

Memorandum

July 14, 2020

TO: Historical Memo

FROM: Rick Butler, Process Control Supervisor

SUBJECT: South Treatment Plant at Renton (STP)
June 2020 Operating Record

Operations in June 2020 was characterized by dry weather, warmer wastewater temperature, good effluent quality, no nitrification, very little deicer, substantial flow/load from the Brightwater service area, scrubbed gas sales all month, on-going offsite demand for reclaimed water, facilities removed from service for summer maintenance, and a maintenance flush of the emergency outfall in the Green River.

June 2020 saw further phased movement to ease the “Stay Home, Stay Healthy” order for COVID-19. Operations at South Plant were little impacted by the new order of business except for changes in the number on-site staff vs. telecommuting staff. Necessary deliveries of chemicals and supplies were received, though delivery times were longer for some chemicals and supplies. Hypochlorite use has increased to provide pre-chlorination as a preventive measure for staff working at the treatment plant. There were few, if any, signs that influent flows or loads – including septage - have changed due to the “Shelter in place” order.

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 8-mg/L total BOD₅. Respective removals were 98%, 98% and 97%.

Flow averaged 66-mgd, with 6-mgd of that total from the Brightwater service area. The max-day flow was 73-mgd (June 1). All flows received secondary treatment, i.e., no flows were diverted around the secondary process.

June’s rainfall totaled 2.28-inches. June’s historic average rainfall is 1.57-inches; the highest recorded is 3.90-inches (1946). The max-day rainfall was 0.56-inches on June 27. Daily high and low air temperatures averaged 70°F and 53°F, respectively, which are each about 1°F warmer than normal. Water temperatures were in the range of 66°F to 70°F.

Offsite Flows and Loads: 2.76-MG of septage were received in June, accounting for 8% of STP’s influent solids load. The Southern Transfer (aka Allentown) flow averaged 4.6-mgd with a max-day flow of 7.8-mgd on June 28. York P.S. flow (i.e., Brightwater based flow)

averaged 6.2-mgd with a max-day flow of 8.5-mgd on June 16. Deicer was sent to the STP on four days in June with daily BOD loads ranging from 110 to 450 lbs/day.

Sampling and Analyses: All permit-required samples (influent and effluent) were collected and analyzed for South Plant's Puget Sound outfall (No. 1) and the Green River outfall (No. 2). The final ETS effluent sample line/sampler was usually chlorinated every other day. Measured influent loads averaged 180,000-lbs/day BOD₅, 134,000-lbs/day cBOD₅, and 184,000-lbs/day TSS. These loads are in range of values expected this time of year with significant Brightwater flow/load and essentially no deicer. The flows/loads from the Brightwater increased STP's influent TSS load by nearly 10%. 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 June, STP was in summer mode with some process units out of service. The secondary process was operated to avoid nitrification. The gas scrubbing system operated at full capacity most of the month; all scrubbed gas was injected into the PSE pipeline for RINs sales. Process heat was provided by the boiler only (fueled by natural gas). Reclaimed water was applied off-site most of the month; it was also used for internal process applications.

10 of 12 primary tanks, 3 of 4 aeration tanks, 15 of 24 secondary clarifiers, and 1 of the 2 chlorine contact channels (CCC) were in service all month. South Primary Tank 1 remained out of service for repairs while South Primary Tank 5 went out of service for PMs. Aeration Tank 1 remained out of service to install safety access equipment and to repair leaky aeration diffusers. Secondary Clarifiers 5 and 9-12 remained out of service for scheduled repairs and PMs. Secondary Clarifiers 1-4 (POD1) also went out of service late in the month for PMs. The south and north CCC were taken out of service sequentially for cleaning prior to the maintenance flush of the Green River outfall diffuser; both CCCs were in service by mid-month. Five of six DAFTs were in service all month. DAFT4 remained out of service for PMs. All five anaerobic digesters were in service. Dewatering operated every day. On June 30, STP operated with 10 primary tanks, 3 aeration tanks, 15 of 24 secondary clarifiers, two CCCs, 5 of 6 DAFTs and all 5 digesters.

Primary Treatment: 10 to 11 of 12 primary tanks were in service. South Primary Tank 1 was out of service all month for repairs and South Primary Tank 5 went out of service on June 21 for PMs. Primary effluent TSS and BOD averaged 96-mg/L and 153-mg/L, respectively, with average monthly TSS and BOD removals of 69% and 49%. The hydraulic loading rate (HLR) averaged 1162-gpd per ft² of tank surface area.

