

SAWEA WORKSHOP
MBR CHALLENGE

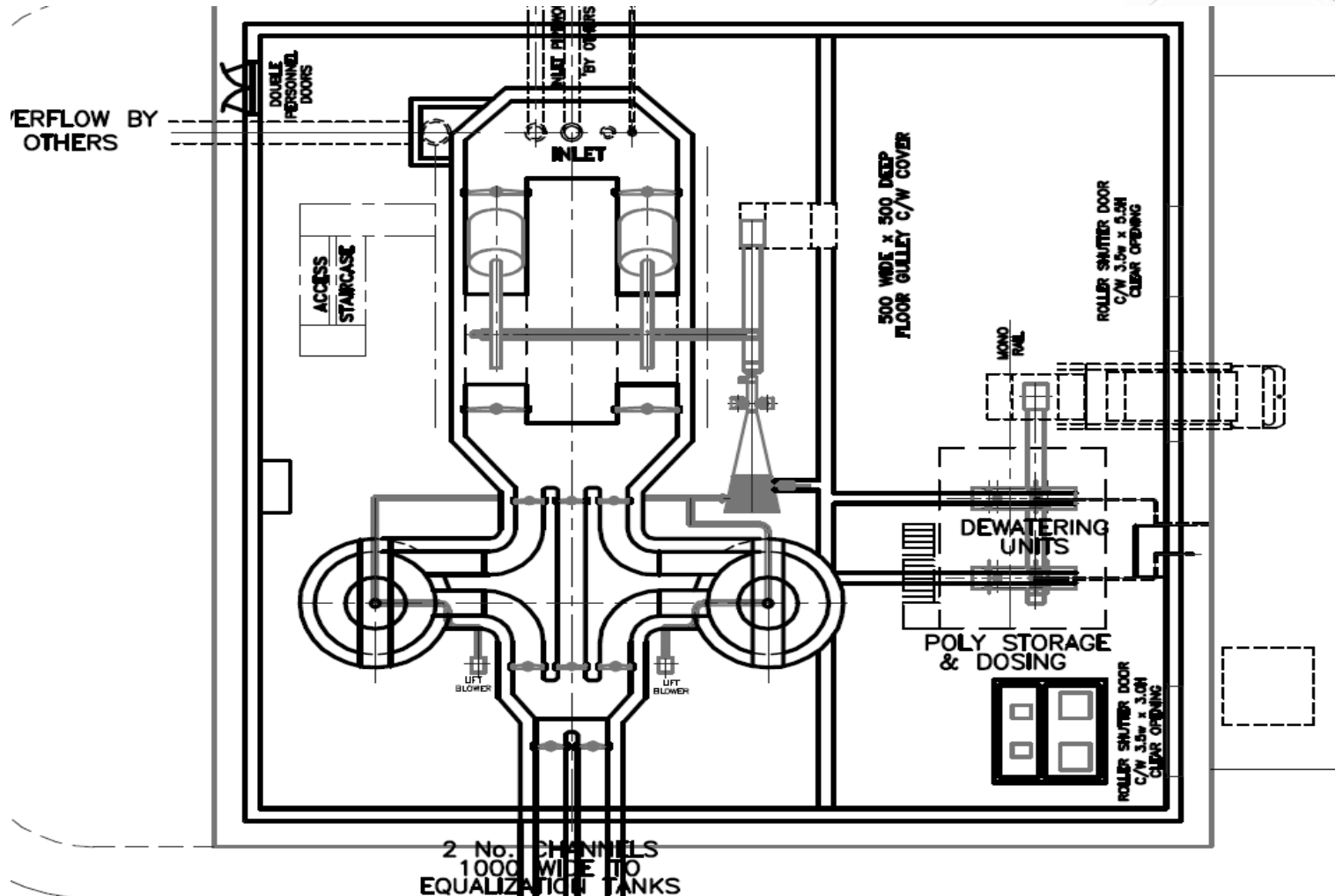
Design Inputs

- **Location: Near Jeddah – space not an issue**
- **Industry Std design requirements**
- **Reliability important to the design**
- **Comply with MOMRA unrestricted reuse requirements**
- **Average annual flow rate – 9500 m³/d**
- **Peak flow 4 times Ave. annual flow rate**
- **BOD₅ – 150 mg/L**
- **TSS – 300 mg/L**
- **NH₃ – 35 mg/L**
- **TKN – 40 mg/L**
- **Alkalinity – 100 mg/L**
- **FOG - < 30 mg/L**
- **Total Phosphorus – 4 mg/L**

