

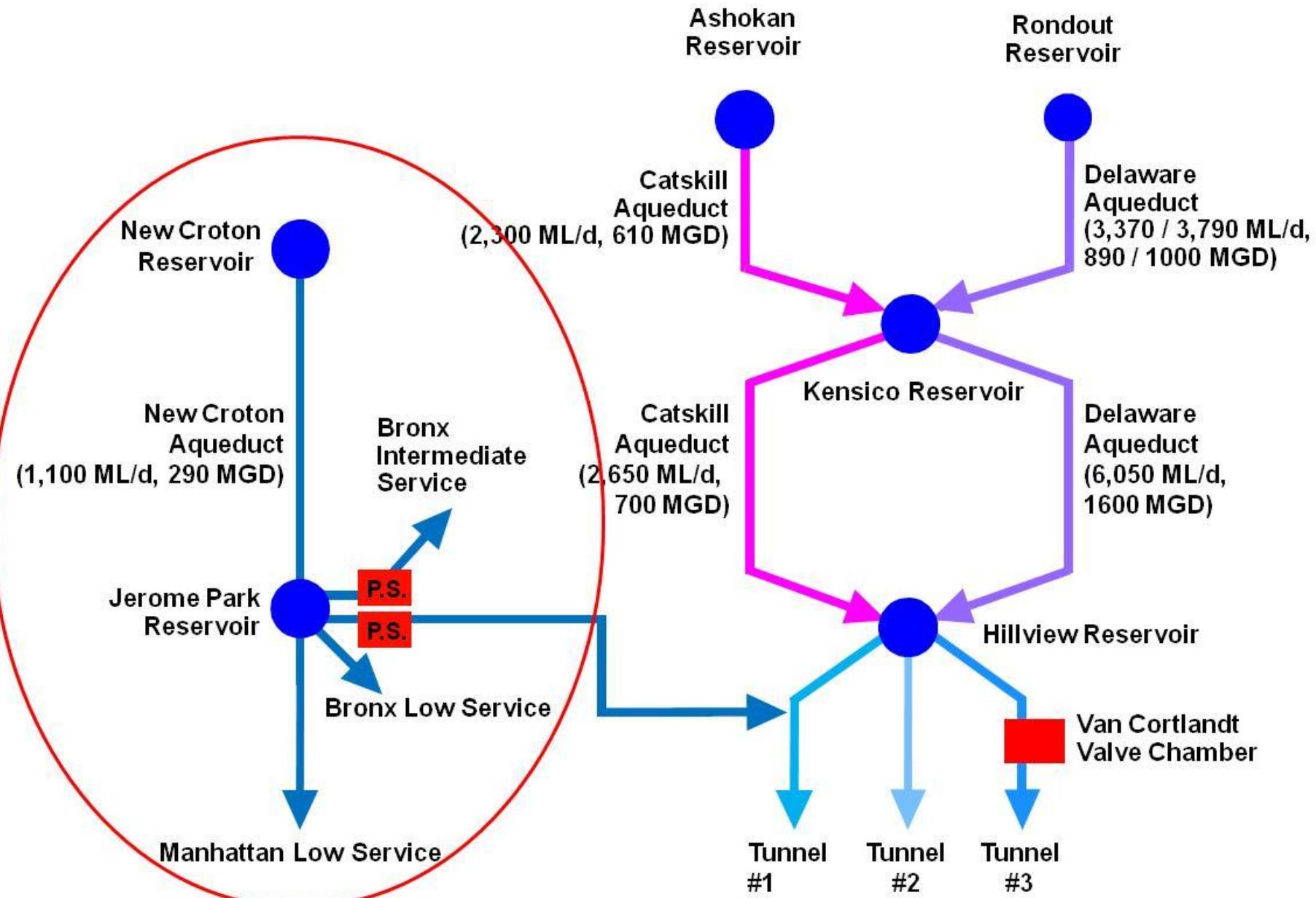


Croton Water Filtration Plant

Dissolved Air Flotation, Filtration, and UV Facility

October 15, 2013

Existing New York City Aqueduct System

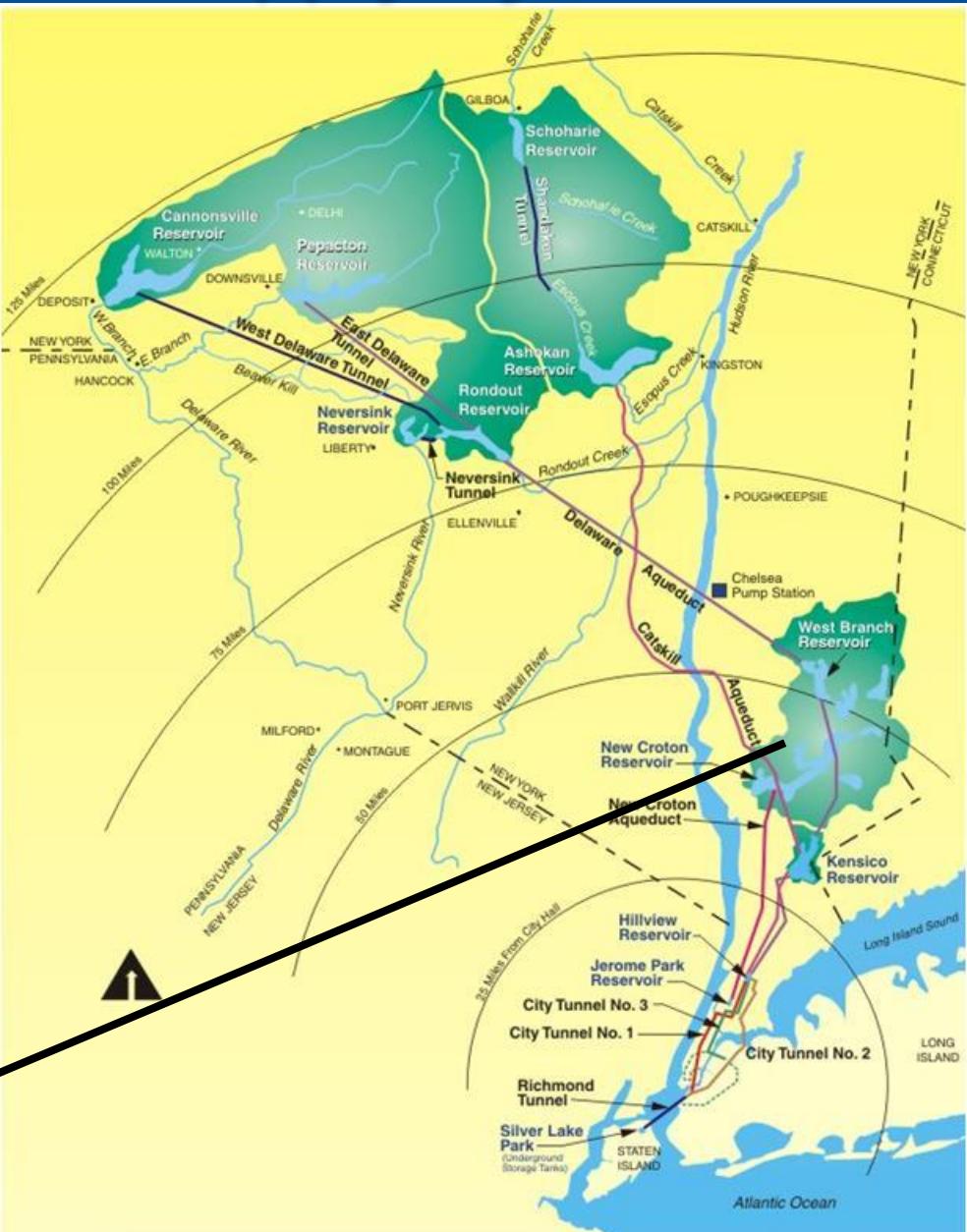


New York City Water Supply System

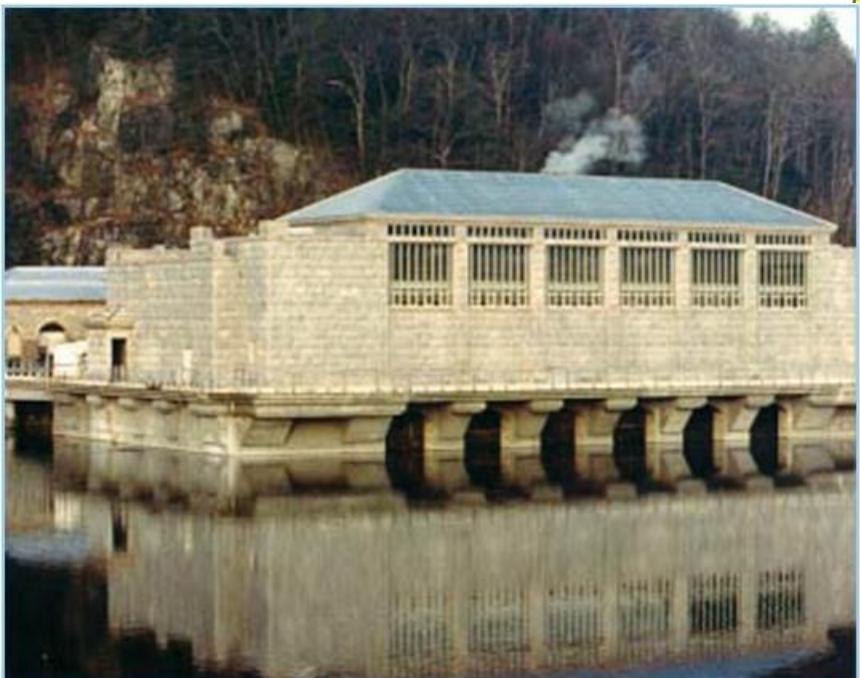


Croton Lake
Gate House

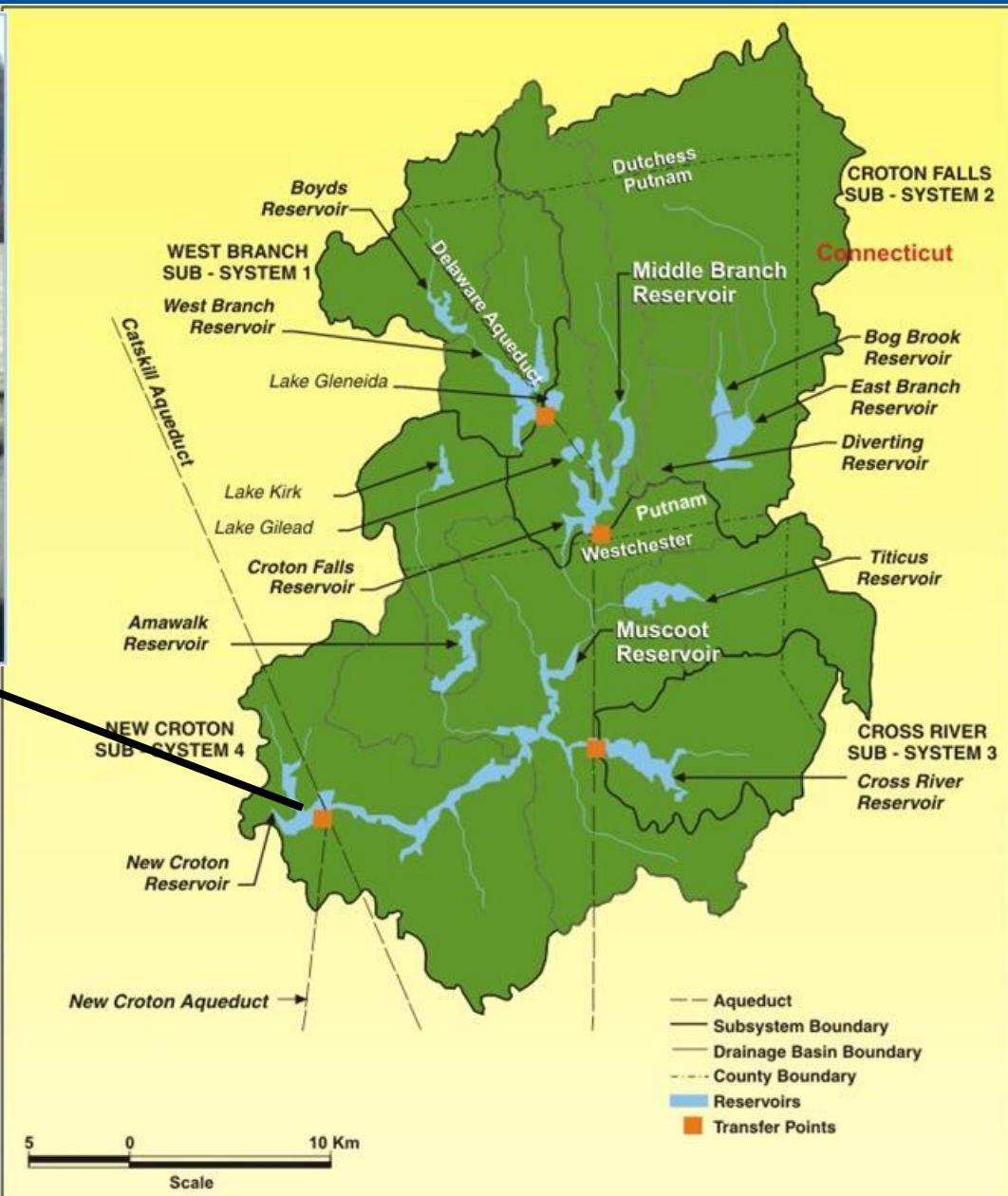
Croton Watershed



Croton Watershed and Gate House

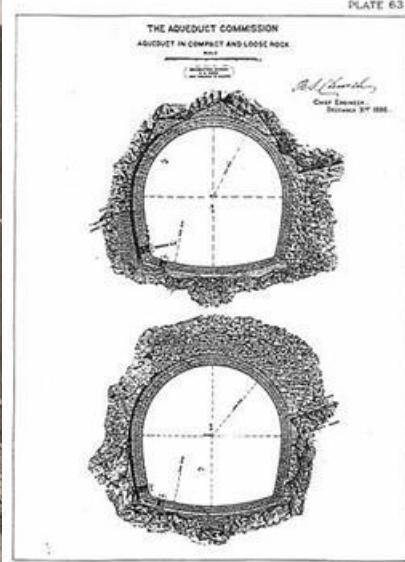
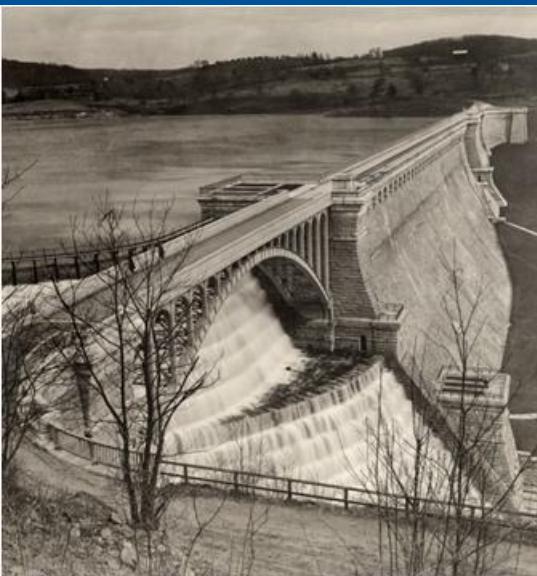


Croton Lake Gate House



New Croton Aqueduct and Jerome Park Reservoir

- ❖ New Croton Lake and Dam
- ❖ Croton Lake Gate House
- ❖ New Croton Aqueduct (NCA)
 - ❖ Horseshoe Shaped 16 ft high
 - ❖ 48 km (30 miles) long
 - ❖ Gravity flow (mostly not pressurized)
 - ❖ Approx. 16 hour delay for flow changes at GH to reach JPR
- ❖ Jerome Park Reservoir (JPR)
 - ❖ Balances flow conveyed down NCA and WFP flow rate
 - ❖ Enables WFP to change flow rates to match system demands
 - ❖ Acts as settling basin during high turbidity events



NYC Primary Aqueducts and Tunnels



Croton Water Filtration Plant



