

Memorandum

September 13, 2019

TO: Historical Memo

FROM: Carol Nelson, Process Analyst
Karla Guevarra, Process Analyst

SUBJECT: Brightwater Treatment Plant
August 2019 Operating Record

All discharge permit requirements were met in August at the Brightwater Treatment Plant (BWTP). All wastewater received MBR secondary treatment. Effluent BOD and TSS averaged <1.7-mg/L and <2.1-mg/L, respectively, and removals were both $\geq 99\%$. All Fecal Coliform results were 0-cfu/100-mL. Effluent pH was maintained between 6.5 and 6.9. Continuous dosing of 25% caustic soda (NaOH) was required to assure permit compliance for pH.

Influent flow averaged 16.1-MGD. Effluent flow to Puget Sound averaged 15.6-MGD. Effluent was also distributed as reclaimed water (0.33-MGD) and recycled to the influent pump station (approximately 0.16-MGD). Approximately 0.04-mgd of effluent was used to flush primary clarifiers and membrane basins. No influent flows were redirected to South Plant or West Point.

August rainfall was slightly above average. Local rain gauges recorded 1.1-inches total precipitation. Most rain fell on August 2, 10, and 21. Precipitation recorded for SeaTac Airport totaled 1.2-inches, which is 0.32-inches above normal. Local area temperatures were 3°F above normal this month. Membrane effluent temperatures rose from 71.3°F to 72.2°F.

All permit-required samples were collected and analyzed. Influent TSS and BOD results for Aug. 13 were rejected because of unusually low results. Most likely, the influent sample line was partially plugged that day. The Aug. 3 influent BOD was rejected because of a laboratory error.

Influent Pumping: Influent flow was pumped with one of the smaller influent raw sewage pumps (RSPs). The maximum flow setpoint for Hollywood Pump Station remained at 13.5-MGD. To accommodate repair work on the East Side Interceptor (ESI), the York Pump Station was locked out to avoid sending influent flow and reclaimed water to South Plant. So, any reclaimed water passing York P.S. that was subsequently rejected for inadequate Cl_2 residual, was pumped back to Brightwater via Hollywood pump station.

Primary Treatment: Three of five primary clarifiers (PC) were in service most of the month. Between July 31 and August 6, PC-1 was taken out of service for degreasing. Solids return flows were switched to PC-2 from PC-1 at that time. Regular cleaning of the primary screens continued. All primary effluent was processed through Secondary Treatment.

Secondary Treatment: Three aeration basins (AB's) were in service this month. The MLSS averaged 8,280-mg/L and ranged from 7,470 to 9,600 mg/L. The solids retention time (SRT) averaged 20.5-days, which is 11 days shorter than the average in July. The SRT was reduced during the last week of July and first week of August in order to maintain DO concentrations while wastewater temperatures continued to increase. Aeration air flow in August averaged approximately 1500 cfm lower than air flow in July, mostly a result of the decreased SRT. Surface wasting was the primary method to maintain the MLSS and SRT.

Total-N (as TKN) removal averaged 39%. Full nitrification was achieved most of the month. Effluent $\text{NH}_3\text{-N}$ averaged <0.1 mg/L for the month. Denitrification was incomplete; effluent nitrite/nitrate (NO_2+NO_3) averaged 34.7-mg/L as N. Influent TKN averaged 60-mg/L, which is 3-mg/L lower than in July but normal for a summer month.

Caustic soda was continually dosed to the secondary process to ensure minimum effluent pH limits were met, and to achieve complete nitrification. The dose averaged 4822-gpd of 25% NaOH solution or 300 gallons/MG of influent, about the same as July's average. Goals of the ongoing aeration optimization project include reduction of caustic soda addition and energy use. As part of this project, additional samples were collected in August to check the calibration of the Biowin model for summer conditions.

Membrane effluent turbidity averaged 0.05-0.10 NTU. Membrane Trains were in "backpulse" mode until Aug. 12. Between Aug. 12 and Aug. 22, the trains alternated between backpulse and relax, and after Aug. 22 they operated in relax mode. (When filterability is good, operating in relax mode saves energy and wear on the backpulse valves.) In August, the turbidity of Train 8 permeate was adequate with only one cassette out of service. Additional repairs will be required for other Train 8 cassettes in the future. Air scour was in 10s-on/30s-off or LEAP "high" mode until the Aug. 16, when the LEAP conversion was completed for all trains. The control system for LEAP aeration was optimized during the following weeks; the control system now allows for variable air scour dependent on membrane flow and fouling. Approximately 5632-gallons of 12.5% sodium hypochlorite (NaOCl) were used for maintenance cleans and 351-gallons were used to prepare basins for the LEAP conversion.