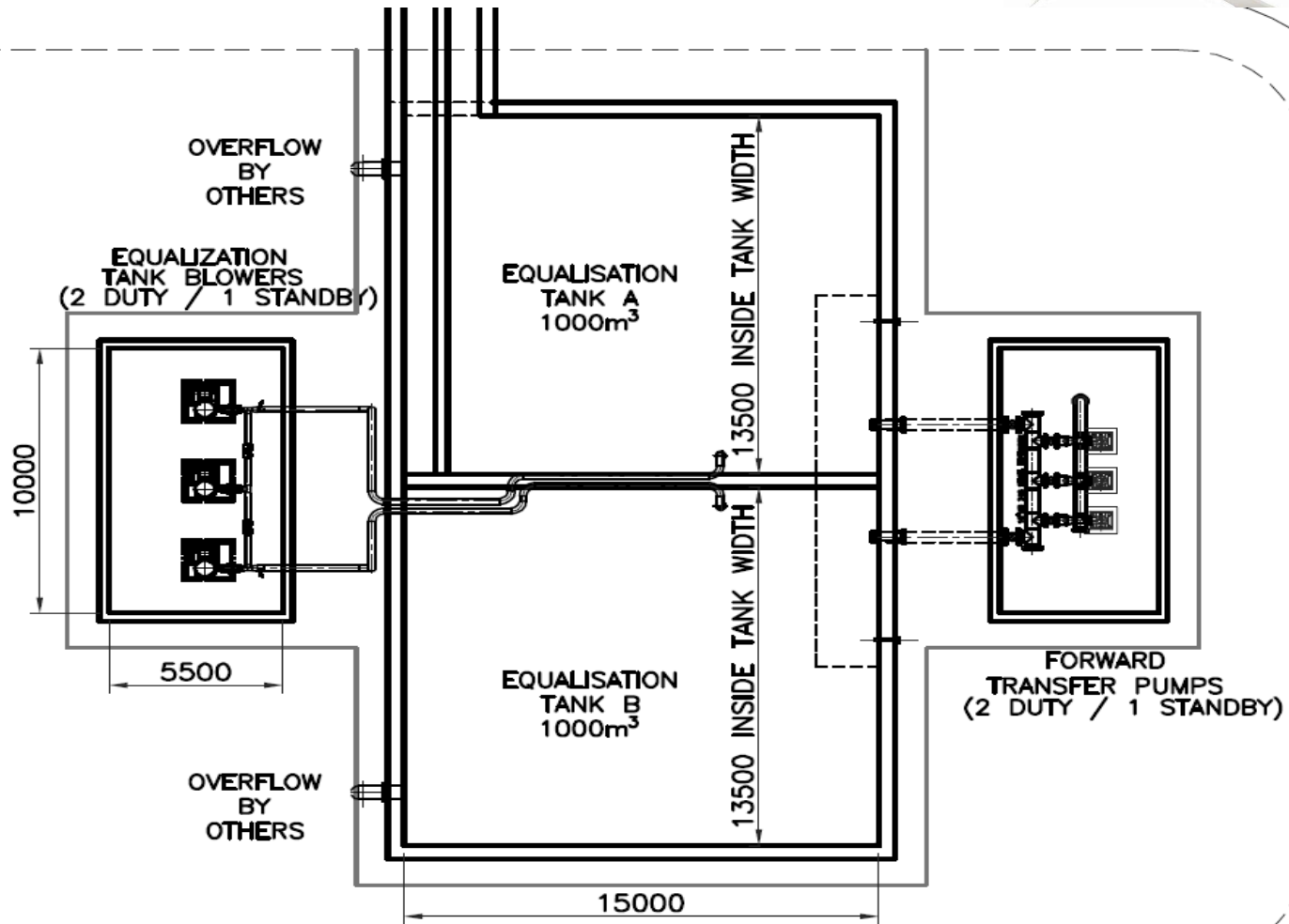
Proposed System

- MBR based technology, utilizing KUBOTA flat sheet membranes.
- Pretreatment based on 3 mm screening, grit removal, and equalization volume to cater for peak flow (4 times average flow).
- 4 Independent equal streams.
- Post chlorination
- Sludge dewatering (1.5% up to 18-22%)