Jerome Park Reservoir



Croton Water System History

- ❖ Croton Dam - Old Croton Aqueduct 340 ML/d (90 mgd), Reservoir in Manhattan 1842, decommissioned in 1950s
- ❖ New Croton Dam, New Croton Aqueduct 1,135 ML/d (300 mgd), Jerome Park Reservoir, 1906
- ❖ Unfiltered water - chlorine, fluoride, corrosion inhibitor, ~10% of 4,540 ML/d (1,200 mgd) average demand
- ❖ Safe Drinking Water Act 1974 mandated filtration
- ❖ Ozone / Diatomaceous Earth (DE) Filtration 1980s, pilot and design
- ❖ Ozone / GAC / DE Filtration early 1990s, demo and design
- ❖ DAF / Ozone / Dual Media Filtration late 1990s, pilot and design
- ❖ DAF / Filtration (DAFF) / UV, 2000 onwards, now under construction in The Bronx, NYC
- ❖ Completion of \$2.1 billion construction project - late 2013

Plant Under Construction (July 2007)



Croton Water Filtration Plant (WFP) is designed to be compact and to merge with Moshulu Golf Course, which is part of Van Cortlandt Park, in the Bronx

Plant Under Construction (November 2008)

NYC
Environmental
Protection



Plant Under Construction (August 2010)



Plant Under Construction (March 2011)



