Memorandum

February 13, 2020

TO: Historical Memo

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

SUBJECT: Brightwater Treatment Plant
January 2020 Operating Record

All discharge permit requirements were met in January at the Brightwater Treatment Plant (BWTP). All wastewater received MBR secondary treatment. Effluent BOD and TSS averaged <1.0-mg/L and <2.0-mg/L, respectively, and removals were both ≥ 99%. All Fecal Coliform results were less than 1-cfu/100-mL. Effluent pH was maintained between 6.6 and 7.1. Continuous dosing of 25% caustic soda (NaOH) was required to assure permit compliance for pH.

Influent flow averaged 18.9-mgd. Effluent flow to Puget Sound averaged 18.8-mgd. Approximately 0.1-mgd of effluent was also recycled to the influent pump station to flush influent gates. No reclaimed water was distributed offsite this month. Influent flow was directed to South Plant because of reduced membrane capacity and constraints on the control of the Raw Sewage Pumps (RSPs). Influent flow to South Plant averaged 4.6-mgd, occurred every day, and was above 5-mgd from Jan.11 to 13 and from Jan. 22 to Jan. 28. The redirection of flow from Brightwater to South Plant did not contribute to any overflow or bypass. Membrane capacity ranged from 20-mgd and 28-mgd this month.

January rainfall was well above average. Local rain gauges recorded 9.3-inches total rain. Days with more than 0.5" of rain included Jan. 8,10, 18, 21, 23, 27, and 28. Precipitation recorded for SeaTac Airport totaled 9.2-inches, which is 3.7-inches above normal. The maximum rainfall in the Woodinville area was 0.91-inches on Jan.18. Local area temperatures were 3.0°F above normal this month. Membrane effluent temperatures declined from 61.5°F to 59.0°F by the end of the month.

All permit-required samples were collected and analyzed. Influent TSS and BOD results for Jan. 3 and 4 were rejected because of unusually low results. Most likely, the influent sample line was partially plugged that day. Influent TSS and BOD results for Jan. 16 were unusually high; these results probably indicate the additional solids load that occurred when the influent wet well was pumped down.

**Influent Pumping:** Influent flow was pumped with one of the smaller RSPs between Jan.1 and Jan. 27. When the membrane capacity is below 25-mgd, only one RSP is used because of constraints on the minimum pump speeds; this occurrence often led to the need to redirect some influent flow to South Plant in January. From Jan. 27 to the end of the month, a second small RSP was used for at least 9 hours/ day because increased membrane capacity. Testing of the control systems for the RSPs was ongoing this month.

Initial cleaning of the IPS wet well by an outside vendor was completed in December. To ensure that the IPS wet well remained clean, the wet well was pumped down 16 days over January, resulting in large volumes of grit, grease, and rags moving up to the Brightwater headworks. Subsequently, Influent Screens #3 and #4 were taken out of service for mechanical problems and related electrical
trips; the accumulation of rags and grit in the influent channel was likely a contributing factor. Grit from
the Influent channel to Screen-4 was removed (via vactor truck) on Jan. 23. Plans were made to
install gates in the influent distribution channel to limit flow to two of the Influent Distribution and
Screens channels in February. This should increase the velocity in the channels and move the grit
downstream to the grit tanks. During the last 10 days of the month, staff observed better performance
of the RSPs and lower accumulation of rags on the influent screens. The maximum flow setpoint for
Hollywood Pump Station was increased from 7.0-mgd to 9.0-mgd on Jan. 28.

**Primary Treatment:** Three of five primary clarifiers (PC) were in service this month. Solids return
flows were directed to PC-1. Regular cleaning of the primary screens continued. Primary scum
pumping was increased to accommodate the extra grease in the influent that resulted from pumping
down the IPS wet well. 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 11,090-mg/L and ranged
from 9,630 to 12,167 mg/L. The solids retention time (SRT) averaged 26-days, the same as the
average in December. Average DO concentrations were maintained at or above the desired setpoint.
Aeration air flow in January averaged approximately 1,100-cfm lower than air flow in December, most
likely because of declining wastewater temperatures and influent solids concentrations. Surface
wasting was the primary method to maintain the MLSS and SRT.

Total-N removal averaged 28%. Full nitrification was achieved most of the month while denitrification
was minimal. Effluent NH₃-N averaged <0.1 mg/L and effluent nitrite/nitrate (NO₂⁺NO₃) averaged
32.2-mg/L as N. Influent TKN averaged 47-mg/L, more typical for a winter month and 14-mg/L lower
than in December.

