

# Memorandum

November 10, 2022

TO: Historical Memo

FROM: Rachael Dyda, Process Supervisor

SUBJECT: South Treatment Plant at Renton (STP)  
October 2022 Operating Record

*Operation in October 2022 was characterized by below average rain, daily effluent flows ranged from 53-mgd to 82-mgd. Additional observations include warmer wastewater temperatures and unseasonably warmer than normal air temperatures in the first half of the month with no precipitation, good effluent quality, moderate nitrification/denitrification, no deicer BOD load, normal septage loads, flow/load from the Brightwater service area due to digesters upset, some process tanks taken in and out of service, and Class-A reclaimed was made available to customers all month. For several weeks this month outside maintenance activities were postponed due to poor air quality from wildfires. Full scrubbed gas system capacity was available throughout the month. Due to a sampler mother board failure, the composite influent samples were collected on a timed interval from October 20<sup>th</sup> until October 26<sup>th</sup>.*

The STP met its conventional permit limits for secondary effluent. Final effluent quality averaged 3-mg/L carbonaceous BOD (cBOD<sub>5</sub>), 5-mg/L TSS and 7-mg/L total BOD<sub>5</sub>. Respective removals were 99%, 99% and 98%. Maximum weekly-average values were 5-mg/L, 8-mg/L and 12-mg/L, respectively.

Effluent flow averaged 60-mgd this month, of which Brightwater flow (York pump station) contributed an average of 5.5-mgd, or approximately 9% this month. Due to the 0.64-inches of rain on October 31, flows increased by 22-mgd from the previous day. All flows received secondary treatment, i.e., no flows were diverted around the secondary process.

The first 20 days of October were unseasonably warm and dry, with zero precipitation through October 20<sup>th</sup> and daily high temperatures above 63°F. Rainfall (2.51-inches at SeaTac Airport) was 65% of the historical average (3.91-inches at SeaTac Airport), all of which fell between October 21–31, with 0.64-inches of rain on October 31 alone. Daily observed high and low air temperatures were 88°F and 41°F. The average monthly maximum and minimum temperatures were 66.2°F and 49.1°F which was 5.7°F and 2.1°F higher than the maximum and minimum long-term averages, respectively. The wastewater effluent temperature decreased throughout the month, from 73°F to 69°F.

**Offsite Flows and Loads:** 2.62-MGD of septage were received at South Plant in October, which accounted for an estimated 9% of STP's influent solids load. Southern Transfer (aka Allentown) flow averaged 4.0-mgd, with a peak flow of 10-mgd on October 31<sup>st</sup>. York P.S. flow (i.e., Brightwater based flow) averaged 5.5-mgd, due to transferring flow and solids to South Plant to limit solids feed to the Brightwater digesters, which were experiencing an upset condition because one digester was out of service for maintenance. York/BW flows accounted for approximately 12% of the influent TS load at the STP. No deicer loads were sent to South Plant from the Port of Seattle in October.

**Sampling and Analyses:** All permit-required samples (influent and effluent) were collected and analyzed. Due to a mother board failure, composite influent samples were collected on a timed interval from October 20-26. The final ETS effluent sample line/sampler was usually chlorinated every other day. The measured influent loads averaged 84-tons/day BOD<sub>5</sub>, 66-tons/day cBOD<sub>5</sub>, and 81-tons/day TSS. The average monthly effluent chlorine (Cl<sub>2</sub>) at the ETS outfall was <0.06-mg/L with minimum and maximum values of <0.05 and 0.10-mg/L, respectively. This is well below the permitted max-day limit of 0.75-mg/L daily average and the monthly average limit of 0.5-mg/L.

**STP Facilities Status:** Throughout October, all four of the North primaries and all 8 of the south primaries were in service. In the beginning of the month, the secondary process was operated to achieve partial nitrification/denitrification while maintaining a population of phosphorus accumulating organisms (PAOs). Full scrubbed gas system capacity was available throughout the month. The scrubbed high-quality gas was injected into PSE's natural gas pipeline. Process heat was provided by the solid's boiler (fueled by natural gas) all month. The reclaimed water (RW) facility was in service throughout the month, producing Class-A quality RW for customers as needed. RW was used for internal process applications and external irrigation throughout the month. Reclaimed Water was distributed to the normal permitted application sites (Starfire Sports, City of Tukwila), and also to Foster Golf Links through October 12<sup>th</sup>.

