

Memorandum

August 12, 2021

TO: Historical Memo

FROM: Rick Butler. Process Control Supervisor

SUBJECT: South Treatment Plant at Renton (STP)
July 2021 Operating Record

Operations in July 2021 was characterized by very low flows, very dry weather, slightly warmer than usual air temperatures, increasing wastewater temperatures, good effluent quality, no nitrification, no deicer, essentially no wastewater flow from the Brightwater service area, scrubbed gas sales all month, steady offsite reclaimed water application, various process tanks remaining and going out of service for summer maintenance, and the end to the hypochlorite supply chain issue.

The STP met all its conventional permit limits for secondary effluent. Final effluent quality averaged 4-mg/L carbonaceous BOD (cBOD₅), 7-mg/L TSS and 10-mg/L total BOD₅. Respective removals were 99%, 98% and 98%.

Flow averaged 52-mgd, with 0.3-mgd of that total from the Brightwater service area (most of it as effluent or reclaimed water). Flows throughout a 24-hour day usually reached a minimum of 30-mgd and a high near 70-mgd. The max-day flow was 55-mgd on July 1. All flows received secondary treatment, i.e., no flows were diverted around the secondary process.

No measurable rain fell in July (Seatac Airport), though there were several days with a “trace” of precipitation. July’s historic rainfall average is 0.6-inches; the highest recorded July rainfall is 2.39-inches (1983). Daily high and low air temperatures averaged 79°F and 57°F which are 2°F and 0.1°F higher than long-term averages, respectively. Maximum air temperatures “only” reached 91-92°F this month. The wastewater temperature continued to increase this summer, jumping 3°F across the month from 72°F to 75°F

Offsite Flows and Loads: 2.75-MG of septage were received at South Plant in July, accounting for about 9% of STP’s influent solids load. Southern Transfer (aka Allentown) flow averaged 3.6-mgd with max-day flow of 3.7-mgd on several days. York P.S. flow (i.e., Brightwater based flow) averaged 0.3-mgd with a max-day flow of 1.5-mgd on July 7. York/BW flows accounted for <1% of the influent TSS load at the STP. No deicer was sent to the STP in July.

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. Measured influent loads averaged 87-tons/day BOD₅, 60-tons/day cBOD₅, and 82-tons/day TSS. These values are in line with values that would be expected with the conditions of July, i.e., normal septage loads, no deicer and low loads from Brightwater. The effluent chlorine (Cl₂) at the ETS outfall was below the 0.75-mg/L daily average and 0.5-mg/L monthly average limits.

STP Facilities Status: In July, several process tanks remained out of service, and a couple more were taken out of service, for annual preventive maintenance (PM), process optimization and energy savings. The secondary process was operated to avoid nitrification. The gas scrubbing system operated at full capacity all month with high quality gas injected into PSE's natural gas pipeline. Process heat was provided by the solid's boiler (fueled by natural gas) only; the electric boilers in main control and the maintenance building were off. Chillers provided cooling for various spaces including occupied facilities and computer rooms. Class-A reclaimed water (RW) was applied offsite throughout the month and used for internal process applications all month. The supply chain issue with sodium hypochlorite was essentially resolved in early July; the disinfection of secondary effluent and reclaimed water continued without interruption.

8 of 12 primary clarifiers, 4 of 4 aeration tanks (ATs), 17 of 24 secondary clarifiers, and 2 of 2 chlorine contact channels (CCC) were in service most of the month. The North Primary Tanks remained out of service for summer maintenance. Aeration Tank 3 was taken out of service July 29 to install a safety system and make scheduled repairs to aeration equipment and baffle walls. Secondary Clarifier POD 4 (tanks 13 - 16) and Clarifier tanks 3, 9 and 20 remained out of service for maintenance and process reasons. The north CCC (and west hypochlorite dosing system) was taken out of service on July 20 to complete PMs and a maintenance project. Five of six DAFTs were in service all month; DAFT1 was out of service for planned maintenance. Four of five anaerobic digesters were in service; Digester 5 was out of service for cleaning and maintenance. Digester 2 was operated as the blending storage tank, receiving flow from the other three digesters. Dewatering operated every day. On July 31, STP operated with 8 primary tanks, 3 ATs, 17 secondary clarifiers, one CCC, 5 DAFTs and four digesters.

