CITY OF OXNARD CALIFORNIA

City of Oxnard
Wastewater Division
Wastewater Treatment Plant
Capital Improvement Projects

Overview:

Recent condition assessment of the Oxnard Wastewater Treatment Plant (OWTP) have documented 40% of the facility to be in poor or very poor condition, with 72% at a moderate, high or very high risk of experiencing failures. The City's overall objective is to reduce the failure risk of all facilities to low or very low; however, understanding the current funding limitations the City has developed a 10-year rehabilitation program with goal of reducing the highest risk facilities to a moderate or better risk grade. This 10-year program includes:

- Years 1 - 2: Repair high risk facilities which have been identified as a health and safety concern or urgent need to maintain plant functionality.
- Years 3 - 5: Rehabilitation activities necessary to maintain required minimum redundancy and treatment facility.
- Years 6 - 10: Abandonment of older facilities that have reached the end of their useful life (1975 or older), repurposing and renewal of other facilities to provide a modern treatment process (such as membrane bioreactor (MBR) or other technology), and efficiency improvements including reduced pumping and more efficient treatment equipment.

Note: Year 6 – 10 capital improvement costs are not included in the current wastewater rate study.

Wastewater Collection System:

The City's sanitary sewer collection system is typical for communities of Oxnard's size, and includes:

- 407 miles of gravity sewers (6-inch to 66-inch)
- 23 miles of pressurized force mains (4-inch to 20-inch)
- 15 wastewater lift stations

Oxnard Wastewater Treatment Plant Process and History:

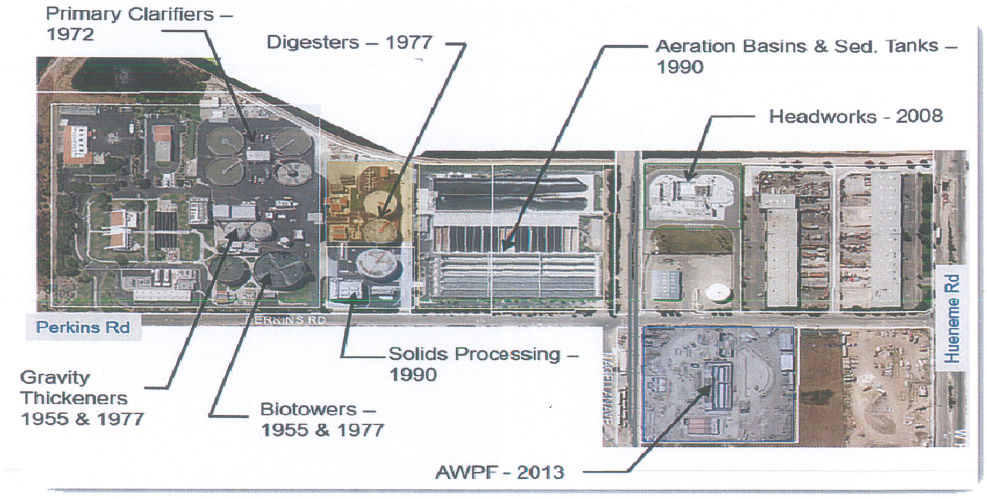
The sanitary sewer system conveys residential, commercial, and industrial wastewater to the City's treatment facility which cleans and discharges the treated water in compliance with the Federal and State requirements applicable to the City's system.

The treatment process at the City's wastewater treatment plant includes:

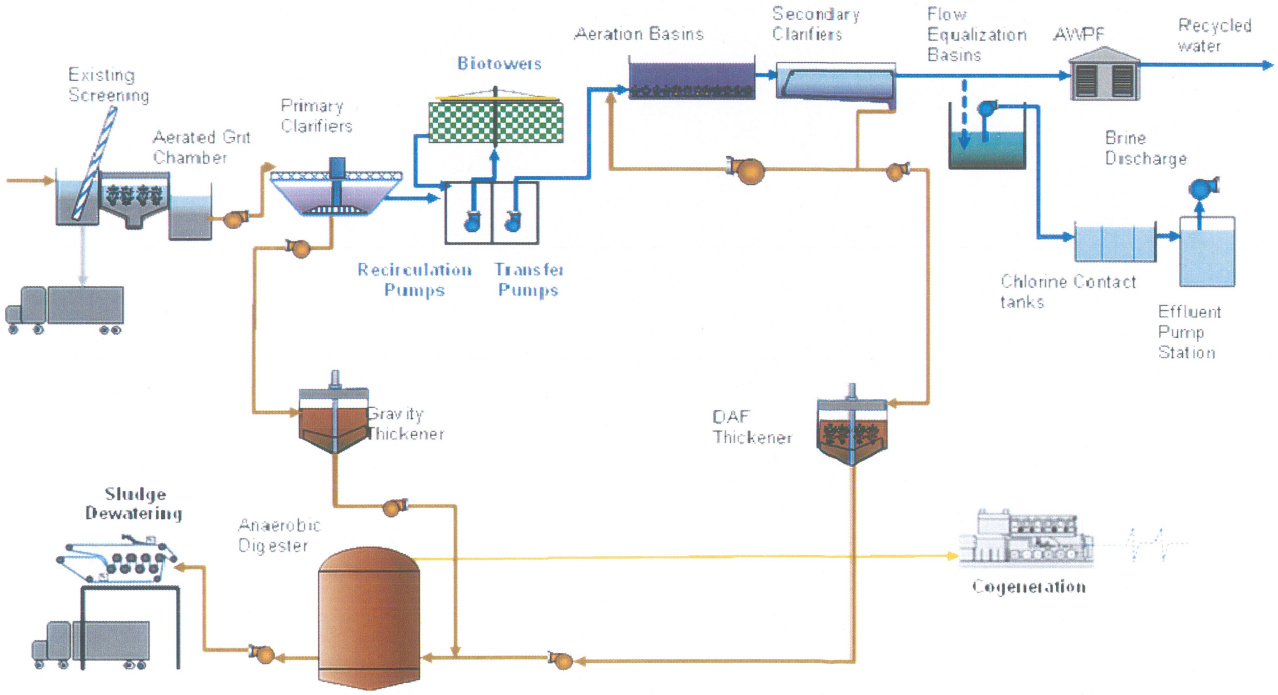
- Preliminary treatment – screening and grit removal (removal of large inorganic materials)
- Primary treatment – removal of heavy solids and inorganic materials

- Secondary treatment – removal of soluble organics through biological treatment

The Oxnard Wastewater Treatment Plant (OWTP) was moved to its current location from the original Durley Park location in the 1950s. Major improvements were completed in the 1970s and 1980s while the most recent plant upgrades were completed in 2006 when the City constructed a new headworks facility to provide reliable preliminary treatment. Currently the OWTP provides regional wastewater treatment services for the City of Port Hueneme, Channel Islands Beach Community District, United States Navy bases, El Rio, Nyeland Acres, and Las Posas Estates.