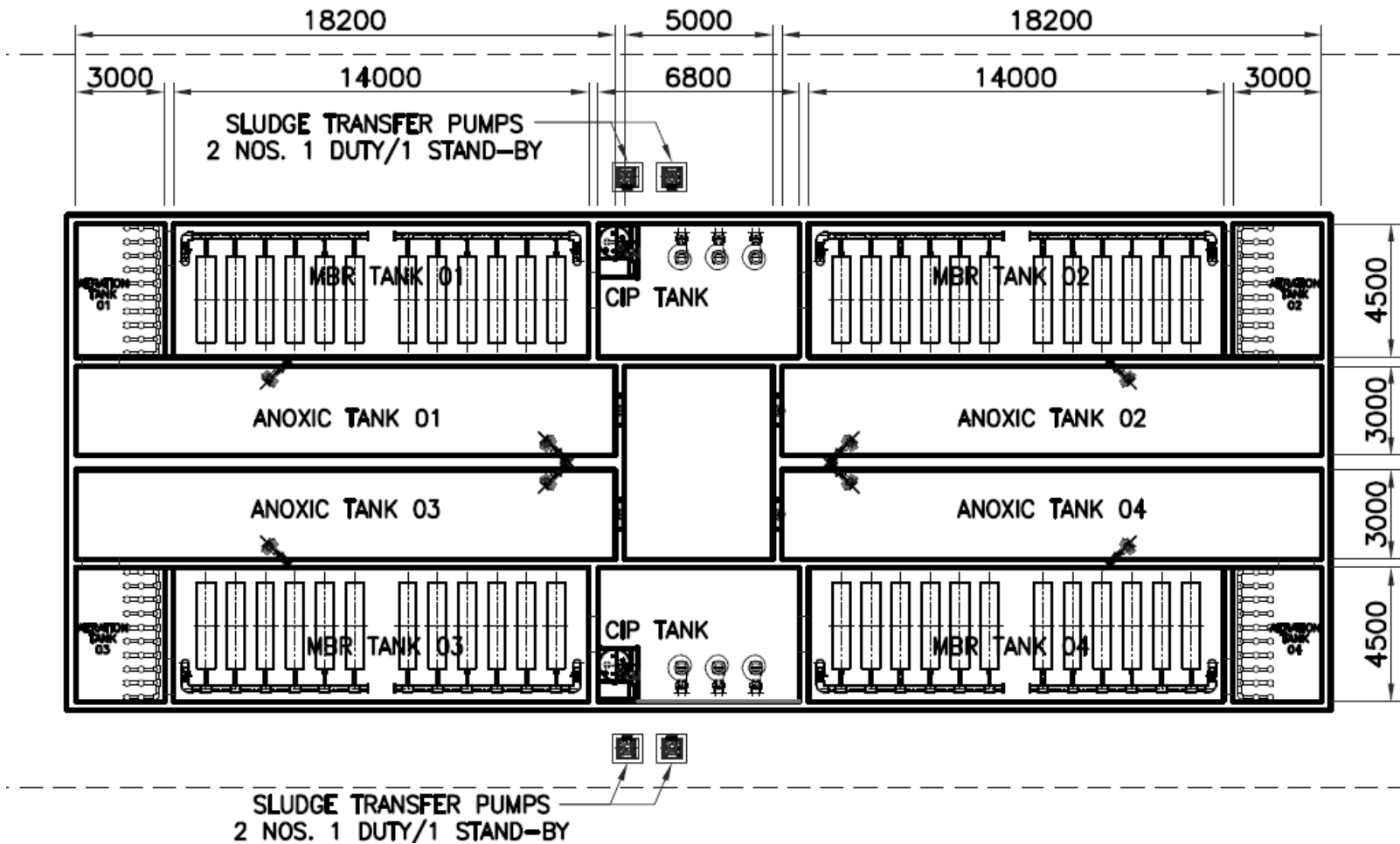
Plot Plan...Pretreatment

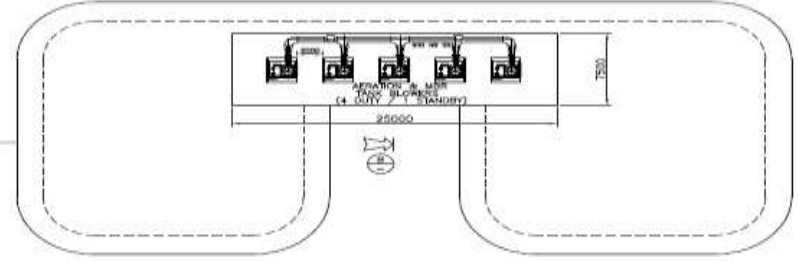
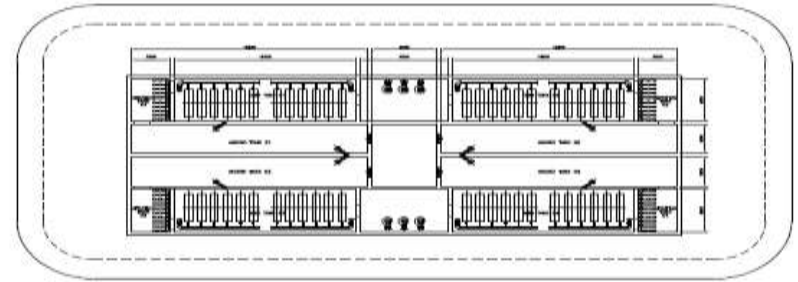
