

Memorandum

February 14, 2023

TO: Historical Memo

FROM: Rachael Dyda, Process Supervisor; Curtis Steinke, Process Engineer; Matt Macdonald, Process Engineer

SUBJECT: South Treatment Plant at Renton (STP)
January 2023 Operating Record

The STP met its conventional permit limits for secondary effluent. Operation in January 2023 was characterized by below average rainfall and cooler than normal temperatures. Daily effluent flows ranged from 70.4-mgd to 99.5-mgd. Additional observations include good effluent quality, little nitrification/denitrification, normal septage loads, normal flow/load from the Brightwater service area and no process tanks out of service. A drain gate in secondary sedimentation tank 8 was left open when the tank was placed back in service, resulting in a substantial amount of secondary biomass being wasted unintentionally, high solids loading to the DAFTs and non-representative influent samples. The Port of Seattle discharged high strength deicer throughout the month of January. Reclaimed water was used for internal purposes only; there was no off-site Class A Reclaimed Water discharged in January.

Climate

January was cooler and experienced significantly less rainfall when compared to historical averages. Rainfall (3.09-inches at SeaTac Airport) was 46% lower than the historical average (5.78-inches at SeaTac Airport). Daily observed high and low air temperatures were 59°F and 24°F. The average monthly maximum and minimum temperatures were 43.2°F and 34.4°F which was 3.8°F and 2.7°F lower than the maximum and minimum long-term averages, respectively. The wastewater effluent temperature had little fluctuation throughout the month, with high and low temperatures of 59.4 °F and 57.9°F.

Effluent Quality

Effluent flow averaged 82.9-mgd this month. All flows received secondary treatment, i.e., no flows were diverted around the secondary process. Final effluent quality averaged 5-mg/L carbonaceous BOD (cBOD₅), 9-mg/L TSS and 8-mg/L total BOD₅. Respective removals were 98%, 96% and 97%. Maximum weekly-average values were 6-mg/L, 11-mg/L and 12-mg/L, respectively. All conventional permit limits for secondary effluent were met.

Offsite Flows and Loads

2.51-MGD of septage were received at South Plant in January. which accounted for an estimated 9% of STP's influent solids load. Southern Transfer (aka Allentown) flow averaged 9.0-mgd, with a peak-daily flow of 16-mgd on January 13. York P.S. flow (i.e., Brightwater based flow) averaged 0.3-mgd, accounting for less than 1% of the monthly flow and less than 1% of the influent TSS load at STP.

Deicer: Due to high SVIs (i.e. a decay in the ML settleability), South Plant restricted deicer loads from the Port of Seattle sent to STP in January. The deicer BOD load averaged about 5.3 tons per day (tpd) in January with a max-day load of 9-tpd January 1-3. Deicer accounted for approximately 8.5% of the influent CBOD load over the month, and 13% during the max-day loads. Deicer was sent to STP on 29 days in January.

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 other day. The measured influent loads averaged 80-tons/day BOD₅, 66-tons/day cBOD₅, and 73-tons/day TSS. These loads excluded influent composites from January 6 and 7 where the influent was non-representative due to excessive solids from the drain in tank 8 being left open and solids being recycled through the plant influent. The average monthly effluent chlorine (Cl₂) at the ETS outfall was <0.09-mg/L with minimum and maximum daily average values of <0.05 and 0.25-mg/L, respectively. This is well below the permitted max-day limit of 0.75-mg/L and the monthly average limit of 0.5-mg/L.

STP Facility Area Status

Primary Treatment: All four north primary tanks and all eight south primary tanks were in service. The primary effluent TSS averaged 70-mg/L, resulting in an average TSS removal rate of 67%. Primary effluent CBOD averaged 103-mg/L resulting in an average CBOD removal rate of 44%. The hydraulic loading rate (HLR) ranged from 1,103-1,538 gpd per ft².

Secondary Treatment: All four ATs were in service all month with between 22-24 (of 24 total) secondary clarifiers in service. During January the secondary process was operated to maintain a PAO population. Settled sewage feed gates were in plug flow mode (i.e., AT feed gates open only in Pass-1) for most of the month, with the exception of January 20-25 when the plant was switched to step feed (6-0-2-0 configuration) to try and improve mixed liquor SVIs. Clarifier 8 was out of service for repairs at the beginning of the month and returned to service on January 6. As previously mentioned, the drain gate was inadvertently left open until January 8, returning solids to headworks and causing the influent composite sample to be non-representative. The majority of the returned solids were removed in the primary treatment process, resulting in significantly reduced biomass in the secondary treatment process and excessive solids loading on the DAFTs.

The MLSS concentration was in the 1,884-2,893 mg/L range with a solids retention time (SRT) range of 3.4 to 5.7 days, with an average monthly SRT of 4.4-days. With STP not

needing to denitrify and to support PAO growth, the RAS flowrate was changed from a fixed flow rate of 2.9-MGD per clarifier for the first 2 days of the month to 40% of flow, or from around 67-mgd down to 39-mgd daily. Mixed liquor settling (SVI) ranged from 94-228 mL/g throughout the month. Higher SVIs occurred after the high strength deicer trial in December and continued through the majority of January.

Aeration tank air use averaged 59 million-ft³/day for the month. Daily use was usually in the 56 - 60 million-ft³/day range, with a peak use of 66 million-ft³/day. DO setpoints in Passes 1&2 and 3&4 were increased in response to the higher BOD loading into secondary from the high strength deicer and unusually poor mixed liquor settleability.

