

Memorandum

May 15, 2019

TO: Historical Memo

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

SUBJECT: Brightwater Treatment Plant
April 2019 Operating Record

All discharge permit requirements were met in April at the Brightwater Treatment Plant (BWTP). All wastewater received MBR secondary treatment. Effluent BOD and TSS averaged <1.0-mg/L and <2.0-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.

Effluent flow to Puget Sound averaged 17.5-MGD. Influent flow averaged 17.8-MGD. Less than 0.1-MGD effluent was used to flush and refill the reclaimed water distribution pipe. Approximately 0.2-MGD was recycled to the influent pump station (IPS) or North Creek Pump Station. 0.3-MGD influent was redirected to South Plant to accommodate constraints on the operating range of the raw sewage pumps (RSPs) and accommodate reduced membrane capacity. No influent flow was directed to West Point this month.

April weather was wetter and warmer than normal. Local rain gauges recorded 3.8-inches total precipitation. Precipitation recorded for SeaTac Airport totaled 3.53-inches, which is 0.82-inches above normal. Most precipitation in the Woodinville area fell on April 5-6, April 10-11, and April 13-14. Local area temperatures were 2.1°F above normal this month. Membrane effluent temperatures rose from 61°F to 62.3°F.

All permit-required samples were collected and analyzed. Influent TSS results for April 29 and 30 and the BOD result for April 29 were rejected because of unusually low results. Most likely, the influent sample line was partially plugged on those days. The BOD result for April 30 was within the normal range.

Influent Pumping: One influent RSP was operated at a time this month. Currently, one small RSP set has a maximum capacity of 20-MGD and two RSPs operating together have a minimum capacity of about 27-MGD. Membrane capacity ranged from 26 to 29-MGD, this combined with relatively low influent flows made it difficult to operate two small RSPs together. RSP #1 was taken out of service on April 30 for repairs. When the repairs are complete, the minimum pump speed for RSP #1 will be lower, effectively lowering the minimum flow for two-RSP operation. Each of the large pumps were exercised briefly once this month. Plans were begun to clean rags and grease out of the influent wet well.

Influent flow diverted to South Plant decreased this month. On twelve days this month, influent flow in the area was low enough so that flow could be stored in the collection system rather than diverted. During two of those days, no flow was diverted so that pumps at North Creek and York could be inspected and tested. The North Creek Connector gate was primarily used to limit flow to Brightwater over the month. Only a small amount of flow was diverted to South Plant via

the Hollywood diversion structure and York P.S. due to mechanical limitations with the York Diversion Gate; repairs to this diversion gate are scheduled for late May.

Primary Treatment: Three of five primary clarifiers (PC) were in service most of the month. PC-2 was out of service April 2-5 for removal of excess scum. Solids return flows were directed to PC-1 all month except April 1 when PC-2 received these flows. 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 9860-mg/L and ranged from 9,200 to 10,500 mg/L. The solids retention time (SRT) averaged 30-days, nearly the same as March's. The MLSS concentration, water temperature and current aeration capacity allowed DO setpoints to be achieved and maintained in the AB's. With the ability to maintain DO concentrations, the MLSS and SRT were maintained to improve mixed liquor filterability. Surface wasting was the primary method to maintain the MLSS and SRT.

Total-N removal averaged 32%. Full nitrification was achieved throughout 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 36.0-mg/L as N. Influent TKN averaged 55-mg/L, nearly the same as in March.

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 5266-gpd of 25% NaOH solution or 300 gallons/MG of influent, nearly the same as March's average. The aeration optimization project should reduce the required caustic dose by reducing the nitrogen load in the solids return flows and/or improving denitrification in the secondary process.

Membrane effluent turbidity averaged 0.05-0.08 NTU. Membrane Trains 1-7 were in "backpulse" mode. Train 8 operated in relax mode, with a backpulse after every third or fourth production cycle. Air scour was usually 10s-on/10s-off because of poor filterability; during the last week, it was in 10s-on/30s-off mode when filterability improved. The schedule for converting from cyclic aeration to "LEAP" aeration was tentatively set for mid-July. One of the damaged cassettes in Train 8 was repaired so that 17 of the 20 cassettes were in service after April 18; additional repair work is planned for May. Approximately 4677-gallons of 12.5% sodium hypochlorite (NaOCl) were used for maintenance cleans. An additional 2270-gallons of sodium hypochlorite were used for recovery cleans of Trains 5, 6, and 8.

Membrane capacity ranged between 26-mgd and 29-mgd, declining during the first week and improving during the last week of the month. Improvement this month appears to be correlated with increasing wastewater temperature. The soluble COD of the mixed liquor and solids return also continued to correlate well with filterability. The maximum hourly flux during peak flow tests was between 11 and 13 gpd per ft^2 of membrane surface in April.

The table 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 3500-3600 gpm this month.

Parameter	4/1	4/8	4/15	4/22	4/29
TMP before backpulse, average psi ²	-2.9	-2.8	-4.0	-3.5	-2.6
TMP before backpulse, peak flow test, psi	-8.5	-8.4	-8.5	-8.4	-7.2
Permeability temperature-corrected ¹ , gfd/psi	1.55	1.55	1.51	1.55	1.91
Flow target for peak flow test, gpm	3600	3530	3500	3500	3500
Flow hourly average during peak flow test, gpm	2695	2690	2645	2680	2750
MB Effluent temperature, degrees F	61.0	61.8	61.6	61.6	62.3
SRT, days	23.7	23.2	27.2	37.8	33.4
MLSS, mg/L	9770	10210	9740	9710	9930

1 Temperature-corrected Permeability based on Peak Flow Test.

2 TMPs during the moderate flow period of the day

Odor Control: The Odor Control (OC) facilities performed well this month. Repairs to the chemical supply systems continued; this month one of the hypochlorite transfer pumps was repaired.

Disinfection: Approximately 17,040 gallons of 12.5% NaOCl were used in April for final effluent disinfection, reclaimed water, and process water at IPS. Hypochlorite effluent disinfection was equal to an average dose of 4.6-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 both 0.11-mg/L.

Thickening: All three gravity belt thickeners (GBTs) were rotated in service this month. The GBTs thickened feed sludge from an average of 1.6% total solids (TS) to 6.1% TS, with an average solids capture of 92.7%. Thickened sludge production totaled 733 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 April. In the active digesters, the solids retention time averaged 26 days, temperature averaged 99°F, and volatile solids (VS) destruction averaged 63%. The total solids concentration in the active digesters averaged 2.7%, with a VS fraction of 81.2% VS/TS. The average digester VS load was 0.14 lbs-VS/cu-ft./d with two digesters in service. Monthly gas production is estimated to be 13.7 million ft³ (based on flow meters and VS destruction).

Dewatering/Biosolids: 1214 wet tons (256 dry tons at 21.1% TS) of biosolids were produced and 1260 wet tons (266 dry tons) were hauled in April. Solids recovery in the dewatering process averaged 94.3%. Polymer dosage averaged 45.3 lbs-active per dry ton processed. Dewatering operated 29 days in April using both centrifuges (No. 1 and No.3). Centrifuge feed averaged 2.6% TS at 79.4% VS/TS. Biosolids product averaged 21.3% TS at 81.8% VS/TS for centrifuge 1 and 20.8% TS at 81.7% VS/TS for centrifuge 3