LIFT STATIONS AND WASTEWATER TREATMENT CONDITION ASSESSMENT

INITIAL FINDINGS

HDR

January, 2022

PROJECT SCOPE

For 15 wastewater lift stations and the Oyster Creek Wastewater Treatment Plant:

- Assess the facilities
- Compare to Texas Commission on Environmental Quality (TCEQ) requirements
- Develop recommendations
- Develop cost estimates for the recommendations
- Recommend scheduling of the improvements

- Also included an energy audit of the Wastewater Treatment Plant.

FACILITIES ASSESSED

15 of the District's wastewater lift stations

Lift Station 5	Lift Station 11	Lift Station 25
Lift Station 7	Lift Station 13	Lift Station 26
Lift Station 8	Lift Station 14	Lift Station 27
Lift Station 9	Lift Station 15	Lift Station 37
Lift Station 10	Lift Station 24	Lift Station 44

Oyster Creek Wastewater Treatment Plant

- Capacity of 3.6 million gallons per day
- Major Upgrades in 1981, 1994, 2006

LIFT STATIONS

LIFT STATIONS

Criticality formula to determine prioritization

Likelihood of Failure x Consequence of Failure = Criticality Score

Or

LoF x CoF = Criticality

- Criticality can range from 1 to 25

Ratings

1 Very Good
2 Good
3 Average
4 Poor
5 Very Poor

LIKELIHOOD OF FAILURE SCORES

Based on weighted average of 6 criteria

Percent of criteria at 4 or 5

Wet Well	*Pumps*	*Generator*
13%	*27%*	*7%*

Piping	*Electrical*	*Site*
33%	*33%*	*13%*

Ratings

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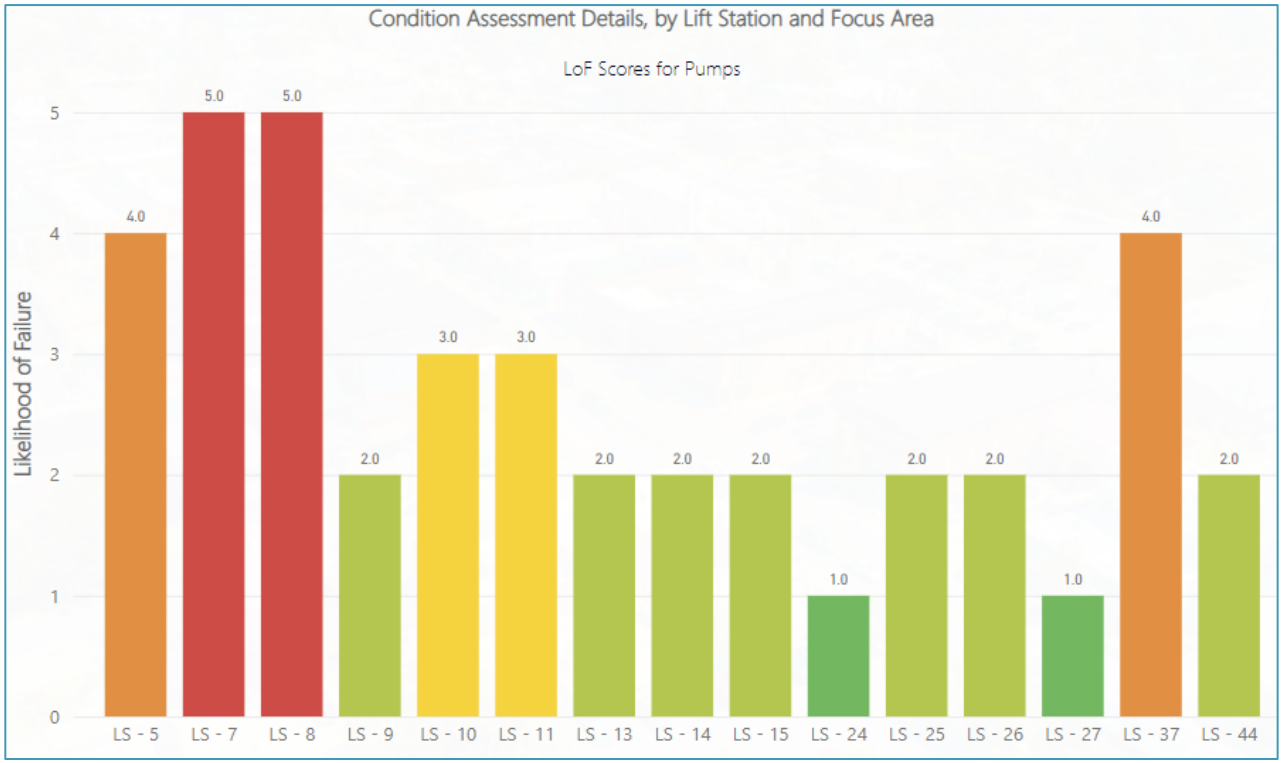
LIKELIHOOD OF FAILURE SCORES

