	0.08	0.08	0.26	1398	1398	1.0
9	Wet	X	10/24/2023 15:05	18.25	0.66	0.65	2.12	632	632	1.0
10	Wet	X	11/1/2023 17:55	15.58	0.94	0.93	3.02	1054	1054	1.0
11	Wet		11/3/2023 18:35	16.00	0.88	0.87	2.83	961	961	1.0
12	Wet		11/5/2023 17:05	5.75	0.24	0.24	0.77	729	729	1.0
13	Wet		11/6/2023 7:25	16.00	0.63	0.62	2.03	688	688	1.0
14	Wet		11/9/2023 15:50	2.58	0.14	0.14	0.45	948	948	1.0
15	Wet		11/10/2023 19:55	1.50	0.09	0.09	0.29	1048	1048	1.0
16	Wet	X	11/11/2023 5:45	4.33	0.53	0.52	1.71	2137	2137	1.0
17	Wet		11/12/2023 13:05	13.33	0.35	0.35	1.13	459	459	1.0
18	Wet		11/18/2023 19:55	3.92	0.33	0.33	1.06	1471	1471	1.0
19	Wet		11/21/2023 18:10	11.92	0.22	0.22	0.71	323	323	1.0
20	Wet		11/30/2023 14:10	17.17	0.45	0.45	1.45	458	458	1.0
21	Wet		12/1/2023 18:00	12.17	0.83	0.82	2.67	1192	1192	1.0
22	Wet		12/2/2023 13:05	1.17	0.04	0.04	0.13	597	597	1.0
23	Wet		12/3/2023 4:55	7.33	0.3	0.30	0.97	715	715	1.0
24	Wet		12/4/2023 6:40	52.00	2.92	2.89	9.40	981	981	1.0
25	Wet		12/6/2023 17:05	16.25	0.39	0.39	1.25	419	419	1.0
26	Wet	X	12/9/2023 10:50	20.25	0.97	0.96	3.12	837	837	1.0
27	Wet		12/14/2023 3:55	6.25	0.15	0.15	0.48	419	419	1.0
28	Wet	X	12/18/2023 15:25	19.92	0.28	0.28	0.90	246	246	1.0
29	Wet		12/22/2023 4:25	3.42	0.23	0.23	0.74	1175	1175	1.0
30	Wet		12/25/2023 8:20	20.00	0.52	0.51	1.67	454	454	1.0
31	Wet		12/27/2023 14:45	10.25	0.09	0.09	0.29	153	153	1.0
32	Wet		12/30/2023 9:25	5.50	0.09	0.09	0.29	286	286	1.0
33	Wet		1/2/2024 8:50	7.33	0.34	0.34	1.09	811	811	1.0
34	Wet		1/3/2024 13:05	17.67	0.12	0.12	0.39	119	119	1.0
35	Wet		1/5/2024 3:25	1.50	0.06	0.06	0.19	699	699	1.0
36	Wet	X	1/5/2024 13:30	19.92	0.37	0.37	1.19	325	325	1.0
37	Wet		1/7/2024 18:50	0.50	0.03	0.03	0.10	1048	1048	1.0
38	Wet		1/8/2024 4:05	31.67	0.92	0.91	2.96	508	508	1.0
39	Wet		1/10/2024 13:45	0.92	0.07	0.07	0.23	1330	1330	1.0
40	Wet		1/16/2024 19:40	16.83	0.4	0.40	1.29	415	415	1.0
41	Wet		1/18/2024 6:15	19.58	0.61	0.60	1.96	544	544	1.0
42	Wet	X	1/20/2024 18:55	43.83	1.31	1.30	4.21	522	522	1.0
43	Wet		1/24/2024 4:05	31.92	0.58	0.57	1.87	318	318	1.0
44	Wet		1/26/2024 15:50	36.92	1.16	1.15	3.73	549	549	1.0
45	Wet		1/30/2024 8:40	1.42	0.05	0.05	0.16	615	615	1.0
46	Wet		1/30/2024 22:55	14.50	0.1	0.10	0.32	121	121	1.0
47	Wet		1/31/2024 23:50	4.25	0.08	0.08	0.26	329	329	1.0
48	Wet		2/5/2024 15:55	14.58	0.18	0.18	0.58	216	216	1.0
49	Wet		2/8/2024 23:35	1.08	0.04	0.04	0.13	647	647	1.0
50	Wet		2/11/2024 5:40	4.50	0.09	0.09	0.29	349	349	1.0
51	Wet		2/11/2024 20:00	12.67	0.27	0.27	0.87	372	372	1.0
52	Wet	X	2/14/2024 20:35	6.17	0.25	0.25	0.80	708	708	1.0
53	Wet		2/19/2024 11:50	2.08	0.08	0.08	0.26	672	672	1.0
54	Wet		2/20/2024 1:05	10.75	0.13	0.13	0.42	211	211	1.0
55	Wet		2/20/2024 18:15	26.08	0.37	0.37	1.19	248	248	1.0
56	Wet		2/25/2024 10:40	6.00	0.12	0.12	0.39	349	349	1.0
57	Wet	X	2/28/2024 1:40	31.17	1.18	1.17	3.80	662	662	1.0
58	Wet		2/29/2024 15:00	10.58	0.36	0.36	1.16	595	595	1.0
59	Wet		3/3/2024 6:35	4.67	0.07	0.07	0.23	262	262	1.0
60	Wet		3/3/2024 19:25	5.58	0.08	0.08	0.26	251	251	1.0
61	Wet		3/10/2024 13:10	8.17	0.07	0.07	0.23	150	150	1.0
62	Wet		3/11/2024 14:00	24.92	0.34	0.34	1.09	238	238	1.0
63	Wet		3/20/2024 20:15	6.08	0.11	0.11	0.35	316	316	1.0
64	Wet		3/21/2024 17:15	4.67	0.03	0.03	0.10	112	112	1.0
65	Wet		3/22/2024 10:10	12.50	0.12	0.12	0.39	168	168	1.0
66	Wet		3/25/2024 13:10	2.08	0.03	0.03	0.10	252	252	1.0
67	Wet		3/27/2024 2:20	6.00	0.23	0.23	0.74	670	670	1.0
68	Wet		3/27/2024 15:30	0.42	0.06	0.06	0.19	2496	2496	1.0
69	Wet		3/28/2024 0:15	3.17	0.14	0.14	0.45	772	772	1.0
70	Wet		4/4/2024 10:20	1.33	0.04	0.04	0.13	526	526	1.0
71	Wet		4/7/2024 12:35	1.75	0.04	0.04	0.13	399	399	1.0
72	Wet		4/8/2024 18:05	14.17	0.29	0.29	0.93	358	358	1.0
73	Wet	X	4/25/2024 4:30	23.58	0.84	0.83	2.70	622	622	1.0
74	Wet		4/26/2024 17:30	4.75	0.05	0.05	0.16	184	184	1.0
75	Wet		4/28/2024 11:05	8.92	0.11	0.11	0.35	215	215	1.0
76	Wet		4/29/24 2:30 AM	6.75	0.29	0.29	0.93	751	751	1.0
77	Wet		4/30/24 6:35 AM	1.75	0.04	0.04	0.13	399	399	1.0
			Total Wet Season	**885.94**	**26.59**	**26.32**	**85.6**			
			Mean Wet Season Flow					**90.9**		
Dry Season										
78	Dry		5/4/2024 13:05	18.67	0.32	0.25	0.81	236	236	1.0
79	Dry		5/6/2024 2:55	12.42	0.17	0.13	0.43	188	188	1.0
80	Dry		5/18/2024 15:10	2.25	0.05	0.04	0.13	306	306	1.0
81	Dry	X	5/21/2024 5:50	15.58	0.29	0.23	0.74	256	256	1.0
82	Dry		5/24/2024 11:05	1.67	0.04	0.03	0.10	330	330	1.0
83	Dry		5/28/2024 12:10	1.00	0.06	0.05	0.15	826	826	1.0
84	Dry		5/29/2024 8:30	0.67	0.06	0.05	0.15	1233	1233	1.0
85	Dry		5/29/2024 18:10	1.83	0.06	0.05	0.15	451	451	1.0
86	Dry	X	6/2/2024 10:05	16.83	0.92	0.72	2.33	753	753	1.0
87	Dry		6/3/2024 23:05	6.42	0.05	0.04	0.13	107	107	1.0
88	Dry		6/4/2024 12:30	0.50	0.06	0.05	0.15	1652	1652	1.0
89	Dry		6/15/2024 2:45	14.50	0.14	0.11	0.35	133	133	1.0
90	Dry		6/29/2024 18:35	3.08	0.05	0.04	0.13	223	223	1.0
91	Dry		7/29/2024 21:20	6.25	0.1	0.08	0.25	220	220	1.0
92	Dry		8/17/2024 19:15	2.83	0.27	0.21	0.68	1313	1313	1.0
93	Dry		8/20/2024 4:00	8.33	0.33	0.26	0.84	545	545	1.0
94	Dry		8/22/2024 22:25	4.67	0.13	0.10	0.33	383	383	1.0
95	Dry		8/23/2024 15:35	18.33	0.34	0.27	0.86	255	255	1.0
96	Dry		8/26/2024 23:35	0.25	0.03	0.02	0.08	1652	1652	1.0
97	Dry	X	9/10/2024 21:15	9.83	0.38	0.30	0.96	532	532	1.0
98	Dry		9/11/2024 23:45	0.17	0.04	0.03	0.10	3239	3239	1.0
99	Dry		9/12/2024 6:00	2.25	0.04	0.03	0.10	245	245	1.0
100	Dry		9/13/2024 17:25	8.17	0.09	0.07	0.23	152	152	1.0
101	Dry		9/14/2024 14:10	5.08	0.27	0.21	0.68	732	732	1.0
102	Dry		9/15/2024 7:15	0.50	0.03	0.02	0.08	826	826	1.0
103	Dry		9/25/2024 12:05	4.17	0.08	0.06	0.20	264	264	1.0
104	Dry		9/26/24 7:00 PM	8.67	0.21	0.16	0.53	333	333	1.0
			Total Dry Season	**174.92**	**4.61**	**3.60**	**11.7**			
			Mean Dry Season Flow					**17.3**		
			Total Annual	**1060.86**	**31.20**	**29.92**	**97**			
			Mean Annual Flow					**60.3**		

Note:

1 *Mean Annual Baseflow based on Water Year 2010 Record in Outfall 245 HSPF Modeling*

Drainage Area: 39 acres

Mean Baseflow: 0 gpm[1]

	Rain Threshold (in)	Runoff Coefficient
Wet Season	0	0.99
Dry Season	0	0.78

Table B9-1.6 WY2024 Storm Event Hydrology for OF245

Table B9-1.7
WY2024 Storm Event Hydrology for OF254

Storm Event	Season	Sampled?	Storm Start Date and Time	Storm Duration (hours)	Total Rain (inches)	Estimated Runoff (inches)	Estimated Storm Volume (acre-feet)	Estimated Mean Stormflow (gpm)	Estimated Combined Flow (gpm)	Storm Fraction (unitless)
						Wet Season				
1	Wet		10/2/2023 10:40	13.00	0.4	0.34	3.35	1399	1399	1.0
2	Wet		10/9/2023 11:55	6.08	0.07	0.06	0.59	523	523	1.0
3	Wet		10/10/2023 4:05	4.67	0.2	0.17	1.67	1947	1947	1.0
4	Wet		10/10/2023 17:00	21.17	0.53	0.45	4.44	1138	1138	1.0
5	Wet		10/13/2023 17:45	9.42	0.18	0.15	1.51	869	869	1.0
6	Wet	X	10/16/2023 7:00	13.33	0.57	0.48	4.77	1944	1944	1.0
7	Wet		10/17/2023 15:20	0.75	0.04	0.03	0.33	2424	2424	1.0
8	Wet		10/21/2023 16:55	1.00	0.08	0.07	0.67	3636	3636	1.0
9	Wet	X	10/24/2023 15:05	18.25	0.66	0.56	5.52	1644	1644	1.0
10	Wet	X	11/1/2023 17:55	15.58	0.94	0.79	7.87	2742	2742	1.0
11	Wet		11/3/2023 18:35	16.00	0.88	0.74	7.37	2500	2500	1.0
12	Wet		11/5/2023 17:05	5.75	0.24	0.20	2.01	1897	1897	1.0
13	Wet		11/6/2023 7:25	16.00	0.63	0.53	5.27	1790	1790	1.0
14	Wet		11/9/2023 15:50	2.58	0.14	0.12	1.17	2467	2467	1.0
15	Wet		11/10/2023 19:55	1.50	0.09	0.08	0.75	2727	2727	1.0
16	Wet		11/11/2023 5:45	4.33	0.53	0.45	4.44	5559	5559	1.0
17	Wet		11/12/2023 13:05	13.33	0.35	0.30	2.93	1193	1193	1.0
18	Wet		11/18/2023 19:55	3.92	0.33	0.28	2.76	3827	3827	1.0
19	Wet		11/21/2023 18:10	11.92	0.22	0.19	1.84	839	839	1.0
20	Wet		11/30/2023 14:10	17.17	0.45	0.38	3.77	1191	1191	1.0
21	Wet		12/1/2023 18:00	12.17	0.83	0.70	6.95	3100	3100	1.0
22	Wet		12/2/2023 13:05	1.17	0.04	0.03	0.33	1554	1554	1.0
23	Wet		12/3/2023 4:55	7.33	0.3	0.25	2.51	1860	1860	1.0
24	Wet		12/4/2023 6:40	52.00	2.92	2.46	24.44	2552	2552	1.0
25	Wet		12/6/2023 17:05	16.25	0.39	0.33	3.26	1091	1091	1.0
26	Wet	X	12/9/2023 10:50	20.25	0.97	0.82	8.12	2177	2177	1.0
27	Wet		12/14/2023 3:55	6.25	0.15	0.13	1.26	1091	1091	1.0
28	Wet		12/18/2023 15:25	19.92	0.28	0.24	2.34	639	639	1.0
29	Wet		12/22/2023 4:25	3.42	0.23	0.19	1.93	3057	3057	1.0
30	Wet		12/25/2023 8:20	20.00	0.52	0.44	4.35	1182	1182	1.0
31	Wet		12/27/2023 14:45	10.25	0.09	0.08	0.75	399	399	1.0
32	Wet		12/30/2023 9:25	5.50	0.09	0.08	0.75	744	744	1.0
33	Wet		1/2/2024 8:50	7.33	0.34	0.29	2.85	2108	2108	1.0
34	Wet		1/3/2024 13:05	17.67	0.12	0.10	1.00	309	309	1.0
35	Wet		1/5/2024 3:25	1.50	0.06	0.05	0.50	1818	1818	1.0
36	Wet	X	1/5/2024 13:30	19.92	0.37	0.31	3.10	844	844	1.0
37	Wet		1/7/2024 18:50	0.50	0.03	0.03	0.25	2727	2727	1.0
38	Wet		1/8/2024 4:05	31.67	0.92	0.78	7.70	1320	1320	1.0
39	Wet		1/10/2024 13:45	0.92	0.07	0.06	0.59	3458	3458	1.0
40	Wet		1/16/2024 19:40	16.83	0.4	0.34	3.35	1080	1080	1.0
41	Wet		1/18/2024 6:15	19.58	0.61	0.51	5.11	1416	1416	1.0
42	Wet		1/20/2024 18:55	43.83	1.31	1.11	10.96	1359	1359	1.0
43	Wet		1/24/2024 4:05	31.92	0.58	0.49	4.85	826	826	1.0
44	Wet		1/26/2024 15:50	36.92	1.16	0.98	9.71	1428	1428	1.0
45	Wet		1/30/2024 8:40	1.42	0.05	0.04	0.42	1601	1601	1.0
46	Wet		1/30/2024 22:55	14.50	0.1	0.08	0.84	313	313	1.0
47	Wet		1/31/2024 23:50	4.25	0.08	0.07	0.67	856	856	1.0
48	Wet		2/5/2024 15:55	14.58	0.18	0.15	1.51	561	561	1.0
49	Wet		2/8/2024 23:35	1.08	0.04	0.03	0.33	1683	1683	1.0
50	Wet		2/11/2024 5:40	4.50	0.09	0.08	0.75	909	909	1.0
51	Wet		2/11/2024 20:00	12.67	0.27	0.23	2.26	969	969	1.0
52	Wet	X	2/14/2024 20:35	6.17	0.25	0.21	2.09	1842	1842	1.0
53	Wet		2/19/2024 11:50	2.08	0.08	0.07	0.67	1748	1748	1.0
54	Wet		2/20/2024 1:05	10.75	0.13	0.11	1.09	550	550	1.0
55	Wet		2/20/2024 18:15	26.08	0.37	0.31	3.10	645	645	1.0
56	Wet		2/25/2024 10:40	6.00	0.12	0.10	1.00	909	909	1.0
57	Wet		2/28/2024 1:40	31.17	1.18	1.00	9.88	1721	1721	1.0
58	Wet		2/29/2024 15:00	10.58	0.36	0.30	3.01	1547	1547	1.0
59	Wet		3/3/2024 6:35	4.67	0.07	0.06	0.59	681	681	1.0
60	Wet		3/3/2024 19:25	5.58	0.08	0.07	0.67	652	652	1.0
61	Wet		3/10/2024 13:10	8.17	0.07	0.06	0.59	389	389	1.0
62	Wet		3/11/2024 14:00	24.92	0.34	0.29	2.85	620	620	1.0
63	Wet		3/20/2024 20:15	6.08	0.11	0.09	0.92	822	822	1.0
64	Wet		3/21/2024 17:15	4.67	0.03	0.03	0.25	292	292	1.0
65	Wet		3/22/2024 10:10	12.50	0.12	0.10	1.00	436	436	1.0
66	Wet		3/25/2024 13:10	2.08	0.03	0.03	0.25	656	656	1.0
67	Wet		3/27/2024 2:20	6.00	0.23	0.19	1.93	1742	1742	1.0
68	Wet		3/27/2024 15:30	0.42	0.06	0.05	0.50	6493	6493	1.0
69	Wet		3/28/2024 0:15	3.17	0.14	0.12	1.17	2007	2007	1.0
70	Wet		4/4/2024 10:20	1.33	0.04	0.03	0.33	1367	1367	1.0
71	Wet		4/7/2024 12:35	1.75	0.04	0.03	0.33	1039	1039	1.0
72	Wet		4/8/2024 18:05	14.17	0.29	0.24	2.43	930	930	1.0
73	Wet		4/25/2024 4:30	23.58	0.84	0.71	7.03	1619	1619	1.0
74	Wet		4/26/2024 17:30	4.75	0.05	0.04	0.42	478	478	1.0
75	Wet		4/28/2024 11:05	8.92	0.11	0.09	0.92	561	561	1.0
76	Wet		4/29/24 2:30 AM	6.75	0.29	0.24	2.43	1953	1953	1.0
77	Wet		4/30/24 6:35 AM	1.75	0.04	0.03	0.33	1039	1039	1.0
			Total Wet Season	**885.94**	**26.59**	**22.44**	**222.55**			
			Mean Wet Season Flow					**236.4**		
Dry Season										
78	Dry		5/4/2024 13:05	18.67	0.32	0.09	0.93	271	271	1.0
79	Dry		5/6/2024 2:55	12.42	0.17	0.05	0.50	217	217	1.0
80	Dry		5/18/2024 15:10	2.25	0.05	0.01	0.15	352	352	1.0
81	Dry		5/21/2024 5:50	15.58	0.29	0.09	0.85	295	295	1.0
82	Dry		5/24/2024 11:05	1.67	0.04	0.01	0.12	379	379	1.0
83	Dry		5/28/2024 12:10	1.00	0.06	0.02	0.17	950	950	1.0
84	Dry		5/29/2024 8:30	0.67	0.06	0.02	0.17	1418	1418	1.0
85	Dry		5/29/2024 18:10	1.83	0.06	0.02	0.17	519	519	1.0
86	Dry		6/2/2024 10:05	16.83	0.92	0.27	2.68	866	866	1.0
87	Dry		6/3/2024 23:05	6.42	0.05	0.01	0.15	123	123	1.0
88	Dry		6/4/2024 12:30	0.50	0.06	0.02	0.17	1900	1900	1.0
89	Dry		6/15/2024 2:45	14.50	0.14	0.04	0.41	153	153	1.0
90	Dry		6/29/2024 18:35	3.08	0.05	0.01	0.15	257	257	1.0
91	Dry		7/29/2024 21:20	6.25	0.1	0.03	0.29	253	253	1.0
92	Dry		8/17/2024 19:15	2.83	0.27	0.08	0.79	1511	1511	1.0
93	Dry		8/20/2024 4:00	8.33	0.33	0.10	0.96	627	627	1.0
94	Dry		8/22/2024 22:25	4.67	0.13	0.04	0.38	441	441	1.0
95	Dry		8/23/2024 15:35	18.33	0.34	0.10	0.99	294	294	1.0
96	Dry		8/26/2024 23:35	0.25	0.03	0.01	0.09	1900	1900	1.0
97	Dry	X	9/10/2024 21:15	9.83	0.38	0.11	1.11	612	612	1.0
98	Dry		9/11/2024 23:45	0.17	0.04	0.01	0.12	3726	3726	1.0
99	Dry		9/12/2024 6:00	2.25	0.04	0.01	0.12	281	281	1.0
100	Dry		9/13/2024 17:25	8.17	0.09	0.03	0.26	174	174	1.0
101	Dry		9/14/2024 14:10	5.08	0.27	0.08	0.79	842	842	1.0
102	Dry		9/15/2024 7:15	0.50	0.03	0.01	0.09	950	950	1.0
103	Dry		9/25/2024 12:05	4.17	0.08	0.02	0.23	304	304	1.0
104	Dry		9/26/2024 19:00	8.67	0.21	0.06	0.61	384	384	1.0
			Total Dry Season	**174.92**	**4.61**	**1.36**	**13.44**			
			Mean Dry Season Flow					**19.9**		
			Total Annual	**1060.86**	**31.20**	**23.80**	**235.99**			
			Mean Annual Flow					**146.3**		

Note:

[1] *Mean Annual Baseflow based on Water Year 2010 Record in Outfall 245 HSPF Modeling*

Drainage Area: 119 acres

Mean Baseflow: 0 gpm[1]

	Rain Threshold (in)	Runoff Coefficient
Wet Season	0	0.84
Dry Season	0	0.29

Table B9-1.7 WY2024 Storm Event Hydrology for OF254

Table B9-2
Annual Flow for All Outfalls

Flow Component	OF237B - Residential												
	WY2010	WY2011	WY2012	WY2015	WY2016	WY2017	WY2018	WY2019	WY2020	WY2021	WY2022	WY2023	WY2024
Wet Season Baseflow (acre-feet)	5,233	5,354	5,365	5,365	5,365	5,365	5,365	5,365	5,365	5,365	5,365	5,365	5,365
Dry Season Baseflow (acre-feet)	3,871	3,864	3,853	3,853	3,853	3,853	3,853	3,853	3,853	3,853	3,853	3,853	3,853
Total Baseflow (acre-feet)	**9,104**	**9,218**	**9,218**	**9,218**	**9,218**	**9,218**	**9,218**	**9,218**	**9,218**	**9,218**	**9,218**	**9,218**	**9,218**
Wet Season Storm Flow (acre-feet)	1,870	2,373	1,973	2,279	2,948	2,844	2,314	1,589	1,891	1,869	2,370	1,433	1,756
Dry Season Storm Flow (acre-feet)	484	238	186	226	118	158	52	145	245	225	256	124	159
Total Storm Flow (acre-feet)	**2,354**	**2,611**	**2,159**	**2,505**	**3,066**	**3,002**	**2,366**	**1,733**	**2,136**	**2,094**	**2,626**	**1,557**	**1,915**
Total Combined Flow (acre-feet)	**11,458**	**11,829**	**11,377**	**11,723**	**12,284**	**12,220**	**11,584**	**10,951**	**11,354**	**11,312**	**11,844**	**10,775**	**11,133**
Fraction Baseflow (percent)	79.5%	77.9%	81.0%	78.6%	75.0%	75.4%	79.6%	84.2%	81.2%	81.5%	77.8%	85.5%	82.8%
Fraction Storm Flow (percent)	20.5%	22.1%	19.0%	21.4%	25.0%	24.6%	20.4%	15.8%	18.8%	18.5%	22.2%	14.5%	17.2%

Flow Component	OF235 - Commercial												
	WY2010	WY2011	WY2012	WY2015	WY2016	WY2017	WY2018	WY2019	WY2020	WY2021	WY2022	WY2023	WY2024
Wet Season Baseflow (acre-feet)	98	103	103	103	103	103	103	103	103	103	103	103	103
Dry Season Baseflow (acre-feet)	79	74	74	74	74	74	74	74	74	74	74	74	74
Total Baseflow (acre-feet)	**177**	**177**	**177**	**177.5**	**178**	**178**	**178**	**178**	**178**	**178**	**178**	**178**	**178**
Wet Season Storm Flow (acre-feet)	225	228	204	222	322	313	255	179	211	208	261	134	132
Dry Season Storm Flow (acre-feet)	72	34	39	24	26	27	12	28	41	37	36	14	20
Total Storm Flow (acre-feet)	**297**	**262**	**243**	**273**	**348**	**341**	**268**	**207**	**252**	**244**	**297**	**148**	**152**
Total Combined Flow (acre-feet)	**474**	**439**	**420**	**451**	**525**	**518**	**445**	**385**	**429**	**422**	**475**	**326**	**330**
Fraction Baseflow (percent)	37.3%	40.3%	42.1%	39.4%	33.8%	34.2%	40%	46%	41%	42%	37%	55%	54%
Fraction Storm Flow (percent)	62.7%	59.7%	57.9%	60.6%	66.2%	65.8%	60%	54%	59%	58%	63%	45%	46%

Flow Component	OF245 - Industrial									
	WY2010	WY2011	WY2012	WY2015	WY2016	WY2017	WY2018	WY2019	WY2020	WY2021
Wet Season Baseflow (acre-feet)	0	0	0	0	0	0	0	0	0	0
Dry Season Baseflow (acre-feet)	0	0	0	0	0	0	0	0	0	0
Total Baseflow (acre-feet)	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Wet Season Storm Flow (acre-feet)	91	96	86	94	139	132	107	76	89	87
Dry Season Storm Flow (acre-feet)	24	13	15	9	10	10	5	10	16	14
Total Storm Flow (acre-feet)	**115**	**109**	**101**	**114**	**149**	**142**	**112**	**86**	**104**	**101**
Total Combined Flow (acre-feet)	**115**	**109**	**101**	**114**	**149**	**142**	**112**	**86**	**104**	**101**
Fraction Baseflow (percent)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Fraction Storm Flow (percent)	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Flow Component	OF237A - Mixed								
	WY2016	WY2017	WY2018	WY2019	WY2020	WY2021	WY2022	WY2023	WY2024
Wet Season Baseflow (acre-feet)	2,300	2,300	2,300	2,300	2,300	2,300	2,300	2,300	2,300
Dry Season Baseflow (acre-feet)	1,671	1,671	1,671	1,671	1,671	1,671	1,671	1,671	1,671
Total Baseflow (acre-feet)	**3,970**	**3,970**	**3,970**	**3,970**	**3,970**	**3,970**	**3,970**	**3,970**	**3,970**
Wet Season Storm Flow (acre-feet)	3,266	3,197	2,606	1,866	2,165	2,132	2,668	1,765	2,039
Dry Season Storm Flow (acre-feet)	269	250	121	278	394	325	364	202	281
Total Storm Flow (acre-feet)	**3,535**	**3,447**	**2,727**	**2,144**	**2,560**	**2,457**	**3,032**	**1,967**	**2,320**
Total Combined Flow (acre-feet)	**7,505**	**7,417**	**6,698**	**6,114**	**6,530**	**6,428**	**7,002**	**5,937**	**6,290**
Fraction Baseflow (percent)	53%	54%	59%	65%	61%	62%	57%	67%	63%
Fraction Storm Flow (percent)	47%	46%	41%	35%	39%	38%	43%	33%	37%

Flow Component	OF230 (2016-WY2022); Transition WY2023; OF230A (WY2024) - Comm/Res.								
	WY2016	WY2017	WY2018	WY2019	WY2020	WY2021	WY2022	WY2023	WY2024
Wet Season Baseflow (acre-feet)	148	148	148	148	148	148	148	0	148
Dry Season Baseflow (acre-feet)	107	107	107	107	107	107	107	0	107
Total Baseflow (acre-feet)	**255**	**255**	**255**	**255**	**255**	**255**	**255**	**0**	**255**
Wet Season Storm Flow (acre-feet)	643	625	509	358	420	414	521	139	413
Dry Season Storm Flow (acre-feet)	58	63	28	64	94	84	92	2	72
Total Storm Flow (acre-feet)	**701**	**688**	**537**	**422**	**514**	**498**	**614**	**141**	**485**
Total Combined Flow (acre-feet)	**956**	**942**	**792**	**676**	**769**	**753**	**868**	**141**	**740**
Fraction Baseflow (percent)	27%	27%	32%	38%	33%	34%	29%	0%	34%
Fraction Storm Flow (percent)	73%	73%	68%	62%	67%	66%	71%	100%	66%

Flow Component	OF243 Comm/Ind								
	WY2016	WY2017	WY2018	WY2019	WY2020	WY2021	WY2022	WY2023	WY2024
Wet Season Baseflow (acre-feet)	0	0	0	0	0	0	0	0	0
Dry Season Baseflow (acre-feet)	0	0	0	0	0	0	0	0	0
Total Baseflow (acre-feet)	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Wet Season Storm Flow (acre-feet)	71.4	69.5	56.6	39.8	46.7	46.0	57.9	37.0	43.9
Dry Season Storm Flow (acre-feet)	3.0	3.2	1.4	3.3	4.9	4.3	4.8	2.5	3.5
Total Storm Flow (acre-feet)	**74**	**72.7**	**58.0**	**43.1**	**51.5**	**50.4**	**63**	**40**	**47**
Total Combined Flow (acre-feet)	**74**	**72.7**	**58.0**	**43.1**	**51.5**	**50.4**	**63**	**40**	**47**
Fraction Baseflow (percent)	0%	0%	0%	0%	0%	0%	0%	0%	0%
Fraction Storm Flow (percent)	100%	100%	100%	100%	100%	100%	100%	100%	100%

Flow Component	OF254 Industrial								
	WY2016	WY2017	WY2018	WY2019	WY2020	WY2021	WY2022	WY2023	WY2024
Wet Season Baseflow (acre-feet)	0	0	0	0	0	0	0	0	0
Dry Season Baseflow (acre-feet)	0	0	0	0	0	0	0	0	0
Total Baseflow (acre-feet)	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Wet Season Storm Flow (acre-feet)	362	352	287	202	237	233	294	200	238
Dry Season Storm Flow (acre-feet)	11	12	5	12	19	16.4	18.1	10.0	14.3
Total Storm Flow (acre-feet)	**374**	**365**	**292**	**214**	**255**	**250**	**312**	**210**	**252**
Total Combined Flow (acre-feet)	**374**	**365**	**292**	**214**	**255**	**250**	**312**	**210**	**252**
Fraction Baseflow (percent)	0%	0%	0%	0%	0%	0%	0%	0%	0%
Fraction Storm Flow (percent)	100%	100%	100%	100%	100%	100%	100%	100%	100%

Drain	Rain Threshold (in)		Runoff Coefficient	R^2
237B	Wet	0.03	0.44	0.86
	Dry	0.06	0.30	0.60
235	Wet	0	0.55	0.99
	Dry	0	0.48	0.62
245	Wet	0	0.99	0.90
	Dry	0	0.78	0.63
230	Wet	0	0.32	0.82
	Dry	0	0.32	0.82
237A	Wet	0.03	0.30	0.72
	Dry	0.06	0.22	0.57
243	Wet	0	0.34	0.57
	Dry	0	0.16	-0.75
254	Wet	0	0.84	0.84
	Dry	0	0.29	0.29

Flow Component	Total Annual Flow acre feet	237A and 237B Annual Flow acre feet	237A and 237B Percent of Total Annual Flow acre feet
Wet Season Baseflow (acre-feet)	7,915	7,664	97%
Dry Season Baseflow (acre-feet)	5,705	5,524	97%
Total Baseflow (acre-feet)	**13,621**	**13,188**	**97%**
Wet Season Storm Flow (acre-feet)	4,707	3,795	81%
Dry Season Storm Flow (acre-feet)	561	440	78%
Total Storm Flow (acre-feet)	**5,268**	**4,235**	**80%**
Total Combined Flow (acre-feet)	**18,890**	**17,423**	**92%**
Fraction Baseflow (percent)	72%	76%	70%
Fraction Storm Flow (percent)	28%	24%	22%

Table B9-3
Comparison of WY2016 and WY2019 and WY2001-2011 Baseflow Data

	Overall WY2016/2019 Data			Overall WY2001-2011 Data			OF230 WY2016/2019		OF230 WY2001-2011		OF235 WY2016/2019		OF235 WY2001-2011	
	% Detections	Arithmetic Mean	Weighted Mean	% Detections	Arithmetic Mean	Weighted Mean	Max	Arithmetic Mean	Max	Arithmetic Mean	Max	Arithmetic Mean	Max	Arithmetic Mean
Conventionals														
TSS (mg/L)	82	4.80	4.2	93	12.29	12.2	12.7	5.3	319	15.8	4.27	2.0	258	25.4
Metals in ug/L														
Lead	84	1.75	1.52	72	5.52	5.53	3.55	1	29.8	5.56	4.79	2	112	14.29
Mercury	27	0.002	0.002	6	0.025	0.025	0.004	0.002	0.003	0.004	0.004	0.003	0.380	0.041
Zinc	100	11.01	9.1	99	46.55	47.5	85.7	29.4	108	46.6	10.5	6.6	355	41.9
Dissolved Lead	59	0.26	0.22	59	2.88	2.86	0.386	0.2	5.5	1.52	2.73	0.7	6.0	1.56
Dissolved Mercury	2	0.003	0.002	3	2.8	2.5	0.0045	0.003	5.9	3.1	*0.005*	*0.003*	*25*	*25*
Dissolved Zinc	100	5.7	4.7	96	25.3	25.9	34.2	14.3	95.0	29.15	5.38	4.3	29.9	10.78
PAHs in ug/L														
2-Methylnaphthalene	16	0.006	0.005	19	0.015	0.015	0.013	0.007	0.122	0.013	0.015	0.006	0.023	0.006
Acenaphthene	25	0.011	0.009	42	0.014	0.014	0.007	0.005	0.013	0.005	*0.01*	*0.005*	0.032	0.011
Acenaphthylene	5	0.005	0.004	2	0.004	0.004	0.005	0.004	*0.005*	*0.004*	*0.005*	*0.005*	*0.005*	*0.004*
Anthracene	30	0.007	0.007	12	0.006	0.006	0.008	0.005	0.012	0.004	0.008	0.005	0.031	0.006
Fluorene	11	0.005	0.004	19	0.006	0.006	0.007	0.006	0.012	0.005	*0.005*	*0.004*	0.060	0.009
Naphthalene	23	0.009	0.007	47	0.023	0.023	0.026	0.015	0.228	0.026	0.021	0.008	0.054	0.011
Phenanthrene	52	0.009	0.008	45	0.013	0.013	0.026	0.017	0.060	0.012	0.020	0.008	0.115	0.014
Total LPAHs[1,2]	64	0.040	0.034	28	0.066	0.011	0.068	0.047	0.270	0.056	0.06	0.027	0.206	0.056
Benzo(a)anthracene	9	0.005	0.004	24	0.012	0.012	0.008	0.005	0.066	0.007	*0.005*	*0.004*	0.114	0.013
Benzo(a)pyrene	14	0.005	0.004	14	0.007	0.007	0.010	0.005	0.057	0.006	*0.005*	*0.004*	0.142	0.013
Benzo(g,h,i)perylene	9	0.009	0.008	18	0.007	0.007	0.026	0.011	0.023	0.007	*0.011*	*0.008*	0.166	0.012
Benzo(b,k)fluoranthenes	20	0.005	0.004	39	0.015	0.015	0.010	0.005	0.113	0.013	*0.005*	*0.004*	0.344	0.026
Chrysene	16	0.005	0.004	26	0.011	0.011	0.007	0.005	0.087	0.010	*0.005*	*0.004*	0.199	0.018
Dibenz(a,h)anthracene	2	0.004	0.004	5	0.005	0.005	0.005	0.004	0.011	0.005	*0.005*	*0.004*	0.028	0.005
Fluoranthene	36	0.007	0.006	60	0.021	0.021	0.015	0.008	0.133	0.017	*0.005*	*0.004*	0.295	0.029
Indeno(1,2,3-c,d)pyrene	5	0.005	0.004	11	0.006	0.006	0.013	0.006	0.019	0.005	*0.005*	*0.005*	0.115	0.009
Pyrene	43	0.008	0.007	79	0.026	0.026	0.016	0.007	0.173	0.021	0.011	0.005	0.253	0.034
Total HPAHs[1]	45	0.037	0.032	30	0.112	0.012	0.107	0.042	0.671	0.091	0.041	0.027	1.639	0.162
Total PAHs[1]	66	0.076	0.066	29	0.178	0.012	0.143	0.089	0.840	0.147	0.090	0.053	1.845	0.217
Phthalates in ug/L														
Bis(2-ethylhexyl)phthalate	18	0.54	0.47	29	1.07	1.06	0.8	0.48	33.00	2.00	0.5	0.37	21.30	1.84
Total Phthalates[3]	23	0.42	0.38	29			2.3	0.72	33.40	4.44	0.5	0.11	22.90	4.06

	OF237A WY2016/2019		OF237A[4] WY2001-2011		OF237B WY2016/2019		OF237B WY2001-2011		OF243 WY2016/2019		OF243 WY2001-2011		OF245/254 WY2016 & WY2019		OF245 WY2001-2011		OF254 WY2001-2011	
	Max	Arithmetic Mean	Max	Arithmetic Mean	Max	Arithmetic Mean	Max	Arithmetic Mean	Max	Arithmetic Mean	Max	Arithmetic Mean	Max	Arithmetic Mean	Max	Arithmetic Mean	Max	Arithmetic Mean
Conventionals																		
TSS (mg/L)	2.94	1.7	16.3	3.08	2.8	1.2	16.9	2.54	21.8	13.7	42.7	13.6	20.8	8.4	78.9	9.6	140	16.1
Metals in ug/L																		
Lead	0.52	0.15	6.11	1.21	0.092	0.04	6.6	0.99	25.4	5	43.9	7.56	2.23	0.85	18.2	3.30	39.0	5.75
Mercury	*0.004*	*0.003*	0.2	0.031	*0.004*	*0.003*	*0.025*	*0.025*	0.004	0.002	0.075	0.029	*0.004*	*0.003*	*0.125*	*0.029*	*0.055*	*0.026*
Zinc	4.1	2.6	27.0	9.5	2.76	1.64	14.2	4.43	30.3	14.8	73.6	21.60	125.0	50.4	1,950	174.1	95.2	27.7
Dissolved Lead	0.08	0.029	*4.5*	*0.81*	0.07	0.031	4.0	0.83	1.81	0.3	35.6	5.38	0.083	0.1	18.9	2.80	47.2	7.26
Dissolved Mercury	*0*	*0.003*	135	31	*0.005*	*0.003*	*25*	*25*	*0*	*0.003*	193	30	*0*	*0.004*	*125*	*29*	114	28
Dissolved Zinc	3.39	1.9	12.6	7.7	1.83	1.3	14.3	4.6	11.9	6.4	45.8	12.3	74.9	28.7	1,220	91.4	54.7	21.3
PAHs in ug/L																		
2-Methylnaphthalene	0.005	0.005	2.100	0.063	0.005	0.005	0.019	0.005	*0.01*	*0.005*	*0.006*	*0.004*	0.029	0.008	0.018	0.005	0.022	0.006
Acenaphthene	*0.01*	*0.005*	0.031	0.005	0.023	0.008	*0.005*	*0.004*	0.132	0.032	0.069	0.030	0.035	0.015	0.103	0.0313	0.096	0.012
Acenaphthylene	*0.005*	*0.005*	0.016	0.004	*0.005*	*0.004*	*0.005*	*0.004*	0.007	0.005	*0.005*	*0.004*	*0.005*	*0.004*	*0.008*	*0.004*	0.019	0.005
Anthracene	*0.005*	*0.004*	*0.005*	*0.004*	*0.005*	*0.004*	*0.005*	*0.004*	0.053	0.019	0.022	0.007	0.017	0.009	0.014	0.006	0.077	0.008
Fluorene	*0.005*	*0.005*	0.086	0.007	*0.005*	*0.004*	*0.005*	*0.004*	0.005	0.005	0.013	0.005	0.013	0.005	0.017	0.006	0.060	0.008
Naphthalene	0.009	0.006	3.00	0.088	*0.009*	*0.007*	0.025	0.007	0.012	0.006	0.017	0.007	0.022	0.010	0.057	0.011	0.034	0.008
Phenanthrene	0.016	0.007	0.149	0.011	*0.013*	*0.006*	*0.008*	*0.004*	0.019	0.008	0.057	0.011	0.037	0.016	0.028	0.011	0.684	0.028
Total LPAHs[1,2]	0.04	0.024	3.276	0.119	0.048	0.028	0.050	0.028	0.22	0.072	0.151	0.065	0.12	0.057	0.181	0.068	0.898	0.068
Benzo(a)anthracene	0.006	0.005	0.022	0.006	*0.005*	*0.004*	0.045	0.005	0.006	0.005	0.055	0.008	*0.004*	*0.003*	0.021	0.006	1.110	0.043
Benzo(a)pyrene	0.006	0.005	0.020	0.006	*0.005*	*0.004*	0.041	0.005	0.007	0.005	0.042	0.007	0.009	0.004	0.048	0.006	0.131	0.010
Benzo(g,h,i)perylene	*0.011*	*0.009*	0.022	0.006	*0.011*	*0.008*	0.044	0.006	0.018	0.011	0.046	0.008	0.019	0.008	0.033	0.006	0.055	0.008
Benzo(b,k)fluoranthenes	0.005	0.004	0.047	0.011	*0.005*	*0.004*	0.107	0.008	0.011	0.006	0.105	0.013	0.008	0.004	0.062	0.009	0.376	0.027
Chrysene	0.006	0.004	0.026	0.006	*0.005*	*0.004*	0.060	0.005	0.014	0.007	0.098	0.011	0.018	0.005	0.063	0.008	0.362	0.020
Dibenz(a,h)anthracene	0.005	0.004	0.010	*0.005*	*0.005*	*0.004*	0.011	*0.005*	*0.005*	*0.005*	0.012	*0.005*	*0.004*	*0.003*	0.013	*0.005*	0.017	0.005
Fluoranthene	0.009	0.005	0.046	0.010	*0.005*	*0.004*	0.088	0.007	0.032	0.013	0.133	0.022	0.020	0.007	0.046	0.013	1.140	0.051
Indeno(1,2,3-c,d)pyrene	*0.005*	*0.005*	0.018	0.005	*0.005*	*0.004*	0.039	0.005	0.008	0.005	0.034	0.006	*0.005*	*0.004*	0.018	0.005	0.053	0.007
Pyrene	0.010	0.005	0.056	0.013	*0.005*	*0.004*	0.078	0.007	0.053	0.018	0.116	0.030	0.038	0.016	0.081	0.024	0.879	0.051
Total HPAHs[1]	0.05	0.029	0.249	0.067	*0.033*	*0.026*	0.513	0.052	0.131	0.060	0.606	0.109	0.11	0.054	0.368	0.081	3.287	0.222
Total PAHs[1]	0.08	0.053	3.464	0.186	0.081	0.054	0.543	0.081	0.353	0.132	0.757	0.174	0.19	0.111	0.436	0.149	4.185	0.290
Phthalates in ug/L																		
Bis(2-ethylhexyl)phthalate	0.5	0.37	1.60	0.56	*0.5*	*0.35*	*0.80*	*0.50*	5.6	1.10	16.00	1.03	2.8	0.63	3.30	0.72	10.00	0.82
Total Phthalates[3]	1.0	0.36	32.00	4.60	0.5	0.08	32.10	5.28	5.8	0.84	22.87	3.14	3.1	0.61	18.70	3.91	13.80	2.21

Italic - zero detected values

Notes:

1 = PAH summations based on 1/2 detection limit for nondetects.

2 = Calculation of Total LPAHs does not include 2-Methylnaphthalene.

3 = Phthalate summations exclude nondetect values.

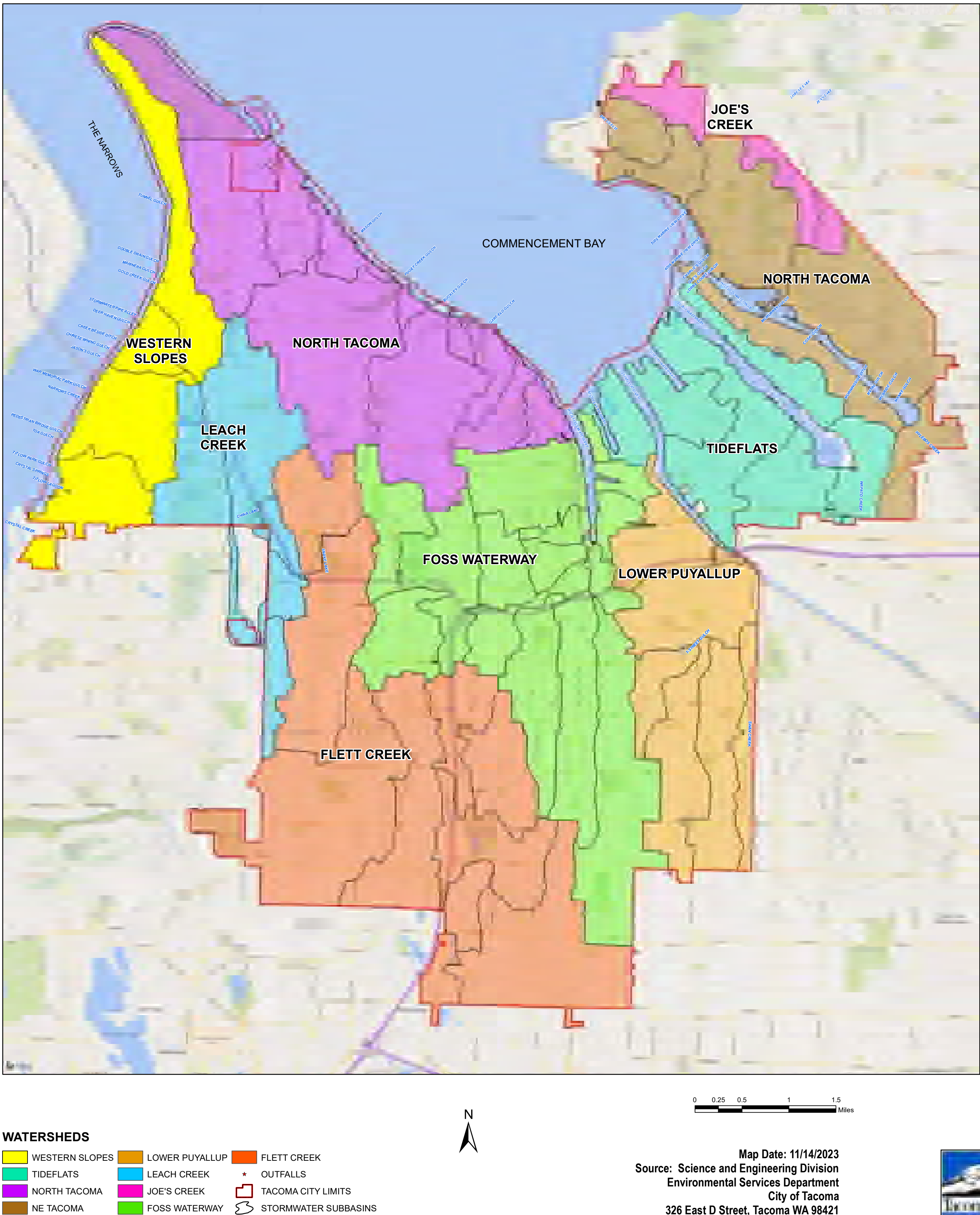
4 = OF237Anew isn't included in the count of samples.

Highest average or highest median concentration detected during monitoring period.

Highest maximum concentration detected during monitoring period.

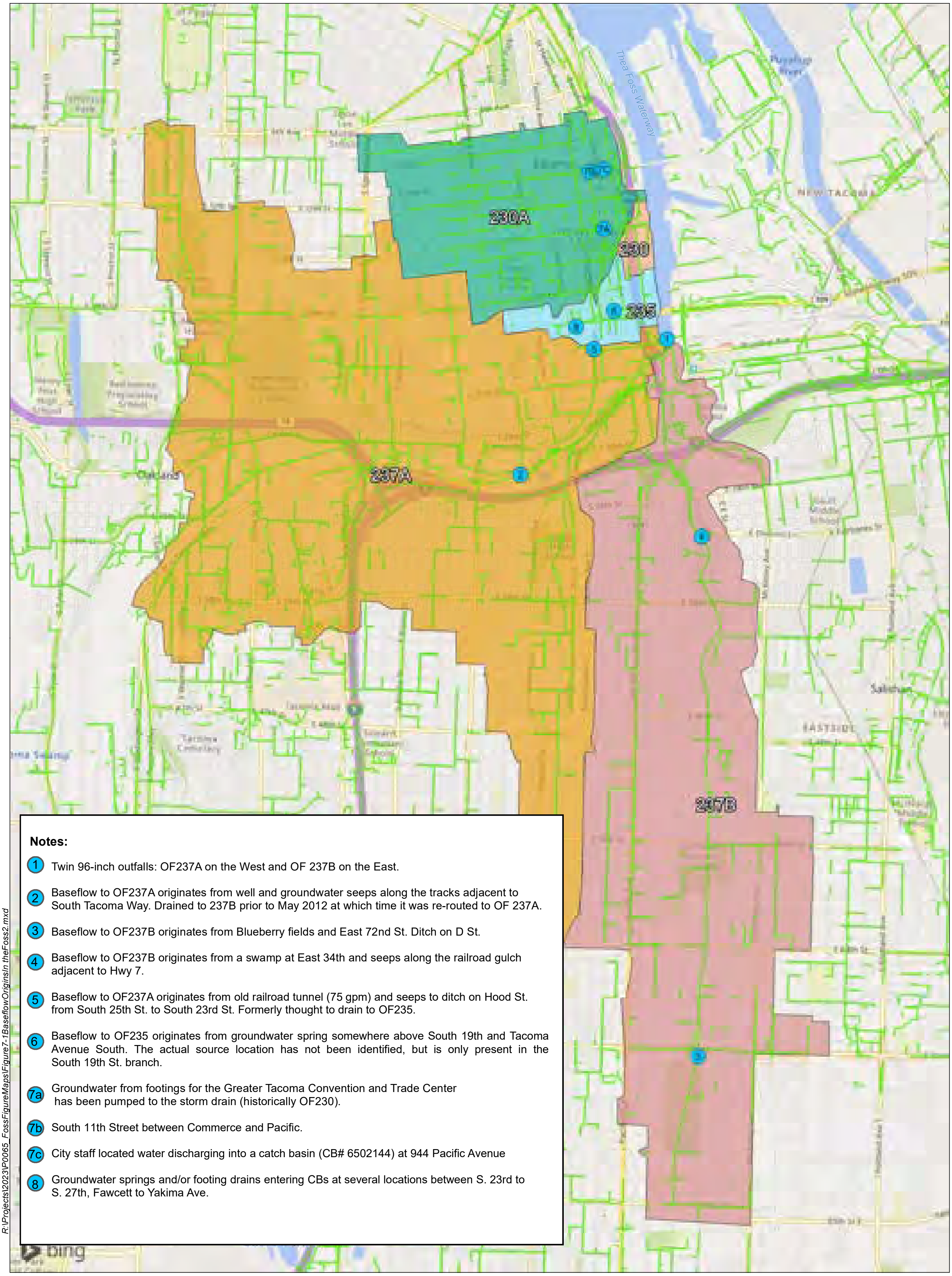
Figures

Figure B2-1
City of Tacoma Watersheds



Map Date: 11/14/2023
Source: Science and Engineering Division
Environmental Services Department
City of Tacoma
326 East D Street, Tacoma WA 98421
(253) 591-5588

Figure B2-2
Baseflow Origins in Foss Drainage



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Surfacewater Mains

Foss Basins

237A | 237B | 230 | 230A | 235

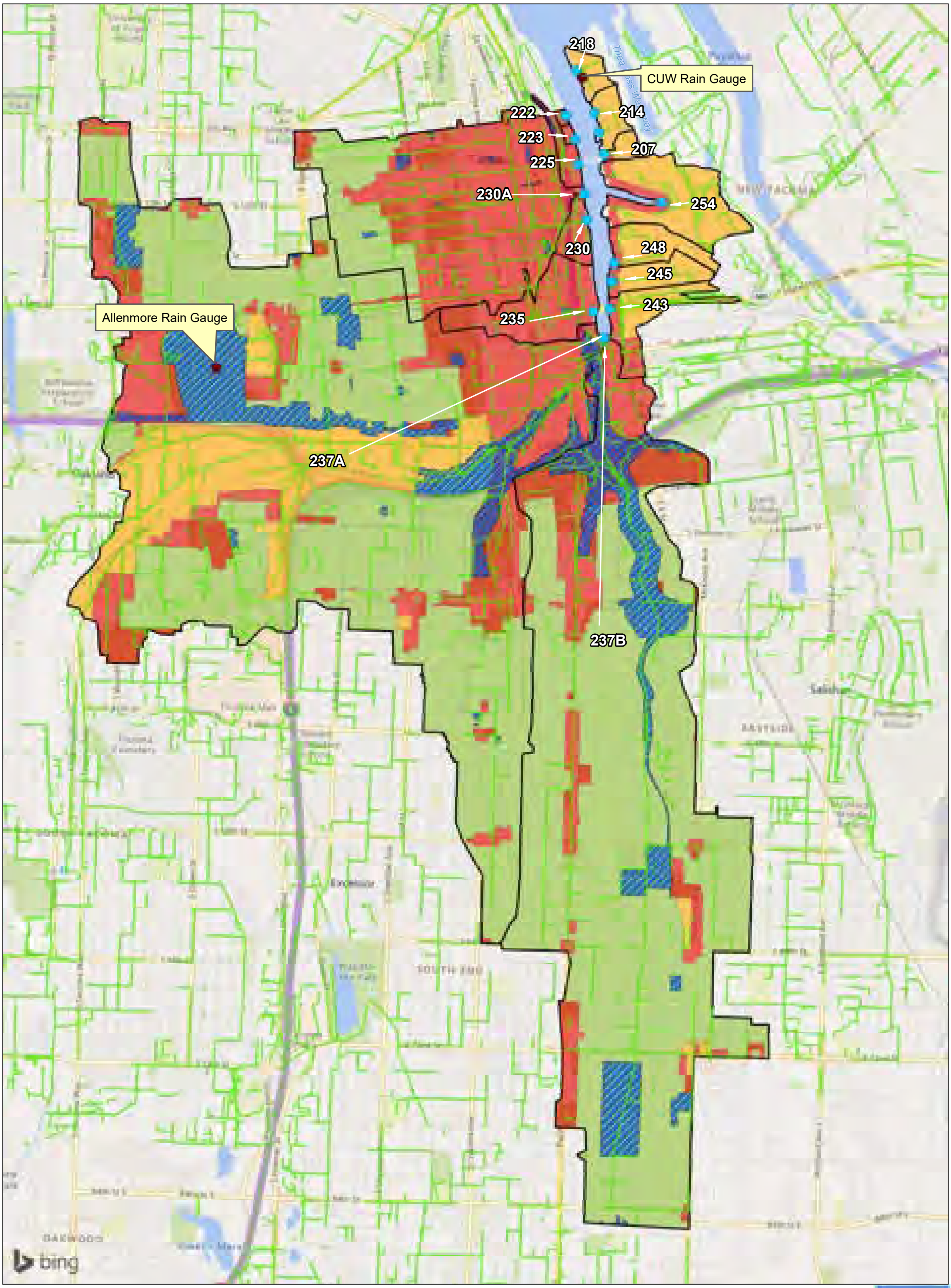
N S E W

0 1,000 2,000 4,000 Feet

Map Date: 9/20/2023
Source: Science and Engineering Division
Environmental Services Department
City of Tacoma
326 East D Street, Tacoma WA 98421
(253) 591-5588

Tacoma

Figure B2-3
Thea Foss Basins Land use



Land Use

Thea Foss Outfalls
Rain Gauge
Surfacewater Mains
Open Space
Industrial
Commercial
Residential

Map Date: 11/17/2023
Source: Science and Engineering Division
Environmental Services Department
City of Tacoma
326 East D Street, Tacoma WA 98421
(253) 591-5588

0 1,000 2,000 4,000 Feet

Tacoma

Figure B2-4
OF230 Sediment and Flow Monitoring Locations

Sediment and Flow Monitoring Locations

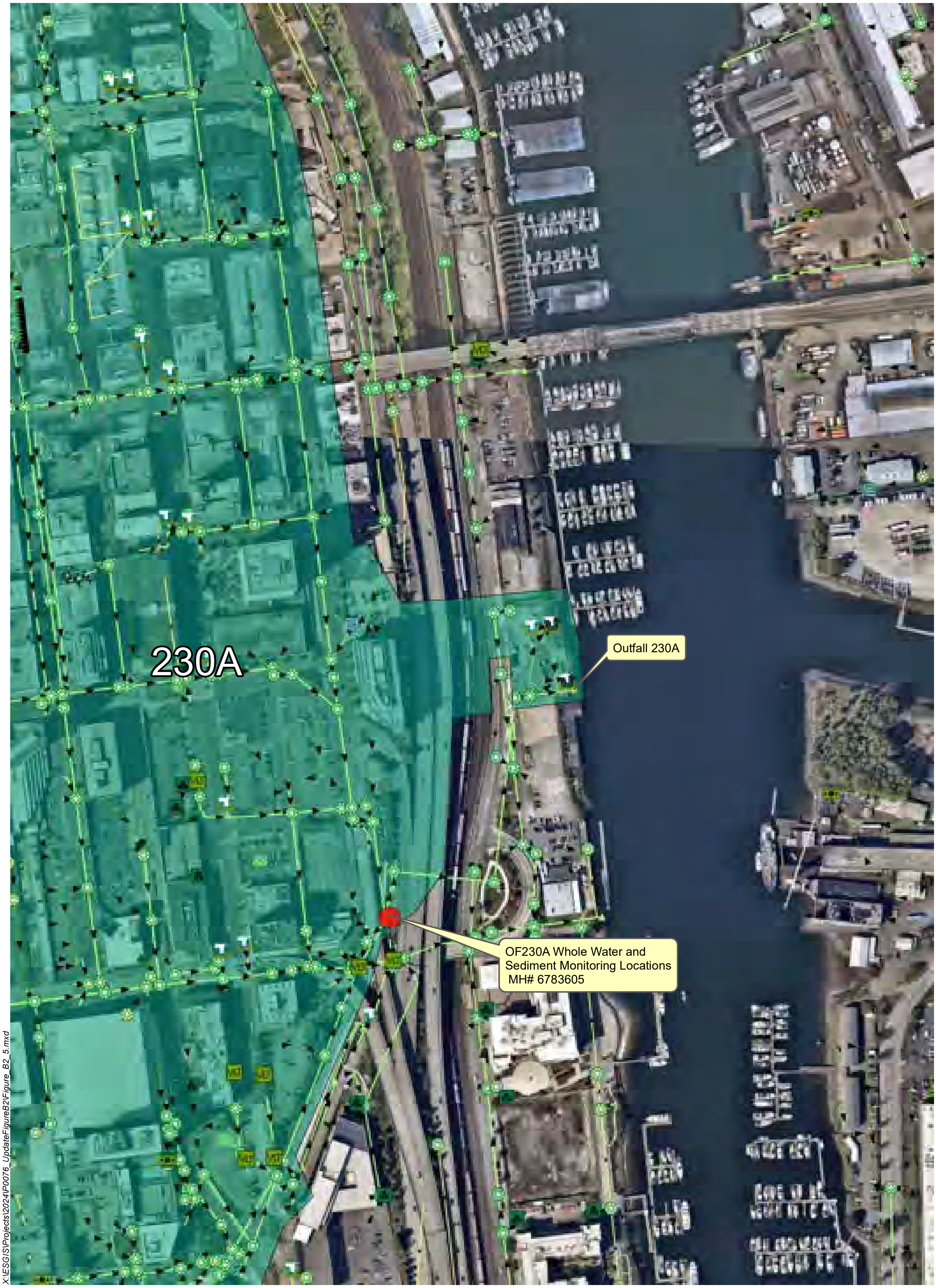
Foss Basin 230

Map Date: 8/17/2023
Source: Science and Engineering Division
Environmental Services Department
City of Tacoma
326 East D Street, Tacoma WA 98421
(253) 591-5588

0 75 150 300 Feet

Tacoma

Figure B2-5
Whole-Water Monitoring and Sediment Trap Monitoring Locations - OF230A



Sediment and Flow Monitoring Locations
Foss Basin 230A
Outfalls

Map Date: 11/4/2024
Source: Science and Engineering Division
Environmental Services Department
City of Tacoma
326 East D Street, Tacoma WA 98421
(253) 591-5588

0 100 200 400 Feet

Tacoma

Figure B2-6
Annual Rainfall-Runoff Correlation for OF230

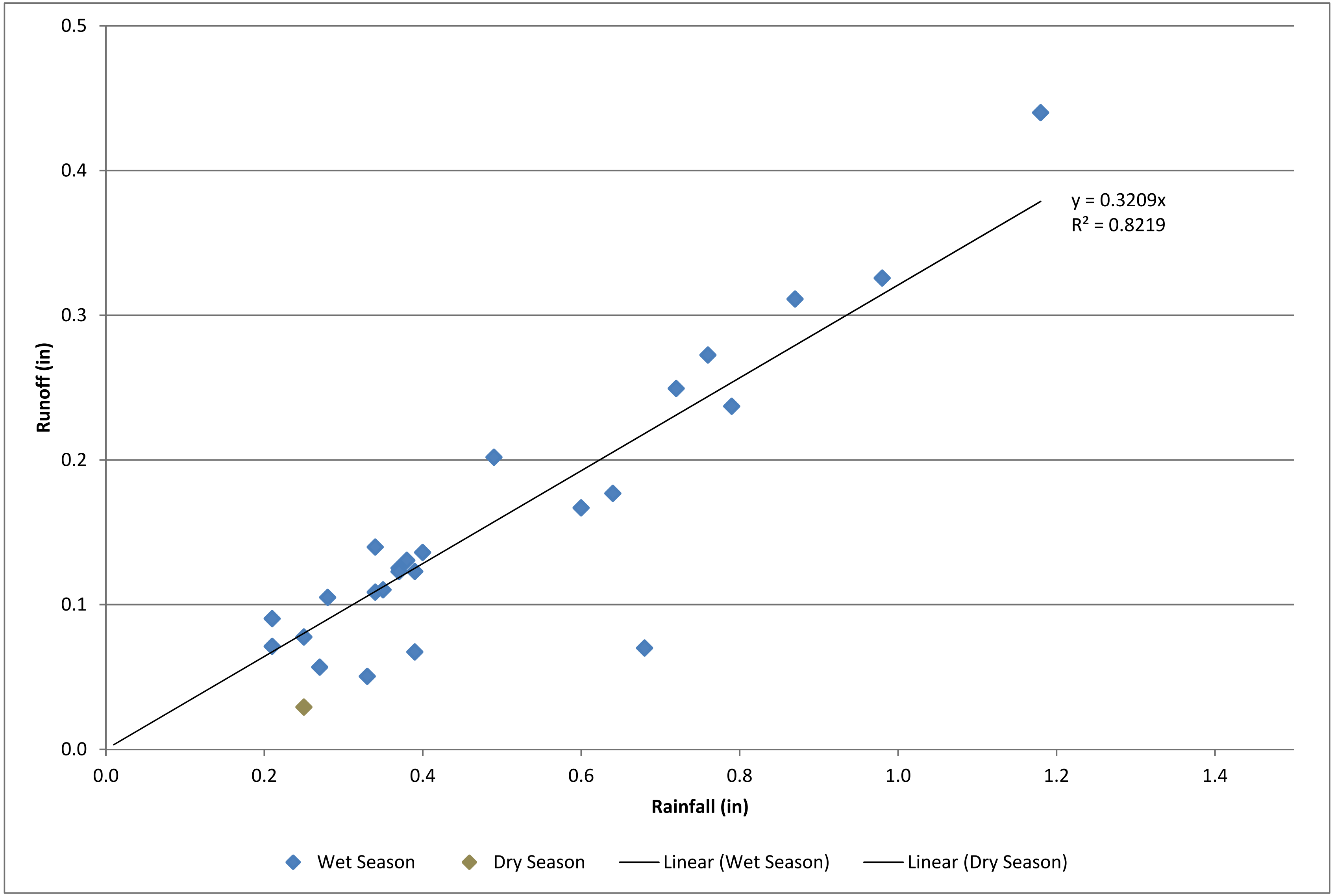


Figure B2-7
Whole-Water Monitoring and Sediment Trap Monitoring Locations - OF235

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Sediment and Flow Monitoring Locations
Drainage Area

0 50 100 200 Feet

Map Date: 11/7/2024
Source: Science and Engineering Division
Environmental Services Department
City of Tacoma
326 East D Street, Tacoma WA 98421
(253) 591-5588

Tacoma

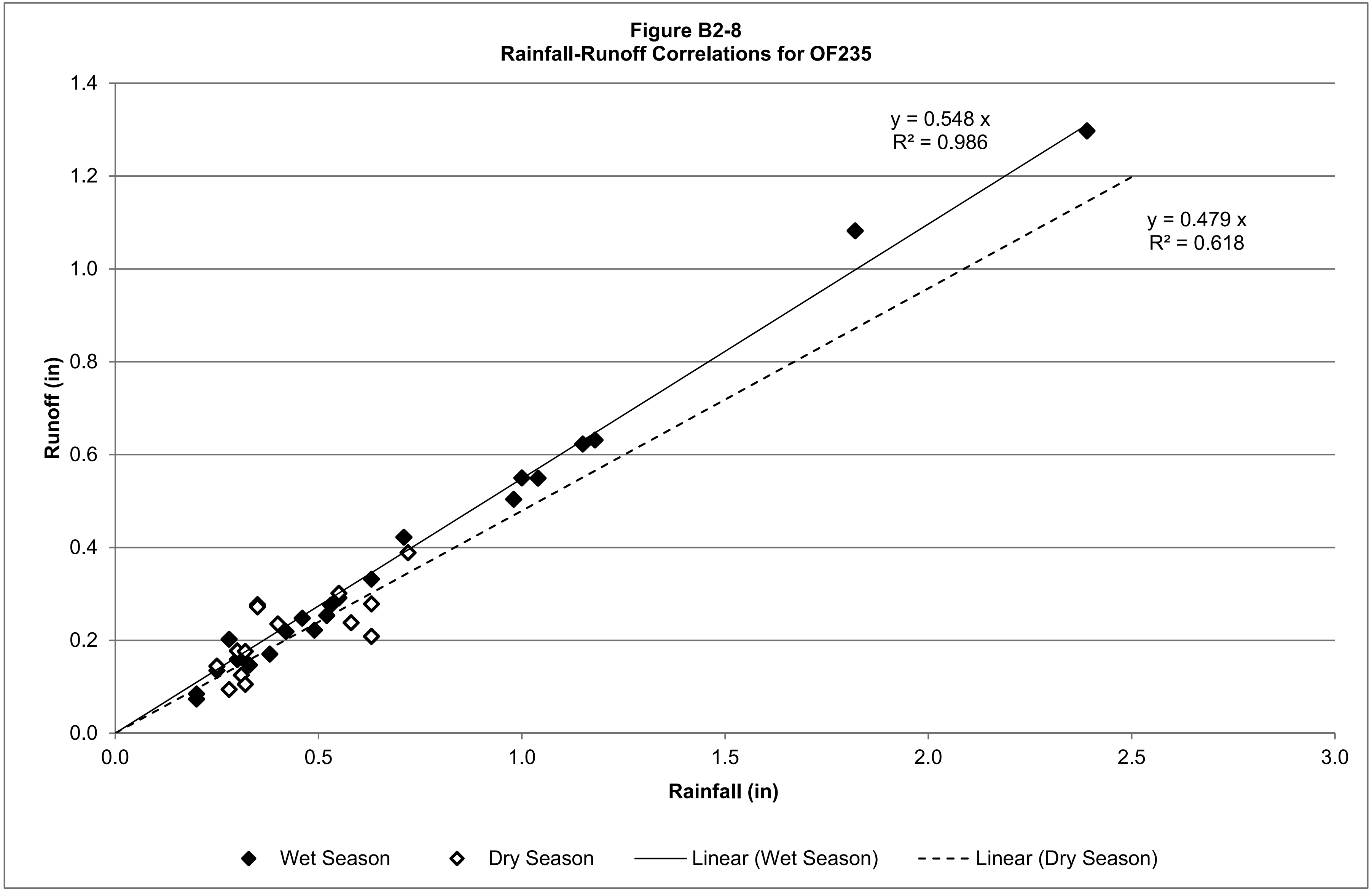


Figure B2-8
Rainfall-Runoff Correlations for OF235
y = 0.548 x
R² = 0.986
y = 0.479 x
R² = 0.618
Runoff (in)
Rainfall (in)
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
0.0
0.5
1.0
1.5
2.0
2.5
3.0
Wet Season
Dry Season
Linear (Wet Season)
Linear (Dry Season)

Figure B2-9
Whole-Water Monitoring and
Sediment Trap Monitoring Locations - OF237A and 237B

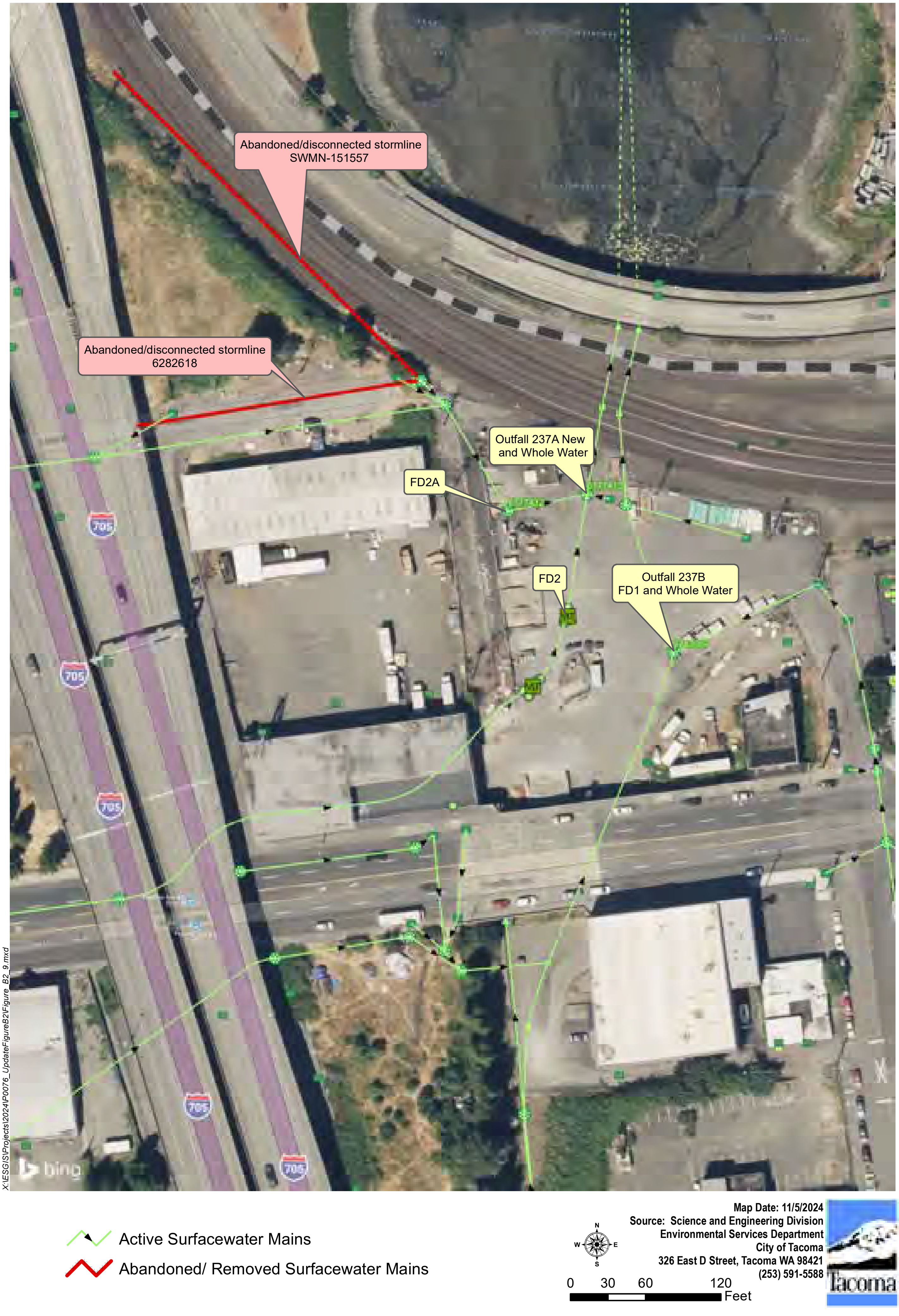


Figure B2-10
Annual Rainfall-Runoff Correlation for OF237A

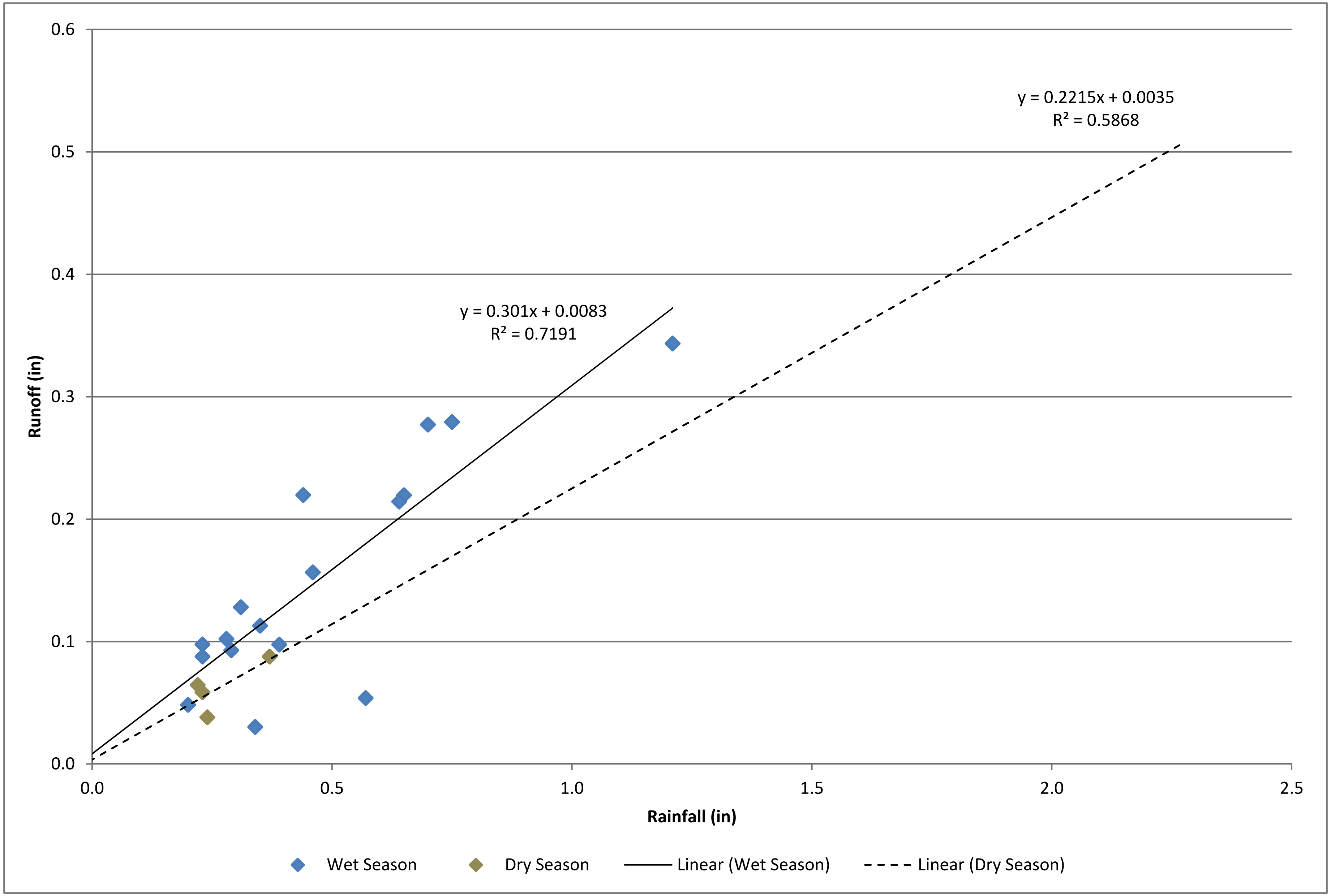


Figure B2-11
Rainfall-Runoff Correlations for OF237B

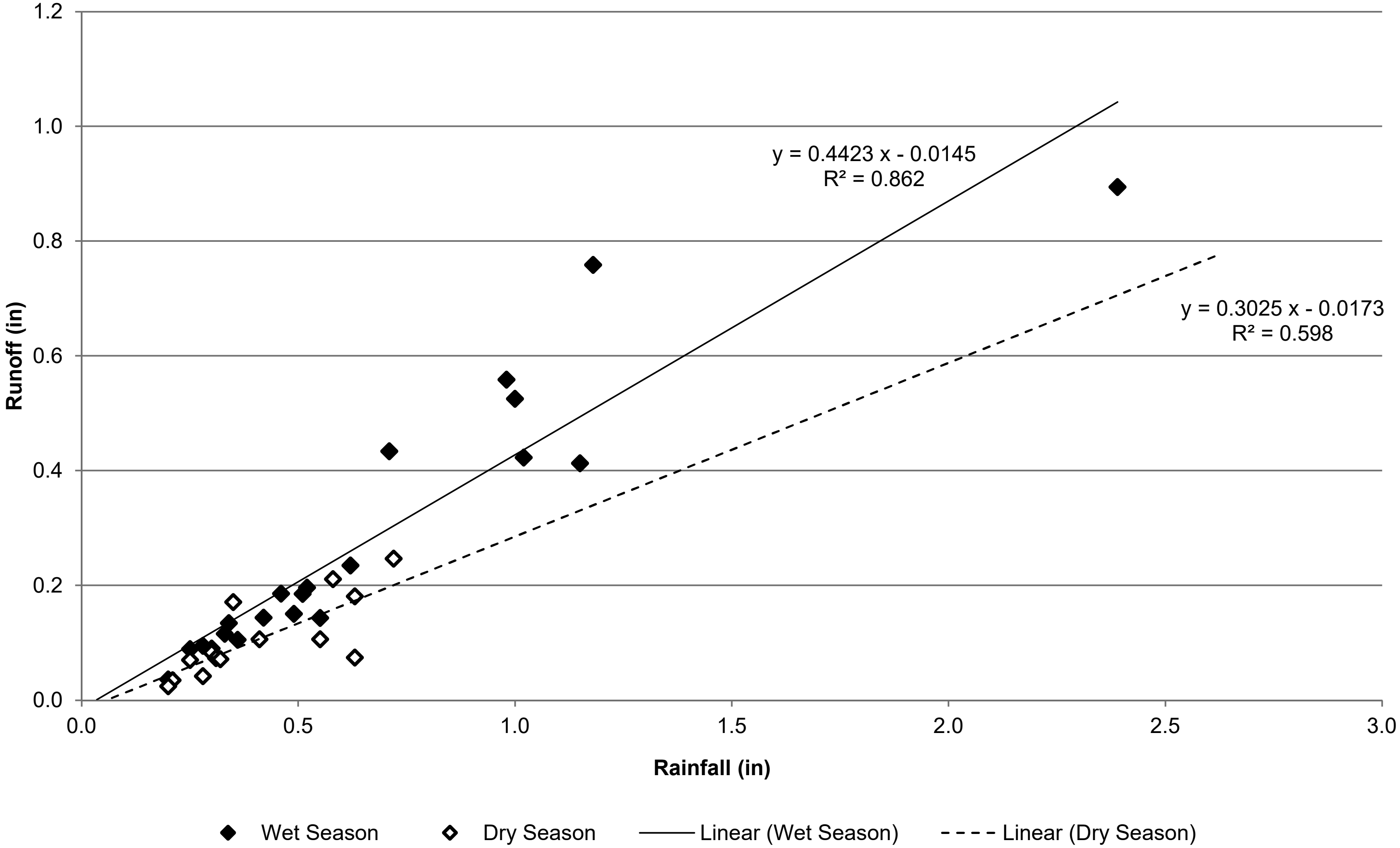


Figure B2-12
Whole-Water Monitoring and
Sediment Trap Monitoring Locations - OF243

X:\ESG\S\Projects\2024\P0076_UpdateFigureB2\Figure_B2_12.mxd

Sediment and Flow Monitoring Locations

Outfall 243 Drainage Area

0 25 50 100 Feet

Map Date: 11/14/2024
Source: Science and Engineering Division
Environmental Services Department
City of Tacoma
326 East D Street, Tacoma WA 98421
(253) 591-5588

Tacoma

Figure B2-13
Annual Rainfall-Runoff Correlation for OF243

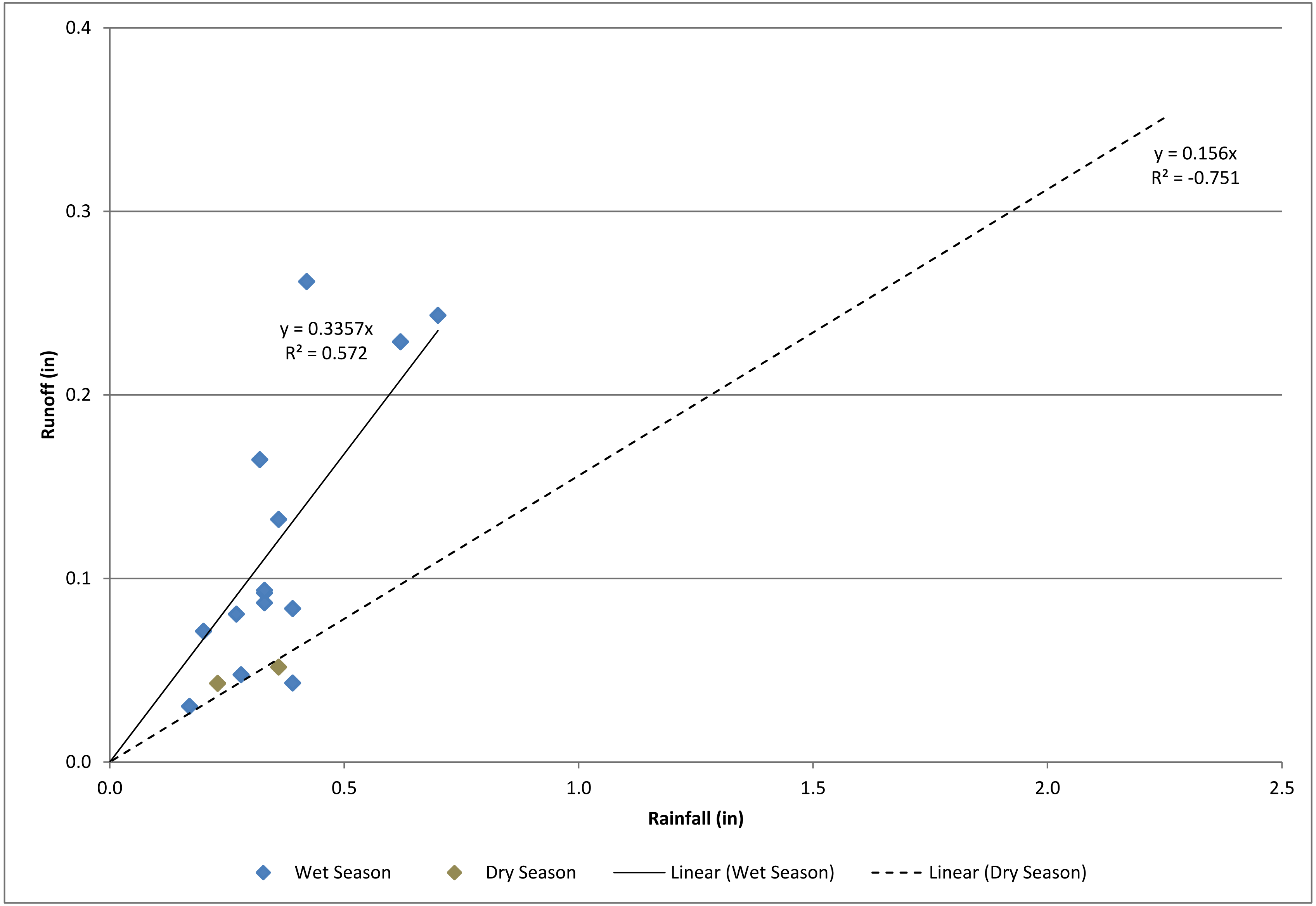
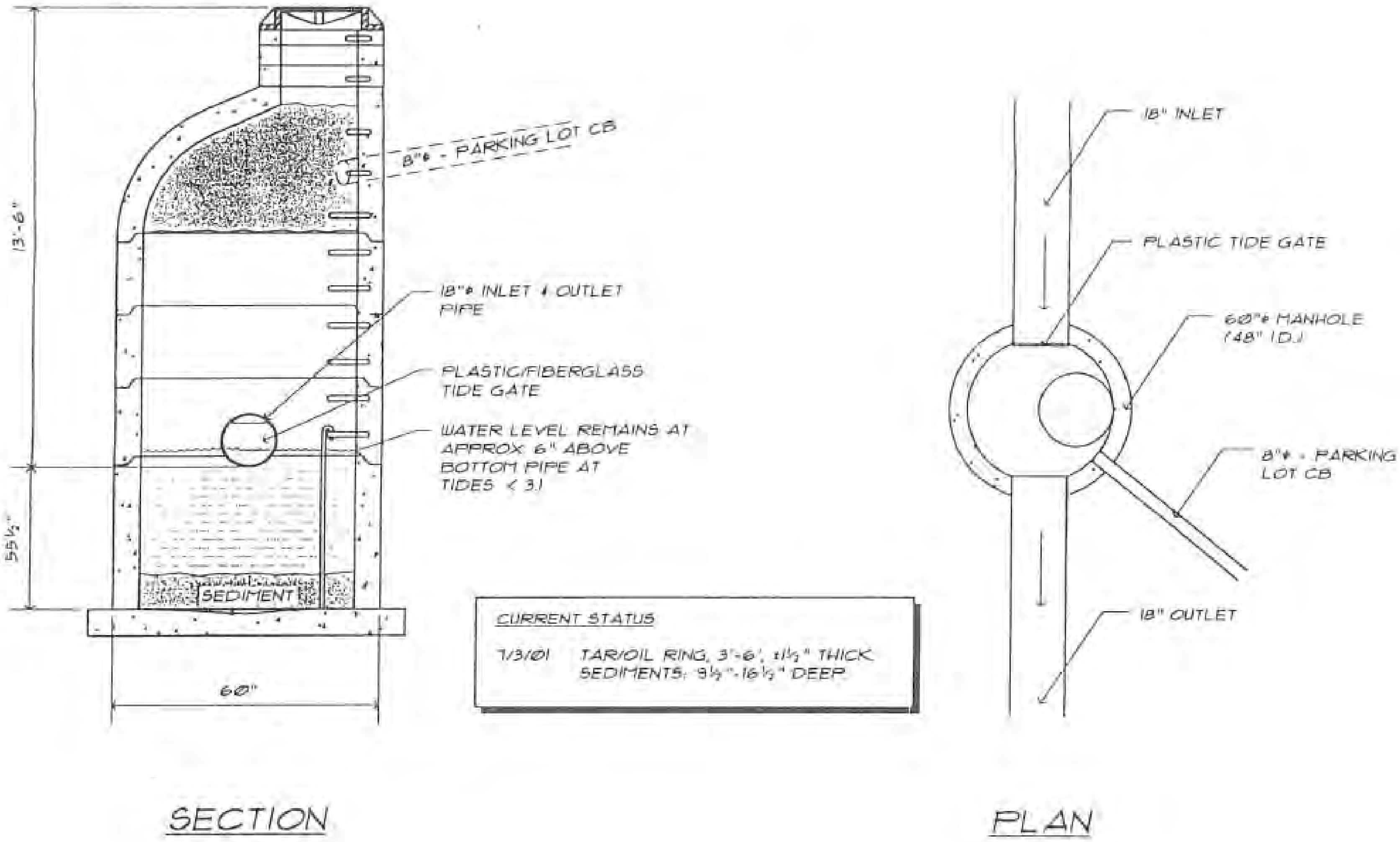


Figure B2-14
Sediment Trap Thea Foss Waterway



Manhole #390
OF 245
Johnny's Dock Restaurant
1900 East 'D' Street

City of Tacoma
Environmental Services Department

Figure B2-15
Whole-Water Monitoring and Sediment Trap Monitoring Locations - OF245

Figure B2-16
Rainfall-Runoff Correlations for OF245

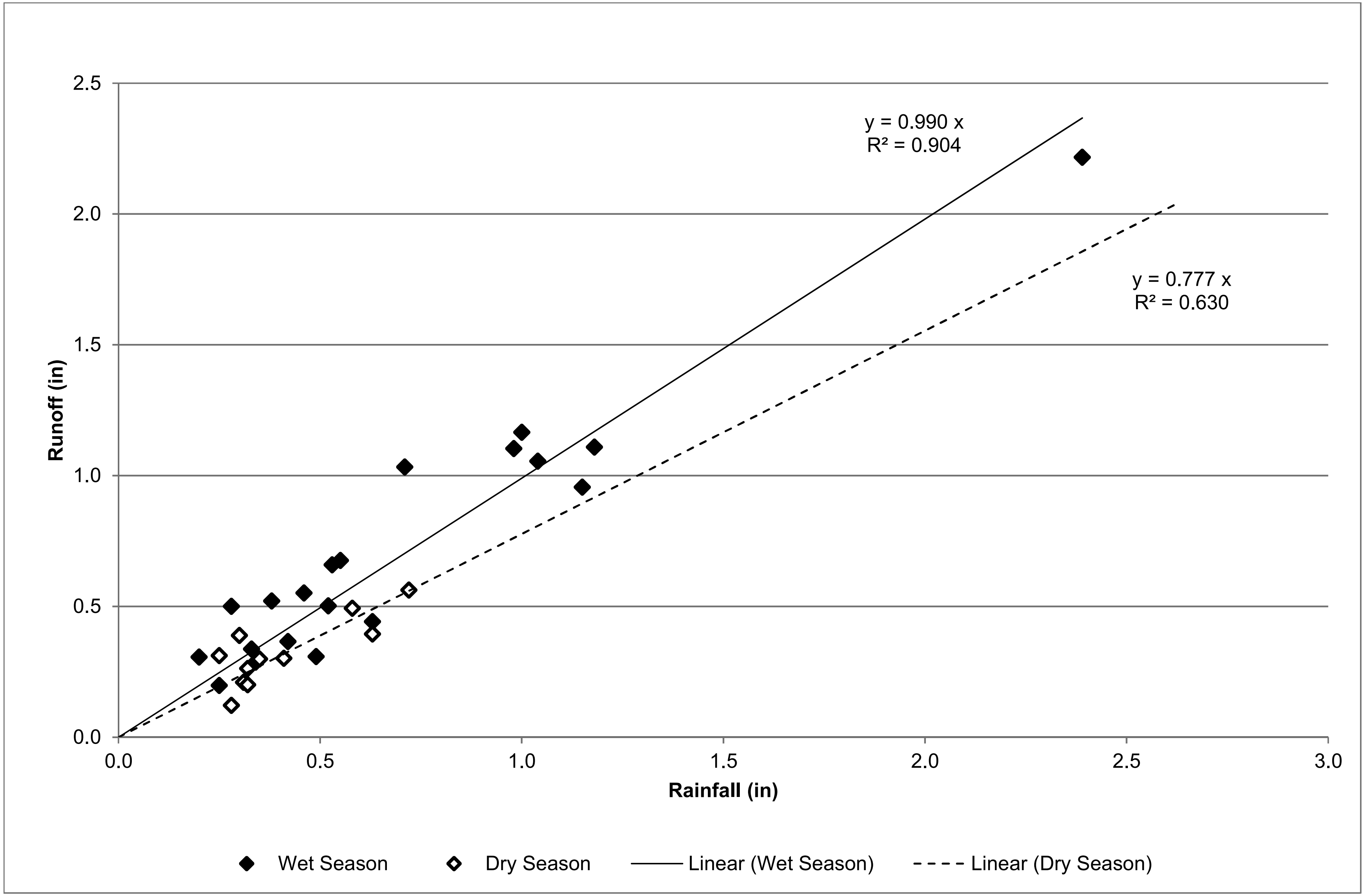
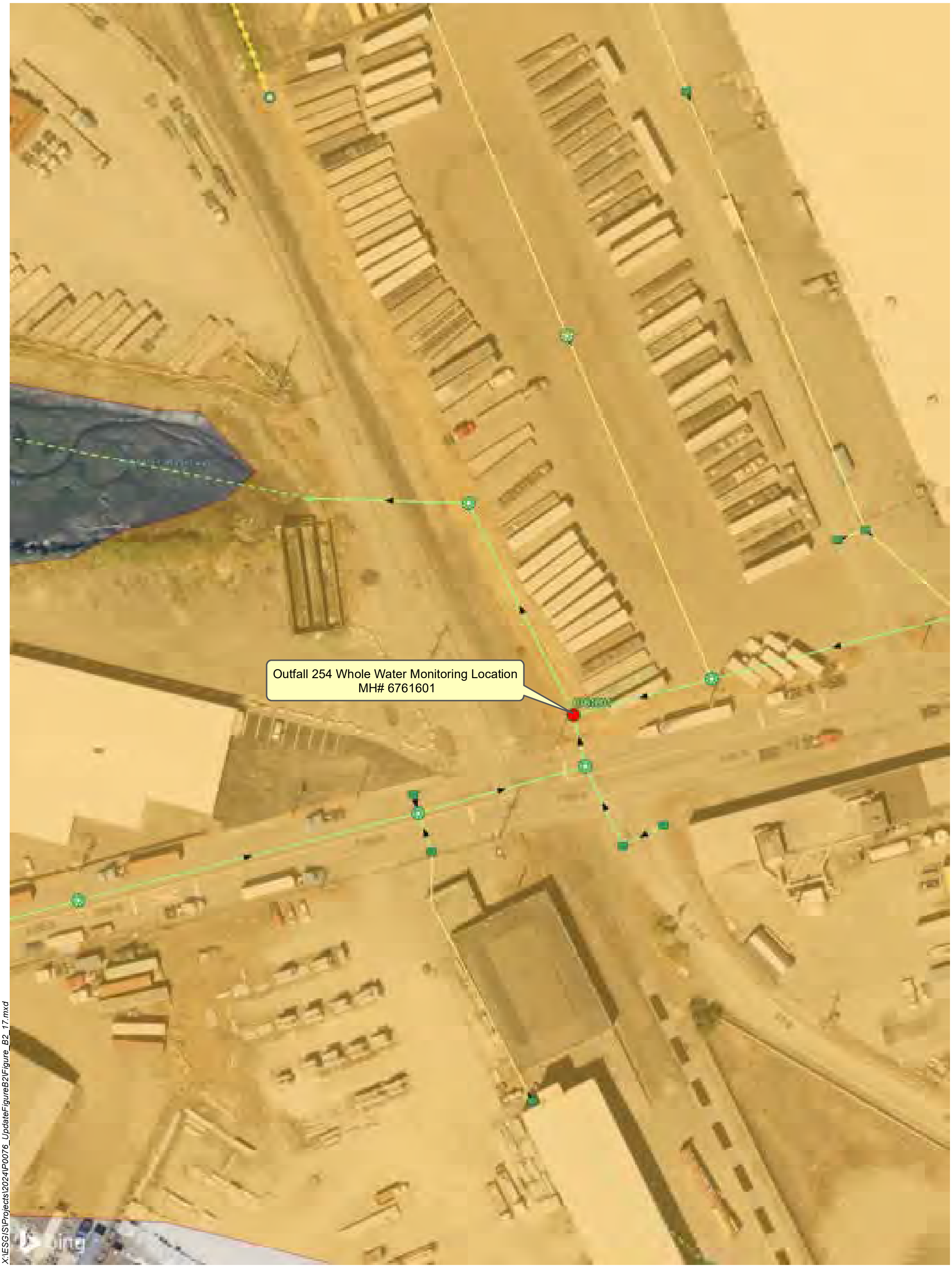


Figure B2-17
Whole-Water Monitoring and
Sediment Trap Monitoring Locations - OF254



● Sediment and Flow Monitoring Locations

Outfall 254 Draina Area

Map Date: 11/15/2024
Source: Science and Engineering Division
Environmental Services Department
City of Tacoma
326 East D Street, Tacoma WA 98421
(253) 591-5588

0 25 50 100
Feet

Tacoma

X:\ESGIS\Projects\2024\P0076_UpdateFigureB2\Figure_B2_17.mxd

Figure B2-18
Annual Rainfall-Runoff Correlation for OF254

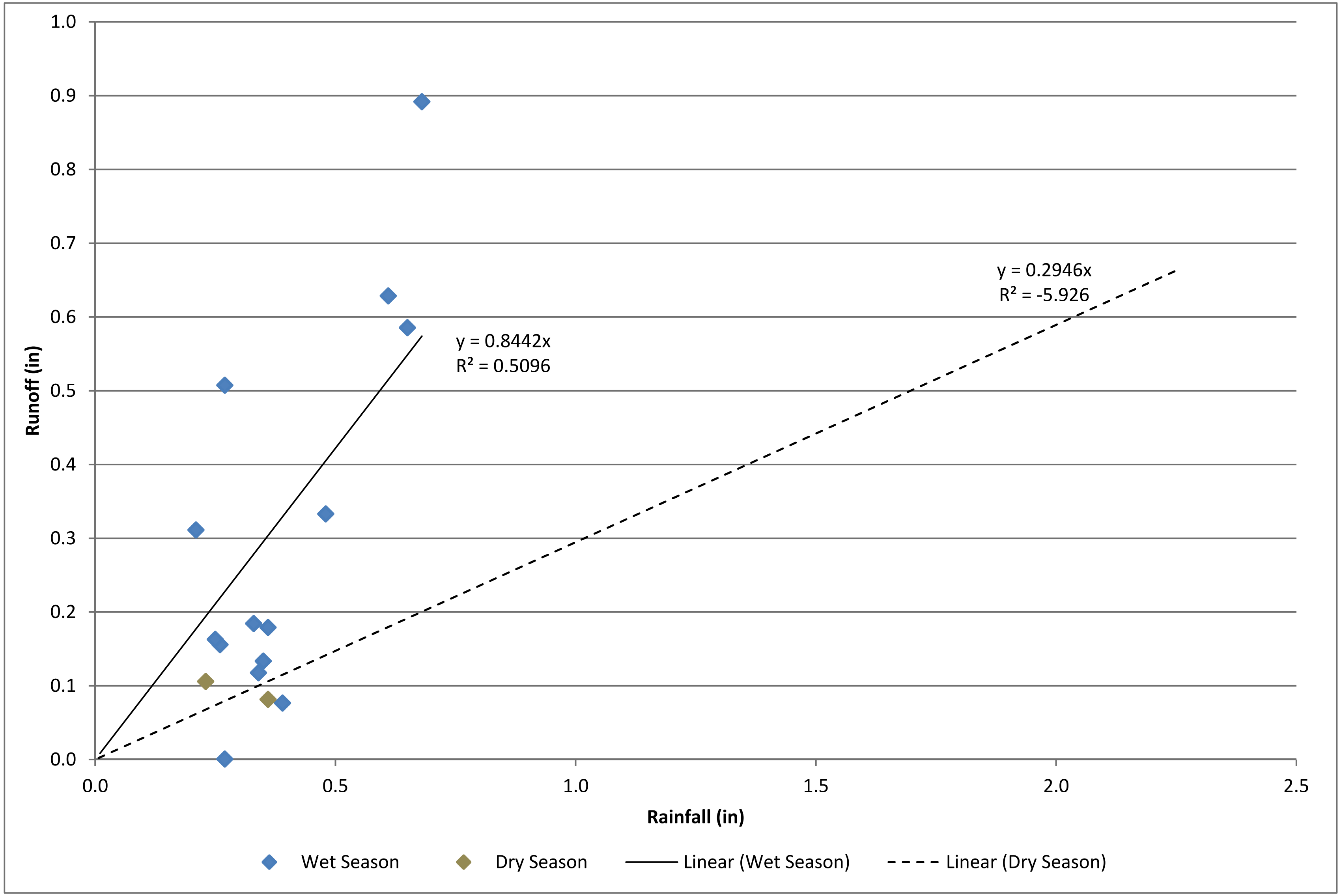
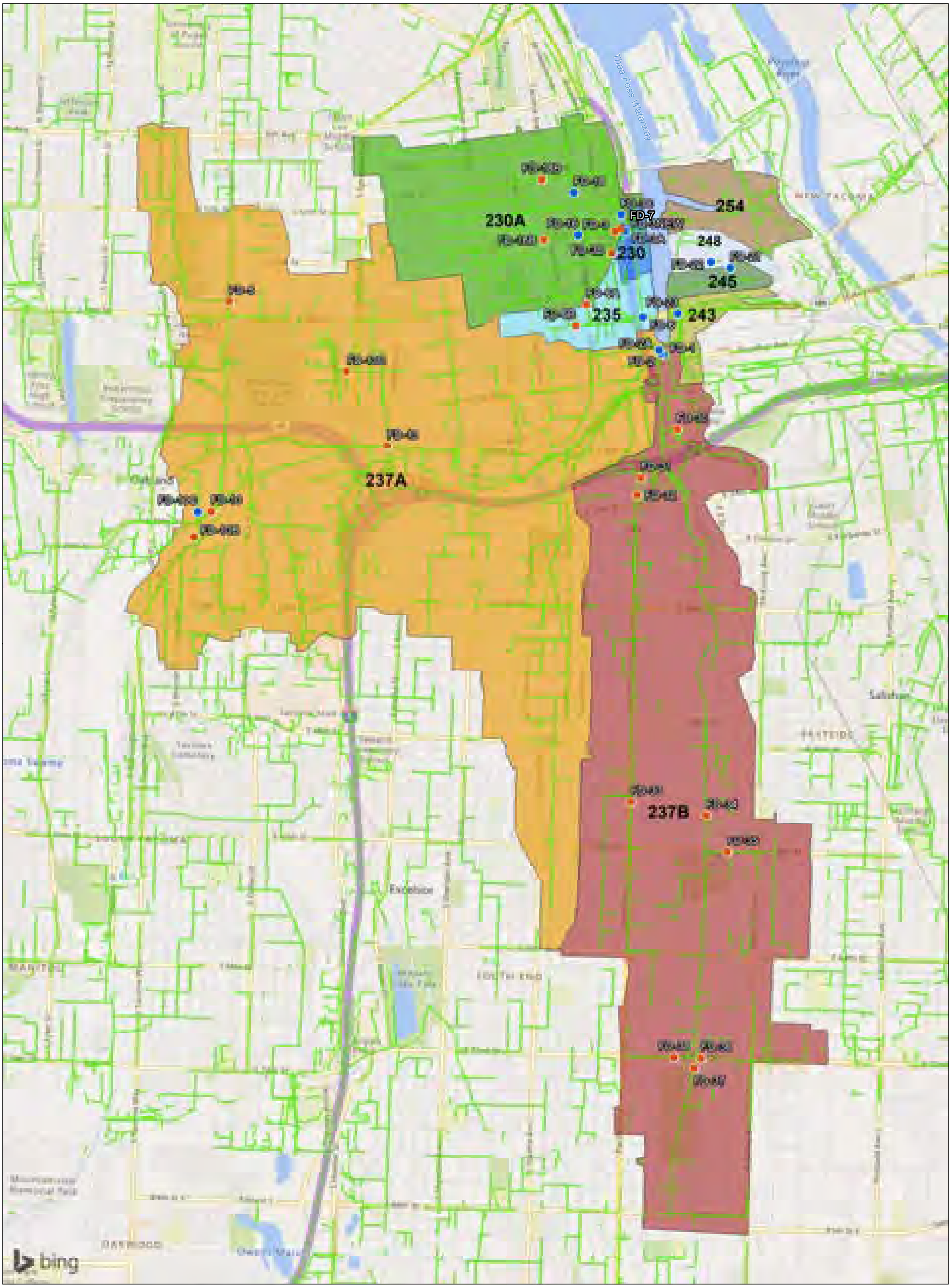


Figure B2-19
Sediment Trap Locations



- Sediment Trap Locations
- Historic Sediment Trap Locations
- Surfacewater Mains

Map Date: 11/14/2023
Source: Science and Engineering Division
Environmental Services Department
City of Tacoma
326 East D Street, Tacoma WA 98421
(253) 591-5588

0 1,000 2,000 4,000 Feet

Tacoma

Figure B2-20 Sequential Sampler Base

Figure B2-21
Stormwater Sediment Traps

Sediment trap mounting bracket.

Typical sediment trap installation – large and medium pipe.

Figure B3-1
WY2024 Daily Rainfall and Average Daily Rainfall, 21-Day Trends Only

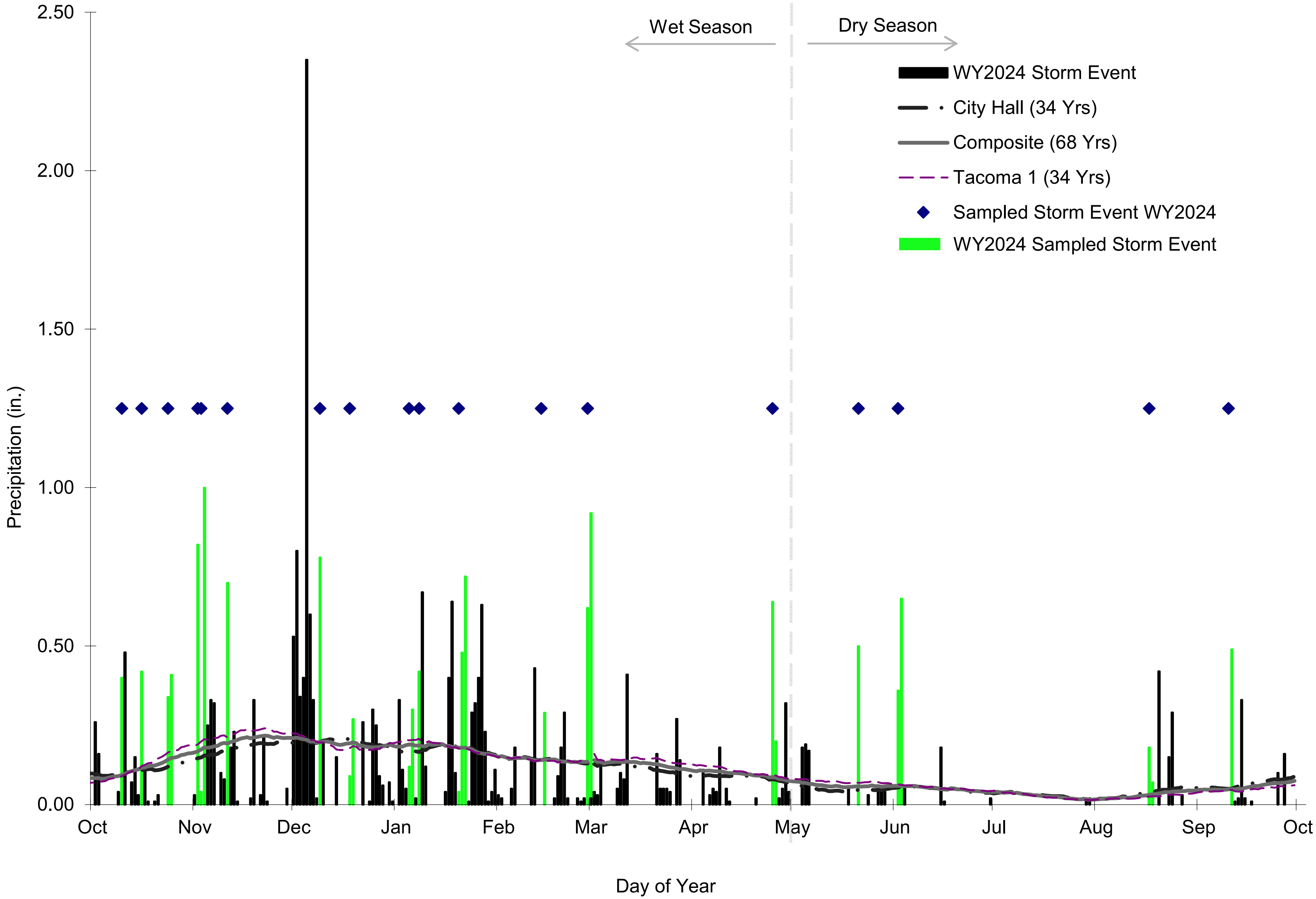


Figure B3-1 WY2024 Daily Rainfall and Average Daily Rainfall, 21-Day Trends Only

Figure B3-2
Daily Rainfall - Monthly Averages WY2024

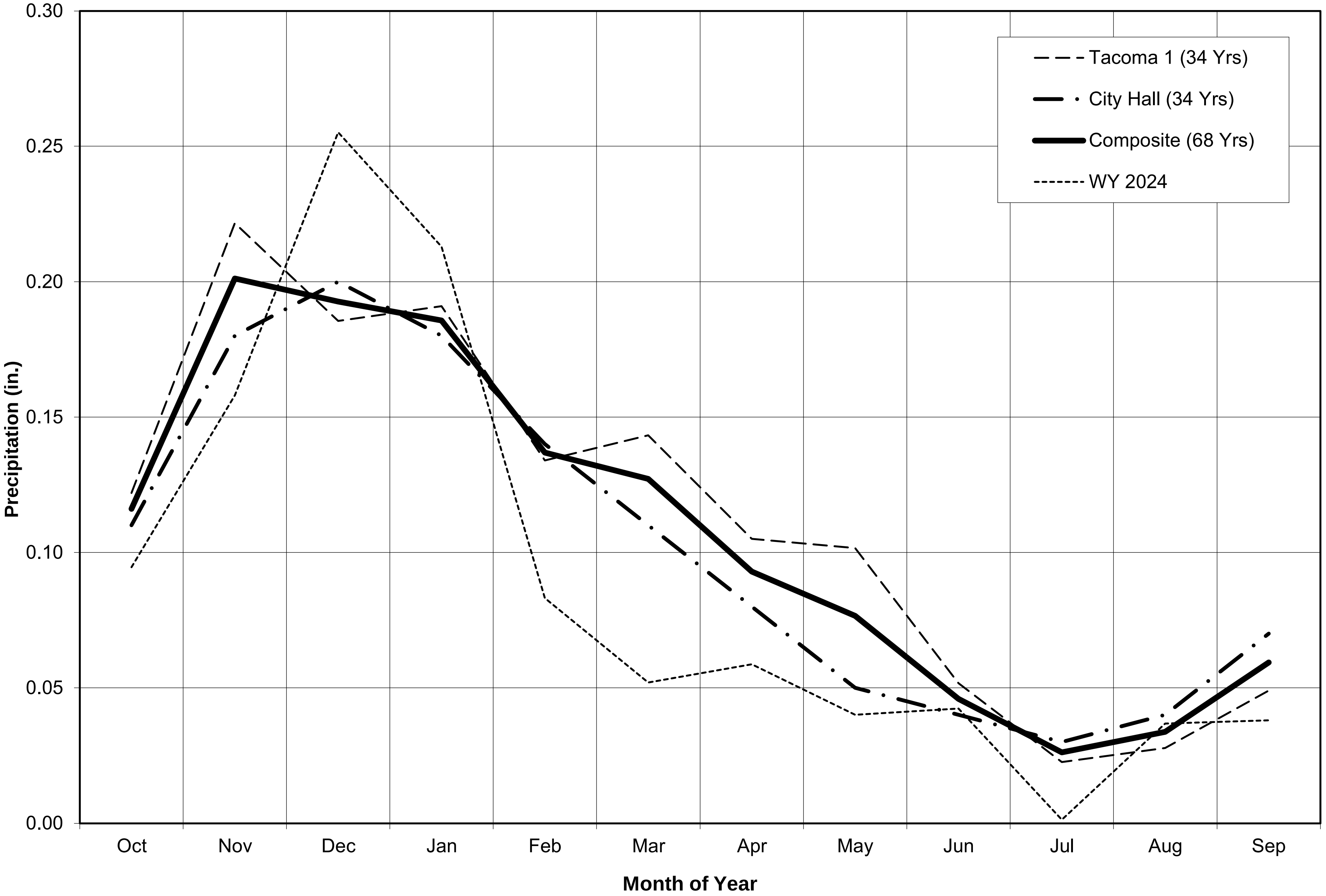


Figure B3-2 Daily Rainfall - Monthly Averages WY2024

Figure B3-3
Daily Rainfall - Monthly Averages WY2002-2024

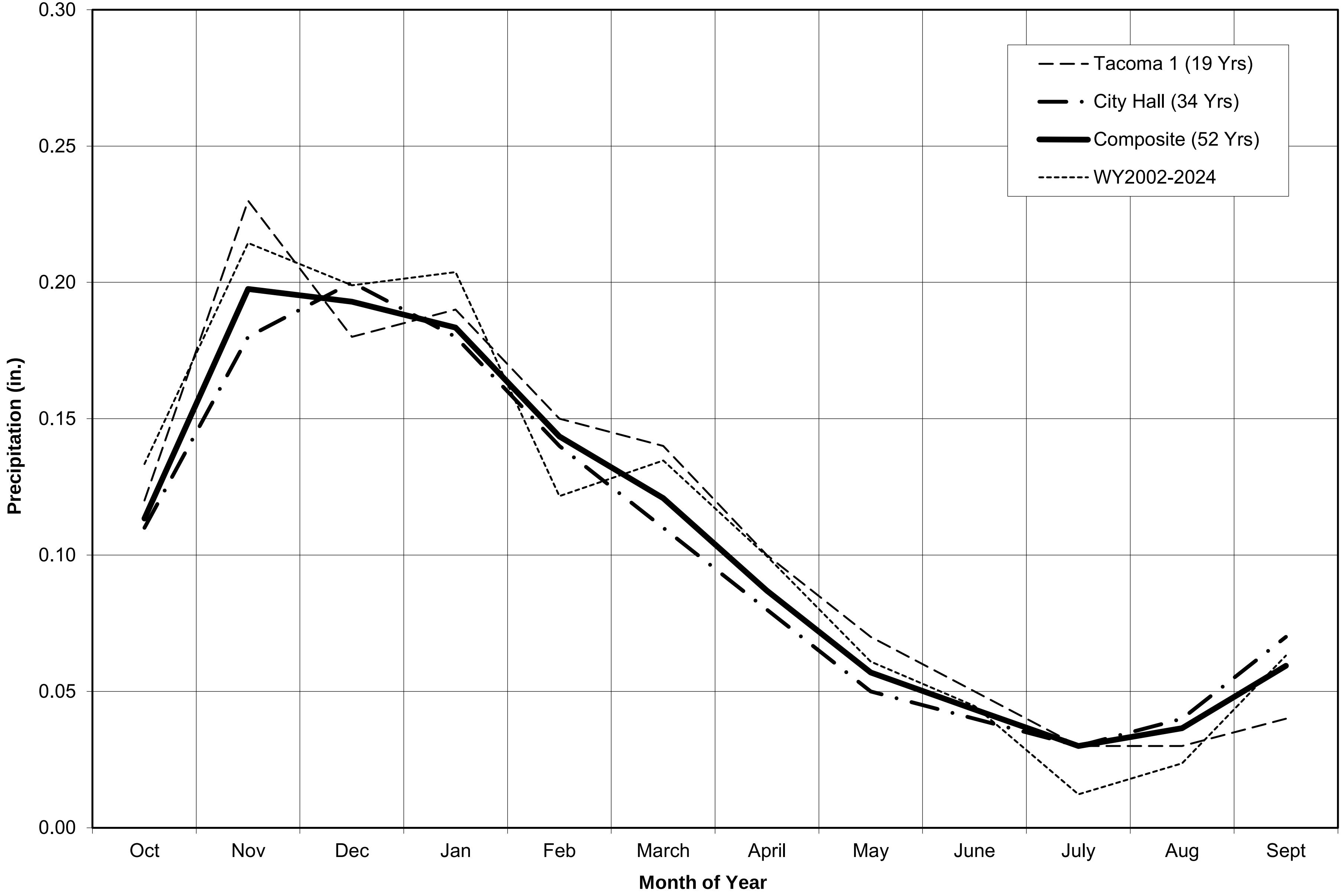
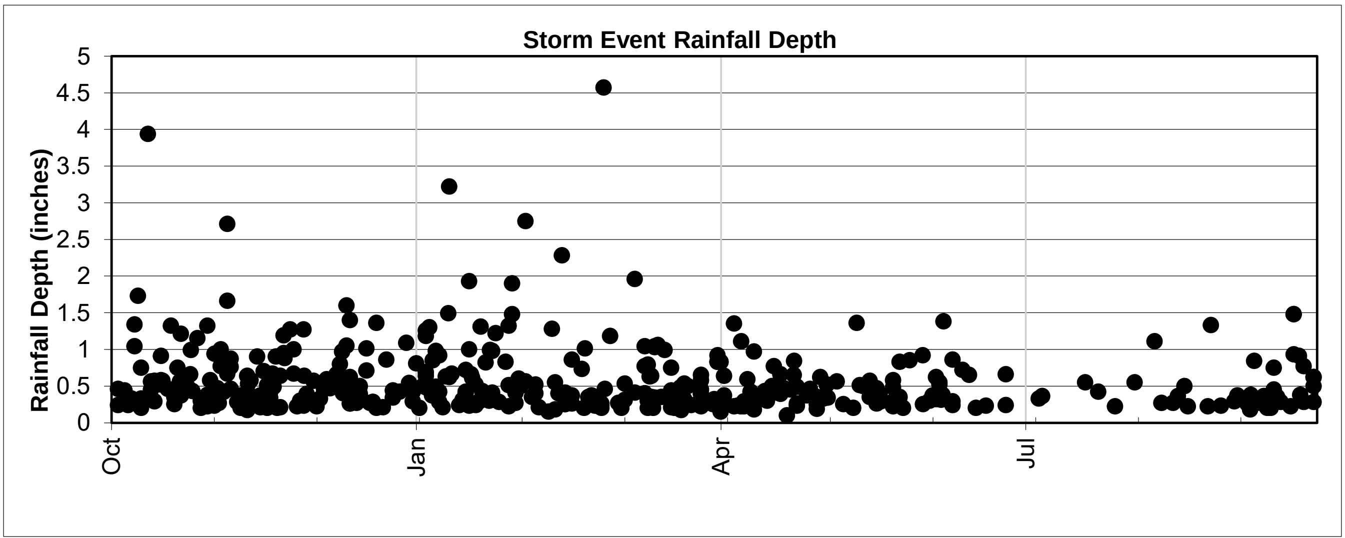
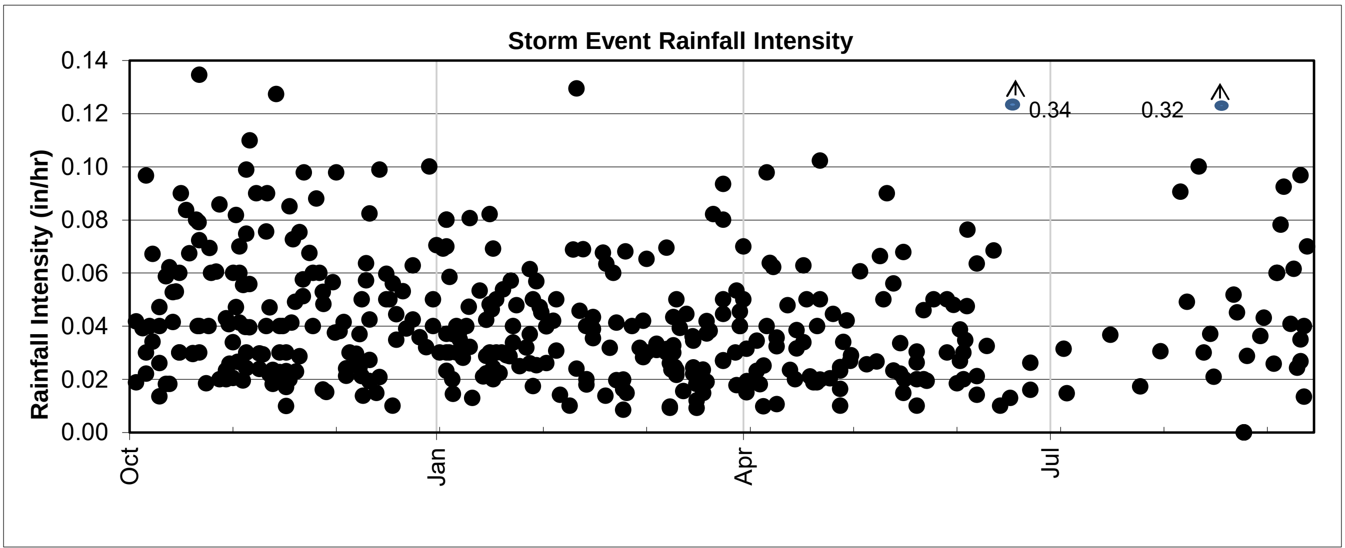


Figure B3-3 Daily Rainfall - Monthly Averages WY2002-2024

Figure B4-1.1
Storm Event Hydrologic Parameters, October 2001 - September 2024





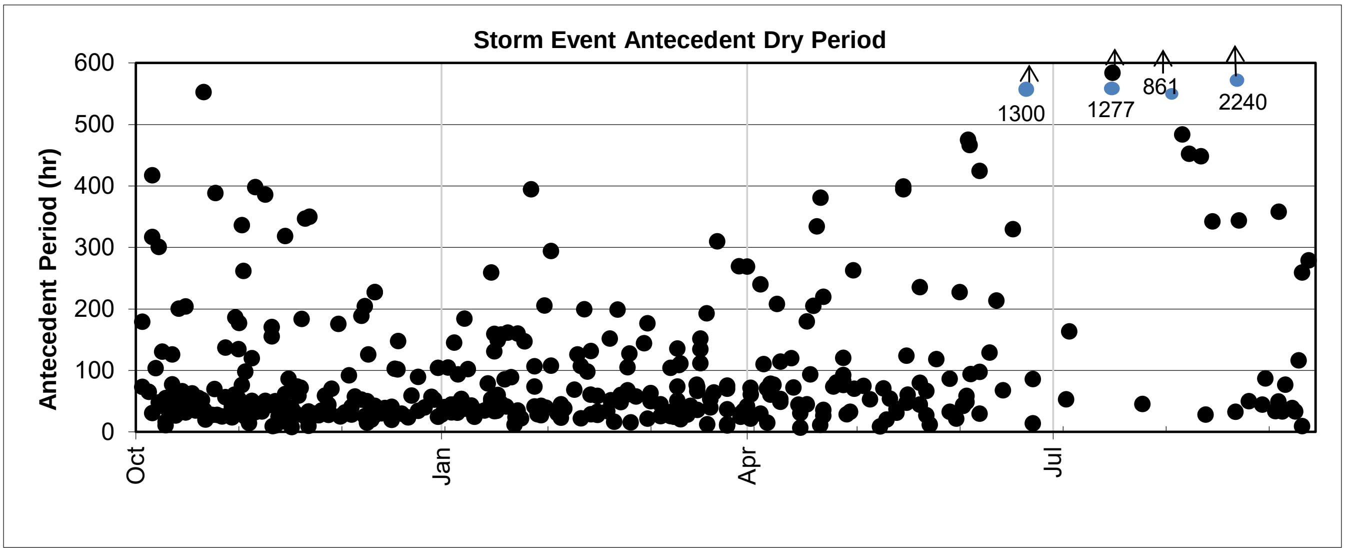


Figure B4-1.1 Storm Event Hydrologic Parameters, October 2001 - September 2024

Figure B4-1.2
Storm Event Hydrologic Parameters, October 2001 - September 2024

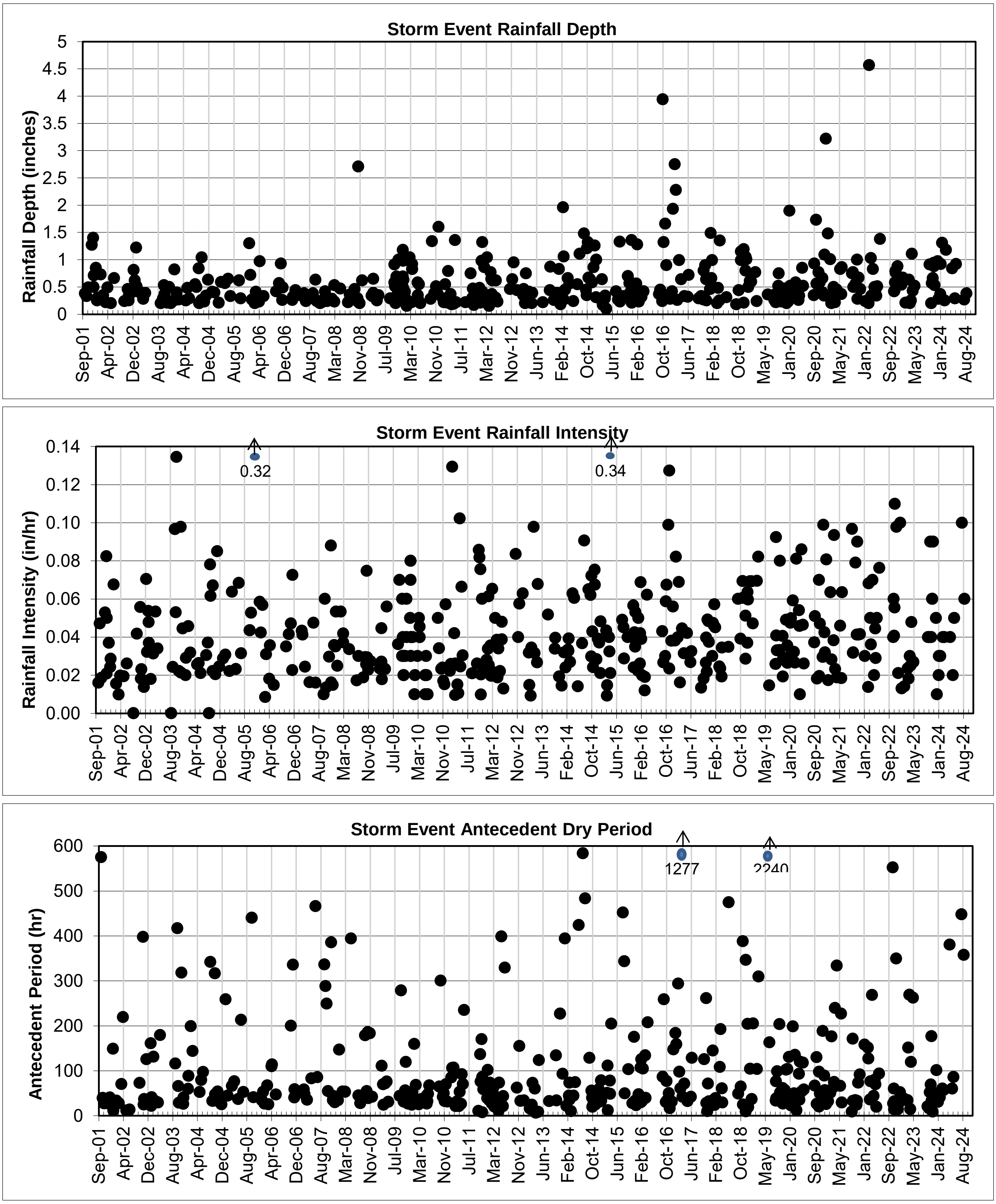
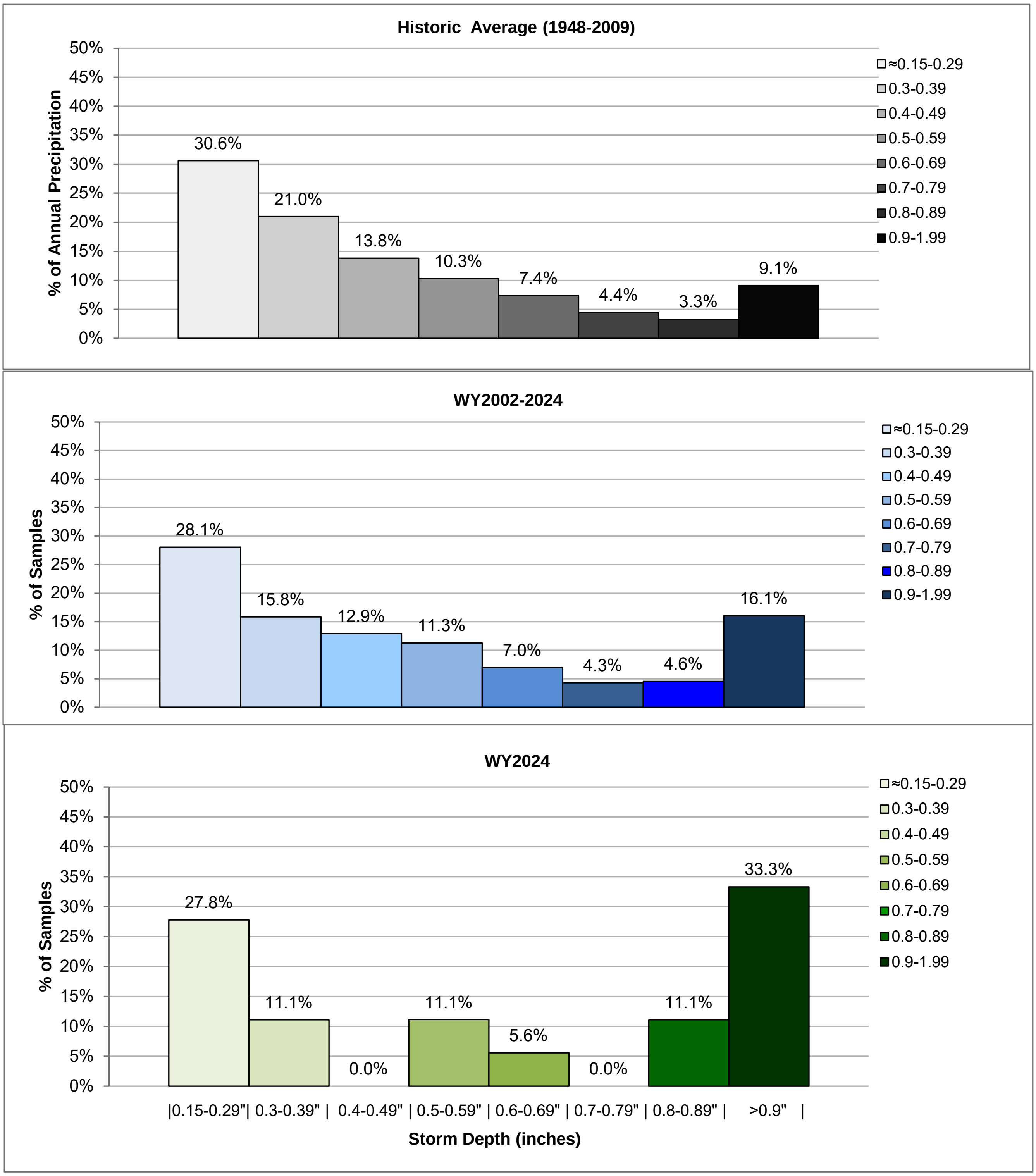


Figure B4-1.2 Storm Event Hydrologic Parameters_WY2024

Figure B4-2
Representativeness of Sampled Storm Sizes



Note: Data for OF237A is from the original OF237A site through WY2011. Data for OF230A is from the original OF230 site through WY2023.

Figure B4-3
Representativeness of Seasonal Sampling Distribution

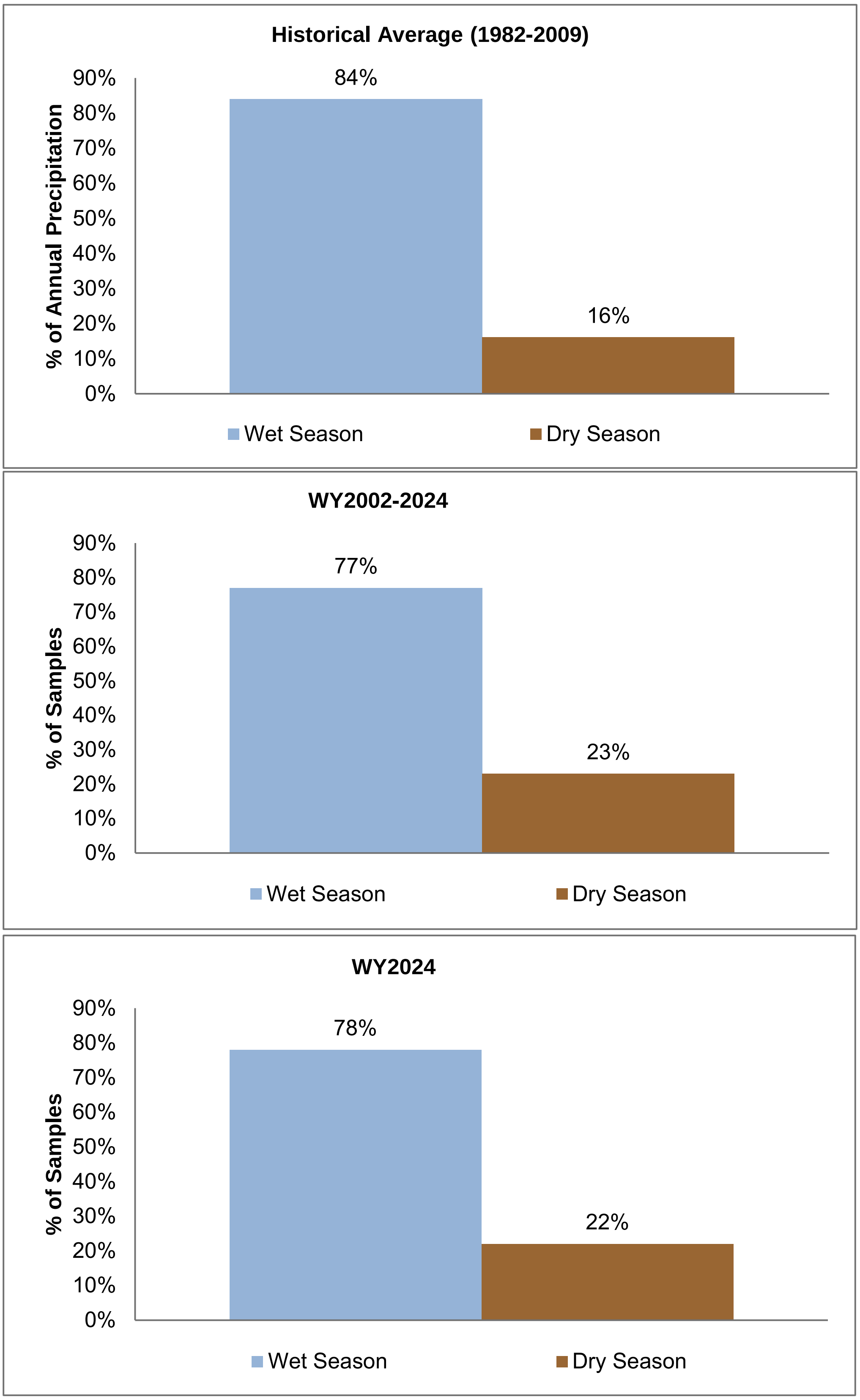


Figure B4-3 Representativeness of Seasonal Sampling Distribution

Figure B7-1
Simplified Guidance for Evaluating Performance-Based Chemical Data – Whole-Water

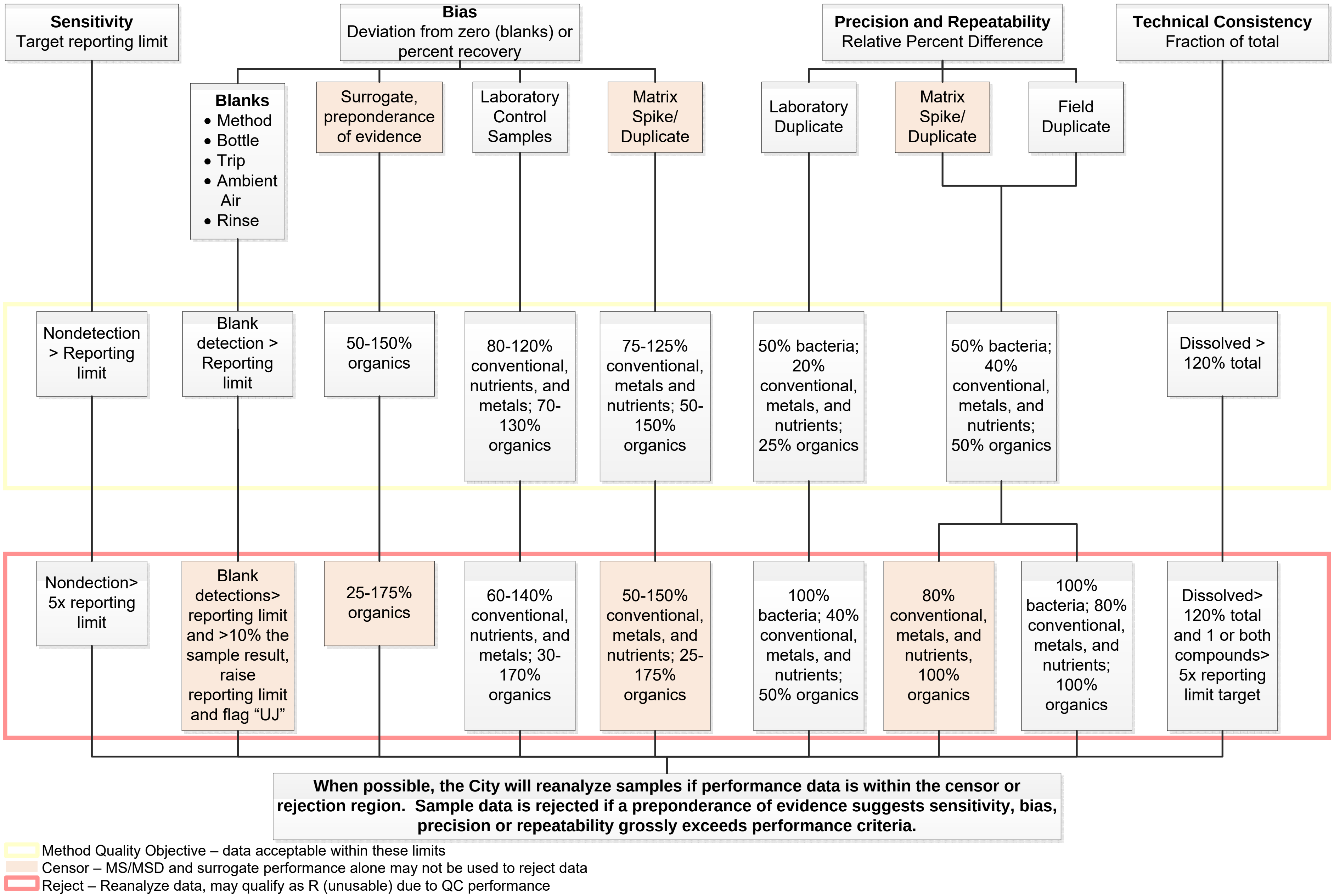


Figure B7-1 Simplified Guidance for Evaluating Performance-Based Chemical Data – Whole-Wate

Figure B7-2
Simplified Guidance for Evaluating Performance-Based Chemical Data – Suspended Sediment Particulate Matter

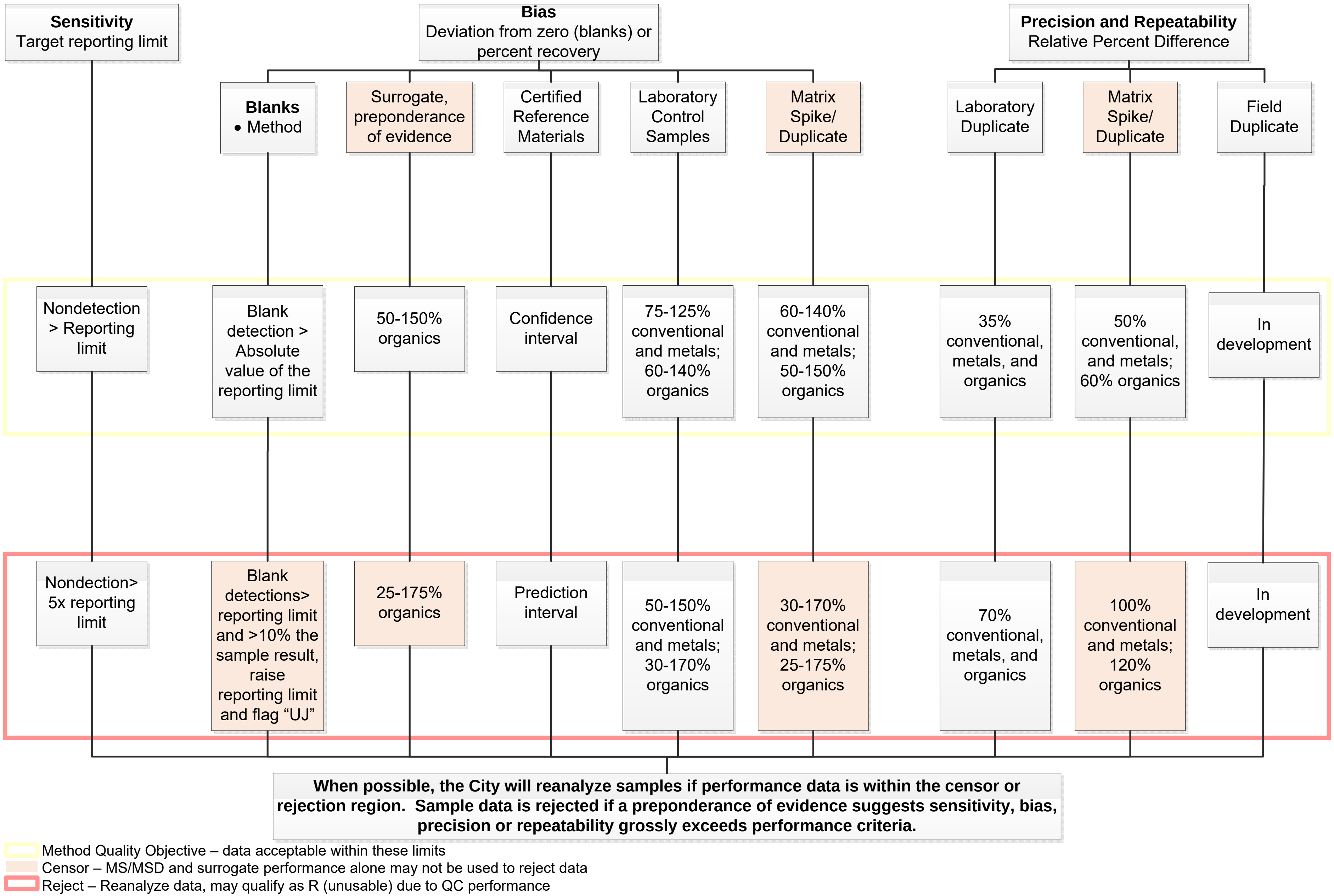


Figure B7-2 Simplified Guidance for Evaluating Performance-Based Chemical Data – Suspended Sediment Particulate Matter

Attachments

ATTACHMENT B.1 - Storm Field Reports

FIELD REPORT

Project: Thea Foss/Wheeler-Osgood Waterways & NPDES Stormwater Monitoring Program

Event: Storm Event – Oct. 10, 2020

INTRODUCTION

This report summarizes the storm event sampled on 10/6/2023-10/11/2023 by the City of Tacoma Environmental Services Collection System Support staff as part of our stormwater monitoring program. This report includes a summary of the following:

- Storm characteristics and criteria;
- Sampling activities;
- Flow characteristics at each sampling location;
- Pacing – set for a 1.3" event, actual event was 0.2"

This event met the sampling criteria for precipitation as specified in the Thea Foss Sampling and Analysis Plan (SAP).

DESCRIPTION OF SAMPLING ACTIVITES

Samplers placed in the field on 10/6/2023. During sampler installation the weather conditions were overcast. All samplers were retrieved on 10/11/23 (For site specific details, see Appendix A for field notes, Chain of Custody (COC) forms, and event hydrographs).

The following unusual observations were noted during the sampling event:

Table 2: Composite Sampling Activities

Sample Location	Site Deployed	Sample Accepted	Pacing (gal)	Enables LVL(ft), VEL(fps)	Comments
Outfall 230A	Yes	No	20 min.	>200gpm	0 Aliquots Collected / 0 Composited
Outfall 235	Yes	No	117,000	LVL > 4.0 VEL > 0.80	25 Aliquots Collected / 0 Composited
Outfall 237ANew	Yes	No	1,312,000	LVL > 4.0 VEL > 0.70	4 Aliquots Collected / 0 Composited
Outfall 237B	Yes	Yes	1,081,000	LVL > 4.0	22 Aliquots Collected / 10 Composited
Outfall 243	Yes	No	20 min.	5.0 ms /cm	8 Aliquots Collected / 0 Composited
Outfall 245	Yes	No	20 min.	>200gpm	18 Aliquots Collected / 0 Composited
Outfall 254	Yes	No	20 min.	<6.5 ms/cm	0 Aliquots Collected / 0 Composited

**QC, QUALITY CONTROL*

ND, NO DATA

NA, NOT APPLICABLE

WATER QUALITY DATA

Accepted samples were analyzed for the target parameters specified in the SAP and QAPP. Samples accepted at all Outfalls were composited and preserved within 24 hours of the last aliquot being collected. The samples were allowed to sit for a minimum of 18 hours before metals analysis was started.

EQUIPMENT INFORMATION

Samples were collected using ISCO 6712 portable auto samplers. Rain data was collected using an ISCO 674 rain gauge located at the Center for Urban Waters at 326 East D Street, Tacoma, WA 98421.

CORRECTIVE ACTIONS AND DEVIATIONS

There were no deviations from the field procedures as discussed in the SAP other than those discussed above/below. No other criteria or procedures as indicated in the SAP were compromised except for those discussed above/below. Due to a software error, no Isco sample reports were saved.

Enclosures: The ISCO program setting/sampling results report, the sample collection chain of custody form, and field records are in Appendix A for each outfall. This includes the following information for the samples collected:

- Plot of flow hydrograph and hyetograph
- Subsample times and conductivities
- Tidal windows
- Field activities

Appendix A

10/6/23 - Storm Deployment 1.3"

254 - @ 13:44 - Jars/Ice - Battery - Download - Setup graph - 20 min timer

245 - @ 14:14 - Jars/Ice - Battery - Download - 20 min timer

237A @ 14:46 - Jars/Ice - Download - 1,312,000

237B @ 14:53 - Jars/Ice - Download - 1,081,000

235 @ 15:10 - Jars/Ice - Download - 117,000

230a @ 15:25 - Jars/Ice - Download - Battery - ~~181,000~~

243 @ 14:26 - Jars/Ice - Download - Cond. - 20 - 25 sal

10/11/23 - Storm Collection

254 @ 9:26 - NO Samples

245 @ 9:34 - 4½/12

243 @ 10:04 - 2 bottles/12

237A @ 10:13 - 1/12

237B @ 10:24 - 4½/12 - 3-5

235 @ 10:35 - 3/4 -

230A @ 10:43 -

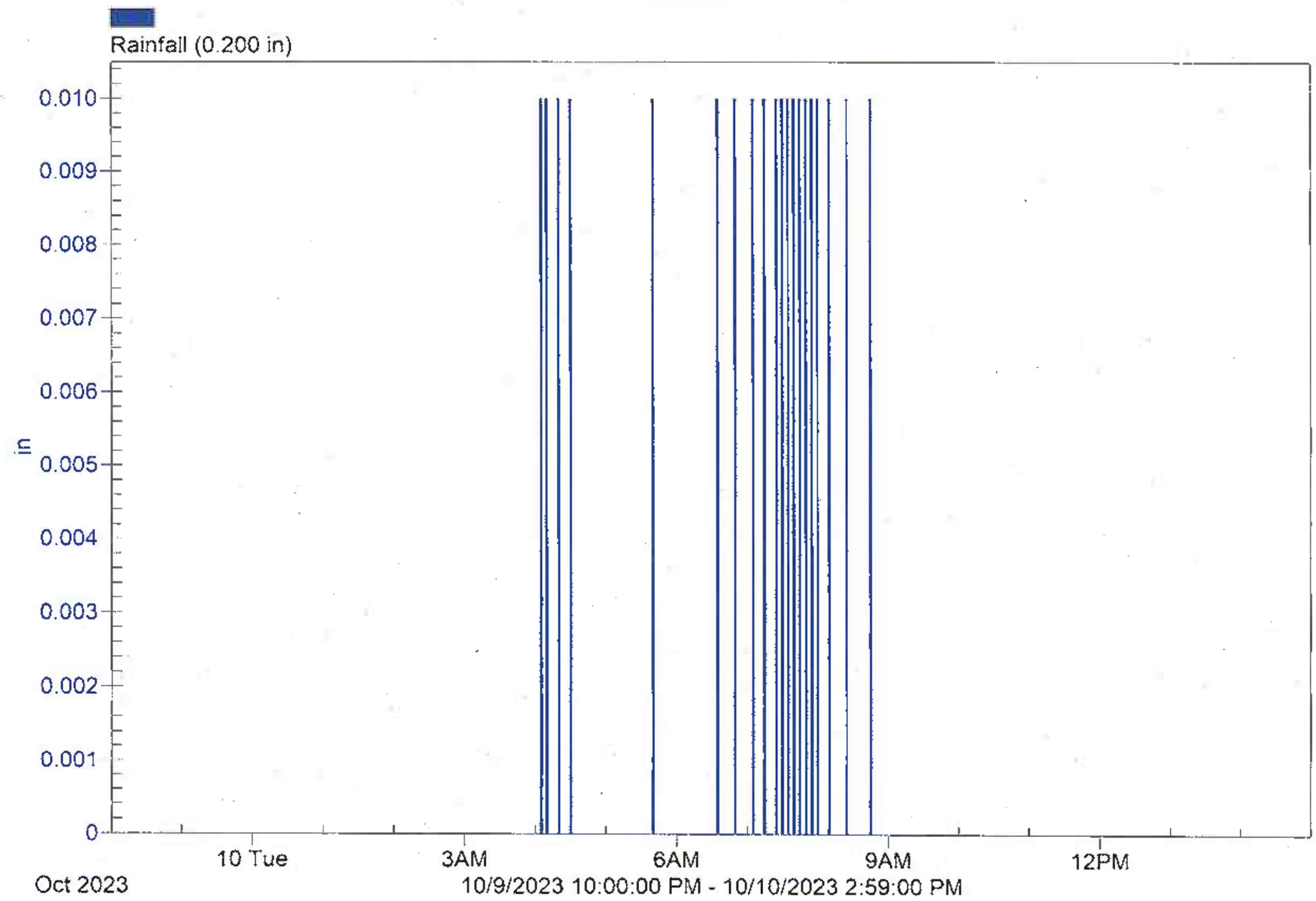
Continued on Page

Read and Understood By

Signed Date Signed Date

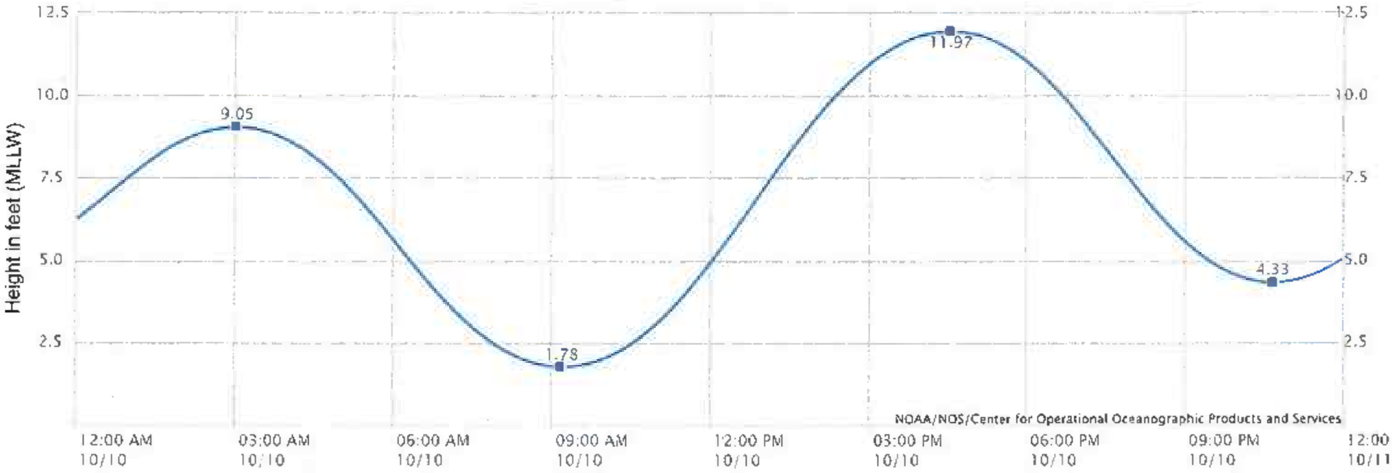
RF1

Flowlink 5



Help Print

NOAA/NOS/CO-OPS
Tide Predictions at 9446486, TACOMA NARROWS BRIDGE WA
From 2023/10/10 12:00 AM LST/LDT to 2023/10/10 11:59 PM LST/LDT
Subordinate Station | Ref. Station (Seattle 9447130) | Time offsets (high: 28 min. low: 23 min.) | Height offsets (high: *1.11 ft. low: *1.02 ft.)



Note: The interval is High/Low, the solid blue line depicts a curve fit between the high and low values and approximates the segments between.
Disclaimer: These data are based upon the latest information available as of the date of your request, and may differ from the published tide tables.

High/Low Tide Prediction Data Listing

Station Name: TACOMA NARROWS BRIDGE, WA
Action: Daily
Product: Tide Predictions
Start Date & Time: 2023/10/10 12:00 AM
End Date & Time: 2023/10/10 11:59 PM

Source: NOAA/NOS/CO-OPS
Prediction Type: Subordinate
Datum: MLLW
Height Units: Feet
Time Zone: LST/LDT

Date	Day	Time	Hgt	Time	Hgt	Time	Hgt	Time	Hgt
2023/10/10	Tue	03:01 AM	9.05 H	09:11 AM	1.78 L	4:32 PM	11.97 H	10:41 PM	4.33 L

NPDES Storm
Chain of Custody

Jar Cert # 2305030-01 Outfall: 237B Date/Time sampler installed: 10/6/23 @ 14:53

Jar Cert # ______ Sampling Crew: CA, SG

Filter lot # 1376827 Weather conditions: Clear Date/Time sampler pickup: 10/11/23 @ 10:24

Observed activities in area: N/A

Observations during sampler collection: N/A

Color, Odors, sheens: N/A

Type of Sample: ☑ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☑ >0.2 inches rain ☐ <0.02 inches of rain previous 24 hours

Samplers: ☑ Data downloaded ☑ Ice Present at pick-up ☑ Caps on containers ☒ Sample bottles marked ☒ Tubing Decon 1000mL Di water

Fill to...	Parameters:	Sample	QC
Neck	PAH's/Phthalates (1L) +	☑	☐ ☐
No head	[1]Total Mercury (125/250mL QC)	☑	☑
No head	[1]Diss Mercury (125/250mL QC)	☑	☑
Shoulder	Total Metals (250mL)	☑	
Shoulder	Diss Metals (125mL)	☑	
Shoulder	TSS (1L), (500 mL min)	☐	
Shoulder	Nutrients (250mL)	☐	
Shoulder	Ortho-P (125mL), (75min)	☐	
Shoulder	BOD (1L)	☐	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☐	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes 4.010 L config above

+1000 mL for QC per bottle, must submit 2 extra bottles

[1]If 250ml bottle used, thenQAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (µS)
1	1000	☐	257.6
2	↓	☐	259.7
3	↓	☑	213.2
4	↓	☑	149.2
5	500	☑	254.9
6		☐	
7		☐	
8		☐	
9		☐	
10		☐	
11		☐	
12		☐	

Total aliquots: 22

Sample Prep

Date/Time: 10/11/23 @ 11:58

Initial: CA, SG

pH: 6.98

COND (µS): 317.8

Lab #:

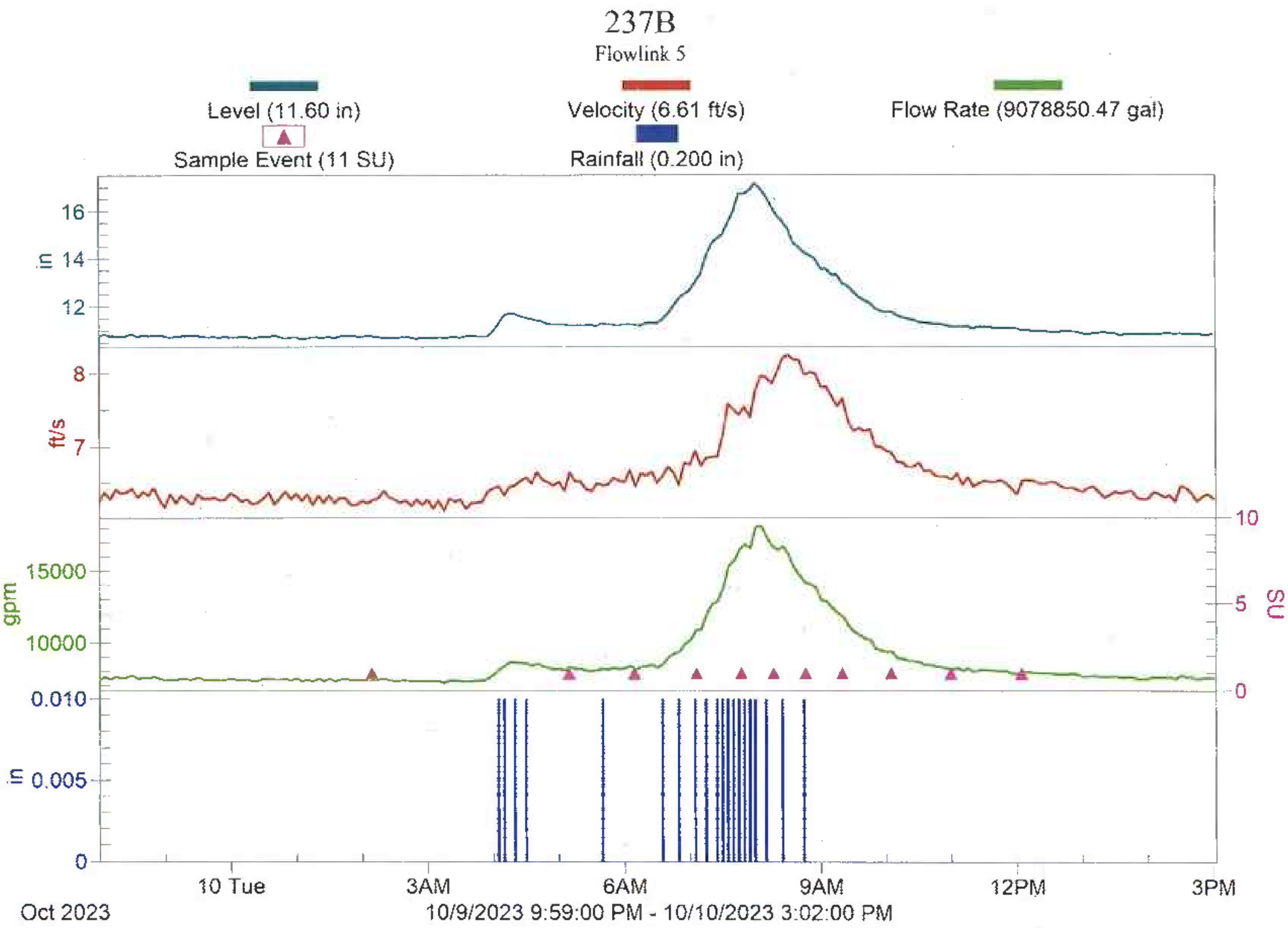
Aliquots composited: 10

Deviations :

Composite End Time: ~~10/10/12:04~~ CA 10/10/23 @ 12:04
(Collect Time) Last aliquot in composite

Relinquished by: [signature] Received by: Terri Torres [signature]

Date/Time: 10/11/23 @ 12:24 Date/Time: 10/11/23 @ 12:30


237B
Flowlink 5
Level (11.60 in)
Velocity (6.61 ft/s)
Flow Rate (9078850.47 gal)
Sample Event (11 SU)
Rainfall (0.200 in)
16
14
12
in
8
7
ft/s
15000
10000
gpm
10
5
0
SU
0.010
0.005
0
in
10 Tue
3AM
6AM
9AM
12PM
3PM
Oct 2023
10/9/2023 9:59:00 PM - 10/10/2023 3:02:00 PM

FIELD REPORT

Project: Thea Foss/Wheeler-Osgood Waterways & NPDES Stormwater Monitoring Program

Event: Storm Event – Oct. 16, 2023

INTRODUCTION

This report summarizes the storm event sampled on 10/15/2023-10/17/2023 by the City of Tacoma Environmental Services Collection System Support staff as part of our stormwater monitoring program. This report includes a summary of the following:

- Storm characteristics and criteria;
- Sampling activities;
- Flow characteristics at each sampling location;
- Pacing – set for a .81" event, actual event was .57"

This event met the sampling criteria for precipitation as specified in the Thea Foss Sampling and Analysis Plan (SAP).

DESCRIPTION OF SAMPLING ACTIVITES

Samplers placed in the field on 10/15/2023. During sampler installation the weather conditions were overcast. All samplers were retrieved on 10/17/23 (For site specific details, see Appendix A for field notes, Chain of Custody (COC) forms, and event hydrographs).

The following unusual observations were noted during the sampling event:

Table 2: Composite Sampling Activities

Sample Location	Site Deployed	Sample Accepted	Pacing (gal)	Enables LVL(ft), VEL(fps)	Comments
Outfall 230A	Yes	No	20 min	> 3000gpm	14 Aliquots Collected / 0 Composited
Outfall 235	Yes	Yes	54,000	LVL > 4.0 VEL > 0.80	12 Aliquots Collected / 12 Composited
Outfall 237ANew	Yes	Yes	583,000	LVL > 4.0 VEL > 0.70	12 Aliquots Collected / 12 Composited
Outfall 237B	Yes	Yes	495,000	LVL > 4.0	32 Aliquots Collected / 28 Composited
Outfall 243	Yes	No	20 min	<5.0 ms/cm	48 Aliquots Collected / 0 Composited
Outfall 245	Yes	Yes	20 min.	> 200gpm	29 Aliquots Collected / 29 Composited
Outfall 254	Yes	Yes	20 min.	<6.5 ms/cm	48 Aliquots Collected / 48 Composited

**QC, QUALITY CONTROL*
ND, NO DATA
NA, NOT APPLICABLE

WATER QUALITY DATA

Accepted samples were analyzed for the target parameters specified in the SAP and QAPP. Samples accepted at all Outfalls were composited and preserved within 24 hours of the last aliquot being collected. The samples were allowed to sit for a minimum of 18 hours before metals analysis was started.

EQUIPMENT INFORMATION

Samples were collected using ISCO 6712 portable auto samplers. Rain data was collected using an ISCO 674 rain gauge located at the Center for Urban Waters at 326 East D Street, Tacoma, WA 98421.

CORRECTIVE ACTIONS AND DEVIATIONS

There were no deviations from the field procedures as discussed in the SAP other than those discussed above/below. No other criteria or procedures as indicated in the SAP were compromised except for those discussed above/below. Due to a software error, no Isco sample reports were saved for this event.

Enclosures: The ISCO program setting/sampling results report, the sample collection chain of custody form, and field records are in Appendix A for each outfall. This includes the following information for the samples collected:

- Plot of flow hydrograph and hyetograph
- Subsample times and conductivities
- Tidal windows
- Field activities

Appendix A

Site
254
245
243
237
237
237
230
235
Rou

ISC
Stai
Fiel
Trip
Amb
Blan
filte
Dup
Sam
Peri
Rair
Rair
Spa
Sam
Ante
Inte
% o
2 - S

Storm Deployment 10/13/23 .2'

254 @ 8:58 am Deployment, Base, Ice. Batt 75%

245 @ 10:17 Deployment, Base, Ice (Changed to 10 mins) Batt 100%

243 @ 9:00 Deployed, Base, Ice 75% - (Changed Conds to 79.0)

237B @ 9:13 Deployed, Base, Ice 100%

237A @ 9:15 Deployed, Base, Ice 100%

235 @ 9:25 Deployed (45,000 pulses) Base, Ice, Batt 75%

230 @ 9:30 Deployed (Changed to 10 min) Base, Ice, New Batt 100%

Storm Deployment 10/15/23 .81"

254 @ 8:30 - Jars/Ice -
245 @ 8:45 - Jars/Ice -
243 @ 9:00 - Jars/Ice -
237A @ 9:15 - Jars/Ice - 583,000
237B @ 9:30 - Jars/Ice - 495,000 - Level 11
235 @ 9:45 - Jars/Ice - 54,000
230A @ 10:00 - Jars/Ice - Battery Replaced

Continued on Page

Read and Understood By

Signed Date Signed Date

10/16/23 - Grabs

254 @ 10:05
245 @ 10:24
243 @ 10:35
237A @ 10:50
237B @ 10:42
235 @ 11:02
230A @ 11:13
222 @ 10:05
Dx QC @ 10:05

10/17/23 - Storm Collection

254 @ 9:47 - 12/12 -
245 @ 10:04 - ~~12/12~~ - 7 1/4/12
243 @ 10:12 - 12/12 -
237A @ 10:21 - 3/12 -
237B @ 10:28 - 8/12
235 @ 10:41 - 3/12
230A @ 10:53 - 3/12

10/23/23 - Pendleton .77

254 1:58 - Jars, Ice, Battery 75% - 1:58
245 2:00 Jars, Ice, Battery 75%
243 2:05 Jars, Ice, Battery Replaced 100% - Set Below 4840 Hts
237A 2:10 - 551,123 Pacing Jars, Ice, Battery 100% - Reset modem
237B 2:16 469,659 Pacing Jars, Ice, Battery 100% -
235 2:11 51,487 Pacing Jars, Ice, Battery Replaced 100%
230A 2:22 - ~~[illegible]~~ Pacing Jars, Ice, Replaced Modem Battery
>3000 gpm

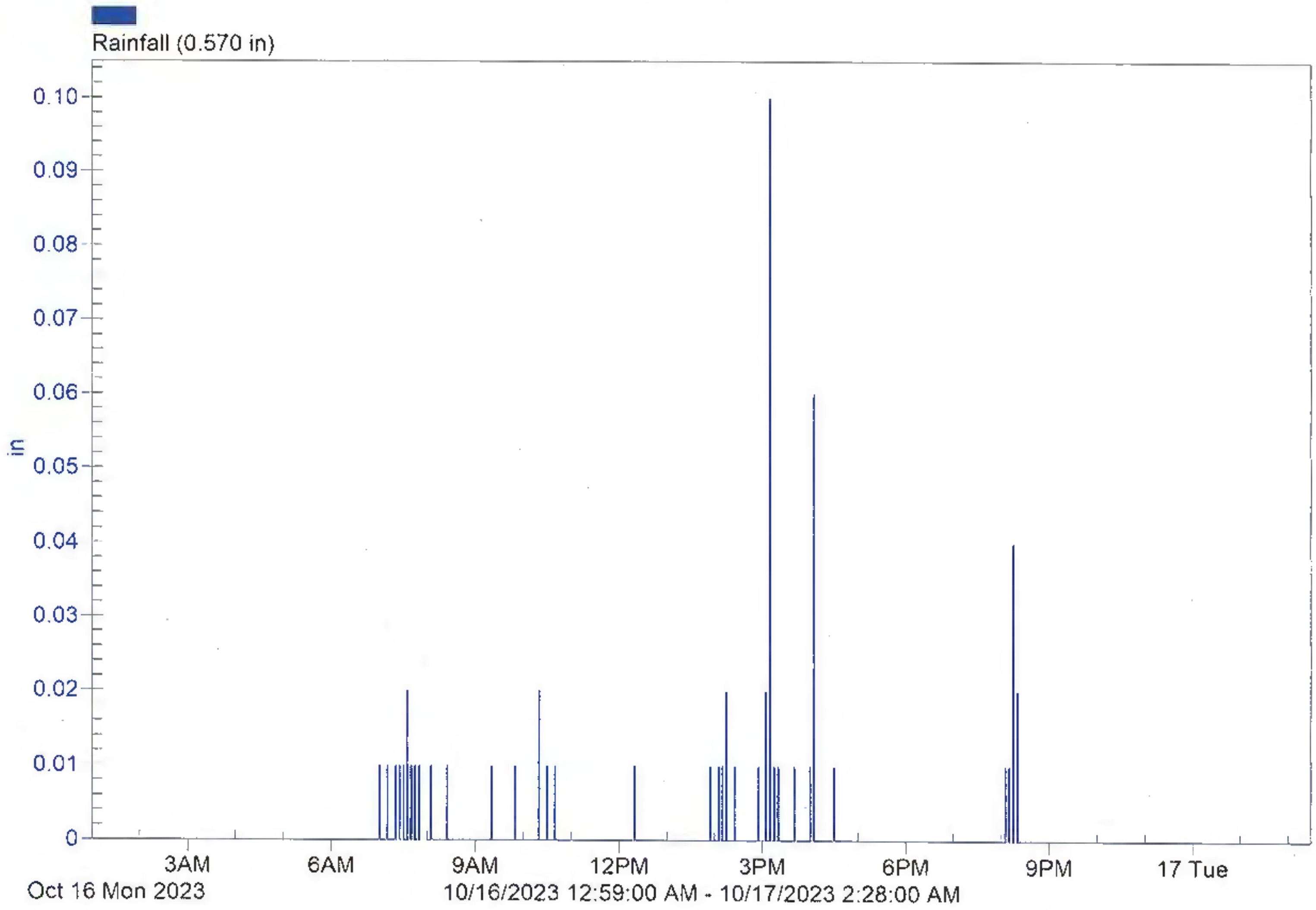
Continued on Page

Read and Understood By

Signed Date Signed Date

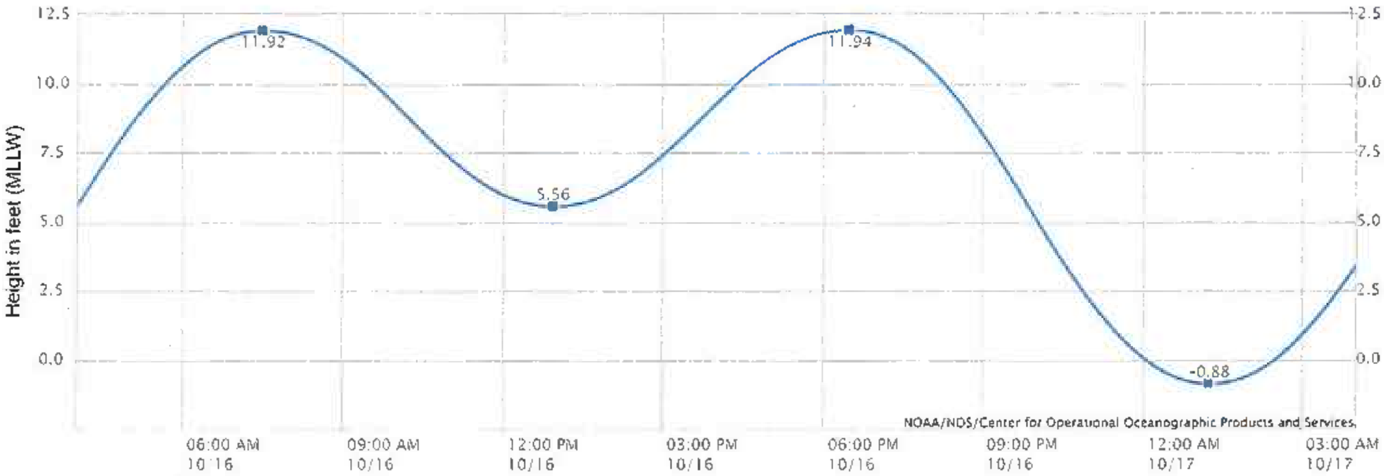
RF1

Flowlink 5



Help Print

NOAA/NOS/CO-OPS
Tide Predictions at 9446486, TACOMA NARROWS BRIDGE WA
From 2023/10/16 12:00 AM LST/LDT to 2023/10/17 11:59 PM LST/LDT
Subordinate Station | Ref. Station (Seattle 9447130) | Time offsets (high: 28 min. low: 23 min.) | Height offsets (high: *1.11 ft. low: *1.02 ft.)



Note: The interval is High/Low, the solid blue line depicts a curve fit between the high and low values and approximates the segments between.
Disclaimer: These data are based upon the latest information available as of the date of your request, and may differ from the published tide tables.

High/Low Tide Prediction Data Listing

Station Name: TACOMA NARROWS BRIDGE, WA
Action: Daily
Product: Tide Predictions
Start Date & Time: 2023/10/16 12:00 AM
End Date & Time: 2023/10/17 11:59 PM

Source: NOAA/NOS/CO-OPS
Prediction Type: Subordinate
Datum: MLLW
Height Units: Feet
Time Zone: LST/LDT

Date	Day	Time	Hgt	Time	Hgt	Time	Hgt	Time	Hgt
2023/10/16	Mon	12:41 AM	-0.19 L	07:29 AM	11.92 H	12:56 PM	5.56 L	6:28 PM	11.94 H
2023/10/17	Tue	01:14 AM	-0.88 L	08:14 AM	12.19 H	1:36 PM	6.44 L	6:53 PM	11.72 H

2303030-01

Bottle Certification
Bottle Certification
*** DEFAULT CONTAINER ***

NPDES Storm
Chain of Custody

Jar Cert #

Outfall: ~~254~~ SG 235

Date/Time sampler installed: 10/15/23 @ ~~8:30~~ SG 9:45

Jar Cert #

Sampling Crew: CA, SG

Filter lot # 1376827

Weather conditions: Cloudy

Date/Time sampler pickup: 10/17/23 @ ~~9:??~~ SG 10:41

Observed activities in area: N/A

Observations during sampler collection: N/A

Color, Odors, sheens: N/A

Type of Sample: ☒ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☒ >0.2 inches rain ☐ <0.02 inches of rain previous 24 hours

Samplers: ☒ Data downloaded ☒ Ice Present at pick-up ☒ Caps on containers ☒ Sample bottles marked ☐ Tubing Decon 1000mL Di water

Fill to...	Parameters:	Sample	QC
Neck	PAH's/Phthalates (1L) +	☒	☐ ☐
No head	[1]Total Mercury (125/250mL QC)	☒	☐
No head	[1]Diss Mercury (125/250mL QC)	☒	☐
Shoulder	Total Metals (250mL)	☒	
Shoulder	Diss Metals (125mL)	☒	
Shoulder	TSS (1L), (500 mL min)	☒	
Shoulder	Nutrients (250mL)	☐	
Shoulder	Ortho-P (125mL), (75min)	☐	
Shoulder	BOD (1L)	☐	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☐	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes 4.010 L config above
+1000 mL for QC per bottle, must submit 2 extra bottles
[1]If 250ml bottle used, thenQAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (µS)
1	1000	☒	70
2	↓	☒	74.1
3		☒	55.2
4		☐	
5		☐	
6		☐	
7		☐	
8		☐	
9		☐	
10		☐	
11		☐	
12		☐	

Total aliquots: 12

Sample Prep

Date/Time: 10/17/23 @ 14:12

Initial: SG, CA

pH: 7.32

COND (µS): 65.84

Lab #: 2310032

Aliquots composited: 12

Deviations :

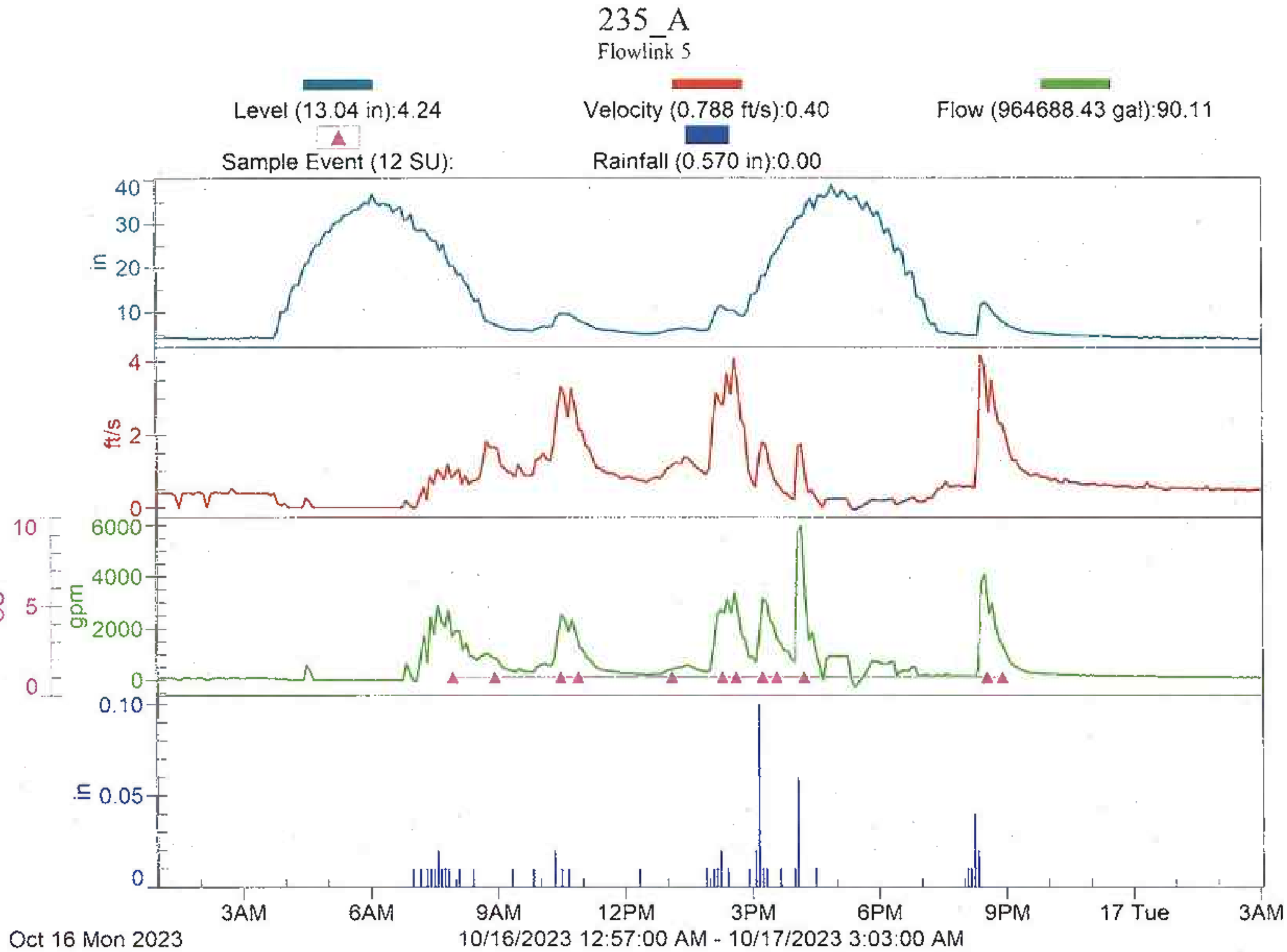
Composite End Time: 10/16/23 @ 22:30
(Collect Time) Last aliquot in composite

Relinquished by: [signature]

Date/Time: 10/17/23 @ 14:25

Received by: Cooler

Date/Time: 10/17/23 @ 14:25



235_A
Flowlink 5
Level (13.04 in):4.24
Velocity (0.788 ft/s):0.40
Flow (964688.43 gal):90.11
Sample Event (12 SU):
Rainfall (0.570 in):0.00
in
40
30
20
10
ft/s
4
2
0
SU
10
5
0
gpm
6000
4000
2000
0
0.10
0.05
0
3AM
6AM
9AM
12PM
3PM
6PM
9PM
17 Tue
3AM
Oct 16 Mon 2023
10/16/2023 12:57:00 AM - 10/17/2023 3:03:00 AM

2305030-01

Bottle Certification
Bottle Certification
*** DEFAULT CONTAINER ***

NPDES Storm
Chain of Custody

Jar Cert #________ Outfall: 237A New Date/Time sampler installed: 10/15/23 @ 9:15

Jar Cert #________ Sampling Crew: CA, SG

Filter lot # 1367811 Weather conditions: Cloudy Date/Time sampler pickup: 10/17/23 @ 10:21

Observed activities in area: N/A

Observations during sampler collection: N/A

Color, Odors, sheens: N/A

Type of Sample: ☒ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☒ >0.2 inches rain ☐ <0.02 inches of rain previous 24 hours

Samplers: ☒ Data downloaded ☒ Sample bottles marked
☒ Ice Present at pick-up ☐ Tubing Decon 1000mL Di water
☒ Caps on containers

Fill to...	Parameters:	Sample	QC
Neck	PAH's/Phthalates (1L) +	☒	☐ ☐
No head	[1]Total Mercury (125/250mL QC)	☒	☐
No head	[1]Diss Mercury (125/250mL QC)	☒	☐
Shoulder	Total Metals (250mL)	☒	
Shoulder	Diss Metals (125mL)	☒	
Shoulder	TSS (1L), (500 mL min)	☒	
Shoulder	Nutrients (250mL)	☒	
Shoulder	Ortho-P (125mL), (75min)	☒	
Shoulder	BOD (1L)	☐	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☐	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes 4.010 L config above
+1000 mL for QC per bottle, must submit 2 extra bottles
[1]If 250ml bottle used, thenQAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (µS)
1	1000	☒	117.2
2	↓	☒	44.9
3		☒	150.9
4		☐	
5		☐	
6		☐	
7		☐	
8		☐	
9		☐	
10		☐	
11		☐	
12		☐	

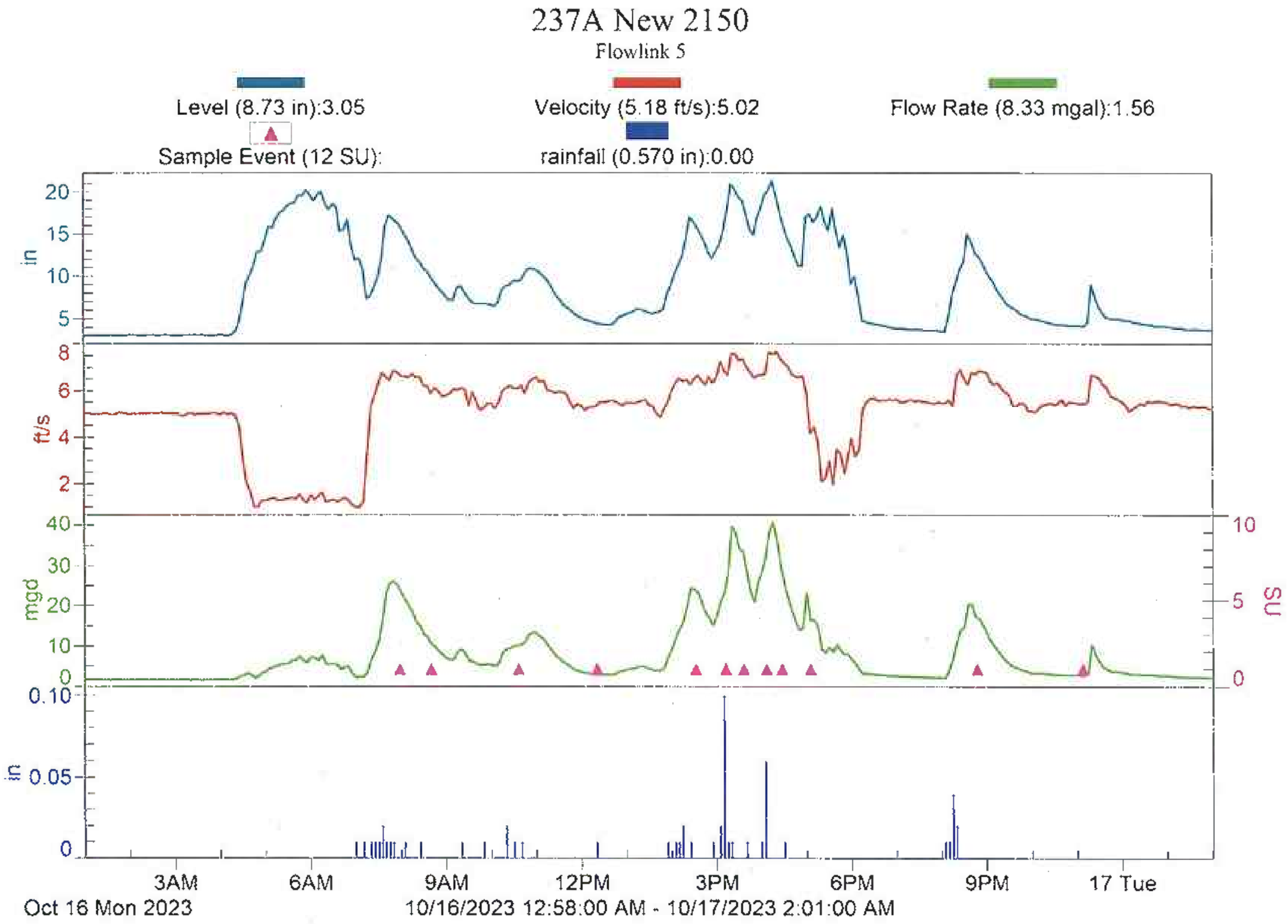
Total aliquots: 12

Sample Prep
Date/Time: 10/17/23 @1250
Initial: SG, CA, SS
pH: 7.21
COND (µS): 107
Lab #: 2310032
Aliquots composited: 12

Deviations: Low volume

Composite End Time: 10/16/23 @ 23:07
(Collect Time) Last aliquot in composite

Relinquished by: [signature] Received by: Cooler
Date/Time: 10/17/23 @ 14:25 Date/Time: 10/17/23 @ 14:25


237A New 2150
Flowlink 5
Level (8.73 in):3.05
Velocity (5.18 ft/s):5.02
Flow Rate (8.33 mgal):1.56
Sample Event (12 SU):
rainfall (0.570 in):0.00
in
ft/s
mgd
SU
3AM
6AM
9AM
12PM
3PM
6PM
9PM
17 Tue
Oct 16 Mon 2023
10/16/2023 12:58:00 AM - 10/17/2023 2:01:00 AM

2305030-01

Bottle Certification
Bottle Certification
*** DEFAULT CONTAINER ***

NPDES Storm
Chain of Custody

Jar Cert #______ Outfall: 237B Date/Time sampler installed: 10/15/23 @ 9:30

Jar Cert #______ Sampling Crew: CA, SG

Filter lot # 136711 Weather conditions: Cloudy Date/Time sampler pickup: 10/17/23 @ 10:28

Observed activities in area: N/A

Observations during sampler collection: N/A

Color, Odors, sheens: N/A

Type of Sample: ☒ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☒ >0.2 inches rain ☐ <0.02 inches of rain previous 24 hours

Samplers: ☒ Data downloaded ☒ Sample bottles marked
☒ Ice Present at pick-up ☐ Tubing Decon 1000mL Di water
☒ Caps on containers

Fill to...	Parameters:	Sample	QC
Neck	PAH's/Phthalates (1L) +	☒	☒ ☒
No head	[1]Total Mercury (125/250mL QC)	☒	☐
No head	[1]Diss Mercury (125/250mL QC)	☒	☐
Shoulder	Total Metals (250mL)	☒	
Shoulder	Diss Metals (125mL)	☒	
Shoulder	TSS (1L), (500 mL min)	☒	
Shoulder	Nutrients (250mL)	☒	
Shoulder	Ortho-P (125mL), (75min)	☒	
Shoulder	BOD (1L)	☒	
	Conventionals (500mL) =		
Neck	turbidity, surf., chl.	☐	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes 4.010 L config above
+1000 mL for QC per bottle, must submit 2 extra bottles
[1]If 250ml bottle used, thenQAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (µS)
1	1000	☒	149.5
2	↓	☒	152.7
3		☒	175.7
4		☒	63.1
5		☒	85.1
6		☒	207.7
7		☒	219.4
8		☐	273.8
9		☐	
10		☐	
11		☐	
12		☐	

Total aliquots: 32

Sample Prep

Date/Time: 10/17/23 @ ~~[illegible]~~ 14:10

Initial: SG, CA

pH: 6.84

COND (µS): 149.5

Lab #: 2310032

Aliquots composited: 28

Deviations: Jar 8 taken after storm → not included

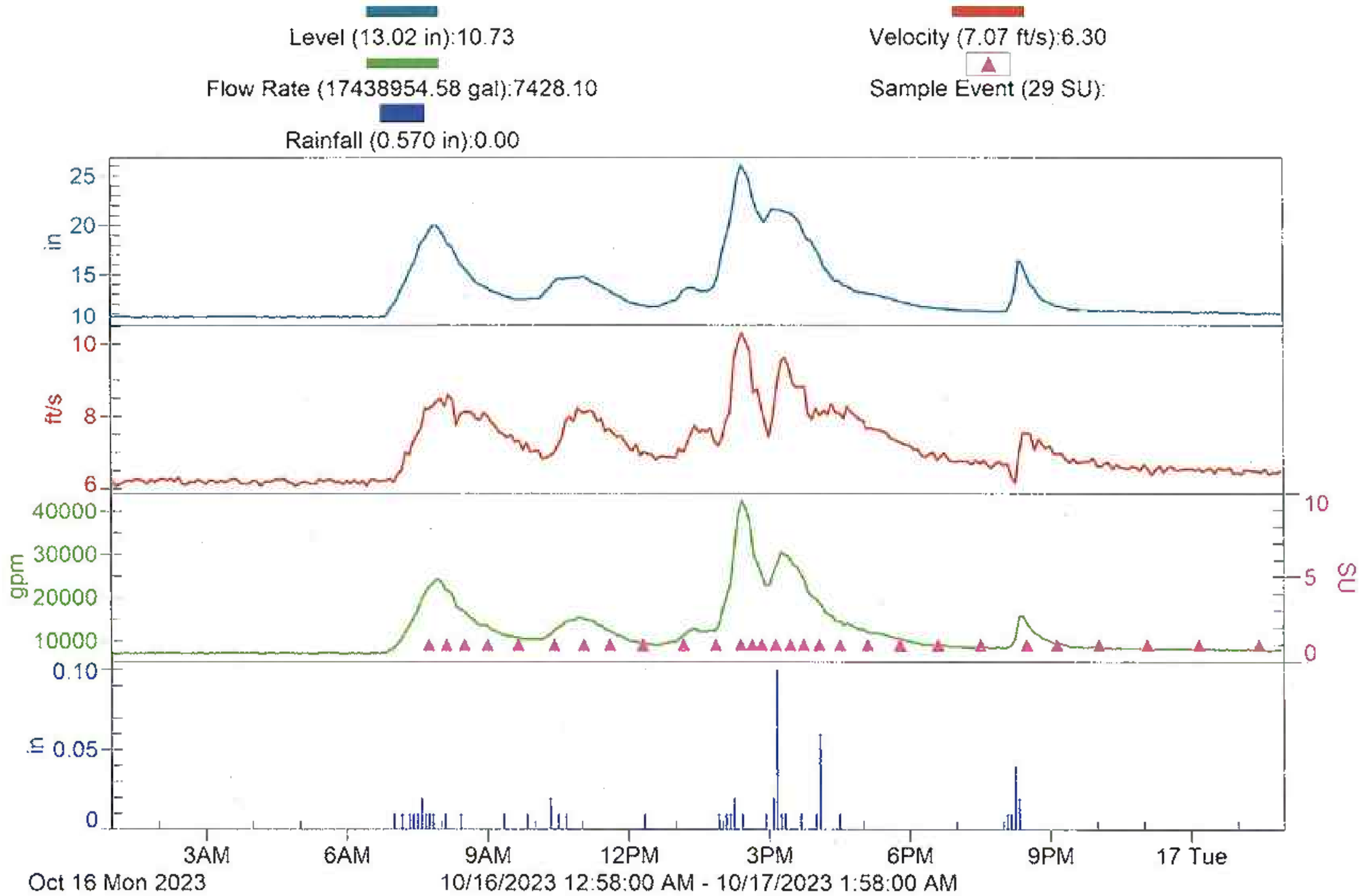
Composite End Time: 10/16/23 @ 23:03
(Collect Time) Last aliquot in composite

Relinquished by: [signature] Received by: Cooler

Date/Time: 10/17/23 @ 14:25 Date/Time: 10/17/23 @ 14:25

237B

Flowlink 5



2303057-01

Bottle Certification

Bottle Certification

*** DEFAULT CONTAINER ****

NPDES Storm

Chain of Custody

Jar Cert #:

Outfall: ~~257~~ 245

Date/Time sampler installed: 10/15/23 @ 8:45

Sampling Crew: CA, SG

Filter lot # 1367811

Weather conditions: Cloudy

Date/Time sampler pickup: 10/17/23 @ 10:04

Observed activities in area: N/A

Observations during sampler collection: N/A

Color, Odors, sheens: N/A

Type of Sample: ☒ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☒ >0.2 inches rain ☐ <0.02 inches of rain previous 24 hours

Samplers: ☒ Data downloaded ☒ Sample bottles marked
☒ Ice Present at pick-up ☐ Tubing Decon 1000mL Di water
☒ Caps on containers

Fill to...	Parameters:	Sample	QC
Neck	PAH's/Phthalates (1L) +	☒	☐ ☐
No head	¹Total Mercury (125/250mL QC)	☒	☒
No head	¹Diss Mercury (125/250mL QC)	☒	☒
Shoulder	Total Metals (250mL)	☒	
Shoulder	Diss Metals (125mL)	☒	
Shoulder	TSS (1L), (500 mL min)	☒	
Shoulder	Nutrients (250mL)	☒	
Shoulder	Ortho-P (125mL), (75min)	☒	
Shoulder	BOD (1L)	☒	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☒	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes 4.010 L config above
+1000 mL for QC per bottle, must submit 2 extra bottles
¹If 250ml bottle used, thenQAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (uS)
1	1000	☒	14700
2		☒	11170
3		☒	738
4		☒	426
5		☒	55.6
6		☒	113.9
7		☒	244.1
8	250	☒	486
9		☐	
10		☐	
11		☐	
12		☐	

Total aliquots: 29

Sample Prep

Date/Time: 10/17/23 @ 1150

Initial: SG, CA, SS

pH: ~~6.18~~ 6.70 SS

COND (µS): 2,840

Lab #: 2310032

Aliquots composited: 29

Deviations :

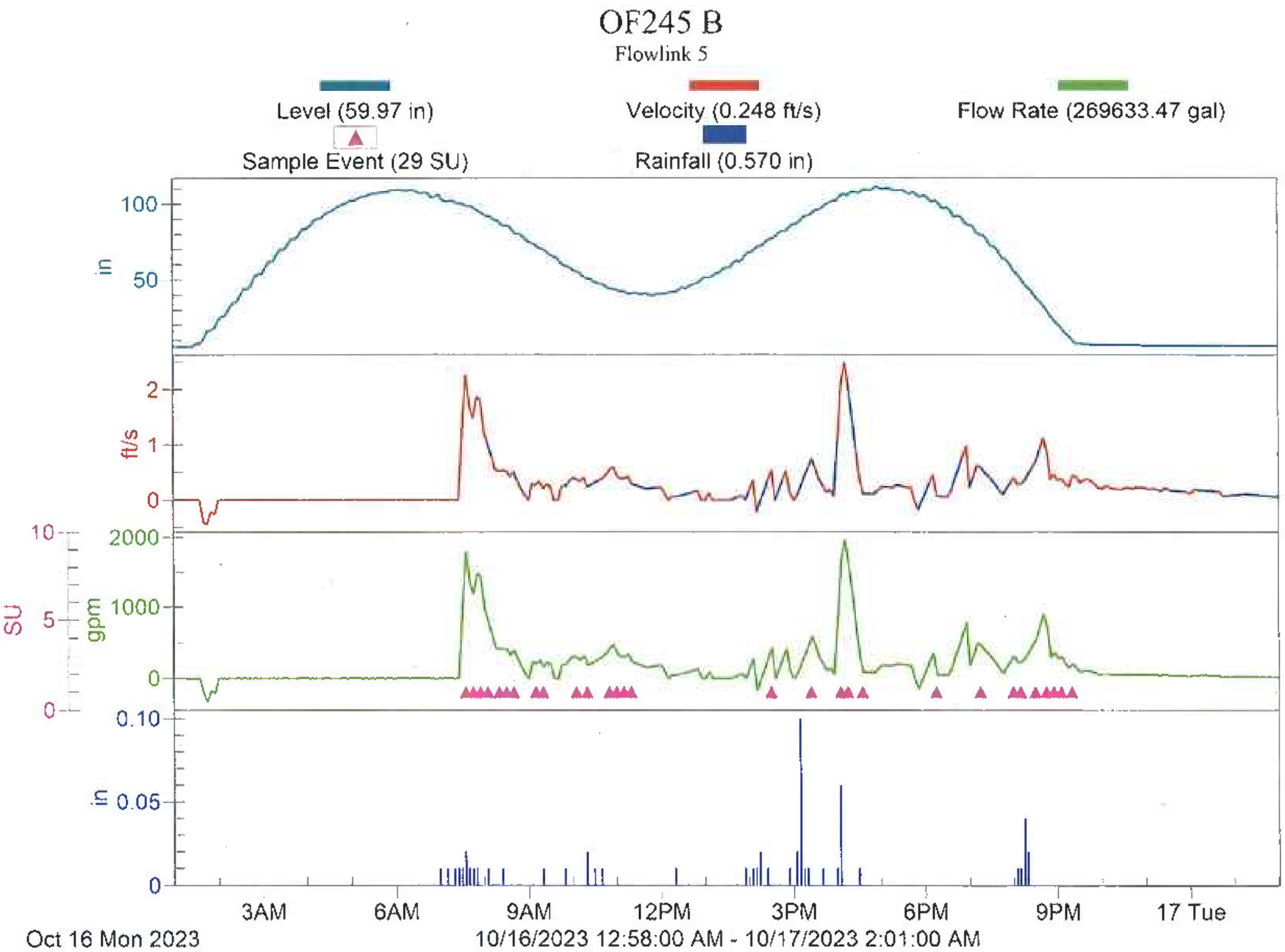
Composite End Time: 10/16/23 @ 21:20
(Collect Time) Last aliquot in composite

Relinquished by: [signature]

Date/Time: 10/17/23 @ 14:25

Received by: Coden

Date/Time: 10/17/23 @ 14:25



OF245 B
Flowlink 5
Level (59.97 in)
Velocity (0.248 ft/s)
Flow Rate (269633.47 gal)
Sample Event (29 SU)
Rainfall (0.570 in)
100
50
in
2
1
0
ft/s
10
5
0
SU
2000
1000
0
gpm
0.10
0.05
0
in
3AM
6AM
9AM
12PM
3PM
6PM
9PM
17 Tue
Oct 16 Mon 2023
10/16/2023 12:58:00 AM - 10/17/2023 2:01:00 AM

2309069-01

Bottle Certification

Bottle Certification

*** DEFAULT CONTAINER ***

NPDES Storm
Chain of Custody

Outfall: ~~245~~ 254

Date/Time sampler installed: 10/15/23 @ ~~8:45~~ 8:30

Jar Cert #

Sampling Crew: CA, SG

Filter lot # 1367811

Weather conditions: Cloudy

Date/Time sampler pickup: 10/17/23 @ ~~10:04~~ 9:47

Observed activities in area: N/A

Observations during sampler collection: N/A

Color, Odors, sheens: N/A

Type of Sample: ☒ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☒ >0.2 inches rain ☐ <0.02 inches of rain previous 24 hours

Samplers: ☒ Data downloaded ☐ Sample bottles marked

☒ Ice Present at pick-up ☐ Tubing Decon 1000mL DI water

☒ Caps on containers

Fill to...	Parameters:	Sample	QC
Neck	PAH's/Phthalates (1L) +	☒	☐ ☐
No head	[1]Total Mercury (125/250mL QC)	☒	☐
No head	[1]Diss Mercury (125/250mL QC)	☒	☐
Shoulder	Total Metals (250mL)	☒	
Shoulder	Diss Metals (125mL)	☒	
Shoulder	TSS (1L), (500 mL min)	☒	
Shoulder	Nutrients (250mL)	☒	
Shoulder	Ortho-P (125mL), (75min)	☒	
Shoulder	BOD (1L)	☒	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☒	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes 4.010 L config above

+1000 mL for QC per bottle, must submit 2 extra bottles

[1]If 250ml bottle used, thenQAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (µS)
1	1000	☒	15100
2		☒	15710
3		☒	18130
4		☒	6850
5		☒	6240
6		☒	5480
7		☒	10230
8		☒	12240
9		☒	13220
10		☒	13320
11		☒	13340
12		☒	13330

Total aliquots: 48

Sample Prep

Date/Time: 10/17/23 @1240

Initial: SG, CA, SS

pH: 6.90

COND (µS): 11,700

Lab #: 2310032

Aliquots composited: 48

Deviations :

Composite End Time: ~~1:0~~ 10/17/23@1:20

(Collect Time) Last aliquot in composite

Relinquished by: [signature]

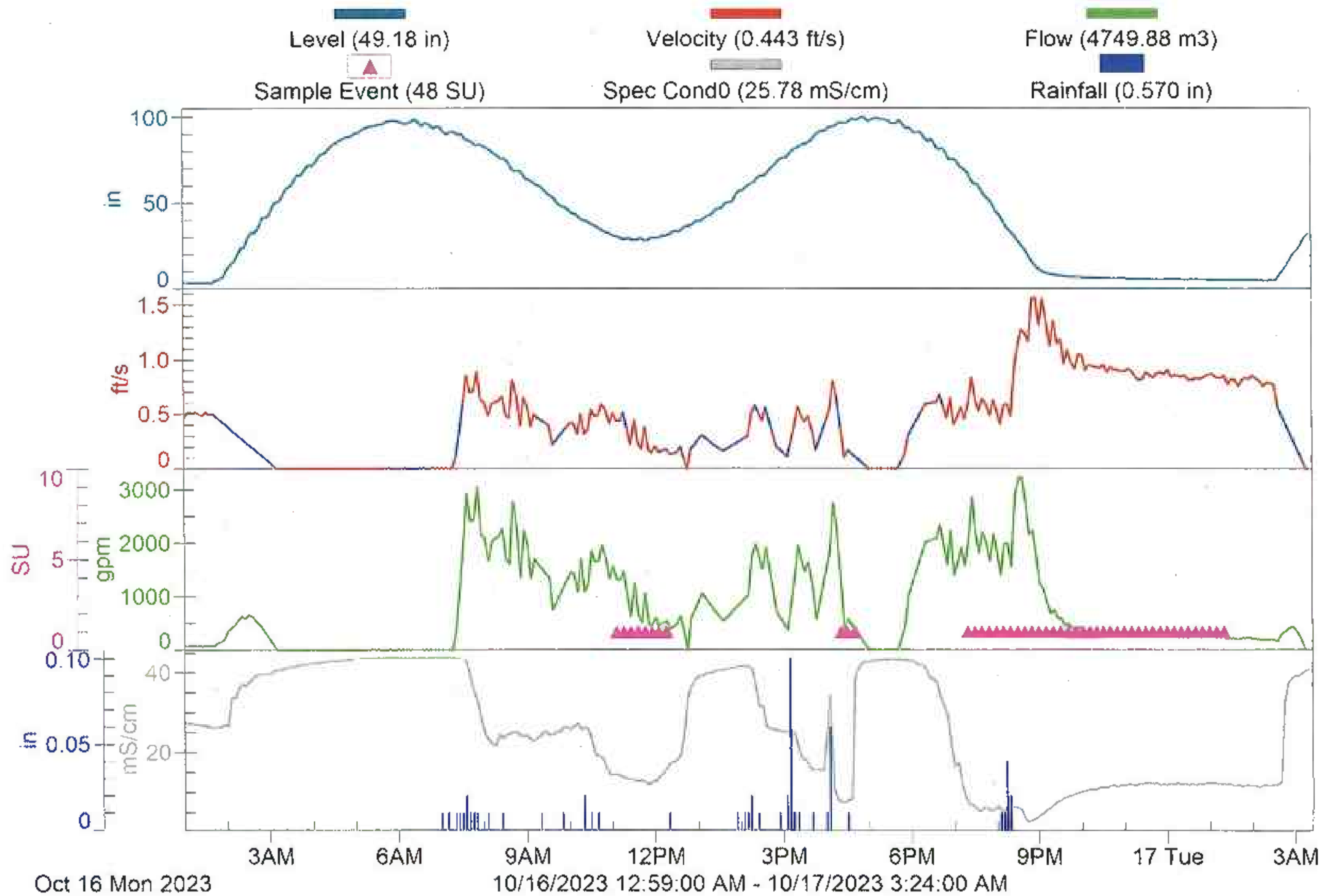
Received by: Cooler

Date/Time: 10/17/23 @ 14:25

Date/Time: 10/17/23 @ 14:25

254-

Flowlink 5



FIELD REPORT

Project: Thea Foss/Wheeler-Osgood Waterways & NPDES Stormwater Monitoring Program

Event: Storm Event – Oct. 24, 2023

INTRODUCTION

This report summarizes the storm event sampled on 10/23/2023-10/26/2023 by the City of Tacoma Environmental Services Collection System Support staff as part of our stormwater monitoring program. This report includes a summary of the following:

- Storm characteristics and criteria;
- Sampling activities;
- Flow characteristics at each sampling location;
- Pacing – set for a .77" event, actual event was .66"

This event met the sampling criteria for precipitation as specified in the Thea Foss Sampling and Analysis Plan (SAP).

DESCRIPTION OF SAMPLING ACTIVITES

Samplers placed in the field on 10/23/2023. During sampler installation the weather conditions were overcast. All samplers were retrieved on 10/26/23 (For site specific details, see Appendix A for field notes, Chain of Custody (COC) forms, and event hydrographs).

The following unusual observations were noted during the sampling event:

Table 2: Composite Sampling Activities

Sample Location	Site Deployed	Sample Accepted	Pacing (gal)	Enables LVL(ft), VEL(fps)	Comments
Outfall 230A	Yes	No	10 min	>3000gpm	4 Aliquots Collected / 0 Composited
Outfall 235	Yes	Yes	51,400	LVL > .370 VEL > 0.80	20 Aliquots Collected / 20 Composited
Outfall 237ANew	Yes	No	551,123	LVL > 0.6 VEL > 0.33	0 Aliquots Collected / 0 Composited N/A
Outfall 237B	Yes	Yes	469,659	LVL > 4.0	39 Aliquots Collected / 39 Composited
Outfall 243	Yes	Yes	10 min.	< 4.0 mS/cm	48 Aliquots Collected / 44 Composited
Outfall 245	Yes	Yes	10 min.	> 200gpm	33 Aliquots Collected / 28 Composited
Outfall 254	Yes	Yes	15 min.	< 14.5 mS/cm	48 Aliquots Collected / 48 Composited
Outfall 222*	Yes	Yes	N/A	N/A	48 Aliquots Collected / 48 Composited

**QC, QUALITY CONTROL*

ND, NO DATA

NA, NOT APPLICABLE

WATER QUALITY DATA

Accepted samples were analyzed for the target parameters specified in the SAP and QAPP. Samples accepted at all Outfalls were composited and preserved within 24 hours of the last aliquot being collected. The samples were allowed to sit for a minimum of 18 hours before metals analysis was started.

EQUIPMENT INFORMATION

Samples were collected using ISCO 6712 portable auto samplers. Rain data was collected using an ISCO 674 rain gauge located at the Center for Urban Waters at 326 East D Street, Tacoma, WA 98421.

CORRECTIVE ACTIONS AND DEVIATIONS

There were no deviations from the field procedures as discussed in the SAP other than those discussed above/below. Site 254 Isco sampler produced no sample report for this event. No other criteria or procedures as indicated in the SAP were compromised except for those discussed above/below.

Enclosures: The ISCO program setting/sampling results report, the sample collection chain of custody form, and field records are in Appendix A for each outfall. This includes the following information for the samples collected:

- Plot of flow hydrograph and hyetograph
- Subsample times and conductivities
- Tidal windows
- Field activities

Appendix A

PROJECT ____________________

10/16/23 - Grabs

254 @ 10:05
245 @ 10:24
243 @ 10:35
237A @ 10:50
237B @ 10:42
235 @ 11:02
230A @ 11:13
222 @ 10:05
Dx QC @ 10:05

10/17/23 - Storm Collection

254 @ 9:47 - 12/12 -
245 @ 10:04 - ~~[illegible]~~ - 7 1/4/12
243 @ 10:12 - 12/12 -
237A @ 10:21 - 3/12 -
237B @ 10:28 - 8/12
235 @ 10:41 - 3/12
230A @ 10:53 - 3/1/2

10/23/23 - Pendleton .77

254 1:58 - Jars, Ice, Battery 75% - 1:58
245 2:00 Jars, Ice, Battery 75%
243 2:05 Jars, Ice, Battery Replaced 100% - Set Below 4000 ms
237A 2:10 - 551,123 Pacing Jars, Ice, Battery 100% - Reset modem
237B 2:45 - 469,659 Pacing Jars, Ice, Battery 100% -
235 2:11 51,487 Pacing Jars, Ice, Battery Replaced 100%
230A 2:22 - ~~80,147~~ Pacing Jar, Ice, Replaced Marine Battery.
>3000 gpm

Continued on Page

Read and Understood By

Signed | Date | Signed | Date

Site
254
245
243
237
237
237
230
235
Rou

ISC
Stai
Fiel
Trip
Amb
Blan
filte

Dup
Sam

Peri
Rai
Rai
Spa
Sam
Ant
Inte
% o
a - S

10/26/23 SG, RG 0.66" Storm Collectio

254 @ 9:45 - 12 Liters Sample collected. Data downloaded
245 @ 9:55 - 8 1/4 Liters Sample collected. Data downloa
243 @ @ 10:05 - 12 Liters Sample collected. Data downloaded
237A New @ 10:10 No samples, programming error
237B @ 10:11 9 3/4 Liters of Sample collected. Data downlo
235 @ 10:20 - 5 Liters of Sample collected. Data downloade
230A @ 10:30 - 1 Liter of Sample - (Not accepted) Data downloade

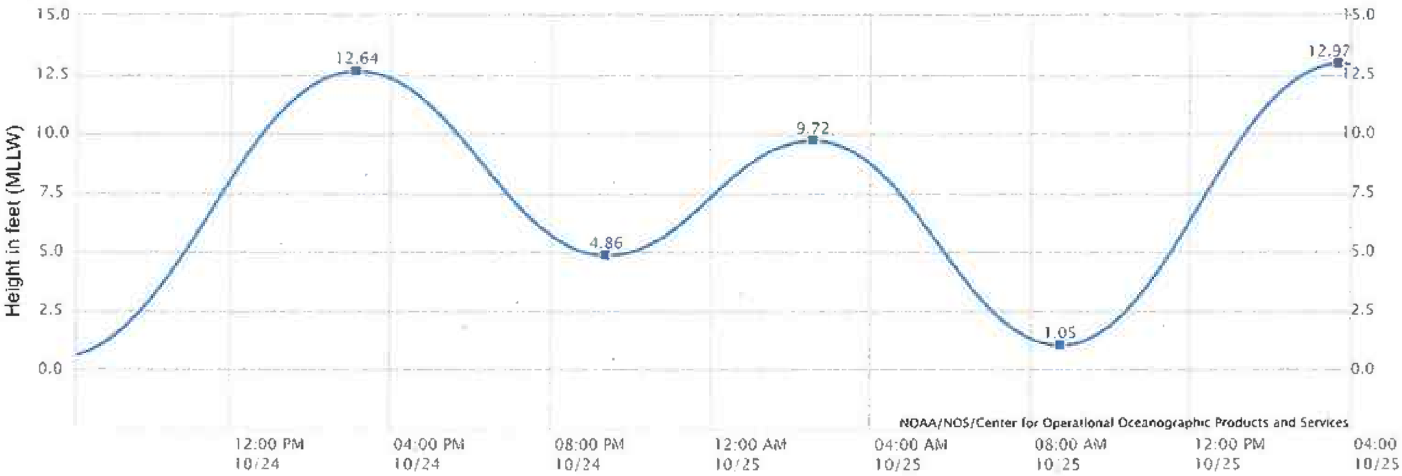
Deployment 1.66
254 - 13:32 - ~~D~~ Replace batt - Ice, Jars.
245 - 13:37 - Ice, Jars, Batt @ 100%
243 - 13:42 Downloaded, Ice, Jars, Batt @ 75%, Pacing Below 2.7
237A New 13:52 - Ice, Jars, Batt 100%
237B - 13:54 - Ice, Jars, Batt 100%
235 - 14:01 - Ice, Jars, Pacing ~~Volley 440~~ 109,000
230A - 14:10 - Ice, Jars, Pacing > 3000 gpm

11/3/23 - Storm Collection
254 @ 9:22 - Download - 7/12 - Tubing Came loose - Tubing
245 @ 9:35 - Download - 1.75/12
243 @ 9:45 - Download - 7.5/12 - Tubing Came loose @ collection
237A @ Re-deploy 9:58 - A1
237B @ 9:59 - A2 - 4.75/12 - Download
235 @ 10:08 - 2.75/12 - Download - A2
230A @ 10:15 - 7/12 - CO - Download

Continued on Page

Help Print

NOAA/NOS/CO-OPS
Tide Predictions at 9446486, TACOMA NARROWS BRIDGE WA
From 2023/10/23 12:00 AM LST/LDT to 2023/10/26 11:59 PM LST/LDT
Subordinate Station | Ref. Station (Seattle 9447130) | Time offsets (high: 28 min. low: 23 min.) | Height offsets (high: *1.11 ft. low: *1.02 ft.)



Note: The interval is High/Low, the solid blue line depicts a curve fit between the high and low values and approximates the segments between.
Disclaimer: These data are based upon the latest information available as of the date of your request, and may differ from the published tide tables.

