King County
Brightwater
TREATMENT SYSTEM

Technical Facts and Information about Wastewater Treatment Processes at Brightwater

Design Basis

- Average Flow: 25.2 mgd (million gallons per day)
- Average BOD_5: 50,447 lb/d
- Total Suspended Solids (TSS): 50,447 lb/d (pounds per day)
- Average Wet Weather Flow (AWWF): 29.0 mgd
- Peak Month Flow: 40.9 mgd

Preliminary treatment

Preliminary Influent Screens:

- 4 perforated plate, 10mm screen
- 43.34 mgd each

Screenings Pumps:

- 3 screw centrifugal
- 7.5 HP, 300 gpm (gallons per minute) each

Grit Channel Blowers:

- 2 multistage centrifugal
- 100 HP, 3600 scfm (standard cubic feet per minute) @ 3.9 psi

Grit Tank Blowers:

- 2 multistage centrifugal
- 100 HP, 1280 scfm @ 6.7 psi

Grit Tanks:

- 5 aerated tanks
- 40 feet long, 20 feet wide, 16.5 feet average sidewater depth
- 98.736 gallons each
- Grit Tank Pumps:
- 10 recessed impeller vortex pumps
- 250 gpm, 40 HP, constant speed

Primary Treatment and Chemically Enhanced Primary Treatment (CEPC)

Primary Clarifier Sludge Collection Systems

- 5 basins with non-metallic chain and flight
- 1 HP, 460 V, 3 Phase 60 Hz
- Constant speed
- 258 feet in length, 20 feet wide, average sidewater depth 12.5 feet, total surface area 25,800 ft^2
- Detention time: AWWF 1,100 gpd/ft^2; peak hour (CEPC mode) 5,000 gpd/ft^2 (gallons per day/ per square feet)

Continued on other side …

Primary Treatment and Chemically Enhanced Primary Treatment (CEPC), continued

Primary Effluent Screens:

- 3 center feed band
- 23.75 mgd @ 6.8 ft immersion
- Screen openings: 2 mm
- Channel inlet: 5.75 feet in width
- Channel 1 outlet, width 14.92 feet; Channel 2 & 3 outlet width 12 feet
- Channel depth: 10.77 feet

Effluent Weir

- Rectangular notch
- AWWF Loading rate: 5.9 gpm/lf (gallons per minute, per linear feet)
- Peak Hour Loading rate: 26.1 gpm/lf

Primary Sludge Pumps

- 5 Positive displacement progressing cavity
- 200 gpm@ 50 psi (pounds per square inch)
- 30 HP, 460 V, 3 Phase, 60 Hz
- Constant speed

Primary Clarifier Scum Skimmers

- 5 Helical scum skimmers
- 20 feet in length
- 6 rpm nominal rotational speed
- 1 HP, 460 V, 3 phase, 6 Hz
- Constant Speed

Ferric Chloride Metering Pumps:

- 5 positive displacement, hydraulically actuated diaphragm
- 151 gph(gallons per hour), 0.5 HP (horsepower)
- Does 65 mg/l (milligrams per liter), 40% concentration

PAC Feed pumps:

- 5 positive displacement, hydraulically actuated diaphragm
- 25 gph, 0.5 HP
- Dose 30 mg/l, 25% concentration

Secondary Treatment

Design Flow:

- 24 mgd (million gallons per day)
- Peak-hour: 44 mgd
- Type: Activated sludge with hollow fiber membranes
- Configuration: Aeration basins flowed by membrane basins
- Solids retention time: 10 days

Aeration basins:

- 3 basins
- 320 feet L x 26 feet W x 25 feet sidewater depth
- Total volume: 4.67 MG
- Return activated sludge (RAS) return capability: 300A% maximum day design flow
- Maximum Design Mixed Liquor Suspended Solids (MLSS): 8,000 mg/L
- Anoxic Zone: 1 zones per basin, Total volume 0.44 MG, Average detention time 0.44 hours, Peak detention time 0.24 hours
- Aerobic Zone: 4 zones per basin, Total volume 4.23 MG, Average detention time 4.23 hours, Peak detention time 2.31 hours, CBOD 1.05 lb O_2/lb BOD removed, Nitrogenous Demand 4.6 O_2/lb TKN applied

Process air blowers:

- 7 variable speed centrfigual
- 5000 scfm @ 14.5 psi (pounds per square inch) capacity each
- 300 HP, 480 V, 3 Phase, 60 Hz
- Variable frequency drive

Mixed Liquor Recycle Pumps:

- 3 vertical axial flow
- 6600 gpm@ 6 feet TDH (total discharge head) capacity, each
- 25 HP, 460 V, 3 Phase, 60 Hz
- Constant speed
- MLSS return capacity 120% of average design flow

