

6PPD-Quinone Removal in Decant Facility

Final Report



December 31, 2024

Prepared for:

Washington State Department of Ecology

Interagency Agreement No. C24000198

Prepared By:

River Wan

Pierce County Planning and Public Works

Table of Contents

1. Summary of Findings.....	4
2. Introduction & Background	4
3. Project Objectives	7
4. Field Sampling.....	8
5. Laboratory Analysis.....	9
6. Conclusions & Discussions	16
7. References	17
8. Appendices	18

List of Tables

Table 1. 6PPD-Quinone Concentration in Treatment Processes.....	10
Table 2. 6PPD-Quinone Removal from Pre-settling Tank to Flocculation.....	10
Table 3. 6PPD-Quinone Removal from Flocculation to GAC Filtration.....	11
Table 4. Overall 6PPD-Quinone Removal	11
Table 5. TSS Removal from Pre-settling Tank to Flocculation Tank	12
Table 6. TSS Removal from Flocculation Tank to GAC Filtration	12
Table 7. Overall TSS Removal.....	12
Table 8. TSS/VSS and 6PPD-Quinone in Pre-settling Tank.....	13
Table 9. 6PPD-Quinone and TSS/VSS in Flocculation Tank	14
Table 10. 6PPD-Quinone and TSS/VSS after GAC Filtration.....	15
Table 11. Lab-Scale Column Study.....	16

Acknowledgments

Washington State Department of Ecology

Morgan Baker and Shelby Giltner served as the project manager.

Nancy Rosenbower served as project coordinator for 6PPD-Quinone (6PPDQ) analysis by Manchester Environmental Laboratory (MEL)

Chris Dudenhoeffer provided overall review of the QAPP.

Joan Protasio with the MEL provided technical review for QAPP related laboratory analysis for 6PPDQ.

Pierce County.

River Wan served as project manager and the lead for study design and analysis.

Jeff Rudolph served as liaison between M&O and Sewer Division.

Emery Hobart operated the decant facility and organized facility sampling for the project.

Pretreatment staff Sonia Hernandez, Earnest Locket, and Melissa Didier conducted field sampling and delivery to MEL.

Laboratory staff Amanda Tobin, Marissa Waltz and Thida Tea provided analysis for total suspended solid (TSS)/volatile suspended solid (VSS).

6PPD-Quinone Removal in Decant Facility

1. Summary of Findings

This study quantified 6PPD-Quinone (6PPDQ) concentrations in residual stormwater collected from catch basin cleaning operations in Pierce County, Washington.

The project focused on evaluating the effectiveness of a multi-stage treatment process at Pierce County's decant facility in removing 6PPDQ. This process includes gravitational settling, flocculation, and granular activated carbon (GAC) filtration.

Findings revealed that 6PPDQ exists in residual stormwater at low but potentially lethal concentrations to coho salmon (*Oncorhynchus kisutch*), ranging from 50 to 140 nanograms per liter (ng/L).

Initial treatment stages (settling and flocculation) exhibited limited 6PPDQ removal, primarily affecting 6PPDQ partitioned in the solid phase.

Conversely, GAC filtration demonstrated significant removal of dissolved 6PPDQ.

The combined treatment process consistently reduced 6PPDQ levels below 3 ng/L, achieving an average removal efficiency exceeding 96%.

A separate laboratory-scale study compared the performance of high-performance bioretention soil mix (HPBSM) and GAC in removing 6PPDQ. This study highlighted the potential interference of suspended solids with the effectiveness of both filtration media in removing 6PPDQ.

These findings underscore the effectiveness of advanced treatment methods in mitigating 6PPDQ contamination in stormwater and suggest that similar principles should be considered when developing Best Management Practices (BMPs) for stormwater management.

2. Introduction & Background

6PPDQ was discovered in 2020 in a groundbreaking study as the chemical responsible for the Urban Runoff Mortality Syndrome (URMS), a phenomenon referring to the mass die-off of adult coho salmon returning to spawn in urban streams in the Puget Sound area, after stormwater runoff (Kendra, et al; Scholz, et al; Tian et al.). The devastating effect of URMS can be explained by the very high toxicity of 6PPDQ at low concentrations to coho salmon. With a reported LC50 of 95ng/L, 6PPDQ is the second most toxic chemical to aquatic species ever evaluated by the Environmental Protection Agency (EPA), after the most toxic chemical Parathion.

6PPDQ is the transformation product of 6PPD, an additive in virtually all tires and possibly other rubber products to prevent degradation from ozone. By design, 6PPD migrates to the surface of tires where it oxidizes to form a layer of 6PPDQ. 6PPD and 6PPDQ are released from tires to the environment by rain, vehicle washing, and normal tire wear and are referred to as tire wear particles. These tire wear

particles may be carried through stormwater conveyance systems to reach receiving streams.

Reducing 6PPDQ in stormwater runoff is urgently needed to protect salmonids and other aquatic biota that are central to ecosystem health, Tribal rights, and economies of the Pacific Northwest. Several adsorption and filtration-based media, which have been approved as BMPs to provide stormwater treatment for the removal of conventional stormwater pollutants, are being actively investigated for the removal of 6PPDQ. Bioretention filtration has proven to be highly effective at reducing 6PPDQ in laboratory studies (McIntyre et al).

Activated carbon (AC) has been widely applied in various industrial sectors and consumer products as an adsorbent to remove a diverse range of pollutants from both air and water. AC's high-performance capabilities stem from its highly porous structure and extensive surface areas, which can reach up to 1000 m²/g. Theoretically, AC should be highly effective in removing 6PPDQ from stormwater due to the hydrophobic property of 6PPDQ. However, AC is not commonly used as a BMP for stormwater treatment, and the options for the evaluation of 6PPDQ removal in the field are very limited.

Pierce County Planning and Public Works (PPW), Maintenance and Operations (M&O) Division, is responsible for managing all County roadways. These responsibilities include the cleaning of stormwater catch basins, debris collection, as well as routine street sweeping. These materials are primarily collected and transported by vactor trucks which are tank trucks with a heavy-duty vacuum designed to pneumatically load solids, liquids, sludge, and slurry through suction lines.



Dumping Pad – Gravity
Drainage of Water



Pre-Settling Tank (Moat) –
Primary Solid and Liquid
Separation



Flocculation Tank – Chemically Enhanced Solid and Liquid Separation



GAC Filtration –Soluble Organic Removal

Drainage Structure Cleaning Program

M&O maintains about 27,238 drainage structures in unincorporated Pierce County. Drainage structures include catch basins, manholes, catch basin mechanical filters, manhole mechanical filters, up-turned pipes, and curb inlets with catch basins and manholes totaling the vast majority. Drainage structures that are not regularly maintained will not collect sediment and pollutants from stormwater runoff as designed and during flood events could discharge pollutants to waterbodies.

M&O has two teams that inspect a percentage of the drainage structures within County right of way and stormwater ponds on an annual basis. The inspection of catch basins is driven by past inspection and maintenance history. M&O maintains catch basins and manholes to have 12 inches or more of clear space from the lowest pipe invert to the top of the sediment or 25% of the sump is free of sediment, whichever is more. Structures that don't meet these criteria are put on the list for cleaning.

The inspection program typically starts around the second week of March and continues until early summer. Inspection data is processed immediately after collection so that work orders can be generated for cleaning crews. Vector truck teams start cleaning catch basins in early April and continue until early fall. Inspection and cleaning work occur concurrently during the spring months. The National Pollutant Discharge Elimination System Phase 1 permit requires all drainage structure maintenance work to be completed within six months of inspections where deficiencies are noted. Vector truck teams are equipped with a mobile data collection device (MDCD) which is typically an iPad or iPhone. The MDCD comes preloaded with the structures that need cleaning along with information that shows the locations of salmon-bearing streams and other critical areas.

Once the structure is cleaned, the teams log a quick assessment of the cleaning activities and then record the work done by function code and date.

After the structures have been cleaned, trucks will return to the decant facility to process the waste materials. The solid and liquid wastes are separated via pools and a sloped pad at the decant facility. Solid materials are removed from the settling pools and stored until dry enough for hauling. Decanted water will drain through the settling pools into settling moats for further treatment and then to a flocculent tank until it is full. The flocculent tank has a volume of about 10,000 gallons and once it has been filled, 20 pounds of flocculent is added and mixed for 45 minutes using a large impellor . The flocculent consists primarily of bentonite and some crystalline silica quartz.

After mixing, sediments will settle to the bottom of the tank and then the decanted water is sent through the GAC filter for final pollutant removal. The carbon vessel holds 2,000 lbs carbon or ~71 cubic feet. At a 14-minute empty bed contact time (EBCT), the flow is 38 gallons per minute (GPM), and the hydraulic loading is 3 GPM/ft². This translates into a filtration rate of 287in/hour, or 24 times the initial, uncorrected filtration rate HPBSM.

On an annual basis, the decant facility discharges about 600,000 gallons of decanted water to the sanitary sewer. It also processes about 2,000 tons of solid materials which are hauled to regional disposal facilities.

Decant facilities are Ecology's preferred method to manage and treat street waste. Investigating 6PPDQ concentration reductions in a decant facility could answer crucial questions and bridge critical data gaps in our quest to reduce 6PPDQ in stormwater. Notably, the decant facility processes residual stormwater — during the dry season, providing a readily available source of 6PPDQ-laden water for study. This avoids the complexities of investigating 6PPDQ during unpredictable storm events.

The Pierce County Decant facility offers a unique opportunity to address pressing questions about 6PPDQ in stormwater. What levels of 6PPDQ exist in this concentrated source? Can we effectively remove this harmful compound from decant water? What fraction is removed during the solid and liquid separation steps employed by the decant treatment processes? And can GAC treatment reduce soluble 6PPDQ below toxic levels, thus safeguarding aquatic life like coho salmon? Deciphering these critical unknowns through controlled studies within the decant facility holds promise for advancing our strategies to combat 6PPDQ pollution in stormwater.

The project initially included mass loading assessment in catch basin (CB) waste. At the time of the proposal being considered, MEL has not been accredited for 6PPDQ analysis in sediment. Mass loading assessment is outside the scope of this study but may be included in future studies.

3. Project Objectives

1. Conduct 6PPDQ sampling and analysis in different stages of stormwater treatment at Pierce County's Decant facility.
2. Investigate 6PPDQ removal by solid/liquid separation and GAC filtration and interferences by co-contaminants such as TPH, other organics, and suspended solids.
3. Evaluate the hydraulic impact on GAC filtration based on pump rate and empty bed contact time.

4. Field Sampling

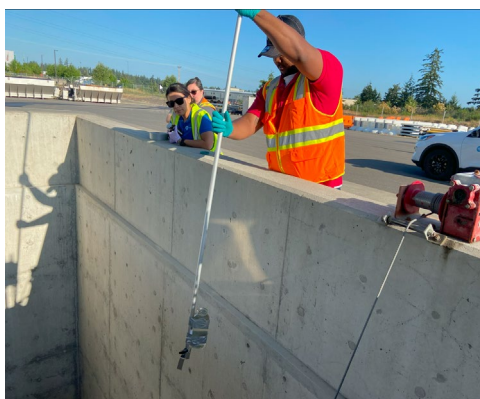
Field sampling protocols followed the established guidelines outlined in the approved Quality Assurance Project Plan (QAPP). Biweekly sampling was conducted from July to September 2024. Although the initial project scope called for sampling from May to October, contractual delays pushed back the start date. Nonetheless, the six sampling events captured the typical frequency and nature of CBs cleaning activities during the dry season.

Decant Facility Study 6PPDq Sampling Plan					
Site	Locations	# of Samples	Frequency	Duration	Total # of Samples
Decant Facility	Pre-settling Tank	1	Every 2 Weeks	July - September, 2024	6
	Flocculation Tank	1	Every 2 Weeks	July - September, 2024	6
	GAC Filtration	1	Every 2 Weeks	July - September, 2024	6
Total # of Samples					18

To minimize the risk of cross-contamination, samples were collected in a sequence that followed the reverse order of the treatment processes. Sampling bottles were directly affixed to sampling poles to reduce potential contamination. Immediately following collection, samples were stored in ice-chilled coolers and transported to MEL. Chain of custody forms were accurately filled out and signed by both field and laboratory staff to ensure sample integrity.



GAC Filtration Sampling



Flocculation Tank Sampling



Pre-settling Tank Sampling



Operation Staff Explains Decant Processes



Samples Taken from Settling Tank, Flocculation Tank and GAC Filtration

5. Laboratory Analysis

6PPDQ analysis was performed by MEL in accordance with their standard operating procedure (SOP). TSS and VSS analysis was conducted by the Pierce County laboratory following their established SOP. Both SOPs were adopted and approved as part of the QAPP.

Before sharing the data with project managers at Ecology and Pierce County, MEL conducted a thorough review of all data against established quality control criteria.

6PPDQ concentrations in residual stormwater, as measured in the settling tank, were found to be at modest yet still lethal levels to coho salmon, similar to the LC50 of 95 ng/L. With the exception of an anomalous data point on 8/8/2024, where the flocculation tank showed higher concentrations than the pre-settling tank, likely due to a sampling error, the data generally indicates that flocculation reduces

6PPDQ by only 30-40% (Table 2). However, the combined treatment process consistently achieved a significant 96-99% removal, reducing 6PPD-quinone concentrations to below 3 ng/L (Table 1, 3, and 4).

