APPENDIX H

Asset Management Plan

Revision History			
Revision	**Date**	**Approval**	**Reason**
0	09/30/05		Original
1	11/05/11		•
2	04/04/14		•
	07/11/19	J. Fenton	• Reviewed – no changes
3	07/08/20	C. Falzone	• Updated Asset Management Plan
4	09/20/21	T. Edwards	• Updated Asset Management Plan
5	09/19/22	T. Edwards	• Updated Asset Management Plan to 2021
6	09/21/23	T. Edwards	• Updated Asset Management Plan to 2022
6	09/19/24	T. Edwards	• Updated Asset Management Plan to 2023
			•
			•
			•
			•
			•
			•

THIS PAGE INTENTIONALLY LEFT BLANK

Asset Management Plan

2023








OC SAN
ORANGE COUNTY SANITATION DISTRICT

This page is intentionally left blank.

Contents

List of Figures

List of Tables

List of Appendices

This page is intentionally left blank.

Acronyms and Abbreviations

Acronym or Abbreviation	Meaning
Ø	Diameter
®	Registered Trademark
ADWF	Average Dry Weather Flow
AM	Asset Management
AMP	Asset Management Plan
AS	Activated Sludge
AS1	Activated Sludge 1
AS2	Activated Sludge 2
BB	Blower Building
BI	Business Intelligence
Board	Orange County Sanitation District Board of Directors
CCTV	Closed-Circuit Television
Cen Gen	Central Generation Facility
CCI	Construction Cost Index
Chem.	Chemical Injection System
CIP	Capital Improvement Program
CIPP	Cured-in-Place Pipe
CM	Corrective Maintenance
CoF	Consequence of Failure
CP	Control Panel
CTS	Co-Thickened Sludge
CWPS	City Water Pump Station
DAFT	Dissolved Air Flotation Thickener
DC	Distribution Center
Demo	Demolish
DIP	Ductile Iron Pipe
DOT	U.S. Department of Transportation
E&I	Electrical and Instrumentation
EAM	Enterprise Asset Management
EBDB	East Basin Distribution Box
EJB	Effluent Junction Box

Acronym or Abbreviation	Meaning
Elec.	Electrical
EPSA	Effluent Pump Station Annex
FE	Facilities Engineering
$FeCl_3$	Ferric Chloride
FRP	Fiberglass Reinforced Plastic
FY	Fiscal Year
Gen Set	Generator Set
GWRS	Groundwater Replenishment System
H_2S	Hydrogen Sulfide
HCl	Hydrochloric Acid
HDPE	High-Density Polyethylene
HP	Horsepower
HPOAS	High-Purity Oxygen-Activated Sludge
HR	Human Resources
HVAC	Heating, Ventilation, and Air Conditioning
HW	Headworks
I&C	Instrumentation and Controls
IDGP	Interplant Digester Gas Pipeline
Inst.	Instrument
IPE	Interplant Trunk E
JB	Junction Box
JSA	Junction Structure A
KPI	Key Performance Indicator
kV	Kilovolt(s)
kVA	Kilovolt-Ampere
kW	Kilowatt(s)
LEL	Lower Explosive Limit
LoF	Likelihood of Failure
LOFLO	Low Flow
LOX	Liquid Oxygen
M&D	Metering and Diversion
MCC	Motor Control Center

Acronym or Abbreviation	Meaning
MGD	Million Gallon(s) Per Day
mi.	Miles
ML	Mixed Liquor
MP	Maintenance Project
MSP	Main Sewage Pump
MTBF	Mean Time between Failure
N/A	Not Applicable
NaOH	Sodium Hydroxide
NASSCO	National Association of Sewer Service Companies
No.	Number
#	Number
NPDES	National Pollutant Discharge Elimination System
NSC	North Scrubber Complex
O&M	Operations and Maintenance
OC San	Orange County Sanitation District
OCWD	Orange County Water District
OEM	Original Equipment Manufacturer
OOBS	Ocean Outfall Booster Station
OPT	Optimization
OSHA	Occupational Safety and Health Administration
OXI	Oxidizer
P1	Plant No. 1
P2	Plant No. 2
PB	Power Building
PC	Primary Clarifier
PdM	Predictive Maintenance
PE	Primary Effluent
PEDB	Primary Effluent Distribution Box
PEDB-1	Primary Effluent Distribution Box 1
PEDB-2	Primary Effluent Distribution Box 2
PEJB	Primary Effluent Junction Box
PEJB-1	Primary Effluent Junction Box 1

Acronym or Abbreviation	Meaning
PEJB-2	Primary Effluent Junction Box 2
PEPS	Primary Effluent Pump Station
Phys.	Physical Injection System
PISB	Primary Influent Splitter Box
PLC	Programmable Logic Controller
PM	Preventive Maintenance
PRN	Project Request Number
PS	Pump Station
PSB	Primary Sedimentation Basin
psi	Pound(s) Per Square Inch
PVC	Polyvinyl Chloride
PWPS	Plant Water Pump Station
PWWF	Peak Wet Weather Flow
RAS	Return-Activated Sludge
RCM	Reliability-Centered Maintenance
RCP	Reinforced Concrete Pipe
RFID	Radio Frequency Identification
ROCCS	Regional Odor and Corrosion Control System
RSS	Return Secondary Sludge
RUL	Remaining Useful Life
RWQCB	Regional Water Quality Control Board
SALS	Steve Anderson Lift Station
SARI	Santa Ana River Interceptor
SBF	Sludge Blending Facility
SC	Secondary Clarifier
SCADA	Supervisory Control and Data Acquisition
SCE	Southern California Edison
SCR	Selective Catalytic Reduction
SC/SR	Solids Contact/Solids Reaeration
SE	Secondary Effluent
SEJB	Secondary Effluent Junction Box
SPF	Standby Power Facility

Acronym or Abbreviation	Meaning
Sq.	Square
SR	Secondary Return
SSC	South Scrubber Complex
SSO	Sanitary Sewer Overflow
T&D	Thickening and Dewatering
TBD	To Be Determined
TF	Trickling Filter
TFPS	Trickling Filter Pump Station
TF/SC	Trickling Filter/Solids Contact
TFSC	Trickling Filter Secondary Clarifier
TFSE	Trickling Filter Secondary Effluent
TFSEJB-2	Trickling Filter Secondary Effluent Junction Box 2
TL	Trunkline
TPAD	Temperature-Phased Anaerobic Digester
TRUL	Theoretical Remaining Useful Life
TWAS	Thickened Waste-Activated Sludge
UPS	Uninterruptible Power Supply
V	Volt(s)
VCP	Vitrified Clay Pipe
VDC	Volt(s) of Direct Current
VFD	Variable Frequency Drive
WAS	Waste-Activated Sludge
WSS	Waste Secondary Sludge
WSSPS	Waste Sidestream Pump Station

This page is intentionally left blank.

Executive Summary

Asset Management Plan Intent and Purpose

The Orange County Sanitation District (OC San) Asset Management Plan (AMP) is a tactical document that captures OC San's organizational structure, maintenance plans, and capital improvement plan implementation on an annual basis. This document will continue to change in content and structure to reflect our efforts for continual improvement and to meet the needs of stakeholders.

Safe and reliable infrastructure and process equipment are essential to providing industry leading wastewater collection and management, while achieving our mission and vision statements. We manage asset reliability, mitigate risk, and ensure the quality of our delivered services according to the following stated intent for our Asset Management Program:

OC San will know the condition of assets we own and will have a plan to operate and maintain these assets to deliver the required level of service, at the lowest life cycle cost, with an acceptable level of risk.

Overview of OC San's Infrastructure

OC San owns and operates wastewater collection system infrastructure, as well as two resource recovery and wastewater treatment facilities located in Fountain Valley and Huntington Beach. Our collection system infrastructure includes 388 miles of regional trunk sewer pipelines and 15 pump stations throughout the OC San service area (Figure ES-1-1). Wastewater is conveyed to Reclamation Plant Number (No.) 1 in Fountain Valley and Treatment Plant No. 2 in Huntington Beach. These facilities treat an average daily wastewater flow of 185 million gallons per day, serving over 2.6 million people in central and northern Orange County, California.

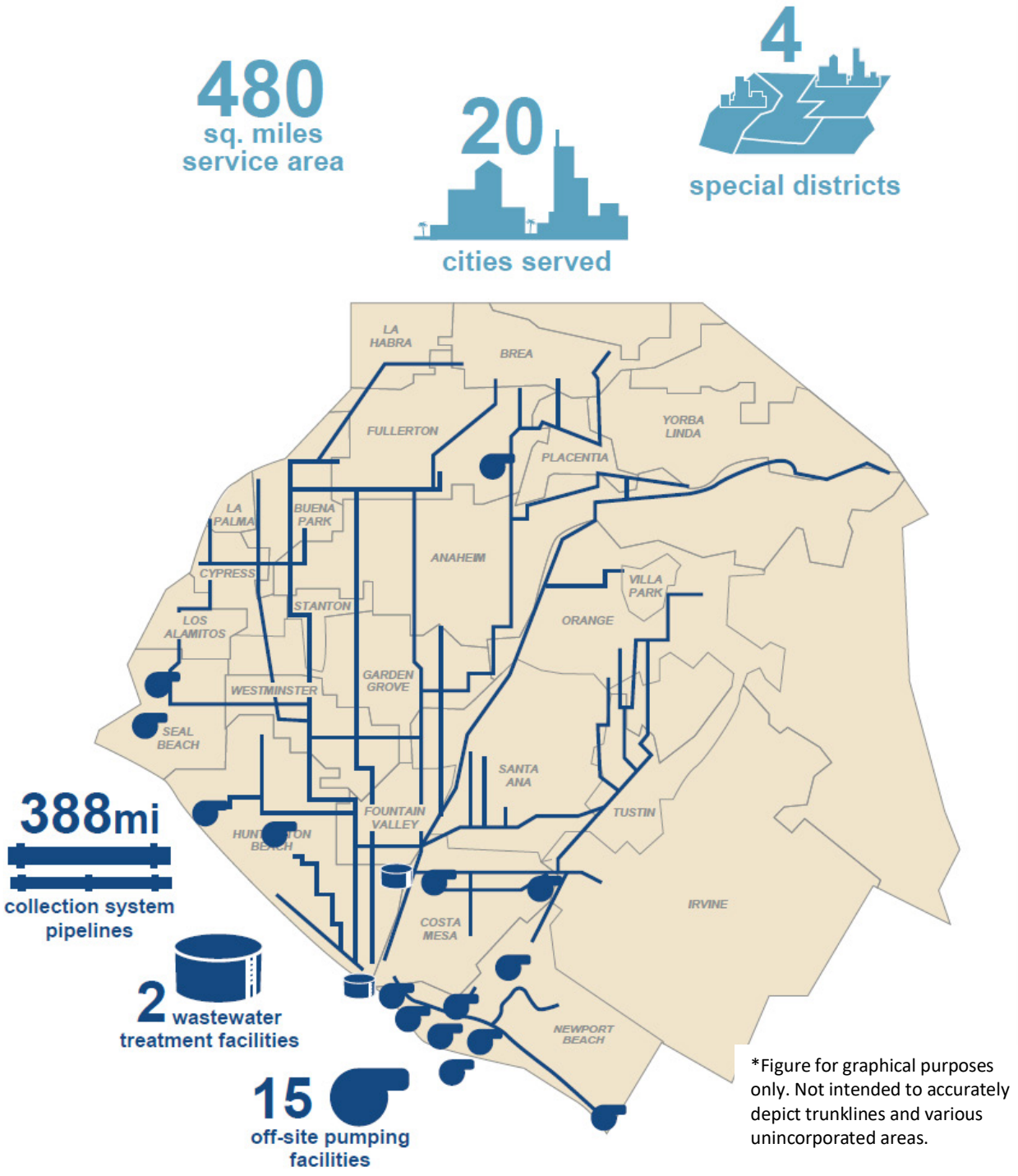


Figure ES-1-1. OC San's Service Area

Acronym Key:

mi = mile(s)
sq. = square

Figure ES-1-2 shows the facility valuation by asset system for OC San's wastewater infrastructure. The original valuation was prepared as part of the 2017 Facilities Master Plan. The estimated replacement value in Fiscal Year (FY) 2023–2024 is $12.6 billion based on the Engineering News-Record Construction Cost Index increases since the 2017 Facilities Master Plan.

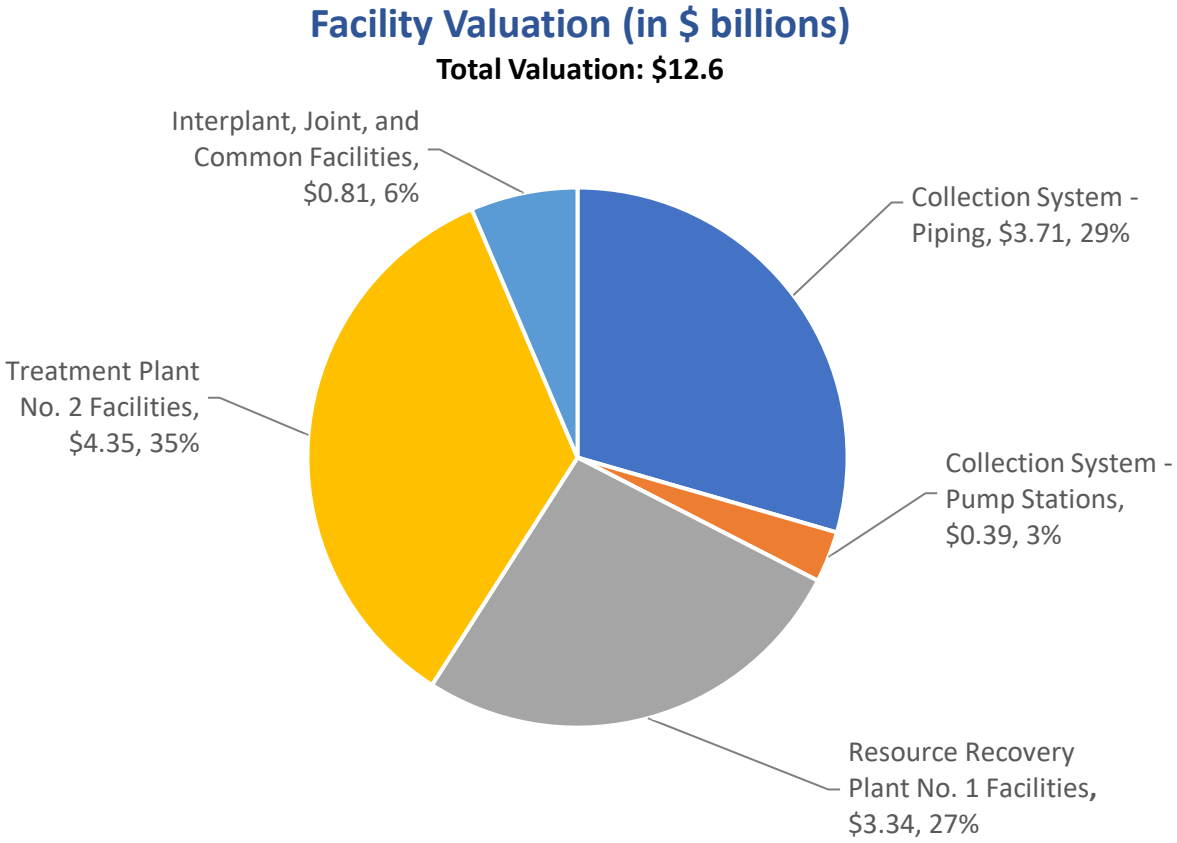


Figure ES-1-2. Facility Valuation by Location

State of OC San's Infrastructure

The following system-level summary tables and condition score maps provide a high-level overview of the Area Asset Management (AM) Summaries contained in Section 2. The system-level summaries are organized as follows:

- Plant No. 1 (Figure ES-1-3 and Table ES-1-1)
- Plant No. 2 (Figure ES-1-4 and Table ES-1-2)
- Collection System – Pump Stations and Newport Force Mains (Figure ES-1-5 and Table ES-1-3)
- Collection System – Pipelines and Manholes (Figure ES-1-6 and Table ES-1-4)

The system-level summaries generally include the following fields:

- **Area No.:** Number that corresponds to individual plant asset areas. Plant No. 1 asset areas are numbers 10 to 19, and Plant No. 2 asset areas are numbers 20 to 29.
- **Area Name:** Name of asset area.
- **Average Remaining Useful Life (RUL) Score**: Estimated average RUL score for each discipline (civil, structural, mechanical, electrical, and instrumentation) or area based on an average of the RUL scores provided by Asset Engineers in the detailed Area AM Summaries.
- **Percentage of RUL Scores with 4s or 5s**: Percentage based on total number of RUL asset scores assigned to each area in the detailed Area AM Summaries. The percentage is an alternate metric for the overall condition of the area and equipment. A RUL score of 5 indicates fewer than 5 years of useful life remains for an asset or set of assets. A RUL score of 4 indicates 5 to 10 years of useful life remains for an asset or a set of assets.
- **Replacement Value ($ millions)**: Process area replacement value from the facility valuation.

ASSET MANAGEMENT SYSTEM SUMMARY – PLANT NO. 1 OVERVIEW

Figure ES-1-3. Plant No. 1 Process Area – Remaining Useful Life Score Map

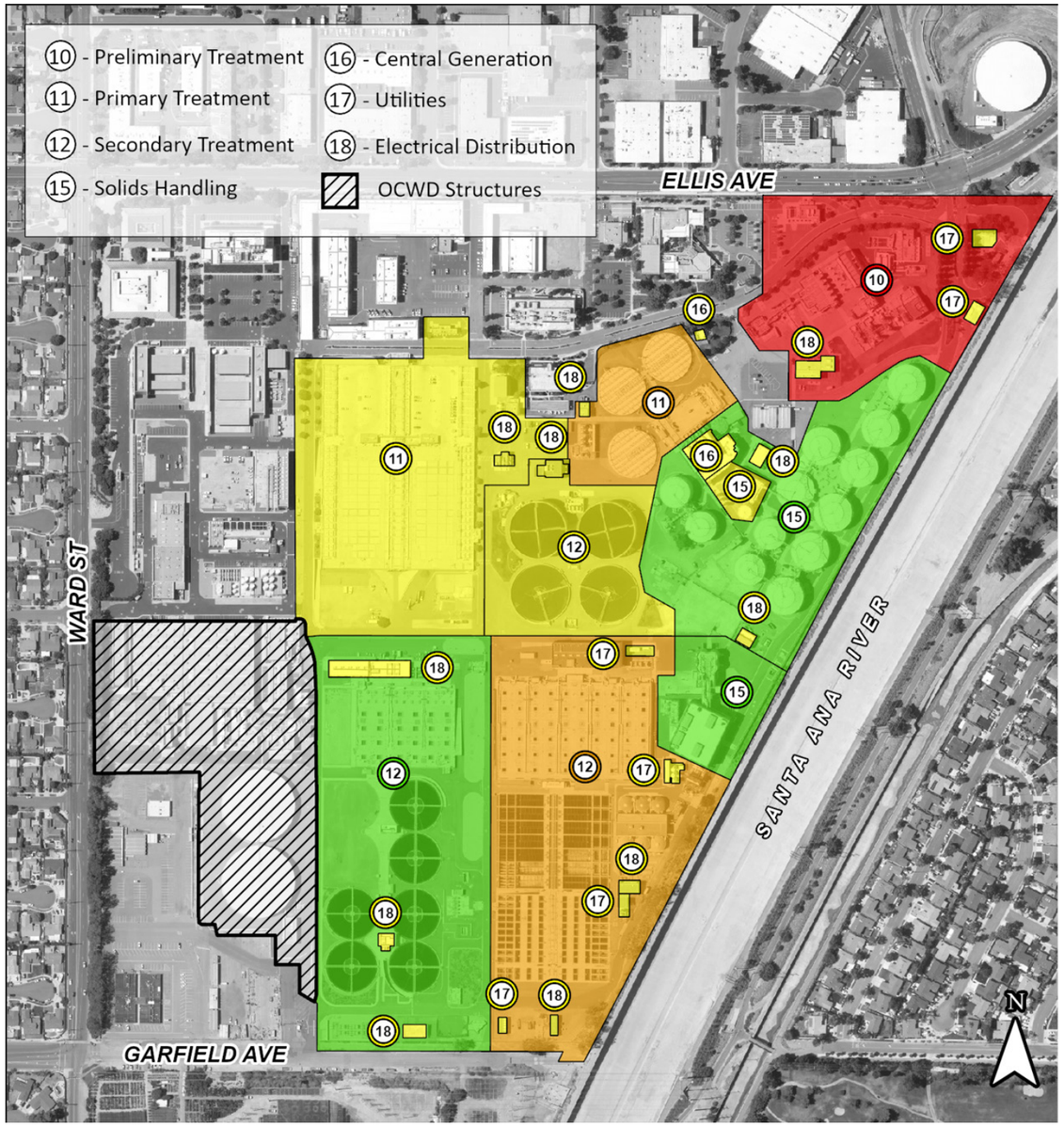


Table ES-1-1. Plant No. 1 Remaining Useful Life and Replacement Value Summary

Area No.	Area Name	Average Remaining Useful Life Score						Percentage of RUL Scores with 4s or 5s	Replacement Value ($ millions, in 2023 dollars)
		Civil	Structural	Mechanical	Electrical	Instrumentation	All Assets		
10	Preliminary Treatment	2	3	5	5	5	5	64%	$416
11	Primary Treatment - Basins (1–5)	4	3	4	5	4	4	71%	$115
11	Primary Treatment - Basins (6–31)	3	3	4	3	3	3	21%	$420
12	Secondary Treatment - Activated Sludge 1 (AS1)	3	3	4	4	5	4	63%	$649
12	Secondary Treatment - Activated Sludge 2 (AS2)	1	1	2	3	2	2	3%	$401
12	Secondary Treatment - Trickling Filter	1	1	4	4	3	3	19%	$73
14	Interplant[a]	2	2	2		1	2	12%	$809
15	Solids Handling - Digesters	2	1	3	2	2	2	2%	$274
15	Solids Handling – Thickening & Dewatering (T&D) Facilities	1	1	2	2	2	2	5%	$204
15	Solids Handling - Gas Handling[a]		3	3	3	3	3	23%	$40
16	Central Generation[a]		1	4	4	3	3	54%	$183
17	Utilities	3	1	3	3	3	3	8%	$209
18	Electrical Distribution[a]				3		3	40%	$88
19	Occupied Buildings	*Refer to Asset Management System Summary – Area 19*							$268
	Plant No. 1 Total							**32%**	**$4,149**

RUL Legend:

RUL < 5 years | **RUL 5–10 years** | **RUL 11–15 years** | **RUL 16–20 years** | **RUL > 20 years**

Acronym Key:

AS1 = Activated Sludge Plant No. 1; AS2 = Activated Sludge Plant No. 2; OCWD = Orange County Water District; RUL = Remaining Useful Life; T&D = Thickening and Dewatering

[a] White box with diagonal line indicates there are no assets assigned to this discipline within this process area.

ASSET MANAGEMENT SYSTEM SUMMARY – PLANT NO. 2 OVERVIEW

Figure ES-1-4. Plant No. 2 Process Area – Remaining Useful Life Score Map

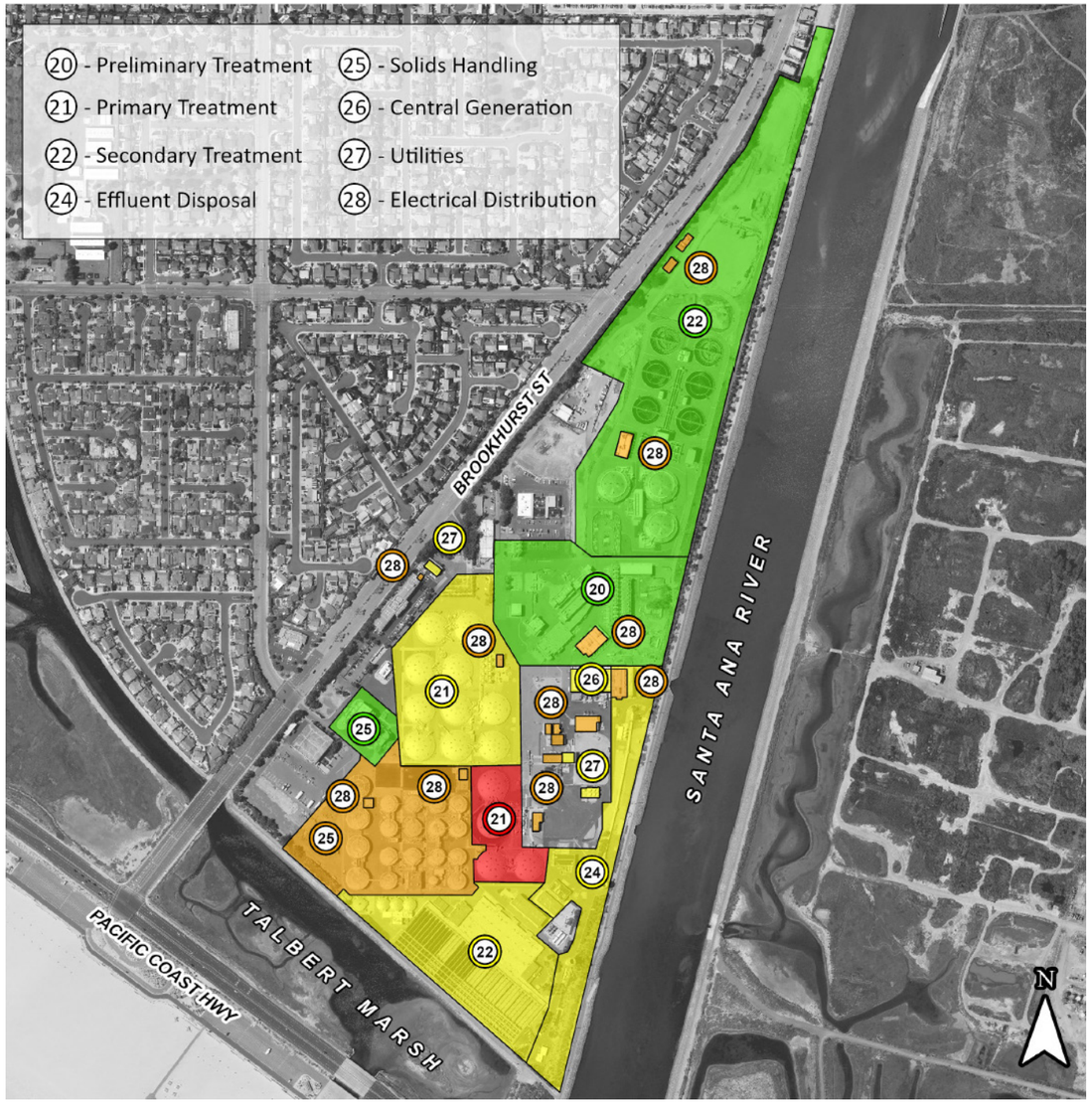


Table ES-1-2. Plant No. 2 Remaining Useful Life and Replacement Value Summary

Area No.	Area Name	Average Remaining Useful Life Score						Percentage of RUL Scores with 4s or 5s	Replacement Value ($ millions, in 2023 dollars)
		Civil	Structural	Mechanical	Electrical	Instrumentation	All Assets		
20	Preliminary Treatment	1	1	3	3	2	2	10%	$384
21	Primary Treatment - A Side	5	5	5	4	4	5	100%	$179
21	Primary Treatment - B & C Side	4	3	3	3	3	3	20%	$359
22	Secondary Treatment - Activated Sludge (AS)	3	3	3	4	3	3	27%	$659
22	Secondary Treatment – Dissolved Air Flotation Thickener (DAFT)	4	1	2	3	3	3	5%	$62
22	Secondary Treatment - Trickling Filter	2	1	2	3	3	2	1%	$368
24	Effluent Disposal	2	2	3	4	4	3	31%	$968
25	Solids Handling - Digesters	4	4	4	4	4	4	70%	$382
25	Solids Handling - Facilities	2	1	2	3	3	2	3%	$198
25	Solids Handling - Gas Handling[a]		3	3	4	3	4	44%	$40
26	Central Generation[a]		1	4	4	3	3	54%	$391
27	Utilities	3	2	3	3	3	3	5%	$116
28	Electrical Distribution[a]				4		4	68%	$86
29	Occupied Buildings	*Refer to Asset Management System Summary - Area 29*							$157
	Plant No. 2 Total							**40%**	**$4,349**

RUL Legend:

RUL < 5 years | **RUL 5–10 years** | **RUL 11–15 years** | **RUL 16–20 years** | **RUL > 20 years**

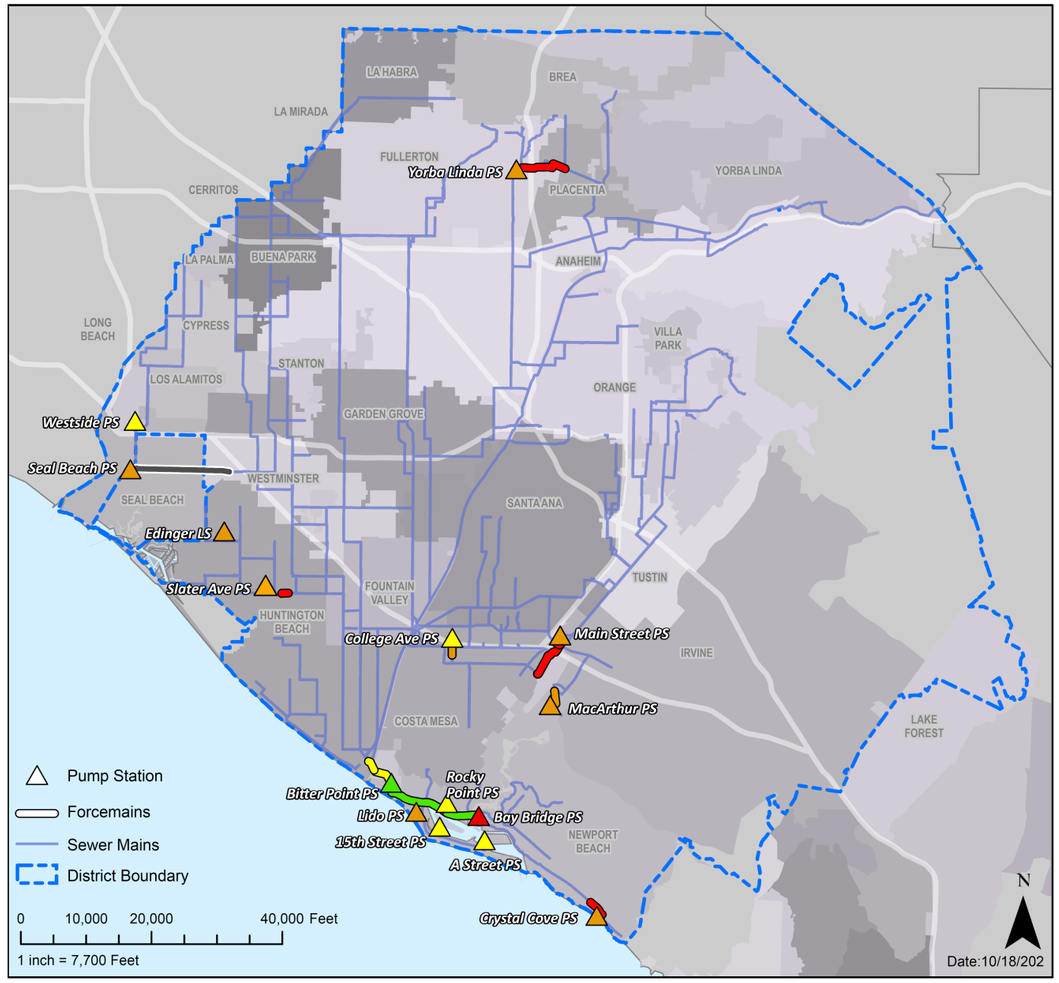
Acronym Key:

AS = Activated Sludge; DAFT = Dissolved Air Flotation Thickener; RUL = Remaining Useful Life

[a] White box with diagonal line indicates there are no assets assigned to this discipline within this process area.

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM PUMP STATION OVERVIEW

Figure ES-1-5. Collection System Pump Station – Remaining Useful Life Score Map



Note: Not all pump station force mains are shown on this map. Only longer force mains are shown. Scores for force mains come from actual force main scores in Chapter 2.

Table ES-1-3. Pump Station and Force Main Remaining Useful Life and Replacement Value Summary

Pump Station	Average Remaining Useful Life Score						Percentage of RUL Scores with 4s or 5s	Replacement Value ($ millions, in 2023 dollars)
	Civil	Structural	Mechanical	Electrical	Instrumentation	All Assets		
15th Street	3	4	4	3	3	3	33%	$16
A Street	3	4	4	3	3	3	25%	$14
Bay Bridge	5	4	5	4	3	5	85%	$39
Bitter Point	3	3	2	2	3	2	15%	$37
College	4	3	3	2	3	3	25%	$28
Crystal Cove	5	4	3	4	2	4	42%	$3
Edinger	5	4	3	4	4	4	64%	$15
Lido	4	4	4	4	3	4	58%	$23
MacArthur	4	5	4	4	3	4	91%	$19
Main Street	5	3	4	3	4	4	46%	$51
Rocky Point	3	3	3	3	4	3	15%	$18
Slater	5	4	4	3	4	4	38%	$41
Seal Beach	1	4	5	5	4	4	83%	$48
Westside	5	3	3	2	3	3	15%	$35
Yorba Linda	5	4	4	4	4	4	73%	Not valued
Newport Force Mains[a]	2					2	0%	
Total							**46%**	**$387**

RUL Legend:

RUL < 5 years | **RUL 5–10 years** | **RUL 11–15 years** | **RUL 16–20 years** | **RUL > 20 years**

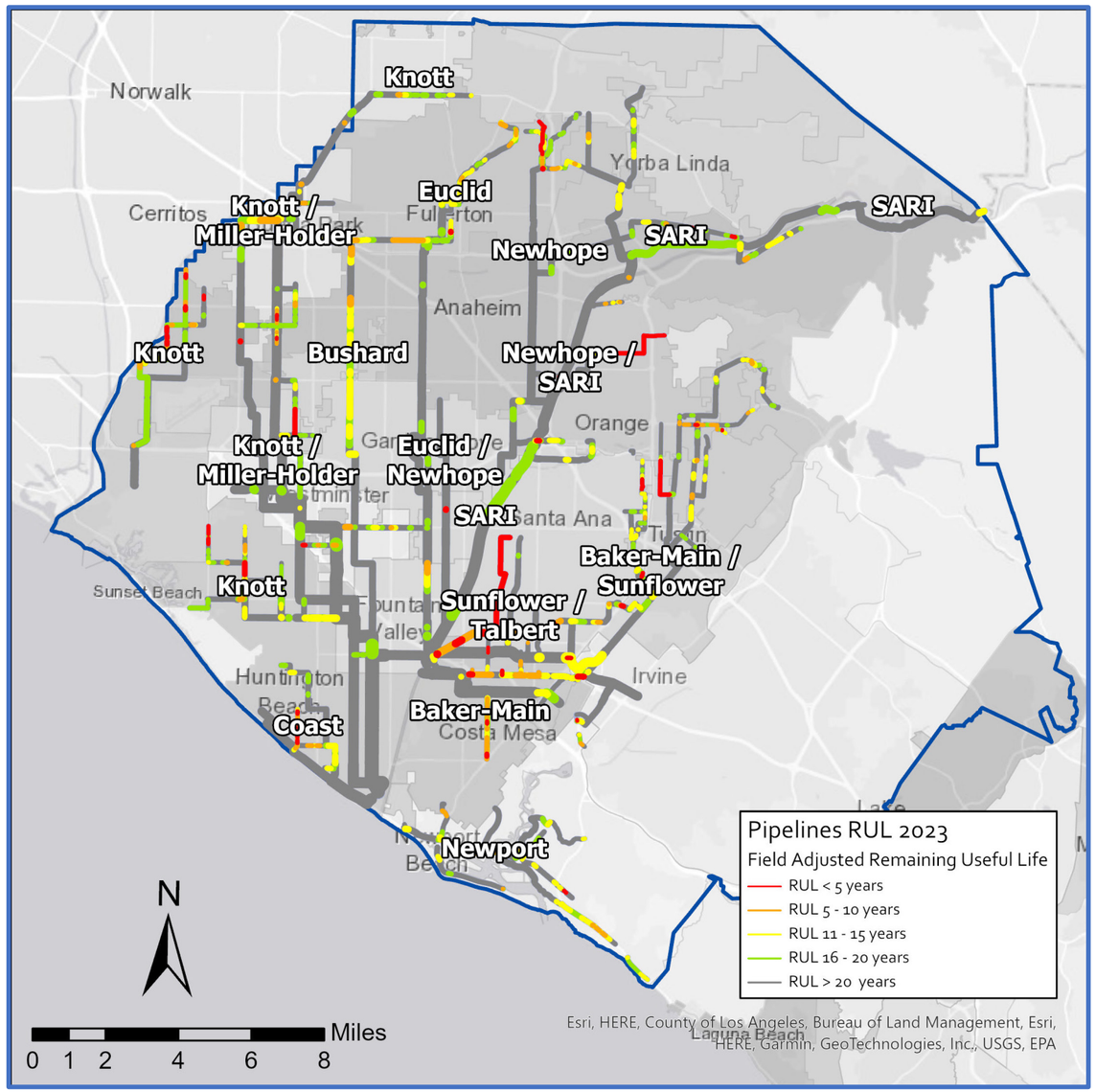
Acronym Key:

PS = Pump Station; RUL = Remaining Useful Life

[a] White box with diagonal line indicates there are no assets assigned to this discipline within this process area.

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM PIPELINES AND MANHOLES OVERVIEW

Figure ES-1-6. Collection System Pipelines and Manholes – Remaining Useful Life Score Map



Note: Only pipelines are shown on this map for clarity. Refer to Collections System Manholes Remaining Useful Life Score Map in Chapter 2 Area Asset Management Summaries.

Table ES-1-4. Collection System Pipelines and Manholes Remaining Useful Life and Replacement Value Summary

Trunklines (TLs)	No. of Pipes with RUL Scores of 4 or 5	Miles of Pipes with RUL Scores of 4 or 5	Percentage of Pipes RUL Scores of 4s or 5s (By Length)	No. of Manholes with RUL Scores of 4s or 5s	Percentage of Manhole RUL Scores of 4s or 5s	Replacement Value ($ millions, in 2023 dollars)[a]
Baker-Main	82	5.70	14%	-[b]	-[b]	$318
Bushard	7	0.81	4%	3	1%	$279
Coast	16	1.05	9%	-[b]	-[b]	$114
Euclid	7	0.79	2%	69	16%	$311
Interplant[c]	0	0.00	0%	-[b]	-[b]	$133
Knott	46	3.19	5%	-[b]	-[b]	$721
Miller-Holder	21	1.56	5%	42	16%	$341
Newhope	22	1.64	6%	85	24%	$241
Newport	11	0.76	4%	28	7%	$249
Santa Ana River Interceptor	54	2.64	5%	158	28%	$595
Sunflower	12	0.55	2%	-[b]	-[b]	$346
Talbert	77	5.93	71%	-[b]	-[b]	$66
Total	**355**	**24.62**	**7%**	**385**	**9%**	**$3,714**

RUL Legend:

RUL < 5 years | **RUL 5–10 years** | **RUL 11–15 years** | **RUL 16–20 years** | **RUL > 20 years**

Acronym Key:

IPE = Interplant Trunk Line E; SARI = Santa Ana River Interceptor

[a] The abandoned pipelines at the Airbase ($6,366,516) and the Harvard Area Trunk Sewer ($191,784) areas are not included in the total.

[b] Only trunks with greater than 50% manhole inspections completed are included in this table and in the Asset Management System Summaries.

[c] Interplant Trunk in this table refers only to IPE assets. Interplant Trunk assets are included with Knott Trunk in its Asset Management System Summary.

Budgetary Considerations

The AMP focuses on documenting short- to long-term planning of maintenance and capital improvement projects to support effective budget development and sustainable operations for robust planning purposes. OC San has been striving to identify more accurately medium- to long-term capital cash flow requirements.

The FY 2023–2024 Budget Update, the second year of the 2-year budget adopted in June 2022, includes updates to the 20-year Capital Improvement Program (CIP) outlay. Figure ES-1-7 includes current and projected CIP projects.

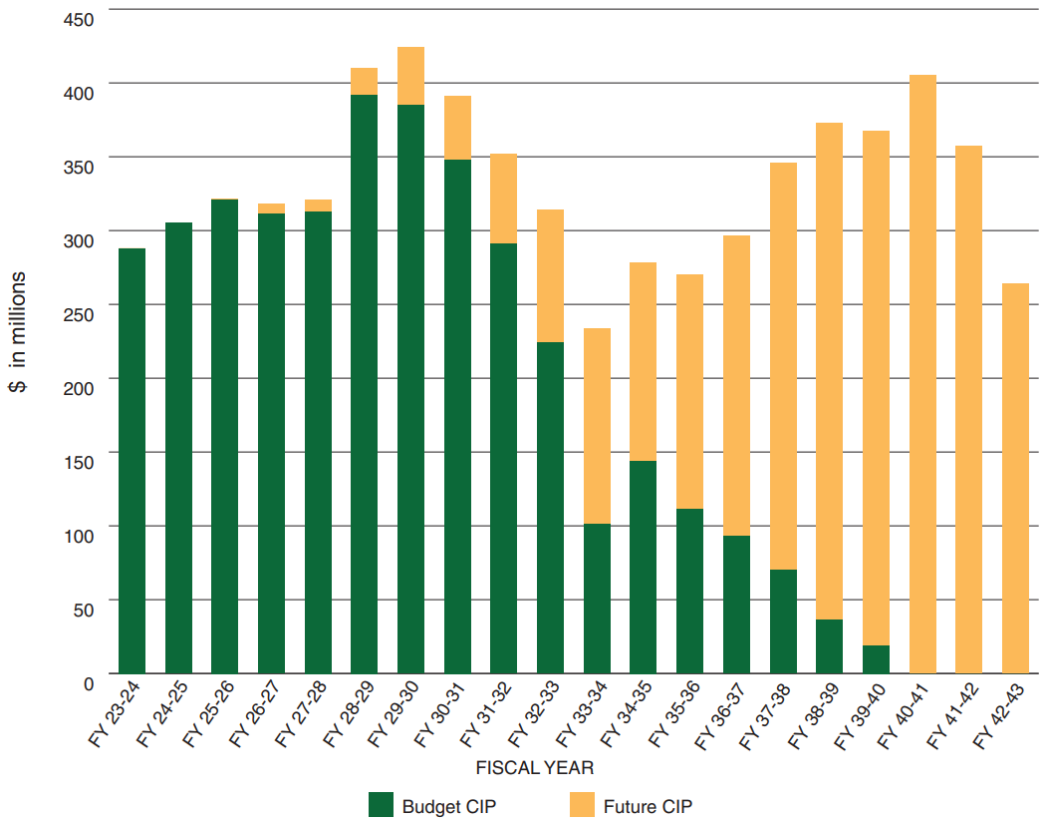


Figure ES-1-7. 20-Year CIP Outlay

This page is intentionally left blank.

1 Introduction

The Orange County Sanitation District (OC San) Board of Directors (Board) developed mission and vision statements to clearly communicate OC San's purpose to our stakeholders and to articulate OC San's organizational objectives. OC San's vision supports our mission by expressing what we strive to achieve now and into the future.

Our Mission

To protect public health and the environment by providing effective wastewater collection, treatment, and recycling.

Our Vision

Orange County Sanitation District will be a leader in:

- *Providing reliable, responsive, and affordable services in line with customer needs and expectations.*
- *Protecting public health and the environment utilizing all practical and effective means for wastewater, energy, and solids resource recovery.*
- *Continually seeking efficiencies to ensure that the public's money is well spent.*
- *Communicating our mission and strategies with those we serve and all other stakeholders.*
- *Partnering with others to benefit our customers, this region, and our industry.*
- *Creating the best possible workforce in terms of safety, productivity, customer service, and training.*

Through improved and robust asset management practices, we are better able to coordinate and plan actions to ensure our collection system, treatment, and resource recovery infrastructure is safe and reliable, and meets the rigorous level of service embodied by our mission statement.

In November 2019, OC San's strategic planning process resulted in the creation of an asset management policy and asset management initiatives. Collectively, the policy and initiatives make up OC San's asset management strategy.

Asset Management Policy

OC San will assess and manage the collection system and treatment plant systems and assets to improve resilience and reliability while lowering life cycle costs. This will be accomplished through adaptive operation, coordinated maintenance and condition assessment, and planned capital investment. Staff will balance maintenance, refurbishment, and replacement strategies to maximize useful life, system availability, and efficiency.

Asset Management Initiatives

- *Create an annual Asset Management Plan documenting the condition of the collection system and treatment plants, and upcoming maintenance or capital projects.*
- *Coordinate the efforts of Operations, Collections, Mechanical Maintenance, Electrical Maintenance, Instrument Maintenance, and Engineering through process teams to assure the OC San's resources are focused on the high priority work functions.*
- *Maintain a 20-year forecast of all CIP projects needed to maintain or upgrade OC San's nearly $12.6 billion in assets on a prioritized risk basis to establish rate structures.*

The Asset Management Plan (AMP) is a living document that describes constantly evolving operation strategies, maintenance and refurbishment plans and adaptations, and CIP implementation initially captured in the Facilities Master Plan and revised on an annual basis through the budgeting process. The information included in the AMP encompasses the breadth of information needed to successfully align the capital and operational planning activities necessary to meet the Asset Management Program objectives. The key objectives that are built into the Asset Management Program include the following:

1) Take a proactive approach to repair, rehabilitate, and replace
2) Ensure assets are reliable and operating when needed.
3) Minimize unplanned outages and equipment downtime.
4) Manage risks associated with asset or service impairment through asset performance optimization.
5) Develop cost-effective management strategies for the long term.
6) Strive to implement world-class asset management strategies through continual improvement in our asset management practices.

The AMP is a key component of OC San's overall planning activities. It aligns with OC San's Strategic Plan and the Facilities Master Plan (inclusive of the projects identified therein), while identifying potential and new opportunities that may require funding in the budget development process. Table 1-1 describes the relationship of the AMP with the other planning activities.

Table 1-1. Linkage between Asset Management Plan and Other Planning Activities

Planning Activity	Description	Planning Horizon	Update Cycle
Strategic Plan	Defines the strategic initiatives to be pursued by OC San and provides a basis for long-term financial, capital, and operating planning. The AMP aligns with Strategic Plan goals and objectives.	5- to 10-year	Biennial
Facilities Master Plan	Identifies long-term capital improvement plans to address treatment and collection system infrastructure improvement needs. Projects identified in the Facilities Master Plan are incorporated into the AMP and refined as appropriate.	20-year	Varies
Asset Management Plan	Documents the overall condition of treatment and collection system assets and plans to address key condition and performance issues to ensure assets meet OC San's levels of service.	1-year 5-year 10-year and greater	Annual
Budget Book	Lays out the framework of OC San's activities and serves as a source of information for our Board of Directors, rate payers, and employees. It includes operational, capital, and debt service expenditures necessary to support our mission and to execute the Strategic Plan adopted by our Board of Directors. The AMP identifies new operational, maintenance, and capital improvement activities for consideration during the budget development process.	2-year	Annual

1.1 Overview of OC San's Infrastructure

OC San is responsible for providing wastewater collection, treatment, and recycling services to over 2.6 million people in central and northern Orange County, California. OC San's two resource recovery and wastewater treatment facilities treat an average daily wastewater flow of 185 million gallons per day (MGD) from residential, commercial, and industrial sources.

In addition to our plant facilities, OC San owns and operates wastewater collection system infrastructure. Our collection system infrastructure includes 388 miles of regional trunk sewer pipelines and 15 pump stations throughout OC San's service area (Figure 1-1). Wastewater is conveyed via the collection system to Reclamation Plant Number (No.) 1 in Fountain Valley, and Treatment Plant No. 2 in Huntington Beach, where resource recovery and wastewater treatment take place.

OC San's treatment plants operate under a regulatory permit from the Regional Water Quality Control Board (RWQCB). This authority is established through the National Pollutant Discharge Elimination System (NPDES) that permits the discharge of treated wastewater through an ocean outfall system to the Pacific Ocean. While some treated water is released 5 miles offshore through a deep-water ocean outfall system, most is recovered and delivered to the Orange County Water District (OCWD). OCWD further treats OC San's effluent using the Groundwater Replenishment System (GWRS), which improves the effluent water quality to drinking water standards for groundwater recharge and irrigation purposes. The following sections briefly describe the key systems under OC San's management.

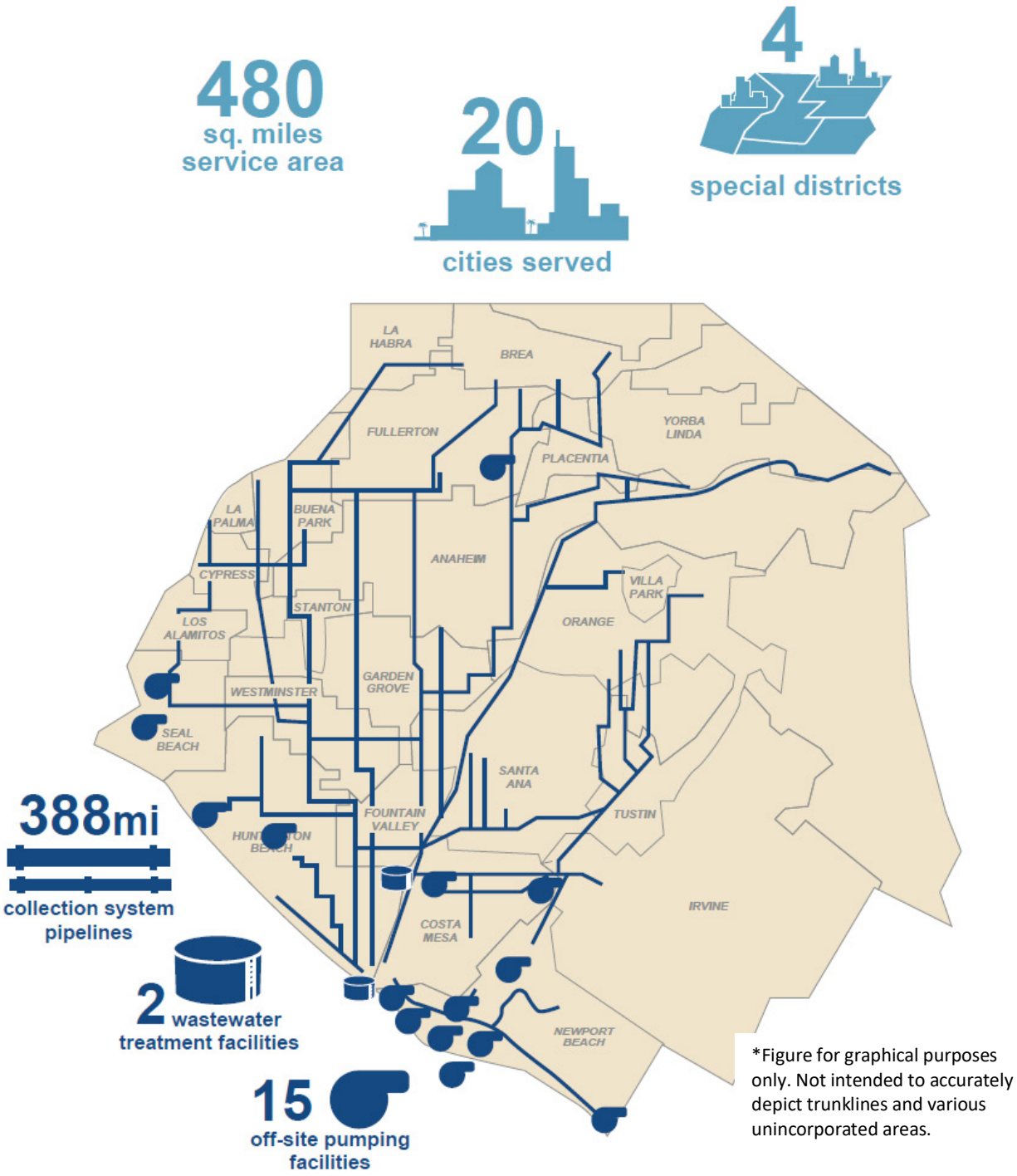
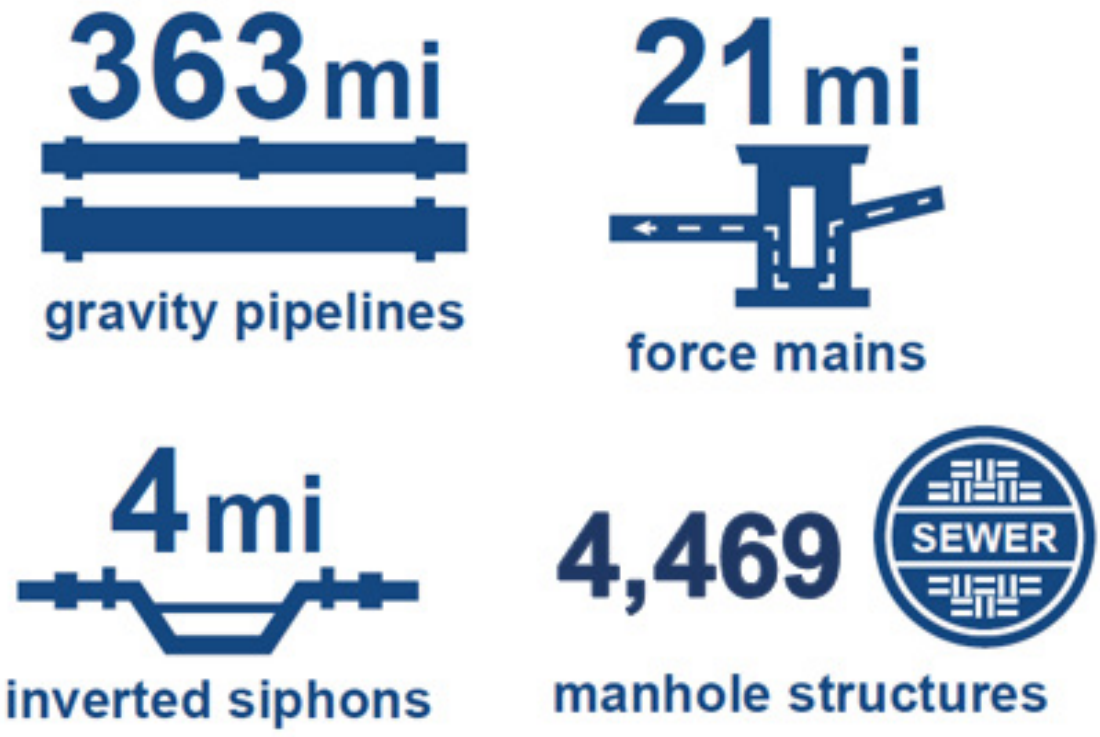


Figure 1-1. OC San's Service Area

1.1.1 Collection System

OC San's collection system serves as a regional conveyance system, collecting and conveying wastewater flows from 20 cities, 4 special districts, and various unincorporated areas, and accommodates dry weather urban runoff. OC San's 388 miles of collection system pipelines and 15 pump stations are spread throughout northern Orange County and include 363 miles of gravity pipelines, 21 miles of force mains, 4 miles of inverted siphons, and 4,469 manhole structures.



OC San has worked with member city and agency staff to understand future development plans and flow estimates, and has collected historical inflow and infiltration rates during wet weather events to assure adequate flow-carrying capability exists in each trunk sewer system. OC San also factors in the effects of drought and lower domestic water usage rates to make sure the sewers operate properly at low-flow rates. Table 1-2 summarizes the design capacities of the pump stations.

Table 1-2. Pump Station Design Capacity

Pump Station	Location	Design Capacity (MGD)
Bitter Point	Newport Beach	39.4
Rocky Point	Newport Beach	6.5
Bay Bridge	Newport Beach	18.2
Crystal Cove	Newport Beach	0.8
Lido	Newport Beach	5.5
15th Street	Newport Beach	2.6
A Street	Newport Beach	1.4
MacArthur	Newport Beach	3.6
Main Street	Irvine	60
Seal Beach	Seal Beach	31.7
Slater	Huntington Beach	28.8
Westside	Los Alamitos	21.6
Edinger	Huntington Beach	2.5
College Avenue	Costa Mesa	8
Yorba Linda	Fullerton	11.5

1.1.2 Reclamation and Treatment Plant System

OC San owns and operates two wastewater treatment plants that serve two primary functions: treatment and reclamation. **Reclamation Plant No. 1** (Plant No. 1) is located in the City of Fountain Valley, approximately 4 miles inland of the Pacific Ocean and adjacent to the Santa Ana River. Influent wastewater entering Plant No. 1 passes through a flow metering and diversion structure, mechanical bar screens, grit chambers, and primary basins, before going to one of two air-activated sludge processes, or trickling filters (TFs), and secondary clarifiers. Thereafter, secondary effluent is diverted to OCWD's facilities for tertiary treatment before reuse. The remaining flow goes to the Plant No. 2 ocean outfall system. For a summary of Plant No. 1 design capacity, please refer to Table 1-3. For a map of the facilities and more detailed understanding of how Plant No. 1 treatment processes work together, please refer to Appendices A and B, respectively.

Solids treatment at Plant No. 1 includes co-thickening of primary and secondary sludge, followed by anaerobic digestion process and centrifuge dewatering of digested sludge to produce Class B biosolids. Digester gas produced at Plant No. 1 is collected, cleaned, compressed, and transferred via a closed piping system to the Central Power Generation Facility as a renewable fuel for energy generation, and is interconnected to the Plant 2 facility. In addition, Plant No. 1 includes facilities for odor control and chemical addition to support the aforementioned processes.

Treatment Plant No. 2 (Plant No. 2) is located in the City of Huntington Beach, adjacent to the Santa Ana River and east of Pacific Coast Highway. Raw sewage flow entering Plant No. 2 passes through a flow metering structure, mechanical bar screens, and grit removal chambers. Flow then passes through primary basins before being split between the oxygen-activated sludge secondary treatment facility or the TFs/solids contact basins.

With the construction of the Groundwater Replenishment System (GWRS) final expansion and associated projects completed in 2023, Plant No. 2 reclaimable secondary effluent together with Plant No. 1 secondary effluent is diverting most of its treated water to OCWD for advanced treatment and groundwater injection. For a summary of Plant No. 2 design capacity, please refer to Table 1-4. For a map of the facilities and more detailed understanding of how Plant No. 2 treatment processes work together, before and after the final expansion of the GWRS, please refer to Appendices C, D, and E, respectively.

Solids treatment at Plant No. 2 includes dissolved air flotation thickening of waste-activated sludge (WAS) and secondary sludge, anaerobic sludge digestion of primary and thickened secondary sludge, and centrifuge dewatering of digested sludge to produce Class B biosolids. Plant No. 2 also has facilities for odor control and chemical addition. Digester gas produced at Plant No. 2 is collected, compressed, cleaned, and distributed to the Central Power Generation System as a renewable fuel for energy generation. Compressed digester gas can be shared between the plants through the interplant digester gas line.

Table 1-3. Plant No. 1 Dry/Wet Weather Design Capacity

Treatment Processes	ADWF Capacity (MGD)	PWWF Capacity (MGD)	Notes
Headworks	220	320	After MSP replacement by P1-105, with four duty pumps in service and one standby
Primary	153	352	With one circular and two rectangular PCs out of service
Secondary	182	345	With all basins, TFs, and clarifiers in service

Table 1-4. Plant No. 2 Dry/Wet Weather Design Capacity

Treatment Processes	ADWF Capacity (MGD)	PWWF Capacity (MGD)	Notes
Headworks	144	322	After P2-122, with three large and two small duty pumps in service, and one large pump and one small pump on standby
Primary	156	312	With one PC out of service
Secondary	150	317	With all basins, TFs, and clarifiers in service

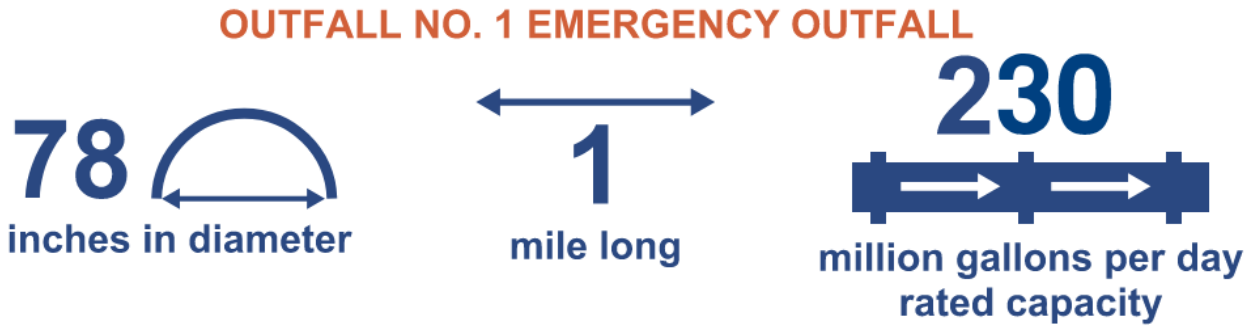
Acronym Key:
ADWF = average dry weather flow; MSP = main sewage pump; PC = primary clarifier; PWWF = peak wet weather flow

1.1.3 Outfall System

The ocean outfall system includes three discharge structures: **Outfall No. 1 (Discharge Point 002)**, **Outfall No. 2 (Discharge Point 001)**, and the **Santa Ana River Emergency Overflow Weirs (Discharge Point 003)**.

Outfall No. 2 serves as the primary ocean outfall, discharging treated wastewater approximately 5 miles offshore at a depth of approximately 200 feet. It began service in 1971. A comprehensive assessment was completed and based on the findings a rehabilitation project is in progress to ensure the outfall's reliability for many years to come.

Outfall No. 1 serves as an emergency outfall and primary backup to Outfall No. 2, discharging treated wastewater over a mile offshore at a depth of approximately 65 feet. It was originally constructed in 1954 and was later modified in 1965. Outfall No. 1 serves as a primary backup to Outfall No. 2. OC San's NPDES permit specifies that this outfall can be used only in the case of an emergency or during planned maintenance activities. This outfall will also go through a comprehensive assessment in the near future.



The outfall system has two **Santa Ana River Emergency Overflow Weirs** at Plant No. 2, which discharge directly to the Santa Ana River. These weirs are for extreme emergency use only and serve as a secondary backup to the primary outfall facilities, ensuring the safety and welfare of the community at large.

1.2 Facility Valuation

As part of the 2017 Facilities Master Plan, OC San commissioned an engineering study to determine the 2017 valuation of all OC San capital facilities, including Plant No. 1, Plant No. 2, interplant and joint treatment facilities, and the collection system (including sewer pipelines and pump stations). The estimated replacement value in Fiscal Year (FY) 2023–2024 is $12.6 billion

based on the Engineering News-Record Construction Cost Index (CCI) increases since the 2017 Facilities Master Plan.

Figure 1-2 shows the valuation information, presented in five general subprocess areas:

- Collections Systems Piping
- Collection Systems Pump Stations
- Reclamation Plant No. 1 Facilities
- Treatment Plant No. 2 Facilities
- Interplant, Joint, and Common Facilities

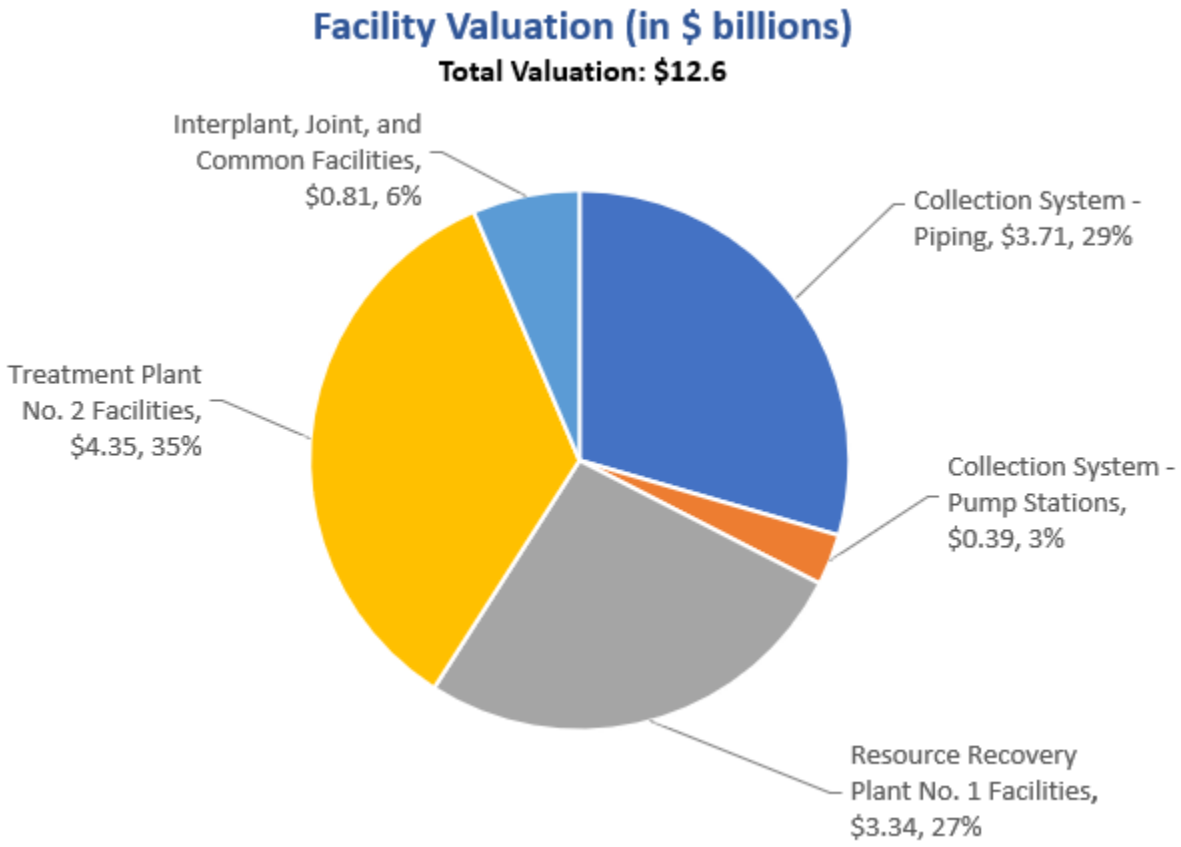


Figure 1-2. Facility Valuation by Area

1.3 Asset Management Organization

Asset management is an essential part of OC San and our overall mission to deliver safe, economical, and reliable wastewater treatment services. Every part of our organization is involved in some aspect of asset management and ensuring that assets are designed, constructed, operated, and maintained to reliably deliver the required level of service to our customers. Through a very collaborative effort, each group plays an important role in ensuring that the individual asset management initiatives are properly executed (Figure 1-3).

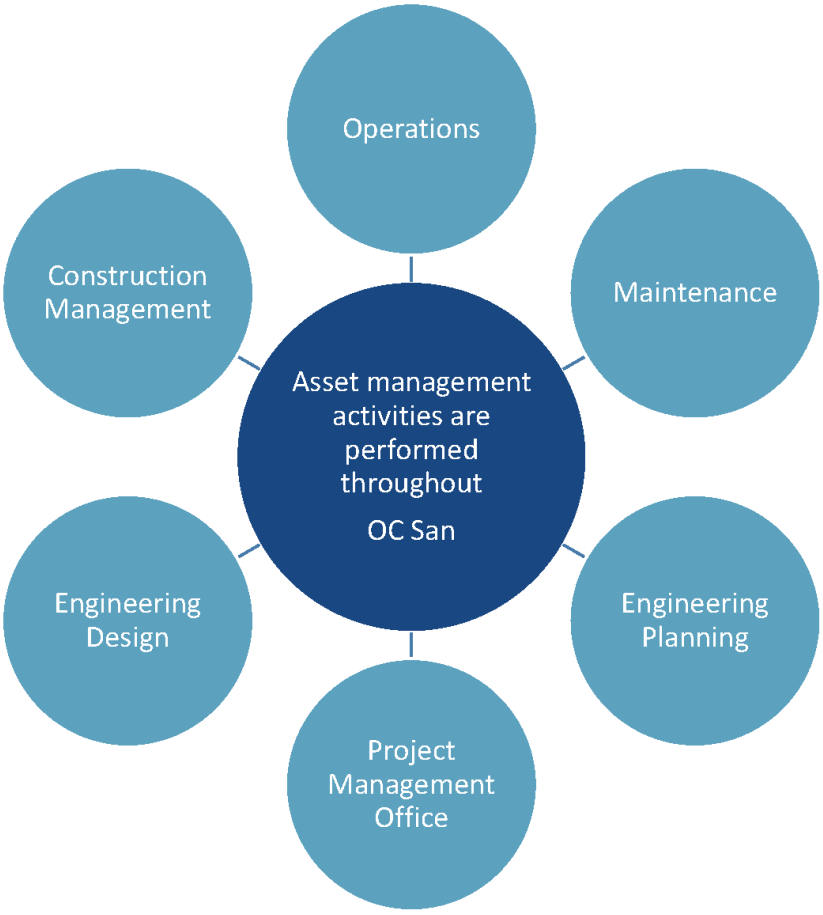


Figure 1-3. Roles in Asset Management

- **Operations** operates and monitors assets and infrastructure that convey, treat, process, and recover resources.
- **Maintenance** performs proactive, corrective, and restorative activities in a planned setting to maintain asset reliability and capacity, collectively referred to as reliability-centered maintenance (RCM). The goals of RCM involve implementing well-coordinated maintenance strategies to ensure OC San's assets will operate at the required level of service.
- **Engineering Planning** provides engineering support for short- and long-term management of assets, while working toward asset management objectives.
- **Engineering Project Management** manages the design and construction of new facilities and the rehabilitation of older facilities. The Small Projects Delivery Team within the Project Management Office is responsible for the design and construction management of facilities and maintenance projects.
- **Engineering Design** ensures projects and assets are designed in accordance with engineering standards and codes and meet stakeholder needs.

- **Construction Management** ensures assets are constructed in accordance with contract requirements.
- **Information Technology** ensures all assets commissioned through projects are included in the Enterprise Asset Management (EAM) database.

To fulfill our commitment to our ratepayers to provide safe and reliable services, OC San's Asset Management Program is structured to align the Engineering and Operations and Maintenance (O&M) departments. OC San's Asset Management Group, within the Engineering Planning Division, consists of nine Asset Engineers assigned to the various process areas in the treatment plants and collection system. They are responsible for understanding the key issues or concerns related to the condition of OC San's assets and for developing and coordinating plans or strategies to ensure that the assets operate reliably and are functioning properly. The Asset Engineers, assigned to their respective process or collection system area(s), work closely with the O&M Area Team members to maintain familiarity with all aspects that may affect the operation, condition, process, and/or maintenance-related issues within their assigned areas. The Operations Team focuses on operating of assets to extend equipment life and minimize energy and chemical use, while meeting all regulatory and level of service requirements. The Maintenance Team is committed to maintaining installed assets in a ready state for Operations and balancing planned maintenance activities with the CIP.

Collectively, the Area Teams work together to reach the goal of providing the required level of service to our customers at the lowest life cycle cost with an acceptable level of risk. This strategy involves a significant investment in internal coordination but ensures that we are properly assessing risks, solving problems, and processing deficiencies in a timely manner.

1.3.1 Major Assets

A "major asset" is defined as any asset that is specifically tracked, monitored, or recorded for the purposes of fulfilling the directives as defined by the AMP. While a major asset is typically defined as a higher-level assembly of simple assets, a major asset can be composed of other assets. For example, while collectively a clarifier can be called a major asset, it is composed of other assets such as pumps, drive mechanisms, motors, etc. Similarly, for buried assets, a system of pipe segments known as a trunkline can be called a major asset. The Asset Engineer uses the term major asset to differentiate and communicate for purposes related to the execution of the AMP, which includes developing short-, medium-, and long-term plans for each process area. It should be noted here that "major assets" are sometimes simply referred to as "assets" for simplicity purposes. Here are some examples of tests that are used to differentiate between a major asset and merely an asset:

- Does it perform a substantial role in the collection, treatment, or effluent process?
- Does its direct use help us to meet level of service and quality metrics?
- Does it require a predictive, proactive, or preventive maintenance service approach to facilitate its management?
- Does its failure present a large impact on a process or system?
- Is its reliability pertinent to the operation of the plant?
- Does its function, or lack thereof, present a detriment to plant performance metrics?
- Is it critical to the operation of the plant?

- Does it have a propensity to affect or influence the safety of the plant?
- Does it directly influence our plant permit compliance?

There are other variations of the definition of an "asset" outside of the AMP. These variations are typically minor and unique to the identifying group based on specific goals and objectives. For example, some variations in the definition exist between those defined in the AMP and by the Maintenance and Finance Departments. The Maintenance definition of an asset serves the Maintenance Department goals and objectives by providing a means to properly track and maintain those assets using an EAM system, Maximo®. Furthermore, the AMP definition of an "asset" deviates from the Finance and Accounting Department's commonly used meaning of an asset, because that definition is relative to accounting practices for tax purposes. In summary, the Asset Management, Maintenance, and Finance groups look at and define assets somewhat differently, albeit minimally in some cases, and it is important to identify those similarities and differences.

1.3.2 Remaining Useful Life

An asset's RUL is the estimated time remaining until the asset cannot be reliably maintained and fails to provide the required level of service. Failure includes structural failure as well as operational/service failure. The Asset Management Program converts RUL into RUL scoring for each asset on a scale of 1 to 5 per Table 1-5.

Table 1-5. Remaining Useful Life Score versus Remaining Useful Life

RUL Score	5	4	3	2	1
RUL	< 5 years	5–10 years	11–15 years	16–20 years	> 20 years

Asset Engineers determine the RUL of major assets based on a variety of factors:

- Expected RUL from original installation, repair, or rehabilitation date(s) and regular maintenance activities based on historical data (when available)
- Condition assessments, including manned or remote inspections as applicable
- O&M field observations and recommendations
- Performance, maintenance, and reliability history, including condition monitoring reports from the Maintenance Reliability Group
- Regular field inspections of asset areas
- Engineering judgment

1.3.3 Predictive Maintenance

In asset management, Predictive Maintenance (PdM) strategies are used to regularly monitor the condition of assets. OC San's Maintenance Reliability Group implements the PdM Program, which collects data through condition monitoring, enabling the real-time performance of assets. The premise of PdM is a proactive approach that minimizes unexpected breakdowns, reduces repair cost, extends the Mean Time Between Failure (MTBF), monitors the actual equipment health through quantifiable means, and performs advanced analysis and failure detection (Figure 1-4). In addition, when sudden changes or variations in the process manifest, they are often found during the regular Maintenance Reliability rounds as part of the group's everyday work. The ability to monitor equipment lends itself to helping Maintenance optimize intervals

between corrective repairs, minimizing the number and cost of unscheduled repairs created by machine-train failures, improving the overall equipment reliability, and assisting the Asset Management Group with accurately determining an asset's RUL.