The OWTP is permitted to treat approximately 32 million gallons per day of the local communities' wastewater.

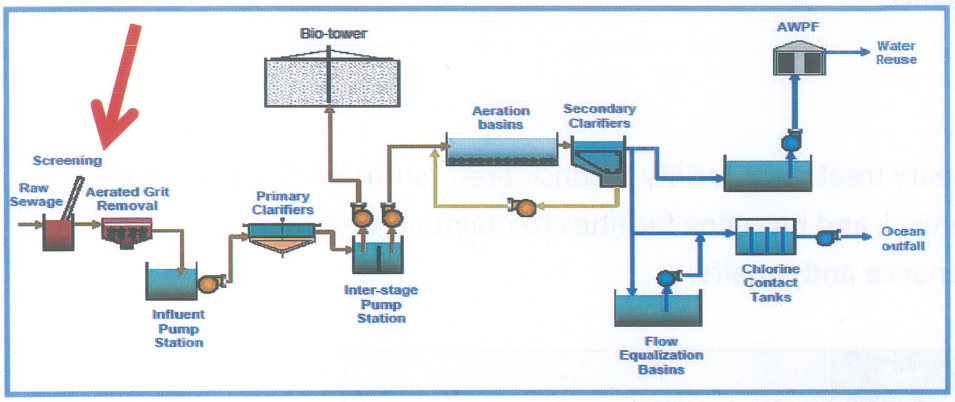


Existing Wastewater Treatment Plant Process Flow Diagram

Preliminary Treatment (Headworks)

Process Description, Location, and Function:

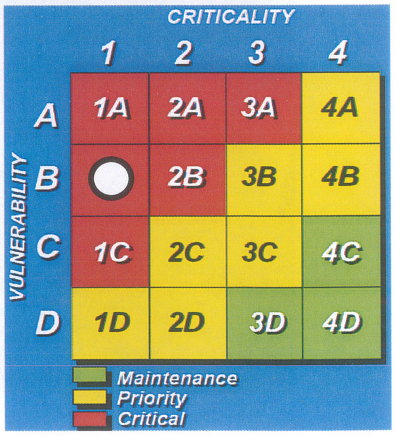
Preliminary treatment is the very first unit process in the treatment plant. It removes large solids and rags (screenings); abrasive inert material (grit); floating debris; and grease from raw sewage. Preliminary treatment at the OWTP includes screening and grit removal facilities, a pump station, and odor control equipment. The location is indicated in the graphics below and to the right.



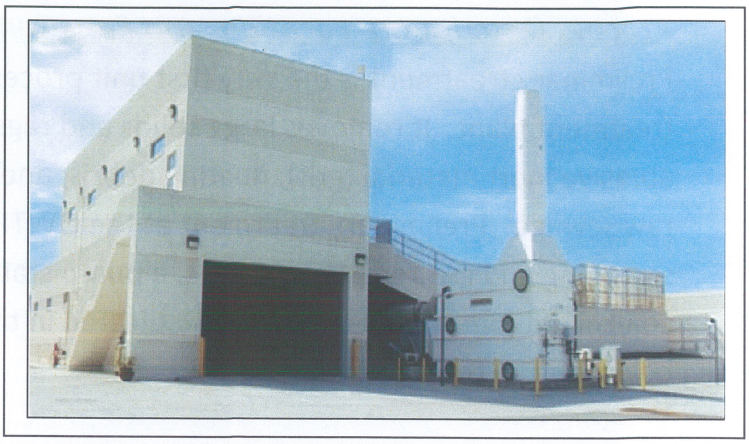
Condition and Risk Grading:

Although the preliminary treatment facility is newer and is generally in good condition, there are some critical health and safety and odor issues that must be addressed. They include:

- Severe degradation of covered basin concrete, steel supports, and fiberglass covers resulting in a safety hazard for staff
- Upper portions of other covered concrete structures have coating failure and concrete degradation and need to be repaired and recoated to maintain the structural integrity
- The odor control system is not functioning adequately to remove nuisance odors resulting in numerous complaints and a lawsuit from neighboring property owners



Preliminary Treatment (Headworks)



Reliability:

Reliability grading of "Not Reliable" due to:

- Extensive concrete and cover degradation
- Odor system is inadequately controlling odors
- Failures result in health hazards and/or public odor nuisance

Redundancy:

Redundancy at the preliminary treatment facility is considered "sufficient" with enough standby screening, grit removal, and pumping facilities to maintain treatment during outages for routine maintenance and repairs.

