



Water Reclamation Facility - Facility Plan



Executive Summary

FINAL / February 2024





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Abbreviations

AADF	average annual daily flow
BOD	biochemical oxygen demand
City	City of Visalia
CIP	capital improvement program
HRT	hydraulic retention time
KOH	potassium hydroxide
MCC	motor control center
MBR	membrane bioreactor
mgd	million gallons per day
NaOH	sodium hydroxide
PS	primary sludge
PWWF	peak wet weather flow
RAS	return activated sludge
THP	thermal hydrolysis process
TM	technical memorandum
TPAD	temperature phased anaerobic digestion
TS	total solids
TSS	total suspended solids
TWAS	thickened waste activated sludge
UV	ultraviolet
VFD	variable frequency drive
WRF	Water Reclamation Facility

EXECUTIVE SUMMARY

ES.1 Introduction

The Facility Plan is the first step in evaluating the current capacity of the City of Visalia's (City) Water Reclamation Facility (WRF), using a biological process model. This will set the basis for developing the framework for improvements required to meet the WRF's near-term (6-year) needs. The biological process model was calibrated to the existing and current flow/loadings data, and then used to determine capacity deficiencies based on the projected future flows/loads, which were developed using annual growth projections. Capacity expansion projects were developed for the identified treatment processes with capacity deficiencies. A near-term capacity improvement program was developed as well.

ES.2 Background and Purpose

The City's WRF treats domestic and industrial wastewater from the City, as well as wastewater from the Goshen Community Services District. Due to the Central Valley Water Boards's adoption of the updated National Pollutant Discharge Elimination System, which increased regulation on processed wastewater discharge into Mill Creek, major upgrades were implemented to divert discharge from Mill Creek. These upgrades, which were constructed in 2017, included membrane bioreactor (MBR) treatment facilities, a new digester, sludge handling facilities, and disinfection facilities to support continued discharge to the Tulare Irrigation District for agricultural uses, along with reuse at the golf course. This project made various improvements resulting in the ability to produce Title 22 compliant recycled water. It was not intended to increase plant capacity, but rather to provide process equipment to support the more stringent wastewater effluent quality requirements. Improvements made to the treatment system were designed around an average annual daily flow (AADF) of 22 mgd; however, to save overall costs, some of the equipment was sized to handle an AADF of 18 mgd.

In recent years, industrial loads have significantly increased, as well as an increase in water conservation efforts in residential wastewater within the City and Goshen, has caused increased influent concentrations. These increased influent concentrations have had a direct impact on the WRF, which is operating near its maximum capacity when it comes to influent biochemical oxygen demand (BOD) and total suspended solids (TSS). These elevated loading concentrations are putting excessive stress on some of the treatment processes and leading to disruptions and disturbances.

The Facility Plan is the first step to evaluate the current capacity of the WRF as well as the condition of the assets to develop the framework for improvements required to meet the WRF's near-term needs.

ES.3 Technical Memorandum 1 – Near-Term Process Performance Evaluation

This technical memorandum (TM) provides an overview of the WRF, the historical and projected influent flows and loads, and the performance and capacity assessments. These performance and capacity assessments were used to identify near-term capacity improvement projects to serve as the basis for the near-term capital improvement plan.

The existing performance of the treatment processes at the WRF was evaluated by comparing the effluent limits to data from January 2018 to April 2023. Overall, the WRF has performed adequately, and plant staff have maintained the facilities in order to meet the effluent limits.

In order to determine the WRF's current total capacity, a process model was used to determine the flow and loading on each treatment process using data from the plant. The model was then used to compare real-life impacts to the treatment process, and capacity ratings were used to determine if the plant could meet the projected 2030 flows.

The results of the analysis indicated that the current WRF has a total capacity of 13.9 mgd (which is less than the 18 mgd design based on the current plant loadings), and the plant's current average annual flows are around 12.6 mgd. However, it was determined that plant's firm capacity, the capacity with the largest unit out of service, is less than the current influent flows. The plant's firm capacity is currently limited by the dewatering process that has an equivalent AADF firm capacity of 7.1 mgd. Two other unit processes that have firm capacities below the current influent flows are anaerobic digestion and ultraviolet disinfection system. Because of this, four projects were recommended to address these capacity issues, which are discussed in TM 4 – Near-Term Project Descriptions.

ES.4 Technical Memorandum 2 – Condition Assessment

This TM summarizes findings for mechanical, structural, and electrical observations for assets in the preliminary, primary, secondary, and tertiary treatment areas as well as the solids handling area of the WRF. The conclusions and recommendations can be seen below for the different areas.

ES.4.1 Preliminary Treatment

The mechanical, structural, and electrical equipment and structures are generally in good to acceptable condition. Some improvements need to be made in this area though. Notable recommended improvements include the following:

- Coat and paint corroded equipment.
- Seal the influent gates to improve the leaking in the hydraulic system.
- Replace the biofilter media since it is approaching its 10-year lifespan.
- Improve the South Diversion Structure.
- Repair the cracking at the Septage Receiving Station.
- Consider replacing MCC-H to avoid possibly lengthy downtime in the future due to difficulty in finding replacement parts.
- Consider replacing the VFD cabinets that have not been replaced.
- Conduct an arc flash study since the last one was performed about five years ago.

ES.4.2 Primary Treatment

Similar to the preliminary treatment area, most of the mechanical, structural, and electrical equipment and structures are in good to acceptable condition. However, piping in Scum Box No. 1 was deemed to be in poor condition. Notable recommended improvements to this area are as follows:

- Coat and paint corroded equipment.

- Replace the piping in Scum Box No. 1.
- Conduct an arc flash study since the last one was performed about five years ago.

ES.4.3 Secondary Treatment

This area is also in good to acceptable condition for all disciplines. Recommended improvements are as follows:

- Install piping from the air release valves to the drains to avoid spillage on the equipment and piping.
- Coat and paint the return activated sludge (RAS) pumps and the hand cranks on the gates in the junction and flow distribution boxes due to spillage and corrosion, respectively.
- Periodically inspect the corrosion at the brace and gusset connection near the MBR system to monitor this development.
- Consider relocating the MCCs that are still in use and fully decommissioning those that are mostly decommissioned.

ES.4.4 Tertiary Treatment

This area was mainly included in the last major project, which was constructed in 2017. The mechanical, structural, and electrical assessments observed that this area is in good condition. No recommended improvements are needed here.

ES.4.5 Solids Handling

Both structurally and electrically, this area is in good condition. Mechanically it is in generally in acceptable condition. The following improvements are recommended:

- Coat and paint corroded equipment.
- Install a third screw press in the near future to provide critical redundancy to the WRF.
- Address the poor drainage under the screw presses.

ES.5 Technical Memorandum 3 – Environmental Opportunities

This TM presents the findings of the evaluation of environmental opportunities performed for the City's WRF. The evaluation includes potential environmental project options to include in the Near-Term and Long-Term capital improvement programs (CIPs) for class A biosolids opportunities and energy opportunities.

ES.5.1 Class A Biosolids Opportunities

This investigation includes understanding regulatory and financial drivers and evaluating different treatment technologies to achieve Class A biosolids. Table ES.1 presents different technologies that were evaluated, a high-level cost estimate, and whether the technology was recommended for further investigation or not.

Table ES.1 Class A Treatment Options, High-Level Cost Estimates, Recommendations

Class A Technology	General Description	Capital Cost Estimate ⁽¹⁾	Recommendation
Thermal Hydrolysis Process (THP)	Pre-digestion thermal hydrolysis uses high heat and high pressure to stabilize sludge prior to anaerobic digestion.	\$23 Million	Further evaluation recommended
Batch Temperature Phased Anaerobic Digestion (TPAD)	Batch TPAD involves a thermophilic continuous phase, followed by a bath thermophilic phase, and a mesophilic continuous phase.	Highly variable. \$10 to \$40 Million depending on modifications required.	Further evaluation recommended
Thermo-Chemical Hydrolysis Process	Post-digestion thermo-chemical hydrolysis uses low heat, and high Ph through addition of KOH/NaOH and high shear mixing.	\$22 Million	Not recommended
Thermal Drying	Thermal drying typically uses a fuel such as natural gas or digester gas to dry dewatered solids. Various technology options including belt, rotary drum, and paddle dryers.	\$64 Million	Not recommended
Thermal Drying with Pyrolysis/ Gasification	Dried solids are processed in either a zero-oxygen environment (pyrolysis) or an oxygen-starved environment (gasification). Both processes produce biochar.	\$104 Million	Not recommended
Composting	Biosolids and bulking agents (agricultural, yard, or wood waste) are ground, combined into piles for composting and curing, and then screened. Various technology options including windrow, aerated static pile, and in-vessel composting.	\$16 Million	Further evaluation recommended

Notes:

(1) Cost estimates were roughly estimated based on Carollo's biosolids master planning and digestion upgrades estimating experience.

After completing this analysis, it is recommended to consider a biosolids master plan to comprehensively evaluate options for solids treatment and biosolids product management.

ES.5.2 Energy Opportunities

This investigation also includes understanding regulatory and financial drivers and evaluating different digester gas utilization and energy generation alternatives. Alternatives for digester gas utilization include uses for digester heating, cogeneration or combined heat and power systems (CHP), upgrading it to renewable natural gas (RNG) for pipeline injection, and upgrading and compressing digester gas to produce renewable compressed natural gas (R-CNG).

Since the City's WRF already has a digester gas conditioning and cogeneration system, it is recommended to resolve the permitting issue to utilize the existing equipment, making this the least costly option. Additionally, the City is currently purchasing natural gas to run the boilers because they are not currently permitted to operate them using digester gas, resulting in 100 percent of the digester gas being flared. Resolving this permitting issue should be the first priority. If these permitting issues cannot be resolved,

the City should consider either performing a digester gas use study or a more comprehensive energy master plan.

ES.6 Technical Memorandum 4 – Near-Term Project Descriptions

This TM summarizes projects that are recommended for implementation within the next six years based on the capacity analysis summarized in TM 1 – Near-Term Process Performance Evaluation.

ES.6.1 Thickened Waste Activated Sludge Pump Replacements

Currently, thickened waste activated sludge (TWAS) is not thickened to its fullest potential of 5 percent total solids (TS) due to the TWAS pumps tripping from too high of pressure. Therefore, the sludge is thickened to 2.5 percent TS, resulting in a significantly higher amount of sludge being sent to the plant's digesters. This reduces the overall digestion capacity since it is currently limited by the hydraulic retention time (HRT) and not the solids loading rate.

It is recommended to implement the TWAS Pump Replacements project as soon as possible to restore some digestion capacity. Therefore, the project should be on an expedited design and construction schedule.

ES.6.2 Dewatering Capacity Expansion

Currently, the City's WRF has two existing screw presses that were designed to operate as one duty and one standby unit. Currently, the dewatering system does not have sufficient firm capacity for the current flows and loads. Therefore, when flows and loads are high, the plant must operate both screw presses to dewater all of the sludge. Operating both units does not allow plant staff to take a unit out of service, so additional dewatering capacity is required to provide critical redundancy to improve operations of the dewatering process.

It is recommended to add a third screw press with the same capacity as the existing screw presses and implement the project as soon as possible to provide redundancy for the dewatering system. Like the TWAS pump replacements, this project should also be on an expedited design and construction schedule.

ES.6.3 Anaerobic Digestion Capacity Expansion

As previously stated, the capacity of the anaerobic digestion system is currently limited by the HRT criteria. At current sludge flows, the digestion system is below capacity with the largest digester, Digester No. 8, out of service, so another digester is needed now to allow the largest digester to be taken out of service. However, it is estimated to take at a minimum 3 years to design, construct, and have a new digester be placed into service. Therefore, thickening the primary sludge (PS) and TWAS feed to the digesters is critical for delaying the need of a new digester by a few years to allow for time to implement the Anaerobic Digestion Capacity Expansion project.

It is recommended to add a new digester with the same digestion and sludge storage capacities as Digester No. 8. This new digester would allow the plant to meet the required HRT for Class B biosolids if Digester No. 8 needs to be taken offline and provide necessary redundancy to the digestion system.

ES.6.4 Ultraviolet (UV) Disinfection System Capacity Expansion

The UV system's peak flow firm capacity, 28.8 mgd, is insufficient to meet the projected 2030 peak wet weather flows (PWWF), 30.2 mgd. In order to have sufficient firm capacity and redundancy for the projected 2030 PWWFs, the UV system must be expanded and brought online by 2027. Four additional UV modules and associated equipment should be installed to meet future capacity needs. Provisional space was included in the 2017 project in the existing UV channels and for the electrical equipment to allow for this expansion.

ES.7 Technical Memorandum 5 – Near-Term Capital Improvement Program

The near-term capital improvement program (CIP) identifies critical near-term capacity related projects, which are described in TM 4 – Near-Term Project Descriptions, required at the WRF over the next six years. Cost estimates were conducted for the projects, and a schedule of the projects was developed as well.

ES.7.1 Cost Estimate

Total project cost estimates for each project are summarized in Table ES.2. The estimate is at a planning level and is limited to capital costs and does not include O&M costs.

Table ES.2 Total Project Capital Cost for Recommended Project

Project	Cost ⁽¹⁾
TWAS Pump Replacements	\$675,000
Dewatering Capacity Expansion	\$5,313,000
Anaerobic Digestion Capacity Expansion	\$42,938,000
UV Disinfection System Capacity Expansion	\$1,488,000

Notes:

- (1) Total project capital costs are provided as present value based on an ENR CCI number of 15157 corresponding to the 20-City Average Index in September 2023. Costs are escalated to the midpoint of construction with an annual inflation rate of 6 percent. Total project costs include factors for estimating contingency, sales tax, general conditions, and contractor overhead and profit as well as 25 percent allowance for engineering, legal, administration, and permitting costs.

ES.7.2 Project Implementation

The implementation timing, determined by when the plant needs additional capacity, and the project duration assign each project a start and completion date. An expedited schedule for design and construction was used for the TWAS pump replacement and dewatering capacity expansion projects. The recommended implementation schedule for the near-term projects can be seen in Table ES.2.

Near-Term Projects CIP Schedule			Design				Bid/Award Contract								Construction/Startup															
			Year																											
			2024				2025				2026				2027				2028				2029				2030			
Project	Total Project Cost ⁽¹⁾⁽²⁾		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
TWAS Pump Replacements	\$675,000																													
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Anaerobic Digestion Capacity Expansion	\$42,938,000																													
UV Disinfection System Capacity Expansion	\$1,488,000																													
Notes:																														
(1) Total project cost includes total construction cost plus an assumed 25 percent for associated costs for engineering, legal, administrative, permitting,																														
(2) All costs are in September 2023 dollars with an Engineering News Record Construction Cost Index of 15157 corresponding to the 20-City Average																														

Figure ES.1 Near-Term Projects CIP Schedule

ES.8 Technical Memorandum 6 – Near-Term Capital Improvement Program Financing Opportunities

This TM summarizes current federal and state grants and low-interest loans that are potential sources of financing for the City's WRF near-term projects. These programs are competitive and limited in their funding capacity, with program funding availability dependent upon annual appropriations, along with other restrictions.

The following funding opportunities may provide for low interest loan or grant opportunities for the projects listed in the City's Near-Term CIP:

- U. S. Environmental Protection Agency – Water Infrastructure Finance Innovation Act (low interest financing).
- Department of Energy – Energy Efficiency and Conservation Block Grant Program (grant or voucher program).
- State of California – Community Project Funding / Congressionally Directed Spending (directed appropriations via Congress).
- State of California – Infrastructure State Revolving Fund (loan program).
- State of California – Clean Water State Revolving Fund (low interest financing with eligible principal forgiveness for disadvantaged communities and green projects).

ES.9 Summary and Recommendations

This Facility Plan outlines key near-term project recommendations and identifies improvements for the WRF. As described above, it is recommended to complete the following projects within the next six years to maintain adequate firm capacity, allowing for necessary redundancy:

- TWAS pump replacements (emergency project): Replace the TWAS pumps, so sludge can be thickened to its fullest potential. It is critical to implement this project as soon as possible to restore some capacity to the digesters, allowing for time to complete the digester expansion project. This project should be on an expedited design and construction schedule.
- Dewatering capacity expansion (emergency project): Install a third screw press with the same capacity as the existing screw presses to provide critical redundancy. This project should also implement the project as soon as possible. Like the TWAS pump replacements, this project should also be on an expedited design and construction schedule.
- Anaerobic digestion capacity expansion (5-year completion): Add a new digester with the same digestion and sludge storage capacities as Digester No. 8. This will increase the digestion capacity and allow the plant to meet the required HRT for Class B biosolids if Digester No. 8 needs to be taken offline as well as provide necessary redundancy to the digestion system.
- UV disinfection system capacity expansion (5-year completion): Install additional UV modules and associated electrical equipment to provide imperative firm capacity to the UV system. This will also provide necessary redundancy.

Overall, the WRF is in good condition. Some improvements need to be made to address some defects observed at the WRF. These improvements are as follows:

- Coat and paint corroded equipment and piping.
- Conduct an arc flash study since the last one was performed about five years ago.
- Conduct structural inspections in 10 years.
- Seal the influent gates to improve the leaking in the hydraulic system.
- Replace the biofilter media since it is approaching its 10-year lifespan.
- Improve the South Diversion Structure.
- Repair the cracking at the Septage Receiving Station.
- Replace the piping in Scum Box No. 1.
- Install piping from the air release valves to the drains to avoid spillage on the equipment and piping.
- Periodically inspect the corrosion at the brace and gusset connection near the MBR system to monitor this development.
- Address the poor drainage under the screw presses.



Water Reclamation Facility - Facility Plan



TECHNICAL MEMORANDUM 1

Near-Term Process Performance Evaluation

FINAL / February 2024





Water Reclamation Facility - Facility Plan

TECHNICAL MEMORANDUM 1

Near-Term Process Performance Evaluation

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Abbreviations

AA	average annual
AADF	average annual daily flow
AB	aeration basin
ADMM	average day maximum month
ADMMF	average day maximum month flow
ADMML	average day maximum month load
AB	aeration basin
BOD	biochemical oxygen demand
Carollo	Carollo Engineers
cfm	cubic feet per minute
City	City of Visalia
COD	chemical oxygen demand
cu ft	cubic foot
deg C	degree Celsius
ft	feet
GBT	gravity belt thickener
GCSD	Goshen Community Services District
gpd/sf	gallons per day per square feet
gpm	gallons per minute
IMLR	internal mixed liquor return
lbs/hr	pounds per hour
MBR	membrane bioreactor
MG	million gallons
mgd	million gallons per day
mg/L	milligrams per liter
MLSS	mixed liquor suspended solids
OOS	out of service
PE	primary effluent
PWWF	peak dry weather flow
ppd	pounds per day
PS	primary sludge
PWWF	peak wet weather flow
RAS	recycled activated sludge
scfh	standard cubic feet per hour
scfm	standard cubic feet per minute
sec	seconds
SRT	solids retention time
TKN	total Kjeldahl nitrogen

TM	technical memorandum
TN	total nitrogen
TP	total phosphorus
TS	total solids
TSS	total suspended solids
TWAS	thickened waste activated sludge
UV	ultraviolet
VS	volatile solids
WAS	waste activated sludge
WDR	Water Discharge Requirements
WRF	Water Reclamation Facility
WW	wastewater

TM 1 NEAR-TERM PROCESS PERFORMANCE EVALUATION

1.1 Introduction

In recent years, there has been a significant increase in industrial loads, along with increased water conservation efforts in residential wastewater within the City and Goshen. The increased concentrations of wastewater has had a direct impact on the facility which is operating near its maximum capacity when it comes to influent biochemical oxygen demand (BOD) and total suspended solids (TSS). These elevated loadings are putting excessive stress on some of the treatment processes and leading to disruptions and disturbances. The objective of this Facility Plan is to evaluate the existing treatment processes and facilities to develop the framework for improvements required to meet the WRF's near-term (6-year) needs.

This technical memorandum (TM) provides an overview of the WRF, summarizes the historical and projected influent flows and loads, and summarizes the performance and capacity assessments. These performance and capacity assessments were used to identify near-term capacity improvement projects to serve as the basis for the near-term capital improvement plan.

1.2 Description of Existing Facilities

The City's WRF was originally built in 1966, and since then, has undergone multiple significant expansions and improvements. In 1995, the City entered into an agreement with the Goshen Community Services District (GCSD) that established the City would accept and treat wastewater discharge from the Community of Goshen. This agreement established maximum limits for flow and BOD and TSS loads that have been modified in subsequent amendments to the agreement.

The Water Discharge Requirements (WDR) state that the WRF has a treatment capacity of 18 million gallons per day (mgd) for dry weather monthly average daily flow. However, during the most recent upgrade project, a phased approach for installing equipment was implemented and structures were designed to handle an average annual daily flow (AADF) of 22 mgd, but wherever practical, the actual equipment installed was designed to handle an AADF of 18 mgd. Therefore, some processes will require equipment expansions to meet the AADF of 22 mgd.

Treatment at the WRF consists of screening, vortex grit removal, primary treatment, secondary treatment with activated sludge and membrane bioreactors, and ultraviolet (UV) disinfection. The treated effluent is discharged to either to Tulare Irrigation District, onsite disposal ponds, or to City-owned Basin No. 4.

Solids processing consists of thickening waste activated sludge (WAS) with gravity belt thickeners (GBTs), anaerobic digestion of primary sludge (PS)/scum and thickened waste activated sludge (TWAS), and dewatering of digested sludge with screw presses. Once the digested sludge has been dewatered, it is transported to onsite sludge drying beds and ultimately disposed by either land application at an approved facility or used as landfill alternative cover.

1.3 Historical Influent Flows and Loads

Daily influent flow and load data was evaluated from January 2018 to April 2023. Figure 1 shows the historical daily and 30-day average influent flow to the WRF. The reported influent BOD and TSS loadings are shown in Figure 2. The reported data shows a significant increase in the raw influent flows and loads (BOD, chemical oxygen demand [COD], and TSS) starting in August 2020 and onwards. Reported influent loads after 2020 have doubled or tripled when compared to the loads prior. Furthermore, the influent ratio of organics (as BOD and COD) to TSS sharply decreased after August 2020, indicating a higher load contribution of inert constituents (see Appendix A).

Through discussions with the City, the observed increase in solids and organic loading to the plant is in part attributable to a higher industrial discharge contribution. To capture this recent increase in industrial loads, the period from August 2020 to April 2023 was selected as the baseline period to calibrate the steady state biological model.

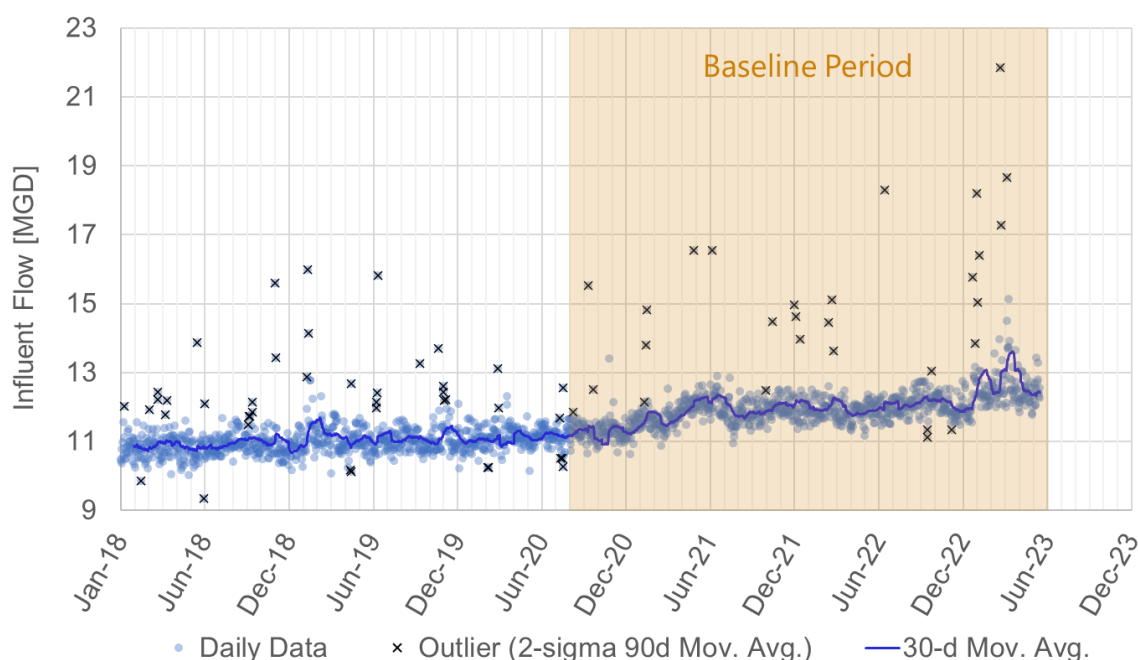


Figure 1 Historical Daily Raw Influent Flow Data

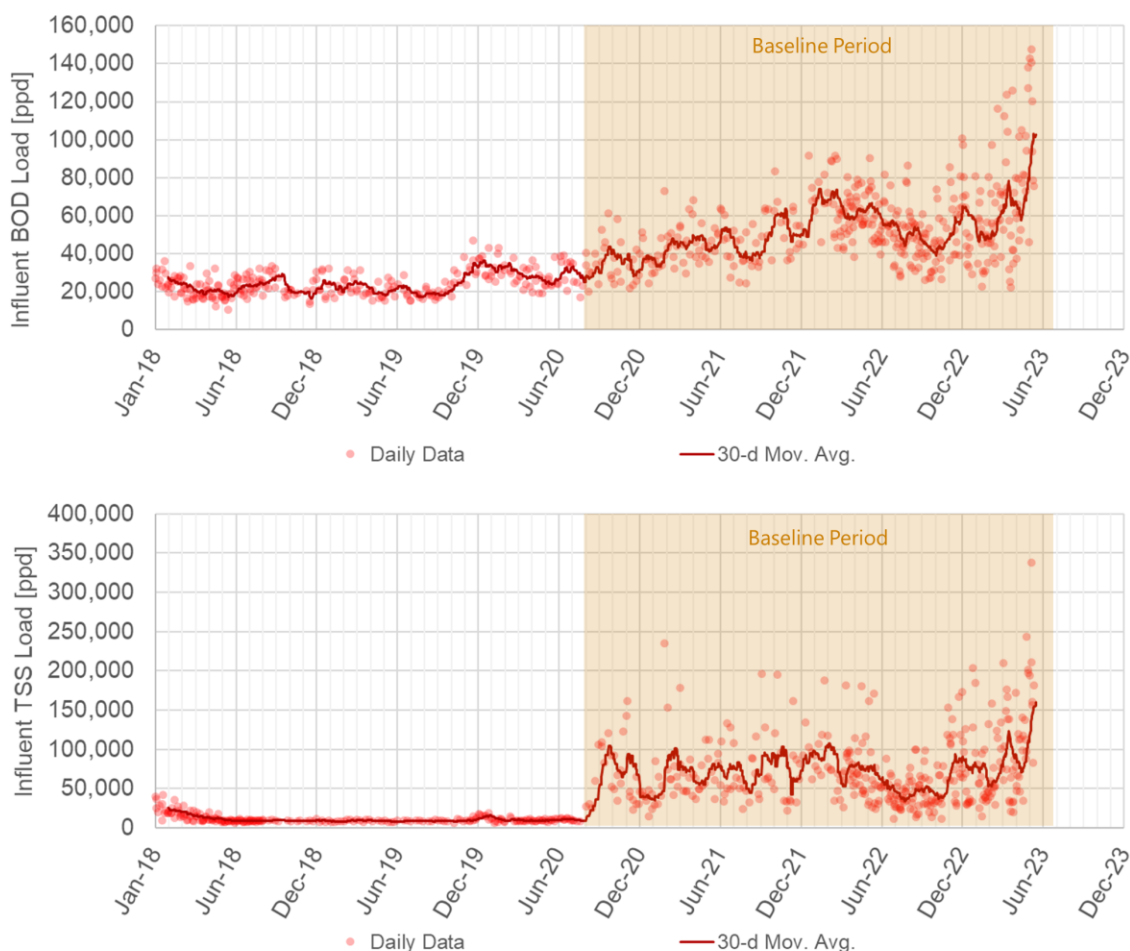


Figure 2 Historical Daily Raw Load Data for BOD (Top) and TSS (Bottom)

A summary of the flows and loads for each year of available data and for the baseline period are presented in Table 1. This data is for the combined influent consisting of both domestic and commercial/industrial flows.

Table 1 Historical Flows and Loads

Condition	2018	2019	2020	2021	2022	2023	Baseline Period Average ⁽¹⁾
Average Annual							
Flow, mgd	10.9	11.1	11.2	11.9	12.0	12.6	11.9
BOD, mg/L	250	253	335	471	554	660	539
BOD, ppd	22,700	23,300	31,300	46,600	55,500	68,700	54,000
COD, mg/L	492	507	708	1,117	1,365	1,402	1,251
COD, ppd	44,600	46,800	66,100	110,600	136,400	146,900	124,000
TSS, mg/L	148	103	313	733	635	907	715

Condition	2018	2019	2020	2021	2022	2023	Baseline Period Average ⁽¹⁾
TSS, ppd	13,400	9,500	29,300	72,600	63,500	95,100	71,000
Maximum Month							
Flow, mgd	11.2	11.7	11.5	12.4	12.3	13.6	12.4
BOD, ppd	29,500	35,600	43,800	63,600	74,000	82,400	73,000
COD, ppd	48,900	50,000	132,000	156,700	186,900	181,000	175,000
TSS, ppd	25,600	12,900	104,400	103,500	107,100	122,300	111,000
Peak Hourly							
Flow, mgd	20.5	19.5	22.0	26.0	21.5	30.0	23.3

Notes:

(1) August 2020 to April 2023 data screened from outliers using a 90-day rolling 2-sigma criterion (95% confidence interval).

Using the data summarized in Table 1, influent flow and load peaking factors were developed. Peaking factors represent the various flow or load conditions as a ratio to the average annual daily flow or load values. The individual peaking factors for each year, as well as the average peaking factors, are summarized in Table 2. The average daily maximum month flow (ADMMF) and peak wet weather flow (PWWF) peaking factors are relatively low and likely due to low inflow and infiltration in the collection system. The BOD, COD, and TSS ADMM load peaking factors are within the expected range for a municipal wastewater treatment facility. Load peaking factors for the 2020 year are higher than usual due to a significant increase in the industrial load contribution after August 2020. Therefore, the load peaking factors prior to 2020 were excluded from the average calculations used for the load projections.

Table 2 **Historical Peaking Factors**

Condition	2018	2019	2020	2021	2022	2023	Baseline Period Average
ADMM to AA							
Flow	1.03	1.06	1.02	1.04	1.03	1.08	1.05 ⁽¹⁾
BOD	1.30	1.52	1.40	1.36	1.33	1.20	1.30 ⁽¹⁾
COD	1.10	1.07	2.00	1.42	1.37	1.23	1.34 ⁽¹⁾
TSS	1.90	1.35	3.57	1.43	1.69	1.29	1.47 ⁽¹⁾
PWW to AA							
Flow	1.87	1.75	1.96	2.18	1.78	2.38	2.00 ⁽²⁾

Notes:

- (1) The average ADMM peaking factor used for BOD, TSS and COD loads are estimated for the 2021-2023 period. Excludes 2020 because of the sharp increase in loading rates after August 2020, which results in high ADMM peak factors values. 2018 and 2019 data were excluded due to lower industrial loads that differ from current nominal operation.
- (2) The average PWWF peaking factor used for the influent flow is estimated for the 2018-2023 period.

1.4 Flow and Load Projections

The influent flow and load projections include both domestic and industrial wastewater flows. The equivalent per capita flow and loads were estimated using 2022 census data and historical influent flow

and loads data. The contribution of industrial flows and loads are hence embedded in the estimated equivalent per capita wastewater generation. Therefore, the projected increase in flows and loads from the industrial contributors in the service area are assumed proportional to the population growth.

The flow and load projection assumed the same growth rate, 2.6 percent per year for the City, as what was used in the City's 2021 Sanitary Sewer System Master Plan. The near-term 2024 flows incorporate the City's current approved permits/projects and approved development maps, taking into account planned annexations. This equates to an increase of approximately 1,053 equivalent dwelling units (EDU's) per year, which is approximately 315,000 gallons per day (gpd) increase over 2023. In addition, the GCSD has proposed an additional 203,000 gpd per Amendment 6. For GCSD, the current max flow limit of 360,000 gallons per day (gpd) was used until mid-2024, when it is assumed to increase to 563,000 gpd.

A summary of the projected 2030 flows and loads is shown in Table 3 and shown in Figures 3 and 4. The average annual flow for 2030 is projected to increase to 15.1 mgd, which is 2.6 mgd more than the current 2023 average.