Table 1. 6PPD-Quinone Concentration in Treatment Processes

6PPD-Quinone (ng/L)			
Sample Date	Pre-settling Tank	Flocculation Tank	GAC
7/11/2024	83.3	49.7	1.88
7/25/2024	89	53.7	2.05
8/8/2024	31.4	46.6	2.09
8/22/2024	52.5	31.6	2.2
9/5/2024	143	29.4	2.03
9/19/2024	59.7	39.1	2.61
Note: First sample taken on 7/11/2024 was from existing GAC bed that has been in service for 2 years. All other samples are taken after a new GAC media bed was put in service.			

Table 2. 6PPD-Quinone Removal from Pre-settling Tank to Flocculation

6PPD-Quinone (ng/L)			
Sample Date	Pre-settling Tank	Flocculation Tank	% Removal
7/11/2024	83.3	49.7	40%
7/25/2024	89	53.7	40%
8/22/2024	52.5	31.6	40%
9/5/2024	143	29.4	79%
9/19/2024	59.7	39.1	35%

Table 3. 6PPD-Quinone Removal from Flocculation to GAC Filtration

6PPD-Quinone (ng/L)			
Sample Date	Flocculation Tank	GAC	% Removal
7/11/2024	49.7	1.88	96%
7/25/2024	53.7	2.05	96%
8/22/2024	31.6	2.2	93%
9/5/2024	29.4	2.03	93%
9/19/2024	39.1	2.61	93%

Table 4. Overall 6PPD-Quinone Removal

6PPD-Quinone (ng/L)			
Sample Date	Pre-settling Tank	GAC	% Removal
7/11/2024	83.3	1.88	98%
7/25/2024	89	2.05	98%
8/22/2024	52.5	2.2	96%
9/5/2024	143	2.03	99%
9/19/2024	59.7	2.61	96%

Table 5. TSS Removal from Pre-settling Tank to Flocculation Tank

TSS (mg/L)			
Sample Date	Pre-settling Tank	Flocculation Tank	% Removal
7/11/2024	36.7	30	18%
7/25/2024	46.7	8	83%
8/22/2024	210	23.3	89%
9/5/2024	245	3.3	98%
9/19/2024	310	5	98%

Table 6. TSS Removal from Flocculation Tank to GAC Filtration

TSS (mg/L)			
Sample Date	Flocculation Tank	GAC	% Removal
7/11/2024	30.0	7.2	76%
7/25/2024	8.0	1.1	87%
8/22/2024	23.3	8.6	63%
9/5/2024	3.3	1.0	69%
9/19/2024	5.0	2.1	58%

Table 7. Overall TSS Removal

TSS (mg/L)			
Sample Date	Pre-settling Tank	GAC	% Removal
7/11/2024	36.7	7.2	80%
7/25/2024	46.7	1.1	98%
8/22/2024	210	8.6	96%
9/5/2024	245	1.0	100%
9/19/2024	310	2.1	99%

An analysis of the data revealed no discernible correlation between TSS/VSS and 6PPDQ concentrations within each unit treatment process.

Table 8. TSS/VSS and 6PPD-Quinone in Pre-settling Tank

Pre-settling- Tank			
Sample Date	TSS (mg/L)	VSS (mg/L)	6PPDq (ng/L)
7/11/2024	36.7	23.3	83.3
7/25/2024	46.7	33.3	89
8/22/2024	210	95	52.5
9/5/2024	245	95	143
9/19/2024	310	140	59.7

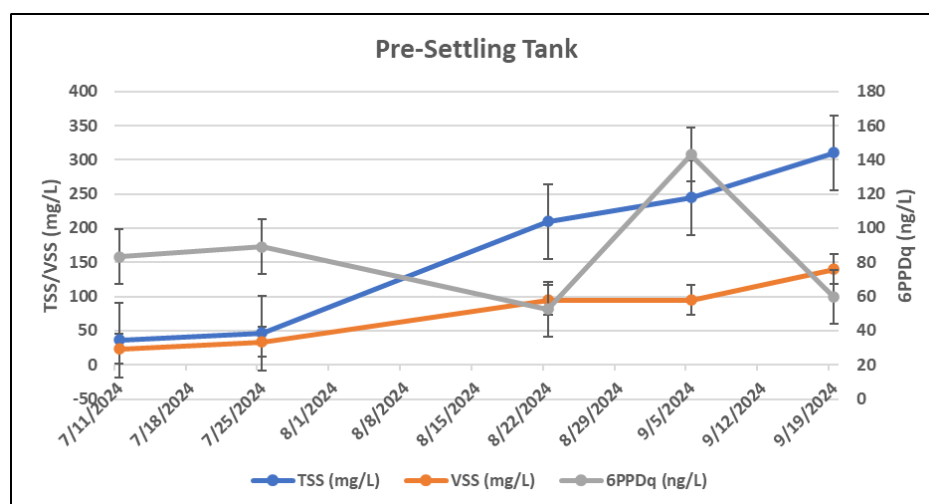


Table 9. 6PPD-Quinone and TSS/VSS in Flocculation Tank

Flocculation Tank			
Sample Date	TSS (mg/L)	VSS (mg/L)	6PPDq (ng/L)
7/11/2024	30.0	30.0	49.7
7/25/2024	8.0	10.0	53.7
8/22/2024	23.3	16.7	31.6
9/5/2024	3.3	3.3	29.4
9/19/2024	5.0	5.0	39.1

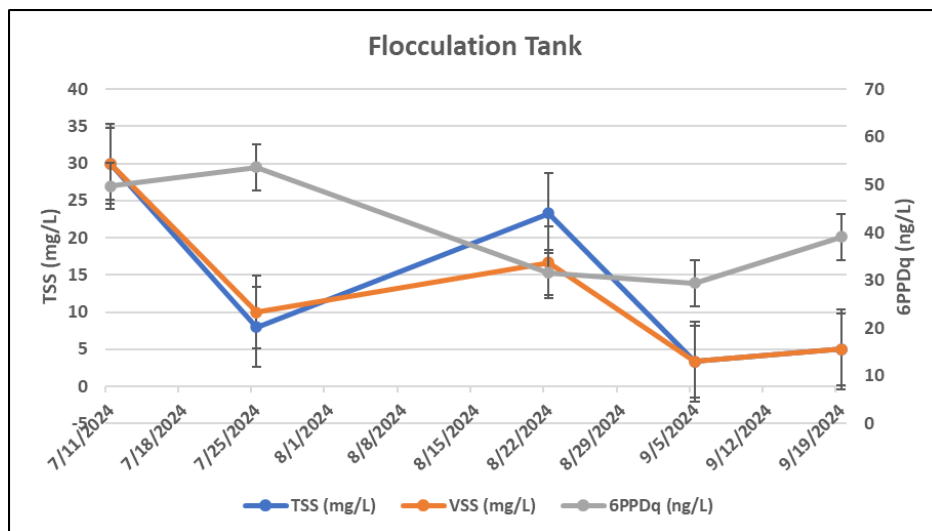
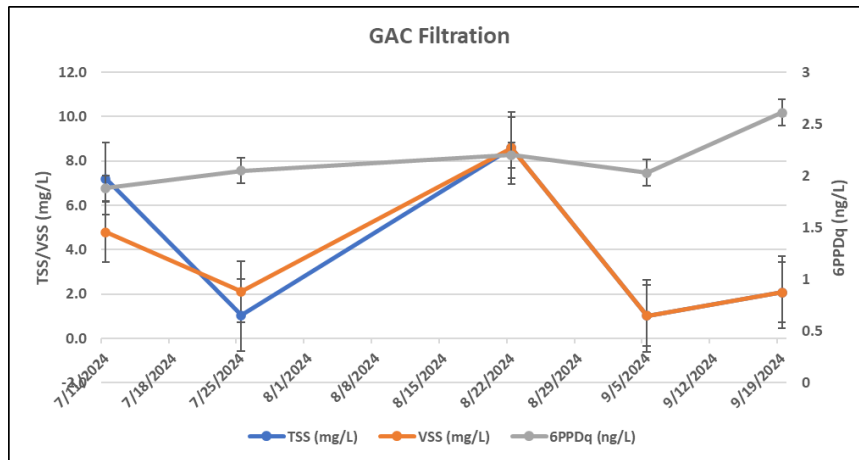


Table 10. 6PPD-Quinone and TSS/VSS after GAC Filtration

GAC Filtration			
Sample Date	TSS (mg/L)	VSS (mg/L)	6PPDq (ng/L)
7/11/2024	7.2	4.8	1.88
7/25/2024	1.1	2.1	2.05
8/22/2024	8.6	8.6	2.2
9/5/2024	1.0	1.0	2.03
9/19/2024	2.1	2.1	2.61



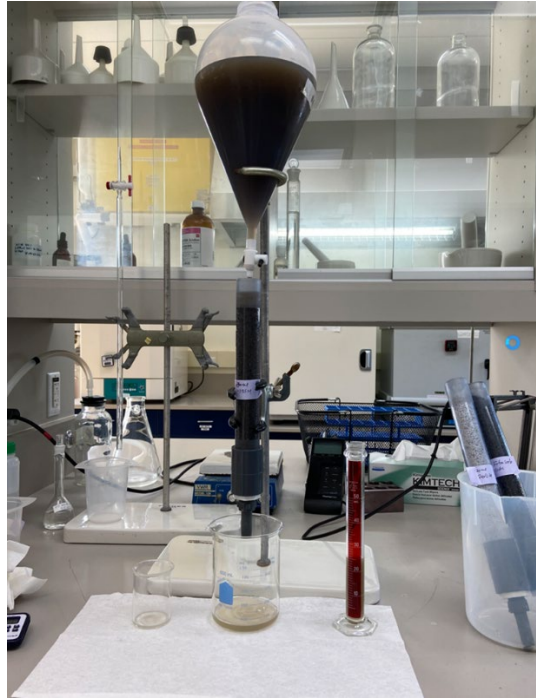
A packed column study, conducted outside the primary project scope but with mutual agreement between Ecology and Pierce County, compared the performance of High-Performance Bioretention Soil Media (HPBSM) and GAC in removing 6PPDQ for pre-settling tank water. This water contained a high concentration of suspended solids (245 mg/L), posing a potential challenge for media filtration.

The study utilized 1-inch diameter columns, 8.5 inches tall, packed with 125 ml of each media. HPBSM was operated at a filtration rate of 32 inches/hour (approximately 3 times the standard rate), while GAC was operated at 6 times the HPBSM rate. Filtration rates were determined by measuring the volume of filtrate collected over time.

Preliminary results indicated that suspended solids could impact media performance at the described filtration rate. HPBSM demonstrated the highest removal efficiency at 81%, followed by GAC at 71%. Perlite used as a control, exhibited the lowest removal efficiency at 55%.

Table 11. Lab-Scale Column Study

6PPD-Quinone (ng/L) in Column Study			
Pre-settling Tank	HPBSM	GAC	Perlite
143	27.1	41.6	63.7
% Removal	81%	71%	55%



Lab-scale Column Study Setup

Attempts are also made to correlate cleaning activities to 6PPDQ concentration observed but are non-conclusive (pre-settling tank is also referred to as moat and the two terms are used interchangeably). Data is attached in appendix B.

6. Conclusions & Discussions

The Pierce County decant facility, a centralized treatment plant for waste generated from CB cleaning activities, demonstrates effective 6PPDQ removal through solid-liquid separation and GAC filtration. This system achieves a high filtration rate, exceeding traditional HPBSM by over 20 times.

Despite its impressive performance, a centralized treatment facility requires active operation and maintenance, making it less practical than passive BMPs for stormwater runoff. However, this successful removal mechanism provides valuable insights for developing innovative BMPs incorporating GAC.

Key considerations for GAC-based BMPs include:

- Fouling: GAC's broad adsorption capacity can lead to fouling by other contaminants, reducing its effectiveness for 6PPDQ removal. Protecting the active adsorption sites is crucial for maintaining high removal capacity.
- Competition: Dissolved 6PPDQ removal efficiency depends on minimizing interference from other contaminants that compete for adsorption sites.
- Pre-treatment: Effective pre-treatment to remove suspended solids and competing organics (e.g., from oil spills) is essential for optimal GAC performance.

Potential solutions for enhancing GAC-based BMPs include:

- Improved solid removal: Incorporating settling tanks or inclined plate separators to enhance the removal of suspended solids.
- Sacrificial media: Utilizing lower-cost sacrificial media to remove suspended solids and other competing organics before reaching the GAC filter.

This research highlights the potential of GAC-based technologies for 6PPDQ removal in stormwater runoff. Further research and development are needed to translate these findings into practical and cost-effective BMPs for real-world applications.

7. References

Ecology [Washington State Department of Ecology]. 2022a. 6PPD in Road Runoff: Assessment and Mitigation Strategies. Publication 22-03-020. Washington Department of Ecology, Olympia, WA.

Kendra, W., and Willms, R. 1990. Recurrent Coho Salmon Mortality at Maritime Heritage Fish Hatchery, Bellingham: A Synthesis of Data Collected from 1987 – 1989. Washington State Department of Ecology, Olympia, WA. Publication 90-e54.