Croton WFP Process Schematic

Plant Capacity

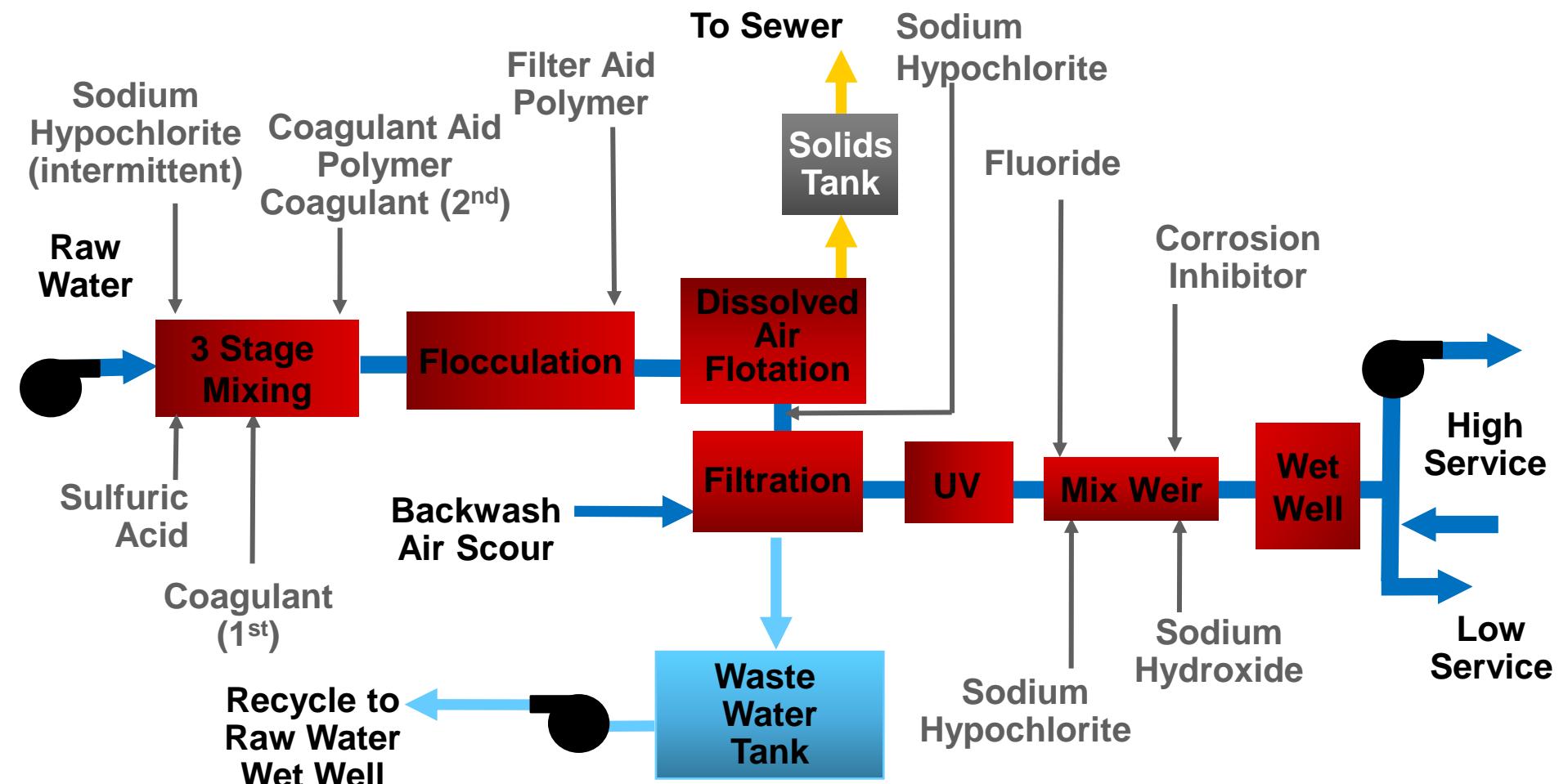
Maximum	1,100 ML/d (290 mgd)
Minimum	340 ML/d (90 mgd)

High Service

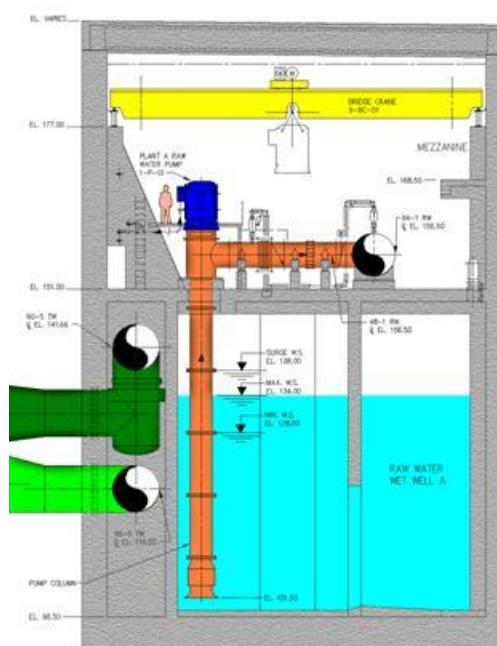
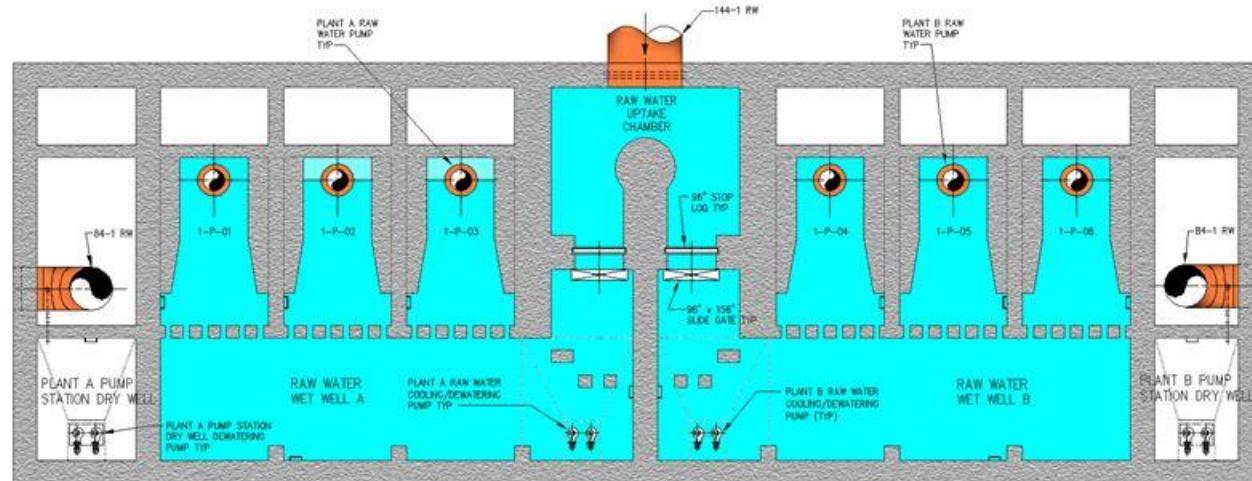
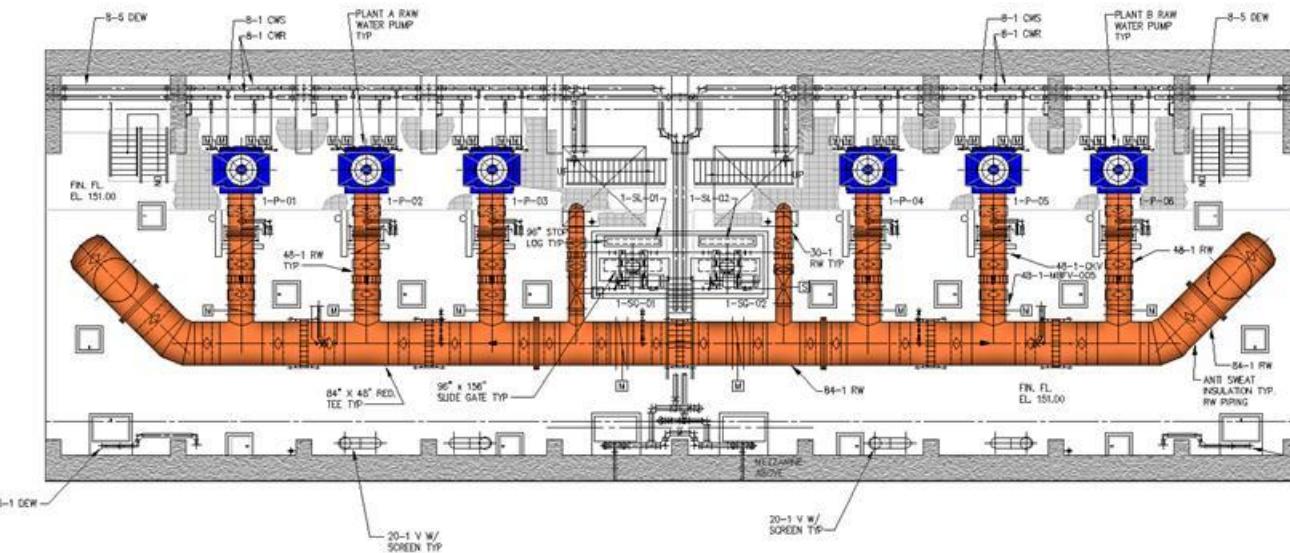
High Pressure System (Cat/Del)