Table 3 **Flow and Load Projections Summary**

Condition	Baseline Period	2030 (6-year Horizon) ⁽¹⁾
Average Annual		
Flow, mgd	11.9	15.1
BOD, mg/L	539	660
BOD, ppd	54,000	83,000
COD, mg/L	1,251	1,405
COD, ppd	124,000	177,000
TSS, mg/L	715	910
TSS, ppd	71,000	114,000
Maximum Month		
Flow, mgd	12.4	15.8
BOD, ppd	73,000	107,000
COD, ppd	175,000	227,000
TSS, ppd	111,000	168,000
Peak Wet Weather		
Flow, mgd	23.3	30.2

Notes:

(1) Wastewater concentrations, flows, loads and peaking factors are projected using average data from August 2020 to April 2023 (baseline period).

Flow Projections

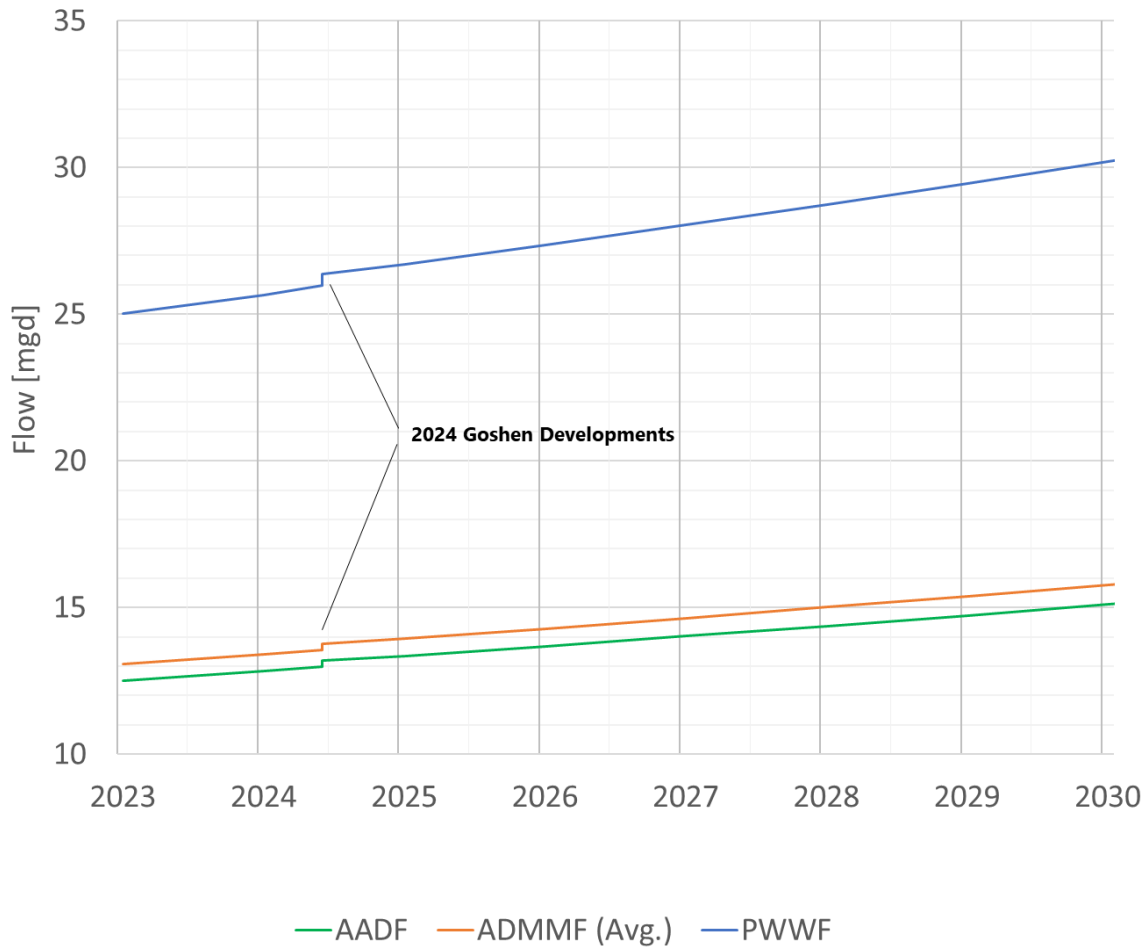


Figure 3 Influent Flow Projections For 2023 To 2030

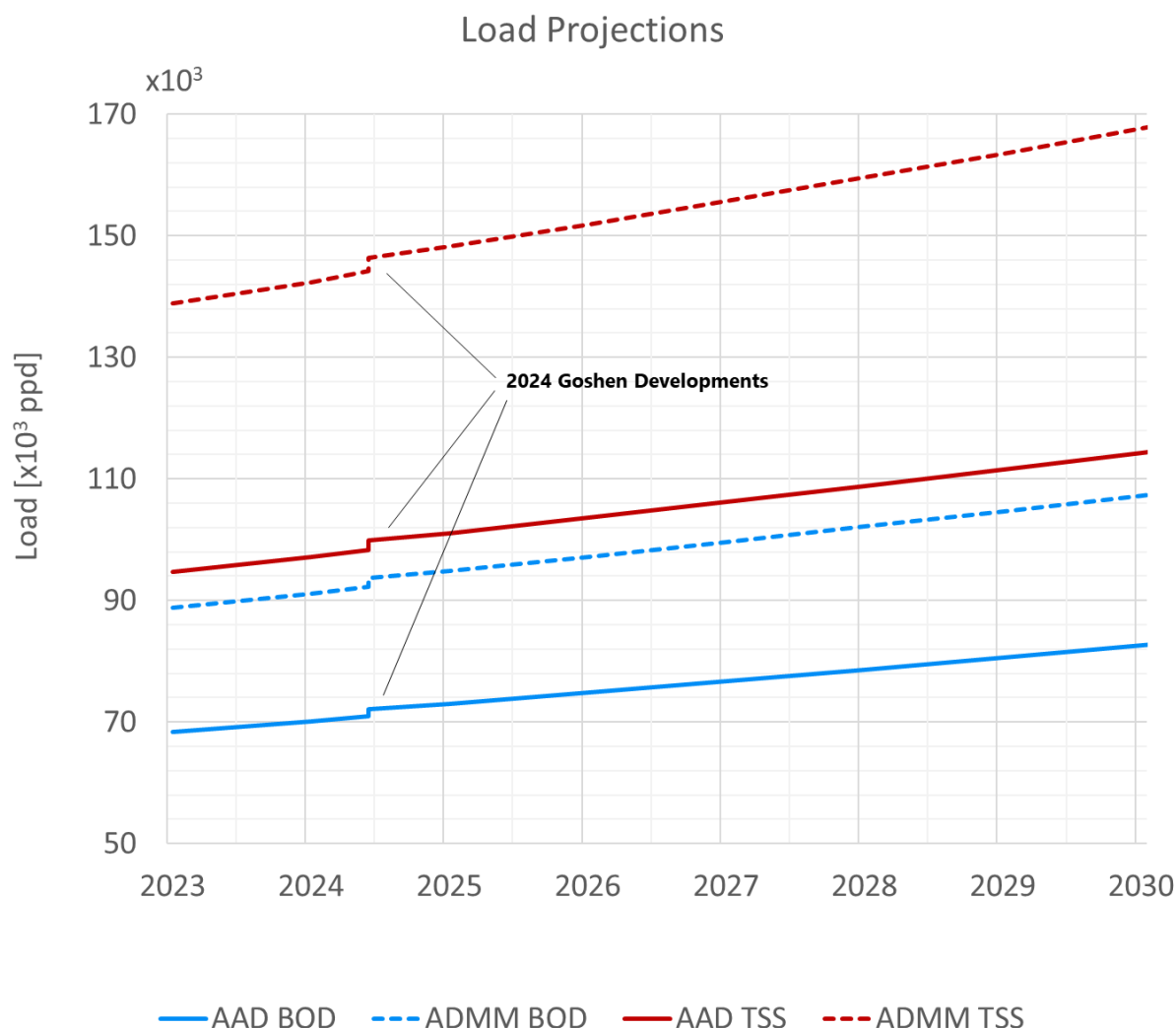


Figure 4 BOD And TSS Load Projections For 2023 To 2030

1.5 Existing Treatment Process Performance

This section summarizes the historical performance of the treatment processes. Daily operating data from January 2018 to April 2023 was reviewed for the assessment. In addition to reviewing historical data, discussions were held with operations and maintenance staff and the WRF's Operations and Maintenance Manual was reviewed to better understand the WRF performance and capacity limitations. Table 4 presents the average daily effluent performance from 2018 to 2023 compared to the effluent discharge limits. As shown in the table, the WRF has had effluent exceedances for daily maximum BOD in June 22nd and 23rd of the year 2022 and monthly average total nitrogen (TN) in August of 2019. The exact cause is unknown. Other than these exceedances, the WRF has performed adequately over the past 5 years to meet the effluent limits.

Table 4 Effluent Limits and Average Performance

Effluent Parameter	Units	Effluent Limit		Effluent Data					
				2018	2019	2020	2021	2022	2023
BOD	mg/L	Annual Average	N/A	4.1	4.2	3.9	1.8	2.6	2.7
		Monthly Avg.	10	6.7	8.7	5.2	2.8	6.4	3.8
		Daily Max	20	14.0	18.0	18.0	7.1	23.0	20.0
TSS	mg/L	Annual Average	N/A	2.1	1.5	1.0	0.8	1.0	1.7
		Monthly Avg.	10	3.8	4.4	1.2	1.7	1.2	2.4
		Daily Max	20	16.0	7.2	2.4	6.6	3.4	3.2
TN	mg/L	Annual Average	N/A	5.9	6.8	5.4	4.5	4.6	5.0
		Monthly Avg.	10	9.3	14.0	6.8	5.7	6.1	5.4
		Daily Max	N/A	10.0	18.0	11.0	8.4	8.7	6.6

An understanding of the WRF's unit process performance is critical to determining the treatment capacity. Based on historical loading and performance, recommended criteria for assessing capacity were developed for each major treatment process to serve as the basis for the process capacity evaluation. The historical load and performance of each unit process was compared to the original design criteria and typical design values. The performance of each unit process provides a benchmark for the planning of new facilities and assessing capacity. In some cases, historical performance confirms that original design criteria are appropriate for assessing unit process capacity. In others, above or below average performance warrants adjusting original design criteria for assessing capacity. For each unit process, recommended design criteria are identified for use in the capacity assessment.

Table 5 summarizes the results of the performance evaluation.

Table 5 Unit Process Performance and Capacity Criteria

Process	Design Parameter	Units	Original Design Capacity	Average of Daily Performance from 2020-2023	MOP-8 or Typical Values	Recommended Criteria for Capacity Analysis
Headworks						
Mechanical Bar Screens	Flowrate	mgd	2 at 47, each 47 firm, 94 installed	30.0 PWWF	Sufficient firm capacity (i.e., 1 unit OOS) for PWWF	47 firm
Influent Pumping Station	Flowrate	mgd	2 at 7, each 4 at 11, each 47 firm, 58 installed	11.9 AADF 30.0 PWWF	Sufficient firm capacity (i.e., 1 unit OOS) for PWWF	47 firm
Grit Tanks	Flowrate	mgd	4 at 12, each 36 firm	11.9 AADF 30.0 PWWF	Sufficient firm capacity (i.e., 1 unit OOS) for PWWF	36 firm
Primary Clarifiers						
	Overflow Rate at AADF	gpd/sf	850	465	800-1,200	850
	Overflow Rate at PWWF	gpd/sf	1,705	969	2,000-3,000	1,705
	Percent BOD ₅ Removal	%	30-35	40	25-40	30-35
	Percent TSS Removal	%	60-65	78 ⁽¹⁾	50-70	78 ⁽¹⁾
	Primary Effluent	mg/L	BOD = 260, COD = 500, TSS = 125 ⁽²⁾ At Max Month Load during AADF	BOD = 400, COD = 725, TSS = 173	Variable depending on WW strength and primary treatment performance	BOD = 400, COD = 725, TSS = 173
Primary Sludge	TS	%	4	2.5	3-4	2.5
Primary Sludge Pumps	Flowrate	gpm	4 at 100, each 200 firm, 400 installed	60 AAD 83 ADMM	Sufficient firm capacity (i.e., 1 unit OOS) for ADMM	200 firm
Inter-Stage Transfer Pumping Station						
Inter-Stage Pumps	Flowrate	mgd	3 at 22, each 44 firm, 66 installed	30.0 PWWF ⁽³⁾	Sufficient firm capacity (i.e., 1 unit OOS) for PWWF	44 firm

Process	Design Parameter	Units	Original Design Capacity	Average of Daily Performance from 2020-2023	MOP-8 or Typical Values	Recommended Criteria for Capacity Analysis
Fine Screens						
Fine Screens	Screen Capacity	mgd	4 at 15, each 45 firm, 60 installed	30.0 PWWF	Sufficient firm capacity (i.e., 1 unit OOS) for PWWF	45 firm
Membrane Bioreactor (MBR) System						
Aeration Basins (MBRs)	MLSS (ABs)	mg/L	8,000	7,300	6,000-8,000	8,000
MBR System	Minimum Month MLSS Temp.	Deg C	Not Available	20.4	Variable depending on climate	20.4
	SRT ⁽⁴⁾	Days	8-12	24.0	8-12	10.0
	Total Peak Day Airflow	scfm	5 at 7,769, each 31,076 firm, 38,845 installed	Not Available	Sufficient firm capacity (i.e., 1 unit OOS) for peak day airflow	31,076 firm
	MLSS (MBRs)	mg/L	12,000	10,100	10,000-12,000	10,000
Membrane Cassettes	Flux at AADF	mgd	10 trains at 2, each 18 firm, 20 installed	11.9	Sufficient firm capacity (i.e., 1 unit OOS) for AADF	18 firm
	Flux at PWWF	mgd	10 trains at 4, each 36 firm, 40 installed	30.0	Sufficient firm capacity (i.e., 1 unit OOS) for PWWF	36 firm
RAS Pump Station	Flowrate	mgd	4 at 26, each 78 firm, 104 installed	30.0 ⁽⁵⁾	Sufficient firm capacity (i.e., 1 unit OOS) for peak day load	78 firm
WAS Pumps	Flowrate	gpm	2 at 500, each 500 firm, 1,000 installed	130 ⁽⁶⁾	Sufficient firm capacity (i.e., 1 unit OOS) for peak day wasting	500 firm
Permeate Pumps	Flowrate	gpm	10 at 3,930, each 35,370 firm, 39,300 installed	20,800	Sufficient firm capacity (i.e., 1 unit OOS) for PWWF	35,370 firm
UV Disinfection System						

Process	Design Parameter	Units	Original Design Capacity	Average of Daily Performance from 2020-2023	MOP-8 or Typical Values	Recommended Criteria for Capacity Analysis
	Flowrate	mgd	28.8 firm	30.0 (PWWF)	Sufficient firm capacity (i.e., 1 unit OOS) for PWWF	28.8 firm
WAS Thickening						
Gravity Belt Thickeners (GBT)	Hydraulic Loding	gpm	2 at 500, each 500 firm, 1,000 installed	130 ⁽⁶⁾	Sufficient firm capacity (i.e., 1 unit OOS) for peak day wasting	500 firm
	Solids Loading	lbs/hr	2 at 3,000, each 3,000 firm, 6,000 installed	640 ⁽⁷⁾	Sufficient firm capacity (i.e., 1 unit OOS) for peak day wasting	3,000 firm
	TS	%	5	2.4	5-6	2.4
	Solids Capture	%	90	93	90-95	90
Thickened Sludge Pumps	Flowrate	gpm	2 at 100, each 100 firm, 200 installed	50	Sufficient firm capacity (i.e., 1 unit OOS) for peak day wasting	100 firm
Anaerobic Digesters						
	HRT	days	19.5	All Units 25.5 (AA) 17.4 (ADMM) All Units w/ No. 8 OOS 17 (AA) 12.1 (ADMM)	15 days (Class B Biosolids)	15 days (largest unit OOS)
	VS Loading at AADF	ppdVS/cu ft	Not Available	0.07	0.12-0.18	0.12 (largest unit OOS)
	VS Loading at ADMMF	ppdVS/cu ft	Not Available	0.11	0.15-0.20	0.17 (largest unit OOS)
	VS Reduction	%	Not Available	50	50-65	50
Sludge Transfer Pumps	Flowrate	gpm	2 at 300, each 300 firm, 600 installed	125 AADF 180 ADMM	Sufficient firm capacity (i.e., 1 unit OOS) for peak day sludge flows	300 firm
Sludge Dewatering and Drying						

Process	Design Parameter	Units	Original Design Capacity	Average of Daily Performance from 2020-2023	MOP-8 or Typical Values	Recommended Criteria for Capacity Analysis
Dewatering Feed Pumps	Flowrate	gpm	3 at 150, each 300 firm, 450 installed	125 AADF 180 ADMM	Sufficient firm capacity (i.e., 1 unit OOS) for peak day sludge flows	300 firm
Screw Press Dewatering Units	Flowrate	gpm	2 at 110, each 110 firm, 220 installed	125 AADF 180 ADMM	Sufficient firm capacity (i.e., 1 unit OOS) for peak day sludge flows	110 firm
	Solids Loading	lbs/hr	2 at 1,100, each 1,100 firm, 2,200 installed	950 AADF 1,450 ADMM	Sufficient firm capacity (i.e., 1 unit OOS) for peak day sludge flows	1,100 firm
Dewatering Screw Conveyors	Flowrate	cu ft/hr	420	96	Sufficient firm capacity (i.e., 1 unit OOS) for peak day sludge flows	420 firm
Digester Gas Handling and Renewable Power Generation System (RPGS)						
Waste Gas Flare System	Maximum Flowrate	scfh	21,250	11,000	Sufficient firm capacity (i.e., 1 unit OOS) for peak day biogas production	21,250

Notes:

- (1) Primary Clarifier BOD and TSS removal rates are estimated through a mass balance of the solids based on measured flows (raw influent, primary sludge, primary scum) and concentrations (raw influent, PS, primary scum, primary effluent). The recommended criteria for capacity analysis have been set at the removal percent estimated through the available primary treatment data. This number is significantly higher than typical. Carollo recommends that the City conduct further investigation of the influent sample location and whether a representative sample is being collected.
- (2) Primary effluent BOD, COD, and TSS design concentrations were estimated using the original raw influent design criteria and typical design PC removal percentages (35% BOD, 65% TSS). COD was estimated using historical primary effluent COD to BOD ratios prior to August 2020
- (3) PWWF at inter-stage pump station flow was assumed to be the same as the influent flow.
- (4) Total SRT of the MBR system is calculated using total volume (basins and membrane tanks), measured RAS TSS, measured MLSS in the aerobic tanks, and estimated WAS flows.
- (5) No RAS data was available for the 2020-2023 period. Reported RAS data was estimated based on a 250% target value of the influent flow rate, as reported by the plant's operations staff.
- (6) No WAS data was available for the 2020-2023 period. Reported WAS data was estimated based on an average 130 gpm value, as reported by the plant's operations staff.
- (7) The loading to the GBTs was estimated based on an average WAS flow of 130 gpm and the actual 2020-2023 TSS concentration data.

1.6 Biological Model

A steady state model was developed for the City's WRF using Envirosim's BioWin software, version 6.2. The scope of the model was limited to primary treatment, secondary treatment, anaerobic digestion, and the sludge handling and processing units. The model was used to determine near-term capacity bottlenecks.

The model was developed using custom-configured unit process modules that reflect the WRF's existing configuration and operation. Physical dimensions (volume and depth or area and depth) of each unit process and flow rates such as raw influent, primary effluent (PE), RAS, internal mixed liquor return (IMLR) and WAS were inputs to the model. Other historical process data collected at different stages of the WRF treatment processes was utilized to calibrate and validate the biological model. The configuration of the model is shown in Figure 5.

The aeration basins were modeled as a series of six zones, as shown in Figure 5. Zones 1 through 3 are anoxic zones, while Zones 4 through 6 represent the aerobic zones. Each zone in the model represents the overall treatment capabilities of the four parallel treatment trains (i.e., total volume, number of diffusers, etc.). The membrane tanks are modeled using one unit process module that is equivalent to ten of the membrane tanks operating in parallel.

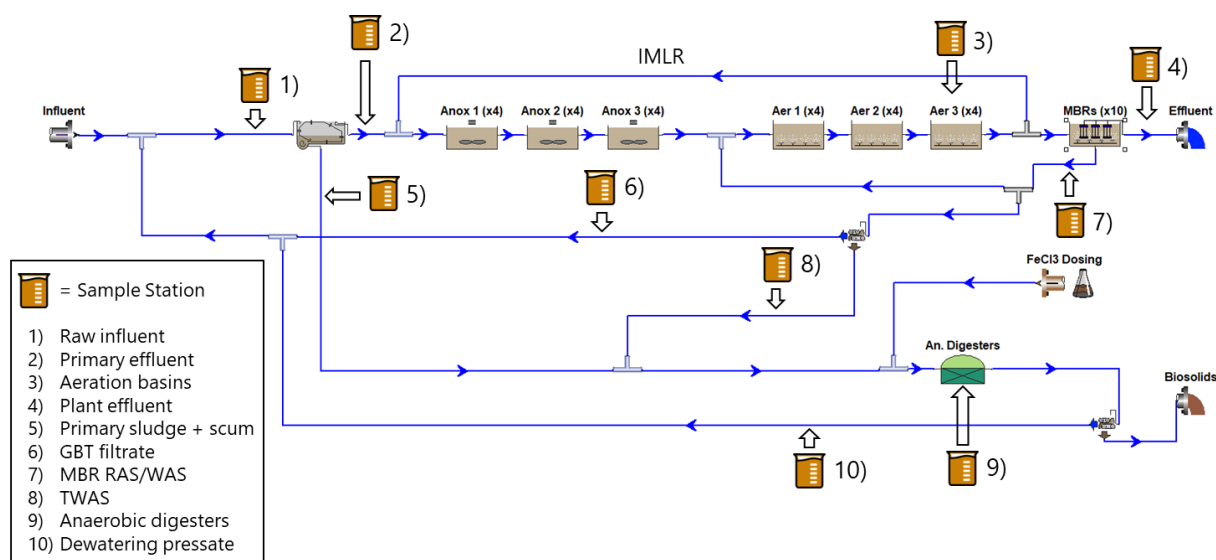


Figure 5 BioWin Configuration for WRF

1.6.1 Summary of Model Calibration Results

For the model calibration, flow inputs such as the influent, primary sludge (PS), WAS, and TWAS, as well as influent concentrations such as COD, total Kjeldahl nitrogen (TKN), and total phosphorus (TP), were set to match the average from the calibration period. The influent COD fractions were adjusted so that model outputs match the plant data as close as possible. The calibration results for the secondary treatment process were good, as the model predictions match the plant's reported performance within 10 percent,

which is considered sufficient for planning and design of wastewater facilities. The full calibration data is provided in detail in Appendix C. One issue was identified during the calibration process when performing a solids mass balance around the primary clarifiers. The predicted primary sludge mass loading rates from the calibrated model were significantly higher than the reported data. A discussion of this primary sludge solids mass balance is included in the section below.

1.6.2 Solids Mass Balance

The model predicts significantly more primary sludge production than reported in the plant data. This can be seen when comparing the model results to historical plant data for the primary sludge flow rates and concentrations. Some potential causes for this primary sludge solids mass balance discrepancy are discussed below.

- Influent Sample: Composite raw influent samples are collected through an autosampler and sent to a local laboratory for analysis. If the sample is not representative and contains more solids than what is actually entering the plant, the model would predict more sludge than is reported.
- PS Flow Meters: The PS flow rate is recorded through flow totalizers that are determined based on the cycling time and the pump run time during each cycling event. Issues with flow meter calibration can impact the estimated PS solids loads. However, the City regularly calibrates these flowmeters and checked them again as part of this study, and they are believed they are sufficiently accurate.
- PS TSS Concentration: Grab samples are collected for the TSS concentration of the PS and then sent to a local laboratory for analysis. A special sampling campaign was performed to compare sampling methodologies (i.e., grab vs. composite sampling). For all primary clarifiers, both methodologies showed good consistency in the TSS accuracy (0 to 10 percent difference between grab and composite sampling).

The most likely explanation for the mass balance discrepancy is that the influent sample is not representative. This is believed for the following reasons:

- Plant staff have QA/QC'd the PS flow meter calibration as well as the PS TSS concentration. The PS TSS concentration has been consistent throughout the review period.
- The primary effluent sample is believed to be representative since it is well calibrated to the secondary process module in the model.
- The PS, WAS, and digester data (% TS, % VS, and gas production) are consistent with each other, suggesting the solids data is reliable. If PS loads to the digester were actually as high as the model predicts, the digesters would be operating at extremely low HRTs (less than 10 days) and would likely have failed by now.
- Primary clarifier TSS and BOD removal are 78 and 40 percent, respectively. This is significantly higher than typical values and suggests either the influent or primary effluent sample is not representative. Since the primary effluent sample is believed to be representative, it's possible the influent sample is not.

We recommend that the City conduct further investigation of the influent sample location and whether a representative sample is being collected.

1.7 Capacity Analysis

This section summarizes the results of the process capacity evaluation. Capacities were estimated for each unit process and were dependent on a range of parameters including flow, influent wastewater characteristics, treatment objectives, process configurations, operational setpoints, and desired redundancy. The capacities are based on the recommended criteria in Table 5.

For the secondary process and solids handling facilities, the calibrated process model was used to simulate process conditions under maximum month loading. The model was used to determine the influent flow at which the recommended (or limiting) criteria in Table 5 is seen. The equivalent AADF capacity is then considered for the scheduling of near-term capacity improvements needs based on future AADF flow projections.

1.7.1 Capacity Analysis Summary

Figure 6 and Table 6 present the estimated capacity for each unit process at the City's WRF. As shown in Figure 6 and Table 6, all unit processes have sufficient capacity to handle the estimated 2030 projections except for the UV disinfection system, anaerobic digestion process, and dewatering screw press units, which are discussed further in the following sections.

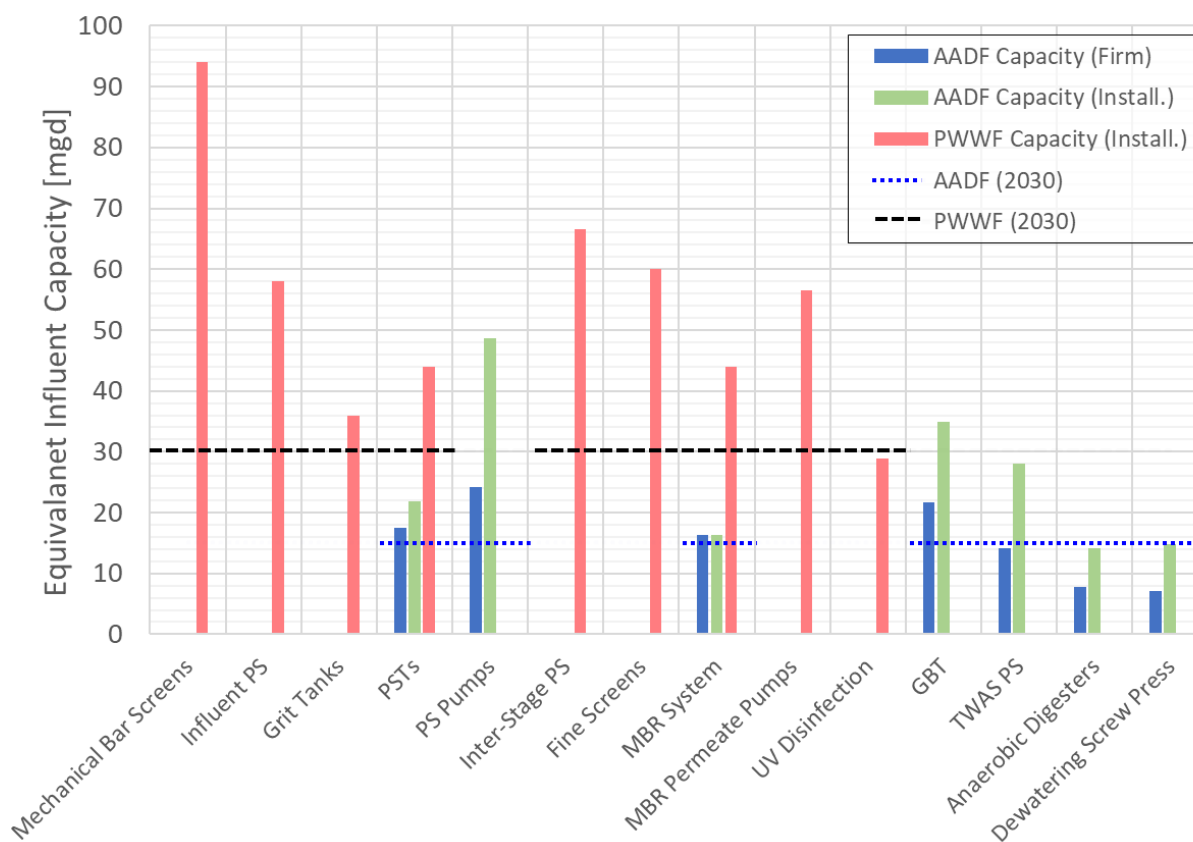


Figure 6 Unit Process Capacities

Table 6 Unit Process Capacities

Process	Controlling Condition	Capacity (mgd)	2030 Projected Flow (mgd)	Firm Capacity Deficit (mgd)
Mechanical Bar Screens	PWWF	47 ⁽¹⁾	30.2	0
Influent Pump Station	PWWF	46.9 ⁽¹⁾	30.2	0
Grit Removal	PWWF	36 ⁽¹⁾	30.2	0
Primary Clarification	AADF	17.5 ⁽¹⁾	15.1	0
	PWWF	44 ⁽¹⁾	30.2	0
Inter-Stage Pump Station	PWWF	44.4 ⁽¹⁾	30.2	0
Fine Screens	PWWF	45 ⁽¹⁾	30.2	0
MBR System	AADF	16.3 ⁽²⁾	15.1	0
	PWWF	36 ⁽²⁾	30.2	0
Membrane Tank Permeate Pumps	PWWF	50.9 ⁽¹⁾	30.2	0
UV Disinfection	PWWF	28.8 ⁽¹⁾	30.2	-1.4
Digesters	AADF	7.8 ⁽³⁾	15.1	-7.3
Sludge Dewatering	AADF	7.1 ⁽³⁾	15.1	-8.0

Notes:

(1) Firm capacity: largest unit out of service.

(2) Total capacity: all units in service.

(3) Capacity was developed based on firm capacity and current operating conditions with an average feed concentration of 2.5% solids to the digesters.

In addition, the overall firm and total capacity of the WRF were plotted against the projected flows and are shown in Figure 7. This is further broken down in Figure 8 that shows the firm capacity, which is the capacity with the largest unit is out of service, in relation to the different unit processes capacities and delineates which unit process limits the firm capacity. Currently, the WRF firm capacity is limited by the dewatering process and anaerobic digestion.

The first recommended near-term project is to replace the TWAS pumps to allow TWAS to be thickened to an average of 5 percent TS and reduce the volume of sludge being fed to the digesters. Since the dewatering process and digesters are currently hydraulically limited, reducing the volume of sludge fed to them will directly increase their available capacities. After replacing the TWAS pumps, the dewatering process is still the limiting process for the WRF firm capacity and therefore, a dewatering process capacity expansion project should install a third screw press. After installation of the third screw press, the digesters become the limiting process and a new digester should be constructed. The last recommended near-term project is to expand the capacity of the UV system to meet the projected 2030 PWWF.

After all four recommended near-term projects have been implemented, the WRF becomes capacity limited by the MBR system at 16.3 mgd, which is greater than the projected 2030 flow so the WRF would then have sufficient near-term capacity.

