

# Memorandum

January 11, 2018

TO: Historical Memo

FROM: Rick Butler, Process Control Supervisor

SUBJECT: South Treatment Plant at Renton (STP)  
December 2017 Operating Record

STP met all of its conventional permit limits for secondary effluent in December 2017. Flow averaged 84-mgd and the max-day flow was 145-mgd (Dec. 29). Final effluent quality averaged 10-mg/L carbonaceous BOD (cBOD<sub>5</sub>), 18-mg/L TSS and 16-mg/L total BOD<sub>5</sub>. Respective removals were 94%, 92% and 93%. All flows received secondary treatment.

Though effluent quality met all permit requirements, it wasn't as good as in previous months. In fact, daily effluent TSS values reached as high as 26-29 mg/L early in the month. This poorer effluent quality was not due to high clarifier sludge blankets (i.e., poor sludge settling), but rather to a decay in the MLSS's ability to flocculate and clarify. An inhibitory substance in the wastewater seems the likely suspect for this deflocculation. The MLSS's ability to properly flocculate "recovered" within 10-12 days, with a corresponding improvement in effluent quality. Effluent TSS levels were 12-13 mg/L by month's end.

Rainfall in December was normal, totaling 5.43-inches. The historic average rainfall is 5.35-inches, and the monthly record is 11.85-inches (1979). The max-day rainfalls were 1.5-inches on Dec. 29 (1.84-inches on Dec. 28-29) and 1.0-inches on Dec. 19 (1.70-inches on Dec. 18-19). Several inches of snow also fell on Dec. 24-25, fulfilling the many wishes for a White Christmas. December 2017 air temperatures were slightly colder than normal, with average daily high and low temperatures of 45.6°F and 34.6°F. Water temperatures decreased notably across December, falling from 62.7°F to 58.6°F.

**Offsite Flows and Loads:** 1.90-MG of septage was received in December, accounting for 7% of STP's influent solids load. Southern Transfer flows from the MLK/Henderson/Norfolk CSO system averaged 8.9-mgd (or 10.6% of STP's flow) with a max-day flow of 22.6-mgd (Dec. 29). Raw sewage flow from the Brightwater service area to STP (via York P.S.) averaged 3.2-mgd with a max-day flow of 7.4-mgd; MLSS filterability issues and membrane maintenance at Brightwater were the reasons for the higher Brightwater flows to STP. An estimated 57 tons BOD of deicer waste was sent from Seatac Airport to STP on 11 days; the max-day load was 25.9 tons (Dec. 28). No sludge was hauled from West Point to STP.

**Sampling and Analyses:** All permit-required samples (influent and effluent) were collected and analyzed in December 2017. The final ETS effluent sample line/sampler was usually chlorinated every other day. Effluent chlorine at the ETS outfall was monitored using two on-line analyzers; the outfall chlorine level was well below the permitted maximum daily limit of 0.75-mg/L and the monthly average limit of 0.5-mg/L. Influent loads averaged 73-tons/day TBOD<sub>5</sub> and 76-tons/day TSS, reflecting values that would be expected based on recent months' loads and flows, plant mass balances, deicer loads and holidays.

**STP Facilities Status:** STP operated in full wet winter mode with most process tanks in service. The secondary process did not nitrify. The boiler provided process heat all month. Very little biogas was beneficially recovered in December because of problems with the gas scrubbing system.

11-12 of 12 primary sedimentation tanks were in service all month; North Primary Tank 1 was out of service for scheduled repairs early in the month. All four aeration tanks, 22 to 24 of the 24 secondary clarifiers and both chlorine contact channels were in service. The RW facility was out of service for major modifications; it will be out of service until spring 2018. Five of six DAFTs (two large and three small) were in service all month: DAFTs 3, 1 and 2 went out of service sequentially to replace THS pumps. Four of five anaerobic digesters were in service all month. Digester-3 remains out of service for process reasons. Dewatering operated 29 of 31 days; centrate was valved to the DAFTs all month. On December 31, STP operated with 12 of 12 primary tanks, 4 of 4 aeration tanks, 24 of 24 secondary clarifiers, 5 of 6 DAFTs and 4 of 5 digesters.

The gas scrubbing system was out of service most of the month to address the issue of finding water in the gas system after the driers in early November. Both scrubbing towers were thoroughly flushed and their demister pads were cleaned. One half of the system (Stream 1) was restarted late in December after several modifications to the physical system and control strategy. The boiler provided process heat all month using natural gas until Dec. 29 when scrubbed gas was available. Cogen operated three times during high flows (when ETS peaking pumps were operated) and several times when ETS peaking pumps were operated to test their new VFDs.

New raw sewage pump (RSP) 4 was essentially in service all month with RSP1 running in tandem during the afternoon and evenings. RSP6 was occasionally in service. One of the classic RSPs (2, 3 and 5) was occasionally operated when flows exceeded 100-mgd.

