

Memorandum

April 15, 2020

TO: Historical Memo

FROM: Carol Nelson, Process Analyst
Samayyah Williams, Process Engineer

SUBJECT: Brightwater Treatment Plant
March 2021 Operating Record

All discharge permit requirements were met in March at the Brightwater Treatment Plant (BWTP). All wastewater received MBR secondary treatment. Effluent BOD and TSS averaged <1.1-mg/L and <2.0-mg/L, respectively, and removals were both $\geq 99\%$. All Fecal Coliform results were less than 1-cfu/100-mL. Effluent pH was maintained between 6.6 and 7.5. Continuous dosing of 59% Magnesium Hydroxide ($Mg(OH)_2$) was required to assure permit compliance for pH. 25% Sodium Hydroxide was also used for alkalinity addition on three days in March. All permit-required samples were collected and analyzed.

Effluent flow to Puget Sound averaged 19.6-MGD. The max-day effluent flow was 21.3-MGD on Mar.7. Influent flow averaged 19.6-MGD; less than 0.1-MGD effluent was recycled to the Influent Pump Station (IPS). No reclaimed water was distributed offsite. Influent flow redirected to South Treatment Plant averaged 0.2-MGD. Flow was redirected via the North Creek Pump Station (PS) to facilitate cleaning of the influent pump station (IPS) wet well. The redirection of flow from BWTP to South Plant did not contribute to any overflow or bypass. Membrane capacity was adequate for the influent flow in March with measured capacity ranging between 43-MGD and 45-MGD.

March rainfall totaled 3.3-inches based on local rain gauges. The two highest rainfall events occurred on Mar. 28 (0.5-inches) and Mar.7 (0.5-inches). The maximum influent and effluent flow occurred on Mar. 7. Precipitation recorded for SeaTac Airport totaled 2.6-inches for the month, which is 1.1-inches below normal. Local area air temperatures were 0.9°F below normal this month. Membrane effluent temperatures increased from 59.0°F to 60.0°F between Mar. 1 and Mar. 31.

All permit-required samples were collected and analyzed. Influent sample results for Mar. 1, 26, and 31 were rejected because of unusually low TSS results; it's likely that the sampling system was plugged. The result for TSS for Membrane Effluent on Mar. 2 was substituted for the Final effluent because of a higher than average TSS value, the result of biological growth on the sampler lines. Membrane effluent and Final effluent should have the same TSS when there are no blending events, which was the case in March. The final effluent sampler was cleaned on Mar. 3.

Influent Pumping: Influent flow was pumped using the two small raw sewage pump sets (RSP). Two RSPs were usually required 4 to 12 hours per day while one RSP operated the other times on all days. In March, when influent was diverted to South Plant, it was usually sent via York PS and the North Creek PS. Infrequently, it was also directed to South Plant via the Hollywood diversion and York PS. The maximum flow setpoint for Hollywood PS remained at 13.5-mgd. The 13.5-mgd flow cap prevents high levels in the conveyance system between Hollywood P.S. and Woodinville PS.

The IPS wet well was “pumped down” on 22 days in March to remove grease and rags. The resulting low wet well level was maintained for a longer period every Tuesday and for shorter periods on the other

weekdays. Influent flow to the plant was reduced from the time just before the wet well was pumped down to two hours afterwards to control the rate of screenings arriving at the headworks. For three days this month, the flow to the plant was restricted for an additional 8 hours to allow for the screening system to be cleared of excess rags. Influent flow was directed to only Influent Screens 1 and 2 this month, with the goal of reducing grit accumulation in the channels. Influent Screen 4 was tested this month but was not put back in service. Repair of Influent Screen 3 continued this month.

Primary Treatment: Three of five primary clarifiers (PC), PC-1, PC-2, and PC-4, were in service this month. Solids return flows were directed to PC-2 this month. Regular cleaning of the primary effluent screens continued.

Secondary Treatment: All three aeration basins (AB's) were in service this month. The MLSS averaged 7,474-mg/L and ranged from 6,500 to 8,600 mg/L. The solids retention time (SRT) averaged 20-days. Secondary foam was minimal this month. The SRT and MLSS was maintained by surface wasting over the scum gates and mixed liquor wasting. Mixed liquor wasting was discontinued after Mar. 24 because there was an increase in foam and the MLSS decreased below 7000 mg/L. Aeration blowers were in DO-control mode this month. Aeration air flow averaged 11,380-scfm. On average, DO concentrations were at or above the desired levels. Construction activities included planning for the testing of the new aeration flow control valves for each aeration zone.

Total-N removal averaged 28%. Full nitrification was achieved this month while denitrification was minimal. Effluent $\text{NH}_3\text{-N}$ averaged <0.1-mg/L, effluent nitrite/nitrate (NO_2+NO_3) averaged 36-mg/L as N and Influent TKN averaged 53-mg/L, 13 -mg/L higher than it was in February.

