

Memorandum

March 13, 2024

TO: Historical Memo

FROM: Andy Strehler, Process Engineer; Rachael Dyda, Process Supervisor; Curtis Steinke, Process Engineer

SUBJECT: South Treatment Plant (STP) DMR Memo
February 2024 Operating Record

STP met its conventional permit limits for secondary effluent. Operation in February 2024 was characterized by typical rainfall and temperatures. The plant was operating to select for phosphate accumulating organisms (PAOs) and did not operate for nitrification/denitrification in February. The SVI decreased throughout the month, starting at 145 mL/g and ending at 92 mL/g. Additional observations include good effluent quality, lower septage loading, stormwater valved to the influent the entire month and an average of <0.1-mgd of flow from the Brightwater service area.

Climate

February rainfall was slightly higher than normal and temperatures were on average slightly warmer than normal when compared to historical averages. Rainfall (3.84-inches at SeaTac Airport) was slightly higher than the historical average (3.76-inches at SeaTac Airport). The observed daily average high and low air temperatures were 58°F and 29°F. The average monthly maximum and minimum air temperatures were 49.6°F and 39.1°F which are 0.7°F lower and 1.4°F higher than the maximum and minimum long-term averages, respectively. The average wastewater effluent temperature ranged from 57.4°F to 59.5°F throughout the month.

Effluent Quality

Effluent flow averaged 81.3-mgd, which falls within the historical February flow range. Final effluent quality for the month averaged 3-mg/L carbonaceous BOD (CBOD₅), 5-mg/L TSS and 10-mg/L total BOD₅. Respective removals were 98%, 98% and 96%. Maximum weekly average values were 4-mg/L, 6-mg/L and 12-mg/L, respectively. All conventional permit limits for secondary effluent were met.

Offsite Flows and Loads

1.35-MG of septage was received at STP in February, which accounted for an estimated 5% of STP's influent solids load and was approximately 20% less than in February of 2023. Southern Transfer (aka Allentown) flow averaged 8.3-mgd, with a peak-daily flow estimate of 20-mgd on Feb. 29. York P.S. flow (i.e., Brightwater based flow) averaged <0.1-mgd, accounting for less than 1% of the monthly flow and TSS loads at STP. Brightwater diverted no flow to STP via the North Creek Pump Station and the York Diversion Gate at Hollywood Pump Station diverted minimal flow on three days. The Port of Seattle sent an estimated 98,000 total pounds of BOD (as deicer) to STP over 15 days in February.

Sampling and Analyses

All permit-required samples (influent and effluent) were collected and analyzed. The final ETS effluent sample line/sampler was usually chlorinated every fourth day. Influent flow, including recycled flows, ranged from 77.2-mgd to 126.8-million gallons per day (mgd) with an average of 87.6-mgd. Daily effluent flows ranged from 70.4-mgd to 120.0-mgd with an average flow of 81.3-mgd. Typically, around 6-8-mgd of the total influent flow is from various internal processes and is returned to the influent via the plant sanitary drain system, causing the influent flow to be higher than effluent flow. The measured influent loads averaged 62-tons/day CBOD₅, 78-tons/day BOD₅, and 80-tons/day TSS. The average monthly effluent chlorine (Cl₂) at the ETS outfall was <59-ug/L with minimum and maximum daily average values of <50 and 120-ug/l, respectively. This is well below the permitted max-day limit of 750-ug/L and the monthly average limit of 500-ug/L.

STP Facility Area Status

Primary Treatment: There were 4 north and 8 south primary tanks in service all month. The primary effluent TSS averaged 71-mg/L, resulting in an average TSS removal rate in the primary clarifiers of 68%. Primary effluent CBOD averaged 103-mg/L resulting in an average CBOD removal rate across the primaries of 40%. The hydraulic loading rate (HLR) ranged from 1,114 – 1,829-gpd per ft², with an average of 1,264-gpd per ft².

Secondary Treatment:

All four ATs were in service all month. 19 to 23 of 24 secondary clarifiers were in service all month; clarifier 8 was out of service all month due to a leaking collector seal, and clarifiers 9 – 12 were out of service on Feb. 2 and for one half day on Feb. 7 to repair leaks in RAS piping to POD-3. The POD5 effluent control valve continues to be operated manually. STP operated the secondary process to select for PAO population for enhanced secondary settling and high-flow operation. Settled sewage feed gates were in plug flow mode all month (i.e., AT feed gates open only in Pass-1).

Average MLSS concentration ranged from 2,388 – 2,988-mg/L, with a monthly average concentration of 2,732-mg/L. The solids retention time (SRT) ranged from 4.0 – 5.4-days, with an average of 4.5-days. The average mixed liquor settling (SVI) was much better in February than in January, ranging from 92 – 145-mL/g, with an average of 125-mL/g. SVI

trended downward all month with values the last week of the end between 92 – 111 mL/g. The RAS strategy was operated as a percentage of effluent flow all month. RAS flow rates varied between 2.6 to 3.2-mgd per secondary sedimentation tank in service throughout the month. One out of 12 Anaerobic Zone mixers was out of service for most of the month.