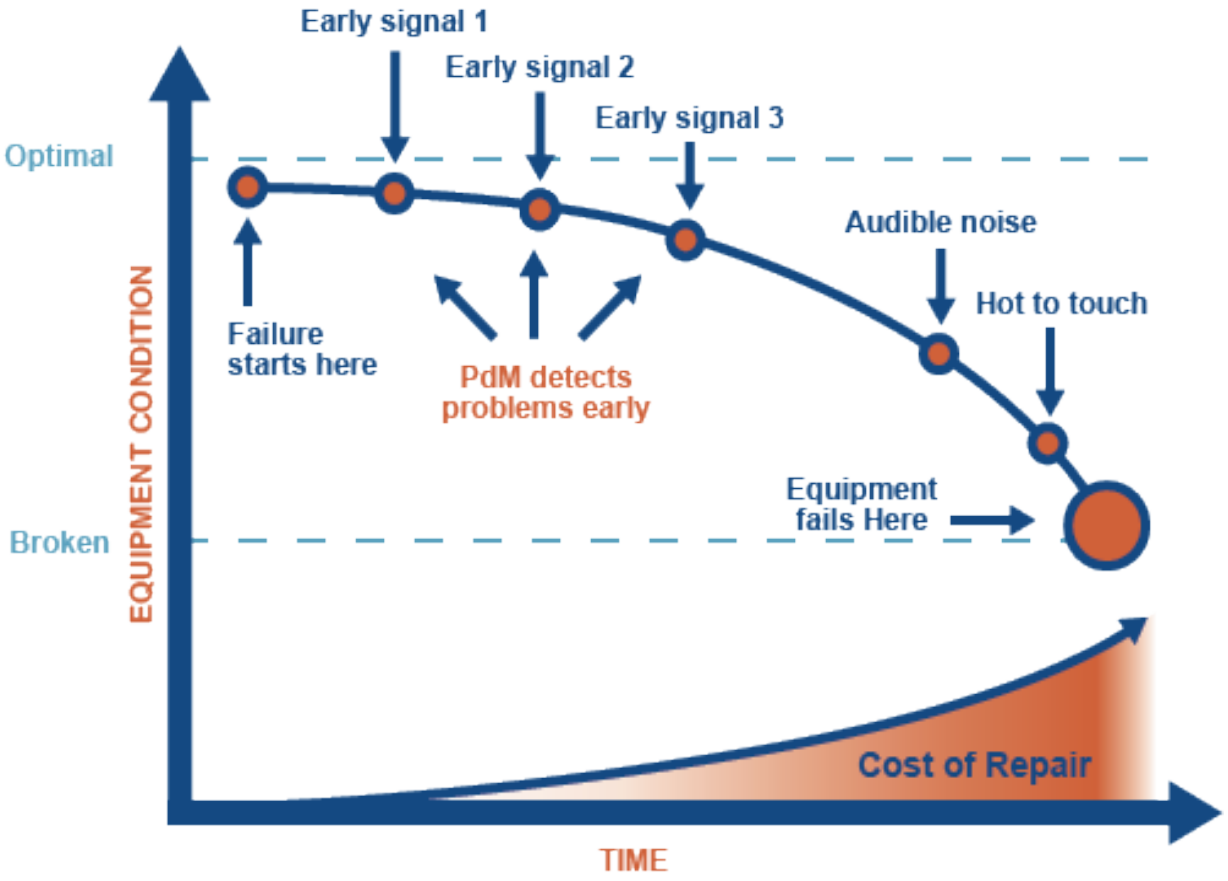


Figure 1-4. PdM Summary

1.3.3.1 Mechanical Discipline

The mechanical discipline involves variance trending of the PdM test results, which includes the following:

- Vibration analysis to measure imbalance in rotating equipment
- Oil analysis to predict lubricant and equipment degradation
- Airborne ultrasound
- Infrared thermograph to detect hot spots
- Iris™ motion camera (measures deflection and displacement)

In addition to PdM activities for mechanical equipment, OC San also uses laser alignment techniques to enhance rotating machinery accuracy to increase the machinery's operating life span.

1.3.3.2 Electrical Discipline

The electrical PdM Program includes the following tests:

- Oil analysis for transformers
- Ultrasound to detect arcing
- Infrared thermography to detect hot spots
- Circuit breakers and protective relays testing
- Motor circuit analysis for large and small motors to determine motor stator health, broken rotor bars, deteriorating motor connections, and any impending failure trends
- Medium-voltage feeder cable testing to determine the health of cables and insulation

1.3.3.3 Civil Discipline

The civil aspect of PdM includes the following:

- Closed-circuit television (CCTV) assessments of buried pipe and manhole structures
- Sonar assessments of inverted siphons
- Structural sampling, testing, and analysis of concrete assets
- Water level monitoring - debris accumulation prediction in the collection system

1.3.4 Preventive and Corrective Maintenance

Beyond the advanced PdM strategies, OC San also performs time and cycle-based preventive maintenance (PM) and corrective maintenance (CM) activities. It is these activities that, if well implemented, greatly extend the life of the assets. Recognizing the importance of these efforts, OC San has dedicated the following two groups of skilled individuals to reinforce and sustain the following activities:

- OC San has created a PM Optimization Group that is tasked with conducting in-depth assessments to optimize preventive maintenance strategies for new and existing assets and to establish maintenance approaches and strategies for assets installed by CIPs prior to beneficial occupancy. The PM Optimization Program tracks, maintains, and manages assets throughout their life cycles, from design, construction, commissioning, beneficial occupancy, operation, and maintenance to the eventual decommissioning or replacement of those assets. This ensures that the asset life cycle is maximized with the lowest risk to process failure by achieving the intended reliability, at the lowest possible cost, and maximizing equipment availability.
- The Maintenance Planning Group drives reliability and effectiveness in the craft-based maintenance work groups they support by ensuring that work groups have sufficient ready-to-execute work with appropriate resources such as tools, materials, labor, and job plans. Maintenance Specialists in this group are responsible for managing blanket maintenance service contracts, planning and scheduling maintenance activities, optimizing PM activities within Maximo® (which includes fine-tuning job plans based on input received from field staff, leads, and Maintenance Supervisors and Engineers), and coordinating complex maintenance activities involving shutdowns and outages.

OC San's PM and CM programs are staffed to address the long-term reliable performance of civil, mechanical, electrical, and instrumentation assets. PM and CM activities specific to these disciplines are an integral part of OC San's maintenance program. The following lists provide examples of tasks performed; however, they are not meant to be inclusive of all maintenance responsibilities.

1.3.4.1 Civil Discipline

PM and CM activities include:

- Cleaning of civil facilities and pipelines (collection system)
- Chemical conditioning of the sewage to reduce corrosion and control odors
- Minor repairs
- Application and repair of coatings
- Maintenance and testing of cathodic protection systems

1.3.4.2 Mechanical, Electrical, and Instrumentation Disciplines

PM and CM activities include:

- Valve and gate exercising program comprising more than 264 PM tasks for over 1,650 valves and gates in both plants and collection system
- Equipment rotation program to ensure equipment wear is predictable
- Adjustments and mechanical alignments
- Equipment rebuilding and regular testing
- Changing of lubricants and filters
- Electrical equipment cleaning and tightening
- Electrical power distribution equipment
- Circuit breakers and protective relays
- Sensors and meters calibration

1.4 Reference

Society for Maintenance and Reliability Professionals (SMRP). 2013. *Maintenance and Reliability Best Practices.* 4th Edition.

2 State of OC San's Infrastructure

The Area Asset Management (AM) Summaries are intended to summarize the condition of major assets, identify key issues for further investigation, and summarize maintenance and CIP projects planned over the next 10 to 15 years. The approach for developing the AM Summaries is to assemble a list of major assets, document key issues, define the average remaining useful lives of these assets, and identify OC San's plan to address performance and reliability issues of these assets over the 1-, 5-, and 10-year planning horizons. Each month, Asset Engineers present one or more of the AM Summaries to the AM Council; over the course of a year all the process areas, pump stations, and collection systems are presented. The Area AM Summaries are updated as needed and incorporated into the AMP, which is published annually.

2.1 Asset Management System Summaries

The following system-level summaries provide a high-level overview of the Area AM Summaries contained in Section 2.2. The RUL scores are an average of the RUL scores for that discipline within that process area. Detailed condition scores are presented in the Area AM Summaries. The system-level summaries are organized by the following:

- Plant No. 1
- Plant No. 2
- Collection System – Pump Stations
- Collection System – Pipelines and Manholes

The system-level summaries include an area map (Figures 2-1 through 2-4) showing the general layout of the process areas or collection system, and a table (Tables 2-1 through 2-4) with the following fields:

- **Area No.:** Number that corresponds to individual plant asset areas. Plant No. 1 asset areas are numbered 10 to 19, and Plant No. 2 asset areas are numbered 20 to 29.
- **Area Name:** Name of asset area.
- **Average RUL Score:** Estimated average RUL score for each discipline (civil, structural, mechanical, electrical, and instrumentation) or area based on an average of the RUL scores provided by Asset Engineers in the detailed Area AM Summaries.
- **Percentage of RUL Scores with 4s or 5s:** Percentage based on total number of RUL scores assigned to each area by Asset Engineers in the detailed Area AM Summaries. The percentage is an alternate metric for the overall condition of the area.
- **Replacement Value ($ million):** Process area replacement value in FY 2023–2024 dollars based on the Engineering News-Record CCI increases since the 2017 Facilities Master Plan.

This page is intentionally left blank.

ASSET MANAGEMENT SYSTEM SUMMARY – PLANT NO. 1 OVERVIEW

Figure 2-1. Plant No. 1 Process Area – Remaining Useful Life Score Map

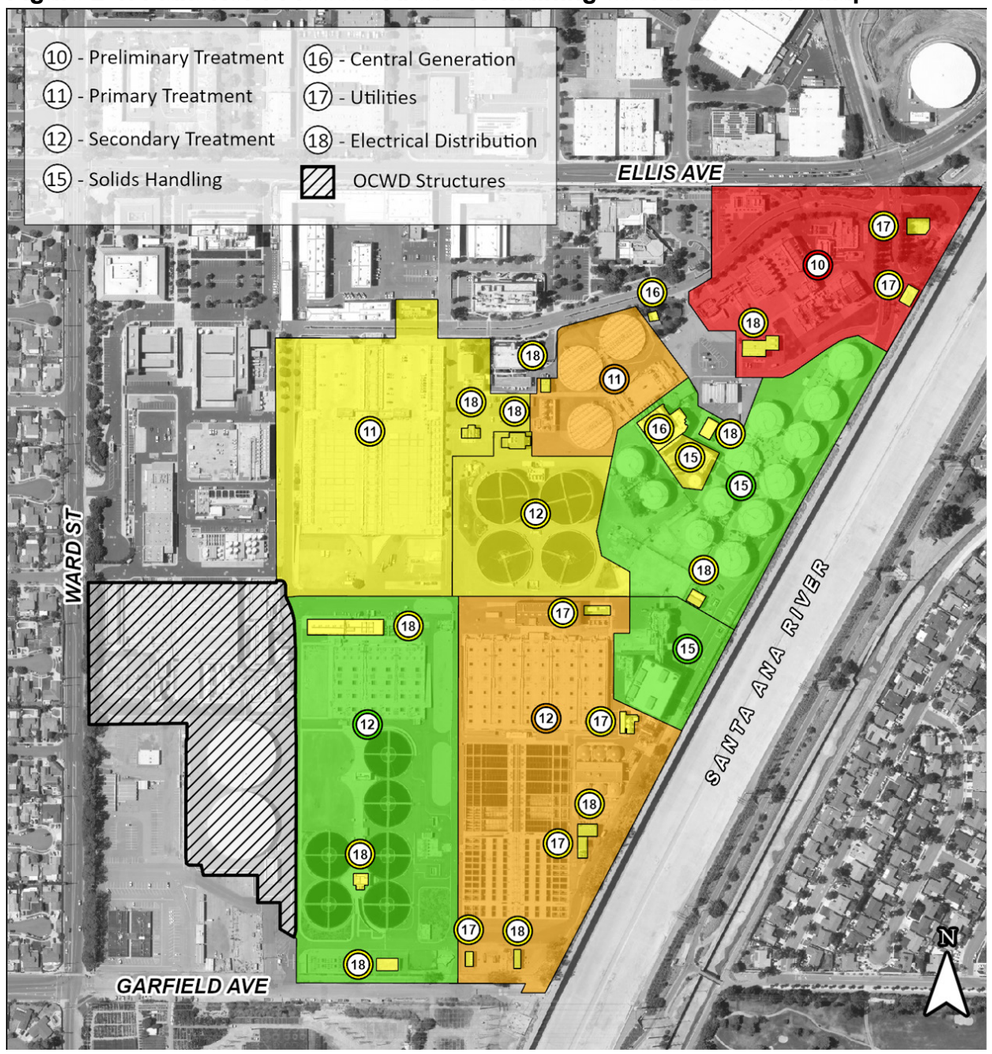


Table 2-1. Plant No. 1 Remaining Useful Life and Replacement Value Summary

Area No.	Area Name	Average Remaining Useful Life Score						Percentage of RUL Scores with 4s or 5s	Replacement Value ($ millions, in 2023 Dollars)
		Civil	Structural	Mechanical	Electrical	Instrumentation	All Assets		
10	Preliminary Treatment	2	3	5	5	5	5	64%	$416
11	Primary Treatment - Basins (1–5)	4	3	4	5	4	4	71%	$115
11	Primary Treatment - Basins (6–31)	3	3	4	3	3	3	21%	$420
12	Secondary Treatment – Activated Sludge 1 (AS-1)	3	3	4	4	5	4	63%	$649
12	Secondary Treatment – Activated Sludge 2 (AS-2)	1	1	2	3	2	2	3%	$401
12	Secondary Treatment – Trickling Filter	1	1	4	4	3	3	19%	$73
14	Interplant[a]	2	2	2		1	2	12%	$809
15	Solids Handling - Digesters	2	1	3	2	2	2	2%	$274
15	Solids Handling – Thickening & Dewatering (T&D) Facilities	1	1	2	2	2	2	5%	$204
15	Solids Handling - Gas Handling[a]		3	3	3	3	3	23%	$40
16	Central Generation[a]		1	4	4	3	3	54%	$183
17	Utilities	3	1	3	3	3	3	8%	$209
18	Electrical Distribution[a]				3		3	40%	$88
19	Occupied Buildings	*Refer to Asset Management System Summary - Area 19*							$268
	Plant No. 1 Total							**32%**	**$4,149**

[a] White box with diagonal line indicates there are no assets assigned to this discipline within this process area.

RUL Legend:

RUL < 5 years | **RUL 5–10 years** | **RUL 11–15 years** | **RUL 16–20 years** | **RUL > 20 years**

Acronym Key:

AS1 = Activated Sludge Plant No. 1; AS2 = Activated Sludge Plant No. 2; OCWD = Orange County Water District; RUL = Remaining Useful Life; T&D = Thickening and Dewatering

ASSET MANAGEMENT SYSTEM SUMMARY – PLANT NO. 2 OVERVIEW

Figure 2-2. Plant No. 2 Process Area – Remaining Useful Life Score Map

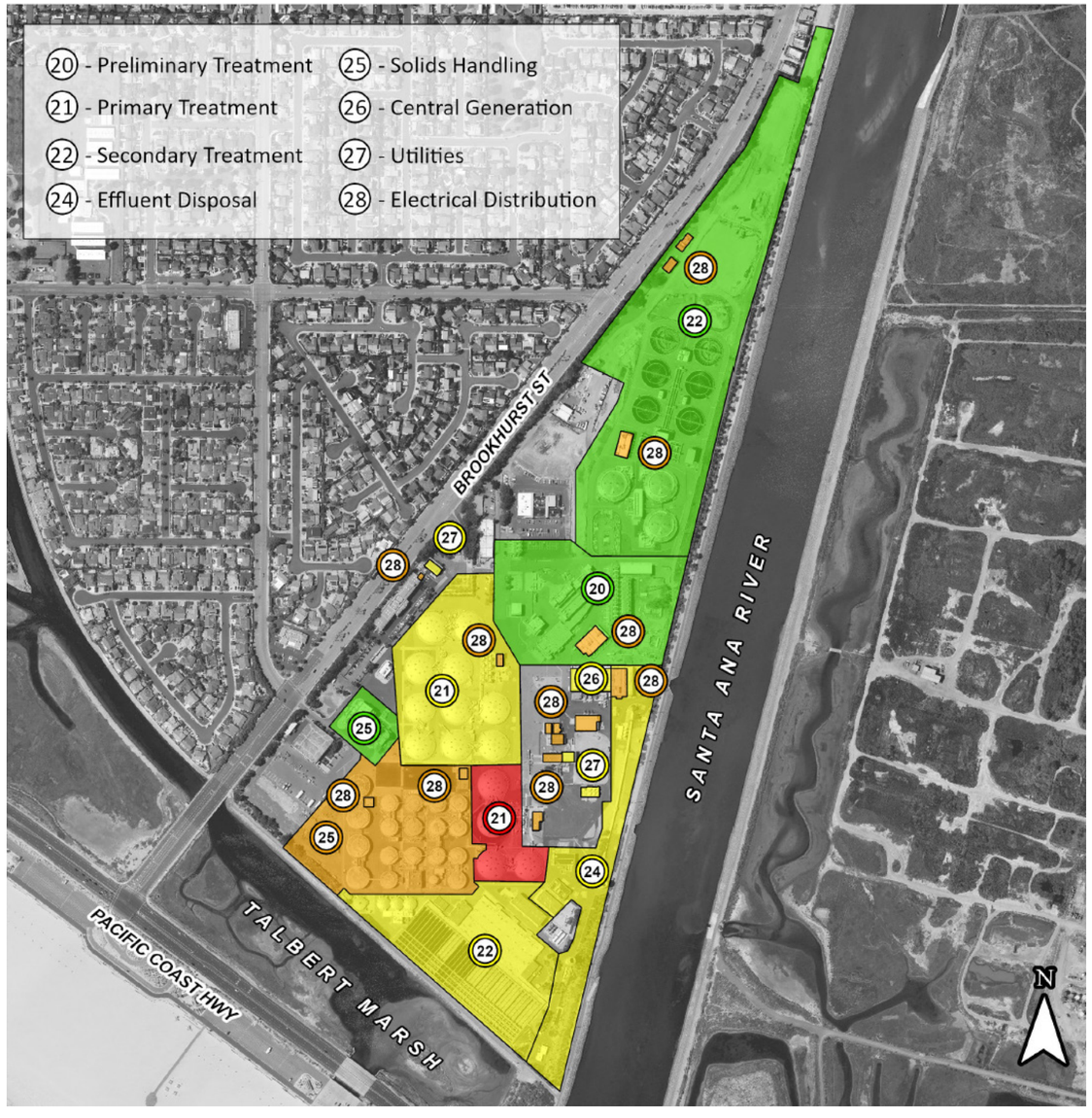


Table 2-2. Plant No. 2 Remaining Useful Life and Replacement Value Summary

Area No.	Area Name	Average Remaining Useful Life Score						Percentage of RUL Scores with 4s or 5s	Replacement Value ($ millions, in 2023 Dollars)
		Civil	Structural	Mechanical	Electrical	Instrumentation	All Assets		
20	Preliminary Treatment	1	1	3	3	2	2	10%	$384
21	Primary Treatment - A Side	5	5	5	4	4	5	100%	$179
21	Primary Treatment - B & C Side	4	3	3	3	3	3	20%	$359
22	Secondary Treatment – Activated Sludge	3	3	3	4	3	3	27%	$659
22	Secondary Treatment - DAFT	4	1	2	3	3	3	5%	$62
22	Secondary Treatment – Trickling Filter	2	1	2	3	3	2	1%	$368
24	Effluent Disposal	2	2	3	4	4	3	31%	$968
25	Solids Handling - Digesters	4	4	4	4	4	4	70%	$382
25	Solids Handling - Facilities	2	1	2	3	3	2	3%	$198
25	Solids Handling - Gas Handling[a]		3	3	4	3	4	44%	$40
26	Central Generation[a]		1	4	4	3	3	54%	$391
27	Utilities	3	2	3	3	3	3	5%	$116
28	Electrical Distribution[a]				4		4	68%	$86
29	Occupied Buildings	*Refer to Asset Management System Summary - Area 29*							$157
	Plant No. 2 Total							**40%**	**$4,349**

[a] White box with diagonal line indicates there are no assets assigned to this discipline within this process area.

RUL Legend:

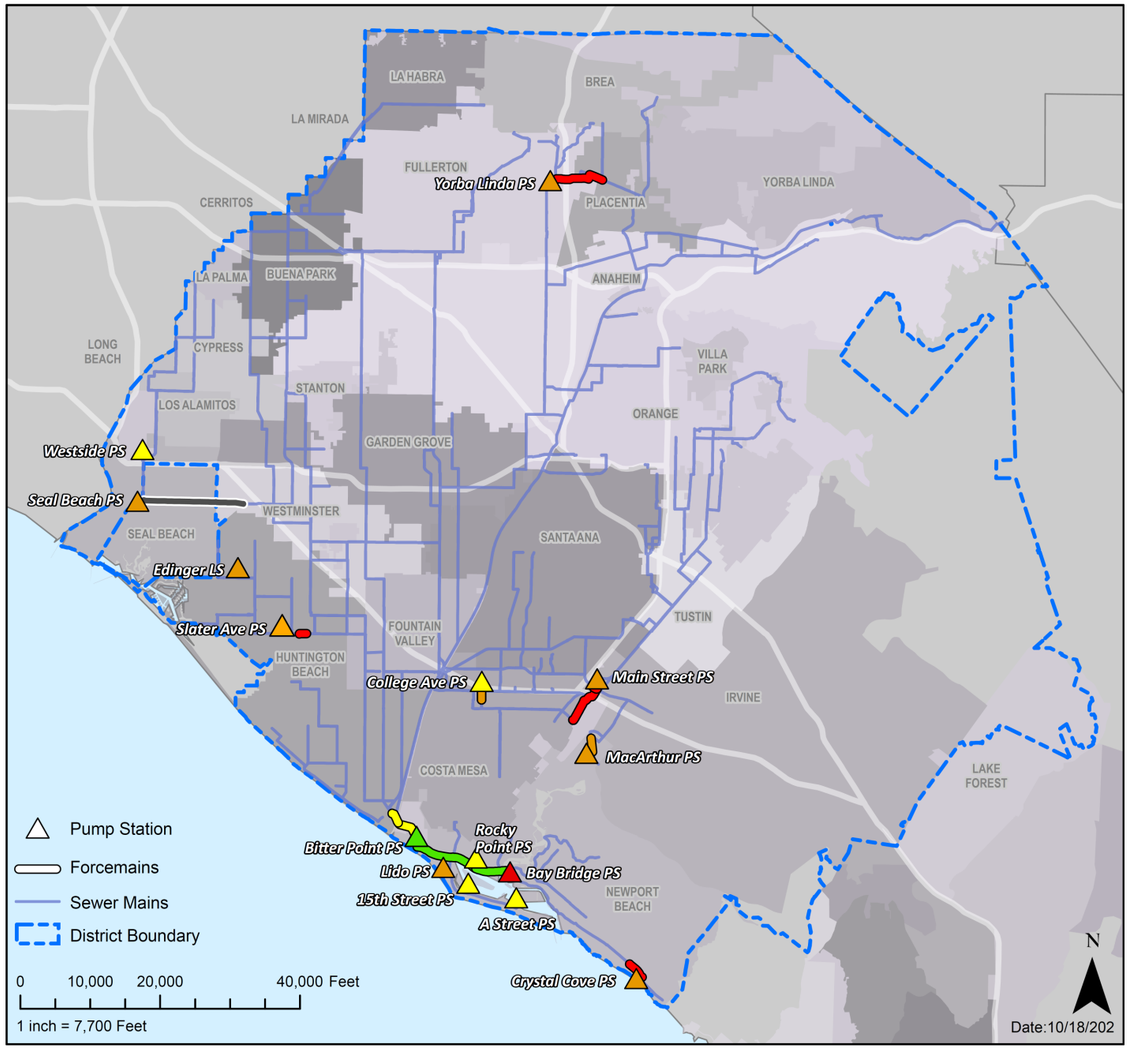
RUL < 5 years | **RUL 5–10 years** | **RUL 11–15 years** | **RUL 16–20 years** | **RUL > 20 years**

Acronym Key:

DAFT = Dissolved Air Flotation Thickener; RUL = Remaining Useful Life

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM PUMP STATION OVERVIEW

Figure 2-3. Collection System Pump Station – Remaining Useful Life Score Map



Note: Not all pump station force mains are shown on this map. Only longer force mains are shown.

Table 2-3. Pump Station and Force Main Remaining Useful Life and Replacement Value Summary

Pump Station	Average Remaining Useful Life Score						Percentage of RUL Scores with 4s or 5s	Replacement Value ($ millions, in 2023 Dollars)
	Civil	Structural	Mechanical	Electrical	Instrumentation	All Assets		
15th Street	3	4	4	3	3	3	33%	$16
A Street	3	4	4	3	3	3	25%	$14
Bay Bridge	5	4	5	4	3	5	85%	$39
Bitter Point	3	3	2	2	3	2	15%	$37
College	4	3	3	2	3	3	25%	$28
Crystal Cove	5	4	3	4	2	4	42%	$3
Edinger	5	4	3	4	4	4	64%	$15
Lido	4	4	4	4	3	4	58%	$23
MacArthur	4	5	4	4	3	4	91%	$19
Main Street	5	3	4	3	4	4	46%	$51
Rocky Point	3	3	3	3	4	3	15%	$18
Slater	5	4	4	3	4	4	38%	$41
Seal Beach	1	4	5	5	4	4	83%	$48
Westside	5	3	3	2	3	3	15%	$35
Yorba Linda	5	4	4	4	4	4	73%	Not valued
Newport Force Mains[a]	2					2	0%	
Total							**46%**	**$387**

[a] White box with diagonal line indicates there are no assets assigned to this discipline within this process area.

RUL Legend:

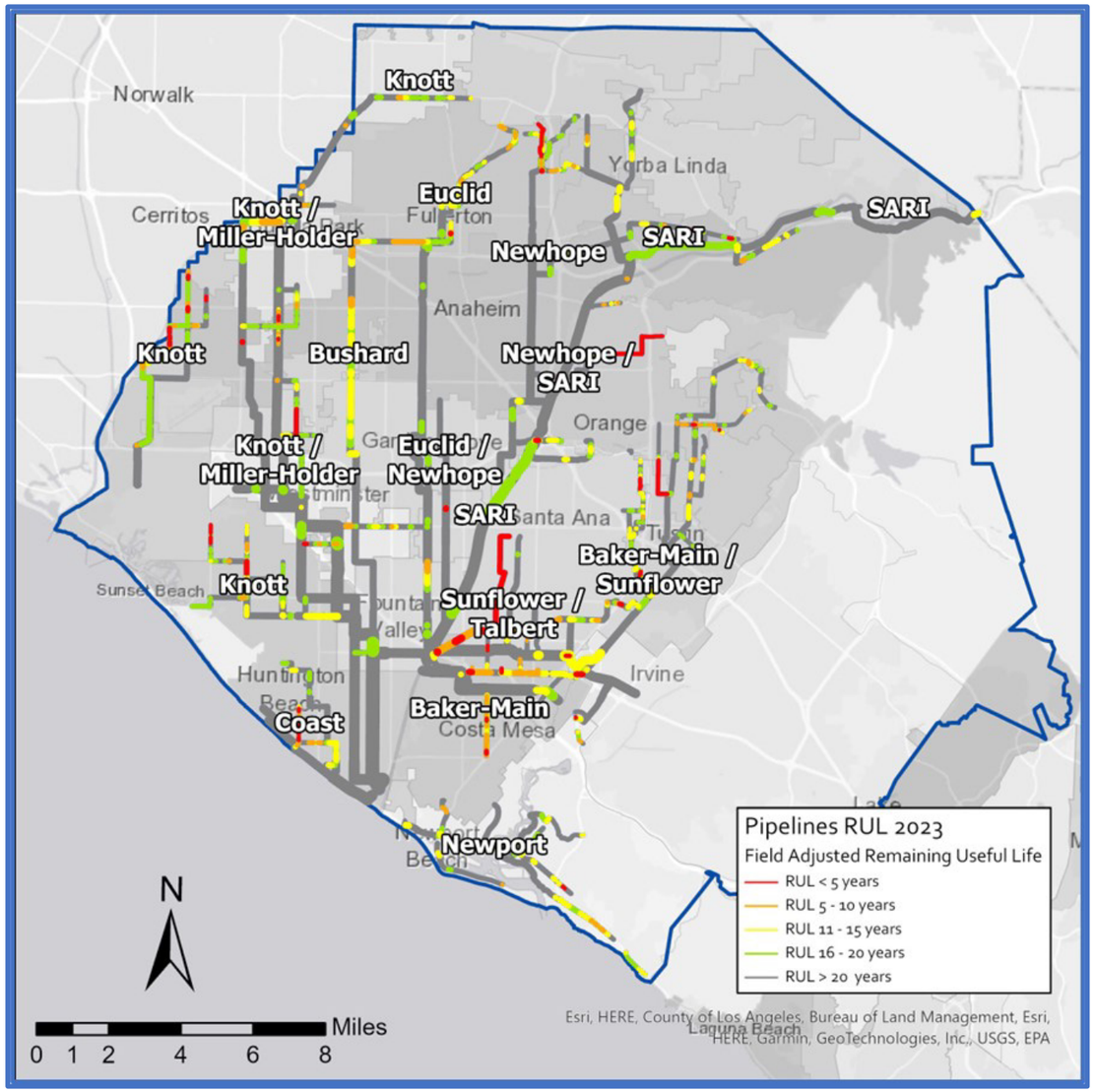
RUL < 5 years | **RUL 5–10 years** | **RUL 11–15 years** | **RUL 16–20 years** | **RUL > 20 years**

Acronym Key:

PS = Pump Station; RUL = Remaining Useful Life

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM PIPELINES AND MANHOLES OVERVIEW

Figure 2-4. Collection System Pipeline and Manholes – Remaining Useful Life Score Map



Note: Only pipelines are shown on this map for clarity. Refer to Collections System Manholes Remaining Useful Life Score Map in Chapter 2, Area Asset Management Summaries.

Table 2-4. Collection System Pipelines and Manholes Remaining Useful Life and Replacement Value Summary

Trunklines (TL)	No. of Pipes with RUL Scores of 4 or 5	Miles of Pipes with RUL Scores of 4 or 5	Percentage of Pipes RUL Scores of 4s or 5s (By Length)	No. of Manholes with RUL Scores of 4s or 5s	Percentage of Manhole RUL Scores of 4s or 5s	Replacement Value ($ Millions, in 2023 Dollars)[a]
Baker-Main	82	5.70	14%	-[b]	-[b]	$318
Bushard	7	0.81	4%	3	1%	$279
Coast	16	1.05	9%	-[b]	-[b]	$114
Euclid	7	0.79	2%	69	16%	$311
Interplant[c]	0	0.00	0%	-[b]	-[b]	$133
Knott	46	3.19	5%	-[b]	-[b]	$721
Miller-Holder	21	1.56	5%	42	16%	$341
Newhope	22	1.64	6%	85	24%	$241
Newport	11	0.76	4%	28	7%	$249
Santa Ana River Interceptor	54	2.64	5%	158	28%	$595
Sunflower	12	0.55	2%	-[b]	-[b]	$346
Talbert	77	5.93	71%	-[b]	-[b]	$66
Total	**355**	**24.62**	**7%**	**385**	**9%**	**$3,714**

[a] The abandoned pipelines at the Airbase ($6,366,516) and the Harvard Area Trunk Sewer ($191,784) areas are not included in the total.
[b] Only trunks with greater than 50% manhole inspections completed are included in this table and in the Asset Management System Summaries.
[c] Interplant Trunk in this table refers only to IPE assets. Interplant Trunk assets are included with Knott Trunk in its Asset Management System Summary.

RUL Legend:
RUL < 5 years **RUL 5–10 years** **RUL 11–15 years** **RUL 16–20 years** **RUL > 20 years**

Acronym Key:
IPE = Interplant Trunk E; RUL = Remaining Useful Life; SARI = Santa Ana River Interceptor

2.2 Area Asset Management Summaries

The following AM Summaries document the current state of process areas in both plants and the collection system. The remainder of this section contains the AM Summaries organized as follows:

Plant No. 1 Asset Management Summaries

- Preliminary Treatment
- Primary Treatment
- Secondary Treatment – AS
- Secondary Treatment – TFs
- Interplant
- Solids Handling – Digesters
- Solids Handling – Facilities
- Central (Power) Generation
- Utilities
- Electrical Distribution
- Miscellaneous and Occupied Buildings

Plant No. 2 Asset Management Summaries

- Preliminary Treatment
- Primary Treatment
- Secondary Treatment – AS
- Secondary Treatment – Trickling Filters/Solids Contact
- Effluent Disposal
- Solids Handling – Digesters
- Solids Handling – Facilities
- Central (Power) Generation
- Utilities
- Electrical Distribution
- Miscellaneous and Occupied Buildings

Collection System Asset Management Summaries

- Pump Stations
- Pipelines and Manholes

The AM Summaries are built around a common structure. This structure provides a framework for continued use and development of the summaries. Key structure elements for AM Summaries are shown on Figure 2-5.

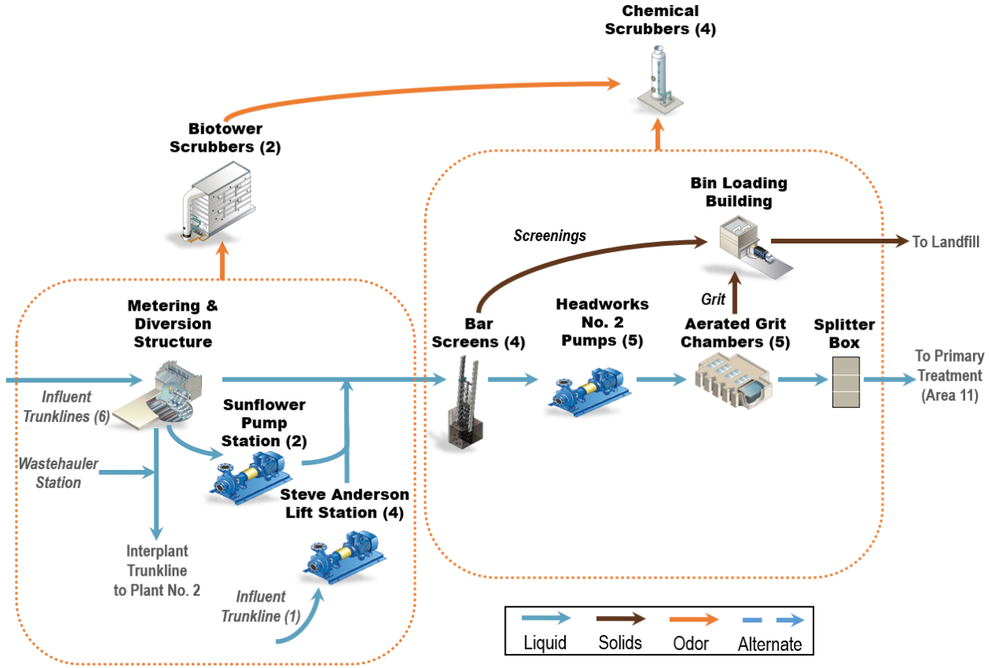
Figure 2-5. Area Asset Management Summary Structure

Plant No. 1 Asset Management Summaries

This page is intentionally left blank.

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 10 – PLANT NO. 1 PRELIMINARY TREATMENT

Process Schematic



Major Assets Remaining Useful Life

Asset Type	Metering & Diversion	Sunflower Pump Station	Steve Andersen Lift Station	Barscreens	Main Sewage Pumps	Grit Chamber	Splitter Box	Bin Loading	Odor Control	Wastehauler Station
Civil										
Effluent Piping	-	-	-	-	-	-	2*	-	-	-
Structural										
General	2	3	1	2	2	2	3	3	3	3
Mechanical										
Piping	5	-	1	-	2*	-	-	-	-	3
Gates/Valves	5	5	2	5	5	5	5	-	5	2
Gearboxes	-	5	-	3	-	-	-	5	-	-
Screens	-	-	-	4	-	-	-	-	-	-
Pumps	-	4	2	-	4	-	-	-	5	-
Conveyors	-	-	-	5	-	-	-	4	-	-
Fans/Blowers	4	4	2	4	5	5	-*	5	5	2
Electrical										
Operators	5	-	-	-	-	-	5	-	-	-
Motors	-	4	1	3	5	-	-	5	-	-
VFDs	-	-	3*	-	5	-	-	-	4	-
MCCs	5	5	2	5	5	5	-	5	5	4
Instrumentation										
General	5	5	3	5	4	-	5	-	5	4

Note: (*) RUL scores that may not reflect most recent development. RUL scores will be updated in the next revision.

Asset RUL Legend:

- RUL < 5 years
- RUL 5–10 years
- RUL 11–15 years
- RUL 16–20 years
- RUL > 20 years

Acronym Key:

MCC = Motor Control Center
RUL = Remaining Useful Life
VFD = Variable Frequency Drive

Major Assets	Quantities
Metering & Diversion	
Flowmeters	7
Gates	29
Sunflower Pump Station	
Screw Pumps	2
Motors	2
Gearboxes	2
Lube Oil Systems	2
Gates	3
Steve Anderson Lift Station	
Main Pump/Motor/VFD	4
Drain Pumps	2
Sump Pumps	4
Flowmeter	1

Major Assets	Quantities
Barscreens	
5/8" Barscreens	2
1" Barscreens	2
Gates	21
Fans	4
Main Sewage Pumps	
Pump/Motor/VFD	5
Gates	15
Splitter Box	
Slide Gates	5
Weir Gates	15
Flowmeters	3

Major Assets	Quantities
Grit Chambers	
Grit Chambers	5
Bulk Gates	18
Slide Gates	15
Flap Gates	5
Blowers	3
Bin Loading	
Paddle Conveyors	2
Belt Conveyor	1
Fans	3

Major Assets	Quantities
Odor Control	
Bioscrubbers	2
Chemical Scrubbers	4
Fans	6
Recirculation Pumps	12
Chemical Tanks	4
Wastehauler Station	
Flushing System/Tank	1
Barrier Arm	1
Fan	1

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 10 – PLANT NO. 1 PRELIMINARY TREATMENT

Key Issues

Key Issues	Actions and Recommendations
• **Headworks Maintainability** – The P1-105 Project will rehabilitate most assets throughout the preliminary treatment area; however, the construction completion date is February 2028. Some assets have very little remaining life or have failed already and will need interim solutions before they are addressed by the project, such as exhaust fans, the hydrogen sulfide (H_2S) monitoring system, and grit paddles.	• Continue to actively monitor the condition of aging assets scheduled for repairs/replacement under P1-105 and develop temporary/minimal solutions as applicable until a permanent solution is provided by P1-105.
• **Sunflower Pump Station** – This pump station is equipped with two screw pumps, which are experiencing issues with bearings and gear boxes. These assets in the pump station are approaching the end of their useful lives.	• FE19-04 is planned to replace Pump No. 1 with associated gear box, bearings, and couplings and rehabilitate the concrete trough. The project will also upgrade electrical and instrumentations required for successful operation of Pump No. 1. Pump No. 2 will be replaced by a separate project (FE19-04 Phase 2) after P1-105 construction completion in 2028.
• **Wastehauler Station** – The station currently lacks an appropriate office building for the staff and that has raised some safety and security concerns.	• FE20-01 will improve the safety and security of the Wastehauler Station by installing entrance and exit gates with a radio frequency identification (RFID) system, providing an office facility for the staff, and installation of two automated sampling systems to collect samples from wastehauler trucks.
• **Steve Anderson Lift Station HVAC** – Both HVAC and condensing units have passed their useful lives with excessive corrosion and reliability issues. Critical electrical and controls at the station are in danger of failure due to heat and humidity levels if these units are not replaced in a timely manner.	• PRN-00953 will replace the existing HVAC and condensing units with new units of the same/similar design to ensure that the systems will continue to maintain adequate temperature and humidity for critical electrical equipment in the building that serves the Ellis Avenue Trunk.

Current and Future Projects

Project No.	Project Title	Impacted Facilities	Description of Work	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35	FY 35/36	FY 36/37	FY 37/38
P1-105	Headworks Rehabilitation at Plant No. 1	Headworks	• Rehabilitate structures of impacted facilities, replace mechanical/electrical/instrumentation as needed throughout impacted facilities, improve grit handling.															
FE19-04	Sunflower Pump Replacement at Plant No. 1	Sunflower Pump Station	• Rehabilitate Sunflower Pump Station and replace pump #1															
PRN-00443	Sunflower Pump Replacement at Plant No. 1 – Pump #2	Sunflower Pump Station	• Replace pump #2 at the Sunflower Pump Station															
PRN-00953	SALS HVAC Replacement at Plant 1	Steve Anderson Lift Station	• Replace existing HVAC split system units (#1 and #2) with like units.															
FE20-01	Wastehauler Station Safety and Security Improvements	Wastehauler Station	• Install automatic samplers, RFID entrance system, and office trailer.															
X-102	Wastehauler Facility Improvements	Wastehauler Station	• Demolish abandoned wastehauler pump station and provide permanent building for staff.															
X-044	Steve Anderson Lift Station Rehabilitation	Steve Anderson Lift Station	• Rehabilitate or replace mechanical, electrical, and instrumentation.															
N/A	Replacement of Bioscrubber Media at Plant 1	TL & M&D Odor Control	• Replace scrubber media for odor control bioscrubbers.															

Types of Project Legend:

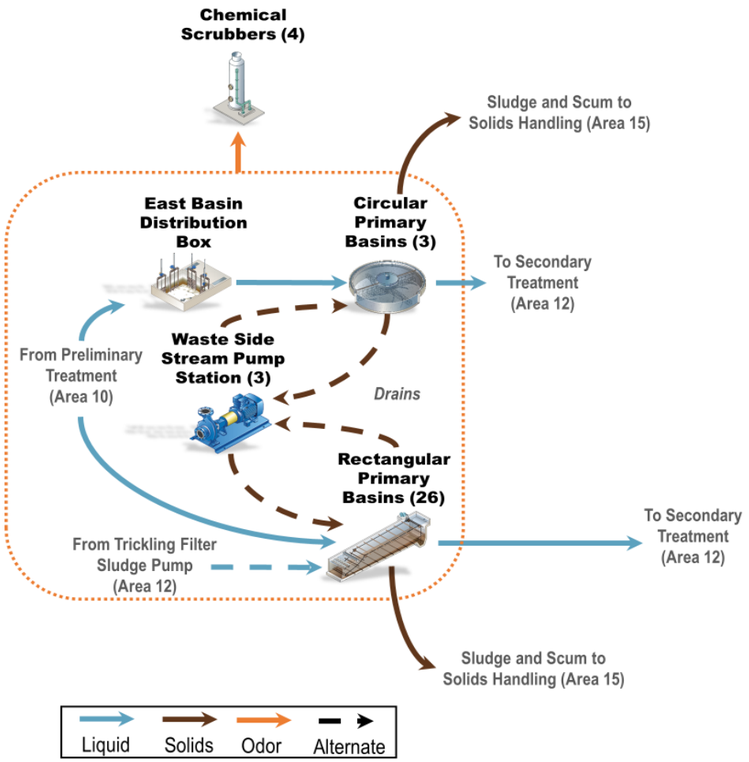
CIP - Planning **CIP - Design** **CIP - Construction** **Maintenance Project**

Acronym Key:

CIP = Capital Improvement Program; FY = Fiscal Year; N/A = not applicable; HVAC = heating, ventilation, and air conditioning; LEL = Lower Explosive Limit; M&D = Metering and Diversion; RFID = Radio Frequency Identification; SALS = Steve Anderson Lift Station; TL = trunkline

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 11 – PLANT NO. 1 PRIMARY TREATMENT

Process Schematic



Note: Primary Basins No. 1 and No. 2 are not shown. The facilities are available for emergency capacity during high flows and are scheduled to be demolished within the next 10 years.

Major Assets Remaining Useful Life

Asset Type	EBDB	PEDB -1	PEJB	PSB 1-2	PSB 3-5	PSB 6-15	PSB 16-31	PISB	Centerfeed Channels	WSSPS-1	Phys. Chem.	Odor Control
Civil												
Effluent Piping	4	5	4	5	4	3	3	-	-	3	-	-
Structural												
Structures	5	4	1	3*	3	2	2	4	3	3	3	3
Cover	-	-	-	3*	3	2	2	2	3	-	-	-
Mechanical												
Piping	-	-	-	-	-	-	-	-	-	3	3	-
Gates/Valves	3	4	3	5	5	3	3	5	3	3	3	3
Sludge/Scum Collection System	-	-	-	5	5	3	3	-	-	-	-	-
Sludge Pumping System	-	-	-	5	4	3	4	-	-	5	-	-
Scum Pumping System	-	-	-	5	4	5	5	-	-	-	-	-
Electrical												
Process – MCC, VFDs	-	-	-	5	5	2	2	2	-	5	3	4
Instrumentation												
PLC, Flow Meters	-	3	-	5	4	3	3	3	-	3	3	5

Note: (*) RUL scores that may not reflect most recent development. RUL scores will be updated in the next revision.

RUL Legend:

RUL < 5 years | RUL 5–10 years | RUL 11–15 years | RUL 16–20 years | RUL > 20 years

Major Assets	Quantities
Rectangular Primary Basins	
Basins	26
Thickened Sludge Pumps	9
Dilute Sludge Pumps	4
Dilute Sludge Sumps	2
Scum Pumps	12
Scum Pits	6

Major Assets	Quantities
Circular Primary Basins	
Basins	3
Sludge Pumps	4
Scum Pumps	3
Chemicals	
Polymer Tanks	4
$FeCl_3$ Tanks	1

Major Assets	Quantities
Waste Sidestream Pump Station 1	
Pumps	3
Primary Odor Scrubber Complex	
Chemical Scrubbers	4
HCl Tanks	1
HCl Pumps	2
NaOH Tanks	1

Major Assets	Quantities
Primary Odor Scrubber Complex	
NaOH Pumps	5
Bleach Tanks	1
Bleach Pumps	8

Acronym Key:
Chem. = Chemical Injection System; EBDB = East Basin Distribution Box; $FeCl_3$ = Ferric Chloride; HCl = Hydrochloric Acid; MCC = Motor Control Center; NaOH = Sodium Hydroxide; PEDB = Primary Effluent Distribution Box; PEDB-1 = Primary Effluent Distribution Box 1; PEJB = Primary Effluent Junction Box; Phys. = Physical Injection System; PISB = Primary Influent Splitter Box; PLC = Programmable Logic Controller; PSB = Primary Sedimentation Basin; RUL = Remaining Useful Life; VFD = Variable Frequency Drive; WSSPS = Waste Sidestream Pump Station

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 11 – PLANT NO. 1 PRIMARY TREATMENT

Key Issues

Key Issues	Actions and Recommendations
• **Rectangular Primary Basins 6–31** – The rectangular primary basins experience relatively frequent issues with mechanical part replacement and sludge pumping systems that require maintenance. These issues require ongoing attention from Maintenance and can affect Plant No. 1's treatment capacity.	• Project P1-133 is planned to address rectangular primary basin reliability and replace launders in the PISB and sludge pumps for primary basins 17–31, and improve the lighting in the area. • X-017 is the future project that will rehabilitate the basins and improve the scum removal system. • Inspecting some areas such as center/influent feed channels remains a challenge. Operation and maintenance need to perform regular preventive maintenance on scum pits and pumps to prevent scum accumulation in the basins, especially during times when capacity is reduced by construction.
• **Rectangular Primary Basins 6–31 Scum Pumps** – The scum pumps are approaching the end of their useful lives. The pumps are also obsolete and replaced parts are difficult to find and have long lead time.	• PRN-00939 will replace the obsolete scum pumps to improve station reliability and availability.
• **Construction Sequencing** – There are many upcoming projects that will perform work on the Plant No. 1 primary treatment system. These projects are largely interdependent and will temporarily impact the primary capacity at Plant No. 1.	• Project P1-126, which will replace the circular basins at P1, is dependent on the schedule of P1-105. Additionally, P1-133, which is improving the reliability of rectangular basins, must be completed prior to the start of P1-126. The X-017 project, which is the future project that will rehabilitate rectangular primary basins completely, can start only after completion of P1-126. Due to all these interdependencies, it is important to continue to holistically assess the primary treatment capacity, especially if project schedules change.
• **Circular Primary Basins 3–5 Leakages** – Junction Structure A (JSA) was leaking through the recently installed bulkhead by P1-105 on demolished Headworks No. 1. There are also potential leakages along the 72-inch piping from the splitter box to the circular basins that led to water collecting inside the basins.	• Coating work on the installed bulkhead and the remaining two pipe joints was completed to provide a watertight seal on the installed bulkhead at the Junction Structure A. However, additional testing and assessment need to be performed to address a new weak point at a different location that appeared after the bulkhead hydrotest. • After the work on West PISB is completed (P1-105), perform dye tests/use CCTV on the 72-inch piping to/from Junction Structure A to identify the weak points and determine a path forward.
• **Scum Management** – The scum collection system in rectangular primary basins have been experiencing operational issues such as trapped scum in various locations, overflow and failure of scum tipping troughs, and clogs in the scum pits and scum pumps.	• PRN-00563 will perform a comprehensive evaluation of the scum collection system and provides recommendations. The study will take the results of previous research studies such as RE19-01 Primary Scum Equipment Evaluation at Plant No. 1 into consideration.
• **WSSPS Pump Ragging** – The pump station has been experiencing increased ragging issues due to the headworks shutdown scheduled for the P1-105 construction. The pumps are approaching the end of their useful lives.	• PRN-00914 will replace one of the WSSPS pumps with a chopper type pump to test the performance the new pump type for this service to mitigate the ragging issues and improve the station's reliability. • Upon improved performance, the other two pumps will be replaced with similar chopper pumps through a subsequent project. • X-006 is the future project that will rehabilitate the pump station and increase the station's capacity.

Current and Future Projects

Project No.	Project Title	Impacted Facilities	Description of Work	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35	FY 35/36	FY 36/37	FY 37/38
PRN-00563	P1-33/37 Scum Study	Primary Basins 6–31	• Perform a study to determine the best solution to the various scum system issues, such as issues for the scum pumping system.															
PRN-00939	PC 6–31 Scum Pump Replacement at Plant No. 1	Primary Basins 6–31	• Replace all 12 existing obsolete scum pumps with new pumps. • Modify pump suction/discharge piping and associated relief valves and steam piping.															
PRN-00914	WSSPS Pump Replacement at Plant No. 1	Waste Sidestream Pump Station	• Replace one of the WSSPS pumps with a chopper pump type to test out new pump type.															
P1-133	Primary Sedimentation Basins (PSBs) Numbers 6–31 Reliability Improvements at Plant No. 1	Primary Basins 6–31	• Upgrade the sludge pumping system. Perform structural repair of launders in PISB. Repair foul air system. • Provide adequate lighting and ventilation alarm improvements to meet current codes.															
P1-126	Primary Clarifiers Replacements and Improvements at Plant No. 1	Primary Basins 3, 4, and 5	• Replace Primary Basins 3, 4, and 5 and primary scrubber system. Rehabilitate associated conveyance pipes and structures. Demolish Primary Basins 1–2.															
X-017	Plant No. 1 Primary Clarifiers 6–31 Rehabilitation	Primary Basins 6–31	• Major rehabilitation of Primary Basins 6–31.															
X-006	Waste Sidestream Pump Station Rehabilitation	Waste Sidestream Pump Station	• Pump station rehabilitation and capacity increase.															

Types of Project Legend:

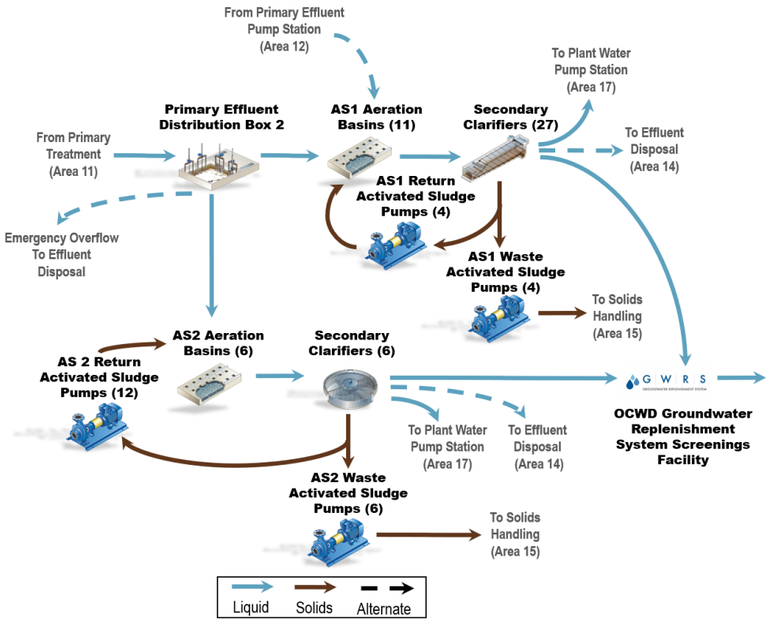
CIP - Planning **CIP - Design** **CIP - Construction** **Maintenance Project**

Acronym Key:

CCTV = closed-circuit television; CIP = Capital Improvement Program; FY = Fiscal Year; GWRS = Groundwater Replenishment System; MGD = Million Gallons per Day; OC San = Orange County Sanitation District; OCWD = Orange County Water District; PISB = Primary Influent Splitter Box; PSB = Primary Sedimentation Basin

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 12 – PLANT NO. 1 SECONDARY TREATMENT – ACTIVATED SLUDGE

Process Schematic



Key Issues – AS1 and AS2

Key Issues	Actions and Recommendations
• **Primary Effluent Pump Station**	• Pumps were rebuilt but do not meet the design pump capacity. • PEPS will be demolished by P1-126 project to allow gravity flow into AS1.
• **Activated Sludge Plant No. 1 – AS1 is an aging facility**	• Condition assessments show corrosion on the reactor wall. Baffle wall supports and vertical airpipes have corrosion in some of the basins. • RAS piping has severe corrosion and will be replaced by FE20-03. • Maintenance is monitoring and replacing the instrumentation equipment as needed.
• **Activated Sludge Basins Diffusers**	• Diffusers are starting to degrade. Maintenance will replace in kind at AS2. P1-140 will replace AS1 diffusers.
• **S1 Blower Controls**	• The blower control system is obsolete and requires an upgrade to operate efficiently. P1-140 will replace blowers and control systems.
• **AS1 Waste-activated Sludge Pumps**	• Pumps have reached the end of useful life and two pumps do not meet pumping capacity required. Will be replaced under P1-140.

Major Assets Remaining Useful Life

Asset Type	PEPS	Blower Building 1	AS1 Aeration Basins	AS1 Clarifiers	AS1 RAS PS	AS1 WAS	AS2 PEPS 2	AS2 Blowers	AS2 Aeration Basins	AS2 Clarifiers	AS2 RAS/WAS PS	WSSPS 2	PEDB-2	AS1 & AS2 Junction Boxes	DAFTs	DAFTs Polymer System
Civil																
Effluent Piping	4	3	3	3	5	3	1	-	-	-	-	-	1	1	4	
Structural																
Buildings	3	3	-	-	4	-	-	1	-	-	-	-	-	-	4	-
Structures	3	3	3	3	-	-	1	-	1	1	-	1	1	1	4	5
Mechanical																
Piping	3	3	4	4	5	3	-	2	2	2	2	2	-	-	5	5
Pumps	5	-	-	-	4	4	-	-	-	-	3	3	-	-	5	5
Diffusers	-	-	4	-	-	-	-	-	4	-	-	-	-	-	-	-
Mixers	-	-	4	-	-	-	-	-	2	-	-	-	-	-	-	-
Solids Collector Mechanism	-	-	-	4	-	-	-	-	-	2	-	-	-	-	5	-
Blowers	-	4	-	-	-	-		2	-	-	-	-	-	-	-	-
Drain Gates & Inlet Gates	-	-	4	4	-	-	1	-	2	2	-	-	2	-	-	-
HVAC & Ventilation	4	4	-	-	-	-	-	3	-	-	-	-	-	-	-	-
Chemical/Polymer Facility	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5
Electrical																
Variable Frequency Drives	3	-	3	3	3	3	-	-	3	3	3	3	-	-	4	4
Motor Control Centers	4	-	4	4	4	4	-	-	2	2	2	2	-	-	4	4
Instrumentation																
PLCs, Flow Meters	5	5	5	5	5	5	-	2	2	2	2	2	-	-	5	5

RUL Legend:

RUL < 5 years | **RUL 5–10 years** | **RUL 11–15 years** | **RUL 16–20 years** | **RUL > 20 years**

Acronym Key:
AS1 = Activated Sludge Plant No. 1; AS2 = Activated Sludge Plant No. 2; DAFT = Dissolved Air Flotation Thickener; HVAC = Heating, Ventilation, and Air Conditioning; OCWD = Orange County Water District; PEDB-1 = Primary Effluent Distribution Box 1; PEDB-2 = Primary Effluent Distribution Box 2; PEPS = Primary Effluent Pump Station; PEPS 2 = Primary Effluent Pump Station 2; PLC = Programmable Logic Controller; PS = Pump Station; PWPS = Plant Water Pump Station; RAS = Return Activated Sludge; RUL = Remaining Useful Life; WAS = Waste-activated Sludge; WSSPS2 = Waste Sidestream Pump Station 2

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 12 – PLANT NO. 1 SECONDARY TREATMENT – ACTIVATED SLUDGE

Major Assets

Major Assets	Quantities
Primary Effluent Pump Station	
Building	1
Wet Well	1
Pumps	3
Discharge Valves	3
AS1 Aeration Basins	
Aeration Basins	10
Inlet Gates	10
AS1 Blower Building 1	
Blower Building	1
Blowers	5

Major Assets	Quantities
AS1 Secondary Clarifiers (SCs)	
Secondary Clarifiers	26
Inlet Gates	78
Sludge Collectors	52
Secondary Clarifiers	26
AS1 RAS PS/WAS PS	
RAS PS Building	1
RAS Pumps	5
WAS Pumps	4
Primary Effluent Pump Station 2	
Structure	1
Gate	1

Major Assets	Quantities
AS2 Aeration Basins	
Aeration Basins	6
Inlet Gates	6
AS2 Blower Building 2	
Blower Building	1
Blowers	4
AS2 Secondary Clarifiers	
Secondary Clarifiers	6
Sludge Collectors	6
AS2 RAS PS/WAS PS	
RAS/WAS Pumps	12/6
Surface Wasting Pumps	6
Scum Pumps	6

Major Assets	Quantities
Waste Side Stream Pump Station 2	
Pumps	2
Structure	1
Primary Effluent Distribution Box 1	
Structure	1
Gates	1
Primary Effluent Distribution Box 2	
Structure	1
Gates	11
AS1 and AS2 Junction Boxes	
Junction Box Structures	8

Major Assets	Quantities
Dissolved Air Flotation Thickeners	
Concrete Tanks	6
Mechanical Sweep	6
Recycle Pumps	12
Retention Tank	6
TWAS Pumps	12
DAFTs Polymer System	
Storage Tank	2
Mix Tank	2
Polymer Transfer Pumps	2
Feed Pumps	6

Current and Future Projects

Project No.	Project Title	Impacted Facilities	Description of Work	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35	FY 35/36	FY 36/37	FY 37/38
FE20-03	Return-Activated Sludge (RAS) Discharge Piping Replacement at Activated Sludge Plant No. 1	AS1 RAS Pipe Discharge	• Replace the RAS discharge pipe located in Basins 3 and 8.															
P1-126	Primary Clarifiers Replacements and Improvements at Plant No. 1	PEPS	• Remove all equipment in PEPS. Gravity feed primary effluent from new primary Basins 3,4, and 5															
P1-140	Activated Sludge 1 and Secondary Clarifier Rehabilitation	AS1 Aeration Basin, Clarifiers, and Blowers	• Major rehabilitation of all mechanical, electrical, and instrumentation assets including the blower system.															
TBD	AS2 Diffuser Replacement	AS2	• Diffuser replacement															

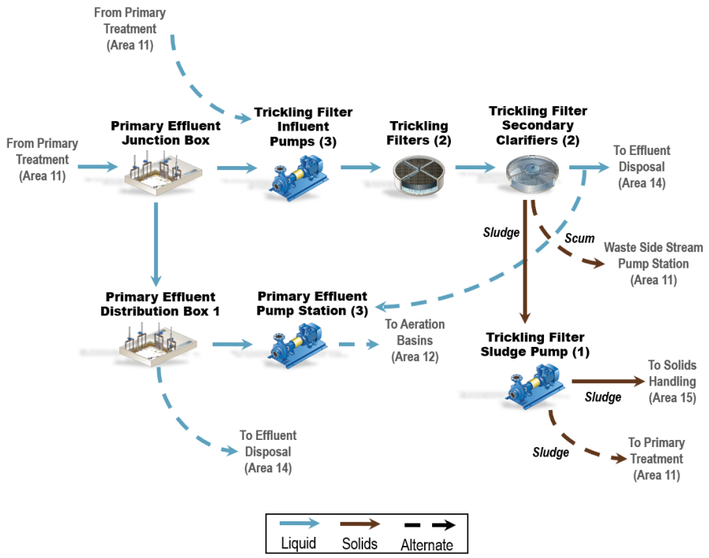
Types of Project Legend:

CIP - Planning **CIP - Design** **CIP - Construction** **Maintenance Project**

Acronym Key:
AS1 = Activated Sludge Plant No. 1; AS2 = Activated Sludge Plant No. 2; CIP = Capital Improvement Program;
DAFT = Dissolved Air Flotation Thickener; FY = Fiscal Year; PEPS = Primary Effluent Pump Station;
PS = Pump Station; RAS = Return-activated Sludge; SC = Secondary Clarifier; TWAS = Thickened Waste-activated Sludge;
WAS = Waste-activated Sludge

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 12 – PLANT NO. 1 SECONDARY TREATMENT – TRICKLING FILTERS

Process Schematic



Major Assets

Major Assets	Quantities
Trickling Filter Pump Station	
Structure	1
Trickling Filter Pumps	3
Trickling Filters	
Trickling Filter Basins	2
Rotary Distributor	2
Recirculation Fans	8
Secondary Clarifiers	
Circular Clarifiers	2
Sludge Collector	2
Sludge Pump	1
Junction Boxes	
Structure	6

Major Assets Remaining Useful Life

Asset Type	Trickling Filter Pump Station	Trickling Filters	Secondary Clarifiers	Sludge Pump Station	Junction Boxes
Civil					
Effluent Piping	1	1	1	-	1
Structural					
Buildings	-	1	1	-	-
Structures	1	1	1	1	1
Mechanical					
Pumps	3	-	3	5	-
Distributor Drive	-	3	-	-	-
Ventilation Fans	-	3	-	-	-
Trickling Filter Media	-	5	-	-	-
Clarifier Moving Mechanism	-	-	3	-	-
Valves, Gates	3	-	5	-	3
Electrical					
Motor Control Centers	3	4	-	3	-
Variable Frequency Drives	5	3	-	5	-
Instrumentation					
PLCs and Flow Meters	3	3	3	3	-

Asset RUL Legend:

- RUL < 5 years
- RUL 5–10 years
- RUL 11–15 years
- RUL 16–20 years
- RUL > 20 years

Acronym Key:

PLC = Programmable Logic Controller

RUL = Remaining Useful Life

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 12 – PLANT NO. 1 SECONDARY TREATMENT – TRICKLING FILTERS

Key Issues

Key Issues	Actions and Recommendations
• **Trickling Filter Sludge Pumps** – Currently, only one sludge pump is in service.	• Project FE19-03 will replace the trickling filter's sludge pump with two sludge pumps and VFDs and remove the scum pumps.
• **Trickling Filter Influent Pumps** – VFDs are obsolete and need to be replaced. Replacement parts are not available.	• FR1-0011 will replace the VFDs and add a second source of power from the Switchgear TFB bus to VFD #1.
• **Trickling Filters Snail Control** – Permanent caustic dosing is needed at trickling filters pump station for snail control. Currently, temporary totes are used to dose caustic into the wet well.	• PRN-00414 was approved to add pumps to the caustic tank in the primary scrubber area and trench a pipe to the trickling filters pump wet well. This project has been included in the P1-126 project scope.
• **Trickling Filter Valve Replacement** – Drain valve and stem for trickling filter clarifier 2 need to be replaced.	• Project FR1-0017 will replace 12-inch trickling filter clarifier 2 drain valve and valve stem.
• **Trickling Filter Media** – Trickling filters at Plant No. 1 have been in operation for over 17 years. The filter media is nearing the end of its useful life and the trickling filter lining and coatings systems are starting to fail.	• Project P1-142 will replace the trickling filter media and repair coating failures, and may replace the rotating assembly as needed upon confirmation of a condition assessment to extend the overall reliability and useful life of the trickling filters. • X-015 is the future project that will perform major rehabilitation of the trickling filter area.
• **Trickling Filter Odor Control** – Increase in odor complaints may be due to the trickling filter operation. Operations has reduced flow to the trickling filters to control odors.	• A planning study will be established for the trickling filters to determine the best solution/approach to minimizing odor at the trickling filters, which may include covering the trickling filters and adding odor control.

Current and Future Projects

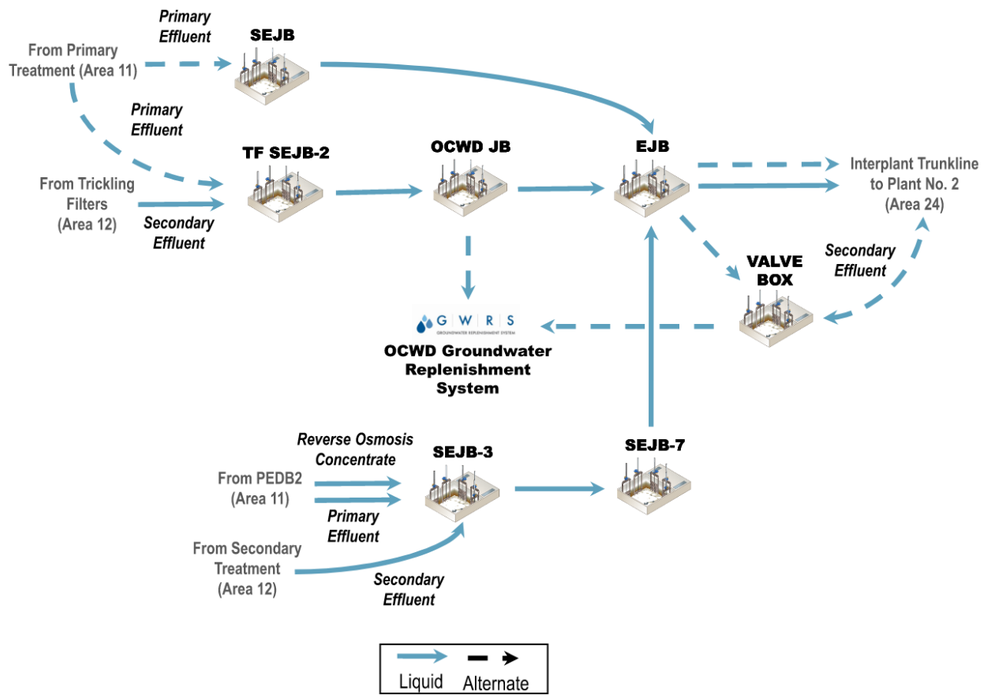
Project No.	Project Title	Impacted Facilities	Description of Work	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35	FY 35/36	FY 36/37	FY 37/38
FE19-03	FE19-03 Trickling Filter Sludge and Scum Pumps Replacement at Plant No. 1	Sludge pumping	• Replace the sludge pump with two new pumps and remove three scum pumps.															
P1-126 (PRN-00414)	Primary Sedimentation Basins Numbers 3–5 Replacement at Plant 1	Trickling Filters Pump Station	• Project P1-126 will install permanent caustic dosing pumps and pipes to dose caustic to the trickling filters. Currently, Operations is using caustic totes.															
P1-142	Trickling Filter Rehabilitation at Plant 1	Trickling Filters	• Replace the trickling filter media, repair coating failures, and inspect/replace rotating assembly as needed.															
FR1-0017	Trickling Filter Valve Replacement at Plant No. 1	Trickling Filters Secondary Clarifier 2	• Replace drain valve and stem for trickling filters Secondary Clarifier 2.															
FR1-0011	Plant No. 1 Trickling Filter Pumps VFD replacement (three pumps)	Trickling Filters Pump Station	• Replace the obsolete VFDs on the trickling filter influent pumps.															
X-015	Trickling Filters Facilities Rehabilitation at Plant No. 1	Major rehabilitation project	• Replace the trickling filter feed pumps, distribution arms and media, and secondary clarifier mechanisms.	→ Project starts in 2040														
N/A	Trickling Filter Odor Control Planning Study at Plant No. 1	Trickling Filters	• Perform a study to determine the best solution/approach to minimizing odor at the trickling filters.															

Types of Project Legend:
CIP - Planning **CIP - Design** **CIP - Construction** **Maintenance Project**

Acronym Key:
CIP = Capital Improvement Program; FY = Fiscal Year; VFD = Variable Frequency Drive

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 14 – PLANT NO. 1 INTERPLANT

Process Schematic



Major Assets Remaining Useful Life

Asset Type	Plant No. 1 Facility									Santa Ana Corridor						
	EJB	TFSEJB-2	SEJB	SEJB-3	SEJB-7	PEJB-1	66" PE/SE	84" PE/SE	108" PE/SE	66" PE/SE	84" PE/SE	120" PE/SE	Digester Gas Line	Ellis Corridor	Brookhurst Corridor	Bushard Corridor
Civil																
Pipeline	-	-	-	-	-	-	4	3	1	1	1	1	3	1	1	-
Structural																
Structure	1	1	3	1	1	4	-	-	-	-	-	-	-	-	-	-
Mechanical																
Sluice Gates	2	-	-	3	1	5	-	-	-	-	-	-	-	-	-	-
Butterfly Valves	2	3	-	-	-	-	-	-	-	1	-	-	-	-	-	-
Ball Valves	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
Instrumentation																
Fiber Optic	-	-	-	-	-	-	-	-	-	-	-	1	-	1	-	1

Asset RUL Legend:

- RUL < 5 years
- RUL 5–10 years
- RUL 11–15 years
- RUL 16–20 years
- RUL > 20 years

Acronym Key:

EJB = Effluent Junction Box
mi = Mile(s)
JB = Junction Box
OCWD = Orange County Water District
PE = Primary Effluent
PEJB-1 = Primary Effluent Junction Box 1
RUL = Remaining Useful Life
SE = Secondary Effluent
SEJB = Secondary Effluent Junction Box
SEJB-3 = Secondary Effluent Junction Box 3
SEJB-7 = Secondary Effluent Junction Box 7
TF = Trickling Filter
TFSEJB-2 = Trickling Filter Secondary Effluent Junction Box 2

Major Assets

Major Assets	Quantities
Plant No. 1 Facility	
Large Diameter Piping	1.1 mi
Junction Boxes	6
Gates	17
Butterfly Valves	9

Major Assets	Quantities
Santa Ana Corridor	
Large Diameter Piping	10.6 mi
Digester Gas Piping	3.9 mi
Fiber Optic Communication	3.2 mi
Ball Valves	2

Major Assets	Quantities
Ellis Corridor	
Large Diameter Piping	1.2 mi
Fiber Optic Communication	0.8 mi
Brookhurst Corridor	
Large Diameter Piping	3.8 mi
Bushard Corridor	
Fiber Optic Communication	4.1 mi

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 14 – PLANT NO. 1 INTERPLANT

Key Issues

Key Issues	Actions and Recommendations
• **Interplant Digester Gas Line Deficiencies** – Surface corrosion of various severity in all blow off vaults; water intrusion in Vaults 1–4; Vault 4 outside existing utility easement; measurable gas leaks in Vaults 4, 7, 8, and 10; access difficulties to Vaults 8 and 9; structural damage to Vault 10; lack of dedicated blowdown valves; and lack of pressure relief between the DOT valves.	• OC San completed interim blow off leak repairs at Vault 10 and capped Vaults 3 to 8 in September 2022. Project FRJ-0003 will repair, replace (or relocate), and abandon blow off vaults. The project also includes installing blowdown valve manifolds and pressure relief for the IDGP.
• **Santa Ana Corridor Soil Erosion (PRN-00935)** – Soil loss has been occurring in the unprotected slopes along the interplant utility corridor paralleling the Santa Ana River for many years. Soil erosion is directly affecting blow off Vault 5 on the Interplant Digester Gas Line. There are significant reaches of pipeline that appear to lack adequate cover for pipeline protection.	• OC San has approved a new planning study PRN-00935 to perform a slope erosion analysis with various field investigations; review slope stabilization alternatives; and identify, compare, and rank conceptual design alternatives. This effort includes developing a new plan and profile for the pipeline to pinpoint areas of inadequate cover and provide the basis of design to resolve the issue(s). Based on the recommendations a proposed improvement project will be developed.
• **PEJB-1** – The sluice gates in PEJB-1 are in very poor condition and no longer properly seal. PEJB-1 structure is also in poor condition.	• Rehabilitation of the PEJB-1 structure and replacement of existing sluice gates with new ones are included in the scope of Project P1-126.
• **66-inch IPP** – 66-inch pipelines between PEJB-1 and EJB are in poor condition per 2021 condition assessment. Conditions have not changed significantly since 2009.	• Perform a reassessment in 2026. Project X-125 will rehabilitate the 66-inch pipelines between PEJB-1 and EJB.
• **Uninspected Assets** – The 108-inch pipelines to EJB, SEJB-3 structure and gates, and SEJB-7 structure and gates have not had formal condition assessments since construction.	• Given theoretical RUL, condition assessments for the 108-inch pipelines to EJB, SEJB-3 structure and gates, and SEJB-7 structure and gates are planned for 2024.

