

Wastewater Treatment Facility

Design Team W-3

Industry Advisor: Reza Sobhani, PhD, PE

Project Manager:David Srouji, dsrouji@uci.edu

Team Members: Melissa Palencia & Fernanda Rocha



Project Description

A semi-arid city must construct a new water treatment facility that approximately handles 20MGD. The facility must include a preliminary, primary, secondary and tertiary treatment process. Moreover, a solids-handling facility must be included to treat the sludge within the primary and secondary treatment. Each system must abide by their respective EPA requirements and regulations.

Design Objectives

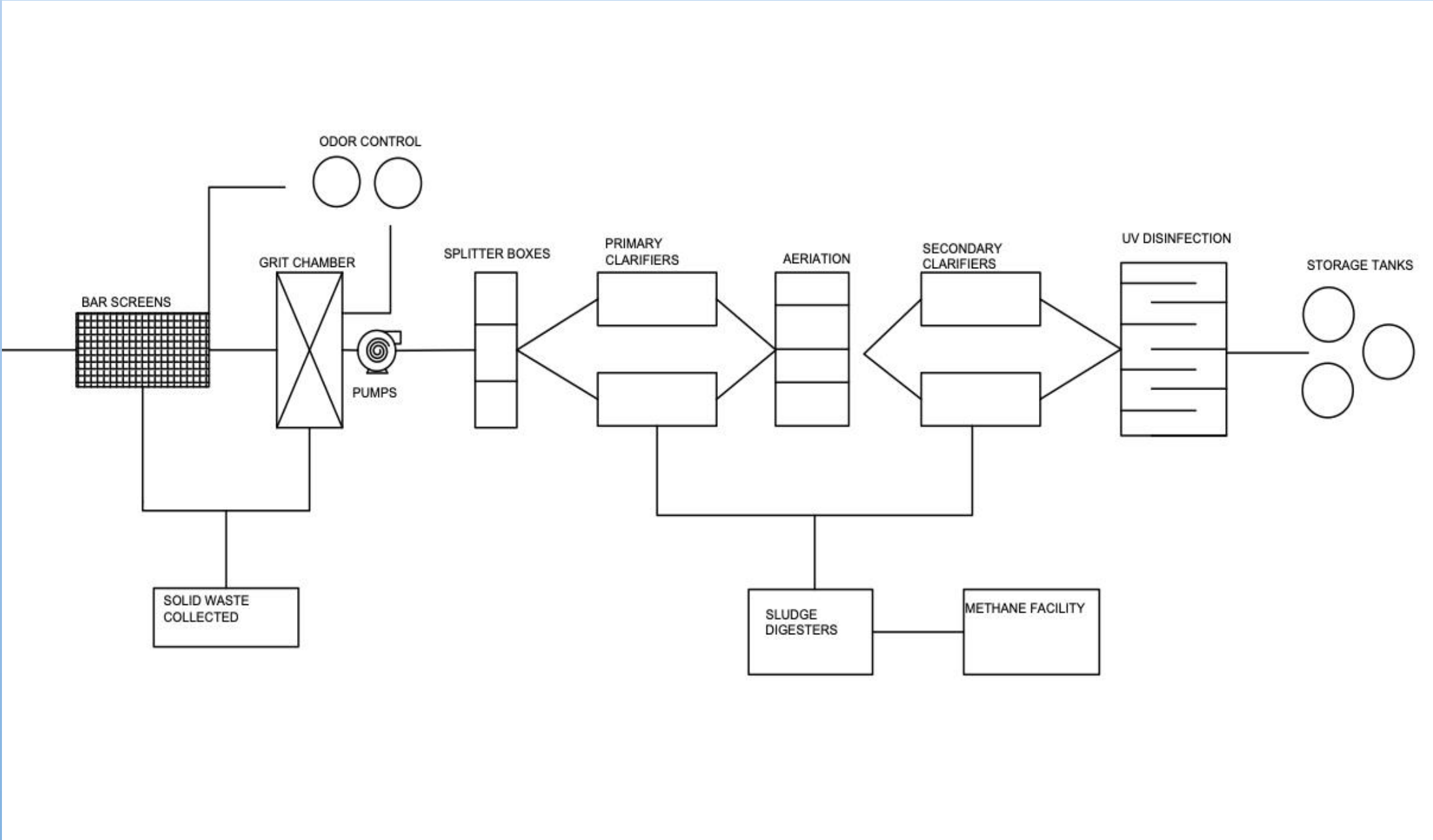
- Minimize facility’s downtime for maintenance or system failure by adding redundancy to the processes
- Account for peaks in influent above 20 MGD by designing the facility for a volume that is double the average daily inflow
- Ensure effluent water meets EPA standards

