MEMORANDUM

February 8, 2024

TO: Historical Memo

FM: Matt Macdonald

RE: Vashon Wastewater Treatment Plant – January 2024

The Vashon Wastewater Treatment Plant effluent met all water quality requirements in January 2024. Effluent Biochemical Oxygen Demand (BOD_5) averaged 2.3-mg/l and Total Suspended Solids (TSS) averaged 3.8-mg/l. BOD_5 and TSS removals were 98% and 97%, respectively. All required analytical testing was completed in January. BOD analyses from the January 4 composite sample failed a QC check and were rejected due to a high depletion in the blank. The issue did not impact any other BOD analyses.

January 2024 had an above average amount of rainfall with 6.77-inches of rainfall recorded at the nearby North Vashon station[1] and 6.31-inches of rainfall recorded at SeaTac Airport; the 30-year historical average for SeaTac Airport in January is 5.78-inches. Influent flow averaged 0.346 million gallons per day (MGD) in January 2023. The maximum daily flow of 0.611-MGD occurred on January 27 in response to 1.01-inches of rain that day, and nearly two weeks of sustained moderate rainfall. Peak hourly flow on January 27 was 0.697-MGD[2] during which the average turbidity was <5-NTU. Effluent temperature in January averaged 11.4°C.

The oxidation ditch was operated at an average solids retention time[3] of 25-days. The dissolved oxygen (DO) control set-point was 0.8-mg/L. Mixed liquor TSS averaged 4,700-mg/L, and ranged from 4,500-mg/L to 5,000-mg/L. The sludge volume index, which measures the mixed liquor's settling characteristics, averaged 178-mL/g. An estimated 2,800 dry pounds of waste activated sludge was hauled to South Plant for further treatment in January.

Both Clarifiers were in service for the duration of January and will remain in service for the wet season. The UV system operated with both units in auto.

A set of samples was collected on January 2 and January 18 for nutrient analysis. Monthly total nitrogen (TN) removal was 91%, with an average effluent TIN concentration of 1.6-

[1] This month the Judd Creek gage appeared to have an issue and incorrectly reported rainfall for the January 27-January 28 storm.
[2] Peak flow shaving was active and flow greater than approximately 670 gpm was directed to the equalization basin. Without peak flow shaving the hourly flow would have been higher. Stored flow was returned to the plant later in the day.
[3] 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.

mg/L (0.12-mg/L NH_3-N and 1.5-mg/L NO_2+NO_3 as N)[4]. The average daily effluent TIN load was 4.2-lbs/day as N, which results in 130-lbs of TIN as N discharged in January. The cumulative annual TIN loading is 130-lbs[5]. Effluent total phosphorus (Total-P) was 2.0-mg/L. No soda ash was added to the ditch for pH adjustment.

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
10.74	0.346	0.236	0.611	8.92

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	2.3	98	30	3.8	97	200	<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	1.9	45	4.4	400	<1
Week 2	45	1.6	45	<2.3	400	E1.0
Week 3	45	2.4	45	4.4	400	<1
Week 4	45	2.1	45	4.6	400	<1
Week 5	45	3.3	45	4.6	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[6] 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	1.5	1.6[7]	1.2	130	130	91%

[4] Due to rounding errors, the monthly average NH_3-N and NO_2+NO_3 as N November not add up to the monthly average TIN.
[5] 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.
[6] TIN = Total Inorganic Nitrogen = NH_3 + NO_2+NO_3 (as N)
[7] Due to rounding errors, the monthly average NH_3-N and NO_2+NO_3 as N don't always add up to the monthly average TIN.