Current and Future Projects

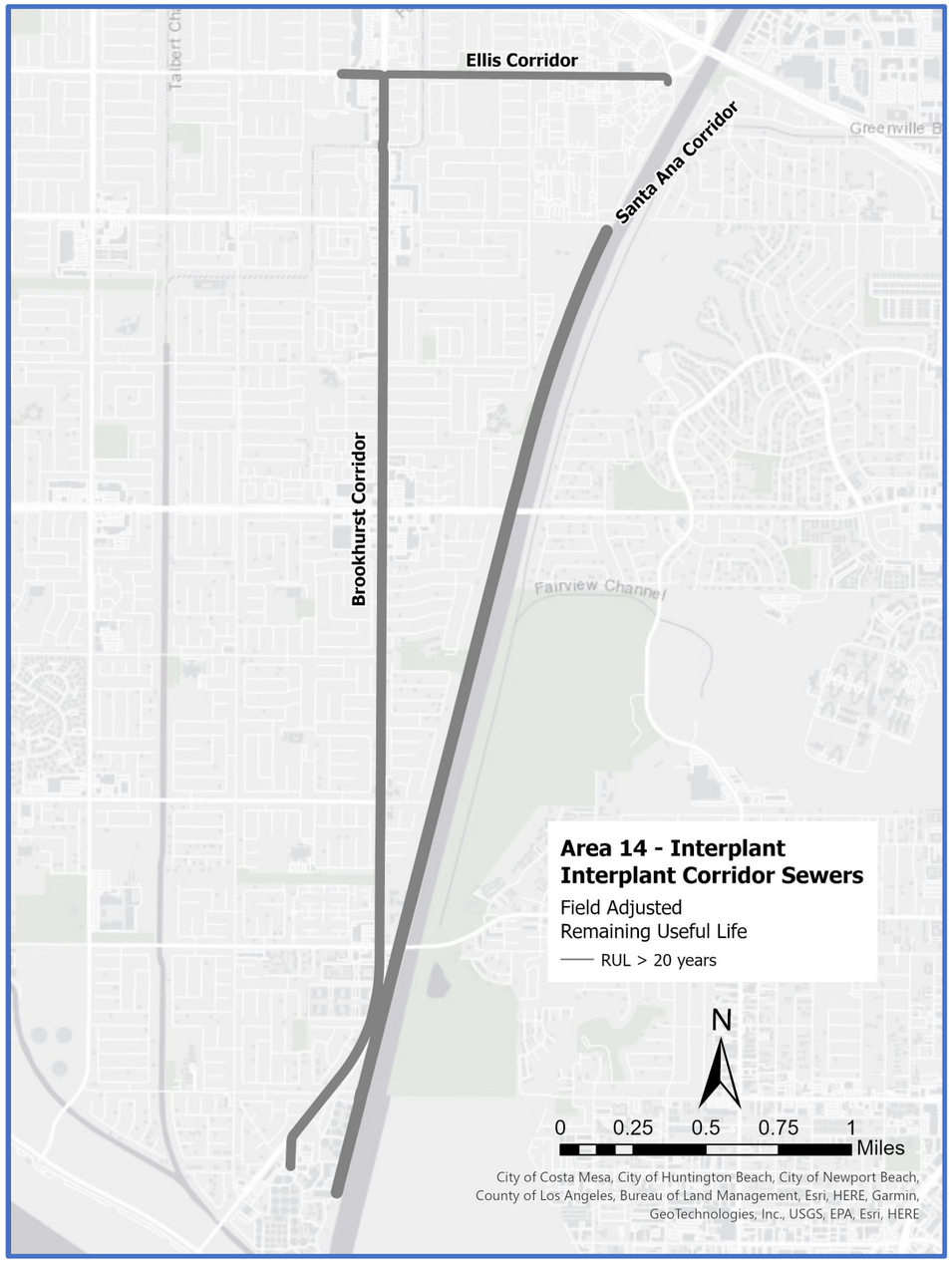
Project No.	Project Title	Impacted Facilities	Description of Work	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35	FY 35/36	FY 36/37	FY 37/38
FRJ-0003	Interplant Gas Line Blow Off Repairs	Digester Gas Piping	• Blow off repair, replacement, and/or abandonment, add blowdown valves at DOT ball valves, and IDGP pressure relief															
PRN-00935	Interplant Digester Gas Pipeline Slope Stabilization Study	Digester Gas Piping	• Slope erosion analysis and conceptual design of slope stabilization alternatives to define recommended improvement project and rebuild adequate cover over pipe															
P1-126	Primary Sedimentation Basins No. 3-5 Replacement at Plant No. 1	PEJB-1	• Includes rehabilitating the PEJB-1 structure and replacing existing sluice gates															
X-125	66-Inch Interplant Pipelines Rehabilitation at Plant 1	66” PE/SE	• Rehabilitate the Plant No. 1 66-inch piping															
X-118	84-inch Interplant Pipelines Rehabilitation at Plant 1	84” PE/SE, SEJB	• Rehabilitate the Plant No. 1 84-inch piping and SEJB															
X-015	Trickling Filters Rehabilitation at Plant 1	TFSE JB-2	• Includes rehabilitating the TFSE JB-2 structure and existing butterfly valve															

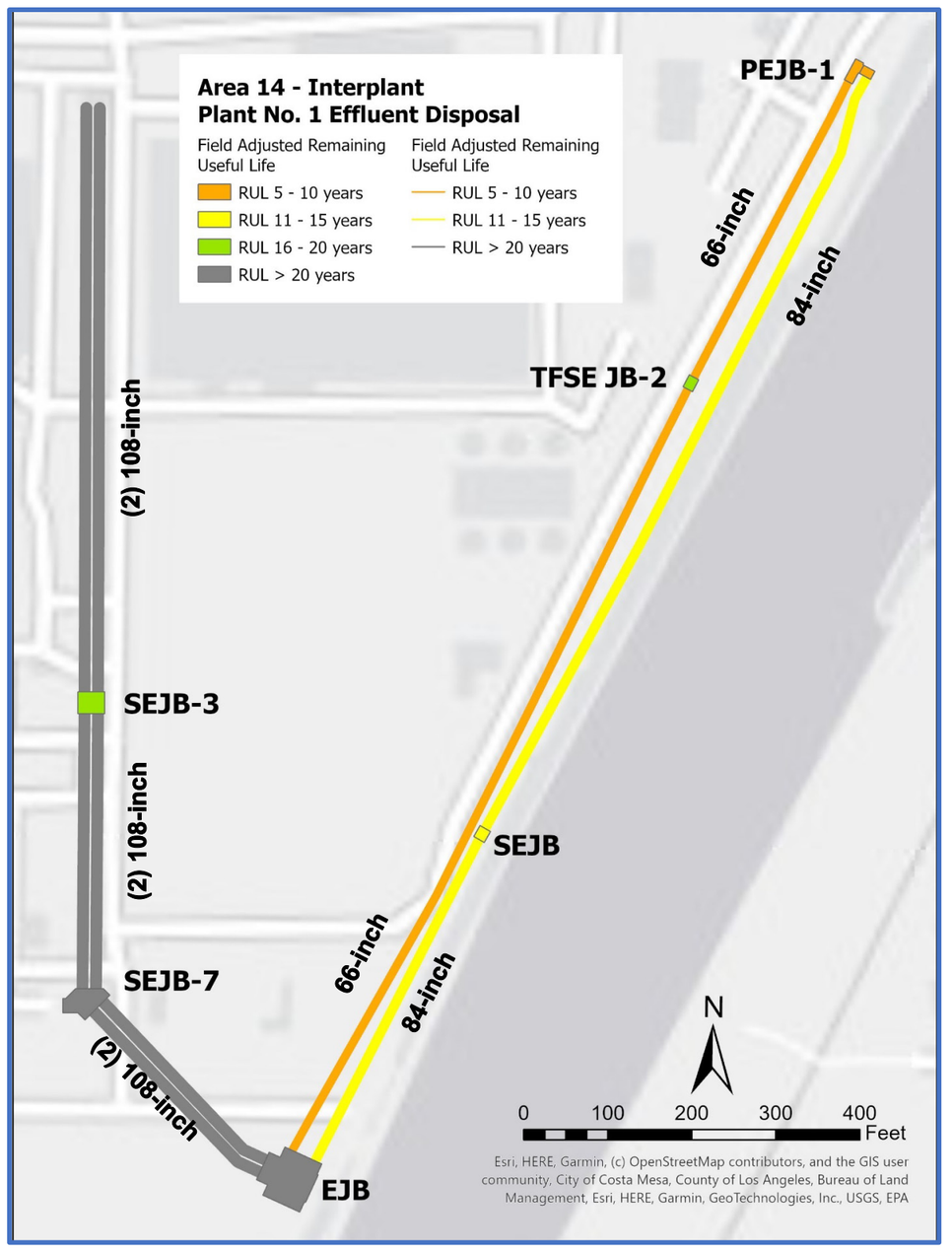
Types of Project Legend:
CIP - Planning **CIP - Design** **CIP - Construction** **Maintenance Project**

Acronym Key:
CIP = Capital Improvement Program; DOT = U.S. Department of Transportation; EJB = Effluent Junction Box; FOC = Fiber Optic Cable; FY = Fiscal Year; GWRS = Groundwater Replenishment System; IDGP = Interplant Digester Gas Pipeline; IPP = Interplant Piping; LOFLO = Low Flow; PE = Primary Effluent;PEJB-1 = Primary Effluent Junction Box 1; RUL = Remaining Useful Life; SE = Secondary Effluent; SEJB-3 = Secondary Effluent Junction Box 3; SEJB-7 = Secondary Effluent Junction Box 7; TFSE = Trickling Filter Secondary Effluent

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 14 – PLANT NO. 1 INTERPLANT

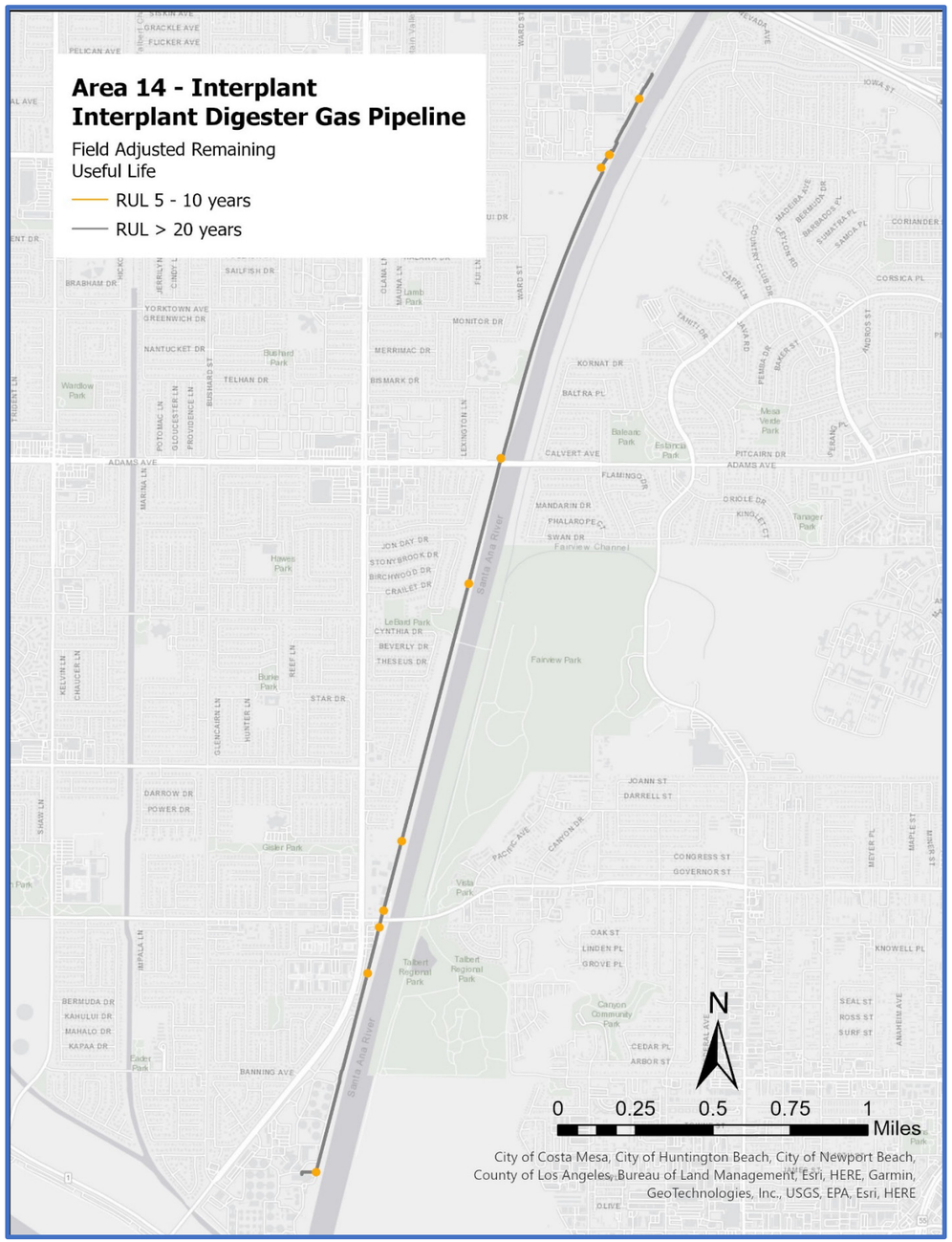
Remaining Useful Life Maps

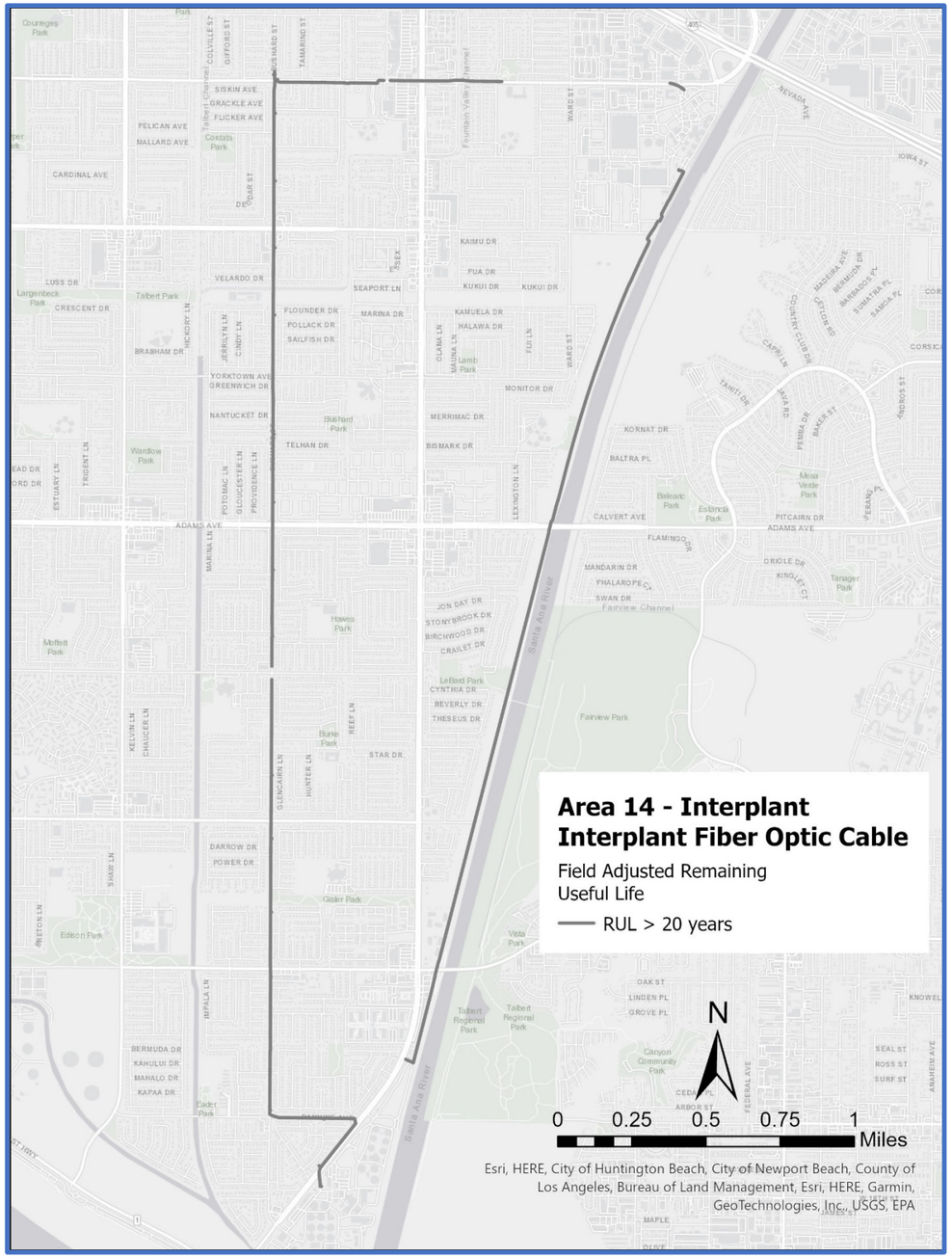




ASSET MANAGEMENT SYSTEM SUMMARY – AREA 14 – PLANT NO. 1 INTERPLANT

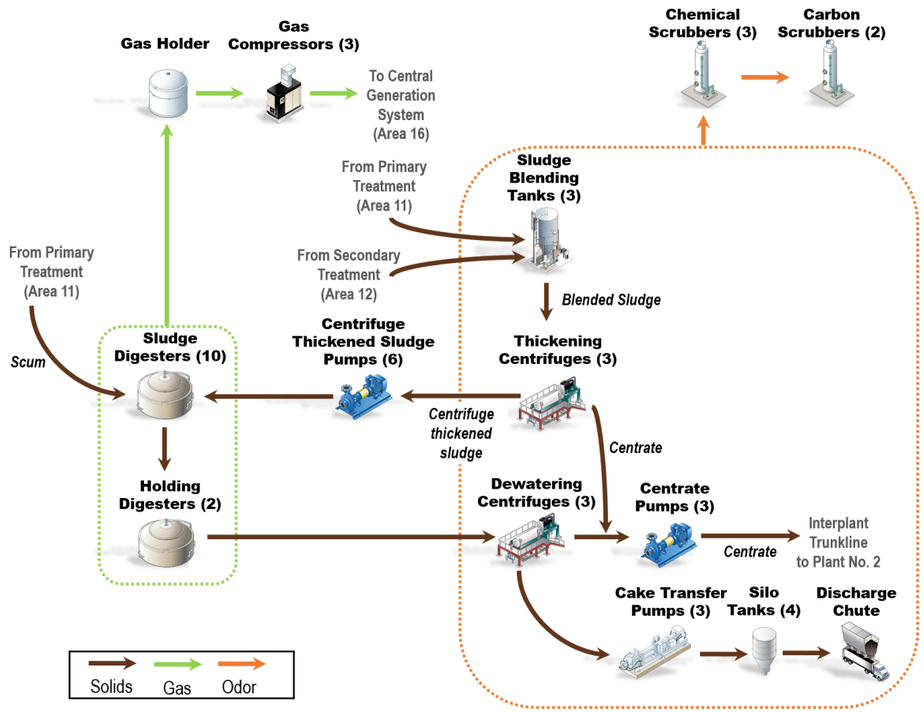
Remaining Useful Life Maps





ASSET MANAGEMENT SYSTEM SUMMARY – AREA 15 – PLANT NO. 1 SOLIDS HANDLING – DIGESTERS

Process Schematic



Major Assets

Major Assets	Quantities
Anaerobic Digesters	
Digesters (7–16)	10
Holding Digesters (5 & 6)	2
Sludge Mixing Pumps	22
Grinders	10+3
Sludge Recirculation Pumps	10
Hot Water Circulation Pumps	10

Major Assets	Quantities
Anaerobic Digesters (Continued)	
Heat Exchangers	10
Bottom Sludge Pumps	5
Digesters Transfer Pumps	3
Ferric System	
Storage Tanks	2
Feed Pumps	2

Major Assets Remaining Useful Life

Asset Type	Digester 5	Digester 6	Digester 7	Digester 8	Digester 9	Digester 10	Digester 11	Digester 12	Digester 13	Digester 14	Digester 15	Digester 16	Ferric System
Civil													
Effluent Piping	2	2	2	2	2	2	2	2	2	2	2	2	-
Structural													
Digester	1	1	1	1	1	1	1	1	1	1	1	1	-
Mechanical													
Piping	2	2	2	2	2	2	2	2	2	2	2	2	2
Chemical Pumps	-	-	-	-	-	-	-	-	-	-	-	-	4
Ferric Control System	-	-	-	-	-	-	-	-	-	-	-	-	4
Sludge Mixing Pumps	3	3	3	3	3	3	3	3	3	3	3	3	-
Sludge Recirculation & Heating System	-	-	3	3	3	3	3	3	3	3	3	3	-
Hot Water System	-	-	3	3	3	3	3	3	3	3	3	3	-
Sludge Transfer Pumps	3		3		3		3		3		3		-
Electrical													
Motor Control Centers	2	2	2	2	2	2	2	2	2	2	2	2	-
Instrumentation													
PLCs & Flow Meters	2	2	2	2	2	2	2	2	2	2	2	2	-

RUL Legend:

RUL < 5 years | **RUL 5–10 years** | **RUL 11–15 years** | **RUL 16–20 years** | **RUL > 20 years**

Acronym Key:
PLC = Programmable Logic Controller; RUL = Remaining Useful Life

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 15 – PLANT NO. 1 SOLIDS HANDLING – DIGESTERS

Key Issues

Key Issues	Actions and Recommendations
• **Ferric Chloride Addition** – Piping, pumps, storage tanks, and injection pipes have reached the end of their useful lives. The ferric system needs to have the ability to dose ferric to more than one digester at a time.	• Project P1-135 replaced most of the ferric piping from the pumps to the injection pipe at the digester. Injection system needs to be upsized at the injection point, which will be done when digesters are taken out of service for cleaning. The ferric pumps and storage tank will be replaced by project P1-105.
• **Structures** – Seismic risk.	• The PS15-06 Seismic Evaluation of Structures at Plant No. 1 and Plant No. 2 has identified lateral spread as the main seismic risk for the digesters and structures close to the Santa Ana River (Project No. X-109).
• **Structures** – In the past year, two digesters had leaks at wall pipe penetrations and the wall of the digester.	• Digester condition assessment will be evaluating pipe penetrations and include repairs as needed.
• **Digester Mixing** – With thicker sludge sent to the digesters, the two existing high-rate pumps are needed to mix the sludge. Any failure of the mixing pumps—even short repairs—will affect the digester mixing efficiency.	• A planning study is needed to evaluate the mixing system considering the co-thickened sludge density and pump repairs.

Current and Future Projects

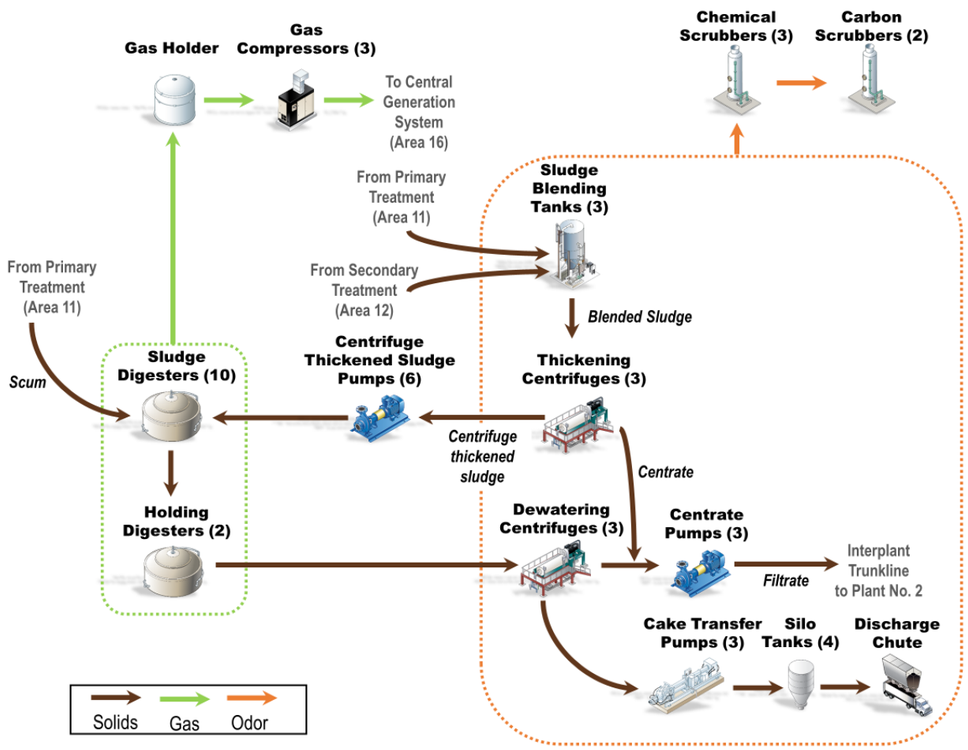
Project No.	Project Title	Impacted Facilities	Description of Work	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35	FY 36/36	FY 36/37	FY 37/38
N/A	Digester Cleaning and Inspection	Ongoing maintenance activity	• Clean the digesters and perform preventive condition assessment, inspections, and incidental repairs every 5 to 7 years.															
X-120	Digester Rehabilitation/Replacement at Plant 1	All digesters and holders	• Major rehabilitation or replacement of all digesters.															
X-109	Lateral Spreading Mitigation at Plant No. 1	All digesters and holders	• To protect process facilities from structural and foundation failure during a seismic event.															

Types of Project Legend:
CIP - Planning **CIP - Design** **CIP - Construction** **Maintenance Project**

Acronym Key:
CIP = Capital Improvement Program; FY = Fiscal Year; N/A = Not Applicable

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 15 – PLANT NO. 1 SOLIDS HANDLING – FACILITIES

Process Schematic



Major Assets Remaining Useful Life

Asset Type	Sludge Blending Facility (SBF)	Thickening System	Dewatering System	Dewatering Odor Control	Truck Loading	Boiler System	Gas Handling	Gas Holder	Gas Flares
Civil									
Effluent Piping	1	1	1	-	1	-	-	-	-
Structural									
Structures	1	-	-	-	1-	-	3	3	-
Buildings	-	1	1	-	1-	2	-	-	-
Mechanical									
Piping & Valve	-	1	1	1	1	3	3	3	-
Pumps & Grinders	2	2	2	3	2	-	-	-	-
Boiler & Heat Exchangers	-	-	-	-	2	-	-	-	-
Centrifuges	-	2	2	-	-	-	-	-	-
Chemical/polymer System	-	1	1	2	-	-	-	-	-
Carbon Unit	-	-	-	2	-	-	-	-	-
Gas Compressors	-	-	-	-	-	3	-	-	-
Gas Dryer	-	-	-	-	-	4	-	-	-
Silo Cake Conveyors	-	-	-	-	1	-	-	-	-
Silo Sliding Frames	-	-	-	-	1	-	-	-	-
Electrical									
Variable Frequency Drives	2	4	4	-	2	-	-	-	-
Motor Control Centers	1	1	1	1	1	2	4	-	-
Instrumentation									
PLCs & Flow Meters	2	2	2	2	2	2	4	-	-

Asset RUL Legend:

- RUL < 5 years
- RUL 5–10 years
- RUL 11–15 years
- RUL 16–20 years
- RUL > 20 years

Acronym Key:
RUL = Remaining Useful Life
PLC = Programmable Logic Controller
SBF = Sludge Blending Facility

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 15 – PLANT NO. 1 SOLIDS HANDLING – FACILITIES

Major Assets

Major Assets	Quantities
Thickening System	
Sludge Blending Tanks	3
Thickening Grinders	3
Centrifuge Feed Pumps	3
Thickening Centrifuges	3
Thickened Sludge Wet Wells	3
Thickened Sludge Pumps	6

Major Assets	Quantities
Thickening System (Continued)	
Centrate Wet Well	1
Centrate Pumps	3
Chemical Equipment	
Thickening Polymer Feed Pumps	3
Dewatering Polymer Feed Pumps	3

Major Assets	Quantities
Chemical Equipment (Continued)	
Polymer Mixing/Aging Tank	6
Polymer Make-Down Unit	4
Dewatering System	
Dewatering Grinders	2
Centrifuge Feed Pumps	3
Dewatering Centrifuges	3
Cake Transfer Pumps	3

Major Assets	Quantities
Dewatering Odor Control	
Three-Stage Packed Tower Scrubbers	3
Carbon Media	2
Truck Loading	
Cake Storage Silos	4
Cake Silo Transfer Pumps	4
Standby Truck Loading Bay	1

Major Assets	Quantities
Gas Handling	
Low Pressure Gas Holder	1
Gas Compressors	3
Gas Dryer	2
Gas Flares	3
Boiler	1

Key Issues

Key Issues	Actions and Recommendations
• **Thickening and Dewatering Maintainability of the Equipment** – Various improvements are needed for equipment access for maintenance.	• Most of the improvements will be done by Maintenance. • FE21-04 small project for safety improvements. FE22-01 small project regarding equipment access and platform installation. • FR1-0018 will replace the diverter gate.
• **Gas Handling System** – Gas compressor system is aging and needs reliability improvements such as regular equipment overhauls.	• Project J-124 Digester Gas Facilities will rehabilitate or replace aging assets. • Gas compressor repairs and overhauls will be performed by Maintenance.
• **Refrigerated Gas Dryer** – Out of service. Currently, gas goes through a chilled water heat exchanger and condensate drops out.	• The refrigerated gas dryer system will be replaced by the FE23-01 Project.
• **Plant Water Piping** – Corrosion from plant water on equipment is causing premature wear on pumps and piping failures.	• PS20-09 will evaluate the plant water and make recommendations to improve the water quality and reduce corrosivity of the water.

Current and Future Projects

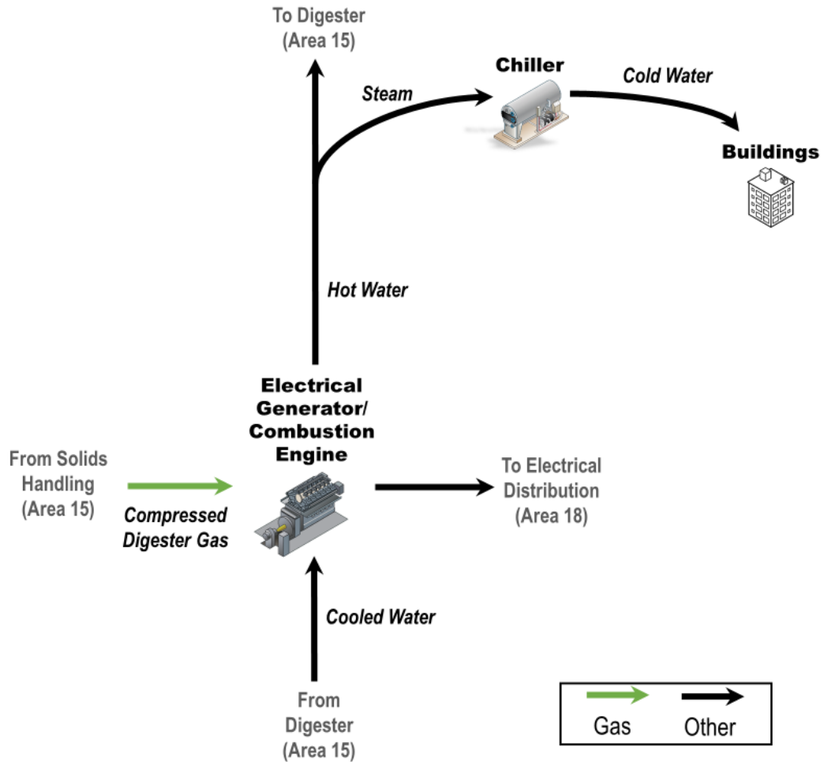
Project No.	Project Title	Impacted Facilities	Description of Work	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35	FY 35/36	FY 36/37	FY 37/38
J-124	Digester Gas Facilities Rehabilitation	Gas compressors, dryers, and flares	• Project J-124 Digester Gas Facilities will rehabilitate and replace aging assets															
FE21-04	Handrail Installation at the Thickening and Dewatering Building	Thickening and dewatering building	• Improve safety outside of the T&D building															
FE22-01	Platform Modifications for Process Areas at Plant No. 1 and No. 2	Truck loading slide frame	• Improve access to the equipment for maintenance activities															
FR1-0018	Dewatering Centrifuge Diverter Gate Improvements at Plant No. 1	Dewatering diverter gate	• Replacement of three diverter gates on the cake chute assemblies															
FE23-01	Digester Gas Compressor Dryer Replacements at Plant No. 1 and No. 2	Gas dryers	• Replacement of gas dryers															
PS20-09	Thickening and Dewatering Plant Water Study	Thickening and dewatering building	• The study will evaluate the plant water used at the T&D building and determine why the water is causing corrosion on equipment															
RE20-06	Co-thickened Sludge Pump Trial	Co-thickening pumps	• Field test a rotary lobe pump in place of the progressive cavity CTS pump.															

Types of Project Legend:
CIP - Planning **CIP - Design** **CIP - Construction** **Maintenance Project**

Acronym Key:
CIP = Capital Improvement Program; CTS = Co-thickened sludge; FY = Fiscal Year; T&D = Thickening and Dewatering

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 16 – PLANT NO. 1 CENTRAL GENERATION

Process Schematic



Major Assets Remaining Useful Life

Asset Type	Engine Generator #1	Engine Generator #2	Engine Generator #3	Absorption Chiller #1	Absorption Chiller #2	Deaerator Vessel	Heat Recovery Boiler #1	Heat Recovery Boiler #2	Heat Recovery Boiler #3	OXI Catalyst	SCR Catalyst	Urea Injection System	Starting Air Compressor #1	Starting Air Compressor #2	Inst. Air Compressor #1	Inst. Air Compressor #2	Battery Backup	Building Elevator	Plant Water Piping	Miscellaneous
Structural																				
Buildings	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Mechanical																				
General	3	5	5	4	4	4	4	4	4	3	3	3	4	4	5	5	-	1	5	-
HVAC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4
Lube Oil System	3	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Electrical																				
General	3	5	5	-	-	-	-	-	-	-	-	3	3	3	4	4	5	1	-	-
Switchgear	4	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Instrumentation																				
General	4	4	4	4	4	3	3	3	3	3	3	3	3	3	4	4	-	1	-	-

RUL Legend:
RUL < 5 years | RUL 5–10 years | RUL 11–15 years | RUL 16–20 years | RUL > 20 years

Acronym Key:
HVAC = Heating, Ventilation, and Air Conditioning; Inst. = Instrument; OXI = Oxidizer; RUL = Remaining Useful Life; SCR = Selective Catalytic Reduction

Major Assets

Major Assets	Quantities
Engine Generator	
Gas Engine (12 Cylinders)	3
Electrical Generator	3
Engine Lube Oil System	3
Cooling System	
Absorption Chiller	2
Deaerator Vessel	1

Major Assets	Quantities
Engine Emission Control	
OXI Catalyst	3
SCR Catalyst	3
Urea Injection System	3
Heat Recovery System	
Heat Recovery Boiler	3

Major Assets	Quantities
Building	
Elevator	1
Piping	Various
HVAC	
Ventilation Exhaust Fans	5
Air Compressors	
Engine Starting Air	2
Instrument Air	2

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 16 – PLANT NO. 1 CENTRAL GENERATION

Key Issues

Key Issues	Actions and Recommendations
• **Gas Engine Generator Set Reliability** – Aging components and systems required to operate the Central Generation Engines are creating reliability issues and need to be addressed.	• Engine #1 overhaul completed. J-135 will overall remaining engines and engine generators (P1-127).
• **Switch Gear Reliability** – The switchgear is aging and needs to be replaced for reliability purposes.	• Replace existing aging and obsolete electrical equipment (P1-136).
• **Plant Water Piping** – The plant water (that is, cooling water) piping has degraded and needs replacement.	• Replace all plant cooling water piping in the basement of Central Generation (FE19-02).
• **Backup Battery System** – The batteries used to provide backup power for switching of the switch gear during a loss of power events have reached the end of their useful lives.	• Replace the lead acid batteries and their respective battery chargers with a suitable backup battery system (FR1-0005).
• **Engine PLC Upgrade** – The existing engine PLCs are obsolete.	• Pilot test a new engine PLC, and replace obsolete PLCs with new ones (AI-169).
• **Engine Protection System and Diagnostics** – Engine diagnostic capability improvement needed.	• Upgrade the Engine Condition Monitoring System and include diagnostic capabilities (PRN-00915).
• **Exhaust Heat Recovery Boilers** – The boilers need to be inspected both internally and externally.	• Inspect and repair Boiler pressure vessels as required to maintain desired performance attributes (AI-194).
• **Engine Ignition Control System Obsolescence Repair** – The existing engine controls are aging and obsolete.	• Install new ignition control systems onto each engine genset (AI-225).

Current and Future Projects

Project No.	Project Title	Impacted Facilities	Description of Work	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35	FY 35/36	FY 36/37	FY 37/38
P1-127	Central Generation Rehabilitation at Plant No. 1	Central Generation	• Rehabilitation of engine generator support systems.															
P1-136	12.47-kV Switchgear Replacement at Central Generation at Plant No. 1	Central Generation Electrical System	• Replace existing obsolete electrical equipment.															
FE19-02	Central Generation Plant Water Pipe Replacement at Plant No. 1	Plant Water Piping	• Replace existing plant water piping with new.															
J-135B	Engine and Generator Overhauls at Plant Numbers 1 and 2	Engine Generator	• Perform top/bottom end engine overhauls.															
FR1-0005	Central Generation and 12-kV Service Center Switchgear Battery System Upgrades	Battery Backup	• Replace the existing backup batteries for the 12-kV switch gear.															
PRN-00915	Engine Protection System Upgrade	Engine Generator	• Upgrade the Engine Condition Monitoring System and include diagnostic capabilities.															
AI-194	Exhaust Heat Recovery Boiler Repair	Heat Recovery System	• Inspect and repair boiler pressure vessels as required to maintain desired performance attributes.															
AI-225	Engine Ignition Control System Obsolescence Repair	Engine Generator	• Install new ignition control systems onto each engine genset.															
AI-169	Engine PLC Upgrade	Engine Generator	• Pilot test a new engine PLC and replace obsolete PLCs with new ones.															

Types of Project Legend:

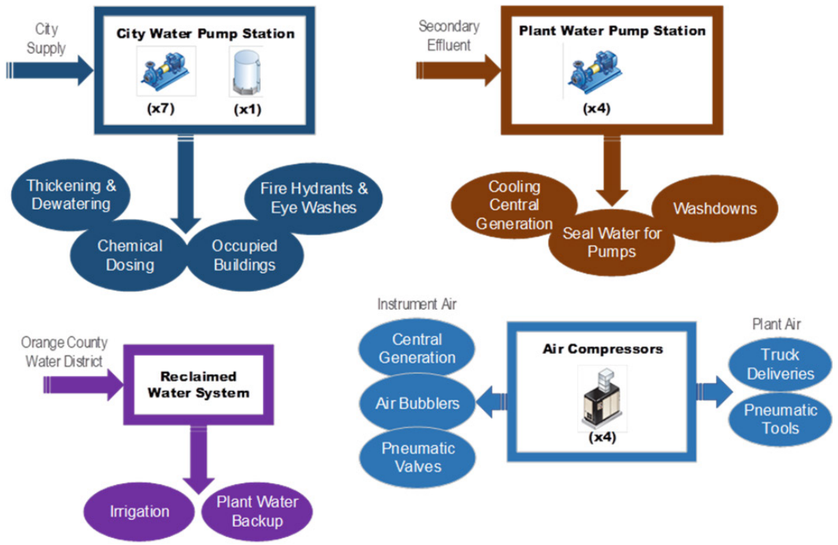
CIP - Planning **CIP - Design** **CIP - Construction** **Maintenance Project**

Acronym Key:

CIP = Capital Improvement Program; FY = Fiscal Year; Gen Set = Generator Set; HVAC = Heating, Ventilation, and Air Conditioning; kV = Kilovolt; OXI = Oxidizer; PLC = Programmable Logic Controller; RUL = Remaining Useful Life; SCR = Selective Catalytic Reduction

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 17 – PLANT NO. 1 UTILITIES

Process Schematic



Major Assets

Major Assets	Quantities
City Water	
Pumps	7
Tanks	3
Piping	10.6 Miles
Plant Water	
Pumps	4
Strainers	3
Piping	12.5 Miles
Reclaimed Water	
Piping	5.4 Miles
Plant Air	
Compressors	4
Plant Air Piping	4 Miles
Instrument Air Piping	3.5 Miles

Major Assets Remaining Useful Life

Asset Type	City Water System	Plant Water System	Reclaimed Water Piping	Plant Air Systems
Civil				
Piping	3	4	2	3
Structural				
Pump Station	1	1	-	-
Tanks	2	-	-	-
Mechanical				
Pumps	3	4	-	-
Strainers	-	3	-	-
Compressors	-	-	-	3
Ventilation System	2	3	-	-
Electrical				
Motor Control Centers	2	2	-	-
Variable Frequency Drives	3	3	-	-
Instrumentation				
PLCs, Flowmeters	3	3	-	3

Asset RUL Legend:

- RUL < 5 years
- RUL 5–10 years
- RUL 11–15 years
- RUL 16–20 years
- RUL > 20 years

Acronym Key:
RUL = Remaining Useful Life
PLC = Programmable Logic Controller

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 17 – PLANT NO. 1 UTILITIES

Key Issues

Key Issues	Actions and Recommendations
• **Plant/Instrument Air Lines** – Excessive condensate and oversized piping causing large pressure drop, reducing compressor redundancy.	• Future small projects to be created to address oversized piping and several dead ends within the system.
• **City Water** – There is no redundancy in the system.	• PRN-0541 City Water Demand Flow Study to provide options.
• **Plant Water** – Piping failures throughout the system due to the corrosive nature of plant water. Current ductile iron pipes are corroding prematurely. Aging pipes also a contributing factor.	• FE19-02 will address corroded plant water piping at Cen Gen and FE20-05 will address recent plant water pipe failures at the secondary clarifiers.
• **Air Compressors** – Plant and Instrument Air supply issues due to the lack of air compressors. Current air compressors are not adequate to meet the current plant needs.	• P1-105 will add 2 new 100 HP compressors at headworks (1 Duty and 1 Standby). FE18-06 will replace the existing 10 HP air compressors at Cen Gen.

Current and Future Projects

Project No.	Project Title	Impacted Facilities	Description of Work	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35	FY 35/36
FE18-06	Instrument Air Compressors at Central Generation	Central Generation	• Replace Instrument Air compressors at Central Generation.													
P1-105	Headworks Rehabilitation at Plant No. 1	City Water Pump Station, Plant air compressors, plant air lines	• Refeed city water pumps from new power building and replace current compressor at headworks with two new compressors. • Replace plant air lines in headworks.													
FE20-05	Plant Water Piping Replacement at Secondary Clarifiers	Secondary Clarifiers	• Replace corroded and failing plant water piping around the AS1 secondary clarifiers.													
P1-126	Primary Clarifier Replacement and Improvement	Primary Clarifier	• Replace aging plant water pipes near primary clarifiers.													
PRN-00743	Plant No. 1 Plant Water Station Replacement Study	Plant Water Station	• Phase 2 of the Plant Water Study will evaluate locations for a new plant water station that uses water from AS1 and AS2 for increased reliability.													
PRN-00541	City Water Demand Flow Assessment at Plant No. 1	City Water Pump Station	• Study to determine current and future city water needs. Will be combined with PRN-00743.													
X-038	City Water Pump Station Replacement	City Water Pump Station	• Replace City Water Pump Station.													
X-039	Plant Water Pump Station Rehabilitation	Plant Water Pump Station	• Rehabilitate Plant Water Pump Station.													
PS20-09	Plant Water Study at T&D Building	T&D Building & Plant Water Station	• The study will evaluate plant water quality chemistry and corrosivity and recommend changes or treatment to improve water quality.													
PRN-0743	Plant and Reclaimed Water Study	Plant Water and Reclaimed Water Facilities	• Study to evaluate water demands and system capacity to meet future needs long term.													

Types of Project Legend:

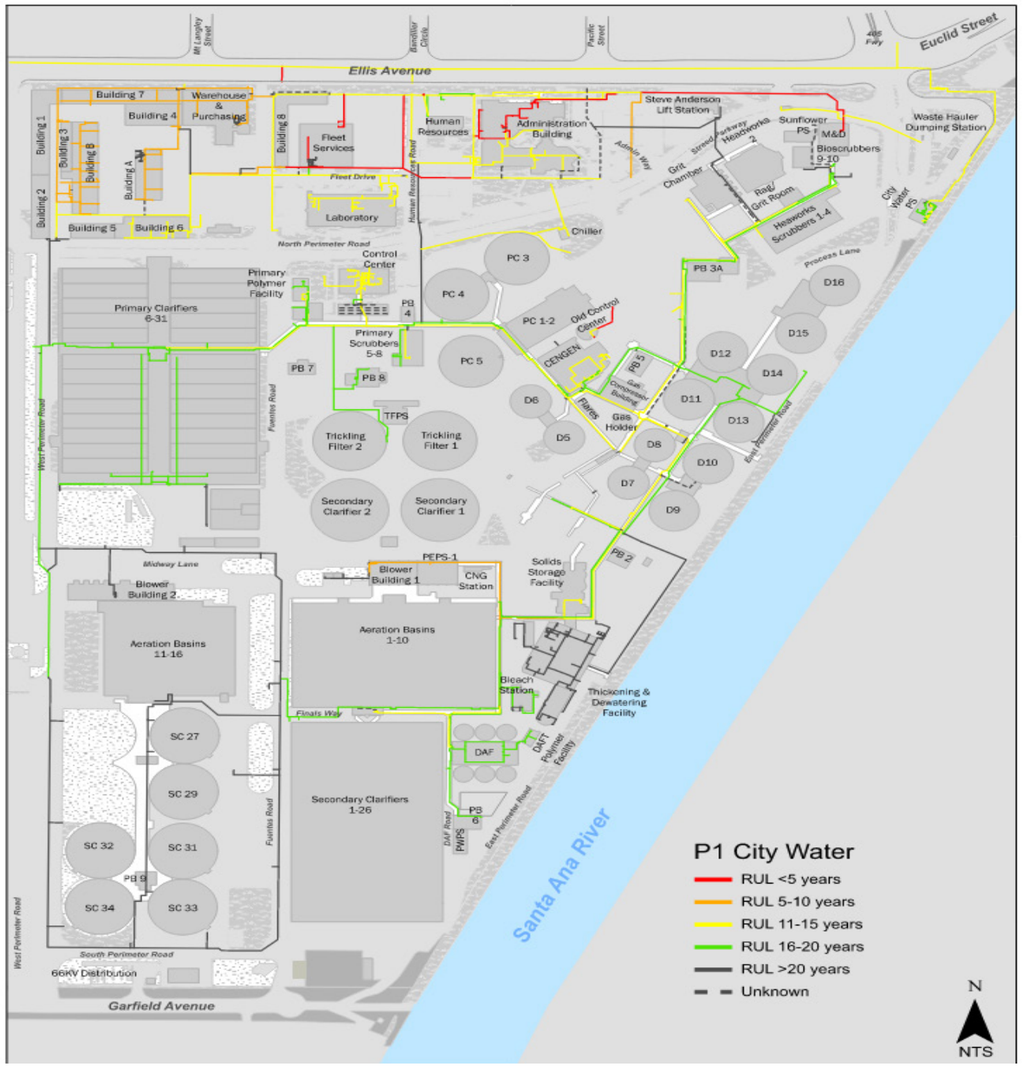
CIP - Planning **CIP - Design** **CIP - Construction** **Maintenance Project**

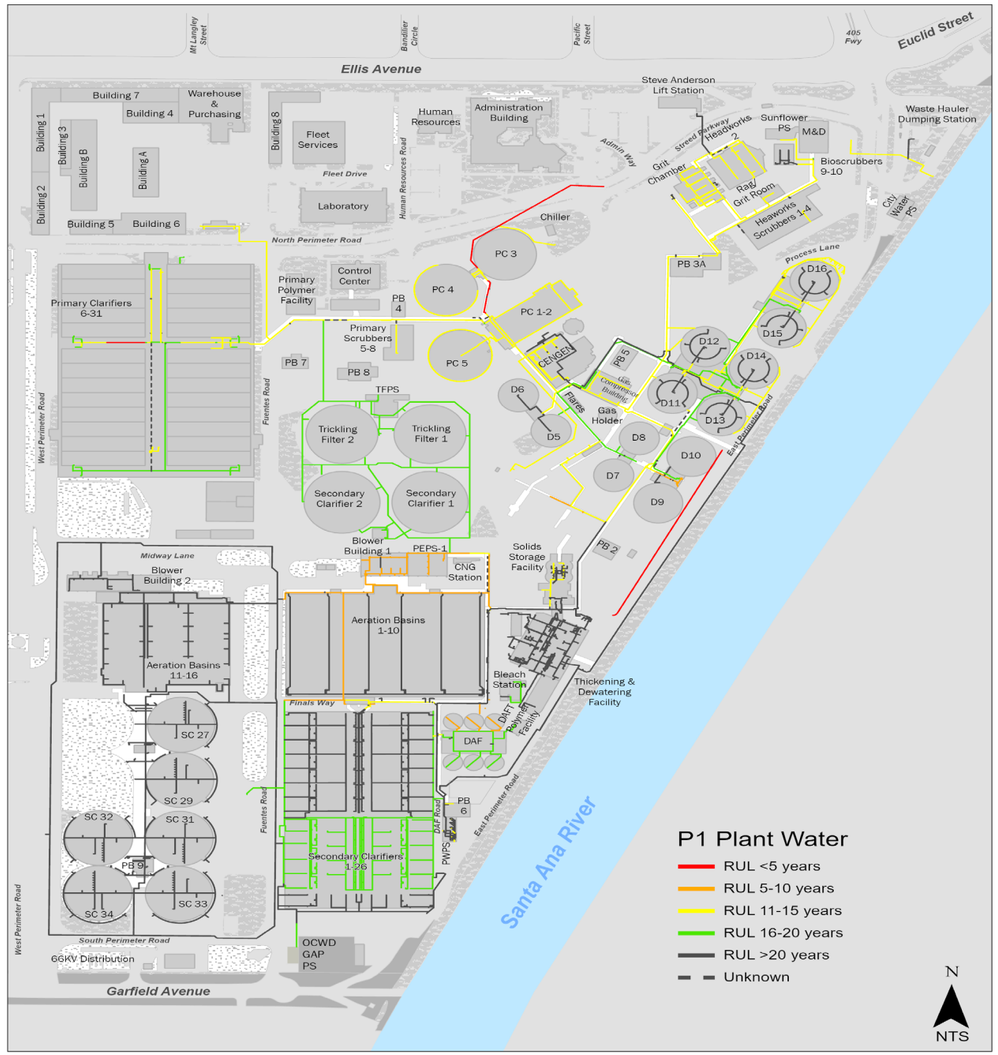
Acronym Key:

AS1 = Activated Sludge 1; Cen Gen = Central Generation Facility; CIP = Capital Improvement Program; FE = Facilities Engineering; FY = Fiscal Year; HDPE = High-Density Polyethylene Resin; HP = Horsepower; OC San = Orange County Sanitation District; OCWD = Orange County Water District; T&D = Thickening and Dewatering

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 17 – PLANT NO. 1 UTILITIES

Remaining Useful Life of Utility Infrastructure





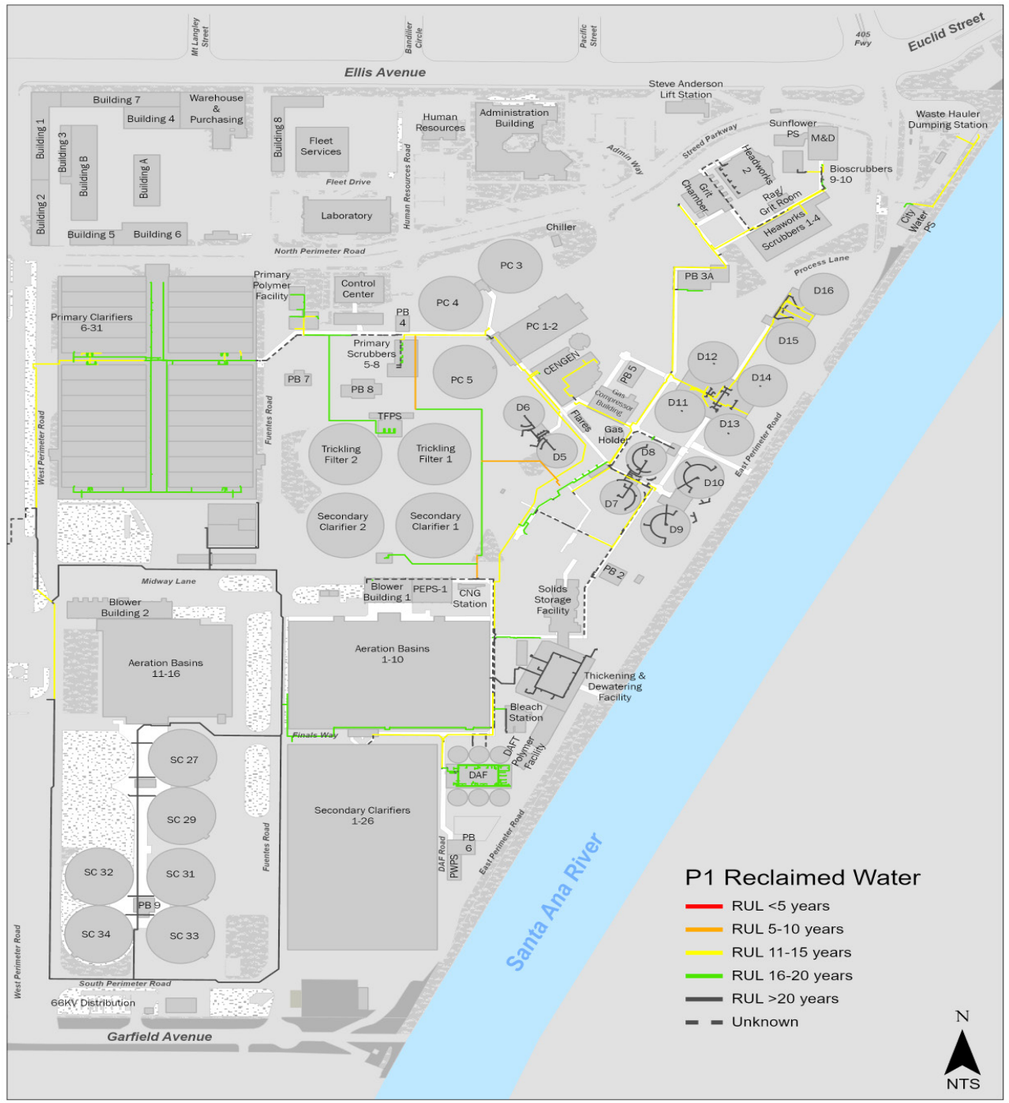
RUL Legend:

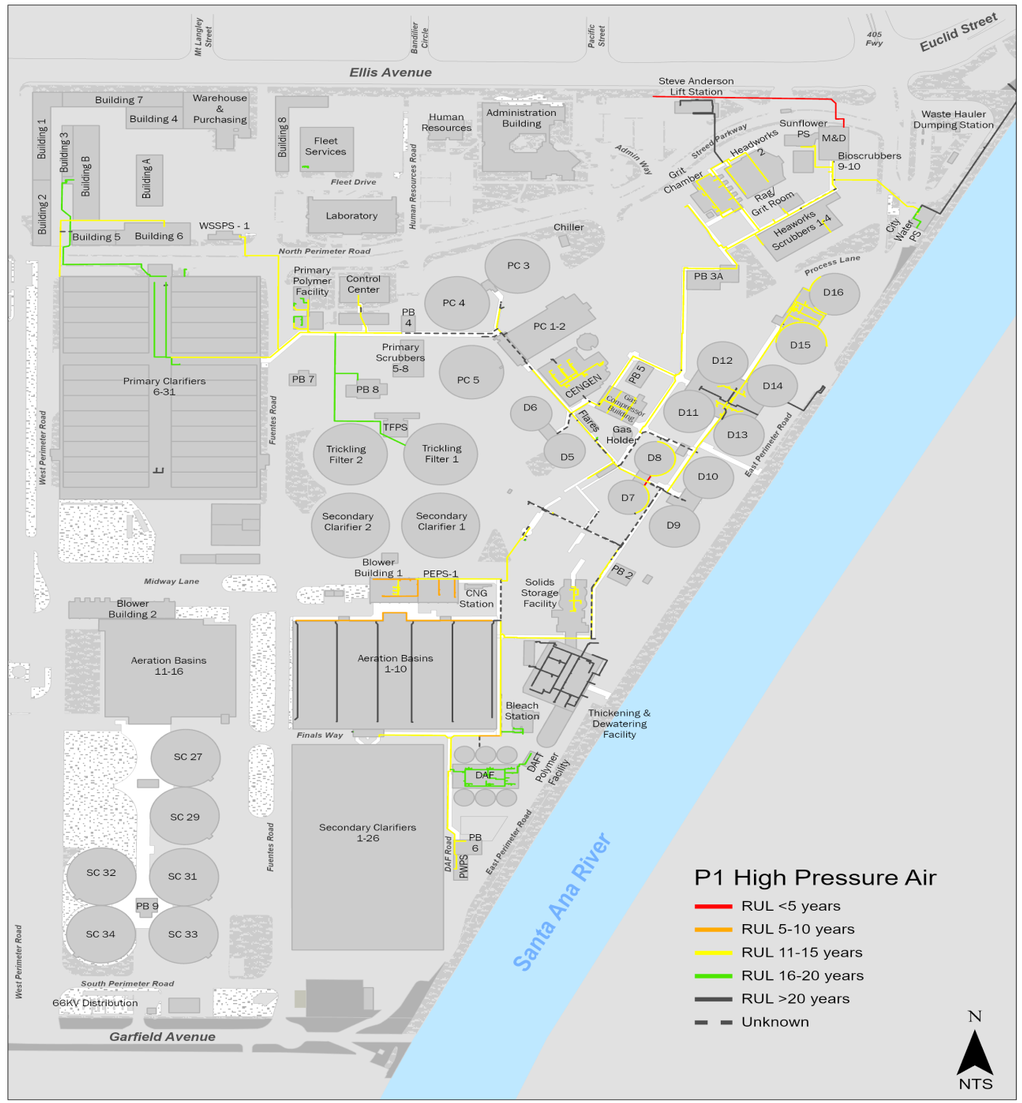
RUL < 5 years | **RUL 5–10 years** | **RUL 11–15 years** | **RUL 16–20 years** | **RUL > 20 years**

Acronym Key:
RUL = Remaining Useful Life
RUL is based solely on age of pipe

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 17 – PLANT NO. 1 UTILITIES

Remaining Useful Life of Utility Infrastructure





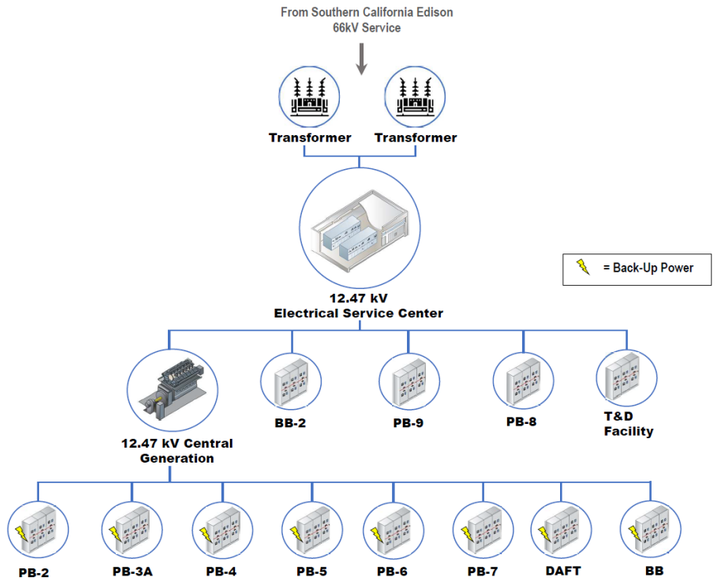
RUL Legend:

RUL < 5 years **RUL 5–10 years** **RUL 11–15 years** **RUL 16–20 years** **RUL > 20 years**

Acronym Key:
RUL = Remaining Useful Life
RUL is based solely on age of pipe

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 18 – PLANT NO. 1 ELECTRICAL DISTRIBUTION

Process Schematic



Major Assets

Major Assets	Quantities
Transformers	40
Standby Generators	8
12-kV and 5-kV Switchgears	16
480-V Switchgears	38
125-VDC and 24-VDC Battery Systems	25
UPS	24

Major Assets Remaining Useful Life

Asset Type	Service Center	Cen Gen	PB-2	PB-3A	PB-4	PB-5	PB-6	PB-7	PB-8	PB-9	DAFT	Blower Bldg.-1	Blower Bldg.-2	T&D Facility
Tier I – 12.47-kV Primary Distribution Level														
Transformers: 12.47/4.16 kV	-	-	-	-	-	-	-	-	-	-	-	3	1	1
Transformers: 12.47/0.48 kV	4	4	3	3	3	2	3	1	2	1	3	3	1	1
12.47-kV Switchgears	4	4	4	4	4	4	4	-	-	-	-	-	3	1
12.47-kV Transfer Switchers	3	-	-	-	-	-	-	-	-	-	-	-	-	-
12.47-kV Load Interrupter Switches	3	-	4	4	3	-	-	1	1	1	3	3	-	-
12.47-kV Feeders	1	4	4	4	4	4	4	1	1	1	3	3	1	1
Tier II – 4.16-kV Distribution Level														
4.16-kV Switchgears	-	-	-	-	-	-	-	-	-	-	-	3	1	-
4.16-kV Feeders	-	-	-	-	-	-	-	-	-	-	-	3	1	-
Tier IV – 480-V Distribution Level														
480-V Switchgears	-	4	3	4	-	2	4	1	1	1	3	3	1	1
Transfer Switches	-	-	2	2	4	-	2	-	-	-	4	4	1	-
Generators	-	-	5	5	5	-	-	1	1	-	-	5	-	-
Tier V – Uninterruptible Power Supply														
UPSs Individual	-	2	-	5	-	-	4	-	3	2	4	3	2	-
Tier VI – 125-VDC and 24-VDC Battery Systems														
125-VDC Chargers	5	5	5	5	-	2	4	3	3	2	3	-	3	1
125-VDC Batteries	5	5	5	5	-	3	4	3	3	3	3	-	3	3
24-VDC Chargers	-	5	5	5	5	-	-	3	3	-	-	3	-	1
24-VDC Batteries	-	5	5	5	5	-	-	3	3	-	-	3	-	3
Generator Controls														
Generator Controls	-	5	5	5	5	-	-	1	1	-	-	5	-	-

Asset RUL Legend:

- RUL < 5 years
- RUL 5–10 years
- RUL 11–15 years
- RUL 16–20 years
- RUL > 20 years

Acronym Key:

BB = Blower Building
Bldg. = Building
Cen Gen = Central Generation Facility
DAFT = Dissolved Air Flotation Thickener
kV = Kilovolt(s)
PB = Power Building
RUL = Remaining Useful Life
T&D = Thickening and Dewatering
V = Volt(s)
VDC = Volts of Direct Current
UPS = Uninterruptible Power Supply

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 18 – PLANT NO. 1 ELECTRICAL DISTRIBUTION

Key Issues

Key Issues	Actions and Recommendations
• **12-kV Feeders** – Aging cables need to continue to be monitored and tested.	• Three-year Service Contract (S-2019-1107B)/MP-320 for testing aging medium voltage cables expires 2023 and a similar contract will be executed for 2024.
• **480-V Feeders** – Cable failures result in process equipment losing power.	• FR1-0011 and FR1-0023 will replace failed cables. Additional testing will be done to proactively identify cable issues before they fail.
• **Variable Frequency Drive** – Models are becoming obsolete and are unsupported by the manufacturer.	• Developed VFD Replacement Strategy. Plant No. 1 obsoleted VFDs will be addressed under FR1-0011 and FR1-0016 Projects. FR1-0016 is in construction and is replacing VFDs at Waste Sidestream Pump Station.
• **Battery Chargers and Batteries** – Aging and obsolescence.	• Project FR1-0005 will replace critical batteries and chargers at 12-kV Service Center and Cen Gen. • PRN-00897 will replace battery systems for Power Buildings 6 and 8.
• **Circuit Breaker and Protective Relay Testing** – Periodic testing of circuit breakers and protective relays is required by InterNational Electrical Testing Association.	• It is recommended that Engineering develop a plan to keep Electrical Transient Analyzer Program model updated, and new task order is developed to contract a testing company to perform periodic testing over a span of time, which can be renewed without the need to rewrite the scope.
• **Laboratory Power Reliability** – The lab has been experiencing outages, putting OC San at risk for noncompliance.	• J-133 Laboratory Replacement is not scheduled to be completed until 2032. Project is being developed to address the power reliability issues.
• **Stand-by Power Policy** – No standby power policy to maintain permit compliance and prevent adverse treatment capability during plant power outages.	• PS21-04 will develop a standby power policy and plan to maintain OC San operations and permit compliance during loss of power.
• **Load Shedding** – Currently some secondary treatment processes do not have backup power from generators.	• J-98 Project will provide capability for Plant No. 1 load shedding to implement this along with Emergency Operation Procedures.
• **Auto Transferring Scheme** – Undervoltage Auto Transferring Scheme upgrades at Plant No. 1 Blower Building 2 and Power Building 9 (current auto transferring scheme does not work correctly; must switch over manually).	• J-98 will upgrade auto transferring scheme and aging protective relays per latest OC San Standards for Blower Building 2 and Power Building 9 12.47-kV, 4.16-kV, and 480-V switchgears.

Current and Future Projects

Project No.	Project Title	Impacted Facilities	Description of Work	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 35/36	FY 36/37	FY 37/38
FR1-0005	Cen Gen and 12-kV Service Center Switchgear Battery System Upgrades at Plant No. 1	Plant No. 1 Power Distribution	• Replace existing obsolete 125-VDC and 24-VDC batteries and battery chargers.														
FR1-0011	P1 VFD Replacement at Plant No. 1	CWPS, RAS, DAFT, TF	• Replacement of existing obsolete Plant No. 1 CWPS, RAS, TF VFDs with new VFDs.														
FR1-0016	Waste Sidestream Pump Station VFD Replacements at Plant No. 1	WSSPS	• Replacement of existing obsolete Plant No. 1 WSSPS with new VFDs.														
FR1-0023	Secondary Effluent Cable Replacement	Secondary Effluent Junction Box Gate Valves	• This project will replace failed cables for two Secondary Effluent Junction Box Gate Valves.														
P1-132	Uninterruptable Power Supply Improvements at Plant No. 1	Plant No. 1 multiple UPS Loads	• This project will provide a new regional UPS at Power Building 8 to provide critical power to facilities in the northwest region of Plant No. 1.														

Current and Future Projects (Continued)

Project No.	Project Title	Impacted Facilities	Description of Work	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 35/36	FY 36/37	FY 37/38
P1-105	Headworks Rehabilitation at Plant No. 1	Plant No. 1 Headworks, Bars Screen, Metering Structure, Power Buildings	• Project will rehabilitate/upgrade Plant No. 1 Headworks and will replace most of the electrical power distribution systems and equipment in Power Building 3A. Project will construct new Power Building 3 and new Headworks Standby Power Building.														
J-98	Electrical Power Distribution System Improvements	Various Plant No. 1 and Plant No. 2 condition based electrical distribution systems	• Project will perform various electrical distribution system improvements at various areas throughout Plant No. 1. The scope covers both 480-V and 12-kV switchgear, motor control centers, breakers, conductors, load shedding, and arc flash mitigation.														
FE19-01	Pump Station Portable Generator Connectors	Power Building 5 Standby Power Connection	• This project includes the addition of standby power connection at Power Building 5.														
P1-126	Primary Sedimentation Basins Nos. 3–5 Replacement at Plant No. 1	Plant No. 1 Power Distribution	• Demolish Power Building 4 diesel generator, refeed standby loads from Power Building 8.														
P1-136	12.47-kV Switchgear replacement at Plant No. 1 Central Generation and Service Center	Plant No. 1 Power Distribution	• The project will replace existing 12.47-kV electrical switchgears at the Plant No. 1 Central Generation facility and Service Center.														
PS21-04	Energy and Digester Gas Master Plan	Plant No. 1 and Plant No. 2 Power Generation and Standby Power	• Develop a standby power policy, load shedding and power restart philosophy, and energy resiliency and independence plan.														
PRN-00897	125-VDC Battery Replacement at Plant No. 1 and No. 2	125-VDC Battery Systems at Plant 1	• This project will replace obsolete battery systems at Plant No. 1 Power Buildings 6 and 8.														
P1-140	Activated Sludge 1 and Secondary Clarifier Rehabilitation	Power Building 2, 12-kV Distribution	• Major rehabilitation of all mechanical, electrical, and instrumentation assets including the blower system.														
J-124	Digester Gas Facilities Replacement	Power Building 5 12-kV Switchgear	• Project J-124 Digester Gas Facilities will rehabilitate and replace aging assets.														
J-133	Laboratory Replacement at Plant No. 1	Lab Power Feed	• This project will replace the Central Laboratory building at Plant No. 1.														
X-039	PWPS Rehabilitation at Plant No. 1	Power Building 6 Electrical Equipment	• Replace 3 pumps installed under P1-34-2. Replace controls associated with the Plant Water Pump Station.														

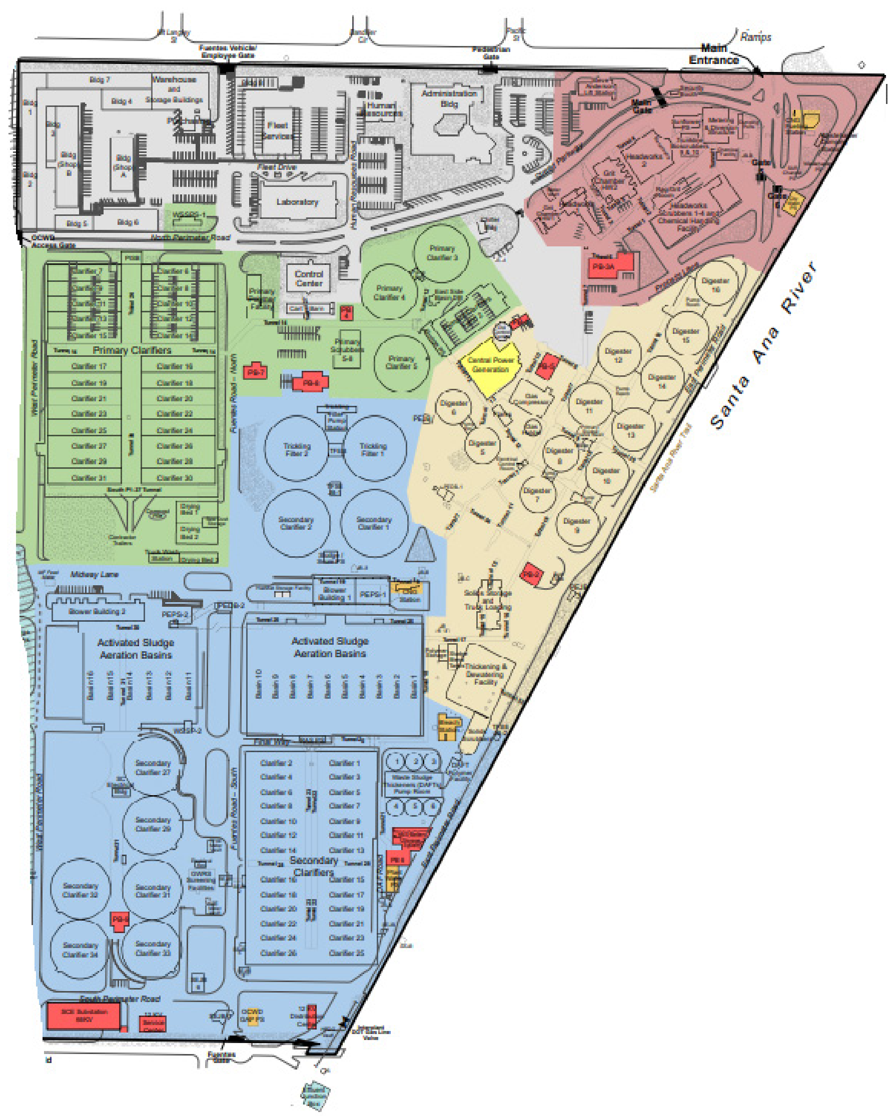
Types of Project Legend:

CIP - Planning **CIP - Design** **CIP - Construction** **Maintenance Project**

Acronym Key:

CIP = Capital Improvement Program; CWPS = City Water Pump Station; DAFT = Dissolved Air Flotation Thickener; DC = Direct Current; FE= Facilities Engineering; FY = Fiscal Year; HVAC = Heating, Ventilation, and Air Conditioning; kV = Kilovolt(s); kW = Kilowatt(s); MCC = Motor Control Center; P1 = Plant No. 1; P2 = Plant No. 2; PWPS = Plant Water Pump Station; RAS = Return Activated Sludge; T&D = Thickening and Dewatering; UPS = Uninterruptible Power Supply; TF = Trickling Filter; V = Volt(s); VDC = Volts of Direct Current; VFD = Variable Frequency Drive; WSS = Waste Sidestream; WSSPS = Waste Sidestream Pump Station

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 19 – PLANT NO. 1 OCCUPIED & POWER BUILDINGS



Asset RUL Legend:

- RUL < 5 years (red)
- RUL 5–10 years (orange)
- RUL 11–15 years (yellow)
- RUL 16–20 years (green)
- RUL > 20 years (gray)

Acronym Key:

HVAC = Heating, Ventilation, and Air Conditioning
kV = Kilovolt(s)
N/A = Not Applicable
RUL = Remaining Useful Life
TBD = To Be Determined
V = Volt(s)

Major Assets Remaining Useful Life

Plant 1-Infrastructure Non-Process	Building Roof	Building Electrical	HVAC	Structural (Visual)	Seismic (PS15-06)	Elevator
Building "Shop" A	1	3	4	1	2	N/A
Building "Shop" B	2	4	4	1	4	N/A
Fleet Services	3	2	4	1	4	N/A
Building 1	2	3	N/A	1	N/A	N/A
Building 2	2	3	N/A	1	N/A	N/A
Building 3	2	3	N/A	1	4	N/A
Building 4	2	2	4	1	N/A	N/A
Building 5	2	3	4	1	5	N/A
Building 6	2	3	4	1	5	3
Building 7	2	3	4	1	N/A	N/A
Building 8	2	3	N/A	1	N/A	N/A
Cart Barn	4	3	N/A	TBD	TBD	N/A
Laboratory	3	4	5	1	5	3
Purchasing Building	4	4	5	1	N/A	N/A
Warehouse Building	1	4	4	1	3	N/A
Purchasing Conference Room	1	2	4	1	N/A	N/A
Control Center	3	4	5	1	5	2
12-kV Distribution Center	4	N/A	3	1	N/A	N/A
12-kV Service Center	3	N/A	2	1	5	N/A
Power Building 2	4	N/A	3	1	2	N/A
Power Building 3A	3	N/A	3	1	N/A	N/A
Power Building 4	3	N/A	3	1	2	N/A
Power Building 5	3	N/A	3	1	2	N/A
Power Building 6	3	N/A	3	1	2	N/A
Power Building 7	5	N/A	5	1	N/A	N/A
Power Building 8	5	N/A	5	1	N/A	N/A
Power Building 9	1	N/A	3	1	N/A	N/A

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 19 – PLANT NO. 1 OCCUPIED BUILDINGS

Current and Future Projects

Project No.	Project Title	Impacted Facilities	Description of Work	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35	FY 35/36
PRN-00947	Power Building 7 HVAC Replacement at Plant No. 1	Power Building 7	• Replace existing HVAC with similar unit.													
FE21-01	Plasma Cutting Fume Extractor installation at Plant No. 1 Rebuild Shop	Rebuild Shop	• Install fume extraction specifically for plasma cutting equipment.													
PS21-02	Public Announcement and Fire System at Plant Nos. 1 and 2	Plantwide	• Study to provide alternatives and recommend upgrading our existing fire and public announcement systems plantwide.													
PS23-01	Fleet Facilities Rehab/Replacement Study	Fleet Building	• Determine the feasibility of rehabilitating or replacing existing fleet services building due to aging equipment, and new electric and hybrid fleet vehicle requirement.													
PRN-00955	Purchasing, PB 7, and PB 8 Roof Replacement	Purchasing, PB 7, & PB 8	• Replace existing roof.													
PRN-00960	Control Center HVAC Replacement	Control Center	• Replace existing HVAC.													
PRN-00953	SALS HVAC System Equipment Replacements	SALS	• Replace existing HVAC, possibly combined with PRN-00960.													
X-124	Electric Vehicle Fleet Services Building	Fleet Building	• Implement recommendations from PS23-01.													
P1-128	Headquarters Complex	New Headquarters, Admin Building and HR	• Construct new Headquarters Building on the north side of Ellis Ave.													
P1-105	Headworks Rehabilitation and Expansion at Plant 1	Power Buildings 3 and 3A	• Build new Power Building 3 to replace Power Building 3A.													
P1-137	Support Building Seismic Improvements	Fleet, Control Center, Rebuild Shop, Shop A Shop B, 12-kV Service Center, Buildings 5 and 6	• Install seismic retrofits per PS15-06 recommendation.													
J-133	Laboratory Replacement at Plant No. 1	Laboratory	• Construct new laboratory per PS19-03 recommendation.													
P1-141	Administration Building and Power Building 3A Demo	Admin and PB 3A	• Demo both Administration and Power Building 3A													

Types of Project Legend:
CIP - Planning **CIP - Design** **CIP - Construction** **Maintenance Project**

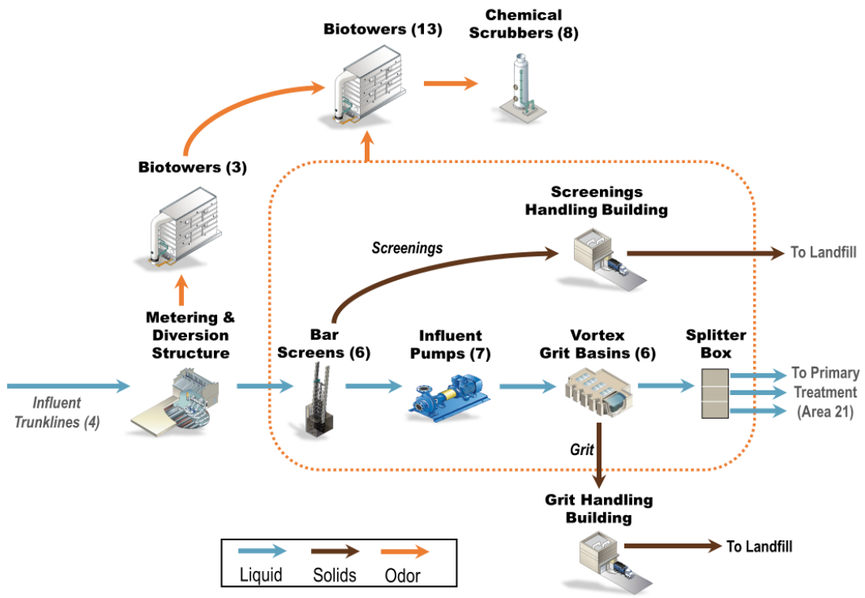
Acronym Key:
Demo = Demolish; FY = Fiscal Year; HVAC = Heating, Ventilation, and Air Conditioning; kV = Kilovolt(s); PB = Power Building; SALS = Steve Anderson Lift Station

Plant No. 2 Asset Management Summaries

This page is intentionally left blank.