Design Constraints

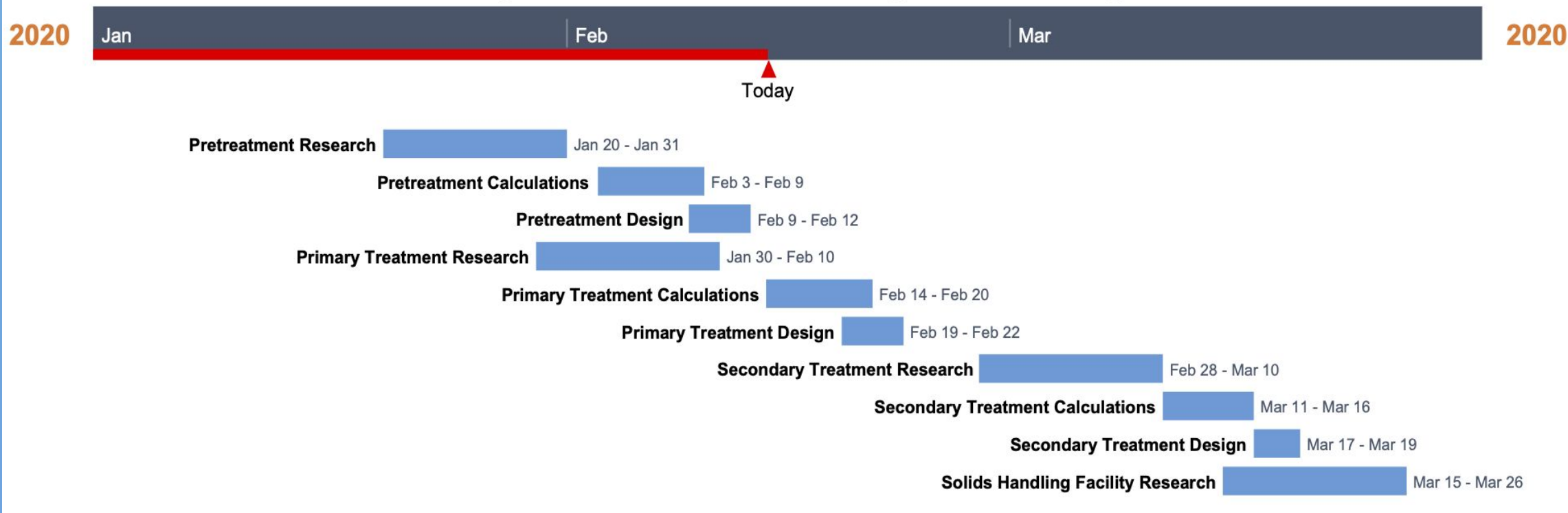
- Facility must treat at least 20 MGD of wastewater (*design accounts for 40 MGD*)
- Influent constituents’ concentrations must be reduced to the effluent concentrations to meet EPA requirements
- No land constraints

Category	Constituent	Value
Organic Matter	Biochemical Oxygen Demand (BOD)	20 mg/L
Suspended Solids	Total Suspended Solids (TSS)	40 mg/L

Treatment Process Diagram



Schedule



Cost Analysis

Criteria	Cost
Preliminary Treatment	\$630,000
Primary Treatment	\$27,000,000
Total	\$27,630,000

Preliminary Treatment

Screenings	
Criteria	Value
Design Flow	20 MGD
Size Openings	12 mm
Moisture Content	75%
Specific Weight	900 kg/m³
Volume Screened	140 ft³/day
Dry Mass Screened	892 kg/day
Head Loss	1 ft
Grit Chamber	
Criteria	Value
Peak Flow	40 MGD
Volume per Unit	13,890 Gallons
Detention Time	60 seconds
Grit Relative Density	2.65 kg/m³
Volume of Grit	80 ft³/day
Mass of Grit	6 MGD

Primary Treatment

Sedimentation Tanks	
Criteria	Value
Hydraulic Retention Time	2 hr
Average Overflow Rate	40 m³/m²/day
Peak Hourly Flow	100 m³/m²/day
Total Surface Area	1893 m²
Dimensions	105 m x 4 m x 7 m
Area of Each Tank	3029 m
Number of Tanks	3
TSS Concentration (65% Removal)	26 mg/L
BOD Concentration (35% Removal)	7 mg/L
Solid Concentration	6%
Specific Gravity of Sludge	1.03 kg/m³
Mass of Sludge	1.97 x10 ⁹ mg/day
Volume of Sludge	319 kg TSS/day