Low Service

Low Pressure Gravity System



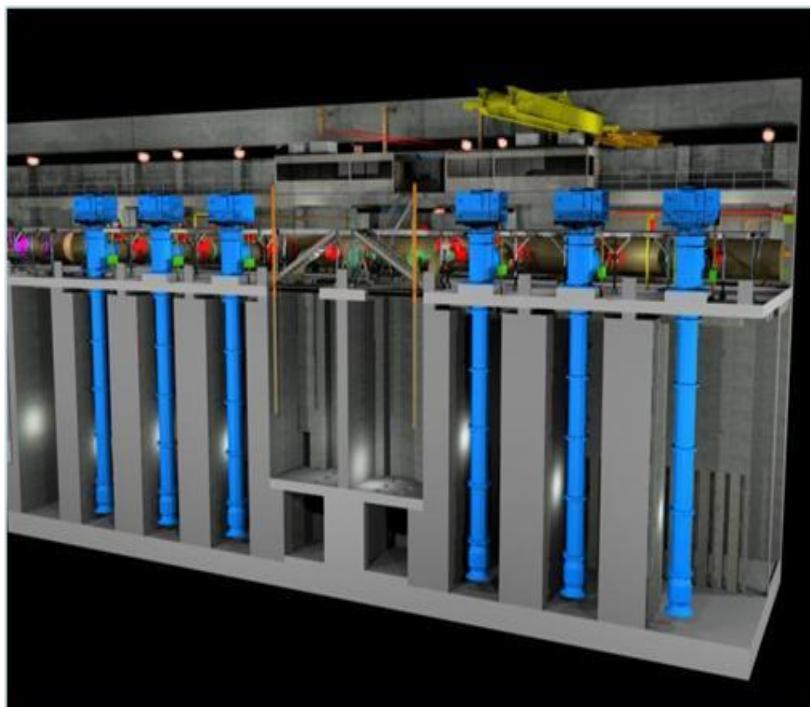
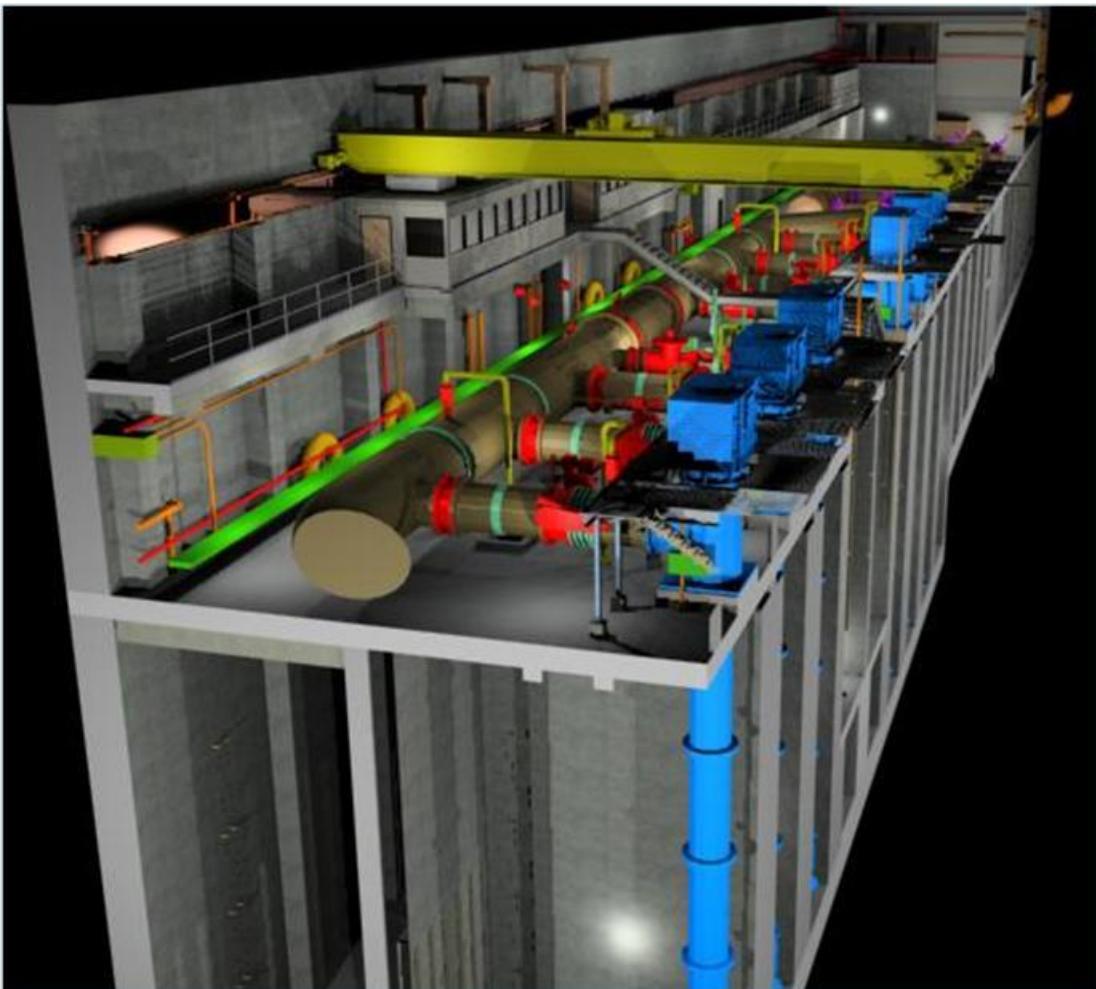
Raw Water Pump Station



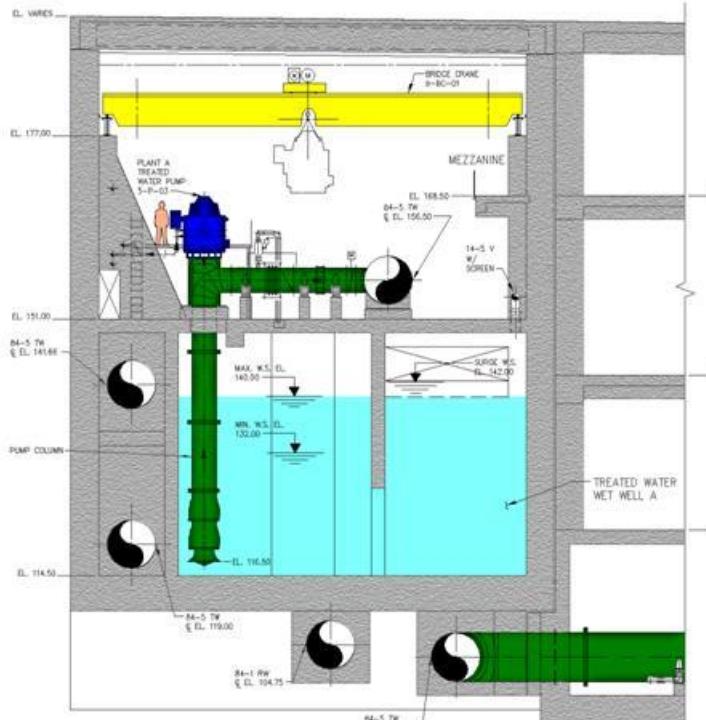
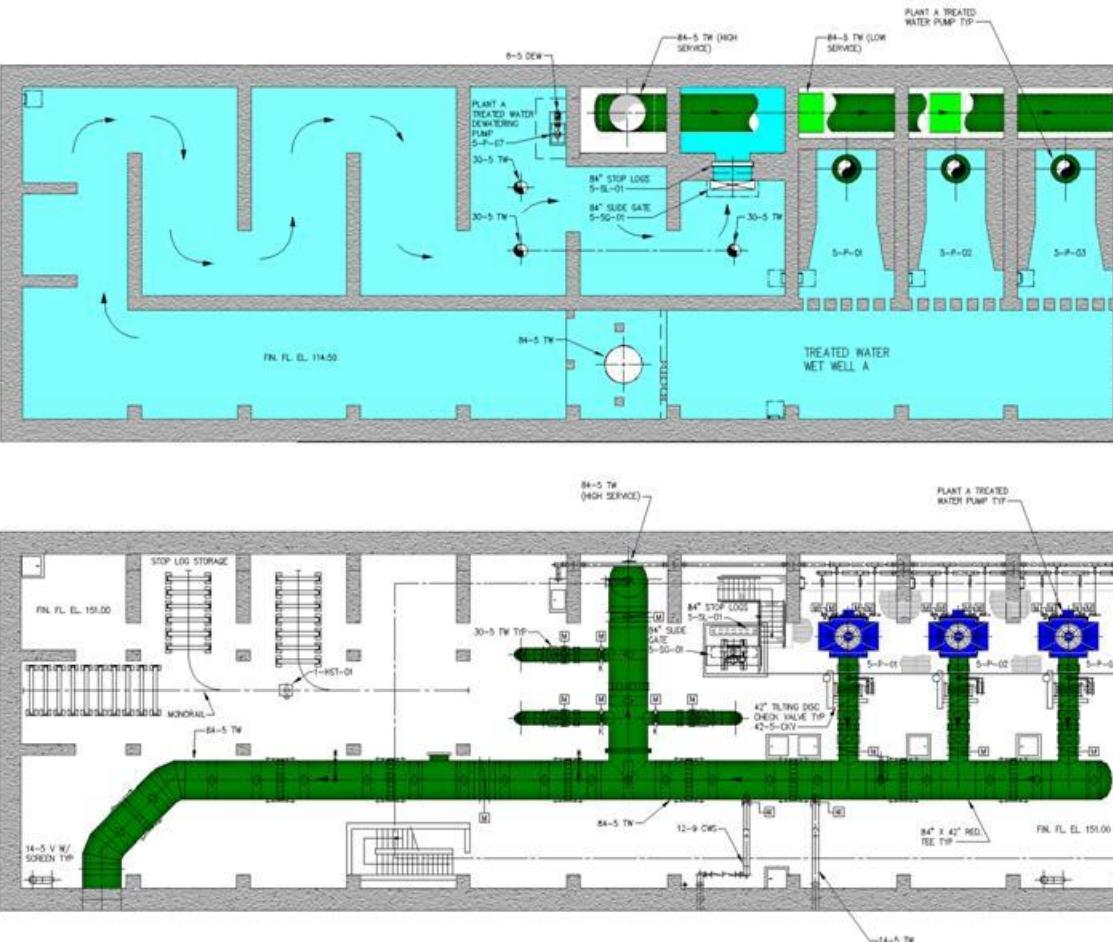
Pump Data