4 of 4 aeration tanks (ATs) were in service all month and 21 to 22 of the 24 secondary clarifiers were in service. On September 28<sup>th</sup>, secondary clarifier tanks 7 and 8 were inspected by plant staff to evaluate if there were noticeable differences that would explain why performance of clarifier tank 8 under-performs compared to the other three tanks in this clarifier pod. Tank 7 was placed back in service on October 20<sup>th</sup> after repairs were completed. Tanks 4 and 8 were out of service the entire month for repairs. Two of 2 chlorine contact channels (CCC) were in service all month. DAFT 3 was out of service in the first half of the month for inspection for a rehabilitation project and was returned to service on October 13<sup>th</sup>. DAFT 6 was taken out of service on October 14<sup>th</sup> for inspection for a rehabilitation project and remained out of service for the rest of the month. Therefore 5 of 6 DAFTs were in service the entire month. All five anaerobic digesters were in service. Dewatering operated on 30 days this month.

**Primary Treatment:** All four north primary tanks and all eight south primary tanks were in service all month. The primary effluent TSS averaged 70-mg/L resulting in an average TSS removal rate of 79%. Primary effluent CBOD averaged 130-mg/L resulting in an average CBOD removal rate of 50%. The hydraulic loading rate (HLR) ranged from 880-1,036-gpd per ft<sup>2</sup>, depending on the number primary of clarifiers in service.

**Secondary Treatment:** All four ATs were in service all month with between 21-22 (of 24 total) secondary clarifiers in service. The ATs were operated in plug flow mode (i.e., AT feed gates open only in Pass-1) and Ludzack-Ettinger process in October. A ½-pass un-aerated zone in Pass-1 was maintained throughout the month.

The MLSS concentration was in the 1,950-2,760 mg/L range with a solids retention time (SRT) around 3.5, increasing to 4.2 by the end of the month, with an average monthly SRT of 3.9-days. The RAS flowrate was steady throughout the month at 4-MGD per clarifier, for an average monthly RAS return rate of 147% of influent flow. Biomass settling (SVI) ranged from 88-201 mL/g throughout the month. The variability in SVI had little to no impact on effluent quality.

Aeration tank air use averaged 71 million-ft<sup>3</sup>/day for the month. Daily use was usually in the 65 – 75 million-ft<sup>3</sup>/day range, with a peak use of 81 million-ft<sup>3</sup>/day. DO setpoints in Passes 1&2 and 3&4 were increased throughout the month to maintain minimal nitrification/dentrification.

**Nutrient Removal and Puget Sound Nutrient (Nitrogen) General Permit (PSNGP).** Nitrogen (N) removal averaged 56%. Effluent ammonia (NH<sub>3</sub>) and nitrite plus nitrate (NO<sub>2</sub>+NO<sub>3</sub>) averaged 25.1-mg/L as N and 5.2-mg/L as N, respectively, resulting in an average effluent Total Inorganic Nitrogen (TIN) of 30.3-mg/L as N. On a mass (as N) basis, the daily average effluent NH<sub>3</sub>, NO<sub>2</sub>+NO<sub>3</sub>, and TIN loads were 12,363-lbs./day, 2,479-lbs./day and 14,843-lbs./day, respectively. South Plant's effluent TIN load in October was well under STP's permitted effluent TIN action level of 20,110-lbs/d (which is the daily average of the 7.34 million lbs. action level for South Plant based on 365 days). Thus, the monthly total effluent TIN load in October was 460,126-lbs, and the year-to-date effluent TIN load is 2,492,152-lbs, based on seven months since April 2022 was the first month of permit coverage. Through October, South Plant averaged 57% of the allowable South Plant effluent TIN load under the PSNGP, thereby allowing WTD to average 83% and be 1.62-million-lbs. below the agency bubbled action level.

Phosphorus (P) removal in October averaged 60% which is within the typical 60-75% range. Effluent Total-P averaged 3.30-mg/L or 1,604-lbs/day with a range of 676-2,100 lbs/day.