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 20 – PLANT NO. 2 PRELIMINARY TREATMENT

Process Schematic



Note: Process Schematic is general in nature. A detailed process diagram is provided in Appendix D

Major Assets Remaining Useful Life

Asset Type	Headworks					Trunkline Odor Control	Headworks Odor Control	Distribution Center H
	Metering & Diversion	Bar Screens	Main Sewage Pump	Grit Basins	Splitter & Metering			
Civil								
Effluent Piping	-	-	-	-	1	-	-	-
Structural								
Building	1	1	1	1	1	-	-	1
Concrete & Tanks	1	1	1	1	1	2	2	-
Mechanical								
Piping & Valve	2	-	2	2	2	-	-	-
Pump	-	-	5	2	-	2	2	-
Screening Washer Compactor	-	3	-	-	-	-	-	-
Grit Cyclone/Classifier	-	-	-	3	-	-	-	-
Conveyor	-	3	-	3	-	-	-	-
Fans & Blower	-	-	-	-	-	2	2	-
Control Gate	2	2	2	2	2	-	-	-
Media	-	-	-	-	-	4	4	
HVAC	3	3	3	3	3	-	-	3
Electrical								
Motor, MCC, VFD	-	-	3	-	-	-	-	2
Instrumentation								
PLCs, Flow Meters	4	2	5	2	2	2	2	-

Asset RUL Legend:

- RUL < 5 years
- RUL 5–10 years
- RUL 11—15 years
- RUL 16—-20 years
- RUL > 20 years

Acronym Key:

HVAC = Heating, Ventilation, and Air Conditioning

MCC = Motor Control Center

PLC = Programmable Logic Controller

RUL = Remaining Useful Life

VFD = Variable Frequency Drive

Major Assets

Major Assets	Quantities
Metering & Diversion Structure	
Influent Flow Meter	4
Control Gate	7
Trunk Odor Control	
Supply Fan	3
Biotower	3
Recirculation Pump	6

Major Assets	Quantities
Bar Screens	
Bar Screen	6
Screening Washer Compacter	3
Screenings Conveyor	4
Control Gate	14

Major Assets	Quantities
Main Sewage Pump	
Pump	7
Control Gate	16
Splitter and Metering	
Flow Meter	3
Control Gate	26

Major Assets	Quantities
Grit Basins	
Grit Basins	6
Grit Slurry Pump	6
Grit Cyclone/Classifier	4
Control Gate	12

Major Assets	Quantities
Headworks Odor Control	
Supply Fan	21
Biotower	13
Chemical Scrubber	8
Recirculation Pump	42
Bleach Tank	1
Bleach Pump	16

Major Assets	Quantities
Headworks Odor Control (Continued)	
Acid Tank	1
Acid Pump	2
Caustic Tank	1

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 20 – PLANT NO. 2 PRELIMINARY TREATMENT

Key Issues

Key Issues	Actions and Recommendations
• **Headworks Low Voltage Cable Reliability** – Many of Headworks 480-V cables are failing, triggering ground faults on 480-V equipment. MP-509 and FR2-0024 were completed to replaced many of the failed cables. The Grit System was also impacted due to cable failures and emergency task (reference SDR-576/AI-473) installed temporary power and control cables for grit pumps and mixers.	• FR2-0026 Headworks Phase 3 Cable Replacement at Plant No. 2 is in the construction phase. Completion is scheduled for June 2024. • MP2-008 is in development to permanently replace Grit Basin power and control cables, and MP2-013 is in development to install temporary cables to the grit classifiers.
• **M&D Trunkline and Bar Screen Grit Buildup** – Due to low flow and low velocity, heavy grit buildups were observed at the lowest point of M&D trunklines. This had impacts on pH and conductivity sensors that are installed on the bottom of the metering pipe. P2-122 relocated probes on the Interplant trunkline. This relocation needs to occur on the three remaining trunklines as well.	• Operations rotate the trunklines monthly and keep only two trunklines in service to help prevent buildup. • Maintenance created a biannual PM to have bar screen inlets cleaned. • PRN-00535 Influent Metering Structure Trunkline Probes Relocation is in progress to relocate probes from the grit buildup in conjunction with grit cleaning as needed for each trunkline prior to the probes relocation. Coast is complete and operational. Bushard and Miller-Holder are in progress.
• **Washer Compactor Vulnerability** – On August 21, 2021, Plant No. 2 observed a slug of rags that plugged two washer compactors. With the plant operating in separated mode following the completion of P2-122, redundancy is reduced with one swing unit on standby available for the non-reclaimable or reclaimable stream.	• Initiate a planning study to further investigate the reliability of the washer compactor system and provide a feasible solution.
• **Plant Water Piping at Influent Pump Station Building** – There is a sluiceway control station in the basement of Influent Pump Station Building. This station is critical to provide adequate conveyance of screenings to the washer compactors. Plant water supply and discharge piping to the control station have failed.	• Maintenance provided a temporary repair to supply 4-inch plant water piping to the sluiceway control station. • FR2-0029 Influent Pump Station Plant Water Piping Repair at Plant No. 2 is in the construction phase to provide permanent fix to 8-inch plant water supply and 2-inch by 6-inch plant water discharge piping. Completion is scheduled for March 2024.
• **Main Sewage Pump Vibration Monitoring System** – Current vibration monitoring system is obsolete. It needs to be modernized to continue to protect both pumps and motors.	• Reliability group uses infrared thermometers to measure temperature of the asset and manual vibration readings to cover the deficiency. • Beta testing of Bently Nevada Orbit 60 on Centrifuge #5 at Plant No. 2 is complete. PRN-00561 will move forward for replacement.
• **Main Sewage Pumps Condition** – The five large main sewage pumps and warehouse spare pump have worn parts and are in need of repair and replacement of parts such as mechanical seals, bearings, shaft sleeves, and O-rings.	• PRN-00923 Main Sewage Pumps Repair at Plant No. 2 is in the scope development phase to bid a pump repair shop to make repairs on the spare large pump and MSP-1. A future project will be requested to apply similar repairs to the remaining MSPs (4, 5, 6, 7).

Current and Future Projects

Project No.	Project Title	Impacted Facilities	Description of Work	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35	FY 35/36	FY 36/37	FY 37/38
FR2-0026	Headworks Phase 3 Cable Replacement at Plant No. 2	Headworks	• In-house engineering design and bid for service contract for repairs on faulty cables.															
FR2-0029	Influent Pump Station Plant Water Piping Repair at Plant No. 2	Influent PS	• Restore Plant Water Piping from west side of Influent Pump Station Building.															
PRN-00535	Influent Metering Structure Trunkline Probes Relocation at Plant No. 2	M&D Structure	• Relocate pH and conductivity probes for each trunkline in M&D Structure.															
PRN-00561	Main Sewage Pump Vibration Monitoring System Modernization at Plant No. 2	Influent PS	• Modernize currently obsolete vibration monitoring system.															
PRN-00923	Main Sewage Pumps Repair at Plant No. 2	Influent PS	• Repair spare pump and MSP-1.															
X-030	Headworks Rehabilitation at Plant No. 2	Headworks	• Rehabilitate any equipment, electrical, structures, or materials that cannot provide 25 years of useful life.															

Types of Project Legend:

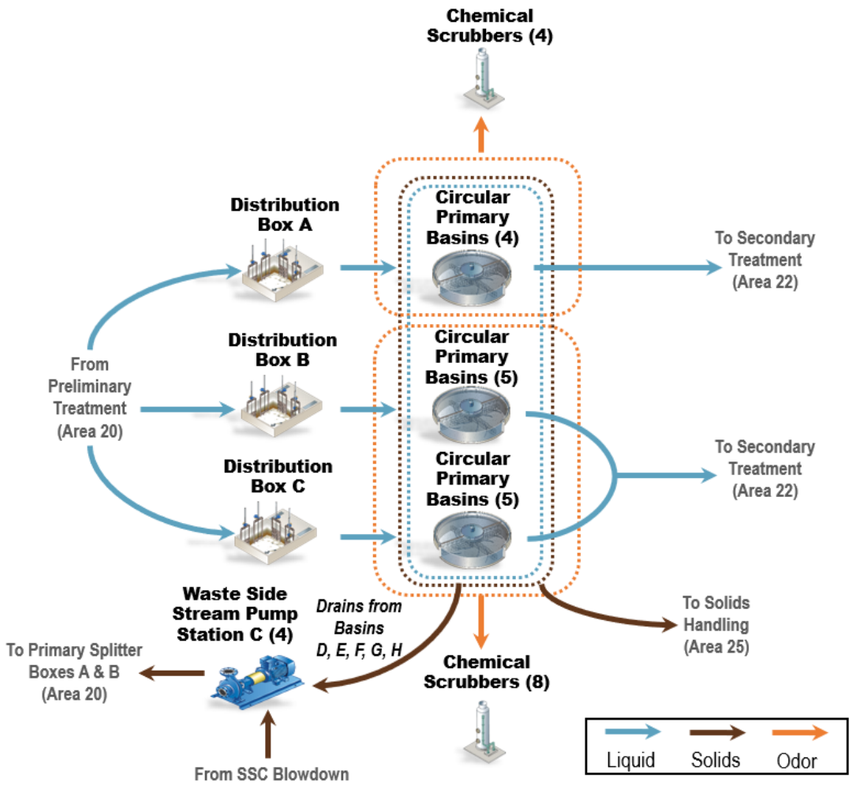
CIP - Planning **CIP - Design** **CIP - Construction** **Maintenance Project**

Acronym Key:

CIP = Capital Improvement Program; DC = Distribution Center; FY = Fiscal Year; GWRS = Groundwater Replenishment System; HW = Headworks; M&D = Metering & Diversion; MSP = Main Sewage Pump; N/A = Not Applicable; PM = Preventive Maintenance; PS = Pump Station; SARI = Santa Ana River Interceptor; TL = Trunkline; UPS = Uninterruptible Power Supply; V = Volts; VFD = Variable Frequency Drive

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 21 – PLANT NO. 2 PRIMARY TREATMENT

Process Schematic



Major Assets Remaining Useful Life

Asset Type	A-Side				B-Side					C-Side										
	PSB-D	PSB-E	PSB-F	PB-G	PB-H	PB-I	PB-J	PB-K	PB-L	PB-M	PB-N	PB-O	PB-P	PB-Q	NSC	SSC	Polymer System	Ferric System	Distribution Box	WSSPS-C
Civil																				
Effluent Piping	5	5	5	5	4	4	4	4	4	4	4	4	4	4	-	-	-	-	-	2
Structural																				
General	5	5	5	5	3	3	3	3	3	3	2	2	2	2	5	4	3	2	4	1
Dome	5	5	5	5	3	3	3	3	3	3	3	3	3	3	-	-	-	-	-	-
Mechanical																				
Piping	4	4	4	4	3	1	3	1	1	1	1	1	2	2	3	4	3	2	3	2
Internal Mechanism & Gates	5	5	5	5	4	4	4	4	4	4	4	4	4	4	-	-	-	-	-	-
Fans & Pumps	5		5		3		3		3		3		3		3	5	4	2	-	2
HVAC	4		4		3		3		3		3		3		-	-	-	-	-	-
Drains	5	5	5	5	3	3	3	3	1	1	1	1	3	3	3	4	-	-	5	-
Electrical																				
Process – Motor, MCC, VFD	4	4	4	4	3	3	3	3	3	3	3	3	3	3	-	-	5	2	-	2
Instrumentation																				
PLC, Flow Meters	4	4	4	4	3	3	3	3	3	3	3	3	3	3	3	4	5	2	-	2

Note: Process Schematic is general in nature. A detailed process diagram is provided in Appendix D

Acronym Key:

HVAC = Heating, Ventilation, and Air Conditioning; MCC = Motor Control Center; NSC = North Scrubber Complex; PB = Power Building; PLC= Programmable Logic Controller; RUL = Remaining Useful Life; SSC = South Scrubber Complex; VFD = Variable Frequency Drive; WSSPS = Waste Sidestream Pump Station

RUL Legend:

RUL < 5 years | RUL 5–10 years | RUL 11–15 years | RUL 16–20 years | RUL > 20 years

Major Assets

Major Assets	Quantities
Primary Basin – A-Side	
Primary Basin	4
Sludge/Scum Collectors	4
Sludge/Scum Pump	8
Supply Fan	6
Primary Basin – B-Side	
Primary Basin	5
Sludge/Scum Collectors	5
Sludge/Scum Pump	10
Supply Fan	7

Major Assets	Quantities
Primary Basin – C-Side	
Primary Basin	5
Sludge/Scum Collectors	5
Sludge/Scum Pump	10
Supply Fan	8
North Scrubber Complex	
Chemical Scrubber	7
Bio Scrubber	1
Recirculation Pump	16
Supply Fan	8
Caustic Tank	1

Major Assets	Quantities
North Scrubber Complex (Continued)	
Acid Feed Pump	2
Bleach Tank	1
Bleach Feed Pump	14
Caustic Feed Pump	16
Acid Tank	1
Acid Feed Pump	2
South Scrubber Complex (SSC)	
Supply Fan	4
Scrubbers	4
Recirculation Pump	8
Caustic Tank	1

Major Assets	Quantities
South Scrubber Complex (Continued)	
Caustic Feed Pump	8
Acid Tank	1
Acid Feed Pump	2
Bleach Tank	1
Bleach Feed Pump	3
Polymer System	
Polymer Bulk Tank	3
Polymer Bulk Transfer Pump	4
Polymer Mix Tank	2

Major Assets	Quantities
Polymer System (Continued)	
Polymer Feed Pump	4
Ferric System	
Ferric Bulk Tank	2
Ferric Feed Pump	6
Distribution Boxes	
Structure	3
Sluice Gates	24
Waste Sidestream Pump Station C	
Waste Sidestream Pump	4

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 21 – PLANT NO. 2 PRIMARY TREATMENT

Key Issues

Key Issues	Actions and Recommendations
• **Reliability of A-Side Primary Basins** – The A-side basins were built in the 1960s. Aluminum dome supports for A-Side Primary Basin E and G are corroded. Currently F and G are not available due to loss of structural integrity from severe corrosion of the rotating mechanisms. Availability of A-Side basins are critical to process non-reclaimable flow until P2-98A commissions four new primary basins.	• MP2-006 PSB-E Dome Support Repair and PRN-865 PSB-G Dome Support Repair will address dome supports by September 2023. • MP2-007 (task order directive) is currently in progress to develop a repair design for rotating mechanisms at PSB-F and PSB-G . • P2-98A is in the construction phase to replace all four A-side primary basins
• **Reliability of B and C Side Primary Sedimentation Basins** – B-side and C-side primary basins were built in the 1970s and 1980s, respectively. These basins are close to the end of their useful lives and require major rehabilitation to continue to operate reliably for next 30+ years.	• P2-98B performed interim repairs to B- and C-sides of primary basins to extend their useful life until a major rehabilitation is performed under future project P2-133. This project will provide long-term rehabilitation on B and C sides of primary basins.
• **Functionality of Distribution Box B Gates** – Distribution Box B has 10 leaking slide gates due to the absence of side seals in the original design.	• Repairs and installation of seals will be performed on one gate to test to start. Remaining gates will be repaired following a successful installation/test.
• **Condition of Primary Effluent Junction Boxes** – Junction boxes 2, A, B, C, D, and F were construction in the 1970s and Junction E was built in 1983. Several of these structures have leaks at the pressurized manhole covers and will need repair or rehabilitation.	• For P2-98A, Primary Effluent Junction Box 2 was inspected and identified heavily corroded roof structure. The project will address the immediate issue, but other effluent junction boxes (JB-A to JB-F) are in the process of being assessed because they have pressure manhole covers.
• **Reliability of Polymer System** – The polymer system was built in 1988 and the RUL is limited. Instrumentation is obsolete and parts are no longer readily available.	• The replacement of instrumentation and associated electrical has been added to the P2-135 Chemical Systems Rehabilitation at Plant No. 2 project. The system will be replaced under P2-133.

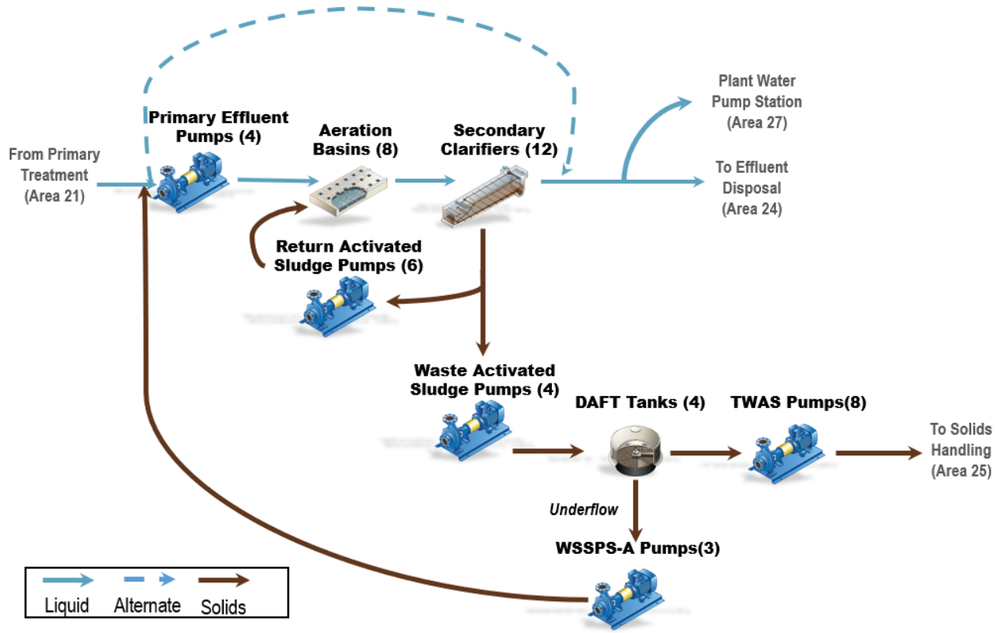
Current and Future Projects

Project No.	Project Title	Impacted Facilities	Description of Work	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35	FY 35/36	FY 36/37	FY 37/38
P2-98A	A-Side Primary Clarifiers Replacement at Plant No. 2	A-Side Primary Basins	• Demolish and replace four existing A-Side Primary Basins, including piping and distribution box. • Demolish and replace the South Scrubber Complex.															
P2-133	B- and C-Side Primary Clarifiers Rehabilitation at Plant No. 2	B- and C-Side Primary Basins	• Long-term full rehab to extend RUL of B- and C-side basins to 40 years or greater.															
P2-135	Chemical Systems Rehabilitation at Plant No. 2	Anionic Polymer System	• Replace obsolete instrumentation and associated electrical assets within the Anionic Polymer System.															
MP2-006	Primary Sedimentation Basin F Dome Support Repair at Plant No. 2	Primary Basin F	• Restore structural integrity of dome supports.															
MP2-007	Primary Sedimentation Basin F and G Rotating Mechanisms Repair at Plant No. 2	Primary Basin F and G	• Repair corroded rotating mechanisms.															
PRN-00865	Primary Sedimentation Basin G Dome Support Repair	Primary Basin G	• Restore structural integrity of dome supports.															
MP2-009	North Scrubber Complex Grating Replacement at Plant No. 2	North Scrubber Complex Grating	• Replacement of FRP grating deteriorated by ultraviolet exposure.															
X-030	Headworks Rehabilitation at Plant No. 2	Ferric Chloride and WSSPS-C	• Rehabilitate Ferric Chloride Facility and WSSPS-C.															
TBD	Primary Clarifiers B & C Side Internal Mechanism Coating Repair	B- and C-Side Primary Basins	• Recoat internal mechanism (preventive maintenance).															

Types of Project Legend:
CIP - Planning **CIP - Design** **CIP - Construction** **Maintenance Project**

Acronym Key:
CIP = Capital Improvement Program; FRP = Fiberglass Reinforced Plastic; FY = Fiscal Year;
RUL = Remaining Useful Life; TBD = To Be Determined; WSSPS = Waste Sidestream Pump Station

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 22 – PLANT NO. 2 SECONDARY TREATMENT – ACTIVATED SLUDGE



Acronym Key:

DAFT = Dissolved Air Flotation Thickener; HVAC = Heating, Ventilation, and Air Conditioning; LOX = Liquid Oxygen; MCC = Motor Control Center; PEPS = Primary Effluent Pump Station; PLC = Programmable Logic Controller; PS = Pump Station; RAS = Return Activated Sludge; RUL = Remaining Useful Life; SEJB = Secondary Effluent Junction Box; TWAS = Thickened Waste-activated Sludge; VFD = Variable Frequency Drive; WAS = Waste-activated Sludge; WSS = Waste Sidestream, Waste Secondary Sludge; WSSPS = Waste Sidestream Pump Station

Major Assets Remaining Useful Life

Asset Type	PEPS	Aeration Basins	Secondary Clarifiers A–L	SEJB	East RAS/WAS PS	West RAS/ WAS PS	Oxygen Facility	DAFTs A–D	DAFTs Polymer System	DAFTs Odor Control	WSSPS - A
Civil											
Effluent Piping	3	-	3	3	2	2	-	-	-	-	4
Structural											
Building	2	-	-	-	2	2	-	1	-	-	-
Structure	2	4	3	3	-	-	-	1	1	1	-
Mechanical											
Pump	4	-	-	-	3	3	-	2	2	-	3
Aerator	-	4	-	-	-	-	-	-	-	-	-
Piping and Valve	3	4	3	3	3	3	4	2	2	3	3
Clarifier/DAFT Moving Mechanism	-	-	4	-	-	-	-	2	-	-	-
Channel Air Blower	-	-	-	-	-	3	-	-	-	-	-
Control Gate	-	4	2	3	-	-	-	-	-	2	3
LOX Facility	-	-	-	-	-	-	4	-	-	-	-
HVAC and Ventilation	2	-	-	-	3	3	-	-	-	-	-
Crane	3	-	-	-	-	-	-	-	-	-	-
Electrical											
MCC and VFD	4	3	3	-	4	4	-	3	3	3	3
Instrumentation											
PLC and Flow Meter	3	4	3	-	3	3	3	3	3	-	3

RUL Legend:

RUL < 5 years | **RUL 5–10 years** | **RUL 11–15 years** | **RUL 16–20 years** | **RUL > 20 years**

Major Assets

Major Assets	Quantities
Primary Effluent Pump Station	
Building	1
Wet Well	1
Pumps	4
Bridge Crane	1
Aeration Basins	
Basins	8
Surface Aerators	32
Inlet gates	8
Purge Air Fans	4

Major Assets	Quantities
Secondary Clarifiers A-L	
Basins	12
Inlet gates	36
Sludge collectors	24
Secondary Effluent Junction Box (SEJB)	
Structure	1
Control Gate	1

Major Assets	Quantities
East RAS/WAS PS	
RAS Pumps	3
WAS Pumps	2
West RAS/WAS PS	
RAS Pumps	3
WAS Pumps	2
Channel air blowers	2
Oxygen Facility	
LOX Storage Tanks	2
Vaporizer	6

Major Assets	Quantities
DAFTs A-D	
Concrete Tanks	4
Mechanical Sweep	4
Recycle Pumps	6
Saturation Tank	4
TWAS Pumps	8
DAFTs Polymer System	
Storage Tank	1
Aging Tank	2

Major Assets	Quantities
DAFTs Polymer System (Continued)	
Storage Tank Rec. Pumps	2
Blend Pumps	2
Feed Pumps	6
DAFTs Odor Control	
Biofilters	3
Foul Air Fans	3
Waste Sidestream Pump Station	
Pumps	3

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 22 – PLANT NO. 2 SECONDARY TREATMENT – ACTIVATED SLUDGE

Key Issues

Key Issues	Actions and Recommendations
• **PEPS** – Obsolete VFD parts; aged PEPS pumps and corrosion on suction pipes; missing flapper gates on the area drains inlets to the wet well; pump discharge header coating condition.	• FE19-08 project will replace the PEPS VFDs. • MP2-0010 will overhaul Pump #1, #2 and #3. PRN-00770 Pump #4 condition assessment and rebuilt completed in 2022. • Missing flapper gates added to X-052. • Plan to perform condition assessment of discharge header coating.
• **Aeration Basins** – Concrete deck structural integrity; aerator motor corrosion and oxygen piping corrosion; inlet gates not totally sealed; aged oxygen analyzer panels and no air conditioning	• P2-136 to replace all oxygen piping, structurally rehab. the aeration basins, replace all aerators, replace all inlet gates and oxygen analyzer panels.
• **Secondary Clarifiers** – Broken clarifier mechanism need to be repaired or replaced; clarifier entry gate not meeting the OSHA requirement; loose handrails at the older portion of the clarifiers by P2-23-6; Scum accumulation and recirculation. Scum is currently flowing to WSSPS-A and then pumped back to PEPS to keep in the non-reclaimable stream.	• FR2-0018 is under construction to replace the remaining six clarifiers left by MP-248, which replaced the worst six ones. • FR2-0023 will add safe entry access platform to each secondary clarifier. • P2-136 will replace the handrails installed by P2-23-6.FR2-0031 will reroute the scum to DAFTs.
• **RAS/WAS Pump Stations** – Obsolete VFDs; aged pumps; seismic risks.	• FE19-08 will replace the RAS and WAS VFDs. • Maintenance is overhauling the pumps. • X-107 will add structural improvements to mitigate seismic risks at East and West RAS/WAS PSs.
• **Oxygen Facility** – LOX Tank A out of service due to leaking flange.	• FE21-07 is in construction phase for tank replacement. FE22-02 will replace LOX Tank-B. • PS22-02 to evaluate feasibility of onsite oxygen generation.
• **WSSPS -A** – Flooding of the pump dry well causing WSSPS pump motor damage.	• Maintenance replaced the sump pump at the dry well as a temporary solution. X-007 will replace the pumps with dry pit submersible type.
• **DAFT** – Seismic issues; lack of fall protection tie off points.	• X-107 will add structural improvements to mitigate seismic risks at DAFT D. • FR2-0023 will install fall protection tie-off points.

Current and Future Projects

Project No.	Project Title	Impacted Facilities	Description of Work	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35	FY 35/36	FY 36/37	FY 37/38
FR2-0018	Plant No. 2 AS Plant Clarifiers Rehabilitation - Phase 2	Secondary clarifiers	• Replace Clarifiers A, B, E, G, H, and L moving mechanisms.															
FR2-0023	Activated Sludge Clarifier Entry Improvements	Secondary clarifiers; DAFTs	• Add safe entry access platform to secondary clarifier and fall protection tie off to DAFTs.															
MP2-0010	PEPS Pump #1, #2 and #3 Overhaul	PEPS	• Overhaul PEPS Pumps #1, #2, and #3 in 3 consecutive years.															
FE19-08	Plant No. 1, Plant No. 2, Collections VFD Drives Replacement	PEPS, RAS, RSS pump stations	• Replace PEPS, RAS, and WAS VFDs.															
P2-136	Activated Sludge Aeration Basin Rehabilitation	AS Plant	• Rehabilitate the AS process.															
X-052	Activated Sludge RAS/WAS/PEPS/Vaporizers Rehabilitation	AS Plant	• Rehabilitate the RAS/WAS/PEPS/LOX vaporizers.															
FE21-07	Liquid Oxygen Tank A Replacement	LOX facility	• Replace LOX Tank A.															
FE22-02	Liquid Oxygen Tank B Replacement	LOX facility	• Replace LOX Tank B.															
FR2-0031	Activated Sludge System Scum Rerouting	AS Plant	• Reroute scum to DAFTs.															
X-007	Waste Sidestream Pump Station A Upgrade	WSSPS A	• Replace the WSSPS pumps with dry pit submersible type.															
X-107	Seismic Improvements to Dissolved Air Flotation Thickeners Area	DAFTs	• Structure seismic improvements.															
PS21-08	Pure Oxygen Activated Sludge Operations Study	AS Plant	• Evaluate the HPOAS facility operational strategies to treat non-reclaimable flow after the GWRS final expansion.															
PS22-02	Onsite Oxygen Generation Feasibility Study	LOX facility	• Evaluate the feasibility of implementing onsite oxygen generation system.															
PS-XXX	Activated Sludge Facility Replacement Planning Study	AS Plant	• Planning study to plan for AS Plant replacement.															
X-114	Activated Sludge Facility Replacement at Plant No. 2	AS Plant	• Install new secondary treatment facility based on the recommendations of the planning study.															

Types of Project Legend:

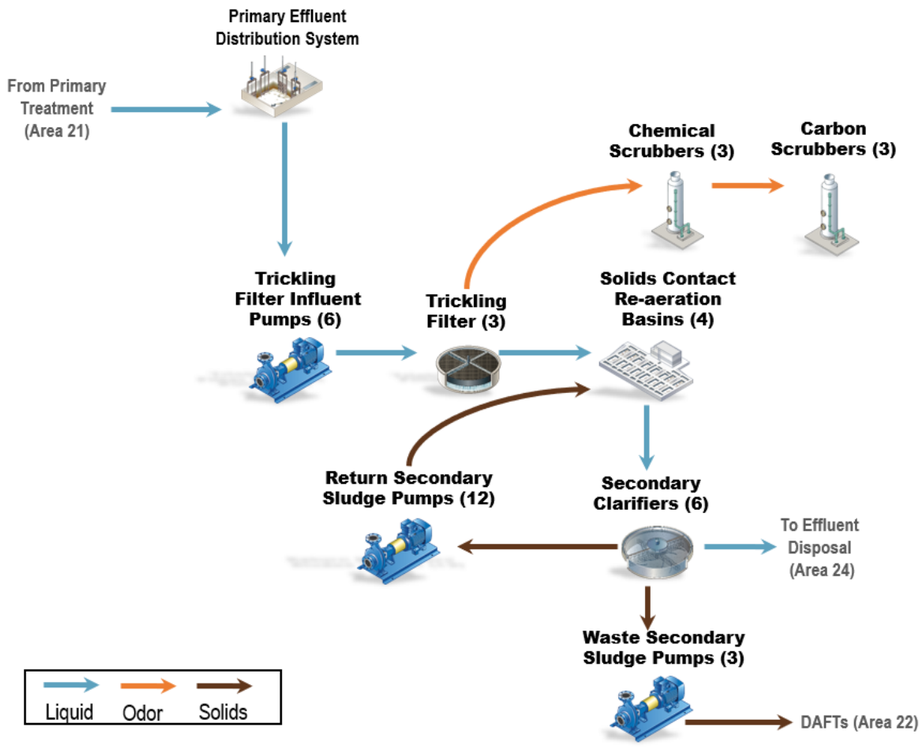
CIP - Planning **CIP - Design** **CIP - Construction** **Maintenance Project**

Acronym Key:

AS = Activated Sludge; CIP = Capital Improvement Program; DAFT = Dissolved Air Flotation Thickener; FY = Fiscal Year; GWRS = Groundwater Replenishment System; HPOAS = High-Purity Oxygen-Activated Sludge; LOX = Liquid Oxygen; OSHA = Occupational Safety and Health Administration; PEPS = Primary Effluent Pump Station; RAS = Return Activated Sludge; VFD = Variable Frequency Drive; WAS = Waste-activated Sludge; WSSPS=Waste Sidestream Pump Station; CIP = Capital Improvement Program; FY = Fiscal Year

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 22 – PLANT NO. 2 SECONDARY TREATMENT – TRICKLING FILTERS AND SOLIDS CONTACT

Process Schematic



Major Assets Remaining Useful Life

Asset Type	TFPS & Elec. Room	Trickling Filters A–C	Solids Contact & ML Channel	Blower/ WSS PS Building	Secondary Clarifiers A–F	RSS PS A	RSS PS B	RSS PS C & Elec. Room	Odor Control Facility	Chemical Facility
Civil										
Effluent Piping	2	2	2	2	2	2	2	2	2	2
Structural										
Building	1	-	-	1	-	1	1	1	-	-
Structure	1	1	1	-	1	-	-	-	2	2
Mechanical										
Pump	2	-	-	2	2	2	2	2	2	3
TF Rotary Distributor	-	2	-	-	-	-	-		-	-
TF Media	-	3	-	-	-	-	-	-	-	-
Clarifier Sludge Collector	-	-	-	-	3	-	-	-	-	-
Blower & Fan	-	2	-	2	-	-	-	-	2	-
Control Gate	-	3	3	3	3	-	-	-	-	-
Piping and Valve	2	2	2	2	2	2	2	2	2	2
Fine Buddle Diffusor	-	-	2	-	-	-	-	-	-	-
HVAC & Ventilation	2	-	-	2	-	2	2	2	-	-
Crane	2	-	-	2	-	2	2	2	-	-
Electrical										
MCC & VFD	4	3	-	3	3	-	-	3	3	3
Instrumentation										
PLCs & Flow Meters	3	3	-	3	3	3	3	3	3	3

Asset RUL Legend:

- RUL < 5 years
- RUL 5–10 years
- RUL 11–15 years
- RUL 16–20 years
- RUL > 20 years

Acronym Key:

Elec. = Electrical
HVAC = Heating, Ventilation, and Air Conditioning
MCC = Motor Control Center
ML = Mixed Liquor
PLC = Programmable Logic Controller
PS = Pump Station
RSS = Return Secondary Sludge
RUL = Remaining Useful Life
SC = Secondary Clarifier
SCR = Selective Catalytic Reduction
SC/SR = Solids Contact/Solids Reaeration
SR = Secondary Return
SRR = Solid State Relay
TF = Trickling Filter
TFPS = Trickling Filter Pump Station
VFD = Variable Frequency Drive
WSS = Waste Secondary Sludge

Major Assets

Major Assets	Quantities
Trickling Filter Pump Station	
Building	1
Pumps	6
Trickling Filters A–C	
Basins	3
TF Media	multiple
Rotary Distributor	3
Recirculation Fans	6
Foul Air Fans	3
Drain Gates	3

Major Assets	Quantities
SC/SR & ML Channel	
Structures	4 SCRs, 4 SRRs, 2 MLs
Control gates	multiple
Diffusors	multiple
Blower/WSS PS Building	
Building	1
SR Blowers	3
SC Blowers	3
WSS Pumps	3

Major Assets	Quantities
Secondary Clarifiers A–F	
Basins	6
Sludge Collector	6
Scum pumps	6
RSS PS-A	
Buildings	1
RSS Pumps	4

Major Assets	Quantities
RSS PS-B	
Buildings	1
RSS Pumps	4
RSS PS-C & Electrical Room	
Buildings	1
RSS Pumps	4

Major Assets	Quantities
Odor Control Facility	
Chemical scrubbers	3
Carbon Units	3
Chemical System	
Bleach Storage Tanks	2
Caustic Storage Tank	1
Bleach Pumps	7
Caustic Pumps	6

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 22 – PLANT NO. 2 SECONDARY TREATMENT – TRICKLING FILTERS AND SOLIDS CONTACT

Key Issues

Key Issues	Actions and Recommendations
• **TFPS** – No backup power to TFPS; pump failure could result in primary effluent to ocean outfall; C1 pump VFD failure, other five pump VFD parts obsolete.	• J-117B will provide a plantwide load shedding system to power critical Distribution Center J loads from Cen Gen. • PRN-00820 for C1 pump VFD replacement and PRN-00780 for remaining pump VFD replacement.
• **TFs** – TF-C center rotating assembly needs a similar replacement as TF-A and TF-B.	• MP2-005 replaced TF-A and TF-B center rotating assemblies in 2023. TF-C has some new parts transferred from TF-A during the TF-A repair effort before the replacement. • Will prepare Clearinghouse and Board approval for TF-C center rotating assembly replacement after proved success of TF-A and TF-B center masts replacement. • Continue monthly PM by contractor and Maintenance.
• **Secondary Clarifiers** – Corroded parts on walkways and clarifier moving mechanisms.	• Coating Program is working on coating the walkways and moving mechanism parts.
• **SC/SR Area** – Using temporary piping to route the area drain PS to SC/SR basins instead of HW to keep the microorganisms in the biological process area. Need hard piping and valves.	• PRN-00703 reroute area drain PS discharge to SC/SR basins instead of HW.
• **Snail control** – Signs of snail shell accumulation at process area and excessive wearing on RSS and WSS pipes. Shells found in long outfall pipeline.	• Changed from 25% caustic injection to 50%. • PS18-10 recommended to change back to original design of flooding with 50% caustic at shorter duration. Will do flooding test after TF-A is back to service.
• **Piping Cathodic Protection** – Cathodic protection survey in 2021 found missing test stations and lack of cathodic protection locations at the large diameter effluent piping.	• Condition assessment to the effluent piping was done in 2022 during J-36-2 and J-117B construction. No bad pipe condition found. Will continue cathodic protection survey every two years. J-117B will repair the relevant testing stations. Asset team is developing solutions to repair and replace the cathodic protection system.

Current and Future Projects

Project No.	Project Title	Impacted Facilities	Description of Work	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35	FY 35/36	FY 36/37	FY 37/38
MP2-005	TF- A & B Center Assemblies Replacement	TF-A, TF-B	• Replace the TF-A & B center rotating assemblies.															
PRN-00780	TFPS A1, A2, B1, B2, C2 VFDs replacement	TFPS	• Replace TFPS A1, A2, B1, B2, C2 VFDs.															
PRN-00703	Trickling Filter Process Drain Improvements	TF/SC	• Reroute area drain pump station discharge to SC/SR basins instead of Headworks.															
J-117B	Outfall Low Flow Pump Station	DCJ, TFPS	• New PWPS to draw flow from TFSC secondary effluent (SE). • Provide a plantwide load shedding system to power critical DC-J loads from Cen Gen.															
X-031	TF/SC Rehabilitation	TF/SC facility	• Overall rehabilitation of TF/SC. Replace the TF media.															
X-014	Odor Control for Trickling Filter Solids Contact Basins	SC/SR	• Cover the SC/SR basins, and install two new chemical scrubbers for odor treatment															

Types of Project Legend:

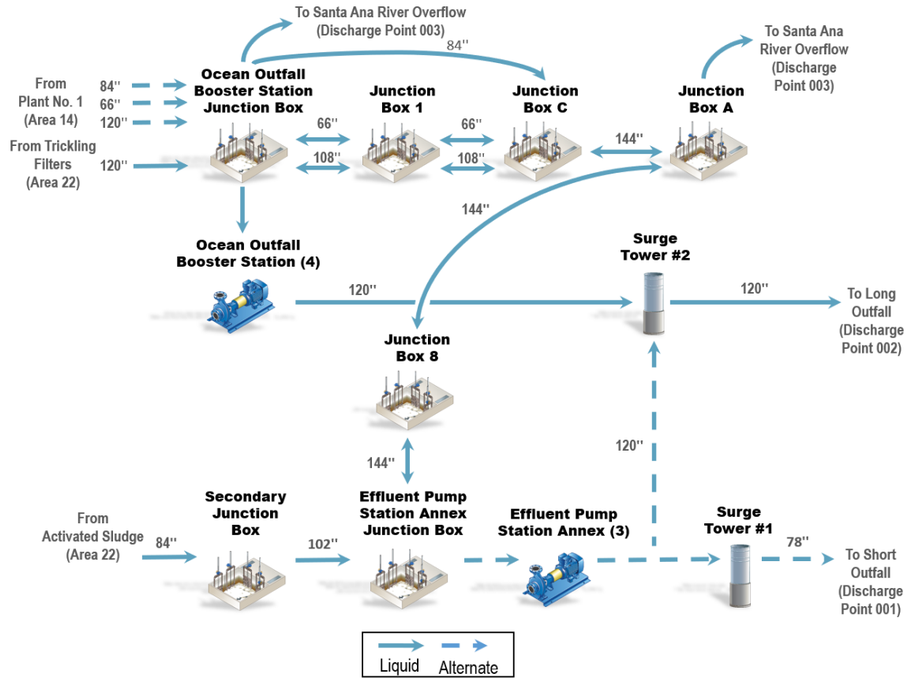
CIP - Planning **CIP - Design** **CIP - Construction** **Maintenance Project**

Acronym Key:

Cen Gen = Central Generation Facility; CIP = Capital Improvement Program; DC = Distribution Center J; FY = Fiscal Year; GWRS = Groundwater Replenishment System; HW = Headworks; ML = Mixed Liquor; OCWD = Orange County Water District; PM = Preventive Maintenance; PWPS = Plant Water Pump Station; RSS = Return Secondary Sludge; PS = Pump Station; SCADA = Supervisory Control and Data Acquisition; SC/SR = Solids Contact/Solids Reaeration; SE = Secondary Effluent; TF = Trickling Filter; TFPS = Trickling Filter Pump Station; TF/SC = Trickling Filter/Solids Contact

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 24 – PLANT NO. 2 EFFLUENT DISPOSAL

Process Schematic



Note: Process Schematic is general in nature. A detailed process diagram is provided in Appendix D.

Major Assets Remaining Useful Life

Asset Type	OOBS	Junction Boxes				EPSA	Disinfection System	Land Outfalls				120" Ocean Outfall	78" Ocean Outfall
		JB-1	JB-C	JB-A	JB-8			Surge Tower #1	Surge Tower #2	Sample Building	Beach Box		
Civil													
Effluent Piping	1	2	2	2	2	2	-	1	2	1	2	-	-
Structural													
Structures, Buildings	4	2	2	4	2	2	2	1	2	1	2	1	1
Mechanical													
Pumps, Fans	5	-	-	-	-	2	2	-	-	-	-	-	-
Gates/Valves	5	3	3	3	3	3	-	3	3	-	-	4	-
Pipes	2	2	2	2	2	2	3	1	2	1	1	-	-
Tank	-	-	-	-	-	-	5	-	-	-	-	-	-
Manhole Covers	-	-	-	-	-	-	-	-	-	-	-	4	4
Monel Parts	-	-	-	-	-	-	-	-	-	-	-	5	-
Ballast	-	-	-	-	-	-	-	-	-	-	-	4	4
Electrical													
Motor and VFD	5	-	-	-	-	3	-	-	-	-	-	-	-
Instrumentation													
PLC, Flow Meters	5	-	-	-	-	3	4	2	2	2	-	-	-
Actuators	4	4	4	4	4	4	-	4	4	-	-	-	-

Asset RUL Legend:

- RUL < 5 years
- RUL 5–10 years
- RUL 11–15 years
- RUL 16–20 years
- RUL > 20 years

Acronym Key:

EPSA = Effluent Pump Station Annex

JB = Junction Box

MCC = Motor Control Center

OOBS = Ocean Outfall Booster Station

PLC = Programmable Logic Controller

RUL = Remaining Useful Life

TBD =To Be Determined

VFD = Variable Frequency Drive

Major Assets

Major Assets	Quantities
Ocean Outfall Booster Station	
Pump	5
Wingwall Structure	1
Gate	3
Junction Boxes	
Junction Boxes	4
Wingwall Structure	1
Gate	13

Major Assets	Quantities
Effluent Pump Station Annex	
Pump	3
Gate	14
Disinfection Facility	
Sodium Bisulfite Tank	3
Sodium Bisulfite Feed Pump	6
Bleach Tank	6
Bleach Feed Pump	8

Major Assets	Quantities
Land Outfalls	
Surge Tower	2
Valve	2
Sample Building	1
Flowmeters	3
Beach Box	1
120" Ocean Outfall	
Port hole	500
Manhole cover	47

Major Assets	Quantities
78" Ocean Outfall	
Port hole	125
Manhole cover	14

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 24 – PLANT NO. 2 EFFLUENT DISPOSAL

Key Issues

Key Issues	Actions and Recommendations
• **Obsolescence of gate and valve actuators** – All actuators in Area 24 are obsolete. Some are failing and have been replaced.	• OC San will monitor conditions for actuators and will note which ones are difficult to operate during regular preventive maintenance activities. Given it would be a great effort to replace all actuators, a path for replacement/repair will be determined on a case-by-case basis depending on criticality.
• **OOBS and EPSA Operation and Maintainability Strategy** – After J-117B completion, Low Flow Pump Station will be the main mode of operation, and OOBS and EPSA will stay standby and used during peak wet weather flows.	• A future planning study will be created to identify operational and maintenance strategies for OOBS and EPSA.
• **Condition of 78-inch Short Outfall** – The short outfall was last used in 2012 and condition is largely unknown. NPDES recently added requirements for external inspection of the short outfall every 2.5 years	• Inspection and condition assessment of the 78-inch short outfall has been added to the scope of the J-137 project. External remotely operated vehicle inspection and reporting on the marine portion of the short outfall was completed in July 2023 and concluded that there were no significant observations requiring immediate attention.
• **Reliability of Sodium Bisulfite System** – P2-135 will rehabilitate the sodium bisulfite chemical feed and storage system and is currently in the design phase. While a temporary tank has been installed, additional set up of appurtenances for maintenance is needed for use and availability for J-137 and P2-135.	• A tank level transmitter along with associated wiring and conduit are currently being installed on the temporary tank. Additionally, plans are in progress for maintenance to install a recirculation loop from an existing pump to the temporary tank to prevent crystallization of sodium bisulfite within the tank.

Current and Future Projects

Project No.	Project Title	Impacted Facilities	Description of Work	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35	FY 35/36	FY 36/37	FY 37/38
J-117B	Outfall Low Flow Pump Station	OOBS and New Low Flow Pump Station	• Rehabilitate the OOBS and construct a new Low Flow Pump Station. • Replace the Plant Water Pump Station.															
P2-135	Chemical Systems Rehabilitation at Plant No. 2	Sodium Bisulfite Station	• Downsize existing sodium bisulfite facility to address new design conditions and rehabilitate to extend the useful life.															
P2-139	Santa Ana River Wingwall Rehabilitation	OOBS and JB-A	• Rehabilitate wingwalls by OOBS and JB-A per PS17-10 final report recommendations.															
J-137	Ocean Outfalls Rehabilitation	120" Ocean Outfall	• Rehabilitate marine portion of 120-inch Ocean Outfall per PS18-09 recommendations. • Inspect and assess the condition of the 78-inch short outfall.															
J-138	Cen Gen Facilities and OOBS Seismic Upgrades	OOBS	• Structural and geotechnical improvements to reduce risk of seismic vulnerability.															
FE19-06	EPSA Motor Cooling Improvement	EPSA	• Modify motor cooling system to provide adequate cooling to the motor at a lower design speed.															
PSXX-XX	Ocean Outfall Land-Section Rehabilitation Study	120" and 78" Ocean Outfalls	• Development of Planning Study to define project elements for future project X-116.															
X-098	EPSA Rehabilitation	EPSA	• Mechanical, structural, architectural, HVAC, and plumbing modifications.															
X-115	Short Outfall Rehabilitation	78” Ocean Outfall	• Rehabilitate 1- mile long 78-inch outfall, Surge Tower #1, and butterfly valves.															
X-116	Outfall Land Section Rehabilitation	120” Ocean Outfall	• Rehabilitate land section assets dedicated for the 120” outfall.															
PRN-00381	42-inch Emergency Overflow Line	42” Overflow from JB-A to Headworks	• CCTV the overflow line and determine plan for replacement or rehabilitation.															
N/A	Outfall External Inspection	120" and 78" Ocean Outfalls	• Ocean outfall external inspection every 2.5 years per the NPDES permit and lease agreement with the California State Lands Commission.															
N/A	Outfall Structural Integrity Report	120” and 78” Ocean Outfalls	• Ocean outfall structural integrity report every 5 years per the NPDES permit.															

Types of Project Legend:

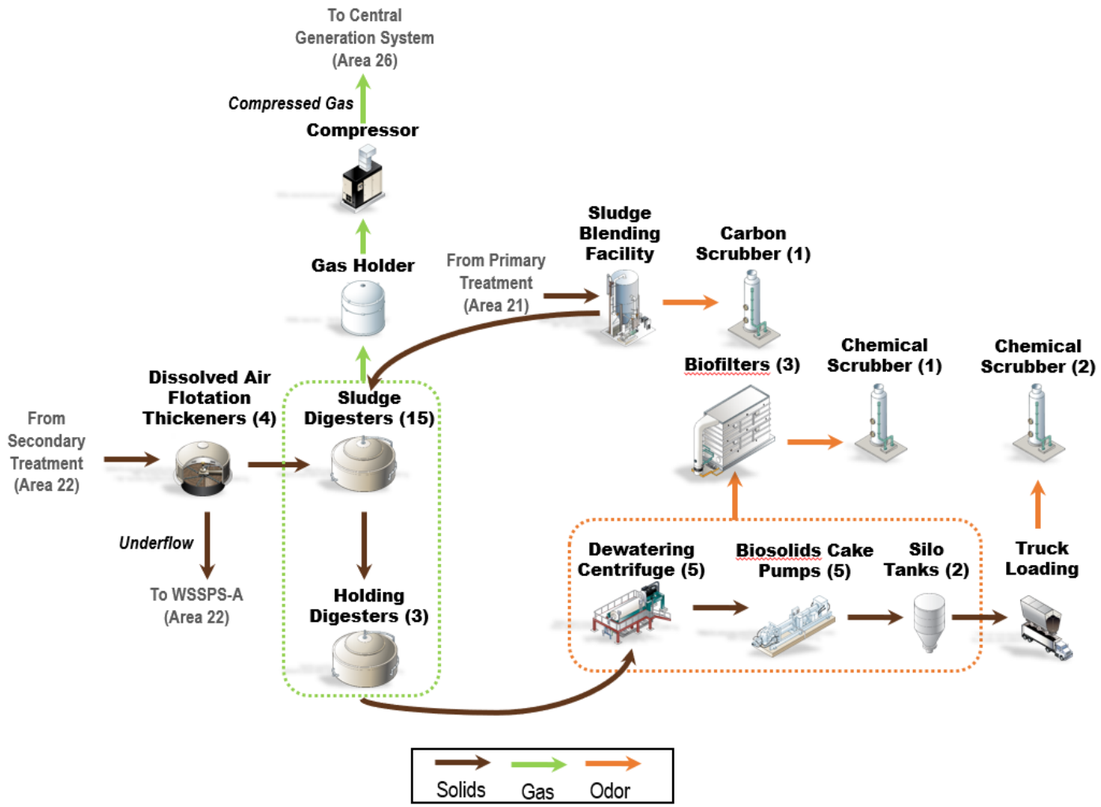
CIP - Planning **CIP - Design** **CIP - Construction** **Maintenance Project**

Acronym Key:

Cen Gen = Central Generation Facility; CIP = Capital Improvement Program; EPSA = Effluent Pump Station Annex; FY = Fiscal Year; JB = Junction Box; N/A = Not Applicable; NPDES = National Pollutant Discharge Elimination System; OOBS = Ocean Outfall Booster Station; TO = Task Order; VFD = Variable Frequency Drive

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 25 – PLANT NO. 2 SOLIDS HANDLING – DIGESTERS

Process Schematic



Major Assets Remaining Useful Life

Asset Type	Digester C	Digester D	Digester E	Digester F	Digester G	Digester H	Digester I	Digester J	Digester K	Digester L	Digester M	Digester N	Digester O	Digester P	Digester Q	Digester R	Digester S	Digester T	Digester Ferric
Civil																			
Effluent Piping	4	4	4	4	4	4	3	3	4	4	4	4	4	4	4	4	4	4	2
Structural																			
Structure	4	4	4	4	4	4	3	3	5	4	4	4	4	5	4	5	4	4	2
Digester Dome	4	4	4	4	4	4	3	3	5	4	4	4	4	5	4	5	4	4	-
Mechanical																			
Sludge Mixing Pumps/Jet Mixing	4	4	3	4	4	3	2	2	3	3	3	3	3	3	3	3	3	3	-
Sludge Recirculation and Heating System	4	4	2	4	4	2	2	2	-	2	4	4	4	4	4	4	4	4	-
Hot Water System	4	4	4	4	4	4	2	2	-	4	4	4	4	4	4	4	4	4	-
Sludge Transfer Pump	4			4			2	2	4		4		4		4		4		-
Piping & Valve	4	4	4	4	4	4	2	2	4	4	4	4	4	4	4	4	4	4	2
Chemical Pump	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
Electrical																			
MCC & VFD	4	4	4	4	4	4	2	2	3	3	3	3	3	4	4	4	4	4	2
Instrumentation																			
PLC & Flow Meter	4	4	4	4	4	4	2	2	3	3	3	3	3	4	4	4	4	4	2

Major Assets

Major Assets	Quantities
Anaerobic Digesters (C-T)	
Active Digesters	15
Active/Holding Digesters (I and J)	2
Holding Digesters (K)	1
Sludge Mixing Pumps	15+1+4 (1 each Digester + 1 at Digester K + 1 backup in each Digester L, M, N, & O)

Major Assets	Quantities
Anaerobic Digesters (C-T) (Continued)	
Jet Mixing Pumps	4 (2 each in Digesters I and J)
Sludge Recirculation Pumps	17
Hot Water Circulation Pumps	17
Heat Exchangers	17
Bottom Sludge Pumps	10

Major Assets	Quantities
Digester Ferric Facility	
Digester Ferric Storage Tanks	2
Ferric Feed Pumps	6

Acronym Key:

MCC = Motor Control Center

RUL = Remaining Useful Life

PLC = Programmable Logic Controller

VFD = Variable Frequency Drive

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 25 – PLANT NO. 2 SOLIDS HANDLING – DIGESTERS

Key Issues

Key Issues	Actions and Recommendations
• **Digester K** – Gas leaking from dome and numerous cracks found.	• FR2-0032 will repair Digester K dome by overlaying polymer concrete. Several rounds of condition assessment and ground penetration radar scanning for concrete and rebar mapping were done, structural analysis with concrete repair report was done.
• **Dig. C, D, F, and G high-rate mixing pump** – Ragging issues. • **PVC Gas balance lines** – Prone to failure due to material type.	• FE20-02 Digesters C, D, F, and G Rehabilitation to replace high-rate mixing pumps, heat exchangers, sludge recirculation pumps, bottom sludge transfer pumps, and hot water pumps and piping. FE20-02 will include the gas balance lines replacement and adjacent bridges repair included in FE19-10.
• **Walking bridges** – Structural deficiencies. Six out of 13 bridges were red tapes to prevent access after unsafe conditions found from assessments. • **Digesters P and R** – Post tensioned ring deterioration. • **Digester Reliability** – Digesters are at the end of their useful lives and pose seismic risk.	• P2-137 Digesters Rehabilitation at Plant No. 2 to repair domes, walking bridges, digester walls, handrails, and hot water piping and replace MCCs. Digesters P and R post tensioned ring and adjacent Q-R bridge repairs will be the first phase of bid. • PRN-00684 Maintenance Projects to replace heat exchangers, sludge recirculation pumps, and bottom sludge transfer pumps. Digesters L, E, and H work competed. • Building new digester complex as recommended by Biosolids Master Plan to replace the aging digesters and to mitigate the seismic risk. Series of projects identified by Biosolids Master Plan and 2017 Facility Master Plan to replace the digesters with TPAD facility and improve the site, including P2-128 TPAD Digester Facility; P2-129 – Digesters P, Q, R, and S Replacement; XP2 131 – Digesters I, J, and K Replacement; XP2-130 – Food Waste Receiving Facility; XP2-132 – Digester Demolition.

Current and Future Projects

Project No.	Project Title	Impacted Facilities	Description of Work	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35	FY 35/36	FY 36/37	FY 37/38
PRN-00684	P2 Digester Maintenance Projects	Digesters E, H, L, M, N, O, P, Q, R, S, and T	• Replace major mechanical equipment in kind, including heat exchangers and sludge recirculation and transfer pumps.															
FE20-02 (&FE19-10)	Digesters C, D, F, and G Rehabilitation Digesters C, D, F, G, and I Gas Balance Lines replacement	Digesters C, D, F, G, and I	• Replace major mechanical equipment, including high-rate mixing pumps, heat exchangers, sludge recirculation and transfer pumps, hot water pumps, and piping. Replace gas balance lines. Repair Digesters F through G, and Digesters D through I bridges.															
FR2-0032	Digester K Dome Repair	Digester K	• Repair Digester K dome.															
P2-137	Digesters Rehabilitation at Plant No. 2	Digesters C, D, F, G, H, L, M, N, O, P, Q, R, S, and T	• Digester domes, walls, large pipe penetration, hot water piping, handrails, walking bridges and MCC rehabilitation. Digesters P and R post-tensioned ring repair.															
P2-124	Interim Food Waste Receiving Facility	All Digesters, gas treatment facilities, and Central Generation	• Receive 150 wet ton per day of source separated and processed organic food waste to digesters for co-digestion.	**Design completed. Construction is pending food waste contract.**														
P2-128	TPAD Digester Facility	New TPAD Digester Facility	• Build five new thermophilic digesters, batching and cooling facilities and use the existing digesters as the mesophilic phase to treat the sludge by TPAD process.															
P2-129	Digesters P, Q, R, and S Replacement	Digesters P, Q, R, and S	• Replace digesters P, Q, R, S as the new mesophilic digesters.															
XP2-130	Food Waste Receiving Facility	All Digesters, gas treatment facilities, and Central Generation	• 500 wet tons of preprocessed food waste receiving facility (pending food waste decision).															
XP2-131	Digesters I, J, and K Replacement	Digesters I, J, K, T, M, N, and O	• Build three new digesters/holders and demolish existing digesters related.															
XP2-132	Digester Demolition	Digesters C, D, E, F, G, and H	• Demolish exiting digesters after all new digesters built.															

Types of Project Legend:

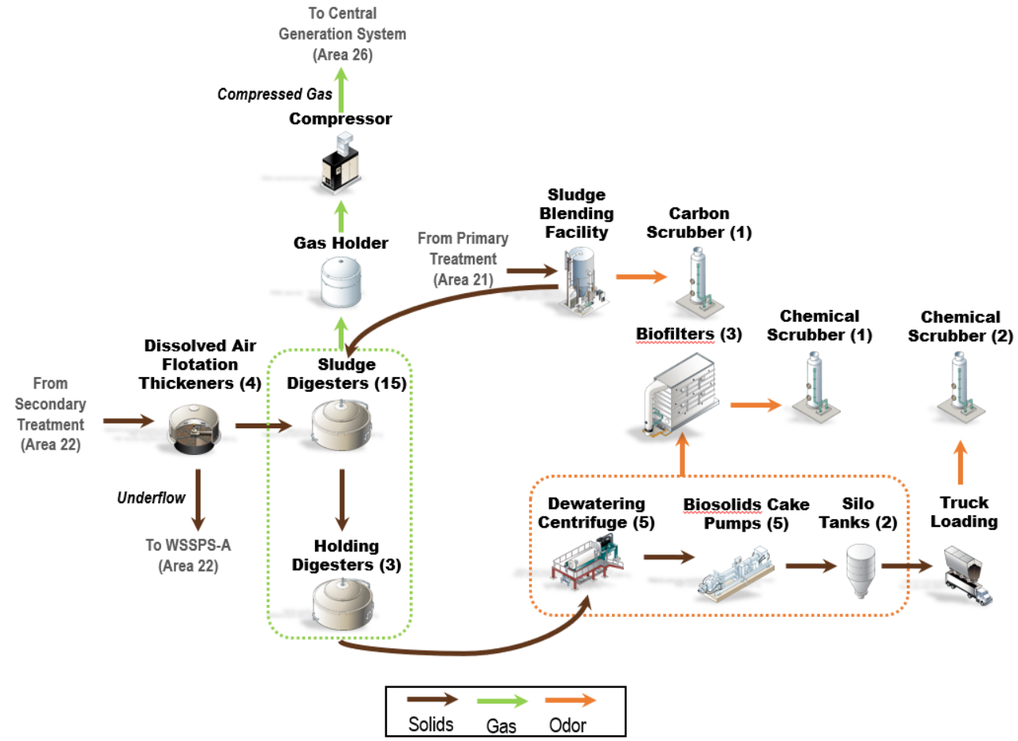
CIP - Planning **CIP - Design** **CIP - Construction** **Maintenance Project**

Acronym Key:

CIP = Capital Improvement Program; FY = Fiscal Year; MCC = Motor Control Center; N/A = Not Applicable; PVC = Polyvinyl Chloride; TPAD = Temperature Phased Anaerobic Digestion

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 25 – PLANT NO. 2 SOLIDS HANDLING – FACILITIES

Process Schematic



Major Assets Remaining Useful Life

Asset Type	Sludge Blending Facility	Plant Boiler	Centrifuge Dewatering	Centrifuge Bldg. & Silos Odor Control	Truck Loading Bay Odor Control	Truck Loading	Gas handling	Gas Holder	Gas Flares
Civil									
Effluent Piping	2	-	-	-	-	-	-	-	-
Structural									
Structure	2	-	1	1	1	1	-	3	3
Building	1	3	1	-	-	-	4	-	-
Mechanical									
Pump	3	-	1	-	-	-	-	-	-
Fan	-	-	-	2	2	-	-	-	-
Boiler & Heat Exchanger	-	2	-	-	-	-	-	-	-
Centrifuge	-	-	1	-	-	-	-	-	-
Polymer System	-	-	1	-	-	-	-	-	-
Biofilter	-	-	-	1	-	-	-	-	-
Chemical System	-	-	-	2	2	-	-	-	-
Gas Compressor	-	-	-	-	-	-	3	-	-
Gas Dryer	-	-	-	-	-	-	4	-	-
Screw Conveyor	-	-	-	-	-	2	-	-	-
Sliding Frame	-	-	-	-	-	2	-	-	-
Piping & Valve	3	3	2	2	2	3	4	3	2
Scale	-	-	-	-	-	4	-	-	-
Electrical									
MCC & VFD	3	3	2	2	2	3	4	-	-
Instrumentation									
PLC & Flow Meter	3	3	2	2	2	3	3	-	-

Asset RUL Legend:

- RUL < 5 years
- RUL 5–10 years
- RUL 11–15 years
- RUL 16–20 years
- RUL > 20 years

Acronym Key:

MCC = Motor Control Center
PLC = Programmable Logic Controller
RUL = Remaining Useful Life
VFD = Variable Frequency Drive
WSSPS = Waste Sidestream Pump Station

Major Assets

Major Assets	Quantities
Sludge Blending Facility	
Sludge Blending Tanks	2
Digester Feed Pumps	6
Recirculation Pump	3
Electrical Building	1
Plant Boiler Facility	
Building	1
Boilers and Heat Exchangers	2

Major Assets	Quantities
Dewatering Centrifuge Facility	
Building	1
Centrifuges	5
Sludge Feed Pumps	5
Cake Transfer Pumps	5
Centrate Pump	2
Polymer System	1

Major Assets	Quantities
Centrifuge Building & Silos Odor Control	
Biofilters	3
Ammonia Scrubber	1
Acid Tank	1
Gas Handling	
Gas Compressors	3
Gas Dryers	2
Gas Flares	3

Major Assets	Quantities
Gas Holder	
Gas Holder Tank	1
Truck Loading	
Cake Storage Silos	2
Sliding Frames	2
Screw Conveyors	12
Scales	2

Major Assets	Quantities
Truck Loading Bay Odor Control	
Chemical Scrubbers	2
Bleach Tank	1
Caustic Tank	1
Bleach Pumps	4
Caustic Pumps	4

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 25 – PLANT NO. 2 SOLIDS HANDLING – FACILITIES

Key Issues

Key Issues	Actions and Recommendations
• **Boilers and Heat Exchangers** – Aging equipment and facility that has reliability and seismic vulnerabilities.	• P2-128 included a Boiler Building with a third boiler to cover exiting boiler capacity. Existing boiler facility demolition is included in XP2-132. • PS21-04 to evaluate digester gas usage and power generation alternatives. The heat recovery and demand will be factored in. PS21-04 decision will impact the Plant Boiler decision.
• **Gas Handling System** – Gas compressor system is aging and needs reliability improvements.	• J-124 Digester Gas Facilities will rehabilitate and replace aging assets. • Gas compressor repairs and overhauls will be performed by Maintenance.
• **Refrigerated Gas Dryer** – Inefficient capacity and unreliable. Currently no redundancy for gas drying.	• The refrigerated gas dryer system will be replaced by FE23-01.
• **Truck Loading Facility Area** – Truck loading bay fugitive odors escaping; aged and corroded scales.	• PS20-03 made recommendations for truck bay odor control improvements, P2-140 will implement recommendations. • MP2-014 will replace the two scales.
• **Centrifuge** – Hinged cover needed to support Maintenance activities; cake pipe lube ring pump replacement parts not readily available.	• PRN-00885 sole source to OEM to replace covers with hinged covers. • AI-642 to research solutions.

Current and Future Projects

Project No.	Project Title	Impacted Facilities	Description of Work	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35	FY 35/36	FY 36/37	FY 37/38
MP2-014	Truck Loading Scale Replacement	Truck Loading Station	• Replace two scales in kind.															
J-124	Digester Gas Facilities Rehabilitation	Gas compressors, dryers, flares	• Rehabilitate existing compressor building and replace the electrical and instrumentation; replace the flares.															
P2-140	Truck Loading Bay Odor Control Improvements	Truck Loading Station	• Truck loadout facility improvements from PS20-03, and minor concrete repair.															
P2-128	TPAD Digester Facility	Boiler facility	• Add new boiler to replace the existing boilers.															
PRN-00885	Centrifuge Hinged Cover Replacement	Centrifuges	• Add hinged cover to improve access and maintainability															
XP2-132	Digester Demolition	Boiler facility and SBF	• Demolish Boiler Facility and SBF with digesters demolition.															

Types of Project Legend:

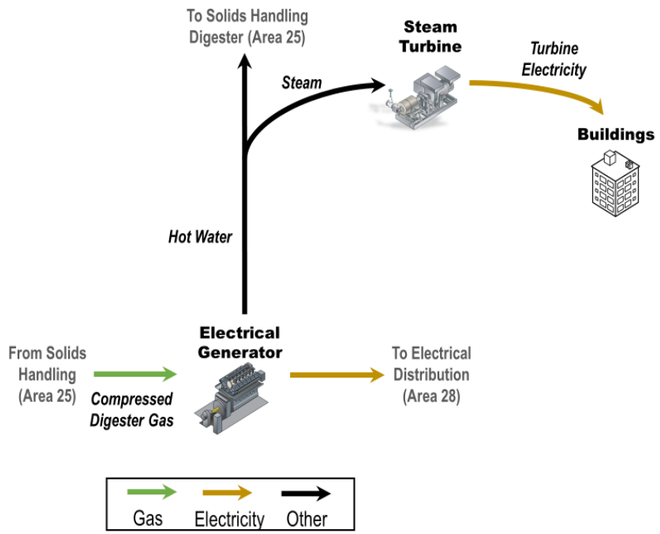
CIP - Planning **CIP - Design** **CIP - Construction** **Maintenance Project**

Acronym Key:

CIP = Capital Improvement Program; FY = Fiscal Year; OEM = Original Equipment Manufacturer; SBF = Sludge Blending Facility; TPAD = Temperature-phased Anaerobic Digester

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 26 – PLANT NO. 2 CENTRAL GENERATION

Process Schematic



Major Assets Remaining Useful Life

Asset Type	Engine Generator #1	Engine Generator #2	Engine Generator #3	Engine Generator #4	Engine Generator #5	Steam Turbine Generator	Steam Condenser	Deaerator Vessel	Heat Recovery Boiler #1	Heat Recovery Boiler #2	Heat Recovery Boiler #3	Heat Recovery Boiler #4	Heat Recovery Boiler #5	OXI Catalyst	SCR Catalyst	Urea Injection System	Starting Air Compressor #1	Starting Air Compressor #2	Starting Air Compressor #3	Inst. Air Compressor #1	Inst. Air Compressor #2	Battery Backup	Plant Water Piping	Miscellaneous
Structural																								
Building	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Mechanical																								
General	5	5	5	5	5	3	3	4	4	4	4	4	4	4	3	3	3	3	3	5	5	-	5	-
HVAC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4
Lube Oil System	4	4	4	4	4	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Electrical																								
General	5	5	5	5	3	3	-	-	-	-	-	-	-	-	-	3	3	3	3	3	3	3	-	-
Switchgear	4	4	4	4	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Instrumentation																								
General	4	4	4	4	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	4	4	-	-	-

RUL Legend:
RUL < 5 years | RUL 5–10 years | RUL 11–15 years | RUL 16–20 years | RUL > 20 years

Acronym Key:
HVAC = Heating, Ventilation, and Air Conditioning; Inst. = Instrument; OXI = Oxidizer; RUL = Remaining Useful Life; SCR = Selective Catalytic Reduction

Major Assets

Major Assets	Quantities
Engine Generator	
Gas Engine (16 Cylinders)	5
Electrical Generator	5
Engine Lube Oil System	5
Steam Turbine Generator	
Steam Turbine	1
Electrical Generator	1
Steam Condenser	1
Deaerator Vessel	1

Major Assets	Quantities
Heat Recovery System	
Heat Recovery Boiler	5
Building	
Building	1
Piping	Various
Engine Emission Control	
OXI Catalyst	5
SCR Catalyst	5
Urea Injection System	5

Major Assets	Quantities
HVAC	
Ventilation Supply Fans	5
Ventilation Exhaust Fans	6
Air Compressors	
Engine Starting Air	3
Instrument Air	2

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 26 – PLANT NO. 2 CENTRAL GENERATION

Key Issues

Key Issues	Actions and Recommendations
• **Gas Engine Generator Set Reliability** – Aging components and systems required to operate the five Central Generation Engines are creating reliability issues and need to be addressed.	• Execute major engine overhauls (J-135B). • Replace obsolete systems (for example, battery backup, switchgear, motor control centers, ignition system, PLC upgrade, etc.) (J-117B, PRN-00915).
• **Engine Lube Oil System** – Lube oil centrifuges instrumentation and controls (I&C) need to be upgraded.	• Install new instrumentation and controls onto the existing two units (PRN-00211).
• **Plant Water Piping** – Plant water (that is, cooling water) piping has degraded and needs replacement.	• Replace all plant water piping in the basement of Central Generation (FE20-04).
• **Emission Control System** – Housings on the Oxidizer Catalysts are failing prematurely.	• Investigate failures, redesign, and install new Catalyst Housings and emissions devices as needed (PRN-00427).
• **Instrument Air Compressors** – Air compressors are no longer operational.	• Replace the entire Instrument Air System, installing new compressors and appurtenances (PRN-00536).
• **Exhaust Heat Recovery Boilers** – The boilers need to be inspected both internally and externally.	• Inspect and repair boiler pressure vessels as required to maintain safety and reliability (AI-195).
• **Engine PLC Upgrade** – The existing engine PLCs are obsolete.	• Replace obsolete engine PLCs with new ones (AI-170).
• **Engine Protection System and Diagnostics** – Engine diagnostic capability improvement needed.	• Upgrade the Engine Condition Monitoring System and include diagnostic capabilities (PRN-00915).
• **Engine Ignition Control System** – The existing engine controls are aging and obsolete.	• Install new ignition control systems onto each engine genset (AI-226).

Types of Project Legend:

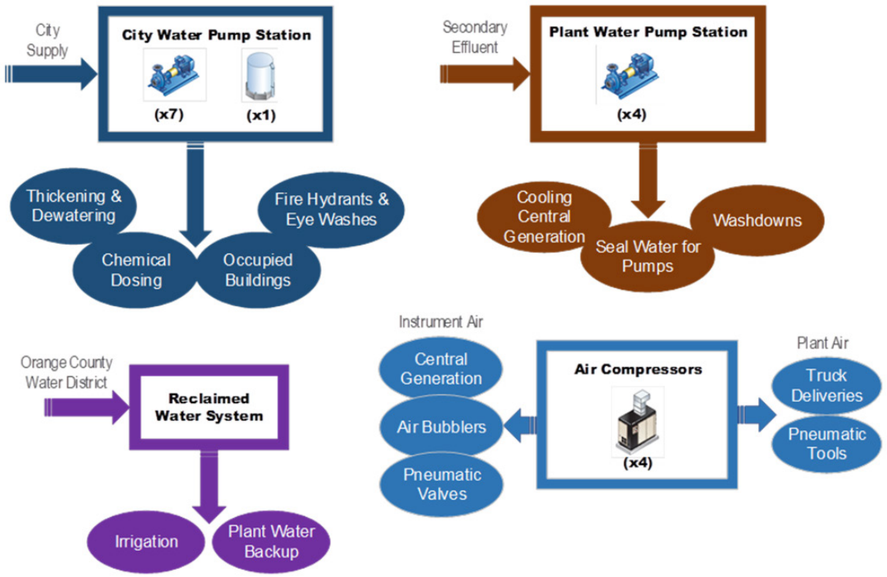
CIP - Planning **CIP - Design** **CIP - Construction** **Maintenance Project**

Acronym Key:

CIP = Capital Improvement Program; FY = Fiscal Year; I&C = Instrumentation and Controls; PLC = Programmable Logic Controller; RUL = Remaining Useful Life

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 27 – PLANT NO. 2 UTILITIES

Process Schematic



Major Assets Remaining Useful Life

Asset Type	City Water System	Plant Water System	Reclaimed Water Piping	Plant Air Systems
Civil				
Pipes	2	4	2	3
Structural				
Pump Station	1	5	-	-
Tanks	3	-	-	-
Mechanical				
Pumps	3	3	-	-
Strainers	-	3	-	-
Compressors	-	-	-	3
Ventilation System	2	2	-	-
Electrical				
MCC	2	2	-	-
VFD	3	3	-	-
Instrumentation				
PLC, Flowmeter	3	3	-	3

Asset RUL Legend:

- RUL < 5 years
- RUL 5–10 years
- RUL 11–15 years
- RUL 16–20 years
- RUL > 20 years

Acronym Key:

MCC = Motor Control Center
PLC = Programmable Logic Controller
RUL = Remaining Useful Life
VFD = Variable Frequency Drive

Major Assets

Major Assets	Quantities
City Water	
Pumps	7
Tanks	4
Piping	8.9 Miles

Major Assets	Quantities
Plant Water	
Pumps	4
Strainers	4
Piping	10.6 Miles

Major Assets	Quantities
Reclaimed Water	
Piping	6 Miles

Major Assets	Quantities
Plant Air	
Compressors	3
Plant Air Piping	6.7 Miles
Instrument Air Piping	1.6 Miles

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 27 – PLANT NO. 2 UTILITIES

Key Issues

Key Issues	Actions and Recommendations
• **Plant/Instrument Air Lines** – Excessive condensate and oversized piping causing large pressure drop, reducing compressor redundancy.	• Future small projects to be created to address oversized piping and several dead ends within the system.
• **Plant Water Piping** – Due to the corrosive nature of the plant water, the current ductile iron pipes are corroding prematurely and causing failures throughout the plant.	• FE18-14 will address corroded plant water piping in the tunnels and PRN-00740 will replace a small portion of plant water piping with HDPE. Overall goal for these and future projects is to replace ductile iron pipes with either fiberglass-reinforced or HDPE piping material.
• **Air Compressors** – Instrument Air Compressors have failed due to reaching their end of life and need to be replaced.	• Air compressors at Cen Gen are being replaced due to multiple failures via PRN-00536

Current and Future Projects

Project No.	Project Title	Impacted Facilities	Description of Work	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35	FY 35/36	FY 36/37
FE18-14	Plant Water Pipeline Rehabilitation	Piping in tunnels	• Replace 1,600 feet of piping in the tunnels.														
J-117B	Outfall Low Flow Pump Station	Plant Water Pump Station	• Replace Plant Water Pump Station and plant water piping near project.														
P2-133	B- and C-Side Primary Clarifiers Rehabilitation	Primary Clarifiers	• Replace City water piping near project.														
P2-98A	Primary Treatment Rehabilitation	City Water Pump Station	• Refeed City Water Pump Station directly from DC-F 480 switchgear.														
X-036	Plant No. 2 City Water Pump Station	City Water Pump Station	• Rehabilitation of City Water Pump Station.														
X-037	Plant No. 2 Plant Water Pump Station Demolition	Plant Water Pump Station	• Demo Plant Water Pump Station as a new Plant Water Station will be built by J-117B.														
P2-136	AS Aeration Basins at Plant No. 2	AS Aeration Basins	• Replace potable water lines.														
PRN-00740	6 in DIP Plant Water Pipe Replacement	Primary Sedimentation Basin	• Replacing 100 feet of DIP near PSB-P and PSB-Q by Maintenance Project.														
PRN-00536	IA Compressors at Plant No. 2 Cen Gen	Central Generation	• Replace instrument air compressors.														
PRN-00230	City Water Assessment at Plant No. 2	City Water Pump Station	• Study to evaluate future demands and capacity improvements to accommodate those demands. Will be combined with PRN-00541 and PRN-00743.														
MP2-011	Ella Tunnel Plant Water Pipe Replacement	Plant Water Piping	• Replace approximately 300 feet of corroded plant water piping in Ella Tunnel.														