<https://fortress.wa.gov/ecy/publications/SummaryPages/90e54.html>

McIntyre, J. K., Spromberg, J., Cameron, J., Incardona, J. P., Davis, J. W., and Scholz, N. L. 2023. Bioretention filtration prevents acute mortality and reduces chronic toxicity for early life stage coho salmon (*Oncorhynchus kisutch*) episodically exposed to urban stormwater runoff. *Science of The Total Environment*, 902, 165759. <https://doi.org/10.1016/J.SCITOTENV.2023.165759>

Scholz, N. L., Myers, M. S., McCarthy, S. G., Labenia, J. S., McIntyre, J. K., Ylitalo, G. M., Rhodes, L. D., Laetz, C. A., Stehr, C. M., French, B. L., McMillan, B., Wilson, D., Reed, L., Lynch, K. D., Damm, S., Davis, J. W., and Collier, T. K. 2011. Recurrent die-offs of adult Coho salmon returning to spawn in Puget Sound lowland urban streams. PLoS ONE, 6(12). <https://doi.org/10.1371/JOURNAL.PONE.0028013>

Tian, Z., Zhao, H., Peter, K. T., Gonzalez, M., Wetzel, J., Wu, C., Hu, X., Prat, J., Mudrock, E., Hettinger, R., Cortina, A. E., Biswas, R. G., Kock, F. V. C., Soong, R., Jenne, A., Du, B., Hou, F., He, H., Lundeen, R., ... Kolodziej, E. P. 2021. A ubiquitous tire rubber-derived chemical induces acute mortality in Coho salmon. *Science*, 371(6525), 185 – 189. <https://doi.org/10.1126/science.abd6951>

Tian, Z., Gonzalez, M., Rideout, C. A., Zhao, H. N., Hu, X., Wetzel, J., Mudrock, E., James, C. A., McIntyre, J. K., and Kolodziej, E. P. 2022. 6PPD-q: Revised Toxicity Assessment and Quantification with a Commercial Standard. *Environmental Science & Technology Letters*.

<https://doi.org/10.1021/ACS.ESTLETT.1C00910>

Wan, R., 6PPD-Quione Removal in Decant Facility, Quality Assurance Project Plan (QAPP), Submittal to Washington State Department of Ecology

Wagner, S., Hüffer, T., Klöckner, P., Wehrhahn, M., Hofmann, T., and Reemtsma, T. 2018. Tire wear particles in the aquatic environment — A review on generation, analysis, occurrence, fate and effects. *Water Research*, 139, 83 – 100. <https://doi.org/10.1016/j.watres.2018.03.051>

8. Appendices

Appendix A. Laboratory Report

Appendix B. Traffic Data Related to CB Cleaning Activities

Appendix A. Laboratory Report

DEPARTMENT OF ECOLOGY
Manchester Environmental Laboratory
7411 Beach Drive East • Port Orchard, Washington 98366-8204

Case Narrative

October 11, 2024

To: Baker, Morgan

Project: 6PPD-quinone Removal in Decant Facility

Work Order: 2409076

Subject: 6PPD-Q by LC-MS/MS

From: Jennifer Pereira

Sample Receipt

Enclosed are the 6PPDQ results for the samples received by MEL on September 19, 2024. All samples were received in acceptable condition unless noted in Analyst Comments. All samples were prepared and analyzed within holding times unless noted in Analyst Comments.

Analytical Methods

These samples were prepared, analyzed, and verified by MEL according to the submitted chain-of-custody and MEL's procedures. A Sample Correlation Table with batch summary is located in Appendix A. The samples were:

- extracted following method SW3535A.
- cleaned up following method(s) SW3630C, .
- analyzed following MEL SOP730136.

Analyst Comments

Samples 2409076-02 and -03 were diluted to reduce matrix interference affecting the internal standards.

Sample Qualification

The samples were qualified according to MEL's procedures. The table in Appendix B summarizes the manual qualifiers added by MEL. All results reported below the method

reporting limit (RL) were automatically qualified as estimates, but not included in Appendix B. The qualifiers are defined in Appendix C.

Sample Verification

All analyses met QC acceptance criteria except as noted in Appendix D. All analytes met linearity requirements unless noted in Appendix E.

Washington State Department of Ecology
Manchester Environmental Laboratory
Final Report for
6PPD-Q by LC-MS/MS

Project: 6PPD-quinone Removal in Decant Facility

Field ID: GAC Filter

Work Order: 2409076
Project Officer: Baker, Morgan
Initial Vol: 191.55 mL
Final Vol: 10 mL

Lab ID #: 2409076-01
Collected: 9/19/2024
Prep Method: SW3535A
Analysis Method: SOP730136

Batch ID: B24I155
Prepared: 9/25/2024
Analyzed: 10/3/2024
Matrix: Water
Units: ng/L

CAS#	Analyte	Result	Qualifier	Dilution	RL	MDL
2754428-18-5	6PPD-quinone	2.61	U	1	2.61	0.626

Surrogate Recovery:

CAS#	Analyte	Result	Spike Level	% Rec.	% Rec. Limits
NULL	13C6-6PPD-Quinone	79.3	104	76	25-200

Authorized by: Jennifer Pereira

Release Date: 10/11/2024

Washington State Department of Ecology
Manchester Environmental Laboratory
Final Report for
6PPD-Q by LC-MS/MS

Project: 6PPD-quinone Removal in Decant Facility

Field ID: Flocculation Tank

Work Order: 2409076
Project Officer: Baker, Morgan
Initial Vol: 237.34 mL
Final Vol: 10 mL

Lab ID #: 2409076-02
Collected: 9/19/2024
Prep Method: SW3535A
Analysis Method: SOP730136

Batch ID: B24I155
Prepared: 9/25/2024
Analyzed: 10/3/2024
Matrix: Water
Units: ng/L

CAS#	Analyte	Result	Qualifier	Dilution	RL	MDL
2754428-18-5	6PPD-quinone	39.1		4	8.43	2.02

Surrogate Recovery:

CAS#	Analyte	Result	Spike Level	% Rec.	% Rec. Limits
NULL	13C6-6PPD-Quinone	115	84.3	136	25-200

Authorized by: Jennifer Pereira

Release Date: 10/11/2024

Washington State Department of Ecology
Manchester Environmental Laboratory
Final Report for
6PPD-Q by LC-MS/MS

Project: 6PPD-quinone Removal in Decant Facility

Field ID: Pre-Settling Tank

Work Order: 2409076
Project Officer: Baker, Morgan
Initial Vol: 218.86 mL
Final Vol: 10 mL

Lab ID #: 2409076-03
Collected: 9/19/2024
Prep Method: SW3535A
Analysis Method: SOP730136

Batch ID: B24I155
Prepared: 9/25/2024
Analyzed: 10/3/2024
Matrix: Water
Units: ng/L

CAS#	Analyte	Result	Qualifier	Dilution	RL	MDL
2754428-18-5	6PPD-quinone	59.7		4	9.14	2.19

Surrogate Recovery:

CAS#	Analyte	Result	Spike Level	% Rec.	% Rec. Limits
NULL	13C6-6PPD-Quinone	91.6	91.4	100	25-200

Authorized by: Jennifer Pereira

Release Date: 10/11/2024

**Washington State Department of Ecology
Manchester Environmental Laboratory
Final Report for
6PPD-Q by LC-MS/MS**

Project: 6PPD-quinone Removal in Decant Facility

QC Type : Method Blank

Work Order: Batch QC
Project Officer: Baker, Morgan
Initial Vol: 250 mL
Final Vol: 10 mL

Lab ID #: B24I155-BLK1
Prep Method: SW3535A
Analysis Method: SOP730136

Batch ID: B24I155
Prepared: 9/25/2024
Analyzed: 10/3/2024
Matrix: Water
Units: ng/L

CAS#	Analyte	Result	Qualifier	RL	MDL
2754428-18-5	6PPD-quinone	0.480	UJ	2.00	0.480

Surrogate Recovery:

CAS#	Analyte	Result	Spike Level	% Rec.	% Rec. Limits
NULL	13C6-6PPD-Quinone	61.4	80.0	77	25-200

Authorized by: Jennifer Pereira

Release Date: 10/11/2024

Washington State Department of Ecology
Manchester Environmental Laboratory
Final Report for
6PPD-Q by LC-MS/MS

Project: 6PPD-quinone Removal in Decant Facility

QC Type : LCS

Work Order: Batch QC
Project Officer: Baker, Morgan
Initial Vol: 250 mL
Final Vol: 10 mL

Lab ID #: B24I155-BS1
Prep Method: SW3535A
Analysis Method: SOP730136

Batch ID: B24I155
Prepared: 9/25/2024
Analyzed: 10/3/2024
Matrix: Water
Units: %

Analyte	Result	Spike Level	RL	%Rec	%Rec Limits
6PPD-quinone	75.3	80.0	2.00	94	70-130

Surrogate Recovery:

CAS#	Analyte	Result	Spike Level	% Rec.	% Rec. Limits
NULL	13C6-6PPD-Quinone	63.2	80.0	79	25-200

Authorized by: Jennifer Pereira

Release Date: 10/11/2024

Washington State Department of Ecology
Manchester Environmental Laboratory
Final Report for
6PPD-Q by LC-MS/MS

Project: 6PPD-quinone Removal in Decant Facility

QC Type : LCS Dup

Work Order: Batch QC
Project Officer: Baker, Morgan
Initial Vol: 250 mL
Final Vol: 10 mL

Lab ID #: B24I155-BSD1
Prep Method: SW3535A
Analysis Method: SOP730136

Batch ID: B24I155
Prepared: 9/25/2024
Analyzed: 10/3/2024
Matrix: Water
Units: %

Analyte	Sample Result	Spike Level	%Rec	RPD	%Rec Limits	RPD Limit
6PPD-quinone	76.2	80.0	95	1	70-130	40

Surrogate Recovery:

CAS#	Analyte	Result	Spike Level	% Rec.	% Rec. Limits
NULL	13C6-6PPD-Quinone	59.4	80.0	74	25-200

Authorized by: Jennifer Pereira

Release Date: 10/11/2024

Appendix A
Sample Correlation Table

Batch ID: B24I155

Prep Method: SW3535A

Prepared: 9/25/2024

Analysis Method: SOP730136

Field ID	MEL ID
GAC Filter	2409076-01
Flocculation Tank	2409076-02
Pre-Settling Tank	2409076-03
Method Blank	B24I155-BLK1
LCS	B24I155-BS1
LCS Dup	B24I155-BSD1

Appendix B
Manual Qualification Table

WO: 2409076

Analysis:

No manual qualifiers were added to the samples or batch QC.

Appendix C

Data Qualifier Definitions

Code	Definition
E	Reported result is an estimate because it exceeds the calibration range.
J	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
N	The analysis indicates the present of an analyte for which there is presumptive evidence to make a “tentative identification”.
NJ	The analysis indicates the presence of an analyte that has been “tentatively identified” and the associated numerical value represents its approximate concentration.
NAF	Not analyzed for.
NC	Not calculated.
REJ	The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.
U	The analyte was not detected at or above the reported sample quantitation limit.
UJ	The analyte was not detected at or above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately measure the analyte in the sample.
bold	The analyte was present in the sample. (Visual aid to locate detected compounds on the analytical report.)

Appendix D

QC Exceptions Report

Lab ID	Analyte	Exception
No QC exceptions reported.		

Appendix E
Initial Calibration Exceptions Report

Calibration ID: B4I1701

Analysis: 6PPDQ

LabNumber **Analyte**

QC Exception

No ICAL exceptions.

DEPARTMENT OF ECOLOGY
Manchester Environmental Laboratory
7411 Beach Drive East • Port Orchard, Washington 98366-8204

Case Narrative

July 31, 2024

To: Baker, Morgan

Project: 6PPD-quinone Removal in Decant Facility

Work Order: 2407055

Subject: 6PPD-Q by LC-MS/MS

From: Jennifer Pereira

Sample Receipt

Enclosed are the 6PPDQ results for the samples received by MEL on July 11, 2024. All samples were received in acceptable condition unless noted in Analyst Comments. All samples were prepared and analyzed within holding times unless noted in Analyst Comments.

Analytical Methods

These samples were prepared, analyzed, and verified by MEL according to the submitted chain-of-custody and MEL's procedures. A Sample Correlation Table with batch summary is located in Appendix A. The samples were:

- extracted following method SW3535A.
- cleaned up following method(s) SW3630C, .
- analyzed following MEL SOP730136.

Analyst Comments

None noted.

Sample Qualification

The samples were qualified according to MEL's procedures. The table in Appendix B summarizes the manual qualifiers added by MEL. All results reported below the method reporting limit (RL) were automatically qualified as estimates, but not included in Appendix B.

The qualifiers are defined in Appendix C.

Sample Verification

All analyses met QC acceptance criteria except as noted in Appendix D. All analytes met linearity requirements unless noted in Appendix E.