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 4,168-gpd of 25% NaOH solution
or 256 gallons/MG of influent, approximately 37 gallons/MG more than the dose required in
December. This need for a higher caustic dose is consistent with the lower influent alkalinity observed
during wet weather. Design work on the Brightwater Aeration Optimization capital project continued
this month; project goals include improving the secondary process, reducing the need for caustic soda
addition and reducing energy use.

Membrane effluent turbidity averaged 0.04-0.07 NTU. Membrane Trains were in “backpulse” this
month. Backpulse mode helps reduce fouling when filterability is poor. The turbidity of Train 8
permeate was adequate with three cassettes out of service. Staff plan to repair fibers in Train 8 during
February. The air scour was in LEAP “high” mode for most of the month to reduce fouling and improve
membrane capacity. Suez staff performed additional tuning of the LEAP aeration system this month to
optimize air scour for winter conditions and poor filterability. Approximately 4,580-gallons of 12.5%
NaOCl were used for maintenance cleans.

Membrane capacity improved from 20-mgd to 28-mgd this month. MLSS soluble COD (sCOD)
declined from 400-mg/L to less than 80-mg/L this month, continuing to be well correlated with
filterability. The decline in the MLSS sCOD probably moderated the decline in permeability related to
declining temperature. The maximum hourly flux during peak flow tests was between 9.2 and 12.5
gpd per ft² of membrane surface in January.

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 2600-3500 gpm this month.

**Disinfection:** Approximately 10,820 gallons of 12.5% NaOCl were used in January for final effluent disinfection and process water at IPS. Hypochlorite effluent disinfection was equal to an average dose of 2.6-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 0.10-mg/L and 0.13-mg/L, respectively.

**Odor Control:** The Odor Control (OC) facilities performed well this month. The speed of fans for pulling foul air from the non-classified side of the primary tanks were lowered and the area dampers and air-flows were re-balanced to provide energy savings while still meeting odor control requirements. Operation of the fans in the secondary and solids areas were adjusted to reduce peak energy consumption during the winter months.

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

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Week ending 1/6</th>
<th>Week ending 1/13</th>
<th>Week ending 1/20</th>
<th>Week ending 1/27</th>
</tr>
</thead>
<tbody>
<tr>
<td>TMP before backpulse, average psi</td>
<td>2</td>
<td>6.0</td>
<td>4.7</td>
<td>2.9</td>
</tr>
<tr>
<td>TMP before backpulse, peak flow test, psi</td>
<td>-7.5</td>
<td>-6.0</td>
<td>-4.7</td>
<td>-2.9</td>
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<td>Permeability temperature-corrected1, gfd/psi</td>
<td>1.5</td>
<td>1.8</td>
<td>2.3</td>
<td>2.6</td>
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<tr>
<td>Flow target for peak flow test, gpm</td>
<td>2600</td>
<td>2800</td>
<td>2970</td>
<td>3200</td>
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<tr>
<td>Flow hourly average during peak flow test, gpm</td>
<td>2090</td>
<td>2285</td>
<td>2430</td>
<td>2620</td>
</tr>
<tr>
<td>MB Effluent temperature, degrees F</td>
<td>61.3</td>
<td>60.2</td>
<td>59.3</td>
<td>59.1</td>
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<td>SRT, days</td>
<td>31.0</td>
<td>25.8</td>
<td>24.2</td>
<td>29.3</td>
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<td>MLSS, mg/L</td>
<td>10,180</td>
<td>10,550</td>
<td>11,000</td>
<td>11,780</td>
</tr>
</tbody>
</table>

1 Temperature-corrected Permeability based on Peak Flow Test.
2 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 1.3% total solids (TS) to 6.7% TS, with an average solids capture of 91.8%. Thickened sludge production totaled 581 dry tons. The polymer dose for thickening averaged 5.6 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 January. In the active digesters, the solids retention time averaged 37 days, temperature averaged 99°F, and volatile solids (VS) destruction averaged 62%. The total solids concentration in the active digesters averaged 2.8%, with a VS fraction of 82 % VS/TS. The average digester VS load was 0.11 lbs-VS/cu-ft./d with two digesters in service. Monthly gas production is estimated to be 11.2 million ft3 (based on flow meters and VS destruction).

**Dewatering/Biosolids:** 907 wet tons (189 dry tons at 20.8% TS) of biosolids were produced and 909 wet tons (189 dry tons) were hauled in January. Solids recovery in the dewatering process averaged 93.7%. Polymer dosage averaged 50.2 lbs-active per dry ton processed. Dewatering operated 28 days in January using both centrifuges (No. 1 and No.3). Centrifuge feed averaged 2.6% TS at 81.0% VS/TS. Biosolids product averaged 20.8% TS at 82.9% VS/TS for centrifuge 1 and 20.9% TS at 82.5% VS/TS for centrifuge 3.