OCSD Water Reuse Facility

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Neptune Co.

UCI Samueli School of Engineering | Department of Civil and Environmental Engineering

Project Overview

A new water treatment reuse facility must be designed to treat 20 MGD of wastewater. It will be located in a in a semi-arid inland region. This design entails pre-treatment, primary treatment, secondary treatment, and tertiary treatment processes. It also includes a solids-handling facility that treats sludge from the primary and secondary clarifiers. The treated water will be used for groundwater replenishment.

Constraints and Parameters

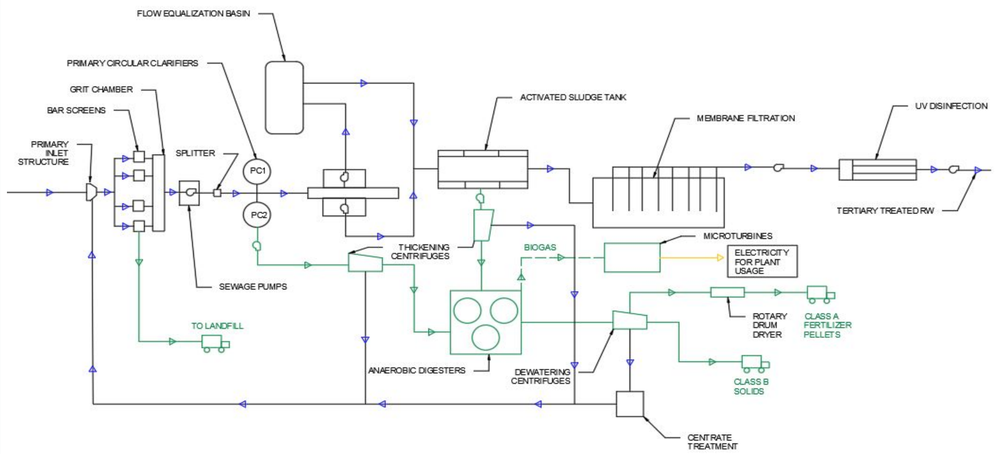
- Average daily flow of 20 MGD, with a peaking factor of 3 to accommodate extreme weather events.
- The treated effluent leaving must be in accordance to the California Code of Regulations, Title 22, to be used as recycled water. Additionally, the effluent must meet The Clean Water Act and National Pollutant Discharge Elimination System (NPDES) standards.
- Develop optimal solutions to prevent odors and pollution for public health and safety.

Design Constituents

Category	Constituent	Influent	Discharge Standard	Units
Organic Matter	Biochemical Oxygen Demand (BOD)	300	30[1]	mg/L
	Chemical Oxygen Demand (COD)	540	30[1]	mg/L
Suspended Solids	Total Suspended Solids (TSS)	430	30[1]	mg/L
Nutrients	Ammonia-Nitrogen	40	2	mg/L

[1]: 30mg/L standard is based on a 30 day average

Process Flow



Pre-Treatment

Mechanically Cleaned Bar Screen		
Criteria	Value	Units
Design Flow	75708 (20)	m^3/day (MGD)
Head Loss	300	mm
Size Opening	25	mm
Moisture Content	70%	—
Specific Weight	7848	N/m^3
Screen Capacity	22	L/1000 m^3
Volume Screened	1666	m^3/day
Dry Mass Screened	3921 (4.32)	kg/day (tons/day)

Aerated Grit Chamber		
Criteria	Value	Units
Peak Flow Rate	60	MGD
Volume per Unit	8355.1	ft^3
Depth	12	ft
Width	18	ft
Length	38.7	ft
Detention Time at Avg. Flow	8.9	minutes
Air Supply	386.8	ft^3/min
Grit Relative Density	2.65	kg/m^3
Volume of Grit	200	ft^3/day
Mass of Grit	15 (33.1)	kg/day (lb/day)

Primary Treatment

Circular Sedimentation Tank		
Criteria	Value	Units
Hydraulic Retention Time	2	hours
Average Overflow Rate	40	m^3/m^2-day
Peak Hourly Flow	100	m^3/m^2-day
Total Surface Area Required at Average Flow Condition	1893	m^2
Depth	4	m
Diameter	30	m
Bottom Slope	0.08	mm/mm
Flight Speed	0.03	rev/min
Area of Each Tank	730	m^2
Number of Tanks Needed	3	—
Detention Time	2.6	hours
TSS Concentration (60% Removal)	172	mg/L
BOD Concentration (34% Removal)	198	mg/L
Solids Concentration	6%	—
Sludge Specific Gravity	1.03	—
Sludge Dry Mass	0.0195	kg/day
Flow of Sludge	0.316	L/day

Secondary Treatment

- Secondary treatment uses biological processes to remove organic matter, suspended solids, and nutrients, such as nitrogen and phosphorus.
- An activated sludge aeration tank will be utilized during this phase of treatment

Tertiary Treatment

- Tertiary treatment removes the remaining inorganic compounds and organisms that may be harmful to public health such as bacteria, parasites, and viruses
- Tertiary treatment will consist of ultrafiltration membranes in conjunction with UV disinfection tore that the facility meets Title 22 regulations and NPDES standards.

Initial Cost Estimate

Criteria	Cost
Pre-Treatment	$650,000
Primary Treatment	$27,400,000
Total	$28,050,000

Next Steps

- Secondary Treatment Design
- Tertiary Treatment Design
- Solids Handling
- Total Cost Analysis

Contact Information

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