

MEMORANDUM

June 12, 2024

TO: Historical Memo

FM: Matt Macdonald

RE: Vashon Wastewater Treatment Plant – May 2024

The Vashon Wastewater Treatment Plant effluent met all water quality requirements in May 2024. Effluent Biochemical Oxygen Demand (BOD₅) averaged 3.0-mg/l and Total Suspended Solids (TSS) averaged 7.5-mg/l. BOD₅ and TSS removals were 99% and 98%, respectively. All required analytical testing was completed in May.

May 2024 had a below-average amount of rainfall with 1.15-inches of rainfall recorded at the nearby Judd Creek station and 1.54-inches of rainfall recorded at SeaTac Airport; the 30-year historical average for SeaTac Airport in May is 1.88-inches. Influent flow averaged 0.097 million gallons per day (MGD) in May 2024. The maximum daily flow of 0.127-MGD occurred on May 16 and did not have an obvious cause. Peak hourly flow on May 16 was 0.268-MGD during which the average turbidity was <5-NTU. Effluent temperature in May averaged 16.1°C and rose from 14.8°C to 17.1°C over the month.

The oxidation ditch was operated at an average solids retention time¹ of 26-days. The dissolved oxygen (DO) control set-point was 0.8-mg/L. Mixed liquor TSS averaged 4,800-mg/L, and ranged from 5,800-mg/L to 4,300-mg/L. The sludge volume index, which measures the mixed liquor's settling characteristics, averaged 185-mL/g. An estimated 6,540 dry pounds of waste activated sludge was hauled to South Plant for further treatment in May.

Clarifier #1 was in service for the duration of the month. 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.

A set of samples was collected on May 7 and May 22 for nutrient analysis. Monthly total nitrogen (TN) removal was 91%, with an average effluent TIN concentration of 2.2-mg/L (0.12-mg/L NH₃-N and 2.1-mg/L NO₂+NO₃ as N). The average daily effluent TIN load was 1.7-lbs/day as N, which results in 53-lbs of TIN as N discharged in May. The cumulative annual TIN loading is 348-lbs². It is worth noting that the effluent NO₂+NO₃ for the May 7 sample was unusually high (3.8-mg/L as N) because the anoxic mixer had been out of service the preceding 6 days. The mixer was out of service from May 1 until May 6 when it was pulled out and found to be bound with trash that had likely entered the oxidation ditch during a bypass of the influent grinder and compactor washer in April. Effluent total phosphorus (Total-P) was 4.0-mg/L. No soda ash was added to the ditch for pH adjustment.

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.

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.

Troubleshooting of high influent loading continued in May. On May 17 the influent level sensor was found to have a corroded mounting bracket which changed the angle of the sensor and caused inaccurate level measurements. Part of the failed bracket fell into the influent channel upstream of the Parshall flume causing a flow disturbance from sludge accumulation which introduced more error into the level measurement. Because the influent level is used with the Parshall flume to calculate the plant flow, flow was erroneously high by approximately 55,000 gal/day. The flow error carried forward in the loading calculations and caused the influent loading to be over-reported. Flows from May 1 to May 16 were revised lower by the estimated 55,000 gal/day. The influent level sensor investigation continues and will determine when the flow error was introduced, after which the flows and loadings will be corrected and affected DMRs will be corrected and resubmitted.

An issue with effluent pH measurement when plant flow is stopped was observed in March and occurred again in May. Due to low plant influent flow, batch wasting drops the level in the clarifier, temporarily stopping effluent flow and causing the effluent pH probe to read erroneously low. The erroneous data was excluded from the DMR. In March, the corrective action was to install a different type of pH probe. Since that has yet to happen, a short-term solution is being investigated.

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
3.007	0.097	0.073	0.127	1.15

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	3.0	99	30	7.5	98	200	<1.0

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	2.6	45	6.7	400	E1.1
Week 2	45	3.2	45	8.3	400	<1
Week 3	45	3.2	45	8.5	400	<1
Week 4	45	2.6	45	6.4	400	<1
Week 5	45	3.2	45	8.0	400	<1

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 %
0.12	2.1	2.2 ⁴	1.7	53	348	91%

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.