Washington State Department of Ecology
Manchester Environmental Laboratory
Final Report for
6PPD-Q by LC-MS/MS

Project: 6PPD-quinone Removal in Decant Facility

Field ID: GAC Filtration

Work Order: 2407055
Project Officer: Baker, Morgan
Initial Vol: 265.5 mL
Final Vol: 10 mL

Lab ID #: 2407055-01
Collected: 7/11/2024
Prep Method: SW3535A
Analysis Method: SOP730136

Batch ID: B24G074
Prepared: 7/15/2024
Analyzed: 7/18/2024
Matrix: Water
Units: ng/L

CAS#	Analyte	Result	Qualifier	Dilution	RL	MDL
2754428-18-5	6PPD-quinone	1.88	U	1	1.88	0.452

Surrogate Recovery:

CAS#	Analyte	Result	Spike Level	% Rec.	% Rec. Limits
NULL	13C6-6PPD-Quinone	73.0	75.3	97	25-200

Authorized by: Jennifer Pereira

Release Date: 7/31/2024

Washington State Department of Ecology
Manchester Environmental Laboratory
Final Report for
6PPD-Q by LC-MS/MS

Project: 6PPD-quinone Removal in Decant Facility

Field ID: Pre-Settling Tank

Work Order: 2407055
Project Officer: Baker, Morgan
Initial Vol: 261 mL
Final Vol: 10 mL

Lab ID #: 2407055-02
Collected: 7/11/2024
Prep Method: SW3535A
Analysis Method: SOP730136

Batch ID: B24G074
Prepared: 7/15/2024
Analyzed: 7/18/2024
Matrix: Water
Units: ng/L

CAS#	Analyte	Result	Qualifier	Dilution	RL	MDL
2754428-18-5	6PPD-quinone	83.3		2	3.83	0.920

Surrogate Recovery:

CAS#	Analyte	Result	Spike Level	% Rec.	% Rec. Limits
NULL	13C6-6PPD-Quinone	71.2	76.6	93	25-200

Authorized by: Jennifer Pereira

Release Date: 7/31/2024

Washington State Department of Ecology
Manchester Environmental Laboratory
Final Report for
6PPD-Q by LC-MS/MS

Project: 6PPD-quinone Removal in Decant Facility

Field ID: Floccutration Tank

Work Order: 2407055
Project Officer: Baker, Morgan
Initial Vol: 236.7 mL
Final Vol: 10 mL

Lab ID #: 2407055-03
Collected: 7/11/2024
Prep Method: SW3535A
Analysis Method: SOP730136

Batch ID: B24G074
Prepared: 7/15/2024
Analyzed: 7/18/2024
Matrix: Water
Units: ng/L

CAS#	Analyte	Result	Qualifier	Dilution	RL	MDL
2754428-18-5	6PPD-quinone	49.7		2	4.22	1.01

Surrogate Recovery:

CAS#	Analyte	Result	Spike Level	% Rec.	% Rec. Limits
NULL	13C6-6PPD-Quinone	82.0	84.5	97	25-200

Authorized by: Jennifer Pereira

Release Date: 7/31/2024

**Washington State Department of Ecology
Manchester Environmental Laboratory
Final Report for
6PPD-Q by LC-MS/MS**

Project: 6PPD-quinone Removal in Decant Facility

QC Type : Method Blank

Work Order: Batch QC
Project Officer: Baker, Morgan
Initial Vol: 250 mL
Final Vol: 10 mL

Lab ID #: B24G074-BLK1
Prep Method: SW3535A
Analysis Method: SOP730136

Batch ID: B24G074
Prepared: 7/15/2024
Analyzed: 7/18/2024
Matrix: Water
Units: ng/L

CAS#	Analyte	Result	Qualifier	RL	MDL
2754428-18-5	6PPD-quinone	0.480	UJ	2.00	0.480

Surrogate Recovery:

CAS#	Analyte	Result	Spike Level	% Rec.	% Rec. Limits
NULL	13C6-6PPD-Quinone	65.4	80.0	82	25-200

Authorized by: Jennifer Pereira

Release Date: 7/31/2024

Washington State Department of Ecology
Manchester Environmental Laboratory
Final Report for
6PPD-Q by LC-MS/MS

Project: 6PPD-quinone Removal in Decant Facility

QC Type : LCS

Work Order: Batch QC
Project Officer: Baker, Morgan
Initial Vol: 250 mL
Final Vol: 10 mL

Lab ID #: B24G074-BS1
Prep Method: SW3535A
Analysis Method: SOP730136

Batch ID: B24G074
Prepared: 7/15/2024
Analyzed: 7/18/2024
Matrix: Water
Units: %

Analyte	Result	Spike Level	RL	%Rec	%Rec Limits
6PPD-quinone	67.1	80.0	2.00	84	70-130

Surrogate Recovery:

CAS#	Analyte	Result	Spike Level	% Rec.	% Rec. Limits
NULL	13C6-6PPD-Quinone	60.5	80.0	76	25-200

Authorized by: Jennifer Pereira

Release Date: 7/31/2024

Washington State Department of Ecology
Manchester Environmental Laboratory
Final Report for
6PPD-Q by LC-MS/MS

Project: 6PPD-quinone Removal in Decant Facility

QC Type : LCS Dup

Work Order: Batch QC
Project Officer: Baker, Morgan
Initial Vol: 250 mL
Final Vol: 10 mL

Lab ID #: B24G074-BSD1
Prep Method: SW3535A
Analysis Method: SOP730136

Batch ID: B24G074
Prepared: 7/15/2024
Analyzed: 7/18/2024
Matrix: Water
Units: %

Analyte	Sample Result	Spike Level	%Rec	RPD	%Rec Limits	RPD Limit
6PPD-quinone	64.3	80.0	80	4	70-130	40

Surrogate Recovery:

CAS#	Analyte	Result	Spike Level	% Rec.	% Rec. Limits
NULL	13C6-6PPD-Quinone	61.2	80.0	76	25-200

Authorized by: Jennifer Pereira

Release Date: 7/31/2024

Appendix A
Sample Correlation Table

Batch ID: B24G074

Prep Method: SW3535A

Prepared: 7/15/2024

Analysis Method: SOP730136

<u>Field ID</u>	<u>MEL ID</u>
GAC Filtration	2407055-01
Pre-Settling Tank	2407055-02
Floccutiation Tank	2407055-03
Method Blank	B24G074-BLK1
LCS	B24G074-BS1
LCS Dup	B24G074-BSD1

Appendix B
Manual Qualification Table

WO: 2407055

Analysis:

No manual qualifiers were added to the samples or batch QC.

Appendix C

Data Qualifier Definitions

Code	Definition
E	Reported result is an estimate because it exceeds the calibration range.
J	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
N	The analysis indicates the present of an analyte for which there is presumptive evidence to make a “tentative identification”.
NJ	The analysis indicates the presence of an analyte that has been “tentatively identified” and the associated numerical value represents its approximate concentration.
NAF	Not analyzed for.
NC	Not calculated.
REJ	The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.
U	The analyte was not detected at or above the reported sample quantitation limit.
UJ	The analyte was not detected at or above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately measure the analyte in the sample.
bold	The analyte was present in the sample. (Visual aid to locate detected compounds on the analytical report.)

Appendix D

QC Exceptions Report

Lab ID	Analyte	Exception
No QC exceptions reported.		

Appendix E
Initial Calibration Exceptions Report

Calibration ID: B4E2001

Analysis: 6PPDQ (1634)

LabNumber **Analyte**

QC Exception

No ICAL exceptions.

DEPARTMENT OF ECOLOGY
Manchester Environmental Laboratory
7411 Beach Drive East • Port Orchard, Washington 98366-8204

Case Narrative

September 11, 2024

To: Baker, Morgan

Project: 6PPD-quinone Removal in Decant Facility

Work Order: 2407076

Subject: 6PPD-Q by LC-MS/MS

From: Jennifer Pereira

Sample Receipt

Enclosed are the 6PPDQ results for the samples received by MEL on July 25, 2024. All samples were received in acceptable condition unless noted in Analyst Comments. All samples were prepared and analyzed within holding times unless noted in Analyst Comments.

Analytical Methods

These samples were prepared, analyzed, and verified by MEL according to the submitted chain-of-custody and MEL's procedures. A Sample Correlation Table with batch summary is located in Appendix A. The samples were:

- extracted following method SW3535A.
- cleaned up following method(s) SW3630C, .
- analyzed following MEL SOP730136.

Analyst Comments

None noted.

Sample Qualification

The samples were qualified according to MEL's procedures. The table in Appendix B summarizes the manual qualifiers added by MEL. All results reported below the method reporting limit (RL) were automatically qualified as estimates, but not included in Appendix B.

The qualifiers are defined in Appendix C.

Sample Verification

All analyses met QC acceptance criteria except as noted in Appendix D. All analytes met linearity requirements unless noted in Appendix E.

Washington State Department of Ecology
Manchester Environmental Laboratory
Final Report for
6PPD-Q by LC-MS/MS

Project: 6PPD-quinone Removal in Decant Facility

Field ID: GAC Filter

Work Order: 2407076
Project Officer: Baker, Morgan
Initial Vol: 244.2 mL
Final Vol: 10 mL

Lab ID #: 2407076-01
Collected: 7/25/2024
Prep Method: SW3535A
Analysis Method: SOP730136

Batch ID: B24H034
Prepared: 8/1/2024
Analyzed: 8/19/2024
Matrix: Water
Units: ng/L

CAS#	Analyte	Result	Qualifier	Dilution	RL	MDL
2754428-18-5	6PPD-quinone	2.05	U	1	2.05	0.491

Surrogate Recovery:

CAS#	Analyte	Result	Spike Level	% Rec.	% Rec. Limits
NULL	13C6-6PPD-Quinone	71.1	81.9	87	25-200

Authorized by: Jennifer Pereira

Release Date: 9/11/2024

Washington State Department of Ecology
Manchester Environmental Laboratory
Final Report for
6PPD-Q by LC-MS/MS

Project: 6PPD-quinone Removal in Decant Facility

Field ID: Floccutataion Tank

Work Order: 2407076
Project Officer: Baker, Morgan
Initial Vol: 227.8 mL
Final Vol: 10 mL

Lab ID #: 2407076-02
Collected: 7/25/2024
Prep Method: SW3535A
Analysis Method: SOP730136

Batch ID: B24H034
Prepared: 8/1/2024
Analyzed: 8/19/2024
Matrix: Water
Units: ng/L

CAS#	Analyte	Result	Qualifier	Dilution	RL	MDL
2754428-18-5	6PPD-quinone	53.7		4	8.78	2.11

Surrogate Recovery:

CAS#	Analyte	Result	Spike Level	% Rec.	% Rec. Limits
NULL	13C6-6PPD-Quinone	127	87.8	145	25-200

Authorized by: Jennifer Pereira

Release Date: 9/11/2024

Washington State Department of Ecology
Manchester Environmental Laboratory
Final Report for
6PPD-Q by LC-MS/MS

Project: 6PPD-quinone Removal in Decant Facility

Field ID: Pre-Settling Tank

Work Order: 2407076
Project Officer: Baker, Morgan
Initial Vol: 225.5 mL
Final Vol: 10 mL

Lab ID #: 2407076-03
Collected: 7/25/2024
Prep Method: SW3535A
Analysis Method: SOP730136

Batch ID: B24H034
Prepared: 8/1/2024
Analyzed: 8/19/2024
Matrix: Water
Units: ng/L

CAS#	Analyte	Result	Qualifier	Dilution	RL	MDL
2754428-18-5	6PPD-quinone	89.0	J	10	22.2	5.32

Surrogate Recovery:

CAS#	Analyte	Result	Spike Level	% Rec.	% Rec. Limits
NULL	13C6-6PPD-Quinone	234	88.7	264	25-200

Authorized by: Jennifer Pereira

Release Date: 9/11/2024

**Washington State Department of Ecology
Manchester Environmental Laboratory
Final Report for
6PPD-Q by LC-MS/MS**

Project: 6PPD-quinone Removal in Decant Facility

QC Type : Method Blank

Work Order: Batch QC
Project Officer: Baker, Morgan
Initial Vol: 250 mL
Final Vol: 10 mL

Lab ID #: B24H034-BLK1
Prep Method: SW3535A
Analysis Method: SOP730136

Batch ID: B24H034
Prepared: 8/1/2024
Analyzed: 8/19/2024
Matrix: Water
Units: ng/L

CAS#	Analyte	Result	Qualifier	RL	MDL
2754428-18-5	6PPD-quinone	0.480	UJ	2.00	0.480

Surrogate Recovery:

CAS#	Analyte	Result	Spike Level	% Rec.	% Rec. Limits
NULL	13C6-6PPD-Quinone	83.4	80.0	104	25-200

Authorized by: Jennifer Pereira

Release Date: 9/11/2024

Washington State Department of Ecology
Manchester Environmental Laboratory
Final Report for
6PPD-Q by LC-MS/MS

Project: 6PPD-quinone Removal in Decant Facility

QC Type : LCS

Work Order: Batch QC
Project Officer: Baker, Morgan
Initial Vol: 250 mL
Final Vol: 10 mL

Lab ID #: B24H034-BS1
Prep Method: SW3535A
Analysis Method: SOP730136

Batch ID: B24H034
Prepared: 8/1/2024
Analyzed: 8/19/2024
Matrix: Water
Units: %

Analyte	Result	Spike Level	RL	%Rec	%Rec Limits
6PPD-quinone	70.5	80.0	2.00	88	70-130

Surrogate Recovery:

CAS#	Analyte	Result	Spike Level	% Rec.	% Rec. Limits
NULL	13C6-6PPD-Quinone	79.3	80.0	99	25-200

Authorized by: Jennifer Pereira

Release Date: 9/11/2024

Washington State Department of Ecology
Manchester Environmental Laboratory
Final Report for
6PPD-Q by LC-MS/MS

Project: 6PPD-quinone Removal in Decant Facility

QC Type : LCS Dup

Work Order: Batch QC
Project Officer: Baker, Morgan
Initial Vol: 250 mL
Final Vol: 10 mL

Lab ID #: B24H034-BSD1
Prep Method: SW3535A
Analysis Method: SOP730136

Batch ID: B24H034
Prepared: 8/1/2024
Analyzed: 8/19/2024
Matrix: Water
Units: %

Analyte	Sample Result	Spike Level	%Rec	RPD	%Rec Limits	RPD Limit
6PPD-quinone	70.8	80.0	89	0.5	70-130	40

Surrogate Recovery:

CAS#	Analyte	Result	Spike Level	% Rec.	% Rec. Limits
NULL	13C6-6PPD-Quinone	77.4	80.0	97	25-200

Authorized by: Jennifer Pereira

Release Date: 9/11/2024

Appendix A
Sample Correlation Table

Batch ID: B24H034

Prep Method: SW3535A

Prepared: 8/1/2024

Analysis Method: SOP730136

<u>Field ID</u>	<u>MEL ID</u>
GAC Filter	2407076-01
Floccutiation Tank	2407076-02
Pre-Settling Tank	2407076-03
Method Blank	B24H034-BLK1
LCS	B24H034-BS1
LCS Dup	B24H034-BSD1

Appendix B

Manual Qualification Table

WO: 2407076

Analysis: 6PPDQ

Reported result is estimated; Surrogate recovery exceeded QC limits.

