City of Riverside Public Works Department

UPDATE OF THE INTEGRATED MASTER PLAN FOR THE WASTEWATER COLLECTION AND TREATMENT FACILITIES

VOL. 7

Capital Improvement Program and Implementation

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Abbreviations

αF	alpha factor
µg/L	micrograms per liter
A/A Trunk Sewer	Acorn/Arlanza Trunk Sewer
AACE	Advancement of Cost Engineering
AADF	annual average daily flow
AAF	average annual flow
AB	Assembly Bill
ABS	Acrylonitrile-Butadiene-Styrene
ACI	American Concrete Institute
ACP	asbestos cement pipe
ACS	American Community Survey
ACT treatment train	Activated treatment train
ADC	alternative daily cover
ADEQ	Arizona Department of Environmental Quality
ADF	average daily flow
ADWF	average dry weather flow
AFY	acre-feet per year
APAD	acid-phase anaerobic digestion
AQMD	Air Quality Management District
AQMP	Air Quality Management Plan
ARB	California Air Resources Board
ARVs	air release valves
ASCE	American Society of Civil Engineers
AWT	Advanced Water Treatment
BACT	best available control technology
BCM	Best Available Control Measures for Fugitive Dust Sources
BFP	belt filter press
BMP	best management practices
BNR	Biological nutrient removal
BOD	biochemical oxygen demand
BOD_5	5-day biochemical oxygen demand
BPTC	Best Practicable Treatment or Control
Btu/lb	British thermal unit per pound
BWF	base wastewater flow
C	Celsius
$CaCO_3$	calcium carbonate
Carollo	Carollo Engineers, Inc.

CASA	California Association of Sanitation Agencies
CCB	chlorine contact basin
CCF	hundred cubic feet
CCI	Construction Cost Index
CCTV	Closed Circuit Television
CDFW	California Division of Fish and Wildlife
CDM	Camp Dresser & McKee, Inc.
CECs	Contaminants of Emerging Concern
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
cfd	cubic feet per day
cfm	cubic feet per minute
cfs	cubic feet per second
CIP	Capital Improvement Program
City	City of Riverside
CIWQS	California's Integrated Water Quality System
CMB	Combustion Sources
CMMS	Computerized Maintenance Management System
CNG	compressed natural gas
CO_2	carbon dioxide
COD	chemical oxygen demand
COS	cost-of-service
cP	centipoise
CSCI	California Stream Condition Index
CSD	Community Services Districts
CTS	Coatings and Solvents
cu ft	cubic feet
CWA	Clean Water Act
CWC	California Water Code
CWEA	California Water Environment Association
DAF	dissolved air flotation
DAFT	dissolved air flotation thickeners
days/week	days per week
DCR	demand-capacity ratio
DDW	California Division of Drinking Water
DG	digester gas
DIR	Department of Industrial Relations
DMR	discharge monitoring report
DU	dwelling unit

DWF	dry weather flow
EBRT	empty bed residence time
EC	Emerging Constituents
EDR	electro-dialysis reversal
EDU	equivalent dwelling units
EGM	Emission Growth Management
EIR	Environmental Impact Report
EnerTech	EnerTech Environmental California, LLC
ENR	Engineering News Record
EPA	Environmental Protection Agency
EQ	equalization
ESA	Endangered Species Act
F	Fahrenheit
FDA	Food & Drug Administration
Flo-Dar	Marsh-McBirney Flo-Dar™
FLX	Compliance Flexibility Program
FOG	fats, oils, and grease
fps	feet per second
ft	feet
FTE	Full Time Employee
FUG	Fugitive Emissions
FY	fiscal years
g	grams
gal	gallons
GBT	gravity belt thickeners
GHG	Greenhouse Gas
GIS	Geographic Information System
GL	General Ledger
gpcd	gallons per capita day
gpd	gallons per day
gpd/ac	gallons per day per acre
gpm	gallons per minute
gpm/sq ft	gallons per minute per square feet
GWI	groundwater infiltration
H_2S	hydrogen sulfide
HGL	hydraulic grade line
HID	High-Intensity Discharge
hp	horsepower
hr	hour

hrs/day	hours per day
HS^-	hydrogen sulfide ion
HVAC	heating, ventilation, and air conditioning
I/I	Infiltration/inflow
IEBL	Inland Empire Brine Line
IEUA	Inland Empire Utilities Agency
in.	inch
iPACS	Internet-based POTW Administration and Compliance System
IRWD	Irvine Ranch Water District
IT	Information Technology
IWWMP	Integrated Wastewater Master Plan
klb/d	thousand pounds per day
klbN/d	thousand pounds of nitrogen per day
KPI	Key Performance Indicator
kWh	kilowatt hour
lbs	pounds
lbs/cfd	pounds per cubic feet per day
lbs/ft^3	pounds per cubic feet
LF	linear feet
LIMS	Laboratory Information Management System
LM	Longitudinal Motion
LOTO	Lock Out / Tag Out
LRO	legally responsible official
Master Plan	Integrated Master Plan for the Wastewater Collection and Treatment Facilities
MBR	Membrane Bioreactor
MBR treatment train	Membrane Bioreactor treatment train
MCC	motor control center
MCS	Multiple Component Sources
MDD	maximum day demand
MDL	Method Detection Limits
MF	microfiltration
MFR	multi-family residential
MG	million gallons
mg-min/L	milligrams per minute per liter
mg/L	milligrams per liter
mgd	million gallons per day
mgN/L	milligrams of nitrogen per liter
min	minute

min/hr	minutes per hour
ML&C	mortar lined and coated
MLSS	mixed liquor suspended solids
mm	millimeter
MMBtu	million British thermal units
MMBtu/hr	million British thermal units per hour
MMRP	Measurement, Monitoring and Reporting Procedures
MOB	Mobile Source Programs
MP	Master Plan
MPN	most probable number
MRP	Monitoring and Reporting Program
msl	mean sea level
mV	millivolt
N/L	nitrogen per liter
N_2O	nitrous oxide
NACWA	National Association of Clean Water Agencies
$NaHSO_3$	sodium bisulfite
NaOCl	sodium hypochlorite
NASSCO	National Association of Sewer Service Companies
NEC	National Electric Code
NELAC	National Environmental Laboratory Accreditation Conference
NELAP	National Environmental Laboratory Accreditation Program
NFPA	National Fire Protection Association
NGO	Non-Governmental Organizations
NH_3-N	ammonia nitrogen
NOAA	National Oceanic and Atmospheric Association
NOI	notice of intent
NO_X	Nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NTU	nephelometric turbidity unit
O&M	Operations and Maintenance
OCSD	Orange County Sanitation District
OERP	Overflow Emergency Response Plan
OES	Office of Emergency Services
OJT	On-the-Job Training
ORP	Oxidation-Reduction Potential
P/L	phosphorus per liter
PACP	Pipeline Assessment Certification Program
PAYGO	Pay-As-You-Go

PDR	Preliminary Design Report
PEIR	Programmatic Environmental Impact Report
PFRP	Process to Further Reduce Pathogens
PLC	programmable logic controller
POTW	Publicly Operated Treatment Work
ppbv	parts per billion by volume
ppcd	pounds per capita per day
ppd	pounds per day
ppd/cu ft	pounds per day per cubic feet
ppd/sq ft	pounds per day per square feet
pph	pounds per hour
ppm	parts per million
psf	pounds per square foot
psi	pounds per square inch
PTZ	Pan-Tilt-Zoom
PVC	Polyvinyl Chloride
PWS	potable water salinity
PWWF	peak wet weather flow
QICS	Qualitative Intelligence and Communication System
R&R	rehabilitation and repair
RAS	return activated sludge
RCNLD	Replacement Cost New Less Depreciation
RCP	reinforced concrete pipe
RDII	Rain Derived Infiltration and Inflow
RDT	rotary drum thickeners
RECLAIM	Regional Clean Air Incentives Market
Regional Board	California Regional Water Quality Control Board
RG	rain gauge
RNG	renewable natural gas
RO	reverse osmosis
RPU	Riverside Public Utilities
RST	rotary screw thickeners
RTP	Regional Transportation Plan
RWQCB	Regional Water Quality Control Board
RWQCP	Regional Water Quality Control Plant
S_2^-	sulfide ion
SARDA	Santa Ana River Dischargers Association
SART	Santa Ana River Trail
SB	Senate Bill

sBOD	Soluble biochemical oxygen demand
SBT	sludge blending tank
SCADA	supervisory control and data acquisition
SCAG	Southern California Association of Governments
SCAP	Site Cleanup Subaccount Program
SCAQMD	South Coast Air Quality Management District
scfm	standard cubic feet per minute
sCOD	soluble chemical oxygen demand
SECAP	System Evaluation and Capacity Assurance Plan
SFR	single-family residential
SFY	square feet per year
SIU	Significant Industrial Users
SLCP	Short Lived Climate Pollutant
SLR	solids loading rate
SOC	Strengths, Opportunities, and Concerns
SOP	Standard Operating Procedures
SOR	surface overflow rate
South Star	South Star Engineering & Consulting, Inc.
SO_X	Sulphur oxides
sq mi	square mile
SQR	Structural Quick Rating
SRF	State Revolving Fund
SRT	solids retention time
SS	stainless steel
SSC	Sustainable Communities Strategy
SSMP	Sewer System Management Plan
SSO	Sanitary Sewer Overflows
State Water Board	California State Water Resources Board
SWMM	Storm Water Management Model
SWRCB	State Water Resources Control Board
TDS	total dissolved solids
TIN	total inorganic nitrogen
TKN	total Kjeldahl nitrogen
TL	
TM	Technical Memorandum
TMDL	total maximum daily load
TN	total nitrogen
TOC	total organic carbon
TP	total phosphorus

TS	total solids
TSS	total suspended solids
TST	Test for Significant Toxicity
URS	URS Corporations
USACE	United States Army Corps of Engineers
USBR	U.S. Department of the Interior Bureau of Reclamation
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
UV/AOP	Ultraviolet/Advanced Oxidation Process
V&A	V&A Consulting Engineers
VCP	Vitrified Clay Pipe
VFA	volatile fatty acids
VFD	variable frequency drive
VSR	volatile solids reduction
VSS	volatile suspended solids
WaPUG	Wastewater Planning Users Group
WAS	waste activated sludge
WDR	Waste Discharge Requirements
WLAM	Waste Load Allocation Model
WMWD	Western Municipal Water District
WQMP	Water Quality Management Plan
WRCRWA	Western Riverside County Regional Wastewater Authority
wt	wet ton
WTPD	wet tons per day
WWTP	wastewater treatment plant
ZLD	Zero Liquid Discharge

City of Riverside Public Works Department

UPDATE OF THE INTEGRATED

MASTER PLAN FOR THE WASTEWATER COLLECTION AND TREATMENT FACILITIES

VOL. 7

CHAPTER 1

Capital Improvement Program and Implementation

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Engineers...Working Wonders With Water®

City of Riverside Public Works Department

Update of the Integrated Master Plan for the Wastewater Collection and Treatment Facilities

VOLUME 7: CAPITAL IMPROVEMENT PROGRAM AND IMPLEMENTATION

CHAPTER 1: CAPITAL IMPROVEMENT PROGRAM AND IMPLEMENTATION

FINAL | June 2019

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City of Riverside Public Works Department

Update of the Integrated Master Plan for the Wastewater Collection and Treatment Facilities

VOLUME 7: CAPITAL IMPROVEMENT PROGRAM AND IMPLEMENTATION

CHAPTER 1: CAPITAL IMPROVEMENT PROGRAM AND IMPLEMENTATION

Carollo Project No. 10495A00

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Chapter 1

CAPITAL IMPROVEMENT PROGRAM AND IMPLEMENTATION

1.1 Purpose

The purpose of this Chapter is to present a summary of the capital improvement projects that have been developed during the course of the analyses that are presented in the 42 Chapters that make up the update of the Master Plan for the City.

This Chapter also details the project prioritization step that was completed whereby the schedule and costs for some projects in the initial project list were adjusted based on project triggers that were set by looking at three criteria: 1) consideration of recommendations that were used to develop the initial project list; 2) annual expenditures versus available funds; and, 3) the impact of the CIP on customer rates.

The project development process and project descriptions presented in this Chapter are for the RWQCP only. However, this Chapter does include a summary for both the RWQCP and the Collection System. The methodology used to develop the list of projects that are included in the Collection System CIP and the resulting project descriptions are presented in Volume 3, Chapter 7, Capacity Evaluation and Proposed Improvements; Volume 3, Chapter 8, Sewer Lift Station Condition Assessment; Volume 3, Chapter 9, Sewer Pipeline Risk Evaluation and R&R Program; and Volume 3, Chapter 10, Capital Improvement Program.

1.2 Conclusions and Recommendations

- An initial list of eighteen RWQCP projects was developed based on six inputs that are presented in the 42 Chapters that make up the update to the Master Plan. These inputs include: data collection; population, flow, and loading projections; condition assessment; regulatory and climate change considerations; process capacity modelling; and alternatives study.
- Using the initial projects list, the total project cost of all the RWQCP projects and Collection System projects is projected to be $181 and $361 million, respectively. The total CIP expenditure over the planning period was initially projected to be $542 million.
- A preliminary rate impact analysis to determine the City's capital funding potential in relation to the projected annual capital expenditures found that it would require an annual user rate increase of 5 percent to complete the projects from the initial CIP.
- A prioritization step was implemented that explored different CIP scenarios and options. The scenarios and options were developed by one of four actions as follows: 1) changing the project implementation period; 2) removing a project from the planning period; 3) changing the project elements to alter the project cost; or, 4) combinations of the aforementioned actions. The decision to explore different CIP scenarios was made to evaluate if the City could meet the same level of service without requiring a rate increase of 5 percent every year.

- The prioritization step showed two things: 1) the series of projects and CIP that would result following the MBR treatment train (Plant 1) Expansion would cost more than the series of projects and CIP resulting from implementing a larger Tertiary Filter Project; 2) the more recycled water that RPU is willing to accept, the lower the CIP scenario costs become. However, for planning purposes the most conservative scenario was selected. This option gives the RWQCP the flexibility to function with minimal RPU commitment constraints or a change in the Santa Ana River discharge commitments. It also allows the City to continue the philosophy of maximizing the use of the MBR treatment train (Plant 1) to be in a better position to meet future regulatory requirements.
- Based on the prioritization process, the original RWQCP CIP was reduced by approximately $36 million. However, two additional projects were added to the RWQCP CIP totaling approximately $16 million. Furthermore, the Collection System CIP also underwent considerable changes as discussed in Volume 3, Chapter 10.
- The updated combined sewer CIP, including the selected RWQCP CIP implementation scenario (Scenario 4, Option 1) and Collection System projects throughout the planning period, is approximately $500 million (an 8-percent reduction over the initial combined sewer CIP estimate). This CIP was used to estimate the impacts on user rates, discussed in detail in Volume 8, Chapter 1, Financial Plan and User Rates and Fees.