- Six Vertical Axial Flow - 1 Stage
- Capacity $12,580 \text{ m}^3/\text{h}$ (55,400 gpm, 80 mgd) at 14.0 m (46 ft)
- Motor – 750 kW (1,000 HP) Totally Enclosed Water-to-Air Cooled
- Variable Frequency Drive

Raw Water Pump Station



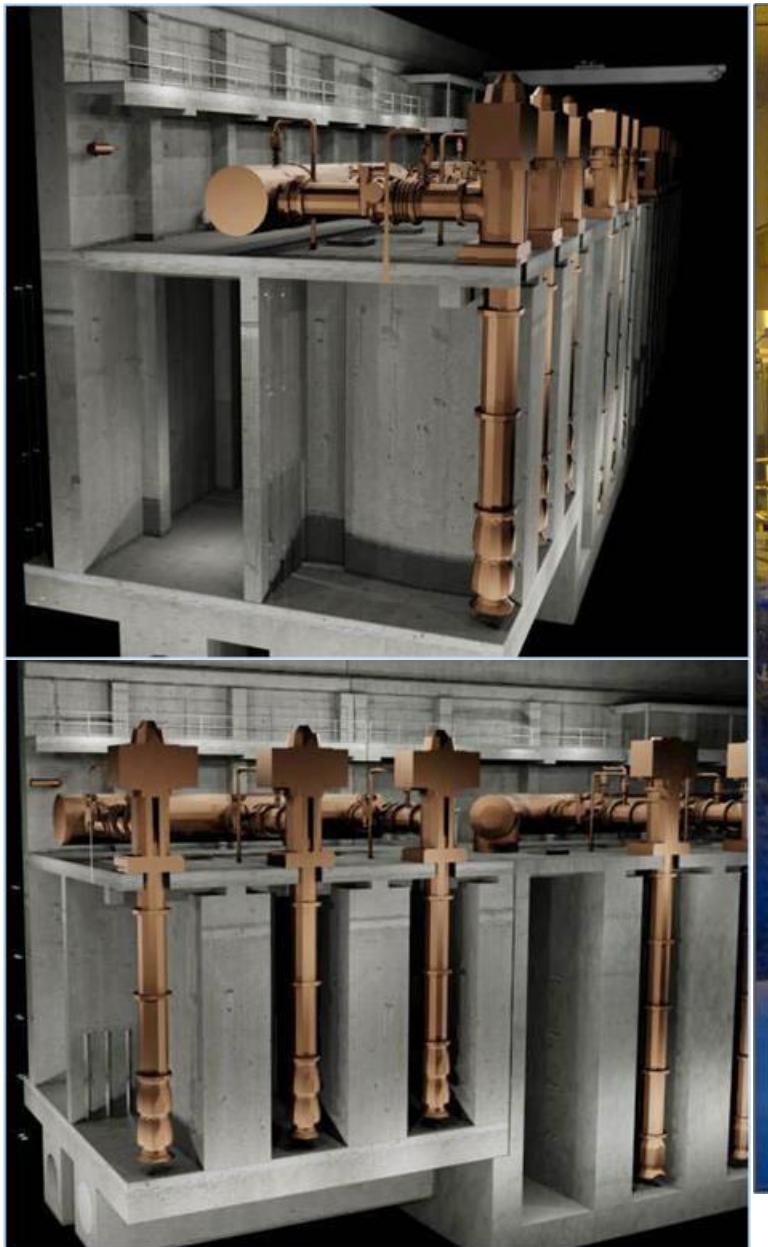
Treated Water Pump Station



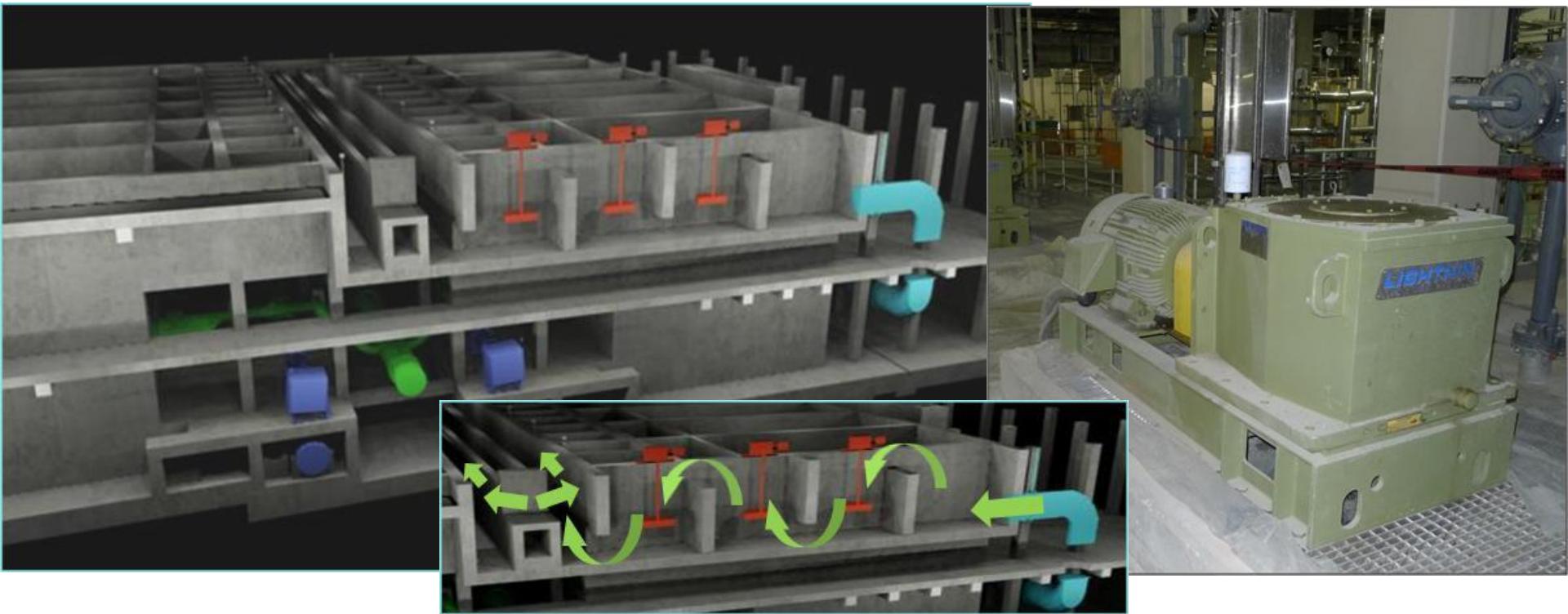
Pump Data

- Six Vertical Axial Flow - 2 Stage
 - Capacity 9,150 m³/h (40,300 gpm, 58 mgd) at 51.8 m (170 ft)
 - Motor – 1,865 kW (2,500 Hp)
Totally Enclosed Water-to-Air Cooled
 - Variable Frequency Drive

Treated Water Pumps



Rapid Mixing Top Entry Turbine - 3 Stages



Mixing

Number of Trains and Mixing Stations - 4 (2 per half plant), 3 stages per train

Dimensions - 4.57 m by 4.57 m in plan, 3.81 m water depth

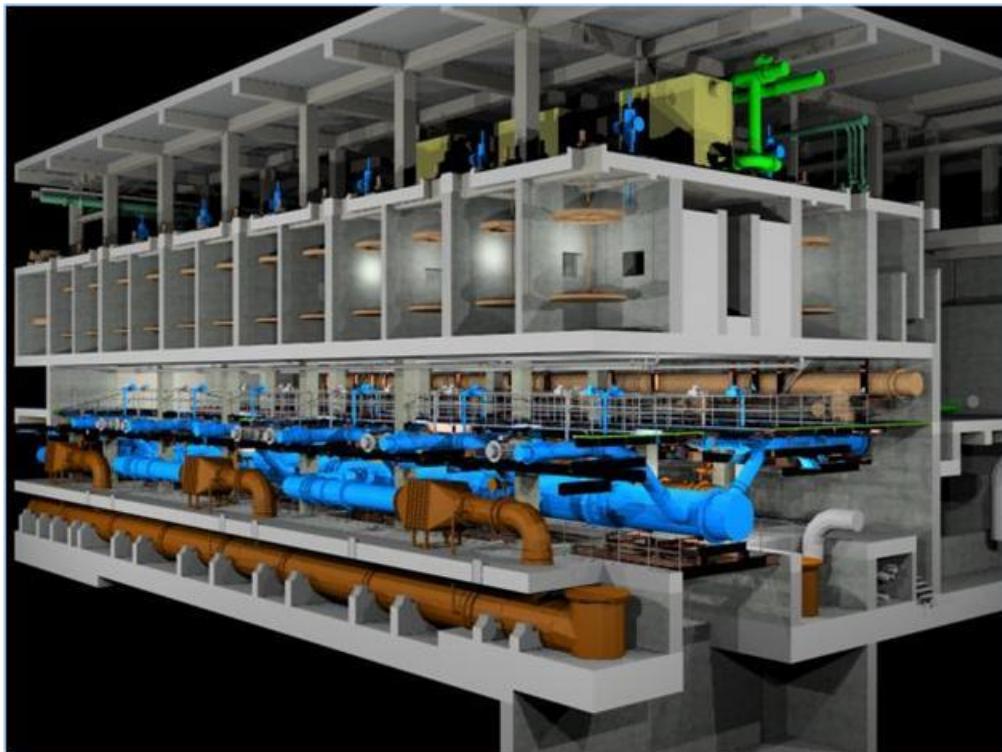
Top entry turbine type, 3 in series - Radial flow impellers, adjustable speed