6PPD-quinone J: 2407076-03,

Appendix C

Data Qualifier Definitions

Code	Definition
E	Reported result is an estimate because it exceeds the calibration range.
J	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
N	The analysis indicates the present of an analyte for which there is presumptive evidence to make a “tentative identification”.
NJ	The analysis indicates the presence of an analyte that has been “tentatively identified” and the associated numerical value represents its approximate concentration.
NAF	Not analyzed for.
NC	Not calculated.
REJ	The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.
U	The analyte was not detected at or above the reported sample quantitation limit.
UJ	The analyte was not detected at or above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately measure the analyte in the sample.
bold	The analyte was present in the sample. (Visual aid to locate detected compounds on the analytical report.)

Appendix D

QC Exceptions Report

Lab ID	Analyte	Exception
2407076-03	surr: 13C6-6PPD-Quinone	Exceeds upper control limit

QC Exceptions determined using unrounded QC results but are reported as integers throughout this analytical report.

C:\PROGRAM FILES (X86)\PROMIUM\ELEMENT\FORMAT\MEL_CASENARRATIVECLP_PDF_V3.5.3.RPT

09/11/2024

13:51

Appendix E
Initial Calibration Exceptions Report

Calibration ID: B4H1401

Analysis: 6PPDQ (1634)

LabNumber **Analyte**

QC Exception

No ICAL exceptions.

DEPARTMENT OF ECOLOGY
Manchester Environmental Laboratory
7411 Beach Drive East • Port Orchard, Washington 98366-8204

Case Narrative

September 19, 2024

To: Baker, Morgan

Project: 6PPD-quinone Removal in Decant Facility

Work Order: 2408056

Subject: 6PPD-Q by LC-MS/MS

From: Jennifer Pereira

Sample Receipt

Enclosed are the 6PPDQ results for the samples received by MEL on August 8, 2024. All samples were received in acceptable condition unless noted in Analyst Comments. All samples were prepared and analyzed within holding times unless noted in Analyst Comments.

Analytical Methods

These samples were prepared, analyzed, and verified by MEL according to the submitted chain-of-custody and MEL's procedures. A Sample Correlation Table with batch summary is located in Appendix A. The samples were:

- extracted following method SW3535A.
- cleaned up following method(s) SW3630C, .
- analyzed following MEL SOP730136.

Analyst Comments

Samples were diluted due to matrix interference causing a suppression in the internal standard.

Sample Qualification

The samples were qualified according to MEL's procedures. The table in Appendix B summarizes the manual qualifiers added by MEL. All results reported below the method reporting limit (RL) were automatically qualified as estimates, but not included in Appendix B.

The qualifiers are defined in Appendix C.

Sample Verification

All analyses met QC acceptance criteria except as noted in Appendix D. All analytes met linearity requirements unless noted in Appendix E.

Washington State Department of Ecology
Manchester Environmental Laboratory
Final Report for
6PPD-Q by LC-MS/MS

Project: 6PPD-quinone Removal in Decant Facility

Field ID: GAC Filter

Work Order: 2408056
Project Officer: Baker, Morgan
Initial Vol: 239.65 mL
Final Vol: 10 mL

Lab ID #: 2408056-01
Collected: 8/8/2024
Prep Method: SW3535A
Analysis Method: SOP730136

Batch ID: B24H096
Prepared: 8/15/2024
Analyzed: 9/6/2024
Matrix: Water
Units: ng/L

CAS#	Analyte	Result	Qualifier	Dilution	RL	MDL
2754428-18-5	6PPD-quinone	2.09	U	1	2.09	0.501

Surrogate Recovery:

CAS#	Analyte	Result	Spike Level	% Rec.	% Rec. Limits
NULL	13C6-6PPD-Quinone	64.9	83.5	78	25-200

Authorized by: Jennifer Pereira

Release Date: 9/19/2024

Washington State Department of Ecology
Manchester Environmental Laboratory
Final Report for
6PPD-Q by LC-MS/MS

Project: 6PPD-quinone Removal in Decant Facility

Field ID: Flocculation Tank

Work Order: 2408056
Project Officer: Baker, Morgan
Initial Vol: 192.67 mL
Final Vol: 10 mL

Lab ID #: 2408056-02
Collected: 8/8/2024
Prep Method: SW3535A
Analysis Method: SOP730136

Batch ID: B24H096
Prepared: 8/15/2024
Analyzed: 9/6/2024
Matrix: Water
Units: ng/L

CAS#	Analyte	Result	Qualifier	Dilution	RL	MDL
2754428-18-5	6PPD-quinone	46.6		8	20.8	4.98

Surrogate Recovery:

CAS#	Analyte	Result	Spike Level	% Rec.	% Rec. Limits
NULL	13C6-6PPD-Quinone	188	104	181	25-200

Authorized by: Jennifer Pereira

Release Date: 9/19/2024

**Washington State Department of Ecology
Manchester Environmental Laboratory
Final Report for
6PPD-Q by LC-MS/MS**

Project: 6PPD-quinone Removal in Decant Facility

Field ID: Pre-Settling Tank

Work Order: 2408056
Project Officer: Baker, Morgan
Initial Vol: 209.66 mL
Final Vol: 10 mL

Lab ID #: 2408056-03
Collected: 8/8/2024
Prep Method: SW3535A
Analysis Method: SOP730136

Batch ID: B24H096
Prepared: 8/15/2024
Analyzed: 9/6/2024
Matrix: Water
Units: ng/L

CAS#	Analyte	Result	Qualifier	Dilution	RL	MDL
2754428-18-5	6PPD-quinone	31.4		5	11.9	2.86

Surrogate Recovery:

CAS#	Analyte	Result	Spike Level	% Rec.	% Rec. Limits
NULL	13C6-6PPD-Quinone	123	95.4	129	25-200

Authorized by: Jennifer Pereira

Release Date: 9/19/2024

**Washington State Department of Ecology
Manchester Environmental Laboratory
Final Report for
6PPD-Q by LC-MS/MS**

Project: 6PPD-quinone Removal in Decant Facility

QC Type : Method Blank

Work Order: Batch QC
Project Officer: Baker, Morgan
Initial Vol: 250 mL
Final Vol: 10 mL

Lab ID #: B24H096-BLK1
Prep Method: SW3535A
Analysis Method: SOP730136

Batch ID: B24H096
Prepared: 8/15/2024
Analyzed: 9/6/2024
Matrix: Water
Units: ng/L

CAS#	Analyte	Result	Qualifier	RL	MDL
2754428-18-5	6PPD-quinone	0.480	UJ	2.00	0.480

Surrogate Recovery:

CAS#	Analyte	Result	Spike Level	% Rec.	% Rec. Limits
NULL	13C6-6PPD-Quinone	66.9	80.0	84	25-200

Authorized by: Jennifer Pereira

Release Date: 9/19/2024

Washington State Department of Ecology
Manchester Environmental Laboratory
Final Report for
6PPD-Q by LC-MS/MS

Project: 6PPD-quinone Removal in Decant Facility

QC Type : LCS

Work Order: Batch QC
Project Officer: Baker, Morgan
Initial Vol: 250 mL
Final Vol: 10 mL

Lab ID #: B24H096-BS1
Prep Method: SW3535A
Analysis Method: SOP730136

Batch ID: B24H096
Prepared: 8/15/2024
Analyzed: 9/6/2024
Matrix: Water
Units: %

Analyte	Result	Spike Level	RL	%Rec	%Rec Limits
6PPD-quinone	72.9	80.0	2.00	91	70-130

Surrogate Recovery:

CAS#	Analyte	Result	Spike Level	% Rec.	% Rec. Limits
NULL	13C6-6PPD-Quinone	66.7	80.0	83	25-200

Authorized by: Jennifer Pereira

Release Date: 9/19/2024

Washington State Department of Ecology
Manchester Environmental Laboratory
Final Report for
6PPD-Q by LC-MS/MS

Project: 6PPD-quinone Removal in Decant Facility

QC Type : LCS Dup

Work Order: Batch QC
Project Officer: Baker, Morgan
Initial Vol: 250 mL
Final Vol: 10 mL

Lab ID #: B24H096-BSD1
Prep Method: SW3535A
Analysis Method: SOP730136

Batch ID: B24H096
Prepared: 8/15/2024
Analyzed: 9/6/2024
Matrix: Water
Units: %

Analyte	Sample Result	Spike Level	%Rec	RPD	%Rec Limits	RPD Limit
6PPD-quinone	80.0	80.0	100	9	70-130	40

Surrogate Recovery:

CAS#	Analyte	Result	Spike Level	% Rec.	% Rec. Limits
NULL	13C6-6PPD-Quinone	67.7	80.0	85	25-200

Authorized by: Jennifer Pereira

Release Date: 9/19/2024

Appendix A
Sample Correlation Table

Batch ID: B24H096

Prep Method: SW3535A

Prepared: 8/15/2024

Analysis Method: SOP730136

<u>Field ID</u>	<u>MEL ID</u>
GAC Filter	2408056-01
Flocculation Tank	2408056-02
Pre-Settling Tank	2408056-03
Method Blank	B24H096-BLK1
LCS	B24H096-BS1
LCS Dup	B24H096-BSD1

Appendix B
Manual Qualification Table

WO: 2408056

Analysis:

No manual qualifiers were added to the samples or batch QC.

Appendix C

Data Qualifier Definitions

Code	Definition
E	Reported result is an estimate because it exceeds the calibration range.
J	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
N	The analysis indicates the present of an analyte for which there is presumptive evidence to make a “tentative identification”.
NJ	The analysis indicates the presence of an analyte that has been “tentatively identified” and the associated numerical value represents its approximate concentration.
NAF	Not analyzed for.
NC	Not calculated.
REJ	The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.
U	The analyte was not detected at or above the reported sample quantitation limit.
UJ	The analyte was not detected at or above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately measure the analyte in the sample.
bold	The analyte was present in the sample. (Visual aid to locate detected compounds on the analytical report.)

Appendix D

QC Exceptions Report

Lab ID	Analyte	Exception
No QC exceptions reported.		

Appendix E
Initial Calibration Exceptions Report

Calibration ID: B4I1701

Analysis: 6PPDQ

LabNumber **Analyte**

QC Exception

No ICAL exceptions.

DEPARTMENT OF ECOLOGY
Manchester Environmental Laboratory
7411 Beach Drive East • Port Orchard, Washington 98366-8204

Case Narrative

September 20, 2024

To: Baker, Morgan

Project: 6PPD-quinone Removal in Decant Facility

Work Order: 2408057

Subject: 6PPD-Q by LC-MS/MS

From: Jennifer Pereira

Sample Receipt

Enclosed are the 6PPDQ results for the samples received by MEL on August 22, 2024. All samples were received in acceptable condition unless noted in Analyst Comments. All samples were prepared and analyzed within holding times unless noted in Analyst Comments.

Analytical Methods

These samples were prepared, analyzed, and verified by MEL according to the submitted chain-of-custody and MEL's procedures. A Sample Correlation Table with batch summary is located in Appendix A. The samples were:

- extracted following method SW3535A.
- cleaned up following method(s) SW3630C, .
- analyzed following MEL SOP730136.

Analyst Comments

Samples were diluted due to matrix interference causing a suppression in the internal standard.

Expired surrogate was used to extract these samples. The surrogate expired on 8/20/2024 and the samples were extracted on 8/28/2024.

