

MEMORANDUM

September 13, 2024

TO: Historical Memo

FM: Matt Macdonald

RE: Vashon Wastewater Treatment Plant – August 2024

The Vashon Wastewater Treatment Plant effluent met all water quality requirements in August 2024. Effluent Biochemical Oxygen Demand (BOD₅) averaged 5.6-mg/l and Total Suspended Solids (TSS) averaged 8.2-mg/l. BOD₅ and TSS removals were 99% and 98%, respectively. All required analytical testing was completed in August.

August 2024 had a typical amount of rainfall with 0.89-inches of rainfall recorded at the nearby Judd Creek station and 1.66-inches of rainfall recorded at SeaTac Airport; the 30-year historical average for SeaTac Airport in August is 0.97-inches. It is unusual for Vashon to have less rainfall than the SeaTac Airport. This could indicate an issue with the Judd Creek rain gauge or localized rainfall. Influent flow averaged 0.080 million gallons per day (MGD). On August 8, a scaling mismatch between the flow transmitter and the Supervisory Control and Data Acquisition (SCADA) system was corrected. This mismatch caused the flow to be under-reported by approximately 20%. As a result, the August 1 to August 8 daily flow data was corrected. Flow data reported in earlier DMRs will be corrected and resubmitted. Even after correcting the flow data, August 2024 was the lowest flow in August since 2013. The maximum daily flow of 0.105-MGD occurred on August 23. Peak hourly flow on August 23 was 0.220-MGD during which the average turbidity was approximately 6-NTU. Effluent temperature in August averaged 21.0°C.

The dissolved oxygen (DO) control set-point was 0.8-mg/L except for August 7 to August 12 where it was increased because Aerator 2 was put in service after Aerator 1 failed. The DO setpoint was lowered on August 12 to 0.8-mg/L where it remained for the rest of the month. Aerator 1 failed on August 7 and was out of service for the remainder of August.

The oxidation ditch was operated at an average solids retention time¹ of 21-days. Mixed liquor TSS averaged 3,800-mg/L, and ranged from 3,500-mg/L to 4,400-mg/L. The sludge volume index, which measures the mixed liquor's settling characteristics, continued to decline in August from approximately 90-mL/g to under 60-mL/g. The declining SVI was due to reduced filamentous bacteria, but the root cause was not identified. An estimated 4,080 dry pounds of waste activated sludge was hauled to South Plant for further treatment in August.

Clarifier # 2 was in service in August. Two clarifiers are not needed during the dry season so one is removed from service for maintenance and energy savings. The UV system operated with both units in Auto.

¹ This is not a true solids retention time but rather a metric that is proportional to the solids retention time (the inverse of the Food to Microorganism ratio). It is used for historical consistency.

A set of samples was collected on August 6 and August 14 for nutrient analysis. Monthly total nitrogen (TN) removal was 88%, with an average effluent TIN concentration of 6.6-mg/L (0.57-mg/L NH₃-N and 6.0-mg/L NO₂+NO₃ as N). The average daily effluent TIN load was 4.1-lbs/day as N, which results in 127-lbs of TIN as N discharged in August. The cumulative annual TIN loading is 659-lbs². The failure of Aerator 1 caused reduced performance. Due to asymmetry of the oxidation ditch, Aerator 2 adds more dissolved oxygen to the anoxic zone which impedes denitrification. Effluent total phosphorus (Total-P) was 9.8-mg/L.

The issue with effluent pH measurement dropping when plant flow is stopped persisted in August. During dry weather when plant influent flow is low, batch wasting drops the level in the clarifier, which temporarily stops effluent flow and causes the effluent pH probe to read erroneously low. A pH probe from a different manufacturer was installed on August 20 and is being compared in a side-by-side test.

² As a “Permittee with a small TIN load”, the Vashon Wastewater Treatment Plant does not have a numeric “action level” for annual cumulative TIN load under the Puget Sound Nutrient General Permit.

Table 1. Summary of Monthly Flow & Rain

Monthly Total Flow Volume, MG	Monthly Average Flow, MGD	Minimum Daily Flow, MGD	Maximum Daily Flow, MGD	Total Rainfall, Inches
2.473	0.080	0.065	0.080	0.89

Table 2. Summary of Monthly Compliance/Exceptions

Biochemical Oxygen Demand 5-day			Total Suspended Solids			Fecal Coliform (CFU/100 mL)	
Permit mg/L	Actual mg/L	Rem %	Permit mg/L	Actual mg/L	Rem %	Permit	Actual
30	5.6	99	30	8.2	98	200	E11.1

Table 3. Summary of Weekly Compliance/Exceptions

	Biochemical Oxygen Demand (mg/L)		Total Suspended Solids (mg/L)		Fecal Coliforms (CFU/100 mL)	
	Permit	Actual	Permit	Actual	Permit	Actual
Week 1	45	4.5	45	5.5	400	E7.9
Week 2	45	6.3	45	8.9	400	E3.5
Week 3	45	6.0	45	9.4	400	E14.3
Week 4	45	6.3	45	10	400	37

Table 4. Summary of Effluent Nitrogen

Average NH ₃ mg/L as N	Average NO ₂ +NO ₃ mg/L as N	Average TIN ³ mg/L as N	Average TKN mg/L as N	Monthly TIN lbs as N	Annual TIN lbs as N	Average Monthly Total N removal %
0.57	6.0	6.6 ⁴	2.5	127	659	88%

³ TIN = Total Inorganic Nitrogen = NH₃ + NO₂+NO₃ (as N)

⁴ Due to rounding errors, the monthly average NH₃-N and NO₂+NO₃ as N don't always add up to the monthly average TIN.