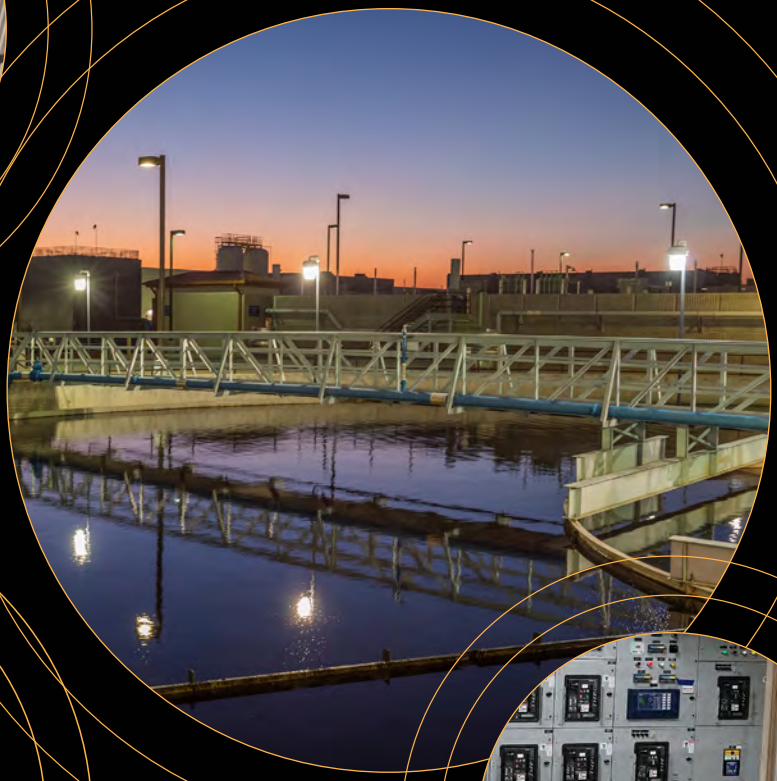
Asset Management Plan 2024



OCSAN
ORANGE COUNTY SANITATION DISTRICT
70 Years

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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
CPUC	California Public Utilities Commission
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
Elec.	Electrical
EMP	Energy and Digester Gas Master Plan
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
HEX	Heat Exchanger
HP	Horsepower
HPOAS	High-Purity Oxygen-Activated Sludge

Acronym or Abbreviation	Meaning
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
MGD	Million Gallon(s) Per Day
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
PIC/TIC	Pressure Indicating Controller/Temperature Indicating Controller
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
RIO	Remote Input Output
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
SBS	Sodium Bisulfite System
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
Sq.	Square
SR	Secondary Return
SRR	Sludge Reaeration Reactor
SSC	South Scrubber Complex
SSO	Sanitary Sewer Overflow
T&D	Thickening and Dewatering
TBD	To Be Determined
TDS	Total Dissolved Solid
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
TPAD	Temperature-Phased Anaerobic Digester

Acronym or Abbreviation	Meaning
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
VSA	Vacuum Swing Adsorption
WAS	Waste-Activated Sludge
WSS	Waste Secondary Sludge
WSSPS	Waste Sidestream Pump Station

Executive Summary

Asset Management Plan Intent and Purpose

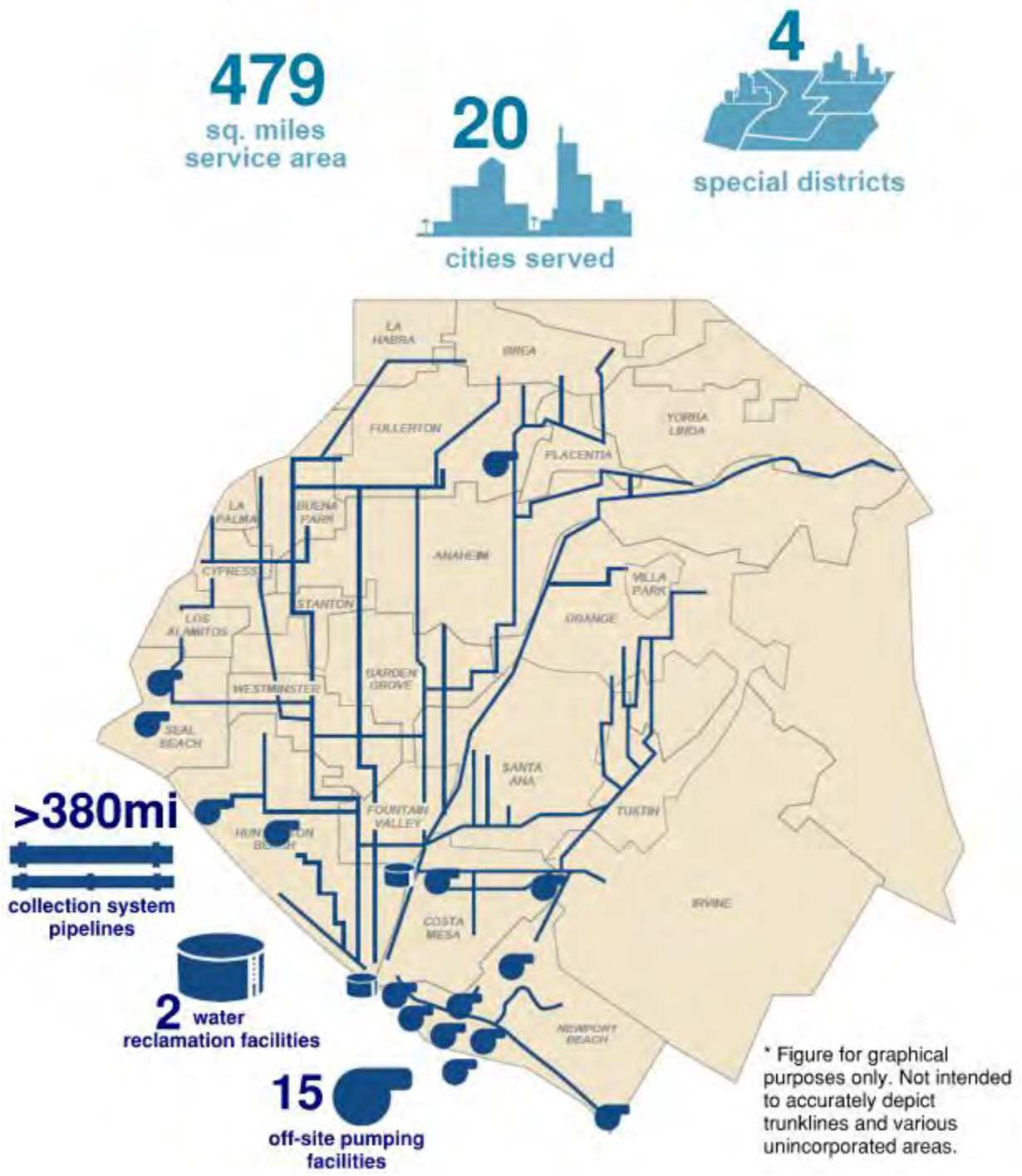
The Orange County Sanitation District (OC San) Asset Management Plan (AMP) is a tactical document that captures OC San's organizational structure, maintenance plans, and capital improvement plan implementation on an annual basis. This document will continue to change in content and structure to reflect 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. OC San manages asset reliability, mitigates risk, and ensures the quality of our delivered services according to the following stated intent or mission statement of the 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 over 380 miles of regional trunk sewer pipelines and 15 pump stations throughout the OC San service area (Figure ES-1). Wastewater is conveyed to Reclamation Plant Number (No.) 1 in Fountain Valley and Reclamation Plant No. 2 in Huntington Beach. These facilities treat an average daily wastewater flow of more than 190 million gallons per day, serving over 2.6 million people in central and northern Orange County, California.



Please see the comprehensive Acronyms and Abbreviations list for definitions.

Figure ES-1. OC San's Service Area

Figure ES-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) 2024–2025 is $14.0 billion based on the Engineering News-Record Construction Cost Index increases since the 2017 Facilities Master Plan.

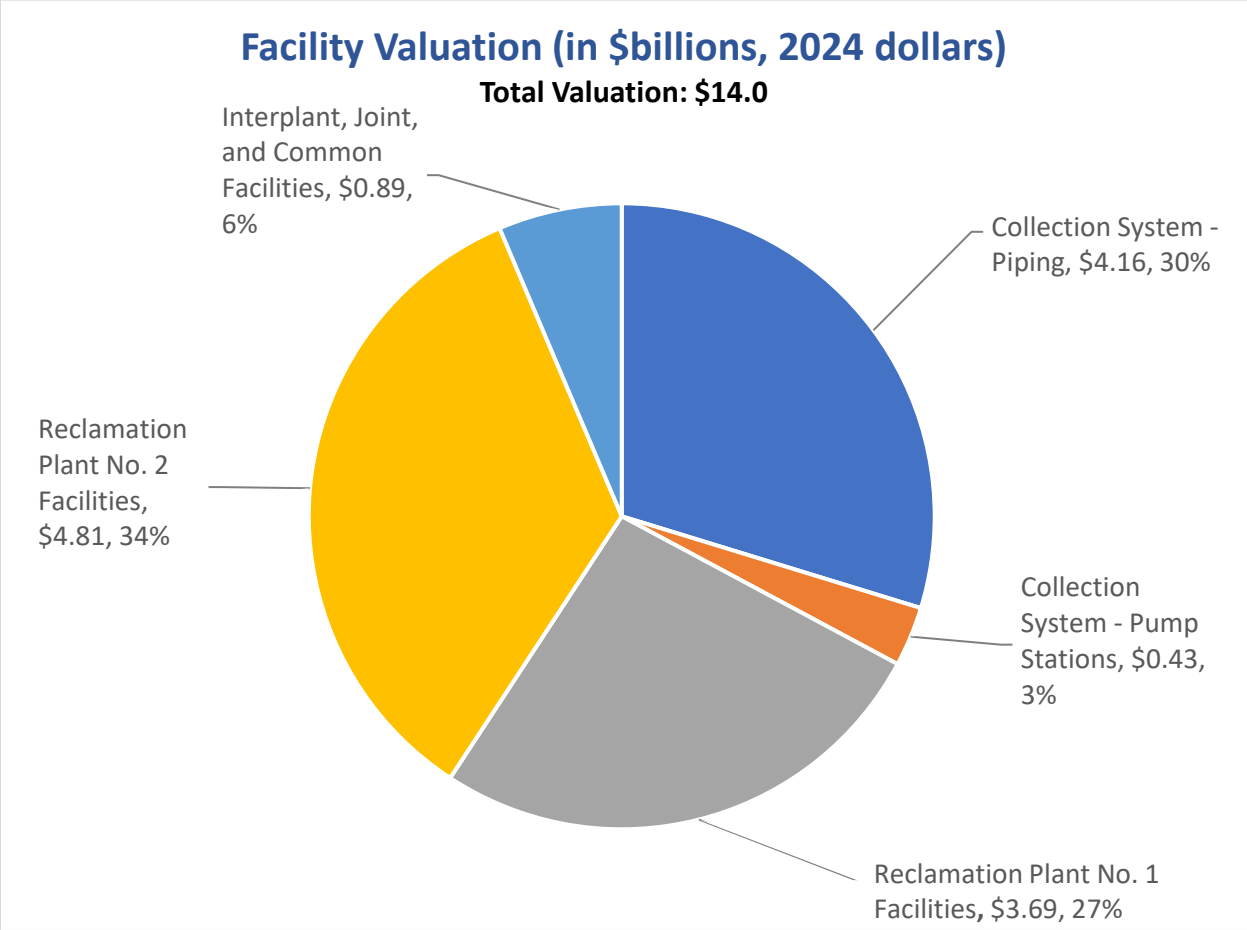


Figure ES-2. Facility Valuation by Location

State of OC San's Infrastructure

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

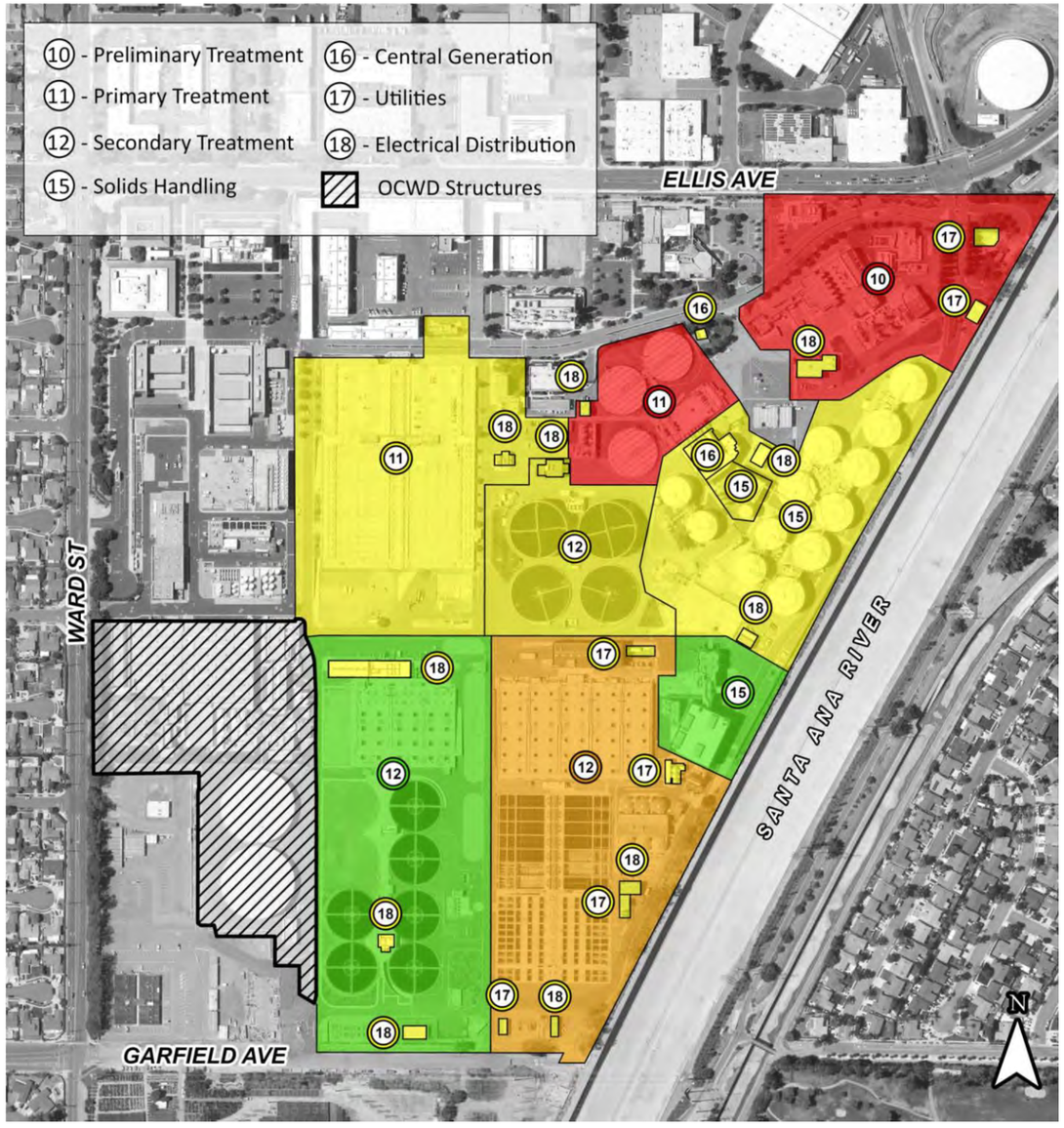
- Plant No. 1 (Figure ES-3 and Table ES-1)
- Plant No. 2 (Figure ES-4 and Table ES-2)
- Collection System – Pump Stations and Newport Force Mains (Figure ES-5 and Table ES-3)
- Collection System – Pipelines and Manholes (Figure ES-6 and Table ES-4)

The 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 major 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 remain for an asset or set of assets. A RUL score of 4 indicates 5 to 10 years of useful life remain for an asset or a set of assets.
- **Replacement Value ($ millions):** Process area replacement value from the facility valuation.

AREA ASSET MANAGEMENT SUMMARY – PLANT NO. 1 OVERVIEW



Note: Areas 14 and 19 are excluded from the map. The colored process areas reflect the average RUL score as shown on the respective table.

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

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

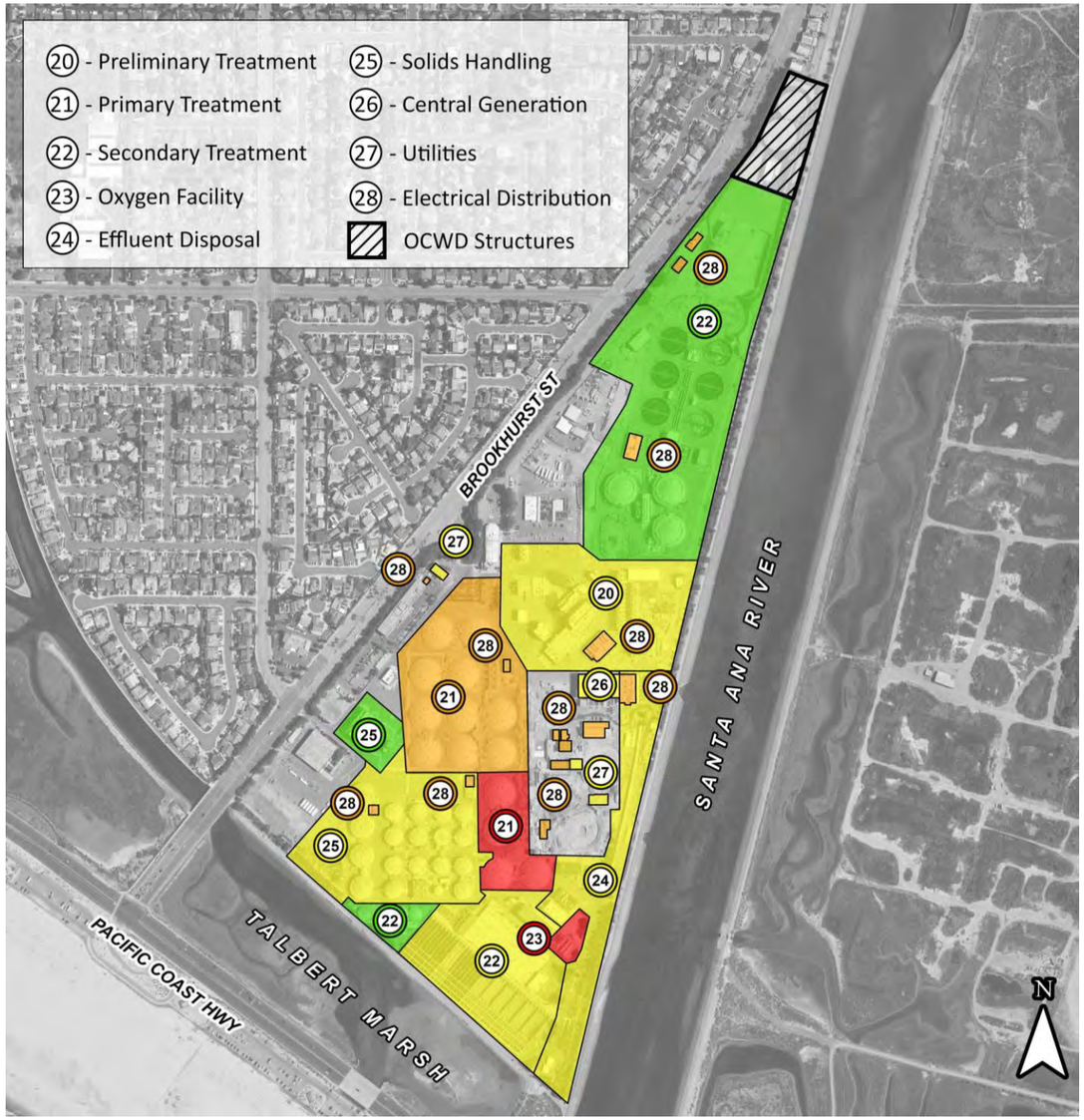
Area No.	Area Name	Average Remaining Useful Life Score						Percentage of RUL Scores with 4s or 5s	Replacement Value ($ millions, in 2024 dollars)
		Civil	Structural	Mechanical	Electrical	Instrumentation	All Assets		
10	Preliminary Treatment	3	3	5	5	5	5	69%	$459
11	Primary Treatment - Basins (1–5)	5	3	5	5	4	5	74%	$127
11	Primary Treatment - Basins (6–31)	3	3	4	4	3	3	32%	$464
12	Secondary Treatment - Activated Sludge 1 (AS1)	3	4	4	4	5	4	73%	$717
12	Secondary Treatment - Activated Sludge 2 (AS2)	1	1	2	3	2	2	3%	$443
12	Secondary Treatment - Trickling Filter	1	1	4	3	3	3	20%	$81
14	Interplant[a]	2	2	2		1	2	15%	$894
15	Solids Handling - Digesters	2	2	3	3	3	3	12%	$303
15	Solids Handling – Thickening & Dewatering (T&D) Facilities	1	1	2	2	4	2	25%	$226
15	Solids Handling - Gas Handling[a]		3	3	3	4	3	44%	$44
16	Central Generation (Cen Gen)[a]		1	4	3	4	3	54%	$203
17	Utilities	3	1	4	4	3	3	31%	$231
18	Electrical Distribution[a]				3		3	46%	$97
19	Occupied Buildings	*Refer to Area 19 Asset Management Summary*							$296
	Plant No. 1 Total							**38%**	**$4,585**

Please see the comprehensive Acronyms and Abbreviations list for definitions.

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

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

AREA ASSET MANAGEMENT SUMMARY – PLANT NO. 2 OVERVIEW



Note: Area 29 is excluded from the map. The colored process areas reflect the average RUL score as shown on the respective table.

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

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

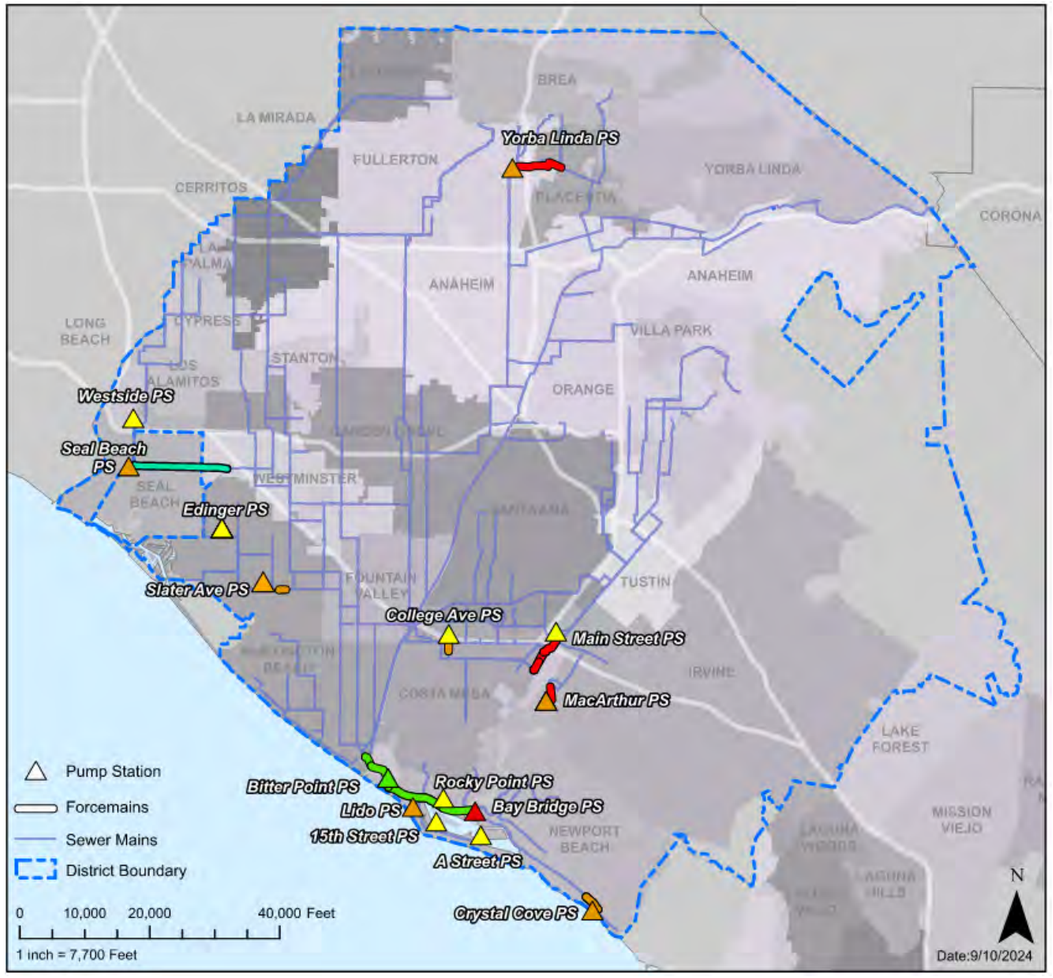
Area No.	Area Name	Average Remaining Useful Life Score						Percentage of RUL Scores with 4s or 5s	Replacement Value ($ millions, in 2024 dollars)
		Civil	Structural	Mechanical	Electrical	Instrumentation	All Assets		
20	Preliminary Treatment	1	1	3	4	3	3	10%	$425
21	Primary Treatment - A Side	5	5	4	4	4	5	86%	$198
21	Primary Treatment - B & C Side	4	3	4	3	4	4	32%	$437
22	Secondary Treatment - Activated Sludge (AS)	3	3	3	4	3	3	28%	$735
22	Secondary Treatment – Dissolved Air Flotation Thickener (DAFT)	4	1	2	2	3	2	13%	$72
22	Secondary Treatment - Trickling Filter	2	1	2	2	3	2	9%	$407
23	Oxygen Facility		5	5	4	4	5	100%	$20
24	Effluent Disposal	2	2	3	4	4	3	33%	$1,069
25	Solids Handling - Digesters	4	4	4	3	3	3	70%	$422
25	Solids Handling - Facilities	2	1	2	2	3	2	5%	$147
25	Solids Handling - Gas Handling[a]		3	4	4	4	4	50%	$44
26	Central Generation (Cen Gen) [a]		1	4	3	4	3	55%	$432
27	Utilities	3	2	3	4	3	3	30%	$129
28	Electrical Distribution[a]				4		4	63%	$95
29	Occupied Buildings	*Refer to Area 29Asset Management Summary*							$174
	Plant No. 2 Total							**42%**	**$4,806**

Please see the comprehensive Acronyms and Abbreviations list for definitions.

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

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

ASSET MANAGEMENT SUMMARY – COLLECTION SYSTEM PUMP STATION OVERVIEW



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. The colored pump stations reflect the average RUL score as shown on the respective table.

Figure ES-5. Collection System Pump Station and Force Main – Remaining Useful Life Score Map

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

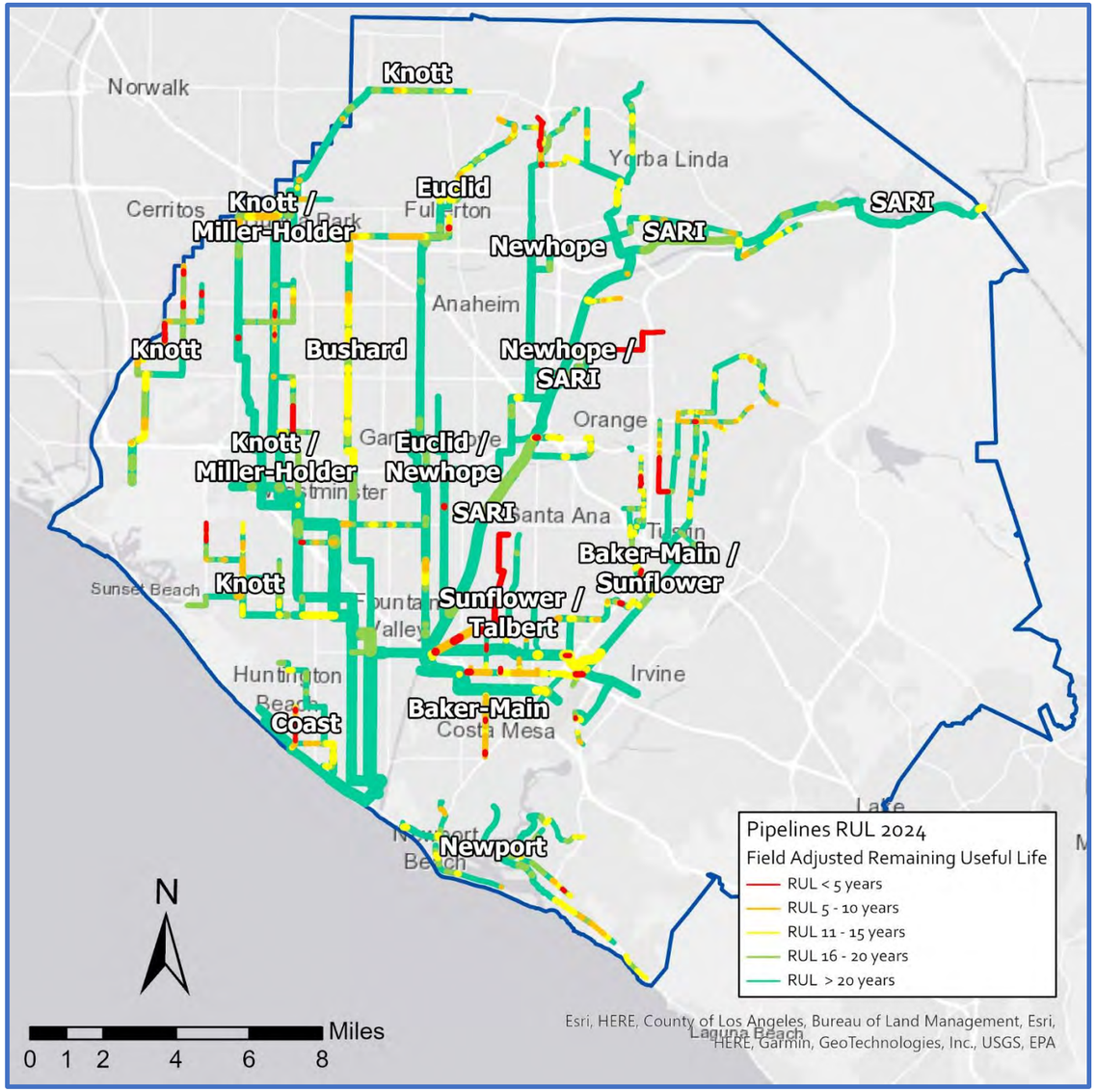
Pump Station	Average Remaining Useful Life Score						Percentage of RUL Scores with 4s or 5s	Replacement Value ($ millions, in 2024 dollars)
	Force Main	Structural	Mechanical	Electrical	Instrumentation	All Assets		
15th Street	3	4	4	3	3	3	27%	$17
A Street	3	4	4	3	3	3	25%	$15
Bay Bridge	5	4	5	4	3	5	85%	$44
Bitter Point	2	2	2	2	4	2	15%	$42
College	4	3	3	2	3	3	25%	$31
Crystal Cove	4	4	3	4	3	4	50%	$3
Edinger	5	4	3	4	5	4	64%	$17
Lido	4	4	4	4	3	4	67%	$26
MacArthur	5	3	4	4	4	4	82%	$21
Main Street	5	2	4	3	4	3	38%	$57
Rocky Point	3	3	3	3	4	3	15%	$21
Slater	4	3	4	3	4	4	31%	$45
Seal Beach	1	4	4	4	5	4	83%	$54
Westside	5	3	3	3	4	3	23%	$39
Yorba Linda [b]	5	4	4	4	4	4	82%	Not valued [b]
Newport Force Mains [a, c]	2					2	0%	
Total							**46%**	**$432**

Please see the comprehensive Acronyms and Abbreviations list for definitions.

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

[a] White box with diagonal line indicates there are no assets assigned to this discipline within this process area.
[b] The station is being decommissioned, hence the replacement value was not included.
[c] The Newport Force Mains replacement value is captured within the collection system valuations. These force mains are common to multiple pump stations.

ASSET MANAGEMENT SUMMARY – COLLECTION SYSTEM PIPELINES AND MANHOLES OVERVIEW



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.

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

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

Trunklines	No. of Pipes with RUL Score of 4 or 5	Miles of Pipes with RUL Score of 4 or 5	Percentage of Pipes with RUL Score of 4 or 5 (by length)	No. of Manholes with RUL Score of 4 or 5	Percentage of Manholes with RUL Score of 4 or 5	Replacement Value ($ millions, in 2024 dollars)[a]
Baker-Main	88	5.9	15%	-[b]	-[b]	$356
Bushard	10	1.2	6%	3	1%	$312
Coast	16	1.0	9%	-[b]	-[b]	$128
Euclid	7	0.8	2%	69	16%	$348
Interplant[c]	0	0.0	0%	0	0%	$149
Knott	49	3.4	5%	84	11%	$807
Miller-Holder	21	1.6	5%	43	16%	$382
Newhope	25	1.7	6%	84	24%	$270
Newport	19	1.2	5%	30	7%	$279
Santa Ana River Interceptor	59	2.8	6%	159	28%	$666
Sunflower	15	0.7	2%	-[b]	-[b]	$387
Talbert	77	5.9	71%	-[b]	-[b]	$74
Total	**386**	**26.1**	**7%**	**472**	**11%**	**$4,158**

Please see the comprehensive Acronyms and Abbreviations list for definitions.
[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 trunklines 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 Interplant Trunkline E (IPE) assets. Interplant Trunkline assets are included with Knott Trunkline 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.

The FY 2024–2025 Budget Update, the first year of the 2-year budget adopted in June 2024, includes updates to the 20-year Capital Improvement Program (CIP) outlay. Figure ES-7 includes current and projected CIP projects. The green bars show the current proposed CIP projects while the yellow bars show the future CIP projects, which are reevaluated and adjusted annually to reflect any new information.

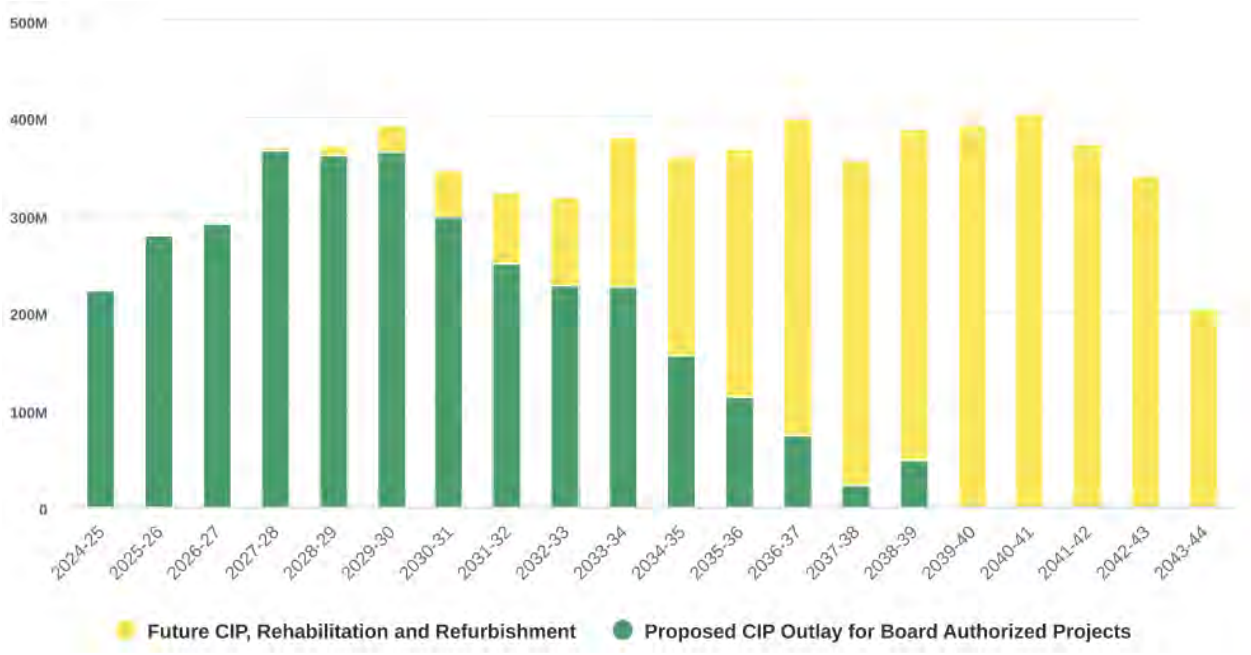


Figure ES-7. 20-Year CIP Outlay

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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 the 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's asset management policy states:

> *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

The asset management policy calls for the following initiatives:

- Create an annual Asset Management Plan (AMP) 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 ensure 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 $14.0 billion in assets on a prioritized risk basis to establish rate structures.

The AMP is a living document that describes evolving operational strategies, maintenance, and refurbishment plans and adaptations, and Capital Improvement Program (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:

- Take a proactive approach to repair, rehabilitate, and replace.
- 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.

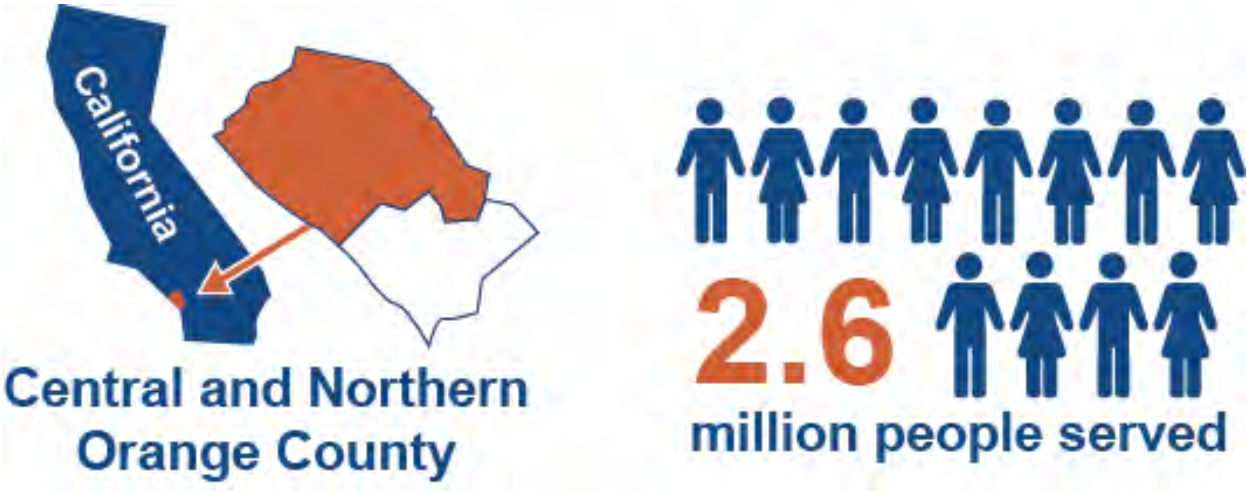
The AMP is a key component of OC San's overall planning activities. It aligns with OC San's Strategic Plan and the Facilities Master Plan (inclusive of the projects identified therein), while identifying potential and new opportunities that may require funding in the budget development process. Table 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 major 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 over 380 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 Reclamation Plant No. 2 in Huntington Beach, where resource recovery and wastewater treatment take place.

OC San's reclamation 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.

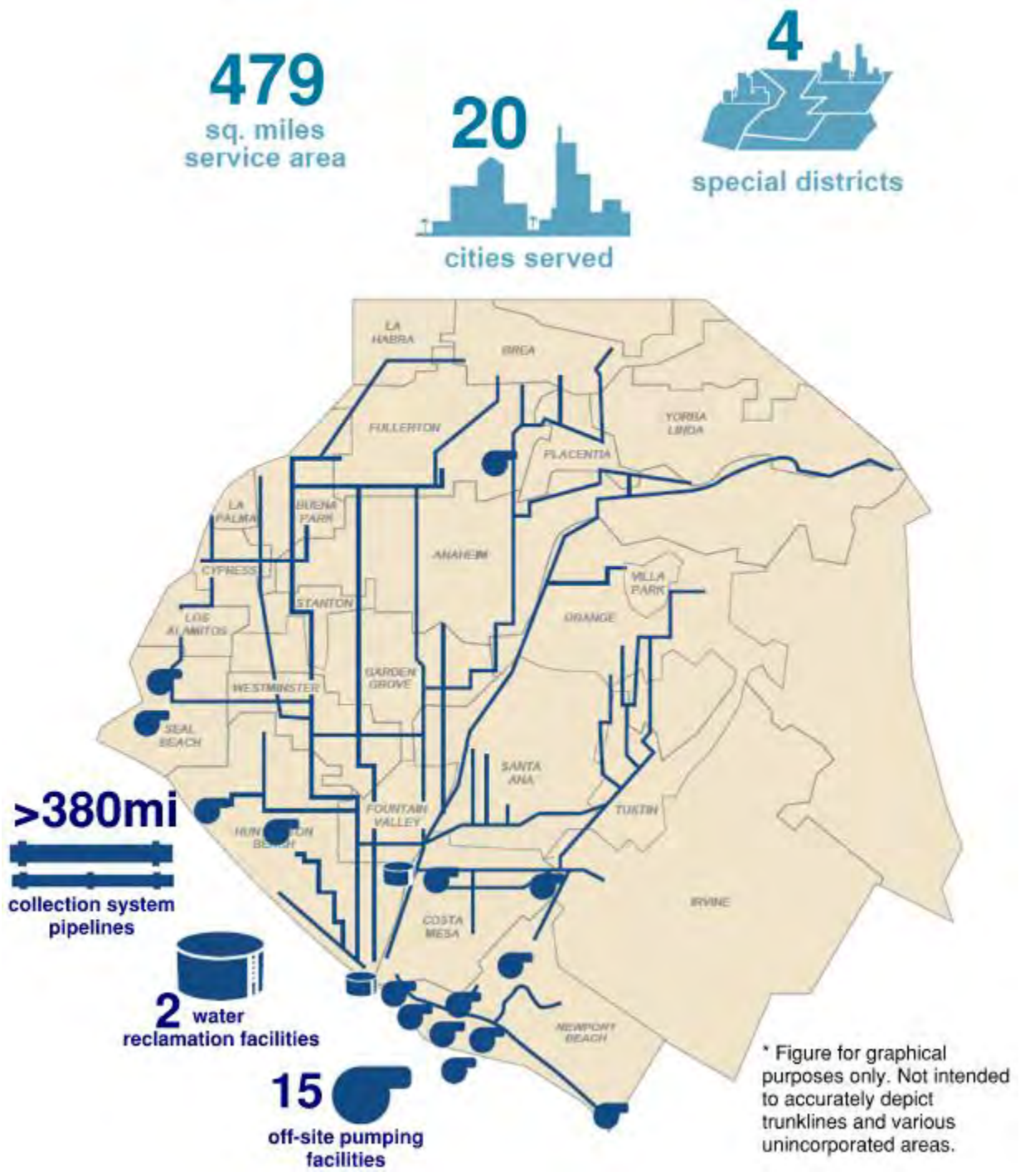


Figure 1-1. OC San's Service Area

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 more than 380 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 more than 4,450 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 ensure 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, which reflect the maximum capacity of each station when all duty pumps are on and standby pumps are off.

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 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 (M&D) structure, mechanical bar screens, grit chambers, and primary basins, before going to one of two air-activated sludge (AS) processes, or trickling filters (TFs), and secondary clarifiers. Thereafter, secondary effluent is diverted to OCWD's facilities for tertiary treatment before reuse. For a summary of Plant No. 1 design capacity, refer to Table 1-3. For a map of the facilities and more detailed understanding of how Plant No. 1 treatment processes work together, 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 No. 2 facility. In addition, Plant No. 1 includes facilities for odor control and chemical addition to support the aforementioned processes.

Reclamation 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-AS secondary treatment facility or the TFs/solids contact basins.

With the construction of the GWRS final expansion and associated projects completed in 2023, Plant No. 2 is able to operate in a separated stream mode, splitting non-reclaimable and reclaimable streams. Additionally, both Plant No. 2 reclaimable secondary effluent and Plant No. 1 secondary effluent are diverting most of their treated water to OCWD for advanced treatment and groundwater injection. For a summary of Plant No. 2 design capacity, 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, 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 primary clarifiers out of service
Secondary	182	345	With all basins, TFs, and clarifiers in service

Please see the comprehensive Acronyms and Abbreviations list for definitions.

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

Treatment Processes	ADWF Capacity (MGD)	PWWF Capacity (MGD)	Notes
Headworks	144	340	Three large and two small duty pumps in service, and one large pump and one small pump on standby
Primary	156	312	With one primary clarifier out of service
Secondary	150	317	With all basins, TFs, and clarifiers in service

Please see the comprehensive Acronyms and Abbreviations list for definitions.

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. Based on the findings of a comprehensive assessment study completed in 2022, 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. OC San's NPDES permit specifies that this outfall can be used only in the case of an emergency or during planned maintenance activities.

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 for Fiscal Year (FY) 2024–2025 is $14.0 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
- Reclamation Plant No. 2 Facilities
- Interplant, Joint, and Common Facilities

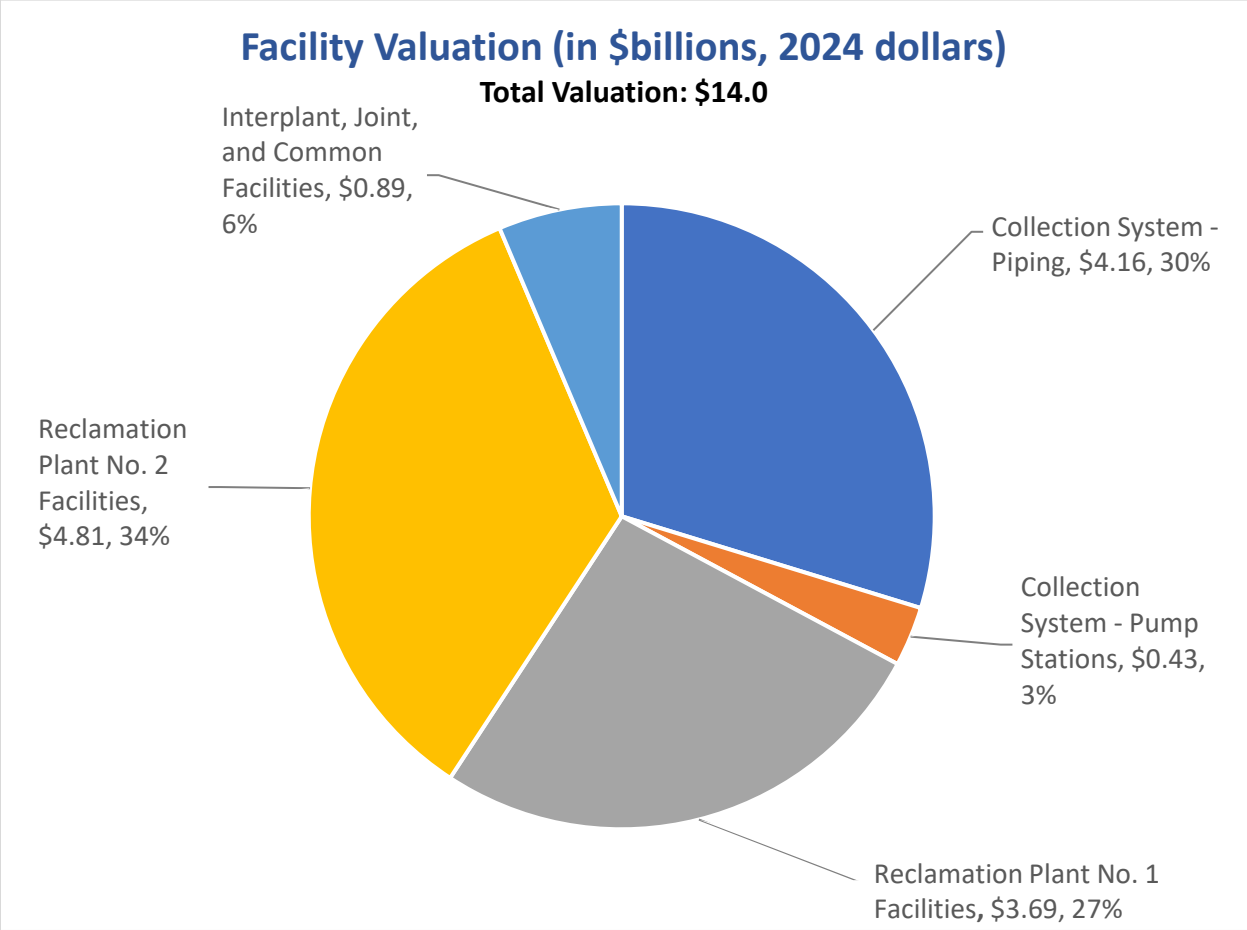


Figure 1-2. FY 2024–2025 Facility Valuation by Area

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 collaborative effort, each OC San group plays an important role in ensuring that the individual asset management initiatives and projects are properly executed (Figure 1-3).

Figure 1-3. Groups with 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.
- **Planning** provides engineering support for short- and long-term management of assets, while working toward asset management objectives. The Asset Management Group works in the Planning Division of Engineering interfacing with Operations, Maintenance, and the other Engineering Divisions on a regular basis.
- **Project Management Office** 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 of facilities' maintenance, repair, and replacement projects.
- **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 documents.

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 Department and Operations and Maintenance (O&M) Departments. OC San's Asset Management Group, within Engineering's 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 and performance 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 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 in a cost-effective manner that optimizes planned maintenance activities.

Collectively, the Area Asset Engineer and O&M 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 policies and initiatives of the AM Program. 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. "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 (PM) 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 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 items using the Enterprise Asset Management (EAM) system, Maximo®. Furthermore, the AMP definition of an "asset" deviates from the Finance and Accounting Division's definition as it is based on accounting practices for tax purposes. In summary, the Asset Management, Maintenance, and Finance groups look at and define assets somewhat differently and it is important to identify those similarities and differences to maintain alignment among the groups to achieve OC San's common goals and objectives.

1.3.2 Remaining Useful Life

An asset's Remaining Useful Life (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 to provide real-time performance evaluation of assets. PdM is a proactive approach that minimizes unexpected breakdowns, extends the mean time between failures (MTBF), and reduces not only the likelihood of failure but also overall equipment downtime and repair costs by monitoring the actual equipment health through quantifiable means and performing advanced analysis and failure detection to identify condition degradation in its early phase (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.

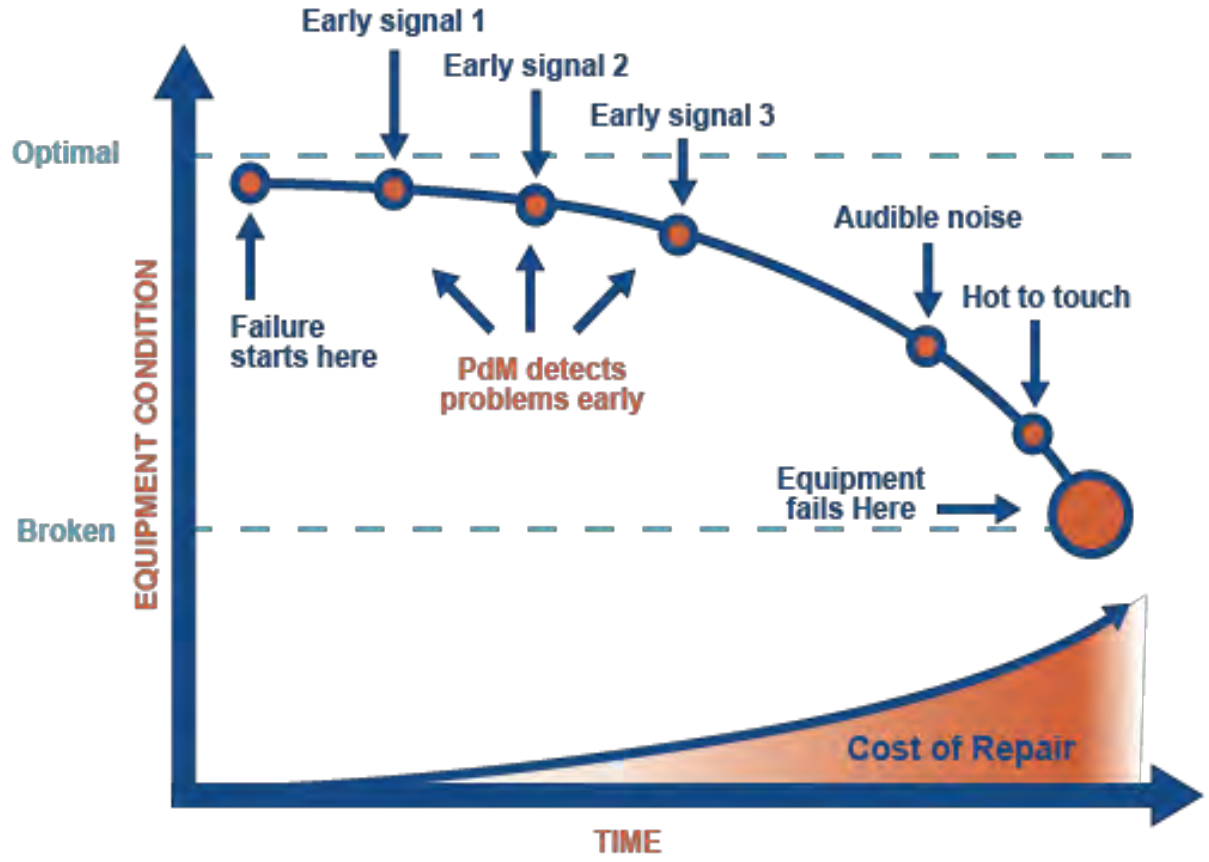


Figure 1-4. PdM Summary

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
- Structure ultrasound
- Infrared thermograph to detect hot spots
- Iris™ motion camera (measures deflection and displacement) – Motion amplification camera

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 and 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 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 PM strategies for new and existing assets and to establish maintenance approaches and strategies for assets installed by projects 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 of 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 throughout both plants and collection system
- Equipment rotation program to ensure equipment wear is predictable

- Mechanical equipment adjusting and alignment
- Equipment rebuilding and regular testing
- Changing of lubricants and filters
- Electrical equipment cleaning and torque verification
- Electrical power distribution equipment testing
- Circuit breaker and protective relay testing
- Sensors and meters calibration

1.3.5 Asset Lifecycle Curve D-I-P-F

The ‘P-F’ curve is a concept that identifies the intervals between Potential Failure ‘P’ and Functional Failure ‘F’ and was first introduced by Stan Nowland and Howard Heap in 1978. The curve has since been extended to include Design ‘D’ and Installation ‘I’ by Doug Plucknette and is called the ‘D-I-P-F’ curve, also known as the Asset Lifecycle Curve.

At OC San, it is understood that detecting potential failure alone is simply not enough to consider a program a success. For each detected potential failure, it is also important to determine the root cause of the failure and know how to eliminate the cause. OC San’s goal is to ensure all asset stakeholders are working together to move to the left of the ‘P-F’ curve into the ‘I-P’ precision domain with proper installation, commissioning, precision alignment, and balancing through good work processes, procedures, and practices. Ultimately, the goal is to apply the lessons learned into the future designs to improve asset reliability and resistance to failure and minimize maintenance costs.

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 AM Summaries provide a list of major assets and are intended to summarize information on those assets, including condition, average RULs, key issues under further investigation, and plans to address performance and reliability issues of these assets over the 1-, 5-, and 10-year planning horizons, as well as CIP projects planned over the next 10 to 15 years. Over the course of the year, Asset Engineers present one or more of the Area AM Summaries to the OC San Managers who make up the AM Council. All the process areas, pump stations, and collection systems are presented with feedback and questions being provided by the AM Council. The Area AM Summaries are updated as needed and incorporated into the AMP, which is published annually.

2.1 Area Asset Management Summaries

The Area AM Summaries provide a high-level overview of the assets in the areas 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 summaries include the following:

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

The Area Asset Management Summaries include an area map (Figure 2-1 through Figure 2-4) showing the general layout of the process areas or collection system, and a table (Table 2-1 through Table 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. A RUL score of 5 indicates fewer than 5 years of useful life remain for an asset or set of assets. A RUL score of 4 indicates 5 to 10 years of useful life remain for an asset or a set of assets.
- **Replacement Value ($ million):** Process area replacement value in FY 2024–2025 dollars based on the Engineering News-Record CCI increases since the 2017 Facilities Master Plan.