High/Low Tide Prediction Data Listing

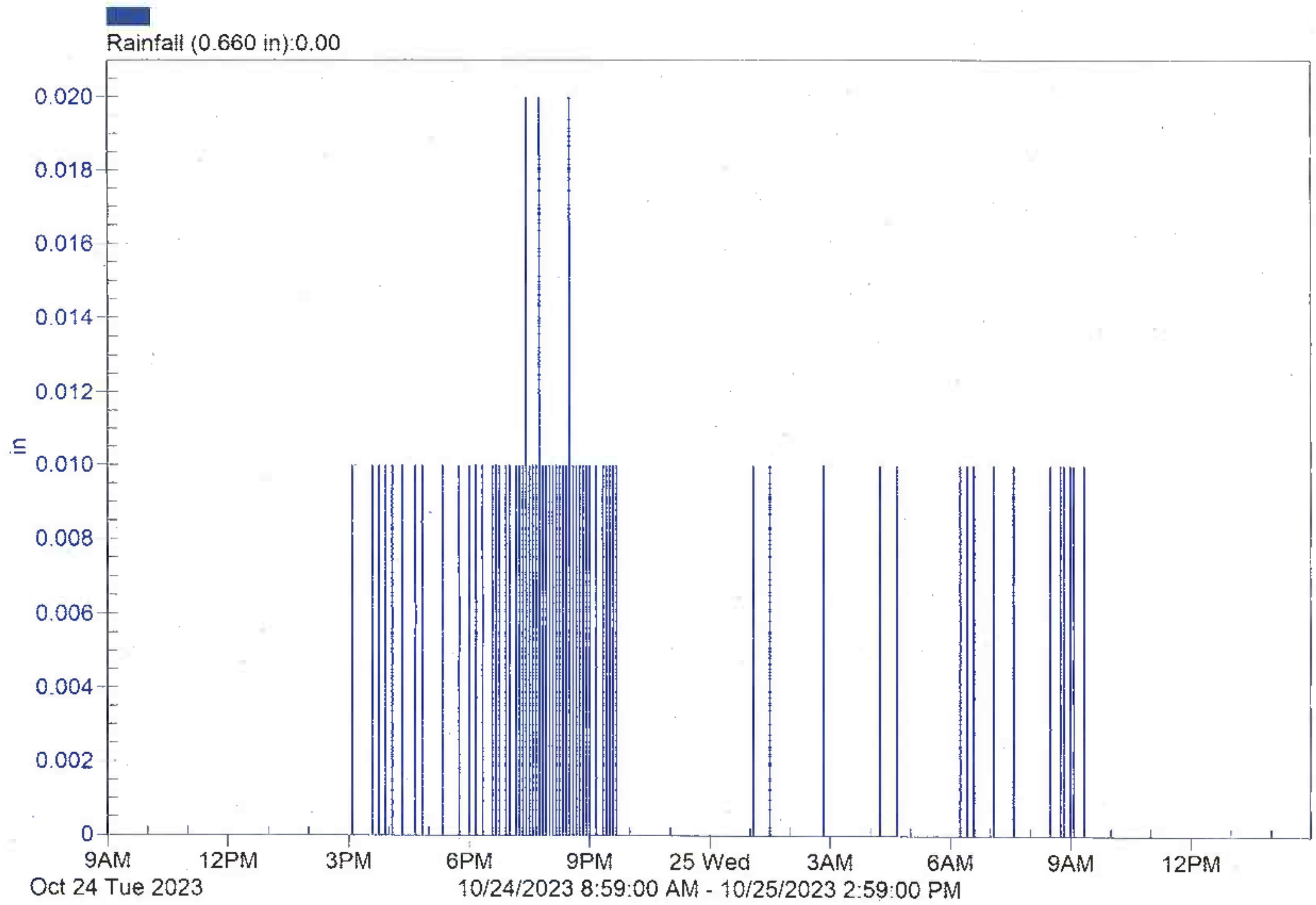
Station Name: TACOMA NARROWS BRIDGE, WA
Action: Daily
Product: Tide Predictions
Start Date & Time: 2023/10/23 12:00 AM
End Date & Time: 2023/10/26 11:59 PM

Source: NOAA/NOS/CO-OPS
Prediction Type: Subordinate
Datum: MLLW
Height Units: Feet
Time Zone: LST/LDT

Date	Day	Time	Hgt	Time	Hgt	Time	Hgt	Time	Hgt
2023/10/23	Mon	06:32 AM	0.07 L	2:27 PM	12.31 H	8:38 PM	6.40 L		
2023/10/24	Tue	01:07 AM	9.21 H	07:42 AM	0.52 L	3:09 PM	12.64 H	9:23 PM	4.86 L
2023/10/25	Wed	02:34 AM	9.72 H	08:45 AM	1.05 L	3:43 PM	12.97 H	10:01 PM	3.14 L
2023/10/26	Thu	03:48 AM	10.50 H	09:42 AM	1.79 L	4:13 PM	13.24 H	10:39 PM	1.42 L

RF1

Flowlink 5



2309070-01

Bottle Certification

Bottle Certification

*** DEFAULT CONTAINER ***

NPDES Storm
Chain of Custody

Outfall: 235

Date/Time sampler installed: 10/23/23 @ 15:11

Jar Cert #

Sampling Crew: SG, RG

Filter lot # 376827

Weather conditions: Sunny

Date/Time sampler pickup: 10/26/23 @ 10:20

Observed activities in area: Ø

Observations during sampler collection: Ø

Color, Odors, sheens: Ø

Type of Sample: ☒ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☒ >0.2 inches rain ☐ <0.02 inches of rain previous 24 hours

Samplers: ☒ Data downloaded ☐ Ice Present at pick-up ☒ Caps on containers ☒ Sample bottles marked ☒ Tubing Decon 1000mL DI water

Fill to...	Parameters:	Sample	QC
Neck	PAH's/Phthalates (1L) +	☒	☐ ☐
No head	[1]Total Mercury (125/250mL QC)	☒	☐
No head	[1]Diss Mercury (125/250mL QC)	☒	☐
Shoulder	Total Metals (250mL)	☒	
Shoulder	Diss Metals (125mL)	☒	
Shoulder	TSS (1L), 500 mL min)	☒	
Shoulder	Nutrients (250mL)	☒	
Shoulder	Ortho-P (125mL), (75min)	☒	
Shoulder	BOD (1L)	☒	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☒	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes 4.010 L config above

+1000 mL for QC per bottle, must submit 2 extra bottles

[1]If 250ml bottle used, thenQAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (µS)
1	1000	☒	75.3
2		☒	24.7
3		☒	32.9
4		☒	72.1
5		☒	97.3
6		☐	
7		☐	
8		☐	
9		☐	
10		☐	
11		☐	
12		☐	

Total aliquots: 20

Sample Prep

Date/Time: 10/26/23 @ 1245

Initial: SG, SS, RG

pH: 7.51

COND (µS): 60.27

Lab #: 2310047-02

Aliquots composited: 20

Deviations :

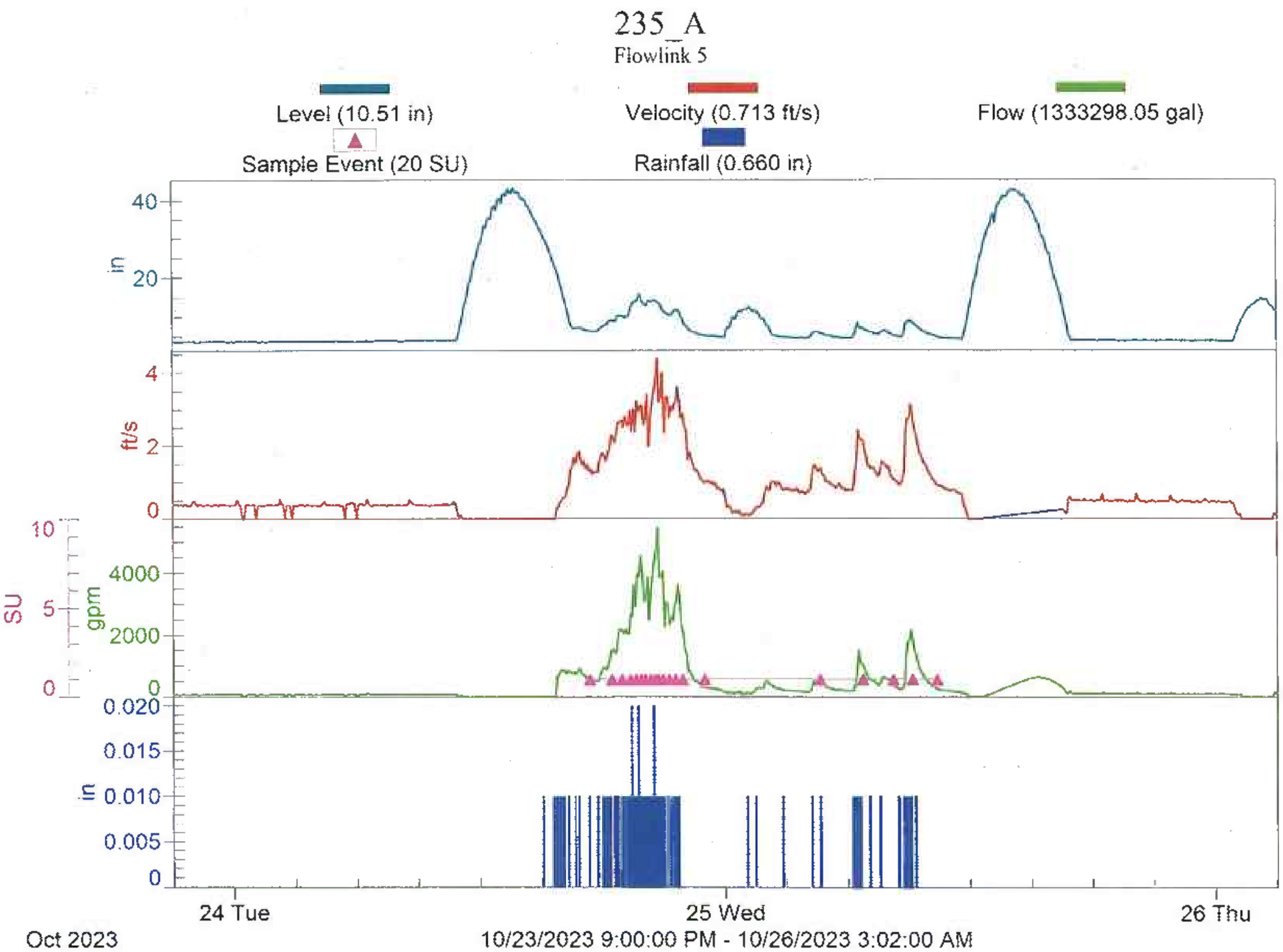
Composite End Time: 10/23/23 @ ~~11:22~~ 11:22 (Collect Time) Last aliquot in composite

Relinquished by: [signature]

Date/Time: 10/26/23 @ 13:00

Received by: [signature]

Date/Time: 10/26/23 @ 13:00



235_A
Flowlink 5
Level (10.51 in)
Velocity (0.713 ft/s)
Flow (1333298.05 gal)
Sample Event (20 SU)
Rainfall (0.660 in)
40
20
in
4
2
0
ft/s
10
5
0
SU
4000
2000
0
gpm
0.020
0.015
0.010
0.005
0
in
24 Tue
25 Wed
26 Thu
Oct 2023
10/23/2023 9:00:00 PM - 10/26/2023 3:02:00 AM

SAMPLER ID# 1242995716 09:20 26-OCT-23
Hardware: A1 Software: 2.33
*********** PROGRAM SETTINGS ***********

PROGRAM NAME:
"235A "
SITE DESCRIPTION:
"235A ST "

UNITS SELECTED:
LENGTH: ft

UNITS SELECTED:
FLOW RATE: gpm
FLOW VOLUME: gal
VELOCITY: fps

AREA-VEL MODULE:
AREA*VELOCITY
ROUND PIPE

----

5 MINUTE
DATA INTERVAL

12, 1000 ml BTLS
56 ft SUCTION LINE
AUTO SUCTION HEAD
1 RINSES, 1 RETRIES

ONE-PART PROGRAM

PACING:
FLOW, EVERY
51400 gal
NO SAMPLE AT START

DISTRIBUTION:
4 SAMPLES/BOTTLE

VOLUME:

250 ml SAMPLES

ENABLE:
LEVEL >0.370 ft
AND
VEL > 0.80 fps

ENABLE:
REPEATABLE ENABLE
NO SAMPLE AT DISABLE
NO SAMPLE AT ENABLE

ENABLE:
COUNTDOWN IS STOPPED
WHILE DISABLED

ENABLE:
0 PAUSE & RESUMES

NO DELAY TO START

200 HOURS RUN TIME

LIQUID DETECT ON

QUICK VIEW/CHANGE

TAKE MEASUREMENTS
AT STORAGE INTERVAL

DUAL SAMPLER OFF
BTL FULL DETECT OFF
TIMED BACKLIGHT

EVENT MARK SENT
DURING PUMP CYCLE

PUMP COUNTS FOR
EACH PURGE CYCLE:
100 PRE-SAMPLE
AUTO POST-SAMPLE

NO PERIODIC
SERIAL OUTPUT

INTERROGATOR
CONNECTOR
POWER ALWAYS ON

NO RAIN GAUGE

NO SDI-12 SONDE

AUTO SDI-12 SCAN OFF

I/O1= NONE
I/O2= NONE
I/O3= NONE

----

0 ANALOG OUTPUTS

NO EXTERNAL MODEM

NO ALARM
CONDITIONS SET


```
SAMPLER ID# 1242995716  09:21 26-OCT-23
  Hardware:      A1  Software: 2.33
*********** SAMPLING RESULTS ***********
   SITE: 235A ST
PROGRAM: 235A
Program Started at 13:08 MO 23-OCT-23
Nominal Sample Volume =  250 ml
                                   COUNT
                                      TO
SAMPLE  BOTTLE TIME  SOURCE ERROR LIQUID
------- ------ ----    -- --     ------
              13:08  PGM DISABLED
------------- TU 24-OCT-23 -------------
              16:15  PGM ENABLED
  1,4     1   17:21      F          1888
  2,4     1   18:26      F          1873
  3,4     1   18:55      F          1871
  4,4     1   19:20      F          1891
  1,4     2   19:37      F          1903
  2,4     2   19:51      F          1909
  3,4     2   20:04      F          1902
  4,4     2   20:20      F          1891
  1,4     3   20:33      F          1899
  2,4     3   20:43      F          1899
  3,4     3   20:56      F          1901
  4,4     3   21:13      F          1897
  1,4     4   21:32      F          1890
  2,4     4   21:54      F          1892
  3,4     4   22:59      F          1874
              23:50  PGM DISABLED
              23:55  PGM ENABLED
------------- WE 25-OCT-23 -------------
              00:05  PGM DISABLED
              02:00  PGM ENABLED
              02:10  PGM DISABLED
              02:15  PGM ENABLED
              03:15  PGM DISABLED
              03:20  PGM ENABLED
              03:25  PGM DISABLED
              03:30  PGM ENABLED
              03:35  PGM DISABLED
              04:10  PGM ENABLED
  4,4     4   04:37      F          1832
              05:55  PGM DISABLED
              06:00  PGM ENABLED
              06:05  PGM DISABLED
              06:10  PGM ENABLED
```

```
             06:15  PGM DISABLED
             06:20  PGM ENABLED
 1,4     5   06:45      F           1836
 2,4     5   08:12      F           1845
 3,4     5   09:12      F           1851
 4,4     5   10:22      F           1864
             11:00  PGM DISABLED
             11:05  PGM ENABLED
             11:10  PGM DISABLED
             11:15  PGM ENABLED
             11:20  PGM DISABLED


  SOURCE F  ==> FLOW
----------------------------------------
```

2309069-01

Bottle Certification

Bottle Certification

*** DEFAULT CONTAINER ****

Jar Cert #

Filter lot # 1376827

NPDES Storm

Chain of Custody

Outfall: 237 B

Date/Time sampler installed: 10/23/23 @ 14:35

Sampling Crew: SG RG

Weather conditions: Sunny

Date/Time sampler pickup: 10/26/23 @ 10:11

Observed activities in area: Ø

Observations during sampler collection: Ø

Color, Odors, sheens: Ø

Type of Sample: ☒ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☒ >0.2 inches rain ☐ <0.02 inches of rain previous 24 hours

Samplers: ☒ Data downloaded ☒ ~~Sample bottles marked~~

☐ Ice Present at pick-up ☒ Tubing Decon 1000mL DI water

☒ Caps on containers

Fill to...	Parameters:	Sample	QC
Neck	PAH's/Phthalates (1L) +	☒	☐ ☐
No head	[1]Total Mercury (125/250mL QC)	☒	☐
No head	[1]Diss Mercury (125/250mL QC)	☒	☐
Shoulder	Total Metals (250mL)	☒	
Shoulder	Diss Metals (125mL)	☒	
Shoulder	TSS (1L), (500 mL min)	☒	
Shoulder	Nutrients (250mL)	☒	
Shoulder	Ortho-P (125mL), (75min)	☒	
Shoulder	BOD (1L)	☒	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☒	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum Volumes 4.010 L config above

+1000 mL for QC per bottle, must submit 2 extra bottles

[1]If 250ml bottle used, thenQAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (µS)
1	1060	☒	189.1
2		☒	71.3
3		☒	46.6
4		☒	51.7
5		☒	134.8
6		☒	245.8
7		☒	229.5
8		☒	157.1
9		☒	138.3
10	750	☒	258.4
11		☐	
12		☐	

Total aliquots: 39

Sample Prep

Date/Time: 10/26/23 @ 12 30

Initial: SS, SG, RG

pH: 7.45

COND (µS): 142.7

Lab #: 2310097-04

Aliquots composited: 39

Deviations :

Composite End Time: 10/25/23 @ 16:25

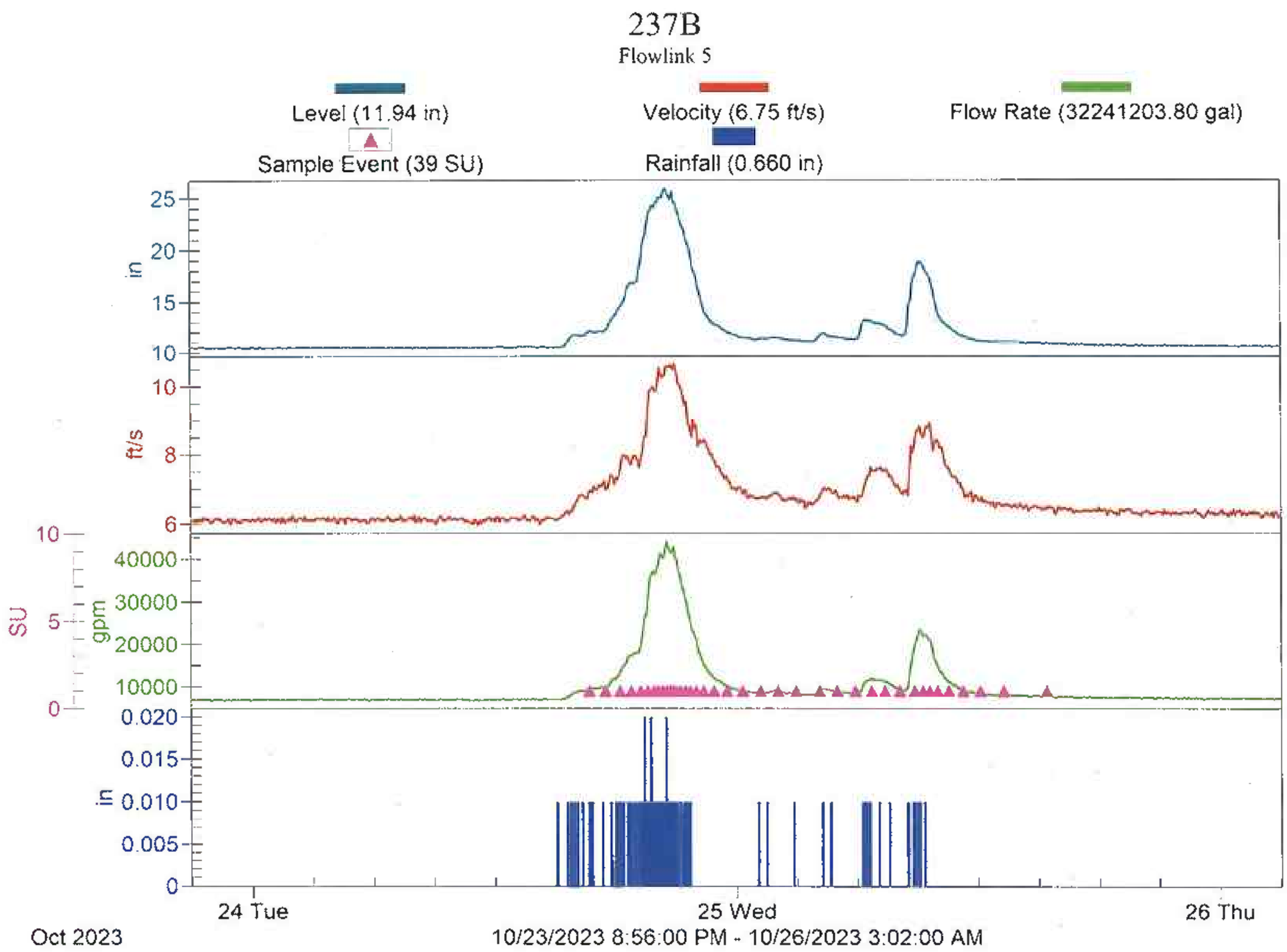
(Collect Time) Last aliquot in composite

Relinquished by: [signature]

Date/Time: 10/26/23 @ 13:00

Received by: [signature]

Date/Time: 10/26/23 @ 13:00


237B
Flowlink 5
Level (11.94 in)
Velocity (6.75 ft/s)
Flow Rate (32241203.80 gal)
Sample Event (39 SU)
Rainfall (0.660 in)
in
25
20
15
10
ft/s
10
8
6
SU
10
5
0
gpm
40000
30000
20000
10000
in
0.020
0.015
0.010
0.005
0
24 Tue
25 Wed
26 Thu
Oct 2023
10/23/2023 8:56:00 PM - 10/26/2023 3:02:00 AM

SAMPLER ID# 1243003651 09:10 26-OCT-23
Hardware: A1 Software: 2.33
*********** PROGRAM SETTINGS ***********

PROGRAM NAME:
" STORM 1 "
SITE DESCRIPTION:
" 237 B   "

UNITS SELECTED:
LENGTH: ft

12, 1000 ml BTLS
16 ft SUCTION LINE
AUTO SUCTION HEAD
1 RINSES, 1 RETRIES

ONE-PART PROGRAM

PACING:
FLOW, EVERY
1 PULSES
NO SAMPLE AT START

DISTRIBUTION:
4 SAMPLES/BOTTLE

VOLUME:

250 ml SAMPLES

ENABLE:

NONE PROGRAMMED

ENABLE:
REPEATABLE ENABLE
NO SAMPLE AT DISABLE
NO SAMPLE AT ENABLE

ENABLE:

COUNTDOWN IS STOPPED
WHILE DISABLED

ENABLE:
0 PAUSE & RESUMES

NO DELAY TO START

200 HOURS RUN TIME

LIQUID DETECT ON

QUICK VIEW/CHANGE

TAKE MEASUREMENTS
AT STORAGE INTERVAL

DUAL SAMPLER OFF
BTL FULL DETECT ON
TIMED BACKLIGHT

EVENT MARK SENT
DURING PUMP CYCLE

PUMP COUNTS FOR
EACH PURGE CYCLE:
100 PRE-SAMPLE
AUTO POST-SAMPLE

NO PERIODIC
SERIAL OUTPUT

INTERROGATOR
CONNECTOR
POWER ALWAYS ON

```
  ----------
  ----------
  ----------

NO RAIN GAUGE


  ----------
NO SDI-12 SONDE

AUTO SDI-12 SCAN OFF

  ----------
I/O1= NONE
I/O2= NONE
I/O3= NONE

  ----------

0 ANALOG OUTPUTS


  ----------

NO EXTERNAL MODEM


  ----------

   NO ALARM
CONDITIONS SET

  ----------
  ----------
----------------------------------------


SAMPLER ID# 1243003651  09:11 26-OCT-23
  Hardware:     A1  Software: 2.33
*********** SAMPLING RESULTS ***********
   SITE:   237 B
PROGRAM:  STORM 1
Program Started at 13:36 MO 23-OCT-23
Nominal Sample Volume =  250 ml
                                   COUNT
                                      TO
SAMPLE  BOTTLE TIME  SOURCE ERROR LIQUID
------- ------ ----      -- --    ------
              13:36  PGM ENABLED
```

```
------------- TU 24-OCT-23 -------------
  1,4      1  16:40       F            518
  2,4      1  17:28       F            516
  3,4      1  18:12       F            513
  4,4      1  18:45       F            519
  1,4      2  19:12       F            517
  2,4      2  19:35       F            512
  3,4      2  19:52       F            513
  4,4      2  20:05       F            508
  1,4      3  20:18       F            510
  2,4      3  20:30       F            510
  3,4      3  20:41       F            508
  4,4      3  20:52       F            515
  1,4      4  21:03       F            511
  2,4      4  21:14       F            508
  3,4      4  21:27       F            513
  4,4      4  21:41       F            510
  1,4      5  21:59       F            519
  2,4      5  22:20       F            526
  3,4      5  22:51       F            517
  4,4      5  23:30       F            512
------------- WE 25-OCT-23 -------------
  1,4      6  00:17       F            513
  2,4      6  01:10       F            515
  3,4      6  02:03       F            510
  4,4      6  02:57       F            514
  1,4      7  04:07       F            510
  2,4      7  04:59       F            510
  3,4      7  05:53       F            512
  4,4      7  06:42       F            509
  1,4      8  07:22       F            511
  2,4      8  08:05       F            512
  3,4      8  08:51       F            513
  4,4      8  09:15       F            513
  1,4      9  09:36       F            516
  2,4      9  09:59       F            537
  3,4      9  10:32       F            515
  4,4      9  11:15       F            520
  1,3     10  12:06       F            522
  2,3     10  13:15       F            522
  3,3     10  15:25       F            523
------------- TH 26-OCT-23 -------------
              09:09  MANUAL PAUSE
              09:09  PGM STOPPED 26-OCT


   SOURCE F  ==> FLOW
----------------------------------------
```

NPDES Storm
Chain of Custody

2309069-01

Bottle Certification

Bottle Certification

*** DEFAULT CONTAINER ***

Filter lot # 1376827

Outfall: 243

Date/Time sampler installed: 10/23/23 @ 14:05

Sampling Crew: SG RG

Weather conditions: Sunny

Date/Time sampler pickup: 10/26/23 @ 10:05

Observed activities in area: Ø

Observations during sampler collection: Ø

Color, Odors, sheens: Ø

Type of Sample: ☒ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☒ >0.2 inches rain ☐ <0.02 inches of rain previous 24 hours

Samplers: ☒ Data downloaded ☐ Ice Present at pick-up ☒ Caps on containers ☒ Sample bottles marked ☒ Tubing Decon 1000mL Di water

Fill to...	Parameters:	Sample	QC
Neck	PAH's/Phthalates (1L) +	☒	☒ ☒
No head	Total Mercury (125/250mL QC)	☒	☐
No head	Diss Mercury (125/250mL QC)	☒	☐
Shoulder	Total Metals (250mL)	☒	
Shoulder	Diss Metals (125mL)	☒	
Shoulder	TSS (1L), (500 mL min)	☒	
Shoulder	Nutrients (250mL)	☒	
Shoulder	Ortho-P (125mL), (75min)	☒	
Shoulder	BOD (1L)	☒	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☒	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes 4.010 L config above
+1000 mL for QC per bottle, must submit 2 extra bottles
'If 250ml bottle used, thenQAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (µS)
1	1000	☐	5520
2		☒	5410
3		☒	5150
4		☒	4870
5		☒	4770
6		☒	4300
7		☒	2831
8		☒	2561
9		☒	2534
10		☒	2205
11		☒	2091
12		☒	1818

Total aliquots: 48

Sample Prep

Date/Time: 10/26/23 @ 12:01

Initial: RG

pH: 6.90

COND (µS): 3316

Lab #: 2310047-05

Aliquots composited: 44

Deviations:

Composite End Time: 10/23/23 @ 7:35
(Collect Time) Last aliquot in composite

Relinquished by: [signature]

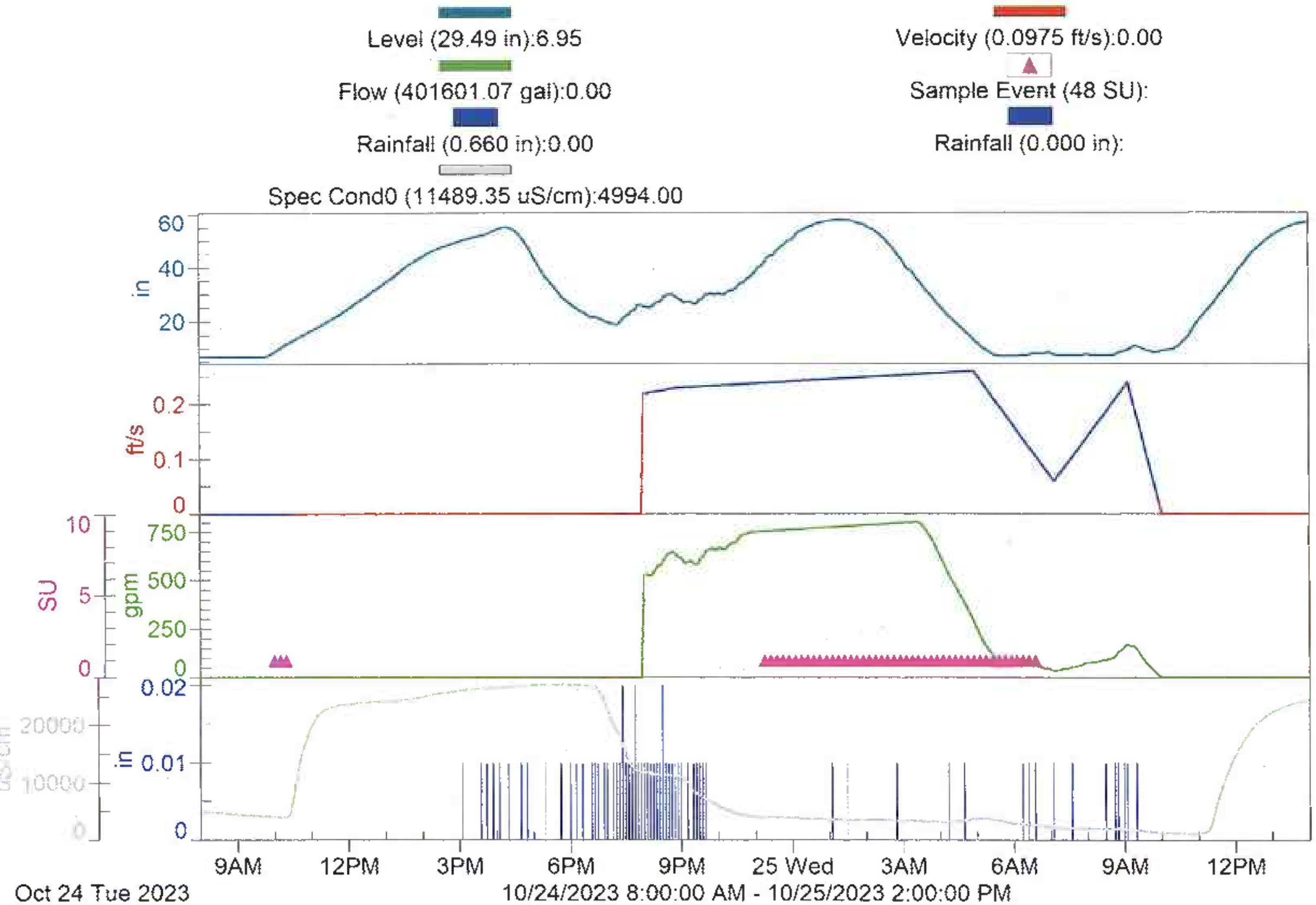
Date/Time: 10/26/23 @ 13:00

Received by: [signature]

Date/Time: 10/26/23 @ 1300

243

Flowlink 5



SAMPLER ID# 1242893352 09:01 26-OCT-23
Hardware: A1 Software: 2.33
*********** PROGRAM SETTINGS ***********

PROGRAM NAME:
"STORM 1   "
SITE DESCRIPTION:
" 243   "

UNITS SELECTED:
LENGTH: ft
CONDUCTIVITY: mS/cm
TEMPERATURE: F

UNITS SELECTED:
FLOW RATE: gpm
FLOW VOLUME: Mgal
VELOCITY: fps

AREA-VEL MODULE:
AREA*VELOCITY
ROUND PIPE

----

5 MINUTE
DATA INTERVAL

12, 1000 ml BTLS
17 ft SUCTION LINE
AUTO SUCTION HEAD
1 RINSES, 1 RETRIES

ONE-PART PROGRAM

PACING:
TIME, EVERY
0 HOURS, 10 MINUTES

DISTRIBUTION:
4 SAMPLES/BOTTLE

VOLUME:

250 ml SAMPLES

ENABLE:

SP_CO0 <4.000 mS/cm

ENABLE:
REPEATABLE ENABLE
NO SAMPLE AT DISABLE
NO SAMPLE AT ENABLE

ENABLE:
COUNTDOWN IS STOPPED
WHILE DISABLED

ENABLE:
0 PAUSE & RESUMES

NO DELAY TO START

LIQUID DETECT ON

QUICK VIEW/CHANGE

TAKE MEASUREMENTS
AT STORAGE INTERVAL

DUAL SAMPLER OFF
BTL FULL DETECT OFF
TIMED BACKLIGHT

EVENT MARK SENT
DURING PUMP CYCLE

PUMP COUNTS FOR
EACH PURGE CYCLE:
200 PRE-SAMPLE
AUTO POST-SAMPLE

NO PERIODIC
SERIAL OUTPUT

INTERROGATOR
CONNECTOR
POWER ALWAYS ON

NO RAIN GAUGE

SDI-12 DATA:
01DATA0 02DATA0
TEMP0 SP_CO0 05DATA0

I/O1= NONE
I/O2= NONE
I/O3= NONE

----

0 ANALOG OUTPUTS

NO EXTERNAL MODEM

NO ALARM
CONDITIONS SET

SAMPLER ID# 1242893352 09:02 26-OCT-23
Hardware: A1 Software: 2.33
*********** SAMPLING RESULTS ***********
SITE: 243
PROGRAM: STORM 1
Program Started at 13:01 MO 23-OCT-23
Nominal Sample Volume = 250 ml

SAMPLE	BOTTLE	TIME	SOURCE	ERROR	COUNT TO LIQUID
		13:01	PGM DISABLED		
		TU 24-OCT-23			
		09:50	PGM ENABLED		
1,4	1	10:00	T		440
2,4	1	10:10	T		441
3,4	1	10:20	T		441
		10:25	PGM DISABLED		
		23:10	PGM ENABLED		
4,4	1	23:15	T		423
1,4	2	23:25	T		426
2,4	2	23:35	T		428
3,4	2	23:45	T		430
4,4	2	23:55	T		429
		WE 25-OCT-23			
1,4	3	00:05	T		428
2,4	3	00:15	T		427
3,4	3	00:25	T		426
4,4	3	00:35	T		426
1,4	4	00:45	T		426
2,4	4	00:55	T		426
3,4	4	01:05	T		426
4,4	4	01:15	T		426
1,4	5	01:25	T		426
2,4	5	01:35	T		426
3,4	5	01:45	T		426
4,4	5	01:55	T		426
1,4	6	02:05	T		428
2,4	6	02:15	T		430
3,4	6	02:25	T		429
4,4	6	02:35	T		429
1,4	7	02:45	T		431
2,4	7	02:55	T		432
3,4	7	03:05	T		433
4,4	7	03:15	T		437
1,4	8	03:25	T		435
2,4	8	03:35	T		440

3,4	8	03:45	T	438
4,4	8	03:55	T	441
1,4	9	04:05	T	442
2,4	9	04:15	T	442
3,4	9	04:25	T	444
4,4	9	04:35	T	444
1,4	10	04:45	T	446
2,4	10	04:55	T	445
3,4	10	05:05	T	447
4,4	10	05:15	T	451
1,4	11	05:25	T	449
2,4	11	05:35	T	449
3,4	11	05:45	T	447
4,4	11	05:55	T	449
1,4	12	06:05	T	450
2,4	12	06:15	T	449
3,4	12	06:25	T	449
4,4	12	06:35	T	449
		06:36	PGM DONE 25-OCT	

SOURCE T ==> TIME

NPDES Storm
Chain of Custody

Jar Cert # 2309069-01 Outfall: 245 Date/Time sampler installed: 10/23/23 @ 14:00

Jar Cert # ________ Sampling Crew: SG RG

Filter lot # 1376827 Weather conditions: Sunny Date/Time sampler pickup: 10/26/23 @ 09:55

Observed activities in area: Ø

Observations during sampler collection: Ø

Color, Odors, sheens: Ø

Type of Sample: ☒ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☒ >0.2 inches rain ☐ <0.02 inches of rain previous 24 hours

Samplers: ☒ Data downloaded ☒ Sample bottles marked
☒ Ice Present at pick-up ☒ Tubing Decon 1000mL DI water
☒ Caps on containers

Fill to...	Parameters:	Sample	QC
Neck	PAH's/Phthalates (1L) +	☒	☐ ☐
No head	[1]Total Mercury (125/250mL QC)	☒	☒
No head	[1]Diss Mercury (125/250mL QC)	☒	☒
Shoulder	Total Metals (250mL)	☒	
Shoulder	Diss Metals (125mL)	☒	
Shoulder	TSS (1L), (500 mL min)	☒	
Shoulder	Nutrients (250mL)	☒	
Shoulder	Ortho-P (125mL), (75min)	☒	
Shoulder	BOD (1L)	☒	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☒	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes 4.010 L config above
+1000 mL for QC per bottle, must submit 2 extra bottles
[1]If 250ml bottle used, thenQAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (µS)
1	1000	☐	19960
2		☒	2197
3		☒	150.5
4		☒	107.9
5		☒	139.5
6		☒	561
7		☒	969
8		☒	138.4
9	250	☐	4810
10		☐	
11		☐	
12		☐	

Total aliquots: 33

Sample Prep

Date/Time: 10/26/23 11:55

Initial: SG

pH: 7.14

COND (µS): 602.0

Lab #: 2310047-06

Aliquots composited: 28

Deviations :

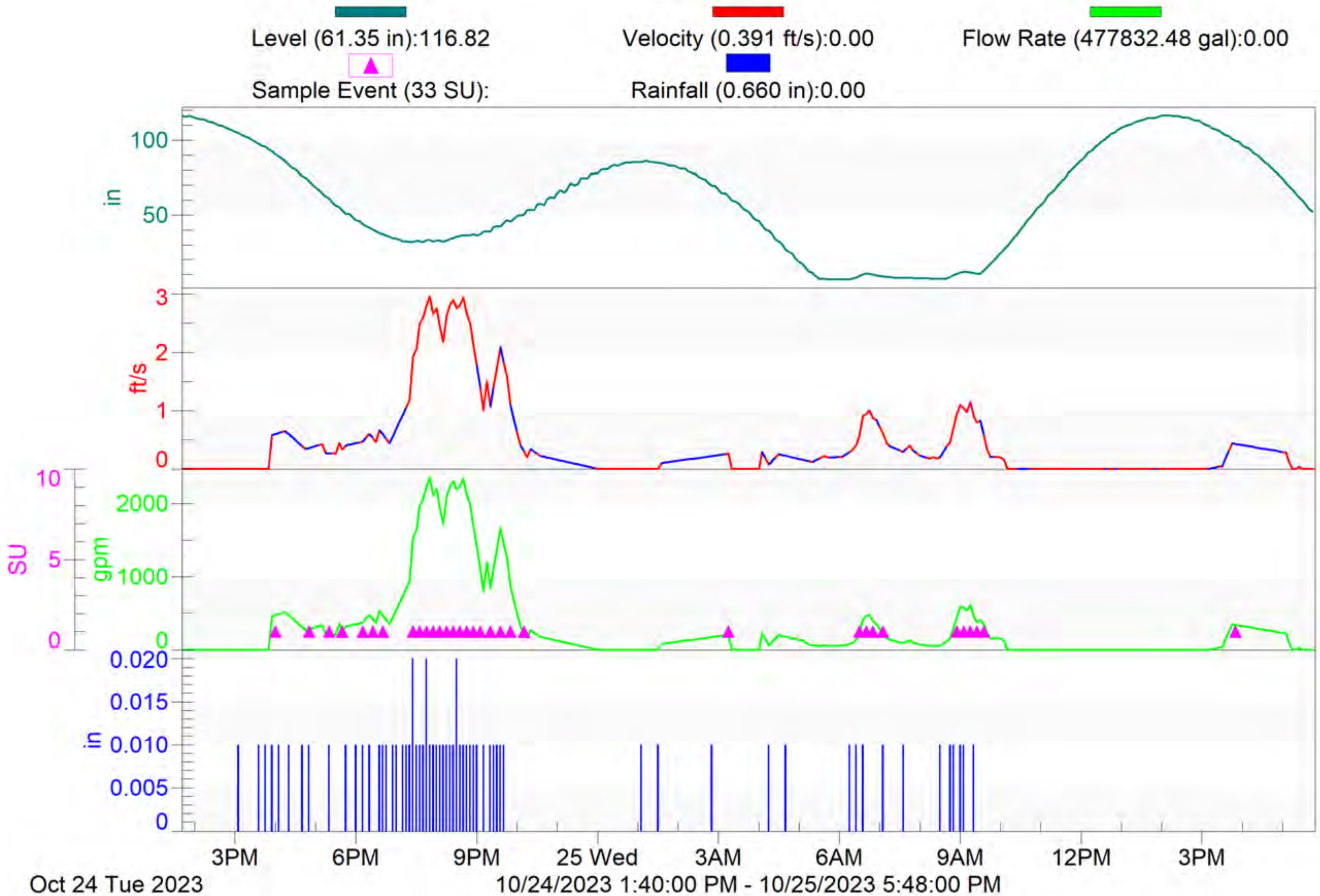
Composite End Time: 10/25/23 @ 10:35
(Collect Time) Last aliquot in composite

Relinquished by: [signature] Received by: [signature]

Date/Time: 10/26/23 @ 13:00 Date/Time: 10/26/23 @ 13:00

245

Flowlink 5



SAMPLER ID# 1284476967 08:54 26-OCT-23
Hardware: A1 Software: 2.33
*********** PROGRAM SETTINGS ***********

PROGRAM NAME:
"STORM   "
SITE DESCRIPTION:
"OF245 B "

UNITS SELECTED:
LENGTH: ft

UNITS SELECTED:
FLOW RATE: gpm
FLOW VOLUME: gal
VELOCITY: fps

AREA-VEL MODULE:
AREA*VELOCITY
ROUND PIPE

----

5 MINUTE
DATA INTERVAL

12, 1000 ml BTLS
21 ft SUCTION LINE
AUTO SUCTION HEAD
1 RINSES, 1 RETRIES

ONE-PART PROGRAM

PACING:
TIME, EVERY
0 HOURS, 10 MINUTES

DISTRIBUTION:
4 SAMPLES/BOTTLE

VOLUME:

250 ml SAMPLES

ENABLE:

FLOW >200.0 gpm

ENABLE:
REPEATABLE ENABLE
NO SAMPLE AT DISABLE
NO SAMPLE AT ENABLE

ENABLE:
COUNTDOWN IS STOPPED
WHILE DISABLED

ENABLE:
0 PAUSE & RESUMES

NO DELAY TO START

LIQUID DETECT ON

QUICK VIEW/CHANGE

TAKE MEASUREMENTS
EVERY 5 MINUTES

DUAL SAMPLER OFF
BTL FULL DETECT OFF
TIMED BACKLIGHT

PULSED EVENT MARK
AT INITIAL PURGE

PUMP COUNTS FOR
EACH PURGE CYCLE:
200 PRE-SAMPLE
AUTO POST-SAMPLE

NO PERIODIC
SERIAL OUTPUT

INTERROGATOR
CONNECTOR
POWER ALWAYS ON

NO RAIN GAUGE

NO SDI-12 SONDE

AUTO SDI-12 SCAN OFF

I/O1= NONE
I/O2= NONE
I/O3= NONE

----

0 ANALOG OUTPUTS

NO EXTERNAL MODEM

NO ALARM
CONDITIONS SET

SAMPLER ID# 1284476967 08:54 26-OCT-23
Hardware: A1 Software: 2.33
*********** SAMPLING RESULTS ***********
SITE: OF245 B
PROGRAM: STORM
Program Started at 12:59 MO 23-OCT-23
Nominal Sample Volume = 250 ml

SAMPLE	BOTTLE	TIME	SOURCE	ERROR	COUNT TO LIQUID
		12:59	PGM	DISABLED	
		TU 24-OCT-23			
		01:35	PGM	ENABLED	
		01:40	PGM	DISABLED	
		15:55	PGM	ENABLED	
1,4	1	16:00	T		531
		16:02	PGM	DISABLED	
		16:15	PGM	ENABLED	
		16:20	PGM	DISABLED	
		16:45	PGM	ENABLED	
2,4	1	16:50	T		544
		16:51	PGM	DISABLED	
		17:10	PGM	ENABLED	
3,4	1	17:20	T		551
		17:21	PGM	DISABLED	
		17:30	PGM	ENABLED	
4,4	1	17:40	T		559
		17:50	PGM	DISABLED	
		18:10	PGM	ENABLED	
1,4	2	18:10	T		567
		18:15	PGM	DISABLED	
		18:20	PGM	ENABLED	
2,4	2	18:25	T		572
		18:26	PGM	DISABLED	
		18:30	PGM	ENABLED	
3,4	2	18:40	T		577
		18:41	PGM	DISABLED	
		18:50	PGM	ENABLED	
		18:55	PGM	DISABLED	
		19:20	PGM	ENABLED	
4,4	2	19:25	T		578
1,4	3	19:35	T		582
2,4	3	19:45	T		585
3,4	3	19:55	T		588
4,4	3	20:05	T		585
1,4	4	20:15	T		585

2,4	4	20:25	T	585
3,4	4	20:35	T	583
4,4	4	20:45	T	583
1,4	5	20:55	T	583
2,4	5	21:05	T	582
		21:06	PGM DISABLED	
		21:10	PGM ENABLED	
3,4	5	21:20	T	580
		21:25	PGM DISABLED	
		21:30	PGM ENABLED	
4,4	5	21:35	T	577
		21:40	PGM DISABLED	
		21:45	PGM ENABLED	
1,4	6	21:50	T	571
		21:55	PGM DISABLED	
		22:05	PGM ENABLED	
2,4	6	22:10	T	563
		22:11	PGM DISABLED	
		22:20	PGM ENABLED	
		22:25	PGM DISABLED	
-------------		WE 25-OCT-23	-------------	
		02:00	PGM ENABLED	
		02:05	PGM DISABLED	
		03:15	PGM ENABLED	
3,4	6	03:15	T	544
		03:20	PGM DISABLED	
		04:05	PGM ENABLED	
		04:10	PGM DISABLED	
		06:30	PGM ENABLED	
4,4	6	06:30	T	598
1,4	7	06:40	T	600
2,4	7	06:50	T	603
		07:00	PGM DISABLED	
		07:05	PGM ENABLED	
3,4	7	07:05	T	605
		07:10	PGM DISABLED	
		08:50	PGM ENABLED	
4,4	7	08:55	T	600
1,4	8	09:05	T	599
2,4	8	09:15	T	603
3,4	8	09:25	T	608
4,4	8	09:35	T	604
		09:36	PGM DISABLED	
		09:40	PGM ENABLED	
		09:45	PGM DISABLED	
		15:45	PGM ENABLED	
1,1	9	15:50	T	529
		15:51	PGM DISABLED	
		17:05	PGM ENABLED	
		17:10	PGM DISABLED	

SOURCE T ==> TIME

2309069-01

Bottle Certification

Bottle Certification

*** DEFAULT CONTAINER ***

NPDES Storm
Chain of Custody

Outfall: 254

Date/Time sampler installed: 10/23/23 @ 13:58

Jar Cert # 2309069-01

Sampling Crew: SG, RG

Filter lot # 1376827

Weather conditions: Sunny

Date/Time sampler pickup: 10/26/23 @ 09:45

Observed activities in area: ∅

Observations during sampler collection: ∅

Color, Odors, sheens: ∅

Type of Sample: ☒ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☒ >0.2 inches rain ☐ <0.02 inches of rain previous 24 hours

Samplers: ☒ Data downloaded ☒ Sample bottles marked ☒ Ice Present at pick-up ☒ Tubing Decon 1000mL DI water ☒ Caps on containers

Fill to...	Parameters:	Sample	QC
Neck	PAH's/Phthalates (1L) +	☒	☐ ☐
No head	¹Total Mercury (125/250mL QC)	☒	☐
No head	¹Diss Mercury (125/250mL QC)	☒	☐
Shoulder	Total Metals (250mL)	☒	
Shoulder	Diss Metals (125mL)	☒	
Shoulder	TSS (1L), (500 mL min)	☒	
Shoulder	Nutrients (250mL)	☒	
Shoulder	Ortho-P (125mL), (75min)	☒	
Shoulder	BOD (1L)	☒	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☒	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes 4.010 L config above

+1000 mL for QC per bottle, must submit 2 extra bottles

¹If 250ml bottle used, thenQAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (µS)
1	1000	☒	9040
2		☒	5540
3		☒	4690
4		☒	6700
5		☒	10960
6		☒	11330
7		☒	12400
8		☒	9870
9		☒	12610
10		☒	13040
11		☒	4690
12		☒	6710

Total aliquots: 48

Sample Prep

Date/Time: 10/26/23 @ 11:10

Initial: RG

pH: 6.99

COND (µS): 8214

Lab #: 2310047-07

Aliquots composited: 48

Deviations :

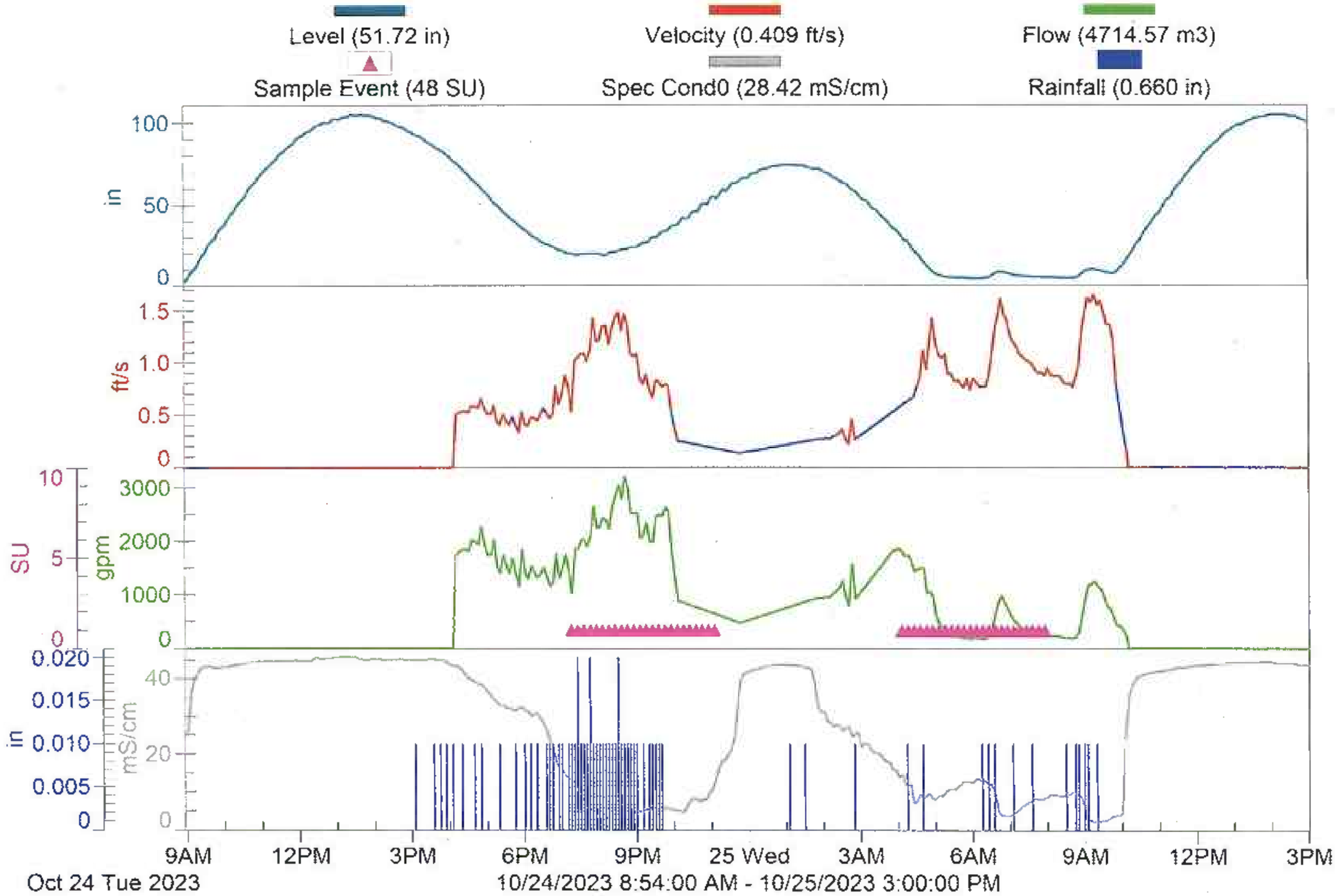
Composite End Time: 10/25/23 @ 08:55
(Collect Time) Last aliquot in composite

Relinquished by: [signature] Received by: [signature]

Date/Time: 10/26/23 @ 13:00 Date/Time: 10/26/23 @ 13:00

254-

Flowlink 5



NPDES Storm
Chain of Custody

Jar Cert # ~~2309069-01~~ Outfall: 222 Date/Time sampler installed: 10/23/23 @ 13:58

Jar Cert # Sampling Crew: SG, RG

Filter lot # 1376827 Weather conditions: Sunny Date/Time sampler pickup: 10/26/23 @ 09:45

Observed activities in area: Ø

Observations during sampler collection: Ø

Color, Odors, sheens? Ø

Type of Sample: ☒ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☒ >0.2 inches rain ☐ <0.02 inches of rain previous 24 hours

Samplers: ☒ Data downloaded ☒ Sample bottles marked
☒ Ice Present at pick-up ☒ Tubing Decon 1000mL DI water
☒ Caps on containers

Fill to...	Parameters:	Sample	QC
Neck	PAH's/Phthalates (1L) +	☒	☐ ☐
No head	[1]Total Mercury (125/250mL QC)	☒	☐
No head	[1]Diss Mercury (125/250mL QC)	☒	☐
Shoulder	Total Metals (250mL)	☒	
Shoulder	Diss Metals (125mL)	☒	
Shoulder	TSS (1L), (300 mL min)	☒	
Shoulder	Nutrients (250mL)	☒	
Shoulder	Ortho-P (125mL), (75min)	☒	
Shoulder	BOD (1L)	☒	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☒	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes 4.010 L config above
+1000 mL for QC per bottle, must submit 2 extra bottles
[1]If 250ml bottle used, thenQAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (uS)
1		☐	
2		☐	
3		☐	
4		☐	
5		☐	
6		☐	
7		☐	
8		☐	
9		☐	
10		☐	
11		☐	
12		☐	

Total aliquots: 48

Sample Prep

Date/Time: 10/26/23 @ 11:10

Initial: RG

pH: 6.99

COND (µS): 8214

Lab #: 2310047-08

Aliquots composited: 48

Deviations :

Composite End Time: 10/25/23 @ 08:55
(Collect Time) Last aliquot in composite

Relinquished by: [signature] Received by: [signature]

Date/Time: 10/26/23 @ 13:00 Date/Time: 10/26/23 @ 13:00

FIELD REPORT

Project: Thea Foss/Wheeler-Osgood Waterways & NPDES Stormwater Monitoring Program

Event: Storm Event – Nov. 2, 2023

INTRODUCTION

This report summarizes the storm event sampled on 11/1/2023-11/3/2023 by the City of Tacoma Environmental Services Collection System Support staff as part of our stormwater monitoring program. This report includes a summary of the following:

- Storm characteristics and criteria;
- Sampling activities;
- Flow characteristics at each sampling location;
- Pacing – set for a 1.66" event, actual event was .94"

This event met the sampling criteria for precipitation as specified in the Thea Foss Sampling and Analysis Plan (SAP).

DESCRIPTION OF SAMPLING ACTIVITES

Samplers placed in the field on 11/1/2023. During sampler installation the weather conditions were overcast. All samplers were retrieved on 11/3/23 (For site specific details, see Appendix A for field notes, Chain of Custody (COC) forms, and event hydrographs).

The following unusual observations were noted during the sampling event:

Table 2: Composite Sampling Activities

Sample Location	Site Deployed	Sample Accepted	Pacing (gal)	Enables LVL(ft), VEL(fps) COND.(mS/cm)	Comments
Outfall 230A	Yes	Yes	10 min.	>3000gpm	28 Aliquots Collected / 16 Composited
Outfall 235	Yes	Yes	109,000	LVL > .37 VEL > 0.8	11 Aliquots Collected / 11 Composited
Outfall 237ANew	Yes	No	1,278,534	LVL > .33 VEL > 7.5	0 Aliquots Collected / 0 Composited
Outfall 237B	Yes	Yes	1,402,760	LVL > 1.0	19 Aliquots Collected / 16 Composited
Outfall 243	Yes	Yes	10 min.	< 2.7 mS/cm	30 Aliquots Collected / 30 Composited
Outfall 245	Yes	Yes	10 min.	> 200gpm	47 Aliquots Collected / 44 Composited
Outfall 254	Yes	Yes	10 min.	< 13.5 mS/cm	27 Aliquots Collected / 27 Composited
Outfall 222*	Yes	Yes	N/A	N/A	48 Aliquots Collected / 48 Composited
Outfall 555*	Yes	Yes	N/A	N/A	48 Aliquots Collected / 48 Composited

**QC, QUALITY CONTROL*

ND, NO DATA

NA, NOT APPLICABLE

WATER QUALITY DATA

Accepted samples were analyzed for the target parameters specified in the SAP and QAPP. Samples accepted at all Outfalls were composited and preserved within 24 hours of the last aliquot being collected. The samples were allowed to sit for a minimum of 18 hours before metals analysis was started.

EQUIPMENT INFORMATION

Samples were collected using ISCO 6712 portable auto samplers. Rain data was collected using an ISCO 674 rain gauge located at the Center for Urban Waters at 326 East D Street, Tacoma, WA 98421.

CORRECTIVE ACTIONS AND DEVIATIONS

There were no deviations from the field procedures as discussed in the SAP other than those discussed above/below. A programming error resulted in no samples taken at site 237Anew. Due to equipment malfunction, no sample Isco report was generated at site 254. No other criteria or procedures as indicated in the SAP were compromised except for those discussed above/below.

Enclosures: The ISCO program setting/sampling results report, the sample collection chain of custody form, and field records are in Appendix A for each outfall. This includes the following information for the samples collected:

- Plot of flow hydrograph and hyetograph
- Subsample times and conductivities
- Tidal windows
- Field activities

Appendix A

Site
254
245
243
237
237
237
230
235
Rou

ISC
Stai
Fiel
Trip
Amb
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Sam

Peri
Rair
Rair
Spa
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PROJECT

Notebook No.

Continued from Page

10/26/23 SG, RG, 0.66" Storm Collectio

254 @ 9:45 - 12 Liters Sample collected. Data downloaded

245 @ 9:55 - 8¼ Liters Sample collected. Data downloa

243 @ @ 10:05 - 12 Liters Sample collected. Data downloaded

237A New @ 10:10 No Samples, programming error

237B @ 10:11 9¾ Liters of Sample collected. Data downlo

235 @ 10:20 - 5 Liters of Sample collected. Data downloade

230A @ 10:30 1 Liter of Sample - (Not accepted) Data downloade

Deployment 1.66

254 - 13:32 - Replace batt - Ice, Jars,

245 - 13:37 - Ice, Jars, Batt @ 100%

243 - 13:42 Downloaded, Ice, Jars, Batt @ 75%, Pacing Below 2.7

237A New 13:52 - Ice, Jars, Batt 100%

237B - 13:54 - Ice, Jars, Batt 100%

235 - 14:01 - Ice, Jars, Pacing ~~Volume 440~~ 100,000

230 A - 14:10 - Ice, Jars, Pacing > 3000 gal

11/3/23 - Storm Collection 0.94"

254 @ 9:22 - Download - 7/12 - Tubing came loose - Tubing

245 @ 9:35 - Download - 1.25/12

243 @ 9:45 - Download - 7.5/12 - Tubing came loose @ collection

237A @ Re-deploy 9:58 - A1

237B @ 9:59 - A1 - 4.75/12 - Download

235 @ 10:08 - 2.75/12 - Download - A1

230A @ 10:15 - 7/12 - CO - Download

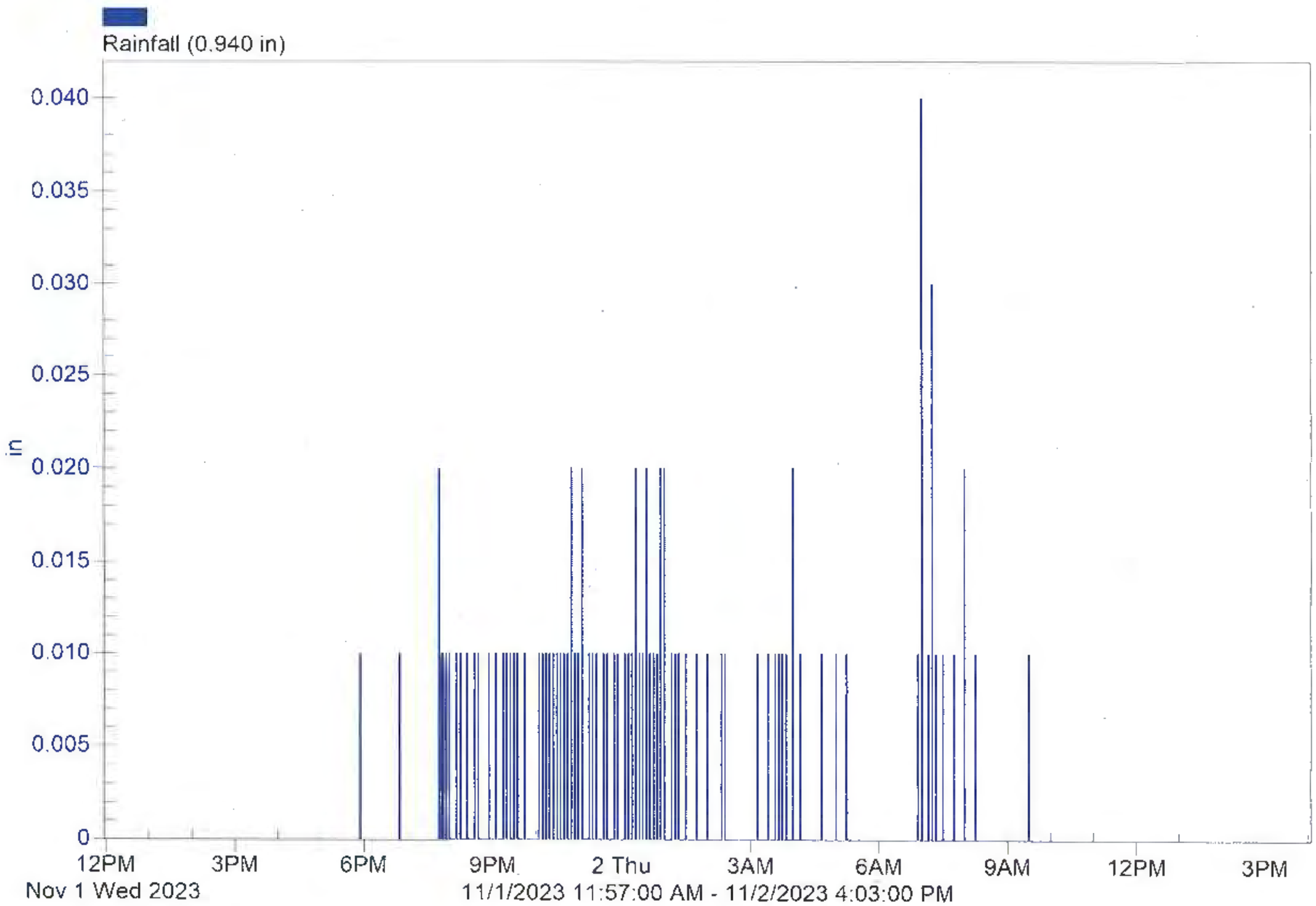
Continued on Page

Read and Understood By

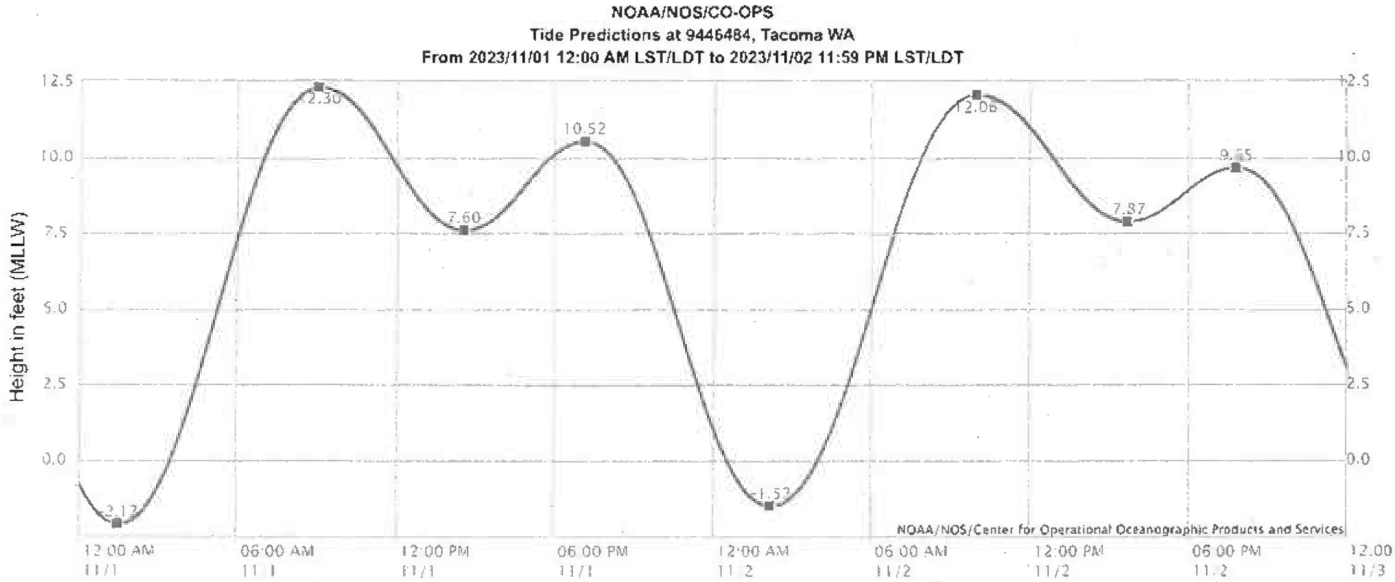
Signed Date Signed Date

RF1

Flowlink 5



Help Print



Note: The interval is High/Low, the solid blue line depicts a curve fit between the high and low values and approximates the segments between.
Disclaimer: These data are based upon the latest information available as of the date of your request, and may differ from the published tide tables.

High/Low Tide Prediction Data Listing

Station Name: Tacoma, WA
Action: Daily
Product: Tide Predictions
Start Date & Time: 2023/11/1 12:00 AM
End Date & Time: 2023/11/2 11:59 PM

Source: NOAA/NOS/CO-OPS
Prediction Type: Harmonic
Datum: MLLW
Height Units: Feet
Time Zone: LST/LDT

Date	Day	Time	Hgt	Time	Hgt	Time	Hgt	Time	Hgt
2023/11/01	Wed	01:29 AM	-2.12 L	09:01 AM	12.30 H	2:33 PM	7.60 L	7:07 PM	10.52 H
2023/11/02	Thu	02:11 AM	-1.52 L	09:58 AM	12.06 H	3:43 PM	7.87 L	7:52 PM	9.65 H

2309070-01

Bottle Certification

Bottle Certification

*** DEFAULT CONTAINER ***

NPDES Storm

Chain of Custody

Jar Cert #

Filter lot # 1376827

...fall: 230A

Sampling Crew: CA, RG

Weather conditions: Clear

Date/Time sampler installed: 11/1/23 @ 14:10

Date/Time sampler pickup: 11/3/23 @ 10:15

Observed activities in area: N/A

Observations during sampler collection: N/A

Color, Odors, sheens: N/A

Type of Sample: ☑ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☑ >0.2 inches rain ☐ <0.02 inches of rain previous 24 hours

Samplers: ☑ Data downloaded ☐ Sample bottles marked

☑ Ice Present at pick-up ☐ Tubing Decon 1000mL Diwater

☑ Caps on containers

Fill to...	Parameters:	Sample	QC
Neck	PAH's/Phthalates (1L) +	☑	☐ ☐
No head	[1]Total Mercury (125/250mL QC)	☑	☒ CA
No head	[1]Diss Mercury (125/250mL QC)	☑	☒ CA
Shoulder	Total Metals (250mL)	☑	
Shoulder	Diss Metals (125mL)	☑	
Shoulder	TSS (1L), (500 mL min)	☑	
Shoulder	Nutrients (250mL)	☑	
Shoulder	Ortho-P (125mL), (75min)	☑	
Shoulder	BOD (1L)	☐	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☑	
	Other:		
	Xtra (Unpreserved Conventionals)	☐	

*Minimum volumes 4.010 L config above

+1000 mL for QC per bottle, must submit 2 extra bottles

[1]If 250ml bottle used, thenQAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (µS)
1	1000	☑	71.4
2	↓	☑	38.3
3		☑	31.5
4		☑	56.9
5		☐	47200
6		☐	16580
7		☐	25050
8		☐	
9		☐	
10		☐	
11		☐	
12		☐	

Total aliquots: 28

Sample Drop

Date/Time: 11/3/23 @ 12:30

Initial: CA, RG

pH: 6.96

COND (µS): 52.2

Lab #:

Aliquots composited: 16

Deviations:

Composite End Time: 11/2/23 @ 3:55

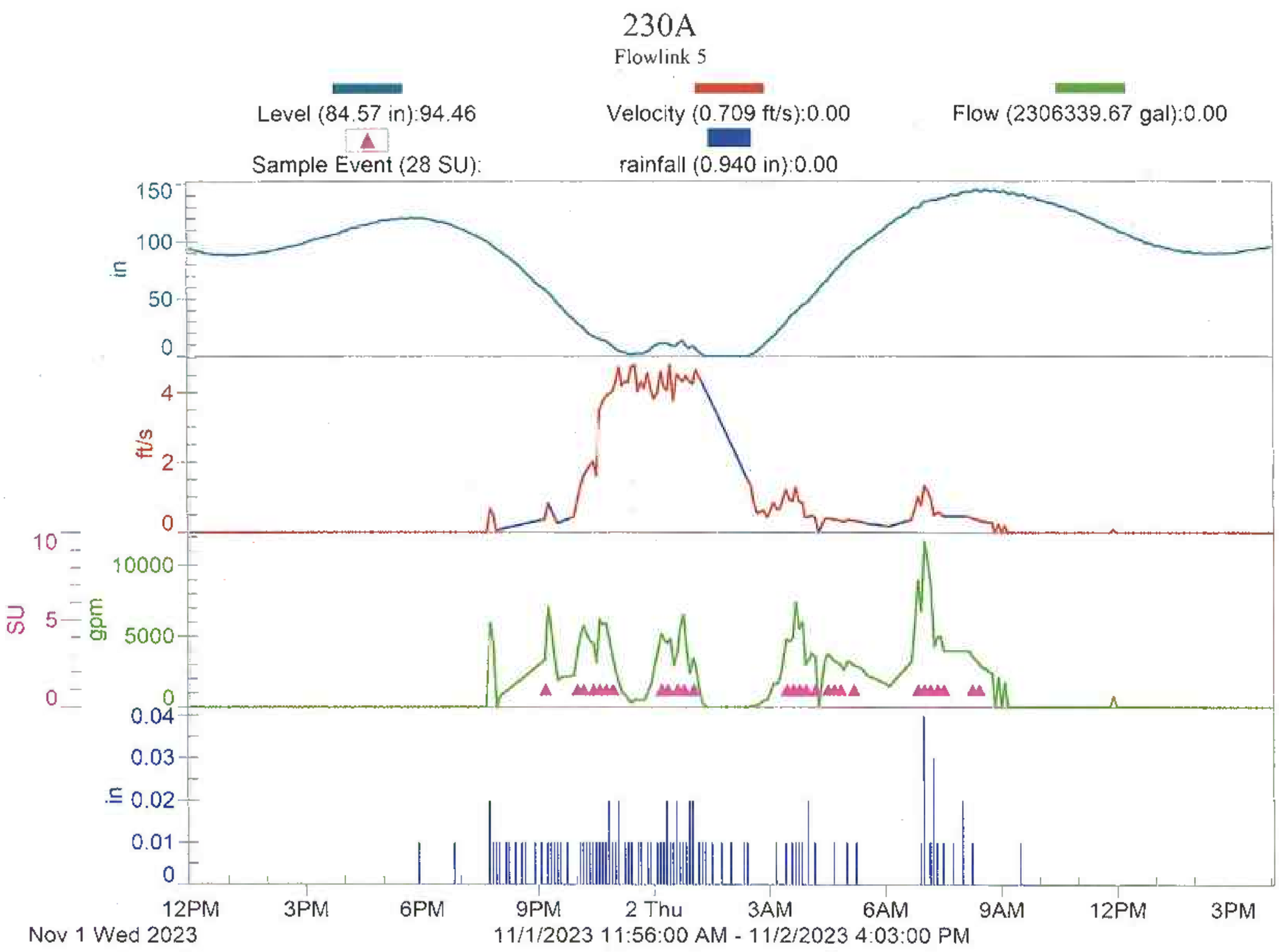
(Collect Time) Last aliquot in composite

Relinquished by: [signature]

Date/Time: 11/3/23 @ 12:55

Received by: Cooler

Date/Time: 11/3/23 12:55


230A
Flowlink 5
Level (84.57 in):94.46
Velocity (0.709 ft/s):0.00
Flow (2306339.67 gal):0.00
Sample Event (28 SU):
rainfall (0.940 in):0.00
150
100
50
0
in
4
2
0
ft/s
10
5
0
SU
10000
5000
0
gpm
0.04
0.03
0.02
0.01
0
in
12PM
3PM
6PM
9PM
2 Thu
3AM
6AM
9AM
12PM
3PM
Nov 1 Wed 2023
11/1/2023 11:56:00 AM - 11/2/2023 4:03:00 PM

```
SAMPLER ID# 1481205047  08:56  3-NOV-23
  Hardware:      C0  Software: 3.01.0075
*********** PROGRAM SETTINGS ***********
      ----------
   PROGRAM NAME:
    "STORM 1   "
 SITE DESCRIPTION:
    "230A      "
      ----------
   UNITS SELECTED:
     LENGTH: ft


      ----------
   UNITS SELECTED:
   FLOW RATE: gpm
  FLOW VOLUME: gal
   VELOCITY: fps
      ----------
  AREA-VEL MODULE:
   AREA*VELOCITY
     ROUND PIPE

      ----------

      5 MINUTE
   DATA INTERVAL

      ----------
  12,  1000 ml BTLS
 30 ft SUCTION LINE
 AUTO SUCTION HEAD
1 RINSES, 1 RETRIES
      ----------

  ONE-PART PROGRAM


      ----------
      PACING:
    TIME, EVERY
 0 HOURS, 10 MINUTES

      ----------
    DISTRIBUTION:
   4 SAMPLES/BOTTLE


      ----------
```

VOLUME:

250 ml SAMPLES

ENABLE:

FLOW >3000 gpm

ENABLE:
REPEATABLE ENABLE
NO SAMPLE AT DISABLE
NO SAMPLE AT ENABLE

ENABLE:
COUNTDOWN IS STOPPED
WHILE DISABLED

ENABLE:
0 PAUSE & RESUMES

NO DELAY TO START

LIQUID DETECT ON

QUICK VIEW/CHANGE

TAKE MEASUREMENTS
AT STORAGE INTERVAL

DUAL SAMPLER OFF
BTL FULL DETECT OFF
TIMED BACKLIGHT

PULSED EVENT MARK
AT THE BEGINNING OF

FORWARD PUMPING

PUMP COUNTS FOR
EACH PURGE CYCLE:
100 PRE-SAMPLE
AUTO POST-SAMPLE

NO PERIODIC
SERIAL OUTPUT

NO RAIN GAUGE

NO SDI-12 SONDE

AUTO SDI-12 SCAN OFF

I/O1= NONE
I/O2= NONE
I/O3= NONE

----

0 ANALOG OUTPUTS

NO EXTERNAL MODEM

NO ALARM
CONDITIONS SET

SAMPLER ID# 1481205047 08:57 3-NOV-23
Hardware: C0 Software: 3.01.0075
*********** SAMPLING RESULTS ***********
SITE: 230A
PROGRAM: STORM 1
Program Started at 12:50 TU 31-OCT-23
Nominal Sample Volume = 250 ml

SAMPLE	BOTTLE	TIME	SOURCE	ERROR	COUNT TO LIQUID
		12:50	PGM DISABLED		
		------------- WE 01-NOV-23 -------------			
		19:45	PGM ENABLED		
		19:55	PGM DISABLED		
		21:10	PGM ENABLED		
1,4	1	21:10	T		1054
		21:20	PGM DISABLED		
		22:00	PGM ENABLED		
2,4	1	22:00	T		1102
3,4	1	22:10	T		1120
		22:15	PGM DISABLED		
		22:20	PGM ENABLED		
4,4	1	22:25	T		1136
1,4	2	22:35	T		1158
2,4	2	22:45	T		1164
3,4	2	22:55	T		1178
		23:00	PGM DISABLED		
		------------- TH 02-NOV-23 -------------			
		00:05	PGM ENABLED		
4,4	2	00:10	T		1150
1,4	3	00:20	T		1160
		00:30	PGM DISABLED		
		00:35	PGM ENABLED		
2,4	3	00:35	T		1165
3,4	3	00:45	T		1165
		00:55	PGM DISABLED		
		01:00	PGM ENABLED		
4,4	3	01:00	T		1177
		01:05	PGM DISABLED		
		03:20	PGM ENABLED		
1,4	4	03:25	T		1096
2,4	4	03:35	T		1096
3,4	4	03:45	T		1092
		03:55	PGM DISABLED		
		03:55	PGM ENABLED		
4,4	4	03:55	T		1090
		04:00	PGM DISABLED		

```
              04:05  PGM ENABLED
  1,4     5   04:10      T          1084
              04:15  PGM DISABLED
              04:25  PGM ENABLED
  2,4     5   04:30      T          1066
  3,4     5   04:40      T          1060
  4,4     5   04:50      T          1052
              04:52  PGM DISABLED
              05:00  PGM ENABLED
  1,4     6   05:10      T          1035
              05:11  PGM DISABLED
              06:40  PGM ENABLED
  2,4     6   06:50      T           966
  3,4     6   07:00      T           966
  4,4     6   07:10      T           971
  1,4     7   07:20      T           970
  2,4     7   07:30      T           970
              07:35  PGM DISABLED
              08:10  PGM ENABLED
  3,4     7   08:15      T           969
  4,4     7   08:25      T           972
              08:30  PGM DISABLED
              17:45  PGM ENABLED
              17:50  PGM DISABLED
------------- FR 03-NOV-23 -------------
              08:54  MANUAL PAUSE
              08:54  PGM STOPPED 03-NOV


   SOURCE T  ==> TIME
----------------------------------------
```

2309071-01

Bottle Certification

Bottle Certification

*** DEFAULT CONTAINER ***

NPDES Storm
Chain of Custody

Jar Cert #______ Outfall: 235 Date/Time sampler Installed: 11/1/23 @ 14:01

Jar Cert #______ Sampling Crew: CA, RG

Filter lot # 1376827 Weather conditions: Clear Date/Time sampler pickup: 11/3/23 @ 10:08

Observed activities in area: N/A

Observations during sampler collection: N/A

Color, Odors, sheens: N/A

Type of Sample: ☑ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☑ >0.2 inches rain ☐ <0.02 inches of rain previous 24 hours

Samplers: ☑ Data downloaded ☐ Sample bottles marked ☑ Ice Present at pick-up ☐ Tubing Decon 1000mL Divater ☑ Caps on containers

Fill to...	Parameters:	Sample	QC
Neck	PAH's/Phthalates (1L) +	☐	☐ ☐
No head	[1]Total Mercury (125/250mL QC)	☐	☐
No head	[1]Diss Mercury (125/250mL QC)	☐	☐
Shoulder	Total Metals (250mL)	☐	
Shoulder	Diss Metals (125mL)	☐	
Shoulder	TSS (1L), (500 mL min)	☐	
Shoulder	Nutrients (250mL)	☐	
Shoulder	Ortho-P (125mL), (75min)	☐	
Shoulder	BOD (1L)	☐	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☐	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes 4.010 L config above

+1000 mL for QC per bottle, must submit 2 extra bottles

[1]If 250ml bottle used, thenQAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (uS)
1	1000	☑	66.7
2	1000	☑	37.7
3	750	☑	58.1
4		☐	
5		☐	
6		☐	
7		☐	
8		☐	
9		☐	
10		☐	
11		☐	
12		☐	

Total aliquots: 11

Sample Drop

Date/Time: 11/3/23 @

Initial: CA, RG

pH: 6.9

COND (µS): 50.86

Lab #:

Aliquots composited: 11

Deviations :

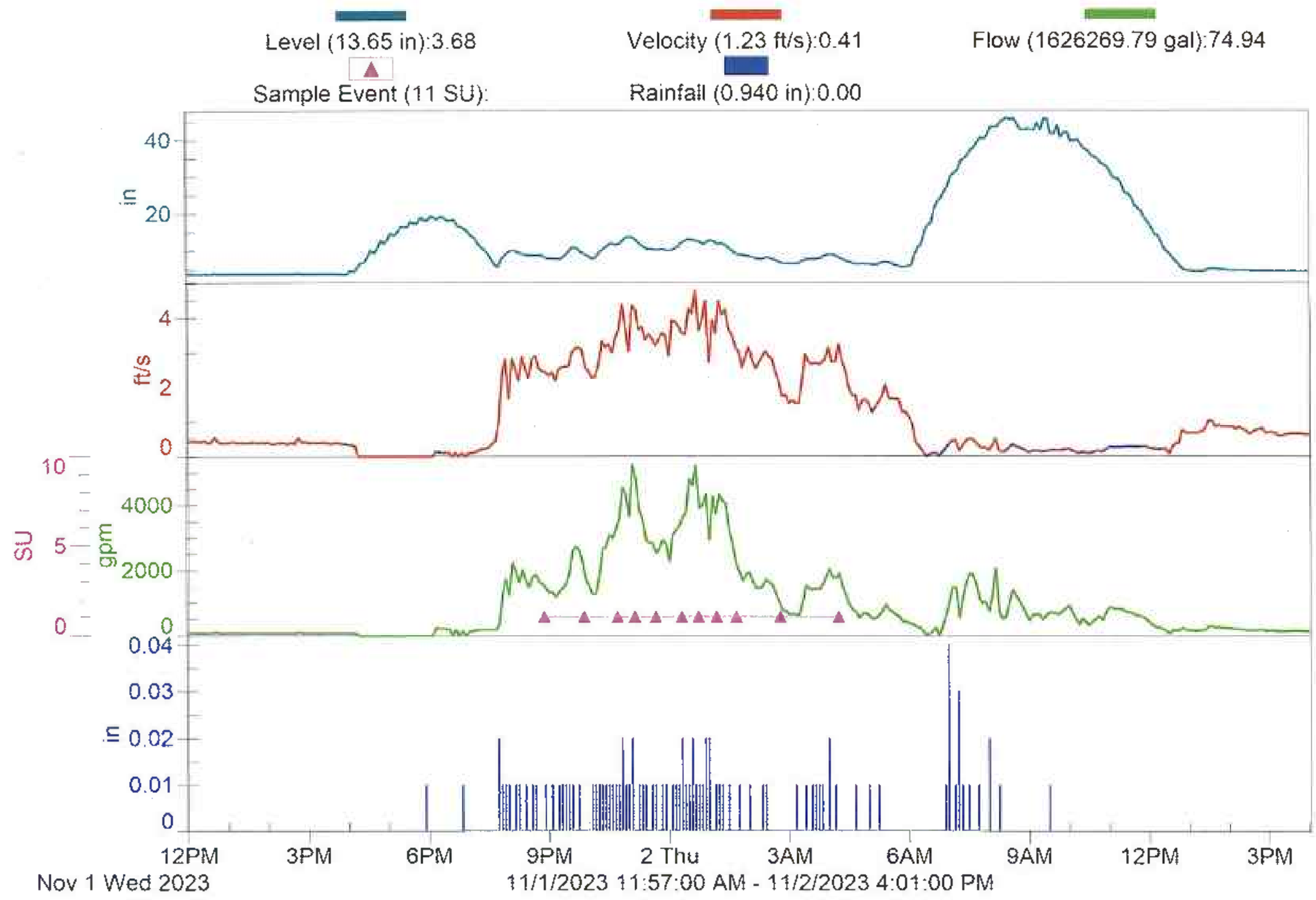
Composite End Time: 11/2/23 @ 4:15
(Collect Time) Last aliquot in composite

Relinquished by: [signature] Received by: Cooler

Date/Time: 11/3/23 @ 12:55 Date/Time: 11/3/23 12:55

235_A

Flowlink 5



```
SAMPLER ID# 1242995716  09:09  3-NOV-23
  Hardware:      A1  Software: 2.33
*********** PROGRAM SETTINGS ***********
      ----------
   PROGRAM NAME:
    "235A      "
 SITE DESCRIPTION:
    "235A ST   "
      ----------
   UNITS SELECTED:
     LENGTH: ft


      ----------
   UNITS SELECTED:
   FLOW RATE: gpm
 FLOW VOLUME: Mgal
   VELOCITY: fps
      ----------
  AREA-VEL MODULE:
   AREA*VELOCITY
     ROUND PIPE

      ----------

      5 MINUTE
   DATA INTERVAL

      ----------
  12,  1000 ml BTLS
 56 ft SUCTION LINE
 AUTO SUCTION HEAD
1 RINSES, 1 RETRIES
      ----------

  ONE-PART PROGRAM


      ----------
      PACING:
    FLOW, EVERY
     0.109 Mgal
NO SAMPLE AT START
      ----------
    DISTRIBUTION:
   4 SAMPLES/BOTTLE


      ----------
```

VOLUME:

250 ml SAMPLES

ENABLE:
LEVEL >0.370 ft
AND
VEL > 0.80 fps

ENABLE:
REPEATABLE ENABLE
NO SAMPLE AT DISABLE
NO SAMPLE AT ENABLE

ENABLE:
COUNTDOWN IS STOPPED
WHILE DISABLED

ENABLE:
0 PAUSE & RESUMES

NO DELAY TO START

200 HOURS RUN TIME

LIQUID DETECT ON

QUICK VIEW/CHANGE

TAKE MEASUREMENTS
AT STORAGE INTERVAL

DUAL SAMPLER OFF
BTL FULL DETECT OFF
TIMED BACKLIGHT

EVENT MARK SENT

DURING PUMP CYCLE

PUMP COUNTS FOR
EACH PURGE CYCLE:
100 PRE-SAMPLE
AUTO POST-SAMPLE

NO PERIODIC
SERIAL OUTPUT

INTERROGATOR
CONNECTOR
POWER ALWAYS ON

NO RAIN GAUGE

NO SDI-12 SONDE

AUTO SDI-12 SCAN OFF

I/O1= NONE
I/O2= NONE
I/O3= NONE

----

0 ANALOG OUTPUTS

NO EXTERNAL MODEM

NO ALARM
CONDITIONS SET

SAMPLER ID# 1242995716 09:09 3-NOV-23
Hardware: A1 Software: 2.33
*********** SAMPLING RESULTS ***********
SITE: 235A ST
PROGRAM: 235A
Program Started at 13:04 TU 31-OCT-23
Nominal Sample Volume = 250 ml

SAMPLE	BOTTLE	TIME	SOURCE	ERROR	COUNT TO LIQUID
		13:04	PGM DISABLED		
		------------- WE 01-NOV-23 -------------			
		19:45	PGM ENABLED		
1,4	1	20:53	F		1873
2,4	1	21:53	F		1867
3,4	1	22:43	F		1949
4,4	1	23:09	F		1963
1,4	2	23:40	F		1919
		------------- TH 02-NOV-23 -------------			
2,4	2	00:19	F		1931
3,4	2	00:44	F		1915
4,4	2	01:11	F		1921
1,3	3	01:41	F		1931
2,3	3	02:47	F		1915
3,3	3	04:15	F		1888
		06:10	PGM DISABLED		
		13:25	PGM ENABLED		
		14:10	PGM DISABLED		
		14:15	PGM ENABLED		
		14:20	PGM DISABLED		
		18:00	PGM ENABLED		
		18:25	PGM DISABLED		
		------------- FR 03-NOV-23 -------------			
		09:07	MANUAL PAUSE		
		09:07	PGM STOPPED 03-NOV		

SOURCE F ==> FLOW

2309070-01

Bottle Certification

/Bottle Certification

**** DEFAULT CONTAINER ****

NPDES Storm
Chain of Custody

Outfall: 2578 Date/Time sampler installed: 11/1/23 @ 13:54

Jar Cert #: ______ Sampling Crew: CA, RG

Filter lot # 1376827 Weather conditions: Clear Date/Time sampler pickup: 11/3/23 @ 9:59

Observed activities in area: N/A

Observations during sampler collection: N/A

Color, Odors, sheens: N/A

Type of Sample: ☑ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☑ >0.2 inches rain ☐ <0.02 inches of rain previous 24 hours

Samplers: ☑ Data downloaded ☐ Sample bottles marked
☑ Ice Present at pick-up ☐ Tubing Decon 1000mL DI water
☑ Caps on containers

Fill to...	Parameters:	Sample	QC
Neck	PAH's/Phthalates (1L) +	☐	☐ ☐
No head	¹Total Mercury (125/250mL QC)	☑	☐
No head	¹Diss Mercury (125/250mL QC)	☑	☐
Shoulder	Total Metals (250mL)	☑	
Shoulder	Diss Metals (125mL)	☑	
Shoulder	TSS (1L), (500 mL min)	☑	
Shoulder	Nutrients (250mL)	☑	
Shoulder	Ortho-P (125mL), (75min)	☑	
Shoulder	BOD (1L)	☐	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☐	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes 4.010 L config above
+1000 mL for QC per bottle, must submit 2 extra bottles
¹If 250ml bottle used, thenQAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (µS)
1	1000	☑	86.0
2	1000	☑	65.4
3	1000	☑	138.4
4	1000	☑	182.1
5	750	~~☑~~ CA	256.9
6	0	☐	
7	0	☐	
8	0	☐	
9	0	☐	
10	0	☐	
11	0	☐	
12	0	☐	

Total aliquots: 19

Sample Prep

Date/Time: 11/3/23 @ 11:16

Initial: CA, RG

pH: ~~7~~ CA 6.52

COND (µS): 108.6

Lab #:

Aliquots composited: 16

Deviations: Jar#5 not added to composite

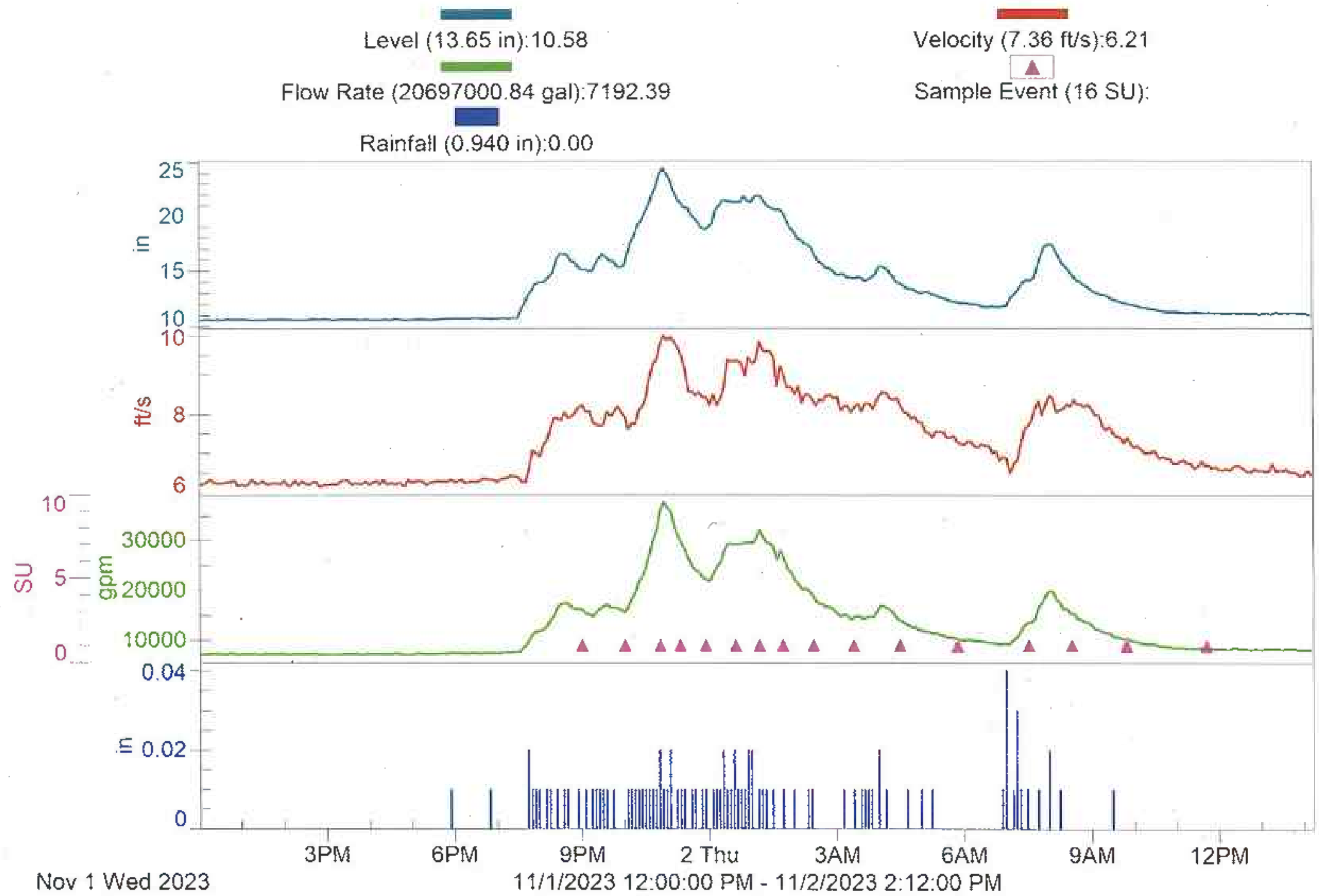
Composite End Time: 11/2/23 @ 11:42
(Collect Time) Last aliquot in composite

Relinquished by: [signature] Received by: Cooler

Date/Time: 11/3/23 @ 12:55 Date/Time: 11/3/23 12:55

237B

Flowlink 5



SAMPLER ID# 1243003651 08:59 3-NOV-23
Hardware: A1 Software: 2.33
*********** PROGRAM SETTINGS ***********

PROGRAM NAME:
" STORM 1 "
SITE DESCRIPTION:
" 237 B   "

UNITS SELECTED:
LENGTH: ft

12, 1000 ml BTLS
16 ft SUCTION LINE
AUTO SUCTION HEAD
1 RINSES, 1 RETRIES

ONE-PART PROGRAM

PACING:
FLOW, EVERY
1 PULSES
NO SAMPLE AT START

DISTRIBUTION:
4 SAMPLES/BOTTLE

VOLUME:

250 ml SAMPLES

ENABLE:

NONE PROGRAMMED

ENABLE:
REPEATABLE ENABLE
NO SAMPLE AT DISABLE
NO SAMPLE AT ENABLE

ENABLE:
COUNTDOWN IS STOPPED
WHILE DISABLED

ENABLE:
0 PAUSE & RESUMES

NO DELAY TO START

200 HOURS RUN TIME

LIQUID DETECT ON

QUICK VIEW/CHANGE

TAKE MEASUREMENTS
AT STORAGE INTERVAL

DUAL SAMPLER OFF
BTL FULL DETECT ON
TIMED BACKLIGHT

EVENT MARK SENT
DURING PUMP CYCLE

PUMP COUNTS FOR
EACH PURGE CYCLE:
100 PRE-SAMPLE
AUTO POST-SAMPLE

NO PERIODIC
SERIAL OUTPUT

INTERROGATOR
CONNECTOR

POWER ALWAYS ON

NO RAIN GAUGE

NO SDI-12 SONDE

AUTO SDI-12 SCAN OFF

I/O1= NONE
I/O2= NONE
I/O3= NONE

----

0 ANALOG OUTPUTS

NO EXTERNAL MODEM

NO ALARM
CONDITIONS SET

SAMPLER ID# 1243003651 08:59 3-NOV-23
Hardware: A1 Software: 2.33
*********** SAMPLING RESULTS ***********
SITE: 237 B
PROGRAM: STORM 1
Program Started at 12:54 TU 31-OCT-23
Nominal Sample Volume = 250 ml
COUNT
TO

SAMPLE	BOTTLE	TIME	SOURCE	ERROR	LIQUID
------	------	----	--	--	------
		12:54	PGM ENABLED		
-------------		WE 01-NOV-23			-------------
1,4	1	20:59	F		521
2,4	1	22:01	F		520
3,4	1	22:51	F		509
4,4	1	23:19	F		507
1,4	2	23:55	F		519
-------------		TH 02-NOV-23			-------------
2,4	2	00:37	F		506
3,4	2	01:11	F		509
4,4	2	01:44	F		508
1,4	3	02:27	F		511
2,4	3	03:24	F		515
3,4	3	04:30	F		505
4,4	3	05:50	F		515
1,4	4	07:32	F		515
2,4	4	08:33	F		505
3,4	4	09:49	F		521
4,4	4	11:42	F		526
1,3	5	14:53	F		521
2,3	5	17:55	F		519
3,3	5	19:57	F		517
-------------		FR 03-NOV-23			-------------
		08:58	MANUAL PAUSE		
		08:58	PGM STOPPED 03-NOV		

SOURCE F ==> FLOW

2309071-01 [redacted]

Bottle Certification

Bottle Certification

*** DEFAULT CONTAINER ***

NPDES Storm

Chain of Custody

Jar Cert #______ Outfall: 243 Date/Time sampler installed: 11/1/23 @ 13:42

Jar Cert #______ Sampling Crew: CA, RG

Filter lot # 1376827 Weather conditions: Clear Date/Time sampler pickup: 11/3/23 @ 9:45

Observed activities in area: N/A

Observations during sampler collection: N/A

Color, Odors, sheens: N/A

Type of Sample: ☑ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☑ >0.2 inches rain ☐ <0.02 inches of rain previous 24 hours

Samplers: ☐ Data downloaded ☐ Sample bottles cracked
☑ Ice Present at pick-up ☐ Tubing Decon 1000mL Divater
☑ Caps on containers

Fill to...	Parameters:	Sample	QC
Neck	PAH's/Phthalates (1L) +	☒	☒ ☑
No head	[1]Total Mercury (125/250mL QC)	☒	☒
No head	[1]Diss Mercury (125/250mL QC)	☒	☒
Shoulder	Total Metals (250mL)	☒	
Shoulder	Diss Metals (125mL)	☒	
Shoulder	TSS (1L), 500 mL min)	☒	
Shoulder	Nutrients (250mL)	☒	
Shoulder	Ortho-P (125mL), (75min)	☒	
Shoulder	BOD (1L)	☒	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☒	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes 4.010 L config above
+1000 mL for QC per bottle, must submit 2 extra bottles
[1]If 250ml bottle used, thenQAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (µS)
1	1000	☑	2653
2	1000	☑	2374
3	1000	☑	2064
4	1000	☑	1740
5	1000	☑	1588
6	1000	☑	1632
7	1000	☑	1685
8	500	☑	3410
9		☐	
10		☐	
11		☐	
12		☐	

Total aliquots: 30

Sample Prep

Date/Time: 11/3/23 @ 12:10

Initial: CA, RG

pH: 6.72

COND (µS): 1949

Lab #:

Aliquots composited: 30

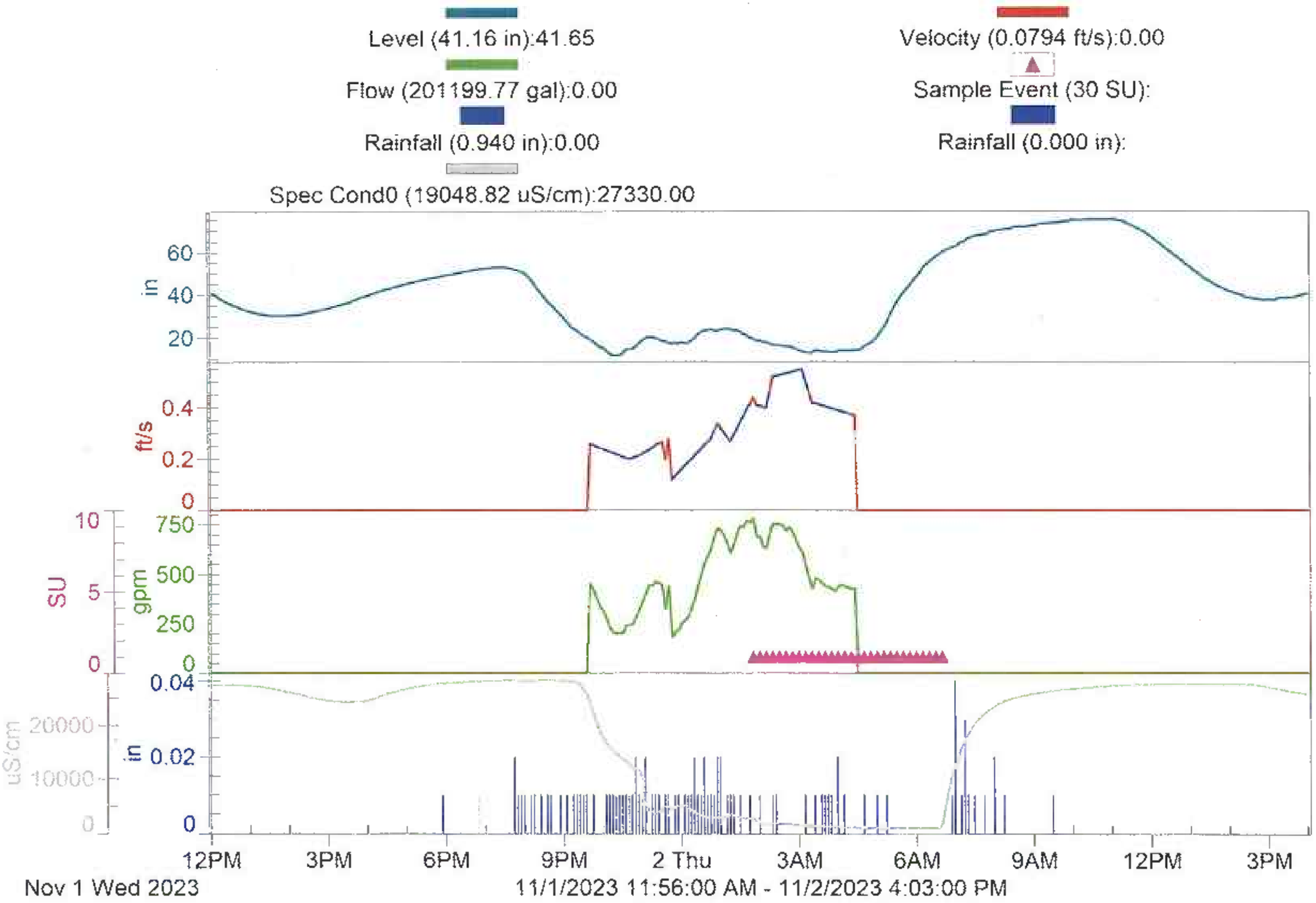
Deviations :

Composite End Time: 11/3/23 @ 6:40
(Collect Time) Last aliquot in composite

Relinquished by: [signature] Received by: Cooler

Date/Time: 11/3/23 @ 12:55 Date/Time: 11/3/23 12:55

243
Flowlink 5



```
SAMPLER ID# 1242893352  08:46  3-NOV-23
  Hardware:     A1  Software: 2.33
*********** PROGRAM SETTINGS ***********
     ----------
    PROGRAM NAME:
     "STORM 1   "
  SITE DESCRIPTION:
     "  243     "
     ----------
    UNITS SELECTED:
      LENGTH: ft
CONDUCTIVITY: mS/cm
  TEMPERATURE:  F
     ----------
    UNITS SELECTED:
    FLOW RATE: gpm
  FLOW VOLUME: Mgal
    VELOCITY: fps
     ----------
   AREA-VEL MODULE:
    AREA*VELOCITY
      ROUND PIPE

     ----------

      5 MINUTE
    DATA INTERVAL

     ----------
   12,  1000 ml BTLS
  17 ft SUCTION LINE
  AUTO SUCTION HEAD
1 RINSES, 1 RETRIES
     ----------

   ONE-PART PROGRAM


     ----------
      PACING:
     TIME, EVERY
 0 HOURS, 10 MINUTES

     ----------
    DISTRIBUTION:
   4 SAMPLES/BOTTLE


     ----------
```

VOLUME:

250 ml SAMPLES

ENABLE:

SP_CO0 <2.700 mS/cm

ENABLE:
REPEATABLE ENABLE
NO SAMPLE AT DISABLE
NO SAMPLE AT ENABLE

ENABLE:
COUNTDOWN IS STOPPED
WHILE DISABLED

ENABLE:
0 PAUSE & RESUMES

NO DELAY TO START

LIQUID DETECT ON

QUICK VIEW/CHANGE

TAKE MEASUREMENTS
AT STORAGE INTERVAL

DUAL SAMPLER OFF
BTL FULL DETECT OFF
TIMED BACKLIGHT

EVENT MARK SENT

DURING PUMP CYCLE

PUMP COUNTS FOR
EACH PURGE CYCLE:
200 PRE-SAMPLE
AUTO POST-SAMPLE

NO PERIODIC
SERIAL OUTPUT

INTERROGATOR
CONNECTOR
POWER ALWAYS ON

NO RAIN GAUGE

SDI-12 DATA:
01DATA0 02DATA0
TEMP0 SP_CO0 05DATA0

I/O1= NONE
I/O2= NONE
I/O3= NONE

----

0 ANALOG OUTPUTS

NO EXTERNAL MODEM

NO ALARM
CONDITIONS SET

SAMPLER ID# 1242893352 08:47 3-NOV-23
Hardware: A1 Software: 2.33
*********** SAMPLING RESULTS ***********
SITE: 243
PROGRAM: STORM 1
Program Started at 12:44 TU 31-OCT-23
Nominal Sample Volume = 250 ml

SAMPLE	BOTTLE	TIME	SOURCE	ERROR	COUNT TO LIQUID
		12:44	PGM DISABLED		
		TH 02-NOV-23			
		01:40	PGM ENABLED		
1,4	1	01:50	T		440
2,4	1	02:00	T		441
3,4	1	02:10	T		441
4,4	1	02:20	T		446
1,4	2	02:30	T		446
2,4	2	02:40	T		447
3,4	2	02:50	T		446
4,4	2	03:00	T		447
1,4	3	03:10	T		447
2,4	3	03:20	T		450
3,4	3	03:30	T		447
4,4	3	03:40	T		449
1,4	4	03:50	T		450
2,4	4	04:00	T		450
3,4	4	04:10	T		450
4,4	4	04:20	T		450
1,4	5	04:30	T		450
2,4	5	04:40	T		450
3,4	5	04:50	T		449
4,4	5	05:00	T		446
1,4	6	05:10	T		441
2,4	6	05:20	T		441
3,4	6	05:30	T		438
4,4	6	05:40	T		438
1,4	7	05:50	T		435
2,4	7	06:00	T		431
3,4	7	06:10	T		430
4,4	7	06:20	T		429
1,2	8	06:30	T		429

```
  2,2     8   06:40       T          429
              06:45  PGM DISABLED
------------- FR 03-NOV-23 -------------
              08:43  MANUAL PAUSE
              08:43  PGM STOPPED 03-NOV

   SOURCE T  ==> TIME
----------------------------------------
```

2309070-01

Bottle Certification

Bottle Certification

*** DEFAULT CONTAINER ***

NPDES Storm
Chain of Custody

Jar Cert #

Jar Cert #

Filter lot # 1376827

Outfall: 245

Date/Time sampler installed: 11/1/23 @ 13:37

Sampling Crew: CA, RG

Weather conditions: Clear

Date/Time sampler pickup: 11/3/23 @ 9:35

Observed activities in area: N/A

Observations during sampler collection: N/A

Color, Odors, sheens: N/A

Type of Sample: ☑ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☑ >0.2 inches rain ☐ <0.02 inches of rain previous 24 hours

Samplers: ☑ Data downloaded ☐ Sample bottles marked

☑ Ice Present at pick-up ☐ Tubing Decon 1000mL DI water

☑ Caps on containers

Fill to...	Parameters:	Sample	QC
Neck	PAH's/Phthalates (1L) +	☑	☐ ☐
No head	'Total Mercury (125/250mL QC)	☑	☐
No head	'Diss Mercury (125/250mL QC)	☑	☐
Shoulder	Total Metals (250mL)	☑	
Shoulder	Diss Metals (125mL)	☑	
Shoulder	TSS (1L), (500 mL min)	☑	
Shoulder	Nutrients (250mL)	☑	
Shoulder	Ortho-P (125mL), (75min)	☑	
Shoulder	BOD (1L)	☑	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☑	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes 4.010 L config above

+1000 mL for QC per bottle, must submit 2 extra bottles

'If 250ml bottle used, thenQAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (uS)
1	1000	☑	1754
2	↓	☑	395
3		☑	179
4		☑	190
5		☑	155
6		☑	109
7		☑	136
8		☑	225
9		☑	326
10		☑	235
11		☑	4880
12	750	☐	882

Total aliquots: 47

Sample Prep

Date/Time: 11/3/23 @ 11:41

Initial: CA, RG

pH: ~~RCA~~ 6.80

COND (µS): ~~245~~ RG 784.5

Lab #:

Aliquots composited: 44

Deviations :

Composite End Time: (Collect Time) 11/2/23 @ 7:30 Last aliquot in composite

Relinquished by: 11/3/2 [signature]

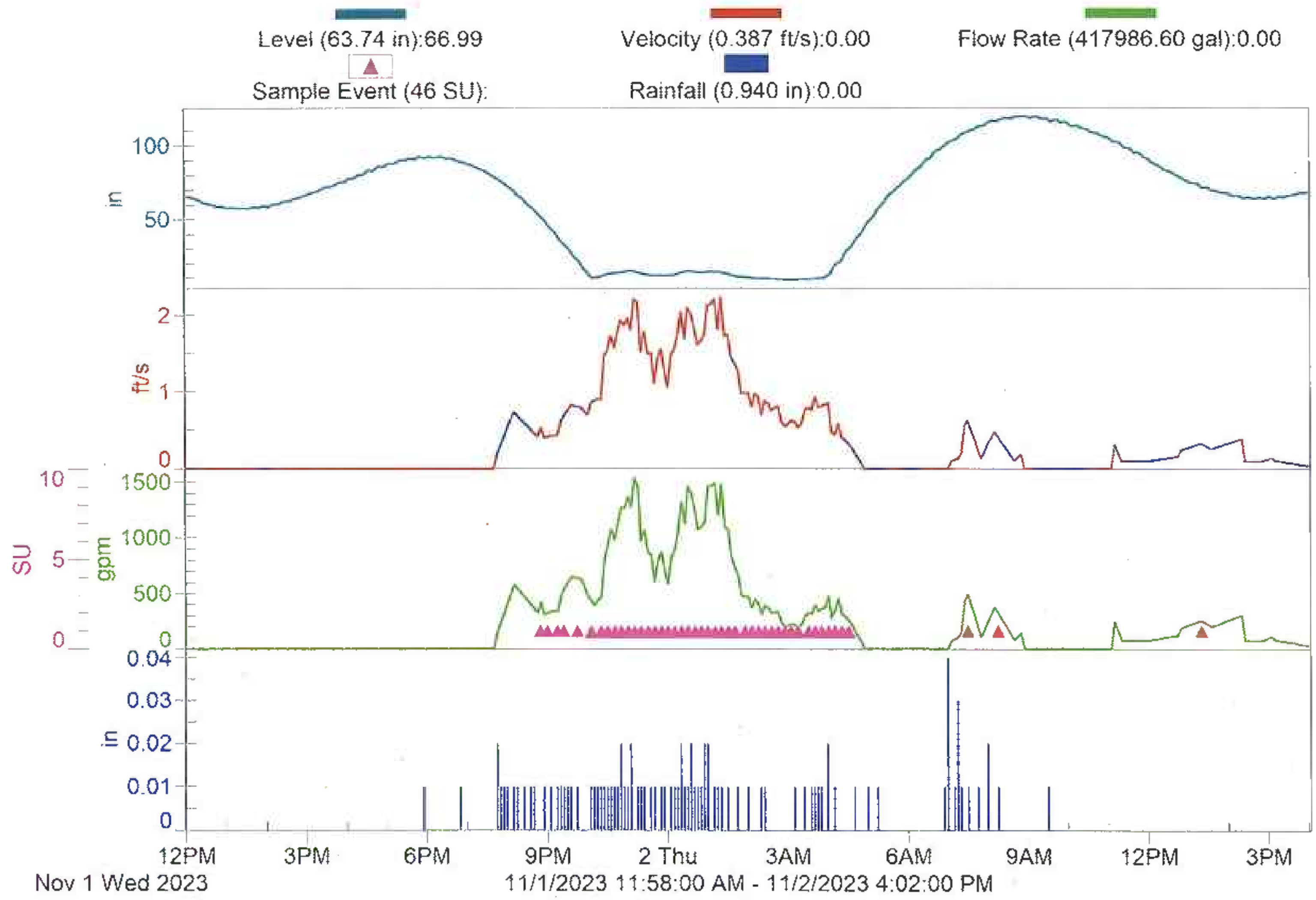
Date/Time: 11/3/23 @ 12:55

Received by: Cooler

Date/Time: 11/3/23 @ 12:55

OF245 B

Flowlink 5



SAMPLER ID# 1284476967 08:37 3-NOV-23
Hardware: A1 Software: 2.33
*********** PROGRAM SETTINGS ***********

PROGRAM NAME:
"STORM   "
SITE DESCRIPTION:
"OF245 B   "

UNITS SELECTED:
LENGTH: ft

UNITS SELECTED:
FLOW RATE: gpm
FLOW VOLUME: gal
VELOCITY: fps

AREA-VEL MODULE:
AREA*VELOCITY
ROUND PIPE

----

5 MINUTE
DATA INTERVAL

12, 1000 ml BTLS
21 ft SUCTION LINE
AUTO SUCTION HEAD
1 RINSES, 1 RETRIES

ONE-PART PROGRAM

PACING:
TIME, EVERY
0 HOURS, 10 MINUTES

DISTRIBUTION:
4 SAMPLES/BOTTLE

VOLUME:

250 ml SAMPLES

ENABLE:

FLOW >200.0 gpm

ENABLE:
REPEATABLE ENABLE
NO SAMPLE AT DISABLE
NO SAMPLE AT ENABLE

ENABLE:
COUNTDOWN IS STOPPED
WHILE DISABLED

ENABLE:
0 PAUSE & RESUMES

NO DELAY TO START

LIQUID DETECT ON

QUICK VIEW/CHANGE

TAKE MEASUREMENTS
EVERY 5 MINUTES

DUAL SAMPLER OFF
BTL FULL DETECT OFF
TIMED BACKLIGHT

PULSED EVENT MARK

AT INITIAL PURGE

PUMP COUNTS FOR
EACH PURGE CYCLE:
200 PRE-SAMPLE
AUTO POST-SAMPLE

NO PERIODIC
SERIAL OUTPUT

INTERROGATOR
CONNECTOR
POWER ALWAYS ON

NO RAIN GAUGE

NO SDI-12 SONDE

AUTO SDI-12 SCAN OFF

I/O1= NONE
I/O2= NONE
I/O3= NONE

----

0 ANALOG OUTPUTS

NO EXTERNAL MODEM

NO ALARM
CONDITIONS SET

SAMPLER ID# 1284476967 08:37 3-NOV-23
Hardware: A1 Software: 2.33
*********** SAMPLING RESULTS ***********
SITE: OF245 B
PROGRAM: STORM
Program Started at 12:35 TU 31-OCT-23
Nominal Sample Volume = 250 ml

SAMPLE	BOTTLE	TIME	SOURCE	ERROR	COUNT TO LIQUID
		12:35	PGM	DISABLED	
-------------		WE 01-NOV-23	-------------		
		20:10	PGM	ENABLED	
		20:15	PGM	DISABLED	
		20:45	PGM	ENABLED	
1,4	1	20:50	T		558
2,4	1	21:00	T		564
		21:01	PGM	DISABLED	
		21:05	PGM	ENABLED	
3,4	1	21:15	T		571
4,4	1	21:25	T		581
		21:26	PGM	DISABLED	
		21:35	PGM	ENABLED	
1,4	2	21:45	T		593
		21:46	PGM	DISABLED	
		21:50	PGM	ENABLED	
		21:55	PGM	DISABLED	
		22:00	PGM	ENABLED	
2,4	2	22:05	T		607
		22:10	PGM	DISABLED	
		22:15	PGM	ENABLED	
3,4	2	22:20	T		607
4,4	2	22:30	T		604
1,4	3	22:40	T		604
2,4	3	22:50	T		604
3,4	3	23:00	T		607
4,4	3	23:10	T		605
1,4	4	23:20	T		609
2,4	4	23:30	T		612
3,4	4	23:40	T		613
4,4	4	23:50	T		609

------------- TH 02-NOV-23 -------------

1,4	5	00:00	T	611
2,4	5	00:10	T	612
3,4	5	00:20	T	609
4,4	5	00:30	T	608
1,4	6	00:40	T	606
2,4	6	00:50	T	608
3,4	6	01:00	T	607
4,4	6	01:10	T	612
1,4	7	01:20	T	612
2,4	7	01:30	T	612
3,4	7	01:40	T	612
		01:41	PGM DISABLED	
		01:45	PGM ENABLED	
4,4	7	01:55	T	613
1,4	8	02:05	T	613
2,4	8	02:15	T	614
3,4	8	02:25	T	613
4,4	8	02:35	T	614
1,4	9	02:45	T	613
2,4	9	02:55	T	615
3,4	9	03:05	T	615
4,4	9	03:15	T	615
		03:16	PGM DISABLED	
		03:20	PGM ENABLED	
1,4	10	03:30	T	613
2,4	10	03:40	T	613
3,4	10	03:50	T	614
4,4	10	04:00	T	611
1,4	11	04:10	T	603
2,4	11	04:20	T	600
3,4	11	04:30	T	591
		04:31	PGM DISABLED	
		04:35	PGM ENABLED	
		04:40	PGM DISABLED	
		07:25	PGM ENABLED	
4,4	11	07:30	T	518
		07:35	PGM DISABLED	
		08:10	PGM ENABLED	
1,3	12	08:15	T	509
		08:20	PGM DISABLED	
		11:10	PGM ENABLED	
		11:15	PGM DISABLED	
		13:20	PGM ENABLED	
2,3	12	13:20	T	547
		13:25	PGM DISABLED	
		14:20	PGM ENABLED	
		14:25	PGM DISABLED	
		21:35	PGM ENABLED	
3,3	12	21:35	T	559

```
              21:40  PGM DISABLED
------------- FR 03-NOV-23 -------------
              08:34  MANUAL PAUSE
              08:34  PGM STOPPED 03-NOV

   SOURCE T  ==> TIME
----------------------------------------
```

2309070-01

NPDES Storm
Chain of Custody

Bottle Certification
Bottle Certification
*** DEFAULT CONTAINER ***

Jar Cert #______ Outfall: 254 Date/Time sampler installed: 11/1/23 @ 13:32

Jar Cert #______ Sampling Crew: CA, RG

Filter lot # 1371827 Weather conditions: Clear Date/Time sampler pickup: 11/3/23 @ 9:22

Observed activities in area: N/A

Observations during sampler collection: N/A

Color, Odors, sheens: N/A

Type of Sample: ☑ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☑ >0.2 inches rain ☐ <0.02 inches of rain previous 24 hours

Samplers: ☑ Data downloaded ☐ ~~Sample bottles marked~~
☑ ~~Ice Present at pick-up~~ ☐ Tubing Decon 1000mL Divater
☑ Caps on containers

Fill to...	Parameters:	Sample	QC
Neck	PAH's/Phthalates (1L) +	☑	☐ ☐
No head	1 Total Mercury (125/250mL QC)	☑	☐
No head	1 Diss Mercury (125/250mL QC)	☑	☐
Shoulder	Total Metals (250mL)	☑	
Shoulder	Diss Metals (125mL)	☑	
Shoulder	TSS (1L), (500 mL min)	☑	
Shoulder	Nutrients (250mL)	☑	
Shoulder	Ortho-P (125mL), (75min)	☑	
Shoulder	BOD (1L)	☑	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☑	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes 4.010 L config above
+1000 mL for QC per bottle, must submit 2 extra bottles
1 If 250ml bottle used, then QAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (µS)
1	1000	☑	8220
2	1000	☑	7010
3	1000	☑	4500
4	1000	☑	6180
5	1000	☑	4220
6	1000	☑	3520
7	750	☑	5000
8	↓	☐	
9		☐	
10		☐	
11		☐	
12		☐	

Total aliquots: 27

Sample Prep

Date/Time: 11/3/23 @ 11:30

Initial: CA, RG

pH: 6.41

COND (µS): 5200

Lab #:

Aliquots composited: 27

* Deviations: tubing disconnected during storm event 27/48 aliquots

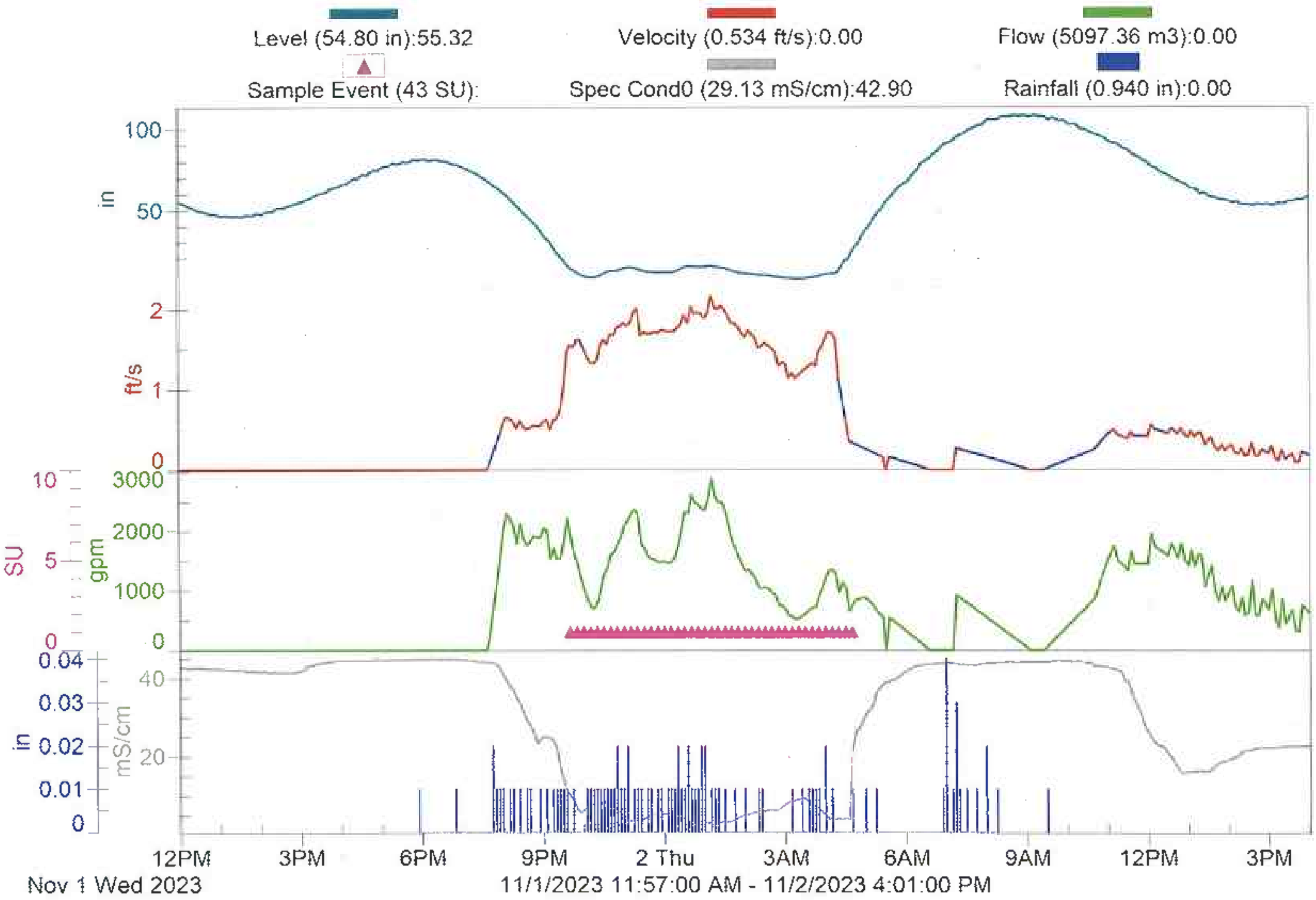
Composite End Time: (Collect Time) 11/2/23 @ 2:00 ☆ Last aliquot in composite

Relinquished by: [signature] Received by: Cooler

Date/Time: 11/3/23 @ 12:55 Date/Time: 11/3/23 @ 12:55

254-

Flowlink 5



NPDES Storm
Chain of Custody

Jar Cert #

Outfall: 222

Date/Time sampler installed: 11/1/23 @ 13:37

Jar Cert #

Sampling Crew: CA, RG

Filter lot # 1376827

Weather conditions: Clear

Date/Time sampler pickup: 11/3/23 @ 9:35

Observed activities in area: N/A

Observations during sampler collection: N/A

Color, Odors, sheens: N/A

Type of Sample: ☑ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☑ >0.2 inches rain ☐ <0.02 inches of rain previous 24 hours

Samplers: ☑ ~~Data downloaded~~ ☐ ~~Sample bottles marked~~
☑ Ice Present at pick-up ☐ Tubing Decon 1000mL DI water
☑ Caps on containers

Fill to...	Parameters:	Sample	QC
Neck	PAH's/Phthalates (1L) +	☑	☐ ☐
No head	[1]Total Mercury (125/250mL QC)	☑	☐
No head	[1]Diss Mercury (125/250mL QC)	☑	☐
Shoulder	Total Metals (250mL)	☑	
Shoulder	Diss Metals (125mL)	☑	
Shoulder	TSS (1L), (500 mL min)	☑	
Shoulder	Nutrients (250mL)	☑	
Shoulder	Ortho-P (125mL), (75min)	☑	
Shoulder	BOD (1L)	☐	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☐	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes 4.010 L config above
+1000 mL for QC per bottle, must submit 2 extra bottles
[1]If 250ml bottle used, thenQAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (µ3)
1	1000	☑	1754
2		☑	395
3		☐	179
4		☑	190
5		☑	155
6		☑	103
7		☑	136
8		☑	226
9		☑	328
10		☑	235
11		☑	4880
12	750	☑	882

Total aliquots: 47

Sample Prep

Date/Time: 11/3/23 @ 11:41

Initial: CA, RG

pH: 6.80

COND (µS): 784.5

Lab #:

Aliquots composited: 44

Deviations : Jar Broke

Composite End Time: 11/2/23 @ 7:30
(Collect Time) Last aliquot in composite

Relinquished by: [signature]

Received by: Cooler

Date/Time: 11/3/23 @ 12:55

Date/Time: 11/3/23 12:55

NPDES Storm
Chain of Custody

Jar Cert #______ Outfall: SSS Date/Time sampler installed: ______

Jar Cert #______ Sampling Crew: CA, RG

Filter lot # 1376827 Weather conditions: Clear Date/Time sampler pickup: 11/3/23

Observed activities in area: N/A

Observations during sampler collection: N/A

Color, Odors, sheens: N/A

Type of Sample: ☑ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☑ >0.2 inches rain ☐ <0.02 inches of rain previous 24 hours

Samplers: ☑ Data downloaded ☐ Sample bottles marked
☑ ~~Ice Present at pick-up~~ ☐ Tubing Decon 1000mL Diwater
☑ Caps on containers

Fill to...	Parameters:	Sample	QC
Neck	PAH's/Phthalates (1L) +	☑	☐ ☐
No head	[1]Total Mercury (125/250mL QC)	☑	☐
No head	[1]Diss Mercury (125/250mL QC)	☑	☐
Shoulder	Total Metals (250mL)	☑	
Shoulder	Diss Metals (125mL)	☑	
Shoulder	TSS (1L), (500 mL min)	☑	
Shoulder	Nutrients (250mL)	☑	
Shoulder	Ortho-P (125mL), (75min)	☑	
Shoulder	BOD (1L)	☑	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☑	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes 4.010 L config above
+1000 mL for QC per bottle, must submit 2 extra bottles
[1]If 250ml bottle used, thenQAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (µS)
1	1000	☐	
2		☐	
3		☐	
4		☐	
5		☐	
6		☐	
7		☐	
8		☐	
9		☐	
10		☐	
11		☐	
12		☐	

Total aliquots: 48

Sample Drop
Date/Time: 11/3/23 @ 11:05
Initial: CA, RG
pH: 8.05
COND (µS): 3.17
Lab #:
Aliquots composited: 48

Deviations :

Composite End Time: ______
(Collect Time) Last aliquot in composite

Relinquished by: [signature] Received by: Cooler
Date/Time: 11/3/23 @ 12:55 Date/Time: 11/3/23 12:55

FIELD REPORT

Project: Thea Foss/Wheeler-Osgood Waterways & NPDES Stormwater Monitoring Program

Event: Storm Event – Nov. 3, 2023

INTRODUCTION

This report summarizes the storm event sampled on 11/3/2023-11/5/2023 by the City of Tacoma Environmental Services Collection System Support staff as part of our stormwater monitoring program. This report includes a summary of the following:

- Storm characteristics and criteria;
- Sampling activities;
- Flow characteristics at each sampling location;
- Pacing – set for a .8" event, actual event was .88"

This event met the sampling criteria for precipitation as specified in the Thea Foss Sampling and Analysis Plan (SAP).

DESCRIPTION OF SAMPLING ACTIVITES

Samplers placed in the field on 11/3/2023. During sampler installation the weather conditions were overcast. All samplers were retrieved on 11/5/23 (For site specific details, see Appendix A for field notes, Chain of Custody (COC) forms, and event hydrographs).

The following unusual observations were noted during the sampling event:

Table 2: Composite Sampling Activities

Sample Location	Site Deployed	Sample Accepted	Pacing (gal)	Enables LVL(ft), VEL(fps)	Comments
Outfall 230A	No	N/A	N/A	N/A	N/A
Outfall 235	No	N/A	N/A	N/A	N/A
Outfall 237ANew	Yes	Yes	575,643	LVL > .33 VEL > 6.0	17 Aliquots Collected / 17 Composited
Outfall 237B	No	N/A	N/A	N/A	N/A
Outfall 243	No	N/A	N/A	N/A	N/A
Outfall 245	No	N/A	N/A	N/A	N/A
Outfall 254	No	N/A	N/A	N/A	N/A

**QC, QUALITY CONTROL*

ND, NO DATA

NA, NOT APPLICABLE

WATER QUALITY DATA

Accepted samples were analyzed for the target parameters specified in the SAP and QAPP. Samples accepted at all Outfalls were composited and preserved within 24 hours of the last aliquot being collected. The samples were allowed to sit for a minimum of 18 hours before metals analysis was started.

EQUIPMENT INFORMATION

Samples were collected using ISCO 6712 portable auto samplers. Rain data was collected using an ISCO 674 rain gauge located at the Center for Urban Waters at 326 East D Street, Tacoma, WA 98421.

CORRECTIVE ACTIONS AND DEVIATIONS

There were no deviations from the field procedures as discussed in the SAP other than those discussed above/below. No other criteria or procedures as indicated in the SAP were compromised except for those discussed above/below.

Enclosures: The ISCO program setting/sampling results report, the sample collection chain of custody form, and field records are in Appendix A for each outfall. This includes the following information for the samples collected:

- Plot of flow hydrograph and hyetograph
- Subsample times and conductivities
- Tidal windows
- Field activities

Appendix A

PROJECT ______ Notebook No. ______

Continued from Page ______

11/3/23 - Storm Deployment 0.80
237A @ 9:58

11/5/23 - Storm Collection 0.88
237A @ 8:31 - Download - 4¼/12

Storm Deployment - .48" 11/9/23

245 - Jars/Ice - 14:45
237A - Jars/Ice - 15:00 - 418,000
237B - Jars/Ice - 15:05 - 377,000
235 - Jars/Ice - 15:10 - 41,000
230A - Jars/Ice - 15:15 - 10mn 72500 gpm

11/12/23 Storm Collection HA, HB ".66

245 - 9:49, data downloaded, 8.5L/34 aliquots

237A - 9:58, " ", 5.5L/22 aliquots

237B - 10:07, " ", 11.5L/46 aliquots

235 - 10:19, " ",

230A - 10:29, " ", only 1 bottle

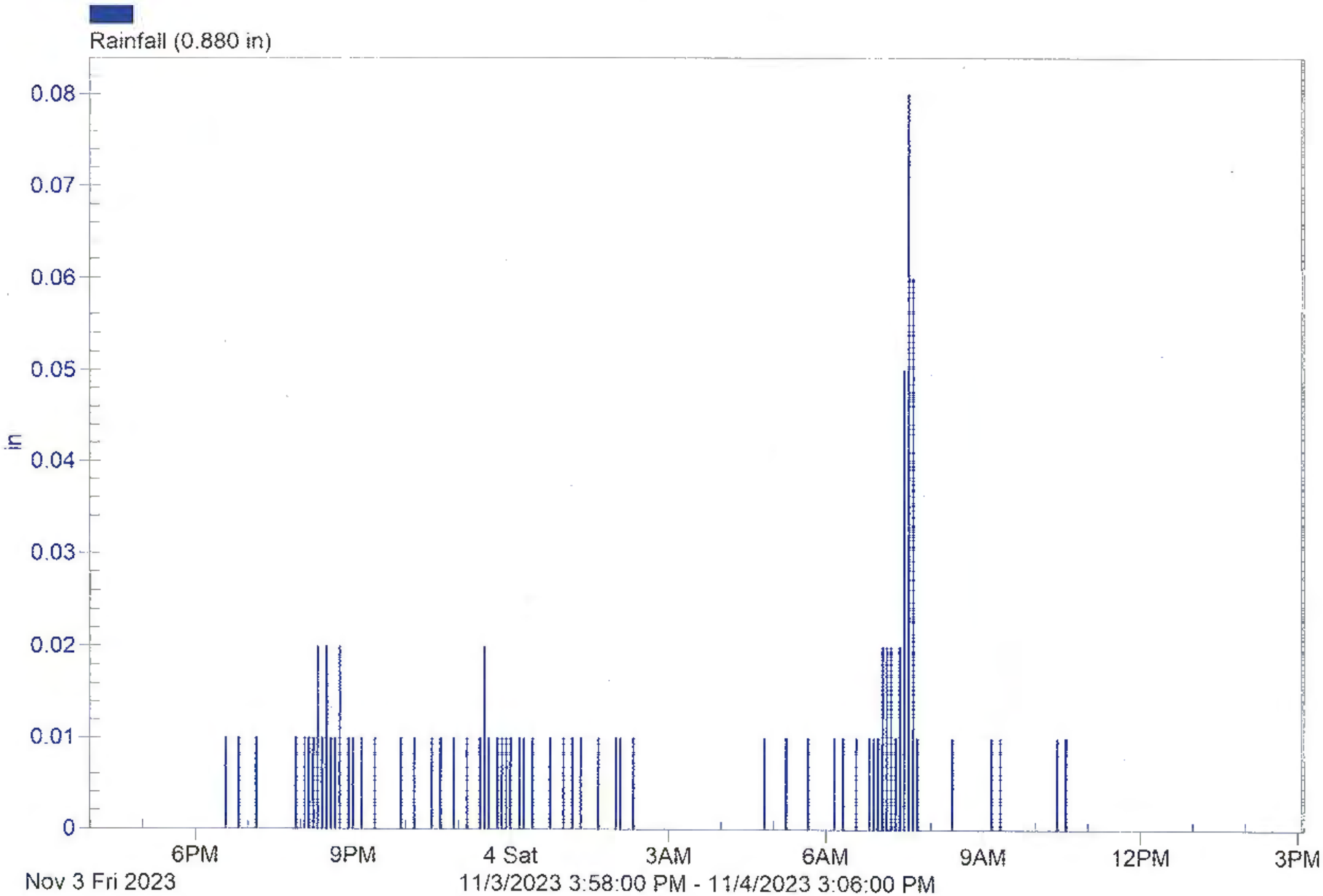
Continued on Page

Read and Understood By

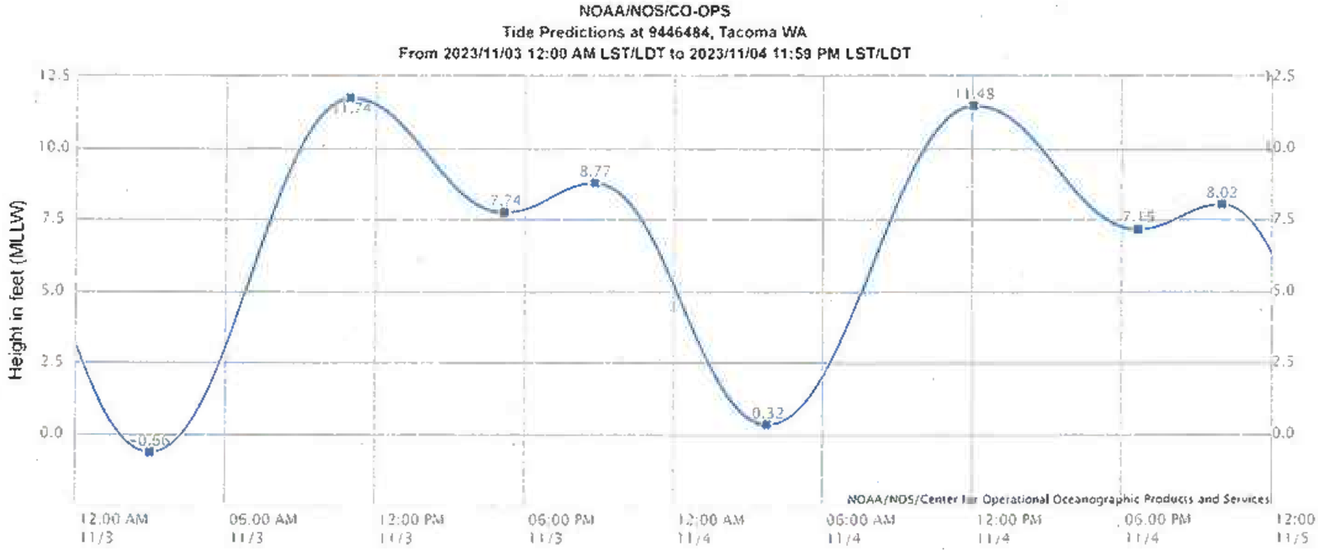
Signed ______ Date ______ Signed ______ Date ______

RF1

Flowlink 5



Help Print



Note: The interval is High/Low, the solid blue line depicts a curve fit between the high and low values and approximates the segments between.
Disclaimer: These data are based upon the latest information available as of the date of your request, and may differ from the published tide tables.

High/Low Tide Prediction Data Listing

Station Name: Tacoma, WA
Action: Daily
Product: Tide Predictions
Start Date & Time: 2023/11/3 12:00 AM
End Date & Time: 2023/11/4 11:59 PM

Source: NOAA/NOS/CO-OPS
Prediction Type: Harmonic
Datum: MLLW
Height Units: Feet
Time Zone: LST/LDT

Date	Day	Time	Hgt	Time	Hgt	Time	Hgt	Time	Hgt
2023/11/03	Fri	02:57 AM	-0.66 L	10:58 AM	11.74 H	5:11 PM	7.74 L	8:47 PM	8.77 H
2023/11/04	Sat	03:49 AM	0.32 L	12:02 PM	11.48 H	6:41 PM	7.15 L	10:02 PM	8.02 H

2309070-01

Bottle Certification
Bottle Certification
*** DEFAULT CONTAINER ***

NPDES Storm
Chain of Custody

Jar Cert #

Jar Cert #

Filter lot # 1376827

Outfall: 237A

Sampling Crew: CA, KL

Weather conditions: Clear

Date/Time sampler installed: 11/3/23 @ 9:58

Date/Time sampler pickup: 11/5/23 @ 8:31

Observed activities in area: N/A

Observations during sampler collection: N/A

Color, Odors, sheens: N/A

Type of Sample: ☑ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☑ >0.2 inches rain ☐ <0.02 inches of rain previous 24 hours

Samplers: ☑ Data downloaded ☐ ~~Sample bottles marked~~
☑ Ice Present at pick-up ☐ Tubing Decon 1000mL DIwater
☑ Caps on containers

Fill to...	Parameters:	Sample	QC
Neck	PAH's/Phthalates (1L) +	☑	☐ ☐
No head	[1]Total Mercury (125/250mL QC)	☑	☐
No head	[1]Diss Mercury (125/250mL QC)	☑	☐
Shoulder	Total Metals (250mL)	☑	
Shoulder	Diss Metals (125mL)	☑	
Shoulder	TSS (1L), (500 mL min)	☑	
Shoulder	Nutrients (250mL)	☑	
Shoulder	Ortho-P (125mL), (75min)	☑	
Shoulder	BOD (1L)	☑	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☐	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes 4.010 L config above
+1000 mL for QC per bottle, must submit 2 extra bottles
[1]If 250ml bottle used, thenQAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (µS)
1	1000	☑	76.9
2	↓	☑	84.5
3		☑	36.0
4		☑	79.5
5	250	☑	351
6		☐	
7		☐	
8		☐	
9		☐	
10		☐	
11		☐	
12		☐	

Total aliquots: 33

Sample Prep

Date/Time: 11/5/23 @ 9:00

Initial: CA, KL

pH: 6.43

COND (µS): 81.73

Lab #: 2311014-03

Aliquots composited: 33

Deviations :

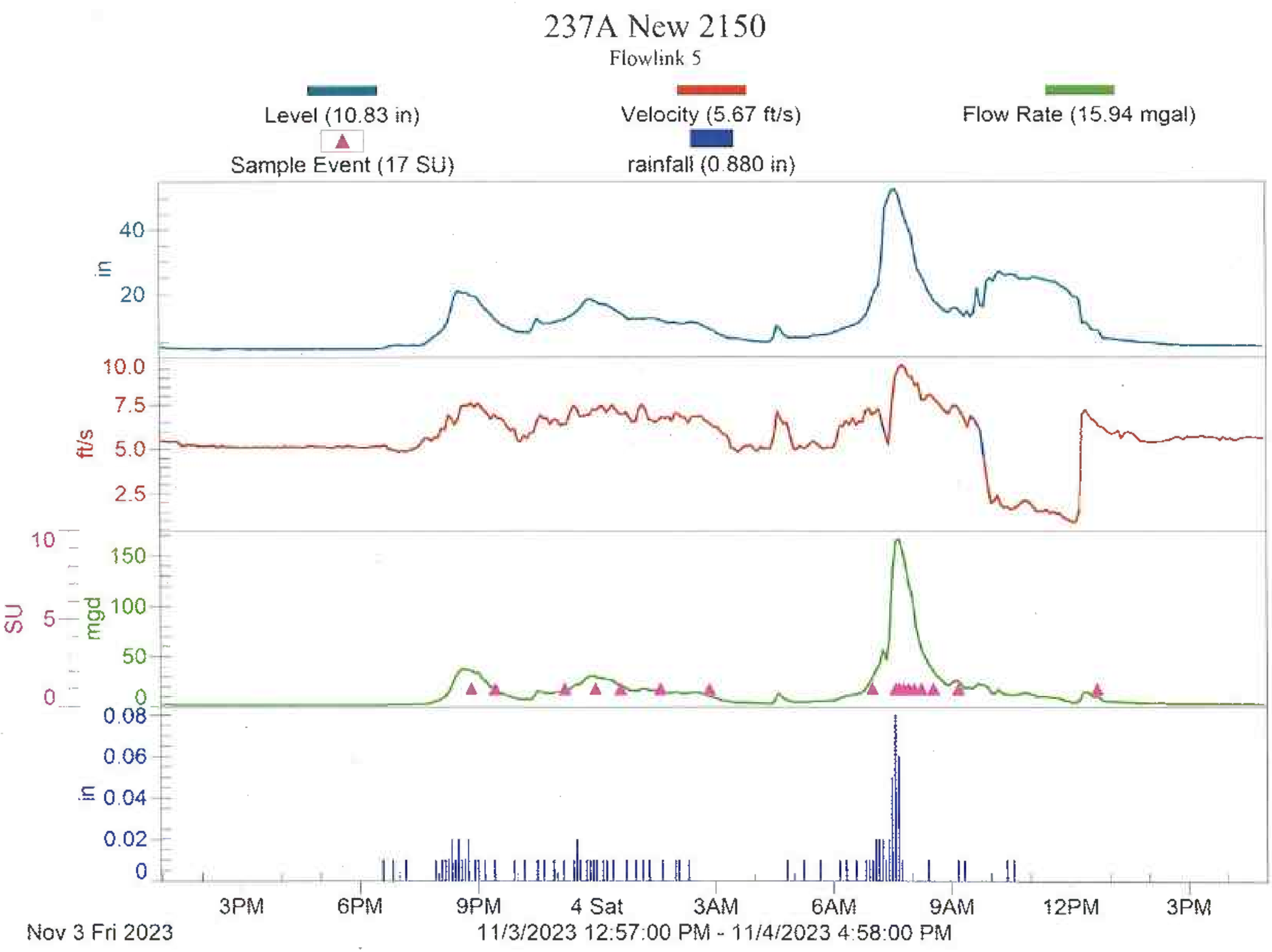
Composite End Time: 11/4/23 @ 12:41
(Collect Time) Last aliquot in composite

Relinquished by: [signature]

Date/Time: 11/5/23 @ 9:46

Received by: Cooler

Date/Time: 11/5/23 @ 9:46


237A New 2150
Flowlink 5
Level (10.83 in)
Velocity (5.67 ft/s)
Flow Rate (15.94 mgal)
Sample Event (17 SU)
rainfall (0.880 in)
in
40
20
ft/s
10.0
7.5
5.0
2.5
SU
10
5
0
mgd
150
100
50
0
in
0.08
0.06
0.04
0.02
0
3PM
6PM
9PM
4 Sat
3AM
6AM
9AM
12PM
3PM
Nov 3 Fri 2023
11/3/2023 12:57:00 PM - 11/4/2023 4:58:00 PM

```
SAMPLER ID# 1245320993  08:30  5-NOV-23
  Hardware:     A1  Software: 2.33
*********** PROGRAM SETTINGS ***********
      ----------
   PROGRAM NAME:
    "237ANEW   "
 SITE DESCRIPTION:
    "237ANEW   "
      ----------
   UNITS SELECTED:
     LENGTH: ft


      ----------
  12,  1000 ml BTLS
 21 ft SUCTION LINE
 AUTO SUCTION HEAD
1 RINSES, 1 RETRIES
      ----------

  ONE-PART PROGRAM


      ----------
       PACING:
    FLOW, EVERY
       1 PULSES
NO SAMPLE AT START
      ----------
    DISTRIBUTION:
   4 SAMPLES/BOTTLE


      ----------
       VOLUME:

   250 ml SAMPLES

      ----------
       ENABLE:

  NONE PROGRAMMED

      ----------
       ENABLE:
 REPEATABLE ENABLE
NO SAMPLE AT DISABLE
NO SAMPLE AT ENABLE
      ----------
```

ENABLE:
COUNTDOWN IS STOPPED
WHILE DISABLED

ENABLE:
0 PAUSE & RESUMES

NO DELAY TO START

200 HOURS RUN TIME

LIQUID DETECT ON

QUICK VIEW/CHANGE

TAKE MEASUREMENTS
AT STORAGE INTERVAL

DUAL SAMPLER OFF
BTL FULL DETECT OFF
TIMED BACKLIGHT

EVENT MARK SENT
DURING PUMP CYCLE

PUMP COUNTS FOR
EACH PURGE CYCLE:
400 PRE-SAMPLE
400 POST-SAMPLE

NO PERIODIC
SERIAL OUTPUT

INTERROGATOR
CONNECTOR

```
  POWER ALWAYS ON

      ----------
      ----------
      ----------

   NO RAIN GAUGE


      ----------
  NO SDI-12 SONDE

AUTO SDI-12 SCAN OFF

      ----------
 I/O1= NONE
 I/O2= NONE
 I/O3= NONE

      ----------

  0 ANALOG OUTPUTS


      ----------

 NO EXTERNAL MODEM


      ----------

      NO ALARM
   CONDITIONS SET

      ----------
      ----------
----------------------------------------


SAMPLER ID# 1245320993  08:31  5-NOV-23
  Hardware:     A1  Software: 2.33
*********** SAMPLING RESULTS ***********
   SITE: 237ANEW
PROGRAM: 237ANEW
Program Started at 08:48 FR  3-NOV-23
Nominal Sample Volume =  250 ml
                                    COUNT
                                       TO
```

SAMPLE	BOTTLE	TIME	SOURCE	ERROR	LIQUID
		08:48	PGM ENABLED		
1,4	1	20:50	F		505
2,4	1	21:25	F		515
3,4	1	23:11	F		519
4,4	1	23:58	F		510
		SA 04-NOV-23			
1,4	2	00:36	F		513
2,4	2	01:36	F		518
3,4	2	02:51	F		519
4,4	2	07:00	F		512
1,4	3	07:34	F		465
2,4	3	07:40	F		466
3,4	3	07:47	F		483
4,4	3	07:54	F		467
1,4	4	08:02	F		473
2,4	4	08:13	F		495
3,4	4	08:32	F		519
4,4	4	09:10	F		519
1,1	5	12:41	F		529
		SU 05-NOV-23			
		08:27	MANUAL PAUSE		
		08:27	MANUAL RESUME		

SOURCE F ==> FLOW

FIELD REPORT

Project: Thea Foss/Wheeler-Osgood Waterways & NPDES Stormwater Monitoring Program

Event: Storm Event – Nov. 11, 2023

INTRODUCTION

This report summarizes the storm event sampled on 11/9/2023-11/12/2023 by the City of Tacoma Environmental Services Collection System Support staff as part of our stormwater monitoring program. This report includes a summary of the following:

- Storm characteristics and criteria;
- Sampling activities;
- Flow characteristics at each sampling location;
- Pacing – set for a .48" event, actual event was .54"

This event met the sampling criteria for precipitation as specified in the Thea Foss Sampling and Analysis Plan (SAP).

DESCRIPTION OF SAMPLING ACTIVITES

Samplers placed in the field on 11/9/2023. During sampler installation the weather conditions were overcast. All samplers were retrieved on 11/12/23 (For site specific details, see Appendix A for field notes, Chain of Custody (COC) forms, and event hydrographs).

The following unusual observations were noted during the sampling event:

Table 2: Composite Sampling Activities

Sample Location	Site Deployed	Sample Accepted	Pacing (gal)	Enables LVL(ft), VEL(fps)	Comments
Outfall 230A	Yes	No	72,500	LVL > 0.2'	4 Aliquots Collected / 0 Composited N/A
Outfall 235	Yes	Yes	40,999	LVL > 0.37' VEL > 0.8	29 Aliquots Collected / 25 Composited
Outfall 237ANew	Yes	Yes	418,000	LVL > 0.29' VEL > 6.0	22 Aliquots Collected / 22 Composited
Outfall 237B	Yes	Yes	377,000	LVL > 1.0'	43 Aliquots Collected / 39 Composited
Outfall 243	No	N/A	N/A	N/A	N/A
Outfall 245	Yes	Yes	10 min.	> 200gpm	34 Aliquots Collected / 26 Composited
Outfall 254	No	N/A	N/A	N/A	N/A

**QC, QUALITY CONTROL*

ND, NO DATA

NA, NOT APPLICABLE

WATER QUALITY DATA

Accepted samples were analyzed for the target parameters specified in the SAP and QAPP. Samples accepted at all Outfalls were composited and preserved within 24 hours of the last aliquot being collected. The samples were allowed to sit for a minimum of 18 hours before metals analysis was started.

EQUIPMENT INFORMATION

Samples were collected using ISCO 6712 portable auto samplers. Rain data was collected using an ISCO 674 rain gauge located at the Center for Urban Waters at 326 East D Street, Tacoma, WA 98421.

CORRECTIVE ACTIONS AND DEVIATIONS

There were no deviations from the field procedures as discussed in the SAP other than those discussed above/below. No other criteria or procedures as indicated in the SAP were compromised except for those discussed above/below.

Enclosures: The ISCO program setting/sampling results report, the sample collection chain of custody form, and field records are in Appendix A for each outfall. This includes the following information for the samples collected:

- Plot of flow hydrograph and hyetograph
- Subsample times and conductivities
- Tidal windows
- Field activities

Appendix A

PROJECT

11/3/23 - Storm Deployment .8
237A @ 9:58

11/5/23 - Storm Collection
237A @ 8:31 - Download - 4/4/12

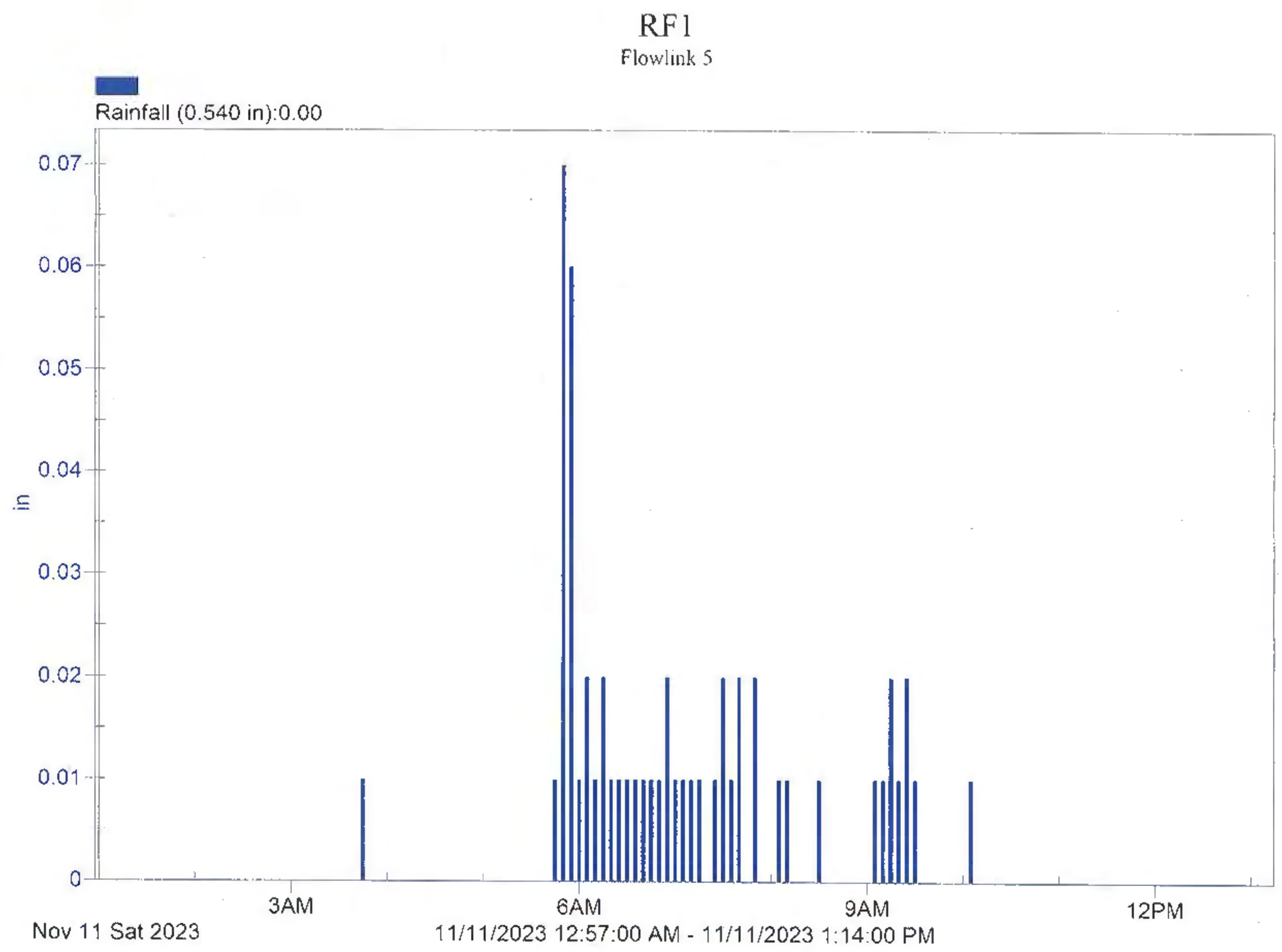
Storm Deployment - .48" 11/9/23

245 - Jars/Ice - 14:45
237A - Jars/Ice - 15:00 - 418,000
237B - Jars/Ice - 15:05 - 377,000
235 - Jars/Ice - 15:10 - 41,000
230A - Jars/Ice - 15:15 - 10min 72500 gpm

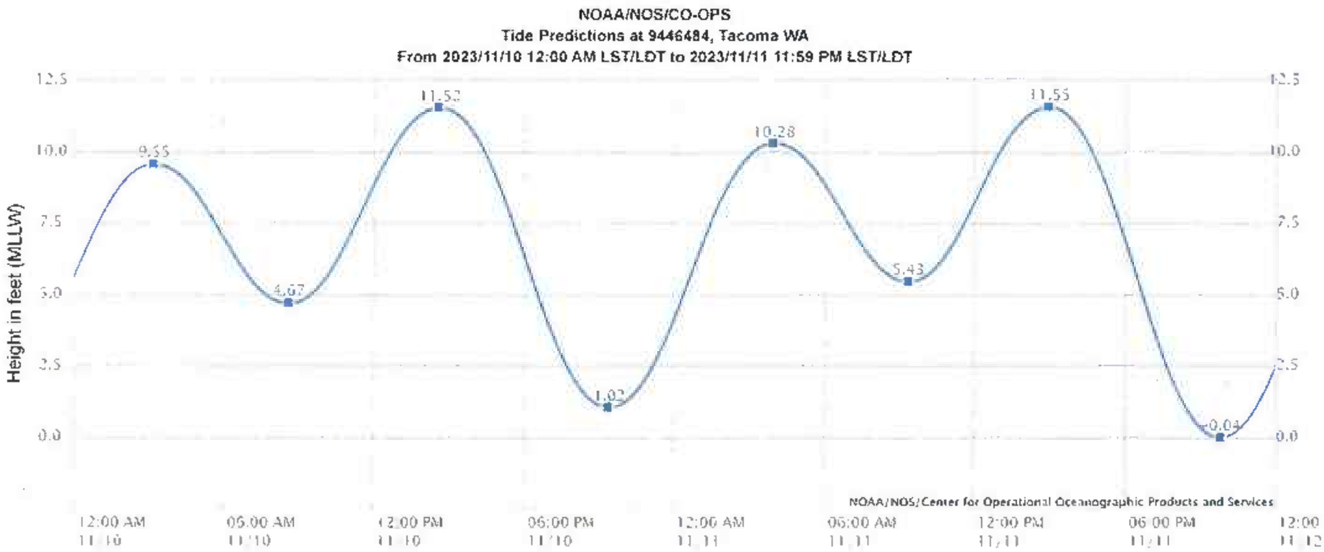
11/12/23 Storm Collection HA, HB " ~~.66~~ 0.54" RG

245 - 9:48, data downloaded, 8.5L/34 aliquots
237A - 9:58, " ", 5.5L/22 aliquots
237B - 10:07, " ", 11.5L/46 aliquots
239 - 10:19, " ",
230A - 10:29, " ", only 1 bottle

Continued on Page


RF1
Flowlink 5
Rainfall (0.540 in):0.00
in
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
3AM
6AM
9AM
12PM
Nov 11 Sat 2023
11/11/2023 12:57:00 AM - 11/11/2023 1:14:00 PM

Help Print



Note: The interval is High/Low, the solid blue line depicts a curve fit between the high and low values and approximates the segments between.
Disclaimer: These data are based upon the latest information available as of the date of your request, and may differ from the published tide tables.

High/Low Tide Prediction Data Listing

Station Name: Tacoma, WA
Action: Daily
Product: Tide Predictions
Start Date & Time: 2023/11/10 12:00 AM
End Date & Time: 2023/11/11 11:59 PM

Source: NOAA/NOS/CO-OPS
Prediction Type: Harmonic
Datum: MLLW
Height Units: Feet
Time Zone: LST/LDT

Date	Day	Time	Hgt	Time	Hgt	Time	Hgt	Time	Hgt
2023/11/10	Fri	03:11 AM	9.55 H	08:37 AM	4.67 L	2:37 PM	11.52 H	9:24 PM	1.02 L
2023/11/11	Sat	03:57 AM	10.28 H	09:20 AM	5.43 L	2:58 PM	11.55 H	9:49 PM	-0.04 L

2309071-01

Bottle Certification

Bottle Certification

*** DEFAULT CONTAINER ***

NPDES Storm
Chain of Custody

Jar Cert #: ________ Outfall: 235 Date/Time sampler installed: 11/9/23 15:10

Jar Cert #: ________ Sampling Crew: HA, MB, KL

Filter lot # 1376827 Weather conditions: clear Date/Time sampler pickup: 11/12/23 10:19

Observed activities in area: N/A

Observations during sampler collection: N/A

Color, Odors, sheens: N/A

Type of Sample: ☒ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☒ >0.2 inches rain ☐ <0.02 inches of rain previous 24 hours

Samplers: ☒ Data downloaded ~~☐ Sample bottles marked~~

☒ Ice Present at pick-up ☐ Tubing Decon 1000mL Divater

☒ Caps on containers

Fill to...	Parameters:	Sample	QC
Neck	PAH's/Phthalates (1L) +	☒	☐ ☐
No head	[1]Total Mercury (125/250mL QC)	☒	☒
No head	[1]Diss Mercury (125/250mL QC)	☒	☒
Shoulder	Total Metals (250mL)	☒	
Shoulder	Diss Metals (125mL)	☒	
Shoulder	TSS (1L), (500 mL min)	☒	
Shoulder	Nutrients (250mL)	☒	
Shoulder	Ortho-P (125mL), (75min)	☒	
Shoulder	BOD (1L)	☒	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☒	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes 4.010 L config above

+1000 mL for QC per bottle, must submit 2 extra bottles

[1]If 250ml bottle used, thenQAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (uS)
1	1000	☐	86.9
2	1000	☒	32.1
3		☒	27.9
4		☒	31.6
5		☒	32.9
6		☒	57.5
7		☒	65.1
8	250	☒	121.0
9		☐	
10		☐	
11		☐	
12		☐	

Total aliquots: 29

Sample Prep

Date/Time: 11/12/23 12:00

Initial: HA

pH: 7.88

COND (µS): 42.82

Lab #: 2311031-02

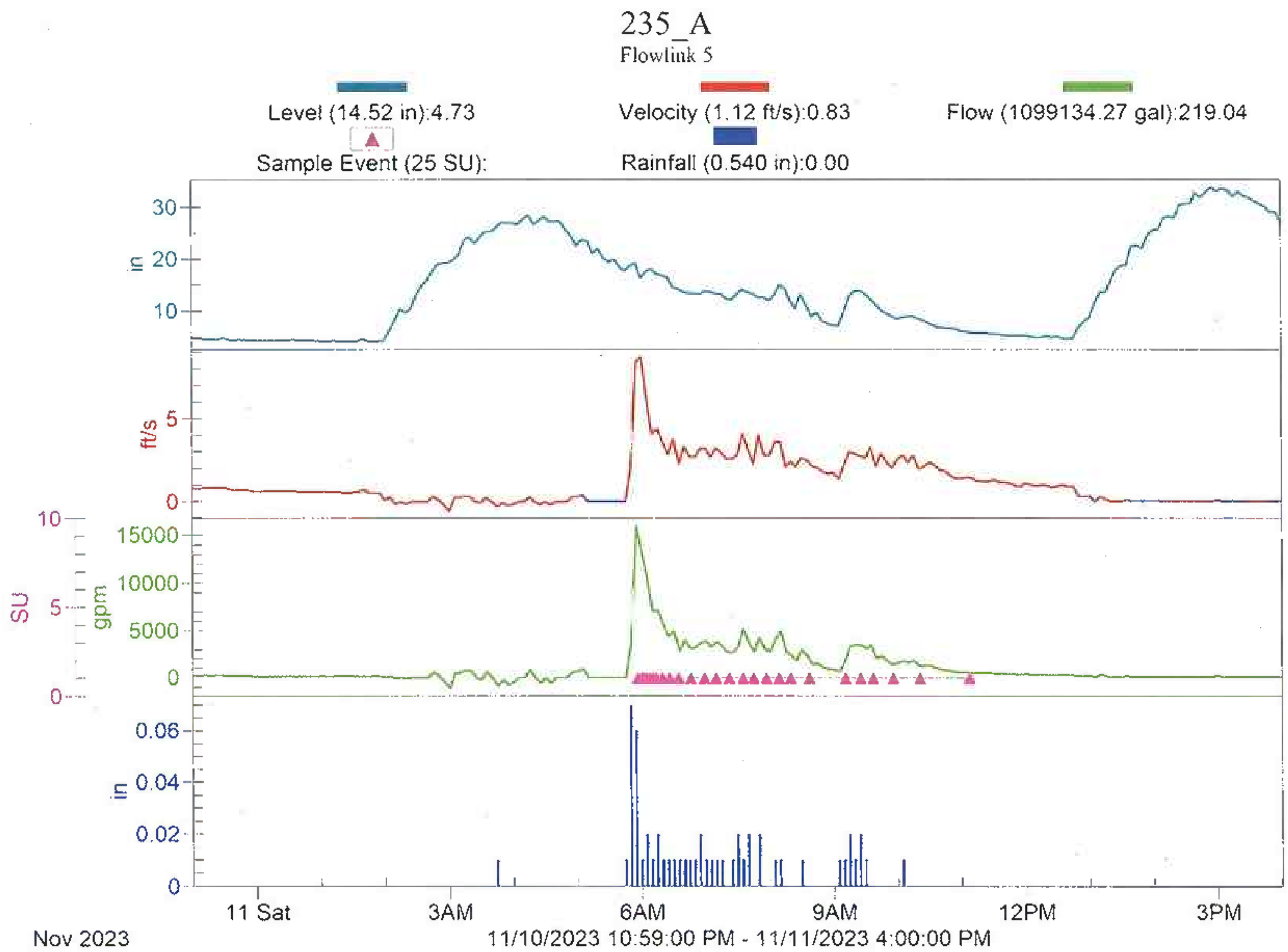
Aliquots composited: 25

Deviations:

Composite End Time: 11:07 ~~11/12~~ HA 11/11/23
(Collect Time) Last aliquot in composite

Relinquished by: [signature] Received by: cooler / [signature]

Date/Time: ~~11~~ HA 11/12/23 12:35 Date/Time: 11/12/23 12:35 / 11/13/23 07:45


235_A
Flowlink 5
Level (14.52 in):4.73
Velocity (1.12 ft/s):0.83
Flow (1099134.27 gal):219.04
Sample Event (25 SU):
Rainfall (0.540 in):0.00
30
in 20
10
ft/s 5
0
10
SU 5
0
15000
10000
gpm 5000
0
0.06
in 0.04
0.02
0
11 Sat
3AM
6AM
9AM
12PM
3PM
Nov 2023
11/10/2023 10:59:00 PM - 11/11/2023 4:00:00 PM

```
SAMPLER ID# 1242995716  10:19 12-NOV-23
  Hardware:     A1  Software: 2.33
*********** PROGRAM SETTINGS ***********
     ----------
   PROGRAM NAME:
    "235A      "
 SITE DESCRIPTION:
    "235A ST   "
     ----------
   UNITS SELECTED:
     LENGTH: ft


     ----------
   UNITS SELECTED:
   FLOW RATE: gpm
  FLOW VOLUME: gal
   VELOCITY: fps
     ----------
  AREA-VEL MODULE:
   AREA*VELOCITY
     ROUND PIPE

     ----------

      5 MINUTE
   DATA INTERVAL

     ----------
  12,  1000 ml BTLS
 56 ft SUCTION LINE
 AUTO SUCTION HEAD
1 RINSES, 1 RETRIES
     ----------

  ONE-PART PROGRAM


     ----------
      PACING:
    FLOW, EVERY
     40999 gal
NO SAMPLE AT START
     ----------
    DISTRIBUTION:
   4 SAMPLES/BOTTLE


     ----------
```

VOLUME:

250 ml SAMPLES

ENABLE:
LEVEL >0.370 ft
AND
VEL > 0.80 fps

ENABLE:
REPEATABLE ENABLE
NO SAMPLE AT DISABLE
NO SAMPLE AT ENABLE

ENABLE:
COUNTDOWN IS STOPPED
WHILE DISABLED

ENABLE:
0 PAUSE & RESUMES

START: 07:00
FR
NOT BEFORE: 10-NOV
200 HOURS RUN TIME

LIQUID DETECT ON

QUICK VIEW/CHANGE

TAKE MEASUREMENTS
AT STORAGE INTERVAL

DUAL SAMPLER OFF
BTL FULL DETECT OFF
TIMED BACKLIGHT

EVENT MARK SENT

DURING PUMP CYCLE

PUMP COUNTS FOR
EACH PURGE CYCLE:
100 PRE-SAMPLE
AUTO POST-SAMPLE

NO PERIODIC
SERIAL OUTPUT

INTERROGATOR
CONNECTOR
POWER ALWAYS ON

NO RAIN GAUGE

NO SDI-12 SONDE

AUTO SDI-12 SCAN OFF

I/O1= NONE
I/O2= NONE
I/O3= NONE

----

0 ANALOG OUTPUTS

NO EXTERNAL MODEM

NO ALARM
CONDITIONS SET

```
      ----------
      ----------
----------------------------------------


SAMPLER ID# 1242995716  10:19 12-NOV-23
  Hardware:     A1  Software: 2.33
*********** SAMPLING RESULTS ***********
   SITE: 235A ST
PROGRAM: 235A
Program Started at 07:00 FR 10-NOV-23
Nominal Sample Volume =  250 ml
                                  COUNT
                                     TO
SAMPLE  BOTTLE TIME  SOURCE ERROR LIQUID
------- ------ ----    -- --     ------
               07:00  PGM DISABLED
               09:00  PGM ENABLED
               09:10  PGM DISABLED
               09:30  PGM ENABLED
               09:35  PGM DISABLED
               20:10  PGM ENABLED
  1,4     1    20:38      F         1899
  2,4     1    21:04      F         1903
  3,4     1    21:33      F         1897
  4,4     1    22:52      F         1897
               23:05  PGM DISABLED
               23:10  PGM ENABLED
               23:35  PGM DISABLED
-------------- SA 11-NOV-23 ------------
               05:50  PGM ENABLED
  1,4     2    05:56      F         2044
  2,4     2    06:01      F         2285
  3,4     2    06:04      F         1893
  4,4     2    06:07      F         1908
  1,4     3    06:10      F         1925
  2,4     3    06:13      F         1921
  3,4     3    06:19      F         1925
  4,4     3    06:26      F         1916
  1,4     4    06:34      F         1915
  2,4     4    06:46      F         1913
  3,4     4    06:59      F         1909
  4,4     4    07:10      F         1907
  1,4     5    07:22      F         1910
  2,4     5    07:35      F         1921
  3,4     5    07:45      F         1907
  4,4     5    07:57      F         1914
  1,4     6    08:09      F         1936
```

```
  2,4     6   08:20       F          1913
  3,4     6   08:37       F          1913
  4,4     6   09:11       F          1885
  1,4     7   09:25       F          1923
  2,4     7   09:37       F          1897
  3,4     7   09:56       F          1897
  4,4     7   10:21       F          1891
  1,1     8   11:07       F          1879
              12:50  PGM DISABLED
------------- SU 12-NOV-23 -------------
              07:45  PGM ENABLED
              07:50  PGM DISABLED
              10:17  MANUAL PAUSE
              10:17  PGM STOPPED 12-NOV


   SOURCE F  ==> FLOW
----------------------------------------
```

231031-03

Bottle Certification

Bottle Certification

*** DEFAULT CONTAINER ***

NPDES Storm
Chain of Custody

Jar Cert #

Outfall: 237 A

Date/Time sampler installed: ~~11/9/12~~ HA ~~11/9/23 9:5~~ HA 11/9/23 15:00

Jar Cert #

Sampling Crew: HA MB KL

Filter lot # 1376827

Weather conditions: clear

Date/Time sampler pickup: 11/12/23 9:58

Observed activities in area: N/A

Observations during sampler collection: N/A

Color, Odors, sheens: N/A

Type of Sample: ☒ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☒ >0.2 inches rain ☐ <0.02 inches of rain previous 24 hours

Samplers: ☒ Data downloaded ☐ Sample bottles marked ☒ Ice Present at pick-up ☐ Tubing Decon 1000mL DI water ☒ Caps on containers

Fill to...	Parameters:	Sample	QC
Neck	PAH's/Phthalates (1L) +	☒	☐ ☐
No head	[1]Total Mercury (125/250mL QC)	☒	☒
No head	[1]Diss Mercury (125/250mL QC)	☒	☒
Shoulder	Total Metals (250mL)	☒	
Shoulder	Diss Metals (125mL)	☒	
Shoulder	TSS (1L), (500 mL min)	☒	
Shoulder	Nutrients (250mL)	☒	
Shoulder	Ortho-P (125mL), (75min)	☒	
Shoulder	BOD (1L)	☒	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☐	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes 4.010 L config above

+1000 mL for QC per bottle, must submit 2 extra bottles

[1]If 250ml bottle used, thenQAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (uS)
1	1000	☒	67.4
2	↓	☒	31.3
3		☒	51.9
4		☒	58.0
5		☒	106.5
6	500	☒	296.0
7		☐	
8		☐	
9		☐	
10		☐	
11		☐	
12		☐	

Total aliquots: 22

Sample Drop

Date/Time: 11/12/23 12:10

Initial: HA

pH: 6.58

COND (µS): ~~83.32~~ KL 11/11/23 86.29

Lab #: 231031-03

Aliquots composited: 22

Deviations :

Composite End Time: (Collect Time) 17:58 11/11/23 Last aliquot in composite

Relinquished by: [signature]

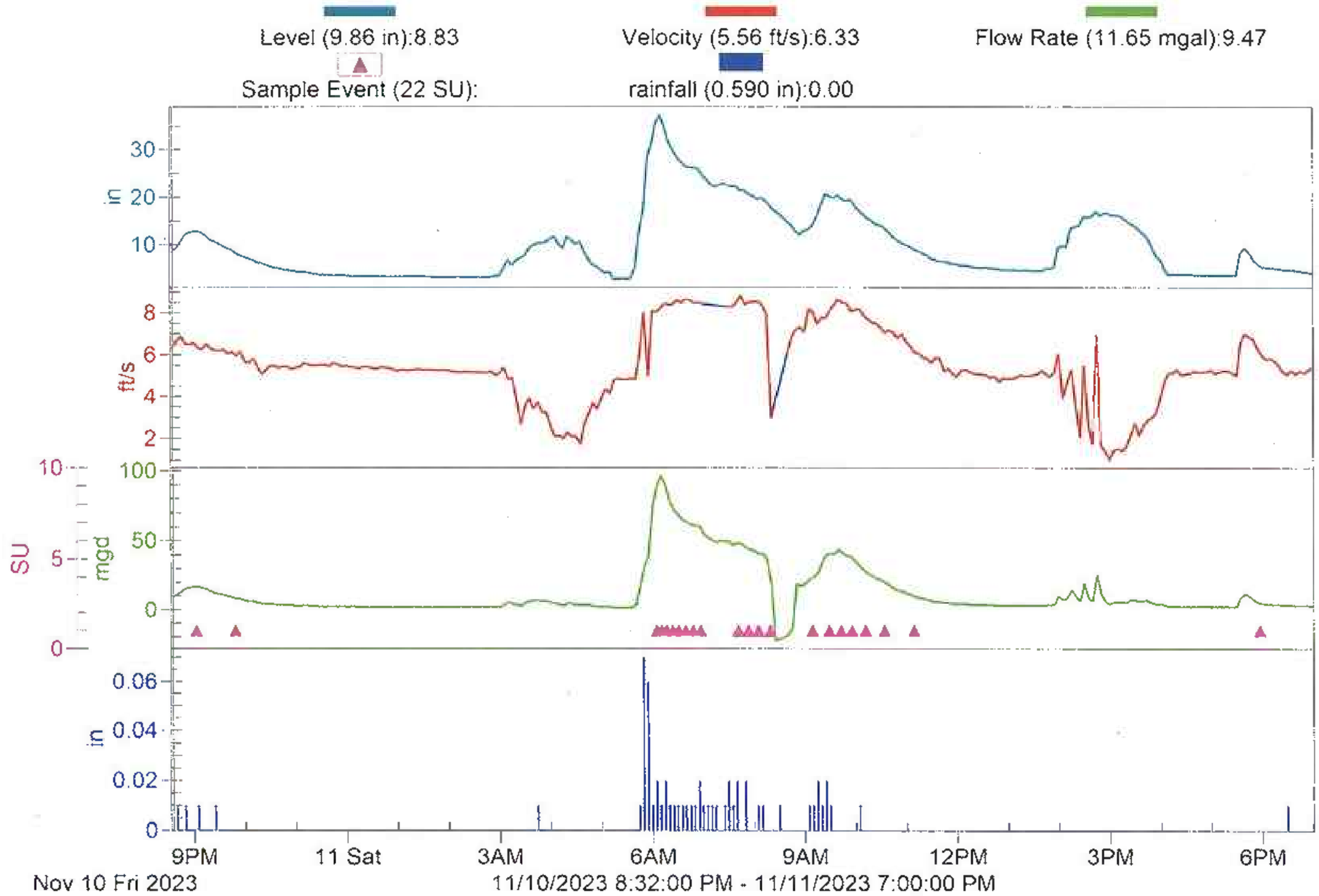
Received by: cooler / [signature]

Date/Time: 11/12/23 12:35

Date/Time: 11/12/23 12:35 / 11/13/23 07:45

237A New 2150

Flowlink 5



SAMPLER ID# 1245320993 09:52 12-NOV-23
Hardware: A1 Software: 2.33
*********** PROGRAM SETTINGS ***********

PROGRAM NAME:
"237ANEW   "
SITE DESCRIPTION:
"237ANEW   "

UNITS SELECTED:
LENGTH: ft

12, 1000 ml BTLS
21 ft SUCTION LINE
AUTO SUCTION HEAD
1 RINSES, 1 RETRIES

ONE-PART PROGRAM

PACING:
FLOW, EVERY
1 PULSES
NO SAMPLE AT START

DISTRIBUTION:
4 SAMPLES/BOTTLE

VOLUME:

250 ml SAMPLES

ENABLE:

NONE PROGRAMMED

ENABLE:
REPEATABLE ENABLE
NO SAMPLE AT DISABLE
NO SAMPLE AT ENABLE

ENABLE:
COUNTDOWN IS STOPPED
WHILE DISABLED

ENABLE:
0 PAUSE & RESUMES

NO DELAY TO START

200 HOURS RUN TIME

LIQUID DETECT ON

QUICK VIEW/CHANGE

TAKE MEASUREMENTS
AT STORAGE INTERVAL

DUAL SAMPLER OFF
BTL FULL DETECT OFF
TIMED BACKLIGHT

EVENT MARK SENT
DURING PUMP CYCLE

PUMP COUNTS FOR
EACH PURGE CYCLE:
400 PRE-SAMPLE
400 POST-SAMPLE

NO PERIODIC
SERIAL OUTPUT

INTERROGATOR
CONNECTOR

```
   POWER ALWAYS ON

      ----------
      ----------
      ----------

    NO RAIN GAUGE


      ----------
   NO SDI-12 SONDE

AUTO SDI-12 SCAN OFF

      ----------
  I/O1= NONE
  I/O2= NONE
  I/O3= NONE

      ----------

   0 ANALOG OUTPUTS


      ----------

  NO EXTERNAL MODEM


      ----------

       NO ALARM
    CONDITIONS SET

      ----------
      ----------
----------------------------------------


SAMPLER ID# 1245320993  09:52 12-NOV-23
  Hardware:      A1  Software: 2.33
*********** SAMPLING RESULTS ***********
    SITE: 237ANEW
PROGRAM: 237ANEW
Program Started at 14:52 TH  9-NOV-23
Nominal Sample Volume =  250 ml
                                   COUNT
                                      TO
```

SAMPLE	BOTTLE	TIME	SOURCE	ERROR	LIQUID
		14:52	PGM ENABLED		
		FR 10-NOV-23			
1,4	1	21:02	F		527
2,4	1	21:49	F		531
		SA 11-NOV-23			
3,4	1	06:05	F		491
4,4	1	06:11	F		485
1,4	2	06:17	F		485
2,4	2	06:24	F		495
3,4	2	06:31	F		501
4,4	2	06:39	F		501
1,4	3	06:48	F		507
2,4	3	06:57	F		513
3,4	3	07:41	F		513
4,4	3	07:53	F		519
1,4	4	08:05	F		519
2,4	4	08:19	F		513
3,4	4	09:09	F		522
4,4	4	09:29	F		519
1,4	5	09:43	F		515
2,4	5	09:56	F		513
3,4	5	10:12	F		519
4,4	5	10:34	F		521
1,2	6	11:09	F		526
2,2	6	17:58	F		533

SOURCE F ==> FLOW

2311031-01

Bottle Certification

Bottle Certification

*** DEFAULT CONTAINER ***

Jar Cert #

NPDES Storm
Chain of Custody

Outfall: 237B

Date/Time sampler installed: 11/9/23 15:05

Jar Cert #

Sampling Crew: HA, MB, KL

Filter lot # 1376827

Weather conditions: N/A

Date/Time sampler pickup: 11/12/23 10:07

Observed activities in area: N/A

Observations during sampler collection: N/A

Color, Odors, sheens: N/A

Type of Sample: ☒ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☒ >0.2 inches rain ☐ <0.02 inches of rain previous 24 hours

Samplers: ☒ Data downloaded ☒ Sample bottles marked ☒ Ice Present at pick-up ☐ Tubing Decon 1000mL DI water ☒ Caps on containers

Fill to...	Parameters:	Sample	QC
Neck	PAH's/Phthalates (1L) +	☒	☐ ☐
No head	[1]Total Mercury (125/250mL QC)	☒	☒
No head	[1]Diss Mercury (125/250mL QC)	☒	☒
Shoulder	Total Metals (250mL)	☒	
Shoulder	Diss Metals (125mL)	☒	
Shoulder	TSS (1L), (500 mL min)	☒	
Shoulder	Nutrients (250mL)	☒	
Shoulder	Ortho-P (125mL), (75min)	☒	
Shoulder	BOD (1L)	☒	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☒	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes 4.010 L config above

+1000 mL for QC per bottle, must submit 2 extra bottles

[1]If 250ml bottle used, thenQAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (uS)
1	1000	☐	141.1
2		☒	94.6
3		☒	38.2
4		☒	39.8
5		☒	47.0
6		☒	50.4
7		☒	78.3
8		☒	143.3
9		☒	212.5
10	~~750~~ KL 11/12/23	☒	247.3
11	750	☒	261.7
12		☐	

Total aliquots: 43

Sample Prep

Date/Time: 11/12/23 ~~12:10~~ HA 12:15

Initial: HA

pH: 6.80

COND (µS): 113.8

Lab #: 2311031-04

Aliquots composited: 39

Deviations:

Composite End Time: ~~8:03~~ HA 19:24 11/11/23

(Collect Time) Last aliquot in composite

Relinquished by: [signature]

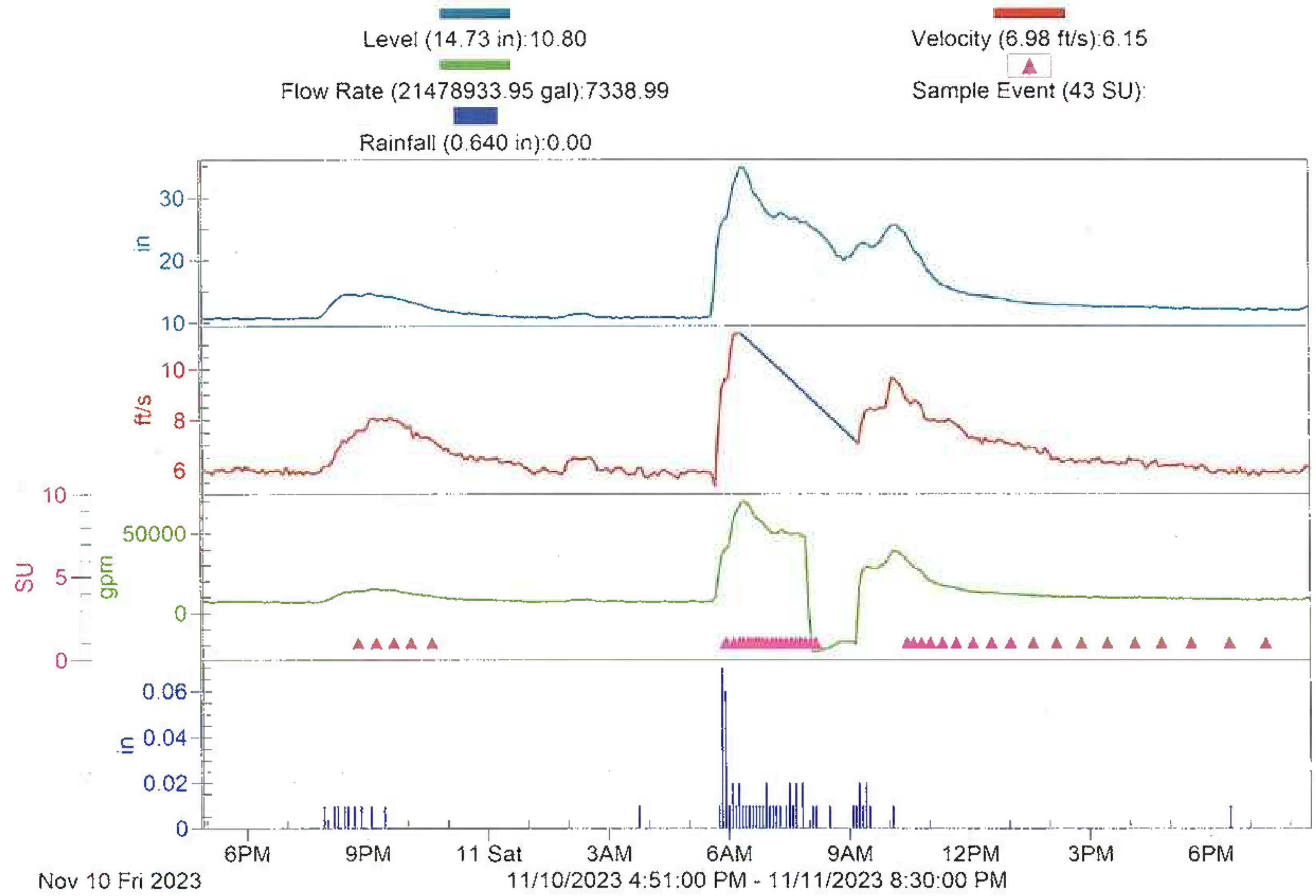
Date/Time: 11/12/23 12:35

Received by: cooler / [signature] / [signature]

Date/Time: 11/12/23 12:35 / 11/13/23 [illegible]

237B

Flowlink 5



SAMPLER ID# 1243003651 10:07 12-NOV-23
Hardware: A1 Software: 2.33
*********** PROGRAM SETTINGS ***********

PROGRAM NAME:
" STORM 1 "
SITE DESCRIPTION:
" 237 B   "

UNITS SELECTED:
LENGTH: ft

12, 1000 ml BTLS
16 ft SUCTION LINE
AUTO SUCTION HEAD
1 RINSES, 1 RETRIES

ONE-PART PROGRAM

PACING:
FLOW, EVERY
1 PULSES
NO SAMPLE AT START

DISTRIBUTION:
4 SAMPLES/BOTTLE

VOLUME:

250 ml SAMPLES

ENABLE:

NONE PROGRAMMED

ENABLE:
REPEATABLE ENABLE
NO SAMPLE AT DISABLE
NO SAMPLE AT ENABLE

ENABLE:
COUNTDOWN IS STOPPED
WHILE DISABLED

ENABLE:
0 PAUSE & RESUMES

NO DELAY TO START

200 HOURS RUN TIME

LIQUID DETECT ON

QUICK VIEW/CHANGE

TAKE MEASUREMENTS
AT STORAGE INTERVAL

DUAL SAMPLER OFF
BTL FULL DETECT ON
TIMED BACKLIGHT

EVENT MARK SENT
DURING PUMP CYCLE

PUMP COUNTS FOR
EACH PURGE CYCLE:
100 PRE-SAMPLE
AUTO POST-SAMPLE

NO PERIODIC
SERIAL OUTPUT

INTERROGATOR
CONNECTOR

POWER ALWAYS ON

NO RAIN GAUGE

NO SDI-12 SONDE

AUTO SDI-12 SCAN OFF

I/O1= NONE
I/O2= NONE
I/O3= NONE

----

0 ANALOG OUTPUTS

NO EXTERNAL MODEM

NO ALARM
CONDITIONS SET

SAMPLER ID# 1243003651 10:07 12-NOV-23
Hardware: A1 Software: 2.33
*********** SAMPLING RESULTS ***********
SITE: 237 B
PROGRAM: STORM 1
Program Started at 14:59 TH 9-NOV-23
Nominal Sample Volume = 250 ml
COUNT
TO

SAMPLE	BOTTLE	TIME	SOURCE	ERROR	LIQUID
		14:59	PGM ENABLED		
------------- FR 10-NOV-23 -------------					
1,4	1	20:47	F		525
2,4	1	21:14	F		524
3,4	1	21:40	F		521
4,4	1	22:06	F		521
1,4	2	22:37	F		519
------------- SA 11-NOV-23 -------------					
2,4	2	05:56	F		522
3,4	2	06:08	F		509
4,4	2	06:16	F		502
1,4	3	06:23	F		506
2,4	3	06:29	F		506
3,4	3	06:34	F		510
4,4	3	06:40	F		507
1,4	4	06:45	F		513
2,4	4	06:51	F		512
3,4	4	06:57	F		513
4,4	4	07:04	F		513
1,4	5	07:11	F		510
2,4	5	07:18	F		513
3,4	5	07:25	F		514
4,4	5	07:33	F		513
1,4	6	07:40	F		512
2,4	6	07:48	F		513
3,4	6	07:55	F		514
4,4	6	08:03	F		519
1,4	7	08:10	F		514
2,4	7	10:27	F		507
3,4	7	10:37	F		513
4,4	7	10:49	F		519
1,4	8	11:02	F		519
2,4	8	11:20	F		524
3,4	8	11:41	F		523
4,4	8	12:06	F		527
1,4	9	12:34	F		527
2,4	9	13:03	F		529
3,4	9	13:36	F		526
4,4	9	14:11	F		527
1,4	10	14:48	F		526
2,4	10	15:27	F		522
3,4	10	16:08	F		522
4,4	10	16:48	F		523
1,3	11	17:33	F		517
2,3	11	18:30	F		519
3,3	11	19:24	F		518
------------- SU 12-NOV-23 -------------					

```
          10:05  MANUAL PAUSE
          10:05  PGM STOPPED 12-NOV

SOURCE F  ==> FLOW
----------------------------------------
```

231031-01

Bottle Certification

Bottle Certification

*** DEFAULT CONTAINER ***

NPDES Storm
Chain of Custody

Jar Cert #

Outfall: 245

Date/Time sampler installed: 11/9/23 14:45

Jar Cert #

Sampling Crew: HA, MB, KL

Filter lot # 1376877

Weather conditions: clear

Date/Time sampler pickup: 11/12/23 9:48

Observed activities in area: N/A

Observations during sampler collection: N/A

Color, Odors, sheens: N/A

Type of Sample: ☑ Stormwater ☐ Backflow ☐ Rinse Blank

Rain event: ☑ >0.2 inches rain ☐ <0.02 inches of rain previous 24 hours

Samplers: ☑ Data downloaded ☐ ~~Sample bottles marked~~

☑ Ice Present at pick-up ☐ Tubing Decon 1000mL Diwater

☑ Caps on containers

Fill to...	Parameters:	Sample	QC
Neck	PAH's/Phthalates (1L) +	☑	☐ ☐
No head	[1]Total Mercury (125/250mL QC)	☑	☑
No head	[1]Diss Mercury (125/250mL QC)	☑	☑
Shoulder	Total Metals (250mL)	☑	
Shoulder	Diss Metals (125mL)	☑	
Shoulder	TSS (1L), (500 mL min)	☑	
Shoulder	Nutrients (250mL)	☑	
Shoulder	Ortho-P (125mL), (75min)	☑	
Shoulder	BOD (1L)	☑	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☑	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes 4.010 L config above

+1000 mL for QC per bottle, must submit 2 extra bottles

[1]If 250ml bottle used, thenQAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (uS)
1	1000	☐	1395
2		~~☑~~ HA	519
3		☑	3040
4		☑	66.4
5		☑	45.5
6		☑	79.2
7		☑	243.5
8		☑	161.9
9	500	☑	653
10		☐	
11		☐	
12		☐	

Total aliquots: 34

Sample Prep

Date/Time: 11/12/23 12:25

Initial: HA

pH: 6.85

COND (µS): 601.3

Lab #: 2311031-05

Aliquots composited: 26

Deviations :

Composite End Time: 11:05 11/11/23

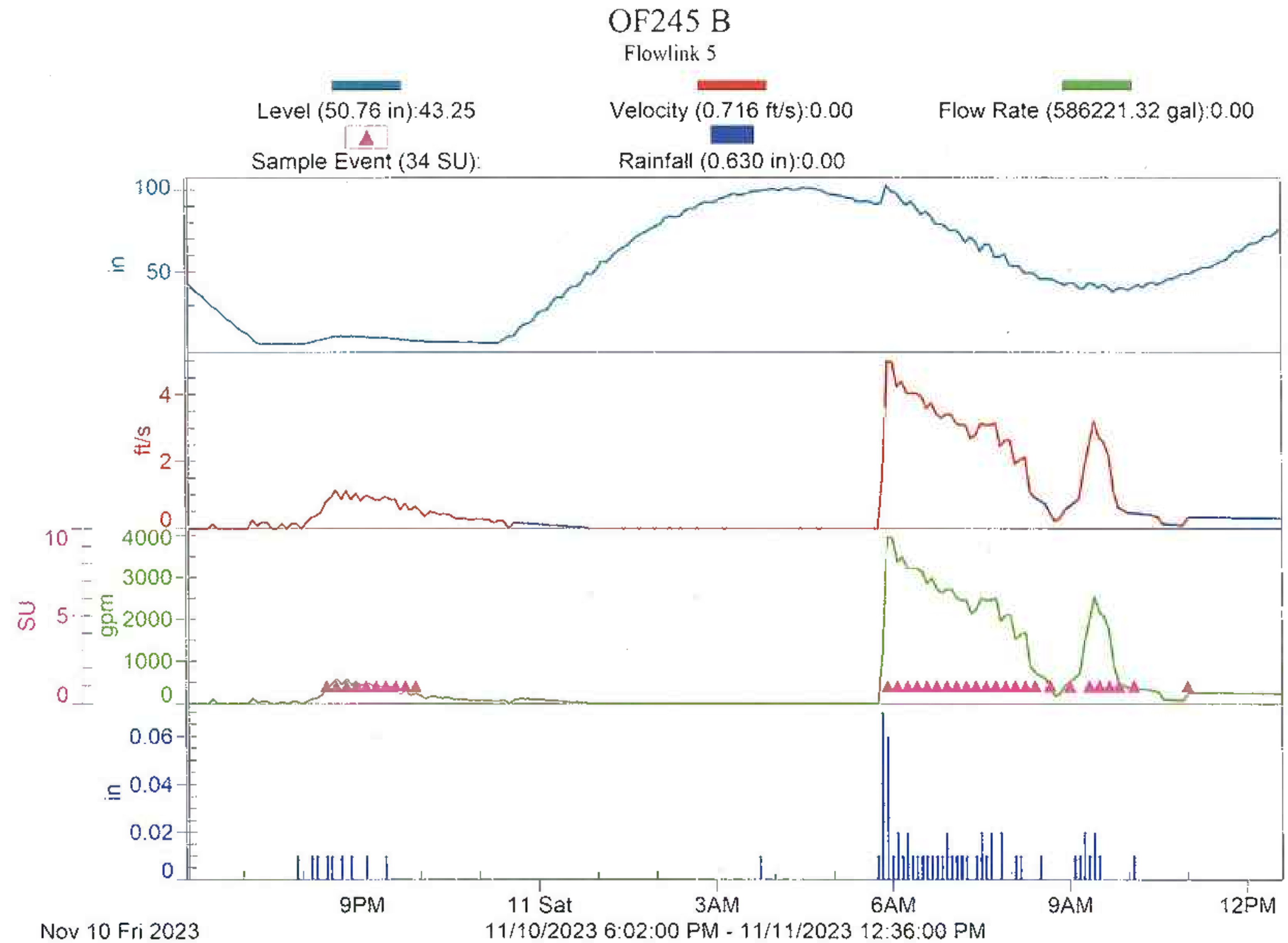
(Collect Time) Last aliquot in composite

Relinquished by: [signature]

Date/Time: 11/12/23 12:35

Received by: cooler / [signature]

Date/Time: ~~11/12/23 12:35~~ / 11/13/23 7:45



OF245 B
Flowlink 5
Level (50.76 in):43.25
Velocity (0.716 ft/s):0.00
Flow Rate (586221.32 gal):0.00
Sample Event (34 SU):
Rainfall (0.630 in):0.00
100
50
in
4
2
0
ft/s
10
5
0
SU
4000
3000
2000
1000
0
gpm
0.06
0.04
0.02
0
in
9PM
11 Sat
3AM
6AM
9AM
12PM
Nov 10 Fri 2023
11/10/2023 6:02:00 PM - 11/11/2023 12:36:00 PM

SAMPLER ID# 1284476967 09:48 12-NOV-23
Hardware: A1 Software: 2.33
*********** PROGRAM SETTINGS ***********

PROGRAM NAME:
"STORM   "
SITE DESCRIPTION:
"OF245 B   "

UNITS SELECTED:
LENGTH: ft

UNITS SELECTED:
FLOW RATE: gpm
FLOW VOLUME: gal
VELOCITY: fps

AREA-VEL MODULE:
AREA*VELOCITY
ROUND PIPE

----

5 MINUTE
DATA INTERVAL

12, 1000 ml BTLS
21 ft SUCTION LINE
AUTO SUCTION HEAD
1 RINSES, 1 RETRIES

ONE-PART PROGRAM

PACING:
TIME, EVERY
0 HOURS, 10 MINUTES

DISTRIBUTION:
4 SAMPLES/BOTTLE

VOLUME:

250 ml SAMPLES

ENABLE:

FLOW >200.0 gpm

ENABLE:
REPEATABLE ENABLE
NO SAMPLE AT DISABLE
NO SAMPLE AT ENABLE

ENABLE:
COUNTDOWN IS STOPPED
WHILE DISABLED

ENABLE:
0 PAUSE & RESUMES

START: 07:00
FR
NOT BEFORE: 10-NOV

LIQUID DETECT ON

QUICK VIEW/CHANGE

TAKE MEASUREMENTS
EVERY 5 MINUTES

DUAL SAMPLER OFF
BTL FULL DETECT OFF
TIMED BACKLIGHT

PULSED EVENT MARK

AT INITIAL PURGE

PUMP COUNTS FOR
EACH PURGE CYCLE:
200 PRE-SAMPLE
AUTO POST-SAMPLE

NO PERIODIC
SERIAL OUTPUT

INTERROGATOR
CONNECTOR
POWER ALWAYS ON

NO RAIN GAUGE

NO SDI-12 SONDE

AUTO SDI-12 SCAN OFF

I/O1= NONE
I/O2= NONE
I/O3= NONE

----

0 ANALOG OUTPUTS

NO EXTERNAL MODEM

NO ALARM
CONDITIONS SET

SAMPLER ID# 1284476967 09:48 12-NOV-23
Hardware: A1 Software: 2.33
*********** SAMPLING RESULTS ***********
SITE: OF245 B
PROGRAM: STORM
Program Started at 07:00 FR 10-NOV-23
Nominal Sample Volume = 250 ml

SAMPLE	BOTTLE	TIME	SOURCE	ERROR	COUNT TO LIQUID
		07:00	PGM DISABLED		
		16:50	PGM ENABLED		
		16:55	PGM DISABLED		
		20:20	PGM ENABLED		
1,4	1	20:25	T		604
2,4	1	20:35	T		608
3,4	1	20:45	T		604
4,4	1	20:55	T		604
1,4	2	21:05	T		605
2,4	2	21:15	T		607
3,4	2	21:25	T		608
4,4	2	21:35	T		608
1,4	3	21:45	T		611
2,4	3	21:55	T		612
		22:00	PGM DISABLED		
		SA 11-NOV-23			
		05:50	PGM ENABLED		
3,4	3	05:55	T		517
4,4	3	06:05	T		528
1,4	4	06:15	T		533
2,4	4	06:25	T		535
3,4	4	06:35	T		535
4,4	4	06:45	T		541
1,4	5	06:55	T		545
2,4	5	07:05	T		545
3,4	5	07:15	T		549
4,4	5	07:25	T		553
1,4	6	07:35	T		553
2,4	6	07:45	T		563
3,4	6	07:55	T		559
4,4	6	08:05	T		564
1,4	7	08:15	T		570

2,4	7	08:25	T	571
		08:30	PGM DISABLED	
		08:35	PGM ENABLED	
3,4	7	08:40	T	576
		08:41	PGM DISABLED	
		08:50	PGM ENABLED	
4,4	7	09:00	T	571
		09:01	PGM DISABLED	
		09:10	PGM ENABLED	
1,4	8	09:20	T	571
2,4	8	09:30	T	573
3,4	8	09:40	T	577
4,4	8	09:50	T	575
		09:55	PGM DISABLED	
		10:00	PGM ENABLED	
1,2	9	10:05	T	574
		10:06	PGM DISABLED	
		10:20	PGM ENABLED	
		10:25	PGM DISABLED	
		10:30	PGM ENABLED	
		10:35	PGM DISABLED	
		11:00	PGM ENABLED	
2,2	9	11:00	T	565
		11:05	PGM DISABLED	
		19:15	PGM ENABLED	
		19:15	PGM DISABLED	

SOURCE T ==> TIME

FIELD REPORT

Project: Thea Foss/Wheeler-Osgood Waterways & NPDES Stormwater Monitoring Program

Event: Storm Event – Dec. 9, 2023

INTRODUCTION

This report summarizes the storm event sampled on 12/9/2023-12/11/2023 by the City of Tacoma Environmental Services Collection System Support staff as part of our stormwater monitoring program. This report includes a summary of the following:

- Storm characteristics and criteria;
- Sampling activities;
- Flow characteristics at each sampling location;
- Pacing – set for a 1.79" event, actual event was .97"

This event met the sampling criteria for precipitation as specified in the Thea Foss Sampling and Analysis Plan (SAP).

DESCRIPTION OF SAMPLING ACTIVITES

Samplers placed in the field on 12/8/2023. During sampler installation the weather conditions were overcast. All samplers were retrieved on 12/11/23 (For site specific details, see Appendix A for field notes, Chain of Custody (COC) forms, and event hydrographs).

The following unusual observations were noted during the sampling event:

Table 2: Composite Sampling Activities

Sample Location	Site Deployed	Sample Accepted	Pacing (gal)	Enables LVL(ft), VEL(fps) COND.(mS/cm)	Comments
Outfall 230A	Yes	Yes	10 min.	LVL > .5	48 Aliquots Collected / 48 Composited
Outfall 235	Yes	Yes	123,000	LVL > .370 VEL > 0.80	12 Aliquots Collected / 12 Composited
Outfall 237ANew	Yes	Yes	1,384,000	LVL > .292 VEL > 6	15 Aliquots Collected / 15 Composited
Outfall 237B	Yes	Yes	1,126,000	LVL > 1	46 Aliquots Collected / 32 Composited
Outfall 243	Yes	Yes	10 min.	< 3.5 mS/cm	48 Aliquots Collected / 48 Composited
Outfall 245	Yes	Yes	10 min.	> 200 gpm	48 Aliquots Collected / 48 Composited
Outfall 254	Yes	Yes	10 min.	<15. mS/cm	48 Aliquots Collected / 48 Composited
Outfall 222	Yes	Yes	10 min.	> 200 gpm	48 Aliquots Collected / 48 Composited

**QC, QUALITY CONTROL*

ND, NO DATA

NA, NOT APPLICABLE

WATER QUALITY DATA

Accepted samples were analyzed for the target parameters specified in the SAP and QAPP. Samples accepted at all Outfalls were composited and preserved within 24 hours of the last aliquot being collected. The samples were allowed to sit for a minimum of 18 hours before metals analysis was started.

EQUIPMENT INFORMATION

Samples were collected using ISCO 6712 portable auto samplers. Rain data was collected using an ISCO 674 rain gauge located at the Center for Urban Waters at 326 East D Street, Tacoma, WA 98421.

CORRECTIVE ACTIONS AND DEVIATIONS

There were no deviations from the field procedures as discussed in the SAP other than those discussed above/below. No other criteria or procedures as indicated in the SAP were compromised except for those discussed above/below.

Enclosures: The ISCO program setting/sampling results report, the sample collection chain of custody form, and field records are in Appendix A for each outfall. This includes the following information for the samples collected:

- Plot of flow hydrograph and hyetograph
- Subsample times and conductivities
- Tidal windows
- Field activities

Appendix A

PROJECT

Notebook No.

Continued from Page

Storm Deployment - 2.46" - 11/30/23

254 @ 13:30 - Jars/Ice - Delay Start 1am Friday

245 @ 13:40 - Jars/Ice - Delay start

243 @ 13:51 - Jars/Ice - Battery - Delay start

237A @ 14:04 - Jars/Ice - ~~Delay start~~ - Pacing = 2,576,000

237B @ 14:08 - Jars/Ice - ~~Delay start~~ - Pacing = 2,077,000

235 @ 14:20 - Jars/Ice - Delay Start - Pacing = 225,000

230A @ 14:37 - Jars/Ice - Delay start - Pacing = 343,000 - Lvl = 6"

Grabs - 12/4/23

254 - @ 9:45
245 - 9:55
243 - 10:15
237A - 10:~~20~~
237B - 10:30
235 - 10:40
230A - 10:50
222 - 10:40
744 - 9:30 A 10:40

237A New 1,384,785
237B 1,126,471
230A 187,737
235 122,531
1.79

RG

Storm Deployment 12/8/23 Prediction 1.79

254 @ 10:36 Jars/Ice, Download, Battery 75%, Delay Start Set 1am

245 @ 10:52 Jars/Ice, Download, Battery 100%, Delay start SAT, 1:00am

243 @ 11:06 Jars/Ice, Download, Battery 75%, Delay start SAT 1:00am

237A new @ 11:28 Jars/Ice, Download, Batt Good, " " Recycled meter

237B @ 11:41 Jars/Ice, Download, Batt good, " "

235 @ 11:53 Jars/Ice, Download, Batt changed Delay to Start

230A @ 12:11 Jars/Ice, Download, Batt Change,

Continued on Page

Read and Understood By

Signed Date Signed Date

PROJECT ______ Notebook No. ______ 29

Continued from Page ______

Storm Collection 9:49 12/11/23 .97

254 @ 9:49 Data Downloaded, 48 Aliquots / "Full boat"

245 @ 9:57 Data Downloaded, 48 Aliquots / "Full Boat"

243 @ 10:09 Data Downloaded, 48 Aliquots / "Full boat"

237A new @ 10:17 Data Downloaded, 15 Aliquots / 1 ~~[illegible]~~ Bottles 3 3/4 Bottles

237B @ 10:26 Data Downloaded, 48 Aliquots "Full Boat"

235 @ 10:37 Data Downloaded, 14 Aliquots, 3 1/2 Jars

230A @ 10:52 Data Downloaded, 48 Aliquots, "Full Boat"

Storm Deployment - 12/19/23 .24

245 @ 10:[illegible] - Jars/Ice

237A @ [illegible] - Jars/Ice - 117.9[illegible]

237B @ [illegible]:18 - Jars/Ice - ~~[illegible]~~ → 160,496

235 @ 10:3[illegible] - Jars/Ice - ~~37,000~~ 10,4[illegible]0

230A @ 10:4[illegible] - Jars/Ice - 30,[illegible]

Storm Collection - 12/20/23 .28

245 @ 10:01 - Download - 3 1/4/12
237A @ 10:10 - Download - 3 1/2/12
237B @ 10:19 - Download - 12/12 - Used DI Cooler
235 @ 10:29 - Download - 8 1/4/12 RA
230A @ 10:40 - Download - 9/12

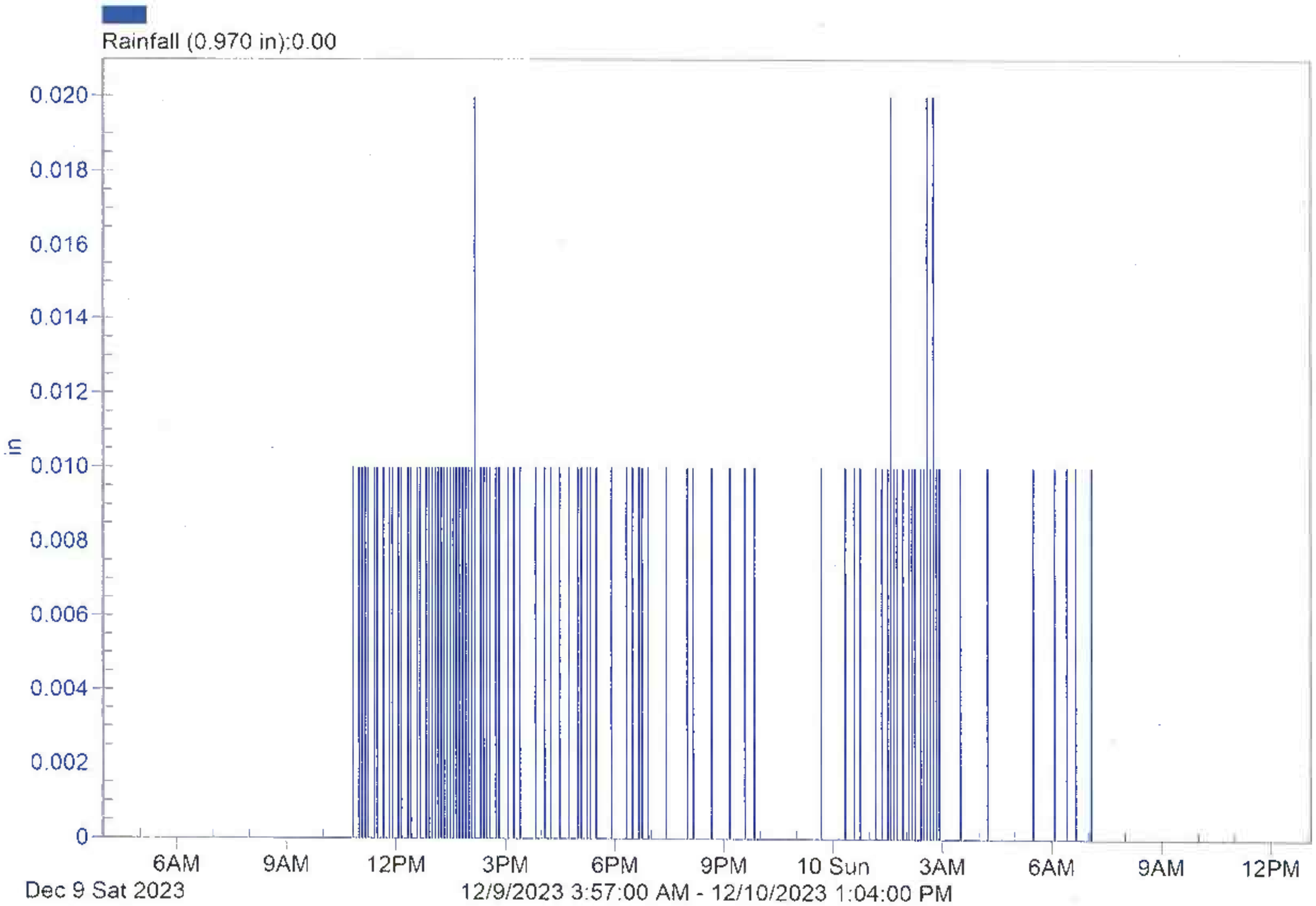
Continued on Page ______

Read and Understood By

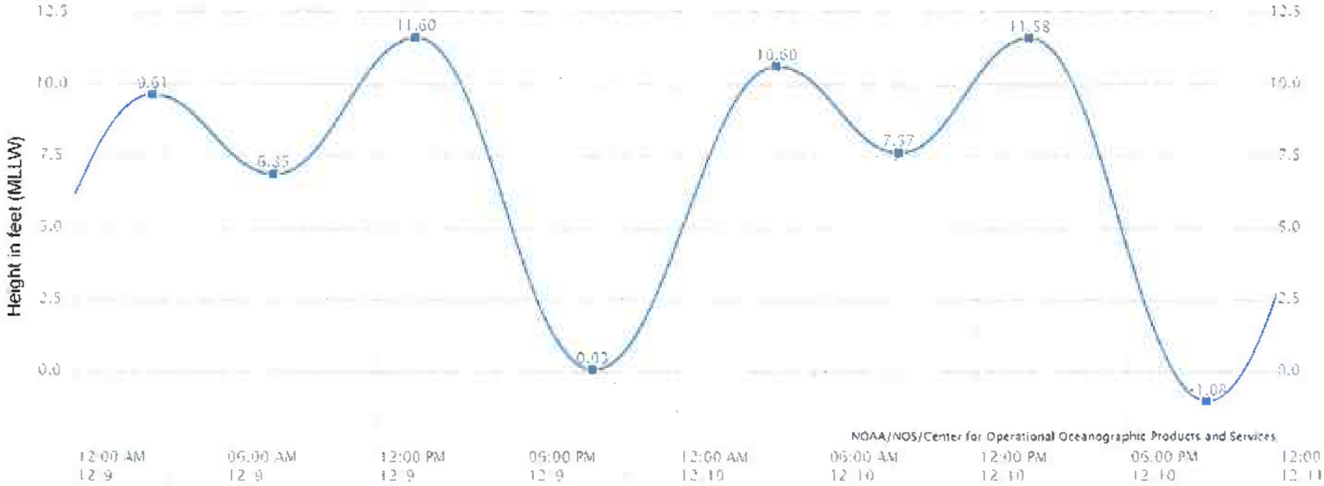
Signed ______ Date ______ Signed ______ Date ______

RF1

Flowlink 5



NOAA/NOS/CO-OPS
Tide Predictions at 9446484, Tacoma WA
From 2023/12/09 12:00 AM LST/LDT to 2023/12/10 11:59 PM LST/LDT



Note: The interval is High/Low, the solid blue line depicts a curve fit between the high and low values and approximates the segments between.
Disclaimer: These data are based upon the latest information available as of the date of your request, and may differ from the published tide tables.

High/Low Tide Prediction Data Listing

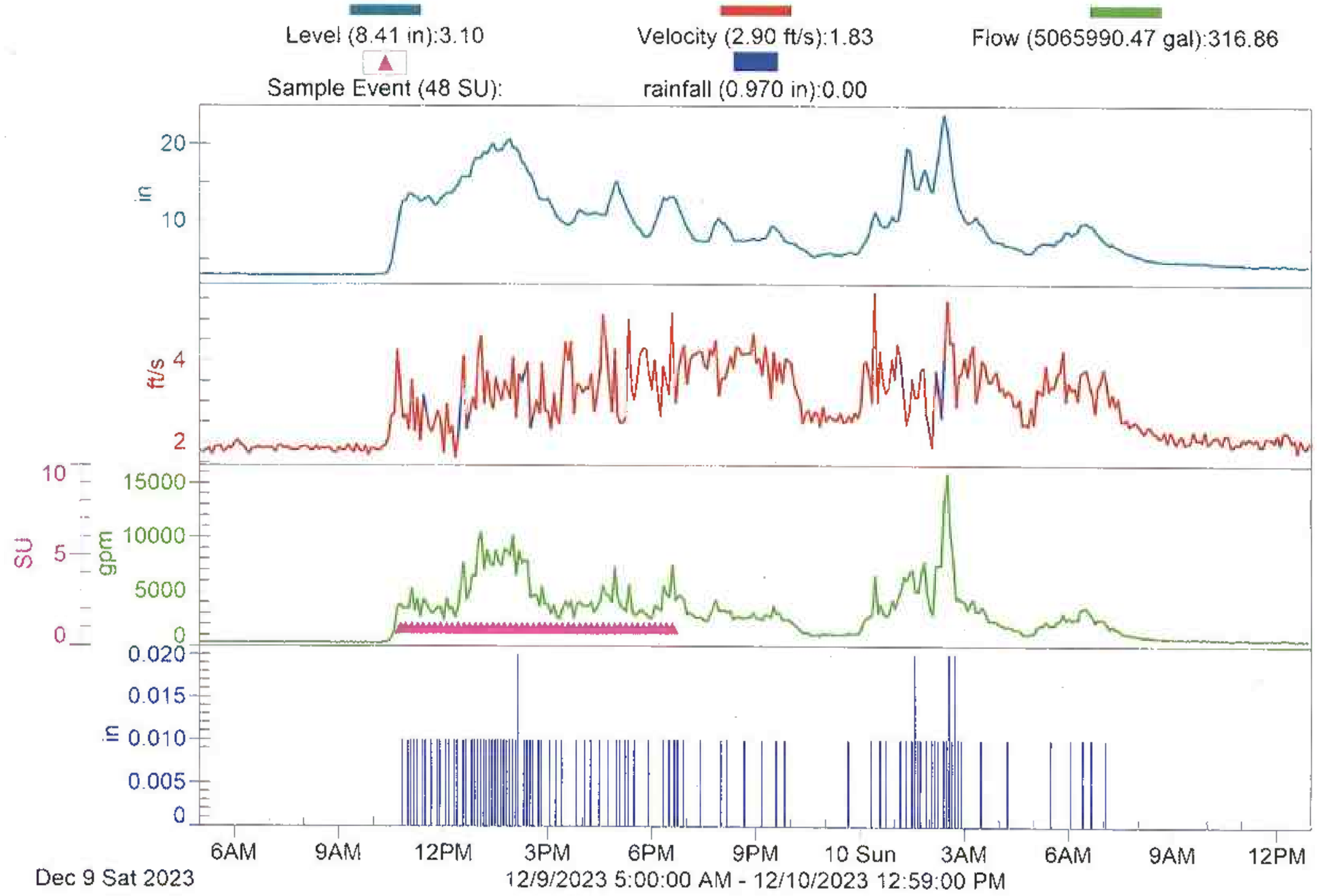
Station Name: Tacoma, WA
Action: Daily
Product: Tide Predictions
Start Date & Time: 2023/12/9 12:00 AM
End Date & Time: 2023/12/10 11:59 PM

Source: NOAA/NOS/CO-OPS
Prediction Type: Harmonic
Datum: MLLW
Height Units: Feet
Time Zone: LST/LDT

Date	Day	Time	Hgt	Time	Hgt	Time	Hgt	Time	Hgt
2023/12/09	Sat	03:06 AM	9.61 H	07:56 AM	6.85 L	1:33 PM	11.60 H	8:42 PM	0.03 L
2023/12/10	Sun	03:57 AM	10.60 H	08:51 AM	7.57 L	2:02 PM	11.58 H	9:13 PM	-1.08 L

230A

Flowlink 5



2311026-01

Bottle Certification
Bottle Certification
*** DEFAULT CONTAINER ***

NPDES Storm
Chain of Custody

2311026-01
Bottle Certification
Bottle Certification
*** DEFAULT CONTAINER ***

Outfall: 230A

Date/Time sampler installed: 12/8/23 @ 12:11

Jar Cert #______

Sampling Crew: CA, SG

Filter lot #______

Weather conditions: Clear

Date/Time sampler pickup: 12/11/23 @ 10:52

Observed activities in area: N/A

Observations during sampler collection: N/A

Color, Odors, sheens: N/A

Type of Sample: ☑ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☑ >0.2 inches rain ☐ <0.02 inches of rain previous 24 hours

Samplers: ☑ Data downloaded ☐ Sample bottles marked
☑ Ice Present at pick-up ☐ Tubing Decon 1000mL Diwater
☑ Caps on containers

Fill to...	Parameters:	Sample	QC
Neck	PAH's/Phthalates (1L) +	☑	☐ ☐
No head	[1]Total Mercury (125/250mL QC)	☑	☐
No head	[1]Diss Mercury (125/250mL QC)	☑	☐
Shoulder	Total Metals (250mL)	☑	
Shoulder	Diss Metals (125mL)	☑	
Shoulder	TSS (1L), (500 mL min)	☑	
Shoulder	Nutrients (250mL)	☑	
Shoulder	Ortho-P (125mL), (75min)	☑	
Shoulder	BOD (1L)	☑	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☑	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes 4.010 L config above
+1000 mL for QC per bottle, must submit 2 extra bottles
[1]If 250ml bottle used, thenQAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (µS)
1	1000	☑	522
2		☑	143.5
3		☑	74.3
4		☑	47.8
5		☑	32.8
6		☑	32.2
7		☑	43.1
8		☑	59.7
9		☑	52.7
10		☑	42.7
11		☑	63.5
12		☑	53.2

Total aliquots: 48

Sample Prep

Date/Time: 12/11/23 14:08

Initial: CA, RS, SG

pH: 7.18

COND (µS): 122.5

Lab #: 2312013-01

Aliquots composited: 48

Deviations :

Composite End Time: 12/9/23 @ 18:35
(Collect Time) Last aliquot in composite

Relinquished by: [signature]

Date/Time: 12/11/23 @ 14:25

Received by: [signature]

Date/Time: 12/11/23 @ 14:26

```
SAMPLER ID# 1481205047  10:33 11-DEC-23
  Hardware:     C0  Software: 3.01.0075
*********** PROGRAM SETTINGS ***********
     ----------
   PROGRAM NAME:
    "STORM 1   "
 SITE DESCRIPTION:
    "230A      "
     ----------
   UNITS SELECTED:
     LENGTH: ft


     ----------
   UNITS SELECTED:
   FLOW RATE: gpm
  FLOW VOLUME: gal
   VELOCITY: fps
     ----------
  AREA-VEL MODULE:
   AREA*VELOCITY
     ROUND PIPE

     ----------

      5 MINUTE
   DATA INTERVAL

     ----------
  12,  1000 ml BTLS
 30 ft SUCTION LINE
 AUTO SUCTION HEAD
1 RINSES, 1 RETRIES
     ----------

  ONE-PART PROGRAM


     ----------
      PACING:
    TIME, EVERY
 0 HOURS, 10 MINUTES

     ----------
    DISTRIBUTION:
   4 SAMPLES/BOTTLE


     ----------
```

VOLUME:

250 ml SAMPLES

ENABLE:

LEVEL >0.500 ft

ENABLE:
REPEATABLE ENABLE
NO SAMPLE AT DISABLE
NO SAMPLE AT ENABLE

ENABLE:
COUNTDOWN IS STOPPED
WHILE DISABLED

ENABLE:
0 PAUSE & RESUMES

START: 01:00
SA
NOT BEFORE: 9-DEC

LIQUID DETECT ON

QUICK VIEW/CHANGE

TAKE MEASUREMENTS
AT STORAGE INTERVAL

DUAL SAMPLER OFF
BTL FULL DETECT OFF
TIMED BACKLIGHT

PULSED EVENT MARK
AT THE BEGINNING OF

FORWARD PUMPING

PUMP COUNTS FOR
EACH PURGE CYCLE:
100 PRE-SAMPLE
AUTO POST-SAMPLE

NO PERIODIC
SERIAL OUTPUT

NO RAIN GAUGE

NO SDI-12 SONDE

AUTO SDI-12 SCAN OFF

I/O1= NONE
I/O2= NONE
I/O3= NONE

----

0 ANALOG OUTPUTS

NO EXTERNAL MODEM

NO ALARM
CONDITIONS SET

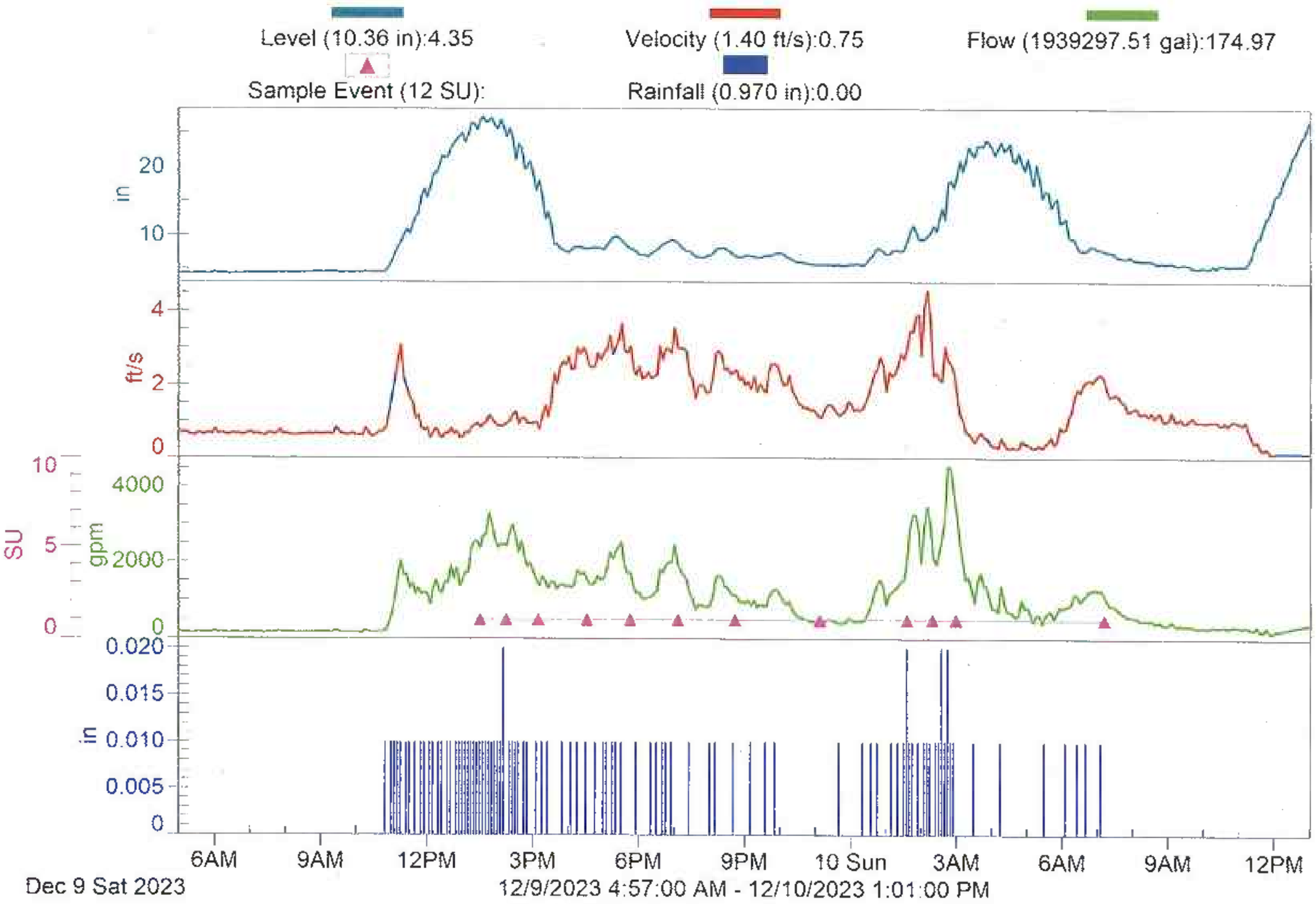

```
SAMPLER ID# 1481205047  10:33 11-DEC-23
  Hardware:     C0  Software: 3.01.0075
*********** SAMPLING RESULTS ***********
   SITE: 230A
PROGRAM: STORM 1
Program Started at 01:00 SA  9-DEC-23
Nominal Sample Volume =  250 ml
                                   COUNT
                                      TO
SAMPLE  BOTTLE TIME  SOURCE ERROR LIQUID
------- ------ ----    -- --     ------
               01:00  PGM DISABLED
               10:35  PGM ENABLED
  1,4      1   10:45       T        1350
  2,4      1   10:55       T        1357
  3,4      1   11:05       T        1363
  4,4      1   11:15       T        1362
  1,4      2   11:25       T        1375
  2,4      2   11:35       T        1377
  3,4      2   11:45       T        1378
  4,4      2   11:55       T        1373
  1,4      3   12:05       T        1378
  2,4      3   12:15       T        1384
  3,4      3   12:25       T        1384
  4,4      3   12:35       T        1378
  1,4      4   12:45       T        1385
  2,4      4   12:55       T        1378
  3,4      4   13:05       T        1386
  4,4      4   13:15       T        1385
  1,4      5   13:25       T        1379
  2,4      5   13:35       T        1379
  3,4      5   13:45       T        1379
  4,4      5   13:55       T        1367
  1,4      6   14:05       T        1365
  2,4      6   14:15       T        1377
  3,4      6   14:25       T        1378
  4,4      6   14:35       T        1381
  1,4      7   14:45       T        1384
  2,4      7   14:55       T        1380
  3,4      7   15:05       T        1380
  4,4      7   15:15       T        1384
  1,4      8   15:25       T        1385
  2,4      8   15:35       T        1384
  3,4      8   15:45       T        1388
  4,4      8   15:55       T        1390
  1,4      9   16:05       T        1395
  2,4      9   16:15       T        1387
  3,4      9   16:25       T        1390
```

4,4	9	16:35	T	1390
1,4	10	16:45	T	1384
2,4	10	16:55	T	1387
3,4	10	17:05	T	1383
4,4	10	17:15	T	1390
1,4	11	17:25	T	1386
2,4	11	17:35	T	1386
3,4	11	17:45	T	1396
4,4	11	17:55	T	1390
1,4	12	18:05	T	1391
2,4	12	18:15	T	1390
3,4	12	18:25	T	1386
4,4	12	18:35	T	1390
		18:37	PGM DONE 09-DEC	

SOURCE T ==> TIME

235_A

Flowlink 5



~~2311026-01~~

~~Bottle Certification~~

Bottle Certification

*** DEFAULT CONTAINER ***

NPDES Storm

Chain of Custody

235

Date/Time sampler installed: 12/8/23 @ 11:53

Jar Cert #

Filter lot # 1376827

Sampling Crew: CA, SG

Weather conditions: Clear

Date/Time sampler pickup: 12/11/23 @ 10:37

Observed activities in area: N/A

Observations during sampler collection: N/A

Color, Odors, sheens: N/A

Type of Sample: ☑ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☑ >0.2 inches rain ☐ <0.02 inches of rain previous 24 hours

Samplers: ☑ Data downloaded ☐ Sample bottles marked

☑ Ice Present at pick-up ☐ Tubing Decon 1000mL Divater

☑ Caps on containers

Fill to...	Parameters:	Sample	QC
Neck	PAH's/Phthalates (1L) +	☑	☐ ☐
No head	[1]Total Mercury (125/250mL QC)	☑	☐
No head	[1]Diss Mercury (125/250mL QC)	☑	☐
Shoulder	Total Metals (250mL)	☑	
Shoulder	Diss Metals (125mL)	☑	
Shoulder	TSS (1L), (500 mL min)	☑	
Shoulder	Nutrients (250mL)	☐	
Shoulder	Ortho-P (125mL), (75min)	☐	
Shoulder	BOD (1L)	☐	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☐	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes 4.010 L config above

+1000 mL for QC per bottle, must submit 2 extra bottles

[1]If 250ml bottle used, thenQAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (uS)
1	1000	☑	71.2
2	|	☑	102.2
3	|	☑	78.2
4	500	~~☑~~ CA	318.0
5		☐	
6		☐	
7		☐	
8		☐	
9		☐	
10		☐	
11		☐	
12		☐	

Total aliquots: 12

Sample Drop

Date/Time: 12/11/23 14:17

Initial: CA, SG, RG

pH: 7.04

COND (µS): 80

Lab #: 2312013-02

Aliquots composited: 12

Deviations :

Composite End Time: 12/10/23 @ 7:12
(Collect Time) Last aliquot in composite

Relinquished by: [signature]

Date/Time: 12/11/23 @ 14:25

Received by: [signature]

Date/Time: 12/11/23 @ 14:26

```
SAMPLER ID# 1242995716  10:36 11-DEC-23
  Hardware:     A1  Software: 2.33
*********** PROGRAM SETTINGS ***********
     ----------
    PROGRAM NAME:
     "235A     "
  SITE DESCRIPTION:
     "235A ST   "
     ----------
    UNITS SELECTED:
      LENGTH: ft


     ----------
    UNITS SELECTED:
    FLOW RATE: gpm
  FLOW VOLUME: Mgal
    VELOCITY: fps
     ----------
   AREA-VEL MODULE:
    AREA*VELOCITY
     ROUND PIPE

     ----------

      5 MINUTE
    DATA INTERVAL

     ----------
   12,  1000 ml BTLS
  56 ft SUCTION LINE
  AUTO SUCTION HEAD
1 RINSES, 1 RETRIES
     ----------

  ONE-PART PROGRAM


     ----------
       PACING:
     FLOW, EVERY
      0.123 Mgal
NO SAMPLE AT START
     ----------
    DISTRIBUTION:
   4 SAMPLES/BOTTLE


     ----------
```

VOLUME:

250 ml SAMPLES

ENABLE:
LEVEL >0.370 ft
AND
VEL > 0.80 fps

ENABLE:
REPEATABLE ENABLE
NO SAMPLE AT DISABLE
NO SAMPLE AT ENABLE

ENABLE:
COUNTDOWN IS STOPPED
WHILE DISABLED

ENABLE:
0 PAUSE & RESUMES

START: 01:00
SA
NOT BEFORE: 9-DEC
200 HOURS RUN TIME

LIQUID DETECT ON

QUICK VIEW/CHANGE

TAKE MEASUREMENTS
AT STORAGE INTERVAL

DUAL SAMPLER OFF
BTL FULL DETECT OFF
TIMED BACKLIGHT

EVENT MARK SENT

DURING PUMP CYCLE

PUMP COUNTS FOR
EACH PURGE CYCLE:
100 PRE-SAMPLE
AUTO POST-SAMPLE

NO PERIODIC
SERIAL OUTPUT

INTERROGATOR
CONNECTOR
POWER ALWAYS ON

NO RAIN GAUGE

NO SDI-12 SONDE

AUTO SDI-12 SCAN OFF

I/O1= NONE
I/O2= NONE
I/O3= NONE

----

0 ANALOG OUTPUTS

NO EXTERNAL MODEM

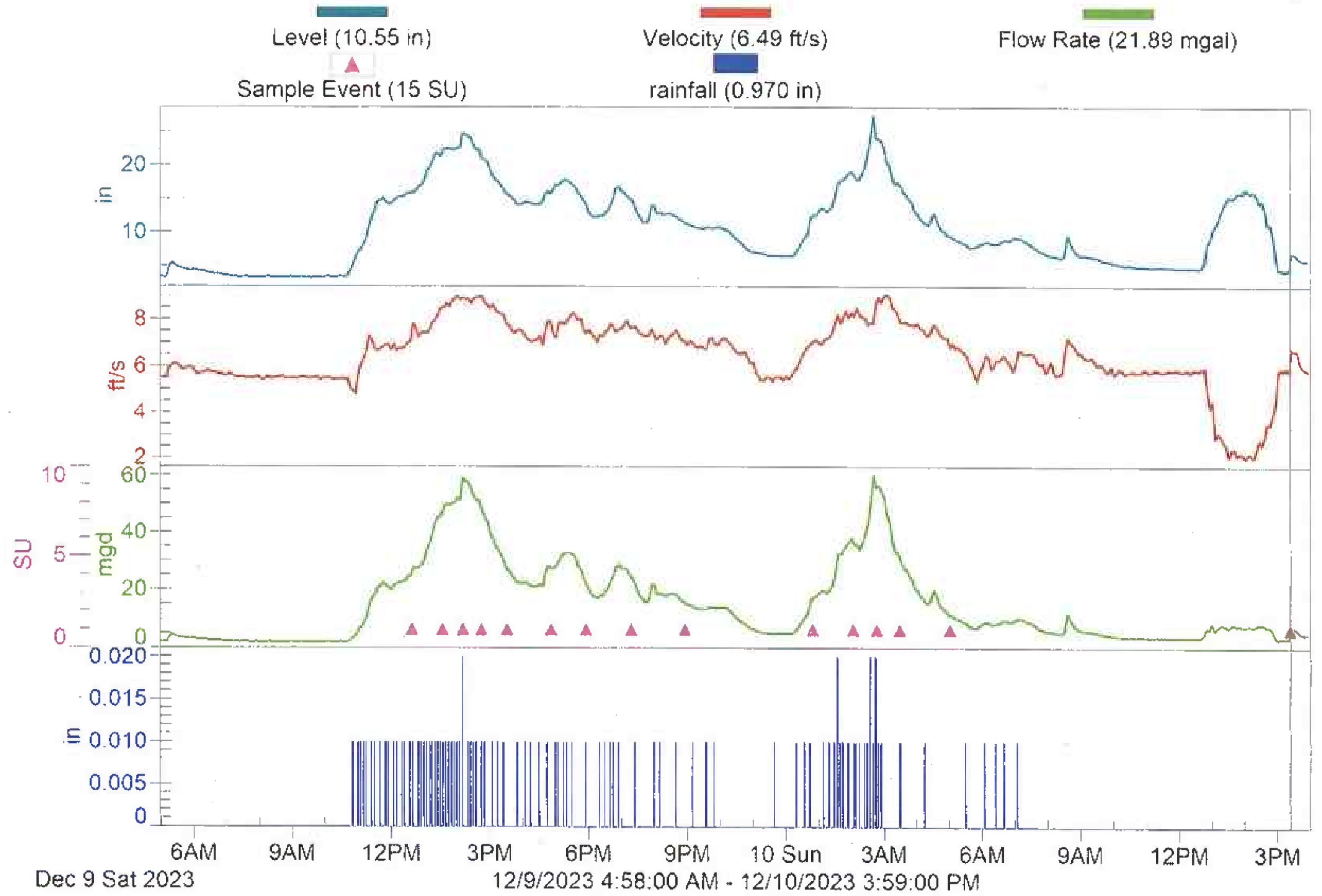
NO ALARM
CONDITIONS SET

```
     ----------
     ----------
----------------------------------------


SAMPLER ID# 1242995716  10:36 11-DEC-23
  Hardware:     A1  Software: 2.33
*********** SAMPLING RESULTS ***********
   SITE: 235A ST
PROGRAM: 235A
Program Started at 01:00 SA  9-DEC-23
Nominal Sample Volume =  250 ml
                                   COUNT
                                      TO
SAMPLE  BOTTLE TIME  SOURCE ERROR LIQUID
------- ------ ----      -- --   ------
              01:00  PGM DISABLED
              06:00  PGM ENABLED
              06:05  PGM DISABLED
              09:25  PGM ENABLED
              09:35  PGM DISABLED
              10:15  PGM ENABLED
              10:20  PGM DISABLED
              10:50  PGM ENABLED
              11:55  PGM DISABLED
              12:00  PGM ENABLED
              12:05  PGM DISABLED
              12:15  PGM ENABLED
              12:20  PGM DISABLED
              12:40  PGM ENABLED
              12:45  PGM DISABLED
              13:15  PGM ENABLED
  1,4      1  13:29      F          1785
  2,4      1  14:15      F          1798
  3,4      1  15:09      F          1819
  4,4      1  16:32      F          1848
  1,4      2  17:44      F          1845
  2,4      2  19:06      F          1845
  3,4      2  20:43      F          1845
  4,4      2  23:06      F          1844
------------- SU 10-DEC-23 -------------
  1,4      3  01:36      F          1836
  2,4      3  02:19      F          1839
  3,4      3  02:59      F          1828
              03:15  PGM DISABLED
              05:55  PGM ENABLED
              06:00  PGM DISABLED
              06:05  PGM ENABLED
```

```
 4,4      3   07:12       F          1848
              11:20  PGM DISABLED
              16:15  PGM ENABLED
              16:45  PGM DISABLED
              16:50  PGM ENABLED
 1,2      4   17:03       F          1872
              17:20  PGM DISABLED
              17:25  PGM ENABLED
              22:15  PGM DISABLED
              22:20  PGM ENABLED
              22:55  PGM DISABLED
              23:00  PGM ENABLED
              23:35  PGM DISABLED
              23:40  PGM ENABLED
              23:45  PGM DISABLED
              23:50  PGM ENABLED
------------- MO 11-DEC-23 -------------
              00:00  PGM DISABLED
              00:05  PGM ENABLED
              00:15  PGM DISABLED
              00:20  PGM ENABLED
              00:55  PGM DISABLED
              01:00  PGM ENABLED
 2,2      4   01:00       F          1851
              01:05  PGM DISABLED
              01:10  PGM ENABLED
              01:30  PGM DISABLED
              01:35  PGM ENABLED
              01:40  PGM DISABLED
              01:50  PGM ENABLED
              02:00  PGM DISABLED
              08:05  PGM ENABLED
              08:30  PGM DISABLED
              08:40  PGM ENABLED
              09:05  PGM DISABLED
              09:45  PGM ENABLED
              09:50  PGM DISABLED
              10:00  PGM ENABLED
              10:05  PGM DISABLED
              10:15  PGM ENABLED
              10:20  PGM DISABLED
              10:30  PGM ENABLED
              10:35  PGM DISABLED


  SOURCE F  ==> FLOW
---------------------------------------
```

237A New 2150

Flowlink 5



~~2311026-01~~ [redacted]

Bott Certification
Bott_ertification
*** AINER ***
Cont #

NPDES Storm
Chain of Custody

Outfall: 237A

Date/Time sampler installed: 12/1/23 @ 11:21

Jar Cert #

Sampling Crew: CA, SG

Filter lot # 1376827

Weather conditions: Clear

Date/Time sampler pickup: 12/11/23 @ 10:17

Observed activities in area: N/A

Observations during sampler collection: N/A

Color, Odors, sheens: N/A

Type of Sample: ☑ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☑ >0.2 inches rain ☐ <0.02 inches of rain previus 24 hours

Samplers: ☑ Data downloaded ☑ Ice Present at pick-up ☑ Caps on containers ☐ Sample bottles marked ☐ Tubing Decon 1000mL Diwater

Fill to...	Parameters:	Sample	QC
Neck	PAH's/Phthalates (1L) +	☑	☐ ☐
No head	[1]Total Mercury (125/250mL QC)	☑	☐
No head	[1]Diss Mercury (125/250mL QC)	☑	☐
Shoulder	Total Metals (250mL)	☑	
Shoulder	Diss Metals (125mL)	☑	
Shoulder	TSS (1L), (500 mL min)	☑	
Shoulder	Nutrients (250mL)	☑	
Shoulder	Ortho-P (125mL), (75min)	☑	
Shoulder	BOD (1L)	☑	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☑	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes 4.010 L config above
+1000 mL for QC per bottle, must submit 2 extra bottles
[1]If 250ml bottle used, thenQAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (µS)
1	1000	☑	
2	|	☑	50.6
3	|	☑	93.1
4	750	☑	99.6
5		☐	231.1
6		☐	
7		☐	
8		☐	
9		☐	
10		☐	
11		☐	
12		☐	

Total aliquots: ~~16~~ 15 ea

Sample Prep

Date/Time: 12/11/23 @ 14:00

Initial: CA, RG, SG

pH: 7

COND (µS): 114

Lab #: 2312013-03

Aliquots composited: ~~16~~ 15 ea

eviations :

Composite End Time: 12/10/23 @ 15:24
(Collect Time) Last aliquot in composite

Relinquished by: [signature]

Date/Time: 12/11/23 @ 14:25

Received by: [signature]

Date/Time: 12/11/23 @ 14:26

```
SAMPLER ID# 1245320993  10:13 11-DEC-23
  Hardware:     A1  Software: 2.33
*********** PROGRAM SETTINGS ***********
     ----------
   PROGRAM NAME:
    "237ANEW   "
 SITE DESCRIPTION:
    "237ANEW   "
     ----------
   UNITS SELECTED:
     LENGTH: ft


     ----------
  12,  1000 ml BTLS
 21 ft SUCTION LINE
 AUTO SUCTION HEAD
1 RINSES, 1 RETRIES
     ----------

  ONE-PART PROGRAM


     ----------
      PACING:
    FLOW, EVERY
       1 PULSES
NO SAMPLE AT START
     ----------
    DISTRIBUTION:
   4 SAMPLES/BOTTLE


     ----------
      VOLUME:

   250 ml SAMPLES

     ----------
      ENABLE:

  NONE PROGRAMMED

     ----------
      ENABLE:
 REPEATABLE ENABLE
NO SAMPLE AT DISABLE
NO SAMPLE AT ENABLE
     ----------
```

ENABLE:
COUNTDOWN IS STOPPED
WHILE DISABLED

ENABLE:
0 PAUSE & RESUMES

NO DELAY TO START

200 HOURS RUN TIME

LIQUID DETECT ON

QUICK VIEW/CHANGE

TAKE MEASUREMENTS
AT STORAGE INTERVAL

DUAL SAMPLER OFF
BTL FULL DETECT OFF
TIMED BACKLIGHT

EVENT MARK SENT
DURING PUMP CYCLE

PUMP COUNTS FOR
EACH PURGE CYCLE:
400 PRE-SAMPLE
400 POST-SAMPLE

NO PERIODIC
SERIAL OUTPUT

INTERROGATOR
CONNECTOR

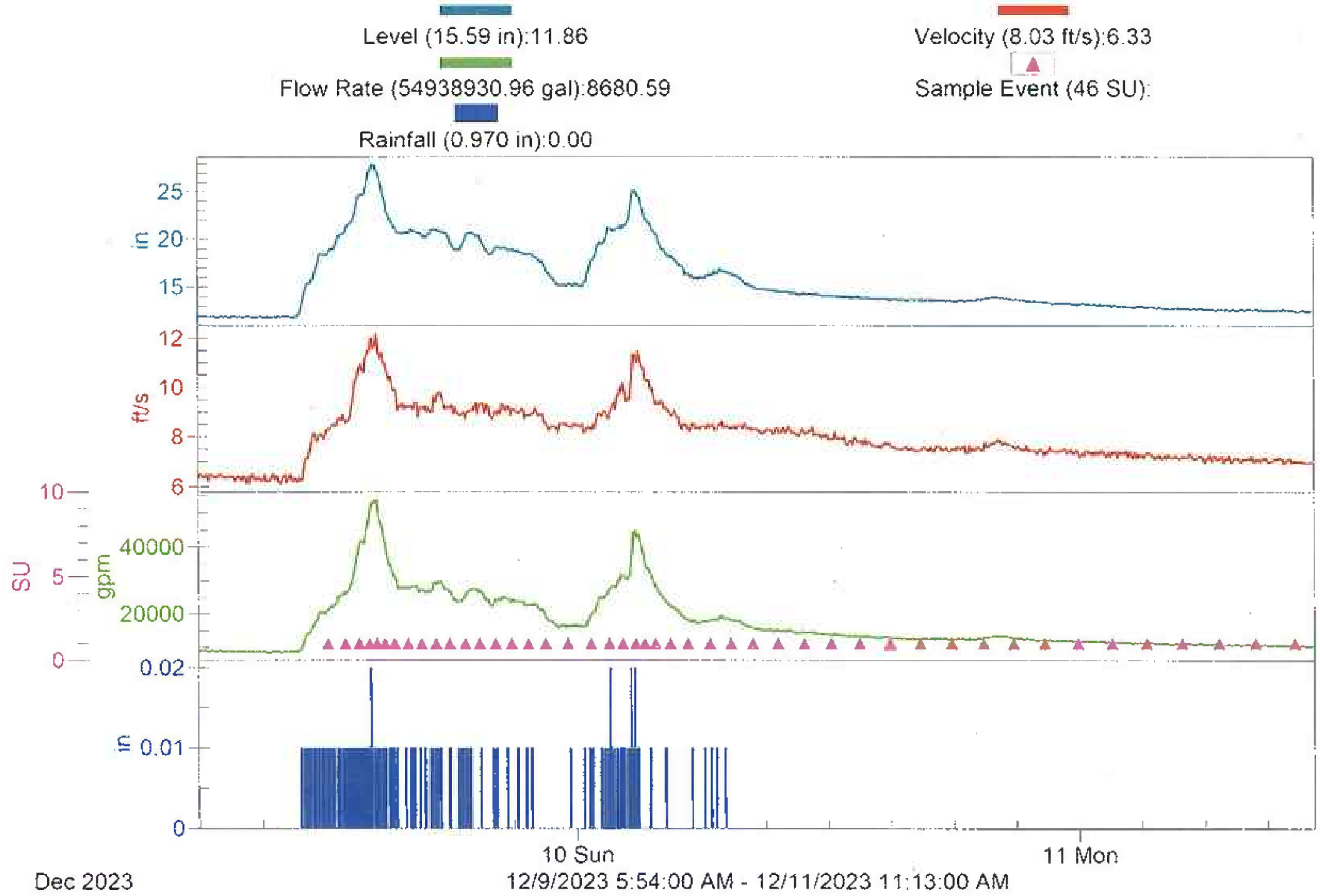
```
   POWER ALWAYS ON

      ----------
      ----------
      ----------

    NO RAIN GAUGE


      ----------
   NO SDI-12 SONDE

 AUTO SDI-12 SCAN OFF

      ----------
  I/O1= NONE
  I/O2= NONE
  I/O3= NONE

      ----------

   0 ANALOG OUTPUTS


      ----------

  NO EXTERNAL MODEM


      ----------

       NO ALARM
    CONDITIONS SET

      ----------
      ----------
----------------------------------------



SAMPLER ID# 1245320993  10:13 11-DEC-23
  Hardware:     A1  Software: 2.33
*********** SAMPLING RESULTS ***********
   SITE: 237ANEW
PROGRAM: 237ANEW
Program Started at 11:31 FR  8-DEC-23
Nominal Sample Volume =  250 ml
                                   COUNT
                                      TO
```

SAMPLE	BOTTLE	TIME	SOURCE	ERROR	LIQUID
		11:31	PGM ENABLED		
		SA 09-DEC-23			
1,4	1	12:38	F		515
2,4	1	13:33	F		513
3,4	1	14:11	F		509
4,4	1	14:44	F		505
1,4	2	15:32	F		515
2,4	2	16:52	F		513
3,4	2	17:55	F		513
4,4	2	19:18	F	P	*
		19:18	POWER FAILED!		
		19:18	POWER RESTORED		
1,4	3	20:55	F		515
		SU 10-DEC-23			
2,4	3	00:50	F		515
3,4	3	02:04	F		497
4,4	3	02:48	F		503
1,3	4	03:29	F		503
2,3	4	05:01	F		515
3,3	4	15:24	F		783

SOURCE F ==> FLOW
ERROR P ==> POWER FAILED!