1 of 6: Pump Scores



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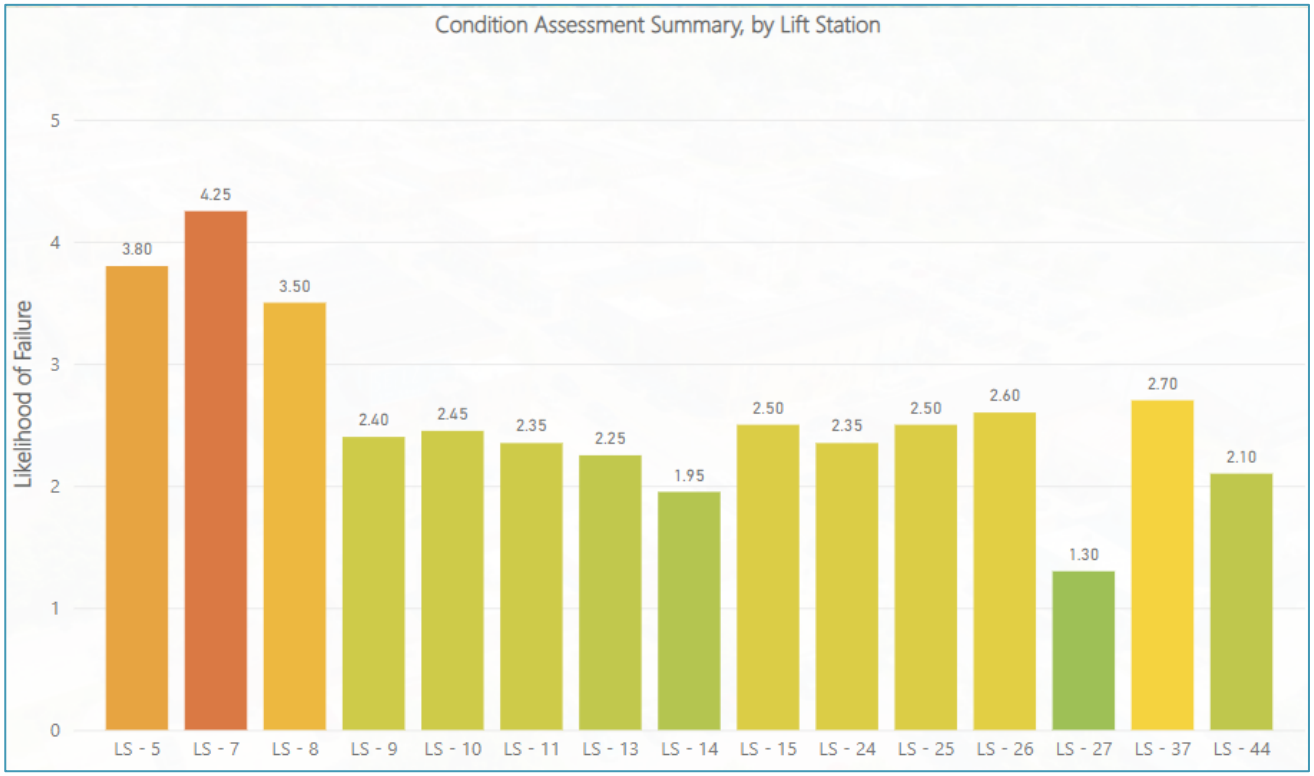
LIKELIHOOD OF FAILURE TOTAL SCORES PER LIFT STATION



Lift Stations 5, 7, 8 are in the worst condition.

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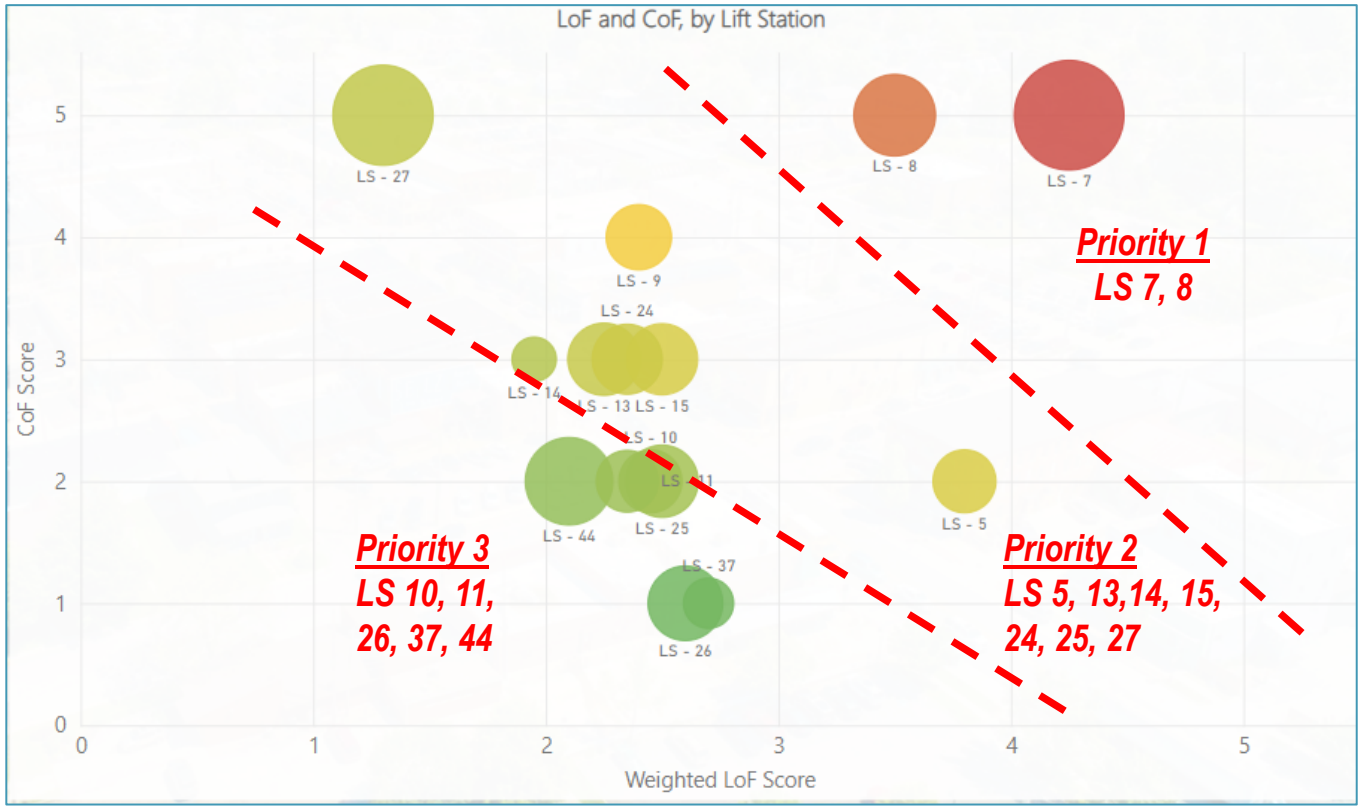
CONSEQUENCE OF FAILURE SCORES