Sample Qualification

The samples were qualified according to MEL's procedures. The table in Appendix B summarizes the manual qualifiers added by MEL. All results reported below the method reporting limit (RL) were automatically qualified as estimates, but not included in Appendix B. The qualifiers are defined in Appendix C.

Sample Verification

All analyses met QC acceptance criteria except as noted in Appendix D. All analytes met linearity requirements unless noted in Appendix E.

Washington State Department of Ecology
Manchester Environmental Laboratory
Final Report for
6PPD-Q by LC-MS/MS

Project: 6PPD-quinone Removal in Decant Facility

Field ID: GAC Filter

Work Order: 2408057
Project Officer: Baker, Morgan
Initial Vol: 226.83 mL
Final Vol: 10 mL

Lab ID #: 2408057-01
Collected: 8/22/2024
Prep Method: SW3535A
Analysis Method: SOP730136

Batch ID: B24H195
Prepared: 8/28/2024
Analyzed: 9/6/2024
Matrix: Water
Units: ng/L

CAS#	Analyte	Result	Qualifier	Dilution	RL	MDL
2754428-18-5	6PPD-quinone	2.20	U	1	2.20	0.529

Surrogate Recovery:

CAS#	Analyte	Result	Spike Level	% Rec.	% Rec. Limits
NULL	13C6-6PPD-Quinone	86.5	88.2	98	25-200

Authorized by: Jennifer Pereira

Release Date: 9/20/2024

Washington State Department of Ecology
Manchester Environmental Laboratory
Final Report for
6PPD-Q by LC-MS/MS

Project: 6PPD-quinone Removal in Decant Facility

Field ID: Flocculation Tank

Work Order: 2408057
Project Officer: Baker, Morgan
Initial Vol: 251.37 mL
Final Vol: 10 mL

Lab ID #: 2408057-02
Collected: 8/22/2024
Prep Method: SW3535A
Analysis Method: SOP730136

Batch ID: B24H195
Prepared: 8/28/2024
Analyzed: 9/6/2024
Matrix: Water
Units: ng/L

CAS#	Analyte	Result	Qualifier	Dilution	RL	MDL
2754428-18-5	6PPD-quinone	31.6		8	15.9	3.82

Surrogate Recovery:

CAS#	Analyte	Result	Spike Level	% Rec.	% Rec. Limits
NULL	13C6-6PPD-Quinone	152	79.6	192	25-200

Authorized by: Jennifer Pereira

Release Date: 9/20/2024

Washington State Department of Ecology
Manchester Environmental Laboratory
Final Report for
6PPD-Q by LC-MS/MS

Project: 6PPD-quinone Removal in Decant Facility

Field ID: Pre-Settling Tank

Work Order: 2408057
Project Officer: Baker, Morgan
Initial Vol: 239.06 mL
Final Vol: 10 mL

Lab ID #: 2408057-03
Collected: 8/22/2024
Prep Method: SW3535A
Analysis Method: SOP730136

Batch ID: B24H195
Prepared: 8/28/2024
Analyzed: 9/6/2024
Matrix: Water
Units: ng/L

CAS#	Analyte	Result	Qualifier	Dilution	RL	MDL
2754428-18-5	6PPD-quinone	52.5	J	8	16.7	4.02

Surrogate Recovery:

CAS#	Analyte	Result	Spike Level	% Rec.	% Rec. Limits
NULL	13C6-6PPD-Quinone	151	83.7	180	25-200

Authorized by: Jennifer Pereira

Release Date: 9/20/2024

**Washington State Department of Ecology
Manchester Environmental Laboratory
Final Report for
6PPD-Q by LC-MS/MS**

Project: 6PPD-quinone Removal in Decant Facility

QC Type : Method Blank

Work Order: Batch QC
Project Officer: Baker, Morgan
Initial Vol: 250 mL
Final Vol: 10 mL

Lab ID #: B24H195-BLK1
Prep Method: SW3535A
Analysis Method: SOP730136

Batch ID: B24H195
Prepared: 8/28/2024
Analyzed: 9/6/2024
Matrix: Water
Units: ng/L

CAS#	Analyte	Result	Qualifier	RL	MDL
2754428-18-5	6PPD-quinone	0.480	UJ	2.00	0.480

Surrogate Recovery:

CAS#	Analyte	Result	Spike Level	% Rec.	% Rec. Limits
NULL	13C6-6PPD-Quinone	72.5	80.0	91	25-200

Authorized by: Jennifer Pereira

Release Date: 9/20/2024

Washington State Department of Ecology
Manchester Environmental Laboratory
Final Report for
6PPD-Q by LC-MS/MS

Project: 6PPD-quinone Removal in Decant Facility

QC Type : LCS

Work Order: Batch QC
Project Officer: Baker, Morgan
Initial Vol: 250 mL
Final Vol: 10 mL

Lab ID #: B24H195-BS1
Prep Method: SW3535A
Analysis Method: SOP730136

Batch ID: B24H195
Prepared: 8/28/2024
Analyzed: 9/6/2024
Matrix: Water
Units: %

Analyte	Result	Spike Level	RL	%Rec	%Rec Limits
6PPD-quinone	75.2	80.0	2.00	94	70-130

Surrogate Recovery:

CAS#	Analyte	Result	Spike Level	% Rec.	% Rec. Limits
NULL	13C6-6PPD-Quinone	73.3	80.0	92	25-200

Authorized by: Jennifer Pereira

Release Date: 9/20/2024

Washington State Department of Ecology
Manchester Environmental Laboratory
Final Report for
6PPD-Q by LC-MS/MS

Project: 6PPD-quinone Removal in Decant Facility

QC Type : LCS Dup

Work Order: Batch QC
Project Officer: Baker, Morgan
Initial Vol: 250 mL
Final Vol: 10 mL

Lab ID #: B24H195-BSD1
Prep Method: SW3535A
Analysis Method: SOP730136

Batch ID: B24H195
Prepared: 8/28/2024
Analyzed: 9/6/2024
Matrix: Water
Units: %

Analyte	Sample Result	Spike Level	%Rec	RPD	%Rec Limits	RPD Limit
6PPD-quinone	72.0	80.0	90	4	70-130	40

Surrogate Recovery:

CAS#	Analyte	Result	Spike Level	% Rec.	% Rec. Limits
NULL	13C6-6PPD-Quinone	70.4	80.0	88	25-200

Authorized by: Jennifer Pereira

Release Date: 9/20/2024

Appendix A
Sample Correlation Table

Batch ID: B24H195

Prep Method: SW3535A

Prepared: 8/28/2024

Analysis Method: SOP730136

<u>Field ID</u>	<u>MEL ID</u>
GAC Filter	2408057-01
Flocculation Tank	2408057-02
Pre-Settling Tank	2408057-03
Method Blank	B24H195-BLK1
LCS	B24H195-BS1
LCS Dup	B24H195-BSD1

Appendix B

Manual Qualification Table

WO: 2408057

Analysis: 6PPDQ

Reported result is estimated; ISTD recovery exceeded QC limits.

6PPD-quinone J: 2408057-03,

Appendix C

Data Qualifier Definitions

Code	Definition
E	Reported result is an estimate because it exceeds the calibration range.
J	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
N	The analysis indicates the present of an analyte for which there is presumptive evidence to make a “tentative identification”.
NJ	The analysis indicates the presence of an analyte that has been “tentatively identified” and the associated numerical value represents its approximate concentration.
NAF	Not analyzed for.
NC	Not calculated.
REJ	The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.
U	The analyte was not detected at or above the reported sample quantitation limit.
UJ	The analyte was not detected at or above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately measure the analyte in the sample.
bold	The analyte was present in the sample. (Visual aid to locate detected compounds on the analytical report.)

Appendix D

QC Exceptions Report

Lab ID	Analyte	Exception
2408057-03	istd: D5-6PPD-quinone	Exceeds lower control limit

QC Exceptions determined using unrounded QC results but are reported as integers throughout this analytical report.

C:\PROGRAM FILES (X86)\PROMIUM\ELEMENT\FORMAT\MEL_CASENARRATIVECLP_PDF_V3.5.3.RPT

09/20/2024

14:05

Appendix E
Initial Calibration Exceptions Report

Calibration ID: B4I1701

Analysis: 6PPDQ

LabNumber **Analyte**

QC Exception

No ICAL exceptions.

DEPARTMENT OF ECOLOGY
Manchester Environmental Laboratory
7411 Beach Drive East • Port Orchard, Washington 98366-8204

Case Narrative

October 2, 2024

To: Baker, Morgan

Project: 6PPD-quinone Removal in Decant Facility

Work Order: 2409047

Subject: 6PPD-Q by LC-MS/MS

From: Jennifer Pereira

Sample Receipt

Enclosed are the 6PPDQ results for the samples received by MEL on September 6, 2024. All samples were received in acceptable condition unless noted in Analyst Comments. All samples were prepared and analyzed within holding times unless noted in Analyst Comments.

Analytical Methods

These samples were prepared, analyzed, and verified by MEL according to the submitted chain-of-custody and MEL's procedures. A Sample Correlation Table with batch summary is located in Appendix A. The samples were:

- extracted following method SW3535A.
- cleaned up following method(s) SW3630C, .
- analyzed following MEL SOP730136.

Analyst Comments

Samples were diluted to help reduce matrix interference affecting the internal standards.

Samples 2409047-05 and 2409047-06 arrived to the lab frozen.

Sample Qualification

The samples were qualified according to MEL's procedures. The table in Appendix B summarizes the manual qualifiers added by MEL. All results reported below the method reporting limit (RL) were automatically qualified as estimates, but not included in Appendix B. The qualifiers are defined in Appendix C.

Sample Verification

All analyses met QC acceptance criteria except as noted in Appendix D. All analytes met linearity requirements unless noted in Appendix E.

Washington State Department of Ecology
Manchester Environmental Laboratory
Final Report for
6PPD-Q by LC-MS/MS

Project: 6PPD-quinone Removal in Decant Facility

Field ID: GAC Filter

Work Order: 2409047
Project Officer: Baker, Morgan
Initial Vol: 246.7 mL
Final Vol: 10 mL

Lab ID #: 2409047-01
Collected: 9/5/2024
Prep Method: SW3535A
Analysis Method: SOP730136

Batch ID: B24I063
Prepared: 9/12/2024
Analyzed: 9/19/2024
Matrix: Water
Units: ng/L

CAS#	Analyte	Result	Qualifier	Dilution	RL	MDL
2754428-18-5	6PPD-quinone	2.03	U	1	2.03	0.486

Surrogate Recovery:

CAS#	Analyte	Result	Spike Level	% Rec.	% Rec. Limits
NULL	13C6-6PPD-Quinone	72.1	81.1	89	25-200

Authorized by: Jennifer Pereira

Release Date: 10/2/2024

Washington State Department of Ecology
Manchester Environmental Laboratory
Final Report for
6PPD-Q by LC-MS/MS

Project: 6PPD-quinone Removal in Decant Facility

Field ID: Flocculation Tank

Work Order: 2409047
Project Officer: Baker, Morgan
Initial Vol: 240.5 mL
Final Vol: 10 mL

Lab ID #: 2409047-02
Collected: 9/5/2024
Prep Method: SW3535A
Analysis Method: SOP730136

Batch ID: B24I063
Prepared: 9/12/2024
Analyzed: 9/19/2024
Matrix: Water
Units: ng/L

CAS#	Analyte	Result	Qualifier	Dilution	RL	MDL
2754428-18-5	6PPD-quinone	29.4		5	10.4	2.49

Surrogate Recovery:

CAS#	Analyte	Result	Spike Level	% Rec.	% Rec. Limits
NULL	13C6-6PPD-Quinone	141	83.2	170	25-200

Authorized by: Jennifer Pereira

Release Date: 10/2/2024

Washington State Department of Ecology
Manchester Environmental Laboratory
Final Report for
6PPD-Q by LC-MS/MS

Project: 6PPD-quinone Removal in Decant Facility

Field ID: Pre-Settling Tank

Work Order: 2409047
Project Officer: Baker, Morgan
Initial Vol: 244.2 mL
Final Vol: 10 mL

Lab ID #: 2409047-03
Collected: 9/5/2024
Prep Method: SW3535A
Analysis Method: SOP730136

Batch ID: B24I063
Prepared: 9/12/2024
Analyzed: 9/19/2024
Matrix: Water
Units: ng/L

CAS#	Analyte	Result	Qualifier	Dilution	RL	MDL
2754428-18-5	6PPD-quinone	143		8	16.4	3.93

Surrogate Recovery:

CAS#	Analyte	Result	Spike Level	% Rec.	% Rec. Limits
NULL	13C6-6PPD-Quinone	133	81.9	162	25-200

Authorized by: Jennifer Pereira

Release Date: 10/2/2024

Washington State Department of Ecology
Manchester Environmental Laboratory
Final Report for
6PPD-Q by LC-MS/MS

Project: 6PPD-quinone Removal in Decant Facility

Field ID: HPBSM-Column Study

Work Order: 2409047
Project Officer: Baker, Morgan
Initial Vol: 259.3 mL
Final Vol: 10 mL

Lab ID #: 2409047-04
Collected: 9/5/2024
Prep Method: SW3535A
Analysis Method: SOP730136