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

Nitrogen (N) removal averaged -7.3% (influent TIN load vs. Effluent TIN load). Effluent ammonia (NH₃) and nitrite plus nitrate (NO₂+NO₃) averaged 31.1-mg/L as N and <0.2-mg/L as N, respectively, resulting in an average effluent Total Inorganic Nitrogen (TIN) of 31.3-mg/L as N. On a mass (as N) basis, the daily average effluent NH₃, NO₂+NO₃, and TIN loads were 21,269-lbs./day, 143-lbs./day and 21,412-lbs./day, respectively. South Plant's effluent TIN load in January was 106% of STP's individual 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) if WTD had not bubbled. Thus, the monthly total effluent TIN load for STP in January was 663,757-lbs, and the year-to-date effluent TIN WTD bubbled load was 1,422,716-lbs, which is 79,098 lbs over the bubbled limit. This higher TIN discharge is a result of a lack of nitrification by South Plant during the colder (water and air temperatures) winter months. In comparison, in 2022 (between April and December), STP averaged 64% of the allowable STP effluent TIN load under the PSNGP; in the same time period, WTD averaged 84% of the bubble action level (15.82 million-lbs/year) and was 1.794-million-lbs. below the bubble action level.

In-situ sensors measuring ammonia and nitrate in the secondary influent and at the end of the aeration basin remained in service in January. They will be removed in early February.

Phosphorus (P) removal in January averaged 71% which is within the typical 60-75% range. Effluent Total-P averaged 1.27-mg/L or 875-lbs/day with a range of 599-1,162-lbs/day.

Disinfection

33,788 gallons of 12.5% sodium hypochlorite (NaOCl) were used to disinfect STP's final effluent in January. This resulted in an average dose of 1.58-mg/L as chlorine (Cl₂) based on effluent flow. Daily hypochlorite use was usually in the 1,100 gpd range. 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 and influent pre-chlorination were not practiced in January.

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 95.7 dry-tons/day (0.43-mgd at 5.3% TS) of thickened raw sludge (THS) was produced by the DAFTs. DAFT 4 was taken out of service on 11/26 due to failure of its track system that also damaged two truck and wheel assemblies and was out of service throughout December and January. 5 of 6 DAFTs were in service the entire month of January. 16,500-lbs of polymer (Polydyne WE-1531) were added to DAFT feed sludge in January. The solids loading rate (SLR) averaged 19.5 lbs./d/ft² for the smaller DAFTs and 22.1 lbs./d/ft² for the larger DAFTs. SLR ranged from 10.7-lb/ft²/day to 40.0-lb/ft²/day throughout the month. All DAFTs had 1 pressurization system in service for most of the 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 primary digester detention time averaged 26-days with Digester 5 providing an additional 4.1-days. Volatile solids (VS) reduction among all of the digesters averaged 61.1%.

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 87.8% and 73.7%, respectively. The alkalinity levels were in the range of 5,128-7,328 mg/L as calcium carbonate (CaCO₃) for Digesters 1-4. Digester temperatures were in the 98-100.1°F range. The HRS temperature setpoint for the plant heat loop was maintained at 155°F in January due to continued heating issues resulting from struvite precipitation decreasing heat transfer. Digester 2 heat loop piping was acid washed to remove struvite in December 2022. On January 11, 2023 the Digester 1 heat loop was taken out of service (and feed to the digester was stopped) to install equipment that will facilitate acid washing in early February. Standard operation of Digester 1 resumed on January 12.

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 and the “C-2” pumped mixing system pump from side-to-side and heated the digesters.

Energy

The scrubbed gas system operated at reduced total production between January 5-13 and January 29-31. On January 5 scrubber water pump 3 was taken out of service for repairs. With scrubber water pump 2 already out of service, scrubber tower 2 had to be taken out

of service until a scrubber water pump was repaired on January 13. From January 29 through January 31, scrubbed gas was sold intermittently due to various issues. On January 31 PSE contacted operations to discuss an unrealistically high gas BTU content.

254,650 therms of scrubbed gas (biomethane) was distributed into PSE's pipeline. 58,079 therms, or approximately 18.5% of the biogas produced was flared. Cogen Turbine #2 was operated on Jan. 4, 5 and 9 to assist with power fluctuations that shut equipment off. Cogen Turbine 1 is not available. The solids gas-fired boiler operated all month to heat STP. The maintenance building electric boiler and main control electric boiler were operated all month.

Dewatering/Biosolids

1,256 dry-tons biosolids (6125 wet-tons at 20.5% TS) were hauled in January. Approximately 95% of the biosolids (based on wet tons) were distributed to Western Washington (WA) forest sites and 5% to Eastern WA agricultural sites. An estimated 69,610 lbs.-active polymer were applied for dewatering biosolids equal to an average dose of 51.3 lb.-active/dry ton hauled. The polymer was Polydyne WE1514, a 43% active cationic emulsion solution.

Dewatering operated 31 out of 31 days in January. Dewatering operation was essentially 24-hour shifts on weekdays and half-day shifts on weekends, with two centrifuges typically in operation. Typical centrifuge feed rate ranged was 230 gpm per each centrifuge when in service. Some gas-scrubbing water was sent to the centrate sump to provide struvite control. Centrate was valved to the DAFTs for all of January.