Types of Project Legend:

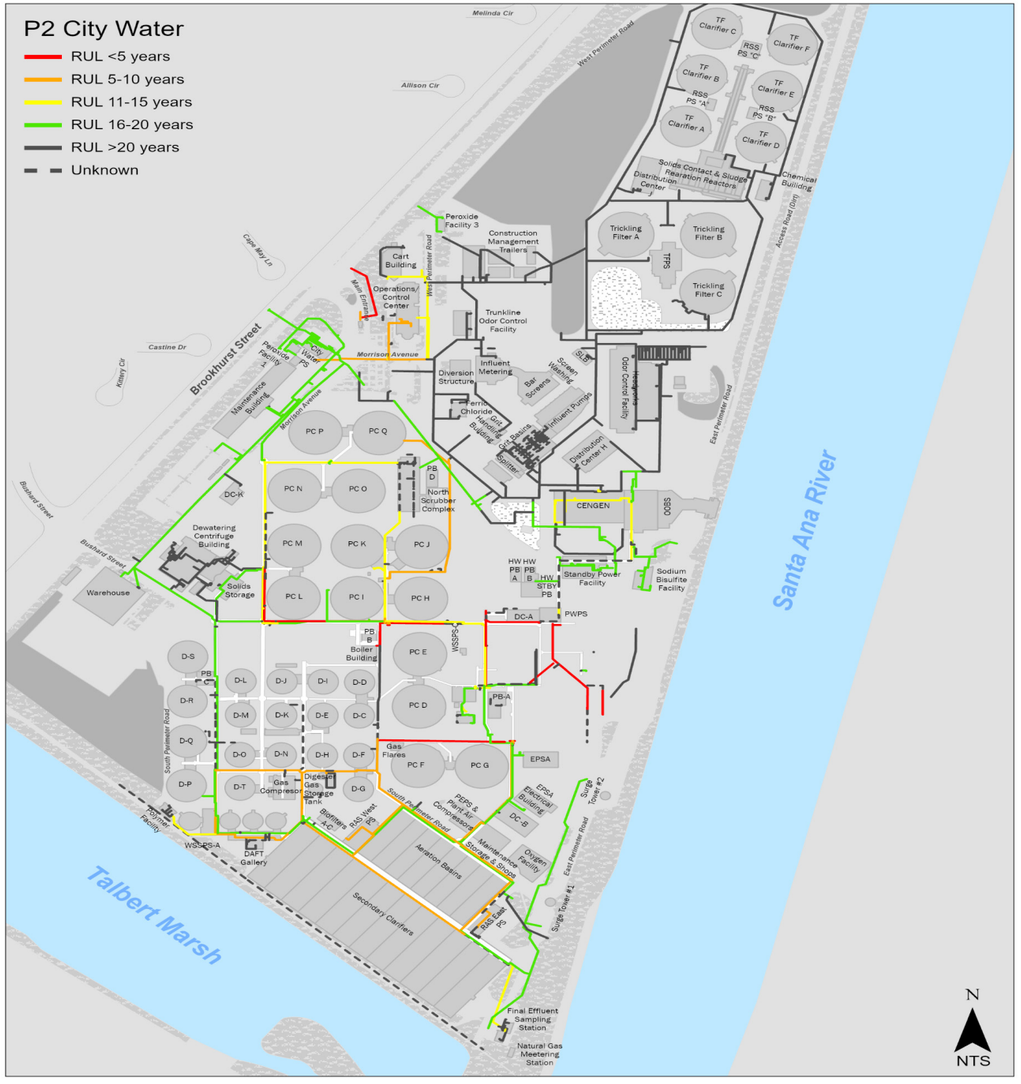
CIP - Planning **CIP - Design** **CIP - Construction** **Maintenance Project**

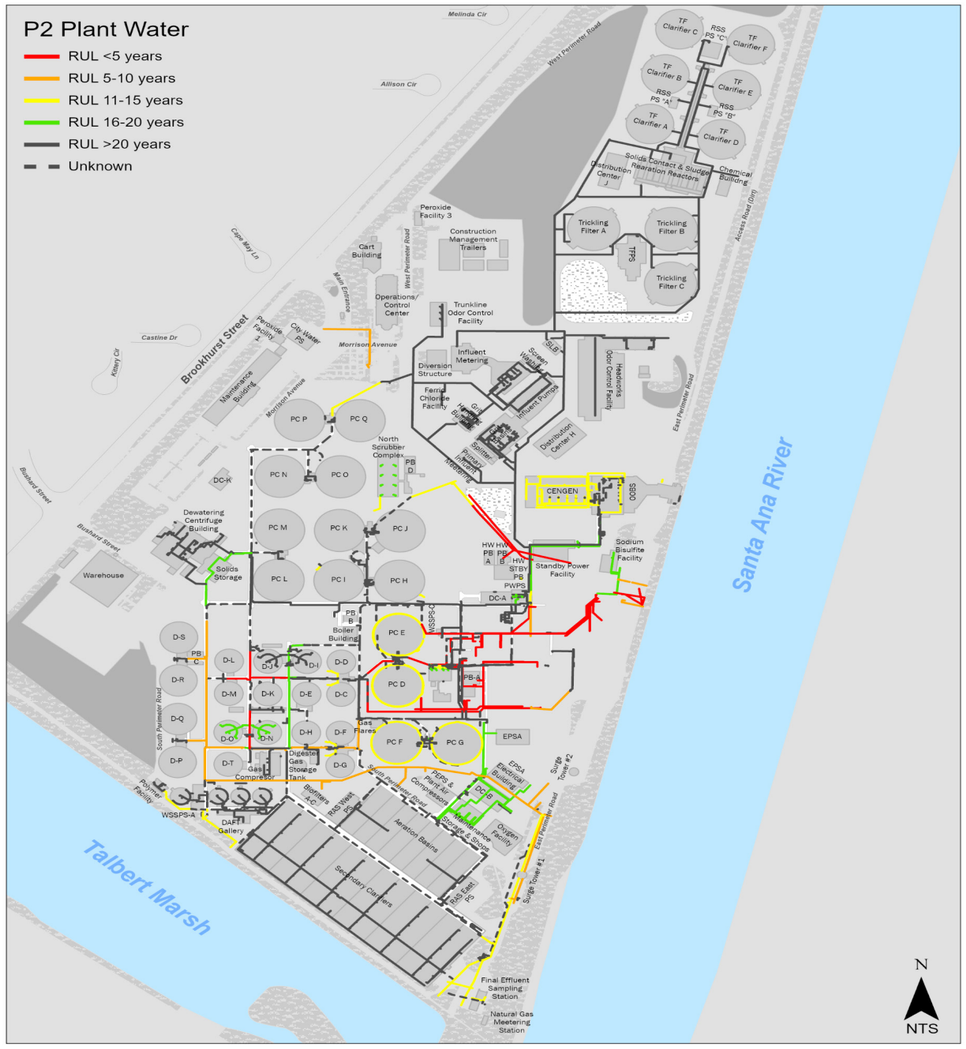
Acronym Key:

AS = Activated Sludge; Cen Gen = Central Generation Facility; CIP = Capital Improvement Program; DIP = Ductile Iron Pipe; DC-F = Distribution Center F; FY = Fiscal Year; HP = Horsepower; HDPE = High-Density Polyethylene; IA = Instrument Air, PSB = Primary Sedimentation Basin

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 27 – PLANT NO. 2 UTILITIES

Remaining Useful Life of Utility Infrastructure





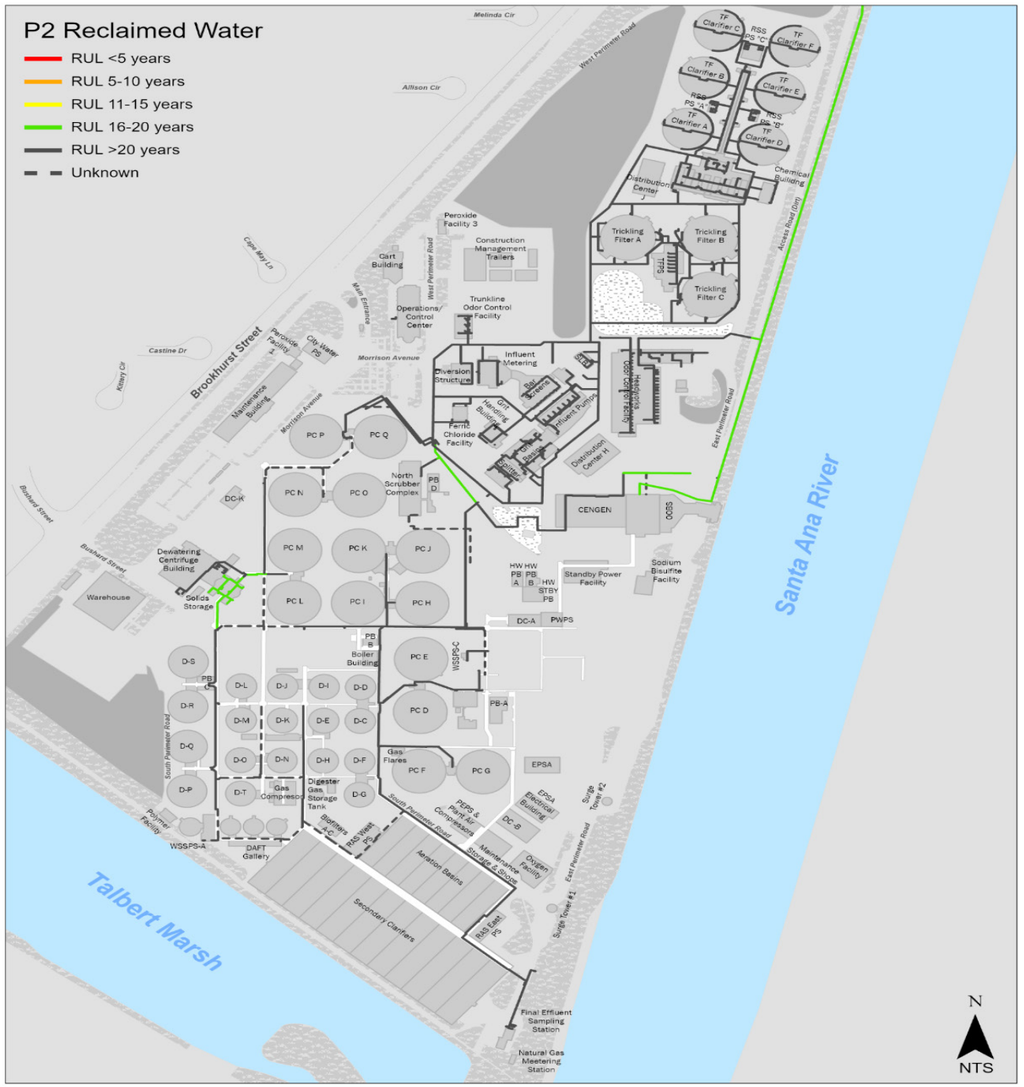
RUL Legend:

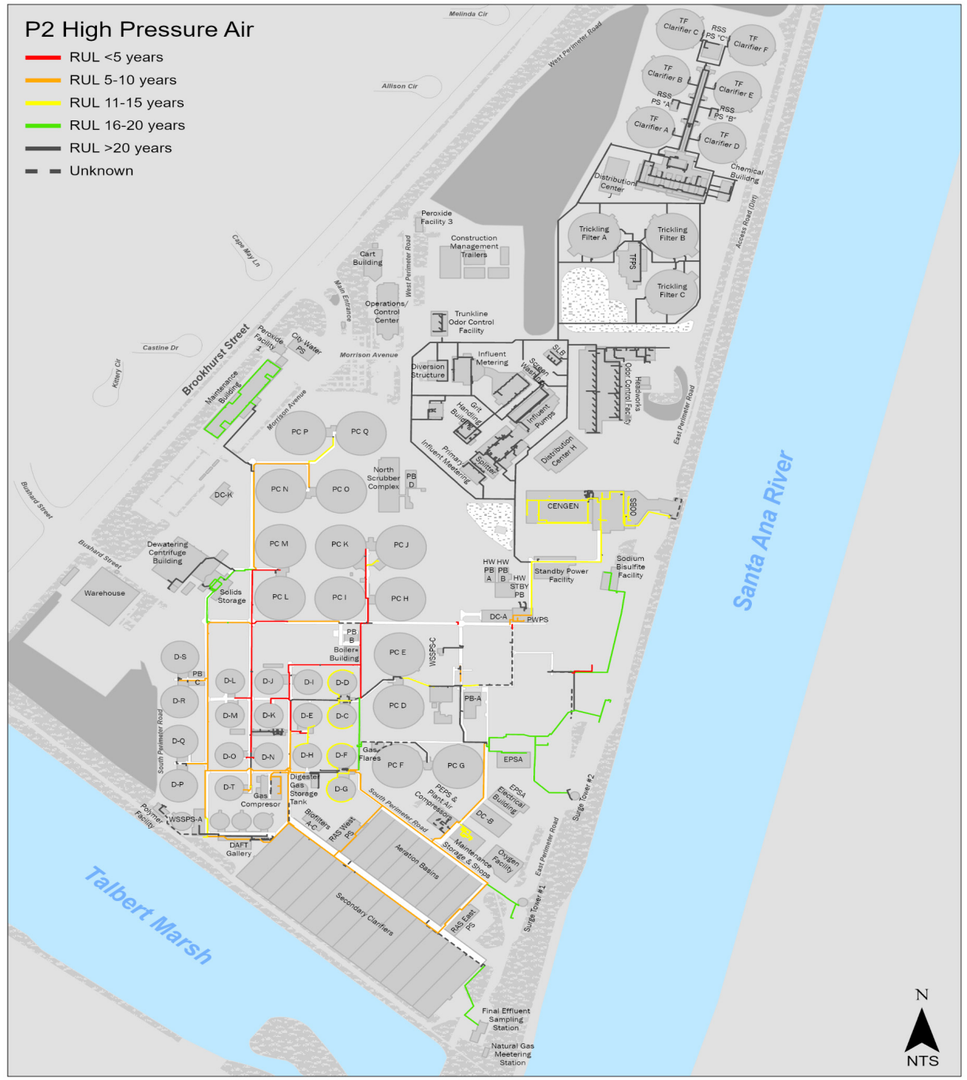
RUL < 5 years | **RUL 5–10 years** | **RUL 11–15 years** | **RUL 16–20 years** | **RUL > 20 years**

Acronym Key:
RUL = Remaining Useful Life
RUL is based solely on age of pipe

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 27 – PLANT NO. 2 UTILITIES

Remaining Useful Life of Utility Infrastructure





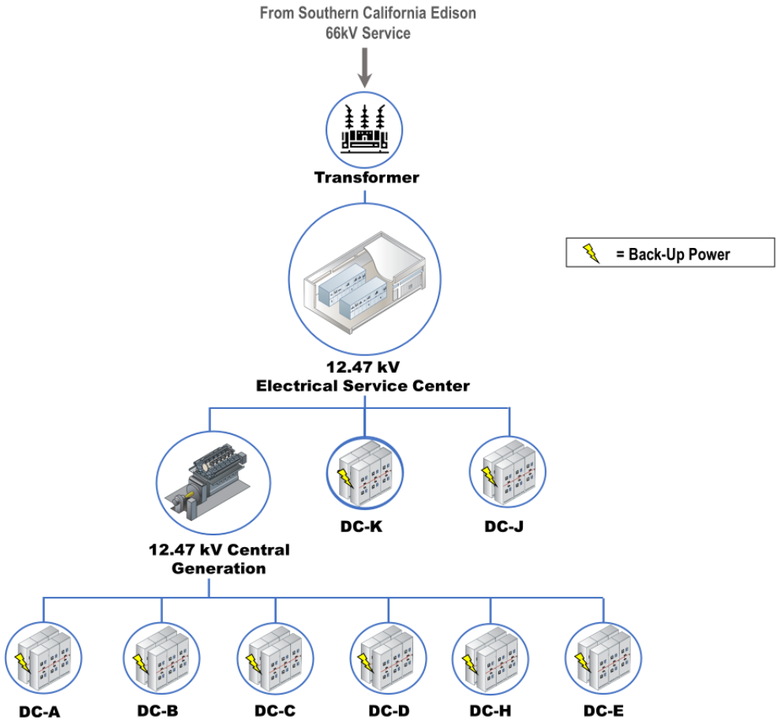
RUL Legend:

RUL < 5 years | **RUL 5–10 years** | **RUL 11—15 years** | **RUL 16—-20 years** | **RUL > 20 years**

Acronym Key:
RUL = Remaining Useful Life
RUL is based solely on age of pipe

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 28 – PLANT NO. 2 ELECTRICAL DISTRIBUTION

Process Schematic



Major Assets

Major Assets	Quantities
Transformers	58
Standby Generators	9
12-kV Switchgears	27
480-V Switchgears	32
125-VDC and 24-VDC Battery Systems	38

Acronym Key:
Cen Gen = Central Generation Facility
DC = Distribution Center
EPSA = Effluent Pump Station Annex
kV = Kilovolt(s)
PB = Power Building
SPF = Standby Power Facility
RUL = Remaining Useful Life
VDC = Volt(s) of Direct Current
UPS = Uninterruptible Power Supply
V = Volt(s)

Major Assets Remaining Useful Life

Asset Type	Service Center	Cen Gen	DC-A	DC-B	DC-C	DC-D	DC-E (EPSA)	EPSA SPF	DC-H (Headworks)	Headworks Standby Building	DC-J	DC-K	PB-A	PB-B	PB-C	PB-D
Tier I – 12.47-kV Primary Distribution Level																
Transformers: 12.47/2.4-kV	-	-	-		4	-	-	-	-	-	-	-	-	-	-	
Transformers: 12.47/0.48-kV	3	4	3	3	4	3	3	-	2	-	2	1	4	4	4	4
12.47-kV Switchgears	3	5	3	3	4	4	4	3	2	2	2	1	-	-	-	-
12.47-kV Load Interrupter Switches	-	-	-	3	-	-	-	-	-	-	-	1	4	4	4	4
12.47-kV Feeders	4	4	1	1	4	4	4	3	2	2	2	1	1	1	4	4
12.47-kV Generators	-	-	-	-	-	-	-	3	-	3	-	-	-	-	-	-
Tier II – 4.16-kV Distribution Level																
4.16-kV Feeders	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-
Tier III – 2.4-kV Distribution Level																
2.4-kV Feeders	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-
Tier IV – 480-V Distribution Level																
480-V Switchgears	-	4	3	3	4	4	-	-	2	-	2	1	4	4	4	4
Transfer Switches	-	-	-	-	-	-	-	-	-	-	-	-	4	4	4	4
Generators	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	4
Tier V – UPS																
UPSs Individual	-	5	-	-	5	4	-	-	4	-	-	4	-	4	-	-
UPSs Regional	-	-	-	4	-	-	4	-	-	-	4	-	-	-	-	-
Tier VI – 125-VDC and 24-VDC Battery Systems																
125-VDC Chargers	5	5	5	5	-	-	-	4	4	4	4	4	5	4	-	-
125-VDC Batteries	5	5	5	5	-	-	-	4	4	4	4	4	5	4	-	-
24-VDC Chargers	-	5	-	-	-	-	-	4	-	4	-	-	-	-	4	4
24-VDC Batteries	-	5	-	-	-	-	-	4	-	4	-	-	-	-	4	4
Generator Controls																
Generator Controls	-	5	-	-	-	-	-	3		3	-	-	-	-	4	4

RUL Legend:
RUL < 5 years | **RUL 5–10 years** | **RUL 11–15 years** | **RUL 16–20 years** | **RUL > 20 years**

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 28 – PLANT NO. 2 ELECTRICAL DISTRIBUTION

Key Issues

Key Issues	Actions and Recommendations
• **Edison Substation** – Southern California Edison Substation is aging; currently only a single 66-kV Feeder Service.	• X-095 Project will install new 66-kV Switchyard; additional 66-kV Line; additional transformer with automatic load tap changes, new Electrical Service Center.
• **Variable Frequency Drive** – Models are becoming obsolete and are unsupported by the manufacturer.	• FE19-08, currently in construction, is replacing obsolete VFDs at the Pure Oxygen Activated Sludge Facility. PRN-00780 and PRN-00820 are also replacing additional VFDs in the Trickling Filter area.
• **Medium Voltage Cables** – Aging cables need to continue to be monitored and tested.	• Three-year Service Contract (S-2019-1107B)/MP-320 in place for testing aging medium voltage cables (and perform Condition Assessment and develop plan for PM) expires 2023 and similar contract will be executed for 2024.
• **Headworks Cables** – 480-V and control cables failing in the Headworks area. Multiple cable failures occurred in the grit basin and grit handling system causing a complete system failure.	• FR2-0026 is currently in construction and is scheduled to be completed in 2024. Urgent task (reference SDR-576/AI-473) installed temporary power and control cables for Grit Pumps and Mixers. MP2-008 is in development to permanently replace Grit Basin power and control cables, and MP2-013 is in development to install temporary cables in the Grit Classifiers.
• **Distribution Center H 12-kV 1,500-kVA Transformer TFR-H04** – Transformer TFR-H04 failed and is currently out of service.	• MP2-012, currently in construction, will repair the transformer.
• **MSP #7 VFD Transformer** – VFD transformer has failed and the drive is currently out of service.	• Purchase of new transformer was approved by the Board (PRN-00912)
• **12-kV Cen Gen Switchgear** – Obsolescence.	• J-117B Project will replace 12-kV switchgear.
• **Standby Power Policy** – No Standby Power policy to maintain permit compliance and prevent adverse impacts on treatment capability during plant power outages.	• PS21-04, currently in the development phase, will determine a standby power policy and plan to maintain OC San operations and permit compliance during loss of power.
• **Circuit Breaker and Protective Relay Testing** – Periodic testing of circuit breakers and protective relays is required by InterNational Electrical Testing Association	• It is recommended that Engineering develop a plan to keep Electrical Transient Analyzer Program model updated, and new task order is developed to contract a testing company to perform periodic testing over a span of time, which can be renewed without the need to rewrite the scope.
• **Battery Chargers and Batteries** – Aging and obsolescence.	• PRN-00897 will replace battery systems.

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 28 – PLANT NO. 2 ELECTRICAL DISTRIBUTION

Current and Future Projects

Project No.	Project Title	Impacted Facilities	Description of Work	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35	FY 35/36	FY 36/37	FY 37/38
S-2019-1107B	On-Call Plant No. 1 and Plant No. 2 Medium Voltage Cable Testing Services	Plant No. 1 and Plant No. 2 Power Distribution and Cabling Infrastructure	• Condition assessment and Testing of Plant No. 1 and Plant No. 2 Medium Voltage Cabling Infrastructure.															
FR2-0026	Headworks Phase 3 Cable Replacement at Plant No. 2	Headworks	• Project will replace damaged low voltage power and control wiring in headworks and trickling filters area of Plant No. 2.															
J-117B	Outfall Low Flow PS	Power Distribution	• Project will replace LOFLO/PWPS 480-V Switchgear, 12.47-kV Switchgears (Main and Generators) at Cen Gen, OOBS/DC-C 12.47-kV and 480-V Switchgear, replace electromechanical relays with solid state relays for Service Center and Distribution Center B, add new SCADA Points and Load Shedding System.															
FE19-08	Secondary Treatment VFD Replacements at Plant No. 2	Power Distribution	• This project will replace six 125-HP Return-Activated Sludge VFDs, four 50-HP Waste-activated Sludge VFDs, four 300-HP Primary Effluent Pump Station VFDs, and associated cables and conductors at Plant No. 2.															
SC19-06	EPSA Standby Power Generator Control Upgrades at Plant No. 2	Plant No. 2 Power Distribution	• This project will upgrade 12.47-kV EPSA Generator Switchgear and Generator controls.															
P2-98A	A-Side Primary Basins Replacement at Plant No. 2	Plant No. 2 Primary Basins, Power Distribution System	• This project will demolish existing electrical distribution equipment at Primary Clarifiers D, E, F, G Electrical Building, Power Buildings A, B, C, City Water Pump station, Plant Water Strainers, and other facilities. The project will provide new electrical services to existing power buildings and new Distribution Center F.															
J-124	Digesters Gas Facility Replacement	Plants No. 1 and Plant No. 2 Compressors, Flares, Power Distribution	• This project will upgrade electrical equipment and control systems inside Gas Compressor Building.															
J-98	Electrical Power Distribution System Improvements	Various Plant No. 1 and Plant No. 2 condition based electrical distribution systems	• Project will perform various Electrical Distribution System Improvements at various areas throughout Plant No. 2. The scope covers both 480-V and 12-kV switchgear, Motor Control Centers, breakers, conductors, load shedding, and arc flash mitigation.															
P2-128	TPAD Digester Facility at Plant No. 2	Plant No. 2 Digesters, Electrical and Mechanical Systems	• This project will include two-story Electrical Power Building consisting of electrical distribution equipment to support new TPAD Digester Facility.															
P2-133	Plant No. 2 - B/C-Side Basins Rehabilitation	Plant No. 2 Primary Basins, Mechanical and Electrical Systems	• New B- and C-Side Primary Scrubber Complex construction including relocating the electrical feed to new Distribution Center F and demolition of Power Building D.															
P2-129	Digesters P, Q, R, and S Replacement	Digesters P, Q, R, S	• Replace digesters P, Q, R, and S as the new mesophilic digesters.															
P2-138	Operations and Maintenance Complex at Plant No. 2	Electrical Distribution	• Construct new Operations Building and make improvements to existing Maintenance Building.															
PS21-04	Energy and Digester Gas Master Plan	Plant No. 1 and Plant No. 2 Power Generation and Standby Power	• Develop a Standby Power Policy, load shedding and power restart philosophy, and energy resiliency and independence plan.															

Current and Future Projects (Continued)

Project No.	Project Title	Impacted Facilities	Description of Work	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35	FY 35/36	FY 36/37	FY 37/38
PRN-00780	TFPS A1, A2, B1, B2, and C2 VFD Replacement	Trickling Filter Pump Station	• This project will replace VFDs for TFPS															
PRN-00897	125-VDC Battery Replacement at Plant 1 and 2	125-VDC Battery Systems at Plant 2	• This project will replace obsolete battery systems at Plant 2 12-kV Service Center, Distribution Center A, Distribution Center B, East RAS, West RAS, EPSA Electrical Building, EPSA Standby Power Building, Headworks Standby Power Building, and DAFT Switchgear Room.															
PRN-00912	MSP No. 7 VFD Transformer Replacement/Repair	12-kV VFD Transformer	• Replace/Repair MSP No. 7 VFD Transformer															
MP2-008	Grit Basin Numbers 5 and 6 Pump and Mixer Cable Replacement at Plant No. 2	Distribution Center H, Grit Basins, Grit Handling Facility	• This project will permanently replace all power and control cables for Grit Basin Pumps and Mixers and Grit Classifiers.															
MP2-012	Transformer TFR-H04 Repair at Plant 2	Distribution Center H	• This project will repair the failed 12-kV 1,500-kVA Transformer TFR-H04															
MP2-013	Grit Classifier Temporary Cable Installation at Plant 2	Distribution Center H, Grit Handling Facility	• This project will install temporary cables for power and controls for all four Grit Classifiers															
X-037	Plant Water Pump Station and 12-kV Distribution Center A Demolition at Plant No. 2	Plant Water Pump Station and Distribution Center A	• This project will demolish Plant Water Pump Station and 12-kV Distribution Center A (DC-A), which are adjacent and share a wall. After Power Buildings A, B, C, D and Plant Water Pump Station. Power Buildings A and D are demolished by P2-98A and P2-133, respectively.															
X-095	Electrical Substation and 12-kV Service Center Replacement at Plant No. 2	SCE Substation and 12-kV Service Center	• This project will add an additional feeder from the SCE substation and replace the 12-kV Service Center.															
X-098	Effluent Pump Station Annex Rehabilitation	EPSA Power Distribution	• EPSA Rehabilitation to include mechanical, structural, architectural, HVAC, and plumbing systems modifications, and electrical Switchgear, MCCs, and VFDs.															

Types of Project Legend:

CIP - Planning **CIP - Design** **CIP - Construction** **Maintenance Project**

Acronym Key:

Cen Gen = Central Generation Facility; CIP = Capital Improvements Program; EPSA = Effluent Pump Station Annex; FY = Fiscal Year; HVAC = Heating, Ventilation, and Air Conditioning; kV = Kilovolt(s); kVA = Kilovolt-ampere(s); LOFLO = Low Flow; MCC = Motor Control Center; MSP = Main Sewage Pump; OOBS = Ocean Outfall Booster Station; PS = Pump Station; PWPS = Plant Water Pump Station; RAS = Return-Activated Sludge; SCADA = Supervisory Control and Data Acquisition; SCE = Southern California Edison; TFPS = Trickling Filter Pump Station; TPAD = Temperature-Phased Anaerobic Digester; UPS = Uninterruptible Power Supply; V = Volt(s); VFD = Variable Frequency Drive

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 29 – PLANT NO. 2 OCCUPIED & POWER BUILDINGS

Major Assets Remaining Useful Life

Plant 2 - Infrastructure Non-Process	Building Roof	Building Electrical	HVAC	Structural (Visual)	Seismic (PS15-06)	Elevator
Cart Building	4	N/A	N/A	TBD	N/A	N/A
Maintenance Building	4	2	5	1	5	2
Operations Center Bldg.	3	4	5	1	4	4
12-kV Distribution Center A	4	N/A	3	1	2	N/A
12-kV Distribution Center B	4	N/A	3	1	2	N/A
12-kV Distribution Center C	2	N/A	3	1	N/A	N/A
12-kV Distribution Center D	2	N/A	3	1	2	N/A
Distribution Center H	1	N/A	5	1	N/A	N/A
Distribution Center J	2	N/A	3	1	N/A	N/A
Distribution Center K	2	N/A	3	1	N/A	N/A
12-kV Service Center	4	N/A	3	1	4	N/A
HW Power Building A	3	N/A	3	1	2	N/A
HW Power Building B	3	N/A	3	1	2	N/A
EPSA Electrical Building	2	N/A	5	1	N/A	N/A
Power Building B	4	N/A	3	1	4	N/A
Power Building C	4	N/A	3	1	2	N/A
Power Building D	3	N/A	3	1	2	N/A

Asset RUL Legend:

- **RUL < 5 years**
- **RUL 5–10 years**
- **RUL 11–15 years**
- **RUL 16–20 years**
- **RUL > 20 years**

Acronym Key:

EPSA = Effluent Pump Station Annex; HVAC = Heating, Ventilation, and Air Conditioning; HW = Headworks; kV = Kilovolt(s); N/A = Not Applicable; RUL = Remaining Useful Life; TBD = To Be Determined

ASSET MANAGEMENT SYSTEM SUMMARY – AREA 29 – PLANT NO. 2 OCCUPIED BUILDINGS

Key Issues

Key Issues	Actions and Recommendations
• **Seismic Retrofits Needed** – Recent Planning study (PS15-06) recommended seismic retrofits to several buildings.	• Maintenance building will be retrofitted with seismic upgrades, existing Operation Center will be demolished after new Operations Complex is built via P2-138.
• **Aging Elevators** – All elevators need to be rehabilitated and modernized.	• As the building elevators age and are less reliable over time, projects are being created to address modernization and upgrades as needed. One such project is SC20-02 to address the OOBS elevators.
• **Aging HVAC Units** – HVAC units have shorter RUL due to coastal environment.	• When units are obsolete, corroded and reach the end of their useful life, projects will be created to replace these units. A few recent projects to replace HVAC units are SC22-01 and SC22-02.
• **Public Announcement System Failure** – The public announcement system plantwide needs to be replaced because it is obsolete and not functional in some areas.	• PS21-02 study is looking at alternatives to the existing public announcement system and will make recommendations for new modern systems that will meet the district needs.

Current and Future Projects

Project No.	Project Title	Impacted Facilities	Description of Work	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35	FY 35/36	FY 36/37
P2-127	Collections Yard Relocation and Warehouse Demolition at Plant No. 2	Warehouse Building	Demolish Warehouse Building.														
P2-138	Operations and Maintenance Complex at Plant No. 2	Operations and Maintenance Building	Construct new Operations Building and make improvements to existing Maintenance Building.														
PS21-02	Fire and PA System Study at Plants 1 and 2	Plantwide	Study to provide alternatives and recommend upgrading our existing fire and public announcement systems plantwide.														
SC22-01	Plant 2 EPSA and 12-kV Distribution Center H HVAC Replacement	EPSA Electrical Building and Distribution Center H	Replace HVAC systems on both building because they have reached the end of their useful lives.														
SC22-02	HVAC Replacement for Plant 2 Centrifuge Building, Op Center, and Bitterpoint PS	Operations Center, Centrifuge Server Room, and Bitterpoint PS	Replace HVAC for Operations Center														
SC20-02	Ocean Outfall Booster Station Elevator Rehabilitation	OOBS	Rehabilitate Elevator														
X-037	Plant Water PS and 12-kV Distribution Center Demolition at Plant 2	12-kV Distribution Center	Demolish existing 12-kV Distribution Center														
X-095	SCE Substation & 12-kV Service Center Demolition	12-kV Service Center	Demolish existing 12-kV Service Center														
P2-129	Digesters P, Q, R, & S Replacement at Plant 2	Power Building C	Replace Power Building C														
P2-133	B/C Side Sedimentation Basin Rehabilitation at Plant 2	Power Building D	Demolish Power Building D														
XP2-132	Digester Demolition at Plant 2	Power Building B	Demolish Power Building B														

Types of Project Legend:
CIP - Planning | CIP - Design | CIP – Construction | Maintenance Project

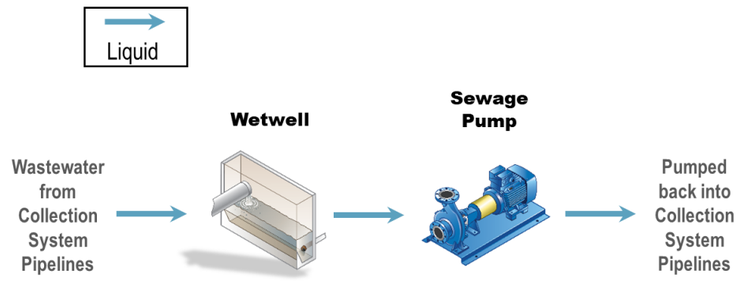
Collection System Pump Station and Force Main Asset Management Summaries

This page is intentionally left blank

.

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – PUMP Stations

Process Schematic



Pump Station	Major Assets – Quantities				
	Wet Wells	Pumps	Force Mains	Valves	Emergency Generators (Y/N)
15th Street	1	3	2	22	N
A Street	1	3	2	19	N
Bay Bridge	1	5	2	17	Y
Bitter Point	1	5	2	23	Y
College	1	3	2	18	N
Crystal Cove	1	2	2	13	Y
Edinger	1	2	1	8	N
Lido	1	3	2	17	N
MacArthur	1	2	1	8	N
Main Street	2	10	3	38	Y
Rocky Point	1	4	2	18	Y
Slater	1	5	2	17	Y
Seal Beach	2	8	2	24	N
Westside	1	4	1	16	Y
Yorba Linda	1	3	1	11	N
Newport Force Mains	--	--	2	--	--
Total	**17**	**62**	**29**	**269**	**-**

Major Assets Remaining Useful Life

Asset Type	15th Street	A Street	Bay Bridge	Bitter Point	College	Crystal Cove	Edinger	Lido	MacArthur	Main Street	Rocky Point	Slater	Seal Beach	Westside	Yorba Linda	Newport Force Mains
Civil - Piping																
Force Mains	3	3	5	3	4	5	5	4	4	5	3	5	1	5	5	2
Structural																
Pump Station	4	4	4	4	1	4	3	3	5	2	3	3	4	2	4	-
Wet Well	3	3	4	1	4	3	4	4	4	4	3	4	4	3	3	-
Mechanical																
Pumps	5	3	5	2	2	2	4	3	4	5	2	5	5	4	4	-
Valves	5	5	5	2	3	5	3	5	4	5	2	4	4	3	5	-
Ventilation System	3	3	4	4	3	3	3	4	4	3	5	3	5	3	3	-
Emergency Generator	-	-	3	1	-	3	-	-	-	2	2	3	-	2	-	-
Electrical																
Motor Control Center	2	2	4	1	1	4	4	3	4	3	2	3	5	2	4	-
VFD	4	4	5	3	4	-	-	4	4	4	3	3	5	3	-	-
Motors	3	3	4	2	2	3	3	4	4	3	2	3	4	2	4	-
Transformer	2	2	4	2	2	4	4	3	4	2	3	2	4	2	4	-
Instrumentation																
PLC	3	3	4	3	3	3	4	4	3	3	4	3	3	3	3	-
Flowmeter	3	3	1	3	2	1	4	2	-	4	3	4	4	3	4	-

Asset RUL Legend:

- **RUL < 5 years**
- **RUL 5–10 years**
- **RUL 11–15 years**
- **RUL 16–20 years**
- **RUL > 20 years**

Acronym Key:

N = No
PLC = Programmable Logic Controller
RUL = Remaining Useful Life
VFD = Variable Frequency Drive
Y = Yes

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – PUMP STATIONS

Key Issues	Actions and Recommendations
Safety – Currently, four of OC San's older pump stations do not have atmospheric monitoring (for hydrogen sulfide gases) or standard safety indication lighting. Also, pump station infrastructure is often located in the public right-of-way, making safe access to these facilities an ongoing issue.	An ongoing planning study (PS18-06) is reviewing and interpreting electrical code and will establish OC San design standards to address this issue. Practicing ongoing safety measures and traffic control when working in the public right-of-way will continue to be of the utmost importance. In the meantime, efforts are being made to find interim solutions to address this issue until the project implements the permanent solutions.
Natural Phenomenon – Edinger pump station is located immediately adjacent to an undersized flood control channel. Crystal Cove pump station is experiencing gradual site settlement. Both natural hazards present a risk to normal operation of the pump stations.	A capital project (11-33) has been established to replace and relocate Edinger pump station. A future capital project (5-66) has been established to determine the necessary mitigation measures to remediate site settlement at Crystal Cove pump station.
Increased Methane Gas Levels – Methane gas accumulation has become a safety concern at some pump stations. The amount of gas seems to increase during summer months and presents a unique challenge because of the short response time necessary to address the safety concerns of increased ignition risk.	A CIP project (5-68), currently in construction, will address the ventilation issues that cause odorants to migrate to unwanted areas at the OC San Newport Beach pump stations including Bitter Point, Lido, Rocky Point, 15th Street, A Street, and Crystal Cove Pump Stations. The project will add ventilation and pressure relief dampers to the wet wells to prevent pressurization (positive and negative) and add odor scrubbing/polishing systems at the pump stations to treat the air released from the wet wells. Additionally, a chemical dosing station will be added at 15th Street Pump Station for downstream odor control. Finally, an operation strategy for venting the force main system will be established separately.
Accelerated Corrosion – Corrosion is an ongoing problem due to the presence of raw sewage. In places where the system has been kept from venting and mixing of wastewater is prevalent, such as wet wells, the degree of corrosion has (or will soon) require the replacement/rehabilitation of the assets.	Visual assessments of known corrosion issues are performed on an ongoing basis. When necessary, cameras are used to evaluate the spreading of corrosion impacts and confined space entry may be performed to gather additional information to determine when the facility needs to be rehabilitated. At College Pump Station, visual assessment found delaminated liner and soft concrete underneath the damage liner in the wet well; a planning study (PS20-07) was completed that performed more detailed assessment of the wet well and provided rehabilitation recommendations. At Slater Pump Station, visual assessment found damaged T-lock liner in both west and east sides of the wet well; a repair has been completed to address the west side, which has more significant damage; east side to follow. At A and 15th Street Pump Stations, visual assessment found bubbling liner and some soft concrete underneath damaged liner in the wet well (A Street). Concrete cores taken at A Street Pump Station found that the concrete is still in good condition; a project will be established to repair the damaged liner at A Street. A follow-up visual assessment at 15th Street Pump Station is scheduled.
Groundwater Intrusion – Groundwater has penetrated four of the newly constructed pump stations in the coastal region of the service area including 15th Street, A Street, Bitter Point and Rocky Point Pump Stations. Groundwater is notoriously corrosive and may compromise the strength of the rebar within the concrete structure walls.	Further inspections will be scheduled to determine short-term repair solutions and crack repairs. A planning study (XPS0065) will be established to identify possible mitigation measures and long-term solutions to be incorporated into future pump station CIP projects.
Maintenance Access – In some cases, such as venting of the Newport Beach force main system, access to critical facilities is limited by safety and public impact concerns. In other cases, such as MacArthur Pump Station force main, access to critical facilities is not possible because redundancy was not considered when the pump station was designed. In case of Slater Pump Station, the West and East wet wells are isolated by slide gates access via a 48-inch inner-diameter manhole; however, due the curvature of the manhole, installation of the slide gate is difficult, which has resulted in staff injuries.	OC San continues to improve planned maintenance processes and inter-agency coordination that allow crews to minimize impacts on the community during necessary maintenance operations. Testing of modern automatic air/vacuum valves could facilitate automatic venting of the Newport Beach force main system and minimize impacts on traffic on Pacific Coast Highway. A capital project (7-68) has been established to construct a redundant force main to serve MacArthur Pump Station. A small project (FRC-0017) will modify the wet well access at Slater Pump Station to provide a safer working environment for staff.
Valve Operability and Reliability – In many aging pump stations isolation valves, check valves and force main valves are starting to fail or becoming difficult to operate due to age, debris and corrosion. These valves are critical to the operability and reliability of OC San pump stations and will require replacement.	Multiple valve replacement projects have been identified and efforts are being made to prioritize these projects (FRC-0017, FRC-0018) so that they can be executed in a timely manner to ensure OC San pump stations can continue to operate reliably.
Force Main Operability and Reliability – Force mains are some of OC San's highest-risk assets. While these assets have been replaced and rehabilitated in a timely manner, there are many that are not yet inspected, and asset analysis has relied on theoretical useful life. Accessing these assets to perform condition assessments is often a challenging endeavor due to traffic impacts and lack of physical access points.	A force main inspection and assessment plan was established to assess the force mains, one by one, based on age and risk (likelihood and consequence of failure). The pump station and force main layouts were reviewed, and it was determined that the majority of the force mains can be inspected without bypassing. Thus, OC San plans to use Condition Assessment program resources along with Collections CCTV program resources to complete these efforts, understanding that additional coordination with Operations, Maintenance, and execution will be required. The Force Main Summary and Inspection Plan will summarize OC San's inspection plan for the force mains as well as future projects established to rehabilitate or replace the force mains.
Outdated Bubbler Level System – At multiple pump stations (Bay Bridge, Crystal Cove, Edinger, MacArthur, Main Street, Slater, Seal Beach), the bubbler systems are outdated and do not meet OC San's latest bubbler system standard. They do not have redundancy or automatic blowdown and are becoming increasingly unreliable.	A small project was established (PRN-00920) to upgrade the existing system to a modern bubbler level system with automatic blowdown controls and a backup level transmitter.

Acronym Key: CCTV = Closed-Circuit Television; CIP = Capital Improvement Program; OC San = Orange County Sanitation District

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – PUMP STATIONS

Current and Future Projects

Project No.	Location	Project Title	Impacted Facilities	Description of Work	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35	FY 35/36	FY 36/37	FY 37/38
5-68	Newport Beach	Newport Beach Pump Station Odor Control Improvements	15th Street, A Street, Bitter Point, Crystal Cove, Lido, and Rocky Point Pump Stations	• Installation of venting equipment; phased implementation of chemical use															
FE19-01	Multiple	Portable Generator Connectors at Pump Stations	15th Street, A Street, Bay Bridge, Bitter Point, College, Crystal Cove, Edinger, MacArthur, Main Street, Rocky Point, Seal Beach, Slater, and Westside Pump Stations	• Installation of standard portable generator connectors															
PS18-06	Multiple	Go/No-Go Lights and Signage	15th Street, A Street, Bay Bridge, Bitter Point, College, Crystal Cove, Edinger, Lido, MacArthur, Main Street, Rocky Point, Seal Beach, Slater, Westside, and Yorba Linda Pump Stations	• Standardize safety lights and signage															
PRN-00920	Multiple	Pump Station Bubbler Level Control System Upgrade	Seal Beach, Bay Bridge, Crystal Cove, Main Street, MacArthur, Slater, Edinger Pump Stations	• Upgrade of existing bubbler technology to a modern bubbler level system															
FRC-0018	Newport Beach	Valve Replacements at Lido, Crystal Cove, A St., and 15th St. Pump Stations	15th Street, A Street, Lido, and Crystal Cove Pump Stations	• Replacement of multiple valves at each station															
XPS0065	Newport Beach	Pump Station Groundwater Intrusion Study	15th Street, A Street, Bitter Point, and Rocky Point Pump Stations	• Comprehensive study of groundwater management solutions															
X-022	Newport Beach	15th Street Pump Station and Force Main Project	15th Street Pump Station	• Comprehensive rehabilitation of pump station and force mains															
X-041	Newport Beach	A Street Pump Station and Force Main Project	A Street Pump Station	• Comprehensive rehabilitation of pump station and force mains															
5-67	Newport Beach	Bay Bridge Pump Station Replacement	Bay Bridge Pump Station	• Comprehensive rehabilitation of pump station and force mains															
SC22-02	Newport Beach	HVAC Replacement for Plant 2 Centrifuge Building, Operations Building, and Bitter Point Pump Station	Bitter Point Pump Station	• Replacement of HVAC system															
X-025	Newport Beach	Bitter Point Pump Station Rehabilitation Project	Bitter Point Pump Station	• Comprehensive rehabilitation of pump station															
PRN-00926	Costa Mesa	College Pump Station Wet Well Rehabilitation	College Pump Station	• Rehabilitate the pump station wet well per PS20-07 recommendations															
X-040	Costa Mesa	College Pump Station Replacement and Force Main Rehabilitation	College Pump Station	• Reconstruction of pump station • Comprehensive rehabilitation of force mains															
MPC-XXXX	Newport Beach	Crystal Cove Pump Station Automatic Transfer Switch Replacement	Crystal Cove Pump Station	• Replacement of obsolete automatic transfer switch															
5-66	Newport Beach	Crystal Cove Pump Station Upgrade and Rehabilitation Project	Crystal Cove Pump Station	• Comprehensive rehabilitation of pump station															

Current and Future Projects (Continued)

Project No.	Location	Project Title	Impacted Facilities	Description of Work	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35	FY 35/36	FY 36/37	FY 37/38
11-33	Huntington Beach	Edinger Pump Station Rehabilitation Project	Edinger Pump Station	• Construct new pump station located at Sunset Channel • Construct new force mains															
X-023	Newport Beach	Lido Pump Station Rehabilitation Project	Lido Pump Station	• Comprehensive rehabilitation of pump station															
7-63	Newport Beach	MacArthur Pump Station Rehabilitation Project	MacArthur Pump Station	• Comprehensive rehabilitation of pump station															
7-68	Newport Beach	MacArthur Force Main Improvements	MacArthur Pump Station	• Installation of second force main and rehabilitation of existing force main															
7-65	Irvine	Gisler-Redhill Interceptor Rehabilitation	Main Street Pump Station	• Rehabilitation of pump station force mains and replacement of pump suction, discharge, and check valves															
7-64	Irvine	Main Street Pump Station Rehabilitation Project	Main Street Pump Station	• Comprehensive rehabilitation of pump station															
X-024	Newport Beach	Rocky Point Pump Station Rehabilitation Project	Rocky Point Pump Station	• Comprehensive rehabilitation of pump station															
FRC-0017	Huntington Beach	Valve Replacements and Wet Well Access Improvements at Slater Pump Station	Slater Pump Station	• Replacement of check valves inside Slater Pump Station • Modify wet well manhole access															
11-34	Huntington Beach	Slater Pump Station Rehabilitation Project	Slater Pump Station	• Comprehensive rehabilitation of pump station															
3-67	Seal Beach	Seal Beach Pump Station Replacement	Seal Beach Pump Station	• Reconstruction of pump station															
PRN-00930	Seal Beach	Navy Fence Replacement In-Kind Consideration Project for 3-67	Seal Beach Pump Station	• Replacement of fence for the Navy															
PRN-00922	Fullerton	Decommission Yorba Linda Pump Station	Yorba Linda Pump Station	• Decommission the pump station and force main															
2-73	Fullerton and Yorba Linda	Yorba Linda Pumping Station and Spur Odor Station Demolition	Yorba Linda Pump Station Yorba Linda Spur Odor Station	• Abandonment of pump station and force main • Demolition of Yorba Linda Spur Odor Station															

Types of Project Legend:

CIP - Planning **CIP - Design** **CIP - Construction** **Maintenance Project**

Acronym Key:

CIP = Capital Improvement Project; FY = Fiscal Year; HVAC = Heating, Ventilation, and Air Conditioning

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – PUMP STATIONS

Force Main Summary and Inspection Plan

Pump Station Force Main	Built by Project (Year)	Size	Material	Cathodic Protection	RUL (years)	Previous Inspection	Planned Inspection	Notes
Newport force main system	5-29 (1989) 5-60 (2016)	30"–36"	Ductile Iron with CIPP HDPE	No	15–20	None		
Bitter Point (East)	5-58 (2012)	42"	HDPE		> 20	None	2027	Project X-025 will complete rehabilitation of Bitter Point pump station and replace or rehabilitate the force mains in 2038.
Bitter Point (West)	5-29 (1988) 5-29-R1 (2004)	36"	Ductile Iron with HDPE slip liner	No	10–15	None	2027	
Lido (East, North of Short Street)	5-9 (1959) 5-41 (1992) FE15-10 (2016)	16"/24"	Ductile Iron with CIPP HDPE	No	> 20	FE15-10 warranty CCTV 2020 CCTV 2022	2025	
Lido (West, North of Short Street)	5-26 (1968) 5-60 (2016)	16"/24"	DIP with CIPP HDPE	No	> 20	CCTV 2014, 2023	2025	
Lido (East/West, South of Short Street)	5-41-1 (1997) FRC-0019 (2022)	16"	Ductile Iron	first pipe joint only	5–10	CCTV 2022–2023	2025	Project X-023 will complete rehabilitation of Lido pump station in 2032, rehabilitation of the unlined force mains could potentially be added to this project if a separate small project is not launched ahead of time.
Rocky Point	5-50 (2008)	12"	Ductile Iron	No	10–15	None	2027	Project X-024 will complete rehabilitation of Rocky Point pump station and force mains in 2037.
Bay Bridge (North/South)	5-18R (1981)	24"	Ductile Iron	No	< 5	None	2035	Project 5-67 will complete construction of the new force mains in 2025, and the pump station in 2029.
Bay Bridge (North/South under the bay)	5-12 (1965) 5-18R (1981)	24"/22"	Ductile Iron with Polyethylene lining	No	< 5	None	2035	
15th Street	5-51 (2004)	10"	Ductile Iron	No	10–15	None	2026	Project X-022 will complete rehabilitation of 15th Street pump station and force mains in 2037.
A Street	5-52 (2004)	8"	Ductile Iron	No	10–15	None	2026	Project X-041 will complete rehabilitation of A Street pump station and force mains in 2037.
Crystal Cove	5-36 (1995)	8"	Ductile Iron	No	< 5	CCTV (600 feet) and UT 2015 CCTV 2023 (500–600 feet from gravity manhole)	Follow up CCTV from pump station side is scheduled for Sep-Oct 2023	Crystal Cove force mains are over 2,000 feet in length Project 5-66 will complete rehabilitation of Crystal Cove pump station in 2032.
MacArthur	7-1-D (1960)	12"	Asbestos cement		5–10	None	2034	Project 7-68 will complete construction of the new force mains in 2024.
Main Street (Sunflower)	7-7 (1985)	30"	Vitrified Clay		> 20	None	2025	
Main Street (Baker East)	14-1-2 (1991)	42"	Ductile Iron	Yes	5–10	CCTV 2020	2035	Project 7-65 will complete the Baker force mains rehabilitation in 2025.
Main Street (Baker West)	14-1-2 (1991)	42"	Ductile Iron	Yes	< 5	None	2035	
College	7-23-1 (2003)	18"	Ductile Iron	No	5–10	None	2024	Project X-040 will complete rehabilitation of College pump station and force mains in 2037.
Slater (North)	11-17-1 (1998)	36"	Ductile Iron	first pipe joint only	5–10	None	2024	Project 11-34 will rehabilitate Slater pump station and the force mains by 2033.
Slater (South)	11-10-3 (1981)	24"	Ductile Iron	first pipe joint only	< 5	CCTV and UT 2015	2024	

Force Main Summary and Inspection Plan (Continued)

Pump Station Force Main	Built by Project (Year)	Size	Material	Cathodic Protection	RUL (years)	Previous Inspection	Planned Inspection	Notes
Edinger	11-9 (1965)	18"	Cast Iron		< 5	UT 2015, 2021, 2022	Follow-up UT 2024	Pitting corrosion but low consequence of failure; mitigation measures will be established in case of a leak. Project 11-33, currently in design, will construct the new Edinger pump station and force main by 2028.
Seal Beach	3-62 (2022)	36"	HDPE		> 20	None	2032	New force mains were constructed in 2022.
Westside	3-36R (1995)	20"	Ductile Iron	No	< 5	2016	2024	Westside pump station will be abandoned by project 3-68 by 2033. Inspection may require bypass.
Yorba Linda	2-16-2 (1975)	30"	Ductile Iron	first pipe joint only	< 5	2014	None	The pump station will be decommissioned via PRN-00922 ahead of CIP project 2-73, which will remove the pump station permanently by 2029.

Acronym Key:

CCTV = Closed-Circuit Television

CIPP = Cured-in-Place Pipe

CIP = Capital Improvement Project

HDPE = High-Density Polyethylene

RUL = Remaining Useful Life

UT = Ultrasonic Testing

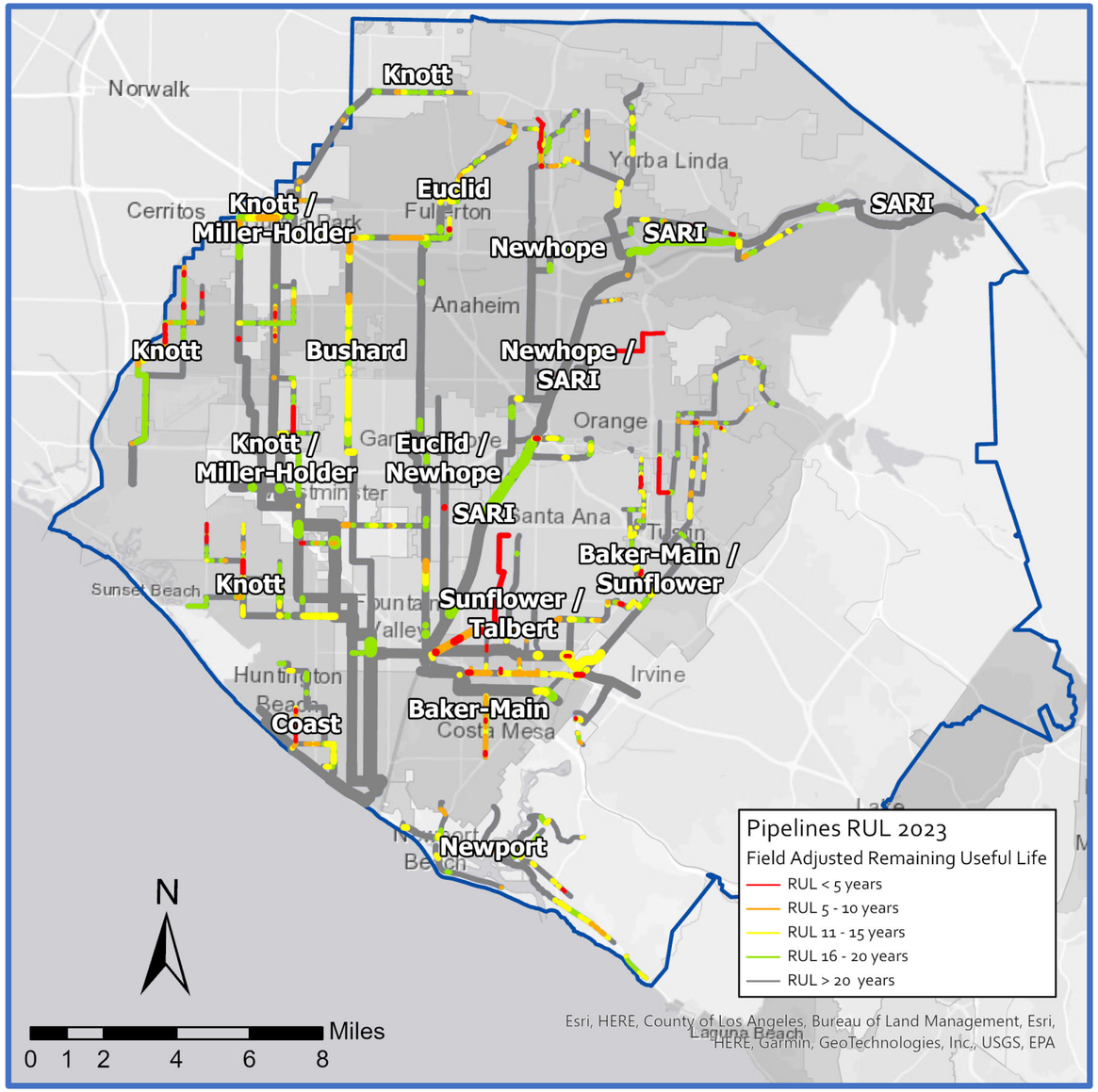
Collection System Pipeline and Manhole Asset Management Summaries

This page is intentionally left blank

.

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – ALL TRUNKS

System Overview - Pipelines



Collection System Pipelines and Manholes Remaining Useful Life and Replacement Value Summary

Trunklines (TLs)	No. of Pipes with RUL Scores of 4 or 5	Miles of Pipes with RUL Scores of 4 or 5	Percentage of Pipes RUL Scores of 4s or 5s (By Length)	No. of Manholes with RUL Scores of 4s or 5s	Percentage of Manhole RUL Scores of 4s or 5s	Replacement Value ($ Millions, in 2023 Dollars)[a]
Baker-Main	82	5.70	14%	-[b]	-[b]	$318
Bushard	7	0.81	4%	3	1%	$279
Coast	16	1.05	9%	-[b]	-[b]	$114
Euclid	7	0.79	2%	69	16%	$311
Interplant[c]	0	0.00	0%	-[b]	-[b]	$133
Knott	46	3.19	5%	-[b]	-[b]	$721
Miller-Holder	21	1.56	5%	42	16%	$341
Newhope	22	1.64	6%	85	24%	$241
Newport	11	0.76	4%	28	7%	$249
Santa Ana River Interceptor	54	2.64	5%	158	28%	$595
Sunflower	12	0.55	2%	-[b]	-[b]	$346
Talbert	77	5.93	71%	-[b]	-[b]	$66
Total	**355**	**24.62**	**7%**	**385**	**9%**	**$3,714**

[a] The abandoned pipelines at the Airbase ($6,366,516) and the Harvard Area Trunk Sewer ($191,784) areas are not included in the total.

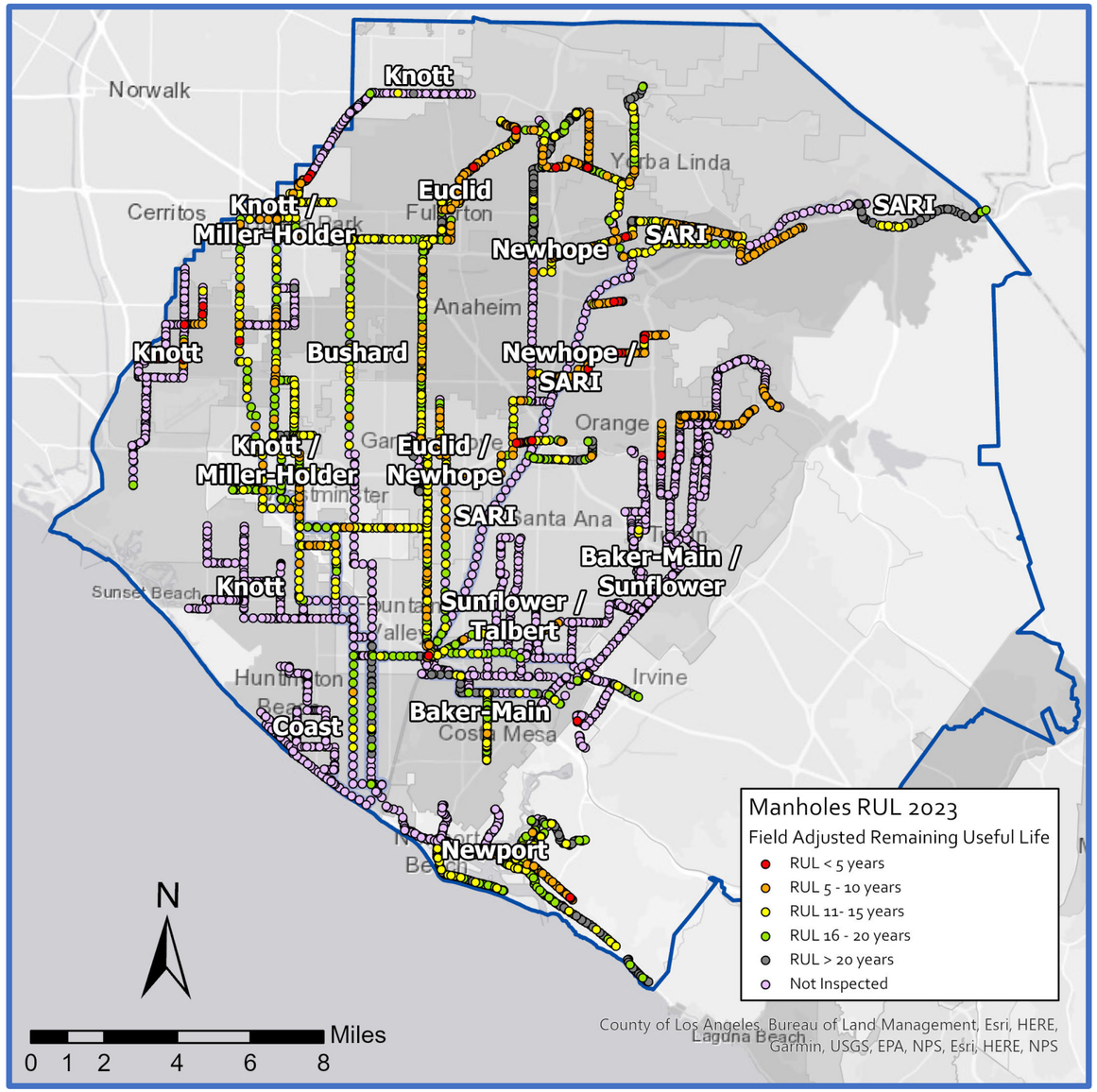
[b] Only trunks with greater than 50% manhole inspections completed are included in this table and in the Asset Management System Summaries.

[c] Interplant Trunk in this table refers only to IPE assets. Interplant Trunk assets are included with Knott Trunk in its Asset Management System Summary.

Acronym Key:

No. = Number; RUL = Remaining Useful Life; SARI = Santa Ana River Interceptor

System Overview - Manholes



ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – ALL TRUNKS

Key Issues

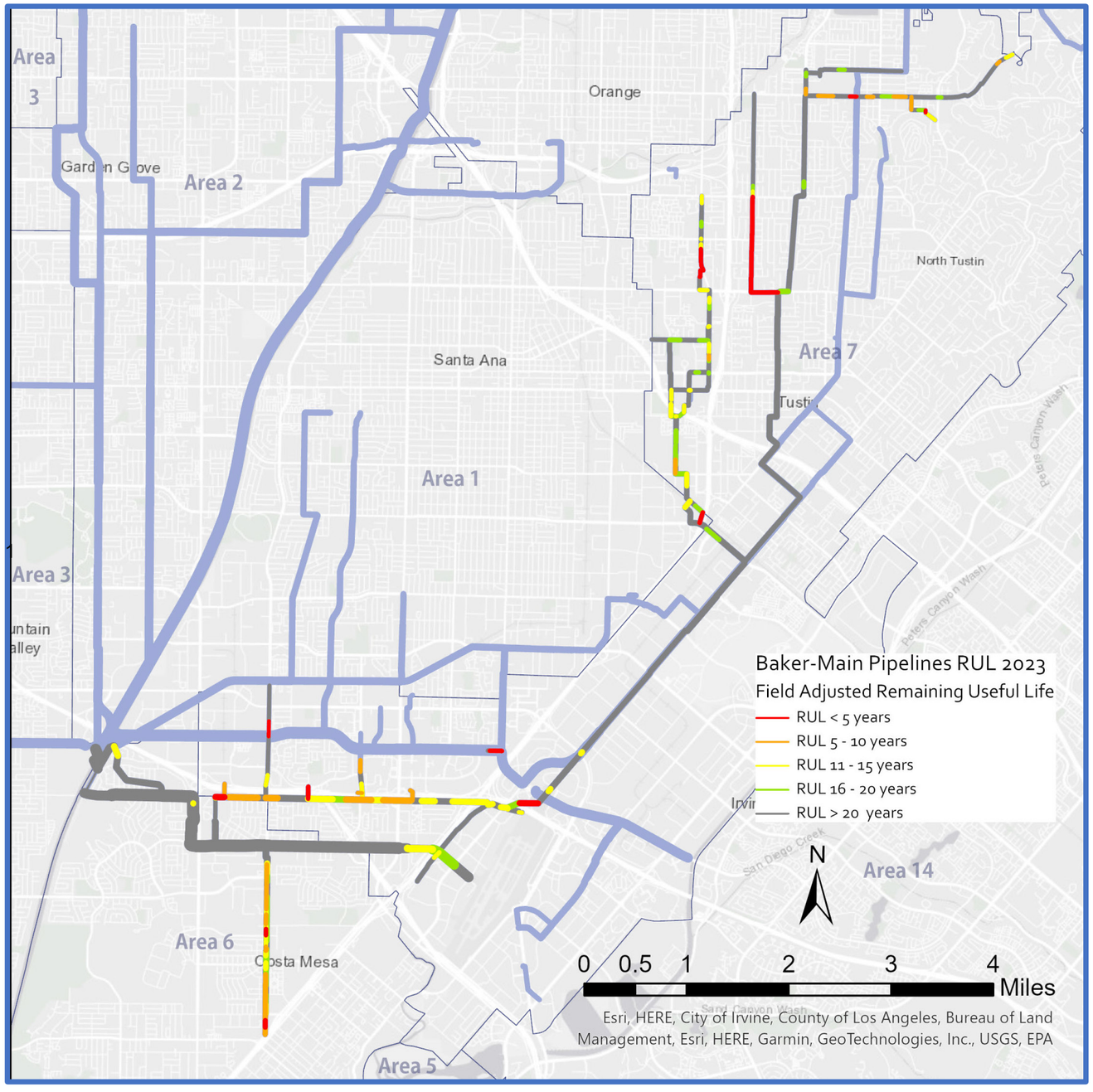
Key Issues	Actions & Recommendations
• **Cleaning of Inverted Siphons and Large-Diameter Pipelines** – Large-diameter pipes (> 42 inches) are not cleaned and CCTV footage does not identify sediment or debris below the waterline. OC San staff has identified potential risks in the large RCP Baker-Main Trunk sewers near the Santa Ana River, the 108-inch Bushard Trunk pipelines near Plant No. 2, the 84-inch Coast Trunk pipelines immediately upstream of Plant No. 2 headworks, the 54-inch Euclid Trunk pipelines immediately upstream of Plant No. 1 headworks and 48-inch pipelines in Fullerton, Miller-Holder Trunk pipelines downstream of the Wintersburg Channel inverted siphon, the Newhope Trunk connection to the Euclid Trunk near Plant No. 1, a northern branch of the SARI system, and upstream of the Talbert Trunk's Santa Ana River inverted siphon.	• OC San completed sonar inspections for 54 large-diameter inverted siphons and gravity sewers in the Baker-Main, Bushard, Coast, Euclid, Knott, Miller-Holder, Newhope, SARI, Sunflower, and Talbert trunks in June 2023. Sediment reports and hydraulic modeling data were utilized to confirm or amend the theoretical cleansing state of each pipeline segment. OC San staff are working on next steps to clean and assess the condition of up to five inverted siphons and one gravity sewer from the 54 large-diameter segments to validate sonar accuracy and pilot the inverted siphon assessment program. Additionally, the list of recommended large-diameter inverted siphons and gravity sewers to regularly clean will be finalized after the additional investigations are completed this fiscal year. With numerous diversions throughout the collection system it is anticipated this will be an ongoing effort.
• **Condition Assessment of Gravity Pipelines** – The current calendar-based CCTV program inspects pipelines every 5 years. For assets with 10 years or less RUL, inspections every 5 years may not be frequent enough to properly track asset deterioration rates. For example, two DIP gravity sewers in the Newhope Trunk system do not have protective linings and need to be monitored closely. Conversely, for assets with 20 years or more RUL inspections every 5 years may not be necessary.	• It is recommended that the frequency of monitoring of pipelines with RUL scores of 4 or 5 be increased from every 5 years to a higher frequency (that is, every 2.5 years) and the frequency of pipelines with RUL scores of 1 be decreased from every 5 years to a lower frequency (that is, every 10 years). OC San staff recommend exploring the optimization of condition assessment resources for gravity pipeline assets such that condition assessment frequencies are closely tied to RUL and likelihood of failure (LoF) and balanced given available resources.
• **Condition Assessment of Inverted Siphons** – Inverted siphons are regularly cleaned but are not inspected because they are typically inaccessible using CCTV equipment. High priority inspections have been identified for two single-barrel VCP inverted siphons in Costa Mesa and Irvine, a dual-barrel vitrified clay pipe (VCP) inverted siphon in Cypress, three DIP air jumpers in Buena Park, a single-barrel VCP inverted siphon in Fullerton, a dual-barrel VCP inverted siphon in the Coast Highway Trunk, three inverted siphons in the SARI Trunk, and a dual-barrel VCP inverted siphon in the Talbert Trunk based on theoretical RUL.	• OC San staff plan to clean and assess the condition of up to five inverted siphons and one gravity sewer from the large-diameter segments inspected with sonar to validate sonar accuracy and pilot the inverted siphon assessment program. A combination of minimal flow and high flow single barrel inverted siphons have been selected to test the best practices for condition assessment of these assets. This pilot program is expected to be completed this fiscal year. Additionally, OC San staff are reviewing all dual barrel inverted siphon locations to confirm no bypass is required. OC San conducted an inspection in 2022 on a Miller-Holder trunk dual-barrel inverted siphon and successfully inspected the assets using a clean, isolate, dewater, CCTV approach for each barrel. However, results of the pilot program could affect this approach if alternative cleaning and inspection methods are more cost competitive. It is anticipated this effort will span over multiple years. • Given the potential complexity (that is, bypassing and/or temporary plugging, traffic control, etc.) for inverted siphon inspections, variety in inspection methods that may be required, and different asset priorities based on asset RUL, the condition assessment program is being phased into separate projects with similar work and priorities.
• **Groundwater Infiltration** – CCTV identified areas experiencing significant groundwater infiltration in the Baker-Main, Bushard, Knott, Miller-Holder, Newport, SARI, and Sunflower trunk systems. Specifically, significant groundwater infiltration is most prominent in the I-405 corridor in Costa Mesa, throughout the western regional trunks of the Knott trunk in Cypress, Los Alamitos, etc.; Jamboree Road and the Balboa Peninsula in Newport Beach; and various locations in Anaheim, Buena Park, Fountain Valley, Huntington Beach, Irvine, Garden Grove, Orange, Santa Ana, and Westminster.	• Projects 2-78, 3-60, 3-64A, B, and C, 7-65, 11-35, X-061, and X-085 will address the majority of areas with significant groundwater infiltration. Eleven severe and isolated locations not already included in CIP projects are suitable for chemical grouting. OC San staff are preparing smaller pilot task orders as part of the evaluation to move forward (or not) with a new blanket contract for chemical grouting. • Areas with significant groundwater infiltration that are co-located with fractures or tuberculation are not suitable for chemical grouting and therefore have been identified as high-priority point repairs; refer to individual trunk key issue tables for more details. Additional areas with groundwater infiltration do not have any other defects and are lower priority.
• **Manhole Access** – OC San staff have identified specific locations where manholes are difficult to access for maintenance. Current issues exist with manholes in some OC San easement areas and along the Santa Ana River. OC San staff has identified specific locations where manholes are difficult to access for maintenance, such as an easement area on California Department of Transportation property near I-5 and State Route 91, an easement area encroached upon by residents near the Wintersburg Channel in Huntington Beach, Crystal Cove, the southern portion of the Santa Ana River, Orange Park Acres, and North Tustin.	• OC San staff will track and prioritize access issues to address key concerns. High-priority access improvements will continue to be recommended as small projects or addition to an existing project. This effort is in conjunction and collaboration with easement access reclamation efforts of Finance (Real Property).
• **Root Intrusion** – CCTV identified significant root intrusion in numerous segments of the sewer trunks in Orange, Tustin, and unincorporated areas; Lake Street and Bolsa Chica Street in Huntington Beach; Coyote Hills and Craig Regional Park in Fullerton; northern Santa Ana; and isolated areas located near Newport Dunes, Orange Park Acres, and within Costa Mesa. Some blockages in OC San sewer mains may have contributed to a local sanitary sewer overflow in Orange in 2021, and a blockage due to roots occurred in one of pipe segments in northern Huntington Beach in 2022.	• OC San staff are preparing to start the first phase of root treatment with the new blanket contract and have drafted a new standard operating procedure and monitoring plan to validate the dilution factor and/or removal of the contractor's active herbicide ingredient with no adverse effects on OC San's biological treatment processes before moving on to additional treatment phases. Root treatment is generally effective at preventing regrowth for 2 to 3 years after treatment. Collections staff increase cleaning intervals in the interim to mitigate roots. • Projects 7-70, 11-35, and X-126 will address the permanent rehabilitation of pipeline segments damaged by root intrusion and provide structural resistance to the recurrence of root intrusion.
• **Uninspected Gravity Pipelines** – Forty-nine gravity sewers have never been inspected in the collection system between the Baker-Main, Coast, Knott, Newhope, Newport, SARI, and Sunflower trunk systems. There is no condition data for these reaches to determine field-adjusted RUL.	• Refer to the key issue tables for the Baker-Main, Coast, Knott, Newhope, Newport, SARI, and Sunflower trunk systems for more details.