1.3 Background and Methodology

Projects were identified for the Collection System and the RWQCP during the preparation of the various Volumes and Chapters that are part of the update to the Master Plan. This Chapter includes:

1. A description of the methodology used to develop the list of projects that are in the RWQCP CIP.
2. Project descriptions for each of the RWQCP's CIP projects.
3. The results of a prioritization of the Collection System and RWQCP projects.
4. A summary of the proposed CIP through 2037 for the RWQCP and the Collection System.

In addition to the information presented in this Chapter, the methodology used to develop the list of projects that are included in the Collection System CIP and the resulting project descriptions are presented in Volume 3, Chapter 7; Volume 3, Chapter 8; Volume 3, Chapter 9; and Volume 3, Chapter 10.

Figure 1.1 illustrates the steps taken to develop the CIP for the update of the Master Plan. The shapes at the top of the Figure show the six inputs that were used to develop the initial list of CIP projects. These inputs include the following:

- Data Collection - RWQCP and Collection System data were collected from the City and other sources in order to have accurate information that formed the basis for the various evaluations that were performed for the update of the Master Plan. This data was used as input to each of the Volumes and Chapters in the update of the Master Plan.
- Population, Flow, and Loading Projections - These were developed to determine the flows and loads into the Collection System and RWQCP so that the need for future capacity projects could be determined. The details of this evaluation are described in Volume 2, Chapter 3, Population, Loading, and Flow Projections.

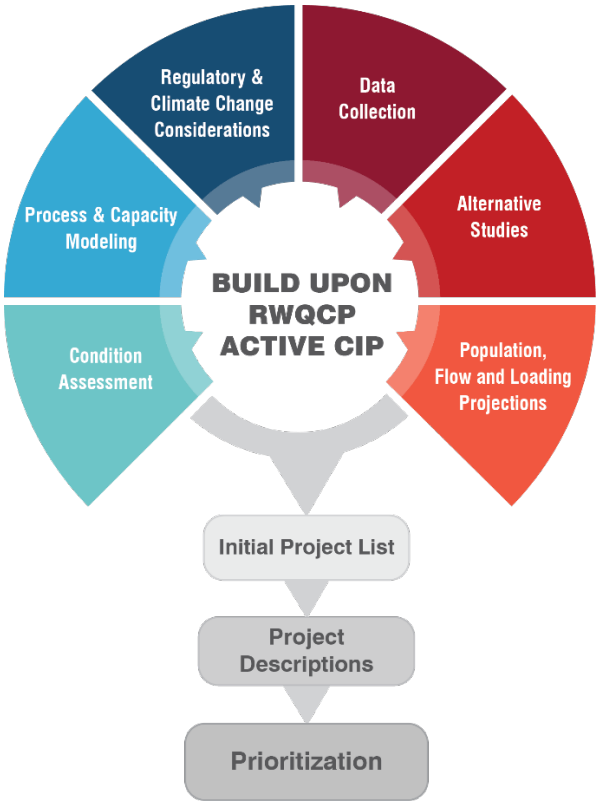


Figure 1.1 Project Development Strategy

- Condition Assessment - A team of engineers assessed the RWQCP unit processes that are not part of the Phase I Plant Expansion and a select group of Collection System lift stations to determine the need for rehabilitation and/or replacement of these assets. In this process, projects were identified through the condition assessment. The timing of the projects was determined by triggers of when actions are required over the planning period to keep the process areas in good working condition. These evaluations led to a list of rehabilitation/replacement projects that are included in the initial list of projects. In addition, the CCTV information that was prepared for the Collection System was used to develop the Collection System rehabilitation CIP. The details of these evaluations are included in Volume 3, Chapter 8 and Volume 6, Chapter 1, Plant Condition Assessment Results.
- Regulatory and Climate Change Considerations - This analysis focused on future climate, water quality, air, and biosolids regulations that could impact the evaluation and selection of projects during the update of the Master Plan planning period. The goals of the analysis were to: 1) consider the perspective of impacts of climate change on the collection system and RWQCP facilities; 2) identify specific regulatory requirements likely to arise during the planning period; 3) determine how to address those requirements (whether through a regulatory compliance effort using City compliance staff or through infrastructure

planning via the update of the Master Plan or other projects); and 4) identify and evaluate specific methods/technologies that would meet the infrastructure needs that were identified during the regulatory and climate change analysis. The details of this analysis are included in Volume 2, Chapter 2, Regulatory and Climate Change Considerations.

- Process Capacity Modeling - This analysis included the use of computer-based process and hydraulic models to help determine the capacity of the RWQCP unit processes and the Collection System. These models in conjunction with the population, flow, and loading projections were used to determine the need for capacity driven projects. Capacity driven projects compare the capacities of the treatment facilities to projected future flows and loads. This was done to determine if the existing treatment capacities are sufficient or if capacity expansion projects are necessary over the planning period. These models in turn helped to determine what specific projects would be required for the RWQCP unit processes and the Collection System, and the timing of those projects. For the RWQCP, a BioWin process model was used to determine unit process capacities. Details of this analysis are included in Volume 4, Chapter 3, Process Design and Reliability Criteria, and Volume 5, Chapter 3, Design Criteria. For the Collection System, a hydraulic model was used to determine pipeline and lift station capacities. The detail of this analysis is included in Volume 3, Chapter 7.
- Alternative Studies - Throughout the various updates to the Master Plan Volumes and Chapters, analyses were performed to determine the best solution for each RWQCP unit process and segment of the Collection System. In general, these solutions were a direct result of the need for expansion, replacement/rehabilitation, to meet an O&M initiative, or to meet future regulatory requirements. These analyses led to the majority of the projects that make up the update of the Master Plan initial project list.

Using the six input criteria described above, an initial list of projects was developed. For each of the projects that were identified a project cost was developed. These costs were developed in the Chapter where the corresponding project was evaluated. Volume 2, Chapter 4, Basis of Cost Estimates, can be referenced for more detail on the methodology used to produce a project cost. The identified projects were then placed into a project list and a project description was developed that contains a problem statement and a description of the work to be carried out for that project. The final step was the prioritization step whereby the schedule and costs for some projects were adjusted based on project triggers that were set by looking at three criteria: 1) consideration of recommendations that were used to develop the initial project list; 2) annual expenditures versus available funds; and, 3) the impact of the CIP on customer rates.

1.4 Project List

Table 1.1 is the initial list of the RWQCP projects that was developed through the process described in Section 1.3. The list includes the project name, the project driver, project cost, and location in the update of the Master Plan where more information on the corresponding project is located. The Collection System project list is included in Volume 3, Chapter 10. Projects grouped by process area are summarized in the following section.

Table 1.1 2018 Initial Project List

Project No.	Project Name	Project Cost(1)	Project Driver	Master Plan Source
FI-01	Headworks Rehabilitation	$8,782,600	Condition	Vol. 6 Ch. 1
FI-02	Headworks Screening Conveyor Replacement	$933,700	Condition	Vol. 6 Ch. 1/ Vol. 4 Ch. 4
FI-03	Headworks Bypass	$1,070,545	O&M Initiative	Vol. 4 Ch. 4
FI-04	Headworks Grit Classifiers and Pumps	$1,855,700	Condition	Vol. 6 Ch. 1
FI-05	MBR Treatment Train (Plant 1) Phase II Expansion	$20,517,500	O&M Initiative	Vol. 4 Ch. 6
FI-06	MBR Treatment Train (Plant 1) Enhanced Nutrient Removal	$24,207,600	Regulatory	Vol. 4 Ch. 6
FI-07	ACT Treatment Train (Plant 2) Rehabilitation	$3,384,000	Condition	Vol. 6 Ch. 1
FI-08	ACT Treatment Train (Plant 2) Mixers Rehabilitation	$532,000	Condition	Vol. 6 Ch. 1
FI-09	ACT Treatment Train (Plant 2) RAS/WAS Pump Station Rehabilitation	$2,073,200	Condition	Vol. 6 Ch. 1
FI-10	ACT Treatment Train (Plant 2) RAS/WAS Pumps Replacement	$1,142,000	Condition	Vol. 6 Ch. 1
FI-11	ACT Treatment Train (Plant 2) Enhanced Nutrient Removal	$38,423,200	Regulatory	Vol. 4 Ch. 6
FI-12	Tertiary Filter Replacement and CCB Retrofits	$9,430,400	Condition	Vol. 6 Ch. 1/ Vol. 4 Ch. 7
FI-13	CCB Rehabilitation	$1,005,300	Condition	Vol. 6 Ch. 1
FI-14	First AWT Project	$38,615,642	Regulatory	Vol. 4 Ch. 8
FI-15	Second AWT Project	$18,640,783	Regulatory	Vol. 4 Ch. 8
FI-16	WAS Thickening Project	$8,028,800	Capacity	Vol. 5 Ch. 4
FI-17	First Primary Sludge Pumping Rehabilitation Project	$1,876,200	Condition	Vol. 6 Ch. 1
FI-18	Second Primary Sludge Pumping Rehabilitation Project	$749,500	Condition	Vol. 6 Ch. 1
Facility CIP Total		**$181,268,670**		

Notes:
(1) Project costs are in 2017 Dollars.

1.4.1 Headworks Projects

Table 1.2 summarizes the Headworks projects that are included in the initial RWQCP project list. Based on the anticipated timing of these projects, which is presented later in this Chapter, it makes sense to combine FI-01 through FI-03 into one project to minimize mobilization and bidding costs. A final decision on combining the projects can be made during preliminary design.

Table 1.2 Headworks CIP Summary

Project Number	Project Name	Project Cost[1] ($ Million)
Headworks Project		
FI-01	Rehabilitation	8.8
FI-02	Screening Conveyor	0.9
FI-03	Bypass	1.1
FI-04	Grit Classifiers and Pumps	1.9
Headworks Total		**12.7**

Notes:
(1) Project costs are in 2017 Dollars.

1.4.2 Primary Sludge Pumping Rehabilitation

Table 1.3 summarizes the Primary Sludge Pumping projects that are included in the initial RWQCP project list. Based on the anticipated timing of these projects, which is presented later in this Chapter, it may make sense to combine FI-17 with FI-01 through FI-03 into one project to minimize mobilization and bidding costs. A final decision on combining the projects can be made during preliminary design.

Table 1.3 Primary Treatment CIP Summary

Project Number	Project Name	Project Cost[1] ($ Million)
Primary Sludge Pumping Project		
FI-17	Near-Term Rehabilitation	1.9
FI-18	Long-Term Rehabilitation	0.7
Primary Sludge Pumping Project Total		**2.6**

Notes:
(1) Project costs are in 2017 Dollars.

1.4.3 MBR Treatment Train (Plant 1) Projects

Table 1.4 summarizes the MBR treatment train (Plant 1) projects that are included in the initial RWQCP project list.

Table 1.4 MBR Treatment Train (Plant 1) CIP Summary

Project Number	Project Name	Project Cost[1] ($ Million)
MBR Treatment Train (Plant 1) Project		
FI-05	Phase II Expansion	20.5
FI-06	Enhanced Nutrient Removal	24.2
MBR Treatment Train (Plant 1) Total		**44.7**

Notes:
(1) Project costs are in 2017 Dollars.

1.4.4 ACT Treatment Train (Plant 2) Projects

Table 1.5 summarizes the ACT treatment train (Plant 2) projects that are included in the initial RWQCP project list.

Table 1.5 ACT Treatment Train (Plant 2) CIP Summary

Project Number	Project Name	Project Cost[1] ($ Million)
ACT Treatment Train (Plant 2) Project		
FI-07	Rehabilitation	3.4
FI-08	Mixers Rehabilitation	0.5
FI-09	RAS/WAS Pump Station Rehabilitation	2.1
FI-10	RAS/WAS Pump Station Replacement	1.1
FI-11	Enhanced Nutrient Removal	38.4
ACT Treatment Train (Plant 2) Total		**45.6**

Notes:
(1) Project costs are in 2017 Dollars.

1.4.5 Tertiary Treatment and Effluent Disinfection

Table 1.6 summarizes the Tertiary Treatment and Disinfection projects that are included in the initial RWQCP project list. These projects include two AWT projects to reduce the plant effluent salinity.

Table 1.6 Tertiary Treatment and Disinfection CIP Summary

Project Number	Project Name	Project Cost[1] ($ Million)
Tertiary Treatment and Disinfection Projects		
FI-12	Filter Replacement and CCB Retrofit	9.4
FI-13	CCB Retrofit	1.0
FI-14	First AWT Project	38.6
FI-15	Second AWT Project	18.6
Tertiary Treatment and Disinfection Total		**67.6**

Notes:
(1) Project costs are in 2017 Dollars.

1.4.6 Solids Treatment

Table 1.7 summarizes the Solids Treatment project that is included in the initial RWQCP project list.

Table 1.7 Solids Treatment CIP Summary

Project Number	Project Name	Project Cost[1] ($ Million)
Solids Treatment Project		
FI-16	WAS Thickening	8.0
Solids Treatment Total		**8.0**

Notes:
(1) Project costs are in 2017 Dollars.

1.5 Initial Project Summary

Table 1.8 summarizes the project costs of the initial project list for the RWQCP and the Collection System. The project cost of the RWQCP projects is approximately $181 million and the project cost of the Collection System projects is approximately $361 million, totaling $542 million. This section describes how the initial schedule and costs for the projects, which are based on the project drivers listed in Table 1.1 (regulatory, capacity, condition, or O&M initiative), changed into the final costs and schedule for the projects, through the project prioritization process. The initial project costs and schedule were analyzed to determine if the annual expenditure is financially feasible (based on rates impacts) for the City. Based on this analysis, the project costs and schedule were adjusted by one of four actions as follows: 1) changing the project implementation period; 2) removing a project from the planning period; 3) changing the project elements to alter the project cost; or, 4) a combination of the aforementioned actions. Final project costs and schedules were generated after the analysis.

Table 1.8 Initial RWQCP CIP Summary for Collection System and Treatment Facilities

Project Area	Project Cost[1] ($ Million)
Collection System	
Capacity Related	58.6
New Service Related	42.4
Rehabilitation and Replacement	151.6
Other Projects	108.6
Total Collection System Cost	**361.2**
Treatment Facilities	
Headworks	12.7
Primary Sludge Pumping	2.6
MBR Treatment Train (Plant 1)	44.7
ACT Treatment Train (Plant 2)	45.5
Tertiary Treatment and Disinfection	67.6
Solids Treatment	8.0
Total Treatment Facilities Cost	**181.1**
Total CIP Cost	**542.3**

Notes:
(1) Project costs are in 2017 Dollars.