Preliminary Treatment (Headworks)

Necessary Improvements:

Phase	Improvements	Estimated Cost
Emergency (Yrs 1-2)	New dampers, fan, and duct repairs at odor control system; Repair basin concrete and replace fiberglass covers (partial)	$310,000
CIP (Yrs 3-5)	Repair basin concrete and replace fiberglass covers (remainder)	$409,100
	New odor control system; enclose screens; install screen wall along north and west of property	$7,250,000
CIP (Yrs 6-10)*	New non-hazardous waste receiving station with metering and screening systems to increase wastewater revenue.	$2,400,000

Note: CIP (Yrs 6-10) costs are not included in the current wastewater rate study

Consequences of Inaction:

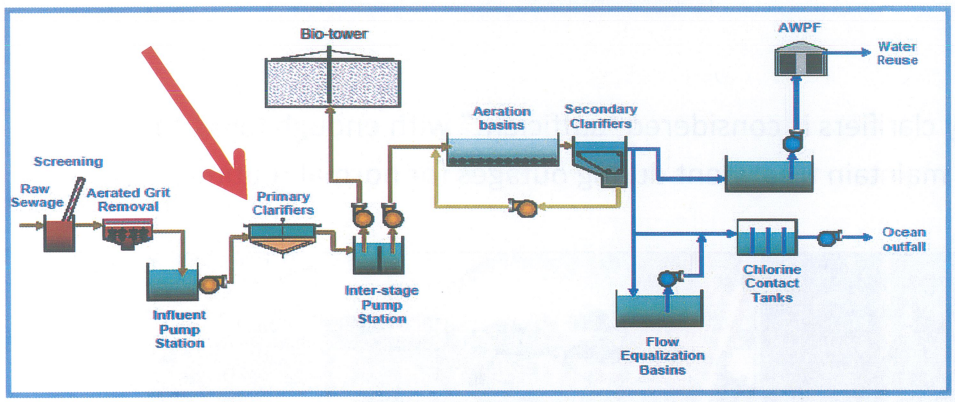
Potential consequences if no action is taken to address the identified issues and facility needs include:

- Life threatening injuries to City staff are possible
- Regulatory penalties including damages to environment, base liability, investigation & enforcement costs
- More neighborhood sewer odor complaints
- Increased cost of facility operation and repairs

Primary Treatment

Process Description, Location, and Function:

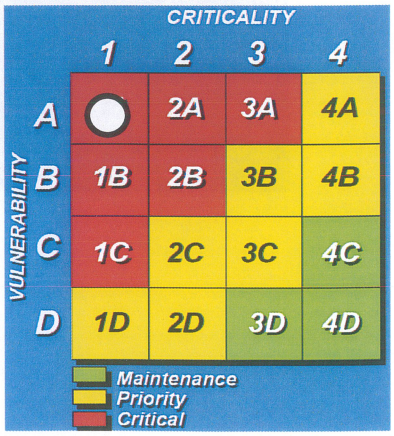
The primary treatment tanks ("Primary Clarifiers") consist of 4 circular settling tanks which process preliminary treated wastewater to remove heavy solids and inorganic materials. The location of the primary clarifiers on the OWTP site and within the treatment process are indicated in the graphics below and to the right.



Condition and Risk Grading:

Overall the condition of the primary treatment is poor with a risk grading of "critical." Factors include:

- Extensive corrosion of interior and exterior steel components
- Walkways are severely corroded in certain locations and pose a direct safety hazard to plant staff
- Effluent weirs, launder troughs, and associated supports are severely corroded to the point of being beyond repair – all requiring replacement
- Scraper mechanisms are substantially corroded and require selective steel replacement and full sandblast/recoating of surfaces
- Pumps, drives, access walkways, and other equipment (including scraper mechanisms) are beyond their useful service lives



Primary Treatment

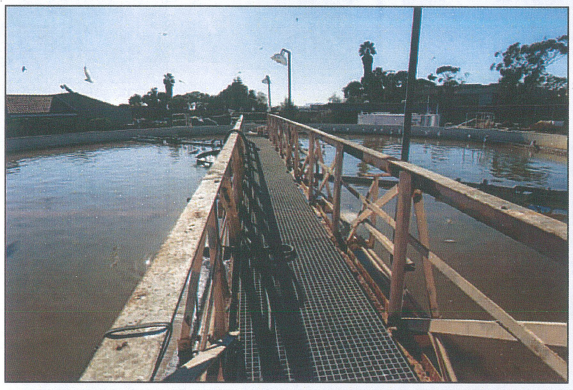
Reliability:

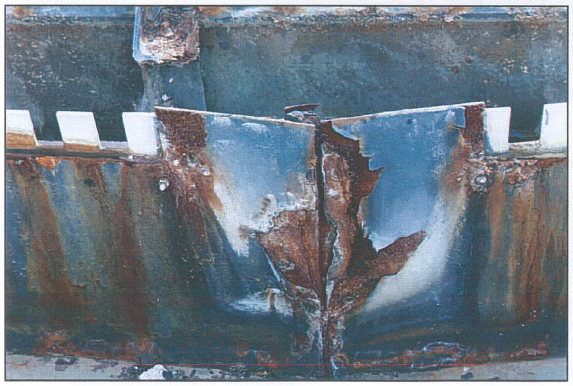
Reliability grading of "Not Reliable" due to:

- Extensive corrosion of interior steel components
- Failure results in loss of treatment

Redundancy:

Redundancy at the primary clarifiers is considered "sufficient" with enough tanks to allow reasonable ability to maintain treatment during outages for normal routine maintenance and repairs.





Primary Treatment

Necessary Improvements:

Phase	Improvements	Estimated Cost
Emergency (Yrs 1-2)	Replace effluent weirs, launder troughs, and supports Replace clarifier #4 walkway Install Chemically Enhanced Primary Treatment (CEPT)	$655,000
CIP (Yrs 3-5)	None Identified	---
CIP (Yrs 6-10)*	Existing primary clarifiers demolition. Repurpose existing secondary clarifiers as primary treatment facilities. Remove equipment, concrete, piping and electrical systems in primary clarifier areas.	$7,800,000