Primary Treatment: 8 of 12 primary tanks were in service; the four north primary tanks remained out of service. Primary effluent TSS and BOD averaged 98-mg/L and 200-mg/L, respectively, with average monthly TSS and BOD removals of 71% and 46%. The hydraulic loading rate (HLR) averaged 1301-gpd per ft² of tank surface area. The max-day HLR was only 1355-gpd per ft².

Secondary Treatment: The secondary process was operated to grow phosphorus accumulating organisms (PAOs) and to avoid nitrification. Four ATs were in service all

month until July 29 when AT3 went out of service to install safety equipment and make scheduled repairs. The ATs were operated in plug flow mode (i.e., AT feed gates open only in Pass-1). A ½-pass un-aerated zone in Pass-1 was maintained throughout the month. 17 of 24 secondary clarifiers were in service all month.

The MLSS concentration averaged 2600-mg/L over the month, with values usually in the 2300-3000 mg/L range. The solids retention time (SRT) averaged 4.5 days, usually ranging from 4.3-days to about 5.0-days before AT3 was taken out of service. The RAS return rate was 60% all month to help with denitrification in case the secondary process started to nitrify. Biomass settling was very good in July, with the sludge volume index (SVI) usually in the 40 - 80 mL/g range. Aeration tank air use averaged 69 million-ft³/day for the month, with daily use usually in the 65-75 million-ft³/day range. D.O. setpoints were in the 1.75-mg/L range for both Passes 1&2 and 3&4 throughout the month.

Nutrient Removal. Nitrogen (N) removal averaged 41%. Effluent ammonia (NH₃) averaged 35-mg/L as N and 15,358-lbs/day. Effluent nitrite plus nitrate (NO₂+NO₃) averaged 0.7-mg/L as N. Phosphorus (P) removal averaged 66%. Effluent Total-P averaged 3.3-mg/L and 1459-lbs/day. Effluent alkalinity was in the range of 100,000 - 110,000 lbs./day as CaCO₃. Analyses for N and P constituents were usually performed once per week (Tuesday samples only). NH₃ analysis was also performed on Sunday samples.

Disinfection: 40,863 gallons of 12.5% sodium hypochlorite (NaOCl) were used to disinfect STP's final effluent in July. This resulted in an average dose of 3.0-mg/L as chlorine (Cl₂) based on effluent flow. Daily hypochlorite use was usually in the 1000-1500 gpd range except during the second week when much higher doses were required to achieve weekly permit-required fecal coliform levels. Higher short-term doses (6-10 mg/L dose for 2-hours) were applied every other week – restarting in early July when the hypochlorite supply chain issue was abated - to control bio-growth on the surfaces of the contact channels and ETS forebay. The daily Cl₂ residual at the ETS outfall was always <0.50-mg/L. Dechlorination (via sodium bisulfite) was not required. RAS chlorination was not practiced.

Both the south and north CCCs were in service until June 20 when the north CCC was taken out of service for scheduled PMs and to complete a maintenance project. Only the south CCC was in service afterwards. The switch to operating with only the south CCC was achieved by 1) removing the gate between the north and south CCCs at POD4, 2) installing a gate in the north CCC just west of POD 1 and 3) installing a gate in the south CCC just downstream of the ETS “falls”. With these gates moves, all POD1-4 effluent flowed eastward in the north CCC until it entered the south CCC at POD4 where it combined with POD5-6 flows. The combined POD flows were then disinfected in the south CCC using the east hypochlorite system.