1.5.1 Initial Project Schedule

Figure 1.2 shows the initial project schedule for all the projects identified for the RWQCP. Note that Figure 1.2 only includes RWQCP projects. For each project the total duration is spilt into time to complete the planning, design, and construction phases of the project. The initial schedule of the projects for the Collection System is included in Volume 3, Chapter 10.

Project No.	Project Name	Project Cost Estimate (2017)	Project Start	Project Completion
FI-01	Headworks Rehabilitation	$ 8,782,600	12/31/2019	12/31/2023
FI-02	Headworks Screening Conveyor Replacement	$ 933,700	12/31/2019	12/31/2023
FI-03	Headworks Bypass	$ 1,070,545	12/31/2019	12/31/2023
FI-04	Headworks Grit Classifiers and Pumps	$ 1,855,700	12/31/2029	12/31/2033
FI-05	MBR (Plant 1) Phase II Expansion	$ 20,517,500	12/31/2022	12/31/2028
FI-06	MBR (Plant 1) Enhanced Nutrient Removal	$ 24,207,600	1/1/2029	12/31/2035
FI-07	ACT (Plant 2) Rehabilitation	$ 3,384,000	12/31/2019	12/31/2023
FI-08	ACT (Plant 2) Mixers Rehabilitation	$ 532,000	12/31/2029	12/31/2033
FI-09	ACT (Plant 2) RAS/WAS Pump Station Rehabilitation	$ 2,073,200	12/31/2019	12/31/2023
FI-10	ACT (Plant 2) RAS/WAS Pumps Replacement	$ 1,142,000	12/31/2029	12/31/2033
FI-11	ACT (Plant 2) Enhanced Nutrient Removal	$ 38,423,200	1/1/2029	12/31/2035
FI-12	Tertiary Filter Replacement and CCB Retrofits	$ 9,430,400	12/31/2021	12/31/2025
FI-13	CCB Rehabilitation	$ 1,005,300	12/31/2029	12/31/2033
FI-14	First AWT Project	$ 38,615,642	12/31/2018	12/31/2024
FI-15	Second AWT Project	$ 18,640,783	12/31/2027	12/31/2033
FI-16	WAS Thickening Project	$ 8,028,800	12/31/2024	12/31/2028
FI-17	First Primary Sludge Pumping Rehabilitation	$ 1,876,200	12/31/2019	12/31/2023
FI-18	Second Primary Sludge Pumping Rehabilitation	$ 749,500	12/31/2032	12/31/2036

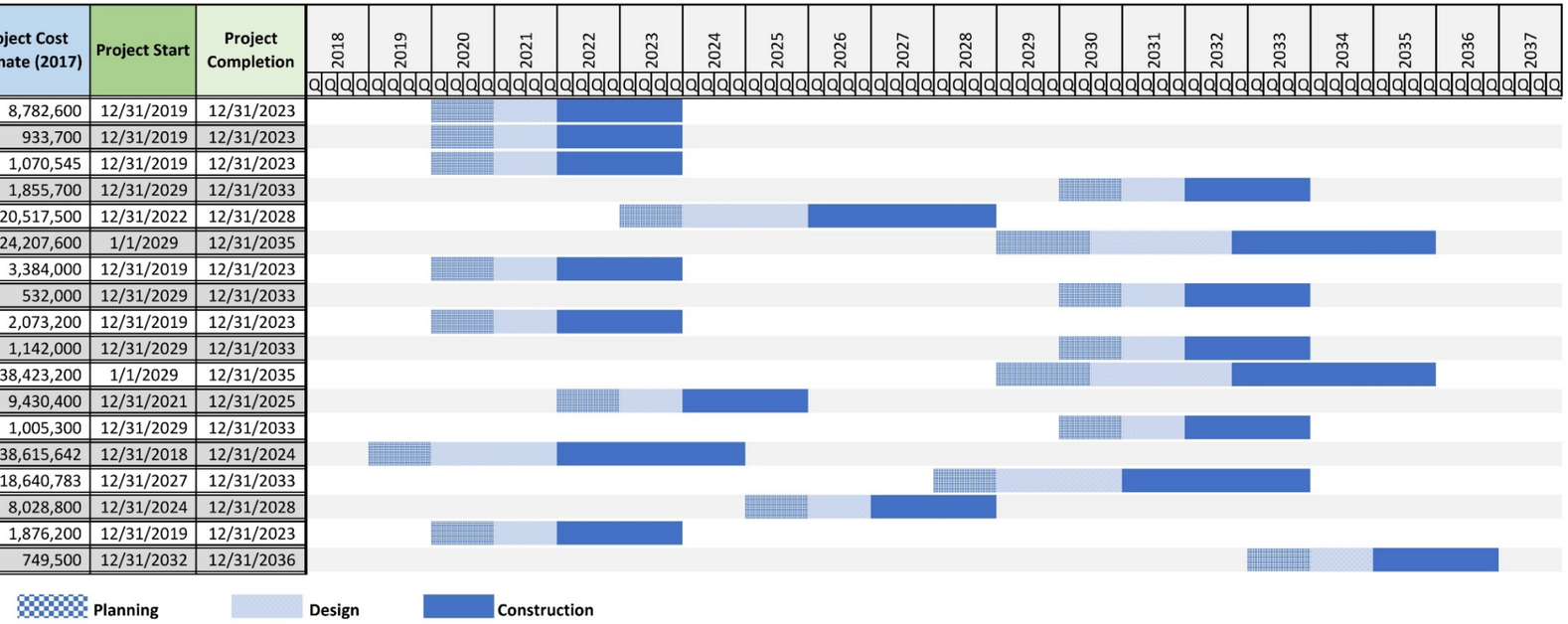


Figure 1.2 2018 Initial Project Schedule for RWQCP

Combining the initial schedules for the RWQCP and the collections system projects allowed for development of an initial CIP. Figure 1.3 shows a bar graph chart of the CIP annual expenditures for both the RWQCP and Collections System. This is based on the preliminary schedules that are presented in Section 1.5.1. As shown, annual expenditures would be expected to range between $18 million and $56 million, or approximately $30 million per year. Note that the costs presented on Figure 1.3 include escalation of 3 percent to the mid-point of construction.

1.5.2 Initial Evaluation of Rate Impacts

To prioritize the City's projects, it was necessary to perform a preliminary rate impact analysis to determine the City's capital funding potential in relation to the projected annual capital expenditures. Figure 1.4 shows the results of this analysis. The colored horizontal lines on Figure 1.5 represent the funds available for different levels of potential annual user rate increases, ranging from 0 percent to 5 percent. On Figure 1.4 these horizontal lines are superimposed on the CIP bar chart graph that is shown on Figure 1.3. It should be noted that these lines represent a continuation of the practice of maximizing the use of the rate increase funds to finance bonds to pay for the future CIP, while keeping the cash funding of the CIP at a minimum. For example, in the 5.0 percent rate increase scenario (red line) that is shown on Figure 1.4, the overall debt service would be approximately 50 percent of the RWQCP's operating revenues, which is consistent with the existing debt ratio. Using that assumption, Figure 1.4 shows that it would require an annual user rate increase of about 5 percent in order to complete the projects from the initial CIP.

It should be also be noted that since the previously approved FY 18-19 user rate was rescinded and it is understood that a rate increase in FY 19-20 is not likely, the bar chart graph shows that there are not funds available to pay for the CIP projects that are planned for FY 18-19 and FY 19-20. The City may be able to alleviate some of this two-year funding gap by using some bond funds that are left over from the Phase I Plant Expansion Project, borrow from reserves, or delay some of those projects.

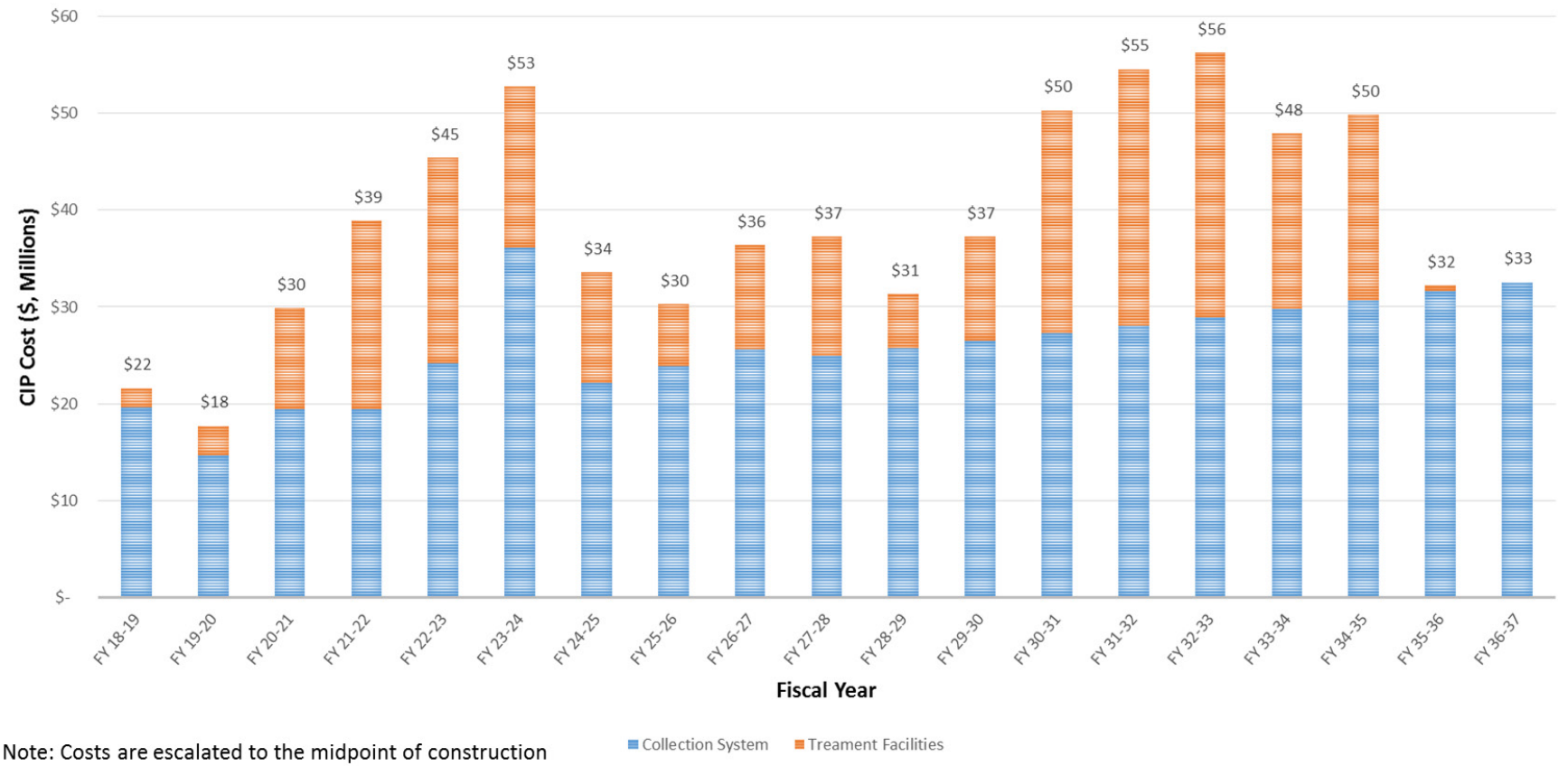
Figure 1.5 shows a detailed look at the first six years of CIP funding requirements and the available rate funding from Figure 1.4. The first six years aligns with the last year of the current rate cycle and the next five-year rate cycle (FY 18/19 - FY 23/24). The blue colored bars are for Collection System projects and the orange/red colored bars are for RWQCP (Treatment Facility) projects. The intent of Figure 1.5 is to provide the reader with more detail of the projects that would be paid for during the next five-year rate cycle.

1.5.3 Initial CIP Workshop

The process to develop the CIP as described in Sections 1.5.1 through 1.5.2 of this Chapter was presented to the City during a workshop on January 31st, 2018. At that workshop City staff decided to explore different CIP scenarios that were developed by one of four actions as follows:

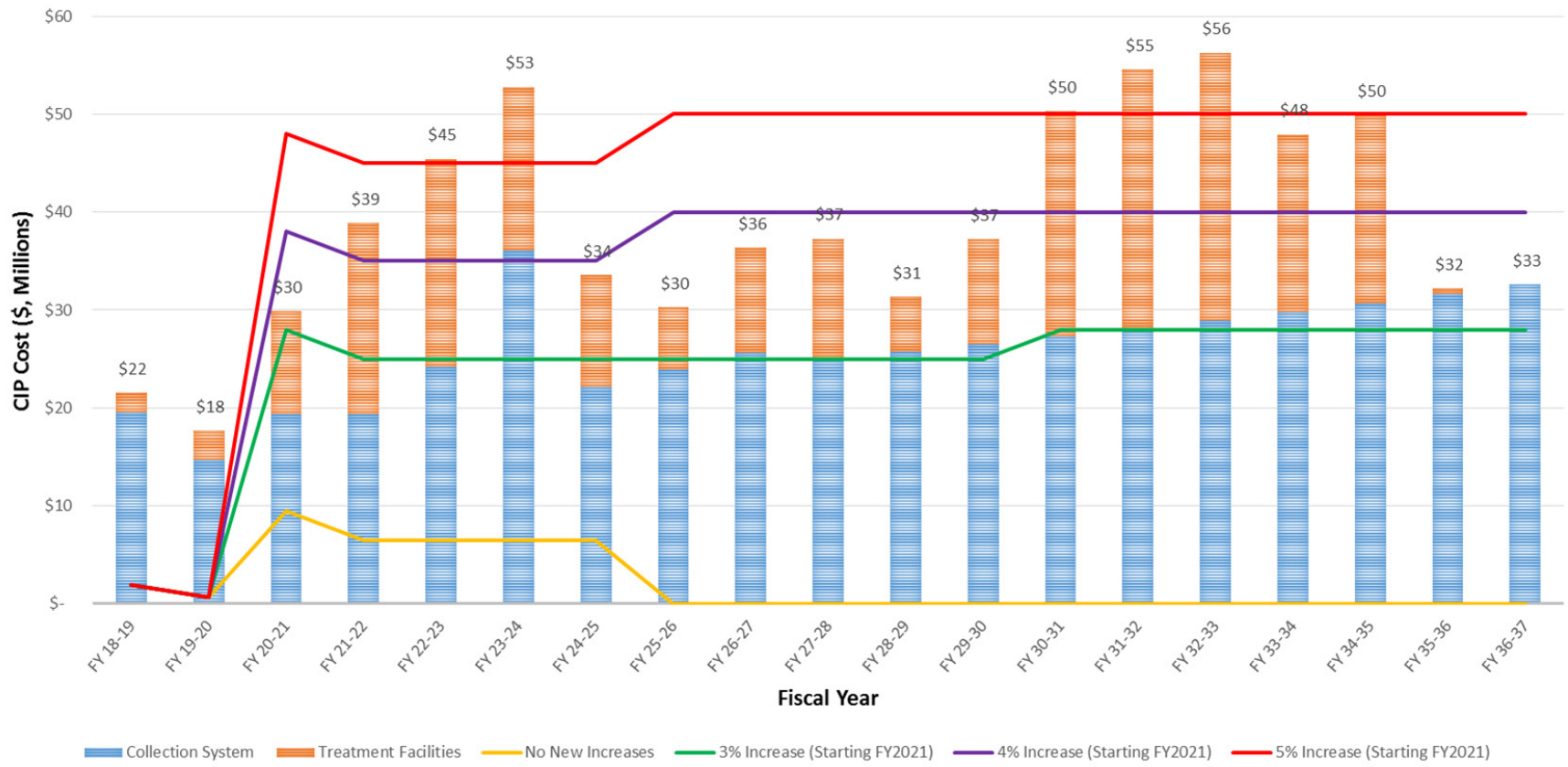
1. Changing the project implementation period.
2. Removing one or more projects from the planning period.
3. Changing the project elements to alter the project cost.
4. Combination of items 1 to 3 above.