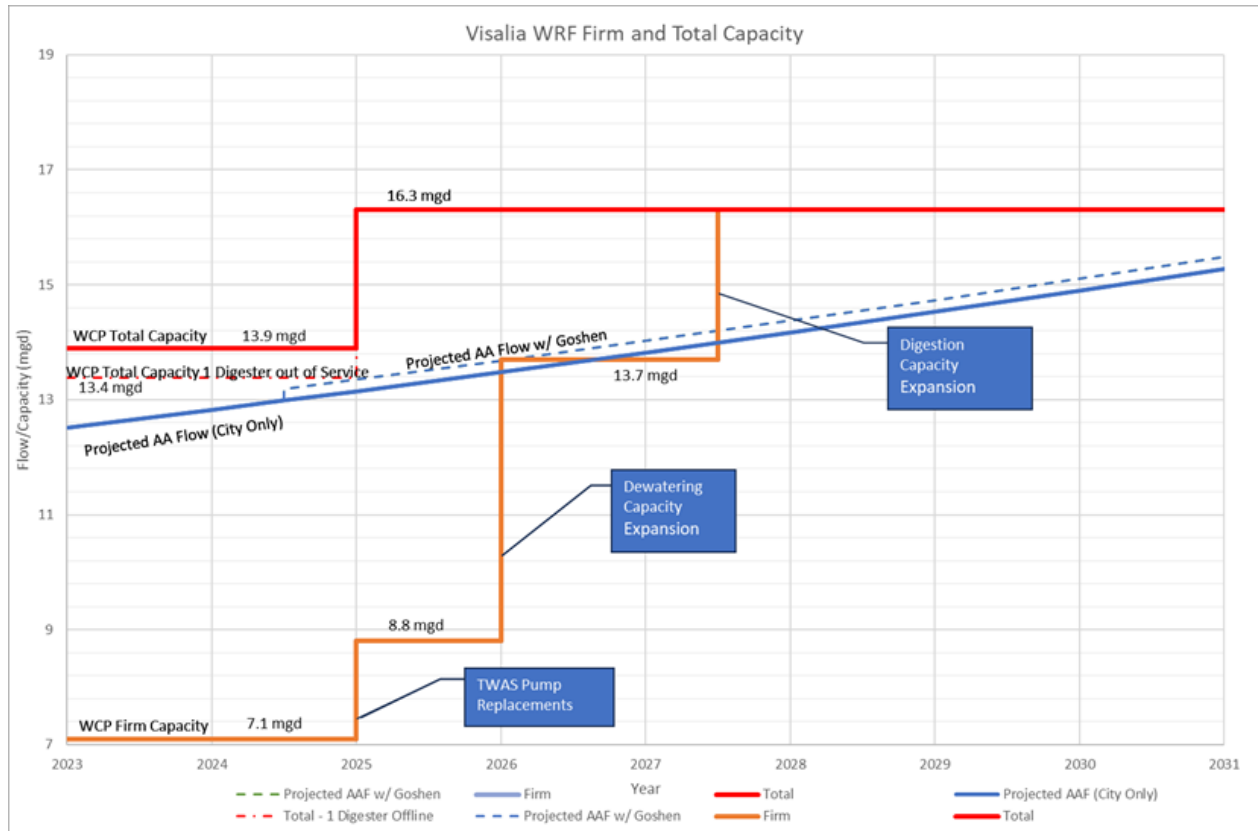


Figure 7 Firm and Total Capacity Trigger Plot With Projected AADF Flows and Necessary Capacity Expansion Improvements

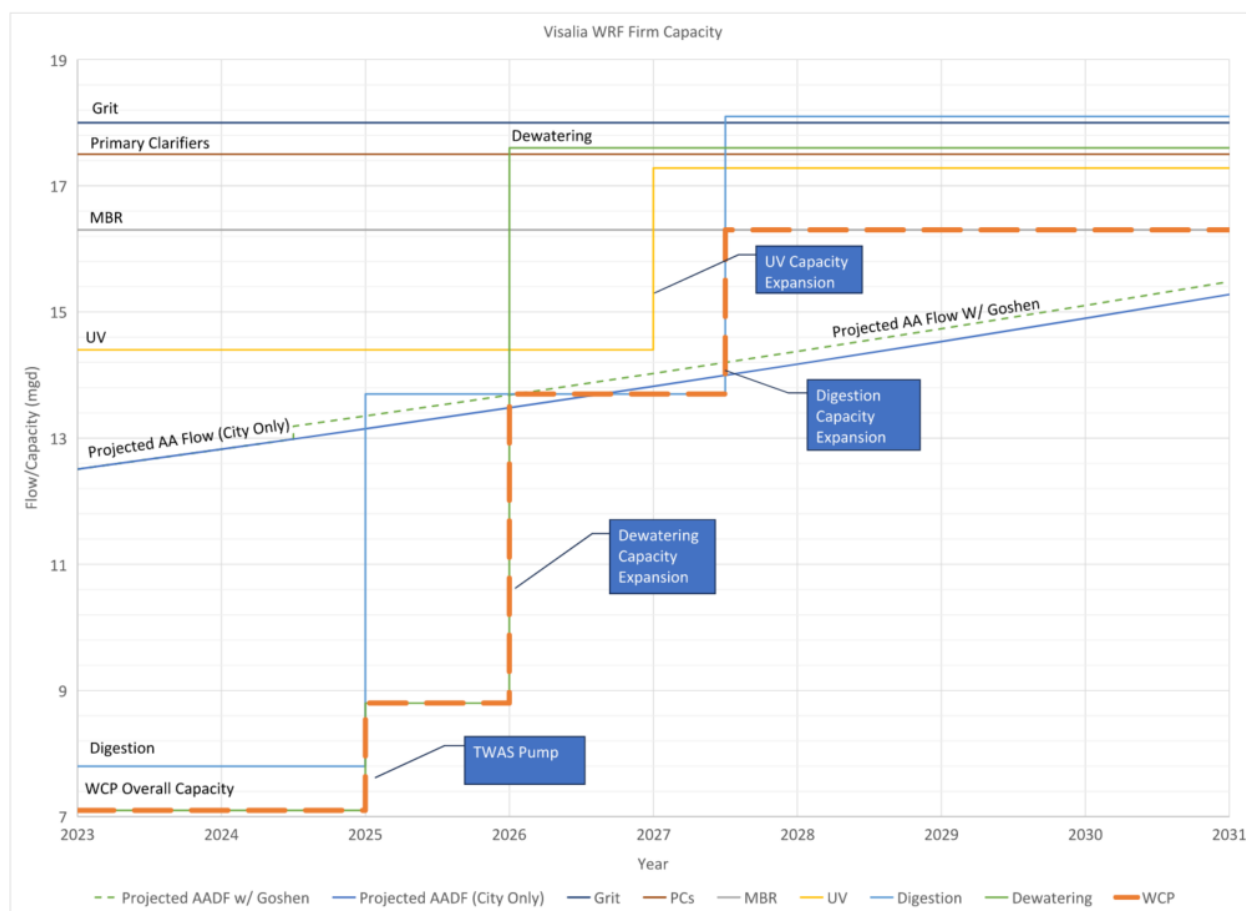


Figure 8 Firm Capacity Trigger Plot With Unit Processes Capacities

1.7.2 UV Disinfection System

As shown in Table 6 above, the capacity of the UV disinfection system does not have sufficient firm capacity to meet the projected 2030 PWWF and will need to be expanded. The existing system was constructed with space allocated for installing four additional modules in the existing channels. Installing these modules would increase the UV system's firm capacity to be able to meet the projected 2030 flows. Refer to TM 4 – Near-Term Project Descriptions for more information on the UV expansion project.

1.7.3 Anaerobic Digestion System

For the near-term horizon, the digesters have sufficient treatment capacity in terms of volatile solids (VS) loading but are limited by the hydraulic retention time (HRT). The HRT of the digesters was estimated based on the projected sludge flows. PS and scum flow was assumed to be proportional to the raw influent flows based on historical ratios from 2020 to 2023. Although TWAS flows for the calibration of the biological model were estimated based on WAS flows needed to match an SRT of 10 days, the TWAS flows used for digester HRT projections were conservatively assumed proportional to the raw influent flows based on historical ratios from 2020 to 2023.

Based on the 2023 average sludge concentrations (2.6 percent PS+scum and 2.5 percent TWAS) and with Digester No. 8 OOS, the ADMMF HRT capacity of the digesters is below the minimum 15-day threshold for achieving Class B biosolids as seen in Figure 9.

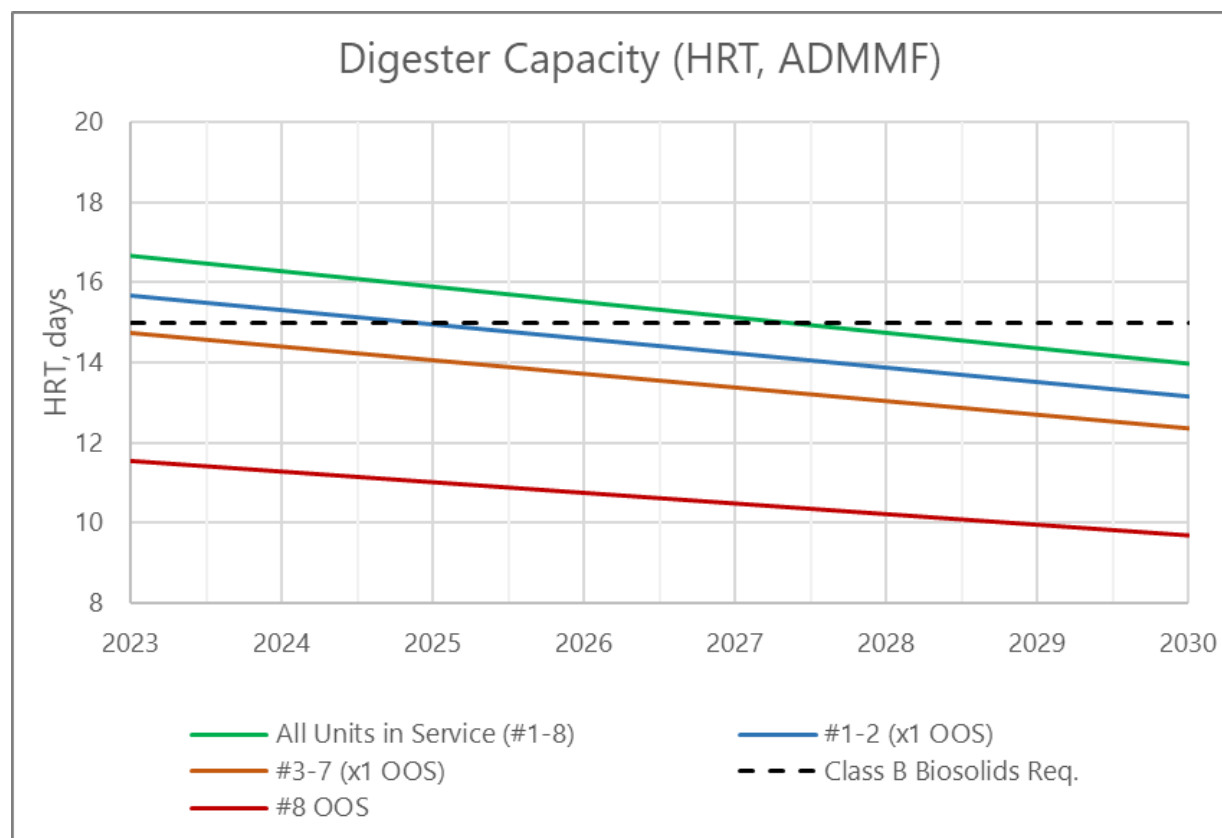


Figure 9 Projected Anaerobic Digestion Hydraulic Retention Time (2.6% PS+scum and 2.5% TWAS).

By further thickening the PS + scum and TWAS streams to average concentrations of 3 percent and 5 percent, respectively, the sludge feed flows to the digesters could be reduced and restore some digestion capacity. The HRT of the digesters with these thicker sludge feeds is shown in Figure 10. As shown, an additional digester will need to be constructed by 2027 to meet the 15-day HRT requirement with the largest digester out of service. Refer to TM 4 – Near-Term Project Descriptions for more information on replacing the TWAS pumps and the digester capacity expansion project.

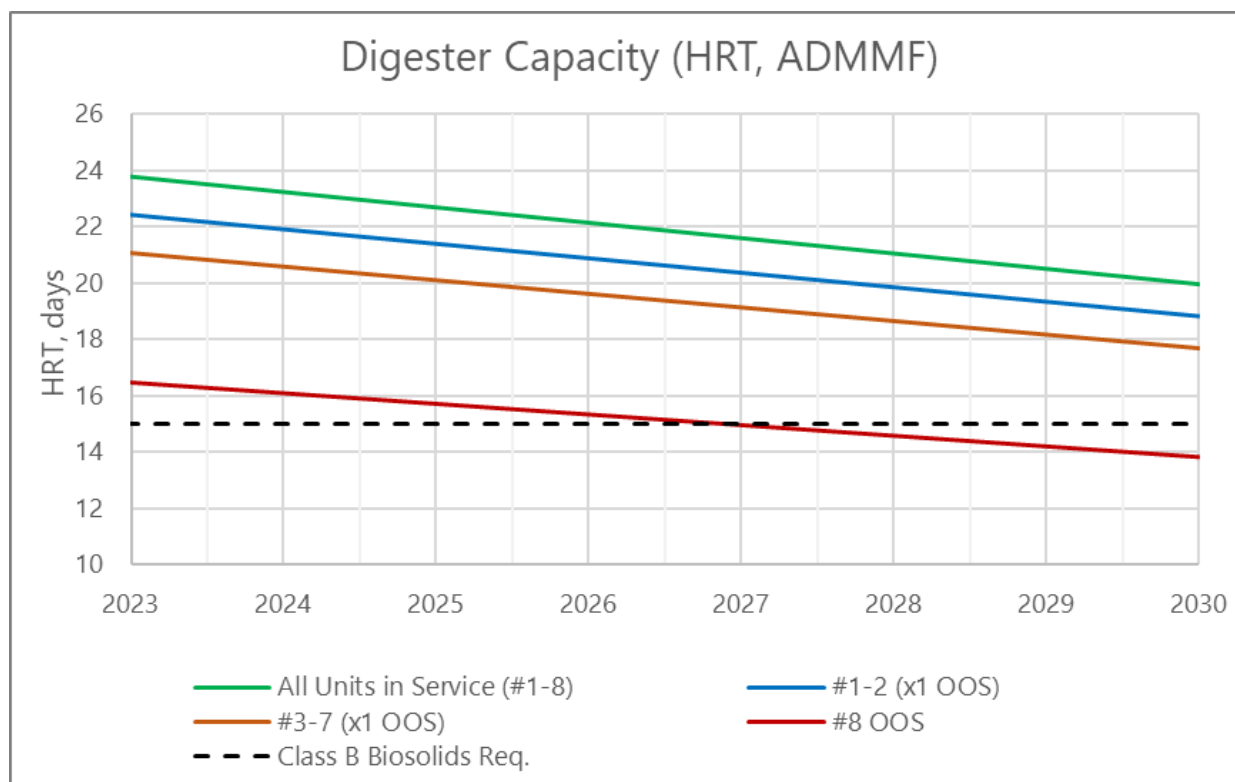


Figure 10 Projected Anaerobic Digestion Hydraulic Retention Time (3% PS+scum and 5% TWAS)

1.7.4 Dewatering System

As shown in Table 6 above, the capacity of the dewatering system is not sufficient to meet the projected 2030 sludge flows. In addition, the dewatering system does not have enough firm capacity to meet the current peak sludge flows and the plant must run both screw presses to dewater all of the sludge. In order to be able to take a unit out of service, the dewatering system should be expanded with a third screw press to have sufficient firm capacity to meet the projected sludge flows and loads. Refer to TM 4 – Near-Term Project Descriptions for more information on the dewatering expansion project.

APPENDIX A FLOW AND LOAD DATA

Different datasets of the Visalia WRF operations were used as inputs of the biological model and to compare the model outputs during the calibration phase. Daily data mainly included the operational variables such as flows (influent, primary sludge and scum and TWAS) and water quality parameters (TSS COD, and BOD₅. Daily water quality parameters such as ammonia, nitrate, TKN, TP, alkalinity, were collected for a few weeks after the start of the project to augment the information regarding the influent characterization.

The input and output data of the biological model was screened from outliers using a 90-day rolling 2-sigma criterion (95% confidence interval) and were then reviewed and analyzed for periods of operations that diverged from nominal operating conditions. Outlier data was flagged and was not considered in the biological model calibration.