Secondary Treatment: The secondary process was operated to grow phosphorus accumulating organisms (PAOs) and to avoid nitrification. Three aeration tanks were in service all month; Aeration Tank 1 was out of service for maintenance and modifications. 15 to 19 clarifiers were in service. Clarifiers 5 and 9 - 12 (POD3) were out of service all month and Clarifiers 1 - 4 (POD1) went out of service June 22-24. The aeration tanks were operated

in plug flow mode (i.e., aeration tank feed gates open only in Pass-1) with a ½-pass un-aerated zone in Pass-1.

The MLSS concentration was in the 2600-3100 mg/L range with the solids retention time (SRT) in the 3.5 - 4.5 days range. D.O. setpoints were 2.0-mg/L and the RAS return rate was always 40%. Biomass settling was very good with a sludge volume index (SVI) of 70-100 mL/g.

Aeration tank air use averaged 65 million-ft³/day for the month. The higher-than-lately aeration rate was due to warmer water temperatures and the additional flow/load from Brightwater. Aeration was usually in the 62-70 million-ft³/day range in June.

Nutrient Removal. Nitrogen (N) removal averaged 24%. Effluent ammonia (NH₃) averaged 39-mg/L as N. Effluent nitrite plus nitrate (NO₂+NO₃) averaged <0.2-mg/L as N. Phosphorus (P) removal averaged 64% and effluent Total-P averaged 2.3-mg/L. Effluent alkalinity was usually in the range of 130,000 - 140,000 lbs/day as CaCO₃. N&P analyses were usually performed only once per week (on Tuesday samples only).

Disinfection: 46,589 gallons of 12.5% sodium hypochlorite (NaOCl) were used to disinfect STP's final effluent in June. This resulted in an average dose of 2.8-mg/L as chlorine (Cl₂) based on effluent flow. Daily hypochlorite use was usually in the 1400-1800 gpd range. It is unclear why these doses are so much higher than usual. Higher short-term doses (6-10 mg/L dose for 2-hours) were applied every other week to control bio-growth on the surfaces of the contact channels and ETS forebay. The daily Cl₂ residual at the ETS outfall was always <0.1-mg/L. Dechlorination (via sodium bisulfite) was not required for the Puget Sound outfall but was required for the Green River outfall. RAS chlorination for SVI control was not practiced.

Only the south Chlorine Contact Channel (CCC) was in service to start the month. In this configuration, the combined effluents from all secondary clarifier PODs flowed down the south CCC where they were disinfected with the east hypochlorite dosing system. During this time, the north CCC was then cleaned to prepare it for the maintenance flush of the Green River outfall diffuser. The north CCC returned to service on June 8 and the south CCC was gated out of service (but remained full of water). This configuration was used for the maintenance flush of the Green River outfall on June 10, with disinfection provided by the west hypochlorite dosing system. The south CCC was returned to service on June 11, bringing both CCCs into service for the remainder of the month with both the east and west hypochlorite dosing systems.

Prechlorination: Prechlorination was practiced throughout June in order to provide an additional layer of protection for the staff working in STP. A total of 33,747 gallons of 12.5% sodium hypochlorite (NaOCl) was applied for pre-chlorination over the month. The pre-

chlorination dose was usually 15 or 20 gallons per MG of wastewater flow. Prechlorination has historically been practiced only for odor issues which can occur in summer.

DAFT: An average of 94 dry-tons/day (0.37-mgd at 6.1% TS) of thickened raw sludge (THS) was produced by the DAFTs. Two large DAFTs and three small DAFTs were in service all month; DAFT4 remained out of service. 16,500-lbs of polymer were added to DAFT feed sludge in June for an average dose of 5.8-lb active/dry ton THS or 2.9-lb active/dry ton DAFT feed. Polydyne WE-1531 was the polymer used. The solids loading rate (SLRs) averaged 34-lbs./d/ft² for the larger DAFTs and 22-lbs./d/ft² for the smaller ones. One of two fizz systems was in service for each small DAFT while both fizz systems were used for each large DAFT. The larger DAFTs were loaded higher due to the additional load from Brightwater.