237B

Flowlink 5



2311020-01

Bottle Certification

Bottle Certification

*** DEFAULT CONTAINER ***

Jar Cert #

NPDES Storm

Chain of Custody

Outfall: 2378

Date/Time sampler installed: ~~12/8/23~~ 11:41

Jar Cert #______

Filter lot # 1376827

Sampling Crew: CA, SG

Weather conditions: Clear

Date/Time sampler pickup: 12/11/23 10:26

Observed activities in area: N/A

Observations during sampler collection: N/A

Color, Odors, sheens: N/A

Type of Sample: ☑ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☑ >0.2 inches rain ☐ <0.02 inches of rain previous 24 hours

Samplers: ☑ Data downloaded ☐ Sample bottles marked

☑ Ice Present at pick-up ☐ Tubing Decon 1000mL DIwater

☑ Caps on containers

Fill to...	Parameters:	Sample	QC
Neck	PAH's/Phthalates (1L) +	☑	☐ ☐
No head	[1]Total Mercury (125/250mL QC)	☑	☑
No head	[1]Diss Mercury (125/250mL QC)	☑	☑
Shoulder	Total Metals (250mL)	☑	
Shoulder	Diss Metals (125mL)	☑	
Shoulder	TSS (1L), (500 mL min)	☑	
Shoulder	Nutrients (250mL)	☑	
Shoulder	Ortho-P (125mL), (75min)	☑	
Shoulder	BOD (1L)	☑	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☑	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes 4.010 L config above

+1000 mL for QC per bottle, must submit 2 extra bottles

[1]If 250ml bottle used, thenQAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (uS)
1	1000	☑	86.1
2	500 CA	☑	61.0
3	1000	☑	94.0
4		☑	~~94.1~~ 115.0
5		☑	146.8
6		☑	76.5
7		☑	153.9
8		☑	200.1
9		☐	228.7
10		☐	234.2
11		☐	250.5
12	500	☐	254.7

Total aliquots: ~~44~~ 46 RG

Sample Prep

Date/Time: 12/11/23 @ 13:52

Initial: CA, RG, SG

pH: 6.82

COND (µS): 177

Lab #: 2312013-04

Aliquots composited: ~~44~~ 32 RG

Deviations: Bottle #2 500mL

Composite End Time: 12/11/23 @ 10:19
(Collect Time) Last aliquot in composite

Relinquished by: [signature]

Date/Time: 12/11/23 @ 14:25

Received by: [signature]

Date/Time: 12/11/23 @ 14:26

```
SAMPLER ID# 1243003651  10:25 11-DEC-23
  Hardware:     A1  Software: 2.33
*********** PROGRAM SETTINGS ***********
     ----------
   PROGRAM NAME:
    " STORM 1  "
  SITE DESCRIPTION:
    "  237 B   "
     ----------
   UNITS SELECTED:
     LENGTH: ft


     ----------
  12,  1000 ml BTLS
 16 ft SUCTION LINE
 AUTO SUCTION HEAD
1 RINSES, 1 RETRIES
     ----------

  ONE-PART PROGRAM


     ----------
      PACING:
    FLOW, EVERY
       1 PULSES
NO SAMPLE AT START
     ----------
    DISTRIBUTION:
   4 SAMPLES/BOTTLE


     ----------
      VOLUME:

   250 ml SAMPLES

     ----------
      ENABLE:

  NONE PROGRAMMED

     ----------
      ENABLE:
 REPEATABLE ENABLE
NO SAMPLE AT DISABLE
NO SAMPLE AT ENABLE
     ----------
```

ENABLE:
COUNTDOWN IS STOPPED
WHILE DISABLED

ENABLE:
0 PAUSE & RESUMES

NO DELAY TO START

200 HOURS RUN TIME

LIQUID DETECT ON

QUICK VIEW/CHANGE

TAKE MEASUREMENTS
AT STORAGE INTERVAL

DUAL SAMPLER OFF
BTL FULL DETECT ON
TIMED BACKLIGHT

EVENT MARK SENT
DURING PUMP CYCLE

PUMP COUNTS FOR
EACH PURGE CYCLE:
100 PRE-SAMPLE
AUTO POST-SAMPLE

NO PERIODIC
SERIAL OUTPUT

INTERROGATOR
CONNECTOR

POWER ALWAYS ON

NO RAIN GAUGE

NO SDI-12 SONDE

AUTO SDI-12 SCAN OFF

I/O1= NONE
I/O2= NONE
I/O3= NONE

----

0 ANALOG OUTPUTS

NO EXTERNAL MODEM

NO ALARM
CONDITIONS SET

SAMPLER ID# 1243003651 10:26 11-DEC-23
Hardware: A1 Software: 2.33
*********** SAMPLING RESULTS ***********
SITE: 237 B
PROGRAM: STORM 1
Program Started at 11:46 FR 8-DEC-23
Nominal Sample Volume = 250 ml
COUNT
TO

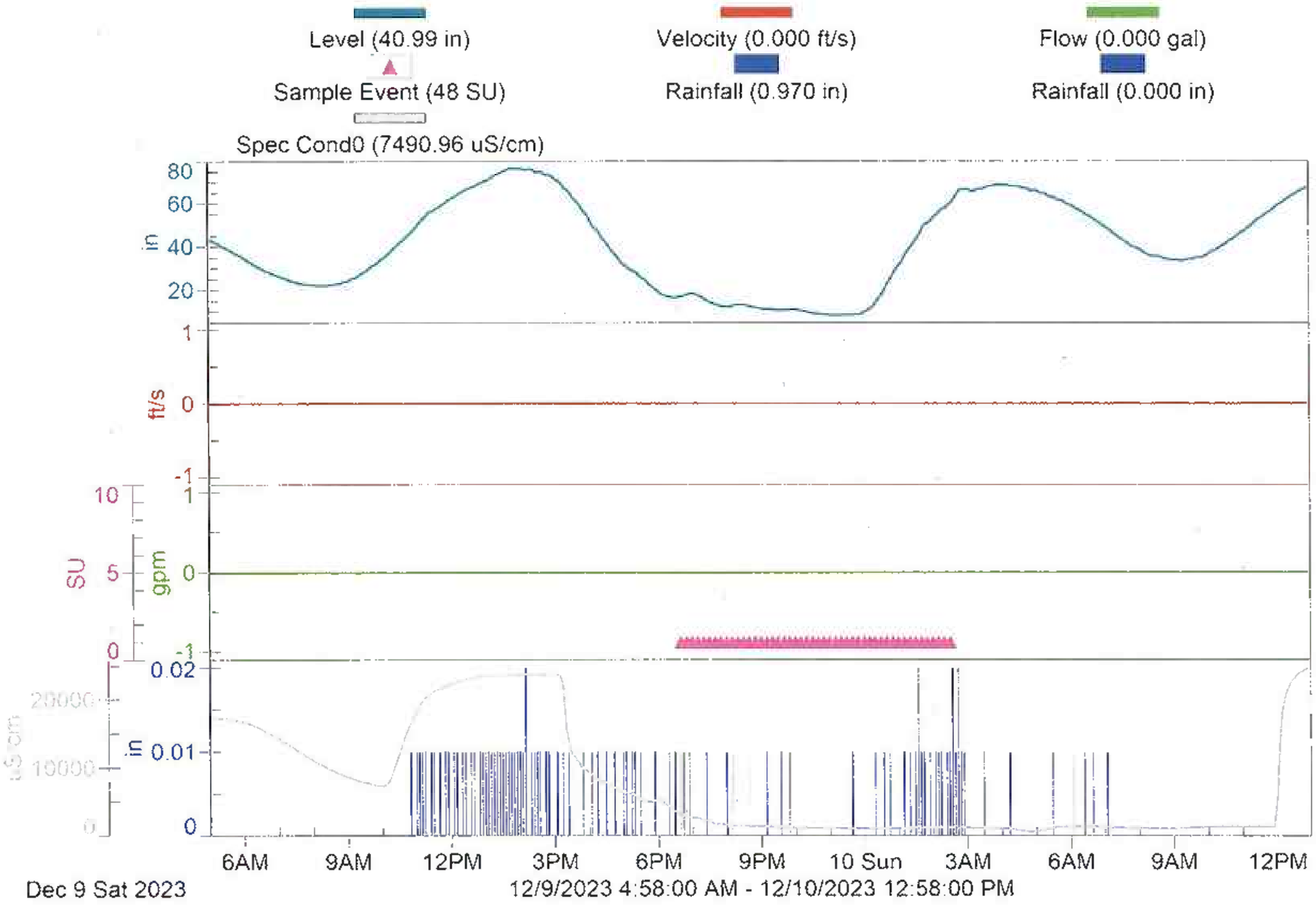
```
SAMPLE  BOTTLE TIME   SOURCE ERROR LIQUID
------- ------ ----       -- --    ------
               11:46  PGM ENABLED
------------- SA 09-DEC-23 -------------
  1,4      1   12:07       F          521
  2,4      1   12:57       F          500
  3,4      1   13:37       F          503
  4,4      1   14:06       F          499
  1,4      2   14:28       F          496
  2,4      2   14:50       F          502
  3,4      2   15:18       F          504
  4,4      2   15:56       F          504
  1,4      3   16:35       F          505
  2,4      3   17:17       F          505
  3,4      3   17:55       F          502
  4,4      3   18:40       F          508
  1,4      4   19:22       F          503
  2,4      4   20:07       F          520
  3,4      4   20:53       F          503
  4,4      4   21:40       F          506
  1,4      5   22:30       F          509
  2,4      5   23:33       F          504
------------- SU 10-DEC-23 -------------
  3,4      5   00:40       F          511
  4,4      5   01:32       F          504
  1,4      6   02:12       F          504
  2,4      6   02:48       F          505
  3,4      6   03:14       F          498
  4,4      6   03:45       F          507
  1,4      7   04:27       F          509
  2,4      7   05:18       F          519
  3,4      7   06:21       F          512
  4,4      7   07:21       F          519
  1,4      8   08:24       F          519
  2,4      8   09:36       F          515
  3,4      8   10:52       F          519
  4,4      8   12:09       F          523
  1,4      9   13:31       F          521
  2,4      9   14:57       F          522
  3,4      9   16:25       F          517
  4,4      9   17:55       F          517
  1,4     10   19:26       F          516
  2,4     10   20:52       F          514
  3,4     10   22:23       F          510
  4,4     10   23:58       F          513
------------- MO 11-DEC-23 -------------
  1,4     11   01:35       F          515
  2,4     11   03:14       F          510
  3,4     11   04:56       F          511
```

4,4	11	06:41	F	509
1,2	12	08:27	F	508
2,2	12	10:19	F	515

SOURCE F ==> FLOW

243

Flowlink 5



2311025 01

Bottle Certification

Bottle Certification

*** DEFAULT CONTAINER ***

NPDES Storm

Chain of Custody

Outfall: 243

Date/Time sampler installed: 12/8/23 @ 11:06

Jar Cert # ____

Sampling Crew: CA, SG

Filter lot # 1376827

Weather conditions: Clear

Date/Time sampler pickup: 12/11/23 @ 10:09

Observed activities in area: N/A

Observations during sampler collection: N/A

Color, Odors, sheens: N/A

Type of Sample: ☑ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☑ >0.2 inches rain ☐ <0.02 inches of rain previus 24 hours

Samplers: ☑ Data downloaded ☐ Sample bottles marked

☑ Ice Present at pick-up ☐ Tubing Decon 1000mL Divater

☑ Caps on containers

Fill to...	Parameters:	Sample	QC
Neck	PAH's/Phthalates (1L) +	☑	☐ ☐
No head	[1]Total Mercury (125/250mL QC)	☑	☐
No head	[1]Diss Mercury (125/250mL QC)	☑	☐
Shoulder	Total Metals (250mL)	☑	
Shoulder	Diss Metals (125mL)	☑	
Shoulder	TSS (1L), (500 mL min)	☑	
Shoulder	Nutrients (250mL)	☑	
Shoulder	Ortho-P (125mL), (75min)	☑	
Shoulder	BOD (1L)	☑	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☑	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes 4.010 L config above

+1000 mL for QC per bottle, must submit 2 extra bottles

[1]If 250ml bottle used, thenQAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (uS)
1	1000	☑	3990
2		☑	2785
3		☑	2208
4		☑	2102
5		☑	1915
6		☑	1753
7		☑	1706
8		☑	1649
9		☑	1629
10		☑	1746
11		☑	2178
12		☑	1840

Total aliquots: 48

Sample Prep

Date/Time: 12/11/23 @ 13:46

Initial: CA, RG, SG

pH: 6.66

COND (µS): 2049

Lab #: 2312013-05

Aliquots composited: 48

Deviations :

Composite End Time: 12/10/23 @ 2:30

(Collect Time) Last aliquot in composite

Relinquished by: [signature]

Date/Time: 12/11/23 @ 14:25

Received by: [signature]

Date/Time: 12/11/23 @ 14:26

SAMPLER ID# 1242893352 10:07 11-DEC-23
Hardware: A1 Software: 2.33
*********** PROGRAM SETTINGS ***********

PROGRAM NAME:
"STORM 1 "
SITE DESCRIPTION:
" 243 "

UNITS SELECTED:
LENGTH: ft
CONDUCTIVITY: mS/cm
TEMPERATURE: F

UNITS SELECTED:
FLOW RATE: gpm
FLOW VOLUME: Mgal
VELOCITY: fps

AREA-VEL MODULE:
AREA*VELOCITY
ROUND PIPE

----

5 MINUTE
DATA INTERVAL

12, 1000 ml BTLS
17 ft SUCTION LINE
AUTO SUCTION HEAD
1 RINSES, 1 RETRIES

ONE-PART PROGRAM

PACING:
TIME, EVERY
0 HOURS, 10 MINUTES

DISTRIBUTION:
4 SAMPLES/BOTTLE

VOLUME:

250 ml SAMPLES

ENABLE:

SP_CO0 <3.500 mS/cm

ENABLE:
REPEATABLE ENABLE
NO SAMPLE AT DISABLE
NO SAMPLE AT ENABLE

ENABLE:
COUNTDOWN IS STOPPED
WHILE DISABLED

ENABLE:
0 PAUSE & RESUMES

START: 01:00
SA
NOT BEFORE: 9-DEC

LIQUID DETECT ON

QUICK VIEW/CHANGE

TAKE MEASUREMENTS
AT STORAGE INTERVAL

DUAL SAMPLER OFF
BTL FULL DETECT OFF
TIMED BACKLIGHT

EVENT MARK SENT

DURING PUMP CYCLE

PUMP COUNTS FOR
EACH PURGE CYCLE:
200 PRE-SAMPLE
AUTO POST-SAMPLE

NO PERIODIC
SERIAL OUTPUT

INTERROGATOR
CONNECTOR
POWER ALWAYS ON

NO RAIN GAUGE

SDI-12 DATA:
01DATA0 02DATA0
TEMP0 SP_CO0 05DATA0

I/O1= NONE
I/O2= NONE
I/O3= NONE

----

0 ANALOG OUTPUTS

NO EXTERNAL MODEM

NO ALARM
CONDITIONS SET

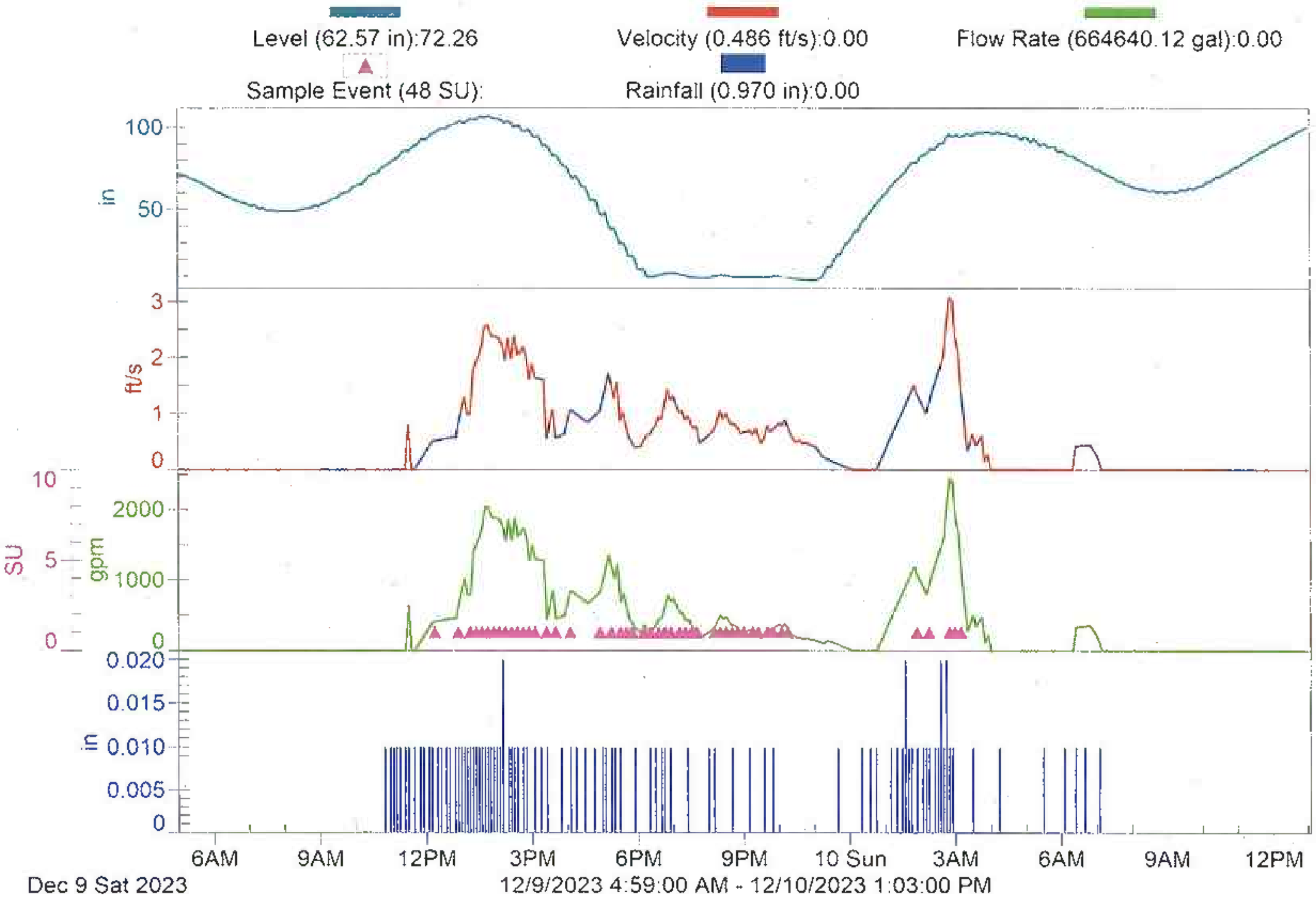
SAMPLER ID# 1242893352 10:08 11-DEC-23
Hardware: A1 Software: 2.33
*********** SAMPLING RESULTS ***********
SITE: 243
PROGRAM: STORM 1
Program Started at 01:00 SA 9-DEC-23
Nominal Sample Volume = 250 ml

SAMPLE	BOTTLE	TIME	SOURCE	ERROR	COUNT TO LIQUID
		01:00	PGM DISABLED		
		18:30	PGM ENABLED		
1,4	1	18:40	T		436
2,4	1	18:50	T		436
3,4	1	19:00	T		437
4,4	1	19:10	T		440
1,4	2	19:20	T		440
2,4	2	19:30	T		442
3,4	2	19:40	T		442
4,4	2	19:50	T		442
1,4	3	20:00	T		441
2,4	3	20:10	T		441
3,4	3	20:20	T		444
4,4	3	20:30	T		441
1,4	4	20:40	T		444
2,4	4	20:50	T		445
3,4	4	21:00	T		446
4,4	4	21:10	T		445
1,4	5	21:20	T		445
2,4	5	21:30	T		445
3,4	5	21:40	T		445
4,4	5	21:50	T		445
1,4	6	22:00	T		444
2,4	6	22:10	T		445
3,4	6	22:20	T		445
4,4	6	22:30	T		446
1,4	7	22:40	T		447
2,4	7	22:50	T		448
3,4	7	23:00	T		447
4,4	7	23:10	T		447
1,4	8	23:20	T		447
2,4	8	23:30	T		447

```
  3,4      8   23:40        T            447
  4,4      8   23:50        T            448
------------- SU 10-DEC-23 ------------
  1,4      9   00:00        T            446
  2,4      9   00:10        T            445
  3,4      9   00:20        T            446
  4,4      9   00:30        T            441
  1,4     10   00:40        T            439
  2,4     10   00:50        T            435
  3,4     10   01:00        T            435
  4,4     10   01:10        T            434
  1,4     11   01:20        T            434
  2,4     11   01:30        T            429
  3,4     11   01:40        T            429
  4,4     11   01:50        T            428
  1,4     12   02:00        T            428
  2,4     12   02:10        T            425
  3,4     12   02:20        T            423
  4,4     12   02:30        T            424
               02:31  PGM DONE 10-DEC

   SOURCE T  ==> TIME
----------------------------------------
```

OF245 B

Flowlink 5



Bottle Certification

Bottle Certification

*** DEFAULT CONTAINER ***

Jar Cert #

Filter lot # 1376927

NPDES Storm

Chain of Custody

Outfall: 245

Date/Time sampler installed: 12/8/23 @ 10:52

Sampling Crew: CA, SG

Weather conditions: Clear

Date/Time sampler pickup: 12/11/23 @ 9:57

Observed activities in area: N/A

Observations during sampler collection: N/A

Color, Odors, sheens: N/A

Type of Sample: ☑ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☑ >0.2 inches rain ☐ <0.02 inches of rain previus 24 hours

Samplers: ☑ Data downloaded ☑ Ice Present at pick-up ☑ Caps on containers ☐ Sample bottles marked ☐ Tubing Decon 1000mL Diwater

Fill to...	Parameters:	Sample	QC
Neck	PAH's/Phthalates (1L) +	☑	☐ ☐
No head	[1]Total Mercury (125/250mL QC)	☑	☐
No head	[1]Diss Mercury (125/250mL QC)	☑	☐
Shoulder	Total Metals (250mL)	☑	
Shoulder	Diss Metals (125mL)	☑	
Shoulder	TSS (1L), (500 mL min)	☑	
Shoulder	Nutrients (250mL)	☑	
Shoulder	Ortho-P (125mL), (75min)	☑	
Shoulder	BOD (1L)	☑	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☑	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes 4.010 L config above

+1000 mL for QC per bottle, must submit 2 extra bottles

[1]If 250ml bottle used, thenQAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (µS)
1	1000	☑	144.3
2		☑	82.5
3		☑	23.94
4		☑	28.32
5		☑	111.6
6		☑	302.0
7		☑	252.8
8		☑	393
9		☑	393
10		☑	571
11		☑	383
12		☑	39.8

Total aliquots: 48

Sample Prep

Date/Time: 12/11/23 @ 13:30

Initial: CA, SG, RG

pH: 6.56

COND (µS): 214

Lab #: 2312013-06

Aliquots composited: 48

Deviations :

Composite End Time: (Collect Time) 12/10/23 @ 3:10

Last aliquot in composite

Relinquished by: [signature]

Date/Time: 12/11/23 @ 14:25

Received by: [signature]

Date/Time: 12/11/23 @ 14:26

SAMPLER ID# 1284476967 09:58 11-DEC-23
Hardware: A1 Software: 2.33
*********** PROGRAM SETTINGS ***********

PROGRAM NAME:
"STORM   "
SITE DESCRIPTION:
"OF245 B   "

UNITS SELECTED:
LENGTH: ft

UNITS SELECTED:
FLOW RATE: gpm
FLOW VOLUME: gal
VELOCITY: fps

AREA-VEL MODULE:
AREA*VELOCITY
ROUND PIPE

----

5 MINUTE
DATA INTERVAL

12, 1000 ml BTLS
21 ft SUCTION LINE
AUTO SUCTION HEAD
1 RINSES, 1 RETRIES

ONE-PART PROGRAM

PACING:
TIME, EVERY
0 HOURS, 10 MINUTES

DISTRIBUTION:
4 SAMPLES/BOTTLE

VOLUME:

250 ml SAMPLES

ENABLE:

FLOW >200.0 gpm

ENABLE:
REPEATABLE ENABLE
NO SAMPLE AT DISABLE
NO SAMPLE AT ENABLE

ENABLE:
COUNTDOWN IS STOPPED
WHILE DISABLED

ENABLE:
0 PAUSE & RESUMES

START: 01:00
SA
NOT BEFORE: 9-DEC

LIQUID DETECT ON

QUICK VIEW/CHANGE

TAKE MEASUREMENTS
EVERY 5 MINUTES

DUAL SAMPLER OFF
BTL FULL DETECT OFF
TIMED BACKLIGHT

PULSED EVENT MARK

AT INITIAL PURGE

PUMP COUNTS FOR
EACH PURGE CYCLE:
200 PRE-SAMPLE
AUTO POST-SAMPLE

NO PERIODIC
SERIAL OUTPUT

INTERROGATOR
CONNECTOR
POWER ALWAYS ON

NO RAIN GAUGE

NO SDI-12 SONDE

AUTO SDI-12 SCAN OFF

I/O1= NONE
I/O2= NONE
I/O3= NONE

----

0 ANALOG OUTPUTS

NO EXTERNAL MODEM

NO ALARM
CONDITIONS SET

SAMPLER ID# 1284476967 09:59 11-DEC-23
Hardware: A1 Software: 2.33
*********** SAMPLING RESULTS ***********
SITE: OF245 B
PROGRAM: STORM
Program Started at 01:00 SA 9-DEC-23
Nominal Sample Volume = 250 ml

SAMPLE	BOTTLE	TIME	SOURCE	ERROR	COUNT TO LIQUID
		01:00	PGM DISABLED		
		11:30	PGM ENABLED		
		11:35	PGM DISABLED		
		12:10	PGM ENABLED		
1,4	1	12:15	T		522
		12:16	PGM DISABLED		
		12:35	PGM ENABLED		
		12:40	PGM DISABLED		
		12:50	PGM ENABLED		
2,4	1	12:55	T		513
		12:56	PGM DISABLED		
		13:05	PGM ENABLED		
3,4	1	13:15	T		516
4,4	1	13:25	T		518
1,4	2	13:35	T		517
2,4	2	13:45	T		517
3,4	2	13:55	T		521
4,4	2	14:05	T		521
1,4	3	14:15	T		520
2,4	3	14:25	T		523
3,4	3	14:35	T		523
4,4	3	14:45	T		532
1,4	4	14:55	T		528
2,4	4	15:05	T		529
		15:10	PGM DISABLED		
		15:20	PGM ENABLED		
3,4	4	15:25	T		529
		15:30	PGM DISABLED		
		15:35	PGM ENABLED		
4,4	4	15:40	T		535
		15:45	PGM DISABLED		
		15:55	PGM ENABLED		

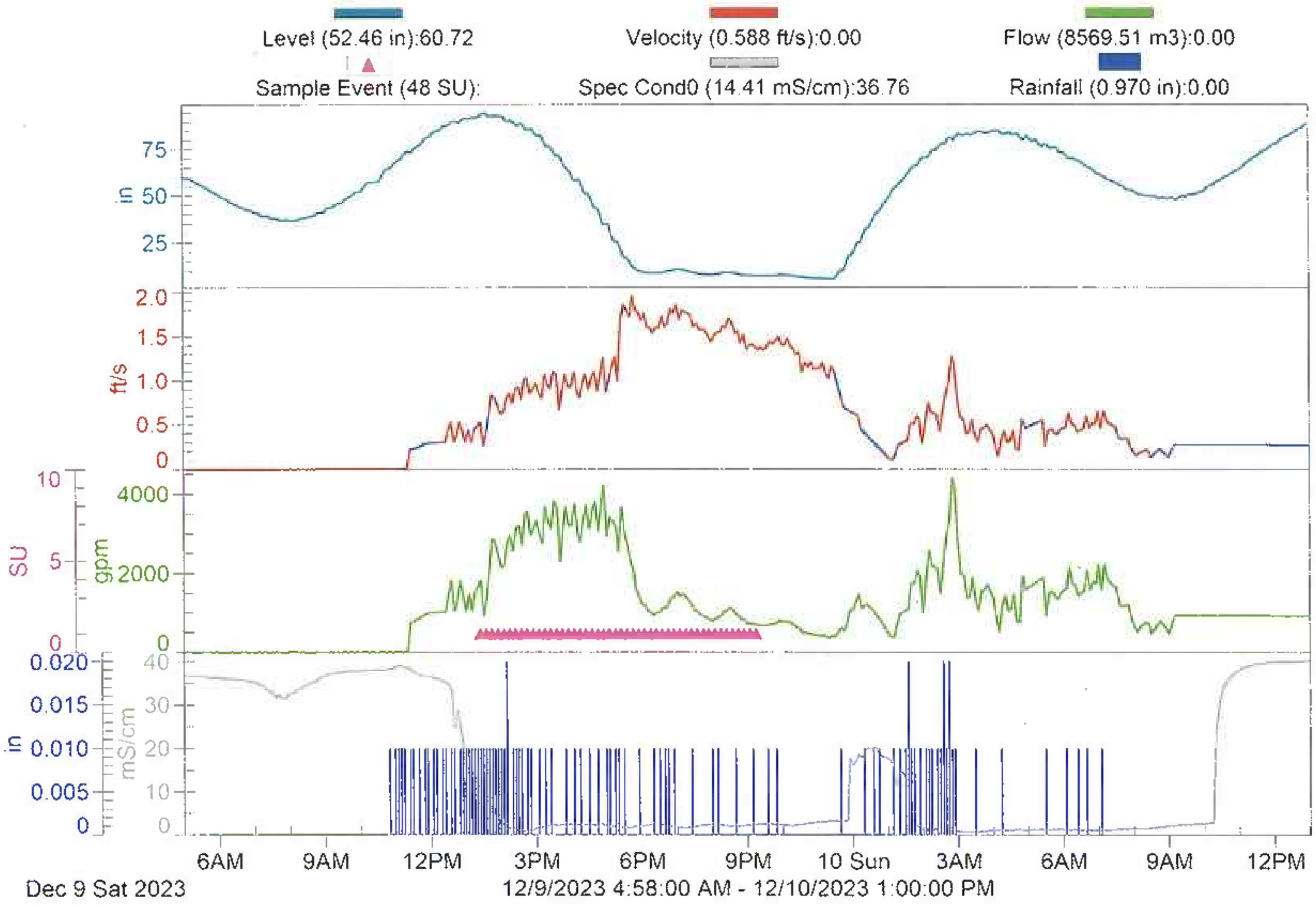
		16:00	PGM DISABLED	
		16:05	PGM ENABLED	
1,4	5	16:05	T	546
		16:10	PGM DISABLED	
		16:35	PGM ENABLED	
		16:40	PGM DISABLED	
		16:55	PGM ENABLED	
2,4	5	16:55	T	560
		17:00	PGM DISABLED	
		17:10	PGM ENABLED	
3,4	5	17:15	T	571
		17:16	PGM DISABLED	
		17:20	PGM ENABLED	
4,4	5	17:30	T	583
1,4	6	17:40	T	588
2,4	6	17:50	T	592
		17:51	PGM DISABLED	
		17:55	PGM ENABLED	
		18:00	PGM DISABLED	
		18:05	PGM ENABLED	
3,4	6	18:10	T	602
4,4	6	18:20	T	608
		18:25	PGM DISABLED	
		18:30	PGM ENABLED	
1,4	7	18:35	T	606
2,4	7	18:45	T	608
3,4	7	18:55	T	607
		19:05	PGM DISABLED	
		19:10	PGM ENABLED	
4,4	7	19:10	T	608
1,4	8	19:20	T	607
2,4	8	19:30	T	609
3,4	8	19:40	T	612
		19:45	PGM DISABLED	
		20:05	PGM ENABLED	
4,4	8	20:10	T	603
1,4	9	20:20	T	607
2,4	9	20:30	T	605
3,4	9	20:40	T	609
4,4	9	20:50	T	610
1,4	10	21:00	T	612
		21:05	PGM DISABLED	
		21:10	PGM ENABLED	
2,4	10	21:15	T	612
3,4	10	21:25	T	612
		21:30	PGM DISABLED	
		21:35	PGM ENABLED	
4,4	10	21:40	T	609
1,4	11	21:50	T	612

		21:51	PGM DISABLED	
		21:55	PGM ENABLED	
2,4	11	22:05	T	609
3,4	11	22:15	T	608
		22:16	PGM DISABLED	
		22:20	PGM ENABLED	
		22:25	PGM DISABLED	
------------		SU 10-DEC-23	------------	
		01:50	PGM ENABLED	
4,4	11	01:55	T	529
		02:00	PGM DISABLED	
		02:10	PGM ENABLED	
1,4	12	02:15	T	529
		02:16	PGM DISABLED	
		02:40	PGM ENABLED	
2,4	12	02:50	T	523
3,4	12	03:00	T	528
4,4	12	03:10	T	523
		03:11	PGM DONE 10-DEC	

SOURCE T ==> TIME

254-

Flowlink 5



2311025-01

Bottle Certification

Bottle Certification

*** DEFAULT CONTAINER ***

NPDES Storm
Chain of Custody

2311026-01

Bottle Certification

Bottle Certification

*** DEFAULT CONTAINER ***

Outfall: 254   Date/Time sampler installed: 12/8/23 @ 10:56

Jar Cert #________   Sampling Crew: CA, SG

Filter lot # 1376827   Weather conditions: Clear   Date/Time sampler pickup: 12/11/23 @ 9:49

Observed activities in area: N/A

Observations during sampler collection: N/A

Color, Odors, sheens: N/A

Type of Sample: ☑ Stormwater   ☐ Baseflow   ☐ Rinse Blank

Rain event: ☑ >0.2 inches rain   ☐ <0.02 inches of rain previus 24 hours

Samplers: ☑ Data downloaded   ☐ Sample names marked

☑ Ice Present at pick-up   ☐ Tubing Decon 1000mL Diwater

☑ Caps on containers

Fill to...	Parameters:	Sample	QC
Neck	PAH's/Phthalates (1L) +	☑	☑ ☑
No head	[1]Total Mercury (125/250mL QC)	☑	☐
No head	[1]Diss Mercury (125/250mL QC)	☑	☐
Shoulder	Total Metals (250mL)	☑	
Shoulder	Diss Metals (125mL)	☑	
Shoulder	TSS (1L), (500 mL min)	☑	
Shoulder	Nutrients (250mL)	☑	
Shoulder	Ortho-P (125mL), (75min)	☑	
Shoulder	BOD (1L)	☑	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☑	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes   4.010 L config above

+1000 mL for QC per bottle, must submit 2 extra bottles

[1]If 250ml bottle used, thenQAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (uS)
1	1000	☑	6350
2		☑	1424
3		☑	1654
4		☑	2584
5		☑	2733
6		☑	2593
7		☑	1993
8		☑	2631
9		☑	1892
10		☑	2381
11		☑	2378
12		☑	2568

Total aliquots: 48

Sample Prep

Date/Time: 12/11/23 @ 13:40

Initial: CA, RG, SG

pH: 6.17

COND (µS): 2509

Lab #: 2312013-07

Aliquots composited: 48

Deviations :

Composite End Time: 12/9/23 @ 21:15

(Collect Time)   Last aliquot in composite

Relinquished by: [signature]   Received by: [signature]

Date/Time: 12/11/23 @ 14:25   Date/Time: 12/11/23 @ 14:26

```
SAMPLER ID# 1673008074  09:48 11-DEC-23
  Hardware:     C0  Software: 3.08.0001
*********** PROGRAM SETTINGS ***********
     ----------
   PROGRAM NAME:
    "STORM 1   "
 SITE DESCRIPTION:
    "254-      "
     ----------
   UNITS SELECTED:
     LENGTH: ft
CONDUCTIVITY: mS/cm
  TEMPERATURE:  F
     ----------
   UNITS SELECTED:
   FLOW RATE: gpm
 FLOW VOLUME: Mgal
   VELOCITY: fps
     ----------
  AREA-VEL MODULE:
   AREA*VELOCITY
     ROUND PIPE

     ----------

      5 MINUTE
   DATA INTERVAL

     ----------
  12,  1000 ml BTLS
 21 ft SUCTION LINE
 AUTO SUCTION HEAD
1 RINSES, 1 RETRIES
     ----------

  ONE-PART PROGRAM


     ----------
      PACING:
    TIME, EVERY
 0 HOURS, 10 MINUTES

     ----------
    DISTRIBUTION:
   4 SAMPLES/BOTTLE


     ----------
```

VOLUME:

250 ml SAMPLES

ENABLE:

SP_CO0 <15.00 mS/cm

ENABLE:
REPEATABLE ENABLE
NO SAMPLE AT DISABLE
NO SAMPLE AT ENABLE

ENABLE:
COUNTDOWN IS STOPPED
WHILE DISABLED

ENABLE:
0 PAUSE & RESUMES

START: 01:00
SA
NOT BEFORE: 9-DEC

LIQUID DETECT ON

QUICK VIEW/CHANGE

TAKE MEASUREMENTS
AT STORAGE INTERVAL

DUAL SAMPLER OFF
BTL FULL DETECT OFF
TIMED BACKLIGHT

EVENT MARK SENT

DURING PUMP CYCLE

PUMP COUNTS FOR
EACH PURGE CYCLE:
500 PRE-SAMPLE
AUTO POST-SAMPLE

NO PERIODIC
SERIAL OUTPUT

NO RAIN GAUGE

SDI-12 DATA:
SP_CO0

I/O1= NONE
I/O2= NONE
I/O3= NONE

----

0 ANALOG OUTPUTS

NO EXTERNAL MODEM

NO ALARM
CONDITIONS SET

SAMPLER ID# 1673008074 09:48 11-DEC-23
Hardware: C0 Software: 3.08.0001
*********** SAMPLING RESULTS ***********
SITE: 254-
PROGRAM: STORM 1
Program Started at 01:00 SA 9-DEC-23
Nominal Sample Volume = 250 ml

SAMPLE	BOTTLE	TIME	SOURCE	ERROR	COUNT TO LIQUID
-------	------	----	--	--	------
		01:00	PGM DISABLED		
		13:15	PGM ENABLED		
1,4	1	13:25	T		572
2,4	1	13:35	T		578
3,4	1	13:45	T		578
4,4	1	13:55	T		580
1,4	2	14:05	T		586
2,4	2	14:15	T		584
3,4	2	14:25	T		586
4,4	2	14:35	T		586
1,4	3	14:45	T		585
2,4	3	14:55	T		586
3,4	3	15:05	T		588
4,4	3	15:15	T		586
1,4	4	15:25	T		592
2,4	4	15:35	T		592
3,4	4	15:45	T		588
4,4	4	15:55	T		603
1,4	5	16:05	T		598
2,4	5	16:15	T		605
3,4	5	16:25	T		600
4,4	5	16:35	T		597
1,4	6	16:45	T		614
2,4	6	16:55	T		610
3,4	6	17:05	T		620
4,4	6	17:15	T		618
1,4	7	17:25	T		622
2,4	7	17:35	T		634
3,4	7	17:45	T		637
4,4	7	17:55	T		639
1,4	8	18:05	T		647
2,4	8	18:15	T		640
3,4	8	18:25	T		644
4,4	8	18:35	T		634
1,4	9	18:45	T		638
2,4	9	18:55	T		638
3,4	9	19:05	T		638

4,4	9	19:15	T	642
1,4	10	19:25	T	643
2,4	10	19:35	T	648
3,4	10	19:45	T	643
4,4	10	19:55	T	646
1,4	11	20:05	T	642
2,4	11	20:15	T	644
3,4	11	20:25	T	642
4,4	11	20:35	T	640
1,4	12	20:45	T	639
2,4	12	20:55	T	640
3,4	12	21:05	T	643
4,4	12	21:15	T	643
		21:16	PGM DONE 09-DEC	

SOURCE T ==> TIME

NPDES Storm

Chain of Custody

Jar Cert #_ Outfall: 222 Date/Time sampler installed: 12/8/23 @ 10:52

Jar Cert #__________ Sampling Crew: CA, SG

Filter lot # 1376827 Weather conditions: Clear Date/Time sampler pickup: 12/11/23 @ 9:57

Observed activities in area: N/A

Observations during sampler collection: N/A

Color, Odors, sheens: N/A

Type of Sample: ☑ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☑ >0.2 inches rain ☐ <0.02 inches of rain previous 24 hours

Samplers: ☑ Data downloaded ☐ Sample bottles marked

☑ Ice Present at pick-up ☐ Tubing Decon 1000mL Divater

☑ Caps on containers

Fill to...	Parameters:	Sample	QC
Neck	PAH's/Phthalates (1L) +	☑	☐ ☐
No head	[1]Total Mercury (125/250mL QC)	☑	☐
No head	[1]Diss Mercury (125/250mL QC)	☑	☐
Shoulder	Total Metals (250mL)	☑	
Shoulder	Diss Metals (125mL)	☑	
Shoulder	TSS (1L), (500 mL min)	☑	
Shoulder	Nutrients (250mL)	☑	
Shoulder	Ortho-P (125mL), (75min)	☑	
Shoulder	BOD (1L)	☑	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☑	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes 4.010 L config above

+1000 mL for QC per bottle, must submit 2 extra bottles

[1]If 250ml bottle used, thenQAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (µS)
1	1000	☐	144.3
2	↓	☐	32.3
3		☐	23.94
4		☐	28.32
5		☐	111.6
6		☐	302.0
7		☐	252.8
8		☐	343
9		☐	393
10		☐	571
11		☐	383
12		☐	34.8

Total aliquots:

Sample Prep

Date/Time: 12/11/23 @ 13:30

Initial: CA, SG, RG

pH: 6.56

COND (µS): 214

Lab #: 2312013-08

Aliquots composited:

Deviations :

Composite End Time: 12/10/23 @ 3:10
(Collect Time) Last aliquot in composite

Relinquished by:

Date/Time: 12/11/23 @ 14:25

Received by:

Date/Time: 12/11/23 @ 14:26

FIELD REPORT

Project: Thea Foss/Wheeler-Osgood Waterways & NPDES Stormwater Monitoring Program

Event: Storm Event – Dec. 18, 2023

INTRODUCTION

This report summarizes the storm event sampled on 12/18/2023-12/20/2023 by the City of Tacoma Environmental Services Collection System Support staff as part of our stormwater monitoring program. This report includes a summary of the following:

- Storm characteristics and criteria;
- Sampling activities;
- Flow characteristics at each sampling location;
- Pacing – set for a .24" event, actual event was .28"

This event met the sampling criteria for precipitation as specified in the Thea Foss Sampling and Analysis Plan (SAP).

DESCRIPTION OF SAMPLING ACTIVITES

Samplers placed in the field on 12/18/2023. During sampler installation the weather conditions were overcast. All samplers were retrieved on 12/20/23 (For site specific details, see Appendix A for field notes, Chain of Custody (COC) forms, and event hydrographs).

The following unusual observations were noted during the sampling event:

Table 2: Composite Sampling Activities

Sample Location	Site Deployed	Sample Accepted	Pacing (gal)	Enables LVL(ft), VEL(fps) COND.(mS/cm)	Comments
Outfall 230A	Yes	Yes	30,000	LVL > .5	34 Aliquots Collected / 34 Composited
Outfall 235	Yes	Yes	10,910	LVL > .370 VEL > 0.80	33 Aliquots Collected / 33 Composited
Outfall 237ANew	Yes	Yes	117,948	LVL > .29 VEL > 6	14 Aliquots Collected / 12 Composited
Outfall 237B	Yes	Yes	160,476	LVL > 1	48 Aliquots Collected / 48 Composited
Outfall 243	No	N/A	N/A	N/A	N/A
Outfall 245	Yes	Yes	10 min.	> 200 gpm	13 Aliquots Collected / 13 Composited
Outfall 254	No	N/A	N/A	N/A	N/A
Outfall 555	Yes	Yes	N/A	N/A	48 Aliquots Collected / 48 Composited

**QC, QUALITY CONTROL*

ND, NO DATA

NA, NOT APPLICABLE

WATER QUALITY DATA

Accepted samples were analyzed for the target parameters specified in the SAP and QAPP. Samples accepted at all Outfalls were composited and preserved within 24 hours of the last aliquot being collected. The samples were allowed to sit for a minimum of 18 hours before metals analysis was started.

EQUIPMENT INFORMATION

Samples were collected using ISCO 6712 portable auto samplers. Rain data was collected using an ISCO 674 rain gauge located at the Center for Urban Waters at 326 East D Street, Tacoma, WA 98421.

CORRECTIVE ACTIONS AND DEVIATIONS

There were no deviations from the field procedures as discussed in the SAP other than those discussed above/below. No other criteria or procedures as indicated in the SAP were compromised except for those discussed above/below.

Enclosures: The ISCO program setting/sampling results report, the sample collection chain of custody form, and field records are in Appendix A for each outfall. This includes the following information for the samples collected:

- Plot of flow hydrograph and hyetograph
- Subsample times and conductivities
- Tidal windows
- Field activities

Appendix A

PROJECT

Notebook No. 29

Continued from Page

Storm Collection 9:49 12/11/23 .97

254 @ 9:49 Data Downloaded, 48 Aliquots / "Full boat"

245 @ 9:57 Data Downloaded, 48 Aliquots / "Full Boat"

243 @ 10:09 Data Downloaded, 48 Aliquots / "Full boat"

237A new @ 10:17 Data Downloaded, 15 Aliquots / 1 ~~3 3/4~~ Bottles 3 3/4 Bottles

237B @ 10:26 Data Downloaded, 48 Aliquots "Full Boat"

235 @ 10:37 Data Downloaded, 14 Aliquots, 3 1/2 Jars

230A @ 10:52 Data Downloaded, 48 Aliquots, "Full Boat"

Storm Deployment - 12/18/23 .24

245 @ 10:17 - Jars / Ice
237A @ 10:23 - Jars / Ice - 117,946
237B @ 10:28 - Jars / Ice - ~~128,374~~ 160,476
235 @ 10:32 - Jars / Ice - ~~37,000~~ 10,910
230A @ 10:40 - Jars / Ice - 30,000

Storm Collection - 12/20/23 .28

245 @ 10:01 - Download - 3 1/4 /12
237A @ 10:10 - Download - 3 1/2 /12
237B @ 10:19 - Download - 12/12 - Used DI Carboy
235 @ 10:29 - Download - 8 3/4 /12
230A @ 10:40 - Download - 9/12

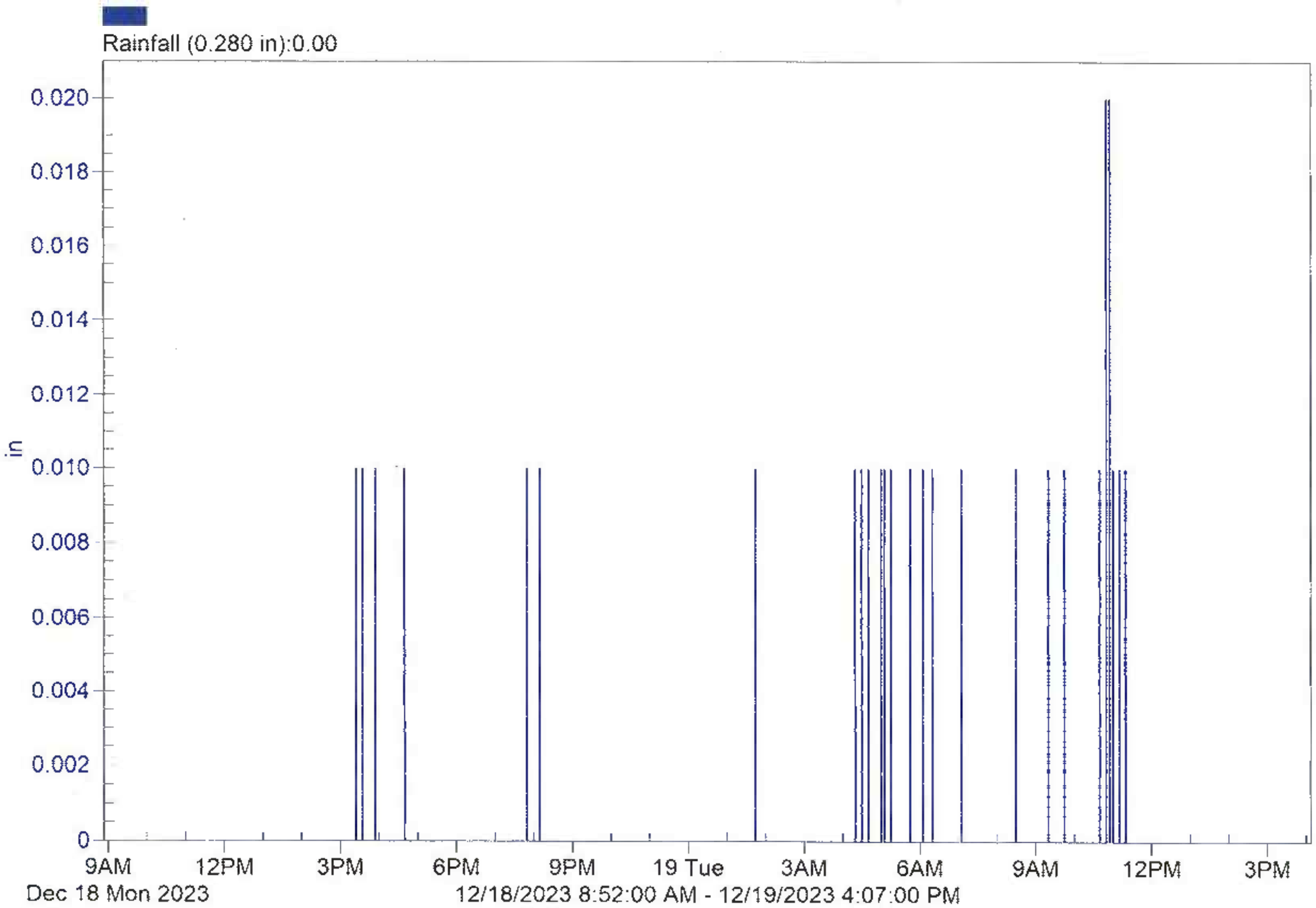
Continued on Page

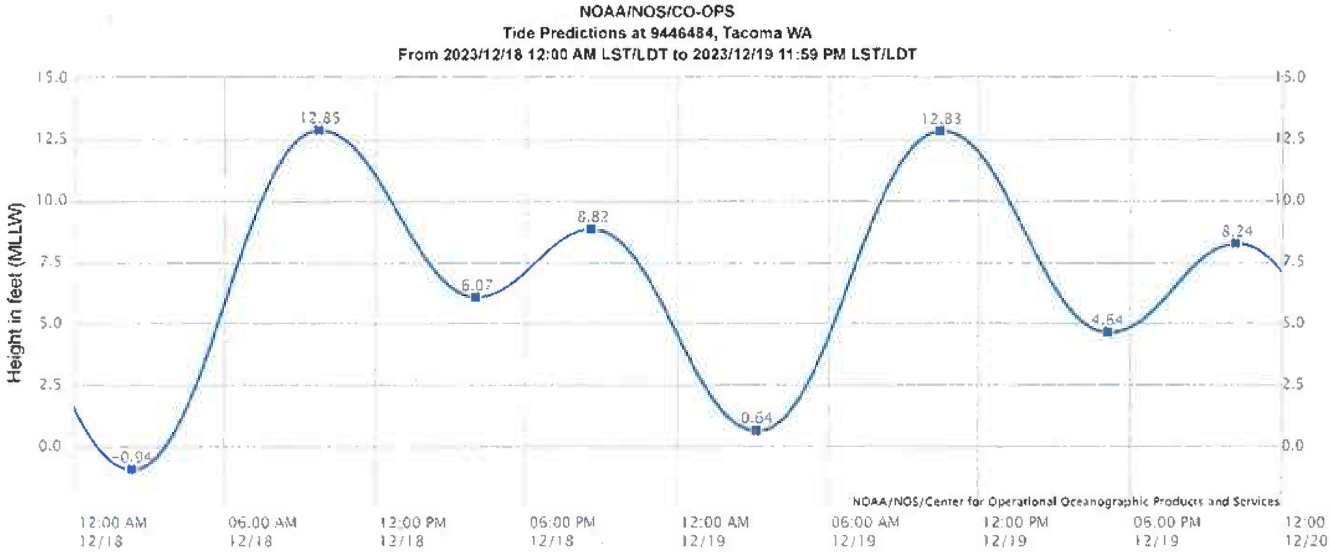
Read and Understood By

Signed Date Signed Date

RF1

Flowlink 5





Note: The interval is High/Low, the solid blue line depicts a curve fit between the high and low values and approximates the segments between.
Disclaimer: These data are based upon the latest information available as of the date of your request, and may differ from the published tide tables.

High/Low Tide Prediction Data Listing

Station Name: Tacoma, WA
Action: Daily
Product: Tide Predictions
Start Date & Time: 2023/12/18 12:00 AM
End Date & Time: 2023/12/19 11:59 PM

Source: NOAA/NOS/CO-OPS
Prediction Type: Harmonic
Datum: MLLW
Height Units: Feet
Time Zone: LST/LDT

Date	Day	Time	Hgt	Time	Hgt	Time	Hgt	Time	Hgt
2023/12/18	Mon	02:18 AM	-0.94 L	09:44 AM	12.85 H	4:01 PM	6.07 L	8:39 PM	8.82 H
2023/12/19	Tue	03:12 AM	0.64 L	10:28 AM	12.83 H	5:08 PM	4.64 L	10:14 PM	8.24 H

2311026-01 | 2311026-01

Bottle Certification
Bottle Certification
*** DEFAULT CONTAINER ***

NPDES Storm
Chain of Custody

Bottle Certification
Bottle Certification
*** DEFAULT CONTAINER ***

Jar Cert #______ Outfall: 230A Date/Time sampler installed: 12/18/23 @ 10:40

Jar Cert #______ Sampling Crew: CA, SG Battery load tested: Y / N

Jar Cert # 1376827 Weather conditions: Clear Date/Time sampler pickup: 12/20/23 @ 10:40

Observed activities in area: N/A

Observations during sampler collection: N/A

Color, Odors, sheens: N/A

Type of Sample: ☑ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☑ >0.2 inches rain ☐ <0.02 inches of rain previous 24 hours

Samplers: ☑ Data downloaded ☑ Tubing Decon 1000mL DI water
☑ Ice Present at pick-up ☐ Foil over tubing
☑ Caps on containers ☐ Ice added to base
☑ Sample bottles marked

Fill to...	Parameters:	Sample	QC
Neck	PAH's/Phthalates (1L) +	☑	☐ ☐
No head	[1]Total Mercury (125/250mL QC)	☑	☑
No head	[1]Diss Mercury (125/250mL QC)	☑	☑
Shoulder	Total Metals (250mL)	☑	
Shoulder	Diss Metals (125mL)	☑	
Shoulder	TSS (1L), (500 mL min)	☑	
Shoulder	Nutrients (250mL)	☑	
Shoulder	Ortho-P (125mL), (75min)	☑	
Shoulder	BOD (1L)	☑	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☑	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes 4,010 L config above
+1000 mL for QC per bottle, must submit 2 extra bottles
[1]If 250ml bottle used, thenQAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (µS)
1	1000	☑	800
2		☑	186.1
3		☑	115.4
4		☑	107.7
5		☑	109.5
6		☑	78.4
7		☑	49.7
8		☑	63.7
9	500	☑	87.5
10		☐	-
11		☐	
12		☐	

Total aliquots: 34

Sample Prep

Date/Time: 12/20/23 @ 12:05

Initial: CA, RG, SG

pH: 6.91

COND (µS): 171.1

Lab #: 2312094-01

Aliquots composited: ~~34~~ CA 34

Deviations :

Start Time: N/A Composite Start Time: N/A

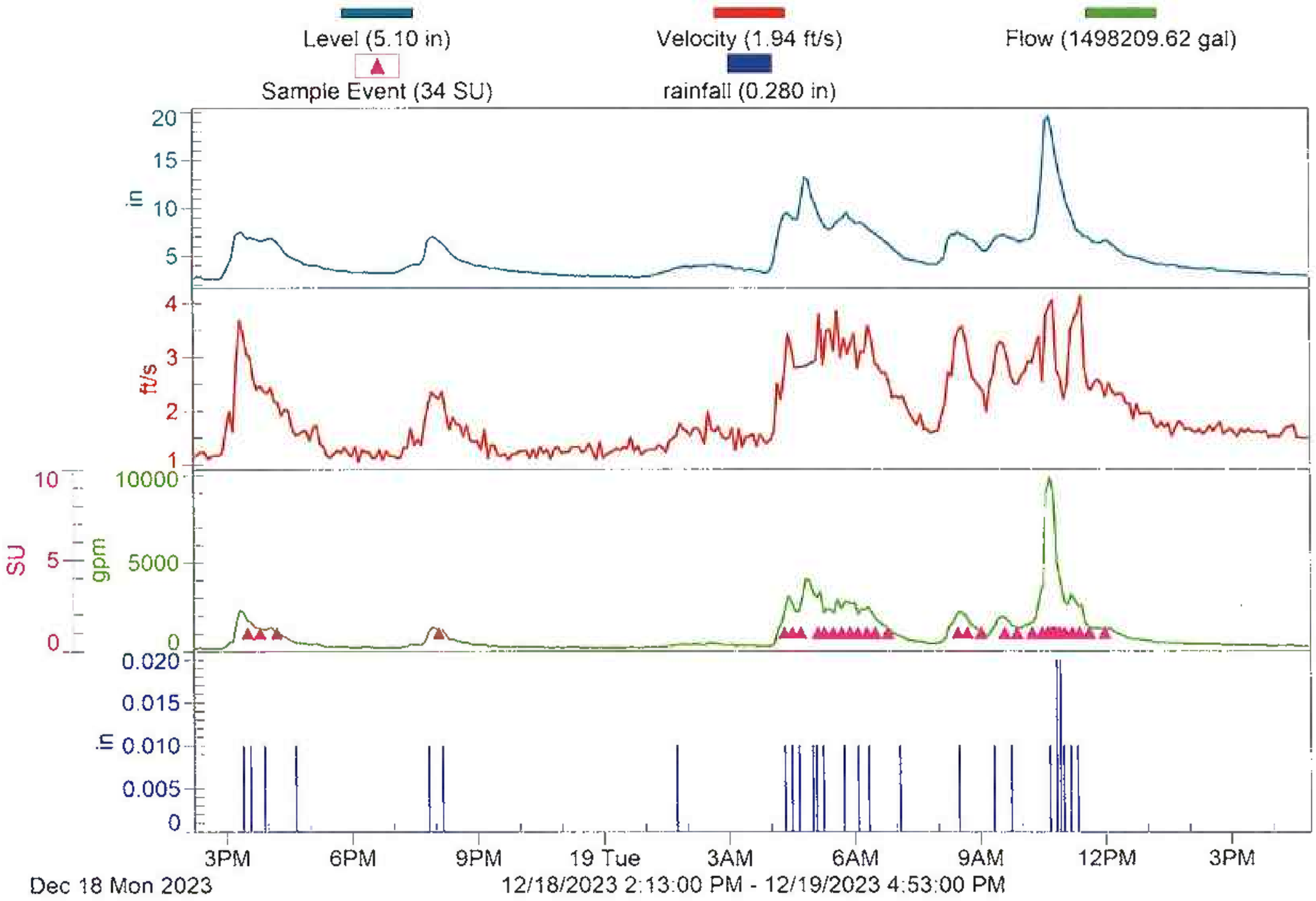
End Time: N/A Composite End Time: (Collect Time) 12/14/23 @ 11:57

Relinquished by: [signature] Received by: [signature]

Date/Time: 12/20/23 @ 12:19 Date/Time: 12/20/23 @ 12:19

230A

Flowlink 5



SAMPLER ID# 1481205047 10:17 20-DEC-23
Hardware: C0 Software: 3.01.0075
*********** PROGRAM SETTINGS ***********

PROGRAM NAME:
"STORM 1   "
SITE DESCRIPTION:
"230A   "

UNITS SELECTED:
LENGTH: ft

UNITS SELECTED:
FLOW RATE: gpm
FLOW VOLUME: gal
VELOCITY: fps

AREA-VEL MODULE:
AREA*VELOCITY
ROUND PIPE

----

5 MINUTE
DATA INTERVAL

12, 1000 ml BTLS
30 ft SUCTION LINE
AUTO SUCTION HEAD
1 RINSES, 1 RETRIES

ONE-PART PROGRAM

PACING:
FLOW, EVERY
30000 gal
NO SAMPLE AT START

DISTRIBUTION:
4 SAMPLES/BOTTLE

VOLUME:

250 ml SAMPLES

ENABLE:

LEVEL >0.500 ft

ENABLE:
REPEATABLE ENABLE
NO SAMPLE AT DISABLE
NO SAMPLE AT ENABLE

ENABLE:
COUNTDOWN IS STOPPED
WHILE DISABLED

ENABLE:
0 PAUSE & RESUMES

NO DELAY TO START

144 HOURS RUN TIME

LIQUID DETECT ON

QUICK VIEW/CHANGE

TAKE MEASUREMENTS
AT STORAGE INTERVAL

DUAL SAMPLER OFF
BTL FULL DETECT OFF
TIMED BACKLIGHT

PULSED EVENT MARK
AT THE BEGINNING OF

FORWARD PUMPING

PUMP COUNTS FOR
EACH PURGE CYCLE:
100 PRE-SAMPLE
AUTO POST-SAMPLE

NO PERIODIC
SERIAL OUTPUT

NO RAIN GAUGE

NO SDI-12 SONDE

AUTO SDI-12 SCAN OFF

I/O1= NONE
I/O2= NONE
I/O3= NONE

----

0 ANALOG OUTPUTS

NO EXTERNAL MODEM

NO ALARM
CONDITIONS SET

SAMPLER ID# 1481205047 10:17 20-DEC-23
Hardware: C0 Software: 3.01.0075
*********** SAMPLING RESULTS ***********
SITE: 230A
PROGRAM: STORM 1
Program Started at 14:14 MO 18-DEC-23
Nominal Sample Volume = 250 ml

SAMPLE	BOTTLE	TIME	SOURCE	ERROR	COUNT TO LIQUID
		14:14	PGM DISABLED		
		15:15	PGM ENABLED		
1,4	1	15:30	F		1364
2,4	1	15:49	F		1373
3,4	1	16:12	F		1374
		16:25	PGM DISABLED		
		19:50	PGM ENABLED		
4,4	1	20:03	F		1361
		20:20	PGM DISABLED		
		TU 19-DEC-23			
		04:10	PGM ENABLED		
1,4	2	04:18	F		1352
2,4	2	04:30	F		1373
3,4	2	04:42	F		1374
4,4	2	05:06	F		1374
1,4	3	05:16	F		1385
2,4	3	05:28	F		1391
3,4	3	05:40	F		1385
4,4	3	05:52	F		1384
1,4	4	06:03	F		1385
2,4	4	06:16	F		1387
3,4	4	06:29	F		1397
4,4	4	06:47	F		1390
		06:55	PGM DISABLED		
		08:15	PGM ENABLED		
1,4	5	08:27	F		1372
2,4	5	08:41	F		1381
3,4	5	09:00	F		1385
		09:05	PGM DISABLED		
		09:20	PGM ENABLED		
4,4	5	09:34	F		1384
1,4	6	09:52	F		1390
2,4	6	10:14	F		1387
3,4	6	10:28	F		1389
4,4	6	10:36	F		1380
1,4	7	10:39	F		1413
2,4	7	10:42	F		1403

3,4	7	10:45	F	1414
4,4	7	10:48	F	1416
1,4	8	10:53	F	1417
2,4	8	11:01	F	1403
3,4	8	11:11	F	1403
4,4	8	11:21	F	1415
1,2	9	11:35	F	1409
2,2	9	11:57	F	1409
		12:15	PGM DISABLED	

------------- WE 20-DEC-23 -------------

10:15 MANUAL PAUSE

10:15 PGM STOPPED 20-DEC

SOURCE F ==> FLOW

~~2311026-01~~

~~Bottle Certification~~

~~Bottle Certification~~

~~*** DEFAULT CONTAINER ***~~

NPDES Storm

Chain of Custody

~~Jar Cert #~~ Outfall: 235 ~~Date/Time sampler installed:~~ 12/18/23 @ 10:52

Jar Cert #______ Sampling Crew: CA, SG Battery load tested: Y / N

Jar Cert # 1376827 Weather conditions: Clear Date/Time sampler pickup: 12/20/23 @ 10:24

Observed activities in area: N/A

Observations during sampler collection: N/A

Color, Odors, sheens: N/A

Type of Sample: ☑ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☑ >0.2 inches rain ☐ <0.02 inches of rain previous 24 hours

~~Samplers: ☑ Data downloaded~~ ~~☐ Tubing Decon 1000mL DI water~~

☑ Ice Present at pick-up ☐ Foil over tubing

☑ Caps on containers ☐ Ice added to base

☑ Sample bottles marked

Fill to...	Parameters:	Sample	QC
Neck	PAH's/Phthalates (1L) +	☑	☐ ☐
No head	[1]Total Mercury (125/250mL QC)	☑	☐
No head	[1]Diss Mercury (125/250mL QC)	☑	☐
Shoulder	Total Metals (250mL)	☑	
Shoulder	Diss Metals (125mL)	☑	
Shoulder	TSS (1L), (500 mL min)	☑	
Shoulder	Nutrients (250mL)	☑	
Shoulder	Ortho-P (125mL), (75min)	☑	
Shoulder	BOD (1L)	☑	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☑	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes 4.010 L config above

+1000 mL for QC per bottle, must submit 2 extra bottles

[1]If 250ml bottle used, thenQAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (µC)
1	1600	☑	278.3
2		☑	286.4
3		☑	307
4		☑	175.9
5		☑	119.3
6		☑	102.5
7		☑	99.8
8		☑	133.4
9	250	☑	269.5
10		☐	
11		☐	
12		☐	

Total aliquots: 33

Sample Prep

Date/Time: 12/20/23 @ 11:55

Initial: CA, KG, SG

pH: 6.8

COND (µS): 184.0

Lab #: 2312044-02

Aliquots composited: 33

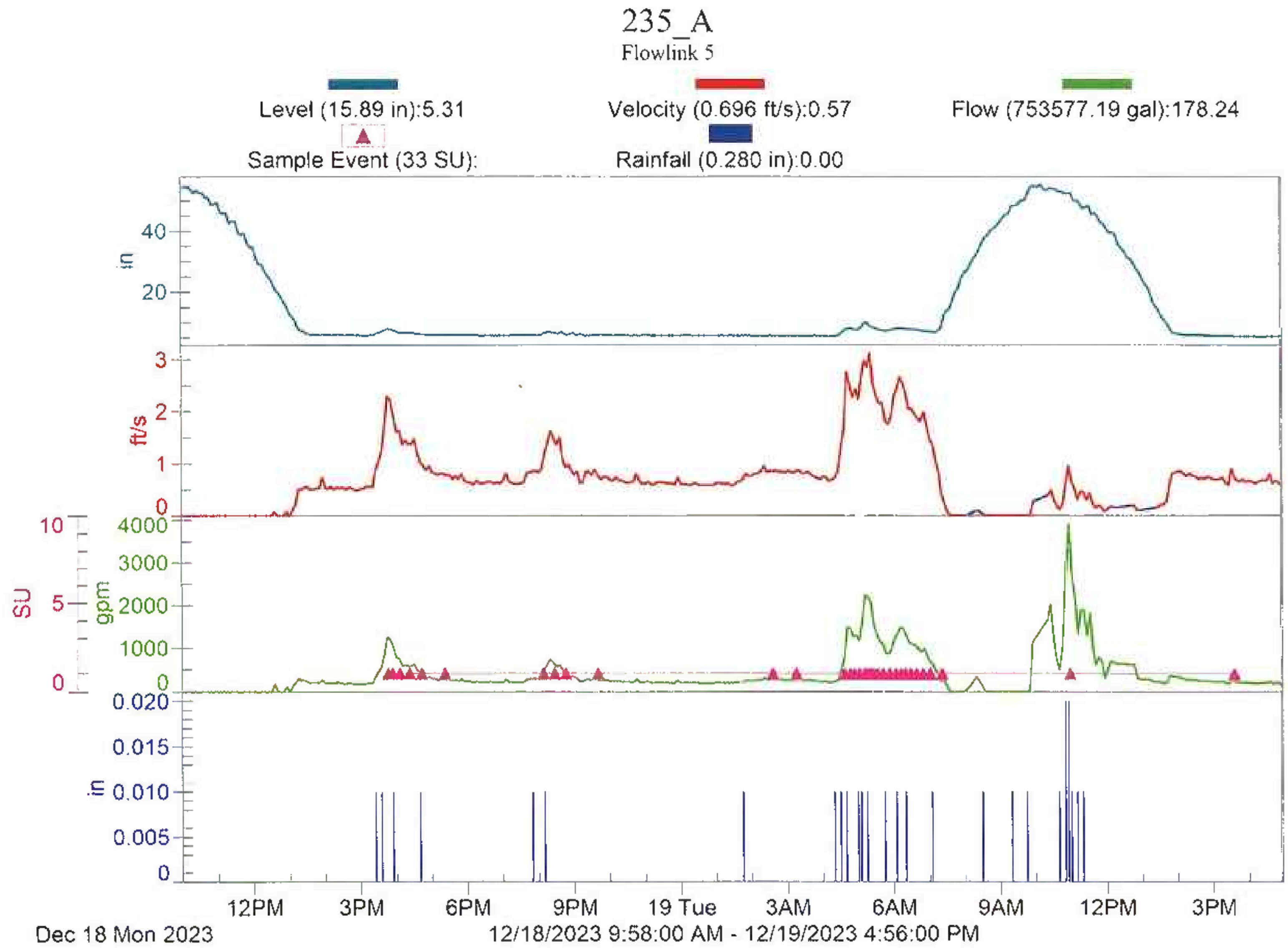
Start Time: N/A Composite Start Time: N/A

End Time: N/A Composite End Time: 12/19/23 @ 15:34 (Collect Time)

Deviations :

Relinquished by: [signature] Received by: [signature]

Date/Time: 12/20/23 @ 12:19 Date/Time: 12/20/23 @ 12:19


235_A
Flowlink 5
Level (15.89 in):5.31
Velocity (0.696 ft/s):0.57
Flow (753577.19 gal):178.24
Sample Event (33 SU):
Rainfall (0.280 in):0.00
in
40
20
ft/s
3
2
1
0
SU
10
5
0
gpm
4000
3000
2000
1000
0
in
0.020
0.015
0.010
0.005
0
12PM
3PM
6PM
9PM
19 Tue
3AM
6AM
9AM
12PM
3PM
Dec 18 Mon 2023
12/18/2023 9:58:00 AM - 12/19/2023 4:56:00 PM

SAMPLER ID# 1242995716 10:30 20-DEC-23
Hardware: A1 Software: 2.33
*********** PROGRAM SETTINGS ***********

PROGRAM NAME:
"235A   "
SITE DESCRIPTION:
"235A ST   "

UNITS SELECTED:
LENGTH: ft

UNITS SELECTED:
FLOW RATE: gpm
FLOW VOLUME: gal
VELOCITY: fps

AREA-VEL MODULE:
AREA*VELOCITY
ROUND PIPE

----

5 MINUTE
DATA INTERVAL

12, 1000 ml BTLS
56 ft SUCTION LINE
AUTO SUCTION HEAD
1 RINSES, 1 RETRIES

ONE-PART PROGRAM

PACING:
FLOW, EVERY
10910 gal
NO SAMPLE AT START

DISTRIBUTION:
4 SAMPLES/BOTTLE

VOLUME:

250 ml SAMPLES

ENABLE:
LEVEL >0.370 ft
AND
VEL > 0.80 fps

ENABLE:
REPEATABLE ENABLE
NO SAMPLE AT DISABLE
NO SAMPLE AT ENABLE

ENABLE:
COUNTDOWN IS STOPPED
WHILE DISABLED

ENABLE:
0 PAUSE & RESUMES

NO DELAY TO START

200 HOURS RUN TIME

LIQUID DETECT ON

QUICK VIEW/CHANGE

TAKE MEASUREMENTS
AT STORAGE INTERVAL

DUAL SAMPLER OFF
BTL FULL DETECT OFF
TIMED BACKLIGHT

EVENT MARK SENT

DURING PUMP CYCLE

PUMP COUNTS FOR
EACH PURGE CYCLE:
100 PRE-SAMPLE
AUTO POST-SAMPLE

NO PERIODIC
SERIAL OUTPUT

INTERROGATOR
CONNECTOR
POWER ALWAYS ON

NO RAIN GAUGE

NO SDI-12 SONDE

AUTO SDI-12 SCAN OFF

I/O1= NONE
I/O2= NONE
I/O3= NONE

----

0 ANALOG OUTPUTS

NO EXTERNAL MODEM

NO ALARM
CONDITIONS SET

```
     ----------
     ----------
----------------------------------------


SAMPLER ID# 1242995716  10:30 20-DEC-23
  Hardware:     A1  Software: 2.33
*********** SAMPLING RESULTS ***********
   SITE: 235A ST
PROGRAM: 235A
Program Started at 11:04 MO 18-DEC-23
Nominal Sample Volume =  250 ml
                                   COUNT
                                      TO
SAMPLE  BOTTLE TIME  SOURCE ERROR LIQUID
------- ------ ----   -- --    ------
              11:04  PGM DISABLED
              15:25  PGM ENABLED
  1,4     1   15:45      F        1873
  2,4     1   15:54      F        1889
  3,4     1   16:06      F        1907
  4,4     1   16:23      F        1909
  1,4     2   16:43      F        1901
              17:10  PGM DISABLED
              17:15  PGM ENABLED
  2,4     2   17:22      F        1891
              17:25  PGM DISABLED
              17:50  PGM ENABLED
              17:55  PGM DISABLED
              19:05  PGM ENABLED
              19:10  PGM DISABLED
              19:40  PGM ENABLED
  3,4     2   20:08      F        1863
  4,4     2   20:27      F        1875
  1,4     3   20:46      F        1899
              21:00  PGM DISABLED
              21:05  PGM ENABLED
              21:10  PGM DISABLED
              21:20  PGM ENABLED
              21:30  PGM DISABLED
              21:35  PGM ENABLED
  2,4     3   21:40      F        1873
              21:43  PGM DISABLED
              22:45  PGM ENABLED
              22:50  PGM DISABLED
------------- TU 19-DEC-23 -------------
              01:50  PGM ENABLED
              01:55  PGM DISABLED
```

		02:05	PGM ENABLED	
3,4	3	02:34	F	1851
4,4	3	03:14	F	1874
		03:40	PGM DISABLED	
		04:25	PGM ENABLED	
1,4	4	04:35	F	1861
2,4	4	04:45	F	1890
3,4	4	04:52	F	1911
4,4	4	05:01	F	1922
1,4	5	05:09	F	1934
2,4	5	05:14	F	1931
3,4	5	05:19	F	1934
4,4	5	05:24	F	1938
1,4	6	05:31	F	1941
2,4	6	05:40	F	1940
3,4	6	05:52	F	1931
4,4	6	06:02	F	1929
1,4	7	06:11	F	1927
2,4	7	06:18	F	1937
3,4	7	06:27	F	1933
4,4	7	06:37	F	1929
1,4	8	06:48	F	1928
2,4	8	07:00	F	1927
3,4	8	07:20	F	1898
		07:23	PGM DISABLED	
		10:55	PGM ENABLED	
4,4	8	10:58	F	1718
		11:01	PGM DISABLED	
		13:50	PGM ENABLED	
		14:15	PGM DISABLED	
		14:20	PGM ENABLED	
		14:25	PGM DISABLED	
		15:30	PGM ENABLED	
1,1	9	15:34	F	1863
		15:37	PGM DISABLED	
		16:35	PGM ENABLED	
		16:40	PGM DISABLED	
-------------		WE 20-DEC-23	-------------	
		10:28	MANUAL PAUSE	
		10:29	PGM STOPPED 20-DEC	

SOURCE F ==> FLOW

2311027-01

Bottle Certification

Bottle Certification

DEFAULT CONTAINER

NPDES Storm

Chain of Custody

Outfall: 237A

Date/Time sampler installed: 12/18/23 @ 10:23

Jar Cert #

Jar Cert # 1376827

Sampling Crew: CA, SG

Battery load tested: Y / N

Weather conditions: Clear

Date/Time sampler pickup: 12/20/23 @ 10:10

Observed activities in area: N/A

Observations during sampler collection: N/A

Color, Odors, sheens: N/A

Type of Sample: ☑ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☑ >0.2 inches rain ☐ <0.02 inches of rain previous 24 hours

Samplers: ☑ Data downloaded ☑ Ice Present at pick-up ☑ Caps on containers ☑ Sample bottles marked

☐ Tubing Decon 1000mL DI water ☐ Foil over tubing ☐ Ice added to base

Fill to...	Parameters:	Sample	QC
Neck	PAH's/Phthalates (1L) +	☑	☐ ☐
No head	[1]Total Mercury (125/250mL QC)	☑	☐
No head	[1]Diss Mercury (125/250mL QC)	☑	☐
Shoulder	Total Metals (250mL)	☑	
Shoulder	Diss Metals (125mL)	☑	
Shoulder	TSS (1L), (500 mL min)	☑	
Shoulder	Nutrients (250mL)	☑	
Shoulder	Ortho-P (125mL), (75min)	☐	
Shoulder	BOD (1L)	☐	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☐	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes 4.010 L config above

+1000 mL for QC per bottle, must submit 2 extra bottles

[1]If 250ml bottle used, thenQAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (µs)
1	1000	☑	121.4
2	↓	☑	121.4
3	↓	☑	181.2
4	500	☐	295.8
5		☐	
6		☐	
7		☐	
8		☐	
9		☐	
10		☐	
11		☐	
12		☐	

Total aliquots: 14

Sample Prep

Date/Time: 12/20/23 @ 11:30

Initial: CA, SG, RG

pH: 6.44

COND (µS): 135.1

Lab #: 2312044-03

Aliquots composited: 12

Start Time: N/A

End Time: N/A

Composite Start Time: N/A

Composite End Time: 12/19/23 @ 7:41
(Collect Time)

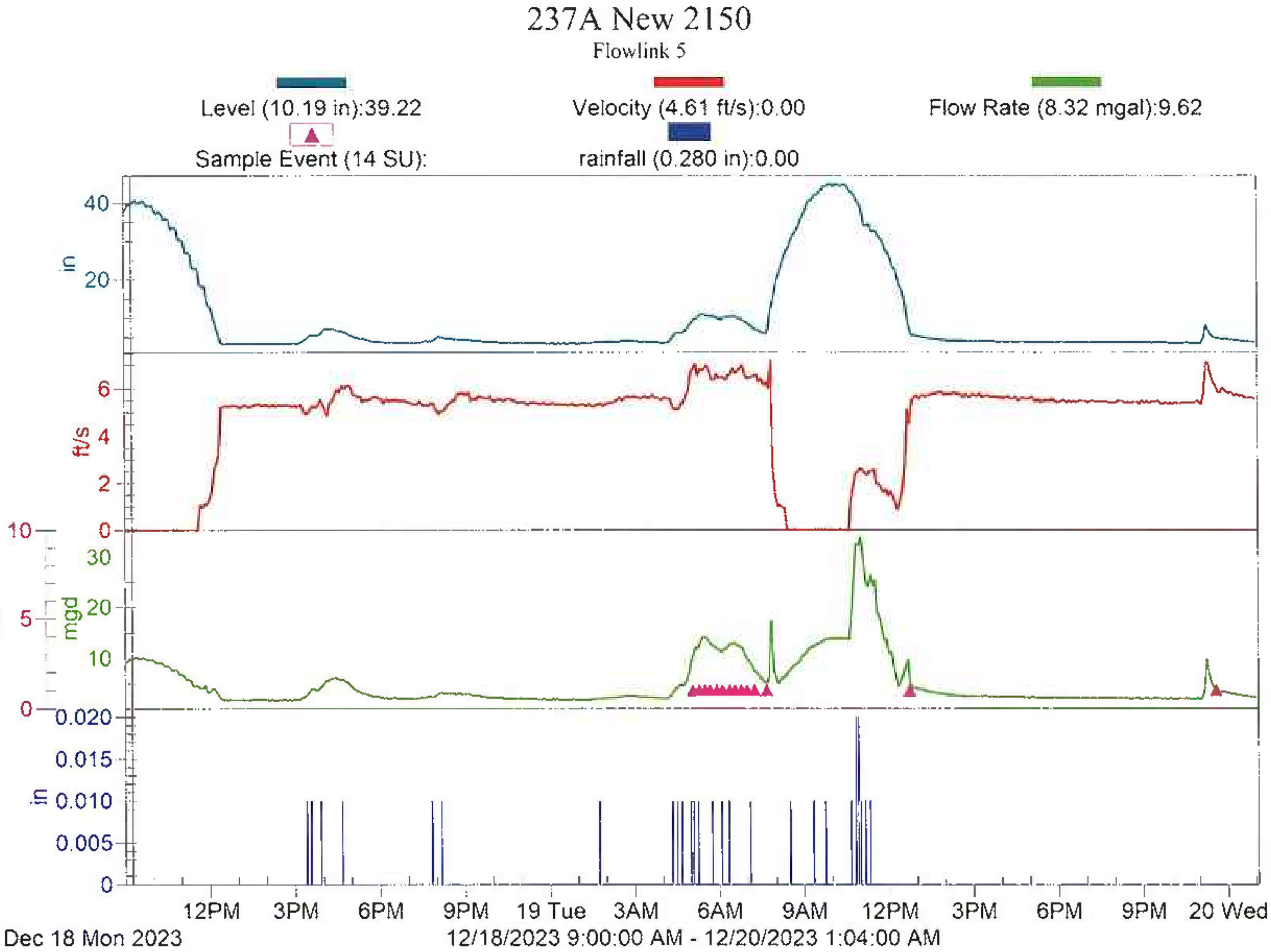
Deviations :

Relinquished by: [signature]

Date/Time: 12/20/23 @ 12:19

Received by: [signature]

Date/Time: 12/20/23 @ 12:19


237A New 2150
Flowlink 5
Level (10.19 in):39.22
Velocity (4.61 ft/s):0.00
Flow Rate (8.32 mgal):9.62
Sample Event (14 SU):
rainfall (0.280 in):0.00
in
ft/s
SU
mgd
in
12PM
3PM
6PM
9PM
19 Tue
3AM
6AM
9AM
12PM
3PM
6PM
9PM
20 Wed
Dec 18 Mon 2023
12/18/2023 9:00:00 AM - 12/20/2023 1:04:00 AM

```
SAMPLER ID# 1245320993  10:05 20-DEC-23
  Hardware:     A1  Software: 2.33
*********** PROGRAM SETTINGS ***********
     ----------
   PROGRAM NAME:
    "237ANEW   "
 SITE DESCRIPTION:
    "237ANEW   "
     ----------
   UNITS SELECTED:
     LENGTH: ft



     ----------
  12,  1000 ml BTLS
 21 ft SUCTION LINE
 AUTO SUCTION HEAD
1 RINSES, 1 RETRIES
     ----------

  ONE-PART PROGRAM


     ----------
      PACING:
    FLOW, EVERY
       1 PULSES
NO SAMPLE AT START
     ----------
    DISTRIBUTION:
   4 SAMPLES/BOTTLE


     ----------
      VOLUME:

   250 ml SAMPLES

     ----------
      ENABLE:

  NONE PROGRAMMED

     ----------
      ENABLE:
 REPEATABLE ENABLE
NO SAMPLE AT DISABLE
NO SAMPLE AT ENABLE
     ----------
```

ENABLE:
COUNTDOWN IS STOPPED
WHILE DISABLED

ENABLE:
0 PAUSE & RESUMES

NO DELAY TO START

200 HOURS RUN TIME

LIQUID DETECT ON

QUICK VIEW/CHANGE

TAKE MEASUREMENTS
AT STORAGE INTERVAL

DUAL SAMPLER OFF
BTL FULL DETECT OFF
TIMED BACKLIGHT

EVENT MARK SENT
DURING PUMP CYCLE

PUMP COUNTS FOR
EACH PURGE CYCLE:
400 PRE-SAMPLE
400 POST-SAMPLE

NO PERIODIC
SERIAL OUTPUT

INTERROGATOR
CONNECTOR

POWER ALWAYS ON

NO RAIN GAUGE

NO SDI-12 SONDE

AUTO SDI-12 SCAN OFF

I/O1= NONE
I/O2= NONE
I/O3= NONE

----

0 ANALOG OUTPUTS

NO EXTERNAL MODEM

NO ALARM
CONDITIONS SET

SAMPLER ID# 1245320993 10:05 20-DEC-23
Hardware: A1 Software: 2.33
*********** SAMPLING RESULTS ***********
SITE: 237ANEW
PROGRAM: 237ANEW
Program Started at 10:16 MO 18-DEC-23
Nominal Sample Volume = 250 ml
COUNT
TO

SAMPLE	BOTTLE	TIME	SOURCE	ERROR	LIQUID
		10:16	PGM ENABLED		
		TU 19-DEC-23			
1,4	1	05:02	F		539
2,4	1	05:17	F		532
3,4	1	05:29	F		531
4,4	1	05:40	F		532
1,4	2	05:54	F		537
2,4	2	06:07	F		538
3,4	2	06:21	F		537
4,4	2	06:33	F		536
1,4	3	06:46	F		537
2,4	3	06:59	F		537
3,4	3	07:15	F		537
4,4	3	07:41	F		538
1,2	4	12:43	F		526
2,2	4	23:35	F		545

SOURCE F ==> FLOW

2311026-01

Bottle Certification

Bottle Certification

*** DEFAULT CONTAINER ***

NPDES Storm

Chain of Custody

Jar Cert #_____ Outfall: 2370 Date/Time sampler installed: 12/18/23 @ 1028

Jar Cert #_____ Sampling Crew: CA, SG Battery load tested: Y / N

Jar Cert # 1376827 Weather conditions: Clear Date/Time sampler pickup: 12/20/23 @ 10:19

Observed activities in area: N/A

Observations during sampler collection: N/A

Color, Odors, sheens: N/A

Type of Sample: ☑ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☑ >0.2 inches rain ☐ <0.02 inches of rain previous 24 hours

Samplers: ☑ ~~Data downloaded~~ ☐ ~~Tubing Decon 1000mL DI water~~

☑ Ice Present at pick-up ☐ Foil over tubing

☑ Caps on containers ☐ Ice added to base

☑ Sample bottles marked

Fill to...	Parameters:	Sample	QC
Neck	PAH's/Phthalates (1L) +	☑	☑ ☑
No head	[1]Total Mercury (125/250mL QC)	☑	☐
No head	[1]Diss Mercury (125/250mL QC)	☑	☐
Shoulder	Total Metals (250mL)	☑	
Shoulder	Diss Metals (125mL)	☑	
Shoulder	TSS (1L), (500 mL min)	☑	
Shoulder	Nutrients (250mL)	☑	
Shoulder	Ortho-P (125mL), (75min)	☑	
Shoulder	BOD (1L)	☑	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☑	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes 4.010 L config above

+1000 mL for QC per bottle, must submit 2 extra bottles

[1]If 250ml bottle used, thenQAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (µS)
1	1000	☑	252.2
2		☑	216.0
3		☑	234.9
4		☑	147.5
5		☑	142.8
6		☑	149.3
7		☑	193.3
8		☑	211.5
9		☑	198.4
10		☑	157.2
11		☑	70.6
12		☑	39.1

Total aliquots: 48

Sample Prep

Date/Time: 12/20/23 @ 11:41

Initial: CA, RG, SG

pH: 6.56

COND (µS): 164.0

Lab #: 2312044-04

Aliquots composited: 48

Start Time: N/A Composite Start Time: N/A

Deviations :

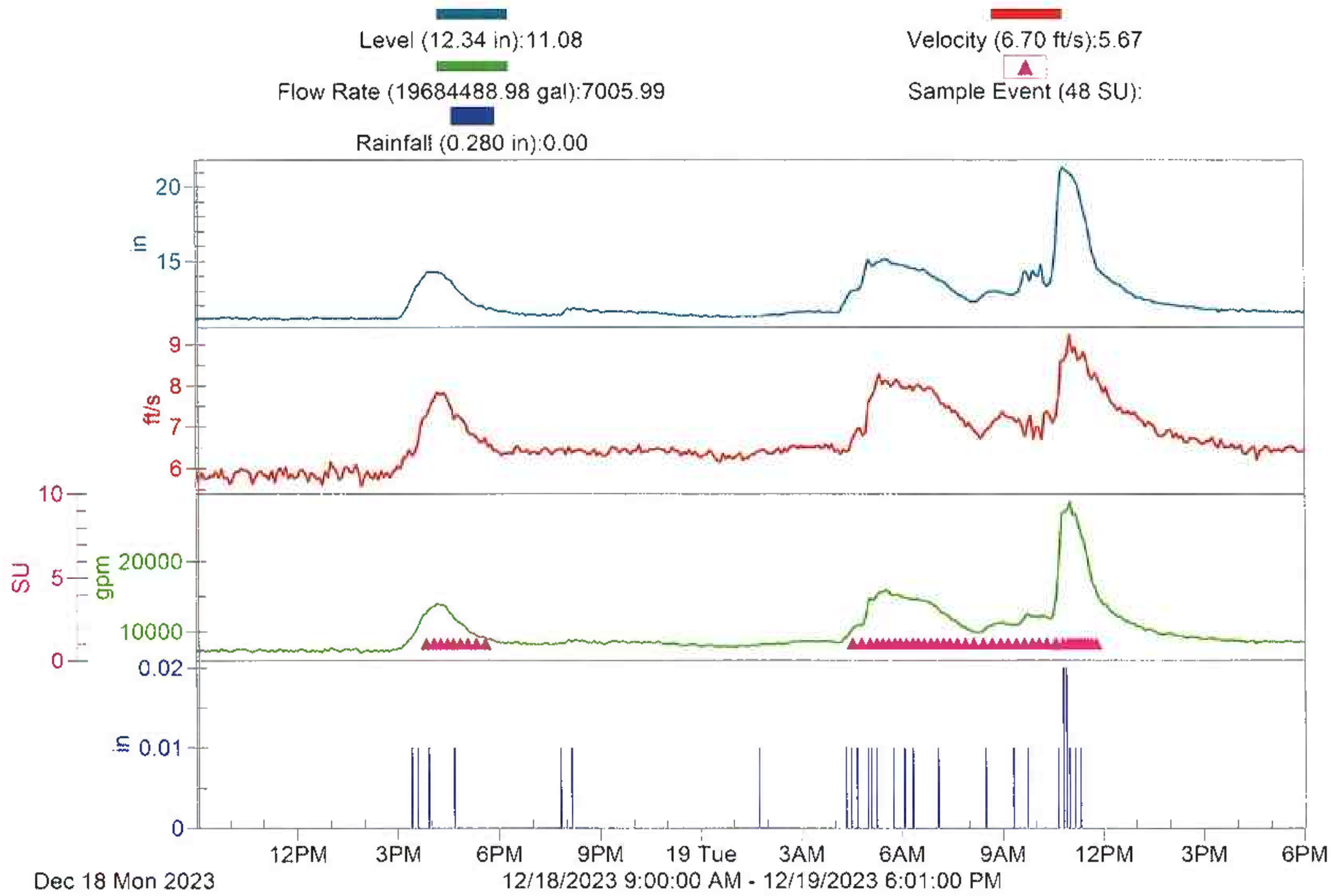
End Time: N/A Composite End Time: 12/19/23 @ 11:46 (Collect Time)

Relinquished by: [signature] Received by: [signature]

Date/Time: 12/20/23 @ 12:19 Date/Time: 12/20/23 @ 12:19

237B

Flowlink 5



SAMPLER ID# 1243003651   10:19 20-DEC-23
Hardware: A1 Software: 2.33
*********** PROGRAM SETTINGS ***********

PROGRAM NAME:
" STORM 1 "
SITE DESCRIPTION:
" 237 B   "

UNITS SELECTED:
LENGTH: ft

12, 1000 ml BTLS
16 ft SUCTION LINE
AUTO SUCTION HEAD
1 RINSES, 1 RETRIES

ONE-PART PROGRAM

PACING:
FLOW, EVERY
1 PULSES
NO SAMPLE AT START

DISTRIBUTION:
4 SAMPLES/BOTTLE

VOLUME:

250 ml SAMPLES

ENABLE:

NONE PROGRAMMED

ENABLE:
REPEATABLE ENABLE
NO SAMPLE AT DISABLE
NO SAMPLE AT ENABLE

ENABLE:
COUNTDOWN IS STOPPED
WHILE DISABLED

ENABLE:
0 PAUSE & RESUMES

NO DELAY TO START

200 HOURS RUN TIME

LIQUID DETECT ON

QUICK VIEW/CHANGE

TAKE MEASUREMENTS
AT STORAGE INTERVAL

DUAL SAMPLER OFF
BTL FULL DETECT ON
TIMED BACKLIGHT

EVENT MARK SENT
DURING PUMP CYCLE

PUMP COUNTS FOR
EACH PURGE CYCLE:
100 PRE-SAMPLE
AUTO POST-SAMPLE

NO PERIODIC
SERIAL OUTPUT

INTERROGATOR
CONNECTOR

POWER ALWAYS ON

NO RAIN GAUGE

NO SDI-12 SONDE

AUTO SDI-12 SCAN OFF

I/O1= NONE
I/O2= NONE
I/O3= NONE

----

0 ANALOG OUTPUTS

NO EXTERNAL MODEM

NO ALARM
CONDITIONS SET

SAMPLER ID# 1243003651 10:19 20-DEC-23
Hardware: A1 Software: 2.33
*********** SAMPLING RESULTS ***********
SITE: 237 B
PROGRAM: STORM 1
Program Started at 10:25 MO 18-DEC-23
Nominal Sample Volume = 250 ml

COUNT
TO

SAMPLE	BOTTLE	TIME	SOURCE	ERROR	LIQUID
		10:25	PGM ENABLED		
1,4	1	15:51	F		514
2,4	1	16:04	F		519
3,4	1	16:16	F		523
4,4	1	16:28	F		523
1,4	2	16:39	F		523
2,4	2	16:51	F		521
3,4	2	17:05	F		520
4,4	2	17:20	F		523
1,4	3	17:36	F		519
-------------		TU 19-DEC-23			-------------
2,4	3	04:33	F		512
3,4	3	04:49	F		514
4,4	3	05:04	F		514
1,4	4	05:16	F		520
2,4	4	05:27	F		518
3,4	4	05:38	F		523
4,4	4	05:48	F		525
1,4	5	05:58	F		520
2,4	5	06:09	F		523
3,4	5	06:20	F		524
4,4	5	06:30	F		524
1,4	6	06:41	F		523
2,4	6	06:53	F		525
3,4	6	07:04	F		523
4,4	6	07:15	F		522
1,4	7	07:27	F		523
2,4	7	07:40	F		518
3,4	7	07:54	F		523
4,4	7	08:09	F		520
1,4	8	08:26	F		519
2,4	8	08:42	F		517
3,4	8	08:57	F		517
4,4	8	09:11	F		518
1,4	9	09:26	F		518
2,4	9	09:40	F		518
3,4	9	09:54	F		519
4,4	9	10:07	F		519
1,4	10	10:20	F		518
2,4	10	10:34	F		517
3,4	10	10:47	F		519
4,4	10	10:56	F		515
1,4	11	11:02	F		519
2,4	11	11:08	F		517
3,4	11	11:14	F		515
4,4	11	11:19	F		519
1,4	12	11:25	F		516

2,4	12	11:32	F	521
3,4	12	11:39	F	522
4,4	12	11:46	F	524
		11:47	PGM DONE 19-DEC	

SOURCE F ==> FLOW

NPDES Storm

Chain of Custody

Jar Cert # 2311026-01 Outfall: 245 Date/Time sampler installed: 12/18/23 @ 10:17

Jar Cert # ________ Sampling Crew: CA, SG Battery load tested: Y / N

Jar Cert # 1376827 Weather conditions: Clear Date/Time sampler pickup: 12/20/23 @ 10:01

Observed activities in area: N/A

Observations during sampler collection: N/A

Color, Odors, sheens: N/A

Type of Sample: ☑ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☑ >0.2 inches rain ☐ <0.02 inches of rain previous 24 hours

Samplers: ☑ Data downloaded ☐ Tubing Decon 1000mL DI water

☑ Ice Present at pick-up ☐ Foil over tubing

☑ Caps on containers ☐ Ice added to base

☑ Sample bottles marked

Fill to...	Parameters:	Sample	QC
Neck	PAH's/Phthalates (1L) +	☑	☐ ☐
No head	[1]Total Mercury (125/250mL QC)	☑	☐
No head	[1]Diss Mercury (125/250mL QC)	☑	☐
Shoulder	Total Metals (250mL)	☑	
Shoulder	Diss Metals (125mL)	☑	
Shoulder	TSS (1L), (500 mL min)	☑	
Shoulder	Nutrients (250mL)	☑	
Shoulder	Ortho-P (125mL), (75min)	☐	
Shoulder	BOD (1L)	☐	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☐	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes 4.010 L config above

+1000 mL for QC per bottle, must submit 2 extra bottles

[1]If 250ml bottle used, thenQAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (µS)
1	1000	☑	3760
2			☑	1099
3			☑	4850
4	250	☑	1464
5		☐	
6		☐	
7		☐	
8		☐	
9		☐	
10		☐	
11		☐	
12		☐	

Total aliquots: ~~14~~ 13 RG

Sample Prep

Date/Time: 12/20/23 @ 11:20

Initial: CA, SG, RG

pH: 5.86

COND (µS): 2853

Lab #: 2312044-05

Aliquots composited: ~~14~~ 13 RG

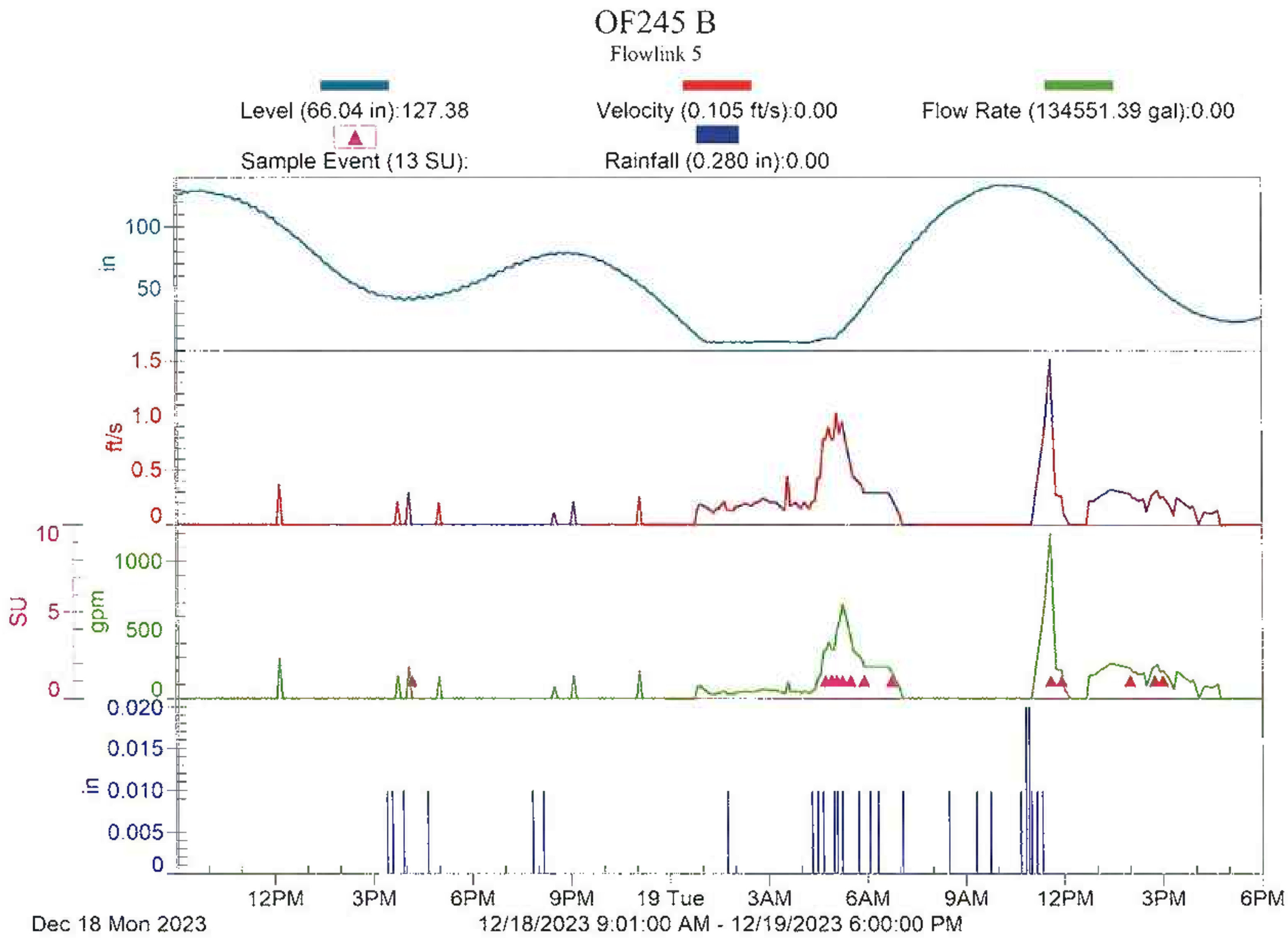
Start Time: N/A Composite Start Time: N/A

End Time: N/A Composite End Time: 12/19/23 @ 15:00 (Collect Time)

Deviations : ________

Relinquished by: [signature] Received by: [signature]

Date/Time: 12/20/23 @ 12:19 Date/Time: 12/20/23 @ 12:19


OF245 B
Flowlink 5
Level (66.04 in):127.38
Velocity (0.105 ft/s):0.00
Flow Rate (134551.39 gal):0.00
Sample Event (13 SU):
Rainfall (0.280 in):0.00
in
100
50
ft/s
1.5
1.0
0.5
0
SU
gpm
10
5
0
1000
500
0
in
0.020
0.015
0.010
0.005
0
12PM
3PM
6PM
9PM
19 Tue
3AM
6AM
9AM
12PM
3PM
6PM
Dec 18 Mon 2023
12/18/2023 9:01:00 AM - 12/19/2023 6:00:00 PM

SAMPLER ID# 1284476967 10:01 20-DEC-23
Hardware: A1 Software: 2.33
*********** PROGRAM SETTINGS ***********

PROGRAM NAME:
"STORM   "
SITE DESCRIPTION:
"OF245 B   "

UNITS SELECTED:
LENGTH: ft

UNITS SELECTED:
FLOW RATE: gpm
FLOW VOLUME: gal
VELOCITY: fps

AREA-VEL MODULE:
AREA*VELOCITY
ROUND PIPE

----

5 MINUTE
DATA INTERVAL

12, 1000 ml BTLS
21 ft SUCTION LINE
AUTO SUCTION HEAD
1 RINSES, 1 RETRIES

ONE-PART PROGRAM

PACING:
TIME, EVERY
0 HOURS, 10 MINUTES

DISTRIBUTION:
4 SAMPLES/BOTTLE

VOLUME:

250 ml SAMPLES

ENABLE:

FLOW >200.0 gpm

ENABLE:
REPEATABLE ENABLE
NO SAMPLE AT DISABLE
NO SAMPLE AT ENABLE

ENABLE:
COUNTDOWN IS STOPPED
WHILE DISABLED

ENABLE:
0 PAUSE & RESUMES

NO DELAY TO START

LIQUID DETECT ON

QUICK VIEW/CHANGE

TAKE MEASUREMENTS
EVERY 5 MINUTES

DUAL SAMPLER OFF
BTL FULL DETECT OFF
TIMED BACKLIGHT

PULSED EVENT MARK

AT INITIAL PURGE

PUMP COUNTS FOR
EACH PURGE CYCLE:
200 PRE-SAMPLE
AUTO POST-SAMPLE

NO PERIODIC
SERIAL OUTPUT

INTERROGATOR
CONNECTOR
POWER ALWAYS ON

NO RAIN GAUGE

NO SDI-12 SONDE

AUTO SDI-12 SCAN OFF

I/O1= NONE
I/O2= NONE
I/O3= NONE

----

0 ANALOG OUTPUTS

NO EXTERNAL MODEM

NO ALARM
CONDITIONS SET

```
     ----------
     ----------
----------------------------------------


SAMPLER ID# 1284476967  10:01 20-DEC-23
  Hardware:     A1  Software: 2.33
*********** SAMPLING RESULTS ***********
   SITE: OF245 B
PROGRAM: STORM
Program Started at 10:17 MO 18-DEC-23
Nominal Sample Volume =  250 ml
                                   COUNT
                                      TO
SAMPLE  BOTTLE TIME  SOURCE ERROR LIQUID
------- ------ ----    -- --     ------
              10:17  PGM DISABLED
              12:10  PGM ENABLED
              12:15  PGM DISABLED
              16:05  PGM ENABLED
  1,4     1   16:10     T           571
              16:12  PGM DISABLED
              23:05  PGM ENABLED
              23:10  PGM DISABLED
------------- TU 19-DEC-23 -------------
              04:40  PGM ENABLED
  2,4     1   04:45     T           603
  3,4     1   04:55     T           608
  4,4     1   05:05     T           607
  1,4     2   05:15     T           603
              05:20  PGM DISABLED
              05:25  PGM ENABLED
  2,4     2   05:30     T           596
              05:31  PGM DISABLED
              05:35  PGM ENABLED
              05:40  PGM DISABLED
              05:50  PGM ENABLED
  3,4     2   05:55     T           580
              06:00  PGM DISABLED
              06:40  PGM ENABLED
  4,4     2   06:45     T           547
              06:46  PGM DISABLED
              11:15  PGM ENABLED
              11:20  PGM DISABLED
              11:25  PGM ENABLED
              11:30  PGM DISABLED
              11:35  PGM ENABLED
  1,4     3   11:35     T           508
```

```
                11:40  PGM DISABLED
                11:45  PGM ENABLED
                11:50  PGM DISABLED
                11:55  PGM ENABLED
  2,4     3     11:55      T           509
                12:00  PGM DISABLED
                13:25  PGM ENABLED
                13:30  PGM DISABLED
                14:00  PGM ENABLED
  3,4     3     14:00      T           545
                14:05  PGM DISABLED
                14:40  PGM ENABLED
  4,4     3     14:45      T           564
                14:55  PGM DISABLED
                15:00  PGM ENABLED
  1,1     4     15:00      T           573
                15:05  PGM DISABLED

   SOURCE T  ==> TIME
---------------------------------------
```

NPDES Storm

Chain of Custody

Jar Cert # —— Outfall: 555 Date/Time sampler installed: 12/20/24 @ 09:30

Jar Cert # ______ Sampling Crew: SG, CA

Filter lot # 1376827 Weather conditions: ______ Date/Time sampler pickup: 12/20/24 @ 09:30

Observed activities in area: —

Observations during sampler collection: —

Color, Odors, sheens: —

Type of Sample: ☐ Stormwater ☐ Baseflow ~~☐ Rinse~~ Trip Blank

Rain event: ☒ >0.2 inches rain ☐ <0.02 inches of rain previous 24 hours

Samplers: ☐ Data downloaded ☐ Sample bottles marked
☐ Ice Present at pick-up ☐ Tubing Decon 1000mL DI water
☐ Caps on containers

Fill to...	Parameters:	Sample	QC
Neck	PAH's/Phthalates (1L) +	☒	☐ ☐
No head	[1]Total Mercury (125/250mL QC)	☒	☐
No head	[1]Diss Mercury (125/250mL QC)	☒	☐
Shoulder	Total Metals (250mL)	☒	
Shoulder	Diss Metals (125mL)	☒	
Shoulder	TSS (1L), (500 mL min)	☒	
Shoulder	Nutrients (250mL)	☒	
Shoulder	**Ortho-P (125mL), (75min)	☒	
Shoulder	**BOD (1L)	☒	
Neck	**Conventionals (500mL) = MBA's, turbidity, surf., chl.	☒	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes 4.010 L config above
+1000 mL for QC per bottle, must submit 2 extra bottles
[1]If 250ml bottle used, then QAQC volume already included
**Short hold times

Jars	Volume (mL)	Added to Comp	Conductivity (µS)
1	1000	☒	
2	↓	☒	
3		☒	
4		☒	
5		☒	
6		☒	
7		☒	
8		☒	
9		☒	
10		☒	
11		☒	
12	↓	☒	

Total aliquots: 48

Sample Prep

Date/Time: 12/20/23 @ 11:15

Initial: ~~RG~~, CA, SG

pH: ~~7.04~~ ~~8.16~~ 7.65

COND (µS): 2.25

Lab #: 2312044-07

Aliquots composited: 48

Deviations: X 555 trip blank

Composite End Time: 12/20/24 @ 09:30
(Collect Time) Last aliquot in composite

Relinquished by: [signature] Received by: [signature]

Date/Time: 12/20/23 @ 12:19 Date/Time: 12/20/23 @ 12:19

FIELD REPORT

Project: Thea Foss/Wheeler-Osgood Waterways & NPDES Stormwater Monitoring Program

Event: Storm Event – Jan. 5, 2024

INTRODUCTION

This report summarizes the storm event sampled on 1/4/2024-1/7/2024 by the City of Tacoma Environmental Services Collection System Support staff as part of our stormwater monitoring program. This report includes a summary of the following:

- Storm characteristics and criteria;
- Sampling activities;
- Flow characteristics at each sampling location;
- Pacing – set for a .47" event, actual event was .37"

This event met the sampling criteria for precipitation as specified in the Thea Foss Sampling and Analysis Plan (SAP).

DESCRIPTION OF SAMPLING ACTIVITES

Samplers placed in the field on 1/4/2024. During sampler installation the weather conditions were overcast. All samplers were retrieved on 1/7/2024 (For site specific details, see Appendix A for field notes, Chain of Custody (COC) forms, and event hydrographs).

The following unusual observations were noted during the sampling event:

Table 2: Composite Sampling Activities

Sample Location	Site Deployed	Sample Accepted	Pacing (gal)	Enables LVL(ft), VEL(fps) COND.(mS/cm)	Comments
Outfall 230A	Yes	Yes	81,000	LVL > .5	23 Aliquots Collected / 19 Composited
Outfall 235	Yes	Yes	30,000	LVL > .37 VEL > 0.8	32 Aliquots Collected / 28 Composited
Outfall 237ANew	Yes	Yes	400,000	LVL > .29 VEL > 6.0	16 Aliquots Collected / 16 Composited
Outfall 237B	Yes	Yes	460,000	LVL > 1.0	25 Aliquots Collected / 21 Composited
Outfall 243	No	N/A	N/A	N/A	N/A
Outfall 245	Yes	Yes	10 min.	> 200 gpm	18 Aliquots Collected / 14 Composited
Outfall 254	Yes	Yes	10 min.	<15 mS/cm	48 Aliquots Collected / 48 Composited

**QC, QUALITY CONTROL*

ND, NO DATA

NA, NOT APPLICABLE

WATER QUALITY DATA

Accepted samples were analyzed for the target parameters specified in the SAP and QAPP. Samples accepted at all Outfalls were composited and preserved within 24 hours of the last aliquot being collected. The samples were allowed to sit for a minimum of 18 hours before metals analysis was started.

EQUIPMENT INFORMATION

Samples were collected using ISCO 6712 portable auto samplers. Rain data was collected using an ISCO 674 rain gauge located at the Center for Urban Waters at 326 East D Street, Tacoma, WA 98421.

CORRECTIVE ACTIONS AND DEVIATIONS

There were no deviations from the field procedures as discussed in the SAP other than those discussed above/below. No other criteria or procedures as indicated in the SAP were compromised except for those discussed above/below.

Enclosures: The ISCO program setting/sampling results report, the sample collection chain of custody form, and field records are in Appendix A for each outfall. This includes the following information for the samples collected:

- Plot of flow hydrograph and hyetograph
- Subsample times and conductivities
- Tidal windows
- Field activities

Appendix A

Notebook No.
Continued from Page

Storm Deployment - 1/4/24 .47 prediction

254 @ 14:26 - Jars/Ice - Download

245 @ 14:35 - Jars/Ice - Download
243 @ 14:43 - Jars/Ice - Download - Battery Change -
237A @ 14:56 - Jars/Ice - Download - 400,000
237B @ 15:01 - Jars/Ice - Download - 460,000
235 @ 15:12 - Jars/Ice - Download - 30,000
230A @ 15:21 - Jars/Ice - Download = 81,000

Storm Collection - 1/7/24 0.43"
254 @ 9:40 - Jars/Ice - 12/12 - Download
245 @ 9:48 - 4½/12 - Download
243 @ 9:58 - ½/12 - Download
237A @ 10:07 - 4/12 - Download
237B @ 10:12 - 8/12 - Download
235 @ 10:23 - 8/12 - Download
230A @ 10:35 - 6/12 - Download *

Storm Deployment - 1/7/24
243 @ 9:58 - Jars/Ice - Download - Changed Cond. to 4 mS/cm

Grabs - 1/8/24
254 @ 11:10 am - QC
245 @ 11:20
243 @ 11:30
237A @ 11:45
237B @ 11:55
235 @ 12:10
230A @ 12:20
BB5 @ 11:00 - add to app*

RG

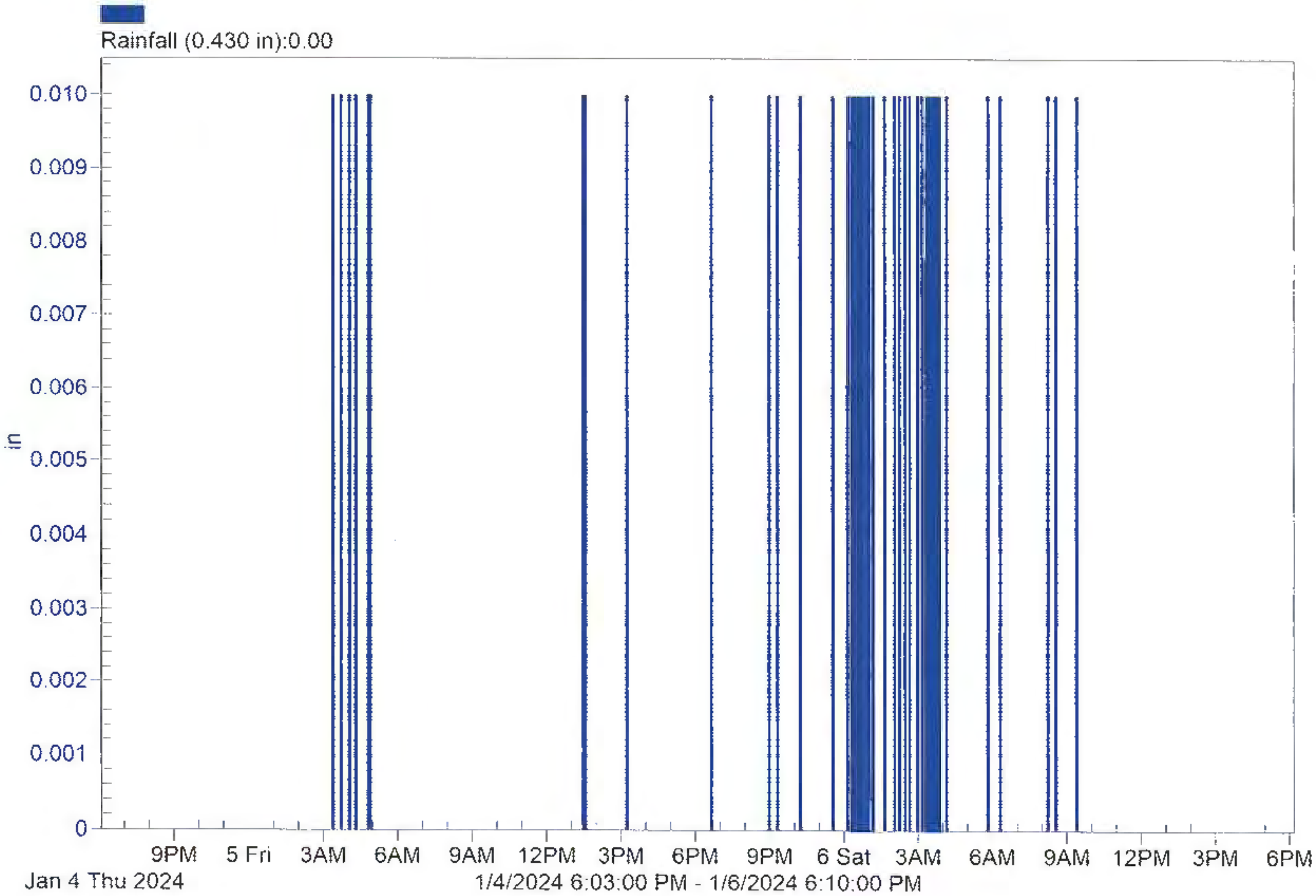
Continued on Page

Read and Understood By

Signed Date Signed Date

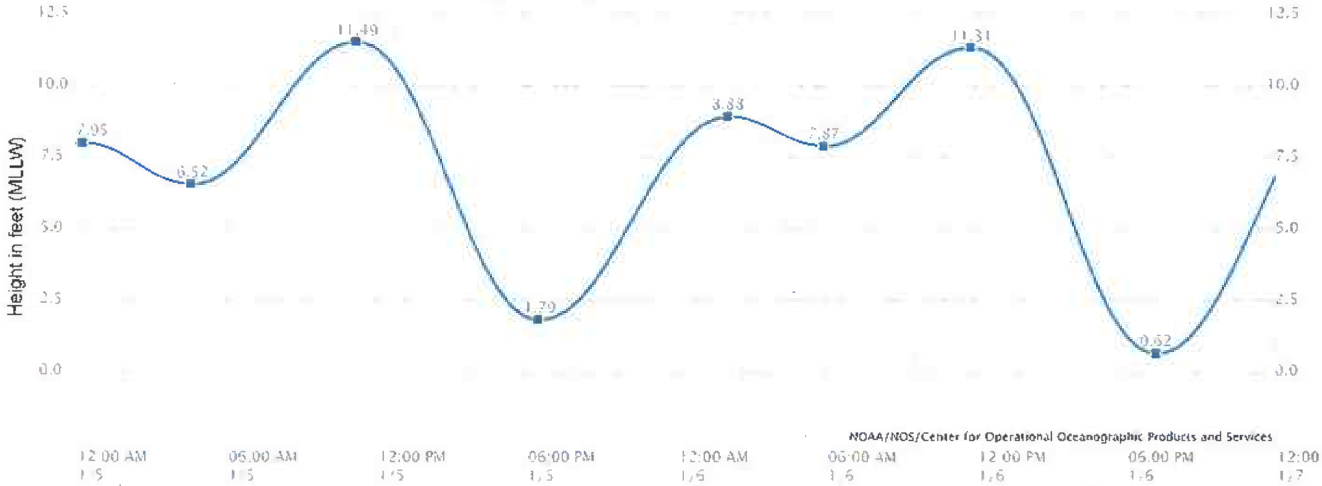
RF1

Flowlink 5



Help Print

NOAA/NOS/CO-OPS
Tide Predictions at 9446484, Tacoma WA
From 2024/01/05 12:00 AM LST/LDT to 2024/01/06 11:59 PM LST/LDT



Note: The interval is High/Low, the solid blue line depicts a curve fit between the high and low values and approximates the segments between.
Disclaimer: These data are based upon the latest information available as of the date of your request, and may differ from the published tide tables.

High/Low Tide Prediction Data Listing

Station Name: Tacoma, WA
Action: Daily
Product: Tide Predictions
Start Date & Time: 2024/1/5 12:00 AM
End Date & Time: 2024/1/6 11:59 PM

Source: NOAA/NOS/CO-OPS
Prediction Type: Harmonic
Datum: MLLW
Height Units: Feet
Time Zone: LST/LDT

Date	Day	Time	Hgt	Time	Hgt	Time	Hgt	Time	Hgt
2024/01/05	Fri	12:18 AM	7.95 H	04:38 AM	6.52 L	11:11 AM	11.49 H	6:34 PM	1.79 L
2024/01/06	Sat	02:01 AM	8.88 H	05:55 AM	7.87 L	11:48 AM	11.31 H	7:17 PM	0.62 L

23110027-01

Bottle Certification

Bottle Certification

*** DEFAULT CONTAINER ***

NPDES Storm
Chain of Custody

Outfall: 230A

Date/Time sampler installed: 1/4/24 @ 18:08

Jar Cert #

Sampling Crew: CA, RG

Filter lot # 1375252

Weather conditions: Clear

Date/Time sampler pickup: 1/7/24 @ 10:35

Observed activities in area: N/A

Observations during sampler collection: N/A

Color, Odors, sheens: N/A

Type of Sample: ☑ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☑ >0.2 inches rain ☐ <0.02 inches of rain previous 24 hours

Samplers: ☑ Data downloaded ☑ Ice Present at pick-up ☑ Caps on containers ☐ Sample bottles marked ☐ Tubing Decon 1000mL DIwater

Fill to...	Parameters:	Sample	QC
Neck	PAH's/Phthalates (1L) +	☑	☐ ☐
No head	[1]Total Mercury (125/250mL QC)	☑	☐
No head	[1]Diss Mercury (125/250mL QC)	☑	☐
Shoulder	Total Metals (250mL)	☑	
Shoulder	Diss Metals (125mL)	☑	
Shoulder	TSS (1L), (500 mL min)	☑	
Shoulder	Nutrients (250mL)	☑	
Shoulder	Ortho-P (125mL), (75min)	☑	
Shoulder	BOD (1L)	☑	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☑	
	Other:		
	Xtra (Unpreserved Conventionals)	☐	

*Minimum volumes 4.010 L config above

+1000 mL for QC per bottle, must submit 2 extra bottles

[1]If 250ml bottle used, thenQAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (uS)
1	1000	☐	85.8
2	↓	☑	65.2
3		☑	44.3
4		☑	38.0
5		☑	35.3
6	750	☑	64.7
7		☐	
8		☐	
9		☐	
10		☐	
11		☐	
12		☐	

Total aliquots: ~~24~~ 23 RG

Sample Prep

Date/Time: 1/7/24 @ 12:39

Initial: CA, RG

pH: 7.3

COND (µS): 48.3

Lab #: 2401017-01

Aliquots composited: 20

Deviations :

Composite End Time: 1/6/24 @ 6:23
(Collect Time) Last aliquot in composite

Relinquished by: [signature]

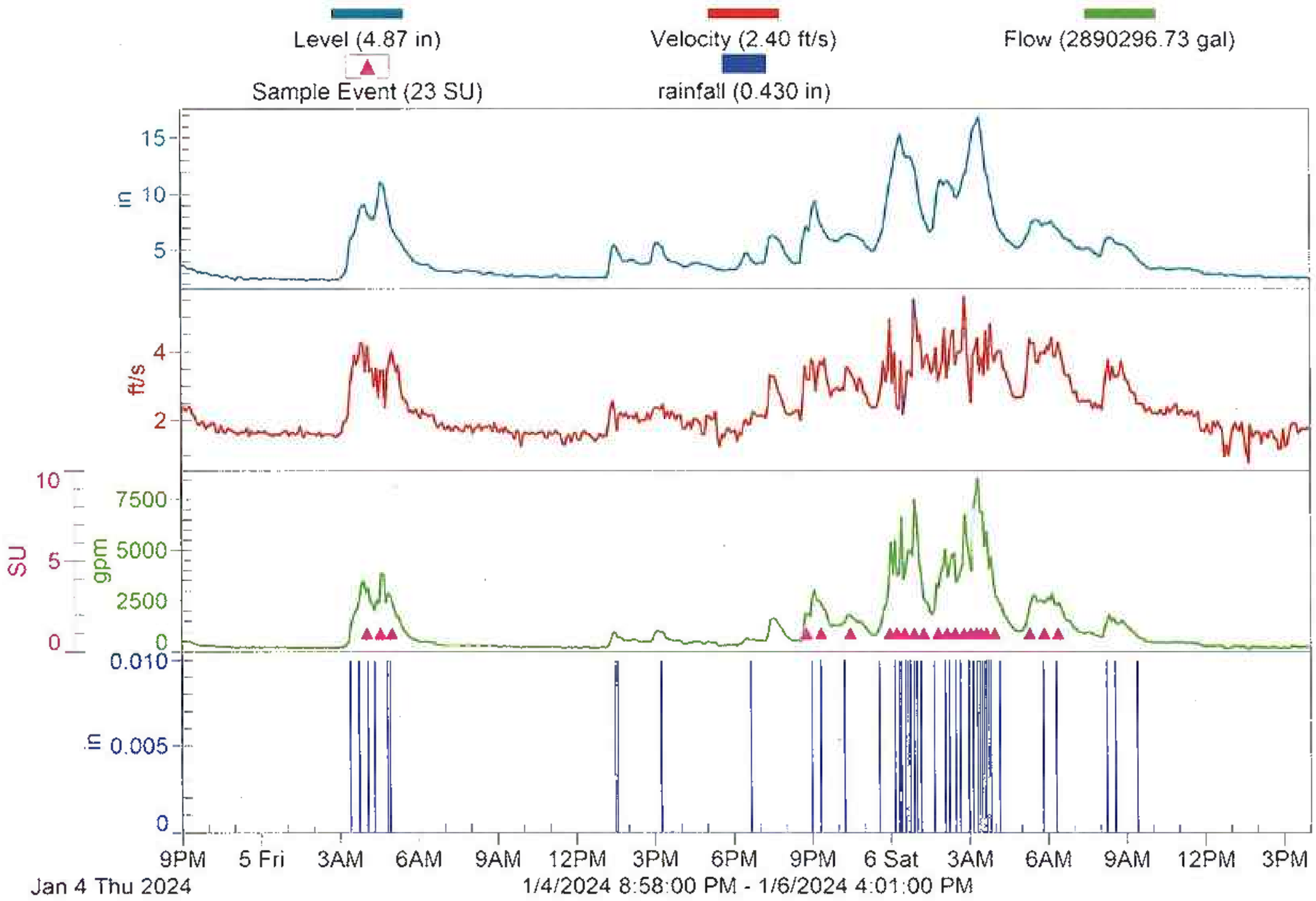
Date/Time: 1/7/24 @ 12:48

Received by: Cooler

Date/Time: 1/7/24 @ 12:48

230A

Flowlink 5



```
SAMPLER ID# 1481205047  10:13  7-JAN-24
  Hardware:     C0  Software: 3.01.0075
*********** PROGRAM SETTINGS ***********
     ----------
    PROGRAM NAME:
     "STORM 1   "
  SITE DESCRIPTION:
     "230A      "
     ----------
    UNITS SELECTED:
      LENGTH: ft


     ----------
    UNITS SELECTED:
    FLOW RATE: gpm
   FLOW VOLUME: gal
    VELOCITY: fps
     ----------
   AREA-VEL MODULE:
    AREA*VELOCITY
      ROUND PIPE

     ----------

       5 MINUTE
    DATA INTERVAL

     ----------
   12,  1000 ml BTLS
  30 ft SUCTION LINE
  AUTO SUCTION HEAD
1 RINSES, 1 RETRIES
     ----------

   ONE-PART PROGRAM


     ----------
       PACING:
     FLOW, EVERY
      81000 gal
NO SAMPLE AT START
     ----------
     DISTRIBUTION:
    4 SAMPLES/BOTTLE


     ----------
```

VOLUME:

250 ml SAMPLES

ENABLE:

LEVEL >0.500 ft

ENABLE:

REPEATABLE ENABLE

NO SAMPLE AT DISABLE

NO SAMPLE AT ENABLE

ENABLE:

COUNTDOWN IS STOPPED

WHILE DISABLED

ENABLE:

0 PAUSE & RESUMES

NO DELAY TO START

144 HOURS RUN TIME

LIQUID DETECT ON

QUICK VIEW/CHANGE

TAKE MEASUREMENTS

AT STORAGE INTERVAL

DUAL SAMPLER OFF

BTL FULL DETECT OFF

TIMED BACKLIGHT

PULSED EVENT MARK

AT THE BEGINNING OF

FORWARD PUMPING

PUMP COUNTS FOR
EACH PURGE CYCLE:
100 PRE-SAMPLE
AUTO POST-SAMPLE

NO PERIODIC
SERIAL OUTPUT

NO RAIN GAUGE

NO SDI-12 SONDE

AUTO SDI-12 SCAN OFF

I/O1= NONE
I/O2= NONE
I/O3= NONE

----

0 ANALOG OUTPUTS

NO EXTERNAL MODEM

NO ALARM
CONDITIONS SET

```
SAMPLER ID# 1481205047  10:13  7-JAN-24
  Hardware:     C0  Software: 3.01.0075
*********** SAMPLING RESULTS ***********
   SITE: 230A
PROGRAM: STORM 1
Program Started at 15:07 TH  4-JAN-24
Nominal Sample Volume =  250 ml
                                   COUNT
                                      TO
SAMPLE  BOTTLE TIME  SOURCE ERROR LIQUID
------- ------ ----   -- --       ------
               15:07  PGM DISABLED
------------- FR 05-JAN-24 -------------
               03:30  PGM ENABLED
  1,4     1    04:01     F          1360
  2,4     1    04:33     F          1362
  3,4     1    04:59     F          1364
               05:20  PGM DISABLED
               19:25  PGM ENABLED
               19:50  PGM DISABLED
               20:45  PGM ENABLED
  4,4     1    20:45     F          1361
  1,4     2    21:20     F          1364
               21:45  PGM DISABLED
               21:50  PGM ENABLED
               21:55  PGM DISABLED
               22:10  PGM ENABLED
  2,4     2    22:27     F          1367
               22:55  PGM DISABLED
               23:40  PGM ENABLED
  3,4     2    23:57     F          1362
------------- SA 06-JAN-24 -------------
  4,4     2    00:15     F          1379
  1,4     3    00:32     F          1381
  2,4     3    00:54     F          1389
  3,4     3    01:15     F          1390
  4,4     3    01:49     F          1376
  1,4     4    02:09     F          1398
  2,4     4    02:28     F          1390
  3,4     4    02:48     F          1390
  4,4     4    03:03     F          1396
  1,4     5    03:17     F          1378
  2,4     5    03:27     F          1395
  3,4     5    03:40     F          1408
  4,4     5    03:58     F          1409
               04:30  PGM DISABLED
               05:15  PGM ENABLED
  1,3     6    05:19     F          1384
```

```
 2,3     6   05:51       F          1380
 3,3     6   06:23       F          1381
             06:50  PGM DISABLED
             08:20  PGM ENABLED
             08:35  PGM DISABLED

  SOURCE F  ==> FLOW
---------------------------------------
```

231 2035-01

Bottle Certification

Bottle Certification

*** DEFAULT CONTAINER ***

NPDES Storm

Chain of Custody

Outfall: 235

Date/Time sampler installed: 1/4/24 @ 15:12

Jar Cert #

Sampling Crew: CA, RG

Filter lot # 1375252

Weather conditions: Clear

Date/Time sampler pickup: 1/7/24 @ 10:23

Observed activities in area: N/A

Observations during sampler collection: N/A

Color, Odors, sheens: N/A

Type of Sample: ☑ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☑ >0.2 inches rain ☐ <0.02 inches of rain previous 24 hours

Samplers: ☑ Data downloaded ☑ Sample bottles marked

☑ Ice Present at pick-up ☑ Tubing Decon 1000mL DI water

☑ Caps on containers

Fill to...	Parameters:	Sample	QC
Neck	PAH's/Phthalates (1L) +	☑	☐ ☐
No head	[1]Total Mercury (125/250mL QC)	☑	☑
No head	[1]Diss Mercury (125/250mL QC)	☑	☑
Shoulder	Total Metals (250mL)	☑	
Shoulder	Diss Metals (125mL)	☑	
Shoulder	TSS (1L), (500 mL min)	☑	
Shoulder	Nutrients (250mL)	☑	
Shoulder	Ortho-P (125mL), (75min)	☑	
Shoulder	BOD (1L)	☑	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☑	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes 4.010 L config above

+1000 mL for QC per bottle, must submit 2 extra bottles

[1]If 250ml bottle used, thenQAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (uS)
1	1000	☐	134.9
2	↓	☑	228.6
3		☑	176.4
4		☑	58.5
5		☑	64.3
6		☑	52.2
7		☑	49.5
8		☑	104.2
9		☐	
10		☐	
11		☐	
12		☐	

Total aliquots: 32

Sample Prep

Date/Time: 1/7/24 @ 12:25

Initial: CA, RG

pH: 7.08

COND (µS): 102.1

Lab #: 2401017-02

Aliquots composited: 28

Deviations :

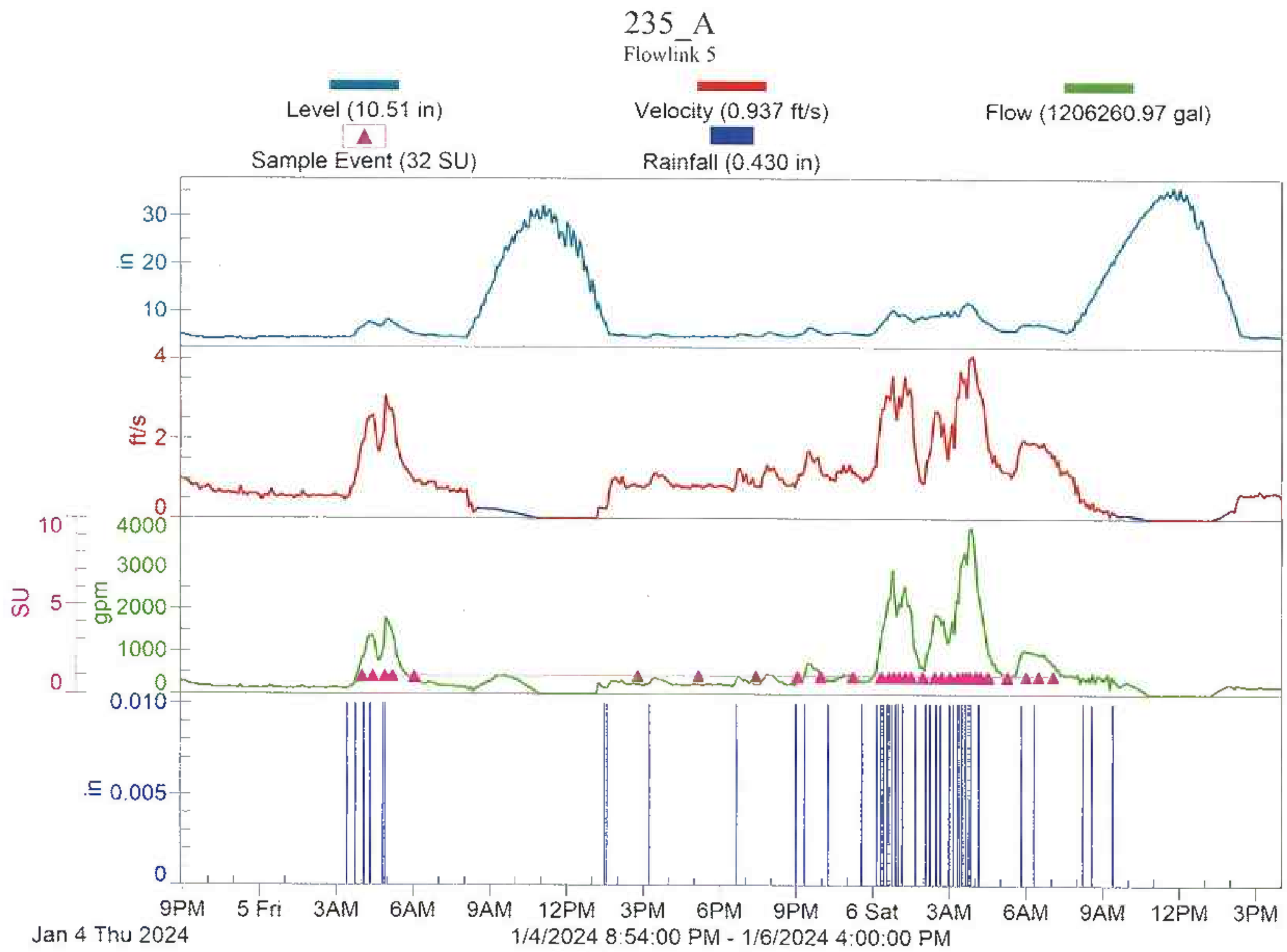
Composite End Time: 1/6/24 @ 7:05
(Collect Time) Last aliquot in composite

Relinquished by: [signature]

Date/Time: 1/7/24 @ 12:48

Received by: Cooler

Date/Time: 1/7/24 @ 12:48



235_A
Flowlink 5
Level (10.51 in)
Velocity (0.937 ft/s)
Flow (1206260.97 gal)
Sample Event (32 SU)
Rainfall (0.430 in)
in
30
20
10
ft/s
4
2
0
SU
10
5
0
gpm
4000
3000
2000
1000
0
in
0.010
0.005
0
9PM
5 Fri
3AM
6AM
9AM
12PM
3PM
6PM
9PM
6 Sat
3AM
6AM
9AM
12PM
3PM
Jan 4 Thu 2024
1/4/2024 8:54:00 PM - 1/6/2024 4:00:00 PM

```
SAMPLER ID# 1242995716  10:24  7-JAN-24
  Hardware:     A1  Software: 2.33
*********** PROGRAM SETTINGS ***********
     ----------
   PROGRAM NAME:
    "235A      "
 SITE DESCRIPTION:
    "235A ST   "
     ----------
   UNITS SELECTED:
     LENGTH: ft


     ----------
   UNITS SELECTED:
   FLOW RATE: gpm
  FLOW VOLUME: gal
   VELOCITY: fps
     ----------
  AREA-VEL MODULE:
   AREA*VELOCITY
     ROUND PIPE

     ----------

      5 MINUTE
   DATA INTERVAL

     ----------
  12,  1000 ml BTLS
 56 ft SUCTION LINE
 AUTO SUCTION HEAD
1 RINSES, 1 RETRIES
     ----------

  ONE-PART PROGRAM


     ----------
      PACING:
    FLOW, EVERY
     30000 gal
NO SAMPLE AT START
     ----------
    DISTRIBUTION:
   4 SAMPLES/BOTTLE


     ----------
```

VOLUME:

250 ml SAMPLES

ENABLE:
LEVEL >0.370 ft
AND
VEL > 0.80 fps

ENABLE:
REPEATABLE ENABLE
NO SAMPLE AT DISABLE
NO SAMPLE AT ENABLE

ENABLE:
COUNTDOWN IS STOPPED
WHILE DISABLED

ENABLE:
0 PAUSE & RESUMES

NO DELAY TO START

200 HOURS RUN TIME

LIQUID DETECT ON

QUICK VIEW/CHANGE

TAKE MEASUREMENTS
AT STORAGE INTERVAL

DUAL SAMPLER OFF
BTL FULL DETECT OFF
TIMED BACKLIGHT

EVENT MARK SENT

DURING PUMP CYCLE

PUMP COUNTS FOR
EACH PURGE CYCLE:
100 PRE-SAMPLE
AUTO POST-SAMPLE

NO PERIODIC
SERIAL OUTPUT

INTERROGATOR
CONNECTOR
POWER ALWAYS ON

NO RAIN GAUGE

NO SDI-12 SONDE

AUTO SDI-12 SCAN OFF

I/O1= NONE
I/O2= NONE
I/O3= NONE

----

0 ANALOG OUTPUTS

NO EXTERNAL MODEM

NO ALARM
CONDITIONS SET


```
SAMPLER ID# 1242995716  10:24  7-JAN-24
  Hardware:     A1  Software: 2.33
*********** SAMPLING RESULTS ***********
   SITE: 235A ST
PROGRAM: 235A
Program Started at 15:14 TH  4-JAN-24
Nominal Sample Volume =  250 ml
                                   COUNT
                                      TO
SAMPLE  BOTTLE TIME  SOURCE ERROR LIQUID
------- ------ ----      -- --    ------
              15:14  PGM DISABLED
              18:25  PGM ENABLED
              18:30  PGM DISABLED
              19:35  PGM ENABLED
              19:40  PGM DISABLED
              20:30  PGM ENABLED
              21:40  PGM DISABLED
------------- FR 05-JAN-24 -------------
              03:40  PGM ENABLED
  1,4     1   04:00      F           1847
  2,4     1   04:26      F           1861
  3,4     1   04:55      F           1851
  4,4     1   05:13      F           1867
  1,4     2   06:03      F           1859
              06:55  PGM DISABLED
              07:20  PGM ENABLED
              07:25  PGM DISABLED
              13:45  PGM ENABLED
              14:20  PGM DISABLED
              14:25  PGM ENABLED
  2,4     2   14:47      F           1853
              15:00  PGM DISABLED
              15:05  PGM ENABLED
              16:10  PGM DISABLED
              16:15  PGM ENABLED
              16:30  PGM DISABLED
              16:35  PGM ENABLED
              16:45  PGM DISABLED
              16:55  PGM ENABLED
  3,4     2   17:11      F           1854
              17:20  PGM DISABLED
              17:25  PGM ENABLED
```

```
                18:20  PGM DISABLED
                18:35  PGM ENABLED
  4,4     2     19:26      F          1857
  1,4     3     21:02      F          1857
  2,4     3     21:57      F          1864
  3,4     3     23:13      F          1865
------------ SA 06-JAN-24 ------------
  4,4     3     00:19      F          1863
  1,4     4     00:37      F          1876
  2,4     4     00:49      F          1895
  3,4     4     01:02      F          1897
  4,4     4     01:16      F          1898
  1,4     5     01:29      F          1902
  2,4     5     01:56      F          1893
  3,4     5     02:25      F          1881
  4,4     5     02:41      F          1889
  1,4     6     03:01      F          1893
  2,4     6     03:19      F          1903
  3,4     6     03:30      F          1891
  4,4     6     03:39      F          1905
  1,4     7     03:48      F          1911
  2,4     7     04:01      F          1905
  3,4     7     04:13      F          1915
  4,4     7     04:30      F          1907
  1,4     8     05:16      F          1882
  2,4     8     06:00      F          1875
  3,4     8     06:30      F          1873
  4,4     8     07:05      F          1872
                07:55  PGM DISABLED
                08:00  PGM ENABLED
                08:05  PGM DISABLED
                18:00  PGM ENABLED
                18:05  PGM DISABLED


   SOURCE F  ==> FLOW
--------------------------------------
```

NPDES Storm
Chain of Custody

Jar Cert # 2311027-01 Outfall: 257 A Date/Time sampler installed: 1/4/24 @ 14:56

Jar Cert #

Sampling Crew: CA, RG

Filter lot # 1375252

Weather conditions: Clear

Date/Time sampler pickup: 1/9/24 @ 10:07

Observed activities in area: N/A

Observations during sampler collection: N/A

Color, Odors, sheens: N/A

Type of Sample: ☑ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☑ >0.2 inches rain ☐ <0.02 inches of rain previous 24 hours

Samplers: ☑ Data downloaded ☑ Sample bottles marked

☑ Ice Present at pick-up ☑ Tubing Decon 1000mL DIwater

☑ Caps on containers

Fill to...	Parameters:	Sample	QC
Neck	PAH's/Phthalates (1L) +	☒	☐ ☐
No head	†Total Mercury (125/250mL QC)	☒	☐
No head	†Diss Mercury (125/250mL QC)	☑	☐
Shoulder	Total Metals (250mL)	☑	
Shoulder	Diss Metals (125mL)	☒	
Shoulder	TSS (1L), (500 mL min)	☑	
Shoulder	Nutrients (250mL)	☑	
Shoulder	Ortho-P (125mL), (75min)	☒	
Shoulder	BOD (1L)	☐	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☑	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes 4.010 L config above

+1000 mL for QC per bottle, must submit 2 extra bottles

†If 250ml bottle used, thenQAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (uS)
1	1000	☑	133.6
2	↓	☑	72.8
3		☑	55.6
4		☑	145.8
5		☐	
6		☐	
7		☐	
8		☐	
9		☐	
10		☐	
11		☐	
12		☐	

Total aliquots: 16

Sample Prep

Date/Time: 1/7/24 @ 11:41

Initial: CA, RG

pH: 6.5

COND (µS): 98.6

Lab #: 2401017-03

Aliquots composited: 16

eviations :

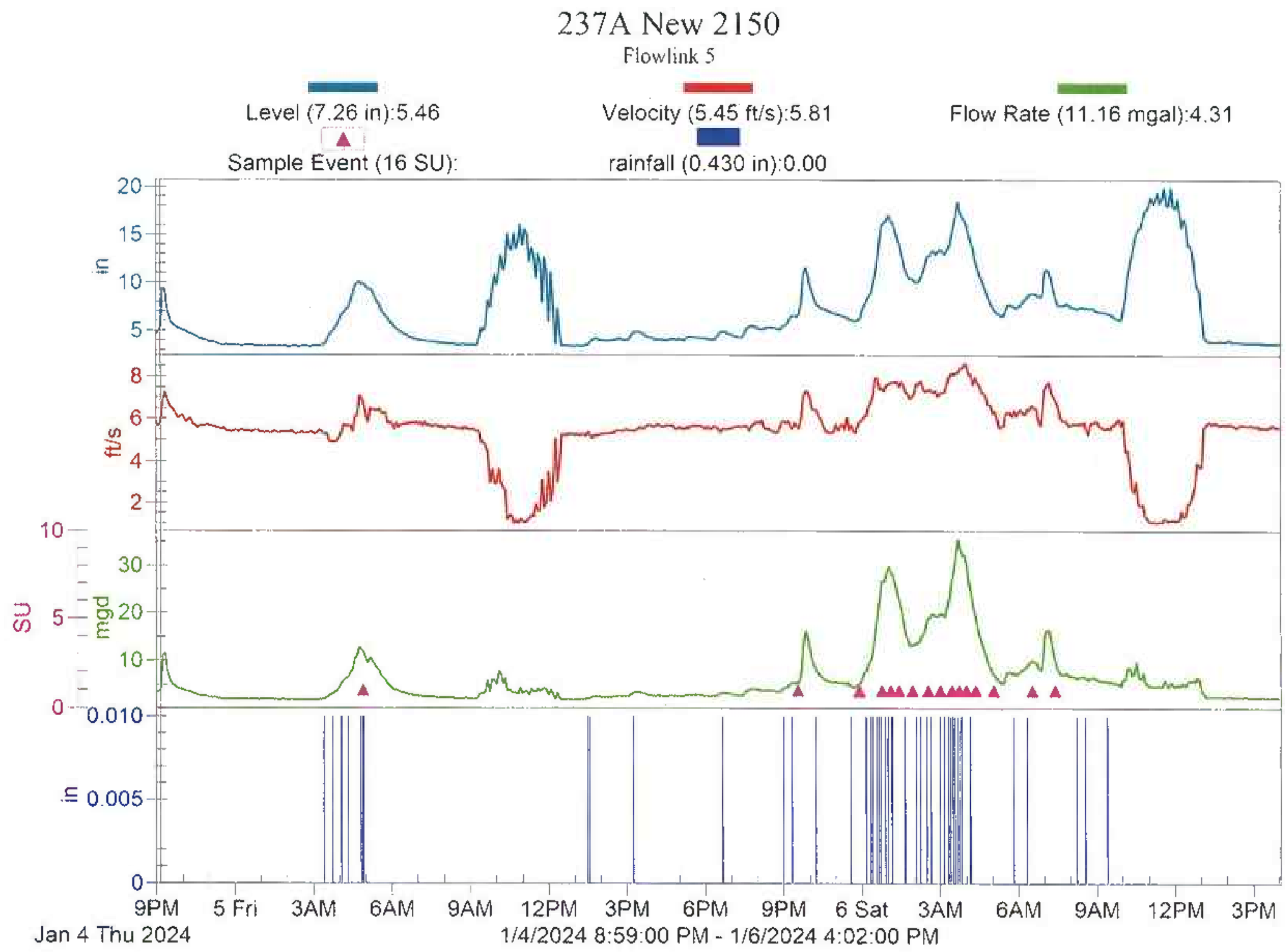
Composite End Time: 1/6/24 @ 7:25
(Collect Time) Last aliquot in composite

Relinquished by: [signature]

Date/Time: 1/7/24 @ 12:48

Received by: Cooler

Date/Time: 1/7/24 @ 12:48


237A New 2150
Flowlink 5
Level (7.26 in):5.46
Velocity (5.45 ft/s):5.81
Flow Rate (11.16 mgal):4.31
Sample Event (16 SU):
rainfall (0.430 in):0.00
20
15
10
5
in
8
6
4
2
ft/s
10
5
0
SU
30
20
10
mgd
0.010
0.005
0
in
9PM
5 Fri
3AM
6AM
9AM
12PM
3PM
6PM
9PM
6 Sat
3AM
6AM
9AM
12PM
3PM
Jan 4 Thu 2024
1/4/2024 8:59:00 PM - 1/6/2024 4:02:00 PM

SAMPLER ID# 1245320993 10:00 7-JAN-24
Hardware: A1 Software: 2.33
*********** PROGRAM SETTINGS ***********

PROGRAM NAME:
"237ANEW   "
SITE DESCRIPTION:
"237ANEW   "

UNITS SELECTED:
LENGTH: ft

12, 1000 ml BTLS
21 ft SUCTION LINE
AUTO SUCTION HEAD
1 RINSES, 1 RETRIES

ONE-PART PROGRAM

PACING:
FLOW, EVERY
1 PULSES
NO SAMPLE AT START

DISTRIBUTION:
4 SAMPLES/BOTTLE

VOLUME:

250 ml SAMPLES

ENABLE:

NONE PROGRAMMED

ENABLE:
REPEATABLE ENABLE
NO SAMPLE AT DISABLE
NO SAMPLE AT ENABLE

ENABLE:
COUNTDOWN IS STOPPED
WHILE DISABLED

ENABLE:
0 PAUSE & RESUMES

NO DELAY TO START

200 HOURS RUN TIME

LIQUID DETECT ON

QUICK VIEW/CHANGE

TAKE MEASUREMENTS
AT STORAGE INTERVAL

DUAL SAMPLER OFF
BTL FULL DETECT OFF
TIMED BACKLIGHT

EVENT MARK SENT
DURING PUMP CYCLE

PUMP COUNTS FOR
EACH PURGE CYCLE:
400 PRE-SAMPLE
400 POST-SAMPLE

NO PERIODIC
SERIAL OUTPUT

INTERROGATOR
CONNECTOR

```
  POWER ALWAYS ON

      ----------
      ----------
      ----------

   NO RAIN GAUGE


      ----------
  NO SDI-12 SONDE

AUTO SDI-12 SCAN OFF

      ----------
 I/O1= NONE
 I/O2= NONE
 I/O3= NONE

      ----------

  0 ANALOG OUTPUTS


      ----------

 NO EXTERNAL MODEM


      ----------

      NO ALARM
   CONDITIONS SET

      ----------
      ----------
----------------------------------------



SAMPLER ID# 1245320993  10:00  7-JAN-24
  Hardware:     A1  Software: 2.33
*********** SAMPLING RESULTS ***********
   SITE: 237ANEW
PROGRAM: 237ANEW
Program Started at 14:52 TH  4-JAN-24
Nominal Sample Volume =  250 ml
                                   COUNT
                                      TO
```

```
SAMPLE  BOTTLE TIME  SOURCE ERROR LIQUID
------- ------ ----      -- --    ------
               14:52  PGM ENABLED
------------- FR 05-JAN-24 -------------
  1,4     1    04:54       F          537
  2,4     1    21:33       F          543
  3,4     1    23:53       F          540
------------- SA 06-JAN-24 -------------
  4,4     1    00:47       F          527
  1,4     2    01:07       F          527
  2,4     2    01:26       F          530
  3,4     2    01:57       F          532
  4,4     2    02:33       F          531
  1,4     3    03:01       F          532
  2,4     3    03:28       F          537
  3,4     3    03:45       F          533
  4,4     3    04:02       F          531
  1,4     4    04:23       F          531
  2,4     4    05:04       F          537
  3,4     4    06:33       F          534
  4,4     4    07:25       F          533
------------- SU 07-JAN-24 -------------
               09:59  MANUAL PAUSE
               09:59  PGM STOPPED 07-JAN


   SOURCE F  ==> FLOW
----------------------------------------
```

NPDES Storm
Chain of Custody

Jar Cert # 2311027-01 Outfall: 237B Date/Time sampler installed: 1/4/24 @ 15:01

Jar Cert #______ Sampling Crew: CA, RG

Filter lot # 1375252 Weather conditions: Clear Date/Time sampler pickup: 1/7/24 @ 10:12

Observed activities in area: N/A

Observations during sampler collection: N/A

Color, Odors, sheens: N/A

Type of Sample: ☑ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☑ >0.2 inches rain ☐ <0.02 inches of rain previous 24 hours

Samplers: ☑ Data downloaded ☐ Sample bottles marked
☐ Ice Present at pick-up ☑ Tubing Decon 1000mL Diwater
☑ Caps on containers

Fill to...	Parameters:	Sample	QC
Neck	PAH's/Phthalates (1L) +	☑	☐ ☐
No head	[1]Total Mercury (125/250mL QC)	☑	☐
No head	[1]Diss Mercury (125/250mL QC)	☑	☐
Shoulder	Total Metals (250mL)	☑	
Shoulder	Diss Metals (125mL)	☑	
Shoulder	TSS (1L), (500 mL min)	☑	
Shoulder	Nutrients (250mL)	☑	
Shoulder	Ortho-P (125mL), (75min)	☑	
Shoulder	BOD (1L)	☑	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☑	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes 4.010 L config above
+1000 mL for QC per bottle, must submit 2 extra bottles
[1]If 250ml bottle used, thenQAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (uS)
1	1000	☐	183.3
2	↓	☑	99.9
3		☑	97.2
4		☑	113.4
5		☑	169.4
6		☑	192.1
7	250	☑	220.2
8		☐	
9		☐	
10		☐	
11		☐	
12		☐	

Total aliquots: 25

Sample Prep

Date/Time: 1/7/24 @ 12:11

Initial: CA, RG

pH: 6.74

COND (µS): 132.5

Lab #: 2401017-04

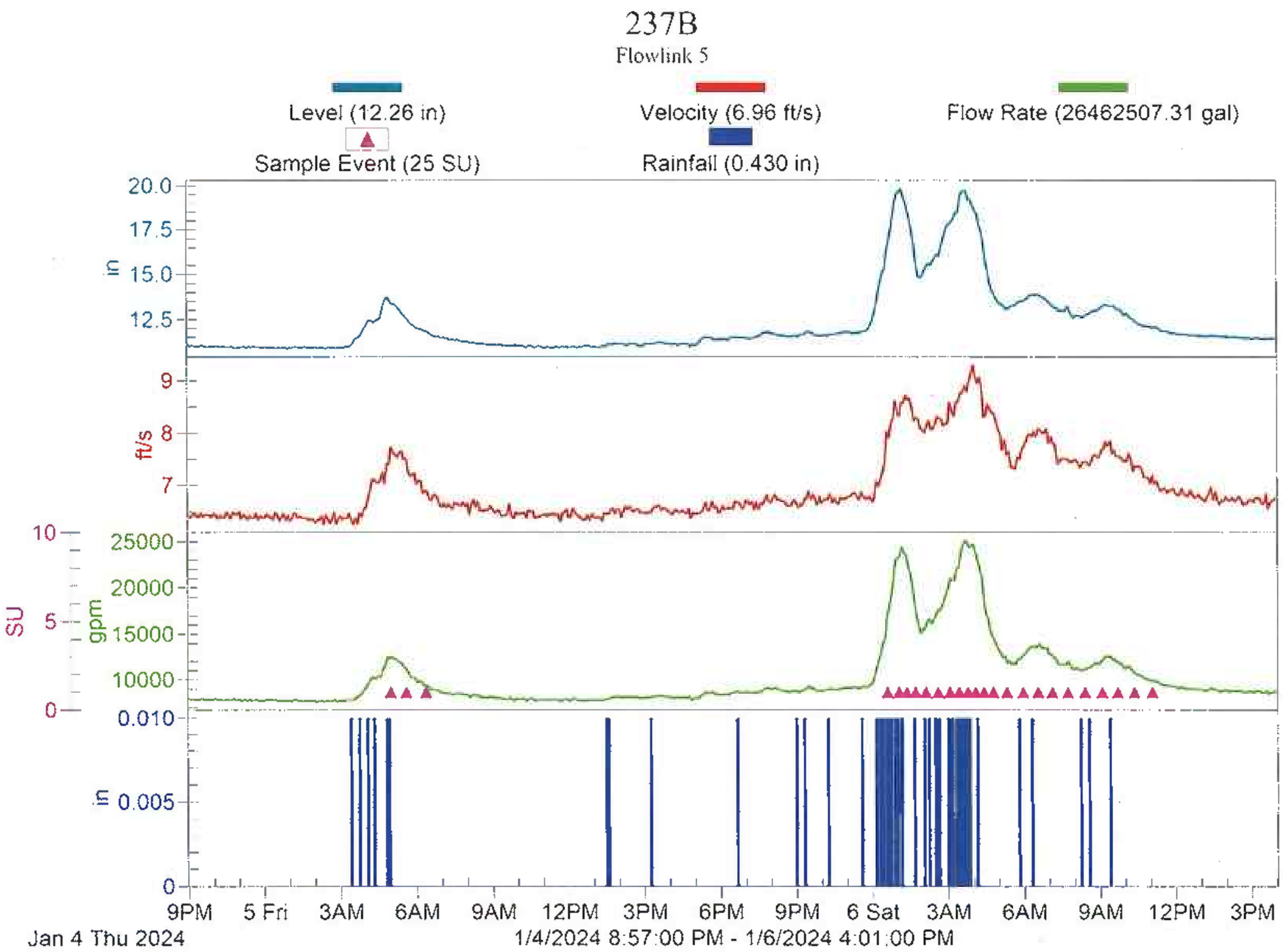
Aliquots composited: 21

Deviations :

Composite End Time: 1/6/24 @ 11:05
(Collect Time) Last aliquot in composite

Relinquished by: [signature] Received by: Cooler

Date/Time: 1/7/24 @ 12:48 Date/Time: 1/7/24 @ 12:48



237B
Flowlink 5
Level (12.26 in)
Velocity (6.96 ft/s)
Flow Rate (26462507.31 gal)
Sample Event (25 SU)
Rainfall (0.430 in)
in
20.0
17.5
15.0
12.5
ft/s
9
8
7
SU
10
5
0
gpm
25000
20000
15000
10000
0.010
0.005
0
9PM
5 Fri
3AM
6AM
9AM
12PM
3PM
6PM
9PM
6 Sat
3AM
6AM
9AM
12PM
3PM
Jan 4 Thu 2024
1/4/2024 8:57:00 PM - 1/6/2024 4:01:00 PM

```
SAMPLER ID# 1243003651  10:14  7-JAN-24
  Hardware:     A1  Software: 2.33
*********** PROGRAM SETTINGS ***********
     ----------
   PROGRAM NAME:
    " STORM 1  "
  SITE DESCRIPTION:
    "  237 B   "
     ----------
   UNITS SELECTED:
     LENGTH: ft


     ----------
  12,  1000 ml BTLS
 16 ft SUCTION LINE
 AUTO SUCTION HEAD
1 RINSES, 1 RETRIES
     ----------

  ONE-PART PROGRAM


     ----------
      PACING:
    FLOW, EVERY
       1 PULSES
NO SAMPLE AT START
     ----------
    DISTRIBUTION:
   4 SAMPLES/BOTTLE


     ----------
      VOLUME:

   250 ml SAMPLES

     ----------
      ENABLE:

  NONE PROGRAMMED

     ----------
      ENABLE:
 REPEATABLE ENABLE
NO SAMPLE AT DISABLE
NO SAMPLE AT ENABLE
     ----------
```

ENABLE:
COUNTDOWN IS STOPPED
WHILE DISABLED

ENABLE:
0 PAUSE & RESUMES

NO DELAY TO START

200 HOURS RUN TIME

LIQUID DETECT ON

QUICK VIEW/CHANGE

TAKE MEASUREMENTS
AT STORAGE INTERVAL

DUAL SAMPLER OFF
BTL FULL DETECT ON
TIMED BACKLIGHT

EVENT MARK SENT
DURING PUMP CYCLE

PUMP COUNTS FOR
EACH PURGE CYCLE:
100 PRE-SAMPLE
AUTO POST-SAMPLE

NO PERIODIC
SERIAL OUTPUT

INTERROGATOR
CONNECTOR

```
  POWER ALWAYS ON

      ----------
      ----------
      ----------

   NO RAIN GAUGE


      ----------
  NO SDI-12 SONDE

AUTO SDI-12 SCAN OFF

      ----------
 I/O1= NONE
 I/O2= NONE
 I/O3= NONE

      ----------

  0 ANALOG OUTPUTS


      ----------

 NO EXTERNAL MODEM


      ----------

     NO ALARM
   CONDITIONS SET

      ----------
      ----------
----------------------------------------


SAMPLER ID# 1243003651  10:14  7-JAN-24
  Hardware:     A1  Software: 2.33
*********** SAMPLING RESULTS ***********
   SITE:   237 B
PROGRAM:  STORM 1
Program Started at 15:03 TH  4-JAN-24
Nominal Sample Volume =  250 ml
                                   COUNT
                                      TO
```

SAMPLE	BOTTLE	TIME	SOURCE	ERROR	LIQUID
		15:03	PGM ENABLED		
		FR 05-JAN-24			
1,4	1	04:58	F		517
2,4	1	05:35	F		517
3,4	1	06:22	F		517
		SA 06-JAN-24			
4,4	1	00:36	F		522
1,4	2	01:04	F		512
2,4	2	01:23	F		515
3,4	2	01:43	F		512
4,4	2	02:08	F		525
1,4	3	02:37	F		522
2,4	3	03:04	F		525
3,4	3	03:26	F		522
4,4	3	03:47	F		515
1,4	4	04:06	F		512
2,4	4	04:25	F		512
3,4	4	04:48	F		516
4,4	4	05:20	F		521
1,4	5	05:58	F		519
2,4	5	06:34	F		523
3,4	5	07:08	F		520
4,4	5	07:45	F		516
1,4	6	08:25	F		519
2,4	6	09:06	F		514
3,4	6	09:43	F		520
4,4	6	10:22	F		518
1,1	7	11:05	F		518
		SU 07-JAN-24			
		10:10	MANUAL PAUSE		
		10:10	PGM STOPPED 07-JAN		

SOURCE F ==> FLOW

2311027-01

Bottle Certification

Bottle Certification

*** DEFAULT CONTAINER ***

NPDES Storm

Chain of Custody

Outfall: 245

Date/Time sampler installed: 1/4/24 @ 10:55

Sampling Crew: CA, RG

Filter lot # 1375252

Weather conditions: Clear

Date/Time sampler pickup: 1/7/24 @ 9:48

Observed activities in area: N/A

Observations during sampler collection: N/A

Color, Odors, sheens: N/A

Type of Sample: ☑ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☑ >0.2 inches rain ☐ <0.02 inches of rain previous 24 hours

Samplers: ☑ Data downloaded ☐ Sample bottles marked

☑ Ice Present at pick-up ☐ Tubing Decon 1000mL DI water

☑ Caps on containers

Fill to...	Parameters:	Sample	QC
Neck	PAH's/Phthalates (1L) +	☑	☐ ☐
No head	[1]Total Mercury (125/250mL QC)	☑	☐
No head	[1]Diss Mercury (125/250mL QC)	☑	☐
Shoulder	Total Metals (250mL)	☑	
Shoulder	Diss Metals (125mL)	☑	
Shoulder	TSS (1L), (500 mL min)	☑	
Shoulder	Nutrients (250mL)	☑	
Shoulder	Ortho-P (125mL), (75min)	☑	
Shoulder	BOD (1L)	☐	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☐	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes 4.010 L config above

+1000 mL for QC per bottle, must submit 2 extra bottles

[1]If 250ml bottle used, then QAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (µS)
1	1000	☐	17280.0
2	1000	☒	156.3
3	1000	☒	54.3
4	1000	☒	274.6
5	500	☒	1424.0
6		☐	
7		☐	
8		☐	
9		☐	
10		☐	
11		☐	
12		☐	

Total aliquots: 18

Sample Prep

Date/Time: 1/7/24 @ 1153

Initial: CA, RG

pH: 6.91

COND (µS): 335.2

Lab #: 2401017-06

Aliquots composited: 14

Deviations :

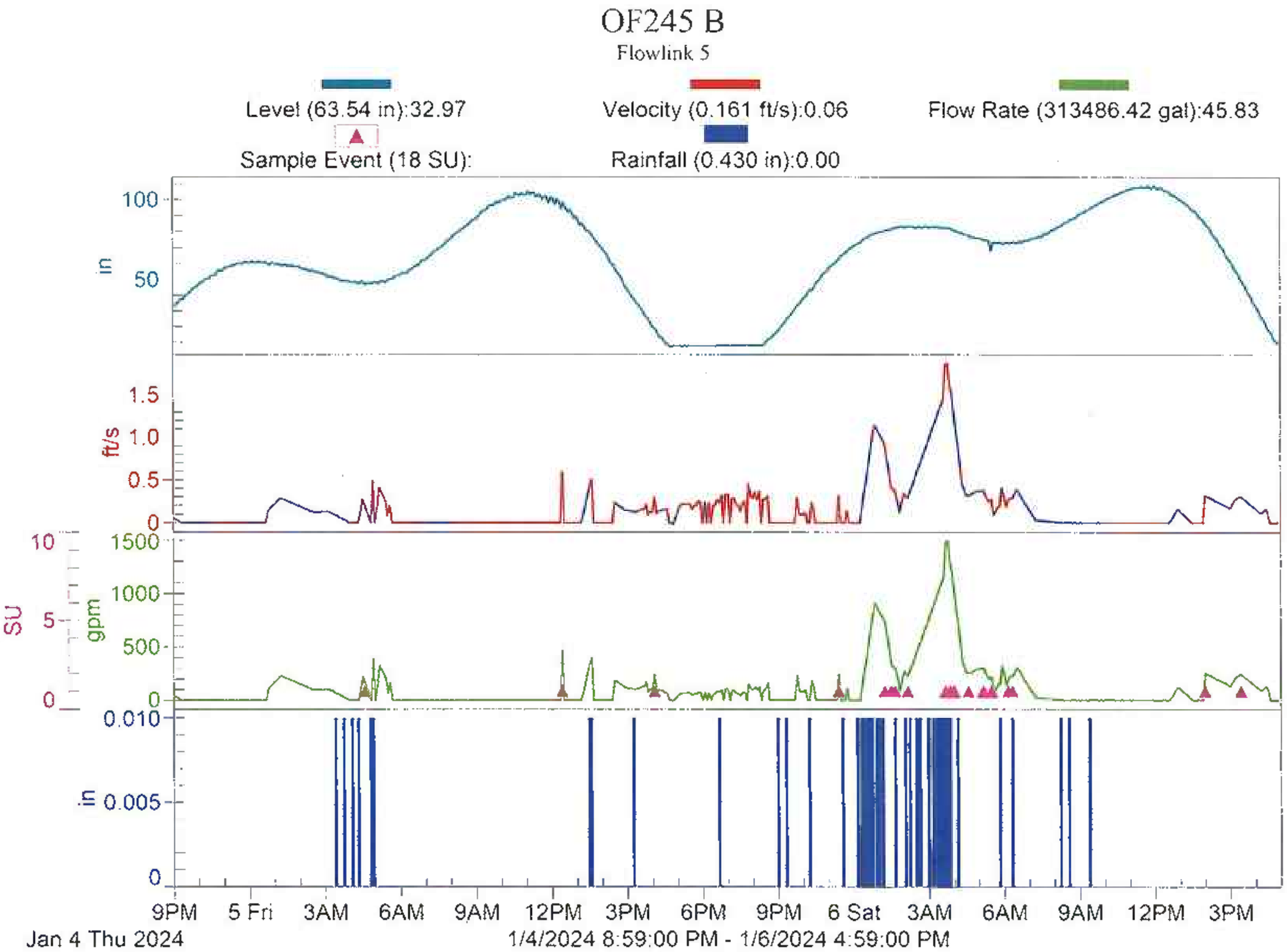
Composite End Time: 1/6/24 @ 15:25
(Collect Time) Last aliquot in composite

Relinquished by: [signature]

Date/Time: 1/7/24 @ 12:48

Received by: Cooler

Date/Time: 1/7/24 @ 12:48



OF245 B
Flowlink 5
Level (63.54 in):32.97
Velocity (0.161 ft/s):0.06
Flow Rate (313486.42 gal):45.83
Sample Event (18 SU):
Rainfall (0.430 in):0.00
100
50
in
1.5
1.0
0.5
0
ft/s
10
5
0
SU
1500
1000
500
0
gpm
0.010
0.005
0
in
9PM
5 Fri
3AM
6AM
9AM
12PM
3PM
6PM
9PM
6 Sat
3AM
6AM
9AM
12PM
3PM
Jan 4 Thu 2024
1/4/2024 8:59:00 PM - 1/6/2024 4:59:00 PM

```
SAMPLER ID# 1284476967  09:48  7-JAN-24
  Hardware:     A1  Software: 2.33
*********** PROGRAM SETTINGS ***********
     ----------
   PROGRAM NAME:
    "STORM     "
  SITE DESCRIPTION:
    "OF245 B   "
     ----------
   UNITS SELECTED:
     LENGTH: ft


     ----------
   UNITS SELECTED:
   FLOW RATE: gpm
  FLOW VOLUME: gal
   VELOCITY: fps
     ----------
  AREA-VEL MODULE:
   AREA*VELOCITY
     ROUND PIPE

     ----------

      5 MINUTE
   DATA INTERVAL

     ----------
  12,  1000 ml BTLS
 21 ft SUCTION LINE
 AUTO SUCTION HEAD
1 RINSES, 1 RETRIES
     ----------

  ONE-PART PROGRAM


     ----------
      PACING:
    TIME, EVERY
 0 HOURS, 10 MINUTES

     ----------
    DISTRIBUTION:
   4 SAMPLES/BOTTLE


     ----------
```

VOLUME:

250 ml SAMPLES

ENABLE:

FLOW >200.0 gpm

ENABLE:
REPEATABLE ENABLE
NO SAMPLE AT DISABLE
NO SAMPLE AT ENABLE

ENABLE:
COUNTDOWN IS STOPPED
WHILE DISABLED

ENABLE:
0 PAUSE & RESUMES

NO DELAY TO START

LIQUID DETECT ON

QUICK VIEW/CHANGE

TAKE MEASUREMENTS
EVERY 5 MINUTES

DUAL SAMPLER OFF
BTL FULL DETECT OFF
TIMED BACKLIGHT

PULSED EVENT MARK

AT INITIAL PURGE

PUMP COUNTS FOR
EACH PURGE CYCLE:
200 PRE-SAMPLE
AUTO POST-SAMPLE

NO PERIODIC
SERIAL OUTPUT

INTERROGATOR
CONNECTOR
POWER ALWAYS ON

NO RAIN GAUGE

NO SDI-12 SONDE

AUTO SDI-12 SCAN OFF

I/O1= NONE
I/O2= NONE
I/O3= NONE

----

0 ANALOG OUTPUTS

NO EXTERNAL MODEM

NO ALARM
CONDITIONS SET

```
     ----------
     ----------
----------------------------------------


SAMPLER ID# 1284476967  09:48  7-JAN-24
  Hardware:     A1  Software: 2.33
*********** SAMPLING RESULTS ***********
   SITE: OF245 B
PROGRAM: STORM
Program Started at 14:38 TH  4-JAN-24
Nominal Sample Volume =  250 ml
                                   COUNT
                                      TO
SAMPLE  BOTTLE TIME  SOURCE ERROR LIQUID
------- ------ ----      -- --    ------
              14:38  PGM DISABLED
------------- FR 05-JAN-24 -------------
              01:15  PGM ENABLED
              01:20  PGM DISABLED
              04:30  PGM ENABLED
  1,4     1   04:35      T            559
              04:37  PGM DISABLED
              04:55  PGM ENABLED
              05:00  PGM DISABLED
              05:10  PGM ENABLED
              05:15  PGM DISABLED
              12:25  PGM ENABLED
  2,4     1   12:25      T            523
              12:30  PGM DISABLED
              13:35  PGM ENABLED
              13:40  PGM DISABLED
              16:05  PGM ENABLED
  3,4     1   16:05      T            591
              16:10  PGM DISABLED
              21:45  PGM ENABLED
              21:50  PGM DISABLED
              23:25  PGM ENABLED
  4,4     1   23:25      T            545
              23:30  PGM DISABLED
------------- SA 06-JAN-24 -------------
              00:50  PGM ENABLED
              00:55  PGM DISABLED
              01:15  PGM ENABLED
  1,4     2   01:15      T            534
              01:25  PGM DISABLED
              01:30  PGM ENABLED
  2,4     2   01:30      T            535
```

3,4	2	01:40	T	537
		01:45	PGM DISABLED	
		02:00	PGM ENABLED	
		02:05	PGM DISABLED	
		02:10	PGM ENABLED	
4,4	2	02:10	T	534
		02:15	PGM DISABLED	
		03:35	PGM ENABLED	
1,4	3	03:40	T	531
2,4	3	03:50	T	533
3,4	3	04:00	T	535
		04:01	PGM DISABLED	
		04:20	PGM ENABLED	
		04:25	PGM DISABLED	
		04:30	PGM ENABLED	
4,4	3	04:35	T	537
		04:40	PGM DISABLED	
		04:55	PGM ENABLED	
		05:00	PGM DISABLED	
		05:10	PGM ENABLED	
1,4	4	05:10	T	537
		05:15	PGM DISABLED	
		05:20	PGM ENABLED	
		05:25	PGM DISABLED	
		05:30	PGM ENABLED	
2,4	4	05:30	T	541
		05:35	PGM DISABLED	
		05:55	PGM ENABLED	
		06:00	PGM DISABLED	
		06:10	PGM ENABLED	
3,4	4	06:10	T	539
4,4	4	06:20	T	541
		06:25	PGM DISABLED	
		06:30	PGM ENABLED	
		06:35	PGM DISABLED	
		14:00	PGM ENABLED	
1,2	5	14:00	T	533
		14:05	PGM DISABLED	
		15:10	PGM ENABLED	
		15:15	PGM DISABLED	
		15:25	PGM ENABLED	
2,2	5	15:25	T	564
		15:30	PGM DISABLED	

------------- SU 07-JAN-24 -------------

		09:47	MANUAL PAUSE	
		09:47	PGM STOPPED 07-JAN	

SOURCE T ==> TIME

NPDES Storm
Chain of Custody

Jar Cert # 231027-01 Outfall: 254 Date/Time sampler installed: 1/4/24 @ 11:26

Jar Cert #

Filter lot # 375252

Sampling Crew: CA, RG

Weather conditions: Clear

Date/Time sampler pickup: 1/7/24 @ 9:40

Observed activities in area: N/A

Observations during sampler collection: N/A

Color, Odors, sheens: N/A

Type of Sample: ☑ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☑ >0.2 inches rain ☐ <0.02 inches of rain previous 24 hours

Samplers: ☑ Data downloaded ☑ Ice Present at pick-up ☑ Caps on containers ☑ Sample bottles marked ☑ Tubing Decon 1000mL Diwater

Fill to...	Parameters:	Sample	QC
Neck	PAH's/Phthalates (1L) +	☑	☑ ☑
No head	[1]Total Mercury (125/250mL QC)	☑	☐
No head	[1]Diss Mercury (125/250mL QC)	☑	☐
Shoulder	Total Metals (250mL)	☑	
Shoulder	Diss Metals (125mL)	☑	
Shoulder	TSS (1L), (500 mL min)	☑	
Shoulder	Nutrients (250mL)	☑	
Shoulder	Ortho-P (125mL), (75min)	☑	
Shoulder	BOD (1L)	☑	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☑	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes 4.010 L config above

+1000 mL for QC per bottle, must submit 2 extra bottles

[1]If 250ml bottle used, thenQAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (µS)
1	1000	☑	5720
2	↓	☑	15740
3		☑	15640
4		☑	17250
5		☑	15990
6		☑	13750
7		☑	12480
8		☑	11290
9		☑	10030
10		☑	11820
11		☑	5580
12		☑	6840

Total aliquots: 48

Sample Drop

Date/Time: 1/7/24 @ 11:14

Initial: CA, RG

pH: 6.67

COND (µS): 11260

Lab #: 2401017-07

Aliquots composited: 48

Deviations :

Composite End Time: 1/6/24 @ 3:20
(Collect Time) Last aliquot in composite

Relinquished by: [signature]

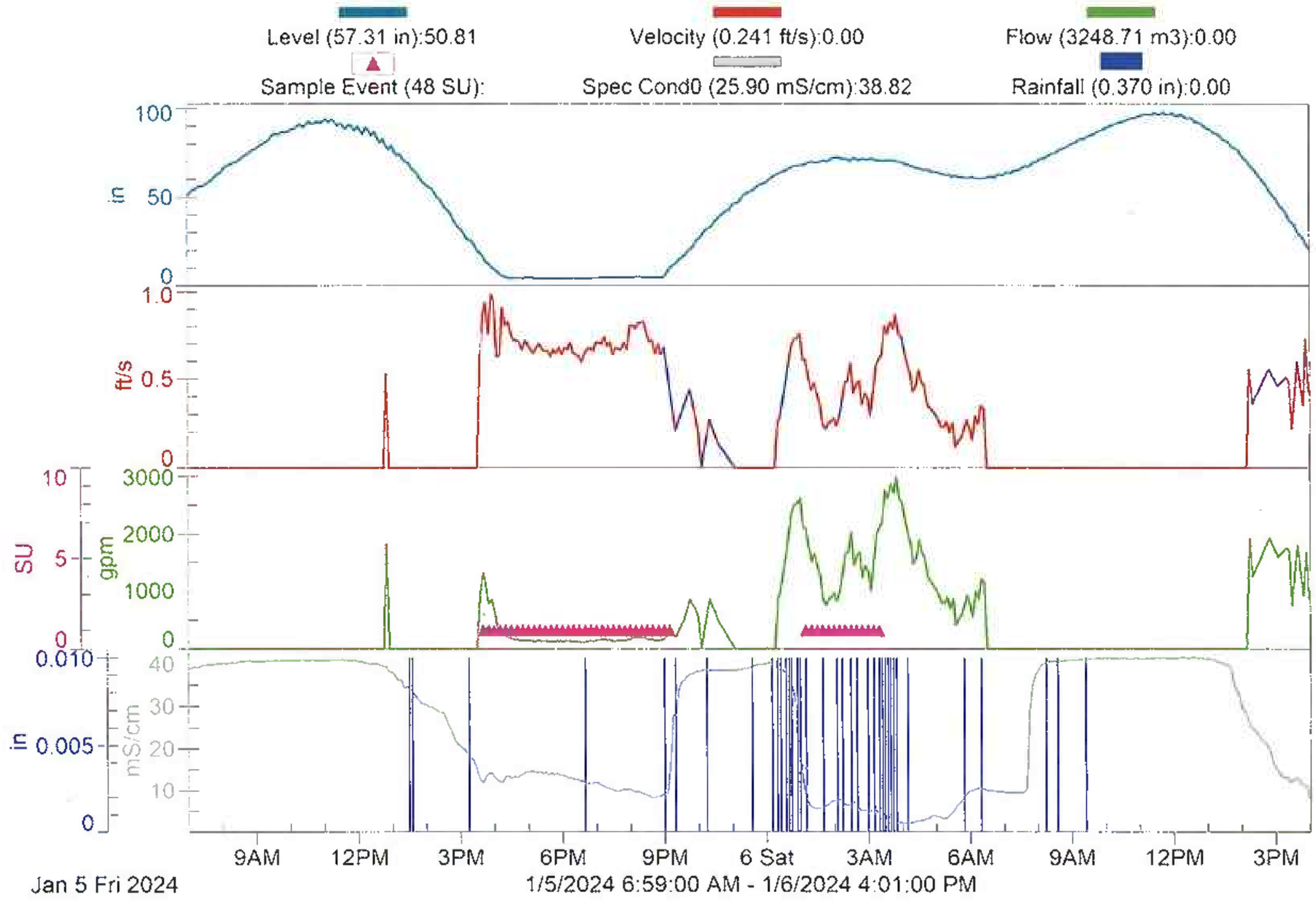
Date/Time: 1/7/24 @ 12:48

Received by: Cooler

Date/Time: 1/7/24 @ 12:48

254-

Flowlink 5



```
SAMPLER ID# 1673008074  09:40  7-JAN-24
  Hardware:     C0  Software: 3.08.0001
*********** PROGRAM SETTINGS ***********
     ----------
   PROGRAM NAME:
    "STORM 1   "
 SITE DESCRIPTION:
    "254-      "
     ----------
   UNITS SELECTED:
     LENGTH: ft
CONDUCTIVITY: mS/cm
  TEMPERATURE:  F
     ----------
   UNITS SELECTED:
   FLOW RATE: gpm
 FLOW VOLUME: Mgal
   VELOCITY: fps
     ----------
  AREA-VEL MODULE:
   AREA*VELOCITY
     ROUND PIPE

     ----------

      5 MINUTE
   DATA INTERVAL

     ----------
  12,  1000 ml BTLS
 21 ft SUCTION LINE
 AUTO SUCTION HEAD
1 RINSES, 1 RETRIES
     ----------

  ONE-PART PROGRAM


     ----------
      PACING:
    TIME, EVERY
 0 HOURS, 10 MINUTES

     ----------
    DISTRIBUTION:
   4 SAMPLES/BOTTLE


     ----------
```

VOLUME:

250 ml SAMPLES

ENABLE:

SP_C00 <15.00 mS/cm

ENABLE:
REPEATABLE ENABLE
NO SAMPLE AT DISABLE
NO SAMPLE AT ENABLE

ENABLE:
COUNTDOWN IS STOPPED
WHILE DISABLED

ENABLE:
0 PAUSE & RESUMES

NO DELAY TO START

LIQUID DETECT ON

QUICK VIEW/CHANGE

TAKE MEASUREMENTS
AT STORAGE INTERVAL

DUAL SAMPLER OFF
BTL FULL DETECT OFF
TIMED BACKLIGHT

EVENT MARK SENT

DURING PUMP CYCLE

PUMP COUNTS FOR
EACH PURGE CYCLE:
500 PRE-SAMPLE
AUTO POST-SAMPLE

NO PERIODIC
SERIAL OUTPUT

NO RAIN GAUGE

SDI-12 DATA:
SP_CO0

I/O1= NONE
I/O2= NONE
I/O3= NONE

----

0 ANALOG OUTPUTS

NO EXTERNAL MODEM

NO ALARM
CONDITIONS SET

SAMPLER ID# 1673008074 09:40 7-JAN-24
Hardware: C0 Software: 3.08.0001
*********** SAMPLING RESULTS ***********
SITE: 254-
PROGRAM: STORM 1
Program Started at 14:29 TH 4-JAN-24
Nominal Sample Volume = 250 ml

SAMPLE	BOTTLE	TIME	SOURCE	ERROR	COUNT TO LIQUID
-------	------	----	--	--	------
		14:29	PGM DISABLED		
-------------		FR 05-JAN-24	-------------		
		15:30	PGM ENABLED		
1,4	1	15:40	T		622
2,4	1	15:50	T		636
3,4	1	16:00	T		646
4,4	1	16:10	T		647
1,4	2	16:20	T		655
2,4	2	16:30	T		658
3,4	2	16:40	T		655
4,4	2	16:50	T		652
1,4	3	17:00	T		654
2,4	3	17:10	T		654
3,4	3	17:20	T		654
4,4	3	17:30	T		658
1,4	4	17:40	T		658
2,4	4	17:50	T		658
3,4	4	18:00	T		652
4,4	4	18:10	T		659
1,4	5	18:20	T		654
2,4	5	18:30	T		655
3,4	5	18:40	T		656
4,4	5	18:50	T		657
1,4	6	19:00	T		658
2,4	6	19:10	T		659
3,4	6	19:20	T		659
4,4	6	19:30	T		659
1,4	7	19:40	T		659
2,4	7	19:50	T		659
3,4	7	20:00	T		659
4,4	7	20:10	T		659
1,4	8	20:20	T		660
2,4	8	20:30	T		659
3,4	8	20:40	T		659
4,4	8	20:50	T		658
1,4	9	21:00	T		659
2,4	9	21:10	T		658

```
              21:15  PGM DISABLED
------------- SA 06-JAN-24 -------------
              01:05  PGM ENABLED
  3,4      9  01:10      T          588
  4,4      9  01:20      T          596
  1,4     10  01:30      T          602
  2,4     10  01:40      T          602
  3,4     10  01:50      T          602
  4,4     10  02:00      T          604
  1,4     11  02:10      T          604
  2,4     11  02:20      T          604
  3,4     11  02:30      T          606
  4,4     11  02:40      T          604
  1,4     12  02:50      T          604
  2,4     12  03:00      T          606
  3,4     12  03:10      T          608
  4,4     12  03:20      T          608
              03:21  PGM DONE 06-JAN

   SOURCE T  ==> TIME
----------------------------------------
```

FIELD REPORT

Project: Thea Foss/Wheeler-Osgood Waterways & NPDES Stormwater Monitoring Program

Event: Storm Event – Jan. 8, 2024

INTRODUCTION

This report summarizes the storm event sampled on 1/7/2024-1/9/2024 by the City of Tacoma Environmental Services Collection System Support staff as part of our stormwater monitoring program. This report includes a summary of the following:

- Storm characteristics and criteria;
- Sampling activities;
- Flow characteristics at each sampling location;
- Pacing – set for a .89" event, actual event was .92"

This event met the sampling criteria for precipitation as specified in the Thea Foss Sampling and Analysis Plan (SAP).

DESCRIPTION OF SAMPLING ACTIVITES

Samplers placed in the field on 1/7/2024. During sampler installation the weather conditions were overcast. All samplers were retrieved on 1/9/2024 (For site specific details, see Appendix A for field notes, Chain of Custody (COC) forms, and event hydrographs).

The following unusual observations were noted during the sampling event:

Table 2: Composite Sampling Activities

Sample Location	Site Deployed	Sample Accepted	Pacing (gal)	Enables LVL(ft), VEL(fps) COND.(mS/cm)	Comments
Outfall 230A	No	N/A	N/A	N/A	N/A
Outfall 235	No	N/A	N/A	N/A	N/A
Outfall 237ANew	No	N/A	N/A	N/A	N/A
Outfall 237B	No	N/A	N/A	N/A	N/A
Outfall 243	Yes	Yes	10 min.	< 4.0 mS/cm	47 Aliquots Collected / 47 Composited
Outfall 245	No	N/A	N/A	N/A	N/A
Outfall 254	No	N/A	N/A	N/A	N/A

**QC, QUALITY CONTROL*
ND, NO DATA
NA, NOT APPLICABLE

WATER QUALITY DATA

Accepted samples were analyzed for the target parameters specified in the SAP and QAPP. Samples accepted at all Outfalls were composited and preserved within 24 hours of the last aliquot being collected. The samples were allowed to sit for a minimum of 18 hours before metals analysis was started.

EQUIPMENT INFORMATION

Samples were collected using ISCO 6712 portable auto samplers. Rain data was collected using an ISCO 674 rain gauge located at the Center for Urban Waters at 326 East D Street, Tacoma, WA 98421.

CORRECTIVE ACTIONS AND DEVIATIONS

There were no deviations from the field procedures as discussed in the SAP other than those discussed above/below. No other criteria or procedures as indicated in the SAP were compromised except for those discussed above/below.

Enclosures: The ISCO program setting/sampling results report, the sample collection chain of custody form, and field records are in Appendix A for each outfall. This includes the following information for the samples collected:

- Plot of flow hydrograph and hyetograph
- Subsample times and conductivities
- Tidal windows
- Field activities

Appendix A

Notebook No.
Continued from Page

Storm Deployment - 1/4/24 .47 precipitation

254 @ 14:26 - Jars/Ice - Download

245 @ 14:35 - Jars/Ice - Download
243 @ 14:45 - Jars/Ice - Download - Battery Change -
237A @ 14:56 - Jars/Ice - Download - 400,000
237B @ 15:01 - Jars/Ice - Download - 460,000
235 @ 15:12 - Jars/Ice - Download - 50,000
230A @ 15:21 - Jars/Ice - Download = 81,000

Storm Collection - 1/7/24
254 @ 9:40 - Jars/Ice - 12/12 - Download
245 @ 9:48 - 4½/12 - Download
243 @ 9:58 - ½/12 - Download
237A @ 10:07 - 4/12 - Download
237B @ 10:12 - 6/12 - Download
235 @ 10:23 - 8/12 - Download
230A @ 10:35 - 6/12 - Download

Storm Deployment - 1/7/24
243 @ 9:58 - Jars/Ice - Download - Changed Cond. to 4 m/km

Grabs - 1/8/24

254 @ 11:10 am - QC
245 @ 11:20
243 @ 11:30
237A @ 11:45
237B @ 11:55
235 @ 12:10
230A @ 12:20
BBJ @ 11:00 - add to app*

Continued on Page

Read and Understood By

Signed Date Signed Date

PROJECT ____________ Notebook No. ______ 31

Continued from Page ____

Storm Collection - 1/9/24

243 - @ - 15:53 - ~~11~~/12 - Download

Storm Deployment - 1/20/24 1.16"

- 245 @ 8:55 - Jars/Ice
- 237A @ 9:02 - Jars/Ice - ~~869,000~~ 652,000
- 237B @ 9:08 - Jars/Ice - ~~720,000~~ 900,000
- 235 @ 9:12 - Jars/Ice - 78,000 - Battery change
- 230A @ 9:20 - Jars/Ice - 131,000

Storm Collection - 1/23/24

- 245 @ 9:24 - 12/12
- 237A @ 9:34 - ~~11/12~~ 10½/12
- 237B @ 9:41 - 12/12
- 235 @ 9:50 - 10¾/12
- 230A @ 9:58 - 10/12

Re

Storm Deployment - 2/14/24

254 @ 10:09 - Jars/Ice - Replaced Battery - Reconnected Sonde - Download
245 @ 10:34 - Jars/Ice - Download
243 @ 10:47 - Jars/Ice - Download - Spec. = 3.2
237A @ 11:00 - Jars/Ice - Download - Pacing = 166,000 enable = >6.5 fps + .4 ft
23B @ 11:08 - Jars/Ice - Download - Pacing = 208,000 enable = .7 ft
238 @ 11:26 - Jars/Ice - Download - Pacing = 14,000
230A @ 11:50 - Jars/Ice - Download - Pacing = 30,000 - Calibration

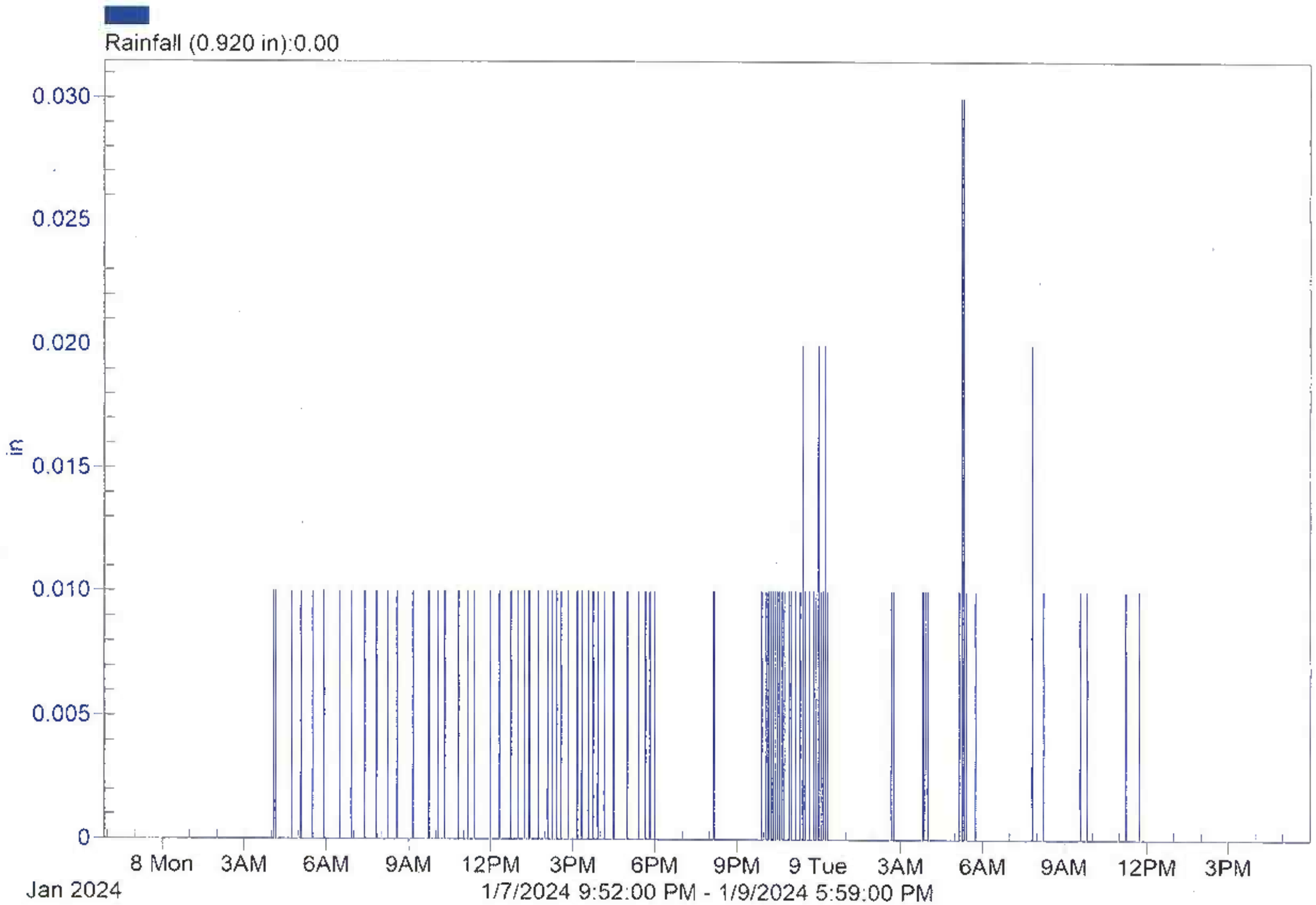
Continued on Page

Read and Understood By

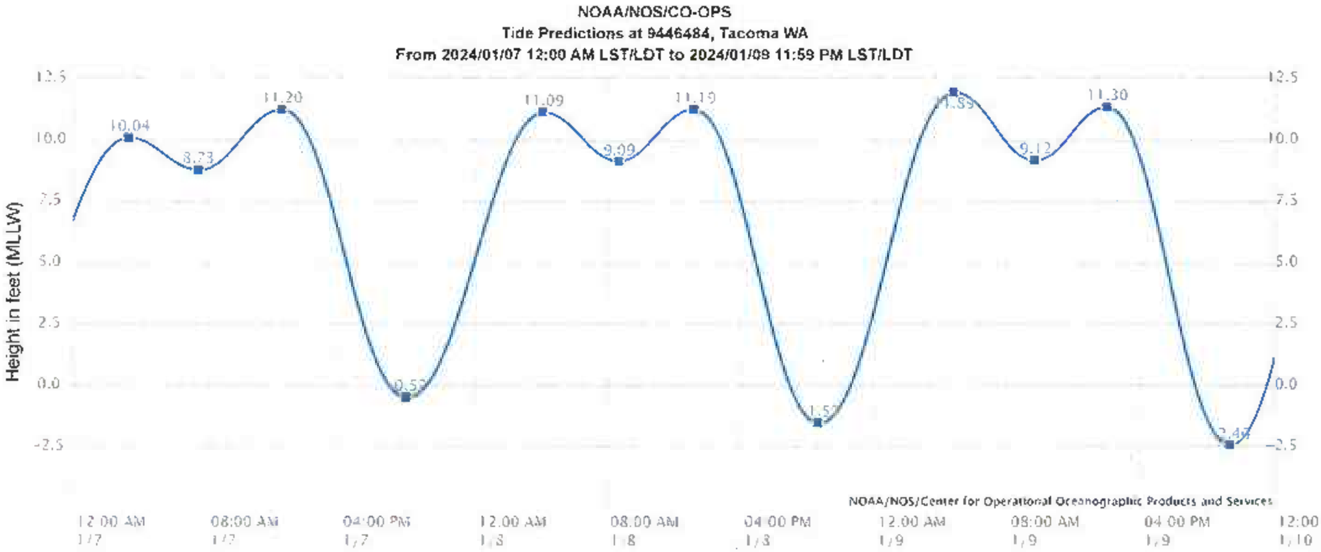
Signed ____ Date ____ Signed ____ Date ____

RF1

Flowlink 5



Help Print



Note: The interval is High/Low, the solid blue line depicts a curve fit between the high and low values and approximates the segments between.
Disclaimer: These data are based upon the latest information available as of the date of your request, and may differ from the published tide tables.

High/Low Tide Prediction Data Listing

Station Name: Tacoma, WA
Action: Daily
Product: Tide Predictions
Start Date & Time: 2024/1/7 12:00 AM
End Date & Time: 2024/1/9 11:59 PM

Source: NOAA/NOS/CO-OPS
Prediction Type: Harmonic
Datum: MLLW
Height Units: Feet
Time Zone: LST/LDT

Date	Day	Time	Hgt	Time	Hgt	Time	Hgt	Time	Hgt
2024/01/07	Sun	03:14 AM	10.04 H	07:25 AM	8.73 L	12:28 PM	11.20 H	7:59 PM	-0.52 L
2024/01/08	Mon	04:05 AM	11.09 H	08:42 AM	9.09 L	1:11 PM	11.19 H	8:41 PM	-1.57 L
2024/01/09	Tue	04:45 AM	11.89 H	09:39 AM	9.12 L	1:56 PM	11.30 H	9:25 PM	-2.46 L

2312055-01

Bottle Certification

Bottle Certification

*** DEFAULT CONTAINER ***

NPDES Storm

Chain of Custody

Outfall: 243 Date/Time sampler installed: 1/8/24 @ 9:58

Jar Cert # ______ Sampling Crew: CA

Filter lot # 1375252 Weather conditions: Clear Date/Time sampler pickup: 1/9/24 @ 15:53

Observed activities in area: N/A

Observations during sampler collection: N/A

Color, Odors, sheens: N/A

Type of Sample: ☑ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☑ >0.2 inches rain ☐ <0.02 inches of rain previous 24 hours

Samplers: ☑ Data downloaded ☒ Sample bottles marked

☑ Ice Present at pick-up ☒ Tubing Decon 1000mL DI water

☑ Caps on containers

Fill to...	Parameters:	Sample	QC
Neck	PAH's/Phthalates (1L) +	☒	☐ ☐
No head	*Total Mercury (125/250mL QC)	☒	☐
No head	*Diss Mercury (125/250mL QC)	☒	☐
Shoulder	Total Metals (250mL)	☒	
Shoulder	Diss Metals (125mL)	☒	
Shoulder	TSS (1L), (500 mL min)	☒	
Shoulder	Nutrients (250mL)	☒	
Shoulder	Ortho-P (125mL), (75min)	☒	
Shoulder	BOD (1L)	☒	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☒	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes 4.010 L config above

+1000 mL for QC per bottle, must submit 2 extra bottles

[1]If 250ml bottle used, then QAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (uS)
1	1000	☒	5530
2	↓	☒	5310
3		☒	4630
4		☒	3570
5		☒	2065
6		☒	1658
7		☒	1512
8		☒	2319
9		☒	3930
10		☒	6230
11		☒	1249
12	750	☒	5730

Total aliquots: 47

Sample Prep

Date/Time: 1/9/24 @ 16:25

Initial: CA, RG

pH: 6.31

COND (µS): 4443 us

Lab #: 2401017-05

Aliquots composited: 47

Deviations :

Composite End Time: 1/9/24 @ 11:50

(Collect Time) Last aliquot in composite

Relinquished by: [signature] Received by: Cooler

Date/Time: 1/9/24 @ 16:35 Date/Time: 1/9/24 16:35

243

Flowlink 5

Level (49.78 in):6.83

Flow (526.15 gal):0.00

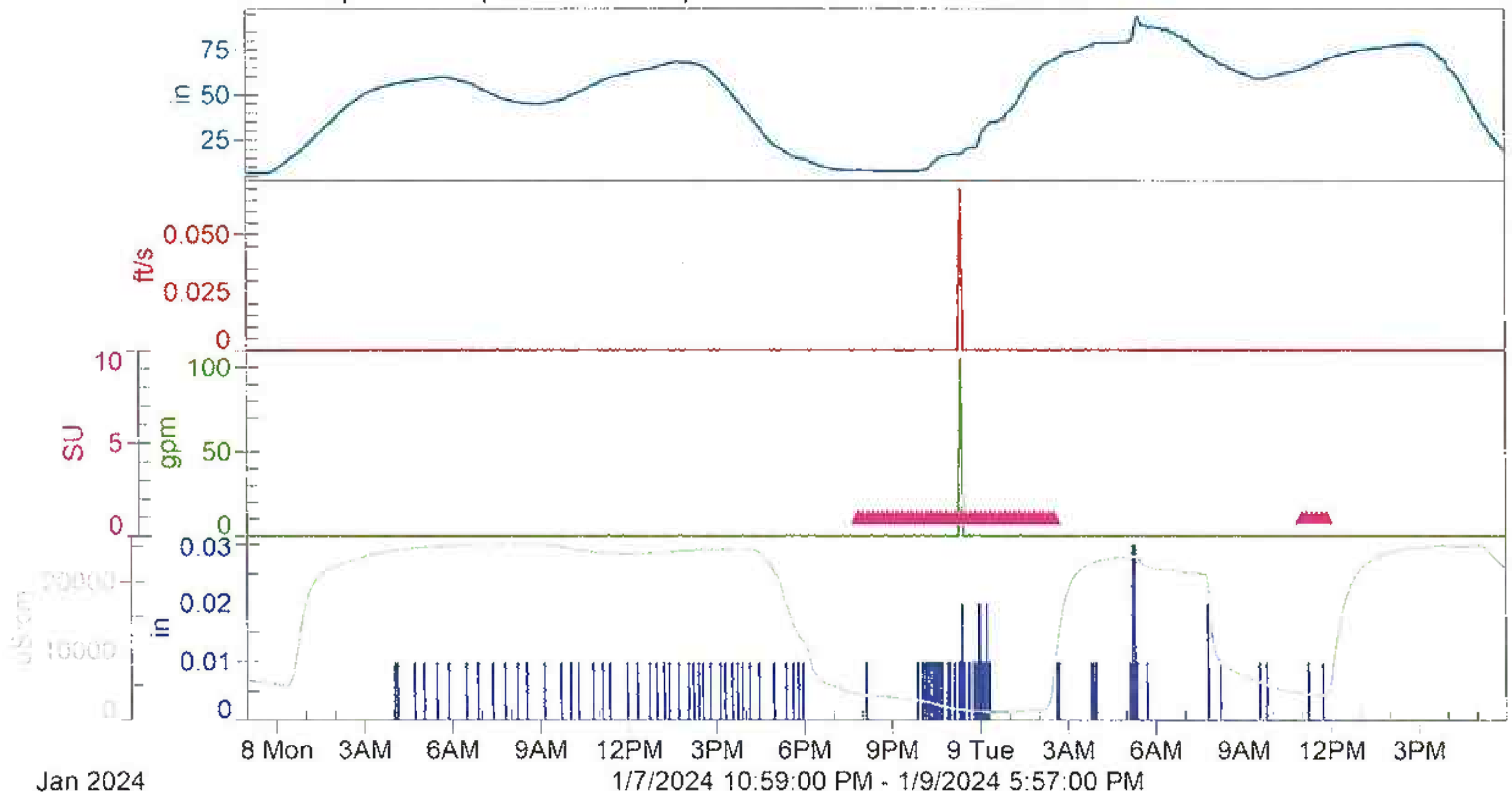
Rainfall (0.920 in):0.00

Spec Cond0 (16627.84 uS/cm):5724.00

Velocity (0.000136 ft/s):0.00

Sample Event (47 SU):

Rainfall (0.000 in):



```
SAMPLER ID# 1242893352  15:49  9-JAN-24
  Hardware:     A1  Software: 2.33
*********** PROGRAM SETTINGS ***********
     ----------
   PROGRAM NAME:
    "STORM 1   "
 SITE DESCRIPTION:
    "  243     "
     ----------
   UNITS SELECTED:
     LENGTH: ft
CONDUCTIVITY: mS/cm
  TEMPERATURE:  F
     ----------
   UNITS SELECTED:
   FLOW RATE: gpm
 FLOW VOLUME: Mgal
   VELOCITY: fps
     ----------
  AREA-VEL MODULE:
   AREA*VELOCITY
     ROUND PIPE

     ----------

      5 MINUTE
   DATA INTERVAL

     ----------
  12,  1000 ml BTLS
 17 ft SUCTION LINE
 AUTO SUCTION HEAD
1 RINSES, 1 RETRIES
     ----------

  ONE-PART PROGRAM


     ----------
      PACING:
    TIME, EVERY
 0 HOURS, 10 MINUTES

     ----------
    DISTRIBUTION:
   4 SAMPLES/BOTTLE


     ----------
```

VOLUME:

250 ml SAMPLES

ENABLE:

SP_CO0 <4.000 mS/cm

ENABLE:

REPEATABLE ENABLE

NO SAMPLE AT DISABLE

NO SAMPLE AT ENABLE

ENABLE:

COUNTDOWN IS STOPPED

WHILE DISABLED

ENABLE:

0 PAUSE & RESUMES

NO DELAY TO START

LIQUID DETECT ON

QUICK VIEW/CHANGE

TAKE MEASUREMENTS

AT STORAGE INTERVAL

DUAL SAMPLER OFF

BTL FULL DETECT OFF

TIMED BACKLIGHT

EVENT MARK SENT

DURING PUMP CYCLE

PUMP COUNTS FOR
EACH PURGE CYCLE:
200 PRE-SAMPLE
AUTO POST-SAMPLE

NO PERIODIC
SERIAL OUTPUT

INTERROGATOR
CONNECTOR
POWER ALWAYS ON

NO RAIN GAUGE

SDI-12 DATA:
01DATA0 02DATA0
TEMP0 SP_CO0 05DATA0

I/O1= NONE
I/O2= NONE
I/O3= NONE

----

0 ANALOG OUTPUTS

NO EXTERNAL MODEM

NO ALARM
CONDITIONS SET

```
     ----------
     ----------
----------------------------------------


SAMPLER ID# 1242893352  15:50  9-JAN-24
  Hardware:     A1  Software: 2.33
*********** SAMPLING RESULTS ***********
   SITE:   243
PROGRAM: STORM 1
Program Started at 10:00 SU  7-JAN-24
Nominal Sample Volume =  250 ml
                                   COUNT
                                      TO
SAMPLE  BOTTLE TIME  SOURCE ERROR LIQUID
------- ------ ----      -- --    ------
               10:00  PGM DISABLED
------------- MO 08-JAN-24 -------------
               19:40  PGM ENABLED
  1,4     1    19:50       T         446
  2,4     1    20:00       T         447
  3,4     1    20:10       T         447
  4,4     1    20:20       T         447
  1,4     2    20:30       T         450
  2,4     2    20:40       T         451
  3,4     2    20:50       T         451
  4,4     2    21:00       T         452
  1,4     3    21:10       T         452
  2,4     3    21:20       T         451
  3,4     3    21:30       T         453
  4,4     3    21:40       T         452
  1,4     4    21:50       T         451
  2,4     4    22:00       T         453
  3,4     4    22:10       T         453
  4,4     4    22:20       T         453
  1,4     5    22:30       T         449
  2,4     5    22:40       T         447
  3,4     5    22:50       T         452
  4,4     5    23:00       T         452
  1,4     6    23:10       T         452
  2,4     6    23:20       T         450
  3,4     6    23:30       T         450
  4,4     6    23:40       T         447
  1,4     7    23:50       T         447
------------- TU 09-JAN-24 -------------
  2,4     7    00:00       T         443
  3,4     7    00:10       T         441
  4,4     7    00:20       T         441
```

1,4	8	00:30	T	438
2,4	8	00:40	T	439
3,4	8	00:50	T	440
4,4	8	01:00	T	436
1,4	9	01:10	T	433
2,4	9	01:20	T	434
3,4	9	01:30	T	432
4,4	9	01:40	T	427
1,4	10	01:50	T	425
2,4	10	02:00	T	426
3,4	10	02:10	T	424
4,4	10	02:20	T	425
1,4	11	02:30	T	423
		02:31	PGM DISABLED	
		10:50	PGM ENABLED	
2,4	11	11:00	T	416
3,4	11	11:10	T	420
4,4	11	11:20	T	422
1,3	12	11:30	T	422
2,3	12	11:40	T	422
3,3	12	11:50	T	420
		11:55	PGM DISABLED	
		15:45	MANUAL PAUSE	
		15:47	MANUAL RESUME	

SOURCE T ==> TIME

FIELD REPORT

Project: Thea Foss/Wheeler-Osgood Waterways & NPDES Stormwater Monitoring Program

Event: Storm Event – Jan. 20, 2024

INTRODUCTION

This report summarizes the storm event sampled on 1/20/2024-1/23/2024 by the City of Tacoma Environmental Services Collection System Support staff as part of our stormwater monitoring program. This report includes a summary of the following:

- Storm characteristics and criteria;
- Sampling activities;
- Flow characteristics at each sampling location;
- Pacing – set for a 1.16" event, actual event was 1.31"

This event met the sampling criteria for precipitation as specified in the Thea Foss Sampling and Analysis Plan (SAP).

DESCRIPTION OF SAMPLING ACTIVITES

Samplers placed in the field on 1/20/2024. During sampler installation the weather conditions were overcast. All samplers were retrieved on 1/23/2024 (For site specific details, see Appendix A for field notes, Chain of Custody (COC) forms, and event hydrographs).

The following unusual observations were noted during the sampling event:

Table 2: Composite Sampling Activities

Sample Location	Site Deployed	Sample Accepted	Pacing (gal)	Enables LVL(ft), VEL(fps) COND.(mS/cm)	Comments
Outfall 230A	Yes	Yes	151,000	LVL > 0.5	39 Aliquots Collected / 39 Composited
Outfall 235	Yes	Yes	59,000	LVL > 0.37 VEL > 0.8	41 Aliquots Collected / 40 Composited
Outfall 237ANew	Yes	Yes	652,000	LVL > 0.29 VEL > 6.0	41 Aliquots Collected / 41 Composited
Outfall 237B	Yes	Yes	900,000	LVL > 1.0	48 Aliquots Collected / 48 Composited
Outfall 243	No	N/A	10 min.	N/A	N/A
Outfall 245	Yes	Yes	10 min.	> 200 gpm	48 Aliquots Collected / 48 Composited
Outfall 254	No	N/A	10 min.	N/A	N/A

**QC, QUALITY CONTROL*
ND, NO DATA
NA, NOT APPLICABLE

WATER QUALITY DATA

Accepted samples were analyzed for the target parameters specified in the SAP and QAPP. Samples accepted at all Outfalls were composited and preserved within 24 hours of the last aliquot being collected. The samples were allowed to sit for a minimum of 18 hours before metals analysis was started.

EQUIPMENT INFORMATION

Samples were collected using ISCO 6712 portable auto samplers. Rain data was collected using an ISCO 674 rain gauge located at the Center for Urban Waters at 326 East D Street, Tacoma, WA 98421.

CORRECTIVE ACTIONS AND DEVIATIONS

There were no deviations from the field procedures as discussed in the SAP other than those discussed above/below. No other criteria or procedures as indicated in the SAP were compromised except for those discussed above/below.

Enclosures: The ISCO program setting/sampling results report, the sample collection chain of custody form, and field records are in Appendix A for each outfall. This includes the following information for the samples collected:

- Plot of flow hydrograph and hyetograph
- Subsample times and conductivities
- Tidal windows
- Field activities

Appendix A

PROJECT ____

Storm Collection - 1/9/24

243 - @ - 15:53 - 12/12 - Download

RG

Storm Deployment - 1/20/24 1.16"

- 245 @ 8:55 - Jars/Ice
- 237A @ 9:02 - Jars/Ice - ~~869,000~~ 652,000
- 237B @ 9:08 - Jars/Ice - ~~720,000~~ 900,000
- 235 @ 9:12 - Jars/Ice - ~~78,000~~ - Battery change 59,000
- 230A @ 9:20 - Jars/Ice - 131,000

Storm Collection - 1/23/24 1.31"

- 245 @ 9:24 - 12/12
- 237A @ 9:34 - ~~11/12~~ 10¼/12
- 237B @ 9:41 - 12/12
- 235 @ 9:50 - 10¼/12
- 230A @ 9:58 - 10/12

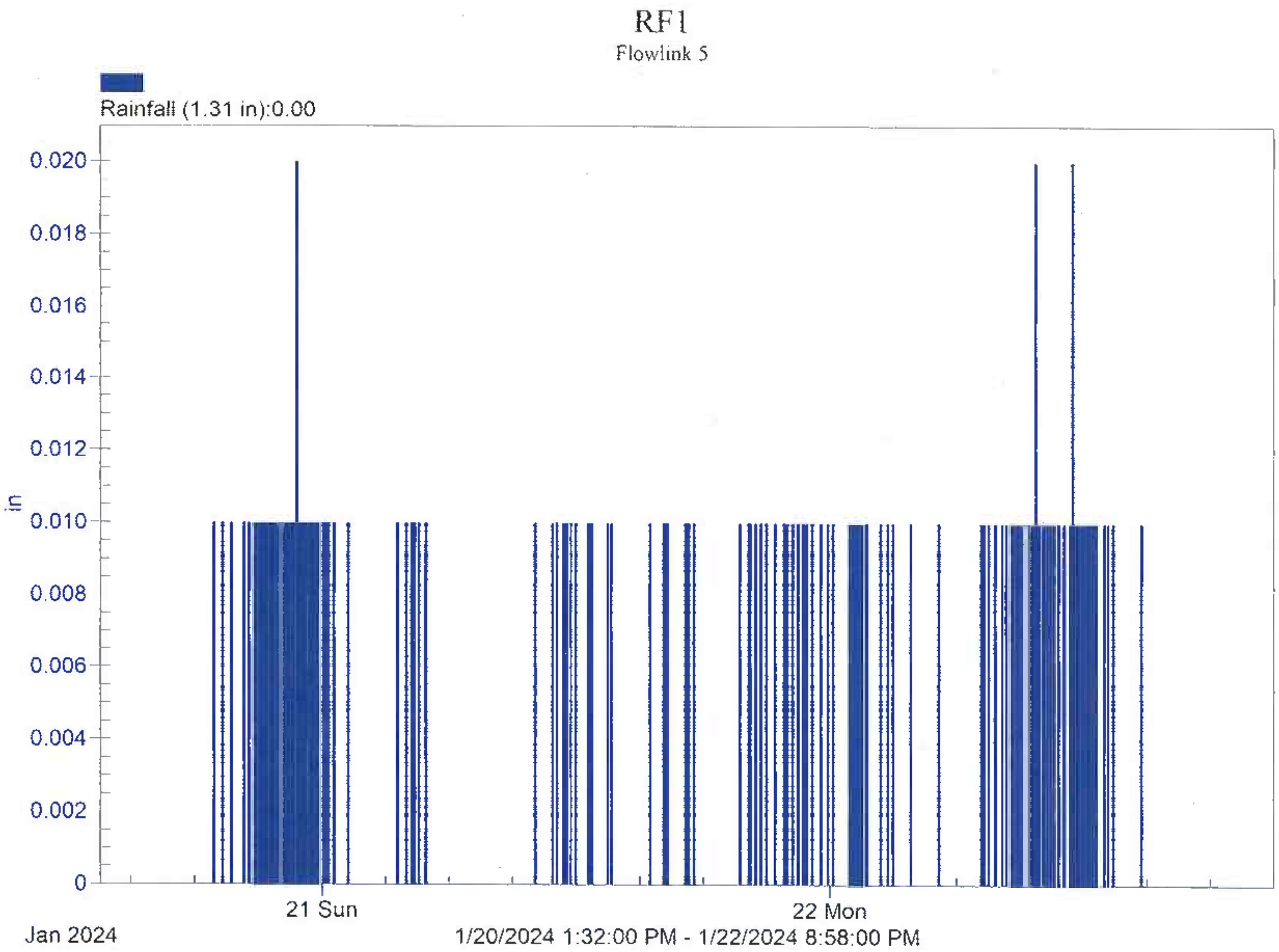
Storm Deployment - 2/14/24

254 @ 10:09 - Jars/Ice - Replaced Battery - Reconnected Sonde - Download
245 @ 10:34 - Jars/Ice - Download
243 @ 10:47 - Jars/Ice - Download - Spec. = 3.2
237A @ 11:00 - Jars/Ice - Download - Pacing = 166,000 enable = 6.5 ft³/s & .4 ft
237B @ 11:08 - Jars/Ice - Download - Pacing = 208,000 enable = .7 ft
235 @ 11:26 - Jars/Ice - Download - Pacing = 14,000
230A @ 11:50 - Jars/Ice - Download - Pacing = 30,000 - Calibration RG

Continued on Page ____

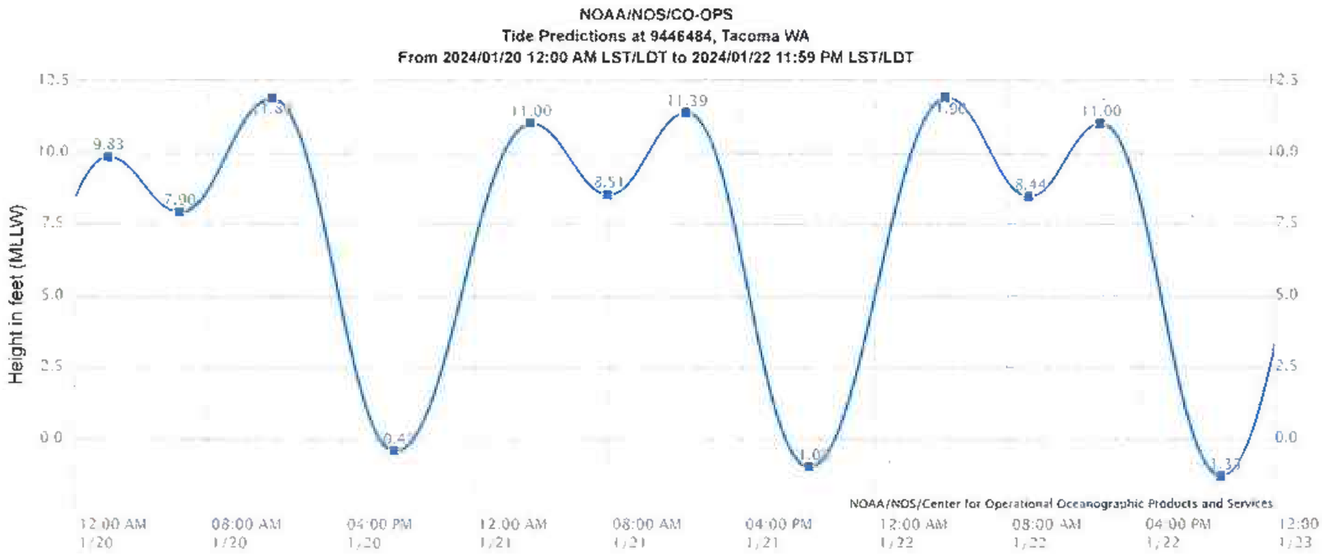
Read and Understood By

Signed ____ Date ____ Signed ____ Date ____



RF1
Flowlink 5
Rainfall (1.31 in):0.00
0.020
0.018
0.016
0.014
0.012
0.010
0.008
0.006
0.004
0.002
0
in
21 Sun
22 Mon
Jan 2024
1/20/2024 1:32:00 PM - 1/22/2024 8:58:00 PM

Help Print



Note: The interval is High/Low, the solid blue line depicts a curve fit between the high and low values and approximates the segments between.
Disclaimer: These data are based upon the latest information available as of the date of your request, and may differ from the published tide tables.