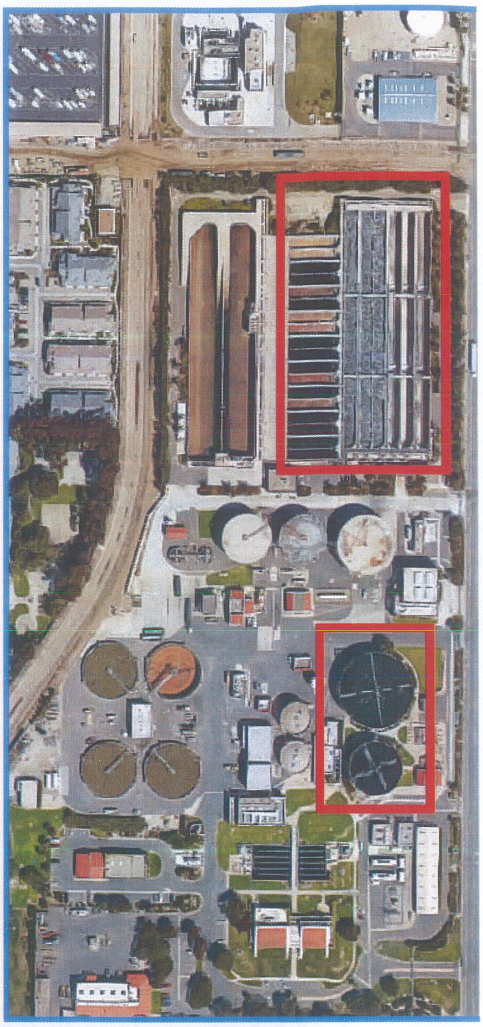
Note: CIP (Yrs 6-10) costs are not included in the current wastewater rate study

Consequences of Inaction:

Potential consequences if no action is taken to address the identified issues and facility needs include:

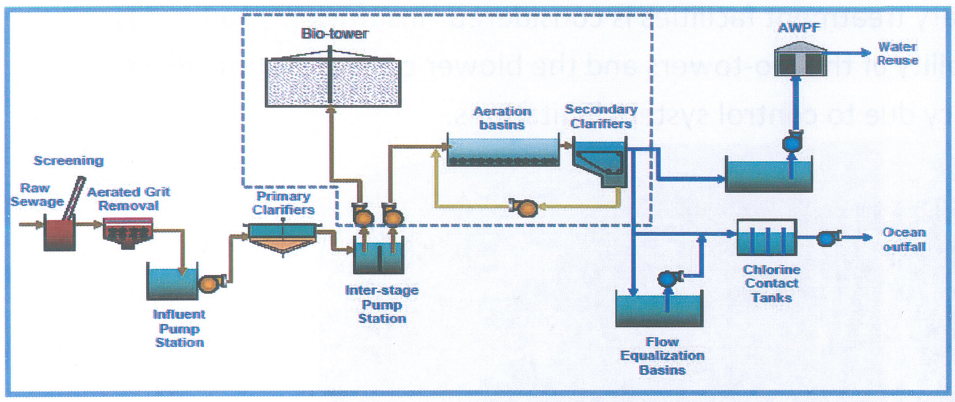
- Regulatory penalties including damages to environment, base liability, investigation & enforcement costs
- Beach contamination & closure
- More neighborhood sewer odor complaints
- Increased cost of facility operation and repairs

Secondary Treatment



Process Description, Location, and Function:

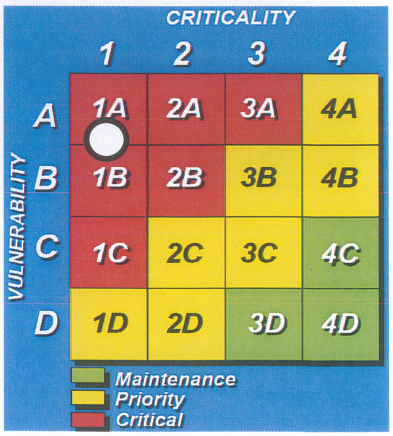
Secondary treatment facilities remove organic material in the wastewater using microorganisms that convert the organic matter into new cell mass and byproducts which are then settled out and removed. At the OWTP, the secondary systems include bio-towers, aeration basins, and secondary clarifiers along with support systems (aeration blowers, pumping systems, etc.).



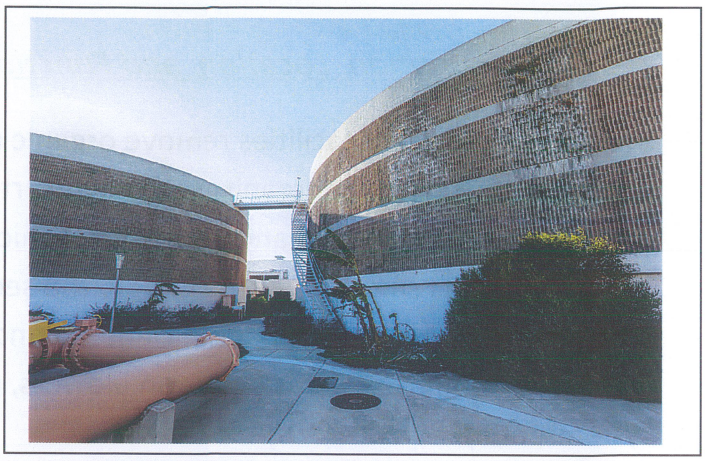
Condition and Risk Grading:

Overall the condition of the secondary treatment is poor with a risk grading of "critical." Factors include:

- Bio-tower structures are beyond their useful life and have been documented as a safety hazard due to high risk of tank wall failure
- The blower facility control system no longer functions adequately and must be replaced in order to remove the failing bio-towers from service
- The activated sludge tank diffused air piping (diffuser grid) is beyond its useful life and the piping joints fail, requiring continual repairs to keep the system functioning
- The activated sludge tank instruments – dissolved oxygen meters, air flow control valves, isolation gates and air flow meters no longer work properly



Secondary Treatment



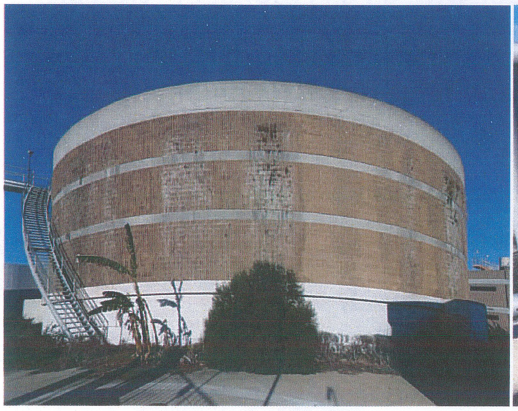
Reliability:

Reliability grading of "Not Reliable" due to:

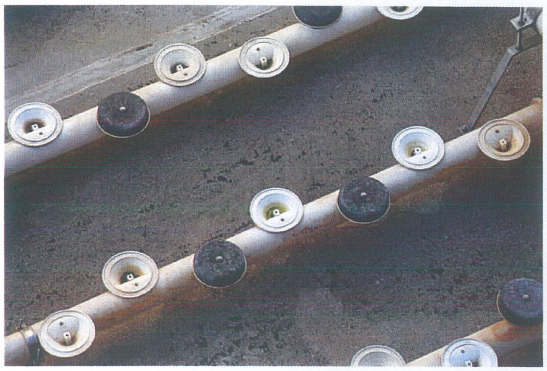
- Bio-tower risk of collapse
- Blower controls unreliable
- Power failures cause overflows
- Failure results in loss of treatment

Redundancy:

Redundancy at the secondary treatment facilities is considered "insufficient," primarily due to the structural instability of the bio-towers and the blower control system which completely lacks redundancy due to control system limitations.



Secondary Treatment



Necessary Improvements:

Phase	Improvements	Estimated Cost
Emergency (Yrs 1-2)	Biotower reinforcement – install wire wrap or mesh to limit hazards from a block tank wall failure	$630,000
	Activated sludge tank repairs – replace air flow meters, air control valves, isolation gates and dissolved oxygen meters	$150,000
CIP (Yrs 3-5)	None identified	---
CIP (Yrs 6-10)*	Activated sludge tank reconfiguration and upgrade –replace air diffuser system, Piping, gates and controls; partition tanks and add internal recycle pumps. Convert 2 aeration tanks to Flow Equalization Basins Biotower decommissioning – Demolish existing tanks after activated sludge system upgrades are complete; relocate process piping and relocate electrical duct banks Convert secondary clarifiers to primary clarifiers; EQ storage, screening systems and pumping Membrane bioreactor or other technology. Remove secondary clarifiers 13 – 18 and construct new process tanks. Construct process building with disinfection and effluent pumping Connect Headworks discharge piping to converted primary clarifiers	$130,650,000

Note: CIP (Yrs 6-10) costs are not included in the current wastewater rate study

Consequences of Inaction:

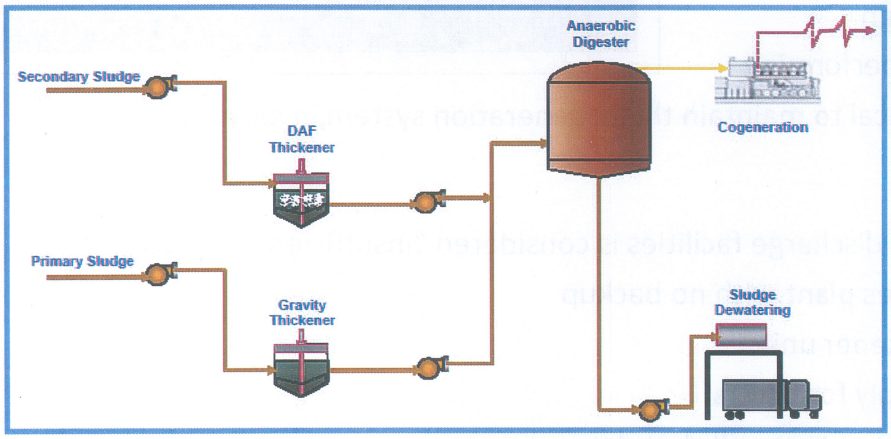
Potential consequences if no action is taken to address the identified needs:

- Regulatory penalties including damages to environment, base liability, investigation & enforcement costs
- Beach contamination & closure
- More neighborhood sewer odor complaints
- Increased cost of facility operation and repairs

Biosolids Treatment

Process Description, Location, and Function:

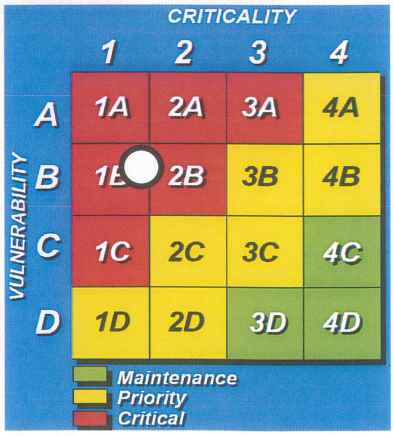
The residual microorganisms from the secondary treatment process as well as inorganic materials settled in the primary clarifiers must be thickened, digested, and dewatered prior to final disposal of the residual solids (also called biosolids, or sludge). The digestion process removes pathogens and stabilizes the solids prior to disposal. The gas produced in the digestion process is converted to energy and used to power parts of the OWTP through the cogeneration system. The dewatering process removes excess water to reduce hauling costs.



Condition and Risk Grading:

Overall the condition of the effluent discharge systems is poor with a risk grading of "Critical." Factors include:

- One of two gravity thickeners is out of service with a failed sludge collector mechanism
- One of three digesters is out of service with a failed roof
- Belt filter presses are in need of repair and have not been overhauled in more than 20 years
- Heating system for digesters is hot water from cogeneration system. Outage of cogeneration system causes a cascading failure of digester, thickeners and dewatering.