Anaerobic Digestion: Time and temperature requirements for Class B biosolids were met via digestion. All four primary anaerobic digesters were in service all month, fed equal amounts of THS, and each discharging to Digester 5. Volatile solids (VS) reduction averaged 63.9% and total solids (TS) destruction averaged about 54%. Digesters temperatures were held in the 97-100°F range. The primary digester VS loading rate averaged 0.12-lbs./day/ft³. The VS/TS ratio entering and leaving the digestion process averaged 87.7% and 72.0%, respectively. The average digester detention time was 34-days, 5-days of which were provided by Digester 5. Digester 1-4 alkalinity levels were usually in the range of 7800-8400 mg/L as CaCO₃. The gas and pumped mixing systems for all digesters operated in a “normal” mode, with one gas mixing compressor in service per digester.

Dewatering/Biosolids: 1,112 dry-tons biosolids (4818 wet-tons at 23.1%TS) were hauled in June. The dry tons of digested solids produced was closer to 1,164 dry tons since the digester inventory increased by 52 dry tons across the month. 25% and 75% of the biosolids wet tons were applied to Eastern WA. agricultural sites and Western WA. forest lands, respectively. No biosolids went to Groco for composting. An estimated 54,473 lbs.-active polymer were applied for dewatering, resulting in an average dose of 49 lb.-active/dry ton hauled. The polymer was Polydyne WE586, a 41.5% cationic emulsion solution.

Biosolids were dewatered every day. Dewatering operation was essentially 24-hour shifts on weekdays and half-day shifts on weekends. Centrifuge operation was usually around 150-160 gpm with two centrifuges in service during the month’s first half, and 150-gpm or 180-gpm with two units during the second half of the month. Gas-scrubber-water was sent to the centrate sump to provide struvite control. Centrate was valved to the DAFTs.

Maintenance Flush of the Green River Outfall - Outfall No. 2: On June 10, STP discharged effluent through its Green River emergency outfall diffuser in order to perform essential maintenance. This essential maintenance flush was used to remove the river silt and sediment that had built up around and within the outfall structure. Though the Green River outfall is more likely to be used because peak flows exceed the capacity of STP’s effluent transfer system (ETS), this maintenance flush took on additional importance because of

concerns with the stability of the West Seattle bridge. That is because the South Plant's effluent transfer line runs very close to the western abutments of the bridge. Unlike high flow reasons which may require a Green River discharge on the order of hours, any damage or failure to the ETS pipeline will likely result in a Green River discharge on the order of days or weeks or longer. 2014 was the most recent time that a maintenance discharge of the Green River outfall occurred.

June 10 was chosen for the maintenance discharge because of its mid-morning high tide, the greater chance for higher flows in the Green River to provide greater dilution, and the reduced potential for salmonid exposure to effluent and sediment movement. (Prior to a maintenance discharge in 2013, Washington State Department Fisheries staff advised that June through August would be a reasonable window to reduce mid-year exposure to aquatic species.)

On June 10, a volume of 2.1-MG of disinfected, dechlorinated secondary effluent was discharged through the Green River emergency outfall diffuser for slightly longer than 1.5-hours. The flushing event started at 9AM on the outgoing tide. Initial flows through the outfall were estimated as high as 150-mgd. The high initial flow was necessary to fully flush the outfall structure and diffuser. Effluent flow was quickly dropped soon after the initial flush to achieve an effluent flow that averaged 31-mgd for the event. The Green River flow at the Auburn gage station during the event was 1580-cfs (or 1021-MGD).

All permit conditions (e.g., cBOD, TSS, pH) were met except for the effluent fecal coliform limit of 200-cfu/100-mL. Three fecal samples were collected during the event but ranged from 270-cfu/100-mL to 520-cfu/100-mL. Effluent was dechlorinated using 38% sodium bisulfite in order to meet the permit required 95 µg/l chlorine level; effluent residual chlorine averaged <20-µg/L during the event. Biosolids dewatering was shut down 21-hours prior to the flush in order to minimize the effluent ammonia (NH₃) level; the effluent NH₃ was 33.5-mg/L as N. (This effluent NH₃-N is nearly equal to the average influent NH₃-N of 32.1-mg/L in June.) The average effluent flow to the Green River of 31-mgd was below the maximum permitted flow of 5% of the Green River flow based on mgd; 5% * 1021-mgd = 51-mgd. Also, approval for the maintenance discharge was obtained from the Department of Ecology at least five (5) working days in advance of the event, as required by the permit.

Comparing VSS/TSS values from the river and the effluent illustrates how most of the solids released to the river were river-based silt and sediment. Effluent TSS during the flush averaged 8.2-mg/L @ 89% VSS/TSS. A river sample collected upstream of the diffuser during the flush had a TSS of 9-mg/L @ 26% VSS/TSS. River samples collected downstream of the diffuser during the flush averaged 14-mg/L @ 22%.