High/Low Tide Prediction Data Listing

Station Name: Tacoma, WA
Action: Daily
Product: Tide Predictions
Start Date & Time: 2024/1/20 12:00 AM
End Date & Time: 2024/1/22 11:59 PM

Source: NOAA/NOS/CO-OPS
Prediction Type: Harmonic
Datum: MLLW
Height Units: Feet
Time Zone: LST/LDT

Date	Day	Time	Hgt	Time	Hgt	Time	Hgt	Time	Hgt
2024/01/20	Sat	01:58 AM	9.83 H	06:18 AM	7.90 L	11:42 AM	11.88 H	7:12 PM	-0.45 L
2024/01/21	Sun	03:18 AM	11.00 H	07:57 AM	8.51 L	12:36 PM	11.39 H	8:03 PM	-1.00 L
2024/01/22	Mon	04:13 AM	11.90 H	09:15 AM	8.44 L	1:30 PM	11.00 H	8:50 PM	-1.33 L

2312036-01

Bottle Certification

Bottle Certification

*** DEFAULT CONTAINER ***

2312036-01

Bottle Certification

Bottle Certification

*** DEFAULT CONTAINER ***

NPDES Storm
Chain of Custody

Jar Cert #

Jar Cert #

Filter lot #

Outfall: 230A

Date/Time sampler installed: 1/20/24 @ 9:20

Sampling Crew: CA, SG

Weather conditions: Clear

Date/Time sampler pickup: 1/23/24 @ 9:58

Observed activities in area: N/A

Observations during sampler collection: N/A

Color, Odors, sheens: N/A

Type of Sample: ☑ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☑ >0.2 inches rain ☐ <0.02 inches of rain previous 24 hours

Samplers: ☑ Data downloaded ☐ ~~Sample bottles marked~~ ☑ Ice Present at pick-up ☐ Tubing Decon 1000mL DI water ☑ Caps on containers

Fill to...	Parameters:	Sample	QC
Neck	PAH's/Phthalates (1L) +	☑	☐ ☐
No head	[1]Total Mercury (125/250mL QC)	☑	☐
No head	[1]Diss Mercury (125/250mL QC)	☑	☐
Shoulder	Total Metals (250mL)	☑	
Shoulder	Diss Metals (125mL)	☑	
Shoulder	TSS (1L), (500 mL min)	☑	
Shoulder	Nutrients (250mL)	☑	
Shoulder	Ortho-P (125mL), (75min)	☑	
Shoulder	BOD (1L)	☑	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☑	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes 4.010 L config above

+1000 mL for QC per bottle, must submit 2 extra bottles

[1]If 250ml bottle used, then QAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (µS)
1	1000	☑	85.8
2		☑	72.7
3		☑	77.6
4		☑	77.3
5		☑	79.9
6		☑	62.7
7		☑	82.5
8		☑	47.7
9		☑	43.3
10	760	☑	77.7
11		☐	
12		☐	

Total aliquots: ~~40~~ 39

Sample Prep

Date/Time: 1/23/24 @ 11:34

Initial: CA, SG, RG

pH: 7.52

COND (µS): 68.3

Lab #: 2401041-01

Aliquots composited: ~~40~~ 39

Deviations: Last aliquot in bottle #10 outside storm

Composite End Time: 1/23/24 @ 2:57
(Collect Time) Last aliquot in composite

Relinquished by:

Received by:

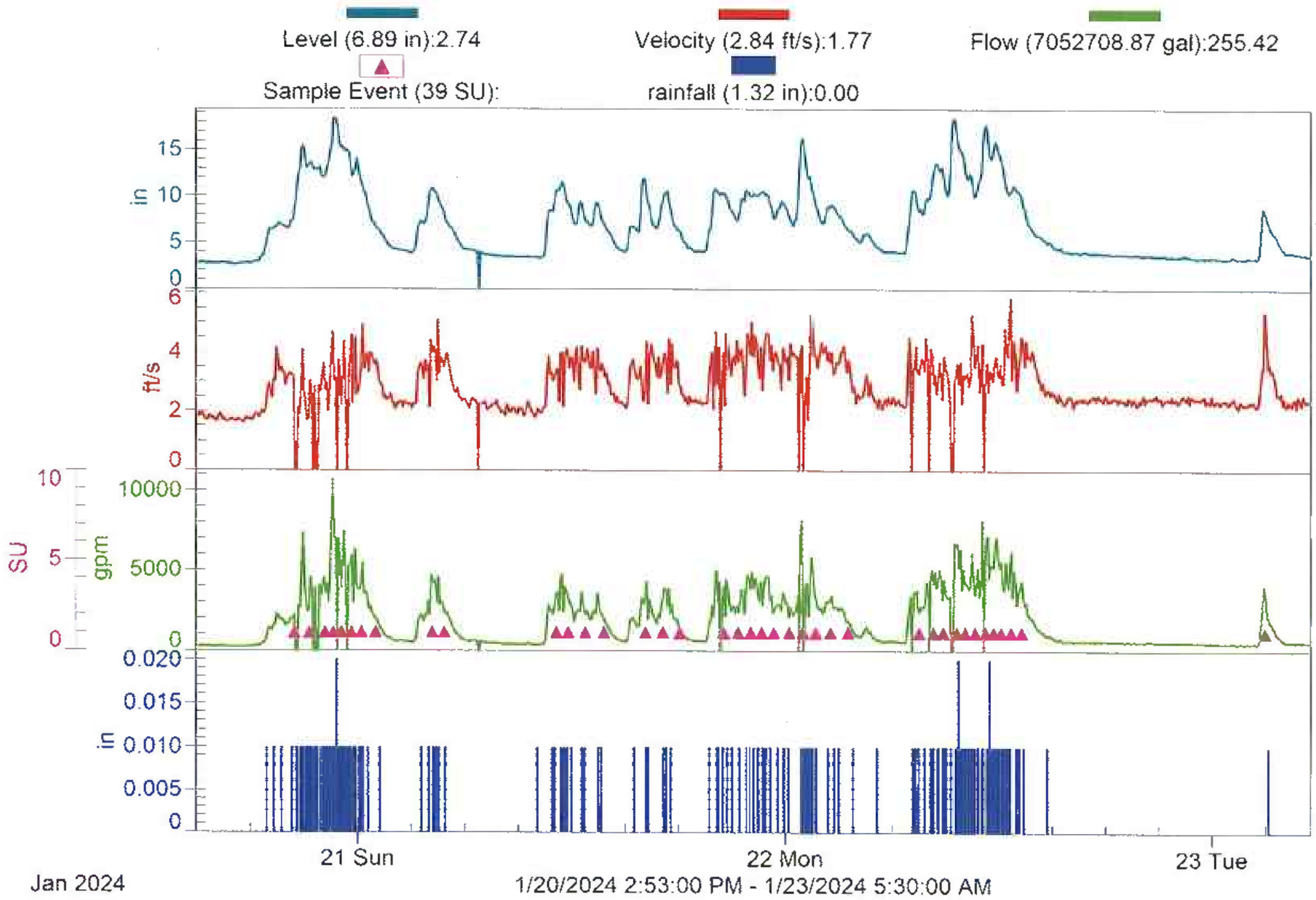
Date/Time: 1/23/24 @ 11:45

Date/Time: 1/23/24 @ 11:45

12.7°C corrected

230A

Flowlink 5



SAMPLER ID# 1481205047 09:40 23-JAN-24
Hardware: C0 Software: 3.01.0075
*********** PROGRAM SETTINGS ***********

PROGRAM NAME:
"STORM 1   "
SITE DESCRIPTION:
"230A   "

UNITS SELECTED:
LENGTH: ft

UNITS SELECTED:
FLOW RATE: gpm
FLOW VOLUME: Mgal
VELOCITY: fps

AREA-VEL MODULE:
AREA*VELOCITY
ROUND PIPE

----

5 MINUTE
DATA INTERVAL

12, 1000 ml BTLS
30 ft SUCTION LINE
AUTO SUCTION HEAD
1 RINSES, 1 RETRIES

ONE-PART PROGRAM

PACING:
FLOW, EVERY
0.151 Mgal
NO SAMPLE AT START

DISTRIBUTION:
4 SAMPLES/BOTTLE

VOLUME:

250 ml SAMPLES

ENABLE:

LEVEL >0.500 ft

ENABLE:
REPEATABLE ENABLE
NO SAMPLE AT DISABLE
NO SAMPLE AT ENABLE

ENABLE:
COUNTDOWN IS STOPPED
WHILE DISABLED

ENABLE:
0 PAUSE & RESUMES

NO DELAY TO START

144 HOURS RUN TIME

LIQUID DETECT ON

QUICK VIEW/CHANGE

TAKE MEASUREMENTS
AT STORAGE INTERVAL

DUAL SAMPLER OFF
BTL FULL DETECT OFF
TIMED BACKLIGHT

PULSED EVENT MARK
AT THE BEGINNING OF

FORWARD PUMPING

PUMP COUNTS FOR
EACH PURGE CYCLE:
100 PRE-SAMPLE
AUTO POST-SAMPLE

NO PERIODIC
SERIAL OUTPUT

NO RAIN GAUGE

NO SDI-12 SONDE

AUTO SDI-12 SCAN OFF

I/O1= NONE
I/O2= NONE
I/O3= NONE

----

0 ANALOG OUTPUTS

NO EXTERNAL MODEM

NO ALARM
CONDITIONS SET


```
SAMPLER ID# 1481205047  09:40 23-JAN-24
  Hardware:     C0  Software: 3.01.0075
*********** SAMPLING RESULTS ***********
   SITE: 230A
PROGRAM: STORM 1
Program Started at 09:03 SA 20-JAN-24
Nominal Sample Volume =  250 ml
                                   COUNT
                                      TO
SAMPLE  BOTTLE TIME  SOURCE ERROR LIQUID
------- ------ ----    -- --     ------
               09:03  PGM DISABLED
               19:00  PGM ENABLED
  1,4      1   20:25      F         1369
  2,4      1   21:16      F         1373
  3,4      1   22:10      F         1377
  4,4      1   22:38      F         1405
  1,4      2   23:05      F         1391
  2,4      2   23:39      F         1391
------------- SU 21-JAN-24 -------------
  3,4      2   00:13      F         1395
  4,4      2   01:00      F         1386
               01:20  PGM DISABLED
               03:20  PGM ENABLED
  1,4      3   04:09      F         1369
  2,4      3   04:50      F         1378
               05:25  PGM DISABLED
               10:35  PGM ENABLED
  3,4      3   11:07      F         1367
  4,4      3   11:49      F         1368
  1,4      4   12:45      F         1373
  2,4      4   13:48      F         1375
               14:10  PGM DISABLED
               15:15  PGM ENABLED
  3,4      4   16:08      F         1374
  4,4      4   17:07      F         1380
  1,4      5   18:02      F         1383
               18:10  PGM DISABLED
               19:40  PGM ENABLED
  2,4      5   20:30      F         1377
  3,4      5   21:20      F         1380
  4,4      5   22:02      F         1380
  1,4      6   22:40      F         1387
  2,4      6   23:20      F         1387
------------- MO 22-JAN-24 -------------
  3,4      6   00:12      F         1389
  4,4      6   00:59      F         1397
  1,4      7   01:39      F         1386
```

2,4	7	02:33	F	1391
3,4	7	03:31	F	1401
		03:50	PGM DISABLED	
		04:30	PGM ENABLED	
		04:40	PGM DISABLED	
		06:50	PGM ENABLED	
4,4	7	07:29	F	1374
1,4	8	08:19	F	1378
2,4	8	08:54	F	1386
3,4	8	09:39	F	1395
4,4	8	10:06	F	1383
1,4	9	10:41	F	1384
2,4	9	11:17	F	1403
3,4	9	11:43	F	1390
4,4	9	12:08	F	1390
1,3	10	12:41	F	1385
2,3	10	13:17	F	1387
		14:05	PGM DISABLED	

------------- TU 23-JAN-24 -------------

		02:45	PGM ENABLED	
3,3	10	02:57	F	1361
		03:25	PGM DISABLED	

SOURCE F ==> FLOW

2312035-01

Bottle Certification

Bottle Certification

*** DEFAULT CONTAINER ***

NPDES Storm
Chain of Custody

2312036-01

Bottle Certification

Bottle Certification

*** DEFAULT CONTAINER ***

Jar Cert #

Outfall: 235

Date/Time sampler installed: 1/20/24 @ 9:12

Jar Cert #

Sampling Crew: CA, SG

Filter lot #

Weather conditions: Clear

Date/Time sampler pickup: 1/23/24 @ 9:50

Observed activities in area: N/A

Observations during sampler collection: N/A

Color, Odors, sheens: N/A

Type of Sample: ☑ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☑ >0.2 inches rain ☐ <0.02 inches of rain previous 24 hours

Samplers: ☑ Data downloaded ☐ ~~Sample bottles marked~~

☑ Ice Present at pick-up ☐ Tubing Decon 1000mL Diwater

☑ Caps on containers

Fill to...	Parameters:	Sample	QC
Neck	PAH's/Phthalates (1L) +	☑	☐ ☐
No head	[1]Total Mercury (125/250mL QC)	☑	☐
No head	[1]Diss Mercury (125/250mL QC)	☑	☐
Shoulder	Total Metals (250mL)	☑	
Shoulder	Diss Metals (125mL)	☑	
Shoulder	TSS (1L), (500 mL min)	☑	
Shoulder	Nutrients (250mL)	☑	
Shoulder	Ortho-P (125mL), (75min)	☑	
Shoulder	BOD (1L)	☑	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☑	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes 4.010 L config above

+1000 mL for QC per bottle, must submit 2 extra bottles

[1]If 250ml bottle used, thenQAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (uS)
1	1000	☑	138.1
2		☑	75.2
3		☑	72.4
4		☑	151.9
5		☑	121.4
6		☑	101.0
7		☑	77.4
8		☑	67.9
9		☑	69.7
10		☑	238.4
11	250	☐	373
12		☐	

Total aliquots: 41

Sample Drop

Date/Time: 1/23/24 @ 11:22

Initial: CA, SG, RG

pH: 7.27

COND (µS): 108.4

Lab #: 2401041-02

Aliquots composited: 40

Deviations: ~~Last aliquot in bottle #10 outside storm~~ CA

Composite End Time: 1/22/24 @ 22:21

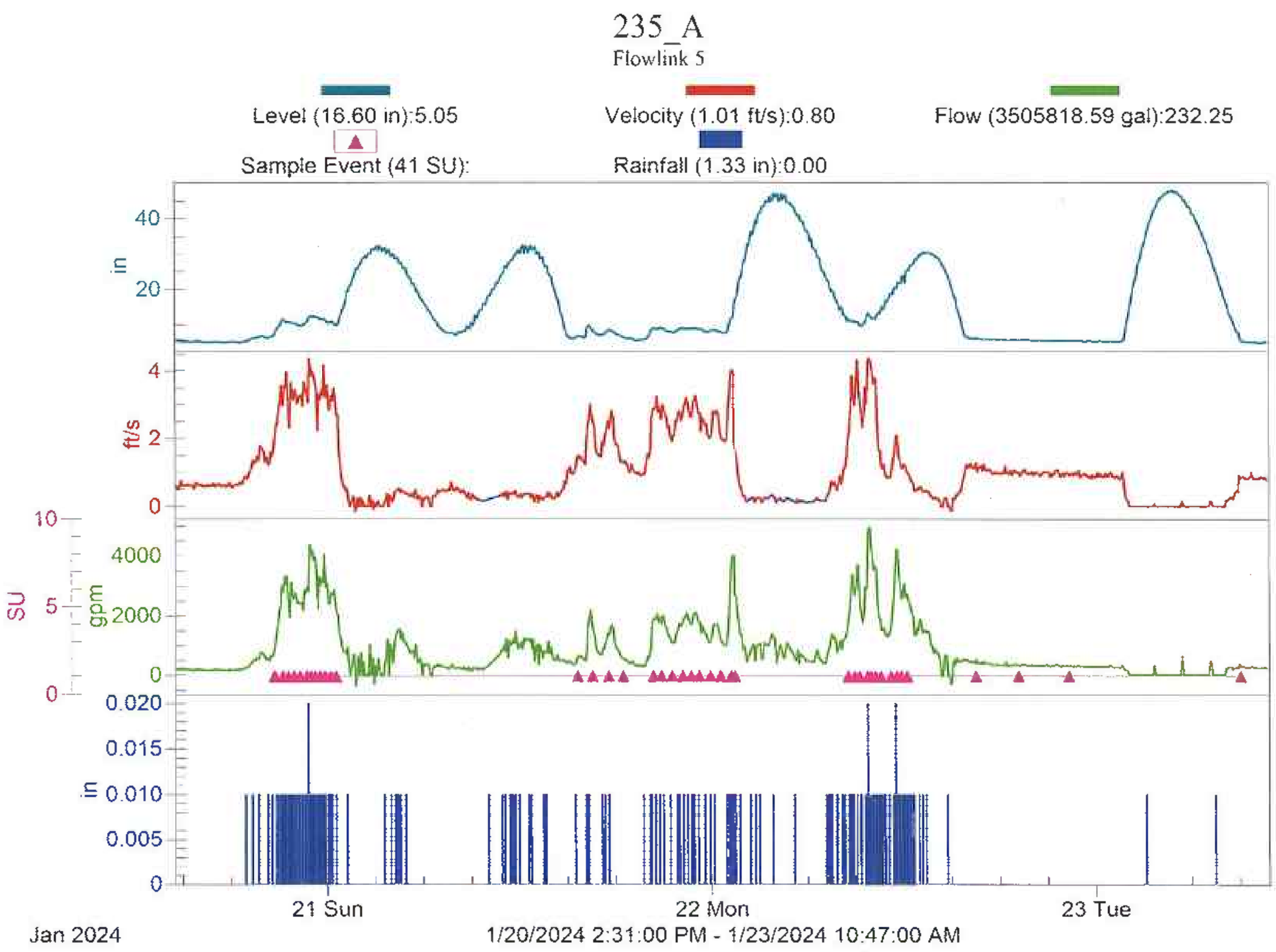
(Collect Time) Last aliquot in composite

Relinquished by: [signature]

Received by: [signature]

Date/Time: 1/23/24 @ 11:45

Date/Time: 1/23/24 @ 11:45



235_A
Flowlink 5
Level (16.60 in):5.05
Velocity (1.01 ft/s):0.80
Flow (3505818.59 gal):232.25
Sample Event (41 SU):
Rainfall (1.33 in):0.00
in
40
20
ft/s
4
2
0
SU
10
5
0
gpm
4000
2000
0
in
0.020
0.015
0.010
0.005
0
21 Sun
22 Mon
23 Tue
Jan 2024
1/20/2024 2:31:00 PM - 1/23/2024 10:47:00 AM

SAMPLER ID# 1242995716 09:51 23-JAN-24
Hardware: A1 Software: 2.33
*********** PROGRAM SETTINGS ***********

PROGRAM NAME:
"235A   "
SITE DESCRIPTION:
"235A ST   "

UNITS SELECTED:
LENGTH: ft

UNITS SELECTED:
FLOW RATE: gpm
FLOW VOLUME: gal
VELOCITY: fps

AREA-VEL MODULE:
AREA*VELOCITY
ROUND PIPE

----

5 MINUTE
DATA INTERVAL

12, 1000 ml BTLS
56 ft SUCTION LINE
AUTO SUCTION HEAD
1 RINSES, 1 RETRIES

ONE-PART PROGRAM

PACING:
FLOW, EVERY
59000 gal
NO SAMPLE AT START

DISTRIBUTION:
4 SAMPLES/BOTTLE

VOLUME:

250 ml SAMPLES

ENABLE:
LEVEL >0.370 ft
AND
VEL > 0.80 fps

ENABLE:
REPEATABLE ENABLE
NO SAMPLE AT DISABLE
NO SAMPLE AT ENABLE

ENABLE:
COUNTDOWN IS STOPPED
WHILE DISABLED

ENABLE:
0 PAUSE & RESUMES

NO DELAY TO START

200 HOURS RUN TIME

LIQUID DETECT ON

QUICK VIEW/CHANGE

TAKE MEASUREMENTS
AT STORAGE INTERVAL

DUAL SAMPLER OFF
BTL FULL DETECT OFF
TIMED BACKLIGHT

EVENT MARK SENT

DURING PUMP CYCLE

PUMP COUNTS FOR
EACH PURGE CYCLE:
100 PRE-SAMPLE
AUTO POST-SAMPLE

NO PERIODIC
SERIAL OUTPUT

INTERROGATOR
CONNECTOR
POWER ALWAYS ON

NO RAIN GAUGE

NO SDI-12 SONDE

AUTO SDI-12 SCAN OFF

I/O1= NONE
I/O2= NONE
I/O3= NONE

----

0 ANALOG OUTPUTS

NO EXTERNAL MODEM

NO ALARM
CONDITIONS SET

```
     ----------
     ----------
-----------------------------------------


SAMPLER ID# 1242995716  09:51 23-JAN-24
  Hardware:     A1  Software: 2.33
*********** SAMPLING RESULTS ***********
   SITE: 235A ST
PROGRAM: 235A
Program Started at 09:13 SA 20-JAN-24
Nominal Sample Volume =  250 ml
                                  COUNT
                                     TO
SAMPLE  BOTTLE TIME  SOURCE ERROR LIQUID
------- ------ ----      -- --    ------
              09:13  PGM DISABLED
              18:50  PGM ENABLED
  1,4      1  20:43        F         1907
  2,4      1  21:15        F         1877
  3,4      1  21:34        F         1893
  4,4      1  21:56        F         1897
  1,4      2  22:19        F         1898
  2,4      2  22:43        F         1891
  3,4      2  23:01        F         1910
  4,4      2  23:15        F   NL       *
  1,4      3  23:34        F         1979
  2,4      3  23:52        F         1960
------------- SU 21-JAN-24 ------------
  3,4      3  00:12        F         1937
  4,4      3  00:33        F         1937
              01:00  PGM DISABLED
              15:00  PGM ENABLED
  1,4      4  15:38        F         1885
  2,4      4  16:34        F         1889
  3,4      4  17:35        F         1892
  4,4      4  18:29        F         1901
  1,4      5  20:22        F         1887
  2,4      5  20:53        F         1897
  3,4      5  21:32        F         1903
  4,4      5  22:12        F         1901
  1,4      6  22:43        F         1899
  2,4      6  23:13        F         1901
  3,4      6  23:55        F         1903
------------- MO 22-JAN-24 ------------
  4,4      6  00:33        F         1905
  1,4      7  01:13        F         1886
  2,4      7  01:29        F         1893
```

		01:40	PGM DISABLED	
		08:00	PGM ENABLED	
		08:05	PGM DISABLED	
		08:10	PGM ENABLED	
3,4	7	08:31	F	2064
4,4	7	08:54	F	1895
1,4	8	09:13	F	1913
2,4	8	09:43	F	1909
3,4	8	09:56	F	1908
4,4	8	10:11	F	1916
1,4	9	10:32	F	1907
2,4	9	11:11	F	1879
3,4	9	11:33	F	2835
4,4	9	11:49	F	1907
1,4	10	12:11	F	1915
		12:25	PGM DISABLED	
		15:45	PGM ENABLED	
2,4	10	16:32	F	1891
3,4	10	19:12	F	1888
4,4	10	22:21	F	1879
-------------	TU 23-JAN-24 -------------			
		01:45	PGM DISABLED	
		09:00	PGM ENABLED	
1,1	11	09:05	F	1875

SOURCE F ==> FLOW
ERROR NL ==> NO LIQUID DETECTED!

2312035-01

Bottle Certification

Bottle Certification

*** DEFAULT CONTAINER ***

NPDES Storm
Chain of Custody

Outfall: 237A

Date/Time sampler installed: 1/20/24 @ 9:02

Jar Cert #

Sampling Crew: CA, SG

Filter lot # 1375252

Weather conditions: Clear

Date/Time sampler pickup: 1/23/24 @ 9:34

Observed activities in area: N/A

Observations during sampler collection: N/A

Color, Odors, sheens: N/A

Type of Sample: ☑ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☑ >0.2 inches rain ☐ <0.02 inches of rain previous 24 hours

Samplers: ☑ Data downloaded ☐ ~~Sample bottles marked~~

☑ Ice Present at pick-up ☐ Tubing Decon 1000mL Diwater

☑ Caps on containers

Fill to...	Parameters:	Sample	QC
Neck	PAH's/Phthalates (1L) +	☑	☑ ☑
No head	[1]Total Mercury (125/250mL QC)	☑	☐
No head	[1]Diss Mercury (125/250mL QC)	☑	☐
Shoulder	Total Metals (250mL)	☑	
Shoulder	Diss Metals (125mL)	☑	
Shoulder	TSS (1L), (500 mL min)	☑	
Shoulder	Nutrients (250mL)	☑	
Shoulder	Ortho-P (125mL), (75min)	☑	
Shoulder	BOD (1L)	☑	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☑	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes 4.010 L config above

+1000 mL for QC per bottle, must submit 2 extra bottles

[1]If 250ml bottle used, thenQAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (µS)
1	1000	☑	120.2
2		☑	91.9
3		☑	214.0
4		☑	184.1
5		☑	197.1
6		☑	137.8
7		☑	131.3
8		☑	74.0
9		☑	76.3
10		☑	200.6
11	250	☑	329
12		☐	

Total aliquots: 41

Sample Prep

Date/Time: 1/23/24 @ 11:06

Initial: CA, RG, SG

pH: 7.32

COND (µS): ~~141.2~~ CA 141.2

Lab #: 2401041-03

Aliquots composited: 41

Deviations : Bottle #11 outside storm

Composite End Time: 1/22/24 @ 22:44

(Collect Time) Last aliquot in composite

Relinquished by: [signature]

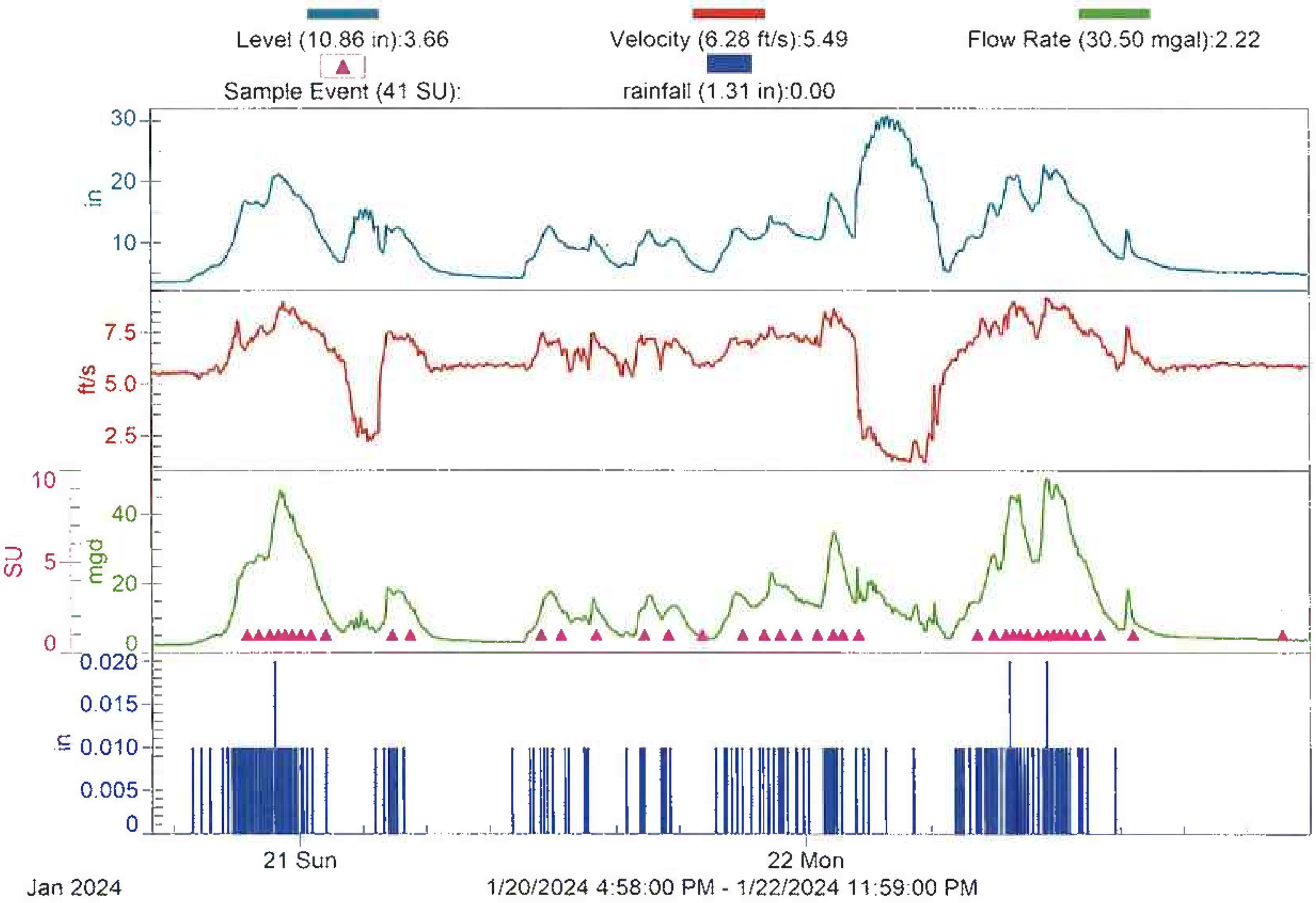
Received by: [signature]

Date/Time: 1/23/24 @ 11:45

Date/Time: 1/23/24 @ 11:45

237A New 2150

Flowlink 5



SAMPLER ID# 1245320993 09:27 23-JAN-24
Hardware: A1 Software: 2.33
*********** PROGRAM SETTINGS ***********

PROGRAM NAME:
"237ANEW "
SITE DESCRIPTION:
"237ANEW "

UNITS SELECTED:
LENGTH: ft

12, 1000 ml BTLS
21 ft SUCTION LINE
AUTO SUCTION HEAD
1 RINSES, 1 RETRIES

ONE-PART PROGRAM

PACING:
FLOW, EVERY
1 PULSES
NO SAMPLE AT START

DISTRIBUTION:
4 SAMPLES/BOTTLE

VOLUME:

250 ml SAMPLES

ENABLE:

NONE PROGRAMMED

ENABLE:
REPEATABLE ENABLE
NO SAMPLE AT DISABLE
NO SAMPLE AT ENABLE

ENABLE:
COUNTDOWN IS STOPPED
WHILE DISABLED

ENABLE:
0 PAUSE & RESUMES

NO DELAY TO START

200 HOURS RUN TIME

LIQUID DETECT ON

QUICK VIEW/CHANGE

TAKE MEASUREMENTS
AT STORAGE INTERVAL

DUAL SAMPLER OFF
BTL FULL DETECT OFF
TIMED BACKLIGHT

EVENT MARK SENT
DURING PUMP CYCLE

PUMP COUNTS FOR
EACH PURGE CYCLE:
400 PRE-SAMPLE
400 POST-SAMPLE

NO PERIODIC
SERIAL OUTPUT

INTERROGATOR
CONNECTOR

POWER ALWAYS ON

NO RAIN GAUGE

NO SDI-12 SONDE

AUTO SDI-12 SCAN OFF

I/O1= NONE
I/O2= NONE
I/O3= NONE

----

0 ANALOG OUTPUTS

NO EXTERNAL MODEM

NO ALARM
CONDITIONS SET

SAMPLER ID# 1245320993 09:28 23-JAN-24
Hardware: A1 Software: 2.33
*********** SAMPLING RESULTS ***********
SITE: 237ANEW
PROGRAM: 237ANEW
Program Started at 10:04 SA 20-JAN-24
Nominal Sample Volume = 250 ml
COUNT
TO

SAMPLE	BOTTLE	TIME	SOURCE	ERROR	LIQUID
		10:04	PGM ENABLED		
1,4	1	21:30	F		525
2,4	1	22:03	F		531
3,4	1	22:35	F		528
4,4	1	23:00	F		522
1,4	2	23:19	F		519
2,4	2	23:40	F		523
SU 21-JAN-24					
3,4	2	00:04	F		520
4,4	2	00:33	F		522
1,4	3	01:15	F		527
2,4	3	04:24	F		534
3,4	3	05:16	F		537
4,4	3	11:27	F		543
1,4	4	12:24	F		538
2,4	4	14:04	F		538
3,4	4	16:22	F		537
4,4	4	17:31	F		534
1,4	5	19:06	F		543
2,4	5	21:02	F		533
3,4	5	22:03	F		534
4,4	5	22:49	F		533
1,4	6	23:36	F		533
MO 22-JAN-24					
2,4	6	00:35	F		530
3,4	6	01:21	F		524
4,4	6	01:48	F		529
1,4	7	02:33	F		531
2,4	7	08:13	F		537
3,4	7	08:58	F		531
4,4	7	09:32	F		531
1,4	8	09:54	F		514
2,4	8	10:14	F		519
3,4	8	10:36	F		523
4,4	8	11:07	F		519
1,4	9	11:32	F		519
2,4	9	11:50	F		520
3,4	9	12:09	F		519
4,4	9	12:28	F		518
1,4	10	12:52	F		525
2,4	10	13:22	F		528
3,4	10	14:02	F		531
4,4	10	15:36	F		533
1,1	11	22:44	F		534

SOURCE F ==> FLOW

2312035-01

Bottle Certification

Bottle Certification

*** DEFAULT CONTAINER ***

NPDES Storm
Chain of Custody

Jar Cert #

Outfall: 237B

Date/Time sampler installed: 1/20/24 @ 9:08

Jar Cert #

Sampling Crew: CA, SG

Filter lot # 1375282

Weather conditions: Clear

Date/Time sampler pickup: 1/23/24 @ 9:41

Observed activities in area: N/A

Observations during sampler collection: N/A

Color, Odors, sheens: N/A

Type of Sample: ☑ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☑ >0.2 inches rain ☐ <0.02 inches of rain previous 24 hours

Samplers: ☑ Data downloaded ☐ Sample bottles marked
☑ Ice Present at pick-up ☐ Tubing Decon 1000mL Diwater
☑ Caps on containers

Fill to...	Parameters:	Sample	QC
Neck	PAH's/Phthalates (1L) +	☑	☐ ☐
No head	[1]Total Mercury (125/250mL QC)	☑	☐
No head	[1]Diss Mercury (125/250mL QC)	☑	☐
Shoulder	Total Metals (250mL)	☑	
Shoulder	Diss Metals (125mL)	☑	
Shoulder	TSS (1L), (500 mL min)	☑	
Shoulder	Nutrients (250mL)	☑	
Shoulder	Ortho-P (125mL), (75min)	☑	
Shoulder	BOD (1L)	☑	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☑	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes 4.010 L config above
+1000 mL for QC per bottle, must submit 2 extra bottles
[1]If 250ml bottle used, thenQAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (µS)
1	1000	☑	182.2
2		☑	92.4
3		☑	176.9
4		☑	200.8
5		☑	181.6
6		☑	186.6
7		☑	156.4
8		☑	130.3
9		☑	142.5
10		☑	175.1
11		☑	92.9
12		☑	77.6

Total aliquots: 48

Sample Prep

Date/Time: 1/23/24 @ 10:55

Initial: CA, SG, RG

pH: 6.80

COND (µS): 145.4

Lab #: 2401041-04

Aliquots composited: 48

Deviations :

Composite End Time: 1/22/24 @ 12:51
(Collect Time) Last aliquot in composite

Relinquished by: [signature]

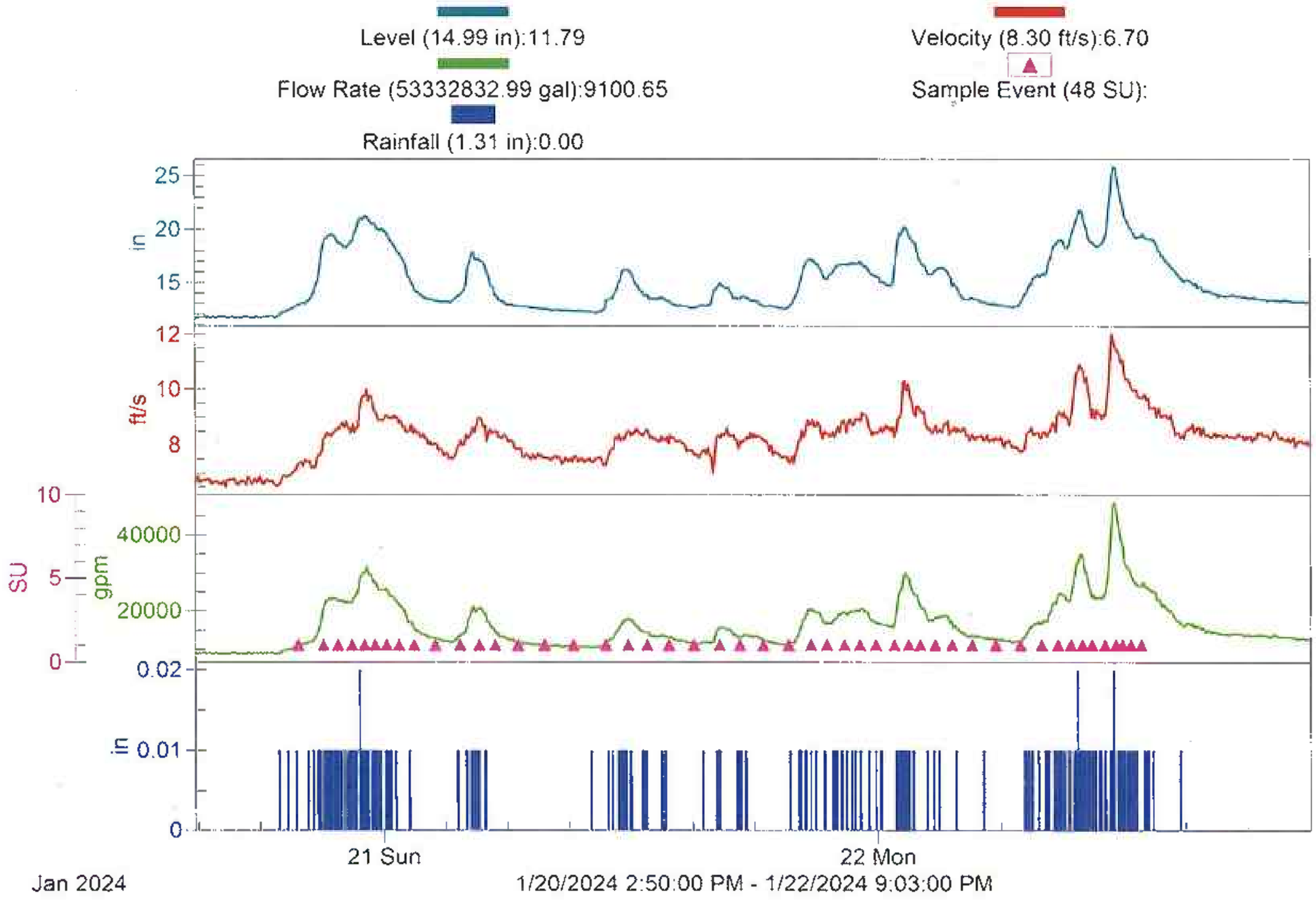
Date/Time: 1/23/24 @ 11:45

Received by: [signature]

Date/Time: 1/23/24 @ 11:45

237B

Flowlink 5



SAMPLER ID# 1243003651 09:40 23-JAN-24
Hardware: A1 Software: 2.33
*********** PROGRAM SETTINGS ***********

PROGRAM NAME:
" STORM 1 "
SITE DESCRIPTION:
" 237 B   "

UNITS SELECTED:
LENGTH: ft

12, 1000 ml BTLS
16 ft SUCTION LINE
AUTO SUCTION HEAD
1 RINSES, 1 RETRIES

ONE-PART PROGRAM

PACING:
FLOW, EVERY
1 PULSES
NO SAMPLE AT START

DISTRIBUTION:
4 SAMPLES/BOTTLE

VOLUME:

250 ml SAMPLES

ENABLE:

NONE PROGRAMMED

ENABLE:
REPEATABLE ENABLE
NO SAMPLE AT DISABLE
NO SAMPLE AT ENABLE

ENABLE:
COUNTDOWN IS STOPPED
WHILE DISABLED

ENABLE:
0 PAUSE & RESUMES

NO DELAY TO START

200 HOURS RUN TIME

LIQUID DETECT ON

QUICK VIEW/CHANGE

TAKE MEASUREMENTS
AT STORAGE INTERVAL

DUAL SAMPLER OFF
BTL FULL DETECT ON
TIMED BACKLIGHT

EVENT MARK SENT
DURING PUMP CYCLE

PUMP COUNTS FOR
EACH PURGE CYCLE:
100 PRE-SAMPLE
AUTO POST-SAMPLE

NO PERIODIC
SERIAL OUTPUT

INTERROGATOR
CONNECTOR

```
POWER ALWAYS ON

    ----------
    ----------
    ----------

  NO RAIN GAUGE


    ----------
 NO SDI-12 SONDE

AUTO SDI-12 SCAN OFF

    ----------
 I/O1= NONE
 I/O2= NONE
 I/O3= NONE

    ----------

 0 ANALOG OUTPUTS


    ----------

 NO EXTERNAL MODEM


    ----------

    NO ALARM
  CONDITIONS SET

    ----------
    ----------
----------------------------------------


SAMPLER ID# 1243003651  09:41 23-JAN-24
  Hardware:     A1  Software: 2.33
*********** SAMPLING RESULTS ***********
   SITE:   237 B
PROGRAM:  STORM 1
Program Started at 09:05 SA 20-JAN-24
Nominal Sample Volume =  250 ml
                                   COUNT
                                      TO
```

SAMPLE	BOTTLE	TIME	SOURCE	ERROR	LIQUID
		09:05	PGM ENABLED		
1,4	1	19:50	F		521
2,4	1	21:05	F		519
3,4	1	21:47	F		515
4,4	1	22:27	F		514
1,4	2	23:04	F		510
2,4	2	23:34	F		512
		SU 21-JAN-24			
3,4	2	00:08	F		512
4,4	2	00:44	F		513
1,4	3	01:28	F		512
2,4	3	02:29	F		521
3,4	3	03:42	F		514
4,4	3	04:38	F		516
1,4	4	05:24	F		510
2,4	4	06:30	F		516
3,4	4	07:48	F		514
4,4	4	09:12	F		516
1,4	5	10:46	F		519
2,4	5	11:53	F		512
3,4	5	12:47	F		519
4,4	5	13:51	F		526
1,4	6	15:03	F		520
2,4	6	16:19	F		514
3,4	6	17:18	F		525
4,4	6	18:26	F		521
1,4	7	19:41	F		515
2,4	7	20:46	F		796
3,4	7	21:32	F		510
4,4	7	22:23	F		515
1,4	8	23:09	F		517
2,4	8	23:55	F		591
		MO 22-JAN-24			
3,4	8	00:49	F		503
4,4	8	01:31	F		509
1,4	9	02:05	F		512
2,4	9	02:49	F		534
3,4	9	03:38	F		509
4,4	9	04:37	F		520
1,4	10	05:45	F		518
2,4	10	06:57	F		519
3,4	10	08:00	F		489
4,4	10	08:48	F		512
1,4	11	09:26	F		512
2,4	11	09:59	F		507
3,4	11	10:27	F		513
4,4	11	11:04	F		510

```
 1,4     12   11:36       F             507
 2,4     12   11:55       F             510
 3,4     12   12:20       F             509
 4,4     12   12:51       F             513
              12:52  PGM DONE 22-JAN

  SOURCE F   ==> FLOW
----------------------------------------
```

2312036-01

~~NPDES Storm~~

Chain of Custody

~~Bottle Certification~~

Bottle Certification

*** DEFAULT CONTAINER ***

Jar Cert #

Jar Cert #

Filter lot # 1375252

Outfall: 245

Sampling Crew: CA, SG

Weather conditions: Clear

Date/Time sampler installed: 1/20/24 @ 8:55

Date/Time sampler pickup: 1/23/24 @ 9:24

Observed activities in area: N/A

Observations during sampler collection: N/A

Color, Odors, sheens: N/A

Type of Sample: ☑ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☑ >0.2 inches rain ☐ <0.02 inches of rain previous 24 hours

Samplers: ☑ Data downloaded ☐ Sample bottles marked

☑ Ice Present at pick-up ☐ Tubing Decon 1000mL Di water

☑ Caps on containers

Fill to...	Parameters:	Sample	QC
Neck	PAH's/Phthalates (1L) +	☑	☐ ☐
No head	[1]Total Mercury (125/250mL QC)	☑	☑
No head	[1]Diss Mercury (125/250mL QC)	☑	☑
Shoulder	Total Metals (250mL)	☑	
Shoulder	Diss Metals (125mL)	☑	
Shoulder	TSS (1L), (500 mL min)	☑	
Shoulder	Nutrients (250mL)	☑	
Shoulder	Ortho-P (125mL), (75min)	☑	
Shoulder	BOD (1L)	☑	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☑	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes 4.010 L config above

+1000 mL for QC per bottle, must submit 2 extra bottles

[1]If 250ml bottle used, thenQAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (µS)
1	1000	☑	1377
2		☑	535
3		☑	343
4		☑	303
5		☑	228.3
6		☑	339
7		☑	402
8		☑	431
9		☑	384
10		☑	447
11		☑	357
12		☑	262.9

Total aliquots: 48

Sample Prep

Date/Time: 1/23/24 @ 10:35

Initial: CA, SG, RG

pH: 6.22

COND (µS): 430.3 µs

Lab #: 2401041-06

Aliquots composited: 48

Deviations :

Composite End Time: 1/22/24 @ 7:50

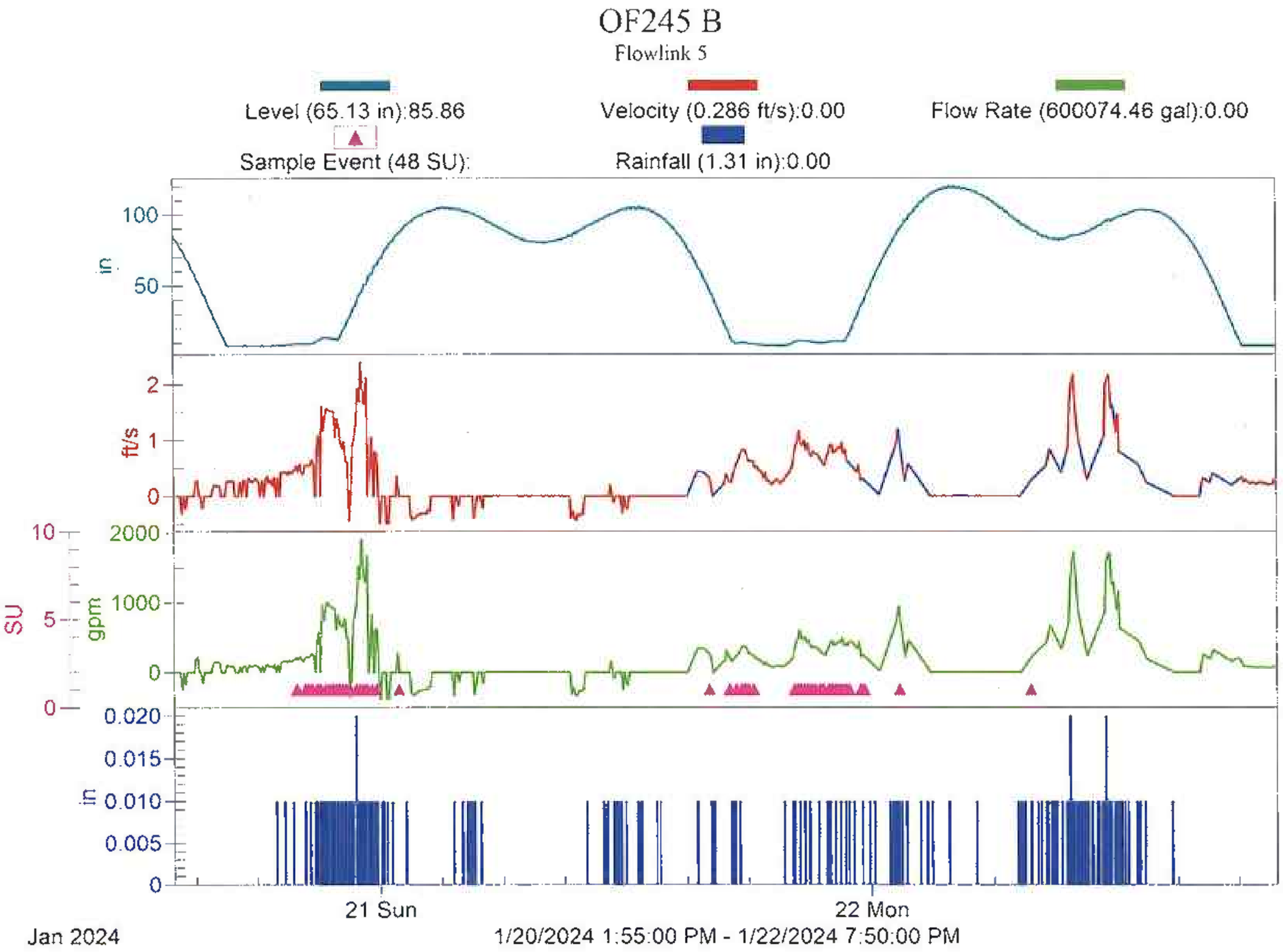
(Collect Time) Last aliquot in composite

Relinquished by: [signature]

Date/Time: 1/23/24 @ 11:45

Received by: [signature]

Date/Time: 1/23/24 @ 11:45



OF245 B
Flowlink 5
Level (65.13 in):85.86
Velocity (0.286 ft/s):0.00
Flow Rate (600074.46 gal):0.00
Sample Event (48 SU):
Rainfall (1.31 in):0.00
100
50
in
2
1
0
ft/s
10
5
0
SU
2000
1000
0
gpm
0.020
0.015
0.010
0.005
0
in
21 Sun
22 Mon
Jan 2024
1/20/2024 1:55:00 PM - 1/22/2024 7:50:00 PM

```
SAMPLER ID# 1284476967  09:25 23-JAN-24
  Hardware:     A1  Software: 2.33
*********** PROGRAM SETTINGS ***********
     ----------
   PROGRAM NAME:
    "STORM     "
 SITE DESCRIPTION:
    "OF245 B   "
     ----------
   UNITS SELECTED:
     LENGTH: ft


     ----------
   UNITS SELECTED:
   FLOW RATE: gpm
  FLOW VOLUME: gal
   VELOCITY: fps
     ----------
  AREA-VEL MODULE:
   AREA*VELOCITY
     ROUND PIPE

     ----------

      5 MINUTE
   DATA INTERVAL

     ----------
  12,  1000 ml BTLS
 21 ft SUCTION LINE
 AUTO SUCTION HEAD
1 RINSES, 1 RETRIES
     ----------

  ONE-PART PROGRAM


     ----------
      PACING:
    TIME, EVERY
 0 HOURS, 10 MINUTES

     ----------
    DISTRIBUTION:
   4 SAMPLES/BOTTLE


     ----------
```

VOLUME:

250 ml SAMPLES

ENABLE:

FLOW >200.0 gpm

ENABLE:
REPEATABLE ENABLE
NO SAMPLE AT DISABLE
NO SAMPLE AT ENABLE

ENABLE:
COUNTDOWN IS STOPPED
WHILE DISABLED

ENABLE:
0 PAUSE & RESUMES

NO DELAY TO START

LIQUID DETECT ON

QUICK VIEW/CHANGE

TAKE MEASUREMENTS
EVERY 5 MINUTES

DUAL SAMPLER OFF
BTL FULL DETECT OFF
TIMED BACKLIGHT

PULSED EVENT MARK

AT INITIAL PURGE

PUMP COUNTS FOR
EACH PURGE CYCLE:
200 PRE-SAMPLE
AUTO POST-SAMPLE

NO PERIODIC
SERIAL OUTPUT

INTERROGATOR
CONNECTOR
POWER ALWAYS ON

NO RAIN GAUGE

NO SDI-12 SONDE

AUTO SDI-12 SCAN OFF

I/O1= NONE
I/O2= NONE
I/O3= NONE

----

0 ANALOG OUTPUTS

NO EXTERNAL MODEM

NO ALARM
CONDITIONS SET

SAMPLER ID# 1284476967 09:25 23-JAN-24
Hardware: A1 Software: 2.33
*********** SAMPLING RESULTS ***********
SITE: OF245 B
PROGRAM: STORM
Program Started at 08:52 SA 20-JAN-24
Nominal Sample Volume = 250 ml

SAMPLE	BOTTLE	TIME	SOURCE	ERROR	COUNT TO LIQUID
		08:52	PGM DISABLED		
		13:45	PGM ENABLED		
		13:50	PGM DISABLED		
		15:05	PGM ENABLED		
		15:10	PGM DISABLED		
		19:55	PGM ENABLED		
1,4	1	19:55	T		615
		20:00	PGM DISABLED		
		20:05	PGM ENABLED		
		20:10	PGM DISABLED		
		20:20	PGM ENABLED		
2,4	1	20:20	T		612
3,4	1	20:30	T		614
4,4	1	20:40	T		618
		20:50	PGM DISABLED		
		20:55	PGM ENABLED		
1,4	2	20:55	T		617
2,4	2	21:05	T		616
		21:06	PGM DISABLED		
		21:10	PGM ENABLED		
3,4	2	21:20	T		615
4,4	2	21:30	T		614
1,4	3	21:40	T		614
2,4	3	21:50	T		616
3,4	3	22:00	T		616
4,4	3	22:10	T		609
1,4	4	22:20	T		602
2,4	4	22:30	T		596
		22:31	PGM DISABLED		
		22:40	PGM ENABLED		
3,4	4	22:50	T		583
4,4	4	23:00	T		581

1,4	5	23:10	T	573
2,4	5	23:20	T	573
		23:25	PGM DISABLED	
		23:30	PGM ENABLED	
3,4	5	23:35	T	565
		23:40	PGM DISABLED	
		23:45	PGM ENABLED	
4,4	5	23:50	T	558
		23:55	PGM DISABLED	

------------- SU 21-JAN-24 -------------

		00:50	PGM ENABLED	
1,4	6	00:55	T	533
		00:56	PGM DISABLED	
		15:30	PGM ENABLED	
		15:35	PGM DISABLED	
		15:50	PGM ENABLED	
		15:55	PGM DISABLED	
		16:05	PGM ENABLED	
2,4	6	16:05	T	567
		16:10	PGM DISABLED	
		16:55	PGM ENABLED	
		17:00	PGM DISABLED	
		17:05	PGM ENABLED	
3,4	6	17:05	T	603
		17:10	PGM DISABLED	
		17:20	PGM ENABLED	
4,4	6	17:25	T	614
		17:35	PGM DISABLED	
		17:40	PGM ENABLED	
1,4	7	17:40	T	615
2,4	7	17:50	T	617
3,4	7	18:00	T	618
		18:05	PGM DISABLED	
		18:10	PGM ENABLED	
4,4	7	18:15	T	619
		18:20	PGM DISABLED	
		20:10	PGM ENABLED	
1,4	8	20:15	T	610
2,4	8	20:25	T	611
3,4	8	20:35	T	615
4,4	8	20:45	T	614
1,4	9	20:55	T	617
2,4	9	21:05	T	615
3,4	9	21:15	T	615
		21:16	PGM DISABLED	
		21:20	PGM ENABLED	
4,4	9	21:30	T	618
1,4	10	21:40	T	620
		21:41	PGM DISABLED	

		21:45	PGM ENABLED	
2,4	10	21:55	T	616
3,4	10	22:05	T	620
4,4	10	22:15	T	617
1,4	11	22:25	T	618
2,4	11	22:35	T	618
3,4	11	22:45	T	619
4,4	11	22:55	T	615
		22:56	PGM DISABLED	
		23:20	PGM ENABLED	
1,4	12	23:30	T	586
2,4	12	23:40	T	583
		23:41	PGM DISABLED	
-------------		MO 22-JAN-24	-------------	
		01:15	PGM ENABLED	
3,4	12	01:25	T	527
		01:26	PGM DISABLED	
		01:40	PGM ENABLED	
		01:45	PGM DISABLED	
		01:50	PGM ENABLED	
		01:55	PGM DISABLED	
		07:50	PGM ENABLED	
4,4	12	07:50	T	523
		07:51	PGM DONE 22-JAN	

SOURCE T ==> TIME

FIELD REPORT

Project: Thea Foss/Wheeler-Osgood Waterways & NPDES Stormwater Monitoring Program

Event: Storm Event – Feb. 14, 2024

INTRODUCTION

This report summarizes the storm event sampled on 2/14/2024-2/15/2024 by the City of Tacoma Environmental Services Collection System Support staff as part of our stormwater monitoring program. This report includes a summary of the following:

- Storm characteristics and criteria;
- Sampling activities;
- Flow characteristics at each sampling location;
- Pacing – set for a 0.3" event, actual event was 0.25"

This event met the sampling criteria for precipitation as specified in the Thea Foss Sampling and Analysis Plan (SAP).

DESCRIPTION OF SAMPLING ACTIVITES

Samplers placed in the field on 2/14/2024. During sampler installation the weather conditions were overcast. All samplers were retrieved on 2/15/2024 (For site specific details, see Appendix A for field notes, Chain of Custody (COC) forms, and event hydrographs).

The following unusual observations were noted during the sampling event:

Table 2: Composite Sampling Activities

Sample Location	Site Deployed	Sample Accepted	Pacing (gal)	Enables LVL(ft), VEL(fps) COND.(mS/cm)	Comments
Outfall 230A	Yes	Yes	30,000	LVL > 0.5	36 Aliquots Collected / 36 Composited
Outfall 235	Yes	Yes	14,000	LVL > 0.37 VEL > 0.8	43 Aliquots Collected / 43 Composited
Outfall 237ANew	Yes	No	166,000	LVL > 0.4 VEL > 6.5	0 Aliquots Collected / 0 Composited N/A
Outfall 237B	Yes	Yes	208,000	LVL > 0.7	25 Aliquots Collected / 25 Composited
Outfall 243	Yes	No	10 min.	< 3.2 mS/cm	0 Aliquots Collected / 0 Composited N/A
Outfall 245	Yes	Yes	10 min.	> 200 gpm	16 Aliquots Collected / 16 Composited
Outfall 254	Yes	Yes	10 min.	<15 mS/cm	24 Aliquots Collected / 20 Composited
Outfall 222	Yes	Yes	N/A	N/A	48 Aliquots Collected / 48 Composited

**QC, QUALITY CONTROL*

ND, NO DATA

NA, NOT APPLICABLE

WATER QUALITY DATA

Accepted samples were analyzed for the target parameters specified in the SAP and QAPP. Samples accepted at all Outfalls were composited and preserved within 24 hours of the last aliquot being collected. The samples were allowed to sit for a minimum of 18 hours before metals analysis was started.

EQUIPMENT INFORMATION

Samples were collected using ISCO 6712 portable auto samplers. Rain data was collected using an ISCO 674 rain gauge located at the Center for Urban Waters at 326 East D Street, Tacoma, WA 98421.

CORRECTIVE ACTIONS AND DEVIATIONS

There were no deviations from the field procedures as discussed in the SAP other than those discussed above/below. No other criteria or procedures as indicated in the SAP were compromised except for those discussed above/below.

Enclosures: The ISCO program setting/sampling results report, the sample collection chain of custody form, and field records are in Appendix A for each outfall. This includes the following information for the samples collected:

- Plot of flow hydrograph and hyetograph
- Subsample times and conductivities
- Tidal windows
- Field activities

Appendix A

PROJECT ______

Storm Collection - 1/9/24

243 - @ - 15:53 - 12/12 - Download

Storm Deployment - 1/20/24 1.16"

- 245 @ 8:55 - Jars/Ice
- 237A @ 9:02 - Jars/Ice - ~~869,000~~ 652,000
- 237B @ 9:08 - Jars/Ice - ~~720,000~~ 900,000
- 235 @ 9:12 - Jars/Ice - 72,000 - Battery change
- 230A @ 9:20 - Jars/Ice - 131,000

Storm Collection - 1/23/24

- 245 @ 9:24 - 12/12
- 237A @ 9:34 - ~~11/12~~ 10½/12
- 237B @ 9:41 - 11/12
- 235 @ 9:50 - 10½/12
- 230A @ 9:58 - 10/12

RE

Storm Deployment - 2/14/24 0.3"

254 @ 10:09 - Jars/Ice - Replaced Battery - Re connected Sonde - Download
245 @ 10:34 - Jars/Ice - Download
243 @ 10:47 - Jars/Ice - Download - Spec. = 3.2
237A @ 11:00 - Jars/Ice - Download - Pacing = 166,000 enable => 5.5 ft & .4 ft
238 @ 11:08 - Jars/Ice - Download - Pacing = 208,000 enable = .7 ft
235 @ 11:26 - Jars/Ice - Download - Pacing = 14.000
230A @ 11:50 - Jars/Ice - Download - Pacing = 30.000 - Calibration

Continued on Page

Read and Understood By

Signed ______ Date ______ Signed ______ Date ______

Storm Collection - 2/15/24 0.25"
254 @ 9:56 - 6/12
245 @ 10:00 - 4/12 - Slow download
243 @ 10:26 - 0/12
237A @ 10:40 - 0/12 - Low Battery
237B @ 10:50 - 6½/12 -
235 @ 10:00 - 10½/12 -
230A @ 11:11 - 9/12 -

Storm Deployment - 2/23/24 .45"
245 @ 13:58 - Jars / Ice - Download
243 @ 14:06 - Jars / Ice - Download - Spec. Cond. = < 3.2
237A @ 14:54 - Jars / Ice - Download - Enable = 386,000
237B @ 14:17 - Jars / Ice - Download - Enable = 351,000 Gpm
~~245 @~~ enable 0.65'
235 @ 14:28 - Jars / Ice - Download - Enable = ~~33~~ 29,000
230 @ 14:40 - Jars / Ice - Download - Enable = 77,000 LvL = 4 ft

Storm Deployment - 2/27/24 2.12"
245 @ 10:01 - Jars / Ice - Download - 20 min pacing
243 @ 10:06 - Jars / Ice - Download - Enable < 7.5 ms/cm
237A @ 10:19 - Jars / Ice - Download - 2,205,000 enable
237B @ 10:25 - Jars / Ice - Download - 1,785,000 enable LvL = 3.6'
235 @ 10:34 - Jars / Ice - Download - 145,000
230A @ 10:55 - Jars / Ice - Download - 369,000

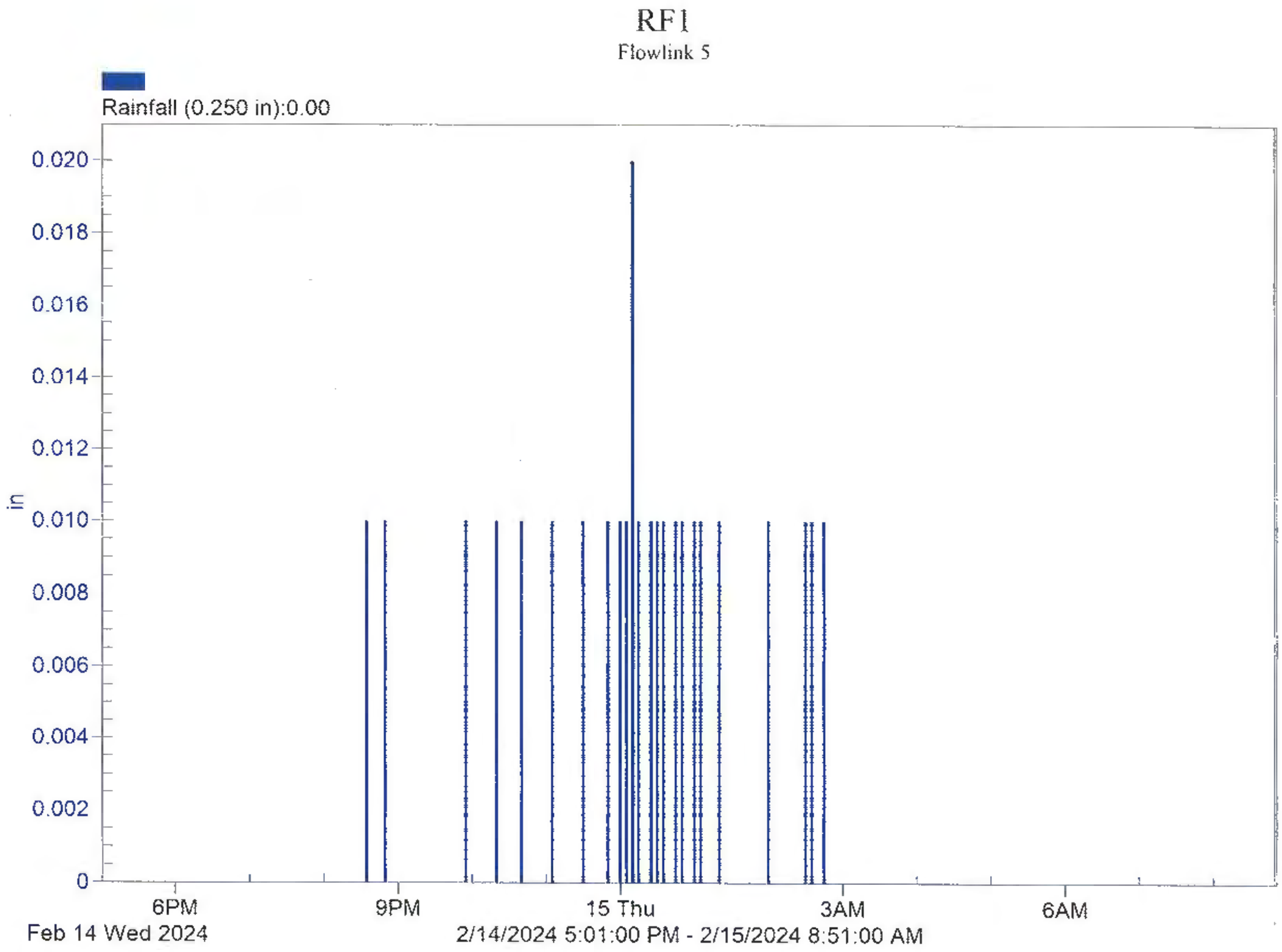
RG

Grabs - 2/28/24
254 @ 10:56 230A @ 11:48
245 @ 11:06
243 @ 11:13
222 @ 11:13
237A @ 11:27
237B @ 11:28
235 @ 11:37

Continued on Page

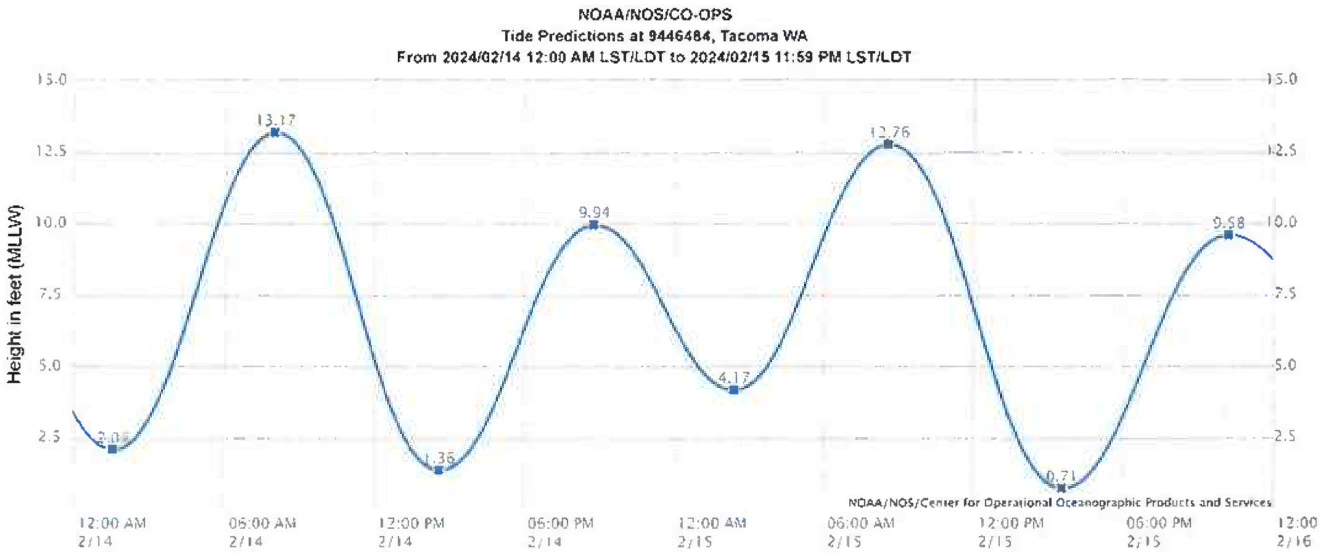
Read and Understood By

Signed ________ Date ________ Signed ________ Date ________



RF1
Flowlink 5
Rainfall (0.250 in):0.00
in
0.020
0.018
0.016
0.014
0.012
0.010
0.008
0.006
0.004
0.002
0
6PM
9PM
15 Thu
3AM
6AM
Feb 14 Wed 2024
2/14/2024 5:01:00 PM - 2/15/2024 8:51:00 AM

Help Print



Note: The interval is High/Low, the solid blue line depicts a curve fit between the high and low values and approximates the segments between.
Disclaimer: These data are based upon the latest information available as of the date of your request, and may differ from the published tide tables.

High/Low Tide Prediction Data Listing

Station Name: Tacoma, WA
Action: Daily
Product: Tide Predictions
Start Date & Time: 2024/2/14 12:00 AM
End Date & Time: 2024/2/15 11:59 PM

Source: NOAA/NOS/CO-OPS
Prediction Type: Harmonic
Datum: MLLW
Height Units: Feet
Time Zone: LST/LDT

Date	Day	Time	Hgt	Time	Hgt	Time	Hgt	Time	Hgt
2024/02/14	Wed	01:35 AM	2.08 L	08:00 AM	13.17 H	2:36 PM	1.36 L	8:48 PM	9.94 H
2024/02/15	Thu	02:23 AM	4.17 L	08:37 AM	12.76 H	3:31 PM	0.71 L	10:15 PM	9.58 H

Bottle Certification

Bottle Certification

*** DEFAULT CONTAINER ***

NPDES Storm

Chain of Custody

Outfall: 2304 Date/Time sampler installed: 2/14/24 @ 11:50

Jar Cert # Sampling Crew: CA, SS

HIMOM # B83988 Weather conditions: Clear Date/Time sampler pickup: 2/15/24 @ 11:11

Observed activities in area: N/A

Observations during sampler collection: N/A

Color, Odors, sheens: N/A

Type of Sample: ☑ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☑ >0.2 inches rain ☐ <0.02 inches of rain previus 24 hours

Samplers: ☑ Data downloaded ☑ Sample bottles marked

☑ Ice Present at pick-up ☑ Tubing Decon 1000mL Divater

☑ Caps on containers

Fill to...	Parameters	Sample	QC
Neck	PAH's/Phthalates (1L) +	☑	☑ ☑
No head	[1]Total Mercury (125/250mL QC)	☑	☑
No head	[1]Diss Mercury (125/250mL QC)	☑	☑
Shoulder	Total Metals (250mL)	☑	
Shoulder	Diss Metals (125mL)	☑	
Shoulder	TSS (1L), (500 mL min)	☑	
Shoulder	Nutrients (250mL)	☑	
Shoulder	Ortho-P (125mL), (75min)	☑	
Shoulder	BOD (1L)	☑	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☑	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes 4.010 L config above

+1000 mL for QC per bottle, must submit 2 extra bottles

[1]If 250ml bottle used, thenQAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (uS)
1	1000	☑	220
2		☑	83.1
3		☑	45.1
4		☑	33.5
5		☑	33.8
6		☑	63.2
7		☑	250
8		☑	258
9		☑	179
10		☐	
11		☐	
12		☐	

Total aliquots: 36

Sample Prep

Date/Time: 2/15/24 @ 1300

Initial: SS, RG, SG, CA

pH: 6.69

COND (µS): 123

Lab #:

Aliquots composited: 36

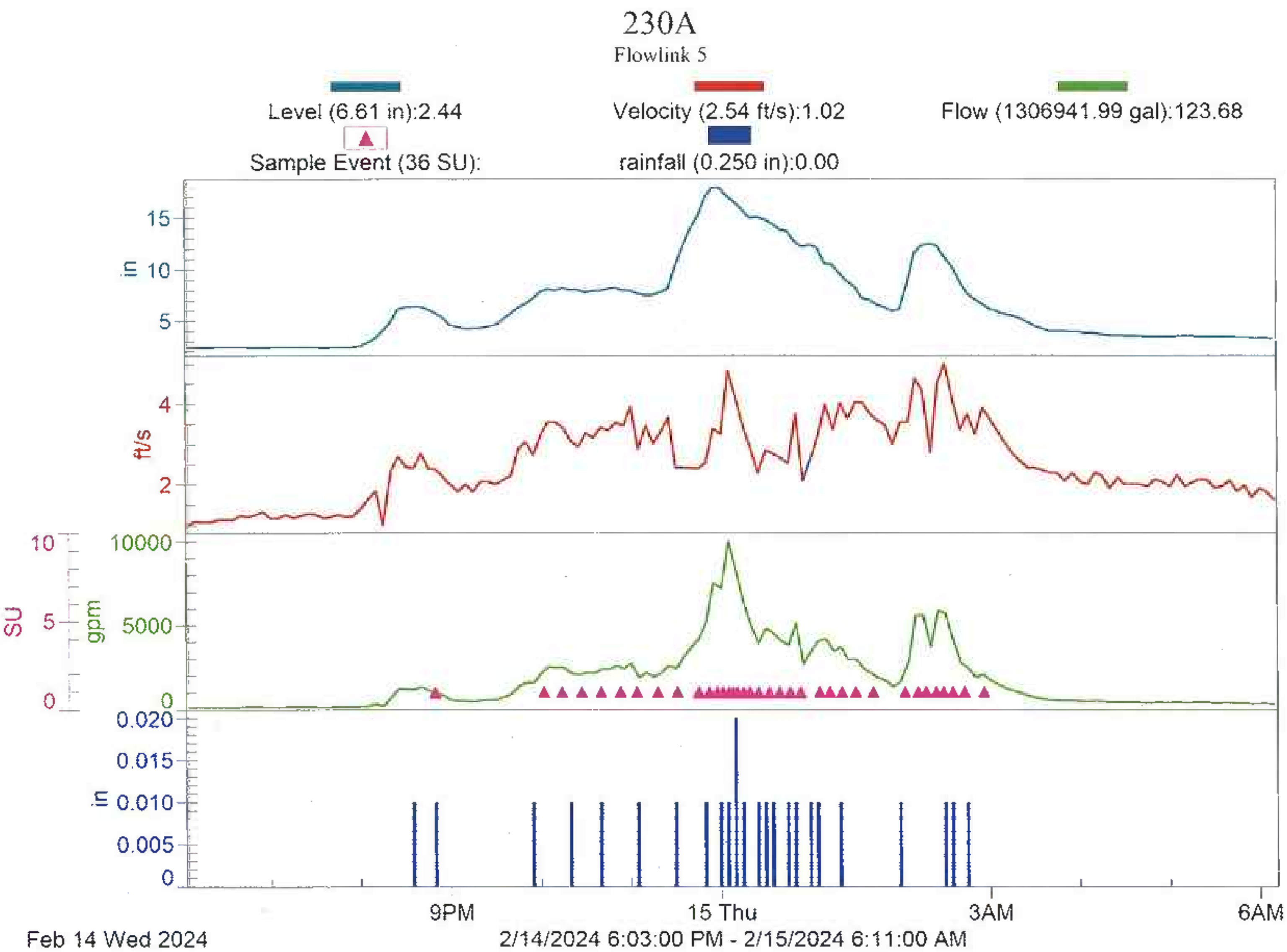
Deviations :

Composite End Time: 2/15/24 @ 01:42

(Or time of last aliquot in composite)

Relinquished by: [signature] Received by: [signature]

Date/Time: 2/15/24 @ 13:45 Date/Time: 2/15/24 @ 13:52


230A
Flowlink 5
Level (6.61 in):2.44
Velocity (2.54 ft/s):1.02
Flow (1306941.99 gal):123.68
Sample Event (36 SU):
rainfall (0.250 in):0.00
in
15
10
5
ft/s
4
2
SU
10
5
0
gpm
10000
5000
0
in
0.020
0.015
0.010
0.005
0
9PM
15 Thu
3AM
6AM
Feb 14 Wed 2024
2/14/2024 6:03:00 PM - 2/15/2024 6:11:00 AM

```
SAMPLER ID# 1481205047  10:47 15-FEB-24
  Hardware:     C0  Software: 3.01.0075
*********** PROGRAM SETTINGS ***********
     ----------
   PROGRAM NAME:
    "STORM 1   "
 SITE DESCRIPTION:
    "230A      "
     ----------
   UNITS SELECTED:
     LENGTH: ft


     ----------
   UNITS SELECTED:
   FLOW RATE: gpm
  FLOW VOLUME: gal
   VELOCITY: fps
     ----------
  AREA-VEL MODULE:
   AREA*VELOCITY
     ROUND PIPE

     ----------

      5 MINUTE
   DATA INTERVAL

     ----------
  12,  1000 ml BTLS
 30 ft SUCTION LINE
 28 ft SUCTION HEAD

     ----------

  ONE-PART PROGRAM


     ----------
      PACING:
    FLOW, EVERY
     30000 gal
NO SAMPLE AT START
     ----------
    DISTRIBUTION:
   4 SAMPLES/BOTTLE


     ----------
```

VOLUME:

250 ml SAMPLES

ENABLE:

LEVEL >0.500 ft

ENABLE:
REPEATABLE ENABLE
NO SAMPLE AT DISABLE
NO SAMPLE AT ENABLE

ENABLE:
COUNTDOWN IS STOPPED
WHILE DISABLED

ENABLE:
0 PAUSE & RESUMES

NO DELAY TO START

200 HOURS RUN TIME

LIQUID DETECT OFF

QUICK VIEW/CHANGE

TAKE MEASUREMENTS
AT STORAGE INTERVAL

DUAL SAMPLER OFF
BTL FULL DETECT OFF
TIMED BACKLIGHT

PULSED EVENT MARK
AT THE BEGINNING OF

FORWARD PUMPING

PUMP COUNTS FOR
EACH PURGE CYCLE:
100 PRE-SAMPLE
500 POST-SAMPLE

NO PERIODIC
SERIAL OUTPUT

NO RAIN GAUGE

NO SDI-12 SONDE

AUTO SDI-12 SCAN OFF

I/O1= NONE
I/O2= NONE
I/O3= NONE

----

0 ANALOG OUTPUTS

NO EXTERNAL MODEM

NO ALARM
CONDITIONS SET

```
SAMPLER ID# 1481205047  10:48 15-FEB-24
  Hardware:     C0  Software: 3.01.0075
*********** SAMPLING RESULTS ***********
   SITE: 230A
PROGRAM: STORM 1
Program Started at 14:13 WE 14-FEB-24
Nominal Sample Volume =  250 ml
                                   COUNT
                                      TO
SAMPLE  BOTTLE TIME  SOURCE ERROR LIQUID
------- ------ ----      -- --   ------
               14:13  PGM DISABLED
               20:25  PGM ENABLED
  1,4      1   20:48      F            0
               20:50  PGM DISABLED
               21:45  PGM ENABLED
  2,4      1   22:02      F            0
  3,4      1   22:14      F            0
  4,4      1   22:27      F            0
  1,4      2   22:40      F            0
  2,4      2   22:53      F            0
  3,4      2   23:04      F            0
  4,4      2   23:18      F            0
  1,4      3   23:31      F            0
  2,4      3   23:45      F            0
  3,4      3   23:52      F            0
  4,4      3   23:57      F            0
------------- TH 15-FEB-24 ------------
  1,4      4   00:01      F            0
  2,4      4   00:05      F            0
  3,4      4   00:08      F            0
  4,4      4   00:11      F            0
  1,4      5   00:15      F            0
  2,4      5   00:19      F            0
  3,4      5   00:25      F            0
  4,4      5   00:32      F            0
  1,4      6   00:38      F            0
  2,4      6   00:46      F            0
  3,4      6   00:53      F            0
  4,4      6   01:06      F            0
  1,4      7   01:13      F            0
  2,4      7   01:21      F            0
  3,4      7   01:30      F            0
  4,4      7   01:42      F            0
               01:55  PGM DISABLED
               02:00  PGM ENABLED
  1,4      8   02:03      F            0
  2,4      8   02:12      F            0
```

```
  3,4     8  02:17       F          0
  4,4     8  02:24       F          0
  1,4     9  02:29       F          0
  2,4     9  02:35       F          0
  3,4     9  02:43       F          0
  4,4     9  02:55       F          0
             03:05  PGM DISABLED
             10:43  MANUAL PAUSE
             10:43  PGM STOPPED 15-FEB

   SOURCE F  ==> FLOW
----------------------------------------
```

2312036-01[redacted]

Bottle Certification

Bottle Certification

*** DEFAULT CONTAINER ***

NPDES Storm
Chain of Custody

Outfall: 235

Date/Time sampler installed: 2/14/24 @ 11:26

Jar Cert # ______

Filter lot # 1383988

Sampling Crew: CA, SG

Weather conditions: Clear

Date/Time sampler pickup: 2/15/24 @ 11:00

Observed activities in area: N/A

Observations during sampler collection: N/A

Color, Odors, sheens: N/A

Type of Sample: ☒ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☒ >0.2 inches rain ☐ <0.02 inches of rain previous 24 hours

Samplers: ☒ Data downloaded ☒ Sample bottles marked ☒ Ice Present at pick-up ☒ Tubing Decon 1000mL Diwater ☒ Caps on containers

Fill to...	Parameters	Sample	QC
Neck	PAH's/Phthalates (1L) +	☒	☐ ☐
No head	[1]Total Mercury (125/250mL QC)	☒	☐
No head	[1]Diss Mercury (125/250mL QC)	☒	☐
Shoulder	Total Metals (250mL)	☒	
Shoulder	Diss Metals (125mL)	☒	
Shoulder	TSS (1L), (500 mL min)	☒	
Shoulder	Nutrients (250mL)	☒	
Shoulder	Ortho-P (125mL), (75min)	☒	
Shoulder	BOD (1L)	☒	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☒	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes 4.010 L config above

+1000 mL for QC per bottle, must submit 2 extra bottles

[1]If 250ml bottle used, thenQAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (uS)
1	10(2)	☒	178
2	↓	☒	107
3		☒	79.4
4		☒	54.2
5		☒	44.6
6		☒	45.7
7		☒	48.5
8		☒	67.7
9		☒	68.8
10		☒	66.7
11	750	☒	174
12		☐	

Total aliquots: 43

Sample Prep

Date/Time: 2/15/24 @ 1240

Initial: SS, RG, SG, CA

pH: 6.52

COND (µS): 79.3

Lab #:

Aliquots composited: 43

Deviations:

Composite End Time: 2/15/24 @ 05:01

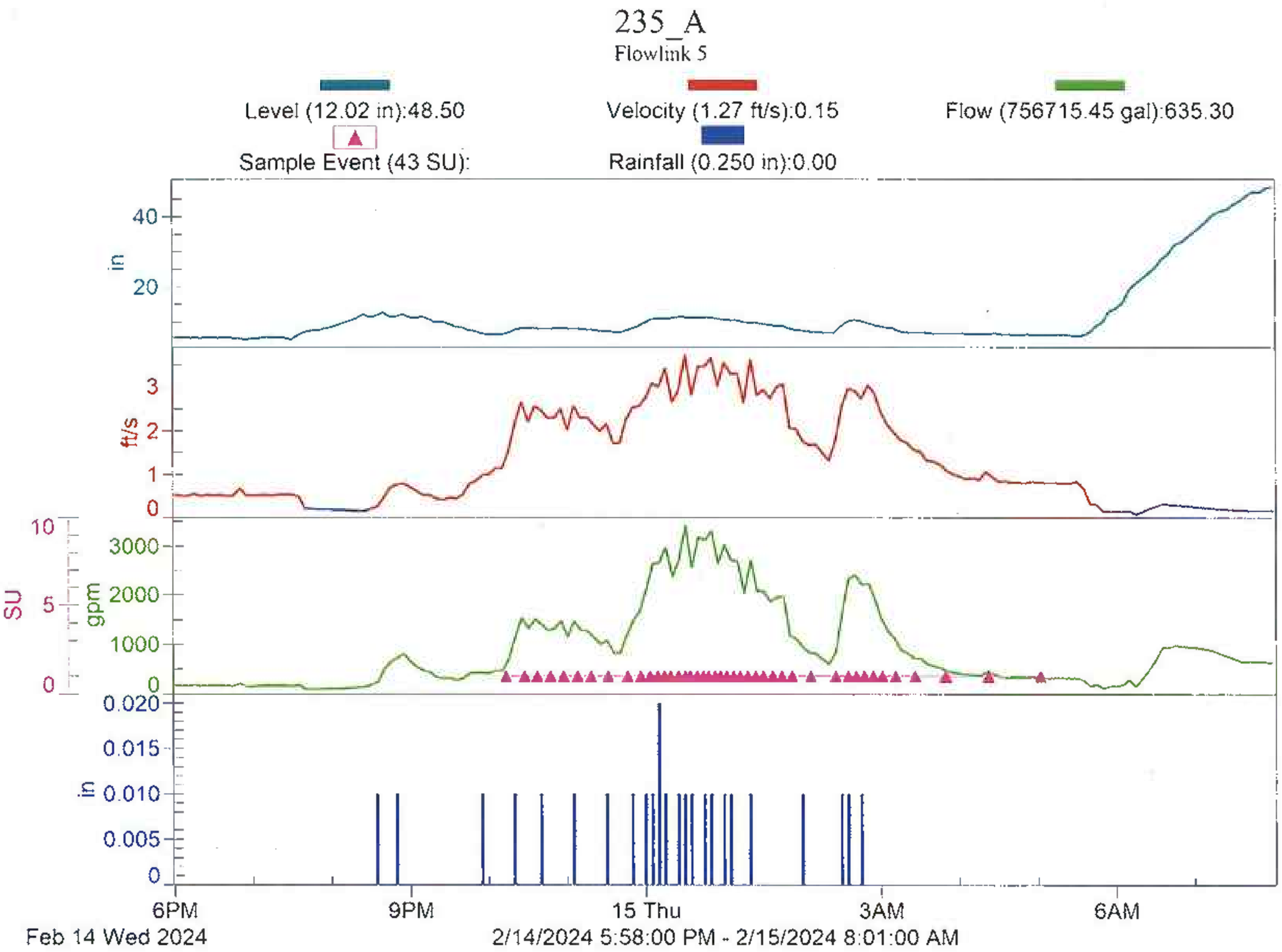
(Collect Time) Last aliquot in composite

Relinquished by: [signature]

Date/Time: 2/15/24 @ 13:45

Received by: [signature]

Date/Time: 2/15/24 @ 13:52


235_A
Flowlink 5
Level (12.02 in):48.50
Velocity (1.27 ft/s):0.15
Flow (756715.45 gal):635.30
Sample Event (43 SU):
Rainfall (0.250 in):0.00
in
40
20
ft/s
3
2
1
0
SU
10
5
0
gpm
3000
2000
1000
0
in
0.020
0.015
0.010
0.005
0
6PM
9PM
15 Thu
3AM
6AM
Feb 14 Wed 2024
2/14/2024 5:58:00 PM - 2/15/2024 8:01:00 AM

```
SAMPLER ID# 1242995716  11:01 15-FEB-24
  Hardware:     A1  Software: 2.33
*********** PROGRAM SETTINGS ***********
     ----------
   PROGRAM NAME:
    "235A       "
 SITE DESCRIPTION:
    "235A ST    "
     ----------
   UNITS SELECTED:
     LENGTH: ft


     ----------
   UNITS SELECTED:
   FLOW RATE: gpm
  FLOW VOLUME: gal
   VELOCITY: fps
     ----------
  AREA-VEL MODULE:
   AREA*VELOCITY
     ROUND PIPE

     ----------

      5 MINUTE
   DATA INTERVAL

     ----------
  12,  1000 ml BTLS
 56 ft SUCTION LINE
 AUTO SUCTION HEAD
1 RINSES, 1 RETRIES
     ----------

  ONE-PART PROGRAM


     ----------
      PACING:
    FLOW, EVERY
     14000 gal
NO SAMPLE AT START
     ----------
    DISTRIBUTION:
   4 SAMPLES/BOTTLE


     ----------
```

VOLUME:

250 ml SAMPLES

ENABLE:
LEVEL >0.370 ft
AND
VEL > 0.80 fps

ENABLE:
REPEATABLE ENABLE
NO SAMPLE AT DISABLE
NO SAMPLE AT ENABLE

ENABLE:
COUNTDOWN IS STOPPED
WHILE DISABLED

ENABLE:
0 PAUSE & RESUMES

NO DELAY TO START

200 HOURS RUN TIME

LIQUID DETECT ON

QUICK VIEW/CHANGE

TAKE MEASUREMENTS
AT STORAGE INTERVAL

DUAL SAMPLER OFF
BTL FULL DETECT OFF
TIMED BACKLIGHT

EVENT MARK SENT

DURING PUMP CYCLE

PUMP COUNTS FOR
EACH PURGE CYCLE:
100 PRE-SAMPLE
AUTO POST-SAMPLE

NO PERIODIC
SERIAL OUTPUT

INTERROGATOR
CONNECTOR
POWER ALWAYS ON

NO RAIN GAUGE

NO SDI-12 SONDE

AUTO SDI-12 SCAN OFF

I/O1= NONE
I/O2= NONE
I/O3= NONE

----

0 ANALOG OUTPUTS

NO EXTERNAL MODEM

NO ALARM
CONDITIONS SET

```
    ----------
    ----------
-----------------------------------------


SAMPLER ID# 1242995716  11:01 15-FEB-24
  Hardware:     A1  Software: 2.33
*********** SAMPLING RESULTS ***********
   SITE: 235A ST
PROGRAM: 235A
Program Started at 11:34 WE 14-FEB-24
Nominal Sample Volume =  250 ml
                                   COUNT
                                      TO
SAMPLE  BOTTLE TIME  SOURCE ERROR LIQUID
------- ------ ----    -- --     ------
               11:34  PGM DISABLED
               20:55  PGM ENABLED
               21:00  PGM DISABLED
               21:50  PGM ENABLED
  1,4     1    22:12    F           1874
  2,4     1    22:27    F           1883
  3,4     1    22:37    F           1891
  4,4     1    22:47    F           1909
  1,4     2    22:57    F           1902
  2,4     2    23:08    F           1913
  3,4     2    23:18    F           1913
  4,4     2    23:31    F           1901
  1,4     3    23:46    F           1895
  2,4     3    23:56    F           1902
------------ TH 15-FEB-24 ------------
  3,4     3    00:03    F           1915
  4,4     3    00:09    F           1924
  1,4     4    00:14    F           1925
  2,4     4    00:19    F           1926
  3,4     4    00:25    F           1943
  4,4     4    00:30    F           1939
  1,4     5    00:34    F           1943
  2,4     5    00:39    F           1943
  3,4     5    00:44    F           1947
  4,4     5    00:48    F           1947
  1,4     6    00:52    F           1965
  2,4     6    00:57    F           1956
  3,4     6    01:02    F           1962
  4,4     6    01:07    F           1959
  1,4     7    01:12    F           1955
  2,4     7    01:18    F           1959
  3,4     7    01:24    F           1954
```

4,4	7	01:30	F	1950
1,4	8	01:37	F	1945
2,4	8	01:44	F	1947
3,4	8	01:52	F	1942
4,4	8	02:06	F	1935
1,4	9	02:24	F	1919
2,4	9	02:35	F	1915
3,4	9	02:41	F	1925
4,4	9	02:47	F	1928
1,4	10	02:54	F	1943
2,4	10	03:01	F	1936
3,4	10	03:11	F	1925
4,4	10	03:26	F	1909
1,3	11	03:49	F	1918
2,3	11	04:22	F	1897
3,3	11	05:01	F	1881
		05:10	PGM DISABLED	
		05:15	PGM ENABLED	
		05:20	PGM DISABLED	
		05:30	PGM ENABLED	
		05:35	PGM DISABLED	
		11:00	MANUAL PAUSE	
		11:00	PGM STOPPED 15-FEB	

SOURCE F ==> FLOW

2312036-01

NPDES Storm
Chain of Custody

Bottle Certification
*** DEFAULT CONTAINER ***

Outfall: 2375

Date/Time sampler installed: 2/14/24 @ 11:08

Jar Cert #

Sampling Crew: CA, SG

Filter lot # 1383988

Weather conditions: Clear

Date/Time sampler pickup: 2/15/24 @ 10:50

Observed activities in area: N/A

Observations during sampler collection: N/A

Color, Odors, sheens: N/A

Type of Sample: ☑ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☑ >0.2 inches rain ☐ <0.02 inches of rain previus 24 hours

Samplers: ☑ Data downloaded ☑ Sample bottles marked
☑ Ice Present at pick up ☑ Tubing Decon 1000mL Divater
☑ Caps on containers

Fill to...	Parameters:	Sample	QC
Neck	PAH's/Phthalates (1L) +	☑	☐ ☐
No head	[1]Total Mercury (125/250mL QC)	☑	☐
No head	[1]Diss Mercury (125/250mL QC)	☑	☐
Shoulder	Total Metals (250mL)	☑	
Shoulder	Diss Metals (125mL)	☑	
Shoulder	TSS (1L), (500 mL min)	☑	
Shoulder	Nutrients (250mL)	☑	
Shoulder	Ortho-P (125mL), (75min)	☑	
Shoulder	BOD (1L)	☑	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☑	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes 4.010 L config above
+1000 mL for QC per bottle, must submit 2 extra bottles
[1]If 250ml bottle used, thenQAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (uS)
1	1000	☑	141
2		☑	119
3		☑	81.9
4		☑	110
5		☑	109
6		☑	169
7	250	☑	220
8		☐	
9		☐	
10		☐	
11		☐	
12		☐	

Total aliquots: 25

Sample Prep

Date/Time: 2/15/24 @ 1325

Initial: SS, RG, SG, CA

pH: 6.53

COND (µS): 121

Lab #:

Aliquots composited: 25

Deviations:

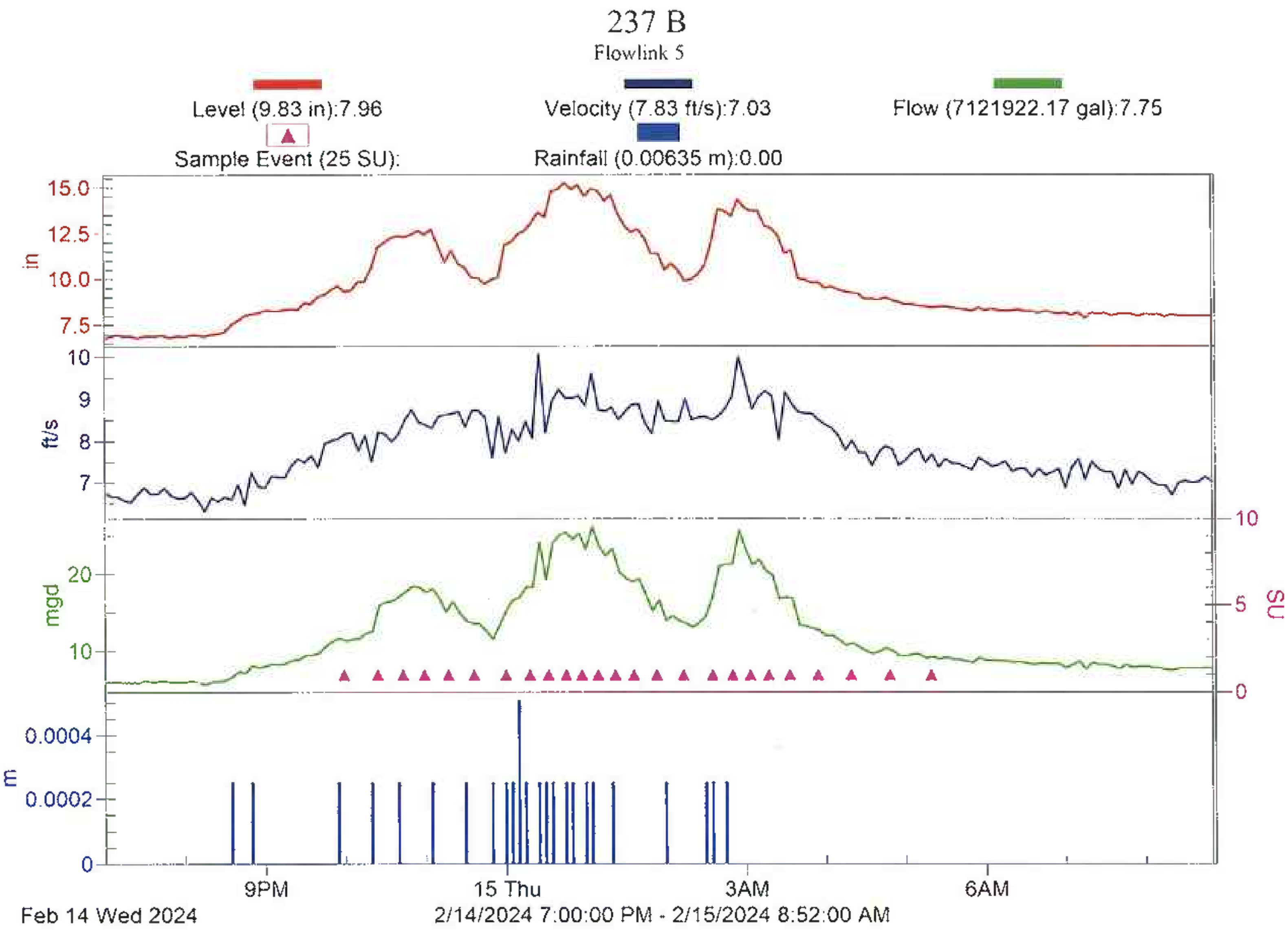
Composite End Time: 2/15/24 @ 05:19
(Collect Time) Last aliquot in composite

Relinquished by:

Date/Time: 2/15/24 @ 13:45

Received by:

Date/Time: 2/15/24 @ 13:52


237 B
Flowlink 5
Level (9.83 in):7.96
Velocity (7.83 ft/s):7.03
Flow (7121922.17 gal):7.75
Sample Event (25 SU):
Rainfall (0.00635 m):0.00
15.0
12.5
10.0
7.5
in
10
9
8
7
ft/s
20
10
mgd
10
5
0
SU
0.0004
0.0002
0
m
9PM
15 Thu
3AM
6AM
Feb 14 Wed 2024
2/14/2024 7:00:00 PM - 2/15/2024 8:52:00 AM

```
SAMPLER ID# 1243003651  10:53 15-FEB-24
  Hardware:     A1  Software: 2.33
*********** PROGRAM SETTINGS ***********
     ----------
   PROGRAM NAME:
    " STORM 1  "
 SITE DESCRIPTION:
    "  237 B   "
     ----------
   UNITS SELECTED:
     LENGTH: ft


     ----------
   UNITS SELECTED:
   FLOW RATE: gpm
 FLOW VOLUME: Mgal
   VELOCITY: fps
     ----------
  AREA-VEL MODULE:
   AREA*VELOCITY
     ROUND PIPE

     ----------

      5 MINUTE
   DATA INTERVAL

     ----------
  12,  1000 ml BTLS
 16 ft SUCTION LINE
 AUTO SUCTION HEAD
1 RINSES, 1 RETRIES
     ----------

  ONE-PART PROGRAM


     ----------
      PACING:
    FLOW, EVERY
     0.208 Mgal
NO SAMPLE AT START
     ----------
    DISTRIBUTION:
   4 SAMPLES/BOTTLE


     ----------
```

VOLUME:

250 ml SAMPLES

ENABLE:

LEVEL >0.700 ft

ENABLE:
REPEATABLE ENABLE
NO SAMPLE AT DISABLE
NO SAMPLE AT ENABLE

ENABLE:
COUNTDOWN IS STOPPED
WHILE DISABLED

ENABLE:
0 PAUSE & RESUMES

NO DELAY TO START

200 HOURS RUN TIME

LIQUID DETECT ON

QUICK VIEW/CHANGE

TAKE MEASUREMENTS
AT STORAGE INTERVAL

DUAL SAMPLER OFF
BTL FULL DETECT ON
TIMED BACKLIGHT

EVENT MARK SENT

DURING PUMP CYCLE

PUMP COUNTS FOR
EACH PURGE CYCLE:
100 PRE-SAMPLE
AUTO POST-SAMPLE

NO PERIODIC
SERIAL OUTPUT

INTERROGATOR
CONNECTOR
POWER ALWAYS ON

NO RAIN GAUGE

NO SDI-12 SONDE

AUTO SDI-12 SCAN OFF

I/O1= NONE
I/O2= NONE
I/O3= NONE

----

0 ANALOG OUTPUTS

NO EXTERNAL MODEM

NO ALARM
CONDITIONS SET


```
SAMPLER ID# 1243003651  10:54 15-FEB-24
  Hardware:     A1  Software: 2.33
*********** SAMPLING RESULTS ***********
   SITE:   237 B
PROGRAM:  STORM 1
Program Started at 14:26 WE 14-FEB-24
Nominal Sample Volume =  250 ml
                                  COUNT
                                     TO
SAMPLE  BOTTLE TIME  SOURCE ERROR LIQUID
------- ------ ----      -- --    ------
              14:26  PGM DISABLED
              21:30  PGM ENABLED
  1,4      1  21:59      F           521
  2,4      1  22:24      F           519
  3,4      1  22:43      F           517
  4,4      1  22:59      F           517
  1,4      2  23:16      F           520
  2,4      2  23:36      F           513
------------- TH 15-FEB-24 -------------
  3,4      2  00:00      F           517
  4,4      2  00:18      F           521
  1,4      3  00:32      F           510
  2,4      3  00:45      F           513
  3,4      3  00:57      F           516
  4,4      3  01:09      F           513
  1,4      4  01:22      F           516
  2,4      4  01:36      F           517
  3,4      4  01:53      F           522
  4,4      4  02:13      F           521
  1,4      5  02:35      F           517
  2,4      5  02:50      F           513
  3,4      5  03:03      F           515
  4,4      5  03:17      F           514
  1,4      6  03:33      F           519
  2,4      6  03:54      F           520
  3,4      6  04:19      F           519
  4,4      6  04:48      F           517
  1,1      7  05:19      F           514
              05:40  PGM DISABLED
              05:55  PGM ENABLED
              06:00  PGM DISABLED
              10:45  MANUAL PAUSE
```

```
          10:45  PGM STOPPED 15-FEB

   SOURCE F  ==> FLOW
-------------------------------------
```

231 2 035-01

Bottle Certification

Bottle Certification

*** DEFAULT CONTAINER ***

NPDES Storm
Chain of Custody

Outfall: 245 Date/Time sampler installed: 2/14/24 @ 10:34

Jar Cert # Sampling Crew: SG, CA

Filter lot # 1383988 Weather conditions: Clear Date/Time sampler pickup: 2/15/24 @ 10:00

Observed activities in area: N/A

Observations during sampler collection: N/A

Color, Odors, sheens: N/A

Type of Sample: ☑ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☑ >0.2 inches rain ☐ <0.02 inches of rain previus 24 hours

Samplers: ☑ Data downloaded ☑ Sample bottles marked
☑ Ice Present at pick-up ☑ Tubing Decon 1000mL DIwater
☑ Caps on containers

Fill to...	Parameters:	Sample	QC
Neck	PAH's/Phthalates (1L)+	☑	☐ ☐
No head	[1]Total Mercury (125/250mL QC)	☑	☐
No head	[1]Diss Mercury (125/250mL QC)	☑	☐
Shoulder	Total Metals (250mL)	☑	
Shoulder	Diss Metals (125mL)	☑	
Shoulder	TSS (1L), (500 mL min)	☑	
Shoulder	Nutrients (250mL)	☑	
Shoulder	Ortho-P (125mL), (75min)	☑	
Shoulder	BOD (1L)	☐	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☑	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes 4.010 L config above
+1000 mL for QC per bottle, must submit 2 extra bottles
[1]If 250ml bottle used, then QAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (µS)
1	1000	☑	1470
2		☑	766
3		☑	331
4		☑	497
5	88	☐	
6		☐	
7		☐	
8		☐	
9		☐	
10		☐	
11		☐	
12		☐	

Total aliquots: 16

Sample Prep

Date/Time: 2/15/24 @ 1340

Initial: SS, RG, SG, CA

pH: 6.79

COND (µS): 738

Lab #:

Aliquots composited: 16

Deviations:

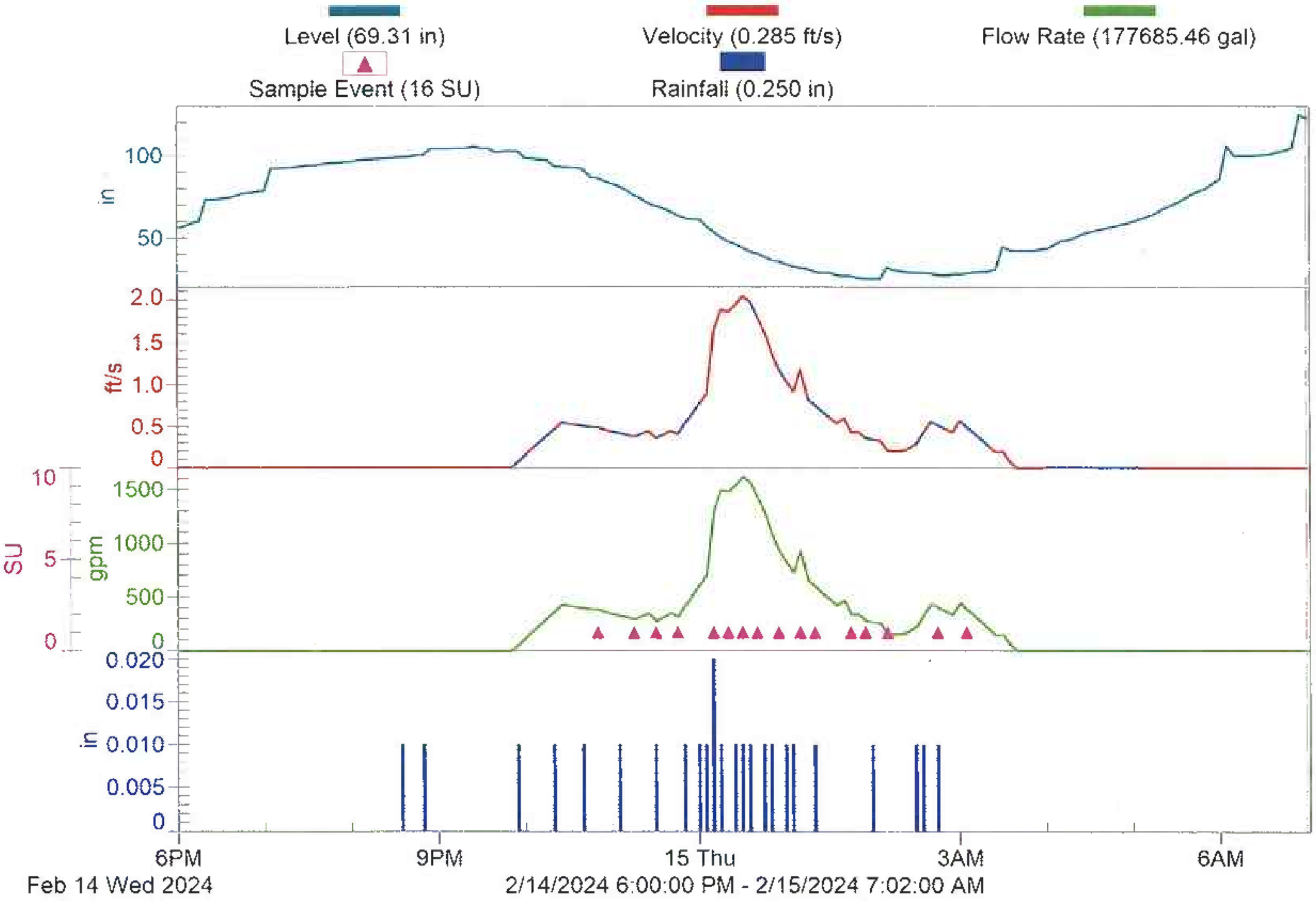
Composite End Time: 2/15/24 @ 03:05
(Collect Time) Last aliquot in composite

Relinquished by: [signature] Received by: [signature]

Date/Time: 2/15/24 @ 13:45 Date/Time: 2/15/24 @ 13:52

OF245 B

Flowlink 5



```
SAMPLER ID# 1284476967  10:19 15-FEB-24
  Hardware:     A1  Software: 2.33
*********** PROGRAM SETTINGS ***********
     ----------
   PROGRAM NAME:
    "STORM     "
 SITE DESCRIPTION:
    "OF245 B   "
     ----------
   UNITS SELECTED:
     LENGTH: ft


     ----------
   UNITS SELECTED:
   FLOW RATE: gpm
  FLOW VOLUME: gal
   VELOCITY: fps
     ----------
  AREA-VEL MODULE:
   AREA*VELOCITY
     ROUND PIPE

     ----------

      5 MINUTE
   DATA INTERVAL

     ----------
  12,  1000 ml BTLS
 21 ft SUCTION LINE
 AUTO SUCTION HEAD
1 RINSES, 1 RETRIES
     ----------

  ONE-PART PROGRAM


     ----------
      PACING:
    TIME, EVERY
 0 HOURS, 10 MINUTES

     ----------
    DISTRIBUTION:
   4 SAMPLES/BOTTLE


     ----------
```

VOLUME:

250 ml SAMPLES

ENABLE:

FLOW >200.0 gpm

ENABLE:
REPEATABLE ENABLE
NO SAMPLE AT DISABLE
NO SAMPLE AT ENABLE

ENABLE:
COUNTDOWN IS STOPPED
WHILE DISABLED

ENABLE:
0 PAUSE & RESUMES

NO DELAY TO START

LIQUID DETECT ON

QUICK VIEW/CHANGE

TAKE MEASUREMENTS
EVERY 5 MINUTES

DUAL SAMPLER OFF
BTL FULL DETECT OFF
TIMED BACKLIGHT

PULSED EVENT MARK

AT INITIAL PURGE

PUMP COUNTS FOR
EACH PURGE CYCLE:
200 PRE-SAMPLE
AUTO POST-SAMPLE

NO PERIODIC
SERIAL OUTPUT

INTERROGATOR
CONNECTOR
POWER ALWAYS ON

NO RAIN GAUGE

NO SDI-12 SONDE

AUTO SDI-12 SCAN OFF

I/O1= NONE
I/O2= NONE
I/O3= NONE

----

0 ANALOG OUTPUTS

NO EXTERNAL MODEM

NO ALARM
CONDITIONS SET


```
SAMPLER ID# 1284476967  10:19 15-FEB-24
  Hardware:     A1  Software: 2.33
*********** SAMPLING RESULTS ***********
   SITE: OF245 B
PROGRAM: STORM
Program Started at 10:38 WE 14-FEB-24
Nominal Sample Volume =  250 ml
                                   COUNT
                                      TO
SAMPLE  BOTTLE TIME  SOURCE ERROR LIQUID
------- ------ ----      -- --   ------
              10:38  PGM DISABLED
              22:25  PGM ENABLED
              22:30  PGM DISABLED
              22:35  PGM ENABLED
              22:40  PGM DISABLED
              22:50  PGM ENABLED
  1,4      1  22:50      T           546
              22:55  PGM DISABLED
              23:00  PGM ENABLED
              23:05  PGM DISABLED
              23:15  PGM ENABLED
  2,4      1  23:15      T           552
              23:20  PGM DISABLED
              23:25  PGM ENABLED
  3,4      1  23:30      T           558
              23:35  PGM DISABLED
              23:40  PGM ENABLED
  4,4      1  23:45      T           561
              23:50  PGM DISABLED
------------- TH 15-FEB-24 -------------
              00:05  PGM ENABLED
  1,4      2  00:10      T           567
  2,4      2  00:20      T           573
  3,4      2  00:30      T           578
  4,4      2  00:40      T           581
              00:41  PGM DISABLED
              00:45  PGM ENABLED
  1,4      3  00:55      T           585
              01:00  PGM DISABLED
              01:05  PGM ENABLED
  2,4      3  01:10      T           589
  3,4      3  01:20      T           592
```

		01:21	PGM DISABLED	
		01:35	PGM ENABLED	
4,4	3	01:45	T	593
1,4	4	01:55	T	597
		02:00	PGM DISABLED	
		02:05	PGM ENABLED	
2,4	4	02:10	T	596
		02:11	PGM DISABLED	
		02:30	PGM ENABLED	
		02:35	PGM DISABLED	
		02:40	PGM ENABLED	
3,4	4	02:45	T	590
		02:46	PGM DISABLED	
		02:55	PGM ENABLED	
4,4	4	03:05	T	586
		03:06	PGM DISABLED	
		10:10	PGM ENABLED	

SOURCE T ==> TIME

2312036-01

Bottle Certification

Bottle Certification

*** DEFAULT CONTAINER ***

NPDES Storm

Chain of Custody

Outfall: 254

Date/Time sampler installed: 2/14/24 @ 10:09

Jar Cert #

Sampling Crew: CA, SG

Filter lot # 1383988

Weather conditions: Clear

Date/Time sampler pickup: 2/15/24 @ 9:56

Observed activities in area: N/A

Observations during sampler collection: N/A

Color, Odors, sheens: N/A

Type of Sample: ☑ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☑ >0.2 inches rain ☐ <0.02 inches of rain previous 24 hours

Samplers: ☑ Data downloaded ☑ Ice Present at pick-up ☐ Caps on containers ☑ Sample bottles marked ☑ Tubing Decon 1000mL Diwater

Fill to...	Parameters:	Sample	QC
Neck	PAH's/Phthalates (1L) +	☑	☐ ☐
No head	[1]Total Mercury (125/250mL QC)	☑	☐
No head	[1]Diss Mercury (125/250mL QC)	☑	☐
Shoulder	Total Metals (250mL)	☑	
Shoulder	Diss Metals (125mL)	☑	
Shoulder	TSS (1L), (500 mL min)	☑	
Shoulder	Nutrients (250mL)	☑	
Shoulder	Ortho-P (125mL), (75min)	☑	
Shoulder	BOD (1L)	☑	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☑	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes 4.010 L config above

+1000 mL for QC per bottle, must submit 2 extra bottles

[1]If 250ml bottle used, thenQAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (µS)
1	10W	☑	~~6,850~~ 7440
2		☑	~~6,640~~ 5,070
3		☑	6,980
4		☑	7,780
5		☑	5,240
6	10W	☐	13,400
7		☐	
8		☐	
9		☐	
10		☐	
11		☐	
12		☐	

Total aliquots: 24

Sample Prep

Date/Time: 2/15/24 @ 1330

Initial: SB, RG, SG, CA

pH: 6.35

COND (µS): 6,410

Lab #:

Aliquots composited: 20

Deviations: Jar 6 not accepted due to high conductivity

Composite End Time: (Collect Time) 2/15/24 @ 03:30 Last aliquot in composite

Relinquished by: [signature]

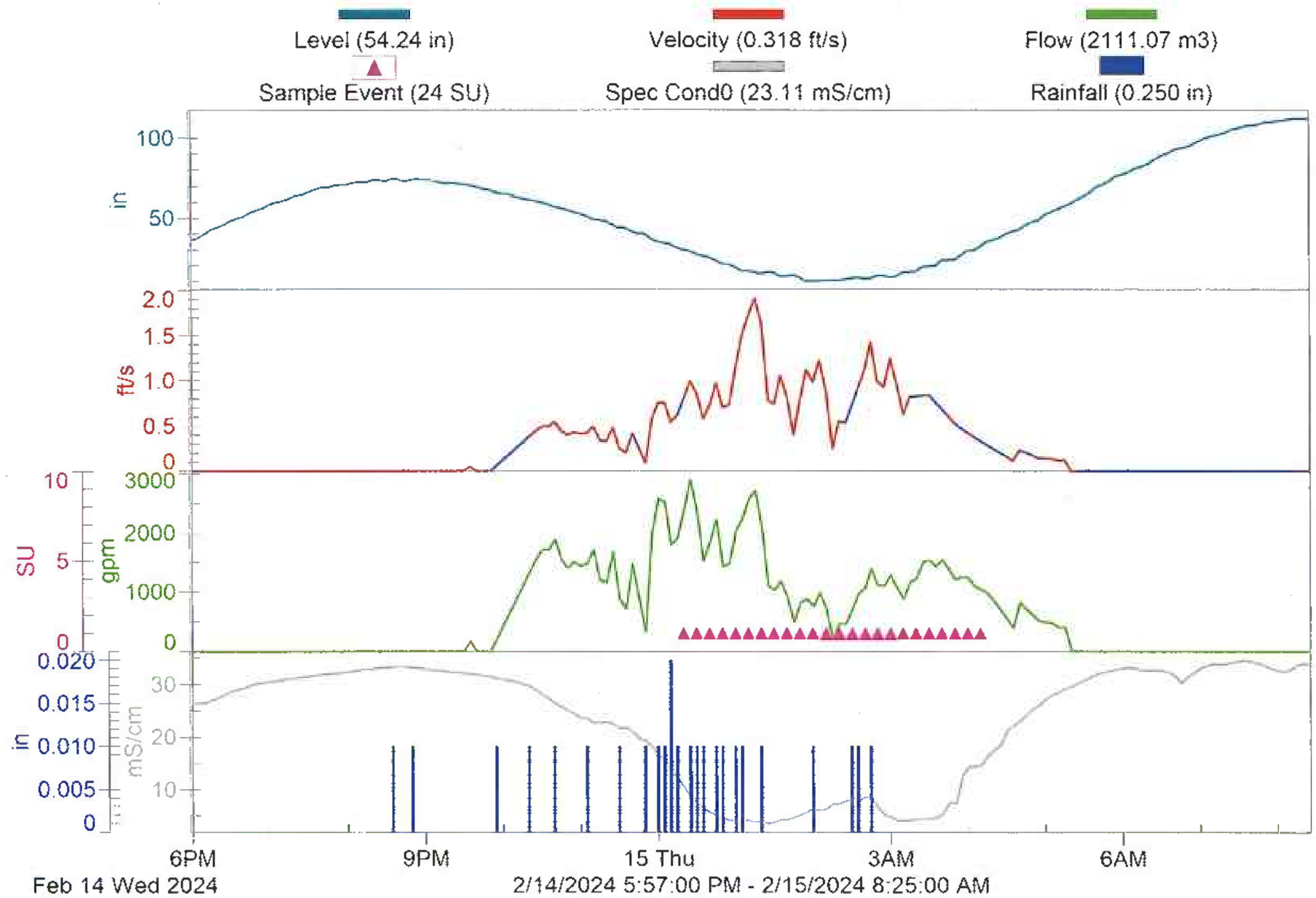
Date/time: 2/15/24 @ 13:45

Received by: [signature]

Date/Time: 2/15/24 @ 13:52

254-

Flowlink 5



SAMPLER ID# 1673008074 09:55 15-FEB-24
Hardware: C0 Software: 3.08.0001
*********** PROGRAM SETTINGS ***********

PROGRAM NAME:
"STORM 1 "
SITE DESCRIPTION:
"254- "

UNITS SELECTED:
LENGTH: ft
CONDUCTIVITY: mS/cm
TEMPERATURE: F

UNITS SELECTED:
FLOW RATE: gpm
FLOW VOLUME: Mgal
VELOCITY: fps

AREA-VEL MODULE:
AREA*VELOCITY
ROUND PIPE

----

5 MINUTE
DATA INTERVAL

12, 1000 ml BTLS
21 ft SUCTION LINE
AUTO SUCTION HEAD
1 RINSES, 1 RETRIES

ONE-PART PROGRAM

PACING:
TIME, EVERY
0 HOURS, 10 MINUTES

DISTRIBUTION:
4 SAMPLES/BOTTLE

VOLUME:

250 ml SAMPLES

ENABLE:

SP_CO0 <15.00 mS/cm

ENABLE:
REPEATABLE ENABLE
NO SAMPLE AT DISABLE
NO SAMPLE AT ENABLE

ENABLE:
COUNTDOWN IS STOPPED
WHILE DISABLED

ENABLE:
0 PAUSE & RESUMES

NO DELAY TO START

LIQUID DETECT ON

QUICK VIEW/CHANGE

TAKE MEASUREMENTS
AT STORAGE INTERVAL

DUAL SAMPLER OFF
BTL FULL DETECT OFF
TIMED BACKLIGHT

EVENT MARK SENT

DURING PUMP CYCLE

PUMP COUNTS FOR
EACH PURGE CYCLE:
500 PRE-SAMPLE
AUTO POST-SAMPLE

NO PERIODIC
SERIAL OUTPUT

NO RAIN GAUGE

SDI-12 DATA:
SP_CO0

I/O1= NONE
I/O2= NONE
I/O3= NONE

----

0 ANALOG OUTPUTS

NO EXTERNAL MODEM

NO ALARM
CONDITIONS SET

SAMPLER ID# 1673008074 09:56 15-FEB-24
Hardware: C0 Software: 3.08.0001
*********** SAMPLING RESULTS ***********
SITE: 254-
PROGRAM: STORM 1
Program Started at 10:28 WE 14-FEB-24
Nominal Sample Volume = 250 ml

SAMPLE	BOTTLE	TIME	SOURCE	ERROR	COUNT TO LIQUID
		10:28	PGM DISABLED		
		TH 15-FEB-24			
		00:10	PGM ENABLED		
1,4	1	00:20	T		641
2,4	1	00:30	T		646
3,4	1	00:40	T		654
4,4	1	00:50	T		658
1,4	2	01:00	T		660
2,4	2	01:10	T		667
3,4	2	01:20	T		700
4,4	2	01:30	T		667
1,4	3	01:40	T		670
2,4	3	01:50	T		669
3,4	3	02:00	T		670
4,4	3	02:10	T		672
1,4	4	02:20	T		672
2,4	4	02:30	T		670
3,4	4	02:40	T		668
4,4	4	02:50	T		665
1,4	5	03:00	T		667
2,4	5	03:10	T		664
3,4	5	03:20	T		665
4,4	5	03:30	T		663
1,4	6	03:40	T		657
2,4	6	03:50	T		658
3,4	6	04:00	T		654
4,4	6	04:10	T		659
		04:15	PGM DISABLED		

SOURCE T ==> TIME

NPDES Storm
Chain of Custody

Jar Cert #

Outfall: 222

Date/Time sampler installed: 2/14/24 @ 11:26

Jar Cert # 2312036-01 Sampling Crew: SG, CA

Filter lot # 1383988 Weather conditions: Clear

Date/Time sampler pickup: 2/16/24 @ 11:00

Observed activities in area: N/A

Observations during sampler collection: N/A

Color, Odors, sheens: N/A

Type of Sample: ☒ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☒ >0.2 inches rain ☐ <0.02 inches of rain previus 24 hours

Samplers: ☒ Data downloaded ☒ Sample bottles marked ☒ Ice Present at pick up ☒ Tubing Decon 1000mL DIwater ☒ Caps on containers

Fill to...	Parameters:	Sample	QC
Neck	PAH's/Phthalates (1L) +	☒	☐ ☐
No head	[1]Total Mercury (125/250mL QC)	☒	☐
No head	[1]Diss Mercury (125/250mL QC)	☒	☐
Shoulder	Total Metals (250mL)	☒	
Shoulder	Diss Metals (125mL)	☒	
Shoulder	TSS (1L), (500 mL min)	☒	
Shoulder	Nutrients (250mL)	☒	
Shoulder	Ortho-P (125mL), (75min)	☒	
Shoulder	BOD (1L)	☒	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☒	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes 4.010 L config above

+1000 mL for QC per bottle, must submit 2 extra bottles

[1]If 250ml bottle used, thenQAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (uS)
1	1000	☒	
2		☒	
3		☒	
4		☒	
5		☒	
6		☒	
7		☒	
8		☒	
9		☒	
10		☒	
11	750	☒	
12	0	☐	

Total aliquots: 43

Sample Prep

Date/Time: 2/15/24 @ 1240

Initial: SS, RG, SG, CA

pH: 6.52

COND (µS): 79.3

Lab #:

Aliquots composited: 43

Deviations :

Composite End Time: 2/15/24 @ 05:01
(Collect Time) Last aliquot in composite

Relinquished by:

Date/Time: 2/15/24 @ 13:45

Received by:

Date/Time: 2/15/24 @ 13:52

FIELD REPORT

Project: Thea Foss/Wheeler-Osgood Waterways & NPDES Stormwater Monitoring Program

Event: Storm Event – Feb 28, 2024

INTRODUCTION

This report summarizes the storm event sampled on 2/28/2024 – 2/29/2024 by the City of Tacoma Environmental Services Collection System Support staff as part of our stormwater monitoring program. This report includes a summary of the following:

- Storm characteristics and criteria;
- Sampling activities;
- Flow characteristics at each sampling location;
- Pacing – set for a 2.12" event, actual event was 1.18"

This event met the sampling criteria for precipitation as specified in the Thea Foss Sampling and Analysis Plan (SAP).

DESCRIPTION OF SAMPLING ACTIVITES

Samplers placed in the field on 2/27/2024. During sampler installation the weather conditions were overcast. All samplers were retrieved on 3/1/2024 (For site specific details, see Appendix A for field notes, Chain of Custody (COC) forms, and event hydrographs).

The following unusual observations were noted during the sampling event:

Table 2: Composite Sampling Activities

Sample Location	Site Deployed	Sample Accepted	Pacing (gal)	Enables LVL(ft), VEL(fps) COND.(mS/cm)	Comments
Outfall 230A	Yes	No	369,000	LVL > 0.5	19 Aliquots Collected / 0 Composited
Outfall 235	Yes	Yes	145,000	LVL > 0.37 VEL > 0.8	23 Aliquots Collected / 16 Composited
Outfall 237ANew	Yes	No	2,205,000	LVL > 0.4 VEL > 6.5	14 Aliquots Collected / 0 Composited
Outfall 237B	Yes	Yes	1,700,000	LVL > 0.6	17 Aliquots Collected / 12 Composited
Outfall 243	Yes	Yes	20 min.	< 7.5 mS/cm	48 Aliquots Collected / 48 Composited
Outfall 245	Yes	Yes	20 min.	> 200 gpm	31 Aliquots Collected / 24 Composited
Outfall 254	No	No	N/A	N/A	N/A

**QC, QUALITY CONTROL*

ND, NO DATA

NA, NOT APPLICABLE

WATER QUALITY DATA

Accepted samples were analyzed for the target parameters specified in the SAP and QAPP. Samples accepted at all Outfalls were composited and preserved within 24 hours of the last aliquot being collected. The samples were allowed to sit for a minimum of 18 hours before metals analysis was started.

EQUIPMENT INFORMATION

Samples were collected using ISCO 6712 portable auto samplers. Rain data was collected using an ISCO 674 rain gauge located at the Center for Urban Waters at 326 East D Street, Tacoma, WA 98421.

CORRECTIVE ACTIONS AND DEVIATIONS

There were no deviations from the field procedures as discussed in the SAP other than those discussed above/below. No other criteria or procedures as indicated in the SAP were compromised except for those discussed above/below.

Enclosures: The ISCO program setting/sampling results report, the sample collection chain of custody form, and field records are in Appendix A for each outfall. This includes the following information for the samples collected:

- Plot of flow hydrograph and hyetograph
- Subsample times and conductivities
- Tidal windows
- Field activities

Appendix A

PROJECT

Notebook No

Continued from Page

Storm Collection - 2/15/24
254 @ 9:56 - 6/12
245 @ 10:00 - 9/12 - Slow download
243 @ 10:26 - 0/12
237A @ 10:40 - 0/12 - Low Battery
237B @ 10:50 - 6½/12 -
235 @ 10:00 - 10½/12 -
230A @ 11:11 - 9/12 - PB

Storm Deployment - 2/23/24 - .45"

245 @ 13:58 - Jars/Ice - Download
243 @ 14:06 - Jars/Ice - Download - Spec. Cond. = < 3.2
237A @ 14:54 - Jars/Ice - Download - Enable = 386,000
237B @ 14:17 - Jars/Ice - Download - Enable = 351,000 Gpm
~~245 @~~ enable 0.65'
235 @ 14:28 - Jars/Ice - Download - Enable = ~~32,~~ 29,000
230 @ 14:40 - Jars/Ice - Download - Enable = 77,000 Lvl = .4 ft

Storm Deployment - 2/27/24 2.12"

245 @ 10:01 - Jars/Ice - Download - 20 min pacing
243 @ 10:06 - Jars/Ice - Download - Enable < 7.5 ms/cm
237A @ 10:19 - Jars/Ice - Download - 2,205,000 enable
237B @ 10:25 - Jars/Ice - Download - 1,785,000 enable Lvl = 7.6'
235 @ 10:34 - Jars/Ice - Download - 145,000
230A @ 10:55 - Jars/Ice - Download - 369,000

Grabs - 2/28/24
254 @ 10:56 230A @ 11:48
245 @ 11:06
243 @ 11:13
232 @ 11:17
237A @ 11:23
237B @ 11:24
235 @ 11:37

Continued on Page

Read and Understood By

Signed Date Signed Date

PROJECT ______

Storm Collection - 3/1/24
245 @ 8:47 - 7 3/4/12
243 @ 8:56 - 12/12
237A @ 9:02 - 3 1/2/12
237B @ 9:08 - 4 1/4/12
235 @ 9:21 - ~~3 6oll~~ 6/12
230A @ 8:39 - ~~5~~ 19 aliquots RG

3/8/24 - Storm Deployment 1.02"
254 @ 13:22 - Jars/Ice - Sensor issue
245 @ 13:47 - Jars/Ice -
243 @ 13:57 - Jars/Ice - < 50 uS/cm
237A @ 14:11 - Jars/Ice - 755,000
237B @ 14:20 - Jars/Ice - 788,000
235 @ 14:29 - Jars/Ice - 68,000
230A @ 14:43 - Jars/Ice - 133,000

3/13/24

254. New Sensor installed / New strainer installed.
level check @ 6.0" / .5' Data downloaded.

3/14/24 SG. RG Baseflow Grabs

243 @ 13:46. Sample collected. ~~[illegible]~~

237A @ 13:54 " " " "

237B + 222 @ 14:02

235 @ @ 14:12

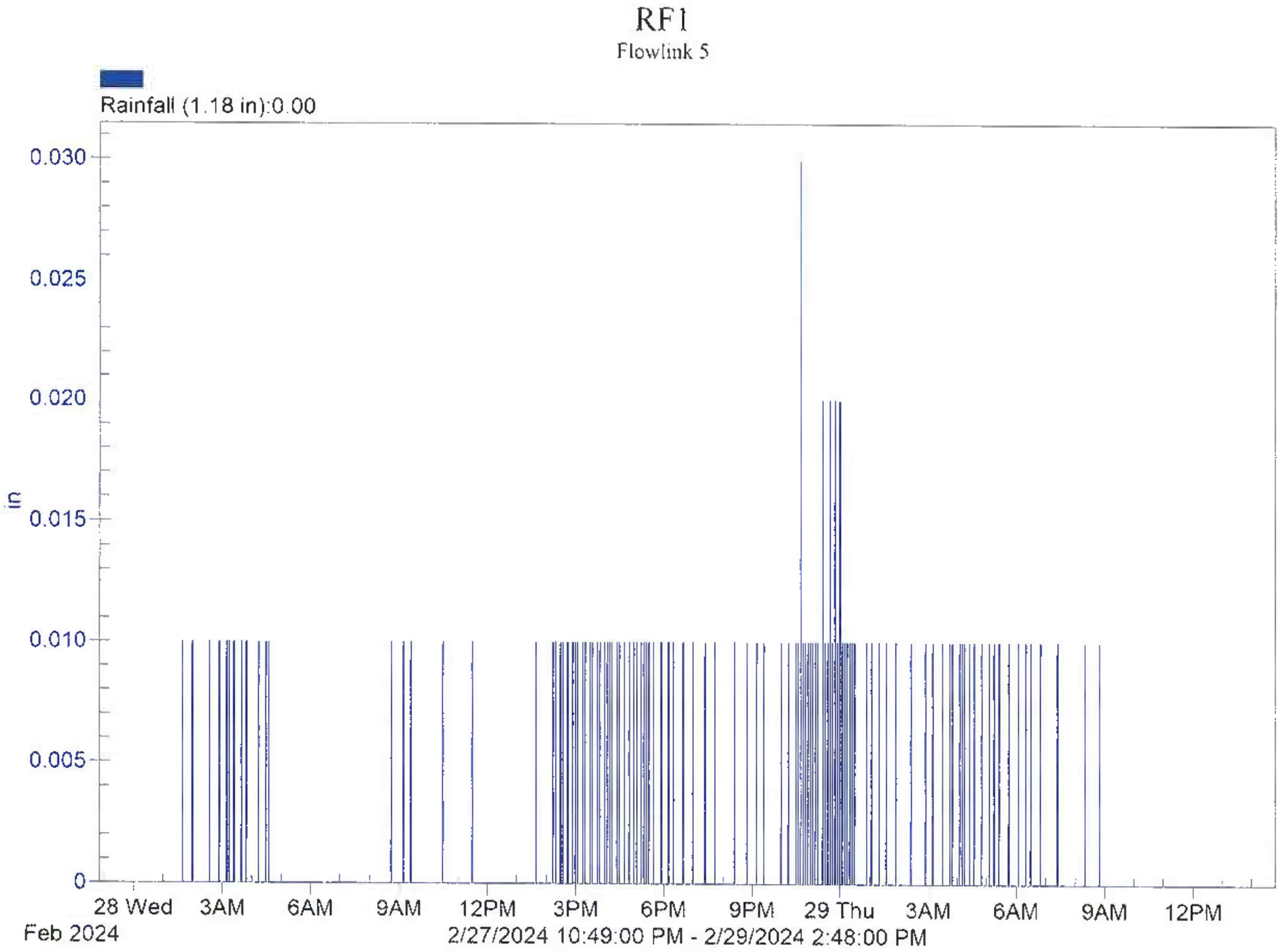
230A @ 14:23

RG

Continued on Page

Read and Understood By

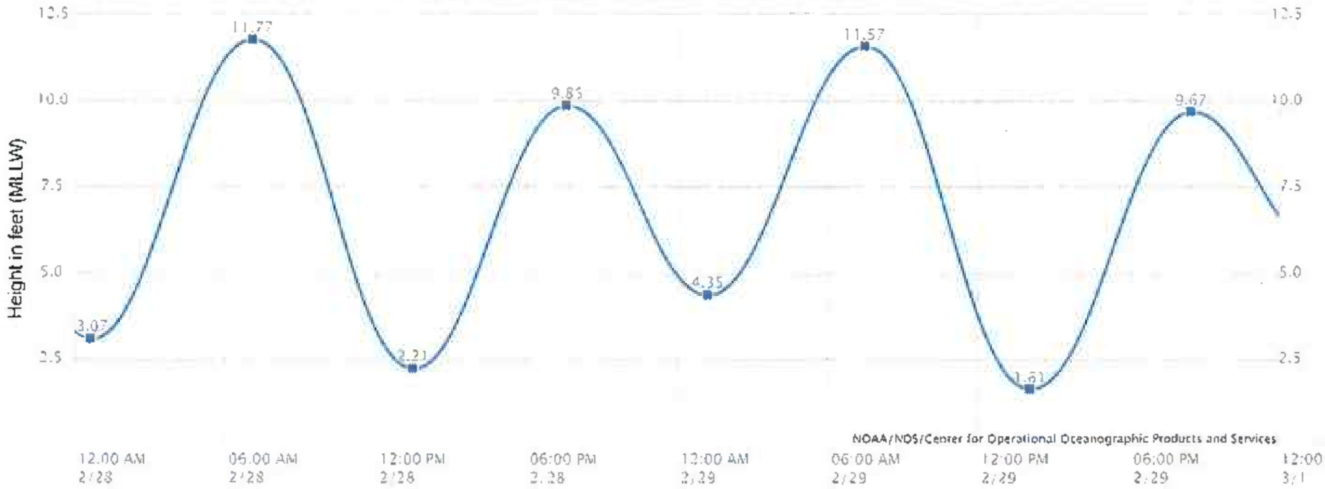
Signed ______ Date ______ Signed ______ Date ______



RF1
Flowlink 5
Rainfall (1.18 in):0.00
in
0.030
0.025
0.020
0.015
0.010
0.005
0
28 Wed
3AM
6AM
9AM
12PM
3PM
6PM
9PM
29 Thu
3AM
6AM
9AM
12PM
Feb 2024
2/27/2024 10:49:00 PM - 2/29/2024 2:48:00 PM

Help Print

NOAA/NOS/CO-OPS
Tide Predictions at 9446484, Tacoma WA
From 2024/02/28 12:00 AM LST/LDT to 2024/02/29 11:59 PM LST/LDT



Note: The interval is High/Low, the solid blue line depicts a curve fit between the high and low values and approximates the segments between.
Disclaimer: These data are based upon the latest information available as of the date of your request, and may differ from the published tide tables.

High/Low Tide Prediction Data Listing

Station Name: Tacoma, WA
Action: Daily
Product: Tide Predictions
Start Date & Time: 2024/2/28 12:00 AM
End Date & Time: 2024/2/29 11:59 PM

Source: NOAA/NOS/CO-OPS
Prediction Type: Harmonic
Datum: MLLW
Height Units: Feet
Time Zone: LST/LDT

Date	Day	Time	Hgt	Time	Hgt	Time	Hgt	Time	Hgt
2024/02/28	Wed	12:41 AM	3.07 L	07:00 AM	11.77 H	1:29 PM	2.21 L	7:34 PM	9.85 H
2024/02/29	Thu	01:13 AM	4.35 L	07:24 AM	11.57 H	2:06 PM	1.61 L	8:27 PM	9.67 H

2401000-01

Bottle Certification

Bottle Certification

*** DEFAULT CONTAINER ***

NPDES Storm
Chain of Custody

2401000-01

Bottle Certification

Bottle Certification

*** DEFAULT CONTAINER ***

Jar Cert #____ Outfall: 235 Date/Time sampler installed: 2/27/24 @ 10:34

Jar Cert #____ Sampling Crew: CA/HA

Filter lot # 138 3988 Weather conditions: Clear Date/Time sampler pickup: 3/1/24 @ 9:21

Observed activities in area: N/A

Observations during sampler collection: N/A

Color, Odors, sheens: N/A

Type of Sample: ☑ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☑ >0.2 inches rain ☐ <0.02 inches of rain previous 24 hours

Samplers: ☑ Data downloaded ☐ Sample bottles marked

☐ Ice Present at pick-up ☐ Tubing Decon 1000mL Divater

☑ Caps on containers

Fill to...	Parameters:	Sample	QC
Neck	PAH's/Phthalates (1L) +	☑	☐ ☐
No head	[1]Total Mercury (125/250mL QC)	☑	☐
No head	[1]Diss Mercury (125/250mL QC)	☑	☐
Shoulder	Total Metals (250mL)	☑	
Shoulder	Diss Metals (125mL)	☑	
Shoulder	TSS (1L), (500 mL min)	☑	
Shoulder	Nutrients (250mL)	☑	
Shoulder	Ortho-P (125mL), (75min)	☑	
Shoulder	BOD (1L)	☐	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☑	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes 4.010 L config above

+1000 mL for QC per bottle, must submit 2 extra bottles

[1]If 250ml bottle used, thenQAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (µS)
1	1000	☑	129.3
2	1000	☑	77.9
3	1000	☑	49.6
4	1000	☑	76.0
5	1000	☐	115.8
6	750	☐	172.6
7		☐	
8		☐	
9		☐	
10		☐	
11		☐	
12		☐	

Total aliquots: 23

Sample Prep

Date/Time: 3/1/24 @ 10:56

Initial: CA, HA

pH: 7.17

COND (µS): 74.90

Lab #: 2402033-02

Aliquots composited: 16

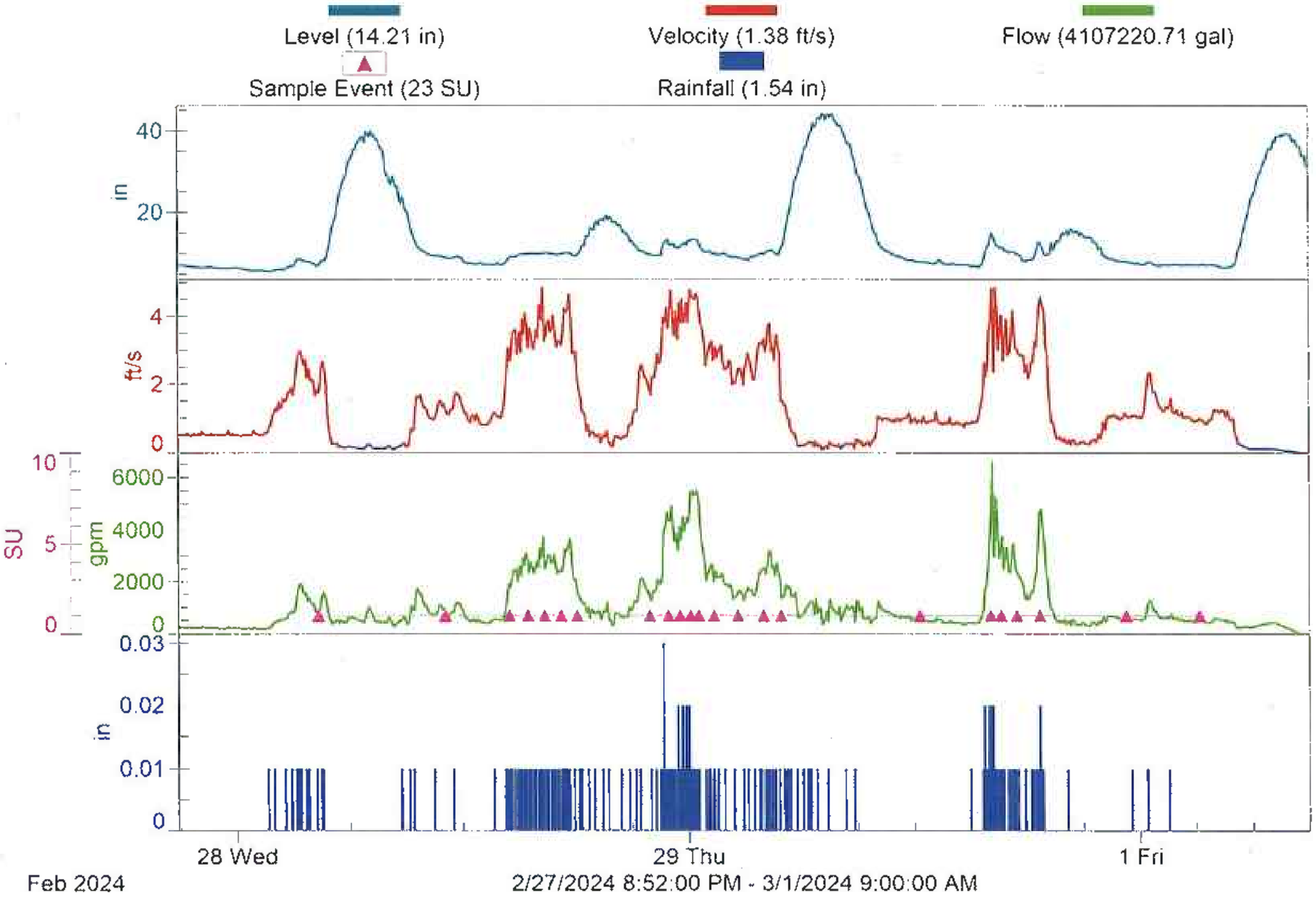
Deviations: Jars 5 &6 taken after event

Composite End Time: 2/29/24 @ 4:55 (Collect Time) Last aliquot in composite

Relinquished by: [signature] Received by: [signature]

Date/Time: 3/1/24 @ 11:40 Date/Time: 3/1/24 @ 11:45

235_A
Flowlink 5



SAMPLER ID# 1242995716 09:20 1-MAR-24
Hardware: A1 Software: 2.33
*********** PROGRAM SETTINGS ***********

PROGRAM NAME:
"235A   "
SITE DESCRIPTION:
"235A ST   "

UNITS SELECTED:
LENGTH: ft

UNITS SELECTED:
FLOW RATE: Mgd
FLOW VOLUME: Mgal
VELOCITY: fps

AREA-VEL MODULE:
AREA*VELOCITY
ROUND PIPE

----

5 MINUTE
DATA INTERVAL

12, 1000 ml BTLS
56 ft SUCTION LINE
AUTO SUCTION HEAD
1 RINSES, 1 RETRIES

ONE-PART PROGRAM

PACING:
FLOW, EVERY
0.145 Mgal
NO SAMPLE AT START

DISTRIBUTION:
4 SAMPLES/BOTTLE

VOLUME:

250 ml SAMPLES

ENABLE:
LEVEL >0.370 ft
AND
VEL > 0.80 fps

ENABLE:
REPEATABLE ENABLE
NO SAMPLE AT DISABLE
NO SAMPLE AT ENABLE

ENABLE:
COUNTDOWN IS STOPPED
WHILE DISABLED

ENABLE:
0 PAUSE & RESUMES

NO DELAY TO START

200 HOURS RUN TIME

LIQUID DETECT ON

QUICK VIEW/CHANGE

TAKE MEASUREMENTS
AT STORAGE INTERVAL

DUAL SAMPLER OFF
BTL FULL DETECT OFF
TIMED BACKLIGHT

EVENT MARK SENT

DURING PUMP CYCLE

PUMP COUNTS FOR
EACH PURGE CYCLE:
100 PRE-SAMPLE
AUTO POST-SAMPLE

NO PERIODIC
SERIAL OUTPUT

INTERROGATOR
CONNECTOR
POWER ALWAYS ON

NO RAIN GAUGE

NO SDI-12 SONDE

AUTO SDI-12 SCAN OFF

I/O1= NONE
I/O2= NONE
I/O3= NONE

----

0 ANALOG OUTPUTS

NO EXTERNAL MODEM

NO ALARM
CONDITIONS SET

```
     ----------
     ----------
-----------------------------------------


SAMPLER ID# 1242995716  09:20  1-MAR-24
  Hardware:     A1  Software: 2.33
*********** SAMPLING RESULTS ***********
   SITE: 235A ST
PROGRAM: 235A
Program Started at 10:38 TU 27-FEB-24
Nominal Sample Volume =  250 ml
                                   COUNT
                                      TO
SAMPLE  BOTTLE TIME  SOURCE ERROR LIQUID
------- ------ ----  ------ -- --  ------
              10:38  PGM DISABLED
------------- WE 28-FEB-24 -------------
              01:50  PGM ENABLED
  1,4     1   04:19      F          1878
              04:55  PGM DISABLED
              09:30  PGM ENABLED
  2,4     1   11:04      F          1865
  3,4     1   14:29      F          1886
  4,4     1   15:28      F          1873
  1,4     2   16:20      F          1878
  2,4     2   17:13      F          1880
  3,4     2   18:05      F          1887
              18:35  PGM DISABLED
              18:40  PGM ENABLED
              18:45  PGM DISABLED
              20:50  PGM ENABLED
  4,4     2   21:57      F          1872
  1,4     3   22:56      F          2146
  2,4     3   23:32      F          1878
------------- TH 29-FEB-24 -------------
  3,4     3   00:06      F          1895
  4,4     3   00:33      F          1914
  1,4     4   01:21      F          1895
  2,4     4   02:37      F          1879
  3,4     4   03:59      F          1861
  4,4     4   04:55      F          1857
              05:25  PGM DISABLED
              10:05  PGM ENABLED
  1,4     5   12:17      F          1867
              14:40  PGM DISABLED
              14:45  PGM ENABLED
  2,4     5   16:05      F          1912
```

3,4	5	16:39	F	1860
4,4	5	17:28	F	1876
1,3	6	18:41	F	1842
		19:30	PGM DISABLED	
		22:05	PGM ENABLED	
		22:10	PGM DISABLED	
		22:15	PGM ENABLED	
2,3	6	23:17	F	1840
------------		FR 01-MAR-24	------------	
3,3	6	03:09	F	1839
		05:05	PGM DISABLED	
		09:19	MANUAL PAUSE	
		09:19	MANUAL RESUME	

SOURCE F ==> FLOW

Bottle Certification
Bottle Certificate
*** DEFAULT CONTAINER

NPDES Storm
Chain of Custody

Jar Cert #
Outfall: 237B
Date/Time sampler installed: 2/27/24 @ 10:25
Jar Cert #
Sampling Crew: CA/HA
Filter lot #
Weather conditions: Clear
Date/Time sampler pickup: 3/1/24 @ 9:08
Observed activities in area: N/A
Observations during sampler collection: N/A
Color, Odors, sheens: N/A

Type of Sample: ☑ Stormwater ☐ Baseflow ☐ Rinse Blank
Rain event: ☑ >0.2 inches rain ☐ <0.02 inches of rain previous 24 hours
Samplers: ☐ Data downloaded ☐ Sample bottles marked
☑ Pre Cont at pick-up ☐ Tubing Decon 1000mL Divater
☑ Caps on containers

Fill to...	Parameters	Sample	QC
Neck	PAH's/Phthalates (1L) +	☑	☐ ☐
No head	[1]Total Mercury (125/250mL QC)	☑	☐
No head	[1]Diss Mercury (125/250mL QC)	☑	☐
Shoulder	Total Metals (250mL)	☑	
Shoulder	Diss Metals (125mL)	☑	
Shoulder	TSS (1L), (500 mL min)	☑	
Shoulder	Nutrients (250mL)	☑	
Shoulder	Ortho-P (125mL), (75min)	☑	
Shoulder	BOD (1L)	☐	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☐	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes 4.010 L config above
+1000 mL for QC per bottle, must submit 2 extra bottles
[1]If 250ml bottle used, thenQAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (µS)
1	1000	☑	128.6
2	1000	☑	84.1
3	1000	☑	159.4
4	1000	☐	—
5	250	☐	—
6		☐	
7		☐	
8		☐	
9		☐	
10		☐	
11		☐	
12		☐	

Total aliquots: 17

Sample Prep
Date/Time: 3/1/24 @ 10:58
Initial: CA, HA,
pH: ~~7.17~~ 6.93 HA
COND (µS): ~~112.8~~ 114.4 HA
Lab #: ~~138988~~ 2402033-04
Aliquots composited: 12

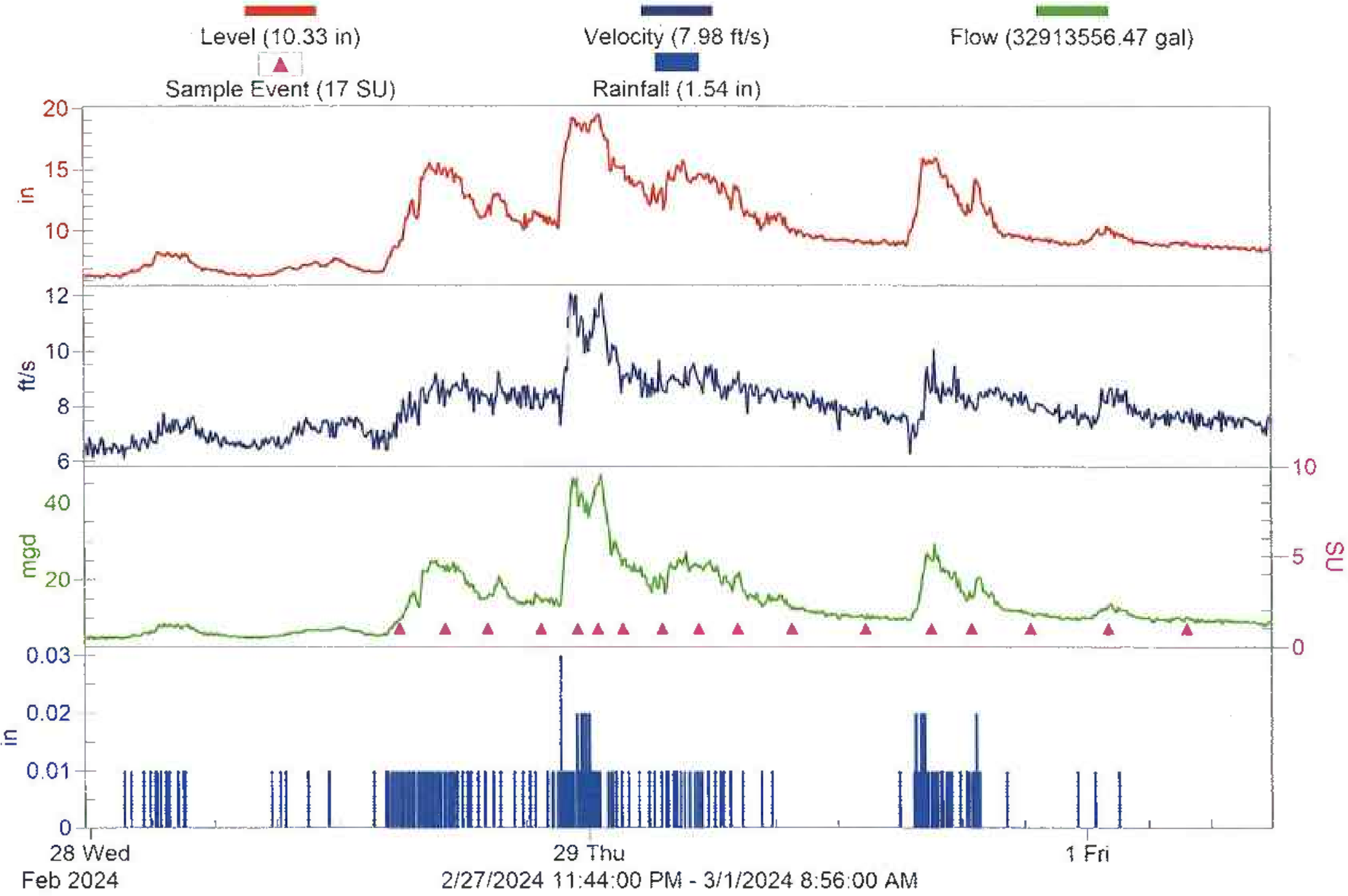
Deviations: Jars 4 & 5 taken after event

Composite End Time: 2/29/24 @ 13:22
(Collect Time) Last aliquot in composite

Relinquished by: [signature]
Date/Time: 3/1/24 @ 11:40
Received by: [signature]
Date/Time: 3/1/24 @ 11:45

237 B

Flowlink 5



```
SAMPLER ID# 1243003651  09:08  1-MAR-24
  Hardware:     A1  Software: 2.33
*********** PROGRAM SETTINGS ***********
     ----------
   PROGRAM NAME:
    " STORM 1  "
 SITE DESCRIPTION:
    "  237 B   "
     ----------
   UNITS SELECTED:
     LENGTH: ft


     ----------
   UNITS SELECTED:
   FLOW RATE: gpm
 FLOW VOLUME: Mgal
   VELOCITY: fps
     ----------
  AREA-VEL MODULE:
   AREA*VELOCITY
     ROUND PIPE

     ----------

      5 MINUTE
   DATA INTERVAL

     ----------
  12,  1000 ml BTLS
 16 ft SUCTION LINE
 AUTO SUCTION HEAD
1 RINSES, 1 RETRIES
     ----------

  ONE-PART PROGRAM


     ----------
      PACING:
    FLOW, EVERY
     1.700 Mgal
NO SAMPLE AT START
     ----------
    DISTRIBUTION:
   4 SAMPLES/BOTTLE


     ----------
```

VOLUME:

250 ml SAMPLES

ENABLE:

LEVEL >0.600 ft

ENABLE:

REPEATABLE ENABLE

NO SAMPLE AT DISABLE

NO SAMPLE AT ENABLE

ENABLE:

COUNTDOWN IS STOPPED

WHILE DISABLED

ENABLE:

0 PAUSE & RESUMES

NO DELAY TO START

200 HOURS RUN TIME

LIQUID DETECT ON

QUICK VIEW/CHANGE

TAKE MEASUREMENTS

AT STORAGE INTERVAL

DUAL SAMPLER OFF

BTL FULL DETECT ON

TIMED BACKLIGHT

EVENT MARK SENT

DURING PUMP CYCLE

PUMP COUNTS FOR
EACH PURGE CYCLE:
100 PRE-SAMPLE
AUTO POST-SAMPLE

NO PERIODIC
SERIAL OUTPUT

INTERROGATOR
CONNECTOR
POWER ALWAYS ON

NO RAIN GAUGE

NO SDI-12 SONDE

AUTO SDI-12 SCAN OFF

I/O1= NONE
I/O2= NONE
I/O3= NONE

----

0 ANALOG OUTPUTS

NO EXTERNAL MODEM

NO ALARM
CONDITIONS SET

SAMPLER ID# 1243003651 09:08 1-MAR-24
Hardware: A1 Software: 2.33
*********** SAMPLING RESULTS ***********
SITE: 237 B
PROGRAM: STORM 1
Program Started at 10:28 TU 27-FEB-24
Nominal Sample Volume = 250 ml

SAMPLE	BOTTLE	TIME	SOURCE	ERROR	COUNT TO LIQUID
		10:28	PGM DISABLED		
-------------		WE 28-FEB-24	-------------		
		02:40	PGM ENABLED		
		05:15	PGM DISABLED		
		10:20	PGM ENABLED		
		11:15	PGM DISABLED		
		11:20	PGM ENABLED		
		12:35	PGM DISABLED		
		14:20	PGM ENABLED		
1,4	1	14:55	F		525
2,4	1	17:06	F		515
3,4	1	19:09	F		521
4,4	1	21:43	F		488
1,4	2	23:28	F		507
-------------		TH 29-FEB-24	-------------		
2,4	2	00:28	F		502
3,4	2	01:40	F		510
4,4	2	03:33	F		515
1,4	3	05:19	F		512
2,4	3	07:11	F		515
3,4	3	09:49	F		523
4,4	3	13:22	F		521
1,4	4	16:32	F		511
2,4	4	18:29	F		516
3,4	4	21:19	F		510
-------------		FR 01-MAR-24	-------------		
4,4	4	01:04	F		515
1,1	5	04:50	F		508
		09:06	MANUAL PAUSE		
		09:06	PGM STOPPED 01-MAR		

SOURCE F ==> FLOW

2312036-01

NPDES Storm
Chain of Custody

Bottle Certification
Bottle Certification
*** DEFAULT CONTAINER ***

Jar Cert # ____ Outfall: 243 Date/Time sampler installed: 2/27/24 @ 10:06

Jar Cert # ____ Sampling Crew: CA/HA

Filter lot # 1383988 Weather conditions: Clear Date/Time sampler pickup: 3/1/24 @ 8:56

Observed activities in area: N/A

Observations during sampler collection: N/A

Color, Odors, sheens: N/A

Type of Sample: ☑ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☑ >0.2 inches rain ☐ <0.02 inches of rain previous 24 hours

Samplers: ☑ Data downloaded ☐ Sample bottles marked
☑ Ice Present at pick-up ☐ Tubing Decon 1000mL DI water
☑ Caps on containers

Bottle Certification
Bottle Certification
2312036-01

Fill to...	Parameters:	Sample	QC
Neck	PAH's/Phthalates (1L) +	☑	☑ ☑
No head	[1]Total Mercury (125/250mL QC)	☑	☑
No head	[1]Diss Mercury (125/250mL QC)	☑	☑
Shoulder	Total Metals (250mL)	☑	
Shoulder	Diss Metals (125mL)	☑	
Shoulder	TSS (1L), (500 mL min)	☑	
Shoulder	Nutrients (250mL)	☑	
Shoulder	Ortho-P (125mL), (75min)	☑	
Shoulder	BOD (1L)	☑	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☑	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes 4.010 L config above
+1000 mL for QC per bottle, must submit 2 extra bottles
[1]If 250ml bottle used, thenQAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (uS)
1	1000	☑	14150
2	1000	☑	11460
3	1000	☑	11800
4	1000	☑	11610
5	1000	☑	9300
6	1000	☑	6450
7	1000	☑	2711
8	~~2553~~ 1000	☑	2553
9	1000	☑	2506
10	1000	☑	2564
11	1000	☑	2604
12	1000	☑	12920

Total aliquots: 48

Sample Prep

Date/Time: 3/1/24 @ 10:52

Initial: CA, HA

pH: ~~12.56~~ HA 6.45

COND (µS): ~~7260~~ ~~71600~~ HA 7280

Lab #: 2402033-05

Aliquots composited: 48

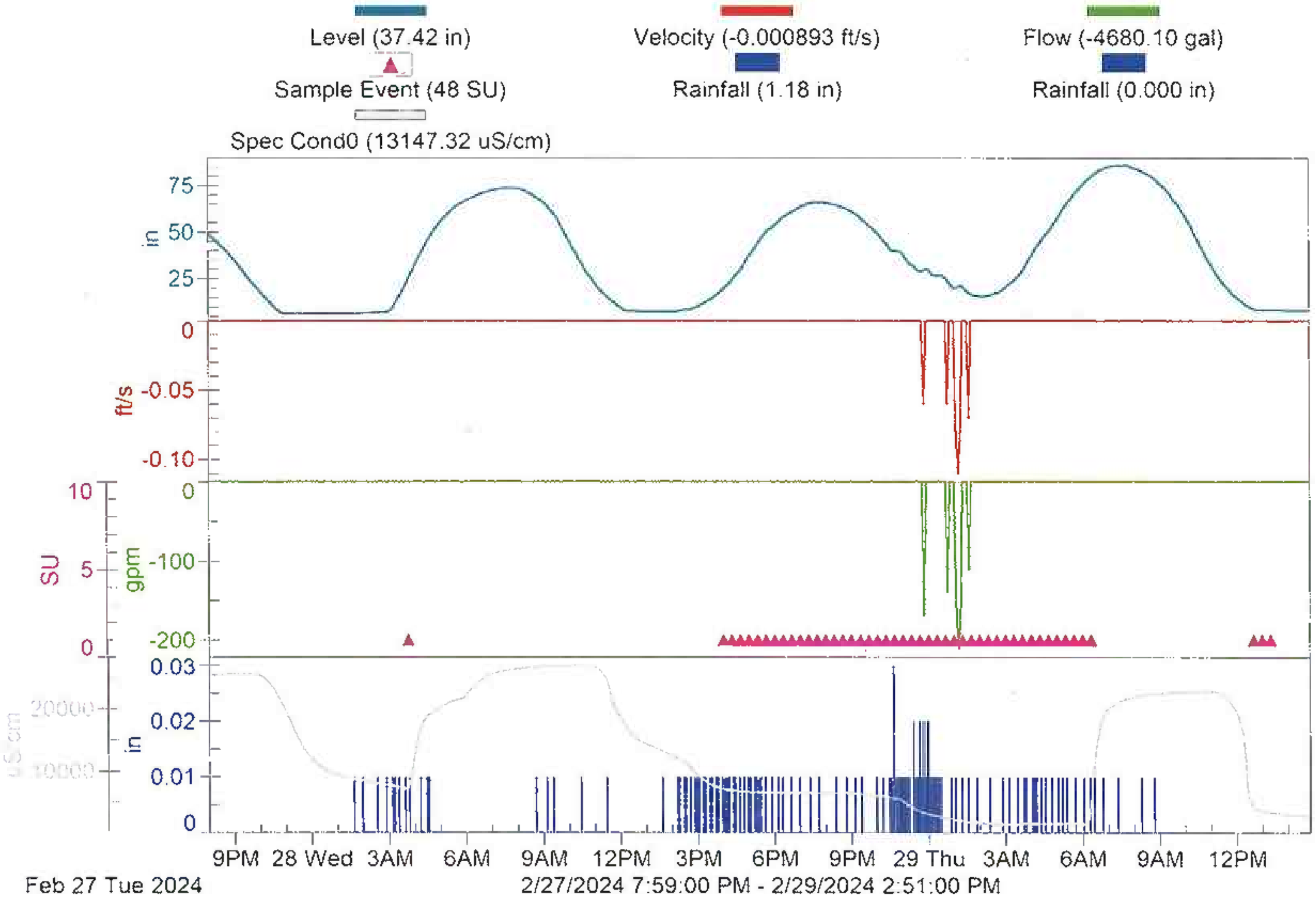
Deviations :

Composite End Time: 2/28/24 @ 13:20
(Collect Time) Last aliquot in composite

Relinquished by: [signature] Received by: [signature]

Date/Time: 3/1/24 @ 11:40 Date/Time: 3/1/24 @ 11:45

Flowlink 5



Level (37.42 in)
Velocity (-0.000893 ft/s)
Flow (-4680.10 gal)
Sample Event (48 SU)
Rainfall (1.18 in)
Rainfall (0.000 in)
Spec Cond0 (13147.32 uS/cm)
75
50
25
in
0
-0.05
-0.10
ft/s
10
5
0
SU
0
-100
-200
gpm
20000
10000
uS/cm
0.03
0.02
0.01
0
in
9PM
28 Wed
3AM
6AM
9AM
12PM
3PM
6PM
9PM
29 Thu
3AM
6AM
9AM
12PM
Feb 27 Tue 2024
2/27/2024 7:59:00 PM - 2/29/2024 2:51:00 PM

SAMPLER ID# 1242893352 08:54 1-MAR-24
Hardware: A1 Software: 2.33
*********** PROGRAM SETTINGS ***********

PROGRAM NAME:
"STORM 1   "
SITE DESCRIPTION:
" 243   "

UNITS SELECTED:
LENGTH: ft
CONDUCTIVITY: mS/cm
TEMPERATURE: F

UNITS SELECTED:
FLOW RATE: gpm
FLOW VOLUME: Mgal
VELOCITY: fps

AREA-VEL MODULE:
AREA*VELOCITY
ROUND PIPE

----

5 MINUTE
DATA INTERVAL

12, 1000 ml BTLS
17 ft SUCTION LINE
AUTO SUCTION HEAD
1 RINSES, 1 RETRIES

ONE-PART PROGRAM

PACING:
TIME, EVERY
0 HOURS, 20 MINUTES

DISTRIBUTION:
4 SAMPLES/BOTTLE

VOLUME:

250 ml SAMPLES

ENABLE:

SP_CO0 <7.500 mS/cm

ENABLE:
REPEATABLE ENABLE
NO SAMPLE AT DISABLE
NO SAMPLE AT ENABLE

ENABLE:
COUNTDOWN IS STOPPED
WHILE DISABLED

ENABLE:
0 PAUSE & RESUMES

NO DELAY TO START

LIQUID DETECT ON

QUICK VIEW/CHANGE

TAKE MEASUREMENTS
AT STORAGE INTERVAL

DUAL SAMPLER OFF
BTL FULL DETECT OFF
TIMED BACKLIGHT

EVENT MARK SENT

DURING PUMP CYCLE

PUMP COUNTS FOR
EACH PURGE CYCLE:
200 PRE-SAMPLE
AUTO POST-SAMPLE

NO PERIODIC
SERIAL OUTPUT

INTERROGATOR
CONNECTOR
POWER ALWAYS ON

NO RAIN GAUGE

SDI-12 DATA:
01DATA0 02DATA0
TEMP0 SP_CO0 05DATA0

I/O1= NONE
I/O2= NONE
I/O3= NONE

----

0 ANALOG OUTPUTS

NO EXTERNAL MODEM

NO ALARM
CONDITIONS SET

SAMPLER ID# 1242893352 08:54 1-MAR-24
Hardware: A1 Software: 2.33
*********** SAMPLING RESULTS ***********
SITE: 243
PROGRAM: STORM 1
Program Started at 10:12 TU 27-FEB-24
Nominal Sample Volume = 250 ml

SAMPLE	BOTTLE	TIME	SOURCE	ERROR	COUNT TO LIQUID
		10:13	PGM DISABLED		
-------------	WE 28-FEB-24	-------------			
		03:25	PGM ENABLED		
1,4	1	03:45	T		439
		03:50	PGM DISABLED		
		15:45	PGM ENABLED		
2,4	1	16:00	T		440
3,4	1	16:20	T		440
4,4	1	16:40	T		440
1,4	2	17:00	T		436
2,4	2	17:20	T		434
3,4	2	17:40	T		431
4,4	2	18:00	T		429
1,4	3	18:20	T		425
2,4	3	18:40	T		427
3,4	3	19:00	T		425
4,4	3	19:20	T		426
1,4	4	19:40	T		422
2,4	4	20:00	T		423
3,4	4	20:20	T		423
4,4	4	20:40	T		426
1,4	5	21:00	T		423
2,4	5	21:20	T		426
3,4	5	21:40	T		429
4,4	5	22:00	T		429
1,4	6	22:20	T		435
2,4	6	22:40	T		435
3,4	6	23:00	T		435
4,4	6	23:20	T		437
1,4	7	23:40	T		438
-------------	TH 29-FEB-24	-------------			
2,4	7	00:00	T		438

3,4	7	00:20	T	439
4,4	7	00:40	T	441
1,4	8	01:00	T	444
2,4	8	01:20	T	444
3,4	8	01:40	T	446
4,4	8	02:00	T	445
1,4	9	02:20	T	443
2,4	9	02:40	T	446
3,4	9	03:00	T	441
4,4	9	03:20	T	442
1,4	10	03:40	T	440
2,4	10	04:00	T	435
3,4	10	04:20	T	429
4,4	10	04:40	T	425
1,4	11	05:00	T	426
2,4	11	05:20	T	420
3,4	11	05:40	T	417
4,4	11	06:00	T	418
1,4	12	06:20	T	417
		06:25	PGM DISABLED	
		12:25	PGM ENABLED	
2,4	12	12:40	T	445
3,4	12	13:00	T	445
4,4	12	13:20	T	447
		13:21	PGM DONE 29-FEB	

SOURCE T ==> TIME

2401044.01

NPDES Storm
Chain of Custody

Bottle Certification
Bottle Certification
*** DEFAULT CONTAINER ***

Jar Cert #
Filter lot # 1383488

Outfall: 245
Date/Time sampler installed: 2/27/24 @ 1001
Sampling Crew: CA, HA
Weather conditions: Clear
Date/Time sampler pickup: 3/1/24 @ 8:47
Observed activities in area: N/A
Observations during sampler collection: N/A
Color, Odors, sheens: N/A

Type of Sample: ☑ Stormwater ☐ Baseflow ☐ Rinse Blank
Rain event: ☑ >0.2 inches rain ☐ <0.02 inches of rain previous 24 hours
Samplers: ☑ Data downloaded ☐ Sample bottles marked
☑ Ice Present at pick-up
☑ Caps on containers ☐ Tubing Decon 1000mL Divater

Fill to...	Parameters:	Sample	QC
Neck	PAH's/Phthalates (1L) +	☑	☐ ☐
No head	*Total Mercury (125/250mL QC)	☑	☐
No head	*Diss Mercury (125/250mL QC)	☑	☐
Shoulder	Total Metals (250mL)	☑	
Shoulder	Diss Metals (125mL)	☑	
Shoulder	TSS (1L), (500 mL min)	☑	
Shoulder	Nutrients (250mL)	☑	
Shoulder	Ortho-P (125mL), (75min)	☑	
Shoulder	BOD (1L)	☐	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☑	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes 4.010 L config above
+1000 mL for QC per bottle, must submit 2 extra bottles
*If 250ml bottle used, thenQAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (uS)
1	1000	☑	181.5
2	1000	☑	98.2
3	1000	☑	186.7
4	1000	☑	74.8
5	1000	☑	90.3
6	1000	☑	27.7
7	1000	☐	146.3
8	750	☐	134.9
9		☐	
10		☐	
11		☐	
12		☐	

Total aliquots: 31

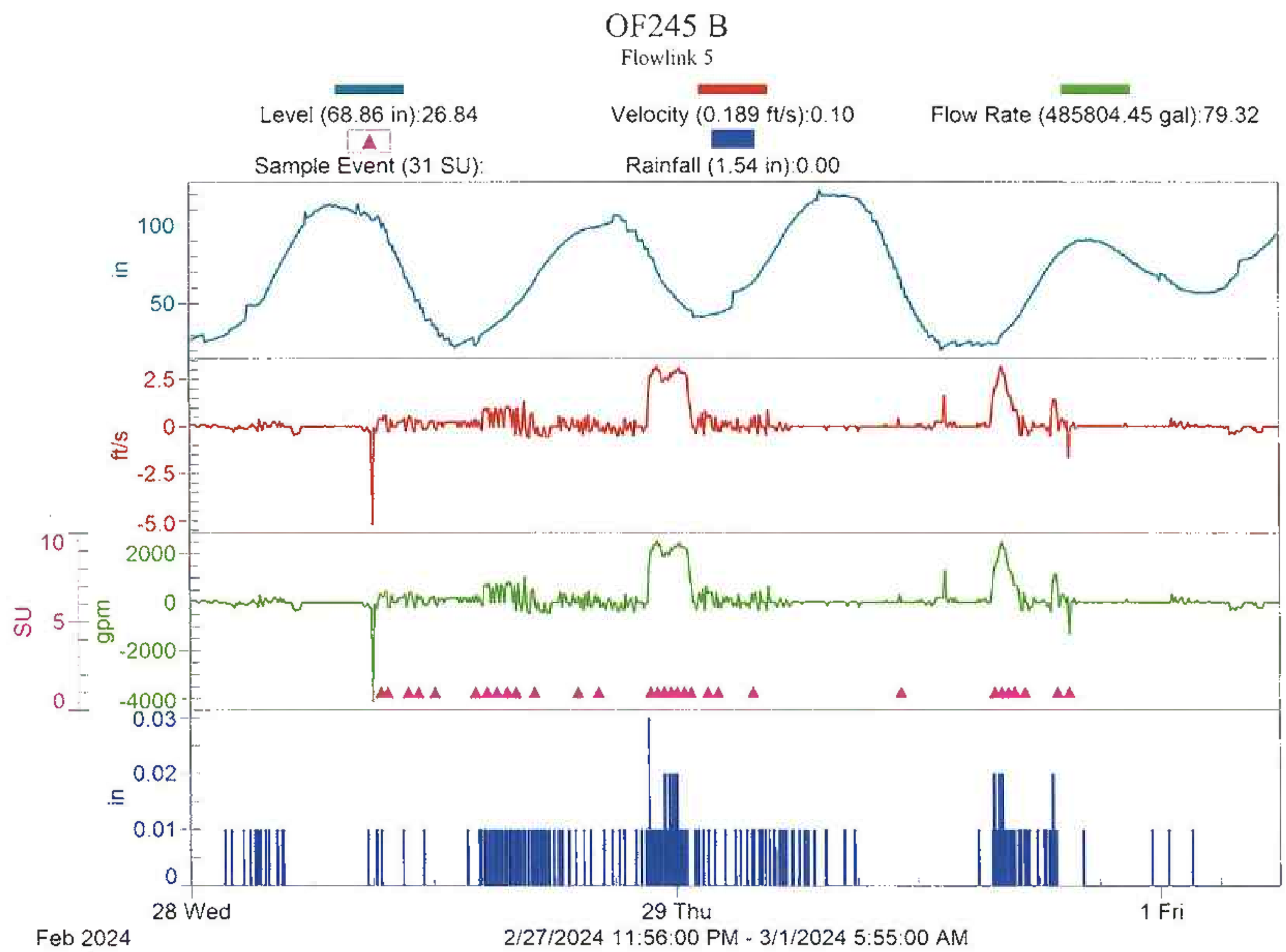
Sample Prep
Date/Time: 3/1/24 10:47
Initial: CA, HA
pH: 6.72
COND (µS): 548.6
Lab #: 2402033-06
Aliquots composited: 24

Deviations: Jars 7&8 taken after event

Composite End Time: 2/29/24 @ 11:10
(Collect Time) Last aliquot in composite

Relinquished by: [signature]
Date/Time: 3/1/24 @ 11:40

Received by: [signature]
Date/Time: 3/1/24 @ 11:45



OF245 B
Flowlink 5
Level (68.86 in):26.84
Velocity (0.189 ft/s):0.10
Flow Rate (485804.45 gal):79.32
Sample Event (31 SU):
Rainfall (1.54 in):0.00
in
ft/s
SU
gpm
28 Wed
29 Thu
1 Fri
Feb 2024
2/27/2024 11:56:00 PM - 3/1/2024 5:55:00 AM

```
SAMPLER ID# 1284476967  08:47  1-MAR-24
  Hardware:     A1  Software: 2.33
*********** PROGRAM SETTINGS ***********
     ----------
   PROGRAM NAME:
    "STORM      "
  SITE DESCRIPTION:
    "OF245 B   "
     ----------
   UNITS SELECTED:
     LENGTH: ft


     ----------
   UNITS SELECTED:
   FLOW RATE: gpm
  FLOW VOLUME: gal
   VELOCITY: fps
     ----------
  AREA-VEL MODULE:
   AREA*VELOCITY
     ROUND PIPE

     ----------

      5 MINUTE
   DATA INTERVAL

     ----------
  12,  1000 ml BTLS
 21 ft SUCTION LINE
 AUTO SUCTION HEAD
1 RINSES, 1 RETRIES
     ----------

  ONE-PART PROGRAM


     ----------
      PACING:
    TIME, EVERY
 0 HOURS, 20 MINUTES

     ----------
    DISTRIBUTION:
   4 SAMPLES/BOTTLE


     ----------
```

VOLUME:

250 ml SAMPLES

ENABLE:

FLOW >200.0 gpm

ENABLE:

REPEATABLE ENABLE

NO SAMPLE AT DISABLE

NO SAMPLE AT ENABLE

ENABLE:

COUNTDOWN IS STOPPED

WHILE DISABLED

ENABLE:

0 PAUSE & RESUMES

NO DELAY TO START

LIQUID DETECT ON

QUICK VIEW/CHANGE

TAKE MEASUREMENTS

EVERY 5 MINUTES

DUAL SAMPLER OFF

BTL FULL DETECT OFF

TIMED BACKLIGHT

PULSED EVENT MARK

AT INITIAL PURGE

PUMP COUNTS FOR
EACH PURGE CYCLE:
200 PRE-SAMPLE
AUTO POST-SAMPLE

NO PERIODIC
SERIAL OUTPUT

INTERROGATOR
CONNECTOR
POWER ALWAYS ON

NO RAIN GAUGE

NO SDI-12 SONDE

AUTO SDI-12 SCAN OFF

I/O1= NONE
I/O2= NONE
I/O3= NONE

----

0 ANALOG OUTPUTS

NO EXTERNAL MODEM

NO ALARM
CONDITIONS SET

```
     ----------
     ----------
----------------------------------------


SAMPLER ID# 1284476967  08:47  1-MAR-24
  Hardware:     A1  Software: 2.33
*********** SAMPLING RESULTS ***********
   SITE: OF245 B
PROGRAM: STORM
Program Started at 10:02 TU 27-FEB-24
Nominal Sample Volume =  250 ml
                                  COUNT
                                     TO
SAMPLE  BOTTLE TIME  SOURCE ERROR LIQUID
------- ------ ----      -- --    ------
              10:02  PGM DISABLED
------------- WE 28-FEB-24 -------------
              03:25  PGM ENABLED
              03:30  PGM DISABLED
              04:10  PGM ENABLED
              04:15  PGM DISABLED
              04:25  PGM ENABLED
              04:30  PGM DISABLED
              09:20  PGM ENABLED
  1,4     1   09:25      T           533
  2,4     1   09:45      T           541
              09:46  PGM DISABLED
              09:55  PGM ENABLED
              10:00  PGM DISABLED
              10:25  PGM ENABLED
              10:40  PGM DISABLED
              10:45  PGM ENABLED
  3,4     1   10:45      T           566
              11:00  PGM DISABLED
              11:10  PGM ENABLED
  4,4     1   11:15      T           580
              11:16  PGM DISABLED
              11:20  PGM ENABLED
              11:30  PGM DISABLED
              11:50  PGM ENABLED
              11:55  PGM DISABLED
              12:00  PGM ENABLED
  1,4     2   12:05      T           601
              12:06  PGM DISABLED
              13:00  PGM ENABLED
              13:05  PGM DISABLED
              13:20  PGM ENABLED
```

		13:25	PGM DISABLED	
		13:35	PGM ENABLED	
		13:40	PGM DISABLED	
		13:55	PGM ENABLED	
		14:00	PGM DISABLED	
		14:05	PGM ENABLED	
2,4	2	14:05	T	614
		14:10	PGM DISABLED	
		14:15	PGM ENABLED	
		14:20	PGM DISABLED	
		14:30	PGM ENABLED	
3,4	2	14:40	T	604
		14:50	PGM DISABLED	
		14:55	PGM ENABLED	
		15:00	PGM DISABLED	
		15:05	PGM ENABLED	
4,4	2	15:09	T	593
		15:15	PGM DISABLED	
		15:20	PGM ENABLED	
		15:30	PGM DISABLED	
		15:35	PGM ENABLED	
1,4	3	15:39	T	581
		15:55	PGM DISABLED	
		16:00	PGM ENABLED	
2,4	3	16:04	T	575
		16:06	PGM DISABLED	
		16:10	PGM ENABLED	
		16:15	PGM DISABLED	
		16:30	PGM ENABLED	
		16:35	PGM DISABLED	
		16:50	PGM ENABLED	
3,4	3	17:00	T	551
		17:01	PGM DISABLED	
		18:15	PGM ENABLED	
		18:20	PGM DISABLED	
		18:25	PGM ENABLED	
		18:35	PGM DISABLED	
		18:55	PGM ENABLED	
		19:00	PGM DISABLED	
		19:10	PGM ENABLED	
4,4	3	19:10	T	525
		19:15	PGM DISABLED	
		19:30	PGM ENABLED	
		19:35	PGM DISABLED	
		19:40	PGM ENABLED	
		19:45	PGM DISABLED	
		20:00	PGM ENABLED	
		20:05	PGM DISABLED	
		20:10	PGM ENABLED	

1,4	4	20:10	T	525
		20:15	PGM DISABLED	
		21:30	PGM ENABLED	
		21:35	PGM DISABLED	
		22:00	PGM ENABLED	
		22:05	PGM DISABLED	
		22:40	PGM ENABLED	
2,4	4	22:45	T	554
3,4	4	23:05	T	564
4,4	4	23:25	T	570
1,4	5	23:45	T	575
-------------		TH 29-FEB-24	------------	
2,4	5	00:05	T	582
3,4	5	00:25	T	589
4,4	5	00:45	T	588
		00:50	PGM DISABLED	
		01:10	PGM ENABLED	
		01:15	PGM DISABLED	
		01:20	PGM ENABLED	
		01:25	PGM DISABLED	
		01:30	PGM ENABLED	
1,4	6	01:35	T	592
		01:50	PGM DISABLED	
		02:00	PGM ENABLED	
2,4	6	02:05	T	587
		02:06	PGM DISABLED	
		02:20	PGM ENABLED	
		02:25	PGM DISABLED	
		02:30	PGM ENABLED	
		02:35	PGM DISABLED	
		03:05	PGM ENABLED	
		03:10	PGM DISABLED	
		03:45	PGM ENABLED	
3,4	6	03:50	T	554
		03:51	PGM DISABLED	
		03:55	PGM ENABLED	
		04:00	PGM DISABLED	
		04:10	PGM ENABLED	
		04:15	PGM DISABLED	
		04:35	PGM ENABLED	
		04:40	PGM DISABLED	
		11:05	PGM ENABLED	
4,4	6	11:10	T	567
		11:11	PGM DISABLED	
		13:00	PGM ENABLED	
		13:06	PGM DISABLED	
		13:20	PGM ENABLED	
		13:25	PGM DISABLED	
		15:40	PGM ENABLED	

1,4	7	15:49	T	600
2,4	7	16:09	T	591
3,4	7	16:29	T	587
4,4	7	16:49	T	577
		17:05	PGM DISABLED	
		17:15	PGM ENABLED	
1,3	8	17:19	T	568
		17:20	PGM DISABLED	
		17:45	PGM ENABLED	
		17:50	PGM DISABLED	
		18:40	PGM ENABLED	
2,3	8	18:55	T	534
		19:00	PGM DISABLED	
		19:05	PGM ENABLED	
		19:15	PGM DISABLED	
		19:25	PGM ENABLED	
3,3	8	19:30	T	529
		19:31	PGM DISABLED	

------------- FR 01-MAR-24 -------------

00:35	PGM ENABLED
00:40	PGM DISABLED
00:45	PGM ENABLED
00:50	PGM DISABLED
01:05	PGM ENABLED
01:10	PGM DISABLED
08:45	MANUAL PAUSE
08:45	PGM STOPPED 01-MAR

SOURCE T ==> TIME

FIELD REPORT

Project: Thea Foss/Wheeler-Osgood Waterways & NPDES Stormwater Monitoring Program

Event: Storm Event – April 25, 2024

INTRODUCTION

This report summarizes the storm event sampled on 4/25/2024 – 4/26/2024 by the City of Tacoma Environmental Services Collection System Support staff as part of our stormwater monitoring program. This report includes a summary of the following:

- Storm characteristics and criteria;
- Sampling activities;
- Flow characteristics at each sampling location;
- Pacing – set for a 0.8" event, actual event was 0.84"

This event met the sampling criteria for precipitation as specified in the Thea Foss Sampling and Analysis Plan (SAP).

DESCRIPTION OF SAMPLING ACTIVITES

Samplers placed in the field on 4/24/2024. During sampler installation the weather conditions were overcast. All samplers were retrieved on 4/26/2024 (For site specific details, see Appendix A for field notes, Chain of Custody (COC) forms, and event hydrographs).

The following unusual observations were noted during the sampling event:

Table 2: Composite Sampling Activities

Sample Location	Site Deployed	Sample Accepted	Pacing (gal)	Enables LVL(ft), VEL(fps) COND.(mS/cm)	Comments
Outfall 230A	Yes	Yes	104,000	LVL > 0.4	19 Aliquots Collected / 19 Composited
Outfall 235	Yes	Yes	40,000	LVL > 0.37 VEL > 0.8	37 Aliquots Collected / 37 Composited
Outfall 237ANew	Yes	Yes	575,000	LVL > 0.55 VEL > 6.0	14 Aliquots Collected / 14 Composited
Outfall 237B	Yes	Yes	611,000	LVL > 0.6	16 Aliquots Collected / 16 Composited
Outfall 243	Yes	Yes	20 min.	< 4.0 mS/cm	14 Aliquots Collected / 14 Composited
Outfall 245	Yes	Yes	10 min.	> 200 gpm	48 Aliquots Collected / 48 Composited
Outfall 254	Yes	No	10 min.	< 15.0 mS/cm	0 Aliquots Collected / 0 Composited

**QC, QUALITY CONTROL*

ND, NO DATA

NA, NOT APPLICABLE

WATER QUALITY DATA

Accepted samples were analyzed for the target parameters specified in the SAP and QAPP. Samples accepted at all Outfalls were composited and preserved within 24 hours of the last aliquot being collected. The samples were allowed to sit for a minimum of 18 hours before metals analysis was started.

EQUIPMENT INFORMATION

Samples were collected using ISCO 6712 portable auto samplers. Rain data was collected using an ISCO 674 rain gauge located at the Center for Urban Waters at 326 East D Street, Tacoma, WA 98421.

CORRECTIVE ACTIONS AND DEVIATIONS

There were no deviations from the field procedures as discussed in the SAP other than those discussed above/below. No other criteria or procedures as indicated in the SAP were compromised except for those discussed above/below.

Enclosures: The ISCO program setting/sampling results report, the sample collection chain of custody form, and field records are in Appendix A for each outfall. This includes the following information for the samples collected:

- Plot of flow hydrograph and hyetograph
- Subsample times and conductivities
- Tidal windows
- Field activities

Appendix A

Storm Deployment - 4/24/24 .8"

254 @ 13:15 - Download - Battery Check - Sonde issues / Reset
245 @ 13:30 - Download - Battery Check
243 @ 13:36 - Download - Battery Check
237A @ 13:47 - Download - Battery Check - 575,000
237B @ 13:55 - Download - Battery Check - 611,000
235 @ 14:00 - Download - Battery Check - 40,000
230A @ 14:15 - Download - Battery Check - 104,000
- Desecant Replaced at all sites

Grabs - 4/25/24
254 @ 10:00
245 @ 10:10
243 @ 10:20
237B @ 10:30
237A @ 10:35
235 @ 10:40
230A @ 10:48
222 @ 10:20

Storm Collection - 4/26/24

254 @ 10:35 - 0/12
245 @ 10:43 - 12/12 - Calibrate -
243 @ 10:50 - 3½/12
237A @ 10:58 - 3½/12
237B @ 11:02 - 4/12
235 @ 11:08 - 9/12
230 @ 11:20 - 5/12

Battery Checks - 5/15/24
254 - 50% - Changed - Download - Sonde issue
245 - 100% - Download
243 - 100% - Download
237A = Skipped
237B = 100% - Download
235 = 25% - Changed - Download
230A = 75% - Download

RG

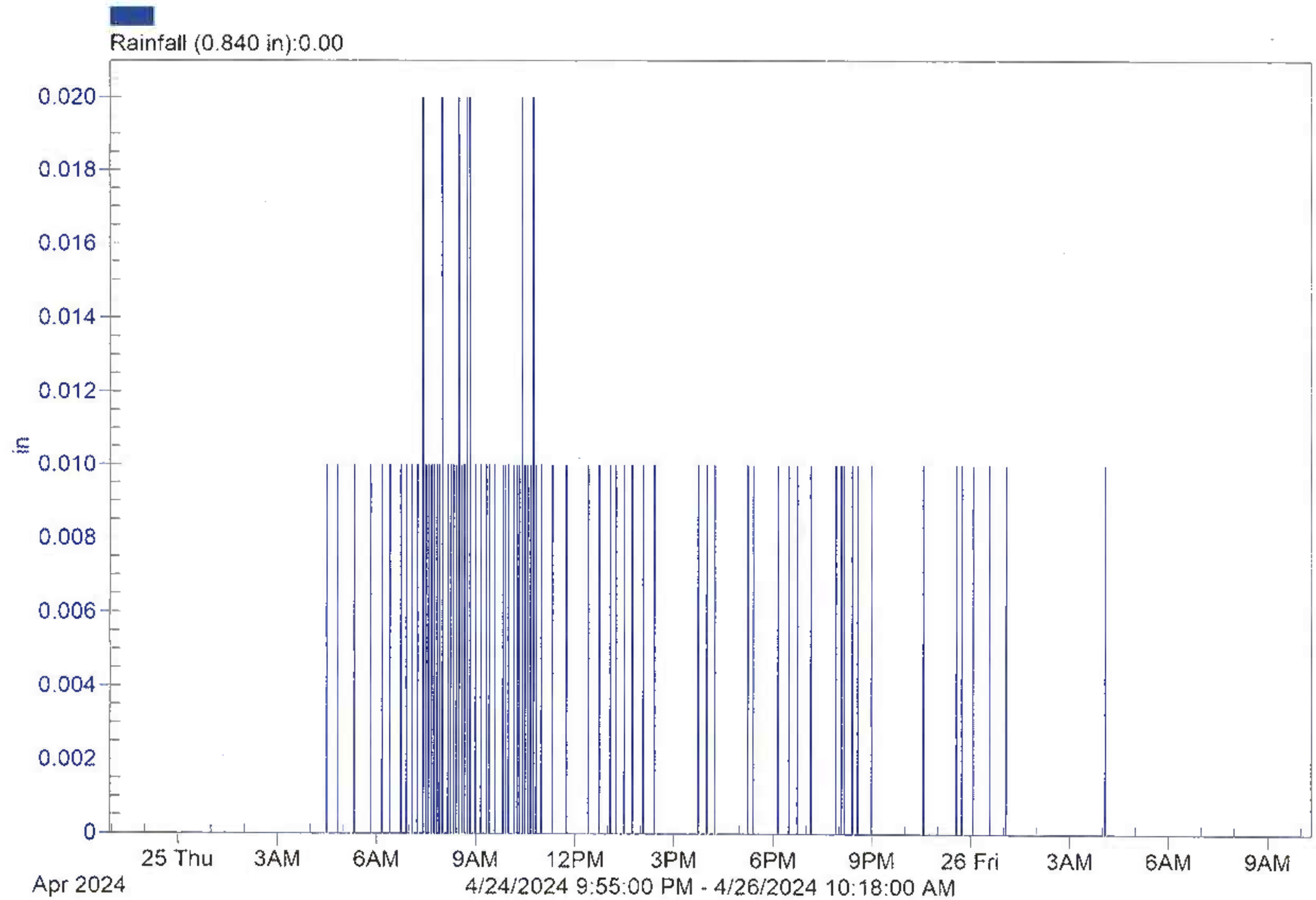
Continued on Page

Read and Understood By

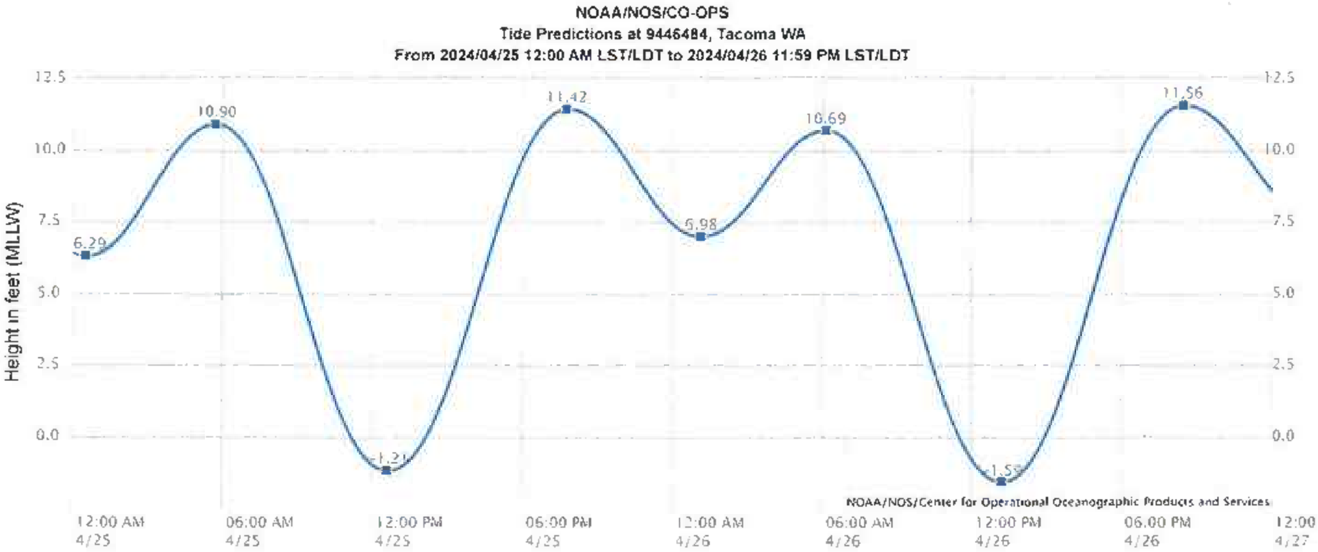
Signed Date Signed Date

RF1

Flowlink 5



Help Print



Note: The interval is High/Low, the solid blue line depicts a curve fit between the high and low values and approximates the segments between.
Disclaimer: These data are based upon the latest information available as of the date of your request, and may differ from the published tide tables.

High/Low Tide Prediction Data Listing

Station Name: Tacoma, WA
Action: Daily
Product: Tide Predictions
Start Date & Time: 2024/4/25 12:00 AM
End Date & Time: 2024/4/26 11:59 PM

Source: NOAA/NOS/CO-OPS
Prediction Type: Harmonic
Datum: MLLW
Height Units: Feet
Time Zone: LST/LDT

Date	Day	Time	Hgt	Time	Hgt	Time	Hgt	Time	Hgt
2024/04/25	Thu	12:30 AM	6.29 L	05:42 AM	10.90 H	12:39 PM	-1.21 L	7:45 PM	11.42 H
2024/04/26	Fri	01:09 AM	6.98 L	06:07 AM	10.69 H	1:13 PM	-1.59 L	8:29 PM	11.56 H

Bottle Certification

Bottle Certification

*** DEFAULT CONTAINER ***

Chain of Custody

Outfall: 230A

Date/Time sampler installed: 4/24/24 @ 14:15

Jar Cert #: ________

Sampling Crew: CA, SG

Filter lot #: 1383488

Weather conditions: Clear

Date/Time sampler pickup: 4/26/24 @ 11:20

Observed activities in area: N/A

Observations during sampler collection: N/A

Color, Odors, sheens: N/A

Type of Sample: ☑ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☑ >0.2 inches rain ☐ <0.02 inches of rain previous 24 hours

Samplers: ☑ Data downloaded ☑ Ice Present at pick up ☑ Caps on containers ☐ Sample bottles marked ☐ Tubing Decon 1000mL Diwater

Fill to...	Parameters:	Sample	QC
Neck	PAH's/Phthalates (1L) +	☑	☐ ☐
No head	ᵗTotal Mercury (125/250mL QC)	☑	☐
No head	ᵗDiss mercury (125/250mL QC)	☑	☐
Shoulder	Total Metals (250mL)	☑	
Shoulder	Diss Metals (125mL)	☑	
Shoulder	TSS (1L), (500 mL min)	☑	
Shoulder	Nutrients (250mL)	☑	
Shoulder	Ortho-P (125mL), (75min)	☑	
Shoulder	BOD (1L)	☑	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☑	
	Other:		
	Xtra (Unpreserved Conventionals)	☐	

*Minimum volumes 4.010 L config above

+1000 mL for QC per bottle, must submit 2 extra bottles

ᵗIf 250ml bottle used, then QAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (µS)
1	1000	☑	
2		☑	47.4
3		☑	35.9
4		☑	59.5
5	750	☑	58.1
6		☐	65.0
7		☐	
8		☐	
9		☐	
10		☐	
11		☐	
12		☐	

Total aliquots: ~~20~~ 19 RE

Sample Prep

Date/Time: 4/26/24 @ 14:05

Initial: CA, SG, ~~?~~ HA

pH: 7.44

COND (µS): 52.05

Lab #: 240404-01

Aliquots composited: ~~20~~ 19 RE

Deviations :

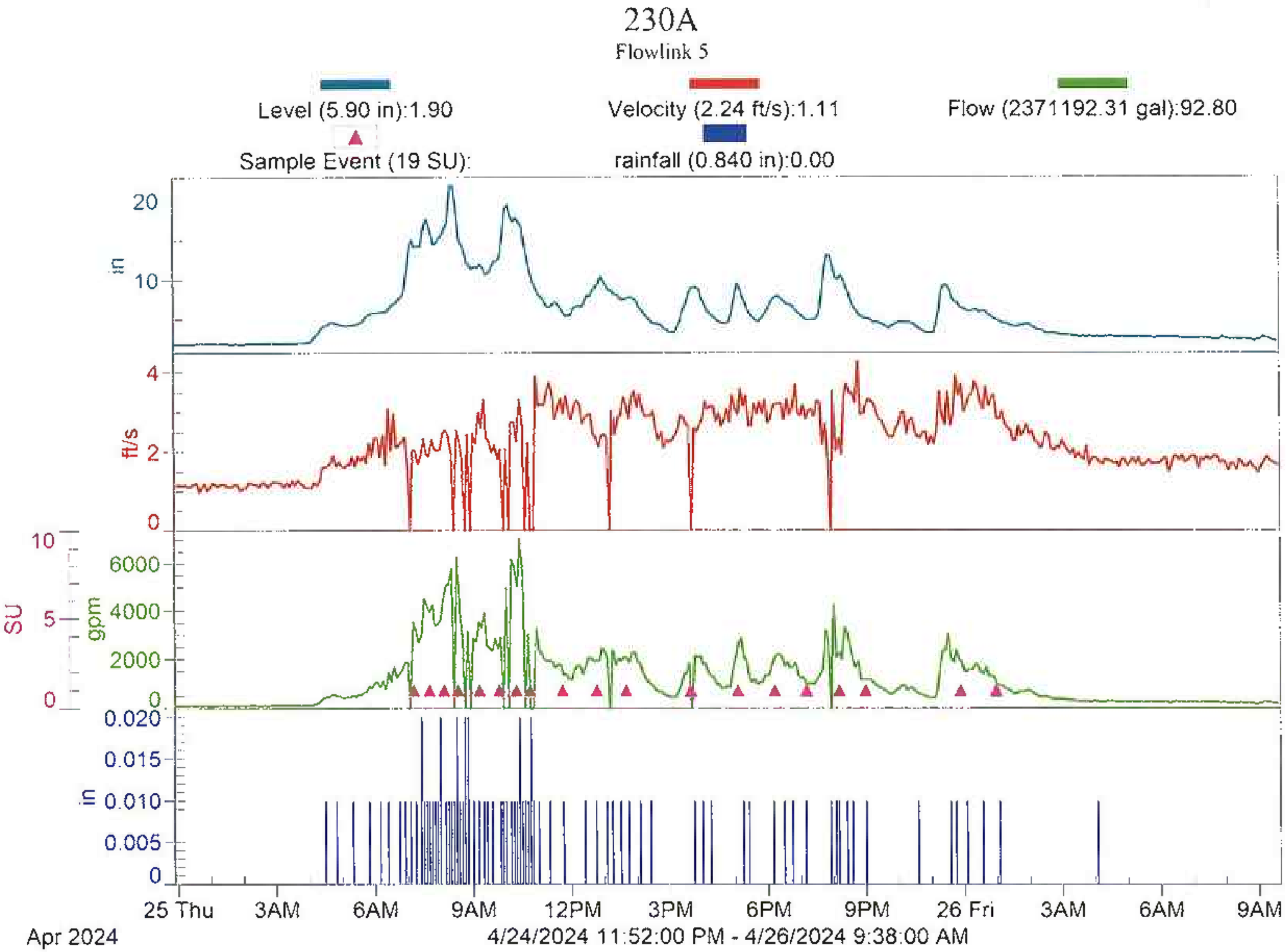
Composite End Time: 4/26/24 @ 00:58
(Collect Time) Last aliquot in composite

Relinquished by: [signature]

Date/Time: 4/26/24 @ 14:20

Received by: Cooler

Date/Time: 4/26/24 @ 14:20


230A
Flowlink 5
Level (5.90 in):1.90
Velocity (2.24 ft/s):1.11
Flow (2371192.31 gal):92.80
Sample Event (19 SU):
rainfall (0.840 in):0.00
in
ft/s
SU
gpm
25 Thu
3AM
6AM
9AM
12PM
3PM
6PM
9PM
26 Fri
3AM
6AM
9AM
Apr 2024
4/24/2024 11:52:00 PM - 4/26/2024 9:38:00 AM

SAMPLER ID# 1481205047 10:00 26-APR-24
Hardware: C0 Software: 3.01.0075
*********** PROGRAM SETTINGS ***********

PROGRAM NAME:
"STORM 1 "
SITE DESCRIPTION:
"230A "

UNITS SELECTED:
LENGTH: ft

UNITS SELECTED:
FLOW RATE: gpm
FLOW VOLUME: Mgal
VELOCITY: fps

AREA-VEL MODULE:
AREA*VELOCITY
ROUND PIPE

----

5 MINUTE
DATA INTERVAL

12, 1000 ml BTLS
30 ft SUCTION LINE
28 ft SUCTION HEAD

ONE-PART PROGRAM

PACING:
FLOW, EVERY
0.104 Mgal
NO SAMPLE AT START

DISTRIBUTION:
4 SAMPLES/BOTTLE

VOLUME:

250 ml SAMPLES

ENABLE:

LEVEL >0.400 ft

ENABLE:

REPEATABLE ENABLE

NO SAMPLE AT DISABLE

NO SAMPLE AT ENABLE

ENABLE:

COUNTDOWN IS STOPPED

WHILE DISABLED

ENABLE:

0 PAUSE & RESUMES

NO DELAY TO START

200 HOURS RUN TIME

LIQUID DETECT OFF

QUICK VIEW/CHANGE

TAKE MEASUREMENTS

AT STORAGE INTERVAL

DUAL SAMPLER OFF

BTL FULL DETECT OFF

TIMED BACKLIGHT

PULSED EVENT MARK

AT THE BEGINNING OF

FORWARD PUMPING

PUMP COUNTS FOR
EACH PURGE CYCLE:
100 PRE-SAMPLE
500 POST-SAMPLE

NO PERIODIC
SERIAL OUTPUT

NO RAIN GAUGE

NO SDI-12 SONDE

AUTO SDI-12 SCAN OFF

I/O1= NONE
I/O2= NONE
I/O3= NONE

----

0 ANALOG OUTPUTS

NO EXTERNAL MODEM

NO ALARM
CONDITIONS SET

SAMPLER ID# 1481205047 10:00 26-APR-24
Hardware: C0 Software: 3.01.0075
*********** SAMPLING RESULTS ***********
SITE: 230A
PROGRAM: STORM 1
Program Started at 12:50 WE 24-APR-24
Nominal Sample Volume = 250 ml

SAMPLE	BOTTLE	TIME	SOURCE	ERROR	COUNT TO LIQUID
-------	------	----	--	--	------
		12:50	PGM DISABLED		
-------------		TH 25-APR-24	-------------		
		05:40	PGM ENABLED		
1,4	1	07:11	F		0
2,4	1	07:40	F		0
3,4	1	08:07	F		0
4,4	1	08:32	F		0
1,4	2	09:11	F		0
2,4	2	09:47	F		0
3,4	2	10:19	F		0
4,4	2	10:44	F		0
1,4	3	11:42	F		0
2,4	3	12:46	F		0
3,4	3	13:40	F		0
		14:30	PGM DISABLED		
		15:25	PGM ENABLED		
4,4	3	15:36	F		0
		16:35	PGM DISABLED		
		16:55	PGM ENABLED		
1,4	4	17:04	F		0
		17:45	PGM DISABLED		
		17:50	PGM ENABLED		
2,4	4	18:12	F		0
3,4	4	19:10	F		0
4,4	4	20:10	F		0
1,3	5	20:59	F		0
		21:15	PGM DISABLED		
		23:15	PGM ENABLED		
2,3	5	23:53	F		0
-------------		FR 26-APR-24	-------------		
3,3	5	00:58	F		0
		01:10	PGM DISABLED		
		09:58	MANUAL PAUSE		
		09:58	PGM STOPPED 26-APR		

SOURCE F ==> FLOW

NPDES Storm
Chain of Custody

Jar Cert #

Jar Cert #

Filter lot # 1383988

Outfall: 235

Sampling Crew: CA, SG

Weather conditions: Clear

Observed activities in area: N/A

Observations during sampler collection: N/A

Color, Odors, sheens: N/A

Date/Time sampler installed: 4/24/24 @ 14:00

Date/Time sampler pickup: 4/26/24 @ 11:08

Type of Sample: ☑ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☑ >0.2 inches rain ☐ <0.02 inches of rain previus 24 hours

Samplers: ☑ Data downloaded ☑ Present at pick up ☑ Caps on containers ☐ Sample bottles marked ☐ Tubing Decon 1000mL Dwater

Fill to	Parameters	Sample	QC
Neck	PAH's/Phthalates (1L) +	☑	☐ ☐
No head	[1]Total Mercury (125/250mL QC)	☑	☐
No head	[1]Diss Mercury (125/250mL QC)	☑	☐
Shoulder	Total Metals (250mL)	☑	
Shoulder	Diss Metals (125mL)	☑	
Shoulder	TSS (1L), (500 mL min)	☑	
Shoulder	Nutrients (250mL)	☑	
Shoulder	Ortho-P (125mL), (75min)	☑	
Shoulder	BOD (1L)	☑	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☑	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes 4.010 L config above

+1000 mL for QC per bottle, must submit 2 extra bottles

[1]If 250ml bottle used, thenQAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (µS)
1	1000	☑	
2		☑	101.5
3		☑	53.7
4		☑	54.2
5		☑	49.3
6		☑	46.9
7		☑	88.5
8		☑	88.0
9		☑	89.9
10	250	☑	131.1
11		☐	159.5
12		☐	

Total aliquots: 37

Sample Drop

Date/Time: 4/26/24 @ 13:51

Initial: CA, SG, HA

pH: 7.23

COND (µS): 76.91

Lab #: 2404044-02

Aliquots composited: 37

Deviations :

Composite End Time: (Collect Time) 4/26/24 @ 1:51 Last aliquot in composite

Relinquished by: [signature]

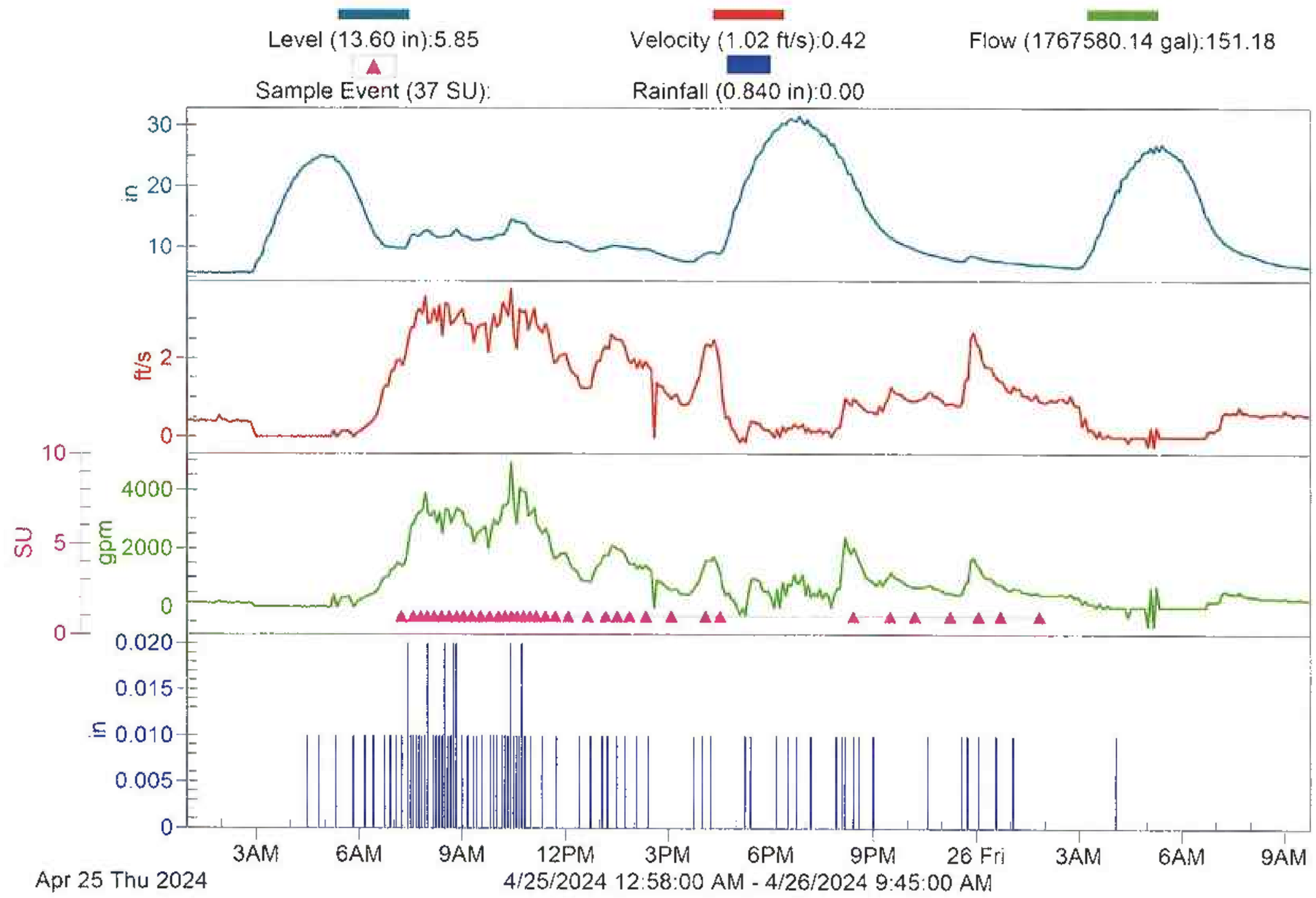
Date/Time: 4/26/24 @ 14:20

Received by: Cooler

Date/Time: 4/26/24 @ 14:20

235_A

Flowlink 5



SAMPLER ID# 1242995716 10:07 26-APR-24
Hardware: A1 Software: 2.33
*********** PROGRAM SETTINGS ***********

PROGRAM NAME:
"235A   "
SITE DESCRIPTION:
"235A ST   "

UNITS SELECTED:
LENGTH: ft

UNITS SELECTED:
FLOW RATE: Mgd
FLOW VOLUME: gal
VELOCITY: fps

AREA-VEL MODULE:
AREA*VELOCITY
ROUND PIPE

----

5 MINUTE
DATA INTERVAL

12, 1000 ml BTLS
56 ft SUCTION LINE
AUTO SUCTION HEAD
1 RINSES, 1 RETRIES

ONE-PART PROGRAM

PACING:
FLOW, EVERY
40000 gal
NO SAMPLE AT START

DISTRIBUTION:
4 SAMPLES/BOTTLE

VOLUME:

250 ml SAMPLES

ENABLE:
LEVEL >0.370 ft
AND
VEL > 0.80 fps

ENABLE:
REPEATABLE ENABLE
NO SAMPLE AT DISABLE
NO SAMPLE AT ENABLE

ENABLE:
COUNTDOWN IS STOPPED
WHILE DISABLED

ENABLE:
0 PAUSE & RESUMES

NO DELAY TO START

200 HOURS RUN TIME

LIQUID DETECT ON

QUICK VIEW/CHANGE

TAKE MEASUREMENTS
AT STORAGE INTERVAL

DUAL SAMPLER OFF
BTL FULL DETECT OFF
TIMED BACKLIGHT

EVENT MARK SENT

DURING PUMP CYCLE

PUMP COUNTS FOR
EACH PURGE CYCLE:
100 PRE-SAMPLE
AUTO POST-SAMPLE

NO PERIODIC
SERIAL OUTPUT

INTERROGATOR
CONNECTOR
POWER ALWAYS ON

NO RAIN GAUGE

NO SDI-12 SONDE

AUTO SDI-12 SCAN OFF

I/O1= NONE
I/O2= NONE
I/O3= NONE

----

0 ANALOG OUTPUTS

NO EXTERNAL MODEM

NO ALARM
CONDITIONS SET

SAMPLER ID# 1242995716 10:08 26-APR-24
Hardware: A1 Software: 2.33
*********** SAMPLING RESULTS ***********
SITE: 235A ST
PROGRAM: 235A
Program Started at 13:02 WE 24-APR-24
Nominal Sample Volume = 250 ml

SAMPLE	BOTTLE	TIME	SOURCE	ERROR	COUNT TO LIQUID
		13:02	PGM DISABLED		
		TH 25-APR-24			
		06:40	PGM ENABLED		
1,4	1	07:13	F		1864
2,4	1	07:34	F		1873
3,4	1	07:47	F	NL	*
4,4	1	07:59	F		1943
1,4	2	08:11	F		1921
2,4	2	08:24	F		1899
3,4	2	08:37	F		1895
4,4	2	08:50	F		1885
1,4	3	09:02	F		1893
2,4	3	09:16	F		1898
3,4	3	09:32	F		1893
4,4	3	09:48	F		1889
1,4	4	10:02	F		1892
2,4	4	10:15	F		1889
3,4	4	10:26	F		1906
4,4	4	10:36	F		1913
1,4	5	10:47	F		1901
2,4	5	10:58	F		1937
3,4	5	11:10	F		1928
4,4	5	11:25	F		1903
1,4	6	11:43	F		1905
2,4	6	12:05	F		1913
3,4	6	12:39	F		1903
4,4	6	13:11	F		1883
1,4	7	13:31	F		1879
2,4	7	13:53	F		1900
3,4	7	14:21	F		1889
4,4	7	15:06	F		1894
1,4	8	16:06	F		1867

```
  2,4    8   16:31      F         1884
             16:40  PGM DISABLED
             20:10  PGM ENABLED
  3,4    8   20:25      F         1823
             20:40  PGM DISABLED
             21:10  PGM ENABLED
             21:15  PGM DISABLED
             21:20  PGM ENABLED
  4,4    8   21:29      F         1881
  1,4    9   22:13      F         1865
  2,4    9   23:15      F         1866
             23:30  PGM DISABLED
             23:35  PGM ENABLED
------------- FR 26-APR-24 -------------
  3,4    9   00:04      F         1860
  4,4    9   00:43      F         1873
  1,1   10   01:51      F         1867
             02:55  PGM DISABLED


   SOURCE F  ==> FLOW
    ERROR NL ==> NO LIQUID DETECTED!
----------------------------------------
```

2404044-01

NPDES Storm
Chain of Custody

Bottle Certification
Bottle Certification
*** DEFAULT CONTAINER ***

Jar Cert #
Filter lot # 1383988

Outfall: 237A
Date/Time sampler installed: 4/24/24 @ 13:47
Sampling Crew: CA, SG
Weather conditions: Clear
Date/Time sampler pickup: 4/26/24 @ 10:58
Observed activities in area: N/A
Observations during sampler collection: N/A
Color, Odors, sheens: N/A

Type of Sample: ☑ Stormwater ☐ Baseflow ☐ Rinse Blank
Rain event: ☑ >0.2 inches rain ☐ <0.02 inches of rain previous 24 hours
Samplers: ☑ Data downloaded ☐ Sample bottles marked
☑ Ice Present at pick up ☐ Tubing Decon 1000mL DI water
☑ Caps on containers

Fill to:	Parameters:	Sample	QC
Neck	PAH's/Phthalates (1L) +	☑	☐ ☐
No head	¹Total Mercury (125/250mL QC)	☑	☐
No head	¹Diss Mercury (125/250mL QC)	☑	☐
Shoulder	Total Metals (250mL)	☑	
Shoulder	Diss Metals (125mL)	☑	
Shoulder	TSS (1L), (500 mL min)	☑	
Shoulder	Nutrients (250mL)	☑	
Shoulder	Ortho-P (125mL), (75min)	☑	
Shoulder	BOD (1L)	☐	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☑	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes 4.010 L config above
+1000 mL for QC per bottle, must submit 2 extra bottles
¹If 250ml bottle used, thenQAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (uS)
1	1000	☑	203.2
2		☑	60
3		☑	169.3
4	500	☑	143.8
5		☐	
6		☐	
7		☐	
8		☐	
9		☐	
10		☐	
11		☐	
12		☐	

Total aliquots: 14

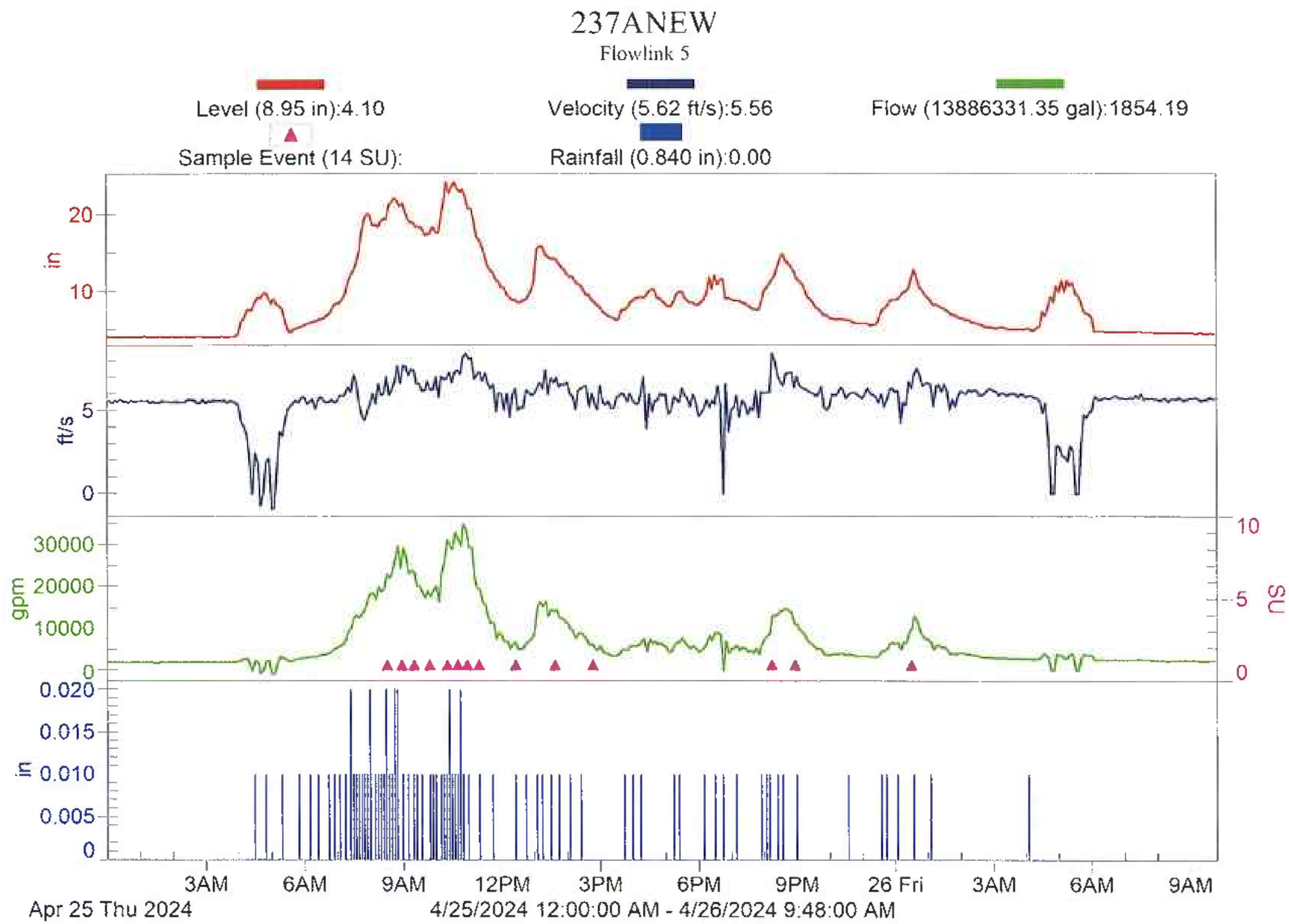
Sample Prep
Date/Time: 4/26/24 @ 13:27
Initial: CA, SG, HA
pH: 7.2
COND (µS): 139.5
Lab #: 2404044-03
Aliquots composited: 14

Deviations:

Composite End Time: 4/26/24 @00:30
(Collect Time) Last aliquot in composite

Relinquished by:
Date/Time: 4/26/24 @ 14:20

Received by: Cooler
Date/Time: 4/26/24 @ 14:20



237ANEW
Flowlink 5
Level (8.95 in):4.10
Velocity (5.62 ft/s):5.56
Flow (13886331.35 gal):1854.19
Sample Event (14 SU):
Rainfall (0.840 in):0.00
in
20
10
ft/s
5
0
gpm
30000
20000
10000
0
SU
10
5
0
in
0.020
0.015
0.010
0.005
0
3AM
6AM
9AM
12PM
3PM
6PM
9PM
26 Fri
3AM
6AM
9AM
Apr 25 Thu 2024
4/25/2024 12:00:00 AM - 4/26/2024 9:48:00 AM

```
SAMPLER ID# 1245320993  09:50 26-APR-24
  Hardware:     A1  Software: 2.33
*********** PROGRAM SETTINGS ***********
      ----------
   PROGRAM NAME:
    "237ANEW   "
 SITE DESCRIPTION:
    "237ANEW   "
      ----------
   UNITS SELECTED:
     LENGTH: ft


      ----------
   UNITS SELECTED:
   FLOW RATE: gpm
 FLOW VOLUME: Mgal
   VELOCITY: fps
      ----------
  AREA-VEL MODULE:
   AREA*VELOCITY
     ROUND PIPE

      ----------

      5 MINUTE
   DATA INTERVAL

      ----------
  12,  1000 ml BTLS
 21 ft SUCTION LINE
 AUTO SUCTION HEAD
1 RINSES, 1 RETRIES
      ----------

  ONE-PART PROGRAM


      ----------
      PACING:
    FLOW, EVERY
     0.575 Mgal
NO SAMPLE AT START
      ----------
    DISTRIBUTION:
   4 SAMPLES/BOTTLE


      ----------
```

VOLUME:

250 ml SAMPLES

ENABLE:

VEL > 6.00 fps

AND

LEVEL >0.550 ft

ENABLE:

REPEATABLE ENABLE

NO SAMPLE AT DISABLE

NO SAMPLE AT ENABLE

ENABLE:

COUNTDOWN IS STOPPED

WHILE DISABLED

ENABLE:

0 PAUSE & RESUMES

NO DELAY TO START

200 HOURS RUN TIME

LIQUID DETECT ON

QUICK VIEW/CHANGE

TAKE MEASUREMENTS

AT STORAGE INTERVAL

DUAL SAMPLER OFF

BTL FULL DETECT OFF

TIMED BACKLIGHT

EVENT MARK SENT

DURING PUMP CYCLE

PUMP COUNTS FOR
EACH PURGE CYCLE:
400 PRE-SAMPLE
400 POST-SAMPLE

NO PERIODIC
SERIAL OUTPUT

INTERROGATOR
CONNECTOR
POWER ALWAYS ON

NO RAIN GAUGE

NO SDI-12 SONDE

AUTO SDI-12 SCAN OFF

I/O1= NONE
I/O2= NONE
I/O3= NONE

----

0 ANALOG OUTPUTS

NO EXTERNAL MODEM

NO ALARM
CONDITIONS SET

```
    ----------
    ----------
----------------------------------------


SAMPLER ID# 1245320993  09:51 26-APR-24
  Hardware:     A1  Software: 2.33
*********** SAMPLING RESULTS ***********
   SITE: 237ANEW
PROGRAM: 237ANEW
Program Started at 12:43 WE 24-APR-24
Nominal Sample Volume =  250 ml
                                   COUNT
                                      TO
SAMPLE  BOTTLE TIME  SOURCE ERROR LIQUID
------- ------ ----      -- --    ------
              12:43  PGM DISABLED
------------- TH 25-APR-24 -------------
              07:15  PGM ENABLED
              07:40  PGM DISABLED
              08:05  PGM ENABLED
              08:10  PGM DISABLED
              08:15  PGM ENABLED
              08:20  PGM DISABLED
              08:25  PGM ENABLED
  1,4     1   08:31      F            521
              08:35  PGM DISABLED
              08:40  PGM ENABLED
  2,4     1   08:58      F            524
  3,4     1   09:20      F            525
  4,4     1   09:49      F            527
              10:05  PGM DISABLED
              10:10  PGM ENABLED
  1,4     2   10:21      F            516
  2,4     2   10:40      F            516
  3,4     2   10:57      F            517
  4,4     2   11:19      F            526
              11:50  PGM DISABLED
              11:55  PGM ENABLED
              12:05  PGM DISABLED
              12:10  PGM ENABLED
              12:15  PGM DISABLED
              12:25  PGM ENABLED
  1,4     3   12:26      F            534
              12:30  PGM DISABLED
              12:45  PGM ENABLED
              12:55  PGM DISABLED
              13:00  PGM ENABLED
```

		13:25	PGM DISABLED	
		13:30	PGM ENABLED	
2,4	3	13:38	F	527
		14:10	PGM DISABLED	
		14:20	PGM ENABLED	
		14:40	PGM DISABLED	
		14:45	PGM ENABLED	
3,4	3	14:47	F	530
		14:50	PGM DISABLED	
		15:00	PGM ENABLED	
		15:05	PGM DISABLED	
		15:40	PGM ENABLED	
		15:45	PGM DISABLED	
		15:55	PGM ENABLED	
		16:00	PGM DISABLED	
		16:15	PGM ENABLED	
		16:25	PGM DISABLED	
		16:30	PGM ENABLED	
		16:35	PGM DISABLED	
		16:50	PGM ENABLED	
		16:55	PGM DISABLED	
		17:00	PGM ENABLED	
		17:05	PGM DISABLED	
		17:30	PGM ENABLED	
		17:35	PGM DISABLED	
		18:35	PGM ENABLED	
		18:40	PGM DISABLED	
		18:50	PGM ENABLED	
		18:55	PGM DISABLED	
		19:45	PGM ENABLED	
		19:50	PGM DISABLED	
		19:55	PGM ENABLED	
4,4	3	20:15	F	532
1,2	4	20:56	F	525
		21:35	PGM DISABLED	
		21:40	PGM ENABLED	
		21:50	PGM DISABLED	
		23:35	PGM ENABLED	
		23:40	PGM DISABLED	
		23:50	PGM ENABLED	
-------------		FR 26-APR-24	-------------	
		00:10	PGM DISABLED	
		00:25	PGM ENABLED	
2,2	4	00:30	F	525
		01:10	PGM DISABLED	
		01:15	PGM ENABLED	
		01:40	PGM DISABLED	

```
   SOURCE F  ==> FLOW
----------------------------------------
```

2402016-01

Bottle Certification

Bottle Certification

*** DEFAULT CONTAINER ***

for Cert #

Filter lot # 1323988

NPDES Storm
Chain of Custody

Outfall: 237B

Sampling Crew: CA, SG

Weather conditions: Clear

Observed activities in area: ~~Clear~~ N/A

Observations during sampler collection: N/A

Color, Odors, sheens: N/A

Date/Time sampler installed: 4/24/24 @ 13:55

Date/Time sampler pickup: 4/26/24 @ 11:02

Type of Sample: ☑ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☑ >0.2 inches rain ☐ <0.02 inches of rain previus 24 hours

Samplers: ☑ Data downloaded ☑ Ice Present at pick up ☑ Caps on containers ☐ Sample bottles marked ☐ Tubing Decon 1000mL DIwater

Fill to	Parameters	Sample	QC
Neck	PAH's/Phthalates (1L) +	☑	☐ ☐
No head	[1]Total Mercury (125/250mL QC)	☑	☐
No head	[1]Diss Mercury (125/250mL QC)	☑	☐
Shoulder	Total Metals (250mL)	☑	
Shoulder	Diss Metals (125mL)	☑	
Shoulder	TSS (1L), (500 mL min)	☑	
Shoulder	Nutrients (250mL)	☑	
Shoulder	Ortho-P (125mL), (75min)	☑	
Shoulder	BOD (1L)	☐	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☑	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes 4.010 L config above

+1000 mL for QC per bottle, must submit 2 extra bottles

[1]If 250ml bottle used, thenQAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (uS)
1	1 or 6	☑	
2		☑	73.7
3		☑	122.2
4		☑	153.1
5		☐	213
6		☐	
7		☐	
8		☐	
9		☐	
10		☐	
11		☐	
12		☐	

Total aliquots: 16

Sample Prep

Date/Time: 4/26/24 @ 13:38

Initial: CA, SG, HA

pH: 6.82

COND (µS): 138.2

Lab #: 2404044-04

Aliquots composited: 16

Deviations :

Composite End Time: 4/26/24 @ 2:58

(Collect Time) Last aliquot in composite

Relinquished by: [signature]

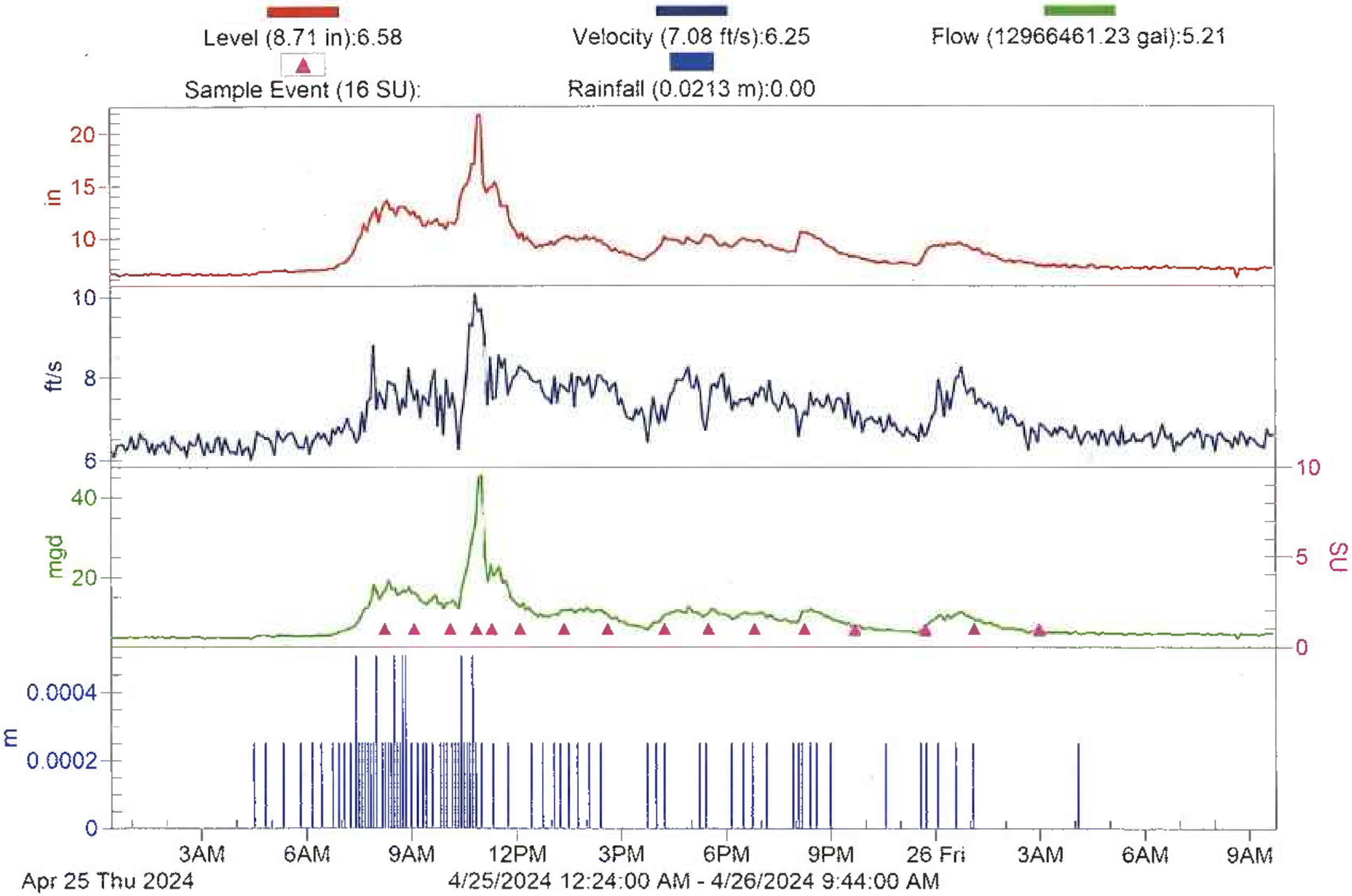
Date/Time: 4/26/24 @ 14:20

Received by: Cooler

Date/Time: 4/26/24 @ 14:20

237 B

Flowlink 5



SAMPLER ID# 1243003651 10:01 26-APR-24
Hardware: A1 Software: 2.33
*********** PROGRAM SETTINGS ***********

PROGRAM NAME:
" STORM 1 "
SITE DESCRIPTION:
" 237 B   "

UNITS SELECTED:
LENGTH: ft

UNITS SELECTED:
FLOW RATE: gpm
FLOW VOLUME: Mgal
VELOCITY: fps

AREA-VEL MODULE:
AREA*VELOCITY
ROUND PIPE

----

5 MINUTE
DATA INTERVAL

12, 1000 ml BTLS
16 ft SUCTION LINE
AUTO SUCTION HEAD
1 RINSES, 1 RETRIES

ONE-PART PROGRAM

PACING:
FLOW, EVERY
0.611 Mgal
NO SAMPLE AT START

DISTRIBUTION:
4 SAMPLES/BOTTLE

VOLUME:

250 ml SAMPLES

ENABLE:

LEVEL >0.600 ft

ENABLE:
REPEATABLE ENABLE
NO SAMPLE AT DISABLE
NO SAMPLE AT ENABLE

ENABLE:
COUNTDOWN IS STOPPED
WHILE DISABLED

ENABLE:
0 PAUSE & RESUMES

NO DELAY TO START

200 HOURS RUN TIME

LIQUID DETECT ON

QUICK VIEW/CHANGE

TAKE MEASUREMENTS
AT STORAGE INTERVAL

DUAL SAMPLER OFF
BTL FULL DETECT ON
TIMED BACKLIGHT

EVENT MARK SENT

DURING PUMP CYCLE

PUMP COUNTS FOR
EACH PURGE CYCLE:
100 PRE-SAMPLE
AUTO POST-SAMPLE

NO PERIODIC
SERIAL OUTPUT

INTERROGATOR
CONNECTOR
POWER ALWAYS ON

NO RAIN GAUGE

NO SDI-12 SONDE

AUTO SDI-12 SCAN OFF

I/O1= NONE
I/O2= NONE
I/O3= NONE

----

0 ANALOG OUTPUTS

NO EXTERNAL MODEM

NO ALARM
CONDITIONS SET

```
     ----------
     ----------
----------------------------------------


SAMPLER ID# 1243003651  10:01 26-APR-24
  Hardware:     A1  Software: 2.33
*********** SAMPLING RESULTS ***********
   SITE:    237 B
PROGRAM:  STORM 1
Program Started at 12:54 WE 24-APR-24
Nominal Sample Volume =  250 ml
                                   COUNT
                                      TO
SAMPLE  BOTTLE TIME  SOURCE ERROR LIQUID
------- ------ ----      -- --    ------
              12:54  PGM DISABLED
------------- TH 25-APR-24 -------------
              06:55  PGM ENABLED
  1,4     1   08:14        F         517
  2,4     1   09:05        F         522
  3,4     1   10:07        F         813
  4,4     1   10:51        F         510
  1,4     2   11:18        F         515
  2,4     2   12:06        F         660
  3,4     2   13:22        F         512
  4,4     2   14:36        F         519
  1,4     3   16:14        F         516
  2,4     3   17:30        F         515
  3,4     3   18:49        F         511
  4,4     3   20:15        F         508
  1,4     4   21:40        F         513
  2,4     4   23:42        F         508
------------- FR 26-APR-24 -------------
  3,4     4   01:07        F         509
  4,4     4   02:58        F         510
              03:50  PGM DISABLED
              03:55  PGM ENABLED
              04:10  PGM DISABLED
              04:25  PGM ENABLED
              04:40  PGM DISABLED
              04:55  PGM ENABLED
              05:00  PGM DISABLED
              05:15  PGM ENABLED
              05:20  PGM DISABLED
              05:40  PGM ENABLED
              05:45  PGM DISABLED
              06:05  PGM ENABLED
```

```
            06:10  PGM DISABLED
            06:40  PGM ENABLED
            06:45  PGM DISABLED
            07:40  PGM ENABLED
            07:45  PGM DISABLED
            08:10  PGM ENABLED
            08:15  PGM DISABLED


   SOURCE F  ==> FLOW
----------------------------------------
```

2401044-01

NPDES Storm Chain of Custody

Bottle Certification

Bottle Certification

*** DEFAULT CONTAINER ***

Jar Cert #

Outfall: 243

Date/Time sampler installed: 4/24/24 @ 13:56

Jar Cert #

Sampling Crew: CA, RG

Filter lot # 1383988

Weather conditions: Clear

Date/Time sampler pickup: 4/26/24 @ 10:50

Observed activities in area: N/A

Observations during sampler collection: N/A

Color, Odors, sheens: N/A

Type of Sample: ☑ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☑ >0.2 inches rain ☐ <0.02 inches of rain previus 24 hours

Samplers: ☑ Data downloaded ☐ Sample bottles marked

☑ Ice Present at pick up ☐ Tubing Decon 1000mL Diwater

☑ Caps on containers

Fill to...	Parameters:	Sample	QC
Neck	PAH's/Phthalates (1L) +	☑	☐ ☐
No head	[1]Total Mercury (125/250mL QC)	☑	☐
No head	[1]Diss Mercury (125/250mL QC)	☑	☐
Shoulder	Total Metals (250mL)	☑	
Shoulder	Diss Metals (125mL)	☑	
Shoulder	TSS (1L), (500 mL min)	☑	
Shoulder	Nutrients (250mL)	☑	
Shoulder	Ortho-P (125mL), (75min)	☑	
Shoulder	BOD (1L)	☐	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☑	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes 4.010 L config above

+1000 mL for QC per bottle, must submit 2 extra bottles

[1]If 250ml bottle used, thenQAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (uS)
1	~~4200~~ 1000	☑	4200
2	~~3707~~ 1000	☑	3707
3	~~2491~~ 1000	☑	2491
4	~~8980~~ 500	☑	8980
5		☐	
6		☐	
7		☐	
8		☐	
9		☐	
10		☐	
11		☐	
12		☐	

Total aliquots: 14

Sample Prep

Date/Time: 4/26/24 @ 12:54

Initial: CA, SG, HA

pH: 6.58

COND (µS): 3896

Lab #: 2404044-05

Aliquots composited: 14

Deviations :

Composite End Time: 4/25/24 @ 16:10

(Collect Time) Last aliquot in composite

Relinquished by: [signature]

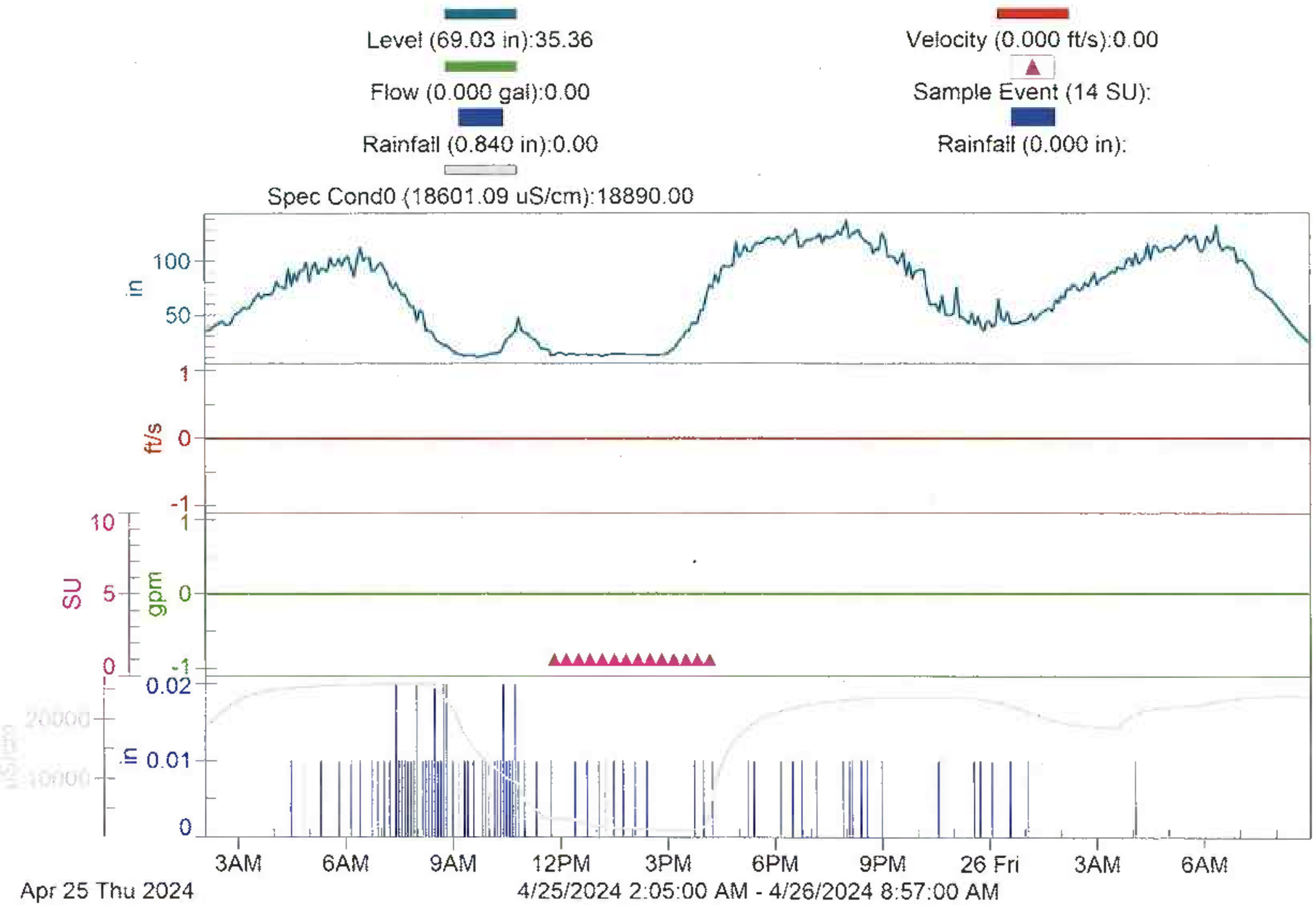
Date/Time: 4/26/24 @ 14:20

Received by: Cooler

Date/Time: 4/26/24 @ 14:20

243

Flowlink 5



```
SAMPLER ID# 1242893352  09:48 26-APR-24
  Hardware:     A1  Software: 2.33
*********** PROGRAM SETTINGS ***********
     ----------
   PROGRAM NAME:
    "STORM 1   "
 SITE DESCRIPTION:
    "  243     "
     ----------
   UNITS SELECTED:
     LENGTH: ft
CONDUCTIVITY: mS/cm
  TEMPERATURE:  F
     ----------
   UNITS SELECTED:
   FLOW RATE: gpm
 FLOW VOLUME: Mgal
   VELOCITY: fps
     ----------
  AREA-VEL MODULE:
   AREA*VELOCITY
     ROUND PIPE

     ----------

      5 MINUTE
   DATA INTERVAL

     ----------
  12,  1000 ml BTLS
 17 ft SUCTION LINE
 AUTO SUCTION HEAD
1 RINSES, 1 RETRIES
     ----------

  ONE-PART PROGRAM


     ----------
      PACING:
    TIME, EVERY
 0 HOURS, 20 MINUTES

     ----------
    DISTRIBUTION:
   4 SAMPLES/BOTTLE


     ----------
```

VOLUME:

250 ml SAMPLES

ENABLE:

SP_CO0 <4.000 mS/cm

ENABLE:
REPEATABLE ENABLE
NO SAMPLE AT DISABLE
NO SAMPLE AT ENABLE

ENABLE:
COUNTDOWN IS STOPPED
WHILE DISABLED

ENABLE:
0 PAUSE & RESUMES

NO DELAY TO START

LIQUID DETECT ON

QUICK VIEW/CHANGE

TAKE MEASUREMENTS
AT STORAGE INTERVAL

DUAL SAMPLER OFF
BTL FULL DETECT OFF
TIMED BACKLIGHT

EVENT MARK SENT

DURING PUMP CYCLE

PUMP COUNTS FOR
EACH PURGE CYCLE:
200 PRE-SAMPLE
AUTO POST-SAMPLE

NO PERIODIC
SERIAL OUTPUT

INTERROGATOR
CONNECTOR
POWER ALWAYS ON

NO RAIN GAUGE

SDI-12 DATA:
01DATA0 02DATA0
TEMP0 SP_CO0 05DATA0

I/O1= NONE
I/O2= NONE
I/O3= NONE

----

0 ANALOG OUTPUTS

NO EXTERNAL MODEM

NO ALARM
CONDITIONS SET

```
     ----------
     ----------
----------------------------------------


SAMPLER ID# 1242893352  09:49 26-APR-24
  Hardware:     A1  Software: 2.33
*********** SAMPLING RESULTS ***********
   SITE:   243
PROGRAM: STORM 1
Program Started at 12:39 WE 24-APR-24
Nominal Sample Volume =  250 ml
                                   COUNT
                                      TO
SAMPLE  BOTTLE TIME  SOURCE ERROR LIQUID
------- ------ ----     -- --    ------
              12:39  PGM DISABLED
------------- TH 25-APR-24 -------------
              11:30  PGM ENABLED
  1,4     1   11:50       T          454
  2,4     1   12:10       T          451
  3,4     1   12:30       T          449
  4,4     1   12:50       T          454
  1,4     2   13:10       T          450
  2,4     2   13:30       T          450
  3,4     2   13:50       T          450
  4,4     2   14:10       T          452
  1,4     3   14:30       T          454
  2,4     3   14:50       T          451
  3,4     3   15:10       T          452
  4,4     3   15:30       T          447
  1,2     4   15:50       T          442
  2,2     4   16:10       T          439
              16:11  PGM DISABLED


   SOURCE T  ==> TIME
----------------------------------------
```

2403014-01

NPDES Storm

Chain of Custody

Bottle Certification

Bottle Certification

*** DEFAULT CONTAINER ***

Jar Cert #______

Filter lot # 1383988

Outfall: 245

Date/Time sampler installed: 4/24/24 @ 13:30

Sampling Crew: CA, KG

Weather conditions: Clear

Date/Time sampler pickup: 4/26/24 @ 10:43

Observed activities in area: N/A

Observations during sampler collection: N/A

Color, Odors, sheens: N/A

Type of Sample: ☑ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☑ >0.2 inches rain ☐ <0.02 inches of rain previus 24 hours

Samplers: ☑ Data downloaded ☐ Sample bottles marked

☑ Ice Present at pick up ☐ Tubing Decon 1000mL Divater

☑ Caps on containers

Fill to...	Parameters:	Sample	QC
Neck	PAH's/Phthalates (1L) +	☑	☑ ☑
No head	[1]Total Mercury (125/250mL QC)	☑	☑
No head	[1]Diss Mercury (125/250mL QC)	☑	☑
Shoulder	Total Metals (250mL)	☑	
Shoulder	Diss Metals (125mL)	☑	
Shoulder	TSS (1L), (500 mL min)	☑	
Shoulder	Nutrients (250mL)	☑	
Shoulder	Ortho-P (125mL), (75min)	☑	
Shoulder	BOD (1L)	☑	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☑	
	Other:		
	Xtra (Unpreserved Conventionals)		☑

*Minimum volumes 4.010 L config above

~~+1000 mL for QC per bottle, must submit 2 extra bottles~~

[1]If 250ml bottle used, thenQAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (uS)
1	1000	☑	3800
2	↓	☑	239.2
3		☑	233.9
4		☑	221.4
5		☑	125
6		☑	120.8
7		☑	232.5
8		☑	315
9		☑	194.3
10		☑	201.2
11		☑	106.7
12		☑	251.5

Total aliquots: 48

Sample Prep

Date/Time: 4/26/24 @ 13:14

Initial: CA, SG, HA

pH: 6.70

COND (µS): 555.2

Lab #: 2404044-06

Aliquots composited: 48

Deviations :

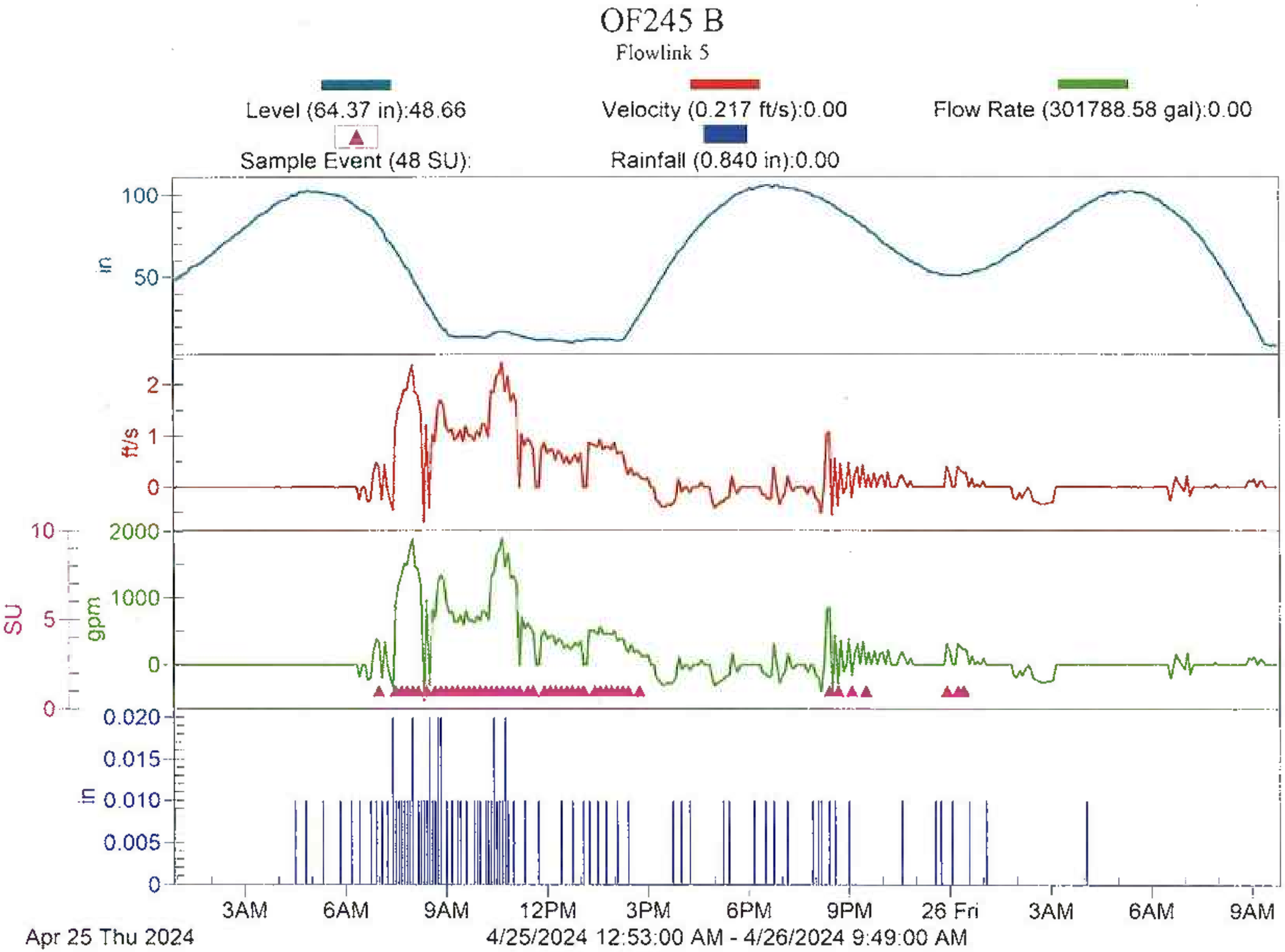
Composite End Time: 4/26/24 @ 00:25
(Collect Time) Last aliquot in composite

Relinquished by: [signature]

Date/Time: 4/26/24 @ 14:20

Received by: Cooler

Date/Time: 4/26/24 @ 14:20



OF245 B
Flowlink 5
Level (64.37 in):48.66
Velocity (0.217 ft/s):0.00
Flow Rate (301788.58 gal):0.00
Sample Event (48 SU):
Rainfall (0.840 in):0.00
in
ft/s
SU
gpm
100
50
2
1
0
10
5
2000
1000
0.020
0.015
0.010
0.005
3AM
6AM
9AM
12PM
3PM
6PM
9PM
26 Fri
3AM
6AM
9AM
Apr 25 Thu 2024
4/25/2024 12:53:00 AM - 4/26/2024 9:49:00 AM

```
SAMPLER ID# 1284476967  09:42 26-APR-24
  Hardware:     A1  Software: 2.33
*********** PROGRAM SETTINGS ***********
      ----------
   PROGRAM NAME:
    "STORM     "
 SITE DESCRIPTION:
    "OF245 B   "
      ----------
   UNITS SELECTED:
     LENGTH: ft


      ----------
   UNITS SELECTED:
   FLOW RATE: gpm
  FLOW VOLUME: gal
   VELOCITY: fps
      ----------
  AREA-VEL MODULE:
   AREA*VELOCITY
     ROUND PIPE

      ----------

      5 MINUTE
   DATA INTERVAL

      ----------
  12,  1000 ml BTLS
 21 ft SUCTION LINE
 AUTO SUCTION HEAD
1 RINSES, 1 RETRIES
      ----------

  ONE-PART PROGRAM


      ----------
      PACING:
    TIME, EVERY
 0 HOURS, 10 MINUTES

      ----------
    DISTRIBUTION:
   4 SAMPLES/BOTTLE


      ----------
```

VOLUME:

250 ml SAMPLES

ENABLE:

FLOW >200.0 gpm

ENABLE:
REPEATABLE ENABLE
NO SAMPLE AT DISABLE
NO SAMPLE AT ENABLE

ENABLE:
COUNTDOWN IS STOPPED
WHILE DISABLED

ENABLE:
0 PAUSE & RESUMES

NO DELAY TO START

LIQUID DETECT ON

QUICK VIEW/CHANGE

TAKE MEASUREMENTS
EVERY 5 MINUTES

DUAL SAMPLER OFF
BTL FULL DETECT OFF
TIMED BACKLIGHT

PULSED EVENT MARK

AT INITIAL PURGE

PUMP COUNTS FOR
EACH PURGE CYCLE:
200 PRE-SAMPLE
AUTO POST-SAMPLE

NO PERIODIC
SERIAL OUTPUT

INTERROGATOR
CONNECTOR
POWER ALWAYS ON

NO RAIN GAUGE

NO SDI-12 SONDE

AUTO SDI-12 SCAN OFF

I/O1= NONE
I/O2= NONE
I/O3= NONE

----

0 ANALOG OUTPUTS

NO EXTERNAL MODEM

NO ALARM
CONDITIONS SET

SAMPLER ID# 1284476967 09:43 26-APR-24
Hardware: A1 Software: 2.33
*********** SAMPLING RESULTS ***********
SITE: OF245 B
PROGRAM: STORM
Program Started at 12:31 WE 24-APR-24
Nominal Sample Volume = 250 ml

SAMPLE	BOTTLE	TIME	SOURCE	ERROR	COUNT TO LIQUID
		12:31	PGM DISABLED		
------------- TH 25-APR-24 -------------					
		06:50	PGM ENABLED		
1,4	1	07:00	T		542
		07:05	PGM DISABLED		
		07:10	PGM ENABLED		
		07:15	PGM DISABLED		
		07:30	PGM ENABLED		
2,4	1	07:30	T		549
3,4	1	07:40	T		559
4,4	1	07:50	T		565
1,4	2	08:00	T		572
2,4	2	08:10	T		580
		08:20	PGM DISABLED		
		08:25	PGM ENABLED		
3,4	2	08:25	T		590
		08:30	PGM DISABLED		
		08:35	PGM ENABLED		
4,4	2	08:40	T		602
1,4	3	08:50	T		611
2,4	3	09:00	T		611
3,4	3	09:10	T		612
4,4	3	09:20	T		615
1,4	4	09:30	T		612
2,4	4	09:40	T		620
3,4	4	09:50	T		617
4,4	4	10:00	T		619
1,4	5	10:10	T		616
2,4	5	10:20	T		613
3,4	5	10:30	T		613
4,4	5	10:40	T		612
1,4	6	10:50	T		612

2,4	6	11:00	T	617
3,4	6	11:10	T	619
		11:11	PGM DISABLED	
		11:15	PGM ENABLED	
4,4	6	11:25	T	617
1,4	7	11:35	T	619
		11:40	PGM DISABLED	
		11:50	PGM ENABLED	
2,4	7	11:55	T	615
3,4	7	12:05	T	618
4,4	7	12:15	T	619
1,4	8	12:25	T	621
2,4	8	12:35	T	621
3,4	8	12:45	T	621
4,4	8	12:55	T	621
1,4	9	13:05	T	621
		13:06	PGM DISABLED	
		13:15	PGM ENABLED	
2,4	9	13:25	T	616
3,4	9	13:35	T	619
4,4	9	13:45	T	621
1,4	10	13:55	T	619
2,4	10	14:05	T	620
3,4	10	14:15	T	620
4,4	10	14:25	T	610
		14:26	PGM DISABLED	
		14:30	PGM ENABLED	
		14:35	PGM DISABLED	
		14:40	PGM ENABLED	
1,4	11	14:45	T	599
		14:46	PGM DISABLED	
		18:45	PGM ENABLED	
		18:50	PGM DISABLED	
		20:20	PGM ENABLED	
2,4	11	20:25	T	519
		20:30	PGM DISABLED	
		20:35	PGM ENABLED	
3,4	11	20:40	T	527
		20:41	PGM DISABLED	
		20:45	PGM ENABLED	
		20:50	PGM DISABLED	
		21:00	PGM ENABLED	
4,4	11	21:05	T	532
		21:06	PGM DISABLED	
		21:15	PGM ENABLED	
		21:20	PGM DISABLED	
		21:25	PGM ENABLED	
1,4	12	21:30	T	533
		21:31	PGM DISABLED	

```
               21:45  PGM ENABLED
               21:50  PGM DISABLED
               22:10  PGM ENABLED
               22:15  PGM DISABLED
               23:55  PGM ENABLED
  2,4     12   23:55       T           558
------------- FR 26-APR-24 -------------
               00:05  PGM DISABLED
               00:15  PGM ENABLED
  3,4     12   00:15       T           559
  4,4     12   00:25       T           563
               00:26  PGM DONE 26-APR


   SOURCE T  ==> TIME
----------------------------------------
```

FIELD REPORT

Project: Thea Foss/Wheeler-Osgood Waterways & NPDES Stormwater Monitoring Program

Event: Storm Event – May 21, 2024

INTRODUCTION

This report summarizes the storm event sampled on 5/21/2024 by the City of Tacoma Environmental Services Collection System Support staff as part of our stormwater monitoring program. This report includes a summary of the following:

- Storm characteristics and criteria;
- Sampling activities;
- Flow characteristics at each sampling location;
- Pacing – set for a 0.42" event, actual event was 0.29"

This event met the sampling criteria for precipitation as specified in the Thea Foss Sampling and Analysis Plan (SAP).