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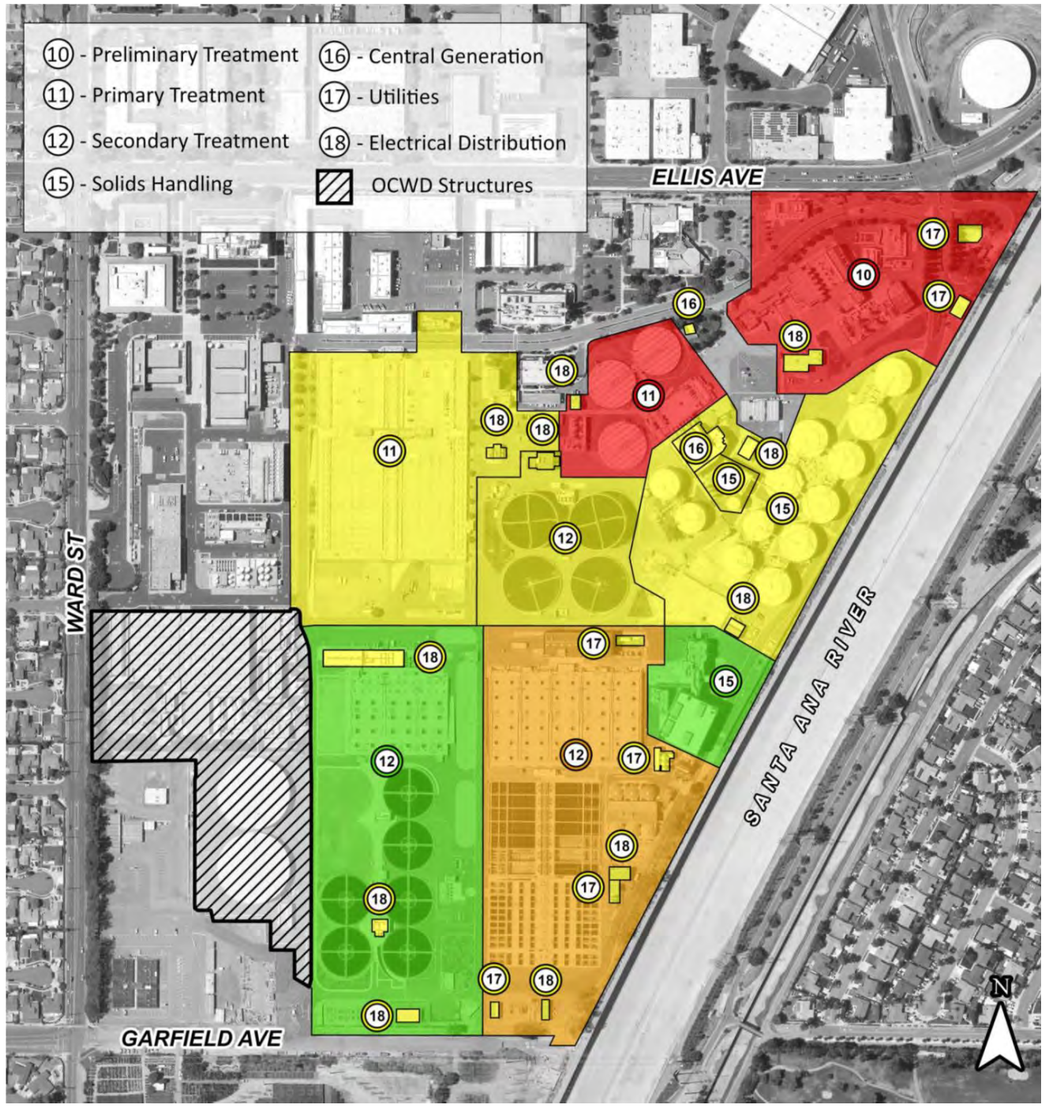
AREA ASSET MANAGEMENT SUMMARY – PLANT NO. 1 OVERVIEW

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



Note: Areas 14 and 19 are excluded from the map. The colored process areas reflect the average RUL score as shown on the respective table.

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 2024 dollars)
		Civil	Structural	Mechanical	Electrical	Instrumentation	All Assets		
10	Preliminary Treatment	3	3	5	5	5	5	69%	$459
11	Primary Treatment - Basins (1–5)	5	3	5	5	4	5	74%	$127
11	Primary Treatment - Basins (6–31)	3	3	4	4	3	3	32%	$464
12	Secondary Treatment – Activated Sludge 1 (AS-1)	3	4	4	4	5	4	73%	$717
12	Secondary Treatment – Activated Sludge 2 (AS-2)	1	1	2	3	2	2	3%	$443
12	Secondary Treatment – Trickling Filter	1	1	4	3	3	3	20%	$81
14	Interplant[a]	2	2	2		1	2	15%	$894
15	Solids Handling - Digesters	2	2	3	3	3	3	12%	$303
15	Solids Handling – Thickening & Dewatering (T&D) Facilities	1	1	2	2	4	2	25%	$226
15	Solids Handling - Gas Handling[a]		3	3	3	4	3	44%	$44
16	Central Generation (Cen Gen)[a]		1	4	3	4	3	54%	$203
17	Utilities	3	1	4	4	3	3	31%	$231
18	Electrical Distribution[a]				3		3	46%	$97
19	Occupied Buildings	*Refer to Area 19 Asset Management Summary*							$296
	Plant No. 1 Total							**38%**	**$4,585**

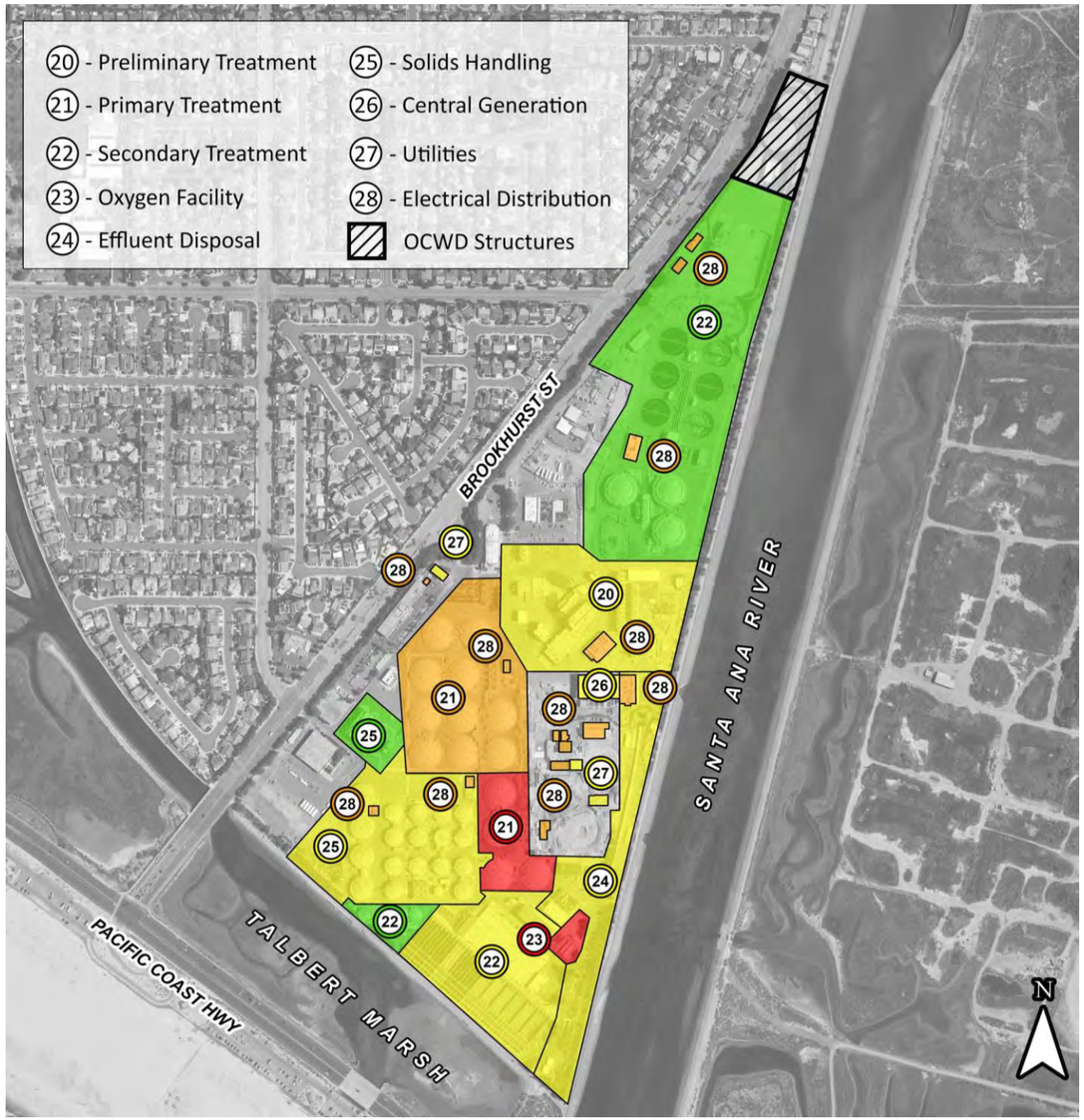
Please see the comprehensive Acronyms and Abbreviations list for definitions.

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

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

AREA ASSET MANAGEMENT SUMMARY – PLANT NO. 2 OVERVIEW

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



Note: Area 29 is excluded from the map. The colored process areas reflect the average RUL score as shown on the respective table.

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 2024 dollars)
		Civil	Structural	Mechanical	Electrical	Instrumentation	All Assets		
20	Preliminary Treatment	1	1	3	4	3	3	10%	$425
21	Primary Treatment - A Side	5	5	4	4	4	5	86%	$198
21	Primary Treatment - B & C Side	4	3	4	3	4	4	32%	$437
22	Secondary Treatment – Activated Sludge	3	3	3	4	3	3	28%	$735
22	Secondary Treatment - DAFT	4	1	2	2	3	2	13%	$72
22	Secondary Treatment – Trickling Filter	2	1	2	2	3	2	9%	$407
23	Oxygen Facility		5	5	4	4	5	100%	$20
24	Effluent Disposal	2	2	3	4	4	3	33%	$1,069
25	Solids Handling - Digesters	4	4	4	3	3	3	70%	$422
25	Solids Handling - Facilities	2	1	2	2	3	2	5%	$147
25	Solids Handling - Gas Handling[a]		3	4	4	4	4	50%	$44
26	Central Generation[a]		1	4	3	4	3	55%	$432
27	Utilities	3	2	3	4	3	3	30%	$129
28	Electrical Distribution[a]				4		4	63%	$95
29	Occupied Buildings	*Refer to Area 29 Asset Management Summary*							$174
	Plant No. 2 Total							**42%**	**$4,806**

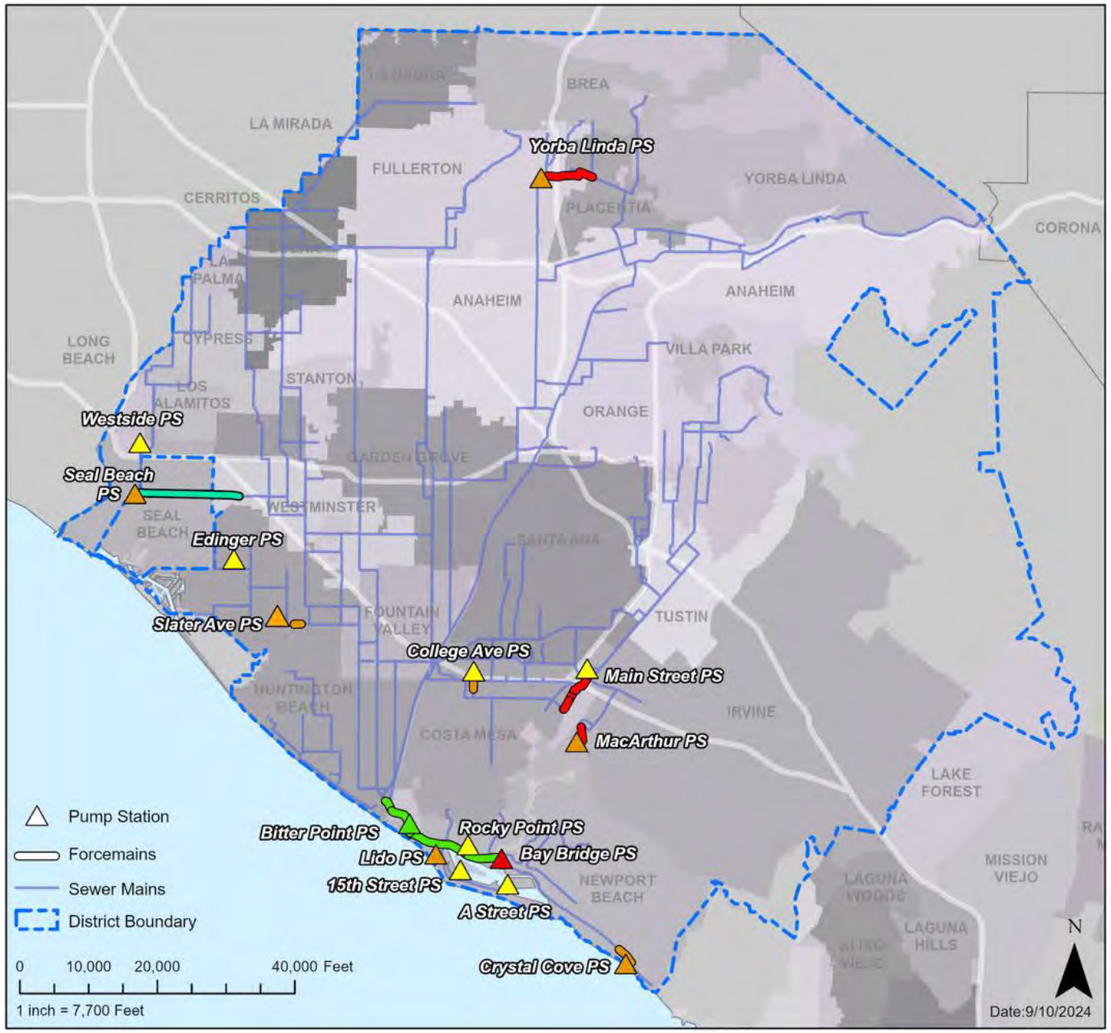
Please see the comprehensive Acronyms and Abbreviations list for definitions.

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

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

ASSET MANAGEMENT SUMMARY – COLLECTION SYSTEM PUMP STATION OVERVIEW

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



Note: Not all pump station force mains are shown on this map. Only longer force mains are shown. The colored pump stations reflect the average RUL score as shown on the respective table.

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 2024 dollars)
	Force Main	Structural	Mechanical	Electrical	Instrumentation	All Assets		
15th Street	3	4	4	3	3	3	27%	$17
A Street	3	4	4	3	3	3	25%	$15
Bay Bridge	5	4	5	4	3	5	85%	$44
Bitter Point	2	2	2	2	4	2	15%	$42
College	4	3	3	2	3	3	25%	$31
Crystal Cove	4	4	3	4	3	4	50%	$3
Edinger	5	4	3	4	5	4	64%	$17
Lido	4	4	4	4	3	4	67%	$26
MacArthur	5	3	4	4	4	4	82%	$21
Main Street	5	2	4	3	4	3	38%	$57
Rocky Point	3	3	3	3	4	3	15%	$21
Slater	4	3	4	3	4	4	31%	$45
Seal Beach	1	4	4	4	5	4	83%	$54
Westside	5	3	3	3	4	3	23%	$39
Yorba Linda[b]	5	4	4	4	4	4	82%	Not valued
Newport Force Mains[a, c]	2					2	0%	
Total							**46%**	**$432**

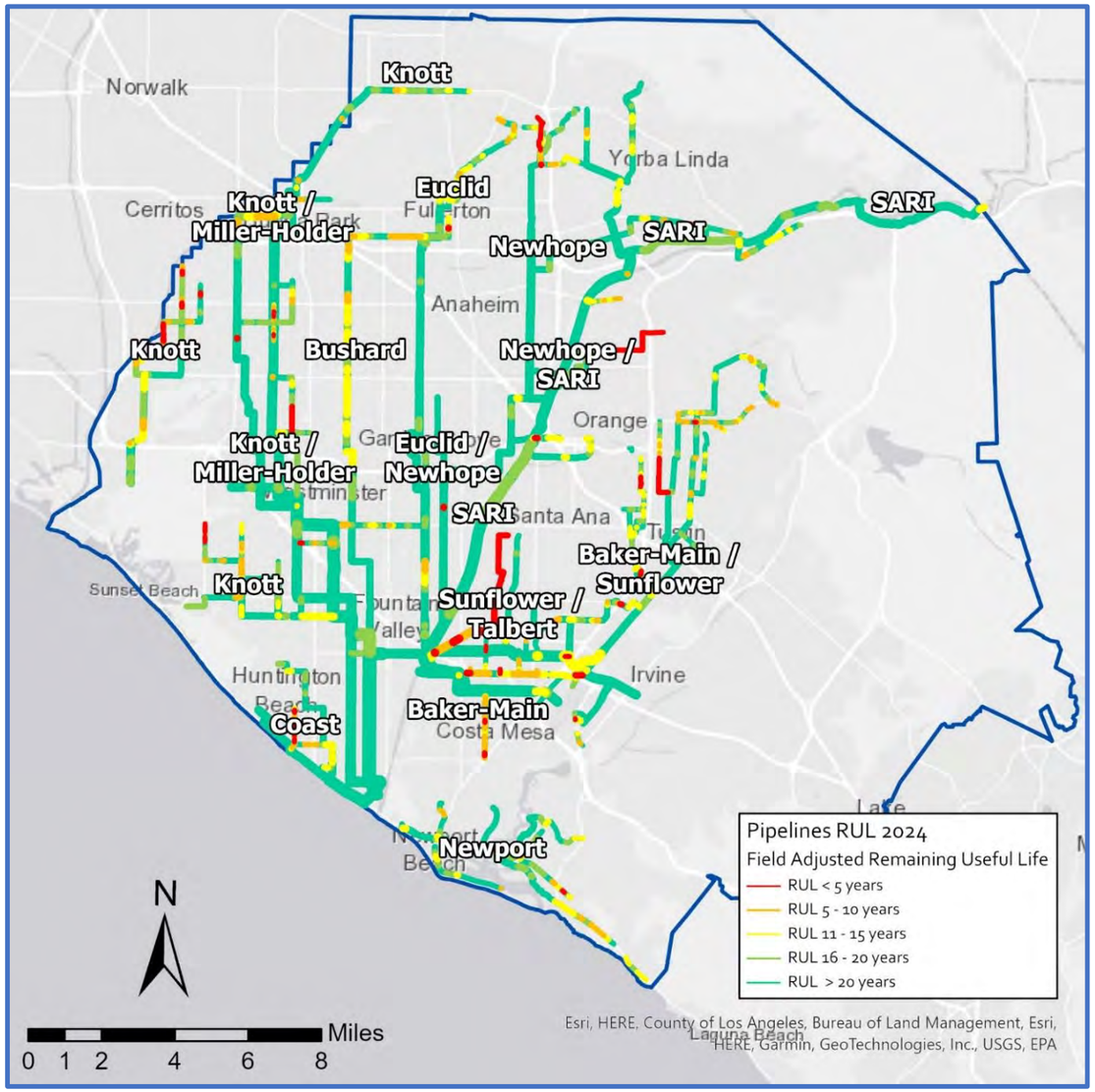
Please see the comprehensive Acronyms and Abbreviations list for definitions.

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

[a] White box with diagonal line indicates there are no assets assigned to this discipline within this process area.
[b] The station is being decommissioned, hence the replacement value was not included.
[c] The Newport Force Mains replacement value is captured within the collection system valuations. These force mains are common to multiple pump stations.

ASSET MANAGEMENT SUMMARY – COLLECTION SYSTEM PIPELINES AND MANHOLES OVERVIEW

Figure 2-4. Collection System Pipeline and Manhole – 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 Pipeline and Manhole Remaining Useful Life and Replacement Value Summary

Trunklines	No. of Pipes with RUL Score of 4 or 5	Miles of Pipes with RUL Score of 4 or 5	Percentage of Pipes with RUL Score of 4 or 5 (by length)	No. of Manholes with RUL Score of 4 or 5	Percentage of Manholes with RUL Score of 4 or 5	Replacement Value ($ millions, in 2024 dollars)[a]
Baker-Main	88	5.9	15%	-[b]	-[b]	$356
Bushard	10	1.2	6%	3	1%	$312
Coast	16	1.0	9%	-[b]	-[b]	$128
Euclid	7	0.8	2%	69	16%	$348
Interplant[c]	0	0.0	0%	0	0%	$149
Knott	49	3.4	5%	84	11%	$807
Miller-Holder	21	1.6	5%	43	16%	$382
Newhope	25	1.7	6%	84	24%	$270
Newport	19	1.2	5%	30	7%	$279
Santa Ana River Interceptor	59	2.8	6%	159	28%	$666
Sunflower	15	0.7	2%	-[b]	-[b]	$387
Talbert	77	5.9	71%	-[b]	-[b]	746
Total	**386**	**26.1**	**7%**	**472**	**11%**	**$4,158**

Please see the comprehensive Acronyms and Abbreviations list for definitions.
[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 trunklines 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 Interplant Trunkline E (IPE) assets. Interplant Trunkline assets are included with Knott Trunkline in its Asset Management System Summary.

2.2 Area Asset Management Summaries List

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 Area Asset Management Summaries

- Preliminary Treatment
- Primary Treatment
- Secondary Treatment – Activated Sludge
- Secondary Treatment – Trickling Filters
- Interplant
- Solids Handling – Digesters
- Solids Handling – Facilities
- Solids Handling – Gas Handling
- Central (Power) Generation
- Utilities
- Electrical Distribution
- Occupied and Power Buildings

Plant No. 2 Area Asset Management Summaries

- Preliminary Treatment
- Primary Treatment
- Secondary Treatment – Activated Sludge
- Secondary Treatment – Trickling Filters/Solids Contact
- Effluent Disposal
- Solids Handling – Digesters
- Solids Handling – Facilities
- Solids Handling – Gas Handling
- Oxygen Facility
- Central (Power) Generation
- Utilities
- Electrical Distribution
- Occupied and Power 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 Area Asset Management Summaries

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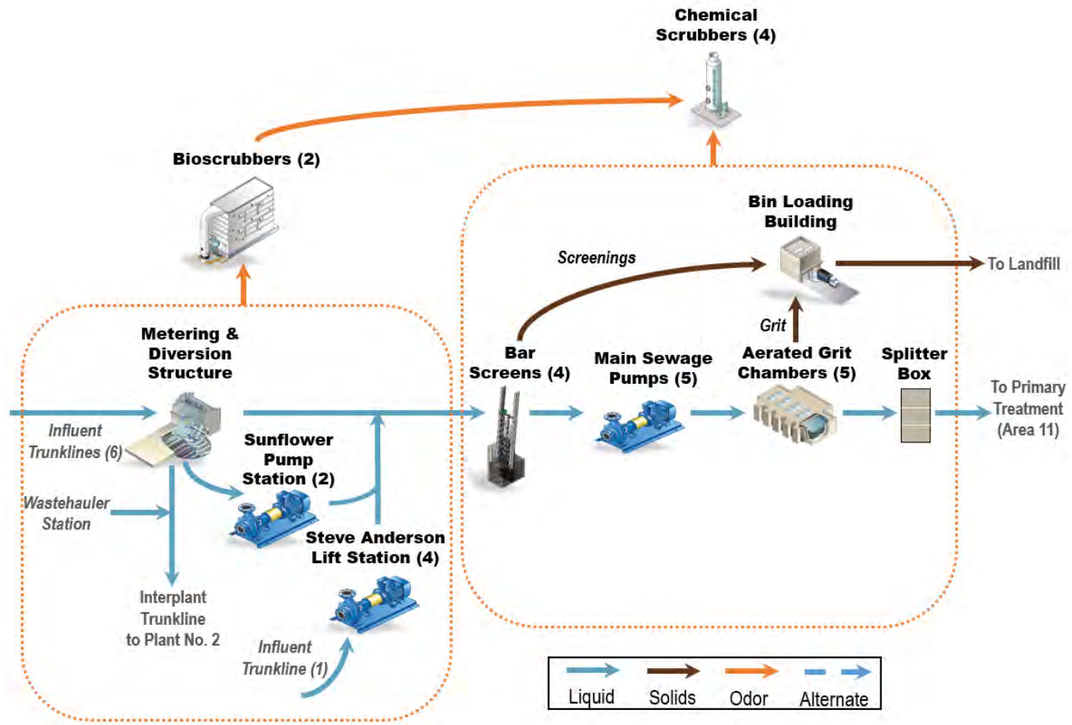
AREA 10 ASSET MANAGEMENT SUMMARY – PLANT NO. 1 PRELIMINARY TREATMENT

Process Schematic



Major Assets Remaining Useful Life

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

Please see the comprehensive Acronyms and Abbreviations list for definitions.

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

Major Assets	Quantities
Metering and 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
Bar Screens	
5/8" Bar screens	4
1" Bar screens	2
Gates	21
Fans	4
Main Sewage Pumps	
Pump/Motor/VFD	5
Gates	15
Aerated Grit Chambers	
Grit Chambers	5
Bulk Gates	18
Slide Gates	15
Flap Gates	5
Blowers	3

Major Assets	Quantities
Splitter Box	
Slide Gates	5
Weir Gates	15
Flowmeters	3
Bin Loading Building	
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

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

Key Issues

Key Issues	Short-Term Actions and Recommendations	Long-Term 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, these assets include exhaust fans, the hydrogen sulfide (H_2S) monitoring system, and corroded piping and grit paddles.	Continue to actively monitor the condition of aging assets scheduled for repair under P1-105 and develop appropriate solutions as applicable.	Permanent solutions will be provided by Project P1-105.
Metering & Diversion (M&D) – The trunkline pipes inside the M&D building are at the end of their useful life and are experiencing accelerated corrosion causing recent failures and leaks (Sunflower and Santa Ana River Interceptor [SARI]). O&M is also experiencing issues with the flow meters being inaccurate.	Planning is coordinating with O&M to perform condition assessments on each trunkline and repair as needed to extend the useful life of the piping within the next year. Instrumentation is also replacing the troubled flow meters during these assessments.	M&D structure and piping along with the flow meters will be rehabilitated/replaced by Project 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. The pump station structure also has coating failure and concrete deterioration along with rebar corrosion. While Pump No. 1 was being rehabilitated by FE19-04, Pump No. 2 failed, resulting in Sunflower Pump Station being completely out of service.	Pump No. 2 trough had deep grooves that have been repaired with grout and has since been put back in service by Maintenance. A maintenance project installed metal I-beams inside the outlet channels as temporary supports to strengthen the structure supporting the gearbox concrete pads before wet season starts.	FE19-04 is replacing Pump No. 1 with associated gear box, bearings, and couplings and rehabilitating the concrete trough. The project is also upgrading electrical equipment and instrumentation required for successful operation of Pump No. 1. A separate project will be planned for the 2025 dry season to rehabilitate both outlet channels to repair the concrete, rebar, and coating. Finally, Pump No. 2 will eventually be replaced by a separate project, which will be similar in scope as FE19-04 after P1-105 construction is complete in 2028.
Wastehauler Station – The automated sampling systems installed by FE20-01 have been experiencing some issues with the valves, switches, and touch screens causing shutdowns and delays. The connection point height and angle create an upward flow direction, which is not ideal, causing waste to drain out when haulers disconnect, leading to additional odor.	The team has been working with the vendor to troubleshoot equipment issues and making warranty claims.	A planning study is recommended to review the ongoing issues at the wastehauler station and propose solutions to be implemented by future CIP Project X-102, Wastehauler Facility Improvements, to improve the operation and maintenance of the facility.
Steve Anderson Lift Station HVAC – Both HVAC and condensing units have passed their useful lives with excessive corrosion and reliability issues. Critical electrical equipment 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.	N/A	FE23-06 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

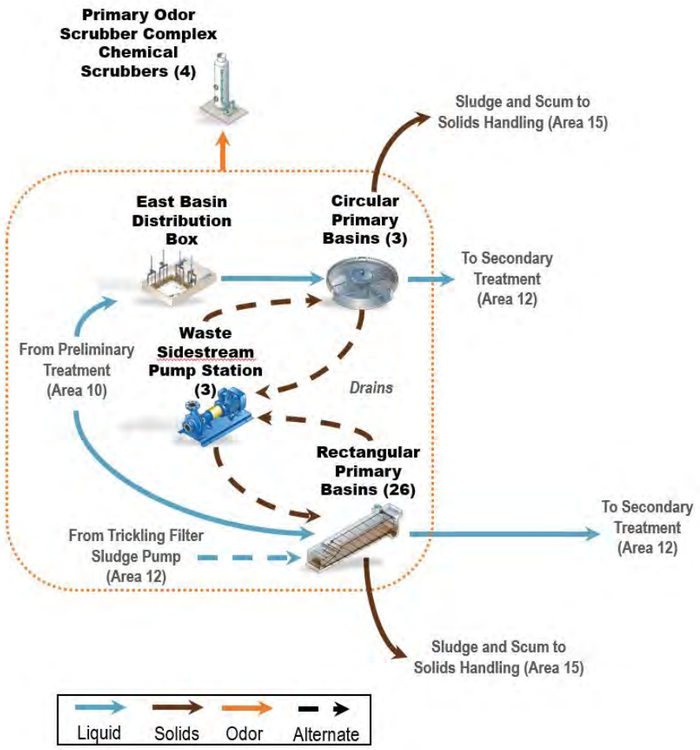
Project No.	Project Title	Impacted Facilities	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
P1-105	Headworks Rehabilitation at Plant No. 1	Headworks															
FE19-04	Sunflower Pump Replacement at Plant No. 1	Sunflower Pump Station															
TBD	Sunflower Pump Replacement at Plant No. 1 – Pump #2	Sunflower Pump Station															
PRN-001000	Sunflower Pump Station Effluent Channel Temporary Repairs	Sunflower Pump Station															
FR1-0026	Sunflower Pump Sation Effluent Channel Repairs	Sunflower Pump Station															
FE23-06	HVAC Replacements at Plant Nos. 1 and 2	Steve Anderson Lift Station															
FE20-01	Wastehauler Station Safety and Security Improvements	Wastehauler Station															
TBD	Wastehauler Facility Improvements Planning Study	Wastehauler Station															
X-102	Wastehauler Facility Improvements	Wastehauler Station															
X-044	Steve Anderson Lift Station Rehabilitation	Steve Anderson Lift Station															
N/A	Replacement of Bioscrubber Media at Plant No. 1	TL & M&D Odor Control															

Please see the comprehensive Acronyms and Abbreviations list for definitions.

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

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

Process Schematic



Note: Primary Basins No. 1 and No. 2 are not shown. The facilities are scheduled to be demolished within the next 10 years.

Major Assets Remaining Useful Life

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

Please see the comprehensive Acronyms and Abbreviations list for definitions.
Note: (*) RUL scores do not reflect new pumps and VFDs recently installed by P1-133, currently in commissioning. RUL scores will be updated in the next revision.

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	7*
Dilute Sludge Sumps	2
Scum Pumps	12
Scum Pits	6

Note: (*) Quantity may not reflect the most recent development. To be updated in the next revision.

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

Major Assets	Quantities
Waste Sidestream Pump Station	
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

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

Key Issues

Key Issues	Short-Term Actions and Recommendations	Long-Term Actions and Recommendations
Rectangular Primary Basins 6–31 Reliability and Obsolescence – 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. The scum pumps serving these basins are also obsolete, which means parts cannot be procured quickly for repairs when some of the pump are down, causing significant interruption to operation	The center feed channel was recently inspected during a month-long planned outage; settled grit at the bottom of the channel was cleaned out and repairs were made to the T-lock liner to extend the useful life of the structure. Condition assessments and repairs of the primary basin tanks will be planned in conjunction with O&M activities in the coming years to increase reliability of the basins prior to the future rehabilitation project.	P1-133 has recently replaced five of the six launders in the Primary Influent Splitter Box (PISB), installed new variable frequency drives (VFDs) for the three dilute sludge pumps serving basins 6–15, and replaced the three dilute sludge pumps serving basins 17–31. This will increase the reliability of the rectangular primary basins for the coming decade before X-017 provides a general rehabilitation of the primary sedimentation basins.
Rectangular Primary Basins 6–31 Scum Pumps – The scum pumps are approaching the end of their useful lives. The pumps are also obsolete. Replacement parts are difficult to find and have a long lead time.	O&M needs to perform regular PM on scum pits and pumps to prevent scum accumulation in the basins, especially during times when capacity is reduced by construction.	FE23-05 will replace the obsolete scum pumps to improve scum pumping reliability and availability.
Circular Primary Basins 3–5 Leakages – Operations indicated that water was still collecting inside the basins even after grouting and coating work was completed at Junction Structure A (JSA) and Primary Basin 3 and 4 influent pipes. Further leak testing conducted at the East Basin Distribution Box (EBDB) found that all stop gates and weir walls have leaks. A condition assessment of the 72-inch pipe was also conducted to determine whether any leakage may have come from cracks inside the pipe; however, the assessment found the pipe to be in good condition.	The gates to basins 1, 2, and 5 were sealed shut to minimize leakage.	P1-126 will eventually replace these circular basins.
Scum Management – The scum collection systems 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 provide 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.	X-017 will take into consideration the results of the Scum Study to improve the scum removal system during the rehabilitation.
Waste Sidestream Pump Station (WSSPS) Pump Ragging and Grit – The pump station has been experiencing increased ragging issues due to the headworks shutdown scheduled for the P1-105 construction. Grit buildup has also increased resulting in Maintenance having to schedule grit removal monthly. The pumps are also approaching the end of their useful lives.	Maintenance has increased the frequency of pump de-ragging and grit removal from the wet well as a mitigation. It is also recommended to install a de-ragger on one of the pumps to test out compatibility in this service.	MP1-003 will replace one of the WSSPS pumps with a chopper type pump to test the performance of 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

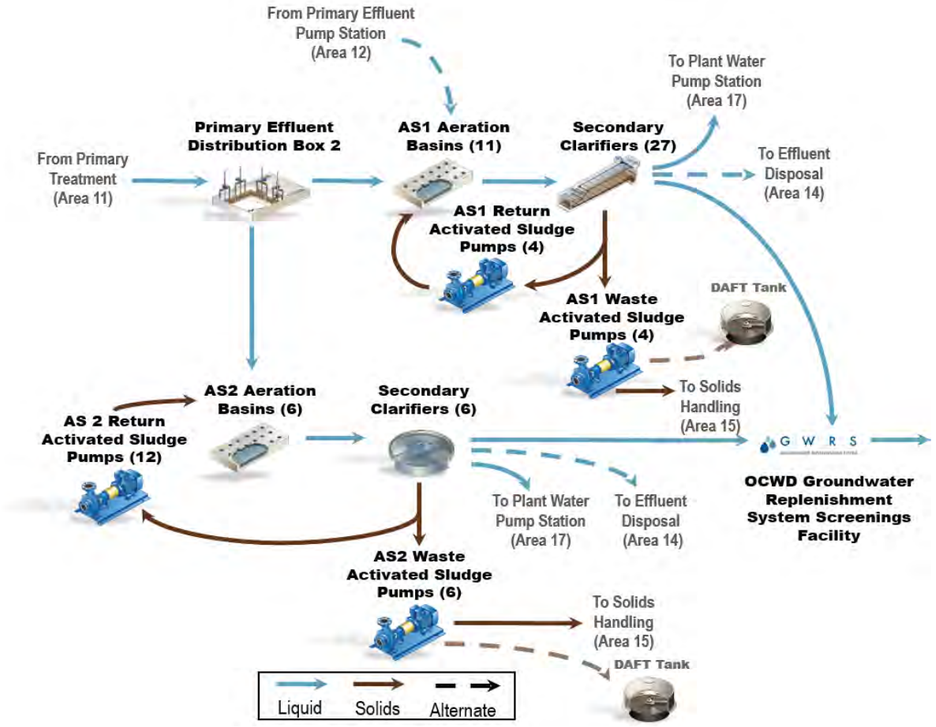
Project No.	Project Title	Impacted Facilities	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
PRN-001004	H2S Analyzer Technology Evaluation	Primary Scrubbers 5-8															
PRN-00563	P1-33/37 Scum Study	Primary Basins 6–31															
FE23-05	Primary Clarifier 6–31 Scum Pump Replacement at Plant No. 1	Primary Basins 6–31															
MP1-003	WSSPS Pump Replacement at Plant No. 1	Waste Sidestream Pump Station															
P1-133	Primary Sedimentation Basins (PSBs) Numbers 6–31 Reliability Improvements at Plant No. 1	Primary Basins 6–31															
P1-126	Primary Clarifiers Replacements and Improvements at Plant No. 1	Primary Basins 3, 4, and 5															
X-017	Plant No. 1 Primary Clarifiers 6–31 Rehabilitation	Primary Basins 6–31															
X-006	Waste Sidestream Pump Station Rehabilitation	Waste Sidestream Pump Station															

Please see the comprehensive Acronyms and Abbreviations list for definitions.

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

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

Process Schematic



Major Assets Remaining Useful Life

Asset Type	PEPS	Blower Building 1	AS1 Aeration Basins	AS1 Clarifiers	AS1 RAS PS	AS1 WAS	AS2 PEPS 2	Blower Building 2	AS2 Aeration Basins	AS2 Clarifiers	AS2 RAS PS/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	4	4	-	-	3	-	-	1	-	-	-	-	-	-	4	-
Structures	3	-	4	4	-	-	1	-	1	1	-	1	1	1	4	5
Mechanical																
Piping	4	4	4	4	5	3	-	2	2	2	2	2	-	-	5	5
Pumps	5	-	-	-	5	5	-	-	-	-	3	3	-	-	5	5
Diffusers	-	-	4	-	-	-	-	-	4	-	-	-	-	-	-	-
Mixers	-	-	4	-	-	-	-	-	2	-	-	-	-	-	-	-
Solids Collector Mechanism	-	-	-	4	-	-	-	-	-	2	-	-	-	-	5	-
Blowers	-	4	-	-	-	-		2	-	-	-	-	-	-	-	-
Drain Gates & Inlet Gates	-	-	5	4	-	-	1	-	2	2	-	-	2	-	-	-
HVAC & Ventilation	4	4	-	-	-	-	-	3	-	-	-	-	-	-	-	-
Chemical/Polymer Facility	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5
Electrical																
VFDs	3	-	3	3	3	3	-	-	3	3	3	3	-	-	4	4
MCCs	5	-	5	5	5	5	-	-	2	2	2	2	-	-	5	5
Instrumentation																
PLCs, Flow Meters	5	5	5	5	5	5	-	2	2	2	2	2	-	-	5	5

Please see the comprehensive Acronyms and Abbreviations list for definitions.

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

AREA 12 ASSET MANAGEMENT SUMMARY – 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 (PEPS 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 2	
Structure	1
Gates	11
AS1 and AS2 Junction Boxes	
Junction Box Structures	8

Major Assets	Quantities
Dissolved Air Flotation Thickeners (DAFTs)	
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

Key Issues – AS1 and AS2

Key Issues	Short-Term Actions and Recommendations	Long-Term Actions and Recommendations
Activated Sludge Plant No. 1 – AS1 is an aging facility. Condition assessments show corrosion on the reactor wall. Baffle wall supports and vertical air pipes have corrosion in some of the basins. In addition, final clarifier drives are obsolete.	Maintenance is monitoring and replacing the instrumentation equipment as needed. PRN-01003 was approved to rebuild Final Clarifiers 11 and 13 due to broken chain and flight. Planning and Maintenance are working on a plan to address the obsolete clarifier drives.	P1-140 will rehabilitate AS1, replacing blowers, repairing basins, and replacing mechanical equipment.
PEDB2 – PEDB 2 has limited hydraulic capacity. Routing flows from rectangular primary clarifiers to AS1 through PEDB2 has some limitations and risk of overflows.	A Planning study to investigate hydraulic capacity of the PEDB2 will be performed to investigate the issue and find solutions.	P1-126 performed hydraulic model and plans for bypass during peak wet weather flow.
Obsolescence at AS1 and AS2 Blower Controls – The blower control system is obsolete and requires an upgrade to operate efficiently.	Upgrading obsolete vane actuators.	P1-140 will replace blowers and control systems for AS1.

Current and Future Projects

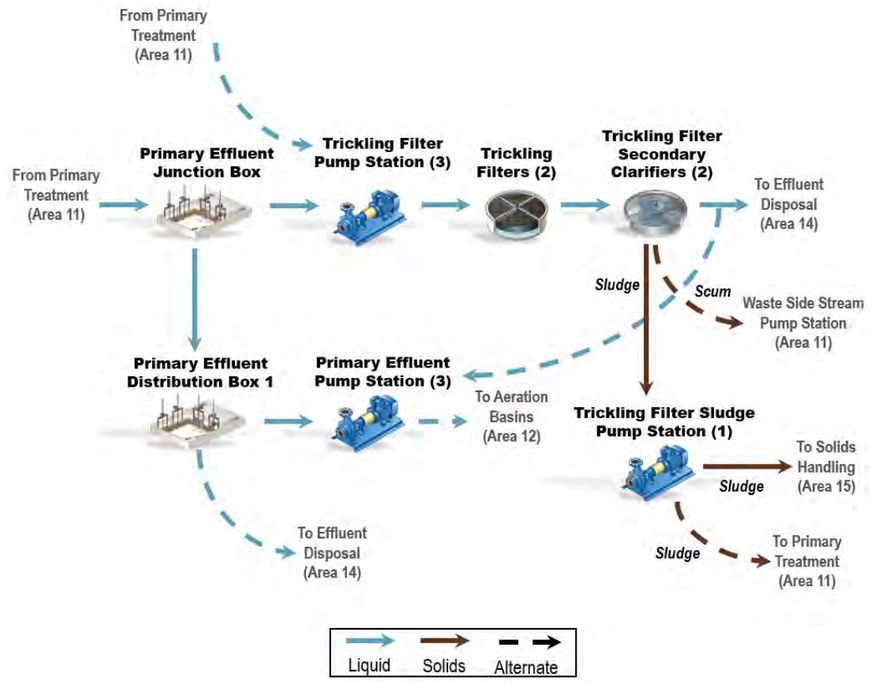
Project No.	Project Title	Impacted Facilities	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
FE20-05	Plant Water Pipe Replacement	AS1 Aeration Basin and Clarifiers															
PRN-01003	Activated Sludge Final Clarifiers 11&13 Rebuild at Plant No. 1	AS1, Final Clarifiers 11 and 13															
P1-140	Activated Sludge -1 Rehabilitation at Plant No. 1	AS1 Basins, Blowers, Clarifiers, PEPS															
X-039	Plant Water Pump Station Rehabilitation	AS1 Aeration Basin, Clarifiers, and Blowers															
X-018	Activated Sludge - 2 Rehabilitation at Plant No. 1	AS2															

Please see the comprehensive Acronyms and Abbreviations list for definitions.

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

AREA 12 ASSET MANAGEMENT SUMMARY – 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	Trickling Filter Sludge Pump Station	Junction Boxes
Civil					
Effluent Piping	1	1	1	-	1
Structural					
Buildings	-	1	1	-	-
Structures	1	2	1	1	1
Mechanical					
Pumps	4	-	3	5	-
Distributor Drive	-	4	-	-	-
Ventilation Fans	3	3	-	3	-
Trickling Filter Media	-	5	-	-	-
Clarifier Moving Mechanism	-	-	3	-	-
Valves, Gates	3	-	5	3	3
Electrical					
VFDs	3	5	-	5	-
MCCs	2	2	2	2	-
Instrumentation					
PLCs and Flow Meters	3	3	3	3	-

Please see the comprehensive Acronyms and Abbreviations list for definitions.

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

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

Key Issues

Key Issues	Short-Term Actions and Recommendations	Long-Term Actions and Recommendations
Trickling Filter Sludge Pumps – Currently, only one sludge pump is in service.	N/A	Project FE19-03, currently in construction, will replace the trickling filter's sludge pumps with two constant speed sludge pumps and remove the scum pumps.
Trickling Filters Snail Control – Permanent caustic dosing is needed at Trickling Filter Pump Station for snail control. Currently, temporary totes are used to dose caustic into the wet well.	Continue to dose caustic using temporary totes for snail control.	P1-126 will add pumps to the caustic tank in the primary scrubber area to provide a permanent solution for trickling filter snail control.
Trickling Filter Pump Station Reliability – The presence of snail shells can cause damage to the trickling filter pump impellers affecting the reliability of the pump station.	Perform condition assessment and repair as needed.	N/A
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 need repairs.	N/A	Project P1-142 will replace the trickling filter media and repair coating defects and failures.
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 to determine the best solution/approach to minimizing odor at the trickling filters, which may include covering the trickling filters and adding odor control.	Solutions from the planning study (PRN-00961) will be implemented via future project X-015.

Current and Future Projects

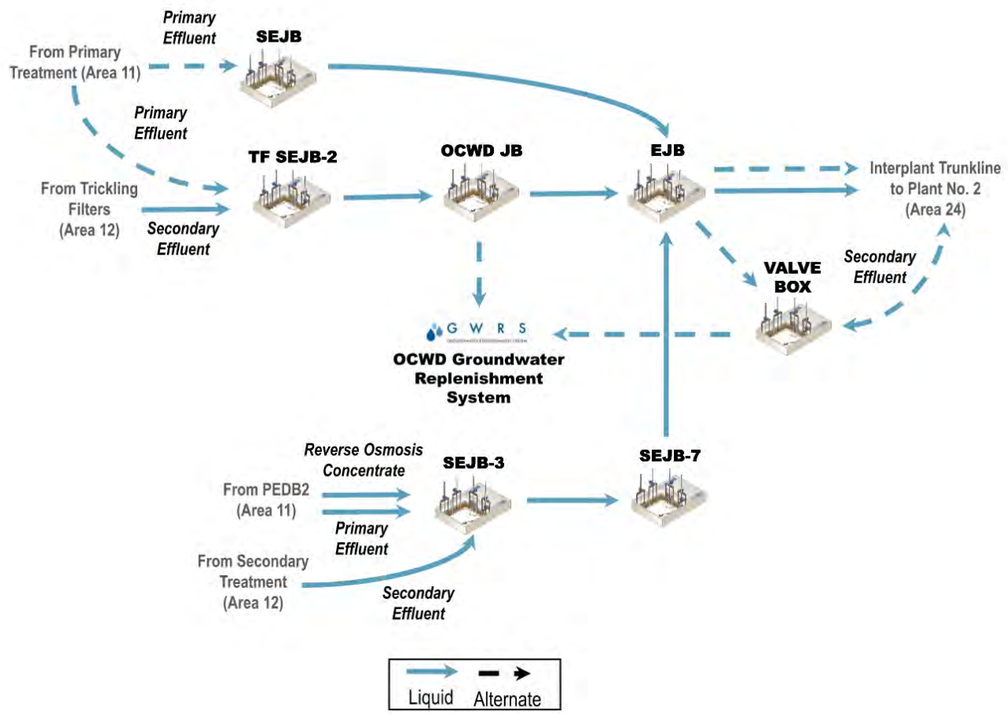
Project No.	Project Title	Impacted Facilities	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
FE19-03	FE19-03 Trickling Filter Sludge and Scum Pumps Replacement at Plant No. 1	Sludge Pumps															
P1-126	Primary Sedimentation Basins Numbers 3–5 Replacement at Plant No. 1	Trickling Filters Pump Station															
P1-142	Trickling Filter Rehabilitation at Plant No. 1	Trickling Filters															
TBD	Plant No. 1 Trickling Filter Rotary Distributor Drive and Motor Replacement	Trickling Filters															
TBD	Plant No. 1 Trickling Filter Rotary Distributor VFD Replacement	Trickling Filters															
FR1-0017	Trickling Filter Valve Replacement at Plant No. 1	Trickling Filters Secondary Clarifier 2															
TBD	Trickling Filter Clarifier #1 Drain Valve Replacement at Plant No.1	Trickling Filters Secondary Clarifier 1															
FR1-0011	Plant No. 1 Trickling Filter Pumps VFD replacement (three pumps)	Trickling Filters Pump Station															
PRN-00961	Trickling Filter Odor Control Planning Study at Plant No. 1	Trickling Filters															
X-015	Trickling Filters Facilities Rehabilitation at Plant No. 1	Trickling Filters	Project starts in 2040														

Please see the comprehensive Acronyms and Abbreviations list for definitions.

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

AREA 14 ASSET MANAGEMENT SUMMARY – 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	4	2	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

Please see the comprehensive Acronyms and Abbreviations list for definitions.
For spatial representation of asset remaining useful life, please see remaining useful life maps at the end of this area summary.

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

Major Assets

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

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

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

AREA 14 ASSET MANAGEMENT SUMMARY – PLANT NO. 1 INTERPLANT

Key Issues

Key Issues	Short-Term Actions and Recommendations	Long-Term Actions and Recommendations
EJB Vandalism – Repeated vandalism to electrical controls at EJB are due to existing security fence damage allowing access to the site. Exposed conduit outside of the fence line was cut and wire stolen.	N/A	Projects SC23-02 and MP1-008 will address security issues by replacing existing fencing with a higher security fencing system, enclosing exposed conduit with new fencing, and installing new lighting to improve nighttime visibility and deterrence.
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; 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.	N/A	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 Interplant Digester Gas Pipeline (IDGP).
Santa Ana Corridor Soil Erosion – 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 of PRN-00935, a proposed improvement project will be developed to construct permanent improvements. The future improvement project must at least be started prior to OC San's next audit with the California Public Utilities Commission (CPUC) in 2032.
PEJB-1 Condition – The sluice gates in PEJB-1 are in very poor condition and no longer properly seal. The PEJB-1 structure is also in poor condition.	N/A	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 Interplant Pipeline Condition – The 66-inch pipelines between PEJB-1 and EJB are in poor condition per the 2021 condition assessment. Conditions have not changed significantly since 2009. The 66-inch pipelines between EJB and Ocean Outfall Booster Station (OOBS) that were not sliplined are also in poor condition.	Perform a new condition assessment of the 66-inch Interplant Pipeline between PEJB-1 and EJB in 2026.	Project X-125 will rehabilitate the 66-inch pipelines between PEJB-1 and EJB, and portions of the 66-inch pipeline not sliplined between EJB and OOBS.

Current and Future Projects

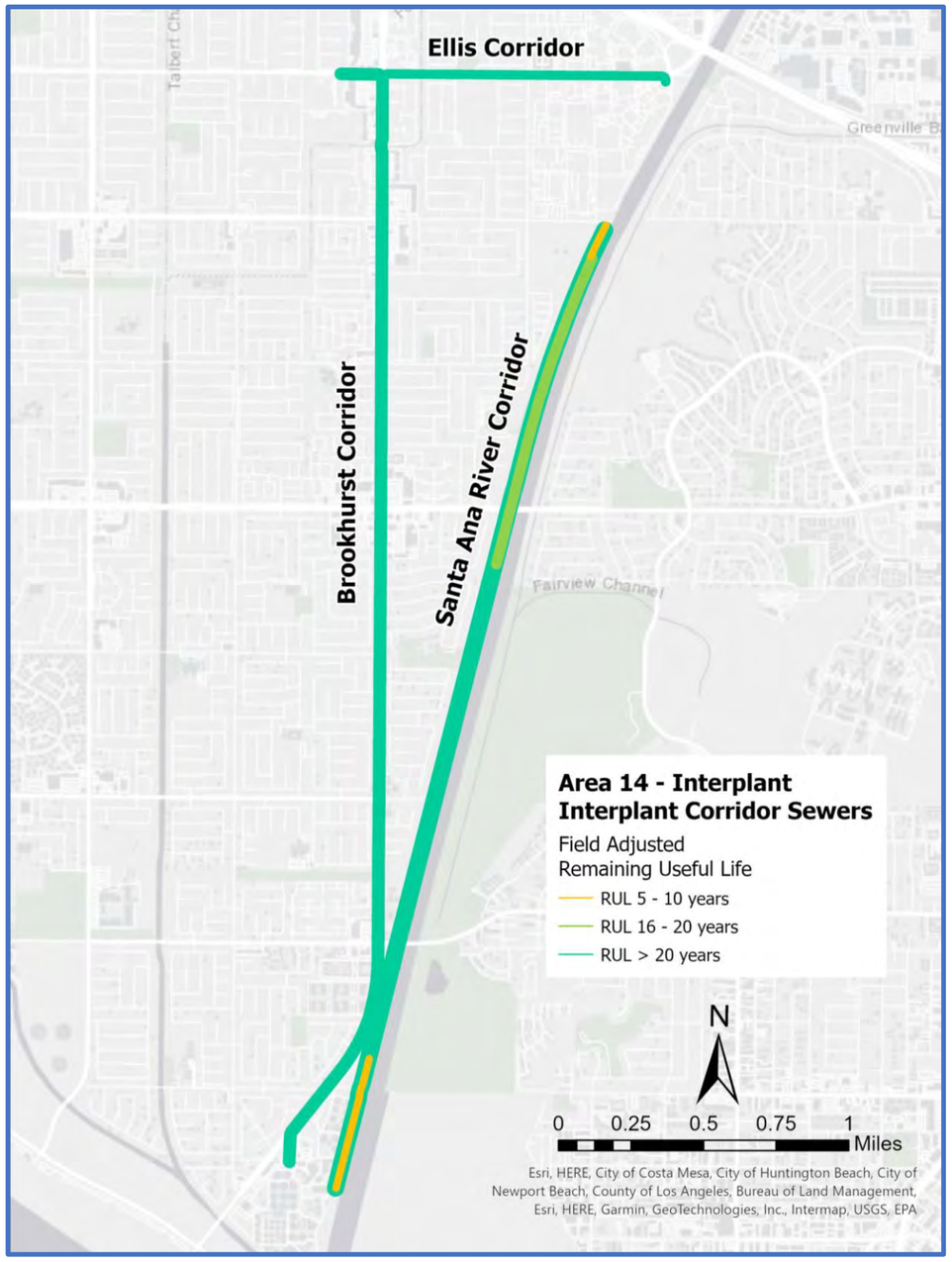
Project No.	Project Title	Impacted Facilities	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
MP1-008	Effluent Junction Box Security Lighting Improvement at Plant No. 1	EJB															
SC23-02	Effluent Junction Box Security Fence Replacement at Plant No. 1	EJB															
FRJ-0003	Interplant Gas Line Blow Off Repairs	Digester Gas Piping															
PRN-00935	Interplant Digester Gas Pipeline Slope Stabilization Study	Digester Gas Piping															
P1-126	Primary Sedimentation Basins No. 3-5 Replacement at Plant No. 1	PEJB-1															
X-125	66-Inch Interplant Pipeline Rehabilitation at Plant No. 1	66" PE/SE															
X-118	84-inch Interplant Pipeline Rehabilitation at Plant No. 1	84" PE/SE, SEJB															

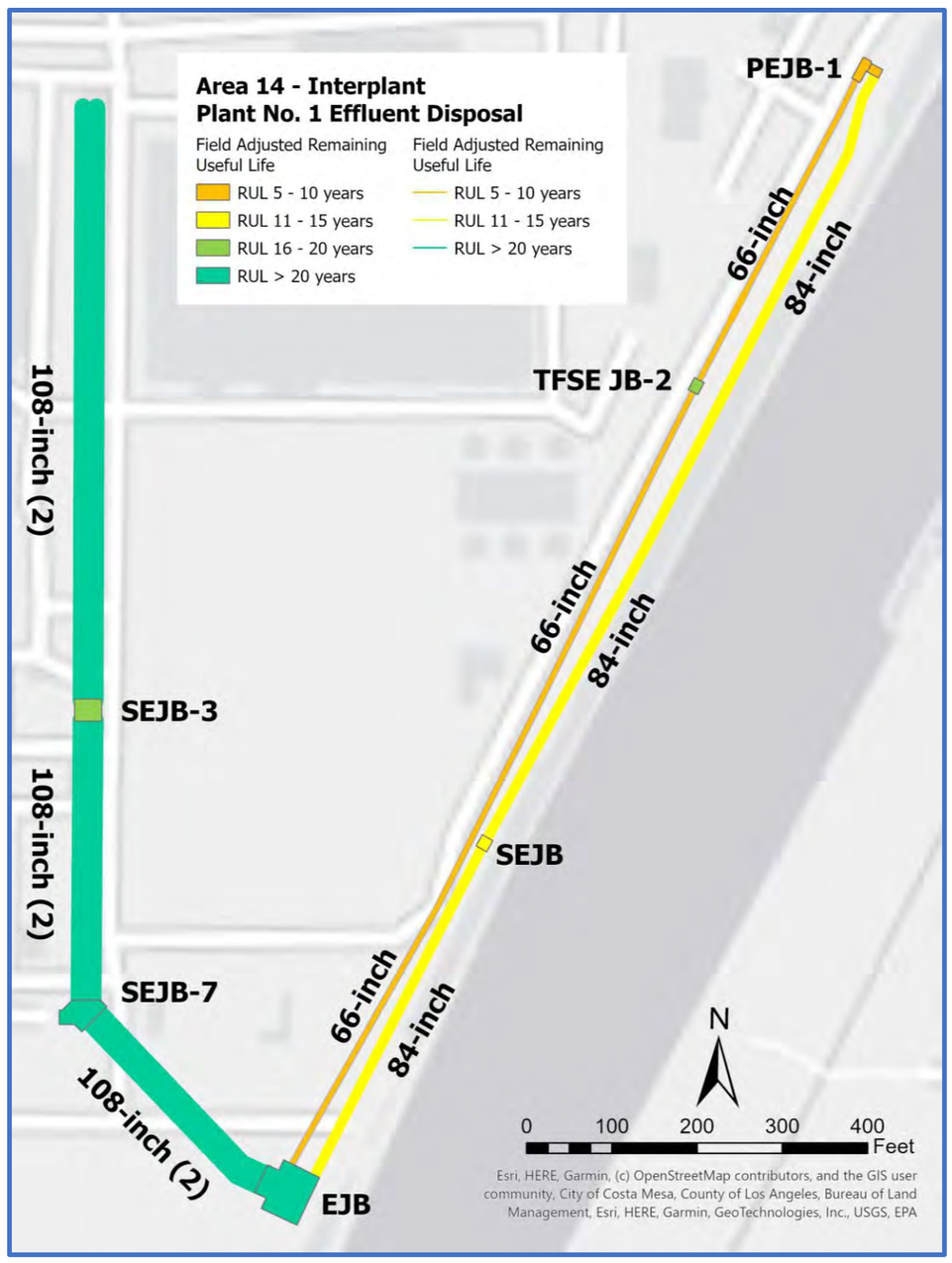
Please see the comprehensive Acronyms and Abbreviations list for definitions.