Hydraulic Detention Time (HDT) - 22 seconds at maximum flow

Mixing Intensity - $G = 1,000 \text{ sec}^{-1}$ maximum

Flocculation, Air Scour and Pipe Gallery

NYC
Environmental Protection



Flocculation (Close-coupled to DAF)

Number of Trains and Stages - 48 (24 per half plant), 2 stages each

Dimensions - 3.96 m by 3.20 m, 3.66 m water depth

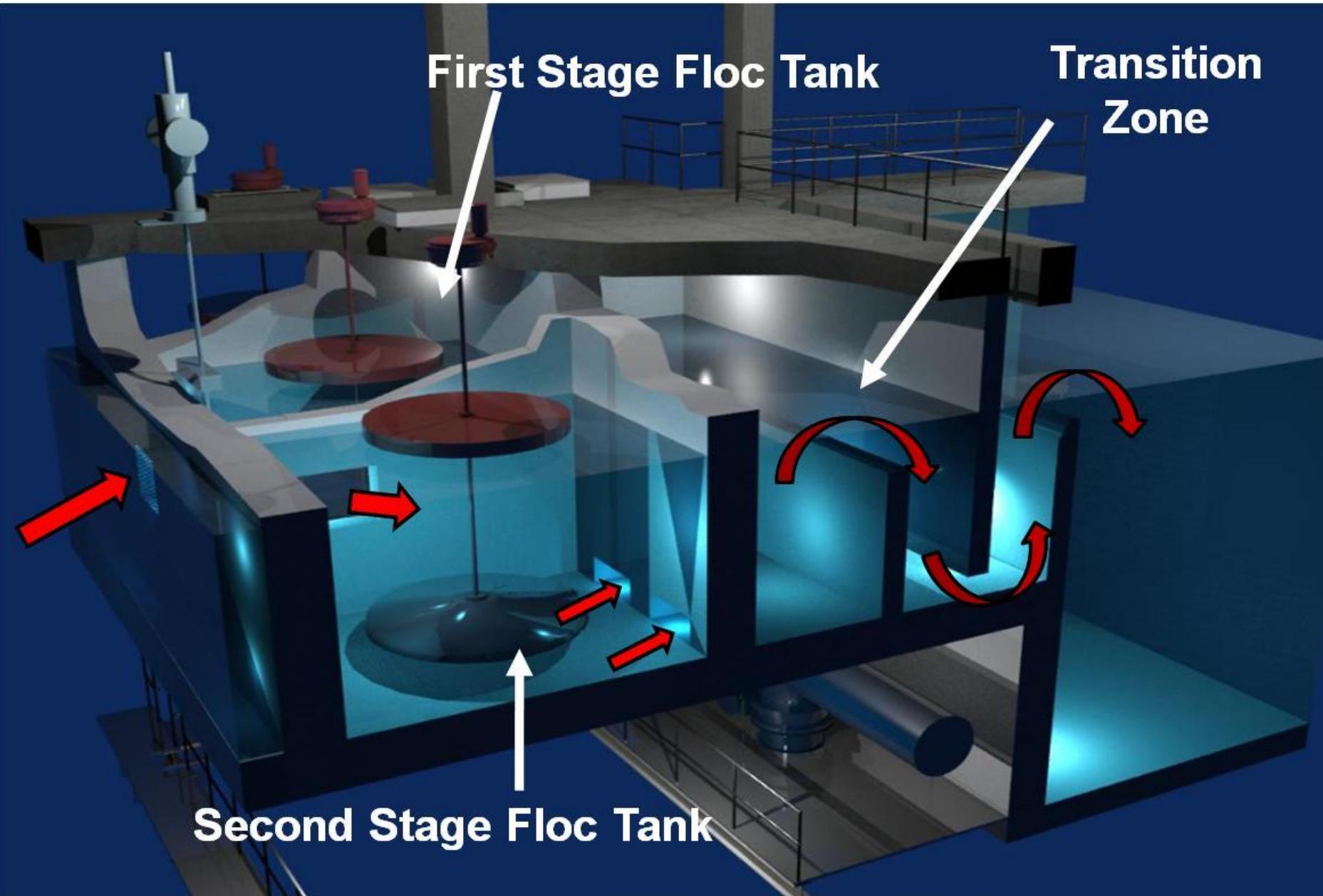
Top entry turbine type - Axial flow hydrofoil impellers, adjustable speed

Number of stages - 2 close-coupled to DAF

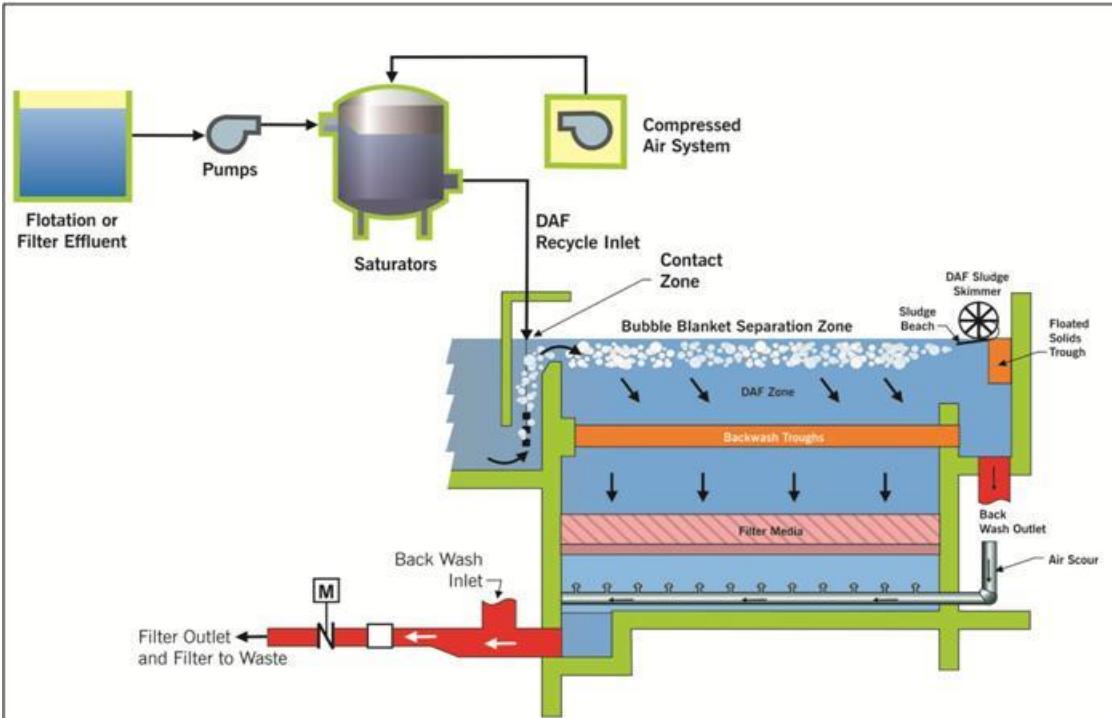
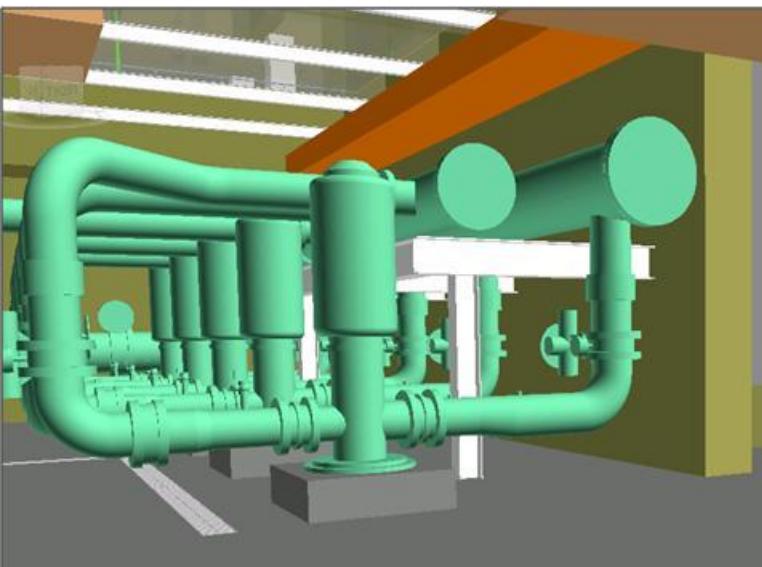
HDT - 2.4 min. per stage, 4.8 min. total