**Secondary Treatment:** The secondary process was operated in plug flow mode with a ½-pass un-aerated zone in Pass-1 to grow phosphorus accumulating organisms (PAOs). The secondary system did not nitrify. All four aeration tanks were in service. The aeration tanks were occasionally operated in step-feed mode due to higher flows. The secondary system's solids retention time (SRT) started and ended the month around 5-days, but was raised to 10-days (in order to maintain a consistent MLSS concentration)

when effluent TSS levels increased early in the month. The MLSS concentration reflected the changes in SRT, with a MLSS concentration near 2800 – 3000 mg/L to start and end the month, and a MLSS as low as 2300-mg/L. The RAS return rate was 40% of the secondary influent flow. Aeration tank air use averaged 66 million-ft<sup>3</sup>/day, ranging from 52 to 79 million-ft<sup>3</sup>/day, with higher values reflecting deicer loads.

Biomass settling characteristics (including effluent clarity) were very good during the latter half of the month, but suffered during the first half. The sludge volume index (SVI) was in the 40-50 mL/g range early in the month when effluent clarity was poor. The SVI increased during the second half to 100-110 mL/g. For South Plant, it's preferable for the SVI to be in the range of 70-120 mL/g.

Nitrogen (N) removal averaged 5% and phosphorus (P) removal averaged 45%. These removals are lower than usual, most likely the result of the MLSS deflocculation that occurred early in the month. Effluent NH<sub>3</sub>-N averaged 37-mg/L, effluent NO<sub>2</sub>+NO<sub>3</sub> averaged <0.2-mg/L as N, and effluent total-P averaged 3.1-mg/L. The effluent NH<sub>3</sub>-N load was similar to recent months without nitrification, averaging 22,260-lbs/day. Effluent pH was usually 6.7-7.1 and effluent alkalinity was usually 210-260 mg/L as CaCO<sub>3</sub>.

**Disinfection:** 36,797 gallons of 12.5% sodium hypochlorite (NaOCl) were used to disinfect STP's final effluent in December. This resulted in an average dose of 1.7-mg/L as Cl<sub>2</sub> based on effluent flow. Daily hypochlorite use was usually in the 900-1500 gpd range. Historically, the Cl<sub>2</sub> disinfection dose has been 1.5-2.0 mg/L during winter and 2.0-3.0 mg/L in summer.

Both the South and North chlorine contact channels (CCC) were in service. A gate placed near POD4 separated the two CCCs. Thus, POD1-4 effluent flowed in the North CCC and POD5-6 effluent flowed in the South CCC. The CCCs, ETS effluent pipeline, and ETS outfall structure were usually disinfected with slug doses of hypochlorite every two weeks. No NaOCl was added to the influent (i.e., for odor control) or the RAS (for SVI control).

**DAFT:** An average of 80 dry tons/day of thickened raw sludge (THS) was fed to the digesters. THS flow averaged 0.32-mgd with a solids concentration of 6.0% TS. Five of six DAFTs were in service - both large DAFTs (5&6) and three small DAFTs. 14,850-lbs/month of polymer were added to 170-dry tons/day of DAFT feed sludge for an average polymer dose of 2.8-lb active/dry ton feed. Polydyne polymer WE-1531 was used in December.

Replacement of the progressive-cavity THS withdrawal pumps was nearly completed. The stators in the new brand of pump should last well past the couple months at which the stators of the previous pumps failed. Failing stators make it difficult to withdraw the THS from the DAFTs as fast as it is being produced, resulting in high recycle loads.

**Anaerobic Digestion:** Time and temperature requirements for Class B biosolids were met via the digesters. Volatile solids (VS) and total solids (TS) reductions averaged 65.0% and

57%, respectively. The detention time averaged 29-days; three of those days were provided by Digester 5. Digester temperatures were held in the 95-100°F range. The VS/TS content entering and leaving the digesters averaged 86.9% and 69.9%, respectively. Digester alkalinity levels were usually in the 7600-8100 mg/L range. All primary digesters were operating in parallel and fed equal amounts of THS. The digester VS loading rate averaged 0.13-lbs./day. Digester 3 remained out of service – and will remain out of service - in case of prolonged mountain pass closures that impact biosolids hauling options. The gas and pumped mixing systems for all digesters operated in a “normal” mode.

**Dewatering/Biosolids:** 4512 wet tons of biosolids (1048-dry tons) were beneficially reused in December. 67% of all dry tons (2730 wet tons @ 25.7%TS) were applied to Eastern WA agricultural sites. 33% of dry tons (1782 wet tons @ 19.4%TS) were hauled to Western WA forest sites. Digested sludge production was closer to 1104-dry tons since STP’s digester inventory increased by about 56 dry tons in December.

A total of 43,333 lbs.-active polymer was applied for dewatering, resulting in an average polymer dose of 41.3 lb.-active/dry ton hauled. The applied polymer was Polydyne WE586, a 41.5% cationic emulsion solution. Centrifuge feed rates were usually 140-150 gpm to produce biosolids for Eastern WA. sites and 180-gpm for Western WA. sites. Dewatering operated every day in December. All three centrifuges were often in operation together.