DESCRIPTION OF SAMPLING ACTIVITES

Samplers placed in the field on 5/20/2024. During sampler installation the weather conditions were overcast. All samplers were retrieved on 5/22/2024 (For site specific details, see Appendix A for field notes, Chain of Custody (COC) forms, and event hydrographs).

The following unusual observations were noted during the sampling event:

Table 2: Composite Sampling Activities

Sample Location	Site Deployed	Sample Accepted	Pacing (gal)	Enables LVL(ft), VEL(fps) COND.(mS/cm)	Comments
Outfall 230A	Yes	Yes	71,999	LVL > 0.4	10 Aliquots Collected / 10 Composited
Outfall 235	Yes	Yes	27,000	LVL > 0.37 VEL > 0.8	21 Aliquots Collected / 21 Composited
Outfall 237ANew	Yes	No	353,000	LVL > 0.55 VEL > 6.0	0 Aliquots Collected / 0 Composited
Outfall 237B	Yes	Yes	407,000	LVL > 0.6	13 Aliquots Collected / 13 Composited
Outfall 243	Yes	No	10 min.	< 4.0 mS/cm	0 Aliquots Collected / 0 Composited
Outfall 245	Yes	Yes	10 min.	> 200 gpm	31 Aliquots Collected / 24 Composited
Outfall 254	No	No	10 min.	N/A	N/A

**QC, QUALITY CONTROL*
ND, NO DATA
NA, NOT APPLICABLE

WATER QUALITY DATA

Accepted samples were analyzed for the target parameters specified in the SAP and QAPP. Samples accepted at all Outfalls were composited and preserved within 24 hours of the last aliquot being collected. The samples were allowed to sit for a minimum of 18 hours before metals analysis was started.

EQUIPMENT INFORMATION

Samples were collected using ISCO 6712 portable auto samplers. Rain data was collected using an ISCO 674 rain gauge located at the Center for Urban Waters at 326 East D Street, Tacoma, WA 98421.

CORRECTIVE ACTIONS AND DEVIATIONS

There were no deviations from the field procedures as discussed in the SAP other than those discussed above/below. No other criteria or procedures as indicated in the SAP were compromised except for those discussed above/below.

Enclosures: The ISCO program setting/sampling results report, the sample collection chain of custody form, and field records are in Appendix A for each outfall. This includes the following information for the samples collected:

- Plot of flow hydrograph and hyetograph
- Subsample times and conductivities
- Tidal windows
- Field activities

Appendix A

Storm Deployment 5/20/24 .42"

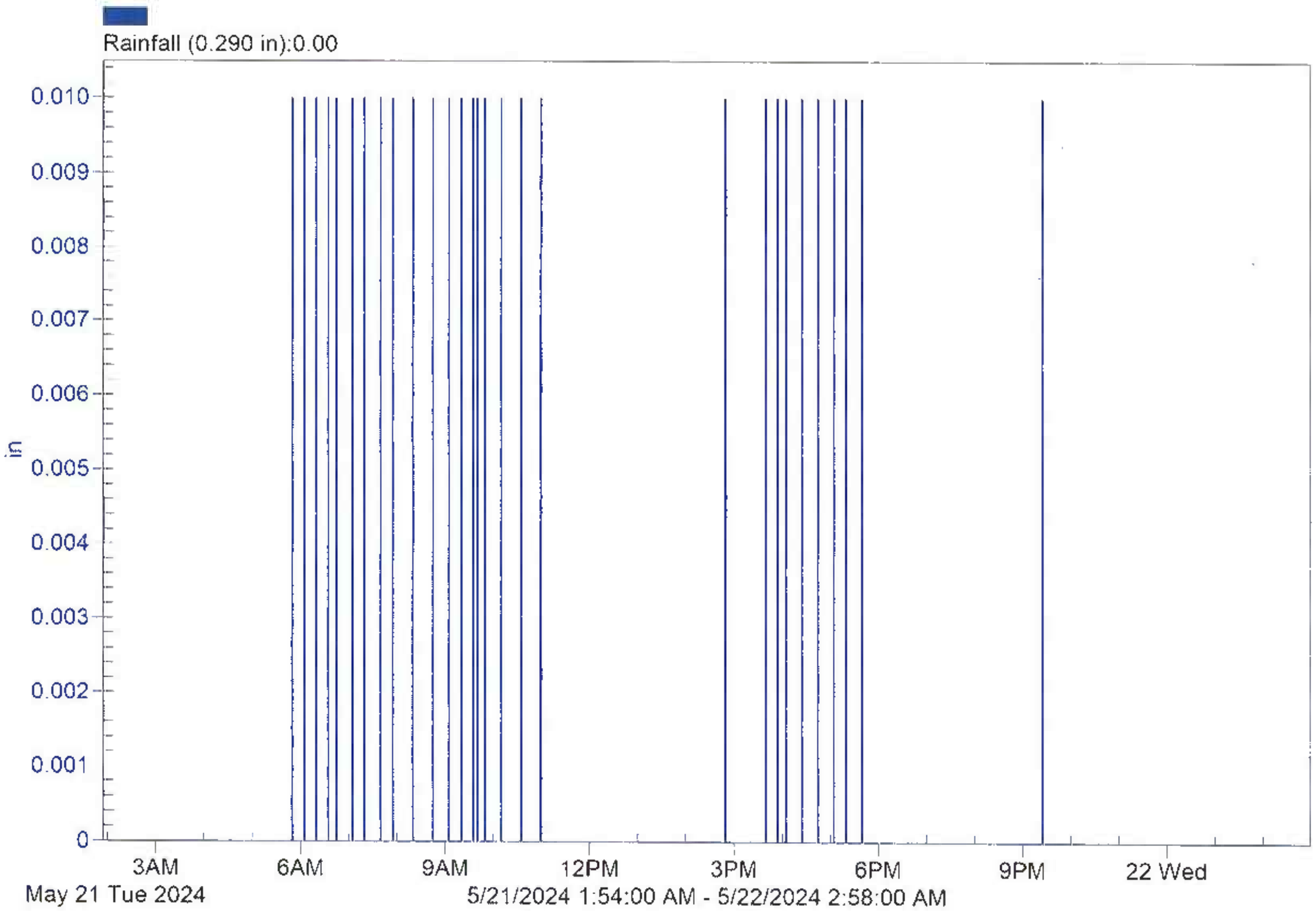
245 @ 13:47 - Download - Battery Check - Jars/Ice
243 @ 14:00 - Download - Battery Check - Jars/Ice
237A @ 14:09 - Download - Battery Check - Jars/Ice - 353,000
237B @ 14:19 - Download - Battery Check - Jars/Ice - 407,000
235 @ 14:28 - Download - Battery Check - Jars/Ice - 27,000
230A @ 14:38 - Download - Battery Check - Jars/Ice - 72,000

Grabs 5/21/24
~~254~~ @
245 @
243 @
237A @
237B @
235 @
230A @

Storm Collection - 5/22/24
245 - @ 9:28 - 2/12 - Download
243 - @ 9:34 - 2/12 - Download
237A - @ 9:41 - 1/12 - Download
237B - @ 9:48 - 3½/12 - Download
235 @ 9:51 - 5¼/12 - Download
230A @ 9:59 - 3/12 - Download

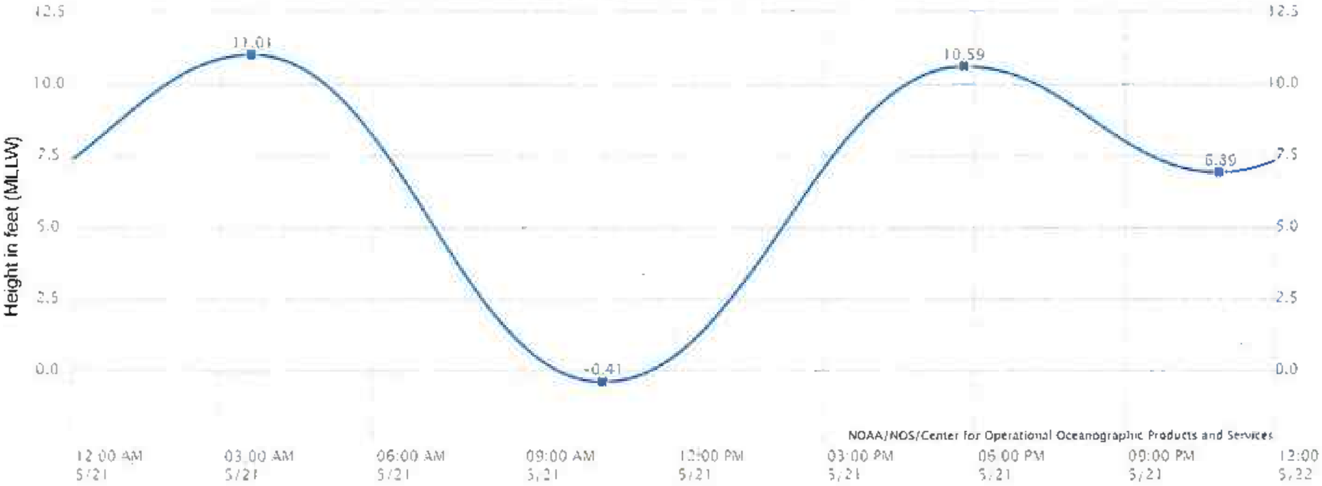
RF1

Flowlink 5



Help Print

NOAA/NOS/CO-OPS
Tide Predictions at 9446484, Tacoma WA
From 2024/05/21 12:00 AM LST/LDT to 2024/05/21 11:59 PM LST/LDT



Note: The interval is High/Low, the solid blue line depicts a curve fit between the high and low values and approximates the segments between.
Disclaimer: These data are based upon the latest information available as of the date of your request, and may differ from the published tide tables.

High/Low Tide Prediction Data Listing

Station Name: Tacoma, WA
Action: Daily
Product: Tide Predictions
Start Date & Time: 2024/5/21 12:00 AM
End Date & Time: 2024/5/21 11:59 PM

Source: NOAA/NOS/CO-OPS
Prediction Type: Harmonic
Datum: MLLW
Height Units: Feet
Time Zone: LST/LDT

Date	Day	Time	Hgt	Time	Hgt	Time	Hgt	Time	Hgt
2024/05/21	Tue	03:35 AM	11.01 H	10:36 AM	-0.41 L	5:47 PM	10.59 H	10:54 PM	6.89 L

2403015-01[redacted]

Bottle Certification

Bottle Certification

*** DEFAULT CONTAINER ***

Jar Cert # ____

Filter lot # 13K3128P

NPDES Storm

Chain of Custody

Outfall: 230A

Sampling Crew: CA, SG

Weather conditions: Clear

Observed activities in area: N/A

Observations during sampler collection: N/A

Color, Odors, sheens: N/A

Date/Time sampler initiated: 5/21/24 @ 14:59

Date/Time sampler pickup: 5/22/24 @ 9:59

Type of Sample: ☑ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☑ >0.2 inches rain ☐ <0.02 inches of rain previus 24 hours

Samplers: ☑ Data downloaded ☐ Sample bottle ... ☑ ... ☑ Caps on containers ☐ Tubing Decon 1000mL DI water

Fill to...	Parameters	Sample	QC
Neck	PAHs/Phthalates (1L) +	☑	☐ ☐
No head	[1] Total Mercury (125/250mL QC)	☑	☐
No head	[1] Diss Mercury (125/250mL QC)	☑	☐
Shoulder	Total Metals (250mL)	☑	
Shoulder	Diss Metals (125mL)	☑	
Shoulder	TSS (1L), (500 mL min)	☑	
Shoulder	Nutrients (250mL)	☑	
Shoulder	Ortho-P (125mL), (75min)	☑	
Shoulder	BOD (1L)	☐	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☐	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes 4.010 L config above

+1000 mL for QC per bottle, must submit 2 extra bottles

[1] If 250ml bottle used, thenQAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (µS)
1	1000	☑	67.8
2	|	☑	56.0
3	⊥	☑	50.6
4		☐	
5		☐	
6		☐	
7		☐	
8		☐	
9		☐	
10		☐	
11		☐	
12		☐	

Total aliquots: ~~10~~ 3

Sample Prep

Date/Time: 5/22/24 10:30

Initial: CA, SG, RG

pH: 7.24

COND (µS): 57.5

Lab #: 2405024-01

Aliquots composited: ~~10~~ 3

Deviations :

Composite End Time: 5/21/24 @ 17:36

(Collect Time) Last aliquot in composite

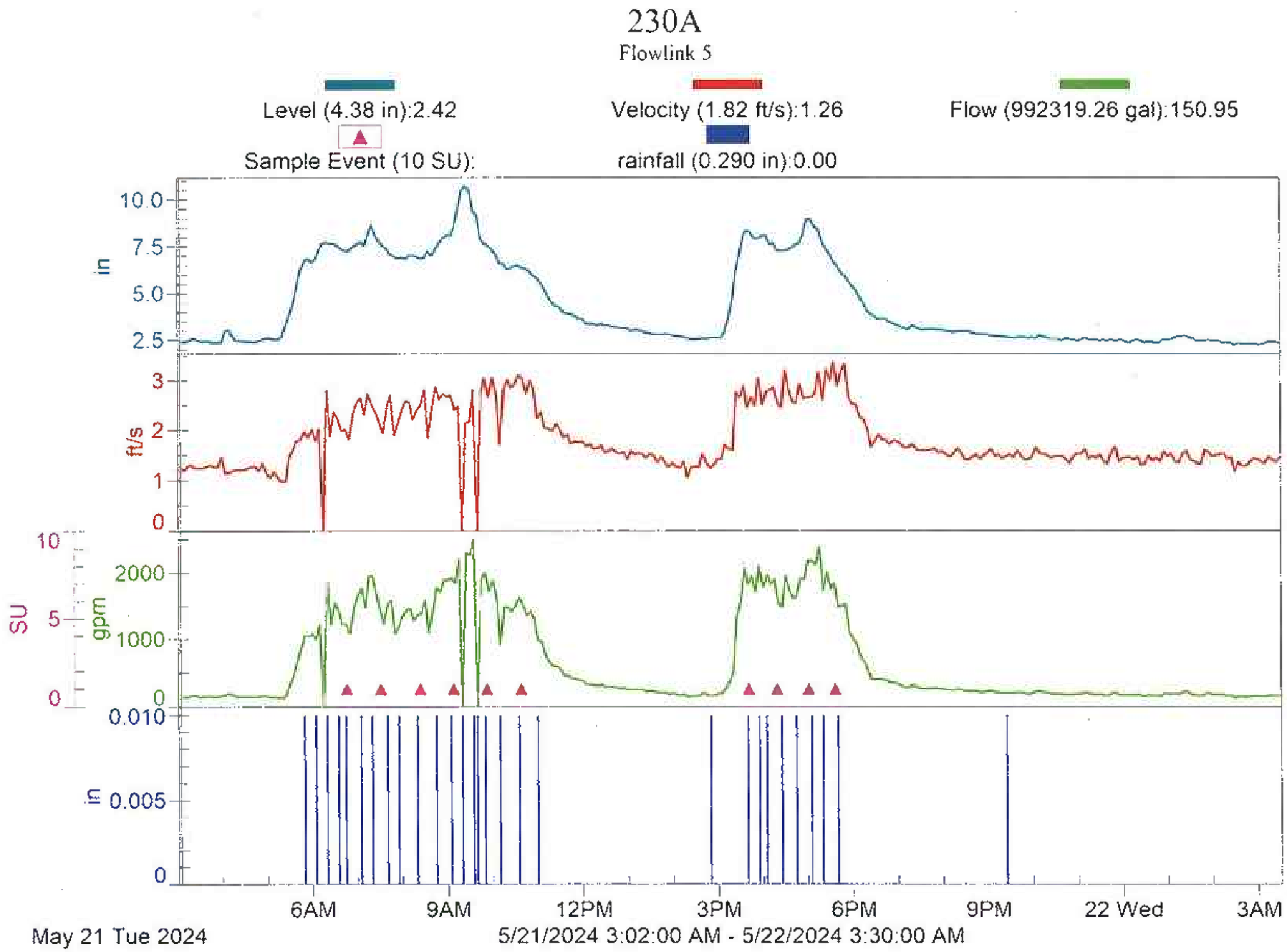
Relinquished by: [signature]

Date/Time: 5/22/24 @ 11:25

Received by: Cooler

Date/Time: 5/22/24 @ 11:25

NPDES Storm ... COC ...


230A
Flowlink 5
Level (4.38 in):2.42
Velocity (1.82 ft/s):1.26
Flow (992319.26 gal):150.95
Sample Event (10 SU):
rainfall (0.290 in):0.00
in
10.0
7.5
5.0
2.5
ft/s
3
2
1
0
SU
10
5
0
gpm
2000
1000
0
in
0.010
0.005
0
6AM
9AM
12PM
3PM
6PM
9PM
22 Wed
3AM
May 21 Tue 2024
5/21/2024 3:02:00 AM - 5/22/2024 3:30:00 AM

SAMPLER ID# 1481205047 08:33 22-MAY-24
Hardware: C0 Software: 3.01.0075
*********** PROGRAM SETTINGS ***********

PROGRAM NAME:
"STORM 1   "
SITE DESCRIPTION:
"230A   "

UNITS SELECTED:
LENGTH: ft

UNITS SELECTED:
FLOW RATE: gpm
FLOW VOLUME: gal
VELOCITY: fps

AREA-VEL MODULE:
AREA*VELOCITY
ROUND PIPE

----

5 MINUTE
DATA INTERVAL

12, 1000 ml BTLS
30 ft SUCTION LINE
28 ft SUCTION HEAD

ONE-PART PROGRAM

PACING:
FLOW, EVERY
71999 gal
NO SAMPLE AT START

DISTRIBUTION:
4 SAMPLES/BOTTLE

VOLUME:

250 ml SAMPLES

ENABLE:

LEVEL >0.400 ft

ENABLE:
REPEATABLE ENABLE
NO SAMPLE AT DISABLE
NO SAMPLE AT ENABLE

ENABLE:
COUNTDOWN IS STOPPED
WHILE DISABLED

ENABLE:
0 PAUSE & RESUMES

NO DELAY TO START

200 HOURS RUN TIME

LIQUID DETECT OFF

QUICK VIEW/CHANGE

TAKE MEASUREMENTS
AT STORAGE INTERVAL

DUAL SAMPLER OFF
BTL FULL DETECT OFF
TIMED BACKLIGHT

PULSED EVENT MARK
AT THE BEGINNING OF

FORWARD PUMPING

PUMP COUNTS FOR
EACH PURGE CYCLE:
100 PRE-SAMPLE
500 POST-SAMPLE

NO PERIODIC
SERIAL OUTPUT

NO RAIN GAUGE

NO SDI-12 SONDE

AUTO SDI-12 SCAN OFF

I/O1= NONE
I/O2= NONE
I/O3= NONE

----

0 ANALOG OUTPUTS

NO EXTERNAL MODEM

NO ALARM
CONDITIONS SET

```
SAMPLER ID# 1481205047  08:33 22-MAY-24
  Hardware:     C0  Software: 3.01.0075
*********** SAMPLING RESULTS ***********
   SITE: 230A
PROGRAM: STORM 1
Program Started at 13:16 MO 20-MAY-24
Nominal Sample Volume =  250 ml
                                   COUNT
                                      TO
SAMPLE  BOTTLE TIME  SOURCE ERROR LIQUID
------- ------ ----     -- --     ------
              13:16  PGM DISABLED
------------- TU 21-MAY-24 -------------
              05:40  PGM ENABLED
  1,4     1   06:46      F             0
  2,4     1   07:31      F             0
  3,4     1   08:23      F             0
  4,4     1   09:08      F             0
  1,4     2   09:51      F             0
  2,4     2   10:38      F             0
              11:15  PGM DISABLED
              15:25  PGM ENABLED
  3,4     2   15:41      F             0
  4,4     2   16:19      F             0
  1,2     3   17:01      F             0
  2,2     3   17:36      F             0
              18:10  PGM DISABLED
------------- WE 22-MAY-24 -------------
              08:32  MANUAL PAUSE
              08:32  PGM STOPPED 22-MAY


   SOURCE F  ==> FLOW
----------------------------------------
```

NPDES Storm
Chain of Custody

Jar Cert # 2403019-01 Outfall: 235 Date/Time sampler installed: 5/20/24 @ 14:28

Jar Cert # ________ Sampling Crew: CA, SG

Filter lot # 1389938 Weather conditions: Clear Date/Time sampler pickup: 5/22/24 @ ~~14~~ 9:51

Observed activities in area: N/A

Observations during sampler collection: N/A

Color, Odors, sheens: N/A

Type of Sample: ☑ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☑ >0.2 inches rain ☐ <0.02 inches of rain previous 24 hours

Samplers: ☑ Data downloaded ☐ Sample bottles marked

☑ Ice Present at pick up ☐ Tubing Decon 1000mL Diwater

☑ Caps on containers

Fill to...	Parameters:	Sample	QC
Neck	PAHs/Phthalates (1L) +	☑	☐ ☐
No head	[1]Total Mercury (125/250mL QC)	☑	☑
No head	[1]Diss Mercury (125/250mL QC)	☑	☑
Shoulder	Total Metals (250mL)	☑	
Shoulder	Diss Metals (125mL)	☑	
Shoulder	TSS (1L), (500 mL min)	☑	
Shoulder	Nutrients (250mL)	☑	
Shoulder	Ortho-P (125mL), (75min)	☑	
Shoulder	BOD (1L)	☑	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☑	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes 4.010 L config above

+1000 mL for QC per bottle, must submit 2 extra bottles

[1]If 250ml bottle used, then QAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (µS)
1	1000	☑	168.8
2		☑	135.8
3		☑	94.9
4		☑	116.0
5		☑	123.2
6	250	☑	149.4
7		☐	
8		☐	
9		☐	
10		☐	
11		☐	
12		☐	

Total aliquots: 21

Sample Prep

Date/Time: 5/22/24 11:15

Initial: CA, SG, RG

pH: 6.77

COND (µS): 126.6

Lab #: 2405024-02

Aliquots composited: 21

Deviations :

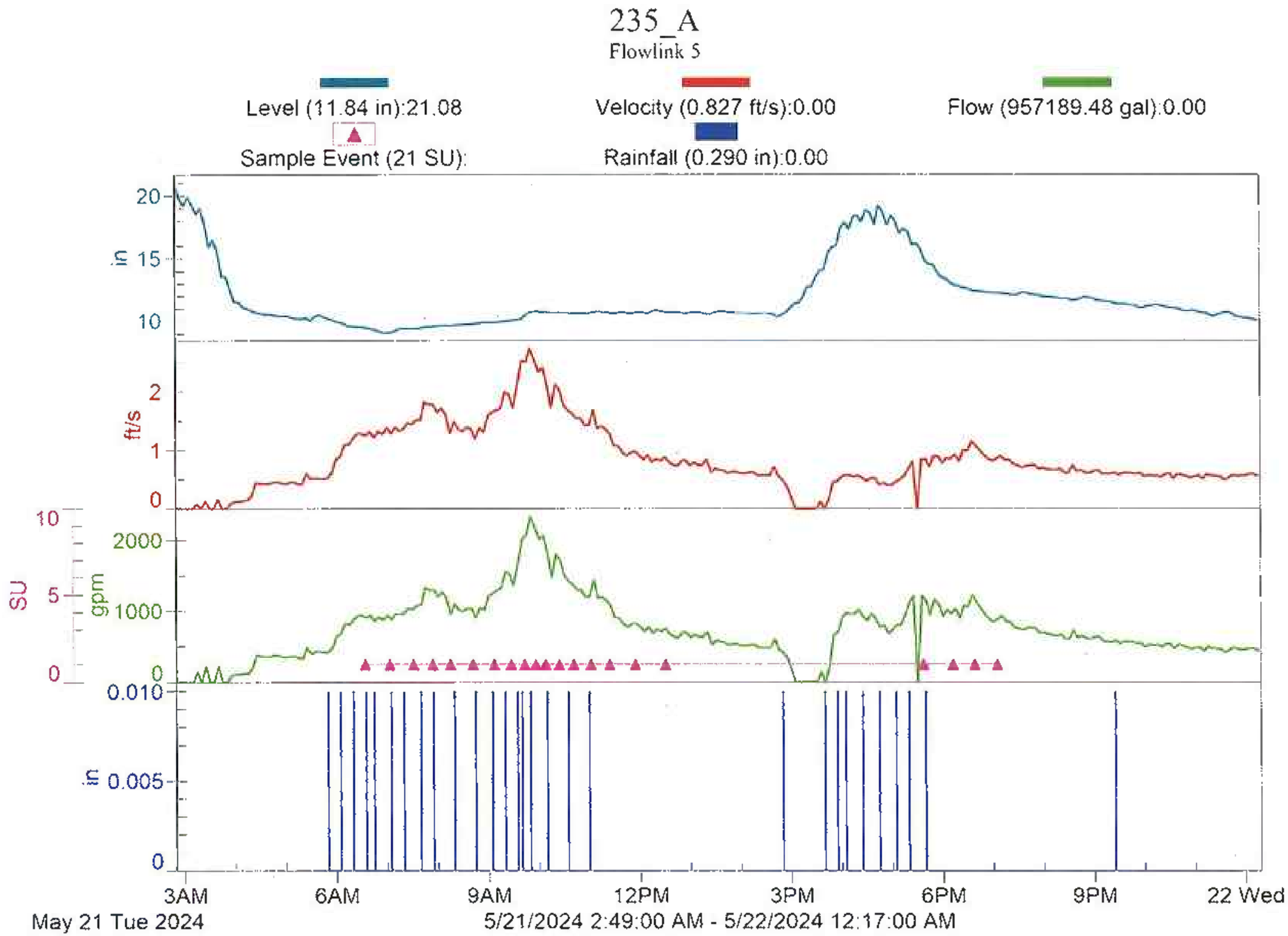
Composite End Time: 5/21/24 @ 19:05
(Collect Time) Last aliquot in composite

Relinquished by: [signature]

Date/Time: 5/22/24 11:25

Received by: GC Cooler

Date/Time: 5/22/24 @ 11:25


235_A
Flowlink 5
Level (11.84 in):21.08
Velocity (0.827 ft/s):0.00
Flow (957189.48 gal):0.00
Sample Event (21 SU):
Rainfall (0.290 in):0.00
in
ft/s
SU
gpm
in
3AM
6AM
9AM
12PM
3PM
6PM
9PM
22 Wed
May 21 Tue 2024
5/21/2024 2:49:00 AM - 5/22/2024 12:17:00 AM

SAMPLER ID# 1242995716 08:50 22-MAY-24
Hardware: A1 Software: 2.33
*********** PROGRAM SETTINGS ***********

PROGRAM NAME:
"235A   "
SITE DESCRIPTION:
"235A ST   "

UNITS SELECTED:
LENGTH: ft

UNITS SELECTED:
FLOW RATE: Mgd
FLOW VOLUME: gal
VELOCITY: fps

AREA-VEL MODULE:
AREA*VELOCITY
ROUND PIPE

----

5 MINUTE
DATA INTERVAL

12, 1000 ml BTLS
56 ft SUCTION LINE
AUTO SUCTION HEAD
1 RINSES, 1 RETRIES

ONE-PART PROGRAM

PACING:
FLOW, EVERY
27000 gal
NO SAMPLE AT START

DISTRIBUTION:
4 SAMPLES/BOTTLE

VOLUME:

250 ml SAMPLES

ENABLE:
LEVEL >0.370 ft
AND
VEL > 0.80 fps

ENABLE:
REPEATABLE ENABLE
NO SAMPLE AT DISABLE
NO SAMPLE AT ENABLE

ENABLE:
COUNTDOWN IS STOPPED
WHILE DISABLED

ENABLE:
0 PAUSE & RESUMES

NO DELAY TO START

200 HOURS RUN TIME

LIQUID DETECT ON

QUICK VIEW/CHANGE

TAKE MEASUREMENTS
AT STORAGE INTERVAL

DUAL SAMPLER OFF
BTL FULL DETECT OFF
TIMED BACKLIGHT

EVENT MARK SENT

DURING PUMP CYCLE

PUMP COUNTS FOR
EACH PURGE CYCLE:
100 PRE-SAMPLE
AUTO POST-SAMPLE

NO PERIODIC
SERIAL OUTPUT

INTERROGATOR
CONNECTOR
POWER ALWAYS ON

NO RAIN GAUGE

NO SDI-12 SONDE

AUTO SDI-12 SCAN OFF

I/O1= NONE
I/O2= NONE
I/O3= NONE

----

0 ANALOG OUTPUTS

NO EXTERNAL MODEM

NO ALARM
CONDITIONS SET

```
     ----------
     ----------
----------------------------------------


SAMPLER ID# 1242995716  08:50 22-MAY-24
  Hardware:     A1  Software: 2.33
*********** SAMPLING RESULTS ***********
   SITE: 235A ST
PROGRAM: 235A
Program Started at 13:31 MO 20-MAY-24
Nominal Sample Volume =  250 ml
                                   COUNT
                                      TO
SAMPLE  BOTTLE TIME   SOURCE ERROR LIQUID
------- ------ ----       -- --    ------
               13:31  PGM DISABLED
------------- TU 21-MAY-24 -------------
               06:00  PGM ENABLED
  1,4      1   06:33      F          1879
  2,4      1   07:03      F          1867
  3,4      1   07:31      F          1875
  4,4      1   07:54      F          1884
  1,4      2   08:15      F          1885
  2,4      2   08:42      F          1883
  3,4      2   09:07      F          1879
  4,4      2   09:27      F          1883
  1,4      3   09:43      F          1897
  2,4      3   09:55      F          1910
  3,4      3   10:08      F          1908
  4,4      3   10:24      F          1907
  1,4      4   10:41      F          1904
  2,4      4   11:02      F          1901
  3,4      4   11:24      F          1899
  4,4      4   11:54      F          1903
  1,4      5   12:30      F          1893
               12:40  PGM DISABLED
               12:50  PGM ENABLED
               13:00  PGM DISABLED
               13:20  PGM ENABLED
               13:25  PGM DISABLED
               17:25  PGM ENABLED
  2,4      5   17:37      F          1846
               17:45  PGM DISABLED
               17:50  PGM ENABLED
               18:00  PGM DISABLED
               18:05  PGM ENABLED
  3,4      5   18:12      F          1869
```

```
  4,4      5   18:38       F           1882
  1,1      6   19:05       F           1889
               19:25  PGM DISABLED
------------- WE 22-MAY-24 -------------
               00:55  PGM ENABLED
               01:00  PGM DISABLED
               08:49  MANUAL PAUSE
               08:49  PGM STOPPED 22-MAY

   SOURCE F  ==> FLOW
----------------------------------------
```

2403014-01

Bottle Certification

Bottle Certification

*** DEFAULT CONTAINER ***

Jar Cert #______

Filter lot # 1383988

NPDES Storm
Chain of Custody

Outfall: 237B

Date/Time sampler installed: 5/20/24 @ 14:19

Sampling Crew: CA, SG

Weather conditions: Clear

Date/Time sampler pickup: 5/22/24 @ 9:48

Observed activities in area: N/A

Observations during sampler collection: N/A

Color, Odors, sheens: N/A

Type of Sample: ☑ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☑ >0.2 inches rain ☐ <0.02 inches of rain previous 24 hours

Samplers: ☑ Data downloaded ☑ Ice Present at pick up ☑ Caps on containers ☐ Sample bottles ... ☐ Tubing Decon 1000mL DIwater

Fill to	Parameters:	Sample	QC
Neck	PAH's/Phthalates (1L) +	☑	☐ ☐
No head	¹Total Mercury (125/250mL QC)	☑	☐
No head	¹Diss Mercury (125/250mL QC)	☑	☐
Shoulder	Total Metals (250mL)	☑	
Shoulder	Diss Metals (125mL)	☑	
Shoulder	TSS (1L), (500 mL min)	☑	
Shoulder	Nutrients (250mL)	☑	
Shoulder	Ortho-P (125mL), (75min)	☑	
Shoulder	BOD (1L)	☐	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☐	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes 4.010 L config above

+1000 mL for QC per bottle, must submit 2 extra bottles

¹If 250ml bottle used, thenQAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (µS)
1	1000	☑	192.0
2	↓	☑	190.5
3		☑	148.1
4	250	☑	236.9
5		☐	
6		☐	
7		☐	
8		☐	
9		☐	
10		☐	
11		☐	
12		☐	

Total aliquots: 13

Sample Prep

Date/Time: 5/22/24 10:45

Initial: CA, RG, SG

pH: 6.38

COND (µS): 174.0

Lab #: 2405024-04

Aliquots composited: 13

Deviations :

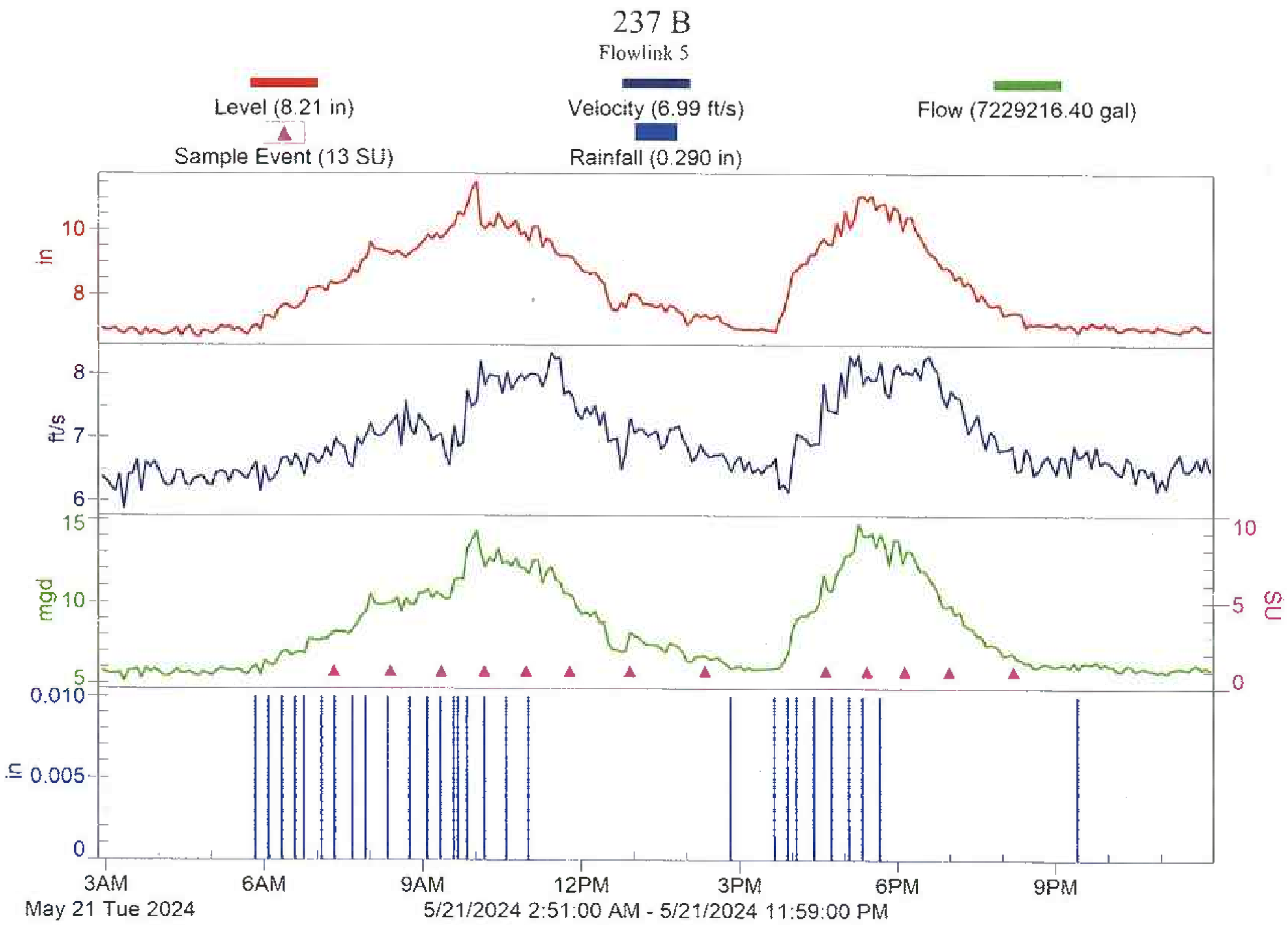
Composite End Time: 5/21/24 @ 20:12 (Collect Time) Last aliquot in composite

Relinquished by: [signature]

Date/Time: 5/22/24 @ 11:25

Received by: Cooler

Date/Time: 5/22/24 @ 11:25


237 B
Flowlink 5
Level (8.21 in)
Velocity (6.99 ft/s)
Flow (7229216.40 gal)
Sample Event (13 SU)
Rainfall (0.290 in)
in
10
8
ft/s
8
7
6
mgd
15
10
5
SU
10
5
0
in
0.010
0.005
0
3AM
6AM
9AM
12PM
3PM
6PM
9PM
May 21 Tue 2024
5/21/2024 2:51:00 AM - 5/21/2024 11:59:00 PM

SAMPLER ID# 1243003651 08:44 22-MAY-24
Hardware: A1 Software: 2.33
*********** PROGRAM SETTINGS ***********

PROGRAM NAME:
" STORM 1 "
SITE DESCRIPTION:
" 237 B "

UNITS SELECTED:
LENGTH: ft

UNITS SELECTED:
FLOW RATE: gpm
FLOW VOLUME: Mgal
VELOCITY: fps

AREA-VEL MODULE:
AREA*VELOCITY
ROUND PIPE

----

5 MINUTE
DATA INTERVAL

12, 1000 ml BTLS
16 ft SUCTION LINE
AUTO SUCTION HEAD
1 RINSES, 1 RETRIES

ONE-PART PROGRAM

PACING:
FLOW, EVERY
0.407 Mgal
NO SAMPLE AT START

DISTRIBUTION:
4 SAMPLES/BOTTLE

VOLUME:

250 ml SAMPLES

ENABLE:

LEVEL >0.600 ft

ENABLE:
REPEATABLE ENABLE
NO SAMPLE AT DISABLE
NO SAMPLE AT ENABLE

ENABLE:
COUNTDOWN IS STOPPED
WHILE DISABLED

ENABLE:
0 PAUSE & RESUMES

NO DELAY TO START

200 HOURS RUN TIME

LIQUID DETECT ON

QUICK VIEW/CHANGE

TAKE MEASUREMENTS
AT STORAGE INTERVAL

DUAL SAMPLER OFF
BTL FULL DETECT ON
TIMED BACKLIGHT

EVENT MARK SENT

DURING PUMP CYCLE

PUMP COUNTS FOR
EACH PURGE CYCLE:
100 PRE-SAMPLE
AUTO POST-SAMPLE

NO PERIODIC
SERIAL OUTPUT

INTERROGATOR
CONNECTOR
POWER ALWAYS ON

NO RAIN GAUGE

NO SDI-12 SONDE

AUTO SDI-12 SCAN OFF

I/O1= NONE
I/O2= NONE
I/O3= NONE

----

0 ANALOG OUTPUTS

NO EXTERNAL MODEM

NO ALARM
CONDITIONS SET

```
     ----------
     ----------
----------------------------------------


SAMPLER ID# 1243003651  08:45 22-MAY-24
  Hardware:     A1  Software: 2.33
*********** SAMPLING RESULTS ***********
   SITE:   237 B
PROGRAM:  STORM 1
Program Started at 13:22 MO 20-MAY-24
Nominal Sample Volume =  250 ml
                                   COUNT
                                      TO
SAMPLE  BOTTLE TIME  SOURCE ERROR LIQUID
------- ------ ----    -- --     ------
              13:22  PGM DISABLED
              14:00  PGM ENABLED
              14:05  PGM DISABLED
------------- TU 21-MAY-24 -------------
              06:00  PGM ENABLED
  1,4     1   07:19       F          519
  2,4     1   08:23       F          514
  3,4     1   09:21       F          513
  4,4     1   10:10       F          509
  1,4     2   10:57       F          526
  2,4     2   11:47       F          517
  3,4     2   12:55       F          519
              14:00  PGM DISABLED
              14:05  PGM ENABLED
  4,4     2   14:21       F          518
              14:40  PGM DISABLED
              15:45  PGM ENABLED
  1,4     3   16:38       F          512
  2,4     3   17:25       F          513
  3,4     3   18:08       F          534
  4,4     3   18:59       F          508
  1,1     4   20:12       F          517
              20:25  PGM DISABLED
------------- WE 22-MAY-24 -------------
              08:35  PGM ENABLED
              08:43  MANUAL PAUSE
              08:43  PGM STOPPED 22-MAY


   SOURCE F  ==> FLOW
----------------------------------------
```

NPDES Storm
Chain of Custody

Jar Cert #: 2402016-01 Outfall: 245 Date/Time sampler installed: 5/20/24 @ 13:47

Jar Cert #: ______ Sampling Crew: CA, SG

Filter lot #: 1389988 Weather conditions: Clear Date/Time sampler pickup: 5/22/24 @ 9:28

Observed activities in area: N/A

Observations during sampler collection: N/A

Color, Odors, sheens: N/A

Type of Sample: ☑ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☑ >0.2 inches rain ☐ <0.02 inches of rain previous 24 hours

Samplers: ☑ Data downloaded ☐ Sample bottles marked
☑ Ice Present at pick-up ☐ Tubing Decon 1000mL Diwater
☑ Caps on containers

Fill to...	Parameters	Sample	QC
Neck	PAH's/Phthalates (1L) +	☑	☑ ☑
No head	[1]Total Mercury (125/250mL QC)	☑	☐
No head	[1]Diss Mercury (125/250mL QC)	☑	☐
Shoulder	Total Metals (250mL)	☑	
Shoulder	Diss Metals (125mL)	☑	
Shoulder	TSS (1L), (500 mL min)	☑	
Shoulder	Nutrients (250mL)	☑	
Shoulder	Ortho-P (125mL), (75min)	☑	
Shoulder	BOD (1L)	☐	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☐	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes 4.010 L config above
+1000 mL for QC per bottle, must submit 2 extra bottles
[1]If 250ml bottle used, then QAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (µS)
1	1000	☑	1953
2		☑	1022
3		☑	672
4		☑	326
5		☑	306
6		☑	327
7		☐	15590
8	250	☐	16650
9		☐	
10		☐	
11		☐	
12		☐	

Total aliquots: ~~32~~ 31 (RC)

Sample Prep
Date/Time: 5/22/24 11:00
Initial: CA, RD, SG
pH: 6.52
COND (µS): 658
Lab #: 240524-06
Aliquots composited: 24

Deviations :

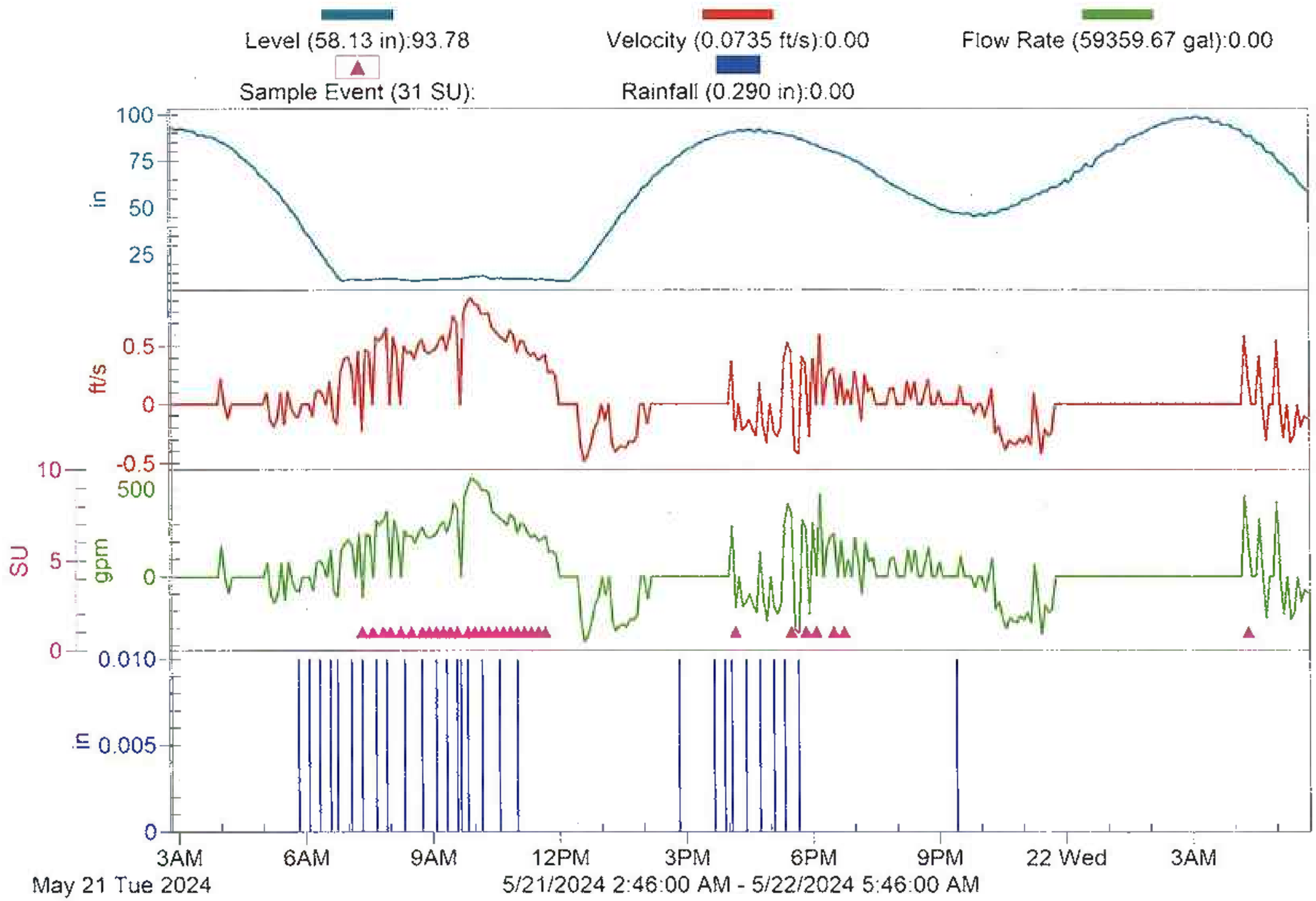
Composite End Time: (Collect Time) 5/21/24 @ 11:40 Last aliquot in composite

Relinquished by: [signature] Received by: Cooler

Date/Time: 5/22/24 @ 11:25 Date/Time: 5/22/24 @ 11:25

OF245 B

Flowlink 5



```
SAMPLER ID# 1284476967  08:27 22-MAY-24
  Hardware:     A1  Software: 2.33
*********** PROGRAM SETTINGS ***********
     ----------
   PROGRAM NAME:
    "STORM     "
  SITE DESCRIPTION:
    "OF245 B   "
     ----------
   UNITS SELECTED:
     LENGTH: ft


     ----------
   UNITS SELECTED:
   FLOW RATE: gpm
  FLOW VOLUME: gal
   VELOCITY: fps
     ----------
  AREA-VEL MODULE:
   AREA*VELOCITY
     ROUND PIPE

     ----------

      5 MINUTE
   DATA INTERVAL

     ----------
  12,  1000 ml BTLS
 21 ft SUCTION LINE
 AUTO SUCTION HEAD
1 RINSES, 1 RETRIES
     ----------

  ONE-PART PROGRAM


     ----------
      PACING:
    TIME, EVERY
 0 HOURS, 10 MINUTES

     ----------
    DISTRIBUTION:
   4 SAMPLES/BOTTLE


     ----------
```

VOLUME:

250 ml SAMPLES

ENABLE:

FLOW >200.0 gpm

ENABLE:

REPEATABLE ENABLE

NO SAMPLE AT DISABLE

NO SAMPLE AT ENABLE

ENABLE:

COUNTDOWN IS STOPPED

WHILE DISABLED

ENABLE:

0 PAUSE & RESUMES

NO DELAY TO START

LIQUID DETECT ON

QUICK VIEW/CHANGE

TAKE MEASUREMENTS

EVERY 5 MINUTES

DUAL SAMPLER OFF

BTL FULL DETECT OFF

TIMED BACKLIGHT

PULSED EVENT MARK

AT INITIAL PURGE

PUMP COUNTS FOR
EACH PURGE CYCLE:
200 PRE-SAMPLE
AUTO POST-SAMPLE

NO PERIODIC
SERIAL OUTPUT

INTERROGATOR
CONNECTOR
POWER ALWAYS ON

NO RAIN GAUGE

NO SDI-12 SONDE

AUTO SDI-12 SCAN OFF

I/O1= NONE
I/O2= NONE
I/O3= NONE

----

0 ANALOG OUTPUTS

NO EXTERNAL MODEM

NO ALARM
CONDITIONS SET

```
     ----------
     ----------
----------------------------------------


SAMPLER ID# 1284476967  08:28 22-MAY-24
  Hardware:     A1  Software: 2.33
*********** SAMPLING RESULTS ***********
   SITE: OF245 B
PROGRAM: STORM
Program Started at 12:53 MO 20-MAY-24
Nominal Sample Volume =  250 ml
                                   COUNT
                                      TO
SAMPLE  BOTTLE TIME  SOURCE ERROR LIQUID
------- ------ ----    -- --      ------
              12:53  PGM DISABLED
------------- TU 21-MAY-24 -------------
              06:55  PGM ENABLED
              06:55  PGM DISABLED
              07:00  PGM ENABLED
              07:05  PGM DISABLED
              07:15  PGM ENABLED
  1,4      1  07:20      T           604
              07:22  PGM DISABLED
              07:25  PGM ENABLED
  2,4      1  07:35      T           604
              07:36  PGM DISABLED
              07:40  PGM ENABLED
  3,4      1  07:50      T           604
  4,4      1  08:00      T           608
              08:01  PGM DISABLED
              08:05  PGM ENABLED
  1,4      2  08:15      T           612
              08:16  PGM DISABLED
              08:20  PGM ENABLED
  2,4      2  08:30      T           610
              08:35  PGM DISABLED
              08:40  PGM ENABLED
  3,4      2  08:45      T           614
  4,4      2  08:55      T           611
  1,4      3  09:05      T           614
  2,4      3  09:15      T           614
  3,4      3  09:25      T           612
  4,4      3  09:35      T           614
              09:40  PGM DISABLED
              09:45  PGM ENABLED
  1,4      4  09:50      T           610
```

```
 2,4     4   10:00       T            612
 3,4     4   10:10       T            616
 4,4     4   10:20       T            611
 1,4     5   10:30       T            616
 2,4     5   10:40       T            612
 3,4     5   10:50       T            615
 4,4     5   11:00       T            617
 1,4     6   11:10       T            615
 2,4     6   11:20       T            617
 3,4     6   11:30       T            616
 4,4     6   11:40       T            619
             11:45   PGM DISABLED
             16:05   PGM ENABLED
 1,4     7   16:10       T            527
             16:11   PGM DISABLED
             17:20   PGM ENABLED
 2,4     7   17:30       T            523
             17:35   PGM DISABLED
             17:45   PGM ENABLED
 3,4     7   17:50       T            523
             17:55   PGM DISABLED
             18:00   PGM ENABLED
 4,4     7   18:05       T            534
             18:06   PGM DISABLED
             18:10   PGM ENABLED
             18:15   PGM DISABLED
             18:25   PGM ENABLED
 1,3     8   18:30       T            535
             18:35   PGM DISABLED
             18:40   PGM ENABLED
 2,3     8   18:45       T            537
             18:46   PGM DISABLED
             19:00   PGM ENABLED
             19:05   PGM DISABLED
------------ WE 22-MAY-24 ------------
             04:15   PGM ENABLED
 3,3     8   04:20       T            523
             04:21   PGM DISABLED
             04:35   PGM ENABLED
             04:40   PGM DISABLED
             05:00   PGM ENABLED
             05:05   PGM DISABLED


  SOURCE T  ==> TIME
--------------------------------------
```

FIELD REPORT

Project: Thea Foss/Wheeler-Osgood Waterways & NPDES Stormwater Monitoring Program

Event: Storm Event – June 2, 2024

INTRODUCTION

This report summarizes the storm event sampled on 6/2-3/2024 by the City of Tacoma Environmental Services Collection System Support staff as part of our stormwater monitoring program. This report includes a summary of the following:

- Storm characteristics and criteria;
- Sampling activities;
- Flow characteristics at each sampling location;
- Pacing – set for a 1.45" event, actual event was 0.92"

This event met the sampling criteria for precipitation as specified in the Thea Foss Sampling and Analysis Plan (SAP).

DESCRIPTION OF SAMPLING ACTIVITES

Samplers placed in the field on 5/31/2024. During sampler installation the weather conditions were overcast. All samplers were retrieved on 6/3/2024 (For site specific details, see Appendix A for field notes, Chain of Custody (COC) forms, and event hydrographs).

The following unusual observations were noted during the sampling event:

Table 2: Composite Sampling Activities

Sample Location	Site Deployed	Sample Accepted	Pacing (gal)	Enables LVL(ft), VEL(fps) COND.(mS/cm)	Comments
Outfall 230A	Yes	No	252,000	LVL > 0.4	9 Aliquots Collected / 0 Composited
Outfall 235	Yes	Yes	98,000	LVL > 0.37 VEL > 0.8	41 Aliquots Collected / 41 Composited
Outfall 237ANew	Yes	No	1,400,000	LVL > 0.55 VEL > 6.0	9 Aliquots Collected / 0 Composited
Outfall 237B	Yes	No	1,5000,000	LVL > 0.6	8 Aliquots Collected / 0 Composited
Outfall 243	Yes	Yes	20 min.	< 3.0 mS/cm	17 Aliquots Collected / 16 Composited
Outfall 245	Yes	Yes	10 min.	> 200 gpm	42 Aliquots Collected / 42 Composited
Outfall 254	Yes	No	10 min.	< 15.0 mS/cm	0 Aliquots Collected / 0 Composited
222	Yes	Yes	N/A	N/A	41 Aliquots Collected / 41 Composited

**QC, QUALITY CONTROL*

ND, NO DATA

NA, NOT APPLICABLE

WATER QUALITY DATA

Accepted samples were analyzed for the target parameters specified in the SAP and QAPP. Samples accepted at all Outfalls were composited and preserved within 24 hours of the last aliquot being collected. The samples were allowed to sit for a minimum of 18 hours before metals analysis was started.

EQUIPMENT INFORMATION

Samples were collected using ISCO 6712 portable auto samplers. Rain data was collected using an ISCO 674 rain gauge located at the Center for Urban Waters at 326 East D Street, Tacoma, WA 98421.

CORRECTIVE ACTIONS AND DEVIATIONS

There were no deviations from the field procedures as discussed in the SAP other than those discussed above/below. No other criteria or procedures as indicated in the SAP were compromised except for those discussed above/below.

Enclosures: The ISCO program setting/sampling results report, the sample collection chain of custody form, and field records are in Appendix A for each outfall. This includes the following information for the samples collected:

- Plot of flow hydrograph and hyetograph
- Subsample times and conductivities
- Tidal windows
- Field activities

Appendix A

Storm Deployment 5/20/24 .42"

245 @ 13:47 - Download - Battery Check - Jars/Ice
243 @ 14:00 - Download - Battery Check - Jars/Ice
237A @ 14:09 - Download - Battery Check - Jars/Ice - 353,000
237B @ 14:19 - Download - Battery Check - Jars/Ice - 407,000
235 @ 14:28 - Download - Battery Check - Jars/Ice - 27,000
230A @ 14:38 - Download - Battery Check - Jars/Ice - 72,000

Grabs 5/21/24
~~254~~ @
245 @
243 @
237A @
237B @
235 @
230A @

Storm Collection - 5/22/24
245 - @ 9:28 - 8/12 - Download
243 - @ 9:34 - 2/12 - Download
237A - @ 9:41 - 1/12 - Download
237B - @ 9:48 - 3 1/2/12 - Download
235 @ 9:51 - 5 3/4/12 - Download
230A @ 9:59 - 3/12 - Download

Storm Deployment - 5/31/24 1.45"

254 @ 14:22 - Download - Battery Replaced - Jars/Ice
245 @ 14:40 - Download - Battery Check - Jars/Ice
243 @ 14:51 - Download - Battery Check - Jars/Ice
237A @ 15:01 - Download - Battery Check - Jars/Ice - 1,400,000
237B @ 15:21 - Download - Battery Check - Jars/Ice - 1,500,000
235 @ 15:26 - Download - Battery Change - Jars/Ice - 98,000
230A @ 15:35 - Download - Battery Change - Jars/Ice 252,000

Continued on Page

PROJECT ____________

Notebook No. ____________

Continued from Page ________

Storm Collection - 6/3/24

- 254 @ 10:41 - $0/12$ - Sonde issue
- 245 @ 10:49 - $10\frac{1}{2}/12$ -
- 243 @ 10:56 - $4\frac{1}{4}/12$ -
- 237A @ 11:00 - $2\frac{1}{4}/12$
- 237B @ 11:10 - $2/12$
- 235 @ 11:15 - $10\frac{1}{4}/12$
- 230A @ 11:30 - $2\frac{1}{4}/12$

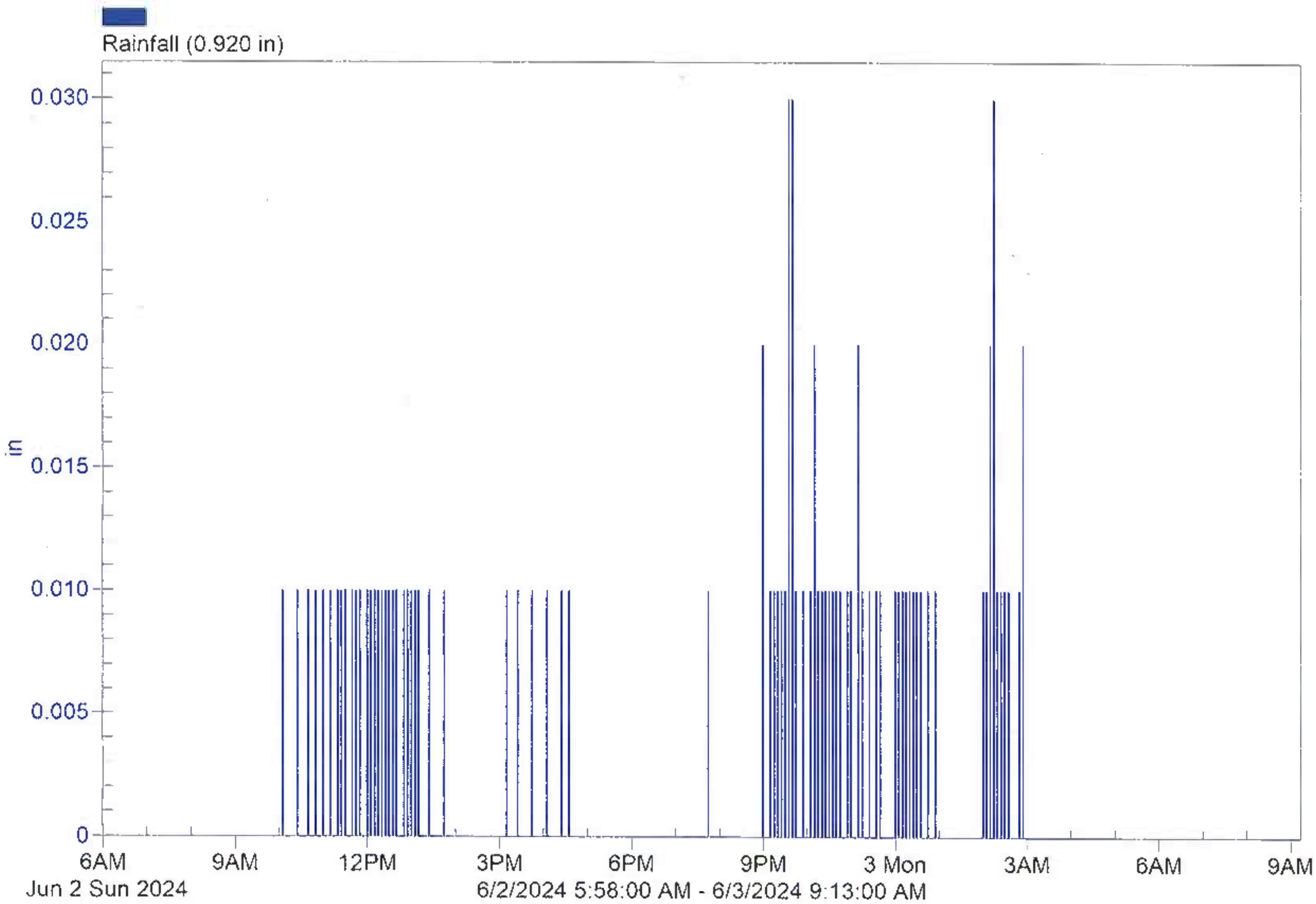
Continued on Page

Read and Understood By

Signed	Date	Signed	Date

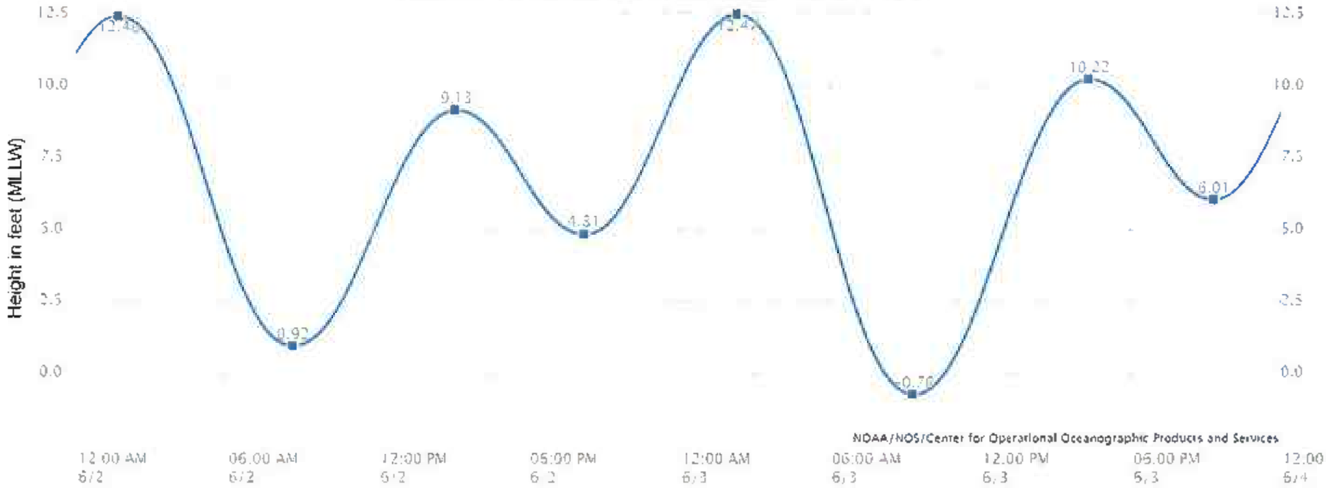
RF1

Flowlink 5



Help Print

NOAA/NOS/CO-OPS
Tide Predictions at 9446484, Tacoma WA
From 2024/06/02 12:00 AM LST/LDT to 2024/06/03 11:59 PM LST/LDT



Note: The interval is High/Low, the solid blue line depicts a curve fit between the high and low values and approximates the segments between.
Disclaimer: These data are based upon the latest information available as of the date of your request, and may differ from the published tide tables.

High/Low Tide Prediction Data Listing

Station Name: Tacoma, WA
Action: Daily
Product: Tide Predictions
Start Date & Time: 2024/6/2 12:00 AM
End Date & Time: 2024/6/3 11:59 PM

Source: NOAA/NOS/CO-OPS
Prediction Type: Harmonic
Datum: MLLW
Height Units: Feet
Time Zone: LST/LDT

Date	Day	Time	Hgt	Time	Hgt	Time	Hgt	Time	Hgt
2024/06/02	Sun	01:40 AM	12.40 H	08:39 AM	0.92 L	3:06 PM	9.13 H	8:16 PM	4.81 L
2024/06/03	Mon	02:17 AM	12.47 H	09:22 AM	-0.76 L	4:20 PM	10.22 H	9:21 PM	6.01 L

2403015-01[redacted]

Bottle Certification

Bottle Certification

*** DEFAULT CONTAINER ***

NPDES Storm
Chain of Custody

2404027-01[redacted]

Bottle Certification

Bottle Certification

*** DEFAULT CONTAINER ***

Outfall: 235 Date/Time sampler installed: 5/31/24 @ 15:26

Jar Cert #________ Sampling Crew: CA, SG

Filter lot # 1383998 Weather conditions: Clar Date/Time sampler pickup: 6/3/24 @ 11:15

Observed activities in area: N/A

Observations during sampler collection: N/A

Color, Odors, sheens: N/A

Type of Sample: ☑ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☑ >0.2 inches rain ☐ <0.02 inches of rain previous 24 hours

Samplers: ☑ Data downloaded ☐ Sample bottles marked

☑ Ice Present at pick-up ☐ Tubing Decon 1000mL Divater

☑ Caps on containers

Fill to...	Parameters:	Sample	QC
Neck	PAH's/Phthalates (1L) +	☑	☑ ☑
No head	[1]Total Mercury (125/250mL QC)	☑	☐
No head	[1]Diss Mercury (125/250mL QC)	☑	☐
Shoulder	Total Metals (250mL)	☑	
Shoulder	Diss Metals (125mL)	☑	
Shoulder	TSS (1L), (500 mL min)	☑	
Shoulder	Nutrients (250mL)	☑	
Shoulder	Ortho-P (125mL), (75min)	☑	
Shoulder	BOD (1L)	☑	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☑	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes 4.010 L config above

+1000 mL for QC per bottle, must submit 2 extra bottles

[1]If 250ml bottle used, thenQAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (µS)
1	1000	☑	109.8
2		☑	55.7
3		☑	51.2
4		☑	100.1
5		☑	82.5
6		☑	92.3
7		☑	74.0
8		☑	38.2
9		☑	37.0
10		☑	106.7
11	250	☑	205.0
12		☐	

Total aliquots: 41

Sample Prep

Date/Time: 6/3/24 @ 12:30

Initial: CA, SG, KG

pH: 7.32

COND (µS): 74.7

Lab #: ←

Aliquots composited: 2406007-02 41

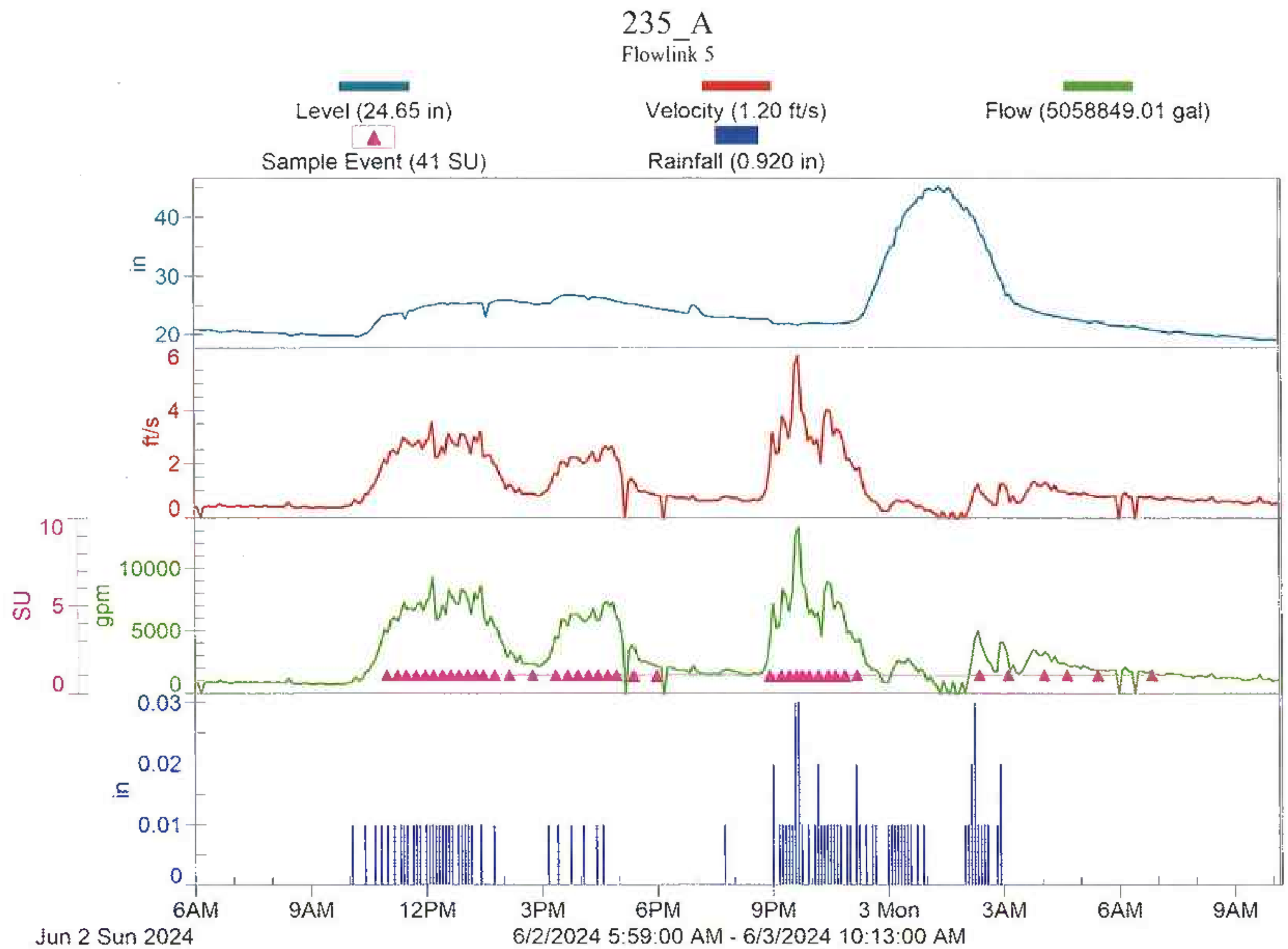
Deviations :

Composite End Time: 6/3/24 @ 8:52
(Collect Time) Last aliquot in composite

Relinquished by: [signature] Received by: [signature]

Date/Time: 6/3/24 @ 12:50 Date/Time: 6/3/24 @ 12:50

14.1°C corrected



235_A
Flowlink 5
Level (24.65 in)
Velocity (1.20 ft/s)
Flow (5058849.01 gal)
Sample Event (41 SU)
Rainfall (0.920 in)
in
40
30
20
ft/s
6
4
2
0
SU
10
5
0
gpm
10000
5000
0
in
0.03
0.02
0.01
0
6AM
9AM
12PM
3PM
6PM
9PM
3 Mon
3AM
6AM
9AM
Jun 2 Sun 2024
6/2/2024 5:59:00 AM - 6/3/2024 10:13:00 AM

```
SAMPLER ID# 1242995716  10:14  3-JUN-24
  Hardware:     A1  Software: 2.33
*********** PROGRAM SETTINGS ***********
     ----------
   PROGRAM NAME:
    "235A      "
  SITE DESCRIPTION:
    "235A ST   "
     ----------
   UNITS SELECTED:
     LENGTH: ft


     ----------
   UNITS SELECTED:
   FLOW RATE: Mgd
  FLOW VOLUME: gal
   VELOCITY: fps
     ----------
  AREA-VEL MODULE:
   AREA*VELOCITY
     ROUND PIPE

     ----------

      5 MINUTE
   DATA INTERVAL

     ----------
  12,  1000 ml BTLS
 56 ft SUCTION LINE
 AUTO SUCTION HEAD
1 RINSES, 1 RETRIES
     ----------

  ONE-PART PROGRAM


     ----------
      PACING:
    FLOW, EVERY
     98000 gal
NO SAMPLE AT START
     ----------
    DISTRIBUTION:
   4 SAMPLES/BOTTLE


     ----------
```

VOLUME:

250 ml SAMPLES

ENABLE:
LEVEL >0.370 ft
AND
VEL > 0.80 fps

ENABLE:
REPEATABLE ENABLE
NO SAMPLE AT DISABLE
NO SAMPLE AT ENABLE

ENABLE:
COUNTDOWN IS STOPPED
WHILE DISABLED

ENABLE:
0 PAUSE & RESUMES

NO DELAY TO START

200 HOURS RUN TIME

LIQUID DETECT ON

QUICK VIEW/CHANGE

TAKE MEASUREMENTS
AT STORAGE INTERVAL

DUAL SAMPLER OFF
BTL FULL DETECT OFF
TIMED BACKLIGHT

EVENT MARK SENT

DURING PUMP CYCLE

PUMP COUNTS FOR
EACH PURGE CYCLE:
100 PRE-SAMPLE
AUTO POST-SAMPLE

NO PERIODIC
SERIAL OUTPUT

INTERROGATOR
CONNECTOR
POWER ALWAYS ON

NO RAIN GAUGE

NO SDI-12 SONDE

AUTO SDI-12 SCAN OFF

I/O1= NONE
I/O2= NONE
I/O3= NONE

----

0 ANALOG OUTPUTS

NO EXTERNAL MODEM

NO ALARM
CONDITIONS SET

```
     ----------
     ----------
----------------------------------------


SAMPLER ID# 1242995716  10:14  3-JUN-24
  Hardware:     A1  Software: 2.33
*********** SAMPLING RESULTS ***********
   SITE: 235A ST
PROGRAM: 235A
Program Started at 14:29 FR 31-MAY-24
Nominal Sample Volume =  250 ml
                                   COUNT
                                      TO
SAMPLE  BOTTLE TIME  SOURCE ERROR LIQUID
------- ------ ----         -- --  ------
              14:29  PGM DISABLED
------------- SU 02-JUN-24 -------------
              10:25  PGM ENABLED
  1,4     1   10:58       F          1891
  2,4     1   11:16       F          1905
  3,4     1   11:30       F          1919
  4,4     1   11:45       F          1922
  1,4     2   11:59       F          1927
  2,4     2   12:11       F          1919
  3,4     2   12:26       F          1925
  4,4     2   12:39       F          1925
  1,4     3   12:52       F          1923
  2,4     3   13:05       F          1933
  3,4     3   13:18       F          1925
  4,4     3   13:30       F          1931
  1,4     4   13:47       F          1943
  2,4     4   14:10       F          1933
  3,4     4   14:46       F          1934
  4,4     4   15:22       F          1906
  1,4     5   15:40       F          1921
  2,4     5   15:57       F          1917
  3,4     5   16:13       F          1923
  4,4     5   16:28       F          1939
  1,4     6   16:43       F          1924
  2,4     6   16:57       F          1928
  3,4     6   17:23       F          1931
  4,4     6   17:59       F          1925
              18:30  PGM DISABLED
              18:55  PGM ENABLED
              19:00  PGM DISABLED
              19:50  PGM ENABLED
              19:55  PGM DISABLED
```

```
              20:45  PGM ENABLED
 1,4     7    20:55      F          1896
 2,4     7    21:13      F          1887
 3,4     7    21:26      F          1899
 4,4     7    21:37      F          1904
 1,4     8    21:45      F          2640
 2,4     8    21:56      F          2063
 3,4     8    22:11      F          1925
 4,4     8    22:26      F          1969
 1,4     9    22:38      F          1941
 2,4     9    22:52      F          1919
 3,4     9    23:12      F          1885
              23:30  PGM DISABLED
------------- MO 03-JUN-24 -------------
              02:15  PGM ENABLED
 4,4     9    02:23      F          1801
              02:35  PGM DISABLED
              02:55  PGM ENABLED
 1,4    10    03:08      F          1835
              03:11  PGM DISABLED
              03:15  PGM ENABLED
              03:20  PGM DISABLED
              03:35  PGM ENABLED
 2,4    10    04:04      F          1877
 3,4    10    04:40      F          1891
 4,4    10    05:28      F          1883
              06:20  PGM DISABLED
              06:35  PGM ENABLED
              06:40  PGM DISABLED
              06:50  PGM ENABLED
 1,1    11    06:52      F          1875
              06:55  PGM DISABLED
              09:40  PGM ENABLED
              09:45  PGM DISABLED
              10:12  MANUAL PAUSE
              10:12  PGM STOPPED 03-JUN


  SOURCE F  ==> FLOW
----------------------------------------
```

NPDES Storm
Chain of Custody

Jar Cert # ______ Outfall: 243 Date/Time sampler installed: 5/31/24 @ 14:51

Jar Cert # ______ Sampling Crew: CA, SG

Filter lot # 1383988 Weather conditions: Clear Date/Time sampler pickup: 6/3/24 @ 10:56

Observed activities in area: N/A

Observations during sampler collection: N/A

Color, Odors, sheens: N/A

Type of Sample: ☑ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☑ >0.2 inches rain ☐ <0.02 inches of rain previous 24 hours

Samplers: ☑ Data downloaded ☐ Sample bottles marked

☑ Ice Present at pick-up ☐ Tubing Decon 1000mL DIwater

☑ Caps on containers

Fill to...	Parameters:	Sample	QC
Neck	PAH's/Phthalates (1L) +	☑	☐ ☐
No head	[1]Total Mercury (125/250mL QC)	☑	☐
No head	[1]Diss Mercury (125/250mL QC)	☑	☐
Shoulder	Total Metals (250mL)	☑	
Shoulder	Diss Metals (125mL)	☑	
Shoulder	TSS (1L), (500 mL min)	☑	
Shoulder	Nutrients (250mL)	☑	
Shoulder	Ortho-P (125mL), (75min)	☑	
Shoulder	BOD (1L)	☑	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☐	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes 4.010 L config above
+1000 mL for QC per bottle, must submit 2 extra bottles
[1]If 250ml bottle used, thenQAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (µS)
1	1000	☑	2637
2		☑	3780
3		☑	1748
4		☑	1623
5	250	☐	1527
6		☐	
7		☐	
8		☐	
9		☐	
10		☐	
11		☐	
12		☐	

Total aliquots: ~~16~~ 17 RG

Sample Prep

Date/Time: 6/3/24 @ 12:15

Initial: CA, SG, RG

pH: 7.9

COND (µS): 2346

Lab #: ~~24~~ CA 2406007-05

Aliquots composited: 16

Deviations: Bottle #5 outside of storm

Composite End Time: 6/3/24 @ 9:15
(Collect Time) Last aliquot in composite

Relinquished by: [signature]

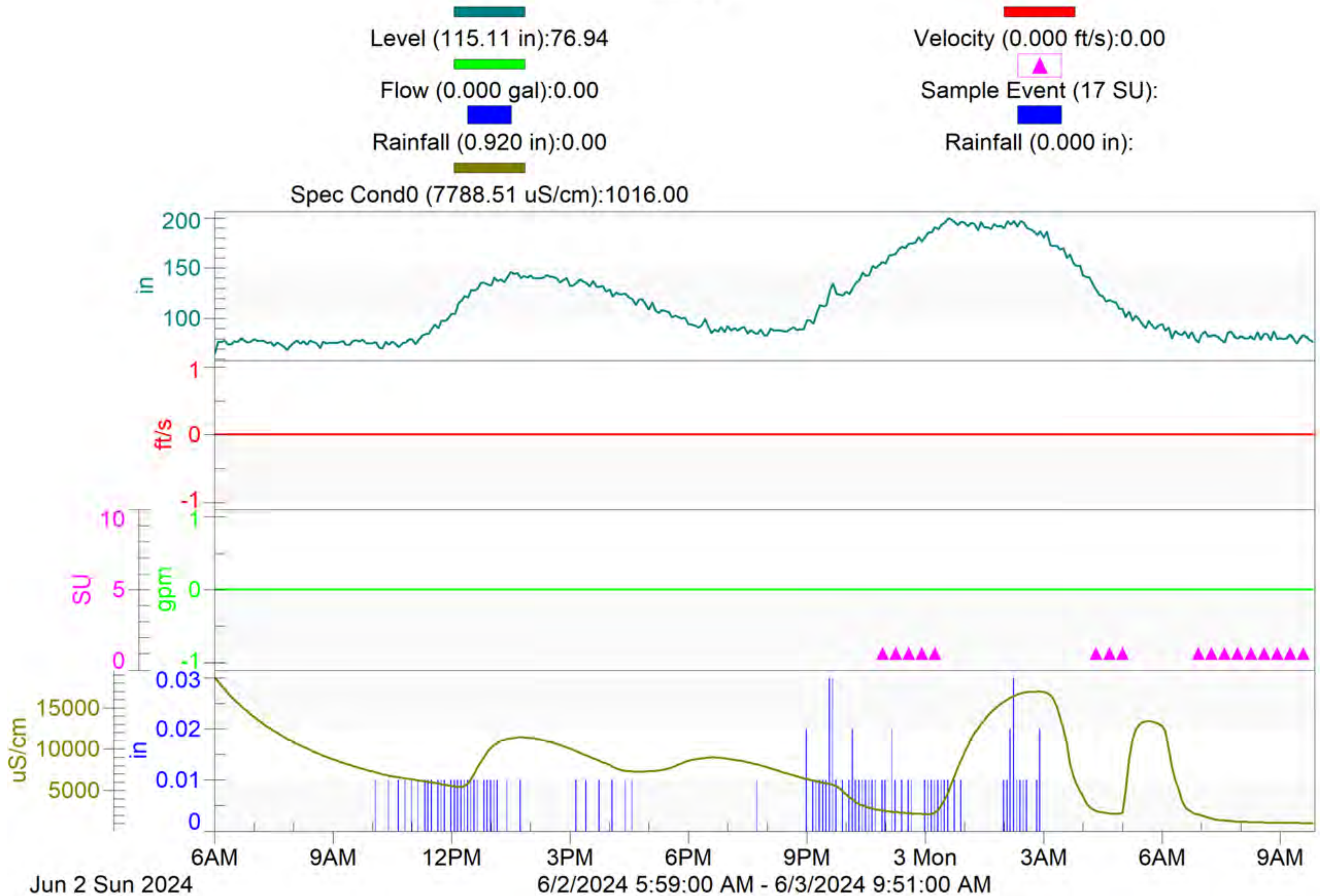
Date/Time: 6/3/24 @ 12:50

Received by: [signature]

Date/Time: 6/3/24 @ 12:50

243

Flowlink 5



SAMPLER ID# 1242893352 09:54 3-JUN-24
Hardware: A1 Software: 2.33
*********** PROGRAM SETTINGS ***********

PROGRAM NAME:
"STORM 1   "
SITE DESCRIPTION:
" 243   "

UNITS SELECTED:
LENGTH: ft
CONDUCTIVITY: mS/cm
TEMPERATURE: F

UNITS SELECTED:
FLOW RATE: gpm
FLOW VOLUME: Mgal
VELOCITY: fps

AREA-VEL MODULE:
AREA*VELOCITY
ROUND PIPE

----

5 MINUTE
DATA INTERVAL

12, 1000 ml BTLS
17 ft SUCTION LINE
AUTO SUCTION HEAD
1 RINSES, 1 RETRIES

ONE-PART PROGRAM

PACING:
TIME, EVERY
0 HOURS, 20 MINUTES

DISTRIBUTION:
4 SAMPLES/BOTTLE

VOLUME:

250 ml SAMPLES

ENABLE:

SP_CO0 <3.000 mS/cm

ENABLE:

REPEATABLE ENABLE

NO SAMPLE AT DISABLE

NO SAMPLE AT ENABLE

ENABLE:

COUNTDOWN IS STOPPED

WHILE DISABLED

ENABLE:

0 PAUSE & RESUMES

NO DELAY TO START

LIQUID DETECT ON

QUICK VIEW/CHANGE

TAKE MEASUREMENTS

AT STORAGE INTERVAL

DUAL SAMPLER OFF

BTL FULL DETECT OFF

TIMED BACKLIGHT

EVENT MARK SENT

DURING PUMP CYCLE

PUMP COUNTS FOR
EACH PURGE CYCLE:
200 PRE-SAMPLE
AUTO POST-SAMPLE

NO PERIODIC
SERIAL OUTPUT

INTERROGATOR
CONNECTOR
POWER ALWAYS ON

NO RAIN GAUGE

SDI-12 DATA:
01DATA0 02DATA0
TEMP0 SP_CO0 05DATA0

I/O1= NONE
I/O2= NONE
I/O3= NONE

----

0 ANALOG OUTPUTS

NO EXTERNAL MODEM

NO ALARM
CONDITIONS SET

SAMPLER ID# 1242893352 09:55 3-JUN-24
Hardware: A1 Software: 2.33
*********** SAMPLING RESULTS ***********
SITE: 243
PROGRAM: STORM 1
Program Started at 13:53 FR 31-MAY-24
Nominal Sample Volume = 250 ml

SAMPLE	BOTTLE	TIME	SOURCE	ERROR	COUNT TO LIQUID
		13:53	PGM DISABLED		
-------------		SU 02-JUN-24	-------------		
		22:35	PGM ENABLED		
1,4	1	22:55	T		423
2,4	1	23:15	T		420
3,4	1	23:35	T		417
4,4	1	23:55	T		417
-------------		MO 03-JUN-24	-------------		
1,4	2	00:15	T		416
		00:25	PGM DISABLED		
		04:10	PGM ENABLED		
2,4	2	04:20	T		430
3,4	2	04:40	T		434
4,4	2	05:00	T		440
		05:05	PGM DISABLED		
		06:40	PGM ENABLED		
1,4	3	06:55	T		441
2,4	3	07:15	T		446
3,4	3	07:35	T		446
4,4	3	07:55	T		447
1,4	4	08:15	T		448
2,4	4	08:35	T		447
3,4	4	08:55	T		452
4,4	4	09:15	T		450
1,1	5	09:35	T		447

SOURCE T ==> TIME

2403015-01[redacted]

Bottle Certification

Bottle Certification

*** DEFAULT CONTAINER ***

NPDES Storm
Chain of Custody

Outfall: 245

Date/Time sampler installed: 5/31/24 @ 14:40

Jar Cert # ________

Sampling Crew: CA, SG

Filter lot # 1383988

Weather conditions: Clear

Date/Time sampler pickup: 6/3/24 @ 10:49

Observed activities in area: N/A

Observations during sampler collection: N/A

Color, Odors, sheens: N/A

Type of Sample: ☑ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☑ >0.2 inches rain ☐ <0.02 inches of rain previus 24 hours

Samplers: ☑ Data downloaded ☐ Sample bottles marked

☑ Ice Present at pick up ☐ Tubing Decon 1000mL Diwater

☑ Caps on containers

Fill to...	Parameters:	Sample	QC
Neck	PAH's/Phthalates (1L) +	☑	☐ ☐
No head	[1]Total Mercury (125/250mL QC)	☑	☑
No head	[1]Diss Mercury (125/250mL QC)	☑	☑
Shoulder	Total Metals (250mL)	☑	
Shoulder	Diss Metals (125mL)	☑	
Shoulder	TSS (1L), (500 mL min)	☑	
Shoulder	Nutrients (250mL)	☑	
Shoulder	Ortho-P (125mL), (75min)	☑	
Shoulder	BOD (1L)	☑	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☑	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes 4.010 L config above

+1000 mL for QC per bottle, must submit 2 extra bottles

[1]If 250ml bottle used, thenQAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (µS)
1	1000	☑	679
2		☑	83.5
3		☑	132.9
4		☑	168.4
5		☑	50.8
6		☑	42.1
7		☑	36.6
8		☑	38.5
9		☑	29.9
10		☑	112.4
11	~~250~~ 500	☑	422
12		☐	

Total aliquots: ~~41~~ 42

Sample Prep

Date/Time: 6/3/24 @ 12:04

Initial: CA, SG, RG

pH: 7.05

COND (µS): 149.4

Lab #: 2406007-06

Aliquots composited: ~~40~~ ~~41~~ 42

Deviations :

Composite End Time: 6/3/24 @ 5:55

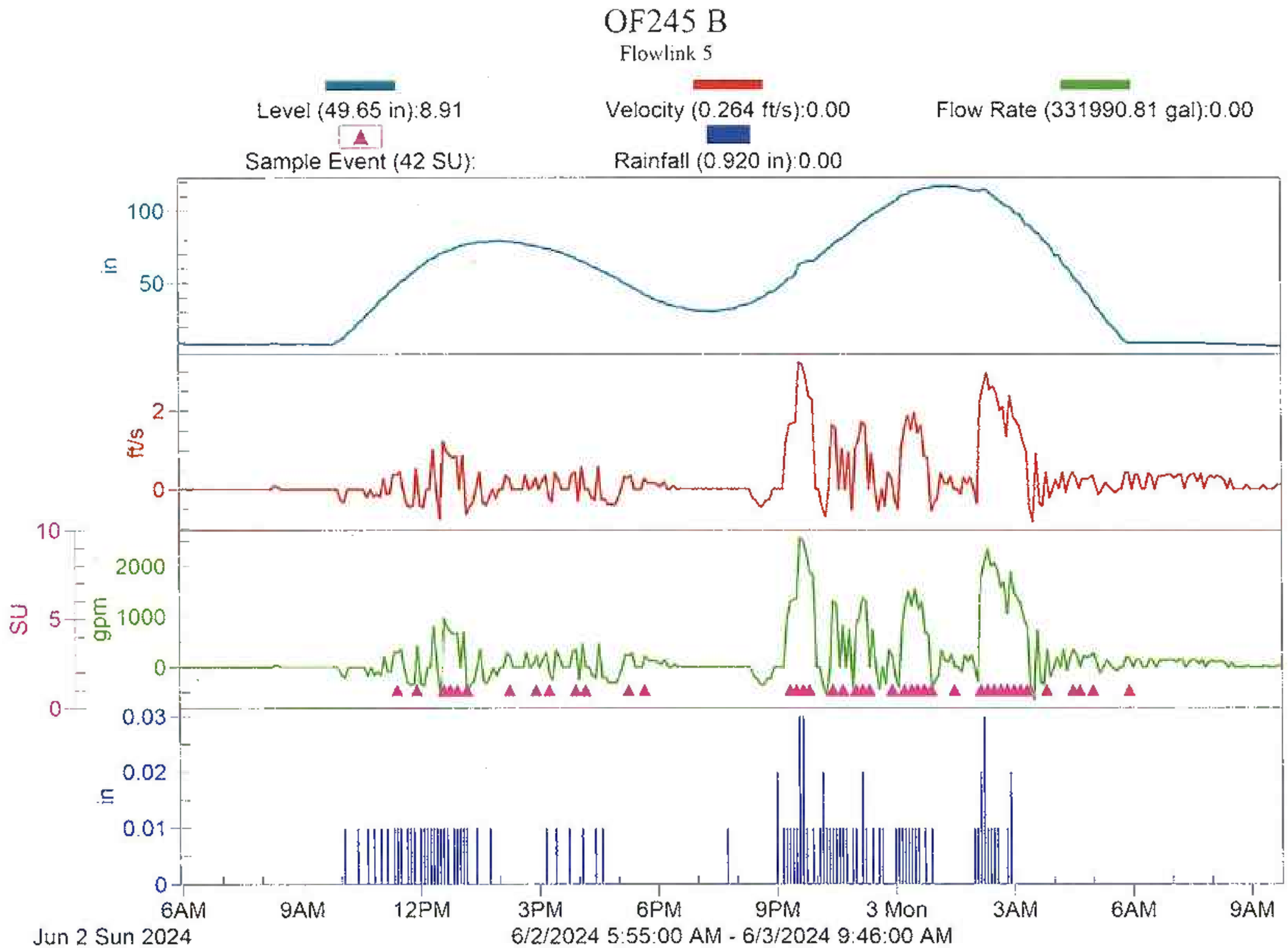
(Collect Time) Last aliquot in composite

Relinquished by:

Date/Time: 6/3/24 @ 12:50

Received by:

Date/Time: 6/3/24 @ 12:50



OF245 B
Flowlink 5
Level (49.65 in):8.91
Velocity (0.264 ft/s):0.00
Flow Rate (331990.81 gal):0.00
Sample Event (42 SU):
Rainfall (0.920 in):0.00
in
100
50
ft/s
2
0
SU
10
5
0
gpm
2000
1000
0
in
0.03
0.02
0.01
0
6AM
9AM
12PM
3PM
6PM
9PM
3 Mon
3AM
6AM
9AM
Jun 2 Sun 2024
6/2/2024 5:55:00 AM - 6/3/2024 9:46:00 AM

```
SAMPLER ID# 1284476967  09:48  3-JUN-24
  Hardware:     A1  Software: 2.33
*********** PROGRAM SETTINGS ***********
     ----------
   PROGRAM NAME:
    "STORM     "
 SITE DESCRIPTION:
    "OF245 B   "
     ----------
   UNITS SELECTED:
     LENGTH: ft


     ----------
   UNITS SELECTED:
   FLOW RATE: gpm
  FLOW VOLUME: gal
   VELOCITY: fps
     ----------
  AREA-VEL MODULE:
   AREA*VELOCITY
     ROUND PIPE

     ----------

      5 MINUTE
   DATA INTERVAL

     ----------
  12,  1000 ml BTLS
 21 ft SUCTION LINE
 AUTO SUCTION HEAD
1 RINSES, 1 RETRIES
     ----------

  ONE-PART PROGRAM


     ----------
      PACING:
    TIME, EVERY
 0 HOURS, 10 MINUTES

     ----------
    DISTRIBUTION:
   4 SAMPLES/BOTTLE


     ----------
```

VOLUME:

250 ml SAMPLES

ENABLE:

FLOW >200.0 gpm

ENABLE:
REPEATABLE ENABLE
NO SAMPLE AT DISABLE
NO SAMPLE AT ENABLE

ENABLE:
COUNTDOWN IS STOPPED
WHILE DISABLED

ENABLE:
0 PAUSE & RESUMES

NO DELAY TO START

LIQUID DETECT ON

QUICK VIEW/CHANGE

TAKE MEASUREMENTS
EVERY 5 MINUTES

DUAL SAMPLER OFF
BTL FULL DETECT OFF
TIMED BACKLIGHT

PULSED EVENT MARK

AT INITIAL PURGE

PUMP COUNTS FOR
EACH PURGE CYCLE:
200 PRE-SAMPLE
AUTO POST-SAMPLE

NO PERIODIC
SERIAL OUTPUT

INTERROGATOR
CONNECTOR
POWER ALWAYS ON

NO RAIN GAUGE

NO SDI-12 SONDE

AUTO SDI-12 SCAN OFF

I/O1= NONE
I/O2= NONE
I/O3= NONE

----

0 ANALOG OUTPUTS

NO EXTERNAL MODEM

NO ALARM
CONDITIONS SET

SAMPLER ID# 1284476967 09:49 3-JUN-24
Hardware: A1 Software: 2.33
*********** SAMPLING RESULTS ***********
SITE: OF245 B
PROGRAM: STORM
Program Started at 13:45 FR 31-MAY-24
Nominal Sample Volume = 250 ml

SAMPLE	BOTTLE	TIME	SOURCE	ERROR	COUNT TO LIQUID
		13:45	PGM DISABLED		
SU 02-JUN-24					
		11:05	PGM ENABLED		
		11:10	PGM DISABLED		
		11:20	PGM ENABLED		
1,4	1	11:25	T		565
		11:35	PGM DISABLED		
		11:55	PGM ENABLED		
2,4	1	11:55	T		553
		12:00	PGM DISABLED		
		12:20	PGM ENABLED		
		12:25	PGM DISABLED		
		12:35	PGM ENABLED		
3,4	1	12:35	T		541
4,4	1	12:45	T		546
1,4	2	12:55	T		540
		13:00	PGM DISABLED		
		13:05	PGM ENABLED		
2,4	2	13:10	T		544
		13:11	PGM DISABLED		
		13:30	PGM ENABLED		
		13:35	PGM DISABLED		
		14:10	PGM ENABLED		
3,4	2	14:15	T		537
		14:20	PGM DISABLED		
		14:40	PGM ENABLED		
		14:45	PGM DISABLED		
		14:55	PGM ENABLED		
4,4	2	14:55	T		543
		15:00	PGM DISABLED		
		15:10	PGM ENABLED		
1,4	3	15:15	T		546

		15:16	PGM DISABLED	
		15:25	PGM ENABLED	
		15:30	PGM DISABLED	
		15:50	PGM ENABLED	
2,4	3	15:55	T	545
		16:00	PGM DISABLED	
		16:05	PGM ENABLED	
3,4	3	16:10	T	552
		16:11	PGM DISABLED	
		16:30	PGM ENABLED	
		16:35	PGM DISABLED	
		17:10	PGM ENABLED	
4,4	3	17:15	T	565
		17:25	PGM DISABLED	
		17:40	PGM ENABLED	
1,4	4	17:40	T	573
		17:45	PGM DISABLED	
		21:15	PGM ENABLED	
2,4	4	21:20	T	552
3,4	4	21:30	T	556
4,4	4	21:40	T	549
1,4	5	21:50	T	547
		22:00	PGM DISABLED	
		22:25	PGM ENABLED	
2,4	5	22:25	T	535
		22:35	PGM DISABLED	
		22:40	PGM ENABLED	
3,4	5	22:40	T	533
		22:45	PGM DISABLED	
		22:50	PGM ENABLED	
		22:55	PGM DISABLED	
		23:00	PGM ENABLED	
4,4	5	23:00	T	528
1,4	6	23:10	T	527
2,4	6	23:20	T	523
		23:21	PGM DISABLED	
		23:25	PGM ENABLED	
		23:30	PGM DISABLED	
		23:50	PGM ENABLED	
3,4	6	23:55	T	513
-------------		MO 03-JUN-24	-------------	
		00:00	PGM DISABLED	
		00:10	PGM ENABLED	
4,4	6	00:14	T	511
1,4	7	00:24	T	511
2,4	7	00:34	T	511
3,4	7	00:44	T	511
4,4	7	00:54	T	511
		00:56	PGM DISABLED	

		01:10	PGM ENABLED	
		01:15	PGM DISABLED	
		01:25	PGM ENABLED	
1,4	8	01:30	T	505
		01:31	PGM DISABLED	
		01:45	PGM ENABLED	
		01:50	PGM DISABLED	
		01:55	PGM ENABLED	
		02:00	PGM DISABLED	
		02:10	PGM ENABLED	
2,4	8	02:10	T	510
3,4	8	02:20	T	509
4,4	8	02:30	T	511
1,4	9	02:40	T	520
2,4	9	02:50	T	522
3,4	9	03:00	T	521
4,4	9	03:10	T	525
1,4	10	03:20	T	529
		03:25	PGM DISABLED	
		03:35	PGM ENABLED	
		03:40	PGM DISABLED	
		03:50	PGM ENABLED	
2,4	10	03:50	T	539
		03:55	PGM DISABLED	
		04:15	PGM ENABLED	
		04:20	PGM DISABLED	
		04:30	PGM ENABLED	
3,4	10	04:30	T	555
4,4	10	04:40	T	566
		04:41	PGM DISABLED	
		04:45	PGM ENABLED	
		04:50	PGM DISABLED	
		04:55	PGM ENABLED	
1,2	11	05:00	T	578
		05:05	PGM DISABLED	
		05:50	PGM ENABLED	
2,2	11	05:55	T	610
		05:56	PGM DISABLED	

SOURCE T ==> TIME

NPDES Storm
Chain of Custody

Jar Cert #______ Outfall: 222 Date/Time sampler installed: 5/31/24 @ 14:40

Jar Cert #______ Sampling Crew: CA, SG

Filter lot # 1353988 Weather conditions: Clear Date/Time sampler pickup: 6/3/24 @ 10:49

Observed activities in area: N/A

Observations during sampler collection: N/A

Color, Odors, sheens: N/A

Type of Sample: ☑ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☑ >0.2 inches rain ☐ <0.02 inches of rain previus 24 hours

Samplers: ☑ Data downloaded ☐ Sample bottles marked
☑ Ice Present at pick up ☐ Tubing Decon 1000mL Diwater
☑ Caps on containers

Fill to...	Parameters:	Sample	QC
Neck	PAH's/Phthalates (1L) +	☑	☐ ☐
No head	[1]Total Mercury (125/250mL QC)	☑	☐
No head	[1]Diss Mercury (125/250mL QC)	☑	☐
Shoulder	Total Metals (250mL)	☑	
Shoulder	Diss Metals (125mL)	☑	
Shoulder	TSS (1L), (500 mL min)	☑	
Shoulder	Nutrients (250mL)	☑	
Shoulder	Ortho-P (125mL), (75min)	☑	
Shoulder	BOD (1L)	☑	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☑	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes 4.010 L config above
+1000 mL for QC per bottle, must submit 2 extra bottles
[1]If 250ml bottle used, thenQAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (uS)
1	1000	☑	67.9
2		☑	83.5
3		☑	132.9
4		☑	168.4
5		☑	50.9
6		☑	42.1
7		☑	36.6
8		☑	38.5
9		☑	29.9
10		☑	112.9
11	260	☑	422
12		☐	

Total aliquots: 41

Sample Prep
Date/Time: 6/3/24 @ 12:04
Initial: CA, SG, RG
pH: 7.05
COND (µS): 149.4
Lab #: 2406007-08
Aliquots composited: 41

Deviations:

Composite End Time: (Collect Time) 6/3/24 @ 5:55 Last aliquot in composite

Relinquished by: [signature] Received by: [signature]

Date/Time: 6/3/24 @ 12:50 Date/Time: 6/3/24 @ 12:50

FIELD REPORT

Project: Thea Foss/Wheeler-Osgood Waterways & NPDES Stormwater Monitoring Program

Event: Storm Event – August 17, 2024

INTRODUCTION

This report summarizes the storm event sampled on 8/17/2024 by the City of Tacoma Environmental Services Collection System Support staff as part of our stormwater monitoring program. This report includes a summary of the following:

- Storm characteristics and criteria;
- Sampling activities;
- Flow characteristics at each sampling location;
- Pacing – set for a 0.48" event, actual event was 0.27"

This event met the sampling criteria for precipitation as specified in the Thea Foss Sampling and Analysis Plan (SAP).

DESCRIPTION OF SAMPLING ACTIVITES

Samplers placed in the field on 8/16/2024. During sampler installation the weather conditions were overcast. All samplers were retrieved on 8/19/2024 (For site specific details, see Appendix A for field notes, Chain of Custody (COC) forms, and event hydrographs).

The following unusual observations were noted during the sampling event:

Table 2: Composite Sampling Activities

Sample Location	Site Deployed	Sample Accepted	Pacing (gal)	Enables LVL(ft), VEL(fps) COND.(mS/cm)	Comments
Outfall 230A	Yes	No	55,000	LVL > 0.4	1 Aliquots Collected / 0 Composited
Outfall 235	Yes	Yes	20,000	LVL > 0.37 VEL > 0.8	13 Aliquots Collected / 13 Composited
Outfall 237ANew	Yes	No	314,102	LVL > 0.55 VEL > 6.0	0 Aliquots Collected / 0 Composited
Outfall 237B	Yes	No	313,000	LVL > 0.6	6 Aliquots Collected / 0 Composited
Outfall 243	No	No	N/A	N/A	0 Aliquots Collected / 0 Composited
Outfall 245	Yes	No	10 min.	> 200 gpm	9 Aliquots Collected / 0 Composited
Outfall 254	No	No	N/A	N/A	0 Aliquots Collected / 0 Composited
222	No	No	N/A	N/A	0 Aliquots Collected / 0 Composited

**QC, QUALITY CONTROL*

ND, NO DATA

NA, NOT APPLICABLE

WATER QUALITY DATA

Accepted samples were analyzed for the target parameters specified in the SAP and QAPP. Samples accepted at all Outfalls were composited and preserved within 24 hours of the last aliquot being collected. The samples were allowed to sit for a minimum of 18 hours before metals analysis was started.

EQUIPMENT INFORMATION

Samples were collected using ISCO 6712 portable auto samplers. Rain data was collected using an ISCO 674 rain gauge located at the Center for Urban Waters at 326 East D Street, Tacoma, WA 98421.

CORRECTIVE ACTIONS AND DEVIATIONS

The Isco sample report file was not retained for site 235 after the event and is not present in this report. There were no other deviations from the field procedures as discussed in the SAP other than those discussed above/below. No other criteria or procedures as indicated in the SAP were compromised except for those discussed above/below.

Enclosures: The ISCO program setting/sampling results report, the sample collection chain of custody form, and field records are in Appendix A for each outfall. This includes the following information for the samples collected:

- Plot of flow hydrograph and hyetograph
- Subsample times and conductivities
- Tidal windows
- Field activities

Appendix A

PROJECT

8/6/24 - Rinse Blank

235 - 13:00 - Sensor Swap
230A - 14:00

Base flow - Collection 8/8/24

235 @ 10:32 - 12/12 - Download
230A @ 10:40 - 12/12 - Download

BaseFlow Deployment 8/8/24

230A - @ 11:50 enable < 3 cf pacing: 13680 gallons

Base Flow - Collection 8/9/24

230A @ 13:16 - Download

8/16/24 - Storm Deployment - .48

- 245 @ 11:05 - Jars/Ice - Download
- 237A @ 11:18 - Jars/Ice - Download - ~~Sensor Issue~~ CA 314,102 @
- 237B @ 11:28 - Jars/Ice - Download - 313,000
- 235 @ 11:40 - Jars/Ice - Download - Change Basecount - 20,000
- 230A @ 11:50 - Jars/Ice - Download - 55,000

8/19/24 - Storm Collection
- 245 @ 9:22 - Jars/Ice - Download - 2½ Jars
- 237A @ 9:38 - 0/12 - Download
- 237B @ 9:45 - ½/12 - Download
- 235 @ 9:51 - 3/4/12 - Download
- 230A @ 9:58 - ½/12 - Download

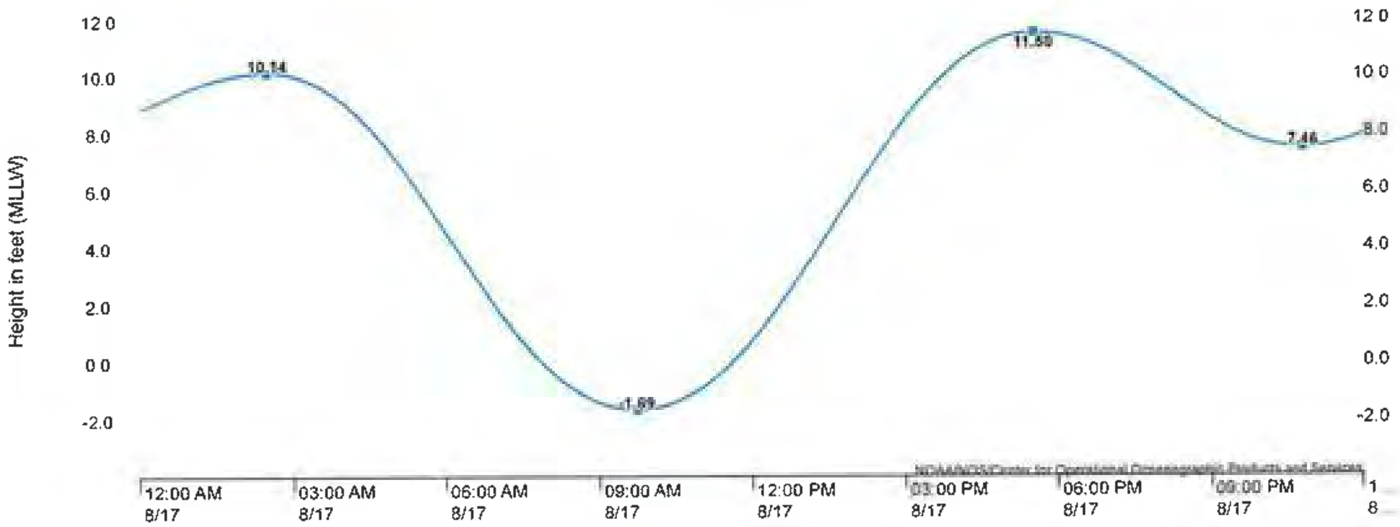
Continued on Page

Read and Understood By

Signed | Date | Signed | Date

Help Print

NOAA/NOS/CO-OPS
Tide Predictions at 9446484, Tacoma WA
From 2024/08/17 12:00 AM LST/LDT to 2024/08/17 11:59 PM LST/LDT



Note: The interval is High/Low. the solid blue line depicts a curve fit between the high and low values and approximates the segments between.
Disclaimer: These data are based upon the latest information available as of the date of your request, and may differ from the published tide tables.

High/Low Tide Prediction Data Listing

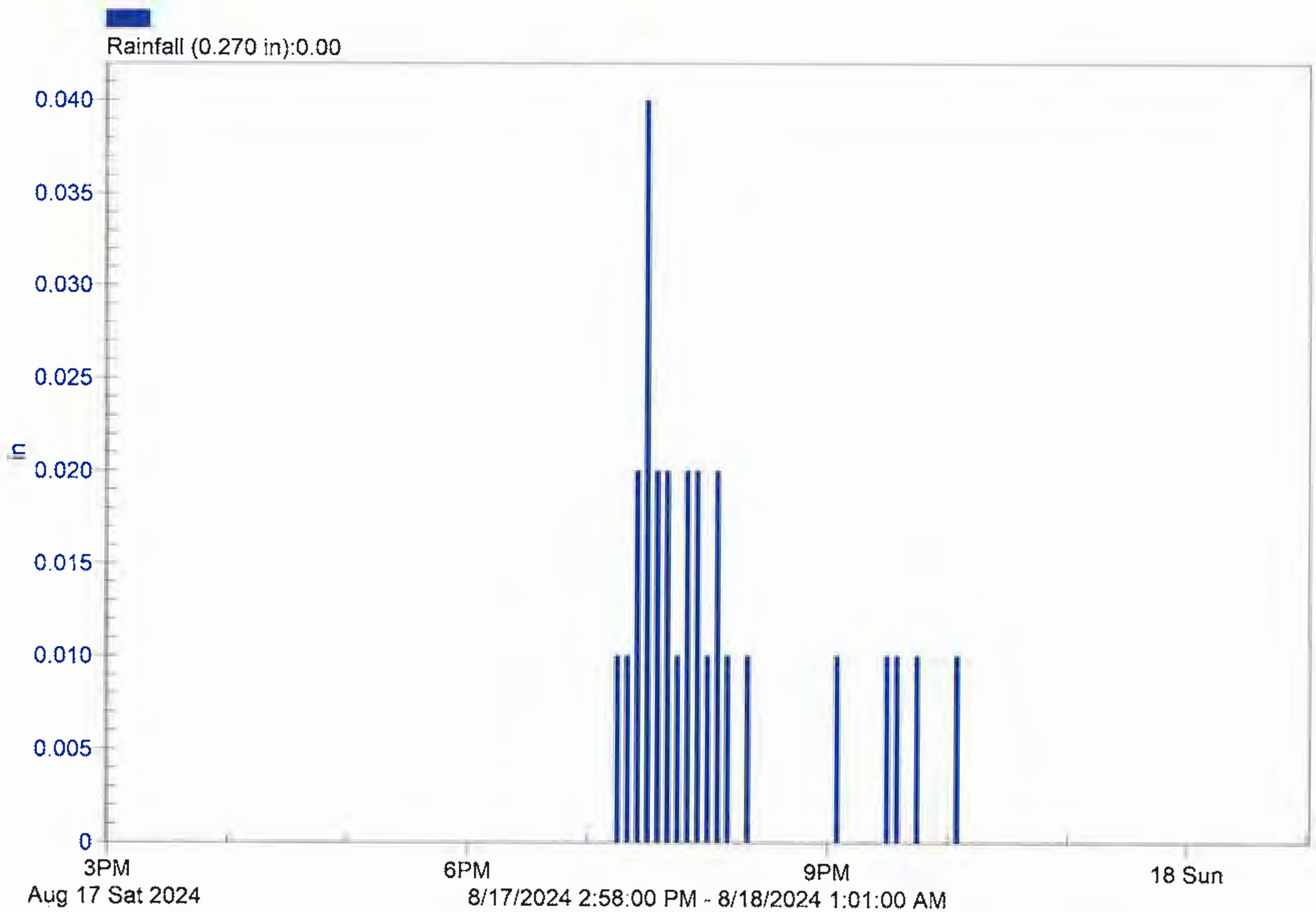
Station Name: Tacoma, WA
Action: Daily
Product: Tide Predictions
Start Date & Time: 2024/8/17 12:00 AM
End Date & Time: 2024/8/17 11:59 PM

Source: NOAA/NOS/CO-OPS
Prediction Type: Harmonic
Datum: MLLW
Height Units: Feet
Time Zone: LST/LDT

Date	Day	Time	Hgt	Time	Hgt	Time	Hgt	Time	Hgt
2024/08/17	Sat	02:28 AM	10.14 H	09:44 AM	-1.69 L	5:31 PM	11.50 H	10:49 PM	7.46 L

RF1

Flowlink 5



2406009-01

Bottle Certification

Bottle Certification

*** DEFAULT CONTAINER ***

NPDES Storm

Chain of Custody

Outfall: 235

Date/Time sampler installed: 8/16/24 @ 11:40

Jar Cert #

Sampling Crew: CA, SG

Filter lot # 1391669

Weather conditions:

Date/Time sampler pickup: 8/19/24 @ 9:57

Observed activities in area: N/A

Observations during sampler collection: N/A

Color, Odors, sheens: N/A

Type of Sample: ☑ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☐ >0.2 inches rain ☐ <0.02 inches of rain previous 24 hours

Samplers: ☐ Data downloaded ☐ Sample bottles marked

☐ Ice Present at pick-up ☐ Tubing Decon 1000mL Di water

☐ Caps on containers

Fill to...	Parameters:	Sample	QC
Neck	PAH's/Phthalates (1L) +	☑	☐ ☐
No head	'Total Mercury (125/250mL QC)	☑	☐
No head	'Diss Mercury (125/250mL QC)	☑	☐
Shoulder	Total Metals (250mL)	☑	
Shoulder	Diss Metals (125mL)	☑	
Shoulder	TSS (1L). (500 mL min)	☑	
Shoulder	Nutrients (250mL)	☑	
Shoulder	Ortho-P (125mL). (75min)	☑	
Shoulder	BOD (1L)	☐	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☐	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes 4.010 L config above

+1000 mL for QC per bottle, must submit 2 extra bottles

'If 250ml bottle used, thenQAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (µS)
1	1000	☑	151.3
2	1000	☑	81.6
3	1000	☑	109.1
4	250	☑	100.9
5		☐	
6		☐	
7		☐	
8		☐	
9		☐	
10		☐	
11		☐	
12		☐	

Total aliquots: 13

Sample Prep

Date/Time: 8/19/24 @ 10:35

Initial: CA, SG

pH: 6.86

COND (µS): 113.2

Lab #: 2408031-02

Aliquots composited: 13

Deviations:

Composite End Time: 8/18/24 @ 22:08

(Collect Time) Last aliquot in composite

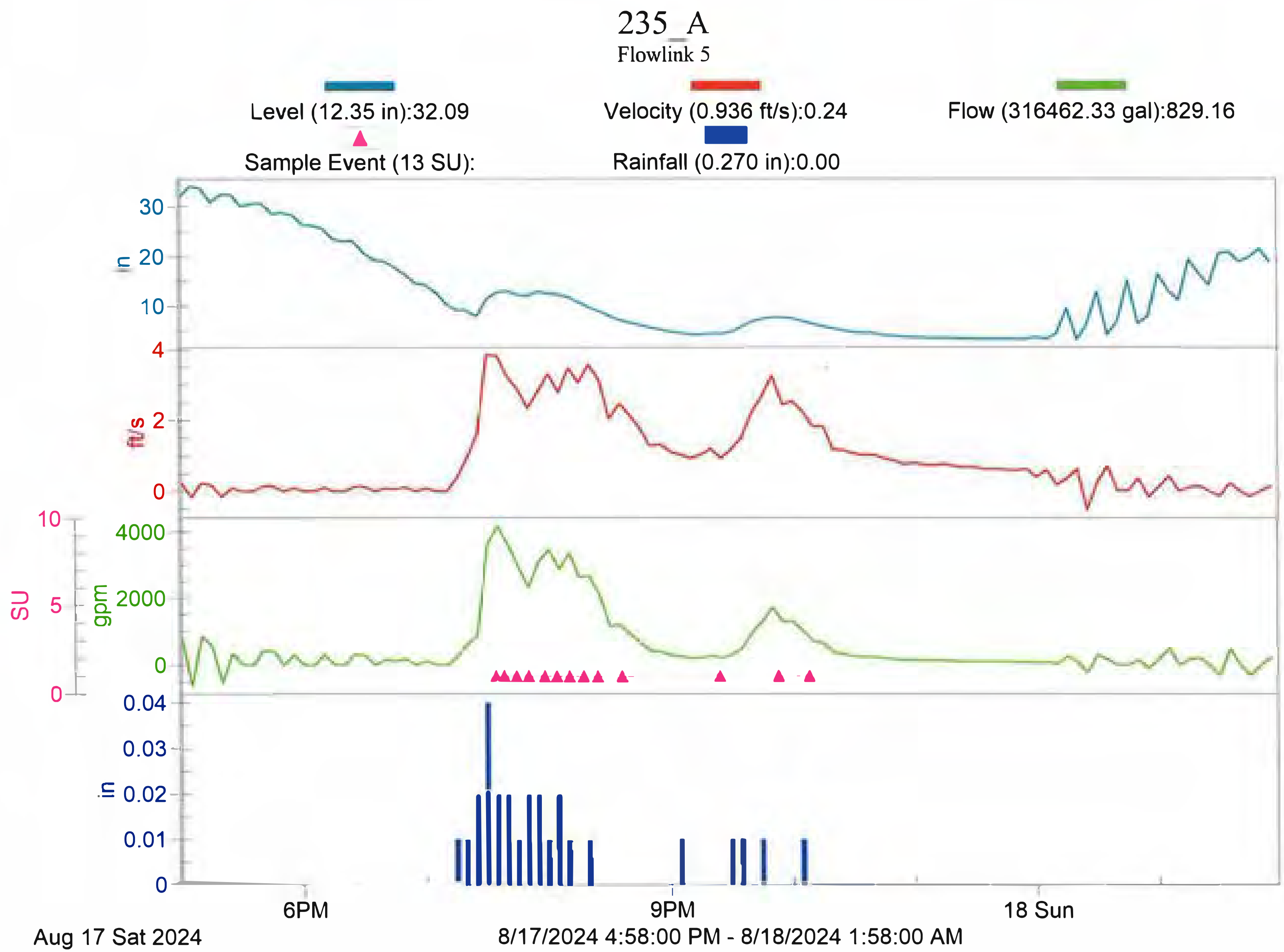
Relinquished by: [signature]

Date/Time: 8/19/24 @ 10:55

Received by: [signature]

Date/Time: 8/19/24 @ 10:55

19.7°C corrected S/N 122026693


235_A
Flowlink 5
Level (12.35 in):32.09
Velocity (0.936 ft/s):0.24
Flow (316462.33 gal):829.16
Sample Event (13 SU):
Rainfall (0.270 in):0.00
in
30
20
10
ft/s
4
2
0
SU
10
5
0
gpm
4000
2000
0
in
0.04
0.03
0.02
0.01
0
6PM
9PM
18 Sun
Aug 17 Sat 2024
8/17/2024 4:58:00 PM - 8/18/2024 1:58:00 AM

FIELD REPORT

Project: Thea Foss/Wheeler-Osgood Waterways & NPDES Stormwater Monitoring Program

Event: Storm Event – September 10, 2024

INTRODUCTION

This report summarizes the storm event sampled on 9/10/2024 by the City of Tacoma Environmental Services Collection System Support staff as part of our stormwater monitoring program. This report includes a summary of the following:

- Storm characteristics and criteria;
- Sampling activities;
- Flow characteristics at each sampling location;
- Pacing – set for a 0.35" event, actual event was 0.38"

This event met the sampling criteria for precipitation as specified in the Thea Foss Sampling and Analysis Plan (SAP).

DESCRIPTION OF SAMPLING ACTIVITES

Samplers placed in the field on 9/10/2024. During sampler installation the weather conditions were overcast. All samplers were retrieved on 9/11/2024 (For site specific details, see Appendix A for field notes, Chain of Custody (COC) forms, and event hydrographs).

The following unusual observations were noted during the sampling event:

Table 2: Composite Sampling Activities

Sample Location	Site Deployed	Sample Accepted	Pacing (gal)	Enables LVL(ft), VEL(fps) COND.(mS/cm)	Comments
Outfall 230A	Yes	Yes	45,000	LVL > 0.25	18 Aliquots Collected / 18 Composited
Outfall 235	Yes	Yes	16,000	LVL > 0.37 VEL > 0.8	32 Aliquots Collected / 32 Composited
Outfall 237ANew	Yes	Yes	207,000	LVL > 0.55 VEL > 6.0	17 Aliquots Collected / 17 Composited
Outfall 237B	Yes	Yes	249,000	LVL > 0.6	20 Aliquots Collected / 20 Composited
Outfall 243	No	No	N/A	N/A	0 Aliquots Collected / 0 Composited
Outfall 245	Yes	Yes	10 min.	> 200 gpm	21 Aliquots Collected / 21 Composited
Outfall 254	Yes	Yes	10 min.	< 2.0 ms/cm	15 Aliquots Collected / 15 Composited
222	No	No	N/A	N/A	0 Aliquots Collected / 0 Composited

**QC, QUALITY CONTROL*

ND, NO DATA

NA, NOT APPLICABLE

WATER QUALITY DATA

Accepted samples were analyzed for the target parameters specified in the SAP and QAPP. Samples accepted at all Outfalls were composited and preserved within 24 hours of the last aliquot being collected. The samples were allowed to sit for a minimum of 18 hours before metals analysis was started.

EQUIPMENT INFORMATION

Samples were collected using ISCO 6712 portable auto samplers. Rain data was collected using an ISCO 674 rain gauge located at the Center for Urban Waters at 326 East D Street, Tacoma, WA 98421.

CORRECTIVE ACTIONS AND DEVIATIONS

There were no other deviations from the field procedures as discussed in the SAP other than those discussed above/below. No other criteria or procedures as indicated in the SAP were compromised except for those discussed above/below.

Enclosures: The ISCO program setting/sampling results report, the sample collection chain of custody form, and field records are in Appendix A for each outfall. This includes the following information for the samples collected:

- Plot of flow hydrograph and hyetograph
- Subsample times and conductivities
- Tidal windows
- Field activities

Appendix A

Storm Deployment: 8/22/24 1"

245 @ 13:41 - Jars/Ice - Download

237A @ 13:50 - Jars/Ice - Download - 739,000

237B @ 13:58 - Jars/Ice - Download - 617,000

230A @ 14:04 - Jars/Ice - Download - 130,000

S

Storm Deployment: 9/10/24 .35"

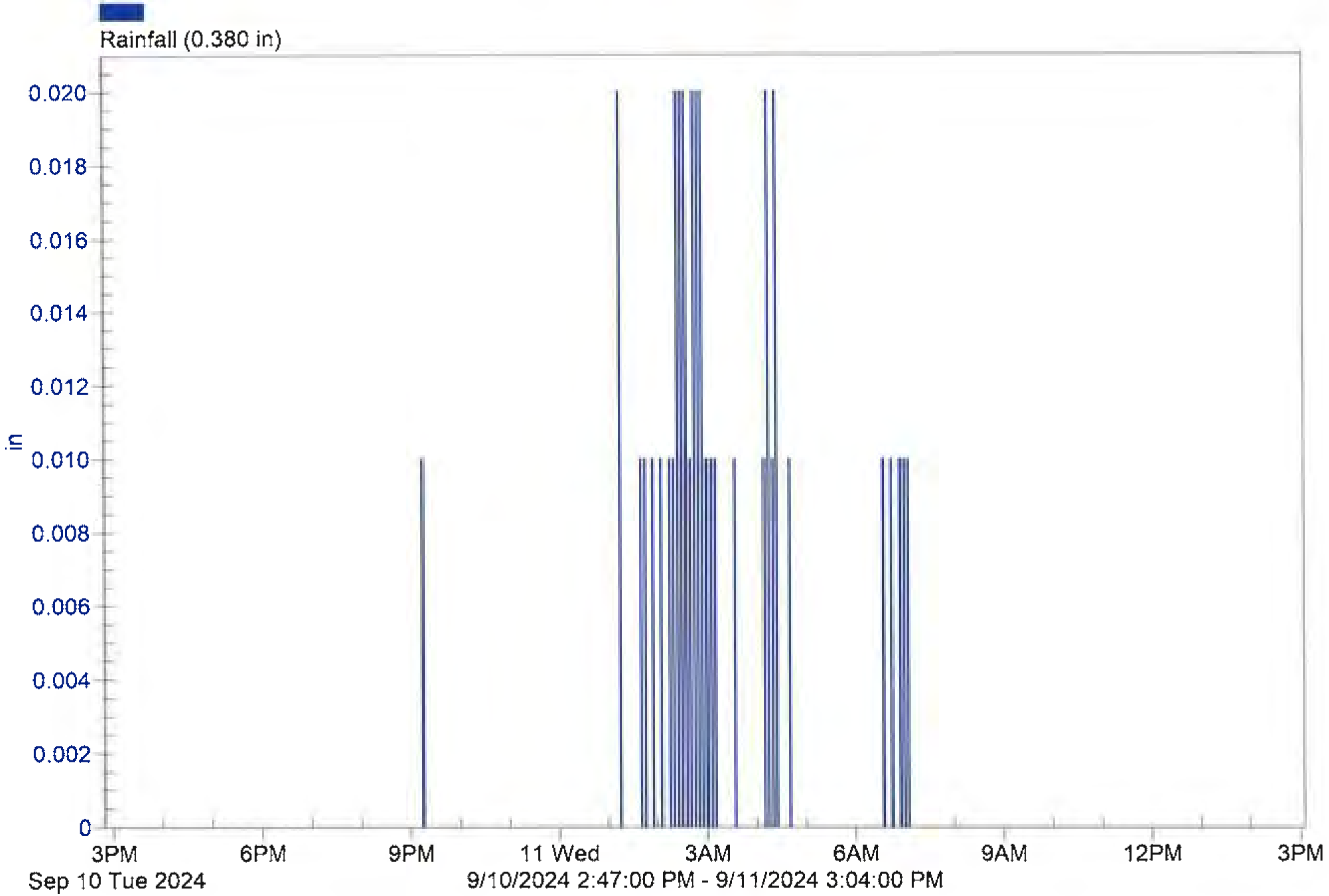
254 - Jars/Ice - Download - 1414
245 - Jars/Ice - Download - 14:30
~~243 - Jars/Ice - Download -~~
237A - Jars/Ice - Download - 14:45 - 207,000
237B - Jars/Ice - Download - 14:53 - 244,000
235 - Jars/Ice - Download - 15:02 - 16,000
230A - Jars/Ice - Download - 15:15 - 45,000

Storm Collection 9/11/24

254 @ 13:57 - 3.75/12 - Download
245 @ 14:06 - 5.25/12 - Download
237A @ 14:17 - 9.25/12 - Download
237B @ 14:31 - 5/12 - Download
235 @ 14:50 - 8/12 - Download
230A @ 14:59 - 4½/12 - Download

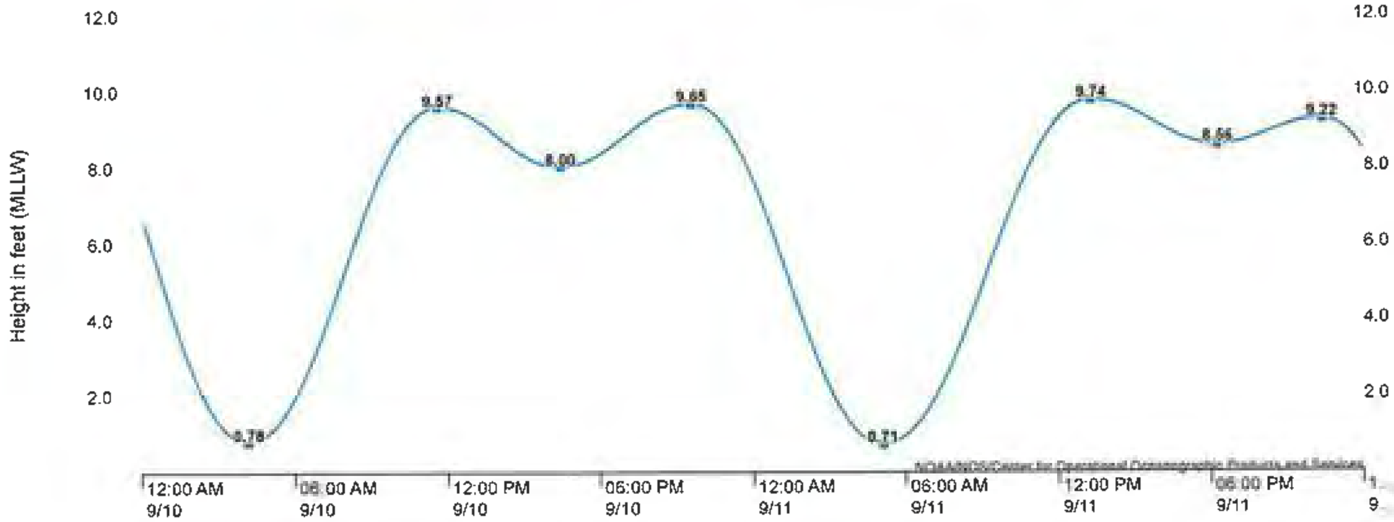
Continued on Page

RF1
Flowlink 5



Help Print

NOAA/NOS/CO-OPS
Tide Predictions at 9446484, Tacoma WA
From 2024/09/10 12:00 AM LST/LDT to 2024/09/11 11:59 PM LST/LDT



Note: The interval is High/Low, the solid blue line depicts a curve fit between the high and low values and approximates the segments between.
Disclaimer: These data are based upon the latest information available as of the date of your request, and may differ from the published tide tables.

High/Low Tide Prediction Data Listing

Station Name: Tacoma, WA
Action: Daily
Product: Tide Predictions
Start Date & Time: 2024/9/10 12:00 AM
End Date & Time: 2024/9/11 11:59 PM

Source: NOAA/NOS/CO-OPS
Prediction Type: Harmonic
Datum: MLLW
Height Units: Feet
Time Zone: LST/LDT

Date	Day	Time	Hgt	Time	Hgt	Time	Hgt	Time	Hgt
2024/09/10	Tue	04:11 AM	0.78 L	11:33 AM	9.57 H	4:25 PM	8.00 L	9:30 PM	9.65 H
2024/09/11	Wed	05:07 AM	0.71 L	1:16 PM	9.74 H	6:15 PM	8.56 L	10:23 PM	9.22 H

2406009-01

Bottle Certification

Bottle Certification

*** DEFAULT CONTAINER ***

NPDES Storm

Chain of Custody

Jar Cert #__________

Filter lot # 1391669

Outfall: 230 A

Date/Time sampler installed: 9/10/24 @ 15:15

Sampling Crew: SG, CA

Weather conditions: Sunny

Date/Time sampler pickup: 9/11/24 @ 14:59

Observed activities in area: NA

Observations during sampler collection: N/A

Color, Odors, sheens: N/A

Type of Sample: ☑ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☒ >0.2 inches rain ☐ <0.02 inches of rain previous 24 hours

Samplers: ☑ Data downloaded ☑ ~~Sample bottles marked~~ ☑ Ice Present at pick-up ☑ Tubing Decon 1000mL DI water ☑ Caps on containers

Fill to	Parameters:	Sample	QC
Neck	PAH's/Phthalates (1L) +	☑	☐ ☐
No head	¹Total Mercury (125/250mL QC)	☑	☐
No head	¹Diss Mercury (125/250mL QC)	☑	☐
Shoulder	Total Metals (250mL)	☑	
Shoulder	Diss Metals (125mL)	☑	
Shoulder	TSS (1L), (500 mL min)	☑	
Shoulder	Nutrients (250mL)	☑	
Shoulder	Ortho-P (125mL), (75min)	☑	
Shoulder	BOD (1L)	☑	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☑	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes 4.010 L config above

+1000 mL for QC per bottle, must submit 2 extra bottles

¹If 250ml bottle used, thenQAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (µS)
1	1000	☑	108
2	1000	☑	35
3	1000	☑	48
4	1000	☑	65
5	500	☑	64
6		☐	
7		☐	
8	RG	☐	
9		☐	
10		☐	
11		☐	
12		☐	

Total aliquots: 18

Sample Prep

Date/Time: 9/11/24 @ 15:42

Initial: CA, RG, SG

pH: 7.19

COND (µS): 59.9

Lab #: 2409013-01

Aliquots composited: 18

Deviations: __________

Composite End Time: 9/11/24 @ 11:34

(Collect Time) Last aliquot in composite

Relinquished by: [signature]

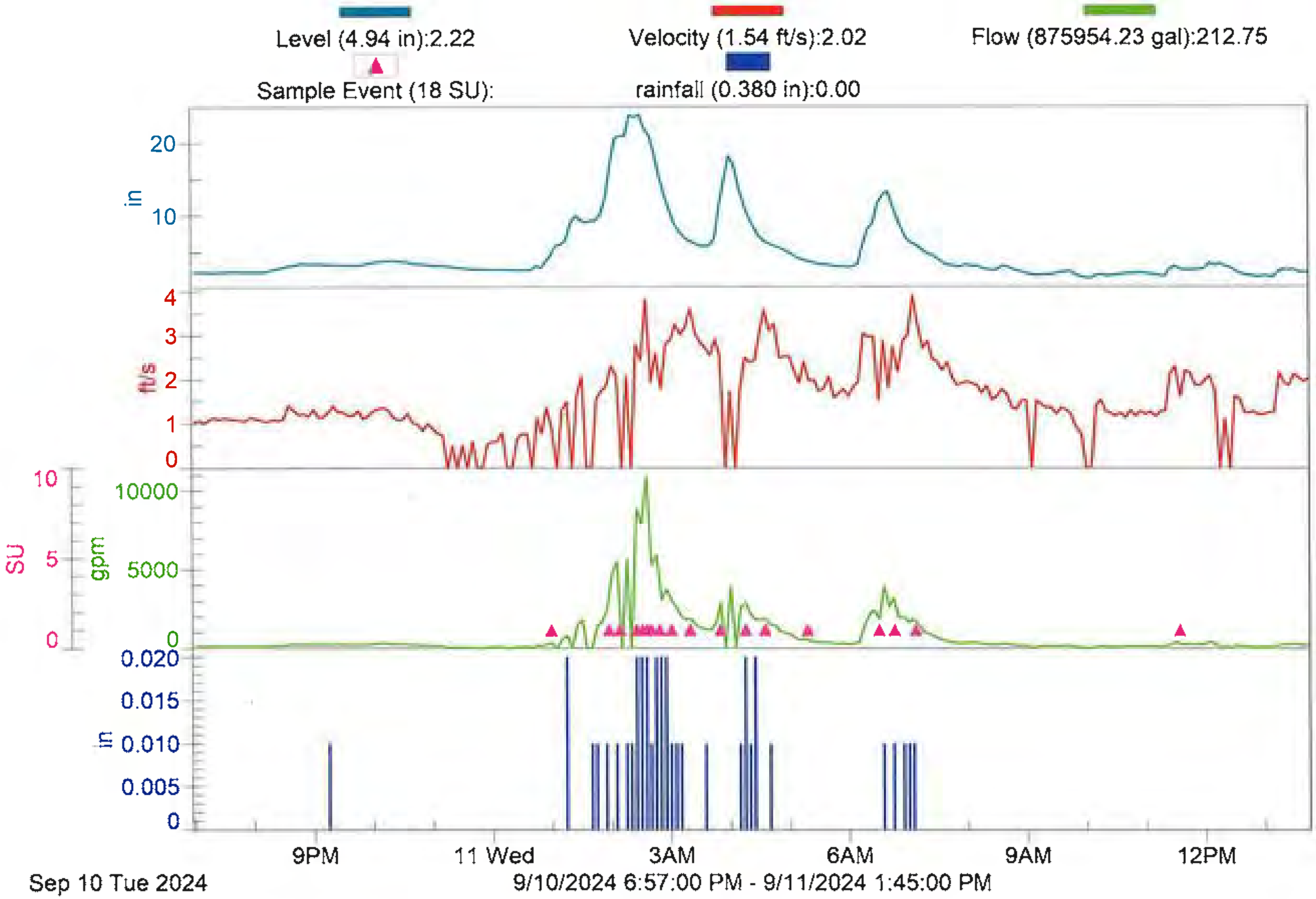
Date/Time: 9/12/24 @ 9:55

Received by: [signature]

Date/Time: 9/12/24 @ 9:55

230A

Flowlink 5



*********** SAMPLING RESULTS ***********
SITE: 230A
PROGRAM: STORM 1
Program Started at 13:52 TU 10-SEP-24
Nominal Sample Volume = 250 ml

SAMPLE	BOTTLE	TIME	SOURCE	ERROR	COUNT TO LIQUID
		13:52	PGM	DISABLED	
		14:05	PGM	ENABLED	
		14:25	PGM	DISABLED	
		20:35	PGM	ENABLED	
		23:20	PGM	DISABLED	
		WE 11-SEP-24			
		00:45	PGM	ENABLED	
		00:50	PGM	DISABLED	
		00:55	PGM	ENABLED	
1,4	1	00:59	F		0
2,4	1	01:57	F		0
3,4	1	02:07	F		0
4,4	1	02:25	F		0
1,4	2	02:30	F		0
2,4	2	02:36	F		0
3,4	2	02:40	F		0
4,4	2	02:48	F		0
1,4	3	03:00	F		0
2,4	3	03:19	F		0
3,4	3	03:50	F		0
4,4	3	04:14	F		0
1,4	4	04:35	F		0
2,4	4	05:18	F		0
		05:50	PGM	DISABLED	
		06:05	PGM	ENABLED	
3,4	4	06:30	F		0
4,4	4	06:46	F		0
1,2	5	07:07	F		0
		07:50	PGM	DISABLED	
		08:00	PGM	ENABLED	
		08:15	PGM	DISABLED	
		08:35	PGM	ENABLED	
		08:45	PGM	DISABLED	
		11:30	PGM	ENABLED	
2,2	5	11:34	F		0
		11:35	PGM	DISABLED	
		12:05	PGM	ENABLED	
		12:25	PGM	DISABLED	

SOURCE F ==> FLOW

250 ml SAMPLES

ENABLE:

LEVEL >0.250 ft

ENABLE:
REPEATABLE ENABLE
NO SAMPLE AT DISABLE
NO SAMPLE AT ENABLE

ENABLE:
COUNTDOWN IS STOPPED
WHILE DISABLED

ENABLE:
0 PAUSE & RESUMES

NO DELAY TO START

200 HOURS RUN TIME

LIQUID DETECT OFF

QUICK VIEW/CHANGE

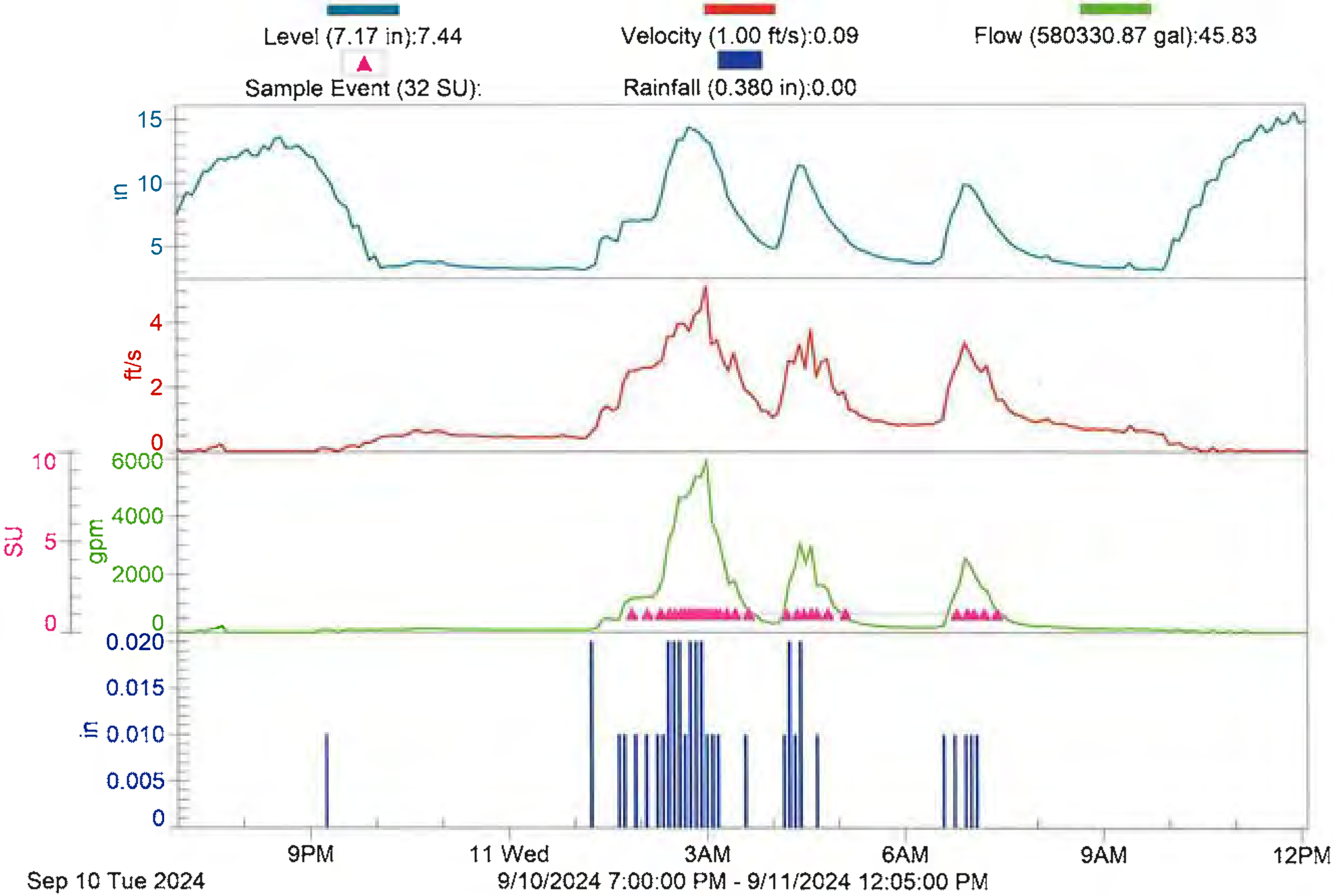
TAKE MEASUREMENTS
AT STORAGE INTERVAL

DUAL SAMPLER OFF
BTL FULL DETECT OFF
TIMED BACKLIGHT

PULSED EVENT MARK
AT THE BEGINNING OF
FORWARD PUMPING

235_A

Flowlink 5



2406009-01

Bottle Certification

Bottle Certification

*** DEFAULT CONTAINER ***

NPDES Storm

Chain of Custody

Outfall: 235 — Date/Time sampler installed: 9/10/24 @ 15:02

Jar Cert #________ — Sampling Crew: SG, CA

Filter lot # 1391669 — Weather conditions: Sunny — Date/Time sampler pickup: 9/11/24 @ 14:50

Observed activities in area: N/A

Observations during sampler collection: N/A

Color, Odors, sheens: N/A

Type of Sample: ☒ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☒ >0.2 inches rain ☐ <0.02 inches of rain previous 24 hours

Samplers: ☒ Data downloaded ☒ Sample bottles marked

☒ Ice Present at pick-up ☒ Tubing Decon 1000mL DI water

☒ Caps on containers

Fill to...	Parameters:	Sample	QC
Neck	PAHs/Phthalates (1L) +	☑	☑ ☑
No head	[1]Total Mercury (125/250mL QC)	☑	☐
No head	[1]Diss Mercury (125/250mL QC)	☑	☐
Shoulder	Total Metals (250mL)	☑	
Shoulder	Diss Metals (125mL)	☑	
Shoulder	TSS (1L), (500 mL min)	☑	
Shoulder	Nutrients (250mL)	☑	
Shoulder	Ortho-P (125mL), (75min)	☑	
Shoulder	BOD (1L)	☑	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☑	
	Other:		
	Xtra (Unpreserved Conventionals)	☐	

*Minimum volumes 4.010 L config above

+1000 mL for QC per bottle, must submit 2 extra bottles

[1]If 250ml bottle used, thenQAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (µS)
1	1000	☑	117
2		☑	55
3		☑	42
4		☑	41
5		☑	50
6		☑	55
7		☑	71
8		☑	69
9	RO	☐	
10		☐	
11		☐	
12		☐	

Total aliquots 32

Sample Prep

Date/Time: 9/11/24 @ 15:41

Initial: CA, KG, SG

pH: 7.36

COND (µS): 62.2

Lab #: 2409013-02

Aliquots composited: 32

Deviations:

Composite End Time: 9/11/24 @ 7:24
(Collect Time) Last aliquot in composite

Relinquished by: [signature] — Received by: [signature]

Date/Time: 9/12/24 @ 9:55 — Date/Time: 9/12/24 @ 9:58

SAMPLER ID# 1242995716 13:50 11-SEP-24
Hardware: A1 Software: 2.33
*********** SAMPLING RESULTS ***********
SITE: 235A ST
PROGRAM: 235A
Program Started at 14:07 TU 10-SEP-24
Nominal Sample Volume = 250 ml

SAMPLE	BOTTLE	TIME	SOURCE	ERROR	COUNT TO LIQUID
		14:07	PGM DISABLED		
		WE 11-SEP-24			
		01:25	PGM ENABLED		
1,4	1	01:52	F		1887
2,4	1	02:06	F		1877
3,4	1	02:18	F		1903
4,4	1	02:26	F		1893
1,4	2	02:31	F		1903
2,4	2	02:36	F		2131
3,4	2	02:39	F		1922
4,4	2	02:43	F		1932
1,4	3	02:46	F		1959
2,4	3	02:49	F		1949
3,4	3	02:52	F		1938
4,4	3	02:55	F		1950
1,4	4	02:58	F		1953
2,4	4	03:01	F		1950
3,4	4	03:04	F		1985
4,4	4	03:08	F		1983
1,4	5	03:12	F		1962
2,4	5	03:18	F		1961
3,4	5	03:26	F		1959
4,4	5	03:38	F		1945
1,4	6	04:12	F		1901
2,4	6	04:22	F		1895
3,4	6	04:28	F		1904
4,4	6	04:35	F		1915
1,4	7	04:40	F		1920
2,4	7	04:50	F		1922
3,4	7	05:06	F		1915
		05:30	PGM DISABLED		
		06:40	PGM ENABLED		
4,4	7	06:47	F		1855
1,4	8	06:57	F		1867
2,4	8	07:03	F		1883
3,4	8	07:12	F		1900

250 ml SAMPLES

ENABLE:
LEVEL >0.370 ft
AND
VEL > 0.80 fps

ENABLE:
REPEATABLE ENABLE
NO SAMPLE AT DISABLE
NO SAMPLE AT ENABLE

ENABLE:
COUNTDOWN IS STOPPED
WHILE DISABLED

ENABLE:
0 PAUSE & RESUMES

NO DELAY TO START

200 HOURS RUN TIME

LIQUID DETECT ON

QUICK VIEW/CHANGE

TAKE MEASUREMENTS
AT STORAGE INTERVAL

DUAL SAMPLER OFF
BTL FULL DETECT OFF
TIMED BACKLIGHT

EVENT MARK SENT
DURING PUMP CYCLE

2406009-01

Bottle Certification

Bottle Certification

*** DEFAULT CONTAINER ***

Jar Cert #__________

Filter lot # 1391669

NPDES Storm

Chain of Custody

Outfall: 237 A new

Date/Time sampler installed: 9/10/24 @ 14:45

Sampling Crew: SG, CM

Weather conditions: Sunny

Date/Time sampler pickup: 9/11/24 @ 14:17

Observed activities in area: N/A

Observations during sampler collection: N/A

Color, Odors, sheens: N/A

Type of Sample: ☒ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☒ >0.2 inches rain ☐ <0.02 inches of rain previous 24 hours

Samplers: ☒ Data downloaded ☒ Sample bottles marked

☒ Ice Present at pick-up ☒ Tubing Decon 1000mL DI water

☒ Caps on containers

Fill to...	Parameters	Sample	QC
Neck	PAH's/Phthalates (1L) +	☒	☐ ☐
No head	[1]Total Mercury (125/250mL QC)	☒	☐
No head	[1]Diss Mercury (125/250mL QC)	☒	☐
Shoulder	Total Metals (250mL)	☒	
Shoulder	Diss Metals (125mL)	☒	
Shoulder	TSS (1L), (500 mL min)	☒	
Shoulder	Nutrients (250mL)	☒	
Shoulder	Ortho-P (125mL), (75min)	☒	
Shoulder	BOD (1L)	☒	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☐	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes 4.010 L config above

+1000 mL for QC per bottle, must submit 2 extra bottles

[1]If 250ml bottle used, thenQAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (µS)
1	1000	☒	35
2	1000	☒	56
3	1000	☒	51
4	1000	☒	77
5	250	☒	127
6		☐	
7		☐	
8	RG	☐	
9		☐	
10		☐	
11		☐	
12		☐	

Total aliquots: ~~24~~ 17

Sample Prep

Date/Time: 9/11/24 @ 15:33

Initial: CA, RG, SG

pH: 7.25

COND (µS): 58.8

Lab #: 2409013-03

Aliquots composited: ~~25~~ 17

Deviations:

Composite End Time: 9/11/24 @ 7:43

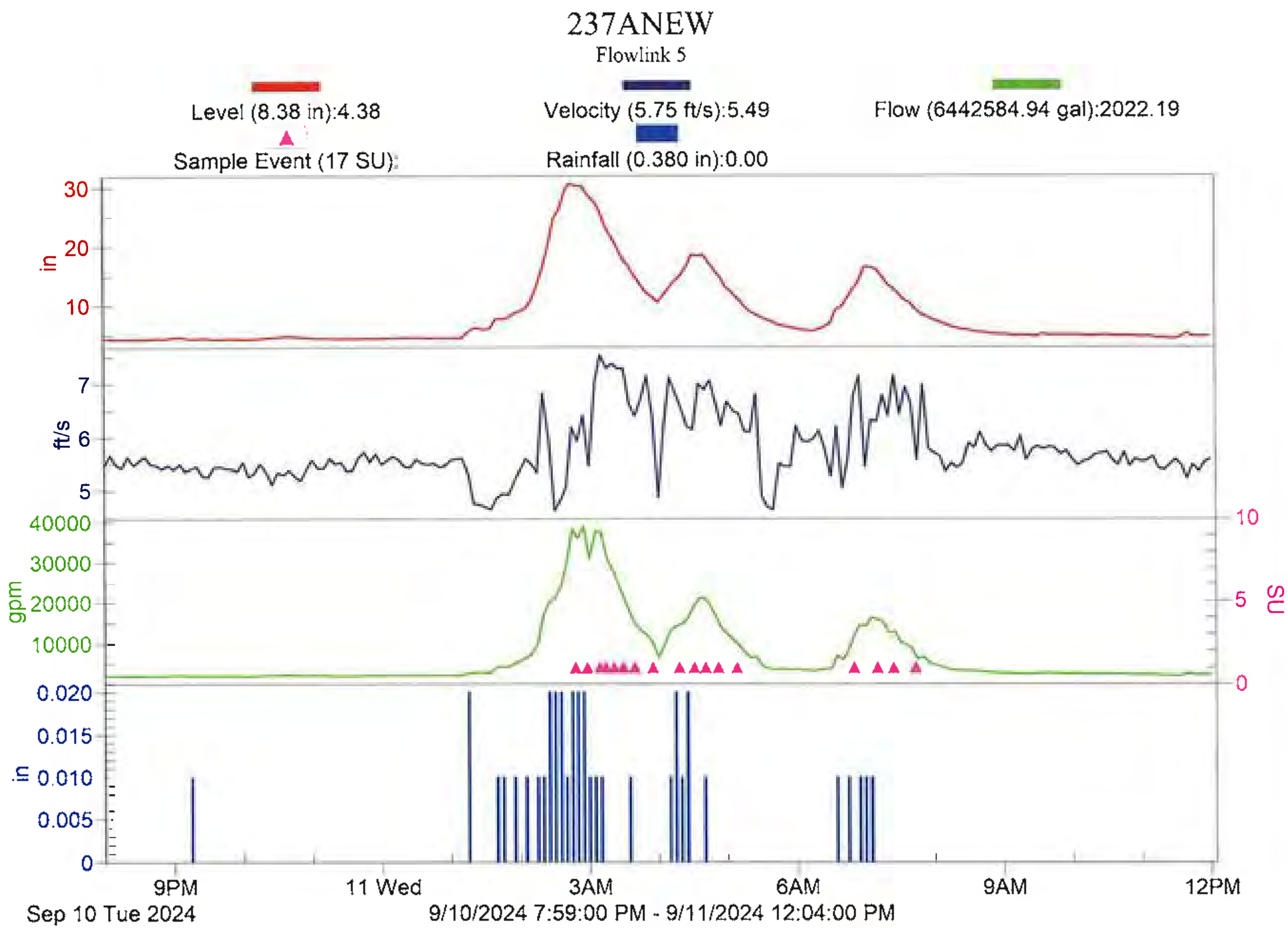
(Collect Time) Last aliquot in composite

Relinquished by: [signature]

Date/Time: 9/12/24 @ 9:55

Received by: [signature]

Date/Time: 9/12/24 @ 9:58



237ANEW
Flowlink 5
Level (8.38 in):4.38
Velocity (5.75 ft/s):5.49
Flow (6442584.94 gal):2022.19
Sample Event (17 SU):
Rainfall (0.380 in):0.00
in
30
20
10
ft/s
7
6
5
gpm
40000
30000
20000
10000
SU
10
5
0
in
0.020
0.015
0.010
0.005
0
9PM
11 Wed
3AM
6AM
9AM
12PM
Sep 10 Tue 2024
9/10/2024 7:59:00 PM - 9/11/2024 12:04:00 PM

SAMPLER ID# 1245320993 13:17 11-SEP-24
Hardware: A1 Software: 2.33
*********** SAMPLING RESULTS ***********
SITE: 237ANEW
PROGRAM: 237ANEW
Program Started at 13:43 TU 10-SEP-24
Nominal Sample Volume = 250 ml

SAMPLE	BOTTLE	TIME	SOURCE	ERROR	COUNT TO LIQUID
		13:43	PGM	DISABLED	
------------- WE 11-SEP-24 -------------					
		02:20	PGM	ENABLED	
		02:25	PGM	DISABLED	
		02:45	PGM	ENABLED	
1,4	1	02:48	F		513
		02:50	PGM	DISABLED	
		02:55	PGM	ENABLED	
2,4	1	02:58	F		515
		03:00	PGM	DISABLED	
		03:05	PGM	ENABLED	
3,4	1	03:09	F		531
4,4	1	03:14	F		515
1,4	2	03:21	F		519
2,4	2	03:29	F		518
3,4	2	03:39	F		527
4,4	2	03:55	F		533
		04:00	PGM	DISABLED	
		04:05	PGM	ENABLED	
1,4	3	04:18	F		548
2,4	3	04:31	F		539
3,4	3	04:41	F		521
4,4	3	04:52	F		519
1,4	4	05:08	F		527
		05:30	PGM	DISABLED	
		06:35	PGM	ENABLED	
		06:40	PGM	DISABLED	
		06:50	PGM	ENABLED	
2,4	4	06:50	F		538
		07:00	PGM	DISABLED	
		07:05	PGM	ENABLED	
3,4	4	07:10	F		531
4,4	4	07:24	F		537
1,1	5	07:43	F		539
		07:45	PGM	DISABLED	
		07:50	PGM	ENABLED	

250 ml SAMPLES

ENABLE:
VEL > 6.00 fps
AND
LEVEL >0.550 ft

ENABLE:
REPEATABLE ENABLE
NO SAMPLE AT DISABLE
NO SAMPLE AT ENABLE

ENABLE:
COUNTDOWN IS STOPPED
WHILE DISABLED

ENABLE:
0 PAUSE & RESUMES

NO DELAY TO START

200 HOURS RUN TIME

LIQUID DETECT ON

QUICK VIEW/CHANGE

TAKE MEASUREMENTS
AT STORAGE INTERVAL

DUAL SAMPLER OFF
BTL FULL DETECT OFF
TIMED BACKLIGHT

EVENT MARK SENT
DURING PUMP CYCLE

2406010-01

Bottle Certification

Bottle Certification

*** DEFAULT CONTAINER ***

NPDES Storm

Chain of Custody

Jar Cert #_________

Filter lot #1391669

Outfall: 237B

Date/Time sampler installed: 9/10/24 @ 14:53

Sampling Crew: SG, CA

Weather conditions: Sunny

Date/Time sampler pickup: 9/11/24 @ 14:31

Observed activities in area: N/A

Observations during sampler collection: N/A

Color, Odors, sheens: N/A

Type of Sample: ☒ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☒ >0.2 inches rain ☐ <0.02 inches of rain previous 24 hours

Samplers: ☒ Data downloaded ☒ Sample bottles marked

☒ Ice Present at pick-up ☒ Tubing Decon 1000mL DI water

☒ Caps on containers

Fill to...	Parameters:	Sample	QC
Neck	PAH's/Phthalates (1L) +	☑	☐ ☐
No head	¹Total Mercury (125/250mL QC)	☑	☑
No head	¹Diss Mercury (125/250mL QC)	☑	☑
Shoulder	Total Metals (250mL)	☑	
Shoulder	Diss Metals (125mL)	☑	
Shoulder	TSS (1L), (500 mL min)	☑	
Shoulder	Nutrients (250mL)	☑	
Shoulder	Ortho-P (125mL), (75min)	☑	
Shoulder	BOD (1L)	☑	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☑	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes 4.010 L config above

+1000 mL for QC per bottle, must submit 2 extra bottles

¹If 250ml bottle used, thenQAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (µS)
1	1000	☑	96
2	1000	☑	57
3	1000	☑	91
4	1000	☑	139
5	1000	☑	166
6		☐	
7		☐	
8	Dc	☐	
9		☐	
10		☐	
11		☐	
12		☐	

Total aliquots: 20

Sample Prep

Date/Time: 9/11/24 @ 15:36

Initial: CA, RG, SG

pH: 7.29

COND (µS): 107.6

Lab #: 2409013-04

Aliquots composited: 20

Deviations:

Composite End Time: 9/11/24 @ 9:15

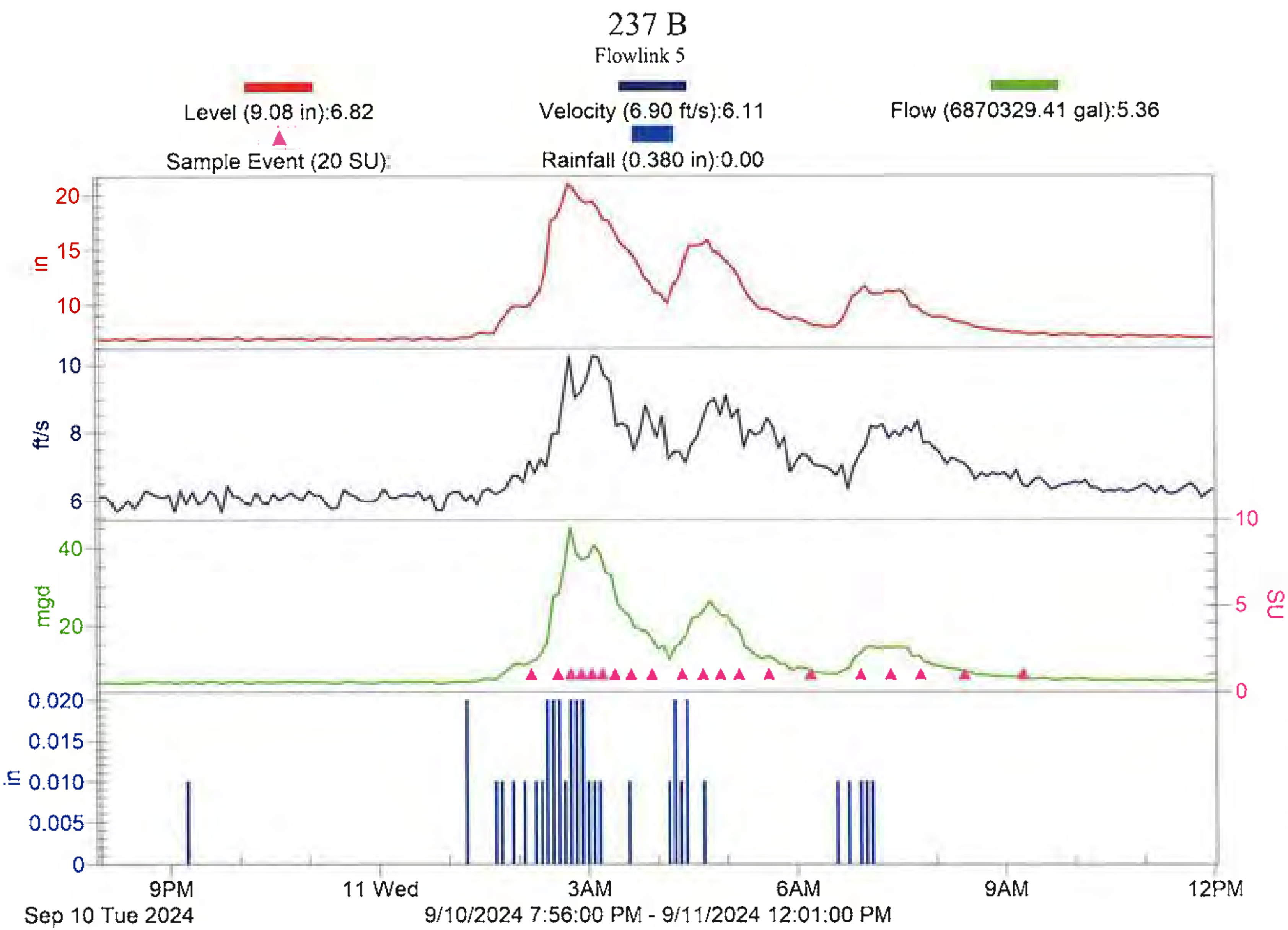
(Collect Time) Last aliquot in composite

Relinquished by: [signature]

Date/Time: 9/12/24 @ 9:55

Received by: [signature]

Date/Time: 9/12/24 @ 9:55


237 B
Flowlink 5
Level (9.08 in):6.82
Velocity (6.90 ft/s):6.11
Flow (6870329.41 gal):5.36
Sample Event (20 SU):
Rainfall (0.380 in):0.00
in
20
15
10
ft/s
10
8
6
mgd
40
20
SU
10
5
0
in
0.020
0.015
0.010
0.005
0
9PM
11 Wed
3AM
6AM
9AM
12PM
Sep 10 Tue 2024
9/10/2024 7:56:00 PM - 9/11/2024 12:01:00 PM

SAMPLER ID# 1243003651 13:31 11-SEP-24
Hardware: A1 Software: 2.33
*********** SAMPLING RESULTS ***********
SITE: 237 B
PROGRAM: STORM 1
Program Started at 13:56 TU 10-SEP-24
Nominal Sample Volume = 250 ml

SAMPLE	BOTTLE	TIME	SOURCE	ERROR	COUNT TO LIQUID
		13:56	PGM DISABLED		
		WE 11-SEP-24			
		01:25	PGM ENABLED		
1,4	1	02:11	F		517
2,4	1	02:34	F		502
3,4	1	02:45	F		506
4,4	1	02:54	F		501
1,4	2	03:03	F		504
2,4	2	03:12	F		509
3,4	2	03:23	F		509
4,4	2	03:37	F		514
1,4	3	03:55	F		885
2,4	3	04:21	F		515
3,4	3	04:39	F		511
4,4	3	04:54	F		513
1,4	4	05:10	F		510
2,4	4	05:36	F		513
3,4	4	06:12	F		515
4,4	4	06:55	F		511
1,4	5	07:21	F		538
2,4	5	07:47	F		503
3,4	5	08:25	F		515
4,4	5	09:15	F		520
		09:25	PGM DISABLED		
		09:30	PGM ENABLED		
		09:40	PGM DISABLED		
		09:50	PGM ENABLED		
		09:55	PGM DISABLED		
		10:05	PGM ENABLED		
		10:10	PGM DISABLED		

SOURCE F ==> FLOW

250 ml SAMPLES

ENABLE:

LEVEL >0.600 ft

ENABLE:
REPEATABLE ENABLE
NO SAMPLE AT DISABLE
NO SAMPLE AT ENABLE

ENABLE:
COUNTDOWN IS STOPPED
WHILE DISABLED

ENABLE:
0 PAUSE & RESUMES

NO DELAY TO START

200 HOURS RUN TIME

LIQUID DETECT ON

QUICK VIEW/CHANGE

TAKE MEASUREMENTS
AT STORAGE INTERVAL

DUAL SAMPLER OFF
BTL FULL DETECT ON
TIMED BACKLIGHT

EVENT MARK SENT
DURING PUMP CYCLE

2406010-01

Bottle Certification
Bottle Certification
*** DEFAULT CONTAINER ***

Jar Cert #

Filter lot # 1391669

NPDES Storm
Chain of Custody

2406009-01

Bottle Certification
Bottle Certification
*** DEFAULT CONTAINER ***

Outfall: 245

Date/Time sampler installed: 9/10/24 @ 14:30

Sampling Crew: SG, CA

Weather conditions: Sunny

Date/Time sampler pickup: 9/11/24 @ 14:06

Observed activities in area: N/A

Observations during sampler collection: N/A

Color, Odors, sheens: N/A

Type of Sample: ☒ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☒ >0.2 inches rain ☐ <0.02 inches of rain previous 24 hours

Samplers: ☒ Data downloaded ☒ Sample bottles marked

☒ Ice Present at pick-up ☒ Tubing Decon 1000mL DI water

☒ Caps on containers

Fill to...	Parameters:	Sample	QC
Neck	PAH's/Phthalates (1L) +	☑	☐ ☐
No head	[1]Total Mercury (125/250mL QC)	☑	☐
No head	[1]Diss Mercury (125/250mL QC)	☑	☐
Shoulder	Total Metals (250mL)	☑	
Shoulder	Diss Metals (125mL)	☑	
Shoulder	TSS (1L), (500 mL min)	☑	
Shoulder	Nutrients (250mL)	☑	
Shoulder	Ortho-P (125mL), (75min)	☑	
Shoulder	BOD (1L)	☑	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☐	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes 4.010 L config above
+1000 mL for QC per bottle, must submit 2 extra bottles
[1]If 250ml bottle used, thenQAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (µS)
1	1000	☑	148
2	1000	☑	95
3	1000	☑	194
4	1000	☑	96
5	1000	☑	139
6	250	☑	105
7		☐	
8		☐	
9		☐	
10		☐	
11		☐	
12		☐	

Total aliquots: 21

Sample Prep

Date/Time: 9/11/24 @ 15:29

Initial: CA, RG, SG

pH: 7.19

COND (µS): 402

Lab #: 2409013-05

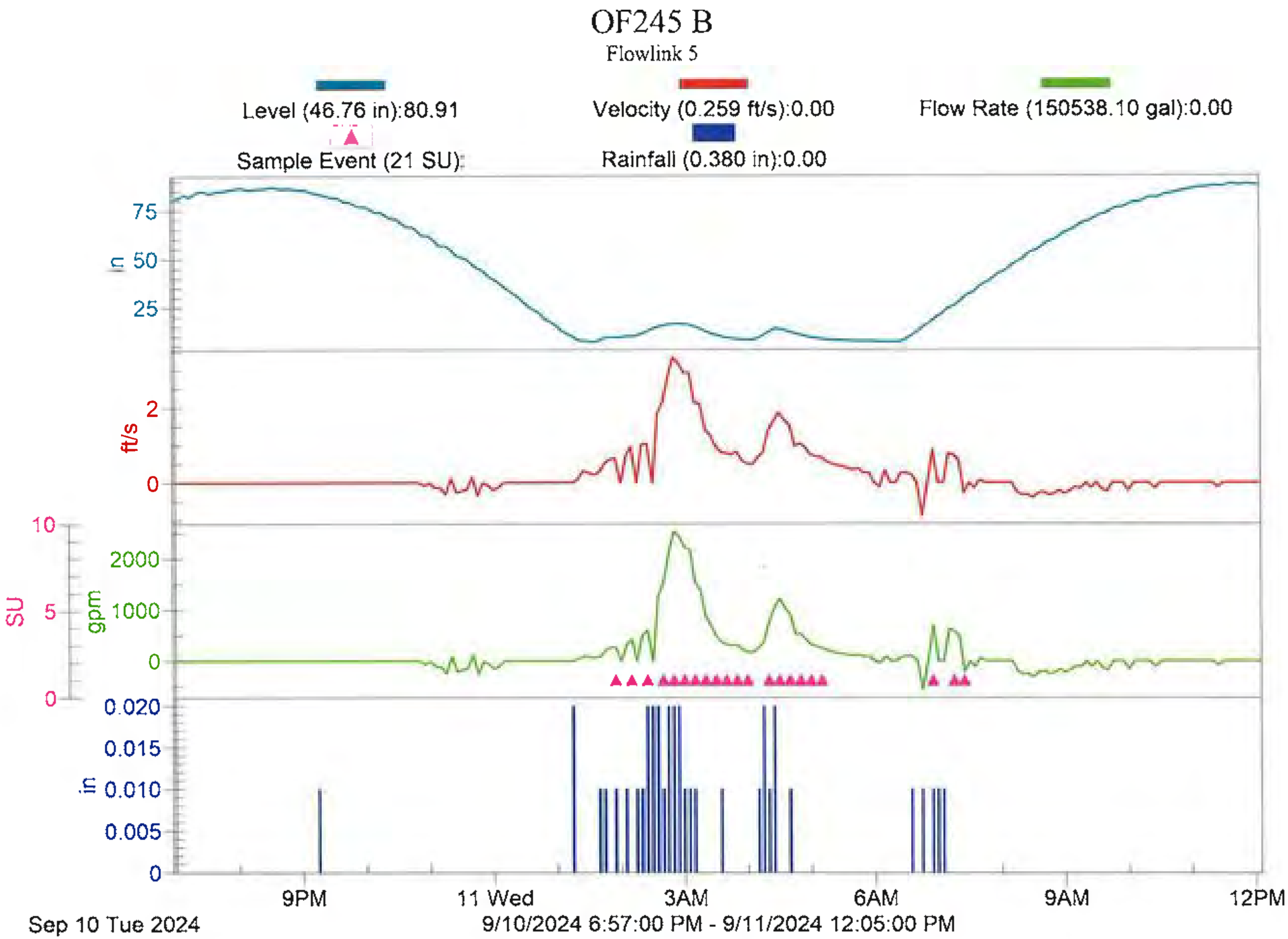
Aliquots composited: 21

Deviations:

Composite End Time: 9/11/24 @ 7:25
(Collect Time) Last aliquot in composite

Relinquished by: [signature] Received by: [signature]

Date/Time: 9/12/24 @ 955 Date/Time: 9/12/24 @ 9:58


OF245 B
Flowlink 5
Level (46.76 in):80.91
Velocity (0.259 ft/s):0.00
Flow Rate (150538.10 gal):0.00
Sample Event (21 SU):
Rainfall (0.380 in):0.00
in
75
50
25
ft/s
2
0
SU
10
5
0
gpm
2000
1000
0
in
0.020
0.015
0.010
0.005
0
9PM
11 Wed
3AM
6AM
9AM
12PM
Sep 10 Tue 2024
9/10/2024 6:57:00 PM - 9/11/2024 12:05:00 PM

SAMPLER ID# 1284476967 13:05 11-SEP-24
Hardware: A1 Software: 2.33
*********** SAMPLING RESULTS ***********
SITE: OF245 B
PROGRAM: STORM
Program Started at 13:36 TU 10-SEP-24
Nominal Sample Volume = 250 ml

SAMPLE	BOTTLE	TIME	SOURCE	ERROR	COUNT TO LIQUID
		13:36	PGM	DISABLED	
		WE 11-SEP-24			
		01:45	PGM	ENABLED	
1,4	1	01:55		T	594
		02:00	PGM	DISABLED	
		02:05	PGM	ENABLED	
2,4	1	02:10		T	599
		02:15	PGM	DISABLED	
		02:20	PGM	ENABLED	
3,4	1	02:25		T	596
		02:30	PGM	DISABLED	
		02:35	PGM	ENABLED	
4,4	1	02:40		T	591
1,4	2	02:50		T	592
2,4	2	03:00		T	596
3,4	2	03:10		T	599
4,4	2	03:20		T	602
1,4	3	03:30		T	604
2,4	3	03:40		T	605
3,4	3	03:50		T	607
4,4	3	04:00		T	608
		04:01	PGM	DISABLED	
		04:10	PGM	ENABLED	
1,4	4	04:20		T	600
2,4	4	04:30		T	600
3,4	4	04:40		T	604
4,4	4	04:50		T	604
1,4	5	05:00		T	608
2,4	5	05:10		T	608
		05:20	PGM	DISABLED	
		06:55	PGM	ENABLED	
3,4	5	06:55		T	583
		07:00	PGM	DISABLED	
		07:10	PGM	ENABLED	
4,4	5	07:15		T	579
1,1	6	07:25		T	577

250 ml SAMPLES

ENABLE:

FLOW >200.0 gpm

ENABLE:
REPEATABLE ENABLE
NO SAMPLE AT DISABLE
NO SAMPLE AT ENABLE

ENABLE:
COUNTDOWN IS STOPPED
WHILE DISABLED

ENABLE:
0 PAUSE & RESUMES

NO DELAY TO START

LIQUID DETECT ON

QUICK VIEW/CHANGE

TAKE MEASUREMENTS
EVERY 5 MINUTES

DUAL SAMPLER OFF
BTL FULL DETECT OFF
TIMED BACKLIGHT

PULSED EVENT MARK
AT INITIAL PURGE

2406009-01

Bottle Certification

Bottle Certification

*** DEFAULT CONTAINER ***

Jar Cert #__________

Filter lot # 1391669

NPDES Storm

Chain of Custody

Outfall: 254

Date/Time sampler installed: 9/10/24 @ 14:14

Sampling Crew: CA, SG

Weather conditions: Sunny

Date/Time sampler pickup: 9/11/24 @ 13:57

Observed activities in area: N/A

Observations during sampler collection: N/A

Color, Odors, sheens: N/A

Type of Sample: ☒ Stormwater ☐ Baseflow ☐ Rinse Blank

Rain event: ☒ >0.2 inches rain ☐ <0.02 inches of rain previous 24 hours

Samplers: ☒ Data downloaded ☒ ~~Sample bottles marked~~

☒ Ice Present at pick-up ☒ Tubing Decon 1000mL Di water

☒ Caps on containers

Fill to...	Parameters:	Sample	QC
Neck	PAH's/Phthalates (1L) +	☒	☐ ☐
No head	'Total Mercury (125/250mL QC)	☒	☐
No head	'Diss Mercury (125/250mL QC)	☒	☐
Shoulder	Total Metals (250mL)	☒	
Shoulder	Diss Metals (125mL)	☒	
Shoulder	TSS (1L), (500 mL min)	☒	
Shoulder	Nutrients (250mL)	☒	
Shoulder	Ortho-P (125mL), (75min)	☒	
Shoulder	BOD (1L)	☐	
Neck	Conventionals (500mL) = turbidity, surf., chl.	☒	
	Other:		
	Xtra (Unpreserved Conventionals)		☐

*Minimum volumes 4.010 L config above

+1000 mL for QC per bottle, must submit 2 extra bottles

'If 250ml bottle used, thenQAQC volume already included

Jars	Volume (mL)	Added to Comp	Conductivity (µS)
1	1000	☒	1186
2	1000	☒	2204
3	1000	☒	1899
4	750	☒	7010
5		☐	
6		☐	
7		☐	
8		☐	
9		☐	
10		☐	
11		☐	
12		☐	

Total aliquots: 15

Sample Prep

Date/Time: 9/11/24 @ 15:25

Initial: CA, RG

pH: ~~L02~~ 6.62

COND (µS): 2814

Lab #: 2409013-06

Aliquots composited: 15

Deviations:

Composite End Time: 9/11/24 @ 7:30

(Collect Time) Last aliquot in composite

Relinquished by: [signature]

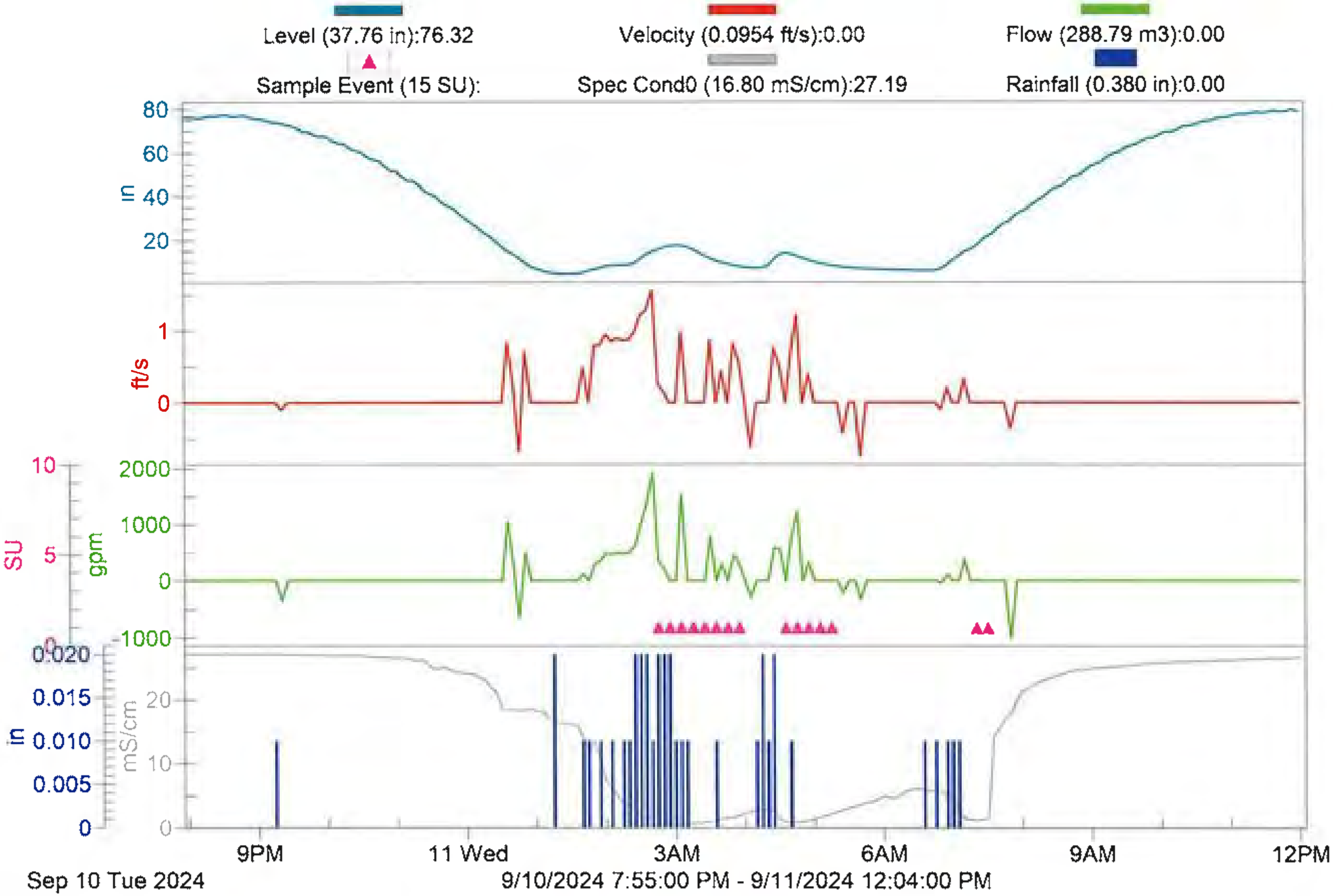
Date/Time: 9/12/24 @ 9:55

Received by: [signature]

Date/Time: 9/12/24 @ 9:58

254-

Flowlink 5



*********** SAMPLING RESULTS ***********
SITE: 254-
PROGRAM: STORM 1
Program Started at 15:07 TU 10-SEP-24
Nominal Sample Volume = 250 ml

SAMPLE	BOTTLE	TIME	SOURCE	ERROR	COUNT TO LIQUID
		15:07	PGM DISABLED		
------------- WE 11-SEP-24 -------------					
		02:35	PGM ENABLED		
1,4	1	02:45	T		644
2,4	1	02:55	T		628
3,4	1	03:05	T		628
4,4	1	03:15	T		632
1,4	2	03:25	T		630
2,4	2	03:35	T		636
3,4	2	03:45	T		636
4,4	2	03:55	T		640
		04:00	PGM DISABLED		
		04:30	PGM ENABLED		
1,4	3	04:35	T		628
2,4	3	04:45	T		634
3,4	3	04:55	T		636
4,4	3	05:05	T		636
1,3	4	05:15	T		640
		05:16	PGM DISABLED		
		07:10	PGM ENABLED		
2,3	4	07:20	T		618
3,3	4	07:30	T		618
		07:35	PGM DISABLED		

SOURCE T ==> TIME

250 ml SAMPLES

ENABLE:

SP_CO0 <2.000 mS/cm

ENABLE:

REPEATABLE ENABLE

NO SAMPLE AT DISABLE

NO SAMPLE AT ENABLE

ENABLE:

COUNTDOWN IS STOPPED

WHILE DISABLED

ENABLE:

0 PAUSE & RESUMES

NO DELAY TO START

LIQUID DETECT ON

QUICK VIEW/CHANGE

TAKE MEASUREMENTS

AT STORAGE INTERVAL

DUAL SAMPLER OFF

BTL FULL DETECT OFF

TIMED BACKLIGHT

EVENT MARK SENT

DURING PUMP CYCLE

ATTACHMENT B.2 - SSPM Field Reports

Field Report for the 2023-2024 Sediment Trap Samples

DESCRIPTION OF SAMPLING EVENTS

WY2024 sediment traps were installed August 21, 2023 - August 24, 2023. Traps were inspected quarterly; January 2023, March 2024, and June 2024. Sediment traps were collected August 20-22, 2024. Deviations from these dates are as follows:

- Sediment trap FD-7 bracket, and trap were installed in the new location for this water year on November 30, 2023. Rainfall accumulation missed at this location between August 21, 2023, and November 30, 2023, was 9.38 inches. The rainfall for the sampling period was 23.54 inches.
- Two bottles at site FD-23 were removed for WY2023 on August 22, 2024, due to cleaning and maintenance of the system the bottles were replaced for WY2024 on September 14, 2024. Rainfall accumulation during this time period was 0.0 inch.

As shown in Table 1, total rainfall during the sampling period was 26.44 inches as measured at NOAA Station Tacoma 1 located at the Central Wastewater Treatment Plant (CTP), 2201 Portland Avenue, Tacoma, WA 98421.

Table 1 – Rainfall for the Sampling Period

Month	August 2023-2024 Tacoma 1 Monthly Rainfall (inches)	Tacoma 1 Mar 18 – Aug 10 Average Monthly Rainfall (inches)	Historic Monthly Mean NCDC 1971 – 2000 (inches)
August 21-24, 2023 Sediment Traps Installed through August 31, 2024	0.0		
September 2023	1.14	1.29	1.42
October 2023	2.93	3.70	3.39
November 2023	4.74	6.68	6.10
December 2023	7.91	5.52	5.89
January 2024	6.6	5.93	5.38
February 2024	2.41	3.86	4.44
March 2024	1.61	4.06	4.18
April 2024	1.76	3.00	2.87
May 2024	1.24	2.11	2.01
June 2024	1.27	1.57	1.58
July 2024	0.4	0.68	0.86
August 20-22, 2024 Sediment Traps Retrieved	0.91	0.82[a]	0.83[a]
TOTAL	32.92	38.22	38.95

a. Total rainfall for the month of August

SAMPLE COLLECTION AND COMPOSITION

The samples were collected in accordance with the Thea Foss and Wheeler-Osgood Waterways Stormwater Monitoring Quality Assurance Project Plan, September 2014 (QAPP) and delivered to the City of Tacoma laboratory under chain-of custody procedures as described in the QAPP.

CORRECTIVE ACTION

No traps were lost during the deployment period from August 2023 to August 2024. Three sediment trap checks were performed quarterly during the 2023 – 2024 sampling year in January 2024, March 2024, and June 2024 as per QAPP requirements.

Appendix A

Field App Notes for the 2023-2024 Sediment Trap Samples

site name	visit time_pst	crew	bottle count	site condition	site issue comments	site repair	visit type	bottle collect	bottle deploy1	comments
FD-1	8/24/2023 11:34	CA,RG	2	Functioning			deploy	2	2	
FD-1	1/3/2024 13:58	SG,CA	2	Functioning			sitecheck			
FD-1	3/5/2024 14:44	SG,CA	2	Functioning			sitecheck			
FD-1	6/6/2024 11:04	SG,CA	2	Functioning			sitecheck			
FD-1	8/21/2024 14:10	CA,SG	2	Functioning			collect	2	2	
FD-10C	8/23/2023 10:55	RG,CA	1	Functioning			deploy	1	1	
FD-10C	1/11/2024 14:06	RG,CA	1	Functioning			sitecheck			
FD-10C	3/5/2024 11:00	SG,CA	1	Functioning			sitecheck			
FD-10C	6/7/2024 10:58	CA,SG	1	Functioning			sitecheck			
FD-10C	8/21/2024 14:50	CA,SG	1	Functioning			collect	1	1	
FD-13BNEW	8/22/2023 0:15	SG,RG,CA	1	Functioning			deploy	1	1	
FD-13BNEW	1/3/2024 14:31	SG,CA	1	Functioning			sitecheck			
FD-13BNEW	3/5/2024 11:10	SG,CA	1	Functioning			sitecheck			
FD-13BNEW	6/5/2024 14:12	SG,CA	1	Functioning			sitecheck			
FD-13BNEW	8/21/2024 11:30	CA,SG	1	Functioning			collect	1	1	
FD-16	8/22/2023 11:40	SG,RG,CA	1	Functioning			deploy	1	1	
FD-16	1/11/2024 14:22	CA,RG	1	Functioning			sitecheck			
FD-16	3/5/2024 10:20	SG,CA	1	Functioning			sitecheck			
FD-16	6/6/2024 11:01	SG,CA	1	Functioning			sitecheck			
FD-16	8/22/2024 10:00	SG,CA	1	Functioning			collect	1	1	
FD-18	8/22/2023 11:55	RG,CA	1	Functioning			deploy	1	1	
FD-18	1/11/2024 14:18	RG,CA	1	Functioning			sitecheck			
FD-18	3/5/2024 10:16	SG,CA	1	Functioning			sitecheck			
FD-18	6/6/2024 11:02	SG,CA	1	Functioning			sitecheck			
FD-18	8/22/2024 10:10	CA,SG	1	Functioning			collect	1	1	
FD-2	8/24/2023 11:24	RG,CA	2	Functioning			deploy	2	2	
FD-2	1/26/2024 10:31	RG,CA	2	Functioning			sitecheck			
FD-2	3/5/2024 14:44	SG,CA	2	Functioning			sitecheck			
FD-2	6/6/2024 11:03	SG,CA	2	Functioning			sitecheck			
FD-2	8/20/2024 15:04	SG,CA	2	Functioning			collect	2	2	
FD-21	8/24/2023 10:50	CA,RG	1	Functioning			deploy	1	1	
FD-21	1/3/2024 13:45	SG,CA	1	Functioning			sitecheck			
FD-21	3/5/2024 10:05	SG,CA	1	Functioning			sitecheck			
FD-21	6/5/2024 14:35	SG,CA	1	Functioning			sitecheck			
FD-21	8/21/2024 10:12	CA,SG	1	Functioning			collect	1	1	
FD-22	8/24/2023 10:40	RG,CA	2	Functioning			deploy	2	2	
FD-22	1/3/2024 13:43	SG,CA	2	Functioning			sitecheck			
FD-22	3/5/2024 10:02	CA,SG	2	Functioning			sitecheck			
FD-22	6/5/2024 14:33	SG,CA	2	Functioning			sitecheck			
FD-22	8/21/2024 10:05	SG,CA	2	Functioning			collect	2	2	
FD-23	9/14/2023 11:00	SG,RG,CA	2	Functioning			deploy	2	2	
FD-23	1/26/2024 10:25	RG,CA	2	Functioning			sitecheck			
FD-23	3/5/2024 10:08	SG,CA	2	Functioning			sitecheck			
FD-23	6/6/2024 11:24	SG,CA	2	Functioning			sitecheck			
FD-23	8/20/2024 14:40	SG,CA	2	Functioning			collect	2	2	Not yet redeployed for WY25 due to cleaning efforts
FD-2A	8/24/2023 11:11	CA,RG	2	Functioning			deploy	2	2	
FD-2A	1/3/2024 13:55	SG,CA	2	Functioning			sitecheck			
FD-2A	3/5/2024 14:45	SG,CA	2	Functioning			sitecheck			
FD-2A	6/6/2024 11:03	SG,CA	2	Functioning			sitecheck			
FD-2A	8/20/2024 15:13	CA,SG	2	Functioning			collect	2	2	
FD-3C	8/23/2023 0:45	RG,CA	2	Functioning			deploy	2	2	
FD-3C	1/3/2024 14:16	SG,CA	2	Functioning			sitecheck			
FD-3C	3/5/2024 10:28	CA,SG	2	Functioning			sitecheck			
FD-3C	6/6/2024 11:35	SG,CA	2	Functioning			sitecheck			
FD-3C	8/22/2024 11:00	SG,CA	2	Functioning			collect	2	2	
FD-3NEW	8/23/2023 11:28	RG,CA	1	Functioning			deploy	1	1	
FD-3NEW	1/3/2024 14:10	CA,SG	1	Functioning			sitecheck			
FD-3NEW	3/5/2024 10:25	SG,CA	1	Functioning			sitecheck			
FD-3NEW	6/6/2024 11:31	SG,CA	1	Functioning			sitecheck			
FD-3NEW	8/22/2024 10:50	SG,CA	1	Functioning			collect	1	1	
FD-6	8/23/2023 0:15	RG,CA	2	Functioning			deploy	2	2	
FD-6	1/3/2024 14:04	SG,CA	2	Functioning			sitecheck			
FD-6	3/5/2024 10:33	SG,CA	2	Functioning			sitecheck			
FD-6	6/6/2024 11:26	SG,CA	2	Functioning			sitecheck			
FD-6	8/21/2024 14:30	SG,CA	2	Functioning			collect	2	2	
FD-7	11/30/2023 12:00	RG,CA,SG	2	Functioning			deploy	2	2	Installed new site at 230A
FD-7	1/3/2024 14:13	RG,CA	2	Functioning			sitecheck			
FD-7	3/5/2024 10:25	SG,CA	2	Functioning			sitecheck			
FD-7	6/6/2024 11:32	SG,CA	2	Functioning			sitecheck			
FD-7	8/22/2024 11:58	SG,CA	2	Functioning			collect	2	2	

CHAIN OF COUSTODY

Tacoma

City of Tacoma Environmental Services
326 East D Street
Tacoma
WA, 98421-1801

phone (253) 502-2130
fax (253) 502-2170

Lab Work Order Number 2408030

Client Name: ES Science and Engineering	Project Name: 2024 NPDES/Foss Stormwater Sediment Traps
Client Contact: Laura Nokes	Project Number: ENV-03002-04-01
Address: 326 East D Street	Project Description: 2024 NPDES/Foss Stormwater Discharge Monitoring
City: Tacoma	PO Number: 61000059492
State/Zip: WA, 98421	Sampler Signatures:
Phone: (253) 502-2109 / Fax: (253) 502-2295	
Samplers:	

Requested Turn Around

Rush requests subject to additional charge

Rush requests subject to lab approval.

Standard (days):

Expedited (days):

Due Date:

Requested Analyses

Sample Name or Field ID #	Sampled Date	Sampled Time	Sample Type Code	Matrix Code	Container Count	MTC_Grainsize_PSEP	Total DS 6020B::Mercury, total 7471B	S8270E_SIM::S8270E_PCB	NWTPH_Dx	Phosphorus, Total_4500P_BF	Organic Carbon, Total 9060 Mod; Solids, Total SM2540	Solids, Total Volatile SM2540G	PBDE		Sample Number	Sample Comments
FD3-New	8/22/24	10:50	C	S	1	x	x	x	x	x	x	x	x		-01	
FD3-C	8/22/24	11:00	C	S	2	x	x	x			x	x			-02	
FD16	8/22/24	11:00	C	S	1	x		x			x	x			-03	
FD18	8/22/24	10:10	C	S	1	x		x			x	x			-04	
FD6	8/21/24	14:40	C	S	2	x	x	x	x	x	x	x	x		-05	
FD2	8/20/24	15:04	C	S	2	x	x	x	x	x	x	x	x		-06	
FD2-A	8/20/24	15:13	C	S	2	x		x			x	x			-07	
FD13B-New	8/21/24	11:30	C	S	1	x		x			x	x			-08	
FD10-C	8/21/24	14:50	C	S	1	x		x			x	x			-09	
FD1	8/21/24	19:10	C	S	2	x	x	x	x	x	x	x	x		-10	
FD23	8/20/24	14:40	C	S	2	x	x	x	x	x	x	x	x		-11	
FD21	8/21/24	10:12	C	S	1	x	x				x	x			-12	
FD22	8/21/24	10:05	C	S	2	x	x	x			x	x			-15	

Relinquished By	Received By	Date/Time
		8/22/24 @
Relinquished By	Received By	Date/Time
Relinquished By	Received By	Date/Time

Comments: Analyses dependent upon sample volume. Some analyses may not be analyzed due to low sample volumes

Cooler Numbers and Temperatures

Matrix Codes: S=Soil

Preserv Codes:

Login Reviewed By ____________ Date ____________

Chain of Custody

Tacoma

326 East D Street
Tacoma
WA, 98421-1801

phone (253) 502-2130
fax (253) 502-2170

Lab Work Order Number 2408030

Client Name	Project Name
ES Science and Engineering	
Client Contact	**Project Number**
Laura Nokes	
Address	**Project Description**
326 East D Street	
City	**PO Number**
Tacoma	
State/Zip	**Sampler Signatures**
WA, 98421	
Phone / **Fax**	
(253) 502-2274 / (253) 502-2295	
Sampler	
Chad Atkinson, Steve Shortencarrier, Chad Atkinson, Steve Shortencarrier, R	

Requested Turn Around	
Rush requests subject to additional charge Rush requests subject to lab approval	
Standard (days)	
Expedited (days)	
Due Date	

Sample Name or Field ID	Sampled Date	Sampled Time	Sample Type	Matrix Code	Container Count	MTC_Grainsize_PSEP	Total DS 6020B_Mercury, total 7471B	S8270E_SIM_S8270E_PCB	NWTPH_Dx	Phosphorus, Total_4500P_BF	Organic Carbon, Total 9060 Mod_Solids, Total SM2540	PBDE			Sample Number	Sample Comments
Preservation Code						::NH32SO4	:Cool									
FD7	8/22/24	11:58	C	S	2	x	x	x	x	x	x	x			-16	
	8/21/24															

Relinquished By	Received By	Date/Time
[signature]		8/22/24 @
Relinquished By	Received By	Date/Time
Relinquished By	Received By	Date/Time

Comments

Cooler Numbers and Temperatures
Default Cooler

Matrix Codes: S=Sediment

Preserv. Codes: Cool=Cool <6°C (All unpreserved samples),NH32SO4=(NH3)2SO4, Cool <6°C

Cont. Codes: =*** DEFAULT CONTAINER ***, =250 mL WM CG :Conventionals, =250 mL WM CG :Metals, =250 mL WM CG :Organics

2023-2024 SEDIMENT TRAP LOCATIONS			
SED TRAP ID	**LOCATION**	**MH SAP**	**# of Traps**
FD-1	Dock St. pump station; MH inside pump station yard.	6762057	2
FD-2	Dock St. pump station; OF pipe offset from MH inside pump station ya	6774909	2
FD-2A	E. 23rd St. & Dock St.	6777412	2
FD-3C	S. 14th St. & A St. (triangle in on-ramp)	6776949	2
FD-3NEW	S. 15th St. & A St. (on bridge)	6766944	1
FD-6	E. 21st St. & Dock St. on the west side of Thea Foss.	6767511	2
FD-7	S. 15th St. & A St. (new OF230A sampling site)	6783605	2
FD-10C	Lawrence St. near Nalley's main Bldg. 7 loading dock door.	6765018	1
FD-13BNEW	S. 23rd St. & Ferry St. (west of FD-13B)	6782087	1
FD-16	S. 15th St. & Market St.	6766836	1
FD-18	1100 block of Market St.	6766487	1
FD-21	457 E. 18th St; CB near main office.	6510897	1
FD-22	CB downstream of site adjacent to Super Value on E. 18th St.	CB1614	2
FD-23	E. 21st St. & E. D St. east side of the The Foss.	6761877	2

Thea Foss and Wheeler-Osgood Waterways
Stormwater Monitoring Program

Field Report for Water Year 2024 Outfall 245 Sump Sample

DESCRIPTION OF SAMPLING EVENT:

The sump (Manhole 390 – MH390) at Outfall 245 was cleaned on September 13, 2023 and sampled on August 20, 2024. The accumulated sump sediment for this year measured approximately 0 to 1.5 inches in depth. The calculated amount of sediment present in the sump was approximately 0.35 cubic feet of material.

A confined space entry was performed to measure the sediment depths. Samples were obtained from the top of the manhole using a ponar sampling device. Random samples were obtained from the deposited sediment and composited into a large stainless-steel bowl. The sediment in the bowl was homogenized by stirring with a stainless-steel spoon until textural and color homogeneity was achieved. After final homogenization, the composite was placed into appropriate sample. The samples were collected under chain-of-custody procedures and delivered to the City of Tacoma laboratory. At the laboratory, the samples were logged and analyzed according to standard operating procedures. Field notes are attached in Appendix A.

The manhole was sampled, and all mapping and depth measurements of accumulated sediment were completed on August 20, 2024. The site was cleaned for the WY2025 monitoring period on August 21, 2024 in accordance with QAPP guidelines.

It was determined that pre-cleaning sampling was not required for disposal based on past analytical results. Vactor wastes were co-mingled with sanitary wastes at the Central Treatment Plant decant facility.

Total rainfall in WY2024 between the sampling/cleaning events was 32.61 inches as shown in Table 1 as measured at NOAA Station Tacoma 1 located at the Central Wastewater Treatment Plant located at 2201 Portland Avenue, Tacoma, WA 98421.

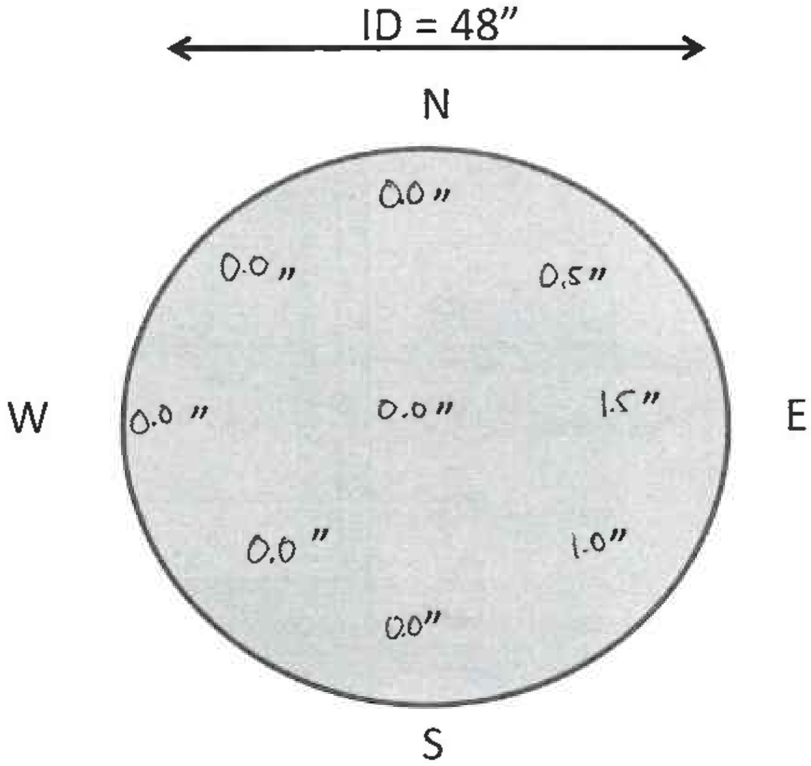
Table 1 – Rainfall for the Sampling Period			
Month	September 2023-August 2024 Tacoma 1 Monthly Rainfall (inches)	Tacoma 1 1982-1998 Average Monthly Rainfall (inches)	Historic Monthly Mean NCDC 1971 – 2000 (inches)
September 1-12 (date sampled) Note cleaned on September 13, 2023)	0.00		
September	1.14		
October	2.93	3.49	3.39
November	4.74	6.73	6.10
December	7.91	5.65	5.89
January	6.6	6.01	5.38
February	2.41	3.63	4.44
March	1.61	4.09	4.18
April	1.76	2.96	2.87
May	1.24	1.93	2.01
June	1.27	1.56	1.58
July	0.4	0.73	0.86
August 20, 2024 (date cleaned) – August 21, 2024	0.60	1.14[a]	1.42[a]
TOTAL	32.61	38.80	38.95

a. Total rainfall for the month of September.

SAMPLE COLLECTION AND COMPOSITING:

The sample was collected in accordance with the QAPP and delivered to the City of Tacoma Laboratory under chain-of-custody procedures as described in the QAPP. The sample was analyzed for solids, total-volatiles, NWTPH-Dx, total-PCBs, PAH, total-phthalates, pesticides, grain size, TOC, total-phosphorous, bifenthrin, mercury, lead, copper, cadmium, and zinc. There were no deviations from the field procedures as discussed in the QAPP other than those discussed above.

MH 390 Depth measurements and collected samples perform on August 20, 2024 @ 10:10



Radius (r) = 24"

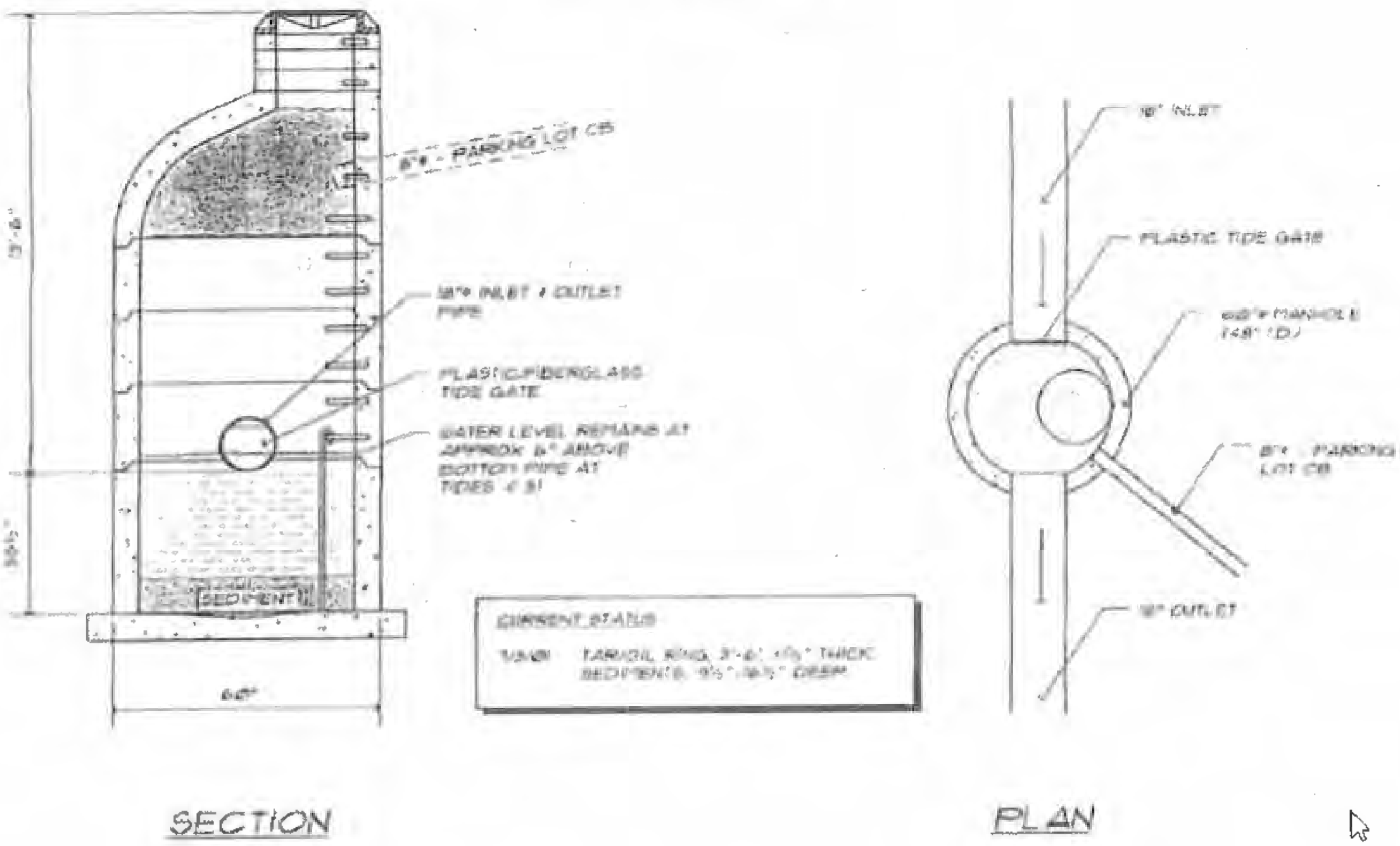
Avg depth (h) = 0."

$V = \pi r^2 h$

V = 602.58 cubic inches

V = 0.35 cubic feet

Figure B2-11
Sediment Trap Thea Foss Waterway



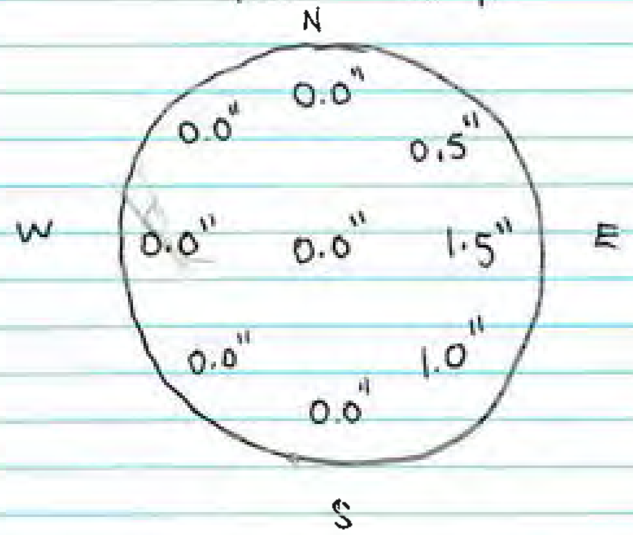
City of Tacoma
Environmental Services Department

Manhole #390
OF 245
Johnny's Dock Restaurant
1900 East 'D' Street

MH390 Sampling 8/20/24

SG, CA, RG @ 10:10

Measured depths in sump:



Sampling completed @ 10:45

$$\frac{0.0 + 0.0 + 0.0 + 0.0 + 0.0 + 0.0 + 0.5 + 1.5 + 1.0}{9} =$$

average = 0.333 (height)
Radius = 24'

City of Tacoma Environmental Services
326 East D Street phone (253) 502-2130
Tacoma fax (253) 502-2170
WA, 98421-1801

Page 1 of 1

Lab Work Order Number 2408030

Client Name: ES Science and Engineering		Project Name: 2024 NPDES/Foss Stormwater Sediment Traps	
Client Contact: Laura Nokes		Project Number: ENV-03002-04-01	
Address: 326 East D Street		Project Description: 2024 NPDES/Foss Stormwater Discharge Monitoring	
City: Tacoma		PO Number: 61000059492	
State/Zip: WA, 98421		Sampler Signatures	
Phone: (253) 502-2109	Fax: (253) 502-2295		
Samplers: R. Gore. S. George. C. Atkinson			

Requested Analyses: MTC_Grainsize_PSEP; Total DS 6020B::Mercury, total 7471B; S8270E_SIM:: S8270E_PCB; NWTPH_Dx; Phosphorus, Total_4500P_BF; Organic Carbon, Total 9060 Mod:: Solids, Total SM2540; Solids, Total Volatile SM2540G; PBDE

Requested Turn Around: Rush requests subject to additional charge. Rush requests subject to lab approval. Standard (days): X; Expedited (days); Due Date

Sample Name or Field ID #	Sampled Date	Sampled Time	Sample Type Code	Matrix Code	Container Count	MTC_Grainsize_PSEP	Total DS 6020B::Mercury, total 7471B	S8270E_SIM:: S8270E_PCB	NWTPH_Dx	Phosphorus, Total_4500P_BF	Organic Carbon, Total 9060 Mod:: Solids, Total SM2540	Solids, Total Volatile SM2540G	PBDE		Sample Number	Sample Comments
MH-390	8/20/24	@ 10:45	C	S	2	x	x	x	x	x	x	x	x		-13	
MH-390 DUP	8/20/24	@ 10:45	C	S	2	x	x	x	x	x	x	x	x		-14	
			C	S												
			C	S												
			C	S												
			C	S												
			C	S												
			C	S												
			C	S												
			C	S												
			C	S												
			C	S												
			C	S												
			C	S												

Relinquished By	Received By	Date/Time
[signature]	Cooler	8/20/24 @ 11:10

Cooler Numbers and Temperatures

Comments: Analyses dependent upon sample volume. Some analyses may not be analyzed due to low sample volumes.