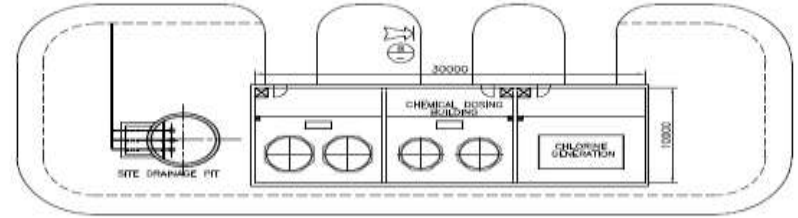
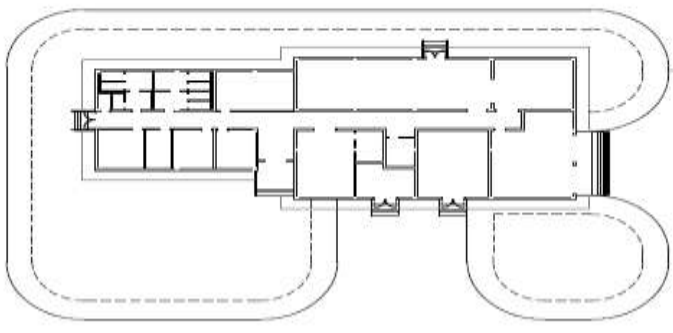
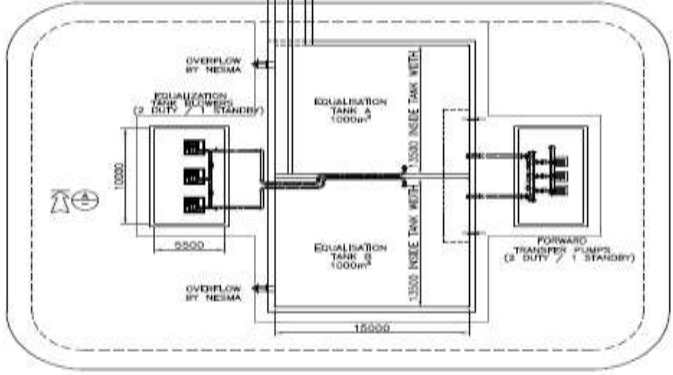
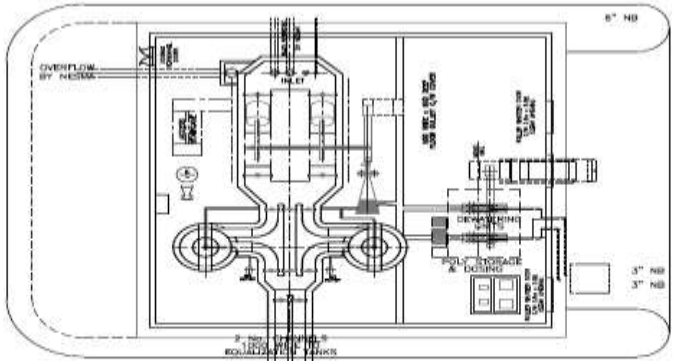