Biosolids Treatment

- There is no independent digested sludge storage, leading to excessive operation times for the dewatering system

Reliability:

Reliability grading of "Not Reliable" due to:

- Only 2 of 3 digesters available
- Gravity thickeners do not perform well
- Scum management is inadequate
- Belt filter presses are high maintenance and poor performing
- Gas management is critical to maintain the cogeneration system in service

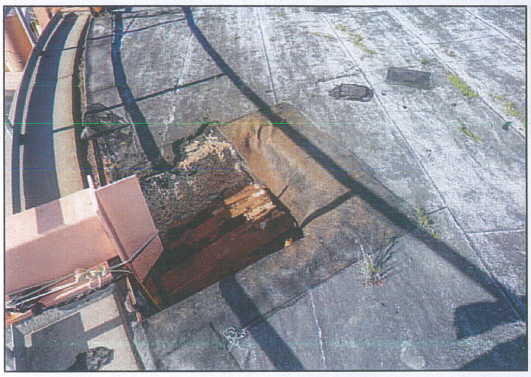
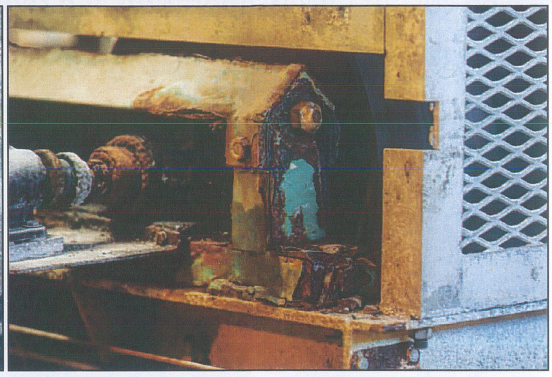
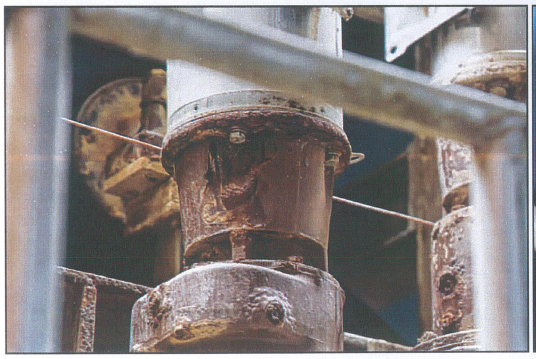
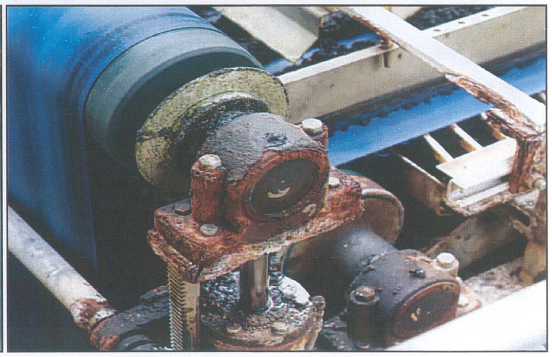
Redundancy:

Redundancy at the effluent discharge facilities is considered "insufficient" due to

- No digester outage leaves plant with no backup
- No standby gravity thickener unit
- No independent air supply for DAFTs
- Any cogeneration system outage will shut down digesters

Biosolids Treatment



Necessary Improvements:

Phase	Improvements	Estimated Cost
Emergency (Yrs 1-2)	Dewatering system rehabilitation and belt filter press replacement, conveyor repairs	$1,180,000
CIP (Yrs 3-5)	Digester 2 cover and cleaning of digesters 1 and 3	$3,700,000
	Belt Filter Press replacement	$1,430,000
CIP (Yrs 6-10)*	Digesters Mixing Systems replacement, heat exchanger upgrades, concrete repairs Demolish DAFTs and Gravity Thickeners and construct Thickening Building Fats Oils Grease Receiving Station	$36,140,000

Note: CIP (Yrs 6-10) costs are not included in the current wastewater rate study

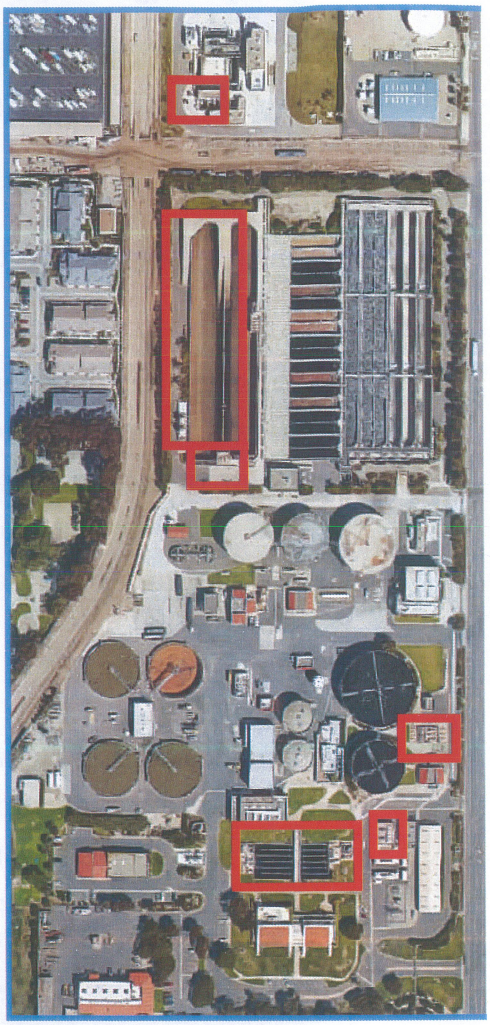
Biosolids Treatment

Consequences of Inaction:

Potential consequences if no action is taken to address the identified needs:

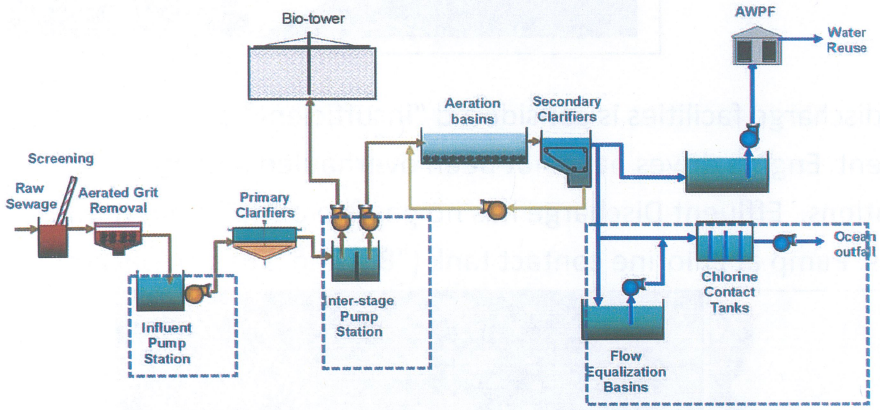
- Operational System Upsets
- Regulatory penalties including damages to environment, base liability, investigation & enforcement costs
- More neighborhood sewer odor complaints
- Increased cost of facility operation and repairs

