

Memorandum

August 12, 2024

TO: Historical Memo

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

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

STP met its conventional permit limits for secondary effluent. The plant continued to partially nitrify/denitrify in July. Secondary effluent was recycled internally with the goal of removing additional nitrate to improve TIN removal. The recycle flow also has the benefit of returning alkalinity to the process and raising the final effluent pH. Additional observations include good effluent quality, higher septage loading compared to July of 2023, but still approximately 60% lower than in July of 2020, 2021 & 2022. Stormwater was valved to the influent the entire month.

Climate

July rainfall was significantly lower than normal and average temperatures were higher compared to historical averages. 0.16-inches of rainfall fell at SeaTac Airport which was much lower than the historical average of 0.60-inches. The majority of the rainfall (0.13-inches) occurred on July 29. The observed daily high and low air temperatures were 98°F and 52°F. The monthly average daily maximum and minimum air temperatures were °F and 58.2°F, which are 4.0°F and 1.4°F higher than the maximum and minimum long-term averages, respectively. The average wastewater effluent temperature increased from a low of 70.0°F in early July to 72.9°F by the end of the month.

Effluent Quality

All secondary effluent permit limits were met. Effluent flow averaged 56.6-million gallons per day (mgd), which falls within the historical July flow range. Final effluent quality for the month averaged 3-mg/L carbonaceous BOD (CBOD₅), 4-mg/L TSS and 8-mg/L total BOD₅. Respective removals were 99%, 99% and 98%. Maximum weekly average values were 4-mg/L, 6-mg/L and 9-mg/L, respectively.

Offsite Flows and Loads

1.69-MG of septage was received at STP in July (282,183-lbs at 2% TS), which was similar to June 2024 and approximately 6% higher than in July 2023. However it was nearly 60% lower than July 2022, 2021 or 2020. Septage accounted for an estimated 6.0% of STP's influent solids load for the month. Southern Transfer (aka Allentown) flow averaged 3.7-mgd, with a peak-daily flow estimate of 4.0-mgd on July 29. Brightwater did not divert any flow to STP

via the North Creek Pump Station or the York Diversion Gate at Hollywood Pump Station all month.

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 77.9-mgd to 85.1-mgd with an average of 82.2-mgd. Daily effluent flows ranged from 52.4-mgd to 59.3-mgd with an average flow of 56.6-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. Recycle of secondary effluent continued through July - more detail is provided in the secondary treatment section. The influent loads averaged 66-tons/day CBOD₅, 84-tons/day BOD₅, and 79-tons/day TSS. The average monthly effluent chlorine (Cl₂) at the ETS outfall was <50-ug/L with minimum and maximum daily average values of <50-ug/l. 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 primary tanks in service all month. All 8 of the south primary tanks were out of service the entire month for planned work to the division channel. The reduction in primary tanks resulted in decreased TSS removal rates and increased hydraulic loading rate (HLR) across the remaining primaries in service. The primary effluent TSS averaged 121-mg/L, resulting in an average TSS removal rate in the primary clarifiers of 48%. Primary effluent CBOD averaged 128-mg/L resulting in an average CBOD removal rate across the primaries of 34%. The HLR ranged from 3,372 – 3,682-gpd per ft², with an average of 3,560-gpd per ft².

Secondary Treatment:

Aeration was operated with 4 aeration tanks (AT) in service all month. South Plant operated the secondary process to partially nitrify and denitrify. Settled sewage feed gates were in plug flow mode all month (i.e., AT feed gates open only in Pass-1). An estimated 19.7-mgd of unchlorinated secondary effluent was recycled daily in order to increase denitrification.

Average MLSS concentration ranged from 2,478 – 2,795-mg/L, with a monthly average concentration of 2,682-mg/L. The solids SRT ranged from 3.8 – 5.0-days, with an average of 4.2-days. The average mixed liquor settling (SVI) was higher than in June, with values ranging from 87 – 152-mL/g and a monthly average of 126-mL/g. The RAS flowrate was held constant at 3.0-mgd per clarifier in service, or around 100% of plant effluent flow.

AT air use ranged from 86.5 – 105.1-million-ft³/day with an average of 95.5-million-ft³/day for the month. WAS flows and loads along with dissolved oxygen (DO) setpoints for passes

1&2 and 3&4 varied throughout the month to maintain partial nitrification. DO probe #5, located ½ way down pass 2, was used for control of airflow to passes 1&2 and DO probe #12 was used to control airflow to passes 3&4 all month.

22-18 of 24 secondary clarifiers were in service all month; clarifier 8 was out of service all month due to a leaking collector seal; clarifier 2 was out of service all month to repair a shear pin in its collector mechanism. POD5 clarifiers were taken out of service between in mid-June to accommodate repairs to the effluent control valve; repairs were completed the week of July 22 and refilling of the POD started on July 26 with all 4 clarifier tanks back in service on July 30. On July 30 POD 3 was taken out of service to repair a leak in its effluent collection pipe just downstream of the flow meter.