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

AREA 14 ASSET MANAGEMENT SUMMARY – PLANT NO. 1 INTERPLANT

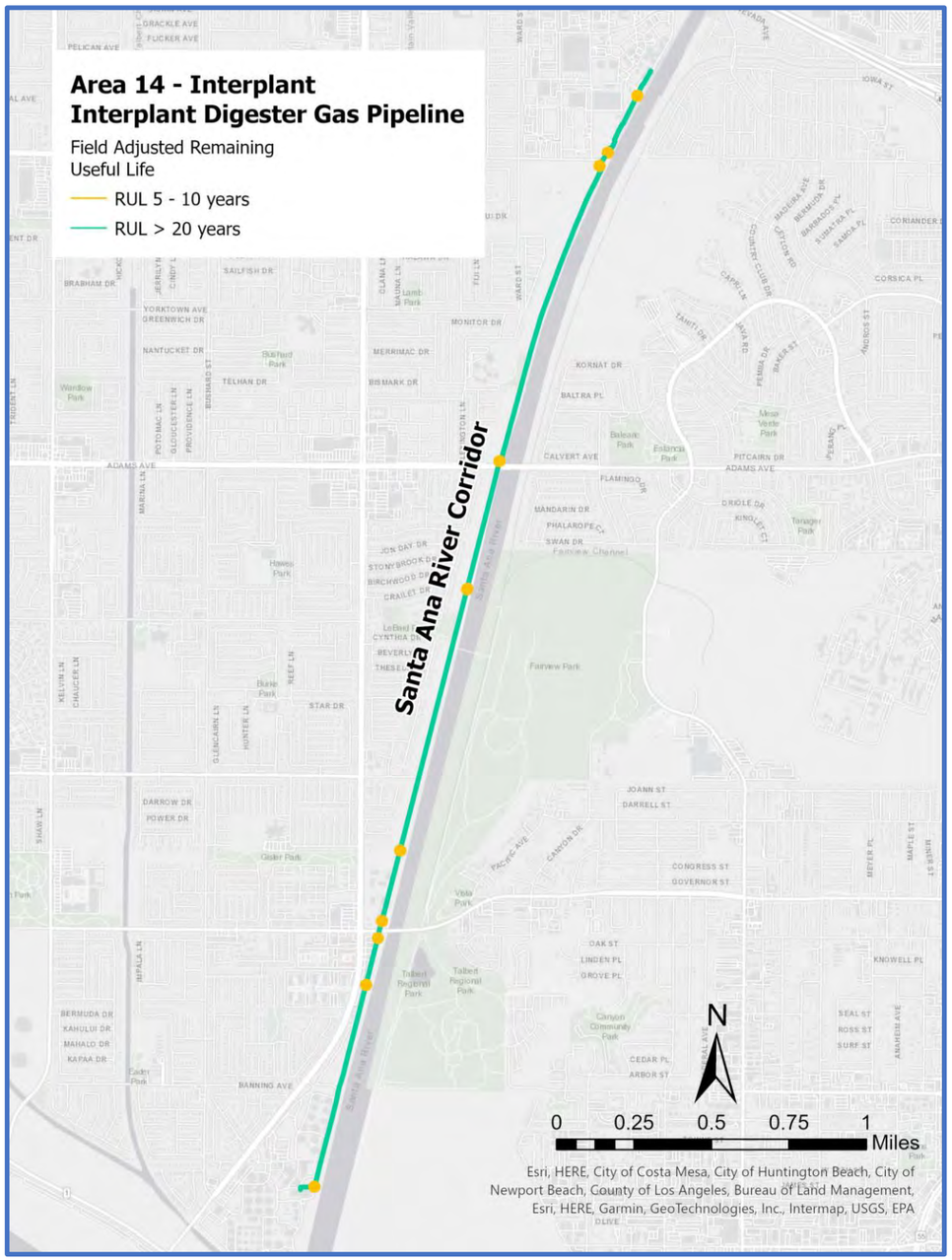
Remaining Useful Life Maps

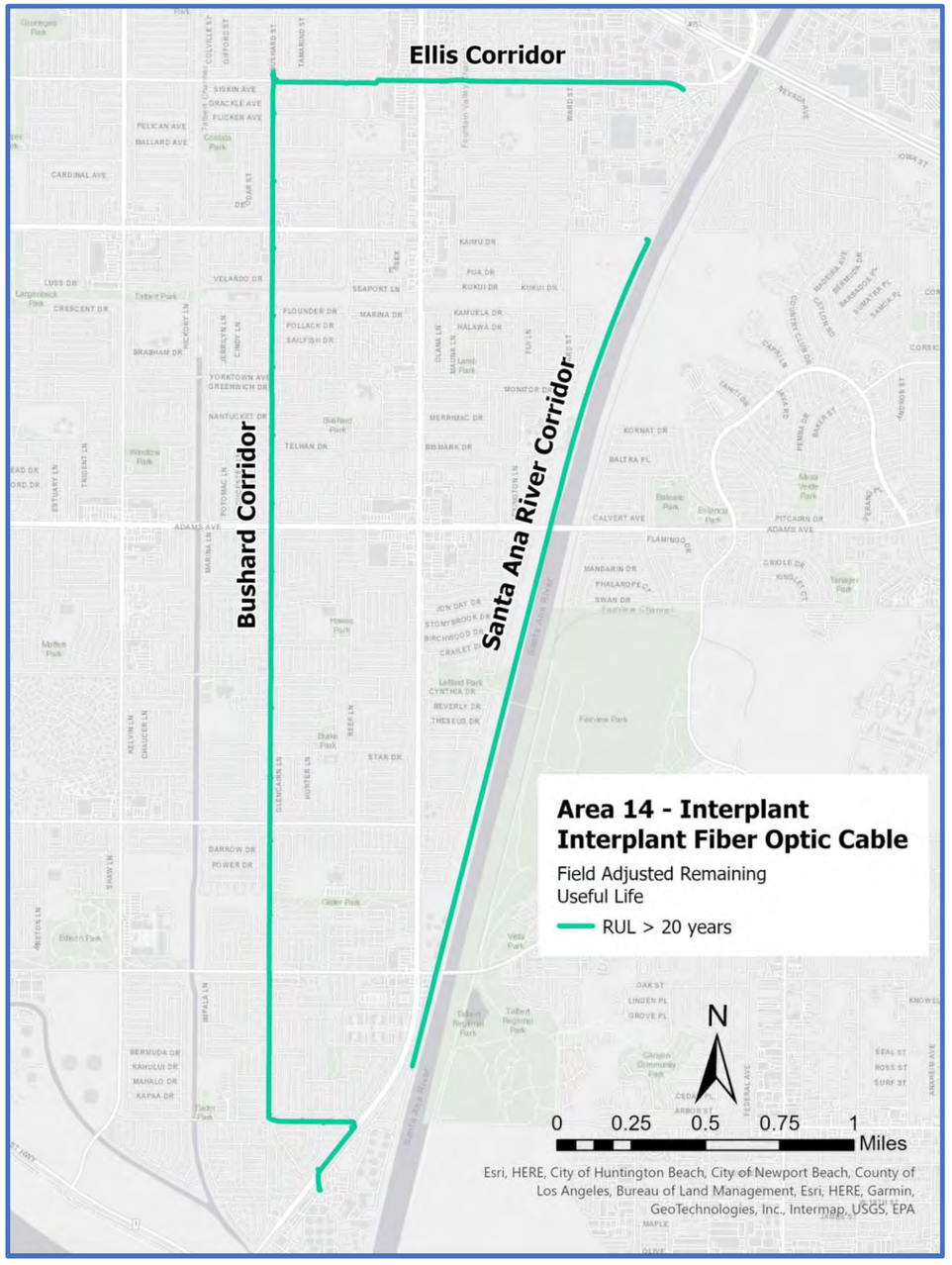




AREA 14 ASSET MANAGEMENT SUMMARY PLANT NO. 1 INTERPLANT

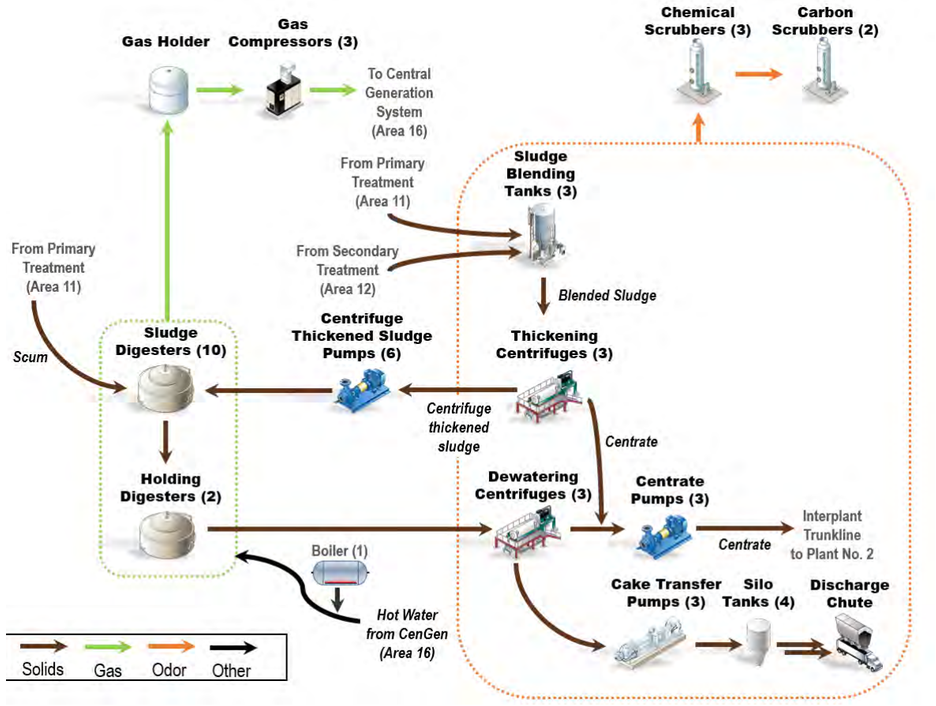
Remaining Useful Life Maps





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

Process Schematic



Note: Process Schematic shows entire Area 15 Solids Handling Facility.

Major Assets Remaining Useful Life

Asset Type	Digester 5 (Holder)	Digester 6 (Holder)	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	2	2	2	2	2	2	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													
VFDs	4	4	4	4	4	4	4	4	4	4	4	4	
MCCs	2	2	2	2	2	2	2	2	2	2	2	2	-
Instrumentation													
PLCs and Flow Meters	3	3	3	3	3	3	3	3	3	3	3	3	-

Please see the comprehensive Acronyms and Abbreviations list for definitions.

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

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

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

Key Issues

Key Issues	Short-Term Actions and Recommendations	Long-Term Actions and Recommendations
Structures – 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.	N/A	Project X-109 will address lateral spread seismic risk.
Digester Leaks – In the past year, two digesters had leaks at wall pipe penetrations.	Repairs were made under the Condition Assessment Program. Digester condition assessment will be evaluating pipe penetrations and include repairs as needed.	Project X-120 will perform comprehensive rehabilitation or replacement of the digesters.
Digester Mixing – With thicker sludge being sent to the digesters, the two existing high-rate pumps are needed to mix the sludge. Any failure of the mixing pumps, even with short repairs will affect the digester mixing efficiency.	A trial study is in progress to install one chopper pump at Digester 16 to improve digester mixing (FE24-01).	A planning study (PRN-00962) will evaluate the mixing system considering the co-thickened sludge density and pump repair history.

Current and Future Projects

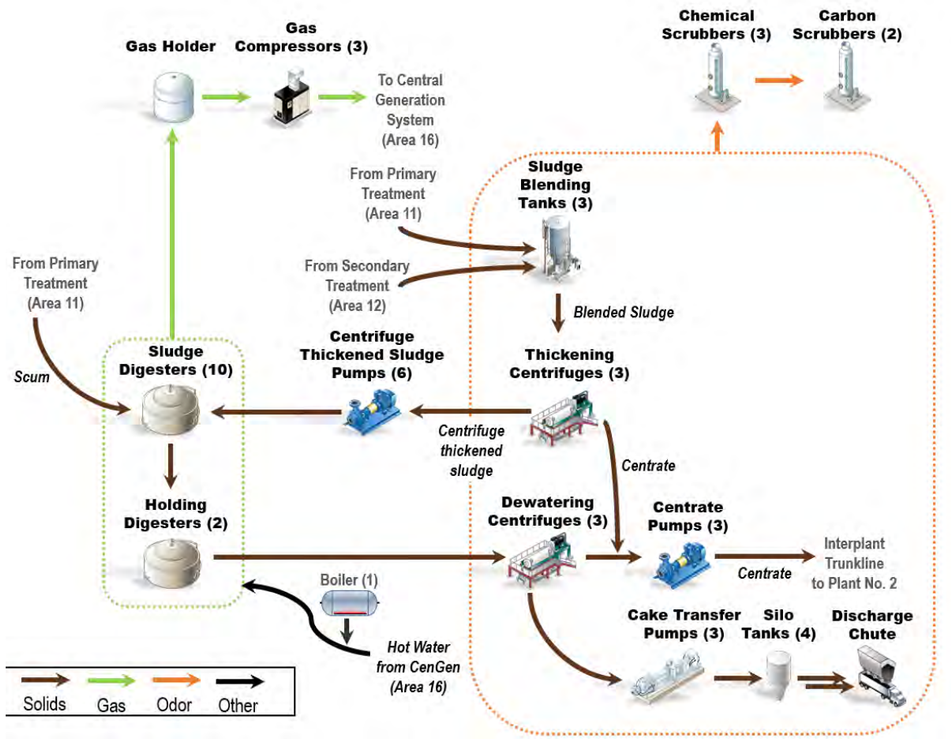
Project No.	Project Title	Impacted Facilities	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
FE24-01	Chopper Pump Trial for Digester Mixing at Plant No. 1	Digester 16 Mixing System															
PRN-00962	Digester Mixing Capacity Reliability Study	All Digesters and Holders															
P1-105	P1-105 Headworks Rehabilitation at Plant No. 1	All Digesters and Holders															
X-109	Lateral Spreading Mitigation at Plant No. 1	All Digesters and Holders															
X-120	Digester Rehabilitation/Replacement at Plant No. 1	All Digesters and Holders															

Please see the comprehensive Acronyms and Abbreviations list for definitions.

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

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

Process Schematic



Note: Process Schematic shows entire Area 15 Solids Handling Facility.

Major Assets Remaining Useful Life

Asset Type	Sludge Blending Facility (SBF)	Thickening System	Dewatering System	Centrate System	Dewatering Odor Control	Truck Loading	Boiler System	Gas Handling	Gas Holder	Gas Flares
Civil										
Effluent Piping	1	1	1	1	-	1	-	-	-	-
Structural										
Structures	1	-			-	-	-	-	3	3
Buildings	-	1			-	1	-	4	-	-
Mechanical										
Piping and Valve	-	1	1	1	1	2	1	4	2	3
Pumps and Grinders	2	2	2	2	3	2	-	-	-	-
Boiler and Heat Exchangers		-	-	-	-	-	2	-	-	-
Centrifuges		2	2	-	-	-	-	-	-	-
Chemical/polymer System		1	1	-	2	-	-	-	-	-
Carbon Unit		-	-	-	2	-	-	2	-	-
Gas Compressors		-	-	-	-	-	-	4	-	-
Gas Dryers		-	-	-	-	-	-	5	-	-
Silo Cake Conveyors		-	-	-	-	2	-	-	-	-
Silo Sliding Frames		-	-	-	-	2	-	-	-	-
Electrical										
VFDs	4	4	4	4	4	4	-	-	-	-
MCCs	1	1	1	1	1	1	1	5	-	-
Instrumentation										
PLCs and Flow Meters	4	4	4	4	4	4	5	4	-	3

Please see the comprehensive Acronyms and Abbreviations list for definitions.

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

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 Dryers	2
Gas Flares	3
Carbon Media	2
Boiler	1

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

Key Issues

Key Issues	Short-Term Actions and Recommendations	Long-Term Actions and Recommendations
Thickening and Dewatering Maintainability of the Equipment – Access to equipment to perform maintenance is difficult due to congestion.	Currently, a small project is being scoped to add lifting supports for equipment in the basement.	Project FE21-04 will install a handrail for safety improvements. Project FE22-01 will install equipment access and a platform.
Odor Control System – The booster fan inside the T&D Building frequently fails.	A small study will investigate the issue and recommend a solution.	Pending the outcome of the study.
Gas Handling System Reliability – The aging facility requires replacement or rehabilitation to meet current and future process needs and regulatory requirements. The gas compressor system is aging and needs reliability improvements such as regular equipment overhauls.	Continue to actively monitor the condition of aging assets and perform preventative maintenance until replacement and/or overhaul.	Project J-124 Digester Gas Facilities will replace existing flares and compressor inlet moisture separator systems; install new closed-loop cooling water systems; rehabilitate building, perform various electrical, instrumentation, and control upgrades to improve reliability; and add a new control room. Gas compressor overhauls will be performed by Maintenance.
Gas Dryer System Not Operational – The refrigerated gas dryer is out of service. Currently, gas goes through the chilled water gas heat exchangers and condensate drops out without backup spare. These heat exchangers are also aging and need replacement.	Continue to actively monitor the chilled water heat exchanger conditions until replacement.	The refrigerated gas dryer system will be replaced by the FE23-01 project. The chilled water shell and tube heat exchangers will be replaced by project FE24-02.
Plant Water – Corrosion from plant water on equipment is causing premature wear on pumps and piping failures.	N/A	Project will be created to incorporate recommendations by PS20-09. The goal of the study was to improve the water quality and reduce corrosivity of the plant water.

Current and Future Projects

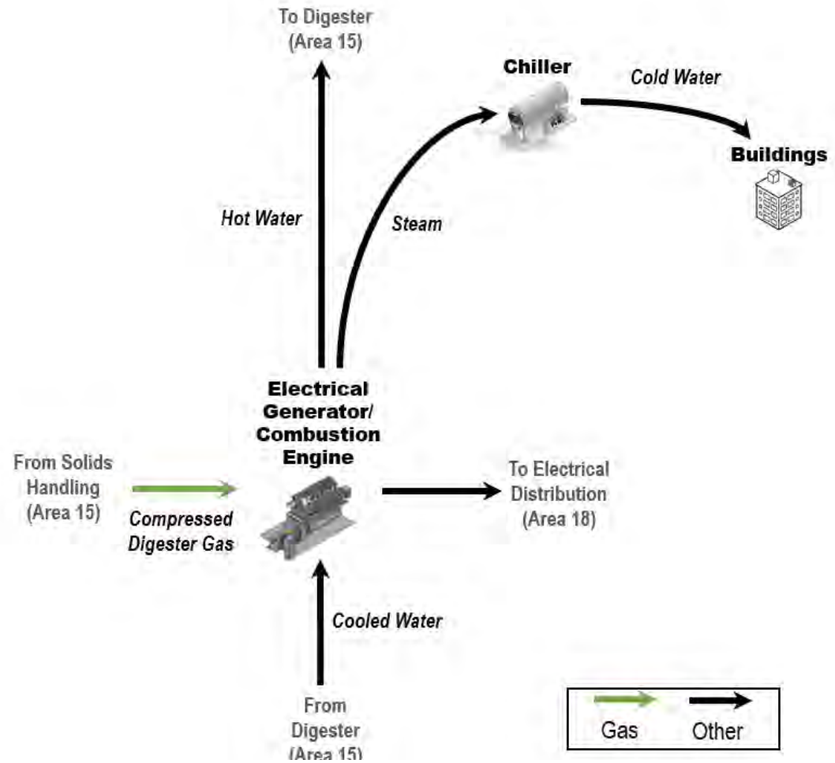
Project No.	Project Title	Impacted Facilities	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
J-124	Digester Gas Facilities Rehabilitation	Electrical and Instrumentations, Building, Compressor Cooling System, Inlet Separators, and Flares															
N/A	Digester Gas Compressor Overhauls at Plant No.1 and No. 2 (Maintenance Service)	Gas Compressors															
FE22-01	Platform Modifications for Process Areas at Plant No. 1 and No. 2	Truck Loading Slide Frame															
FR1-0018	Dewatering Centrifuge Diverter Gate Improvements at Plant No. 1	Dewatering Diverter Gate															
FE23-01	Digester Gas Compressor Dryer Replacements at Plant No. 1 and No. 2	Refrigerated Gas Dryers															
FE21-04	Thickening and Dewatering Facility Handrail Installation at Plant No. 1	No Process Impact															
PRN-00686	Scrubber Acid System Installation	Sulfuric Acid Tank															
FR1-0024	Centrifuge Motor Disconnect	Centrifuge Motors															
FE24-02	Gas Compressor Building Exchanger Replacement at Plant No. 1	Chilled Water Gas Heat Exchangers															
X-119	Thickening, Dewatering and Truck Loadout Rehabilitation at Plant No. 1	Solids Storage, T&D, and Solids Scrubbers															

Please see the comprehensive Acronyms and Abbreviations list for definitions.

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

AREA 16 ASSET MANAGEMENT SUMMARY – 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*	Jacket Water HEX System	Aux. Waste HEX System	Waste Heat HEX System	Plant Water Piping	Miscellaneous
Structural																						
Buildings	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Mechanical																						
General	3	5	3	5	5	4	3	3	3	3	3	3	4	4	5	5	-	3	3	3	5	-
HVAC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4
Lube Oil System	3	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Electrical																						
Generator	3	5	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MCCs	4	4	4	4	4	4	-	-	-	-	-	4	2	2	2	2	-	-	-	-	-	4
Instrumentation																						
General / PLCs	5	5	5	5	5	3	4	4	4	3	3	3	3	3	5	5	-	4	4	4	-	-

Please see the comprehensive Acronyms and Abbreviations list for definitions.
*Refer to Area 18 for switchgears, batteries and other electrical assets.

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

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
Boiler Feed Water System	
Deaerator System	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

Major Assets	Quantities
Heat Exchanger Systems	
Jacket Water System	3
Aux. Waste Heat System	3
Waste Heat System	2

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

Key Issues

Key Issues	Short-Term Actions and Recommendations	Long-Term Actions and Recommendations
Gas Engine Generator Set Reliability – Aging components and systems required to operate the Central Generation (Cen Gen) Engines are creating reliability issues and need to be addressed.	Continue to perform engine/generator PMs and monitor engine/generator performance.	J-135B completed overhauling engine/generator set #1 and #3. A subsequent project will be planned to overhaul engine/generator set #2 after J-135B is completed in 2026. Upgrade engine/generator protection system and diagnostics (PRN-00915).
Switchgear Reliability – The switchgears and electrical equipment at the Cen Gen and Service Center are aging and need to be replaced for reliability purposes.	Continue to perform switchgears and major electrical equipment PMs, provide as-need CMs, and monitor equipment performance.	Project P1-136 will replace aging and obsolete 12 kV switchgear.
Plant Water Piping Corrosion – The plant water (that is, cooling water) piping has corroded and needs to be replaced.	Continue to monitor existing piping and provide as-needed CMs until replacement.	Project FE19-02 is replacing all plant cooling water piping in the basement of Cen Gen.
Backup Battery System Reliability – The batteries used to provide backup power for switching of the switch gear during a loss of power event have reached the end of their useful lives.	N/A.	Project FR1-0005 is replacing the lead acid batteries and their respective battery chargers with a suitable backup battery system.
Engine Programmable Logic Controller (PLC) Obsolescence – The existing master and engine PLCs and RIO cards are obsolete.	Continue to perform PLC PMs, provide as-needed CMs, and monitor equipment performance until replacement.	PRN-00994 will replace obsolete PLCs and RIO cards with new Modicon M580 PLCs and new RIO cards.
Engine Protection System Obsolescence and Limited Engine Diagnostics – The existing engine vibration monitoring systems are aging, obsolete, and lack diagnostic capability.	Continue to actively monitor obsolete system until replacement.	PRN-00915 will upgrade the Engine Condition Monitoring System and include diagnostic capabilities.
Engine Cylinder Pressure Monitoring and Balancing – There is no online engine cylinder pressure monitoring to assist with engine load balancing/troubleshooting.	N/A.	PRN-00697 will add pressure sensors to monitor individual cylinders pressure.
Exhaust Heat Recovery Boilers Reliability – The boilers need to be inspected both internally and externally.	N/A.	Obtain a maintenance service contract to inspect/clean boilers to improve performance and plan for repairs (Maintenance Contract). Perform as-needed repairs based on inspection results to improve boiler performance and reliability.
Engine Ignition Control System Obsolescence – The existing engine ignition controls are aging and obsolete.	Continue to actively monitor the obsolete assets and perform as-needed CMs until replacement.	PRN-00965 will pilot test new engine ignition system on one engine to test compatibility and performance prior to installing new ignition control systems onto each engine genset.
Absorption Chiller Obsolescence – The chillers are obsolete and need to be replaced.	Continue to actively monitor the obsolete assets and perform as-needed CMs until replacement.	Perform a planning study to determine the best solution/approach to replace the obsolete chillers. Replace the obsolete chillers with new chillers designed for revised chilled water balance or with alternative technologies based on planning study recommendation.
Deaerator Reliability – The deaerator system is aging and needs to be replaced to improve reliability.	Continue to perform PMs, provide as-needed CMs, and monitor equipment performance until replacement.	Plan a project to replace the deaerator system.

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

Current and Future Projects

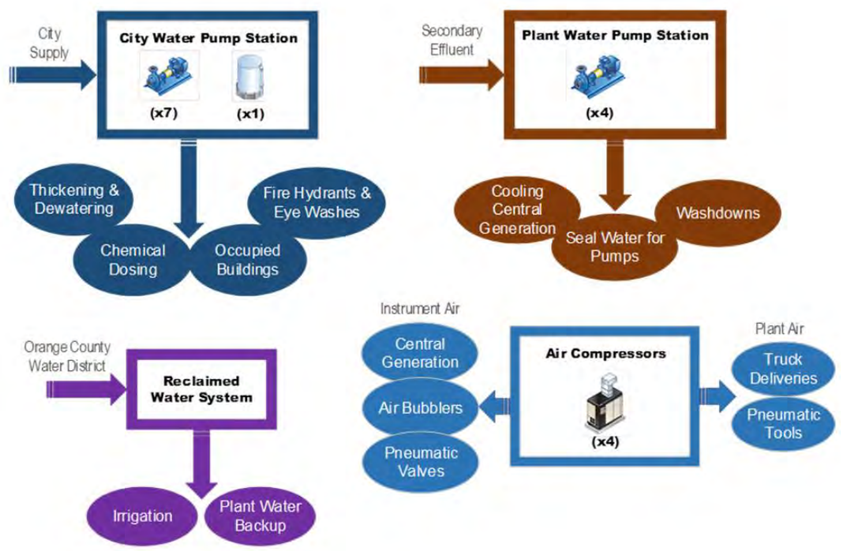
Project No.	Project Title	Impacted Facilities	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
P1-136	12.47kV Switchgear Replacement at Cen Gen at Plant No. 1	Cen Gen Electrical System															
FE19-02	Cen Gen Plant Water Pipe Replacement at Plant No. 1	Plant Water Piping															
FE18-06	Cen Gen Instrument Air Compressor Replacement at Plant No. 1	Instrument Air Compressor															
J-135B	Engine and Generator Overhauls at Plant Nos. 1 and 2	Engine Generator															
TBD	Engine Generator Set#2 Overhauls at Plant No. 1	Engine Generator															
FR1-0005	Cen Gen and 12kV Service Center Switchgear Battery System Upgrades	Battery Backup															
PRN-00915/ 00697	Cen Gen Engine Monitoring System and Pressure Sensing Upgrade	Engine Generator															
N/A	Cen Gen Exhaust Heat Recovery Boiler Cleaning/Assessment (Maintenance Service)	Heat Recovery System															
PRN-00965	Cen Gen Engine Ignition Control System Obsolescence Replacement	Engine Generator															
PRN-00994	Cen Gen Engine PLC Replacement	Engine Generator															
PS21-07	Process Simulation Model Development for Cen Gen Facilities	Cen Gen Facility															
FE20-09	Cen Gen Smoke Detection Replacement at Plant No. 1 and No. 2	Building															
FR1-0021	Cen Gen Basement Access Hatch Faill Restraint at Plant No. 1 and No. 2	Building															
PRN-00420	Cen Gen Exhaust Heat Recovery Boiler Damper Control Upgrade – Pilot	Heat Recovery System															
TBD	Cen Gen Deaerator System Replacement at Plant No. 1	Deaerator System															
N/A	Cen Gen Starting Air Compressor Overhauls (Maintenance Service)	Starting Air Compressor															
TBD	Cen Gen Building HVAC Replacement at Plant No.1	HVAC															
TBD	Cen Gen Absorption Chiller Replacement Plant No.1	Absorption Chiller															

Please see the comprehensive Acronyms and Abbreviations list for definitions.

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

AREA 17 ASSET MANAGEMENT SUMMARY – 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	4	4	-	-
Electrical				
MCCs	4	4	-	-
VFDs	4	4	-	-
Instrumentation				
PLCs, Flowmeters	3	3	-	3

Please see the comprehensive Acronyms and Abbreviations list for definitions.

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

AREA 17 ASSET MANAGEMENT SUMMARY – PLANT NO. 1 UTILITIES

Key Issues

Key Issues	Short-Term Actions and Recommendations	Long-Term Actions and Recommendations
Plant/Instrument Air Line Issues – Excessive condensate and oversized piping causing large pressure drop, reducing compressor redundancy.	Continue to actively monitor existing piping and replace as needed.	Future small projects to be created to address oversized piping and several dead ends within the system. PRN-00995 Plant Air Piping Study to provide recommendations. Project P1-105 will provide new compressors with filtration and condensate removal.
City Water Redundancy and Aging Pump Station – There is no redundancy in the system should the pump station fail. Pump station is getting old, requiring increased maintenance, and will not be reliable long term.	N/A	PS23-05 Utility Water Planning Study to provide options for potable water if no City water is available for long periods and provide recommendations for rehabilitation or replacement of pump station.
Plant Water Piping Reliability – Piping failures throughout the system due to the corrosive nature of plant water. Current ductile iron pipes (DIPs) are corroding prematurely. Aging pipes are also a contributing factor. Pump Station reliability needs evaluation.	Continue to actively monitor existing piping and replace as needed.	Project 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. PS23-05 will provide recommendations for rehabilitation or replacement of pump station.
Air Compressor Capacity – Plant and instrument air supply issues exist due to the lack of air compressors. Current air compressors are not adequate to meet the current plant needs.	Continue to monitor existing compressors and provide as-needed CMs until replacement.	Project P1-105 will add two 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	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
FE18-06	Instrument Air Compressors at Cen Gen	Instrument Air Piping															
P1-105	Headworks Rehabilitation at Plant No. 1	City Water Pump Station, Plant Air Compressors, Plant Air Lines															
FE20-05	Plant Water Piping Replacement at Secondary Clarifiers	Plant Water Piping															
P1-126	Primary Clarifier Replacement and Improvement	Plant Water Piping															
FE19-02	Cen Gen Plant Water Pipe Replacement at Plant No. 1	Plant Water Piping															
X-124	Fleet Services Rehabilitation/Replacement	City Water Piping Replacement															
X-038	City Water Pump Station Replacement	City Water Pump Station															
X-039	Plant Water Pump Station Rehabilitation	Plant Water Pump Station															
PS23-05	Utility Water Planning Study at Plant Nos. 1 and 2	City and Plant Water Pump Stations															
P1-140	Activated Sludge -1 Rehabilitation at Plant No. 1	Plant Water Piping															
PRN-00995	Plant Air Piping Study at Plant Nos. 1 and 2	Plant Air Piping															

Please see the comprehensive Acronyms and Abbreviations list for definitions.

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

AREA 17 ASSET MANAGEMENT SUMMARY – PLANT NO. 1 UTILITIES

Remaining Useful Life of Utility Infrastructure

Please see the comprehensive Acronyms and Abbreviations list for definitions.

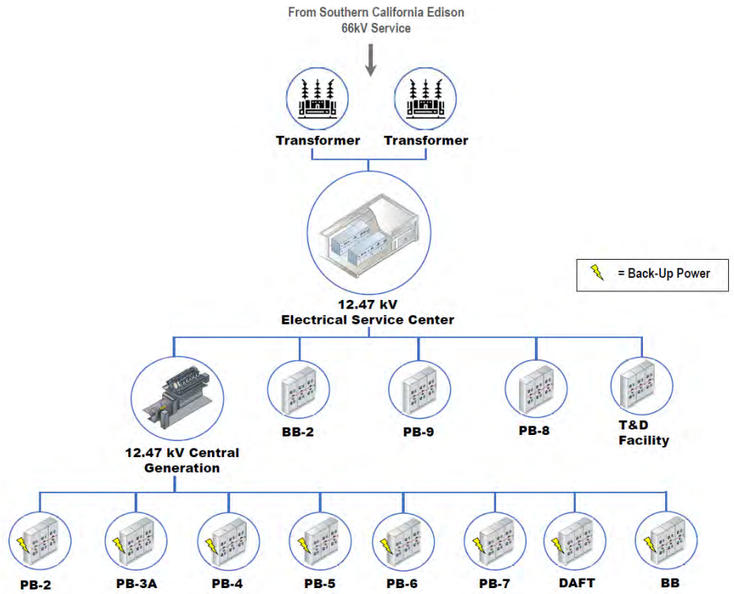
AREA 17 ASSET MANAGEMENT SUMMARY – PLANT NO. 1 UTILITIES

Remaining Useful Life of Utility Infrastructure

Please see the comprehensive Acronyms and Abbreviations list for definitions.

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

Process Schematic



Major Assets

Major Assets	Quantities
12kV Transformers	40
Standby Generators	8
12kV Switchgear	14
5kV and 480V Switchgear	42
MCCs	89
VFDs	180
125VDC and 24VDC 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 – 12.47kV Primary Distribution Level														
12.47kV Feeders	1	4	4	4	4	4	4	1	1	1	3	4	1	1
12.47kV Switchgears	4	4	4	5	4	4	4	-	-	-	-	-	1	1
12.47kV Transfer Switchers	3	-		-		-	-	-	-	-		-	-	-
12.47kV Load Interrupter Switches	3	-	4	4	3	-	-	1	1	1	3	3	-	-
Transformers: 12.47/4.16kV		-	-	-	-		-	-	-	-	-	2	1	1
Transformers: 12.47/0.48kV	4	4	3	3	3	2	3	1	2	1	3	3	1	1
Tier II – 4.16kV Distribution Level														
4.16kV Switchgears	-	-	-	-	-	-	-	-	-	-	-	3	1	-
4.16kV Feeders	-	-	-	-	-	-	-	-	-	-	-	3	1	-
Tier IV – 480V Distribution Level														
480V Switchgears	-	4	3	4	-	2	4	1	1	1	3	3	1	1
Transfer Switches	3	-	2	2	4	-	4	-	-	-	4	4	1	-
Generators	-	-	5	5	5	-	-	1	1	-	-	5	-	-
Tier V – Uninterruptible Power Supply														
UPSs Individual	-	2	-	5	-		4	5	4	4	5	4	3	-
Tier VI – 125VDC and 24VDC Battery Systems														
125VDC Chargers	2	2	4	5		2	3	3	3	3	4	-	3	1
125VDC Batteries	3	3	4	5		3	3	4	4	4	4	-	4	4
24VDC Chargers	-	2	4	5	4	-	-	3	3	-	-	4	-	1
24VDC Batteries	-	3	4	5	4	-	-	4	4	-	-	4	-	4
Standby Generator														
Generator Controls	-	5	5	5	5	-	-	1	1	-	-	5	-	-

Please see the comprehensive Acronyms and Abbreviations list for definitions.

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

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

Key Issues

Key Issues	Short-Term Actions and Recommendations	Long-Term Actions and Recommendations
Variable Frequency Drive Obsolescence – Models across various areas of Plant No. 1 are becoming obsolete and are unsupported by the manufacturer.	Small Projects and Maintenance Projects are currently replacing VFDs, including FR1-0011 to be complete next year. Use of a co-op contract is being explored for the next projects, which would be a turn-key solution.	Develop a long-term VFD Replacement Strategy.
480V and 120V Cable Failures – Multiple unexpected power and control cable failures have occurred within the past few years that indicate there may be underlying duct bank issues that may cause future failures.	Small Projects and Maintenance Projects are currently replacing failed cables, such as FR1-0023.	Utilize new Repair and Maintenance Electrical Pack and Electrical Blanket Repair Contracts to replace cables more efficiently and cost-effectively. Create a project to test cables in problem areas to proactively replace cables if needed. If needed, conduct a condition assessment of the underground duct banks that are affected.
Batteries – Aging and obsolescence due to short life span of batteries.	Project FR1-0005 will replace critical batteries and chargers at 12kV Service Center and Cen Gen. Maintenance has replaced many of the obsolete batteries.	Work with Maintenance to develop a battery maintenance program.
Laboratory Power Reliability – The lab has been experiencing utility outages, putting OC San at risk for noncompliance.	Alert notification has been created for Operations to increase response time from Maintenance to switch power from Utility to Plant power in the event of an outage. Ground fault sensor feeder breakers will be added to reduce nuisance tripping of the main breaker. The option to install an automatic transfer switch will be evaluated.	J-133 Laboratory Replacement Project is scheduled to be completed in 2028.
Aging Switchgear – Various 12kV and 480V switchgear are reaching the end of their useful life.	Project FE23-10 will replace 12kV switchgear at Power Building 5. Future CIP projects will replace additional switchgear but some may require repairs or small projects during the interim.	Revise the theoretical useful life span to more accurately track the equipment and plan for future CIP projects.

Current and Future Projects

Project No.	Project Title	Impacted Facilities	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
FR1-0005	Cen Gen and 12kV Service Center Switchgear Battery System Upgrades at Plant No. 1	Plant No. 1 Power Distribution															
FR1-0011	P1 VFD Replacement at Plant No. 1	City Water Pump Station, RAS, DAFT, TF															
FR1-0023	Secondary Effluent Cable Replacement at Plant No. 1	Secondary Effluent Junction Box Gate Valves															
P1-132	Uninterruptable Power Supply Improvements at Plant No. 1	Plant No. 1 Multiple UPS Loads															
P1-105	Headworks Rehabilitation at Plant No. 1	Plant No. 1 Headworks, Bars Screen, Metering Structure, PBs															
J-98	Electrical Power Distribution System Improvements	Various Plant No. 1 and Plant No. 2 Conditions based Electrical Distribution Systems															
P1-126	Primary Sedimentation Basins Nos. 3–5 Replacement at Plant No. 1	Plant No. 1 Power Distribution															
P1-133	Primary Sedimentation Basins No. 6–31 Reliability Improvements at Plant No. 1	Sludge Pump VFD Replacement															
P1-140	Activated Sludge 1 and Secondary Clarifier Rehabilitation	PB 2, DAFT, and Blower Building 1 Electrical Equipment															
J-124	Digester Gas Facilities Rehabilitation	PB 5 MCCs															
FE23-10	12kV Switchgear Replacement for PB 5 at Plant No. 1	PB 5 12kV Switchgear															
J-133	Laboratory Replacement at Plant No. 1	Lab Power Feed															
P1-136	12.47kV Switchgear Replacement at Plant No. 1 Cen Gen and Service Center	Service Center and Cen Gen 12kV Equipment															
X-036	City Water Pump Station Rehabilitation at Plant No. 2	MCCs, VFDs															
X-038	City Water Pump Station Rehabilitation at Plant No. 1	City Water Pump Station MCC															
X-039	PWPS Rehabilitation at Plant No. 1	PB 6 Electrical Equipment															
X-006	Waste Sidestream Pump Station Rehabilitation at Plant No. 1	MCCs, VFDs															

Please see the comprehensive Acronyms and Abbreviations list for definitions.

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

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

Occupied and Power Building Site Plan at Plant No. 1

Note: Building colors are used to help identify the buildings and do not represent RUL Score.

Major Assets Remaining Useful Life

Plant No. 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	5
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	5
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	5
12kV Distribution Center	4	N/A	3	1	N/A	N/A
12kV Service Center	3	N/A	2	1	5	N/A
PB 2	4	N/A	3	1	2	N/A
PB 3A	3	N/A	3	1	N/A	N/A
PB 4	3	N/A	3	1	2	N/A
PB 5	3	N/A	3	1	2	N/A
PB 6	3	N/A	3	1	2	N/A
PB 7	5	N/A	5	1	N/A	N/A
PB 8	5	N/A	5	1	N/A	N/A
PB 9	1	N/A	3	1	N/A	N/A

Please see the comprehensive Acronyms and Abbreviations list for definitions.

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

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

Key Issues

Key Issues	Short-Term Actions and Recommendations	Long-Term Actions and Recommendations
Seismic Deficiencies – Recent planning study (PS15-06) recommended seismic retrofits to several buildings to avoid serious damage during an earthquake	N/A	Project P1-137 will make seismic modifications to several support buildings in Plant No. 1.
Aging Elevators – Elevators at Building 6, Control Center, and Lab need to be rehabilitated and modernized.	N/A	As the building elevators age and are less reliable over time, projects are being created to address modernization and upgrades as needed. PRN-00771 is one such project.
Building Roof Reaching Their Useful Life – PB 7/8 and Purchasing roofs need to be replaced.	N/A	As roofs reach the end of their useful life and are no longer repairable, small projects will be created to replace them.
Electric Vehicle Fleet Require Service Center – As more of the District Fleet becomes electric, there is a need for a specialized service center.	N/A	PS23-01 will provide recommendations on rehabilitating existing fleet services building or building a new facility to address the servicing of electric vehicles

Current and Future Projects

Project No.	Project Title	Impacted Facilities	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
FE23-08	PB 7 and 8 HVAC Replacement at Plant No. 1	PB 7 and 8															
FE21-01	Plasma Cutting Fume Extractor Installation at Plant No. 1 Rebuild Shop	Rebuild Shop															
PS23-01	Fleet Facilities Improvements Study	Fleet Building															
PRN-00955	Purchasing, PB 7, and PB 8 Roof Replacement	Purchasing, PB 7, and PB 8															
PRN-00960	Control Center HVAC Replacement	Control Center															
FE23-06	HVAC Replacements at Plant Nos. 1 and 2	SALS															
X-124	Electric Vehicle Fleet Services Building	Fleet Building															
P1-105	Headworks Rehabilitation at Plant No. 1	PBs 3 and 3A															
P1-137	Support Building Seismic Improvements at Plant No. 1	Fleet, Control Center, Rebuild Shop, Shop A Shop B, 12kV Service Center, Buildings 5 and 6															
J-133	Laboratory Replacement at Plant No. 1	Laboratory															
P1-141	Administration Facilities Demolition	Administration Building															
FR1-0022	Backup Power for Laboratory Equipment at Plant No. 1	Laboratory															
PRN-00771	Building 6, Control Center, Lab Elevator Modernization	Building 6, Control Center, Laboratory															
P1-140	Activated Sludge - 1 Rehabilitation at Plant No. 1	12kV Distribution Center, Power Bldg. 2															

Please see the comprehensive Acronyms and Abbreviations list for definitions.

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

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Plant No. 2 Area Asset Management Summaries

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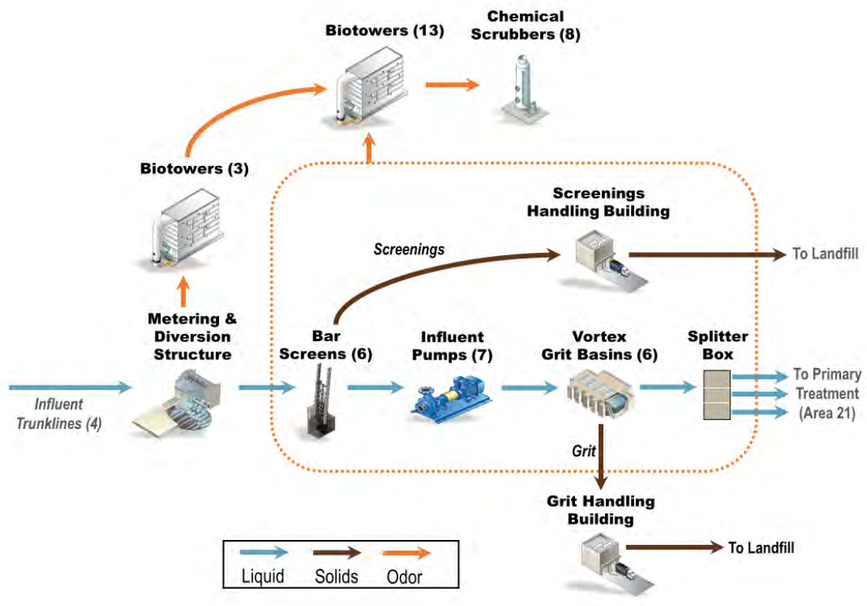
AREA 20 ASSET MANAGEMENT SUMMARY – PLANT NO. 2 PRELIMINARY TREATMENT

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	PB-D	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	1
Concrete and Tanks	1	1	1	1	1	2	2		-
Mechanical									
Piping and Valve	2	-	2	2	2	-	-	-	-
Pump	-	-	4	3	-	3	3	-	-
Bar Screens		4	-	-	-	-	-	-	-
Screening Washer Compactor	-	3	-	-	-	-	-	-	-
Grit Cyclone/Classifier	-	-	-	3	-	-	-	-	-
Conveyor	-	3	-	3	-	-	-	-	-
Fans and Blower	-	-	-	-	-	3	3	-	-
Control Gate	2	2	2	2	2	-	-	-	-
Media	-	-	-	-	-	4	4	-	-
HVAC	3	3	3	3	3	-	-	-	-
Electrical									
VFDs	-	-	5	-	-	5	5	-	-
MCCs			-					4	2
Instrumentation									
PLCs, Flow Meters	3	3	3	3	3	3	3		-

Please see the comprehensive Acronyms and Abbreviations list for definitions.

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

Major Assets

Major Assets	Quantities
Metering and 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

Major Assets	Quantities
Headworks Odor Control (Cont'd)	
Bleach Pump	16
Acid Tank	1
Acid Pump	2
Caustic Tank	1

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

Key Issues

Key Issues	Short-Term Actions and Recommendations	Long-Term Actions and Recommendations
Headworks Cables – 480V and control cables are failing in the headworks area. Multiple cable failures occurred in the grit basin and grit handling system causing a complete system failure.	See Area 28	See Area 28
Washer Compactor Redundancy – 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.	Continue to address plugging through maintenance work orders and performing PMs.	Initiate a planning study, including research and outside agency feedback, on the use of other manufacturer-recommended equipment models that are less prone to plugging to further investigate the reliability of the washer compactor system and provide a feasible solution.
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.	PRN-00561 will move forward for replacement of the obsolete system with the Bently Nevada Orbit 60.
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.	Continue to monitor and provide short-term maintenance repairs.	MP2-018 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 (5, 6, 7).

Current and Future Projects

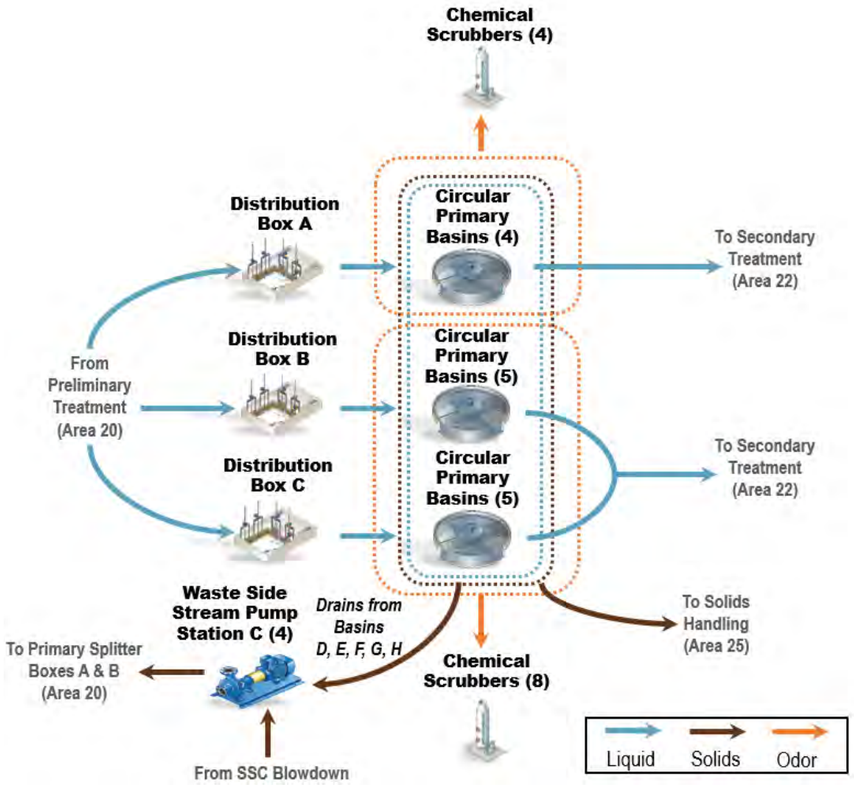
Project No.	Project Title	Impacted Facilities	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
FR2-0026	Headworks Phase 3 Cable Replacement at Plant No. 2	Headworks															
PRN-00561	Main Sewage Pump Vibration Monitoring System Modernization at Plant No. 2	Influent PS															
MP2-018	Main Sewage Pumps Repair at Plant No. 2	Influent PS															
X-030	Headworks Rehabilitation at Plant No. 2	Headworks															

Please see the comprehensive Acronyms and Abbreviations list for definitions.

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

AREA 21 ASSET MANAGEMENT SUMMARY – 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	3	4	3	2	4	1
Dome	5	5	5	5	3	3	3	3	3	3	3	3	3	3	-	-	-	-	-	-
Mechanical																				
Piping	3	3	3	3	3	3	3	3	3	2	2	2	2	2	3	3	3	2	3	2
Internal Mechanism and Gates	5	5	5	5	4	4	4	4	4	4	5	4	4	4	-	-	-	-	5	-
Fans and Pumps	5		5		3		3		3		3		3		3	5	4	2	-	2
HVAC	4		4		3		3		3		3		3		-	-	-	-	-	-
Electrical																				
VFDs	-	-	-	-	-	-	-	-	-	-	-	-	-	-			5	-	-	-
MCCs	4	4	4	4	3	3	3	3	3	3	3	3	3	3	3	4	4	-	-	-
Instrumentation																				
PLC, Flow Meters	4	4	4	4	3	3	3	3	3	3	3	3	3	3	3	4	5	3	-	3

Please see the comprehensive Acronyms and Abbreviations list for definitions.

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

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

Key Issues

Key Issues	Short-Term Actions and Recommendations	Long-Term 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.	FE23-09 (formerly MP2-007) will rehabilitate failed and corroded rotating mechanisms at Primary Clarifiers F and 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.	In April 2024, Maintenance staff observed noise from the drive at Primary Clarifier N. Following the Original Equipment Manufacturer's (OEM's) assessment, PRN-00997 is currently in progress to comply with the OEM's recommendation to replace the drive. Each clarifier, including rotating mechanisms, will be inspected one at a time over the next several months to verify RUL and timing of the P2-133 project.	P2-133 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 under Planning task order.	P2-133 will provide long-term rehabilitation on B and C sides of primary basins and related systems such as Distribution Box B.
Condition of Primary Effluent Junction Boxes – Junction boxes 2, A, B, C, D, and F were constructed 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. Primary Effluent Junction Box 2 was inspected and a heavily corroded roof structure was identified.	P2-98A will address the corroded roof for Primary Effluent Junction Box 2, but other effluent junction boxes (JB-A to JB-F), which have pressure manhole covers, are in the process of being assessed.	N/A until short term action to perform condition assessment is completed.
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 full system will be replaced under P2-133.

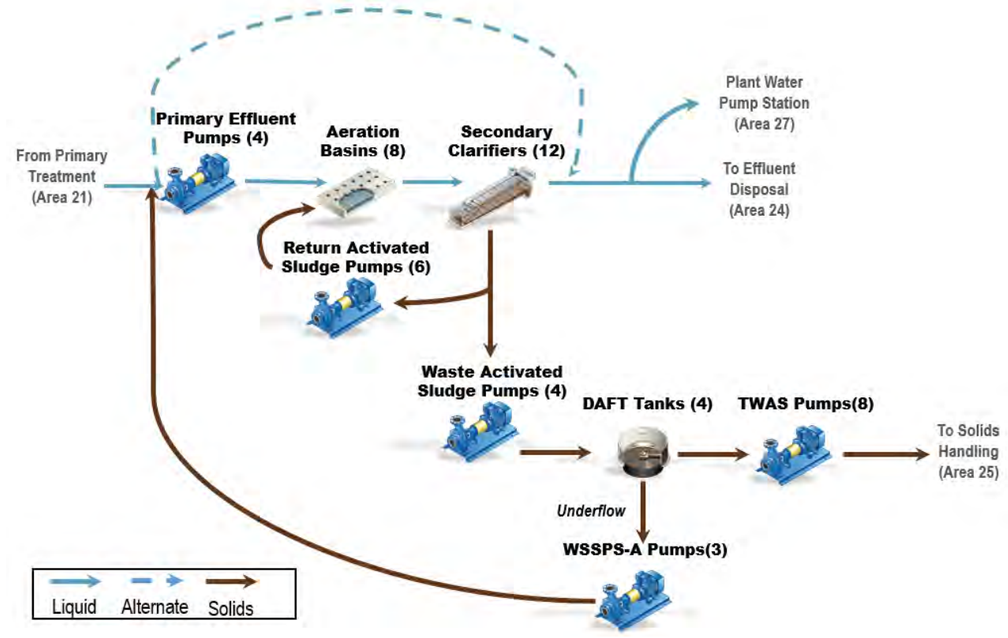
Current and Future Projects

Project No.	Project Title	Impacted Facilities	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
P2-98A	A-Side Primary Clarifiers Replacement at Plant No. 2	A-Side Primary Clarifiers															
P2-133	B- and C-Side Primary Clarifiers Rehabilitation at Plant No. 2	B- and C-Side Primary Clarifiers															
P2-135	Chemical Systems Rehabilitation at Plant No. 2	Anionic Polymer System															
FE23-09	Primary Clarifiers F and G Rotating Mechanisms Rehabilitation at Plant No. 2	Primary Clarifier F and G															
X-030	Headworks Rehabilitation at Plant No. 2	Ferric Chloride and WSSPS-C															
PRN-00997	Primary Clarifier N Drive Replacement	Primary Clarifier N															

Please see the comprehensive Acronyms and Abbreviations list for definitions.

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

AREA 22 & 23 ASSET MANAGEMENT SUMMARY – PLANT NO. 2 SECONDARY TREATMENT – ACTIVATED SLUDGE AND OXYGEN FACILITY



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	4	-	3	3	2	2	-	-	-	-	4
Structural											
Building	3	-	-	-	3	3	-	1	-	-	-
Structure	3	4	3	3	-	-	5	1	1	1	-
Mechanical											
Pump	4	-	-	-	3	3	-	2	2	-	3
Aerator	-	4	-	-	-	-	-	-	-	-	-
Piping and Valve	3	4	3	3	3	3	5	2	2	3	3
Clarifier/DAFT Moving Mechanism	-	-	4	-	-	-	-	2	-	-	-
Channel Air Blower	-	-	-	-	-	3	-	-	-	-	-
Control Gate	-	4	2	3	-	-	-	-	-	2	3
LOX Facility	-	-	-	-	-	-	5	-	-	-	-
HVAC and Ventilation	3	-	-	-	3	3	-	-	-	-	-
Electrical											
MCCs	4	3	3	-	3	3	4	1	1	1	1
VFDs	5	-	-	-	5	5	-	4	4	-	-
Instrumentation											
PLC and Flow Meter	3	4	3	-	3	3	4	3	3	-	3

Please see the comprehensive Acronyms and Abbreviations list for definitions.

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

AREA 22 & 23 ASSET MANAGEMENT SUMMARY – PLANT NO. 2 SECONDARY TREATMENT – ACTIVATED SLUDGE AND OXYGEN FACILITY

Key Issues

Key Issues	Short-Term Actions and Recommendations	Long-Term Actions and Recommendations
Primary Effluent Pump Station (PEPS) Corrosion – Obsolete VFD parts; aged PEPS pumps and corrosion on suction pipes; missing flapper gates on the area drain inlets to the wet well; corroded individual pump discharge header; pump discharge header poor coating condition.	Replace Pump #3 discharge header with stainless steel pipe (assessment done, significant pipe loss found). Install Pump #3 after rebuild and remove the next one. Perform condition assessment of the discharge header of the next removed pump, and replace the discharge header as Pump #3.	FE19-08 project will replace the PEPS VFDs. MP2-0010 is overhauling Pump #1, #2, and #3. Pump #3 pump was removed in November 2023 and planned to be reinstalled in October 2024. (Pump #4 overhaul completed in 2022) X-052 will replace the PEPS pumps with all electrical works including switchgears, rehabilitate the major discharge header, and replace the missing flapper gates.
Aeration Basin Reliability – Concrete deck cracking and structural integrity concerns; aerator motor corrosion and oxygen piping corrosion; aged oxygen analyzer panels and no air conditioning.	Continue the aerator motor rebuild as needed.	P2-136 will replace all oxygen piping, perform structural rehabilitation of the aeration basins, replace all aerators, and replace all inlet gates and oxygen analyzer panels.
Secondary Clarifiers Issues – Broken clarifier mechanisms; unsafe access into clarifier basins; scum accumulation and recirculation process issue (scum is currently flowing to WSSPS-A and then is pumped back to PEPS to keep in the non-reclaimable stream); some handrails do not meet Occupational Safety and Health Administration (OSHA) requirements; Clarifier D&G chain and flight collapsed after MP-248 replacement.	N/A	FR2-0018 is under construction to replace the remaining six clarifiers left by MP-248, which replaced the worst six ones. FR2-0023 is under construction to add a safe entry access platform to each secondary clarifier. FR2-0031 will reroute the scum to DAFTs. P2-136 will replace part of the handrails. PRN-00989 will rebuild Clarifier D&G and add an alignment monitoring system.
RAS/WAS Pump Station Reliability and Sizing – Obsolete VFDs; aged pumps; seismic risks; WAS pumps are oversized to cover low-flow condition.	Continue to complete the pump overhaul being led by Maintenance.	FE19-08 is replacing the RAS and WAS VFDs. X-107 will add structural improvements to mitigate seismic risks at East and West RAS/WAS PSs. X-052 will replace all RAS and WAS pumps and will consider WAS pumps to cover low-flow condition.
Liquid Oxygen (LOX) Supply and Storage Issues – LOX Tank A had been demolished and not available until new tank is installed. LOX Tank B is over 40 years old and at the end of its useful life.	Continue the maintenance activities to maintain the temporary LOX trailer and LOX Tank B.	FE21-07 is in under construction for Tank A replacement. FE22-02 will replace LOX Tank B. PS22-02 evaluated the feasibility of onsite oxygen generation and recommended the installation of three 10-tons-per-day Vacuum Swing Adsorption (VSA) units.
WSSPS - A Vulnerability – Flooding of the pump dry well has occurred in the past causing WSSPS pump motor damage.	Maintain the sump pump to avoid fooding; rebuild the main pumps as needed.	X-007 will replace the pumps with dry pit submersible type.
DAFT Seismic and Safety Issues – DAFT structure is vulnerable to a seismic event and has lack of fall protection tie off points for maintenance activities.	N/A	X-107 will add structural improvements to mitigate seismic risks at DAFT D. FR2-0023 is under construction to install fall protection tie-off points.