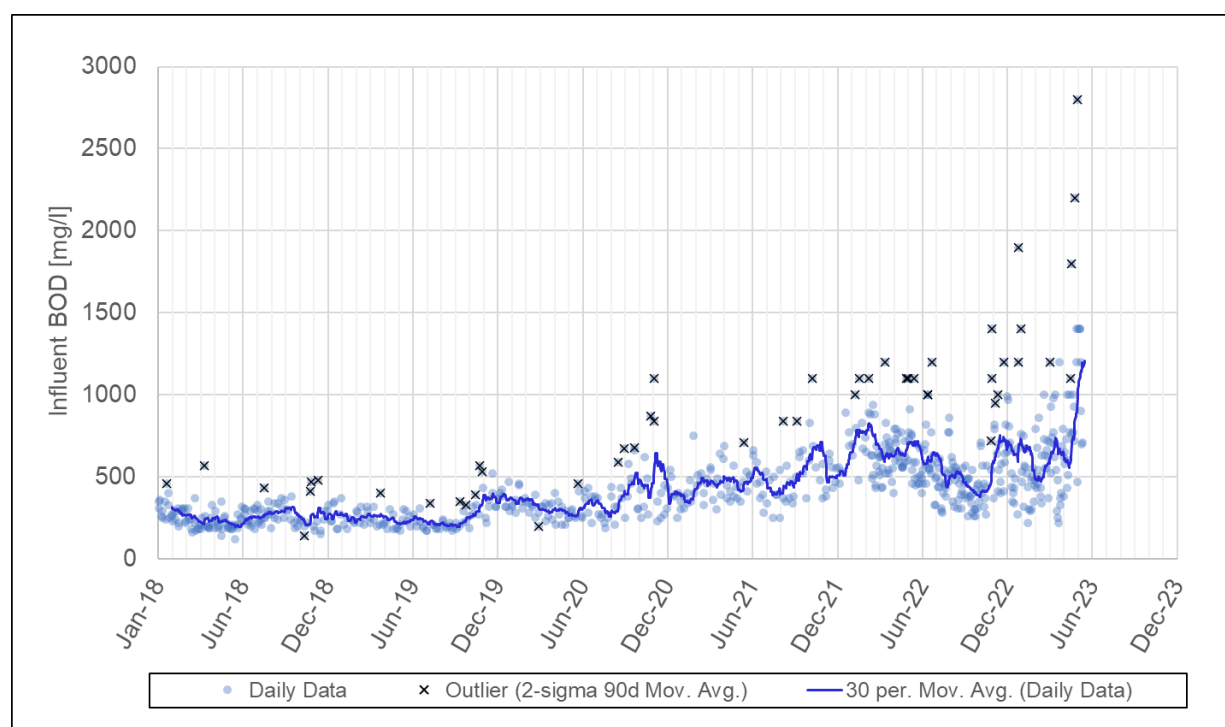


Figure 1A.1 Historical Daily Raw Influent BOD Concentrations

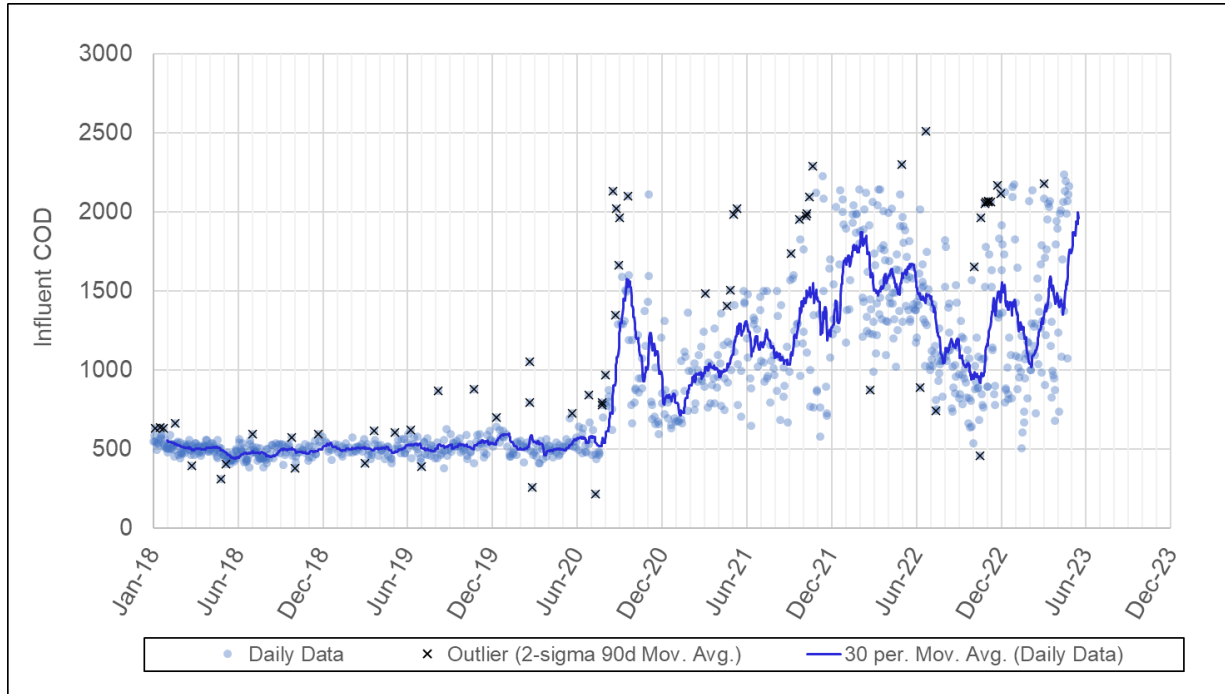


Figure 1A.2 Historical Daily Raw Influent COD Concentrations

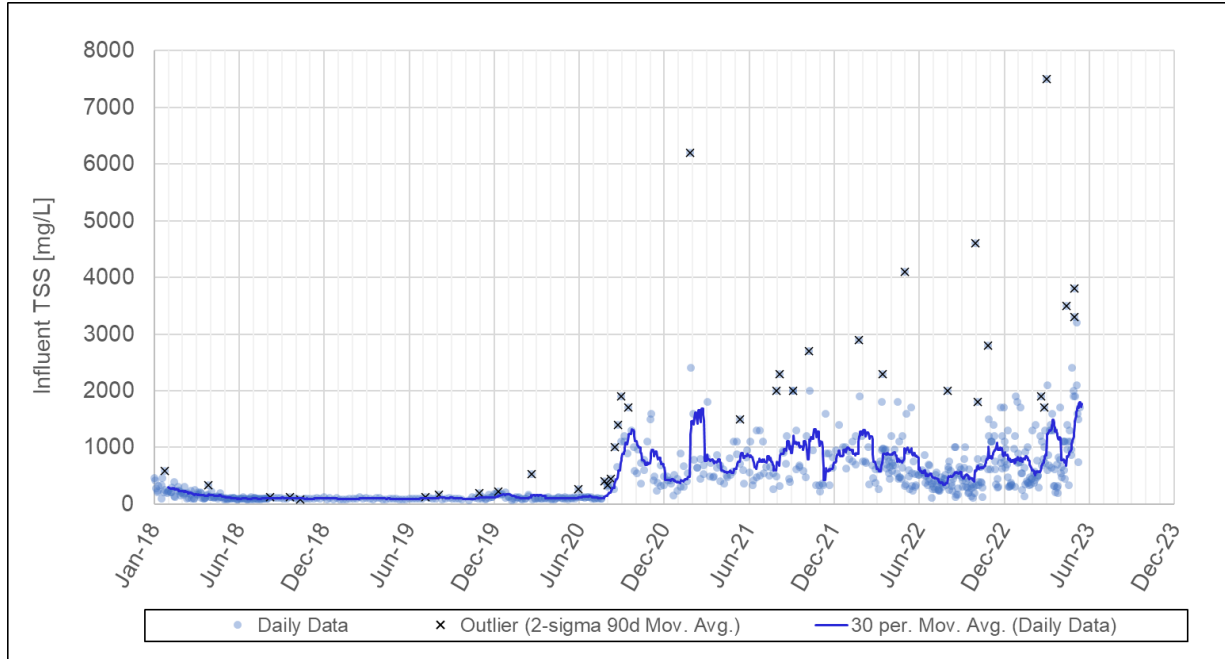


Figure 1A.3 Historical Daily Raw Influent TSS Concentrations

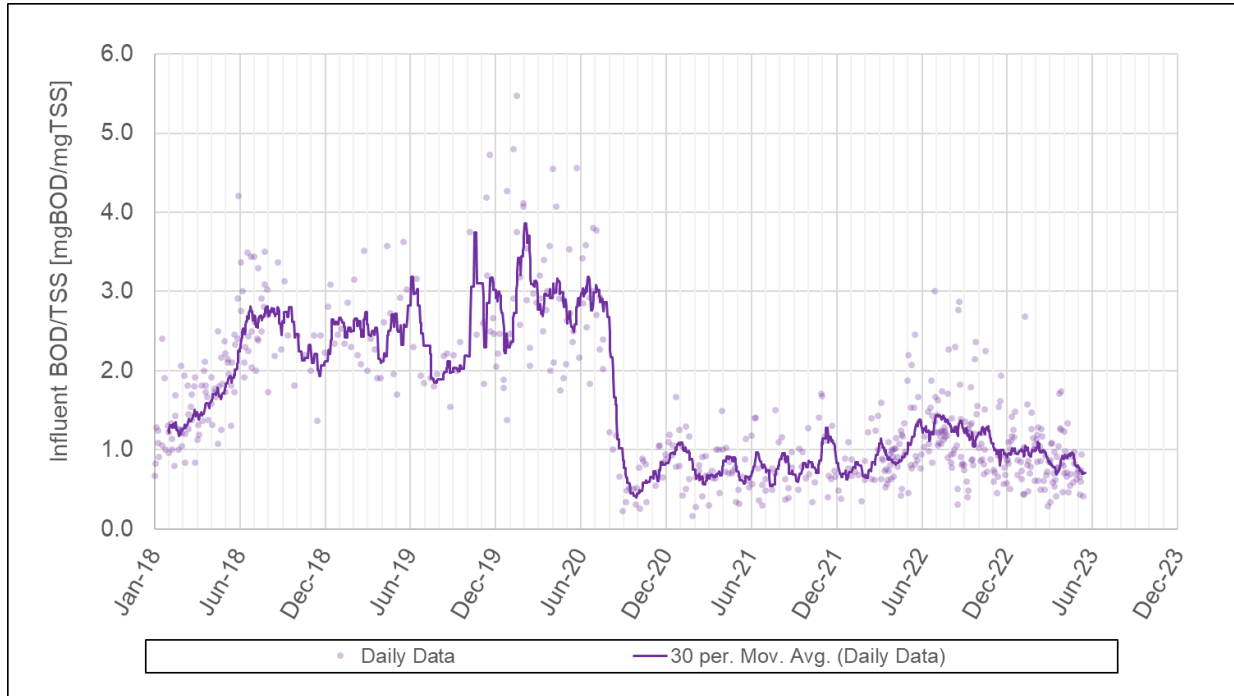


Figure 1A.4 Historical BOD Over TSS Ratios

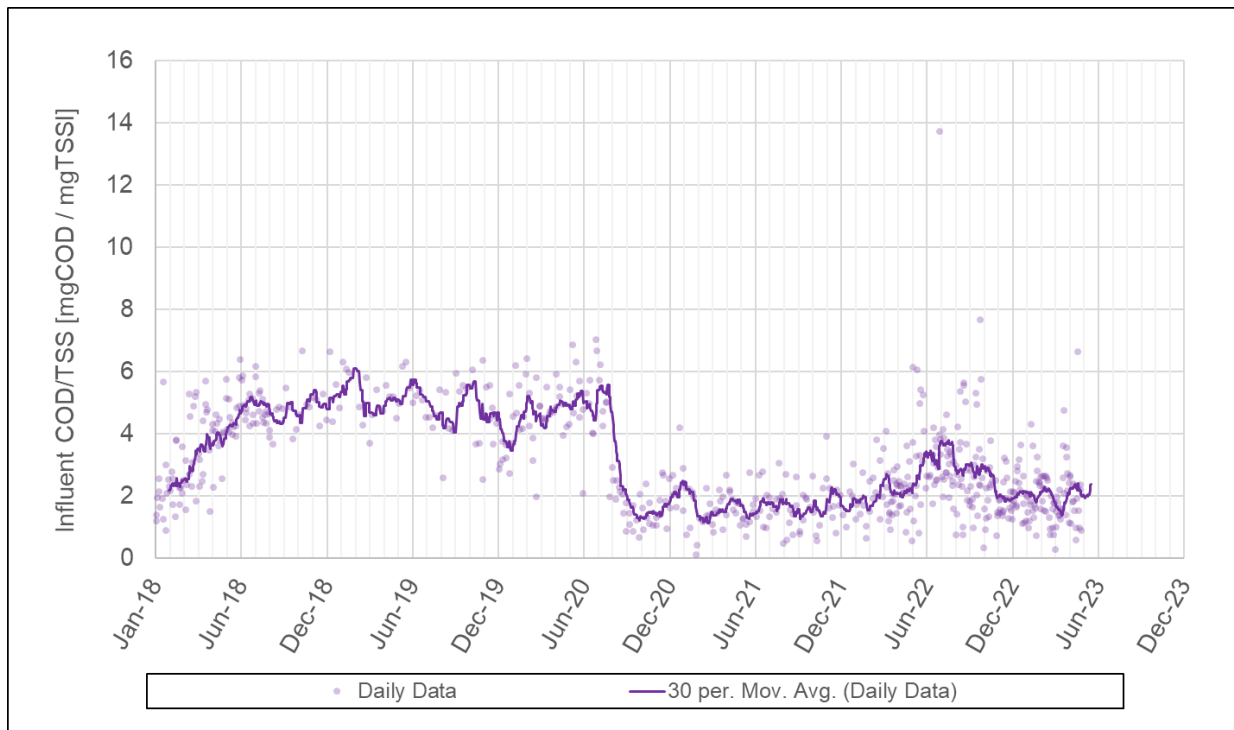


Figure 1A.5 Historical COD Over TSS Ratios

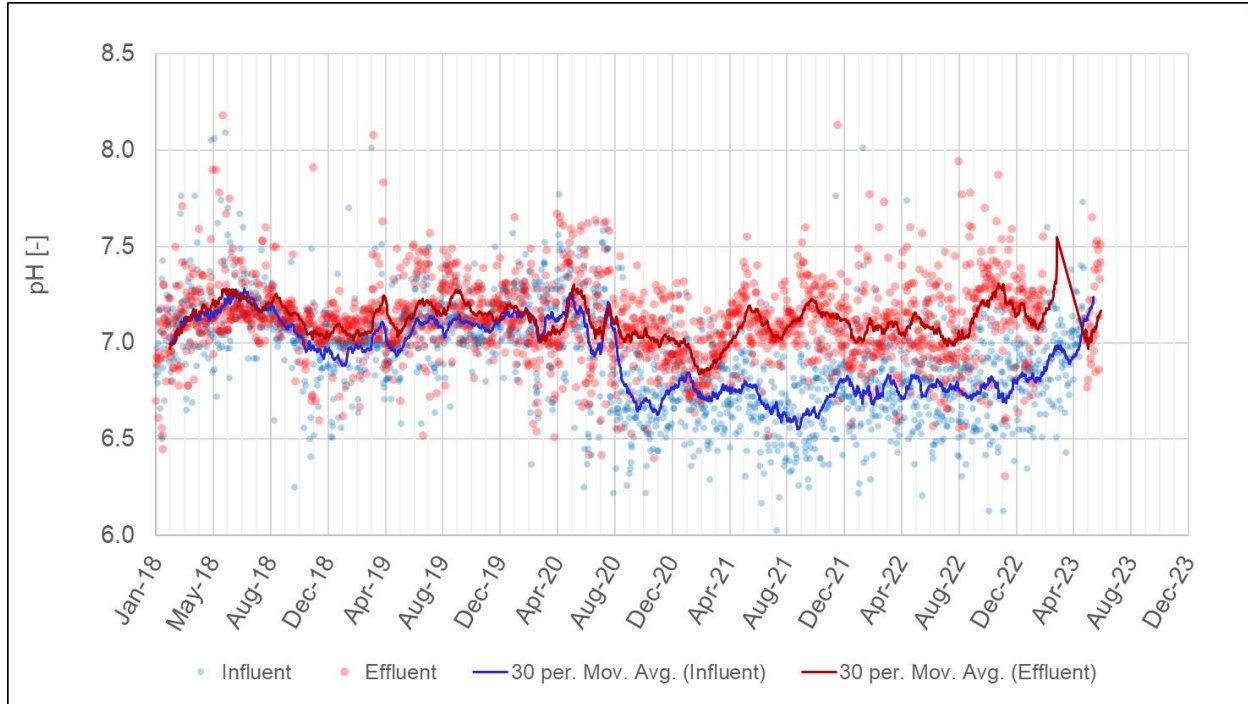


Figure 1A.6 Historical Influent And Effluent pH

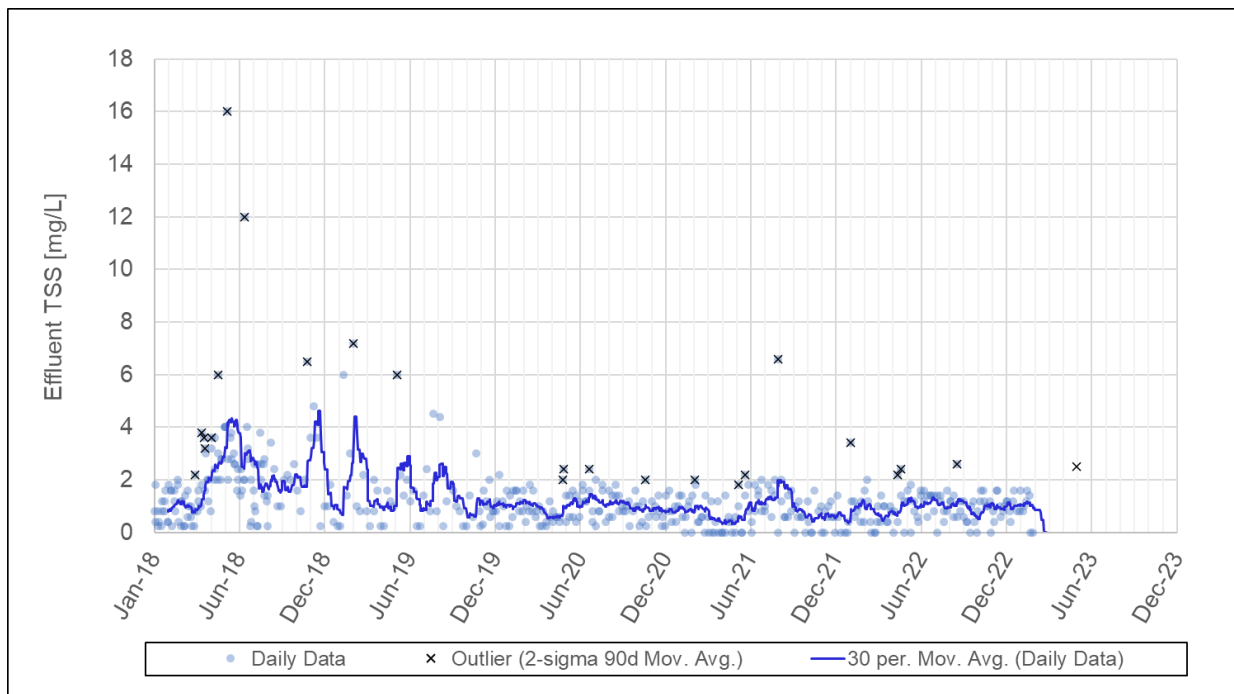


Figure 1A.7 Historical Effluent TSS

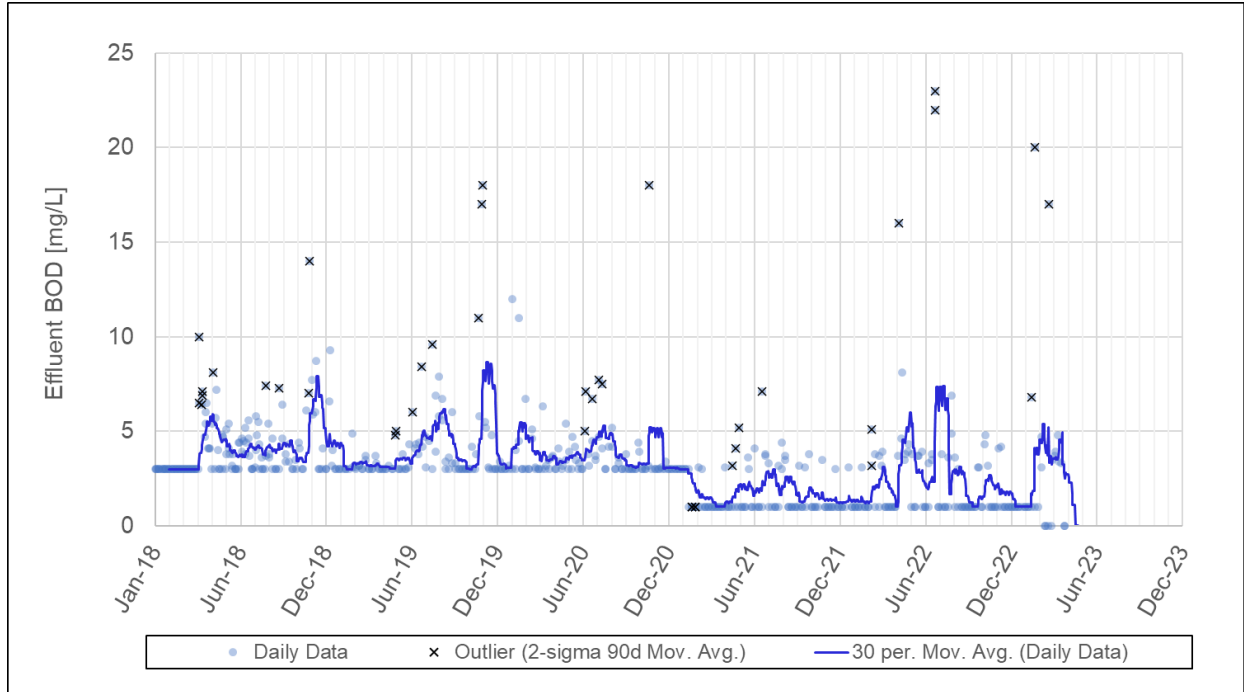


Figure 1A.8 Historical Effluent BOD

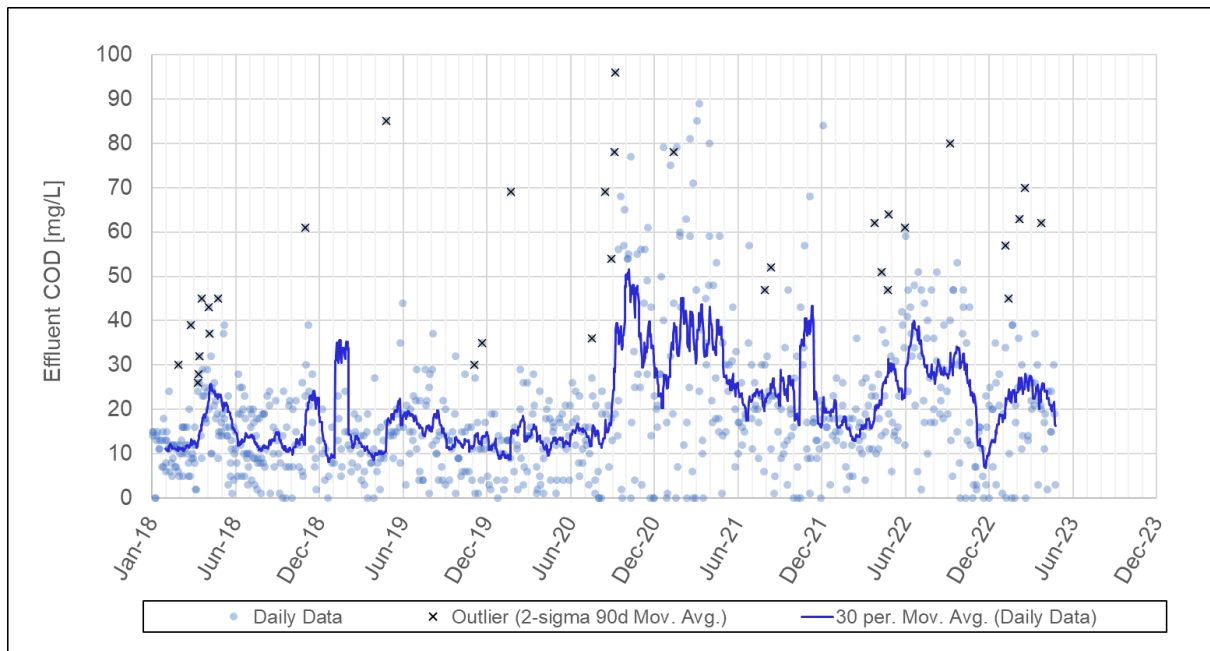


Figure 1A.9 Historical Effluent COD

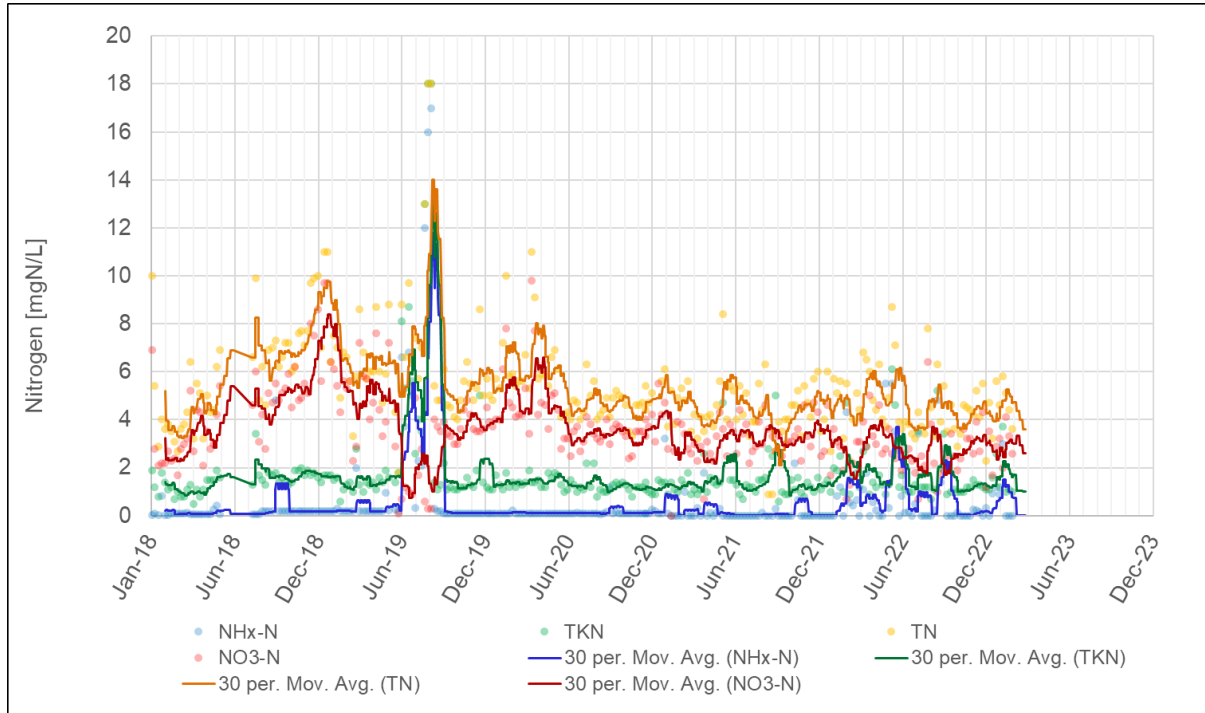


Figure 1A.10 Historical Effluent Nitrogenous Compounds

APPENDIX B

BIOLOGICAL MODEL INFORMATION

Table 1B.1 Biological Model Calibration Table

Variable	Units	Data (average over baseline period)	Coefficient of Variation of Data ⁽¹⁾	Simulated w/ biological model	Data/Model Difference
Raw Influent					
Flow	MGD	12	7%	12	0.1%
TSS	mg/L	715	62%	668	6.6%
BOD	mg/L	539	36%	530	1.7%
COD	mg/L	1,251	33%	1252	0.1%
TP ⁽³⁾	mgP/L	18.3	25%	18.1	0.7%
NHx-N ⁽³⁾	mgN/L	50.3	25%	47.8	4.9%
Temperature	C	24	12%	24	0.0%
pH	-	6.8	4%	6.8	0.0%
Primary Clarifiers					
PS + Scum Flow	MGD	0.1070		0.107	0.0%
Effluent TSS	mg/L	128	50%	142	11%
Effluent BOD	mg/L	294	25%	291	1.0%
Effluent COD	mg/L	588	16%	553	6.0%
Sludge TSS	mg/L	24,801	30%	58,782	137%
Sludge VSS ⁽²⁾	mg/L	22,174	29%	49,851	125%
Aeration Basins					
MLSS	mg/L	7,299	15%	7,198	1.4%
MLVSS	mg/L	5,815	15%	5,515	5.2%
Airflow	cfm	missing		14,320	
DO	mg/L	2.13	35%	2	6.1%
Membrane Tanks					
MLSS	mg/L	10101	21%	10,061	0.4%
MLVSS	mg/L	7,970	24%	7,706	3.3%
Airflow	ppd	missing		11,056	
DO	mg/L	2.1	6.1%	2.0	6.1%
WAS TSS	mg/L	9,727	15%	10,061	3.4%
WAS VSS	mg/L	7,927	13%	7,706	2.8%
GBT Filter					
TWAS Flow	MGD	0.08	39%	0.08	4.1%
TWAS TSS	mg/L	24,015	20%	23,512	2.1%
TWAS VSS	mg/L	18,794	19%	18,008	4.2%
Effluent TSS	mg/L	678	134%	683	0.7%
Effluent VSS	mg/L	554	73%	523	5.6%
Digesters					
Digester TSS	mg/L	15,217	6%	28,478	87.1%
Reactor VSS	mg/L	10,727	9%	20,428	90.4%

Variable	Units	Data (average over baseline period)	Coefficient of Variation of Data ⁽¹⁾	Simulated w/ biological model	Data/Model Difference
HRT ⁽²⁾	days	17		17	2.9%
Biogas Production	cfm	264,403	15%	406,166	53.6%
Screw Press Dewatering					
Cake TSS	%	15.6%	9%	15.8%	1.5%
Cake VSS	%	missing		11.4%	
Screw Pressate TSS	mg/L	307	81%	605	97.3%
Screw Pressate VSS	mg/L	missing	9%	434	1.5%
Effluent					
BOD	mg/L	2.57	3.0 ⁽⁴⁾	0.79	1.78
COD	mg/L	28.1	81%	29.25	4.2%
TSS	mg/L	1.12	0.68 ⁽⁴⁾	0.00	1.12 ⁽⁴⁾
NH _x -N	mg/L	0.90	1.34 ⁽⁴⁾	0.04	0.86 ⁽⁴⁾
TKN	mg/L	1.52	0.94 ⁽⁴⁾	1.40	0.12 ⁽⁴⁾
NO ₃ -N	mg/L	3.09	0.92 ⁽⁴⁾	5.22	2.13 ⁽⁴⁾
TN	mg/L	4.54	1.18 ⁽⁴⁾	6.63	2.09 ⁽⁴⁾
TP	mg/L	6.73	0.90 ⁽⁴⁾	6.89	0.16 ⁽⁴⁾
pH	-	7.08	3%	6.72	5.1%

Notes:

1. The coefficient of variation shows the extent of variability in relation to the mean of the data. The coefficient of variation is computed by dividing the standard deviation by the mean.
2. The estimates for the hydraulic retention time of the digesters do not account for digester no. 8.
3. Data averages are computed using only 4 data samples, following a special sampling campaign.
4. The variation of the data and the difference between data and simulated values are shown here in absolute terms.

APPENDIX C ANAEROBIC DIGESTER PERFORMANCE

Primary sludge, scum, and thickened waste activated sludge (TWAS) undergo anaerobic digestion, a process designed for mesophilic stabilization of the solids and biogas generation. The solids are distributed across eight existing digesters. Of these eight digesters, No. 1 and No. 2 have an operating volume of 0.26 million gallons (MG) each, No. 3 through No. 7 have 0.52 MG each, and No. 8 has 1.94 MG (1.38 MG designed for active digestion and 0.55 MG for storage).

Following the 2017 improvements, the plant's typical de-gritting of the digesters through gravity wasting has been limited. In April 2023, Digester No. 4 was taken out of service for maintenance and inspected. The inspection revealed a significant accumulation of grit. It is expected that the other digesters also have significant grit accumulation that reduces the active volume of the digester and thus, reduces the overall HRT of the anaerobic digestion system.

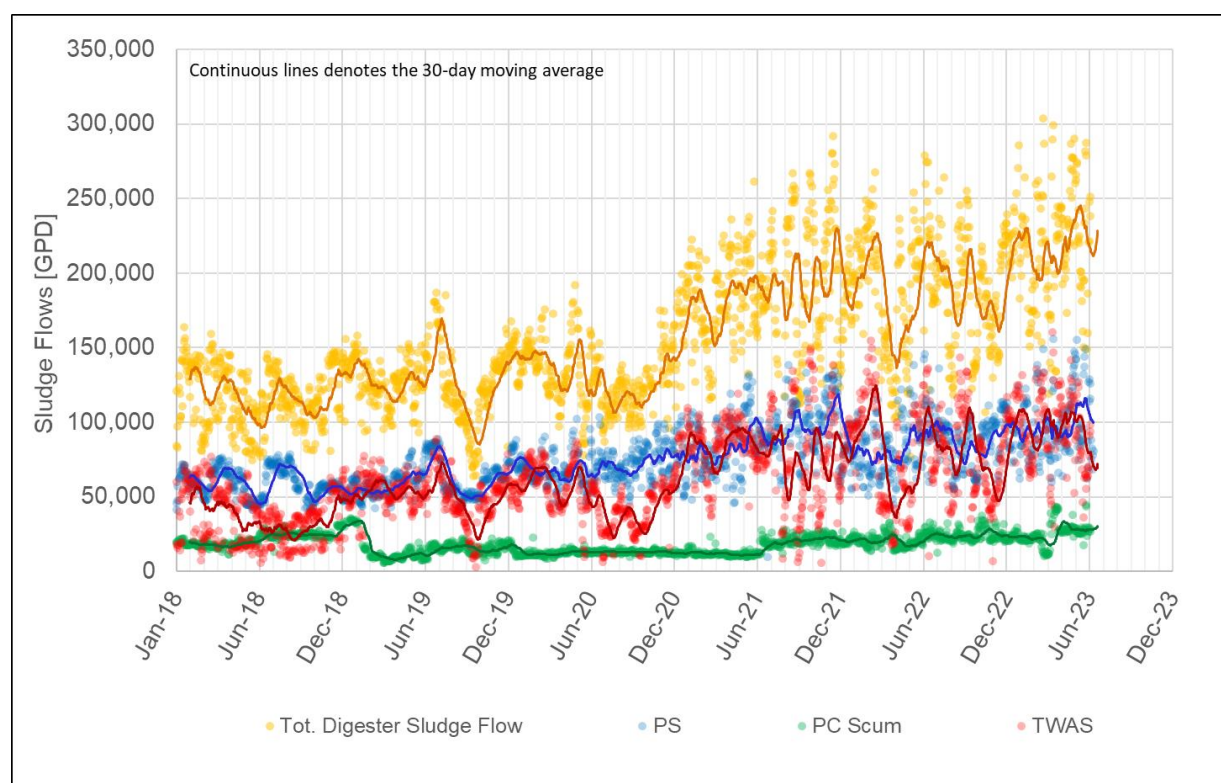


Figure 1C.1 Historical Sludge Flows

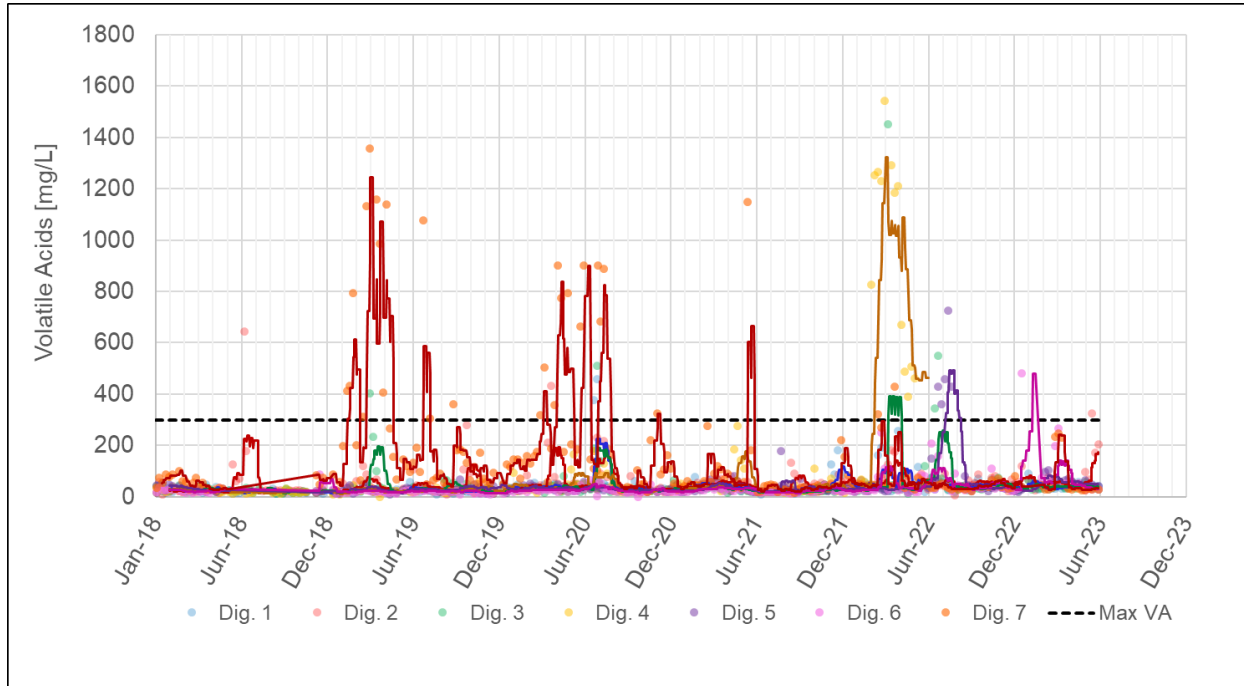


Figure 1C.2 Historical VFA Profiles For Digesters No. 1 Through No. 7

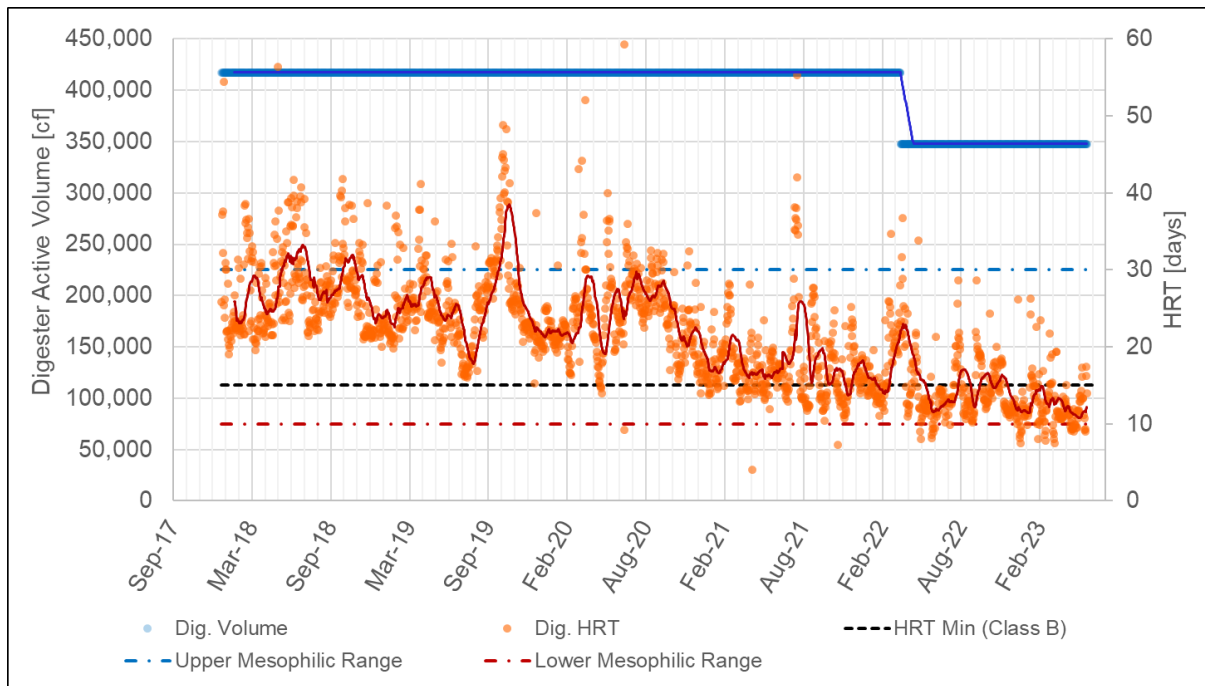


Figure 1C.3 Historical Active Digester Volumes And Estimated HRTs



Water Reclamation Facility - Facility Plan



TECHNICAL MEMORANDUM 2

Condition Assessment

FINAL / February 2024





Water Reclamation Facility - Facility Plan

TECHNICAL MEMORANDUM 2

Condition Assessment

FINAL / February 2024

This document is released for the purpose of information exchange review and planning only under the authority of Kyle T. Leonard, February 2024, CA PE 86011 .

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Abbreviations

Carollo	Carollo Engineers
EUL	estimated useful life
ft	feet
MBR	membrane bioreactor
MG	million gallons
mgd	million gallons per day
mg/L	milligrams per liter
psi	pounds per square inch
RAS	recycled activated sludge
RUL	remaining useful life
SCADA	supervisory control and data acquisition
TWAS	thickened waste activated sludge
WAS	waste activated sludge
WRF	Water Reclamation Facility
WWTP	wastewater treatment plant

TM 2 **CONDITION ASSESSMENT**

2.1 Introduction

2.1.1 Overview

This Technical Memorandum (TM) presents the findings and recommendations of the condition assessment performed for Visalia’s Water Reclamation Facility (WRF). The assessment includes evaluations for mechanical, structural, and electrical components of various assets at the WRF.

2.1.2 Project Goals

The goals of this condition assessment include the following:

- Evaluate the condition of each asset to identify system deficiencies.
- Develop a list of rehabilitation and replacement needs for the near- and long-term time horizons.
- Estimate remaining service life.

2.2 Condition Assessment Methodology

2.2.1 Introduction

This section provides background for how the assets at the WRF were scored and the rating system that dictated the scores. Additionally, the methodology for determining the asset’s ultimate remaining useful life (RUL) and the reinvestment year is described.

2.2.2 Condition Assessment Rating Scale

A visual condition assessment was performed for mechanical, structural, and electrical components of assets, which were then assigned a condition-based assessment score. The condition scoring (condition and performance) is based on a scale of one to five as described in Table 1.

Table 1 **General Condition Scores**

Condition or Probability of Failure Score	General Description	Percent Life Consumed
1 (Best)	Good: Asset is in good condition (no defects).	0 - 39
2	Acceptable: Asset has minor defects.	40 - 64
3	Fair: Asset has significant defects that will affect reliability or efficiency.	65 - 79
4	Poor: Asset is highly unreliable or inefficient.	80 - 19
5 (Worst)	Failed: Asset is no longer able to function in its current condition.	90 - 100

2.2.3 Determining Reinvestment Year

The condition-based scores and installation dates were used to determine when assets should be replaced or rehabilitated, which is referred to as the reinvestment year. To calculate this, the estimated useful life (EUL), RUL, condition-based scores, and installation dates were needed.

The EUL is a set number of years associated with a specific asset that indicates the typical lifetime of the asset. For example, a pump has an EUL of 20 years while a grinder has an EUL of 15 years. The RUL is a calculated time period, also in years, which uses the condition-based scores. To compute the RUL, the upper limit of the percent life consumed column in Table 1 was multiplied by the asset's EUL then subtracted from the EUL.

The reinvestment year was then calculated using one of two ways: using the condition-based score from the field inspection or using the installation date of the asset. These methods are described further below:

Method 1- Field Inspection: The condition-based scores were used to calculate the estimated RUL as described above. The RUL was then added to 2023 – the year the condition assessment was performed – to determine the reinvestment year.

Method 2 - Installation Date: This method does not rely on inspecting the assets in the field and instead only uses the installation date and EUL. The reinvestment year is obtained by adding the EUL to the installation year.

Each asset's reinvestment year was calculated both ways, and the project team determined which reinvestment year to use based on the asset's criticality. For example, if the asset was a redundant pump to a critical process, then the minimum reinvestment year was used. For structures, the maximum reinvestment year was used. This is because the EUL is 50 years, but most of the structures at the WRF are in good to acceptable condition even though they exceed the 50-year lifespan for some structures. It is not recommended to tear down the structures that surpass the EUL and rebuild them though. Instead, another structural inspection should be performed in 10 years.

Asset reinvestment years and scores can be seen in Appendix A.

2.3 Preliminary Treatment

Several processes are included in preliminary treatment. The project team assessed the headworks, grit removal, biofilter, and septage receiving station areas. As mentioned previously, field inspections resulted in scoring related to mechanical, structural, and electrical components in areas as appropriate.

2.3.1 Condition and Performance Assessment

2.3.1.1 South Diversion Structure

Structural: Based on feedback from the City, this structure is in failed condition. The City indicated that exposed rock was present in the wall when they cored it for a new drain line. Improvements to this structure are needed.

2.3.1.2 Headworks

Mechanical: Overall, the mechanical equipment is in acceptable or good condition with the exception of the influent gates and washer compactor. City staff indicated that the influent gates do not seal, and the hydraulic system has leaks, which will need to be repaired. Corrosion could be seen on both the influent gates and washer compactor as well.

Structural: Overall, the headworks building is in acceptable condition. No structural movement or any major deterioration is observed.

Electrical: Electrical equipment is in good and acceptable condition. Two of the six raw sewage pump VFD cabinets have been recently replaced while the other four are original. City staff has indicated that they have not had any issues with the equipment. There was some corrosion on the instruments and components of the raceway system, in the room with the bar screens.

2.3.1.3 Grit Removal

Mechanical: The grit removal equipment is generally in acceptable condition; however, corrosion was observed in the field, as seen on the hand cranks and gearboxes of the gates in Figure 1. The grit drive and the motors and piping of the grit pumps and classifiers need to be recoated to provide better protection of the equipment.



Figure 1 Gates in Grit Basins – Corroded Hand Crank

Structural: Overall, the grit basins are in acceptable condition. Minor cracks on the floor are present, but these are mostly hairline cracks with no impact to the structure.

Electrical: There are some scratches and rust forming on the local control panels and their mounting brackets. The overall condition of the electrical equipment is good, with no reported issues from staff.

2.3.1.4 Biofilter

Mechanical: Both fans and the biofilter media are in good condition. However, the typical useful life of biofilter media is 10 years, which was last replaced in 2017. Replacing the media should be considered in the near future.

Structural: Overall structural condition is in good condition. Minor stains are at the anchor location. No major issues found.

Electrical: There was visible rust at the top of the bucket door in the second section of the MCC. No issues reported from city staff. The electrical equipment is in good condition.

2.3.1.5 Septage Receiving Station

Structural: The wall at the septage receiving station has damage to it seen in Figure 2. This may be due to a truck hitting the structure while backing up. The rest of the structure appeared to be in good condition, but overall, the structure is only in acceptable condition. Repair is recommended.



Figure 2 Septage Receiving Station – Cracked Concrete

2.3.2 Conclusions and Recommendations

2.3.2.1 Mechanical

Generally, the mechanical equipment is in acceptable condition. However, some improvements are needed. The influent gates need to be sealed better since the hydraulic system has leaks. The biofilter's media is approaching its 10-year lifespan and should be replaced soon. Additionally, a majority of the equipment has corrosion, which should be addressed with a coating and painting job.

2.3.2.2 Structural

The structures in this area are in good to acceptable condition with exception of the South Diversion Structure, which was scored as failed condition based on feedback from City staff. Improvements to the South Diversion structure are needed. Additionally, the septage receiving station was observed to have cracking, which could have been caused by a truck. As mentioned above, it is recommended to repair the structure where the crack is. No other structures need to be repaired.

2.3.2.3 Electrical

City staff have not indicated any issues with finding replacement parts for MCC H. Obtaining replacement parts will be a future issue and consideration should be made in replacing the MCC to avoid possible lengthy downtime in the future due to difficulty in finding replacement parts. The same considerations should be made for the VFD cabinets that have not been replaced. Arc flash stickers indicate that the previous study was done about 5 years ago, so an arc flash study is due.

2.4 Primary Treatment

This section includes the assessments performed for the Flow Split Structure, Primary Distribution Box A And B, the Primary Sedimentation Basins and Associated Equipment, and Scum Box No. 1 and No. 2. Like the previous section, assessments for the mechanical, structural, and electrical components are included as needed.

2.4.1 Condition and Performance Assessment

2.4.1.1 Flow Split Structure

Mechanical: The piping at this structure are generally in acceptable condition. Corrosion was observed on some of the piping by the structure, which can be seen in Figure 3. This piping should be recoated.



Figure 3 [Piping by the Flow Split Structure](#)

Structural: Overall, the structure is in good condition. Minor cracks are present, but these are mostly hairline cracks with no impact to the structure.

2.4.1.2 Primary Distribution Box A and B

Structural: Overall, the structure is in acceptable condition. Primary Distribution Box B can be seen below in Figure 4.



Figure 4 Primary Distribution Box B

2.4.1.3 Primary Sedimentation Basins (1, 2, 3, 4, and 5)

Mechanical: The basins along with the associated equipment are in good to fair condition. The effluent troughs for all the primary sedimentation basins, except Primary Sedimentation Basin 5, are in fair condition, meaning significant defects were observed in the fields. The scum skimmers for Primary Sedimentation Basin 4 are also in fair condition. Corrosion was seen on all the sludge collectors, scum skimmers, and effluent troughs of the primary sedimentation basins.

Structural: Minor cracks and spalls are on the rebate at gratings, but the overall condition is acceptable.

Electrical: The electrical equipment is in good condition. There were no visible defects on the local control stations enclosures, conduits, and the mounting hardware. City staff indicated they have not had any issues with the electrical equipment.

2.4.1.4 Scum Box No. 1 and No. 2

Mechanical: Both scum boxes are in fair condition with corrosion seen on the piping, grinders, and pumps. Scum Box No. 1's piping is in poor condition, however. It is recommended to replace the piping in Scum Box No. 1.



Figure 5 Scum Box No. 1 – Corrosion on Piping

Structural: Condition of the structure is good. Minor stains on the wall will not impact the adequacy of the structure.