Matrix Codes: S=Soil

Preserv. Codes:

APPENDIX C

Table C-1
Storm Field Summary Report for OF230A WY2024

	Storm Flow Criteria	Sample 1	Sample 2	Sample 2 Partial	Sample 3	Sample 4	Sample 5	Sample 6	Sample 7	Sample 8	Sample 9
Start of Rainfall		11/1/2023	12/9/2023	12/9/2023	12/18/2023	1/5/2024	1/20/2024	2/14/2024	4/25/2024	5/21/2024	9/10/2024
		17:55:00	10:50:00	10:50:00	15:25:00	13:30:00	18:55:00	20:35:00	4:30:00	5:50:00	21:15:00
End of Rainfall		11/2/2023	12/10/2023	12/9/2023	12/19/2023	1/6/2024	1/22/2024	2/15/2024	4/26/2024	5/21/2024	9/11/2024
		9:30:00	7:05:00	18:30:00	11:20:00	9:25:00	14:45:00	2:45:00	4:05:00	21:25:00	7:05:00
Antecedent Dry Period (hours)	<0.02 in 24 hours	176.58	49.5	49.5	101.25	8.58	41.08	59.92	380.25	60.42	357.42
Total Rainfall (inches)	>0.2	0.94	0.97	0.56	0.28	0.37	1.31	0.25	0.84	0.29	0.38
Rainfall Duration (hours)		15.58	20.25	7.67	19.92	19.92	43.83	6.17	23.58	15.58	9.83
Start of Storm Flow		11/1/23 22:00	12/9/23 10:30	12/9/23 10:30	12/18/23 15:00	1/5/24 13:20	1/20/24 18:55	2/14/24 20:20	4/25/24 4:25	5/21/24 5:30	9/11/24 0:55
End of Storm Flow		11/2/23 8:50	12/10/23 8:25	12/9/23 18:40	12/19/23 12:40	1/6/24 9:45	1/22/24 15:40	2/15/24 3:50	4/26/24 4:10	5/21/24 21:30	9/11/24 7:45
Total Volume of Storm Runoff (cf)		258,196	641,317	315,030	187,003	298,893	909,917	163,940	331,835	125,271	118,608
Duration of storm runoff (hours)		10.83	21.92	8.17	21.67	20.42	44.75	7.50	23.75	16.00	6.83
Corrected Duration of storm runoff (hours)		9.66	21.92	8.17	21.67	20.42	44.75	7.50	23.75	16.00	6.83
Flow Calculation (method)	Area*Velocity										
Flow Range (cfs) Avg		6.62	8.13	10.72	2.40	4.07	5.65	6.07	3.88	2.17	4.82
Flow Range (cfs) Max		26.11	35.42	23.40	21.97	19.03	23.88	22.38	15.71	5.58	24.30
Volume Sampled (cf)	>75% of Storm Volume Sampled	121,520	311,657	311,657	176,840	217,001	820,590	151,693	296,504	101,913	114,396
Start of Event		11/1/2023	12/9/2023	12/9/2023	12/18/2023	1/5/2024	1/20/2024	2/14/2024	4/25/2024	5/21/2024	9/11/2024
		19:45:00	10:35:00	10:35:00	15:15:00	20:45:00	19:00:00	20:25:00	5:40:00	5:40:00	0:45:00
End of Event		11/2/2023	12/9/2023	12/9/2023	12/19/2023	1/6/2024	1/22/2024	2/15/2024	4/26/2024	5/21/2024	9/11/2024
		3:56:00	18:35:00	18:35:00	23:57:00	6:23:00	13:17:00	2:55:00	0:58:00	17:36:00	7:07:00
Sampling Duration (hours)	>2*Time of Concentration up to 24 hours	8.18	8.00	8.00	32.70	9.63	42.28	6.50	19.30	11.93	6.37
Corrected Sampling Duration (hours)		4.68	8.00	8.00	20.00	7.80	29.70	5.50	15.97	7.76	6.03
Disable time subtracted		3.50	0.00	0.00	12.70	1.83	12.58	1.00	3.33	4.17	0.34
Aliquots Composited	>10	16	48	48	34	20	39	36	19	12	18
Conductivity Range (uS/cm)	<2,000	31.5 - 71.4	32.2 - 522	32.2 - 522	78.4 - 800	35.3 - 85.8	43.3 - 85.8	33.5 - 258	35.9 - 65.0	50.6 - 67.8	35 - 108
Tidal Window		11/1/2023	10/9/2023	10/9/2023	12/18/2023	1/5/2024	1/20/2024	2/14/2024	4/25/2024	5/21/2024	9/10/2024
Time (24:00) Stage (feet)		14:33 7.60	07:56 6.85	07:56 6.85	09:44 12.85	00:16 8.0	11:40 11.9	14:39 1.4	00:30 6.1	03:35 10.9	21:30 9.65
		19:07 10.52	13:33 11.60	13:33 11.60	16:01 6.07	04:42 6.4	19:13 -0.7	20:46 9.9	05:42 10.8	10:35 -0.3	9/11/2024
		11/2/2023	20:42 0.03	20:42 0.03	20:39 8.82	11:12 11.5	1/21/2024	2/15/2024	12:36 -1.3	17:46 10.5	05:07 0.71
		02:11 -1.52	12/10/2023	12/10/2023	12/19/2023	18:30 1.9	03:18 10.9	02:17 4.2	19:45 11.4	22:56 6.7	13:16 9.74
		09:58 12.06	03:57 10.60	03:57 10.60	03:12 0.64	1/6/2024	07:52 8.7	08:36 12.8	4/26/2024		14:15 8.56
			08:51 7.57	08:51 7.57	10:28 12.83	01:57 8.9	12:33 11.4		01:09 6.7		
					17:08 4.64	05:58 7.7	20:05 -1.3		06:08 10.6		
						11:48 11.2	1/22/2024				
							04:13 11.8				
							09:14 8.6				
							13:29 11.0				
Percent coverage		47	49	99	95	73	90	93	89	81	96

Table C-2
Storm Field Summary Report for OF235 WY2024

	Storm Flow Criteria	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	Sample 6	Sample 7	Sample 8	Sample 9	Sample 10	Sample 11	Sample 12	Sample 13	Sample 14	Sample 15
Start of Rainfall		10/16/2023	10/24/2023	11/1/2023	11/11/2023	12/9/2023	12/18/2023	1/5/2024	1/20/2024	2/14/2024	2/28/2024	4/25/2024	5/21/2024	6/2/2024	8/17/2024	9/10/2024
		7:00:00	15:05:00	17:55:00	5:45:00	10:50:00	15:25:00	13:30:00	18:55:00	20:35:00	1:40:00	4:30:00	5:50:00	10:05:00	19:15:00	21:15:00
End of Rainfall		10/16/2023	10/25/2023	11/2/2023	11/11/2023	12/10/2023	12/19/2023	1/6/2024	1/22/2024	2/15/2024	2/29/2024	4/26/2024	5/21/2024	6/3/2024	8/17/2024	9/11/2024
		20:20:00	9:20:00	9:30:00	10:05:00	7:05:00	11:20:00	9:25:00	14:45:00	2:45:00	8:50:00	4:05:00	21:25:00	2:55:00	22:05:00	7:05:00
Antecedent Dry Period (hours)	<0.02 in 24 hours	51.83	69.17	176.58	9.08	49.5	101.25	8.58	41.08	59.92	57	380.25	60.42	86.08	447.67	357.42
Total Rainfall (inches)	>0.2	0.57	0.66	0.94	0.53	0.97	0.28	0.37	1.31	0.25	1.18	0.84	0.26	0.92	0.27	0.38
Rainfall Duration (hours)		13.33	18.25	15.58	4.33	20.25	19.92	19.92	43.83	6.17	31.17	23.58	15.58	16.83	2.83	9.83
Start of Storm Flow		10/16/23 7:10	10/24/23 16:15	11/1/23 19:45	11/11/23 5:50	12/9/23 10:55	12/18/23 15:25	1/5/24 13:40	1/20/24 19:10	2/14/24 21:45	2/28/24 1:50	4/25/24 6:30	5/21/24 6:00	6/2/24 10:25	8/17/24 19:15	9/11/24 1:25
End of Storm Flow		10/16/23 21:35	10/25/23 10:35	11/2/23 10:15	11/11/23 11:10	12/10/23 9:10	12/19/23 15:35	1/6/24 9:35	1/22/24 15:00	2/15/24 5:05	2/29/24 9:20	4/26/24 4:10	5/21/24 21:30	6/3/24 6:55	8/17/24 22:20	9/11/24 7:45
Total Volume of Storm Runoff (cf)		119,255	145,975	198,512	136,548	242,439	94,622	119,340	427,320	80,570	379,839	224,255	111,996	618,635	36,820	71,717
Duration of storm runoff (hours)		14.42	18.33	14.50	5.33	22.25	24.17	19.92	43.83	7.33	31.50	21.67	15.50	20.50	3.08	6.33
Corrected Duration of storm runoff (hours)		14.09	18.33	14.33	5.33	22.25	22.34	19.92	42.08	7.33	31.50	20.67	14.92	20.08	3.08	6.33
Flow Calculation (method)	Area*Velocity															
Flow Range (cfs) Avg		2.30	2.21	3.80	7.11	3.03	1.09	1.66	2.71	3.05	3.35	2.88	2.01	8.38	3.32	3.15
Flow Range (cfs) Max		13.39	12.22	11.73	35.57	10.16	8.71	8.86	11.06	7.62	12.26	11.04	5.23	29.73	9.34	13.22
Volume Sampled (cf)	>75% of Storm Volume Sampled	100,100	141,804	161,570	136,205	189,015	49,973	110,525	297,589	80,077	312,333	200,729	79,615	554,854	35,490	68,702
Sample Type (Flow/Time Composite)																
Start of Event		10/16/2023	10/24/2023	11/1/2023	11/11/2023	12/9/2023	12/18/2023	1/5/2024	1/20/2024	2/14/2024	2/28/2024	4/25/2024	5/21/2024	6/2/2024	8/17/2024	9/11/2024
		7:25:00	16:15:00	19:45:00	5:50:00	13:15:00	15:25:00	13:45:00	18:50:00	21:50:00	1:50:00	6:40:00	6:00:00	10:25:00	19:20:00	1:25:00
End of Event		10/16/2023	10/25/2023	11/2/2023	11/11/2023	12/10/2023	12/19/2023	1/6/2024	1/22/2024	2/15/2024	2/29/2024	4/26/2024	5/21/2024	6/3/2024	8/17/2024	9/11/2024
		20:55:00	10:22:00	4:15:00	11:07:00	7:12:00	10:58:00	7:05:00	12:11:00	5:01:00	4:55:00	1:51:00	19:05:00	6:52:00	22:08:00	7:24:00
Sampling Duration (hours)	>2*Time of Concentration up to 24 hours	13.50	18.12	8.50	5.28	17.95	19.55	17.33	41.35	7.18	27.08	19.18	13.08	20.45	2.80	5.98
Corrected Sampling Duration (hours)		9.50	15.03	8.50	5.28	15.20	8.57	16.50	6.17	7.18	20.33	15.02	8.42	14.55	2.80	4.08
Disable time subracted		4.00	3.09	0.00	0.00	2.75	10.98	0.83	35.18	0.00	6.75	4.16	4.66	5.90	0.00	1.90
Aliquots Composited	>10	12	20	11	25	12	33	28	40	43	16	37	21	41	13	32
Conductivity Range (uS/cm)	<2,000	55.2 - 74.1	32.9 -97.3	37.7 - 62.7	31.6 - 121.0	71.2 - 102.2	99.8 - 307	49.5 - 228.6	67.9 - 238.4	45.7 - 178	49.6 - 129.3	46.9 - 159.5	94.9 - 168.8	51.2 - 109.8	81.6 - 151.3	41 - 117
Tidal Window Time (24:00) Stage (feet)		10/16/2023 00:21 -0.10 07:00 11.22 12:36 5.53 18:03 11.27 12/17/2023 00:54 -0.78	10/24/2025 14:44 11.85 21:02 4.78 10/25/2023 02:12 9.23 08:26 1.02 15:18 12.17	11/1/2023 14:33 7.60 19:07 10.52 11/2/2023 02:11 -1.52 09:58 12.06	11/11/2023 03:57 10.28 09:20 5.43 14:58 11.55 21.49 -0.04	10/9/2023 07:56 6.85 13:33 11.60 20:42 0.03 12/10/2023 03:57 10.60 08:51 7.57	12/18/2023 09:44 12.85 16:01 6.07 20:39 8.82 12/19/2023 03:12 0.64 10:28 12.83 17:08 4.64	1/5/2024 00:16 8.0 04:42 6.4 11:12 11.5 18:30 1.9 1/6/2024 01:57 8.9 05:58 7.7 11:48 11.2	1/20/2024 11:40 11.9 19:13 -0.7 1/21/2024 03:18 10.9 07:52 8.7 12:33 11.4 20:05 -1.3 1/22/2024 04:13 11.8 09:14 8.6 13:29 11.0	2/14/2024 14:39 1.4 20:46 9.9 2/15/2024 02:17 4.2 08:36 12.8	2/28/2024 19:34 9.9 2/29/2024 01:15 4.2 07:26 11.6 14:03 1.6 20:28 9.7 3/1/2024 5.5	4/25/2024 00:30 6.1 05:42 10.8 12:36 -1.3 19:45 11.4 4/26/2024 01:09 6.7 06:08 10.6	5/21/2024 03:35 10.9 10:35 -0.3 17:46 10.5 22:56 6.7	6/2/2024 08:42 0.9 15:03 9.0 20:09 4.9 45446 02:18 12.5 09:25 -0.9	8/17/2024 09:44 -1.69 17:31 11.5 22:49 7.46	9/10/2024 21:30 9.65 9/11/2024 05:07 0.71 13:16 9.74 14:15 8.56
Percent coverage		84	97	81	100	78	53	93	70	99	82	90	71	90	96	96

Table C-3
Storm Field Summary Report for OF237A WY2024

	Storm Flow Criteria	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5 Rejected	Sample 6	Sample 7	Sample8	Sample 9
Start of Rainfall		10/16/2023	11/3/2023	11/11/2032	12/9/2023	12/18/2023	1/5/2024	1/20/2024	4/25/2024	9/10/2024
		7:00:00	18:35:00	5:45:00	10:50:00	15:25:00	13:30:00	18:55:00	4:30:00	21:15:00
End of Rainfall		10/16/2023	11/4/2023	11/11/2023	12/10/2023	12/19/2023	1/6/2024	1/22/2024	4/26/2024	9/11/2024
		20:20:00	10:35:00	10:05:00	7:05:00	11:20:00	9:25:00	14:45:00	4:05:00	7:05:00
Antecedent Dry Period (hours)	<0.02 in 24 hours	51.83	33.08	9.05	49.5	101.25	8.58	41.08	380.25	357.42
Total Rainfall (inches)	>0.2	0.57	0.88	0.53	0.97	0.28	0.37	1.31	0.84	0.38
Rainfall Duration (hours)		13.33	16.00	4.33	20.25	19.92	19.92	43.83	23.58	9.83
Start of Storm Flow		10/16/23 7:20	11/3/23 20:05	11/11/23 5:45	12/9/23 5:45	12/18/23 16:25	1/5/24 18:35	1/20/24 19:45	4/25/24 7:30	9/11/24 2:05
End of Storm Flow		10/16/23 23:45	11/4/23 12:45	11/11/23 12:40	12/10/23 12:40	12/19/23 12:20	1/6/24 0:00	1/22/24 16:50	4/26/24 4:10	9/11/24 8:10
Total Volume of Storm Runoff (cf)		971,726	1,982,329	1,245,451	2,796,618	728,393	932,616	3,871,626	1,608,055	672,252
Duration of storm runoff (hours)		16.42	16.67	6.92	30.92	19.92	5.42	45.08	20.67	6.08
Corrected Duration of storm runoff (hours)		16.42	16.67	6.92	30.92	19.92	5.42	45.08	20.67	6.08
Flow Calculation (method)	Area*Velocity									
Flow Range (cfs) Avg		16.44	33.04	50.02	25.13	10.16	47.83	23.85	21.61	30.70
Flow Range (cfs) Max		63.08	257.64	149.36	93.07	52.25	25.30	77.75	77.67	87.01
Volume Sampled (cf)	>75% of Storm Volume Sampled	951,824	1,840,137	1,198,440	2,461,477	170,655	833,579	3,329,972	1,237,919	551,624
Sample Type (Flow/Time Composite)										
Start of Event		10/16/2023	11/3/2023	11/11/2023	12/9/2023	12/19/2023	1/5/2024	1/20/2024	4/25/2024	9/11/2024
		7:20:00	19:50:00	5:45:00	11:05:00	4:55:00	4:35:00	20:40:00	7:15:00	2:20:00
End of Event		10/16/2023	11/4/2023	11/11/2023	12/10/2023	12/19/2023	1/6/2024	1/22/2024	4/26/2024	9/11/2024
		23:07:00	12:41:00	11:09:00	5:01:00	7:41:00	7:25:00	15:36:00	0:30:00	7:43:00
Sampling Duration (hours)	>2*Time of Concentration up to 24 hours	15.78	16.85	5.40	17.93	2.77	26.83	42.93	17.25	5.38
Corrected Sampling Duration (hours)		15.78	14.35	5.40	17.93	2.77	10.67	31.77	9.17	2.83
Disable time subracted		0.00	2.50	0.00	0.00	0.00	16.16	11.16	8.08	2.55
Aliquots Composited	>10	12	33	22	15	12	16	41	14	17
Conductivity Range (uS/cm)	<2,000	44.9 - 150.9	36.0 - 351	31.3 - 106	50.6 - 231	121.4 - 295.8	55.6 - 145.8	74.0 - 329	60.0 -203.2	35 - 127
Tidal Window Time (24:00) Stage (feet)		10/16/2023 00:21 -0.10 07:00 11.22 12:36 5.53 18:03 11.27 12/17/2023 00:54 -0.78	11/3/2023 17:11 7.74 20:47 8.77 11/4/2023 03:49 0.32 12:02 11.48 18:41 7.15	11/10/2023 14:37 11.52 21:24 1.02 11/11/2023 03:57 10.28 09:20 5.43 14:58 11.55 21:49 -0.04	10/9/2023 07:56 6.85 13:33 11.60 20:42 0.03 12/10/2023 03:57 10.60 08:51 7.57	12/18/2023 09:44 12.85 16:01 6.07 20:39 8.82 12/19/2023 03:12 0.64 10:28 12.83 17:08 4.64	1/5/2024 00:16 8.0 04:42 6.4 11:12 11.5 18:30 1.9 1/6/2024 01:57 8.9 05:58 7.7 11:48 11.2	1/20/2024 11:40 11.9 19:13 -0.7 1/21/2024 03:18 10.9 07:52 8.7 12:33 11.4 20:05 -1.3 1/22/2024 04:13 11.8 09:14 8.6 13:29 11.0	4/25/2024 00:30 6.1 05:42 10.8 12:36 -1.3 19:45 11.4 4/26/2024 01:09 6.7 06:08 10.6	9/10/2024 21:30 9.65 9/11/2024 05:07 0.71 13:16 9.74 14:15 8.56
Percent coverage		98	93	96	88	23	89	86	77	82

Table C-3 Storm Field Summary Report for OF237A WY2024

Table C-4
Storm Field Summary Report for OF237B WY2024

	Storm Flow Criteria	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	Sample 6	Sample 7	Sample 8	Sample 9	Sample 10	Sample 11	Sample 12	Sample 13	Sample 14
Start of Rainfall		10/10/2023 7:00:00	10/16/2023 7:00:00	10/24/2023 15:05:00	11/1/2023 17:55:00	11/11/2023 5:45:00	12/9/2023 10:50:00	12/18/2023 15:25:00	1/5/2024 13:30:00	1/20/2024 18:55:00	2/14/2024 20:35:00	2/28/2024 1:40:00	4/25/2024 4:30:00	5/21/2024 5:50:00	9/10/2024 21:15:00
End of Rainfall		10/16/2023 20:20:00	10/16/2023 20:20:00	10/25/2023 9:20:00	11/2/2023 9:30:00	11/11/2023 10:05:00	12/10/2023 7:05:00	12/19/2023 11:20:00	1/6/2024 9:25:00	1/22/2024 14:45:00	2/15/2024 2:45:00	2/29/2024 8:50:00	4/26/2024 4:05:00	5/21/2024 21:25:00	9/11/2024 7:05:00
Antecedent Dry Period (hours)	<0.02 in 24 hours	51.83	51.83	69.17	176.58	9.08	49.5	101.25	8.58	41.08	59.92	57	380.25	60.42	357.42
Total Rainfall (inches)	>0.2	0.57	0.57	0.66	0.94	0.53	0.97	0.28	0.37	1.31	0.25	1.18	0.84	0.29	0.38
Rainfall Duration (hours)		13.33	13.33	18.25	15.58	4.33	20.25	19.92	19.92	43.83	6.17	31.17	23.58	15.58	9.83
Start of Storm Flow		10/10/23 4:05	10/16/23 6:50	10/24/23 15:35	11/1/23 19:30	11/11/23 5:30	12/9/23 10:45	12/18/23 15:20	1/5/24 17:25	1/20/24 18:55	2/14/24 20:50	2/28/24 2:35	4/25/24 6:50	5/21/24 5:55	9/11/24 1:20
End of Storm Flow		10/10/23 13:00	10/16/23 23:05	10/25/23 15:25	11/2/23 11:45	11/11/23 19:25	12/10/23 12:10	12/19/23 13:35	1/6/24 12:45	1/22/24 16:15	2/15/24 5:25	2/29/24 13:25	4/26/24 4:10	5/21/24 21:30	9/11/24 9:15
Total Volume of Storm Runoff (cf)		731,852	1,809,462	2,568,736	2,176,018	2,323,625	4,835,067	1,951,476	1,945,898	6,320,538	735,029	2,968,531	1,356,209	793,708	671,504
Duration of storm runoff (hours)		8.92	16.25	23.83	16.25	13.92	25.42	22.25	19.33	45.33	8.58	34.83	21.33	15.58	7.92
Corrected Duration of storm runoff (hours)		8.92	16.00	23.50	16.00	13.67	25.17	22.25	19.33	45.08	8.58	34.50	21.00	15.58	7.50
Flow Calculation (method)	Area*Velocity														
Flow Range (cfs) Avg		22.80	30.93	29.94	37.20	46.38	52.84	24.36	27.96	38.73	23.79	23.67	17.66	14.15	23.56
Flow Range (cfs) Max		40.50	95.20	97.28	84.51	155.64	120.27	63.27	55.98	107.07	40.66	73.22	70.39	22.85	70.03
Volume Sampled (cf)	>75% of Storm Volume Sampled	673,675	1,798,936	2,563,536	2,165,386	2,306,277	4,819,799	1,772,113	1,283,697	5,785,057	695,529	2,529,259	1,307,875	712,105	668,908
Start of Event		10/10/2023 4:00:00	10/16/2023 6:55:00	10/24/2023 15:40:00	11/1/2023 19:35:00	11/11/2023 5:40:00	12/9/2023 10:50:00	12/18/2023 15:25:00	1/6/2024 0:36:00	1/20/2024 19:00:00	2/14/2024 21:30:00	2/28/2024 14:20:00	4/25/2024 6:55:00	5/21/2024 6:00:00	9/11/2024 1:25:00
End of Event		10/10/2023 12:04:00	10/16/2023 23:04:00	10/25/2023 15:25:00	11/2/2023 11:42:00	11/12/2023 19:24:00	12/10/2023 12:09:00	12/19/2023 11:46:00	1/6/2024 11:05:00	1/22/2024 12:51:00	2/15/2024 5:19:00	2/29/2024 13:22:00	4/26/2024 2:58:00	5/21/2024 20:12:00	9/11/2024 9:15:00
Sampling Duration (hours)	>2*Time of Concentration up to 24 hours	8.07	16.15	23.75	16.12	37.73	25.32	20.35	10.48	41.85	7.82	23.03	20.05	14.20	7.83
Corrected Sampling Duration (hours)		8.07	16.15	23.75	16.12	37.73	25.32	20.35	10.48	41.85	7.82	23.03	20.05	13.03	7.83
Disable time subracted		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Aliquots Composited	>10	28	28	39	16	39	32	48	21	48	25	12	16	13	20
Conductivity Range (uS/cm)	<2,000	63.1 - 219.4	63.1 - 219.4	46.6 -258.4	65.4 - 122	38.2 - 261	61.0 - 200	70.6 - 252	97.2 - 220	77.6 - 200.8	81.9 - 220	84.1 - 159.4	43.7 - 213	148.1 - 236.9	57 - 166
Tidal Window Time (24:00) Stage (feet)		10/16/2023 00:21 -0.10 07:00 11.22 12:36 5.53 18:03 11.27 12/17/2023 00:54 -0.78	10/16/2023 00:21 -0.10 07:00 11.22 12:36 5.53 18:03 11.27 12/17/2023 00:54 -0.78	10/24/2025 14:44 11.85 21:02 4.78 10/25/2023 02:12 9.23 08:26 1.02 15:18 12.17	11/1/2023 14:33 7.60 19:07 10.52 11/2/2023 02:11 -1.52 09:58 12.06	11/11/2023 03:57 10.28 09:20 5.43 14:58 11.55 21.49 -0.04	10/9/2023 07:56 6.85 13:33 11.60 20:42 0.03 12/10/2023 03:57 10.60 08:51 7.57 14:02 11.58 21:13 -1.08	12/18/2023 09:44 12.85 16:01 6.07 20:39 8.82 12/19/2023 03:12 0.64 10:28 12.83 17:08 4.64	1/5/2024 00:16 8.0 04:42 6.4 11:12 11.5 18:30 1.9 1/6/2024 01:57 8.9 05:58 7.7 11:48 11.2	1/20/2024 11:40 11.9 19:13 -0.7 1/21/2024 03:18 10.9 07:52 8.7 12:33 11.4 20:05 -1.3 1/22/2024 04:13 11.8 09:14 8.6 13:29 11.0	2/14/2024 14:39 1.4 20:46 9.9 2/15/2024 02:17 4.2 08:36 12.8	2/28/2024 19:34 9.9 2/29/2024 01:15 4.2 07:26 11.6 14:03 1.6 20:28 9.7 3/1/2024 5.5	4/25/2024 00:30 6.1 05:42 10.8 12:36 -1.3 19:45 11.4 4/26/2024 01:09 6.7 06:08 10.6	5/21/2024 03:35 10.9 10:35 -0.3 17:46 10.5 22:56 6.7	9/10/2024 21:30 9.65 9/11/2024 05:07 0.71 13:16 9.74 14:15 8.56
Percent coverage		92	99	100	100	99	100	91	66	92	95	85	96	90	100

Table C-4 Storm Field Summary Report for OF237B WY2024

Table C-5
Storm Field Summary Report for OF243 WY2024

	Storm Flow Criteria	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	Sample 6	Sample 7
Start of Rainfall		10/24/2023	11/1/2023	12/9/2023	1/8/2024	2/28/2024	4/25/2024	6/2/2024
		15:05:00	17:55:00	10:50:00	4:05:00	1:40:00	4:30:00	10:05:00
End of Rainfall		10/25/2023	11/2/2023	12/10/2023	1/9/2024	2/29/2024	4/26/2024	6/3/2024
		9:20:00	9:30:00	7:05:00	11:45:00	8:50:00	4:05:00	2:55:00
Antecedent Dry Period (hours)	<0.02 in 24 hours	69.17	176.58	49.5	8.75	57	380.25	86.08
Total Rainfall (inches)	>0.2	0.66	0.94	0.97	0.92	1.18	0.84	0.92
Rainfall Duration (hours)		18.25	15.58	20.25	31.67	31.17	23.58	16.83
Start of Storm Flow		10/24/23 20:00	11/1/23 21:40	12/9/23 18:15	1/8/24 23:20	2/28/24 3:40	4/25/24 10:00	6/2/24 22:00
End of Storm Flow		10/25/23 10:00	11/2/23 9:30	12/10/23 2:30	1/9/24 11:50	2/29/24 13:20	4/26/24 4:05	6/3/24 10:00
Total Volume of Storm Runoff (cf)		53,686	34,450	4,940	6,034	13,608	4,994	1,845
Duration of storm runoff (hours)		14.00	11.83	8.25	12.50	33.67	18.08	12.00
Corrected Duration of storm runoff (hours)		14.00	9.08	8.25	6.58	16.67	7.08	6.25
Flow Calculation (method)	Area*Velocity							
Flow Range (cfs) Avg		1.07	0.81	0.17	0.13	0.11	0.08	0.04
Flow Range (cfs) Max		1.80	1.75	0.36	0.35	0.57	0.49	0.21
Volume Sampled (cf)	>75% of Storm Volume Sampled	34,654	20,930	4,644	5,112	13,060	2,398	1,495
Start of Event		10/24/2023	11/2/2023	12/9/2023	1/8/2024	2/28/2024	4/25/2024	6/2/2024
		23:15:00	1:40:00	18:30:00	19:40:00	3:25:00	11:30:00	22:35:00
End of Event		10/25/2023	11/2/2023	12/10/2023	1/9/2024	2/29/2024	4/25/2024	6/3/2024
		6:35:00	6:40:00	2:30:00	11:50:00	13:20:00	16:10:00	9:15:00
Sampling Duration (hours)	>2*Time of Concentration up to 24 hours	7.33	5.00	8.00	16.17	33.92	4.67	10.67
Corrected Sampling Duration (hours)		7.33	5.00	8.00	7.85	16.00	4.67	2.75
Disable time subracted		0.00	0.00	0.00	8.32	17.92	0.00	7.92
Aliquots Composited	>10	44	30	48	47	48	14	17
Conductivity Range (uS/cm)	<2,000	1818 - 5410	1632 - 2653	1629 - 3990	1512 - 6230	2506 - 17920	2491 - 8920	1623 - 3780
Tidal Window Time (24:00) Stage (feet)		10/16/2023 00:21 -0.10 07:00 11.22 12:36 5.53 18:03 11.27 12/17/2023 00:54 -0.78	11/1/2023 14:33 7.60 19:07 10.52 11/2/2023 02:11 -1.52 09:58 12.06	10/9/2023 07:56 6.85 13:33 11.60 20:42 0.03 12/10/2023 03:57 10.60 08:51 7.57	1/8/2024 04:02 11.1 08:46 8.9 13:11 11.1 20:38 -1.5 1/9/2024 04:43 12.0 09:42 8.9 13:57 11.2	2/28/2024 19:34 9.9 2/29/2024 01:15 4.2 07:26 11.6 14:03 1.6 20:28 9.7 3/1/2024 5.5	4/25/2024 00:30 6.1 05:42 10.8 12:36 -1.3 19:45 11.4 4/26/2024 01:09 6.7 06:08 10.6	6/2/2024 08:42 0.9 15:03 9.0 20:09 4.9 6/3/2024 02:18 12.5 09:25 -0.9
Percent coverage		65	61	94	85	96	48	81

Table C-5 Storm Field Summary Report for OF243 WY2024

Table C-6
Storm Field Summary Report for OF245 WY2024

	Storm Flow Criteria	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	Sample 6	Sample 7	Sample 8	Sample 9	Sample 10	Sample 11	Sample 12	Sample 13	Sample 14
Start of Rainfall		10/16/2023	10/24/2023	11/1/2023	11/11/2023	12/9/2023	12/18/2023	1/5/2024	1/20/2024	2/14/2024	2/28/2024	4/25/2024	5/21/2024	6/2/2024	9/10/2024
		7:00:00	15:05:00	17:55:00	5:45:00	10:50:00	15:25:00	13:30:00	18:55:00	20:35:00	1:40:00	4:30:00	5:50:00	10:05:00	21:15:00
End of Rainfall		10/16/2023	10/25/2023	11/2/2023	11/11/2023	12/10/2023	12/19/2023	1/6/2024	1/22/2024	2/15/2024	2/29/2024	4/26/2024	5/21/2024	6/3/2024	9/11/2024
		20:20:00	9:20:00	9:30:00	10:05:00	7:05:00	11:20:00	9:25:00	14:45:00	2:45:00	8:50:00	4:05:00	21:25:00	2:55:00	7:05:00
Antecedent Dry Period (hours)	<0.02 in 24 hours	51.83	69.17	176.58	9.08	49.5	101.25	8.58	41.08	59.92	57	380.25	60.42	86.08	357.42
Total Rainfall (inches)	>0.2	0.57	0.66	0.94	0.53	0.97	0.28	0.37	1.31	0.25	1.18	0.84	0.29	0.92	0.38
Rainfall Duration (hours)		13.33	18.25	15.58	4.33	20.25	19.92	19.92	43.83	6.17	31.17	23.58	15.58	16.83	9.83
Start of Storm Flow		10/16/23 7:30	10/24/23 15:55	11/1/23 20:05	11/11/23 5:50	12/9/23 11:30	12/18/23 15:45	1/5/24 14:30	1/20/24 19:10	2/14/24 21:55	2/28/24 3:25	4/25/24 6:50	5/21/24 6:15	6/2/24 11:05	9/11/24 1:45
End of Storm Flow		10/16/23 22:00	10/25/23 10:10	11/2/23 9:30	11/11/23 11:00	12/10/23 7:10	12/19/23 16:45	1/6/24 9:25	1/22/24 14:50	2/15/24 3:40	2/29/24 11:10	4/26/24 4:05	5/21/24 21:35	6/3/24 6:00	9/11/24 7:25
Total Volume of Storm Runoff (cf)		35,623	60,222	49,915	67,458	88,850	17,791	31,635	80,381	23,753	65,624	54,369	18,182	61,277	25,017
Duration of storm runoff (hours)		14.50	18.25	13.42	5.17	19.67	25.00	18.92	43.67	5.75	31.75	21.25	15.33	18.92	5.67
Corrected Duration of storm runoff (hours)		12.83	15.92	10.67	5.17	16.34	11.75	15.17	23.84	5.75	13.67	13.00	9.25	12.09	5.00
Flow Range (cfs) Avg		0.68	0.92	1.03	3.63	1.25	0.20	0.46	0.51	1.15	0.57	0.71	0.33	0.90	1.23
Flow Range (cfs) Max		4.38	5.23	3.43	8.85	5.44	2.69	3.34	4.26	3.62	5.65	4.23	1.26	5.71	5.63
Volume Sampled (cf)	>75% of Storm Volume Sampled	33,019	45,410	44,951	66,395	66,715	9,968	13,506	38,867	19,568	59,219	50,084	11,837	54,982	24,086
Start of Event		10/16/2023	10/24/2023	11/1/2023	11/11/2023	12/9/2023	12/18/2023	1/6/2024	1/20/2024	2/14/2024	2/28/2024	4/25/2024	5/21/2024	6/2/2024	9/11/2024
		7:30:00	17:40:00	20:10:00	5:50:00	11:30:00	16:05:00	0:50:00	13:45:00	22:25:00	9:20:00	6:50:00	7:00:00	11:05:00	1:45:00
End of Event		10/16/2023	10/25/2023	11/2/2023	11/11/2023	12/10/2023	12/19/2023	1/6/2024	1/22/2024	2/15/2024	2/29/2024	4/26/2024	5/21/2024	6/3/2024	9/11/2024
		21:20:00	9:35:00	7:30:00	11:05:00	3:10:00	15:05:00	15:30:00	7:55:00	3:05:00	11:10:00	0:25:00	11:40:00	5:55:00	7:25:00
Sampling Duration (hours)	>2*Time of Concentration up to 24 hours	13.83	15.92	11.33	5.25	15.67	23.00	14.67	42.17	4.67	25.83	17.58	4.67	18.83	5.67
Corrected Sampling Duration (hours)		10.33	4.73	7.43	4.05	8.12	2.23	2.35	8.22	2.73	7.87	8.12	4.08	7.12	3.27
Disable time subracted		3.50	11.19	3.90	1.20	7.55	20.77	12.32	33.95	1.94	17.96	9.46	0.59	11.71	2.40
Aliquots Composited	>10	29	28	44	26	48	13	14	48	16	24	48	24	42	21
Conductivity Range (uS/cm)	<2,000	55.6 - 16700	561 - 2197	103 - 4880	45.5 - 3040	23.9 - 571	1099 - 4850	54.3 - 1424	262.9 -1377	331 - 1470	74.8 - 1815	120.8 - 3800	305 - 1953	29.9 - 422	95 - 1481
Tidal Window Time (24:00) Stage (feet)		10/16/2023 00:21 -0.10 07:00 11.22 12:36 5.53 18:03 11.27 12/17/2023 00:54 -0.78	10/24/2025 14:44 11.85 21:02 4.78 10/25/2023 02:12 9.23 08:26 1.02 15:18 12.17	11/1/2023 14:33 7.60 19:07 10.52 11/2/2023 02:11 -1.52 09:58 12.06	11/10/2023 14:37 11.52 21:24 1.02 11/11/2023 03:57 10.28 09:20 5.43 14:58 11.55 21:49 -0.04	10/9/2023 07:56 6.85 13:33 11.60 20:42 0.03 12/10/2023 03:57 10.60 08:51 7.57	12/18/2023 09:44 12.85 16:01 6.07 20:39 8.82 12/19/2023 03:12 0.64 10:28 12.83 17:08 4.64	1/5/2024 00:16 8.0 04:42 6.4 11:12 11.5 18:30 1.9 1/6/2024 01:57 8.9 05:58 7.7 11:48 11.2	1/20/2024 11:40 11.9 19:13 -0.7 1/21/2024 03:18 10.9 07:52 8.7 12:33 11.4 20:05 -1.3 1/22/2024 04:13 11.8 09:14 8.6 13:29 11.0	2/14/2024 14:39 1.4 20:46 9.9 2/15/2024 02:17 4.2 08:36 12.8	2/28/2024 19:34 9.9 2/29/2024 01:15 4.2 07:26 11.6 14:03 1.6 20:28 9.7 3/1/2024 5.5	4/25/2024 00:30 6.1 05:42 10.8 12:36 -1.3 19:45 11.4 4/26/2024 01:09 6.7 06:08 10.6	5/21/2024 03:35 10.9 10:35 -0.3 17:46 10.5 22:56 6.7	6/2/2024 08:42 0.9 15:03 9.0 20:09 4.9 6/3/2024 02:18 12.5 09:25 -0.9	9/10/2024 21:30 9.65 9/11/2024 05:07 0.71 13:16 9.74 14:15 8.56
Percent coverage		93	75	90	98	75	56	43	99	82	90	92	65	90	96

Table C-7
Storm Field Summary Report for OF254 WY2024

	Storm Flow Criteria	Sample 1	Sample 2	Sample 3	Sample 4	Sample 4 Partial	Sample 5	Sample 6	Sample 7
Start of Rainfall		10/16/2023 7:00:00	10/24/2023 15:05:00	11/1/2023 17:55:00	12/9/2023 10:50:00	12/9/2023 10:50:00	1/5/2024 13:30:00	2/14/2024 20:35:00	9/10/2024 21:15:00
End of Rainfall		10/16/2023 20:20:00	10/25/2023 9:20:00	11/2/2023 9:30:00	12/10/2023 7:05:00	12/9/2023 21:10:00	1/6/2024 9:25:00	2/15/2024 2:45:00	9/11/2024 7:05:00
Antecedent Dry Period (hours)	<0.02 in 24 hours	51.83	69.17	176.58	49.5	49.5	8.58	59.92	357.42
Total Rainfall (inches)	>0.2	0.57	0.66	0.94	0.97	0.64	0.37	0.25	0.38
Rainfall Duration (hours)	0.00	13.33	18.25	15.58	20.25	10.33	19.92	6.17	9.83
Start of Storm Flow		10/16/23 7:30	10/24/23 16:10	11/1/23 19:55	12/9/23 12:30	12/9/23 12:30	1/5/24 15:35	2/14/24 21:55	9/11/24 1:50
End of Storm Flow		10/17/23 1:20	10/25/23 10:10	11/2/23 9:30	12/10/23 9:10	12/9/23 21:15	1/6/24 6:30	2/15/24 5:20	9/11/24 7:30
Total Volume of Storm Runoff (cf)		158,245	166,494	124,378	266,126	146,901	91,037	74,437	18,320
Duration of storm runoff (hours)		17.83	18.00	13.58	20.67	8.75	14.92	7.42	5.67
Corrected Duration of storm runoff (hours)		17.00	18.00	12.41	20.67	8.75	13.59	7.42	3.67
Flow Calculation (method)	Area*Velocity								
Flow Range (cfs) Avg		2.46	2.57	2.54	3.58	4.66	1.70	2.79	0.90
Flow Range (cfs) Max		7.22	7.16	6.45	9.82	9.43	6.67	6.47	4.31
Volume Sampled (cf)	>75% of Storm Volume Sampled	60,518	82,564	66,625	138,503	138,503	37,286	38,041	13,448
Sample Type (Flow/Time Composite)									
Start of Event		10/16/2023 10:55:00	10/24/2023 19:05:00	11/1/2023 21:30:00	12/9/2023 13:15:00	12/9/2023 13:15:00	1/5/2024 15:30:00	2/15/2024 0:10:00	9/11/2024 2:35:00
End of Event		10/17/2023 1:20:00	10/25/2023 7:55:00	11/2/2023 2:00:00	12/9/2023 21:15:00	12/9/2023 21:15:00	1/6/2024 3:20:00	2/15/2024 3:30:00	9/11/2024 7:30:00
Sampling Duration (hours)	>2*Time of Concentration up to 24 hours	14.42	12.83	4.50	8.00	8.00	11.83	3.33	4.92
Corrected Sampling Duration (hours)		8.08	7.92	4.5	8	8	8	3.33	2.18
Disable time subracted		6.34	4.91	0.00	0.00	0.00	3.83	0.00	2.74
Aliquots Composited	>10	48	48	27	48	48	48	20	15
Conductivity Range (uS/cm)	<2,000	5480 - 18130	4680 - 13040	3520 - 8220	1424 - 6350	1424 - 6350	5580 - 17250	5070 - 7780	1186 - 7010
Tidal Window Time (24:00) Stage (feet)		10/16/2023 00:21 -0.10 07:00 11.22 12:36 5.53 18:03 11.27 12/17/2023 00:54 -0.78 07:45 11.44	10/24/2025 14:44 11.85 21:02 4.78 10/25/2023 02:12 9.23 08:26 1.02 15:18 12.17	11/1/2023 14:33 7.60 19:07 10.52 11/2/2023 02:11 -1.52 09:58 12.06	10/9/2023 07:56 6.85 13:33 11.60 20:42 0.03 12/10/2023 03:57 10.60 08:51 7.57	10/9/2023 07:56 6.85 13:33 11.60 20:42 0.03 12/10/2023 03:57 10.60 08:51 7.57	1/5/2024 00:16 8.0 04:42 6.4 11:12 11.5 18:30 1.9 1/6/2024 01:57 8.9 05:58 7.7 11:48 11.2	2/14/2024 14:39 1.4 20:46 9.9 2/15/2024 02:17 4.2 08:36 12.8	9/10/2024 21:30 9.65 9/11/2024 05:07 0.71 13:16 9.74 14:15 8.56
Percent coverage		38	50	54	52	94	41	51	73

Table C-8
Field and Hydrologic Data Summary for Outfall 230/230A Baseflow
Water Year 2019 and 2024

Baseflow Critiera		2019		2024	
	Goals	Baseflow 1 (230)	Baseflow 2 (230)	Baseflow 1 (230A)	Baseflow 2 (230A)
Start of Event		6/20/2019 8:15	8/13/2019 21:45	8/8/2024 10:25	9/18/2024 8:00
End of Event		6/21/2019 3:07	8/14/2019 13:45	8/9/2024 10:25	9/19/2024 8:00
Sampling Duration (hours)	>4	18.63	14.40	23.45	20.48
Duration of Baseflow		10.4	6.90	24.0	24.0
Total Rainfall (inches)	<0.02	0	0	0	0
Last rainfall of0 .01		6/20/2019 1:50	8/10/2019 8:05	7/30/2024 3:35	9/15/2024 7:45
Antecedent Dry Period (hours)	<0.02 in 24 hours	344 (0.03", 6/20/19 00:35)	85.4	222.8	72.3
Flow Calculation (method)		Manning	Manning	Area*Velocity	Area*Velocity
Flow Range (cfs)	Avg/Max	0.72/1.13	2.09/2.49	0.24/0.82	0.29/1.32
Volume (cf)		29,054	65,587	20,849	24,842
Sampled Volume (cf)		46,323	57,534	20,453	20,911
Sample Type (Flow/Time Composite)		Flow	Flow	Flow	Flow
Sample Start		6/20/2019 8:29	8/13/2019 21:30	8/8/2024 10:25	9/18/2024 8:00
Sample Stop		6/21/2019 3:07	8/14/2019 11:54	8/9/2024 9:52	9/19/2024 4:29
Aliquots Composited	>10	40	48	48	48
Conductivity Range (uhmos)	<2,000	245 - 765	211 - 370	329 - 392	252 - 390
Tidal Window		Yes	Yes	No	No
Date		6/20/2019	8/13/2019		
Time (24:00) Stage (feet)		02:13 6.85	03:35 10.39		
		06:44 9.89	10:29 -1.06		
		13:36 -1.54	18:02 11.67		
		21:10 12.15	23:33 6.09		
		6/21/2019	8/14/2019		
		03:03 6.66	04:20 10.37		
		07:31 9.35	11:07 -0.98		
		14:16 -0.82	18:31 11.68		
		21:47 12.03			

Table C-9
Field and Hydrologic Data Summary for Outfall 235 Baseflow
Water Year 2019 and 2024

Baseflow Critiera		2019			2024	
	Goals	**Baseflow 1**	**Baseflow 2**	**Baseflow 3**	**Baseflow 1**	**Baseflow 2**
Start of Event		6/20/2019 11:15	8/13/2019 7:45	10/1/2019 21:00	8/6/2024 21:30	9/19/2024 7:10
End of Event		6/21/2019 9:30	8/14/2019 15:00	10/2/2019 10:33	8/7/2024 16:55	9/20/2024 4:25
Sampling Duration (hours)	>4	21.92	24.75	26.02	17.33	19.90
Duration of Baseflow		16.17	21.69	17.26	19.33	21.57
Total Rainfall (inches)	<0.02	0	0	0	0	0
Last rainfall of .01	<0.02	6/20/2019 1:50	8/10/2019 8:05	9/28/2019 6:00	7/30/2024 3:35	9/15/2024 7:45
Antecedent Dry Period (hours)	<0.02 in 24 hours	344 (0.03", 6/20/19 00:35)	71.4	74.5	185.9	96.6
Flow Calculation (method)		Manning	Manning	Manning	Area*Velocity	Area*Velocity
Flow Range (cfs)	Avg/Max	1.26/1.46	1.17/1.18	1.09/1.47	0.11/0.19	0.11/0.19
Volume (cf)		57,590	48,030	67,994	6,827	14,862
Sampled Volume (cf)		49,960	48,399	68,019	6,057	14,348
Sample Type (Flow/Time Composite)		Flow	Flow	Flow	Flow	Flow
Sample Start		6/20/2019 6:50	8/13/2019 7:31	10/1/2019 8:32	8/6/2024 21:30	9/19/2024 8:23
Sample Stop		6/21/2019 4:45	8/14/2019 8:16	10/2/2019 10:33	8/7/2024 14:50	9/20/2024 4:17
Aliquots Composited	>10	48	48	44	48	34
Conductivity Range (uhmos)	<2,000	318 - 389	307 - 337	378 - 904	364 - 677	433 - 845
Tidal Window		Yes	Yes	Yes	Yes	Yes
Date		6/20/2019	8/13/2019	10/1/2019	8/6/2024	9/19/2024
Time (24:00) Stage (feet)		02:13 6.85	03:35 10.39	01:11 -.024	19:55 11.8	06:13 11.6
		06:44 9.89	10:29 -1.06	07:37 11.61	8/7/2024	12:18 1.4
		13:36 -1.54	18:02 11.67	13:29 3.25	01:47 5.1	18:29 12.6
		21:10 12.15	23:33 6.09	19:20 12.15	06:57 9.8	9/20/2024
		6/21/2019	8/14/2019	10/2/2019	13:25 0.2	00:57 0.0
		03:03 6.66	04:20 10.37	01:56 -0.72	20:18 11.8	07:12 11.5
		07:31 9.35	11:07 -0.98	08:38 11.39		
		14:16 -0.82	18:31 11.68	14:21 4.56		
		21:47 12.03		20:00 11.56		

Table C-10
Field and Hydrologic Data Summary for Outfall 237A New Baseflow
Water Year 2019

	Baseflow Criteria[1]	Baseflow 1	Baseflow 2	Baseflow 3	Baseflow 4
Start of Event		5/8/2019 7:00	6/20/2019 5:00	7/31/2019 4:14	10/1/2019 19:51
End of Event		5/9/2019 7:00	6/21/2019 5:00	8/1/2019 4:14	10/2/2019 19:51
Sampling Duration (hours)	>4	24.90	28.95	21.65	24.12
Duration of Baseflow		21.87	24.95	17.90	21.62
Total Rainfall (inches)	<0.02	0	0	0	0
Last rainfall of 0.01		5/7/2019 6:10	6/20/2019 1:50	7/17/2019 19:45	9/28/2019 6:00
Antecedent Dry Period (hours)	<0.02 in 24 hours	24.8	344 (0.03", 6/20/19 00:35)	320.5	87.8
Flow Calculation (method)		Area*Velocity	Area*Velocity	Area*Velocity	Area*Velocity
Flow Range (cfs)	Avg/Max	5.19 / 5.40	3.26 / 3.59	5.41 / 5.97	5.73 / 7.50
Volume (cf)		392,598	240,707	363,395	399,772
Sampled Volume (cf)		228,903	148,968	353,203	437,427
Sample Type (Flow/Time Composite)		Flow	Flow	Flow	Flow
Sample Start		5/8/2019 7:00	6/20/2019 5:00	7/31/2019 4:14	10/1/2019 21:51
Sample Stop		5/9/2019 7:54	6/21/2019 9:57	8/1/2019 1:53	10/2/2019 21:58
Aliquots Composited	>10	43	29	20	44
Conductivity Range (uhmos)	<2,000	335 - 345	328 - 334	327 - 341	330 - 333
Tidal Window		Yes	Yes	Yes	Yes
Date		5/8/2019	6/20/2019	7/31/2019	10/1/2019
Time (24:00) Stage (feet)		02:02 6.68	02:13 6.85	03:51 11.28	01:11 -.024
		07:01 10.62	06:44 9.89	10:58 -2.91	07:37 11.61
		14:07 -2.08	13:36 -1.54	18:19 12.10	13:29 3.25
		21:21 11.88	21:10 12.15	23:45 6.69	19:20 12.15
		8/9/2019	6/21/2019	8/1/2019	10/2/2019
		02:57 7.06	03:03 6.66	04:42 11.45	01:56 -0.72
		07:45 10.19	07:31 9.35	11:45 -3.11	08:38 11.39
		14:56 -1.78	14:16 -0.82	18:58 12.45	14:21 4.56
		22:18 11.81	21:47 12.03		20:00 11.56

[1]Criteria are considered goals.

Table C-11
Field and Hydrologic Data Summary for Outfall 237B Baseflow
Water Year 2019

	Baseflow Criteria[1]	Baseflow 1	Baseflow 2	Baseflow 3
Start of Event		6/20/2019 7:00	7/31/2019 6:20	10/1/2019 12:04
End of Event		6/21/2019 7:00	8/1/2019 6:22	10/2/2019 13:41
Sampling Duration (hours)	>4	21.40	24.03	25.62
Duration of Baseflow		24.00	24.00	24.00
Total Rainfall (inches)	<0.02	0	0	0
Last rainfall of .01		6/20/2019 1:50	7/17/2019 20:10	9/28/2019 6:00
Antecedent Dry Period (hours)	<0.02 in 24 hours	344 (0.03", 6/20/19 00:35)	322.2	78.1
Flow Calculation (method)		Area*Velocity	Area*Velocity	Area*Velocity
Flow Range (cfs)	Avg/Max	8.38 / 8.71	8.53 / 8.95	6.88 / 6.99
Volume (cf)		726,906	739,817	887,602
Sampled Volume (cf)		646,453	739,817	887,602
Sample Type (Flow/Time Composite)		Flow	Flow	Flow
Sample Start		6/20/2019 7:00	7/31/2019 6:20	10/1/2019 12:04
Sample Stop		6/21/2019 4:24	8/1/2019 6:22	10/2/2019 13:41
Aliquots Composited	>10	48	48	48
Conductivity Range (uhmos)	<2,000	273 - 280	279 - 280	281 - 282
Tidal Window		Yes	Yes	Yes
Date		6/20/2019	7/31/2019	10/1/2019
Time (24:00) Stage (feet)		02:13 6.85	03:51 11.28	01:11 -.024
		06:44 9.89	10:58 -2.91	07:37 11.61
		13:36 -1.54	18:19 12.10	13:29 3.25
		21:10 12.15	23:45 6.69	19:20 12.15
		6/21/2019	04:42 11.45	10/2/2019
		03:03 6.66	11:45 -3.11	01:56 -0.72
		07:31 9.35	18:58 12.45	08:38 11.39
		14:16 -0.82		14:21 4.56
		21:47 12.03		20:00 11.56

[1]Criteria are considered goals.

Table C-12
Field and Hydrologic Data Summary for Outfall 243 Baseflow
Water Year 2019

	Baseflow Criteria[1]	Baseflow 1
Start of Event		10/1/2019 11:15
End of Event		10/2/2019 4:15
Sampling Duration (hours)	>4	16.47
Duration of Baselfow (hours)		9.5
Total Rainfall (inches)	<0.02	0
Last rainfall of .01		9/28/2019 6:00
Antecedent Dry Period (hours)	<0.02 in 24 hours	78.0
Flow Calculation (method)		Manning
Flow Range (cfs)	Avg/Max	3.46 / 3.68
Volume (cf)		121,336
Sampled Volume (cf)		113,610
Sample Type (Flow/Time Composite)		Flow
Sample Start		10/1/2019 12:01
Sample Stop		10/2/2019 4:29
Aliquots Composited	>10	38
Conductivity Range (uhmos)	<2,000	8190 - 20920
Tidal Window		Yes
Date		10/1/2019
Time (24:00) Stage (feet)		01:11 -.024
		07:37 11.61
		13:29 3.25
		19:20 12.15
		10/2/2019
		01:56 -0.72
		08:38 11.39
		14:21 4.56
		20:00 11.56

[1]Criteria are considered goals.

Table C-12 Field and Hydrologic Data Summary for Outfall 243 Baseflow Water Year 2019

Table C-13
Field and Hydrologic Data Summary for Outfall 245 Baseflow
Water Year 2019

	Baseflow Criteria[1]	Baseflow 1	Baseflow 2	Baseflow 3
Start of Event		5/8/2019 10:15	8/14/2019 7:30	10/1/2019 11:46
End of Event		5/8/2019 15:45	8/14/2019 12:45	10/2/2019 3:30
Sampling Duration (hours)	>4	2.95	4.80	15.75
Duration of Baseflow		5.50	5.25	5.75
Total Rainfall (inches)	<0.02	0	0	0
Last rainfall of .01		5/7/2019 6:10	8/10/2019 8:05	9/28/2019 6:00
Antecedent Dry Period (hours)	<0.02 in 24 hours	29.9	95.0	77.8
Flow Calculation (method)		Manning	Manning	Manning
Flow Range (cfs)	Avg/Max	0.77 / 1.64	0.48 / 0.49	0.77 / 0.86
Volume (cf)		15,061	9,429	17,251
Sampled Volume (cf)		130,843	9,994	18,910
Sample Type (Flow/Time Composite)		Flow	Flow	Flow
Sample Start		5/8/2019 12:01	8/14/2019 7:07	10/1/2019 11:46
Sample Stop		5/8/2019 14:58	8/14/2019 11:55	10/2/2019 3:31
Aliquots Composited	>10	48	48	40
Conductivity Range (uhmos)	<2,000	4000 - 9400	8710 - 20930	5960 - 21770
Tidal Window		Yes	Yes	Yes
Date		5/8/2019	8/14/2019	10/1/2019
Time (24:00) Stage (feet)		02:02 6.68	04:20 10.37	01:11 -.024
		07:01 10.62	11:07 -0.98	07:37 11.61
		14:07 -2.08	18:31 11.68	13:29 3.25
		21:21 11.88	8/15/2019	19:20 12.15
		8/9/2019	00:07 5.77	10/2/2019
		02:57 7.06	05:01 10.36	01:56 -0.72
		07:45 10.19	11:43 -0.77	08:38 11.39
		14:56 -1.78	18:57 11.63	14:21 4.56
		22:18 11.81		20:00 11.56

[1]Criteria are considered goals.

Table C-14
Field and Hydrologic Data Summary for Outfall 254 Baseflow
Water Year 2019

	Baseflow Criteria[1]	Baseflow 1	Baseflow 2	Baseflow 3
Start of Event		5/8/2019 10:00	6/20/2019 9:45	7/31/2019 7:30
End of Event		5/8/2019 16:00	6/20/2019 17:45	7/31/2019 13:15
Sampling Duration (hours)	>4	6.00	6.50	5.13
Duration of Baseflow		5.75	5.75	5.50
Total Rainfall (inches)	<0.02	0	0	0
Last rainfall of .01		5/7/2019 6:10	6/20/2019 1:50	7/17/2019 19:45
Antecedent Dry Period (hours)	<0.02 in 24 hours	28.0	344 (0.03", 6/20/19 00:35)	324.3
Flow Calculation (method)		Manning	Manning	Manning
Flow Range (cfs)	Avg/Max	0.08 / 0.23	0.11 / 0.16	0.12 / 0.24
Volume (cf)		1,564	2,391	2,090
Sampled Volume (cf)		1,604	3,902	2,501
Sample Type (Flow/Time Composite)		Flow	Flow	Flow
Sample Start		5/8/2019 10:08	6/20/2019 9:30	7/31/2019 8:00
Sample Stop		5/8/2019 16:08	6/20/2019 16:00	7/31/2019 13:08
Aliquots Composited	>10	46	20	27
Conductivity Range (uhmos)	<2,000	29750 - 33000	30600 - 35200	36600 - 39300
Tidal Window		Yes	Yes	Yes
Date		5/8/2019	6/20/2019	7/31/2019
Time (24:00) Stage (feet)		02:02 6.68	02:13 6.85	03:51 11.28
		07:01 10.62	06:44 9.89	10:58 -2.91
		14:07 -2.08	13:36 -1.54	18:19 12.10
		21:21 11.88	21:10 12.15	23:45 6.69
		8/9/2019	6/21/2019	8/1/2019
		02:57 7.06	03:03 6.66	04:42 11.45
		07:45 10.19	07:31 9.35	11:45 -3.11
		14:56 -1.78	14:16 -0.82	18:58 12.45
		22:18 11.81	21:47 12.03	

[1]Criteria are considered goals.

Table C-15
Precipitation Summary of Storm Events Sampled

	Antecedent (hours)	Precip (in)	Duration (hours)	Avg Intensity (in/hour)
9/25/2001	575	0.38	23.75	0.02
WY2002				
10/10/2001	39.5	0.33	7	0.05
10/24/2001	27.25	0.49	26.5	0.02
11/28/2001	27.3	1.27	24	0.05
12/12/2001	26.5	1.4	17	0.08
12/15/2001	38.3	0.5	24	0.02
1/6/2002	34.8	0.85	23	0.04
1/18/2002	149	0.25	10.3	0.02
1/23/2002	11.3	0.3	10.5	0.03
2/20/2002	33.5	0.73	10.8	0.07
3/16/2002	27.8	0.35	22.5	0.02
4/9/2002	70.5	0.22	22.5	0.01
4/26/2002	219.5	0.49	24.75	0.02
5/28/2002	11.3	0.2	10.3	0.02
6/28/2002	13.8	0.66	25.25	0.03
Annual Avg	**52.17**	**0.57**	**18.46**	**0.03**
WY2003				
10/3/2002	73	0.24	5.75	0.04
11/6/2002	397.5	0.46	8.25	0.06
11/13/2002	24.5	0.25	13.75	0.02
11/17/2002	37	0.34	14.75	0.02
12/10/2002	125.5	0.4	29	0.01
1/1/2003	27.5	0.81	11.5	0.07
(1)	--	0.97	26.25	0.04
1/11/2003	24.3	0.62	19.3	0.03
1/21/2003	161	0.43	8	0.05
1/25/2003	21.5	1.22	25.5	0.05
1/29/2003	41	0.51	13.8	0.04
(1)	--	0.44	6.75	0.07
2/15/2003	131.25	0.41	22.8	0.02
(1)		0.31	7.5	0.04
3/11/2003	31.75	0.4	12.75	0.03
(1)	--	0.36	4.75	0.08
4/1/2003	29.25	0.28	5.25	0.05
(1)	--	0.23	3	0.08
4/21/2003	179	0.39	11.5	0.03
9/16/2003	116	0.2	8.25	0.02
(1)	--	0.19	4	0.05
Annual Avg	**94.67**	**0.46**	**14.01**	**0.04**
WY2004				
10/6/2003	417	0.29	3	0.10
10/15/2003	65.5	0.53	10	0.05
10/22/2003	29	0.37	2.75	0.13
11/15/2003	318	0.21	9.5	0.02
12/2/2003	26	0.22	2.25	0.10
12/4/2003	40.5	0.5	23.5	0.02
(1)	--	0.34	9.5	0.04
12/20/2003		0.2	4.5	0.04
1/18/2004	59.75	0.25	12.5	0.02
(1)	--	0.21	9	0.02
1/22/2004	88.75	0.82	28.25	0.03
2/13/2004	199	0.4	8.75	0.05
3/3/2004	143.8	0.27	8.5	0.03
(1)	--	0.26	5.75	0.05
5/10/2004	52.5	0.25	9.75	0.03
5/25/2004	79.5	0.48	18.25	0.03
(1)	--	0.4	6.5	0.06
6/12/2004	97	0.29	13.75	0.02
8/6/2004	1277	0.55	18	0.03
8/21/2004	341.75	0.5	13.5	0.04
9/10/2004	32.75	0.84	10.75	0.08
(1)	--	0.8	4.75	0.17
9/15/2004	33	0.2	3.25	0.06
Annual Avg	**183.38**	**0.39**	**10.90**	**0.05**
WY2005				
10/5/2004	316.5	0.26	11.75	0.02
(1)	--	0.25	5.45	0.05
10/8/2004	47.25	1.04	15.5	0.07
11/1/2004	53.75	0.23	11.25	0.02
(1)	--	0.22	7.25	0.03
11/17/2004	30.25	0.34	4	0.09
12/9/2004	25	0.63	25.75	0.02
1/15/2005	259	0.41	14.25	0.03
2/6/2005	44.5	0.4	13	0.03
(1)	--	0.33	9.25	0.04
3/19/2005	66.25	0.21	9.5	0.02
(1)	--	0.2	6.75	0.03
4/10/2005	76.5	0.59	9.25	0.06
5/17/2005	37	0.57	24.5	0.02
6/16/2005	213	0.65	9.5	0.07
7/8/2005	52.75	0.33	10.5	0.03
9/29/2005	440.25	0.62	14.25	0.04
Annual Avg	**127.85**	**0.48**	**13.31**	**0.04**
WY2006				
10/14/2005	40.75	0.29	5.5	0.05
1/5/2006	33.75	1.3	22.25	0.06
(1)	--	1.06	12	0.09
1/16/2006	53.25	0.72	17	0.04
(1)	--	0.4	6.75	0.06
1/31/2006	26.75	0.27	4.75	0.06
2/26/2006	67.25	0.2	23.5	0.01
(1)	--	0.11	4.25	0.03
3/8/2006	25	0.41	13.25	0.03
(1)	--	0.28	2.45	0.11
4/8/2006	110	0.23	12.75	0.02
4/13/2006	114	0.97	27.25	0.04
(1)	--	0.65	9.5	0.07
5/21/2006	47	0.33	22.25	0.01
(1)	--	0.31	13.75	0.02
9/17/2006	2240.25	0.42	12	0.04
(1)	--	0.4	6.25	0.06
Annual Avg	**275.80**	**0.51**	**16.05**	**0.04**
WY2007				
10/14/2006	200	0.57	13.75	0.04
Partial	--	0.27	11.25	0.02
11/2/2006	335.75	0.93	19.75	0.05
Partial	--	0.31	11	0.03
Partial	--	0.54	15.75	0.03
Partial	--	0.66	16.5	0.04
11/15/2006	40.25	0.26	11.5	0.02
11/19/2006	58.5	0.49	6.75	0.07
Partial	--	0.28	2.75	0.10
2/17/2007	58	0.26	6	0.04
2/24/2007	48	0.32	7.75	0.04
3/19/2007	35.25	0.44	18	0.02
Partial	--	0.25	7.22	0.03
5/2/2007	83	0.35	21.5	0.02
6/9/2007	466.25	0.38	8	0.05
6/28/2007	85.5	0.24	15	0.02
9/3/2007	336.5	0.38	8.25	0.05
(1)	--	0.24	0.75	0.32
9/16-17/2007	288.25	0.28	22	0.01
9/27-28/2007	249.25	0.63	10.25	0.06
Annual Avg	**175.73**	**0.43**	**12.96**	**0.04**
WY2008				
10/10/2007	54.5	0.24	17.75	0.01
11/9-10/2007	385.5	0.20	6.75	0.03
11/26/2007	34.25	0.22	2.5	0.09
11/28-29/2007	43.75	0.23	14.25	0.02
12/14-15/07	29.75	0.27	18.25	0.01
12/27/2007	39.25	0.42	11.75	0.04
1/8/2008	37.5	0.28	8	0.04
1/14/2008	34.25	0.24	4.5	0.05
(1)	--	0.18	2.25	0.08
1/26/2008	147	0.28	11.25	0.02
(1)	--	0.24	4.5	0.05
2/29/2008	53.5	0.28	5.25	0.05
(1)	--	0.27	3.75	0.07
3/23/2008	53.25	0.53	14.25	0.04
Partial	--	0.23	5.5	0.04
5/20/2008	394	0.47	14	0.03
(1)	--	0.4	7.5	0.05
7/31/2008	45	0.22	12.75	0.02
8/19/2008	27.5	0.36	12	0.03
Annual Avg	**98.50**	**0.30**	**10.95**	**0.03**
WY2009				
10/3/2008	178.5	0.46	24.5	0.02
(1)	--	0.41	12.5	0.03
10/20/2008	54.75	0.25	8.5	0.03
10/31/2008	185.75	0.29	11.25	0.03
11/5/2008	38.75	2.71	36.25	0.07
Partial	--	0.36	10.25	0.04
11/10/2008	42.75	0.22	7.5	0.03
11/20/2008	183.25	0.2	8.75	0.02
12/12/2008	42	0.62	22.75	0.03
3/14/2009	111	0.34	14.5	0.02
3/28/2009	70	0.65	24	0.03
Partial	--	0.49	11.75	0.04
4/1/2009	24.25	0.32	18	0.02
4/17/2009	71.75	0.3	12.75	0.02
5/2/2009	75.75	0.25	10.75	0.02
5/18/2009	30.75	0.35	6.25	0.06
9/5/2009	44	0.29	8	0.04
(1)	--	0.28	4.75	0.06
9/19/2009	278.5	0.28	4	0.07
Annual Avg	**95.45**	**0.35**	**12.78**	**0.03**
WY2010				
10/16/2009	31.25	0.91	26.25	0.03
Partial	--	0.58	10	0.06
10/22/2009	31	0.52	17.25	0.03
(1)	--	0.51	12.5	0.04
10/28/2009	56.25	0.2	10	0.02
10/30/2009	38.25	0.22	13.75	0.02
11/5/2009	119.5	0.69	21.5	0.03
11/15/2009	42	0.37	11.25	0.03
11/25/2009	26.75	1.00	25.75	0.04
Partial	--	0.67	11	0.06
12/31/2009	24	0.29	5.75	0.05
1/4/2010	43.75	1.18	39.25	0.03
Partial	--	0.64	8.3	0.08
Partial	--	0.69	9	0.08
Partial	--	0.49	7	0.07
1/7/2010	53	0.98	28.25	0.03
Partial	--	0.49	15.5	0.03
1/10/2010	42.25	0.63	15.5	0.04
1/24/2010	159.25	0.41	9.5	0.04
2/10/2010	68.5	0.15	10.75	0.01
2/15/2010	28.25	0.25	11.5	0.02
3/11/2010	25.25	1.04	30.5	0.03
3/28/2010	36.25	0.22	4.75	0.05
4/2/2010	34	0.92	26	0.04
Partial	--	0.83	22.5	0.04
Partial	--	0.62	18.25	0.03
5/25/2010	44	0.58	31	0.02
Partial	--	0.29	20.75	0.01
5/27/2010	26.5	0.35	20	0.02
6/3/2010	32.25	0.25	9.25	0.03
6/8/2010	48.75	0.55	23.5	0.02
6/19/2010	67.25	0.2	14	0.01
9/26/2010	64.5	0.28	6	0.05
Annual Avg	**49.68**	**0.53**	**17.88**	**0.03**
WY2011				
10/8/2010	300.25	1.34	39.25	0.03
10/30/2010	42	0.38	16.25	0.02
11/9/2010	50	0.37	15.5	0.02
11/17/2010	32.5	0.51	30	0.02
11/29/2010	70	0.39	25.75	0.02
12/11/2010	31.25	1.84	42.25	0.04
1/20/2011	84.75	0.29	13	0.02
1/29/2011	106.5	0.22	8.5	0.03
2/12/2011	106.75	0.55	4.25	0.13
3/4/2011	21	0.21	5	0.04
3/12/2011	30.75	0.30	11.5	0.03
4/4/2011	21.25	0.37	24.5	0.02
4/13/2011	53	0.18	17	0.01
4/26/2011	26.25	0.23	2.25	0.10
5/2/2011	92.25	0.19	7.75	0.02
5/14/2011	70.5	1.36	20.5	0.07
5/25/2011	234.75	0.22	7.25	0.03
8/22/2011	861.5	0.22	10.5	0.02
Annual Avg	**124.18**	**0.51**	**16.72**	**0.04**
WY2012				
10/10/2011	10.75	0.75	28.75	0.03
Partial	--	0.54	10.25	0.05
Partial	--	0.56	11.75	0.05
Partial	--	0.66	16.75	0.04
10/28/2011	136.75	0.30	3.5	0.09
11/2/2011	75.75	0.47	5.75	0.08
11/11/2011	170.25	0.17	2.25	0.08
11/16/2011	86.25	0.31	15.25	0.02
Partial	--	0.19	5.5	0.03
11/21/2011	72.75	0.18	3.25	0.06
11/27/2011	58.75	0.30	5	0.06
1/4/2012	39	0.48	20.75	0.02
Partial	--	0.39	10.25	0.04
1/9/2012	101.5	0.21	7.5	0.03
1/24/2012	34.5	0.98	29	0.03
1/29/2012	73.25	1.32	21.5	0.06
1/31/2012	42	0.41	16.25	0.03
2/17/2012	27.25	0.86	24.25	0.04
Partial	--	0.83	24	0.03
2/24/2012	59.75	0.23	11.75	0.02
3/5/2012	62.5	0.31	4.75	0.07
3/14/2012	20.25	1.04	48.25	0.02
Partial	--	0.21	10.3	0.02
Partial	--	0.46	24	0.02
4/3/2012	41.25	0.15	3	0.05
4/19/2012	30.5	0.77	20	0.04
4/25/2012	11	0.65	34.5	0.02
4/29/2012	73.5	0.37	18.25	0.02
5/3/2012	28	0.62	18.25	0.03
5/20/2012	398.75	0.26	11.75	0.02
6/5/2012	21.25	0.30	6.25	0.05
6/7/2012	43.25	0.62	16	0.04
6/22/2012	329	0.23	17.75	0.01
Annual Avg	**81.91**	**0.49**	**15.74**	**0.04**
WY2013				
10/18/2012	62.25	0.46	5.5	0.08
11/11/2012	154.75	0.64	16	0.04
11/22/2012	32.75	0.95	16.5	0.06
12/25/2012	33.75	0.44	7	0.06
2/22/2013	16	0.35	11	0.03
2/27/2013	15	0.46	31	0.01
3/12/2013	24	0.20	21.75	0.01
3/19/2013	72.75	0.75	21.75	0.03
4/10/2013	60	0.22	2.25	0.10
4/19/2013	6.50	0.41	13	0.03
5/13/2013	8.5	0.20	7.5	0.03
5/21/2013	123.75	0.39	5.75	0.07
8/28/2013	32.25	0.22	4.25	0.05
9/21/2013	26.5	0.51	17.5	0.03
(2)	--	1.01	38	0.03
Annual Avg	**47.77**	**0.48**	**14.58**	**0.04**
WY2014				
11/1/2013	134	0.44	13	0.03
11/6/2013	34	0.87	22	0.04
12/12/2013	227	0.26	13.5	0.02
(1)	--	0.22	4	0.06
1/6/2014	93.25	0.39	27	0.01
1/28/2014	394.25	0.83	26	0.03
Partial	--	0.60	8.5	0.07
2/12/2014	21.75	0.18	7.5	0.02
3/8/2014	44.5	1.96	58.75	0.03
Partial	--	1.12	19.5	0.06
3/13/2014	73.5	0.27	8.25	0.03
3/15/2014	35.75	1.06	27	0.04
3/28/2014	10	0.45	16.75	0.03
4/21/2014	44.25	0.66	10.5	0.06
5/8/2014	74.5	0.56	9.25	0.06
6/12/2014	423.75	0.24	17	0.01
(1)	--	0.18	8.75	0.02
Partial	--	0.18	8.75	0.02
7/22/2014	583.75	0.55	15	0.04
8/12/2014	483.25	1.11	12.25	0.09
9/23/2014	128.75	1.48	22.75	0.07
(1) (3)	--	0.58	7	0.08
Partial	--	1.05	19	0.06
Partial	--	0.58	11	0.05
Annual Avg	**175.39**	**0.71**	**19.16**	**0.04**
WY2015				
10/13/2014	55.75	0.45	7.25	0.06
10/20/2014	40	0.35	11.75	0.03
10/22/2014	19.5	1.21	16.75	0.07
10/30/2014	23.25	1.32	30.75	0.04
Partial	--	0.5	14	0.04
11/5/2014	32.25	0.67	27.75	0.02
11/21/2014	24.5	0.64	12.25	0.05
(1)	24.5	0.64	12.25	0.08
Partial (1)	--	0.42	9.75	0.07
11/24/2014	29.25	1.27	31	0.04
(1)	--	1.27	31	0.07
Partial (1)	--	0.77	16.5	0.08
12/8/2014	52.25	0.58	20.5	0.03
Partial	--	0.27	8.75	0.03
12/23/2014	58.5	0.86	22	0.04
1/4/2015	31.25	1.26	34	0.04
1/15/2015	78.25	0.31	14.75	0.02
1/17/2015	33.25	1	20.75	0.05
3/13/2015	50.5	0.64	14.75	0.04
3/20/2015	111.25	0.21	22.75	0.01
3/22/2015	12.25	0.17	11.5	0.01
4/10/2015	77.75	0.29	7.25	0.04
4/13/2015	48.5	0.34	10.5	0.03
4/23/2015	204.5	0.1	4.75	0.02
7/26/2015	1300.5	0.42	1.25	0.34
8/14/2015	451.75	0.27	5.5	0.05
8/29/2015	343.5	1.33	29.5	0.05
Partial	--	1.06	22	0.05
9/1/2015	49.75	0.23	8	0.03
Annual Avg	**142.19**	**0.63**	**16.6**	**0.05**
WY2016				
10/7/2015	103.2	0.33	8.25	0.04
11/16/2015	27.9	1.69	25.6	0.07
Partial	--	0.31	10.1	0.03
Partial	--	0.70	17.4	0.04
12/1/2015	175.25	0.57	10.1	0.06
12/5/2015	27.5	0.59	24.5	0.02
Partial	--	0.35	11.3	0.03
12/12/2015	33.5	0.41	9.7	0.04
12/20/2015	29.2	1.36	39	0.03
Partial	--	0.29	19.7	0.01
12/22/2015 (3)	23.0	0.21	3.6	0.05
1/16/2016 (3)	47.8	0.42	18.9	0.02
1/19/2016 (3)	45.3	0.52	18.7	0.05
Partial	--	0.43	8.6	0.05
2/3/2016	107.25	0.56	21.5	0.03
Partial	--	0.49	14.9	0.03
2/5/2016	29.8	0.35	8.3	0.04
2/11/2016 (3)	125.7	1.28	26.7	0.07
Partial	--	0.88	19.9	0.04
2/17/2016	32.5	0.37	9.5	0.04
2/26/2016	104.5	0.23	11.6	0.02
3/20/2016	134.3	0.41	34.2	0.01
3/23/2016	39.3	0.32	16.8	0.02
4/12/2016	207.6	0.42	6.75	0.06
9/6/2016	86.5	0.37	8.6	0.04
9/17/2016	258.8	0.45	16.8	0.03
Annual Avg	**86.3**	**0.51**	**16.0**	**0.04**
WY2017				
10/6/2016	30.2	0.24	11.7	0.03
10/12/2016	77.1	3.94	67.1	0.06
10/19/2016	34.2	1.32	19.6	0.07
11/5/2016 (1)	50.1	1.66	25.5	0.10
11/13/2016	24.8	0.79	22.3	0.04
Partial	---	0.35	14.9	0.02
11/14/2016 (1,2)	16.4	0.90	10.0	0.13
12/3/2016	31.3	0.33	8.7	0.04
12/19/2016	147.2	0.28	5.0	0.06
1/8/2017	184.0	0.42	11.0	0.04
1/17/2017 (1)	159.1	1.93	30.7	0.08
2/3/2017	293.6	2.75	69.0	0.04
Partial	---	0.70	18.2	0.04
Partial	---	0.53	15.2	0.03
Partial	---	0.79	22.1	0.04
2/14/2017	97.8	2.28	33.1	0.07
Partial	---	1.26	17.9	0.07
Partial	---	1.44	20.0	0.07
2/26/2017	60.8	0.26	16.1	0.02
3/17/2017	42.1	0.99	22.2	0.04
Partial	---	0.58	11.3	0.05
4/4/2017	71.3	0.64	20.3	0.03
Partial	---	0.42	12.2	0.03
5/4/2017	32.3	0.33	7.8	0.04
6/7/2017	41.8	0.32	11.9	0.03
6/15/2017	128.7	0.72	22.2	0.03
9/18/2017 (3)	858.9	0.29	21.7	0.01
Annual Avg	**125.3**	**1.02**	**21.7**	**0.05**
WY2018				
10/12/2017 (1)	125.3	0.33	18.2	0.02
Partial	---	0.3	15.4	0.02
11/2/2017	261.4	0.27	10.2	0.03
11/4/2017	28.1	0.80	20.2	0.04
11/12/2017 (2)	10.0	0.30	13.8	0.02
11/19/2017	71.3	0.90	18.3	0.05
11/28/2017	31.7	0.64	13.3	0.05
12/1/2017	24.5	0.25	6.7	0.04
1/4/2018	144.6	0.46	15.3	0.03
1/10/2018	35.0	1.49	31.5	0.05
Partial	---	0.36	12.3	0.03
1/17/2018	34.0	0.66	14.3	0.05
1/23/2018	23.9	0.99	17.3	0.06
2/1/2018	38.8	0.50	11.1	0.05
Partial	---	0.44	11.1	0.04
3/13/2018	108.1	0.20	8.2	0.02
3/21/2018	192.3	0.48	20.3	0.02
4/4/2018	60.6	0.25	13.0	0.02
4/7/2018	29.1	1.35	39.2	0.03
Partial	---	0.84	17.2	0.05
6/8/2018	474.8	0.31	8.9	0.03
Partial	---	0.23	5.2	0.04
9/9/2018	49.0	0.18	3.0	0.06
Annual Avg	**96.8**	**0.58**	**15.7**	**0.04**
WY2019				
10/5/2018	64.8	0.44	11.3	0.04
10/25/2018 (1)	388.0	0.99	31.1	0.07
10/27/2018	24.5	1.15	19.0	0.06
11/21/2018 (3)	346.3	0.21	7.3	0.03
11/22/2018	9.4	1.19	23.3	0.05
Partial		0.76	12.5	0.06
12/9/2018	204.0	0.80	21.7	0.04
12/11/2018 (1)	19.7	1.05	16.5	0.06
12/17/2018 (1)	19.0	1.01	32.0	0.06
1/3/2019 (1)	104.4	0.50	12.3	0.07
1/18/2019	37.0	0.61	11.4	0.07
2/1/2019 (3)	205.0	0.60	17.5	0.05
Partial		0.56	14.7	0.04
3/11/2019 (3)	103.9	0.77	11.1	0.07
3/25/2019	309.4	0.24	9.4	0.08
7/9/2019	162.9	0.36	24.6	0.01
9/9/2019	33.2	0.26	10.1	0.03
9/12/2019	76.4	0.27	2.92	0.09
Partial		0.26	2.42	0.11
9/14/2019 (1)	38.2	0.36	14.3	0.04
9/22/2019 (3)	98.8	0.22	6.7	0.03
Annual Avg	**124.7**	**0.61**	**15.7**	**0.05**
WY2020				
10/16/2019 (1)	203.8	0.52	15.7	0.03
10/21/2019 (3)	51.4	0.75	12.3	0.08
11/15/2019 (1)	61.3	0.23	5.67	0.04
11/17/2019	38.3	0.27	9.6	0.03
11/18/2019	26.8	0.42	21.8	0.02
12/6/2019	57.0	0.47	16.9	0.03
12/18/2019 (1)	102.3	0.27	6.9	0.05
12/31/2019	103.7	0.42	11.8	0.04
1/2/2020 (1)	39.8	0.20	7.6	0.03
1/17/2020 (1)(3)	130.8	0.23	10.4	0.03
1/30/2020	28.1	1.9	40.0	0.05
Partial	--	0.86	21.1	0.04
2/6/2020 (2)	22.9	0.52	10.4	0.05
Partial	--	0.28	4.3	0.06
2/23/2020	198.7	0.37	6.3	0.06
3/5/2020	49.8	0.53	16.5	0.03
3/13/2020 (1)	135.1	0.35	13.17	0.03
3/28/2020 (2)(3)	12.0	0.58	13.7	0.08
4/22/2020 (3)	93.0	0.47	12.50	0.05
4/26/2020	35.3	0.26	5.7	0.05
5/2/2020	119.8	0.34	34.00	0.01
5/16/2020 (3)	53.6	0.50	23.0	0.09
5/30/2020	118.1	0.85	18.33	0.05
6/8/2020	58.2	0.52	19.92	0.03
9/18/2020 (1)	649.1	0.35	9.4	0.04
9/23/2020	66.6	0.93	18.3	0.05
Annual Avg	**102.30**	**0.51**	**15.0**	**0.04**
WY2021				
10/9/2020	130.3	1.73	11.5	0.15
10/13/2020	26.4	0.56	6.3	0.02
11/3/2020 (3)	97.6	0.77	15.42	0.07
11/4/2020 (2)	20.0	0.42	21.5	0.02
Partial	--	0.24	7.7	0.03
11/12/2020	49.7	0.58	12.3	0.05
12/8/2020	188.4	0.66	22.3	0.03
Partial	--	0.31	13.7	0.02
12/15/2020 (1)	35.3	0.39	12.1	0.10
12/25/2020	88.8	0.34	8.0	0.04
12/29/2020 (3)	56.8	1.1	34.1	0.03
1/11/2021	25.9	3.22	39.9	0.08
Partial	--	2.02	22.3	0.09
Partial	--	1.07	14.8	0.07
Partial	--	1.04	12.8	0.08
Partial	--	0.60	6.3	0.10
1/30/2021 (1)	32.3	1.48	85.3	0.02
Partial	--	0.53	43.2	0.01
Partial	--	1.05	56.33	0.01
2/21/2021	51.0	1.01	15.9	0.06
3/4/2021	176.3	0.20	7.08	0.03
3/24/2021	63.8	0.50	13.1	0.04
3/28/2021	74.9	0.39	4.17	0.09
4/7/2021	239.8	0.22	9.50	0.02
4/24/2021	333.8	0.45	23.9	0.02
5/27/2021	66.0	0.83	18.1	0.05
6/6/2021	226.8	0.37	20.1	0.02
6/12/2021 (1) (3)	29.3	0.86	22.9	0.06
9/17/2021¹ (2)	9.1	0.75	7.8	0.10
9/26/2021	171.2	0.77	24.3	0.03
9/29/2021	32.9	0.50	15.7	0.03
Annual Avg	**96.79**	**0.79**	**19.62**	**0.05**
WY2022				
10/21/2021	34.3	0.56	7.1	0.08
11/3/2021 (1)	24.3	1.00	23.0	0.04
11/8/2021 (3)	32.7	0.28	5.9	0.09
11/18/2021	73.6	0.67	16.3	0.04
12/4/2021	91.5	0.46	11.1	0.04
Partial	--	0.32	6.4	0.05
12/17/2021 (3)	40.4	0.71	21.9	0.05
1/19/2022 (3)	158.0	0.24	13.3	0.03
2/20/2022	151.6	0.20	14.5	0.01
2/26/2022	127.2	4.57	67.1	0.07
Partial	--	2.02	39.8	0.05
3/14/2022 (1)	35.8	1.03	29.7	0.05
3/18/2022	76.4	0.34	9.4	0.04
4/3/2022 (3)	269	0.83	21.1	0.07
4/18/2022	43.9	0.50	25.1	0.02
4/29/2022	79.8	0.46	10.3	0.04
5/5/2022	69.8	0.34	11.8	0.03
5/15/2022 (2) (3)	19.5	0.51	19.9	0.05
Partial	--	0.38	10.9	0.03
6/9/2022	93.7	1.38	18.1	0.08
Partial	--	0.71	10.8	0.07
Annual Avg	**83.6**	**0.83**	**19.14**	**0.05**
WY2023				
10/21/2022 (3)	552	0.42	14.9	0.04
10/25/2022 (3)	27.0	0.43	9.67	0.06
10/30/2022	60.3	0.58	14.3	0.04
11/4/2022 (2)	14.0	0.79	14.3	0.06
11/6/2022	31.8	0.76	6.92	0.11
11/22/2022	350	0.88	9.00	0.10
Partial	--	0.20	3.92	0.05
Partial	--	0.57	5.50	0.10
Partial	--	0.70	5.92	0.12
Partial	--	0.60	5.58	0.11
12/9/2022 (2)	14.58	0.58	27.5	0.02
12/29/2022 (3)	52.25	0.54	12.5	0.10
1/11/2023	32.7	0.67	51.6	0.01
2/7/2023	37.8	0.21	14.9	0.01
3/12/2023	34.3	0.63	26.7	0.02
3/19/2023	151	0.20	11.0	0.02
3/31/2023 (3)	269	0.25	12.7	0.03
4/9/2023 (2)	14.3	1.11	44.3	0.03
4/16/2023	120	0.43	9.00	0.05
5/4/2023	262	0.52	19.3	0.03
9/24/2023 (2) (3)	20.8	0.91	30.7	0.04
Annual Avg	**120**	**0.58**	**19.36**	**0.04**
WY2024				
10/10/2023 (2)	16.3	0.20	4.7	0.04
10/16/2023 (3)	51.8	0.57	13.3	0.09
10/24/2023	69.2	0.66	18.3	0.04
11/1/2023	176.6	0.94	15.6	0.06
11/3/2023	33.1	0.88	16.0	0.06
11/11/2023 (2)	9.1	0.53	4.3	0.09
12/9/2023	49.5	0.97	20.3	0.05
Partial	49.5	0.56	7.7	0.07
Partial	49.5	0.64	10.3	0.06
12/18/2023	101.3	0.28	19.9	0.01
1/5/2024 (1)	30.8	0.37	19.9	0.02
1/8/2024	44.7	0.92	31.7	0.03
1/20/2024	41.1	1.31	43.8	0.03
2/14/2024	59.9	0.25	6.2	0.04
2/28/2024	57.0	1.18	31.2	0.04
4/25/2024	380.3	0.84	23.6	0.04
5/21/2024	60.4	0.29	15.6	0.02
6/2/2024	86.1	0.92	16.8	0.05
8/17/2024	447.7	0.27	2.8	0.10
9/10/2024 (3)	357.4	0.38	9.8	0.06
Annual Avg	**115**	**0.65**	**17.43**	**0.05**

Avg Intensity is total rainfall (in) for the event divided by duration of event (hr)

Minimum value for the monitoring year

Maximum value for the monitoring year

(1) =< 0.05 inches ocurred in the previous 24 hours of event and/or the resulting antecendent is believed to be a better representation of the event.

(2) The antecedent period is <24 hours. The flow at all sites returned to baseflow conditions and the samples collected are believed to be representative of the event.

(3) Most of the precipitation occurred in a shorter amount of time. The resulting Avg Intensity is believed to be a better representation of the event.

Partial - Event sampled represents only a part of the entire event. Rainfall characteristics reflect partial event sampled for that outfall.

Table C-16
Number Of Storms For Each Amount Of Precipitation

	Total Rainfall in Inches								
	≈0.15-0.29	0.3-0.39	0.4-0.49	0.5-0.59	0.6-0.69	0.7-0.79	0.8-0.89	0.9-1.99	Total
Water Year 2002									
237A	3	2			1	1	1	1	9
237B	3	2	1		1		1	1	9
230	3	2	1		1	1	1	2	11
235	3	2	1	1	1	1	1		10
243	1	3	1		1	1		1	8
245	3	2	2		1	1		2	11
254	3	2	1		1	1		1	9
Yr 1 Storm	3	3	2	1	1	1	1	2	14
Water Year 2003									
237A	3	1	5				1		10
237B	3	1	5		1				10
230	1	2	3				1	1	8
235	1	2	5				1		9
243	1	2	3	1					7
245	2	2	4				1		9
254	1	1	5				1		8
Yr 2 Storm	4	2	5	1	1	0	1	1	15
Water Year 2004									
237A	6	1	2	2			1		12
237B	5	1	2	3			1		12
230	5	1	2	4			1		13
235	7	1	1	2			1		12
243	4	1	1	2			2		10
245	5	1	2	1			1		10
254	3		1	3			2		9
Yr 3 Storm	9	1	2	4	0	0	2	0	18
Water Year 2005									
237A	3	2	2	1	3				11
237B	3	2	2	2	3				12
230	2	2	1		3			1	9
235	3	2	2	2	3				12
243	1	1	1		3			1	7
245	3	2	1	1	3				10
254	3	2	1	1	3				10
Yr 4 Storm	3	2	2	2	3	0	0	1	13
Water Year 2006									
237A	4	1	1						6
237B	4	1							5
230	3	1	2			1			7
235	3	1	1			1			6
243	2		2					2	6
245	3		1			1		2	7
254	2	1	2			1		1	7
Yr 5 Storm	3	1	2	0	0	1	0	2	9
Water Year 2007									
237A	2	5	1		1				9
237B	5	2			1				8
230	2	2	1	1	1				7
235	2	2	2	1	2				9
243	1				1				2
245	1	2	2	1	1			1	8
254	2	2	1		1			1	7
Yr 6 Storm	7	5	2	2	2	0	0	1	19
Water Year 2008									
237A	7	1	1	1					10
237B	7	1	1	1					10
230	8	1	1						10
235	6	1	1	1					9
243	3	1	2	1					7
245	7	1	1	1					10
254	7	1	1	1					10
Yr 7 Storm	10	1	2	1	0	0	0	0	14
Water Year 2009									
237A	4	3	1		2				10
237B	4	4	1		2				11
230	3	4			1				8
235	4	3	1		2				10
243	2	5			1				8
245	4	3	1		2				10
254	2	4	1		1				8
Yr 8 Storm	7	5	2	0	2	0	0	0	16
Water Year 2010									
237A	5	1	1	1	2			2	12
237B	5		1	1	2			3	12
230	5	1	2	1				2	11
235	8		2		1		1	4	16
243	4			2	1				7
245	3	1	1	2	3			2	12
254	3	1	1	1	2			3	11
Yr 9 Storm	10	2	2	2	3	0	1	4	24
Water Year 2011									
237A	6	1		2				3	12
237B	6	2		2				3	13
230	4	2		1				2	9
235	6	4		2				2	14
243	1	3		1				1	6
245	4	3		2					9
254	4	2		2				1	9
Yr 10 Storm	6	4	0	2	0	0	0	3	15
Water Year 2012									
237A	3	2	1	0	2	1	0	0	9
237B	2	5	0	0	0	1	0	2	10
230	2	3	0	0	1	2	0	1	9
235	3	3	2	0	0	2	1	1	12
243	0	0	0	0	2	2	0	0	4
245	4	4	1	0	0	2	0	1	12
254	1	0	1	0	0	1	0	1	4
Yr 11 Storm	7	6	3	0	3	2	1	3	25

	Total Rainfall in Inches								
	≈0.15-0.29	0.3-0.39	0.4-0.49	0.5-0.59	0.6-0.69	0.7-0.79	0.8-0.89	0.9-1.99	Total
Water Year 2013									
237A	3	1	4	0	0	1	0	1	10
237B	1	1	3	1	0	1	0	1	8
230	2	1	3	0	1	1	0	0	8
235	4	1	4	0	1	1	0	0	11
243	1	0	2	0	0	0	0	0	3
245	1	0	1	0	1	0	0	0	3
254	1	1	1	0	0	0	0	1	4
Yr 12 Storm	4	1	4	1	1	1	0	1	13
Water Year 2014									
237A	2	1	1	1	1	0	2	1	9
237B	2	0	2	2	1	0	1	2	10
230	0	1	2	2	1	0	1	2	9
235	1	1	1	1	1	0	1	2	8
243	1	0	1	0	0	0	0	2	4
245	2	0	1	0	1	0	0	1	5
254	1	0	1	1	1	0	0	1	5
Yr 13 Storm	4	1	2	2	1	0	2	4	16
Water Year 2015									
237A	2	2	0	0	0	0	1	5	10
237B	3	1	0	0	1	0	1	2	8
230	0	1	1	2	2	1	1	2	10
235	2	2	2	1	0	0	1	5	13
243	0	0	0	0	2	0	1	0	3
245	2	2	2	0	0	0	0	1	7
254	0	1	0	0	2	0	1	3	7
Yr 14 Storm	3	3	2	1	3	0	1	6	19
Water Year 2016									
237A	0	4	3	1	0	0	0	0	8
237B	2	1	2	1	0	0	1	0	7
230	0	3	2	1	0	0	0	1	7
235	1	3	3	2	0	0	0	1	10
243	0	1	1	2	0	1	0	0	5
245	1	1	4	1	0	0	0	1	8
254	0	2	3	1	0	0	0	1	7
Yr 15 Storm	3	7	7	4	0	1	1	2	25
Water Year 2017									
237A	3	2	0	0	1	1	0	5	12
237B	1	1	1	1	1	1	0	5	11
230	3	2	1	0	1	1	0	5	13
235	2	2	1	0	1	1	0	5	12
243	2	1	0	0	0	1	0	3	7
245	2	2	2	1	0	1	0	5	13
254	2	3	1	1	0	1	0	2	10
Yr 16 Storm	4	4	2	2	1	4	0	10	27
Water Year 2018									
237A	0	1	1	1	0	0	1	4	8
237B	2	1	2	1	1	0	1	1	9
230	3	0	2	1	1	0	1	1	9
235	1	2	0	1	0	0	1	3	8
243	2	2	1	1	1	0	1	0	8
245	3	2	1	1	1	0	1	2	11
254	1	2	0	1	1	0	1	0	6
Yr 17 Storm	5	3	2	1	2	0	1	4	18
Water Year 2019									
237A	1	0	0	0	2	1	1	3	8
237B	2	0	1	1	1	1	0	2	8
230	1	1	0	1	2	0	1	2	8
235	2	1	1	1	2	1	1	2	11
243	1	1	1	0	2	1	0	2	8
245	2	0	1	0	2	1	1	1	8
254	0	0	0	0	2	1	1	2	6
Yr 18 Storm	5	2	1	1	2	1	1	5	18
Water Year 2020									
237A	3	1	2	2	0	1	1	1	11
237B	3	3	3	4	0	0	1	0	14
230	0	1	2	5	0	0	1	0	9
235	2	2	3	4	0	1	1	1	14
243	1	0	3	3	0	0	0	2	9
245	3	2	3	2	0	0	1	1	12
254	2	0	3	3	0	0	1	1	10
Yr 19 Storm	6	4	4	6	0	1	1	2	24
Water Year 2021									
237A	1	3	0	3	0	0	2	2	11
237B	2	1	0	3	0	2	1	3	12
230	2	0	1	2	1	0	2	4	12
235	3	1	0	3	1	2	1	3	14
243	0	1	0	2	1	2	0	3	9
245	0	1	0	2	1	2	2	4	12
254	2	1	1	1	2	2	1	0	10
Yr 20 Storm	3	5	1	5	0	3	2	4	23
Water Year 2022									
237A	0	2	1	1	0	1	1	2	8
237B	1	0	1	3	1	1	1	3	11
230	2	0	1	3	1	1	1	3	12
235	1	1	1	3	1	2	1	2	12
243	0	1	1	1	0	0	1	3	7
245	1	1	0	2	1	1	1	4	11
254	2	1	1	1	1	0	1	2	9
Yr 21 Storm	3	2	2	3	1	1	1	4	17
Water Year 2023									
237A	2	0	2	2	2	2	0	2	12
237B	2	0	1	1	1	1	0	2	8
230	1	0	0	2	0	0	0	0	3
235	1	0	2	5	2	0	0	1	11
243	1	0	2	1	1	1	0	1	7
245	1	0	0	3	2	0	1	2	9
254	0	0	0	1	0	0	0	0	1
Yr 22 Storm	3	0	3	4	2	2	1	2	17
Water Year 2024									
237A	0	2	0	2	0	0	2	2	8
237B	4	2	0	2	0	1	1	4	14
230	3	2	0	1	0	0	1	2	9
235	4	2	0	2	0	1	1	5	15
243	0	0	0	0	1	0	1	5	7
245	3	2	0	2	0	1	1	5	14
254	1	2	0	1	1	1	0	1	7
Yr 23 Storm	5	2	0	2	1	0	2	6	18
Water Year 2002-2024									
237A	63	39	29	20	17	9	14	34	225
237B	72	32	29	29	17	9	10	34	232
230	55	33	28	27	17	8	12	31	211
235	70	39	36	32	18	13	13	37	258
243	29	23	22	17	17	9	6	26	149
245	60	34	31	22	19	10	10	35	221
254	43	29	26	19	18	8	9	22	174
Yr1-23 Storm	117	66	54	47	29	18	19	67	417
Historic Record									
06/48-12/81	628	402	301	214	155	96	68	177	2041
03/82-12/99	349	269	141	115	81	46	38	115	1154
Historic Total	977	671	442	329	236	142	106	292	3195

Note: Data for 237A is from the original 237A site through WY2011. The 237A New sampling site data was used for WY2012 and later. OF230 was not sampled after 12/30/2023 due to the flow being directed to the new OF230A.

Table C-16 cont'd
Number Of Storms For Each Amount Of Precipitation

PERCENT OF STORM PRECIPITATION RANGES - YEARLY AND HISTORIC									
	≈0.15-0.29	0.3-0.39	0.4-0.49	0.5-0.59	0.6-0.69	0.7-0.79	0.8-0.89	0.9-1.99	Total
Water Year 2002									
237A	33.3%	22.2%	0.0%	0.0%	11.1%	11.1%	11.1%	11.1%	100%
237B	33.3%	22.2%	11.1%	0.0%	11.1%	0.0%	11.1%	11.1%	100%
230	27.3%	18.2%	9.1%	0.0%	9.1%	9.1%	9.1%	18.2%	100%
235	30.0%	20.0%	10.0%	10.0%	10.0%	10.0%	10.0%	0.0%	100%
243	12.5%	37.5%	12.5%	0.0%	12.5%	12.5%	0.0%	12.5%	100%
245	27.3%	18.2%	18.2%	0.0%	9.1%	9.1%	0.0%	18.2%	100%
254	33.3%	22.2%	11.1%	0.0%	11.1%	11.1%	0.0%	11.1%	100%
Yr 1 Storm	21.4%	21.4%	14.3%	7.1%	7.1%	7.1%	7.1%	14.3%	100%
Water Year 2003									
237A	30.0%	10.0%	50.0%	0.0%	0.0%	0.0%	10.0%	0.0%	100%
237B	30.0%	10.0%	50.0%	0.0%	10.0%	0.0%	0.0%	0.0%	100%
230	12.5%	25.0%	37.5%	0.0%	0.0%	0.0%	12.5%	12.5%	100%
235	11.1%	22.2%	55.6%	0.0%	0.0%	0.0%	11.1%	0.0%	100%
243	14.3%	28.6%	42.9%	14.3%	0.0%	0.0%	0.0%	0.0%	100%
245	22.2%	22.2%	44.4%	0.0%	0.0%	0.0%	11.1%	0.0%	100%
254	12.5%	12.5%	62.5%	0.0%	0.0%	0.0%	12.5%	0.0%	100%
Yr 2 Storm	26.7%	13.3%	33.3%	6.7%	6.7%	0.0%	6.7%	6.7%	100%
Water Year 2004									
237A	50.0%	8.3%	16.7%	16.7%	0.0%	0.0%	8.3%	0.0%	100%
237B	41.7%	8.3%	16.7%	25.0%	0.0%	0.0%	8.3%	0.0%	100%
230	38.5%	7.7%	15.4%	30.8%	0.0%	0.0%	7.7%	0.0%	100%
235	58.3%	8.3%	8.3%	16.7%	0.0%	0.0%	8.3%	0.0%	100%
243	40.0%	10.0%	10.0%	20.0%	0.0%	0.0%	20.0%	0.0%	100%
245	50.0%	10.0%	20.0%	10.0%	0.0%	0.0%	10.0%	0.0%	100%
254	33.3%	0.0%	11.1%	33.3%	0.0%	0.0%	22.2%	0.0%	100%
Yr 3 Storm	50.0%	5.6%	11.1%	22.2%	0.0%	0.0%	11.1%	0.0%	100%
Water Year 2005									
237A	27.3%	18.2%	18.2%	9.1%	27.3%	0.0%	0.0%	0.0%	100%
237B	25.0%	16.7%	16.7%	16.7%	25.0%	0.0%	0.0%	0.0%	100%
230	22.2%	22.2%	11.1%	0.0%	33.3%	0.0%	0.0%	11.1%	100%
235	25.0%	16.7%	16.7%	16.7%	25.0%	0.0%	0.0%	0.0%	100%
243	14.3%	14.3%	14.3%	0.0%	42.9%	0.0%	0.0%	14.3%	100%
245	30.0%	20.0%	10.0%	10.0%	30.0%	0.0%	0.0%	0.0%	100%
254	30.0%	20.0%	10.0%	10.0%	30.0%	0.0%	0.0%	0.0%	100%
Yr 4 Storm	23.1%	15.4%	15.4%	15.4%	23.1%	0.0%	0.0%	7.7%	100%
Water Year 2006									
237A	66.7%	16.7%	16.7%	0.0%	0.0%	0.0%	0.0%	0.0%	100%
237B	80.0%	20.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100%
230	42.9%	14.3%	28.6%	0.0%	0.0%	14.3%	0.0%	0.0%	100%
235	50.0%	16.7%	16.7%	0.0%	0.0%	16.7%	0.0%	0.0%	100%
243	33.3%	0.0%	33.3%	0.0%	0.0%	0.0%	0.0%	33.3%	100%
245	42.9%	0.0%	14.3%	0.0%	0.0%	14.3%	0.0%	28.6%	100%
254	28.6%	14.3%	28.6%	0.0%	0.0%	14.3%	0.0%	14.3%	100%
Yr 5 Storm	33.3%	11.1%	22.2%	0.0%	0.0%	11.1%	0.0%	22.2%	100%
Water Year 2007									
237A	22.2%	55.6%	11.1%	0.0%	11.1%	0.0%	0.0%	0.0%	100%
237B	62.5%	25.0%	0.0%	0.0%	12.5%	0.0%	0.0%	0.0%	100%
230	28.6%	28.6%	14.3%	14.3%	14.3%	0.0%	0.0%	0.0%	100%
235	22.2%	22.2%	22.2%	11.1%	22.2%	0.0%	0.0%	0.0%	100%
243	50.0%	0.0%	0.0%	0.0%	50.0%	0.0%	0.0%	0.0%	100%
245	12.5%	25.0%	25.0%	12.5%	12.5%	0.0%	0.0%	12.5%	100%
254	28.6%	28.6%	14.3%	0.0%	14.3%	0.0%	0.0%	14.3%	100%
Yr 6 Storm	36.8%	26.3%	10.5%	10.5%	10.5%	0.0%	0.0%	5.3%	100%
Water Year 2008									
237A	70.0%	10.0%	10.0%	10.0%	0.0%	0.0%	0.0%	0.0%	100%
237B	70.0%	10.0%	10.0%	10.0%	0.0%	0.0%	0.0%	0.0%	100%
230	80.0%	10.0%	10.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100%
235	66.7%	11.1%	11.1%	11.1%	0.0%	0.0%	0.0%	0.0%	100%
243	42.9%	14.3%	28.6%	14.3%	0.0%	0.0%	0.0%	0.0%	100%
245	70.0%	10.0%	10.0%	10.0%	0.0%	0.0%	0.0%	0.0%	100%
254	70.0%	10.0%	10.0%	10.0%	0.0%	0.0%	0.0%	0.0%	100%
Yr 7 Storm	71.4%	7.1%	14.3%	7.1%	0.0%	0.0%	0.0%	0.0%	100%
Water Year 2009									
237A	40.0%	30.0%	10.0%	0.0%	20.0%	0.0%	0.0%	0.0%	100%
237B	36.4%	36.4%	9.1%	0.0%	18.2%	0.0%	0.0%	0.0%	100%
230	37.5%	50.0%	0.0%	0.0%	12.5%	0.0%	0.0%	0.0%	100%
235	40.0%	30.0%	10.0%	0.0%	20.0%	0.0%	0.0%	0.0%	100%
243	25.0%	62.5%	0.0%	0.0%	12.5%	0.0%	0.0%	0.0%	100%
245	40.0%	30.0%	10.0%	0.0%	20.0%	0.0%	0.0%	0.0%	100%
254	25.0%	50.0%	12.5%	0.0%	12.5%	0.0%	0.0%	0.0%	100%
Yr 8 Storm	43.8%	31.3%	12.5%	0.0%	12.5%	0.0%	0.0%	0.0%	100%
Water Year 2010									
237A	41.7%	8.3%	8.3%	8.3%	16.7%	0.0%	0.0%	16.7%	100%
237B	41.7%	0.0%	8.3%	8.3%	16.7%	0.0%	0.0%	25.0%	100%
230	45.5%	9.1%	18.2%	9.1%	0.0%	0.0%	0.0%	18.2%	100%
235	50.0%	0.0%	12.5%	0.0%	6.3%	0.0%	6.3%	25.0%	100%
243	57.1%	0.0%	0.0%	28.6%	14.3%	0.0%	0.0%	0.0%	100%
245	25.0%	8.3%	8.3%	16.7%	25.0%	0.0%	0.0%	16.7%	100%
254	27.3%	9.1%	9.1%	9.1%	18.2%	0.0%	0.0%	27.3%	100%
Yr 9 Storm	41.7%	8.3%	8.3%	8.3%	12.5%	0.0%	4.2%	16.7%	100%
Water Year 2011									
237A	50.0%	8.3%	0.0%	16.7%	0.0%	0.0%	0.0%	25.0%	100%
237B	46.2%	15.4%	0.0%	15.4%	0.0%	0.0%	0.0%	23.1%	100%
230	44.4%	22.2%	0.0%	11.1%	0.0%	0.0%	0.0%	22.2%	100%
235	42.9%	28.6%	0.0%	14.3%	0.0%	0.0%	0.0%	14.3%	100%
243	16.7%	50.0%	0.0%	16.7%	0.0%	0.0%	0.0%	16.7%	100%
245	44.4%	33.3%	0.0%	22.2%	0.0%	0.0%	0.0%	0.0%	100%
254	44.4%	22.2%	0.0%	22.2%	0.0%	0.0%	0.0%	11.1%	100%
Yr 10 Storm	40.0%	26.7%	0.0%	13.3%	0.0%	0.0%	0.0%	20.0%	100%
Water Year 2012									
237A	33.3%	22.2%	11.1%	0.0%	22.2%	11.1%	0.0%	0.0%	100%
237B	20.0%	50.0%	0.0%	0.0%	0.0%	10.0%	0.0%	20.0%	100%
230	22.2%	33.3%	0.0%	0.0%	11.1%	22.2%	0.0%	11.1%	100%
235	25.0%	25.0%	16.7%	0.0%	0.0%	16.7%	8.3%	8.3%	100%
243	0.0%	0.0%	0.0%	0.0%	50.0%	50.0%	0.0%	0.0%	100%
245	33.3%	33.3%	8.3%	0.0%	0.0%	16.7%	0.0%	8.3%	100%
254	25.0%	0.0%	25.0%	0.0%	0.0%	25.0%	0.0%	25.0%	100%
Yr 11 Storm	28.0%	24.0%	12.0%	0.0%	12.0%	8.0%	4.0%	12.0%	100%

PERCENT OF STORM PRECIPITATION RANGES - YEARLY AND HISTORIC									
	≈0.15-0.29	0.3-0.39	0.4-0.49	0.5-0.59	0.6-0.69	0.7-0.79	0.8-0.89	0.9-1.99	Total
Water Year 2013									
237A	30.0%	10.0%	40.0%	0.0%	0.0%	10.0%	0.0%	10.0%	100%
237B	12.5%	12.5%	37.5%	12.5%	0.0%	12.5%	0.0%	12.5%	100%
230	25.0%	12.5%	37.5%	0.0%	12.5%	12.5%	0.0%	0.0%	100%
235	36.4%	9.1%	36.4%	0.0%	9.1%	9.1%	0.0%	0.0%	100%
243	33.3%	0.0%	66.7%	0.0%	0.0%	0.0%	0.0%	0.0%	100%
245	33.3%	0.0%	33.3%	0.0%	33.3%	0.0%	0.0%	0.0%	100%
254	25.0%	25.0%	25.0%	0.0%	0.0%	0.0%	0.0%	25.0%	100%
Yr 12 Storm	30.8%	7.7%	30.8%	7.7%	7.7%	7.7%	0.0%	7.7%	100%
Water Year 2014									
237A	22.2%	11.1%	11.1%	11.1%	11.1%	0.0%	22.2%	11.1%	100%
237B	20.0%	0.0%	20.0%	20.0%	10.0%	0.0%	10.0%	20.0%	100%
230	0.0%	11.1%	22.2%	22.2%	11.1%	0.0%	11.1%	22.2%	100%
235	12.5%	12.5%	12.5%	12.5%	12.5%	0.0%	12.5%	25.0%	100%
243	25.0%	0.0%	25.0%	0.0%	0.0%	0.0%	0.0%	50.0%	100%
245	40.0%	0.0%	20.0%	0.0%	20.0%	0.0%	0.0%	20.0%	100%
254	20.0%	0.0%	20.0%	20.0%	20.0%	0.0%	0.0%	20.0%	100%
Yr 13 Storm	25.0%	6.3%	12.5%	12.5%	6.3%	0.0%	12.5%	25.0%	100%
Water Year 2015									
237A	20.0%	20.0%	0.0%	0.0%	0.0%	0.0%	10.0%	50.0%	100%
237B	37.5%	12.5%	0.0%	0.0%	12.5%	0.0%	12.5%	25.0%	100%
230	0.0%	10.0%	10.0%	20.0%	20.0%	10.0%	10.0%	20.0%	100%
235	15.4%	15.4%	15.4%	7.7%	0.0%	0.0%	7.7%	38.5%	100%
243	0.0%	0.0%	0.0%	0.0%	66.7%	0.0%	33.3%	0.0%	100%
245	28.6%	28.6%	28.6%	0.0%	0.0%	0.0%	0.0%	14.3%	100%
254	0.0%	14.3%	0.0%	0.0%	28.6%	0.0%	14.3%	42.9%	100%
Yr 14 Storm	15.8%	15.8%	10.5%	5.3%	15.8%	0.0%	5.3%	31.6%	100%
Water Year 2016									
237A	0.0%	50.0%	37.5%	12.5%	0.0%	0.0%	0.0%	0.0%	100%
237B	28.6%	14.3%	28.6%	14.3%	0.0%	0.0%	14.3%	0.0%	100%
230	0.0%	42.9%	28.6%	14.3%	0.0%	0.0%	0.0%	14.3%	100%
235	10.0%	30.0%	30.0%	20.0%	0.0%	0.0%	0.0%	10.0%	100%
243	0.0%	20.0%	20.0%	40.0%	0.0%	20.0%	0.0%	0.0%	100%
245	12.5%	12.5%	50.0%	12.5%	0.0%	0.0%	0.0%	12.5%	100%
254	0.0%	28.6%	42.9%	14.3%	0.0%	0.0%	0.0%	14.3%	100%
Yr 15 Storm	12.0%	28.0%	28.0%	16.0%	0.0%	4.0%	4.0%	8.0%	100%
Water Year 2017									
237A	25.0%	16.7%	0.0%	0.0%	8.3%	8.3%	0.0%	41.7%	100%
237B	9.1%	9.1%	9.1%	9.1%	9.1%	9.1%	0.0%	45.5%	100%
230	23.1%	15.4%	7.7%	0.0%	7.7%	7.7%	0.0%	38.5%	100%
235	16.7%	16.7%	8.3%	0.0%	8.3%	8.3%	0.0%	41.7%	100%
243	28.6%	14.3%	0.0%	0.0%	0.0%	14.3%	0.0%	42.9%	100%
245	15.4%	15.4%	15.4%	7.7%	0.0%	7.7%	0.0%	38.5%	100%
254	20.0%	30.0%	10.0%	10.0%	0.0%	10.0%	0.0%	20.0%	100%
Yr 16 Storm	14.8%	14.8%	7.4%	7.4%	3.7%	14.8%	0.0%	37.0%	100%
Water Year 2018									
237A	0.0%	12.5%	12.5%	12.5%	0.0%	0.0%	12.5%	50.0%	100%
237B	22.2%	11.1%	22.2%	11.1%	11.1%	0.0%	11.1%	11.1%	100%
230	33.3%	0.0%	22.2%	11.1%	11.1%	0.0%	11.1%	11.1%	100%
235	12.5%	25.0%	0.0%	12.5%	0.0%	0.0%	12.5%	37.5%	100%
243	25.0%	25.0%	12.5%	12.5%	12.5%	0.0%	12.5%	0.0%	100%
245	27.3%	18.2%	9.1%	9.1%	9.1%	0.0%	9.1%	18.2%	100%
254	16.7%	33.3%	0.0%	16.7%	16.7%	0.0%	16.7%	0.0%	100%
Yr 17 Storm	27.8%	16.7%	11.1%	5.6%	11.1%	0.0%	5.6%	22.2%	100%
Water Year 2019									
237A	12.5%	0.0%	0.0%	0.0%	25.0%	12.5%	12.5%	37.5%	100%
237B	25.0%	0.0%	12.5%	12.5%	12.5%	12.5%	0.0%	25.0%	100%
230	12.5%	12.5%	0.0%	12.5%	25.0%	0.0%	12.5%	25.0%	100%
235	18.2%	9.1%	9.1%	9.1%	18.2%	9.1%	9.1%	18.2%	100%
243	12.5%	12.5%	12.5%	0.0%	25.0%	12.5%	0.0%	25.0%	100%
245	25.0%	0.0%	12.5%	0.0%	25.0%	12.5%	12.5%	12.5%	100%
254	0.0%	0.0%	0.0%	0.0%	33.3%	16.7%	16.7%	33.3%	100%
Yr 18 Storm	27.8%	11.1%	5.6%	5.6%	11.1%	5.6%	5.6%	27.8%	100%
Water Year 2020									
237A	27.3%	9.1%	18.2%	18.2%	0.0%	9.1%	9.1%	9.1%	100%
237B	21.4%	21.4%	21.4%	28.6%	0.0%	0.0%	7.1%	0.0%	100%
230	0.0%	11.1%	22.2%	55.6%	0.0%	0.0%	11.1%	0.0%	100%
235	14.3%	14.3%	21.4%	28.6%	0.0%	7.1%	7.1%	7.1%	100%
243	11.1%	0.0%	33.3%	33.3%	0.0%	0.0%	0.0%	22.2%	100%
245	25.0%	16.7%	25.0%	16.7%	0.0%	0.0%	8.3%	8.3%	100%
254	20.0%	0.0%	30.0%	30.0%	0.0%	0.0%	10.0%	10.0%	100%
Yr 19 Storm	25.0%	16.7%	16.7%	25.0%	0.0%	4.2%	4.2%	8.3%	100%
Water Year 2021									
237A	9.1%	27.3%	0.0%	27.3%	0.0%	0.0%	18.2%	18.2%	100%
237B	16.7%	8.3%	0.0%	25.0%	0.0%	16.7%	8.3%	25.0%	100%
230	16.7%	0.0%	8.3%	16.7%	8.3%	0.0%	16.7%	33.3%	100%
235	21.4%	7.1%	0.0%	21.4%	7.1%	14.3%	7.1%	21.4%	100%
243	0.0%	11.1%	0.0%	22.2%	11.1%	22.2%	0.0%	33.3%	100%
245	0.0%	8.3%	0.0%	16.7%	8.3%	16.7%	16.7%	33.3%	100%
254	20.0%	10.0%	10.0%	10.0%	20.0%	20.0%	10.0%	0.0%	100%
Yr 20 Storm	13.0%	21.7%	4.3%	21.7%	0.0%	13.0%	8.7%	17.4%	100%
Water Year 2022									
237A	0.0%	25.0%	12.5%	12.5%	0.0%	12.5%	12.5%	25.0%	100%
237B	9.1%	0.0%	9.1%	27.3%	9.1%	9.1%	9.1%	27.3%	100%
230	16.7%	0.0%	8.3%	25.0%	8.3%	8.3%	8.3%	25.0%	100%
235	8.3%	8.3%	8.3%	25.0%	8.3%	16.7%	8.3%	16.7%	100%
243	0.0%	14.3%	14.3%	14.3%	0.0%	0.0%	14.3%	42.9%	100%
245	9.1%	9.1%	0.0%	18.2%	9.1%	9.1%	9.1%	36.4%	100%
254	22.2%	11.1%	11.1%	11.1%	11.1%	0.0%	11.1%	22.2%	100%
Yr 21 Storm	17.6%	11.8%	11.8%	17.6%	5.9%	5.9%	5.9%	23.5%	100%
Water Year 2023									
237A	16.7%	0.0%	16.7%	16.7%	16.7%	16.7%	0.0%	16.7%	100%
237B	25.0%	0.0%	12.5%	12.5%	12.5%	12.5%	0.0%	25.0%	100%
230	33.3%	0.0%	0.0%	66.7%	0.0%	0.0%	0.0%	0.0%	100%
235	9.1%	0.0%	18.2%	45.5%	18.2%	0.0%	0.0%	9.1%	100%
243	14.3%	0.0%	28.6%	14.3%	14.3%	14.3%	0.0%	14.3%	100%
245	11.1%	0.0%	0.0%	33.3%	22.2%	0.0%	11.1%	22.2%	100%
254	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	100%
Yr 22 Storm	17.6%	0.0%	17.6%	23.5%	11.8%	11.8%	5.9%	11.8%	100%
Water Year 2023									
237A	0.0%	25.0%	0.0%	25.0%	0.0%	0.0%	25.0%	25.0%	100%
237B	28.6%	14.3%	0.0%	14.3%	0.0%	7.1%	7.1%	28.6%	100%
230	33.3%	22.2%	0.0%	11.1%	0.0%	0.0%	11.1%	22.2%	100%
235	26.7%	13.3%	0.0%	13.3%	0.0%	6.7%	6.7%	33.3%	100%
243	0.0%	0.0%	0.0%	0.0%	14.3%	0.0%	14.3%	71.4%	100%
245	21.4%	14.3%	0.0%	14.3%	0.0%	7.1%	7.1%	35.7%	100%
254	14.3%	28.6%	0.0%	14.3%	14.3%	14.3%	0.0%	14.3%	100%
Yr 23 Storm	27.8%	11.1%	0.0%	11.1%	5.6%	0.0%	11.1%	33.3%	100%
Water Year 2002-2024									
237A	28.0%	17.3%	12.9%	8.9%	7.6%	4.0%	6.2%	15.1%	100%
237B	31.0%	13.8%	12.5%	12.5%	7.3%	3.9%	4.3%	14.7%	100%
230	26.1%	15.6%	13.3%	12.8%	8.1%	3.8%	5.7%	14.7%	100%
235	27.1%	15.1%	14.0%	12.4%	7.0%	5.0%	5.0%	14.3%	100%
243	19.5%	15.4%	14.8%	11.4%	11.4%	6.0%	4.0%	17.4%	100%
245	27.1%	15.4%	14.0%	10.0%	8.6%	4.5%	4.5%	15.8%	100%
254	24.7%	16.7%	14.9%	10.9%	10.3%	4.6%	5.2%	12.6%	100%
Yr1-23 Storm	28.1%	15.8%	12.9%	11.3%	7.0%	4.3%	4.6%	16.1%	100%
Historic Record									
06/48-12/81	30.8%	19.7%	14.7%	10.5%	7.6%	4.7%	3.3%	8.7%	100%
03/82-12/99	30.2%	23.3%	12.2%	10.0%	7.0%	4.0%	3.3%	10.0%	100%
Historic Total	30.6%	21.0%	13.8%	10.3%	7.4%	4.4%	3.3%	9.1%	100%

Note: Data for 237A is from the original 237A site through WY2011. The 237A New sampling site data was used for WY2012 and later. OF230 was not sampled after 12/30/2023 due to the flow being directed to the new OF230A.

Table C-17
Corrective Actions for WY2024

Date	Outfall	Issue	Explanation	Corrective Action	Date Corrective Action Performed
10/6/2023	230A	Sampler tubing	Tubing was outside of the distributor arm causing bottle filling errors	Corrected tubing direction	10/10/23
10/6/2023	254	Distributor arm install	New sampler that did not have distributor arm installed when deployed	Installed distributor arm	10/10/23
10/16/2023	230A	Battery Issue	Dead battery - vandalization of box has lead to the storm team trying new battery ideas for this site	Using marine battery and being able to secure box again so theft will not hamper deployments.	TBD
10/24/2023	237ANEW	Sampler Issue	Did not turn off the sampler from previous storm, so sampler did not collect samples .	Reminder to always turn sampler heads off via app when collecting samples.	10/26/23
11/3/2023	237ANEW	Sampler Issue	2150 box is not communicating with the Cambell Telemetry box inorder to enable for storms.	We power cycled the 2150, and it seemed to be working again. Long term we are taking it off Telemetry	11/03/23
2/14/2024	237ANEW & 237B	Swap set up	Took both sites off telemetry. Back to regular programing storms on the 6712 head		
2/15/2024	237ANEW	Low Battery	Wiring issue from telemetry set up to normal set up.	Waiting for new solar controller to show up and swap out.	02/21/24
3/13/2024	254	Sensor Swap	Graph showed Level issues.	Sensor was installed.	03/13/24
4/24/2024	254	Sonde issues	Sonde wasn't responding	Sampler and sonde were reset	04/24/24
5/15/2024	254	Sonde issues	Sonde was not recording after a few days of data.	New sonde ordered, wating on sonde to arrive.	07/16/24
5/21/2024	254	Sonde issues	New sonde is on order, site was not deployed.	New sonde ordered, wating on sonde to arrive.	07/16/24
7/31/2024	254	Strainer replaced	Strainer was not operating normally	Strainer Fixed	7/31/2024
8/1/2024	243	Equipment removed	Annual line cleaning performed	Still waiting for line to be cleaned, and new box to be installed	TBD
8/6/2024	235	Sensor drift	Old sensor was drifting.	Sensor replaced with new	8/6/2024
9/16/2024	243	Vandalism	Box was broken into, battery, solar controller, and tubing was stolen	Waiting for I&I to install new box, **update** on 9/25 is that the box will be installed next week	TBD

APPENDIX D

Table D-1.1
Stormwater and Baseflow Analytical Data for Outfall 230A WY2024 - Composite Samples

	Storm 1 11/2/2023	Storm 2 12/9/2023	Storm 3 12/19/2023	Storm 4 1/6/2024	Storm 5 1/23/2024	Storm 6 2/15/2024	Storm 7 4/26/2024	Storm 8 5/21/2024	Storm 9 9/10/2024	Baseflow 1 8/9/2024	Baseflow 2 9/19/2024
Conventionals											
Anionic Surfactants - MBAS (ug/L)	**45.4**	**38**	**83**	**31** J	**35.5**	**76**	**78.8**	–	134	**33** J	**68**
BOD (mg/L)	–	**2.3** J	**4.9**	**3.2** J	**2.6**	**4.6**	**7.9** NJ	–	8.8 NJ	2.0 U	2 U
Chloride (mg/L)	7.91 UJ	**18.1**	**38**	4.17 UJ	8.8 UJ	**26.1**	**4.5**	–	3.36	**31.8**	**31.8**
Conductivity (uS/cm)	**52.2**	**123**	**171**	**48.3**	**68.3**	**123**	**52.1**	**57.5**	59.9	**372**	**364**
Hardness (mg CaCO3/L)	**10.6**	**13.5**	**21.0**	**14.3**	**16.0**	**13.5**	**15.3**	**17.8**	20	**135**	**133**
pH (pH Units)	**7.0**	**7.2**	**6.9**	**7.3**	**7.5**	**6.7**	**7.4**	**8.2**	7.2	**8.2**	**7.8**
Total Suspended Solids (mg/L)	**26.6**	**9.8**	**25.2**	**19.5**	**13.6**	**18.0**	**34.0**	**19.5**	53.9	1.0 U	**3.1**
Turbidity (NTU)	**9.26**	**6.53** J	**16.50**	**12.90** J	**7.75**	**8.69**	**11.50**	–	15.3	**2.17**	**4.34**
Nutrients											
Nitrate+Nitrite as N (mg/L)	**0.116**	**0.176**	**0.224**	**0.132**	**0.221**	**0.171**	**0.212**	**0.30**	0.526	**1.82**	1.54
Phosphate, Ortho (mg/L)	**0.028**	**0.017**	**0.03**	**0.015** J	**0.017**	**0.028**	**0.03**	**0.046**	0.104	**0.095** J	0.166
Phosphorus, Total (mg/L)	**0.118**	**0.058**	**0.124**	**0.074**	**0.050**	**0.093**	**0.130**	**0.145**	0.272	**0.316**	0.208
Total Nitrogen (mg/L)	**0.69**	**0.76**	**0.75**	**0.65**	**0.45**	**0.60**	**0.82**	**1.24**	1.52	**2.42**	1.82
Metals											
Cadmium (ug/L)	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.139 J	0.100 U	0.100 U
Cadmium, Dissolved (ug/L)	0.045 U	0.045 U	0.045 U	0.045 U	0.045 U	0.045 U	0.045 U	0.086 U	0.086 U	0.086 U	0.086 U
Copper (ug/L)	**9.46**	**4.19**	**8.82**	**5.73**	**5.53**	**5.61**	**12.70**	**15.00**	20.8	**10.10**	**6.03**
Copper, Dissolved (ug/L)	**3.07**	**2.25**	**3.53**	**1.86**	**2.78**	**3.02**	**7.13**	**11.40**	9.12	**9.22**	**4.86**
Lead (ug/L)	**3.84**	**2.50**	**5.75**	**4.63**	**3.28**	**3.15**	**5.04**	**3.58**	14.3	**1.29**	**0.93**
Lead, Dissolved (ug/L)	**0.429**	**0.264**	**0.358**	**0.153**	**0.196**	**0.242**	**0.491**	**0.774**	0.705	**0.792**	**0.497**
Mercury (ug/L)	**0.0103** J	0.0080 U	0.0080 U	0.0016 U	0.0080 U	0.0080 U	0.0080 U	0.0080 U	0.0080 U	0.0080 U	0.0016 U
Mercury, Dissolved (ug/L)	0.0111 U	0.0111 U	0.0111 U	0.0022 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0022 U
Zinc (ug/L)	**58.0**	**48.0**	**311**	**65.4**	**51.6**	**61.7**	**92.7**	**99.4**	174	**34.9**	**27.5**
Zinc, Dissolved (ug/L)	**32.7**	**33.2**	**233**	**36.5**	**30.6**	**42.2**	**48.7**	**74.3**	84.9	**30.6**	**21.5**
Insecticides											
Bifenthrin (ug/L)	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	**0.013** J	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U
LPAHs											
2-Methylnaphthalene (ug/L)	**0.019**	**0.016**	**0.018**	**0.036**	**0.012**	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U
Acenaphthene (ug/L)	0.009 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U
Acenaphthylene (ug/L)	0.009 U	**0.011**	0.010 U	0.009 U	0.009 U	0.009 U	0.009 U	0.009 U	0.009 U	0.010 U	0.009 U
Anthracene (ug/L)	**0.007** J	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	**0.011** J
Fluorene (ug/L)	0.009 U	0.009 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U
Naphthalene (ug/L)	**0.035**	**0.050**	**0.031**	**0.049**	**0.041**	0.016 U	0.016 U	**0.034**	0.026 U	0.029 UJ	0.029 U
Phenanthrene (ug/L)	**0.04**	**0.026**	**0.045**	**0.028**	0.007 U	**0.019**	**0.016** J	0.007 U	**0.027**	0.007 U	**0.008** J
Total LPAHs	**0.096**	**0.099**	**0.094**	**0.094**	**0.062**	**0.044**	**0.040**	**0.055**	**0.056**	**0.036**	**0.047**
HPAHs											
Benzo(a)anthracene (ug/L)	**0.013**	0.006 U	**0.034**	**0.014**	**0.011**	**0.012**	0.006 U	0.006 U	0.006 U	0.006 U	0.006 U
Benzo(a)pyrene (ug/L)	**0.022**	**0.013**	**0.035**	**0.024**	**0.017**	**0.030**	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U
Benzo(b,j,k)fluoranthene (ug/L)	**0.042**	**0.025** J	**0.068**	**0.048**	**0.033**	**0.051**	**0.035**	**0.021** J	0.048	0.011 U	0.011 U
Benzo(g,h,i)perylene (ug/L)	**0.026**	**0.016**	**0.042**	**0.029**	**0.021**	**0.029**	**0.020**	**0.014**	0.005 U	**0.006** J	0.005 U
Chrysene (ug/L)	**0.020**	**0.014**	**0.034**	**0.022**	**0.016**	**0.022**	**0.015**	**0.009** J	0.020	0.008 U	0.008 U
Dibenz(a,h)anthracene (ug/L)	0.006 U	0.006 U	0.006 U	0.006 U	0.006 U	**0.007** J	0.006 U	0.006 U	0.006 U	0.006 U	0.006 U
Fluoranthene (ug/L)	**0.040**	**0.026**	**0.056**	**0.042**	**0.030**	**0.043**	**0.027**	**0.017**	0.036	0.007 U	0.007 U
Indeno(1,2,3-c,d)pyrene (ug/L)	**0.017**	**0.012**	**0.031**	**0.023**	**0.017**	**0.027**	**0.015**	**0.010**	0.022	0.005 U	0.005 U
Pyrene (ug/L)	**0.047**	**0.033**	**0.074**	**0.049**	**0.042**	**0.051**	**0.036**	**0.022**	0.032	0.009 U	0.008 U
Retene (ug/L)	**0.007** J	**0.009** J	**0.017**	**0.007** J	**0.006** J	**0.007** J	**0.006** J	0.005 U	0.005 U	0.005 U	0.005 U
Total HPAHs	**0.230**	**0.145**	**0.377**	**0.254**	**0.190**	**0.272**	**0.154**	**0.101**	**0.167**	**0.034**	**0.030**
Total PAHs	**0.326**	**0.244**	**0.471**	**0.348**	**0.252**	**0.316**	**0.194**	**0.155**	**0.224**	**0.070**	**0.077**
Phthalates											
Bis(2-ethylhexyl) phthalate (ug/L)	**1.32**	**0.72** J	**1.79**	**0.97** J	**0.96** J	**1.08**	**1.37**	**1.51**	1.75	**0.39** J	0.362 U
Butyl benzyl phthalate (ug/L)	**0.509** J	0.405 U	**0.545** J	0.411 U	0.413 U	0.418 U	**1.99**	0.416 U	0.410 U	0.422 U	0.411 U
Diethyl phthalate (ug/L)	**0.343** J	0.314 U	0.327 U	**0.349** J	0.32 U	**0.634** J	**0.526** J	**0.688** J	0.621 J	**0.480** J	0.318 U
Dimethyl phthalate (ug/L)	0.338 U	0.341 U	0.355 U	0.346 U	0.348 U	0.352 U	0.346 U	0.350 U	0.346 U	0.355 U	0.346 U
Di-n-butyl phthalate (ug/L)	0.293 U	**0.348** J	0.308 U	**0.303** J	0.301 U	0.305 U	0.299 U	0.303 U	0.299 U	0.308 U	0.300 U
Di-n-octyl phthalate (ug/L)	0.358 U	0.362 U	0.377 U	0.367 U	0.369 U	0.373 U	0.366 U	0.371 U	0.366 U	0.377 U	0.367 U
Total Phthalates	**2.17**	**1.07**	**2.34**	**1.63**	**0.96**	**1.71**	**3.89**	**2.20**	**2.37**	**0.87**	**0.00**
Herbicides											
Dichlobenil (ug/L)	**0.103**	**0.020** J	**0.025** J	**0.024** J	**0.022** J	**0.105**	**0.041** J	**0.031** J	**0.018** J	**0.012** J	0.00851 U

Bold – The analyte was present in the sample.
U – The analyte was not detected at or above the reported value.
UJ – The analyte was not detected at or above the reported estimated value.
J – The analyte was positively identified. The associated value is an estimate.
R – The value is considered unusable.

Table D-1.2
Stormwater Analytical Data for Outfall 230A WY2024 - Grab Samples

	Grab Sample 1 10/16/2023		Grab Sample 2 12/4/2023		Grab Sample 3 1/8/2024		Grab Sample 4 2/28/2024		Grab Sample 5 4/25/2024		Grab Sample 6 5/21/2024	
TPH												
NWTPH-Diesel (mg/L)	0.10	U	0.09	U	0.10	U	0.10	U	0.10	U	0.10	U
NWTPH-Heavy Oil (mg/L)	**0.67**		**0.28**		**0.55**		**1.48**		**0.46**		**0.69**	
Bacteria[1]												
Coliform, Fecal (CFU/100mL)	**50000**		**230000**		**11000**		**11000**		**13000**		**24000**	
E. Coli (CFU/100mL)	**50000**		**230000**		**2100**		**7000**		**13000**		**3500**	
Enterococci (CFU/100mL)	**140000**		**17000**		**2400**		**27000**		**9800**		**9600**	

Bold – The analyte was present in the sample.
U – The analyte was not detected at or above the reported value.
UJ – The analyte was not detected at or above the reported estimated value.
J – The analyte was positively identified. The associated value is an estimate.
R – The value is considered unusable.
E - Exceeds value.

Table D-2.1
Stormwater and Baseflow Analytical Data for Outfall 235 WY2024 - Composite Samples

	Storm 1 10/16/2023	Storm 2 10/25/2023	Storm 3 11/2/2023	Storm 4 11/11/2023	Storm 5 12/10/2023	Storm 6 12/19/2023	Storm 7 1/6/2024	Storm 8 1/22/2024	Storm 9 2/15/2024	Storm 10 2/29/2024	Storm 11 4/26/2024	Storm 12 5/21/2024	Storm 13 6/3/2024	Storm 14 8/18/2024	Storm 15 9/11/2024	Baseflow 1 8/7/2024	Baseflow 2 9/17/2024
Conventionals																	
Anionic Surfactants - MBAS (ug/L)	–	32	–	56	–	56	23 J	25 J	57	25	57	111	83	–	83	43	19 J
BOD (mg/L)	–	3.0	–	3.7	–	4.3	2.5 J	2.0	3.4	–	8.1 NJ	9.2 NJ	5.8	–	8.7 NJ	2.0 U	2.0 U
Chloride (mg/L)	–	3.58	–	3.17 UJ	–	18.9	6.48 UJ	10.6 UJ	6.12 UJ	6.58	4.7	6.64	3.91	–	2.58	45.4	65.4
Conductivity (uS/cm)	65.8	60.3	50.9	42.8	80.0	184.0	102.0	108.0	79.3	74.9	76.9	127.0	74.7	113.0	62.2	448.0	540
Hardness (mg CaCO3/L)	27.0	20.2	16.8	16.6	27.6	57.1	36.3	34.3	25.8	23.8	29.4	46.7	29.1	43.2	23.9	148.0	161
pH (pH Units)	7.3	7.5	6.9	7.9	7.0	6.8	7.1	7.3	6.5	7.2	7.2	6.8	7.3	6.9	7.4	8.1	8.2
Total Suspended Solids (mg/L)	62.4	16.8	12.8	37.0	20.6	25.7	16.4	25.8	16.1 J	36.5	39.7	33.8	76.3	127.0	74.7	1.21	1.02 U
Turbidity (NTU)	–	16.80	–	16.70	–	16.30	18.20 J	9.41	8.06	16.60	17.90	23.00	21.20	–	14.9	1.27	2.31
Nutrients																	
Nitrate+Nitrite as N (mg/L)	–	0.305	–	0.249	–	0.529	0.26	0.338	0.275	0.193	0.392	0.634	0.441	0.082	0.504	0.646	0.86
Phosphate, Ortho (mg/L)	0.037	0.044	0.042	0.027	0.021	0.032	0.022 J	0.022	0.028	0.020	0.044	0.060	0.047	0.007 J	0.066	0.136	0.125
Phosphorus, Total (mg/L)	–	0.090	–	0.097	–	0.089	0.063	0.055	0.066	0.074	0.174	0.216	0.156	0.706	0.276	0.152	0.123
Total Nitrogen (mg/L)	–	0.74	–	0.77	–	1.13	0.51	0.74	0.66	0.41	1.02	1.50	0.94	2.91	1.35	1.16	1.13
Metals																	
Cadmium (ug/L)	0.151 J	0.100 J	0.100 U	0.126 J	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.128 J	0.102 J	0.390 J	0.236 J	0.100 U	0.1 U
Cadmium, Dissolved (ug/L)	0.053 J	0.045 U	0.045 U	0.051 J	0.045 U	0.045 U	0.045 U	0.045 U	0.045 U	0.045 U	0.045 U	0.086 U	0.086 U	0.086 U	0.086 U	0.086 U	0.086 U
Copper (ug/L)	45.7	22.9	19.3	27.0	14.3	28.6	19.2	21.2	20.4	20.2	40.3	48.7	37.5	133.0	54.9	4.3	2.95
Copper, Dissolved (ug/L)	12.2	12.2	10.9	7.68	7.11	13.1	8.2	7.09	10.6	7.53	18.1	31.8	17.2	55.9	20.5	3.7	1.72
Lead (ug/L)	61.1	30.9	34.3	28.5	24.2	44.1	23.5	29.4	36.6	34.5	57.2	51.4	51	144	111	1.55	2.73
Lead, Dissolved (ug/L)	5.64	5.20	7.32	3.91	5.26	4.58	3.78	3.00	5.16	2.66	5.67	13.70	8.88	20.20	7.98	0.38	0.501
Mercury (ug/L)	0.0088 J	0.0080 U	0.0080 U	0.0080 U	0.0080 U	0.0080 U	0.0016 U	0.0080 U	0.0080 U	0.0080 U	0.0172 J	0.0080 U	0.0080 U	0.0334	0.0089 J	0.0080 U	0.0016 U
Mercury, Dissolved (ug/L)	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0022 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0146 J	0.0111 U	0.0111 U	0.0022 U
Zinc (ug/L)	148	67.4	54.9	92.5	42.5	89.4	65.1	80.8	61.4	69.6	122	199	123	321	193	6.82	6.77
Zinc, Dissolved (ug/L)	31.7	34.8	29.9	32.3	24.6	38.8	32.7	28.7	33	26.9	41.7	120	48.3	156	51.1	5.59	5.14
Insecticides																	
Bifenthrin (ug/L)	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U
LPAHs																	
2-Methylnaphthalene (ug/L)	0.010 U	0.010 U	0.009 U	0.010 U	0.010	0.010 U	0.009 U	0.010 U	0.010 U	0.010 U	0.019	0.010 U	0.010 U	0.010 U	0.010 U	0.009 U	0.010 U
Acenaphthene (ug/L)	0.010 U	0.010 U	0.009 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U
Acenaphthylene (ug/L)	0.009 U	0.009 U	0.009 U	0.013	0.015	0.009 U	0.009 U	0.012	0.009 U	0.009 U	0.009 U	0.010 U	0.010 U	0.009 U	0.009 U	0.009 U	0.009 U
Anthracene (ug/L)	0.043	0.005 U	0.005 U	0.018	0.022	0.005 U	0.008 J	0.018	0.005 U	0.012	0.005 U	0.005 U	0.019	0.005 U	0.005 U	0.005 U	0.008 J
Fluorene (ug/L)	0.010 U	0.010 U	0.009 U	0.010 U	0.009 U	0.010 U	0.009 U	0.010 U	0.010 U	0.010 U	0.011	0.010 U	0.010 U	0.010 U	0.010 U	0.009 U	0.010 U
Naphthalene (ug/L)	0.016 U	0.016 U	0.015 U	0.016 U	0.041	0.036	0.016 U	0.016 U	0.016 U	0.016 U	0.016 U	0.037	0.025 UJ	0.022 U	0.026 U	0.026 UJ	0.033 UJ
Phenanthrene (ug/L)	0.041	0.022	0.016 J	0.027	0.027	0.029	0.022	0.038	0.014 J	0.026	0.032	0.021	0.019	0.043	0.007 U	0.007 U	0.007 U
Total LPAHs	0.107	0.047	0.040	0.076	0.115	0.082	0.052	0.086	0.039	0.061	0.063	0.075	0.065	0.071	0.033	0.033	0.042
HPAHs																	
Benzo(a)anthracene (ug/L)	0.019	0.012	0.007 J	0.033	0.026	0.028	0.018	0.038	0.013	0.033	0.016	0.006 U	0.020	0.006 U	0.006 U	0.006 U	0.006 U
Benzo(a)pyrene (ug/L)	0.030	0.018	0.009 J	0.043	0.027	0.027	0.023	0.045	0.025	0.040	0.003 U	0.004 U	0.027	0.003 U	0.003 U	0.003 U	0.003 U
Benzo(b,k)fluoranthene (ug/L)	0.063	0.036	0.019 J	0.084	0.063	0.046	0.042	0.094	0.044	0.084	0.041	0.011 U	0.061	0.011 U	0.038	0.011 U	0.023 J
Benzo(g,h,i)perylene (ug/L)	0.048	0.031	0.015	0.039	0.024	0.037	0.030	0.043	0.024	0.035	0.022	0.022	0.030	0.005 U	0.035	0.005 U	0.006 J
Chrysene (ug/L)	0.036	0.018	0.009 J	0.055	0.035	0.028	0.022	0.050	0.014	0.044	0.022	0.015	0.029	0.025	0.019	0.008 U	0.008 U
Dibenz(a,h)anthracene (ug/L)	0.006 U	0.006 U	0.006 U	0.010	0.006 U	0.006 U	0.006 U	0.008 J	0.006 U	0.007 J	0.006 U	0.007 U	0.007 U	0.006 U	0.006 U	0.006 U	0.006 U
Fluoranthene (ug/L)	0.075	0.039	0.022	0.069	0.051	0.064	0.051	0.091	0.030	0.073	0.052	0.029	0.045	0.007 U	0.044	0.007 U	0.010 J
Indeno(1,2,3-c,d)pyrene (ug/L)	0.025	0.015	0.008 J	0.035	0.020	0.021	0.021	0.033	0.019	0.031	0.015	0.012	0.021	0.005 U	0.018	0.005 U	0.005 U
Pyrene (ug/L)	0.094	0.058	0.036	0.080	0.067	0.109	0.076	0.128	0.052	0.101	0.073	0.042	0.057	0.063	0.047	0.008 U	0.014
Retene (ug/L)	0.013	0.009 J	0.007 J	0.016	0.008 J	0.024	0.011	0.015	0.012	0.010	0.005 U	0.005 U	0.009 J	0.005 U	0.015	0.005 U	0.007 J
Total HPAHs	0.393	0.230	0.128	0.448	0.316	0.363	0.286	0.530	0.224	0.448	0.245	0.133	0.292	0.110	0.208	0.030	0.067
Total PAHs	0.500	0.277	0.168	0.524	0.431	0.445	0.338	0.616	0.263	0.509	0.307	0.208	0.357	0.181	0.242	0.063	0.109
Phthalates																	
Bis(2-ethylhexyl) phthalate (ug/L)	2.07	1.35	1.11	1.57	0.71 J	1.81	0.94 J	1.27	0.74 J	1.40	1.09	2.79	1.21	2.21	1.66	0.36 U	0.36 U
Butyl benzyl phthalate (ug/L)	0.409 U	0.416 U	0.398 U	0.411 U	0.404 U	0.408 U	0.407 U	0.408 U	0.407 U	0.410 U	0.405 U	0.433 U	0.431 U	0.416 U	0.415 U	0.406 U	0.413 U
Diethyl phthalate (ug/L)	0.317 U	0.322 U	0.308 U	0.318 U	0.313 U	0.316 U	0.315 U	0.316 U	0.316 U	0.318 U	0.314 U	0.335 U	0.334 U	0.322 U	0.321 U	0.314 U	0.320 U
Dimethyl phthalate (ug/L)	0.344 U	0.350 U	0.335 U	0.346 U	0.340 U	0.344 U	0.342 U	0.343 U	0.343 U	0.346 U	0.341 U	0.365 U	0.363 U	0.350 U	0.349 U	0.342 U	0.348 U
Di-n-butyl phthalate (ug/L)	0.298 U	0.303 U	0.325 J	0.300 U	0.295 U	0.298 U	0.297 U	0.298 U	0.297 U	0.299 U	0.296 U	0.339 J	0.314 U	0.354 J	0.303 U	0.296 U	0.301 U
Di-n-octyl phthalate (ug/L)	0.365 U	0.371 U	0.355 U	0.367 U	0.361 U	0.365 U	0.363 U	0.364 U	0.364 U	0.366 U	0.362 U	0.387 U	0.385 U	0.371 U	0.370 U	0.362 U	0.369 U
Total Phthalates	2.07	1.35	1.44	1.57	0.71	1.81	0.94	1.27	0.74	1.40	1.09	3.13	1.21	2.56	1.66	0.00	0.00
Herbicides																	
Dichlobenil (ug/L)	0.020 J	0.629	0.352	0.046 J	0.016 J	0.025 J	0.012 J	0.016 J	0.023 J	0.017 J	0.032 J	0.009 U	0.017 J	0.009 U	0.00858 U	0.008 U	0.00854 U

Bold – The analyte was present in the sample.
U – The analyte was not detected at or above the reported value.
UJ – The analyte was not detected at or above the reported estimated value.
J – The analyte was positively identified. The associated value is an estimate.
R – The value is considered unusable.

Table D-3.1
Stormwater Analytical Data for Outfall 237A WY2024 - Composite Samples

	Stormwater Analytical Data								
	Storm 1 10/16/2023	Storm 2 11/4/2023	Storm 3 11/11/2023	Storm 4 12/10/2023	Rejected 12/19/2023	Storm 6 1/6/2024	Storm 7 1/22/2024	Storm 8 4/26/2024	Storm 9 9/11/2024
Conventionals									
Anionic Surfactants - MBAS (ug/L)	–	–	–	–	–	**24** J	**23** J	**61**	–
BOD (mg/L)	–	**5.4**	**5.8**	2.0 U	–	–	**3.5**	–	**8.1**
Chloride (mg/L)	–	–	–	–	–	9.41 UJ	**22.7**	**25.3**	–
Conductivity (uS/cm)	**107**	**81.7**	**86.3**	**114**	**135**	**98.6**	**141**	**140**	**58.8**
Hardness (mg CaCO3/L)	**36.6**	**29.7**	**30.2**	**36.6**	**38.9**	**30.6**	**33.9**	**26.0**	**19.6**
pH (pH Units)	**7.2**	**6.4**	**6.6**	**7**	**6.5**	**6.5**	**7.3**	**7.2**	**7.3**
Total Suspended Solids (mg/L)	**70.4**	**108**	**59.2**	–	**20.8**	**20.3**	**18.6**	**37.2**	**92.2**
Turbidity (NTU)	–	–	–	–	–	**50** J	**9.7**	**18.5**	–
Nutrients									
Nitrate+Nitrite as N (mg/L)	**0.388**	**0.198**	**0.203**	**0.702**	**0.106**	**0.389**	**0.467**	**0.321**	**0.423**
Phosphate, Ortho (mg/L)	**0.024**	**0.018**	**0.015**	**0.015**	**0.018**	**0.011** J	**0.015**	**0.025**	**0.055**
Phosphorus, Total (mg/L)	**0.261**	**0.192**	**0.092**	**0.061**	**0.063**	**0.059**	**0.049**	**0.129**	**0.161**
Total Nitrogen (mg/L)	0.93 UJ	**0.62**	**0.40**	**1.22**	**0.91**	**0.69**	**0.70**	**0.83**	**0.85**
Metals									
Cadmium (ug/L)	**0.166** J	**0.113** J	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	**0.123** J
Cadmium, Dissolved (ug/L)	0.045 U	0.045 U	0.045 U	0.045 U	0.045 U	0.045 U	0.045 U	0.045 U	0.086 U
Copper (ug/L)	**20.1**	**13.6**	**11.3**	**4.43**	**6.27**	**5.61**	**6.1**	**8.43**	**12.1**
Copper, Dissolved (ug/L)	**3.2**	**2.82**	**2.88**	**2.08**	**2.78**	**1.65**	**2.28**	**4.77**	**4.87**
Lead (ug/L)	**18.7**	**14.9**	**8.35**	**3.02**	**4.27**	**4.46**	**3.81**	**3.36**	**8.69**
Lead, Dissolved (ug/L)	**0.81**	**0.36**	**0.33**	**0.21**	**0.22**	**0.18**	**0.17**	**0.25**	**0.38**
Mercury (ug/L)	0.0080 U	**0.0106** J	0.0080 U	0.0080 U	0.0080 U	0.0016 U	0.0080 U	0.0080 U	0.008 U
Mercury, Dissolved (ug/L)	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0022 U	0.0111 U	0.0111 U	0.0111 U
Zinc (ug/L)	**122**	**72.6**	**66**	**33.5**	**51.6**	**51.2**	**42.8**	**70.4**	**82.6**
Zinc, Dissolved (ug/L)	**25.3**	**20.3**	**24.3**	**19.6**	**28.9**	**27.0**	**22.4**	**44.8**	**35.9**
Insecticides									
Bifenthrin (ug/L)	0.010 U	0.010 U	0.011 UJ	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.0099 U
LPAHs									
2-Methylnaphthalene (ug/L)	**0.017**	**0.014**	**0.016**	**0.057**	0.010 U	**0.014**	0.009 U	0.009 U	0.010 U
Acenaphthene (ug/L)	0.010 U	0.009 U	0.010 U	0.009 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U
Acenaphthylene (ug/L)	0.009 U	0.009 U	0.009 U	0.009 U	0.009 U	0.009 U	0.009 U	0.009 U	0.009 U
Anthracene (ug/L)	**0.041**	**0.010** J	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Fluorene (ug/L)	0.009 U	0.009 U	**0.019**	**0.011**	0.010 U	0.010 U	0.009 U	0.009 U	0.010 U
Naphthalene (ug/L)	0.016 U	**0.022** J	**0.030**	**0.078**	**0.046**	**0.017** J	**0.020** J	0.016 U	0.026 U
Phenanthrene (ug/L)	**0.039**	**0.077**	**0.032**	**0.028**	**0.025**	**0.024**	**0.021**	**0.014** J	**0.036**
Total LPAHs	**0.102**	**0.123**	**0.093**	**0.129**	**0.088**	**0.058**	**0.058**	**0.038**	**0.065**
HPAHs									
Benzo(a)anthracene (ug/L)	**0.031**	**0.074**	**0.03**	0.006 U	**0.024**	**0.018**	**0.017**	**0.013**	0.006 U
Benzo(a)pyrene (ug/L)	**0.060**	**0.128**	**0.067**	**0.013**	**0.024**	**0.032**	**0.030**	0.003 U	0.003 U
Benzo(b,k)fluoranthene (ug/L)	**0.142**	**0.282**	**0.121**	**0.028** J	**0.050**	**0.069**	**0.068**	**0.057**	**0.112**
Benzo(g,h,i)perylene (ug/L)	**0.074**	**0.128**	**0.061**	**0.017**	**0.029**	**0.042**	**0.036**	**0.024**	**0.058**
Chrysene (ug/L)	**0.063**	**0.125**	**0.065**	**0.014**	**0.023**	**0.032**	**0.028**	**0.024**	**0.049**
Dibenz(a,h)anthracene (ug/L)	**0.014**	**0.026**	**0.014**	0.006 U	0.006 U	0.006 U	0.006 U	0.006 U	**0.012**
Fluoranthene (ug/L)	**0.084**	**0.204**	**0.089**	**0.021**	**0.041**	**0.055**	**0.049**	**0.039**	**0.083**
Indeno(1,2,3-c,d)pyrene (ug/L)	**0.060**	**0.114**	**0.071**	**0.014**	**0.025**	**0.035**	**0.033**	**0.023**	**0.061**
Pyrene (ug/L)	**0.095**	**0.193**	**0.079**	**0.030**	**0.060**	**0.063**	**0.058**	**0.043**	**0.066**
Retene	**0.009** J	**0.021**	**0.012**	**0.007** J	**0.012**	**0.007** J	**0.008** J	**0.006** J	**0.013**
Total HPAHs	**0.623**	**1.274**	**0.597**	**0.143**	**0.279**	**0.349**	**0.322**	**0.228**	**0.446**
TOTAL PAHs	**0.725**	**1.397**	**0.690**	**0.272**	**0.367**	**0.407**	**0.380**	**0.266**	**0.512**
Phthalates									
Bis(2-ethylhexyl) phthalate (ug/L)	**1.34**	**1.16**	**1.04**	**0.526** J	**1.08**	**0.88** J	**0.789** J	**1.21**	**1.16**
Butyl benzyl phthalate (ug/L)	0.405 U	0.395 U	0.406 U	0.401 U	0.409 U	0.411 U	0.407 U	0.403 U	0.411 U
Diethyl phthalate (ug/L)	0.314 U	0.306 U	0.314 U	0.311 U	0.317 U	0.319 U	0.315 U	0.312 U	0.319 U
Dimethyl phthalate (ug/L)	0.341 U	0.333 U	0.342 U	0.338 U	0.344 U	0.347 U	0.342 U	0.339 U	0.347 U
Di-n-butyl phthalate (ug/L)	**0.309** J	**0.345** J	0.296 U	0.293 U	0.298 U	**0.333** J	0.297 U	0.294 U	0.300 U
Di-n-octyl phthalate (ug/L)	0.362 U	0.353 U	0.362 U	0.358 U	0.365 U	0.367 U	0.363 U	0.360 U	0.367 U
Total Phthalates	**1.65**	**1.51**	**1.04**	**0.53**	**1.08**	**1.21**	**0.79**	**1.21**	**1.16**
Herbicides									
Dichlobenil (ug/L)	**0.020** J	**0.047** J	**0.030** J	**0.022** J	**0.021** J	**0.012** J	**0.016** J	**0.050**	**0.020** J

Bold – The analyte was present in the sample.
U – The analyte was not detected at or above the reported value.
UJ – The analyte was not detected at or above the reported estimated value.
J – The analyte was positively identified. The associated value is an estimate.
R – The value is considered unusable.
E - Exceeds value.

Table D-3.2
Stormwater Analytical Data for Outfall 237A WY2024 - Grab Samples

	Stormwater Analytical Data					
	Grab Sample 1 10/16/2023	Grab Sample 2 12/4/2023	Grab Sample 3 1/8/2024	Grab Sample 4 2/28/2024	Grab Sample 5 4/25/2024	Grab Sample 6 5/21/2024
TPH						
NWTPH-Diesel (mg/L)	0.10 U	0.12	0.15	0.10 U	0.10 U	0.10 U
NWTPH-Heavy Oil (mg/L)	0.27	0.43	0.77	0.42	0.54	0.75
Bacteria						
Coliform, Fecal (CFU/100mL)	**8000**	**130**	**2300**	**1700**	**2400**	**13000**
E. Coli (CFU/100mL)	**8000**	**130**	**2300**	**1700**	**2400**	**900**
Enterococci (CFU/100mL)	**19000**	**3200**	**3900**	**1700**	**9200**	**3200**

Bold – The analyte was present in the sample.
U – The analyte was not detected at or above the reported value.
UJ – The analyte was not detected at or above the reported estimated value.
J – The analyte was positively identified. The associated value is an estimate.
R – The value is considered unusable.
E - Exceeds value.

Table D-4.1
Stormwater Analytical Data for Outfall 237B WY2024 - Composite Samples

	Stormwater Analytical Data													
	Storm Sample 1 10/10/2023	Storm Sample 2 10/16/2023	Storm Sample 3 10/25/2023	Storm Sample 4 11/2/2023	Storm Sample 5 11/11/2023	Storm Sample 6 12/11/2023	Storm Sample 7 12/19/2023	Storm Sample 8 1/6/2024	Storm Sample 9 1/22/2024	Storm Sample 10 2/15/2024	Storm Sample 11 2/29/2024	Storm Sample 12 4/26/2024	Storm Sample 13 5/21/2024	Storm Sample 14 9/11/2024
Conventionals														
Anionic Surfactants - MBAS (ug/L)	–	–	**42.9**	–	**49.0**	**25.0**	**45.0**	**22.0** J	**22.1** J	**35.0**	–	**65.4**	–	**104**
BOD (mg/L)	–	**3.1**	**2.9**	–	**3.5**	2 U	**3**	**2.4**	2 U	**2.7**	–	–	–	8.4 NJ
Chloride (mg/L)	–	–	**5.98**	–	4.86 UJ	6.79 UJ	8.4 UJ	5.42 UJ	9.05 UJ	5.51 UJ	–	**5.60**	–	**3.65**
Conductivity (uS/cm)	**218**	**150**	**143**	**109**	**114**	**177**	**164**	**133**	**145**	**121**	**114**	**138**	**174**	**108**
Hardness (mg CaCO3/L)	**82.1**	**60.8**	**54.8**	**49.7**	**48.8**	**70.2**	**63.1**	**52.4**	**55.1**	**48.4**	**43.8**	**58.8**	**73.6**	**45.4**
pH (pH Units)	**7.0**	**6.8**	**7.5**	**6.5**	**6.8**	**6.8**	**6.6**	**6.7**	**6.8**	**6.5**	**6.9**	**6.8**	**6.4**	**7.3**
Total Suspended Solids (mg/L)	–	**37.2**	**18.4**	**18.2**	**43.5**	**8.6**	**22**	**21.6**	**14.8**	**19.5**	**35**	**51.3**	**15.2**	**60.6**
Turbidity (NTU)	–	–	**20.3**	–	**19.4**	**6.47**	**15.1**	**27.1** J	**8.61**	**11.6**	–	**12.2**	–	**18.9**
Nutrients														
Nitrate+Nitrite as N (mg/L)	–	**1.42**	**1.36**	**1.14**	**1.1**	**2.4**	**1.47**	**1.21**	**1.3**	**1.03**	**0.961**	**1.32**	**1.89**	**1.19**
Phosphate, Ortho (mg/L)	–	**0.035**	**0.04**	**0.031**	**0.019**	**0.026**	**0.025**	**0.016** J	**0.024**	**0.018**	**0.023**	**0.021**	**0.03**	**0.059**
Phosphorus, Total (mg/L)	–	**0.092**	**0.078**	**0.045**	**0.092**	**0.053**	**0.064**	**0.072**	**0.048**	**0.068**	**0.09**	**0.109**	**0.094**	**0.195**
Total Nitrogen (mg/L)	–	**1.95**	**1.68**	**1.35**	**1.34**	**2.72**	**1.84**	**1.37**	**1.63**	**1.36**	**1.29**	**1.75**	**2.13**	**1.66**
Metals														
Cadmium (ug/L)	**0.112** J	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U	0.100 U
Cadmium, Dissolved (ug/L)	**0.062** J	0.045 U	0.045 U	0.045 U	0.045 U	0.045 U	0.045 U	0.045 U	0.045 U	0.045 U	0.045 U	0.045 U	0.086 U	0.086 U
Copper (ug/L)	**4.81**	**7.39**	**4.44**	**4.65**	**8.68**	**3.87**	**4.81**	**4.44**	**66.3**	**4.49**	**7.76**	**7.93**	**6.62**	**12.7**
Copper, Dissolved (ug/L)	**2.14**	**2.16**	**1.90**	**2.11**	**1.93**	**2.40**	**1.83**	**1.43**	**2.18**	**1.60**	**2.01**	**3.99**	**3.82**	**4.52**
Lead (ug/L)	**2.12**	**3.92**	**2.75**	**2.08**	**6.39**	**1.31**	**3.04**	**3.25**	**2.35**	**3.08**	**6.23**	**3.59**	**2.01**	**8.62**
Lead, Dissolved (ug/L)	**0.17**	**0.237**	**0.212**	**0.172**	**0.208**	**0.147**	**0.16**	**0.152**	**0.161**	**0.165**	**0.209**	**0.225**	**0.159**	**0.239**
Mercury (ug/L)	0.0080 U	0.0080 U	0.0080 U	0.0080 U	0.0080 U	0.0080 U	0.0080 U	0.0016 U	0.0080 U	0.0080 U	0.0080 U	0.0080 U	0.0080 U	0.008 U
Mercury, Dissolved (ug/L)	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0022 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U
Zinc (ug/L)	**24.2**	**34.6**	**30.3**	**28.9**	**44.7**	**23.7**	**41.7**	**28.2**	**27.9**	**32.1**	**53**	**43.1**	**82.6**	**70.4**
Zinc, Dissolved (ug/L)	**9.5**	**10.4**	**16.0**	**15.6**	**12.9**	**16.8**	**23.6**	**13.4**	**16.6**	**15.7**	**18.8**	**16.9**	**57.9**	**20.9**
Insecticides														
Bifenthrin (ug/L)	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.0101 U
LPAHs														
2-Methylnaphthalene (ug/L)	0.010 U	**0.062**	0.010 U	**0.028**	0.010 U	0.009 U	**0.023**	**0.014**	**0.122**	0.010 U	0.009 U	0.009 U	0.010 U	0.010 U
Acenaphthene (ug/L)	0.010 U	0.010 U	0.010 U	0.009 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.009 U	0.010 U	0.010 U
Acenaphthylene (ug/L)	0.009 U	0.009 U	0.009 U	0.009 U	**0.011**	0.009 U	**0.010**	0.009 U	0.009 U	0.009 U	0.009 U	0.009 U	0.010 U	0.009 U
Anthracene (ug/L)	0.005 U	**0.037**	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	**0.018**	0.005 U	0.005 U	0.005 U	0.005 U
Fluorene (ug/L)	0.010 U	**0.013**	0.010 U	**0.013**	**0.013**	0.009 U	0.010 U	0.009 U	0.010 U	0.010 U	0.009 U	0.009 U	0.010 U	0.010 U
Naphthalene (ug/L)	0.016 U	**0.033**	0.016 U	**0.024** J	0.016 U	**0.031**	**0.033**	0.016 U	**0.080**	0.016 U	0.016 U	**0.028**	**0.039**	0.026 U
Phenanthrene (ug/L)	0.007 U	**0.035**	**0.012** J	**0.018**	**0.021**	**0.009** J	**0.025**	**0.020**	**0.026**	**0.018**	**0.012** J	**0.011** J	**0.027**	0.007 U
Total LPAHs	**0.029**	**0.128**	**0.037**	**0.067**	**0.061**	**0.057**	**0.081**	**0.045**	**0.123**	**0.059**	**0.037**	**0.055**	**0.084**	**0.034**
HPAHs														
Benzo(a)anthracene (ug/L)	0.006 U	**0.010**	0.006 U	0.006 U	**0.014**	0.006 U	**0.029**	**0.010**	**0.008** J	**0.009** J	**0.010**	**0.009** J	**0.015**	0.006 U
Benzo(a)pyrene (ug/L)	0.003 U	**0.019**	**0.011**	**0.008** J	**0.029**	0.003 U	**0.022**	**0.015**	**0.013**	**0.017**	**0.017**	0.003 U	0.004 U	0.003 U
Benzo(b,k)fluoranthene (ug/L)	**0.018** J	**0.042**	**0.026** J	**0.018** J	**0.047**	0.011 U	**0.043**	**0.025** J	**0.025** J	**0.023** J	**0.029** J	**0.029** J	0.011 U	**0.044**
Benzo(g,h,i)perylene (ug/L)	**0.012**	**0.026**	**0.018**	**0.012**	**0.026**	0.005 U	**0.024**	**0.019**	**0.013**	**0.014**	**0.015**	**0.013**	0.005 U	**0.025**
Chrysene (ug/L)	0.008 U	**0.021**	**0.009** J	0.008 U	**0.022**	0.008 U	**0.018**	**0.012**	**0.011**	**0.010**	**0.014**	**0.013**	**0.015**	**0.017**
Dibenz(a,h)anthracene (ug/L)	0.006 U	0.006 U	0.006 U	0.006 U	**0.008** J	0.006 U	0.006 U	0.006 U	0.006 U	0.006 U	0.006 U	0.006 U	0.007 U	0.006 U
Fluoranthene (ug/L)	**0.014**	**0.036**	**0.020**	**0.017**	**0.042**	0.007 U	**0.034**	**0.024**	**0.026**	**0.025**	**0.026**	**0.021**	**0.035**	**0.036**
Indeno(1,2,3-c,d)pyrene (ug/L)	**0.010**	**0.017**	**0.011**	**0.008** J	**0.024**	0.005 U	**0.020**	**0.014**	**0.013**	**0.014**	**0.015**	**0.011**	0.005 U	**0.021**
Pyrene (ug/L)	**0.022**	**0.051**	**0.029**	**0.026**	**0.044**	**0.011**	**0.049**	**0.035**	**0.032**	**0.031**	**0.034**	**0.030**	**0.035**	**0.034**
Retene (ug/L)	0.005 U	**0.006** J	**0.006** J	**0.006** J	**0.015**	0.005 U	**0.014**	**0.007** J	**0.007** J	**0.007** J	**0.007** J	0.005 U	0.005 U	0.005 U
Total HPAHs	**0.088**	**0.225**	**0.130**	**0.099**	**0.256**	**0.037**	**0.242**	**0.157**	**0.144**	**0.146**	**0.163**	**0.130**	**0.115**	**0.186**
Total PAHs	**0.116**	**0.353**	**0.167**	**0.166**	**0.317**	**0.093**	**0.323**	**0.202**	**0.267**	**0.205**	**0.200**	**0.185**	**0.199**	**0.219**
Phthalates														
Bis(2-ethylhexyl) phthalate (ug/L)	**0.915** J	**0.884** J	**0.714** J	**0.642** J	**1.100**	0.356 U	**0.770** J	**0.535** J	**0.408** J	**0.446** J	**0.512** J	**0.634** J	**0.507** J	**1.07**
Butyl benzyl phthalate (ug/L)	0.409 U	0.409 U	0.416 U	0.4 U	0.409 U	0.403 U	0.409 U	0.406 U	0.409 U	0.408 U	0.406 U	0.399 U	0.431 U	0.418 U
Diethyl phthalate (ug/L)	0.317 U	0.317 U	0.322 U	0.310 U	0.317 U	0.313 U	0.317 U	0.315 U	0.317 U	0.316 U	0.314 U	0.309 U	0.334 U	0.324 U
Dimethyl phthalate (ug/L)	0.345 U	0.344 U	0.350 U	0.337 U	0.344 U	0.340 U	0.345 U	0.342 U	0.344 U	0.344 U	0.342 U	0.336 U	0.363 U	0.352 U
Di-n-butyl phthalate (ug/L)	0.299 U	0.298 U	0.303 U	0.292 U	0.298 U	0.294 U	0.299 U	**0.315** J	0.298 U	0.298 U	0.296 U	0.291 U	0.314 U	**0.35** J
Di-n-octyl phthalate (ug/L)	0.366 U	0.365 U	0.371 U	0.358 U	0.514 UJ	0.360 U	0.366 U	0.363 U	0.365 U	0.365 U	0.362 U	0.356 U	0.385 U	0.373 U
Total Phthalates	**0.915**	**0.884**	**0.714**	**0.642**	**1.100**	**0.000**	**0.770**	**0.850**	**0.408**	**0.446**	**0.512**	**0.634**	**0.507**	**1.420**
Herbicides														
Dichlobenil (ug/L)	**0.023** J	**0.022** J	**0.042** J	**0.036** J	**0.017** J	**0.011** J	**0.013** J	**0.021** J	**0.017** J	**0.039** J	**0.065**	**0.0461** J	**0.0435** J	**0.0422** J

Bold – The analyte was present in the sample.
U – The analyte was not detected at or above the reported value.
UJ – The analyte was not detected at or above the reported estimated value.
J – The analyte was positively identified. The associated value is an estimate.
R – The value is considered unusable.
E - Exceeds value.

Insufficient Volume
Laboratory Issue

Table D-4.2
Stormwater Analytical Data for Outfall 237B WY2024 - Grab Samples

	Stormwater Analytical Data					
	Grab Sample 1 10/16/2023	Grab Sample 2 12/4/2023	Grab Sample 3 1/8/2024	Grab Sample 4 2/28/2024	Grab Sample 6 4/25/2024	Grab Sample 7 5/21/2024
TPH						
NWTPH-Diesel (mg/L)	0.10 U	0.09 U	0.10 U	0.10 U	0.11 U	**0.15**
NWTPH-Heavy Oil (mg/L)	**0.20**	**0.26**	**0.32**	**0.39**	**0.55**	**0.72**
Bacteria						
Coliform, Fecal (CFU/100mL)	**5000**	**1700**	**1700**	**1300**	**3000**	**5000**
E. Coli (CFU/100mL)	**3000**	**1300**	**800**	**800**	**3000**	**5000**
Enterococci (CFU/100mL)	**52000**	**3400**	**1100**	**1200**	**6100**	**5500**

Bold – The analyte was present in the sample.
U – The analyte was not detected at or above the reported value.
UJ – The analyte was not detected at or above the reported estimated value.
J – The analyte was positively identified. The associated value is an estimate.
R – The value is considered unusable.
E - Exceeds value.

Table D-5.1
Stormwater Analytical Data for Outfall 243 WY2024 - Composite Samples

	Stormwater Analytical Data						
	Storm Sample 1 10/25/2023	Storm Sample 2 11/2/2023	Storm Sample 3 12/10/2023	Storm Sample 4 1/9/2024	Storm Sample 5 2/28/2024	Storm Sample 6 4/25/2024	Storm Sample 7 6/3/2024
Conventionals							
Anionic Surfactants - MBAS (ug/L)	**42.1**	**50.8**	**25.0**	**36.0**	**29.0** J	**75.1**	–
BOD (mg/L)	**2.3**	**3.1**	**2** J	**4.4**	**2.8**	–	**4.2**
Chloride (mg/L)	**962**	**561**	**566**	**695**	**2400**	**1260**	–
Conductivity (uS/cm)	**3316**	**1950**	**2050**	**4443**	**7280**	**3900**	**2350**
Hardness (mg CaCO3/L)	**319**	**219**	**222**	**445**	**631**	**407**	**246**
pH (pH Units)	**6.9**	**6.7**	**6.7**	**6.3**	**6.5**	**6.6**	**7.9**
Total Suspended Solids (mg/L)	**12.8**	**30.7**	**24.3**	**59.4**	**58.2**	**84.4**	**56.6**
Turbidity (NTU)	**17.9**	**28.3**	**18.1**	**202**	**51.6**	**77.9**	–
Nutrients							
Nitrate+Nitrite as N (mg/L)	**0.236**	**0.287**	**0.139**	**0.241**	**0.141**	**0.349**	**0.278**
Phosphate, Ortho (mg/L)	**0.04**	**0.047**	**0.027**	**0.03**	**0.02** J	**0.052**	**0.046**
Phosphorus, Total (mg/L)	**0.139**	**0.368**	**0.456**	**0.324**	**0.4**	**0.8**	**1.01**
Total Nitrogen (mg/L)	**0.74**	**0.81**	**0.45**	**0.61**	**0.45**	**0.96**	**0.71**
Metals							
Cadmium (ug/L)	**0.118** J	**0.217** J	**0.157** J	**0.388** J	**0.466** J	**0.249** J	**0.297** J
Cadmium, Dissolved (ug/L)	**0.094** J	**0.079** J	**0.081** J	**0.111** J	**0.109** J	**0.057** J	0.086 U
Copper (ug/L)	**10.1**	**15.7**	**10.2**	**29.1**	**31.9**	**34.4**	**21.1**
Copper, Dissolved (ug/L)	**4.79**	**4.42**	**3.47**	**3.46**	**3.95**	**7.86**	**4.37**
Lead (ug/L)	**4.25**	**10.2**	**5.99**	**25.2**	**32.3**	**22.8**	**24.9**
Lead, Dissolved (ug/L)	**0.466**	**0.566**	**0.349**	**0.459**	**0.353**	**0.77**	**0.569**
Mercury (ug/L)	0.0080 U	**0.0100** J	0.0080 U	**0.0023** J	**0.0199** J	**0.0130** J	**0.0083** J
Mercury, Dissolved (ug/L)	0.0111 U	0.0111 U	0.0111 U	0.0022 U	0.0111 U	0.0111 U	0.0111 U
Zinc (ug/L)	**33.7**	**47.2**	**40.9**	**71.8**	**85.2**	**95.2**	**65.2**
Zinc, Dissolved (ug/L)	**21.3**	**21.2**	**25.0**	**24.3**	**22.6**	**30.3**	**14.9**
Insecticides							
Bifenthrin (ug/L)	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.011 U
LPAHs							
2-Methylnaphthalene (ug/L)	**0.078**	0.009 U	0.009 U	0.010 U	**0.015**	0.009 U	0.010 U
Acenaphthene (ug/L)	**0.018**	0.009 U	**0.033**	**0.019**	0.010 U	0.010 U	0.010 U
Acenaphthylene (ug/L)	0.009 U	**0.012**	**0.014**	**0.010**	0.009 U	0.009 U	0.010 U
Anthracene (ug/L)	0.005 U	**0.033**	**0.038**	**0.034**	**0.021**	0.005 U	**0.022**
Fluorene (ug/L)	**0.020**	**0.011**	**0.010**	0.010 U	0.009 U	**0.010** J	0.010 U
Naphthalene (ug/L)	**0.031**	**0.019** J	**0.039**	0.016 U	**0.019** J	**0.038**	0.036 UJ
Phenanthrene (ug/L)	**0.038**	**0.029**	**0.066**	**0.044**	**0.031**	**0.041**	**0.021**
Total LPAHs	**0.114**	**0.109**	**0.200**	**0.120**	**0.085**	**0.101**	**0.076**
HPAHs							
Benzo(a)anthracene (ug/L)	0.006 U	**0.011**	0.006 U	**0.035**	**0.027**	**0.020**	**0.018**
Benzo(a)pyrene (ug/L)	**0.009** J	**0.014**	**0.025**	**0.051**	**0.041**	0.003 U	**0.025**
Benzo(b,k)fluoranthene (ug/L)	**0.021** J	**0.034**	**0.051**	**0.097**	**0.081**	**0.067**	**0.052**
Benzo(g,h,i)perylene (ug/L)	**0.011**	**0.014**	**0.022**	**0.039**	**0.024**	**0.022**	**0.021**
Chrysene (ug/L)	**0.009** J	**0.015**	**0.032**	**0.048**	**0.039**	**0.032**	**0.022**
Dibenz(a,h)anthracene (ug/L)	0.006 U	0.006 U	0.006 U	0.006 U	0.006 U	0.006 U	0.007 U
Fluoranthene (ug/L)	**0.024**	**0.035**	**0.072**	**0.100**	**0.072**	**0.066**	**0.044**
Indeno(1,2,3-c,d)pyrene (ug/L)	**0.009** J	**0.013**	**0.021**	**0.041**	**0.031**	**0.022**	**0.020**
Pyrene (ug/L)	**0.033**	**0.040**	**0.078**	**0.103**	**0.079**	**0.075**	**0.047**
Retene (ug/L)	**0.009** J	**0.010**	0.005 U	**0.014**	**0.009** J	**0.012**	**0.008** J
Total HPAHs	**0.122**	**0.179**	**0.307**	**0.517**	**0.397**	**0.308**	**0.253**
Total PAHs	**0.236**	**0.288**	**0.507**	**0.637**	**0.482**	**0.409**	**0.329**
Phthalates							
Bis(2-ethylhexyl) phthalate (ug/L)	**0.567** J	0.348 U	**0.415** J	**0.559** J	**0.514** J	**0.937** J	**0.419** J
Butyl benzyl phthalate (ug/L)	0.416 U	0.395 U	0.401 U	0.416 U	0.406 U	0.405 U	0.437 U
Diethyl phthalate (ug/L)	0.322 U	0.306 U	0.310 U	0.322 U	0.314 U	0.314 U	0.339 U
Dimethyl phthalate (ug/L)	0.350 U	0.333 U	0.338 U	0.350 U	0.342 U	0.341 U	0.368 U
Di-n-butyl phthalate (ug/L)	0.303 U	0.288 U	0.292 U	0.303 U	0.296 U	0.296 U	0.319 U
Di-n-octyl phthalate (ug/L)	0.371 U	0.353 UJ	0.358 U	0.371 U	0.362 U	0.362 U	0.391 U
Total Phthalates	**0.567**	**0.000**	**0.415**	**0.559**	**0.514**	**0.937**	**0.419**
Herbicides							
Dichlobenil (ug/L)	0.009 U	**0.023** J	0.008 U	0.009 U	**0.015** J	**0.022** J	**0.011** J

Bold – The analyte was present in the sample.
U – The analyte was not detected at or above the reported value.
UJ – The analyte was not detected at or above the reported estimated value.
J – The analyte was positively identified. The associated value is an estimate.
R – The value is considered unusable.
E - Exceeds value.

Insufficient Volume
Laboratory Issue

Table D-5.2
Stormwater Analytical Data for Outfall 243 WY2024 - Grab Samples

	Grab Sample 1 10/16/2023		Grab Sample 2 12/4/2023		Grab Sample 3 1/8/2024		Grab Sample 4 2/28/2024		Grab Sample 5 4/25/2024		Grab Sample 6 5/21/2024	
TPH												
NWTPH-Diesel (mg/L)	0.10	U	0.09	U	0.10	U	0.11	U	0.10	U	0.10	U
NWTPH-Heavy Oil (mg/L)	**0.27**		**0.39**		**0.25**		0.22	U	0.21	U	**0.24**	
Bacteria												
Coliform, Fecal (CFU/100mL)	**14000**		**330**		**2100**		**Unusable**	**R**	**Unusable**	**R**	**800**	
E. Coli (CFU/100mL)	**6000**		**330**		**50**		**Unusable**	R	**Unusable**	R	**800**	
Enterococci (CFU/100mL)	**37000**		**3200**		**1800**		**Unusable**	R	**3100**		**4200**	

Bold – The analyte was present in the sample.
U – The analyte was not detected at or above the reported value.
UJ – The analyte was not detected at or above the reported estimated value.
J – The analyte was positively identified. The associated value is an estimate.
R – The value is considered unusable.
E - Exceeds value.

Table D-6.1
Stormwater Analytical Data for Outfall 245 WY2024 - Composite Samples

	Storm Sample 1 10/16/2023	Storm Sample 2 10/25/2023	Storm Sample 3 11/2/2023	Storm Sample 4 11/11/2023	Storm Sample 5 12/10/2023	Storm Sample 6 12/19/2023	Storm Sample 7 1/6/2024	Storm Sample 8 1/22/2024	Storm Sample 9 2/15/2024	Storm Sample 10 2/29/2024	Storm Sample 11 4/26/2024	Storm Sample 12 5/21/2024	Storm Sample 13 6/3/2024	Storm Sample 14 9/11/2024
Conventionals														
Anionic Surfactants - MBAS (ug/L)	**51.2**	**38.9**	**47.2**	**67.0**	**25.0**	–	–	**27.0** J	**62.0**	**39.0**	**99.0**	–	**79.0**	–
BOD (mg/L)	**3.2**	**3.3**	**2.9**	2.0 U	2.0 UJ	–	–	**2.8**	–	**3.4**	**6.2**	–	**3.0**	8.8 NJ
Chloride (mg/L)	**834**	**166**	**204**	**152**	**49.7**	–	–	**103**	**182**	**142**	**72.2**	–	**30.4**	–
Conductivity (uS/cm)	**2840**	**602**	**785**	**601**	**214**	**2850**	**335**	**430**	**738**	**549**	**555**	**658**	**149**	**402**
Hardness (mg CaCO3/L)	**281**	**63.7**	**83.2**	**69.2**	**33.2**	**296**	**47**	**62.7**	**86.5**	**65.5**	**68.3**	**89.2**	**25.2**	**52.4**
pH (pH Units)	**6.7**	**7.1**	**6.8**	**6.9**	**6.6**	**5.9**	**6.9**	**6.2**	**6.8**	**6.7**	**6.7**	**6.5**	**7.1**	**7.2**
Total Suspended Solids (mg/L)	**56**	**33.4**	**19.1**	**75.5**	**13.3**	**119**	**28.9**	**18**	**55.5**	**71**	**43.8**	**43.3**	**31.6**	**85**
Turbidity (NTU)	**53**	**35.6**	**18.4**	**32.6**	**9.94**	–	–	**13.5**	**29.7**	**60.1**	**51.6**	–	**26.3**	–
Nutrients														
Nitrate+Nitrite as N (mg/L)	**0.134**	**0.121**	**0.131**	**0.060**	**0.075**	**0.154**	**0.053**	**0.147**	**0.123**	**0.053**	**0.189**	**0.315**	**0.197**	**0.371**
Phosphate, Ortho (mg/L)	**0.036**	**0.035**	**0.027**	**0.016**	**0.013**	**0.014**	**0.022**	**0.018**	**0.022**	**0.018**	**0.057**	**0.071**	**0.033**	**0.050**
Phosphorus, Total (mg/L)	**0.147**	**0.120**	**0.089**	**0.120**	**0.033** J	**0.198**	**0.085**	**0.060**	**0.159**	**0.179**	**0.206**	**0.275**	**0.131**	**0.350**
Total Nitrogen (mg/L)	0.68 UJ	**0.46**	**0.53**	**0.31**	**0.21**	**2.07**	**0.27**	**0.43**	**0.76**	**0.37**	**1.03**	**2.2**	**0.47**	**1.44**
Metals														
Cadmium (ug/L)	**0.203** J	**0.126** J	**0.110** J	**0.177** J	0.100 U	**0.317** J	**0.106** J	**0.119** J	**0.170** J	**0.135** J	**0.134** J	**0.186** J	**0.105** J	**0.262** J
Cadmium, Dissolved (ug/L)	**0.120** J	**0.058** J	**0.051** J	0.045 U	0.045 U	**0.352** J	0.045 U	**0.090** J	0.045 U	0.045 U	**0.049** J	0.086 U	0.086 U	0.086 U
Copper (ug/L)	**14.0**	**10.0**	**6.84**	**13.2**	**4.23**	**21.5**	**9.08**	**6.43**	**13.1**	**14.5**	**50.1**	**20**	**8.17**	**20.9**
Copper, Dissolved (ug/L)	**3.32**	**2.62**	**2.51**	**1.47**	**1.61**	**2.96**	**1.85**	**1.80**	**2.18**	**2.37**	**6.39**	**8.43**	**3.36**	**5.75**
Lead (ug/L)	**5.61**	**3.57**	**1.91**	**5.40**	**0.845**	**16.8**	**3.02**	**1.95**	**5.6**	**5.47**	**5.53**	**5.25**	**2.7**	**9.49**
Lead, Dissolved (ug/L)	**0.18**	**0.13**	**0.08** J	**0.13**	**0.07** J	**0.15**	**0.12**	**0.08** J	**0.15**	**0.12**	**0.21**	**0.33**	**0.13**	**0.15**
Mercury (ug/L)	0.0080 U	0.0080 U	0.0080 U	0.0080 U	0.0080 U	**0.0138** J	0.0016 U	0.0080 U	0.0080 U	0.0080 U	0.0080 U	0.0080 U	0.0080 U	0.0080 U
Mercury, Dissolved (ug/L)	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0022 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0111 U
Zinc (ug/L)	**98.9**	**74**	**51.9**	**104**	**30.2**	**123**	**69.8**	**50.2**	**93.4**	**90.8**	**86.7**	**109**	**59**	**148**
Zinc, Dissolved (ug/L)	**27.3**	**25.3**	**26.3**	**22.7**	**20.8**	**39.7**	**23.9**	**22.8**	**23.2**	**20.2**	**25.6**	**38.2**	**23.7**	**37.3**
Insecticides														
Bifenthrin (ug/L)	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.097 U	0.010 U	0.011 U	0.010 U	0.010 U
LPAHs														
2-Methylnaphthalene (ug/L)	0.010 U	**0.011**	**0.012**	0.009 U	0.010 U	**0.010**	**0.056**	**0.014**	0.010 U	0.094 U	0.009 U	0.010 U	0.010 U	0.010 U
Acenaphthene (ug/L)	0.010 U	0.010 U	**0.013**	0.009 U	0.010 U	**0.012**	**0.011**	**0.014**	0.010 U	0.095 U	0.009 U	0.010 U	0.010 U	**0.012**
Acenaphthylene (ug/L)	0.009 U	0.009 U	**0.01**	0.009 U	0.009 U	**0.013**	0.009 U	0.009 U	**0.016**	0.091 U	0.00905 U	0.00989 U	0.00922 U	0.00945 U
Anthracene (ug/L)	**0.052**	0.005 U	**0.007** J	0.005 U	**0.006** J	**0.009** J	0.005 U	**0.031**	**0.028**	0.049 U	0.00491 U	0.00537 U	0.005 U	0.00513 U
Fluorene (ug/L)	**0.016**	0.010 U	**0.017**	**0.010**	0.010 U	**0.012**	0.010 U	**0.013**	0.010 U	0.094 U	0.009 U	0.010 U	0.010 U	0.010 U
Naphthalene (ug/L)	0.016 U	**0.02** J	**0.042**	**0.018** J	**0.041**	**0.023** J	0.016 U	**0.017** J	0.016 U	0.155 U	**0.0337**	0.0168 U	0.0157 U	0.0261 U
Phenanthrene (ug/L)	**0.05**	**0.039**	**0.044**	**0.038**	**0.028**	**0.059**	**0.053**	**0.032**	**0.029**	0.068 U	**0.0318**	**0.0284**	**0.0235**	**0.0603**
Total LPAHs	**0.136**	**0.076**	**0.133**	**0.078**	**0.090**	**0.128**	**0.084**	**0.112**	**0.091**	**0.276**	**0.082**	**0.055**	**0.048**	**0.098**
HPAHs														
Benzo(a)anthracene (ug/L)	0.006 U	0.006 U	0.006 U	**0.007** J	**0.009** J	**0.038**	0.006 U	0.006 U	**0.007** J	**0.068** J	0.006 U	0.006 U	0.006 U	0.006 U
Benzo(a)pyrene (ug/L)	**0.009** J	**0.012**	0.003 U	**0.015**	0.003 U	**0.040**	**0.011**	**0.008** J	**0.024**	**0.058** J	0.003 U	0.004 U	0.003 U	0.003 U
Benzo(b,k)fluoranthene (ug/L)	**0.025** J	**0.025** J	**0.011** J	**0.026** J	0.011 U	**0.058**	**0.021** J	**0.014** J	**0.028** J	0.105 U	**0.024** J	0.012 U	**0.015** J	**0.035**
Benzo(g,h,i)perylene (ug/L)	**0.016**	**0.020**	**0.009** J	**0.018**	0.005 U	**0.031**	**0.019**	**0.010**	**0.021**	0.050 UJ	**0.016**	0.005 U	**0.012**	**0.028**
Chrysene (ug/L)	**0.014**	**0.014**	0.008 U	**0.012**	0.008 U	**0.037**	**0.012**	0.008 U	**0.013**	0.079 U	**0.012**	0.009 U	0.008 U	**0.020**
Dibenz(a,h)anthracene (ug/L)	0.006 U	0.006 U	0.006 U	0.006 U	0.006 U	0.006 U	0.006 U	0.006 U	0.006 U	0.061 U	0.006 U	0.007 U	0.006 U	0.006 U
Fluoranthene (ug/L)	**0.040**	**0.036**	**0.021**	**0.041**	**0.011**	**0.071**	**0.036**	**0.024**	**0.033**	0.071 U	**0.031**	**0.030**	**0.020**	**0.064**
Indeno(1,2,3-c,d)pyrene (ug/L)	**0.008** J	**0.010**	0.005 U	**0.012**	0.005 U	**0.026**	0.005 U	**0.008** J	**0.014**	0.047 U	0.005 U	0.005 U	0.005 U	**0.014**
Pyrene (ug/L)	**0.047**	**0.047**	**0.025**	**0.046**	**0.014**	**0.095**	**0.061**	**0.038**	**0.050**	0.082 U	**0.039**	**0.037**	**0.023**	**0.051**
Retene (ug/L)	**0.009** J	**0.008** J	**0.008** J	**0.010**	0.005 U	**0.017**	**0.008** J	**0.007** J	**0.012**	0.050 U	**0.007** J	**0.011**	0.005 U	0.005 **U**
Total HPAHs	**0.165**	**0.170**	**0.080**	**0.180**	**0.053**	**0.399**	**0.169**	**0.112**	**0.193**	**0.374**	**0.131**	**0.090**	**0.083**	**0.221**
TOTAL PAHs	**0.301**	**0.246**	**0.213**	**0.258**	**0.143**	**0.527**	**0.253**	**0.224**	**0.284**	**0.650**	**0.213**	**0.145**	**0.131**	**0.319**
Phthalates														
Bis(2-ethylhexyl) phthalate (ug/L)	**0.99**	**1.07**	**0.74** J	**1.36**	**0.50** J	**1.00**	**0.84** J	**0.67** J	**1.16**	3.54 U	**0.98**	**0.96** J	**0.83** J	**1.90**
Butyl benzyl phthalate (ug/L)	0.407 U	0.416 U	0.396 U	0.399 U	0.411 U	0.401 U	0.409 U	0.407 U	0.409 U	4.02 U	0.4 U	0.437 U	0.407 U	0.418 U
Diethyl phthalate (ug/L)	0.316 U	0.322 U	0.307 U	0.309 U	0.319 U	0.310 U	0.317 U	0.315 U	0.317 U	3.110 U	0.310 U	0.339 U	0.316 U	0.324 U
Dimethyl phthalate (ug/L)	0.343 U	0.350 U	0.334 U	0.336 U	0.347 U	0.338 U	0.344 U	0.343 U	0.344 U	3.380 U	0.337 U	0.368 U	0.343 U	0.352 U
Di-n-butyl phthalate (ug/L)	**0.616** J	**0.648** J	**0.347** J	**0.694** J	**1.48**	**0.652** J	**0.941** J	**0.523** J	**0.509** J	2.93 U	**0.747** J	0.319 U	**0.418** J	**1.12**
Di-n-octyl phthalate (ug/L)	0.364 U	0.371 U	0.354 U	0.356 U	0.367 U	0.358 U	0.365 U	0.363 U	0.365 U	3.590 U	0.357 U	0.391 U	0.364 U	0.373 U
Total Phthalates	**1.60**	**1.72**	**1.08**	**2.05**	**1.98**	**1.65**	**1.78**	**1.19**	**1.67**	**0.00**	**1.73**	**0.96**	**1.25**	**3.02**
Herbicides														
Dichlobenil (ug/L)	**0.013** J	**0.010** J	**0.030** J	0.008 U	0.009 U	**0.010** J	0.008 U	0.008 U	**0.017** J	**0.135** J	**0.019** J	0.009 U	0.008 U	0.009 U

Bold – The analyte was present in the sample.
U – The analyte was not detected at or above the reported value.
UJ – The analyte was not detected at or above the reported estimated value.
J – The analyte was positively identified. The associated value is an estimate.
R – The value is considered unusable.
E - Exceeds value.

Insufficient Volume
Laboratory Issue

Table D-6.2
Stormwater Analytical Data for Outfall 245 WY2024 - Grab Samples

	Grab Sample 1 10/16/2023		Grab Sample 2 12/4/2023		Grab Sample 3 1/8/2024		Grab Sample 4 2/28/2024		Grab Sample 6 4/25/2024		Grab Sample 7 5/21/2024	
TPH												
NWTPH-Diesel (mg/L)	0.10	U	0.09	U	0.11	U	0.10	U	0.10	U	0.10	U
NWTPH-Heavy Oil (mg/L)	**0.25**		**0.25**		**0.29**		**0.42**		**0.42**		**0.60**	
Bacteria												
Coliform, Fecal (CFU/100mL)	**50000**		**11000**		**17000**		**280**		**700**		**30000**	**J**
E. Coli (CFU/100mL)	**50000**		**3300**		**8000**		**280**		**700**		**30000**	J
Enterococci (CFU/100mL)	**170000**		**5400**		**8700**		**1700**		**2100**		**12000**	J

Note: *The baseflow sample for OF245 is an additional sample collected outside the scope of this Foss report for a separate project. It is inclu it appears in the lab reports.*

Bold – The analyte was present in the sample.
U – The analyte was not detected at or above the reported value.
UJ – The analyte was not detected at or above the reported estimated value.
J – The analyte was positively identified. The associated value is an estimate.
R – The value is considered unusable.
E - Exceeds value.

Table D-7.1
Stormwater Analytical Data for Outfall 254 WY2024 - Composite Samples

Stormwater Analytical Data							
	Storm Sample 1 10/16/2023	Storm Sample 2 10/23/2023	Storm Sample 3 11/2/2023	Storm Sample 4 12/9/2024	Storm Sample 5 1/5/2024	Storm Sample 6 2/14/2024	Storm Sample 7 9/10/2024
Conventionals							
Anionic Surfactants - MBAS (ug/L)	**43.8**	**45.6**	**61.4**	**38.0**	**48.0** J	**48.0**	**105.0**
BOD (mg/L)	2 U	2 U	**2.6**	2 UJ	**2.3** J	**3.3**	–
Chloride (mg/L)	**766**	**2650**	**1220**	**749**	**3730**	**1020**	**844**
Conductivity (uS/cm)	**11700**	**8210**	**5200**	**2510**	**11300**	**6410**	**2820**
Hardness (mg CaCO3/L)	**1160**	**766**	**523**	**242**	**1050**	**647**	**279**
pH (pH Units)	**6.9**	**7.0**	**6.4**	**6.2**	**6.7**	**6.4**	**6.6**
Total Suspended Solids (mg/L)	**49.7**	**42**	**44.2**	**11.5**	**17.3**	**106**	**98.8**
Turbidity (NTU)	**49.3**	**34.2**	**35.4**	**15.1** J	**38.5** J	**77.5**	**64.4**
Nutrients							
Nitrate+Nitrite as N (mg/L)	**0.103**	**0.102**	**0.107**	**0.096**	**0.135**	**0.095**	**0.355**
Phosphate, Ortho (mg/L)	**0.097**	**0.045**	0.012 U	0.012 U	**0.024** J	**0.014**	**0.1**
Phosphorus, Total (mg/L)	**0.124**	**0.112**	**0.108**	**0.051**	**0.076**	**0.2**	**0.252**
Total Nitrogen (mg/L)	0.41 UJ	**0.34**	**0.31**	**0.32**	**0.51**	**0.41**	**1.55**
Metals							
Cadmium (ug/L)	**0.283** J	**0.120** J	**0.169** J	0.100 U	0.200 U	**0.165** J	**0.294** J
Cadmium, Dissolved (ug/L)	**0.214** J	**0.108** J	**0.087** J	**0.072** J	0.226 U	0.045 U	0.086 U
Copper (ug/L)	**13.6**	**9.89**	**23.2**	**3.94**	**7.13**	**18.1**	**70.9**
Copper, Dissolved (ug/L)	**2.53**	**1.76**	**2.33**	**1.92**	**4.16**	**0.96**	**4.36**
Lead (ug/L)	**7.08**	**3.93**	**6.87**	**1.16**	**2.34**	**9.68**	**22.6**
Lead, Dissolved (ug/L)	**2.27**	**0.114**	**0.083** J	**0.147**	**0.259** J	**0.086** J	**0.637**
Mercury (ug/L)	0.0080 U	0.0080 U	**0.0121** J	0.0080 U	0.0016 U	**0.0125** J	**0.0118** J
Mercury, Dissolved (ug/L)	0.0111 U	0.0111 U	0.0111 U	0.0111 U	0.0022 U	0.0111 U	0.0111 U
Zinc (ug/L)	**64**	**50**	**76**	**41.6**	**45.4**	**83.2**	**147**
Zinc, Dissolved (ug/L)	**25.1**	**27.5**	**33.9**	**33.7**	**38.0**	**25.8**	**45.3**
Insecticides							
Bifenthrin (ug/L)	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U
LPAHs							
2-Methylnaphthalene (ug/L)	**0.029**	**0.023**	**0.031**	**0.018**	**0.016**	**0.033**	**0.018**
Acenaphthene (ug/L)	0.010 U	0.010 U	**0.010**	0.009 U	0.010 U	0.010 U	0.010 U
Acenaphthylene (ug/L)	0.009 U	0.009 U	**0.014**	0.009 U	0.009 U	0.009 U	0.009 U
Anthracene (ug/L)	**0.034**	0.005 U	**0.009** J	**0.007** J	**0.007** J	**0.061**	0.005 U
Fluorene (ug/L)	0.010 U	0.010 U	**0.012**	0.009 U	0.009 U	**0.012**	0.010 U
Naphthalene (ug/L)	**0.019** J	0.016 U	**0.040**	**0.040**	**0.047**	0.016 U	0.037 UJ
Phenanthrene (ug/L)	**0.033**	**0.027**	**0.053**	**0.021**	**0.021**	**0.063**	**0.053**
Total LPAHs	**0.101**	**0.052**	**0.138**	**0.082**	**0.089**	**0.154**	**0.089**
HPAHs							
Benzo(a)anthracene (ug/L)	**0.008** J	0.006 U	**0.017**	0.006 U	0.006 U	**0.039**	0.006 U
Benzo(a)pyrene (ug/L)	**0.012**	**0.010**	**0.023**	**0.004** J	**0.013**	**0.078**	0.003 U
Benzo(b,k)fluoranthene (ug/L)	**0.033**	**0.030**	**0.052**	**0.013** J	**0.033**	**0.130**	**0.067**
Benzo(g,h,i)perylene (ug/L)	**0.012**	**0.014**	**0.022**	0.005 U	**0.014**	**0.044**	**0.035**
Chrysene (ug/L)	**0.020**	**0.016**	**0.031**	**0.010**	**0.017**	**0.063**	**0.038**
Dibenz(a,h)anthracene (ug/L)	0.006 U	0.006 U	0.006 U	0.006 U	0.006 U	**0.011**	0.006 U
Fluoranthene (ug/L)	**0.051**	**0.039**	**0.066**	**0.025**	**0.040**	**0.112**	**0.081**
Indeno(1,2,3-c,d)pyrene (ug/L)	**0.009** J	**0.010**	**0.017**	0.005 U	**0.013**	**0.044**	**0.027**
Pyrene (ug/L)	**0.046**	**0.042**	**0.071**	**0.025**	**0.044**	**0.156**	**0.067**
Retene (ug/L)	0.005 U	0.005 U	**0.010**	**0.006** J	**0.006** J	**0.034**	**0.013**
Total HPAHs	**0.194**	**0.167**	**0.302**	**0.088**	**0.180**	**0.677**	**0.324**
Total PAHs	**0.295**	**0.219**	**0.440**	**0.170**	**0.269**	**0.831**	**0.412**
Phthalates							
Bis(2-ethylhexyl) phthalate (ug/L)	**0.522** J	**0.701** J	**0.946** J	0.355 U	**0.522** J	**1.210**	**1.930**
Butyl benzyl phthalate (ug/L)	0.411 U	0.416 U	0.396 U	0.403 U	0.405 U	0.405 U	0.416 U
Diethyl phthalate (ug/L)	**1.350**	**0.927** J	**1.320**	**0.734** J	**0.646** J	**0.686** J	**0.878** J
Dimethyl phthalate (ug/L)	0.346 U	0.350 U	0.334 U	0.339 U	0.341 U	0.341 U	**0.389** J
Di-n-butyl phthalate (ug/L)	0.3 U	0.303 U	0.289 U	0.294 U	0.296 U	**0.389** J	**0.859** J
Di-n-octyl phthalate (ug/L)	0.367 U	0.371 U	0.354 U	0.360 U	0.362 U	0.362 U	0.372 U
Total Phthalates	**1.872**	**1.628**	**2.266**	**0.734**	**1.168**	**2.285**	**4.056**
Herbicides							
Dichlobenil (ug/L)	**0.011** J	0.009 U	**0.027** J	0.008 U	**0.019** J	**0.025** J	0.009 U

Bold – The analyte was present in the sample.
U – The analyte was not detected at or above the reported value.
UJ – The analyte was not detected at or above the reported estimated value.
J – The analyte was positively identified. The associated value is an estimate.
R – The value is considered unusable.
E - Exceeds value.

Insufficient Volume
Laboratory Issue

Table D-7.2
Stormwater and Baseflow Analytical Data for Outfall 254 WY2023 - Grab Samples

	Grab Sample 1 10/16/2023		Grab Sample 2 12/4/2023		Grab Sample 3 1/8/2024		Grab Sample 4 2/28/2024		Grab Sample 5 4/25/2024	
TPH										
NWTPH-Diesel (mg/L)	0.10	U	0.09	U	0.10	U	0.10	U	0.10	U
NWTPH-Heavy Oil (mg/L)	**0.49**		**0.73**		**0.94**		**0.36**		**0.46**	
Bacteria										
Coliform, Fecal (CFU/100mL)	**13000**		**1300**		**2100**		**1700**		**500**	
E. Coli (CFU/100mL)	**8000**	J	**1300**		**56**		**500**		**500**	
Enterococci (CFU/100mL)	**55000**		**490**		**270**		**3300**		**2000**	

Bold – The analyte was present in the sample.
U – The analyte was not detected at or above the reported value.
UJ – The analyte was not detected at or above the reported estimated value.
J – The analyte was positively identified. The associated value is an estimate.
R – The value is considered unusable.
E - Exceeds value.

Table D-8
Sediment Trap Analytical Data WY2024

Outfall	OF230A				OF230	OF235	OF237A				OF237B	OF243	OF245		OF248
ID#	FD16	FD18	FD3-C[6]	FD7	FD3-New	FD6	FD10-C	FD13-B New	FD2	FD2-A	FD1	FD23	FD21	MH-390	FD22
Lab ID	2408030-03	2408030-04	2408030-02	2408030-16	2408030-01	2408030-05	2408030-09	2408030-08	2408030-06	2408030-07	2408030-10	2408030-11	2408030-12	2408030-13	2408030-15
Date Collected	8/22/2024	8/22/2024	8/22/2024	8/21/2024	8/21/2024	8/21/2024	8/21/2024	8/21/2024	8/20/2024	8/20/2024	8/21/2024	8/20/2024	8/21/2024	8/20/2024	8/21/2024
Conventionals															
Particle/Grain Size, Clay (%)	--	**10.5**	**5.6**	**5.7**	--	**7.8**	--	--	**4.3**	**5.7**	**4.8**	--	**2.9**	**8.1**	**5.5**
Particle/Grain Size, Sand (%)	--	**57.8**	**67.9**	**65.6**	--	**76.1**	--	--	**89.2**	**69.8**	**91.1**	--	**66.8**	**71.6**	**69.6**
Particle/Grain Size, Silt (%)	--	**31.8**	**26.5**	**28.8**	--	**16.0**	--	--	**6.5**	**24.5**	**4.0**	--	**30.2**	**20.3**	**24.9**
Total Organic Carbon (mg/Kg)	**198000**	**195000**	**193000**	**164000**		**66700**	**170000**	**197000**	**59200**	**56800**	**26900**	**96000**	**98500**	**127000**	**171000**
Total Solids (%)	**26.3**	**26.2**	**30.5**	**29.4**	**19.2**	**58**	**31**	**26.8**	**61.1**	**63.9**	**65**	**24.9**	**52.8**	**45.5**	**34.3**
Total Volatile Solids (%)	--	--	--	**32.6**	**30.7**	**13.4**	--	--	**10.8**	--	**5.8**	**24.4**	--	**19**	--
Nutrients															
Phosphorus, Total (mg/Kg)	--	--	--	**1120**	--	**563**	--	--	**575**	--	--	**2130**	--	**1740**	--
Metals															
Cadmium (mg/Kg dry)	--	--	--	**0.659**	--	0.0706 U	--	--	**0.278**	--	0.0708 U	**2.96**	--	**0.801**	--
Copper (mg/Kg dry)	--	--	--	**106**	--	**173**	--	--	**70.5**	--	**40.3**	**275**	--	**160**	--
Lead (mg/Kg dry)	--	--	--	**137**	--	**253**	--	--	**56.9**	--	**31.8**	**449**	**71.7**	**88.9**	**259**
Mercury (mg/Kg dry)	--	--	**0.198**	**0.131**	--	**0.281**	--	--	**0.0543**	--	**0.0394**	**0.178**	--	**0.126**	--
Zinc (mg/Kg dry)	--	--	--	**763**	--	**704**	--	--	**394**	--	**213**	**837**	**1410**	**539**	**1890**
LPAHs															
2-Methylnaphthalene (ug/Kg)	--	**130**	**106**	**45** J	**165**	**93**	--	12 U	**43** J	**119**	**14**	**104**	--	**104** J	--
Acenaphthene (ug/Kg)	--	**36**	**224**	**34** J	**59**	**43** J	--	**144**	**37**	**144**	13 U	**37**	--	**26** J	--
Acenaphthylene (ug/Kg)	--	**61**	**122**	6 UJ	**56**	**40** J	--	6 U	6 U	6 U	6 U	6 U	--	6 UJ	--
Anthracene (ug/Kg)	--	**165**	**725**	**121** J	**1570**	**112**	--	**1100**	**202**	**417**	**40**	**349**	--	**74** J	--
Fluorene (ug/Kg)	--	**106**	**384**	**76** J	**90**	**58**	--	**287**	**72**	**130**	**14**	**57**	--	5 UJ	--
Naphthalene (ug/Kg)	--	**398**	**203**	**143** J	**182**	**138**	--	**86**	**47** J	**100**	**14**	**140**	--	**140** J	--
Phenanthrene (ug/Kg)	--	**1130**	**5500**	**978** J	**1370**	**593**	--	**6990**	**1180**	**1500**	**242**	**463**	--	**260** J	--
Total LPAHs		**1897**	**7158**	**1356**	**3327**	**984**		**8610**	**1541**	**2294**	**319**	**1049**		**506**	--
HPAHs															
Benzo(a)anthracene (ug/Kg)	--	**858**	**5830**	**559** J	**728**	**427**	--	**7170**	**1110**	**834**	**267**	**407**	--	5 UJ	--
Benzo(a)pyrene (ug/Kg)	--	11 U	**5600**	**788** J	**857**	**398**	--	**5410**	**1530**	**1010**	**279**	**434**	--	**153** J	--
Benzo(b,j,k)fluoranthenes (ug/Kg)	--	**1150**	**10000**	**1600** J	**1640**	**604**	--	**12100**	**2450**	**1100**	**522**	**984**	--	**284** J	--
Benzo(g,h,i)perylene (ug/Kg)	--	**258**	**2770**	**653** J	**573**	**504**	--	**3420**	**1230**	**609**	**334**	**689**	--	**326** J	--
Chrysene (ug/Kg)	--	**838**	**6040**	**802** J	**751**	**376**	--	**7550**	**1330**	**816**	**245**	**506**	--	**112** J	--
Dibenz(a,h)anthracene (ug/Kg)	--	**193** J	**1140**	13 UJ	**143**	**52**	--	**1390**	**355**	**185**	**66**	**137**	--	13 UJ	--
Fluoranthene (ug/Kg)	--	**2870**	**16500**	**2130** J	**2780**	**1160**	--	**21200**	**3630**	**1780**	**674**	**1260**	--	**482** J	--
Indeno(1,2,3-c,d)pyrene (ug/Kg)	--	**316**	**4450**	**699** J	**604**	**210**	--	**5620**	**1430**	**664**	**344**	**578**	--	**201** J	--
Pyrene (ug/Kg)	--	**1490**	**9380**	**1180** J	**1370**	**759**	--	**11000**	**1890**	**1460**	**370**	**892**	--	**406** J	--
Retene (ug/Kg)	--	**452**	**131**	**136** J	**125**	**327**	--	**489**	**141**	**630**	**87**	**202**	--	**79** J	--
Total HPAHs	--	**7979**	**61710**	**8418**	**9446**	**4490**	--	**74860**	**14955**	**8458**	**3101**	**5887**		**1973**	--
Total PAHs	--	**9875**	**68868**	**9774**	**12773**	**5474**	--	**83470**	**16496**	**10752**	**3420**	**6936**		**2478**	--
Phthalates															
bis(2-Ethylhexyl)phthalate (ug/Kg)	--	--	--	**8170** J	**10100**	**11500**	--	--	**5090**	--	**1550**	**12400**	--	**7180** J	**6570** J
Butyl benzyl phthalate (ug/Kg)	--	--	--	**4360** J	**1410**	**638** J	--	--	**591**	--	**105**	**681**	--	**67700** J	**1750** J
Diethylphthalate (ug/Kg)	--	--	--	136 UJ	162 UJ	35 UJ	--	--	159 UJ	--	35 U	35 U	--	52 UJ	91 UJ
Dimethyl phthalate (ug/Kg)	--	--	--	**231** J	**165**	**569** J	--	--	**693**	--	**21**	**70**	--	**44** J	6 UJ
Di-n-butylphthalate (ug/Kg)	--	--	--	**353** J	**433**	**392**	--	--	**186**	--	**73**	**179**	--	**328** J	31 UJ
Di-n-Octyl phthalate (ug/Kg)	--	--	--	14 UJ	41 U	14 U	--	--	14 U	--	14 U	14 U	--	14 UJ	14 UJ
Total Phthalates	--	--	--	**13114**	**12108**	**13099**	--	--	**6560**	--	**1748**	**13330**		**75252**	**8320**
PCBs															
Aroclor-1016 (ug/Kg)	3.61 U	3.6 U	1.78 U	3.6 U	--	1.74 U	1.8 U	--	1.76 U	1.81 U	1.74 U	1.79 U	--	3.59 U	--
Aroclor-1221 (ug/Kg)	3.61 U	3.6 U	1.78 U	3.6 U	--	1.74 U	1.8 U	--	1.76 U	1.81 U	1.74 U	1.79 U	--	3.59 U	--
Aroclor-1232 (ug/Kg)	3.61 U	3.6 U	1.78 U	3.6 U	--	1.74 U	1.8 U	--	1.76 U	1.81 U	1.74 U	1.79 U	--	3.59 U	--
Aroclor-1242 (ug/Kg)	3.61 U	3.6 U	1.78 U	3.6 U	--	1.74 U	1.8 U	--	1.76 U	1.81 U	1.74 U	1.79 U	--	3.59 U	--
Aroclor-1248 (ug/Kg)	3.99 U	3.98 U	1.97 U	3.99 U	--	1.93 U	1.99 U	--	1.94 U	2 U	1.93 U	1.98 U	--	3.97 U	--
Aroclor-1254 (ug/Kg)	3.99 U	3.98 U	**1380**	3.99 U	--	1.93 U	1.99 U	--	1.94 U	2 U	1.93 U	1.98 U	--	3.97 U	--
Aroclor-1260 (ug/Kg)	3.99 U	3.98 U	1.97 U	3.99 U	--	1.93 U	1.99 U	--	1.94 U	2 U	1.93 U	1.98 U	--	3.97 U	--
TOTAL PCBs	--	--	**1380**	--	--	--	--	--	--	--	--	--	--	--	--
TPH															
NWTPH-Diesel (mg/Kg)	--	--	--	**344**	--	19.3 U	--	--	19.4 U	--	19.3 U	19.8 U	--	19.8 U	--
NWTPH-Heavy Oil (mg/Kg)	--	--	--	**5370**	--	**2880**	--	--	**2850**	--	**1380**	**4080**	--	**7530**	--
Insecticides															
Bifenthrin (ug/Kg)	--	--	--	**31.2** J	1.21 UJ	**16.7** J	--	--	**17.1** J	--	**9.96** J	**20.4** J	--	0.412 UJ	--
Herbicides															
Dichlobenil (ug/L)	--	--	--	0.74 UJ	**42.5** J	**53.4** J	--	--	0.732 UJ	--	0.745 UJ	0.746 UJ	--	0.733 UJ	--
Phenolics															
2-Methylphenol (ug/Kg dry)	--	--	--	**36.4** J	22.2 UJ	**9.59** J	--	--	7.54 UJ	--	7.67 UJ	7.68 UJ	--	7.55 UJ	--
4-Methylphenol (ug/Kg dry)	--	--	--	**848** J	**34.6** J	**103**	--	--	**72.2**	--	**28.4** J	**96.4** J	--	9.66 UJ	--
Pentachlorophenol (ug/Kg dry)	--	--	--	**306** J	96.9 UJ	**110** J	--	--	**52.4** J	--	33.5 UJ	**226** J	--	32.9 UJ	--

Notes
1 - Total LPAHs is the sum of the concentration or non-detected calculated value of the following compounds: Naphthalene, acenaphthene, acenaphthylene, anthracene, fluorene, and phenanthrene.
2 - Total HPAHs is the sum of the concentration of non-detected calculated value of the following compounds: Fluoranthene, pyrene, benzo(a)anthracene, chrysene, benzo(b,k)fluoranthene, benzo(b,k)fluoranthene, benzo(a)pyrene, indeno(1,2,3-c,d)pyrene, dibenz(a,h)anthracene, benzo(g,h,i)perylene.
3 - Total PAHs is the sum of the LPAHs and HPAHs.
4 - Total value for PCBs is the sum of detected values only.
5 - Total phthalates is the sum of detected values only.
6 - The upline FD3A sediment trap was removed due to the construction of the new OF230A on 12/17/2021 and no sediment was analyzed for WY2022. FD3C was installed upstream and represents the previous FD3A drainage area.
7 - Due to insufficient sample size the following samples were not analyzed for grain size FD16, FD3-NEW, FD10-C, FD13-B NEW, FD23 (FD23 was not sent out due to insufficient sample size)
8 - Sediment trap sample quantities were historically limited in volume. As such, samples analyses were prioritized following the Sampling and Analysis plan in Table 9-5 and as assigned in Table 3-3.
9 - PBDE samples were sent to a contract lab (SGS AXYS). The analytical results for the PBDE analysis were not received until March 11, 2025 and will not be included in the WY2024 report. A technical memo will be submitted with the EIM results in June which will include validated WY2023 and WY2024 PBDE data.

Bold – The analyte was present in the sample.
U – The analyte was not detected at or above the reported value.
UJ – The analyte was not detected at or above the reported estimated value.
J – The analyte was positively identified. The associated value is an estimate.
NJ - There is evidence the analyte is present. The associated value is an estimate.
E - Estimated above the calibration curve.