Acronym Key:

CCTV = Closed-Circuit Television; CIP = Capital Improvement Program; OC San = Orange County Water District; RUL = Remaining Useful Life; SARI = Santa Ana River Interceptor

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – BAKER-MAIN TRUNK

System Overview - Pipelines



Major Assets and Condition Information - Pipelines

Asset Type	Total Length (miles)	No. of Pipes	Average Age (years)	No. of Pipes with RUL Score of 5	No. of Pipes with RUL Score of 4
Vitrified Clay					
≤ 18" Ø	18.8	341	55	34	26
21"–33" Ø	15.9	245	41	3	19
Reinforced Concrete					
48"–66" Ø	1.2	16	31	-	-
≥ 72" Ø	3.7	34	29	-	-
Ductile Iron					
24" Ø–42" Ø	0.5	3	30	-	-
Polyvinyl Chloride					
10"–21" Ø	0.04	2	21	-	-

Acronym Key:

Ø = Diameter; No. = Number; RUL = Remaining Useful Life

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – BAKER-MAIN TRUNK

Key Issues

Key Issues	Actions & Recommendations
• **Capacity** – The Collections Capacity Evaluation Study completed in 2019 conducted a detailed capacity analysis to identify the location of capacity deficiencies during dry and peak wet weather flows. During peak wet weather flows, capacity issues were identified in a portion of the North Trunk and Tustin Avenue sewers.	• Project 7-69 will upsize a portion of the North Trunk and Project X-084 will upsize a portion of the Tustin Avenue sewer to address existing capacity issues.
• **Missing Air Jumpers** – One out of 10 inverted siphon/reduction locations in the Baker-Main Trunk system do not have air jumpers.	• Project X-129 includes constructing a new air jumper.
• **Pipeline Fracturing** – CCTV identified several areas with significant fracturing of VCP pipelines. The largest concentration of fractures is concentrated in the Fairview Trunk.	• Project 6-20 will rehabilitate the entire Fairview Trunk to address pipeline fractures. Projects 7-65, 7-70, and X-129 will also address fracturing with rehabilitation work. • Isolated defects elsewhere not included or near a CIP project and one pipeline that may not have its fractures addressed in time by the X-129 project have been identified as high-priority point repairs. OC San staff are in the process of grouping point repairs together for 7-pack task orders.
• **Uninspected Gravity Pipelines** – Fifteen gravity sewers have never been inspected in the Baker-Main Trunk system. There is no condition data for these reaches to determine field-adjusted RUL.	• Two of the gravity sewers have a common manhole with a chemical line that must be temporarily relocated for CCTV access. There are no known access issues for the remaining 13 uninspected gravity sewers. Inspections will be completed via future CCTV PM work orders or separate CCTV work orders.

Current and Future Projects

Project No.	Project Title	Description of Work	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35	FY 35/36	FY 36/37	FY 37/38
7-65	Gisler-Redhill Interceptor Rehabilitation	• Rehabilitate sewer facilities in the City of Costa Mesa.															
6-20	Fairview Trunk Sewer Rehabilitation	• Rehabilitate sewer facilities in the City of Costa Mesa.															
7-69	North Trunk/Yorba Street Sub-Trunk Improvements	• Upsize pipe segments to increase capacity in the City of Tustin.															
7-70	North Trunk/Panorama Heights/Tustin-Orange Rehabilitation	• Rehabilitate sewer facilities in the City of Orange.															
X-084	Tustin Avenue Sewer Improvements	• Upsize pipe segments to increase capacity in the City of Santa Ana.															
X-129	South Coast Metro Sub-Trunks Rehabilitation	• Rehabilitate sewer facilities in the Cities of Costa Mesa and Santa Ana.															

Types of Project Legend:

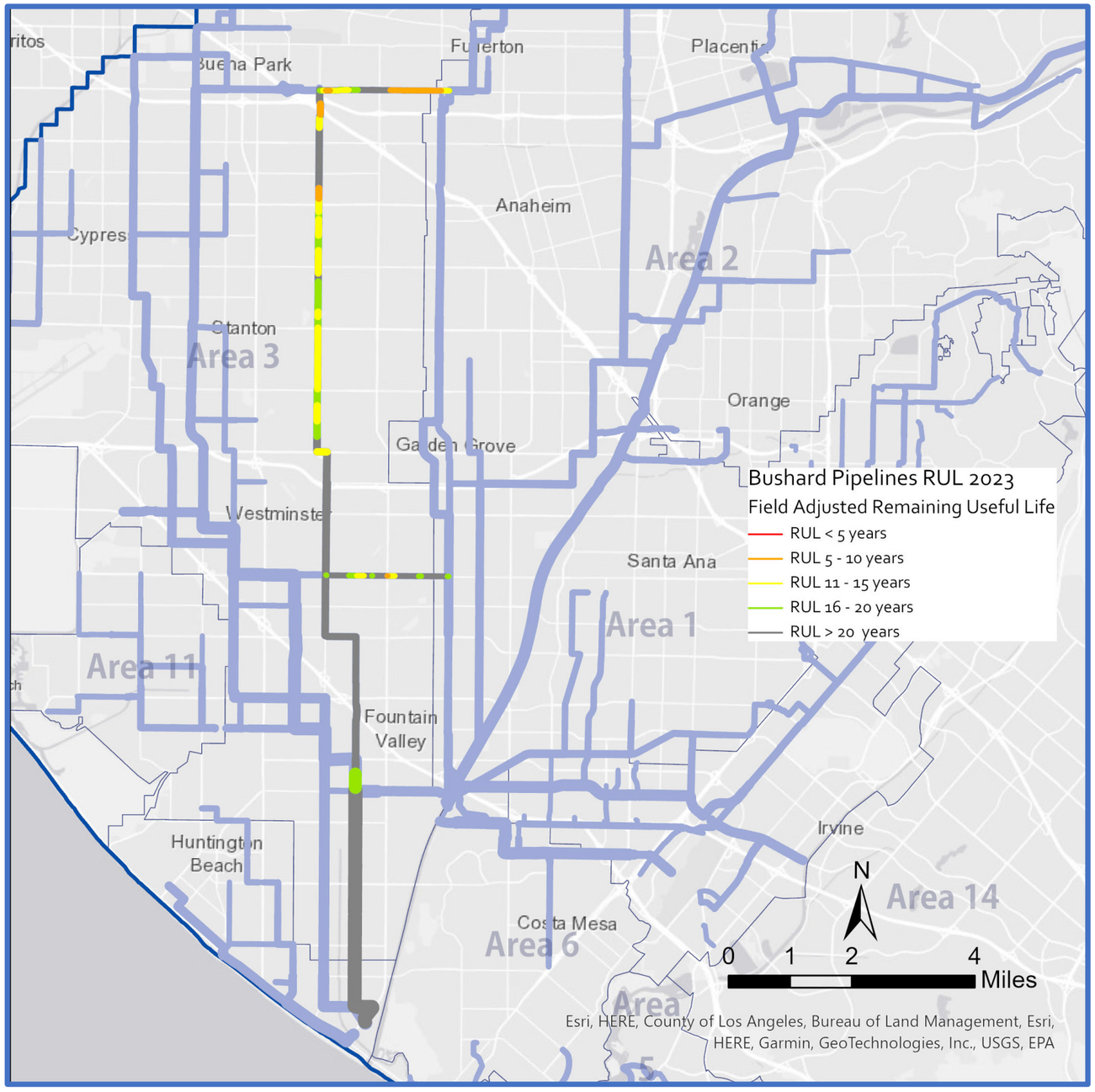
CIP - Planning **CIP - Design** **CIP - Construction** **Maintenance Project**

Acronym Key:

CCTV = Closed-Circuit Television; CIP = Capital Improvement Program; FY = Fiscal Year; I-405 = Interstate 405; OC San = Orange County Sanitation District; PM = Preventive Maintenance; RCB = Reinforced Concrete Box; RUL = Remaining Useful Life; VCP = Vitrified Clay Pipe

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – BUSHARD TRUNK

System Overview - Pipelines



Major Assets and Condition Information - Pipelines

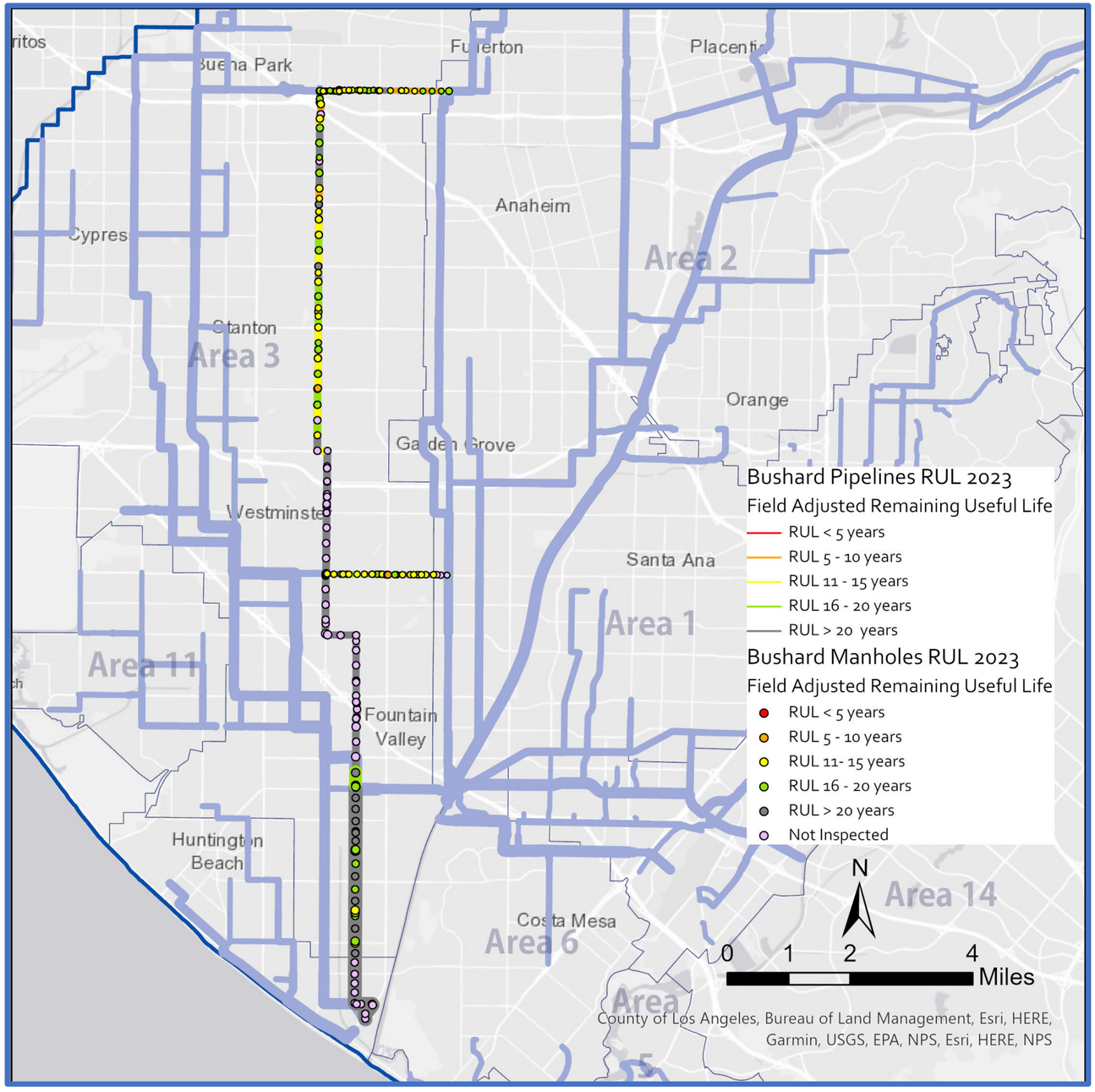
Asset Type	Total Length (miles)	No. of Pipes	Average Age (years)	No. of Pipes with RUL Score of 5	No. of Pipes with RUL Score of 4
Vitrified Clay					
≤ 18" Ø	0.03	3	39	-	-
24"–27" Ø	5.1	73	51	-	8
39" Ø	3.6	24	72	-	1
Reinforced Concrete					
≤ 48" Ø	3.5	24	59	-	1
60"–66" Ø	0.2	7	21	-	-
≥ 72" Ø	4.5	33	23	-	-
Fiberglass					
36"–48" Ø	4.7	27	59	-	-
High-Density Polyethylene					
22" Ø	0.1	2	25	-	-
Polyvinyl Chloride					
6"–24" Ø	0.2	8	19	-	-
Steel					
12"–26" Ø	0.06	4	14	-	-

Acronym Key:

Ø = Diameter; No. = Number; RUL = Remaining Useful Life

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – BUSHARD TRUNK

System Overview - Manholes



Major Assets and Condition Information - Manholes

Asset Type	No. of Manholes	Average Age (years)	No. of Manholes with RUL Score of 5	No. of Manholes with RUL Score of 4
Concrete				
≤ 48" Ø	35	64	-	-
60"–72" Ø	52	39	-	2
> 72" Ø	115	38	-	1

Acronym Key:

Ø = Diameter; No. = Number; RUL = Remaining Useful Life

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – BUSHARD TRUNK

Key Issues

Key Issues	Actions & Recommendations
• **Bushard Diversion Box** – Due to corrosion and ragging issues, the Bushard Diversion Box cannot operate as originally intended.	• MP-307 will provide short-term repairs to this box. Future improvements that are included in project X-096.
• **Improperly Abandoned Manhole Under I-5** – In 2017 CCTV discovered a manhole in the Magnolia Street sewer that had a partially abandoned manhole underneath the I-5 travel lanes. Subsequent investigations in 2022 confirmed the manhole structure had significant liner delamination and aggregate visible.	• Project FRC-0014 will complete the abandonment of the manhole under I-5.
• **Manhole Defects** – CCTV identified one manhole has significant liner delamination.	• Manhole is suitable for repair under the Manhole Rehabilitation blanket contract.
• **Missing Air Jumpers** – One out of 8 inverted siphon/reduction locations in the Bushard Trunk system do not have air jumpers.	• Project X-130 includes constructing a new air jumper.
• **Pipeline Fracturing** – CCTV identified an area with significant fracturing of VCP pipelines primarily in Magnolia Street and Orangethorpe Avenue in the cities of Anaheim and Fullerton.	• Projects X-085 and X2-79 will address fracturing with rehabilitation work.

Current and Future Projects

Project No.	Project Title	Description of Work	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35	FY 35/36	FY 36/37	FY 37/38
MP-307	Bushard Diversion Structure Repair	• Repair structural assets and replace electrical, instrumentation, and control components.															
FRC-0014	Magnolia Sewer Manhole Abandonment at I-5	• Complete abandonment of manhole under I-5.															
X-130	McFadden Branch - Bolsa Relief Trunk Rehabilitation	• Rehabilitate sewer facilities in the Cities of Westminster, Huntington Beach, and an unincorporated area of Orange County.															
X-096	Bushard Diversion Structure Improvements	• Replace mechanical equipment.															
X-085	Hoover-Western Sub-Trunk and Katella Interceptor Improvements	• Upsize sewer segments to increase capacity and rehabilitation of sewer facilities in the Cities of Cypress, Garden Grove, and Stanton.															
X2-79	Fullerton-Brea Interceptor and Rolling Hills Drive Sub-Trunk Rehabilitation	• Rehabilitate sewer facilities in the City of Fullerton.															

Types of Project Legend:

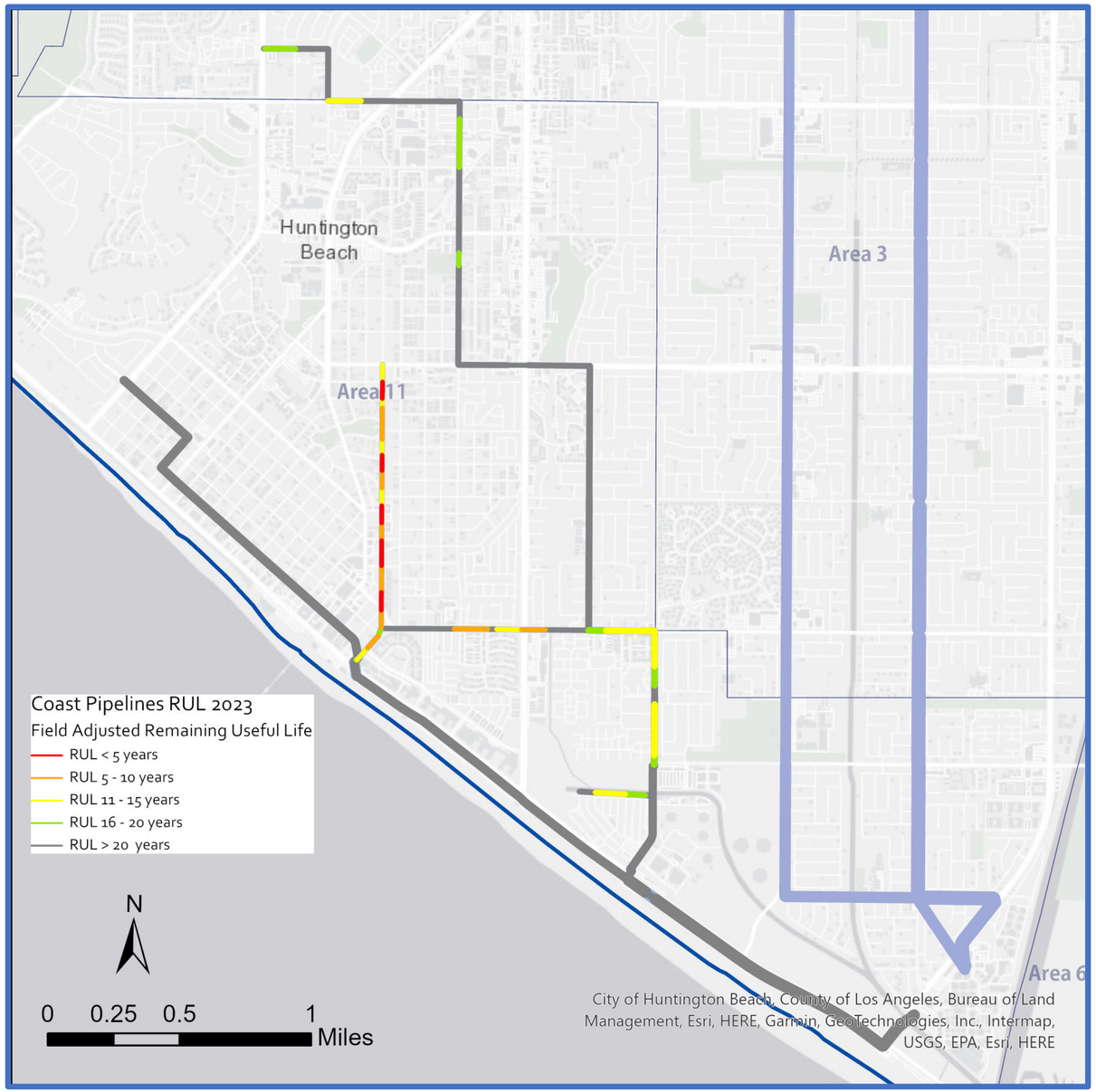
CIP - Planning **CIP - Design** **CIP - Construction** **Maintenance Project**

Acronym Key:

CCTV = Closed-Circuit Television; FY = Fiscal Year; I-5 = Interstate 5; OC San = Orange County Sanitation District; RUL = Remaining Useful Life; VCP = Vitrified Clay Pipe

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – COAST TRUNK

System Overview - Pipelines



Major Assets and Condition Information - Pipelines

Asset Type	Total Length (miles)	No. of Pipes	Average Age (years)	No. of Pipes with RUL Score of 5	No. of Pipes with RUL Score of 4
Vitrified Clay					
≤ 18" Ø	2.1	32	64	6	10
21"–36" Ø	4.4	58	62	-	-
Reinforced Concrete					
42"–54" Ø	3.4	45	41	-	-
≥ 72" Ø	1.7	13	38	-	-

Acronym Key:

Ø = Diameter; No. = Number; RUL = Remaining Useful Life

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – COAST TRUNK

Key Issues

Key Issues	Actions & Recommendations
• **Pipeline Fracturing** – CCTV identified an area with significant fracturing of VCP pipelines primarily in Lake Street and Atlanta Avenue.	• Project X-126 will address all of the major fractures by rehabilitating the pipelines. • Three pipelines that may not have fractures addressed in time by the X-126 project have been identified as high priority point repairs. OC San staff are in the process of grouping point repairs together for 7-pack task orders.
• **Uninspected Gravity Pipelines** – Two gravity sewers within Plant No. 2 have never been inspected in the Coast Trunk system. There is no condition data for these reaches to determine field-adjusted RUL.	• There are no known access issues for the two uninspected gravity sewers. Inspections will be completed via future CCTV PM work orders or separate CCTV work orders.

Current and Future Projects

Project No.	Project Title	Description of Work	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35	FY 35/36	FY 36/37	FY 37/38
X-126	Lake Avenue and Atlanta Interceptor Rehabilitation	• Rehabilitation of sewer facilities in the City of Huntington Beach															

Types of Project Legend:

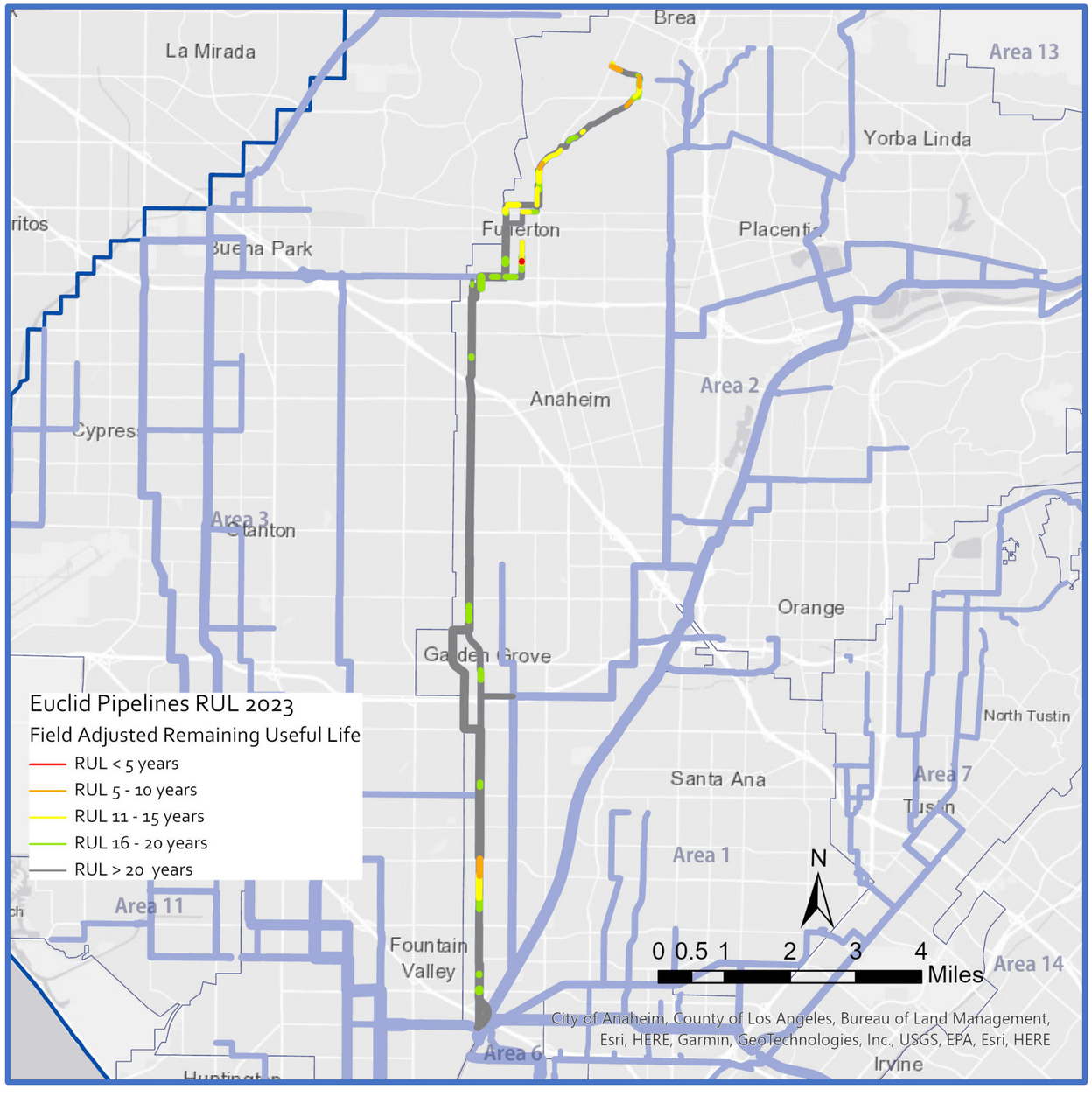
CIP - Planning | CIP - Design | CIP - Construction | Maintenance Project

Acronym Key:

CCTV = Closed-Circuit Television; FY = Fiscal Year; PM = Preventive Maintenance; OC San = Orange County Sanitation District; RUL = Remaining Useful Life; VCP = Vitrified Clay Pipe

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – EUCLID TRUNK

System Overview - Pipelines



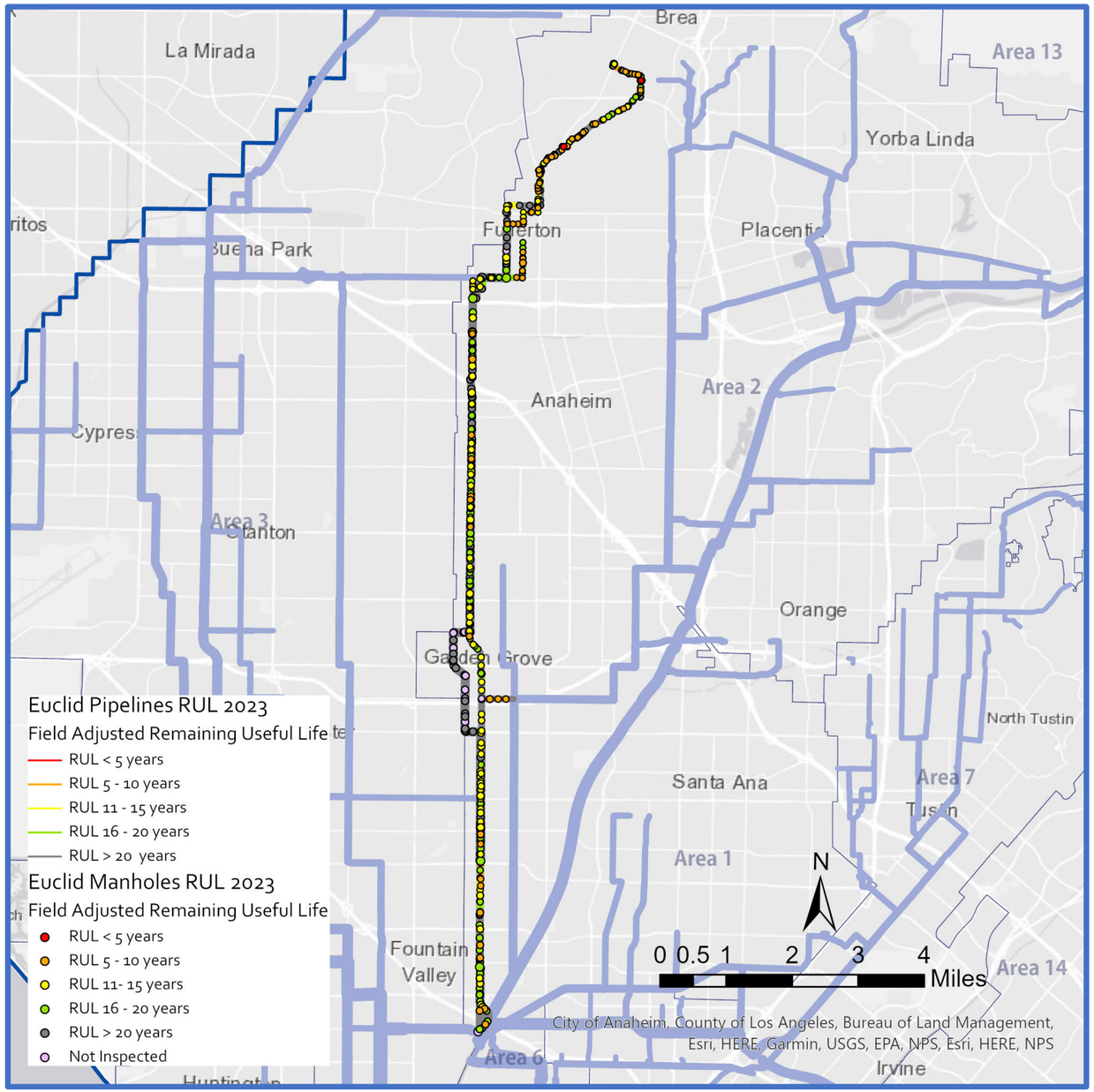
Major Assets and Condition Information - Pipelines

Asset Type	Total Length (miles)	No. of Pipes	Average Age (years)	No. of Pipes with RUL Score of 5	No. of Pipes with RUL Score of 4
Vitrified Clay					
≤ 18" Ø	4.4	79	60	-	4
21"–27" Ø	3.9	52	40	-	1
≥ 30" Ø	12.1	151	51	1	1
Reinforced Concrete					
≤ 42" Ø	2.4	15	51	-	-
45"–60" Ø	11.6	131	34	-	-
Polyvinyl Chloride					
10"–30" Ø	0.1	12	18	-	-
Steel					
10" Ø	0.01	3	14	-	-
High-Density Polyethylene					
26" Ø	0.05	1	14	-	-

Acronym Key:
Ø = Diameter; No. = Number; RUL = Remaining Useful Life

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – EUCLID TRUNK

System Overview - Manholes



Major Assets and Condition Information - Manholes

Asset Type	No. of Manholes	Average Age (years)	No. of Manholes with RUL Score of 5	No. of Manholes with RUL Score of 4
Concrete				
≤ 48" Ø	43	59	1	21
60"–72" Ø	217	46	1	26
> 72" Ø	116	34	-	3
Brick				
≤ 48" Ø	48	63	-	17
60" Ø	2	55	-	-

Acronym Key:

Ø = Diameter; No. = Number; RUL = Remaining Useful Life

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – EUCLID TRUNK

Key Issues

Key Issues	Actions & Recommendations
• **Manhole Defects –** CCTV identified areas with significant liner delamination and some structures with exposed rebar throughout the Euclid trunk system, but especially in the vicinity of Coyote Hills and northern Fullerton.	• Project X2-79 will address the majority of the liner delamination and exposed rebar by rehabilitating the manhole structures. Other manholes not included or near a CIP project as well as several manholes that need some rehabilitation work to prevent failure prior to the construction phase of the X2-79 project are suitable for repair under the Manhole Rehabilitation blanket contract.
• **Pipeline Fracturing** – CCTV identified an area with significant fracturing of VCP pipelines in the vicinity of Coyote Hills and northern Fullerton.	• Project X2-79 will address all of the major fractures by rehabilitating the pipelines. • Isolated defects elsewhere not included or near a CIP project and one pipeline that may not have its fractures addressed in time by the X2-79 project have been identified as high-priority point repairs. OC San staff are in the process of grouping point repairs together for 7-pack task orders.

Current and Future Projects

Project No.	Project Title	Description of Work	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35	FY 35/36	FY 36/37	FY 37/38
X2-79	Fullerton-Brea Interceptor and Rolling Hills Drive Sub-Trunk Rehabilitation	• Rehabilitate sewer facilities in the City of Fullerton.															

Types of Project Legend:

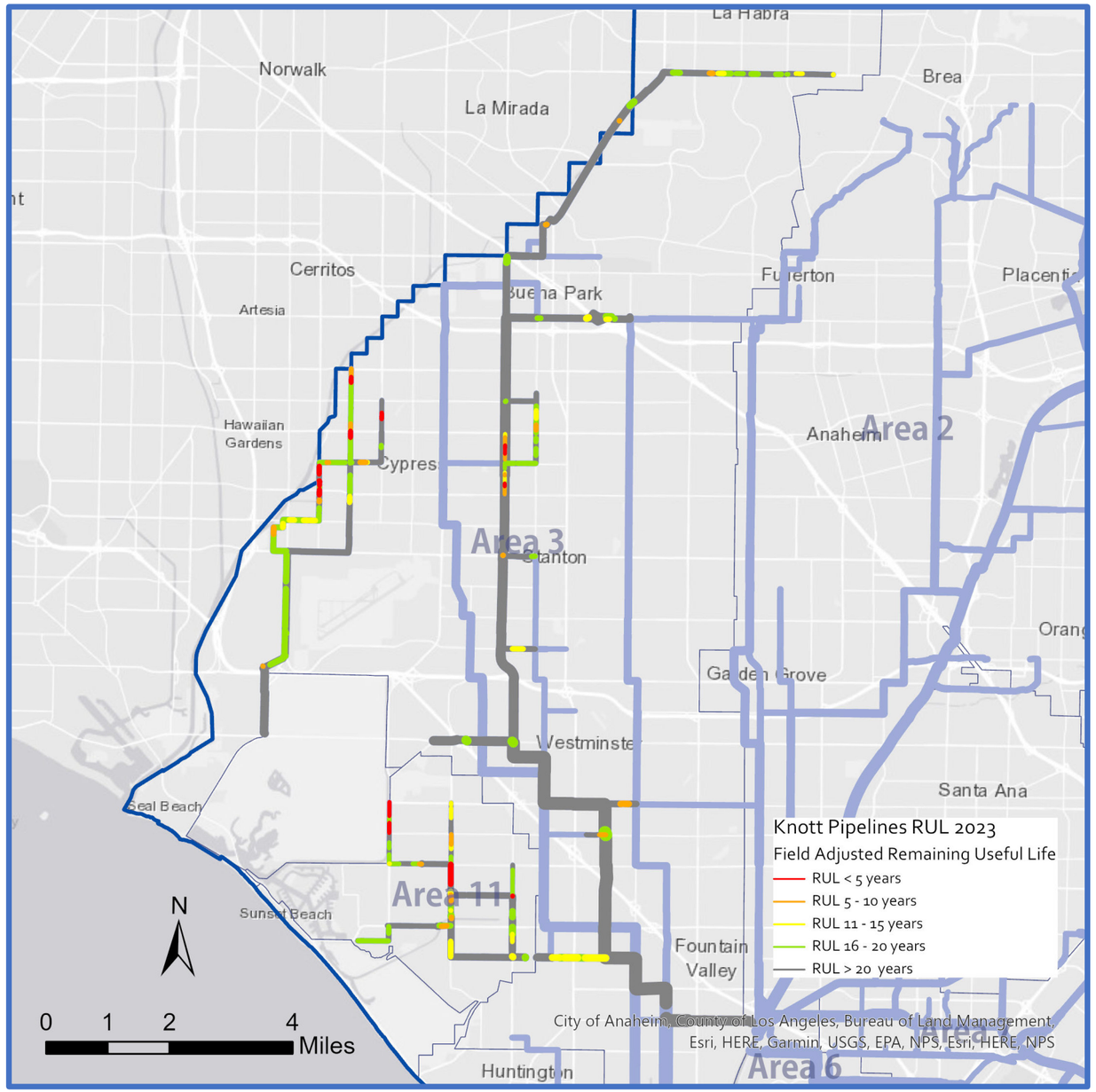
CIP - Planning | CIP - Design | CIP - Construction | Maintenance Project

Acronym Key:

CCTV = Closed-Circuit Television; CIP = Capital Improvement Program; FY = Fiscal Year; OC San = Orange County Sanitation District; RUL = Remaining Useful Life; VCP = Vitrified Clay Pipe

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – KNOTT TRUNK

System Overview - Pipelines



Note: Map and data table include Interplant IPE pipelines and manholes.

Major Assets and Condition Information - Pipelines

Asset Type	Total Length (miles)	No. of Pipes	Average Age (years)	No. of Pipes with RUL Score of 5	No. of Pipes with RUL Score of 4
Vitrified Clay					
≤ 18" Ø	9.1	130	55	11	12
21"–27" Ø	20.5	300	51	6	14
≥ 30" Ø	14.4	184	47	-	1
Reinforced Concrete					
≤ 42" Ø	4.7	58	29	-	-
45"–66" Ø	7.7	70	46	-	-
≥ 72" Ø	9.6	68	49	-	-
Polyvinyl Chloride					
≤ 18" Ø	1.2	17	18	-	-
High-Density Polyethylene					
18"–32" Ø	0.04	5	12	-	-
Fiberglass Reinforced Plastic					
16"–24" Ø	0.1	2	14	-	-
66"–78" Ø	1.1	8	16	-	-
Ductile Iron					
20" Ø	0.02	1	64	-	-
Steel					
4" Ø	0.02	1	14	-	-
Unknown					
18" Ø	0.01	2	65	-	2

Acronym Key:

Ø = Diameter; IPE = Interplant Trunk E; No. = Number; RUL = Remaining Useful Life

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – KNOTT TRUNK

Key Issues

Key Issues	Actions & Recommendations
• **Missing Air Jumpers** – Four out of 17 inverted siphon/reduction locations in the Knott Trunk system do not have air jumpers.	• Project X-078 includes constructing a new air jumper at two locations. Two other locations do not require air jumpers due to lack of normal surcharge conditions at one location and an infeasible location at the end of a force main.
• **Pipeline Fracturing** – CCTV identified several areas with significant fracturing of VCP pipelines. Most fractures are concentrated in northern Huntington Beach, Cypress, and with small-diameter sewers owned and operated by the City of Anaheim in the northern central area of the trunk.	• Projects 3-60, 3-64B and C, 11-35, X-061, X-078, X-085, and X-130 will address the majority of fractures by rehabilitating the pipelines. OC San staff will coordinate with the City of Anaheim pertaining to operation and maintenance of the local small-diameter sewers. • Isolated defects elsewhere not included or near a CIP project and two pipelines that may not have fractures addressed in time by the X-061 project have been identified as high-priority point repairs. OC San staff are in the process of grouping point repairs together for 7-pack task orders.
• **Uninspected Gravity Pipelines** – Three gravity sewers have never been inspected in the Knott and Ellis Avenue Trunk systems. There is no condition data for these reaches to determine field-adjusted RUL.	• There are no known access issues for the three uninspected gravity sewers. Inspections will be completed via future CCTV PM work orders or separate CCTV work orders.
• **Vault Vibration Issues** – Three sewer vaults in Warner Avenue cause local vibration/resonance issues to nearby residences when cars pass over them.	• Project FRC-0010 will rehabilitate each of the Warner Avenue vaults to eliminate local vibration/resonance issues.

Current and Future Projects

Project No.	Project Title	Description of Work	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35	FY 35/36	FY 36/37	FY 37/38
3-64A&B	Orange Western Sub-Trunk Rehabilitation & Los Alamitos Trunk Sewer Rehabilitation	• Rehabilitate sewer facilities in the Cities of Anaheim, Buena Park, Cypress, Los Alamitos, Seal Beach, and the community of Rossmoor.															
FRC-0010	Warner Avenue Vault Cover Improvements	• Rehabilitate sewer vaults in the City of Huntington Beach.															
FE21-06	Chemical Dosing Station Installation at Westside Pump Station	• Install odor control chemical dosing facility in the community of Rossmoor.															
3-64C	Cypress Trunk Sewer Rehabilitation - West	• Rehabilitate sewer facilities in the Cities of Cypress, La Palma, and Los Alamitos.															
3-60	Knott/Miller-Holder/Artesia Branch Rehabilitation	• Rehabilitate sewer facilities in the Cities of Buena Park and La Palma.															
11-35	Bolsa Chica/Edinger/Springdale Rehabilitation	• Rehabilitate sewer facilities in the City of Huntington Beach.															
X-130	McFadden Branch - Bolsa Relief Trunk Rehabilitation	• Rehabilitate sewer facilities in the Cities of Westminster and Huntington Beach and an unincorporated area of Orange County.															
3-68	Los Alamitos Sub-Trunk Extension	• Extend the Los Alamitos Sub-Trunk to facilitate abandonment of Westside Pump Station															
X-085	Hoover-Western Sub-Trunk and Katella Interceptor Improvements	• Upsize sewer segments to increase the capacity and rehabilitation of sewer facilities in the Cities of Cypress, Garden Grove, and Stanton.															
X-078	Inverted Siphon and Air Jumper Improvements	• Install new air jumper facilities and rehabilitate sewer facilities in the Cities of Cypress, La Habra, La Mirada, Orange, and Santa Ana.															
X-061	Imperial Relief Interceptor/Miller-Holder Trunk Rehabilitation	• Rehabilitate sewer facilities in the City of La Habra.															

Types of Project Legend:

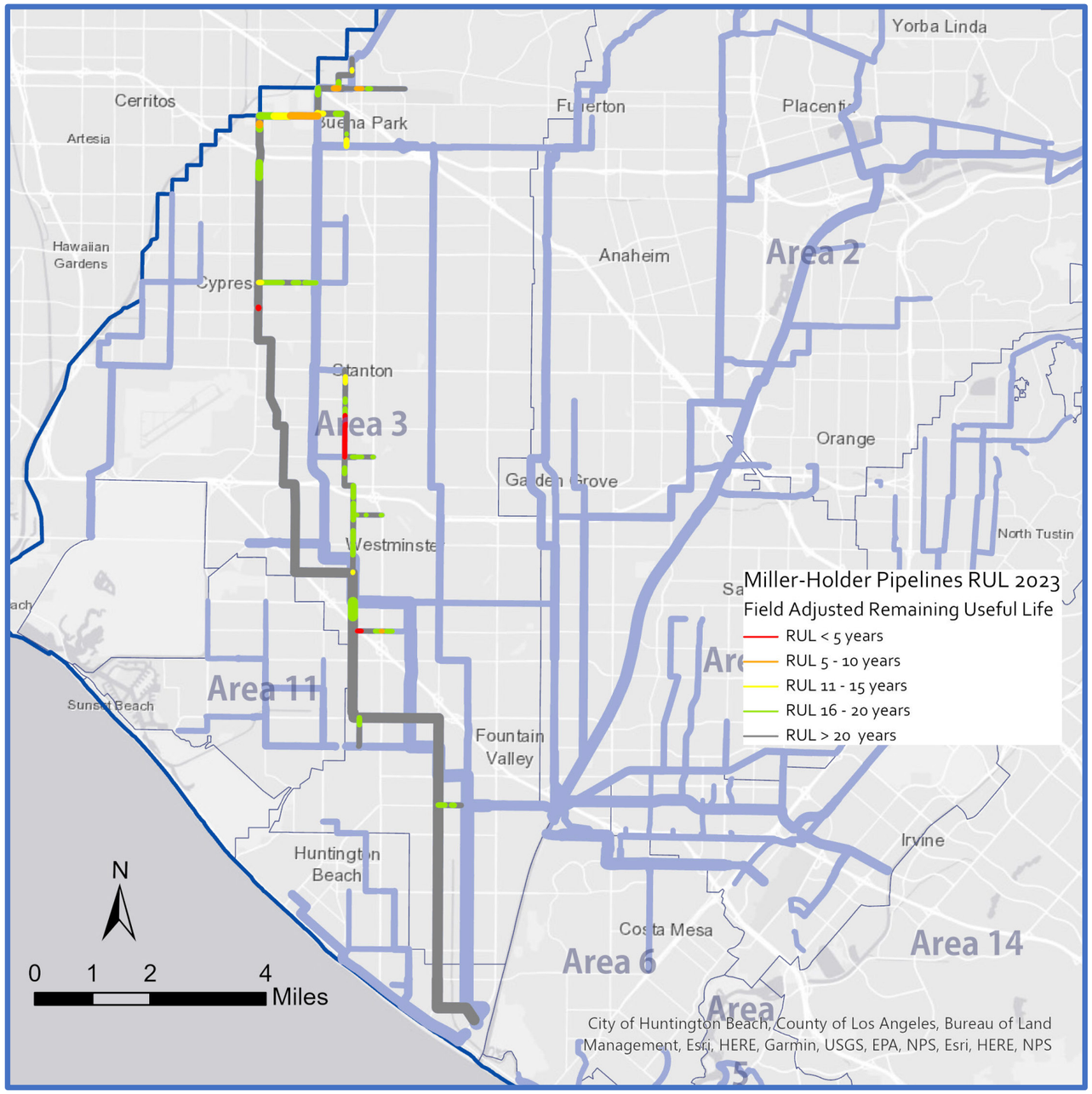
CIP - Planning **CIP - Design** **CIP - Construction** **Maintenance Project**

Acronym Key:

CCTV = Closed-Circuit Television; CIP = Capital Improvement Program; FY = Fiscal Year; OC San = Orange County Sanitation District; PM = Preventive Maintenance; RUL = Remaining Useful Life; VCP = Vitrified Clay Pipe

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – MILLER-HOLDER TRUNK

System Overview - Pipelines



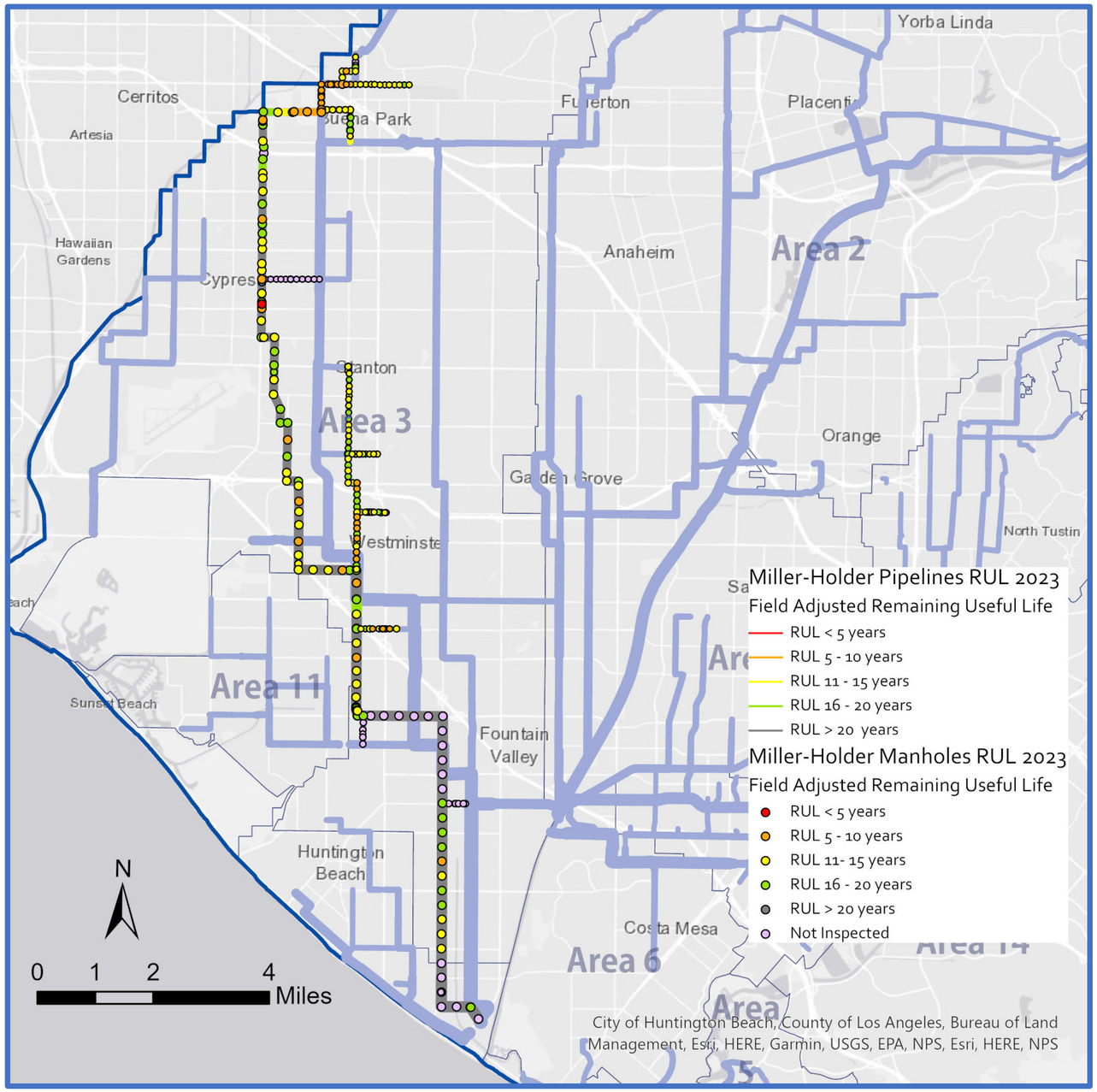
Major Assets and Condition Information - Pipelines

Asset Type	Total Length (miles)	No. of Pipes	Average Age (years)	No. of Pipes with RUL Score of 5	No. of Pipes with RUL Score of 4
Vitrified Clay					
≤ 18" Ø	2.9	50	63	1	2
21"–27" Ø	6.9	87	62	10	-
≥ 30" Ø	2.5	27	61	1	3
Reinforced Concrete					
45"–69" Ø	13.4	76	64	-	1
≥ 72" Ø	5.8	25	73	-	-
Ductile Iron					
≤ 18" Ø	0.1	5	41	-	3
Polyvinyl Chloride					
24" Ø	0.02	1	21	-	-

Acronym Key:
Ø = Diameter; No. = Number; RUL = Remaining Useful Life

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – MILLER-HOLDER TRUNK

System Overview - Manholes



Major Assets and Condition Information - Manholes

Asset Type	No. of Manholes	Average Age (years)	No. of Manholes with RUL Score of 5	No. of Manholes with RUL Score of 4
Concrete				
≤ 48" Ø	68	64	-	5
60"–72" Ø	82	62	-	19
> 72" Ø	115	62	1	17

Acronym Key:
Ø = Diameter; No. = Number; RUL = Remaining Useful Life

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – MILLER-HOLDER TRUNK

Key Issues

Key Issues	Actions & Recommendations
• **Capacity** – The Collections Capacity Evaluation Study completed in 2019 conducted a detailed capacity analysis to identify the location of capacity deficiencies during dry and peak wet weather flows. During existing peak wet weather flows, capacity issues were identified in a portion of the Hoover-Western Sub-Trunk.	• Project X-085 includes upsizing a portion of the Hoover-Western Sub-Trunk to address existing capacity issues.
• **Manhole Defects** – CCTV identified areas with significant liner delamination and some structures with exposed rebar, primarily in Buena Park and Westminster.	• Projects 3-60, 3-64A, X-078, and X-130 will address the majority of the liner delamination and exposed rebar by rehabilitating the manhole structures. Other manholes not included or near a CIP project as well as one manhole that needs some rehabilitation work to prevent failure prior to the construction phase of the X-078 project are suitable for repair under the Manhole Rehabilitation blanket contract.
• **Missing Air Jumpers** – Two out of 5 inverted siphon/reduction locations in the Miller-Holder Trunk system do not have air jumpers.	• Projects 3-60 and X-078 includes constructing a new air jumper at both locations.
• **Pipeline Fracturing** – CCTV identified several areas with significant fracturing of VCP pipelines. Most fractures are concentrated in Buena Park and Westminster.	• Projects 3-60, X-085, and X-130 will address the majority of the fractures by rehabilitating the pipelines. • Isolated defects elsewhere not included or near a CIP project and one pipeline under I-405 that may not have fractures addressed in time by the X-130 project have been identified as high-priority point repairs. OC San staff are in the process of grouping point repairs together for 7-pack task orders.

Current and Future Projects

Project No.	Project Title	Description of Work	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35	FY 35/36	FY 36/37	FY 37/38
3-64A&B	Orange Western Sub-Trunk Rehabilitation & Los Alamitos Trunk Sewer Rehabilitation	• Rehabilitate sewer facilities in the Cities of Anaheim, Buena Park, Cypress, Los Alamitos, and Seal Beach and the community of Rossmoor.															
3-60	Knott/Miller-Holder/Artesia Branch Rehabilitation	• Rehabilitate sewer facilities in the Cities of Buena Park and La Palma.															
X-130	McFadden Branch - Bolsa Relief Trunk Rehabilitation	• Rehabilitate sewer facilities in the Cities of Westminster and Huntington Beach and an unincorporated area of Orange County.															
X-078	Inverted Siphon and Air Jumper Improvements	• Install new air jumper facilities and rehabilitate sewer facilities in the Cities of Cypress, La Habra, La Mirada, Orange, and Santa Ana.															
X-085	Hoover-Western Sub-Trunk and Katella Interceptor Improvements	• Upsize sewer segments to increase capacity and rehabilitation of sewer facilities in the Cities of Cypress, Garden Grove, and Stanton.															

Types of Project Legend:

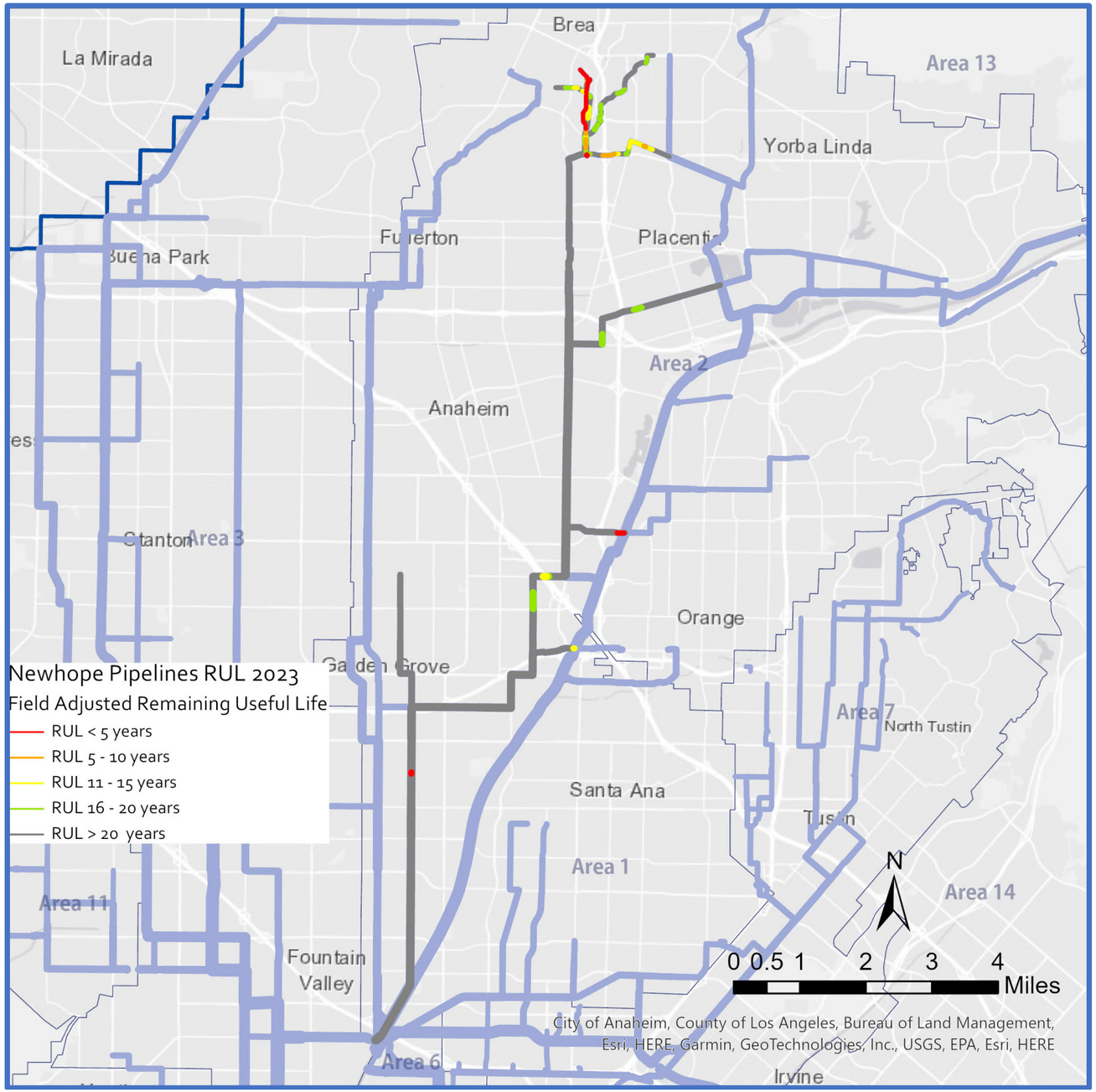
CIP - Planning **CIP - Design** **CIP - Construction** **Maintenance Project**

Acronym Key:

CCTV = Closed-Circuit Television; CIP = Capital Improvement Program; DIP = Ductile Iron Pipe; FY = Fiscal Year; I-405 = Interstate 405; OC San = Orange County Sanitation District; RUL = Remaining Useful Life; VCP = Vitrified Clay Pipe

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – NEWHOPE TRUNK

System Overview - Pipelines



Major Assets and Condition Information - Pipelines

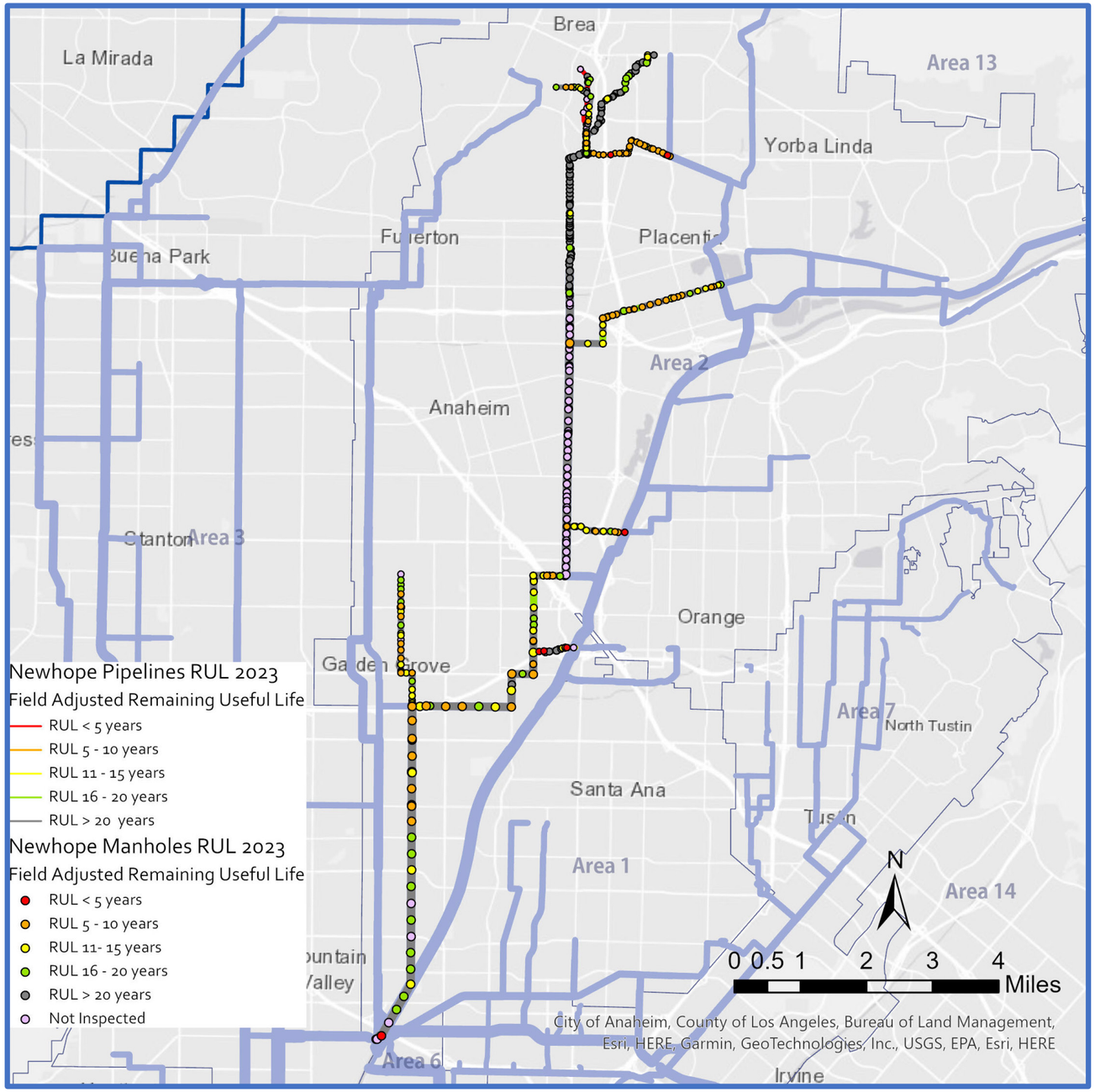
Asset Type	Total Length (miles)	No. of Pipes	Average Age (years)	No. of Pipes with RUL Score of 5	No. of Pipes with RUL Score of 4
Vitrified Clay					
≤ 18” Ø	4.0	69	50	8	6
21”–27” Ø	2.7	39	55	-	-
≥ 30” Ø	8.6	130	40	2	-
Reinforced Concrete					
45”–54” Ø	7.9	42	63	-	-
Polyvinyl Chloride					
12”–30” Ø	0.03	5	23	1	-
Fiberglass Reinforced Plastic					
39”–54” Ø	4.6	51	5	-	-
Ductile Iron					
16”–36” Ø	1.3	25	32	4	1
Steel					
12” Ø	0.07	6	14	-	-

Acronym Key:

Ø = Diameter; No. = Number; RUL = Remaining Useful Life

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – NEWHOPE TRUNK

System Overview - Manholes



Major Assets and Condition Information - Manholes

Asset Type	No. of Manholes	Average Age (years)	No. of Manholes with RUL Score of 5	No. of Manholes with RUL Score of 4
Concrete				
≤ 48" Ø	53	61	1	19
60”–72” Ø	192	43	5	44
> 72" Ø	112	29	1	15

Acronym Key:
Ø = Diameter; No. = Number; RUL = Remaining Useful Life

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – NEWHOPE TRUNK

Key Issues

Key Issues	Actions & Recommendations
• **Broken Siphon** – In 2020, CCTV discovered the Olive Sub-Trunk siphon has a hole in the pipeline. In addition, CCTV showed corrosion issues in upstream manholes due to an ineffective air jumper.	• Project FE20-08 will replace a portion of the Olive Sub-Trunk siphon, rehabilitate other portions, reconstruct the air jumper, and restore the siphon into service.
• **Increase Dry Weather Reclaimable Flows to P1** – To support the full production capacity of GWRS in future years, it is expected that more dry weather reclaimable flows are needed at OC San's treatment plants.	• Project X-131 includes the construction of a new diversion to allow the routing of some flows from the SAR0345 branch into the Newhope Trunk system.
• **Manhole Defects** – CCTV identified several areas with significant liner delamination and some structures with exposed rebar located in Anaheim, Fullerton, Garden Grove, Orange, Placentia, and Santa Ana. There are also three isolated manholes in the southern reaches of the Newhope Trunk system with severe liner detachment, surface aggregate missing, and visible reinforcement.	• Projects FE20-08, FE21-08, X-078, X-131, and X-132 will address the majority of the liner delamination and exposed rebar by rehabilitating the manhole structures. Other manholes not included or near a CIP project as well as several manholes that need some rehabilitation work to prevent failure prior to the construction phase of the X-078 and X-131 projects are suitable for repair under the Manhole Rehabilitation blanket contract.
• **Pipeline Fracturing** – CCTV identified several areas with significant fracturing of VCP pipelines. Most fractures are concentrated in Fullerton.	• Project X-131 will address all of the fractures by rehabilitating the pipelines.
• **Pipeline Tuberculation** – CCTV identified a few ductile iron pipes in Craig Regional Park with no lining or significant delamination and widespread tuberculation.	• Project X-131 will address all of the tuberculation by rehabilitating the pipelines.
• **Uninspected Gravity Pipelines** – Thirteen gravity sewers have never been inspected in the Newhope Trunk system. There is no condition data for these reaches to determine field-adjusted RUL.	• Four gravity sewers were recently constructed in 2017 and 2018 and have no access issues. Eight gravity sewers appear to have buried manhole frames and covers, which will be located and uncovered by OC San staff. All of these reaches will be inspected via future CCTV PM work orders or separate CCTV work orders. The final gravity sewer is proposed to be abandoned as part of Project 2-73.

Current and Future Projects

Project No.	Project Title	Description of Work	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35	FY 35/36	FY 36/37	FY 37/38
FE20-08	Olive Sub-Trunk Siphon Rehabilitation at Santa Ana River	• Rehabilitate an inverted siphon in the Cities of Anaheim and Orange															
FE21-08	Newhope-Placentia Sewer Manhole Replacements	• Rehabilitate sewer manholes in Fountain Valley, Garden Grove, and Santa Ana															
X-131	Pioneer Branch - Kraemer Boulevard Interceptor Rehabilitation	• Rehabilitate sewer facilities in the Cities of Brea, Fullerton, and Placentia															
X-132	Atwood Sub-Trunk Rehabilitation	• Rehabilitate sewer facilities in the Cities of Anaheim and Placentia															
X-078	Inverted Siphon and Air Jumper Improvements	• Install new air jumper facilities and rehabilitate sewer facilities in the Cities of Cypress, La Habra, La Mirada, Orange, and Santa Ana															

Types of Project Legend:

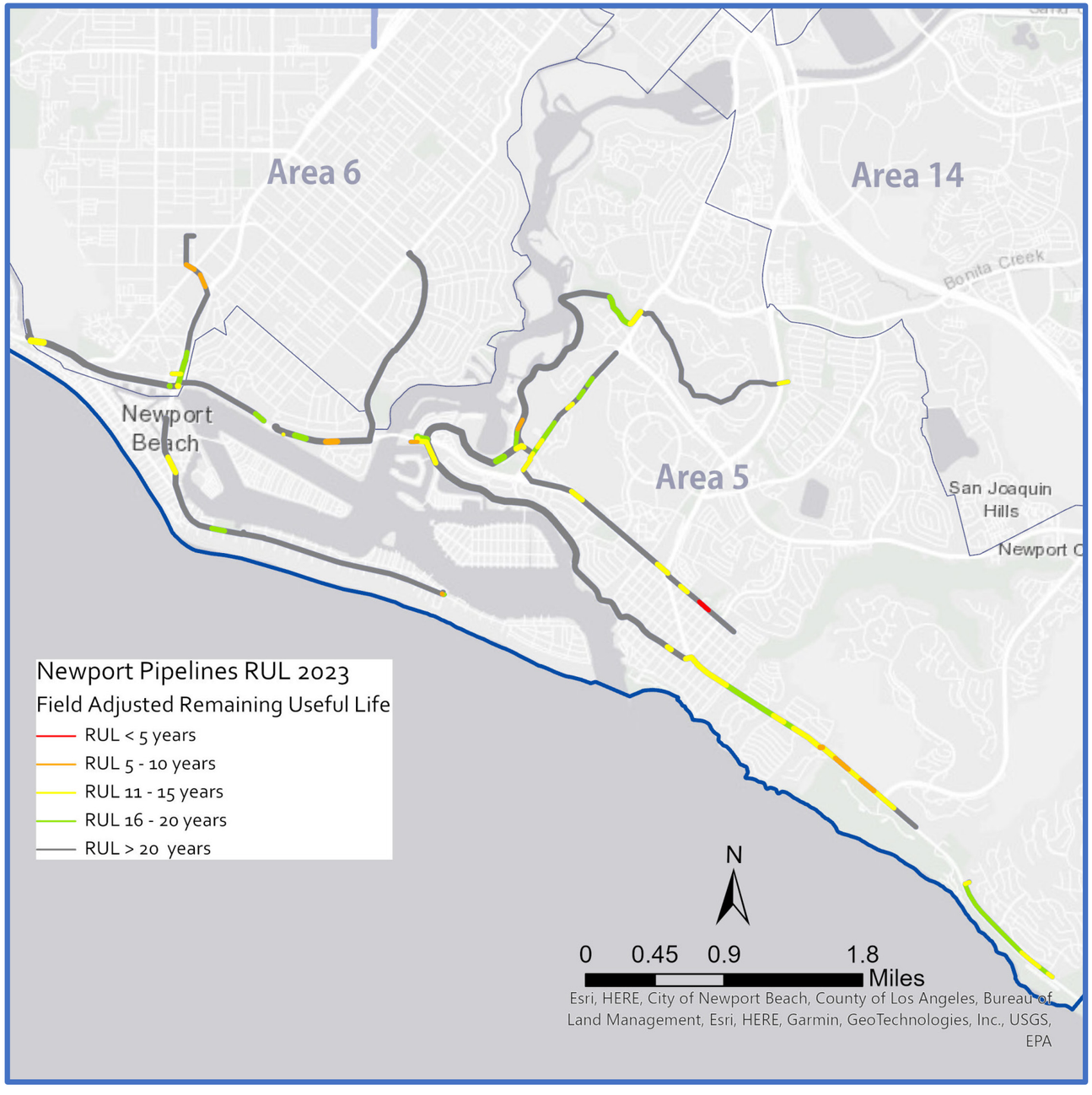
CIP - Planning **CIP - Design** **CIP - Construction** **Maintenance Project**

Acronym Key:

CCTV = Closed-Circuit Television; CIP = Capital Improvement Program; DIP = Ductile Iron Pipe; FY = Fiscal Year; GWRS = Groundwater Replenishment System; OC San = Orange County Sanitation District; P1 = Plant No. 1; PM = Preventive Maintenance; RUL = Remaining Useful Life; VCP = Vitrified Clay Pipe

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – NEWPORT TRUNK

System Overview - Pipelines



Major Assets and Condition Information - Pipelines

Asset Type	Total Length (miles)	No. of Pipes	Average Age (years)	No. of Pipes with RUL Score of 5	No. of Pipes with RUL Score of 4
Vitrified Clay					
≤ 18” Ø	5.9	127	46	2	5
21”–27” Ø	4.5	100	38	-	-
≥ 30” Ø	3.8	76	36	-	1
Ductile & Cast Iron					
≤ 18” Ø	1.4	20	31	-	2
24”–30” Ø	1.5	22	31	-	1
Polyvinyl Chloride					
≤ 18” Ø	0.1	3	11	-	-
30”–36” Ø	2.6	36	23	-	-
Cured-in-Place					
24” Ø	1.1	13	25	-	-
High-Density Polyethylene					
15”–42” Ø	0.8	16	29	-	-
Reinforced Concrete					
48” Ø	0.02	1	11	-	-

Acronym Key:
Ø = Diameter; No. = Number; RUL = Remaining Useful Life

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – NEWPORT TRUNK

System Overview - Manholes

Major Assets and Condition Information - Manholes

Asset Type	No. of Manholes	Average Age (years)	No. of Manholes with RUL Score of 5	No. of Manholes with RUL Score of 4
Concrete				
≤ 48" Ø	111	64	1	19
60”–72” Ø	287	28	-	8
> 72" Ø	5	26	-	-
Fiberglass Reinforced Plastic				
36" Ø	2	16	-	-
72" Ø	2	19	-	-

Acronym Key:

Ø = Diameter; No. = Number; RUL = Remaining Useful Life

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – NEWPORT TRUNK

Key Issues

Key Issues	Actions & Recommendations
• **Manhole Defects** – CCTV identified several areas with significant liner delamination and some structures with exposed rebar, concentrated in East Coast Highway and Fifth Avenue.	• Project X-128 will address the majority of the liner delamination and exposed rebar by rehabilitating the manhole structures. Other manholes not included or near a CIP project as well as one manhole that needs some rehabilitation work to prevent failure prior to the construction phase of the X-128 project are suitable for repair under the Manhole Rehabilitation blanket contract.
• **Missing Air Jumpers** – One out of two inverted siphon locations in the Newport Trunk system do not have air jumpers.	• Project X-128 includes the construction of a new air jumper.
• **Pipeline Fracturing** – CCTV identified several areas with significant fracturing of VCP pipelines. The fractures are scattered throughout the Newport Trunk system.	• Project X-128 will address one of the fractures by rehabilitating the pipeline. • Isolated defects elsewhere not included or near a CIP project have been identified as high-priority point repairs. OC San staff are in the process of grouping point repairs together for 7-pack task orders.
• **Pipeline Tuberculation** – CCTV identified a few ductile iron pipes in East Coast Highway with pockets of significant liner delamination and tuberculation.	• The areas of liner delamination and tuberculation appear to be small enough they are suitable for point repairs and have been added to the list of high-priority point repairs. OC San staff are in the process of grouping point repairs together for 7-pack task orders.
• **Uninspected Gravity Pipelines** – Twelve gravity sewers have never been inspected in the Newport Trunk system. There is no condition data for these reaches to determine field-adjusted RUL.	• There are no known access issues for the 12 uninspected gravity sewers. Inspections will be completed via future CCTV PM work orders or separate CCTV work orders.

Current and Future Projects

Project No.	Project Title	Description of Work	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35	FY 35/36	FY 36/37	FY 37/38
X-128	East Coast Highway - Bayside Trunk Rehabilitation	• Rehabilitate sewer facilities in the City of Newport Beach.															