Electrical: The electrical equipment is in good and acceptable condition. There were no defects visible on the primary sludge pump local control stations, conduits, and mounting hardware. There is some visible rust on the ferrous chloride pump enclosure, conduits, and mounting equipment. City staff have indicated that they have not experienced issues with the electrical equipment.

2.4.2 Conclusions and Recommendations

2.4.2.1 Mechanical

Similar to the preliminary treatment section, most of the equipment is in acceptable or fair condition with exception of Scum Box No. 1's piping, which was in poor condition. It is recommended to replace this piping soon. Additionally, most equipment was noted to have corrosion; a coating and painting project is recommended.

2.4.2.2 Structural

All structures are in good and acceptable condition. There are no reports of movement or settlement. Minor cracks are present, but these are mostly hairline cracks with no impact to the structure.

2.4.2.3 Electrical

Electrical equipment is in good and acceptable condition. City staff did not report experiencing any issues with the electrical equipment. Arc flash stickers indicate that the previous study was done about 5 years ago, so an arc flash study is due.

2.5 Secondary Treatment

This section includes assessments for junction boxes, the inter-stage pump station, fine screen channels, flow distribution boxes, aeration basins and blowers, membrane bioreactor (MBR) system, MBR blower building, chemical area, and the recycled activated sludge (RAS) pump station.

2.5.1 Condition and Performance Assessment

2.5.1.1 Junction Box A

Mechanical: Mechanical equipment at Junction Box A included gates. The gates are in acceptable condition. As seen in Figure 6, the hand cranks on the effluent gates are corroded and need to be coated.

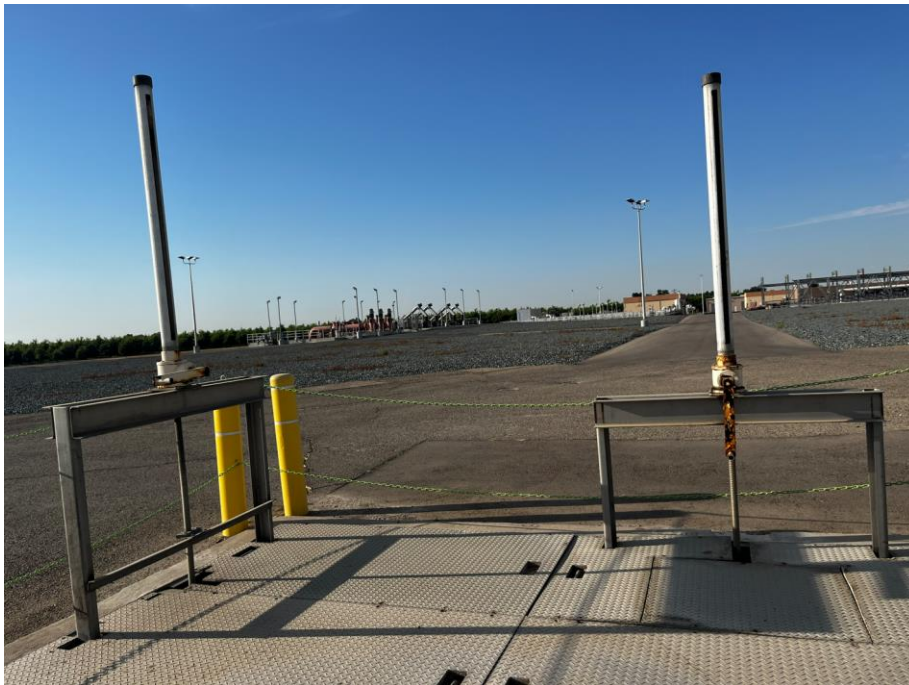


Figure 6 Effluent Gates – Corrosion on Hand Cranks

Structural: The structure is in acceptable condition.

2.5.1.2 Inter-Stage Pump Station

Mechanical: The pumps at the Inter-Stage Pump Station are generally in good condition. Some corrosion was observed on the pumps though. Coating and re-painting the pumps is recommended.

Structural: Overall, structural is in good condition. Minor cracks are present, but these are mostly hairline cracks with no impact to the structure.

Electrical: The overall condition of the electrical equipment is good. Some of the equipment is dirty but there are no visible defects on the enclosures, conduits, and the mounting hardware. City staff have indicated that they have not had any issue with the electrical equipment.

2.5.1.3 Fine Screen Channels

Mechanical: The washer-dewatering-compacting units and booster pumps are in good condition and function well.

Structural: Similar to the Inter-Stage Pump Station, the structural elements are in good condition. Minor cracks are present, but these are mostly hairline cracks with no impact to the structure.

Electrical: The overall condition of the electrical equipment is good. Some of the equipment is dirty but there are no visible defects on the enclosures, conduits, and the mounting hardware. City staff have indicated that they have not had issues with the electrical equipment.

2.5.1.4 Junction Box C

Structural: This structure is in acceptable condition.

2.5.1.5 Flow Distribution Box A

Mechanical: The gates at Flow Distribution Box A are in acceptable condition. The hand cranks have corrosion on them, which should be recoated.

Structural: The structure is in acceptable condition.



Figure 7 Junction Box A

2.5.1.6 Aeration Basins

Mechanical: The submersible mixers in the aeration basins are in good condition. The fine diffusers are generally in acceptable condition, but corrosion was not an issue nor was the piping. Staff indicated that some diffusers had burst though and needed to be replaced. Small diameter piping in the basins is in acceptable condition.

Structural: Aeration Basins Nos. 1-4 are in acceptable condition. Minor cracks and spalls on the rebate at gratings were observed in the field.

Electrical: The overall condition of the electrical equipment is good and acceptable. There is rust on the conduits and mounting hardware for the lighting and receptacles. There are no visible defects on the electrical enclosures, conduits, and mounting hardware. City staff have indicated that they have not had any issues with the electrical equipment.

2.5.1.7 Aeration Blowers

Mechanical: Aeration Blowers No. 1 – 5 were recently replaced in 2017 and are in good condition. No defects were observed.

Electrical: The electrical equipment is in good and acceptable condition. MCC D has some wear but is in acceptable condition. MCC NS and MCC SB have some buckets that are still being used but are mostly decommissioned. Staff have indicated that they do not have current issues with either the mostly decommissioned MCCs or the equipment still in use, considerations should be made in relocating the equipment that is still being used and fully decommissioning the MCCs. Consider including this effort of

relocating the is use equipment buckets with future upgrades. MCC MD has some wear but is in acceptable condition. MCC GB is dirty but does not have observable defects. It is recommended that MCC GB be cleaned and inspected for any defects. City staff have indicated that they have not had issues with the electrical equipment and with obtaining replacement parts.

2.5.1.8 Aeration Effluent Junction Box D-1 and D-2

Mechanical: The gates in the effluent junction box are in acceptable condition. Some corrosion was observed. It is recommended to coat the hand cranks and gearboxes to protect the equipment.

Structural: Minor corrosion on the gates and hair line cracks on concrete are observed. Overall, the condition of the structure is acceptable.

2.5.1.9 Junction Box D-3 and D-4

Mechanical: Both Junction Box D-3 and D-4 had gates that are in acceptable condition. Some corrosion could be seen as shown in Figure 8. It is recommended that the gearboxes be coated to protect the equipment.



Figure 8 Corrosion on Gearbox

Structural: The junction boxes are in acceptable condition.

2.5.1.10 MBR System

Mechanical: The MBR system, membrane equipment, permeate pumps, and backpulse pumps were installed in 2017 and are in good condition. No defects were observed, and City staff did not note any issues with this equipment.

Structural: Corrosion is observed at the brace and gusset connection, and this connection has corroded welds as seen in Figure 9. Periodic inspection is recommended.



Figure 9 Braced Frame near MBR -Corrosion at Brace and Gusset Connection

Electrical: The overall condition of the electrical equipment is good. There are no visible defects on the electrical enclosures, conduits, and mounting hardware. City staff have indicated that they have not had issues with the electrical equipment.

2.5.1.11 MBR Blower Building

Mechanical: Along with the MBR system, the equipment in the MBR building was installed in 2017. The scouring and agitation air blowers, air compressors, and air dryers all are in good condition. No defects were observed at the equipment in this building.



Figure 10 Air Scour Blower No. 1

Structural: The existing MBR building is a masonry building built in 2015, which is in good condition. No major cracks or settlement of the structure were observed.

Electrical: The overall condition of the electrical equipment is good. There were no visible defects on the electrical enclosures, conduits, and mounting software. City staff have indicated that they have not had issues with the electrical equipment.

2.5.1.12 Chemical Area

Mechanical: The chemical area contains the sodium hypochlorite and citric acid metering pumps. The pumps worked well and appeared to be in good condition. No defects were observed here.

Structural: The overall structural condition is good. The area was clean with no defects observed in the concrete.



Figure 11 Chemical Area

Electrical: The overall condition of the electrical equipment is in good condition. There were no visible defects on the conduits and mounting hardware. City staff have indicated that they have not had issues with the electrical equipment.

2.5.1.13 RAS Pump Station

Mechanical: The RAS pumps and waste activated sludge (WAS) pumps are in good condition. However, the RAS pumps could be recoated/repainted since sludge is coming out of the air release valve and spilling onto the equipment and surrounding area as seen in Figure 12. It is recommended to install piping from the air release valves to drains instead of having them spill onto the equipment and piping.



Figure 12 RAS Pump – Sludge Spillage

Structural: Overall, structural is in good condition. No major cracks or settlement of the structure were observed.

Electrical: The overall condition of the electrical system is in good condition. There were no visible defects on the electrical enclosures, conduits, and mounting hardware. City staff have indicated they have not had issues with the electrical equipment.

2.5.2 Conclusions and Recommendations

2.5.2.1 Mechanical

Most of the equipment was installed in 2017 and is in good condition. City staff did not mention any issues with the equipment either. The RAS pumps had some sludge spillage coming out from the valve. It is recommended to install piping from the air release valves to drains instead of having them spill onto the equipment and piping. Also, a coating and painting project is recommended for those pumps and the hand cranks on the gates in the junction and flow distribution boxes.

2.5.2.2 Structural

Structures in the secondary treatment area are in good to acceptable condition with little to no defects observed in the field. Multiple structures had minor cracks, which were mostly hairline cracks that had no impact on the structure. The aeration basins also had some minor cracks and spalls on the rebate at

gratings. In addition, corrosion was observed at the brace and gusset connection near the MBR system. Periodic inspections are recommended to monitor this development.

2.5.2.3 Electrical

This area is in good condition. Only minor defects, such as rust on some conduits and dirty equipment, were observed in a couple areas, but otherwise, no visible defects were observed. The MCCs in the aeration basin area are in acceptable condition; a few of them, however, are mostly decommissioned. It is recommended to consider relocating the MCCs that are still in use and fully decommissioning those that are mostly decommissioned. This effort should be considered with future upgrades.

2.6 Tertiary Treatment

Tertiary Treatment includes the ultraviolet (UV) equipment and structure, the recycled water distribution box, recycled water equipment, ponds, and the Irrigation Pump Station.

2.6.1 Condition and Performance Assessment

2.6.1.1 UV Area

Mechanical: The channel gates and modules were installed in 2017 and are in good condition. No defects were observed here.

Structural: Overall, the UV effluent box and structure are in good condition. Minor cracks are present and are acceptable as they are hairline/shrinkage cracks. Settlement and movement of structure is not observed.



Figure 13 UV Channels

Electrical: The overall condition of the electrical equipment is good. There were no visible defects on the electrical enclosures, conduits, and mounting hardware. City staff have indicated that they have not had issues with the electrical equipment.

2.6.1.2 Recycled Water Distribution Box

Structural: The Recycled Water Distribution Box is a concrete structure. No major defects are observed. Minor cracks are present but are acceptable as they are hairline/shrinkage cracks. Settlement and movement of structure is not observed. Overall, the structure is in good condition.

Electrical: The condition of the electrical equipment was good. There were no visible defects on the electrical enclosures, conduits, and mounting hardware. City staff have indicated that they have not had issues with the electrical equipment.

2.6.1.3 Recycled Water Equipment

Mechanical: Equipment included in this area is the hydropneumatics recycled water tank, plant water pumps, and an air compressor. All of these were installed in 2017 and are in good condition. The plant water pumps could use a touch up paint job though.



Figure 14 Plant Water Pumps

Electrical: The condition of the electrical equipment is good. There were no visible defects on the electrical enclosures, conduits, and mounting hardware. City staff have indicated that they have not had issues with the electrical equipment.

2.6.1.4 Regulating Ponds A and B

Mechanical: The regulating ponds are in good condition. No defects were observed during the site visit.

2.6.1.5 Ponds 2 and 3

Mechanical: City staff indicated that these ponds are in good condition, and they do not have any issues with them.

2.6.1.6 Irrigation Pump Station

Mechanical: Based on City feedback, the pumps at the Irrigation Pump Station are in good condition. These pumps were installed in 2017, and City staff indicated that they run properly and do not have issues.

Structural: According to City staff, the Irrigation Pump Station wet well, which was constructed in 2017, is in good condition.

2.6.2 Conclusions and Recommendations

2.6.2.1 Mechanical

The majority of this area was installed in 2017. All the equipment is in good condition, and no defects were observed. No action is required for the mechanical equipment here.

2.6.2.2 Structural

The structures in this area are in good condition with little to no defects found in the structures. No action is required for the structures here.

2.6.2.3 Electrical

Electrical equipment in this area is in good condition with no visible defects on the enclosures, conduits, and mounting hardware. No action is required for the electrical equipment.

2.7 Solids Handling

This section includes the thickening system (gravity belt thickeners [GBTs] and associated equipment and thickened WAS [TWAS]), sludge disintegration system, digesters and associated equipment, digester gas treatment system, and sludge dewatering equipment.

2.7.1 Condition and Performance Assessment

2.7.1.1 Thickening System

Mechanical: The GBTs and TWAS pumps are in acceptable condition with minor defects. The TWAS pump piping could be coated. The wash water booster pumps and polymer system are in fair condition. Corrosion was noted on the booster pump, which would benefit from a coating job.

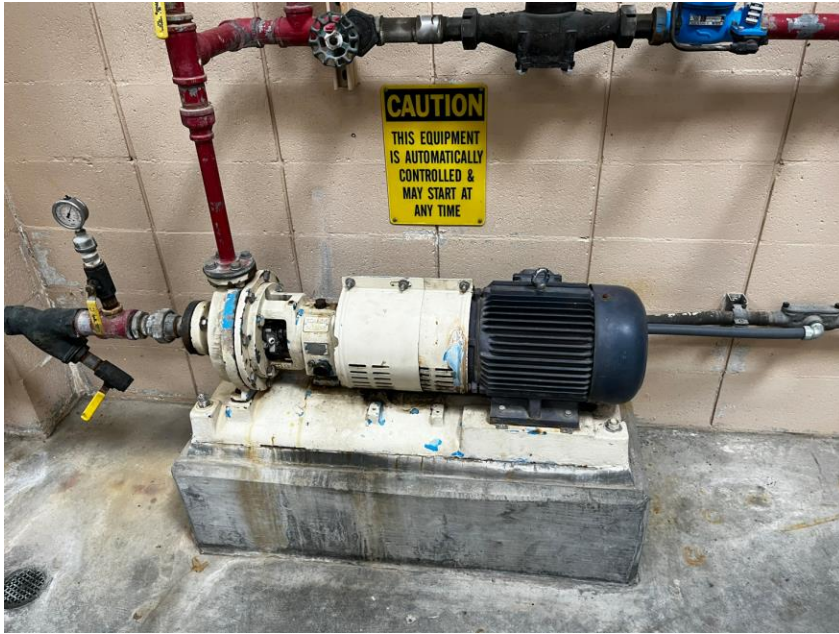


Figure 15 Wash Water Booster Pump

Structural: Overall, the structure is in good condition. Hairline cracks observed are not detrimental to the adequacy of the pad.

Electrical: The overall condition of the electrical equipment is in good and acceptable condition. There were no visible defects on the electrical enclosures, conduits, and mounting hardware. City staff have not indicated any issues with the equipment.

2.7.1.2 Digester Area

Mechanical: Generally, the digester equipment is in acceptable condition except for Boiler No. 3 being in fair condition. Boiler No. 3 had significant corrosion and defects on the piping. Also, the valves on Digester No. 7 need to be painted. Sludge Transfer Pump Station No. 1 and the Digester No. 8 equipment, installed in 2017, are in good condition. Digester No. 4 was out of service when the condition assessment was conducted.

Structural: Overall, Digesters No. 1 – 7 are in acceptable condition. Minor cracks are present but are acceptable as they are hairline/shrinkage cracks. Settlement and movement of the structures is not observed.

Electrical: The overall condition of the electrical equipment is in good and acceptable condition. Even though city staff have not had issues with MCC BC, consideration should be taken into replacing the MCC as it will become harder to find replacement parts. There are no visible defects on the other electrical enclosures, conduits, and mounting hardware.

2.7.1.3 Gas Treatment System

Mechanical: The gas treatment system was installed in 2017 and is in good condition. No defects were observed.

Structural: Overall, structural is in good condition.

Electrical: The overall condition of the electrical system is in good condition. There are no visible defects on the electrical enclosures, conduits, and mounting hardware. City staff have indicated that they have not had issues with the electrical equipment.

2.7.1.4 Sludge Dewatering

Mechanical: The dewatering equipment, installed in 2017, is in good to acceptable condition. Struvite buildup was present on one of the screw presses, so it was taken offline for maintenance, leaving only one screw press running. Both screw presses also had bulging at the panels. Additionally, staff noted that when high loads come into the plant, both screw presses need to run at full capacity to handle the influent. A third screw press should be considered to provide redundancy in the system. Coating the motors and gearboxes of the screw presses should be considered as well.



Figure 16 Struvite Formation on the Screw Press

Structural: Overall, the structure supporting the screw presses is in acceptable condition. There appears to be no significant settlement of columns/foundations. The sludge drying beds also are in good condition.

Electrical: The overall condition of the electrical equipment is in good condition. There are no visible defects on the electrical enclosures, conduits, and mounting hardware. City staff have indicated that they have not had issues with the electrical equipment.

Site/Civil: The drainage in this area is in poor condition. City staff noted that the permeate piping periodically overflows from the screen manhole under the screw presses, which should be addressed. See Figure 17 for location of occasional overflow.



Figure 17 Screen Manhole Under Screw Presses – Location of Overflows

2.7.2 Conclusions and Recommendations

2.7.2.1 Mechanical

Overall, this area is in acceptable condition. In several areas, corrosion was observed as well as equipment needing touch-up paint. It is recommended to have a coating and painting project to address these defects. For the screw presses, City staff noted that both screw presses at full capacity when loading is high to the plant, which means a redundant screw press is not available. It is recommended to add a third screw press in the near future.

2.7.2.2 Structural

There are no major issues, and overall conditions of the structures are in good condition. Minor defects or places of repair have been identified in this report and are documented in the above sections.

2.7.2.3 Electrical

This area is in good condition and no action is required for the equipment here.

APPENDIX A **CONDITION ASSESSMENT SUMMARY TABLE**

Asset	Process	Sub-Process	Discipline	Asset Class	Approximate Year Built	Approximate Structure Age	Estimated Useful Life	POF/ Condition	Reinvestment Year
South Diversion Structure	Preliminary Treatment	Headworks	Structural	Structure	2002	21	50	5	2023
Influent Gates	Preliminary Treatment	Headworks	Mechanical	Slide Gate	2002	21	20	3	2023
Headworks No. 1	Preliminary Treatment	Headworks	Structural	Building	2002	21	50	2	2053
Bar Screens No. 1 and 2	Preliminary Treatment	Headworks	Mechanical	Screen	2002	21	15	3	2023
Washer Compactor	Preliminary Treatment	Headworks	Mechanical	Compactor	2002	21	15	3	2023
Influent Pumps No. 1-5	Preliminary Treatment	Headworks	Mechanical	Pump	2002	21	20	2	2023
Influent Pump No. 6	Preliminary Treatment	Headworks	Mechanical	Pump	2017	6	20	1	2037
Grit Basins	Preliminary Treatment	Grit Removal	Structural	Structure	2002	21	50	2	2053
Grit Basins	Preliminary Treatment	Grit Removal	Mechanical	Basin	2002	21	50	3	2040
Gates	Preliminary Treatment	Grit Removal	Mechanical	Slide Gate	2002	21	20	3	2030
Grit Pumps	Preliminary Treatment	Grit Removal	Mechanical	Pump	2002	21	20	3	2023
Grit Classifiers	Preliminary Treatment	Grit Removal	Mechanical	Classifier	2002	21	20	3	2023
Biofilter Fan No. 1 and 2	Preliminary Treatment	Biofilter	Mechanical	Fan	2017	6	15	1	2032
Biofilter Cells	Preliminary Treatment	Biofilter	Mechanical	Media	2017	6	10	1	2027
Septage Receiving Station	Preliminary Treatment	Septage Receiving Station	Structural	Structure	2017	6	50	2	2067
Motor Control Center (2 12KV Switch Gears)	Preliminary Treatment	N/A	Electrical	MCC	2017	6	30	1	2047
Motor Control Center "H"	Preliminary Treatment	Headworks	Electrical	MCC	1966	57	30	2	2023
Motor Control Center "BIO"	Preliminary Treatment	Biofilter	Electrical	MCC	2017	6	30	2	2041
Bar Screens 1 & 2 Local Control Station	Preliminary Treatment	Headworks	Electrical	Panel	2002	21	20	1	2023
Grit Pumps (4) Local Control Stations	Preliminary Treatment	Grit Removal	Electrical	Panel	2002	21	20	2	2023
12 kVA Switch Gear	Preliminary Treatment	N/A	Electrical	Switchgear	2017	6	30	1	2047
Lighting Panel H	Preliminary Treatment	Headworks	Electrical	Panel	2002	21	20	2	2023
Lighting Transformer "H"	Preliminary Treatment	Headworks	Electrical	Transformer/Lighting	2002	21	20	2	2023
Raw Sewage Pump VFD Cabinets	Preliminary Treatment	Headworks	Electrical	VFD	2002	21	15	1	2023
Flow Split Structure	Primary Treatment	Headworks	Structural	Structure	1966	57	50	1	2073
Primary Distribution Box A	Primary Treatment	Primary Sedimentation Basin 1, 2, and 3	Structural	Structure	1966	57	50	2	2053
Primary Distribution Box B	Primary Treatment	Primary Sedimentation Basin 1, 2, and 3	Structural	Structure	1992	31	50	2	2053

Asset	Process	Sub-Process	Discipline	Asset Class	Approximate Year Built	Approximate Structure Age	Estimated Useful Life	POF/ Condition	Reinvestment Year
Primary Sedimentation Basin 1, 2, 3	Primary Treatment	Primary Sedimentation Basin 1, 2, and 3	Structural	Structure	1966	57	50	2	2053
Sludge Collectors	Primary Treatment	Primary Sedimentation Basin 1	Mechanical	Chain and Flight	2023	0	30	0	2053
Scum Skimmers	Primary Treatment	Primary Sedimentation Basin 1	Mechanical	Skimmer	2023	0	20	0	2043
Sludge Collectors	Primary Treatment	Primary Sedimentation Basin 2	Mechanical	Chain and Flight	2004	19	30	2	2034
Scum Skimmers	Primary Treatment	Primary Sedimentation Basin 2	Mechanical	Skimmer	2004	19	20	2	2024
Sludge Collectors	Primary Treatment	Primary Sedimentation Basin 3	Mechanical	Chain and Flight	2007	16	30	2	2037
Scum Skimmers	Primary Treatment	Primary Sedimentation Basin 3	Mechanical	Skimmer	2007	16	20	2	2027
Effluent Troughs	Primary Treatment	Primary Sedimentation Basin 1, 2, and 3	Mechanical	Trough	1966	57	20	3	2023
Primary Sedimentation Basin 4	Primary Treatment	Primary Sedimentation Basin 4	Structural	Structure	1992	31	50	2	2053
Sludge Collectors	Primary Treatment	Primary Sedimentation Basin 4	Mechanical	Chain and Flight	2014	9	30	2	2041
Scum Skimmers	Primary Treatment	Primary Sedimentation Basin 4	Mechanical	Skimmer	1992	31	20	3	2023
Effluent Troughs	Primary Treatment	Primary Sedimentation Basin 4	Mechanical	Trough	1992	31	20	3	2023
Primary Sedimentation Basin 5	Primary Treatment	Primary Sedimentation Basin 5	Structural	Structure	2001	22	50	2	2053
Sludge Collectors	Primary Treatment	Primary Sedimentation Basin 5	Mechanical	Chain and Flight	2001	22	30	2	2031
Scum Skimmers	Primary Treatment	Primary Sedimentation Basin 5	Mechanical	Skimmer	2001	22	20	3	2023
Effluent Troughs	Primary Treatment	Primary Sedimentation Basin 5	Mechanical	Trough	2001	22	20	2	2023
Primary Sludge Grinders (2)	Primary Treatment	Primary Sedimentation	Mechanical	Grinder	2017	6	15	3	2028
Primary Sludge Pumps (4)	Primary Treatment	Primary Sedimentation	Mechanical	Pump	2017	6	20	2	2035
Scum Grinder	Primary Treatment	Scum Box No. 1	Mechanical	Grinder	1966	57	15	4	2023
Scum Pump	Primary Treatment	Scum Box No. 1	Mechanical	Pump	1966	57	20	4	2023
Scum Grinder	Primary Treatment	Scum Box No. 2	Mechanical	Grinder	1992	31	15	3	2023
Scum Pump	Primary Treatment	Scum Box No. 2	Mechanical	Pump	1992	31	20	3	2023
Effluent Gates	Primary Treatment	Junction box	Mechanical	Slide Gate	1966	57	20	3	2023

Asset	Process	Sub-Process	Discipline	Asset Class	Approximate Year Built	Approximate Structure Age	Estimated Useful Life	POF/ Condition	Reinvestment Year
Motor Control Center "6000"	Primary Treatment	Primary Sedimentation	Electrical	MCC	2017	6	30	1	2047
Primary Sludge Pump Local Control Stations (4)	Primary Treatment	Primary Sedimentation	Electrical	Panel	2017	6	20	1	2037
Primary Sludge Grinders Control Panels	Primary Treatment	Primary Sedimentation	Electrical	Panel	2017	6	20	1	2037
Junction Box A	Secondary Treatment	Junction box	Structural	Structure	1966	57	50	2	2053
Vertical Axial Flow Propeller Pumps (3)	Secondary Treatment	Inter-Stage Pump Station	Mechanical	Pump	2017	6	20	2	2035
Washing-Dewatering-Compacting Unit	Secondary Treatment	Fine Screen Channels	Mechanical	Compactor	2017	6	15	1	2032
Booster Pump	Secondary Treatment	Fine Screen Channels	Mechanical	Pump	2017	6	20	1	2037
Junction Box C	Secondary Treatment	Fine Screen Channels	Structural	Structure	1975	48	50	2	2053
Flow Distribution Box A	Secondary Treatment	Aeration Basins	Structural	Structure	1975	48	50	2	2053
Aeration Basin 1, 2, 3, and 4	Secondary Treatment	Aeration Basin 1, 2, 3, and 4	Structural	Basin	1966	57	50	2	2053
Submersible Mixers	Secondary Treatment	Aeration Basin 1, 2, 3, and 4	Mechanical	Mixer	2017	6	20	1	2037
Fine Bubble Diffusers	Secondary Treatment	Aeration Basin 1, 2, 3, and 4	Mechanical	Diffuser	2017	6	15	2	2032
Small Diameter Piping	Secondary Treatment	Aeration Basin 1, 2, 3, and 4	Mechanical	Pipe	2017	6	40	2	2047
Aeration Blower No. 1-5	Secondary Treatment	Blower Building No. 1	Mechanical	Blower	2017	6	30	1	2047
Aeration Effluent Junction Box D-1	Secondary Treatment	Aeration Basin 1, 2, 3, and 4	Structural	Structure	1975	48	50	2	2053
Junction Box D-3	Secondary Treatment	Aeration Basin 1, 2, 3, and 4	Structural	Structure	2015	8	50	2	2065
Aeration Effluent Junction Box D-2	Secondary Treatment	Aeration Basin 1, 2, 3, and 4	Structural	Structure	2015	8	50	2	2065
Junction Box D-4	Secondary Treatment	Aeration Basin 1, 2, 3, and 4	Structural	Structure	2015	8	50	2	2065
Membrane Equipment	Secondary Treatment	Membrane Bioreactor System	Mechanical	Equipment	2017	6	20	1	2037
Permeate Pumps	Secondary Treatment	Membrane Bioreactor System	Mechanical	Pump	2017	6	20	1	2037
Backpulse Pumps	Secondary Treatment	Membrane Bioreactor System	Mechanical	Pump	2017	6	20	1	2037
MBR Blower Building	Secondary Treatment	MBR Blower Building	Structural	Building	2015	8	50	1	2073
Scouring Blowers (4)	Secondary Treatment	MBR Blower Building	Mechanical	Blower	2017	6	30	1	2047
Agitation Air Blowers (2)	Secondary Treatment	MBR Blower Building	Mechanical	Blower	2017	6	30	1	2047
Air Compressors (2)	Secondary Treatment	MBR Blower Building	Mechanical	Compressor	2017	6	15	1	2032
Air Dryer (2)	Secondary Treatment	MBR Blower Building	Mechanical	Air Dryer	2017	6	20	1	2037
Sodium Hypochlorite Metering Pump	Secondary Treatment	Chemical Area	Mechanical	Pump	2017	6	20	1	2037
Citric Acid Metering Pump	Secondary Treatment	Chemical Area	Mechanical	Chemical Pump	2017	6	10	1	2027

Asset	Process	Sub-Process	Discipline	Asset Class	Approximate Year Built	Approximate Structure Age	Estimated Useful Life	POF/ Condition	Reinvestment Year
Sodium Hypochlorite Spray Nozzles	Secondary Treatment	Chemical Area	Mechanical	Nozzle	2017	6	15	2	2032
RAS Pumps (4)	Secondary Treatment	RAS Pump Station	Mechanical	Pump	2017	6	20	1	2037
WAS Pumps (2)	Secondary Treatment	RAS Pump Station	Mechanical	Pump	2017	6	20	1	2037
Standby Generators 1	Secondary Treatment	N/A	Electrical	Generator	2017	6	30	1	2047
Standby Generators 2	Secondary Treatment	N/A	Electrical	Generator	2017	6	30	1	2047
Blower Bldg 1 XFMR	Secondary Treatment	MBR Blower Building	Electrical	Transformer/Lighting	2017	6	20	1	2037
Blower Bldg 2 XFMR	Secondary Treatment	MBR Blower Building	Electrical	Transformer/Lighting	2017	6	20	1	2037
MCC-SB	Secondary Treatment	Blower Building No. 1	Electrical	MCC	1970	53	30	4	2023
MCC-NS	Secondary Treatment	Blower Building No. 1	Electrical	MCC	1970	53	30	4	2023
Inter-Stage Pump VFD Panels	Secondary Treatment	Inter-Stage Pump Station	Electrical	VFD	2017	6	15	1	2032
Power Panel "5PP-01"	Secondary Treatment	MBR Blower Building	Electrical	Panel	2017	6	20	1	2037
Switchboard 5000	Secondary Treatment	MBR Blower Building	Electrical	Switchgear	2017	6	30	1	2047
MBR Control Panels	Secondary Treatment	Membrane Bioreactor System	Electrical	Panel	2017	6	20	1	2037
Motor Control Center "Recycle"	Secondary Treatment	Recycled water	Electrical	MCC	2017	6	30	3	2033
Switchboard 4000	Secondary Treatment	Blower Building No. 1	Electrical	Switchgear	2017	6	30	1	2047
Motor Control Center "3000"	Secondary Treatment	Blower Building No. 1	Electrical	MCC	2017	6	30	1	2047
Lighting Panel 4LP-1	Secondary Treatment	Blower Building No. 1	Electrical	Transformer/Lighting	2017	6	20	1	2037
Motor Control Center "MBR"	Secondary Treatment	Membrane Bioreactor System	Electrical	MCC	2017	6	30	1	2047
Permeate Pump VFD Panel (10)	Secondary Treatment	Membrane Bioreactor System	Electrical	VFD	2017	6	15	1	2032
Backpulse Pump VFD Cabinets 1 & 2	Secondary Treatment	Membrane Bioreactor System	Electrical	VFD	2017	6	15	1	2032
RAS Pump VFD Cabinets (1-4)	Secondary Treatment	RAS Pump Station	Electrical	VFD	2017	6	15	1	2032
Blower Building 1 Power Panels	Secondary Treatment	Blower Building No. 1	Electrical	Panel	2017	6	20	1	2037
Transformer E	Secondary Treatment	MBR Blower Building	Electrical	Transformer/Liquid Filled	2017	6	30	1	2047
Fine Screen Control Panels	Secondary Treatment	Fine Screen Channels	Electrical	Panel	2017	6	20	2	2035
Motor Control Center "MD"	Secondary Treatment	Blower Building No. 1	Electrical	MCC	1992	31	30	2	2023
Motor Control Center "D"	Secondary Treatment	Blower Building No. 1	Electrical	MCC	1995	28	30	2	2025
Gravity Belt Thickener	Solids Handling	Thickening	Mechanical	Thickener	1992	31	20	3	2023
GBT Wash Water Booster Water Pumps	Solids Handling	Thickening	Mechanical	Pump	1992	31	20	3	2023
Thickened WAS Pumps (2)	Solids Handling	Thickening	Mechanical	Pump	1992	31	20	2	2023
Polymer Injection	Solids Handling	Thickening	Mechanical	Injector	1992	31	15	3	2023