PRIORITIZATION OF LIFT STATIONS



FOCUS ON COMMON ISSUES

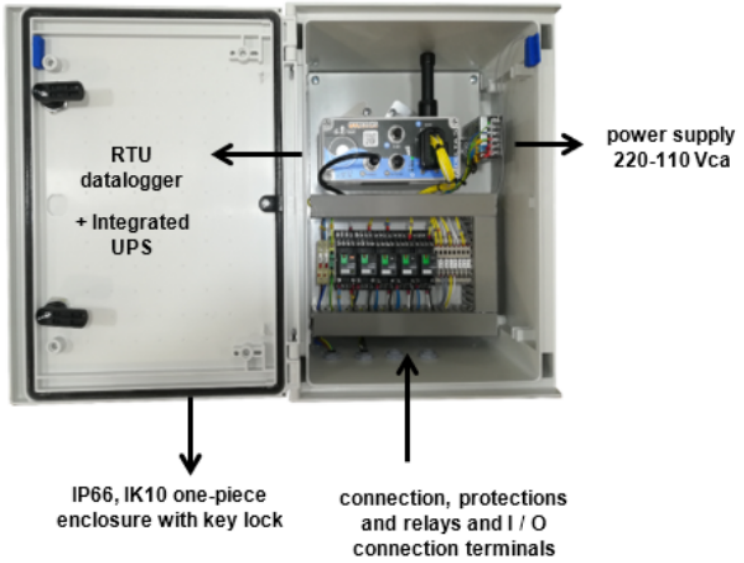
SCADA SYSTEMS

Communicates alarms and status to central location.

No lift stations had SCADA at time of field work

Installation started on several lift stations.

Recommend to install on all lift stations



Typical SCADA Panel

ENCLOSURE REQUIREMENTS

TCEQ Requirement to enclose lift station

Six lift stations have no enclosures.

REPLACE GORMAN RUPP PUMPS WITH SUBMERSIBLES

Perform at end of the pump's useful life

Eliminates above ground piping

Eliminates "Dog House" enclosures.

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Lift Station 24

Typical Submersible Lift Station

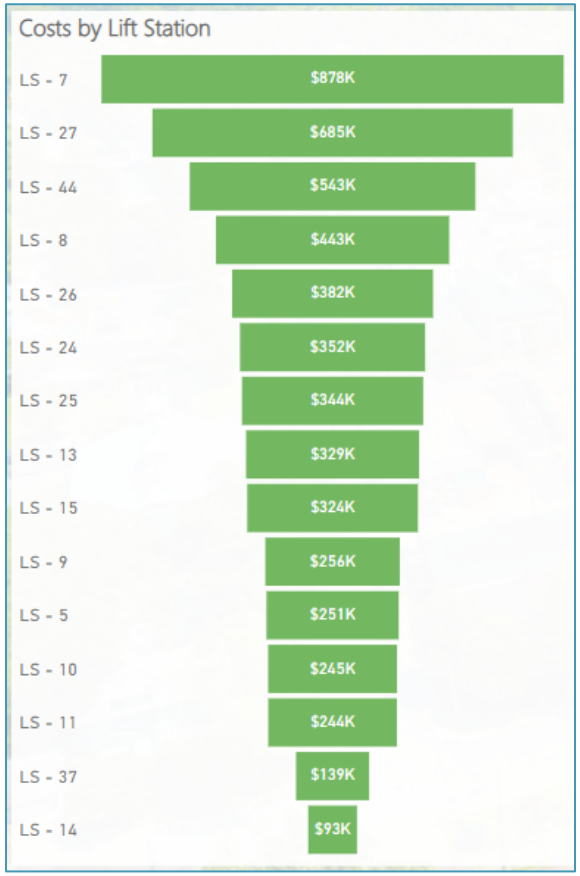
BACKUP POWER

Existing Backup Power and Pumping Systems

Generator	Electrical Quick Connect	Number of Lift Stations	Lift Stations
None	None	6	5, 10, 11, 13, 26, 37
	✓	6	8, 9, 14, 15, 24, 25
✓		3	7, 27, 44