Types of Project Legend:

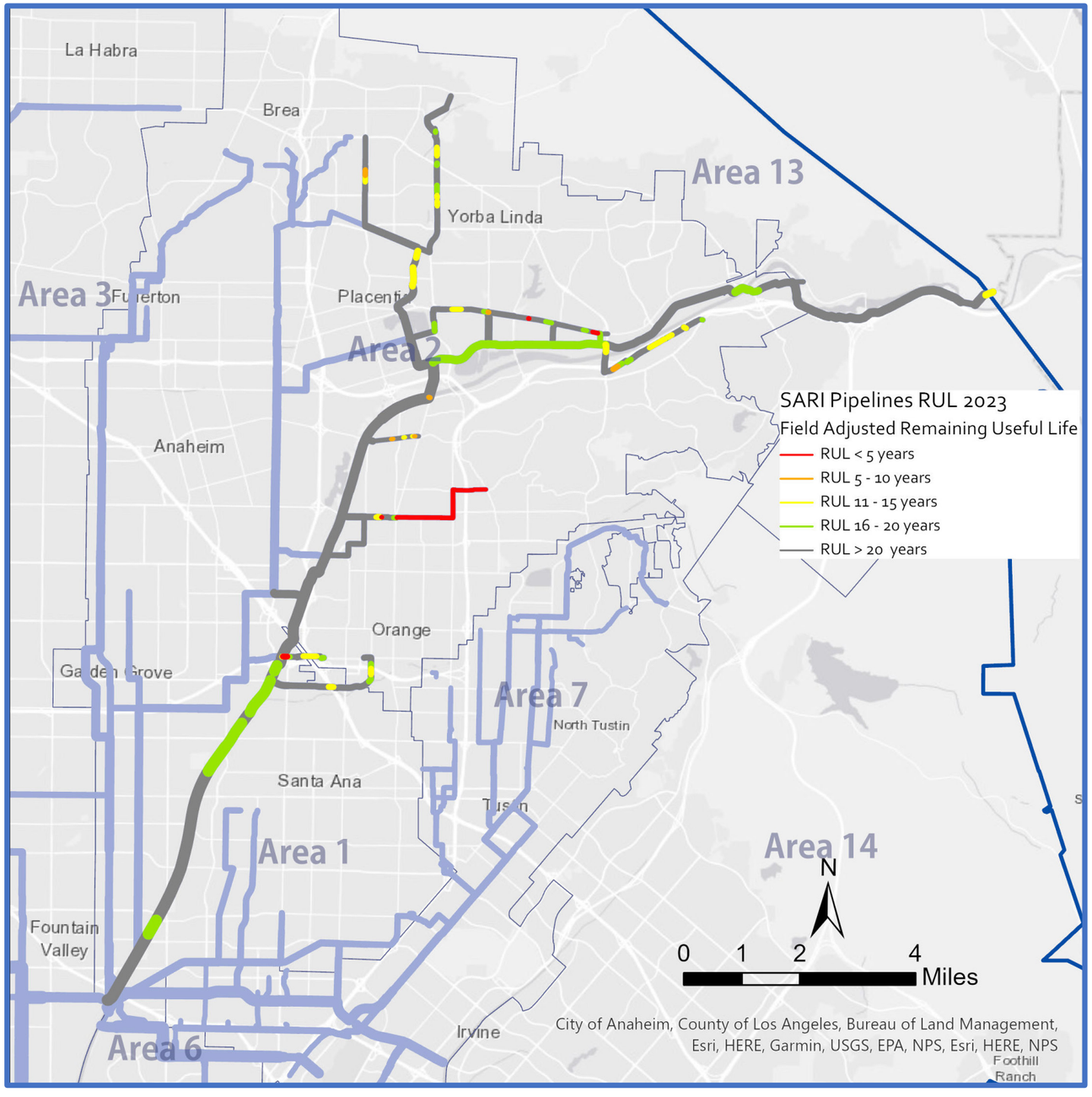
CIP - Planning **CIP - Design** **CIP - Construction** **Maintenance Project**

Acronym Key:

CCTV = Closed-Circuit Television; CIP = Capital Improvement Program; FY = Fiscal Year; PM = Preventive Maintenance; OC San = Orange County Sanitation District; RUL = Remaining Useful Life; VCP = Vitrified Clay Pipe

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – SARI TRUNK

System Overview - Pipelines



Major Assets and Condition Information - Pipelines

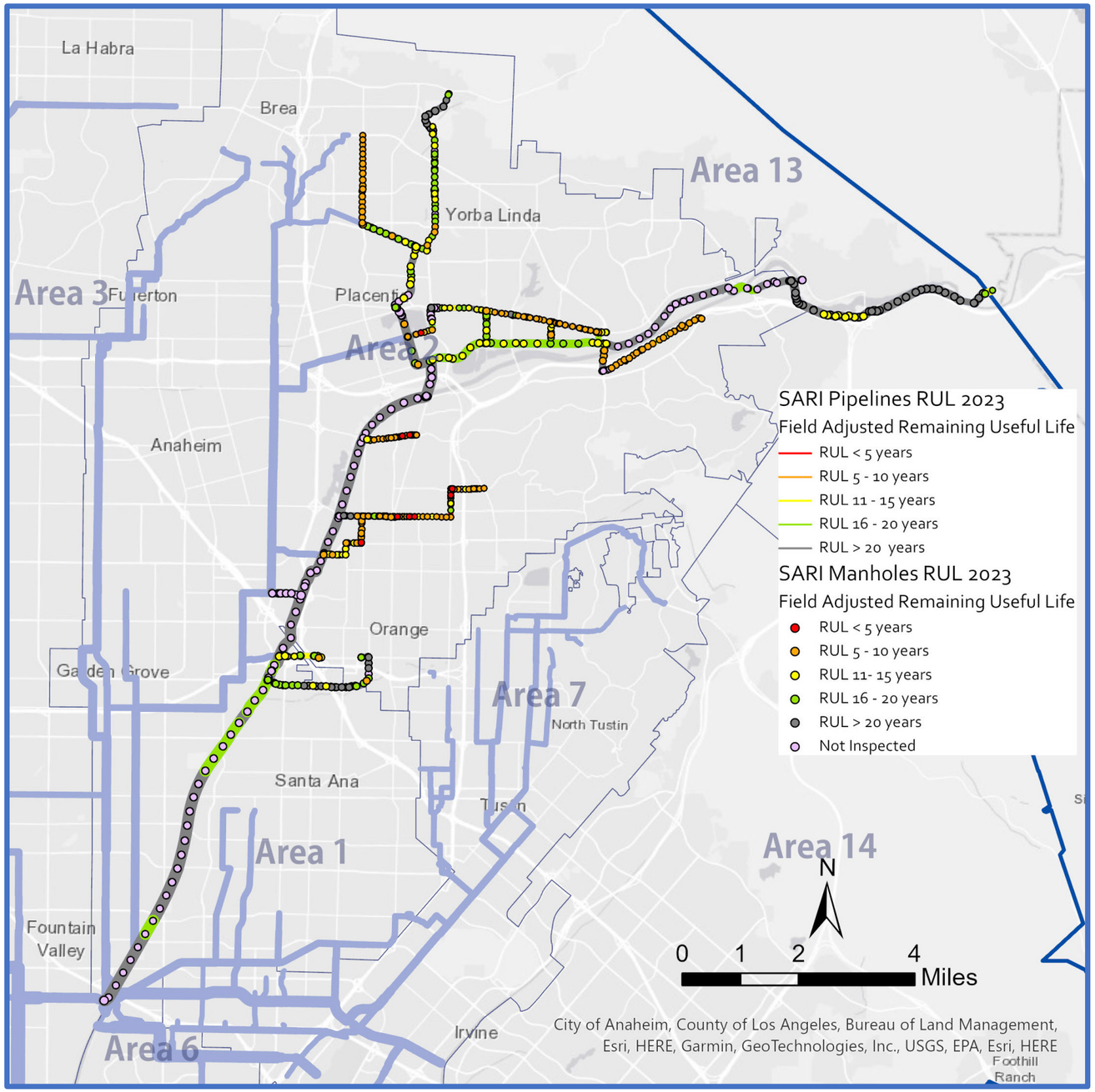
Asset Type	Total Length (miles)	No. of Pipes	Average Age (years)	No. of Pipes with RUL Score of 5	No. of Pipes with RUL Score of 4
Vitrified Clay					
≤ 18" Ø	5.0	113	58	46	3
21"–27" Ø	11.4	184	47	-	3
≥ 30" Ø	5.7	79	38	-	-
Reinforced Concrete					
42"–66" Ø	12.0	88	44	-	-
≥ 72" Ø	10.0	50	48	-	-
Fiberglass Reinforced Plastic					
36"–54" Ø	3.9	41	12	-	-
High-Density Polyethylene					
≤ 18" Ø	0.5	4	9	-	-
30" Ø	0.7	3	12	-	-
Ductile Iron					
24"–30" Ø	0.8	10	37	2	-
Steel					
30" Ø	0.03	2	12	-	-
Cured-in-Place					
33" Ø	0.3	4	14	-	-
Polyvinyl Chloride					
12" Ø	0.01	1	7	-	-

Acronym Key:

Ø = Diameter; No. = Number; RUL = Remaining Useful Life; SARI=Santa Ana River Interceptor

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – SARI TRUNK

System Overview - Manholes



Major Assets and Condition Information - Manholes

Asset Type	No. of Manholes	Average Age (years)	No. of Manholes with RUL Score of 5	No. of Manholes with RUL Score of 4
Concrete				
≤ 48" Ø	128	62	8	81
60"–72" Ø	300	43	1	66
> 72" Ø	93	38	-	2
Fiberglass Reinforced Plastic				
≥ 72" Ø	49	12	-	-

Acronym Key:

Ø = Diameter; No. = Number; RUL = Remaining Useful Life; SARI=Santa Ana River Interceptor

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – SARI TRUNK

Key Issues

Key Issues	Actions & Recommendations
• **Broken Siphon** – In 2020, CCTV discovered the Olive Sub-Trunk siphon has a hole in the pipeline. In addition, CCTV showed corrosion issues in upstream manholes due to an ineffective air jumper.	• Project FE20-08 will replace a portion of the Olive Sub-Trunk siphon, rehabilitate other portions, reconstruct the air jumper, and restore the siphon into service.
• **Capacity** – The Collections Capacity Evaluation Study completed in 2019 conducted a detailed capacity analysis to identify the location of capacity deficiencies during dry and peak wet weather flows. During existing peak wet weather flows, capacity issues were identified in the Taft Branch. During future peak wet weather flows, capacity issues were identified in a northern portion of the SARI system.	• Project 2-49 will address existing wet weather capacity issues in the Taft Branch and Project X-086 will address future wet weather capacity issues in a northern portion of the SARI system.
• **Manhole Defects** – CCTV identified widespread areas with significant liner delamination and some structures with exposed rebar. The defects are primarily concentrated in Anaheim, Orange, and Placentia.	• Projects 2-49, 2-78, X-131, X-132, and X-134 will address the majority of the liner delamination and exposed rebar by rehabilitating the manhole structures. Other manholes not included or near a CIP project as well as several manholes that needs some rehabilitation work to prevent failure prior to the construction phase of the X-131, X-132, and X-134 projects are suitable for repair under the Manhole Rehabilitation blanket contract.
• **Missing Air Jumpers** – Four out of 12 inverted siphon/reduction locations in the SARI Trunk system do not have air jumpers.	• Projects X-078, X-132, and X-134 include constructing a new air jumper at all four locations.
• **Pipeline Fracturing** – CCTV identified several areas with significant fracturing of VCP pipelines. Most fractures are concentrated in Anaheim and Orange.	• Projects 2-78, X-131, X-132, and X-134 will address some fracturing issues by rehabilitating the pipelines. • Isolated defects not included or near a CIP project as well as three pipelines that may not have fractures addressed in time by the X-132 and X-134 projects have been identified as high-priority point repairs. OC San staff are in the process of grouping point repairs together for 7-pack task orders.
• **Uninspected Gravity Pipelines** – One gravity sewer has never been inspected in the SARI Trunk system. There is no condition data for these reaches to determine field-adjusted RUL.	• This gravity sewer has a tight horizontal curve that may not allow for CCTV inspection and is blocked by a diversion board; OC San staff to discuss with CCTV contractor.

Current and Future Projects

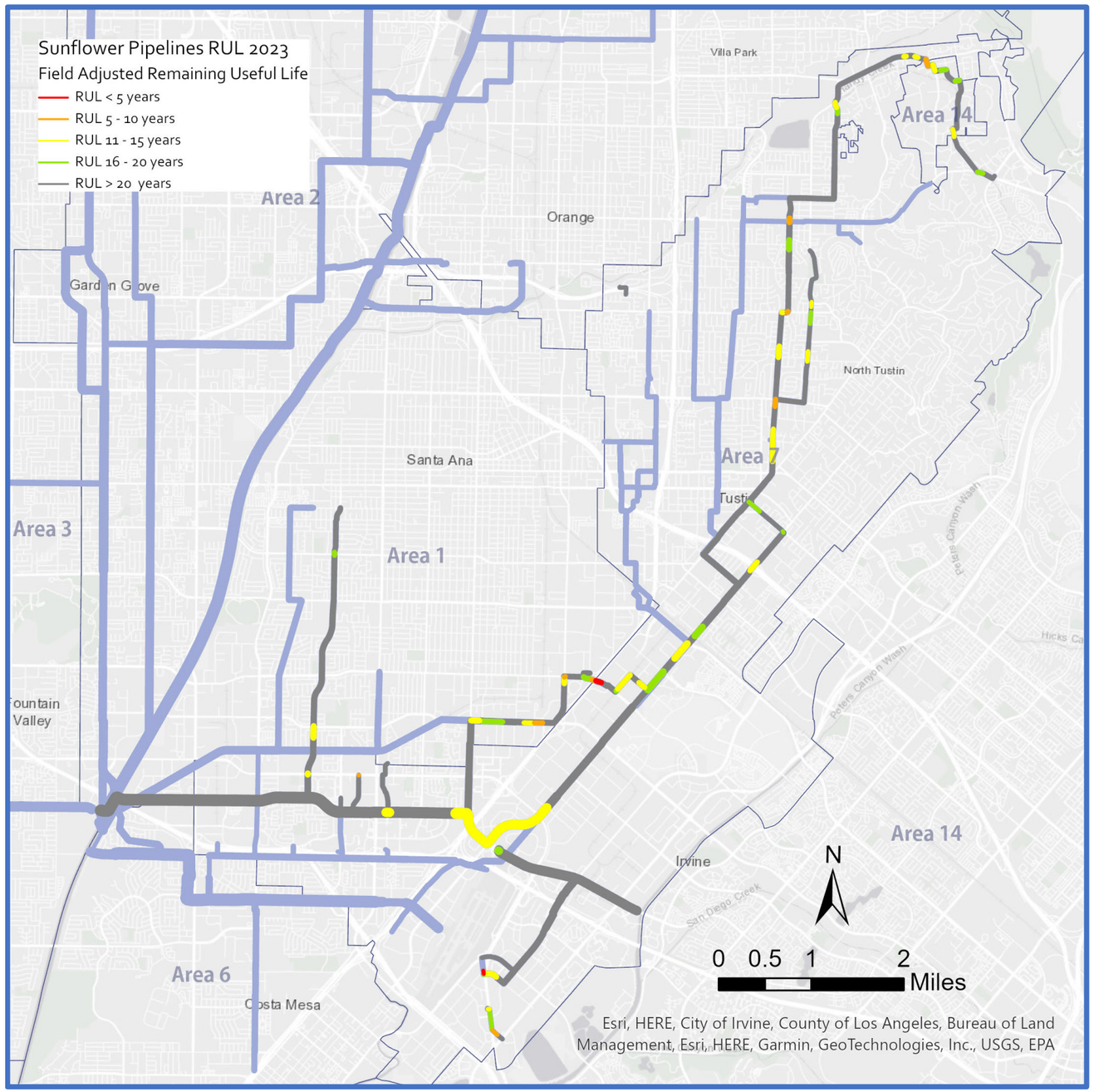
Project No.	Project Title	Description of Work	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35	FY 35/36	FY 36/37	FY 37/38
FE20-08	Olive Sub-Trunk Siphon Rehabilitation at Santa Ana River	• Rehabilitate an inverted siphon in the Cities of Anaheim and Orange.															
2-49	Taft Branch Improvements	• Upsize sewer facilities in the City of Orange.															
2-78	Santa Ana Canyon South River Trunk Rehabilitation	• Rehabilitate sewer facilities in the City of Anaheim.															
X-131	Pioneer Branch - Kraemer Boulevard Interceptor Rehabilitation	• Rehabilitate sewer facilities in the Cities of Brea, Fullerton, and Placentia.															
X-132	Atwood Sub-Trunk Rehabilitation	• Rehabilitate sewer facilities in the Cities of Anaheim and Placentia.															
X-134	Olive Sub-Trunk - Taft Branch Rehabilitation	• Rehabilitate sewer facilities in the City of Orange.															
X-078	Inverted Siphon and Air Jumper Improvements	• Install new air jumper facilities and rehabilitate sewer facilities in the Cities of Cypress, La Habra, La Mirada, Orange, and Santa Ana.															

Types of Project Legend:
CIP - Planning **CIP - Design** **CIP - Construction** **Maintenance Project**

Acronym Key:
CCTV = Closed-Circuit Television; CIP = Capital Improvement Program; FY = Fiscal Year; OC San = Orange County Sanitation District; RUL = Remaining Useful Life; SARI = Santa Ana River Interceptor; VCP = Vitrified Clay Pipe

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – SUNFLOWER TRUNK

System Overview - Pipelines



Major Assets and Condition Information - Pipelines

Asset Type	Total Length (miles)	No. of Pipes	Average Age (years)	No. of Pipes with RUL Score of 5	No. of Pipes with RUL Score of 4
Vitrified Clay					
≤ 18" Ø	7.1	144	47	-	5
21"–27" Ø	13.6	206	49	1	5
≥ 30" Ø	4.4	55	45	-	-
Reinforced Concrete					
42"–66" Ø	4.7	49	43	-	-
≥ 72" Ø	4.1	27	52	-	-
Ductile Iron					
20" Ø	0.5	11	25	-	-
Polyvinyl Chloride					
30" Ø	0.05	3	14	-	-
Reinforced Plastic Mortar					
15" Ø	0.1	3	52	-	-
Asbestos Cement					
10" Ø	0.04	1	59	1	-
Unknown					
18" Ø	0.01	1	6	-	-

Acronym Key:
Ø = Diameter; No. = Number; RUL = Remaining Useful Life

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – SUNFLOWER TRUNK

Key Issues

Key Issues	Actions & Recommendations
• **Missing Air Jumpers** – Two out of 11 inverted siphon/reduction locations in the Sunflower Trunk system do not have air jumpers.	• Projects X-133 includes constructing a new air jumper at one location. The second location does not require an air jumper due to lack of normal surcharged conditions.
• **Pipeline Fracturing and Liner Failures** – CCTV identified several areas with significant fracturing of VCP pipelines and large diameter pipe with liner failures. Most fractures are concentrated in Orange and Santa Ana with others located in Irvine, Newport Beach, and Tustin. Liner failures were found north of John Wayne Airport in the 63-inch to 78-inch RCP.	• Liner failures in the 63-inch to 78-inch RCP are being addressed with Project 7-66 and repairs are substantially complete. Project FRC-0007, 7-70, X-066, X-129, and X-133 address fractures by rehabilitating the pipelines. • An isolated defect not included or near a CIP project as well as four pipelines that may not have fractures addressed in time by the X-066, X-129, and X-133 projects have been identified as high-priority point repairs. OC San staff are in the process of grouping point repairs together for 7-pack task orders.
• **Uninspected Gravity Pipelines** – Three gravity sewers have never been inspected in the Sunflower Trunk system. There is no condition data for these reaches to determine field-adjusted RUL.	• One gravity sewer is proposed to be abandoned-in-place as part of Project 7-68. The other two gravity sewers were constructed more recently in 2017 and inspections will be completed via future CCTV PM work orders or separate CCTV work orders.

Current and Future Projects

Project No.	Project Title	Description of Work	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35	FY 35/36	FY 36/37	FY 37/38
FE18-13	Redhill Relief Sewer Relocation at SR-55	• Relocate sewer facilities in the City of Santa Ana.															
FRC-0007	Redhill Relief Sewer Liner Repair at SR-55	• Rehabilitate sewer facilities in the City of Santa Ana.															
7-70	North Trunk/Panorama Heights/Tustin-Orange Rehabilitation	• Rehabilitate sewer facilities in the City of Orange.															
X-129	South Coast Metro Sub-Trunks Rehabilitation	• Rehabilitate sewer facilities in the cities of Costa Mesa and Santa Ana.															
X-133	Dyer Road - Grand Avenue Trunk Rehabilitation	• Rehabilitate sewer facilities in the City of Santa Ana.															
X-066	Tustin-Orange Interceptor/Orange Park Acres Trunk Rehabilitation	• Rehabilitate sewer facilities in the City of Orange.															
X-065	Tustin-Orange Interceptor Rehabilitation	• Rehabilitate sewer facilities in the City of Orange.															

Types of Project Legend:

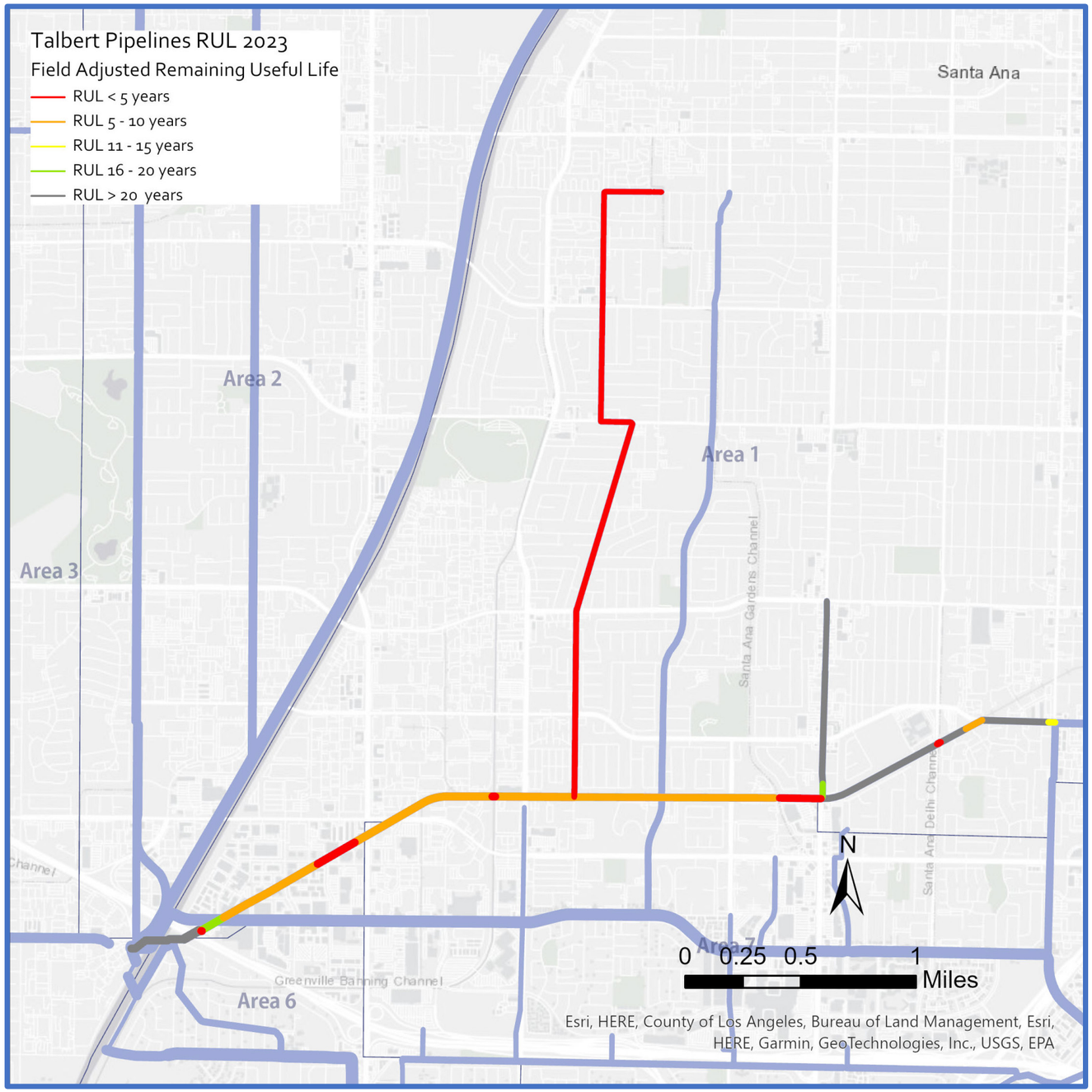
CIP - Planning **CIP - Design** **CIP - Construction** **Maintenance Project**

Acronym Key:

CCTV=Closed-Circuit Television; CIP = Capital Improvement Program; FY=Fiscal Year; OC San=Orange County Sanitation District; PM = Preventive Maintenance; RCP = Reinforced Concrete Pipe; RUL = Remaining Useful Life; SR-55 = State Route 55; VCP = Vitrified Clay Pipe

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – TALBERT TRUNK

System Overview - Pipelines



Major Assets and Condition Information - Pipelines

Asset Type	Total Length (miles)	No. of Pipes	Average Age (years)	No. of Pipes with RUL Score of 5	No. of Pipes with RUL Score of 4
Vitrified Clay					
≤ 18" Ø	0.1	6	48	2	1
21"–27" Ø	3.4	46	70	39	2
≥ 30" Ø	1.7	23	70	2	1
Reinforced Concrete					
42" Ø	1.1	10	55	1	9
48"–60" Ø	2.1	29	53	3	17

Acronym Key:
Ø = Diameter; No. = Number; RUL = Remaining Useful Life

ASSET MANAGEMENT SYSTEM SUMMARY – COLLECTION SYSTEM – TALBERT TRUNK

Key Issues

Key Issues	Actions & Recommendations
• **Capacity** – The Collections Capacity Evaluation Study completed in 2019 conducted a detailed capacity analysis to identify the location of capacity deficiencies during dry and peak wet weather flows. During existing peak wet weather flows, capacity issues were identified in the entire Greenville Trunk.	• Project 1-24 will replace and upsize the entire Greenville Trunk to address existing wet weather capacity issues, including sags, fractures, and widespread infiltration.
• **Missing Air Jumpers** – Four out of five inverted siphon locations in the Talbert Trunk system do not have air jumpers.	• Projects 1-23, 1-24, and X-133 include constructing new air jumpers at three locations. Project 1-24 also includes eliminating one inverted siphon, which subsequently eliminates the need for an air jumper at that location.
• **Pipeline Fracturing** – CCTV identified one VCP pipeline segment with significant fracturing.	• Project X-133 will rehabilitate the fractured pipeline segment.
• **Reinforced Concrete Pipe Corrosion Damage** – Most of the RCP pipeline of the Talbert Trunk between Plant No. 1 and Bristol Street has moderate to severe surface aggregate loss in areas not rehabilitated by past project 1-17.	• Project 1-23 will rehabilitate the remaining pipeline segments with moderate to severe surface aggregate loss.

Current and Future Projects

Project No.	Project Title	Description of Work	FY 23/24	FY 24/25	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35	FY 35/36	FY 36/37	FY 37/38
1-23	Santa Ana Trunk Sewer Rehabilitation	• Rehabilitate sewer facilities in the cities of Santa Ana and Costa Mesa.															
1-24	Greenville Trunk Improvements	• Upsize sewer segments to increase capacity in the City of Santa Ana.															
X-133	Dyer Road - Grand Avenue Trunk Rehabilitation	• Rehabilitate sewer facilities in the City of Santa Ana.															

Types of Project Legend:

CIP - Planning **CIP - Design** **CIP - Construction** **Maintenance Project**

Acronym Key:

CCTV = Closed-Circuit Television; CIP = Capital Improvement Program; FY = Fiscal Year

3 Program Monitoring and Improvements

3.1 Program Monitoring

OC San has developed metrics to monitor and evaluate the Asset Management Program progress and realized benefits. The metrics have been chosen to directly relate to the Asset Management Program objectives. The key objectives OC San is building into the Asset Management Program are as follows:

- Take a proactive approach to repair, rehabilitation, and replacement.
- Ensure assets are reliable and operating when needed.
- Minimize unplanned outages and equipment downtime.
- Manage risks associated with asset or service impairment through asset performance optimization.
- Develop cost-effective management strategies for the long term.
- Strive to implement world-class asset management strategies through continual improvement in our asset management practices.

The following metrics were chosen to demonstrate the effectiveness of the Asset Management Program and establish a baseline by which to gauge future performance:

- ***The proactive maintenance percent***, the percent of PM as a total of all maintenance, demonstrates the effectiveness of the maintenance program (proactive versus reactive). The percent PM includes predictive and preventive maintenance of the assets.
- ***Break-In percent*** illustrates the amount of emergency work (or reactive work) as a percent of total work in the process area. The break-in percent metric will give OC San personnel a better understanding of unplanned outages and the causes of equipment downtime. In our Maximo® EAM system, this is described as a Level 50 priority. This is also described as break-in work that is deemed “emergency” or “urgent” by staff.
- ***Maintenance costs and labor hours*** are presented by process area to illustrate the total resources devoted to maintaining the process areas. The methods used to calculate each metric are included in Appendix E. As the maintenance program moves toward a more proactive state, these costs and labor hours should decline over time.
- ***Collections level of service results*** for sanitary sewer overflow (SSO) per 100 miles of sewer, odor complaints in the Collections system, and the CCTV program demonstrate the effectiveness of the combined efforts of Collections Maintenance, the Regional Odor and Corrosion Control System (ROCCS) program, and the Gravity Collections Condition Assessment Program as they pertain to asset management.

These program metrics or key performance indicators (KPIs) are evaluated on an annual basis and may change over time to better determine program performance.

3.1.1 Data

The metric data were sourced from Maximo®. The data from each database are from FY 2018–2019, FY 2019–2020, FY 2020–2021, FY 2021–2022, and FY 2022–2023 and are included in Appendix E for reference.

3.2 Program Metrics

3.2.1 Proactive Maintenance Percent

The *proactive maintenance percent* is the percent of PM as a total of all maintenance performed. An increase in proactive maintenance percent represents a shift from a reactive to a proactive maintenance program. Tables 3-1 and 3-2 provide the annual average of the proactive maintenance percent for both Reclamation Plant No. 1 and Treatment Plant No. 2. A proactive maintenance percent of 80% is considered a best in class value based on manufacturing industry standards, which may not be comparable to a critical facility as wastewater treatment but helpful to have as a guideline. Many of the areas at both plants were at or below 60%, indicating that improvement in this area is likely over time as proactive maintenance programs are implemented and older facilities are replaced. Refer to Appendix E for more information on proactive maintenance percentages expressed in chart format.

Table 3-1. Proactive Maintenance Percent for Reclamation Plant No. 1

Process Area	FY 2018/2019	FY 2019/2020	FY 2020/2021	FY 2021/2022	FY 2022/2023
Preliminary	25%	39%	39%	25%	41%
Primary	29%	39%	32%	40%	37%
Interplant	69%	84%	82%	59%	34%
Activated Sludge	58%	53%	64%	56%	58%
Trickling Filters	55%	56%	53%	47%	46%
Digesters	34%	46%	46%	47%	42%
Solids Handling Facilities	31%	34%	42%	44%	60%
Central Power Generation	40%	64%	62%	62%	53%
Electrical Distribution	77%	68%	65%	77%	77%
Utilities	43%	33%	30%	26%	32%

Table 3-2. Proactive Maintenance Percent for Reclamation Plant No. 2

Process Area	FY 2018/2019	FY 2019/2020	FY 2020/2021	FY 2021/2022	FY 2022/2023
Preliminary	55%	64%	59%	55%	38%
Primary	37%	25%	35%	38%	36%
Activated Sludge	54%	48%	53%	50%	48%
Trickling Filters	64%	67%	57%	61%	49%
Effluent Disposal	61%	57%	35%	59%	39%
Digesters	39%	39%	55%	51%	47%
Solids Handling Facilities	35%	41%	53%	41%	49%
Central Power Generation	58%	42%	50%	67%	48%
Electrical Distribution	84%	70%	74%	75%	69%
Utilities	34%	39%	44%	43%	45%

At Plant No. 1 and No. 2, the proactive maintenance percent for the solids handling facility is showing an increasing trend over the past 5 years, demonstrating the effectiveness of the maintenance program. The proactive maintenance percent for preliminaries at Plant No. 1 are in the lower range because Project P1-105 Headworks Rehabilitation is in construction. Low voltage cable failure at the headworks is causing the lower percentages of proactive maintenance work at Plant No. 2. Due to active construction work by Project J-117B, the effluent disposal area shows lower percentages in FY 2022–2023.

The pump stations have proactive maintenance percentages over 60% as shown in Table 3-3. Decreases in percentages are indicative of emergency work that was required and will be reflected in the break-in percentage illustrated later in this chapter. For instance, Bay Bridge required break-in work because check valves would not close. Common CM work orders include replacing leaking valves, replacement of pump packing, de-ragging pumps, and attending to equipment that is making excessive noise when operating will also reduce the proactive percent. The low percentages for Edinger and Bay Bridge in FY 2022–2023 was due to multiple electrical and instrumentation failures. Edinger also experienced a failure with east force main.

Table 3-3. Proactive Maintenance Percent for Pump Stations

Pump Station	FY 2018/2019	FY 2019/2020	FY 2020/2021	FY 2021/2022	FY 2022/2023
A Street	84%	86%	85%	67%	60%

Pump Station	FY 2018/2019	FY 2019/2020	FY 2020/2021	FY 2021/2022	FY 2022/2023
15th Street	88%	88%	85%	85%	84%
Lido	47%	80%	42%	72%	50%
Bay Bridge	69%	65%	34%	45%	37%
Rocky Point	76%	96%	84%	76%	69%
Bitter Point	84%	82%	76%	84%	74%
Seal Beach	58%	55%	65%	50%	61%
Westside	79%	75%	74%	80%	64%
Edinger	74%	81%	79%	74%	44%
Slater	63%	86%	86%	73%	78%
College	98%	91%	69%	86%	72%
Crystal Cove	82%	57%	91%	80%	90%
Yorba Linda	72%	30%	92%	99%	80%
Main Street	36%	66%	66%	76%	74%
MacArthur	97%	66%	88%	83%	61%

Table 3-4 is an average of the percent proactive work orders for the process areas at each plant (not including the interplant, effluent disposal, electrical, and utilities) and the pump stations. While there is not a consistently increasing or decreasing trend in Plant 1 and 2 data, pump stations show a decrease in the annual average proactive work. The following pump stations are the major contributors to this reduction:

- MacArthur pump station had a power outage and the pump station aging facility could be a contributor to this. A CIP project to rehabilitate the pump station will be starting in July 2024.
- Edinger pump station is also aging and has an outdated bubbler system that has become unreliable. Maintenance has upgraded the bubbler panel and a small project has been established to upgrade the bubbler system and add redundancy. A CIP project to replace the pump station is currently in the design phase.
- Westside pump station main sewage pumps experience a lot of vibrations due to the natural frequency of the system. Collections is investigating ways to mitigate this issue.
- Lido pump station has experienced several power outages in the past year due to power reliability issue in the Balboa Peninsula. OC San plans to work with SCE to devise strategies to overcome this issue in future years.

Table 3-4. Annual Average Proactive Work for Process Areas

Proactive Work	FY 2018/2019	FY 2019/2020	FY 2020/2021	FY 2021/2022	FY 2022/2023
Plant No. 1	40%	48%	47%	53%	45%
Plant No. 2	49%	47%	49%	52%	45%
Pump Stations	74%	74%	74%	75%	67%

3.2.2 Break-In Percent

Break-In Percent illustrates the amount of emergency work (or reactive work) as a percent of total work (hours) in the process area. Typically, the break-in percent metric should track closely with the inverse of the proactive maintenance percent because one is a measure of proactive maintenance program and the other a measure of unplanned outages or a reactive maintenance response (service requests with priority 40 and 50 service requests). Break-in percentages for Plant No. 1 are shown in Table 3-5 and for Plant No. 2 in Table 3-6. There was an overall increase in break-in work and decrease in proactive work at the Plant 1 preliminary area due to Project P1-105 construction and equipment shutdown demands. Higher numbers of break-in percent at the primaries were mostly due to mechanical issues at the Westside Street Pump Station (WSSPS) and the aging odor control facility. The Asset Management Team is working with maintenance to come up with a plan to improve the reliability of the pumps at WSSPS. Interplant had a break-in percent of 61% in FY 2022–2023 due to vandalism at EJB that damaged wiring and conduits and required extensive repairs.

At Plant No. 2, the data show an increase in break-in percent in areas with current construction projects and the need for shutdowns and tie-ins, including J-117B. Success in break-in percent is measured as a consistent trend downward over time. As mentioned earlier, low voltage cable failure at the headworks is causing higher break-in percentage at the Plant No. 2 preliminary area.

Table 3-5. Break-in Percent for Reclamation Plant No. 1

Process Area	FY 2018/2019	FY 2019/2020	FY 2020/2021	FY 2021/2022	FY 2022/2023
Preliminary	16%	20%	24%	43%	29%
Primary	30%	28%	23%	28%	38%
Interplant	0%	16%	7%	0%	61%
Activated Sludge	14%	14%	11%	8%	9%
Trickling Filters	4%	10%	18%	36%	21%
Digesters	38%	20%	27%	19%	24%
Solids Handling Facilities	37%	22%	24%	20%	16%
Central Power Generation	29%	11%	14%	23%	25%
Electrical Distribution	5%	5%	10%	6%	7%
Utilities	26%	21%	26%	21%	24%

Table 3-6. Break-in Percent for Reclamation Plant No. 2

Process Area	FY 2018/2019	FY 2019/2020	FY 2020/2021	FY 2021/2022	FY 2022/2023
Preliminary	20%	8%	11%	17%	25%
Primary	17%	17%	23%	26%	25%
Activated Sludge	9%	14%	10%	12%	16%
Trickling Filters	18%	17%	19%	22%	27%
Digesters	20%	16%	13%	12%	11%
Solids Handling Facilities	24%	32%	21%	26%	26%
Central Power Generation	23%	20%	20%	13%	9%
Electrical Distribution	13%	7%	14%	6%	15%
Utilities	32%	31%	15%	29%	16%

The pump station break-in percent is shown in Table 3-7. Many aging pump stations, such as Bay Bridge, Seal Beach, Edinger, and Slater saw an increase in break-in percent that is reflective of the RUL of the pump stations. Bay Bridge, Seal Beach, and Edinger pump stations all have replacement projects that are in progress while Slater Pump Station rehabilitation is scheduled to start in a few years. Westside Pump Station also saw an increase in break-in percent. While Westside Pump Station was rehabilitated in 2008, the original structure was constructed in 1962, and the design of the wet well and pumps present some hydraulic challenges and vibration issues that cause the pumps to require additional maintenance. Edinger Pump Station and Lido had higher break-in percentages due to bubbler system issues and Balboa Peninsula power reliability, respectively.

Table 3-7. Break-in Percent for Pump Stations

Process Area	FY 2018/2019	FY 2019/2020	FY 2020/2021	FY 2021/2022	FY 2022/2023
A Street	12%	4%	6%	7%	31%
15th Street	2%	7%	6%	12%	11%
Lido	36%	27%	35%	24%	44%
Bay Bridge	11%	18%	31%	38%	31%
Rocky Point	20%	4%	7%	13%	19%
Bitter Point	9%	14%	14%	11%	25%
Seal Beach	27%	14%	20%	36%	25%

Process Area	FY 2018/2019	FY 2019/2020	FY 2020/2021	FY 2021/2022	FY 2022/2023
Westside	3%	9%	3%	14%	18%
Edinger	12%	18%	0%	22%	53%
Slater	17%	7%	3%	16%	13%
College	0%	2%	11%	12%	24%
Crystal Cove	5%	32%	6%	1%	4%
Yorba Linda	0%	4%	10%	0%	5%
Main Street	60%	11%	4%	1%	12%
MacArthur	3%	3%	11%	1%	18%

Table 3-8 shows an average of the break-in percent for Plant Numbers 1 and 2 and the pump stations. On average, Plant No. 1 had a higher number of break-in percentage and pump stations had the highest increase in the overall percentage compared to previous years.

Table 3-8. Annual Average of Break-in Percent for Process Areas

Process Area	FY 2019/2020	FY 2020/2021	FY 2021/2022	FY 2022/2023
Plant 1	17%	18%	21%	25%
Plant 2	18%	16%	18%	19%
Pump Stations	14%	11%	14%	22%

The trend in emergency call-out work for electrical and mechanical assets is shown on Figures 3-1 and 3-2, respectively, and reflects the demand older assets can have on maintaining the reliability of a facility.

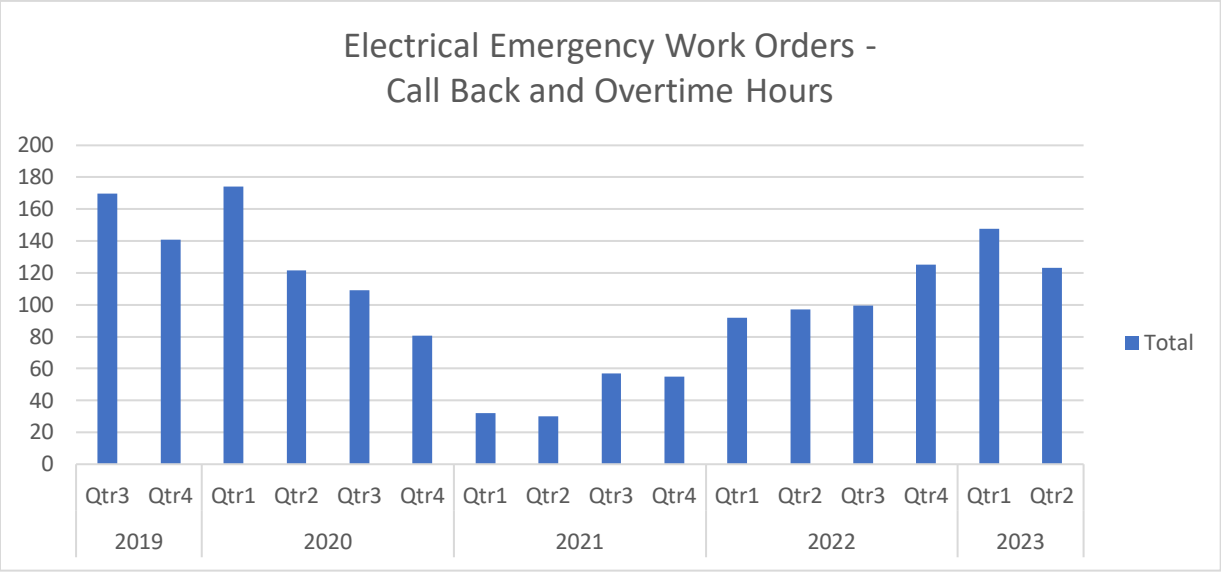


Figure 3-1. Electrical Emergency Work Orders

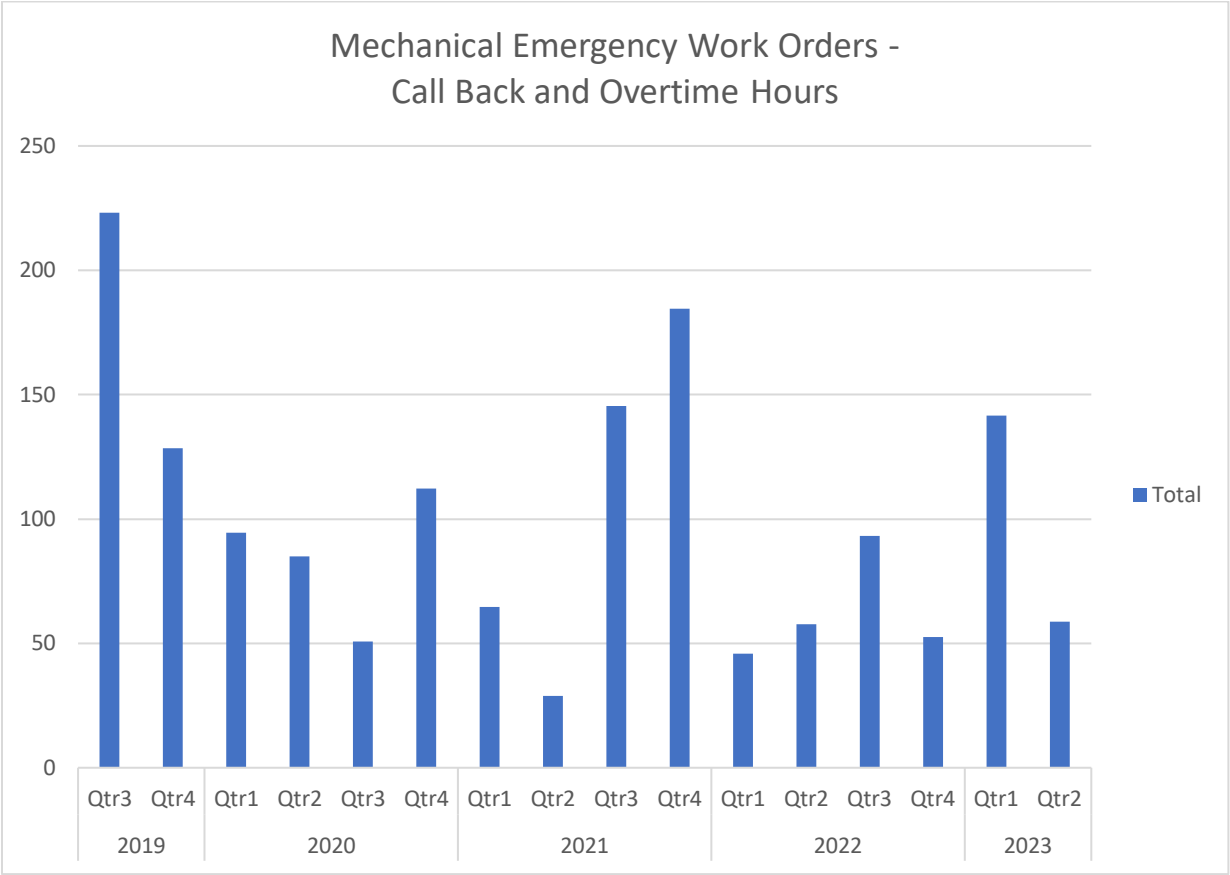


Figure 3-2. Mechanical Emergency Work Orders

The number of electrical "emergency" work orders and associated hours increased primarily due to electrical outages at the pump stations, and headworks power failure at both plants. There were also a few electrical emergency call outs to support the rain events. The mechanical emergency work increased primarily due to Plant No. 1 headworks and primary treatment mechanical failures. On average, about 80% of emergency mechanical call backs were to support Plant No. 1. We expect the trend for electrical break-in/emergency work to trend down as more electrical projects are implemented to replace or upgrade aging assets (for example, P1-105).

3.2.3 Maintenance Costs and Labor Hours

OC San uses the maintenance costs and number of labor hours over time as trend indicators to indicate the amount of resources devoted to reliably maintaining the process areas. Figure 3-3 shows maintenance costs (materials and services) per FY broken down by process area at Plant No. 1. The data indicate that there has been a large increase in maintenance costs at the Plant No. 1 Activated Sludge facility due to several in-house maintenance activities for the aging assets such as the installation of a new WAS pump, and lighting improvement to replace old LED lights. Dewatering centrifuge overhaul is one of the most expensive maintenance activities at the T&D building that happened in both FY 2022–2023 and FY 2021–2022. Overall, the maintenance cost is expected to reduce at the T&D building with several in-house improvements in the past couple of years.

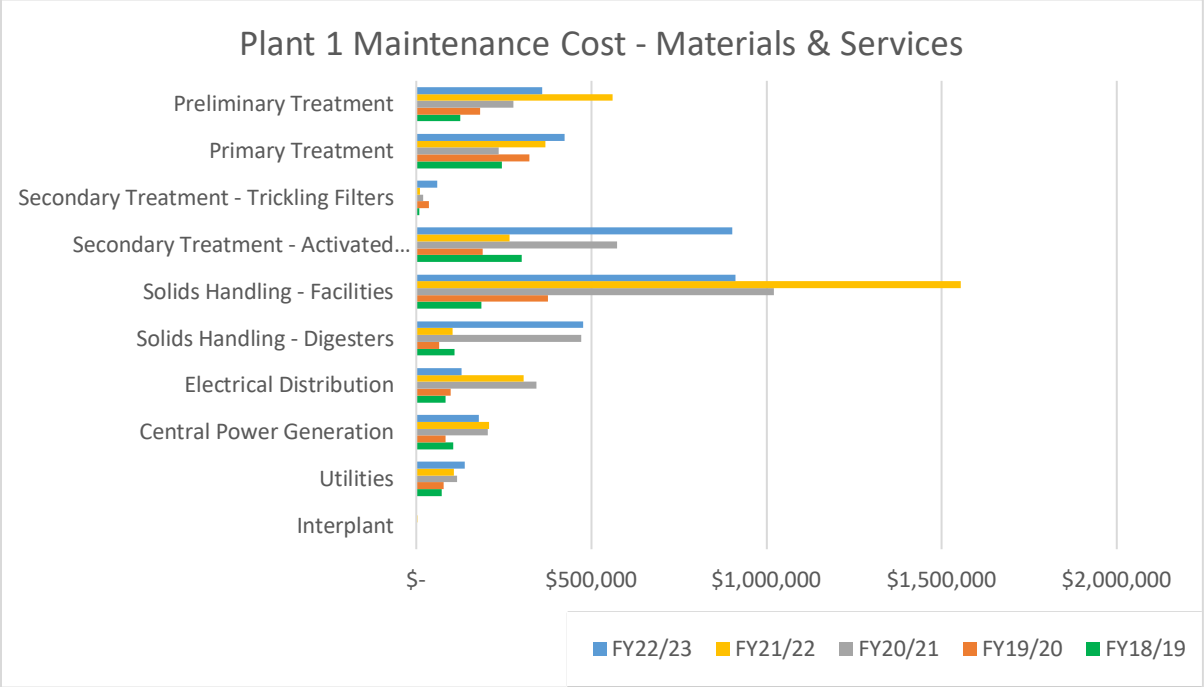


Figure 3-3. Graph of Maintenance Costs (Materials and Services) at Plant No. 1

Figure 3-4 shows Maintenance labor hours per FY broken down by process area at Plant No. 1. The labor hours are high at the Plant No. 1 secondary facility because of the older equipment at activated sludge facility 1, which is scheduled for rehabilitation under Project P1-140. The labor hours are also high at the solids handling facility because the new thickening and dewatering process has more complex equipment that requires more staff to operate and maintain. In FY 2022–2023, the rebuild of two high-rate pumps and several mechanical seal replacements were among the most labor-intensive activities in the digester area.

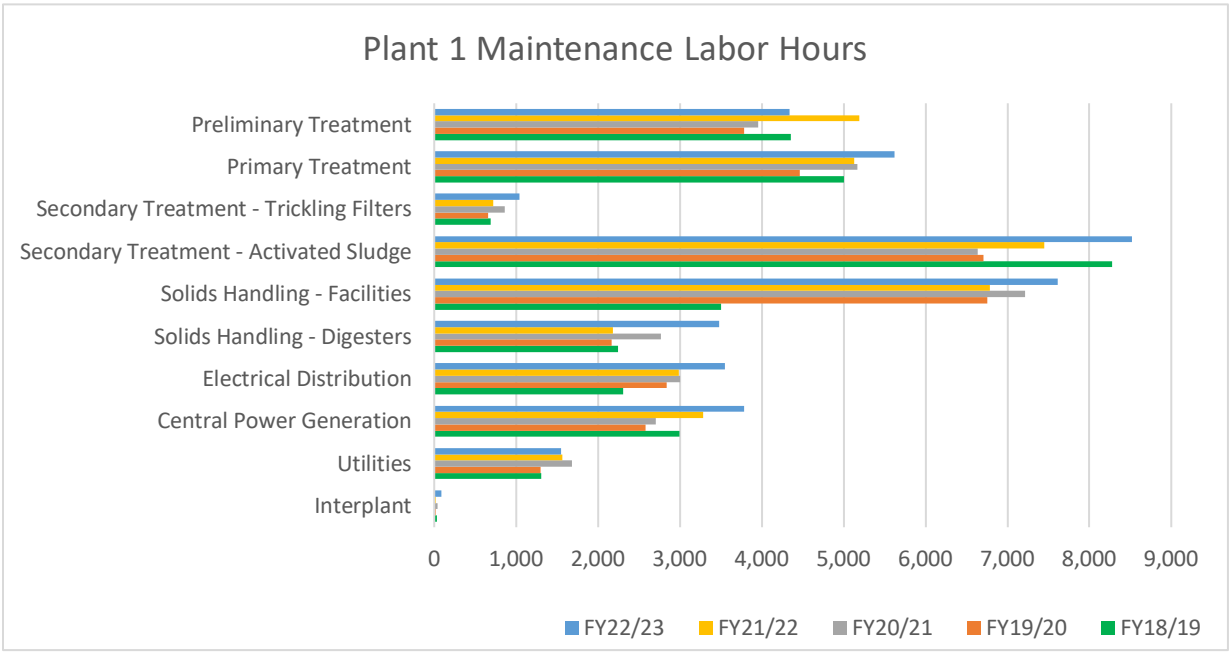


Figure 3-4. Graph of Maintenance Labor Hours at Plant No. 1

Figures 3-5 and 3-6 show maintenance costs (materials and services) and labor hour per FY broken down by process area at Plant No. 2. The maintenance cost at Plant No. 2 were higher for FY 2022–2023 for the solids handling facility due to overhaul of the hydraulic power unit for the truck loading facility and other maintenance activities in the area. At Cen Gen, the air compressor overhaul, Engine 3 repairs, and auxiliary heat exchanger repairs were contributing to higher material and services costs in the past year. Repair of the failed bar screen rake at the headworks and biotower flow transmitter repairs were among the costliest and labor-intensive repairs at preliminary treatment facilities at Plant No. 2. Overall, the labor hour graph follows the trend in material and services.

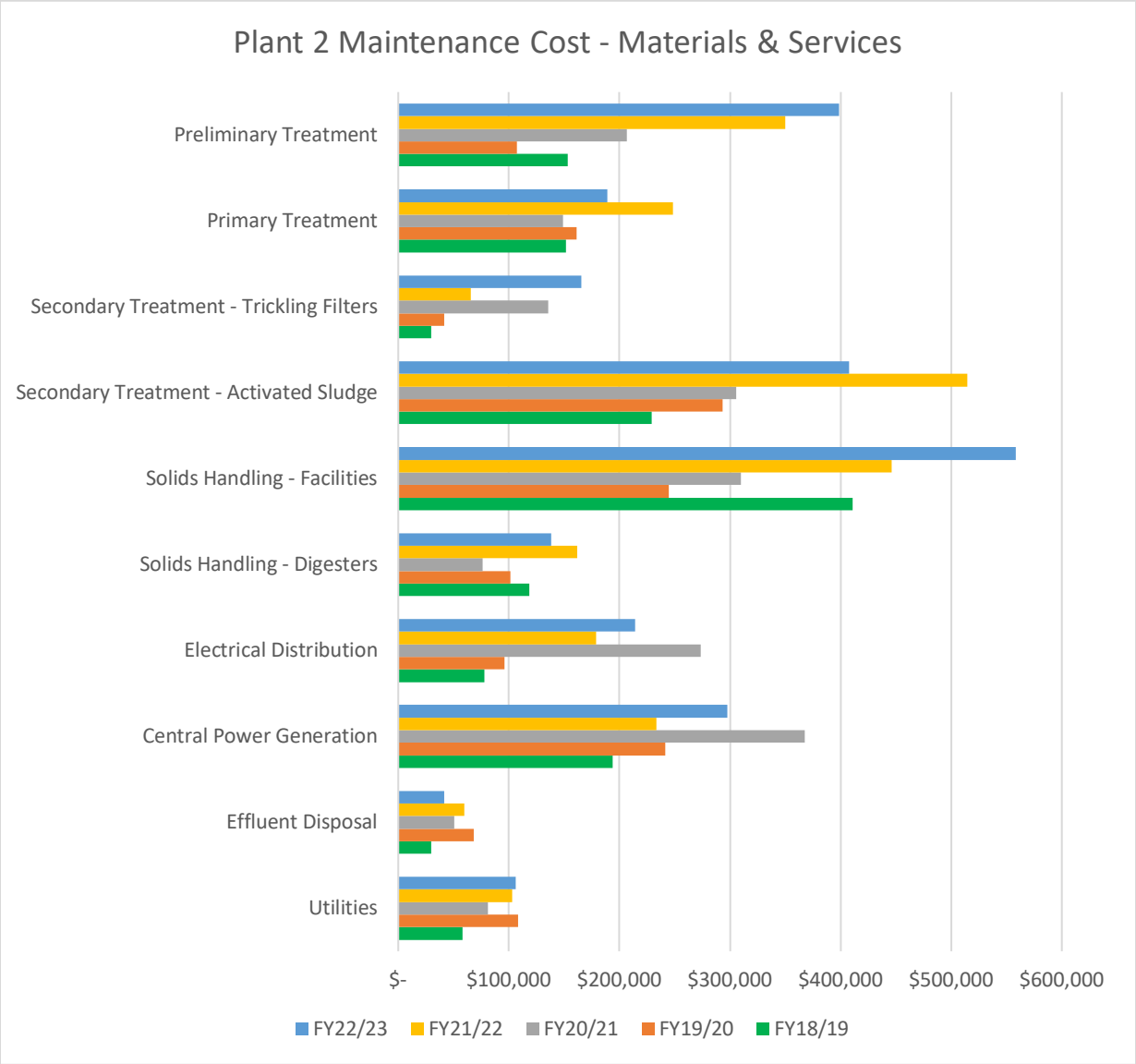


Figure 3-5. Graph of Maintenance Costs (Materials and Services) at Plant No. 2

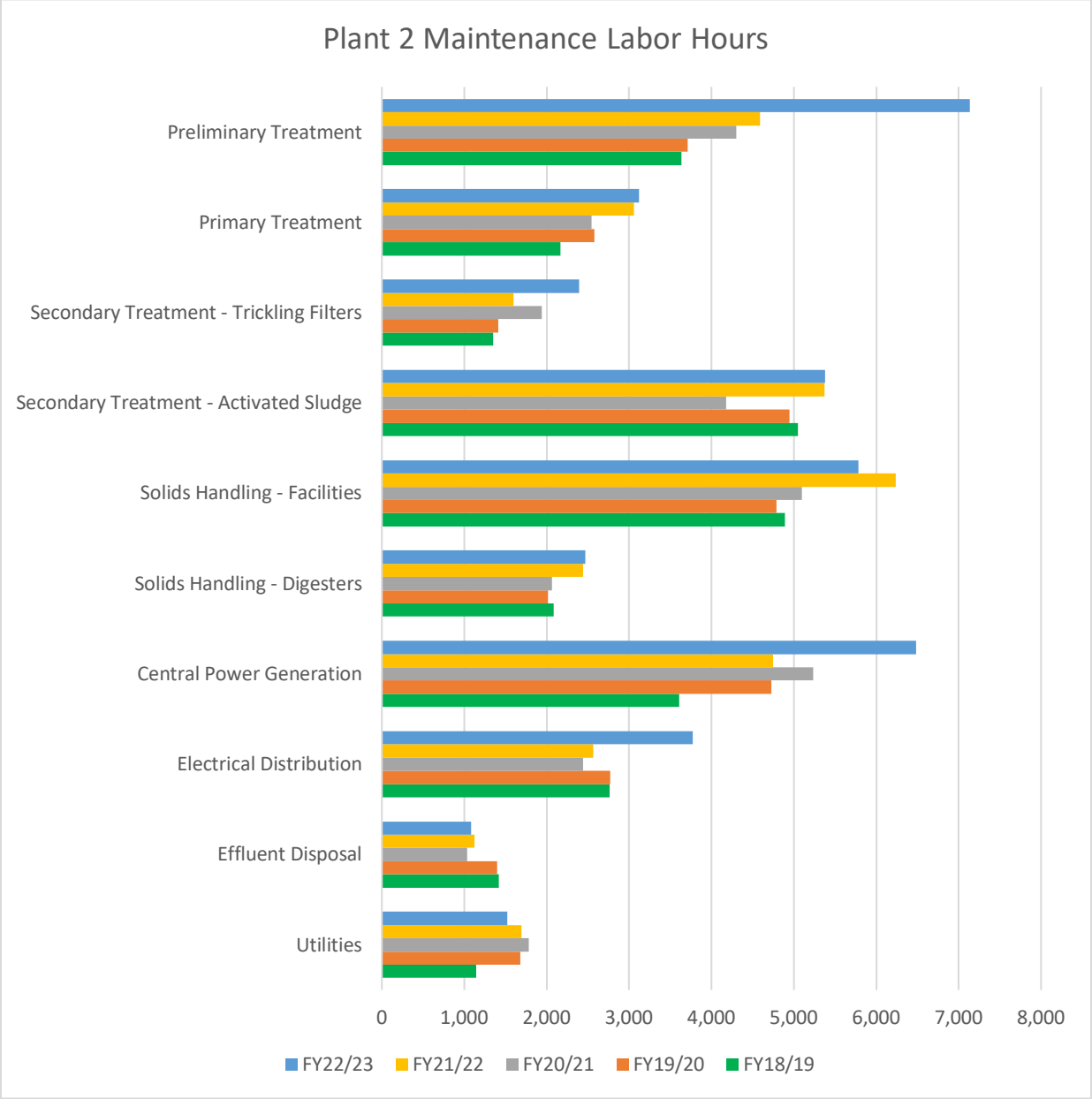


Figure 3-6. Graph of Maintenance Labor Hours at Plant No. 2

Maintenance labor hours and costs for the pump stations are included on Figure 3-7 and Figure 3-8. Overall, Maintenance costs last FY are low or in line with previous years with the exception of Bay Bridge. The Bay Bridge MSP #5 pump was purchased by Maintenance last year for a cost that exceeded $85,000 in total material and labor cost in FY 2022–2023.

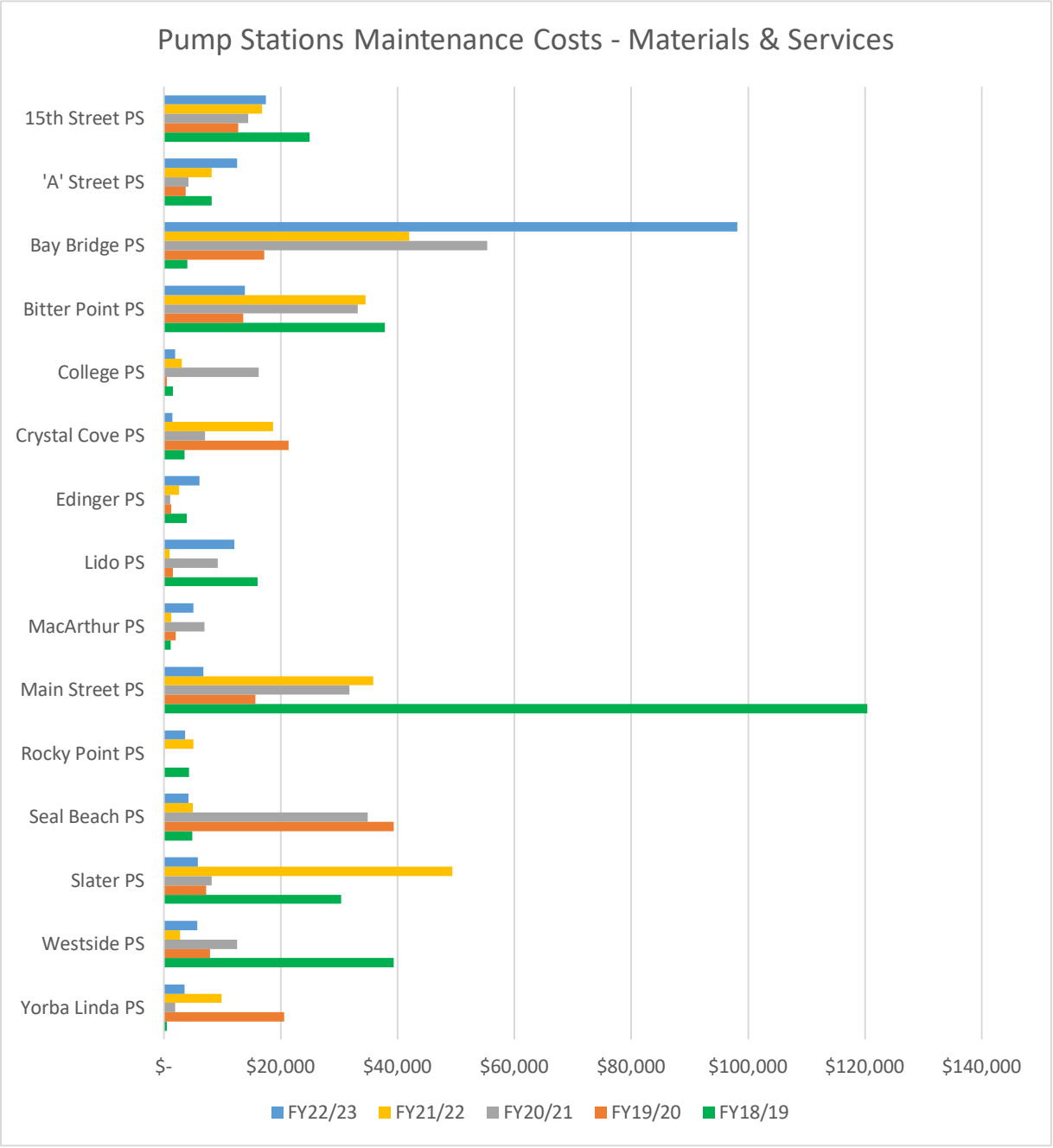


Figure 3-7. Graph of Pump Station Maintenance Costs (Materials and Services)

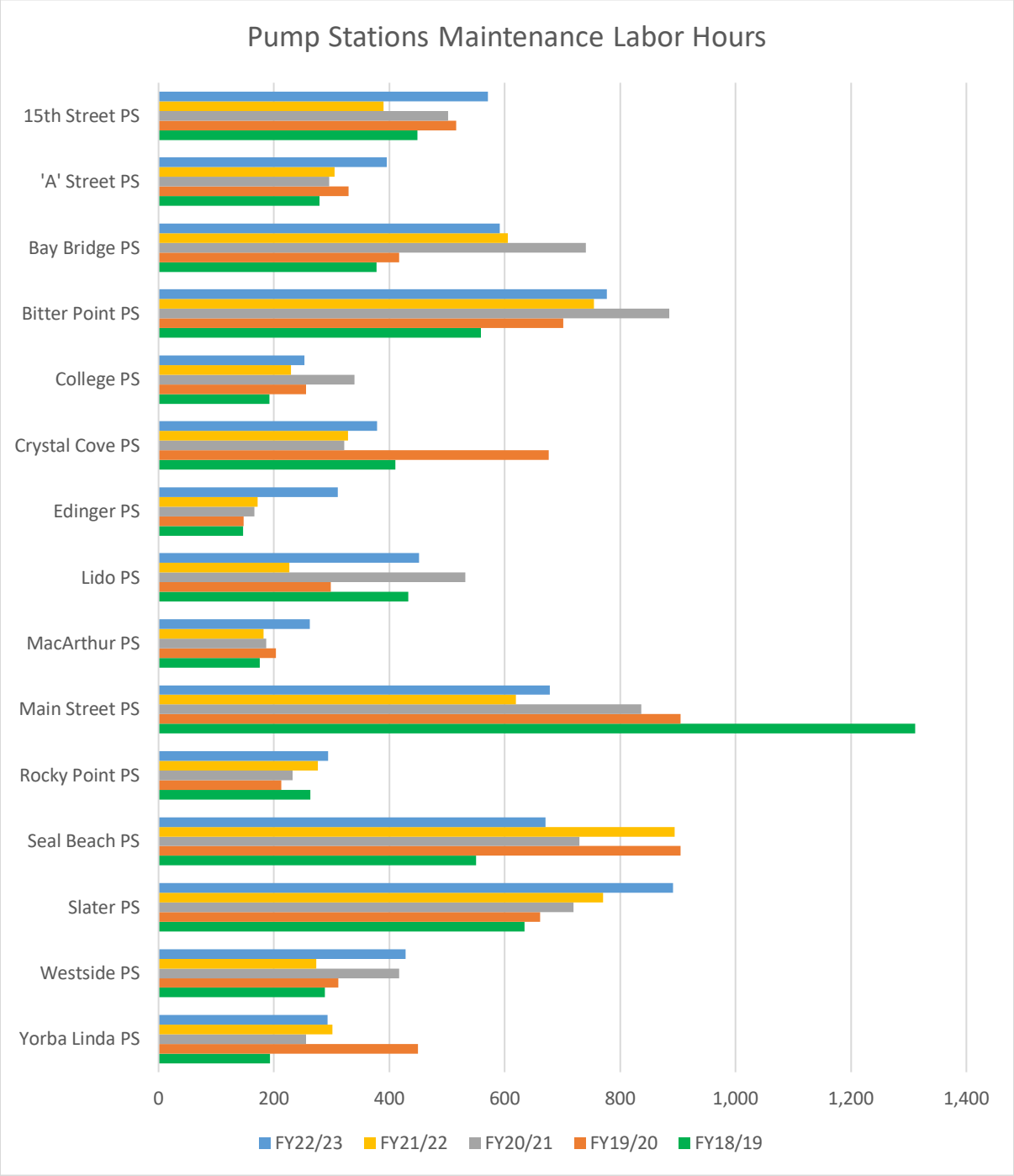


Figure 3-8. Graph of Pump Station Maintenance Labor Hours

3.2.4 Collection Level of Service Results

OC San monitors several levels of service goals pertaining to the Collection system as a whole, but a select subset are relevant to the activities, goals, and effectiveness of asset management. This subset of Collections level of service targets and results for the last 4 fiscal years are presented in Table 3-9. All level of service goals were achieved in FY 2022–2023, demonstrating the effectiveness of the Asset Management Program.

SSO events are primarily caused due to debris accumulation from daily wastewater flows as well as root intrusion. Regular maintenance activities of Collections to clean sewers and the CCTV program serve to identify and prevent SSOs from occurring. Also refer to Section 3.4.2.2 for details on a new root control blanket contract for further PM efforts.

Nuisance odors are actively managed by the ROCCS program through means of regular chemical dosing and caustic dumps at key locations, hydrogen sulfide monitoring, etc. The number of odor complaints are monitored to determine the effectiveness of chemical dosing, flow diversions, etc., to mitigate nuisance odors and prevent resulting corrosion damage to OC San's Collection assets. In recent fiscal years odor complaints in the Collection system have steadily declined given the precision and effectiveness of the ROCCS program. Although odor complaints rose in FY 2022–2023, this number is still below the level of service target.

The condition of assets in the Collection system are monitored via the CCTV program, which inspects all gravity sewer and manhole assets every 5 years. OC San manages three CCTV contractors that provide inspection media and reports to OC San with asset details as well as defects discovered per National Association of Sewer Service Companies (NASSCO) standards. OC San recently completed the latest 5-year CCTV program for pipelines and has restarted the program for FY 2022–2023. Efforts to optimize pipeline CCTV in the past FY were successful to meet the level of service goal.

In November 2020, OC San started conducting routine inspections of the Collection system manholes. OC San has been collating all manhole CCTV inspection data into the Asset Management Program Info Asset Planner for further evaluation and to continue building a comprehensive database of CCTV inspection data. Now that about 2,216 (51%) of OC San's manholes have been inspected since the start of the manhole CCTV program, we are now able to accurately define future gravity sewer projects for manhole rehabilitation and replacement.

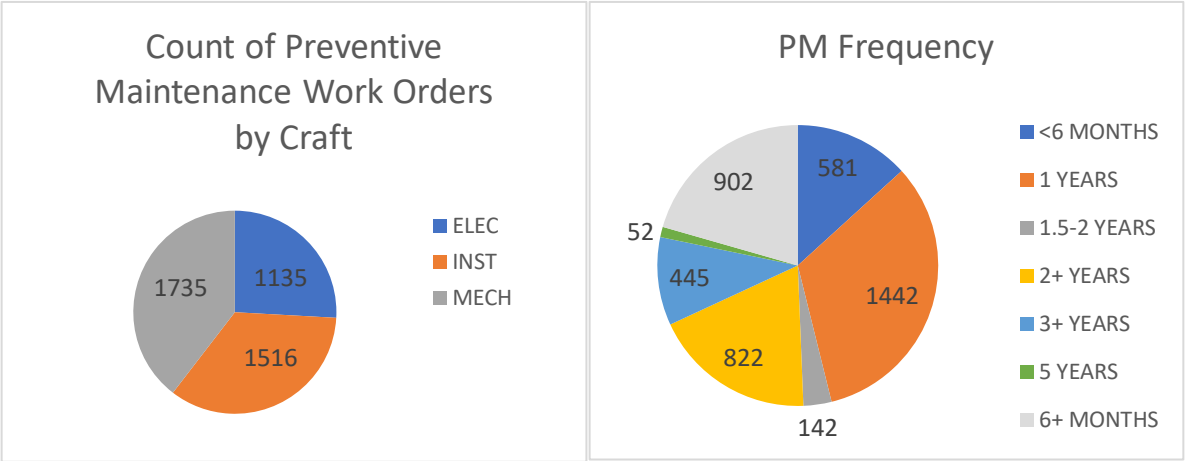
Table 3-9. Collection Level of Service Results

Description	Level of Service Target	FY 2019/2020	FY 2020/2021	FY 2021/2022	FY 2022/2023
SSO per 100 miles	< 2.1	0	1.3	0.3	0.3
Number of Odor Complaints	12	9	7	4	11
Miles of Pipeline CCTV	70	78.4	60	71.9	69.1
Number of Manhole CCTV	650	32	465	813	948

3.3 Maintenance Planning

OC San uses Maximo® as the computerized maintenance management system. All maintenance-related activities are stored in Maximo®. In short, the information in Maximo® makes up OC San's Maintenance Plan. Maintenance planning primarily consists of PM and PdM work orders. Currently, OC San proactively maintains over 65,000 assets stored in Maximo®. For the assets associated with process and treatment, there are typically approximately 7,100 active PM work orders and on average 285 of those PMs are related to

predictive maintenance activities. A summary and breakdown of the PMs and PdMs are shown on Figure 3-9.



Acronym Key:
ELEC = electrical; INST = installation; MECH = mechanical

Figure 3-9. PM Workorder Broken Down by Both Craft and Frequency

OC San proactively maintains over 67,000 assets. This includes non-process-related assets such as HVAC equipment, lighting, mobile equipment, etc.

3.3.1 Projected Maintenance Costs

The projected maintenance costs for the next FY are shown in Table 3-10. This accounts for materials and services only but is inclusive of both treatment plants and the collection system. For historical maintenance expenditures, please refer to Chapter 4.

Table 3-10. Projected Maintenance Costs Next Fiscal Year

	FY 2023–2024
Projected Maintenance Costs	$25.6 million

3.4 Asset Management Program Accomplishments

Another way to measure Asset Management Program performance and effectiveness is by exploring the accomplishments. The accomplishments identified in the following sections are important because they focus on both long-term planning and accomplishments that helped extend the useful life of critical assets, increase reliability, reduce unexpected failures and break-ins, allowing OC San to meet the key objectives of the program.

3.4.1 Condition Assessment Program

Corrosion condition assessments are a key component of the Asset Management Program because they provide vital information with respect to the condition and life expectancy of critical plant and collections process structures and equipment. Condition assessments are conducted during scheduled maintenance activities, by staff observations of the condition of an asset, or when

necessary to determine a more accurate RUL. The Asset Management Team completed approximately 33 different condition assessments during the last FY, spending just over $1 million using an outside consultant and contractor. Figure 3-10 provides annual expenditures on the two condition assessment contracts for the last 3 fiscal years. The overall expenditures show an increasing trend, illustrating Asset Management's dedication to knowing the current condition of OC San's major assets and performing incidental repairs following inspections to increase asset life and reliability.

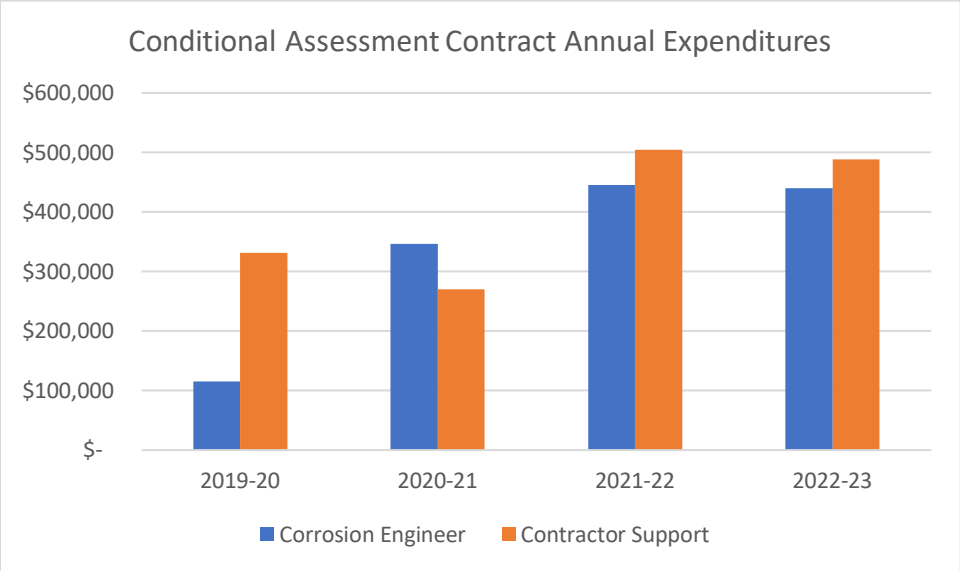


Figure 3-10. Condition Assessment Contract Expenditures

Condition assessments identify deficiencies and the general condition of the assets, but more importantly recommendations for repairs or replacement and general timing based on RUL estimations. Some condition assessments resulted in repairs that extended the useful life of the facility, maintained asset reliability, and identified the need for future improvement projects to keep OC San facilities safe and reliable. The following are a few critical condition assessments completed last year:

- Condition assessments were completed on the A-side Primary Clarifiers at Plant No. 2, which are deteriorating due to corrosion and age. The condition assessment included confined space entry to obtain photographs as well as the use of OC San drone equipment for close-up video recordings. The assessment identified deficiencies and areas of repair needed to extend reliability in the short term until P2-98A is completed to permanently replace the existing A-side clarifiers. Areas identified included dome supports, dome access hatches, baffle walls, rotating mechanisms, and basin concrete walls.
- Condition assessments on anaerobic digesters are completed during the scheduled maintenance cleaning cycle to evaluate and extend the life of the assets when deficiencies are discovered. The condition assessment includes confined space entry, corrosion assessment, sludge line cleaning with CCTV, concrete core sampling, and incidental repairs. Condition assessments on anaerobic digesters are completed during the scheduled maintenance cleaning cycle to evaluate and extend the life of the assets when deficiencies are discovered. This year three digesters were cleaned and assessed, including Digesters 2 and 16 for Plant No. 1, and Digesters K, P, R, and I for Plant No. 2. Incidental repairs were completed by the condition assessment contractor and maintenance staff.

- Digester K dome has massive concrete cracks and was at risk of leaking gas due to pressure inside of the digester. The Asset Management Team performed several rounds of condition assessment and took concrete samples to identify the concrete and rebar conditions. This year, the team completed the ground-penetrating radar mapping of the entire dome and structural analysis, and recommended a detailed repair solution. Project FR2-0032 was created to repair the dome based on the asset management condition assessment and structural evaluation.
- College Pump Station was constructed in 1960 and rehabilitated in 2010. A visual assessment of the wet well performed in 2020 found failed coating and soft concrete underneath the failed coating. A subsequent detailed assessment, performed under planning study PS20-07, found that the existing concrete from 1960 appears to be in fair condition, but the concrete sections added during the 2010 rehabilitation have deteriorated. The planning study also proposed a conceptual plan to rehabilitate the wet well and a small project will be launched to address this issue.

3.4.2 Collection System Assets

Our pump stations, force mains, and gravity sewer system are vital assets for conveying flow safely to the treatment plants. The Asset Management Program is continuously evaluating ways to improve the resiliency and reliability of the system while maintaining the level of service in all flow conditions. Some of the collection system initiatives and accomplishments are identified in the following sections.