Aeration tank air use ranged from 56.8 – 67.4-million-ft³/day with an average of 63.1-million-ft³/day for the month. Wasting rates varied throughout the month in response to changes in flow and in activated sludge inventory. WAS flow rates to the DAFTs varied between 1.5 to 1.8-mgd and averaged 1.75-mgd. DO setpoints in passes 1-4 the first half of the month were at 2.7 mg/L and were increased to 3.0 mg/L for the last half of the month. DO probe #5, located ½ way down pass 2, was used for control of airflow to passes 1&2 all month, and DO probe #10 was used to control airflow to passes 3&4 all month.

Nutrient Removal and Puget Sound Nutrient (Nitrogen) General Permit (PSNGP)

STP operated the secondary process for minimal nitrogen removal in February. South Plant plans to start nitrifying again in mid-March in order to meet the bubbled PSNGP annual total inorganic nitrogen action level for 2024. Total Inorganic Nitrogen (TIN) removal averaged -9.5% in February. Effluent ammonia (NH₃) and nitrite plus nitrate (NO₂+NO₃) averaged 33.0-mg/L as N and <0.4-mg/L as N, respectively, resulting in an average effluent TIN of 33.7-mg/L as N. On a mass (as N) basis, the daily average effluent NH₃, NO₂+NO₃, and TIN loads were 22,281-lbs/day, <245-lbs/day and 23,338-lbs/day, respectively. The monthly total effluent TIN load for STP in February was 676,802-lbs, which was 95,217-lbs over STP's individual monthly limit, if STP had a monthly limit (calculated using STP's individual action level of 7.34 million lbs/year divided by 366 days and multiplied by # of days per month if WTD had not bubbled and STP had a monthly limit). All permit-required samples (influent and effluent) were collected and analyzed.

Phosphorus (P) removal in February averaged 76% and effluent Total-P averaged 1.24-mg/L or 832-lbs/day.

Disinfection

31,981 gallons of 12.5% sodium hypochlorite (NaOCl) were used to disinfect STP's final effluent in February. This resulted in an average dose of 1.9-mg/L as chlorine (Cl₂) based on secondary effluent (POD) flow. Hypochlorite use in February averaged 1,103-gpd, which was lower than January's use (1,232-gpd) due to lower monthly flow. Dechlorination via sodium bisulfite was not required.

Both the north and south CCCs were in service. A gate between the north and south CCCs near POD4 directed PODs 5&6 effluents to flow down the south CCC while PODs 1-4 effluent flowed down the north CCC.

DAFT

An average of 96.8-dry-tons/day (0.410-mgd at 5.66% TS) of co-thickened raw and waste activated sludge (THS) was produced by the DAFTs. Between Feb. 1 – 15 there were 4 DAFTs in service (DAFT 2, 3, 4 & 6). During this time DAFTs 2, 3 & 4 operated with one pressurization unit and DAFT 6 operated with two pressurization units. On Feb 15 DAFT 4 was taken out of service due to ongoing issues with its track system, and DAFT 5 was placed back into service. Between Feb. 15 – 29 DAFTs 5 & 6 operated with two pressurization units; DAFT-2 operated with two pressurization units on all but three days and DAFT-3 operated with two pressurization units on all but one day. 18,150-lbs of polymer (Polydyne WE-1531) were added to DAFT feed sludge in February. The solids loading rate (SLR) averaged 27.2-lbs./d/ft² for the smaller DAFTs and 27.9-lbs./d/ft² for the larger DAFTs. SLR ranged from 19.8-lb/ft²/day to 41.4-lb/ft² /day throughout the month.

Anaerobic Digestion

Time and temperature requirements for Class B biosolids were met via anaerobic 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 primary digester detention time averaged 26.3-days with Digester 5 providing an additional 3.1-days. Volatile solids (VS) reduction through the digestion process averaged 61.2%.

The VS loading rate averaged 0.12-lbs./day/ft³ for the four primary digesters. The VS/TS percent entering and leaving the digestion process averaged 86.7% and 71.6%, respectively. The alkalinity concentrations were in the 6,300 – 7,900-mg/L as calcium carbonate (CaCO₃) for Digesters 1-4. Digester temperatures were in the 98 – 101°F range.

Energy

The gas scrubbing system operated and sold biomethane every day in February. 252,720-therms of scrubbed gas (biomethane) was distributed into PSE's pipeline. 13,636-therms, or approximately 5% of the biogas produced, was flared.

Both Cogen Turbines were available in February, and Cogen 1 was operated twice for routine PM.

The boiler operated all of February using the modified HRS temperature control strategy tied to the most open valve operation (MOV) of the digester HRS valves. The digester temperature setpoints were fixed at 99°F, and the HRS temperature varied between 135 - 144°F in cascade control based upon digester HRS valve MOV control.

Dewatering/Biosolids

1,177-dry-tons biosolids (5,463-wet-tons at 21.5% TS) were hauled in February. Approximately 70% of the biosolids (based on wet tons) were distributed to Western Washington (WA) forest sites and 30% to Eastern WA agricultural sites. An estimated

62,800-lbs. of active polymer were applied for dewatering biosolids equal to an average dose of 53.4 lb-active/dry ton hauled. The polymer was Polydyne WE1514, a 43% active cationic emulsion solution.

Dewatering operated on 29 days in February. Dewatering operation was mostly 24-hour shifts on weekdays and half-day shifts on weekends, with two centrifuges typically in operation. Typical centrifuge feed rate ranged between 150 – 230-gpm per each centrifuge in service. Some gas-scrubbing water was sent to the centrate sump to provide struvite control. Centrate was valved to the DAFTs in February. Centrifuges 1, 2 & 3 were in service all month.