The decision to explore different CIP scenarios was made in order to evaluate whether the City could meet the same level of service without requiring a rate increase of 5 percent every year.



Note: Costs are escalated to the midpoint of construction

Figure 1.3 2018 Initial CIP Annual Expenditure (before prioritization step)



Note: Costs are escalated to the midpoint of construction

Figure 1.4 2018 Initial Rate Impact on CIP Annual Expenditure (before prioritization step)

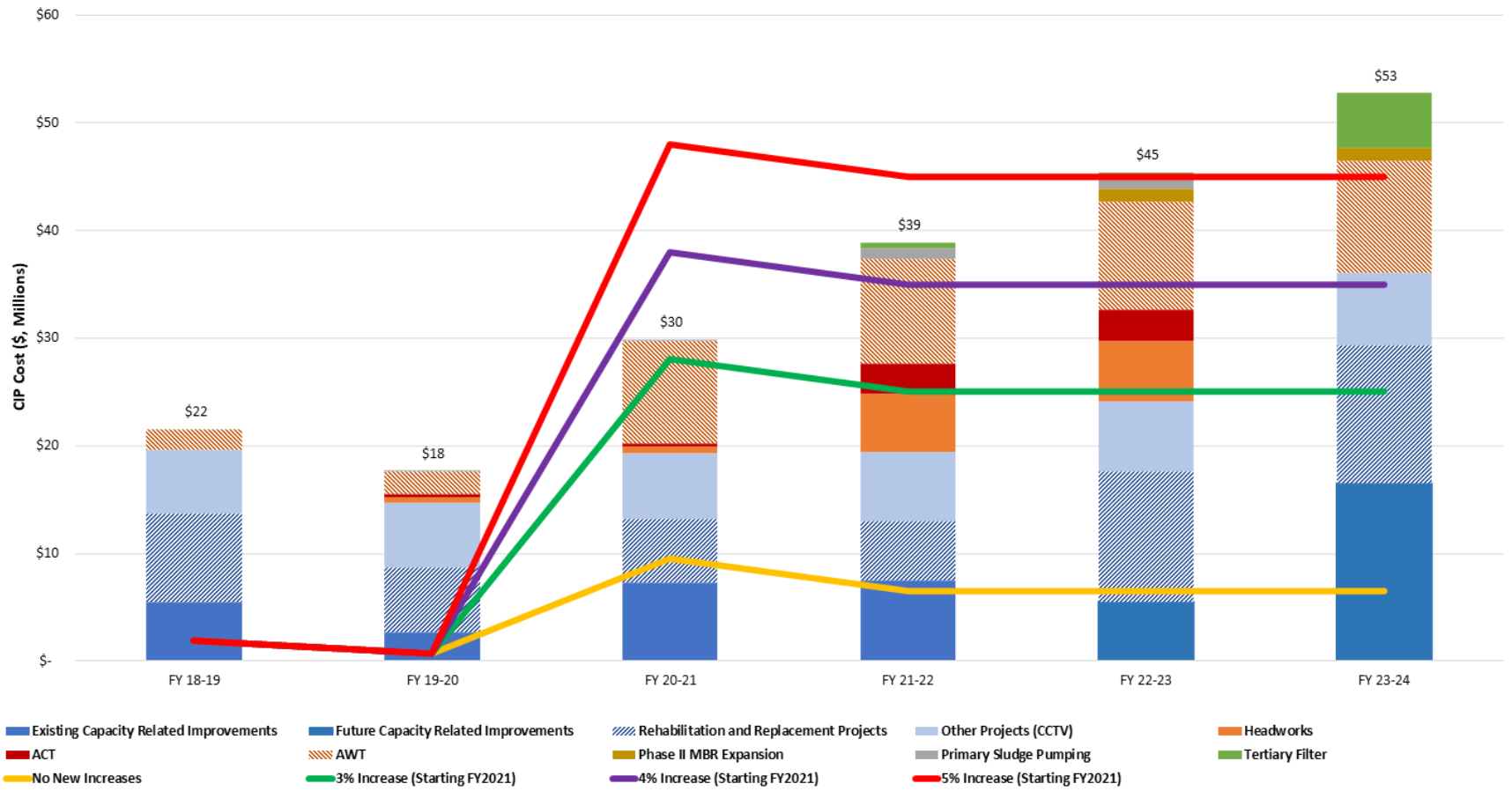


Figure 1.5 Initial Summary of First Six year CIP with Various Levels of Bond Funding (before prioritization step)

1.6 Treatment Facilities CIP Scenarios

This section examines the development and evaluation of the different CIP scenarios that could result in a lower annual capital expenditure, which would in turn allow the City to get by with lower than a 5 percent annual user rate increase.

1.6.1 Project Drivers and Major Questions Related to the CIP Scenarios

As shown previously in Table 1.1, 18 projects were initially identified for RWQCP that would need to be completed. Of these projects, the projects for the headworks (FI-01 through FI-04), the primary sludge pumping projects (FI-17 and FI-18), the ACT treatment train (Plant 2) rehabilitation projects (FI-07 through FI-11), and the WAS thickening project (FI-16) need to be completed and are not subject to adjustment in the CIP scenarios. Additionally, following the workshop with the City, two additional projects were included for the RWQCP: Influent Flow Metering Project discussed in Volume 4, Chapter 4, Preliminary Treatment, and the Levee Phase II Rehabilitation Project discussed in Volume 4, Chapter 11, Capital Project Studies. These projects need to be completed and are not subject to adjustment in the CIP scenarios.

That leaves six projects to be analyzed in different CIP scenarios. Additionally, the AWT projects were moved to a later date based on input from the City. The first AWT project was pushed out to be online by 2034, and the second AWT project has moved outside the planning period. That leaves only one AWT project (FI-18) to be considered in the CIP scenario analysis. Table 1.9 shows the five projects that were considered for alteration as part of the process of developing the different CIP scenarios.

Table 1.9 Projects Considered in CIP Scenarios

Project No.	Project Name	Project Cost
FI-06	MBR Treatment Train (Plant 1) Phase II Expansion	$20,517,500
FI-07	MBR Treatment Train (Plant 1) Enhanced Nutrient Removal	$24,207,600
FI-12	ACT Treatment Train (Plant 2) Enhanced Nutrient Removal	$38,423,200
FI-13	Tertiary Filter Replacement and CCB Retrofits	$9,430,400
FI-18	First AWT Project	$38,615,642
Total CIP Scenario Cost		**$131,194,342**

Notes:
(1) Project costs are in 2017 Dollars

In order to develop the CIP scenarios and their timing, a brainstorming session was held to quantify the drivers that are instrumental in establishing the need for and timing of the five projects that are listed in Table 1.9. In that brainstorming session four drivers were identified. These drivers are listed in Table 1.10.

Table 1.10 Project Drivers Considered in CIP Scenarios

Project Drivers	Online Date	Notes
Size of Tertiary Filter Project	2023	8 or 14 mgd
MBR Treatment Train (Plant 1) Expansion	2028	Include this project or not
TDS Limits	2034	-
Nutrient Limits	2035	Treatment of MBR treatment train (Plant 1) effluent or ACT treatment train (Plant 2) effluent or both

The first project driver is the size of the tertiary filter project. There are two choices here, either 8 mgd or 14 mgd, and this decision is needed in 2021. Table 1.10 has a column that shows the online date for each project driver. The online date is the year in which the projects need to be operational. The decision on the tertiary filter project has two possible outcomes, which are to either implement the MBR treatment train (Plant 1) expansion from 26 mgd to 32 mgd or to remove the project from the CIP. The implementation of the MBR treatment train (Plant 1) project will increase the capacity of the MBR treatment train (Plant 1), which will result in a lower capacity requirement for the ACT treatment train (Plant 2). If the tertiary filter project is implemented at 8-mgd capacity, then the MBR treatment train (Plant 1) expansion is required. If however, 14 mgd of tertiary filters are installed, then an expansion of the MBR treatment train (Plant 1) beyond its current capacity of 26 mgd will not be needed.

The third project driver is the need to continue to meet the TDS effluent limits (TDS limits in Table 1.10). As stated in Volume 4, Chapter 8, Advanced Water Treatment, the City plans to control effluent TDS through source control for as long as possible, rather than implement end-of-pipe treatment. Therefore, effluent TDS as a driver for project prioritization has been pushed out a few years to be online in 2034. This will initiate project FI-18. This project addresses the rising TDS concentration in the effluent that is discharged to the Santa Ana River (reference Volume 4, Chapter 8).

The fourth project driver is the anticipated future more stringent nutrient limits, which triggers two projects (FI-07 and FI-12). This driver is described in Volume 2, Chapter 2. The resultant projects are described in Volume 4, Chapter 6, Secondary Treatment. These projects include the installation of enhanced nutrient removal for the MBR treatment train (Plant 1) and ACT treatment train (Plant 2). The goal of these projects is that all effluent that is discharged to the Santa Ana River meet a TN limit of 3 mg N/L and a TP limit of 1 mg P/L. In the analysis of the CIP scenarios, there was an evaluation of whether both the MBR treatment train (Plant 1) and the ACT treatment train (Plant 2) need to meet these proposed nutrient limits. The amount of recycled water that RPU takes will impact whether enhanced nutrient removal needs to be implemented for both the MBR treatment train (Plant 1) and the ACT treatment train (Plant 2). The water that RPU takes may not need to have nutrients removed from it. Therefore, it is possible that enhanced nutrient removal could be implemented at one or the other, instead of both of the treatment trains, which would save the City a considerable amount of money.

In addition to the project drivers presented in Table 1.10 there are two major questions that need to be answered as part of the CIP scenario development and analysis. These are shown in Table 1.11.

Table 1.11 CIP Scenario Major Questions

Questions	Notes
How much water needs to go to the river?	25,000 AF or 15,000 AF
How much water will RPU take?	All the water available or a limited amount

The first question is, "how much water needs to go to the river?" The City is contemplating revisiting the mandated Santa Ana River discharge of 25,000 AFY or 22.3 mgd. If the mandate can be reduced from 25,000 AFY (22.3 mgd) to 15,000 AFY (13.4 mgd), then more water would be available to the City for recycled water uses. This decision will influence how much of the effluent from the RWQCP needs to meet the proposed nutrient limits. In the case of the 15,000 AFY

(13.4 mgd) discharge requirement, a lower river discharge would mean a smaller scale enhanced nutrient removal treatment project, and a resulting smaller CIP requirement.

The second question is, "how much water will RPU take?" The RWQCP staff is in early talks with RPU about how much recycled water they are willing to commit to taking from the RWQCP. The more water that is taken by RPU, the less water that needs to undergo enhanced nutrient removal. Therefore, a smaller and lower-cost enhanced nutrient removal project would be needed.

1.6.2 Development of CIP Scenarios

Now that the project drivers and the major questions that the CIP scenarios need to address have been established, the next step is to develop and evaluate the specific CIP scenarios. Because there are a large number of potential CIP scenarios that could be developed based on the four project drivers and the two major questions, a second brainstorming session was held to streamline the CIP scenarios that would be evaluated. During the brainstorming session, it was concluded that a set of CIP scenarios for each of the four Project Drivers would need to be developed and evaluated based on when respective projects needed to be online. This led to developing scenarios that would occur at four different times during the planning period.

- 2023 Tertiary Filter Project.
- 2028 MBR Treatment Train (Plant 1) Expansion.
- 2034 Addressing TDS Limits.
- 2035 Addressing Nutrient Limits.

For each of the four scenario times there are multiple options that could occur. For example, in 2023 if an 8-mgd Tertiary Filter project is implemented, then the MBR treatment train (Plant 1) expansion will be needed in 2028. If on the other hand, the tertiary filter project is implemented at 14 mgd, then the MBR treatment train (Plant 1) expansion will not be needed. A similar approach was taken for development of options at the other two scenario times (2034 Addressing TDS Limits and 2035 Addressing Nutrient Limits).

In addition to the assumption to establish scenarios at four different times, two other major assumptions for the development of the **initial** set of scenarios were made, as follows:

- The amount of flow that is required to be discharged to the Santa Ana River is 25,000 AFY. After all of the scenarios and options for each scenario using 25,000 AFY have been explored, all the options presented were revisited, and an evaluation was done to see what happens if the amount of flow that is required to be discharged to the river is decreased from 25,000 to 15,000 AFY.
- RPU will take all of the water that does not have to be discharged to the Santa Ana River. After all of the scenarios and options for each scenario were explored, assuming RPU takes all the water that does not have to be discharged to the Santa Ana River, all the options were revisited, and an evaluation was done to see what impacts occur if this assumption is not true.

The next step was to describe each scenario and option using a graphic, along with minimal text. In order to evaluate each scenario, a simple way to explain and show the options and components of each scenario is necessary. Figure 1.6 is a flow schematic of the RWQCP's key unit processes that correspond to the projects that are being looked at as part of the prioritization process. The

schematic details 1) the capacity, 2) configuration, and 3) the flow routing to the unit processes in question, and two discharge points; the Santa Ana River and RPU.