Current and Future Projects

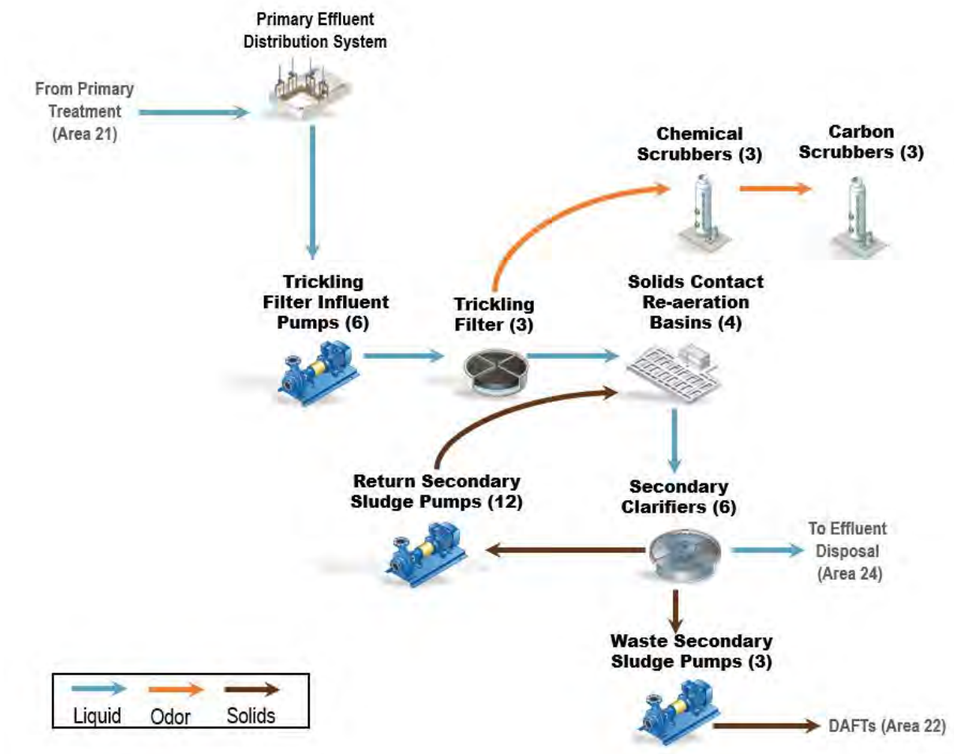
Project No.	Project Title	Impacted Facilities	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
FR2-0018	Plant No. 2 AS Plant Clarifiers Rehabilitation - Phase 2	Secondary Clarifiers															
FR2-0023	Activated Sludge Clarifier Entry Improvements	Secondary Clarifiers; DAFTs															
MP2-0010	PEPS Pump #1, #2, and #3 Overhaul	PEPS															
FE19-08	Plant No. 1, Plant No. 2, Collections VFD Drives Replacement	PEPS, RAS, RSS Pump Stations															
P2-136	Activated Sludge Aeration Basin Rehabilitation	AS Plant															
X-052	Activated Sludge RAS/WAS/PEPS/Vaporizers Rehabilitation	AS Plant															
FE21-07	LOX Tank A Replacement	LOX Facility															
FE22-02	LOX Tank B Replacement	LOX Facility															
FR2-0031	Activated Sludge System Scum Rerouting	AS Plant															
PRN-00989	Activated Sludge Final Clarifier D&G Rebuild	Secondary Clarifiers															
X-007	Waste Sidestream Pump Station A Upgrade	WSSPS A															
X-107	Seismic Improvements to DAFTs Area	DAFTs, East and West RAS/WAS PSs															
PS22-02	Onsite Oxygen Generation Feasibility Study	LOX Facility															
TBD	Activated Sludge Facility Replacement Planning Study	AS Plant															
X-114	Activated Sludge Facility Replacement at Plant No. 2	AS Plant	**Project plan to start in 2041 with construction from 2046 to 2052**														

Please see the comprehensive Acronyms and Abbreviations list for definitions.

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

AREA 22 ASSET MANAGEMENT SUMMARY – 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 & Blowers	WSS PS	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	2
TF Rotary Distributor	-	3	-	-	-	-	-		-	-
TF Media	-	3	-	-	-	-	-	-	-	-
Clarifier Sludge Collector	-	-	-	-	3	-	-	-	-	-
Blower and 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 and Ventilation	2	-	-	2	-	2	2	2	-	-
Electrical										
MCCs	1	1	1	1	1	1	1	1	1	1
VFDs	3	4	-	4	-	4	4	4	4	4
Instrumentation										
PLCs and Flow Meters	3	3	-	3	3	3	3	3	3	3

Please see the comprehensive Acronyms and Abbreviations list for definitions.

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

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 and 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 and 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

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

Key Issues

Key Issues	Short-Term Actions and Recommendations	Long-Term Actions and Recommendations
Trickling Filter Pump Station Back-up Power – No backup power to TFPS; pump failure could result in primary effluent to ocean outfall.	N/A	J-117B will provide a plantwide load shedding system to power critical Distribution Center J loads from Cen Gen.
Trickling Filter Rotary Distributor Failures – TF-C center rotating assembly needs a similar replacement as TF-A and TF-B due to the structural failure found on TF-A and TF-B.	Continue the PMs and greasing.	MP2-005 replaced TF-A and TF-B center rotating assemblies in 2023. MP2-019 is replacing the TF-C center rotating assembly in October 2024. Continue monthly PM by contractor and Maintenance.
Secondary Clarifier Corrosion – Corroded areas have been discovered on walkways and clarifier moving mechanisms.	Coating Program is working on coating the walkways and moving mechanism parts.	X-031 will perform a major rehabilitation of the Secondary Clarifiers.
Solids Contact/Sludge Reaeration Biomass Recycling – Using temporary piping to route the area drain pump station to SC/SR basins instead of Headworks to keep the microorganisms in the biological process area.	Maintenance to continue to maintain existing hose.	PRN-00703 will reroute area drain PS discharge to SC/SR basins instead of Headworks.
Trickling Filter Snail control – Signs of snail shell accumulation at process area and excessive wearing on return secondary sludge (RSS) and waste secondary sludge (WSS) pipes. Shells found in long outfall pipeline.	Operations and Asset Management to continue to monitor the problem.	Changed from 25% caustic injection to 50%. PS18-10 recommended to change back to original design of flooding with 50% caustic at shorter duration. Need to schedule flooding test.

Current and Future Projects

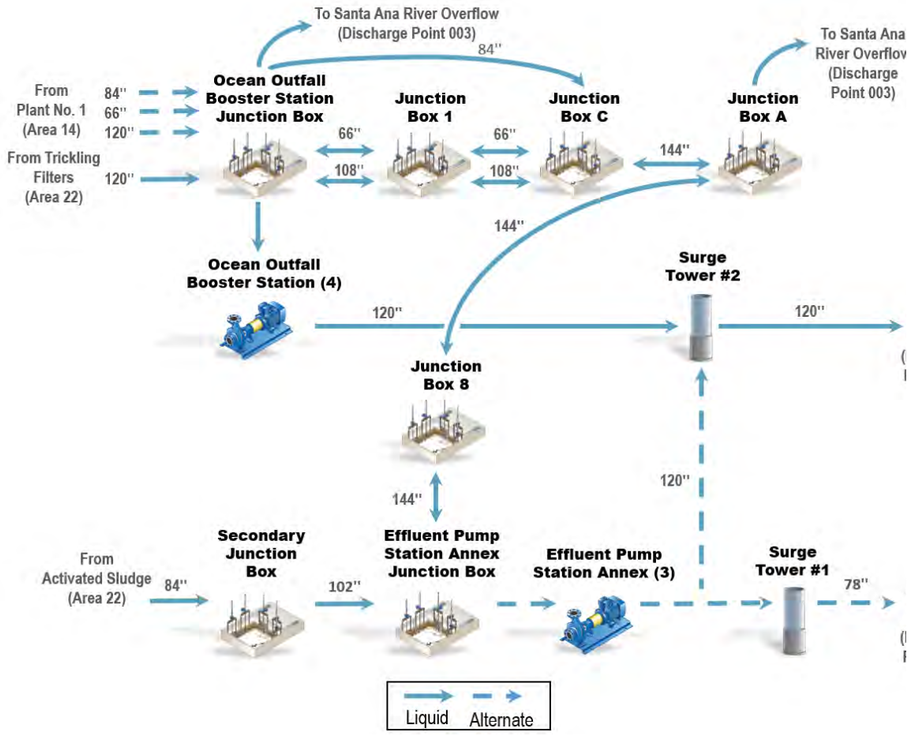
Project No.	Project Title	Impacted Facilities	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
MP2-019	Trickling Filter C Center Mast Assembly Replacement	TF-C															
PRN-00703	Trickling Filter Process Drain Improvements	TF/SC															
J-117B	Outfall Low Flow Pump Station	DC-J, TFPS															
X-031	TF/SC Rehabilitation	TF/SC facility															

Please see the comprehensive Acronyms and Abbreviations list for definitions.

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

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

Process Schematic



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	3	-	-	-	-	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	4	-
Tank	-	-	-	-	-	-	5	-	-	-	-	-	-
Manhole Covers	-	-	-	-	-	-	-	-	-	-	-	4	4
Ballast	-	-	-	-	-	-	-	-	-	-	-	4	4
Electrical													
VFDs	5	-	-	-	-	5	-	-	-	5	-	-	-
MCCs	5					3				3			
Instrumentation													
PLC, Flow Meters	5	-	-	-	-	3	4	3	3	3	-	-	-
Actuators	4	4	4	4	4	4	-	4	4	-	-	-	-

Please see the comprehensive Acronyms and Abbreviations list for definitions.

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

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

Major Assets	Quantities
120" Ocean Outfall	
Port Hole	500
Manhole Cover	47
78" Ocean Outfall	
Port Hole	125
Manhole Cover	14

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

Key Issues

Key Issues	Short-Term Actions and Recommendations	Long-Term 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 PM activities. Since it would be a substantial effort to replace all actuators, a path for replacement/repair will be determined on a case-by-case basis depending on criticality.	N/A
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 on standby and be used during PWWFs.	Continue current maintenance strategy for EPSA and OOBS.	A future planning study will be created to identify operational and maintenance strategies for OOBS and EPSA.
Condition of 120-inch Long Outfall – Planning Study PS18-09 Ocean Outfall Condition Assessment and Scoping Study performed a detailed inspection of the interior and exterior of the outfall, the ballast, and all associated components from the Beach Box to the end flap gate. The study identified 10 required project elements, four of which were immediate needs that were added as tasks to the project and resolved. However, six project elements remain that need to be addressed (see Long-Term Actions and Recommendations for details).	N/A	Project J-137 will address the remaining project elements identified from PS18-09: • Remove debris blocking diffuser access • Replace inspection opening hold-down hardware • Add additional ballast rock in areas identified by 3-D bathymetry survey • Replace existing manhole covers and appurtenances • Remove outfall sediment deposits • Replace flap gate
Condition of 78-inch Short Outfall – The short outfall was last used in 2012 and its condition is largely unknown. NPDES recently added requirements for external inspection of the short outfall every 2.5 years.	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 or action.	J-137 will provide rehabilitation of the 120-inch Ocean Outfall as well as inspection and recommended repairs on the 78-inch Outfall.
Deterioration of Emergency Overflow Wingwalls – The two emergency overflow weirs allow emergency overflow discharges to the Santa Ana River via concrete wingwall structures. Investigations performed under PS17-10 concluded that both structures are gradually deteriorating and if not addressed soon, could require substantial rehabilitation within 6-7 years.	N/A	P2-139 will provide rehabilitation of concrete and rebar at the wingwalls and foundation slabs.
Reliability of Sodium Bisulfite System (SBS) –. The SBS has only been utilized a few times since 2015. Prior to this, higher discharges of effluent to the ocean outfall required dechlorination of disinfected effluent. The infrequent usage of the system led to sodium bisulfite crystallization in tanks, piping, and other appurtenances. Additionally, the equipment at the station is in poor condition and overdesigned for its current usage.	Installation of a tank-level transmitter along with associated wiring and conduit are in progress. A recirculation loop was installed from the existing pumps to the temporary tank to prevent crystallization of sodium bisulfite within the tank. This system will provide temporary use if needed during construction activities of P2-135 and J-137.	P2-135 will replace the sodium bisulfite chemical feed and storage system.

Current and Future Projects

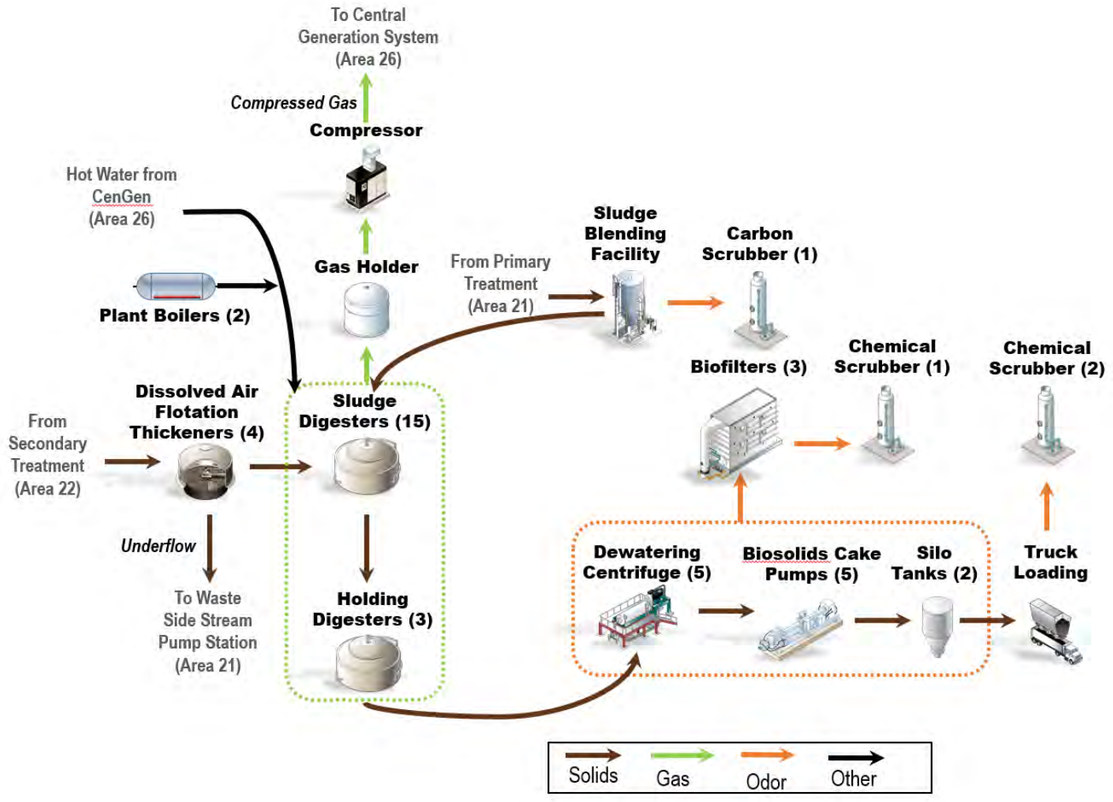
Project No.	Project Title	Impacted Facilities	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
J-117B	Outfall Low Flow Pump Station	OOBS and New Low Flow Pump Station															
P2-135	Chemical Systems Rehabilitation at Plant No. 2	Sodium Bisulfite Station															
P2-139	Santa Ana River Wingwall Rehabilitation	OOBS and JB-A															
J-137	Ocean Outfalls Rehabilitation	120" and 78” Ocean Outfall															
J-138	Cen Gen Facilities and OOBS Seismic Upgrades	OOBS															
PS23-03	2025 Outfall Initial Dilution Model	120" and 78" Ocean Outfalls															
TBD	Ocean Outfall Land-Section Rehabilitation Study	120" and 78" Ocean Outfalls															
X-098	EPSA Rehabilitation	EPSA															
X-115	Short Outfall Rehabilitation	78” Ocean Outfall															
X-116	Outfall Land Section Rehabilitation	120” Ocean Outfall															
PRN-00381	42-inch Emergency Overflow Line	42” Overflow from JB-A to Headworks															
N/A	Outfall External Inspection	120" and 78" Ocean Outfalls															
N/A	Outfall Structural Integrity Report	120” and 78” Ocean Outfalls															

Please see the comprehensive Acronyms and Abbreviations list for definitions.

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

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

Process Schematic



Note: Process Schematic shows entire Area 25 Solids Handling Facility.

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	2	2	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			3	3	4		4		4		4		4		-
Piping and Valve	4	4	4	4	4	4	2	2	4	4	4	4	4	4	4	4	4	4	2
Chemical Pump	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
Electrical																			
MCCs	4	4	5	3	3	5	1	1	1	3	3	3	3	5	5	3	3	5	1
VFDs	-	-	-	-	-	-	4	4	4	-	-	-	-	-	-	-	-	-	-
Instrumentation																			
PLC and Flow Meter	4	4	4	4	4	4	2	2	2	3	3	3	3	4	4	4	4	4	2

Please see the comprehensive Acronyms and Abbreviations list for definitions.

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

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

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

Key Issues

Key Issues	Short-Term Actions and Recommendations	Long-Term Actions and Recommendations
Digester K Dome Integrity – Gas leaking from dome and numerous cracks found.	Keep Holder K out of service. Minimize shutdown time of Holder I and J.	FR2-0032 will repair Digester K dome by overlaying polymer concrete based on the condition assessment and structural analysis report.
Digester C, D, F, G High-Rate Mixing Pump Reliability – Ragging issues. Digesters C, D, F, and G are the only four digesters that need to be upgraded with chopper pumps for the high-rate mixing pumps. All the high-rate mixing pumps on the other P2 digesters have been replaced with chopper pumps.	Heat exchangers had already been purchased and stocked on site, ready for FE20-02.	FE20-02 will replace high-rate mixing pumps, heat exchangers, sludge recirculation pumps, bottom sludge transfer pumps, and hot water pumps and piping.
Digester Gas Balance Line Material Compatibility – Digester C, D, F, G, and I gas balance lines were constructed of polyvinyl chloride (PVC) pipes. Digester P, Q, R, and S gas balance lines were constructed of steel pipes. These gas lines are not meeting the current digester gas line standard of stainless steel and are prone to failure or corrosion.	Coat the steel gas balance lines.	FE19-10 will replace the PVC gas balance lines with stainless steel lines (FE19-10 was combined with FE20-02 as one bid). PRN-00990 was approved to add the steel gas balance line replacement to P2-137.
Digesters P and R Structural Issue – Post-tensioned ring has deteriorated, impacting the structural integrity of the concrete domes.	Digesters P and R are out of service.	P2-137A will repair Digesters P and R post-tensioned rings and demolish Q-R bridge.
Walking Bridge Structural Deficiencies – Six out of 13 bridges were red taped to prevent access after unsafe conditions were found from assessments due to major cracking, buckling, and potential rebar corrosion.	Coat the steel bridges. Repair projects will inspect the bridges on a regular basis before the repair.	FE19-10 will repair Digesters F-G and D-I bridges. FR2-0033 will repair Digester O-T bridge. P2-137 will repair 13 bridges and replace the Digester Q-R bridge to be demolished by P2-137A.
Viewport Corrosion – There are three viewports on each digester. Most viewports are corroded, leaking gas from the seal, and need to be replaced.	Maintenance is scheduled to replace the seals.	PRN-00990 was approved to add the viewports replacement work to P2-137. One viewport per digester will be replaced, and the remining two will be abandoned and filled with proper filling material.
Dig. E and H Flame Arrestors Access – No safe access to do maintenance work on the flame arrestors on the gas balance lines.	Maintenance continues to setup manlift to access.	PRN-00990 approved for P2-137 to add access platforms to those four flame arrestors.
Heat Exchangers, Sludge Recirculation Pump, and Sludge Transfer Pump Reliability – Digester heat exchangers, recirculation pumps, and bottom sludge transfer pumps are nearing the end of their useful lives and need to be replaced.	Maintenance to store spare heat exchangers, sludge recirculation pumps, and bottom sludge transfer pumps.	PRN-00684 Maintenance Projects to replace heat exchangers, sludge recirculation pumps, and bottom sludge transfer pumps. (Digester E, H, L, M, N heat exchangers replacement completed, and E and H pump replacement completed.) FE20-02 will replace those units on Digesters C, D, F, and G.
Digester I and J Coating Failure – Interior coating on walls and ceiling installed by P2-89 are peeling off gradually.	Wash off the peeled coating after digester cleaning to avoid clogging the mixing pump and piping.	Creating project to recoat Digesters I, J, and K interior. Digester Holder K needs to be coated.
Overall Digester Reliability – Digesters are approaching the end of their useful lives and pose a risk of failure during a seismic event. Building new digesters is recommended by Biosolids Master Plan to address the seismic risk and provide the long-term Class B digestion reliability with the ability to convert to Class A digestion in the future.	Perform PM, condition assessment, and incidental repairs.	P2-137 will rehabilitate digesters including domes and walls repair, replace electrical and motor control centers (MCCs), relocate carbon canisters to ground level, and address other project elements mentioned above. P2-128 will build six new digesters. X-135 will replace Digesters P, Q, R, and S. XP2-131 will build three digesters/holders to replace Digesters I, J, and K.

Current and Future Projects

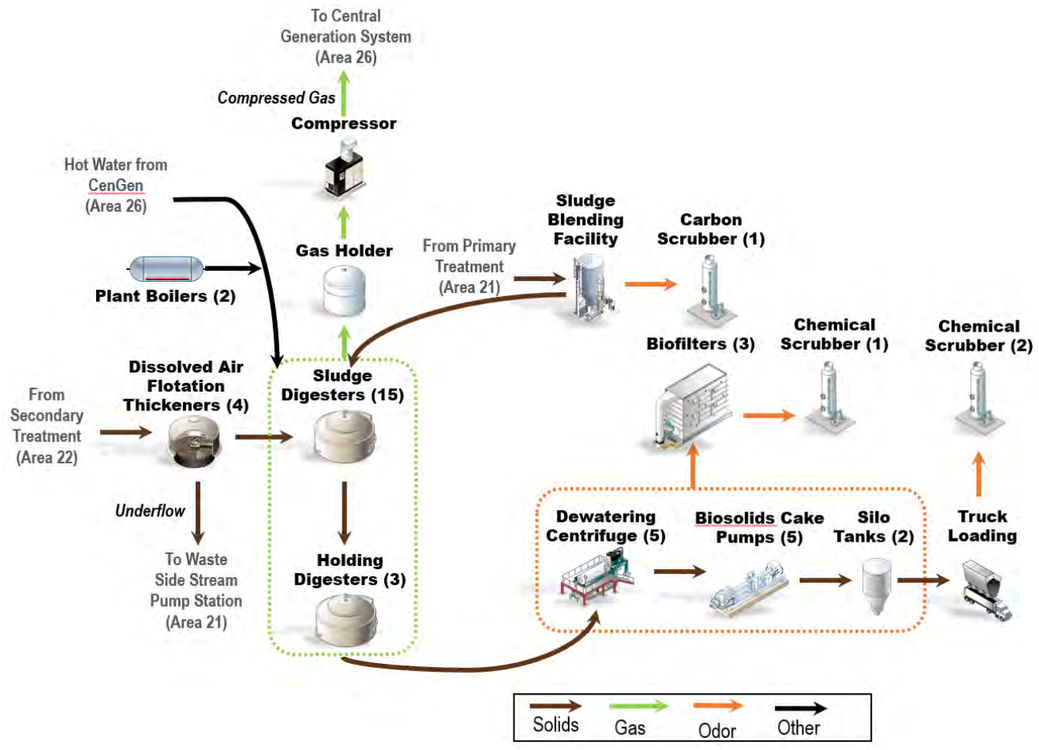
Project No.	Project Title	Impacted Facilities	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
PRN-00684	P2 Digester Maintenance Projects	Digesters E, H, L, M, N, O, P, Q, R, S, and T															
FE20-02 (and FE19-10)	Digesters C, D, F, and G Rehabilitation Digesters C, D, F, G, and I Gas Balance Lines Replacement	Digesters C, D, F, G, and I															
FR2-0033	Digester O-T Bridge Repair	Digester O and T															
FR2-0032	Digester K Dome Repair	Digester K															
P2-137	Digesters Rehabilitation	Digesters C, D, F, G, H, L, M, N, O, P, Q, R, S, and T															
P2-124	Interim Food Waste Receiving Facility	All Digesters, Gas Treatment Facilities, and Cen Gen	**Design completed. Construction is pending food waste contract.**														
P2-128	Digester Replacement	New and Existing Digesters															
X-135	Digesters P, Q, R, and S Replacement	Digesters P, Q, R, and S															
XP2-130	Food Waste Receiving Facility	All Digesters, Gas Treatment Facilities, and Cen Gen															
XP2-131	Digesters I, J, and K Replacement	Digesters I, J, K, M, N, and O															

1. For simplicity, Project Titles are missing “At Plant No. 2.”
2. Please see the comprehensive Acronyms and Abbreviations list for definitions.

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

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

Process Schematic



Note: Process Schematic shows entire Area 25 Solids Handling Facility.

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 and Heat Exchanger	-	2	-	-	-	-	-	-	-
Centrifuge	-	-	1	-	-	-	-	-	-
Polymer System	-	-	1	-	-	-	-	-	-
Biofilter	-	-	-	1	-	-	-	-	-
Chemical System	-	-	-	2	2	-	-	-	-
Carbon Unit	-	-	-	-	-	-	3	-	-
Gas Compressor	-	-	-	-	-	-	4	-	-
Gas Dryer	-	-	-	-	-	-	5	-	-
Screw Conveyor	-	-	-	-	-	2	-	-	-
Sliding Frame	-	-	-	-	-	2	-	-	-
Piping and Valve	3	3	2	2	2	3	4	3	3
Scale	-	-	-	-	-	5	-	-	-
Electrical									
MCCs	1	2	1	1	1	2	4	-	-
VFDs	4	-	3	-	-	-	-	-	-
Instrumentation									
PLCs and Flow Meters	3	3	2	2	2	3	4	-	3

Please see the comprehensive Acronyms and Abbreviations list for definitions.

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

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
Centrifuge Building and Silos Odor Control	
Biofilters	3
Ammonia Scrubber	1
Acid Tank	1
Gas Handling	
Gas Compressors	3
Low Pressure Gas Holder	1
Gas Dryers	2
Gas Flares	3
Carbon Media	3

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
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

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

Key Issues

Key Issues	Short-Term Actions and Recommendations	Long-Term Actions and Recommendations
Boiler and Heat Exchanger Reliability and Vulnerabilities – Equipment is nearing the end of its useful life. Facility has reliability and seismic vulnerabilities.	N/A	P2-128 will install hot water boilers in the existing building to replace the existing steam boilers. J-138 will address the building seismic deficiencies.
Gas Handling System Reliability – The aging facility requires replacement or rehabilitation to meet current and future process needs and regulatory requirements. Gas compressor system is aging and needs major rehabilitation.	Continue to actively monitor the condition of aging assets until replacement and overhaul.	J-124 Digester Gas Facilities will replace existing flares and compressor inlet moisture separator systems, install new closed loop cooling water systems, rehabilitate building, and perform various electrical, instrumentation, and control upgrades to improve reliability. Gas compressors will be overhauled by Maintenance.
Refrigerated Gas Dryer Issues – Inefficient capacity and unreliable. Requires significant maintenance.	N/A	The refrigerated gas dryer systems will be replaced by FE23-01.
Truck Loading Facility Area Issues – Truck loading bay fugitive odors escaping during cake loading operations; truck scales are old and corroded.	Maintenance is renting temporary scales.	P2-140 will implement the recommended odor capture improvements from the PS20-03 planning study. FE23-04 will replace the two scales.
Cake Lubrication Pump Maintenance – Cake pipe lube ring pump replacement parts not readily available making it difficult to maintain and keep operational.	Stock spare parts for lube ring pump.	MP2-015 completed the replacement option evaluation and will replace the lube ring pumps with hydraulic diaphragm pumps.

Current and Future Projects

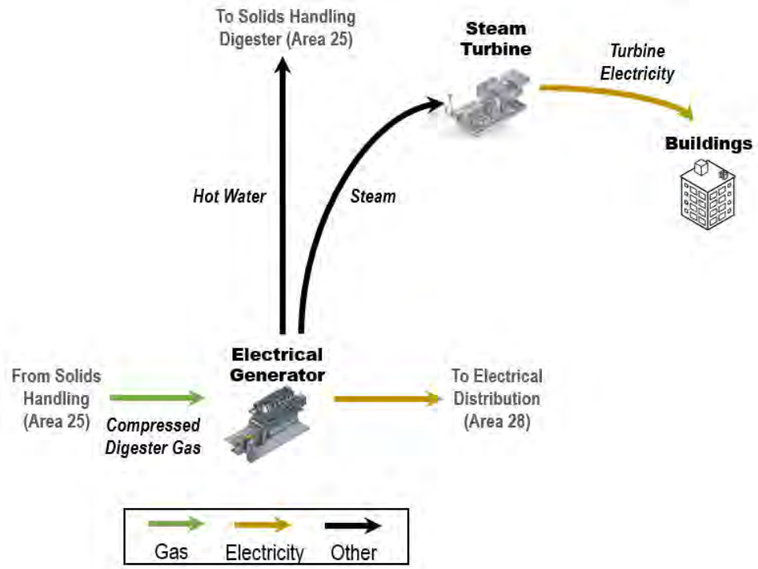
Project No.	Project Title	Impacted Facilities	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
FE23-04	Truck Loading Scale Replacement	Truck Loading Facility															
FE23-01	Digester Gas Compressor Dryer Replacements at Plant No. 1 and No. 2	Refrigerated Gas Dryers															
J-124	Digester Gas Facilities Rehabilitation	Electrical and Instrumentation, Building, Compressor Inlet Separators, Cooling System, Flares															
N/A	Digester Gas Compressor Overhauls at Plant No.1 and No. 2 (Maintenance Service)	Gas Compressors															
P2-140	Truck Loading Bay Odor Control Improvements	Truck Loading Facility															
P2-128	Digester Replacement	Boiler Facility															
J-138	Cen Gen Facilities and OOBS Seismic Upgrades	Cen Gen, OOBS, Boiler Bldg, PB-B															
PRN-00885	Centrifuge Hinged Cover Replacement	Centrifuges															
MP2-015	Cake Pipe Lube Ring Pump Replacement	Centrifuge and Truck Loading Facilities															
SC22-02	Centrifuge Server Room HVAC Replacement	Centrifuge Facility															

1. For simplicity, Project Titles are missing “At Plant No. 2.”
2. Please see the comprehensive Acronyms and Abbreviations list for definitions.

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

AREA 26 ASSET MANAGEMENT SUMMARY – 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*	Jacket Water HEX System	Aux. Waste HEX System	Waste Heat HEX System	Plant Water Piping	Miscellaneous
Structural																											
Building	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Mechanical																											
General	3	5	3	5	5	4	3	4	3	3	3	3	3	4	3	3	3	3	3	5	5	-	3	3	3	5	-
HVAC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4
Lube Oil System	4	4	4	4	4	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Electrical																											
Generator	3	5	3	5	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MCCs	4	4	4	4	4	4	-	-	-	-	-	-	-	-	-	4	2	2	2	2	2	-	-	-	-	-	4
Instrumentation																											
General/ PLCs	5	5	5	5	5	5	3	3	4	4	4	4	4	3	3	3	3	3	3	4	4	-	-	4	4	4	-

Please see the comprehensive Acronyms and Abbreviations list for definitions.
*Refer to Area 18 for switchgears, batteries, and other electrical assets.

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

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

Major Assets	Quantities
Heat Exchanger Systems	
Jacket Water System	5
Aux. Waste Heat System	5
Waste Heat System	2

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

Key Issues

Key Issues	Short-Term Actions and Recommendations	Long-Term Actions and Recommendations
Gas Engine Generator Set Reliability – Aging components and systems required to operate the five Cen Gen Engines are creating reliability issues and need to be addressed.	Continue to perform engine/generator PMs and monitor engine/generator performance.	Execute major engine overhauls (J-135B). A subsequent project will be planned to overhaul engine/generator set #2 and #4 after J-135B is complete in 2026. Replace obsolete systems (for example, battery backup, switchgear, MCCs, ignition system, PLC upgrade, etc.) (J-117B, PRN-00915, etc.).
Engine Lube Oil System Reliability – Lube oil centrifuges instrumentation and controls need to be upgraded.	N/A	Install new instrumentation and controls onto the existing two units (PRN-00211).
Plant Water Piping Corrosion – Plant water (that is, cooling water) piping has degraded and needs replacement.	N/A	Replace all plant water piping in the basement of Cen Gen (FE20-04).
Emission Control System Cracking – Housings on the oxidizer catalysts are failing prematurely.	Continue to perform housing PMs and provide as-needed CMs until replacement.	Investigate failures, redesign, and install new catalyst housings and emissions devices as needed (PRN-00977).
Instrument Air Compressors Non-Operable – Air compressors are no longer operational.	N/A	Replace the entire instrument air system; install new compressors and appurtenances (PRN-00536).
Exhaust Heat Recovery Boilers Reliability – The boilers need to be inspected both internally and externally.	Perform as-needed repairs based on inspection results to improve boiler performance and reliability.	Create a maintenance contract to inspect/clean boilers to improve boiler performance and plan for repairs (Maintenance Contract).
Engine PLC Obsolescence – The existing engine PLCs and RIO cards are obsolete.	Continue to perform PLC PMs, provide as-needed CMs, and monitor equipment performance until replacement.	Replace obsolete engine PLCs and RIO cards with new Modicon M580 PLCs and new RIO cards (PRN-00994).
Engine Protection System Obsolescence and Limited Engine Diagnostics – The existing engine vibration monitoring systems are aging, obsolete, and lack diagnostic capability.	Continue to actively monitor obsolete asset performance until replacement.	Upgrade the engine condition monitoring system and include diagnostic capabilities (PRN-00915).
Engine Cylinder Pressure Monitoring and Balancing – There is no online engine cylinder pressure monitoring to assist with engine load balancing/troubleshooting.	N/A	Add pressure sensors to monitor individual cylinders pressure (PRN 00697).
Engine Ignition Control System Obsolescence – The existing engine controls are aging and obsolete.	Continue to actively monitor the obsolete assets and perform as-needed CMs until replacement.	Pilot test new engine ignition system on one engine at each plant to test compatibility and performance. Install new ignition control systems onto each engine genset (PRN-00965).
Steam Turbine Reliability – Steam turbine has high-vibration issue.	N/A	Steam turbine gearbox to be rebuilt per manufacturer specifications. System realignment to be performed (Maintenance Service).
Deaerator Reliability – The deaerator system is aging and needs to be replaced to improve reliability.	Continue to perform PMs, provide as-needed CMs, and monitor equipment performance until replacement.	Plan a project to replace the deaerator system.

Please see the comprehensive Acronyms and Abbreviations list for definitions.

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

Current and Future Projects

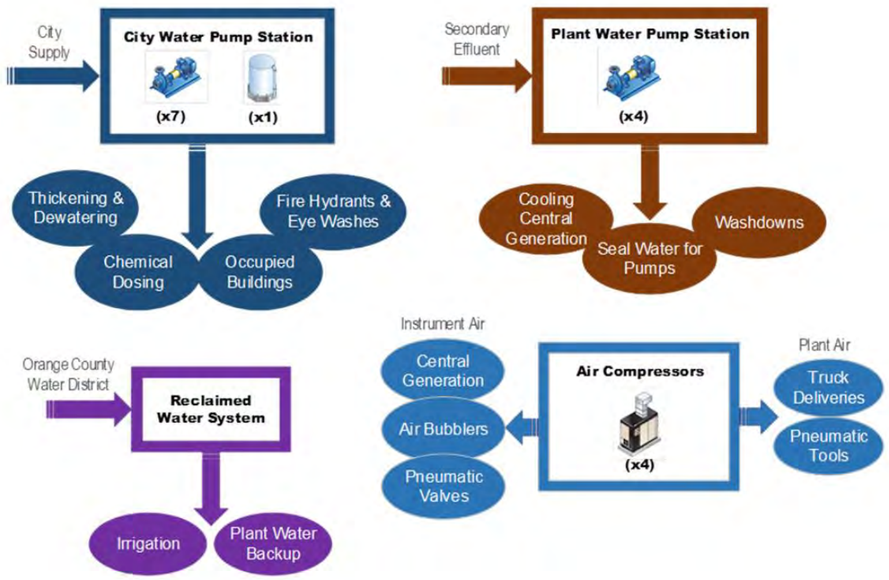
Project No.	Project Title	Impacted Facilities	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
FE20-04	Cen Gen Plant Water Pipe Replacement at Plant No. 2	Plant Water Piping															
PRN-00536	Cen Gen Instrument Air Compressor Replacement at Plant No. 2	Instrument Air Compressor															
J-135B	Engine and Generator Overhauls at Plant Nos. 1 and 2	Engine Generator															
TBD	Engine Generator Set #2 and #4 Overhauls at Plant No. 2	Engine Generator															
J-117B	Outfall Low Flow Pump Station	Switchgear, Battery Backup, HVAC, Deaerator Panel, MCC															
PRN-00915/ 00697	Cen Gen Engine Monitoring System and Pressure Sensing Upgrade	Engine Generator															
AI-194	Cen Gen Exhaust Heat Recovery Boiler Cleaning/Assessment (Maintenance Service)	Heat Recovery System															
PRN-00965	Cen Gen Engine Ignition Control System Obsolescence Replacement	Engine Generator															
PRN-00994	Cen Gen Engine PLC Replacement	Engine Generator															
PS21-07	Process Simulation Model Development for Cen Gen Facilities	Central Generator Facility															
FE20-09	Cen Gen Smoke Detection Replacement at Plant No. 1 and No. 2	Building															
FR1-0021	Cen Gen Basement Access Hatch Faill Restraint at Plant No. 1 and No. 2	Building															
PRN-00420	Cen Gen Exhaust Heat Recovery Boiler Damper Control Upgrade – Pilot	Heat Recovery System															
N/A	Cen Gen Steam Turbine Gearbox Rebuild/ Realignment (Maintenance Service)	Steam Turbine															
PRN-00977	Cen Gen Engine Exhaust Oxidizer Housing Redesign	Oxidizer															
TBD	Cen Gen Deaerator System Replacement at Plant No. 2	Deaerator System															

Please see the comprehensive Acronyms and Abbreviations list for definitions.

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

AREA 27 ASSET MANAGEMENT SUMMARY – 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	1	-	-
Tanks	3	-	-	-
Mechanical				
Pumps	3	3	-	-
Strainers	-	3	-	-
Compressors	-	-	-	3
Ventilation System	4	4	-	-
Electrical				
MCCs	3	4	-	-
VFDs	5	5	-	-
Instrumentation				
PLC, Flowmeter	3	3	-	3

Please see the comprehensive Acronyms and Abbreviations list for definitions.

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

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

AREA 27 ASSET MANAGEMENT SUMMARY – PLANT NO. 2 UTILITIES

Key Issues

Key Issues	Short-Term Actions and Recommendations	Long-Term Actions and Recommendations
Plant/Instrument Air Line Issues – Excessive condensate and oversized piping causing large pressure drop, reducing compressor redundancy.	Continue to monitor existing piping and provide as-needed CMs until replacement.	Future small projects to be created to address oversized piping and several dead ends within the system. PRN-00995 Plant Air Piping Study to provide recommendations.
Plant Water Piping Reliability – Due to the corrosive nature of the plant water, the current ductile iron pipes are corroding prematurely and causing leaks throughout the plant.	Continue to monitor existing piping and provide as-needed CMs until replacement.	FE18-14 will address corroded plant water piping in the tunnels and PRN-00740 will replace a small portion of plant water piping with high-density polyethylene (HDPE). Overall goal for these and future projects is to replace ductile iron pipes with either fiberglass-reinforced or HDPE piping material.
Air Compressor Reliability – Instrument air compressors have failed due to reaching the end of their lives and need to be replaced.	N/A.	Air compressors at Cen Gen are being replaced due to multiple failures via PRN-00536.
City Water Pump Station Aging – Pump station is getting old, requiring increased maintenance, and will not be reliable long term.	N/A	PS23-05 Utility Water Planning study to look into providing recommendation for rehabilitation or replacement.

Current and Future Projects

Project No.	Project Title	Impacted Facilities	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
FE18-14	Plant Water Pipeline Replacement in Kennison Lindstrom Scott Tunnels at Plant No. 2	Plant Water Piping in Tunnels															
J-117B	Outfall Low Flow Pump Station	New Plant Water Pump Station															
P2-133	B/C-Side Primary Sedimentation Basins Rehabilitation at Plant No. 2	City Water and Air Piping															
P2-98A	A-Side Primary Clarifiers Replacement at Plant No. 2	Plant Water Piping															
X-036	City Water Pump Station Rehabilitation at Plant No. 2	City Water Pump Station															
X-037	Plant Water Pump Station and 12 KV Distribution Center A Demolition at Plant No. 2	Existing Plant Water Pump Station															
P2-136	Activated Sludge Aeration Basins Rehabilitation at Plant No. 2	Plant Water Piping															
FR2-0029	Influent Pump Station Plant Water Repairs at Plant No. 2	Plant Water Piping															
PRN-00536	Instrument Air Compressor Replacement at Plant No. 2 Cen Gen	Instrument Air Compressors															
PS23-05	Utility Water Planning Study at Plant Nos. 1 and 2	City Water Pump Station															
PRN-00995	Plant Air Piping Study at Plant Nos. 1 and 2	Plant Air Piping															
PRN-00740	Plant Water Replacement Near Primary Clarifiers P and Q	Plant Water Piping															

Please see the comprehensive Acronyms and Abbreviations list for definitions.

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

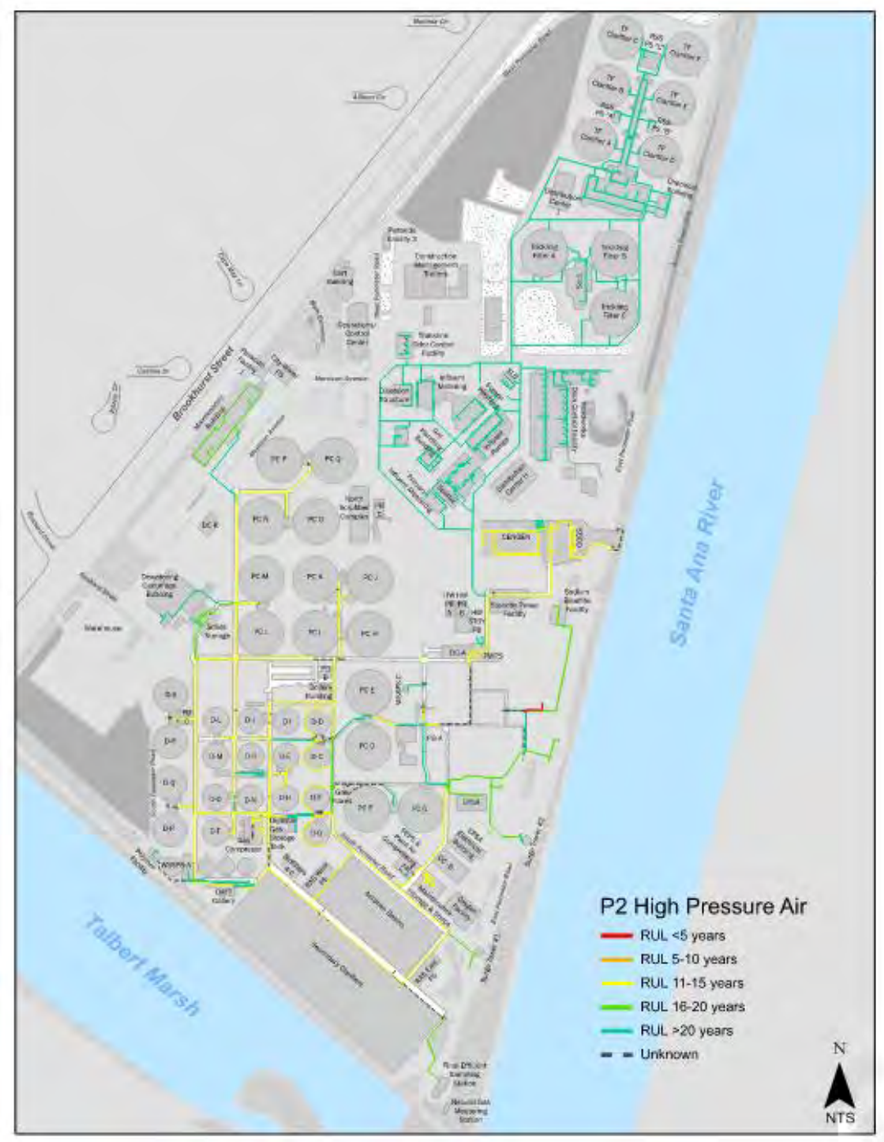
AREA 27 ASSET MANAGEMENT SUMMARY – PLANT NO. 2 UTILITIES

Remaining Useful Life of Utility Infrastructure

Please see the comprehensive Acronyms and Abbreviations list for definitions.

AREA 27 ASSET MANAGEMENT SUMMARY – PLANT NO. 2 UTILITIES

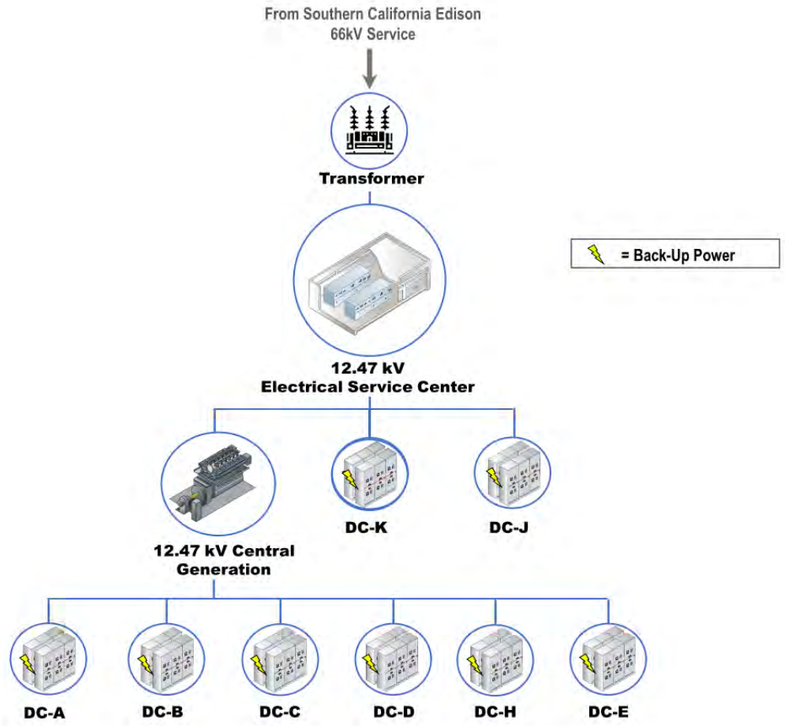
Remaining Useful Life of Utility Infrastructure



Please see the comprehensive Acronyms and Abbreviations list for definitions.

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

Process Schematic



Major Assets

Major Assets	Quantities
12kV Transformers	64
Standby Generators	9
12kV Switchgears	31
5kV and 480V Switchgears	49
MCCs	101
VFDs	130
125VDC and 24VDC Battery Systems	38

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

Please see the comprehensive Acronyms and Abbreviations list for definitions.

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

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

Key Issues

Key Issues	Short-Term Actions and Recommendations	Long-Term Actions and Recommendations
Variable Frequency Drive Obsolescence – Models are becoming obsolete and are unsupported by the manufacturer.	Small Projects and Maintenance Projects are currently replacing VFDs, such as MP2-016 and FE19-08. Use of a co-op contract is being explored for the next projects.	Develop a long-term VFD replacement strategy.
Headworks Cable Failures – 480V 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 replacing various 480V and 120V power and control cables in the headworks area.	P2-141 will permanently replace all headworks power and control cables. X-030 will rehabilitate the headworks area and any additional electrical improvements will be included in the scope.
Batteries – Aging and obsolescence due to short life span of batteries.	Project MP2-022 will replace all obsolete batteries at Plant No. 2 by 2025.	Work with Maintenance to develop a long-term battery maintenance program.
Aging Power Building C Equipment – Electrical Equipment in PB C is obsolete and nearing the end of its useful life.	Maintain and repair equipment until replacement.	New CIP project will be created to replace all electrical equipment.
Aging Switchgear and MCCs – Various 480V Switchgear and MCCs are nearing the end of their useful lives.	Maintain and repair equipment until replacement. Create small projects where Maintenance identifies issues.	Revise the theoretical useful life span to more accurately track the equipment and plan for future CIP projects.

Current and Future Projects

Project No.	Project Title	Impacted Facilities	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
MP2-022	125 VDC Battery System Replacement	See Note. 1 for Locations															
FR2-0026	Headworks Phase 3 Cable Replacement at Plant No. 2	Grit Pumps at Headworks															
J-117B	Outfall Low Flow Pump Station	Power Distribution															
FE19-08	Secondary Treatment VFD Replacements at Plant No. 2	RAS, WAS and PEPS Pumps															
SC19-06	EPSA Standby Power Generator Control Upgrades at Plant No. 2	Plant No. 2 Power Distribution															
P2-98A	A-Side Primary Basins Replacement at Plant No. 2	MCCs Associated with the A-side Clarifiers (fed from PB B).															
J-98	Electrical Power Distribution System Improvements	Various Plant No. 1 and Plant No. 2 Condition-Based Electrical Distribution Systems															
P2-137	Digester Rehabilitation at Plant No. 2	MCCs Fed from PBs B and C (MCC-E, MCC-F, MCC-S, MCC-PQ, MCC-PQS)															
P2-141	Headworks Electrical Distribution Improvements at Plant No. 2	Distribution Center H and Associated Headworks 480V and 120V Power and Control Cables															
J-124	Digesters Gas Facility Replacement	MCCs Associated with Digesters															
P2-128	Digester Replacement at Plant No. 2	Power Distribution System															
P2-138	O&M Complex at Plant No. 2	Distribution Center D and Operations Buildings															
X-036	City Water Pump Station Rehabilitation at Plant No. 2	City Water Pump Station MCC and VFDs															
P2-133	Plant No. 2 - B/C-Side Basins Rehabilitation	PB B, PB D															
X-098	Effluent Pump Station Annex Rehabilitation	EPSA Power Distribution															
X-095	Southern California Edison Substation and Service Center Replacement at Plant No. 2	SCE Substation and 12kV Service Center															
X-030	Headworks Rehabilitation	Distribution Center H, Waste Sidestream PS C															
X-037	Plant Water Pump Station and 12kV Distribution Center A Demolition at Plant No. 2	Plant Water Pump Station and Distribution Center A															
X-135	Digester P, Q, R, and S Replacement	Digester P, Q, R, and S Associated Electrical															

1. Batteries at Service Center, DC-A, DC-B, East RAS, West RAS, EPSA Electrical Building, EPSA Standby PB, Headworks Standby PB, DAFT Switchgear Room
2. Please see the comprehensive Acronyms and Abbreviations list for definitions.

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

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

Occupied and Power Building Site Plan at Plant No. 2

Note: Building colors are used to help identify the buildings and do not represent RUL Score.

Major Assets Remaining Useful Life

Plant No. 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
12kV Distribution Center A	4	N/A	3	1	2	N/A
12kV Distribution Center B	4	N/A	3	1	2	N/A
12kV Distribution Center C	2	N/A	3	1	N/A	N/A
12kV 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
12kV Service Center	4	N/A	3	1	4	N/A
Headworks PB A	3	N/A	3	1	2	N/A
Headworks PB B	3	N/A	3	1	2	N/A
EPSA Electrical Building	2	N/A	5	1	N/A	N/A
PB B	4	N/A	3	1	4	N/A
PB C	4	N/A	3	1	2	N/A
PB D	3	N/A	3	1	2	N/A

Please see the comprehensive Acronyms and Abbreviations list for definitions.

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

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

Key Issues

Key Issues	Short-Term Actions and Recommendations	Long-Term Actions and Recommendations
Seismic Retrofits Needed – Recent planning study (PS15-06) recommended seismic retrofits to several buildings.	N/A	P2-138 will replace existing O&M buildings with new O&M Complex.
Aging Elevators – All elevators need to be rehabilitated and modernized.	N/A	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.	N/A	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.

Current and Future Projects

Project No.	Project Title	Impacted Facilities	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
P2-127	Collections Yard Relocation and Warehouse Demolition at Plant No. 2	Warehouse Building															
P2-138	O&M Complex at Plant No. 2	O&M Building															
SC22-01	Plant No. 2 EPSA and 12kV Distribution Center H HVAC Replacement	EPSA Electrical Building and Distribution Center H															
SC22-02	HVAC Replacement for Plant No. 2 Centrifuge Building, Op Center, and Bitterpoint PS	Operations Center, Centrifuge Server Room, and Bitterpoint PS															
SC20-02	OOBS Elevator Rehabilitation	OOBS															
X-037	Plant Water Pump Station and 12kV Distribution Center Demolition at Plant No. 2	Existing Plant Water Pump Station															
X-135	Digester P, Q , R, and S Replacement at Plant No. 2	Replace PB C															
X-095	SCE Substation and 12kV Service Center Demolition	12kV Service Center															
P2-133	B/C Side Sedimentation Basin Rehabilitation at Plant No. 2	Replace PB D															

Please see the comprehensive Acronyms and Abbreviations list for definitions.

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

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Collection System Pump Station and Force Main Asset Management Summaries

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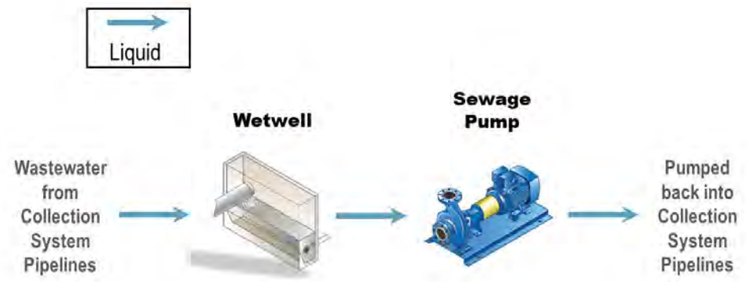
ASSET MANAGEMENT SUMMARY – COLLECTION SYSTEM – PUMP STATIONS

Process Schematic



	Major Assets – Quantities				
Pump Station	**Wet Wells**	**Pumps**	**Force Mains**	**Valves**	**Emergency Generator (X = Yes)**
15th Street	1	3	2	22	
A Street	1	3	2	19	
Bay Bridge	1	5	2	17	X
Bitter Point	1	5	2	23	X
College	1	3	2	18	
Crystal Cove	1	2	2	13	X
Edinger	1	2	1	8	
Lido	1	3	2	17	
MacArthur	1	2	1	8	
Main Street	2	10	3	38	X
Rocky Point	1	4	2	18	X
Slater	1	5	2	17	X
Seal Beach	2	8	2	24	
Westside	1	4	1	16	X
Yorba Linda	1	3	1	11	
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	2	4	4	5	4	5	5	3	4	1	5	5	2
Structural																
Pump Station	4	4	4	2	1	4	3	4	2	1	3	3	4	2	4	-
Wet Well	3	3	4	1	4	3	4	4	3	3	3	3	4	3	3	-
Mechanical																
Pumps	3	3	5	2	2	2	4	3	4	4	2	4	5	4	5	-
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	4	3	3	-
Emergency Generator	-	-	3	1	-	3	-	-	-	2	2	3	-	3	-	-
Electrical																
MCC	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	2	3	-	-
Motors	3	3	4	2	2	3	3	4	4	3	2	3	5	3	4	-
Transformer	2	2	4	2	2	4	4	3	4	2	3	2	5	2	4	-
Instrumentation																
PLC	3	3	4	4	3	4	4	4	4	3	4	3	4	4	4	-
Flowmeter	3	3	1	3	2	1	5	2	-	4	3	4	5	3	4	-

Please see the comprehensive Acronyms and Abbreviations list for definitions.