3.4.2.1 Gravity Collections Remaining Useful Life

Over the past few years, OC San has aggregated and validated all gravity sewer, siphon, air jumper, and manhole data into a single comprehensive Gravity Collections Asset Registry. Over 2022 and 2023, a new RUL model was developed using a weighted LoF formula based on NASSCO quick scores and some of the asset's physical characteristics. Also, a calibration was performed to determine the weights of each LoF formula term. The 2023 NASSCO to RUL model improved RUL model scoring consistency with Asset Engineer judgment and resulted in the modification of a quarter of Gravity Collections sewer pipelines' RUL scores as compared to the 2022 model. An internal quality assurance, quality control review of the new NASSCO to RUL scoring model and individual RUL adjustments for assets with higher RUL scores is in progress to validate the model and provide final results of the model's consistency with Asset Engineer judgment.

3.4.2.2 Proactively Monitoring and Managing Operational and Defect Issues

In the Gravity Collection system there are a significant number of operational and structural defects that are isolated from current and future projects and are severe. Examples of isolated and severe operational defects include heavy root intrusion, infiltration runners and gushers, and large calcified deposits. Root intrusion is the main cause of SSOs in many sanitary sewer systems, and heavy infiltration over long periods of time can compromise soil support outside the sewer pipe wall and develop large, calcified deposits that may block flows and prevent debris from passing downstream. Examples of isolated and severe structural defects include single or heavily clustered segments of broken pipe and holes with voids and/or soil visible. Broken pipe and holes are high risk given they are precursors to structural deformation and eventual collapse. Rather than create numerous small projects to address current and future isolated and severe asset issues, cost-effective and proactive maintenance-based approaches have been recommended as follows:

- Root Control: Create new blanket contract to strategically apply herbicide with a foaming agent into select sewers for root control on an annual basis. After exposing live roots via mechanical cutting, the active ingredient in the root control treatment kills roots in the sewer (without killing the plant they originate from) and prevents regrowth typically for 2 to 3 years. OC San has awarded the contract and is preparing to conduct a monitoring study of the herbicide's active ingredient for the first work order issued. The monitoring study is being performed to validate no risk to OC San's biological treatment processes from the herbicide active ingredient before more widespread usage in OC San's Collection system.
- Infiltration Control: Create a new blanket contract to strategically plug infiltration runners and gushers with chemical grouting and remove large calcified deposits mechanically. OC San is developing a pilot program with smaller work orders prior to moving forward with the creation of a new blanket contract.
- Isolated Structural Defect Repairs: Group isolated and severe structural defects into individual work packages for execution by Maintenance on-call contractors. OC San is finalizing work packages and priority and developing the scope of work.

Although the CCTV program inspects all collection assets every 5 years, there are limitations to the condition data that can be collected with CCTV equipment. Of particular concern is that large-diameter sewers (greater than 42 inches in diameter) are not regularly cleaned and OC San does not have sufficient knowledge on existing debris buildup. CCTV cannot capture debris below the waterline. Therefore, the risk for an SSO due to debris accumulation or a high debris and ragging event at the treatment plant headworks facilities could be high. In response, OC San performed sonar inspections of select large-diameter sewers and inverted siphons to quantify debris and sediment and validated the cleansing state of sewers suspected to be non-cleansing; all sonar inspections were completed in June 2023. For the next steps, OC San is planning the cleaning and assessment of up to five inverted siphons and one gravity sewer that were previously inspected with sonar to validate the accuracy of sonar debris estimates and pilot the inverted siphon assessment program. Recommendations are also to be provided to Collections O&M on which large-diameter sewers and inverted siphons need to be cleaned regularly to adequately mitigate risk.

3.4.2.3 Proactively Addressing Collection Pump Station Challenges

Pump station reliability is critical to conveying wastewater to the treatment plants when gravity flow is not an option. In the past, emergency break-in work has been required due to the failure of critical assets such as isolation valves at some of the pump stations. With the Asset Management Team taking ownership of the pump stations in recent years, OC San is now taking a proactive approach to rehabilitation and repair at the pump stations. For example, three valve replacement projects have recently been completed and two more valve replacement projects, which will replace aging and nonfunctioning valves at five different pump stations, have been opened. The timing of these projects considers risk and criticality to minimize the risk of emergency work.

Pump station force mains are tremendously challenging to maintain and inspect due to being under pressure and located underground, which limits access. In recent years, the Asset Management Team has been looking into establishing a more robust program for force main inspection. Originally, a planning study (XPS-0066) was to be established to cover all the force main inspections. It was determined to be much more cost-effective and efficient for the Asset Management Team to take the lead, working with Collections and contractors, using in-house resources to plan out and perform the force main inspections. This has allowed OC San to be more flexible in prioritizing aging and higher-risk force mains, gathering data quicker, determining whether follow-up inspections or projects are needed, and responding to those needs sooner.

3.4.3 Central Generation Facility Planning

The internal combustion engines at Plant No. 1 and Plant No. 2 have significant run time and need a major overhaul to maintain reliability for the next 10 years or longer. Engines No. 1 and No. 3 at Plant No. 1 recently completed successful top-to-bottom end overhauls. The J-135 project will overhaul the remaining engine gensets at Plant No. 1 and five engines gensets at Plant No. 2. A recently completed planning study showed that OC San's existing engines can be readily maintained for the next 10 to 20 years. For the long-term planning of the Cen Gen Facility, the Energy and Digester Gas Master Plan, PS21-04, is being conducted. This study is evaluating viable alternatives for energy production and digester gas management, considering emerging technologies, market conditions, and potential permitting constraints. The Asset Management Team and Maintenance are working together to ensure OC San has a long-term plan to manage energy use, energy production, and beneficial reuse of digester gas.

3.4.4 Treatment Plant Projects and Planning Studies

A major focus of the Asset Management Program is streamlining the replacement or repair of our critical assets to extend RUL. The Asset Management Team works in tandem with Maintenance to identify and create projects, provide construction bid documents, and manage project implementation of maintenance projects. In addition, the Asset Management Team will take on important planning studies that look at ways to increase treatment reliability and safety and be a good steward of the environment. Here are a few projects that were driven and led by the Asset Management and Maintenance Teams:

- Several of our critical pumping systems are equipped with VFDs that have become obsolete and can no longer be maintained properly. The Asset Management Team is tracking all major VFDs and working on creating VFD replacement projects as needed. Currently, projects FE19-13, FE19-08, FR1-0011, and FR1-0016 are in construction to replace the obsolete VFDs at Seal Beach Pump Station, and various locations at Plant Numbers 1 and 2.
- This year Project PS20-03, Truck Loading Bay Odor Control Improvements at Plant No. 2, was completed to address the odors escaping from the truck loading bays during cake loading and haul out. CIP Project P2-140 was developed based on the recommendations of this study and will make the loading of cake into the trucks safe and control the release of odor, which will help OC San to be a good neighbor. P2-140 will be transferred to the Project Management Office in 2023 for design and construction starting in early 2024.
- Project PS22-02, Onsite Oxygen Generation Feasibility Study at Plant No. 2, is evaluating whether an onsite oxygen generation system should be implemented to provide reliable oxygen supply to meet the High-Purity Oxygen-Activated Sludge Plant at Plant No. 2 in the next 20 years. Currently OC San uses liquid oxygen delivery and storage, but there was a shortage of liquid oxygen during the pandemic.
- The trickling filter rotary distributor assemblies at the Trickling Filter Solids Contact Facility at Plant No. 2 had reliability issues due to major equipment failures. The Trickling Filter A center rotating assembly had a structural failure and thus was removed from service. The Trickling Filter B center rotating assembly also had structural defects but had to be kept in operation. More maintenance inspections and PM were performed to maintain reliability. This year, the replacement Project MP2-005 completed the purchasing and installation of the two new center assemblies to replace the failed units.

- The A-side Primary Clarifiers, originally constructed in the 1960s, are unreliable due to age and deterioration or failure of existing components such as the basin structure, dome and baffle components, and rotating mechanisms. Several projects were completed or are in progress to provide short-term reliability of the existing Side-A Primary Clarifiers until they are replaced by Project P2-98A, which is under construction with an estimated completion in 2027. MP2-006 and S-2023-1385BD were completed to provide reinforcement to existing dome supports, the dome access hatch, and baffle wall connections on Primary Clarifiers E and G. MP2-007 is in the design phase to provide repairs and replacements on corroded sections of the rotating mechanisms and feed well for Primary Clarifiers F and G. Concrete spalls and crack repairs on the exterior concrete basin wall were completed on Primary Clarifier D and are in progress for Primary Clarifier F through blanket purchase order contract 107102-OB.
- The Grit Basins and Grit Handling areas at Plant No. 2 have experienced multiple power and control cable failures that eventually caused the entire Grit Basin system to become nonoperational. An urgent task (reference Shutdown Request 576/Asset Issue 478) was executed to have temporary cables installed aboveground to bring Grit Pumps, Mixers, and Grit Classifiers back online. Project MP2-008 is also in development to replace the cables permanently.
- P1 and P2 Digester Gas Dryer Replacement Project FE23-01 will replace the refrigerated digester gas drying systems at both plants, to ensure that high-quality compressed digester gas is delivered to the Cen Gen engines for subsequent reliable energy production purposes. The dryers are located downstream of the digester gas compressors and are responsible for reducing the dew point and removing water from the digester gas. These dryers are an important and critical part of the gas handling system as a whole, and integral to the reliable operation of the Interplant Gas pipeline and engine systems alike.
- Plant No. 2 PEPS pumps are aged and a previous wet well condition assessment found pump suction line corrosion. A maintenance project was created to remove Pump #4 for factory assessment. The Pump #4 factory condition assessment and subsequent overhaul were completed successfully in November 2022. A larger maintenance project, MP2-0010, was created to overhaul the remaining three pumps in the dry seasons of 3 consecutive years starting in 2024.

3.5 Asset Management Program Improvement Opportunities

The Asset Management Team continues to look at ways to improve the Asset Management Program. The team has focused on improving the Asset Registries and ensuring all critical assets are being tracked appropriately. Additional major assets have been added to the Registries. For example, the tracking of occupied buildings has expanded to include power buildings at Plants Nos. 1 and 2. These power buildings house critical electrical equipment that serve OC San's treatment facilities.

Performing condition assessments is still a big emphasis for the program. In some situations, the team relies on Theoretical Remaining Useful Life (TRUL) for asset planning. TRUL may not necessarily represent when an asset requires replacement or rehabilitating increasing the risk of asset failure or conversely spending resources and funds on an asset where it is not required. Where practical and not cost prohibitive, condition assessments are being performed to convert TRUL into what is called Field-Adjusted Remaining Useful Life. A major focus is performing condition assessments on OC San's pump stations' force mains. A comprehensive condition assessment program for the pump stations force mains is discussed in more detail in Section 3.4.2.3. Another focus area is assessing the inverted siphons in the collection system. Prioritizing these assessments will be based on likelihood and consequence of failure (risk-based approach).

A Planning Study has been created to improve the Asset Management Program. The Digital Asset Management Study has been approved by Clearinghouse and is currently in the project development phase. The key objectives of this study are the following:

- Allow available asset data to be analyzed more quickly and efficiently with the use of business intelligence (BI) dashboards.
- Enhance collaboration and data sharing between Maintenance and Engineering Teams, to support both short-term and long-term planning (BI dashboards).
- Provide a simple and robust means to convey complex asset information to the Executive Management Team and in the AMP (BI dashboards).
- Improve asset planning and prioritization of projects by development of a risk framework.

Fortunately for the Asset Management Program, there is a lot of asset data available to assess and plan for OC San's major assets. One of the challenges is being able to access and utilize that data more efficiently. The Digital Asset Management Planning Study will create asset management and maintenance KPI BI dashboards, providing real-time asset information for improved and defensible decision making and asset planning. Developing a risk assessment framework will also improve asset management planning and project prioritizing with the goal of having risk scores for every project. The following section describes the future program improvement opportunities, both short-term and long-term, and how the new Digital Asset Management Study will address some of these improvement opportunities.

3.5.1 Improvement Opportunities

Condition Assessments:

- Track future condition assessments in the Asset Registries and proactively plan ahead with Operations for assessments that require process interruptions. *STATUS: Completed.*
- Understand the condition and RUL of all of OC San's major critical assets. *STATUS: In progress.*

Remaining Useful Life:

- Consider ways to improve the accuracy of RUL in addition to the Condition Scoring Guidelines already created.
  STATUS: In progress.
- Create more condition scoring categories in the 1- to 10-year range as RUL accuracy improves over time. *STATUS: Longer-term goal.*

Asset Registries:

- Ensure all pertinent asset information is included in the Asset Registries, including having a plan to address all assets with a RUL fewer than 10 years. *STATUS: Completed.*
- Determine the best way to track major assets in the long term such that the Asset Registries are compatible for BI dashboards. *STATUS: Digital Asset Management Planning Study to address.*

Data-Driven Asset Management:

- Develop asset management BI dashboards to track maintenance KPIs and key asset management information down to the asset level. *STATUS: Digital Asset Management Planning Study to address.*
- Use BI dashboards algorithms to more accurately estimate asset performance and RUL. *STATUS: Longer-term goal (not started).*
- Optimize CIP planning using BI cost and risk modeling and constraints. *STATUS: Longer-term goal (not started).*

Risk Assessment (Likelihood and Consequence of Failure):

- Identify a risk assessment approach and develop a framework that fits OC San's needs. *STATUS: Digital Asset Management Planning Study to address.*
- Use risk assessment modeling and scoring to better prioritize projects. *STATUS: To be completed after Digital Asset Management Planning Study.*

These improvement opportunities will be evaluated and updated in the annual AMP. The Asset Management Program must always consider the mission statement of "delivering the required level of service, at the lowest life cycle cost, with an acceptable level of risk."

4 Budgetary Considerations

The AMP focuses on documenting short- to long-term planning of maintenance and capital improvement projects to support effective budget development and sustainable operations. OC San has been striving to identify more accurate medium- to long-term capital cash flow requirements. Specifically, the Planning Division has been working on developing a 20-year CIP by creating project plans for forecasted rehabilitation, replacement, improvements, or expansion for the collection system and treatment plants. The CIP budget is evaluated and updated on a yearly basis as new information becomes available.

4.1 Capital Improvement Expenditures

The FY 2023–2024 Budget Update, the second year of the 2-year budget adopted in June 2022, includes updates to the 20-year CIP outlay. Figure 4-1 shows the 20-year CIP outlay, which includes current and projected future CIP projects. The FY 2023–2024 CIP Outlay is $288.6 million and is further divided into process categories, as shown on Figure 4-2. From the chart, it is apparent that liquid treatment, support facilities, and collection facilities are primary areas where the FY 2023–2024 CIP Outlay will be spent.

For liquid treatment, Project No. P1-105, Headworks Rehabilitation at Plant No. 1, and Project No. P2-98A, A-Side Primary Clarifiers Replacement at Plant No. 2, are expected to be the largest expenditures of $62.7 million and $23.9 million, respectively, in FY 2023–2024. For support facilities, Project No. P1-128, Headquarters Complex, is the biggest driver with $35.1 million in FY 2023–2024. Lastly, for collection facilities, Project No. 3-64, Rehab of Western Regional Sewers, and Project No. 7-68, MacArthur Force Main Improvements, comprise nearly one-third of Collections CIP spending at $6.3 million and $4.3 million, respectively.

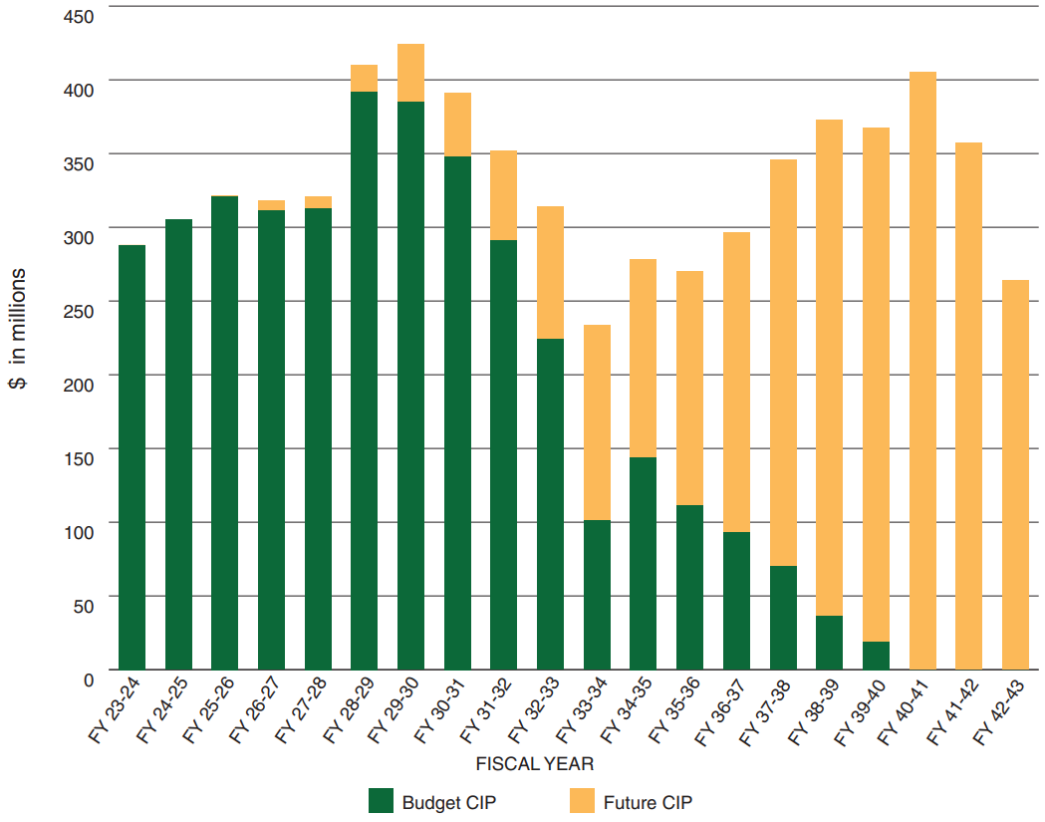


Figure 4-1. 20-Year CIP Outlay

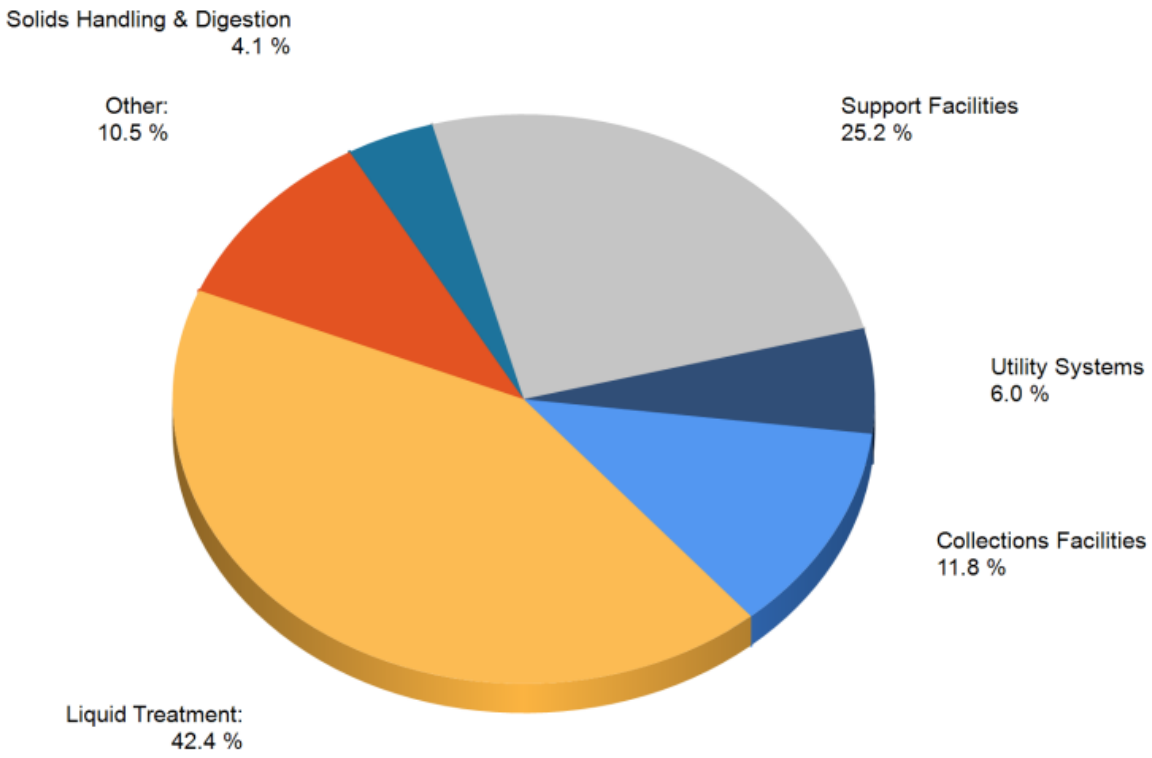


Figure 4-2. FY 2023–2024 CIP Outlay by Process – $288.6 Million

4.2 Maintenance Expenditures

4.2.1 Five-Year Historical Maintenance Expenditures

Figure 4-3 and Figure 4-4 show the historical actual spent versus budgeted operational and maintenance expenditures for the treatment plants and collection system, respectively.

- The treatment plant expenditures include maintenance services and materials (budget objects 54010 and 54020).
- The collection system expenditures include maintenance services and materials (budget objects 54010, 54020, and 53180).
- These costs represent the O&M costs of fixed assets, including operationally funded repair/replacement projects.

A variety of factors and variables are not reflected in the development of the budget. As a result, some years reflect higher expenditures than budget. These factors include but are not limited to the following:

1) Annual inflation rates
2) Manufacturing cost increases (which are also affected by increases in labor, raw material demand, fuel, chemicals, fees to expedite due to long lead times)
3) Supply chain cost increases
4) Geopolitical events

Additional maintenance expenses that were unforeseen or unplanned but include necessary repairs or procurements.

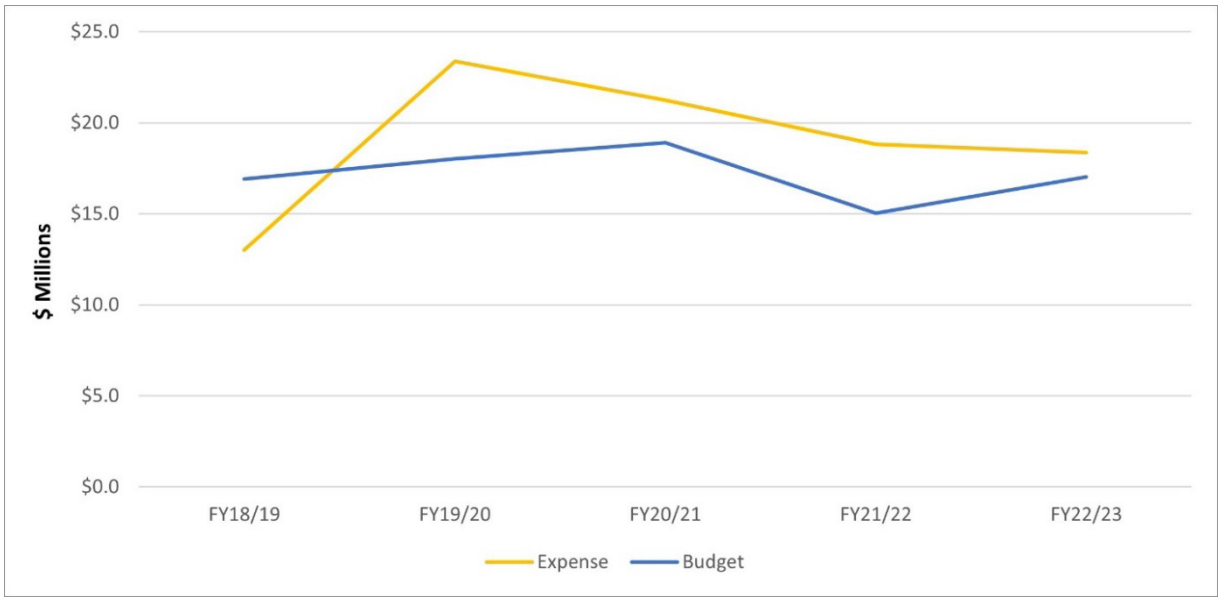


Figure 4-3. Five-Year Historical Maintenance Costs for Treatment Plants

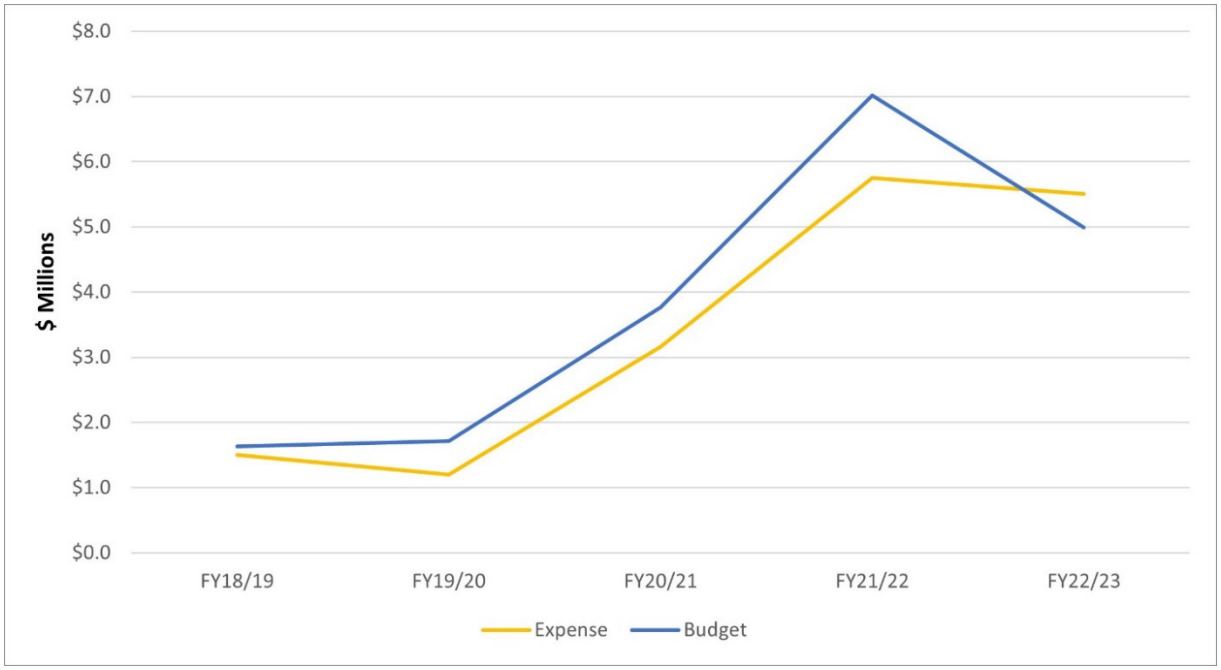


Figure 4-4. Five-Year Historical Maintenance Costs for Collection System

4.2.2 Three-Year Look-Ahead Maintenance Expenditures

Table 4-1 shows operational-funded projects identified to date and includes the projected annual expenditures over the next 3 years. It is likely FY 2023–2024 and beyond will fluctuate based on the condition of assets as they age.

The projects are grouped by location (Collection System, Plant No. 1, Plant No. 2, and Joint), and then sorted by the project start FY. The list encompasses projects identified as of August 9, 2023, with the following criteria:

- Estimated construction cost is equal to or greater than $50,000 and has projected expenditures within the next 3 years.
- Projects on the list represent expenditures that are operationally funded.
- Some projects that are similar in nature have been combined into a single project for more efficient project execution.
- Blanket purchase order contracts are not included.

Table 4-1. Projected Annual Expenditures

PRN	ALT. PROJECT NO.	PROJECT TITLE	FY 2023–2024	FY 2024–2025	FY 2025–2026	3-YEAR TOTAL COST
COLLECTIONS – TRUNKLINES AND DIVERSIONS						
PRN-00159	MP-307	Bushard Diversion Structure Repair	$1,566,234	$196,313		$1,762,547
PRN-00373/PRN-00869	FRC-0014	Magnolia Sewer Manhole Abandonment at Interstate-5		$182,588	$117,413	$300,001
PRN-00592	FRC-0007	Redhill Relief Sewer Liner Repair at State Route 55	$245,000			$245,000
PRN-00730	FRC-0010	Warner Avenue Vault Cover Improvements	$19,288	$580,712		$600,000
PRN-00766	FRC-0011	Richfield Sub-Trunk Encasement for BNSF Railway Addition	$121,000			$121,000
		COLLECTIONS – TRUNKLINES AND DIVERSIONS SUBTOTALS	$1,951,522	$959,613	$117,413	$3,028,548
COLLECTIONS – PUMP STATIONS						
PRN-00527/PRN-00790/PRN-00808/PRN-00949	FRC-0018	Valve Replacements at Lido, Crystal Cove, A St., and 15th St. Pump Stations			$500,000	$500,000
PRN 00734/PRN-00892	FRC-0017	Valve Replacements and Wet Well Access Improvements at Slater Pump Station		$14,250	$756,750	$771,000
PRN-00922		Decommission Yorba Linda Pump Station	$50,000			$50,000
PRN-00926		College Pump Station Wet Well Rehabilitation			$1,250,000	$1,250,000
		COLLECTIONS – PUMP STATIONS SUBTOTALS	$50,000	$14,250	$2,506,750	$2,571,000
PLANT 1						
PRN-00492/PRN-0053	FR1-0011	VFD Replacements at Plant No. 1	$303,138	$650,128	$261,619	$1,214,885
PRN-00176	FR1-0007	Control Center Offices and Day Training Room Remodeling at Plant No. 1	$235,455	$95,545		$331,000
PRN-00525	FR1-0005	Cen Gen and 12-kV Service Center Switchgear Battery System Upgrades at Plant No. 1	$500,000	$1,285,000		$1,785,000
	FR1-0016	Waste Sidestream Pump Station VFD replacements at Plant No. 1	$818,582			$818,582
PRN-00800	FR1-0017	Trickling Filter Valve Replacement at Plant No. 1	$46,314	$78,685		$124,999
PRN-00815	FR1-0018	Dewatering Centrifuge Diverter Gate Improvements at Plant No. 1		$790,581	$109,418	$899,999
PRN-00894/PRN-00890	FR1-0023	Secondary Treatment Area Cable Replacement at Plant No. 1			$750,001	$750,001
PRN-00898	FR1-0022	Backup Power for Laboratory Equipment at Plant No. 1	$14,014	$55,989		$70,003
	FR1-0020	Traffic Signal Installation at Ellis Avenue and Mt. Langley Street Intersection	$380,896	$1,142,687	$380,896	$1,904,479
PRN-00914		WSSPS-1 Pump Replacement at Plant No. 1	$75,000	$75,000		$150,000
PRN-00921		Human Resources Building Demolition and Site Improvements		$170,000	$680,000	$850,000
PRN-00937		Turbine Generator Battery Chargers in Blower Building 1 at Plant No. 1	$180,000			$180,000
PRN-00945		Admin. Chiller Building Hot Water Loop Pipe Replacement	$75,000			$75,000
PRN-00947		Power Building 7 HVAC Replacement at Plant No. 1	$80,000			$80,000
PRN-00950		Laboratory Ventilation and Fume Extraction Replacement at Plant No. 1		$100,000		$100,000
PRN-00953		SALS HVAC Replacement at Plant No. 1	$100,000	$515,000		$615,000

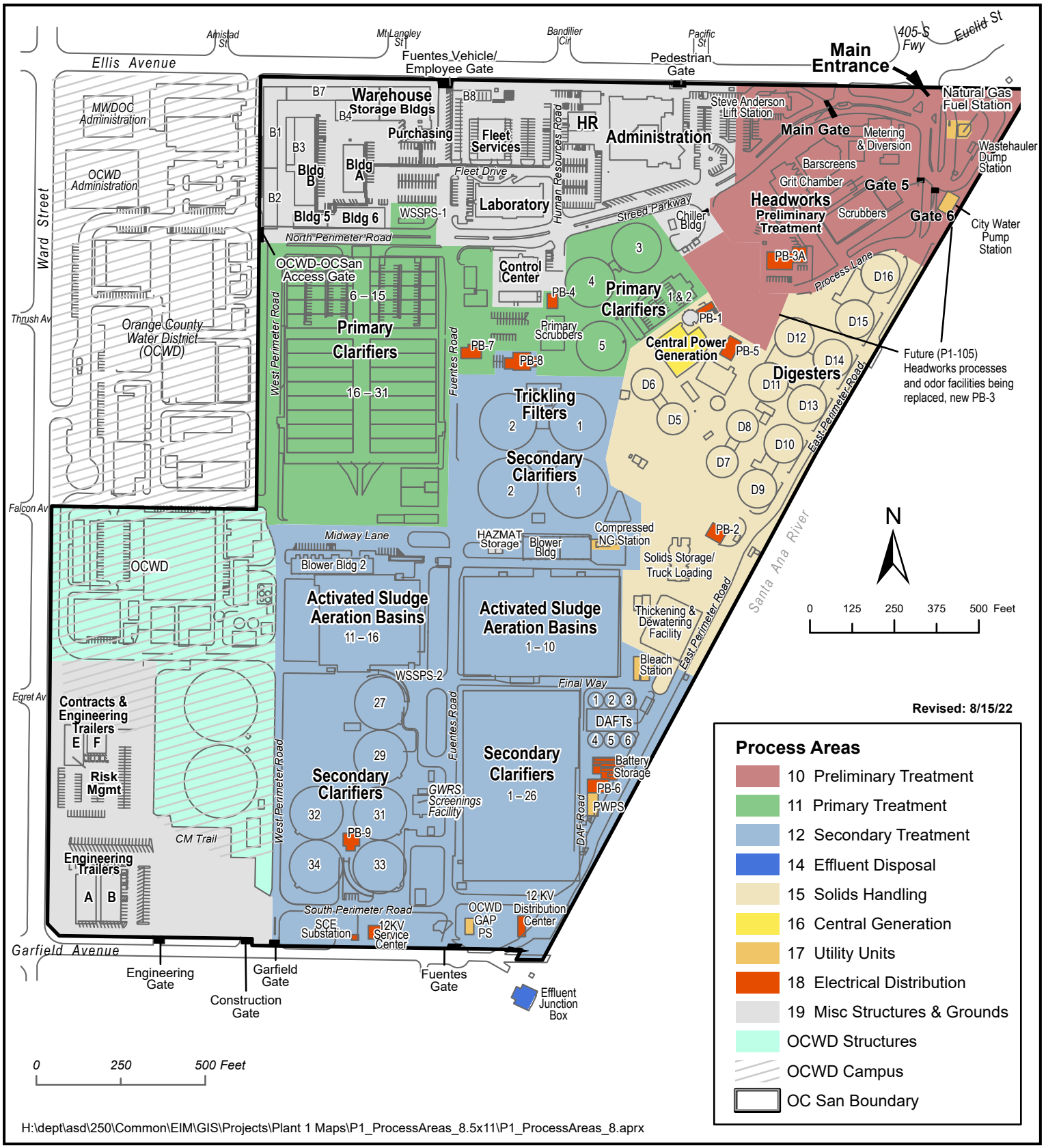
PRN	ALT. PROJECT NO.	PROJECT TITLE	FY 2023–2024	FY 2024–2025	FY 2025–2026	3-YEAR TOTAL COST
		PLANT 1 SUBTOTALS	$2,808,399	$4,958,615	$2,181,934	$9,948,948
PLANT 2						
PRN-00537	FR2-0027	Heavy Mechanics Group Office Space Upgrade at Plant No. 2	$7,323	$222,676	$0	$229,999
PRN-00572	FR2-0018	Activated Sludge Clarifier Repairs at Plant No. 2	$1,789,416	$439,120	$0	$2,228,536
PRN-00633/PRN-00849	FR2-0023	Activated Sludge Clarifier Entry Improvements at Plant No. 2	$80,815	$869,185	$0	$950,000
PRN-00684		P2 Digester Maintenance Projects	$100,000	$100,000	$100,000	$300,000
PRN-00703		Reroute area drain PS discharge to SC/SR basins instead of HW	$0	$163,000	$0	$163,000
PRN-00712/PRN-00749 PRN-00783/PRN-00870	FR2-0026	Headworks Phase 3 Cable Replacement at Plant No. 2	$525,669	$49,691	$0	$575,360
PRN-00770	MP2-0010	PEPS Pumps #1, #2, and #3 Overhaul at Plant No. 2	$190,000	$210,000	$220,000	$620,000
PRN-00780		TFPS A1, A2, B1, B2, and C2 VFDs replacement	$191,290			$191,290
PRN-00858	FR2-0029	Influent Pump Station Plant Water Piping Repair at Plant No. 2	$177,063	$0	$0	$177,063
PRN-00865		Primary Sedimentation Basin G Support Repair at Plant No. 2	$248,600			$248,600
PRN-00866	MP2-005	P2 Trickling Filter A & B Rotary Distributor Center Mast Replacement	$1,500,000	$0	$0	$1,500,000
PRN-00867	FR2-0032	Digester K Dome Repair at Plant No. 2	$550,000	$550,000	$0	$1,100,000
PRN-00873		P2 LOX Emergency Backup System	$458,000	$0	$0	$458,000
PRN-00880		Ella Tunnel Plant Water Piping Replacement	$87,650			$87,650
PRN-00885		Centrifuge Cover Hinge Installation at Plant No. 2	$130,000			$130,000
PRN-00901		P2 EPSA VFD Control Wiring	$55,000	$0	$0	$55,000
PRN-00902	FR2-0031	Activated Sludge System Scum Rerouting at Plant No. 2	$0	$0	$345,005	$345,005
PRN-00906	MP2-006	Primary Sedimentation Basin E Dome Support Repair at Plant No. 2	$205,000			$205,000
PRN-00908		Ocean Outfall External Inspection 2023	$100,000			$100,000
PRN-00912		MSP #7 VFD Isolation Transformer Replacement at Plant No. 2	$280,000	$0	$0	$280,000
PRN-00913		Primary Sedimentation Basin F Concrete Wall Repairs at Plant No. 2		$120,000		$120,000
PRN-00916	MP2-007	Primary Sedimentation Basins F and G Mechanism Repairs at Plant No. 2		$1,250,000		$1,250,000
PRN-00923		Spare Main Sewage Pump Repair for Pump No. 1 at Plant No. 2	$400,000			$400,000
PRN-00927	MP2-008	Grit Basin Pump and Mixer Cable Replacement at Plant No. 2	$200,000			$200,000
PRN-00929	MP2-009	North Scrubber Complex Grating Replacement at Plant No. 2	$315,000			$315,000
PRN-00931		Plant 2 Maintenance Building Variable Air Volume Heat Strip and Controls Replacement		$300,000		$300,000
PRN-00938		Transformer TFR-H04 Repair at Plant No. 2	$265,000	$0	$0	$265,000
		PLANT 2 SUBTOTALS	$7,855,826	$4,273,672	$665,005	$12,794,503

PRN	ALT. PROJECT NO.	PROJECT TITLE	FY 2023-2024	FY 2024-2025	FY 2025-2026	3-YEAR TOTAL COST
JOINT						
PRN-00630	FRJ-0003	Interplant Gas Line Blow Off Vault Repairs	$12,327	$687,674		$700,001
PRN-00699/PRN-00854	FR1-0021	Basement Access Hatch Fall Restraint, Cen Gen Building at Plant No. 1 and Plant No. 2	$97,200			$97,200
PRN-00897		125-VDC Battery Replacement at Plant Nos. 1 and 2	$220,000			$220,000
		JOINT SUBTOTALS	$349,527	$687,674	$0	$1,037,201

Appendix A
Plant No. 1 Process Areas Map

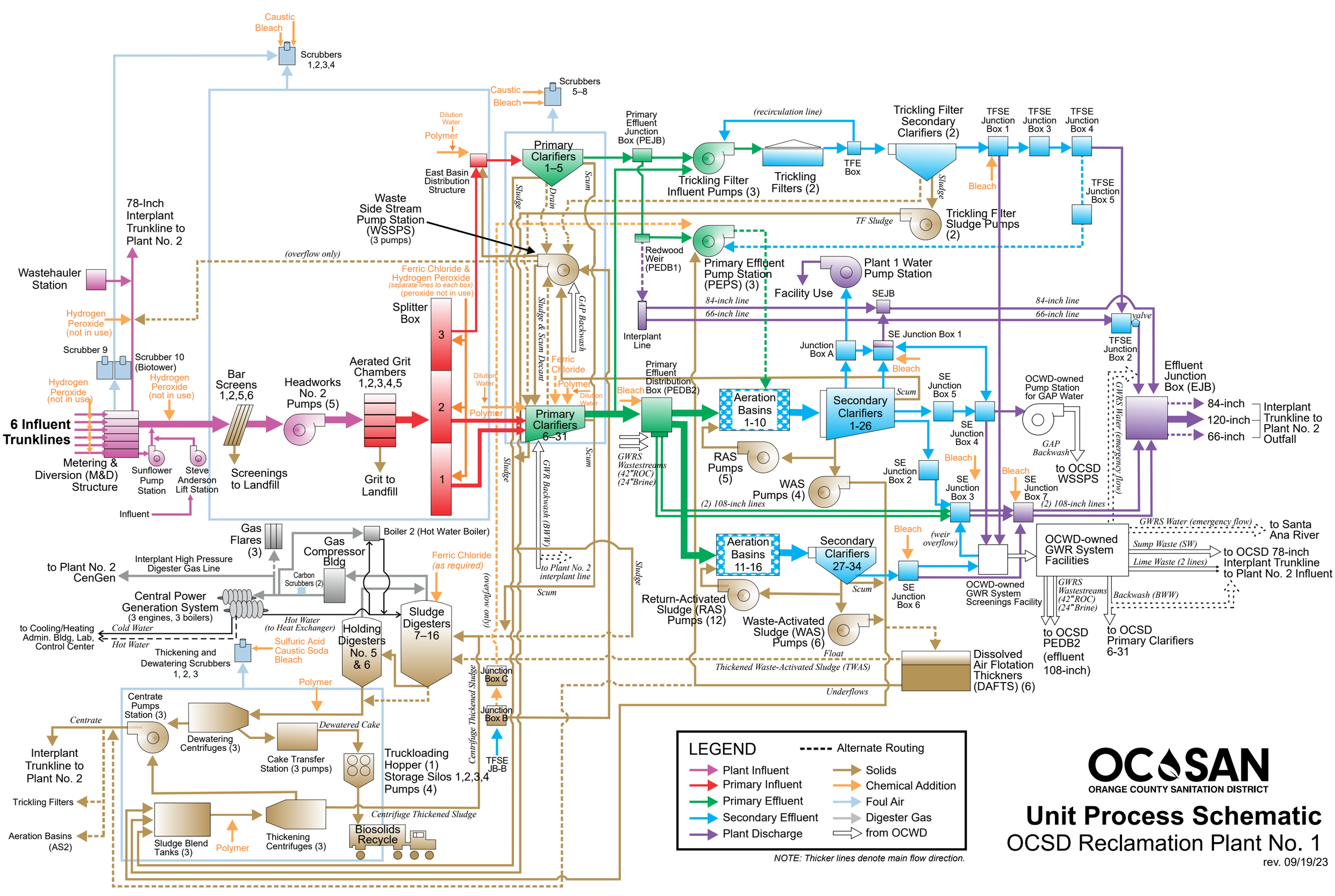
OC SAN
ORANGE COUNTY SANITATION DISTRICT

PROCESS AREAS – Reclamation Plant No. 1



H:\dept\asd\250\Common\EIM\GIS\Projects\Plant 1 Maps\P1_ProcessAreas_8.5x11\P1_ProcessAreas_8.aprx

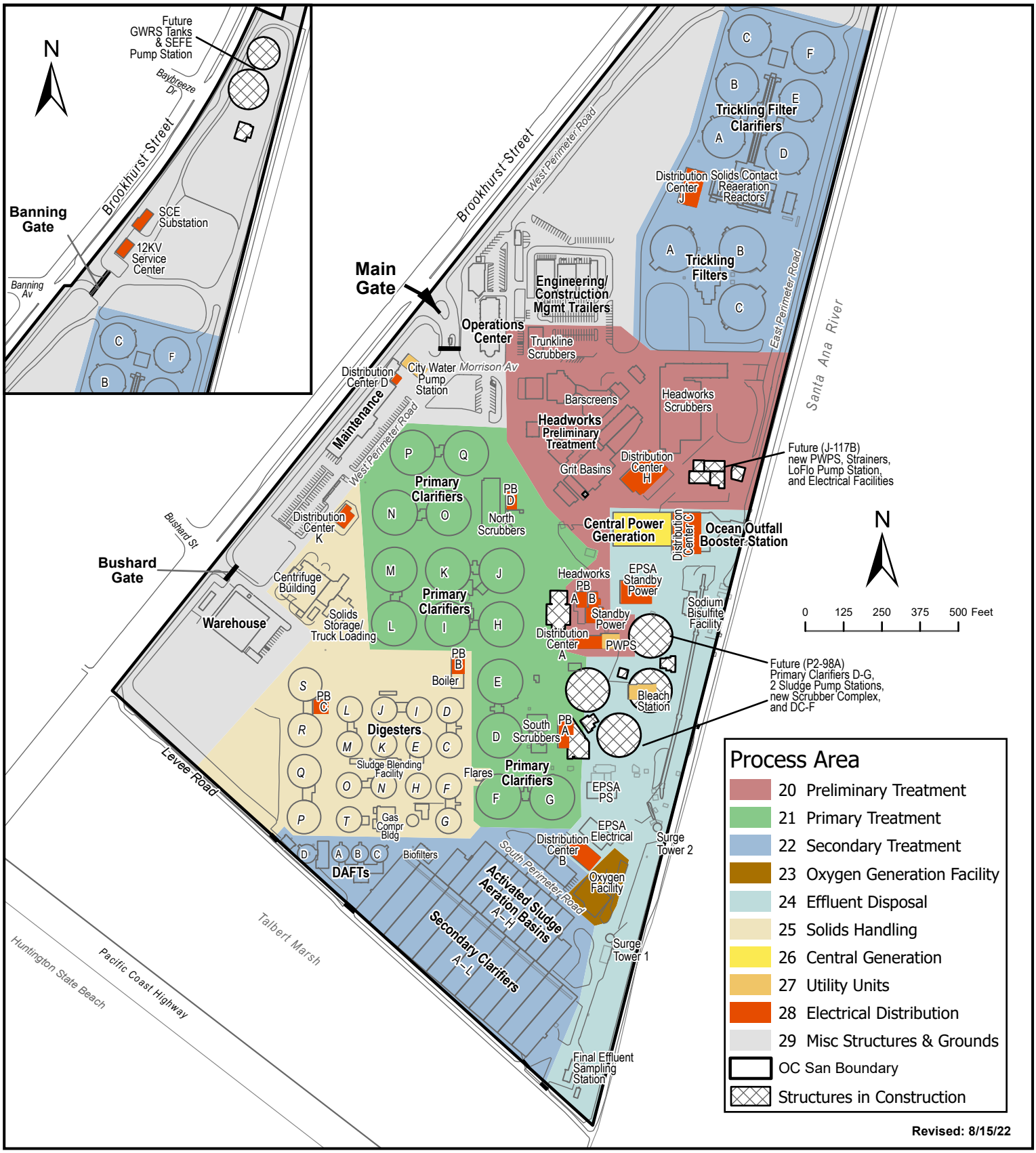
Appendix B
Plant No. 1 Process Diagram


Caustic
Bleach
Scrubbers 1,2,3,4
Scrubbers 5–8
Dilution Water
Polymer
East Basin Distribution Structure
Primary Clarifiers 1–5
Primary Effluent Junction Box (PEJB)
(recirculation line)
Trickling Filter Influent Pumps (3)
Trickling Filters (2)
TFE Box
Trickling Filter Secondary Clarifiers (2)
TFSE Junction Box 1
TFSE Junction Box 3
TFSE Junction Box 4
TFSE Junction Box 5
Bleach
Sludge
Scum
Drain
Waste Side Stream Pump Station (WSSPS) (3 pumps)
78-Inch Interplant Trunkline to Plant No. 2
(overflow only)
TF Sludge
Trickling Filter Sludge Pumps (2)
Redwood Weir (PEDB1)
Primary Effluent Pump Station (PEPS) (3)
Plant 1 Water Pump Station
Facility Use
SEJB
84-inch line
66-inch line
Interplant Line
Wastehauler Station
Ferric Chloride & Hydrogen Peroxide
(separate lines to each box)
(peroxide not in use)
Splitter Box
Sludge & Scum Decant
GAP Backwash
Ferric Chloride
Polymer
Dilution Water
Junction Box A
SE Junction Box 1
Hydrogen Peroxide (not in use)
Scrubber 9
Scrubber 10 (Biotower)
Bar Screens 1,2,5,6
Headworks No. 2 Pumps (5)
Aerated Grit Chambers 1,2,3,4,5
Primary Clarifiers 6–31
Primary Effluent Distribution Box (PEDB2)
Aeration Basins 1-10
Secondary Clarifiers 1-26
SE Junction Box 5
SE Junction Box 4
OCWD-owned Pump Station for GAP Water
GAP Backwash
to OCSD WSSPS
TFSE Junction Box 2
Effluent Junction Box (EJB)
GWRS Water (emergency flow)
84-inch
120-inch
66-inch
Interplant Trunkline to Plant No. 2 Outfall
6 Influent Trunklines
Metering & Diversion (M&D) Structure
Sunflower Pump Station
Steve Anderson Lift Station
Influent
Screenings to Landfill
Grit to Landfill
GWRS Wastestreams (42"ROC) (24"Brine)
RAS Pumps (5)
WAS Pumps (4)
(2) 108-inch lines
SE Junction Box 2
SE Junction Box 3
SE Junction Box 7
Gas Flares (3)
Gas Compressor Bldg
Boiler 2 (Hot Water Boiler)
Interplant High Pressure Digester Gas Line
to Plant No. 2 CenGen
Carbon Scrubbers (2)
Ferric Chloride (as required)
Central Power Generation System
(3 engines, 3 boilers)
Hot Water (to Heat Exchanger)
Cold Water
Hot Water
to Cooling/Heating Admin. Bldg, Lab, Control Center
Sulfuric Acid
Caustic Soda
Bleach
Thickening and Dewatering Scrubbers 1, 2, 3
Holding Digesters No. 5 & 6
Sludge Digesters 7–16
Polymer
Junction Box C
Junction Box B
TFSE JB-B
Centrifuge Thickened Sludge
Centrate Pumps Station (3)
Centrate
Dewatering Centrifuges (3)
Dewatered Cake
Cake Transfer Station (3 pumps)
Truckloading Hopper (1)
Storage Silos 1,2,3,4
Pumps (4)
Interplant Trunkline to Plant No. 2
Trickling Filters
Aeration Basins (AS2)
Sludge Blend Tanks (3)
Thickening Centrifuges (3)
Biosolids Recycle
Aeration Basins 11-16
Secondary Clarifiers 27-34
Return-Activated Sludge (RAS) Pumps (12)
Waste-Activated Sludge (WAS) Pumps (6)
Float
Thickened Waste-Activated Sludge (TWAS)
Underflows
Dissolved Air Flotation Thickners (DAFTS) (6)
OCWD-owned GWR System Facilities
OCWD-owned GWR System Screenings Facility
GWRS Water (emergency flow)
to Santa Ana River
Sump Waste (SW)
Lime Waste (2 lines)
to OCSD 78-inch Interplant Trunkline to Plant No. 2 Influent
GWRS Wastestreams (42"ROC) (24"Brine)
Backwash (BWW)
to OCSD PEDB2 (effluent 108-inch)
to OCSD Primary Clarifiers 6-31
LEGEND
Alternate Routing
Plant Influent
Primary Influent
Primary Effluent
Secondary Effluent
Plant Discharge
Solids
Chemical Addition
Foul Air
Digester Gas
from OCWD
NOTE: Thicker lines denote main flow direction.
OCSAN
ORANGE COUNTY SANITATION DISTRICT
Unit Process Schematic
OCSD Reclamation Plant No. 1
rev. 09/19/23

Appendix C
Plant No. 2 Process Areas Map

ORANGE COUNTY SANITATION DISTRICT

PROCESS AREAS – Treatment Plant No. 2



Revised: 8/15/22

H:\dept\asd\250\Common\EIM\GIS\Projects\Plant 2 Maps\P2_ProcessAreas_8.5x11\P2_ProcessAreas_8.aprx

Appendix D
Plant No. 2 Process Diagram – After GWRS Expansion

Unit Process Schematic — OC San Treatment Plant No. 2

78-interplant line containing SARI, P1 recycle flow, and GWRS wastestreams (Non-Reclaimable)

4 Influent Trunklines (Reclaimable)

Hydrogen Peroxide (not in use)

Trunkline Odor Control (3 Biotowers)

Headworks Odor Control (8 Chemical Scrubbers & 13 Biotowers)

Caustic

Bleach

Diversion Structure
1 Non-Reclaimable
3 Reclaimable

Metering Structure
3 Reclaimable

Bar Screens (6)
3 Non-Reclaimable
3 Reclaimable

Wetwell

Headworks D Pumps (7)
3 Non-Reclaimable
4 Reclaimable

Rag Handling & Loading (4)

Grit Handling & Loading (4)

Vortex Grit Basins (6)
3 Non-Reclaimable
3 Reclaimable

Splitter Box

Ferric Chloride & Bleach (separate lines to each box)

Primary Metering

Polymer

Dilution Water

Distribution System

South Scrubber Complex U–Z

*Primary Clarifiers D–G

Primary Clarifiers H–L

Primary Clarifiers M–Q

Junction Box 4

Primary Effluent Pump Station (PEPS) (4)

High Purity Oxygen

*Aeration Basins (8)

Return-Activated Sludge (RAS) Pumps (6)

*Secondary Clarifiers A–L

Facility Use

Plant Water Pump Station

Bleach

Santa Ana River Overflow (SARO) (Serial Port 003)

Emergency 78-inch Outfall (Serial Port 002)

Surge Tower No. 1

Sodium Bisulfite

Effluent Pump Station Annex (EPSA) (3 pumps)

Junction Box 8 (JB8)

Junction Box A (JBA)

Sodium Bisulfite

Final Sampler Bldg.

120-inch Outfall (Serial Port 001)

Surge Tower No. 2

Wetwell

Ocean Outfall Booster Station (OOBS) (5 pumps)

120-inch line

66-inch line

84-inch line

Overview Weir Box

Interplant Trunklines (from Plant No.1 EJB)

Primary Effluent Distribution Structure (PEDS)

Emergency Overflow

Chemical Scrubber & Carbon Scrubbers (A-C)

Trickling Filters (A,B,C)

Trickling Filter Influent Pumps (6)

Solids Contact Re-aeration Basins (A-D)

Return Secondary Sludge (RSS) Pumps (12)

Secondary Settling Clarifiers (A-F)

Diversion Structure

OCWD EQ Tank and Pumps

To GWRS through the existing 66-inch Interplant Line

To GWRS intake at Plant No. 1

Scrubbers G (Biotower)

Polymer

Dilution Water

Sludge and Scum Decant

Waste Secondary Sludge (WSS) Pumps (3)

Waste-Activated Sludge (WAS) Pumps (4)

Dissolved Air Flotation Thickners (DAFTs) A–D

Float

Thickened Waste-Activated Sludge (TWAS)

DAFT D (underflow) & AS Plant Process Drainage

A through C DAFTS (underflow)

Caustic

Bleach

North Scrubber Complex M–T (Q Biotower)

Sludge & Scum

Waste Stream Pump Station

Sludge Blending Facility

Carbon Scrubber

Central Power Generation System (5 engines, 5 boilers, 1 steam turbine)

Gas Flares (3)

Gas Compressor Cooling Water

Interplant High Pressure Digester Gas Line from Plant No. 1

Carbon Scrubbers (3)

Gas Compressor Bldg.

(to Heat Exchanger)

Hot Water

Centrate

Dewatering Scrubbers Biofilter

Sludge Digesters

Ferric Chloride

A Segment (F,G,H,N,O,T)

B Segment (P,Q,R,S)

C Segment (C,D,E,L,M)

Holding Digesters (I,J,K)

Centrifuge (5)

Polymer

Dilution Water

Cake Transfer (5 pumps)

Hoppers A, B and Truckloading

Truckloading Odor Scrubber

Biosolids Recycle

LEGEND

- Plant Influent
- Primary Influent
- Primary Effluent
- Secondary Effluent
- Plant Discharge
- Solids
- Chemical Addition
- Foul Air
- Digester Gas
- Grit and Screenings
- GWRS
- Alternate Routing

NOTE: Thicker lines denote main flow direction.

OC SAN
ORANGE COUNTY SANITATION DISTRICT

Unit Process Schematic
OCSD Reclamation Plant No. 2
rev. 09/19/23

Appendix E
AM KPI Supplemental Information

Appendix E

Program Monitoring KPI Data

Plant No. 1 Maintenance Activity Data

Sum of actlabhrs	Column Labels					
	Group1		Group1 Total	CM	CM Total	Grand Total
Row Labels	PD	PM		CM		
Preliminary Treatment	8.0%	33.0%	41.0%	59.0%	59.0%	100%
Primary Treatment	4.1%	33.4%	37.5%	62.5%	62.5%	100%
Interplant	0.0%	34.1%	34.1%	65.9%	65.9%	100%
Secondary Treatment - Activated Sludge	9.1%	48.5%	57.6%	42.4%	42.4%	100%
Secondary Treatment - Trickling Filters	5.6%	20.7%	26.3%	73.7%	73.7%	100%
Solids Handling - Digesters	9.2%	32.8%	42.0%	58.0%	58.0%	100%
Solids Handling - Facilities	12.8%	47.6%	60.3%	39.7%	39.7%	100%
Central Power Generation	15.5%	37.4%	52.9%	47.1%	47.1%	100%
Electrical Distribution	8.8%	68.6%	77.4%	22.6%	22.6%	100%
Utilities	9.6%	21.9%	31.5%	68.5%	68.5%	100%
Grand Total	**9.5%**	**42.0%**	**51.5%**	**48.5%**	**48.5%**	**100%**

Plant No. 1 Maintenance Cost and Labor Hour

Row Labels	FY19/20	FY20/21	FY21/22	FY22/23	Grand Total
Utilities	$ 77,631	$ 116,792	$ 107,852	$ 138,885	$ 441,161
Solids Handling - Facilities	$ 376,349	$ 1,020,481	$ 1,555,219	$ 910,940	$ 3,862,989
Solids Handling - Digesters	$ 65,939	$ 471,345	$ 102,912	$ 476,384	$ 1,116,581
Secondary Treatment - Trickling Filters	$ 36,448	$ 19,661	$ 11,391	$ 60,328	$ 127,827
Secondary Treatment - Activated Sludge	$ 189,689	$ 573,375	$ 266,568	$ 902,950	$ 1,932,582
Primary Treatment	$ 322,086	$ 235,044	$ 368,205	$ 423,047	$ 1,348,382
Preliminary Treatment	$ 182,331	$ 277,461	$ 560,414	$ 358,663	$ 1,378,868
Interplant	$ 129	$ 1,274	$ 3,871	$ 127	$ 5,402
Electrical Distribution	$ 99,052	$ 343,786	$ 307,243	$ 128,613	$ 878,694
Central Power Generation	$ 84,162	$ 203,897	$ 207,719	$ 179,392	$ 675,170
Grand Total	**$ 1,433,817**	**$ 3,263,116**	**$ 3,491,396**	**$ 3,579,330**	**$ 11,767,658**

Plant No. 1 Labor Hours

Row Labels	FY19/20	FY20/21	FY21/22	FY22/23	Grand Total
Utilities	1,299	1,680	1,562	1,545	6,086
Solids Handling - Facilities	6,754	7,215	6,782	7,615	28,366
Solids Handling - Digesters	2,165	2,765	2,184	3,479	10,593
Secondary Treatment - Trickling Filters	655	860	717	1,042	3,274
Secondary Treatment - Activated Sludge	6,709	6,634	7,446	8,517	29,306
Primary Treatment	4,464	5,164	5,129	5,618	20,375
Preliminary Treatment	3,784	3,954	5,195	4,335	17,268
Interplant	16	43	20	90	169
Electrical Distribution	2,838	2,999	2,986	3,551	12,374
Central Power Generation	2,577	2,706	3,283	3,784	12,351
Grand Total	**31,262**	**34,019**	**35,302**	**39,577**	**140,160**

Plant 1 Maintenance Activity Code

Sum of actlabhrs	Column Labels					
Row Labels	10	20	30	40	50	Grand Total
Central Power Generation	1.90%	22.26%	50.68%	16.96%	8.21%	100.00%
Electrical Distribution	2.31%	65.53%	25.64%	1.74%	4.79%	100.00%
Interplant	0.00%	34.07%	4.99%	60.94%	0.00%	100.00%
Other	5.27%	52.74%	33.56%	2.74%	5.68%	100.00%
Preliminary Treatment	4.08%	20.77%	46.00%	18.43%	10.73%	100.00%
Primary Treatment	1.34%	34.84%	25.80%	27.79%	10.23%	100.00%
Secondary Treatment - Activated Sludge	6.17%	32.94%	51.69%	6.26%	2.95%	100.00%
Secondary Treatment - Trickling Filters	0.77%	21.52%	57.04%	12.62%	8.06%	100.00%
Solids Handling - Digesters	7.26%	21.74%	47.19%	20.69%	3.13%	100.00%
Solids Handling - Facilities	2.37%	14.97%	66.45%	11.46%	4.74%	100.00%
Utilities	2.23%	30.90%	42.81%	19.14%	4.92%	100.00%
Grand Total	**3.62%**	**29.87%**	**46.57%**	**13.88%**	**6.05%**	**100.00%**

Plant No. 2 Maintenance Activity Data

Sum of actlabhrs	Column Labels					
	Group1		Group1 Total	CM	CM Total	Grand Total
Row Labels	PD	PM		CM		
Preliminary Treatment	7.63%	30.18%	37.8%	62.20%	62.2%	100%
Primary Treatment	2.63%	33.76%	36.4%	63.61%	63.6%	100%
Secondary Treatment - Activated Sludge	10.30%	37.63%	47.9%	52.08%	52.1%	100%
Secondary Treatment - Trickling Filters	4.55%	44.12%	48.7%	51.34%	51.3%	100%
Solids Handling - Digesters	10.32%	36.37%	46.7%	53.31%	53.3%	100%
Solids Handling - Facilities	13.08%	35.79%	48.9%	51.13%	51.1%	100%
Central Power Generation	11.38%	36.63%	48.0%	51.99%	52.0%	100%
Effluent Disposal	11.71%	27.20%	38.9%	61.08%	61.1%	100%
Electrical Distribution	15.88%	53.50%	69.4%	30.62%	30.6%	100%
Utilities	17.92%	27.34%	45.3%	54.74%	54.7%	100%
Grand Total	**10.31%**	**36.68%**	**47.0%**	**53.01%**	**53.0%**	**100%**

Plant No. 2 Maintenance Cost and Labor Hour

Row Labels	FY19/20	FY20/21	FY21/22	FY22/23	Grand Total
Utilities	$ 108,149	$ 80,937	$ 102,743	$ 106,216	$ 398,044
Solids Handling - Facilities	$ 244,815	$ 309,869	$ 446,100	$ 558,182	$ 1,558,966
Solids Handling - Digesters	$ 101,361	$ 76,496	$ 161,736	$ 138,026	$ 477,620
Secondary Treatment - Trickling Filters	$ 41,765	$ 135,668	$ 65,575	$ 165,746	$ 408,754
Secondary Treatment - Activated Sludge	$ 293,271	$ 305,721	$ 514,521	$ 407,396	$ 1,520,909
Primary Treatment	$ 161,145	$ 149,015	$ 248,595	$ 188,878	$ 747,634
Preliminary Treatment	$ 107,316	$ 206,639	$ 350,177	$ 398,801	$ 1,062,933
Electrical Distribution	$ 95,924	$ 273,276	$ 179,106	$ 214,348	$ 762,654
Effluent Disposal	$ 68,107	$ 50,630	$ 59,967	$ 41,519	$ 220,223
Central Power Generation	$ 241,524	$ 367,368	$ 233,256	$ 297,690	$ 1,139,838
Grand Total	**$ 1,463,378**	**$1,955,619**	**$2,361,775**	**$2,516,802**	**$8,297,575**

Plant No. 2 Labor Hours

Row Labels	FY19/20	FY20/21	FY21/22	FY22/23	Grand Total
Utilities	1,677	1,782	1,691	1,522	6,671
Solids Handling - Facilities	4,789	5,098	6,236	5,785	21,908
Solids Handling - Digesters	2,015	2,064	2,445	2,467	8,990
Secondary Treatment - Trickling Filters	1,412	1,940	1,599	2,393	7,343
Secondary Treatment - Activated Sludge	4,944	4,180	5,370	5,382	19,875
Primary Treatment	2,581	2,547	3,062	3,121	11,310
Preliminary Treatment	3,710	4,301	4,587	7,138	19,736
Electrical Distribution	2,773	2,443	2,567	3,773	11,556
Effluent Disposal	1,401	1,038	1,126	1,086	4,651
Central Power Generation	4,726	5,232	4,748	6,487	21,192
Grand Total	**30,028**	**30,624**	**33,430**	**39,152**	**133,232**

Plant 2 Maintenance Activity Code

Sum of actlabhrs	Column Labels					
Row Labels	10	20	30	40	50	Grand Total
Central Power Generation	8.01%	19.33%	63.87%	7.63%	1.16%	100.00%
Effluent Disposal	6.42%	33.51%	35.97%	12.84%	11.25%	100.00%
Electrical Distribution	7.53%	58.79%	19.12%	9.64%	4.92%	100.00%
Other	8.90%	11.72%	57.43%	5.47%	16.48%	100.00%
Preliminary Treatment	7.55%	18.94%	48.83%	19.50%	5.18%	100.00%
Primary Treatment	5.49%	16.69%	52.71%	23.67%	1.45%	100.00%
Secondary Treatment - Activated Sludge	4.76%	33.59%	45.39%	11.59%	4.67%	100.00%
Secondary Treatment - Trickling Filters	2.08%	13.22%	57.30%	20.57%	6.82%	100.00%
Solids Handling - Digesters	11.75%	15.49%	62.18%	8.29%	2.29%	100.00%
Solids Handling - Facilities	3.18%	18.85%	52.14%	20.09%	5.73%	100.00%
Utilities	1.02%	25.07%	57.84%	12.29%	3.78%	100.00%
Grand Total	**6.13%**	**24.51%**	**50.26%**	**14.65%**	**4.45%**	**100.00%**

Pump Station Maintenance Activity Data

	Group1		Group1 Total	CM	CM Total	Grand Total
Row Labels	PD	PM		CM		
'A' Street PS	7.77%	51.77%	59.5%	40.46%	40.5%	100%
15th Street PS	6.00%	78.45%	84.5%	15.55%	15.5%	100%
Lido PS	9.20%	41.02%	50.2%	49.78%	49.8%	100%
Bay Bridge PS	9.26%	28.20%	37.5%	62.54%	62.5%	100%
Rocky Point PS	14.81%	53.79%	68.6%	31.40%	31.4%	100%
Bitter Point PS	14.62%	59.50%	74.1%	25.89%	25.9%	100%
Yorba Linda PS	11.01%	68.69%	79.7%	20.31%	20.3%	100%
Main Street PS	7.74%	65.81%	73.5%	26.46%	26.5%	100%
MacArthur PS	15.52%	45.71%	61.2%	38.76%	38.8%	100%
Seal Beach PS	6.19%	54.40%	60.6%	39.41%	39.4%	100%
Westside PS	21.67%	42.64%	64.3%	35.69%	35.7%	100%
Edinger PS	10.53%	33.60%	44.1%	55.87%	55.9%	100%
Slater PS	10.37%	67.54%	77.9%	22.09%	22.1%	100%
College PS	11.15%	60.61%	71.8%	28.23%	28.2%	100%
Crystal Cove PS	9.89%	80.28%	90.2%	9.83%	9.8%	100%
Grand Total	**10.61%**	**56.63%**	**67.2%**	**32.75%**	**32.8%**	**100%**

Pump Station Maintenance Cost and Labor Hour at Pump Stations

Sum of M&S Costs	Column Labels				
Row Labels	FY19/20	FY20/21	FY21/22	FY22/23	Grand Total
Yorba Linda PS	$ 20,572	$ 1,899	$ 9,846	$ 3,581	$ 35,897
Westside PS	$ 7,862	$ 12,561	$ 2,753	$ 5,671	$ 28,848
Slater PS	$ 7,190	$ 8,200	$ 49,393	$ 5,772	$ 70,554
Seal Beach PS	$ 39,357	$ 34,840	$ 4,983	$ 4,234	$ 83,415
Rocky Point PS	$ 95	$ 126	$ 5,045	$ 3,667	$ 8,932
Main Street PS	$ 15,705	$ 31,724	$ 35,790	$ 6,776	$ 89,995
MacArthur PS	$ 1,974	$ 6,951	$ 1,279	$ 5,020	$ 15,225
Lido PS	$ 1,564	$ 9,256	$ 961	$ 12,013	$ 23,795
Edinger PS	$ 1,303	$ 1,040	$ 2,635	$ 6,093	$ 11,071
Crystal Cove PS	$ 21,309	$ 7,000	$ 18,675	$ 1,459	$ 48,443
College PS	$ 461	$ 16,210	$ 3,026	$ 1,971	$ 21,668
Bitter Point PS	$ 13,573	$ 33,194	$ 34,543	$ 13,877	$ 95,187
Bay Bridge PS	$ 17,214	$ 55,315	$ 41,966	$ 98,162	$ 212,657
'A' Street PS	$ 3,683	$ 4,188	$ 8,207	$ 12,521	$ 28,599
15th Street PS	$ 12,704	$ 14,467	$ 16,826	$ 17,447	$ 61,444
Grand Total	**$ 164,567**	**$236,970**	**$235,929**	**$198,264**	**$ 835,730**

Pump Station Labor Hours

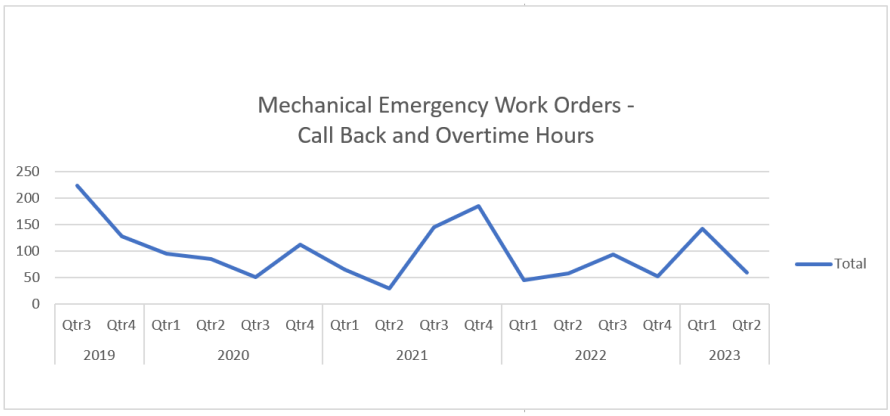
Sum of actlabhrs	Column Labels				
Row Labels	FY19/20	FY20/21	FY21/22	FY22/23	Grand Total
Yorba Linda PS	450	256	302	293	1,300
Westside PS	312	417	273	428	1,429
Slater PS	661	719	771	892	3,043
Seal Beach PS	905	730	895	671	3,200
Rocky Point PS	213	233	277	294	1,016
Main Street PS	905	837	620	679	3,040
MacArthur PS	204	187	182	263	835
Lido PS	298	532	227	451	1,507
Edinger PS	147	166	172	311	796
Crystal Cove PS	676	322	329	379	1,706
College PS	256	340	230	253	1,079
Bitter Point PS	701	885	754	777	3,117
Bay Bridge PS	417	741	605	591	2,355
'A' Street PS	330	296	305	396	1,326
15th Street PS	516	502	390	571	1,979
Grand Total	**6,991**	**7,160**	**6,330**	**7,247**	**27,726**

Pump Station Maintenance Activity Code

Sum of actlabhrs	Column Labels					
Row Labels	10	20	30	40	50	Grand Total
15th Street PS	2.10%	50.64%	35.92%	2.10%	9.24%	100.00%
'A' Street PS	11.25%	9.10%	48.36%	6.70%	24.59%	100.00%
Bay Bridge PS	7.91%	11.54%	49.81%	19.24%	11.50%	100.00%
Bitter Point PS	1.35%	10.40%	63.72%	1.87%	22.67%	100.00%
College PS	6.71%	22.21%	47.19%	6.81%	17.08%	100.00%
Crystal Cove PS	5.41%	68.93%	21.70%	2.37%	1.58%	100.00%
Edinger PS	3.05%	35.29%	8.68%	48.39%	4.58%	100.00%
Gisler Air Jumper Station	0.00%	9.35%	66.49%	11.17%	12.99%	100.00%
Lido PS	3.99%	26.61%	25.50%	4.71%	39.19%	100.00%
MacArthur PS	4.86%	43.05%	34.19%	0.57%	17.33%	100.00%
Main Street PS	10.91%	44.07%	32.79%	1.25%	10.98%	100.00%
Other	1.19%	88.59%	3.26%	2.84%	4.12%	100.00%
Rocky Point PS	5.28%	32.85%	43.23%	6.55%	12.09%	100.00%
SARI Metering Station	0.00%	40.34%	45.40%	0.00%	14.26%	100.00%
Seal Beach PS	3.28%	43.55%	27.96%	11.97%	13.24%	100.00%
Slater PS	2.55%	62.84%	22.00%	3.03%	9.59%	100.00%
Westside PS	12.79%	18.87%	50.35%	4.61%	13.38%	100.00%
Yorba Linda PS	4.27%	65.53%	25.26%	0.00%	4.95%	100.00%
Grand Total	**4.72%**	**43.24%**	**32.56%**	**6.55%**	**12.94%**	**100.00%**

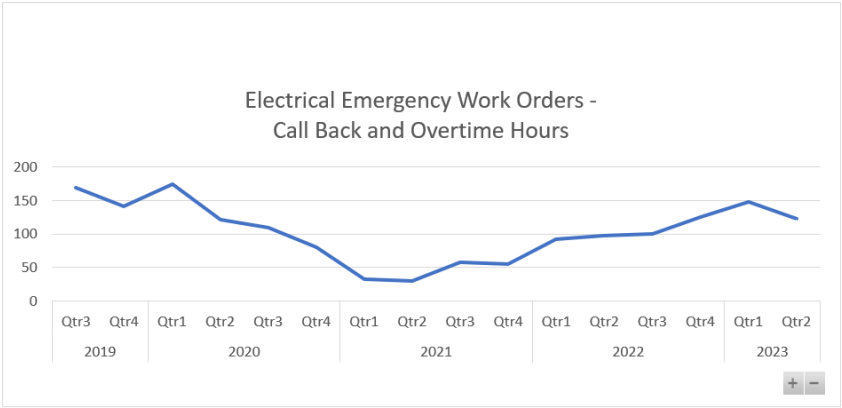
Mechanical Emergency Work Hours

Row Labels	Sum of Overtime
2019	351.75
Qtr3	223.25
Qtr4	128.5
2020	342.5
Qtr1	94.5
Qtr2	85
Qtr3	50.75
Qtr4	112.25
2021	423.75
Qtr1	64.75
Qtr2	29
Qtr3	145.5
Qtr4	184.5
2022	249.25
Qtr1	45.75
Qtr2	57.75
Qtr3	93.25
Qtr4	52.5
2023	200.25
Qtr1	141.5
Qtr2	58.75
Grand Total	1567.5



Electrical Emergency Work Hours

Row Labels	Sum of Overtime
2019	310.5
Qtr3	169.75
Qtr4	140.75
2020	485.5
Qtr1	174.25
Qtr2	121.75
Qtr3	109
Qtr4	80.5
2021	174
Qtr1	32.25
Qtr2	30
Qtr3	57
Qtr4	54.75
2022	413.75
Qtr1	92
Qtr2	97.25
Qtr3	99.5
Qtr4	125
2023	270.5
Qtr1	147.5
Qtr2	123
Grand Total	1654.25



OCSAN
ORANGE COUNTY SANITATION DISTRICT

Orange County Sanitation District, Engineering Planning Division
10844 Ellis Avenue, Fountain Valley, California 92708-7018
714.962.2411 | www.ocsan.gov