In this case, each scenario or scenario option that is to be evaluated will be shown on a modified version of Figure 1.6.

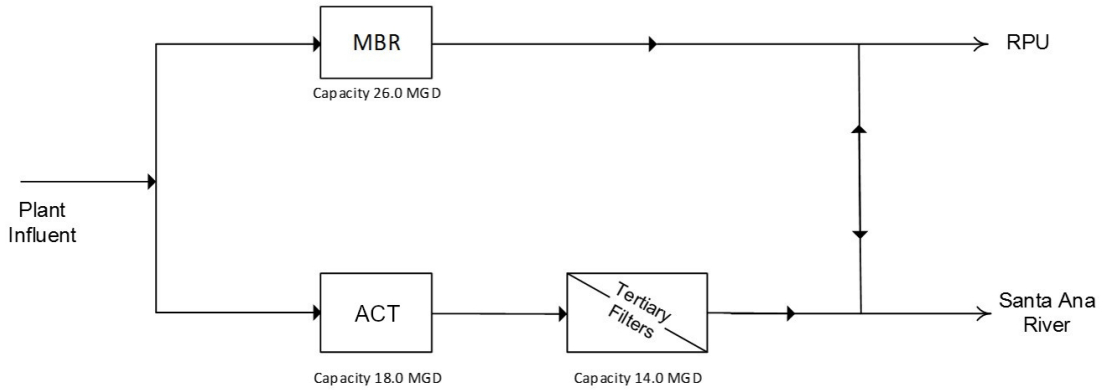


Figure 1.6 RWQCP's Simple Flow Schematic

1.6.3 Scenario 1: RWQCP Year 2023 Tertiary Filter Project

The first scenario will take effect in the year 2023. This is the year that the tertiary filter project is projected to be online. This scenario is shown on Figure 1.7, and there are two options. Option 1 of this scenario is shown with the blue text on the Figure and Option 2 is shown with the orange text. As discussed, the tertiary filter project can be implemented at either 8 mgd (Option 1) or 14 mgd (Option 2). For this scenario, the influent flow is projected to be 34 mgd (flow around 2023). Assuming a mandated 25,000 AFY (22.3 mgd) river discharge, there would be 14.7 mgd of MBR treatment train (Plant 1) effluent available to be sent to RPU.

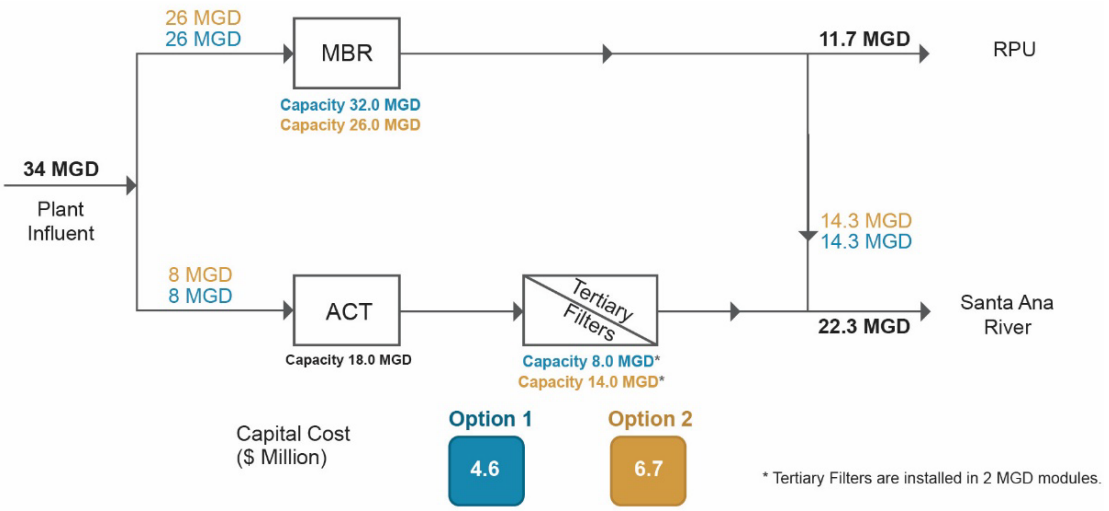


Figure 1.7 Scenario 1: RWQCP Year 2023 Tertiary Filter Project Options

1.6.3.1 Option 1: Tertiary Filter Project at 8 mgd

In Option 1, the tertiary filter project has been implemented at 8 mgd, and all units are online in the year 2023. In this option, the existing MBR treatment train (Plant 1) is run at full capacity

(26 mgd), and the remainder of the influent flow (8 mgd) is routed to the ACT treatment train (Plant 2). The ACT treatment train (Plant 2) undergoes a tertiary filter project that replaces the existing filters with cloth filters that have a capacity of 8 mgd. To meet the mandated Santa Ana River discharge (of 22.3 mgd), 14.3 mgd is routed from the MBR treatment train (Plant 1) side to the ACT treatment train (Plant 2) side of the RWQCP. In this option, effluent from the MBR treatment train (Plant 1) is available as recycled water for RPU at a flow rate of 11.7 mgd, and effluent flow from the ACT treatment train (Plant 2) is routed to the Santa Ana River (22.3 mgd). This option is presented in blue text on Figure 1.7.

The cost of this option is $4.6 million for 8 mgd of cloth filters.

1.6.3.2 Option 2: Tertiary Filter Project at 14 mgd

In Option 2, the tertiary filter project is implemented at 14 mgd. Again, in this option, the MBR treatment train (Plant 1) is run at full capacity (26 mgd), and the remainder of the influent flow (8 mgd) is routed to the ACT treatment train (Plant 2). The ACT treatment train (Plant 2) undergoes a tertiary filter project that replaces the existing filters with cloth filters that have a capacity of 14 mgd. Since only 8 mgd is available at this point, the flow split to the Santa Ana River and available recycled water for RPU would be the same as Option 1. This option is presented in golden text on Figure 1.7.

The cost of this option is $6.7 million. This cost includes just the cost of the 14-mgd cloth filters. Option 2 would cost $2.1 million more than Option 1.

1.6.4 Scenario 2: RWQCP Year 2028 MBR (Plant 1) Expansion

The second scenario would be implemented by 2028 and would depend on the Option selected in Scenario 1. If Option 1 (8 -mgd Tertiary Filters) is selected, then the MBR treatment train (Plant 1) expansion to 32 mgd will take place. On the other hand, if Scenario 1, Option 2 (14-mgd Tertiary Filters) is implemented in 2023, then there will be no need for the MBR treatment train (Plant 1) expansion, and the MBR will remain at 26-mgd capacity.

Both of these Options, with and without the MBR treatment (Plant 1) expansion, are illustrated on Figure 1.8.

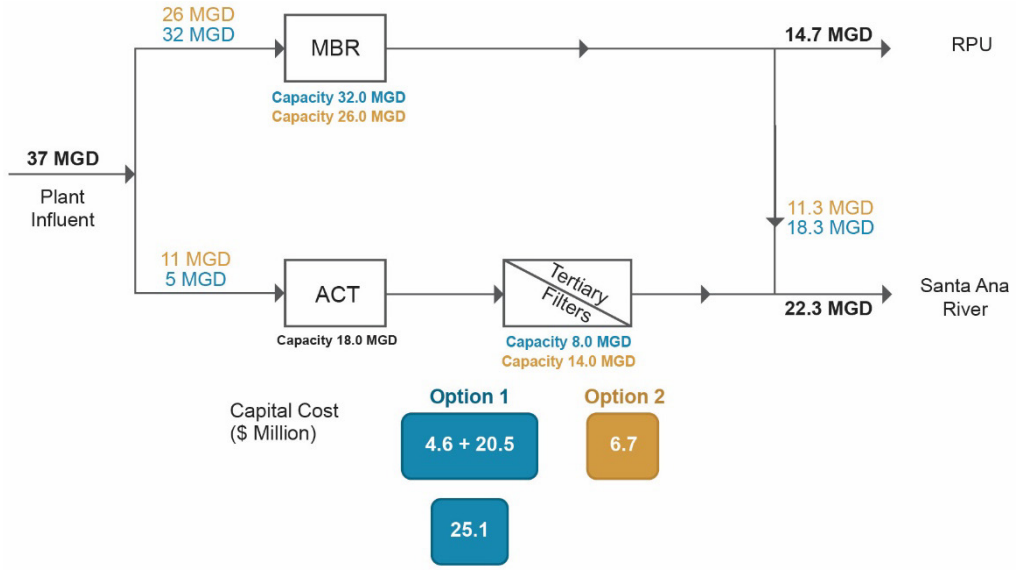


Figure 1.8 Scenario 2: RWQCP Year 2028 MBR (Plant 1) Expansion Options

1.6.4.1 Option 1: With MBR (Plant 1) Expansion

Blue text on Figure 1.8 shows Option 1 that includes the MBR treatment train (Plant 1) expansion to 32 mgd in 2028. At this point the anticipated flow to the RWQCP would be 37 mgd. The MBR treatment train (Plant 1) would be operated at full capacity (32 mgd), and the remaining 5 mgd would be treated in the ACT treatment train (Plant 2). Of the 32 mgd of MBR effluent, 18.3 would be diverted to blend with the 5 mgd from the ACT and the blend of 22.3 mgd would be discharged to the Santa Ana River. This would leave 14.7 mgd available for RPU.

The cost of this option is the summation of Scenario 1, Option 1 costs, presented in Section 1.6.3.1 ($4.6 million) and the cost of the MBR treatment train (Plant 1) expansion project ($20.5 million), which would total $25.1 million.

1.6.4.2 Option 2: Without MBR Treatment Train (Plant 1) Expansion

The option without the MBR treatment train (Plant 1) expansion is shown in golden text on Figure 1.8. Now 26 mgd of the incoming 37 mgd would be directed through the MBR treatment train (Plant 1), and the remaining 11 mgd would be treated by the ACT and the tertiary filters. To make up the required flow to the Santa Ana River, 11.3 mgd of the MBR treatment train (Plant 1) effluent would be blended with the tertiary filter effluent. 14.7 mgd would still be available for RPU.

For this option, since there would be no expansion of the MBR treatment train (Plant 1), there would be no additional capital expenditure. The cost savings compared with Option 1 would be $18.4 million to the year 2028.

1.6.5 Scenario 3: RWQCP Year 2034 Addressing TDS Limits

The next scenario will take place in the year 2034. In this scenario, the first AWT facility (consisting of a RO facility, RO brine concentration, and a brine pipeline) will be constructed. All flow discharged to the river must be blended with AWT effluent in order to meet the RWQCP TDS effluent limits. For this scenario, the influent flow is projected to be 39 mgd in 2034. Assuming a mandated 22.3-mgd river discharge, there is 16.7 mgd available to be sent to RPU. Figure 1.9 shows the two options that could occur for this scenario in the year 2034. The two options are dependent on whether the MBR treatment train (Plant 1) expansion was implemented in 2028 (Scenario 2 above).

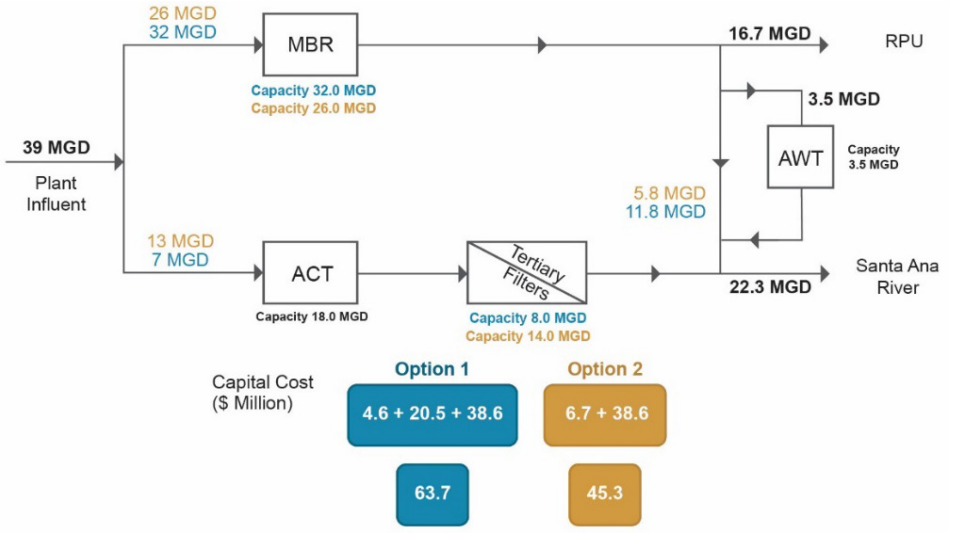


Figure 1.9 Scenario 3: RWQCP Year 2034 Addressing TDS Limits Options

1.6.5.1 Option 1: MBR Treatment Train (Plant 1) Expansion

In this option, the MBR treatment train (Plant 1) was expanded in 2028, and the MBR treatment train (Plant 1) is run at full capacity (32 mgd) and the remainder of the influent flow (7 mgd) is routed to the ACT treatment train (Plant 2). The ACT treatment train (Plant 2) side includes an 8-mgd Tertiary Filter system. To meet TDS limits, the AWT receives 3.5 mgd of flow from the MBR treatment train (Plant 1) effluent, and the AWT effluent is blended with the ACT treatment train (Plant 2) effluent, and then discharged to the Santa Ana River. To meet the mandated Santa Ana River discharge (of 22.3 mgd), flow from the MBR treatment train (Plant 1) of 11.8 mgd is routed and blended with the ACT treatment train (Plant 2) and AWT blended effluent. Flow to RPU would increase to 16.7 mgd. This scenario is presented in blue text on Figure 1.9.

The cost of this option is the summation of Scenario 1, Option 1 and Scenario 2, Option 1 costs, presented earlier ($25.1 million = $4.6 + $20.5) and the cost of the AWT project ($38.6 million), which equals $63.7 million.

1.6.5.2 Option 2: No MBR Treatment Train (Plant 1) Expansion

In this option, the MBR treatment train (Plant 1) was not expanded in 2028, instead the tertiary filter project is installed with a capacity of 14 mgd. In this option, the MBR treatment train (Plant 1) is run at full capacity (26 mgd), and the remainder of the influent flow (13 mgd) is routed to the ACT treatment train (Plant 2). To meet TDS limits the AWT receives 3.5 mgd of flow from the MBR treatment train (Plant 1) effluent and the AWT effluent is blended with the ACT treatment train (Plant 2) effluent and then discharged to the Santa Ana River. To meet the mandated Santa Ana River discharge (of 22.3 mgd), flow from the MBR treatment train (Plant 1) of 5.8 mgd is routed and blended with the flow from the ACT treatment train (Plant 2) of 13 mgd and flow from the AWT of 3.5 mgd. This alternative is presented in golden text on Figure 1.6. RPU would, once again, take 16.7 mgd of MBR treatment train (Plant 1) effluent.