**Disinfection:** 35,156 gallons of 12.5% sodium hypochlorite (NaOCl) were used to disinfect STP's final effluent in October. This resulted in an average dose of 2.3-mg/L as chlorine (Cl<sub>2</sub>)

based on effluent flow. Daily hypochlorite use was usually in the 1100 gpd range, but there were a few days where usage was 1400-1800-gpd. Short-term doses (6-10 mg/L dose for 2-hours) were applied to control bio-growth on the surfaces of the contact channels (CCCs) and ETS forebay. Dechlorination via sodium bisulfite was not required. RAS chlorination was not practiced in October. Influent pre-chlorination was not practiced in October.

Both the north and south CCCs were in service. A gate between the north and south CCCs near POD4 forced PODs 5&6 effluents to flow down the south CCC while PODs 1-4 effluent flowed down the north CCC. The north CCC was disinfected using the “west” hypochlorite system and the south CCC was disinfected using the “east” hypochlorite system.

**DAFT:** An average of 98 dry-tons/day (0.41-mgd at 6.0% TS) of thickened raw sludge (THS) was produced by the DAFTs. DAFT 3 was out of service in the first half of the month and DAFT 6 was out of service for the second half of the month. Therefore 5 of 6 DAFTs were in service the entire month. 13,200-lbs of polymer (Polydyne WE-1531) were added to DAFT feed sludge in October. The solids loading rate (SLR) averaged 22.7 lbs./d/ft<sup>2</sup> for the smaller DAFTs and 28.3 lbs./d/ft<sup>2</sup> for the larger DAFTs. All DAFTs had 1 pressurization system in service all month.

**Anaerobic Digestion:** Time and temperature requirements for Class B biosolids were met via digestion. All five digesters were in service. Digesters 1-4 were the primary digesters, operated in parallel and fed equal amounts of THS. Each discharged to Digester 5 which served as the blending tank before dewatering. Over the month, the digester detention time averaged 27-days with Digester 5 providing an additional 7-days. Volatile solids (VS) reduction among all of the digesters averaged 60.5% and total solids (TS) destruction averaged about 54%.

The VS loading rate averaged about 0.12-lbs./day/ft<sup>3</sup> for the four primary digesters. The VS/TS percent entering and leaving the digestion process averaged 89% and 75%, respectively. The alkalinity levels were in the range of 5,950-7,700 mg/L as calcium carbonate (CaCO<sub>3</sub>) for Digesters 1-4. Average digester temperatures were in the 96-101°F range. The HRS temperature setpoint for the plant heat loop was increased from 130°F to 145°F due to increased digester flow and heating issues on 2 of the 4 Digesters (Digesters 1 and 2).

The gas and pumped mixing systems of the digesters operated in a “normal” mode. In other words, one of the two gas mixing compressors were in service per digester, and the “C-1” bottom-to-top pumped mixing system pumped directly to the top of the digesters (instead of into the “C-2” side-to-side pumped system). Air-spargers are available to control any accumulation of scum/sludge on the digester covers.

284,890 therms of scrubbed gas (biomethane) were sold to the pipeline. 8,266 therms, or 2.8% of the biogas produced was flared. No scrubbed gas was used in the boiler or Cogen.

Cogen was run to maintain operation of turbine 2. Turbine 1 is not available. The solids boiler was operated to heat STP and consumed 37,000 therms of natural gas.

**Dewatering/Biosolids:** 1,414 dry-tons biosolids (6,343 wet-tons at 22.3% TS) were hauled in October. Approximately 69% of the biosolids (based on wet tons) were distributed to Western Washington (WA) forest sites and 31% to Eastern WA agricultural sites. An estimated 63,200 lbs.-active polymer were applied for dewatering biosolids resulting at an average dose of 45 lb.-active/dry ton hauled. The polymer was Polydyne WE1514, a 43% active cationic emulsion solution.

Biosolids were dewatered on 30 days. Dewatering operation was essentially 24-hour shifts on weekdays and half-day shifts on weekends, with two centrifuges typically in operation and the third centrifuge brought on-line infrequently. Centrifuge feed rates were usually in the range of 150-170 gpm per each centrifuge when in service. Gas-scrubbing water was sent to the centrate sump to provide struvite control. Centrate was valved to the DAFTs.