

Memorandum

August 13, 2020

TO: Historical Memo

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

SUBJECT: Brightwater Treatment Plant
July 2021 Operating Record

All discharge permit requirements were met in July at the Brightwater Treatment Plant (BWTP). All wastewater received MBR secondary treatment. Effluent BOD and TSS averaged <1.6-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 7.6. Continuous dosing of 59% Magnesium Hydroxide ($\text{Mg}(\text{OH})_2$) was required to assure permit compliance for pH. Sodium Hydroxide was used for alkalinity addition for one day while maintenance was performed on the $\text{Mg}(\text{OH})_2$ dosing pump.

Effluent flow to Puget Sound averaged 15.5-MGD. The max-day effluent flow was 16.7-MGD on July 1. Approximately 13.2-MG of reclaimed water was distributed offsite in July, all between July 9 and July 31. Effluent flow discharged to South Plant via the reclaimed water system averaged 0.3-MGD. Less than 0.1-MGD of effluent flow, used for processes at IPS, was recirculated to the influent. Influent flow averaged 16.2-MGD. The maximum influent flow occurred on July 27 when 0.4-MG of reclaimed water was recirculated to the influent. No influent flow was redirected to the South or West Point Treatment Plants. Membrane capacity was adequate for the influent flow in July with measured capacity ranging between 38-MGD and 45-MGD.

Warm dry weather continued this month. July rainfall totaled less than 0.03-inches based on local rain gauges. The only rainfall event occurred on July 20. Precipitation recorded for SeaTac Airport was only a trace, which is 0.6-inches below normal. Local area air temperatures were 1.0°F above normal this month. Membrane effluent temperatures increased from 70.0°F to 71.8°F over the month.

All permit-required samples were collected and analyzed. Influent sample results for July 1 were rejected because of unusually low TSS results; it's likely that the sampling system was plugged.

Influent Pumping: Influent flow was pumped using the two small raw sewage pump sets (RSP). Only one RSP was required most of the time. Two RSPs were required when flows exceeded 20-MGD; this occurred on nine days for up to 3 hours per day. The IPS wet well was “pumped down” on 21 days in July to remove grease and rags. Influent flow was directed to only Influent Screens 1 and 2 this month, with the goal of reducing grit accumulation in the influent screen channels. Influent Screen 3 was repaired and placed in the influent channel this month. Plans are in place to complete the installation and testing of this screen in August.

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. Maintenance staff are scheduled to perform preventive maintenance and inspections on PC-3 and PC-5 in August.

Secondary Treatment: All three aeration basins (AB's) were in service this month. The MLSS averaged 6,460-mg/L and ranged from 5,930 to 7,170 mg/L. The solids retention time (SRT) averaged 20-days. Secondary foam was minimal this month, increasing slightly during the last week of the month. The SRT and MLSS were maintained primarily by surface wasting over the scum gates; mixed liquor wasting was started on July 28. Aeration blowers were in DO-control mode this month. Aeration air flow averaged 11,570-scfm. On average, DO concentrations were at or above the desired levels.

Total-N removal averaged 34%. 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 40-mg/L as N and Influent TKN averaged 65-mg/L.

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 approximately 2,000-gpd or 123 gallons/MG of influent, which is nearly 4% lower than the dose used in June. Tuning of setpoints continued this month.

Plans for improvements to the system include installing a flowmeter and a dilution system downstream of the flow meter. The $\text{Mg}(\text{OH})_2$ pumping system had adequate capacity for the alkalinity demand in July. 2140 gallons of NaOH were used on July 20 while the $\text{Mg}(\text{OH})_2$ pumping system was out of service for maintenance.

The permanent NaOH addition system was taken out of service on July 26 so that a contractor could start work to repair leaks in the caustic loop that supplies the NaOH addition system and odor control. A temporary NaOH tank and pumping system for alkalinity addition was installed in July. This system will be available until the contractor work is complete and the caustic loop is placed back in service in case the $\text{Mg}(\text{OH})_2$ pumping system is out of service.

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 3135-gallons of 12.5% NaOCl were used for membrane maintenance cleans, and 672-gallons for a recovery clean on Train 6. Maintenance clean frequencies were returned to a twice per week schedule on July 19; the hypochlorite supply-chain problems that occurred in June diminished by mid-July.