Alkalinity in the form of a 59% $\text{Mg}(\text{OH})_2$ solution was added to the secondary process to ensure minimum effluent pH limits were met and to achieve complete nitrification. $\text{Mg}(\text{OH})_2$ addition is a full-scale trial to determine any operational benefits and cost-savings compared with using 25% NaOH solution. The 59% $\text{Mg}(\text{OH})_2$ solution dose averaged 2,320-gpd or 119 gallons/MG of influent, which is nearly 20% larger than the dose used in February. The increase was due to continued tuning to minimize swings in the effluent pH. Additionally, a total of 2,700 gallons of 25% NaOH solution was required on two days in March to supplement the $\text{Mg}(\text{OH})_2$ dose because of delayed deliveries. The $\text{Mg}(\text{OH})_2$ pumping system had adequate capacity for the alkalinity demand in March. A new level sensor for the $\text{Mg}(\text{OH})_2$ bulk tank was installed in March, improving inventory control. A new flowmeter to further improve monitoring and control will be installed in April.

Membrane effluent turbidity averaged 0.02 - 0.04 NTU. Membrane Trains were in "relax" mode and LEAP "low" mode this month because filterability was very good. All cassettes were in service. Approximately 5450-gallons of 12.5% NaOCl were used for membrane maintenance cleans, and 1190-gallons for recovery cleans on Trains 3 and 7.

Membrane capacity remained between 43-mgd and 45-mgd this month, with very little change in permeability. This range was well above the range needed to process the influent flow. Soluble COD (sCOD) in the MLSS averaged 72-mg/L this month, which is 25-mg/L higher than last month. Filterability, as measured by the peak flow tests described below, did decline slightly, correlating with the higher sCOD this month. The maximum hourly flux during peak flow tests was between 16 and 18 gpd per ft^2 of membrane surface in March.

Table 1 shows the weekly average trans-membrane pressure (TMP), membrane permeability, and SRT. The rated instantaneous peak hourly flow for one membrane train is 4950-gpm. Peak flow tests were run on two trains per day. Normally, flow setpoints for the peak flow tests are adjusted up/down depending on the TMP before backpulse. The flow setpoint remained at 4800-gpm this month. TMPs did not drop below -4.0 psi during the peak flow test this month, indicating that the capacity is adequate for the peak

hourly design flow. Changes in permeability with time are observed more easily when the flow setpoint remains constant.

Disinfection: Approximately 7,740 gallons of 12.5% NaOCl were used in March for final effluent disinfection and process water at IPS. The hypochlorite effluent disinfection dose averaged 1.8-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 0.07-mg/L.

Odor Control: The Odor Control (OC) facilities performed well this month. Repairs on the hypochlorite and caustic addition systems continued this month. Other repair work that is ongoing includes work on the motor mount for one fan for the Headworks / Primary area. The redundant systems were in service during this repair.

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

Parameter	Week ending 3/1	Week ending 3/8	Week ending 3/15	Week ending 3/22	Week ending 3/29
TMP before backpulse, average psi ²	-1.2	-1.1	-1.1	-1.3	-1.2
TMP before backpulse, peak flow test, psi	-2.3	-2.5	-2.6	-3.2	-3.0
Permeability temperature-corrected ¹ , gfd/psi	8.6	7.9	7.5	6.1	6.5
Flow target for peak flow test, gpm	4800	4800	4800	4800	4800
Flow hourly average during peak flow test, gpm	3882	3885	3838	3866	3866
MB Effluent temperature, degrees F	58.7	59.4	59.5	59.8	59.9
SRT, days	23.6	26.0	20.5	14.7	18.9
MLSS, mg/L	7360	7967	7627	7253	6847

¹ Temperature-corrected Permeability based on Peak Flow Test.

² TMPs during the moderate flow period of the day

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 6.8% TS, with an average solids capture of 93.2%. Sludge loading to the thickeners totaled 808 dry tons. The polymer dose for thickening averaged 5.2 pounds active polymer per dry tons solids processed.

Anaerobic Digestion: The digestion process met time and temperature requirements for Class B biosolids production. Three digesters and the blended storage tank were in service in March. In the active digesters, the solids retention time averaged 32.6 days, temperature averaged 98.5°F, and volatile solids (VS) destruction averaged 57.8%. The total solids concentration in the active digesters averaged 3.1% with a VS fraction of 82.1% VS/TS. The average digester VS load was 0.122 lbs-VS/cu-ft./d. Monthly gas production was measured to be 15.9 million ft³ (based on the flow meters).

Dewatering/Biosolids: All biosolids met the requirements for Class B. Dewatering operated all 31 days in March, using both Centrifuges 1 and 3. Centrifuge feed averaged 2.44% TS and 81.8% VS/TS. Biosolids product averaged 19.9% TS at 84.0% VS/TS for centrifuge 1 and 20.1% TS at 83.9% VS/TS for centrifuge 3. A total of 1,414 wet tons (282 dry tons at 20.0% TS) of biosolids were produced and 1,417 wet tons (283 dry tons) were hauled in March. Solids recovery in the dewatering process averaged 94.8%. Polymer dosage averaged 48.1 lbs-active per dry ton processed.