Recommend Electrical Quick Connect at all sites with no generator

LIFT STATION RECOMMENDATIONS



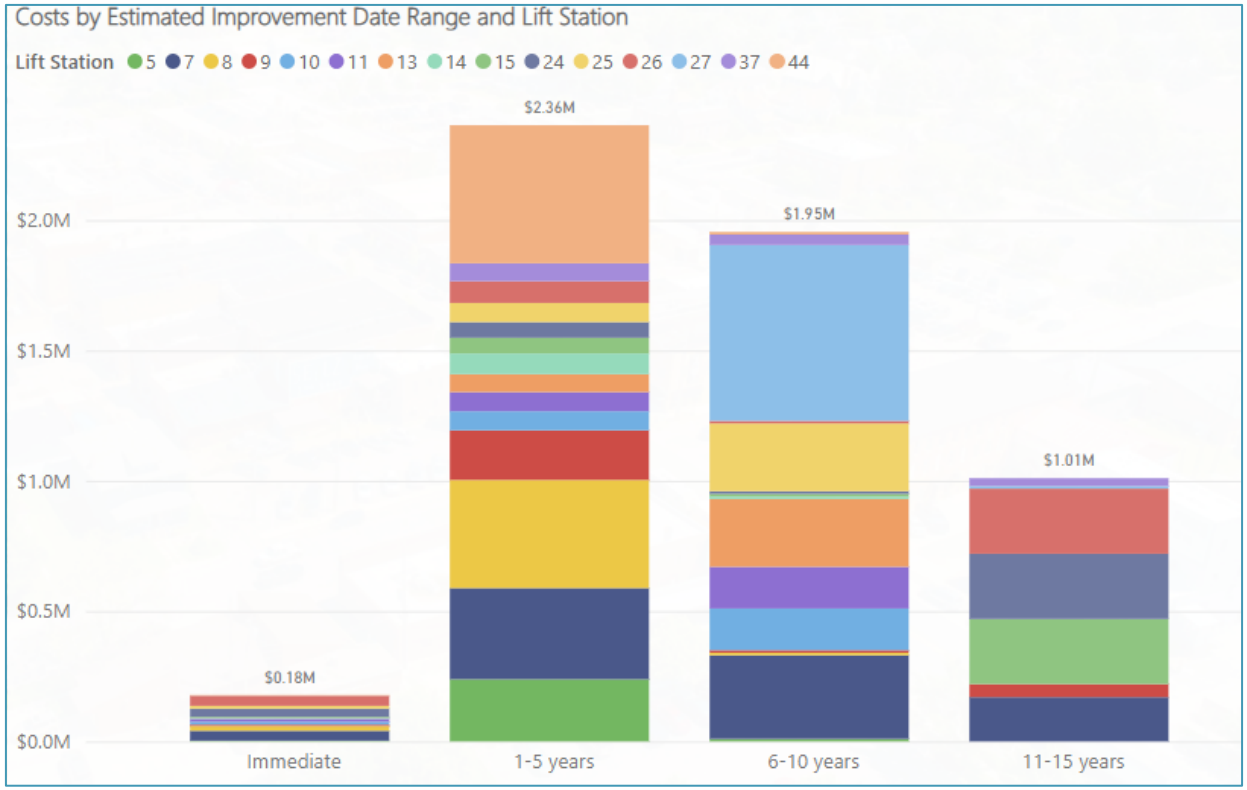
Total of $5.5 million over 15 years.

Estimates include inflation of 3% per year

Largest 5 Recommendations:

LS 7:	**$878,000**
LS 27:	**$685,000**
LS 44:	**$543,000**
LS 8:	**$443,000**
LS 26:	**$382,000**

LIFT STATION RECOMMENDATIONS



Total of $5.5 million over 15 years.

Estimates include inflation of 3% per year

OYSTER CREEK WASTEWATER TREATMENT PLANT

LIKELIHOOD OF FAILURE SCORES

15 Process Areas Assessed:

- Influent Lift Station
- Headworks
- Aeration
- Clarifier 1
- Clarifier 2
- Clarifier 3
- RAS/WAS
- Stormwater Pump Station
- Disinfection Equipment
- Chlorine Contact Basin
- Solids Processing
- Site Electrical
- Site SCADA
- Blower Building
- Plant Facilities