APPENDIX E

TABLE E-1
SUMMARY STATISTICS FOR BASEFLOW AT
OUTFALL 237A Water Years 2002-2011

	Minimum	Maximum	Arithmetic Mean	Median	# of Detects	Count	% Detects	10th Per	90th Per	Standard Deviation	Coefficient of Variation	Standard Error	95% UCL	95% LCL
Conventionals														
Hardness (mg/L as CaCO3)	85.4	126.0		102.0	39	39	100%							
pH (pH units)	6.8	7.8		7.40	39	39	100%							
TSS (mg/L)	0.26	16.30	3.33	2.20	34	39	87%	0.26	7.56	3.47	1.04	0.56	4.45	2.20
Metals in ug/L														
Lead	0.23	6.11	1.43	0.91	16	38	42%	0.34	3.10	1.35	0.94	0.22	1.88	0.99
Mercury	0.025	0.196	0.031	0.025	3	38	8%	0.025	0.025	0.028	0.911	0.005	0.041	0.022
Zinc	1.6	27.0	9.7	9.4	36	37	97%	5.26	14.06	4.58	0.47	0.75	11.24	8.19
Dissolved Lead	0.08	4.50	0.96	0.68	8	38	21%	0.13	1.90	0.92	0.95	0.15	1.27	0.66
Dissolved Mercury	0.025	0.135	0.029	0.025	2	37	5%	0.025	0.025	0.019	0.645	0.003	0.035	0.023
Dissolved Zinc	2.30	12.2	7.88	7.51	36	37	97%	4.30	11.60	2.84	0.36	0.47	8.82	6.93
PAH in ug/L														
LPAHs														
2-Methylnaphthalene	0.002	2.100	0.069	0.005	10	39	26%	0.002	0.021	0.338	4.872	0.054	0.179	-0.040
Acenaphthene	0.002	0.031	0.005	0.005	2	39	5%	0.002	0.005	0.005	0.938	0.001	0.007	0.003
Acenaphthylene	0.002	0.016	0.004	0.005	1	39	3%	0.002	0.005	0.002	0.544	0.000	0.005	0.004
Anthracene	0.002	0.005	0.004	0.005	0	39	0%	0.002	0.005	0.001	0.310	0.000	0.005	0.004
Fluorene	0.002	0.086	0.007	0.005	5	39	13%	0.002	0.005	0.013	1.912	0.002	0.011	0.003
Naphthalene	0.002	3.000	0.097	0.011	22	39	56%	0.005	0.038	0.479	4.946	0.077	0.252	-0.058
Phenanthrene	0.002	0.149	0.012	0.005	15	39	38%	0.004	0.016	0.024	1.992	0.004	0.020	0.004
*Total LPAHs[1]	0.010	3.276	0.130	0.035				0.015	0.078	0.520	4.007			
HPAHs														
Benzo(a)anthracene	0.001	0.022	0.006	0.005	10	39	26%	0.002	0.014	0.005	0.723	0.001	0.008	0.005
Benzo(a)pyrene	0.001	0.020	0.006	0.005	7	39	18%	0.002	0.011	0.004	0.753	0.001	0.007	0.004
Benzo(g,h,i)perylene	0.002	0.022	0.007	0.005	8	39	21%	0.004	0.014	0.005	0.706	0.001	0.008	0.005
Benzo(b,k)fluoranthene	0.002	0.047	0.011	0.005	17	39	44%	0.003	0.028	0.012	1.021	0.002	0.015	0.008
Chrysene	0.002	0.026	0.007	0.005	10	39	26%	0.002	0.016	0.006	0.918	0.001	0.009	0.005
Dibenz(a,h)anthracene	0.003	0.010	0.005	0.005	1	39	3%	0.004	0.005	0.001	0.229	0.000	0.005	0.004
Fluoranthene	0.003	0.046	0.011	0.005	16	39	41%	0.003	0.028	0.011	0.997	0.002	0.015	0.007
Indeno(1,2,3-c,d)pyrene	0.003	0.018	0.006	0.005	6	39	15%	0.004	0.011	0.004	0.616	0.001	0.007	0.005
Pyrene	0.002	0.056	0.014	0.006	23	39	59%	0.003	0.033	0.014	0.981	0.002	0.018	0.009
*Total HPAHs[2]	0.012	0.249	0.071	0.048				0.021	0.172	0.058	0.825			
*Total PAHs[3]	0.023	3.464	0.201	0.094				0.041	0.274	0.543	2.707			
Phenols in ug/L														
4-Methylphenol	0.005	0.163	0.022	0.010	5	16	31%	0.005	0.047	0.040	1.801	0.010	0.044	0.001
Phthalates in ug/L														
Bis(2-ethylhexyl) phthalate	0.2	1.6	0.6	0.5	12	38	32%	0.5	1.1	0.3	0.5	0.0	0.7	0.5
Butylbenzyl phthalate	0.05	0.5	0.4	0.5	3	39	8%	0.1	0.5	0.2	0.5	0.0	0.4	0.3
Diethyl phthalate	0.035	32.0	2.2	0.5	12	39	31%	0.1	1.3	6.3	2.9	1.0	4.2	0.1
Dimethyl phthalate	0.016	0.5	0.4	0.5	0	39	0%	0.0	0.5	0.2	0.6	0.0	0.4	0.3
Di-n-butyl phthalate	0.05	0.5	0.4	0.5	6	39	15%	0.2	0.5	0.1	0.3	0.0	0.5	0.4
Di-n-octyl phthalate	0.042	0.5	0.4	0.5	0	39	0%	0.0	0.5	0.2	0.5	0.0	0.4	0.3
*Total Phthalates[4]		32.0												

TABLE E-1 (Cont'd)

SUMMARY STATISTICS FOR BASEFLOW AT

OUTFALL 237ANew Water Years 2006-2010

	Minimum	Maximum	Arithmetic Mean	Median	# of Detects	Count	% Detects	10th Per	90th Per	Standard Deviation	Coefficient of Variation	Standard Error	95% UCL	95% LCL
Conventionals														
Hardness (mg/L as CaCO3)	95.3	116.0		110.0	21	21	100%							
pH (pH units)	6.5	7.7		7.30	21	21	100%							
TSS (mg/L)	0.26	26.80	3.41	1.80	18	21	86%	0.26	5.41	5.78	1.69	1.26	6.04	0.78
Metals in ug/L														
Lead	0.14	4.60	1.46	1.30	7	18	39%	0.30	3.10	1.21	0.83	0.28	2.06	0.86
Mercury	0.025	0.025	0.025	0.025	0	21	0%	0.025	0.025	0.000	0.000	0.000	0.025	0.025
Zinc	3.24	26.60	10.24	9.70	19	19	100%	4.17	16.48	5.63	0.55	1.29	12.95	7.52
Dissolved Lead	0.01	3.20	0.98	0.75	5	18	28%	0.10	2.83	0.99	1.01	0.23	1.47	0.49
Dissolved Mercury	0.025	0.078	0.028	0.025	1	20	5%	0.025	0.025	0.012	0.429	0.003	0.033	0.022
Dissolved Zinc	3.14	31.20	8.87	7.60	19	19	100%	3.93	14.52	6.38	0.72	1.46	11.95	5.80
PAH in ug/L														
LPAHs														
2-Methylnaphthalene	0.002	0.022	0.005	0.005	5	21	24%	0.002	0.005	0.004	0.869	0.001	0.007	0.003
Acenaphthene	0.002	0.005	0.004	0.005	1	21	5%	0.002	0.005	0.002	0.478	0.000	0.004	0.003
Acenaphthylene	0.002	0.005	0.003	0.004	0	21	0%	0.002	0.005	0.002	0.504	0.000	0.004	0.003
Anthracene	0.002	0.005	0.004	0.005	1	21	5%	0.002	0.005	0.001	0.401	0.000	0.004	0.003
Fluorene	0.002	0.005	0.004	0.005	2	21	10%	0.002	0.005	0.002	0.446	0.000	0.004	0.003
Naphthalene	0.002	0.017	0.007	0.005	9	21	43%	0.003	0.014	0.004	0.605	0.001	0.009	0.005
Phenanthrene	0.002	0.031	0.006	0.005	8	21	38%	0.002	0.011	0.006	0.980	0.001	0.009	0.004
*Total LPAHs[1]	0.010	0.065	0.028	0.030				0.011	0.042	0.013	0.479			
HPAHs														
Benzo(a)anthracene	0.001	0.019	0.005	0.005	2	21	10%	0.001	0.005	0.004	0.864	0.001	0.006	0.003
Benzo(a)pyrene	0.002	0.036	0.006	0.005	4	21	19%	0.002	0.009	0.008	1.277	0.002	0.010	0.003
Benzo(g,h,i)perylene	0.003	0.024	0.006	0.005	3	21	14%	0.004	0.008	0.005	0.776	0.001	0.008	0.004
Benzo(b,k)fluoranthene	0.002	0.058	0.009	0.005	7	21	33%	0.002	0.017	0.012	1.343	0.003	0.015	0.004
Chrysene	0.002	0.029	0.005	0.005	4	21	19%	0.002	0.009	0.006	1.124	0.001	0.008	0.003
Dibenz(a,h)anthracene	0.003	0.008	0.005	0.005	1	21	5%	0.004	0.005	0.001	0.243	0.000	0.005	0.004
Fluoranthene	0.002	0.043	0.008	0.005	6	21	29%	0.003	0.019	0.010	1.167	0.002	0.013	0.004
Indeno(1,2,3-c,d)pyrene	0.003	0.035	0.006	0.005	3	21	14%	0.003	0.010	0.007	1.150	0.002	0.010	0.003
Pyrene	0.002	0.163	0.014	0.005	9	21	43%	0.002	0.017	0.034	2.398	0.008	0.030	-0.001
*Total HPAHs[2]	0.022	0.383	0.065	0.045				0.022	0.089	0.079	1.217			
*Total PAHs[3]	0.032	0.448	0.093	0.075				0.033	0.121	0.090	0.966			
Phenols in ug/L														
4-Methylphenol														
Phthalates in ug/L														
Bis(2-ethylhexyl) phthalate	0.3	0.7	0.5	0.5	6	21	29%	0.4	0.5	0.1	0.2	0.0	0.5	0.4
Butylbenzyl phthalate	0.045	0.5	0.3	0.2	2	21	10%	0.1	0.5	0.2	0.7	0.0	0.4	0.2
Diethyl phthalate	0.04	1.9	0.4	0.5	4	21	19%	0.1	0.5	0.5	1.1	0.1	0.7	0.2
Dimethyl phthalate	0.016	0.5	0.3	0.1	0	21	0%	0.0	0.5	0.2	1.0	0.1	0.4	0.1
Di-n-butyl phthalate	0.05	0.5	0.3	0.5	5	21	24%	0.1	0.5	0.2	0.5	0.0	0.4	0.3
Di-n-octyl phthalate	0.042	1.0	0.3	0.3	0	21	0%	0.0	0.5	0.3	0.9	0.1	0.4	0.2
*Total Phthalates[4]		1.8												

TABLE E-2
SUMMARY STATISTICS FOR BASEFLOW AT
OUTFALL 237B Water Years 2002-2011

	Minimum	Maximum	Arithmetic Mean	Median	# of Detects	Count	% Detects	10th Per	90th Per	Standard Deviation	Coefficient of Variation	Standard Error	95% UCL	95% LCL
Conventionals														
Hardness (mg/L as CaCO3)	61.0	129		113.0	39	39								
pH (pH units)	5.9	7.8		7.2	39	39								
TSS (mg/L)	0.26	16.90	2.52	1.28	36	39	92%	0.55	3.86	3.68	1.46	0.59	3.71	1.32
Metals in ug/L														
Lead	*0.07*	6.60	0.99	0.63	10	38	26%	0.15	1.65	1.23	1.24	0.20	1.40	0.59
Mercury	*0.025*	*0.025*	*0.025*	*0.025*	5	38	13%	0.025	0.025	0.000	0.000	0.000	0.025	0.025
Zinc	1.05	14.20	4.47	3.90	24	39	62%	2.07	6.96	2.47	0.55	0.40	5.27	3.67
Dissolved Lead	*0.02*	4.00	0.96	*0.65*	14	38	37%	0.12	1.93	0.95	0.99	0.15	1.28	0.65
Dissolved Mercury	*0.025*	*0.025*	*0.025*	*0.025*	0	38	0%	0.025	0.025	0.000	0.000	0.000	0.025	0.025
Dissolved Zinc	*0.60*	14.30	4.71	3.79	26	39	67%	1.89	8.59	3.07	0.65	0.49	5.71	3.71
PAH in ug/L														
LPAHs														
2-Methylnaphthalene	*0.002*	0.019	0.005	*0.005*	4	39	10%	0.002	0.005	0.003	0.639	0.001	0.006	0.004
Acenaphthene	*0.002*	*0.005*	*0.004*	*0.005*	2	39	5%	0.002	0.005	0.001	0.324	0.000	0.005	0.004
Acenaphthylene	*0.002*	*0.005*	*0.004*	*0.005*	0	39	0%	0.002	0.005	0.001	0.358	0.000	0.005	0.004
Anthracene	*0.002*	*0.005*	*0.004*	*0.005*	0	39	0%	0.002	0.005	0.001	0.310	0.000	0.005	0.004
Fluorene	*0.002*	*0.005*	*0.004*	*0.005*	0	39	0%	0.002	0.005	0.001	0.356	0.000	0.005	0.004
Naphthalene	*0.002*	0.025	0.008	*0.005*	13	39	33%	0.004	0.013	0.005	0.611	0.001	0.009	0.006
Phenanthrene	*0.002*	*0.005*	*0.004*	*0.005*	3	39	8%	0.002	0.005	0.001	0.291	0.000	0.005	0.004
*Total LPAHs[1]	*0.008*	0.050	0.028	*0.030*				0.013	0.037	0.010	0.342			
HPAHs														
Benzo(a)anthracene	*0.001*	0.045	0.005	*0.005*	4	39	10%	0.001	0.005	0.007	1.229	0.001	0.008	0.003
Benzo(a)pyrene	*0.002*	0.041	0.005	*0.005*	2	39	5%	0.002	0.005	0.006	1.154	0.001	0.007	0.003
Benzo(g,h,i)perylene	*0.003*	0.044	0.006	*0.005*	2	39	5%	0.004	0.005	0.006	1.095	0.001	0.008	0.004
Benzo(b,k)fluoranthene	*0.002*	0.107	0.008	*0.005*	7	39	18%	0.002	0.011	0.017	2.068	0.003	0.013	0.003
Chrysene	*0.002*	0.060	0.006	*0.005*	2	39	5%	0.002	0.005	0.009	1.628	0.001	0.009	0.003
Dibenz(a,h)anthracene	*0.003*	0.011	*0.005*	*0.005*	1	39	3%	0.004	0.005	0.001	0.255	0.000	0.005	0.004
Fluoranthene	*0.003*	0.088	0.007	*0.005*	4	39	10%	0.003	0.005	0.014	1.943	0.002	0.011	0.003
Indeno(1,2,3-c,d)pyrene	*0.003*	0.039	0.005	*0.005*	1	39	3%	0.004	0.005	0.006	1.041	0.001	0.007	0.004
Pyrene	*0.002*	0.078	0.008	*0.005*	11	39	28%	0.003	0.011	0.012	1.577	0.002	0.011	0.004
*Total HPAHs[2]	*0.011*	0.513	0.054	*0.045*				0.024	0.056	0.076	1.421			
*Total PAHs[3]	*0.020*	0.543	0.082	0.075				0.035	0.093	0.079	0.956			
Phenols in ug/L														
4-Methylphenol	*0.005*	0.104	0.012	*0.005*	2	16	13%	0.005	0.008	0.025	2.148	0.006	0.025	-0.002
Phthalates in ug/L														
Bis(2-ethylhexyl) phthalate	*0.3*	*0.8*	*0.5*	*0.5*	6	38	16%	0.4	0.5	0.1	0.2	0.0	0.5	0.5
Butylbenzyl phthalate	*0.05*	*0.5*	*0.4*	*0.5*	1	39	3%	0.1	0.5	0.2	0.5	0.0	0.4	0.3
Diethyl phthalate	*0.04*	17.0	1.1	*0.5*	9	39	23%	0.1	1.3	2.8	2.6	0.4	2.0	0.2
Dimethyl phthalate	*0.016*	*0.5*	*0.4*	*0.5*	0	39	0%	0.0	0.5	0.2	0.6	0.0	0.4	0.3
Di-n-butyl phthalate	*0.05*	*0.5*	*0.4*	*0.5*	6	39	15%	0.1	0.5	0.2	0.4	0.0	0.5	0.4
Di-n-octyl phthalate	*0.042*	*0.5*	*0.4*	*0.5*	0	39	0%	0.0	0.5	0.2	0.5	0.0	0.4	0.3
*Total Phthalates[4]		17.0												

TABLE E-3
SUMMARY STATISTICS FOR BASEFLOW AT
OUTFALL 230 Water Years 2002-2011

	Minimum	Maximum	Arithmetic Mean	Median	# of Detects	Count	% Detects	10th Per	90th Per	Standard Deviation	Coefficient of Variation	Standard Error	95% UCL	95% LCL
Conventionals														
Hardness (mg/L as CaCO3)	27.9	249		142.0	38	38	100%							
pH (pH units)	7.1	9.0		7.7	38	38	100%							
TSS (mg/L)	0.90	319.00	16.44	5.95	38	38	100%	1.52	20.21	51.07	3.11	8.28	33.23	-0.34
Metals in ug/L														
Lead	0.99	29.80	5.81	4.36	28	38	74%	1.61	10.31	5.85	1.01	0.95	7.73	3.89
Mercury	*0.025*	0.083	0.031	*0.025*	6	38	16%	0.025	0.056	0.015	0.477	0.002	0.036	0.026
Zinc	19.3	101.0	46.0	34.0	37	37	100%	22.70	82.20	24.16	0.52	3.97	54.08	37.97
Dissolved Lead	*0.14*	5.50	1.72	1.40	16	38	42%	0.46	3.20	1.27	0.74	0.21	2.14	1.30
Dissolved Mercury	*0.025*	0.059	0.026	*0.025*	1	38	3%	0.025	0.025	0.006	0.213	0.001	0.028	0.024
Dissolved Zinc	6.4	95.0	28.8	23.7	37	37	100%	10.70	46.52	19.33	0.67	3.18	35.27	22.38
PAH in ug/L														
LPAHs														
2-Methylnaphthalene	*0.002*	0.122	0.015	0.005	19	38	50%	0.003	0.032	0.023	1.534	0.004	0.022	0.007
Acenaphthene	*0.002*	0.013	0.005	*0.005*	5	38	13%	0.002	0.006	0.003	0.506	0.000	0.006	0.004
Acenaphthylene	*0.002*	*0.005*	*0.004*	*0.005*	0	38	0%	0.002	0.005	0.001	0.341	0.000	0.005	0.004
Anthracene	*0.002*	0.012	0.004	*0.005*	1	38	3%	0.002	0.005	0.002	0.400	0.000	0.005	0.004
Fluorene	0.002	0.012	0.005	*0.005*	5	38	13%	0.003	0.005	0.002	0.358	0.000	0.005	0.004
Naphthalene	*0.005*	0.228	0.027	0.013	27	38	71%	0.005	0.073	0.042	1.555	0.007	0.040	0.013
Phenanthrene	*0.002*	0.084	0.014	0.011	25	38	66%	0.005	0.022	0.015	1.118	0.003	0.019	0.009
*Total LPAHs[1]	0.016	0.270	0.059	0.045				0.025	0.111	0.052	0.869			
HPAHs														
Benzo(a)anthracene	*0.001*	0.066	0.008	*0.005*	8	38	21%	0.001	0.013	0.011	1.407	0.002	0.011	0.004
Benzo(a)pyrene	*0.002*	0.057	0.007	*0.005*	6	38	16%	0.002	0.012	0.009	1.340	0.001	0.010	0.004
Benzo(g,h,i)perylene	*0.004*	0.036	0.008	*0.005*	12	38	32%	0.004	0.015	0.007	0.828	0.001	0.010	0.006
Benzo(b,k)fluoranthene	*0.002*	0.113	0.014	0.008	19	38	50%	0.002	0.025	0.019	1.365	0.003	0.020	0.008
Chrysene	*0.002*	0.087	0.010	*0.005*	17	38	45%	0.002	0.018	0.014	1.374	0.002	0.015	0.006
Dibenz(a,h)anthracene	*0.003*	0.014	0.005	*0.005*	5	38	13%	0.004	0.007	0.002	0.419	0.000	0.006	0.005
Fluoranthene	*0.003*	0.133	0.017	0.012	26	38	68%	0.005	0.028	0.022	1.295	0.004	0.025	0.010
Indeno(1,2,3-c,d)pyrene	*0.003*	0.033	0.006	*0.005*	4	38	11%	0.004	0.007	0.006	0.908	0.001	0.008	0.004
Pyrene	*0.004*	0.173	0.022	0.015	35	38	92%	0.005	0.032	0.027	1.266	0.004	0.031	0.013
*Total HPAHs[2]	0.025	0.712	0.097	0.061				0.034	0.146	0.113	1.170			
*Total PAHs[3]	0.041	0.923	0.157	0.135				0.062	0.232	0.144	0.920			
Phenols in ug/L														
4-Methylphenol	*0.005*	0.115	0.024	0.008	1	16	6%	0.005	0.058	0.031	1.276	0.008	0.040	0.008
Phthalates in ug/L														
Bis(2-ethylhexyl) phthalate	*0.3*	33.0	1.6	*0.5*	14	37	38%	0.4	1.7	5.3	3.3	0.9	3.4	-0.2
Butylbenzyl phthalate	*0.09*	*0.7*	*0.4*	*0.5*	3	38	8%	0.1	0.5	0.2	0.4	0.0	0.5	0.4
Diethyl phthalate	*0.070*	8.4	0.7	*0.5*	8	38	21%	0.2	0.5	1.4	1.9	0.2	1.2	0.3
Dimethyl phthalate	*0.016*	*0.5*	*0.4*	*0.5*	0	38	0%	0.0	0.5	0.2	0.6	0.0	0.4	0.3
Di-n-butyl phthalate	*0.1*	*0.5*	*0.4*	*0.5*	6	38	16%	0.1	0.5	0.1	0.3	0.0	0.5	0.4
Di-n-octyl phthalate	*0.042*	*2.0*	*0.4*	*0.5*	2	38	5%	0.0	0.5	0.3	0.7	0.1	0.5	0.3
*Total Phthalates[4]		33.0												

TABLE E-4
SUMMARY STATISTICS FOR BASEFLOW AT
OUTFALL 235 Water Years 2002-2011

	Minimum	Maximum	Arithmetic Mean	Median	# of Detects	Count	% Detects	10th Per	90th Per	Standard Deviation	Coefficient of Variation	Standard Error	95% UCL	95% LCL
Conventionals														
Hardness (mg/L as CaCO3)	123.0	199.0		148.0	38	38	100%							
pH (pH units)	7.1	8.0		7.7	38	38	100%							
TSS (mg/L)	1.00	258	27.81	7.37	38	38	100%	1.49	79.03	58.43	2.10	9.48	47.01	8.60
Metals in ug/L														
Lead	1.64	112	15.04	6.85	32	38	84%	3.15	30.38	24.37	1.62	3.95	23.05	7.03
Mercury	*0.025*	0.380	0.043	*0.025*	4	37	11%	0.025	0.080	0.062	1.454	0.010	0.064	0.022
Zinc	7.40	355.0	44.67	17.20	35	35	100%	10.48	73.60	80.96	1.81	13.69	72.48	16.85
Dissolved Lead	*0.24*	6.00	1.64	1.23	16	38	42%	0.54	3.53	1.37	0.83	0.22	2.09	1.19
Dissolved Mercury	*0.025*	*0.025*	*0.025*	*0.025*	3	36	8%	0.025	0.025	0.000	0.000	0.000	0.025	0.025
Dissolved Zinc	3.80	28.50	10.65	9.60	35	35	100%	6.35	15.60	5.15	0.48	0.87	12.42	8.88
PAH in ug/L														
LPAHs														
2-Methylnaphthalene	*0.002*	0.040	0.007	*0.005*	7	38	18%	0.002	0.011	0.007	1.083	0.001	0.009	0.004
Acenaphthene	*0.002*	0.032	0.011	0.012	28	38	74%	0.005	0.018	0.006	0.569	0.001	0.013	0.009
Acenaphthylene	*0.002*	*0.005*	*0.004*	*0.005*	0	38	0%	0.002	0.005	0.001	0.341	0.000	0.005	0.004
Anthracene	*0.002*	0.031	0.006	*0.005*	5	38	13%	0.002	0.009	0.005	0.872	0.001	0.008	0.004
Fluorene	*0.002*	0.043	0.008	*0.005*	14	38	37%	0.002	0.014	0.007	0.939	0.001	0.010	0.005
Naphthalene	*0.003*	0.056	0.013	0.011	23	38	61%	0.004	0.021	0.012	0.936	0.002	0.017	0.009
Phenanthrene	*0.002*	0.115	0.015	0.005	15	38	39%	0.002	0.031	0.025	1.608	0.004	0.024	0.007
*Total LPAHs[1]	*0.013*	0.240	0.058	0.0465				0.022	0.096	0.048	0.829			
HPAHs														
Benzo(a)anthracene	*0.001*	0.114	0.014	*0.005*	11	38	29%	0.001	0.022	0.024	1.766	0.004	0.022	0.006
Benzo(a)pyrene	*0.002*	0.142	0.014	*0.005*	8	38	21%	0.002	0.023	0.030	2.127	0.005	0.024	0.004
Benzo(g,h,i)perylene	*0.002*	0.166	0.013	*0.005*	11	38	29%	0.004	0.027	0.027	2.101	0.004	0.022	0.004
Benzo(b,k)fluoranthene	*0.002*	0.344	0.029	0.008	21	38	55%	0.004	0.055	0.070	2.402	0.011	0.052	0.006
Chrysene	*0.002*	0.199	0.020	*0.005*	11	38	29%	0.002	0.036	0.044	2.234	0.007	0.035	0.005
Dibenz(a,h)anthracene	*0.003*	0.028	0.006	*0.005*	4	38	11%	0.004	0.006	0.004	0.716	0.001	0.007	0.004
Fluoranthene	*0.003*	0.295	0.031	0.012	29	38	76%	0.005	0.054	0.060	1.926	0.010	0.051	0.011
Indeno(1,2,3-c,d)pyrene	*0.003*	0.115	0.009	*0.005*	8	38	21%	0.004	0.018	0.018	1.959	0.003	0.015	0.003
Pyrene	*0.004*	0.253	0.036	0.018	34	38	89%	0.005	0.067	0.057	1.575	0.009	0.055	0.017
*Total HPAHs[2]	*0.025*	1.639	0.173	0.0705				0.041	0.299	0.320	1.854			
*Total PAHs[3]	*0.038*	1.845	0.231	0.124				0.062	0.383	0.358	1.554			
Phenols in ug/L														
4-Methylphenol	*0.005*	0.055	0.016	*0.005*	4	16	25%	0.005	0.045	0.018	1.178	0.005	0.025	0.006
Phthalates in ug/L														
Bis(2-ethylhexyl) phthalate	*0.4*	21.3	2.1	1.2	22	37	59%	0.5	3.3	3.6	1.7	0.6	3.3	0.9
Butylbenzyl phthalate	0.09	1.6	*0.4*	*0.5*	5	38	13%	0.1	0.5	0.3	0.6	0.0	0.5	0.3
Diethyl phthalate	*0.04*	15.0	1.0	*0.5*	9	38	24%	0.1	1.7	2.4	2.4	0.4	1.8	0.2
Dimethyl phthalate	*0.016*	*0.5*	*0.4*	*0.5*	0	38	0%	0.0	0.5	0.2	0.6	0.0	0.4	0.3
Di-n-butyl phthalate	*0.05*	*0.5*	*0.4*	*0.5*	4	38	11%	0.2	0.5	0.1	0.3	0.0	0.5	0.4
Di-n-octyl phthalate	*0.042*	3.9	0.5	*0.5*	1	38	3%	0.0	0.5	0.6	1.2	0.1	0.7	0.3
*Total Phthalates[4]		22.9												

TABLE E-5
SUMMARY STATISTICS FOR BASEFLOW AT
OUTFALL 243 Water Years 2002-2011

	Minimum	Maximum	Arithmetic Mean	Median	# of Detects	Count	% Detects	10th Per	90th Per	Standard Deviation	Coefficient of Variation	Standard Error	95% UCL	95% LCL
Conventionals														
Hardness (mg/L as CaCO3)	463	2,310		1,325	38	38	100%							
pH (pH units)	6.6	7.8		7.0	37	37	100%							
TSS (mg/L)	1.5	42.7	14.2	10.8	37	37	100%	3.36	32.88	11.60	0.82	1.91	18.04	10.30
Metals in ug/L					15									
Lead	*0.39*	43.9	7.9	4.5	22	36	61%	1.90	24.00	9.61	1.22	1.60	11.16	4.65
Mercury	*0.025*	0.065	0.028	*0.025*	0	38	0%	0.025	0.025	0.010	0.352	0.002	0.031	0.025
Zinc	5.3	73.6	22.4	15.4	34	36	94%	8.84	37.55	16.24	0.73	2.71	27.85	16.86
Dissolved Lead	0.01	35.60	5.78	2.88	18	36	50%	0.10	15.25	8.06	1.40	1.34	8.51	3.05
Dissolved Mercury	*0.025*	0.193	0.030	*0.025*	0	38	0%	0.025	0.025	0.027	0.912	0.004	0.039	0.021
Dissolved Zinc	*0.13*	45.80	12.29	8.90	29	36	81%	4.10	23.55	9.34	0.76	1.56	15.45	9.13
PAH in ug/L														
LPAHs														
2-Methylnaphthalene	*0.002*	*0.006*	*0.004*	*0.005*	3	38	8%	0.002	0.005	0.001	0.291	0.000	0.005	0.004
Acenaphthene	*0.005*	0.069	0.031	0.031	37	38	97%	0.012	0.054	0.017	0.533	0.003	0.036	0.026
Acenaphthylene	*0.002*	*0.005*	*0.004*	*0.005*	4	38	11%	0.002	0.005	0.001	0.302	0.000	0.005	0.004
Anthracene	*0.002*	0.022	0.007	*0.005*	11	38	29%	0.003	0.013	0.005	0.697	0.001	0.008	0.005
Fluorene	*0.002*	0.013	0.005	*0.005*	11	38	29%	0.003	0.010	0.003	0.501	0.000	0.006	0.004
Naphthalene	*0.001*	0.017	0.008	*0.005*	17	38	45%	0.005	0.015	0.004	0.527	0.001	0.009	0.007
Phenanthrene	0.002	0.057	0.011	*0.005*	19	38	50%	0.004	0.023	0.013	1.197	0.002	0.015	0.007
*Total LPAHs[1]	*0.025*	0.151	0.066	0.061				0.038	0.103	0.028	0.426			
HPAHs														
Benzo(a)anthracene	*0.001*	0.055	0.009	*0.005*	12	38	32%	0.001	0.015	0.010	1.179	0.002	0.012	0.005
Benzo(a)pyrene	*0.002*	0.042	0.007	*0.005*	4	38	11%	0.002	0.010	0.008	1.204	0.001	0.009	0.004
Benzo(g,h,i)perylene	*0.004*	0.046	0.008	*0.005*	7	38	18%	0.004	0.013	0.009	1.108	0.001	0.011	0.005
Benzo(b,k)fluoranthene	0.002	0.105	0.014	*0.005*	16	38	42%	0.005	0.025	0.023	1.636	0.004	0.022	0.007
Chrysene	*0.002*	0.098	0.012	*0.005*	11	38	29%	0.003	0.028	0.021	1.728	0.003	0.019	0.005
Dibenz(a,h)anthracene	*0.003*	0.012	*0.005*	*0.005*	0	38	0%	0.004	0.005	0.001	0.281	0.000	0.005	0.004
Fluoranthene	*0.003*	0.133	0.023	0.016	32	38	84%	0.005	0.044	0.025	1.093	0.004	0.031	0.015
Indeno(1,2,3-c,d)pyrene	*0.003*	0.034	0.006	*0.005*	3	38	8%	0.004	0.005	0.006	1.022	0.001	0.008	0.004
Pyrene	*0.005*	0.116	0.032	0.022	37	38	97%	0.014	0.063	0.027	0.846	0.004	0.041	0.023
*Total HPAHs[2]	0.031	0.606	0.115	0.074				0.053	0.199	0.123	1.068			
*Total PAHs[3]	0.055	0.757	0.182	0.133				0.092	0.298	0.143	0.789			
Phenols in ug/L														
4-Methylphenol	*0.005*	0.099	0.014	*0.005*	6	16	38%	0.005	0.017	0.023	1.695	0.006	0.026	0.001
Phthalates in ug/L														
Bis(2-ethylhexyl) phthalate	*0.4*	16.0	1.1	*0.5*	9	37	24%	0.5	1.0	2.6	2.4	0.4	2.0	0.2
Butylbenzyl phthalate	*0.085*	*1.8*	*0.4*	*0.5*	3	38	8%	0.1	0.5	0.3	0.6	0.0	0.5	0.4
Diethyl phthalate	*0.05*	10.0	0.8	*0.5*	9	38	24%	0.1	1.1	1.6	2.1	0.3	1.3	0.2
Dimethyl phthalate	*0.016*	*0.5*	*0.4*	*0.5*	1	38	3%	0.0	0.5	0.2	0.5	0.0	0.5	0.3
Di-n-butyl phthalate	*0.05*	4.3	*0.6*	*0.5*	8	38	21%	0.3	0.5	0.6	1.1	0.1	0.8	0.4
Di-n-octyl phthalate	*0.042*	*0.5*	*0.4*	*0.5*	2	38	5%	0.0	0.5	0.2	0.5	0.0	0.5	0.3
*Total Phthalates[4]		22.9												

TABLE E-6
SUMMARY STATISTICS FOR BASEFLOW AT
OUTFALL 245 Water Years 2002-2011

	Minimum	Maximum	Arithmetic Mean	Median	# of Detects	Count	% Detects	10th Per	90th Per	Standard Deviation	Coefficient of Variation	Standard Error	95% UCL	95% LCL
Conventionals														
Hardness (mg/L as CaCO3)	136	2,880	909.23	891.00	39	39	100%	382.40	1468.00	524.51	0.58	83.99	1079.26	739.20
pH (pH units)	7.1	8.0		7.3	39	39	100%							
TSS (mg/L)	0.26	78.90	9.89	6.90	38	39	97%	2.16	19.60	13.16	1.33	2.11	14.16	5.63
Metals in ug/L														
Lead	*0.14*	18.20	4.08	2.58	18	37	49%	0.38	11.94	4.63	1.13	0.76	5.63	2.54
Mercury	*0.025*	*0.125*	*0.030*	*0.025*	5	38	13%	0.025	0.025	0.020	0.671	0.003	0.036	0.023
Zinc	11.8	1950	180	52	39	39	100%	16.80	235.40	386.46	2.15	61.88	305.28	54.73
Dissolved Lead	*0.02*	18.90	3.15	1.60	19	37	51%	0.05	6.99	3.97	1.26	0.65	4.47	1.82
Dissolved Mercury	*0.025*	*0.125*	*0.029*	*0.025*	3	37	8%	0.025	0.025	0.018	0.619	0.003	0.035	0.023
Dissolved Zinc	0.60	1220.00	94.43	24.10	37	39	95%	4.85	113.92	237.53	2.52	38.03	171.42	17.43
PAH in ug/L														
LPAHs														
2-Methylnaphthalene	*0.002*	0.018	0.006	*0.005*	9	39	23%	0.002	0.011	0.004	0.636	0.001	0.007	0.005
Acenaphthene	*0.002*	0.103	0.033	0.026	34	39	87%	0.005	0.068	0.023	0.698	0.004	0.040	0.025
Acenaphthylene	*0.002*	*0.008*	*0.004*	*0.005*	1	39	3%	0.002	0.005	0.002	0.358	0.000	0.005	0.004
Anthracene	*0.002*	0.014	0.006	*0.005*	9	39	23%	0.002	0.011	0.003	0.527	0.000	0.007	0.005
Fluorene	*0.002*	0.017	0.006	*0.005*	14	39	36%	0.003	0.012	0.004	0.613	0.001	0.008	0.005
Naphthalene	*0.004*	0.057	0.011	0.010	22	39	56%	0.005	0.019	0.010	0.842	0.002	0.014	0.008
Phenanthrene	*0.002*	0.027	0.011	0.008	23	39	59%	0.005	0.022	0.007	0.682	0.001	0.013	0.008
*Total LPAHs[1]	0.013	0.181	0.072	0.066				0.030	0.123	0.037	0.522			
HPAHs														
Benzo(a)anthracene	*0.001*	0.021	0.006	*0.005*	8	39	21%	0.001	0.012	0.004	0.658	0.001	0.008	0.005
Benzo(a)pyrene	*0.002*	0.048	0.006	*0.005*	4	39	10%	0.002	0.005	0.007	1.239	0.001	0.008	0.003
Benzo(g,h,i)perylene	*0.003*	0.033	0.006	*0.005*	3	39	8%	0.004	0.006	0.005	0.824	0.001	0.008	0.004
Benzo(b,k)fluoranthene	*0.002*	0.062	0.010	*0.005*	17	39	44%	0.005	0.015	0.010	1.061	0.002	0.013	0.006
Chrysene	*0.002*	0.063	0.008	*0.005*	12	39	31%	0.003	0.017	0.010	1.236	0.002	0.012	0.005
Dibenz(a,h)anthracene	*0.003*	0.013	*0.005*	*0.005*	1	39	3%	0.004	0.005	0.002	0.332	0.000	0.005	0.004
Fluoranthene	*0.003*	0.046	0.014	0.012	27	39	69%	0.005	0.033	0.011	0.775	0.002	0.018	0.011
Indeno(1,2,3-c,d)pyrene	*0.003*	0.018	0.005	*0.005*	3	39	8%	0.004	0.005	0.003	0.526	0.000	0.006	0.004
Pyrene	0.004	0.081	0.025	0.024	37	39	95%	0.010	0.041	0.015	0.594	0.002	0.030	0.020
*Total HPAHs[2]	0.029	0.368	0.086	0.074				0.045	0.126	0.056	0.654			
*Total PAHs[3]	0.042	0.436	0.157	0.144				0.082	0.237	0.074	0.468			
Phenols in ug/L														
4-Methylphenol	*0.005*	0.093	0.028	0.015	10	16	63%	0.005	0.062	0.028	0.972	0.007	0.043	0.014
Phthalates in ug/L														
Bis(2-ethylhexyl) phthalate	*0.4*	3.3	0.7	*0.5*	9	38	24%	0.5	1.2	0.6	0.8	0.1	0.9	0.5
Butylbenzyl phthalate	*0.09*	16.0	1.6	*0.5*	10	39	26%	0.1	3.3	3.4	2.1	0.5	2.7	0.5
Diethyl phthalate	0.04	4.4	0.7	*0.5*	11	39	28%	0.1	1.4	1.0	1.3	0.2	1.1	0.4
Dimethyl phthalate	*0.016*	*0.5*	*0.4*	*0.5*	0	39	0%	0.0	0.5	0.2	0.6	0.0	0.4	0.3
Di-n-butyl phthalate	0.16	*1.3*	*0.5*	*0.5*	10	39	26%	0.3	0.5	0.2	0.4	0.0	0.5	0.4
Di-n-octyl phthalate	*0.042*	*0.5*	*0.4*	*0.5*	0	39	0%	0.0	0.5	0.2	0.5	0.0	0.5	0.3
*Total Phthalates[4]	0.44	18.7												

TABLE E-7
SUMMARY STATISTICS FOR BASEFLOW AT
OUTFALL 254 Water Years 2002-2011

	Minimum	Maximum	Arithmetic Mean	Median	# of Detects	Count	% Detects	10th Per	90th Per	Standard Deviation	Coefficient of Variation	Standard Error	95% UCL	95% LCL
Conventionals														
Hardness (mg/L as CaCO3)	386	4,410		3,020	38	38	100%							
pH (pH units)	6.7	7.6		7.2	38	38	100%							
TSS (mg/L)	1.8	140.0	17.2	9.2	38	38	100%	3.16	30.80	23.41	1.36	3.80	24.89	9.50
Metals in ug/L														
Lead	*0.06*	39.00	6.48	3.10	18	37	49%	0.44	16.82	8.73	1.35	1.43	9.39	3.57
Mercury	*0.025*	*0.055*	*0.026*	*0.025*	0	38	0%	0.025	0.025	0.006	0.236	0.001	0.029	0.024
Zinc	7.24	95.20	28.78	23.90	36	36	100%	11.45	52.35	19.33	0.67	3.22	35.32	22.24
Dissolved Lead	*0.01*	47.20	8.07	2.65	20	37	54%	0.23	19.14	10.65	1.32	1.75	11.62	4.52
Dissolved Mercury	*0.025*	0.114	0.028	*0.025*	1	37	3%	0.025	0.025	0.015	0.537	0.002	0.033	0.023
Dissolved Zinc	*0.33*	54.70	22.08	19.45	30	36	83%	2.10	45.90	15.82	0.72	2.64	27.43	16.73
PAH in ug/L														
LPAHs														
2-Methylnaphthalene	0.002	0.034	0.006	*0.005*	8	38	21%	0.003	0.012	0.006	0.942	0.001	0.008	0.004
Acenaphthene	*0.002*	0.096	0.014	*0.005*	10	38	26%	0.002	0.039	0.020	1.477	0.003	0.020	0.007
Acenaphthylene	*0.002*	0.019	0.005	*0.005*	3	38	8%	0.002	0.005	0.003	0.646	0.001	0.006	0.004
Anthracene	*0.002*	0.077	0.008	*0.005*	7	38	18%	0.002	0.016	0.013	1.564	0.002	0.013	0.004
Fluorene	*0.002*	0.060	0.009	*0.005*	9	38	24%	0.002	0.025	0.012	1.323	0.002	0.013	0.005
Naphthalene	*0.002*	0.029	0.008	*0.005*	10	38	26%	0.004	0.020	0.007	0.856	0.001	0.011	0.006
Phenanthrene	*0.002*	0.684	0.030	0.007	20	38	53%	0.002	0.033	0.110	3.613	0.018	0.067	-0.006
*Total LPAHs[1]	0.010	0.898	0.075	0.033				0.014	0.143	0.148	1.965			
HPAHs														
Benzo(a)anthracene	*0.001*	1.110	0.047	0.005	16	38	42%	0.001	0.037	0.183	3.873	0.030	0.107	-0.013
Benzo(a)pyrene	*0.002*	0.131	0.011	*0.005*	10	38	26%	0.002	0.020	0.022	1.929	0.004	0.018	0.004
Benzo(g,h,i)perylene	*0.003*	0.055	0.008	*0.005*	10	38	26%	0.004	0.014	0.009	1.116	0.002	0.011	0.005
Benzo(b,k)fluoranthene	*0.002*	0.376	0.029	0.014	23	38	61%	0.002	0.043	0.063	2.169	0.010	0.050	0.008
Chrysene	*0.002*	0.362	0.023	0.005	16	38	42%	0.002	0.033	0.060	2.636	0.010	0.042	0.003
Dibenz(a,h)anthracene	*0.003*	0.017	0.005	*0.005*	3	38	8%	0.004	0.005	0.003	0.507	0.000	0.006	0.004
Fluoranthene	*0.003*	1.140	0.065	0.019	30	38	79%	0.003	0.093	0.188	2.875	0.030	0.127	0.004
Indeno(1,2,3-c,d)pyrene	*0.003*	0.053	0.008	*0.005*	8	38	21%	0.004	0.012	0.009	1.187	0.001	0.010	0.005
Pyrene	0.002	0.879	0.057	0.025	35	38	92%	0.006	0.066	0.144	2.519	0.023	0.104	0.010
*Total HPAHs[2]	0.024	3.287	0.254	0.093				0.029	0.422	0.559	2.204			
*Total PAHs[3]	0.034	4.185	0.329	0.131				0.043	0.547	0.697	2.118			
Phenols in ug/L														
4-Methylphenol	*0.005*	0.103	0.015	*0.005*	7	16	44%	0.005	0.017	0.024	1.582	0.006	0.028	0.002
Phthalates in ug/L														
Bis(2-ethylhexyl) phthalate	*0.1*	2.9	0.6	*0.5*	8	37	22%	0.5	0.8	0.5	0.8	0.1	0.8	0.5
Butylbenzyl phthalate	0.09	1.4	*0.4*	*0.5*	4	38	11%	0.1	0.5	0.2	0.5	0.0	0.5	0.4
Diethyl phthalate	0.04	3.8	0.5	*0.5*	9	38	24%	0.1	0.5	0.6	1.2	0.1	0.7	0.3
Dimethyl phthalate	*0.016*	*0.5*	*0.4*	*0.5*	2	38	5%	0.0	0.5	0.2	0.6	0.0	0.4	0.3
Di-n-butyl phthalate	0.05	*0.5*	*0.4*	*0.5*	9	38	24%	0.2	0.5	0.1	0.3	0.0	0.5	0.4
Di-n-octyl phthalate	*0.042*	*0.5*	*0.4*	*0.5*	0	38	0%	0.0	0.5	0.2	0.5	0.0	0.5	0.3
*Total Phthalates[4]		3.9												

Table E-8
Summary Statistics for Stormwater at OF230/230A Water Years 2002-2024

	Minimum	Maximum	Arithmetic Mean	Median	Detects	Count	Percent Detects	10th Per	90th Per	Standard Deviation	Coefficient of Variation	Standard Error	95% UCL	95% LCL
Conventionals														
Anionic Surfactants (mg/L)	0.0004	0.199	0.046	0.037	59	62	95%	0.02	0.079	0.032	0.704	0.004	0.054	0.038
BOD (mg/L)	0.483	9.7	3.99	3.2	56	63	88%	1.96	7.9	2.28	0.57	0.287	4.57	3.45
Chloride (mg/L)	0.823	551	21.6	4.5	61	65	93%	1.51	28.5	72.7	3.36	9.02	41.7	8.36
Conductivity (uS/cm)	14.9	2,260	121	57.7	147	147	100%	32.4	176	286	2.36	23.6	173	81.3
Total Hardness (mg CaCO3/L)	8.73	206	21.2	16	211	211	100%	11.4	26.7	23.5	1.11	1.62	24.6	18.4
Total Suspended Solids (mg/L)	4.8	322	47.6	30.3	205	205	100%	12.9	98.8	50.6	1.06	3.54	55	41
Turbidity (NTU)	5.52	85.2	18	13.5	63	63	100%	7.97	34.4	15.2	0.841	1.91	22	14.7
pH (pH Units)	5	10.6	6.96	7	211	211	100%	6.3	7.5	0.568	0.082	0.039	7.03	6.88
Nutrients														
Nitrate+Nitrite as N (mg/L)	0.062	0.526	0.165	0.133	80	80	100%	0.088	0.295	0.093	0.566	0.01	0.186	0.146
Orthophosphate (mg/L)	0.004	0.104	0.029	0.024	86	86	100%	0.014	0.05	0.019	0.637	0.002	0.034	0.026
Phosphorus, Total (mg/L)	0.042	0.688	0.123	0.087	80	80	100%	0.055	0.251	0.111	0.899	0.012	0.149	0.101
Total Nitrogen (mg/L)	0.13	2.1	0.573	0.46	71	72	98%	0.265	1.07	0.402	0.701	0.047	0.67	0.484
Metals														
Cadmium (ug/L)	0.002	0.466	0.082	0.066	50	94	53%	0.019	0.147	0.075	0.919	0.0078	0.0981	0.068
Cadmium, Dissolved (ug/L)	0.0005	0.125	0.025	0.022	24	93	25%	0.004	0.046	0.019	0.75	0.002	0.029	0.021
Copper (ug/L)	3.72	66.4	11.2	8.31	94	94	100%	5.14	20	9.85	0.882	1.02	13.3	9.39
Copper, Dissolved (ug/L)	0.835	18.1	4.21	3.14	93	93	100%	1.85	8.38	2.97	0.706	0.308	4.85	3.64
Lead (ug/L)	2.09	229	17.5	10.7	211	211	100%	4.34	37.8	21.8	1.24	1.5	20.7	14.9
Lead, Dissolved (ug/L)	0.027	9.05	0.85	0.479	170	210	80%	0.212	1.62	1.18	1.39	0.081	1.02	0.702
Mercury (ug/L)	0.00007	0.13	0.02	0.0076	82	211	38%	0.002	0.05	0.025	1.25	0.002	0.024	0.017
Mercury, Dissolved (ug/L)	0.00007	0.155	0.014	0.0076	26	210	12%	0.001	0.039	0.018	1.24	0.001	0.017	0.012
Zinc (ug/L)	31.8	721	108	80.3	211	211	100%	49.8	176	86.6	0.802	5.96	120	96.7
Zinc, Dissolved (ug/L)	11.5	543	55.6	42.3	210	210	100%	26.7	86.2	54.1	0.974	3.73	63.4	49.1
Insecticides														
2,4-D (ug/L)	0.0008	1.7	0.178	0.05	28	44	63%	0.0058	0.512	0.303	1.71	0.046	0.276	0.0999
Bifenthrin (ug/L)	0.00008	0.013	0.005	0.0057	1	37	2%	0.0007	0.0089	0.003	0.665	0.0006	0.0061	0.004
Carbaryl (ug/L)	0.001	0.473	0.118	0.04	0	26	0%	0.005	0.379	0.151	1.28	0.03	0.18	0.064
Chlorpyrifos (ug/L)	0.00002	1.42	0.039	0.0092	2	70	2%	0.002	0.055	0.169	4.31	0.02	0.082	0.015
PAHs														
LPAHs														
2-Methylnaphthalene (ug/L)	0.0002	0.469	0.024	0.013	159	211	75%	0.004	0.038	0.049	2.05	0.003	0.031	0.018
Acenaphthene (ug/L)	1.00E-05	0.08	0.0064	0.004	42	211	19%	0.0007	0.012	0.0096	1.49	0.0007	0.0078	0.0053
Acenaphthylene (ug/L)	0.00003	0.06	0.0057	0.005	48	211	22%	0.0009	0.01	0.0062	1.08	0.0004	0.0066	0.005
Anthracene (ug/L)	0.00002	0.122	0.01	0.0052	77	211	36%	0.0007	0.022	0.015	1.5	0.001	0.012	0.0083
Fluorene (ug/L)	6.00E-06	0.246	0.011	0.0063	98	211	46%	0.002	0.023	0.02	1.79	0.001	0.014	0.009
Naphthalene (ug/L)	0.0005	0.528	0.033	0.022	160	210	76%	0.0086	0.05	0.051	1.55	0.004	0.04	0.027
Phenanthrene (ug/L)	0.0004	0.653	0.074	0.035	201	211	95%	0.013	0.191	0.101	1.37	0.007	0.088	0.061
Total LPAHs[1]	0.008	0.923	0.135	0.079	210	210	100%	0.034	0.297	0.154	1.14	0.011	0.157	0.115
HPAHs														
Benzo(a)anthracene (ug/L)	0.00003	0.439	0.045	0.016	158	211	74%	0.002	0.112	0.068	1.52	0.005	0.055	0.036
Benzo(a)pyrene (ug/L)	0.00008	0.563	0.053	0.02	153	211	72%	0.002	0.152	0.082	1.54	0.0057	0.065	0.043
Benzo(b,k)fluoranthene (ug/L)	0.0007	1.4	0.146	0.049	177	211	83%	0.0075	0.404	0.221	1.51	0.015	0.177	0.118
Benzo(g,h,i)perylene (ug/L)	0.00002	0.457	0.06	0.028	189	211	89%	0.006	0.15	0.079	1.3	0.0054	0.071	0.05
Chrysene (ug/L)	0.0002	0.86	0.0965	0.031	190	211	90%	0.005	0.269	0.149	1.54	0.01	0.117	0.077
Dibenz(a,h)anthracene (ug/L)	0.00005	0.088	0.013	0.006	103	211	48%	0.001	0.032	0.016	1.29	0.001	0.015	0.011
Fluoranthene (ug/L)	0.0008	1.69	0.15	0.051	207	211	98%	0.014	0.392	0.238	1.58	0.016	0.183	0.121
Indeno(1,2,3-cd)pyrene (ug/L)	0.0001	0.346	0.047	0.022	169	211	80%	0.002	0.129	0.062	1.32	0.004	0.055	0.039
Pyrene (ug/L)	0.003	1.2	0.14	0.052	203	211	96%	0.016	0.366	0.199	1.42	0.014	0.168	0.115
Retene (ug/L)	0.002	0.031	0.0095	0.0075	28	36	77%	0.003	0.019	0.0067	0.703	0.001	0.012	0.0075
Total HPAHs[2]	0.025	6.68	0.75	0.279	211	211	100%	0.054	2.09	1.1	1.47	0.076	0.908	0.608
TOTAL PAHs[3]	0.037	7.49	0.884	0.364	211	211	100%	0.093	2.39	1.24	1.4	0.085	1.06	0.727
Phthalates														
Butylbenzylphthalate (ug/L)	0.002	8.4	0.465	0.279	46	211	21%	0.058	0.779	0.841	1.81	0.058	0.59	0.368
bis(2-Ethylhexyl) phthalate (ug/L)	0.0973	44.1	3.12	1.84	191	210	90%	0.844	6.7	4.09	1.31	0.282	3.72	2.64
Di-n-butylphthalate (ug/L)	0.001	1.6	0.383	0.348	90	211	42%	0.0993	0.707	0.242	0.63	0.017	0.417	0.352
Di-n-octyl phthalate (ug/L)	0.012	3.2	0.48	0.33	78	209	37%	0.069	1	0.5	1.04	0.035	0.549	0.414
Diethylphthalate (ug/L)	0.003	9.3	0.544	0.281	68	211	32%	0.053	1	1.05	1.92	0.072	0.697	0.421
Dimethylphthalate (ug/L)	0.0003	4.7	0.271	0.139	16	211	7%	0.022	0.64	0.488	1.8	0.034	0.342	0.211
***Total Phthalates[4]**	0	44.1	4.12	2.61	203	211	96%	0.848	8.7	5.06	1.23	0.349	4.84	3.48
Herbicides														
Dichlobenil (ug/L)	0.002	0.73	0.069	0.049	85	105	80%	0.012	0.148	0.087	1.25	0.0084	0.088	0.055
TPH														
NWTPH-Diesel (mg/L)	2.0E-04	0.13	0.06	0.06	6	59	10%	0.01	0.10	0.04	0.62	0.01	0.07	0.05
NWTPH-Gasoline (mg/L)	9.E-01	47.8	15.7	12.9	0	46	0%	1.7	33.4	13.5	0.86	2.0	19.7	12.0
NWTPH-Heavy Oil (mg/L)	0.01	1.90	0.61	0.53	50	53	94%	0.28	1.10	0.36	0.59	0.05	0.71	0.52
Bacteria														
Coliform, Fecal (CFU/100 ml)	80	1300000	40900	5000	58	58	100%	1220	38100	173000	4.23	22700	91900	11400
E.coli (CFU/100 ml)	90	230000	41700	13000	18	18	100%	1580	125000	64300	1.54	15200	73100	16600
Enterococci (CFU/100 ml)	1	210000	47200	12900	17	18	94%	1680	158000	69500	1.47	16400	81300	19400
BTEX														
Benzene (ug/L)	0.004	1.2	0.138	0.145	1	46	2%	0.015	0.183	0.171	1.24	0.025	0.196	0.101
Ethylbenzene (ug/L)	0.004	0.4	0.119	0.117	2	46	4%	0.021	0.189	0.074	0.626	0.011	0.141	0.0988
Toluene (ug/L)	0.0071	1.2	0.163	0.097	9	46	19%	0.031	0.3	0.227	1.39	0.033	0.236	0.107
m,p-Xylene (ug/L)	0.0082	1.1	0.255	0.224	4	46	8%	0.067	0.391	0.2	0.787	0.03	0.316	0.202
o-Xylene (ug/L)	0.0003	0.5	0.122	0.112	4	46	8%	0.023	0.191	0.0976	0.797	0.014	0.153	0.0963

[1] Total LPAHs is the sum of the concentration or non-detected calculated value of the following compounds: Naphthalene, acenaphthene, acenaphthylene, anthracene, fluorene, and phenanthrene.

[2] Total HPAHs is the sum of the concentration of non-detected calculated value of the following compounds: Fluoranthene, pyrene, benzo(a)anthracene, chrysene, benzo(b,k)fluoranthene, benzo(b,k)fluoranthene, benzo(a)pyrene, indeno(1,2,3-c,d)pyrene, dibenz(a,h)anthracene, benzo(g,h,i)perylene.

[3] Total PAHs is the sum of the LPAHs and HPAHs.

[4] Total phthalates is the sum of detected values only.

Table E-8 (Cont'd)
Summary Statistics for Stormwater at OF230/230A WY2024

	Minimum	Maximum	Arithmetic Mean	Median	Detects	Count	Percent Detects	10th Per	90th Per	Standard Deviation	Coefficient of Variation	Standard Error	95% UCL	95% LCL
Conventionals														
Anionic Surfactants (mg/L)	0.031	0.134	0.065	0.061	8	8	100%	0.034	0.098	0.035	0.54	0.012	0.089	0.044
BOD (mg/L)	2.3	8.8	4.9	4.6	7	7	100%	2.5	8.3	2.6	0.52	1.0	6.7	3.2
Chloride (mg/L)	2.68	38.00	12.50	4.07	5	8	62%	3.16	29.70	13.50	1.08	4.77	22.10	3.90
Conductivity (uS/cm)	48.3	171.0	83.9	59.9	9	9	100%	51.3	133.0	43.9	0.52	14.6	113.0	58.5
Total Hardness (mg CaCO3/L)	10.6	21.0	15.8	15.3	9	9	100%	12.9	20.2	3.3	0.21	1.1	17.9	13.8
Total Suspended Solids (mg/L)	9.8	53.9	24.5	19.5	9	9	100%	12.8	38.0	13.2	0.54	4.4	33.4	17.3
Turbidity (NTU)	6.5	16.5	11.1	10.4	8	8	100%	7.4	15.7	3.6	0.33	1.3	13.4	8.8
pH (pH Units)	6.7	8.2	7.3	7.2	9	9	100%	6.9	7.6	0.4	0.06	0.1	7.6	7.0
Nutrients														
Nitrate+Nitrite as N (mg/L)	0.116	0.526	0.231	0.212	9	9	100%	0.129	0.345	0.123	0.54	0.041	0.319	0.168
Orthophosphate (mg/L)	0.015	0.104	0.035	0.028	9	9	100%	0.017	0.058	0.028	0.79	0.009	0.053	0.022
Phosphorus, Total (mg/L)	0.050	0.272	0.118	0.118	9	9	100%	0.056	0.170	0.067	0.56	0.022	0.164	0.083
Total Nitrogen (mg/L)	1.52	1.52	1.52	1.52	1	1	100%	1.52	1.52	--	--	--	1.52	1.52
Metals														
Cadmium (ug/L)	0.019	0.139	0.065	0.066	1	9	11%	0.022	0.094	0.036	0.55	0.012	0.088	0.045
Cadmium, Dissolved (ug/L)	0.001	0.050	0.023	0.021	0	9	0%	0.001	0.050	0.019	0.82	0.006	0.035	0.012
Copper (ug/L)	4.19	20.80	9.76	8.82	9	9	100%	5.26	16.20	5.49	0.56	1.83	13.40	6.69
Copper, Dissolved (ug/L)	1.86	11.40	4.91	3.07	9	9	100%	2.17	9.58	3.44	0.70	1.15	7.19	2.97
Lead (ug/L)	2.50	14.30	5.12	3.84	9	9	100%	3.02	7.46	3.59	0.70	1.20	7.60	3.47
Lead, Dissolved (ug/L)	0.153	0.774	0.401	0.358	9	9	100%	0.187	0.719	0.221	0.55	0.074	0.542	0.273
Mercury (ug/L)	0.0005	0.0100	0.0040	0.0040	1	9	11%	0.0010	0.0078	0.0030	0.71	0.0010	0.0063	0.0030
Mercury, Dissolved (ug/L)	0.0001	0.0097	0.0061	0.0070	0	9	0%	0.0020	0.0093	0.0030	0.55	0.0010	0.0080	0.0040
Zinc (ug/L)	48.0	311.0	107.0	65.4	9	9	100%	50.9	201.0	86.0	0.80	28.7	166.0	63.6
Zinc, Dissolved (ug/L)	30.6	233.0	68.5	42.2	9	9	100%	32.3	115.0	64.6	0.94	21.5	113.0	38.8
Insecticides														
Bifenthrin (ug/L)	0.001	0.013	0.005	0.006	1	9	11%	0.001	0.009	0.004	0.74	0.001	0.008	0.003
PAHs														
LPAHs														
2-Methylnaphthalene (ug/L)	0.000	0.036	0.013	0.012	5	9	55%	0.002	0.023	0.011	0.87	0.004	0.020	0.007
Acenaphthene (ug/L)	0.000	0.008	0.004	0.005	0	9	0%	0.002	0.007	0.003	0.58	0.001	0.006	0.003
Acenaphthylene (ug/L)	0.002	0.011	0.005	0.005	1	9	11%	0.002	0.009	0.003	0.61	0.001	0.008	0.003
Anthracene (ug/L)	0.001	0.007	0.003	0.002	1	9	11%	0.001	0.005	0.002	0.68	0.001	0.004	0.002
Fluorene (ug/L)	0.001	0.008	0.004	0.004	0	9	0%	0.002	0.007	0.002	0.51	0.001	0.006	0.003
Naphthalene (ug/L)	0.003	0.050	0.029	0.034	6	9	66%	0.006	0.049	0.017	0.59	0.006	0.040	0.019
Phenanthrene (ug/L)	0.000	0.045	0.022	0.026	7	9	77%	0.002	0.041	0.015	0.67	0.005	0.031	0.013
Total LPAHs[1]	0.040	0.099	0.071	0.061	9	9	100%	0.043	0.096	0.024	0.34	0.008	0.086	0.056
HPAHs														
Benzo(a)anthracene (ug/L)	0.002	0.034	0.010	0.011	5	9	55%	0.002	0.018	0.010	0.95	0.003	0.017	0.005
Benzo(a)pyrene (ug/L)	0.001	0.035	0.016	0.017	6	9	66%	0.002	0.031	0.012	0.75	0.004	0.024	0.009
Benzo(b,k)fluoranthenes (ug/L)	0.021	0.068	0.041	0.042	9	9	100%	0.025	0.055	0.015	0.35	0.005	0.050	0.033
Benzo(g,h,i)perylene (ug/L)	0.003	0.042	0.022	0.021	8	9	88%	0.012	0.032	0.011	0.49	0.004	0.029	0.015
Chrysene (ug/L)	0.009	0.034	0.019	0.020	9	9	100%	0.013	0.024	0.007	0.37	0.002	0.023	0.015
Dibenz(a,h)anthracene (ug/L)	0.001	0.007	0.004	0.004	1	9	11%	0.002	0.006	0.002	0.47	0.001	0.005	0.003
Fluoranthene (ug/L)	0.017	0.056	0.035	0.035	9	9	100%	0.024	0.046	0.012	0.33	0.004	0.042	0.028
Indeno(1,2,3-cd)pyrene (ug/L)	0.010	0.032	0.019	0.017	9	9	100%	0.011	0.028	0.007	0.37	0.002	0.024	0.015
Pyrene (ug/L)	0.022	0.074	0.043	0.042	9	9	100%	0.030	0.056	0.015	0.35	0.005	0.053	0.034
Retene (ug/L)	0.002	0.017	0.007	0.007	7	9	77%	0.002	0.010	0.004	0.62	0.001	0.010	0.005
Total HPAHs[2]	0.101	0.377	0.210	0.190	9	9	100%	0.136	0.293	0.083	0.40	0.028	0.264	0.163
TOTAL PAHs[3]	0.155	0.471	0.281	0.252	9	9	100%	0.187	0.372	0.095	0.34	0.032	0.342	0.226
Phthalates														
Butylbenzylphthalate (ug/L)	0.05	1.99	0.51	0.35	3	9	33%	0.11	0.83	0.58	1.15	0.19	0.91	0.24
bis(2-Ethylhexyl) phthalate (ug/L)	0.724	1.790	1.270	1.320	9	9	100%	0.910	1.760	0.369	0.29	0.123	1.500	1.050
Di-n-butylphthalate (ug/L)	0.083	0.348	0.223	0.229	2	9	22%	0.133	0.312	0.081	0.36	0.027	0.271	0.174
Di-n-octyl phthalate (ug/L)	0.012	0.327	0.198	0.211	0	9	0%	0.056	0.313	0.106	0.54	0.035	0.260	0.129
Diethylphthalate (ug/L)	0.171	0.688	0.439	0.349	6	9	66%	0.275	0.645	0.182	0.42	0.061	0.553	0.328
Dimethylphthalate (ug/L)	0.010	0.292	0.173	0.172	0	9	0%	0.038	0.292	0.111	0.64	0.037	0.241	0.105
Total Phthalates[4]	0.96	3.89	2.04	2.17	9	9	100%	1.05	2.67	0.87	0.43	0.29	2.61	1.54
Herbicides														
Dichlobenil (ug/L)	0.018	0.105	0.043	0.025	9	9	100%	0.019	0.103	0.035	0.82	0.012	0.068	0.024
TPH														
NWTPH-Diesel (mg/L)	0.02	0.10	0.04	0.03	0	6	0%	0.02	0.07	0.03	0.64	0.01	0.07	0.03
NWTPH-Heavy Oil (mg/L)	--	--	--	--	--	0	--	--	--	--	--	--	--	--
Bacteria														
Coliform, Fecal (CFU/100 mL)	11000	230000	56500	18500	6	6	100%	11000	140000	86300	1.53	35200	128000	13500
E. coli (CFU/100 mL)	2100	230000	50900	10000	6	6	100%	2800	140000	89500	1.76	36500	126000	5200
Enterococci (CFU/100 mL)	2400	140000	34300	13400	6	6	100%	6000	83500	52400	1.53	21400	77700	8470

Table E-9
Summary Statistics for Stormwater at OF235 Water Years 2002-2024

	Minimum	Maximum	Arithmetic Mean	Median	Detects	Count	Percent Detects	10th Per	90th Per	Standard Deviation	Coefficient of Variation	Standard Error	95% UCL	95% LCL
Conventionals														
Anionic Surfactants (mg/L)	0.001	0.665	0.061	0.048	101	107	94%	0.023	0.105	0.072	1.17	0.007	0.076	0.050
BOD (mg/L)	0.1	9.7	3.8	3.4	73	89	82%	1.2	7.1	2.2	0.59	0.2	4.2	3.3
Chloride (mg/L)	0.003	114	9.79	4.48	95	100	95%	0.80	20.30	16.70	1.71	1.67	13.30	6.87
Conductivity (uS/cm)	7.2	1590	124.0	81.0	190	190	100%	52.0	175.0	158.0	1.28	11.5	148.0	103.0
Total Hardness (mg CaCO3/L)	9.8	63.9	30.0	27.9	256	256	100%	19.4	42.7	9.9	0.33	0.6	31.2	28.8
Total Suspended Solids (mg/L)	5.6	441.0	54.8	39.2	250	250	100%	15.1	107.0	52.3	0.95	3.3	61.7	48.7
Turbidity (NTU)	5.1	80	18.6	16.5	77	77	100%	8.9	29.6	10.8	0.58	1.2	21.2	16.4
pH (pH Units)	5.4	8.6	7.0	7.1	256	256	100%	6.4	7.5	0.5	0.07	0.0	7.1	7.0
Nutrients														
Nitrate+Nitrite as N (mg/L)	0.028	1.650	0.338	0.254	133	133	100%	0.164	0.658	0.259	0.76	0.022	0.385	0.297
Orthophosphate (mg/L)	0.000	0.143	0.028	0.025	135	135	100%	0.006	0.047	0.020	0.71	0.002	0.032	0.025
Phosphorus, Total (mg/L)	0.019	0.706	0.128	0.097	131	131	100%	0.058	0.232	0.102	0.80	0.009	0.147	0.112
Total Nitrogen (mg/L)	0.007	3.28	0.82	0.67	129	133	96%	0.36	1.41	0.56	0.69	0.05	0.92	0.73
Metals														
Cadmium (ug/L)	0.0008	0.960	0.132	0.097	112	171	65%	0.024	0.262	0.137	1.04	0.010	0.153	0.112
Cadmium, Dissolved (ug/L)	0.0004	0.379	0.047	0.033	70	172	40%	0.007	0.102	0.048	1.02	0.004	0.054	0.040
Copper (ug/L)	3.45	162	28.90	22.90	171	171	100%	14.40	45.70	21.50	0.74	1.64	32.20	25.90
Copper, Dissolved (ug/L)	1.79	79.10	12.20	9.82	171	172	99%	6.15	19.10	9.43	0.77	0.72	13.70	10.90
Lead (ug/L)	2.46	368	53.60	41.20	256	256	100%	22.20	97.80	41.40	0.77	2.58	58.90	48.80
Lead, Dissolved (ug/L)	0.156	28.00	6.14	4.670	253	257	98%	2.120	12.300	4.870	0.79	0.304	6.750	5.540
Mercury (ug/L)	2.000E-06	0.1900	0.0220	0.0089	95	257	36%	0.0020	0.0500	0.0310	1.38	0.0020	0.0260	0.0190
Mercury, Dissolved (ug/L)	2.000E-06	0.0500	0.0140	0.0067	25	257	9%	0.0008	0.0400	0.0150	1.09	0.0009	0.0150	0.0120
Zinc (ug/L)	34.3	598	111.0	86.6	255	255	100%	47.5	190.0	77.0	0.70	4.8	121.0	102.0
Zinc, Dissolved (ug/L)	9.7	347	42.8	33.5	255	255	100%	22.5	69.3	32.6	0.76	2.0	47.0	39.1
Insecticides														
2,4-D (ug/L)	0.002	12.0	0.583	0.125	52	84	61%	0.028	1.250	1.500	2.57	0.164	0.963	0.323
Bifenthrin (ug/L)	0.0008	0.01	0.01	0.01	0	54	0%	0.00	0.01	0.00	0.45	0.0003	0.01	0.01
Carbaryl (ug/L)	0.0010	0.445	0.126	0.041	0	33	0%	0.007	0.327	0.138	1.09	0.024	0.173	0.082
Chlorpyrifos (ug/L)	0.0001	0.707	0.024	0.010	2	111	1%	0.002	0.050	0.069	2.85	0.007	0.039	0.015
PAHs														
LPAHs														
2-Methylnaphthalene (ug/L)	0.0002	4.130	0.032	0.009	161	257	62%	0.002	0.035	0.258	8.12	0.016	0.065	0.014
Acenaphthene (ug/L)	0.00006	0.086	0.009	0.006	87	257	33%	0.001	0.019	0.010	1.20	0.001	0.010	0.007
Acenaphthylene (ug/L)	0.00001	0.060	0.006	0.005	68	257	26%	0.001	0.013	0.007	1.05	0.000	0.007	0.006
Anthracene (ug/L)	0.00008	0.138	0.013	0.008	128	257	49%	0.001	0.030	0.017	1.27	0.001	0.015	0.011
Fluorene (ug/L)	0.00008	0.083	0.011	0.006	115	257	44%	0.001	0.024	0.013	1.21	0.001	0.012	0.009
Naphthalene (ug/L)	0.0006	4.430	0.041	0.015	158	254	62%	0.004	0.052	0.277	6.85	0.017	0.077	0.021
Phenanthrene (ug/L)	0.0002	0.776	0.068	0.028	234	257	91%	0.010	0.180	0.099	1.46	0.006	0.080	0.056
Total LPAHs[1]	0.009	4.93	0.143	0.069	256	256	100%	0.026	0.304	0.335	2.35	0.021	0.190	0.111
HPAHs														
Benzo(a)anthracene (ug/L)	0.00001	0.555	0.040	0.018	213	257	82%	0.002	0.116	0.063	1.57	0.004	0.048	0.033
Benzo(a)pyrene (ug/L)	0.00001	0.498	0.042	0.020	198	257	77%	0.002	0.113	0.064	1.51	0.004	0.051	0.035
Benzo(b,k)fluoranthenes (ug/L)	0.00009	1.200	0.107	0.052	226	257	87%	0.012	0.298	0.152	1.42	0.010	0.126	0.089
Benzo(g,h,i)perylene (ug/L)	0.00003	0.410	0.050	0.030	234	257	91%	0.006	0.131	0.061	1.21	0.004	0.058	0.043
Chrysene (ug/L)	0.00009	0.678	0.079	0.032	243	257	94%	0.009	0.233	0.112	1.42	0.007	0.094	0.066
Dibenz(a,h)anthracene (ug/L)	0.00004	0.154	0.010	0.005	104	257	40%	0.001	0.024	0.015	1.51	0.001	0.011	0.008
Fluoranthene (ug/L)	0.0004	1.550	0.134	0.053	252	257	98%	0.024	0.383	0.189	1.41	0.012	0.159	0.113
Indeno(1,2,3-cd)pyrene (ug/L)	3.00E-06	0.338	0.034	0.019	210	257	81%	0.002	0.087	0.044	1.31	0.003	0.039	0.029
Pyrene (ug/L)	0.00001	1.160	0.139	0.066	253	257	98%	0.028	0.374	0.175	1.26	0.011	0.162	0.118
Retene (ug/L)	0.0007	0.115	0.014	0.010	46	52	88%	0.005	0.020	0.016	1.14	0.002	0.019	0.010
Total HPAHs[2]	0.027	6.50	0.634	0.304	257	257	100%	0.092	1.810	0.861	1.36	0.054	0.741	0.535
TOTAL PAHs[3]	0.045	7.55	0.776	0.364	257	257	100%	0.124	2.200	1.070	1.37	0.066	0.910	0.651
Phthalates														
Butylbenzylphthalate (ug/L)	0.001	7.9	0.85	0.44	128	257	49%	0.09	1.80	1.16	1.37	0.07	0.99	0.71
bis(2-Ethylhexyl) phthalate (ug/L)	0.365	97.00	3.820	1.920	245	256	95%	0.841	7.660	7.070	1.85	0.442	4.810	3.090
Di-n-butylphthalate (ug/L)	0.001	1.60	0.326	0.289	94	257	36%	0.076	0.689	0.244	0.75	0.015	0.356	0.296
Di-n-octyl phthalate (ug/L)	0.004	3.20	0.409	0.231	63	256	24%	0.034	0.986	0.508	1.24	0.032	0.473	0.349
Diethylphthalate (ug/L)	0.003	590.0	2.710	0.244	85	257	33%	0.035	0.929	36.800	13.60	2.290	7.370	0.357
Dimethylphthalate (ug/L)	0.000	2.40	0.246	0.151	17	255	6%	0.020	0.649	0.290	1.18	0.018	0.284	0.212
Total Phthalates[4]	0.00	596.00	7.34	2.69	252	257	98%	0.94	11.10	37.80	5.15	2.36	12.70	4.33
Herbicides														
Dichlobenil (ug/L)	0.0003	3.390	0.097	0.030	104	160	65%	0.006	0.174	0.298	3.06	0.024	0.151	0.061
TPH														
NWTPH-Diesel (mg/L)	0.001	0.31	0.05	0.04	7	81	8%	0.01	0.10	0.05	0.91	0.01	0.06	0.04
NWTPH-Gasoline (ug/L)	0.070	50.0	19.9	16.6	13	67	19%	2.2	41.7	15.4	0.78	1.9	23.5	16.3
NWTPH-Heavy Oil (mg/L)	0.009	1.70	0.63	0.54	75	81	92%	0.21	1.20	0.37	0.60	0.04	0.71	0.55
Bacteria														
Coliform, Fecal (CFU/100 mL)	80	160000	11500	3500	75	75	100%	794	19000	22300	1.95	2580	16900	7190
E. coli (CFU/100 mL)	1300	160000	21800	4950	16	16	100%	1950	60000	41700	1.91	10400	43900	5940
Enterococci (CFU/100 mL)	1.0	350000	54000	6500	17	17	100%	1510	162000	95900	1.77	23300	104000	16100
BTEX														
Benzene (ug/L)	0.007	1.20	0.26	0.16	17	46	36%	0.021	0.700	0.290	1.14	0.043	0.341	0.178
Ethylbenzene (ug/L)	0.008	0.40	0.11	0.09	7	46	15%	0.020	0.200	0.102	0.91	0.015	0.144	0.085
Toluene (ug/L)	0.003	1.20	0.19	0.17	13	46	28%	0.035	0.300	0.206	1.10	0.030	0.254	0.135
m,p-Xylene (ug/L)	0.010	0.60	0.22	0.21	4	46	8%	0.063	0.395	0.145	0.64	0.021	0.267	0.184
o-Xylene (ug/L)	0.007	0.19	0.09	0.09	0	46	0%	0.018	0.166	0.057	0.64	0.009	0.107	0.074

[1] Total LPAHs is the sum of the concentration or non-detected calculated value of the following compounds: Naphthalene, acenaphthene, acenaphthylene, anthracene, fluorene, and phenanthrene.

[2] Total HPAHs is the sum of the concentration of non-detected calculated value of the following compounds: Fluoranthene, pyrene, benzo(a)anthracene, chrysene, benzo(b,k)fluoranthene, benzo(b,k)fluoranthene, benzo(a)pyrene, indeno(1,2,3-c,d)pyrene, dibenz(a,h)anthracene, benzo(g,h,i)perylene.

[3] Total PAHs is the sum of the LPAHs and HPAHs.

[4] Total phthalates is the sum of detected values only.

Table E-9 (Cont'd)
Summary Statistics for Stormwater at OF235 WY2024

	Minimum	Maximum	Arithmetic Mean	Median	Detects	Count	Percent Detects	10th Per	90th Per	Standard Deviation	Coefficient of Variation	Standard Error	95% UCL	95% LCL
Conventionals														
Anionic Surfactants (mg/L)	0.023	0.111	0.055	0.056	11	11	100%	0.025	0.083	0.028	0.52	0.009	0.071	0.040
BOD (mg/L)	2.0	9.2	5.1	4.0	10	10	100%	2.5	8.8	2.7	0.53	0.9	6.7	3.6
Chloride (mg/L)	2.58	18.90	5.85	4.47	7	11	63%	2.68	7.51	4.65	0.79	1.40	8.80	3.84
Conductivity (uS/cm)	42.8	184.0	86.8	76.9	15	15	100%	54.7	121.0	35.7	0.41	9.2	106.0	70.5
Total Hardness (mg CaCO3/L)	16.6	57.1	30.5	27.6	15	15	100%	18.2	45.3	11.3	0.37	2.9	36.3	25.2
Total Suspended Solids (mg/L)	12.8	127.0	41.4	33.8	15	15	100%	16.2	75.7	31.4	0.76	8.1	58.0	27.8
Turbidity (NTU)	8.1	23.0	16.3	16.7	11	11	100%	9.4	21.2	4.4	0.27	1.3	18.7	13.8
pH (pH Units)	6.5	7.9	7.1	7.2	15	15	100%	6.8	7.5	0.3	0.05	0.1	7.3	7.0
Nutrients														
Nitrate+Nitrite as N (mg/L)	0.082	0.634	0.350	0.322	12	12	100%	0.199	0.527	0.156	0.45	0.045	0.435	0.268
Orthophosphate (mg/L)	0.007	0.066	0.035	0.032	15	15	100%	0.020	0.055	0.016	0.46	0.004	0.043	0.027
Phosphorus, Total (mg/L)	0.055	0.706	0.172	0.093	12	12	100%	0.063	0.270	0.182	1.06	0.052	0.286	0.095
Total Nitrogen (mg/L)	0.41	2.91	1.06	0.86	12	12	100%	0.53	1.49	0.67	0.63	0.19	1.47	0.75
Metals														
Cadmium (ug/L)	0.001	0.390	0.119	0.098	7	15	46%	0.058	0.202	0.091	0.77	0.023	0.169	0.079
Cadmium, Dissolved (ug/L)	0.002	0.085	0.038	0.040	2	15	13%	0.009	0.076	0.027	0.71	0.007	0.052	0.025
Copper (ug/L)	14.30	133.00	36.90	27.00	15	15	100%	19.20	52.40	29.40	0.80	7.59	53.60	25.40
Copper, Dissolved (ug/L)	7.09	55.90	16.00	12.20	15	15	100%	7.28	27.30	12.90	0.80	3.32	23.10	10.70
Lead (ug/L)	23.50	144.00	50.80	36.60	15	15	100%	25.90	91.00	33.90	0.67	8.74	69.00	36.20
Lead, Dissolved (ug/L)	2.660	20.200	6.860	5.260	15	15	100%	3.310	11.800	4.610	0.67	1.190	9.390	4.900
Mercury (ug/L)	0.0010	0.0330	0.0081	0.0059	4	15	26%	0.0030	0.0140	0.0080	0.99	0.0020	0.0130	0.0050
Mercury, Dissolved (ug/L)	0.0004	0.0150	0.0040	0.0020	1	15	6%	0.0007	0.0093	0.0040	1.06	0.0010	0.0063	0.0020
Zinc (ug/L)	42.5	321.0	115.0	89.4	15	15	100%	57.5	197.0	74.5	0.65	19.2	155.0	82.6
Zinc, Dissolved (ug/L)	24.6	156.0	48.7	33.0	15	15	100%	27.6	92.4	37.6	0.77	9.7	69.0	33.4
Insecticides														
Bifenthrin (ug/L)	0.001	0.009	0.006	0.006	0	15	0%	0.002	0.009	0.003	0.49	0.001	0.007	0.004
PAHs														
LPAHs														
2-Methylnaphthalene (ug/L)	0.001	0.018	0.006	0.005	2	15	13%	0.001	0.010	0.005	0.81	0.001	0.008	0.004
Acenaphthene (ug/L)	0.003	0.009	0.006	0.007	0	15	0%	0.003	0.009	0.002	0.33	0.001	0.007	0.005
Acenaphthylene (ug/L)	0.000	0.015	0.006	0.004	3	15	20%	0.001	0.012	0.005	0.88	0.001	0.008	0.003
Anthracene (ug/L)	0.002	0.043	0.011	0.005	7	15	46%	0.002	0.021	0.012	1.07	0.003	0.017	0.006
Fluorene (ug/L)	0.000	0.011	0.005	0.004	1	15	6%	0.001	0.009	0.003	0.72	0.001	0.007	0.003
Naphthalene (ug/L)	0.001	0.041	0.014	0.009	3	15	20%	0.004	0.036	0.013	0.93	0.003	0.021	0.008
Phenanthrene (ug/L)	0.000	0.043	0.025	0.026	14	15	93%	0.015	0.040	0.011	0.44	0.003	0.030	0.020
Total LPAHs[1]	0.033	0.114	0.067	0.065	15	15	100%	0.039	0.098	0.024	0.35	0.006	0.079	0.056
HPAHs														
Benzo(a)anthracene (ug/L)	0.001	0.038	0.018	0.018	12	15	80%	0.002	0.033	0.012	0.67	0.003	0.024	0.012
Benzo(a)pyrene (ug/L)	0.000	0.045	0.021	0.025	11	15	73%	0.001	0.042	0.016	0.73	0.004	0.029	0.014
Benzo(b,k)fluoranthenes (ug/L)	0.003	0.094	0.049	0.044	13	15	86%	0.014	0.084	0.027	0.55	0.007	0.062	0.036
Benzo(g,h,i)perylene (ug/L)	0.000	0.048	0.029	0.030	14	15	93%	0.018	0.041	0.012	0.41	0.003	0.035	0.023
Chrysene (ug/L)	0.009	0.055	0.028	0.025	15	15	100%	0.014	0.048	0.014	0.49	0.004	0.035	0.021
Dibenz(a,h)anthracene (ug/L)	0.000	0.010	0.003	0.002	3	15	20%	0.000	0.008	0.003	0.92	0.001	0.005	0.002
Fluoranthene (ug/L)	0.007	0.091	0.049	0.051	14	15	93%	0.025	0.074	0.023	0.46	0.006	0.060	0.039
Indeno(1,2,3-cd)pyrene (ug/L)	0.003	0.035	0.020	0.020	14	15	93%	0.009	0.032	0.009	0.46	0.002	0.024	0.015
Pyrene (ug/L)	0.036	0.128	0.072	0.067	15	15	100%	0.044	0.106	0.026	0.36	0.007	0.085	0.060
Retene (ug/L)	0.002	0.024	0.010	0.010	12	15	80%	0.004	0.015	0.006	0.54	0.001	0.013	0.008
Total HPAHs[2]	0.110	0.530	0.290	0.286	15	15	100%	0.130	0.448	0.127	0.44	0.033	0.352	0.229
TOTAL PAHs[3]	0.168	0.616	0.358	0.338	15	15	100%	0.192	0.518	0.139	0.39	0.036	0.427	0.291
Phthalates														
Butylbenzylphthalate (ug/L)	0.02	0.36	0.17	0.15	0	15	0%	0.05	0.32	0.10	0.61	0.03	0.22	0.12
bis(2-Ethylhexyl) phthalate (ug/L)	0.709	2.790	1.460	1.350	15	15	100%	0.820	2.150	0.574	0.39	0.148	1.760	1.190
Di-n-butylphthalate (ug/L)	0.017	0.354	0.166	0.136	3	15	20%	0.049	0.333	0.110	0.66	0.028	0.221	0.114
Di-n-octyl phthalate (ug/L)	0.076	0.364	0.190	0.183	0	15	0%	0.079	0.317	0.093	0.49	0.024	0.236	0.146
Diethylphthalate (ug/L)	0.029	0.312	0.181	0.198	0	15	0%	0.064	0.282	0.091	0.51	0.024	0.225	0.136
Dimethylphthalate (ug/L)	0.051	0.294	0.178	0.158	0	15	0%	0.066	0.281	0.083	0.47	0.022	0.218	0.138
Total Phthalates[4]	0.71	3.13	1.53	1.40	15	15	100%	0.82	2.37	0.66	0.43	0.17	1.88	1.23
Herbicides														
Dichlobenil (ug/L)	0.002	0.629	0.081	0.017	12	15	80%	0.007	0.230	0.175	2.15	0.045	0.183	0.016
TPH														
NWTPH-Diesel (mg/L)	0.01	0.10	0.05	0.05	0	6	0%	0.02	0.09	0.03	0.60	0.01	0.08	0.03
NWTPH-Heavy Oil (mg/L)	0.42	1.23	0.72	0.70	6	6	100%	0.45	1.02	0.29	0.41	0.12	0.95	0.53
Bacteria														
Coliform, Fecal (CFU/100 mL)	1700	21000	8570	5950	6	6	100%	2250	17500	7490	0.87	3060	14500	3670
E. coli (CFU/100 mL)	1700	21000	6970	4950	6	6	100%	1950	14000	7150	1.03	2920	12800	2950
Enterococci (CFU/100 mL)	2500	37000	9780	4950	6	6	100%	2650	21800	13400	1.37	5480	20900	3420

Table E-10
Summary Statistics for Stormwater at OF237A New Water Years 2002-2024

	Minimum	Maximum	Arithmetic Mean	Median	Detects	Count	Percent Detects	10th Per	90th Per	Standard Deviation	Coefficient of Variation	Standard Error	95% UCL	95% LCL
Conventionals														
Anionic Surfactants (mg/L)	0.003	0.096	0.042	0.040	64	67	95%	0.023	0.069	0.020	0.47	0.002	0.047	0.038
BOD (mg/L)	0.0	9.2	3.2	2.9	51	64	79%	0.8	5.6	1.9	0.60	0.2	3.7	2.7
Chloride (mg/L)	1.79	154	14.20	7.31	64	67	95%	3.55	31.10	20.10	1.42	2.45	19.50	10.30
Conductivity (uS/cm)	7.5	1190	116	91.5	155	155	100%	55.8	177.0	114.0	0.98	9.1	136.0	101.0
Total Hardness (mg CaCO3/L)	14.5	68.8	30.6	28.5	218	218	100%	20.6	42.4	9.9	0.32	0.7	31.9	29.3
Total Suspended Solids (mg/L)	3.5	668.0	49.1	34.3	215	215	100%	16.3	91.3	60.9	1.24	4.2	58.1	41.8
Turbidity (NTU)	6.1	57	20.1	18.0	68	68	100%	11.5	33.3	10.2	0.51	1.2	22.6	17.8
pH (pH Units)	5.3	8.3	6.9	6.9	217	217	100%	6.3	7.4	0.5	0.07	0.0	6.9	6.8
Nutrients														
Nitrate+Nitrite as N (mg/L)	0.161	1.090	0.411	0.388	89	89	100%	0.226	0.665	0.176	0.43	0.019	0.448	0.375
Orthophosphate (mg/L)	0.009	0.069	0.023	0.021	87	87	100%	0.013	0.040	0.012	0.49	0.001	0.026	0.021
Phosphorus, Total (mg/L)	0.041	1.150	0.112	0.086	89	89	100%	0.055	0.181	0.123	1.10	0.013	0.142	0.092
Total Nitrogen (mg/L)	0.18	2.03	0.71	0.64	87	89	97%	0.42	1.05	0.29	0.41	0.03	0.77	0.65
Metals														
Cadmium (ug/L)	0.004	0.615	0.081	0.067	52	99	52%	0.022	0.133	0.076	0.95	0.008	0.097	0.067
Cadmium, Dissolved (ug/L)	6.00E-04	0.098	0.027	0.025	16	99	16%	0.006	0.044	0.018	0.67	0.002	0.030	0.023
Copper (ug/L)	4.09	69.10	10.40	8.09	99	99	100%	5.49	16.30	8.41	0.81	0.845	12.1	8.89
Copper, Dissolved (ug/L)	1.51	12.10	3.31	2.82	99	99	100%	1.94	4.69	1.69	0.51	0.170	3.66	3.01
Lead (ug/L)	1.40	80.60	11.20	8.11	217	218	99%	3.81	23.00	10.50	0.94	0.712	12.70	9.91
Lead, Dissolved (ug/L)	0.003	3.460	0.551	0.318	162	218	74%	0.166	1.250	0.553	1.00	0.037	0.628	0.479
Mercury (ug/L)	3.000E-05	0.098	0.0170	0.0078	70	218	32%	0.0020	0.0430	0.0170	1.01	0.001	0.020	0.015
Mercury, Dissolved (ug/L)	7.000E-05	0.150	0.0150	0.0076	23	217	10%	0.0008	0.0390	0.0180	1.19	0.001	0.017	0.013
Zinc (ug/L)	30.6	361.0	90.1	71.9	218	218	100%	44.4	157.0	56.4	0.63	3.82	98.1	83.0
Zinc, Dissolved (ug/L)	16.9	289.0	45.0	33.8	218	218	100%	22.0	75.5	35.3	0.79	2.39	50.1	40.6
Insecticides														
2,4-D (ug/L)	0.001	2.500	0.296	0.115	42	50	84%	0.038	0.676	0.450	1.52	0.064	0.432	0.185
Bifenthrin (ug/L)	8.0E-05	0.05	0.01	0.01	8	40	20%	0.00	0.02	0.01	1.09	0.001	0.012	0.006
Carbaryl (ug/L)	0.007	0.490	0.170	0.118	0	31	0%	0.018	0.433	0.163	0.96	0.029	0.228	0.114
Chlorpyrifos (ug/L)	0.0001	0.365	0.024	0.009	2	71	2%	0.001	0.053	0.047	1.93	0.006	0.036	0.016
PAHs														
LPAHs														
2-Methylnaphthalene (ug/L)	0.0002	0.104	0.015	0.011	149	217	68%	0.002	0.035	0.015	1.00	0.001	0.017	0.013
Acenaphthene (ug/L)	0.0001	0.532	0.009	0.004	42	217	19%	0.001	0.012	0.037	4.09	0.003	0.015	0.006
Acenaphthylene (ug/L)	6.00E-05	0.061	0.005	0.004	37	217	17%	0.001	0.010	0.006	1.07	0.000	0.006	0.005
Anthracene (ug/L)	2.00E-05	0.225	0.012	0.005	84	217	38%	0.001	0.022	0.024	2.01	0.002	0.015	0.009
Fluorene (ug/L)	7.00E-05	0.110	0.009	0.006	95	217	43%	0.001	0.020	0.011	1.19	0.001	0.011	0.008
Naphthalene (ug/L)	0.0003	0.150	0.024	0.019	146	216	67%	0.005	0.048	0.021	0.86	0.001	0.027	0.022
Phenanthrene (ug/L)	0.0006	0.893	0.079	0.037	205	217	94%	0.011	0.186	0.122	1.54	0.008	0.096	0.064
Total LPAHs[1]	0.003	1.090	0.134	0.081	216	216	100%	0.024	0.269	0.166	1.24	0.011	0.157	0.113
HPAHs														
Benzo(a)anthracene (ug/L)	9.00E-05	0.902	0.061	0.022	184	217	84%	0.003	0.138	0.113	1.85	0.008	0.076	0.047
Benzo(a)pyrene (ug/L)	0.0001	0.865	0.068	0.029	169	217	77%	0.002	0.168	0.111	1.62	0.008	0.084	0.055
Benzo(b,k)fluoranthenes (ug/L)	0.001	2.430	0.212	0.088	200	217	92%	0.014	0.472	0.329	1.55	0.022	0.259	0.172
Benzo(g,h,i)perylene (ug/L)	0.0001	0.794	0.077	0.041	202	217	93%	0.008	0.184	0.102	1.32	0.007	0.092	0.065
Chrysene (ug/L)	2.00E-05	1.490	0.128	0.052	207	217	95%	0.010	0.333	0.192	1.50	0.013	0.155	0.104
Dibenz(a,h)anthracene (ug/L)	2.00E-05	0.305	0.017	0.006	108	217	49%	0.001	0.040	0.031	1.82	0.002	0.021	0.013
Fluoranthene (ug/L)	0.008	2.640	0.208	0.082	216	217	99%	0.021	0.541	0.349	1.67	0.024	0.257	0.165
Indeno(1,2,3-cd)pyrene (ug/L)	0.0001	0.680	0.068	0.034	192	217	88%	0.005	0.173	0.096	1.42	0.007	0.082	0.056
Pyrene (ug/L)	0.001	2.930	0.191	0.080	214	217	98%	0.022	0.488	0.314	1.65	0.021	0.236	0.152
Retene (ug/L)	0.004	0.222	0.021	0.012	37	39	94%	0.006	0.034	0.035	1.67	0.006	0.033	0.013
Total HPAHs[2]	0.029	12.300	1.030	0.450	217	217	100%	0.081	2.520	1.600	1.55	0.108	1.250	0.835
TOTAL PAHs[3]	0.033	13.300	1.160	0.517	217	217	100%	0.117	2.820	1.750	1.50	0.118	1.410	0.945
Phthalates														
Butylbenzylphthalate (ug/L)	0.0003	5.57	0.403	0.298	39	217	17%	0.066	0.848	0.510	1.27	0.035	0.476	0.341
bis(2-Ethylhexyl) phthalate (ug/L)	0.002	13.7	1.960	1.390	180	216	83%	0.572	4.300	1.740	0.89	0.119	2.200	1.730
Di-n-butylphthalate (ug/L)	0.0001	5	0.369	0.305	90	217	41%	0.058	0.691	0.395	1.07	0.027	0.426	0.322
Di-n-octyl phthalate (ug/L)	0.003	2.50	0.337	0.251	48	215	22%	0.047	0.755	0.321	0.95	0.022	0.382	0.297
Diethylphthalate (ug/L)	0.0003	230	1.770	0.265	68	217	31%	0.075	1.030	15.700	8.91	1.070	4.110	0.494
Dimethylphthalate (ug/L)	0.001	0.145	0.067	0.061	11	216	5%	0.012	0.129	0.043	0.65	0.003	0.072	0.061
***Total Phthalates[4]**	0.00	230	3.85	1.86	194	217	89%	0.00	5.66	15.80	4.11	1.07	6.29	2.46
Herbicides														
Dichlobenil (ug/L)	0.0003	1.080	0.063	0.044	83	109	76%	0.011	0.113	0.109	1.72	0.010	0.087	0.047
TPH														
NWTPH-Diesel (mg/L)	0.002	0.32	0.05	0.04	5	60	8%	0.01	0.09	0.05	1.01	0.01	0.06	0.04
NWTPH-Gasoline (ug/L)	0.675	49.7	20.1	20.0	0	46	0%	3.2	41.7	15.8	0.79	2.3	24.6	15.6
NWTPH-Heavy Oil (mg/L)	0.003	2.10	0.56	0.54	55	60	91%	0.25	0.89	0.33	0.58	0.04	0.65	0.49
Bacteria														
Coliform, Fecal (CFU/100 mL)	130	80000	6830	2200	58	58	100%	500	14600	14800	2.17	1950	11100	3610
E. coli (CFU/100 mL)	130	24000	4560	2350	18	18	100%	1040	9800	5840	1.28	1380	7610	2360
Enterococci (CFU/100 mL)	0	110000	16000	4450	17	18	94%	1190	36100	28800	1.80	6790	30900	5480
BTEX														
Benzene (ug/L)	0.001	0.188	0.099	0.105	0	46	0%	0.025	0.165	0.055	0.55	0.008	0.115	0.083
Ethylbenzene (ug/L)	0.004	0.192	0.110	0.117	0	46	0%	0.047	0.176	0.050	0.46	0.007	0.124	0.095
Toluene (ug/L)	0.003	0.800	0.125	0.107	4	46	8%	0.017	0.198	0.124	0.99	0.018	0.165	0.094
m,p-Xylene (ug/L)	0.003	0.387	0.174	0.150	0	46	0%	0.029	0.337	0.119	0.69	0.018	0.208	0.140
o-Xylene (ug/L)	0.008	0.198	0.104	0.108	0	46	0%	0.026	0.172	0.054	0.52	0.008	0.119	0.088

[1] Total LPAHs is the sum of the concentration or non-detected calculated value of the following compounds: Naphthalene, acenaphthene, acenaphthylene, anthracene, fluorene, and phenanthrene.

[2] Total HPAHs is the sum of the concentration of non-detected calculated value of the following compounds: Fluoranthene, pyrene, benzo(a)anthracene, chrysene, benzo(b,k)fluoranthene, benzo(b,k)fluoranthene, benzo(a)pyrene, indeno(1,2,3-c,d)pyrene, dibenz(a,h)anthracene, benzo(g,h,i)perylene.

[3] Total PAHs is the sum of the LPAHs and HPAHs.

[4] Total phthalates is the sum of detected values only.

Table E-10 (Cont'd)
Summary Statistics for Stormwater at OF237A WY2024

	Minimum	Maximum	Arithmetic Mean	Median	Detects	Count	Percent Detects	10th Per	90th Per	Standard Deviation	Coefficient of Variation	Standard Error	95% UCL	95% LCL
Conventionals														
Anionic Surfactants (mg/L)	0.023	0.061	0.036	0.024	3	3	100%	0.024	0.053	0.021	0.59	0.012	0.061	0.023
BOD (mg/L)	1.7	8.1	4.9	5.4	4	5	80%	2.4	7.2	2.4	0.50	1.1	6.7	2.9
Chloride (mg/L)	6.07	25.30	18.00	22.70	2	3	66%	9.39	24.80	10.40	0.58	6.02	25.30	6.07
Conductivity (uS/cm)	58.8	141.0	103.0	103.0	8	8	100%	74.8	140.0	28.4	0.28	10.0	122.0	84.8
Total Hardness (mg CaCO3/L)	19.6	36.6	30.4	30.4	8	8	100%	24.1	36.6	5.7	0.19	2.0	33.8	26.6
Total Suspended Solids (mg/L)	18.6	108.0	58.0	59.2	7	7	100%	19.6	98.5	34.7	0.60	13.1	81.9	34.9
Turbidity (NTU)	9.7	50.0	26.1	18.5	3	3	100%	11.5	43.7	21.2	0.81	12.2	50.0	9.7
pH (pH Units)	6.4	7.3	6.9	7.1	8	8	100%	6.5	7.3	0.4	0.05	0.1	7.2	6.7
Nutrients														
Nitrate+Nitrite as N (mg/L)	0.198	0.702	0.386	0.389	8	8	100%	0.202	0.537	0.161	0.42	0.057	0.496	0.290
Orthophosphate (mg/L)	0.011	0.055	0.022	0.017	8	8	100%	0.014	0.034	0.014	0.63	0.005	0.033	0.015
Phosphorus, Total (mg/L)	0.049	0.261	0.126	0.111	8	8	100%	0.056	0.213	0.075	0.60	0.027	0.176	0.080
Total Nitrogen (mg/L)	0.40	1.22	0.73	0.70	7	8	87%	0.47	0.96	0.25	0.35	0.09	0.90	0.57
Metals														
Cadmium (ug/L)	0.020	0.166	0.076	0.060	3	8	37%	0.026	0.136	0.053	0.69	0.019	0.111	0.044
Cadmium, Dissolved (ug/L)	0.013	0.044	0.030	0.028	0	8	0%	0.015	0.044	0.013	0.43	0.005	0.038	0.022
Copper (ug/L)	4.43	20.10	10.20	9.87	8	8	100%	5.26	15.50	5.19	0.51	1.84	13.70	7.10
Copper, Dissolved (ug/L)	1.65	4.87	3.07	2.85	8	8	100%	1.95	4.80	1.19	0.39	0.42	3.86	2.35
Lead (ug/L)	3.02	18.70	8.16	6.40	8	8	100%	3.26	16.00	5.84	0.72	2.07	12.20	4.74
Lead, Dissolved (ug/L)	0.173	0.810	0.336	0.288	8	8	100%	0.175	0.506	0.208	0.62	0.074	0.489	0.226
Mercury (ug/L)	0.0007	0.0110	0.0040	0.0040	1	8	12%	0.0010	0.0074	0.0030	0.75	0.0010	0.0066	0.0020
Mercury, Dissolved (ug/L)	0.0009	0.0098	0.0063	0.0073	0	8	0%	0.0020	0.0098	0.0030	0.54	0.0010	0.0084	0.0040
Zinc (ug/L)	33.5	122.0	67.6	68.2	8	8	100%	40.0	94.4	27.4	0.41	9.7	86.6	51.3
Zinc, Dissolved (ug/L)	19.6	44.8	27.4	24.8	8	8	100%	20.1	38.6	8.7	0.32	3.1	33.6	22.5
Insecticides														
Bifenthrin (ug/L)	0.000	0.011	0.005	0.004	1	8	12%	0.001	0.010	0.004	0.91	0.001	0.007	0.002
PAHs														
LPAHs														
2-Methylnaphthalene (ug/L)	0.001	0.057	0.016	0.014	5	8	62%	0.002	0.029	0.018	1.11	0.006	0.029	0.007
Acenaphthene (ug/L)	0.001	0.010	0.006	0.006	0	8	0%	0.002	0.009	0.003	0.53	0.001	0.008	0.004
Acenaphthylene (ug/L)	0.001	0.009	0.006	0.006	0	8	0%	0.002	0.009	0.003	0.50	0.001	0.008	0.004
Anthracene (ug/L)	0.000	0.041	0.007	0.002	2	8	25%	0.000	0.019	0.014	1.88	0.005	0.018	0.001
Fluorene (ug/L)	0.003	0.019	0.008	0.008	2	8	25%	0.004	0.013	0.005	0.57	0.002	0.012	0.006
Naphthalene (ug/L)	0.009	0.078	0.027	0.021	5	8	62%	0.011	0.045	0.022	0.83	0.008	0.042	0.016
Phenanthrene (ug/L)	0.014	0.077	0.034	0.030	8	8	100%	0.018	0.050	0.019	0.57	0.007	0.048	0.023
Total LPAHs[1]	0.038	0.129	0.083	0.079	8	8	100%	0.052	0.124	0.033	0.40	0.012	0.105	0.062
HPAHs														
Benzo(a)anthracene (ug/L)	0.000	0.074	0.023	0.017	6	8	75%	0.003	0.044	0.023	0.99	0.008	0.040	0.011
Benzo(a)pyrene (ug/L)	0.002	0.128	0.042	0.031	6	8	75%	0.002	0.086	0.043	1.02	0.015	0.071	0.017
Benzo(b,k)fluoranthenes (ug/L)	0.028	0.282	0.110	0.091	8	8	100%	0.048	0.184	0.079	0.72	0.028	0.168	0.066
Benzo(g,h,i)perylene (ug/L)	0.017	0.128	0.055	0.050	8	8	100%	0.022	0.090	0.035	0.64	0.012	0.080	0.035
Chrysene (ug/L)	0.013	0.125	0.050	0.040	8	8	100%	0.021	0.083	0.036	0.71	0.013	0.075	0.030
Dibenz(a,h)anthracene (ug/L)	0.001	0.026	0.010	0.009	4	8	50%	0.003	0.017	0.008	0.77	0.003	0.016	0.006
Fluoranthene (ug/L)	0.021	0.204	0.078	0.069	8	8	100%	0.034	0.123	0.056	0.72	0.020	0.118	0.048
Indeno(1,2,3-cd)pyrene (ug/L)	0.013	0.114	0.051	0.048	8	8	100%	0.020	0.084	0.032	0.63	0.011	0.074	0.032
Pyrene (ug/L)	0.030	0.193	0.078	0.065	8	8	100%	0.039	0.124	0.050	0.64	0.018	0.115	0.051
Retene (ug/L)	0.006	0.021	0.010	0.008	8	8	100%	0.007	0.015	0.005	0.49	0.002	0.014	0.007
Total HPAHs[2]	0.143	1.270	0.498	0.398	8	8	100%	0.202	0.818	0.355	0.71	0.126	0.748	0.300
TOTAL PAHs[3]	0.266	1.400	0.581	0.459	8	8	100%	0.270	0.926	0.372	0.64	0.132	0.853	0.380
Phthalates														
Butylbenzylphthalate (ug/L)	0.02	0.33	0.15	0.10	0	8	0%	0.05	0.32	0.11	0.77	0.04	0.22	0.08
bis(2-Ethylhexyl) phthalate (ug/L)	0.526	1.340	1.010	1.100	8	8	100%	0.710	1.250	0.266	0.26	0.094	1.170	0.832
Di-n-butylphthalate (ug/L)	0.017	0.345	0.188	0.206	3	8	37%	0.022	0.337	0.138	0.73	0.049	0.275	0.096
Di-n-octyl phthalate (ug/L)	0.030	0.352	0.154	0.116	0	8	0%	0.044	0.306	0.116	0.76	0.041	0.232	0.082
Diethylphthalate (ug/L)	0.006	0.315	0.171	0.171	0	8	0%	0.029	0.311	0.129	0.75	0.045	0.252	0.089
Dimethylphthalate (ug/L)	0.008	0.132	0.066	0.049	0	8	0%	0.018	0.125	0.050	0.76	0.018	0.099	0.034
Total Phthalates[4]	0.53	1.65	1.14	1.19	8	8	100%	0.71	1.55	0.36	0.32	0.13	1.37	0.90
Herbicides														
Dichlobenil (ug/L)	0.012	0.050	0.027	0.021	8	8	100%	0.015	0.048	0.014	0.52	0.005	0.037	0.019
TPH														
NWTPH-Diesel (mg/L)	0.01	0.15	0.07	0.05	2	6	33%	0.02	0.14	0.06	0.85	0.02	0.11	0.03
NWTPH-Heavy Oil (mg/L)	0.27	0.77	0.53	0.49	6	6	100%	0.35	0.76	0.20	0.37	0.08	0.67	0.39
Bacteria														
Coliform, Fecal (CFU/100 mL)	130	13000	4590	2350	6	6	100%	915	10500	4910	1.07	2010	8500	1490
E. coli (CFU/100 mL)	130	8000	2570	2000	6	6	100%	515	5200	2800	1.09	1140	4830	998
Enterococci (CFU/100 mL)	1700	19000	6700	3550	6	6	100%	2450	14100	6560	0.98	2680	12100	2820

Table E-11
Summary Statistics for Stormwater at OF237B Water Years 2002-2024

	Minimum	Maximum	Arithmetic Mean	Median	Detects	Count	Percent Detects	10th Per	90th Per	Standard Deviation	Coefficient of Variation	Standard Error	95% UCL	95% LCL
Conventionals														
Anionic Surfactants (mg/L)	0.001	0.357	0.051	0.042	89	98	90%	0.019	0.073	0.047	0.94	0.005	0.061	0.042
BOD (mg/L)	0.061	9.8	3.1	2.7	66	83	79%	1.1	5.4	1.9	0.62	0.2	3.5	2.7
Chloride (mg/L)	0.003	68.60	5.62	4.42	88	95	92%	0.01	9.07	7.54	1.34	0.77	7.42	4.40
Conductivity (uS/cm)	39.5	708	134	125	167	167	100%	84.5	180.0	64.0	0.48	5.0	145.0	125.0
Total Hardness (mg CaCO3/L)	20.7	1220	54.8	48.6	233	233	100%	33.3	69.8	77.9	1.42	5.1	65.9	48.4
Total Suspended Solids (mg/L)	3.6	278.0	47.1	34.6	221	221	100%	13.8	96.1	42.3	0.90	2.8	53.0	41.9
Turbidity (NTU)	6.5	50	19.1	18.1	70	70	100%	10.5	29.1	9.0	0.47	1.1	21.2	17.0
pH (pH Units)	5.7	8.8	6.9	7.0	234	234	100%	6.4	7.3	0.4	0.06	0.03	7.0	6.9
Nutrients														
Nitrate+Nitrite as N (mg/L)	0.190	2.720	1.210	1.170	127	127	100%	0.741	1.770	0.416	0.34	0.037	1.290	1.140
Orthophosphate (mg/L)	0.000	0.128	0.022	0.021	125	125	100%	0.002	0.038	0.016	0.72	0.001	0.025	0.020
Phosphorus, Total (mg/L)	0.017	0.564	0.102	0.088	125	126	99%	0.052	0.172	0.063	0.61	0.006	0.114	0.092
Total Nitrogen (mg/L)	0.09	3.19	1.36	1.31	126	127	99%	0.73	2.02	0.54	0.40	0.048	1.45	1.27
Metals														
Cadmium (ug/L)	0.001	0.455	0.081	0.067	74	144	51%	0.012	0.164	0.073	0.91	0.006	0.093	0.069
Cadmium, Dissolved (ug/L)	0.0002	0.106	0.032	0.029	44	145	30%	0.006	0.062	0.022	0.68	0.002	0.036	0.028
Copper (ug/L)	2.93	66.30	8.16	6.35	142	142	100%	4.08	12.70	6.47	0.79	0.543	9.32	7.23
Copper, Dissolved (ug/L)	0.15	8.06	2.57	2.18	138	139	99%	1.61	3.83	1.18	0.46	0.100	2.78	2.39
Lead (ug/L)	1.31	64.20	9.56	6.38	230	232	99%	2.34	22.50	9.51	1.00	0.625	10.80	8.38
Lead, Dissolved (ug/L)	0.0003	11.400	0.511	0.240	163	234	69%	0.152	1.070	0.976	1.91	0.064	0.648	0.402
Mercury (ug/L)	7.000E-05	0.2160	0.0180	0.0080	65	234	27%	0.0020	0.0420	0.0280	1.49	0.002	0.022	0.015
Mercury, Dissolved (ug/L)	2.000E-05	0.0750	0.0140	0.0076	19	234	8%	0.0010	0.0400	0.0150	1.06	0.001	0.016	0.012
Zinc (ug/L)	15.0	285.0	59.5	44.6	233	233	100%	24.9	113.0	43.4	0.73	2.8	65.1	54.1
Zinc, Dissolved (ug/L)	6.8	260.0	24.1	18.6	233	234	99%	12.2	38.8	22.7	0.94	1.5	27.3	21.5
Insecticides														
2,4-D (ug/L)	0.002	2.100	0.337	0.150	45	72	62%	0.028	0.805	0.463	1.37	0.055	0.449	0.238
Bifenthrin (ug/L)	1.0E-05	0.04	0.01	0.01	3	47	6%	0.00	0.01	0.01	1.05	0.00	0.01	0.00
Carbaryl (ug/L)	0.0003	0.412	0.122	0.051	0	26	0%	0.006	0.325	0.128	1.05	0.025	0.172	0.077
Chlorpyrifos (ug/L)	2.00E-05	0.043	0.013	0.010	1	94	1%	0.003	0.031	0.011	0.83	0.001	0.015	0.011
PAHs														
LPAHs														
2-Methylnaphthalene (ug/L)	3.00E-05	0.250	0.012	0.008	128	234	54%	0.002	0.022	0.021	1.73	0.001	0.015	0.010
Acenaphthene (ug/L)	2.00E-05	0.063	0.006	0.004	37	234	15%	0.001	0.011	0.006	1.04	0.000	0.006	0.005
Acenaphthylene (ug/L)	7.00E-05	0.064	0.005	0.004	33	234	14%	0.001	0.009	0.005	1.07	0.000	0.006	0.004
Anthracene (ug/L)	2.00E-05	0.097	0.007	0.004	50	234	21%	0.001	0.014	0.010	1.33	0.001	0.009	0.006
Fluorene (ug/L)	3.00E-05	0.078	0.007	0.005	77	234	32%	0.001	0.014	0.009	1.17	0.001	0.009	0.006
Naphthalene (ug/L)	1.00E-05	0.130	0.017	0.014	142	232	61%	0.003	0.032	0.015	0.86	0.001	0.019	0.015
Phenanthrene (ug/L)	0.000	0.838	0.043	0.021	206	234	88%	0.008	0.110	0.072	1.68	0.005	0.053	0.035
Total LPAHs[1]	0.006	1.130	0.079	0.055	232	232	100%	0.020	0.177	0.098	1.23	0.006	0.093	0.068
HPAHs														
Benzo(a)anthracene (ug/L)	5.00E-06	0.685	0.028	0.010	167	234	71%	0.001	0.072	0.058	2.07	0.004	0.036	0.021
Benzo(a)pyrene (ug/L)	2.00E-04	0.690	0.033	0.013	167	234	71%	0.002	0.089	0.063	1.93	0.004	0.042	0.026
Benzo(b,k)fluoranthenes (ug/L)	8.00E-05	1.760	0.091	0.034	189	234	80%	0.006	0.230	0.168	1.86	0.011	0.114	0.071
Benzo(g,h,i)perylene (ug/L)	8.00E-05	0.614	0.040	0.018	201	234	85%	0.004	0.102	0.063	1.55	0.004	0.049	0.033
Chrysene (ug/L)	3.00E-05	0.965	0.059	0.019	194	234	82%	0.003	0.166	0.103	1.76	0.007	0.073	0.046
Dibenz(a,h)anthracene (ug/L)	5.00E-06	0.143	0.008	0.004	76	234	32%	0.001	0.020	0.013	1.55	0.001	0.010	0.007
Fluoranthene (ug/L)	0.0001	1.830	0.089	0.034	229	234	97%	0.010	0.217	0.167	1.87	0.011	0.113	0.070
Indeno(1,2,3-cd)pyrene (ug/L)	6.00E-05	0.546	0.029	0.014	178	234	76%	0.002	0.069	0.049	1.72	0.003	0.036	0.023
Pyrene (ug/L)	0.001	1.490	0.093	0.039	224	234	95%	0.013	0.271	0.150	1.62	0.010	0.114	0.075
Retene (ug/L)	2.00E-04	0.029	0.008	0.007	30	45	66%	0.002	0.013	0.006	0.78	0.001	0.009	0.006
Total HPAHs[2]	0.019	8.730	0.468	0.185	233	233	100%	0.040	1.280	0.830	1.77	0.054	0.585	0.372
TOTAL PAHs[3]	0.028	9.870	0.547	0.251	233	233	100%	0.074	1.480	0.922	1.69	0.060	0.675	0.441
Phthalates														
Butylbenzylphthalate (ug/L)	0.0003	2.80	0.33	0.24	28	234	11%	0.07	0.66	0.34	1.03	0.022	0.371	0.286
bis(2-Ethylhexyl) phthalate (ug/L)	0.012	12.00	1.830	1.070	196	233	84%	0.434	4.500	2.000	1.10	0.131	2.100	1.580
Di-n-butylphthalate (ug/L)	0.0002	1.00	0.318	0.280	84	234	35%	0.063	0.688	0.232	0.73	0.015	0.348	0.289
Di-n-octyl phthalate (ug/L)	0.006	2.300	0.297	0.205	42	233	18%	0.034	0.778	0.342	1.15	0.022	0.342	0.255
Diethylphthalate (ug/L)	0.002	52.000	0.894	0.217	57	234	24%	0.044	0.984	4.510	5.05	0.295	1.540	0.420
Dimethylphthalate (ug/L)	0.0002	0.190	0.080	0.073	6	233	2%	0.014	0.157	0.054	0.67	0.004	0.087	0.073
***Total Phthalates[4]**	0.00	66.20	2.72	1.32	212	232	91%	0.24	4.99	5.60	2.06	0.37	3.53	2.10
Herbicides														
Dichlobenil (ug/L)	0.002	1.380	0.064	0.038	101	137	73%	0.012	0.114	0.128	2.00	0.011	0.090	0.047
TPH														
NWTPH-Diesel (mg/L)	0.001	0.34	0.06	0.05	10	82	12%	0.01	0.10	0.05	0.91	0.01	0.07	0.05
NWTPH-Gasoline (ug/L)	0.055	395.0	24.8	16.0	14	69	20%	1.5	47.5	48.2	1.94	5.8	37.7	16.5
NWTPH-Heavy Oil (mg/L)	0.007	1.30	0.48	0.42	74	82	90%	0.13	0.89	0.28	0.59	0.03	0.54	0.42
Bacteria														
Coliform, Fecal (CFU/100 mL)	130	280000	8360	2400	77	77	100%	300	16000	31800	3.81	3620	16200	3920
E. coli (CFU/100 mL)	790	140000	11700	3000	17	17	100%	800	11800	33200	2.84	8060	28500	2490
Enterococci (CFU/100 mL)	0.609	220000	23400	5800	16	18	88%	770	56200	52300	2.24	12300	50300	5930
BTEX														
Benzene (ug/L)	0.003	0.3	0.099	0.104	1	47	2%	0.0	0.167	0.061	0.62	0.009	0.117	0.082
Ethylbenzene (ug/L)	0.002	0.8	0.117	0.115	1	47	2%	0.0	0.181	0.119	1.02	0.017	0.155	0.088
Toluene (ug/L)	0.014	4.0	0.195	0.101	2	47	4%	0.0	0.194	0.570	2.93	0.083	0.372	0.099
m,p-Xylene (ug/L)	0.020	3.5	0.280	0.221	1	47	2%	0.1	0.360	0.492	1.76	0.072	0.439	0.186
o-Xylene (ug/L)	0.002	1.6	0.135	0.112	1	47	2%	0.0	0.171	0.225	1.66	0.033	0.208	0.092

[1] *Total LPAHs is the sum of the concentration or non-detected calculated value of the following compounds: Naphthalene, acenaphthene, acenaphthylene, anthracene, fluorene, and phenanthrene.*

[2] *Total HPAHs is the sum of the concentration of non-detected calculated value of the following compounds: Fluoranthene, pyrene, benzo(a)anthracene, chrysene, benzo(b,k)fluoranthene, benzo(b,k)fluoranthene, benzo(a)pyrene, indeno(1,2,3-c,d)pyrene, dibenz(a,h)anthracene, benzo(g,h,i)perylene.*

[3] *Total PAHs is the sum of the LPAHs and HPAHs.*

[4] *Total phthalates is the sum of detected values only.*

Table E-11 (Cont'd)
Summary Statistics for Stormwater at OF237B WY2024

	Minimum	Maximum	Arithmetic Mean	Median	Detects	Count	Percent Detects	10th Per	90th Per	Standard Deviation	Coefficient of Variation	Standard Error	95% UCL	95% LCL
Conventionals														
Anionic Surfactants (mg/L)	0.022	0.104	0.046	0.043	9	9	100%	0.022	0.073	0.026	0.57	0.009	0.063	0.031
BOD (mg/L)	0.9	8.4	3.2	2.9	7	9	77%	1.4	4.5	2.1	0.68	0.7	4.6	2.1
Chloride (mg/L)	0.53	7.51	3.20	2.51	3	9	33%	0.59	6.29	2.63	0.82	0.88	4.87	1.66
Conductivity (uS/cm)	108.0	218.0	143.0	140.0	14	14	100%	110.0	176.0	31.5	0.22	8.4	161.0	128.0
Total Hardness (mg CaCO3/L)	43.8	82.1	57.6	55.0	14	14	100%	46.3	72.6	11.3	0.20	3.0	63.6	52.2
Total Suspended Solids (mg/L)	8.6	60.6	28.1	21.6	13	13	100%	14.9	49.7	15.9	0.57	4.4	36.9	20.5
Turbidity (NTU)	6.5	27.1	15.5	15.1	9	9	100%	8.2	21.7	6.5	0.42	2.2	19.6	11.5
pH (pH Units)	6.4	7.5	6.8	6.8	14	14	100%	6.5	7.2	0.3	0.04	0.1	7.0	6.7
Nutrients														
Nitrate+Nitrite as N (mg/L)	0.961	2.400	1.370	1.300	13	13	100%	1.040	1.810	0.389	0.28	0.108	1.600	1.190
Orthophosphate (mg/L)	0.016	0.059	0.028	0.025	13	13	100%	0.018	0.039	0.012	0.41	0.003	0.035	0.023
Phosphorus, Total (mg/L)	0.045	0.195	0.085	0.078	13	13	100%	0.049	0.106	0.039	0.46	0.011	0.107	0.067
Total Nitrogen (mg/L)	1.29	2.72	1.70	1.66	13	13	100%	1.34	2.09	0.40	0.24	0.11	1.92	1.51
Metals														
Cadmium (ug/L)	0.009	0.112	0.050	0.042	1	14	7%	0.013	0.094	0.035	0.70	0.009	0.068	0.033
Cadmium, Dissolved (ug/L)	0.003	0.062	0.032	0.031	1	14	7%	0.009	0.053	0.016	0.51	0.004	0.041	0.024
Copper (ug/L)	3.87	66.30	10.60	5.71	14	14	100%	4.44	11.50	16.20	1.52	4.33	19.70	5.44
Copper, Dissolved (ug/L)	1.43	4.52	2.43	2.12	14	14	100%	1.67	3.94	0.95	0.39	0.26	2.93	1.99
Lead (ug/L)	1.31	8.62	3.62	3.06	14	14	100%	2.03	6.34	2.06	0.57	0.55	4.76	2.69
Lead, Dissolved (ug/L)	0.147	0.239	0.187	0.171	14	14	100%	0.154	0.233	0.033	0.18	0.009	0.204	0.171
Mercury (ug/L)	0.0002	0.0079	0.0040	0.0040	0	14	0%	0.0003	0.0078	0.0030	0.81	0.0008	0.0054	0.0020
Mercury, Dissolved (ug/L)	0.0020	0.0110	0.0069	0.0071	0	14	0%	0.0030	0.0096	0.0030	0.37	0.0007	0.0082	0.0056
Zinc (ug/L)	23.7	82.6	40.4	33.4	14	14	100%	25.3	65.2	17.7	0.44	4.7	50.1	32.4
Zinc, Dissolved (ug/L)	9.5	57.9	18.9	16.3	14	14	100%	11.2	22.8	11.8	0.63	3.2	25.8	14.4
Insecticides														
Bifenthrin (ug/L)	0.000	0.008	0.004	0.005	0	14	0%	0.001	0.007	0.003	0.58	0.001	0.006	0.003
PAHs														
LPAHs														
2-Methylnaphthalene (ug/L)	0.001	0.122	0.021	0.009	5	14	35%	0.002	0.052	0.033	1.54	0.009	0.040	0.008
Acenaphthene (ug/L)	0.000	0.010	0.005	0.005	0	14	0%	0.002	0.009	0.003	0.62	0.001	0.006	0.003
Acenaphthylene (ug/L)	0.001	0.011	0.006	0.006	2	14	14%	0.001	0.010	0.003	0.59	0.001	0.007	0.004
Anthracene (ug/L)	0.000	0.037	0.006	0.004	2	14	14%	0.000	0.014	0.010	1.69	0.003	0.012	0.002
Fluorene (ug/L)	0.001	0.013	0.007	0.007	4	14	28%	0.001	0.013	0.004	0.60	0.001	0.009	0.005
Naphthalene (ug/L)	0.001	0.080	0.023	0.020	7	14	50%	0.002	0.038	0.021	0.90	0.006	0.034	0.013
Phenanthrene (ug/L)	0.000	0.035	0.017	0.018	12	14	85%	0.005	0.027	0.010	0.58	0.003	0.022	0.012
Total LPAHs[1]	0.029	0.128	0.064	0.057	14	14	100%	0.035	0.111	0.031	0.49	0.008	0.080	0.049
HPAHs														
Benzo(a)anthracene (ug/L)	0.001	0.029	0.009	0.009	9	14	64%	0.002	0.014	0.007	0.76	0.002	0.013	0.006
Benzo(a)pyrene (ug/L)	0.001	0.029	0.011	0.012	9	14	64%	0.002	0.021	0.009	0.76	0.002	0.016	0.007
Benzo(b,k)fluoranthenes (ug/L)	0.001	0.047	0.027	0.026	12	14	85%	0.012	0.044	0.014	0.51	0.004	0.034	0.020
Benzo(g,h,i)perylene (ug/L)	0.003	0.026	0.016	0.014	12	14	85%	0.006	0.025	0.008	0.48	0.002	0.020	0.012
Chrysene (ug/L)	0.002	0.022	0.012	0.013	11	14	78%	0.007	0.020	0.006	0.45	0.002	0.015	0.010
Dibenz(a,h)anthracene (ug/L)	0.000	0.008	0.003	0.004	1	14	7%	0.000	0.005	0.002	0.74	0.001	0.004	0.002
Fluoranthene (ug/L)	0.001	0.042	0.026	0.025	13	14	92%	0.015	0.036	0.011	0.43	0.003	0.031	0.020
Indeno(1,2,3-cd)pyrene (ug/L)	0.001	0.024	0.013	0.013	12	14	85%	0.005	0.021	0.006	0.49	0.002	0.016	0.010
Pyrene (ug/L)	0.011	0.051	0.033	0.033	14	14	100%	0.023	0.048	0.011	0.32	0.003	0.038	0.028
Retene (ug/L)	0.000	0.015	0.006	0.006	9	14	64%	0.001	0.012	0.004	0.70	0.001	0.008	0.004
Total HPAHs[2]	0.036	0.256	0.151	0.145	14	14	100%	0.091	0.237	0.061	0.40	0.016	0.182	0.121
TOTAL PAHs[3]	0.093	0.352	0.215	0.201	14	14	100%	0.131	0.321	0.076	0.35	0.020	0.254	0.177
Phthalates														
Butylbenzylphthalate (ug/L)	0.06	0.40	0.27	0.29	0	14	0%	0.12	0.36	0.11	0.40	0.03	0.32	0.21
bis(2-Ethylhexyl) phthalate (ug/L)	0.069	1.100	0.658	0.638	13	14	92%	0.419	1.020	0.279	0.42	0.075	0.798	0.513
Di-n-butylphthalate (ug/L)	0.039	0.350	0.155	0.143	2	14	14%	0.058	0.294	0.098	0.63	0.026	0.206	0.109
Di-n-octyl phthalate (ug/L)	0.030	0.268	0.137	0.136	0	14	0%	0.037	0.249	0.081	0.59	0.022	0.178	0.097
Diethylphthalate (ug/L)	0.005	0.325	0.169	0.164	0	14	0%	0.077	0.275	0.087	0.52	0.023	0.214	0.125
Dimethylphthalate (ug/L)	0.021	0.169	0.078	0.069	0	14	0%	0.023	0.150	0.048	0.62	0.013	0.103	0.054
Total Phthalates[4]	0.41	1.42	0.75	0.71	13	13	100%	0.46	1.06	0.29	0.38	0.08	0.91	0.62
Herbicides														
Dichlobenil (ug/L)	0.011	0.065	0.031	0.029	14	14	100%	0.014	0.045	0.016	0.51	0.004	0.039	0.023
TPH														
NWTPH-Diesel (mg/L)	0.01	0.15	0.07	0.06	1	6	16%	0.01	0.13	0.06	0.87	0.02	0.11	0.03
NWTPH-Heavy Oil (mg/L)	0.20	0.72	0.41	0.36	6	6	100%	0.23	0.64	0.20	0.48	0.08	0.55	0.27
Bacteria														
Coliform, Fecal (CFU/100 mL)	1300	5000	2950	2350	6	6	100%	1500	5000	1690	0.57	689	4120	1780
E. coli (CFU/100 mL)	800	5000	2320	2150	6	6	100%	800	4000	1660	0.72	677	3630	1250
Enterococci (CFU/100 mL)	1100	52000	11600	4450	6	6	100%	1150	29000	19900	1.73	8130	28100	2250

Table E-12
Summary Statistics for Stormwater at OF243 Water Years 2002-2024

	Minimum	Maximum	Arithmetic Mean	Median	Detects	Count	Percent Detects	10th Per	90th Per	Standard Deviation	Coefficient of Variation	Standard Error	95% UCL	95% LCL
Conventionals														
Anionic Surfactants (mg/L)	0.0120	0.158	0.048	0.043	58	59	98%	0.025	0.086	0.027	0.55	0.003	0.055	0.042
BOD (mg/L)	0.1	8.5	2.9	2.4	43	59	72%	0.5	4.8	2.0	0.68	0.3	3.4	2.4
Chloride (mg/L)	261	25400	1810	1140	60	60	100%	624	2560	3200	1.77	413	2730	1260
Conductivity (uS/cm)	942	13300	4990	4200	105	105	100%	2540	8300	2530	0.51	247	5480	4520
Total Hardness (mg CaCO3/L)	59.3	3150	507	417	151	151	100%	222	855	347	0.68	28.2	566	456
Total Suspended Solids (mg/L)	4.4	300.0	61.5	41.0	148	148	100%	14.8	140.0	57.2	0.93	4.7	70.9	52.7
Turbidity (NTU)	0.2	202	47.6	33.3	59	59	100%	15.7	107.0	42.1	0.88	5.5	59.1	37.6
pH (pH Units)	6.1	8	7.0	7.1	151	151	100%	6.7	7.3	0.3	0.04	0.02	7.1	7.0
Nutrients														
Nitrate+Nitrite as N (mg/L)	0.089	0.799	0.252	0.222	67	67	100%	0.131	0.426	0.129	0.52	0.016	0.283	0.223
Orthophosphate (mg/L)	0.009	0.138	0.035	0.032	66	67	98%	0.017	0.049	0.020	0.57	0.002	0.040	0.031
Phosphorus, Total (mg/L)	0.043	3.680	0.427	0.213	67	67	100%	0.121	0.879	0.571	1.34	0.070	0.578	0.307
Total Nitrogen (mg/L)	0.26	2.11	0.74	0.73	67	67	100%	0.42	1.03	0.30	0.40	0.04	0.82	0.67
Metals														
Cadmium (ug/L)	0.005	1.250	0.235	0.188	61	72	84%	0.079	0.432	0.185	0.79	0.022	0.279	0.196
Cadmium, Dissolved (ug/L)	0.004	0.173	0.083	0.083	57	72	79%	0.033	0.137	0.038	0.46	0.004	0.092	0.074
Copper (ug/L)	3.22	110.00	21.00	17.20	72	72	100%	9.92	36.10	15.40	0.74	1.82	24.90	17.90
Copper, Dissolved (ug/L)	0.95	9.19	4.07	3.85	72	72	100%	2.06	6.26	1.76	0.43	0.21	4.48	3.67
Lead (ug/L)	0.12	379	31.90	15.80	151	151	100%	4.26	66.40	49.50	1.55	4.03	40.40	24.80
Lead, Dissolved (ug/L)	0.001	145.0	2.450	0.349	116	151	76%	0.017	3.600	12.200	4.98	0.992	4.680	1.090
Mercury (ug/L)	0.0002	0.1880	0.0230	0.0100	57	151	37%	0.0020	0.0520	0.0320	1.35	0.0030	0.0290	0.0190
Mercury, Dissolved (ug/L)	0.0001	0.5520	0.0170	0.0074	5	151	3%	0.0005	0.0410	0.0460	2.66	0.0040	0.0260	0.0120
Zinc (ug/L)	12.3	1170	89.1	64.9	151	151	100%	37.9	134.0	104.0	1.17	8.5	108.0	75.4
Zinc, Dissolved (ug/L)	5.6	910	33.3	22.8	151	151	100%	13.5	45.7	73.9	2.22	6.0	46.6	25.3
Insecticides														
2,4-D (ug/L)	0.001	0.190	0.047	0.038	19	33	57%	0.004	0.104	0.044	0.93	0.008	0.063	0.033
Bifenthrin (ug/L)	0.00	0.01	0.01	0.00	0	31	0%	0.00	0.01	0.00	0.64	0.00	0.01	0.00
Carbaryl (ug/L)	0.004	0.489	0.248	0.232	0	18	0%	0.028	0.462	0.179	0.72	0.042	0.328	0.169
Chlorpyrifos (ug/L)	0.0002	0.443	0.026	0.010	1	50	2%	0.001	0.044	0.063	2.44	0.009	0.046	0.014
PAHs														
LPAHs														
2-Methylnaphthalene (ug/L)	0.00001	0.136	0.012	0.009	94	151	62%	0.002	0.024	0.015	1.25	0.001	0.015	0.010
Acenaphthene (ug/L)	0.0004	0.105	0.020	0.018	127	151	84%	0.004	0.037	0.015	0.73	0.001	0.023	0.018
Acenaphthylene (ug/L)	0.0001	0.064	0.009	0.007	71	151	47%	0.001	0.021	0.008	0.94	0.001	0.010	0.007
Anthracene (ug/L)	0.0006	0.079	0.029	0.028	141	151	93%	0.008	0.050	0.017	0.58	0.001	0.032	0.026
Fluorene (ug/L)	0.0001	0.098	0.013	0.010	107	151	70%	0.002	0.026	0.013	0.97	0.001	0.016	0.011
Naphthalene (ug/L)	0.00002	0.135	0.021	0.018	104	150	69%	0.005	0.038	0.018	0.86	0.002	0.025	0.019
Phenanthrene (ug/L)	0.00020	0.221	0.048	0.032	147	151	97%	0.013	0.116	0.044	0.90	0.004	0.056	0.042
Total LPAHs[1]	0.030	0.473	0.139	0.120	150	150	100%	0.056	0.263	0.082	0.59	0.007	0.153	0.126
HPAHs														
Benzo(a)anthracene (ug/L)	0.0002	0.615	0.032	0.016	117	151	77%	0.002	0.075	0.063	1.97	0.005	0.043	0.023
Benzo(a)pyrene (ug/L)	0.0004	0.654	0.033	0.016	114	151	75%	0.003	0.078	0.062	1.89	0.005	0.044	0.024
Benzo(b,k)fluoranthenes (ug/L)	0.0002	1.430	0.086	0.041	133	151	88%	0.009	0.196	0.149	1.73	0.012	0.112	0.065
Benzo(g,h,i)perylene (ug/L)	4.00E-05	0.503	0.035	0.020	129	151	85%	0.005	0.083	0.052	1.50	0.004	0.044	0.027
Chrysene (ug/L)	2.00E-05	0.788	0.060	0.026	136	151	90%	0.004	0.151	0.099	1.65	0.008	0.077	0.045
Dibenz(a,h)anthracene (ug/L)	9.00E-06	0.684	0.011	0.004	45	151	29%	0.001	0.017	0.056	5.11	0.005	0.021	0.006
Fluoranthene (ug/L)	0.002	0.444	0.086	0.053	150	151	99%	0.020	0.221	0.087	1.01	0.007	0.101	0.073
Indeno(1,2,3-cd)pyrene (ug/L)	4.00E-05	0.620	0.028	0.016	118	151	78%	0.003	0.056	0.055	2.00	0.004	0.038	0.020
Pyrene (ug/L)	0.012	0.620	0.091	0.054	150	151	99%	0.019	0.227	0.097	1.06	0.008	0.108	0.077
Retene (ug/L)	0.002	0.023	0.009	0.009	26	30	86%	0.003	0.014	0.004	0.48	0.001	0.011	0.008
Total HPAHs[2]	0.031	5.840	0.458	0.248	151	151	100%	0.072	1.170	0.660	1.44	0.054	0.575	0.363
TOTAL PAHs[3]	0.065	6.050	0.596	0.373	151	151	100%	0.137	1.380	0.713	1.20	0.058	0.716	0.492
Phthalates														
Butylbenzylphthalate (ug/L)	0.0004	9.20	0.78	0.30	32	151	21%	0.09	1.80	1.52	1.94	0.12	1.03	0.56
bis(2-Ethylhexyl) phthalate (ug/L)	0.044	41.000	1.760	0.833	122	150	81%	0.344	3.810	3.580	2.03	0.293	2.430	1.320
Di-n-butylphthalate (ug/L)	0.007	1.270	0.317	0.243	43	151	28%	0.051	0.702	0.269	0.85	0.022	0.361	0.275
Di-n-octyl phthalate (ug/L)	0.0005	1.490	0.297	0.214	14	149	9%	0.037	0.706	0.281	0.95	0.023	0.344	0.254
Diethylphthalate (ug/L)	0.007	7.600	0.409	0.226	45	151	29%	0.036	0.930	0.722	1.76	0.059	0.544	0.311
Dimethylphthalate (ug/L)	0.0001	0.100	0.047	0.042	1	150	0%	0.007	0.090	0.031	0.66	0.003	0.052	0.042
***Total Phthalates[4]**	0.00	41.00	2.61	1.29	136	150	90%	0.12	6.34	4.29	1.65	0.35	3.38	2.00
Herbicides														
Dichlobenil (ug/L)	0.0003	0.042	0.016	0.015	26	79	32%	0.003	0.034	0.011	0.69	0.001	0.019	0.014
TPH														
NWTPH-Diesel (mg/L)	0.002	0.19	0.05	0.04	3	48	6%	0.01	0.09	0.04	0.87	0.01	0.06	0.04
NWTPH-Gasoline (ug/L)	0.989	47.1	18.2	18.5	0	35	0%	2.0	37.8	14.8	0.82	2.5	23.0	13.5
NWTPH-Heavy Oil (mg/L)	0.004	0.96	0.33	0.32	37	48	77%	0.12	0.56	0.20	0.62	0.03	0.39	0.27
Bacteria														
Coliform, Fecal (CFU/100 mL)	170	80000	8010	2400	45	45	100%	318	16000	14300	1.79	2140	12500	4450
E. coli (CFU/100 mL)	50	50000	6780	1050	16	16	100%	190	19000	13700	2.01	3410	14100	1630
Enterococci (CFU/100 mL)	1800	110000	22900	5000	17	17	100%	1960	76600	33400	1.45	8090	39900	9410
BTEX														
Benzene (ug/L)	0.002	0.200	0.093	0.081	0.000	35	0%	0.017	0.17	0.06	0.655	0.010	0.113	0.074
Ethylbenzene (ug/L)	0.004	0.198	0.096	0.087	0.000	35	0%	0.022	0.18	0.06	0.614	0.010	0.115	0.076
Toluene (ug/L)	0.002	0.500	0.125	0.115	4.000	35	11%	0.013	0.21	0.11	0.873	0.018	0.162	0.091
m,p-Xylene (ug/L)	0.009	0.600	0.225	0.262	1.000	35	2%	0.024	0.38	0.14	0.639	0.024	0.272	0.178
o-Xylene (ug/L)	0.0001	0.195	0.104	0.109	0.00	35	0%	0.018	0.18	0.06	0.581	0.010	0.123	0.084

[1] Total LPAHs is the sum of the concentration or non-detected calculated value of the following compounds: Naphthalene, acenaphthene, acenaphthylene, anthracene, fluorene, and phenanthrene.

[2] Total HPAHs is the sum of the concentration of non-detected calculated value of the following compounds: Fluoranthene, pyrene, benzo(a)anthracene, chrysene, benzo(b,k)fluoranthene, benzo(a)pyrene, indeno(1,2,3-c,d)pyrene, dibenz(a,h)anthracene, benzo(g,h,i)perylene.

[3] Total PAHs is the sum of the LPAHs and HPAHs.

[4] Total phthalates is the sum of detected values only.

Table E-12 (Cont'd)
Summary Statistics for Stormwater at OF243 WY2024

	Minimum	Maximum	Arithmetic Mean	Median	Detects	Count	Percent Detects	10th Per	90th Per	Standard Deviation	Coefficient of Variation	Standard Error	95% UCL	95% LCL
Conventionals														
Anionic Surfactants (mg/L)	0.025	0.075	0.043	0.039	6	6	100%	0.027	0.063	0.018	0.42	0.007	0.057	0.031
BOD (mg/L)	2.0	4.4	3.1	3.0	6	6	100%	2.2	4.3	1.0	0.31	0.4	3.9	2.5
Chloride (mg/L)	561	2400	1070	828	6	6	100%	564.00	1830	703	0.65	287	1640	652
Conductivity (uS/cm)	1950	7280	3610	3320	7	7	100%	2010.0	5580	1880	0.52	709	5020	2480
Total Hardness (mg CaCO3/L)	219	631	356	319	7	7	100%	221.0	519	151	0.42	57	464	261
Total Suspended Solids (mg/L)	12.8	84.4	46.6	56.6	7	7	100%	19.7	69.4	24.9	0.53	9.4	63.3	29.3
Turbidity (NTU)	17.9	202.0	66.0	40.0	6	6	100%	18.0	140.0	70.5	1.07	28.8	123.0	25.3
pH (pH Units)	6.3	7.9	6.8	6.7	7	7	100%	6.4	7.3	0.5	0.08	0.2	7.2	6.5
Nutrients														
Nitrate+Nitrite as N (mg/L)	0.139	0.349	0.239	0.241	7	7	100%	0.140	0.312	0.077	0.32	0.029	0.291	0.183
Orthophosphate (mg/L)	0.020	0.052	0.037	0.040	7	7	100%	0.024	0.049	0.012	0.32	0.005	0.045	0.029
Phosphorus, Total (mg/L)	0.139	1.010	0.500	0.400	7	7	100%	0.250	0.884	0.300	0.60	0.113	0.716	0.309
Total Nitrogen (mg/L)	0.45	0.96	0.68	0.71	7	7	100%	0.45	0.87	0.19	0.28	0.07	0.81	0.55
Metals														
Cadmium (ug/L)	0.118	0.466	0.270	0.249	7	7	100%	0.141	0.419	0.124	0.46	0.047	0.357	0.189
Cadmium, Dissolved (ug/L)	0.047	0.111	0.083	0.081	6	7	85%	0.053	0.110	0.024	0.30	0.009	0.099	0.066
Copper (ug/L)	10.10	34.40	21.80	21.10	7	7	100%	10.20	32.90	10.20	0.47	3.85	28.40	14.80
Copper, Dissolved (ug/L)	3.46	7.86	4.62	4.37	7	7	100%	3.47	6.02	1.51	0.33	0.57	5.80	3.79
Lead (ug/L)	4.25	32.30	17.90	22.80	7	7	100%	5.29	28.00	11.00	0.61	4.14	25.40	10.40
Lead, Dissolved (ug/L)	0.349	0.770	0.505	0.466	7	7	100%	0.351	0.649	0.147	0.29	0.055	0.610	0.413
Mercury (ug/L)	0.0020	0.0200	0.0093	0.0083	5	7	71%	0.0030	0.0160	0.0058	0.63	0.0020	0.0140	0.0055
Mercury, Dissolved (ug/L)	0.0006	0.0092	0.0055	0.0060	0	7	0%	0.0030	0.0086	0.0030	0.53	0.0010	0.0075	0.0030
Zinc (ug/L)	33.7	95.2	62.7	65.2	7	7	100%	38.0	89.2	23.1	0.37	8.7	78.8	46.7
Zinc, Dissolved (ug/L)	14.9	30.3	22.8	22.6	7	7	100%	18.7	27.1	4.7	0.21	1.8	26.0	19.5
Insecticides														
Bifenthrin (ug/L)	0.001	0.009	0.004	0.003	0	7	0%	0.001	0.008	0.003	0.84	0.001	0.006	0.002
PAHs														
LPAHs														
2-Methylnaphthalene (ug/L)	0.002	0.078	0.017	0.010	3	7	42%	0.002	0.040	0.027	1.56	0.010	0.038	0.005
Acenaphthene (ug/L)	0.003	0.033	0.013	0.010	3	7	42%	0.003	0.025	0.011	0.80	0.004	0.021	0.007
Acenaphthylene (ug/L)	0.001	0.013	0.008	0.008	3	7	42%	0.003	0.013	0.004	0.57	0.002	0.011	0.005
Anthracene (ug/L)	0.003	0.038	0.022	0.022	5	7	71%	0.004	0.035	0.014	0.64	0.005	0.031	0.012
Fluorene (ug/L)	0.000	0.020	0.009	0.010	4	7	57%	0.003	0.015	0.006	0.68	0.002	0.013	0.005
Naphthalene (ug/L)	0.000	0.039	0.025	0.030	5	7	71%	0.011	0.038	0.014	0.55	0.005	0.033	0.015
Phenanthrene (ug/L)	0.021	0.066	0.038	0.038	7	7	100%	0.026	0.053	0.014	0.37	0.005	0.049	0.030
Total LPAHs[1]	0.076	0.200	0.115	0.108	7	7	100%	0.082	0.152	0.041	0.35	0.015	0.146	0.092
HPAHs														
Benzo(a)anthracene (ug/L)	0.003	0.035	0.017	0.018	5	7	71%	0.004	0.030	0.012	0.69	0.004	0.025	0.009
Benzo(a)pyrene (ug/L)	0.003	0.051	0.024	0.025	6	7	85%	0.007	0.045	0.017	0.72	0.007	0.036	0.013
Benzo(b,k)fluoranthenes (ug/L)	0.021	0.097	0.058	0.052	7	7	100%	0.029	0.087	0.026	0.46	0.010	0.076	0.040
Benzo(g,h,i)perylene (ug/L)	0.011	0.039	0.022	0.021	7	7	100%	0.013	0.030	0.009	0.41	0.003	0.028	0.016
Chrysene (ug/L)	0.009	0.048	0.028	0.032	7	7	100%	0.013	0.043	0.014	0.48	0.005	0.037	0.019
Dibenz(a,h)anthracene (ug/L)	0.000	0.005	0.002	0.002	0	7	0%	0.001	0.004	0.002	0.68	0.001	0.004	0.001
Fluoranthene (ug/L)	0.024	0.100	0.059	0.066	7	7	100%	0.031	0.083	0.026	0.44	0.010	0.077	0.041
Indeno(1,2,3-cd)pyrene (ug/L)	0.009	0.041	0.022	0.021	7	7	100%	0.012	0.035	0.011	0.48	0.004	0.030	0.016
Pyrene (ug/L)	0.033	0.103	0.065	0.075	7	7	100%	0.037	0.089	0.025	0.39	0.010	0.083	0.048
Retene (ug/L)	0.002	0.014	0.009	0.009	6	7	85%	0.006	0.013	0.004	0.41	0.001	0.011	0.006
Total HPAHs[2]	0.122	0.517	0.298	0.307	7	7	100%	0.156	0.445	0.132	0.45	0.050	0.390	0.210
TOTAL PAHs[3]	0.236	0.637	0.412	0.409	7	7	100%	0.267	0.559	0.140	0.34	0.053	0.510	0.322
Phthalates														
Butylbenzylphthalate (ug/L)	0.11	0.33	0.21	0.16	0	7	0%	0.12	0.33	0.10	0.48	0.04	0.28	0.15
bis(2-Ethylhexyl) phthalate (ug/L)	0.189	0.937	0.514	0.514	6	7	85%	0.325	0.715	0.227	0.44	0.086	0.682	0.372
Di-n-butylphthalate (ug/L)	0.051	0.292	0.119	0.106	0	7	0%	0.052	0.202	0.084	0.71	0.032	0.183	0.071
Di-n-octyl phthalate (ug/L)	0.105	0.386	0.233	0.177	0	7	0%	0.112	0.369	0.125	0.54	0.047	0.322	0.153
Diethylphthalate (ug/L)	0.065	0.331	0.195	0.157	0	7	0%	0.088	0.309	0.103	0.53	0.039	0.264	0.127
Dimethylphthalate (ug/L)	0.042	0.092	0.070	0.075	0	7	0%	0.051	0.088	0.018	0.26	0.007	0.083	0.057
Total Phthalates[4]	0.42	0.94	0.57	0.54	6	6	100%	0.42	0.75	0.19	0.34	0.08	0.73	0.46
Herbicides														
Dichlobenil (ug/L)	0.005	0.023	0.013	0.011	4	7	57%	0.006	0.022	0.007	0.57	0.003	0.018	0.008
TPH														
NWTPH-Diesel (mg/L)	0.02	0.07	0.04	0.04	0	6	0%	0.03	0.07	0.02	0.45	0.01	0.06	0.03
NWTPH-Heavy Oil (mg/L)	0.12	0.39	0.24	0.25	4	6	66%	0.13	0.33	0.10	0.41	0.04	0.30	0.17
Bacteria														
Coliform, Fecal (CFU/100 mL)	330	14000	4310	1450	4	4	100%	471	10400	6500	1.51	3250	10700	565
E. coli (CFU/100 mL)	50	6000	1800	565	4	4	100%	134	4440	2820	1.57	1410	4580	190
Enterococci (CFU/100 mL)	1800	37000	9860	3200	5	5	100%	2320	23900	15200	1.54	6800	23500	2560

Table E-13
Summary Statistics for Stormwater at OF245 Water Years 2002-2024

	Minimum	Maximum	Arithmetic Mean	Median	Detects	Count	Percent Detects	10th Per	90th Per	Standard Deviation	Coefficient of Variation	Standard Error	95% UCL	95% LCL
Conventionals														
Anionic Surfactants (mg/L)	0.0004	0.434	0.067	0.056	96	98	97%	0.027	0.112	0.055	0.82	0.006	0.079	0.057
BOD (mg/L)	0.19	8.8	3.2	2.8	74	88	84%	1.6	5.8	1.7	0.54	0.2	3.6	2.9
Chloride (mg/L)	0.01	1260	148.0	80.4	96	96	100%	2.80	316	224	1.51	22.90	197	107.0
Conductivity (uS/cm)	46.8	6360	605	363	157	157	100%	114.0	1310	797	1.32	63.6	738	490
Total Hardness (mg CaCO3/L)	14.0	626	75.2	52.8	222	222	100%	26.3	146.0	73.2	0.97	4.9	85.5	66.2
Total Suspended Solids (mg/L)	6.2	296.0	59.1	49.8	215	215	100%	18.0	107.0	43.0	0.73	2.9	65.0	53.5
Turbidity (NTU)	9.9	139	42.9	36.3	76	76	100%	16.6	78.5	26.6	0.62	3.1	49.2	37.2
pH (pH Units)	5.6	8.4	7.0	7.0	222	222	100%	6.4	7.4	0.4	0.06	0.03	7.01	6.89
Nutrients														
Nitrate+Nitrite as N (mg/L)	0.034	1.010	0.195	0.141	114	114	100%	0.076	0.403	0.163	0.84	0.015	0.226	0.167
Orthophosphate (mg/L)	0.00002	0.689	0.038	0.025	115	119	96%	0.002	0.069	0.067	1.76	0.006	0.051	0.029
Phosphorus, Total (mg/L)	0.033	1.510	0.180	0.140	112	112	100%	0.072	0.310	0.161	0.90	0.015	0.214	0.154
Total Nitrogen (mg/L)	0.022	2.90	0.74	0.60	112	114	98%	0.28	1.43	0.50	0.67	0.05	0.84	0.66
Metals														
Cadmium (ug/L)	0.016	2.410	0.281	0.189	127	142	89%	0.086	0.490	0.320	1.14	0.027	0.338	0.234
Cadmium, Dissolved (ug/L)	0.004	1.850	0.124	0.070	104	142	73%	0.020	0.222	0.213	1.72	0.018	0.162	0.093
Copper (ug/L)	3.00	50.10	13.80	12.40	142	142	100%	6.23	23.70	7.87	0.57	0.66	15.20	12.60
Copper, Dissolved (ug/L)	0.02	26.10	3.69	3.00	139	141	98%	1.61	6.20	2.80	0.76	0.24	4.20	3.27
Lead (ug/L)	0.79	60.00	9.26	6.81	220	222	99%	2.45	18.60	8.35	0.90	0.56	10.40	8.22
Lead, Dissolved (ug/L)	0.010	6.270	0.441	0.208	143	222	64%	0.076	1.060	0.654	1.48	0.044	0.535	0.362
Mercury (ug/L)	0.0001	0.8700	0.0200	0.0074	57	222	25%	0.0020	0.0410	0.0620	3.04	0.0040	0.0300	0.0140
Mercury, Dissolved (ug/L)	0.00002	0.1080	0.0130	0.0067	10	222	4%	0.0009	0.0360	0.0160	1.22	0.0010	0.0160	0.0110
Zinc (ug/L)	27.7	585	128.0	102.0	221	221	100%	49.0	226	93.8	0.73	6.31	141.0	116.0
Zinc, Dissolved (ug/L)	0.78	335	52.0	36.1	220	221	99%	21.0	104.0	45.7	0.88	3.08	58.2	46.2
Insecticides														
2,4-D (ug/L)	0.001	1.500	0.151	0.040	17	72	23%	0.008	0.523	0.273	1.81	0.032	0.219	0.093
Bifenthrin (ug/L)	0.0002	0.089	0.007	0.006	0	47	0%	0.001	0.009	0.013	1.79	0.00	0.01	0.01
Carbaryl (ug/L)	0.009	0.454	0.164	0.054	0	27	0%	0.028	0.396	0.159	0.97	0.031	0.225	0.107
Chlorpyrifos (ug/L)	0.00001	0.754	0.027	0.009	3	92	3%	0.002	0.047	0.081	2.98	0.008	0.046	0.015
PAHs														
LPAHs														
2-Methylnaphthalene (ug/L)	0.00006	1.140	0.029	0.010	143	220	65%	0.003	0.038	0.105	3.65	0.007	0.044	0.017
Acenaphthene (ug/L)	6.00E-07	0.855	0.016	0.009	130	220	59%	0.001	0.025	0.058	3.71	0.004	0.024	0.011
Acenaphthylene (ug/L)	2.00E-06	0.095	0.008	0.005	78	220	35%	0.001	0.014	0.012	1.45	0.001	0.010	0.007
Anthracene (ug/L)	4.00E-06	0.289	0.011	0.006	88	220	40%	0.001	0.018	0.024	2.26	0.002	0.014	0.008
Fluorene (ug/L)	0.00003	0.928	0.021	0.009	130	220	59%	0.002	0.030	0.073	3.51	0.005	0.032	0.013
Naphthalene (ug/L)	0.0002	0.795	0.036	0.021	157	218	72%	0.006	0.059	0.075	2.08	0.005	0.047	0.027
Phenanthrene (ug/L)	0.001	1.650	0.059	0.034	210	220	95%	0.015	0.115	0.124	2.10	0.008	0.078	0.046
Total LPAHs[1]	0.007	4.610	0.146	0.085	219	219	100%	0.037	0.252	0.339	2.32	0.023	0.199	0.111
HPAHs														
Benzo(a)anthracene (ug/L)	4.00E-06	0.247	0.017	0.008	125	220	56%	0.001	0.048	0.025	1.49	0.002	0.021	0.014
Benzo(a)pyrene (ug/L)	5.00E-05	0.133	0.017	0.010	144	220	65%	0.002	0.043	0.021	1.21	0.001	0.020	0.014
Benzo(b,k)fluoranthenes (ug/L)	0.0001	0.414	0.043	0.025	163	220	74%	0.004	0.115	0.053	1.24	0.004	0.051	0.037
Benzo(g,h,i)perylene (ug/L)	0.0002	0.112	0.024	0.017	180	220	81%	0.004	0.056	0.023	0.94	0.002	0.027	0.021
Chrysene (ug/L)	2.00E-05	0.420	0.038	0.016	171	220	77%	0.002	0.110	0.054	1.43	0.004	0.045	0.031
Dibenz(a,h)anthracene (ug/L)	5.00E-06	0.027	0.005	0.004	46	220	20%	0.001	0.012	0.005	0.92	0.000	0.006	0.004
Fluoranthene (ug/L)	0.001	1.720	0.062	0.033	212	220	96%	0.012	0.139	0.125	2.00	0.008	0.081	0.049
Indeno(1,2,3-cd)pyrene (ug/L)	6.00E-05	0.058	0.013	0.009	136	220	61%	0.002	0.032	0.013	0.99	0.001	0.015	0.012
Pyrene (ug/L)	0.001	1.310	0.078	0.047	215	220	97%	0.015	0.174	0.113	1.44	0.008	0.095	0.065
Retene (ug/L)	0.002	0.021	0.010	0.009	41	46	89%	0.005	0.017	0.005	0.46	0.001	0.012	0.009
Total HPAHs[2]	0.011	4.390	0.294	0.167	220	220	100%	0.048	0.721	0.402	1.37	0.027	0.352	0.246
TOTAL PAHs[3]	0.020	9.000	0.439	0.258	220	220	100%	0.096	0.980	0.708	1.61	0.048	0.543	0.360
Phthalates														
Butylbenzylphthalate (ug/L)	0.01	290.00	8.24	0.27	83	220	37%	0.05	16.00	30.00	3.64	2.02	12.70	4.74
bis(2-Ethylhexyl) phthalate (ug/L)	0.043	31	2.200	1.270	189	218	86%	0.51	4.33	3.37	1.53	0.228	2.67	1.800
Di-n-butylphthalate (ug/L)	0.002	2	0.525	0.416	118	220	53%	0.086	1.090	0.4	0.77	0.027	0.581	0.473
Di-n-octyl phthalate (ug/L)	0.0006	4.100	0.303	0.198	15	220	6%	0.031	0.729	0.436	1.44	0.029	0.364	0.251
Diethylphthalate (ug/L)	0.005	430.000	2.300	0.228	51	220	23%	0.053	0.758	29.000	12.60	1.950	6.240	0.303
Dimethylphthalate (ug/L)	0.0001	1.100	0.242	0.176	13	219	5%	0.020	0.629	0.249	1.03	0.017	0.276	0.211
***Total Phthalates[4]**	0.00	593	12.70	2.02	212	219	96%	0.69	19.60	50.20	3.94	3.39	20.20	7.11
Herbicides														
Dichlobenil (ug/L)	3.00E-05	0.167	0.026	0.019	68	136	50%	0.003	0.053	0.028	1.07	0.002	0.031	0.022
TPH														
NWTPH-Diesel (mg/L)	0.0001	0.33	0.06	0.05	10	75	13%	0.01	0.12	0.06	0.95	0.01	0.07	0.05
NWTPH-Gasoline (ug/L)	0.103	62.3	16.8	9.7	13	63	20%	0.9	44.4	16.8	1.00	2.1	20.9	12.8
NWTPH-Heavy Oil (mg/L)	0.001	1.10	0.36	0.34	64	75	85%	0.05	0.65	0.22	0.61	0.03	0.41	0.31
Bacteria														
Coliform, Fecal (CFU/100 mL)	50	240000	15600	2700	72	72	100%	262	30000	36400	2.34	4290	24800	8460
E. coli (CFU/100 mL)	5	240000	29200	4250	18	18	100%	75	77000	62300	2.13	14700	61400	6530
Enterococci (CFU/100 mL)	0.542	820000	88100	10400	16	18	88%	840	194000	195000	2.22	46000	189000	22200
BTEX														
Benzene (ug/L)	0.002	0.186	0.106	0.109	0	42	0%	0.029	0.176	0.056	0.524	0.009	0.123	0.090
Ethylbenzene (ug/L)	0.003	0.192	0.093	0.093	0	41	0%	0.020	0.181	0.058	0.626	0.009	0.110	0.075
Toluene (ug/L)	0.001	0.500	0.133	0.129	3	41	7%	0.019	0.196	0.099	0.742	0.015	0.164	0.104
m,p-Xylene (ug/L)	0.003	0.399	0.192	0.169	0	41	0%	0.061	0.348	0.114	0.594	0.018	0.228	0.160
o-Xylene (ug/L)	0.002	0.175	0.083	0.090	0	41	0%	0.017	0.160	0.051	0.613	0.008	0.098	0.068

1 Total LPAHs is the sum of the concentration or non-detected calculated value of the following compounds: Naphthalene, acenaphthene, acenaphthylene, anthracene, fluorene, and phenanthrene.

2 Total HPAHs is the sum of the concentration of non-detected calculated value of the following compounds: Fluoranthene, pyrene, benzo(a)anthracene, chrysene, benzo(b,k)fluoranthene, benzo(b,k)fluoranthene, benzo(a)pyrene, indeno(1,2,3-c,d)pyrene, dibenz(a,h)anthracene, benzo(g,h,i)perylene.

3 Total PAHs is the sum of the LPAHs and HPAHs.

4 Total phthalates is the sum of detected values only.

Table E-13 (Cont'd)
Summary Statistics for Stormwater at OF245 WY2024

	Minimum	Maximum	Arithmetic Mean	Median	Detects	Count	Percent Detects	10th Per	90th Per	Standard Deviation	Coefficient of Variation	Standard Error	95% UCL	95% LCL
Conventionals														
Anionic Surfactants (mg/L)	0.025	0.099	0.054	0.049	10	10	100%	0.027	0.081	0.023	0.44	0.007	0.068	0.041
BOD (mg/L)	0.2	8.8	3.5	3.1	8	10	80%	0.6	6.5	2.5	0.72	0.8	5.0	2.1
Chloride (mg/L)	30	834	194	147	10	10	100%	48	267	232	1.20	74	349	96
Conductivity (uS/cm)	149	2850	836	578	14	14	100%	250	2220	870	1.04	233	1330	460
Total Hardness (mg CaCO3/L)	25.2	296.0	94.5	66.9	14	14	100%	37.3	223.0	84.3	0.89	22.5	141.0	58.0
Total Suspended Solids (mg/L)	13.3	119.0	49.5	43.5	14	14	100%	18.3	82.2	29.9	0.60	8.0	65.6	35.3
Turbidity (NTU)	9.9	60.1	33.1	31.1	10	10	100%	13.1	53.7	17.2	0.52	5.4	43.2	23.1
pH (pH Units)	5.9	7.2	6.7	6.8	14	14	100%	6.3	7.1	0.4	0.05	0.1	6.9	6.5
Nutrients														
Nitrate+Nitrite as N (mg/L)	0.053	0.371	0.152	0.133	14	14	100%	0.055	0.280	0.094	0.62	0.025	0.203	0.108
Orthophosphate (mg/L)	0.013	0.071	0.031	0.025	14	14	100%	0.015	0.055	0.018	0.57	0.005	0.040	0.023
Phosphorus, Total (mg/L)	0.033	0.350	0.154	0.139	14	14	100%	0.068	0.254	0.085	0.55	0.023	0.198	0.113
Total Nitrogen (mg/L)	0.14	2.20	0.76	0.47	13	14	92%	0.23	1.88	0.68	0.89	0.18	1.13	0.46
Metals														
Cadmium (ug/L)	0.016	0.317	0.155	0.135	13	14	92%	0.105	0.244	0.074	0.48	0.020	0.194	0.118
Cadmium, Dissolved (ug/L)	0.007	0.352	0.067	0.047	6	14	42%	0.016	0.111	0.088	1.30	0.023	0.118	0.034
Copper (ug/L)	4.23	50.10	15.10	13.10	14	14	100%	6.55	21.30	11.50	0.76	3.06	21.70	10.30
Copper, Dissolved (ug/L)	1.47	8.43	3.33	2.56	14	14	100%	1.67	6.20	2.07	0.62	0.55	4.44	2.41
Lead (ug/L)	0.85	16.80	5.22	5.33	14	14	100%	1.92	8.33	4.00	0.77	1.07	7.44	3.49
Lead, Dissolved (ug/L)	0.072	0.328	0.144	0.129	14	14	100%	0.076	0.199	0.066	0.45	0.018	0.181	0.115
Mercury (ug/L)	0.0003	0.0140	0.0040	0.0040	1	14	7%	0.0005	0.0072	0.0040	0.79	0.0009	0.0063	0.0030
Mercury, Dissolved (ug/L)	0.0020	0.0110	0.0065	0.0071	0	14	0%	0.0030	0.0097	0.0030	0.45	0.0008	0.0080	0.0050
Zinc (ug/L)	30.2	148.0	84.9	88.8	14	14	100%	50.7	119.0	31.6	0.37	8.5	101.0	69.0
Zinc, Dissolved (ug/L)	20.2	39.7	26.9	24.6	14	14	100%	21.4	37.9	6.5	0.24	1.7	30.4	23.9
Insecticides														
Bifenthrin (ug/L)	0.000	0.089	0.010	0.004	0	14	0%	0.001	0.008	0.023	2.25	0.006	0.023	0.003
PAHs														
LPAHs														
2-Methylnaphthalene (ug/L)	0.001	0.056	0.012	0.009	5	14	35%	0.003	0.020	0.014	1.17	0.004	0.020	0.006
Acenaphthene (ug/L)	0.002	0.060	0.012	0.008	5	14	35%	0.003	0.014	0.014	1.25	0.004	0.020	0.006
Acenaphthylene (ug/L)	0.000	0.056	0.010	0.009	3	14	21%	0.001	0.015	0.014	1.32	0.004	0.018	0.005
Anthracene (ug/L)	0.000	0.052	0.011	0.005	6	14	42%	0.001	0.030	0.015	1.38	0.004	0.020	0.004
Fluorene (ug/L)	0.002	0.079	0.014	0.009	6	14	42%	0.003	0.017	0.019	1.43	0.005	0.025	0.007
Naphthalene (ug/L)	0.000	0.042	0.018	0.015	7	14	50%	0.007	0.039	0.013	0.70	0.003	0.025	0.012
Phenanthrene (ug/L)	0.024	0.061	0.041	0.039	13	14	92%	0.028	0.060	0.013	0.32	0.004	0.048	0.034
Total LPAHs[1]	0.048	0.276	0.106	0.090	14	14	100%	0.061	0.135	0.056	0.53	0.015	0.137	0.082
HPAHs														
Benzo(a)anthracene (ug/L)	0.000	0.068	0.010	0.004	5	14	35%	0.000	0.029	0.019	1.82	0.005	0.022	0.003
Benzo(a)pyrene (ug/L)	0.001	0.058	0.013	0.008	8	14	57%	0.001	0.035	0.017	1.23	0.004	0.023	0.006
Benzo(b,k)fluoranthenes (ug/L)	0.007	0.058	0.023	0.025	11	14	78%	0.009	0.033	0.013	0.56	0.003	0.030	0.017
Benzo(g,h,i)perylene (ug/L)	0.000	0.031	0.015	0.016	11	14	78%	0.004	0.026	0.009	0.59	0.002	0.019	0.011
Chrysene (ug/L)	0.000	0.037	0.011	0.011	8	14	57%	0.002	0.018	0.009	0.81	0.002	0.016	0.007
Dibenz(a,h)anthracene (ug/L)	0.002	0.006	0.004	0.004	0	14	0%	0.003	0.006	0.001	0.35	0.000	0.005	0.004
Fluoranthene (ug/L)	0.011	0.071	0.035	0.032	13	14	92%	0.020	0.057	0.016	0.47	0.004	0.044	0.027
Indeno(1,2,3-cd)pyrene (ug/L)	0.000	0.042	0.010	0.008	7	14	50%	0.002	0.022	0.011	1.09	0.003	0.017	0.005
Pyrene (ug/L)	0.014	0.096	0.042	0.042	13	14	92%	0.017	0.058	0.021	0.50	0.006	0.053	0.032
Retene (ug/L)	0.002	0.017	0.008	0.008	10	14	71%	0.004	0.011	0.004	0.51	0.001	0.010	0.006
Total HPAHs[2]	0.053	0.399	0.173	0.167	14	14	100%	0.081	0.328	0.103	0.60	0.028	0.227	0.124
TOTAL PAHs[3]	0.131	0.650	0.279	0.249	14	14	100%	0.143	0.464	0.145	0.52	0.039	0.358	0.214
Phthalates														
Butylbenzylphthalate (ug/L)	0.02	1.92	0.32	0.22	0	14	0%	0.03	0.37	0.48	1.50	0.13	0.59	0.15
bis(2-Ethylhexyl) phthalate (ug/L)	0.500	1.900	0.971	0.973	13	14	92%	0.622	1.300	0.351	0.36	0.094	1.160	0.808
Di-n-butylphthalate (ug/L)	0.002	1.480	0.624	0.632	12	14	85%	0.133	1.070	0.389	0.62	0.104	0.821	0.431
Di-n-octyl phthalate (ug/L)	0.038	3.210	0.410	0.216	0	14	0%	0.064	0.354	0.813	1.98	0.217	0.862	0.155
Diethylphthalate (ug/L)	0.009	1.690	0.263	0.167	0	14	0%	0.030	0.292	0.419	1.59	0.112	0.501	0.118
Dimethylphthalate (ug/L)	0.025	0.596	0.173	0.160	0	14	0%	0.028	0.308	0.157	0.91	0.042	0.259	0.102
Total Phthalates[4]	0.96	3.02	1.67	1.67	13	13	100%	1.11	2.04	0.53	0.32	0.15	1.96	1.42
Herbicides														
Dichlobenil (ug/L)	0.000	0.135	0.019	0.009	7	14	50%	0.002	0.026	0.034	1.81	0.009	0.038	0.007
TPH														
NWTPH-Diesel (mg/L)	0.01	0.08	0.04	0.05	0	6	0%	0.01	0.08	0.03	0.64	0.01	0.07	0.02
NWTPH-Heavy Oil (mg/L)	0.25	0.60	0.37	0.36	6	6	100%	0.25	0.51	0.14	0.37	0.06	0.48	0.28
Bacteria														
Coliform, Fecal (CFU/100 mL)	280	50000	18200	14000	6	6	100%	490	40000	19100	1.05	7810	32900	5130
E. coli (CFU/100 mL)	280	50000	15400	5650	6	6	100%	490	40000	20300	1.32	8280	31400	2280
Enterococci (CFU/100 mL)	1700	170000	33300	7050	6	6	100%	1900	91000	67100	2.01	27400	88700	3620

Table E-14
Summary Statistics for Stormwater at OF254 Water Years 2002-2024

	Minimum	Maximum	Arithmetic Mean	Median	Detects	Count	Percent Detects	10th Per	90th Per	Standard Deviation	Coefficient of Variation	Standard Error	95% UCL	95% LCL
Conventionals														
Anionic Surfactants (mg/L)	0.003	0.175	0.065	0.052	60	61	98%	0.032	0.110	0.037	0.56	0.005	0.075	0.056
BOD (mg/L)	0.016	69.0	3.6	2.4	37	54	68%	0.8	4.1	9.2	2.53	1.25	6.28	2.13
Chloride (mg/L)	493	8000	2250	2140	62	62	100%	848	3730	1350	0.60	172.0	2600	1940
Conductivity (uS/cm)	4.9	23000	6290	5560	114	114	100%	2210	11200	3760	0.60	352.0	6990	5610
Total Hardness (mg CaCO3/L)	49.5	2380	592	499	173	173	100%	222.0	1090	370	0.63	28.1	649	537
Total Suspended Solids (mg/L)	5.2	354.0	88.8	68.3	170	170	100%	28.4	178.0	67.5	0.76	5.18	99.6	79.0
Turbidity (NTU)	0.46	216	67.8	55.2	61	61	100%	21.2	135.0	48.0	0.71	6.15	80.5	56.5
pH (pH Units)	6.2	8	7.1	7.0	173	173	100%	6.6	7.5	0.4	0.05	0.028	7.11	7.00
Nutrients														
Nitrate+Nitrite as N (mg/L)	0.036	0.355	0.142	0.125	69	69	100%	0.079	0.225	0.065	0.45	0.008	0.158	0.127
Orthophosphate (mg/L)	0.007	0.100	0.029	0.024	69	71	97%	0.012	0.045	0.020	0.70	0.002	0.034	0.025
Phosphorus, Total (mg/L)	0.051	1.090	0.167	0.120	69	69	100%	0.084	0.288	0.150	0.90	0.018	0.206	0.137
Total Nitrogen (mg/L)	0.034	1.95	0.58	0.48	66	69	95%	0.30	1.08	0.34	0.59	0.041	0.664	0.506
Metals														
Cadmium (ug/L)	0.015	0.543	0.192	0.168	59	73	80%	0.090	0.300	0.101	0.53	0.012	0.215	0.170
Cadmium, Dissolved (ug/L)	0.010	0.273	0.095	0.087	59	72	81%	0.044	0.161	0.048	0.51	0.006	0.107	0.085
Copper (ug/L)	3.94	70.90	16.80	13.40	73	73	100%	7.74	30.50	11.80	0.70	1.38	19.60	14.30
Copper, Dissolved (ug/L)	0.53	11.30	2.93	2.27	73	73	100%	0.97	5.61	2.11	0.72	0.25	3.44	2.49
Lead (ug/L)	1.16	68.0	14.70	10.40	169	173	97%	3.94	31.80	12.40	0.84	0.94	16.50	12.90
Lead, Dissolved (ug/L)	0.0001	12.20	1.000	0.230	118	172	68%	0.037	2.480	2.030	2.03	0.155	1.330	0.729
Mercury (ug/L)	0.00005	0.3070	0.0260	0.0140	72	173	41%	0.0040	0.0600	0.0350	1.33	0.0030	0.0320	0.0210
Mercury, Dissolved (ug/L)	0.00003	0.2110	0.0180	0.0082	5	173	2%	0.0008	0.0430	0.0230	1.27	0.0020	0.0210	0.0150
Zinc (ug/L)	27.6	427	119.0	92.3	173	173	100%	48.8	217.0	74.2	0.62	5.64	130	108.0
Zinc, Dissolved (ug/L)	5.1	239	43.9	31.8	173	173	100%	22.2	84.5	32.8	0.75	2.49	49.2	39.2
Insecticides														
2,4-D (ug/L)	0.001	1.000	0.090	0.028	20	40	50%	0.004	0.174	0.185	2.06	0.029	0.153	0.042
Bifenthrin (ug/L)	0.0001	0.01	0.01	0.01	0	28	0%	0.00	0.01	0.00	0.54	0.001	0.006	0.004
Carbaryl (ug/L)	0.009	0.486	0.174	0.140	0	23	0%	0.030	0.393	0.157	0.90	0.033	0.239	0.115
Chlorpyrifos (ug/L)	0.000	0.320	0.028	0.011	2	53	3%	0.003	0.054	0.048	1.71	0.007	0.043	0.017
PAHs														
LPAHs														
2-Methylnaphthalene (ug/L)	0.0006	0.435	0.022	0.013	136	172	79%	0.003	0.037	0.043	1.96	0.003	0.029	0.016
Acenaphthene (ug/L)	0.00002	0.352	0.016	0.009	98	172	56%	0.001	0.028	0.032	2.02	0.002	0.021	0.012
Acenaphthylene (ug/L)	0.00001	0.070	0.010	0.007	73	172	42%	0.002	0.022	0.011	1.14	0.001	0.012	0.009
Anthracene (ug/L)	0.00002	0.389	0.030	0.010	109	172	63%	0.003	0.074	0.054	1.78	0.004	0.039	0.023
Fluorene (ug/L)	0.0004	0.159	0.019	0.010	113	172	65%	0.003	0.045	0.025	1.32	0.002	0.023	0.016
Naphthalene (ug/L)	0.002	0.126	0.025	0.021	125	171	73%	0.006	0.047	0.020	0.80	0.002	0.028	0.022
Phenanthrene (ug/L)	0.001	0.657	0.077	0.044	167	172	97%	0.018	0.177	0.092	1.19	0.007	0.092	0.064
Total LPAHs[1]	0.005	1.240	0.173	0.101	171	171	100%	0.044	0.389	0.195	1.13	0.015	0.204	0.146
HPAHs														
Benzo(a)anthracene (ug/L)	0.0001	0.915	0.057	0.019	141	172	81%	0.004	0.164	0.096	1.68	0.007	0.073	0.044
Benzo(a)pyrene (ug/L)	0.0001	0.428	0.050	0.025	148	172	86%	0.004	0.136	0.064	1.28	0.005	0.060	0.041
Benzo(b,k)fluoranthenes (ug/L)	0.00004	1.660	0.135	0.063	151	172	87%	0.011	0.383	0.189	1.40	0.014	0.166	0.109
Benzo(g,h,i)perylene (ug/L)	0.0001	0.253	0.045	0.029	154	172	89%	0.007	0.118	0.045	0.99	0.003	0.052	0.039
Chrysene (ug/L)	0.0002	1.910	0.119	0.041	160	172	93%	0.010	0.320	0.196	1.64	0.015	0.151	0.093
Dibenz(a,h)anthracene (ug/L)	0.0001	0.071	0.010	0.005	77	172	44%	0.001	0.027	0.011	1.13	0.001	0.012	0.008
Fluoranthene (ug/L)	0.0030	3.960	0.205	0.075	168	172	97%	0.020	0.521	0.382	1.86	0.029	0.267	0.154
Indeno(1,2,3-cd)pyrene (ug/L)	0.0003	0.239	0.031	0.019	143	172	83%	0.003	0.075	0.034	1.12	0.003	0.036	0.026
Pyrene (ug/L)	0.002	4.120	0.208	0.078	168	172	97%	0.025	0.552	0.378	1.82	0.029	0.273	0.160
Retene (ug/L)	0.001	0.034	0.014	0.012	24	27	88%	0.005	0.026	0.008	0.59	0.002	0.017	0.011
Total HPAHs[2]	0.027	13.600	0.860	0.360	172	172	100%	0.088	2.340	1.360	1.59	0.104	1.080	0.677
TOTAL PAHs[3]	0.040	14.700	1.030	0.455	172	172	100%	0.133	2.650	1.530	1.48	0.116	1.280	0.830
Phthalates														
Butylbenzylphthalate (ug/L)	0.00	6.10	0.42	0.26	32	172	18%	0.06	0.92	0.59	1.40	0.05	0.52	0.34
bis(2-Ethylhexyl) phthalate (ug/L)	0.001	10.20	2.040	1.390	141	172	81%	0.352	5.250	1.920	0.94	0.147	2.340	1.760
Di-n-butylphthalate (ug/L)	0.002	1.3	0.379	0.354	76	172	44%	0.101	0.766	0.238	0.63	0.018	0.414	0.344
Di-n-octyl phthalate (ug/L)	0.001	4.500	0.321	0.192	29	170	17%	0.034	0.713	0.474	1.48	0.036	0.400	0.257
Diethylphthalate (ug/L)	0.003	120.000	1.210	0.210	43	172	25%	0.062	0.860	9.230	7.66	0.704	2.740	0.363
Dimethylphthalate (ug/L)	0.008	3.200	0.313	0.188	26	172	15%	0.034	0.794	0.412	1.32	0.031	0.379	0.256
***Total Phthalates[4]**	0.00	123.00	3.52	1.87	163	171	95%	0.34	7.16	9.62	2.73	0.74	5.16	2.50
Herbicides														
Dichlobenil (ug/L)	0.0004	0.263	0.028	0.017	28	79	35%	0.002	0.049	0.041	1.46	0.005	0.038	0.020
TPH														
NWTPH-Diesel (mg/L)	0.001	0.16	0.07	0.06	19	55	34%	0.02	0.14	0.05	0.66	0.0062	0.08	0.06
NWTPH-Gasoline (ug/L)	0.056	49.7	15.9	10.0	0	43	0%	1.0	40.1	15.3	0.96	2.33	20.5	11.6
NWTPH-Heavy Oil (mg/L)	0.022	4.20	0.79	0.55	52	55	94%	0.32	1.30	0.76	0.96	0.103	1.01	0.61
Bacteria														
Coliform, Fecal (CFU/100 mL)	220	800000	25800	2700	54	54	100%	378	16000	110000	4.28	15000	58100	6450
E. coli (CFU/100 mL)	1.5	280000	29400	2500	15	16	93%	278	67000	72000	2.45	18000	70100	4300
Enterococci (CFU/100 mL)	270	820000	87700	6900	17	17	100%	976	206000	213000	2.42	51600	203000	12500
BTEX														
Benzene (ug/L)	0.003	0.199	0.100	0.093	0	44	0%	0.019	0.183	0.062	0.619	0.009	0.118	0.082
Ethylbenzene (ug/L)	0.002	0.196	0.101	0.097	0	43	0%	0.017	0.192	0.068	0.675	0.010	0.121	0.081
Toluene (ug/L)	0.012	1.000	0.166	0.121	6	43	13%	0.037	0.360	0.181	1.090	0.028	0.225	0.119
m,p-Xylene (ug/L)	0.008	0.400	0.185	0.187	0	43	0%	0.013	0.314	0.114	0.616	0.017	0.218	0.152
o-Xylene (ug/L)	0.002	0.199	0.100	0.115	0	43	0%	0.015	0.180	0.066	0.661	0.010	0.120	0.081

[1] Total LPAHs is the sum of the concentration or non-detected calculated value of the following compounds: Naphthalene, acenaphthene, acenaphthylene, anthracene, fluorene, and phenanthrene.

[2] Total HPAHs is the sum of the concentration of non-detected calculated value of the following compounds: Fluoranthene, pyrene, benzo(a)anthracene, chrysene, benzo(b,k)fluoranthene, benzo(b,k)fluoranthene, benzo(a)pyrene, indeno(1,2,3-c,d)pyrene, dibenz(a,h)anthracene, benzo(g,h,i)perylene.

[3] Total PAHs is the sum of the LPAHs and HPAHs.

[4] Total phthalates is the sum of detected values only.

Table E-14 (Cont'd)
Summary Statistics for Stormwater at OF254 WY2024

	Minimum	Maximum	Arithmetic Mean	Median	Detects	Count	Percent Detects	10th Per	90th Per	Standard Deviation	Coefficient of Variation	Standard Error	95% UCL	95% LCL
Conventionals														
Anionic Surfactants (mg/L)	0.038	0.105	0.056	0.048	7	7	100%	0.041	0.079	0.023	0.411	0.009	0.074	0.044
BOD (mg/L)	0.388	3.300	1.890	2.020	3	6	50%	0.718	2.950	1.060	0.561	0.434	2.640	1.140
Chloride (mg/L)	749	3730	1570	1020	7	7	100%	759	3080	1160	0.741	439	2430	873
Conductivity (uS/cm)	2510	11700	6880	6410	7	7	100%	2700	11500	3720	0.541	1410	9460	4370
Total Hardness (mg CaCO3/L)	242	1160	667	647	7	7	100%	264	1090	354	0.531	134	907	431
Total Suspended Solids (mg/L)	11.5	106.0	52.8	44.2	7	7	100%	15.0	102.0	36.800	0.697	13.9	78.7	28.7
Turbidity (NTU)	15.1	77.5	44.9	38.5	7	7	100%	26.6	69.6	20.800	0.463	7.86	59.7	31.2
pH (pH Units)	6.2	7.0	6.6	6.6	7	7	100%	6.3	6.9	0.3	0.044	0.1	6.8	6.4
Nutrients														
Nitrate+Nitrite as N (mg/L)	0.095	0.355	0.142	0.103	7	7	100%	0.096	0.223	0.095	0.669	0.036	0.215	0.099
Orthophosphate (mg/L)	0.007	0.100	0.042	0.024	5	7	71%	0.008	0.098	0.040	0.957	0.015	0.071	0.016
Phosphorus, Total (mg/L)	0.051	0.252	0.132	0.112	7	7	100%	0.066	0.221	0.070	0.534	0.027	0.183	0.087
Total Nitrogen (mg/L)	0.27	1.55	0.53	0.34	6	7	85%	0.29	0.93	0.457	0.862	0.173	0.88	0.32
Metals														
Cadmium (ug/L)	0.026	0.294	0.164	0.165	5	7	71%	0.063	0.287	0.098	0.600	0.037	0.231	0.098
Cadmium, Dissolved (ug/L)	0.043	0.214	0.100	0.087	4	7	57%	0.061	0.150	0.055	0.548	0.021	0.142	0.068
Copper (ug/L)	3.94	70.90	21.00	13.60	7	7	100%	5.85	42.30	23.000	1.100	8.680	39.00	9.18
Copper, Dissolved (ug/L)	0.96	4.36	2.57	2.33	7	7	100%	1.44	4.24	1.260	0.488	0.475	3.44	1.74
Lead (ug/L)	1.16	22.60	7.67	6.87	7	7	100%	1.87	14.80	7.220	0.942	2.730	13.20	3.64
Lead, Dissolved (ug/L)	0.083	2.270	0.514	0.147	7	7	100%	0.085	1.290	0.799	1.550	0.302	1.130	0.120
Mercury (ug/L)	0.0001	0.0130	0.0067	0.0073	3	7	42%	0.0003	0.0120	0.006	0.823	0.002	0.0100	0.0030
Mercury, Dissolved (ug/L)	0.0000	0.0083	0.0040	0.0040	0	7	0%	0.0006	0.0083	0.004	0.828	0.001	0.0070	0.0020
Zinc (ug/L)	41.6	147.0	72.5	64.0	7	7	100%	43.9	109.0	36.400	0.502	13.800	100.0	51.5
Zinc, Dissolved (ug/L)	25.1	45.3	32.8	33.7	7	7	100%	25.5	40.9	7.320	0.224	2.770	38.2	28.0
Insecticides														
Bifenthrin (ug/L)	0.001	0.010	0.004	0.004	0	7	0%	0.001	0.008	0.004	0.840	0.001	0.007	0.002
PAHs														
LPAHs														
2-Methylnaphthalene (ug/L)	0.016	0.033	0.024	0.023	7	7	100%	0.017	0.032	0.007	0.295	0.003	0.029	0.019
Acenaphthene (ug/L)	0.001	0.010	0.007	0.008	1	7	14%	0.003	0.009	0.003	0.441	0.001	0.009	0.005
Acenaphthylene (ug/L)	0.003	0.014	0.007	0.006	1	7	14%	0.003	0.011	0.004	0.638	0.002	0.010	0.004
Anthracene (ug/L)	0.002	0.061	0.018	0.007	5	7	71%	0.003	0.045	0.022	1.250	0.008	0.034	0.005
Fluorene (ug/L)	0.001	0.012	0.006	0.006	3	7	42%	0.001	0.012	0.005	0.804	0.002	0.010	0.003
Naphthalene (ug/L)	0.002	0.047	0.024	0.019	4	7	57%	0.004	0.043	0.018	0.776	0.007	0.036	0.011
Phenanthrene (ug/L)	0.021	0.063	0.039	0.033	7	7	100%	0.021	0.057	0.017	0.447	0.007	0.051	0.028
Total LPAHs[1]	0.052	0.154	0.100	0.089	7	7	100%	0.070	0.144	0.035	0.35	0.013	0.124	0.077
HPAHs														
Benzo(a)anthracene (ug/L)	0.000	0.039	0.011	0.006	3	7	42%	0.002	0.026	0.013	1.220	0.005	0.021	0.004
Benzo(a)pyrene (ug/L)	0.001	0.078	0.020	0.012	6	7	85%	0.003	0.045	0.027	1.330	0.010	0.040	0.006
Benzo(b,k)fluoranthenes (ug/L)	0.013	0.130	0.051	0.033	7	7	100%	0.023	0.092	0.039	0.763	0.015	0.080	0.029
Benzo(g,h,i)perylene (ug/L)	0.002	0.044	0.020	0.014	6	7	85%	0.008	0.039	0.014	0.707	0.006	0.031	0.011
Chrysene (ug/L)	0.010	0.063	0.028	0.020	7	7	100%	0.013	0.048	0.018	0.662	0.007	0.042	0.017
Dibenz(a,h)anthracene (ug/L)	0.001	0.011	0.003	0.003	1	7	14%	0.001	0.006	0.003	0.951	0.001	0.006	0.002
Fluoranthene (ug/L)	0.025	0.112	0.059	0.051	7	7	100%	0.033	0.094	0.030	0.502	0.011	0.080	0.041
Indeno(1,2,3-cd)pyrene (ug/L)	0.005	0.044	0.018	0.013	7	7	100%	0.007	0.034	0.014	0.761	0.005	0.028	0.010
Pyrene (ug/L)	0.025	0.156	0.064	0.046	7	7	100%	0.035	0.105	0.043	0.671	0.016	0.097	0.040
Retene (ug/L)	0.003	0.034	0.011	0.006	5	7	71%	0.003	0.021	0.011	1.030	0.004	0.019	0.005
Total HPAHs[2]	0.088	0.677	0.276	0.194	7	7	100%	0.135	0.465	0.194	0.71	0.074	0.421	0.167
TOTAL PAHs[3]	0.170	0.831	0.376	0.294	7	7	100%	0.199	0.596	0.223	0.59	0.084	0.548	0.250
Phthalates														
Butylbenzylphthalate (ug/L)	0.05	0.39	0.20	0.18	0	7	0%	0.07	0.36	0.125	0.624	0.047	0.29	0.12
bis(2-Ethylhexyl) phthalate (ug/L)	0.301	1.930	0.876	0.701	6	7	85%	0.434	1.500	0.554	0.632	0.209	1.280	0.545
Di-n-butylphthalate (ug/L)	0.102	0.859	0.305	0.207	2	7	28%	0.116	0.577	0.262	0.860	0.099	0.509	0.164
Di-n-octyl phthalate (ug/L)	0.007	0.289	0.129	0.100	0	7	0%	0.033	0.262	0.104	0.805	0.039	0.202	0.061
Diethylphthalate (ug/L)	0.646	1.350	0.934	0.878	7	7	100%	0.670	1.330	0.291	0.312	0.110	1.150	0.748
Dimethylphthalate (ug/L)	0.018	0.389	0.182	0.178	1	7	14%	0.036	0.342	0.140	0.769	0.053	0.277	0.088
Total Phthalates[4]	0.73	4.06	2.00	1.87	7	7	100%	0.99	2.99	1.07	0.53	0.40	2.76	1.34
Herbicides														
Dichlobenil (ug/L)	0.004	0.027	0.014	0.011	5	7	71%	0.005	0.026	0.009	0.650	0.004	0.021	0.008
TPH														
NWTPH-Diesel (mg/L)	0.01	0.06	0.04	0.04	0	5	0%	0.01	0.06	0.02	0.62	0.01	0.06	0.02
NWTPH-Heavy Oil (mg/L)	0.36	0.94	0.60	0.49	5	5	100%	0.40	0.86	0.24	0.40	0.11	0.80	0.43
Bacteria														
Coliform, Fecal (CFU/100 mL)	500	13000	3720	1700	5	5	100%	820	8640	5220.000	1.400	2340.000	8480	980
E. coli (CFU/100 mL)	56	8000	2070	500	5	5	100%	234	5320	3340	1.61	1500	5070	322
Enterococci (CFU/100 mL)	270	55000	12200	2000	5	5	100%	358	34300	24000	1.96	10700	33700	704

Table E-15
Summary Statistics for Stormwater Sediment at OF230/230A FD3New WY2002-WY2024 and FD7 WY2024

	Minimum	Maximum	Arithmetic Mean	Median	Detects	Count	Percent Detects	10th Per	90th Per	Standard Deviation	Coefficient of Variation	Standard Error	95% UCL	95% LCL
Conventionals														
Total Organic Carbon (mg/Kg)	0.67	16	7	6	23	23	100%	3	13	4	0.56	1	8	5
Total Solids (%)	29.4	65	50	51	23	23	100%	34	62	11	0.21	2	54	46
Total Volatile Solids (%)	6.1	33	14	11	10	10	100%	7	23	9	0.61	3	20	10
Nutrients														
Phosphorus, Total (mg/Kg)	543	1560	1040	1120	8	8	100%	635	1500	374	0.36	132	1280	801
Metals														
Cadmium (mg/Kg dry)	0.286	0.926	0.549	0.534	9	9	100%	0.378	0.712	0.181	0.33	0.060	0.668	0.443
Copper (mg/Kg dry)	48.2	132	82	81	9	9	100%	56	111	25.6	0.31	9	99	67
Lead (mg/Kg dry)	28.2	1420.0	197.0	139.0	22	22	100%	74.5	235	279	1.42	59.6	325.0	121.0
Mercury (mg/Kg dry)	0.0330	0.827	0.174	0.123	22	22	100%	0.052	0.296	0.193	1.11	0.041	0.262	0.107
Zinc (mg/Kg dry)	219	3200	619	440	22	22	100%	290	822	607	0.98	129	905	438
TPH														
NWTPH-Diesel (mg/Kg)	6.0	960	165	120	18	23	78%	8.1	327	204	1.24	43	256	97
NWTPH-Heavy Oil (mg/Kg)	25	8300	3580	3300	23	23	100%	996	6060	2130	0.60	445	4450	2750
PAHs														
LPAHs														
2-Methylnaphthalene (ug/Kg)	5.1	310	88	60	18	23	78%	23	178	75	0.86	16	121	60
Acenaphthene (ug/Kg)	4.7	350	118	120	20	23	86%	22	250	91	0.77	19	156	84
Acenaphthylene (ug/Kg)	6.03	93	44	40	13	23	56%	15	81	26	0.60	5	54	34
Anthracene (ug/Kg)	26.6	640	280	283	22	23	95%	61	446	166	0.59	35	347	214
Fluorene (ug/Kg)	18.1	577	167	150	21	23	91%	32	290	126	0.76	26	221	121
Naphthalene (ug/Kg)	8.70	480	131	120	22	23	95%	53	196	100	0.76	21	175	96
Phenanthrene (ug/Kg)	238	5400	2230	2400	23	23	100%	407	4180	1370	0.61	285	2790	1710
Total LPAHs[1]	406	5990	2830	2870	11	23	47%	573	4910	1610	0.57	337	3470	2180
HPAHs														
Benzo(a)anthracene (ug/Kg)	128	3400	1490	1600	23	23	100%	310	2560	912	0.61	190	1860	1130
Benzo(a)pyrene (ug/Kg)	253	5870	1700	1550	23	23	100%	337	2740	1240	0.73	259	2230	1250
Benzo(b,k)fluoranthene (ug/Kg)	641	17900	4500	4030	23	23	100%	920	7200	3740	0.83	779	6100	3190
Benzo(g,h,i)perylene (ug/Kg)	78	3000	1350	1180	23	23	100%	306	2980	964	0.72	201	1740	976
Chrysene (ug/Kg)	283	5000	2160	2130	23	23	100%	407	3500	1270	0.59	264	2670	1650
Dibenz(a,h)anthracene (ug/Kg)	13.1	2700	408	323	20	23	86%	27	714	564	1.38	118	667	225
Fluoranthene (ug/Kg)	368	6800	3430	3270	23	23	100%	768	5820	1930	0.56	403	4190	2640
Indeno(1,2,3-c,d)pyrene (ug/Kg)	122	4260	1320	1290	23	23	100%	269	2480	1010	0.77	211	1750	938
Pyrene (ug/Kg)	388	9400	3890	4000	23	23	100%	595	7140	2580	0.66	537	4960	2870
Retene	31	218	107	89	4	4	100%	34	193	88	1	44	177	37
Total HPAHs[2]	2420	45700	18700	14300	11	23	47%	3110	37700	14600	0.78	3050	24500	13100
Total PAHs[3]	3030	49100	21600	16900	11	23	47%	4450	42300	15600	0.72	3240	27900	15500
Phthalates														
Butyl benzyl phthalate (ug/kg)	42	4700	1140	850	22	23	95%	138	2320	1210	1.07	253	1680	707
bis(2-Ethylhexyl) phthalate (ug/Kg)	3530	43000	17000	15300	23	23	100%	4770	31300	11600	0.68	2430	21800	12500
Di-n-butylphthalate (ug/kg)	8.3	2400	419	250	21	23	91%	59	962	526	1.26	110	652	241
Di-n-octylphthalate (ug/kg)	0.23	9290	1550	895	17	23	73%	6	3680	2080	1.34	433	2460	824
Diethylphthalate (ug/kg)	0.39	170	48	37	7	23	30%	12	117	42	0.87	9	66	33
Dimethylphthalate (ug/kg)	1.05	1200	141	73	13	23	56%	4	225	248	1.76	52	256	65
Total Phthalates[4]	3600	48800	20200	18000	23	23	100%	5750	35800	13600	0.67	2840	25700	14900
Insecticides														
Bifenthrin (ug/Kg)	0.376	142	28.5	20	9	10	90%	4.54	42.3	41.1	1.44	13	56	11.2
PCBs														
Aroclor-1016 (ug/Kg)	0.05	4	1.5	1.20	1	23	4%	0	3	1	0.84	0.262	2.01	1.00
Aroclor-1221 (ug/Kg)	0.21	49	10.4	3.60	2	23	8%	0	33	15	1.44	3.14	16.8	5.0
Aroclor-1232 (ug/Kg)	0.01	74	9.1	3.09	2	23	8%	0	21	18	1.98	3.75	17.1	3.0
Aroclor-1242 (ug/Kg)	0.05	4	1.4	1.01	1	23	4%	0	3	1	0.89	0.265	1.95	0.9
Aroclor-1248 (ug/Kg)	0.02	4	1.5	1.32	1	23	4%	0	3	1	0.78	0.237	1.9	1.0
Aroclor-1254 (ug/Kg)	0.25	581	174	98	14	23	60%	1	482	198	1.14	41.3	254	98.8
Aroclor-1260 (ug/Kg)	0.15	910	78	6	6	23	26%	1	202	200	2.56	41.8	171	15.9
TOTAL PCBs[5]	0	910	252	160	16	23	69%	0	571	269	1.07	56	364	150
Herbicides														
Dichlobenil (ug/L)	1	33	16	15	4	4	100%	3	29	14	0.91	7	27	4
Phenolics														
2-Methylphenol (ug/Kg dry)	6.73	36	20.3	19.00	1	4	25%	10.4	31.2	12.2	0.602	6.1	32	10
4-Methylphenol (ug/Kg dry)	17.20	2300	719.0	484.00	5	6	83%	51.1	1620	874	1.22	357	1440	190
Pentachlorophenol (ug/Kg dry)	19.30	830	326.0	228.00	3	4	75%	58.2	673	356	1.09	178	660	84

[1] *Total LPAHs is the sum of the concentration or non-detected calculated value of the following compounds: Naphthalene, acenaphthene, acenaphthylene, anthracene, fluorene, and phenanthrene.*

[2] *Total HPAHs is the sum of the concentration of non-detected calculated value of the following compounds: Fluoranthene, pyrene, benzo(a)anthracene, chrysene, benzo(b,k)fluoranthene, benzo(b,k)fluoranthene, benzo(a)pyrene, indeno(1,2,3-c,d)pyrene, dibenz(a,h)anthracene, benzo(g,h,i)perylene.*

[3] *Total PAHs is the sum of the LPAHs and HPAHs.*

[4] *Total phthalates is the sum of detected values only.*

[5] *Total value for PCBs is the sum of detected values only.*

Bold – The analyte was present in the sample.
U – The analyte was not detected at or above the reported value.
UJ – The analyte was not detected at or above the reported estimated value.
J – The analyte was positively identified. The associated value is an estimate.
NJ - There is evidence the analyte is present. The associated value is an estimate.
E - Estimated above the calibration curve.

Table E-16
Summary Statistics for Stormwater Sediment at OF235 FD6
WY2002-WY2024

	Minimum	Maximum	Arithmetic Mean	Median	Detects	Count	Percent Detects	10th Per	90th Per	Standard Deviation	Coefficient of Variation	Standard Error	95% UCL	95% LCL
Conventionals														
Total Organic Carbon (mg/Kg)	3.45	9.93	5.86	5.65	23	23	100%	4.09	8.02	1.60	0.27	0.33	6.52	5.24
Total Solids (%)	54.5	72.8	63.0	62.3	23	23	100%	56.6	70.6	5.5	0.09	1.1	65.2	60.9
Total Volatile Solids (%)	10.4	14.7	12.8	12.9	10	10	100%	11.2	14.4	1.3	0.10	0.4	13.5	12.0
Nutrients														
Phosphorus, Total (mg/Kg)	549	1180	837	811	10	10	100%	562	1170	236	0.28	75	976	702
Metals														
Cadmium (mg/Kg dry)	0.001	0.819	0.395	0.406	10	12	83%	0.059	0.722	0.304	0.77	0.088	0.555	0.231
Copper (mg/Kg dry)	84.4	199	137	138	12	12	100%	94	173	34	0.25	10	156	120
Lead (mg/Kg dry)	88.2	286.0	161.0	148.0	23	23	100%	97.0	243.0	54.0	0.34	11.3	184.0	141.0
Mercury (mg/Kg dry)	0.0480	1.350	0.146	0.081	23	23	100%	0.053	0.201	0.268	1.84	0.056	0.265	0.075
Zinc (mg/Kg dry)	219	789	458	396	23	23	100%	298	697	165	0.36	34	525	395
TPH														
NWTPH-Diesel (mg/Kg)	13	1000	156	120	18	23	78%	22	228	196	1.26	41	246	97
NWTPH-Heavy Oil (mg/Kg)	1600	4700	2990	2600	23	23	100%	2100	4480	937	0.31	195	3370	2630
PAHs														
LPAHs														
2-Methylnaphthalene (ug/Kg)	11.5	150	77	75	17	23	73%	29	117	36	0.47	7.5	92	62
Acenaphthene (ug/Kg)	4.0	270	66	58	16	23	69%	20	118	56	0.85	11.6	91	46
Acenaphthylene (ug/Kg)	1.8	179	30	23	7	23	30%	5	47	36	1.19	7.5	46	19
Anthracene (ug/Kg)	35	430	174	170	23	23	100%	52	344	113	0.65	23.5	221	131
Fluorene (ug/Kg)	9.23	270	88	74	18	23	78%	26	162	61	0.69	12.8	114	65
Naphthalene (ug/Kg)	8.18	251	91	87	17	23	73%	39	136	52	0.57	10.8	113	72
Phenanthrene (ug/Kg)	263	2400	1010	960	23	23	100%	344	1640	544	0.54	113.0	1230	796
Total LPAHs	152	2030	1200	1120	11	23	47%	484	2000	611	0.51	127	1440	961
HPAHs														
Benzo(a)anthracene (ug/Kg)	120	1300	581	520	23	23	100%	218	1010	316	0.54	66	712	460
Benzo(a)pyrene (ug/Kg)	184	1100	574	540	23	23	100%	255	950	272	0.47	57	686	466
Benzo(b,k)fluoranthene (ug/Kg)	439	2700	1290	1250	23	23	100%	571	2290	672	0.52	140	1560	1030
Benzo(g,h,i)perylene (ug/Kg)	176	1600	500	343	23	23	100%	201	941	364	0.73	76	656	366
Chrysene (ug/Kg)	297	1800	898	880	23	23	100%	354	1600	464	0.52	97	1090	717
Dibenz(a,h)anthracene (ug/Kg)	0.056	900	119	82	16	23	69%	28	191	180	1.51	38	204	67.6
Fluoranthene (ug/Kg)	432	2650	1320	1160	23	23	100%	635	2280	624	0.47	130	1580	1080
Indeno(1,2,3-c,d)pyrene (ug/Kg)	153	930	348	284	22	23	95%	166	611	195	0.559	40.6	431	277
Pyrene (ug/Kg)	560	4200	1770	1790	23	23	100%	661	2880	1020	0.58	214	2190	1380
Retene	73	327	179	158	4	4	100%	87	288	111	0.62	56	275	96
Total HPAHs	488	11500	6450	6600	11	23	47%	2740	11000	3320	0.51	692	7810	5140
Total PAHs	2470	13500	7650	7900	11	23	47%	3520	12300	3500	0.46	729	9030	6260
Phthalates														
Butyl benzyl phthalate (ug/Kg)	12.2	3800	1160	1150	22	23	95%	526	2000	795	0.69	166	1500	866
bis(2-Ethylhexyl) phthalate (ug/Kg)	1600	22000	12500	12500	23	23	100%	6690	18800	4980	0.40	1040	14400	10500
Di-n-butylphthalate (ug/kg)	41	392	204	190	22	23	95%	65	351	107	0.52	22	248	163
Di-n-octylphthalate (ug/kg)	0.796	2800	803	750	14	23	60%	26	1830	864	1.08	180	1160	468
Diethylphthalate (ug/kg)	0.515	89	28	21	5	23	21%	3	75	26	0.95	5	38.9	17.9
Dimethylphthalate (ug/kg)	15.7	569	145	93	19	23	82%	59	295	140	0.97	29	205	95.1
Total Phthalates	2960	28900	14700	14800	23	23	100%	7540	20900	5870	0.40	1220	17100	12500
Insecticides														
Bifenthrin (ug/Kg)	6	24	14	14	10	10	100%	7	22	6	0.46	2	17	10
PCBs														
Aroclor-1016 (ug/Kg)	0.09	1.74	0.741	0.612	1	23	4%	0.150	1.53	0.512	0.69	0.107	0.954	0.542
Aroclor-1221 (ug/Kg)	0.046	1.74	0.96	1.03	1	23	4%	0.141	1.68	0.600	0.63	0.125	1.190	0.711
Aroclor-1232 (ug/Kg)	0.16	1.74	0.858	0.808	1	23	4%	0.179	1.59	0.543	0.63	0.113	1.080	0.647
Aroclor-1242 (ug/Kg)	0.08	420	28.7	4.02	2	23	8%	0.697	37.7	86.8	3.02	18.1	67.5	6.3
Aroclor-1248 (ug/Kg)	0.077	1.93	0.836	0.617	1	23	4%	0.266	1.63	0.554	0.66	0.115	1.060	0.624
Aroclor-1254 (ug/Kg)	0.166	280	32.3	9.79	9	23	39%	0.500	52.2	59.9	1.86	12.5	59.7	13.3
Aroclor-1260 (ug/Kg)	0.35	44.0	11.8	4.54	3	23	13%	0.566	35.1	14.3	1.22	2.99	18.0	6.54
TOTAL PCBs	0	420	49	0	10	23	43%	0	104	102	2.08	21	96	15
Herbicides														
Dichlobenil (ug/L)	6	76	44	47	4	4	100%	17	69	29	0.66	15	67	18
Phenolics														
2-Methylphenol (ug/Kg dry)	9.59	67	34.6	27.10	3	7	42%	16	60	20	0.58	8	49	22
4-Methylphenol (ug/Kg dry)	44.00	440	207.0	175.00	10	10	100%	94	374	133	0.64	42	289	133
Pentachlorophenol (ug/Kg dry)	19.20	17800	3040.0	108.00	3	6	50%	20	8980	7230	2.38	2950	8950	50

[1] *Total LPAHs is the sum of the concentration or non-detected calculated value of the following compounds: Naphthalene, acenaphthene, acenaphthylene, anthracene, fluorene, and phenanthrene.*

[2] *Total HPAHs is the sum of the concentration of non-detected calculated value of the following compounds: Fluoranthene, pyrene, benzo(a)anthracene, chrysene, benzo(b,k)fluoranthene, benzo(b,k)fluoranthene, benzo(a)pyrene, indeno(1,2,3-c,d)pyrene, dibenz(a,h)anthracene, benzo(g,h,i)perylene.*

[3] *Total PAHs is the sum of the LPAHs and HPAHs.*

[4] *Total phthalates is the sum of detected values only.*

[5] *Total value for PCBs is the sum of detected values only.*

Bold – The analyte was present in the sample.
U – The analyte was not detected at or above the reported value.
UJ – The analyte was not detected at or above the reported estimated value.
J – The analyte was positively identified. The associated value is an estimate.
NJ - There is evidence the analyte is present. The associated value is an estimate.
E - Estimated above the calibration curve.

Table E-17
Summary Statistics for Stormwater Sediment at OF237A FD2
WY2002-WY2024

	Minimum	Maximum	Arithmetic Mean	Median	Detects	Count	Percent Detects	10th Per	90th Per	Standard Deviation	Coefficient of Variation	Standard Error	95% UCL	95% LCL
Conventionals														
Total Organic Carbon (mg/Kg)	2.86	17.0	7.1	6.0	23	23	100%	4.1	11.8	3.5	0.49	0.7	8.6	5.7
Total Solids (%)	48.6	91.7	61.2	61.0	23	23	100%	54.0	66.2	8.4	0.14	1.7	64.9	58.2
Total Volatile Solids (%)	8.8	18.7	13.7	13.7	10	10	100%	10.6	18.7	3.3	0.24	1.0	15.7	11.9
Nutrients														
Phosphorus, Total (mg/Kg)	575	1880	944	790	10	10	100%	583	1350	407	0.43	129	1210	732
Metals														
Cadmium (mg/Kg dry)	0.278	0.853	0.536	0.500	11	11	100%	0.399	0.752	0.173	0.323	0.052	0.636	0.440
Copper (mg/Kg dry)	57.7	100	80	71	11	11	100%	65	100	16	0.20	4.8	89	71.1
Lead (mg/Kg dry)	50.9	114.0	81.9	80.1	23	23	100%	58.4	104.0	18.1	0.22	3.8	89.1	74.7
Mercury (mg/Kg dry)	0.029	0.129	0.066	0.066	23	23	100%	0.047	0.087	0.022	0.34	0.005	0.076	0.058
Zinc (mg/Kg dry)	220	540	358	344	23	23	100%	269	473	85	0.24	17.7	393	324
TPH														
NWTPH-Diesel (mg/Kg)	10.0	780	132	120	19	23	82%	19	168	152	1.15	32	203	85
NWTPH-Heavy Oil (mg/Kg)	1400	4300	2840	2600	23	23	100%	2000	4060	866	0.31	181	3200	2500
PAHs														
LPAHs														
2-Methylnaphthalene (ug/Kg)	3.08	184	71	59	16	23	69%	18.4	136	45	0.64	9.42	89.6	53.3
Acenaphthene (ug/Kg)	11	300	88	65	20	23	86%	19.8	187	72	0.81	15.0	119	61.4
Acenaphthylene (ug/Kg)	0.453	29	15	15	9	23	39%	4.76	27.8	8.99	0.59	1.87	18.7	11.5
Anthracene (ug/Kg)	43	890	324	304	23	23	100%	119	596	207	0.64	43.1	410	247
Fluorene (ug/Kg)	18	270	134	120	23	23	100%	47.8	244	75	0.56	15.7	165	105
Naphthalene (ug/Kg)	7.85	220	99	108	20	23	86%	28.2	140	49	0.50	10.2	118	79.6
Phenanthrene (ug/Kg)	247	4600	2160	2100	23	23	100%	863	3920	1230	0.57	257	2680	1680
Total LPAHs	81.3	16500	3450	2300	11	23	47%	858	7100	3800	1.10	793	5130	2130
HPAHs														
Benzo(a)anthracene (ug/Kg)	194	3700	1720	1580	23	23	100%	508	2920	962	0.56	201	2110	1340
Benzo(a)pyrene (ug/Kg)	260	3300	1720	1700	23	23	100%	466	2920	841	0.49	175	2050	1390
Benzo(b,k)fluoranthene (ug/Kg)	721	8500	4250	4210	23	23	100%	954	7680	2300	0.54	479	5180	3350
Benzo(g,h,i)perylene (ug/Kg)	180	9300	1640	1230	23	23	100%	331	2640	1850	1.13	387	2490	1040
Chrysene (ug/Kg)	305	6900	2580	2200	23	23	100%	777	4240	1560	0.60	325	3240	2000
Dibenz(a,h)anthracene (ug/Kg)	37	2800	463	355	22	23	95%	83	706	568	1.23	118	720	279
Fluoranthene (ug/Kg)	671	7700	3630	3680	23	23	100%	1420	5340	1630	0.45	341	4280	2990
Indeno(1,2,3-c,d)pyrene (ug/Kg)	205	2800	1290	1300	23	23	100%	336	2080	660	0.51	138	1560	1030
Pyrene (ug/Kg)	551	9500	4060	4020	23	23	100%	1480	6260	2390	0.59	498	5060	3140
Retene	138	475	303	300	4	4	100%	139	470	189	0.62	95	466	140
Total HPAHs	358	24000	13700	14100	11	23	47%	3690	20700	6540	0.48	1360	16200	11000
Total PAHs	1720	30700	17100	18100	11	23	47%	4220	26700	7870	0.46	1640	20200	14000
Phthalates														
Butyl benzyl phthalate (ug/kg)	140	2200	799	650	23	23	100%	281	1680	562	0.70	117	1040	588
bis(2-Ethylhexyl) phthalate (ug/Kg)	1300	24000	9320	6900	23	23	100%	4140	15900	5700	0.61	1190	11800	7170
Di-n-butylphthalate (ug/kg)	7.01	1100	300	232	19	23	82%	70	612	265	0.88	55	414	204
Di-n-octylphthalate (ug/kg)	3.13	4800	886	770	16	23	69%	14	1770	1080	1.22	225	1370	511
Diethylphthalate (ug/kg)	1.38	250	55	37	7	23	30%	11	143	60	1.10	13	81	33
Dimethylphthalate (ug/kg)	9.14	2200	249	110	18	23	78%	30	464	457	1.84	95	455	110
Total Phthalates	1660	31200	11500	10100	23	23	100%	4990	18800	7090	0.61	1480	14500	8920
Insecticides														
Bifenthrin (ug/Kg)	12	44	29	30	10	10	100%	14.7	43.1	11.9	0.414	3.76	35.7	21.8
PCBs														
Aroclor-1016 (ug/Kg)	0.055	1.76	0.864	0.85	1	23	4%	0.208	1.39	0.483	0.560	0.101	1.06	0.670
Aroclor-1221 (ug/Kg)	0.127	1.76	0.728	0.64	1	23	4%	0.186	1.54	0.506	0.695	0.106	0.93	0.533
Aroclor-1232 (ug/Kg)	0.091	1.76	0.830	0.88	1	23	4%	0.197	1.70	0.572	0.688	0.119	1.06	0.612
Aroclor-1242 (ug/Kg)	0.011	1.76	0.735	0.88	1	23	4%	0.055	1.47	0.512	0.696	0.107	0.94	0.531
Aroclor-1248 (ug/Kg)	0.027	1.94	0.939	0.96	1	23	4%	0.092	1.79	0.639	0.680	0.133	1.20	0.685
Aroclor-1254 (ug/Kg)	0.168	390	44.9	7.03	8	23	34%	0.411	107	88.0	1.96	18.4	84.3	16.1
Aroclor-1260 (ug/Kg)	0.113	150	39.1	12.2	9	23	39%	1.00	108	46.9	1.20	9.8	58.8	21.0
TOTAL PCBs	0	390	74	63	14	23	60%	0.0	174	93.4	1.27	19.5	115	40.5
Herbicides														
Dichlobenil (ug/L)	0.732	38	21	22	4	4	100%	6.21	34.10	15.5	0.75	7.74	33.2	6.8
Phenolics														
2-Methylphenol (ug/Kg dry)	1.11	7.54	4.50	4.84	1	3	33%	1.86	7.00	3.23	0.72	1.86	7.54	1.11
4-Methylphenol (ug/Kg dry)	56.00	4700	1070.0	479.00	7	7	100%	66	2660	1660	1.55	627	2370	236
Pentachlorophenol (ug/Kg dry)	52.40	326	182.0	174.00	4	4	100%	84	285	113	0.62	56	284	87

[1] *Total LPAHs is the sum of the concentration or non-detected calculated value of the following compounds: Naphthalene, acenaphthene, acenaphthylene, anthracene, fluorene, and phenanthrene.*

[2] *Total HPAHs is the sum of the concentration of non-detected calculated value of the following compounds: Fluoranthene, pyrene, benzo(a)anthracene, chrysene, benzo(b,k)fluoranthene, benzo(b,k)fluoranthene, benzo(a)pyrene, indeno(1,2,3-c,d)pyrene, dibenz(a,h)anthracene, benzo(g,h,i)perylene.*

[3] *Total PAHs is the sum of the LPAHs and HPAHs.*

[4] *Total phthalates is the sum of detected values only.*

[5] *Total value for PCBs is the sum of detected values only.*

Bold – The analyte was present in the sample.
U – The analyte was not detected at or above the reported value.
UJ – The analyte was not detected at or above the reported estimated value.
J – The analyte was positively identified. The associated value is an estimate.
NJ - There is evidence the analyte is present. The associated value is an estimate.
E - Estimated above the calibration curve.

Table E-18
Summary Statistics for Stormwater Sediment at OF237B FD1
WY2002-WY2024

	Minimum	Maximum	Arithmetic Mean	Median	Detects	Count	Percent Detects	10th Per	90th Per	Standard Deviation	Coefficient of Variation	Standard Error	95% UCL	95% LCL
Conventionals														
Total Organic Carbon (mg/Kg)	0.572	11	3.1	2.3	23	23	100%	1.4	5.1	2.3	0.75	0.5	4.0	2.3
Total Solids (%)	54.5	82.8	69.7	68.5	23	23	100%	63.2	77.2	6.8	0.10	1.4	72.4	66.9
Total Volatile Solids (%)	3.1	15.2	5.8	5.0	10	10	100%	3.6	7.2	3.5	0.60	1.1	8.1	4.3
Nutrients														
Phosphorus, Total (mg/Kg)	375	662	526	520	10	10	100%	401	658	102	0.19	32	585	466
Metals														
Cadmium (mg/Kg dry)	0.034	2.030	0.462	0.341	12	12	100%	0.087	0.641	0.524	1.13	0.151	0.795	0.247
Copper (mg/Kg dry)	30.9	64	44	41	12	12	100%	34	62	11	0.24	3	50	39
Lead (mg/Kg dry)	20.6	129.0	46.7	39.5	23	23	100%	27.6	71.1	23.3	0.50	4.9	56.7	38.4
Mercury (mg/Kg dry)	0.0150	0.162	0.046	0.040	22	23	95%	0.018	0.068	0.032	0.69	0.007	0.060	0.035
Zinc (mg/Kg dry)	123	280	200	198	23	23	100%	149	257	39	0.20	8	216	184
TPH														
NWTPH-Diesel (mg/Kg)	1.70	780	77.1	39	15	23	65%	15	123	157	2.04	33	148	35
NWTPH-Heavy Oil (mg/Kg)	520	3000	1310	1380	23	23	100%	760	1780	603	0.46	126	1570	1080
PAHs														
LPAHs														
2-Methylnaphthalene (ug/Kg)	0.823	120	28	22	8	23	34%	6.6	62	27	0.97	5.7	40	19
Acenaphthene (ug/Kg)	1.04	170	41	13	10	23	43%	2.1	128	53	1.28	11.0	63	22
Acenaphthylene (ug/Kg)	1.42	32	14	11	5	23	21%	5.7	22	8	0.58	1.7	17	11
Anthracene (ug/Kg)	0.604	500	115	40	17	23	73%	8.3	344	142	1.23	29.7	177	63
Fluorene (ug/Kg)	0.120	240	62	24	12	23	52%	8.5	176	68	1.11	14.3	91	37
Naphthalene (ug/Kg)	0.340	160	35	26	8	23	34%	3.1	83	38	1.08	7.8	51	21
Phenanthrene (ug/Kg)	36.0	3500	874	394	23	23	100%	110	2320	939	1.08	196	1270	526
Total LPAHs	11.3	555	223	182	11	23	47%	40	510	171	0.77	36	296	158
HPAHs														
Benzo(a)anthracene (ug/Kg)	52	2200	553	301	23	23	100%	84	1200	545	0.99	114	784	354
Benzo(a)pyrene (ug/Kg)	62	2200	541	328	23	23	100%	109	1200	517	0.96	108	762	354
Benzo(b,k)fluoranthene (ug/Kg)	147	7300	1610	848	23	23	100%	356	3840	1790	1.11	374	2400	949
Benzo(g,h,i)perylene (ug/Kg)	47	2900	659	260	23	23	100%	119	1760	813	1.23	169	1010	357
Chrysene (ug/Kg)	68	3000	793	460	23	23	100%	150	1700	759	0.96	158	1110	513
Dibenz(a,h)anthracene (ug/Kg)	7.09	410	120	64	19	23	82%	17	224	114	0.95	24	167	78
Fluoranthene (ug/Kg)	77	4700	1340	795	23	23	100%	242	2660	1210	0.91	253	1850	870
Indeno(1,2,3-c,d)pyrene (ug/Kg)	65	1600	423	255	23	23	100%	126	842	403	0.95	84	601	277
Pyrene (ug/Kg)	73	7400	1500	832	23	23	100%	235	3280	1700	1.13	354	2250	893
Retene	2.01	86.7	38.9	33.5	3	4	75%	8	74	36.4	0.93	18.2	70.5	12.0
Total HPAHs	6.42	4170	1570	1370	11	23	47%	315	3070	1120	0.71	233	2030	1140
Total PAHs	511	4730	1790	1470	11	23	47%	640	3390	1180	0.66	245	2280	1340
Phthalates														
Butyl benzyl phthalate (ug/kg)	15.8	1700	281	141	22	23	95%	45	682	369	1.31	77	445	156
bis(2-Ethylhexyl) phthalate (ug/Kg)	1360	17000	4040	3040	23	23	100%	1540	6500	3410	0.84	711	5560	2870
Di-n-butylphthalate (ug/kg)	1.21	490	103	62	14	23	60%	10	201	117	1.14	25	154	62
Di-n-octylphthalate (ug/kg)	0.813	2000	473	410	14	23	60%	11	878	513	1.08	107	688	281
Diethylphthalate (ug/kg)	2.99	190	35	24	6	23	26%	8	68	41	1.16	8	53	21
Dimethylphthalate (ug/kg)	1.10	7200	361	25	7	23	30%	4	94	1490	4.14	311	1000	28
Total Phthalates	1570	21100	5240	3710	23	23	100%	1660	7800	4950	0.95	1030	7430	3520
Insecticides														
Bifenthrin (ug/Kg)	2	21	9	7	10	10	100%	3.8	17.4	5.90	0.65	1.86	12.8	5.9
PCBs														
Aroclor-1016 (ug/Kg)	0.086	1.74	0.831	1	1	23	4%	0.146	1.44	0.513	0.617	0.107	1.04	0.625
Aroclor-1221 (ug/Kg)	0.061	1.74	0.779	0.8	1	23	4%	0.246	1.57	0.483	0.620	0.101	0.97	0.587
Aroclor-1232 (ug/Kg)	0.196	1.74	0.780	1	1	23	4%	0.301	1.22	0.379	0.486	0.079	0.94	0.637
Aroclor-1242 (ug/Kg)	0.054	1.74	0.961	1	1	23	4%	0.157	1.57	0.504	0.524	0.105	1.16	0.759
Aroclor-1248 (ug/Kg)	0.010	1.93	0.819	1	1	23	4%	0.238	1.67	0.541	0.661	0.113	1.05	0.614
Aroclor-1254 (ug/Kg)	0.043	43	7.93	3	3	23	13%	0.271	19.2	11.4	1.43	2.37	12.9	3.91
Aroclor-1260 (ug/Kg)	0.040	45	11.4	4.3	5	23	21%	0.465	31.6	13.6	1.19	2.83	17.1	6.27
TOTAL PCBs	0	88	7.77	0	5	22	22%	0.0	28.8	20.5	2.64	4.38	17.4	1.36
Herbicides														
Dichlobenil (ug/L)	0.745	7	2.94	2	4	4	100%	1.12	5.5	2.77	0.94	1.39	5.75	1.06
Phenolics														
2-Methylphenol (ug/Kg dry)	1.38	7.67	5.65	5.43	1	7	14%	3.3	7.61	2.27	0.402	0.857	6.99	3.98
4-Methylphenol (ug/Kg dry)	9.19	900	274	150	9	10	90%	18	819	333	1.22	105	482	96.2
Pentachlorophenol (ug/Kg dry)	0.045	204	47.6	18.7	2	6	33%	0.906	123	79	1.65	32.1	113	6.82

[1] *Total LPAHs is the sum of the concentration or non-detected calculated value of the following compounds: Naphthalene, acenaphthene, acenaphthylene, anthracene, fluorene, and phenanthrene.*
[2] *Total HPAHs is the sum of the concentration of non-detected calculated value of the following compounds: Fluoranthene, pyrene, benzo(a)anthracene, chrysene, benzo(b,k)fluoranthene, benzo(b,k)fluoranthene, benzo(a)pyrene, indeno(1,2,3-c,d)pyrene, dibenz(a,h)anthracene, benzo(g,h,i)perylene.*
[3] *Total PAHs is the sum of the LPAHs and HPAHs.*
[4] *Total phthalates is the sum of detected values only.*
[5] *Total value for PCBs is the sum of detected values only.*

Bold – The analyte was present in the sample.
U – The analyte was not detected at or above the reported value.
UJ – The analyte was not detected at or above the reported estimated value.
J – The analyte was positively identified. The associated value is an estimate.
NJ - There is evidence the analyte is present. The associated value is an estimate.
E - Estimated above the calibration curve.

Table E-19
Summary Statistics for Stormwater Sediment at OF243 FD23
WY2002-WY2024

	Minimum	Maximum	Arithmetic Mean	Median	Detects	Count	Percent Detects	10th Per	90th Per	Standard Deviation	Coefficient of Variation	Standard Error	95% UCL	95% LCL
Conventionals														
Total Organic Carbon (mg/Kg)	3.71	14	8	8	18	18	100%	5.4	10.5	2.4	0.29	0.6	9.3	7.2
Total Solids (%)	18.6	47	31	31	23	23	100%	22.6	39.9	7.1	0.23	1.5	34.0	28.3
Total Volatile Solids (%)	17.0	25.8	21.5	21.2	10	10	100%	18.9	25.0	2.8	0.13	0.9	23.2	19.9
Nutrients														
Phosphorus, Total (mg/Kg)	1900	13700	7930	8840	7	7	100%	2040	13500	4920	0.62	1860	11200	4590
Metals														
Cadmium (mg/Kg dry)	1.79	5.55	3.24	2.92	10	10	100%	1.92	4.55	1.18	0.36	0.37	3.98	2.58
Copper (mg/Kg dry)	174	288	230	229	10	10	100%	194	276	35	0.15	11	250	210
Lead (mg/Kg dry)	343	913	512	441	18	18	100%	379	744	167	0.33	39	591	443
Mercury (mg/Kg dry)	0.178	0.972	0.406	0.309	19	19	100%	0.212	0.720	0.236	0.58	0.054	0.518	0.313
Zinc (mg/Kg dry)	440	936	763	765	18	18	100%	648	908	124	0.16	29	817	705
TPH														
NWTPH-Diesel (mg/Kg)	0.715	670	209	185	18	22	81%	10	396	180	0.87	39	286	140
NWTPH-Heavy Oil (mg/Kg)	1700	7400	4290	4090	22	22	100%	2510	6550	1600	0.37	340	4940	3640
PAHs														
LPAHs														
2-Methylnaphthalene (ug/Kg)	29	260	115	107	21	22	95%	58	149	52	0.45	11	137	95
Acenaphthene (ug/Kg)	0.181	211	55	42	15	22	68%	6	92	54	0.98	12	79	35
Acenaphthylene (ug/Kg)	6.44	130	62	59	15	22	68%	18	126	36	0.58	8	78	48
Anthracene (ug/Kg)	40	1000	304	295	22	22	100%	128	458	198	0.65	42	393	231
Fluorene (ug/Kg)	15	330	109	90	20	22	90%	46	198	81	0.74	17	144	79
Naphthalene (ug/Kg)	52	393	182	170	22	22	100%	106	280	82	0.45	18	218	151
Phenanthrene (ug/Kg)	134	2900	928	680	22	22	100%	422	1970	708	0.76	151	1240	664
Total LPAHs	97.7	1930	870	883	11	22	50%	267	1220	468	0.54	100	1070	679
HPAHs														
Benzo(a)anthracene (ug/Kg)	64.2	1700	666	569	21	22	95%	190	1110	407	0.61	87	837	501
Benzo(a)pyrene (ug/Kg)	112	1200	695	650	21	22	95%	283	1100	312	0.45	67	818	570
Benzo(b,k)fluoranthene (ug/Kg)	287	4200	1780	1720	22	22	100%	663	2740	931	0.52	199	2190	1420
Benzo(g,h,i)perylene (ug/Kg)	157	2100	660	515	21	22	95%	233	1280	486	0.74	104	877	479
Chrysene (ug/Kg)	184	2400	1290	1120	22	22	100%	506	2100	642	0.50	137	1550	1030
Dibenz(a,h)anthracene (ug/Kg)	8.18	1700	175	92.5	18	22	81%	25	256	348	1.98	74	335	83
Fluoranthene (ug/Kg)	186	3770	1500	1330	22	22	100%	694	2500	808	0.54	172	1830	1180
Indeno(1,2,3-c,d)pyrene (ug/Kg)	33.9	950	400	374	20	22	90%	122	695	238	0.59	51	499	306
Pyrene (ug/Kg)	316	5700	2190	1750	22	22	100%	864	3700	1410	0.64	300	2800	1640
Retene	70.0	240	166	178	4	4	100%	95	229	73	0.44	37	221	103
Total HPAHs	1540	13100	7320	6900	11	22	50%	3340	11800	3340	0.46	712	8710	5990
Total PAHs	1800	15000	8190	7870	11	22	50%	4030	12300	3410	0.42	726	9580	6820
Phthalates														
Butyl benzyl phthalate (ug/kg)	150	51000	7610	2250	22	22	100%	505	20000	13000	1.71	2780	13600	2930
bis(2-Ethylhexyl) phthalate (ug/Kg)	1830	41000	15100	12600	22	22	100%	5280	29000	11000	0.73	2340	19800	10900
Di-n-butylphthalate (ug/kg)	16.2	725	225	180	20	22	90%	67	439	177	0.79	38	302	160
Di-n-octylphthalate (ug/kg)	1.55	4000	1000	664	15	22	68%	13	3260	1210	1.20	257	1540	549
Diethylphthalate (ug/kg)	5.73	180	48.7	31.9	7	22	31%	9	109	45	0.92	10	68	32
Dimethylphthalate (ug/kg)	6.26	390	98.7	58.5	17	22	77%	17	208	105	1.06	22	145	60
Total Phthalates	1990	96400	24000	17100	22	22	100%	7080	48400	22300	0.93	4750	33900	15800
Insecticides														
Bifenthrin (ug/Kg)	2	29	14	15	10	10	100%	6	25	8	0.58	3	19	10
PCBs														
Aroclor-1016 (ug/Kg)	0.162	1.79	0.79	0.75	1	18	5%	0.283	1.32	0.45	0.57	0.106	1.00	0.60
Aroclor-1221 (ug/Kg)	0.080	1.79	0.72	0.46	1	18	5%	0.126	1.68	0.63	0.88	0.149	1.01	0.45
Aroclor-1232 (ug/Kg)	0.021	1.79	0.82	0.71	1	18	5%	0.078	1.53	0.61	0.74	0.143	1.09	0.55
Aroclor-1242 (ug/Kg)	0.020	1.79	0.85	0.70	1	18	5%	0.109	1.63	0.63	0.75	0.149	1.13	0.57
Aroclor-1248 (ug/Kg)	0.152	1.98	1.05	0.99	1	18	5%	0.249	1.74	0.56	0.53	0.131	1.30	0.80
Aroclor-1254 (ug/Kg)	0.142	220	45.8	4.03	5	18	27%	0.234	153	72.1	1.58	17	79.8	15.6
Aroclor-1260 (ug/Kg)	0.174	96	14.0	2.75	2	18	11%	0.364	44.6	28.1	2.00	6.62	27.9	3.22
TOTAL PCBs	0	220	43.3	0	5	17	29%	0	178	81.8	1.89	19.8	83.5	9.41
Herbicides														
Dichlobenil (ug/L)	0.746	7	4	4	4	4	100%	1.12	6.70	3.03	0.77	1.52	6.5	1.37
Phenolics														
2-Methylphenol (ug/Kg dry)	4.79	11	7.5	7.08	2	4	50%	5	10	2.62	0.35	1.31	9.87	5.51
4-Methylphenol (ug/Kg dry)	14.0	5400	1060	157	6	7	85%	63	3020	1980	1.87	748	2570	97.9
Pentachlorophenol (ug/Kg dry)	106	226	172	178	4	4	100%	123	216	51	0.297	26	210	128

[1] *Total LPAHs is the sum of the concentration or non-detected calculated value of the following compounds: Naphthalene, acenaphthene, acenaphthylene, anthracene, fluorene, and phenanthrene.*
[2] *Total HPAHs is the sum of the concentration of non-detected calculated value of the following compounds: Fluoranthene, pyrene, benzo(a)anthracene, chrysene, benzo(b,k)fluoranthene, benzo(b,k)fluoranthene, benzo(a)pyrene, indeno(1,2,3-c,d)pyrene, dibenz(a,h)anthracene, benzo(g,h,i)perylene.*
[3] *Total PAHs is the sum of the LPAHs and HPAHs.*
[4] *Total phthalates is the sum of detected values only.*
[5] *Total value for PCBs is the sum of detected values only.*

Bold – The analyte was present in the sample.
U – The analyte was not detected at or above the reported value.
UJ – The analyte was not detected at or above the reported estimated value.
J – The analyte was positively identified. The associated value is an estimate.
NJ - There is evidence the analyte is present. The associated value is an estimate.
E - Estimated above the calibration curve.

Table E-20
Summary Statistics for Stormwater Sediment at OF245 MH390
WY2002-WY2024

	Minimum	Maximum	Arithmetic Mean	Median	Detects	Count	Percent Detects	10th Per	90th Per	Standard Deviation	Coefficient of Variation	Standard Error	95% UCL	95% LCL
Conventionals														
Total Organic Carbon (mg/Kg)	0.933	14	5.3	4.3	24	24	100%	1.4	12.2	3.8	0.73	0.8	6.8	3.9
Total Solids (%)	43.8	81	65.4	67.4	24	24	100%	45.2	78.9	12.4	0.19	2.5	70.1	60.4
Total Volatile Solids (%)	3	30.9	13.5	11.5	10	10	100%	5.5	25.9	9.1	0.68	2.9	19.1	8.4
Nutrients														
Phosphorus, Total (mg/Kg)	587	3290	1270	966	10	10	100%	618	1960	837	0.66	265	1830	849
Metals														
Cadmium (mg/Kg dry)	0.541	1.800	0.995	0.796	12	12	100%	0.556	1.760	0.485	0.487	0.140	1.270	0.749
Copper (mg/Kg dry)	45.2	276	124	114	13	13	100%	71	169	59	0.47	16.3	157	96.3
Lead (mg/Kg dry)	8.3	98.4	50.1	47.7	24	24	100%	22.3	84.2	25.1	0.50	5.13	60.0	40.5
Mercury (mg/Kg dry)	0.013	0.2110	0.0710	0.0570	23	24	95%	0.025	0.148	0.052	0.733	0.011	0.093	0.052
Zinc (mg/Kg dry)	80.9	679	424	438	24	24	100%	189	631	173	0.41	35.3	492	355
TPH														
NWTPH-Diesel (mg/Kg)	0.202	2400	325	120	15	24	62%	10	700	519	1.60	106	550	153
NWTPH-Heavy Oil (mg/Kg)	230	10000	3340	2950	24	24	100%	890	6480	2330	0.70	476	4320	2470
PAHs														
LPAHs														
2-Methylnaphthalene (ug/Kg)	0.193	355	54	40	13	24	54%	14	74	68	1.27	13.9	85	33.9
Acenaphthene (ug/Kg)	2.80	248	41	27	8	24	33%	6	80	52	1.29	10.6	63	23.3
Acenaphthylene (ug/Kg)	0.98	29	14	13	8	24	33%	5	27	9	0.61	1.8	18	10.8
Anthracene (ug/Kg)	1.7	1660	141	37	15	23	65%	10.8	222	350	2.48	72.9	308	40.8
Fluorene (ug/Kg)	4.6	260	46	25	11	24	45%	7	80	62	1.35	12.7	74	25.1
Naphthalene (ug/Kg)	11.1	150	67	56	13	24	54%	33	119	36	0.55	7.4	82	53.2
Phenanthrene (ug/Kg)	2.0	1410	259	145	21	23	91%	54	609	315	1.22	65.8	399	152
Total LPAHs	14.4	1050	408	361	11	24	45%	51	921	304	0.75	62	529	293
HPAHs														
Benzo(a)anthracene (ug/Kg)	4.81	3740	287	82	20	24	83%	18	390	755	2.63	154	618	89
Benzo(a)pyrene (ug/Kg)	7.7	2240	217	109	19	24	79%	20	328	447	2.06	91	411	95
Benzo(b,k)fluoranthene (ug/Kg)	29.8	1870	344	222	20	24	83%	68	769	394	1.15	81	520	210
Benzo(g,h,i)perylene (ug/Kg)	32.9	1660	206	126	23	24	95%	60	297	321	1.55	66	350	118
Chrysene (ug/Kg)	15.9	6490	497	160	23	24	95%	56	566	1300	2.61	265	1060	173
Dibenz(a,h)anthracene (ug/Kg)	4.34	616	57	31	8	24	33%	5	79	122	2.13	25	111	25
Fluoranthene (ug/Kg)	52.0	3840	432	220	22	23	95%	97	738	778	1.80	162	793	207
Indeno(1,2,3-c,d)pyrene (ug/Kg)	6.09	608	102	71	15	24	62%	28	194	122	1.20	25	157	64
Pyrene (ug/Kg)	91.5	12100	953	334	22	23	95%	120	1150	2450	2.57	511	2040	345
Retene	22	79	44	37	4	4	100%	26	67	25	0.57	12.5	68.1	26.2
Total HPAHs	204	4700	1630	1300	11	24	45%	459	3390	1200	0.74	245	2110	1190
TOTAL PAHs	515	5750	2030	1490	11	24	45%	793	3750	1370	0.67	279	2590	1520
Phthalates														
Butyl benzyl phthalate (ug/kg)	2500	160000	26400	11000	24	24	100%	3580	56400	34800	1.32	7110	42100	14700
bis(2-Ethylhexyl) phthalate (ug/Kg)	1220	34000	9780	4860	23	24	95%	1610	32000	11600	1.18	2360	14500	5550
Di-n-butylphthalate (ug/kg)	4.37	15000	1070	220	20	23	86%	53.2	1450	3080	2.87	643	2450	282
Di-n-octylphthalate (ug/kg)	6.48	4250	386	72	13	24	54%	14.4	896	878	2.27	179	767	132
Diethylphthalate (ug/kg)	0.175	820	74.7	30.7	5	24	20%	8.03	118	163	2.18	33.3	148	31.6
Dimethylphthalate (ug/kg)	5.01	9810	484	52	12	23	52%	6.95	164	2030	4.20	424	1340	45
Total Phthalates	5330	207000	38000	14700	24	24	100%	5850	80600	45700	1.20	9340	57800	22600
Insecticides														
Bifenthrin (ug/Kg)	0.017	9	3	3	8	10	80%	0.153	7.2	3.2	0.953	1.01	5.32	1.60
PCBs														
Aroclor-1016 (ug/Kg)	0.019	3.59	1.4	1.16	1	22	4%	0.16	3.1	1.17	0.831	0.248	1.88	0.94
Aroclor-1221 (ug/Kg)	0.199	13.0	3.21	1.73	0	21	0%	0.58	7.5	3.56	1.11	0.778	4.85	1.85
Aroclor-1232 (ug/Kg)	0.641	10.9	2.80	1.59	0	21	0%	1.0	5.1	2.48	0.89	0.541	3.93	1.88
Aroclor-1242 (ug/Kg)	0.254	120	9.38	1.59	1	21	4%	0.33	12.3	25.8	2.76	5.640	21.6	2.33
Aroclor-1248 (ug/Kg)	0.010	14.3	4.18	2.42	0	21	0%	0.38	9.4	4.24	1.02	0.926	6.07	2.49
Aroclor-1254 (ug/Kg)	0.114	140	18.8	2.54	6	21	28%	0.23	64.0	34.3	1.83	7.49	34.7	6.58
Aroclor-1260 (ug/Kg)	0.036	180	19.2	3.17	3	21	14%	0.18	24.9	46.2	2.40	10.1	40.9	3.84
TOTAL PCBs	0	440	36.8	0	8	21	38%	0	70	98	2.67	21.4	84.4	6.5
Herbicides														
Dichlobenil (ug/L)	0.733	18	9	9	4	4	100%	2.91	15.6	7.1	0.773	3.55	15.5	3.1
Phenolics														
2-Methylphenol (ug/Kg dry)	0.36	119	33.1	21.40	1	6	16%	2.6	75.4	43.8	1.32	17.9	69.3	8.9
4-Methylphenol (ug/Kg dry)	2.20	100	32.2	11.00	2	9	22%	6.2	91.1	37.3	1.16	12.4	57.2	11.6
Pentachlorophenol (ug/Kg dry)	0.90	111	35.6	9.65	2	5	40%	3.2	86.6	46.4	1.30	20.8	76.8	4.9

[1] Total LPAHs is the sum of the concentration or non-detected calculated value of the following compounds: Naphthalene, acenaphthene, acenaphthylene, anthracene, fluorene, and phenanthrene.
[2] Total HPAHs is the sum of the concentration of non-detected calculated value of the following compounds: Fluoranthene, pyrene, benzo(a)anthracene, chrysene, benzo(b,k)fluoranthene, benzo(b,k)fluoranthene, benzo(a)pyrene, indeno(1,2,3-c,d)pyrene, dibenz(a,h)anthracene, benzo(g,h,i)perylene.
[3] Total PAHs is the sum of the LPAHs and HPAHs.
[4] Total phthalates is the sum of detected values only.
[5] Total value for PCBs is the sum of detected values only.

Bold – The analyte was present in the sample.
U – The analyte was not detected at or above the reported value.
UJ – The analyte was not detected at or above the reported estimated value.
J – The analyte was positively identified. The associated value is an estimate.
NJ - There is evidence the analyte is present. The associated value is an estimate.
E - Estimated above the calibration curve.