The cost of this option is the summation of Scenario 1, Option 2 and Scenario 2, Option 2 costs, presented above ($6.7 million), and the cost of the AWT project ($38.6 million), which equals $45.3 million. Implementing Option 2 would still result in a savings of $18.4 million to the year of 2032.

1.6.6 Scenario 4: RWQCP Year 2035 Addressing Nutrient Limits

The next scenario takes place in the year 2035, when the proposed nutrient limits are expected to come into effect. For the RWQCP to meet these limits any flow discharged to the Santa Ana River must receive enhanced nutrient removal treatment. Additionally, this is chronologically the last scenario, so this scenario and its options include the cumulative decisions laid out for each of the previous scenarios. In 2035, the influent flow is still projected to be 39 mgd and assuming a mandated 22.3 mgd river discharge, there is still 16.7 mgd available to be sent to RPU. Figure 1.10 shows the first two options that could occur for this scenario in the year 2035. The two options are dependent on whether the MBR treatment train (Plant 1) expansion was implemented in 2028 (Scenario 2).

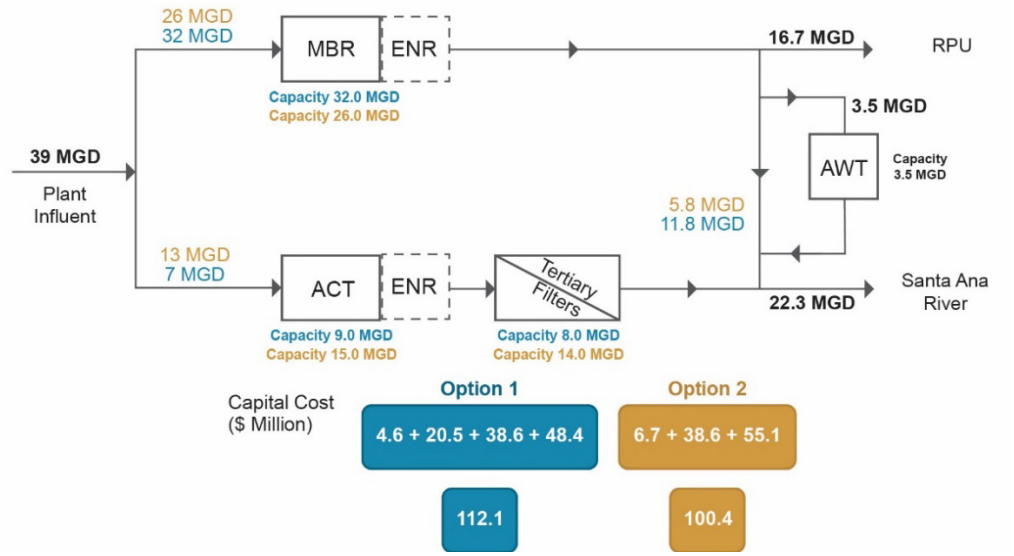


Figure 1.10 Scenario 4: RWQCP Year 2035 Addressing Nutrient Limits Options 1 and 2

1.6.6.1 Option 1: MBR Treatment Train (Plant 1) Expansion and Enhanced Nutrient Removal for Both Plants

In this option, 8 mgd of tertiary filter capacity was provided in 2023, the MBR treatment train (Plant 1) was expanded in 2028, and the MBR treatment train (Plant 1) is run at full capacity (32 mgd) with the remainder of the influent flow (7 mgd) routed to the ACT treatment train (Plant 2). The ACT treatment train (Plant 2) side includes the 8-mgd Tertiary Filters. To meet TDS limits, the AWT was also installed in 2034 as described above. For this scenario, enhanced nutrient removal must be installed for both the MBR treatment train (Plant 1) and the ACT treatment train (Plant 2). This option is presented in blue text on Figure 1.10.

The cost of this option is the summation of Scenario 4, Option 1 costs ($63.7 million = $4.6 + $20.5 + $38.6) and the combined cost ($48.4 million = $24.2 + $24.2) of the 32-mgd MBR treatment train (Plant 1) enhanced nutrient removal project and the 9-mgd capacity ACT treatment train (Plant 2) enhanced nutrient removal project, which equals $112.1 million (Figure 1.10).

1.6.6.2 Option 2: No MBR Treatment Train (Plant 1) Expansion and Enhanced Nutrient Removal for Both Plants

In this option, 14 mgd of tertiary filters was provided for the ACT treatment train (Plant 2) in 2023, the MBR treatment train (Plant 1) was not expanded in 2028, and, therefore, the MBR treatment train (Plant 1) is run at full capacity (26 mgd) with the remainder of the influent flow (13 mgd) routed to the ACT treatment train (Plant 2). To meet TDS limits, the AWT was also installed in 2034 as described above. For this scenario, enhanced nutrient removal must be installed for both the MBR treatment train (Plant 1) and the ACT treatment train (Plant 2). This option is presented in golden text on Figure 1.10.

The cost of this option is the summation of Scenario 3, Option 2 costs, presented above ($45.3 million = $6.7 + $38.6), the combined cost ($55.1 million = $21.1 + $34) of the 26-mgd MBR treatment train (Plant 1) enhanced nutrient removal project, and the 15-mgd ACT treatment train (Plant 2) enhanced nutrient removal project, which equals $100.4 million. Now, the savings achieved by Option 2 equal $11.7 million through the year 2035. Some of the earlier savings are

just due to the higher cost to implement the MBR treatment train (Plant 1) versus a larger tertiary filter project.

1.6.6.3 Option 3: No MBR Treatment Train (Plant 1) Expansion and Enhanced Nutrient Removal for ACT Treatment Train (Plant 2) Only

Figure 1.11 shows an additional option for Scenario 4. This is the same as Scenario 4, Option 2 (Figure 1.10), with two differences: 1) the tertiary filter project is not scaled back and the capacity of the tertiary filters increases to 18.0 mgd; 2) there is an installation of enhanced nutrient removal at the ACT treatment train (Plant 2) and enhanced nutrient removal is not installed for the MBR treatment train (Plant 1). For this option, the ACT treatment train (Plant 2) will be run at full capacity since any flow treated at the MBR treatment train (Plant 1) will not meet the nutrient limits and cannot be discharged to the Santa Ana River. Therefore, 18 mgd will be routed through the ACT treatment train (Plant 2), leaving 21 mgd to be routed through the MBR treatment train (Plant 1). An additional 3.5 mgd from the MBR treatment train (Plant 1) side will go through AWT and be blended in with the ACT treatment train (Plant 2) effluent. AWT not only removes TDS but also nitrogen and phosphorus to concentrations below the anticipated nutrient limits. This will allow 0.8 mgd of MBR treatment train (Plant 1) effluent (that has no enhanced nutrient removal treatment) to be blended with the 18 mgd from the ACT treatment train (Plant 2), and the 3.5 mgd AWT effluent, to meet the Santa Ana River discharge of 22.3 mgd and still meet nutrient limits. The drawback of this scenario is that 16.7 mgd must be taken by RPU, since there will be no enhanced nutrient removal treatment for that flow. This alternative is presented in brown text on Figure 1.11.

The cost of this option is the summation of Scenario 3, Option 2 costs ($45.3 million = $6.7 + $38.6), the cost of an additional 4 mgd (from 14 mgd to 18 mgd) of tertiary filter capacity ($1.2 million), and the cost of the 18 mgd ACT treatment train (Plant 2) enhanced nutrient removal project ($38.4 million), which equals $84.9 million (Figure 1.11).

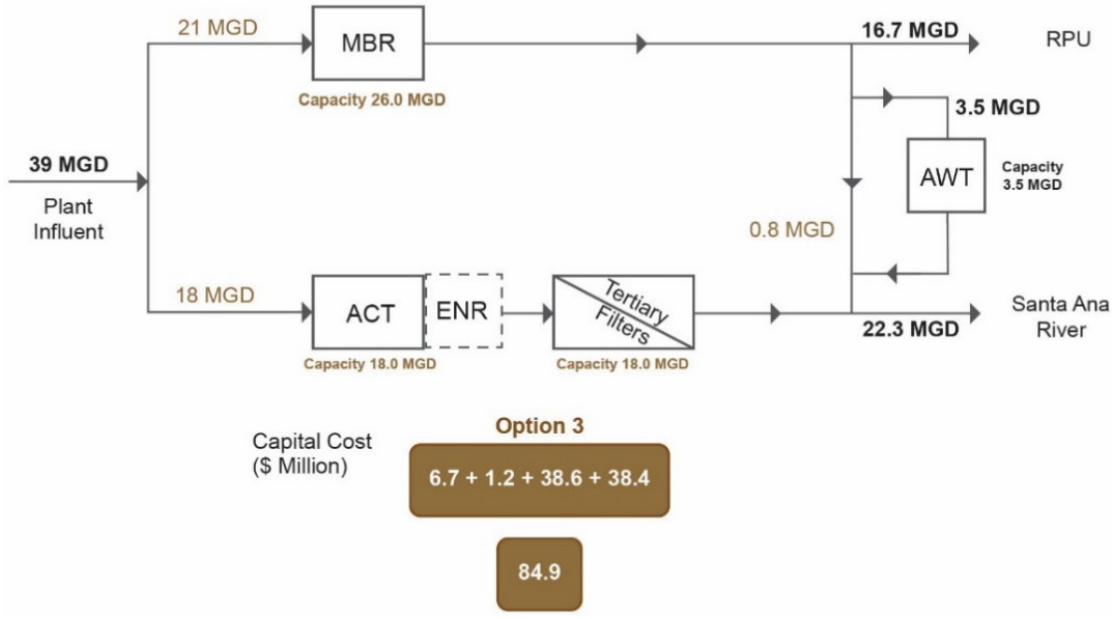


Figure 1.11 Scenario 4: RWQCP Year 2035 Addressing Nutrient Limits Option 3

1.6.6.4 Option 4: MBR Treatment Train (Plant 1) Expansion and Enhanced Nutrient Removal for MBR Treatment Train (Plant 1) Only

Figure 1.12 shows two additional options for Scenario 4. The first of these two options (Option 4) is the same as Scenario 4, Option 1 (Figure 1.10), with two differences: 1) the implementation of enhanced nutrient removal at the MBR treatment train (Plant 1) and not for the ACT treatment train (Plant 2), and 2) Santa Ana discharge flow coming from the MBR treatment train (Plant 1) effluent flow. In this option, a portion (3.7 mgd) of the MBR treatment train (Plant 1) effluent is routed to RPU. However, there is 13 mgd from the ACT treatment train (Plant 2) that needs to be accepted by RPU and cannot be discharged into the Santa Ana River because it will not receive enhanced nutrient removal treatment. This alternative is presented in purple text on Figure 1.12.

The cost of this option is the summation of Scenario 4, Option 1 costs ($63.7 million = $4.6 + $20.5 + $38.6), and the cost of the 32-mgd MBR treatment train (Plant 1) enhanced nutrient removal project ($24.2 million), which equals $87.9 million.

1.6.6.5 Option 5: No MBR Treatment Train (Plant 1) Expansion and Enhanced Nutrient Removal for MBR Treatment Train (Plant 1) Only

Figure 1.12 also shows the fifth option for Scenario 4. This option is the same as Scenario 4, Option 2, with the only difference being the installation of enhanced nutrient removal for the MBR treatment train (Plant 1) and not for the ACT treatment train (Plant 2). In this option, a portion (9.7 mgd) of the MBR treatment train (Plant 1) effluent is routed to RPU. However, there is 7 mgd from the ACT treatment train (Plant 2) that needs to be accepted by RPU and cannot be discharged into the Santa Ana River because it will not receive enhanced nutrient removal treatment. This option is presented in green/teal text on Figure 1.12.

The cost of this option is the summation of Scenario 4, Option 2 costs ($45.3 million = $6.7 + $38.6), and the cost of the 26 mgd MBR treatment train (Plant 1) enhanced nutrient removal project ($21.1 million), which equals $66.4 million.

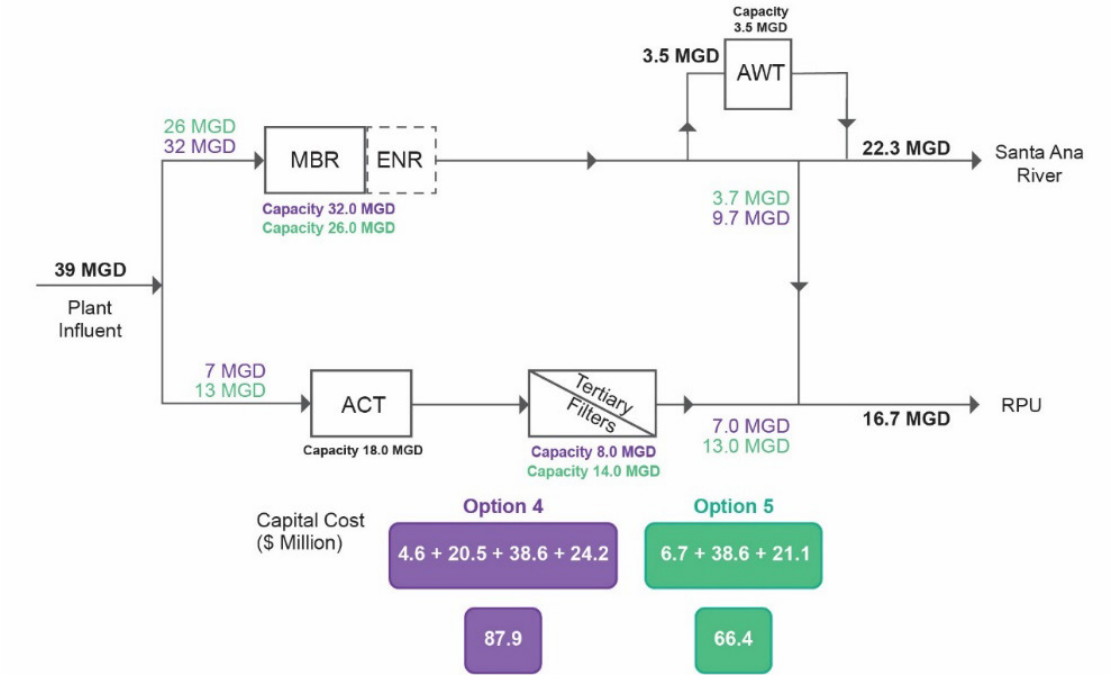


Figure 1.12 Scenario 4: RWQCP Year 2035 Addressing Nutrient Limits Options 4 and 5

1.6.6.6 Option 6: MBR Treatment Train (Plant 1) Expansion and Enhanced Nutrient Removal for MBR Treatment Train (Plant 1) Only, and Modified AWT on ACT Treatment Train (Plant 2) Effluent

Figure 1.13 shows the sixth option for Scenario 4. This option is an alternative of Scenario 4, Option 4. In this option, AWT receives flow from the ACT treatment train (Plant 2) side. This would require an MF unit to be installed upstream of the AWT RO facility. The AWT in this option provides two benefits to the 3.5 mgd routed from the ACT treatment train (Plant 2) side: 1) removes TDS and 2) removes TN and TP to concentrations below the anticipated nutrient limits. This slight modification allows a larger portion (13.2 mgd) of the MBR treatment train (Plant 1) effluent to be routed to RPU. Additionally, this alternative has a smaller portion (3.5 mgd) that has not undergone enhanced nutrient removal treatment and must be accepted by RPU. This option is presented in orange text on Figure 1.13.