Plot Plan...Equalization

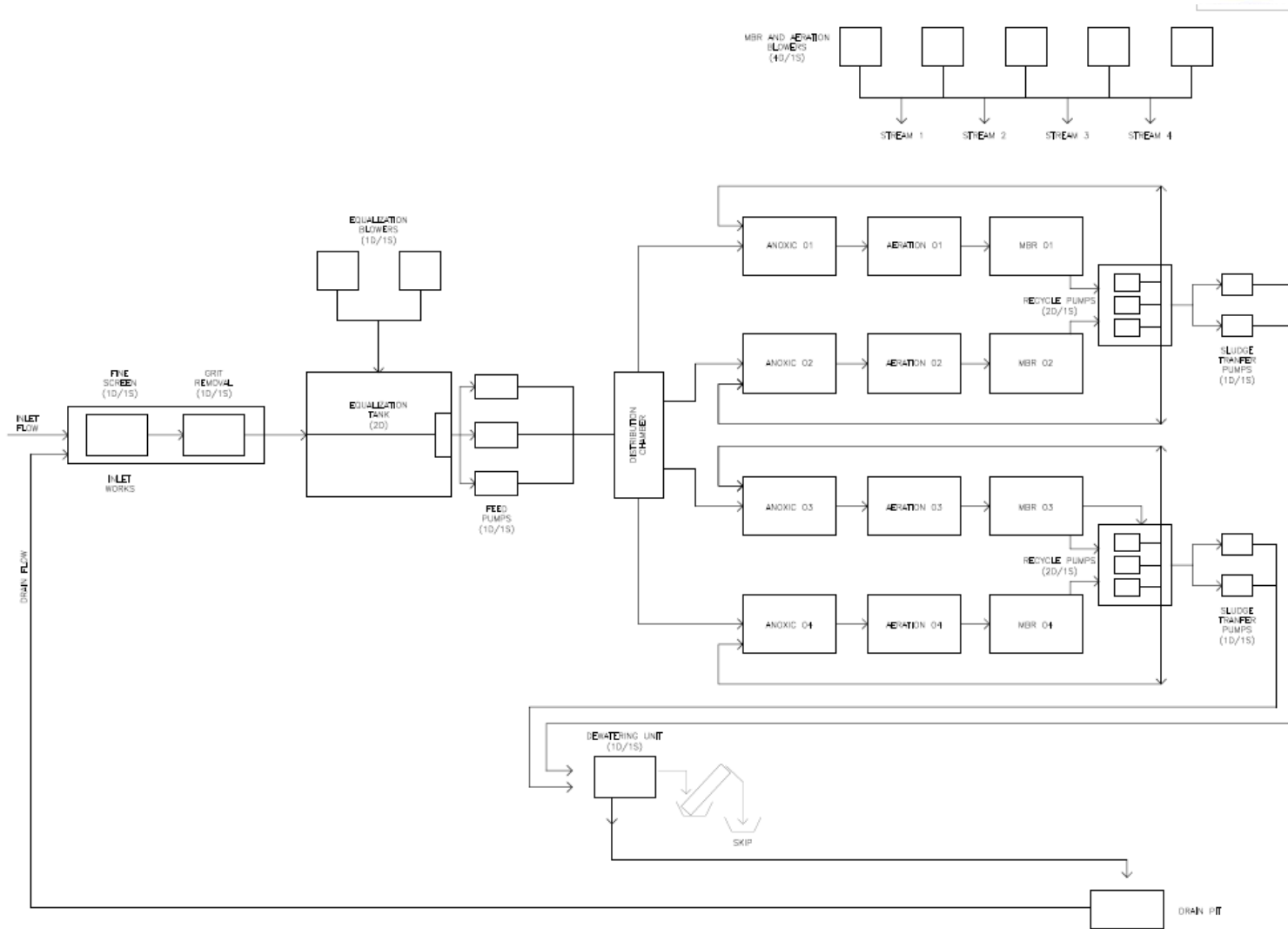


Plot Plan...Treatment Plant





Process Flow Diagram



Major Equipment Listing

- **TANKS**

Equalization Tank : 2 Ea (1,000 CuM Ea)