Table E-21
Baseflow Data at Outfall 230 for WY2016 and WY2019

	Minimum	Maximum	Arithmetic Mean	Median	# of Detects	Count	% Detects	10th Per	90th Per	Standard Deviation	Coefficient of Variation	Standard Error	95% UCL	95% LCL
Conventionals														
Anionic Surfactants - MBAS (ug/L)	0.013	0.0464	0.0	0.0327	4	5	80%	0.0161	0.0429	0.0	0.443	0.006	0.0	0.0
BOD (mg/L)	1.0	4.9	1.8	1.0	1	5	20%	1.0	3.3	1.7	0.980	0.780	3.9	-0.4
Chloride (mg/L)	13.3	44.4	21.6	17.2	5	5	100%	13.3	34.5	13.0	0.604	5.828	37.8	5.4
Conductivity (uS/cm)	126	20900	3201.9	248	7	7	100%	154	8609	7805	2.438	2949.91	10420.0	-4016.3
Hardness (mg CaCO3/L)	67	150	103.2	97.1	7	7	100%	71.9	147	32.3	0.313	12.22	133.1	73.3
pH (pH units)	7.0	8.1	7.7	7.9	7	7	100%	7.0	8.04	0.5	0.061	0.18	8.1	7.2
TSS (mg/L)	1.70	12.7	5.34	2.70	7	7	100%	2.00	12.46	4.92	0.922	1.86	9.9	0.8
Turbidity (NTU)	1.84	15.5	6.51	5.39	5	5	100%	2.26	12.076	5.41	0.831	2.42	13.2	-0.2
Nutrients														
Nitrate+Nitrite as N (mg/L)	0.513	1.570	0.998	0.934	6	6	100%	0.659	1.400	0.365	0.37	0.149	1.381	0.614
Phosphate, Ortho (mg/L)	0.057	0.165	0.116	0.113	6	6	100%	0.076	0.159	0.040	0.35	0.016	0.157	0.074
Phosphorus, Total (mg/L)	0.070	0.184	0.128	0.126	6	6	100%	0.083	0.176	0.045	0.35	0.018	0.175	0.081
Total Nitrogen (mg/L)	0.600	2.000	1.093	1.060	6	6	100%	0.605	1.615	0.522	0.48	0.213	1.642	0.545
Metals														
Cadmium (ug/L)	0.017	0.062	0.036	0.031	2	7	29%	0.019	0.058	0.017	0.472	0.006	0.052	0.020
Cadmium, Dissolved (ug/L)	0.013	0.040	0.024	0.025	2	7	29%	0.013	0.032	0.009	0.386	0.003	0.032	0.015
Copper (ug/L)	2.89	10.100	5.003	4.04	7	7	100%	3.232	7.622	2.445	0.489	0.924	7.264	2.741
Copper, Dissolved (ug/L)	1.78	7.06	3.19	2.68	7	7	100%	2.07	4.67	1.77	0.554	0.668	4.825	1.555
Lead (ug/L)	0.380	3.55	1.25	0.748	7	7	100%	0.46	2.39	1.11	0.888	0.420	2.280	0.224
Lead, Dissolved (ug/L)	0.010	0.386	0.202	0.232	6	7	86%	0.068	0.324	0.128	0.632	0.048	0.321	0.084
Mercury (ng/L)	0.0008	0.004	0.002	0.001	5	7	71%	0.00092	0.004	0.0014	0.705	0.0005	0.0033	0.0007
Mercury, Dissolved (ng/L)	0.0009	0.0045	0.0026	0.0025	1	7	14%	0.0019	0.0034	0.0010	0.406	0.0004	0.0035	0.0016
Zinc (ug/L)	10.3	85.7	29.4	15.0	7	7	100%	12.46	62.06	27.596	0.938	10.430	54.936	3.892
Zinc, Dissolved (ug/L)	6.47	34.2	14.3	11.3	7	7	100%	7.73	23.3	9.28	0.646	3.51	22.9	5.77
Insecticides														
Carbaryl (ug/L)	0.030	0.030	0.030	0.030	0	4	0%	0.030	0.030	0	0	0	0.030	0.030
Chlorpyrifos (ug/L)	0.0255	0.0295	0.0268	0.0260	0	7	0%	0.0255	0.0295	0.002	0.070	0.001	0.029	0.025
PAHs														
LPAHs														
2-Methylnaphthalene (ug/L)	0.005	0.013	0.007	0.005	2	7	29%	0.005	0.012	0.003	0.49	0.001	0.010	0.004
Acenaphthene (ug/L)	0.0025	0.007	0.005	0.005	1	7	14%	0.004	0.006	0.001	0.26	0.000	0.006	0.004
Acenaphthylene (ug/L)	0.0015	0.005	0.004	0.005	1	7	14%	0.003	0.005	0.001	0.30	0.000	0.006	0.003
Anthracene (ug/L)	0.003	0.008	0.005	0.005	1	7	14%	0.003	0.006	0.002	0.35	0.001	0.006	0.003
Fluorene (ug/L)	0.004	0.007	0.006	0.005	3	7	43%	0.005	0.007	0.001	0.20	0.000	0.007	0.005
Naphthalene (ug/L)	0.005	0.03	0.015	0.015	6	7	86%	0.009	0.023	0.007	0.44	0.003	0.022	0.009
Phenanthrene (ug/L)	0.008	0.026	0.017	0.017	7	7	100%	0.012	0.022	0.006	0.33	0.002	0.022	0.012
Total LPAHs	0.035	0.07	0.047	0.046	7	7	100%	0.036	0.061	0.012	0.25	0.005	0.058	0.036
HPAHs in ug/L														
Benzo(a)anthracene (ug/L)	0.003	0.008	0.005	0.005	1	7	14%	0.003	0.006	0.002	0.35	0.001	0.006	0.003
Benzo(a)pyrene (ug/L)	0.002	0.010	0.005	0.005	2	7	29%	0.003	0.007	0.002	0.51	0.001	0.007	0.003
Benzo(b,k)fluoranthenes (ug/L)	0.005	0.026	0.011	0.010	1	7	14%	0.005	0.017	0.007	0.63	0.003	0.018	0.005
Benzo(g,h,i)perylene (ug/L)	0.003	0.010	0.005	0.004	3	7	43%	0.003	0.007	0.002	0.50	0.001	0.007	0.003
Chrysene (ug/L)	0.002	0.007	0.005	0.005	2	7	29%	0.004	0.006	0.001	0.30	0.001	0.006	0.004
Dibenz(a,h)anthracene (ug/L)	0.002	0.005	0.004	0.005	1	7	14%	0.003	0.005	0.001	0.27	0.000	0.005	0.003
Fluoranthene (ug/L)	0.004	0.015	0.008	0.007	5	7	71%	0.004	0.013	0.004	0.49	0.002	0.012	0.005
Indeno(1,2,3-cd)pyrene (ug/L)	0.003	0.013	0.006	0.005	1	7	14%	0.004	0.008	0.003	0.58	0.001	0.009	0.003
Pyrene (ug/L)	0.004	0.016	0.007	0.005	2	7	29%	0.004	0.012	0.004	0.63	0.002	0.011	0.003
Total HPAHs	0.023	0.11	0.042	0.034	4	7	57%	0.025	0.070	0.030	0.70	0.011	0.069	0.015
Total PAHs	0.061	0.14	0.089	0.084	7	7	100%	0.062	0.118	0.029	0.33	0.011	0.116	0.062
Phthalates														
bis(2-Ethylhexyl)phthalate (ug/L)	0.188	0.8	0.48	0.52	2	7	29%	0.190	0.71	0.229	0.473	0.087	0.696	0.272
Butyl benzyl phthalate (ug/L)	0.213	0.52	0.429	0.510	0	7	0%	0.224	0.517	0.142	0.330	0.054	0.560	0.298
Diethylphthalate (ug/L)	0.139	1.20	0.600	0.520	3	7	43%	0.162	1.140	0.412	0.69	0.156	0.981	0.219
Dimethyl phthalate (ug/L)	0.134	0.52	0.414	0.510	0	7	0%	0.174	0.517	0.169	0.409	0.064	0.570	0.257
Di-n-butylphthalate (ug/L)	0.138	0.52	0.359	0.510	2	7	29%	0.141	0.520	0.196	0.546	0.074	0.541	0.178
Di-n-Octyl phthalate (ug/L)	0.174	0.52	0.421	0.510	0	7	0%	0.199	0.517	0.155	0.368	0.059	0.565	0.278
Total Phthalates	--	2.3	0.72	--	3	7	43%	0.000	2.218	1.052	1.47	0.40	1.69	-0.26
Herbicides														
2,4-D (ug/L)	0.044	0.970	0.211	0.050	3	6	50%	0.047	0.535	0.373	1.77	0.152	0.602	-0.180
Dichlobenil (ug/L)	0.020	0.052	0.043	0.051	1	7	14%	0.027	0.052	0.012	0.288	0.005	0.055	0.032
TPH														
NWTPH-Diesel (mg/L)	0.015	0.050	0.022	0.015	0	5	0%	0.015	0.036	0.016	0.71	0.007	0.041	0.003
NWTPH-Gasoline (ug/L)	2.34	25.0	6.9	2.3	0	5	0%	2.3	15.9	10.1	1.47	4.5	19.5	-5.7
NWTPH-Heavy Oil (mg/L)	0.100	0.105	0.102	0.100	0	5	0%	0.100	0.105	0.003	0.03	0.001	0.105	0.099
Bacteria														
Coliform, Fecal (CFU/100 ml)	10	2,400	669	110	4	5	80%	19	1,756	1,020	1.53	456	1,935	-598
BTEX														
Benzene (ug/L)	0.100	0.250	0.220	0.250	0	5	0%	0.160	0.250	0.067	0.30	0.030	0.303	0.137
Ethylbenzene (ug/L)	0.100	0.250	0.220	0.250	0	5	0%	0.160	0.250	0.067	0.30	0.030	0.303	0.137
m,p-Xylene (ug/L)	0.200	1.000	0.840	1.000	0	5	0%	0.520	1.000	0.358	0.43	0.160	1.284	0.396
o-Xylene (ug/L)	0.100	0.250	0.220	0.250	0	5	0%	0.160	0.250	0.067	0.30	0.030	0.303	0.137
Toluene (ug/L)	0.100	0.250	0.220	0.250	0	5	0%	0.160	0.250	0.067	0.30	0.030	0.303	0.137

Table E-22
Baseflow Data at Outfall 235 for WY2016 and WY2019

	Minimum	Maximum	Arithmetic Mean	Median	# of Detects	Count	% Detects	10th Per	90th Per	Standard Deviation	Coefficient of Variation	Standard Error	95% UCL	95% LCL
Conventionals														
Anionic Surfactants - MBAS (ug/L)	0.0048	0.054	0.0	0.029	6	7	86%	0.01378	0.0507	0.0	0.545	0.006	0.0	0.0
BOD (mg/L)	1	1	1.0	1	0	7	0%	1	1	0.0	0.000	0.000	1.0	1.0
Chloride (mg/L)	15.8	50.4	27.3	22.25	6	6	100%	16.65	43.05	13.3	0.487	5.429	41.3	13.4
Conductivity (uS/cm)	323	714	419.1	337	7	7	100%	327.8	567	141.6	0.338	53.52	550.1	288.2
Hardness (mg CaCO3/L)	129	155	138.9	136	7	7	100%	131.4	151.4	9.5	0.068	3.59	147.6	130.1
pH (pH units)	6.9	8.1	7.7	7.8	7	7	100%	7.32	8.04	0.4	0.052	0.15	8.1	7.4
TSS (mg/L)	0.5	4.27	2.0	1.8	6	7	86%	0.62	3.4	1.4	0.686	0.51	3.2	0.7
Turbidity (NTU)	0.8	9.53	3.2	1.74	7	7	100%	1.04	7.034	3.2	1.007	1.21	6.1	0.2
Nutrients														
Nitrate+Nitrite as N (mg/L)	0.980	1.280	1.160	1.210	7	7	100%	0.998	1.280	0.129	0.11	0.049	1.279	1.041
Phosphate, Ortho (mg/L)	0.980	1.280	1.160	1.210	7	7	100%	0.998	1.280	0.129	0.11	0.049	1.279	1.041
Phosphorus, Total (mg/L)	0.093	0.143	0.119	0.125	6	6	100%	0.098	0.136	0.018	0.15	0.007	0.139	0.100
Total Nitrogen (mg/L)	1.080	1.630	1.337	1.350	7	7	100%	1.176	1.516	0.172	0.13	0.065	1.496	1.178
Metals														
Cadmium (ug/L)	0.0085	0.25	0.1	0.03	1	7	14%	0.0	0	0.1	1.601	0.03	0.1	0.0
Cadmium, Dissolved (ug/L)	0.0	0.25	0.1	0.0	0	7	0%	0.0	0	0.1	1.025	0.05	0.2	0.0
Copper (ug/L)	1.34	6.000	3.200	2.6	7	7	100%	1.454	5.772	1.867	0.583	0.706	4.927	1.473
Copper, Dissolved (ug/L)	1.0	4.5	2.0	1.7	7	7	100%	1.1	3	1.2	0.568	0.44	3.1	1.0
Lead (ug/L)	0.51	4.79	2	1.65	7	7	100%	0.5	3	1.4	0.765	0.54	3.2	0.5
Lead, Dissolved (ug/L)	0.1	2.73	0.7	0.4	7	7	100%	0.1	2	0.9	1.271	0.35	1.6	-0.1
Mercury (ng/L)	0.0008	0.0	0.00	0.00	1	7	14%	0.00182	0.004	0.00	0.403	0.000	0.00	0.00
Mercury, Dissolved (ng/L)	0.0	0.0045	0.0	0.0	0	7	0%	0.0	0	0.0	0.448	0.00	0.0	0.0
Zinc (ug/L)	5	10.500	6.600	5.93	7	7	100%	5.186	8.7	1.917	0.290	0.724	8.373	4.827
Zinc, Dissolved (ug/L)	3.6	5.38	4.3	4.1	7	7	100%	3.7	5	0.7	0.157	0.25	4.9	3.7
Insecticides														
Carbaryl (ug/L)	0.030	0.030	0.030	0.030	0	4	0%	0.030	0.030	0.000	0.00	0.000	0.030	0.030
Chlorpyrifos (ug/L)	0.026	0.030	0.027	0.026	0	7	0%	0.026	0.030	0.002	0.08	0.001	0.029	0.025
PAHs														
LPAHs														
2-Methylnaphthalene (ug/L)	0.0015	0.015	0.006	0.005	1	7	14%	0.004	0.009	0.004	0.71	0.002	0.010	0.002
Acenaphthene (ug/L)	0.0025	0.005	0.005	0.005	0	7	0%	0.004	0.005	0.001	0.20	0.000	0.006	0.004
Acenaphthylene (ug/L)	0.0015	0.005	0.005	0.005	0	7	0%	0.004	0.005	0.001	0.29	0.001	0.006	0.003
Anthracene (ug/L)	0.003	0.008	0.005	0.005	1	7	14%	0.003	0.006	0.002	0.35	0.001	0.006	0.003
Fluorene (ug/L)	0.003	0.005	0.004	0.005	0	7	0%	0.003	0.005	0.001	0.22	0.000	0.005	0.003
Naphthalene (ug/L)	0.005	0.02	0.008	0.005	1	7	14%	0.005	0.014	0.006	0.74	0.002	0.013	0.003
Phenanthrene (ug/L)	0.005	0.020	0.008	0.005	2	7	29%	0.005	0.014	0.006	0.73	0.002	0.013	0.003
Total LPAHs	0.012	0.06	0.027	0.019	2	7	29%	0.016	0.048	0.017	0.62	0.006	0.042	0.011
HPAHs in ug/L														
Benzo(a)anthracene (ug/L)	0.003	0.005	0.004	0.005	0	7	0%	0.003	0.005	0.001	0.25	0.000	0.005	0.003
Benzo(a)pyrene (ug/L)	0.002	0.005	0.004	0.005	0	7	0%	0.003	0.005	0.001	0.28	0.000	0.005	0.003
Benzo(b,k)fluoranthenes (ug/L)	0.005	0.011	0.008	0.010	0	7	0%	0.005	0.011	0.003	0.32	0.001	0.011	0.006
Benzo(g,h,i)perylene (ug/L)	0.003	0.005	0.004	0.005	0	7	0%	0.003	0.005	0.001	0.26	0.000	0.005	0.003
Chrysene (ug/L)	0.002	0.005	0.004	0.005	0	7	0%	0.002	0.005	0.002	0.43	0.001	0.005	0.002
Dibenz(a,h)anthracene (ug/L)	0.002	0.005	0.004	0.005	0	7	0%	0.003	0.005	0.001	0.28	0.000	0.005	0.003
Fluoranthene (ug/L)	0.003	0.005	0.004	0.005	0	7	0%	0.003	0.005	0.001	0.21	0.000	0.005	0.003
Indeno(1,2,3-cd)pyrene (ug/L)	0.003	0.005	0.005	0.005	0	7	0%	0.004	0.005	0.001	0.20	0.000	0.005	0.004
Pyrene (ug/L)	0.003	0.011	0.005	0.005	1	7	14%	0.003	0.007	0.003	0.49	0.001	0.008	0.003
Total HPAHs	0.022	0.04	0.027	0.024	1	7	14%	0.022	0.035	0.007	0.27	0.003	0.033	0.020
Total PAHs	0.036	0.09	0.05	0.041	2	7	29%	0.038	0.085	0.022	0.42	0.008	0.074	0.033
Phthalates														
bis(2-Ethylhexyl)phthalate (ug/L)	0.188	0.5	0.37	0.48	1	7	14%	0.190	0.51	0.167	0.452	0.063	0.524	0.215
Butyl benzyl phthalate (ug/L)	0.213	0.52	0.390	0.505	0	7	0%	0.223	0.517	0.153	0.394	0.058	0.532	0.248
Diethylphthalate (ug/L)	0.139	1	0.364	0.505	0	7	0%	0.161	0.517	0.186	0.51	0.070	0.536	0.191
Dimethyl phthalate (ug/L)	0.134	0.52	0.370	0.505	0	7	0%	0.174	0.517	0.179	0.485	0.068	0.536	0.204
Di-n-butylphthalate (ug/L)	0.140	0.52	0.374	0.505	1	7	14%	0.142	0.517	0.179	0.480	0.068	0.540	0.208
Di-n-Octyl phthalate (ug/L)	0.174	0.52	0.380	0.505	0	7	0%	0.199	0.517	0.166	0.438	0.063	0.534	0.226
Total Phthalates	0.000	0.5	0.11	0.000	2	7	29%	0.000	0.363	0.196	1.79	0.07	0.29	-0.07
Herbicides														
2,4-D (ug/L)	0.017	0.061	0.044	0.050	3	7	43%	0.023	0.054	0.016	0.36	0.006	0.058	0.029
Dichlobenil (ug/L)	0.010	0.052	0.039	0.046	1	7	14%	0.016	0.051	0.017	0.43	0.006	0.055	0.023
TPH														
NWTPH-Diesel (mg/L)	0.015	0.050	0.022	0.015	0	5	0%	0.015	0.036	0.016	0.71	0.007	0.041	0.003
NWTPH-Gasoline (ug/L)	2.3	25.0	6.9	2.3	0	5	0%	2.3	15.9	10.1	1.47	4.5	19.5	-5.7
NWTPH-Heavy Oil (mg/L)	0.100	0.105	0.102	0.100	0	5	0%	0.100	0.105	0.003	0.03	0.001	0.105	0.099
Bacteria														
Coliform, Fecal (CFU/100 ml)	110	16,000	5,062	2,400	5	5	100%	626	11,760	6,418	1.27	2,870	13,031	-2,907
BTEX														
Benzene (ug/L)	0.500	1.000	0.740	0.700	5	5	100%	0.580	0.920	0.182	0.25	0.081	0.966	0.514
Ethylbenzene (ug/L)	0.100	0.250	0.190	0.200	3	5	60%	0.140	0.230	0.055	0.29	0.024	0.258	0.122
m,p-Xylene (ug/L)	0.200	1.000	0.720	1.000	1	5	20%	0.280	1.000	0.390	0.54	0.174	1.204	0.236
o-Xylene (ug/L)	0.100	0.250	0.220	0.250	0	5	0%	0.160	0.250	0.067	0.30	0.030	0.303	0.137
Toluene (ug/L)	0.100	0.250	0.190	0.200	3	5	60%	0.140	0.230	0.055	0.29	0.024	0.258	0.122

Table E-23
Baseflow Data at Outfall 237A for WY2016 and WY2019

	Minimum	Maximum	Arithmetic Mean	Median	# of Detects	Count	% Detects	10th Per	90th Per	Standard Deviation	Coefficient of Variation	Standard Error	95% UCL	95% LCL
Conventionals														
Anionic Surfactants - MBAS (ug/L)	0.00475	0.0466	0.0	0.0125	4	10	40%	0.011725	0.03445	0.0	0.685	0.004	0.0	0.0
BOD (mg/L)	1	1	1.0	1	0	9	0%	1	1	0.0	0.000	0.000	1.0	1.0
Chloride (mg/L)	11.5	21.3	16.3	15.95	10	10	100%	12.04	19.95	3.4	0.206	1.062	18.7	13.9
Conductivity (uS/cm)	304	423	347.6	334.5	10	10	100%	306.7	414.9	40.4	0.116	12.79	376.5	318.7
Hardness (mg CaCO3/L)	126	141	130.8	131	10	10	100%	126.9	134.7	4.5	0.035	1.44	134.0	127.6
pH (pH units)	7.1	8.1	7.7	7.9	10	10	100%	7.28	8.01	0.3	0.045	0.11	8.0	7.5
TSS (mg/L)	0.5	2.94	1.7	1.68	7	10	70%	0.95	2.634	0.8	0.447	0.24	2.3	1.2
Turbidity (NTU)	0.53	2	1.1	1.01	10	10	100%	0.548	1.649	0.5	0.452	0.15	1.4	0.7
Nutrients														
Nitrate+Nitrite as N (mg/L)	2.160	2.560	2.369	2.395	10	10	100%	2.178	2.524	0.139	0.06	0.044	2.468	2.270
Phosphate, Ortho (mg/L)	0.028	0.042	0.034	0.034	10	10	100%	0.028	0.039	0.005	0.15	0.002	0.038	0.030
Phosphorus, Total (mg/L)	0.023	0.037	0.029	0.030	10	10	100%	0.026	0.033	0.004	0.14	0.001	0.032	0.027
Total Nitrogen (mg/L)	2.180	2.450	2.299	2.270	10	10	100%	2.189	2.450	0.108	0.05	0.034	2.377	2.221
Metals														
Cadmium (ug/L)	0.0105	0.25	0.1	0.03	0	10	0%	0.0	0	0.1	1.008	0.04	0.2	0.0
Cadmium, Dissolved (ug/L)	0.025	0.25	0.2	0.3	0	10	0%	0.0	0	0.1	0.726	0.04	0.2	0.1
Copper (ug/L)	0.184	1.060	0.466	0.4455	7	10	70%	0.2033	0.702	0.264	0.566	0.084	0.655	0.277
Copper, Dissolved (ug/L)	0.213	0.538	0.3	0.3	10	10	100%	0.2	0	0.1	0.319	0.03	0.4	0.2
Lead (ug/L)	0.037	0.52	0	0.079	7	10	70%	0.1	0	0.1	0.976	0.05	0.3	0.0
Lead, Dissolved (ug/L)	0.007	0.08	0.0	0.0	6	10	60%	0.0	0	0.0	0.801	0.01	0.0	0.0
Mercury (ng/L)	0.0008	0.0	0.00	0.00	0	10	0%	0.00233	0.004	0.00	0.357	0.000	0.00	0.00
Mercury, Dissolved (ng/L)	0.0	0.0045	0.0	0.0	0	10	0%	0.0	0	0.0	0.403	0.00	0.0	0.0
Zinc (ug/L)	0.99	4.090	2.585	2.775	10	10	100%	1.557	3.703	0.991	0.384	0.314	3.294	1.876
Zinc, Dissolved (ug/L)	0.72	3.39	1.9	2.0	10	10	100%	1.2	2	0.7	0.374	0.23	2.5	1.4
Insecticides														
Carbaryl (ug/L)	0.030	0.030	0.030	0.030	0	6	0%	0.030	0.030	0.000	0.00	0.000	0.030	0.030
Chlorpyrifos (ug/L)	0.026	0.030	0.027	0.026	0	10	0%	0.026	0.030	0.002	0.08	0.001	0.029	0.026
PAHs														
LPAHs														
2-Methylnaphthalene (ug/L)	0.004	0.005	0.005	0.005	1	10	10%	0.005	0.005	0.000	0.06	0.000	0.005	0.005
Acenaphthene (ug/L)	0.0025	0.005	0.005	0.005	0	10	0%	0.005	0.005	0.001	0.17	0.000	0.005	0.004
Acenaphthylene (ug/L)	0.0015	0.005	0.005	0.005	0	10	0%	0.005	0.005	0.001	0.24	0.000	0.005	0.004
Anthracene (ug/L)	0.003	0.005	0.004	0.005	0	10	0%	0.003	0.005	0.001	0.25	0.000	0.005	0.003
Fluorene (ug/L)	0.003	0.005	0.005	0.005	0	10	0%	0.004	0.005	0.001	0.18	0.000	0.005	0.004
Naphthalene (ug/L)	0.004	0.01	0.006	0.006	1	10	10%	0.005	0.009	0.002	0.32	0.001	0.008	0.005
Phenanthrene (ug/L)	0.004	0.016	0.007	0.005	4	10	40%	0.004	0.012	0.004	0.60	0.001	0.009	0.004
Total LPAHs	0.019	0.04	0.024	0.020	3	10	30%	0.019	0.032	0.008	0.32	0.002	0.030	0.019
HPAHs in ug/L														
Benzo(a)anthracene (ug/L)	0.004	0.006	0.005	0.005	1	10	10%	0.004	0.005	0.001	0.18	0.000	0.005	0.004
Benzo(a)pyrene (ug/L)	0.004	0.006	0.005	0.005	1	10	10%	0.004	0.005	0.001	0.18	0.000	0.005	0.004
Benzo(b,k)fluoranthenes (ug/L)	0.006	0.011	0.009	0.010	1	10	10%	0.006	0.011	0.002	0.23	0.001	0.010	0.007
Benzo(g,h,i)perylene (ug/L)	0.003	0.005	0.004	0.005	0	10	0%	0.003	0.005	0.001	0.25	0.000	0.005	0.003
Chrysene (ug/L)	0.002	0.006	0.004	0.005	1	10	10%	0.002	0.005	0.002	0.37	0.000	0.005	0.003
Dibenz(a,h)anthracene (ug/L)	0.002	0.005	0.004	0.005	0	10	0%	0.003	0.005	0.001	0.23	0.000	0.005	0.004
Fluoranthene (ug/L)	0.004	0.009	0.005	0.005	1	10	10%	0.004	0.005	0.002	0.32	0.001	0.006	0.004
Indeno(1,2,3-cd)pyrene (ug/L)	0.003	0.005	0.005	0.005	0	10	0%	0.004	0.005	0.001	0.17	0.000	0.005	0.004
Pyrene (ug/L)	0.003	0.010	0.005	0.005	2	10	20%	0.003	0.006	0.002	0.43	0.001	0.006	0.003
Total HPAHs	0.022	0.05	0.029	0.025	2	10	20%	0.022	0.035	0.010	0.36	0.003	0.036	0.022
Total PAHs	0.040	0.08	0.05	0.045	3	10	30%	0.040	0.075	0.016	0.30	0.005	0.065	0.042
Phthalates														
bis(2-Ethylhexyl)phthalate (ug/L)	0.189	0.5	0.37	0.47	2	10	20%	0.193	0.51	0.157	0.420	0.050	0.487	0.262
Butyl benzyl phthalate (ug/L)	0.213	0.52	0.398	0.505	0	10	0%	0.231	0.515	0.145	0.365	0.046	0.502	0.294
Diethylphthalate (ug/L)	0.265	1	0.430	0.488	6	10	60%	0.279	0.521	0.115	0.27	0.036	0.512	0.348
Dimethyl phthalate (ug/L)	0.134	0.52	0.381	0.505	0	10	0%	0.197	0.515	0.168	0.441	0.053	0.501	0.261
Di-n-butylphthalate (ug/L)	0.139	0.52	0.303	0.218	2	10	20%	0.140	0.506	0.179	0.591	0.057	0.431	0.175
Di-n-Octyl phthalate (ug/L)	0.174	0.52	0.389	0.505	0	10	0%	0.214	0.515	0.156	0.402	0.049	0.501	0.277
***Total Phthalates**	0.000	1.0	0.36	0.334	6	10	60%	0.000	0.937	0.383	1.05	0.12	0.64	0.09
Herbicides														
2,4-D (ug/L)	0.009	0.093	0.048	0.050	2	9	22%	0.023	0.059	0.023	0.48	0.008	0.065	0.030
Dichlobenil (ug/L)	0.020	0.052	0.046	0.051	0	10	0%	0.043	0.052	0.010	0.21	0.003	0.053	0.039
TPH														
NWTPH-Diesel (mg/L)	0.015	0.050	0.022	0.015	0	5	0%	0.015	0.036	0.016	0.71	0.007	0.041	0.003
NWTPH-Gasoline (ug/L)	2.3	25.0	6.9	2.3	0	5	0%	2.3	15.9	10.1	1.47	4.5	19.5	-5.7
NWTPH-Heavy Oil (mg/L)	0.095	0.105	0.101	0.100	0	5	0%	0.097	0.105	0.004	0.04	0.002	0.106	0.096
Bacteria														
Coliform, Fecal (CFU/100 ml)	40	490	257	220	5	5	100%	42	490	225	0.87	100	536	-22
BTEX														
Benzene (ug/L)	0.100	0.250	0.220	0.250	0	5	0%	0.160	0.250	0.067	0.30	0.030	0.303	0.137
Ethylbenzene (ug/L)	0.100	0.250	0.220	0.250	0	5	0%	0.160	0.250	0.067	0.30	0.030	0.303	0.137
m,p-Xylene (ug/L)	0.200	1.000	0.840	1.000	0	5	0%	0.520	1.000	0.358	0.43	0.160	1.284	0.396
o-Xylene (ug/L)	0.100	0.250	0.220	0.250	0	5	0%	0.160	0.250	0.067	0.30	0.030	0.303	0.137
Toluene (ug/L)	0.100	0.250	0.210	0.250	1	5	20%	0.140	0.250	0.065	0.31	0.029	0.291	0.129

Table E-24
Baseflow Data at Outfall 237B for WY2016 and WY2019

	Minimum	Maximum	Arithmetic Mean	Median	# of Detects	Count	% Detects	10th Per	90th Per	Standard Deviation	Coefficient of Variation	Standard Error	95% UCL	95% LCL
Conventionals														
Anionic Surfactants - MBAS (ug/L)	0.0125	0.0299	0.0	0.0169	4	6	67%	0.0125	0.0268	0.0	0.385	0.003	0.0	0.0
BOD (mg/L)	1	3.6	1.4	1	1	6	17%	1	2.3	1.1	0.741	0.433	2.5	0.3
Chloride (mg/L)	8.6	90.6	25.3	9.13	5	5	100%	8.63	58.072	36.5	1.446	16.337	70.6	-20.1
Conductivity (uS/cm)	261	281	272.0	273	6	6	100%	262.5	280.5	9.0	0.033	3.67	281.4	262.6
Hardness (mg CaCO3/L)	109	124	116.7	117.5	6	6	100%	110.5	122	5.4	0.047	2.22	122.4	111.0
pH (pH units)	7.1	7.7	7.4	7.4	6	6	100%	7.2	7.65	0.2	0.030	0.09	7.7	7.2
TSS (mg/L)	0.5	2.8	1.2	0.91	2	6	33%	0.5	2.3	0.9	0.758	0.38	2.2	0.3
Turbidity (NTU)	0.74	2.49	1.3	1.23	6	6	100%	0.825	1.99	0.6	0.465	0.26	2.0	0.7
Nutrients														
Nitrate+Nitrite as N (mg/L)	2.900	3.480	3.107	3.060	6	6	100%	2.910	3.350	0.220	0.07	0.090	3.337	2.876
Phosphate, Ortho (mg/L)	0.028	0.051	0.034	0.030	6	6	100%	0.029	0.043	0.009	0.26	0.004	0.043	0.024
Phosphorus, Total (mg/L)	0.028	0.037	0.033	0.034	6	6	100%	0.030	0.036	0.003	0.09	0.001	0.036	0.030
Total Nitrogen (mg/L)	2.940	3.150	3.042	3.035	6	6	100%	2.965	3.125	0.080	0.03	0.033	3.126	2.957
Metals														
Cadmium (ug/L)	0.007	0.25	0.1	0.03	0	6	0%	0.0	0	0.1	1.175	0.05	0.2	0.0
Cadmium, Dissolved (ug/L)	0.0	0.25	0.1	0.0	0	6	0%	0.0	0	0.1	1.630	0.04	0.2	0.0
Copper (ug/L)	0.1235	0.677	0.325	0.28075	3	6	50%	0.1535	0.540	0.207	0.636	0.084	0.541	0.108
Copper, Dissolved (ug/L)	0.0	0.284	0.2	0.2	6	6	100%	0.1	0	0.1	0.483	0.03	0.3	0.1
Lead (ug/L)	0.0135	0.092	0	0.039	2	6	33%	0.0	0	0.0	0.622	0.01	0.1	0.0
Lead, Dissolved (ug/L)	0.0	0.07	0.0	0.0	4	6	67%	0.0	0	0.0	0.806	0.01	0.1	0.0
Mercury (ng/L)	0.0008	0.0	0.00	0.00	0	6	0%	0.00165	0.004	0.00	0.439	0.000	0.00	0.00
Mercury, Dissolved (ng/L)	0.0	0.0045	0.0	0.0	0	6	0%	0.0	0	0.0	0.478	0.00	0.0	0.0
Zinc (ug/L)	0.9	2.760	1.635	1.545	6	6	100%	1.045	2.315	0.646	0.395	0.264	2.312	0.958
Zinc, Dissolved (ug/L)	0.8	1.83	1.3	1.3	6	6	100%	0.9	2	0.4	0.321	0.17	1.8	0.9
Insecticides														
Carbaryl (ug/L)	0.030	0.030	0.030	0.030	0	3	0%	0.030	0.030	0.000	0.00	0.000	0.030	0.030
Chlorpyrifos (ug/L)	0.026	0.030	0.028	0.028	0	6	0%	0.026	0.030	0.002	0.08	0.001	0.030	0.025
PAHs														
LPAHs														
2-Methylnaphthalene (ug/L)	0.005	0.005	0.005	0.005	1	6	17%	0.005	0.005	0.000	0.00	0.000	0.005	0.005
Acenaphthene (ug/L)	0.0025	0.023	0.008	0.005	2	6	33%	0.004	0.015	0.008	0.98	0.003	0.016	0.000
Acenaphthylene (ug/L)	0.0015	0.005	0.004	0.005	0	6	0%	0.003	0.005	0.001	0.32	0.001	0.006	0.003
Anthracene (ug/L)	0.003	0.005	0.004	0.004	0	6	0%	0.003	0.005	0.001	0.27	0.000	0.005	0.003
Fluorene (ug/L)	0.003	0.005	0.004	0.005	0	6	0%	0.003	0.005	0.001	0.23	0.000	0.005	0.003
Naphthalene (ug/L)	0.005	0.01	0.007	0.007	0	6	0%	0.005	0.009	0.002	0.27	0.001	0.009	0.005
Phenanthrene (ug/L)	0.004	0.013	0.006	0.005	0	6	0%	0.004	0.010	0.003	0.53	0.001	0.010	0.003
Total LPAHs	0.019	0.05	0.028	0.024	3	6	50%	0.019	0.040	0.011	0.40	0.005	0.039	0.016
HPAHs in ug/L														
Benzo(a)anthracene (ug/L)	0.003	0.005	0.004	0.004	0	6	0%	0.003	0.005	0.001	0.26	0.000	0.005	0.003
Benzo(a)pyrene (ug/L)	0.002	0.005	0.004	0.004	0	6	0%	0.003	0.005	0.001	0.31	0.001	0.005	0.003
Benzo(b,k)fluoranthenes (ug/L)	0.005	0.011	0.008	0.008	0	6	0%	0.005	0.010	0.003	0.33	0.001	0.011	0.005
Benzo(g,h,i)perylene (ug/L)	0.003	0.005	0.004	0.004	0	6	0%	0.003	0.005	0.001	0.27	0.000	0.005	0.003
Chrysene (ug/L)	0.002	0.005	0.004	0.004	0	6	0%	0.002	0.005	0.002	0.47	0.001	0.005	0.002
Dibenz(a,h)anthracene (ug/L)	0.002	0.005	0.004	0.004	0	6	0%	0.003	0.005	0.001	0.31	0.001	0.005	0.003
Fluoranthene (ug/L)	0.004	0.005	0.004	0.004	0	6	0%	0.004	0.005	0.001	0.19	0.000	0.005	0.003
Indeno(1,2,3-cd)pyrene (ug/L)	0.003	0.005	0.004	0.005	0	6	0%	0.004	0.005	0.001	0.22	0.000	0.005	0.003
Pyrene (ug/L)	0.003	0.005	0.004	0.004	0	6	0%	0.003	0.005	0.001	0.25	0.000	0.005	0.003
Total HPAHs	0.022	0.03	0.026	0.025	0	6	0%	0.022	0.033	0.005	0.19	0.002	0.032	0.021
Total PAHs	0.041	0.08	0.05	0.047	3	6	50%	0.043	0.073	0.015	0.29	0.006	0.070	0.038
Phthalates														
bis(2-Ethylhexyl)phthalate (ug/L)	0.190	0.5	0.35	0.35	0	6	0%	0.191	0.51	0.175	0.498	0.072	0.536	0.168
Butyl benzyl phthalate (ug/L)	0.215	0.52	0.369	0.372	0	6	0%	0.223	0.513	0.156	0.424	0.064	0.533	0.205
Diethylphthalate (ug/L)	0.140	1	0.328	0.315	1	6	17%	0.159	0.510	0.180	0.55	0.074	0.517	0.139
Dimethyl phthalate (ug/L)	0.135	0.52	0.346	0.357	0	6	0%	0.168	0.513	0.183	0.531	0.075	0.538	0.153
Di-n-butylphthalate (ug/L)	0.138	0.52	0.326	0.327	0	6	0%	0.139	0.513	0.203	0.624	0.083	0.539	0.113
Di-n-Octyl phthalate (ug/L)	0.175	0.52	0.357	0.364	0	6	0%	0.196	0.513	0.170	0.475	0.069	0.536	0.179
***Total Phthalates**	0.000	0.5	0.08	0.000	1	6	17%	0.000	0.226	0.185	2.45	0.08	0.27	-0.12
Herbicides														
2,4-D (ug/L)	0.009	0.050	0.031	0.034	1	6	17%	0.009	0.050	0.021	0.69	0.009	0.053	0.009
Dichlobenil (ug/L)	0.020	0.052	0.044	0.048	0	6	0%	0.033	0.051	0.012	0.27	0.005	0.057	0.031
TPH														
NWTPH-Diesel (mg/L)	0.015	0.050	0.022	0.015	0	5	0%	0.015	0.036	0.016	0.71	0.007	0.041	0.003
NWTPH-Gasoline (ug/L)	2.3	25.0	6.9	2.3	0	5	0%	2.3	15.9	10.1	1.47	4.5	19.5	-5.7
NWTPH-Heavy Oil (mg/L)	0.100	0.105	0.101	0.100	0	5	0%	0.100	0.103	0.002	0.02	0.001	0.104	0.098
Bacteria														
Coliform, Fecal (CFU/100 ml)	10	68	31	20	4	5	80%	11	59	25	0.79	11	62	0
BTEX														
Benzene (ug/L)	0.100	0.250	0.220	0.250	0	5	0%	0.160	0.250	0.067	0.30	0.030	0.303	0.137
Ethylbenzene (ug/L)	0.100	0.250	0.220	0.250	0	5	0%	0.160	0.250	0.067	0.30	0.030	0.303	0.137
m,p-Xylene (ug/L)	0.200	1.000	0.840	1.000	0	5	0%	0.520	1.000	0.358	0.43	0.160	1.284	0.396
o-Xylene (ug/L)	0.100	0.250	0.220	0.250	0	5	0%	0.160	0.250	0.067	0.30	0.030	0.303	0.137
Toluene (ug/L)	0.100	0.250	0.220	0.250	0	5	0%	0.160	0.250	0.067	0.30	0.030	0.303	0.137

Table E-25
Baseflow Data at Outfall 243 for WY2016 and WY2019

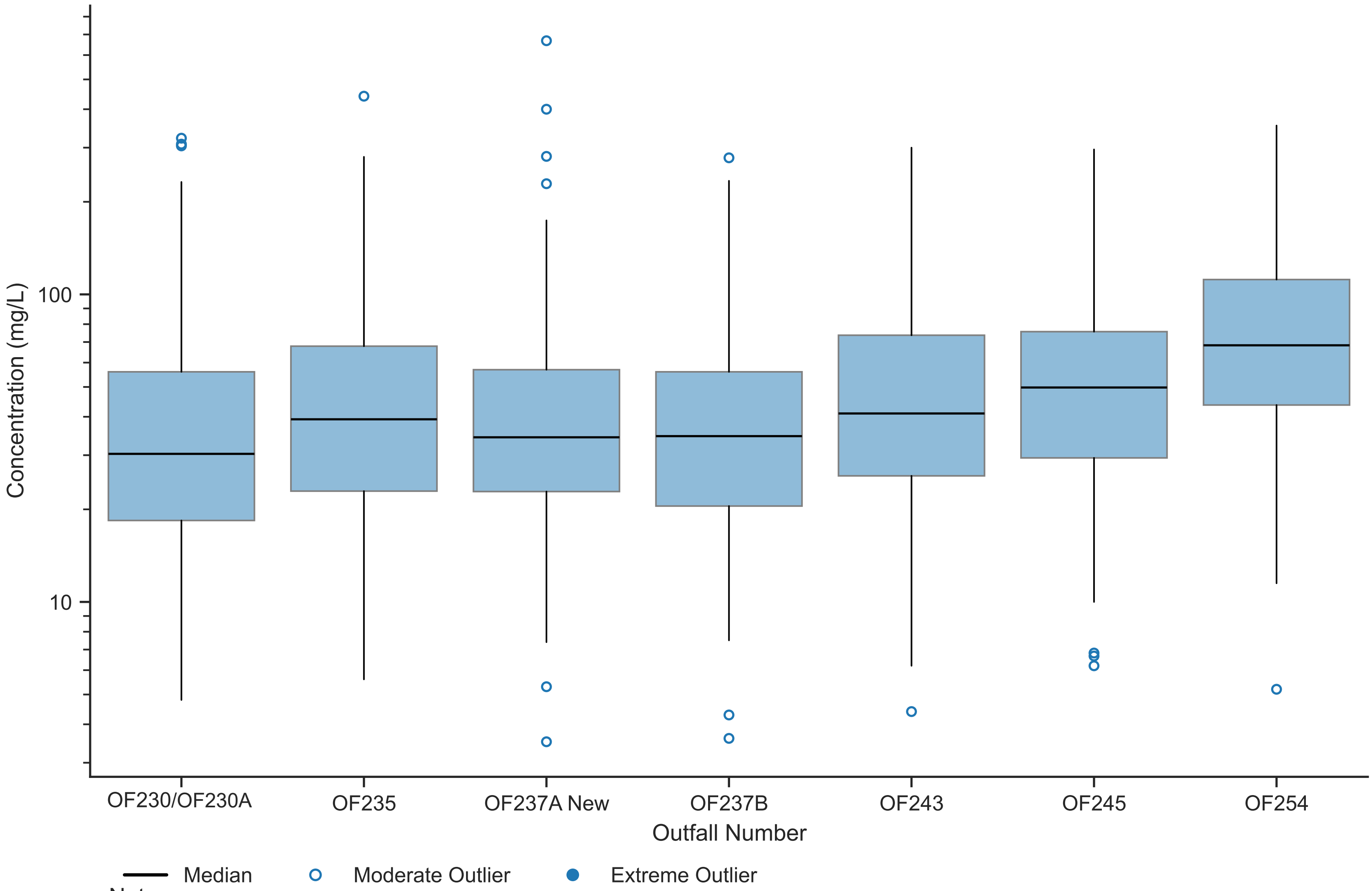
	Minimum	Maximum	Arithmetic Mean	Median	# of Detects	Count	% Detects	10th Per	90th Per	Standard Deviation	Coefficient of Variation	Standard Error	95% UCL	95% LCL
Conventionals														
Anionic Surfactants - MBAS (ug/L)	0.0267	0.0962	0.1	0.0586	7	7	100%	0.03216	0.09566	0.0	0.445	0.010	0.1	0.0
BOD (mg/L)	1	1	1.0	1	0	7	0%	1	1	0.0	0.000	0.000	1.0	1.0
Chloride (mg/L)	2490	13100	8143	8080	7	7	100%	3510	11900	3791	0.466	1433	11649	4636
Conductivity (uS/cm)	8080	35300	22685	23200	8	8	100%	12084	32990	9798	0.432	3464	30876	14494
Hardness (mg CaCO3/L)	808	3770	2214.8	1915	8	8	100%	1117.4	3497	1110.3	0.501	392.53	3142.9	1286.6
pH (pH units)	7	7.5	7.3	7.3	8	8	100%	7	7.43	0.2	0.025	0.07	7.4	7.1
TSS (mg/L)	4.92	21.8	13.7	14.9	8	8	100%	7.972	18.72	5.5	0.398	1.93	18.3	9.2
Turbidity (NTU)	7.36	27.3	15.3	14.8	7	7	100%	8.236	22.32	6.7	0.440	2.55	21.5	9.1
Nutrients														
Nitrate+Nitrite as N (mg/L)	0.046	0.306	0.161	0.151	8	8	100%	0.077	0.258	0.088	0.55	0.031	0.234	0.087
Phosphate, Ortho (mg/L)	0.003	0.139	0.070	0.063	6	7	86%	0.023	0.120	0.048	0.69	0.018	0.115	0.025
Phosphorus, Total (mg/L)	0.181	0.566	0.310	0.267	7	7	100%	0.186	0.471	0.144	0.46	0.054	0.444	0.177
Total Nitrogen (mg/L)	0.420	0.790	0.541	0.480	8	8	100%	0.427	0.748	0.143	0.26	0.051	0.661	0.422
Metals														
Cadmium (ug/L)	0.0215	2.5	0.4	0.0705	3	8	38%	0.0	1	0.9	2.281	0.30	1.1	-0.3
Cadmium, Dissolved (ug/L)	0.0	1.25	0.2	0.1	2	8	25%	0.0	1	0.4	1.856	0.15	0.6	-0.1
Copper (ug/L)	2.53	10.500	5.456	4.89	7	7	100%	3.064	8.202	2.675	0.490	1.011	7.930	2.981
Copper, Dissolved (ug/L)	0.3	3.42	1.7	1.6	7	7	100%	0.5	3	1.1	0.635	0.41	2.7	0.7
Lead (ug/L)	0.788	25.4	5	2.655	8	8	100%	1.2	11	8.2	1.511	2.89	12.3	-1.4
Lead, Dissolved (ug/L)	0.0	1.81	0.3	0.1	3	8	38%	0.0	1	0.6	1.887	0.22	0.8	-0.2
Mercury (ng/L)	0.001	0.0	0.00	0.00	6	8	75%	0.001	0.00295	0.00	0.611	0.000	0.00	0.00
Mercury, Dissolved (ng/L)	0.0	0.0045	0.0	0.0	0	8	0%	0.0	0	0.0	0.257	0.00	0.0	0.0
Zinc (ug/L)	4.33	30.300	14.839	13.4	7	7	100%	7.336	23.1	8.220	0.554	3.107	22.441	7.236
Zinc, Dissolved (ug/L)	2.5	11.9	6.4	5.3	7	7	100%	3.0	10	3.3	0.519	1.26	9.5	3.3
Insecticides														
Carbaryl (ug/L)	0.030	0.030	0.030	0.030	0	7	0%	0.030	0.030	0.000	0.00	0.000	0.030	0.030
Chlorpyrifos (ug/L)	0.026	0.031	0.026	0.026	0	8	0%	0.026	0.027	0.002	0.06	0.001	0.028	0.025
PAHs														
LPAHs														
2-Methylnaphthalene (ug/L)	0.005	0.005	0.005	0.005	0	8	0%	0.005	0.005	0.000	0.00	0.000	0.005	0.005
Acenaphthene (ug/L)	0.005	0.132	0.032	0.00925	5	8	63%	0.005	0.089	0.046	1.45	0.016	0.070	-0.007
Acenaphthylene (ug/L)	0.005	0.007	0.005	0.005	1	8	13%	0.005	0.006	0.001	0.13	0.000	0.006	0.005
Anthracene (ug/L)	0.005	0.053	0.019	0.013	6	8	75%	0.006	0.041	0.017	0.88	0.006	0.033	0.005
Fluorene (ug/L)	0.005	0.005	0.005	0.005	1	8	13%	0.005	0.005	0.000	0.04	0.000	0.005	0.005
Naphthalene (ug/L)	0.003	0.01	0.006	0.005	1	8	13%	0.004	0.010	0.003	0.48	0.001	0.009	0.004
Phenanthrene (ug/L)	0.005	0.019	0.008	0.006	5	8	63%	0.005	0.012	0.005	0.63	0.002	0.012	0.004
Total LPAHs	0.019	0.22	0.072	0.045	7	8	88%	0.022	0.163	0.071	0.98	0.025	0.132	0.013
HPAHs in ug/L														
Benzo(a)anthracene (ug/L)	0.003	0.006	0.005	0.005	2	8	25%	0.003	0.006	0.001	0.25	0.000	0.006	0.004
Benzo(a)pyrene (ug/L)	0.004	0.007	0.005	0.005	2	8	25%	0.005	0.006	0.001	0.19	0.000	0.006	0.004
Benzo(b,k)fluoranthenes (ug/L)	0.006	0.018	0.011	0.010	1	8	13%	0.009	0.013	0.003	0.31	0.001	0.013	0.008
Benzo(g,h,i)perylene (ug/L)	0.003	0.011	0.006	0.005	5	8	63%	0.004	0.010	0.003	0.52	0.001	0.008	0.003
Chrysene (ug/L)	0.005	0.014	0.007	0.005	2	8	25%	0.005	0.011	0.003	0.51	0.001	0.010	0.004
Dibenz(a,h)anthracene (ug/L)	0.004	0.005	0.005	0.005	0	8	0%	0.005	0.005	0.000	0.07	0.000	0.005	0.005
Fluoranthene (ug/L)	0.008	0.032	0.013	0.009	8	8	100%	0.008	0.022	0.008	0.65	0.003	0.020	0.006
Indeno(1,2,3-cd)pyrene (ug/L)	0.005	0.008	0.005	0.005	1	8	13%	0.005	0.006	0.001	0.21	0.000	0.006	0.004
Pyrene (ug/L)	0.007	0.053	0.018	0.012	8	8	100%	0.009	0.031	0.015	0.85	0.005	0.030	0.005
Total HPAHs	0.036	0.13	0.060	0.044	8	8	100%	0.037	0.109	0.035	0.59	0.012	0.089	0.030
Total PAHs	0.059	0.35	0.13	0.095	8	8	100%	0.061	0.235	0.099	0.75	0.035	0.215	0.050
Phthalates														
bis(2-Ethylhexyl)phthalate (ug/L)	0.197	5.6	1.10	0.51	2	8	25%	0.385	2.04	1.821	1.654	0.644	2.623	-0.421
Butyl benzyl phthalate (ug/L)	0.238	0.53	0.478	0.510	0	8	0%	0.425	0.518	0.097	0.204	0.034	0.559	0.396
Diethylphthalate (ug/L)	0.182	1	0.471	0.510	0	8	0%	0.408	0.518	0.117	0.25	0.041	0.569	0.373
Dimethyl phthalate (ug/L)	0.207	0.53	0.474	0.510	0	8	0%	0.416	0.518	0.108	0.228	0.038	0.564	0.384
Di-n-butylphthalate (ug/L)	0.142	0.52	0.352	0.365	3	8	38%	0.181	0.512	0.171	0.485	0.060	0.495	0.209
Di-n-Octyl phthalate (ug/L)	0.222	0.53	0.476	0.510	0	8	0%	0.420	0.518	0.103	0.216	0.036	0.562	0.390
***Total Phthalates**	0.000	5.8	0.84	0.099	4	8	50%	0.000	2.070	2.017	2.41	0.71	2.52	-0.85
Herbicides														
2,4-D (ug/L)	0.009	0.570	0.110	0.050	1	8	13%	0.038	0.206	0.187	1.70	0.066	0.266	-0.046
Dichlobenil (ug/L)	0.047	0.053	0.051	0.051	0	8	0%	0.049	0.052	0.002	0.04	0.001	0.052	0.049
TPH														
NWTPH-Diesel (mg/L)	0.015	0.050	0.022	0.015	0	5	0%	0.015	0.036	0.016	0.71	0.007	0.041	0.003
NWTPH-Gasoline (ug/L)	2.3	25.0	6.9	2.3	0	5	0%	2.3	15.9	10.1	1.47	4.5	19.5	-5.7
NWTPH-Heavy Oil (mg/L)	0.100	0.105	0.101	0.100	0	5	0%	0.100	0.103	0.002	0.02	0.001	0.104	0.098
Bacteria														
Coliform, Fecal (CFU/100 ml)	10	790	169	13	3	5	60%	10	482	347	2.06	155	600	-263
BTEX														
Benzene (ug/L)	0.100	0.250	0.220	0.250	0	5	0%	0.160	0.250	0.067	0.30	0.030	0.303	0.137
Ethylbenzene (ug/L)	0.100	0.250	0.220	0.250	0	5	0%	0.160	0.250	0.067	0.30	0.030	0.303	0.137
m,p-Xylene (ug/L)	0.200	1.000	0.840	1.000	0	5	0%	0.520	1.000	0.358	0.43	0.160	1.284	0.396
o-Xylene (ug/L)	0.100	0.250	0.220	0.250	0	5	0%	0.160	0.250	0.067	0.30	0.030	0.303	0.137
Toluene (ug/L)	0.100	0.250	0.220	0.250	0	5	0%	0.160	0.250	0.067	0.30	0.030	0.303	0.137

Table E-26
Baseflow Data at Outfall 245 and Outfall 254 WY2019

	Minimum	Maximum	Arithmetic Mean	Median	# of Detects	Count	% Detects	10th Per	90th Per	Standard Deviation	Coefficient of Variation	Standard Error	95% UCL	95% LCL
Conventionals														
Anionic Surfactants - MBAS (ug/L)	0.0251	0.0553	0.0	0.0468	5	5	100%	0.03106	0.05222	0.0	0.264	0.005	0.1	0.0
BOD (mg/L)	1	6.2	2.0	1	1	5	20%	1	4.12	2.3	1.140	1.040	4.9	-0.8
Chloride (mg/L)	18.2	13900	4485	3980	5	5	100%	21	10140	5673	1.265	2537	11529	-2560
Conductivity (uS/cm)	6170	38100	22695	22950	6	6	100%	9535	35600	13122	0.578	5357	36466	8924
Hardness (mg CaCO3/L)	728	4430	2581.3	2600	6	6	100%	1094	4050	1492.6	0.578	609.34	4147.7	1015.0
pH (pH units)	7.3	7.6	7.5	7.45	6	6	100%	7.35	7.6	0.1	0.016	0.05	7.6	7.3
TSS (mg/L)	2	20.8	8.4	7	6	6	100%	2.205	15.95	7.4	0.880	3.01	16.1	0.6
Turbidity (NTU)	2.75	13.8	7.1	5.06	5	5	100%	3.154	12.32	4.7	0.662	2.10	12.9	1.3
Nutrients														
Nitrate+Nitrite as N (mg/L)	0.196	3.680	0.962	0.334	5	5	100%	0.210	2.356	1.521	1.58	0.680	2.851	-0.926
Phosphate, Ortho (mg/L)	0.037	0.176	0.096	0.097	5	5	100%	0.051	0.145	0.051	0.53	0.023	0.160	0.032
Phosphorus, Total (mg/L)	0.080	0.595	0.254	0.171	4	4	100%	0.104	0.471	0.231	0.91	0.116	0.622	-0.114
Total Nitrogen (mg/L)	0.430	3.350	1.522	0.980	5	5	100%	0.566	2.842	1.194	0.78	0.534	3.005	0.039
Metals														
Cadmium (ug/L)	0.072	1.1	0.3	0.151	4	6	67%	0.1	1	0.4	1.360	0.16	0.7	-0.1
Cadmium, Dissolved (ug/L)	0.0	0.183	0.1	0.1	3	6	50%	0.0	0	0.1	0.623	0.03	0.2	0.0
Copper (ug/L)	1.43	23.700	11.977	12.85	6	6	100%	3.38	19.700	8.042	0.671	3.283	20.416	3.537
Copper, Dissolved (ug/L)	0.6	3.63	1.7	1.3	6	6	100%	0.6	3	1.3	0.759	0.52	3.0	0.3
Lead (ug/L)	0.201	2.23	1	0.678	6	6	100%	0.2	2	0.8	0.899	0.31	1.6	0.0
Lead, Dissolved (ug/L)	0.0	0.0825	0.1	0.1	0	6	0%	0.0	0	0.0	0.563	0.01	0.1	0.0
Mercury (ng/L)	0.0008	0.0	0.00	0.00	0	6	0%	0.0024	0.004	0.00	0.377	0.001	0.00	0.00
Mercury, Dissolved (ng/L)	0.0	0.0045	0.0	0.0	0	6	0%	0.0	0	0.0	0.377	0.00	0.0	0.0
Zinc (ug/L)	9.39	125.000	50.448	28.7	6	6	100%	15.345	107.3	46.221	0.916	18.869	98.954	1.943
Zinc, Dissolved (ug/L)	4.3	74.9	28.7	23.2	6	6	100%	5.1	58	26.4	0.921	10.79	56.4	1.0
Insecticides														
Chlorpyrifos (ug/L)	0.030	0.031	0.030	0.030	0	6	0%	0.030	0.031	0.000	0.01	0.000	0.030	0.030
PAHs														
LPAHs														
2-Methylnaphthalene (ug/L)	0.0015	0.029	0.008	0.005	2	6	33%	0.003	0.017	0.010	1.21	0.004	0.019	-0.002
Acenaphthene (ug/L)	0.0025	0.035	0.015	0.012	3	6	50%	0.004	0.031	0.013	0.87	0.005	0.029	0.001
Acenaphthylene (ug/L)	0.0015	0.005	0.004	0.005	0	6	0%	0.002	0.005	0.002	0.47	0.001	0.006	0.002
Anthracene (ug/L)	0.003	0.017	0.009	0.008	5	6	83%	0.005	0.014	0.005	0.53	0.002	0.014	0.004
Fluorene (ug/L)	0.003	0.013	0.005	0.004	1	6	17%	0.003	0.009	0.004	0.76	0.002	0.009	0.001
Naphthalene (ug/L)	0.006	0.02	0.010	0.009	1	6	17%	0.006	0.016	0.006	0.59	0.002	0.016	0.004
Phenanthrene (ug/L)	0.004	0.037	0.016	0.012	5	6	83%	0.007	0.029	0.012	0.76	0.005	0.028	0.003
Total LPAHs	0.026	0.12	0.057	0.049	6	6	100%	0.033	0.090	0.034	0.59	0.014	0.093	0.022
HPAHs in ug/L														
Benzo(a)anthracene (ug/L)	0.003	0.004	0.003	0.004	0	6	0%	0.003	0.004	0.001	0.16	0.000	0.004	0.003
Benzo(a)pyrene (ug/L)	0.002	0.009	0.004	0.004	1	6	17%	0.002	0.006	0.003	0.66	0.001	0.007	0.001
Benzo(b,k)fluoranthenes (ug/L)	0.005	0.019	0.008	0.006	1	6	17%	0.005	0.013	0.006	0.73	0.002	0.014	0.002
Benzo(g,h,i)perylene (ug/L)	0.003	0.008	0.004	0.003	1	6	17%	0.003	0.006	0.002	0.53	0.001	0.006	0.002
Chrysene (ug/L)	0.002	0.018	0.005	0.002	2	6	33%	0.002	0.012	0.006	1.24	0.003	0.012	-0.002
Dibenz(a,h)anthracene (ug/L)	0.002	0.004	0.003	0.004	0	6	0%	0.002	0.004	0.001	0.29	0.000	0.004	0.002
Fluoranthene (ug/L)	0.004	0.020	0.007	0.004	2	6	33%	0.004	0.014	0.007	0.95	0.003	0.014	0.000
Indeno(1,2,3-cd)pyrene (ug/L)	0.003	0.005	0.004	0.005	0	6	0%	0.003	0.005	0.001	0.27	0.000	0.005	0.003
Pyrene (ug/L)	0.008	0.038	0.016	0.009	6	6	100%	0.009	0.031	0.012	0.76	0.005	0.029	0.003
Total HPAHs	0.030	0.11	0.054	0.039	5	6	83%	0.032	0.091	0.031	0.58	0.013	0.087	0.021
Total PAHs	0.060	0.19	0.11	0.092	6	6	100%	0.069	0.173	0.051	0.46	0.021	0.165	0.058
Phthalates														
bis(2-Ethylhexyl)phthalate (ug/L)	0.189	2.8	0.63	0.19	1	6	17%	0.190	1.51	1.072	1.700	0.438	1.756	-0.495
Butyl benzyl phthalate (ug/L)	0.214	0.24	0.228	0.233	0	6	0%	0.215	0.238	0.011	0.049	0.005	0.240	0.217
Diethylphthalate (ug/L)	0.140	0	0.167	0.178	0	6	0%	0.140	0.182	0.021	0.13	0.009	0.189	0.145
Dimethyl phthalate (ug/L)	0.135	0.21	0.182	0.203	0	6	0%	0.135	0.208	0.036	0.200	0.015	0.220	0.143
Di-n-butylphthalate (ug/L)	0.142	0.51	0.232	0.145	2	6	33%	0.142	0.408	0.150	0.650	0.061	0.389	0.074
Di-n-Octyl phthalate (ug/L)	0.174	0.22	0.205	0.218	0	6	0%	0.175	0.223	0.024	0.116	0.010	0.230	0.180
***Total Phthalates**	0.000	3.1	0.61	0.000	2	6	33%	0.000	1.818	1.253	2.07	0.51	1.92	-0.71
Herbicides														
2,4-D (ug/L)	0.009	0.026	0.014	0.009	2	6	33%	0.009	0.024	0.008	0.59	0.003	0.022	0.005
Dichlobenil (ug/L)	0.020	0.047	0.037	0.046	0	6	0%	0.020	0.047	0.013	0.36	0.005	0.051	0.023
TPH														
NWTPH-Diesel (mg/L)	0.050	0.050	0.050	0.050	0	2	0%	0.050	0.050	0.000	0.00	0.000	0.050	0.050
NWTPH-Gasoline (ug/L)	25.0	25.0	25.0	25.0	0	2	0%	25.0	25.0	0.0	0.00	0.0	25.0	25.0
NWTPH-Heavy Oil (mg/L)	0.100	0.100	0.100	0.100	0	2	0%	0.100	0.100	0.000	0.00	0.000	0.100	0.100
Bacteria														
Coliform, Fecal (CFU/100 ml)	20	45	33	33	2	2	100%	23	43	18	0.54	13	191	-126
BTEX														
Benzene (ug/L)	0.100	0.100	0.100	0.100	0	2	0%	0.100	0.100	0.000	0.00	0.000	0.100	0.100
Ethylbenzene (ug/L)	0.100	0.100	0.100	0.100	0	2	0%	0.100	0.100	0.000	0.00	0.000	0.100	0.100
m,p-Xylene (ug/L)	0.200	0.200	0.200	0.200	0	2	0%	0.200	0.200	0.000	0.00	0.000	0.200	0.200
o-Xylene (ug/L)	0.100	0.100	0.100	0.100	0	2	0%	0.100	0.100	0.000	0.00	0.000	0.100	0.100
Toluene (ug/L)	0.100	0.100	0.100	0.100	0	2	0%	0.100	0.100	0.000	0.00	0.000	0.100	0.100

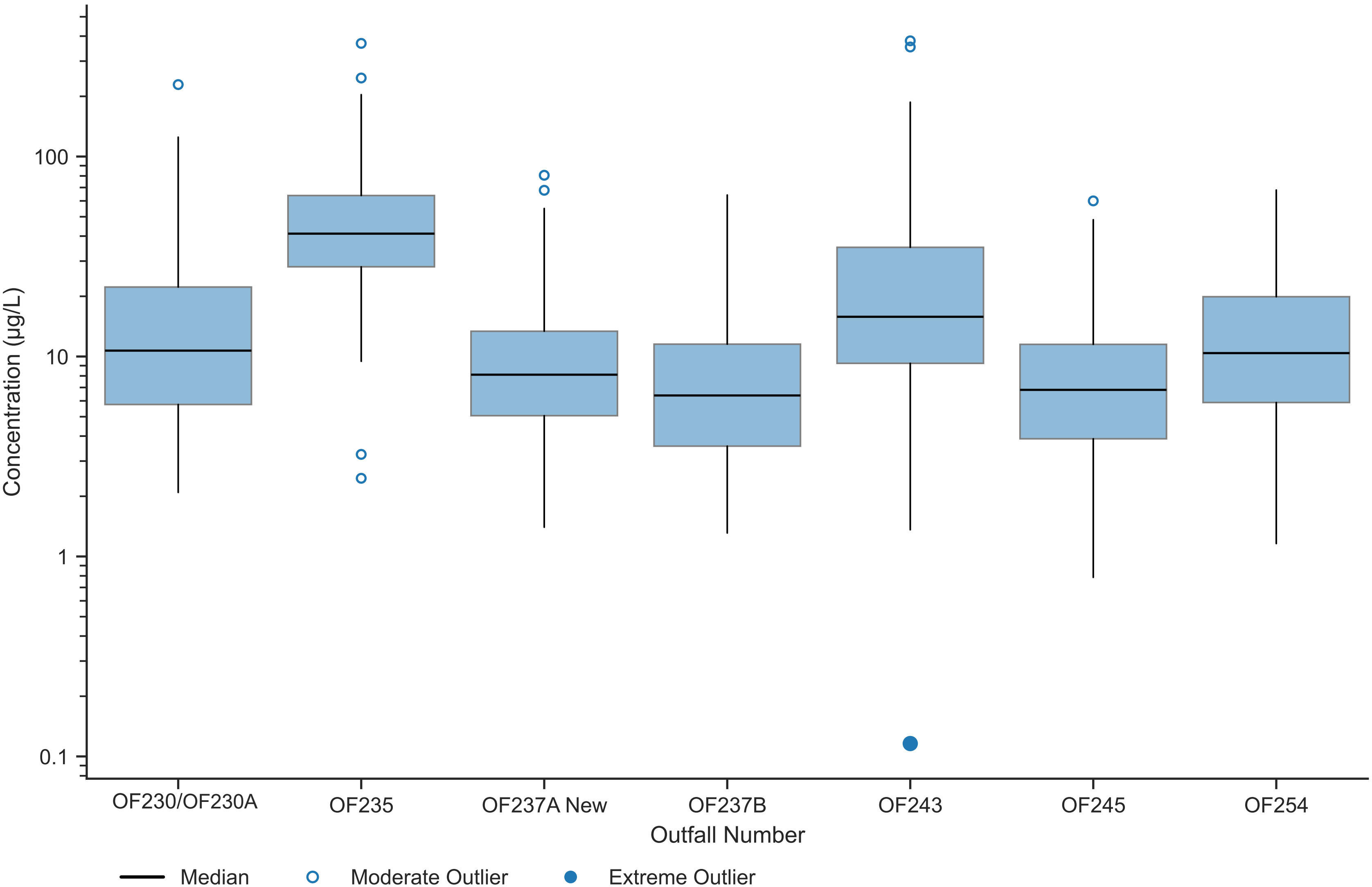
APPENDIX F

Figure F-1
Total Suspended Solids Drain-by-Drain Comparison in Stormwater
October 2001 - September 2024



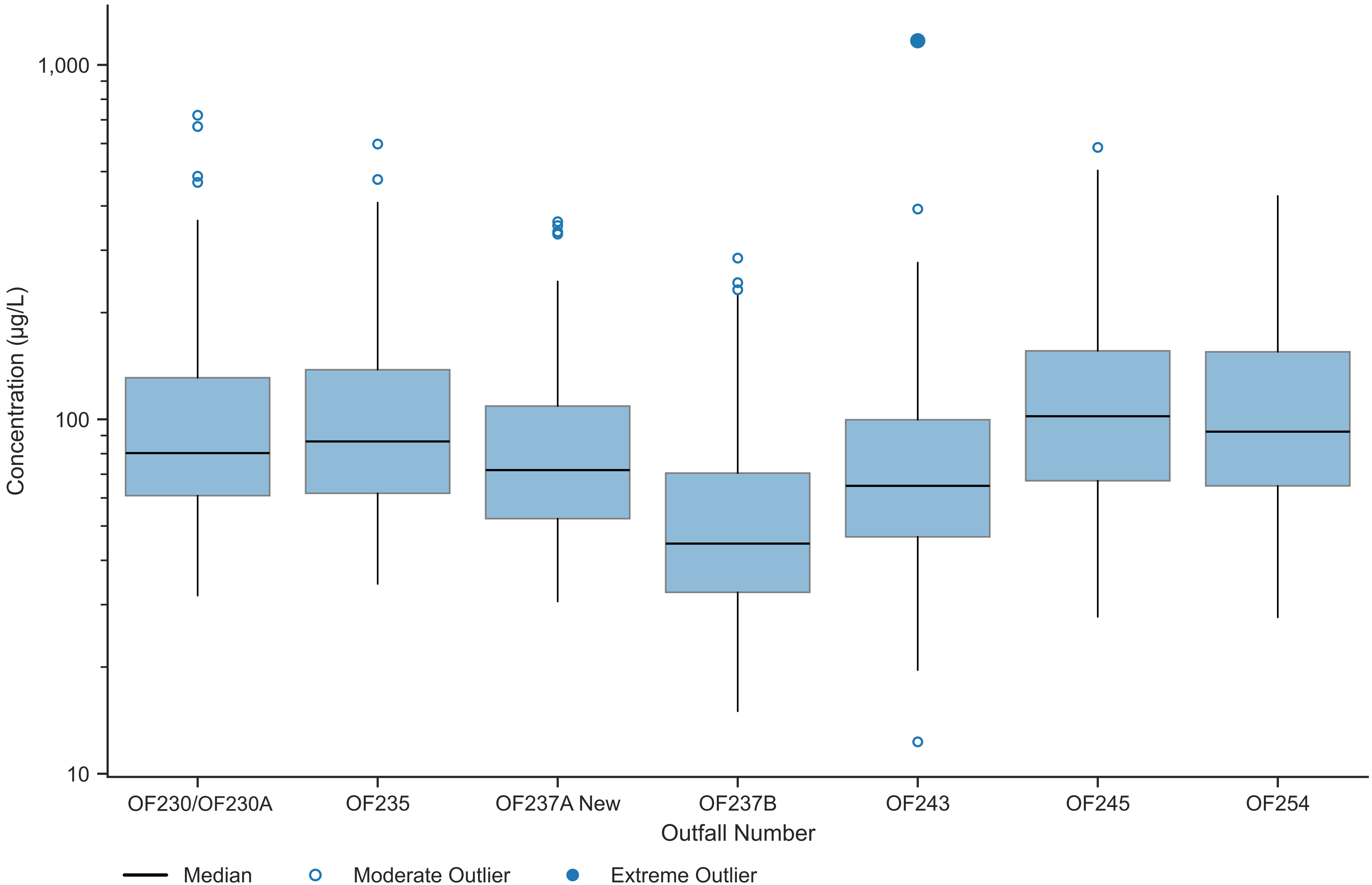
Note:
Tukey Box boundaries display the interquartile range (IQR) of the distribution ranging from the first quartile (Q1) to the third (Q3). The central 50% of data is within the box boundaries. The whiskers represent the remaining data minus the outliers. The moderate outlier value is greater than the Q3 + 1.5 × IQR or less than the Q1 - 1.5 × IQR. The extreme outlier value is greater than the Q3 + 3.0 × IQR or less than the Q1 - 3.0 × IQR.

Figure F-2
Total Lead Drain-by-Drain Comparison in Stormwater
October 2001 - September 2024



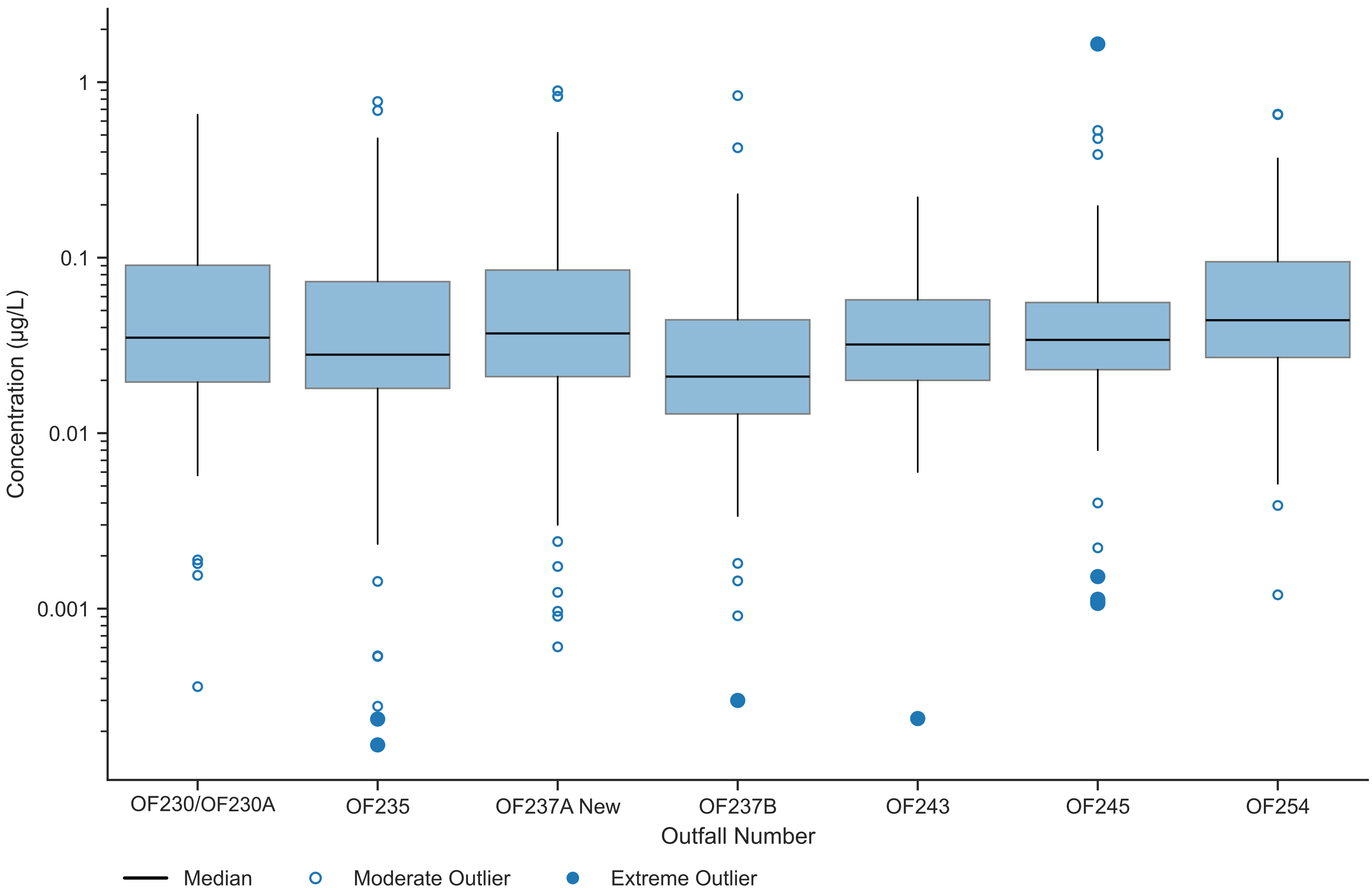
Note:
Tukey Box boundaries display the interquartile range (IQR) of the distribution ranging from the first quartile (Q1) to the third (Q3). The central 50% of data is within the box boundaries. The whiskers represent the remaining data minus the outliers. The moderate outlier value is greater than the Q3 + 1.5 × IQR or less than the Q1 - 1.5 × IQR. The extreme outlier value is greater than the Q3 + 3.0 × IQR or less than the Q1 - 3.0 × IQR.

Figure F-3
Total Zinc Drain-by-Drain Comparison in Stormwater
October 2001 - September 2024



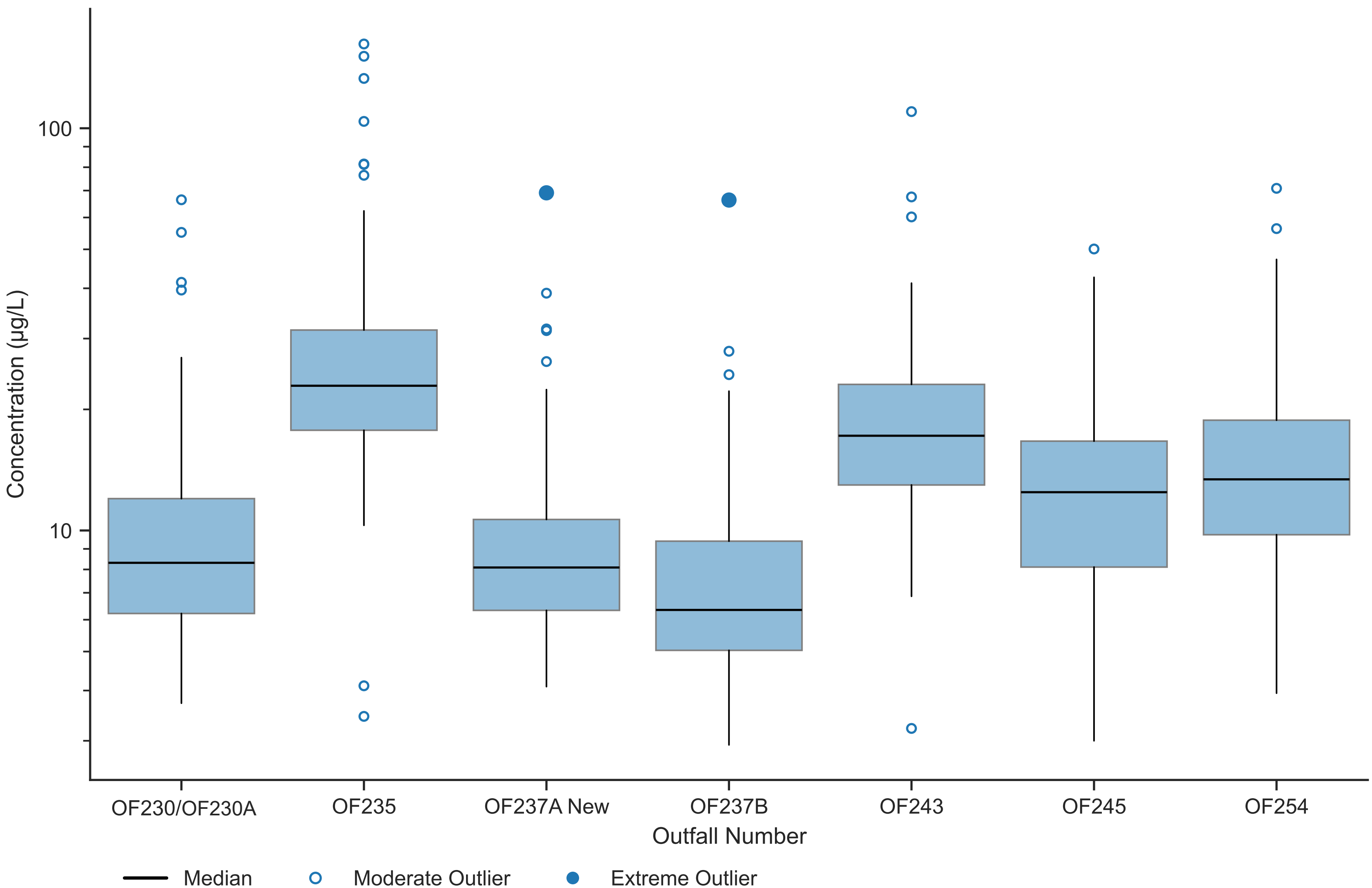
Note:
Tukey Box boundaries display the interquartile range (IQR) of the distribution ranging from the first quartile (Q1) to the third (Q3). The central 50% of data is within the box boundaries. The whiskers represent the remaining data minus the outliers. The moderate outlier value is greater than the Q3 + 1.5 × IQR or less than the Q1 - 1.5 × IQR. The extreme outlier value is greater than the Q3 + 3.0 × IQR or less than the Q1 - 3.0 × IQR.

Figure F-4
Phenanthrene Drain-by-Drain Comparison in Stormwater
October 2001 - September 2024



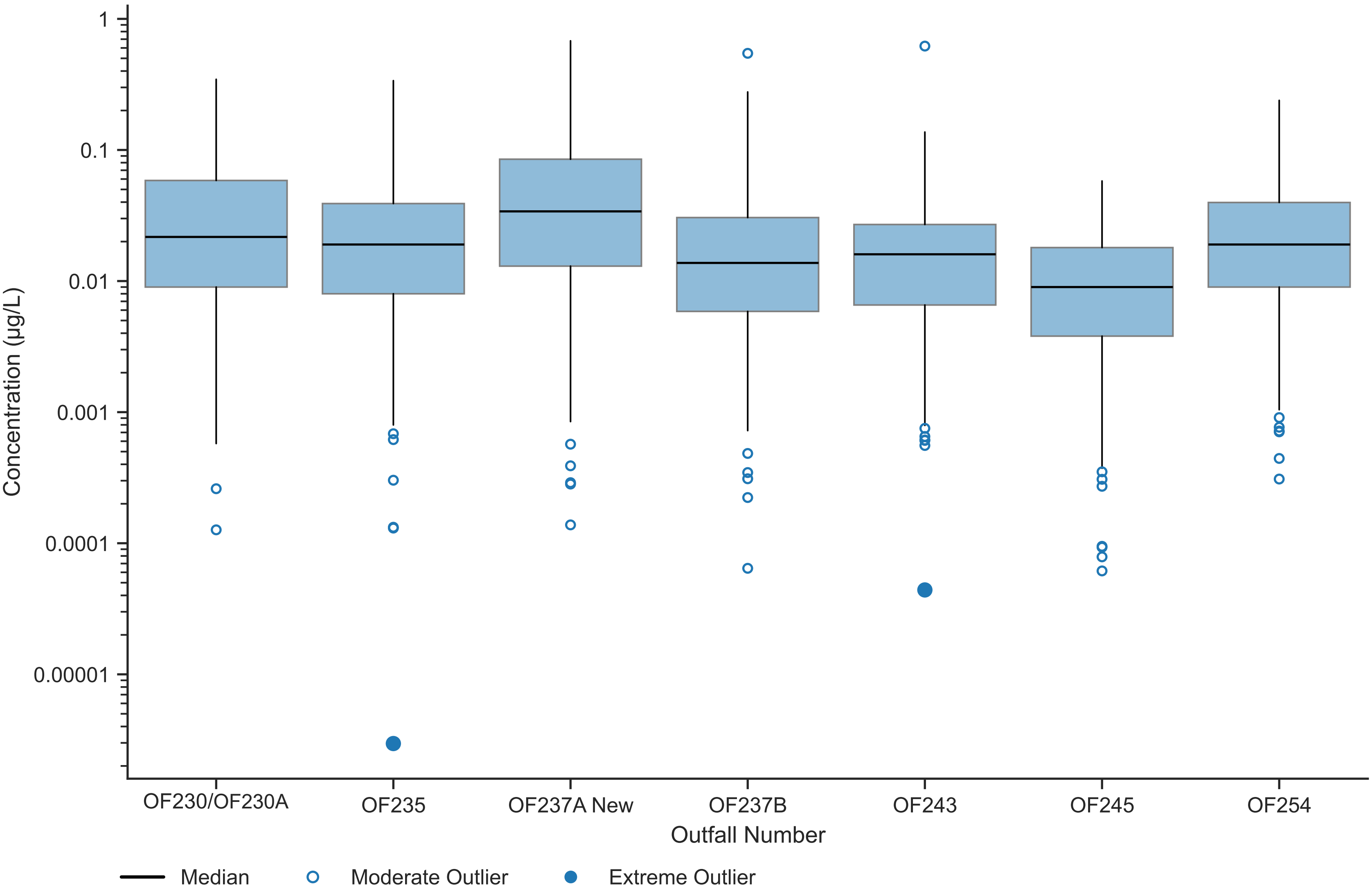
Note:
Tukey Box boundaries display the interquartile range (IQR) of the distribution ranging from the first quartile (Q1) to the third (Q3). The central 50% of data is within the box boundaries. The whiskers represent the remaining data minus the outliers. The moderate outlier value is greater than the Q3 + 1.5 × IQR or less than the Q1 - 1.5 × IQR. The extreme outlier value is greater than the Q3 + 3.0 × IQR or less than the Q1 - 3.0 × IQR.

Figure F-5
Total Copper Drain-by-Drain Comparison in Stormwater
October 2001 - September 2024



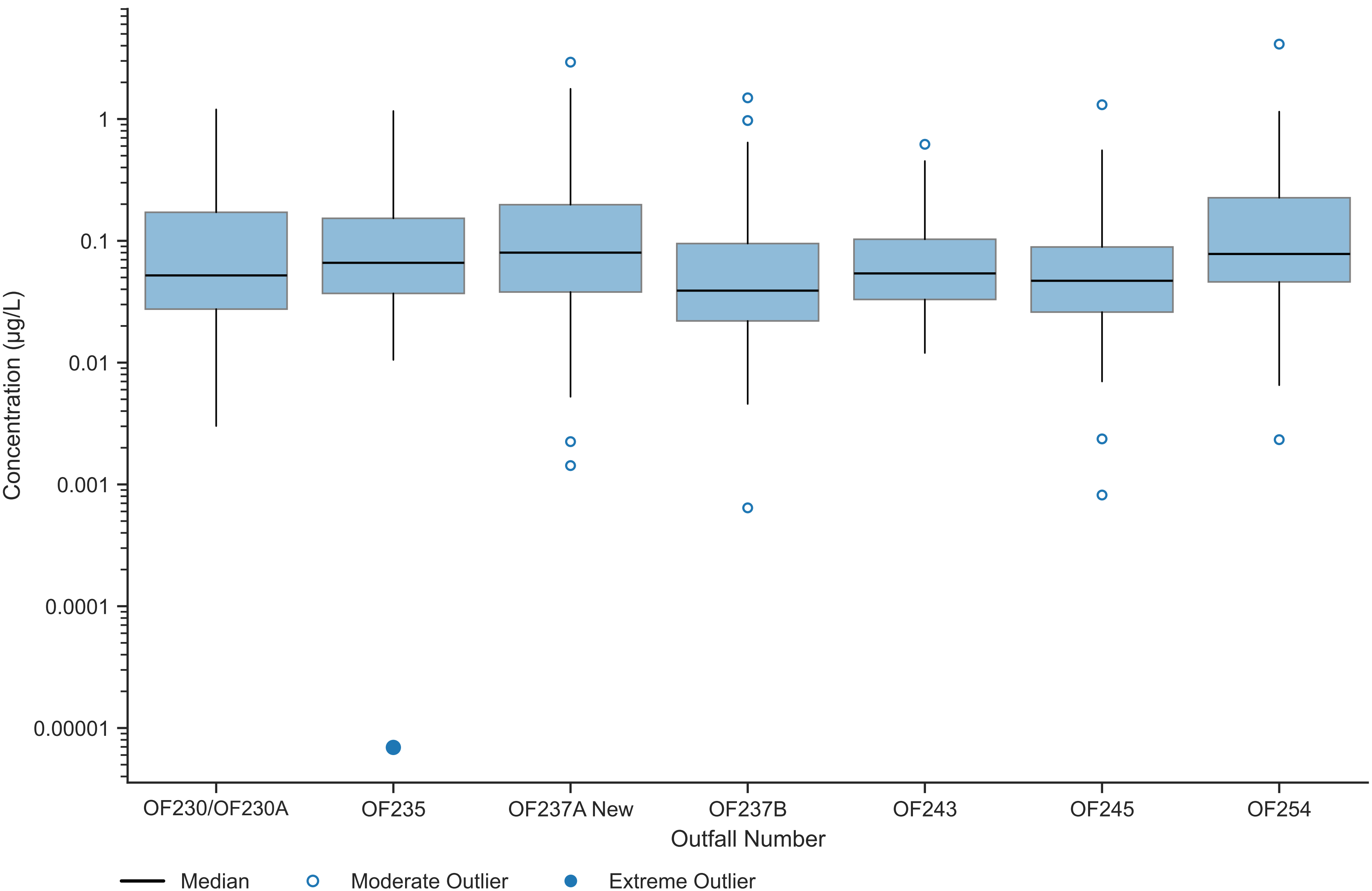
Note:
Tukey Box boundaries display the interquartile range (IQR) of the distribution ranging from the first quartile (Q1) to the third (Q3). The central 50% of data is within the box boundaries. The whiskers represent the remaining data minus the outliers. The moderate outlier value is greater than the Q3 + 1.5 × IQR or less than the Q1 - 1.5 × IQR. The extreme outlier value is greater than the Q3 + 3.0 × IQR or less than the Q1 - 3.0 × IQR.

Figure F-6
Indeno(1,2,3-cd)pyrene Drain-by-Drain Comparison in Stormwater
October 2001 - September 2024



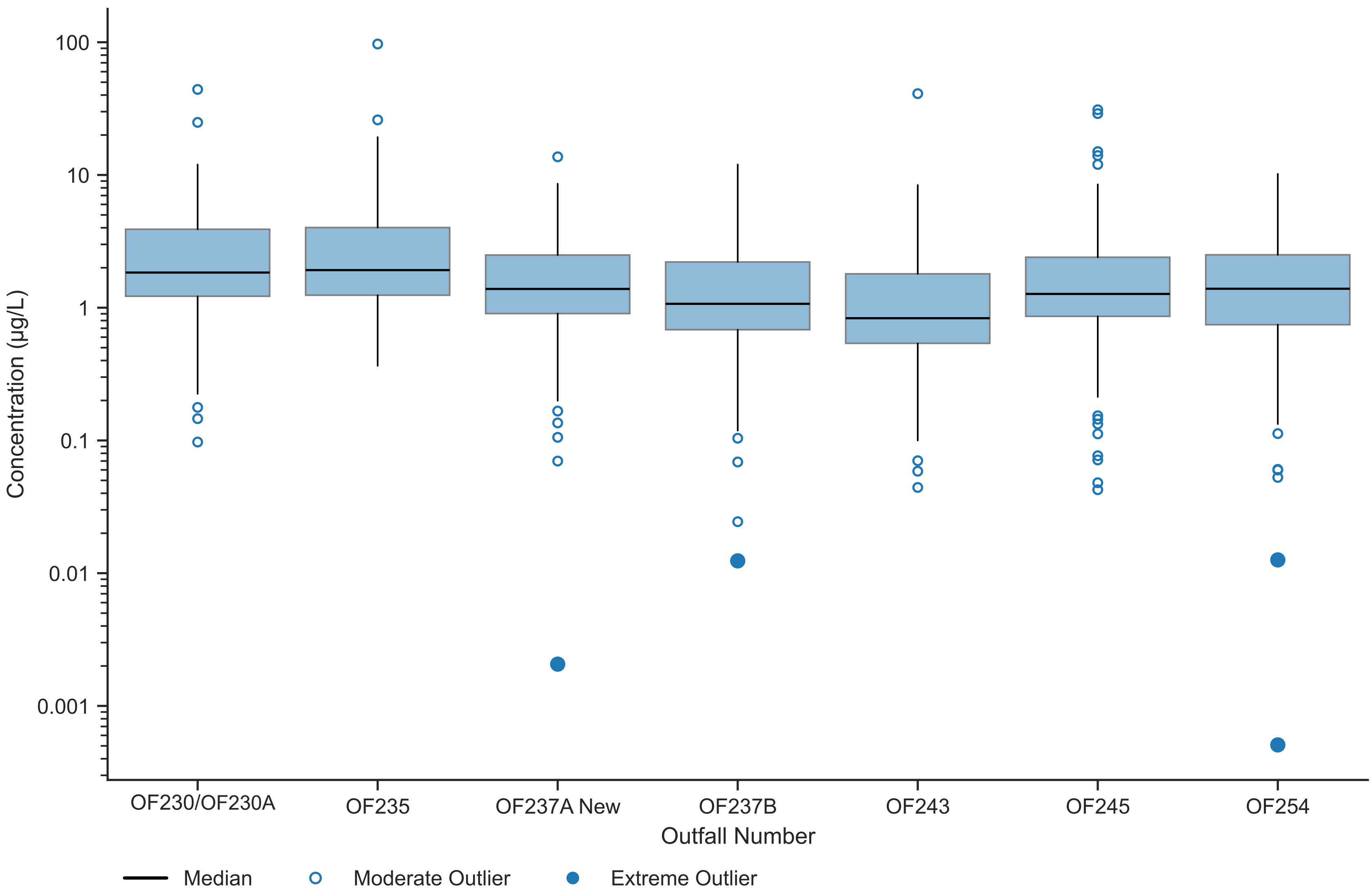
Note:
Tukey Box boundaries display the interquartile range (IQR) of the distribution ranging from the first quartile (Q1) to the third (Q3). The central 50% of data is within the box boundaries. The whiskers represent the remaining data minus the outliers. The moderate outlier value is greater than the Q3 + 1.5 × IQR or less than the Q1 - 1.5 × IQR. The extreme outlier value is greater than the Q3 + 3.0 × IQR or less than the Q1 - 3.0 × IQR.

Figure F-7
Pyrene Drain-by-Drain Comparison in Stormwater
October 2001 - September 2024



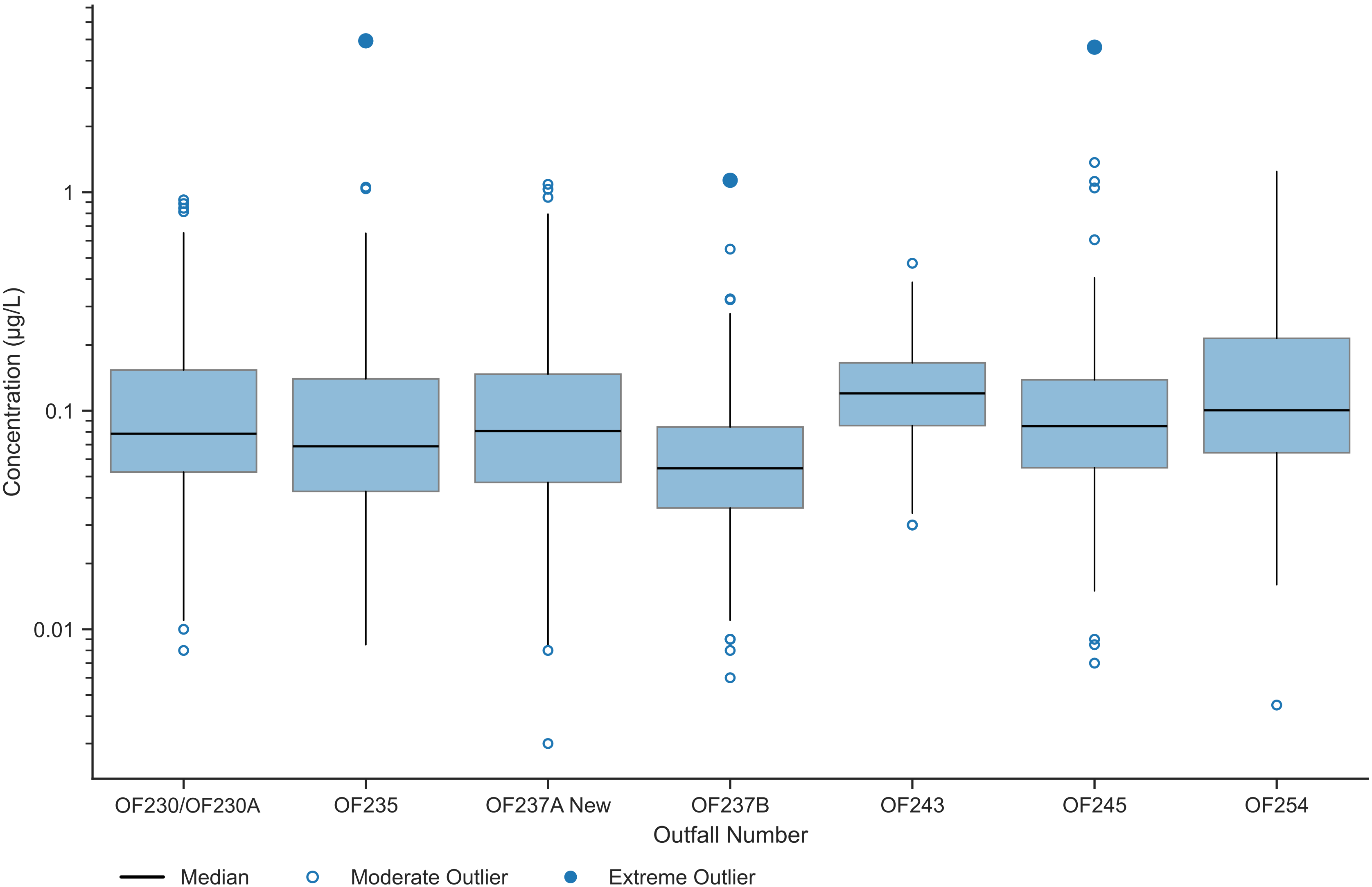
Note:
Tukey Box boundaries display the interquartile range (IQR) of the distribution ranging from the first quartile (Q1) to the third (Q3). The central 50% of data is within the box boundaries. The whiskers represent the remaining data minus the outliers. The moderate outlier value is greater than the Q3 + 1.5 × IQR or less than the Q1 - 1.5 × IQR. The extreme outlier value is greater than the Q3 + 3.0 × IQR or less than the Q1 - 3.0 × IQR.

Figure F-8
Di(2-ethylhexyl)phthalate Drain-by-Drain Comparison in Stormwater
October 2001 - September 2024



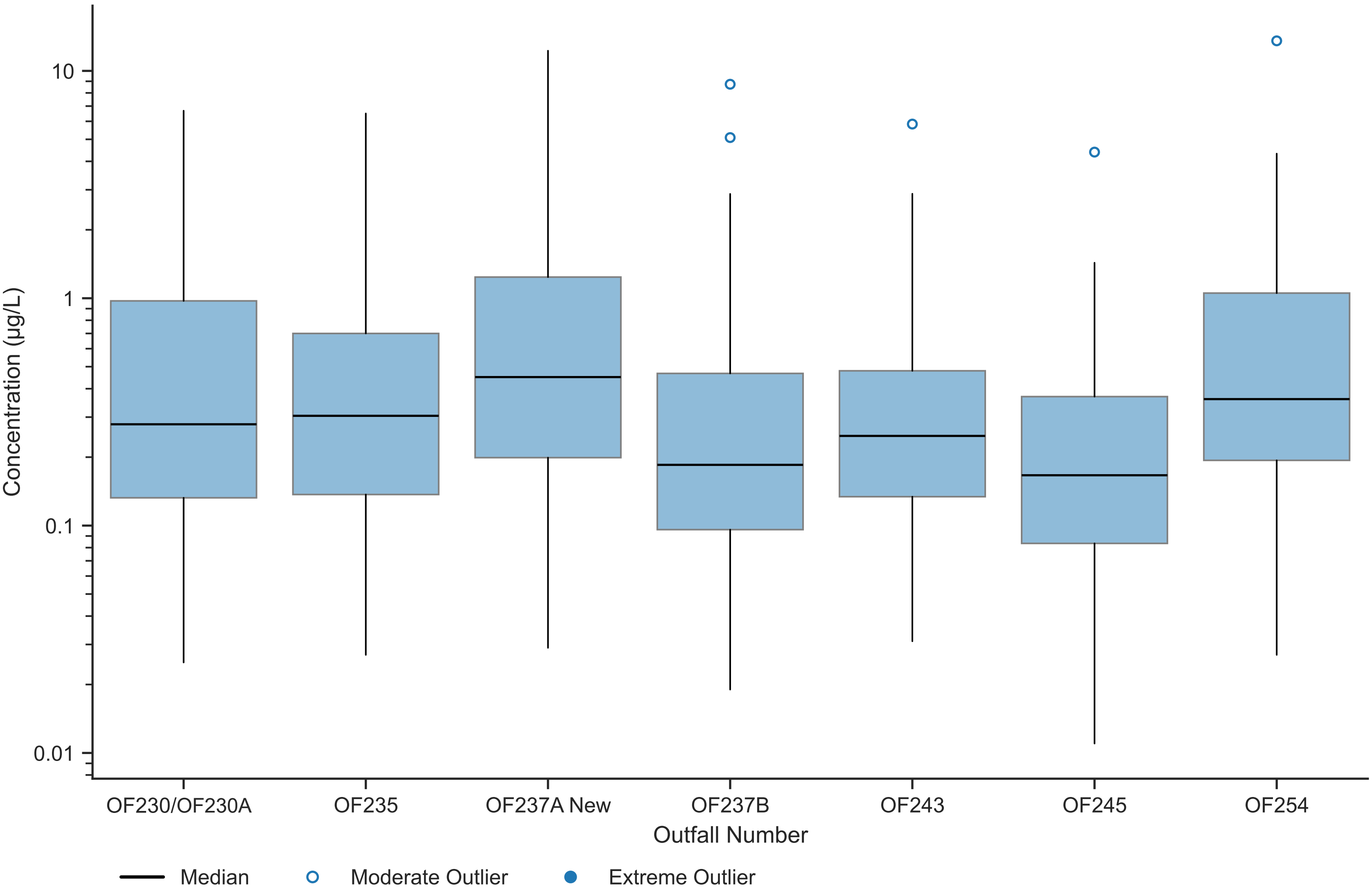
Note:
Tukey Box boundaries display the interquartile range (IQR) of the distribution ranging from the first quartile (Q1) to the third (Q3). The central 50% of data is within the box boundaries. The whiskers represent the remaining data minus the outliers. The moderate outlier value is greater than the Q3 + 1.5 × IQR or less than the Q1 - 1.5 × IQR. The extreme outlier value is greater than the Q3 + 3.0 × IQR or less than the Q1 - 3.0 × IQR.

Figure F-9
Total LPAHs Drain-by-Drain Comparison in Stormwater
October 2001 - September 2024



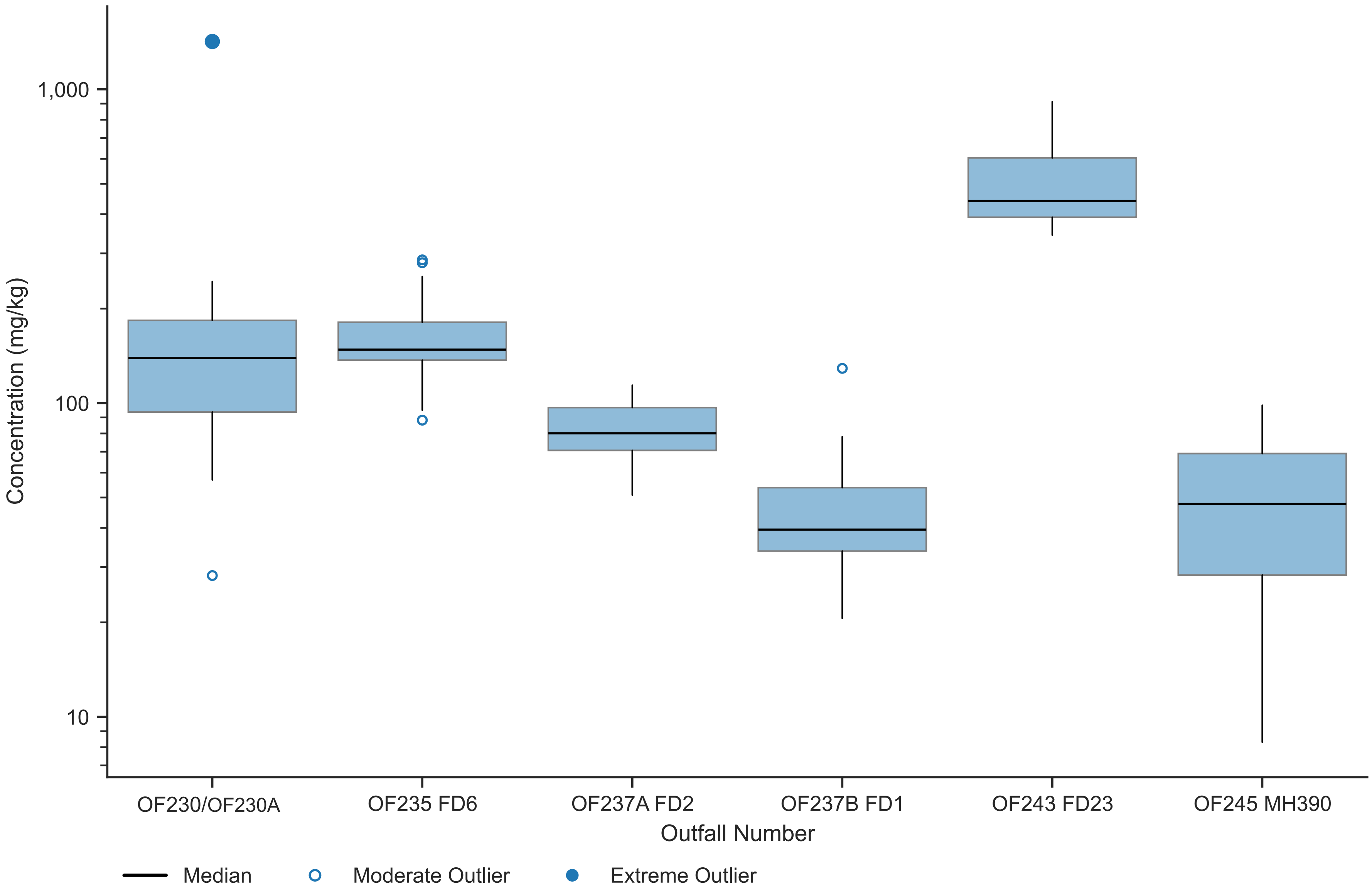
Note:
Tukey Box boundaries display the interquartile range (IQR) of the distribution ranging from the first quartile (Q1) to the third (Q3). The central 50% of data is within the box boundaries. The whiskers represent the remaining data minus the outliers. The moderate outlier value is greater than the Q3 + 1.5 × IQR or less than the Q1 - 1.5 × IQR. The extreme outlier value is greater than the Q3 + 3.0 × IQR or less than the Q1 - 3.0 × IQR.

Figure F-10
Total HPAHs Drain-by-Drain Comparison in Stormwater
October 2001 - September 2024



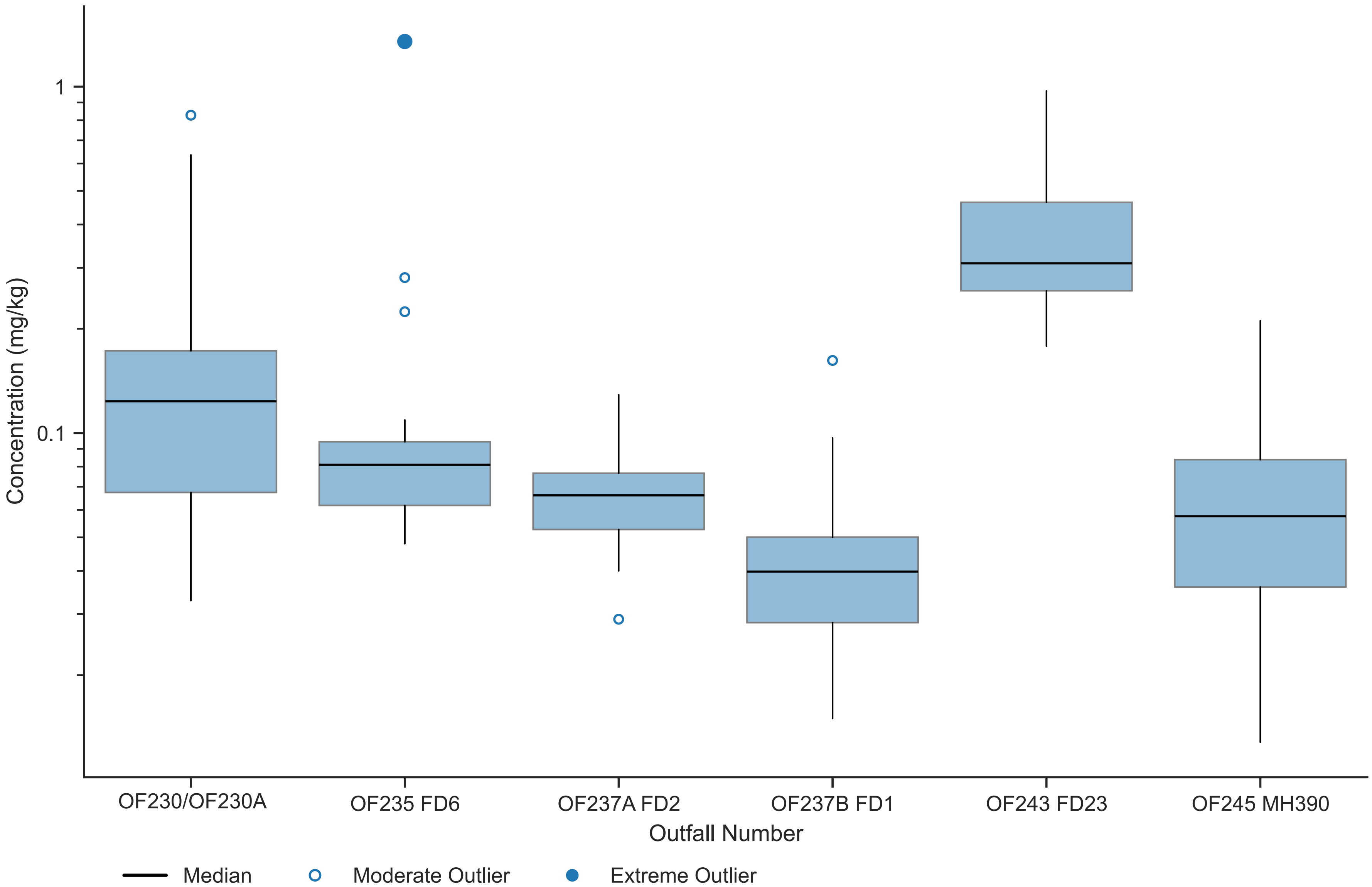
Note:
Tukey Box boundaries display the interquartile range (IQR) of the distribution ranging from the first quartile (Q1) to the third (Q3). The central 50% of data is within the box boundaries. The whiskers represent the remaining data minus the outliers. The moderate outlier value is greater than the Q3 + 1.5 × IQR or less than the Q1 - 1.5 × IQR. The extreme outlier value is greater than the Q3 + 3.0 × IQR or less than the Q1 - 3.0 × IQR.

Figure F-11
Total Lead Basin-by-Basin Comparison in Sediment
October 2001 - September 2024



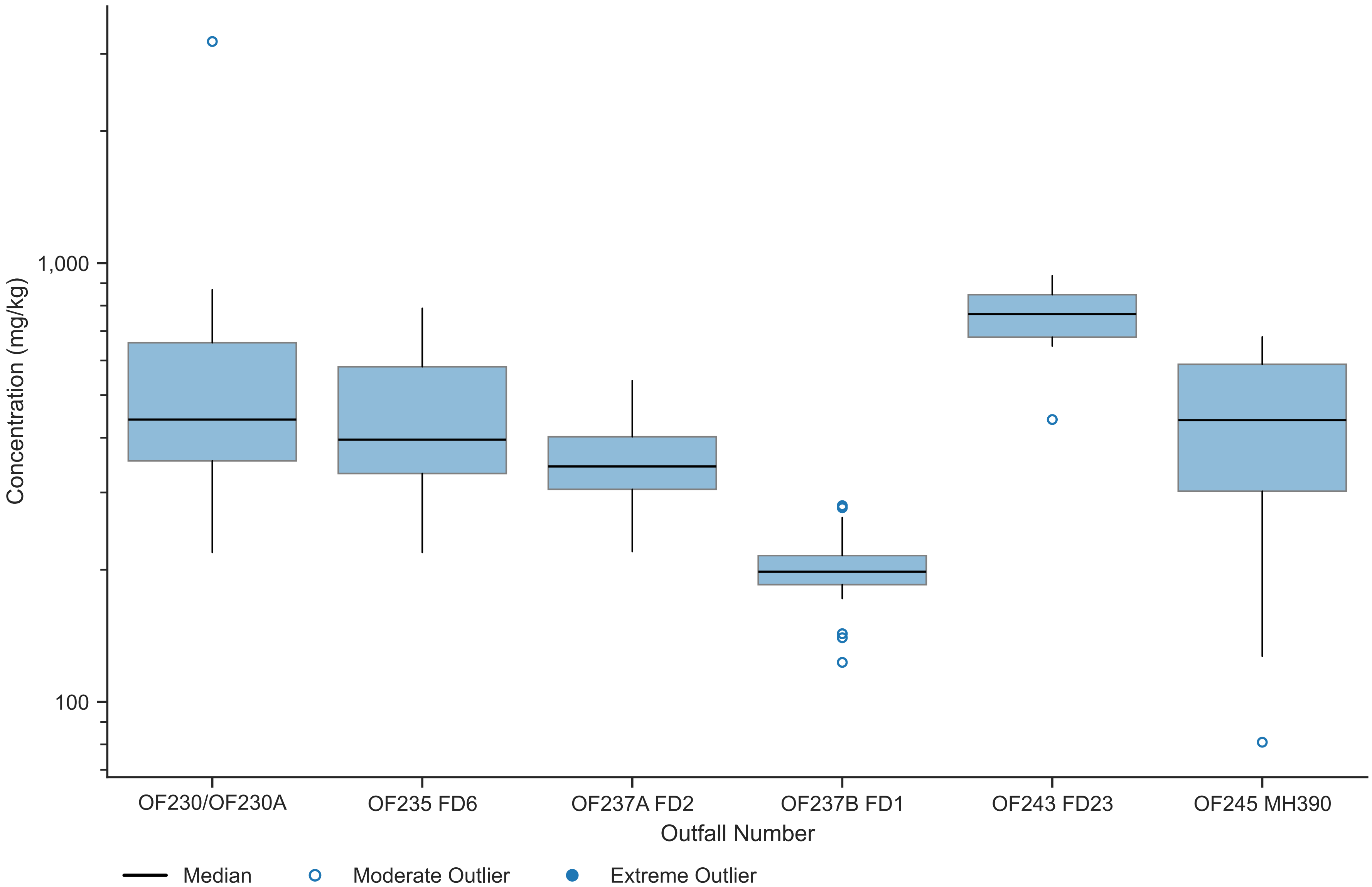
Note:
Tukey Box boundaries display the interquartile range (IQR) of the distribution ranging from the first quartile (Q1) to the third (Q3). The central 50% of data is within the box boundaries. The whiskers represent the remaining data minus the outliers. The moderate outlier value is greater than the Q3 + 1.5 × IQR or less than the Q1 - 1.5 × IQR. The extreme outlier value is greater than the Q3 + 3.0 × IQR or less than the Q1 - 3.0 × IQR.

Figure F-12
Total Mercury Basin-by-Basin Comparison in Sediment
October 2001 - September 2024



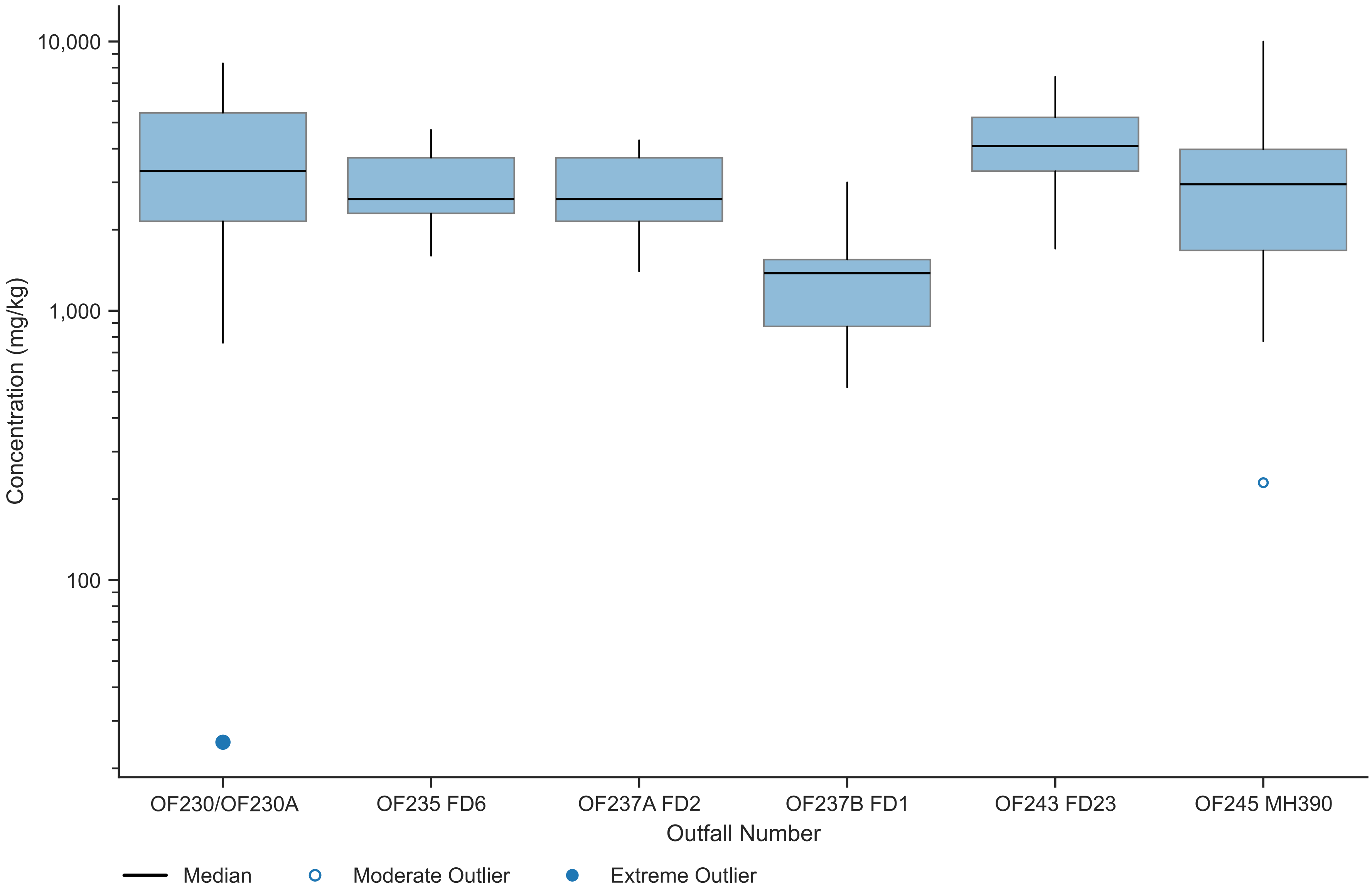
Note:
Tukey Box boundaries display the interquartile range (IQR) of the distribution ranging from the first quartile (Q1) to the third (Q3). The central 50% of data is within the box boundaries. The whiskers represent the remaining data minus the outliers. The moderate outlier value is greater than the Q3 + 1.5 × IQR or less than the Q1 - 1.5 × IQR. The extreme outlier value is greater than the Q3 + 3.0 × IQR or less than the Q1 - 3.0 × IQR.

Figure F-13
Total Zinc Basin-by-Basin Comparison in Sediment
October 2001 - September 2024



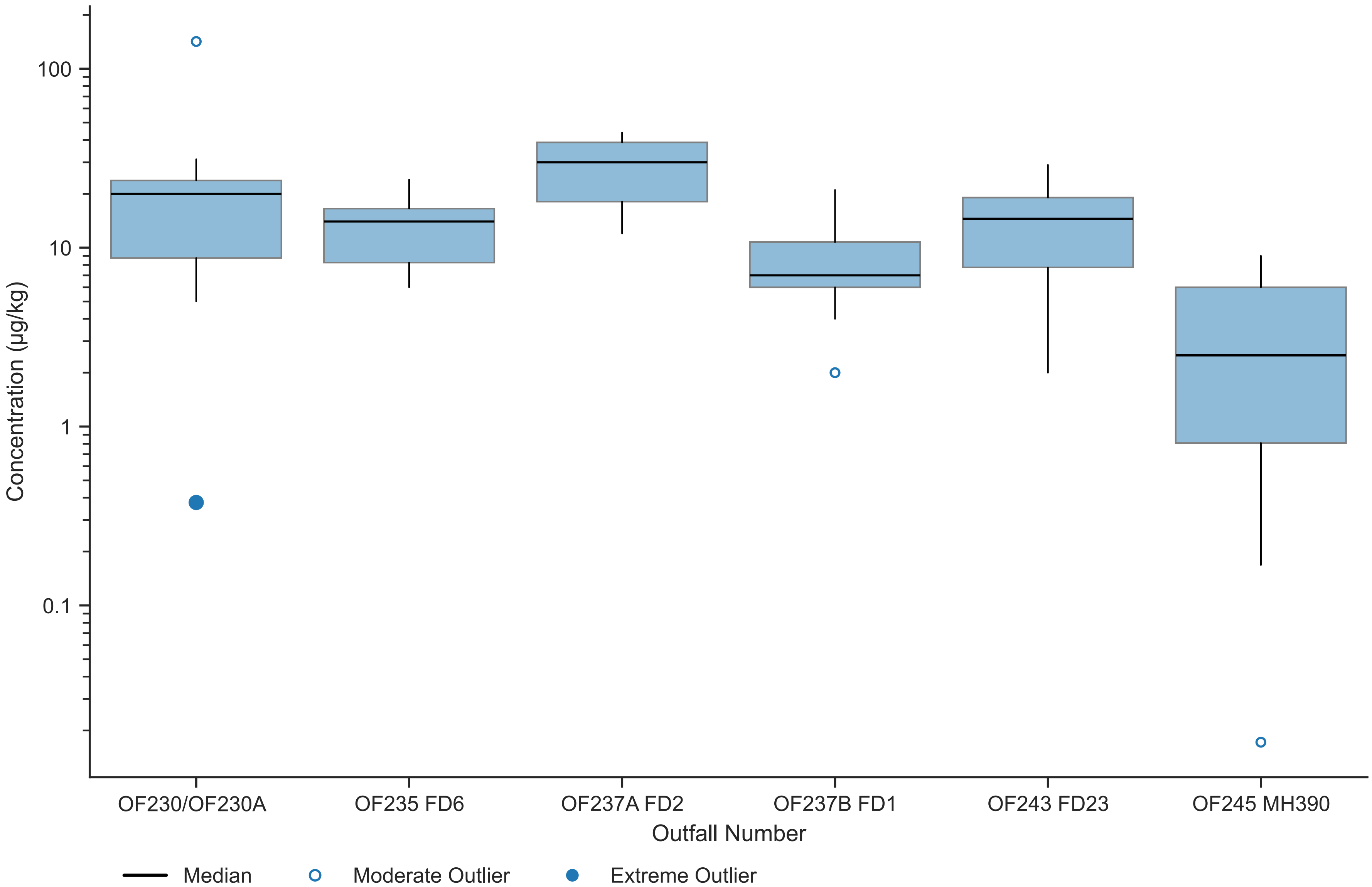
Note:
Tukey Box boundaries display the interquartile range (IQR) of the distribution ranging from the first quartile (Q1) to the third (Q3). The central 50% of data is within the box boundaries. The whiskers represent the remaining data minus the outliers. The moderate outlier value is greater than the Q3 + 1.5 × IQR or less than the Q1 - 1.5 × IQR. The extreme outlier value is greater than the Q3 + 3.0 × IQR or less than the Q1 - 3.0 × IQR.

Figure F-14
NWTPH-Heavy Oil Basin-by-Basin Comparison in Sediment
October 2001 - September 2024



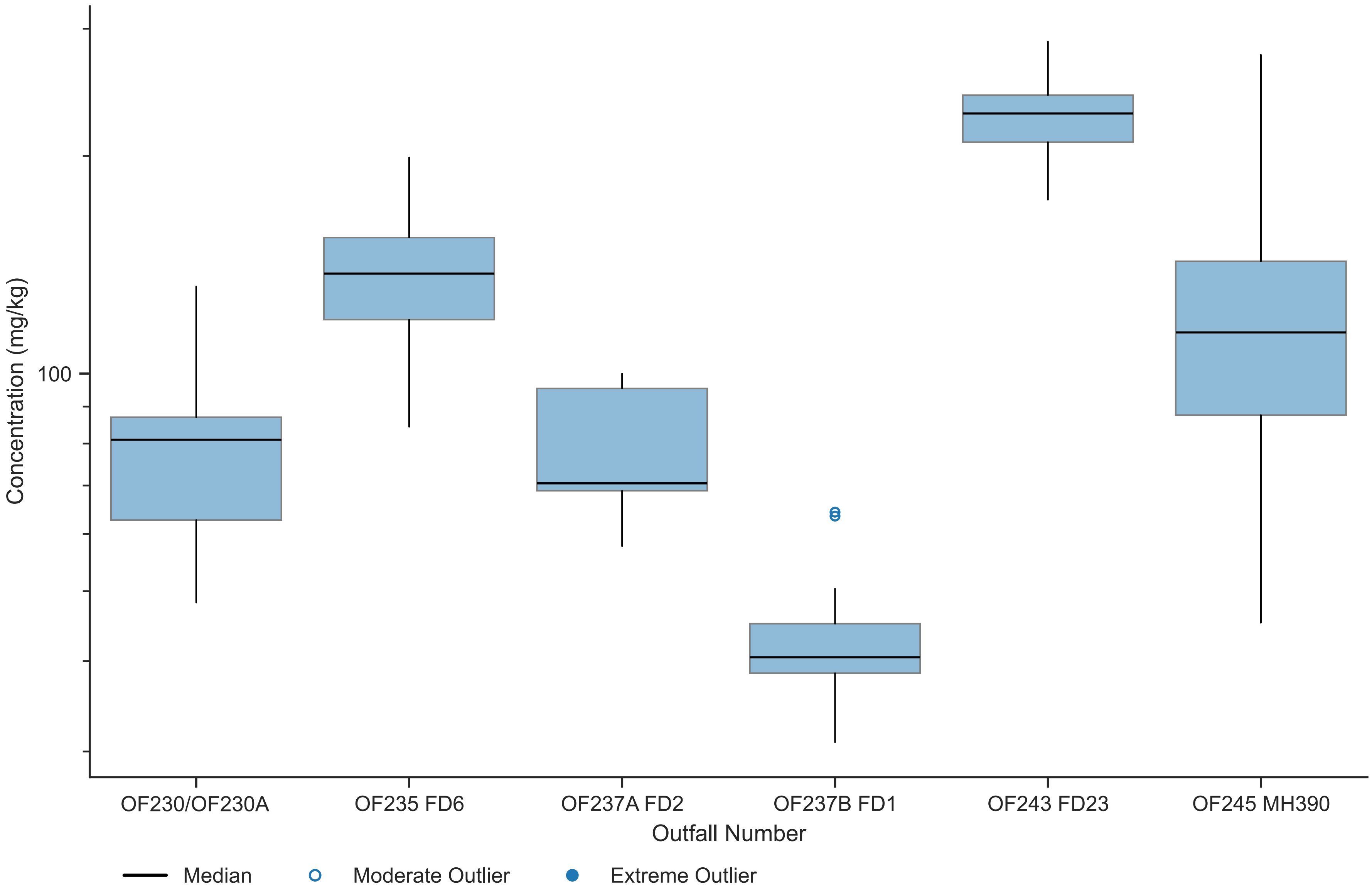
Note:
Tukey Box boundaries display the interquartile range (IQR) of the distribution ranging from the first quartile (Q1) to the third (Q3). The central 50% of data is within the box boundaries. The whiskers represent the remaining data minus the outliers. The moderate outlier value is greater than the Q3 + 1.5 × IQR or less than the Q1 - 1.5 × IQR. The extreme outlier value is greater than the Q3 + 3.0 × IQR or less than the Q1 - 3.0 × IQR.

Figure F-15
Bifenthrin Basin-by-Basin Comparison in Sediment
October 2001 - September 2024



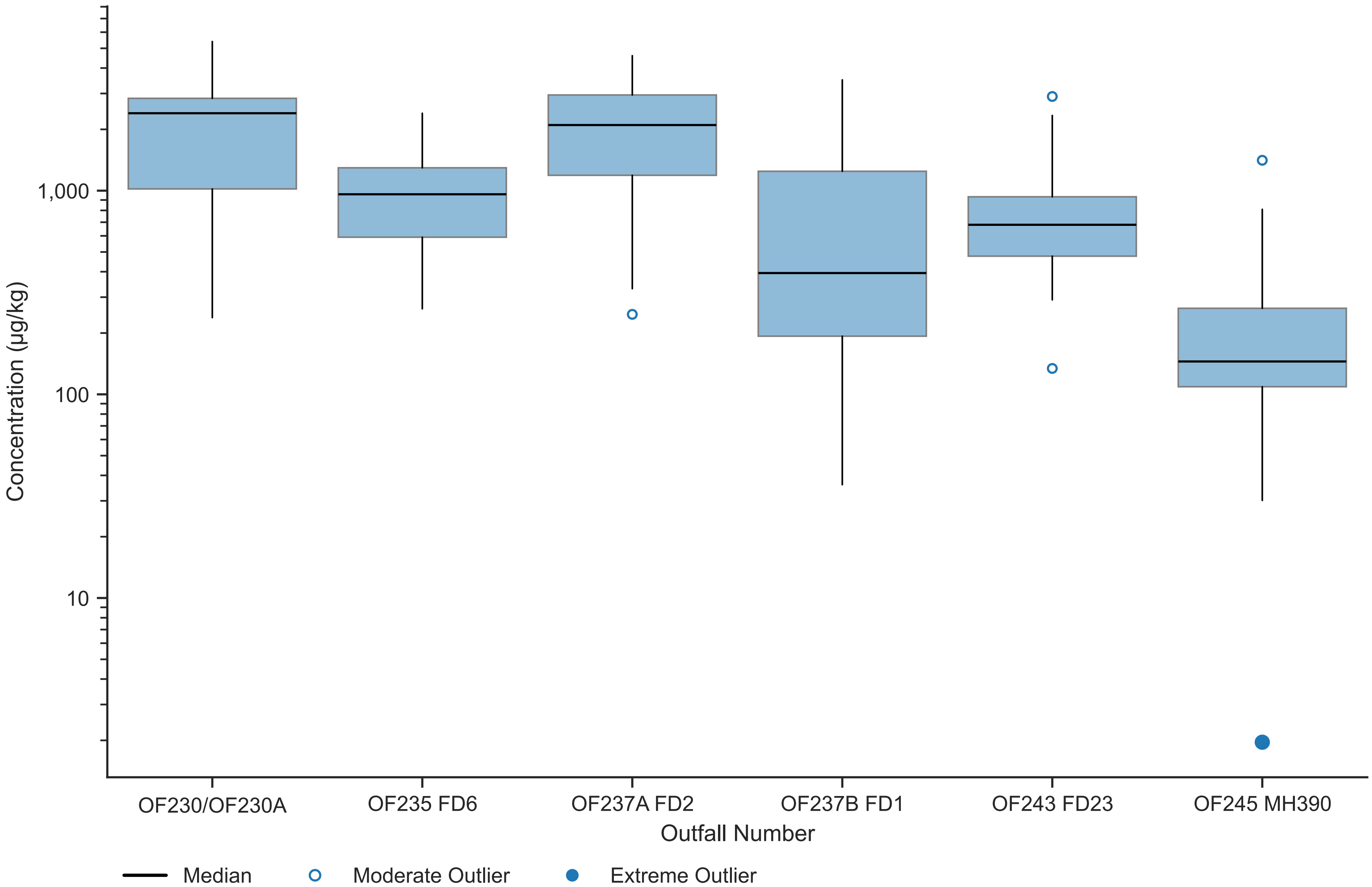
Note:
Tukey Box boundaries display the interquartile range (IQR) of the distribution ranging from the first quartile (Q1) to the third (Q3). The central 50% of data is within the box boundaries. The whiskers represent the remaining data minus the outliers. The moderate outlier value is greater than the Q3 + 1.5 × IQR or less than the Q1 - 1.5 × IQR. The extreme outlier value is greater than the Q3 + 3.0 × IQR or less than the Q1 - 3.0 × IQR.

Figure F-16
Total Copper Basin-by-Basin Comparison in Sediment
October 2001 - September 2024



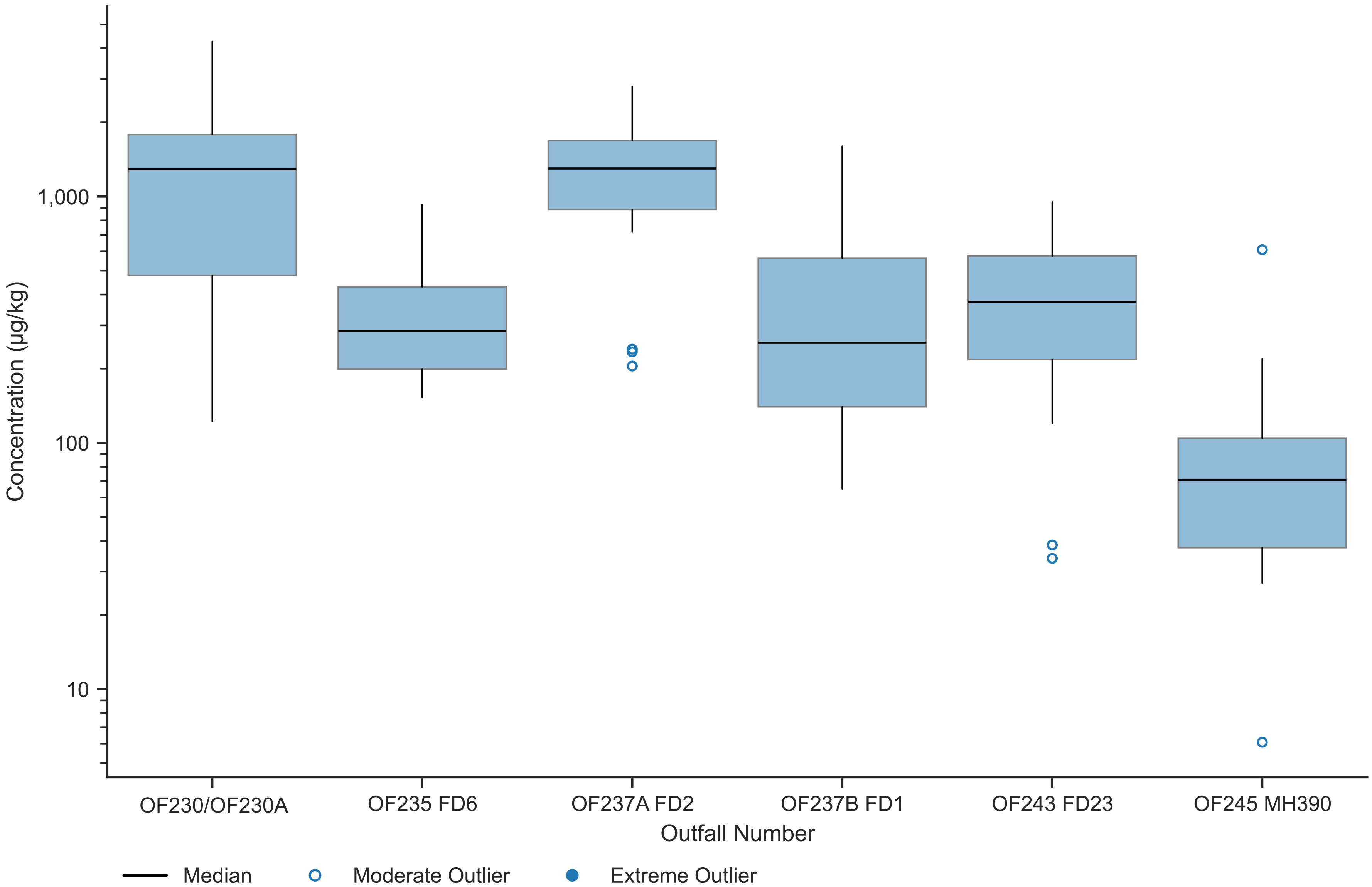
Note:
Tukey Box boundaries display the interquartile range (IQR) of the distribution ranging from the first quartile (Q1) to the third (Q3). The central 50% of data is within the box boundaries. The whiskers represent the remaining data minus the outliers. The moderate outlier value is greater than the Q3 + 1.5 × IQR or less than the Q1 - 1.5 × IQR. The extreme outlier value is greater than the Q3 + 3.0 × IQR or less than the Q1 - 3.0 × IQR.

Figure F-17
Phenanthrene Basin-by-Basin Comparison in Sediment
October 2001 - September 2024



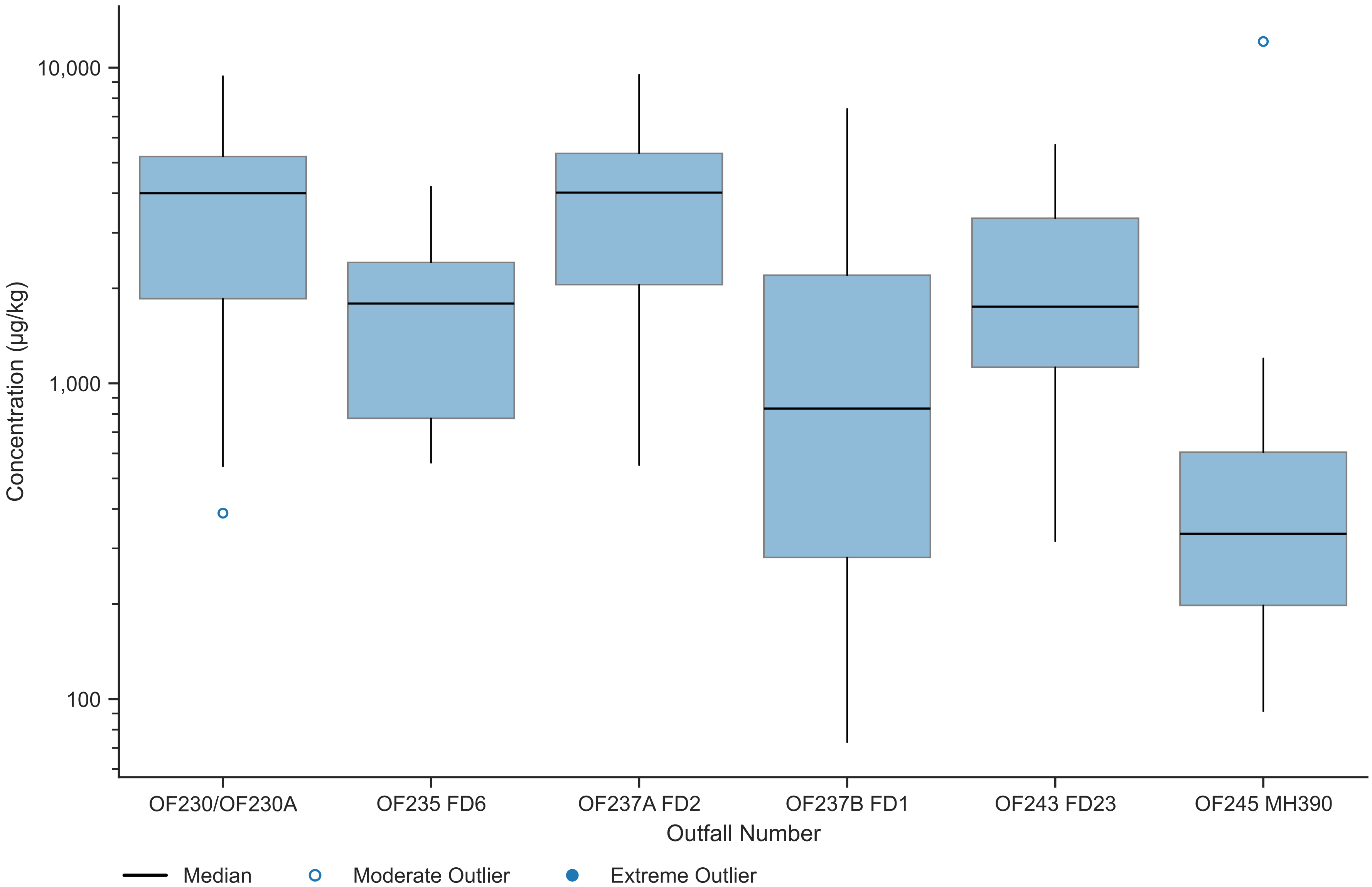
Note:
Tukey Box boundaries display the interquartile range (IQR) of the distribution ranging from the first quartile (Q1) to the third (Q3). The central 50% of data is within the box boundaries. The whiskers represent the remaining data minus the outliers. The moderate outlier value is greater than the Q3 + 1.5 × IQR or less than the Q1 - 1.5 × IQR. The extreme outlier value is greater than the Q3 + 3.0 × IQR or less than the Q1 - 3.0 × IQR.

Figure F-18
Indeno(1,2,3-cd)pyrene Basin-by-Basin Comparison in Sediment
October 2001 - September 2024



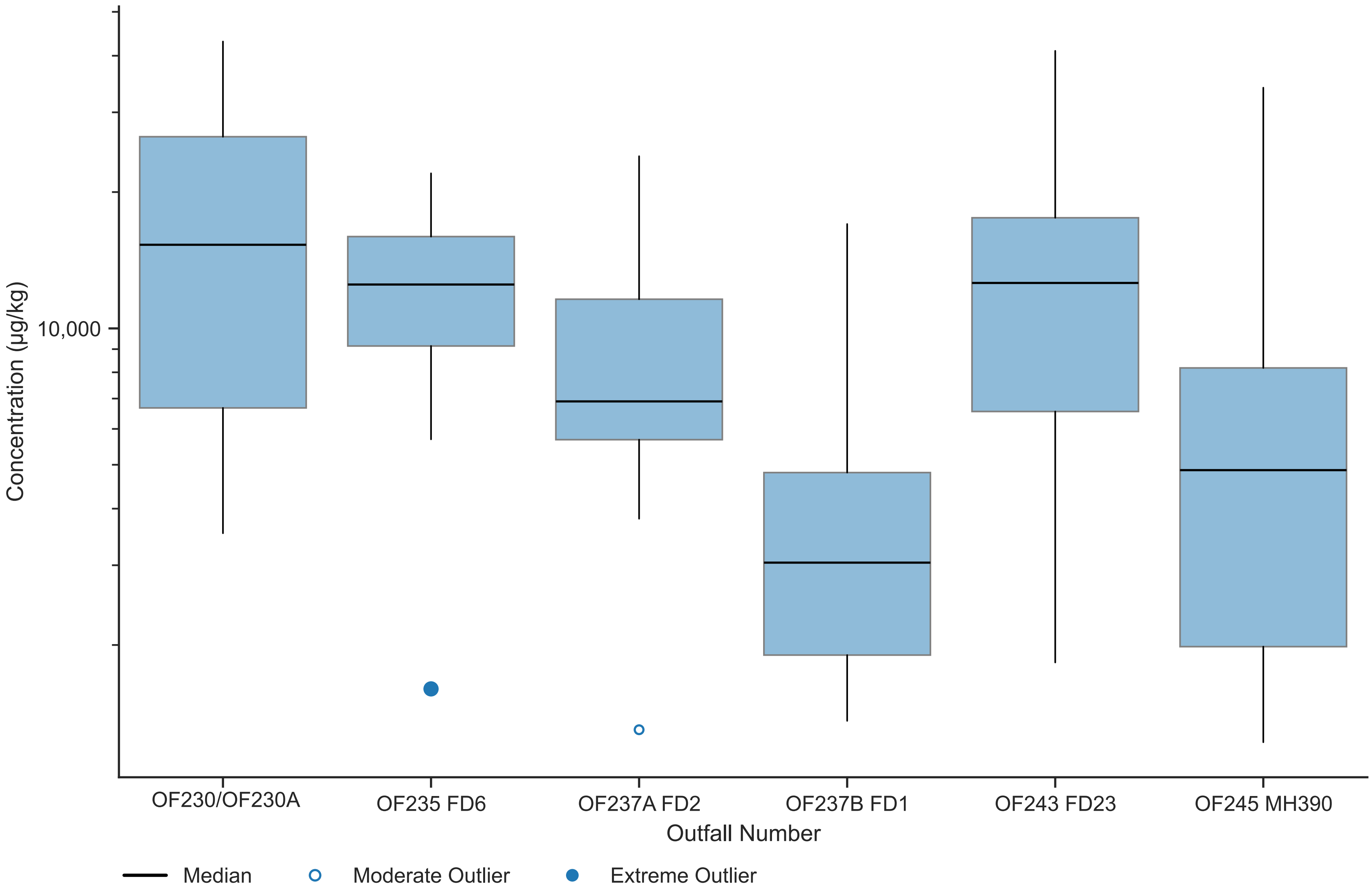
Note:
Tukey Box boundaries display the interquartile range (IQR) of the distribution ranging from the first quartile (Q1) to the third (Q3). The central 50% of data is within the box boundaries. The whiskers represent the remaining data minus the outliers. The moderate outlier value is greater than the Q3 + 1.5 × IQR or less than the Q1 - 1.5 × IQR. The extreme outlier value is greater than the Q3 + 3.0 × IQR or less than the Q1 - 3.0 × IQR.

Figure F-19
Pyrene Basin-by-Basin Comparison in Sediment
October 2001 - September 2024



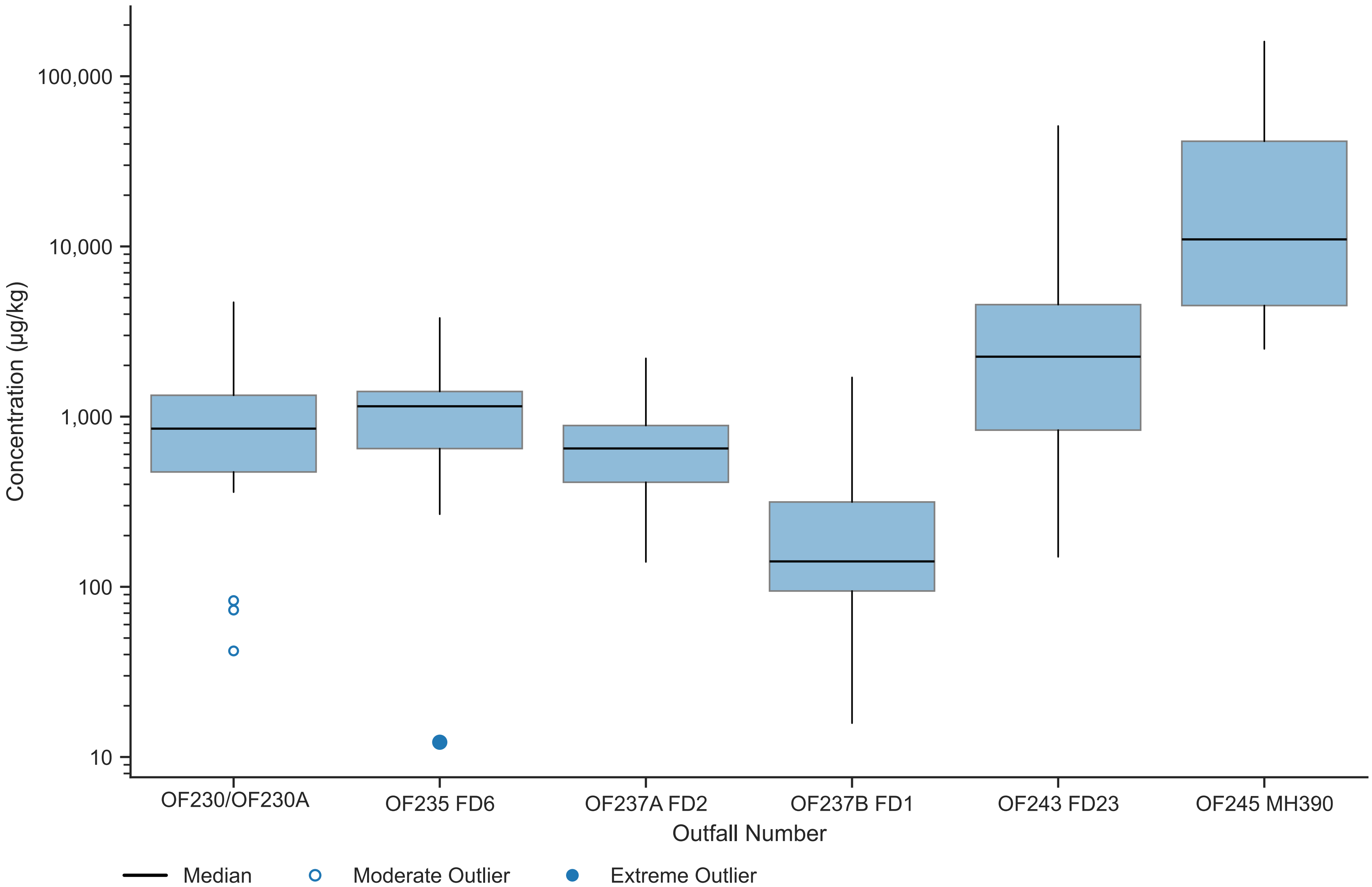
Note:
Tukey Box boundaries display the interquartile range (IQR) of the distribution ranging from the first quartile (Q1) to the third (Q3). The central 50% of data is within the box boundaries. The whiskers represent the remaining data minus the outliers. The moderate outlier value is greater than the Q3 + 1.5 × IQR or less than the Q1 - 1.5 × IQR. The extreme outlier value is greater than the Q3 + 3.0 × IQR or less than the Q1 - 3.0 × IQR.

Figure F-20
Di(2-ethylhexyl)phthalate Basin-by-Basin Comparison in Sediment
October 2001 - September 2024



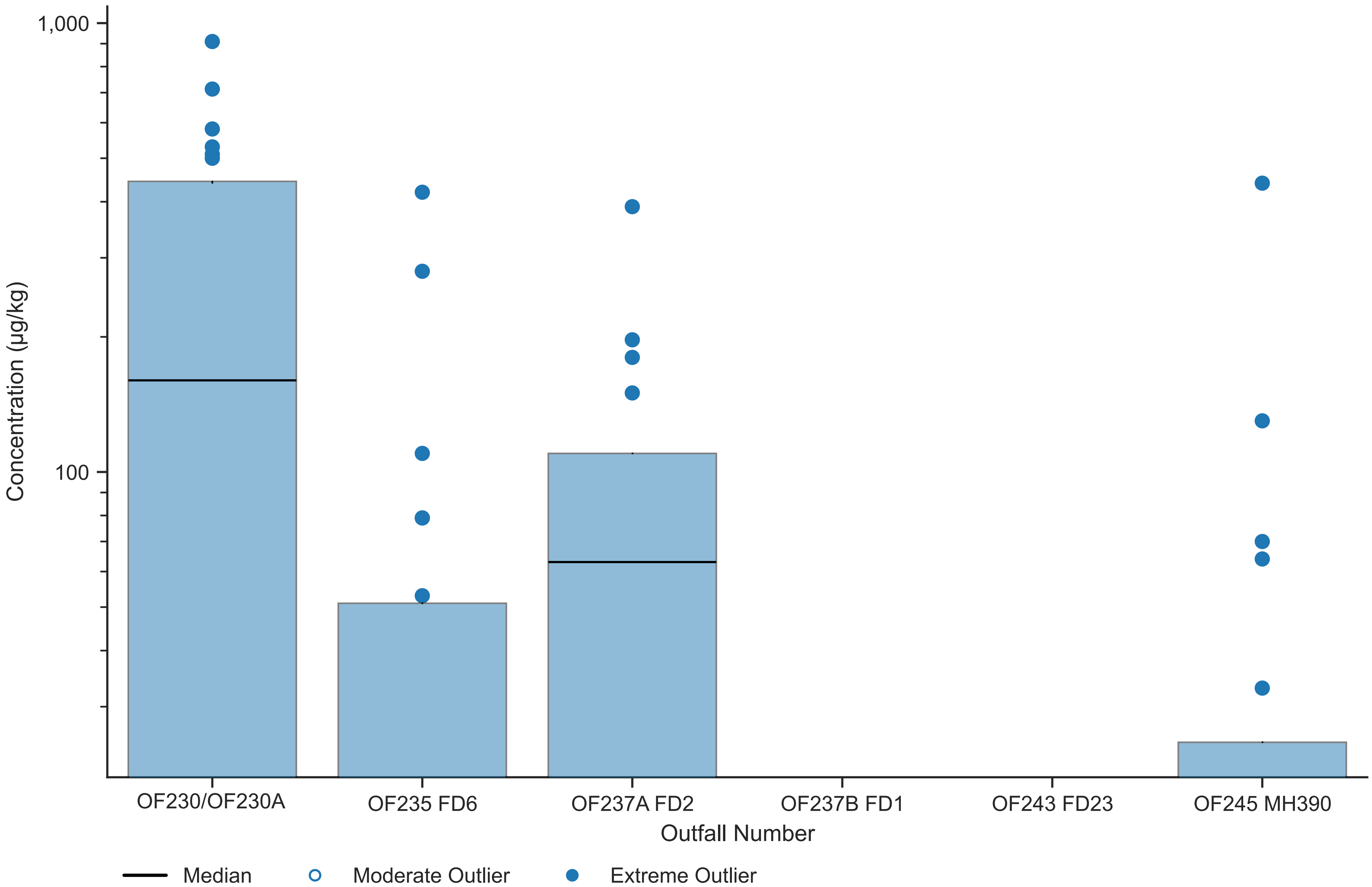
Note:
Tukey Box boundaries display the interquartile range (IQR) of the distribution ranging from the first quartile (Q1) to the third (Q3). The central 50% of data is within the box boundaries. The whiskers represent the remaining data minus the outliers. The moderate outlier value is greater than the Q3 + 1.5 × IQR or less than the Q1 - 1.5 × IQR. The extreme outlier value is greater than the Q3 + 3.0 × IQR or less than the Q1 - 3.0 × IQR.

Figure F-21
Butyl benzyl phthalate Basin-by-Basin Comparison in Sediment
October 2001 - September 2024



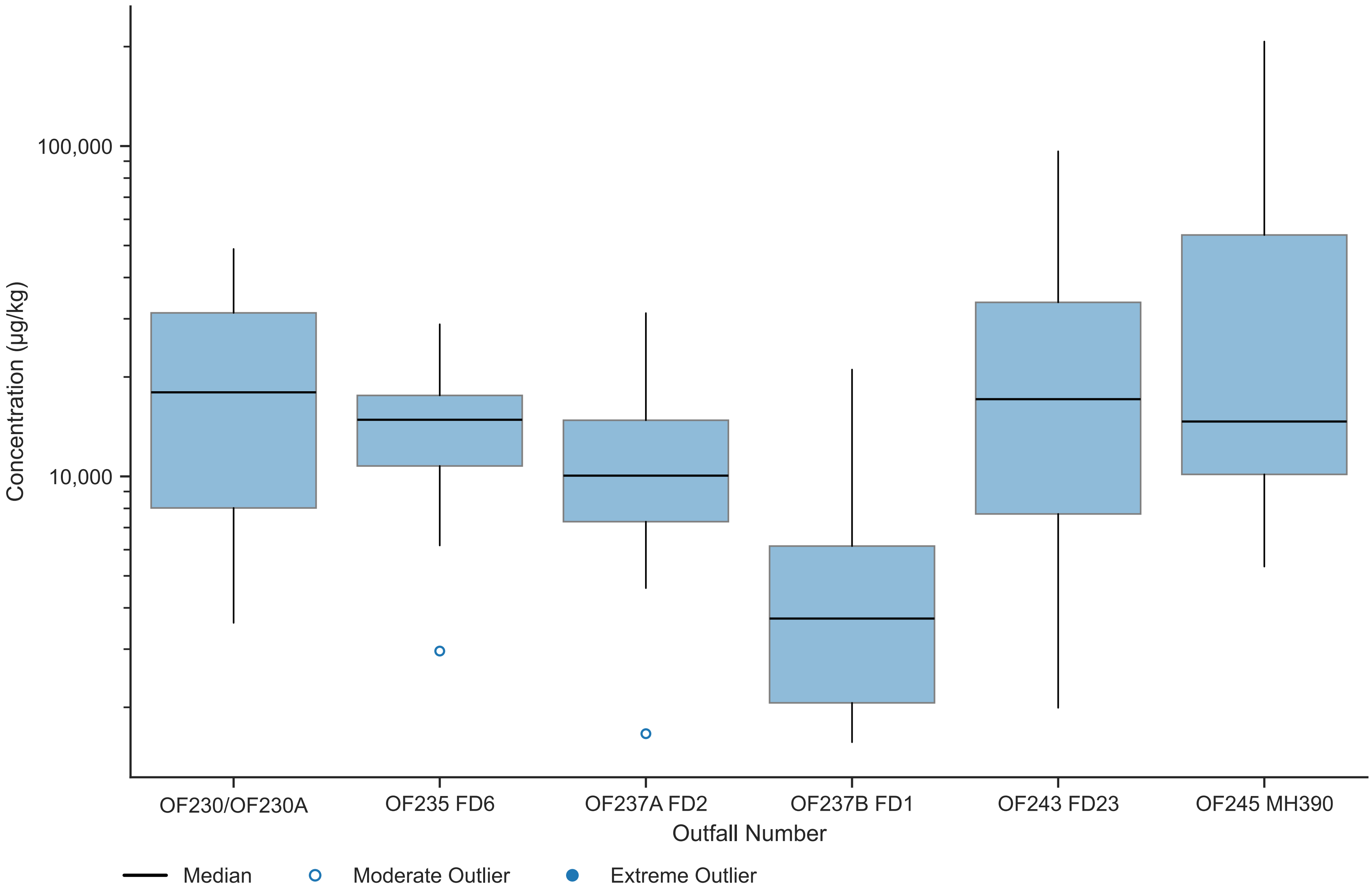
Note:
Tukey Box boundaries display the interquartile range (IQR) of the distribution ranging from the first quartile (Q1) to the third (Q3). The central 50% of data is within the box boundaries. The whiskers represent the remaining data minus the outliers. The moderate outlier value is greater than the Q3 + 1.5 × IQR or less than the Q1 - 1.5 × IQR. The extreme outlier value is greater than the Q3 + 3.0 × IQR or less than the Q1 - 3.0 × IQR.

Figure F-22
Total PCBs Basin-by-Basin Comparison in Sediment
October 2001 - September 2024



Note:
Tukey Box boundaries display the interquartile range (IQR) of the distribution ranging from the first quartile (Q1) to the third (Q3). The central 50% of data is within the box boundaries. The whiskers represent the remaining data minus the outliers. The moderate outlier value is greater than the Q3 + 1.5 × IQR or less than the Q1 - 1.5 × IQR. The extreme outlier value is greater than the Q3 + 3.0 × IQR or less than the Q1 - 3.0 × IQR.

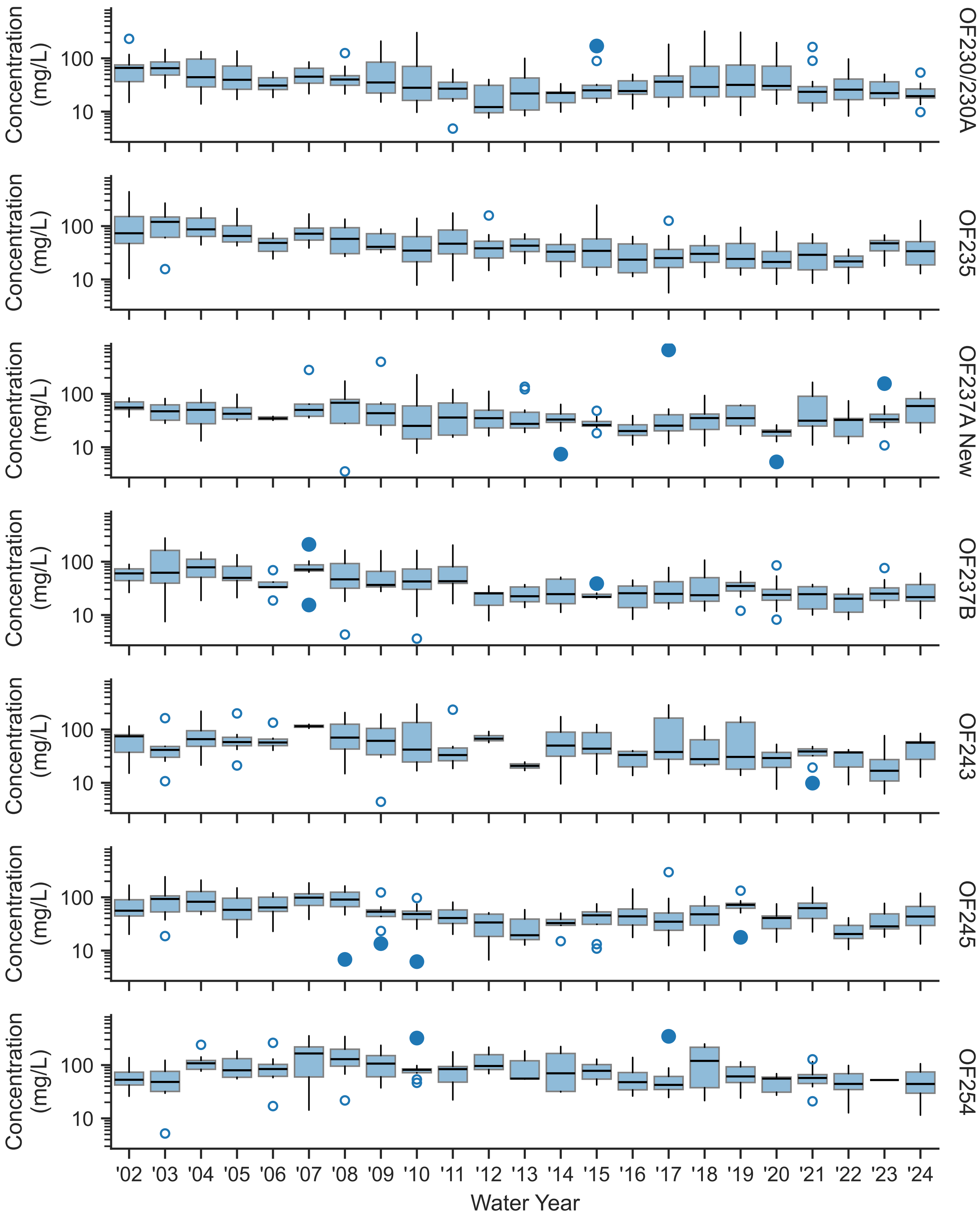
Figure F-23
Total Phthalates Basin-by-Basin Comparison in Sediment
October 2001 - September 2024



Note:
Tukey Box boundaries display the interquartile range (IQR) of the distribution ranging from the first quartile (Q1) to the third (Q3). The central 50% of data is within the box boundaries. The whiskers represent the remaining data minus the outliers. The moderate outlier value is greater than the Q3 + 1.5 × IQR or less than the Q1 - 1.5 × IQR. The extreme outlier value is greater than the Q3 + 3.0 × IQR or less than the Q1 - 3.0 × IQR.

APPENDIX G

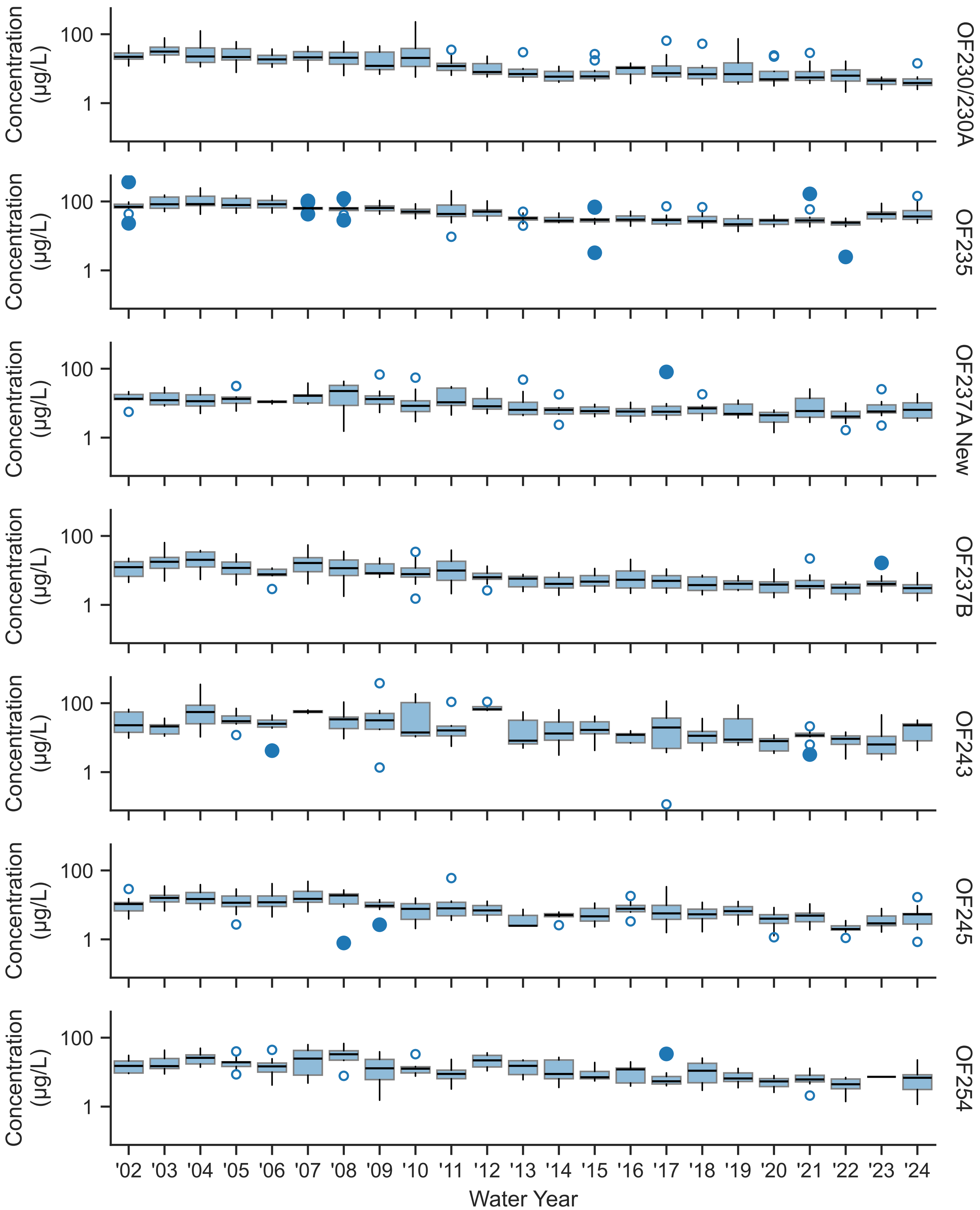
Figure G-1
Total Suspended Solids Year-by-Year Comparison in Stormwater
October 2001 - September 2024



Note:
Tukey Box boundaries display the interquartile range (IQR) of the distribution ranging from the first quartile (Q1) to the third (Q3). The central 50% of data is within the box boundaries. The whiskers represent the remaining data minus the outliers. The moderate outlier value is greater than the Q3 + 1.5 × IQR or less than the Q1 - 1.5 × IQR. The extreme outlier value is greater than the Q3 + 3.0 × IQR or less than the Q1 - 3.0 × IQR.

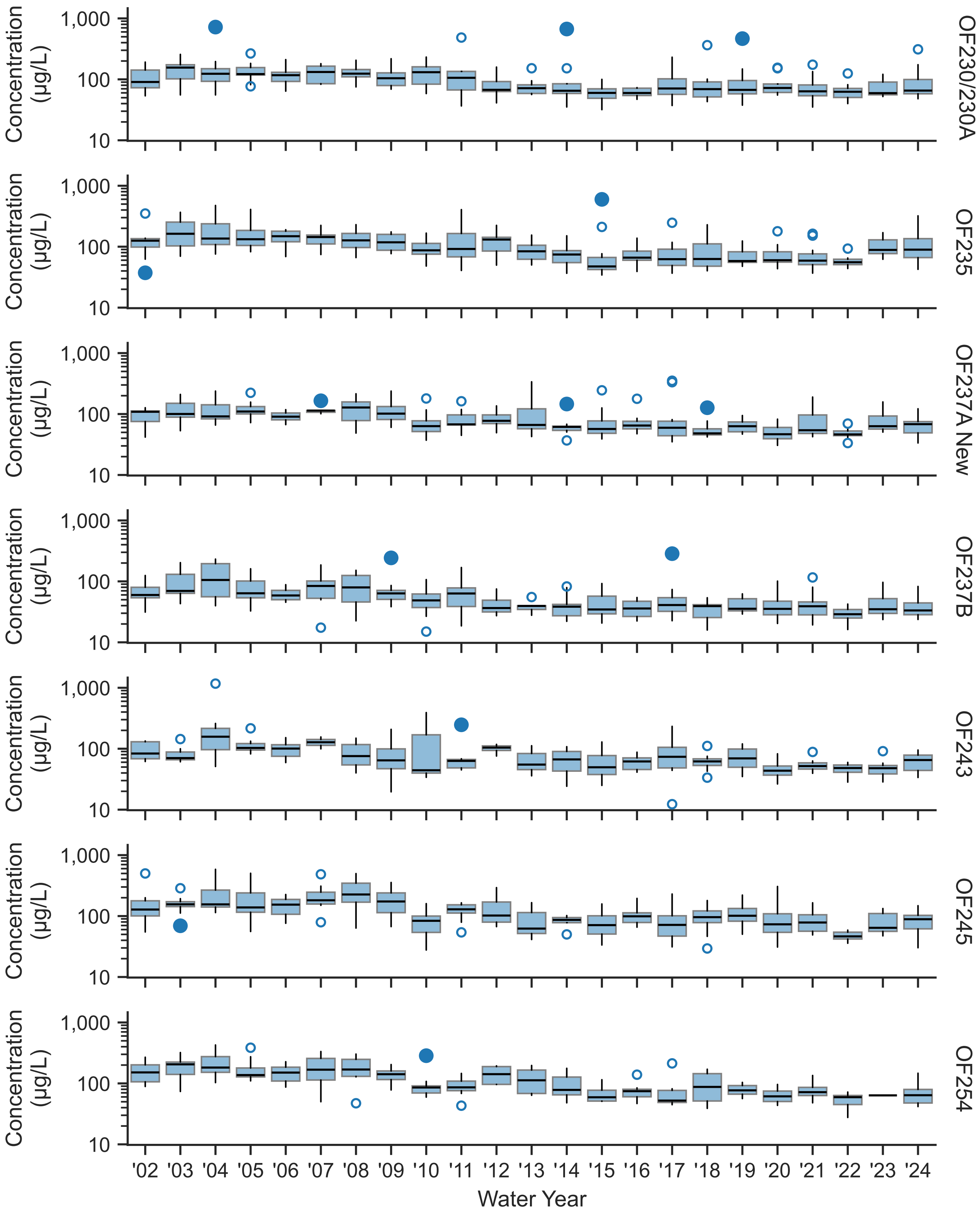
Median   Moderate Outlier   Extreme Outlier

Figure G-2
Total Lead Year-by-Year Comparison in Stormwater
October 2001 - September 2024



Note:
Tukey Box boundaries display the interquartile range (IQR) of the distribution ranging from the first quartile (Q1) to the third (Q3). The central 50% of data is within the box boundaries. The whiskers represent the remaining data minus the outliers. The moderate outlier value is greater than the Q3 + 1.5 × IQR or less than the Q1 - 1.5 × IQR. The extreme outlier value is greater than the Q3 + 3.0 × IQR or less than the Q1 - 3.0 × IQR.

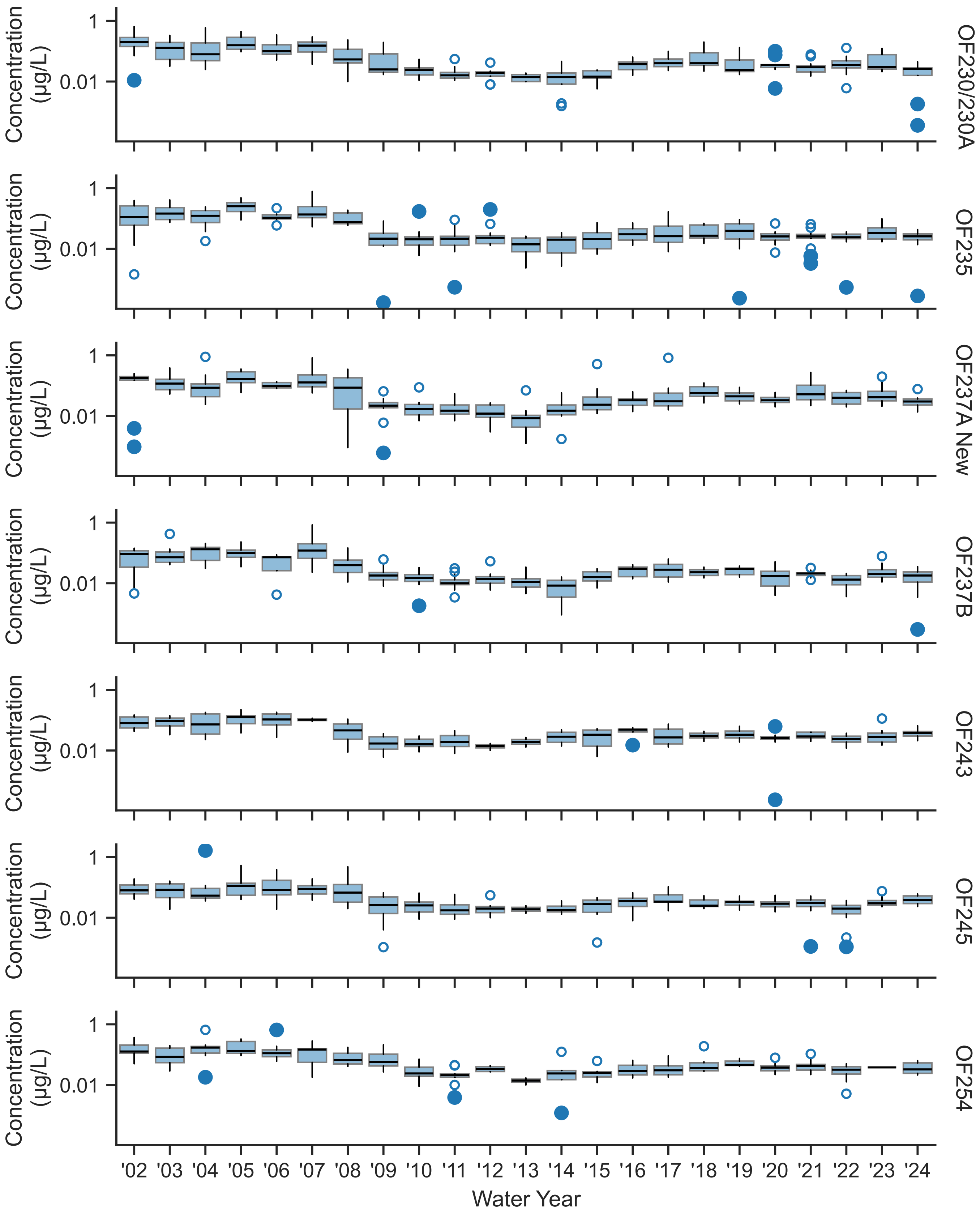
Figure G-3
Total Zinc Year-by-Year Comparison in Stormwater
October 2001 - September 2024



Note:
Tukey Box boundaries display the interquartile range (IQR) of the distribution ranging from the first quartile (Q1) to the third (Q3). The central 50% of data is within the box boundaries. The whiskers represent the remaining data minus the outliers. The moderate outlier value is greater than the Q3 + 1.5 × IQR or less than the Q1 - 1.5 × IQR. The extreme outlier value is greater than the Q3 + 3.0 × IQR or less than the Q1 - 3.0 × IQR.

Median   Moderate Outlier   Extreme Outlier

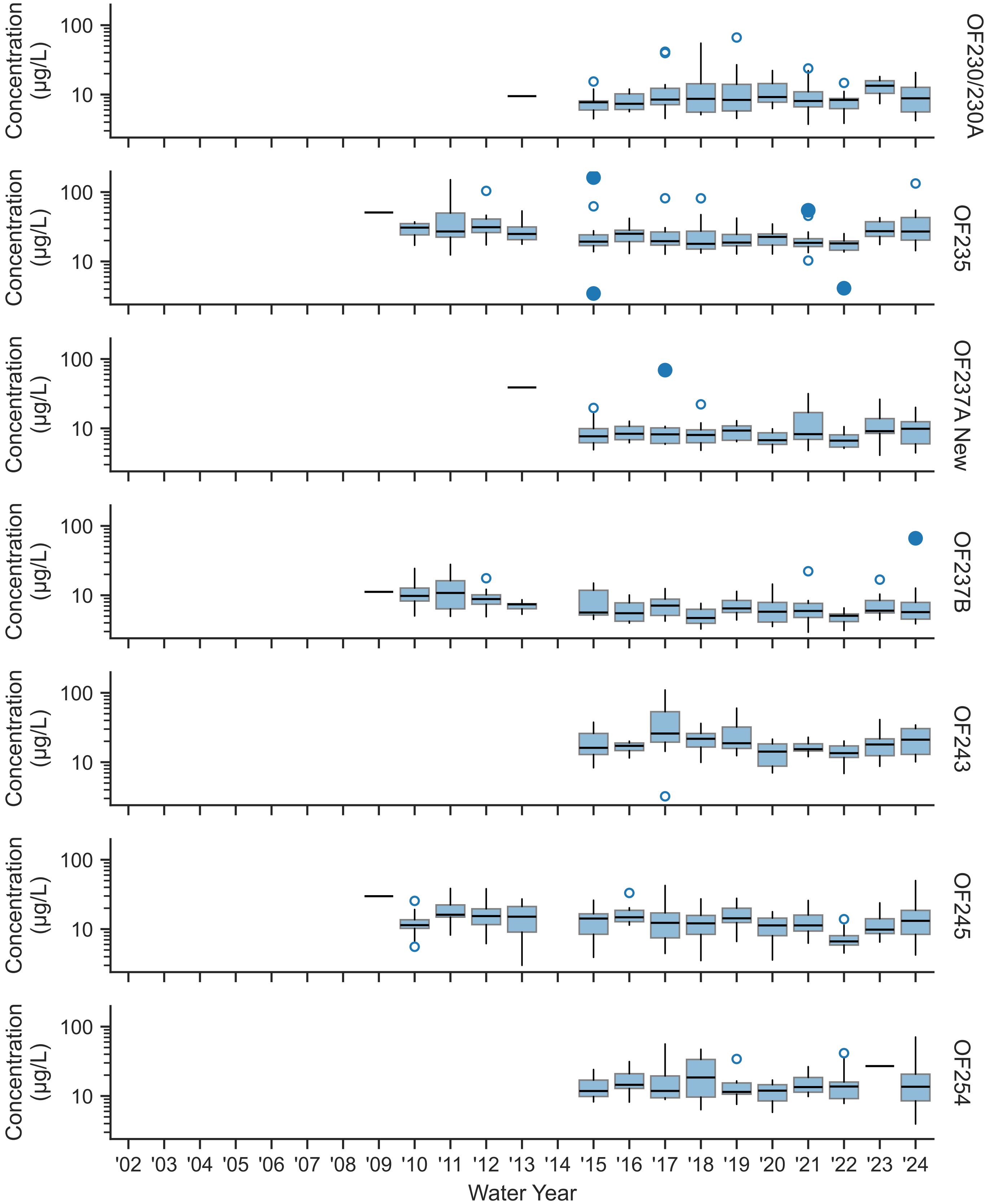
Figure G-4
Phenanthrene Year-by-Year Comparison in Stormwater
October 2001 - September 2024



Note:
Tukey Box boundaries display the interquartile range (IQR) of the distribution ranging from the first quartile (Q1) to the third (Q3). The central 50% of data is within the box boundaries. The whiskers represent the remaining data minus the outliers. The moderate outlier value is greater than the Q3 + 1.5 × IQR or less than the Q1 - 1.5 × IQR. The extreme outlier value is greater than the Q3 + 3.0 × IQR or less than the Q1 - 3.0 × IQR.

Median   Moderate Outlier   Extreme Outlier

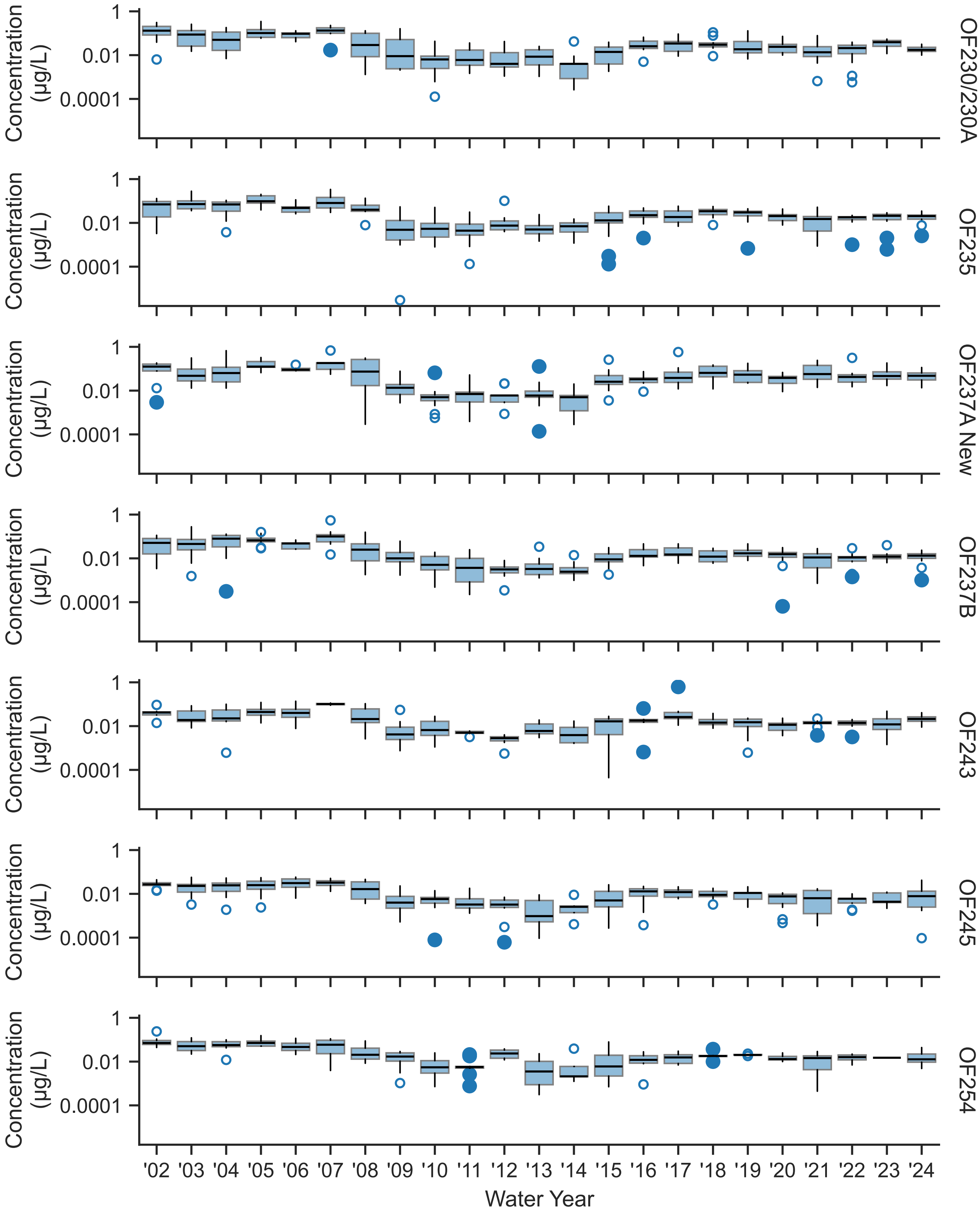
Figure G-5
Total Copper Year-by-Year Comparison in Stormwater
October 2001 - September 2024



Note:
Tukey Box boundaries display the interquartile range (IQR) of the distribution ranging from the first quartile (Q1) to the third (Q3). The central 50% of data is within the box boundaries. The whiskers represent the remaining data minus the outliers. The moderate outlier value is greater than the Q3 + 1.5 × IQR or less than the Q1 - 1.5 × IQR. The extreme outlier value is greater than the Q3 + 3.0 × IQR or less than the Q1 - 3.0 × IQR.

Median   Moderate Outlier   Extreme Outlier

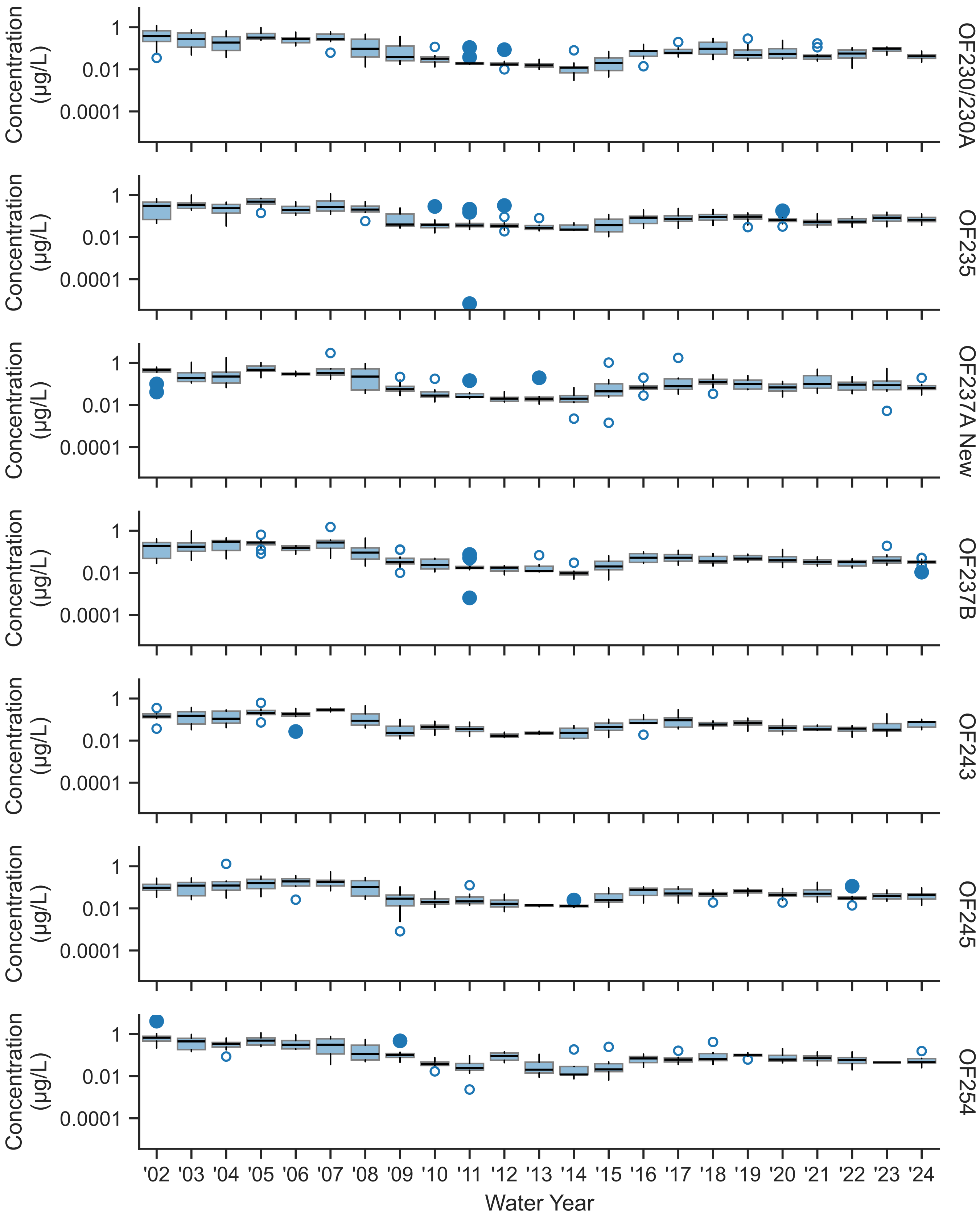
Figure G-6
Indeno(1,2,3-cd)pyrene Year-by-Year Comparison in Stormwater
October 2001 - September 2024



Note:
Tukey Box boundaries display the interquartile range (IQR) of the distribution ranging from the first quartile (Q1) to the third (Q3). The central 50% of data is within the box boundaries. The whiskers represent the remaining data minus the outliers. The moderate outlier value is greater than the Q3 + 1.5 × IQR or less than the Q1 - 1.5 × IQR. The extreme outlier value is greater than the Q3 + 3.0 × IQR or less than the Q1 - 3.0 × IQR.

Median   Moderate Outlier   Extreme Outlier

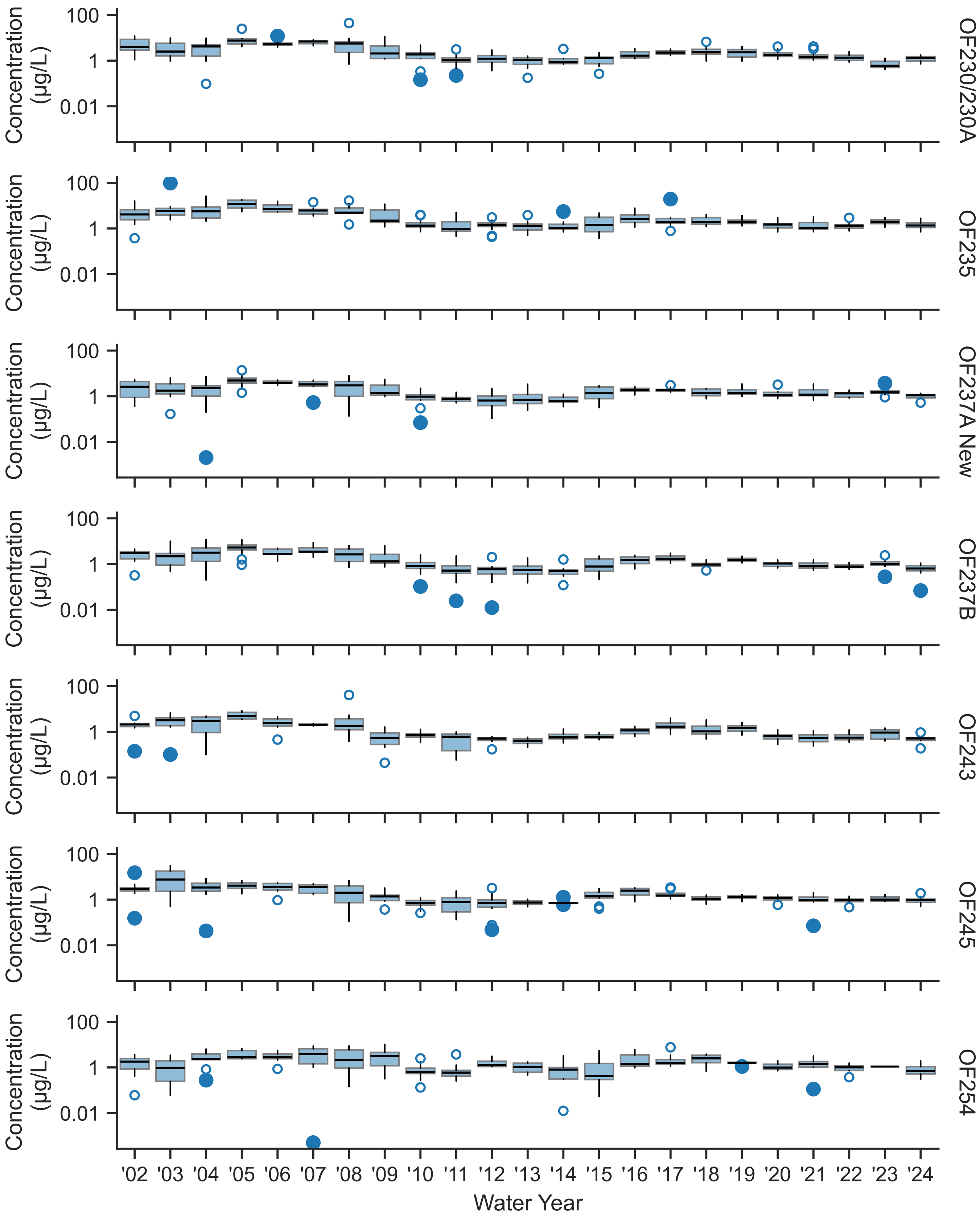
Figure G-7
Pyrene Year-by-Year Comparison in Stormwater
October 2001 - September 2024



Note:
Tukey Box boundaries display the interquartile range (IQR) of the distribution ranging from the first quartile (Q1) to the third (Q3). The central 50% of data is within the box boundaries. The whiskers represent the remaining data minus the outliers. The moderate outlier value is greater than the Q3 + 1.5 × IQR or less than the Q1 - 1.5 × IQR. The extreme outlier value is greater than the Q3 + 3.0 × IQR or less than the Q1 - 3.0 × IQR.

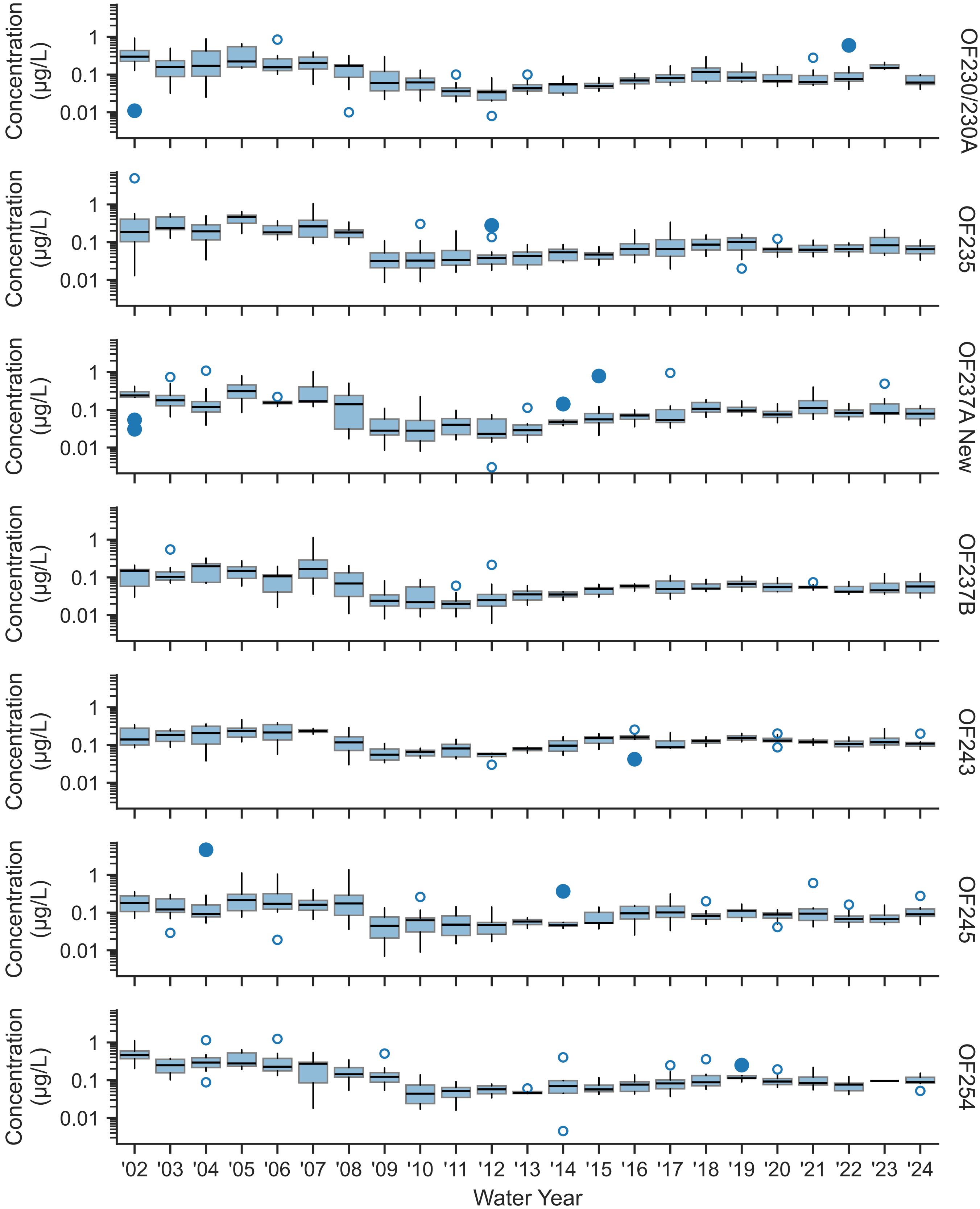
Median Moderate Outlier Extreme Outlier

Figure G-8
Di(2-ethylhexyl)phthalate Year-by-Year Comparison in Stormwater
October 2001 - September 2024



Note:
Tukey Box boundaries display the interquartile range (IQR) of the distribution ranging from the first quartile (Q1) to the third (Q3). The central 50% of data is within the box boundaries. The whiskers represent the remaining data minus the outliers. The moderate outlier value is greater than the Q3 + 1.5 × IQR or less than the Q1 - 1.5 × IQR. The extreme outlier value is greater than the Q3 + 3.0 × IQR or less than the Q1 - 3.0 × IQR.

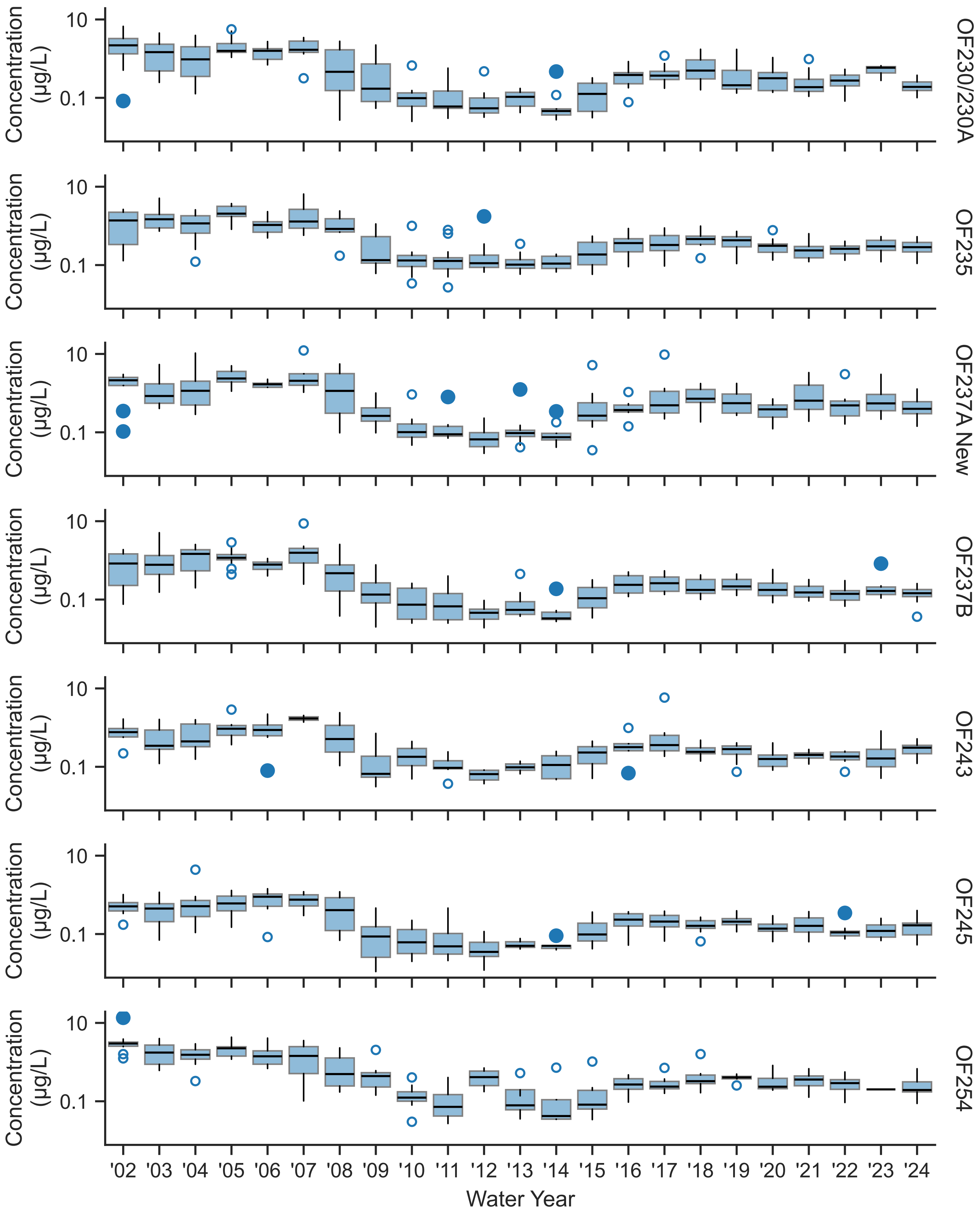
Figure G-9
Total LPAHs Year-by-Year Comparison in Stormwater
October 2001 - September 2024



Note:
Tukey Box boundaries display the interquartile range (IQR) of the distribution ranging from the first quartile (Q1) to the third (Q3). The central 50% of data is within the box boundaries. The whiskers represent the remaining data minus the outliers. The moderate outlier value is greater than the Q3 + 1.5 × IQR or less than the Q1 - 1.5 × IQR. The extreme outlier value is greater than the Q3 + 3.0 × IQR or less than the Q1 - 3.0 × IQR.

Median Moderate Outlier Extreme Outlier

Figure G-10
Total HPAHs Year-by-Year Comparison in Stormwater
October 2001 - September 2024

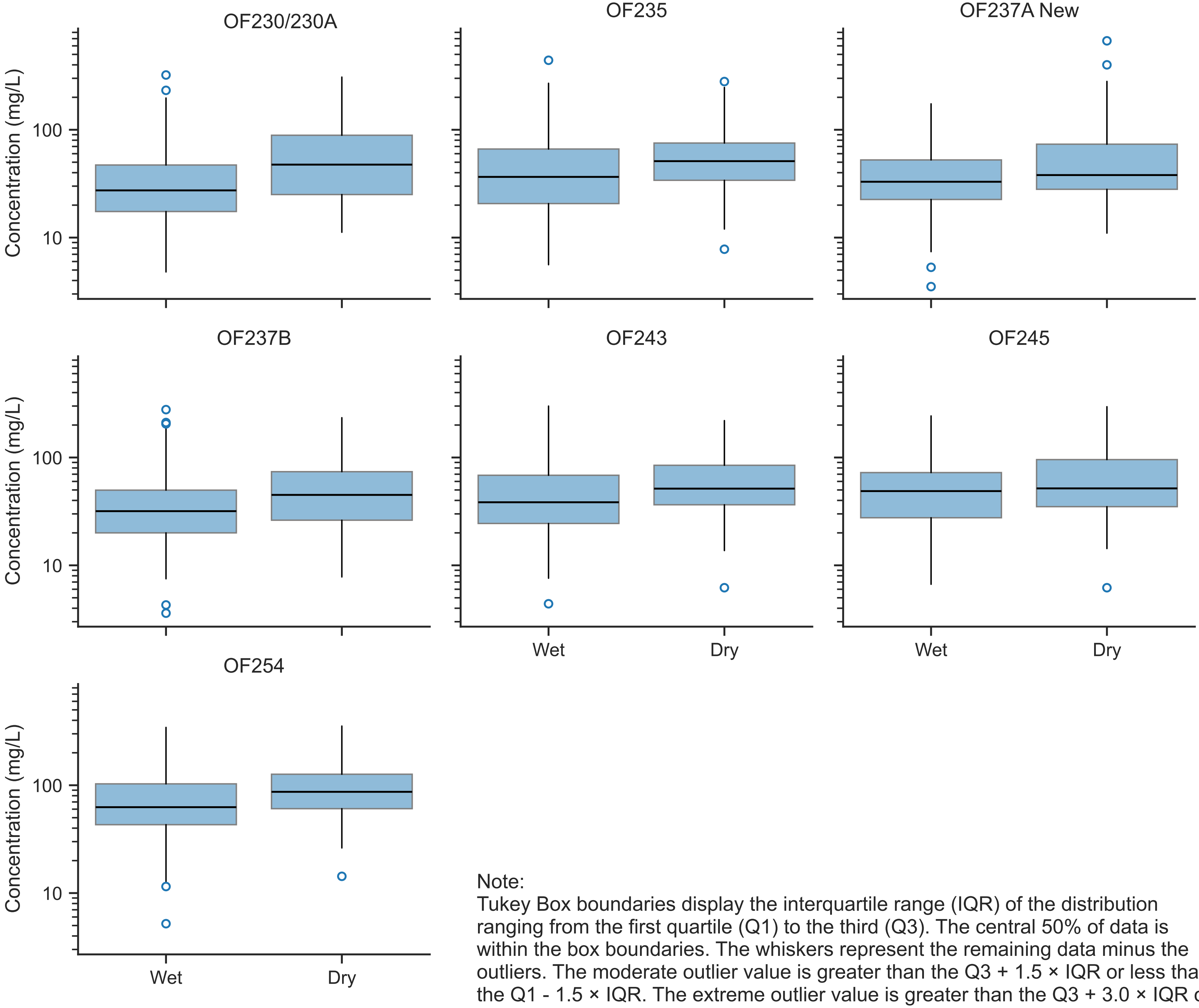


Note:
Tukey Box boundaries display the interquartile range (IQR) of the distribution ranging from the first quartile (Q1) to the third (Q3). The central 50% of data is within the box boundaries. The whiskers represent the remaining data minus the outliers. The moderate outlier value is greater than the Q3 + 1.5 × IQR or less than the Q1 - 1.5 × IQR. The extreme outlier value is greater than the Q3 + 3.0 × IQR or less than the Q1 - 3.0 × IQR.

Median   Moderate Outlier   Extreme Outlier

APPENDIX H

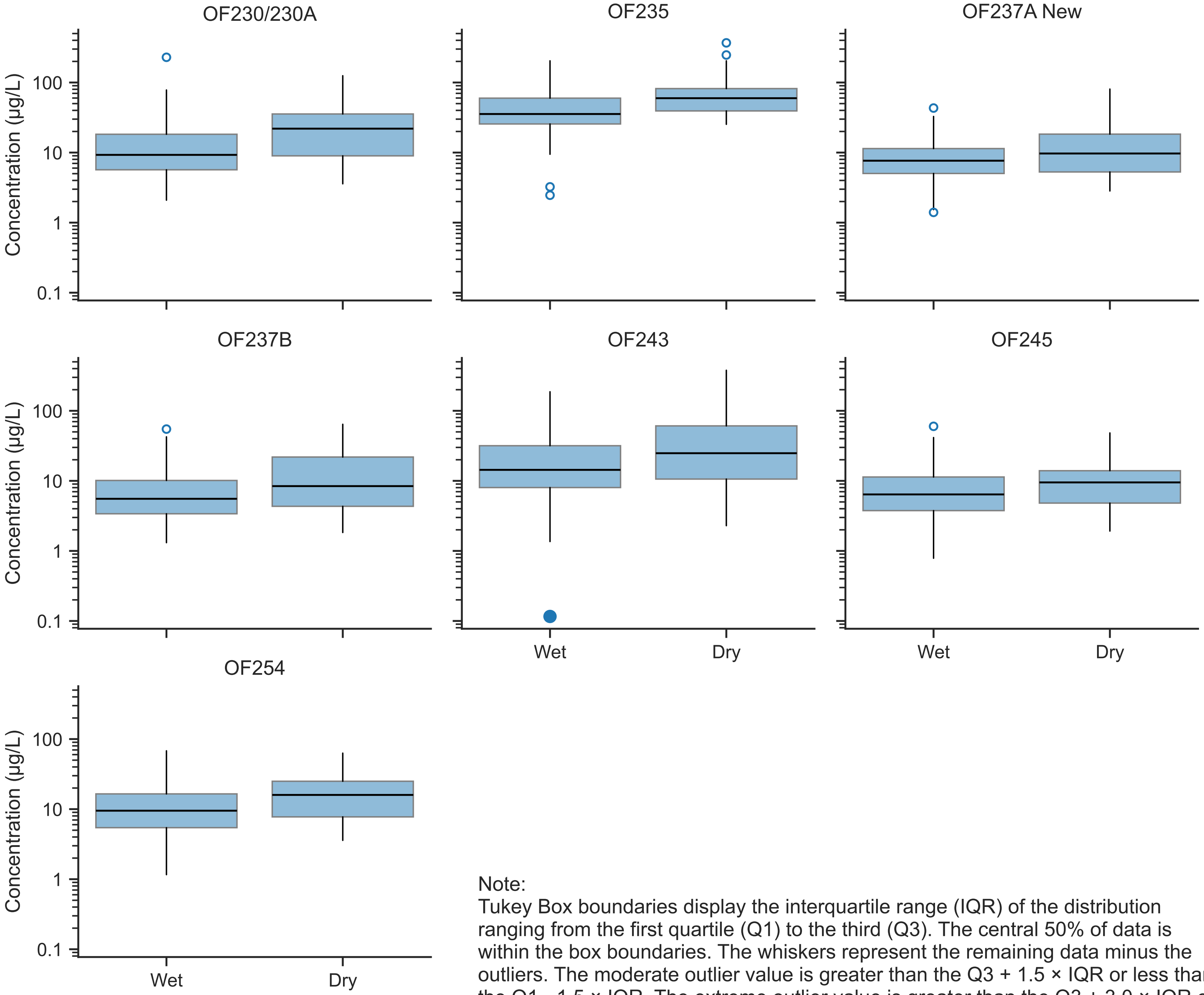
Figure H-1
Total Suspended Solids Seasonal Variation in Stormwater
October 2001 - September 2024



Note:
Tukey Box boundaries display the interquartile range (IQR) of the distribution ranging from the first quartile (Q1) to the third (Q3). The central 50% of data is within the box boundaries. The whiskers represent the remaining data minus the outliers. The moderate outlier value is greater than the Q3 + 1.5 × IQR or less than the Q1 - 1.5 × IQR. The extreme outlier value is greater than the Q3 + 3.0 × IQR or less than the Q1 - 3.0 × IQR.

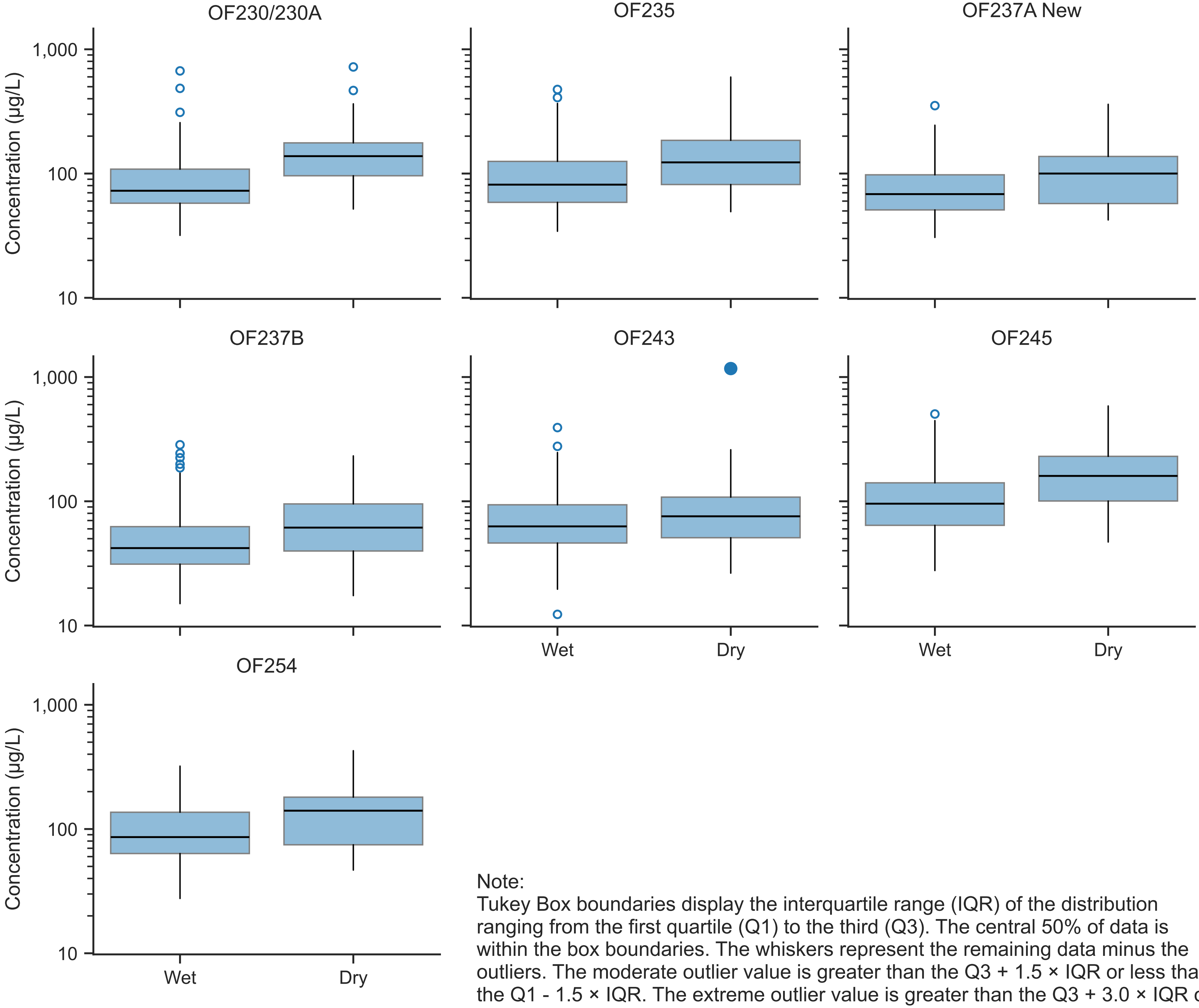
Median   Moderate Outlier   Extreme Outlier

Figure H-2
Total Lead Seasonal Variation in Stormwater
October 2001 - September 2024



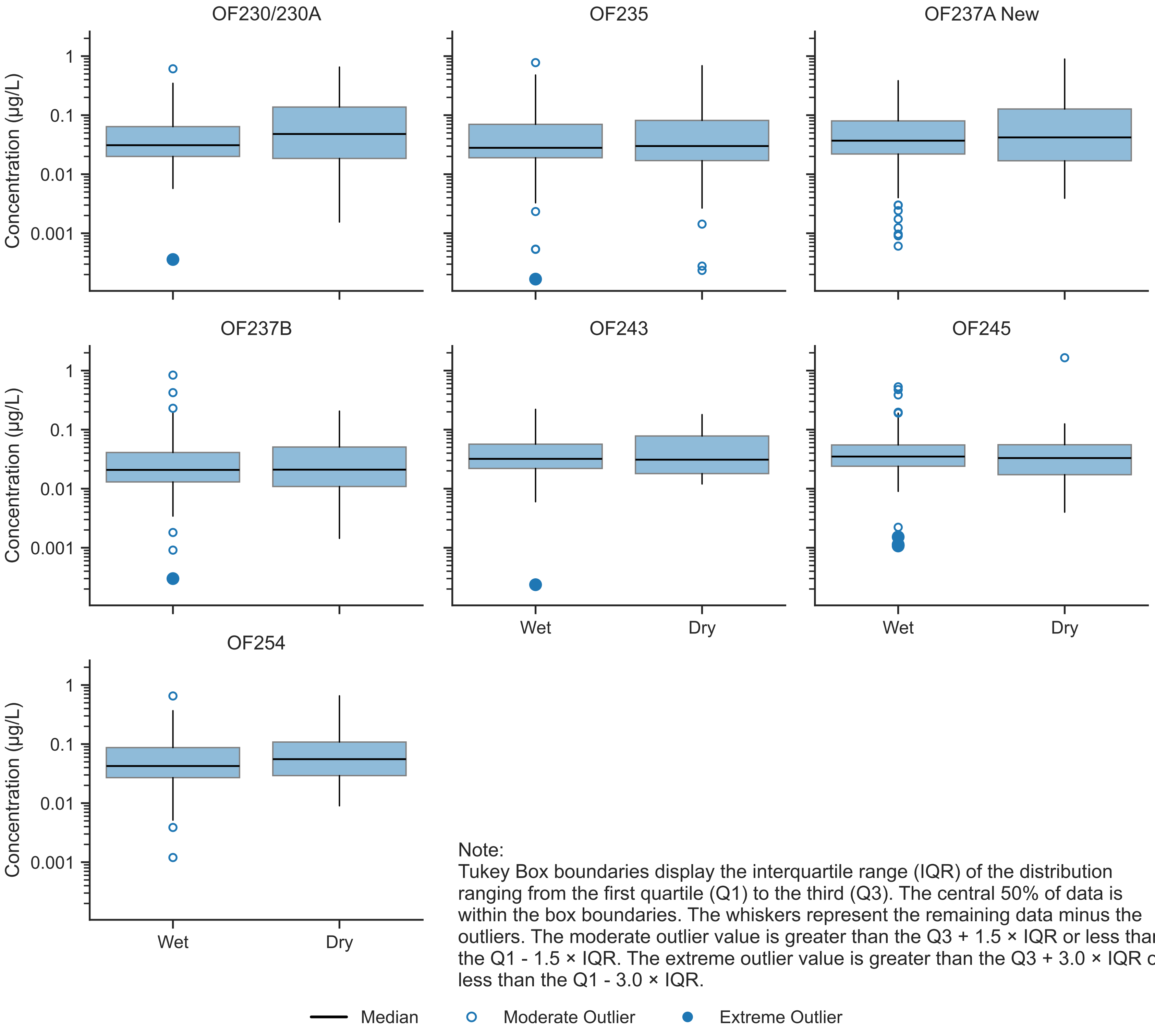
Note:
Tukey Box boundaries display the interquartile range (IQR) of the distribution ranging from the first quartile (Q1) to the third (Q3). The central 50% of data is within the box boundaries. The whiskers represent the remaining data minus the outliers. The moderate outlier value is greater than the Q3 + 1.5 × IQR or less than the Q1 - 1.5 × IQR. The extreme outlier value is greater than the Q3 + 3.0 × IQR or less than the Q1 - 3.0 × IQR.

Figure H-3
Total Zinc Seasonal Variation in Stormwater
October 2001 - September 2024



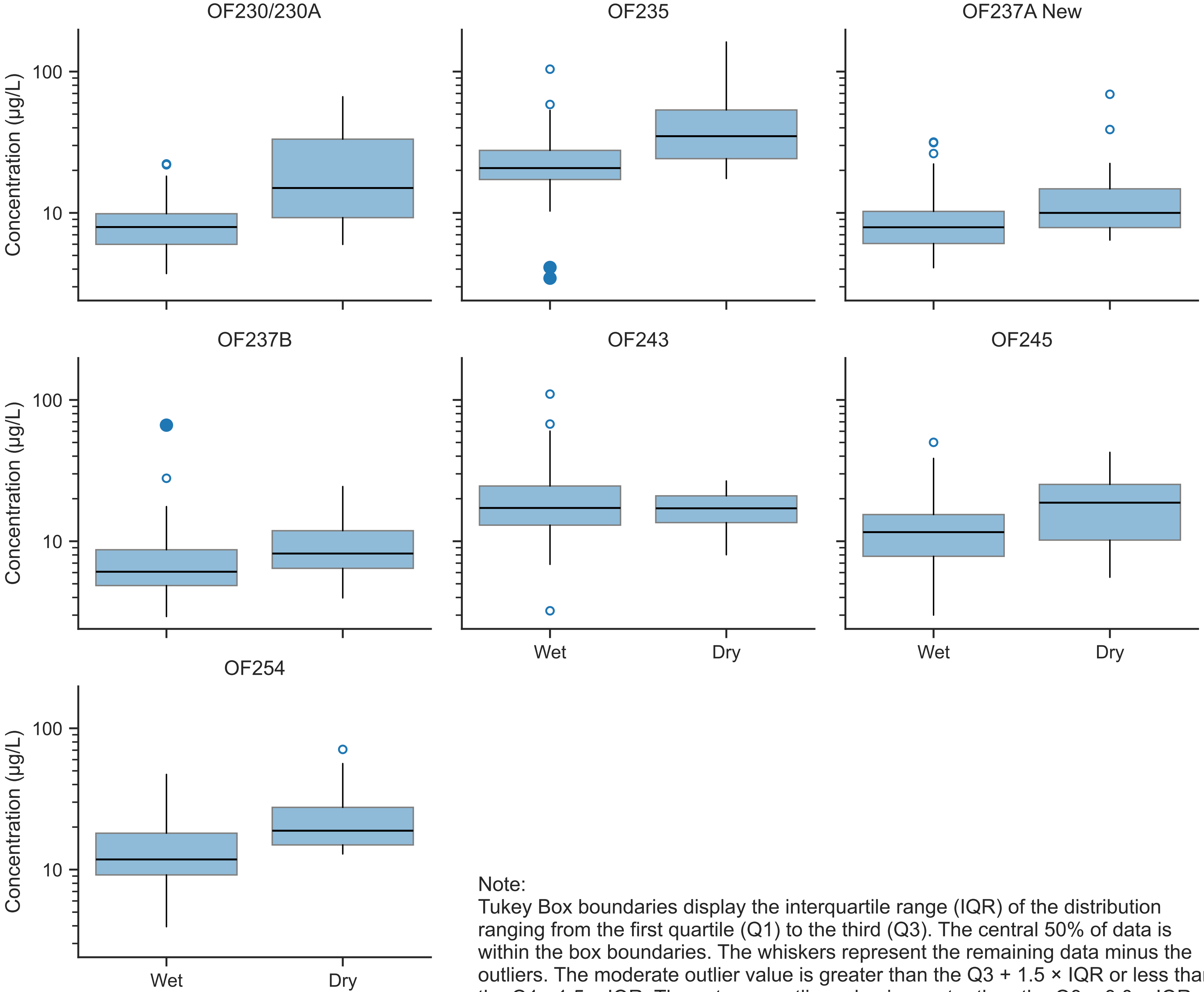
Note:
Tukey Box boundaries display the interquartile range (IQR) of the distribution ranging from the first quartile (Q1) to the third (Q3). The central 50% of data is within the box boundaries. The whiskers represent the remaining data minus the outliers. The moderate outlier value is greater than the Q3 + 1.5 × IQR or less than the Q1 - 1.5 × IQR. The extreme outlier value is greater than the Q3 + 3.0 × IQR or less than the Q1 - 3.0 × IQR.

Figure H-4
Phenanthrene Seasonal Variation in Stormwater
October 2001 - September 2024



Note:
Tukey Box boundaries display the interquartile range (IQR) of the distribution ranging from the first quartile (Q1) to the third (Q3). The central 50% of data is within the box boundaries. The whiskers represent the remaining data minus the outliers. The moderate outlier value is greater than the Q3 + 1.5 × IQR or less than the Q1 - 1.5 × IQR. The extreme outlier value is greater than the Q3 + 3.0 × IQR or less than the Q1 - 3.0 × IQR.

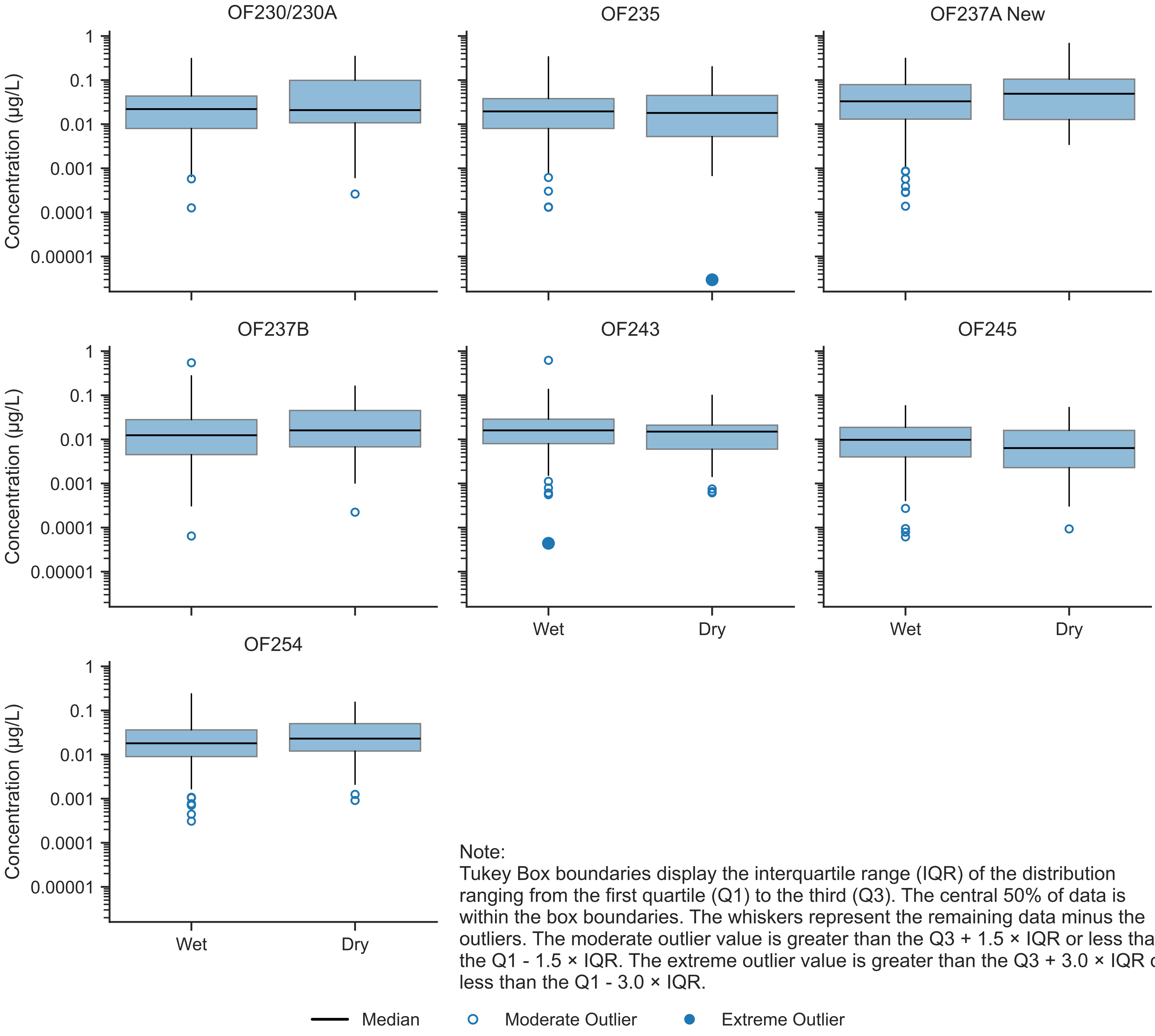
Figure H-5
Total Copper Seasonal Variation in Stormwater
October 2001 - September 2024



Note:
Tukey Box boundaries display the interquartile range (IQR) of the distribution ranging from the first quartile (Q1) to the third (Q3). The central 50% of data is within the box boundaries. The whiskers represent the remaining data minus the outliers. The moderate outlier value is greater than the Q3 + 1.5 × IQR or less than the Q1 - 1.5 × IQR. The extreme outlier value is greater than the Q3 + 3.0 × IQR or less than the Q1 - 3.0 × IQR.

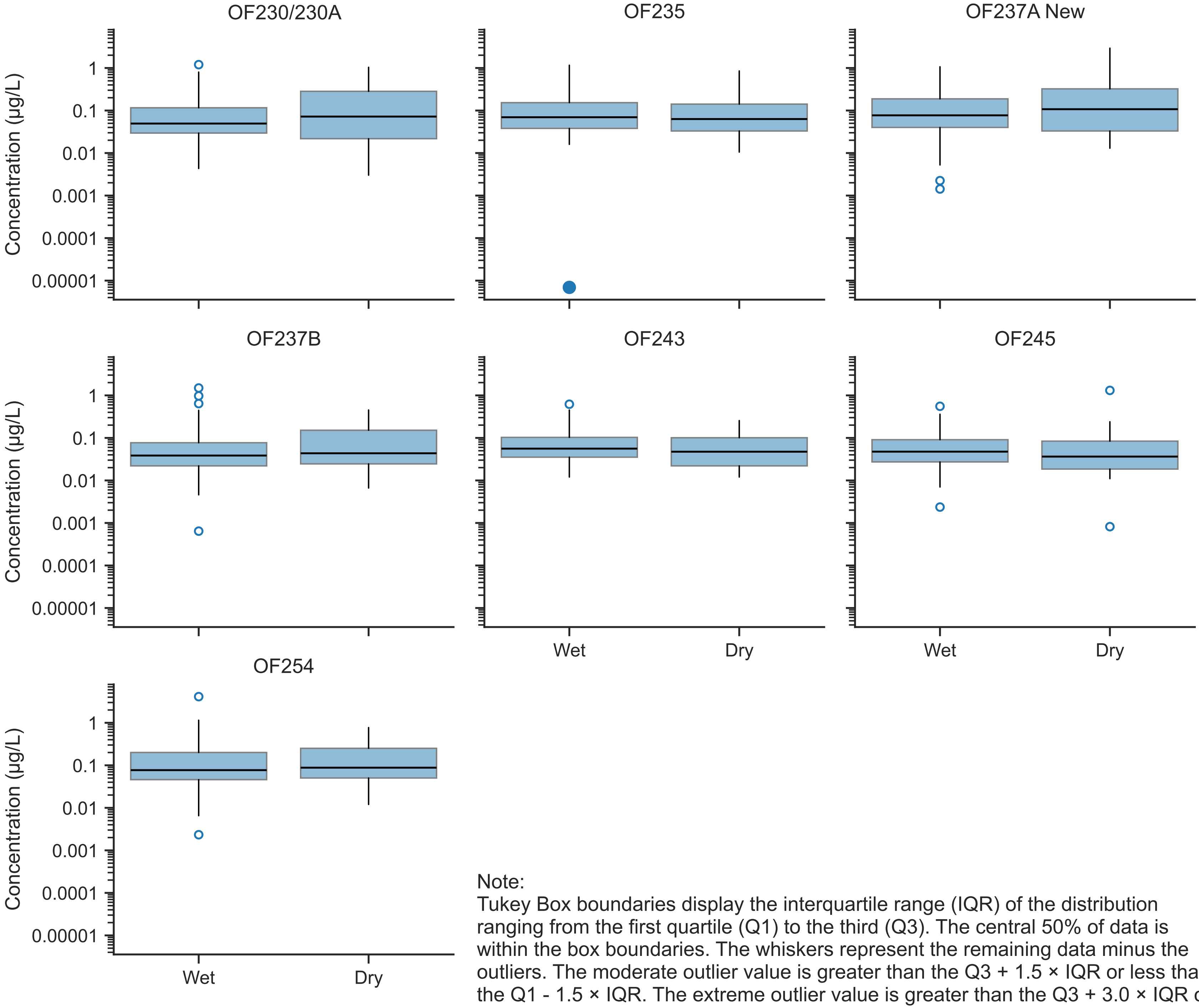
Median   Moderate Outlier   Extreme Outlier

Figure H-6
Indeno(1,2,3-cd)pyrene Seasonal Variation in Stormwater
October 2001 - September 2024



Note:
Tukey Box boundaries display the interquartile range (IQR) of the distribution ranging from the first quartile (Q1) to the third (Q3). The central 50% of data is within the box boundaries. The whiskers represent the remaining data minus the outliers. The moderate outlier value is greater than the Q3 + 1.5 × IQR or less than the Q1 - 1.5 × IQR. The extreme outlier value is greater than the Q3 + 3.0 × IQR or less than the Q1 - 3.0 × IQR.

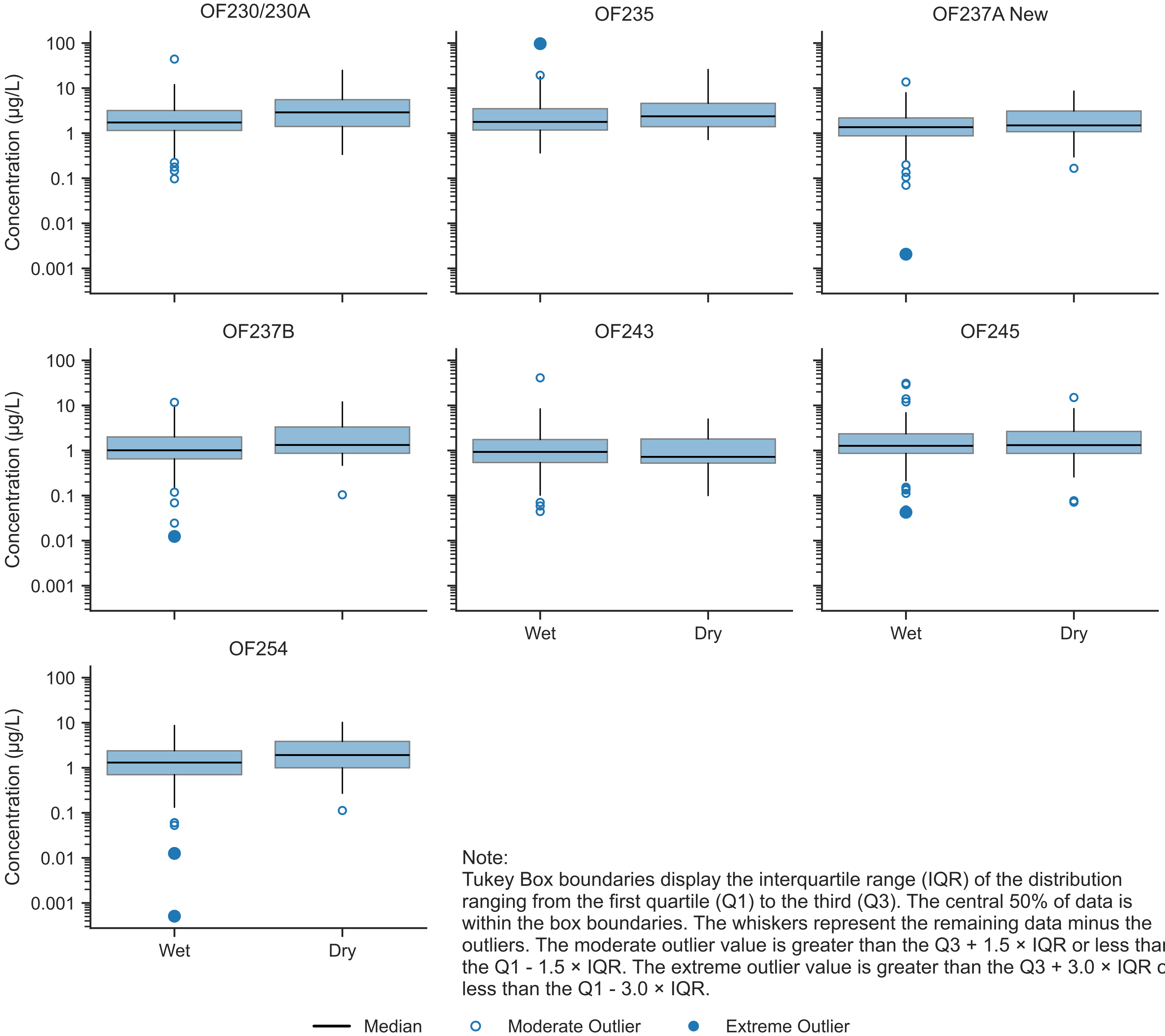
Figure H-7
Pyrene Seasonal Variation in Stormwater
October 2001 - September 2024



Note:
Tukey Box boundaries display the interquartile range (IQR) of the distribution ranging from the first quartile (Q1) to the third (Q3). The central 50% of data is within the box boundaries. The whiskers represent the remaining data minus the outliers. The moderate outlier value is greater than the Q3 + 1.5 × IQR or less than the Q1 - 1.5 × IQR. The extreme outlier value is greater than the Q3 + 3.0 × IQR or less than the Q1 - 3.0 × IQR.

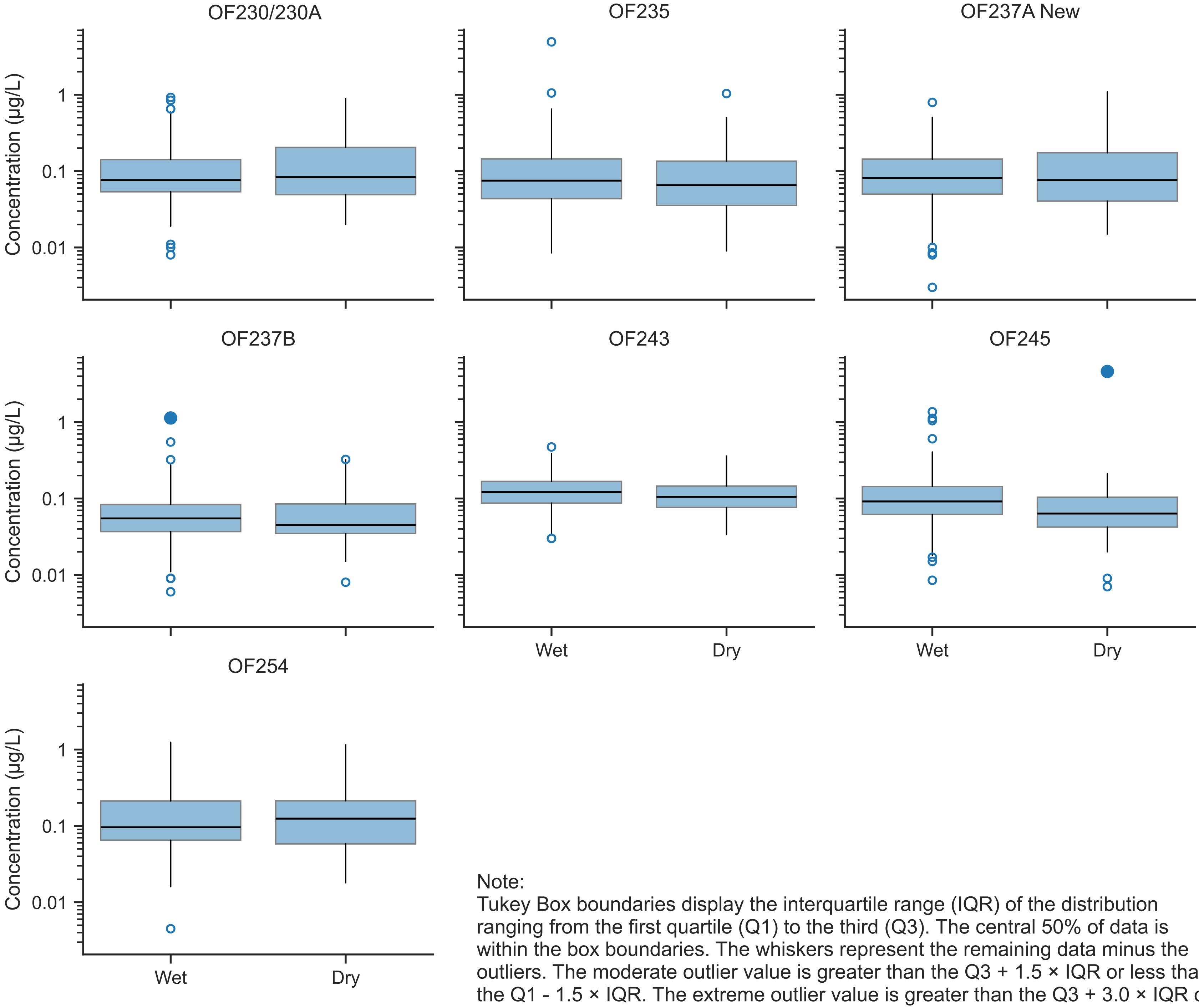
Median Moderate Outlier Extreme Outlier

Figure H-8
Di(2-ethylhexyl)phthalate Seasonal Variation in Stormwater
October 2001 - September 2024



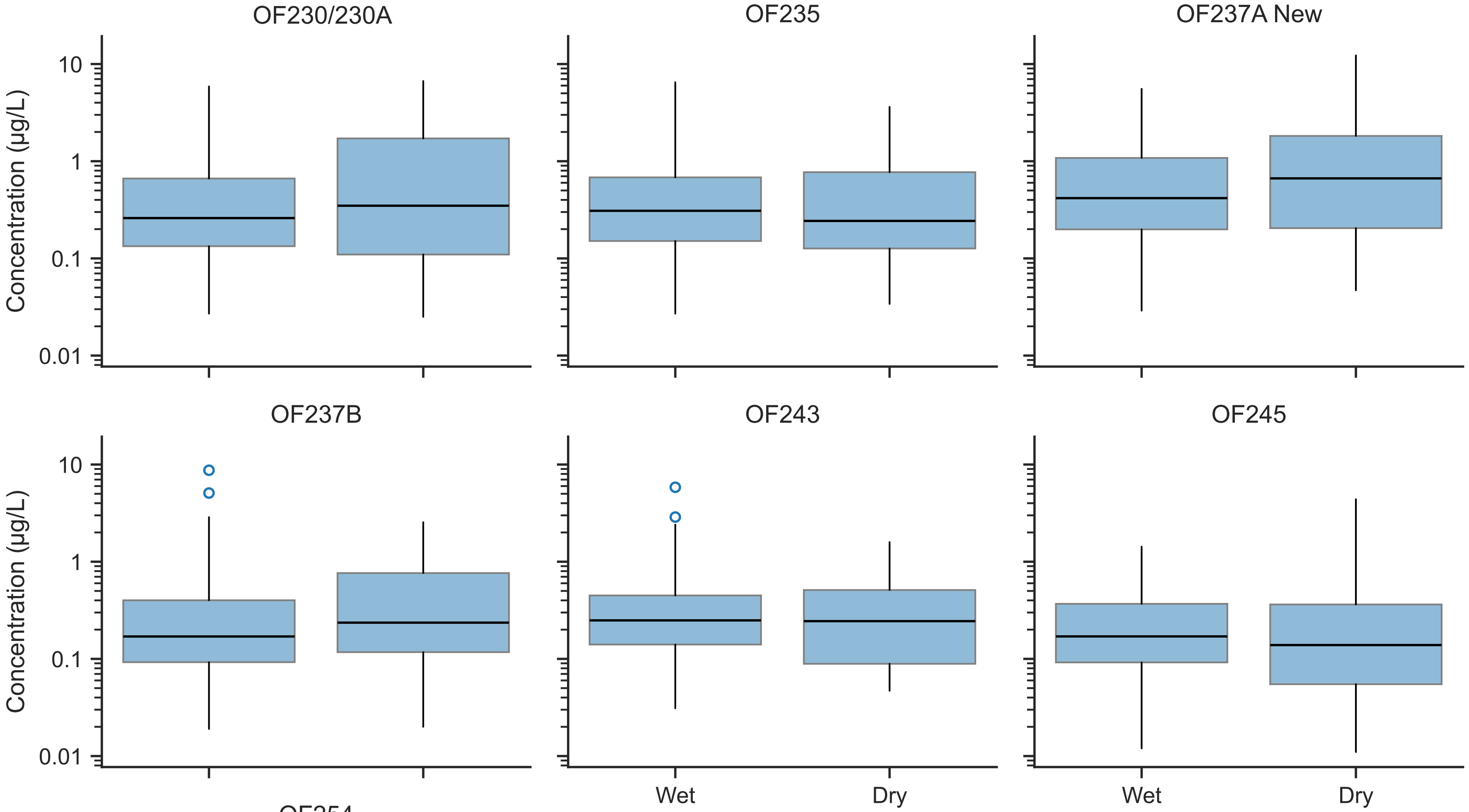
Note:
Tukey Box boundaries display the interquartile range (IQR) of the distribution ranging from the first quartile (Q1) to the third (Q3). The central 50% of data is within the box boundaries. The whiskers represent the remaining data minus the outliers. The moderate outlier value is greater than the Q3 + 1.5 × IQR or less than the Q1 - 1.5 × IQR. The extreme outlier value is greater than the Q3 + 3.0 × IQR or less than the Q1 - 3.0 × IQR.

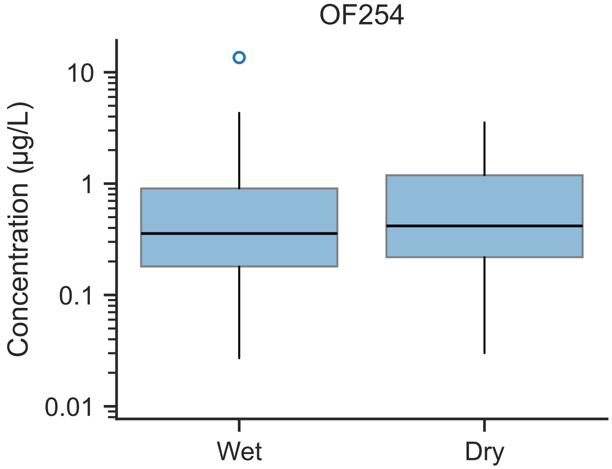
Figure H-9
Total LPAHs Seasonal Variation in Stormwater
October 2001 - September 2024



Note:
Tukey Box boundaries display the interquartile range (IQR) of the distribution ranging from the first quartile (Q1) to the third (Q3). The central 50% of data is within the box boundaries. The whiskers represent the remaining data minus the outliers. The moderate outlier value is greater than the Q3 + 1.5 × IQR or less than the Q1 - 1.5 × IQR. The extreme outlier value is greater than the Q3 + 3.0 × IQR or less than the Q1 - 3.0 × IQR.

Figure H-10
Total HPAHs Seasonal Variation in Stormwater
October 2001 - September 2024





Note:
Tukey Box boundaries display the interquartile range (IQR) of the distribution ranging from the first quartile (Q1) to the third (Q3). The central 50% of data is within the box boundaries. The whiskers represent the remaining data minus the outliers. The moderate outlier value is greater than the Q3 + 1.5 × IQR or less than the Q1 - 1.5 × IQR. The extreme outlier value is greater than the Q3 + 3.0 × IQR or less than the Q1 - 3.0 × IQR.

Median Moderate Outlier Extreme Outlier