Batch ID: B24I063
Prepared: 9/12/2024
Analyzed: 9/19/2024
Matrix: Water
Units: ng/L

CAS#	Analyte	Result	Qualifier	Dilution	RL	MDL
2754428-18-5	6PPD-quinone	27.1		5	9.64	2.31

Surrogate Recovery:

CAS#	Analyte	Result	Spike Level	% Rec.	% Rec. Limits
NULL	13C6-6PPD-Quinone	108	77.1	139	25-200

Authorized by: Jennifer Pereira

Release Date: 10/2/2024

Washington State Department of Ecology
Manchester Environmental Laboratory
Final Report for
6PPD-Q by LC-MS/MS

Project: 6PPD-quinone Removal in Decant Facility

Field ID: GAC-Column Study

Work Order: 2409047
Project Officer: Baker, Morgan
Initial Vol: 254.8 mL
Final Vol: 10 mL

Lab ID #: 2409047-05
Collected: 9/5/2024
Prep Method: SW3535A
Analysis Method: SOP730136

Batch ID: B24I063
Prepared: 9/12/2024
Analyzed: 9/19/2024
Matrix: Water
Units: ng/L

CAS#	Analyte	Result	Qualifier	Dilution	RL	MDL
2754428-18-5	6PPD-quinone	41.6		1	1.96	0.471

Surrogate Recovery:

CAS#	Analyte	Result	Spike Level	% Rec.	% Rec. Limits
NULL	13C6-6PPD-Quinone	58.4	78.5	74	25-200

Authorized by: Jennifer Pereira

Release Date: 10/2/2024

Washington State Department of Ecology
Manchester Environmental Laboratory
Final Report for
6PPD-Q by LC-MS/MS

Project: 6PPD-quinone Removal in Decant Facility

Field ID: Control-Column Study

Work Order: 2409047
Project Officer: Baker, Morgan
Initial Vol: 256.3 mL
Final Vol: 10 mL

Lab ID #: 2409047-06
Collected: 9/5/2024
Prep Method: SW3535A
Analysis Method: SOP730136

Batch ID: B24I063
Prepared: 9/12/2024
Analyzed: 9/19/2024
Matrix: Water
Units: ng/L

CAS#	Analyte	Result	Qualifier	Dilution	RL	MDL
2754428-18-5	6PPD-quinone	63.7		5	9.75	2.34

Surrogate Recovery:

CAS#	Analyte	Result	Spike Level	% Rec.	% Rec. Limits
NULL	13C6-6PPD-Quinone	107	78.0	137	25-200

Authorized by: Jennifer Pereira

Release Date: 10/2/2024

**Washington State Department of Ecology
Manchester Environmental Laboratory
Final Report for
6PPD-Q by LC-MS/MS**

Project: 6PPD-quinone Removal in Decant Facility

QC Type : Method Blank

Work Order: Batch QC
Project Officer: Baker, Morgan
Initial Vol: 250 mL
Final Vol: 10 mL

Lab ID #: B24I063-BLK1
Prep Method: SW3535A
Analysis Method: SOP730136

Batch ID: B24I063
Prepared: 9/12/2024
Analyzed: 9/19/2024
Matrix: Water
Units: ng/L

CAS#	Analyte	Result	Qualifier	RL	MDL
2754428-18-5	6PPD-quinone	0.480	UJ	2.00	0.480

Surrogate Recovery:

CAS#	Analyte	Result	Spike Level	% Rec.	% Rec. Limits
NULL	13C6-6PPD-Quinone	76.9	80.0	96	25-200

Authorized by: Jennifer Pereira

Release Date: 10/2/2024

Washington State Department of Ecology
Manchester Environmental Laboratory
Final Report for
6PPD-Q by LC-MS/MS

Project: 6PPD-quinone Removal in Decant Facility

QC Type : LCS

Work Order: Batch QC
Project Officer: Baker, Morgan
Initial Vol: 250 mL
Final Vol: 10 mL

Lab ID #: B24I063-BS1
Prep Method: SW3535A
Analysis Method: SOP730136

Batch ID: B24I063
Prepared: 9/12/2024
Analyzed: 9/19/2024
Matrix: Water
Units: %

Analyte	Result	Spike Level	RL	%Rec	%Rec Limits
6PPD-quinone	67.2	80.0	2.00	84	70-130

Surrogate Recovery:

CAS#	Analyte	Result	Spike Level	% Rec.	% Rec. Limits
NULL	13C6-6PPD-Quinone	73.8	80.0	92	25-200

Authorized by: Jennifer Pereira

Release Date: 10/2/2024

Washington State Department of Ecology
Manchester Environmental Laboratory
Final Report for
6PPD-Q by LC-MS/MS

Project: 6PPD-quinone Removal in Decant Facility

QC Type : LCS Dup

Work Order: Batch QC
Project Officer: Baker, Morgan
Initial Vol: 250 mL
Final Vol: 10 mL

Lab ID #: B24I063-BSD1
Prep Method: SW3535A
Analysis Method: SOP730136

Batch ID: B24I063
Prepared: 9/12/2024
Analyzed: 9/19/2024
Matrix: Water
Units: %

Analyte	Sample Result	Spike Level	%Rec	RPD	%Rec Limits	RPD Limit
6PPD-quinone	72.0	80.0	90	7	70-130	40

Surrogate Recovery:

CAS#	Analyte	Result	Spike Level	% Rec.	% Rec. Limits
NULL	13C6-6PPD-Quinone	75.2	80.0	94	25-200

Authorized by: Jennifer Pereira

Release Date: 10/2/2024

Appendix A
Sample Correlation Table

Batch ID: B24I063

Prep Method: SW3535A

Prepared: 9/12/2024

Analysis Method: SOP730136

<u>Field ID</u>	<u>MEL ID</u>
GAC Filter	2409047-01
Flocculation Tank	2409047-02
Pre-Settling Tank	2409047-03
HPBSM-Column Study	2409047-04
GAC-Column Study	2409047-05
Control-Column Study	2409047-06
Method Blank	B24I063-BLK1
LCS	B24I063-BS1
LCS Dup	B24I063-BSD1

Appendix B
Manual Qualification Table

WO: 2409047

Analysis:

No manual qualifiers were added to the samples or batch QC.

Appendix C

Data Qualifier Definitions

Code	Definition
E	Reported result is an estimate because it exceeds the calibration range.
J	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
N	The analysis indicates the present of an analyte for which there is presumptive evidence to make a “tentative identification”.
NJ	The analysis indicates the presence of an analyte that has been “tentatively identified” and the associated numerical value represents its approximate concentration.
NAF	Not analyzed for.
NC	Not calculated.
REJ	The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.
U	The analyte was not detected at or above the reported sample quantitation limit.
UJ	The analyte was not detected at or above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately measure the analyte in the sample.
bold	The analyte was present in the sample. (Visual aid to locate detected compounds on the analytical report.)

Appendix D

QC Exceptions Report

Lab ID	Analyte	Exception
No QC exceptions reported.		

Appendix E
Initial Calibration Exceptions Report

Calibration ID: B4I1701

Analysis: 6PPDQ

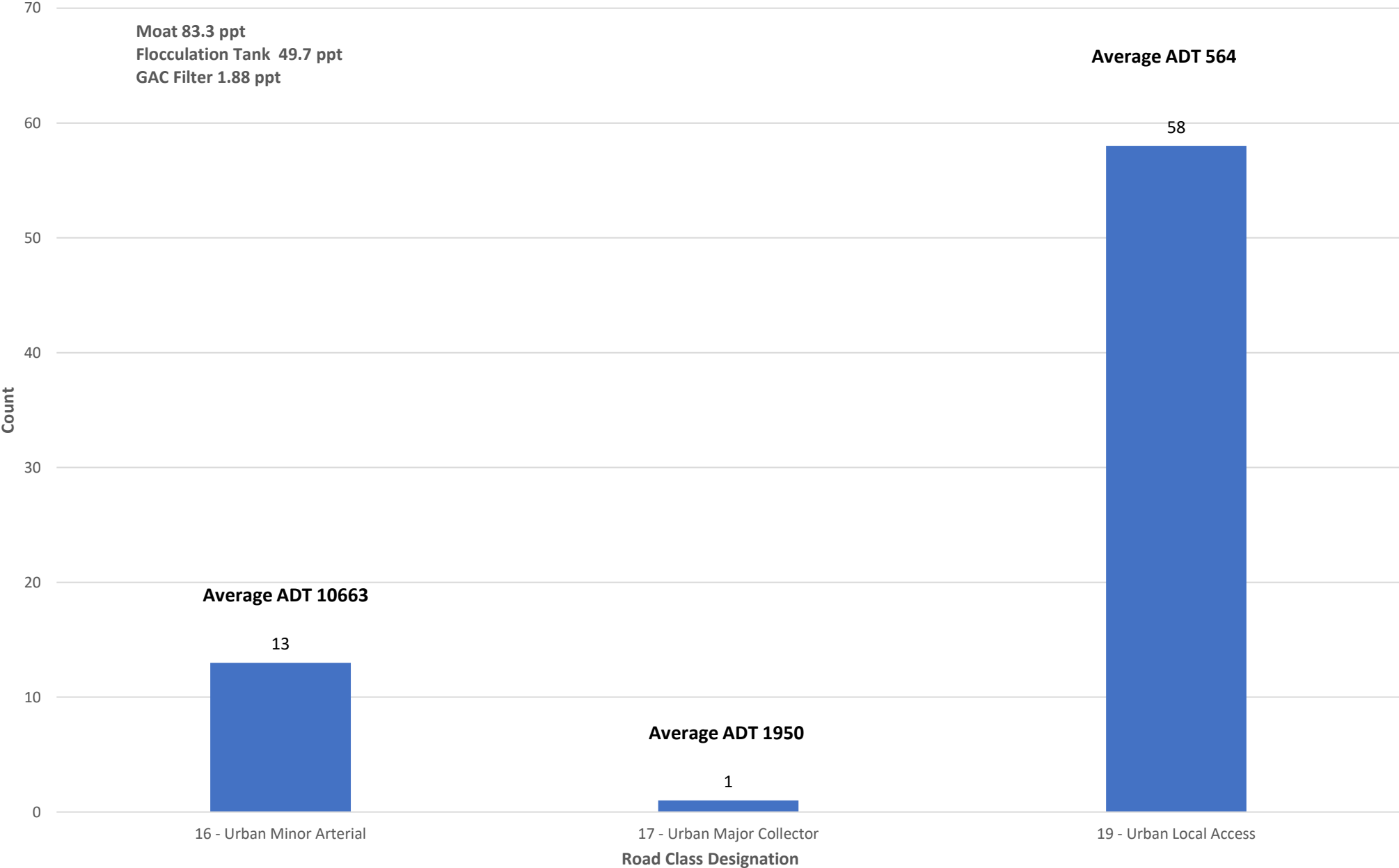
LabNumber **Analyte**

QC Exception

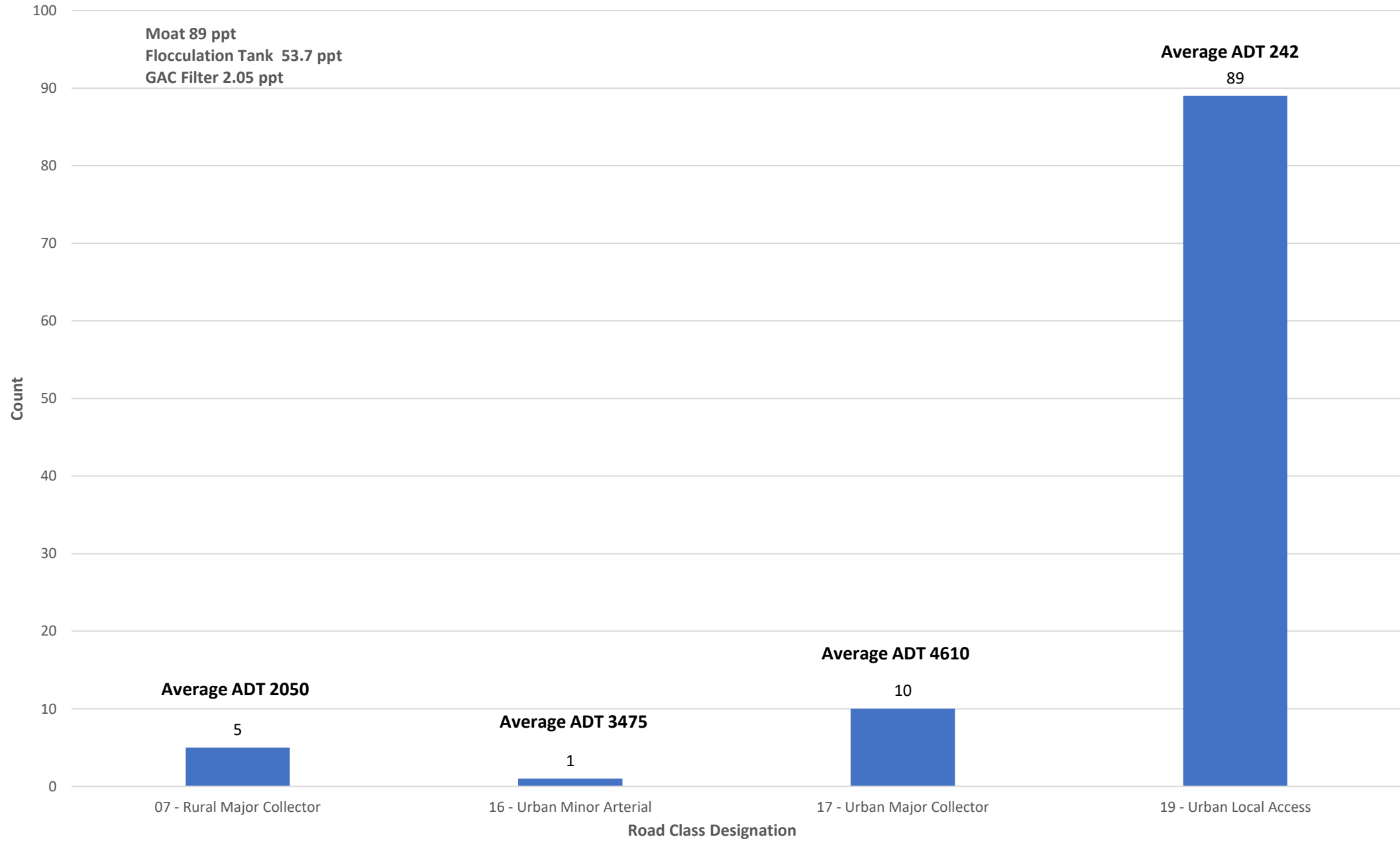
No ICAL exceptions.