Anoxic Tanks : 4 Ea (298 CuM Ea)

Aeration Tanks : 4 Ea (76 CuM Ea)

MBR Tanks : 4 Ea (330 CuM Ea)

TES Tank : 1 Ea (5,000 CuM)

...Major Equipment Listing

- **Mechanical Equipments**

| | |
|-----------------------------------|------------------------------------|
| Inlet 3 mm screen | : 1D/1S (4 x Avg. Flow) |
| Grit Removal | : 1D/1S (4 x Avg. Flow) |
| Feed Forward Pumps | : 2D/1S (98 L/S) |
| Equalization Blowers | : 1D/1S |
| MBR & Aeration Blowers | : 4D/1S |
| RAS Pumps | : 2D/2S |
| Anoxic Mixers | : 8D (2 per stream) |
| Fine Bubble Diffusers | : 72 per tank |
| MBR Modules | : 12 Double Deck per stream |
| Sludge Feed Pumps | : 2D/2S |

...Major Equipment Listing

- ...Mechanical

Alkalinity Dosing : 1D/1S

Chlorine Dosing : 1D/1S

Dewatering Unit : 1D/1S

Polymer Preparation : 1D/1S

CIP Unit : 1D

...Major Equipment Listing

- **Electrical Items**

MCC + PLC

Inlet Flow Meter

Level Transmitters (equalization, anoxic, MBR tanks)

pH monitors (anoxic tanks)

DO monitors (Aeration tanks)

Pressure Transmitters (across MBR modules)

Permeate Flow Meters

Recycle Flow Meters

Flow Transmitters (airline to membrane tank)

Turbidity meters

Tele-monitoring Provision

Control Philosophy

Once Online, PLC assumes full control of process.

Control Includes: -

- **Equipment Functionality**
- **Response to Change in Effluent Flow**
- **Response to Change in Effluent Characteristics**
- **No operator intervention required for operation,**

**Operator tasks limited to regular site maintenance,
Periodic Sludge Tankering Required**

- **Manual control:**
 - **MLSS analysis**
 - **CIP**

Utilities Consumption

- Caustic Consumption 315 Ltr/day
- Chlorine Consumption 250 Ltr/day
- Power Consumption 1.2 KW/CuM
- Polymer 15 Kg/day
- Dry Cake Sludge 5.5 Kg/day @18%

Operation Requirement

| | |
|-----------------------------|--|
| <u>Daily</u> | Fill in Log Sheets, Routine sampling of MLSS (or as required). |
| <u>Weekly</u> | Flushing of diffusers, Sludge Disposal |
| <u>Monthly</u> | Visual inspection of final effluent Visual inspection of M&E equipment Check on Screenings collection |
| <u>Six-Monthly</u> | Chemical cleaning of membrane units |
| <u>Every 4 years</u> | Remove and inspect membrane unit panels for signs of wear and excessive fouling. Undertake cleaning and replacement as required |

Daily Performance Monitor

- 1) Flow
- 2) Trans Membrane Pressure
- 3) pH
- 4) Tank Liquid Level
- 5) Sludge Thickness, MLSS
- 6) Power Consumption
- 7) Dissolved Oxygen

Tele-Monitoring provision for distance monitoring

Advantages

- **Screening** - The Kubota Membrane Bioreactor System, only requires screening down to 3mm
- **Operating MLSS** - The Kubota MBR system allows operation at MLSS concentration ranging from 12,000 to 18,000 mg/l in the MBR Tanks. Operation at this elevated level results in smaller sludge volumes to be treated (or transported off-site).
- **Hydraulic Profile and Gravity Flow** - Because the Kubota MBR Units are dedicated sewage treatment membranes, with a pore size designed specifically for sewage treatment, they operate on gravity flow, without the need for permeate suction pumps.
- **Sludge Holding** – No separate sludge holding tank, or digesters are required
- **Flat Sheet Membrane** – The membrane configuration being a flat sheet, provide a robust surface, with operating life time of REPORTED 10 years.
- **Cleaning** – Only 1 hour 0.5% liquid chlorine soaking (CIP) every six months (while system in operation)

ACWA-Kubota MBR

- Has gained confidence in the region
- Since 2003 more than 27 installations ranging from 100 CuM/day to 76,000 CuM/day, in both Municipal and Industrial applications

Thank You....

Questions...