Ratings

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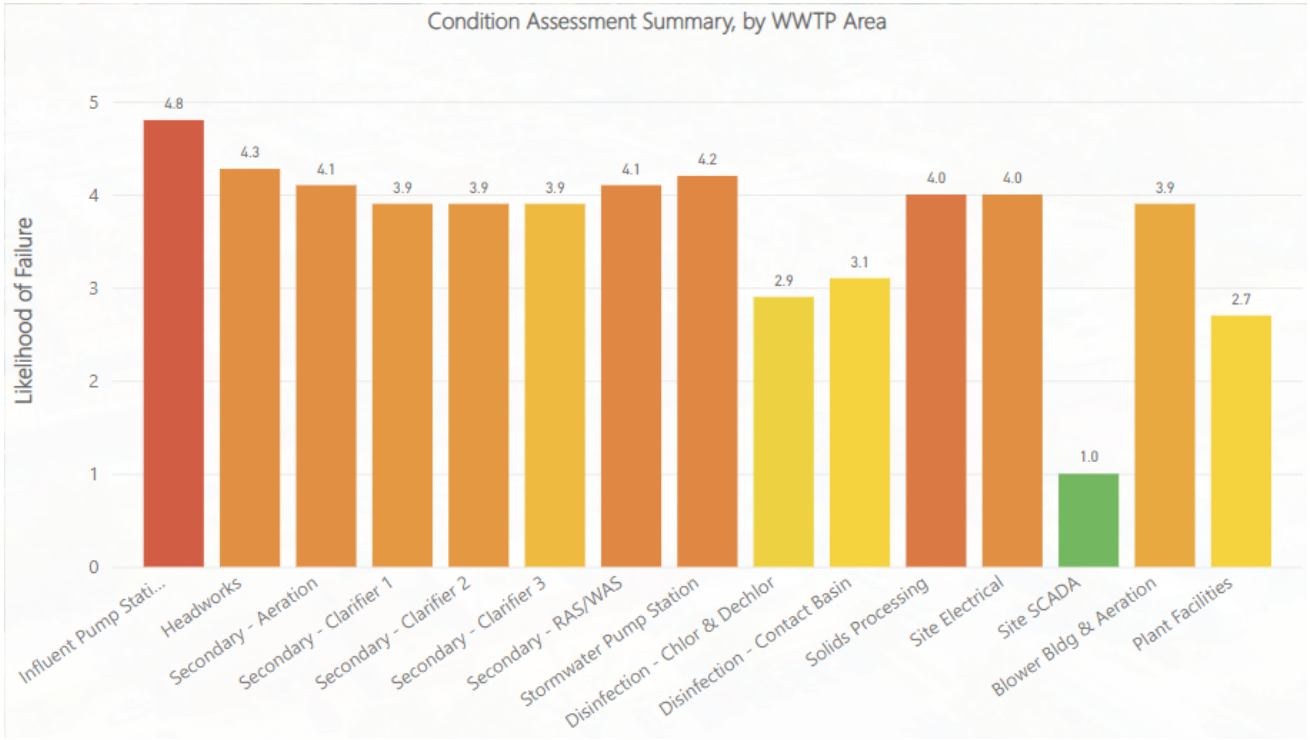
LIKELIHOOD OF FAILURE SCORES



Worst Areas:

Influent Lift Station

Headworks

Stormwater Pump Station

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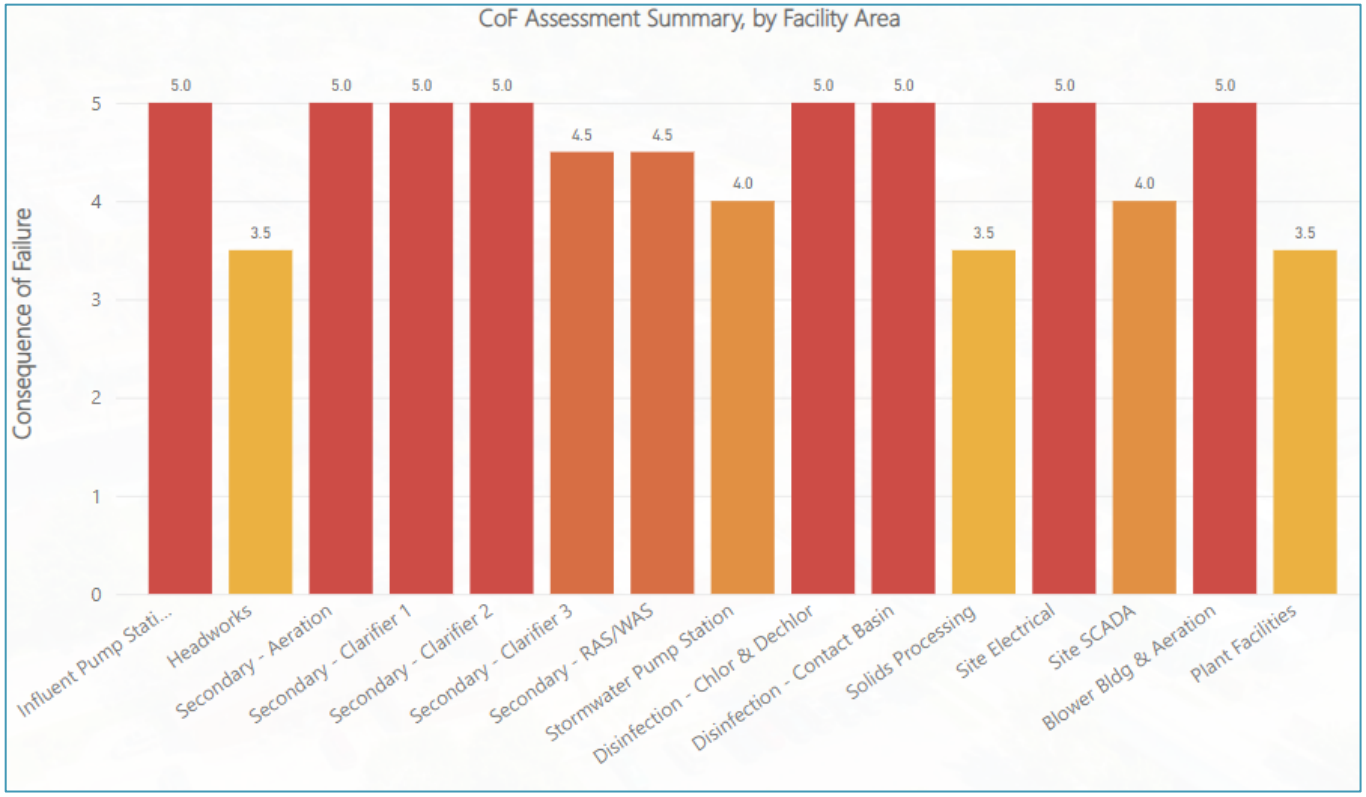
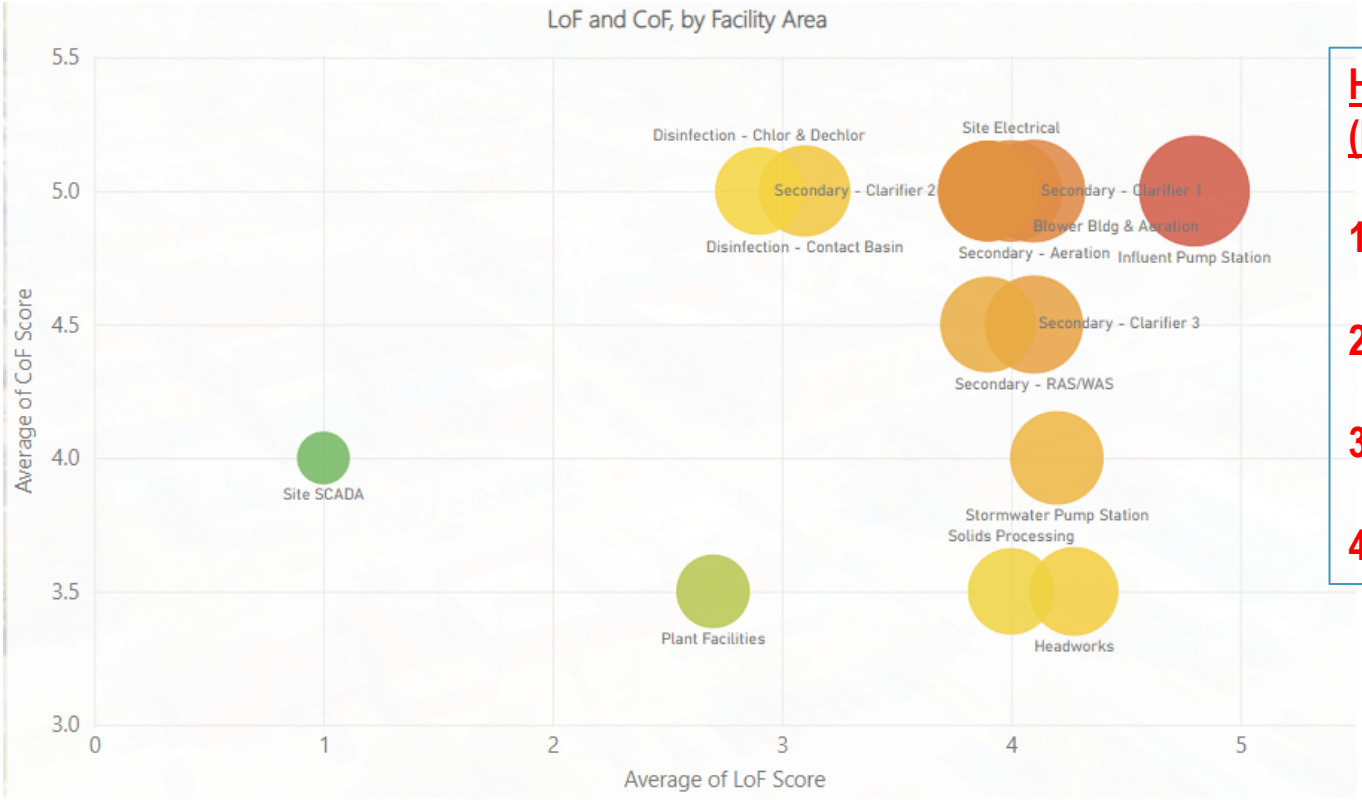
CONSEQUENCE OF FAILURE SCORES



PRIORITIZATION OF WWTP NEEDS



Highest Priorities (In Order):