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

ASSET MANAGEMENT SUMMARY – COLLECTION SYSTEM – PUMP STATIONS

Key Issues

Key Issues	Short-Term Actions and Recommendations	Long-Term Actions and Recommendations
Safety Monitoring and Signage – Four of OC San's older pump stations do not have atmospheric monitoring or standardized safety indication lighting.	Planning Study PS18-06 is establishing OC San design standards to address this issue moving forward and locations where deficiencies exist.	Implement the recommended design standards from PS18-06 in future capital projects and consider addressing some locations sooner where a capital project isn't planned in the near future.
Flood Risk – OC San's new pump stations are designed to specifically consider and mitigate flood risks; however, some older pump stations don't meet the current standards. Specially, Edinger Pump Station is entirely below grade and located immediately adjacent to a flood control channel.	OC San follows protocols ahead of major storm events to be sure facilities are prepared and in good working condition. Facilities are monitored closely during storm events so that staff can respond to any unexpected event quickly.	Project 11-33 has started the design to replace and relocate the Edinger Pump Station to a different location with less flood risk and where critical infrastructure will be located above grade. Additionally, all new pump stations will consider flood elevations and locate critical electrical equipment accordingly.
Accelerated Corrosion – Corrosion is a common problem in sewage systems due to the presence of H_2S. This is exacerbated in locations where sewage becomes turbulent, which can include pump station wet wells. Additionally, in an effort to minimize odors throughout the community, some manholes in the collections system have been sealed to prevent gases from escaping, which accumulates more corrosive gases within the system.	Project 5-68 has added odor scrubbers to six key pump stations where the wet wells have experienced pressurization issues. These new scrubbers will allow the wet wells to vent, reducing the amount of sewer gas trapped in the system while also scrubbing the air so it will not be an odor issue for the surrounding community.	OC San routinely performs inspections on critical assets, including pump station wet wells. Recently, the MacArthur Pump Station wet well was assessed and was found to be in relatively good condition considering the age of the asset but will require some rehabilitation that will be completed under future project 7-63. In the coming year, the Crystal Cove and Lido Pump Station wet wells are expected to be inspected with an ongoing inspection plan following that.
Groundwater Intrusion – Groundwater has penetrated 15th Street, A Street, Bitter Point, and Rocky Point Pump Stations. Groundwater may gradually compromise the strength of reinforcement within the concrete structure walls over time.	Planning study XPS0065 will be launched to identify possible mitigation measures and long-term solutions to be incorporated into future pump station CIP projects.	Implement long-term solutions identified by planning study XPS0065.
Maintenance Access – In some cases, access to collections facilities is not ideal due to limited land or easement rights, other competing public uses, or outdated facilities, which don't meet modern safety standards. One example is the MacArthur Pump Station force main, which is difficult to access because redundancy was not incorporated when the pump station was designed. Another example is the Slater Pump Station wet wells, which are isolated by slide gates within 48-inch manholes that are difficult to access.	Capital project 7-68, currently in construction, will add another force main to serve MacArthur Pump Station. Project FRC-0017 will modify the wet well access at Slater Pump Station to provide a safer working environment for staff.	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. There is also continued effort to research emerging inspection technologies, which could make difficult inspections more easily achievable or cost effective.
Valve Operability and Reliability – Valves at the pump stations sometimes reach the end of their useful life sooner than in other applications due to the harsh raw sewage application. These valves are critical to the operation of the collections system.	Projects FRC-0017 and FRC-0018 have been launched to replace valves at five pump stations	Continue to monitor valve condition and RUL and launch small projects as necessary to replace valves that cannot wait for a larger rehabilitation/replacement project.
Force Main Operability and Reliability – Force mains are some of OC San's highest-risk assets but also some of the most challenging to assess. While these assets have been replaced and rehabilitated in a timely manner, there are many that have not received a detailed inspection since installation.	A force main inspection plan has been developed to assess all the force mains within the next 5 years with support from the existing Condition Assessment program resources. The next planned assessments will occur at College and Slater Pump Stations.	Continue to implement the force main inspection plan and continually reassess the timing and priority of inspections within the program. Future projects will also incorporate updated standards, which will look to add redundancy and improved access where feasible.
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.	Project FE23-03 has launched and is in the design phase to upgrade the level control systems at these pump stations to meet current OC San standards.	Adhere to OC San level control system design standards in all future pump station improvement projects.

ASSET MANAGEMENT SUMMARY – COLLECTION SYSTEM – PUMP STATIONS

Current and Future Projects

Project No.	Location	Project Title	Impacted Facilities	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
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															
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															
FE23-03	Multiple	Pump Station Bubbler Level Control System Upgrade	Seal Beach, Bay Bridge, Crystal Cove, Main Street, MacArthur, Slater, Edinger Pump Stations															
FRC-0018	Newport Beach	Valve Replacements at Lido, Crystal Cove, A Street, and 15th St. Pump Stations	15th Street, A Street, Lido, and Crystal Cove Pump Stations															
XPS0065	Newport Beach	Pump Station Groundwater Intrusion Study	15th Street, A Street, Bitter Point, and Rocky Point Pump Stations															
X-022	Newport Beach	15th Street Pump Station and Force Main Project	15th Street Pump Station															
X-041	Newport Beach	A Street Pump Station and Force Main Project	A Street Pump Station															
5-67	Newport Beach	Bay Bridge Pump Station Replacement	Bay Bridge Pump Station															
SC22-02	Newport Beach	HVAC Replacement for Plant No. 2 Centrifuge Building, Operations Building, and Bitter Point Pump Station	Bitter Point Pump Station															
X-025	Newport Beach	Bitter Point Pump Station Rehabilitation Project	Bitter Point Pump Station															
FRC-0020	Costa Mesa	College Pump Station Wet Well Rehabilitation	College Pump Station															
X-040	Costa Mesa	College Pump Station Replacement and Force Main Rehabilitation	College Pump Station															
MPC-002	Newport Beach	Crystal Cove Pump Station Automatic Transfer Switch Replacement	Crystal Cove Pump Station															
5-66	Newport Beach	Crystal Cove Pump Station Upgrade and Rehabilitation Project	Crystal Cove Pump Station															
11-33	Huntington Beach	Edinger Pump Station Rehabilitation Project	Edinger Pump Station															
X-023	Newport Beach	Lido Pump Station Rehabilitation Project	Lido Pump Station															
7-63	Newport Beach	MacArthur Pump Station Rehabilitation Project	MacArthur Pump Station															
7-68	Newport Beach	MacArthur Force Main Improvements	MacArthur Pump Station															
7-65	Irvine	Gisler-Redhill Interceptor Rehabilitation	Main Street Pump Station															
7-64	Irvine	Main Street Pump Station Rehabilitation Project	Main Street Pump Station															
X-024	Newport Beach	Rocky Point Pump Station Rehabilitation Project	Rocky Point Pump Station															
FRC-0017	Huntington Beach	Valve Replacements and Wet Well Access Improvements at Slater Pump Station	Slater Pump Station															
11-34	Huntington Beach	Slater Pump Station Rehabilitation Project	Slater Pump Station															
3-67	Seal Beach	Seal Beach Pump Station Replacement	Seal Beach Pump Station															
PRN-00930	Seal Beach	Navy Fence Replacement In-Kind Consideration Project for 3-67	Seal Beach Pump Station															
3-68	Seal Beach	Los Alamitos Sub-Trunk Extension and Westside Pump Station Abandonment	Westside Pump Station															
MPC-003	Fullerton	Decommission Yorba Linda Pump Station	Yorba Linda Pump Station															
2-73	Fullerton and Yorba Linda	Yorba Linda Pumping Station and Spur Odor Station Demolition	Yorba Linda Pump Station Yorba Linda Spur Odor Station															

Please see the comprehensive Acronyms and Abbreviations list for definitions.

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

ASSET MANAGEMENT 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	2034	
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	2028	
Lido (West, North of Short Street)	5-26 (1968) 5-60 (2016)	16"/24"	DIP with CIPP HDPE	No	> 20	CCTV 2014, 2023	2028	
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	2028	Project X-023 will complete rehabilitation of Lido Pump Station and the remaining unlined force main section.
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 2038.
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 and 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	Follow up CCTV from pump station side completed in March 2024	None	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	TBD	Project 7-68 will complete construction of the new force mains in 2025.
Main Street (Sunflower)	7-7 (1985)	30"	Vitrified clay		> 20	None	2026	
Main Street (Baker East)	14-1-2 (1991)	42"	Ductile iron	Yes	5–10	CCTV 2020	2028	Project 7-65 will complete the Baker force mains rehabilitation in 2025. CCTV will occur once the rehabilitation is complete.
Main Street (Baker West)	14-1-2 (1991)	42"	Ductile iron	Yes	< 5	None	2028	
College	7-23-1 (2003)	18"	Ductile iron	No	5–10	None	2025	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	2025	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	2025	
Edinger	11-9 (1965)	18"	Cast iron		< 5	UT 2015, 2021, 2022	Follow-up UT 2024	Project 11-33, currently in design, will construct the new Edinger Pump Station and force main by 2029. Significant metal loss seen in 2023 and prior assessments.
Seal Beach	3-62 (2022)	36"	HDPE		> 20	None	2026	New force mains were constructed in 2022.
Westside	3-36R (1995)	20"	Ductile iron	No	< 5	2016	None	Westside Pump Station will be abandoned by project 3-68 by 2033. Force main access is limited; will be assessed on an as-needed basis.
Yorba Linda	2-16-2 (1975)	30"	Ductile iron	first pipe joint only	< 5	2014	None	The pump station will be decommissioned via MPC-003 ahead of CIP project 2-73, which will remove the pump station permanently by 2030.

Please see the comprehensive Acronyms and Abbreviations list for definitions.

Collection System Pipeline and Manhole Asset Management Summaries

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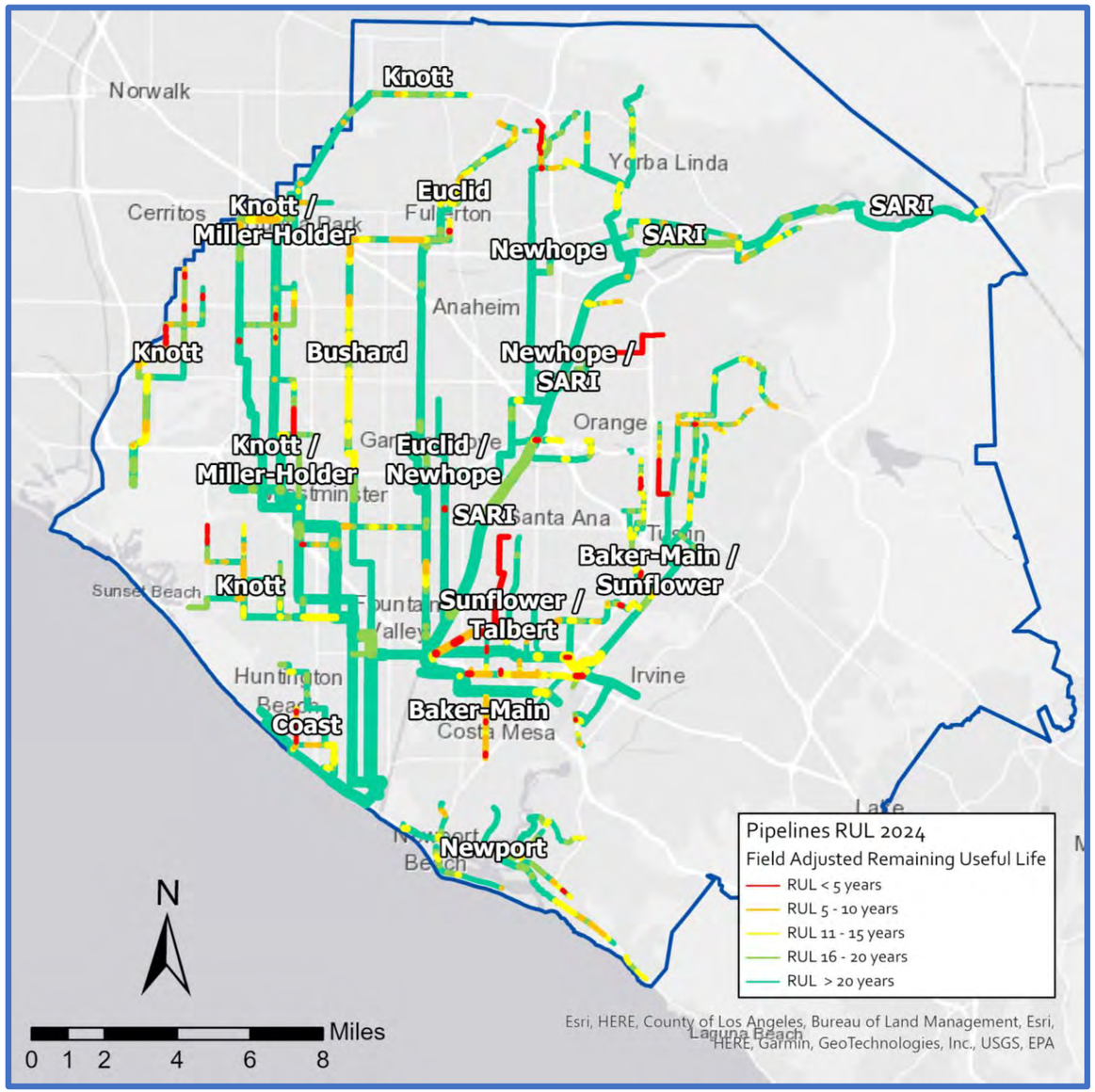
ASSET MANAGEMENT SUMMARY – COLLECTION SYSTEM – ALL TRUNKLINES

System Overview - Pipelines



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

Trunklines	No. of Pipes with RUL Score of 4 or 5	Miles of Pipes with RUL Score of 4 or 5	Percentage of Pipes with RUL Score of 4 or 5 (by length)	No. of Manholes with RUL Score of 4 or 5	Percentage of Manhole with RUL Score of 4 or 5	Replacement Value ($ millions, in 2024 dollars)[a]
Baker-Main	88	5.9	15%	-[b]	-[b]	$356
Bushard	10	1.2	6%	3	1%	$312
Coast	16	1.0	9%	-[b]	-[b]	$128
Euclid	7	0.8	2%	69	16%	$348
Interplant[c]	0	0.0	0%	0	0%	$149
Knott	49	3.4	5%	84	11%	$807
Miller-Holder	21	1.6	5%	43	16%	$382
Newhope	25	1.7	6%	84	24%	$270
Newport	19	1.2	5%	30	7%	$279
Santa Ana River Interceptor	59	2.8	6%	159	28%	$666
Sunflower	15	0.7	2%	-[b]	-[b]	$387
Talbert	77	5.9	71%	-[b]	-[b]	$74
Total	**386**	**26.1**	**7%**	**472**	**11%**	**$4,158**

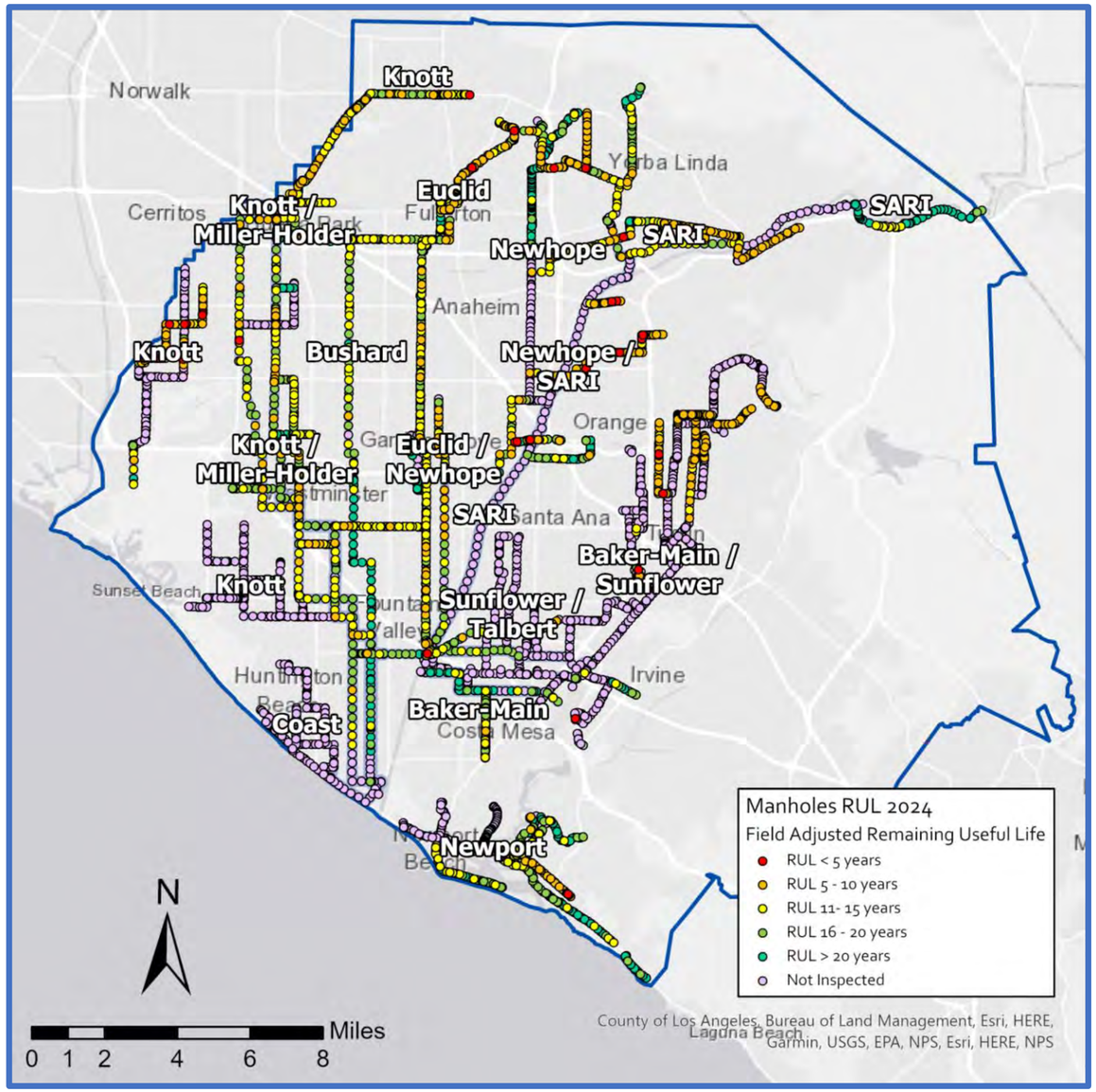
Please see the comprehensive Acronyms and Abbreviations list for definitions.

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

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

System Overview - Manholes



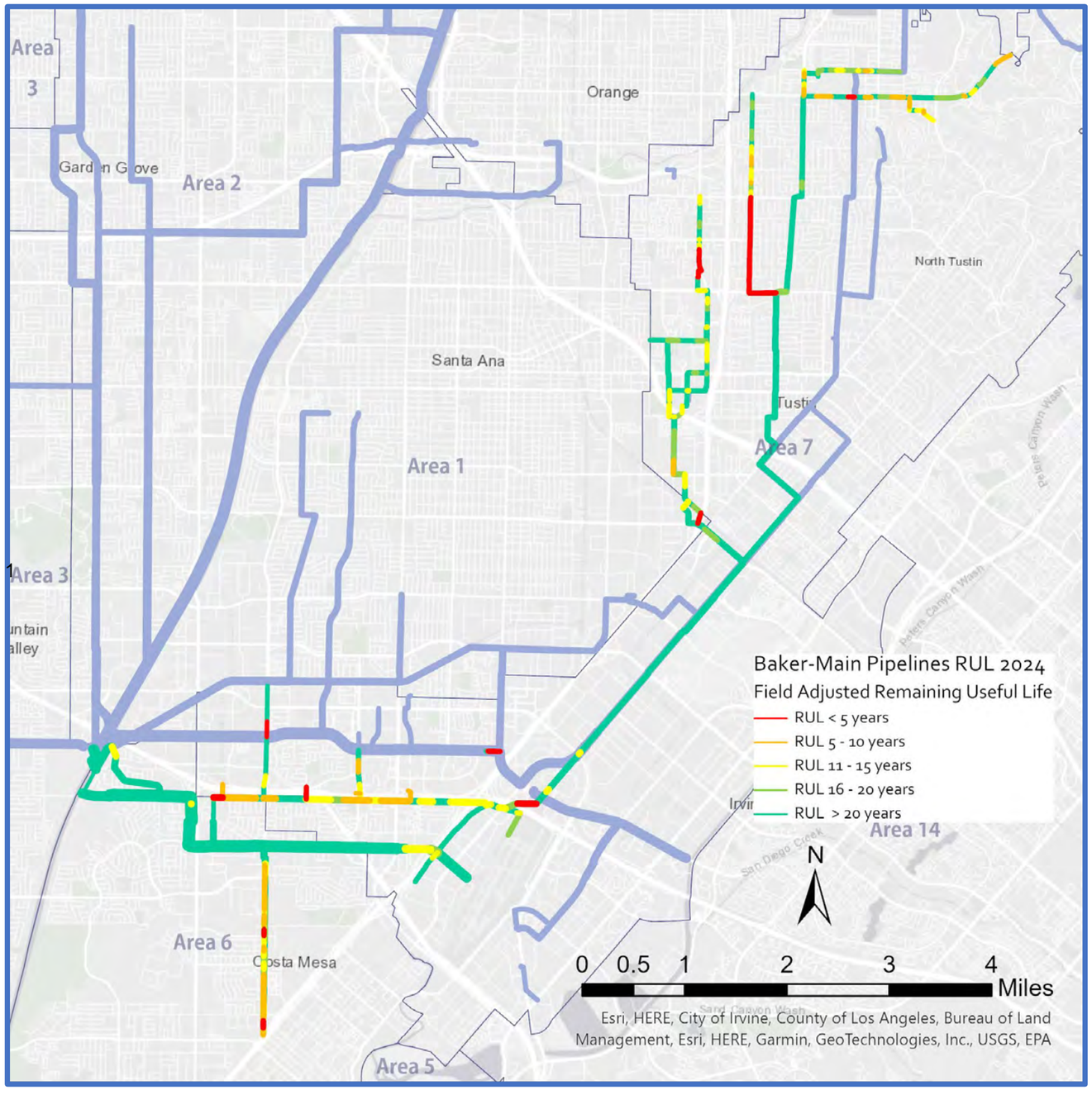
ASSET MANAGEMENT SUMMARY – COLLECTION SYSTEM – ALL TRUNKLINES

Key Issues

Key Issues	Short-Term Actions and Recommendations	Long-Term Actions and Recommendations
Cleaning of Inverted Siphons and Large-Diameter Pipelines – Large-diameter pipes (> 42 inches) are not cleaned within OC San's routine cleaning program and CCTV footage does not identify sediment or debris below the waterline. This poses the potential risk of debris build up, which can negatively impact normal sewer operation and downstream facilities if suddenly released.	OC San has completed sonar inspections for over 5 miles of large-diameter inverted siphons and gravity sewers. Sediment reports and hydraulic modeling data were utilized to confirm or amend the theoretical cleansing state of each pipeline segment. OC San is starting a new procurement to validate the accuracy of sonar inspections, validate the effectiveness of various cleaning methods, and analyze debris data for any trends. The work includes multiple rounds of cleaning and sonar inspections for select inverted siphons and gravity sewers as well as condition assessment and incidental repairs for the inverted siphons. The sonar validation project is expected to be completed in 2025.	OC San is implementing an ongoing large-diameter cleaning program, and the list of recommended large-diameter inverted siphons and gravity sewers to regularly clean will be finalized after the sonar validation project is completed. Additionally, some large-diameter inverted siphons and gravity sewers may be significantly larger than required for current and future capacity needs and are not self-cleansing. After the sonar validation project is completed, OC San staff will evaluate which assets are good candidates for sliplining and will recommend adding them to upcoming CIP projects or the creation of new projects. OC San staff will further validate recommended sliplining projects as part of the work for the 2028 Collections Capacity Study.
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.	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).	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 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. Without this inspection data, it is difficult to accurately know the current condition and RUL of these assets.	There are two efforts underway to kick off the condition assessment program for inverted siphons. One active procurement will perform condition assessment and incidental repairs to two high-priority inverted siphons in Orange on the SARI Trunkline, and the sonar validation project includes condition assessment and incidental repairs of select inverted siphons. Both efforts are expected to be completed in 2025. OC San staff continue to research emerging inspection technologies to identify potential cost savings or improved assessment data through new equipment and methods.	Results of the pilot project and sonar validation project 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, Euclid, Knott, Miller-Holder, Newport, SARI, Sunflower, and Talbert trunkline systems. Specifically, significant groundwater infiltration is most prominent in the I-405 corridor in Costa Mesa, throughout the western regional trunklines of the Knott trunkline 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.	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 trunkline key issue tables for more details. Additional areas with groundwater infiltration do not have any other defects and are lower priority.	Projects 1-23, 2-78, 3-60, 3-64A, B, and C, 5-69, 7-65, 11-35, X-085, X-129, X-130, X-134, and X2-79 will address the majority of areas with significant groundwater infiltration.
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 have 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 additions to an existing CIP project.	Lower-priority access improvements will be recommended within the scope of future CIP projects where feasible.
Uninspected Gravity Pipelines – 31 gravity sewers have never been inspected in the collection system between the Baker-Main, Coast, Knott, Newhope, Newport, SARI, and Sunflower trunkline 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 trunkline systems for more details.	10 of these gravity sewers are proposed to be abandoned as part of Projects 2-73 and 7-68. Refer to the key issue tables for the Newhope and Sunflower trunkline systems for more details.

ASSET MANAGEMENT SUMMARY – COLLECTION SYSTEM – BAKER-MAIN TRUNKLINE

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	19.0	342	56	33	33
> 18" Ø	15.9	245	42	3	19
Reinforced Concrete					
> 42" Ø	4.9	50	31	-	-
Ductile Iron					
> 18" Ø	0.50	3	31	-	-
Polyvinyl Chloride					
10"–21" Ø	0.04	2	22	-	-

Please see the comprehensive Acronyms and Abbreviations list for definitions.

ASSET MANAGEMENT SUMMARY – COLLECTION SYSTEM – BAKER-MAIN TRUNKLINE

Key Issues

Key Issues	Short-Term Actions and Recommendations	Long-Term Actions and 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 PWWFs. During PWWFs, capacity issues were identified in a portion of the North Trunkline and Tustin Avenue sewers.	N/A	Project 7-69 will upsize a portion of the North Trunkline 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 Trunkline system do not have air jumpers.	N/A	Project X-129 includes constructing a new air jumper.
Pipeline Defects – CCTV identified several areas with significant fracturing of VCP pipelines. The largest concentration of fractures is in the Fairview Trunkline. There are also areas of significant root intrusion in and around existing fractures. Some blockages in OC San sewer mains may have contributed to a local sanitary sewer overflow in Orange in 2021.	Future root treatment work is planned to stop root growth and prevent further damage to the pipelines prior to construction of Project 7-69. Isolated defects elsewhere not included or near a CIP project have been identified as high-priority defects. OC San staff are in the process of determining whether some pipelines can be abandoned or otherwise grouped together for 7-pack task orders to rehabilitate and/or repair the pipelines.	Project 6-20 will rehabilitate the entire Fairview Trunkline to address pipeline fractures. Projects 7-65, 7-69, and X-129 will also address fracturing with rehabilitation work.
Uninspected Gravity Pipelines – Two gravity sewers have never been inspected in the Baker-Main Trunkline system. There is no condition data for these reaches to determine field-adjusted RUL.	These gravity sewers have a common manhole with a chemical line that must be temporarily relocated for CCTV access. Inspections will be completed via a CCTV work order in coordination with Plant No. 1 Operations.	N/A

Current and Future Projects

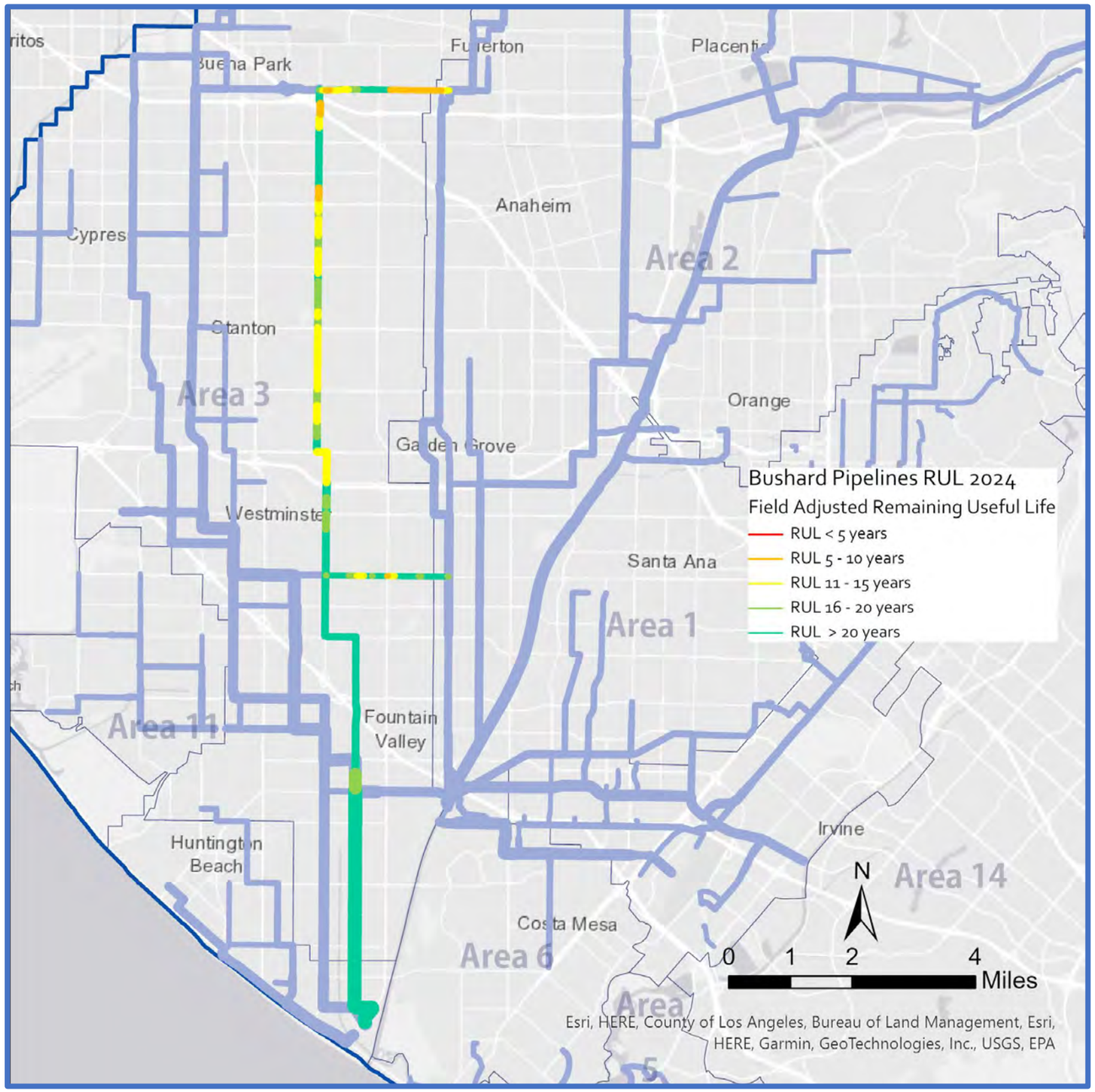
Project No.	Project Title	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
7-65	Gisler-Redhill Interceptor Rehabilitation															
6-20	Fairview Trunk Sewer Rehabilitation															
7-69	North Tustin-Orange Sewer Improvements															
X-084	Tustin Avenue Sewer Improvements															
X-129	South Coast Metro Sewer Rehabilitation															

Please see the comprehensive Acronyms and Abbreviations list for definitions.

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

ASSET MANAGEMENT SUMMARY – COLLECTION SYSTEM – BUSHARD TRUNKLINE

System Overview - Pipelines



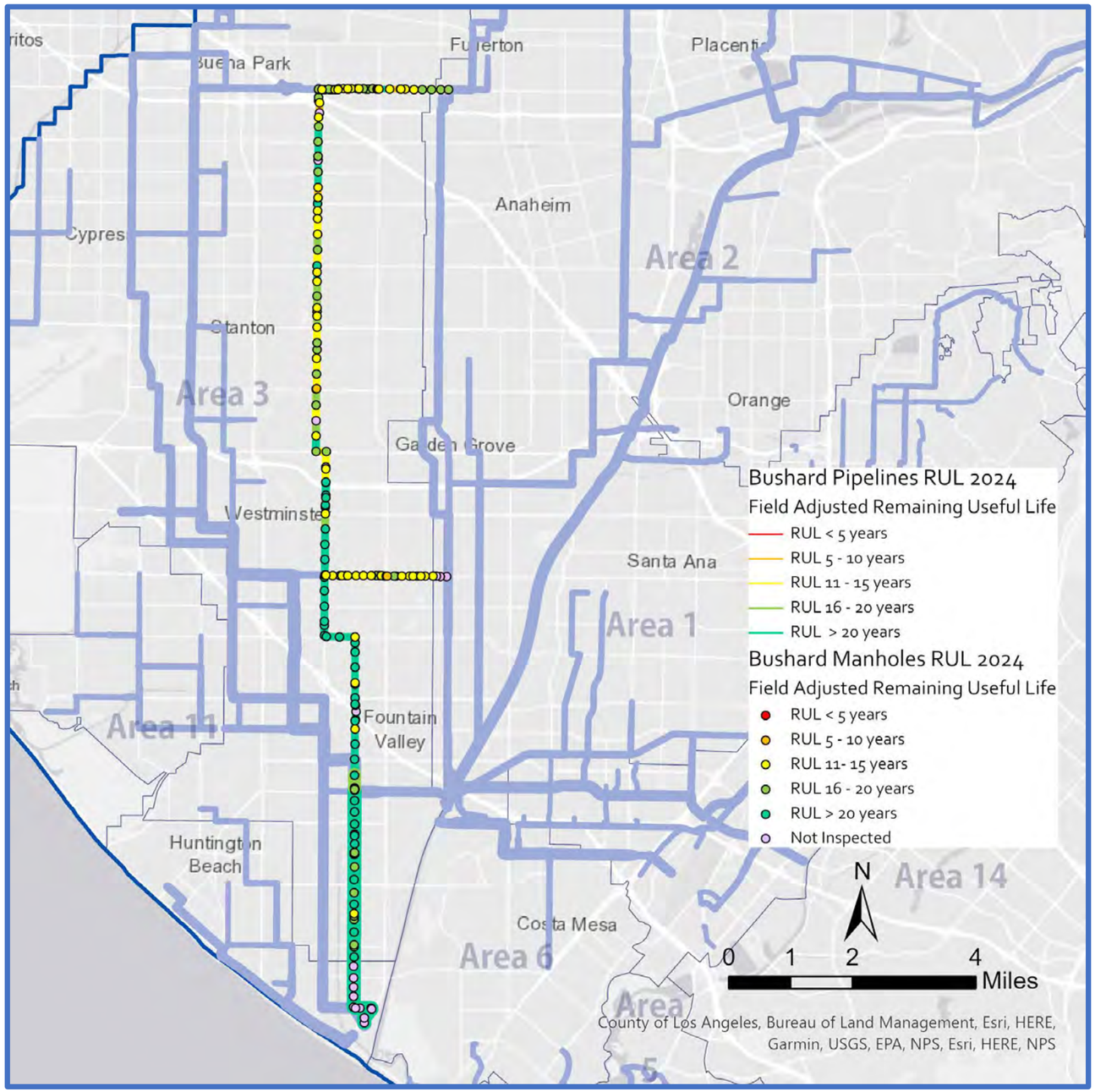
Major Assets and Condition Information - Pipelines

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	40	-	-
> 18" Ø	8.7	97	57	-	9
Reinforced Concrete					
≤ 42" Ø	6.3	35	74	-	1
> 42" Ø	5.5	48	25	-	-
Fiberglass					
≤ 42" Ø	1.0	8	26	-	-
Polyvinyl Chloride					
≤ 18" Ø	0.15	6	20	-	-
> 18" Ø	0.08	2	22	-	-
High-Density Polyethylene					
22" Ø	0.06	2	26	-	-
Steel					
12"–26" Ø	0.06	4	15	-	-

Please see the comprehensive Acronyms and Abbreviations list for definitions.

ASSET MANAGEMENT SUMMARY – COLLECTION SYSTEM – BUSHARD TRUNKLINE

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	65	-	-
> 48" Ø	167	39	-	3

Please see the comprehensive Acronyms and Abbreviations list for definitions.

ASSET MANAGEMENT SUMMARY – COLLECTION SYSTEM – BUSHARD TRUNKLINE

Key Issues

Key Issues	Short-Term Actions and Recommendations	Long-Term Actions and Recommendations
Bushard Diversion Box – Due to corrosion and ragging issues, the Bushard Diversion Box cannot operate as originally intended.	N/A	Permanent improvements including a change in isolation valve type, etc. are included in Project X-096.
Improperly Abandoned Manhole Under I-5 – In 2017, CCTV discovered a partial abandoned manhole in the Magnolia Street sewer underneath the I-5 travel lanes. Subsequent investigations in 2022 confirmed the manhole structure had significant liner delamination and aggregate visible.	N/A	Project FRC-0014 will complete the abandonment of the manhole under I-5.
Manhole Defects – CCTV identified one manhole that has significant liner delamination.	N/A	Manhole is suitable for repair under the manhole repair and rehabilitation blanket contract.
Missing Air Jumpers – One out of eight inverted siphon/reduction locations in the Bushard Trunkline system does not have air jumpers.	N/A	Project X-130 includes constructing a new air jumper.
Pipeline Defects – CCTV identified an area with significant fracturing of VCP pipelines primarily in Magnolia Street and Orangethorpe Avenue in the cities of Anaheim and Fullerton.	N/A	Projects X-085 and X2-79 will address fracturing with rehabilitation work.

Current and Future Projects

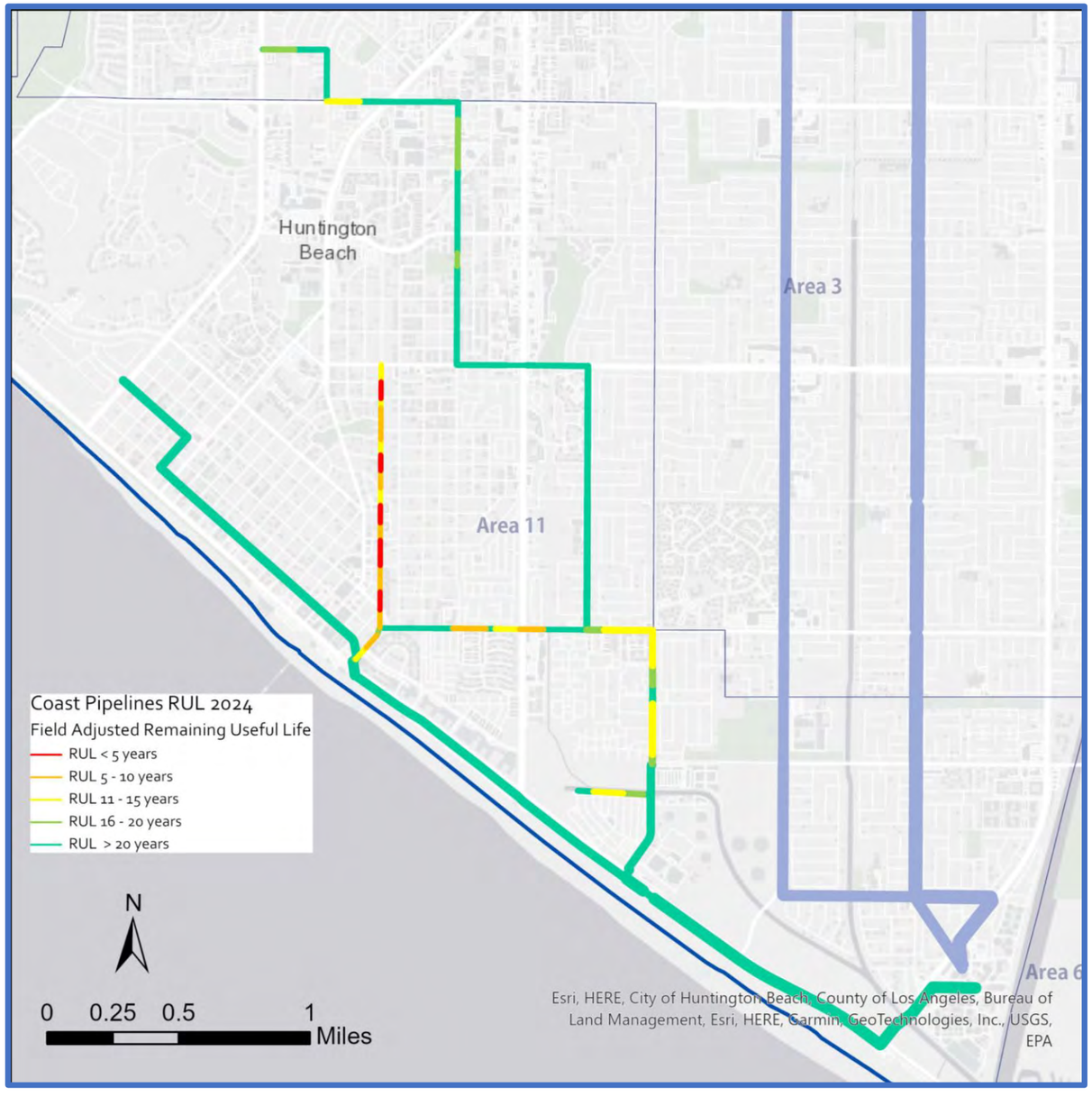
Project No.	Project Title	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
FRC-0014	Magnolia Sewer Manhole Abandonment at I-5															
X-096	Bushard Diversion Structure Improvements															
X-130	McFadden - Bolsa Sewer Rehabilitation															
X-085	Hoover - Western Sewer Rehabilitation															
X2-79	Fullerton - Brea Sewer Rehabilitation															

Please see the comprehensive Acronyms and Abbreviations list for definitions.

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

ASSET MANAGEMENT SUMMARY – COLLECTION SYSTEM – COAST TRUNKLINE

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	65	6	10
> 18” Ø	4.4	58	63	-	-
Reinforced Concrete					
> 42” Ø	5.0	57	41	-	-

Please see the comprehensive Acronyms and Abbreviations list for definitions.

ASSET MANAGEMENT SUMMARY – COLLECTION SYSTEM – COAST TRUNKLINE

Key Issues

Key Issues	Short-Term Actions and Recommendations	Long-Term Actions and Recommendations
Pipeline Defects – CCTV identified an area with significant fracturing of VCP pipelines primarily in Lake Street and Atlanta Avenue. There are also areas of significant root intrusion in and around existing fractures.	Most pipelines in Project X-126 have root intrusion in and around existing fractures. Future root treatment work is planned to stop root growth and prevent further damage to the pipelines prior to construction of Project X-126.	Project X-126 will address all of the major fractures by rehabilitating the pipelines.
Uninspected Gravity Pipelines – Two gravity sewers within Plant No. 2 have never been inspected in the Coast Trunkline system. There is no condition data for these reaches to determine field-adjusted RUL. A CCTV inspection was attempted in 2024, and due to flow conditions, CCTV could not be completed. It is suspected heavy flow from the force mains from Bitter Point Pump Station may be the cause of the adverse flow conditions.	OC San staff plans to re-attempt the CCTV inspections in coordination with the operation of Bitter Point Pump Station.	N/A

Current and Future Projects

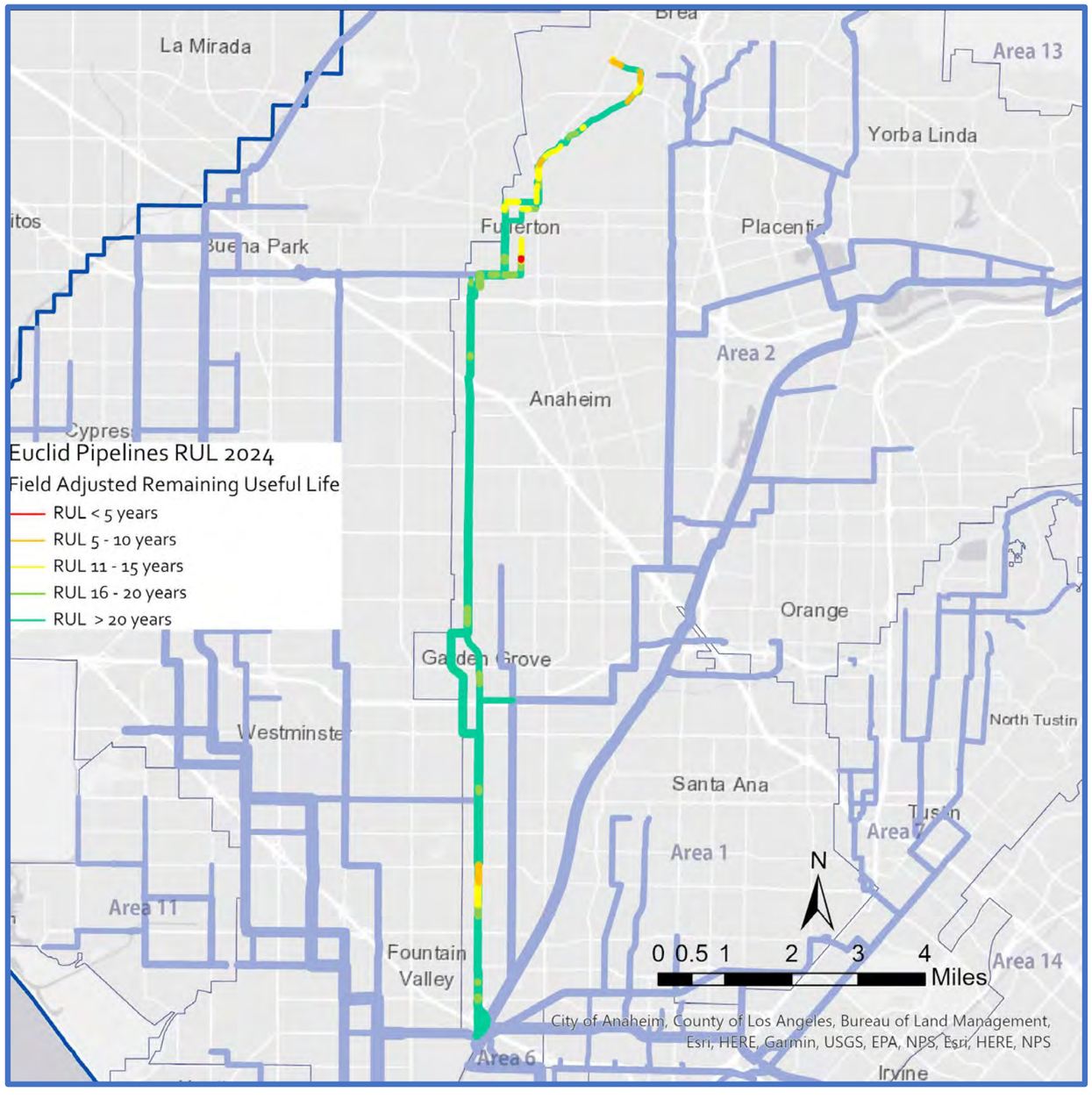
Project No.	Project Title	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
X-126	Lake - Atlanta Sewer Rehabilitation															

Please see the comprehensive Acronyms and Abbreviations list for definitions.

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

ASSET MANAGEMENT SUMMARY – COLLECTION SYSTEM – EUCLID TRUNKLINE

System Overview - Pipelines



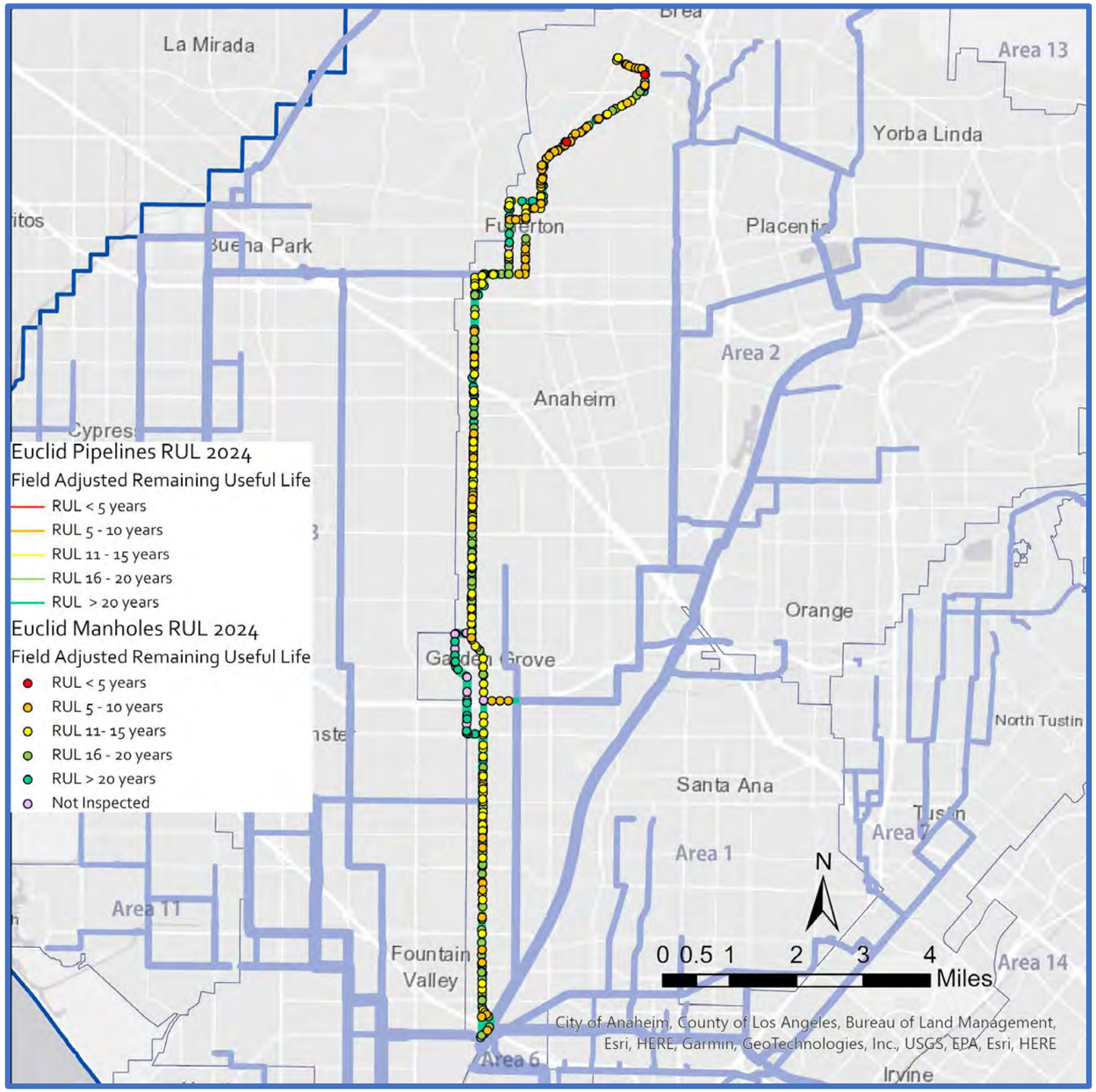
Major Assets and Condition Information - Pipelines

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	61	-	4
> 18" Ø	16.0	203	50	1	2
Reinforced Concrete					
≤ 42" Ø	2.4	15	52	-	-
> 42" Ø	11.6	131	35	-	-
Polyvinyl Chloride					
≤ 18" Ø	0.05	5	25	-	-
> 18" Ø	0.10	7	15	-	-
Steel					
10" Ø	0.01	3	15	-	-
High-Density Polyethylene					
26" Ø	0.05	1	15	-	-

Please see the comprehensive Acronyms and Abbreviations list for definitions

ASSET MANAGEMENT SUMMARY – COLLECTION SYSTEM – EUCLID TRUNKLINE

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	61	1	21
> 48" Ø	333	43	1	29
Brick				
≤ 48" Ø	48	64	-	17
> 48" Ø	2	56	-	-

Please see the comprehensive Acronyms and Abbreviations list for definitions.

ASSET MANAGEMENT SUMMARY – COLLECTION SYSTEM – EUCLID TRUNKLINE

Key Issues

Key Issues	Short-Term Actions and Recommendations	Long-Term Actions and Recommendations
Manhole Defects – CCTV identified areas with significant liner delamination and some structures with exposed rebar throughout the Euclid Trunkline system, but especially in the vicinity of Coyote Hills and northern Fullerton.	Nearly all manholes in Projects X2-79 may reach the end of their useful lives prior to construction starting. Therefore, these manholes need some rehabilitation work performed via the manhole repair and rehabilitation blanket contract to prevent failure prior to the start of Projects X2-79.	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 are suitable for repair under the manhole repair and rehabilitation blanket contract.
Pipeline Defects – CCTV identified an area with significant fracturing of VCP pipelines in northern Fullerton and Fountain Valley. There is also one pipeline with root intrusion in and around existing fractures.	Future root treatment work is planned to stop root growth and prevent further damage to the pipelines prior to construction of Project X2-79. 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.	Project X2-79 will address all of the major fractures by rehabilitating the pipelines.

Current and Future Projects

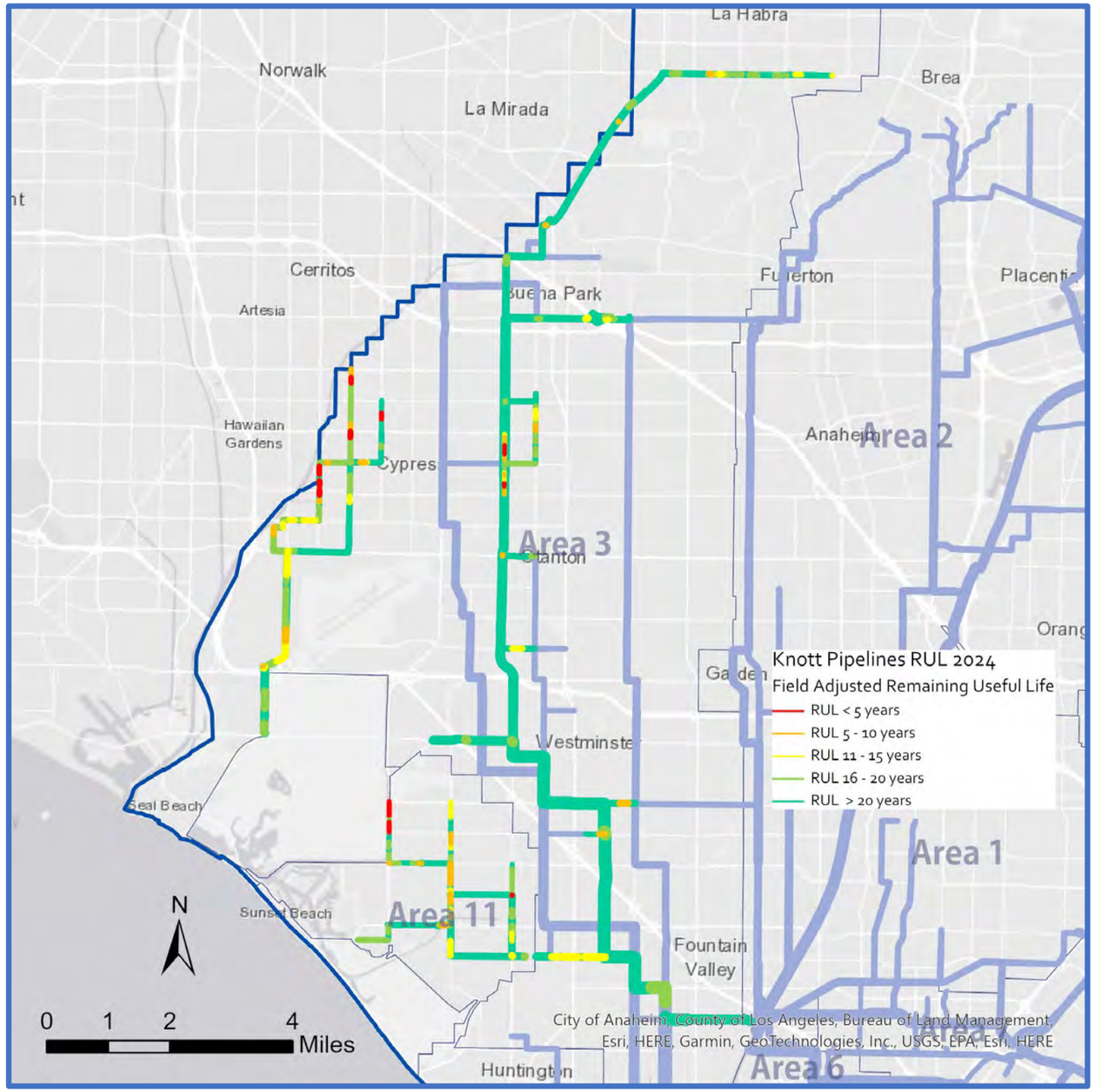
Project No.	Project Title	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
X2-79	Fullerton - Brea Sewer Rehabilitation															

Please see the comprehensive Acronyms and Abbreviations list for definitions.