Appendix B. Traffic Data Related to CBs Cleaning Activities

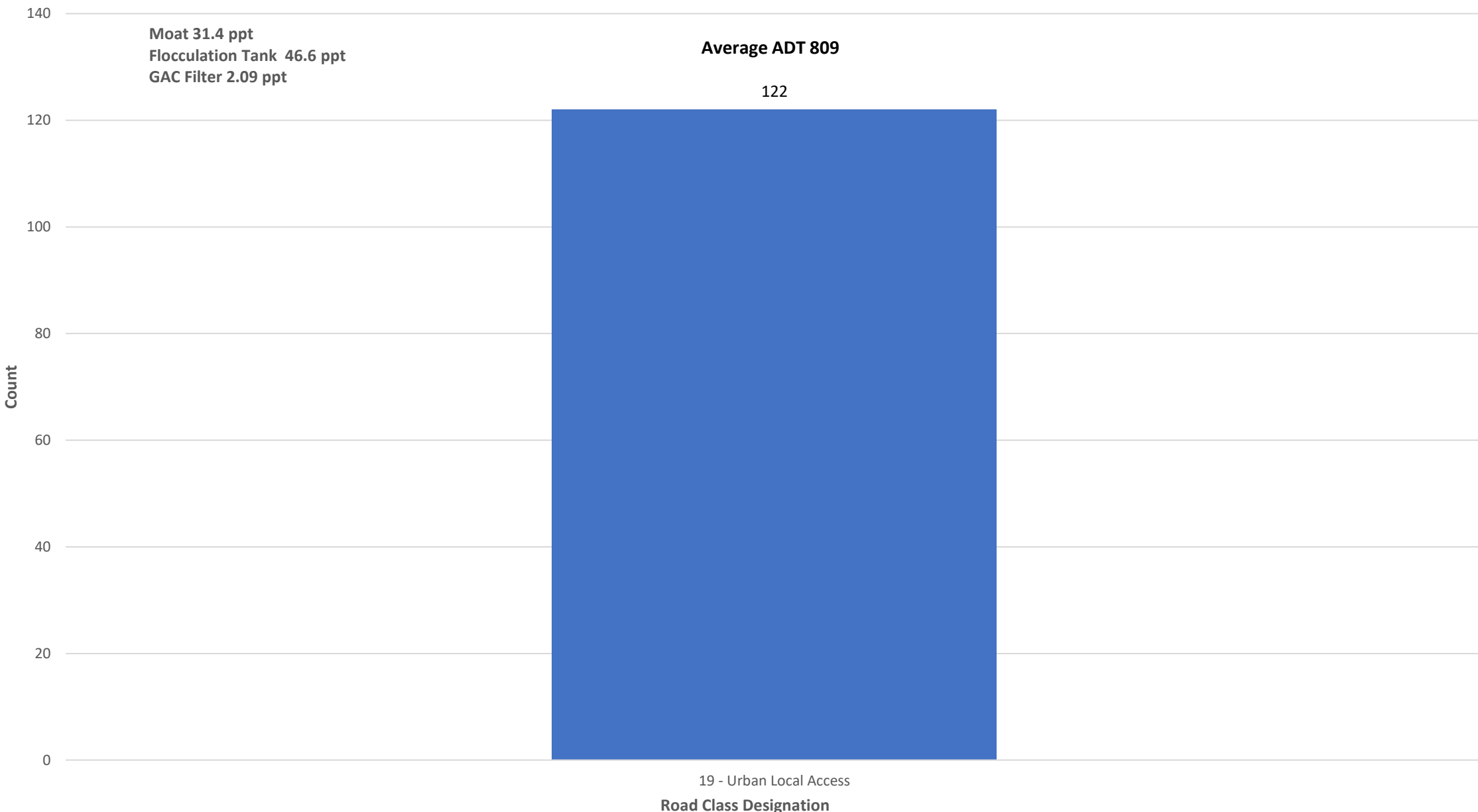
6PPDq Sampling July 11, 2024



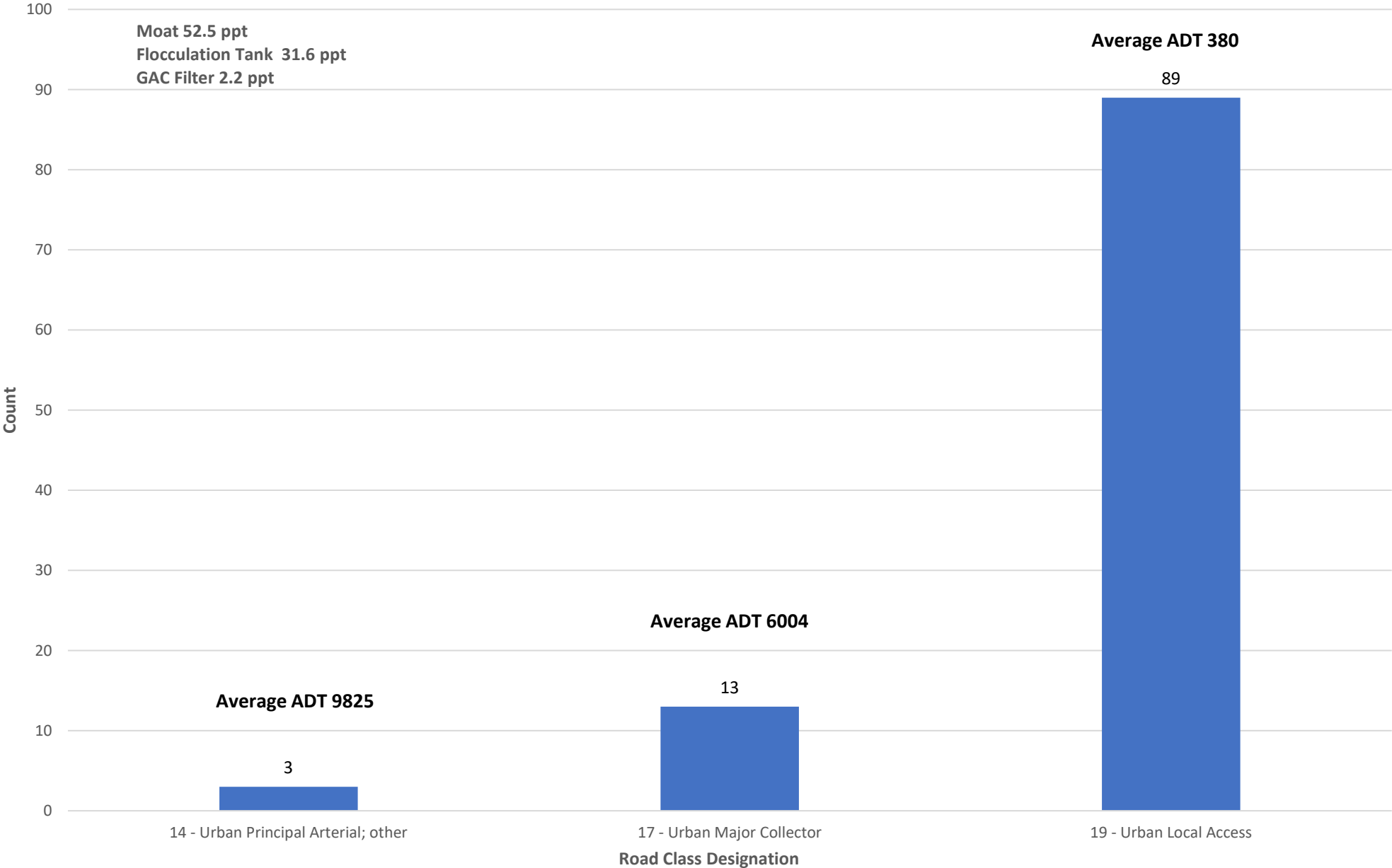
6PPDq Sampling July 25, 2024



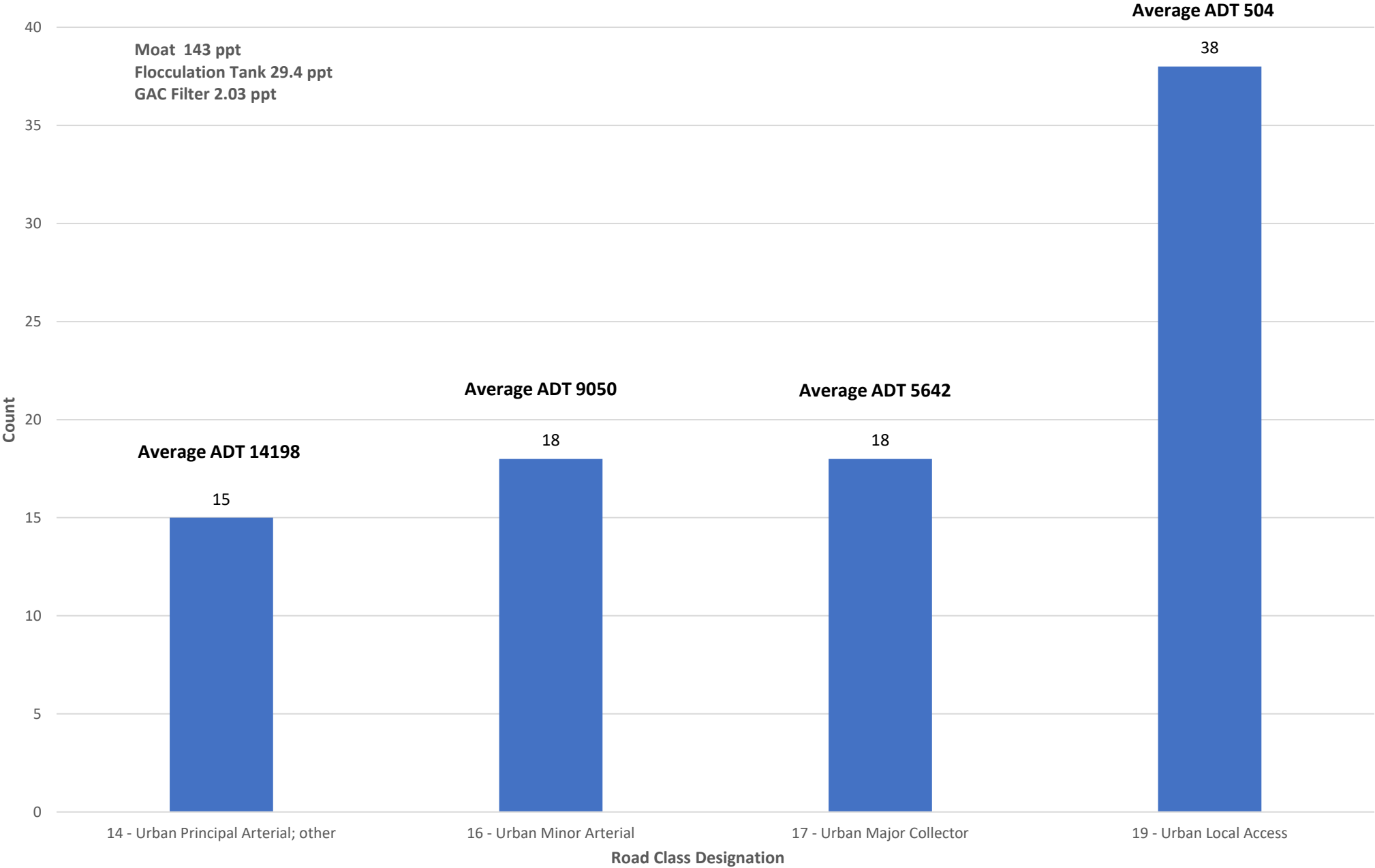
6PPDq Sampling August 8, 2024



6PPDq Sampling August 22, 2024



6PPDq Sampling September 5, 2024



6PPDq Sampling September 19, 2024

