

# Memorandum

December 12, 2019

TO: Historical Memo

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

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All discharge permit requirements were met in November 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. Effluent pH was maintained between 6.5 and 7.2. Continuous dosing of 25% caustic soda (NaOH) was required to assure permit compliance for pH.

Influent flow averaged 17.1-MGD. Effluent flow to Puget Sound averaged 17.0-MGD. Effluent was also recycled to the influent pump station, for flushing the North Creek pump station, and for internal flushing and cleaning tanks (approximately 0.1-MGD). No reclaimed water was distributed offsite this month. A relatively small amount of influent flow was directed to West Point (1.1-MG on Nov. 28) and South Plant (0.3-MG on Nov. 30) during the last week of the month due to declining membrane capacity.

November rainfall was well below average. Local rain gauges recorded 2.8-inches total rain. Most rain fell on November 15, 18, and 25. Precipitation recorded for SeaTac Airport totaled 1.7-inches, which is 4.9-inches below normal. Local area temperatures were 1.2°F above normal this month. Membrane effluent temperatures declined from 67.1°F to 64.4°F.

All permit-required samples were collected and analyzed. Influent TSS and BOD results for Nov. 25 were rejected because of unusually low results. Most likely, the influent sample line was partially plugged that day.

**Influent Pumping:** Influent flow was mainly pumped with one of the smaller influent raw sewage pumps (RSPs). Both small RSPs were required for at least an hour on nineteen days. The maximum flow setpoint for Hollywood Pump Station remained at 13.5-MGD. As mentioned previously, a relatively small amount of influent flow was diverted from Brightwater on Nov. 28 and 30 because membrane capacity declined to under 26-mgd. Both plants and the collection system had adequate capacity on those days.

**Primary Treatment:** Three of five primary clarifiers (PC) were in service this month. Solids return flows were directed to PC-2 through Nov. 14 (when it was taken out of service for cleaning) and subsequently were directed to PC- 3 (which returned to service). 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. Testing of the new Membrane feed pump VFD's continued this month. The MLSS averaged 9,055-mg/L and ranged from 7,570 to 10,930 mg/L. The solids retention time (SRT) averaged 26-days, 2 days longer than the average in October. Average DO concentrations were maintained at or above

the desired setpoint. Aeration air flow in November averaged approximately 200-cfm lower than air flow in October, mostly a result of the declining wastewater temperatures. Surface wasting was the primary method to maintain the MLSS and SRT.

Total-N removal averaged 44%. Full nitrification was achieved most of 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 36.2-mg/L as N. Influent TKN averaged 69-mg/L, higher than normal for a fall month.

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 4,105-gpd of 25% NaOH solution or 240 gallons/MG of influent, approximately 17 g/MG less than the dose in October. Design work on the Brightwater Aeration Optimization capital project continued this month; project goals include improving the secondary process, reducing caustic soda addition and reducing energy use.

Membrane effluent turbidity averaged 0.04-0.09 NTU. Membrane Trains were in “relax” mode until Nov. 16, when they were switched to “backpulse” mode. Backpulse mode helps reduce fouling when filterability is poor. The turbidity of Train 8 permeate was adequate with three cassettes out of service. Staff performed a bubble test on Train 8 on Nov. 7; initial findings showed that nine cassettes need repair; however, some repairs should be relatively minor. New modules were ordered to reduce the labor time for repairing the most damaged cassettes and these should arrive in late December. The air scour was in LEAP “low” mode most of time until Nov. 25. After Nov.25, LEAP “high” mode was used to reduce fouling and improve membrane capacity. Approximately 3,822-gallons of 12.5% NaOCl were used for maintenance cleans. An additional 2,145-gallons was used for recovery cleans on Trains 3, 7 and 8.

Membrane capacity declined from 35-mgd to 23-mgd this month. Average permeability declined steadily during the second and third weeks, and then rapidly during the fourth. MLSS soluble COD (sCOD) continued to be well correlated with filterability; it averaged 560-mg/L which is approximately 350-mg/L higher than it was last month. The decline in permeability was also correlated with declining temperature, as is typical for fall. The maximum hourly flux during peak flow tests was between 10.5 and 14.4 gpd per  $\text{ft}^2$  of membrane surface in November.

Table 1 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 3500-4000 gpm this month.

**Disinfection:** Approximately 15,510 gallons of 12.5% NaOCl were used in November for final effluent disinfection and process water at IPS. Hypochlorite effluent disinfection was equal to an average dose of 4.3-mg/L as  $\text{Cl}_2$ . Hypochlorite was applied through the diffuser. Effluent  $\text{Cl}_2$  residual at the outfall (aka Point Wells) met both the monthly and max-weekly permit limits. The monthly average and maximum weekly residuals were 0.08-mg/L and 0.15-mg/L, respectively.

**Odor Control:** The Odor Control (OC) facilities performed well this month. Repairs to the chemical supply systems continued. The hypochlorite loop supplying odor control, remained out of service this month so that it could be checked for leaks and repaired.

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

Parameter	Week ending 11/4	Week ending 11/11	Week ending 11/18	Week ending 11/25
TMP before backpulse, average psi <sup>2</sup>	-2.1	-1.2	-3.5	-6.2
TMP before backpulse, peak flow test, psi	-7.9	-6.6	-8.1	-8.3
Permeability temperature-corrected <sup>1</sup> , gfd/psi	1.8	2.2	1.6	1.5
Flow target for peak flow test, gpm	4010	3870	3630	3500
Flow hourly average during peak flow test, gpm	3230	3130	2880	2720
MB Effluent temperature, degrees F	66.4	66.3	66.0	65.0
SRT, days	31	34	27	26
MLSS, mg/L	7780	9600	8725	9150

<sup>1</sup> Temperature-corrected Permeability based on Peak Flow Test.

<sup>2</sup> TMPs during the moderate flow period of the day

**Thickening:** Two of three gravity belt thickeners (GBTs) were rotated in service this month. The GBTs thickened feed sludge from an average of 1.8% total solids (TS) to 7.1% TS, with an average solids capture of 93.0%. Thickened sludge production totaled 742 dry tons. The polymer dose for thickening averaged 6.4 pounds active polymer per dry tons solids processed.

**Anaerobic Digestion:** The digestion process met time and temperature requirements for Class B biosolids production. Two digesters and the blended storage tank were in service in November. In the active digesters, the solids retention time averaged 30 days, temperature averaged 99°F, and volatile solids (VS) destruction averaged 64%. The total solids concentration in the active digesters averaged 3.0%, with a VS fraction of 82.6% 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 13.6 million ft<sup>3</sup> (based on flow meters and VS destruction).

**Dewatering/Biosolids:** 1174 wet tons (235 dry tons at 20.1% TS) of biosolids were produced and 1264 wet tons (254 dry tons) were hauled in November. Solids recovery in the dewatering process averaged 93.3%. Polymer dosage averaged 46.1 lbs-active per dry ton processed. Dewatering operated 29 days in November using both centrifuges (No. 1 and No.3). Centrifuge feed averaged 2.7% TS at 80.8% VS/TS. Biosolids product averaged 20.0% TS at 82.7% VS/TS for centrifuge 1 and 20.2% TS at 82.8% VS/TS for centrifuge 3.