Asset	Process	Sub-Process	Discipline	Asset Class	Approximate Year Built	Approximate Structure Age	Estimated Useful Life	POF/ Condition	Reinvestment Year
Digester No. 1-4 Sludge Pumps	Solids Handling	Digestion	Mechanical	Pump	2017	6	20	2	2035
Dig 1-4 Heating Equipment	Solids Handling	Digestion	Mechanical	Heat Exchanger	Unknown	Unknown	20	2	2035
Digester 1, 2, 3, and 4 Mixing Equipment	Solids Handling	Digestion	Mechanical	Pump	2017	6	20	2	2035
Digester 5 Heating Equipment	Solids Handling	Digestion	Mechanical	Pump	Unknown	Unknown	20	2	2035
Digester 5 Mixing Equipment	Solids Handling	Digestion	Mechanical	Pump	2017	6	20	2	2035
Digester 6 Heating Equipment	Solids Handling	Digestion	Mechanical	Pump	Unknown	Unknown	20	2	2035
Digester 6 Mixing Equipment	Solids Handling	Digestion	Mechanical	Pump	2017	6	20	2	2035
Digester 7 Heating Equipment	Solids Handling	Digestion	Mechanical	Pump	Unknown	Unknown	20	2	2035
Digester 7 Mixing Equipment	Solids Handling	Digestion	Mechanical	Pump	2017	6	20	2	2035
Sludge Transfer Pump Station No.1 Pump	Solids Handling	Sludge Transfer Pump Station	Mechanical	Pump	2017	6	20	1	2037
Digester 8 Heating Equipment	Solids Handling	Digestion	Mechanical	Pump	2017	6	20	1	2037
Digester 8 Mixing Equipment	Solids Handling	Digestion	Mechanical	Pump	2017	6	20	1	2037
Boilers #1 and #2	Solids Handling	Digestion	Mechanical	Boiler	2011	12	20	2	2031
Boiler #3	Solids Handling	Digestion	Mechanical	Boiler	1998	25	20	3	2023
Digester Gas Booster Blowers	Solids Handling	Digestion	Mechanical	Blower	2017	6	30	1	2047
Digester Sludge Dewatering Feed Pumps (3)	Solids Handling	Dewatering	Mechanical	Pump	2017	6	20	1	2037
Sludge Dewatering Building	Solids Handling	Dewatering	Mechanical	Building	2017	6	50	1	2067
Screw Presses (2)	Solids Handling	Dewatering	Mechanical	Screw Press	2017	6	20	2	2035
Screw Presses	Solids Handling	Dewatering	Site/Civil	Pipe	2017	6	40	4	2031
Digester Gas Holder	Solids Handling	Gas Treatment	Mechanical	Tank	2017	6	30	1	2047
Gas Treatment System	Solids Handling	Gas Treatment	Mechanical	Gas Treatment	2017	6	20	1	2037
IC Engine	Solids Handling	Gas Treatment	Mechanical	Ice engine	2017	6	20	1	2037
Waste Gas Flare	Solids Handling	Gas Treatment	Mechanical	Flare	2017	6	15	1	2032
MCC-RPGS	Solids Handling	Gas Treatment	Electrical	MCC	2017	6	30	1	2047
Motor Control Center "BC"	Solids Handling	Digestion	Electrical	MCC	1975	48	30	2	2023
Motor Control Center "BC1"	Solids Handling	Digestion	Electrical	MCC	2017	6	30	1	2047
Motor Control Center "DW"	Solids Handling	Dewatering	Electrical	MCC	2017	6	30	1	2047
Polymer Control Panels	Solids Handling	Dewatering	Electrical	Panel	2017	6	20	1	2037
Screw Press Control Panel	Solids Handling	Dewatering	Electrical	Panel	2017	6	20	1	2037
Sludge Drying Beds	Solids Handling	Dewatering	Structural	Drying Bed	1992	31	50	1	2073
Motor Control Center "BA"	Solids Handling	Digestion	Electrical	MCC	2017	6	30	1	2047
Gravity Belt Thickener Remote Control Panels 1 & 2	Solids Handling	Thickening	Electrical	Panel	1992	31	20	1	2023
Lighting Panel LP & Transformer	Solids Handling	Thickening	Electrical	Transformer/Lighting	1992	31	20	1	2023
Dewatering Screw Press Disconnects 1 & 2	Solids Handling	Dewatering	Electrical	Disconnect	2017	6	20	1	2037
Digester Sludge Grinder Control Panels	Solids Handling	Digestion	Electrical	Panel	2017	6	20	1	2037
7LP-01 MPZ Panel	Solids Handling	Dewatering	Electrical	Transformer/Lighting	2017	6	20	2	2035
Digester Gas Holder Unit Control Panel	Solids Handling	Gas Treatment	Electrical	Panel	2017	6	20	1	2037
Motor Control Center "A"	Solids Handling	Gas Treatment	Electrical	MCC	2017	6	30	1	2047
Motor Control Center "GB"	Solids Handling	Thickening	Electrical	MCC	1992	31	30	1	2023
Power Command Transfer Switch	Solids Handling	Digestion	Electrical	Transfer Switch	1992	31	30	3	2023
Gravity Belt Thickener Local Control Panels 1 & 2	Solids Handling	Thickening	Electrical	Panel	1992	31	20	1	2023
Sludge Transfer Pump Station Electrical Equipment	Solids Handling	Sludge Transfer Pump Station	Electrical	Panel	2017	6	20	1	2037
Digester 8	Solids Handling	Digestion	Electrical	Panel	2017	6	20	1	2037
Digester 7	Solids Handling	Digestion	Structural	Structure	2001	22	50	2	2053
Digester 8	Solids Handling	Digestion	Structural	Structure	2017	6	50	2	2067
Gravity Belt Thickener	Solids Handling	Thickening	Structural	Structure	1992	31	50	1	2073
Digester 6	Solids Handling	Digestion	Structural	Structure	1998	25	50	2	2053
Digester 1, 2, 3, 4, & 5	Solids Handling	Digestion	Structural	Structure	1966	57	50	2	2053

Asset	Process	Sub-Process	Discipline	Asset Class	Approximate Year Built	Approximate Structure Age	Estimated Useful Life	POF/ Condition	Reinvestment Year
UV Channel Gates	Tertiary Treatment	UV area	Mechanical	Slide Gate	2017	6	20	1	2037
UV Modules	Tertiary Treatment	UV area	Mechanical	UV System	2017	6	20	1	2037
UV Effluent Box	Tertiary Treatment	UV area	Structural	Structure	2017	6	50	1	2073
Regulating Pond A & B	Tertiary Treatment	Regulating Reservoir	Mechanical	Pond	2017	6	50	1	2067
Pond 2 & 3	Tertiary Treatment	Pond	Mechanical	Pond	1996	27	50	1	2046
Wet well	Tertiary Treatment	Irrigation Pump Station	Structural	Structure	2017	6	50	1	2073
Pumps	Tertiary Treatment	Irrigation Pump Station	Mechanical	Pump	2017	6	20	1	2037
RW Distribution Box	Tertiary Treatment	Recycled water	Structural	Structure	2017	6	50	1	2073
Hydropneumatic RW Tank	Tertiary Treatment	Recycled water	Mechanical	Tank	2017	6	30	1	2047
Hydropneumatic RW Tank	Tertiary Treatment	Recycled water	Mechanical	Pump	2017	6	20	1	2037
Air Compressor	Tertiary Treatment	Recycled water	Mechanical	Compressor	2017	6	15	1	2032
UV Channels 1 & 2 Panels	Tertiary Treatment	UV area	Electrical	Panel	2017	6	20	1	2037
Well and Expansion Tank	Other	N/A	Mechanical	Tank	2003	20	30	2	2033



Water Reclamation Facility - Facility Plan



TECHNICAL MEMORANDUM 3

Environmental Opportunities

FINAL / February 2024





Water Reclamation Facility – Facility Plan

TECHNICAL MEMORANDUM 3

Environmental Opportunities

FINAL / February 2024

This document is released for the purpose of information exchange review and planning only under the authority of Christine Polo, February 2024, CA PE 6843.

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Abbreviations

AACE	Association for the Advancement of Cost Engineering
ACF	Advanced Clean Fleets
AWDF	average dry weather flow
BMP	biosolids master plan
C	Celsius
Carollo	Carollo Engineers
CASA	California Association of Sanitation Agencies
CHP	combined heat and power
CIP	capital improvement program
City	City of Visalia
CPUC	California Public Utilities Commission
eRIN	electric renewable identification number
F	Fahrenheit
FOG	fats, oils, and grease
HRT	hydraulic retention time
H ₂ S	hydrogen sulfide
IRA	Inflation Reduction Act
KOH	potassium hydroxide
kW	kilowatts
kWh/year	kilowatt-hours per year
LCFS	Low Carbon Fuel Standard
M	million
MG	million gallons
mgd	million gallons per day
MW	megawatts
NaOH	sodium hydroxide
O&M	operations and maintenance
PFAS	per- and polyfluoroalkyl substances
PSRP	Process to Significantly Reduce Pathogens
R-CNG	renewable compressed natural gas
RFS	Renewable Fuel Standard
RIN	renewable identification number
RNG	renewable natural gas
scfd	standard cubic feet per day
scfm	standard cubic feet per minute
SGIP	Self-Generation Incentive Program
SWRCB	California State Water Resources Control Board
TM	technical memorandum

TPAD	temperature based anaerobic digestion
USEPA	United States Environmental Protection Agency
W	watt
WT	wet US tons
WRF	Water Reclamation Facility
WWTP	wastewater treatment plant
ZEV	zero emission vehicle

TM 3 ENVIRONMENTAL OPPORTUNITIES

3.1 Introduction

This technical memorandum (TM) presents the findings of the evaluation of environmental opportunities performed for the City of Visalia's (City) Water Reclamation Facility (WRF). The evaluation includes potential environmental project options to include in the Near-Term and Long-Term capital improvement programs (CIPs), including:

- Recycled water opportunities.
- Class A biosolids opportunities.
- Energy opportunities.

3.2 Recycled Water Opportunities

Originally, recycled water opportunities were going to be investigated as part of this TM. However, after talking to City staff, these efforts were shifted to focus more on evaluating biosolids and energy opportunities.

3.3 Class A Biosolids Opportunities

3.3.1 Introduction

The City is interested in investigating Class A treatment and end-use options due to increasing costs for biosolids management and regulatory drivers.

3.3.2 Current Solids Processes and Biosolids Management Practices

The WRF processes primary solids and thickened waste activated sludge in anaerobic digesters. The digested biosolids are then dewatered in screw presses and dried in drying beds. Based on the 2020 to 2023 data, typical solids concentrations are 16 percent total solids (TS) for the dewatered biosolids and 81 to 90 percent TS for the dried biosolids. After drying, the solids are stored in a stockpile. The City either contracts with a third party, Denali, for hauling and beneficial use of the dried biosolids via bulk agricultural land application in Merced and Madera counties or uses its biosolids as landfill alternative cover.

40 CFR Part 503, the United States Environmental Protection Agency (USEPA) regulation that governs biosolids management, classifies air drying as a Process to Significantly Reduce Pathogens (PSRP), which produces Class B biosolids. To produce Class B biosolids using air drying, the following conditions must be met:

- To achieve the pathogen reduction requirement, solids must be dried for a minimum of three months with the average daily ambient temperature above 0°C (32°F) for two of the three months.
- To achieve the vector attraction reduction requirement, digested solids must be dried to at least 75 percent TS and undigested solids must be dried to at least 90 percent TS.

Some air-drying facilities in California obtain Class A designation by conducting ongoing testing of fecal pathogens. The City tested their dried biosolids stockpiles in 2021 and 2022 for pathogens and found that the pathogen concentrations met the limits required to be classified as Class A.

3.3.3 Regulatory Drivers

A detailed review of current and expected future regulations will be covered in a separate master plan. However, this section provides a high-level overview of two major regulatory drivers that could impact biosolids management and may warrant an evaluation of Class A options.

Class B land application is banned in Tulare county, where the City is located, as well as most of the surrounding counties, including Fresno, Kings, Kern, and San Luis Obispo, as shown in Figure 1. This leads to long hauling distances and correspondingly costly hauling rates since Class B biosolids need to be hauled to far-away counties for beneficial use.

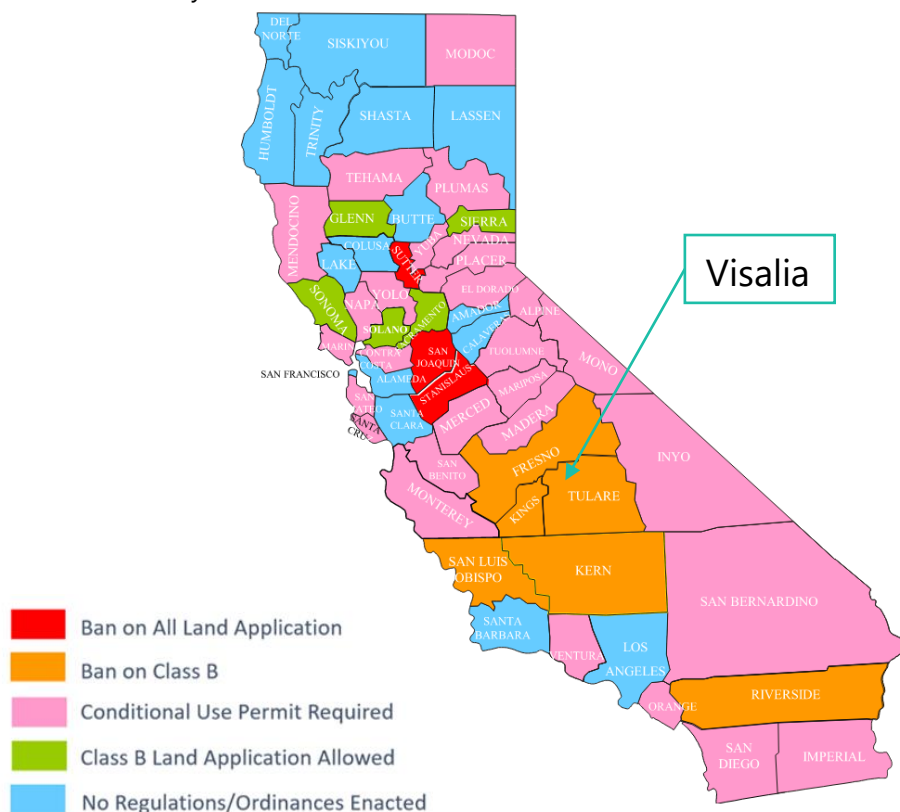


Figure 1 County Land Application Ordinances in California

Expected future federal and state-level limits on per- and polyfluoroalkyl substances (PFAS) may hinder biosolids land application:

- USEPA is conducting a risk assessment and may establish limits by 2025/2026.
- California State Water Resources Control Board (SWRCB) recently issued an order (WQ 2020-0015-DWQ) that requires wastewater treatment plants with average dry weather flow (AWDF) over 5 million

gallons per day (mgd) to sample 31 PFAS analytes in biosolids starting March 2023. Limits may be set based on findings from SWRCB sampling and analysis.

- If stringent PFAS concentration limits are established for biosolids, this could drive wastewater agencies to either landfill biosolids or implement emerging and possibly thermal technologies, such as gasification and pyrolysis (if proven to remove PFAS compounds).

3.3.4 Financial Drivers

Like many other wastewater agencies in the region, the City has experienced rapidly increasing third-party hauling and land application rates. Table 1 shows the historical rates and biosolids quantities in wet US tons (WT) from 2014 to 2022. As seen in this table, rates almost doubled in 2022.

Table 1 Biosolids Hauling and Land Application Rates and Quantities

Year	Hauling Dates	Quantity (WT)	Rate (\$/WT)	Cost (\$)
2014	9/2/2014-11/25/2014	2,668	\$28.16	\$75,136
2015	Data not available.			
2016	Data not available.			
2017	11/6/2017-11/24/2017	1,419	\$33.50	\$47,542
2018	8/27/2018-8/31/2018	1,949	\$33.50	\$65,280
2019	11/7/2019-11/13/2019	1,906	\$35.45	\$67,567
2020	8/12/2020-8/14/2020	2,313	\$36.45	\$84,314
2021	Data not available.			
2022 ⁽¹⁾	1/23/2023-1/31/2023	3,089	\$72	\$70,603 for the 20 percent TS batch. No invoice provided for the 88 percent TS batch.

Notes:

- (1) The 2022 biosolids included two batches: one consisting of 932 WT at 20 percent TS and one consisting of 3,089 WT at 88 percent TS. The wet batch was likely due to rain re-wetting a portion of the biosolids stockpile.

When evaluating solids treatment alternatives, costs for necessary expansions and upgrades for continued operations of the existing facilities need to be accounted for. A capacity analysis of existing processes described in TM 1 – Near-Term Process Performance Evaluation identified the following solids process capacity limitations.

- **Anaerobic Digestion:** An additional anaerobic digester will need to be constructed by 2027 to meet the 15-day hydraulic residence time (HRT) requirement. The capital cost of a new digester and all its required ancillary equipment is estimated at \$43 Million (M).
- **Dewatering:** A third screw press is needed to have sufficient firm capacity and redundancy for the current flows and loads. The capital cost for installing a third screw press and all its ancillary equipment is estimated at \$5M.

For more details on the anaerobic digestion and dewatering expansion projects, see TM 4 – Near-Term Project Descriptions and TM 5 – Near-Term Capital Improvement Program, which provide project descriptions and CIP cost estimates, respectively.

3.3.5 Class A Options and High-Level Cost Estimates

The most viable option for the City to produce a Class A product would be to obtain Class A designation for their air dried biosolids by conducting ongoing testing of fecal pathogens. Initial testing of pathogens indicates that this is possible.

Table 2 summarizes additional treatment technologies that the City could use to achieve Class A biosolids, as well as high-level capital cost estimates. The cost estimates were prepared in accordance with the guidelines of the Association for the Advancement of Cost Engineering (AACE) for a Class 5 estimate, with an expected accuracy range of -30 to +50 percent. These costs are provided below to give the City a rough estimate of what a new Class A solids treatment process may cost. However, it is important to note that factors such as solids quantities and characteristics, usable existing infrastructure, and design requirements and preferences vary for each specific wastewater agency and wastewater treatment plant (WWTP). Furthermore, scaling costs from one agency to another and from larger to smaller capacity, and projecting costs over four years is expected to further widen the accuracy range.

Table 2 Class A Treatment Technology Options, Advantages and Disadvantages, and High-Level Cost Estimates

Class A Technology	General Description	Advantages	Disadvantages	Capital Cost Estimate
Thermal Hydrolysis Process (THP)	Pre-digestion thermal hydrolysis uses high heat and high pressure to stabilize sludge prior to anaerobic digestion.	- Reduces required anaerobic digestion volume. - Higher volatile solids reduction and digester production. - Increases dewaterability.	- Highly complex process requiring sludge screening, pre-dewatering centrifuges, steam boiler and steam supply system, and high-heat and high-pressure tanks. - Steam system requires a full-time certified steam boiler operator. - High ammonia load in recycle stream. - No expected reduction of PFAS.	\$23 Million
Batch Temperature Phased Anaerobic Digestion (TPAD)	Batch TPAD involves a thermophilic continuous phase, followed by a bath thermophilic phase, and a mesophilic continuous phase.	- Higher volatile solids reduction and digester production. - May increase digestion capacity since higher volatile solids loading rate is possible.	- Staged digestion, batch phase, and heating and cooling equipment add process and operational complexity. - High ammonia load in recycle stream. - No expected reduction of PFAS.	Highly variable. \$10 to \$40 Million depending on modifications required.
Thermo-Chemical Hydrolysis Process	Post-digestion thermo-chemical hydrolysis uses low heat, and high Ph through addition of KOH/NaOH and high shear mixing.	- Relatively simple compared to other Class A processes. - Option for technology provider to manage product.	- Product is a liquid at 5-8 percent TS, which would increase hauling costs. - Drying beds would become abandoned assets. - No expected reduction of PFAS. - Only one technology provider.	\$22 Million

Class A Technology	General Description	Advantages	Disadvantages	Capital Cost Estimate
Thermal Drying	Thermal drying typically uses a fuel such as natural gas or digester gas to dry dewatered solids. Various technology options including belt, rotary drum, and paddle dryers.	Reduces hauling costs by consistently producing a > 90 percent dry product.	- Highly complex process requiring drying, dust control, air emissions controls, and dried product storage. - Drying beds would become abandoned assets, except if dryer can be configured to take air dried solids. - No expected reduction of PFAS.	\$64 Million
Thermal Drying with Pyrolysis/ Gasification	Dried solids are processed in either a zero-oxygen environment (pyrolysis) or an oxygen-starved environment (gasification). Both processes produce biochar.	- Heat produced during pyrolysis/gasification is typically used to run the dryer, reducing the fuel needed to run the process. - Promising for reduction of PFAS, although not yet proven.	- Highly complex process requiring drying, dust control, air emissions controls, pyrolysis/gasification reactor, and biochar storage. - Drying beds would become abandoned assets, except if the process can be configured to take air dried solids. - Technologies are not well-established for processing biosolids; limited operational experience. - Market for biochar is not well-established.	\$104 Million
Composting	Biosolids and bulking agents (agricultural, yard, or wood waste) are ground, combined into piles for composting and curing, and then screened. Various technology options including windrow, aerated static pile, and in-vessel composting.	- Market for compost is well-established. - Relatively simple process. - Potential reduction of PFAS through dilution with bulking agent.	- Requires large footprint. - Requires addition of bulking agent to provide porosity and nitrogen to the compost mix.	\$16 Million

Notes:

(1) Cost estimates were roughly estimated based on Carollo's biosolids master planning and digestion upgrades estimating experience.

While a full operations and maintenance (O&M) and life-cycle cost analysis was not included in the scope of this evaluation, future costs for hauling and land application were estimated to determine if the potential savings over 20 years could justify the capital costs of the Class A alternatives shown in Table 2. Note that this analysis assumes a best-case scenario where the new Class A process would not increase the O&M costs, and costs for end-use of the Class A product are assumed to be zero. If the potential end-use cost savings over 20 years are higher than the capital cost estimates, a more detailed evaluation of Class A options would be warranted.

Future costs for hauling and land application of air-dried solids were estimated based on a realistic rate increase scenario of 3 percent increase per year and a worst-case scenario of 10 percent increase per year. The results of this analysis are presented in Table 3.

Table 3 Projected Future Air-Dried Solids Hauling and Land Application Costs for Realistic and Worst-Case Scenario

	Realistic Scenario	Worst-Case Scenario
Annual hauling and land application rate increase (%)	3	10
Hauling and land application rates (\$/WT) ⁽¹⁾	\$74/WT in 2023 to \$130/WT by 2042	\$79/WT in 2023 to \$484/WT by 2042
Air-dried solids quantities (WT/year) ⁽²⁾	2,530 WT in 2023 increasing to 4,120 WT by 2042	
Annual hauling and land application costs (\$/year)	\$188,000 in 2023 to \$536,000 by 2042	\$201,000 in 2023 to \$2.0M by 2042
Present value of hauling and land application costs (2023 \$) ⁽³⁾	\$4.9M over 20 years	\$11M over 20 years

Notes:

- (1) Hauling and land application rates projected from a 2022 rate of \$72/WT.
- (2) Air dried solids quantities were projected proportional to the projected increase in influent BOD loads.
- (3) Present value calculated assuming an interest/discount rate of 3 percent.

Comparing the potential savings in end-use costs of \$4.9M to \$11M over 20 years to the capital cost estimates presented in Table 3, it may be worth further evaluating THP, batch TPAD, and composting as potential future Class A alternatives. THP and batch TPAD could potentially also provide alternatives to anaerobic digestion capacity expansion that may be more cost-effective than the baseline mesophilic digestion expansion estimate of \$42M. Thermo-chemical hydrolysis is not recommended since it produces a liquid product which would increase product quantities and their corresponding end-use costs and the drying beds would become abandoned assets.

The capital costs for thermal drying, pyrolysis, and gasification are too high to justify further evaluation. Furthermore, these thermal processes have high O&M costs, so the actual potential savings would be less than the \$4.9M to \$11M estimated in Table 3, even for this best-case scenario analysis where the Class A product hauling and end-use costs are assumed to be zero. The only future scenario where these processes may be justified is if future PFAS regulations require PFAS removal from biosolids.

3.3.6 Recommendations

Before investing in expansion of the existing mesophilic anaerobic digestion system, with an estimated capital cost of \$42M, the City should consider conducting a biosolids master plan (BMP) to comprehensively evaluate options for solids treatment and biosolids product management. The BMP should include, at least, the following evaluations:

- After completion of the digestion capacity expansion project (see TM 4 – Near-Term Project Descriptions) and for any future digestion capacity expansion needs, the City could evaluate potentially less expensive ways of increasing digestion capacity such as optimizing thickening, evaluating thickening alternatives, evaluating recuperative thickening, or adding a THP system or batch TPAD system. THP and batch TPAD, which would provide multiple benefits, as they both expand digestion capacity and produce a Class A product.
- Evaluation of modifications required for batch TPAD, which, depending on the site-specific required digester modifications, may be the least expensive Class A option.
- Evaluation of options for treating PFAS in biosolids, such as pyrolysis and gasification, in case stringent limits get implemented in the future. This evaluation should investigate whether air dried biosolids can be used as a feedstock for pyrolysis/gasification, which would reduce the overall cost of the system.

- Further testing of the City's air dried biosolids to determine if it is viable to meet Class A through pathogen testing and an evaluation of the regulatory requirements to obtain Class A designation.
- Market analysis of various biosolids products to determine other end-use options that do not require hauling to adjacent counties.
- Evaluation of potential regional partnerships with nearby wastewater agencies or with nearby composting facilities.

3.4 Energy Opportunities

3.4.1 Introduction

The City is interested in investigating alternative digester gas utilization and energy generation opportunities due to permitting issues with their existing cogeneration system.

3.4.2 Current Digester Gas Utilization and Energy Generation Systems

The WRF produces digester gas from anaerobic digestion of primary solids and thickened waste activated sludge. From January 2018 to June 2023, the digesters produced an average of 203,400 standard cubic feet per day (scfd) or about 141 standard cubic feet per minute (scfm) of digester gas. With a 71 percent increase in influent BOD loads projected through 2044, the 2044 digester gas production is estimated to be approximately 240 scfm.

The digester gas is currently conditioned for hydrogen sulfide (H₂S) removal and flared. The digester gas is not used in the boilers because they are not permitted to operate using digester gas; instead, natural gas is used to run the boilers.

A gas conditioning and cogeneration system using engine generators was installed in 2017 but has not been used to date due to issues with obtaining an air permit. The gas conditioning system, provided by Unison, has a capacity of 350 scfm and consists of H₂S removal vessels containing proprietary media, moisture removal using compression, cooling, and reheating of the gas, and siloxane removal using two sets of lead/lag vessels containing activated carbon. The cogeneration system consists of one 988 kilowatt (Kw) Cummins engine generator (model C1000N6C), equivalent to an annual generation capacity of 8,650,000 kilowatt-hours per year (kWh/year). This engine has an electrical efficiency of 41 percent at 100 percent load. The cogeneration system is equipped with a fuel blending skid which allows for supplementing the engine with natural gas.

In addition, the City has a solar system with a 1 MW generation capacity, installed in 2017..

3.4.3 Regulatory and Financial Drivers

There are several financial incentives for monetizing renewable natural gas (RNG) or electricity produced from renewable sources like digester gas.

For RNG projects, there are number of opportunities to monetize this resource, including:

- **Renewable Fuel Standard (RFS) Program.** The RFS program is managed by the USEPA and used to offset carbon emissions in the transportation sector. The program requires oil and gas producers to purchase specified amounts of fuel credits each year to increase the amount of renewable fuel used.

The RFS program tracks the production and sale of renewable fuel used as transportation fuel using what is known as a Renewable Identification Number (RIN) or RIN credit.

- **Low Carbon Fuel Standard (LCFS) Program.** The LCFS program is managed at the state or regional level and establishes compliance goals to reduce carbon emissions. The credits available from this program are known as LCFS credits.
- **Voluntary Markets.** These local and regional programs are implemented by corporations or regional natural gas utilities that are focused on sustainability. In some cases, the corporations or utilities may have compliance goals to achieve long-term sustainability goals for RNG.

There are also several financial incentives available for electricity generation from digester gas. For facilities like the WRF which produce less power than they use, the financial incentives available include:

- **Self-Generation Incentive Program (SGIP):** The California Public Utilities Commission's (CPUC) Self-Generation Incentive Program (SGIP) provides incentives to support existing, new, and emerging distributed energy resources. The incentive for internal combustion engines is \$2.00 per watt (W) and the biogas adder is \$0.60/W, for a total of \$2.60/W. To obtain an SGIP grant, the City must operate the engine on digester gas only, without any natural gas supplementation. The first 50 percent of the grant is paid out after completion of the installation. The remaining 50 percent of the grant is performance based; the electrical generation is metered and reported to the electric utility by an independent third party.
- **Renewable Electric Renewable Identification Numbers (eRIN):** In 2023, the USEPA proposed the addition of eRINs to their RFS program. However, while eRIN generation is set to begin on January 1, 2024, the USEPA has issued a solicitation for feedback and the eRIN program has not yet been finalized.

In addition, the Inflation Reduction Act (IRA), described below, provides funding opportunities for both cogeneration and RNG digester gas projects, as well as solar power and other renewable energy generation projects:

- **Inflation Reduction Act (IRA):** The IRA, passed in 2022, provides funding opportunities for various types of digester gas utilization projects. In addition to a tax credit, available only for private for-profit companies, the program also provides a direct pay option so that non-profits and public agencies can also benefit. A major limitation of this program is that only facilities that begin construction before 12/31/2024 are eligible.

In contrast to incentives to digester gas use, some regulations may disincentivize the use of digester gas derived compressed to renewable compressed natural gas (R-CNG) as a vehicle fuel in California. In April 2023, California adopted the **Advanced Clean Fleets (ACF)** rule that requires a phased transition towards zero-emission medium- and heavy-duty vehicles. As a part of the Advanced Clean Fleets rule, fleet owners operating private services, federal fleets, and state and local government fleets are required to transition towards zero emission vehicles (ZEVs). Existing vehicles are allowed to continue operation throughout their useful life. The Advanced Clean Fleet regulations propose the following requirements for public agencies:

- By 2024, state and local government fleets, including city, county, special district, and State agency fleets are required to ensure 50 percent of new vehicle purchases are zero-emission.
- By 2027, state and local government fleets, including city, county, special district, and State agency fleets are required to ensure 100 percent of new vehicle purchases are zero-emission.

The ACF rule does not count R-CNG vehicles as ZEVs and is thus expected to reduce the future demand for R-CNG in California. Several agencies including the California Association of Sanitation Agencies (CASA) have been advocating to include R-CNG vehicles as a viable renewable fuel option in the ACF.

3.4.4 Energy Opportunities and High-Level Cost Estimates

Digester gas, containing approximately 60 percent methane, is a valuable renewable energy resource that can be used for digester heating, in cogeneration or combined heat and power (CHP) systems, upgraded to renewable natural gas (RNG) for pipeline injection, or upgraded and compressed to renewable compressed natural gas (R-CNG) for vehicle fueling, as shown in Figure 3 and described below.