Prechlorination: Prechlorination was not practiced in July, except for one day. Historically, prechlorination has been practiced only for notable odor issues which tend to occur in

summer. Prechlorination had been continually in service from spring 2020 through June 2021 to provide an additional layer of COVID-19 protection for the staff working in STP. Prechlorination was stopped in early June 2021 in response to the hypochlorite supply chain concern. After hypochlorite supply concerns were lowered in early July, prechlorination was not restarted since state/county mask policies and work from home orders had been removed/eased, and odors were not at a notable level.

DAFT: An average of 84 dry-tons/day (0.32-mgd at 6.3% TS) of thickened raw sludge (THS) was produced by the DAFTs. Two large DAFTs and three small DAFTs were in service all month; DAFT-1 remained out of service. 13,200-lbs of polymer (Polydyne WE-1531) were added to DAFT feed sludge in July for an average dose of 5.1-lb active/dry ton THS or 2.7-lb active/dry ton DAFT feed solids. (While the average polymer dose in June was much higher than seen in previous months, the polymer dose in July was more in line with average doses early in the year.) The solids loading rate (SLR) averaged near 22-23 lbs./d/ft² for both the larger and smaller DAFTs. Only one fizz system per tank was operated through the month. Filtrate from the dewatering of Digester 5 cleanings had little impact on the influent loads to, or the operations of, the DAFTs this month.

Anaerobic Digestion: Time and temperature requirements for Class B biosolids were met via digestion. In July, Digesters 1, 3 and 4 were fed THS (equal amounts) and each of them discharged to Digester 2 which then discharged to the dewatering process. Digester 2 operated as a blending storage tank because Digester 5 was out of service for cleaning and planned maintenance. The average digester detention time was 34-days, with 9-days provided by Digester 2 as the blending storage tank. Over the month, volatile solids (VS) reduction averaged 62.9% and total solids (TS) destruction averaged about 55%. Digesters temperatures were held in the 98-100°F range. The VS loading rate averaged about 0.14-lbs./day/ft³ for the three primary digesters (1, 3 and 4). The VS/TS percent entering and leaving the digestion process averaged 87.3% and 71.8%, respectively. Digester 1, 3 and 4 alkalinity levels were usually in the range of 7300-8000 mg/L as CaCO₃.

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.

Dewatering/Biosolids: 1097 dry-tons biosolids (4857 wet-tons at 22.6%TS) were hauled in July along with 137 dry tons (283 wet tons @ 48%TS) of Digester 5 cleanings. (“Cleanings” are essentially inert solids such as sand, grit, struvite, etc. and a small amount of biosolids that have accumulated on the bottom of the digester.) The dry tons of digested solids produced (excluding digester cleanings) was essentially equal to the dry tons hauled since the digester inventory changed very little over the month. Biosolids were distributed between Eastern WA. agricultural sites and Western WA. forest lands in a 25:75 split (wet

tons). Digester 5 cleanings were all distributed to Eastern WA. (A total of 376 wet tons of digester cleanings were distributed in June and July.)

An estimated 55,000 lbs.-active polymer were applied for dewatering biosolids resulting at an average dose near 50 lb.-active/dry ton hauled. The polymer was Polydyne WE586, a 41.5% cationic emulsion solution. An estimated 150-lbs of DAFT polymer was used to dewater the digester cleanings.

Biosolids were dewatered every day. Dewatering operation was essentially 24-hour shifts on weekdays and half-day shifts on weekends, with two centrifuges usually in operation and the third centrifuge brought on-line occasionally. Centrifuge feed rates were usually near 150 gpm per centrifuge. The belt filter press (affectionately referred to as BFP8) was used to dewater the Digester 5 cleanings. Cleanings were dewatered on six days early in the month. Gas-scrubbing water was sent to the centrate sump to provide struvite control. Centrate was valved to the DAFTs.