Membrane capacity ranged between 38-mgd and 45-mgd this month. This range was well above the range needed to process the influent flow. Permeability continued to be good this month, averaging 8.4 gfd/psi during the peak flow tests. Soluble COD (sCOD) in the mixed liquor, which has found to be well correlated with permeability, averaged 37-mg/L. The maximum hourly flux during peak flow tests was between 15-gpd and 16.5-gpd per ft^2 of membrane surface in July. One set of permeate and backpulse actuators was replaced this month for Membrane Train 3.

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. Flow setpoints for the peak flow tests are normally adjusted up/down depending on the TMP before backpulse. This month the flow setpoint remained at 4500-gpm. TMPs did not drop below -3.0 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 were observed more easily when the peak-flow setpoint was held constant.

Disinfection: Approximately 4,890 gallons of 12.5% NaOCl were used in July for final effluent disinfection and process water at IPS. The hypochlorite effluent disinfection dose averaged 1.5-mg/L as Cl_2 . Hypochlorite was applied through the diffuser. Effluent Cl_2 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 less than 0.05-mg/L.

Odor Control: The Odor Control (OC) facilities performed well this month. ORP setpoints that had been decreased in June were increased in mid-July after the supply of hypochlorite became reliable. Pre-chlorination at Influent Structure (IS), which was turned off on June 11 to reduce hypochlorite usage, was resumed on July 6. Hypochlorite added at the IS reduced odor and corrosion at IPS and the Brightwater influent facilities. Caustic was supplied to the odor control facilities via totes while the permanent caustic supply system was out of service for repair, starting on July 26. Other work that is ongoing includes replacement of two fan motors in the Secondary area. Monitoring of the secondary area indicated maintenance of negative pressures. At least two of the four fans remained running at all times.

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

Parameter	Week ending 7/5	Week ending 7/12	Week ending 7/19	Week ending 7/26
TMP before backpulse, average psi ²	-0.8	-0.9	-0.8	-0.8
TMP before backpulse, peak flow test, psi	-1.9	-1.8	-1.9	-1.8
Permeability temperature-corrected ¹ , gfd/psi	8.3	8.6	8.5	8.3
Flow target for peak flow test, gpm	4500	4500	4500	4500
Flow hourly average during peak flow test, gpm	3610	3630	3635	3585
MBR Effluent temperature, degrees F	70.1	70.0	70.6	71.1
SRT, days	18.5	17.5	20.8	23.6
MLSS, mg/L	6635	6085	6270	6605

¹ Temperature-corrected Permeability based on Peak Flow Test.

² TMPs during the moderate flow period of the day

Thickening: Two of the three gravity belt thickeners (GBTs) were operated in July, with GBT 2 being offline due to a failed sample valve. GBT 2 has been offline since mid-May and repairs are expected to occur upon receipt of replacement parts. The GBTs thickened approximately 11.4 MG of feed sludge from an average of 1.6% total solids (TS) to 7.4% TS, with an average solids capture of 91.8%. Sludge loading to the thickeners totaled 758 dry tons. The polymer dose for thickening averaged 5.4 pounds active polymer per dry tons solids processed.

Anaerobic Digestion: The digestion process met time and temperature requirements for Class B biosolids production and operated with two active digesters during the month of July. Digester 3 has been converted to operate as the digested sludge storage tank while construction occurs in the actual storage tank. The storage tank is expected to return to service in November 2021.

In the active digesters: the solids retention time averaged 29.5 days, temperature averaged 99.0°F, and volatile solids (VS) destruction averaged 56.4%. The total solids concentration in the active digesters averaged 3.1% with a VS fraction of 81.2% VS/TS. The average digester VS load was 0.143 lbs-VS/cu-ft./d. Monthly gas production was measured to be 14.4 million ft³ (based on the flow meters).

Dewatering/Biosolids: All biosolids met the requirements for Class B. Dewatering operated all 31 days of July, using both Centrifuges 1 and 3. Centrifuge feed averaged 2.4% TS and 80.9% VS/TS for the month. Centrifuge biosolids product averaged 20.7% TS at 82.7% VS/TS for centrifuge 1 and 20.4% TS at 82.6% VS/TS for centrifuge 3. A total of 255 dry tons of solids were processed (calculated from the feed flow meters and % solids) and 1,170 wet tons (241 dry tons at 20.6% TS) of biosolids cake were produced. A total of 1,235 wet tons (254 dry tons) of biosolids cake were hauled in July. Solids recovery in the dewatering process averaged 94.5%. Polymer dosage averaged 59.5 lbs-active per dry ton produced.