Pumping, Equalization and Discharge



Process Description, Location, and Function:

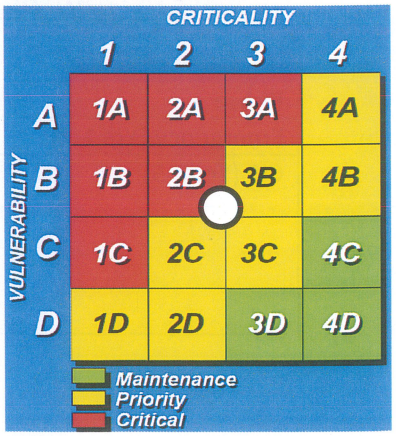
Pumping is provided at four locations in the plant – Influent pumping after the headworks; inter-stage pumping to lift bio-tower effluent to the Aeration basins; equalization basins pumping and effluent pumping to the outfall. After passing through the secondary treatment systems, the wastewater can go through equalization basins (when required), chlorine contact basins, and finally to the effluent pumping station which conveys the treated effluent to the ocean outfall discharge pipeline.



Condition and Risk Grading:

Overall the condition of the effluent discharge systems is poor with a risk grading of "priority/critical." Factors include:

- Equalization Basin has concrete damage and subject to groundwater leakage
- Chlorine Contact tanks are more than 50 years old, with poor flow patterns that lead to settling of solids, algae growth and violation of permit
- Inter-stage pumping system has failed due to signal interruption, leading to a recent spill.
- Effluent pump station is more than 60 years old and has little wetwell capacity

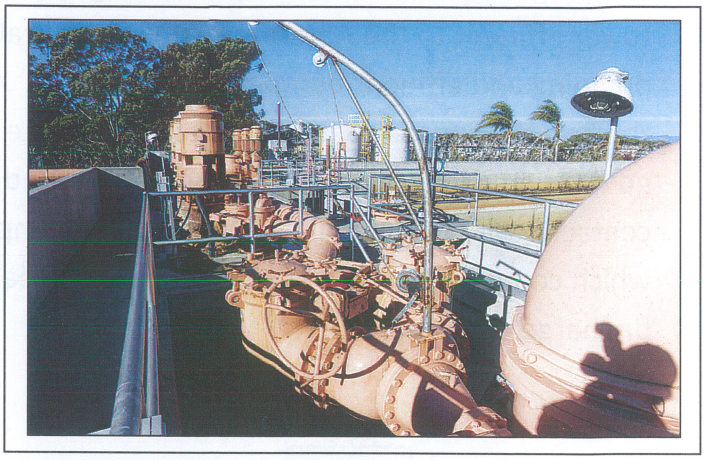


Pumping, Equalization and Discharge

- Effluent pump station does not meet current health and safety codes
- Effluent pumping is costly, and gravity outfall has been shut off

Reliability:

Reliability grading of "Not Reliable" due to:



- Corrosion and deterioration of materials and equipment
- Failure of the disinfection process can lead to permit violation
- Power outage or loss of pumping will result in spills

Redundancy:

Redundancy at the effluent discharge facilities is considered "insufficient" due to reliance on very old equipment. Engine drives have not been overhauled and may not function under certain conditions. Effluent Discharge has no passive outfall from the plant, and could lead to spills. Pump at chlorine contact tank ("Big Red") has no backup.

Necessary Improvements:

Phase	Improvements	Estimated Cost
Emergency (Yrs 1-2)	None Identified	---
CIP (Yrs 3-5)	Interstage Pump station. Replace pumps and VFDs; seismic code improvements. EQ Basins pumping – transfer pumping system to AWPF. Effluent Pump Station rehabilitation. New Isolation check valve on outfall, new pumps, motors, electrical systems,	$11,087,199

Pumping, Equalization and Discharge

	building repairs for seismic compliance	
CIP (Yrs 6-10)*	None Identified	---

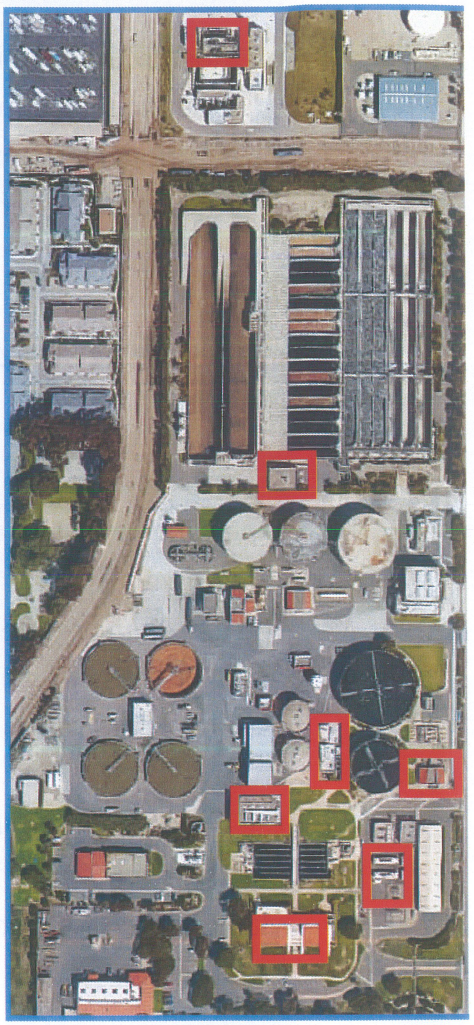
Note: CIP (Yrs 6-10) costs are not included in the current wastewater rate study

Consequences of Inaction:

Potential consequences if no action is taken to address the identified needs:

- Regulatory penalties including damages to environment, base liability, investigation & enforcement costs
- Beach contamination & closure
- More neighborhood sewer odor complaints
- Increased cost of facility operation and repairs

