

Memorandum

August 15, 2018

TO: Historical Memo

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

SUBJECT: Brightwater Treatment Plant
July 2018 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 <3.0-mg/L and <2.0-mg/L, respectively, and removals were both $\geq 99\%$. All Fecal Coliform results were <1-cfu/100-mL. Effluent pH was maintained between 6.4 and 7.8. Continuous dosing of caustic soda (25% NaOH) was required to assure permit compliance for pH.

Effluent flow to Puget Sound averaged 14.5-MGD. Effluent flow plus reclaimed water (RW) flow averaged 15.2-MGD. (0.6-MGD RW was applied for irrigation and 0.1-MGD was sent to South Plant to flush pump stations and assure permit compliance.) In addition to the 15.2-MGD, 0.9-mgd of influent was redirected to other treatment plants in July, primarily to facilitate a BWTP control system upgrade (plant shutdowns on July 10 and 30) and repairs to Aeration Basin 1. Thus, effluent plus RW flow would have averaged 16.1-MGD without the redirected influent.

Influent flow averaged 15.8-MGD in July, which is 0.6-MGD greater than effluent plus reclaimed water flow. Effluent recycle to the influent pump station (IPS) and BWTP accounted for 0.2-MGD of the 0.6-MGD difference. Return flows from BWTP's solids processes (thickening and dewatering) accounted for the remaining 0.4-MGD. A leak in the solids return piping was discovered in early July. In order to facilitate repairs, the solids return tank was allowed to flow into the plant sewer which flowed to BWTP's influent. This occurred July 12 - 26 at an average flow of 0.7-MGD. Though relatively small in flow, the solids return flow affected certain influent sample results during that time. BWTP met the 85% removal requirements even after accounting for the additional loads in the solids return flows to the influent sampler.

July rainfall totaled 0.7-inches this month (local rain gauges). Rainfall at SeaTac Airport totaled 0.05-inches, which is 0.65-inches below normal. Local area temperatures were 5°F above normal this month. Wastewater temperatures increased nearly 2°F in July (from about 70°F to 72°F), continuing the warming trend observed in May and June.

All permit-required samples were collected and reported. The results for analyses of the samples collected on July 15 were rejected because the results for TSS and BOD were anonymously low. Most likely, there was plugging in some part of the sampling lines.

Influent Pumping: Influent storage was used to minimize fill and draw operation of the influent raw sewage pumps (RSPs); the minimum flow for the RSPs is 12-MGD. The influent flow was limited to 18-MGD this month to facilitate taking Aeration Basin 1 (AB1) out of service at month's end, and for process adjustments needed during summer. Only one RSP is required for this operating range. Each large RSP is energized once per month.

Primary Treatment: Three of five primary clarifiers were in service all month. Solids return flows were directed to Primary Clarifier 1 (when they were not flowing into the sewer which directed them to the plant influent). Regular Primary Screen cleaning continued.

Secondary Treatment: Three aeration basins (ABs) were in service until July 3 when AB1 was taken out of service. The MLSS averaged about 7490-mg/L and ranged from 6,200 to 8,500 mg/L. The mean cell residence time (MCRT) averaged 12-days. The MLSS and SRT were steadily decreased across the month to allow for two-basin operation while maintaining the D.O. levels needed for nitrification at higher water temperatures. Both surface wasting and ML wasting were used to decrease the MLSS and the SRT. Initial repairs to AB1's diffuser piping were made in July. Additional work on AB1 will include adding diffusers, replacing old diffuser membranes, and installing a flap gate in the trench between the anoxic and aeration zones.

Full nitrification was achieved most of the month. However, effluent ammonia concentrations reached 5-mg/L for short periods of time when aeration basin DO's were low. Denitrification was incomplete. Effluent ammonia-nitrogen (NH₃-N) averaged <1.2 mg/L and nitrite/nitrate (NO₂+NO₃) averaged 30.8-mg/L as N. Total-N removal averaged 46%; the same as in June. Influent TKN averaged 62.6-mg/L, which was 1-mg/L higher than in June.

Continuous dosing of caustic soda to the secondary process was required to ensure minimum effluent pH permit conditions were met, and to achieve complete nitrification. The dose averaged 4280-gpd of 25% NaOH solution, or 271 gallons/MG of influent. This dose is slightly higher than June's dose, likely a result of the increased dewatering rate in July.