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

ASSET MANAGEMENT SUMMARY – COLLECTION SYSTEM – KNOTT TRUNKLINE

System Overview - Pipelines



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

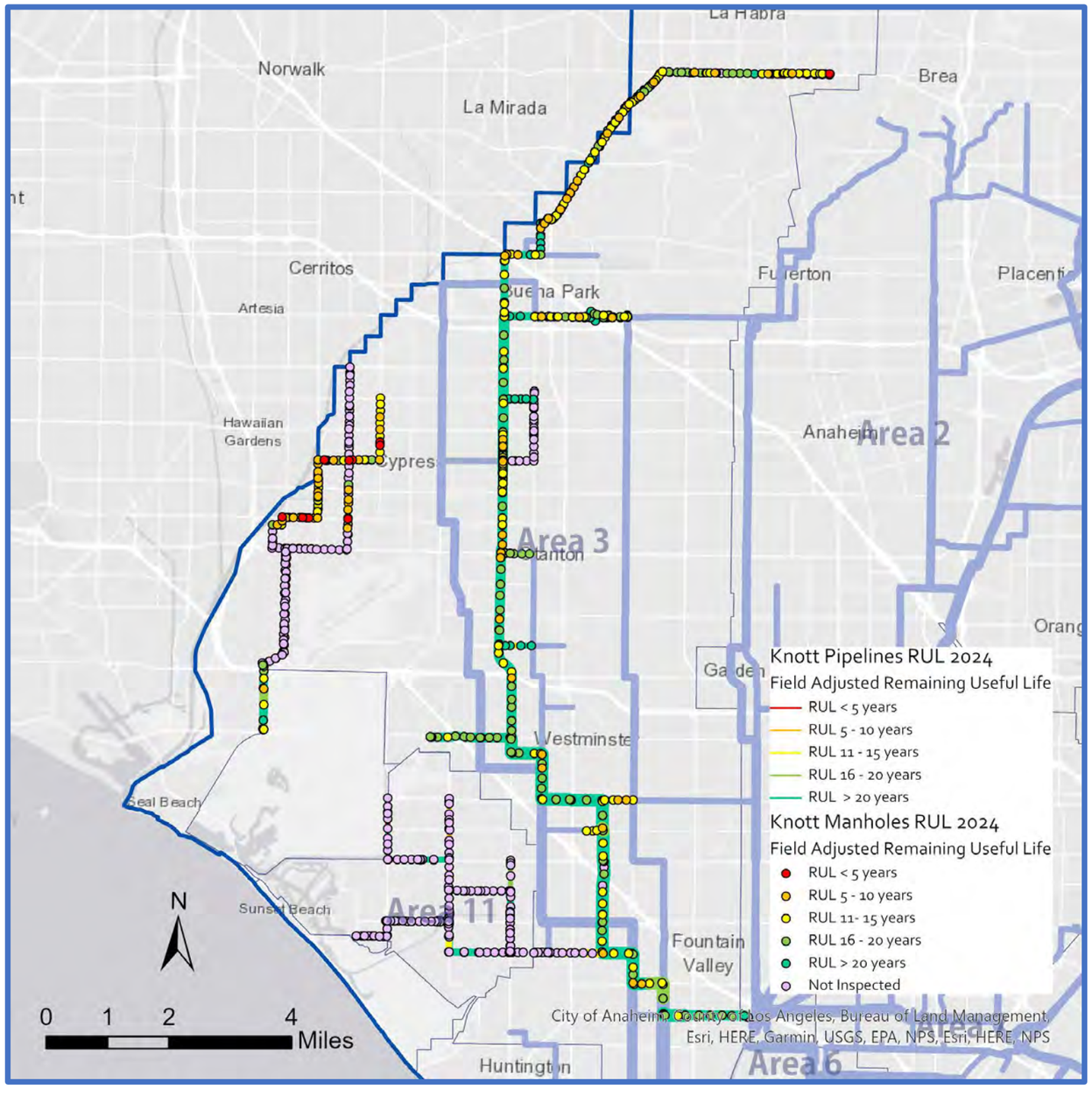
Major Assets and Condition Information - Pipelines

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	56	11	13
> 18" Ø	34.9	484	51	5	18
Reinforced Concrete					
≤ 42" Ø	4.7	58	30	-	-
> 42" Ø	17.2	138	48	-	-
Polyvinyl Chloride					
≤ 18" Ø	1.2	17	19	-	-
Fiberglass Reinforced Plastic					
≤ 42" Ø	0.07	2	16	-	-
> 42" Ø	1.1	8	18	-	-
High-Density Polyethylene					
18" Ø	0.01	2	11	-	-
> 18" Ø	0.03	3	15	-	-
Ductile Iron					
20" Ø	0.02	1	65	-	-
Steel					
4" Ø	0.02	1	15	-	-
Unknown					
18" Ø	0.01	2	66	-	2

Please see the comprehensive Acronyms and Abbreviations list for definitions.

ASSET MANAGEMENT SUMMARY – COLLECTION SYSTEM – KNOTT TRUNKLINE

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	271	58	8	39
> 48" Ø	535	43	4	33

Please see the comprehensive Acronyms and Abbreviations list for definitions.

ASSET MANAGEMENT SUMMARY – COLLECTION SYSTEM – KNOTT TRUNKLINE

Key Issues

Key Issues	Short-Term Actions and Recommendations	Long-Term Actions and Recommendations
Missing Air Jumpers – Four out of 17 inverted siphon/reduction locations in the Knott Trunkline system do not have air jumpers.	N/A	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.
Manhole Defects – CCTV identified areas with significant liner delamination and some structures with exposed rebar, primarily in Buena Park, Cypress, and Los Alamitos.	Five manholes included in Projects X-061, X-085, and X2-79 may reach the end of their useful lives prior to construction starting. Therefore, these manholes need some rehabilitation work performed via the manhole repair and rehabilitation blanket contract to prevent failure prior to the start of Projects X-061, X-085, and X2-79.	Projects 3-60, 3-64A and C, X-061, X-085, X-130, and X2-79 will address the majority of the liner delamination and exposed rebar by rehabilitating the manhole structures. Other manholes are suitable for repair under the manhole repair and rehabilitation blanket contract.
Pipeline Defects – 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 but maintained by OC San in the northern central area of the trunkline. There are also areas of significant root intrusion in and around existing fractures. A blockage due to roots occurred in one of pipe segments in northern Huntington Beach in 2022. Lastly, one pipeline with fractures also has a very large, encrusted deposit from groundwater infiltration.	Root treatment work is planned for 2024 to stop root growth and prevent further damage to the pipelines prior to the construction of Project 11-35. OC San staff plan to use the industrial cleaning blanket contract to remove the large deposit to prevent a flow obstruction prior to construction of Project X-130. Isolated defects elsewhere not included or near a CIP project have been identified as high-priority spot repairs. OC San staff are in the process of grouping point repairs together for 7-pack task orders.	Projects 3-60, 3-64B and C, 11-35, X-061, X-085, and X-130 will address the majority of fractures by rehabilitating the pipelines. OC San staff will also coordinate with the City of Anaheim pertaining to operation and maintenance of the local small-diameter sewers.
Uninspected Gravity Pipelines – Three gravity sewers have never been inspected in the Knott and Ellis Avenue Trunkline 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.	N/A
Vault Vibration Issues – Three sewer vaults in Warner Avenue cause local vibration/resonance issues to nearby residences when cars pass over them.	N/A	Project FRC-0010 will rehabilitate each of the Warner Avenue vaults to eliminate local vibration/resonance issues.

Current and Future Projects

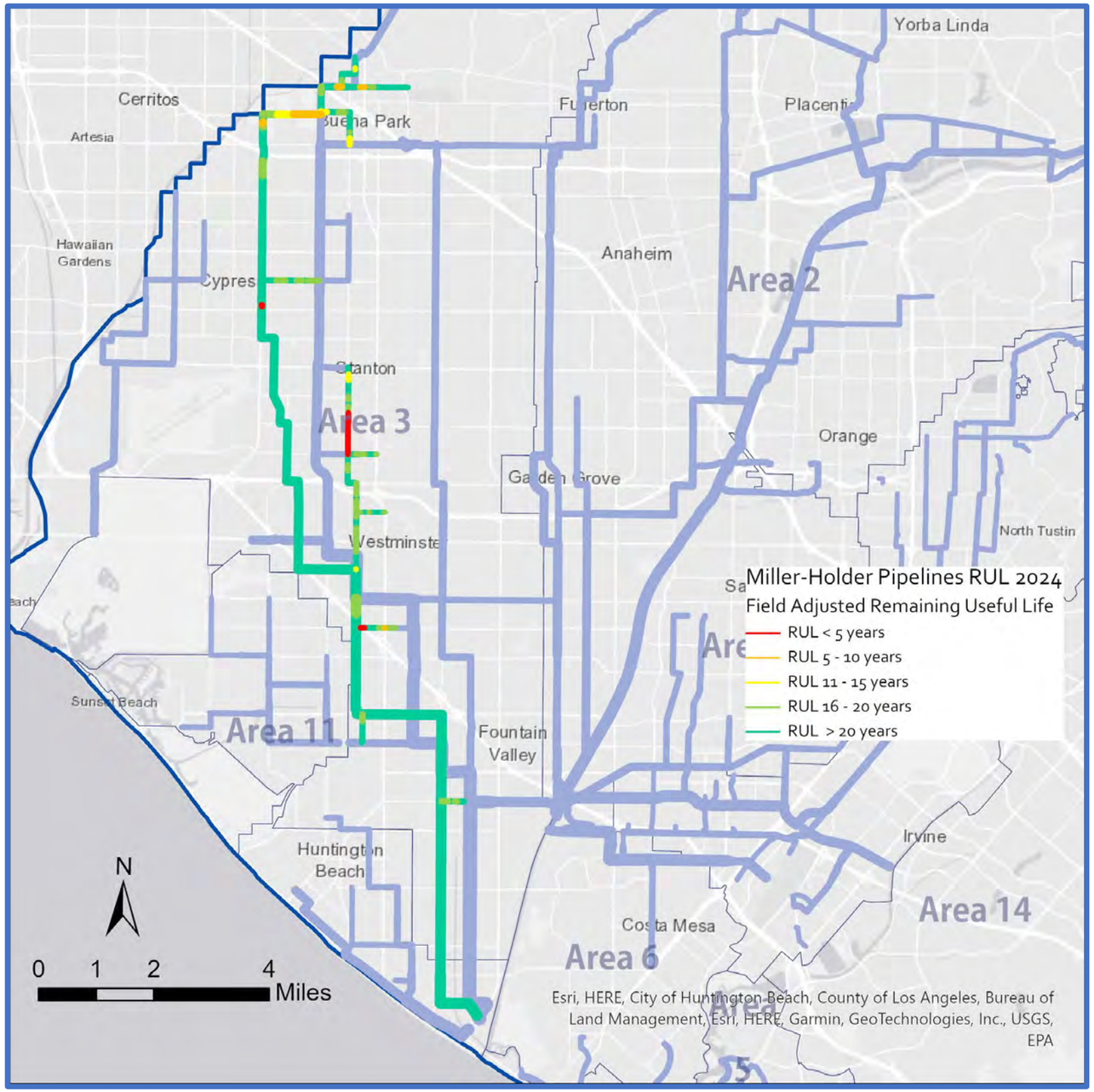
Project No.	Project Title	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
3-64A&B	Orange Western Sub-Trunk Rehabilitation and Los Alamitos Trunk Sewer Rehabilitation															
FRC-0010	Warner Avenue Vault Cover Improvements															
3-64C	Cypress Trunk Sewer Rehabilitation - West															
3-60	Knott - Miller Holder - Artesia Branch Rehabilitation															
11-35	North Huntington Beach Sewer Rehabilitation															
3-68	Los Alamitos Sub-Trunk Extension and Westside PS Abandonment															
X-130	McFadden - Bolsa Sewer Rehabilitation															
X-078	Inverted Siphon and Air Jumper Improvements															
X-085	Hoover - Western Sewer Rehabilitation															
X-061	Imperial Highway Trunk Sewer Rehabilitation															

Please see the comprehensive Acronyms and Abbreviations list for definitions.

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

ASSET MANAGEMENT SUMMARY – COLLECTION SYSTEM – MILLER-HOLDER TRUNKLINE

System Overview - Pipelines



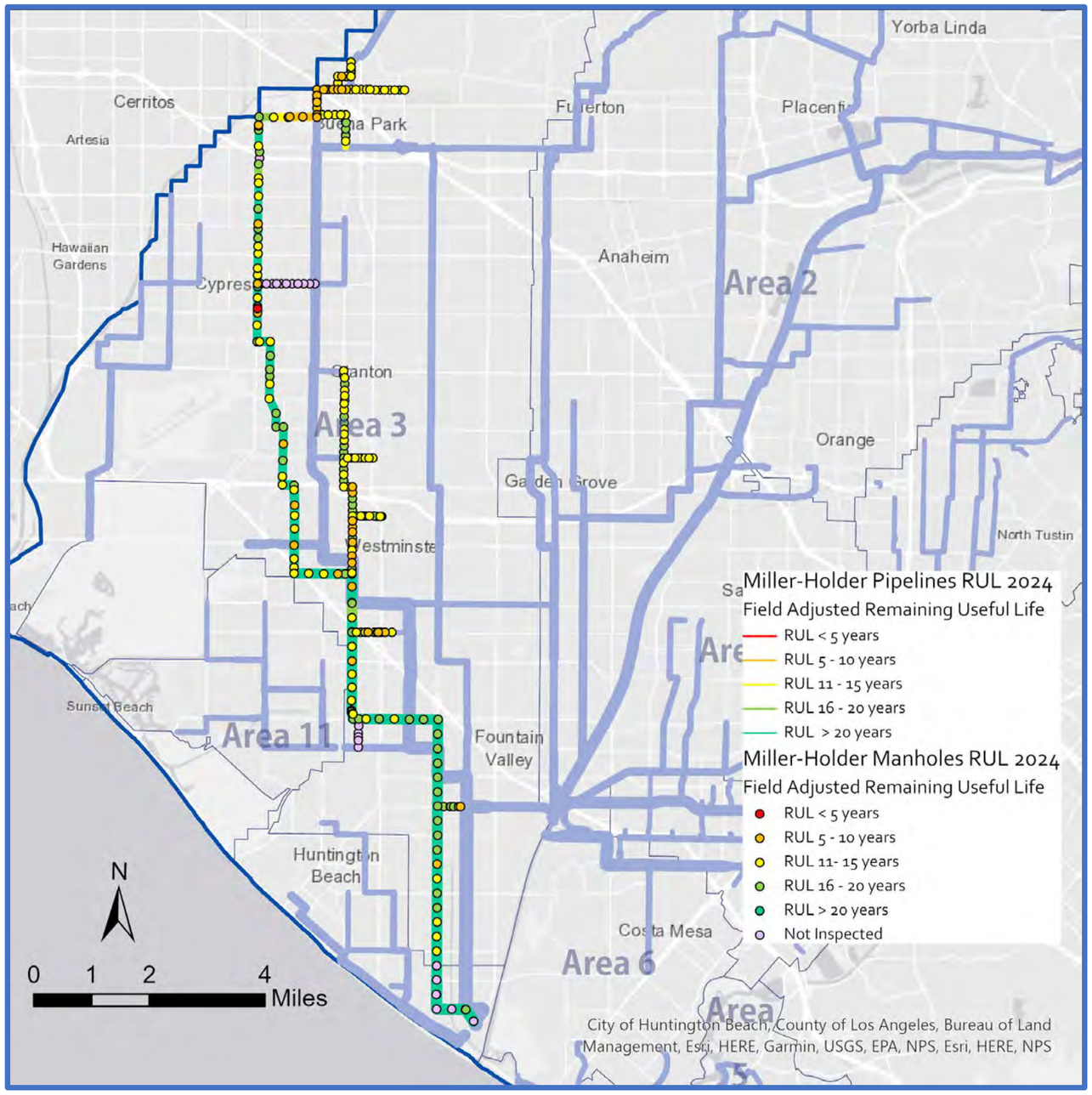
Major Assets and Condition Information - Pipelines

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	64	1	2
> 18" Ø	9.4	114	62	11	3
Reinforced Concrete					
> 42" Ø	19.3	101	67	-	1
Ductile Iron					
≤ 18" Ø	0.07	5	42	-	3
Polyvinyl Chloride					
24" Ø	0.02	1	22	-	-

Please see the comprehensive Acronyms and Abbreviations list for definitions.

ASSET MANAGEMENT SUMMARY – COLLECTION SYSTEM – MILLER-HOLDER TRUNKLINE

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	65	-	5
> 48" Ø	197	63	1	37

Please see the comprehensive Acronyms and Abbreviations list for definitions.

ASSET MANAGEMENT SUMMARY – COLLECTION SYSTEM – MILLER-HOLDER TRUNKLINE

Key Issues

Key Issues	Short-Term Actions and Recommendations	Long-Term Actions and 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 PWWFs. During existing PWWFs, capacity issues were identified in a portion of the Hoover-Western Sub-Trunk.	N/A	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.	N/A	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 are suitable for repair under the manhole repair and rehabilitation blanket contract.
Missing Air Jumpers – Two out of five inverted siphon/reduction locations in the Miller-Holder Trunkline system do not have air jumpers.	N/A	Projects 3-60 and X-078 both include constructing a new air jumper at each location.
Pipeline Defects – CCTV identified several areas with significant fracturing of VCP pipelines. Most fractures are concentrated in Buena Park and Westminster.	N/A	Projects 3-60, X-085, and X-130 will address the majority of the fractures by rehabilitating the pipelines.

Current and Future Projects

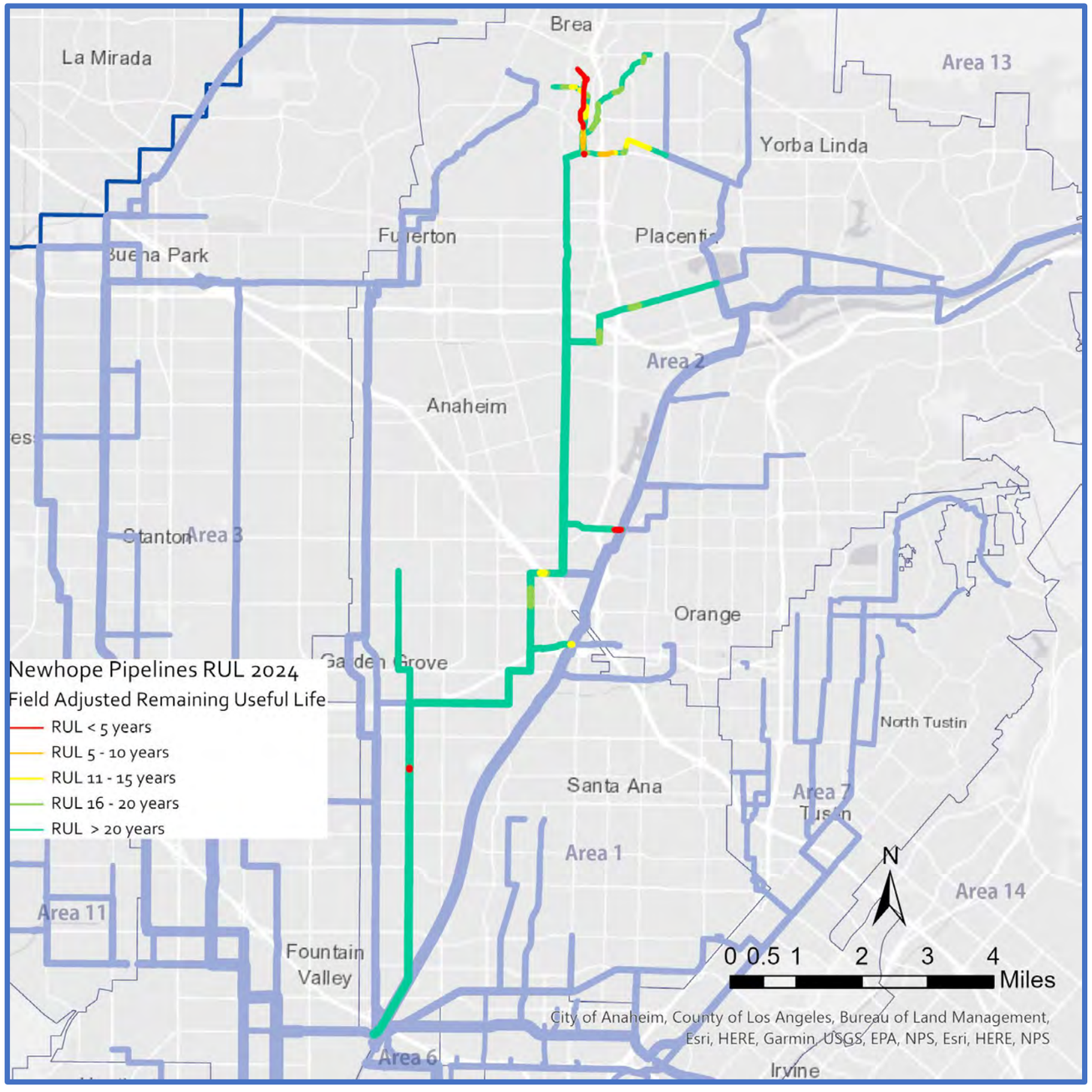
Project No.	Project Title	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
3-64A&B	Orange Western Sub-Trunk Rehabilitation and Los Alamitos Trunk Sewer Rehabilitation															
3-60	Knott - Miller Holder - Artesia Branch Rehabilitation															
X-130	McFadden - Bolsa Sewer Rehabilitation															
X-078	Inverted Siphon and Air Jumper Improvements															
X-085	Hoover - Western Sewer Rehabilitation															

Please see the comprehensive Acronyms and Abbreviations list for definitions.

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

ASSET MANAGEMENT SUMMARY – COLLECTION SYSTEM – NEWHOPE TRUNKLINE

System Overview - Pipelines



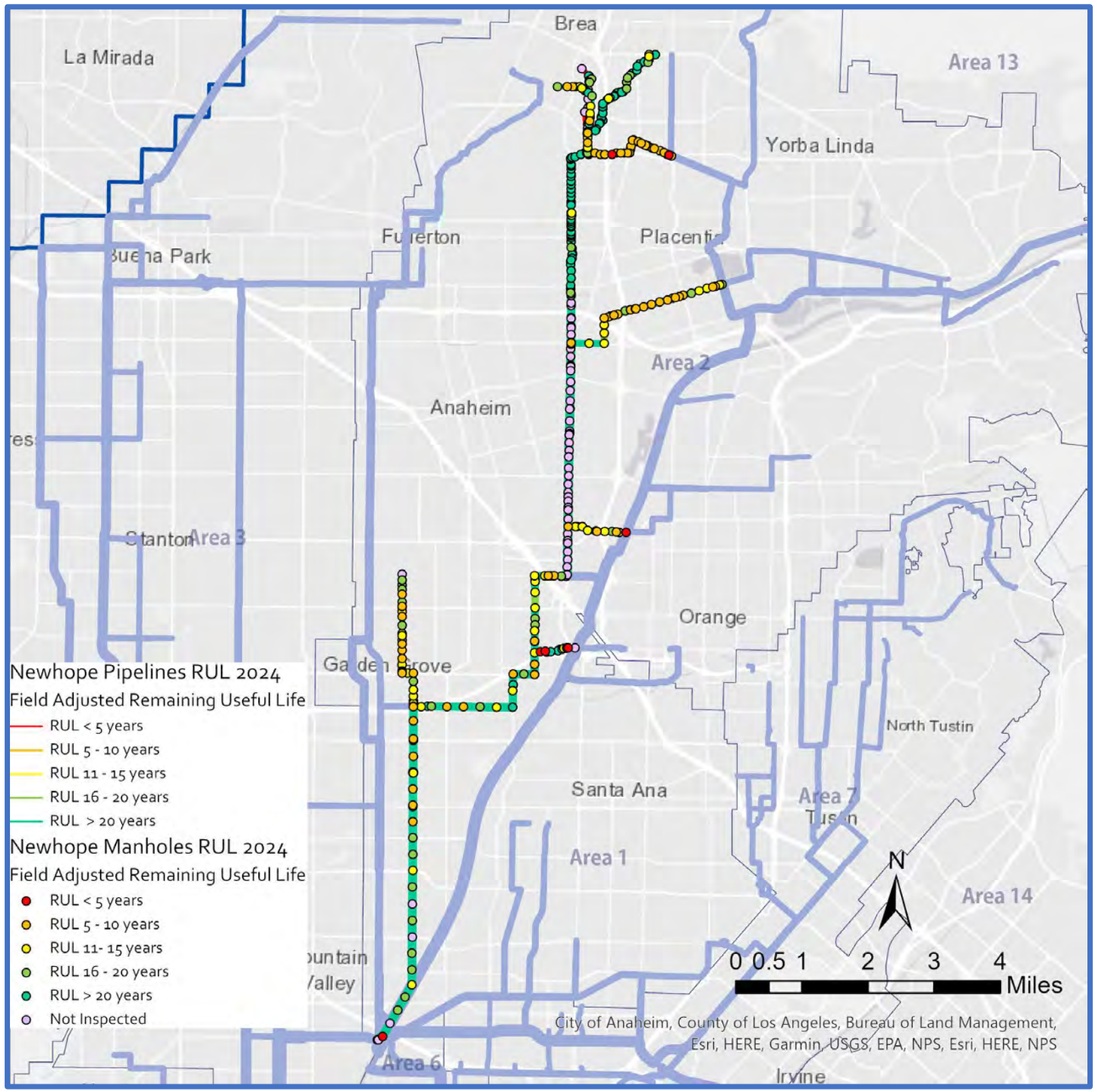
Major Assets and Condition Information - Pipelines

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	3.1	61	50	3	5
> 18” Ø	11.3	168	45	3	-
Reinforced Concrete					
> 42” Ø	7.9	42	64	-	-
Fiberglass Reinforced Plastic					
≤ 42” Ø	0.02	1	6	-	-
> 42” Ø	4.5	50	6	-	-
Ductile Iron					
≤ 18” Ø	0.93	18	29	-	1
> 18” Ø	0.38	7	44	4	-
Cast Iron					
12” Ø	0.91	7	65	7	-
Steel					
12” Ø	0.07	6	15	-	-
Polyvinyl Chloride					
≤ 18” Ø	0.03	2	30	1	-
> 18” Ø	0.01	3	20	1	-

Please see the comprehensive Acronyms and Abbreviations list for definitions.

ASSET MANAGEMENT SUMMARY – COLLECTION SYSTEM – NEWHOPE TRUNKLINE

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	62	1	21
> 48" Ø	304	39	7	55

Please see the comprehensive Acronyms and Abbreviations list for definitions.

ASSET MANAGEMENT SUMMARY – COLLECTION SYSTEM – NEWHOPE TRUNKLINE

Key Issues

Key Issues	Short-Term Actions and Recommendations	Long-Term Actions and 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.	N/A	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.	N/A	Project 2-73 includes the construction of a new diversion to allow the routing of some flows from the SAR0345 branch into the Newhope Trunkline 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 Trunkline system with severe liner detachment, surface aggregate missing, and visible reinforcement.	Two manholes in Project 2-73 may reach the end of their useful lives prior to construction starting. Therefore, these manholes need some rehabilitation work performed via the manhole repair and rehabilitation blanket contract to prevent failure prior to the start of Project 2-73.	Projects FE20-08, FE21-08, 2-73, and 2-78 will address the majority of the liner delamination and exposed rebar by rehabilitating the manhole structures. Other manholes are suitable for repair under the manhole repair and rehabilitation blanket contract.
Pipeline Fracturing – CCTV identified several areas with significant fracturing of VCP pipelines. Most fractures are concentrated in Fullerton.	N/A	Project 2-73 will address all of the fractures by rehabilitating or abandoning the pipelines.
Pipeline Tuberculation – CCTV identified a few ductile iron pipelines in Craig Regional Park with no lining or significant delamination and widespread tuberculation. The last CCTV inspections for these assets were completed in 2013.	CCTV frequency to be increased for all ductile iron pipelines and new CCTV inspections are needed for suspected unlined ductile iron pipelines. External condition assessment is also recommended to field verify the RUL of ductile iron pipelines. Ductile iron pipelines with 5 years or less of RUL with widespread liner delamination and tuberculation will be grouped into either 7-pack task orders or a new small project to rehabilitate the pipelines sooner than Project 2-73.	Project 2-73 will address one of the pipelines with pockets of liner delamination and tuberculation.
Uninspected Gravity Pipelines – 13 gravity sewers have never been inspected in the Newhope Trunkline system. There is no condition data for these reaches to determine field-adjusted RUL. This includes several cast-iron pipelines in a temporarily out-of-service pipeline in Craig Regional Park that are largely inaccessible.	Four gravity sewers were recently constructed in 2017 and 2018 and have no access issues. All these reaches will be inspected via future CCTV PM work orders or separate CCTV work orders.	Nine gravity sewers, including the temporarily out-of-service cast iron pipelines in Craig Regional Park, are proposed to be abandoned as part of Project 2-73.

Current and Future Projects

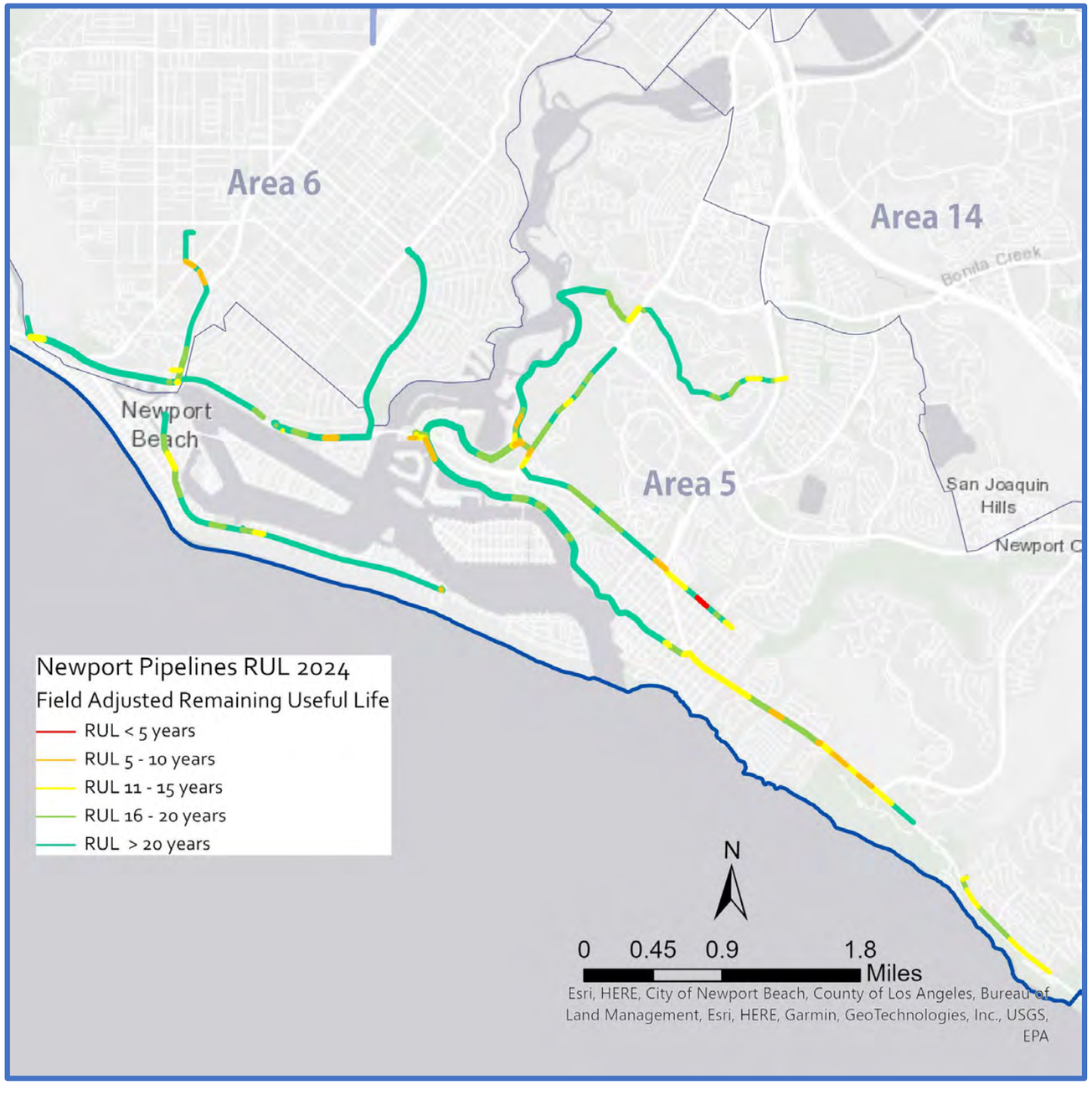
Project No.	Project Title	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
FE20-08	Olive Sub-Trunk Siphon Rehabilitation at Santa Ana River															
FE21-08	Newhope-Placentia Sewer Manhole Replacements															
2-73	Fullerton - Placentia Sewer Facilities Demolition and Rehabilitation															
2-78	Atwood - Santa Ana Canyon Sewer Rehabilitation															

Please see the comprehensive Acronyms and Abbreviations list for definitions.

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

ASSET MANAGEMENT SUMMARY – COLLECTION SYSTEM – NEWPORT TRUNKLINE

System Overview - Pipelines



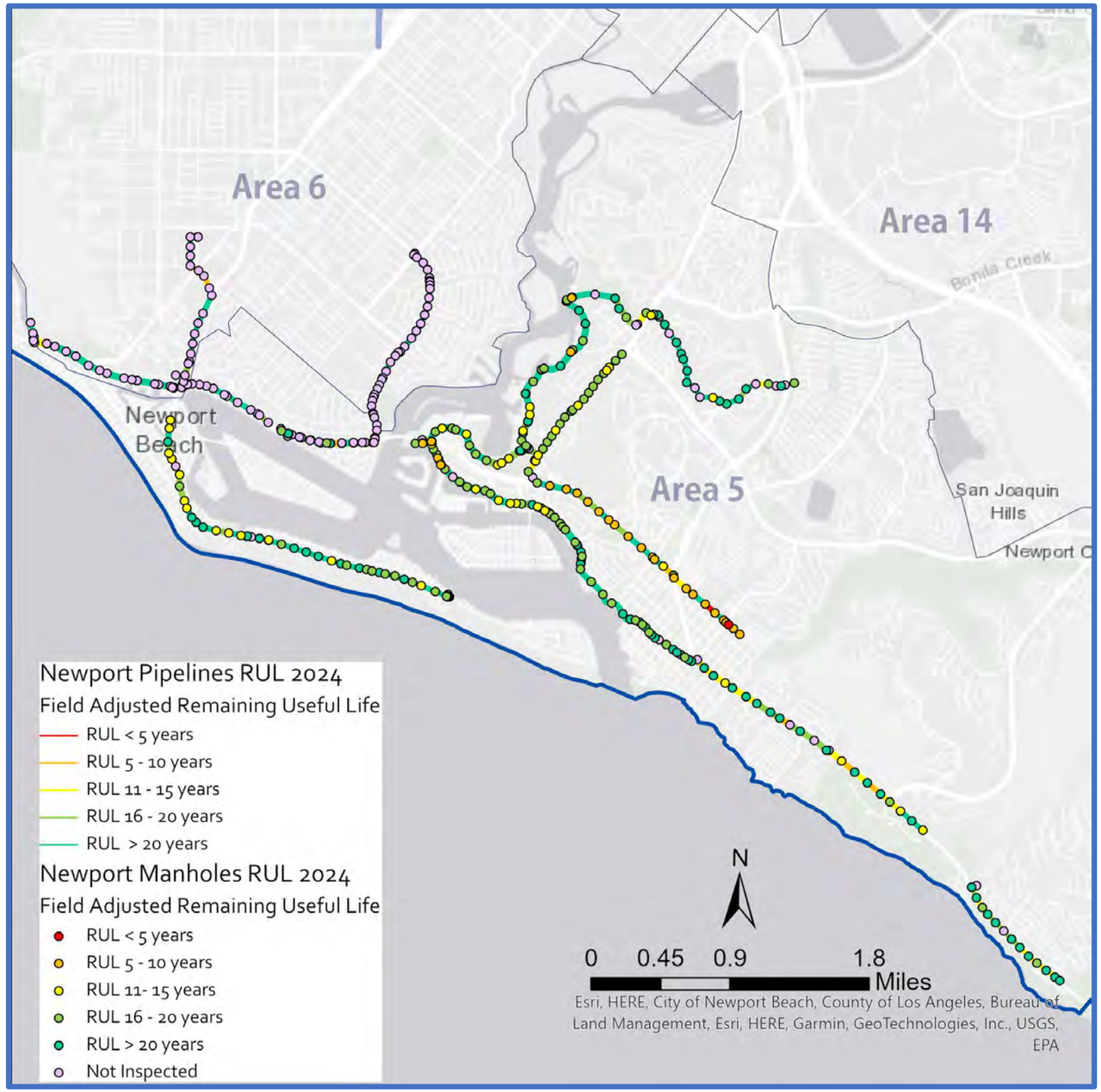
Major Assets and Condition Information - Pipelines

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	47	2	6
> 18” Ø	8.2	176	38	-	7
Ductile Iron					
≤ 18” Ø	1.3	18	31	-	2
> 18” Ø	2.6	35	35	-	2
Polyvinyl Chloride					
≤ 18” Ø	0.13	3	12	-	-
> 18” Ø	2.6	36	24	-	-
High-Density Polyethylene					
≤ 18” Ø	0.13	2	32	-	-
> 18” Ø	0.66	14	30	-	-
Cast Iron					
≤ 18” Ø	0.12	2	49	-	-
Reinforced Concrete					
48” Ø	0.02	1	12	-	-

Please see the comprehensive Acronyms and Abbreviations list for definitions.

ASSET MANAGEMENT SUMMARY – COLLECTION SYSTEM – NEWPORT TRUNKLINE

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	65	1	19
> 48" Ø	295	29	-	10
Fiberglass Reinforced Plastic				
≤ 48" Ø	2	17	-	-
> 48" Ø	2	20	-	-

Please see the comprehensive Acronyms and Abbreviations list for definitions.

ASSET MANAGEMENT SUMMARY – COLLECTION SYSTEM – NEWPORT TRUNKLINE

Key Issues

Key Issues	Short-Term Actions and Recommendations	Long-Term Actions and 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.	One manhole in Project 5-69 may reach the end of its useful life prior to construction starting. Therefore, this manhole needs some rehabilitation work performed via the manhole repair and rehabilitation blanket contract to prevent failure prior to the start of the Project 5-69.	Project 5-69 will address the majority of the liner delamination and exposed rebar by rehabilitating the manhole structures. Other manholes are suitable for repair under the manhole repair and rehabilitation repair blanket contracts.
Missing Air Jumpers – One out of two inverted siphon locations in the Newport Trunkline system do not have air jumpers.	N/A	Project 5-69 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 Trunkline system.	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 spot repairs together for 7-pack task orders.	Project 5-69 will address the fractures by rehabilitating the pipelines.
Pipeline Tuberculation – CCTV identified ductile iron pipes in East Coast Highway with significant liner delamination and tuberculation.	CCTV frequency to be increased for all ductile iron pipe. External condition assessment and total dissolved solid (TDS) sampling is also recommended to field verify the RUL of ductile iron pipelines.	Project 5-69 will address the liner delamination and tuberculation by rehabilitating the pipelines.
Uninspected Gravity Pipelines – Nine gravity sewers have never been inspected in the Newport Trunkline system. There is no condition data for these reaches to determine field-adjusted RUL.	There are no known access issues for the nine uninspected gravity sewers. Inspections will be completed via future CCTV PM work orders or separate CCTV work orders.	N/A

Current and Future Projects

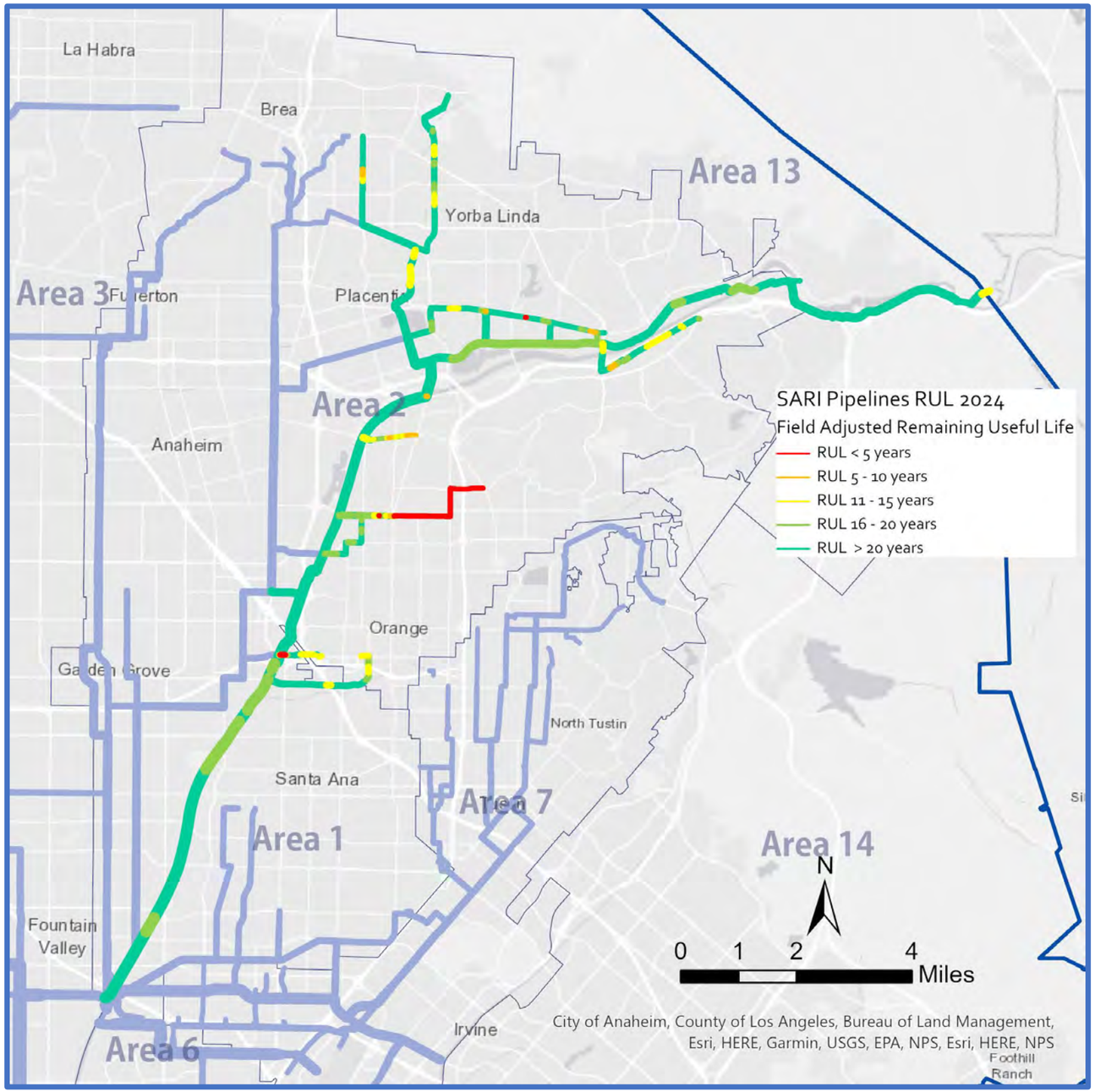
Project No.	Project Title	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
5-69	East Coast Highway Sewer Rehabilitation															

Please see the comprehensive Acronyms and Abbreviations list for definitions.

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

ASSET MANAGEMENT SUMMARY – COLLECTION SYSTEM – SARI TRUNKLINE

System Overview - Pipelines



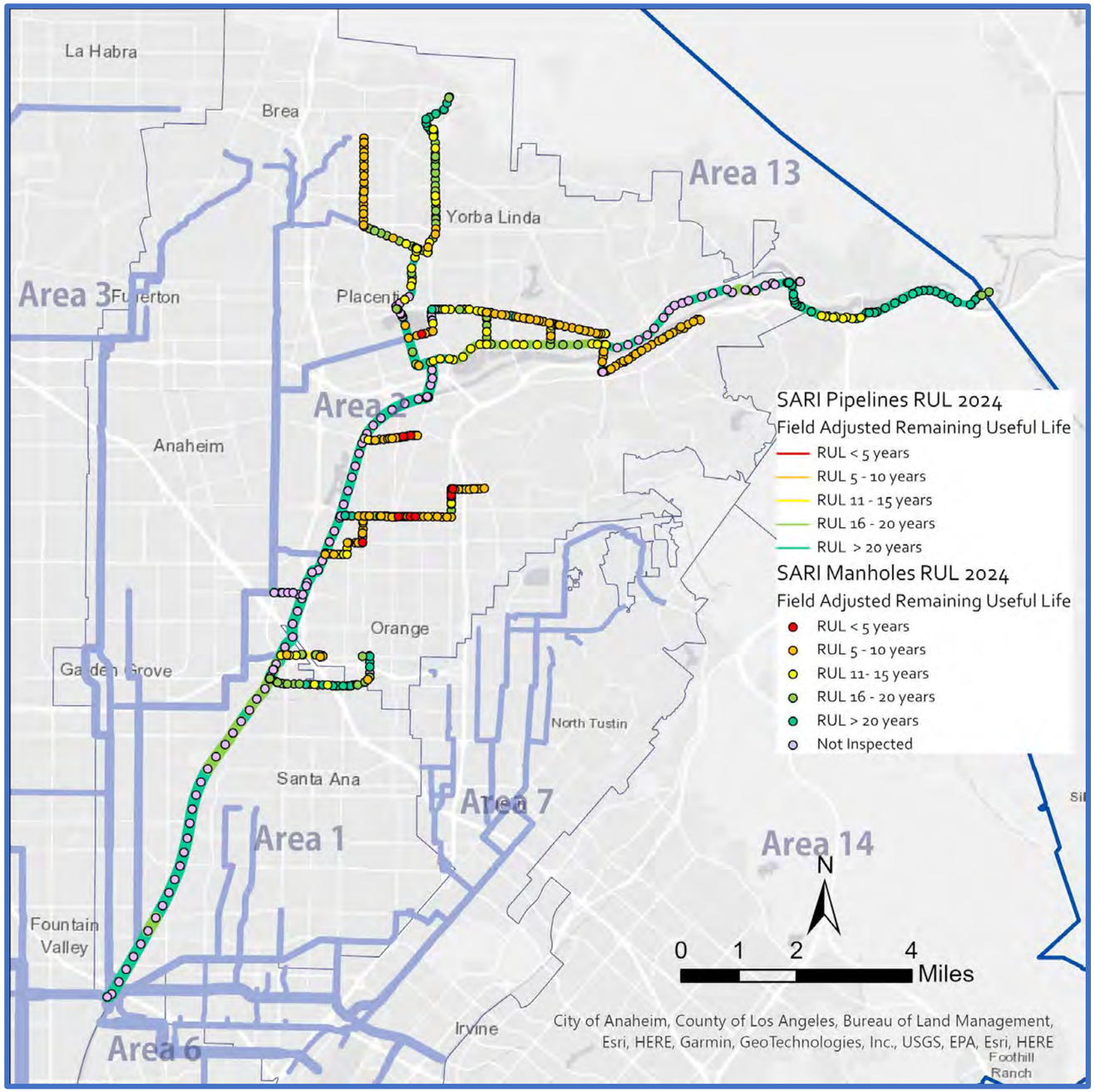
Major Assets and Condition Information - Pipelines

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	59	45	7
> 18" Ø	17.4	266	45	-	3
Reinforced Concrete					
42" Ø	1.5	19	41	-	-
> 42" Ø	20.5	119	48	-	-
Fiberglass Reinforced Plastic					
≤ 42" Ø	0.29	2	15	-	-
> 42" Ø	3.6	39	13	-	-
High-Density Polyethylene					
≤ 18" Ø	0.54	4	10	-	-
> 18" Ø	0.74	3	13	-	-
Ductile Iron					
> 18" Ø	0.80	10	37	2	2
Steel					
30" Ø	0.03	2	13	-	-
Polyvinyl Chloride					
12" Ø	0.01	1	8	-	-

Please see the comprehensive Acronyms and Abbreviations list for definitions.

ASSET MANAGEMENT SUMMARY – COLLECTION SYSTEM – SARI TRUNKLINE

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	63	8	81
> 48" Ø	393	43	1	69
Fiberglass Reinforced Plastic				
> 48" Ø	49	13	-	-

Please see the comprehensive Acronyms and Abbreviations list for definitions.

ASSET MANAGEMENT SUMMARY – COLLECTION SYSTEM – SARI TRUNKLINE

Key Issues

Key Issues	Short-Term Actions and Recommendations	Long-Term Actions and 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 PWWFs. During existing PWWFs, capacity issues were identified in the Taft Branch. During future PWWFs, capacity issues were identified in a northern portion of the SARI system.	N/A	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.	Some manholes in Projects 2-78 and X-134 may reach the end of their useful lives prior to construction starting. Therefore, these manholes need some rehabilitation work performed via the manhole repair and rehabilitation blanket contract to prevent failure prior to the start of Projects 2-78 and X-134.	Projects 2-49, 2-73, 2-78, and X-134 will address the majority of the liner delamination and exposed rebar by rehabilitating the manhole structures. Other manholes are suitable for repair under the manhole repair and rehabilitation and manhole frame and cover repair blanket contracts.
Missing Air Jumpers – Four out of 12 inverted siphon/reduction locations in the SARI Trunkline system do not have air jumpers.	One location is a dual-barrel inverted siphon underneath the Santa Ana River channel with no nearby bridges that could be used for typical air jumper construction. Existing maintenance needs and issues with deep air jumper systems with condensate pumps are significant. There are also no residences nearby the upstream and downstream manholes. Therefore, OC San staff recommend performing additional monitoring and testing if there is sufficient H_2S and air pressure to warrant constructing an air jumper of any type.	Projects 2-78 and X-134 include constructing a new air jumper at three locations.
Pipeline Defects – CCTV identified several areas with significant fracturing of VCP pipelines. Most fractures are concentrated in Anaheim and Orange.	N/A	Projects 2-73, 2-78, and X-134 will address fracturing issues by rehabilitating the pipelines.
Unlined Ductile Iron Pipe – There are four pipeline assets that according to record information are unlined ductile iron pipe and have significantly surpassed their theoretical RUL based on installation date. The gravity sewers have limited inspection data, and the inverted siphon barrels have never been inspected.	Perform new CCTV inspections and external assessments on all the ductile iron pipelines to field verify RUL. Gravity sewers are to be inspected with the pipeline CCTV blanket contract and there is an active procurement to CCTV inspect the inverted siphon barrels.	Ductile iron pipelines with less than 10 years of RUL will be grouped into either 7-pack task orders or a new small project.
Uninspected Gravity Pipelines – One gravity sewer in the SARI Trunkline system has never been inspected. 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 pipeline CCTV contractor.	N/A

Current and Future Projects

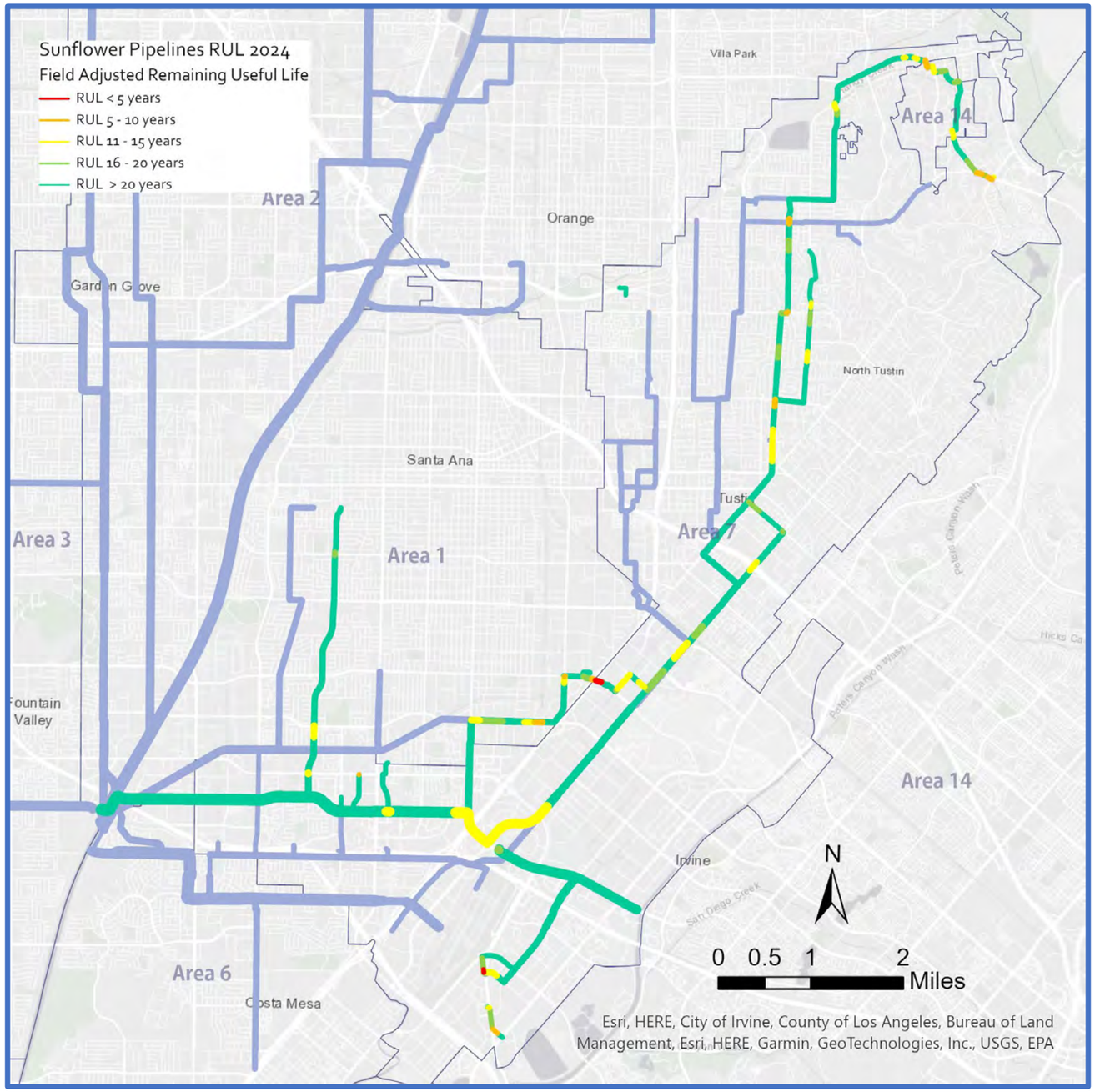
Project No.	Project Title	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
FE20-08	Olive Sub-Trunk Siphon Rehabilitation at Santa Ana River															
FRC-0011	Richfield Sub-Trunk Encasement for BNSF Railway Addition															
2-49	Taft Branch Improvements															
2-73	Fullerton - Placentia Sewer Facilities Demolition and Rehabilitation															
2-78	Atwood - Santa Ana Canyon Sewer Rehabilitation															
X-134	Olive - Taft Sewer Rehabilitation															
X-086	Santa Ana River Interceptor Improvements															

Please see the comprehensive Acronyms and Abbreviations list for definitions.

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

ASSET MANAGEMENT SUMMARY – COLLECTION SYSTEM – SUNFLOWER TRUNKLINE

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	7.2	148	48	-	8
> 18" Ø	18.0	261	50	1	5
Reinforced Concrete					
42" Ø	1.3	9	53	-	-
> 42" Ø	7.5	68	47	-	-
Ductile Iron					
20" Ø	0.51	11	25	-	-
Reinforced Plastic Mortar					
15" Ø	0.11	3	53	-	-
Polyvinyl Chloride					
30" Ø	0.05	3	16	-	-
Asbestos Cement					
10" Ø	0.04	1	60	1	-
Unknown					
18" Ø	0.01	1	7	-	-

Please see the comprehensive Acronyms and Abbreviations list for definitions.

ASSET MANAGEMENT SUMMARY – COLLECTION SYSTEM – SUNFLOWER TRUNKLINE

Key Issues

Key Issues	Short-Term Actions and Recommendations	Long-Term Actions and Recommendations
Missing Air Jumpers – Two out of 11 inverted siphon/reduction locations in the Sunflower Trunkline system do not have air jumpers.	N/A	Project X-129 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 Defects – CCTV identified several areas with significant fracturing of VCP pipelines. Most fractures are concentrated in Orange and Santa Ana with others located in Newport Beach and Tustin.	An isolated defect not near a CIP project has been identified as high-priority point repair. OC San staff are in the process of grouping spot repairs together for 7-pack task orders.	Projects FRC-0007, 7-69, X-066, and X-129 will address fractures by rehabilitating the pipelines.
Uninspected Gravity Pipelines – One gravity sewer in the Sunflower Trunkline system has never been inspected. There is no condition data for this reach to determine field-adjusted RUL.	N/A	This gravity sewer is proposed to be abandoned-in-place as part of Project 7-68 (see Collections System - Pump Stations Summary for project information).