1 - Influent Lift Station

2 - Aeration

3 - Site Electrical

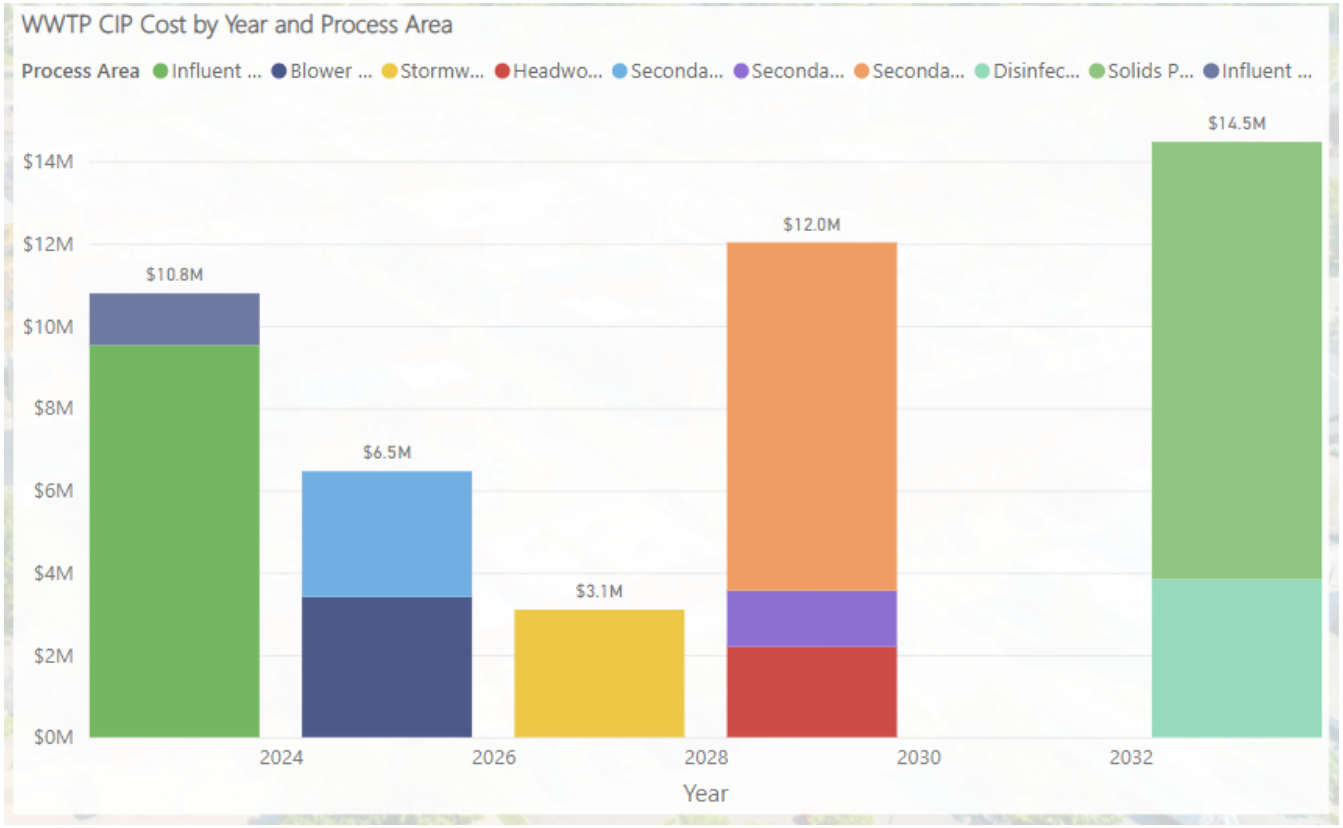
4 - Blower Building

INFLUENT LIFT STATION

- Concrete is in dire condition.
- Two pumps are 40 years old and were not functional (at time of assessment)
- One VFD for all pumps

Recommend total replacement with submersible influent lift station

WWTP PROJECT RECOMMENDATIONS



10 Capital Improvement Projects in 5 packages over the next 15 years.

Estimated total cost of $46.8 million.

WWTP PROJECT RECOMMENDATIONS

Process Area	Risk Score	Recommendation	Year	CIP Cost
Influent Lift Station, Electrical/MCC Building, Operator Building and Site Lighting	24	Full replacement	2023	$9,532,200
Influent Collection System	N/A	N/A	2023	$1,256,500
Blower Building and Blowers	19.5	Full replacement	2025	$3,409,500
Secondary Treatment – Package 1	17.6 – 20.5	Replacement and rehab of select equipment	2025	$3,055,000
Stormwater PS, Stormwater Discharge Pipe and Plant Outfall	16.8	Full replacement	2027	$3,098,300
Headworks Rehabilitation	15.05	Replacement and rehab of select equipment (not being replaced in current CIP)	2029	$2,198,000
Secondary Treatment – Package 2	17.6-20.5	Replacement and rehab of select equipment	2029	$1,365,200
Secondary Treatment – Package 3	17.6-20.5	Replacement and rehab of select equipment	2029	$8,464,100
Disinfection System	14.5	Replacement and rehab of select equipment	2033	$3,849,800
Solids Processing System	15.4	Replacement and rehab of select equipment	2033	$10,620,000
		TOTAL		**$46,848,600**

PACKAGE 1 – YEAR 2023

Estimated $10.7 million

Full Replacement:

- **Influent Lift Station**
- **Electrical/MCC Building,**
- **Operator Building**
- **Site Lighting**

Upsize of influent wastewater pipes

PACKAGE 2 – YEAR 2025

Estimated $6.5 million

New Blower Building, Air Header and Blowers

1st of 3 Packages for Secondary Treatment:

- Diffusers and diffuser piping
- Automate valve to clarifier 3
- Numerous valves and gates
- pH and Dissolved oxygen meters for better process control and energy management

PACKAGE 3 – YEAR 2027

Estimated $3.1 million

- Replace Stormwater Pump Station
- Replace Stormwater Pump Station Discharge Pipe and improve integrity of levee
- Rehabilitate or Replace Plant Outfall Pipe

PACKAGE 4 – YEAR 2029

Estimated $12.9 million

Headworks Improvements

- Replace gates, electrical, and blower.