Mixing Intensity – $G = 100 \text{ sec}^{-1}$ maximum

Flocculation



DAF Recycle System



Dissolved Air Flotation - Above Filters

Number of DAF Units - 48 (24 per half plant)

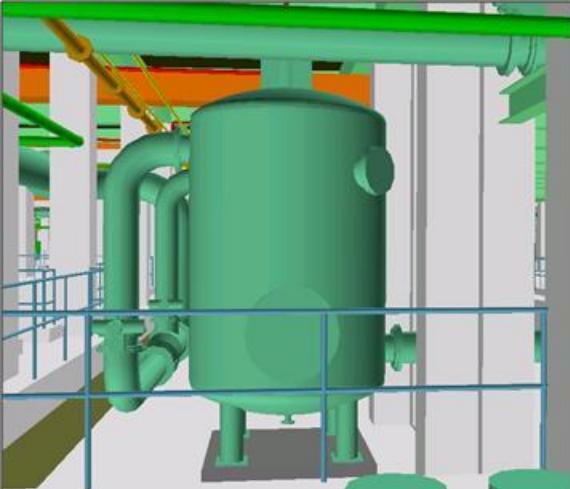
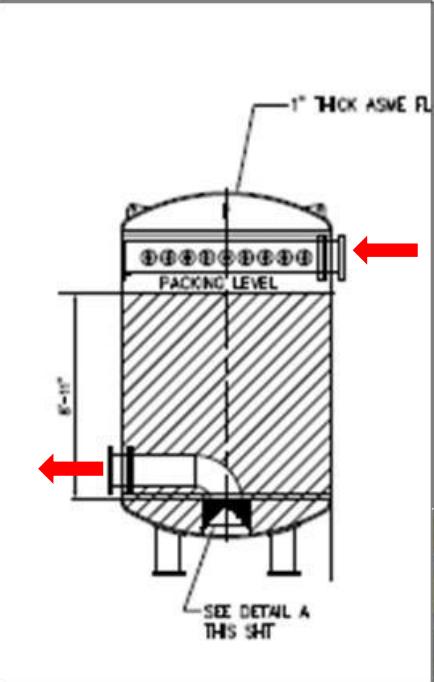
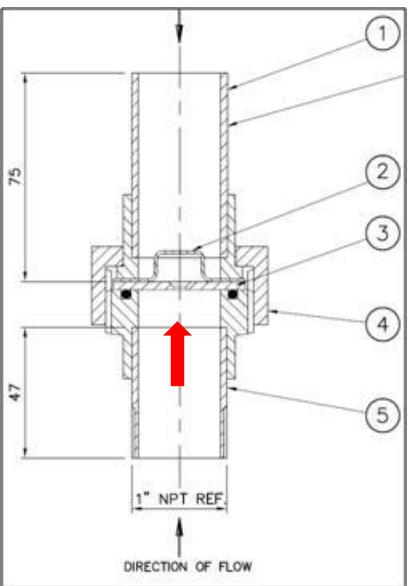
Dimensions - 13.41 m long by 6.71 m wide, 4.48 m to top of media

Loading Rate - 12.2 m/h (5 gpm/ft²)

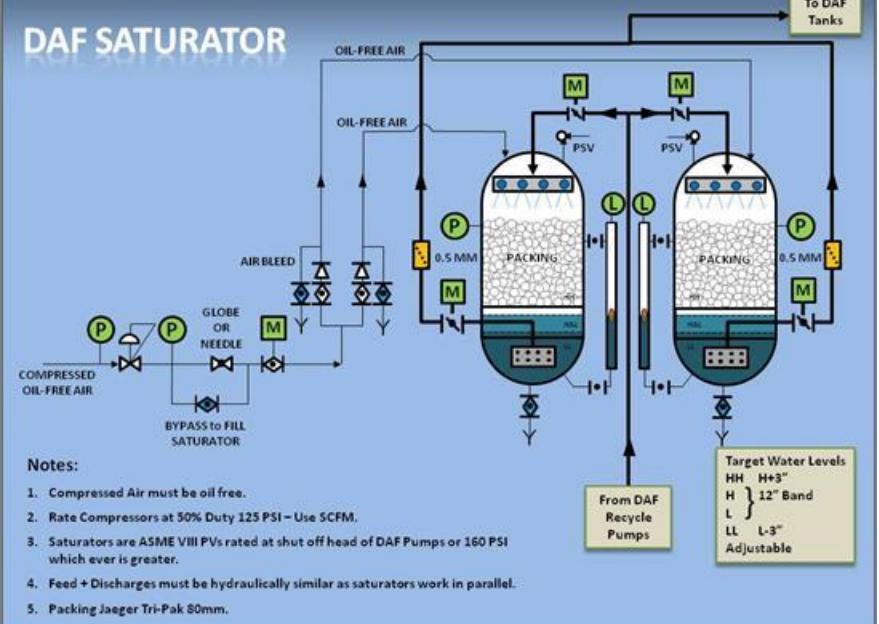
Floated Solids Removal - Rotating Skimmer

Recycle Injection - 3 manifolds per tank, fixed orifice nozzles

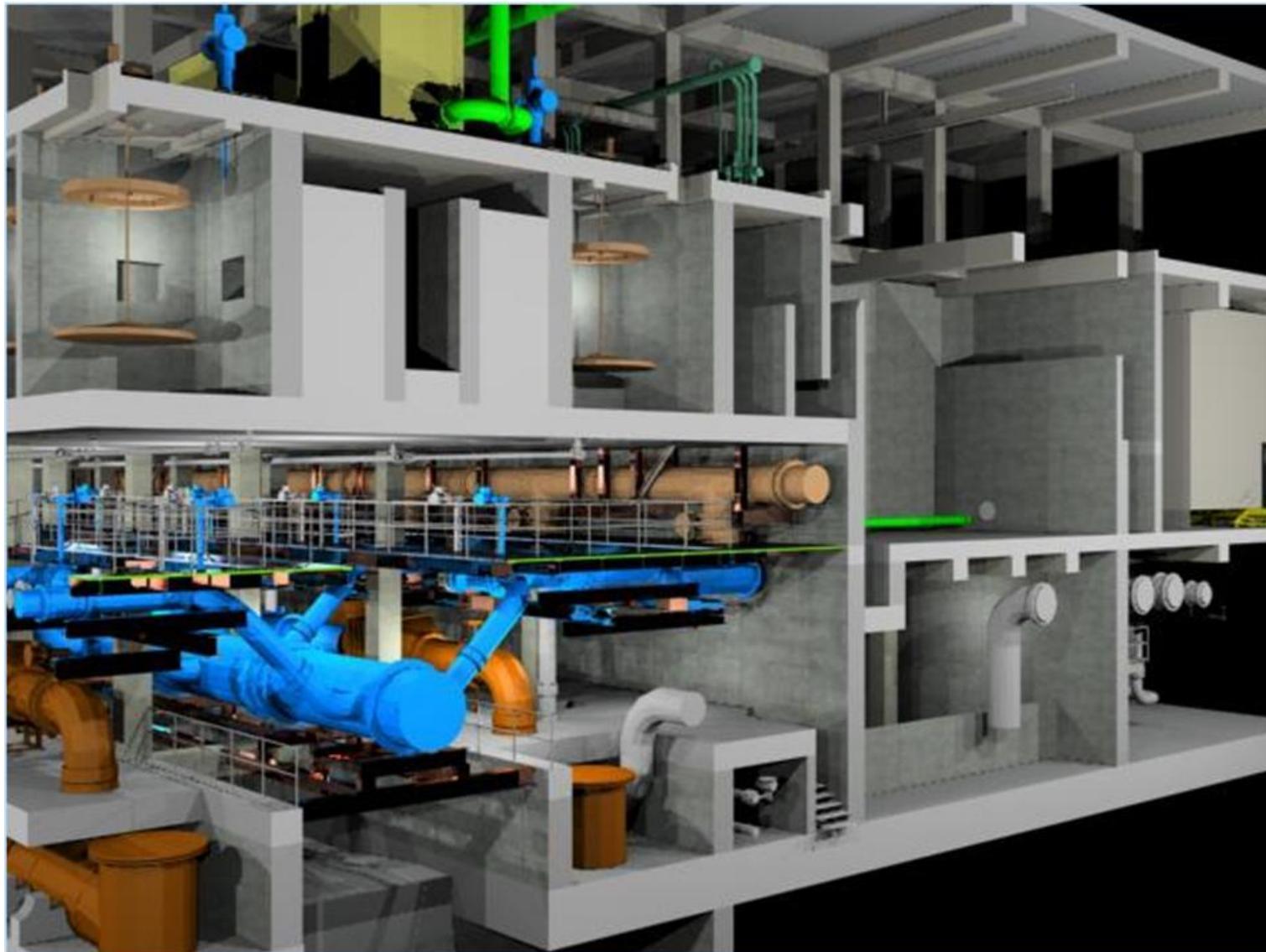
DAF Recycle System



DAF SATURATOR



Filtration and UV – Pipe Gallery



Filters, Media, Backwash and Underdrains

Filtration (Located below DAF)

Number of Filters - 48 (24 per half plant)

Dimensions - 10.97 m long by 6.71 m wide

Loading Rate - 15.9 m/h (6.5 gpm/ft²)