Current and Future Projects

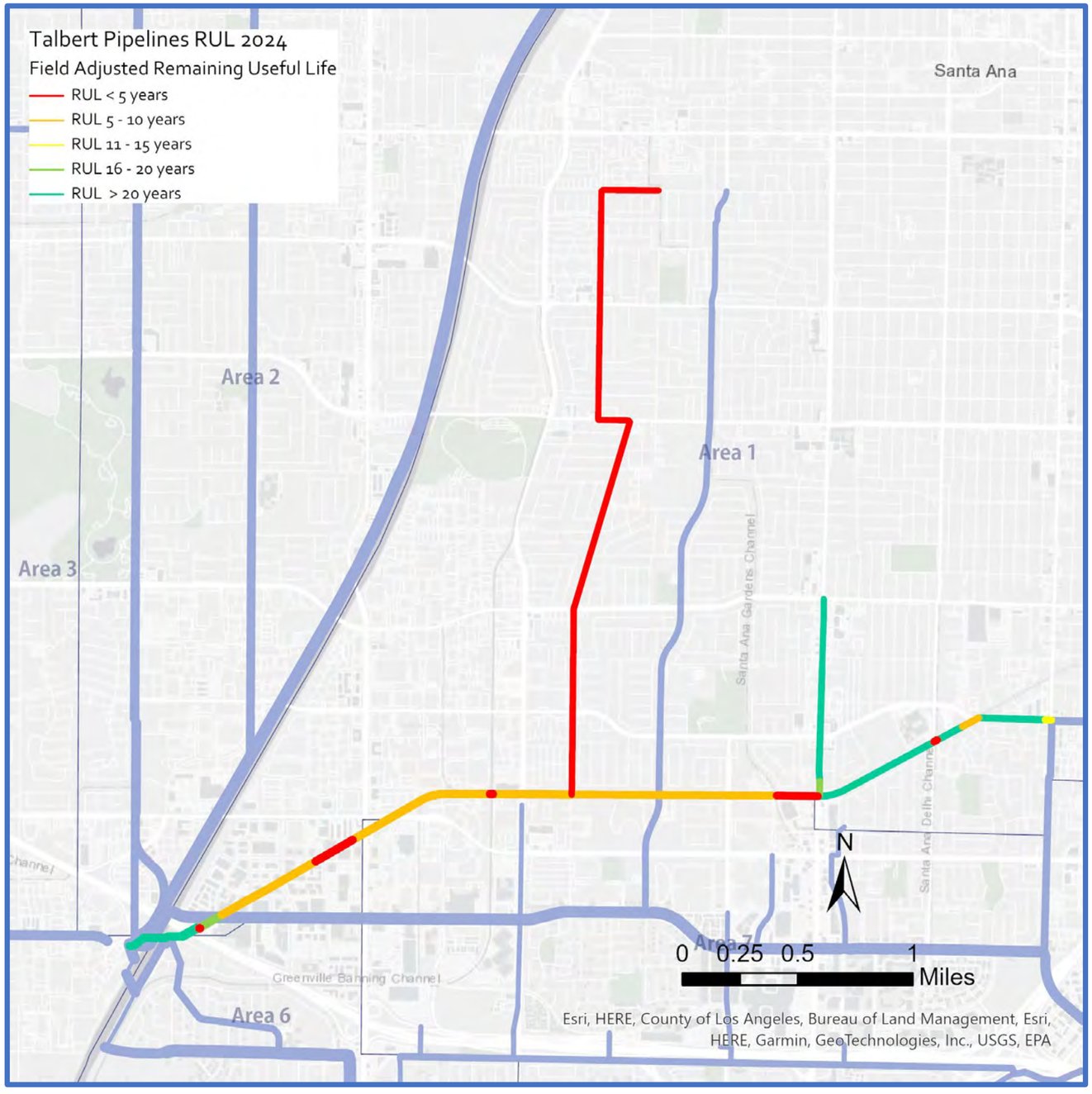
Project No.	Project Title	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
FE18-13	Redhill Relief Sewer Relocation at SR-55															
FRC-0007	Redhill Relief Sewer Liner Repair at SR-55															
7-69	North Tustin-Orange Sewer Improvements															
X-129	South Coast Metro Sewer Rehabilitation															
X-066	Orange Park Acres Sewer Rehabilitation															
X-065	Tustin-Orange Interceptor Rehabilitation [1]															

1. CIP – Design start date is 2039.
2. Please see the comprehensive Acronyms and Abbreviations list for definitions.

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

ASSET MANAGEMENT SUMMARY – COLLECTION SYSTEM – TALBERT TRUNKLINE

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	0.13	6	49	2	1
> 18" Ø	5.0	69	71	41	3
Reinforced Concrete					
42" Ø	1.1	10	56	1	9
> 42" Ø	2.1	29	54	3	17

Please see the comprehensive Acronyms and Abbreviations list for definitions.

ASSET MANAGEMENT SUMMARY – COLLECTION SYSTEM – TALBERT TRUNKLINE

Key Issues

Key Issues	Short-Term Actions and Recommendations	Long-Term Actions and 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 PWWFs. During existing PWWFs, capacity issues were identified in the entire Greenville Trunkline.	N/A	Project 1-24 will replace and upsize the entire Greenville Trunkline 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 Trunkline system do not have air jumpers.	N/A	Projects 1-23, 1-24, and X-129 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.	N/A	Project X-129 will rehabilitate the fractured pipeline segment.
Reinforced Concrete Pipe Corrosion Damage – Most of the reinforced concrete pipe pipeline of the Talbert Trunkline between I-405 and Bristol Street has moderate to severe surface aggregate loss in areas not rehabilitated by past project 1-17.	N/A	Project 1-23 will rehabilitate the pipeline segments with moderate to severe surface aggregate loss.

Current and Future Projects

Project No.	Project Title	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
1-23	Santa Ana Trunk Sewer Rehabilitation															
1-24	Greenville Trunk Improvements															
X-129	South Coast Metro Sewer Rehabilitation															

Please see the comprehensive Acronyms and Abbreviations list for definitions.

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

3 Program Monitoring and Improvements

3.1 Program Monitoring

OC San has 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 of the OC San 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 and maintenance key performance indicators (KPIs) 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 PM 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 Maximo®, the EAM system, this is described as a Level 50 priority. This is also described as break-in work that is deemed “emergency” or “extremely 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.

The metric data were sourced from Maximo® from fiscal year databases—FY 2019–2020 through FY 2023–2024 and are included in Appendix E for reference.

3.2 Program Metrics

3.2.1 Proactive Maintenance Percent

The *proactive maintenance percent* is the proportion of PM tasks compared to the total amount of maintenance performed. An increase in proactive maintenance percent represents a shift from a reactive to a proactive maintenance program. Table 3-1 and Table 3-2 provide the annual average of the proactive maintenance percent for both Reclamation Plant No. 1 and Reclamation Plant No. 2 for the past 5 years to illustrate recent trends and changes. For data from earlier years, refer to previous annual AMPs. For PM goals, OC San typically aims for a higher proportion of maintenance activities to be preventive rather than corrective, often

targeting around 70-80% preventive to 20-30% corrective, as these ratios tend to optimize efficiency and cost-effectiveness. OC San emphasizes a strong focus on PM to minimize unplanned corrective actions.

Many of the process areas at both plants were at or below 60%, indicating that improvement in this area is likely over time as proactive maintenance programs are optimized and older facilities are replaced.

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

Process Area	FY19/20	FY20/21	FY21/22	FY22/23	FY23/24
Preliminary	39%	39%	25%	41%	20%
Primary	39%	32%	40%	37%	46%
Interplant	84%	82%	59%	34%	17%
Activated Sludge	53%	64%	56%	58%	50%
Trickling Filters	56%	53%	47%	46%	46%
Digesters	46%	46%	47%	42%	37%
Solids Handling Facilities	34%	42%	44%	60%	46%
Central Power Generation	64%	62%	62%	53%	57%
Electrical Distribution	68%	65%	77%	77%	80%
Utilities	33%	30%	26%	32%	20%

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

Process Area	FY19/20	FY20/21	FY21/22	FY22/23	FY23/24
Preliminary	64%	59%	55%	38%	36%
Primary	25%	35%	38%	36%	30%
Activated Sludge	48%	53%	50%	48%	43%
Trickling Filters	67%	57%	61%	49%	61%
Effluent Disposal	57%	35%	59%	39%	37%
Digesters	39%	55%	51%	47%	41%
Solids Handling Facilities	41%	53%	41%	49%	51%
Central Power Generation	42%	50%	67%	48%	48%
Electrical Distribution	70%	74%	75%	69%	64%
Utilities	39%	44%	43%	45%	35%

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 preliminary treatment at Plant No. 1 is in the lower range because Project P1-105, Headworks Rehabilitation, is in construction. Continued low-voltage cable failure at the headworks is causing the lower percentages of proactive maintenance work at Plant No. 2. Because of active construction work by Project J-117B, the effluent disposal area shows lower percentages in FY 2023–2024.

Generally speaking, 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. 15th Street Pump Station had a 20% decline in PM work last year. The main issues at 15th Street Pump Station, Lido, and ‘A’ Street Pump Station were frequent maintenance of check valves and related components, as well as recurring electrical problems and power outages. Crystal Cove had several issues with check valve, pumps, and instrumentation alarms resulting in the significant reduction in PM work.

15th Street Pump Station also experienced ongoing concerns with odor complaints and wet well maintenance. A recent valve replacement project at Bay Bridge Pump Station led to a significant improvement in the proactive maintenance percentage for FY 2023–2024 compared to previous years.

Table 3-3. Proactive Maintenance Percent for Pump Stations

Pump Station	FY19/20	FY20/21	FY21/22	FY22/23	FY23/24
'A' Street	86%	85%	67%	60%	72%
15th Street	88%	85%	85%	84%	62%
Lido	80%	42%	72%	50%	38%
Bay Bridge	65%	34%	45%	37%	56%
Rocky Point	96%	84%	76%	69%	51%
Bitter Point	82%	76%	84%	74%	69%
Seal Beach	55%	65%	50%	61%	38%
Westside	75%	74%	80%	64%	73%
Edinger	81%	79%	74%	44%	69%
Slater	86%	86%	73%	78%	59%
College	91%	69%	86%	72%	64%
Crystal Cove	57%	91%	80%	90%	55%
Yorba Linda	30%	92%	99%	80%	82%
Main Street	66%	66%	76%	74%	69%
MacArthur	66%	88%	83%	61%	71%

Table 3-4 demonstrates average percent proactive work orders for the process areas at each plant (not including the interplant, effluent disposal, electrical, and utilities) and the pump stations. The data shows a slight decreasing trend in the annual average proactive work for both plants and pump stations. While there is not a consistently increasing or decreasing trend in Plant No. 1 and No. 2 data, pump stations show a decrease in the annual average proactive work.

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

Proactive Work	FY19/20	FY20/21	FY21/22	FY22/23	FY23/24
Plant No. 1	48%	47%	53%	45%	43%
Plant No. 2	47%	49%	52%	45%	44%
Pump Stations	74%	74%	75%	67%	62%

3.2.2 Break-In Percent

Break-in percent illustrates the amount of emergency work (or reactive work) as a percent of total maintenance 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 the proactive maintenance program and the other a measure of unplanned outages or a reactive maintenance response (service requests with priority 40 and 50 level). Success in break-in percent is measured as a consistent trend downward over time. 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 No. 1 preliminary area due to Project P1-105 construction and equipment shutdown demands. Last year, the break-in percentage peaked at 55% in the preliminary area and many of the work orders were associated with odor control equipment.

The primary treatment area has shown relative stability in break-ins. Although there was a slight increase in FY 2022–2023 due to mechanical issues at the Waste Sidestream Pump Station (WSSPS) and the aging odor control facility, the trend is generally stable. Interplant area is down to 26% after an unexpected high number of break-ins in FY 2022–2023 due to vandalism in the area south of Plant No. 1. Utilities have shown an increasing trend, peaking at 36% in FY 2023–2024, indicating a growing number of break-ins with more than half of the issues happening at the Plant Water Pump Station. The remaining areas at Plant No. 1 have been showing stable trends with overall numbers less than 30%.

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 with 11% increase in the past 4 years. All process areas had break-in percentages in the acceptable range of below 28% at Plant No. 2, with trickling filters, utilities, and primaries showing improving trends.

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

Process Area	FY19/20	FY20/21	FY21/22	FY22/23	FY23/24
Preliminary	20%	24%	43%	29%	55%
Primary	28%	23%	28%	38%	25%
Interplant	16%	7%	0%	61%	26%
Activated Sludge	14%	11%	8%	9%	15%
Trickling Filters	10%	18%	36%	21%	26%
Digesters	20%	27%	19%	24%	17%
Solids Handling Facilities	22%	24%	20%	16%	27%
Central Power Generation	11%	14%	23%	25%	20%
Electrical Distribution	5%	10%	6%	7%	13%
Utilities	21%	26%	21%	24%	36%

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

Process Area	FY19/20	FY20/21	FY21/22	FY22/23	FY23/24
Preliminary	8%	11%	17%	25%	22%
Primary	17%	23%	26%	25%	22%
Activated Sludge	14%	10%	12%	16%	18%
Trickling Filters	17%	19%	22%	27%	13%
Digesters	16%	13%	12%	11%	26%
Solids Handling Facilities	32%	21%	26%	26%	28%
Central Power Generation	20%	20%	13%	9%	23%
Electrical Distribution	7%	14%	6%	15%	18%
Utilities	31%	15%	29%	16%	13%
Effluent Disposal	17%	15%	17%	24%	28%

The pump station break-in percent is shown in Table 3-7. Lido, Rocky Point, and College had the highest break-ins during the last year mainly due to instrumentation and alarm issues. Many aging pump stations, such as Bay Bridge, Seal Beach, Edinger, and Slater also had a high break-in percent that is reflective of their RUL and age. 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. On average, 80% of the pump stations had a break-in percentage of less than 30%, marking an improvement during the past 5 years.

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

Pump Station	FY19/20	FY20/21	FY21/22	FY22/23	FY23/24
A Street	4%	6%	7%	31%	18%
15th Street	7%	6%	12%	11%	22%
Lido	27%	35%	24%	44%	38%
Bay Bridge	18%	31%	38%	31%	23%
Rocky Point	4%	7%	13%	19%	46%
Bitter Point	14%	14%	11%	25%	19%
Seal Beach	14%	20%	36%	25%	28%
Westside	9%	3%	14%	18%	16%
Edinger	18%	0%	22%	53%	27%
Slater	7%	3%	16%	13%	25%
College	2%	11%	12%	24%	35%
Crystal Cove	32%	6%	1%	4%	9%
Yorba Linda	4%	10%	0%	5%	19%
Main Street	11%	4%	1%	12%	21%
MacArthur	3%	11%	1%	18%	23%

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

Table 3-8. Annual Average of Break-in Percent for OC San Facilities

Process Area	FY19/20	FY20/21	FY21/22	FY22/23	FY23/24
Plant No. 1	17%	18%	21%	25%	26%
Plant No. 2	18%	16%	18%	19%	21%
Pump Stations	14%	11%	14%	22%	25%

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

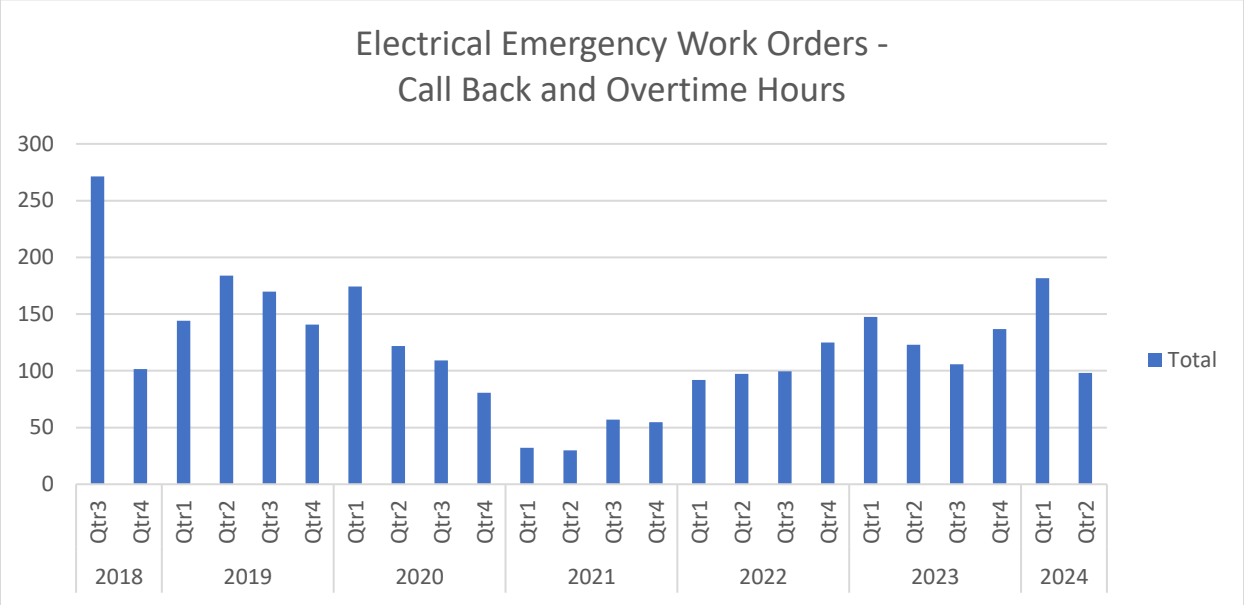


Figure 3-1. Electrical Emergency Work Orders

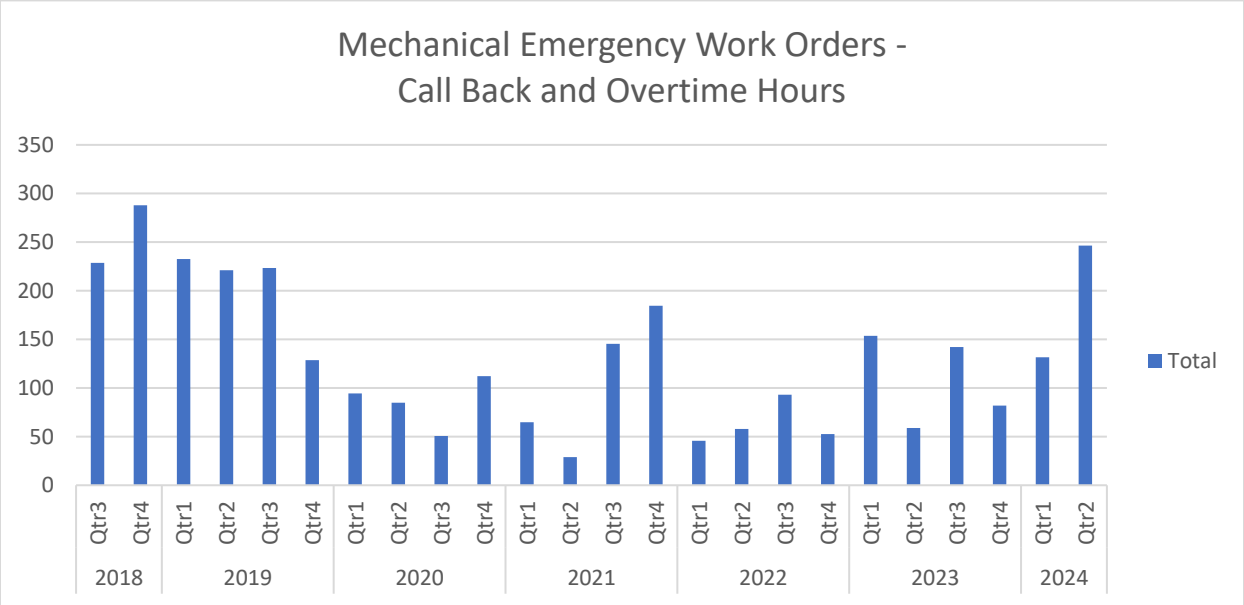


Figure 3-2. Mechanical Emergency Work Orders

The number of electrical “emergency” work orders and associated hours increased primarily due to electrical outages at the pump stations, and headworks power failures at both plants. Plant No. 1 Headworks observed a greater number of call outs due to the age of the facility. 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. One major emergency work at Plant No. 1 was the issues associated with Sunflower Pump No. 2 break and emergency repairs. The Plant No. 1 Grit Collector No. 2 repair was also a labor-intensive effort at Plant No. 1. In the first 6 months of 2024, Maintenance staff spent a lot of time addressing the broken shear pins at the primary clarifiers. On average, about 55% of emergency mechanical call backs were to support Plant No. 1. Electrical break-in/emergency work is expected to trend down as more electrical projects are implemented to replace or upgrade aging assets (e.g., P1-105).

3.2.3 Maintenance Costs and Labor Hours

OC San uses the *maintenance costs and labor hours* over time as trend indicators to indicate the number of resources devoted to reliably maintaining the process areas. Figure 3-3 shows maintenance costs (materials and services) per fiscal year broken down by process area at Plant No. 1. The thickening and dewatering facility at Plant No. 1 has the highest maintenance costs, with recurring issues such as thickening feed pumps losing efficiency and requiring repairs, and frequent leaks in the lube oil pumps of the dewatering centrifuges being among the costliest maintenance activities.

The data indicate that there has been a large increase in maintenance costs at the Plant No. 1 Activated Sludge No. 2 since FY 2022–2023. In FY 2023–2024, regular PM activities at three AS aeration basins at AS2 facility (basins 14,15, and 16), the AS1 Clarifier 16 chain and flight crash, and the aeration basin mixer gearbox #3 installation were among the costliest maintenance activities.

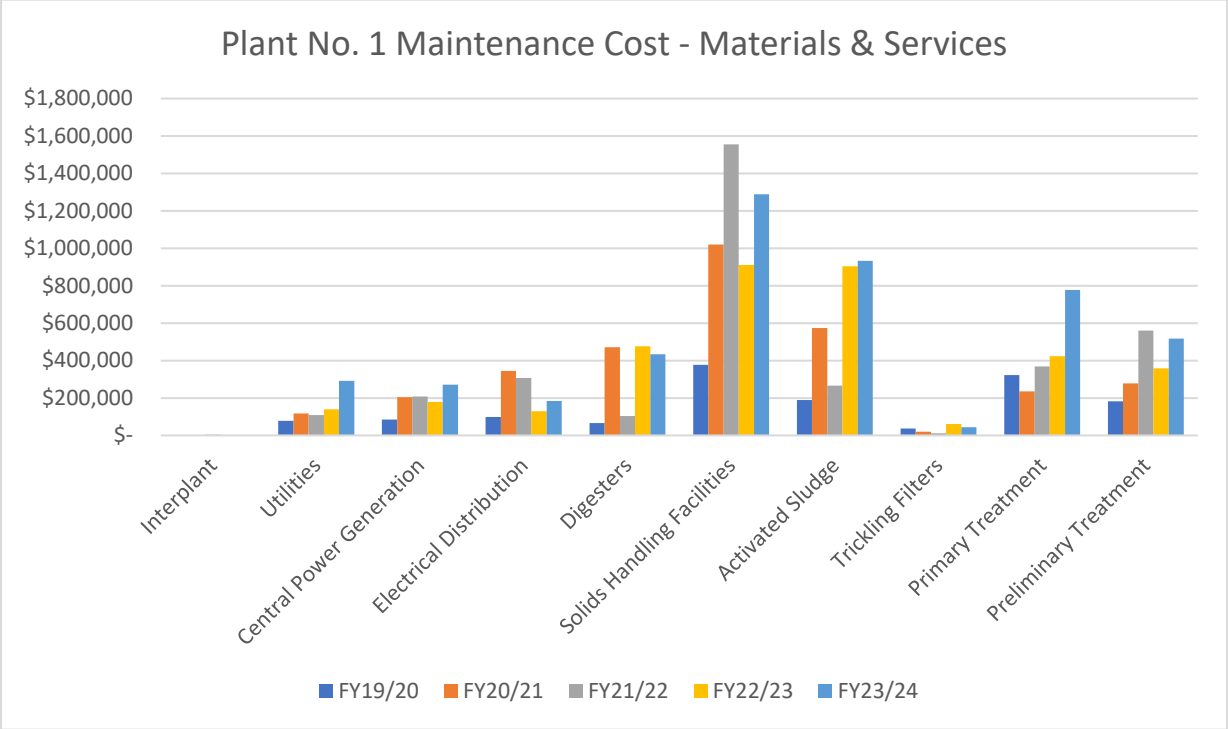


Figure 3-3. Graph of Maintenance Costs (Materials and Services) at Plant No. 1

Figure 3-4 shows Maintenance labor hours per fiscal year 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 AS1, which is scheduled for rehabilitation under Project P1-140. The labor hours are also high at the solids handling facility because the thickening and dewatering process has more complex equipment that requires more staff to operate and maintain. In FY 2023–2024, cleaning of the WSSPS wet well and replacing the seal on the PISB gate were the most labor-intensive activities in the primary area. In October 2023, the Barscreen No. 1 gearbox needed realignment, which required support from both the Mechanical and Electrical teams. Overall, the labor hour graph follows the same trend as material and services.

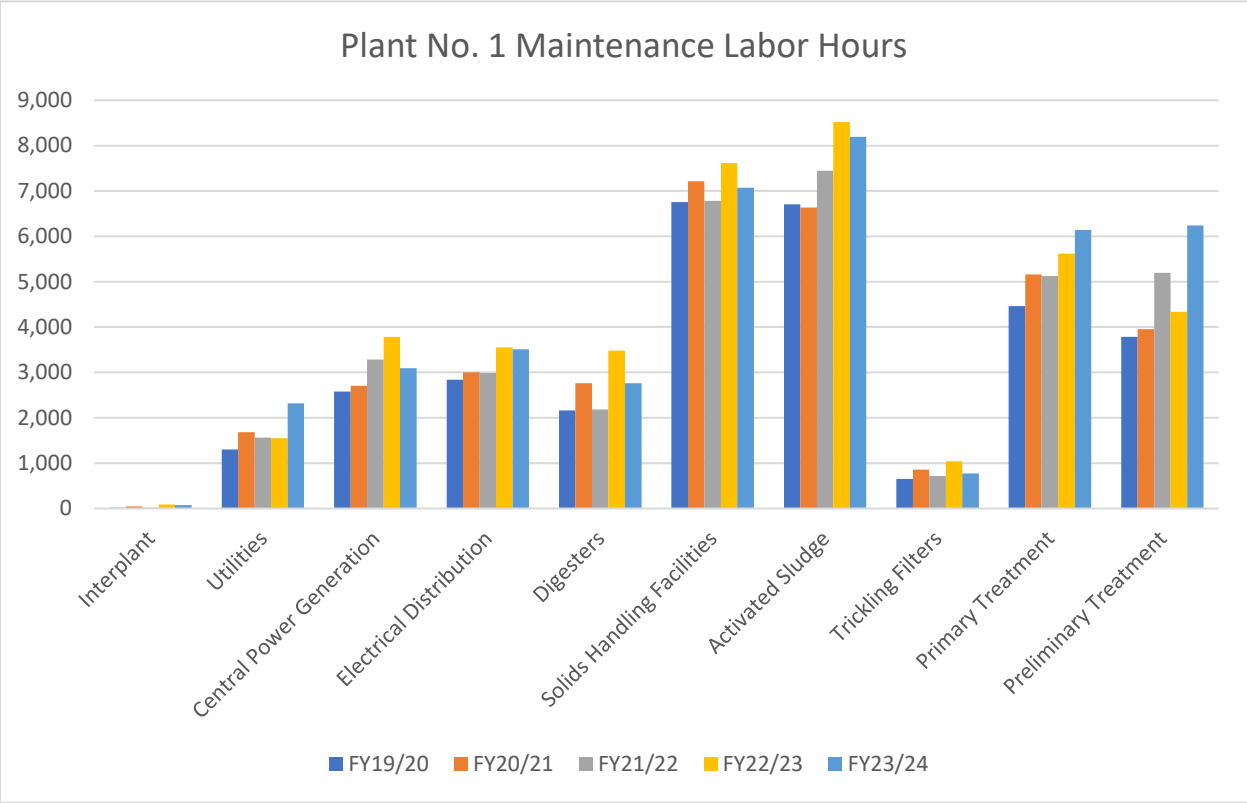


Figure 3-4. Graph of Maintenance Labor Hours at Plant No. 1

Figure 3-5 and Figure 3-6 present the maintenance costs (materials and services) and labor hours per fiscal year, broken down by process area at Plant No. 2. Maintenance costs at Plant No. 2 were significantly higher in FY 2023–2024 for the primary treatment area, primarily due to the old A-Side Primary Clarifier Complex, which is being replaced by Project P2-98A, currently under construction. For example, the repairs at basin E accounted for approximately 37% of the total primary area costs.

In the preliminary treatment area, lighting improvements at the headworks scrubber, and repairs to Barscreen #2 were among the most expensive maintenance activities. Last year, maintenance staff spent over 11,000 hours cleaning M&D pipes and manholes, which required the use of cranes and confined space entry.

The AS facility also saw an increase in costs compared to the previous year. Major expenses included the rebuild of West RAS Pump 1 and the replacement of corroded pipes on the reactor deck.

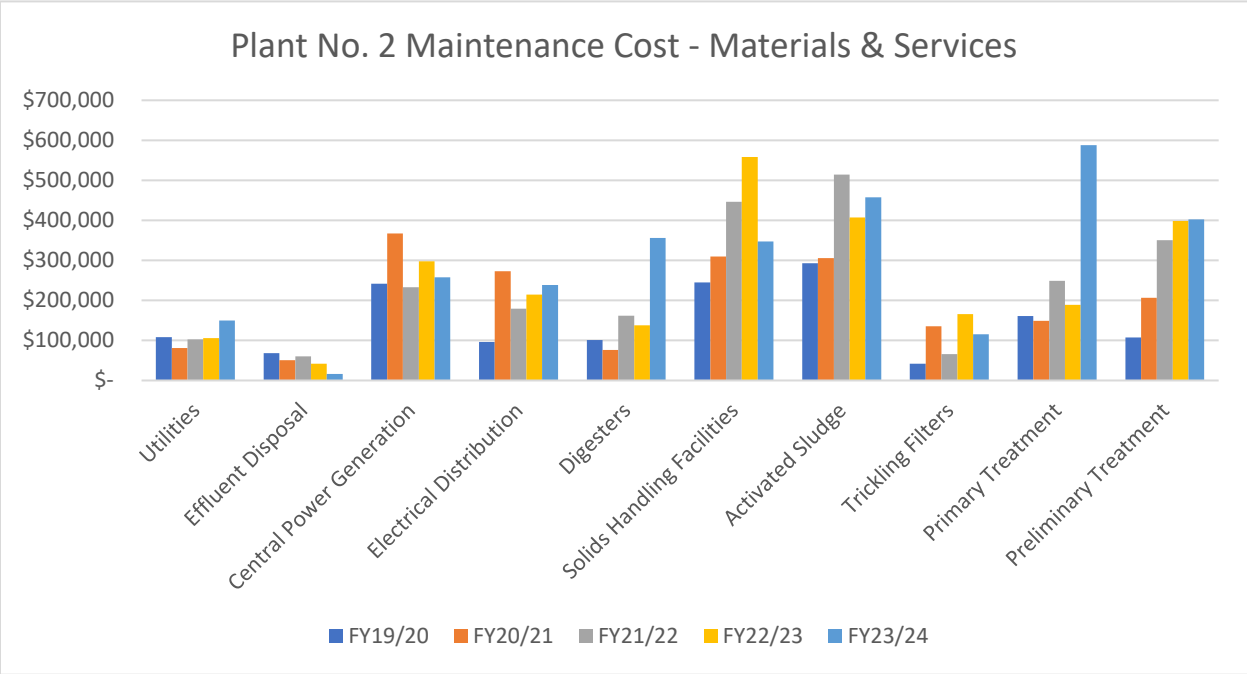


Figure 3-5. Graph of Maintenance Costs (Materials and Services) at Plant No. 2

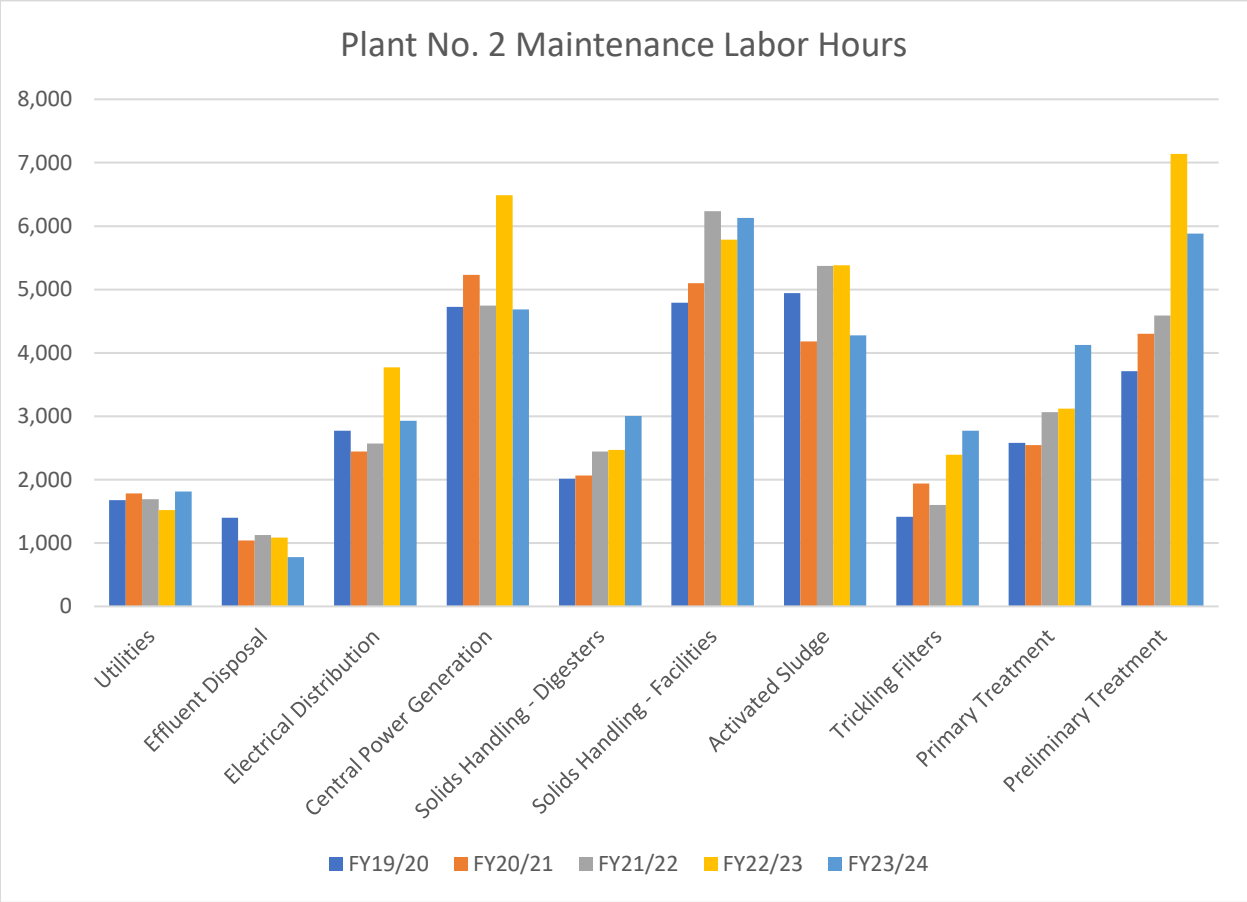


Figure 3-6. Graph of Maintenance Labor Hours at Plant No. 2

Maintenance labor hours and costs for the pump stations are included in Figure 3-7 and Figure 3-8. Significant increases in labor and material costs occurred at the Slater, Seal Beach, and 15th Street Pump Stations. At Seal Beach, MSP Pump #1 was replaced, resulting in more than $83,000 in material costs. Additionally, all pressure transmitters were replaced in FY 2023–2024. Seal Beach Pump Station also shows high labor hours associated with the MSP #1 replacement and fan replacement at the pump station (Figure 3-8). This is one of OC San's oldest pump stations.

At the 15th Street Pump Station, the replacement of Pump #2 last year led to a substantial rise in maintenance costs. At Slater Pump Station, Pumps 1, 4, and 5 were removed and replaced, with these three pumps accounting for 80% of the total maintenance costs.

Figure 3-8 shows an increase in labor hours at Crystal Cove Pump Station due to a new flowmeter installation and the MSP #1 check valve replacement.

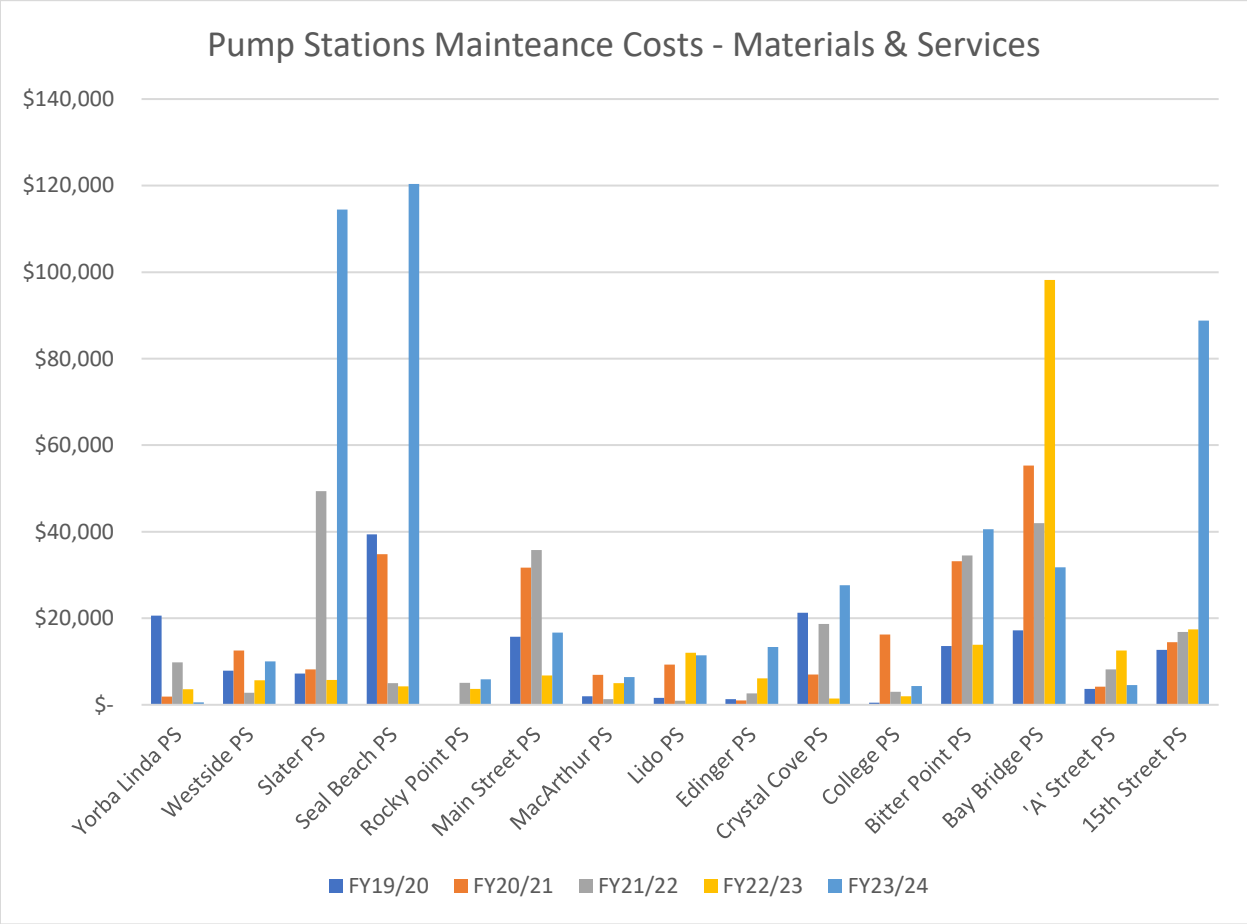


Figure 3-7. Graph of Pump Station Maintenance Costs (Materials and Services)

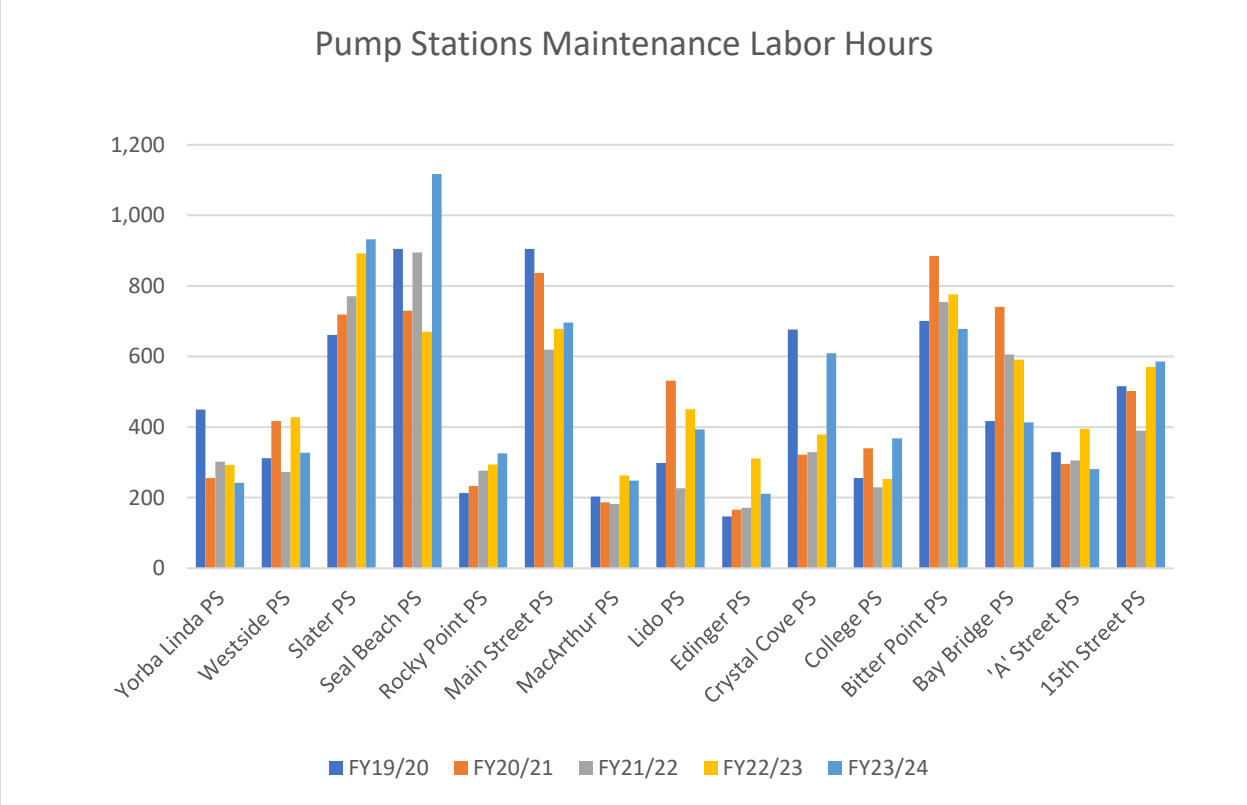


Figure 3-8. Graph of Pump Station Maintenance Labor Hours

3.2.4 Collections 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 5 fiscal years are presented in Table 3-9. The level of service goals for SSO and odor complaints were achieved in FY 2023–2024, but the level of service goals for CCTV were not achieved due to unforeseen challenges as explained below.

SSO events are primarily caused by 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 the root control blanket contract for further PM efforts. In FY 2023–2024, there were zero reported SSOs in the Collections System.

Nuisance odors are actively managed by the ROCCS program through means of regular chemical dosing and caustic dumps at key locations, H_2S 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. Given the precision and effectiveness of the ROCCS program, the number of odor complaints has been below the level of service target in the past 5 fiscal years.

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 report to OC San with asset details as well as defects discovered per National Association of Sewer Service Companies (NASSCO) standards. OC San did not meet the level of service goal for CCTV inspections for both pipelines and manholes primarily due to the unexpected departure of its primary contractor Pro-Pipe for both the pipeline and manhole CCTV contracts. Pro-Pipe abruptly closed down all

operations in California and was unable to complete the majority of work assigned to them in the months prior. OC San is actively procuring new services to restore the full capacity of OC San's CCTV program and meet the level of service goals for FY 2024–2025.

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 2,579 (58%) of OC San's manholes have been inspected since the start of the manhole CCTV program, we are able to accurately define future gravity sewer projects for manhole rehabilitation and replacement.

Table 3-9. Collections Level of Service Results

Description	Level of Service Target	FY19/20	FY20/21	FY21/22	FY22/23	FY23/24
SSO per 100 miles	< 2.1	0	1.3	0.3	0.3	0
Number of Odor Complaints	12	9	7	4	11	10
Miles of Pipeline CCTV	70	78.4	60	71.9	69.1	38.4
Number of Manhole CCTV	650	32	465	813	948	373

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 66,000 assets stored in Maximo®. This includes non-process-related assets such as HVAC equipment, lighting, mobile equipment, etc. For the assets associated with process and treatment, there are typically approximately 7,100 active PM work orders and on average 285 of those PM work orders are related to PdM activities. A current summary and breakdown of the PMs and PdMs are shown on Figure 3-9.

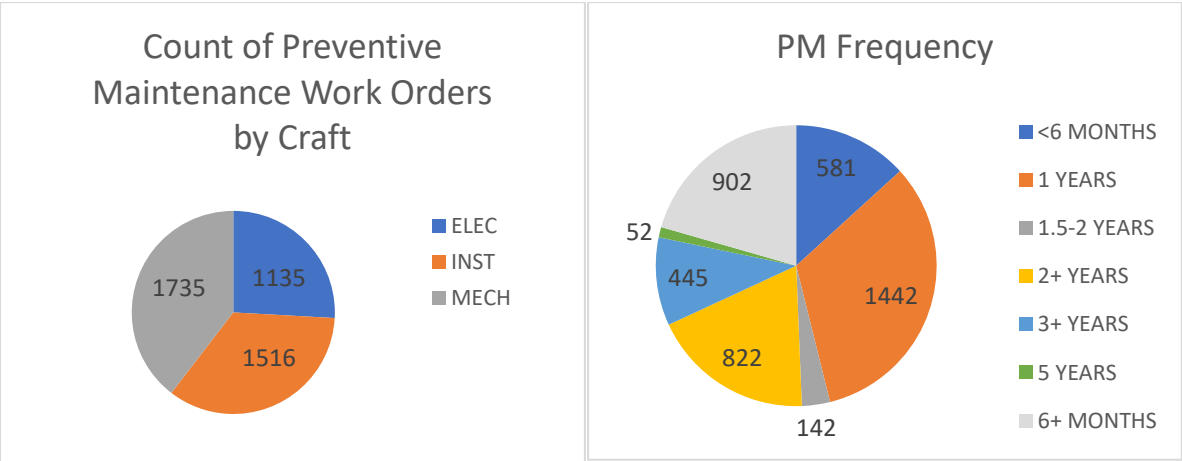


Figure 3-9. PM Workorder Breakdown by Both Craft and Frequency

3.3.1 Projected Maintenance Costs

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

Table 3-10. Projected Maintenance Costs Next Fiscal Year

	FY 2024–2025
Projected Maintenance Costs	$26.6 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, and reduce corrective maintenance and break-ins, allowing OC San to meet the key objectives of the program.

3.4.1 Condition Assessment Program

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 planned in advance and often conducted during scheduled maintenance activities. The Asset Management Team completed approximately 27 different condition assessments during the last fiscal year, spending near $1 million using an outside consultant and contractor. Figure 3-10 provides annual expenditures on the two condition assessment contracts for the last 5 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.

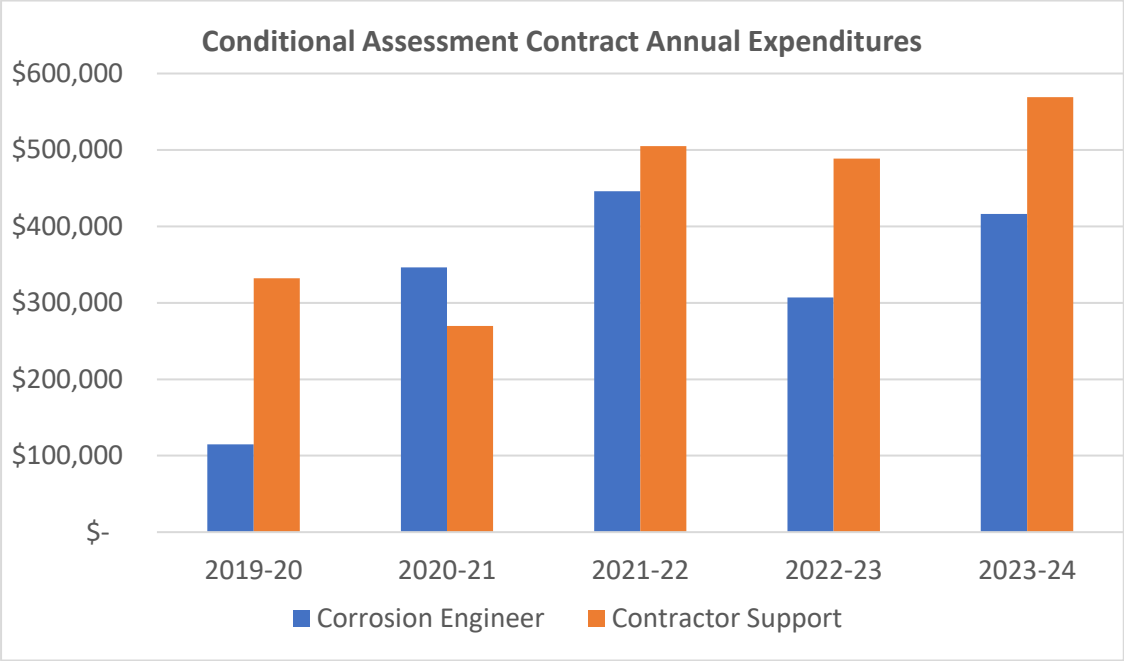


Figure 3-10. Condition Assessment Contract Expenditures

Condition assessments identify deficiencies and the general condition of the assets, but more importantly provide recommendations for repairs or replacement and general timing of rehabilitation/replacement projects. Some condition assessments included incidental repairs following the assessment by the contractor that extended the useful life of the facility. The following are some critical condition assessments completed in the last fiscal year:

- The Primary Clarifiers 6-31 center feed channel at Plant No.1 was taken out of service for the first time since construction finished almost 20 years ago. A condition assessment of the center feed channel along with incidental repairs were performed successfully during this outage. The channel is generally in good condition, some deficiencies were identified and repaired, such as a damaged T-lock at two locations and missing polymer or air diffusers at multiple locations. Additionally, 76 yards of grit were removed from the bottom of the channel.
- The Primary Clarifiers 6-15 East Influent Channel at Plant No. 1 was taken out of service for a condition assessment, which found significant damages at two expansion joints at Basin 8 and Basin 12, causing leakages. Other major findings included T-lock damage and concrete spalling, as well as broken or missing air diffusers. The expansion joints, concrete and T-lock were repaired by the condition assessment program contractor, and Maintenance replaced the broken/missing air diffusers.
- All of the trunkline pipes inside the M&D structure at Plant No. 1 are nearing the end of their useful life and experiencing accelerated corrosion. The SARI trunkline had a leak, which was repaired by welding steel plates on the outside of the pipe. A condition assessment of the Euclid trunkline, performed recently, found multiple holes at the top of the pipe and significant metal loss. The holes were patched with steel plates welded to the outside and Belzona applied to the inside of the pipe. This condition assessment and incidental repair prevented a potential failure and emergency project. A condition assessment for the Talbert trunkline is in the planning phase and will likely be completed before the end of October. The rest of the trunklines will follow, including a revisit to the SARI line.
- A condition assessment at Sunflower Pump Station at Plant No. 1 was conducted and found significant coating failure, concrete degradation, corroded rebars, and compromised support beams in the two effluent channels. A maintenance project was initiated to install temporary support I-beams to strengthen the structure. This work was designed to be completed quickly so the pump station can be returned to operation before the wet season starts. A more permanent solution will be implemented in the next dry season.
- The 72-inch and 90-inch (East) influent lines at Plant No. 1 are being demolished by P1-105 from the splitter box to the meter vault, creating the perfect opportunity for a condition assessment. The assessment found that the 72-inch pipe is in good condition while the 90-inch pipe has T-lock damage in multiple locations. The T-lock repair will be planned in the next year or two when the pipe can be taken out of service again.
- A Plant No. 1 Thickening and Dewatering Facility Centrifuge chute assessment was conducted in 2024. The assessment found deformation of Chute No. 1. Incidental repairs were conducted to strengthen the chute, resulting in timely restoration of the centrifuge unit's operation.
- Condition assessments were completed on the Primary Clarifiers J and N at Plant No. 2, to investigate alignment of the feedwell baffle and the condition of the circular drive respectively. The condition assessment included draining and cleaning of both basins and confined space entry to obtain photographs, take measurements, and collect other data to determine a resolution for issues identified by O&M. The assessment identified deficiencies in both clarifiers and the need for removal and replacement of the drive in Primary Clarifier N.
- 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 and CCTV, concrete core sampling, and incidental repairs. This year, four digesters were cleaned and assessed, including Digesters 13 and 14 at Plant No. 1 and Digesters P and R at Plant No. 2. Incidental repairs were completed by the condition assessment contractor and Maintenance staff.

- A Plant No. 2 PEPS discharge pipe condition assessment was conducted along with incidental repairs to replace the severely corroded pipe. After Pump #3 was removed for overhaul as part of the Maintenance Project MP2-010, the asset team did an assessment of the pump discharge header and found significant metal loss on the steel pipe wall due to corrosion. The team also found that the Pump #4 coupling installed during the overhaul was not the right type and not installed properly to cover the pipe diameter difference and the level offset, which caused water leaking. The condition assessment contractor was able to fabricate a new stainless-steel pipe to replace the corroded steel header for Pump #3 and successfully replaced the Pump #4 leaking coupling. The team will perform a condition assessment and replace the headers for Pumps #1 and #2 during the overhaul as required.
- A condition assessment of the force mains at the Crystal Cove Pump Station, which was constructed in 1993, was conducted in March 2024 and found some apparent joint damage from a visual inspection within the pipes. To determine the extent of the potential corrosion, additional external testing was performed and found no significant thickness loss. The pump station and force mains are set to be rehabilitated under project 5-66 with construction to be completed in 2032.
- MacArthur Pump Station was assessed in July 2024. The pump station was found to be in relatively good condition considering the pump station's age. However, the wet well and various mechanical and electrical assets do require rehabilitation and will be addressed by Project 7-63, which is launching in 2024.

3.4.2 Collection System Assets

OC San 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 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 of the sewer pipe throughout the pipe zone leading to potential structural defects. Similarly, infiltration can also lead to the development of 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: Blanket contract to strategically apply herbicide with a foaming agent into select sewers for root control on an annual basis. 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.

- Infiltration Control: Group isolated and severe infiltration into individual work packages for execution by Maintenance on-call contractors. Utilize the industrial cleaning Maintenance contract to remove large calcified deposits as-needed to prevent obstructions prior to rehabilitation. OC San is finalizing the scope of work packages and priority.
- 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 scope of work packages and priority.

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. 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 given 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 higher than past historical system performance would suggest. In response, OC San performed sonar inspections of over 5 miles of 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 starting a new procurement to validate the accuracy of sonar inspections, validate the effectiveness of various cleaning methods, and analyze debris data for any trends. The work includes multiple rounds of cleaning and sonar inspections for select inverted siphons and gravity sewers as well as condition assessment and incidental repairs for the inverted siphons. The sonar validation project is expected to be completed in 2025. Additionally, a draft large-diameter cleaning program for inverted siphons and gravity sewers was completed in early 2024. This list of recommended large-diameter inverted siphons and gravity sewers to regularly clean will be finalized after the sonar validation project is completed.

While many of these proactive activities increase current costs and potentially identify more defects, they result in better awareness of the true condition of OC San's system, which allows for a more planned approach to maintaining assets. This allows for a more cost-effective CIP program while also reducing the risk of failures from unknown conditions.

3.4.2.2 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. 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, are in progress. Project FRC-0018 is currently in design and will be replacing various valves at Lido, Crystal Cove, A Street, and 15th Street Pump Stations and replacing the wet well lining at A Street and 15 Street Pump Stations. The timing of these projects considers risk and criticality to prevent emergency work.

Pump station force mains are challenging to maintain and inspect since they operate under pressure and are located underground. The force mains typically have limited access and require significant supplemental services to perform a safe and effective condition assessment (i.e., isolation and dewatering, temporary modification of pump station operations, excavation for access, etc.). The Asset Management Team has implemented a more robust program for force main inspections in which all force mains will be inspected on a predictable and recurring schedule. Please refer to the Force Main Summary and Inspection Plan in Chapter 2, Collection System Pump Station and Force Main Asset Management Summaries, for more information. In 2024, the Asset Management Team worked with Collections and contractors to plan out and perform the inspection of force mains at two pump stations, Crystal Cove and Edinger. The Asset Management Team will take lessons learned from the recent inspections to continue

planning inspections at other locations, which may pose challenges that require unique or innovative inspection methods.

3.4.3 Treatment Plant Projects and Planning Studies

A major focus of the Asset Management Program is streamlining the replacement or repair of critical assets to extend RUL ahead of planned CIP projects. The Asset Management Team works in tandem with O&M to identify and create projects, provide construction bid documents, and manage project implementation of some 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 some 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 a VFD replacement program to streamline replacement. Currently, projects FE19-08, FR1-0011, and MP2-016, are in construction and future CIP projects will replace obsolete VFDs at various locations at Plant Nos. 1 and 2 and the Pump Stations.
- Project PS22-02, Onsite Oxygen Generation Feasibility Study at Plant No. 2, was completed in 2024 to evaluate whether an onsite oxygen generation system should be implemented to provide better oxygen supply reliability to meet the High-Purity Oxygen-Activated Sludge Plant demands in the next 20 years. Currently, OC San uses LOX delivery and storage, but there was a shortage of LOX during the pandemic and the cost of LOX is rising significantly. Based on the PS22-02 recommendations, a CIP project will be developed to install a safe and reliable onsite oxygen generation system.
- 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. In the fall of 2023, MP2-005 completed the purchase and installation of the TF-A and TF-B rotary distributor assemblies to replace the failed units. MP2-019 is in progress to replace the TF-C rotary distributor assembly in 2024 and is anticipated to be complete by the end of October. By the start of wet weather season, Plant No. 2 will have all three trickling filter rotary distributor assemblies replaced, providing reliable secondary treatment of reclaimable flows for the GWRS.
- 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, geodesic dome, baffle components, and rotating mechanisms. Several maintenance projects were completed to address these issues and provide short-term reliability of the existing A-Side Primary Clarifiers until they are replaced by Project P2-98A, which is under construction with an estimated completion in 2027. Project FE23-09 will provide rehabilitation of corroded sections of the rotating mechanisms and feed well for Primary Clarifiers F and G. The design was fast tracked and construction has begun.
- The Grit Basins at Plant No. 2 have experienced multiple power and control cable failures that put the entire Grit Basin system at risk of becoming nonoperational. An urgent project, MP2-013, along with multiple work orders by Maintenance, were executed to have temporary cables installed above ground to bring the Grit equipment back online. Project P2-141 has also been fast-tracked 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. In addition, Project FE24-02 will be replacing the heat exchanger moisture separator at Plant No. 1 that has reached the end of its useful life and needs replacement. Both projects will start construction in FY 2024–2025.