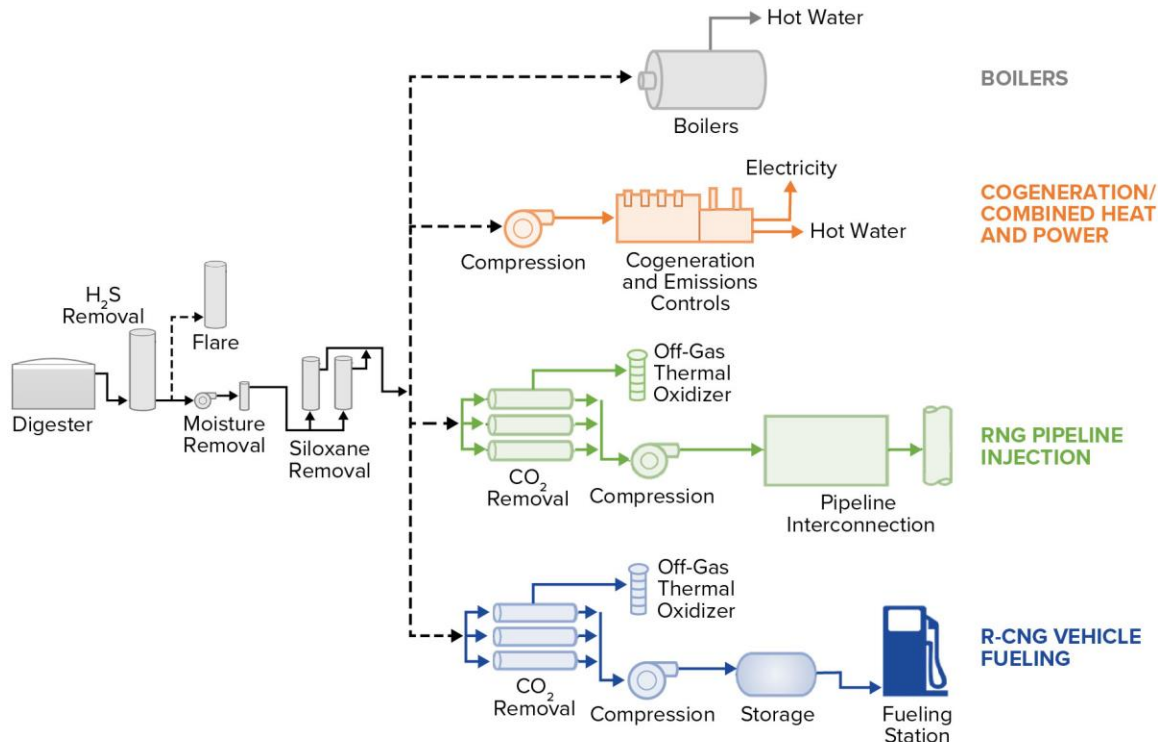


Figure 2 Digester Gas Utilization Options

The WRF currently flares 100 percent of its digester gas. The boilers are currently not permitted to utilize digester gas, and instead are fueled with natural gas. The WRF also has a gas conditioning and cogeneration system, which is currently not in use due to permitting issues. Cogeneration systems require gas conditioning to remove H₂S, moisture, and siloxanes from the digester gas. Cogeneration systems include heat recovery for digester heating and other heating needs and emissions controls. The heat recovered is typically more than enough to heat mesophilic anaerobic digesters. Cogeneration systems can use microturbines, engine generators, gas turbines, or fuel cells. These options are described in more detail below:

- **Engine Generators:** Engine generators are the most commonly used system in wastewater treatment plants (WWTPs) due to their capacity ranges being suitable for the digester gas quantities typically produced at most WWTPs and their high electrical efficiency. Engine generators of the scale used at

municipal WWTPs typically range in efficiency from 35 to 42 percent. These units are available from several well-established manufacturers including GE Jenbacher, Caterpillar, and Cummins.

- **Microturbines:** Microturbines are typically only recommended for smaller WWTPs or for WWTPs that need heat recovery in the form of steam. Microturbines come in small modular units and are easier to install and operate, relative to engine generators. However, their electrical efficiency is lower, ranging from 25 to 33 percent. There are only two microturbine suppliers: Capstone and FlexEnergy.
- **Gas Turbines:** Gas turbines are typically recommended for larger WWTPs with potential generation capacities over 4 megawatts (MW).
- **Fuel Cells:** Relative to the other cogeneration technologies, fuel cells are more expensive in both capital and O&M costs. Several WWTPs that operated fuel cells running on digester gas have had operational issues, and the operations at several of these facilities have been discontinued. However, fuel cells have the advantage of having extremely low air emissions relative to the other cogeneration technologies.

Other options the City could consider for digester gas utilization are upgrading the digester gas to RNG for pipeline injection and upgrading and compressing the digester gas to produce R-CNG for vehicle fueling, described in more detail below.

- **RNG to Pipeline Injection:** There are several upgrading technologies including membrane separation, pressure swing adsorption, amine scrubbing, and water scrubbing. Membrane separation is the most commonly used upgrading technology at smaller WWTPs. In these systems, the digester gas is first conditioned to remove H₂S, moisture, and siloxanes, before going through the digester gas upgrading system to remove the carbon dioxide and produce a >99 percent methane gas. The systems produce an off-gas containing mostly carbon dioxide with a small amount of methane. This off-gas should be flared or burned in a thermal oxidizer to reduce emissions of methane, a potent greenhouse gas. Typically, these systems are designed to use the full digester gas stream to maximize the environmental credits available (RIN and LCFS), and natural gas is used to fuel the boilers for digester heating. The viability of pipeline injection depends on the distance to the pipeline injection location and the injection pressure required. The City could contact SoCalGas for further information on the nearest potential injection point and its pressure.
- **R-CNG to Vehicle Fuel:** The required equipment is similar to the upgrading equipment needed to produce RNG for pipeline injection, although the quality requirements for use of R-CNG in vehicles is less stringent. Similar to RNG systems, these systems are typically designed to upgrade the full digester gas stream, with natural gas used to fuel the boilers. The viability of this alternative depends on there being sufficient local demand for the R-CNG in CNG vehicles and the proximity of a CNG fueling station. As described in the section above, the demand for R-CNG in California may disappear due to the Advanced Clean Fleet rule which requires full conversion to ZEVs.

Carollo recently estimated Class 5 capital costs (with an expected accuracy range of -30 to +50 percent), O&M costs, and payback periods for digester gas utilization alternatives for two agencies with similar digester gas quantities. These costs are provided below to give the City a rough estimate of what a new digester gas utilization system may cost. However, it is important to note that factors such as digester gas quantity and quality, electricity prices and rate structures, proximity to a suitable pipeline injection location, and design requirements and preferences vary for each specific wastewater agency.

- A December 2022 evaluation for the City of Ventura included evaluation of cogeneration using engine generators or microturbines for a design year (2041) average digester gas production of 133 scfm. The

capital costs were almost identical for engine generators and microturbines at approximately \$11.5M. The net savings (calculated accounting for the O&M costs and the power savings) were higher for the engine generator alternative due to the unit's higher electrical efficiency. The payback period for all options was longer than 20 years.

- A February 2021 evaluation for the City of Turlock included evaluation of cogeneration using engine generators, digester gas upgrading for pipeline injection, and digester gas upgrading for vehicle fueling for a design year (2045) average digester gas production of 315 scfm. The vehicle fuel alternative was eliminated due to insufficient local demand for CNG. Even though several City vehicles and trash trucks owned by a solid waste company located adjacent to the treatment plant use CNG, it was estimated that these vehicles could only use about 50 percent of the City's potential R-CNG production. The capital costs were approximately \$13M for the cogeneration alternative and \$11M for the pipeline injection alternative. The pipeline injection alternative was favorable due to a suitable PG&E injection location adjacent to the treatment plant. The payback period for the cogeneration alternative was estimated at 15 to 20 years, depending on whether or not a grant of \$3-M could be obtained through the SGIP program. The payback period for the pipeline injection alternative was estimated at 9 to 17 years, depending on the value of the RIN credits that could be obtained.

3.4.5 Recommendations

The WRF already has a digester gas conditioning and cogeneration system. Given this, the least costly energy opportunity is to resolve the permitting issue that is keeping the existing system from operating. In addition, the City is currently purchasing natural gas to run the boilers because they are not currently permitted to operate using digester gas, resulting in 100 percent of the digester gas being flared. Resolving this permitting issue should be the first priority. If these permitting issues cannot be resolved, the City should consider either performing a digester gas use study or a more comprehensive energy master plan.

A digester gas use study would focus on evaluating the best use of digester gas, given the current regulatory and financial market. This study should evaluate options including cogeneration using engine generators and digester gas upgrading to RNG for pipeline injection. Given the exclusion of R-CNG vehicles from the Advanced Clean Fleet Rule, the demand for R-CNG is expected to dramatically decrease, so this option is not recommended. However, generation of electricity to fuel electric vehicles should be considered, particularly depending on the incentives that may be provided by the eRIN program, when it is finalized.

An energy master plan would comprehensively evaluate energy saving and energy generation opportunities for the WRF, as well as energy resiliency and greenhouse gas reduction opportunities. Energy savings could include evaluations of operational optimizations and alternative treatment processes. Energy generation and resiliency opportunities could include additional solar power generation, battery storage, increasing digester gas production through co-digestion of fats, oils, and grease (FOG) and/or food waste, and an evaluation of digester gas use alternatives.



Water Reclamation Facility - Facility Plan



TECHNICAL MEMORANDUM 4

Near-Term Project Descriptions

FINAL / February 2024



Water Reclamation Facility - Facility Plan

TECHNICAL MEMORANDUM 4

Near-Term Project Descriptions

FINAL / February 2024

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Abbreviations

ADMM	average day maximum month
cu ft	cubic feet
GBT	gravity belt thickener
gpm	gallons per minute
HRT	hydraulic retention time
MCC	motor control center
PLC	programmable logic controller
PS	primary sludge
TM	technical memorandum
TS	total solids
TWAS	thickened waste activated sludge
UVT	ultraviolet transmittance
VFD	variable frequency drive
WRF	Water Reclamation Facility

TM 4 NEAR-TERM PROJECT DESCRIPTIONS

4.1 Introduction

This technical memorandum (TM) summarizes projects that are recommended for implementation within the next six years based on the capacity analysis summarized in TM 1 – Near-Term Process Performance Evaluation. These near-term projects are required to reliably treat current and 6-year projected flows and loads. This TM is not a comprehensive overview of all near-term projects that are required at Visalia’s Water Reclamation Facility (WRF). Certain WRF improvements, such as replacement and rehabilitation improvements, will be needed for aging infrastructure and are discussed at a high level in TM 2 - Condition Assessment. Other WRF improvements for environmental opportunities are discussed at a high level in TM 3 – Environmental Project Opportunities.

The near-term projects are:

- Thickened Waste Activated Sludge Pump Replacements.
- Dewatering Capacity Expansion.
- Anaerobic Digestion Capacity Expansion.
- Ultraviolet (UV) Disinfection System Capacity Expansion.

Near-term projects can be seen on the site plan shown in Figure 1. For each project, this TM summarizes the project background and drivers, basis of design, and recommended improvements. Project costs for the recommended projects are summarized in TM 5 – Near-Term Capital Improvement Program.

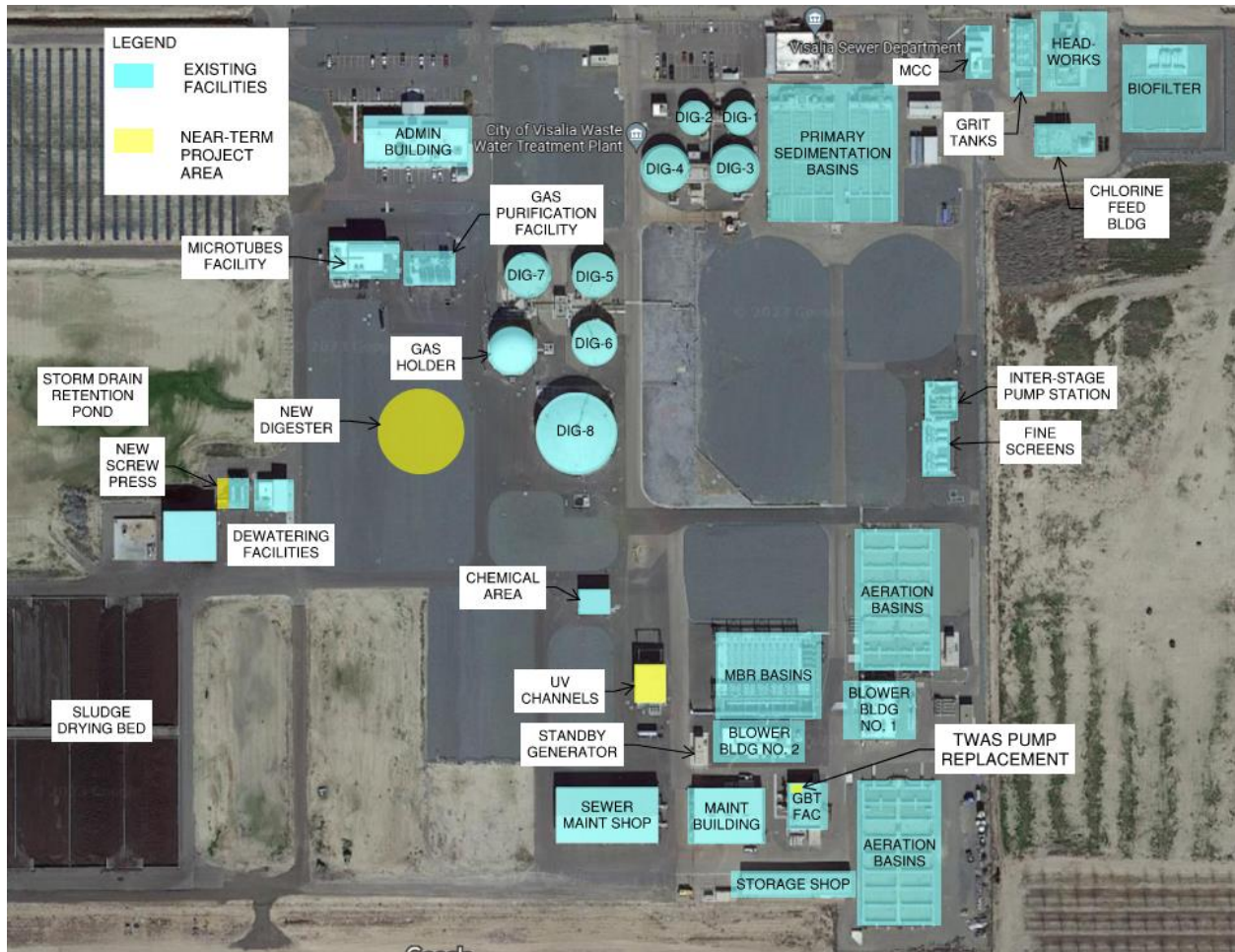


Figure 1 Site Layout of Recommended Projects

4.2 Thickened Waste Activated Sludge Pump Replacements

4.2.1 Background

The WRF uses gravity belt thickeners (GBTs) to thicken waste activated sludge. These GBTs were designed to produce thickened waste activated sludge (TWAS) with 5 percent total solids (TS). However, the plant has run into issues with the TWAS pumps tripping from too high of pressure when the TWAS is thickened to 5 percent TS. Therefore, the GBTs are operated to produce TWAS with about 2.5 percent TS, resulting in a significantly higher amount of sludge being sent to the plant's digesters. Since the capacity of the digesters is currently limited by the hydraulic retention time and not the solids loading rate, this additional volume of sludge being sent to the digesters directly reduces the overall digestion capacity.

Replacing the TWAS pumps with new pumps that can accommodate higher pressures would allow the GBTs to be operated as originally designed and produce TWAS with 5 percent TS. Sending less TWAS to the digesters would restore some additional digestion capacity for accommodating additional increases in flows and loads, resulting in delaying the need for an additional digester and providing more time for the design and construction of the new digester.

4.2.2 Basis of Design

To determine the future TWAS flows for sizing the new TWAS pumps, sludge flows and loads were developed for current and future conditions using a BioWin model, which is described in more detail in TM 1 – Near-Term Process Performance Evaluation. These current and projected TWAS flows are summarized below in Table 1 and were used as the basis for sizing the new TWAS pumps.

Table 1 Current and Future TWAS Production

Sludge Thickness, percent	2023, ADMM (gpm)	2044, ADMM (gpm)
5	42	61

Abbreviations: gpm - gallons per minute. ADMM - average day maximum month.

4.2.3 Recommendations

It is recommended that these TWAS Pump Replacements improvements be implemented as soon as possible to restore some digestion capacity. Therefore, this project should be on an expedited design and construction schedule. The TWAS Pump Replacements improvements would include the following:

- Two higher pressure TWAS pumps.
- Replacement of the exposed TWAS piping, valves, and appurtenances in the room.
- Retrofitting new variable frequency drive (VFD) buckets into the existing motor control center (MCC) section.
- Replacement of local control stations, cable, exposed conduits, conduit supports, and hardware associated with the TWAS pumps.
- Replacement of associated instruments, supports, hardware and wire.
- Replacement of communication cable between the VFD and programmable logic controller (PLC).

4.3 Dewatering Capacity Expansion

4.3.1 Background

Currently, the City's WRF has two existing screw presses that were designed to operate as one duty and one standby unit. As previously stated in TM 1 – Near-Term Process Performance Evaluation, the dewatering system does not have sufficient firm capacity, meaning a unit is out of service, for the current flows and loads. Therefore, when flows and loads are high, the plant must operate both screw presses to dewater all of the sludge. Operating both units does not allow plant staff to take a unit out of service, so additional dewatering capacity is required to provide critical redundancy to improve operations of the dewatering process.

4.3.2 Basis of Design

As mentioned above, the WRF does not have sufficient firm capacity for the dewatering system. This project would include the addition of a third screw press to provide additional dewatering capacity to allow the plant to operate two screw presses with a third on standby, providing the necessary redundancy required.

4.3.3 Recommendations

It is recommended to add a third screw press with the same capacity as the existing screw presses and be implemented as soon as possible to provide redundancy for the dewatering system. Like the TWAS pump replacements, this project should also be on an expedited design and construction schedule. The existing dewatering system was designed with space allocated for an additional screw press on the west side of the existing screw presses. It is recommended that the new screw press be installed in the reserved future space.

According to the future digested sludge flow projections, the existing dewatering feed pump station has sufficient firm capacity so additional dewatering feed pumps are not needed. The dewatered cake conveyors also have sufficient capacity and do not need to be replaced. The existing polymer storage tanks will provide about 30 days of storage at the projected 2030 sludge flows, so additional polymer storage was not included with this project either.

The Dewatering Capacity Expansion improvements would include the following:

- One new screw press, flocculation tank, and sludge grinder with the same capacity as the existing units.
- New concrete base slab and support columns for the screw press.
- Expansion of the elevated platform for the new screw press.
- Necessary piping, valves, and appurtenances for the new screw press.
- The new screw press would be powered from the existing MCC-DW and use an existing spare breaker that is dedicated for Dewatering Screw Press No. 3.
- A new vendor control panel would be installed in the field, and a new cable will be routed through the existing conduit.

4.4 Anaerobic Digestion Capacity Expansion

4.4.1 Background

As previously stated in TM 1 – Near-Term Process Performance Evaluation, the capacity of the anaerobic digestion system is currently limited by the hydraulic retention time (HRT) criteria. At current sludge flows, the digestion system is below capacity with the largest digester, Digester No. 8, out of service, so another digester is needed now to allow the largest digester to be taken out of service. However, it is estimated to take at a minimum 3 years to design, construct, and have a new digester be placed into service. Therefore, thickening the primary sludge (PS) and TWAS feed to the digesters is critical for delaying the need of a new digester by a few years.

Currently, PS feed is not thickened to its fullest potential. The City indicated that it was difficult to thicken PS concentrations greater than 2.5 percent total solids (TS) even though normal operations should allow the primary clarifiers to thicken up to 3-4 percent TS. This is due to long sludge retention times resulting in septic conditions and biogas production, which can hinder the gravity separation process. However, by optimizing PS wastage rates, the WRF should be able to achieve PS with 3 percent TS while still ensuring septic conditions are not established inside the primary clarifiers.

The GBTs are currently not fully optimized and thicken WAS to 2.5 percent TS instead of 5 percent TS. However, 5 percent TS could be achieved by replacing the TWAS pumps, as described above.

4.4.2 Basis of Design

Due to the digestion capacity being limited by the HRT, sludge flow projections to the digesters, assuming 3 percent PS plus scum and 5 percent TWAS, were used to determine the year the capacity of the digesters would be reached with the largest unit out of service. Figure 2 presents the projected HRT of the digestion system for the next 6 years with all units in service and with the largest digester, Digester No. 8, out of service.

With the largest digester out of service, due to maintenance or other reasons, the required HRT is not met. Adding another digester that is the same size as the largest existing digester would provide sufficient digestion capacity for over 10 years.

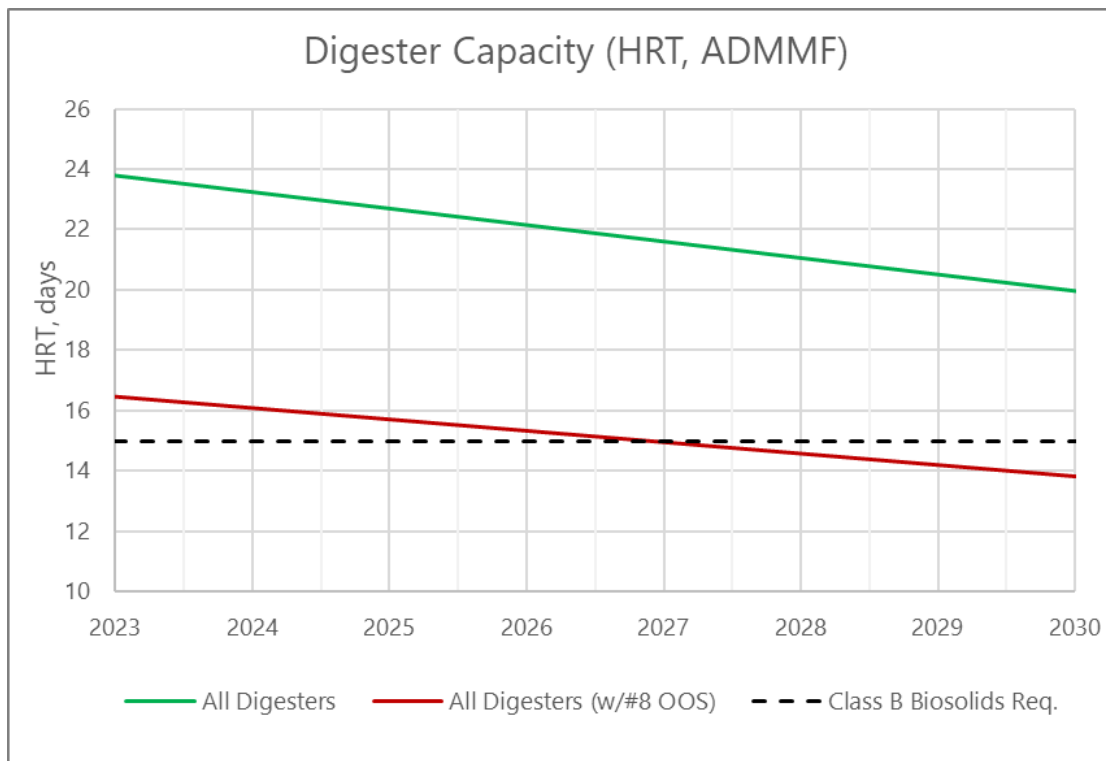


Figure 2 Projected Anaerobic Digestion Hydraulic Retention Time

4.4.3 Recommendations

It is recommended to add a new digester with the same digestion and sludge storage capacities as Digester No. 8. These design capacities are shown below in Table 2. This new digester would allow the plant to meet the required HRT for Class B biosolids if Digester No. 8 needs to be taken offline and provide necessary redundancy to the digestion system.

Table 2 Design Capacities for the New Digester

Parameter	Value
Operating Volume (excluding cone depth)	259,000 cu ft
Sludge Digestion	185,000 cu ft
Sludge Storage	74,000 cu ft

Abbreviations: cu ft – cubic feet.

The Anaerobic Digestion Capacity Expansion improvements would include the following:

- Construction of a new digester.
- Digester mixing system, including a mixing pump and associated piping, valves, and appurtenances.
- Digester heating system, including a sludge recirculation pump, hot water pump, heat exchanger, and associated piping, valves, and appurtenances.
- Digester feed transfer pumps and associated piping, valves, and appurtenances.
- Yard piping, including digester feed, digested sludge, hot water return/supply, and digester gas.
- New electrical and boiler building, with a new boiler to expand the capacity of the main hot water loop and new MCC to power all of the equipment associated with this project.

4.5 UV Disinfection System Capacity Expansion

4.5.1 Background

The existing UV disinfection system was installed in 2017 with a peak flow firm capacity rating of 28.8 mgd. As stated in TM 1 – Near-Term Process Performance Evaluation, this peak flow capacity is insufficient to meet the projected 2030 PWWF of 30.2 mgd, and the UV system needs to be expanded and brought online by 2027 to have sufficient firm capacity to meet the projected PWWFs. This will create necessary redundancy in the system for projected flows.

4.5.2 Basis of Design

The existing UV system was designed with space allocated for installing four additional modules in the existing channels. Installing these four additional modules will increase the firm capacity of the system from 28.8 mgd to 37.0 mgd and provide sufficient firm capacity for the projected 2030 PWWF.

4.5.3 Recommendations

During preliminary design for the UV system expansion, the design assumptions for sizing the original UV system should be revisited and compared to the historical operational data of the system. For example, the system was designed based on a UV transmittance (UVT) of 65 percent, but recent historical data shows that the UVT is higher than 65 percent. Increasing the design UVT could increase the capacity of the existing system but would also decrease the conservatism of the design. For planning purposes, it was assumed that the UV system would be expanded to meet the projected PWWFs.

The UV Disinfection System Capacity Expansion improvements would include the following:

- Installation of four UV modules and associated vendor provided stepdown transformers and power supply units.
- Power the new UV modules from Switchboard (SWBD) SWBD-4000B that has 2 breakers dedicated for the UV power transformers.
- Utilize the existing conduits to route cable from SWBD-4000B to the stepdown transformers and from the transformers to the power supply units.



Water Reclamation Facility - Facility Plan



TECHNICAL MEMORANDUM 5

Near-Term Capital Improvement Program

FINAL / February 2024





Water Reclamation Facility - Facility Plan

TECHNICAL MEMORANDUM 5

Near-Term Capital Improvement Program

FINAL / February 2024

This document is released for the purpose of information exchange review and planning only under the authority of Kyle T. Leonard, February 2024, CA PE 86011.

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Abbreviations

AACE	Association for the Advancement of Cost Engineering
Carollo	Carollo Engineers
CIP	capital improvement program
City	City of Visalia
TM	technical memorandum
TWAS	thickened waste activated sludge
UV	ultraviolet
WRF	Water Reclamation Facility

TM 5 NEAR-TERM CAPITAL IMPROVEMENT PROGRAM

5.1 Introduction

This technical memorandum (TM) presents the near-term capital improvement program (CIP) for Visalia's (City) Water Reclamation Facility (WRF) and a summary of the associated capital costs. The CIP presents an estimate of the City's capital expenses over the next six years to address any capacity-related recommended improvements to the WRF.

5.2 Key Findings and Recommendations

The near-term CIP identifies critical near-term capacity related projects required at the WRF over the next six years, which are described in TM 4 – Near-Term Project Descriptions and listed below.

- Thickened Waste Activated Sludge (TWAS) Pump Replacements.
- Dewatering Capacity Expansion.
- Anaerobic Digestion Capacity Expansion.
- Ultraviolet (UV) Disinfection System Capacity Expansion.

Figure 1 shows an annual cash flow basis for the CIP based on the assumed implementation date for each project. This cash flow analysis is provided as a preliminary tool to assess impacts on the City's resources over time.

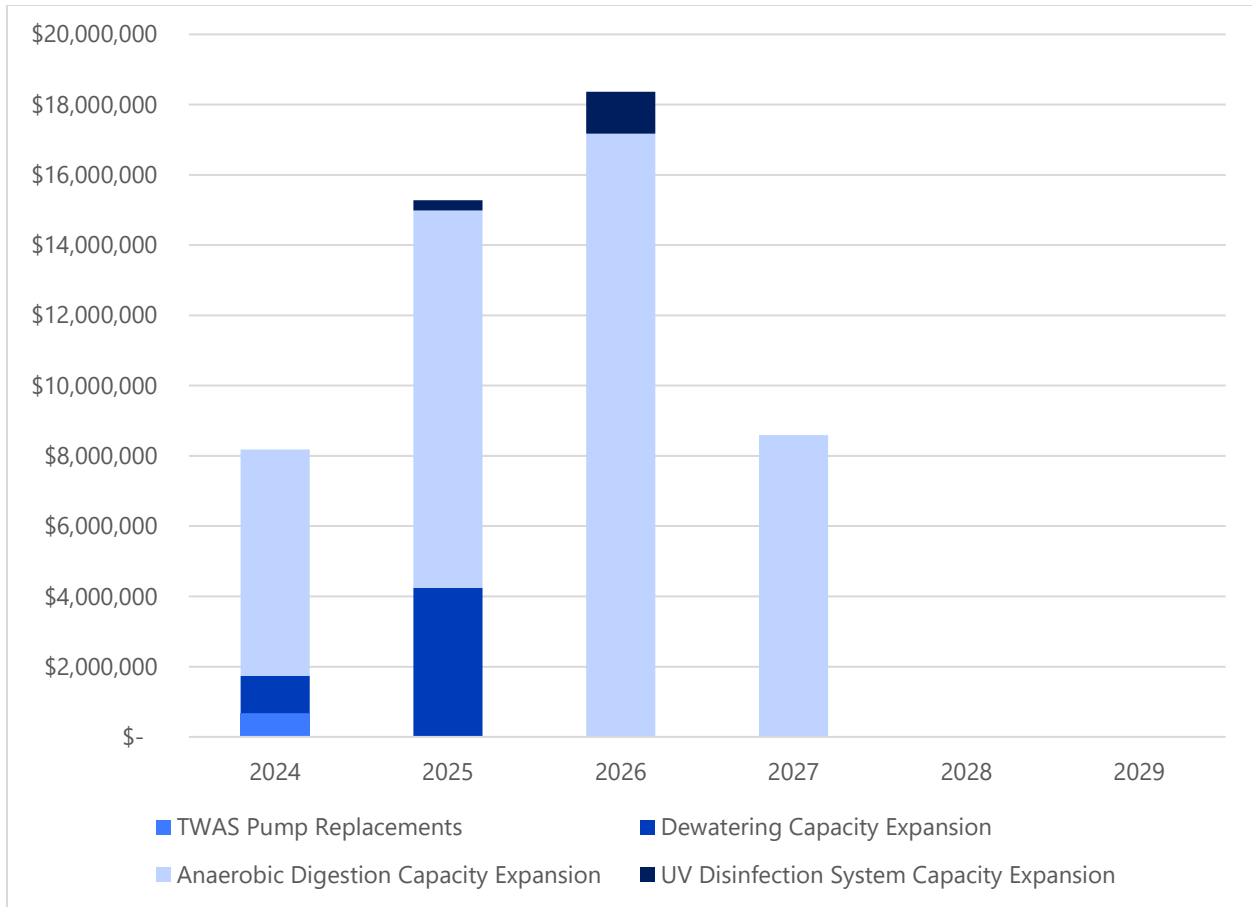


Figure 1 Near-Term Projects CIP Cash Flow

5.3 Cost Estimate

5.3.1 General Cost Assumptions

The cost estimates were prepared in accordance with the guidelines of the AACE International (the Association for the Advancement of Cost Engineering, 18R-97) for a Class 5 estimate. The AACE Cost Estimate Classification System includes five total estimate classes. Class 5 estimates are appropriate for planning projects before more definitive information, such as detailed designs, is available. Class 5 estimates are typically prepared for any number of strategic business planning purposes, including, but not limited to, project screening, evaluating resource needs and budgeting, and long-range capital planning as is being performed in this Facility Plan. Class 5 estimates have wide accuracy ranges. Typical accuracy ranges for Class 5 estimates are -20 to -50 percent on the low side, and +30 to +100 percent on the high side. These ranges vary based on the technological complexity of the project, the availability and accuracy of appropriate reference information, and the inclusion of an appropriate contingency determination.

Construction cost estimates account for both direct and indirect costs. Direct costs include materials, labor, construction equipment required for installation, and subcontractor costs. Indirect costs include contractor general conditions, contractor overhead and profit, sales tax, and an estimating contingency.

Direct construction costs for all improvements were estimated using various references. Where possible, the costs from design estimates or construction bid tabs were used. Other cost sources included reference projects, the R.S. Means price catalog, cost curves, and vendor quotes. Costs used from design estimates, construction bid tabs, or reference projects were adjusted for location using R.S. Means location factors and for inflation using the appropriate ENR CCI. Indirect construction costs were estimated as a percentage of the direct construction cost based on experience and industry-wide standards.

The total project cost was estimated for each project as the total construction cost plus an additional allowance for overall project costs including engineering, legal, administration, permitting costs, etc. Table 1 summarizes the overall approach for developing capital cost estimates.

Table 1 Capital Cost Estimating Approach

Item	Cost Formula
Total Direct Cost = A	
Estimating Contingency	B = 30 percent of A
Sales Tax ⁽¹⁾	C = 8.5 percent of half of A + B
General Conditions ⁽²⁾	D = 10 percent of A + B + C
Contractor Overhead and Profit	E = 25 percent of A + B + C + D
Total Construction Cost = A + B + C + D + E	
Engineering, legal, administrative, and permitting (E.L.A.P) costs for implementing the project	E.L.A.P. = 25 percent of Total Construction Cost
Total Project Capital Cost = Total Construction Cost + E.L.A.P.	

Notes:

- (1) Sales tax is assumed to be applied to 50 percent of the total direct cost (Item A) with estimating contingency (Item B).
- (2) General Conditions accounts for mobilization/demobilization and costs incurred for project management, bonds and insurance, and temporary facilities and utilities.

5.3.2 Project Capital Costs

The total project cost estimates for each project are summarized in Table 2. The estimate is at a planning level and is limited to capital costs and does not include O&M costs.