Secondary Treatment continued

Membrane Basins

- Design:
- Design production capacity, peak hour: 44 mgd
- 10 total number basins, 8 basins with cassettes – 160 cassettes
- 68.5 feet L x 26 feet W x 12 feet H per basin
- Design flux: 10 – 15 gallons / square feet per day
- Total useable volume: 1.15 MG (10 basins)

Membrane Air Blowers:

- 5 multistage centrifugal
- 11,125 scfm (standard cubic feet per minute) each, 350 HP each
- Drive type: constant speed

Membrane Effluent Pumps:

- 10 horizontal end suction, centrifugal
- 4,650 gpm, 60 HP
- Variable frequency drive

Disinfection

Disinfection Hypochlorite Day Tanks

- 2 Polyethylene 325 gallon tanks

Effluent Disinfection Pumps

- 3 positive displacement, magnetically coupled external gear pump
- 1 HP, 460 v, 3 phase, 60 Hz
- Variable speed

Solids

Raw Sludge Blend Tank

- 1 plastic lined concrete, sloped bottom
- 45 feet L x 35 feet W x 12 feet sidewater depth
- Total volume 140,000 gallons
- 1 hour detention time, peak month

Raw Sludge Blend Tank Mix Pump

- 4 vertical dry-pit, non-clogging centrifugal
- 2,829 gpm @ 28 feet TDH
- 30 Ho, 460 V, 3 Phase, 60 Hz
- Constant speed

Solids Return Pumps

- 2 screw centrifugal
- 3,000 gpm @ 58 feet TDH
- 50 HP, 460 V, 3 Phase, 60 Hz
- Constant speed

Solids Return Tank

- 1 plastic lined concrete, flat bottom
- 30 feet L x 15 feet W x 12 feet sidewater depth
- Total volume 40,000 gallons

Gravity Belt Thickeners (GBT)

- 3 GBT with belt width 3 meters
- Polymer usage: 10 lb/dry ton
- Solids feed concentration, dry weight: 0.5%-3%
- Sludge feed rate: 50 gpm per meter
- Thickened sludge solids concentration, dry weight min: 6%
- Solids capture rate: 95%
- 5 HP, 460 V, 3 Phase, 60 Hz
- Variable frequency drive

Thickened Sludge Blend Tanks

- Plastic lined concrete, sloped bottom
- 48 feet L x 14 feet W x 15 feet SWD
- Total volume: 150,000 gallons
- Detention time, peak month: 8 hours

Digestion

Anaerobic Digesters:

- 3 mesophilic, sloped bottom
- 59 feet D x 61 feet sidewater depth
- Volume 1.25 gallons each
- Biosolids quality: class B
- Temperature: 95 – 100 degrees F
- Alkalinity: 6.9 – 7.4 pH
- Volatile solids destructions, min: 49%
- Gas Production rate: 16 cubic feet gas/ lb VS (volatile solids) destroyed

Digester Mixer:

- 9 draft tube
- 20,000 gpm
- Impeller size: 36 inches
- Turnover time: 21 minutes
- Speed (min/max): 100/220 rpm?
- 15 Hp, 460 V, 3 Phase, 60 Hz
- Constant speed

Digester Heat Exchangers:

- 3 spiral digester heat exchangers
- Heat transfer capacity: minimum 3 million BTUs/hour, per unit
- Size: 335 square feet
- Hot water flow rate: 615 gpm
- Entering hot water temperature: 145 degrees F
- Entering sludge temperature: 98 degrees F
- Pressure loss, max: Hot water 4.79 psi; Sludge 4.3 psi

Digester Circulation Pumps:

- 3 recessed impeller vortex
- Minimum capacity 650 gpm@ 35 feet TDH
- 40 HP, 460 C, 3 phase, 60 Hz
- Constant speed

Waste Gas Burners:

- 2 natural draft burners
- up to 525,000 BTUs each
- up to 905 scfm each

Technical Facts and Information about Wastewater Treatment Processes at Brightwater

Digestion, continued

Digested Sludge Storage Tank:

- 1 concrete, sloped bottom
- 59 feet D x 37.5 feet sidewater depth
- 790,000 gallons
- Solids residence time: AWWF 5.0 days, Peak month 3.6 days

Biosolids Dewatering

Centrifuge:

- 2 high solids decanter
- Hydraulic capacity, each 175 gpm
- Solids capacity, each 2,500 lb TSS (total suspended solids)/hour
- Polymer design dose 36.5 lb/dry ton
- Expected cake solids concentration 24%
- Expected capture efficiency 95%
- 200 HP each

Biosolids Hoppers:

- 2 Biosolids storage volume – 110 cubic yards
- Unloading capacity 36,000 lbs/10 minutes

For more information, please contact us:

Phone: 206-263-9453

Email: brightwater@kingcounty.gov

Web site: http://kingcounty.gov/brightwater/

This information is available in alternative formats on request by calling 206-684-1280 or Relay Service 711