

# Memorandum

July 12, 2019

TO: Historical Memo

FROM: Carol Nelson, Process Analyst  
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SUBJECT: Brightwater Treatment Plant  
June 2019 Operating Record

All discharge permit requirements were met in June 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 0-cfu/100-mL, except for one day (Jun 7) that was estimated to be <1-mpn/100mL. 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 15.8-MGD. Effluent flow to Puget Sound averaged 15.2-MGD. Effluent was also distributed as reclaimed water (0.36-MGD), sent to South Plant as rejected reclaimed water (0.15-MGD), and recycled to the influent pump station (approximately 0.1-MGD). The average influent flows redirected to South Plant and West Point were 0.63-MGD and 0.05-MGD, respectively.

June weather was drier and warmer than normal. Local rain gauges recorded 0.72-inches total precipitation. Most rain fell between June 20 and 23. Precipitation recorded for SeaTac Airport totaled 0.90-inches, which is 0.67-inches below normal. Local area temperatures were 3.5°F above normal this month. Membrane effluent temperatures rose from 66.6°F to 68.8°F.

All permit-required samples were collected and analyzed. Influent TSS and BOD results for June 23 were rejected because of unusually low results. Most likely, the influent sample line was partially plugged on that day.

**Influent Pumping:** One influent RSP was always operated except on June 2, 5 and 22 when two small pumps were operated together for a few hours at a time. As expected, influent flows decreased with the beginning of the summer season. Both of the large pump sets were exercised briefly once this month. The maximum flow setpoint for Hollywood Pump Station remained at 13.5-MGD. Influent flow was occasionally directed to South Plant and West Point in June to accommodate control system upgrades, to allow time for restoring disinfection, and in preparation for repair of the York diversion gate.

**Primary Treatment:** Three of five primary clarifiers (PC) were in service most of the month. Solids return flows were directed to PC-1 all month. 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 9,060-mg/L and ranged from 7,400 to 10,300 mg/L. The solids retention time (SRT) averaged 29-days, which is nearly the same as May's. The SRT was reduced during June's last week (June 21) in order to maintain DO concentrations while wastewater temperatures

continued to increase. Aeration air flow in June averaged nearly 10% greater than in May. Surface wasting was the primary method to maintain the MLSS and SRT.

Total-N removal averaged 47%. 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 ( $\text{NO}_2+\text{NO}_3$ ) averaged 35.4-mg/L as N. Influent TKN averaged 70-mg/L, which is 10-mg/L higher than in May. Influent TKN on June 18 (87-mg/L) and primary effluent TKN on June 25 (65-mg/L) were notably higher than expected.

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 5020-gpd of 25% NaOH solution or 316 gallons/MG of influent, slightly higher than May'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 0.05-0.11 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 in 10s-on/30s-off mode except for peak flow tests. The schedule for converting from cyclic aeration to "LEAP" aeration was tentatively set for mid-July. 17 of the 20 cassettes for Train 8 were in service during June. Approximately 5710-gallons of 12.5% sodium hypochlorite ( $\text{NaOCl}$ ) were used for maintenance cleans.

Membrane capacity ranged between 28-mgd and 32-mgd, improving until June 23 and declining thereafter. MLSS soluble COD (sCOD) values after June 3 increased notably, reaching above 1000-mg/L to as high as 1500-mg/L; these are the highest values ever recorded. This may explain the poor filterability at the end of the month, which is atypical for summer. Increasing sCOD of the MLSS and solids return continued to correlate well with decreased filterability. It is not yet understood why the MLSS sCOD increased so much in June; MLSS sCOD averaged closer to 500-mg/L. The maximum hourly flux during peak flow tests was between 12 and 13.5 gpd per  $\text{ft}^2$  of membrane surface in June.

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 3500-3900 gpm this month.

Parameter	Week ending 6/3	Week ending 6/10	Week ending 6/17	Week ending 6/24
TMP before backpulse, average $\text{psi}^2$	-2.8	-2.5	-1.3	-1.6
TMP before backpulse, peak flow test, psi	-5.5	-3.7	-3.4	-4.4
Permeability temperature-corrected <sup>1</sup> , gfd/psi	2.5	3.7	4.0	3.1
Flow target for peak flow test, gpm	3510	3560	3690	3840
Flow hourly average during peak flow test, gpm	2770	2840	2960	3000
MB Effluent temperature, degrees F	66.3	67.1	68.1	68.4
SRT, days	26.7	41.1	27.3	21.3
MLSS, mg/L	9620	9640	9990	8650

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. Repairs to the hypochlorite carrier lines and caustic tank fittings are planned for July.

**Disinfection:** Approximately 20,340 gallons of 12.5% NaOCl were used in June for final effluent disinfection, reclaimed water, and process water at IPS. Hypochlorite effluent disinfection was equal to an average dose of 6.1-mg/L as Cl<sub>2</sub>. Hypochlorite was applied through the diffuser. Effluent Cl<sub>2</sub> residual at the outfall (aka Point Wells) met both the monthly and max-weekly permit limits. The monthly average and maximum weekly residuals were 0.11-mg/L and 0.12-mg/L, respectively.

**Loss of disinfection flow** ERTS# 689804:

On June 9 at approximately 12:30PM, staff were alerted to a final effluent disinfection low hypochlorite flow alarm. Operators quickly discovered a blockage in the hypochlorite line used to disinfect the effluent. Influent flow was soon shut down for about 2-hours (12:44PM to 14:50 PM) while the hypochlorite line was flushed and hypochlorite flow was restored. Operators determined that the blockage was in the flow element of the magnetic flow meter. Though the plant's influent flow was stopped at 12:44PM, liquid stream processes tapered down, with most effluent flow stopped by 1PM; effluent flow was completely stopped about 1:30PM. Effluent flow with hypochlorite disinfection was restarted at 2:50PM with slightly elevated hypochlorite doses; the dose was dropped to usual levels after three hours. A maximum of 0.33 MG may have passed over the effluent weir with no hypochlorite addition. This incident was reported to the Department of Ecology and assigned an ERTS# 689804.

Based on pipe volumes and flow rates for this event, the effluent travel time from Brightwater to Pt. Wells was approximately 49 hours. During this travel time, some mixing occurs in the pipe. Staff monitored the on-line Cl<sub>2</sub> residual analyzers for the next three days at the IPS and Pt. Wells. The Cl<sub>2</sub> residual at Pt. Wells reached a minimum value of 0.047-mg/L (on the afternoon/evening of June 11) but did not go below that value. Daily averages are shown on the DMR. Based on conversations with DOE, it was determined this event does not qualify as a loss of disinfection event.

Corrective Actions: Revise the SOP for low hypochlorite flow events to include immediately opening the bypass line around the flow meter.

**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 6.5% TS, with an average solids capture of 92.4%. Thickened sludge production totaled 761 dry tons. The polymer dose for thickening averaged 7.3 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 June. In the active digesters, the solids retention time averaged 27 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 81.6% 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 14.1 million ft<sup>3</sup> (based on flow meters and VS destruction).

**Dewatering/Biosolids:** 1245 wet tons (253 dry tons at 20.4% TS) of biosolids were produced and 1296 wet tons (264 dry tons) were hauled in June. Solids recovery in the dewatering process averaged 93.8%. Polymer dosage averaged 48.2 lbs-active per dry ton processed. Dewatering operated 28 days in June using both centrifuges (No. 1 and No.3). Centrifuge feed

averaged 2.6% TS at 81.2% VS/TS. Biosolids product averaged 20.2% TS at 83.6% VS/TS for centrifuge 1 and 20.5% TS at 82.8% VS/TS for centrifuge 3.