Electrical and Process Control Systems



Process Description, Location, and Function:

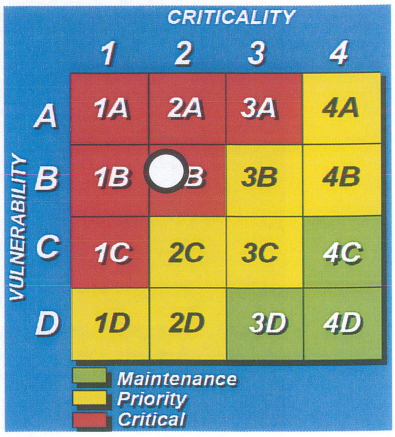
The treatment plant has an extensive electrical network and control networks. These systems provide the operation and automation of the entire plant. The plant is connected to the Southern California Edison power grid near the administration building, but has additional on-site generation systems that provide almost half of the plant power supply. A large cogeneration system using gas from the digesters operates the primary tanks, bio-towers, inter-stage pump station, effluent pump stations and biosolids systems.

The treatment process and all of its safety systems are monitored by a central plant control system. The controls include field instruments, local programmable control units and central monitoring at the operations building.

Condition and Risk Grading:

Overall the condition of the electrical and instrumentation systems is poor with a risk grading of "critical." Factors include:

- The electrical switchgear is very old, and has a great potential for electrical short-circuiting
- The main electrical building has high voltage panels that are highly vulnerable to serious power surge and lethal Arc Flash hazard.
- Electrical cables are in manholes filled with water, and may lead to electrical short-circuiting
- The cogeneration units are more than 30 years old and have not been overhauled. If one unit fails, it will leave the plant power network vulnerable to inadequate power supply.
- Many local control systems are not linked to the central monitoring and control network. Much of the local controls cannot be adjusted by the operations staff.
- Operating software and hardware is outdated, and subject to frequent outages.

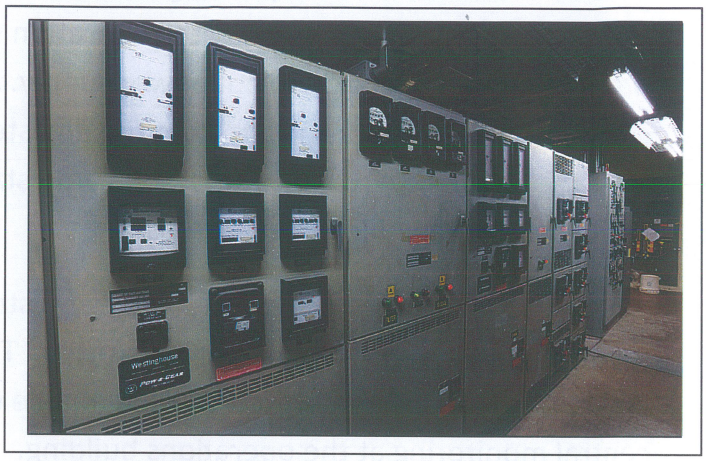


Electrical and Process Control Systems

- Most of the field instruments which control blowers and flow controllers are out of service or cannot be calibrated
- Additional instruments and controls are required to assure proper operation of automated systems.

Reliability:

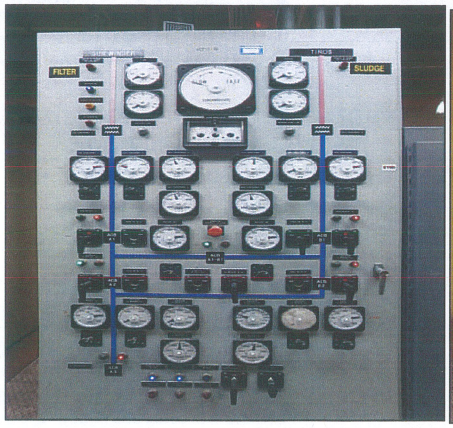
Reliability grading of "Not Reliable" due to:



- The main electrical building could experience an Arc-Flash event and shut down all power to the plant.
- The emergency generators are more than 50 years old, and cannot be assured of operation in the event of a power outage
- The cogeneration units are operating at capacity, and loss of one unit would make the plant vulnerable to power outage.
- Many of the local controllers are inoperable or cannot be modified for changing conditions.

Redundancy:

Redundancy at the effluent discharge facilities is considered "insufficient" due to reliance on very old equipment. There is no redundant electrical transformer and switchgear facility. If there is a major electrical fault at the main electrical building, it could shut the plant down completely for several weeks or more. The digester gas supply is vulnerable to varying quality, which could mean loss of cogeneration capacity.



Electrical and Process Control Systems

Necessary Improvements:

Phase	Improvements	Estimated Cost
Emergency (Yrs 1-2)	Install disconnects and temporary breakers to reduce arc flash hazard. Rehabilitate flooded electrical and instrumentation cable manholes.	$750,000
	Rebuild two cogeneration units.	$810,000
	Install new CMMS system for plant maintenance record keeping, including work scheduling, equipment records keeping, labor hours, and costs.	$300,000
	Temporary convert existing fiber network to Ethernet to prevent SCADA drop-out.	$225,000
CIP (Yrs 3-5)	Install new emergency standby generator	$5,000,000
	Rebuild one cogeneration unit	$405,000
	Install new MCC panels	$2,087,199
	New Main electrical Building; new transformers; reroute electrical duct banks and run new cabling; new Automatic transfer switches; demolish old electrical building and equipment, and restore grade.	$6,000,000
	New SCADA program software and programming	$4,946,500
CIP (Yrs 6-10)*	Construct new electrical building for MBR system Replace plant-wide SCADA systems and PLCs with current technology. Reprogram all processes for new Plant Control System Install cables, duct banks, and wiring	$27,100,000

Note: CIP (Yrs 6-10) costs are not included in the current wastewater rate study

Consequences of Inaction:

Potential consequences if no action is taken to address the identified needs:

- Regulatory penalties including damages to environment, base liability, investigation & enforcement costs
- Beach contamination & closure
- More neighborhood sewer odor complaints
- Increased cost of facility operation and repairs