2nd and 3rd Secondary Treatment Packages

- Replace RAS and WAS pumps on Clarifiers 1 and 2
- Replace drives, weirs and rakes on Clarifiers 1,2,3
- Replace numerous valves, hardware and electrical

PACKAGE 5 – YEAR 2033

Estimated $14.7 million

Solids Treatment

- Replace existing digester and gravity thickener complex.

Disinfection System Improvements

- Enclose chlorine and sulfur dioxide area.
- Replace piping and conduits

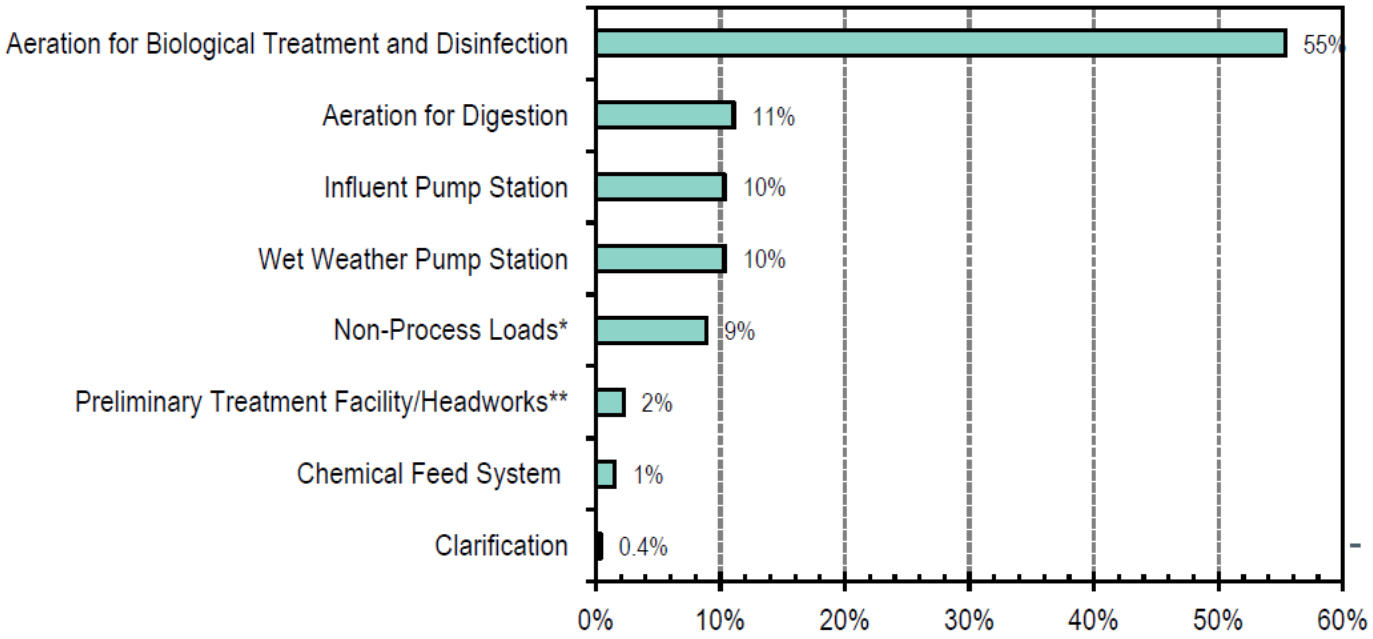
ENERGY OPTIMIZATION

Historical Electricity Usage

Year	Avg Monthly Flow (MG)	Total Monthly kWH	Average Monthly Energy Cost	Average Cost per MGal	Energy Intensity (kWH/ Mgal)
2018	58	250,933	$15,729	$271.19	4,736
2019	57	256,948	$16,007	$280.82	4,639
2020	43	268,336	$13,859	$322.30	6,364
2021	47	271,578	$15,914	$338.59	6,003

Energy usage has stayed relatively constant despite falling flowrates.

USAGE OF ENERGY



Aeration accounts for 66% of electrical usage.

POTENTIAL ENERGY CONSERVATION MEASURES

Eight Potential annual savings of 789,000 kWH or $28,000

Aeration Diffusers and Header System

- Clean diffuser pipes
- Replace existing diffusers to restore fine bubble method
- Estimated annual savings 154,000 kWH or $5,675 (likely much more)

Replace Chlorine Contact Chamber Aeration with Mixers

Estimated annual savings of 214,700 kWH or $7,890

Reduce Digester Blower to operate 67% of the time and at lower pressure

Estimated annual savings of 195,500 kWH or $7,150

POTENTIAL ENERGY CONSERVATION MEASURES

Install VFDs on Influent Pumps

- Estimated annual savings 94,000 kWH or $3,450

Reduce Grit Pump Operations

Estimated annual savings of 24,600 kWH or $900

Reduce Grit Blower to operate 75% of the time

Estimated annual savings of 12,300 kWH or $450

Not recommended due to potential impact on treatment

Change all lights to LED fixtures

Estimated annual savings of 42,000 kWH or $1,550