- Plant No. 2 PEPS pumps are aging, and a previous wet well condition assessment identified corrosion in the pump discharge line. A maintenance project successfully completed a Pump #4 factory condition assessment and subsequent overhaul in November 2022. MP2-0010, is in progress to overhaul the remaining three pumps, and a Pump #3 overhaul will be complete in 2024.
- 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. Project J-135B recently completed top-to-bottom overhauls of Engines No. 1 and No. 3 at Plant No. 1 and Engine No.1 at Plant No. 2. The J-135B project and its subsequent Project J-135C will continue to overhaul the remaining engine generator set at Plant No. 1 and the remaining four engine generator sets at Plant No. 2 in the next 5 years. Planning study PS20-04, completed in 2023, showed that OC San's existing engines can be reliably maintained for the next 10 plus years.
  To develop a long-term plan for the Cen Gen Facilities, the Energy and Digester Gas Master Plan (EMP), PS21-04, was conducted from 2022 to 2024. This study evaluated viable alternatives for energy production and digester gas management based on emerging technologies, market conditions, and potential permitting constraints. The EMP study recommended that at this time, OC San should continue to operate Cen Gen and the associated interplant pipeline until the end of its useful life or changes in market conditions drive replacement of Cen Gen. The outcome of this EMP study is not a single recommendation, but an actionable 5- to-10-year Cen Gen replacement roadmap. Given the rapidly evolving energy market in the U.S., and California in particular, the study recommended OC San revisit and update this EMP and its recommendations in approximately 5 years.

3.5 Asset Management Program Improvement Opportunities

The Asset Management Team continues to look at ways to improve the Asset Management Program. To facilitate continuous improvement and move to a more data-driven program, the Team has created a Digital Asset Management Study.

The key objectives of this study are to:

- Allow available asset data to be analyzed more quickly and efficiently with the creation of business intelligence dashboards.
- Enhance collaboration and data sharing between Maintenance and Engineering Teams to support both short-term and long-term planning through business intelligence (BI) dashboards.
- Provide a simpler and more robust means to convey asset management information in the AMP and to executive leadership.
- Improve asset planning and prioritization of projects by development of a risk framework.
- Find additional Program improvement opportunities based on industry trends and new technology.

OC San has a lot of asset data available through various platforms, programs, and systems to assess OC San's major assets. One of the challenges is being able to utilize all that data more efficiently in one location or platform. The Digital Asset Management 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 average risk scores for every project that take into account consequences of failure. The following list describes the future Asset Management Program improvement opportunities, both

short-term and long-term, and how the new Digital Asset Management Study will address many of these improvement opportunities.

Condition Assessments:

- Track future condition assessments and proactively plan ahead with Operations for assessments that require process interruptions. *STATUS: In progress and led by internal staff.*
- Understand the condition and RUL of all of OC San's major assets. *STATUS: In progress and led by internal staff.*

Remaining Useful Life:

- Consider ways to improve the accuracy of RUL in addition to the Condition Scoring Guidelines already created. *STATUS: In progress via Digital Asset Management Study.*
- Create more condition scoring categories in the 1- to 10-year range as RUL accuracy improves over time. *STATUS: Future goal after completion of Digital Asset Management Study.*

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 with BI dashboards. *STATUS: In progress via Digital Asset Management Study.*

Data-Driven Asset Management:

- Develop asset management BI dashboards to track maintenance KPIs and key major asset information, including RUL and future project planning. *STATUS: In progress via Digital Asset Management Study.*
- Use BI dashboards algorithms to more accurately estimate asset performance and RUL. *STATUS: Future goal after completion of Digital Asset Management Study.*
- Optimize CIP planning using BI cost and risk modeling and constraints. *STATUS: Future goal after completion of Digital Asset Management Study.*

Risk Assessment (Likelihood and Consequence of Failure):

- Identify a risk assessment approach and develop a framework that fits OC San's needs. *STATUS: In progress via Digital Asset Management Study.*
- Use risk assessment modeling and scoring to better prioritize projects. *STATUS: Future goal after completion of Digital Asset Management 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."

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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 developed a 20-year CIP, 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 2024–2025 Budget Book, adopted in June 2024, includes updates to the current 20-year CIP outlay. Figure 4-1 shows the 20-year CIP outlay, which includes current and projected future CIP projects. The FY 2024–2025 CIP Outlay is $253.5 million and is further divided into process categories, as shown on Figure 4-2. Liquid treatment, support facilities, and collection facilities are the primary areas where the FY 2024–2025 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 $41 million and $19.5 million, respectively, in FY 2024–2025. For support facilities, Small Construction Projects Program, is the biggest driver with $26 million in FY 2024–2025. Lastly, for collection facilities, Project No. 3-67, Seal Beach Pump Station Replacement, and Project No. 7-65, Gisler-Red Hill Interceptor and Baker Force Main Rehabilitation, comprise nearly two-thirds of collections CIP spending at $14 million and $26 million, respectively.

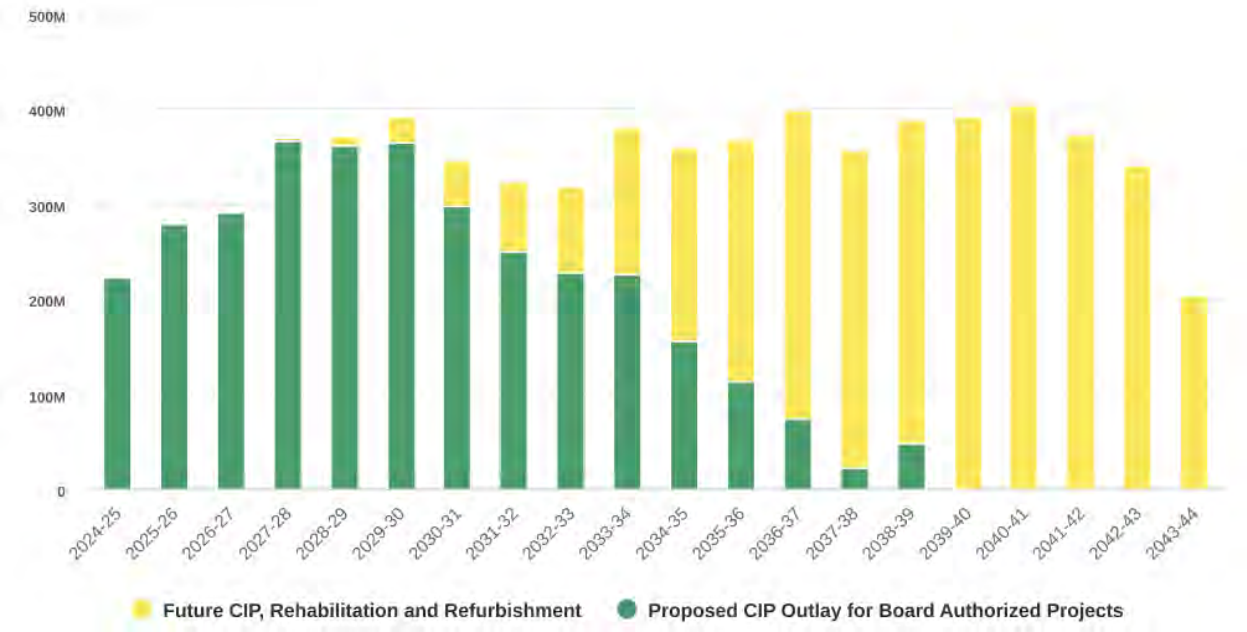

Figure 4-1. 20-Year CIP Outlay

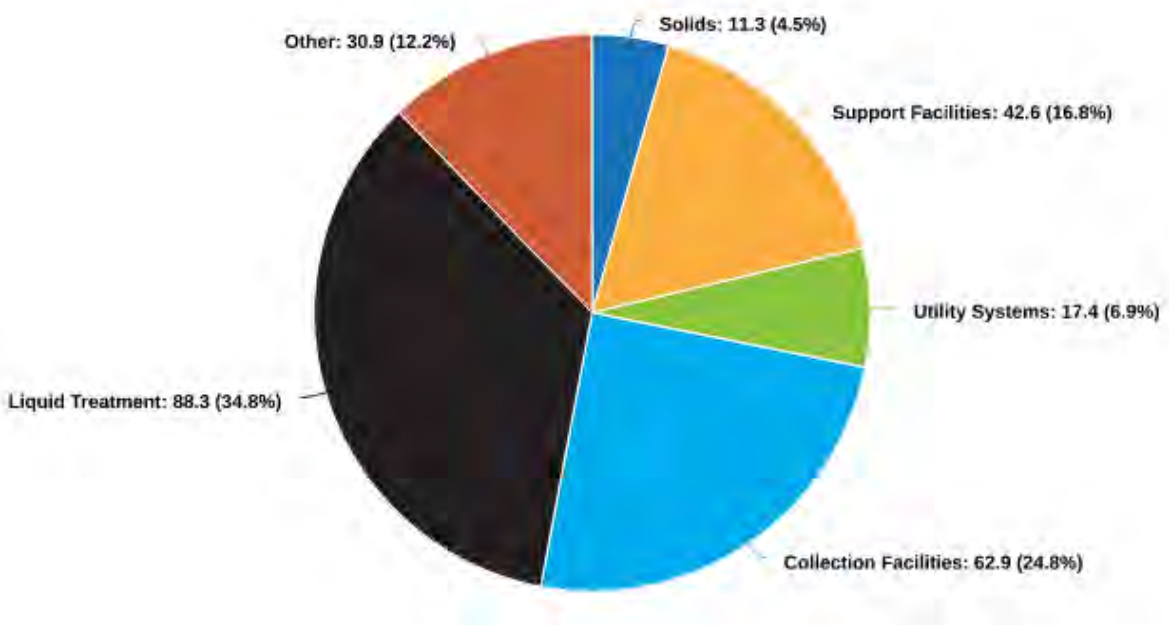

Figure 4-2. FY 2024–2025 CIP Outlay by Process – $253.5 Million

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 budgeted. These factors include but are not limited to the following:

- Annual inflation rates
- Manufacturing cost increases (which are also affected by increases in labor, raw material demand, fuel, chemicals, fees to expedite due to long lead times)
- Supply chain cost increases
- Geopolitical events
- Additional maintenance expenses that were unforeseen or unplanned but include necessary repairs or procurements

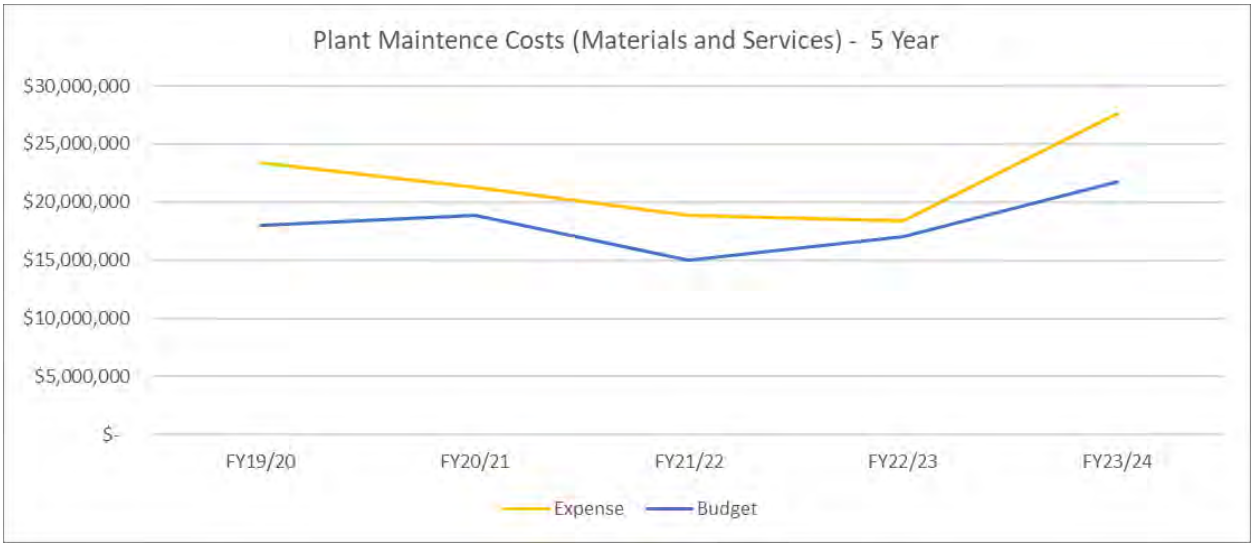

Figure 4-3. Five-Year Historical Maintenance Costs for Treatment Plants

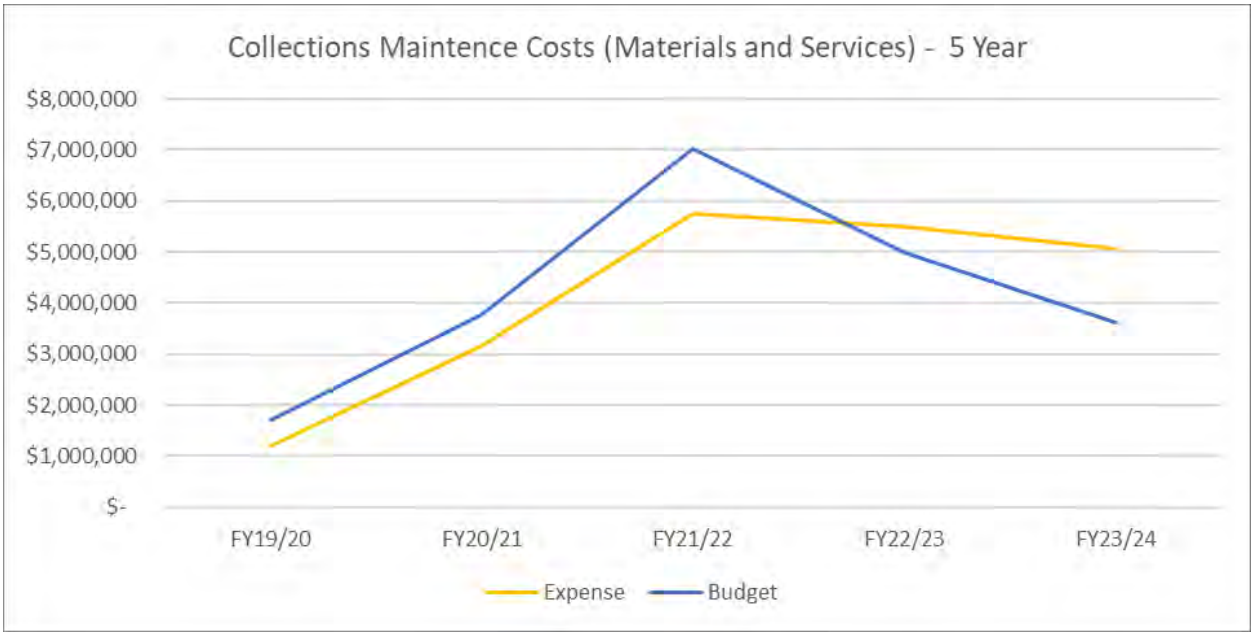

Figure 4-4. Five-Year Historical Maintenance Costs for Collection System

4.2.2 Three-Year Look-Ahead Maintenance Expenditures

Table 4-1 shows operationally funded projects identified to date and includes the projected annual expenditures over the next 3 years. It is likely future projects and costs 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 fiscal year. The list encompasses projects identified as of September 16, 2024, 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 2024–2025	FY 2025–2026	FY 2026–2027	3-YEAR CONST COST
COLLECTIONS – TRUNKLINES AND DIVERSIONS						
PRN-00373/PRN-00869	FRC-0014	Magnolia Sewer Manhole Abandonment at Interstate-5	$196,000	$598,000	$0	$794,000
PRN-00592	FRC-0007	Redhill Relief Sewer Liner Repair at State Route 55	$120,000	$0	$0	$120,000
PRN-00730	FRC-0010	Warner Avenue Vault Cover Improvements	$928,150	$48,850	$0	$977,000
PRN-00930		Navy Fence Replacement In-Kind Consideration Project for 3-67	$0	$290,000	$0	$290,000
PRN-00963		Flat Top Replacement at Wintersburg Channel	$0	$80,000	$0	$80,000
PRN-00766	FRC-0011	Richfield Sub-Trunk Encasement for BNSF Railway Addition	$0	$201,000	$0	$201,000
		COLLECTIONS – TRUNKLINES AND DIVERSIONS SUBTOTALS	**$1,244,150**	**$1,217,850**	**$0**	**$2,462,000**
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	$0	$0	$1,700,000	$1,700,000
PRN 00734/PRN-00892	FRC-0017	Valve Replacements and Wet Well Access Improvements at Slater Pump Station	$0	$693,000	$78,000	$771,000
PRN-00922	MPC-003	Decommission Yorba Linda Pump Station	$83,000	$0	$0	$83,000
PRN-00926	FRC-0020	College Pump Station Wet Well Rehabilitation	$0	$100,000	$2,430,000	$2,530,000
		COLLECTIONS – PUMP STATIONS SUBTOTALS	**$83,000**	**$793,000**	**$4,208,000**	**$5,084,000**
PLANT No. 1						
PRN-00492/PRN-0053	FR1-0011	VFD Replacements at Plant No. 1	$904,500	$305,429	$0	$1,209,929
PRN-00176	FR1-0007	Control Center Offices and Day Training Room Remodeling at Plant No. 1	$348,000	$0	$0	$348,000
PRN-00525	FR1-0005	Cen Gen and 12kV Service Center Switchgear Battery System Upgrades at Plant No. 1	$1,285,000	$500,000	$0	$1,785,000
	FR1-0017	Trickling Filter Valve Replacement at Plant No. 1	$565,530	$0	$0	$565,530
PRN-00815	FR1-0018	Dewatering Centrifuge Diverter Gate Improvements at Plant No. 1	$450,000	$450,000	$0	$900,000
PRN-00894/PRN-00890	FR1-0023	Secondary Treatment Area Cable Replacement at Plant No. 1	$0	$375,000	$375,000	$750,000
PRN-00898	FR1-0022	Backup Power for Laboratory Equipment at Plant No. 1	$55,989	$0	$0	$55,989
	FR1-0020	Traffic Signal Installation at Ellis Avenue and Mt. Langley Street Intersection	$1,142,687	$380,896	$380,896	$1,904,479
PRN-00914	MP1-003	WSSPS-1 Pump Replacement at Plant No. 1	$413,775	$0	$0	$413,775
PRN-00569/PRN-00846	FR1-0019	Generator Protection Relay Replacements and Add Control Center Backup Power at Plant No.1	$0	$0	$565,000	$565,000
PRN-00721/PRN-00821	FR1-0024	PB 7 and 8 Generator and Centrifuge Motor Disconnect Improvements at Plant No. 1	$0	$0	$665,000	$665,000
PRN-001000		Sunflower Pump Station Effluent Channel Temporary Repair s	$149,500	$35,000	$0	$184,500
PRN-00937		Turbine Generator Battery Chargers in Blower Building 1 at Plant No. 1	$180,000	$0	$0	$180,000
PRN-00975		PEPS Pump #3 Rebuild at Plant No. 1	$363,000	$0	$0	$363,000
PRN-00996		Blower Building 1 Fire Suppression System Replacement at Plant No. 1	$140,000	$0	$0	$140,000
PRN-001002	FR1-0026	Sunflower Pump Station Effluent Channel Repair	$0	$450,000	$0	$450,000
	MP1-009	Sunflower Pump Station Pump #2 Power Cable Replacement at Plant No. 1	$94,627	$0	$0	$94,627
		PLANT No. 1 SUBTOTALS	**$6,092,608**	**$2,496,325**	**$1,985,896**	**$10,574,829**
PLANT No. 2						
PRN-00537	FR2-0027	Heavy Mechanics Group Office Space Upgrade at Plant No. 2	$222,676	$0	$0	$222,676
PRN-00633/PRN-00849	FR2-0023	Activated Sludge Clarifier Entry Improvements at Plant No. 2	$1,171,000	$0	$0	$1,171,000
PRN-00712/PRN-00749 PRN-00783/PRN-00870	FR2-0026	Headworks Phase 3 Cable Replacement at Plant No. 2	$313,212	$0	$0	$313,212
PRN-00770	MP2-0010	PEPS Pumps #1, #2, and #3 Overhaul at Plant No. 2	$220,000	$190,000	$210,000	$620,000
PRN-00867	FR2-0032	Digester K Dome Repair at Plant No. 2	$550,000	$550,000	$0	$1,100,000
PRN-00885		Centrifuge Hinged Cover Installation at Plant No. 2	$43,000	$43,000	$43,000	$130,000
PRN-00902	FR2-0031	Activated Sludge System Scum Rerouting at Plant No. 2	$0	$200,000	$200,000	$400,000
	FR2-0029	Influent Pump Station Plant Water Piping Repair at Plant No. 2	$177,063	$0	$0	$177,063

PRN	ALT. PROJECT NO.	PROJECT TITLE	FY 2024–2025	FY 2025–2026	FY 2026–2027	3-YEAR CONST COST
PRN-00901		P2 EPSA VFD Control Wiring	$0	$55,000	$0	$55,000
PRN-00912		MSP #7 VFD Isolation Transformer Replacement at Plant No. 2	$280,000	$0	$0	$280,000
PRN-00987		Plant Water Pump Station 12 KV Transformer Secondary Cable Replacement at Plant No. 2	$325,000	$0	$0	$325,000
PRN-00923	MP2-018	Spare Main Sewage Pump Repair for Pump No. 1 at Plant No. 2	$200,000	$200,000	$0	$400,000
PRN-00985	MP2-015	P2 Centrifuge Dewatering Lubrication Ring Pump Replacement	$200,000	$0	$0	$200,000
PRN-00964	MP2-019	Trickling Filter C Center Mast Assembly Replacement at Plant No. 2	$861,000	$0	$0	$870,000
PRN-00997		Primary Clarifier N Drive Replacement	$300,000	$0	$0	$300,000
		PLANT No. 2 SUBTOTALS	**$5,208,951**	**$1,155,000**	**$390,000**	**$6,753,951**
JOINT						
PRN-00630	FRJ-0003	Interplant Gas Line Blow Off Vault Repairs	$0	$537,000	$537,000	$1,074,000
PRN-00977		Joint Cen Gen Engine Emission Compliance Catalyst Housing Cracks	$200,000	$1,150,000	$1,150,000	$2,500,000
PRN-00965		Joint Cen Gen Engine Ignition System Obsolescence Replacement	$0	$400,000	$400,00	$800,000
		JOINT SUBTOTALS	**$200,000**	**$2,087,000**	**$2,087,000**	**$4,374,000**

Appendix A:
Plant No. 1 Process Areas Map

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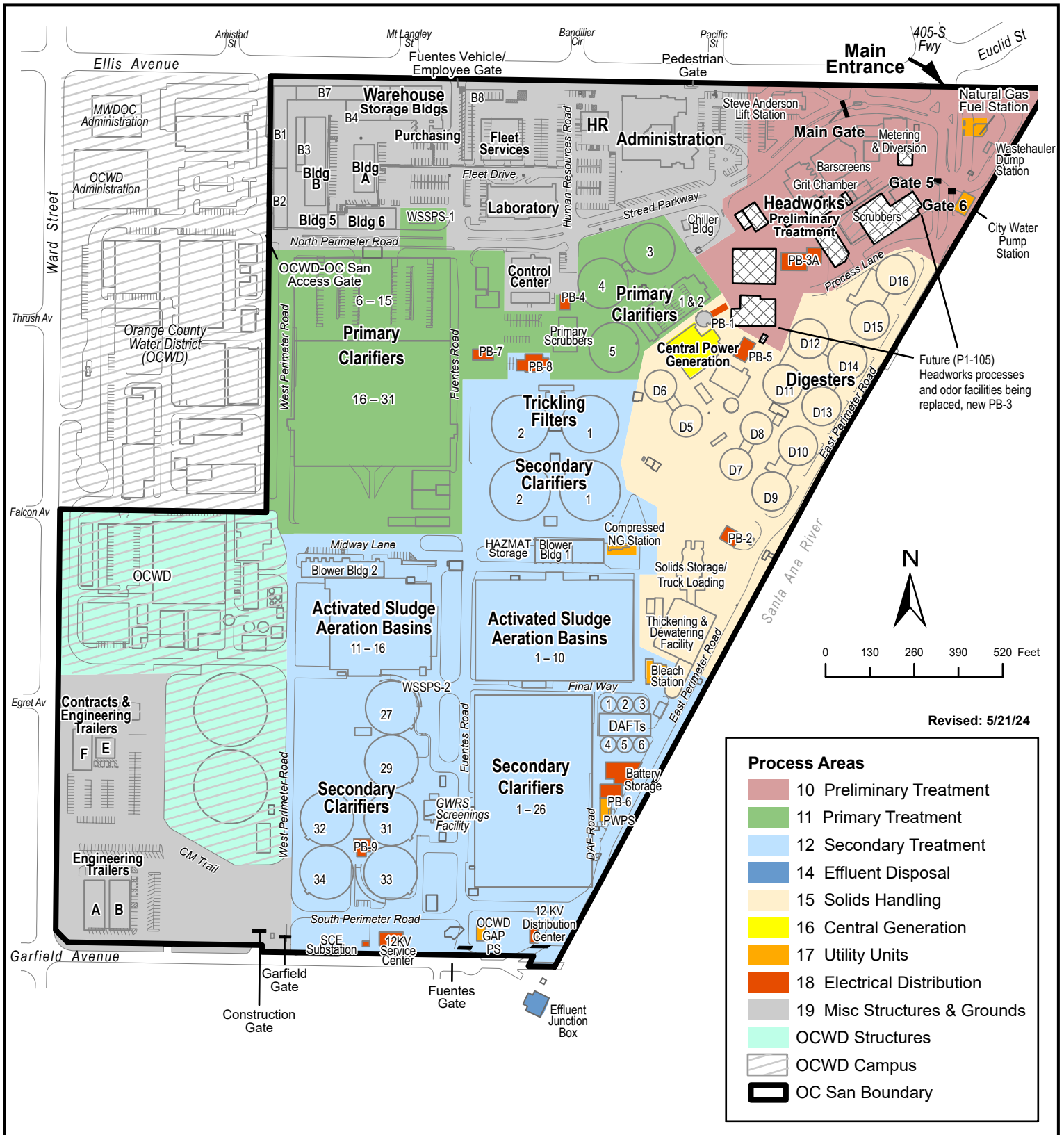
ORANGE COUNTY SANITATION DISTRICT

PROCESS AREAS – Reclamation Plant No. 1



Revised: 5/21/24

Process Areas

- 10 Preliminary Treatment
- 11 Primary Treatment
- 12 Secondary Treatment
- 14 Effluent Disposal
- 15 Solids Handling
- 16 Central Generation
- 17 Utility Units
- 18 Electrical Distribution
- 19 Misc Structures & Grounds
- OCWD Structures
- OCWD Campus
- OC San Boundary

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Appendix B:
Plant No. 1 Process Diagram

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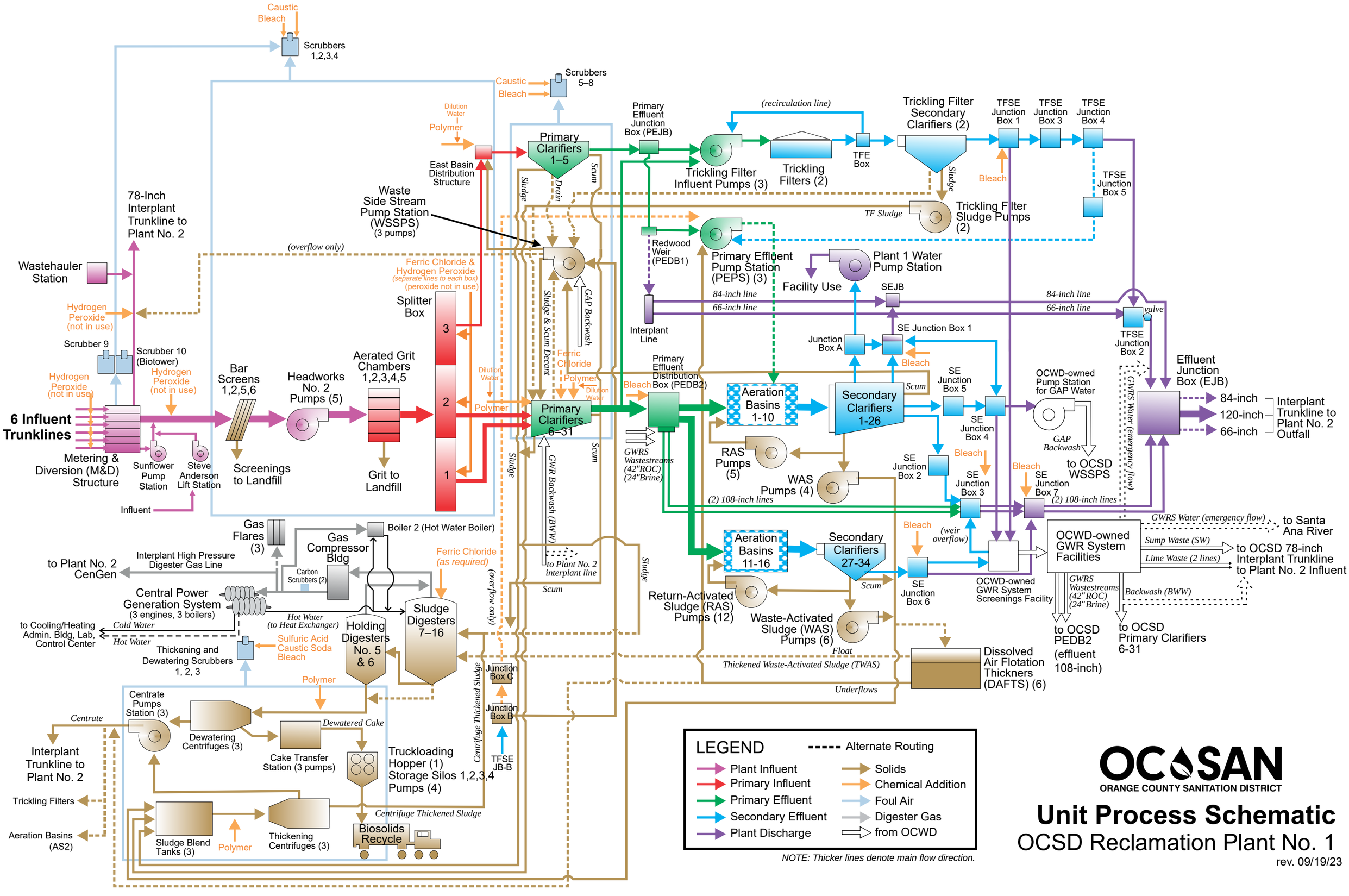
Caustic
Bleach
Scrubbers 1,2,3,4
Scrubbers 5–8
Dilution Water
Polymer
East Basin Distribution Structure
Primary Clarifiers 1–5
Primary Effluent Junction Box (PEJB)
(recirculation line)
Trickling Filter Influent Pumps (3)
Trickling Filters (2)
TFE Box
Trickling Filter Secondary Clarifiers (2)
TFSE Junction 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
Junction Box A
SE Junction Box 1
TFSE Junction Box 2
valve
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
Effluent Junction Box (EJB)
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
GAP Backwash
to OCSD WSSPS
84-inch
120-inch
66-inch
Interplant Trunkline to Plant No. 2 Outfall
GWRS Water (emergency flow)
to Santa Ana River
Gas Flares (3)
Boiler 2 (Hot Water Boiler)
Gas Compressor Bldg
Carbon Scrubbers (2)
Interplant High Pressure Digester Gas Line
to Plant No. 2 CenGen
Ferric Chloride (as required)
Aeration Basins 11-16
Secondary Clarifiers 27-34
(weir overflow)
OCWD-owned GWR System Facilities
Sump Waste (SW)
Lime Waste (2 lines)
to Plant No. 2 Influent
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
to plant No. 2 interplant line
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)
GWRS Wastestreams (42"ROC) (24"Brine)
Backwash (BWW)
to OCSD PEDB2 (effluent 108-inch)
to OCSD Primary Clarifiers 6-31
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
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

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Appendix C:
Plant No. 2 Process Areas Map

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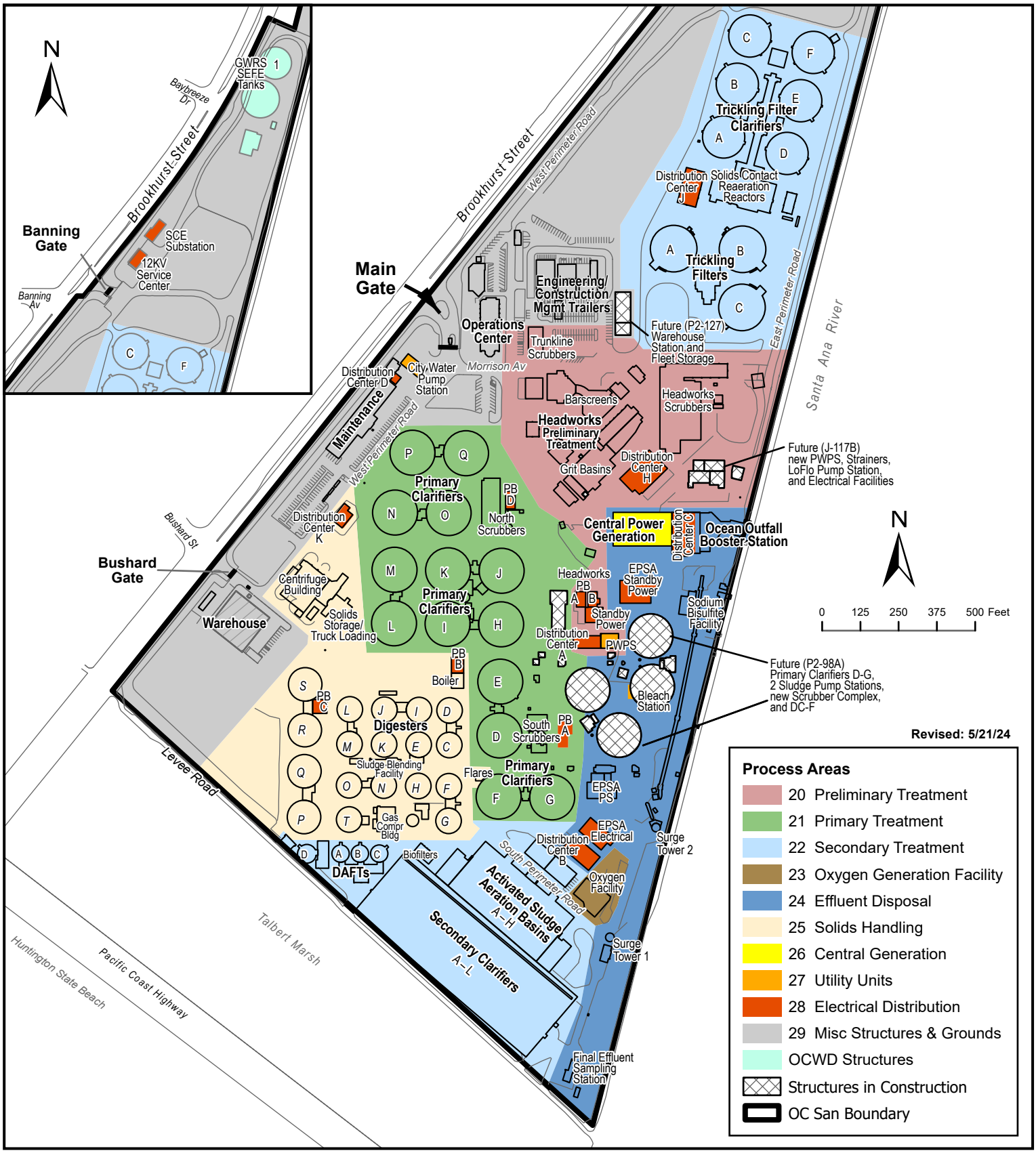
ORANGE COUNTY SANITATION DISTRICT

PROCESS AREAS – Reclamation Plant No. 2



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Appendix D:
Plant No. 2 Process Diagram

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Unit Process Schematic — OC San Reclamation 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
Bar Screens (6)
3 Non-Reclaimable
3 Reclaimable
Rag Handling & Loading (4)
Wetwell
Headworks D Pumps (7)
3 Non-Reclaimable
4 Reclaimable
Grit Handling & Loading (4)
Vortex Grit Basins (6)
3 Non-Reclaimable
3 Reclaimable
Splitter Box
A
B
C
Ferric Chloride & Bleach
(separate lines to each box)
Primary Metering
Polymer
Dilution Water
Distribution System
*Primary Clarifiers D–G
Primary Clarifiers H–L
Primary Clarifiers M–Q
South Scrubber Complex U–Z
North Scrubber Complex M–T (Q Biotower)
Junction Box 4
Primary Effluent Pump Station (PEPS) (4)
Primary Effluent Distribution Structure (PEDS)
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.
Wetwell
120-inch Outfall (Serial Port 001)
Surge Tower No. 2
Emergency Overflow
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)
Diversion Structure
OCWD EQ Tank and Pumps
To GWRS through the existing 66-inch Interplant Line
To GWRS intake at Plant No. 1
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)
Waste Secondary Sludge (WSS) Pumps (3)
Waste-Activated Sludge (WAS) Pumps (4)
Scrubbers G (Biotower)
Polymer
Dilution Water
Sludge and Scum Decant
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)
Sludge & Scum
Caustic
Bleach
Waste Stream Pump Station
Sludge Blending Facility
Carbon Scrubber
Centrate
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
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
OC San Reclamation Plant No. 2
rev. 10/01/24

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Appendix E: Asset Management KPI Supplemental Information

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Appendix E

Program Monitoring KPI Data

Plant No. 1 Maintenance Activity Data

Sum of actlabhrs	Column Lab			
Row Labels	PD	PM	CM	Grand Total
Preliminary Treatment	2.8%	17.7%	79.5%	100%
Primary Treatment	1.7%	44.4%	53.9%	100%
Interplant	0.0%	17.2%	82.8%	100%
Secondary Treatment - Activated Sludge	2.9%	47.1%	50.0%	100%
Secondary Treatment - Trickling Filters	3.1%	43.1%	53.9%	100%
Solids Handling - Digesters	3.5%	33.2%	63.3%	100%
Solids Handling - Facilities	8.1%	37.6%	54.3%	100%
Central Power Generation	9.9%	47.1%	43.0%	100%
Electrical Distribution	7.1%	72.5%	20.4%	100%
Utilities	2.2%	17.7%	80.1%	100%
Grand Total	**4.5%**	**39.9%**	**55.6%**	**100%**

Plant No. 1 Maintenance Materials and Services Cost

Sum of M&S Costs	Column Labels				
Row Labels	FY20/21	FY21/22	FY22/23	FY23/24	Grand Total
Utilities	$ 116,792	$ 107,852	$ 138,885	$ 292,095	$ 655,625
Solids Handling - Facilities	$ 1,020,481	$ 1,555,219	$ 910,940	$ 1,289,064	$ 4,775,704
Solids Handling - Digesters	$ 471,345	$ 102,912	$ 476,384	$ 433,079	$ 1,483,720
Secondary Treatment - Trickling Filters	$ 19,661	$ 11,391	$ 60,328	$ 43,262	$ 134,642
Secondary Treatment - Activated Sludge	$ 573,375	$ 266,568	$ 902,950	$ 933,492	$ 2,676,385
Primary Treatment	$ 235,044	$ 368,205	$ 423,047	$ 776,895	$ 1,803,191
Preliminary Treatment	$ 277,461	$ 560,414	$ 358,663	$ 518,073	$ 1,714,611
Interplant	$ 1,274	$ 3,871	$ 127	$ 154	$ 5,427
Electrical Distribution	$ 343,786	$ 307,243	$ 128,613	$ 3,892,044	$ 4,671,686
Central Power Generation	$ 203,897	$ 207,719	$ 179,392	$ 270,744	$ 861,752
Grand Total	**$ 3,263,116**	**$ 3,491,396**	**$ 3,579,330**	**$ 8,448,902**	**$ 18,782,743**

Plant No. 1 Labor Hours

Labor Hours						
Sum of actlabhrs	Column Labels					
Row Labels	FY19/20	FY20/21	FY21/22	FY22/23	FY23/24	Grand Total
Interplant	16	43	20	90	73	241
Utilities	1,299	1,680	1,562	1,545	2,316	8,403
Central Power Generation	2,577	2,706	3,283	3,784	3,093	15,444
Electrical Distribution	2,838	2,999	2,986	3,551	3,506	15,880
Solids Handling - Digesters	2,165	2,765	2,184	3,479	2,764	13,356
Solids Handling - Facilities	6,754	7,215	6,782	7,615	7,072	35,438
Secondary Treatment - Activated Sludge	6,709	6,634	7,446	8,517	8,191	37,497
Secondary Treatment - Trickling Filters	655	860	717	1,042	774	4,048
Primary Treatment	4,464	5,164	5,129	5,618	6,143	26,518
Preliminary Treatment	3,784	3,954	5,195	4,335	6,243	23,510
Grand Total	**31,262**	**34,019**	**35,302**	**39,577**	**40,175**	**180,334**

Plant 1 Maintenance Activity Code

Sum of actlabhrs	Column Labels					
Row Labels	**10**	**20**	**30**	**40**	**50**	**Grand Total**
Central Power Generation	7.6%	31.2%	41.4%	13.5%	6.2%	100.0%
Electrical Distribution	2.0%	56.6%	28.1%	6.2%	7.1%	100.0%
Interplant	14.1%	17.2%	42.4%	26.2%	0.0%	100.0%
Other	20.2%	31.3%	38.2%	8.1%	2.2%	100.0%
Preliminary Treatment	3.8%	10.0%	31.4%	23.0%	31.7%	100.0%
Primary Treatment	1.5%	49.9%	23.9%	17.2%	7.4%	100.0%
Secondary Treatment - Activated Sludge	3.0%	30.0%	52.1%	12.7%	2.2%	100.0%
Secondary Treatment - Trickling Filters	4.0%	15.0%	54.7%	16.7%	9.6%	100.0%
Solids Handling - Digesters	5.7%	23.9%	53.4%	14.6%	2.4%	100.0%
Solids Handling - Facilities	4.5%	13.0%	55.6%	18.3%	8.5%	100.0%
Utilities	2.6%	32.4%	29.1%	20.0%	15.9%	100.0%
Grand Total	**4.3%**	**28.9%**	**40.9%**	**15.8%**	**10.1%**	**100.0%**

Plant No. 2 Maintenance Activity Data

Sum of actlabhrs	Column Labe			
Row Labels	PD	PM	CM	Grand Total
Preliminary Treatment	3.8%	32.2%	64.0%	100%
Primary Treatment	1.2%	28.3%	70.5%	100%
Secondary Treatment - Activated Sludge	7.6%	34.9%	57.5%	100%
Secondary Treatment - Trickling Filters	2.2%	59.1%	38.7%	100%
Solids Handling - Digesters	4.5%	32.6%	62.9%	100%
Solids Handling - Facilities	7.5%	33.6%	58.9%	100%
Central Power Generation	8.6%	42.1%	49.3%	100%
Effluent Disposal	11.6%	36.0%	52.4%	100%
Electrical Distribution	10.5%	53.5%	36.0%	100%
Utilities	6.8%	28.7%	64.5%	100%
Grand Total	**6.0%**	**37.3%**	**56.7%**	**100%**

Plant No. 2 Maintenance Materials and Services Cost

Sum of M&S Costs	Column Labels				
Row Labels	FY20/21	FY21/22	FY22/23	FY23/24	Grand Total
Utilities	$ 80,937	$ 102,743	$ 106,216	$ 150,027	$ 439,923
Solids Handling - Facilities	$ 309,869	$ 446,100	$ 558,182	$ 347,251	$ 1,661,402
Solids Handling - Digesters	$ 76,496	$ 161,736	$ 138,026	$ 356,108	$ 732,366
Secondary Treatment - Trickling Filters	$ 135,668	$ 65,575	$ 165,746	$ 115,653	$ 482,642
Secondary Treatment - Activated Sludge	$ 305,721	$ 514,521	$ 407,396	$ 457,448	$ 1,685,086
Primary Treatment	$ 149,015	$ 248,595	$ 188,878	$ 587,881	$ 1,174,369
Preliminary Treatment	$ 206,639	$ 350,177	$ 398,801	$ 402,786	$ 1,358,403
Electrical Distribution	$ 273,276	$ 179,106	$ 214,348	$ 238,336	$ 905,066
Effluent Disposal	$ 50,630	$ 59,967	$ 41,519	$ 16,133	$ 168,249
Central Power Generation	$ 367,368	$ 233,256	$ 297,690	$ 257,606	$ 1,155,920
Grand Total	**$ 1,955,619**	**$ 2,361,775**	**$ 2,516,802**	**$ 2,929,229**	**$ 9,763,426**

Plant No. 2 Labor Hours

Labor Hours						
Sum of actlabhrs	Column Labels					
Row Labels	FY19/20	FY20/21	FY21/22	FY22/23	FY23/24	Grand Total
Utilities	1,677	1,782	1,691	1,522	1,810	8,482
Effluent Disposal	1,401	1,038	1,126	1,086	776	5,427
Central Power Generation	4,726	5,232	4,748	6,487	4,688	25,879
Electrical Distribution	2,773	2,443	2,567	3,773	2,928	14,484
Solids Handling - Digesters	2,015	2,064	2,445	2,467	3,003	11,993
Solids Handling - Facilities	4,789	5,098	6,236	5,785	6,128	28,036
Secondary Treatment - Activated Sludge	4,944	4,180	5,370	5,382	4,276	24,151
Secondary Treatment - Trickling Filters	1,412	1,940	1,599	2,393	2,771	10,114
Primary Treatment	2,581	2,547	3,062	3,121	4,124	15,434
Preliminary Treatment	3,710	4,301	4,587	7,138	5,882	25,618
Grand Total	**30,028**	**30,624**	**33,430**	**39,152**	**36,385**	**169,617**

Plant 2 Maintenance Activity Code

Sum of actlabhrs	Column Labels					
Row Labels	10	20	30	40	50	Grand Total
Central Power Generation	3.8%	17.2%	55.5%	13.0%	10.5%	100.0%
Effluent Disposal	6.1%	24.9%	41.3%	14.3%	13.4%	100.0%
Electrical Distribution	6.4%	44.8%	30.4%	10.9%	7.6%	100.0%
Other	4.5%	18.5%	55.0%	16.0%	5.9%	100.0%
Preliminary Treatment	6.7%	17.7%	53.2%	17.4%	5.0%	100.0%
Primary Treatment	5.6%	18.1%	54.8%	20.0%	1.6%	100.0%
Secondary Treatment - Activated Sludge	5.4%	26.7%	49.4%	15.2%	3.3%	100.0%
Secondary Treatment - Trickling Filters	3.7%	14.1%	69.0%	10.5%	2.7%	100.0%
Solids Handling - Digesters	14.0%	16.3%	43.9%	21.3%	4.4%	100.0%
Solids Handling - Facilities	3.1%	15.2%	53.4%	22.6%	5.6%	100.0%
Utilities	5.2%	26.4%	55.2%	9.4%	3.8%	100.0%
Grand Total	**5.7%**	**20.6%**	**51.8%**	**16.5%**	**5.3%**	**100.0%**

Pump Station Maintenance Activity Data

Sum of actlabhrs	Column Labels			
Row Labels	PD	PM	CM	Grand Total
'A' Street PS	6.0%	65.7%	28.4%	100%
15th Street PS	4.3%	57.8%	37.9%	100%
Lido PS	5.3%	32.8%	61.9%	100%
Bay Bridge PS	2.9%	53.2%	43.9%	100%
Rocky Point PS	10.1%	41.2%	48.7%	100%
Bitter Point PS	3.1%	65.4%	31.5%	100%
Seal Beach PS	1.8%	35.9%	62.2%	100%
Westside PS	6.1%	67.2%	26.7%	100%
Edinger PS	11.3%	57.4%	31.2%	100%
Slater PS	1.3%	57.6%	41.1%	100%
College PS	4.9%	58.6%	36.5%	100%
Crystal Cove PS	4.5%	50.3%	45.2%	100%
Yorba Linda PS	7.6%	74.2%	18.1%	100%
Main Street PS	5.6%	63.1%	31.3%	100%
MacArthur PS	8.8%	62.6%	28.5%	100%
Grand Total	**4.4%**	**54.2%**	**41.3%**	**100%**

Pump Station Maintenance Materials and Services Cost at Pump Stations

Sum of M&S Costs	Column Labels				
Row Labels	FY20/21	FY21/22	FY22/23	FY23/24	Grand Total
Yorba Linda PS	$ 1,899	$ 9,846	$ 3,581	$ 562	$ 15,888
Westside PS	$ 12,561	$ 2,753	$ 5,671	$ 10,049	$ 31,035
Slater PS	$ 8,200	$ 49,393	$ 5,772	$ 114,448	$ 177,812
Seal Beach PS	$ 34,840	$ 4,983	$ 4,234	$ 120,411	$ 164,469
Rocky Point PS	$ 126	$ 5,045	$ 3,667	$ 5,913	$ 14,750
Main Street PS	$ 31,724	$ 35,790	$ 6,776	$ 16,680	$ 90,969
MacArthur PS	$ 6,951	$ 1,279	$ 5,020	$ 6,381	$ 19,632
Lido PS	$ 9,256	$ 961	$ 12,013	$ 11,412	$ 33,642
Edinger PS	$ 1,040	$ 2,635	$ 6,093	$ 13,338	$ 23,106
Crystal Cove PS	$ 7,000	$ 18,675	$ 1,459	$ 27,636	$ 54,771
College PS	$ 16,210	$ 3,026	$ 1,971	$ 4,317	$ 25,524
Bitter Point PS	$ 33,194	$ 34,543	$ 13,877	$ 40,562	$ 122,176
Bay Bridge PS	$ 55,315	$ 41,966	$ 98,162	$ 31,761	$ 227,203
'A' Street PS	$ 4,188	$ 8,207	$ 12,521	$ 4,546	$ 29,462
15th Street PS	$ 14,467	$ 16,826	$ 17,447	$ 88,765	$ 137,505
Grand Total	**$ 236,970**	**$ 235,929**	**$ 198,264**	**$ 496,783**	**$ 1,167,946**

Pump Station Labor Hours

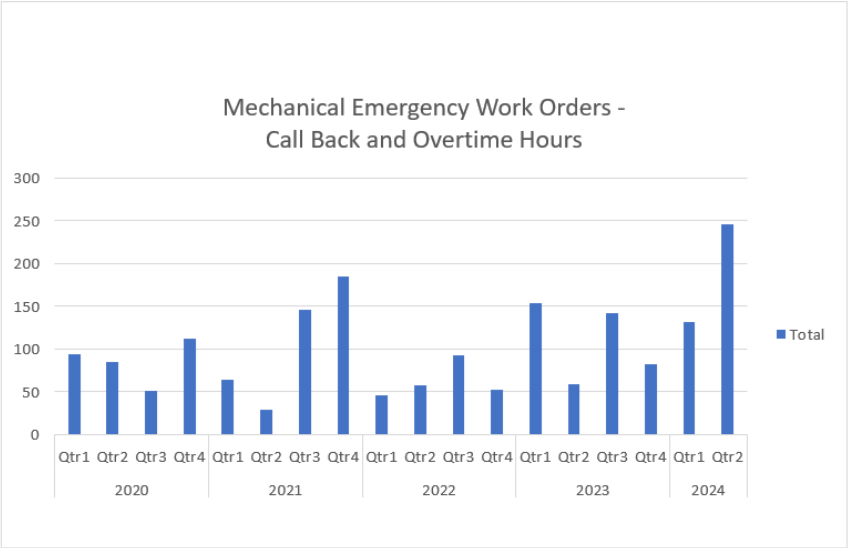
Labor Hours						
Sum of actlabhrs	Column Labels					
Row Labels	FY19/20	FY20/21	FY21/22	FY22/23	FY23/24	Grand Total
Yorba Linda PS	450	256	302	293	243	1,543
Westside PS	312	417	273	428	328	1,757
Slater PS	661	719	771	892	932	3,975
Seal Beach PS	905	730	895	671	1,118	4,318
Rocky Point PS	213	233	277	294	326	1,342
Main Street PS	905	837	620	679	697	3,737
MacArthur PS	204	187	182	263	249	1,084
Lido PS	298	532	227	451	394	1,901
Edinger PS	147	166	172	311	212	1,007
Crystal Cove PS	676	322	329	379	609	2,315
College PS	256	340	230	253	369	1,447
Bitter Point PS	701	885	754	777	678	3,795
Bay Bridge PS	417	741	605	591	413	2,768
'A' Street PS	330	296	305	396	281	1,607
15th Street PS	516	502	390	571	586	2,565
Grand Total	**6,991**	**7,160**	**6,330**	**7,247**	**7,432**	**35,158**

Pump Station Maintenance Activity Code

Sum of actlabhrs	Column Labels					
Row Labels	10	20	30	40	50	Grand Total
15th Street PS	3.51%	33.99%	40.76%	5.87%	15.86%	100.00%
'A' Street PS	8.42%	14.32%	59.44%	5.73%	12.09%	100.00%
Bay Bridge PS	9.27%	17.44%	49.94%	16.89%	6.46%	100.00%
Bitter Point PS	1.93%	21.90%	57.69%	1.59%	16.90%	100.00%
College PS	5.94%	26.89%	32.15%	26.28%	8.74%	100.00%
Crystal Cove PS	4.27%	64.67%	22.28%	6.11%	2.67%	100.00%
Edinger PS	10.28%	47.64%	15.13%	9.22%	17.73%	100.00%
Lido PS	3.19%	33.27%	25.73%	14.81%	22.99%	100.00%
MacArthur PS	5.43%	46.43%	24.72%	2.41%	21.01%	100.00%
Main Street PS	6.79%	36.78%	35.44%	7.95%	13.04%	100.00%
Rocky Point PS	4.00%	28.02%	20.64%	23.00%	24.33%	100.00%
Seal Beach PS	6.16%	25.26%	40.91%	13.85%	13.82%	100.00%
Slater PS	5.71%	41.63%	27.91%	12.11%	12.65%	100.00%
Westside PS	3.54%	24.19%	56.39%	4.01%	11.86%	100.00%
Yorba Linda PS	7.55%	54.08%	19.34%	1.24%	17.79%	100.00%
Grand Total	**5.43%**	**34.05%**	**36.53%**	**10.25%**	**13.73%**	**100.00%**

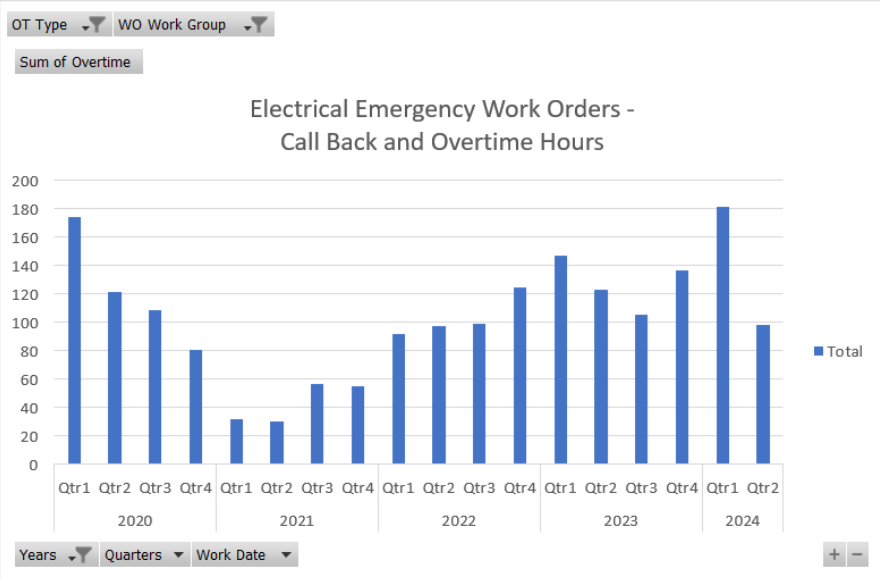
Mechanical Emergency Work Hours

Row Labels	Sum of Overtime
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	436.5
Qtr1	153.5
Qtr2	58.75
Qtr3	142.25
Qtr4	82
2024	378
Qtr1	131.5
Qtr2	246.5
Grand Total	1830



Electrical Emergency Work Hours

Row Labels	Sum of Overtime
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	513
Qtr1	147.5
Qtr2	123
Qtr3	105.75
Qtr4	136.75
2024	279.75
Qtr1	181.5
Qtr2	98.25
Grand Total	1866



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