Membrane capacity ranged between 28-mgd and 41-mgd this month. Capacity was lower until Aug. 16 because at least one basin was out of service while the LEAP aeration manifolds were installed. Overall, permeability continued to improve this month. MLSS soluble COD (sCOD) continued to be well correlated with filterability; MLSS sCOD continued to decline this month, dropping from 240-mg/L to under 140-mg/L and permeability improved at a comparable flux. It is not yet understood why the MLSS sCOD was so high in the early summer; it may be a result of influent characteristics, recycle flows, and caustic addition. The maximum hourly flux during peak flow tests was between 14 and 16 gpd per ft^2 of membrane surface in August.

Table 1 below shows changes in weekly average trans-membrane pressure (TMP), membrane permeability, and SRT over the month. The rated instantaneous peak hourly flow for one membrane train is 4950-gpm. Peak flow tests were run on two trains per day. Flow setpoints for the peak flow tests were adjusted upwards or downwards depending on the "before-BP" TMP. The flow for the peak tests was between 3800-4500 gpm this month.

Odor Control: The Odor Control (OC) facilities performed well this month. Repairs to the chemical supply systems continued. Plans were begun to replace major components for the chemical supply systems including piping and tanks.

Table 1. Trans-membrane pressure, membrane permeability, and SRT.

Parameter	Week ending 8/5	Week ending 8/12	Week ending 8/19	Week ending 8/26
TMP before backpulse, average psi ²	-1.4	-1.2	-0.9	-0.9
TMP before backpulse, peak flow test, psi	-2.1	-2.4	-3.3	-5.5
Permeability temperature-corrected ¹ , gfd/psi	6.1	5.8	4.5	2.8
Flow target for peak flow test, gpm	3860	4100	4440	4500
Flow hourly average during peak flow test, gpm	3057	3243	3440	3559
MB Effluent temperature, degrees F	71.2	71.3	71.6	71.4
SRT, days	19.4	18.5	22.3	18.6
MLSS, mg/L	9190	8540	8070	8120

¹ Temperature-corrected Permeability based on Peak Flow Test.

² TMPs during the moderate flow period of the day

Disinfection: Approximately 18,9320 gallons of 12.5% NaOCl were used in August for final effluent disinfection, reclaimed water, and process water at IPS. Hypochlorite effluent disinfection was equal to an average dose of 5.3-mg/L as Cl₂. Hypochlorite was applied through the diffuser. Effluent Cl₂ residual at the outfall (aka Point Wells) met both the monthly and max-weekly permit limits. The monthly average and maximum weekly residuals were 0.08-mg/L and 0.09-mg/L, respectively.

Thickening: All three gravity belt thickeners (GBTs) were rotated in service this month. The GBTs thickened feed sludge from an average of 1.7% total solids (TS) to 6.4% TS, with an average solids capture of 92.1%. Thickened sludge production totaled 779 dry tons. The polymer dose for thickening averaged 7.7 pounds active polymer per dry tons solids processed.

Anaerobic Digestion: The digestion process met time and temperature requirements for Class B biosolids production. Digesters 2 and 3 and the blended storage tank were in service in August. In the active digesters, the solids retention time averaged 34 days, temperature averaged 99°F, and volatile solids (VS) destruction averaged 62%. The total solids concentration in the active digesters averaged 2.9%, with a VS fraction of 83.4% VS/TS. The average digester VS load was 0.11 lbs-VS/cu-ft./d with two digesters in service. Monthly gas production is estimated to be 14.2 million ft³ (based on flow meters and VS destruction).

Dewatering/Biosolids: 1348 wet tons (276 dry tons at 20.5% TS) of biosolids were produced and 1456 wet tons (298 dry tons) were hauled in August. Solids recovery in the dewatering process averaged 93.9%. Polymer dosage averaged 47.7 lbs-active per dry ton processed. Dewatering operated each day in August using both centrifuges (No. 1 and No.3). Centrifuge feed averaged 2.6% TS at 82.1% VS/TS. Biosolids product averaged 20.5% TS at 83.7% VS/TS for centrifuge 1 and 20.5% TS at 84.0% VS/TS for centrifuge 3.