The cost of this option is the summation of Scenario 2, Option 1 costs ($25.1 million = $4.6 + $20.5), the cost of the AWT project with an upstream MF ($43.7 million), and the cost of the 32-mgd MBR treatment train (Plant 1) enhanced nutrient removal project ($24.2 million), which equals $93.0 million.

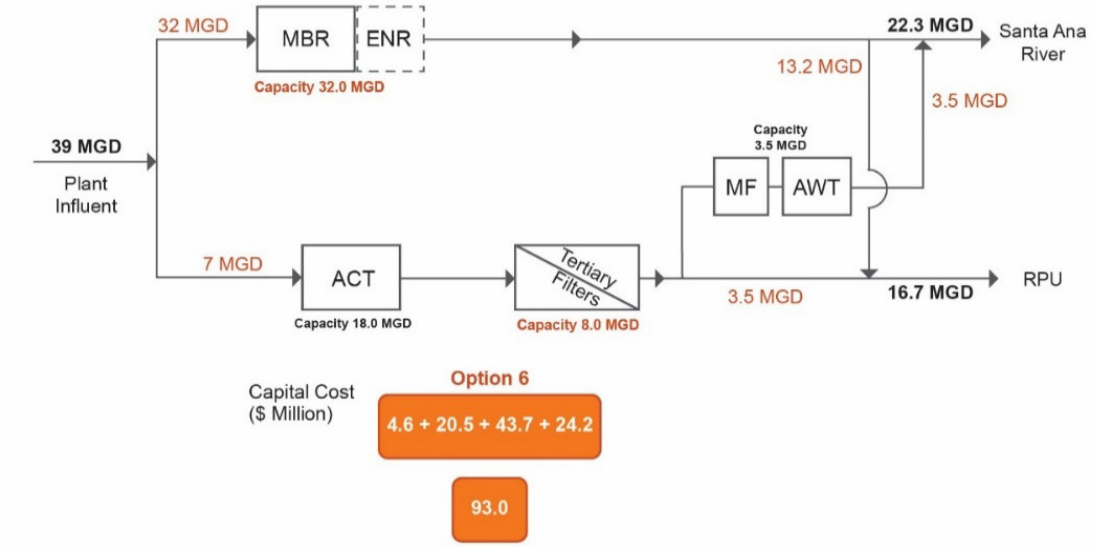


Figure 1.13 Scenario 4: RWQCP Year 2035 Addressing Nutrient Limits Option 6

1.6.7 Summary of Scenarios/Options

Figure 1.14 shows a summary of the costs for Options 1 through 5 for Scenario 4 (2035 Addressing Nutrient Limits). Please note that the costs for the Scenario 4 options in the Figure collectively include the costs of the options for Scenario 1 (2023 Tertiary Filter project), Scenario 2 (2028 MBR Treatment Train (Plant 1) Expansion) and Scenario 3 (2034 Addressing TDS Limits). In this case, the lowest cost option is Scenario 4, Option 5 (Figure 1.14), for $66.4 million, which is the option that includes enhanced nutrient removal on the MBR treatment train (Plant 1) only, the AWT, and does not include an MBR treatment train (Plant 1) expansion. The highest cost option is Scenario 4, Option 1 (Figure 1.10), for $112.1 million, which is the option that includes the MBR treatment train (Plant 1) expansion, the AWT, and enhanced nutrient removal on both treatment trains.

	Assumption: RPU takes all available recycled water in excess of 25,000 AFY to Santa Ana River (Scenario 4 - Year 2035 Nutrient Limits)	
Unit: $ Million	MBR Expansion Tertiary Filters 8 MGD	No MBR Expansion Tertiary Filters 14 MGD
ENR on Both	**Option 1 112.1**	**Option 2 100.4**
ENR on ACT only		**Option 3 84.9**
ENR on MBR only	**Option 4 87.9**	**Option 5 66.4**

Figure 1.14 Summary of Costs for Scenario 4 Options 1 - Option 5

As previously mentioned, the four scenarios, and their various options that are presented, make the following two major assumptions: 1) RPU will take all available water over and above that discharged to the Santa Ana River to meet mandated flow, and 2) the Santa Ana River mandated discharge is 25,000 AFY (22.3 mgd).

1.6.7.1 RPU Commitment

As noted during a workshop with the City on January 31, 2018, RPU is in the process of laying infrastructure that could pump 5,000 AFY (4.46 mgd) of effluent from the RWQCP for recycled water uses. However, it may not be prudent to assume that RPU will be able to accept all or any of the recycled water that is available from the RWQCP. A conservative approach would be to assume that RPU cannot be relied upon to always accept effluent from the RWQCP. Figure 1.15 includes the costs for the same scenarios and options that are included on Figure 1.14, with the assumption that RPU cannot accept all of the recycled water. In this case, enhanced nutrient removal must be installed on both the MBR treatment train (Plant 1) and the ACT treatment train (Plant 2) because all of the water that goes to the river needs to have enhanced nutrient removal.

This means that if RPU is not able to accept all of the water that is above the 25,000 AFY requirement, then the lowest cost option is $93.0 million, which is Scenario 4, Option 6 (Figure 1.13), and includes 8 mgd of tertiary filters, the MBR treatment train (Plant 1) expansion, the AWT (preceded by MF) on the ACT treatment train (Plant 2) side, and enhanced nutrient removal on the MBR treatment train (Plant 1) only. It should be noted that RPU must accept 5,000 AFY at a minimum to make this feasible. If not, then the lowest cost option is Scenario 4, Option 2 (Figure 1.10), for $100.4 million, which does not include an MBR treatment train (Plant 1) expansion, but does include the AWT, and enhanced nutrient removal on both treatment trains. The highest cost option is Scenario 4, Option 1 (Figure 1.10), for $112.1 million, which is the option that includes the MBR treatment train (Plant 1) expansion, the AWT, and enhanced nutrient removal on both treatment trains.

	Assumption: RPU does not take all available recycled water in excess of 25,000 AFY to Santa Ana River (Scenario 4 - Year 2035 Nutrient Limits)	
Unit: $ Million	MBR Expansion Tertiary Filters 8 MGD	No MBR Expansion Tertiary Filters 14 MGD
ENR on Both	**Option 1 112.1**	**Option 2 100.4**
ENR on ACT only		**Not Applicable All water to the river has to have nutrients removed**
ENR on MBR only	**Option 6 93.0***	**Not Applicable All water to the river has to have nutrients removed**

* Requires 3.5 MGD to be pumped to RPU

Figure 1.15 Scenario 4 Options Costs That do not Require RPU to Take all Available Recycled Water

1.6.7.2 Santa Ana River Commitment

The City is considering whether to enter into negotiations to reduce the mandated discharge to the Santa Ana River from 25,000 AFY (22.3 mgd) back to 15,000 AFY (13.4 mgd), which was the mandated discharge until recently. If the negotiations are successful for the City then there could potentially be less river discharge. This would have two outcomes: 1) there will be more recycled water available for RPU; 2) a smaller AWT project would be necessary to reduce TDS levels in the Santa Ana River discharge (only if RPU takes all remaining RWQCP effluent).

Assuming that the mandated discharge is reduced to 15,000 AFY, then in the case that RPU takes all remaining water, a smaller AWT facility could be provided. This will cut the cost of the AWT project by $11.2 million. Similar to Figure 1.14, Figure 1.16 shows a summary of the costs for Options 1 through 5 for Scenario 4 (2035 Addressing Nutrient Limits) with the lower AWT costs. As a reminder, the options presented on Figure 1.16 still assume that RPU will accept all of the recycled water that is above the mandated Santa Ana River discharge amount of 13.4 mgd.

	Assumption: RPU takes all available recycled water in excess of 15,000 AFY to Santa Ana River (Scenario 4 - Year 2035 Nutrient Limits)	
Unit: $ Million	MBR Expansion Tertiary Filters 8 MGD	No MBR Expansion Tertiary Filters 14 MGD
ENR on Both	**Option 1 100.9**	**Option 2 89.2**
ENR on ACT only		**Option 3 73.7**
ENR on MBR only	**Option 4 76.7**	**Option 5 55.2**

Figure 1.16 Scenario 4 Options Costs that Assume 15,000 AF Santa Ana River Discharge

Continuing with the idea that it may not be prudent to assume that RPU will accept all of the water above the mandated discharge amount (13.4 mgd in this case), Figure 1.17 was developed to summarize these costs. The costs on Figure 1.17, and also the makeup of those costs, are the same that were presented for Figure 1.15. Enhanced nutrient removal must be implemented on both the MBR treatment train (Plant 1) and the ACT treatment train (Plant 2) because all of the water that goes to the river needs to have enhanced nutrient removal. This means that if RPU does not accept all of the water that is above the 15,000 AFY (13.4 mgd) requirement, then the lowest cost option is $93.0 million, which is Scenario 4, Option 6 (Figure 1.13), and includes the 8-mgd tertiary filter project, the MBR treatment train (Plant 1) expansion, the AWT (preceded by MF) on the ACT treatment train (Plant 2) side, and enhanced nutrient removal on the MBR treatment train (Plant 1) only. Again, it should be noted that RPU must accept 5,000 AFY at a minimum to make this feasible. If not, then the lowest cost option is Scenario 4, Option 2 (Figure 1.10), for $100.4 million, which does not include an MBR treatment train (Plant 1) expansion, but does include the AWT, and enhanced nutrient removal on both treatment trains. The highest cost option is Scenario 4, Option 1 (Figure 1.10), for $112.1 million, which is the option that includes the MBR treatment train (Plant 1) expansion, the AWT, and enhanced nutrient removal on both treatment trains.

	Assumption: RPU does <u>not</u> all available recycled water in excess of 15,000 AFY to Santa Ana River (Scenario 4 - Year 2035 Nutrient Limits)	
Unit: $ Million	MBR Expansion Tertiary Filters 8 MGD	No MBR Expansion Tertiary Filters 14 MGD
ENR on Both	**Option 1 112.1**	**Option 2 100.4**
ENR on ACT only		**Not Applicable All water to the river has to have nutrients removed**
ENR on MBR only	**Option 6 93.0***	**Not Applicable All water to the river has to have nutrients removed**

* Requires 3.5 mgd to be pumped to RPU

Figure 1.17 Scenario 4 Options Costs that Do Not Require RPU to Take All Available Recycled Water

1.6.8 Treatment Facilities' CIP Scenario Summary

In summary, there were four scenarios, with multiple options, that were presented in this Chapter. Based on the analyses, developing the final CIP comes down to making two important decisions:

1. Should the CIP be based on the City expanding the MBR treatment train (Plant 1) or completing a larger Tertiary Filter project?
2. Should the CIP be based on the City assuming that RPU will accept all of the recycled water that is above the mandated flow requirement to the Santa Ana River (either 25,000 AFY [22.3 mgd] or 15,000 [13.4 mgd])?

Figure 1.18 shows the range of CIP costs for the three scenarios and their various options that occur for both the MBR treatment train (Plant 1) and no MBR treatment train (Plant 1) expansion options, and, at the same time, the range of costs that occur depending on how much recycled water RPU will accept. Additionally, the far-right column of Figure 1.18 shows the CIP costs that occur if the mandated discharge to the Santa Ana River is reduced to 15,000 AFY (13.4 mgd).

There are two main takeaways from Figure 1.18. First, the MBR treatment train (Plant 1) expansion is more expensive than a larger Tertiary Filter project (no MBR treatment train (Plant 1) expansion). Second, the more water that RPU is willing to accept, the lower the CIP scenario costs become. However, considering that this is a master planning exercise, the most conservative scenario was selected, which is Scenario 4, Option 1, for a total combined cost of $112.1 million. This option gives the RWQCP the flexibility to function without any RPU commitment constraints or a change in the Santa Ana River discharge. It also allows the City to continue the philosophy of using the MBR treatment train (Plant 1) to treat flows to be in a better position to meet short term regulatory requirements (e.g., TDS effluent limits) as they are exceeded, and future regulatory requirements (e.g., limits on constituents of emerging concern) as they are implemented. Since this is a planning exercise and further analysis will be completed during preliminary design, before final design is begun for any of the projects that result from the analyses, this is the prudent decision to make. Based on this decision and the scenario analyses, the proposed CIP budget was reduced by approximately $21 million from the original one presented in Table 1.1. A summary of the updated CIP project list with the $21 million removed from the initial project list is presented in Table 1.12. Note that Table 1.12 includes the two new projects discussed earlier and the most expensive scenario (Scenario 4, Option 1) evaluated. As a result, project numbers were adjusted.