Table 2 Total Project Capital Cost for Recommended Project

Project	Cost ⁽¹⁾
TWAS Pump Replacements	\$675,000
Dewatering Capacity Expansion	\$5,313,000
Anaerobic Digestion Capacity Expansion	\$42,938,000
UV Disinfection System Capacity Expansion	\$1,488,000

Notes:

- (1) Total project capital costs are provided as present value based on an ENR CCI number of 15157 corresponding to the 20-City Average Index in September 2023. Costs are escalated to the midpoint of construction with an annual inflation rate of 6 percent. Total project costs

include factors for estimating contingency, sales tax, general conditions, and contractor overhead and profit as well as 25 percent allowance for engineering, legal, administration, and permitting costs.

5.4 Project Implementation

This section discusses the estimated project durations as well as when the projects should be implemented.

5.4.1 Project Durations

Implementation activities for the recommended projects include predesign planning, design, bidding and award, construction, commissioning, and environmental permitting. Project durations were estimated under the following assumptions:

- Smaller-sized projects (those less than \$1.0M) can be completed in two years or less, with one year for planning, design, and bidding, and one year for construction and startup.
- Medium-sized projection (those between \$1.0M and \$10M) can be completed in two to three years, with one year for planning, design, and bidding, and one to two years for construction and startup.
- Larger-sized projects (those greater than \$10M) can be completed in three to five years, with one to two years for planning, design, and bidding, and two to three years for construction and startup.

5.4.2 Implementation Schedule

Plant capacity defines not only the need for the projects, but also implementation timing. The implementation timing, determined by when the plant needs additional capacity, and the project duration assign each project a start and completion date. An expedited schedule for design and construction was used for the TWAS pump replacement and dewatering capacity expansion projects. The recommended implementation schedule for the near-term projects can be seen below in Table 2. Project timing and phasing was based on the criticality of the improvements on treatment process reliability.

Near-Term Projects CIP Schedule		Design				Bid/Award Contract								Construction/Startup															
Project	Total Project Cost ⁽¹⁾⁽²⁾	Year																											
		2024				2025				2026				2027				2028				2029				2030			
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4				
TWAS Pump Replacements	\$675,000																												
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Anaerobic Digestion Capacity Expansion	\$42,938,000																												
UV Disinfection System Capacity Expansion	\$1,488,000																												
Notes:																													
(1) Total project cost includes total construction cost plus an assumed 25 percent for associated costs for engineering, legal, administrative, permitting, and																													
(2) All costs are in September 2023 dollars with an Engineering News Record Construction Cost Index of 15157 corresponding to the 20-City Average Index.																													

Figure 2 Near-Term Projects CIP Schedule



Water Reclamation Facility - Facility Plan



TECHNICAL MEMORANDUM 6

Near-Term Capital Improvement Program Financing Opportunities

FINAL / February 2024





Water Reclamation Facility - Facility Plan

TECHNICAL MEMORANDUM 6

Near-Term Capital Improvement Program Financing Opportunities

FINAL / February 2024

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Abbreviations

AIS	American Iron and Steel
BABA	Build America, Buy America
BIL	Bipartisan Infrastructure Law
BRIC	Building Resilient Infrastructure and Communities
CDS	Congressionally Directed Spending
CEQA	California Environmental Quality Act
CIP	capital improvement program
City	City of Visalia
CPF	Community Project Funding
CWSRF	Clean Water State Revolving Fund
DAC	disadvantaged community
DBE	Disadvantaged Business Enterprises
DOE	Department of Energy
DWR	Department of Water Resources
EDA	Economic Development Administration
EPA	Environmental Protection Agency
FEMA	Federal Emergency Management Agency
GO	General Obligation
HUD	Department of Housing and Urban Development
IBank	Infrastructure and Economic Development Bank
IRS	Internal Revenue Service
ISRF	Infrastructure State Revolving Fund Program
MHI	median household income
NEPA	National Environmental Policy Act
OPR	Office of Planning and Research
PF	principal forgiveness
USBR	micrograms per liter
RRGP	Regional Resilience Grant Program
SCADA	supervisory control and data acquisition
SWRCB	State Water Resources Control Board
TM	technical memorandum
US ACE	United States Army Corps of Engineers
USBR	United States Bureau of Reclamation
USDA	United States Department of Agriculture
WIFIA	Water Infrastructure Finance and Innovation Act
WRF	Water Reclamation Facility
WRFP	Water Recycling Funding Program

TM 6 NEAR-TERM CAPITAL IMPROVEMENT PROGRAM FINANCING OPPORTUNITIES

6.1 Introduction

This technical memorandum (TM) presents a high-level overview of potential funding opportunities for the near-term projects for the City of Visalia's (City) Water Reclamation Facility (WRF). The City has identified critical near-term projects, which are described in TM 4 – Near-Term Project Descriptions, for its WRF to meet current and projected demands as well as provide treatment redundancy to prevent disruption caused by system failures or maintenance reasons. A search of available federal and state grant and loan opportunities was conducted to identify potential funding mechanisms that can assist the City with project costs.

6.2 Federal and State Grants and Loans

Federal and state funding sources and programs are continuously evolving and influenced by legislative initiatives and regulatory drivers which can impact funding program priorities, program authorizations and appropriations, and project applicability. The \$1.2 trillion Infrastructure Investment and Jobs Act, also known as the Bipartisan Infrastructure Law (BIL), has significantly impacted the short-term effects of federal and statewide funding on water-related projects, although long-term impacts of BIL on funding programs is currently unknown.

Federal, state, and local grant and loan funding sources are available for the planning, design, and construction of water, wastewater, and public infrastructure projects. Grants and low interest loan funding programs typically target specific types of projects and/or have specific objectives that a project must achieve. Agencies often require projects to meet as many objectives as possible, such as:

- Builds Regional partnerships.
- Incorporates integrated project benefits.
- Enhances water conservation or efficiency.
- Protects groundwater resources.
- Provides renewable energy improvements or energy efficiency.
- Addresses risk and resiliency.
- Demonstrates consistency with the State and Regional policies and objectives.
- Demonstrates regional cooperation and partnerships with partners and stakeholders.
- Serves a Disadvantaged Community (DAC) or severely DAC.

Many of the federal and state programs listed do not fund projects driven primarily by growth, which will likely be a limiting factor for a number of programs. However, there are near-term projects not driven by growth and may have an opportunity for partial funding that should be investigated.

Available federal, state, and local funding sources should be considered as potential funding mechanisms to help reduce the overall costs of the projects for the City and its rate payers. However, it is important to

recognize that due to the above-mentioned factors, sources of low interest loan financing and grant funding are limited.

Federal and State funding programs generally providing key opportunities for water and wastewater projects include the United States Environmental Protection Agency (USEPA), the State of California's Clean Water State Revolving Fund (CWSRF), United States Bureau of Reclamation (USBR), Department of Energy (DOE), United States Army Corps of Engineers (US ACE), United States Department of Agriculture (USDA), Department of Housing and Urban Development (HUD), etc. While EPA's "Water Infrastructure Finance and Innovation Act [WIFIA] and State of California's CWSRF programs provide some of the best avenues for securing larger sources of loan funding (and potential principal forgiveness), demand for SRF loans are high. While grant programs have the obvious advantage over loans – they do not require repayment – these programs typically do not fully finance a project and are more competitive to secure and are more specific in program priorities.

There are numerous factors that should be considered in the pursuit of external low interest loan and grant funding, including:

- **Federal and State funding programs are project specific – requiring a good fit of the project to the program priorities.** Most low interest loan and grant programs target a specific type of project or purpose. For a project to be competitive, it needs to meet the intent of the program.
- **Grant programs typically do not cover the full cost of the project.** Most federal and state grant programs do not cover the full cost of the project, requiring the sponsoring agency to provide a minimum cost share ranging from 25 to 75 percent (in-kind donations are applicable matches).
- **Demonstration of Ability to Pay for Project.** Typically funding agencies require the Agency to demonstrate the ability to construct, operate, and maintain the project without external funding.
- **Funding Restrictions.** Limited programs allow for the retroactive funding of design and construction work, and some programs will only fund activities that are conducted post selection for award or even require entering into an agreement prior to starting work activities. Most federal programs do not allow for earth disturbance activities prior to environmental (National Environmental Policy Act [NEPA]) clearance.
- **Application Timelines.** Application timing is critical for most grant and loan programs.
 - » Typically grant programs release funding announcements once each year with a 45 to 60-day window to apply, and availability varies year to year pending Congressional appropriations.
 - » Low interest loan programs typically accept applications on a rolling basis (e.g., WIFIA, SRF), however may require submission of project concepts by a prescribed date.
- **Award Timing.** With the increased interest in external funding and limited funding agency staff availability, the review, selection, and execution of a funding agreement can take on average 12 months and sometime longer.

In general, agencies should plan on submitting a loan application 6 to 12 months in advance of when funding is needed and definitely prior to construction start.

- **Project and Documentation Readiness / Readiness to Start Construction.** Identification of required project documentation early on is critical in order to ensure the appropriate level of documentation (e.g., engineering, environmental, and financial) is available to support the grant application.
- **Low Interest Loan and Grant Awards is NOT a promise of grant reimbursement.**
 - » Most low interest loans and grants are reimbursements and not cash up front. This requires that a source of funding be available for the construction of the project.

- » Grant reimbursements are subject to annual budget and appropriations processes and thus disbursement of grant funds on schedule is not guaranteed.
- **Federal Compliance Requirements:** Federal funding sources require compliance with federal requirements including American Iron and Steel (AIS), Davis Bacon Wage Determinations, Anti-lobbying, Disadvantaged Business Enterprises, Build America, Buy America (BABA) and reporting requirements. This can add to the overall administrative and construction costs as well as to the administrative requirements for the project.

Because of the constraints of federal and state grant and loan programs, some agencies secure low interest loan financing for the entire project while simultaneously pursuing grants where the entity will be competitive. Smaller grants can also be pursued as they are helpful in building relationships with funding agencies and reducing the financial burden on the City.

Potential federal, legislative, and state funding programs to evaluate further for the City's projects are summarized in Tables 1, 2, and 3, respectively. In addition to summarizing specific funding program information, the table includes a discussion on applicability of the program to the City's projects as well as next steps for preparing associated applications.

Table 1 Federal Funding Programs ⁽¹⁾

Program	Agency	Type	Description	Deadlines/Next Steps	Priority
Water Infrastructure Finance and Innovation Act (WIFIA)	U.S. Environmental Protection Agency (EPA)	Loan	Low-interest financing mechanism for large dollar value water, wastewater, stormwater, green infrastructure, energy efficiency projects, alternative water supply, aquifer recharge, drought preventing/reduction/mitigation projects or a package of projects serving a similar purpose and secured by a common security thread. Provides up to 49% of the total project financing; agency is required to provide 51% match (SRF, bonds, cash reserves, other grants, etc.). Maximum loan term is 35 years from substantial completion. (Including 5-year deferment of start of repayments). Projects must cost no less than \$20 million, or \$5 million for small community projects (population of 25,000 or fewer). Smaller projects can be grouped to meet minimum project cost limit. Interest rate is equal to the US Treasury rate of a similar maturity. Funds can be used to cover planning/design (retroactive), and construction activities. Two step application process: Letter of Interest and application. Prospective borrowers can submit letters of interest for review by EPA on a rolling basis from the date listed in the Notice of Funding Opportunity until the earlier of (i) the commitment of all available funding made available for that round and (ii) publication of a subsequent notice cancelling or overriding the current NOFA. A rolling selection process allows EPA to provide year-round access to WIFIA funding and submit quicker selection decisions to prospective borrowers. Application fees apply (average \$200,000 - \$300,000 pending reviews and legal negotiations). Most recent NOFO released stated that the FY22 lending capacity was \$5.5 billion and that letters of interest would be accepted starting September 6, 2022.	Applications accepted on rolling basis until funding is depleted or new announcement of funding ability is announced. https://www.epa.gov/wifia	High Priority Low-interest loan funding with \$20 million project minimum.
Public Works and Economic Adjustment Assistance Programs	Department of Commerce Economic Development Administration (EDA)	Grant	Program promotes long-term economic development and assists in the construction of public works and the development of facilities needed to initiate and support the creation or retention of permanent private-sector jobs in areas experiencing long-term economic deterioration and distress. The program provides funding for the construction and/or design of infrastructure to enable them to become more economically competitive. Water and sewer system improvements have been funded historically through this program. Construction projects are expected to range from 12 to 48 months and are expected to be completed within 5 years from the award date. Eligible projects: ▪ Must be consistent with the region's current Comprehensive Economic Development Strategy (CEDS) or equivalent EDA-accepted regional economic development strategy. ▪ Lead to the creation or retention of long-term jobs that provide living wages (preferably, not seasonal). ▪ Be located in areas that meet at least one of the following criteria: low per-capita income, unemployment above the national average, or "special need" as determined by EDA. \$121.5 million is available for the Public Works program and \$39.5 million for the EAA program. Average grant awards are approximately \$3 million with Public Works grants approximately \$1.4 million. Average EAA grants are \$650,000. Although not a defined rule, applicants may receive \$15,000 per job created. Federal/Nonfederal cost share is 50/50. Federal requirements apply.	Applications accepted on rolling basis until funding is depleted or new announcement of funding ability is announced. https://www.grants.gov/web/grants/view-opportunity.html?oppId=346815 Contact Wilfred Marshall at 310-261-6005 or wmarshall@eda.gov	Low Priority Project must provide evidence of job creation and spur economic growth.
Building Resilient Infrastructure and Communities (BRIC) Program	Federal Emergency Management Agency (FEMA)	Grant	FEMA pre-disaster hazard mitigation program to incentivize new, innovative, large infrastructure projects that build resilient communities and reduce risks from hazards such as wildfires, drought, hurricanes, earthquakes, extreme heat, and flooding. Total program funding was \$1 billion for FY 2023 with a \$50 million cap per project. Project must be included in a FEMA-approved Hazard Mitigation Plan, and the project must comply with 2018 and 2021 International Building Codes. Program requires a cost share of 75% to 25%, federal to non-federal. The program offers an increased cost share, 90% federal share, for economically disadvantaged rural communities as well as 100% management costs for all.	Notice of Interest typically due in summer with full application due approximately three months later. Contact HMA@caloes.ca.gov for more information. https://www.caloes.ca.gov/office-of-the-director/operations/recovery-directorate/hazard-mitigation/bric/	Not applicable to selected capital improvement program (CIP) projects but may be of interest to the City.

Program	Agency	Type	Description	Deadlines/Next Steps	Priority
WaterSMART Water and Energy Efficiency Grants	U.S. Bureau of Reclamation (USBR)	Grant	Eligible projects include projects that result in quantifiable and sustained water savings, increase renewable energy use, and improve energy savings, and support broader water quality sustainability benefits. Eligible applicants include public agencies or a private entity service in the capacity of a public agency. Types of projects include water conservation projects (canal lining, municipal metering, irrigation flow measurement, SCADA, high efficiency applications, landscape irrigation, and others) and renewable energy projects (solar/wind energy and hydropower). Requires a 50% cost share and federal requirements compliance (NEPA, AIS, BABA, Davis Bacon, etc.) Three funding limits: ▪ \$500,000 (typically for projects completed within a year). ▪ Up to \$2,000,000 (for projects to be completed in 3 years). ▪ Up to \$5,000,000 (for projects to be completed in 3 years).	Applications are due February 22, 2024. https://www.usbr.gov/watersmart/weeg/	Low Priority Project does not meet program priorities/type of projects funded.
WaterSMART Small-Scale Water Efficiency Projects	USBR	Grant	Reclamation provides funding to irrigation and water districts, tribes, states and other entities with water or power delivery authority for small water efficiency improvements that are limited in scope. <u>Eligible projects:</u> ▪ Canal lining/piping. ▪ Municipal metering. ▪ Irrigation flow measurement. ▪ Supervisory control and data acquisition and automation (SCADA). ▪ Landscape Irrigation measures. ▪ High efficiency indoor appliances and fixtures. ▪ Upgrades to commercial cooling systems to improve water use efficiency. Up to \$100k in Reclamation funds for 2-year projects. Maximum total project costs of \$225k with a 50% non-federal cost share required.	FY24 funding announcement is accepting applications until January 16, 2024. Expected Award of Funding is in September 2024. Contact Nickie McCann at 303-445-3733 or nmccann@usbr.gov https://www.usbr.gov/watersmart/swep/index.html	Low Priority Project does not meet program priorities/type of projects funded.
WaterSMART Planning and Project Design Grants	USBR	Grant	Funding for collaborative planning and design projects to support water management improvements. <u>Grant categories:</u> ▪ Water Strategy Grants to conduct planning activities that will improve water supplies (e.g., water supplies to disadvantaged communities that do not have reliable access to water, water marketing, water conservation, drought resilience, and ecological resilience). ▪ Project Design Grants to conduct project-specific design for projects to improve water management. ▪ Comprehensive Drought Contingency Plans. Up to \$400,000 per application for projects that can be completed within 3 years. Approximately \$35 million is available under this program. Approximately 60-70 projects will be awarded, contingent on appropriations. Most projects except those for tribes or disadvantaged communities will require a 50 percent cost share. Compliance with federal requirements apply (NEPA, AIS/BABA, Davis Bacon, etc.).	Funding deadline for FY23 is Oct. 17, 2023. Deadline for FY24 is April 2, 2024. Contact for Water Strategy Grants: Irene Hoiby Mail Code ihoiby@usbr.gov or 303-445-3575 Project Design Grants: Nickie McCann nmccann@usbr.gov or 720-610- Drought Contingency Planning: Sheri Looper slooper@usbr.gov or 916-978-5556	Not applicable to selected CIP projects but may be of interest to the City.

Program	Agency	Type	Description	Deadlines/Next Steps	Priority
WaterSMART Drought Response Program: Drought Resilience Projects	USBR	Grant	USBR will provide funding for projects that increase water supply reliability and build long-term resilience to drought. To be eligible for funding, the proposed project scope should go beyond routine water management activities or activities required by state law for conservation and efficiency. The proposed project should also help avoid the need for emergency response actions. Approximately 25 to 40 projects will be funded contingent upon available federal appropriations. <u>Eligible projects</u> ▪ Infrastructure projects that increase the reliability of water supplies. ▪ Groundwater recovery that increases the reliability of water supplies. ▪ Projects that improve water management through decision support tools, modeling, and measurement. ▪ Domestic water supply projects for tribes or disadvantaged communities without reliable water access. <u>Funding limits:</u> ▪ Up to \$500,000 for projects to be completed within two years. ▪ \$2 million for projects to be completed within three years. ▪ \$5 million for large projects to be completed within three years. ▪ Up to \$10 million for domestic water supply projects for tribes or disadvantaged communities. A 5% non-federal cost-share is required for domestic water supply projects for tribes or disadvantaged communities. All other projects require a 50% non-federal cost share. Compliance with federal requirements apply (NEPA, AIS/Build America, Buy America, Davis Bacon, etc.).	Funding deadline is Nov. 7, 2023 Contact Interior Region 10: California-Great Basin - Anna Sutton, 916-978-5214, asutton@usbr.gov https://www.usbr.gov/drought/	Not applicable to selected CIP projects but may be of interest to the City.
Section 219: Environmental Infrastructure	U.S. Army Corps of Engineers (US ACE)	Grant	Section 219 authorizes the US ACE to aid non-federal interests (local communities, water districts, sanitation districts, etc.) in carrying out water-related environmental infrastructure and resource protection and development projects; this includes wastewater treatment facility projects. The program has been directed by recent legislation to focus on prioritizing assistance to underserved, economically distressed, and economically disadvantaged minority communities. Program requires a cost share of 75% to 25% of federal to non-federal funding. The application is a two-step process with Congressional authorization required followed by appropriation of funds.	Discussion with local representatives is required for Congressional approval. https://www.spl.usace.army.mil/Missions/Civil-Works/Projects-Studies/	Low Priority City demographics do not fit funding priorities well. Lengthy funding process.

Program	Agency	Type	Description	Deadlines/Next Steps	Priority
Energy Efficiency and Conservation Block Grant (EECBG) Program	US Department of Energy (DOE)	Grant/Voucher	This program allows for either grants or vouchers. Vouchers can be used for technical assistance and/or rebates for the purchases and installation of energy efficiency or clean energy equipment. Technical assistance may include, but not limited to, the following: - Energy plan development. - Decarbonization planning and roadmaps. - Identification of best practices. - Building audits. - Renewable energy system design. - Cost effectiveness studies. Other eligible uses of funds include, but are not limited to, the following: - Developing and implementing energy efficiency and conservation strategy. - Retaining technical consultant services to assist the eligible entity in the development of such a strategy. - Performing energy efficiency retrofits. - Conducting residential and commercial building energy audits. - Establishing financial incentive programs for energy efficiency improvements. The voucher application is separate from applying for grant funds; voucher applications are streamlined with reduced documentation compared to applying for a federal grant. DOE can process voucher applications at least 30 days quicker than grant applications. The grant option for this program is a formula grant, which means eligible cities receive a specific allocation of money. The City of Visalia was allocated \$182,320 for the current period. It is recommended to consider pursuing the voucher option if the entity's allocation is less than \$250,000 or if staffing capacity is limited since the voucher approach is streamlined and less burdensome.	Applications are due April 30, 2024. https://www.energy.gov/scep/energy-efficiency-and-conservation-block-grant-program	Medium Priority An energy study would qualify for this program. It is recommended to monitor this funding opportunity as it is not always available.
Business Energy Investment Tax Credit	Internal Revenue Service (IRS)	Tax Rebate	The Inflation Reduction Act of 2022 expanded existing clean energy tax credits so non-taxable entities can take advantage of the savings. ITC is a tax credit that reduces the federal income tax liability for a percentage of the cost of a clean energy system that is installed during the tax year. Tax-exempt organizations may file paperwork with the IRS to receive a direct pay subsidy for projects started before January 1, 2025. Projects that commence construction on or after January 1, 2025, may receive a tax credit under the new Clean Electricity Investment Tax Credit. Projects under 1 MW are not required to meet the new labor standards established by the Inflation Reduction Act to receive a full 30 percent tax credit. Projects that begin construction after 2021 and before 2025 can receive the full tax credit of 30 percent. Projects over 1 MW will receive a base tax credit of 6 percent but can receive the 30 percent tax credit if they meet prevailing wage and apprenticeship requirements. Other bonuses given for American iron and steel components. Eligible projects: Solar, fuel cells, wind turbines, geothermal systems, microturbines, CHP, offshore wind, waste energy recovery, energy storage systems, thermal energy storage systems, qualified biogas property, and microgrid controllers.	https://www.irs.gov/instructions/i3468#en_US_2022_publink1000297066	Not applicable to selected CIP projects but may be of interest to the City.

Note:
(1) The following funding programs were evaluated and rejected from consideration due to eligibility requirements and other restrictions: HUD Community Development Block Grant Programs, USDA Rural Development Water and Environmental programs, and U.S. Department of Energy programs.

Table 2 Legislative Funding Programs

Program	Agency	Type	Description	Deadlines/Next Steps	Priority
Community Project Funding (CPF)/Congressionally Directed Spending (CDS)	U.S. Congress	Directed Appropriation	CPF is a mechanism by which members of Congress can request funding for specific projects in their home state that have been submitted for consideration by state and local government entities and nonprofits, also known as “earmarks.” Members of Congress can request direct funding for specific entities and projects in their districts to serve the public good. Members may request funding for up to 15 projects in their community for FY24, although only a handful may be funded. Projects with demonstrated community support are considered. CPF is limited to no more than 0.5 percent of discretionary spending. The average funding awards range from \$3 to \$5 million; but can be higher. Projects are ultimately selected by the House of Representatives and the Senate with funding, if approved, distributed as part of the federal appropriations process the next FY (October through September). Funds are to be spent within one (1) year.	Contact Congressman Tom McClintock to discuss the possibility of an earmark. Contact his office at 916-786-5560. Contact Senator Alex Padilla at Appropriations_Padilla@padilla.senate.gov Link: https://appropriations.house.gov/sites/republicans.appropriations.house.gov/files/FY24%20Comunity%20Project%20Funding%20Guidance.pdf	High Priority

Table 3 State Funding Programs

Program	Agency	Type	Description	Deadlines/Next Steps	Priority
Infrastructure State Revolving Fund Program (ISRF)	Infrastructure and Economic Development Bank (IBank)	Loan	IBank's ISRF Loan Fund program provides low-cost, direct loans to local governments and nonprofits sponsored by public agencies for a wide variety of public infrastructure and economic expansion projects (excluding housing) that improve and sustain communities, helping individuals and families thrive. Program focuses on small and mid-/moderate-sized local governments and special districts — including those in underserved regions and communities. ISRF financing is available in amounts ranging from \$1 million to \$65 million with loan terms for the useful life of the project up to 30 years. No scoring mechanisms. IBank operates on a first-come, first-served basis (no scoring mechanism). No CEQA plus, AIS, BABA, or Federal Requirements; will require Davis Bacon. Most recent published interest rate was 4.36% in January 2023.	Timing: Application accepted year-round with Preliminary Review (4-6 weeks) followed by Credit Risk Committee Meeting, Application and Final Board Meeting (6-7 month process). Contact: 916-341-6600 or infrastructureloans@ibank.ca.gov Link: https://ibank.ca.gov/	High Priority Interest rates are not as low as SRF and WIFIA, but applications are less complex.
Clean Water State Revolving Fund (CWSRF)	State Water Resources Control Board (SWRCB)	Loan/Grant	The CWSRF program provides low-interest loans to eligible entities for a wide range of wastewater and stormwater projects that protect surface water and groundwater resources. Program Eligibility (including, but not limited to): - Publicly owned wastewater treatment construction, repair, or replacement. - Implementation of a nonpoint source management plan. - Decentralized systems treating municipal or domestic sewage. - Reducing, treating, or managing stormwater. - Reducing demand to publicly owned works through conservation. - Watershed projects. - Reducing energy consumption. - Projects for reusing or recycling wastewater or stormwater. - Increasing security at publicly owned treatment works. Loan rate is 1/2 of the most recent State General Obligation (GO) Bond Rate at the time of approval. Terms are available for up to 30 years. Principal forgiveness (PF) may be available to disadvantaged borrowers or borrowers that incorporate sustainability into projects. PF is also available for public health projects, estuary projects, water recycling, and stormwater projects. PF Funding for septic-to-sewer conversions for small, disadvantaged communities is available at up to \$125,000 per household. Project will be scored and prioritized based in part on project's readiness to being construction. If plans are greater than 49% complete on December 31, then the project will receive 1 “construction readiness point.” If greater than 89% complete on December 31, then 2 points are given. If plans are less than 50%, no points are given.	Applications accepted year-round via portal (FAAST), email and hard copy. CleanWaterSRF@waterboards.ca.gov or (916) 327-9978 https://www.waterboards.ca.gov/water_issues/programs/grants_loans/srf/	Low Priority CWSRF program is over committed currently, and priority is given to small, disadvantaged communities.

Program	Agency	Type	Description	Deadlines/Next Steps	Priority
Water Recycling Funding Program (WRFP) – Planning and Construction Grants	SWRCB	Loan/Grant	The WRFP funds the planning and construction of recycled water treatment facilities, storage facilities, pumping facilities, groundwater recharge facilities, and distribution systems, including onsite improvements. The end use of recycled water must benefit the community as a whole and offset potable water usage. Onsite recycled water application is not eligible. For non-DACS/SDACs, agencies must apply through the CWSRF program and be on the fundable list to be eligible for funding. For 203-2024 funding, projects need to apply for the fundable list by December 31, 2023. The program required a 50/50 cost share. Historically under Prop 1 of the 50% of funding from the WCPP, up to 35% can be in grant form used for construction costs, while the remaining portion would be a loan, which could be used for both construction and soft costs. For non-DACs and DACs, grant funding is capped at \$5 million. SDACs may receive more funding with the deputy director's approval. Through the Governor's Budget, \$160 million is being allocated over three years (2021-2023) for recycled water projects and groundwater projects each, so funding will hopefully follow a similar formula to when Prop 1 was being implemented. With State funding, federal cross cutters do not apply including BABA, Disadvantaged Business Enterprises (DBE), Davis Bacon, and AIS to name a few. Furthermore, only need California Environmental Quality Act (CEQA) documentation.	Sandeep Kals 916-324-8404 Sandeep.Kals@waterboards.ca.gov	Not applicable to selected CIP projects but may be of interest to the City.
Regional Resilience Grant Program (RRGP)	Governor's Office of Planning and Research (OPR)	Grant	New grant program that funds planning and implementation projects that strengthen climate change resilience at a regional scale. The RRGF funds projects led by partnerships that involve multiple jurisdictions working together to address the most significant climate change risks in their regions, especially in communities that are most vulnerable to climate change impacts. These impacts could include wildfires, rising sea levels, droughts, floods, increasing temperatures, and extreme heat events. Up to \$50 million is available. The funding range for planning projects is \$150,000 to \$650,000. The funding range for implementation projects is \$650,000 to \$3,000,000. Cities must work collaboratively with at least one community-based organization to apply.	An Intent to Apply Survey is required. Contact dolores.barajas@opr.ca.gov. https://opr.ca.gov/climate/icarp/grants/regional-resilience-grant.html	Not applicable to selected CIP projects but may be of interest to the City.
Urban Community Drought Relief Program	Department of Water Resources (DWR)	Grant	Under the Budget Act of 2021, approximately \$285 million in drought relief funding was made available for interim and immediate drought relief to urban communities. Approximately \$175 million will be available in the current funding cycle. A set-aside of at least \$85 million will be made to support underrepresented communities and Native American Tribes (Tribes). Eligible planning, engineering and construction project types include hauled water, installation of temporary community water tanks, bottled water, water vending machines, emergency water interties, new wells or rehabilitation of existing wells, construction, or installation of permanent connection to adjacent water systems, recycled water projects that support immediate relief to potable water supplies, fish and wildlife rescue, protection, and relocation, and drought resiliency planning. Project must be included in an Urban Water Management Plan. There is a minimum award amount of \$3 million per applicant. Smaller projects may be bundled together in a single application to meet the minimum grant award requirement. Applicants are required to have 25% non-state funding match; however, underrepresented and tribal applicants are exempt from this requirement. Funding limits have not yet been determined.	Program is no longer open. Contact: urbandrought@water.ca.gov Link: https://water.ca.gov/Water-Basics/Drought/Drought-Funding/Urban-Drought-Grant	Not available at this time. Program is no longer accepting new applications but may reopen at a later date. Program should be monitored.
Community Development Block Grant (CDBG)	U.S. Department of Housing and Urban Development (HUD)/City	Grant	HUD-awarded funds for local projects. Available to local governments, counties and municipalities. Eligible to fund community water and wastewater projects. CDBG funds are provided as grants to non-entitlement jurisdictions. Grants can vary based on annual allocations and activity limits. Must address one of three national objectives: - Benefit to low- and moderate-income persons - Aid in the prevention or elimination of slums and blight, or - To meet an urgent need	Internal City discussion would be necessary to use fixed CDBG funding for wastewater projects. https://www.visalia.city/depts/community_development/housing_n_cdbg_services/community_development_block_grant/default.asp	Low Priority

6.3 Conclusion

This TM summarizes current federal and state grants and low-interest loans that are potential sources of financing for the City's WRF near-term projects. These programs are competitive and limited in their funding capacity, with program funding availability dependent upon annual appropriations, along with other restrictions.

Many of the federal and state programs listed do not fund projects driven primarily by growth. The City's near-term projects have several beneficial characteristics that could be further investigated to see if the project could be eligible for funding. The City is a small community not included in one of the state's Active Management Areas. According to current U.S. Census reporting, the area has a Median Household Income (MHI) of \$69,252, approximately 82 percent of California's average MHI. Even though this is over California's 80 percent definition of a DAC, it would be prudent to talk with agencies to understand what U.S. Census data is being used and if the City might be considered a DAC. By being classified as a DAC, the City could be eligible for lower interest rates and principal forgiveness.

It should be noted that projects funded with federal financing would need to comply with NEPA, AIS, BABA, Davis Bacon, DBE, competitive procurement, etc. These conditions may add to the project's overall cost, influence project schedules, and increase some administrative burden.

Critical to the success of securing external funding is the tracking of potential funding opportunities, fit of the project to the funding program priorities, readiness of the project, and timing of application submittals. Because many programs have limits on the amount of funding they can offer, it is important to apply early and with complete documentation to prevent complications in the funding process.

The City's community demographics put it at odds with some federal programs' focus on funding projects in small, rural and/or disadvantaged communities. Despite this restriction, there are several opportunities available at the federal and state level that should be further evaluated for financing the project.

The following funding opportunities may provide for low interest loan or grant opportunities for the projects listed in the City's Near-Term CIP:

- U. S. Environmental Protection Agency – WIFIA (low interest financing).
- Department of Energy – EECBG Program (grant or voucher program).
- State of California - CPF/ CDS (directed appropriations via Congress).
- State of California – ISRF (loan program).
- State of California – CWSRF (low interest financing with eligible principal forgiveness for disadvantaged communities and green projects).