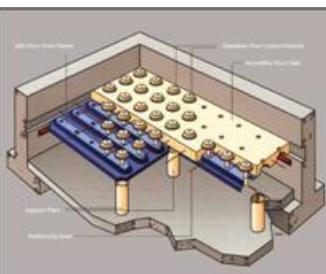
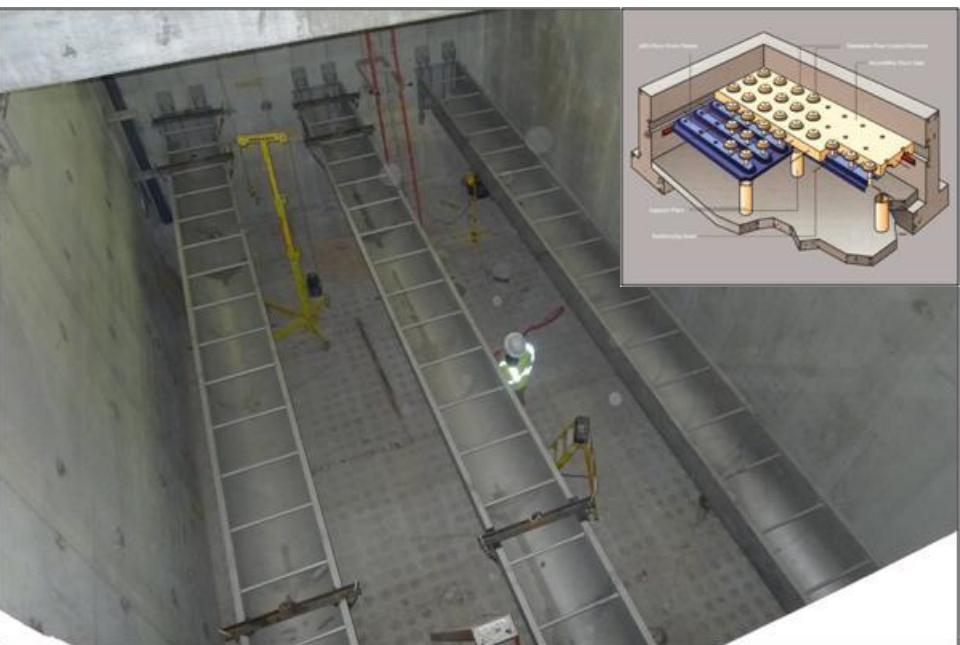
Media type and depth 0.61 m anthracite and 0.30 m silica sand

Filter Floor/ Underdrain - Concrete monolithic plenum with plastic nozzles

Backwash - Air scour, air/low rate wash and high rate wash



Air Scour Blowers



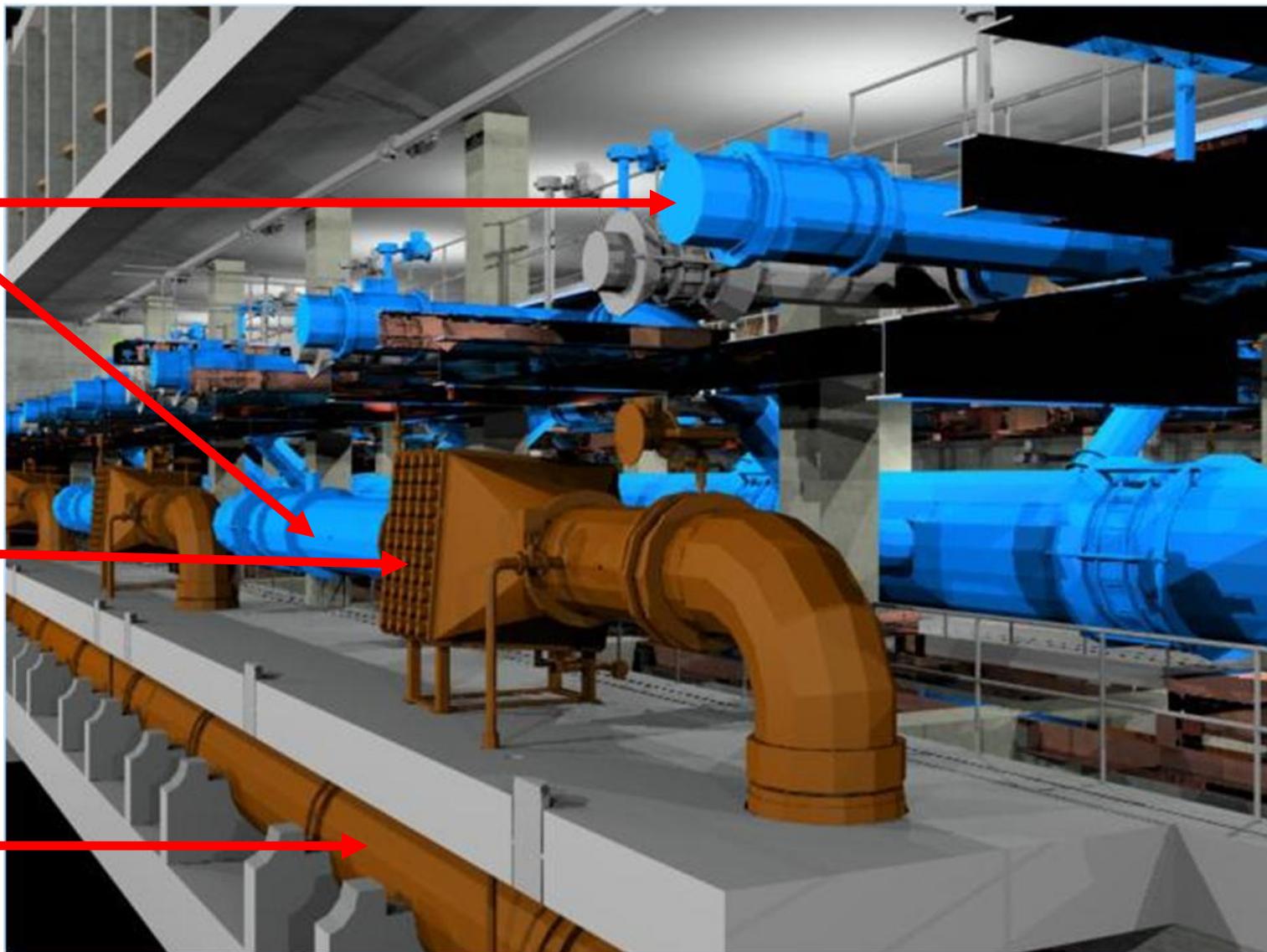
Backwash Pumps

Filtration and UV Pipe Gallery

Filtered Water

UV Unit

UV Effluent
Header



UV Disinfection

UV Disinfection – Trojan UV

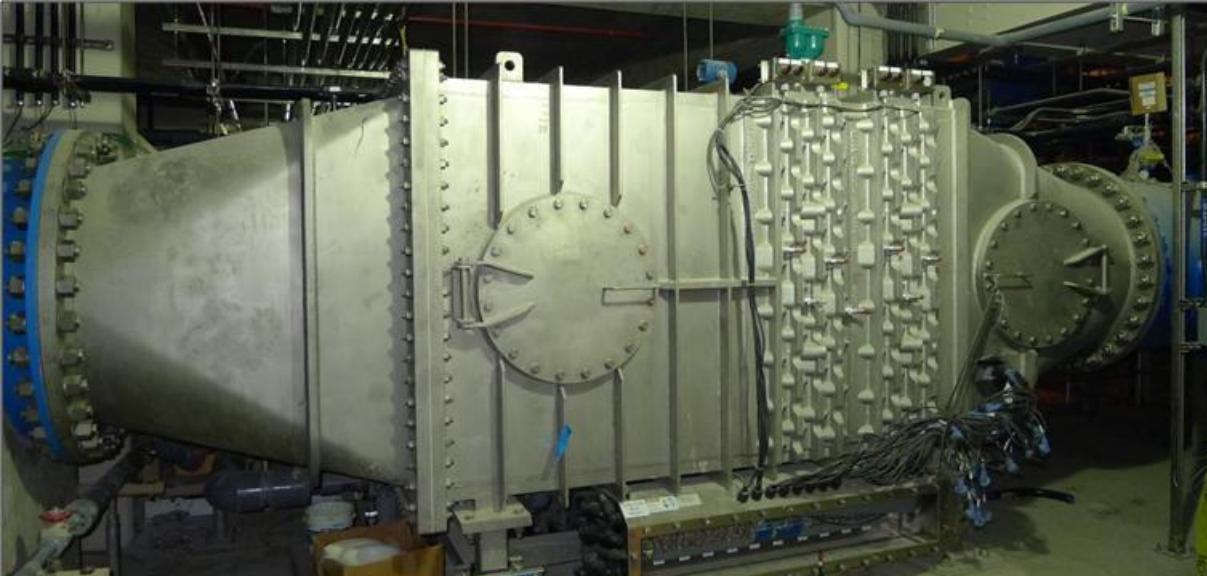
Number of Units - 20 (10 per half plant)

Capacity and Size - 75.7 ML/d (20 mgd), 0.91 m dia. inlet and outlet

UV System Type - Low pressure high output – narrow spectrum

UV Transmittance > 95%

UV Reduction Equivalent Dose (RED) -
 $40 \text{ mJ/cm}^2 > 2 \log$ *Cryptosporidium* inactivation



Thank You - Questions