Membrane effluent turbidity averaged 0.03 to 0.07 NTU. Trains 1 through 7 were primarily in "backpulse" mode with a membrane air scour of 10s-on/30s-off. Membrane Train 8 was operated in relax mode, 10s-on/10s-off aeration, and a reduced permeate flow because of previous damage to its cassettes. All of Train 8's cassettes are now in service. Approximately 2230-gallons of 12.5% sodium hypochlorite (NaOCl) were used for maintenance cleans that were performed two times per week.

Membrane or filtering capacity was between 36 and 41 MGD this month. Filtering capacity continues to increase in concert with increasing water temperature, and lower soluble COD in the mixed liquor and solids return. The maximum flux during the peak flow test was between 16 and 17.5-gfd (i.e., gpd per ft² of membrane surface) in July. Testing of two higher-density cassettes in Train 7 also continued this month. Both cassettes performed well within design rated flows. Higher-density modules and LEAP aeration have the potential for reducing membrane energy use while increasing capacity.

The table below shows changes in trans-membrane pressure (TMP), membrane permeability, and MCRT 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. The initial flow for the peak tests was reduced from 4900-gpm to 47500-gpm during the last week of July. TMPs only reached the "TMP Control" setpoint of 8-psi twice this month.

Parameter	7/2	7/9	7/16	7/23	7/30
TMP before backpulse, average psi	0.7	0.6	0.5	0.5	0.6
TMP before backpulse, peak flow test, psi	3.0	4.0	4.3	4.5	5.2
Permeability temperature-corrected ¹ , gfd/psi	6.6	4.6	5.2	4.6	3.5
Flow target for peak flow test, gpm	4900	4900	4900	4900	4750
Flow hourly average during peak flow test, gpm	3930	3900	3890	3940	3785
Effluent temperature, degrees F	68.2	68.4	69.4	70.2	71.1
MCRT, days	10.7	11.1	11.7	12.7	14.3
MLSS, mg/L	7890	7760	8070	7810	6780

1 Temperature-corrected Permeability based on Peak Flow Test.

2 TMPs were at 0.3– 0.7 psi during the minimum flow period of the day

Odor Control: The Odor Control facilities performed well this month. Maintenance work continued on the chemical systems to minimize leaks in the caustic and hypochlorite transfer systems. The Headworks and Solids area bioscrubbers become more active with the rise in air and effluent temperatures, especially after the third week of July.

Disinfection: Approximately 9,310 gallons of 12.5% NaOCl were used in July for final effluent disinfection, reclaimed water disinfection, and process water at IPS. Hypochlorite effluent disinfection was equal to an average dose of 2.3-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 <0.05-mg/L Cl₂ and 0.05-mg/L Cl₂, respectively.

Thickening: All three gravity belt thickeners (GBTs) were rotated in service this month. The GBTs thickened feed sludge from an average of 1.22% total solids (TS) to 5.7% TS, with an average solids capture of 93%. Thickened sludge production totaled 805 dry tons. The polymer dose for thickening averaged 8.1 pounds active polymer per dry tons solids processed in July.

Anaerobic Digestion: The digestion process met time and temperature requirements for Class B biosolids production. All three Digesters and the blended storage tank were in service in July. In the active digesters, the solids retention time averaged 38.5 days, temperature averaged 99°F, and volatile solids (VS) destruction averaged 59.9%. The total solids concentration in the active digesters averaged 2.73%, with a volatile solids (VS) fraction of 82.6% VS/TS. The digester VS load averaged 0.087 lbs-VS/cu-ft./d. Monthly gas production is estimated to be 14.5 million ft³ (based on biosolids haul data and an estimated 452 tons of VS destroyed).

Dewatering/Biosolids: 1632 wet tons (312 dry tons at 19.1% TS) of biosolids were produced and 1633 wet tons (312 dry tons) were hauled. Solids recovery in the dewatering process averaged 92.6%. Polymer dosage averaged 49.1 lbs-active per dry ton processed. Dewatering operated 31 days in July using both centrifuges (No. 1 and No.3). Centrifuge feed TS averaged 2.54% and VS averaged 82.1% VS/TS. Centrifuge 1 cake averaged 19.1% TS at 84.7% VS/TS. Centrifuge 3 cake averaged 19.2% TS at 84.5% VS/TS. Usually, dewatering operates mostly during day shift with some carry over into the night shift. However, dewatering production was increased in July to keep up with increased wasting from taking aeration basin 1 out of service. Some days both centrifuges ran at the same time and/or dewatering ran at night.