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

STP operated the secondary process for total inorganic nitrogen (TIN) removal during all of July in order to meet the WTD bubbled PSNGP annual total inorganic nitrogen action level for 2024. TIN removal averaged 59.4% in July. Effluent ammonia (NH₃) and nitrite plus nitrate (NO₂+NO₃) averaged 7.90-mg/L as N and 11.2-mg/L as N, respectively, resulting in an average effluent TIN of 18.7-mg/L as N. On a mass (as N) basis, the daily average effluent NH₃, NO₂+NO₃, and TIN loads were 3,761-lbs/day, 5,278-lbs/day and 8,794-lbs/day, respectively. South Plant recycled approximately 611-MG of chlorinated effluent to the influent in July to increase denitrification; which resulted in an estimated 51,340-lbs of additional TIN removal. The monthly total effluent TIN load for STP in July was 272,623-lbs, which was 349,071-lbs below 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 July averaged 73% and effluent Total-P averaged 2.60-mg/L or 1,248-lbs/day.

Disinfection

42,445 gallons of 12.5% sodium hypochlorite (NaOCl) were used to disinfect STP's final effluent in July. This resulted in an average dose of 2.5-mg/L as chlorine (Cl₂) based on secondary effluent (POD) flow. Hypochlorite use in July averaged 1,369-gpd, which was slightly lower than in June. Dechlorination via sodium bisulfite was not required.

Both the north and south CCCs were in service. The recycle of unchlorinated secondary effluent to the influent continued in July. Effluent flow was disinfected using the east CCC disinfection pumps; PODs 1-4 flow was directed east to meet the POD 5&6 effluent flow, from there the combined disinfected effluent flowed west along the south CCC and on to the ETS forebay.

DAFT

An average of 85.0-dry-tons/day (0.386-mgd at 5.28% TS) of co-thickened raw and waste activated sludge (THS) was produced by the DAFTs. The THS TS values were typical all month. There were 5 DAFTs in service (DAFTs 2 – 6) the entire month. Each DAFT operated with 1 pressurization system all month to meet the appropriate air to solids loading ratio for proper operation. 14,850-lbs of polymer (Polydyne WE-1531) were added to DAFT feed sludge in July. The solids loading rate (SLR) averaged 19.9-lbs./d/ft² for the smaller DAFTs and 19.3-lbs./d/ft² for the larger DAFTs. SLR ranged from 16.1-lb/ft²/day to 25.5-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 28.1-days with Digester 5 providing an additional 4.2-days. Volatile solids (VS) reduction through the digestion process averaged 55.6%.

The VS loading rate averaged 0.11-lbs./day/ft³ for the four primary digesters. The VS/TS percent entering and leaving the digestion process averaged 87.3 and 75.2%, respectively. The alkalinity concentrations ranged from 4,642 – 7,534-mg/L as calcium carbonate (CaCO₃) for Digesters 1-4. Digester temperatures ranged from 97 – 98°F.

Energy

The gas scrubbing system operated and sold biomethane until July 25 when PSE requested that biomethane gas be diverted from the main pipeline due to emergency repairs. An estimated 257,535-therms of biomethane gas were produced and 173,910-therms of scrubbed gas (biomethane) were distributed into PSE's pipeline. 51,209-therms of biomethane gas were flared.

Cogen Turbines 1 & 2 were not operated in July.

The boilers in the cogen facility supplied the plant heat loop during all of July. The solids area gas-fired boiler was off all month. The digester temperature setpoints were set at 97.5°F the entire month.

The treatment plant was operated to partially nitrify and denitrify all of July. This required additional energy use: higher aeration rates to achieve nitrification, higher RAS pumping rates, and re-treatment of effluent recycled to the influent to enhance denitrification.

Dewatering/Biosolids

1,194-dry-tons biosolids (5,933-wet-tons at 20.1% TS) were hauled in July. Approximately 67% of the biosolids (based on wet tons) were distributed to Western Washington (WA) forest

sites and 33% to Eastern WA agricultural sites. An estimated 54,831-lbs. of active polymer were applied for dewatering biosolids equal to an average dose of 45.9 lb-active/dry ton hauled. The polymer was Polydyne WE1514, a 43% active cationic emulsion solution.

Dewatering operated on 31 days in July. Dewatering operation was 24-hour shifts on weekdays and half-day shifts on weekends. Two centrifuges were typically in service during dewatering operations. Centrifuges 1 & 2 operated all month and did the bulk of dewatering; centrifuge 3 was utilized for polymer trial during two weeks of the month. Typical centrifuge feed rate ranged between 150 – 180-gpm per each centrifuge in service, but feed rates were as high as 230 gpm on four days to accommodate hauler schedule. Some gas-scrubbing water was sent to the centrate sump to provide struvite control. Centrate was valved to the DAFTs in July.