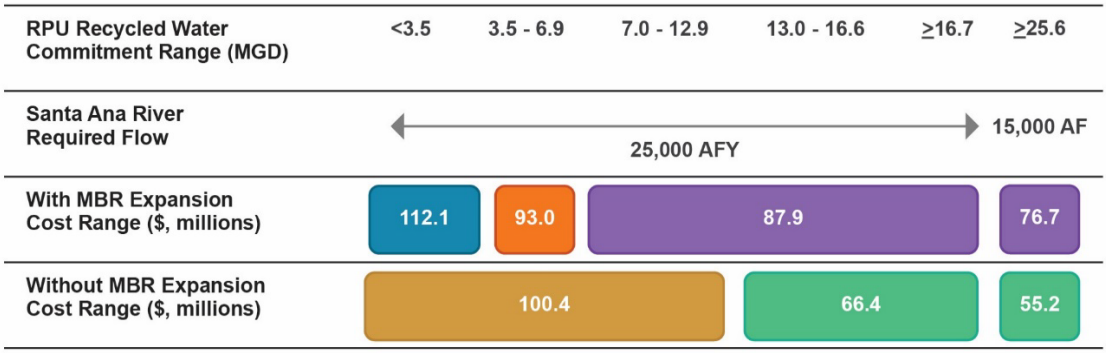


Figure 1.18 CIP Scenario Summary

Table 1.12 Project List with Scenario 4 Option 1 Implemented

Project No.	Project Name	Project Cost
FI-01	Influent Flow Metering Project	$6,226,800
FI-02	Headworks Rehabilitation	$8,782,600
FI-03	Headworks Screening Conveyor Replacement	$933,700
FI-04	Headworks Bypass	$1,070,600
FI-05	Headworks Grit Classifiers and Pumps	$1,855,700
FI-06	MBR Phase II Expansion	$20,517,500
FI-07	MBR Enhanced Nutrient Removal	$24,207,600
FI-08	ACT Rehabilitation	$3,384,000
FI-09	ACT Mixers Rehabilitation	$532,000
FI-10	ACT RAS/WAS Pump Station Rehabilitation	$2,073,200
FI-11	ACT RAS/WAS Pumps Replacement	$1,142,000
FI-12	ACT Enhanced Nutrient Removal	$24,205,000
FI-13	Tertiary Filter Replacement and CCB Retrofits	$6,119,100
FI-14	CCB Rehabilitation	$1,005,300
FI-15	First Primary Sludge Pumping Rehabilitation	$1,876,200
FI-16	Second Primary Sludge Pumping Rehabilitation	$749,500
FI-17	WAS Thickening Project	$8,028,800
FI-18	First AWT Project	$38,615,700
FI-19	Levee Rehabilitation Phase II	$9,364,800
Facility CIP Total		**$160,690,200**

Figure 1.19 summarizes the schedule for the RWQCP CIP projects. Figure 1.20 shows an aerial view of the RWQCP which summarizes the areas within the plant where various CIP projects will be undertaken over the planning period (through 2037). Table 1.12 summarizes the costs for these projects. Figure 1.20 also includes some Renewable Resource Projects (items 10 in blue). These projects are related to the Public Works Department's Renewable Resource Management plan. They are not part of the update to the Master Plan, but are included here for completeness, since they are part of planned plant improvements and address some of the issues identified in Volume 2, Chapter 2 related to Regulatory and Climate Change impacts. The projects are being proposed in support of the City's Sustainability and Resilient Riverside policy committing the City to go green in areas including energy, GHG emissions, and water.

These Figures and Tables are updated based on the $21 million savings that resulted from the selection of Scenario 4, Option 1. In summary, the savings result from the items listed below.

- Moving the Second AWT project out of the planning period as previously described ($18.6 million).
- Reducing the size of the enhanced nutrient removal project for the ACT treatment train (Plant 2) from 18 mgd to 9 mgd ($14.2 million).
- Reducing the size of the tertiary filter project from 16 mgd to 8 mgd ($3.3 million).

Although $36 million was saved as detailed in the above three changes, two projects totaling $15.6 million were added to the CIP (the Influent Flow Metering (FI-01) and the Levee Rehabilitation Phase II (FI-02) projects). Figure 1.21 is a bar chart that shows a summary of the annual CIP costs for the RWQCP throughout the planning period.

Project No.	Project Name	Project Cost Estimate (2017)	Project Start	Project Completion
FI-01	Influent Flow Metering Project	$ 6,226,800	12/31/2020	12/31/2024
FI-02	Headworks Rehabilitation	$ 8,782,600	12/31/2020	12/31/2024
FI-03	Headworks Screening Conveyor Replacement	$ 933,700	12/31/2020	12/31/2024
FI-04	Headworks Bypass	$ 1,070,600	12/31/2020	12/31/2024
FI-05	Headworks Grit Classifiers and Pumps	$ 1,855,700	12/31/2030	12/31/2034
FI-06	MBR Phase II Expansion	$ 20,517,500	12/31/2023	12/31/2029
FI-07	MBR Enhanced Nutrient Removal	$ 24,207,600	1/1/2030	12/31/2036
FI-08	ACT Rehabilitation	$ 3,384,000	12/31/2020	12/31/2024
FI-09	ACT Mixers Rehabilitation	$ 532,000	12/31/2030	12/31/2034
FI-10	ACT RAS/WAS Pump Station Rehabilitation	$ 2,073,200	12/31/2020	12/31/2024
FI-11	ACT RAS/WAS Pumps Replacement	$ 1,142,000	12/31/2030	12/31/2034
FI-12	ACT Enhanced Nutrient Removal	$ 24,205,000	1/1/2030	12/31/2036
FI-13	Tertiary Filter Replacement and CCB Retrofits	$ 6,119,100	1/1/2021	12/31/2023
FI-14	CCB Rehabilitation	$ 1,005,300	12/31/2030	12/31/2034
FI-15	First Primary Sludge Pumping Rehabilitation	$ 1,876,200	12/31/2019	12/31/2023
FI-16	Second Primary Sludge Pumping Rehabilitation	$ 749,500	12/31/2028	12/31/2032
FI-17	WAS Thickening Project	$ 8,028,800	12/31/2020	12/31/2024
FI-18	First AWT Project	$ 38,615,700	1/1/2028	12/31/2034
FI-19	Levee Rehabilitation Phase II	$ 9,364,800	12/31/2024	12/31/2031

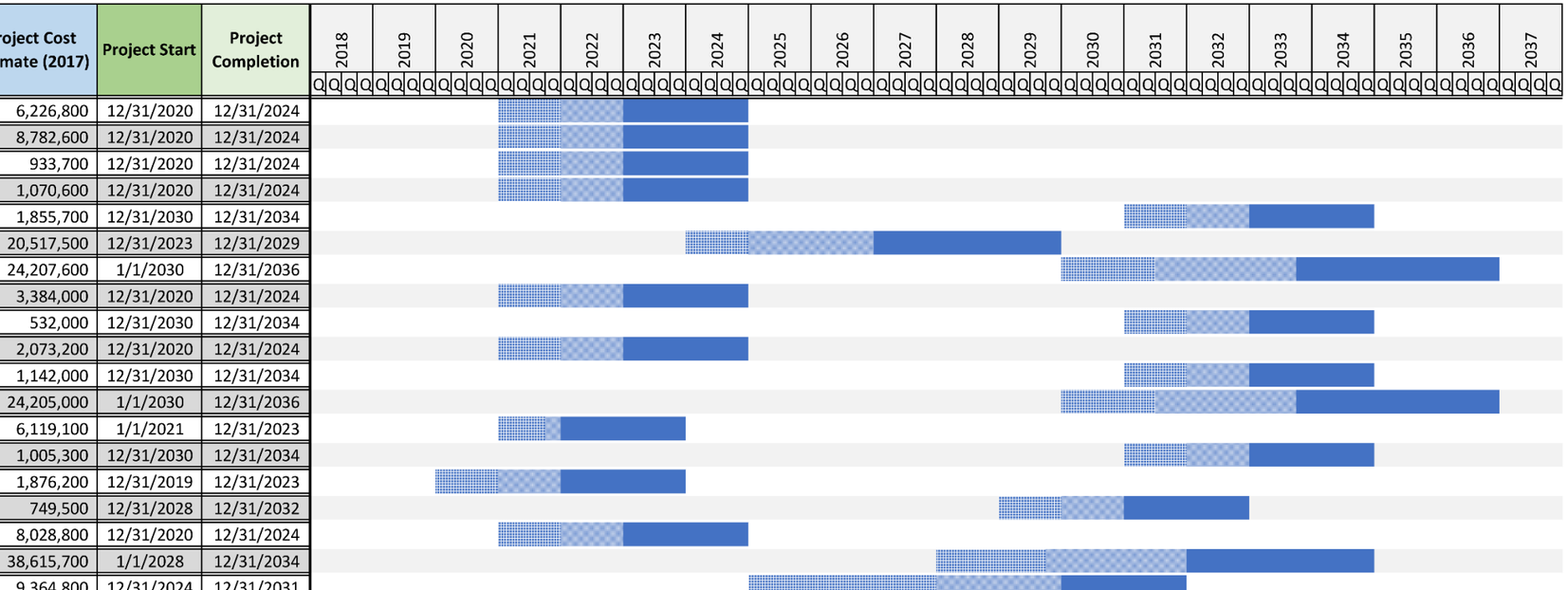


Figure 1.19 2019 Updated Project Schedule (after prioritization step)

Figure 1.20 RWQCP CIP Projects

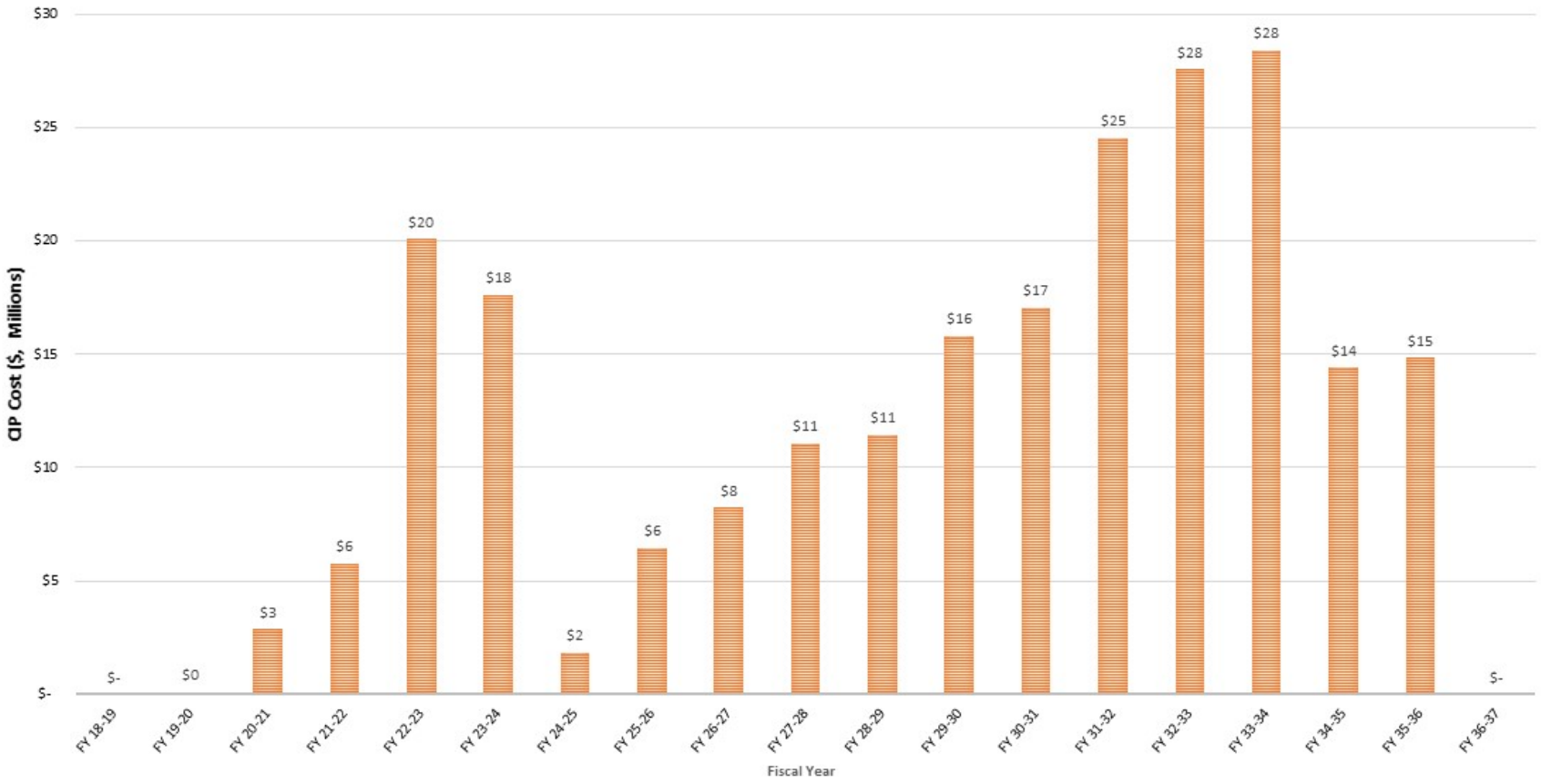


Figure 1.21 2019 Final RWQCP Treatment CIP Annual Expenditure with Scenario 4 Option 1 Implemented

1.7 Overall CIP Summary and User Rate Impacts

1.7.1 Overall CIP Summary

Figure 1.22 is a bar chart that shows a summary of the annual CIP costs for both the RWQCP (Treatment Facilities - orange bars - including the cost updates imparted from Scenario 4, Option 1) and the Collection System (blue bars - details are provided in Volume 3, Chapter 10). The overall CIP costs are shown below.

- RWQCP CIP costs for the planning period - $160.7 million (not escalated).
- Collection System CIP costs for the planning period - $339.5 million (not escalated).
- Total CIP costs for the planning period - $500.2 million (not escalated).

It should be noted that, while the RWQCP CIP was being adjusted, the Collection System CIP was also adjusted significantly. In the initial summary discussed in Section 1.5, the Collection System CIP was $361 million. After changes discussed in Volume 3, Chapter 10, the revised Collection System CIP is approximately $340 million.

1.7.2 CIP Summary Rate Impacts

The values presented on Figure 1.22 were used to establish the impacts on user rates and financial approaches for the combined CIP. Details are presented in Volume 8, Chapter 1, Financial Plan and User Rates and Fees.

1.8 Chapter Summary

The development of this Chapter began with an initial list of projects that were identified for the Collection System and the RWQCP (Treatment Facilities) during the preparation of the other various Volumes and Chapters that are part of the update to the Master Plan. This list was compiled by going through a series of six steps.

- Data Collection.
- Population, Flow, and Loading Projections.
- Condition Assessment.
- Regulatory Analysis.
- Process Capacity Modeling.
- Alternative Studies.

Once the list was compiled, an initial CIP was developed. The list included a total CIP cost of approximately $542 million for both Collection System and RWQCP projects. A prioritization process was undertaken to the initial CIP to help optimize the use of City funds for the projects. The prioritization process involved looking at potential user rate impacts from the CIP and evaluating several lower cost project scenarios for the CIP. Based on the prioritization process, the original CIP adjusted to a new total of approximately $500 million (about an 8-percent adjustment).

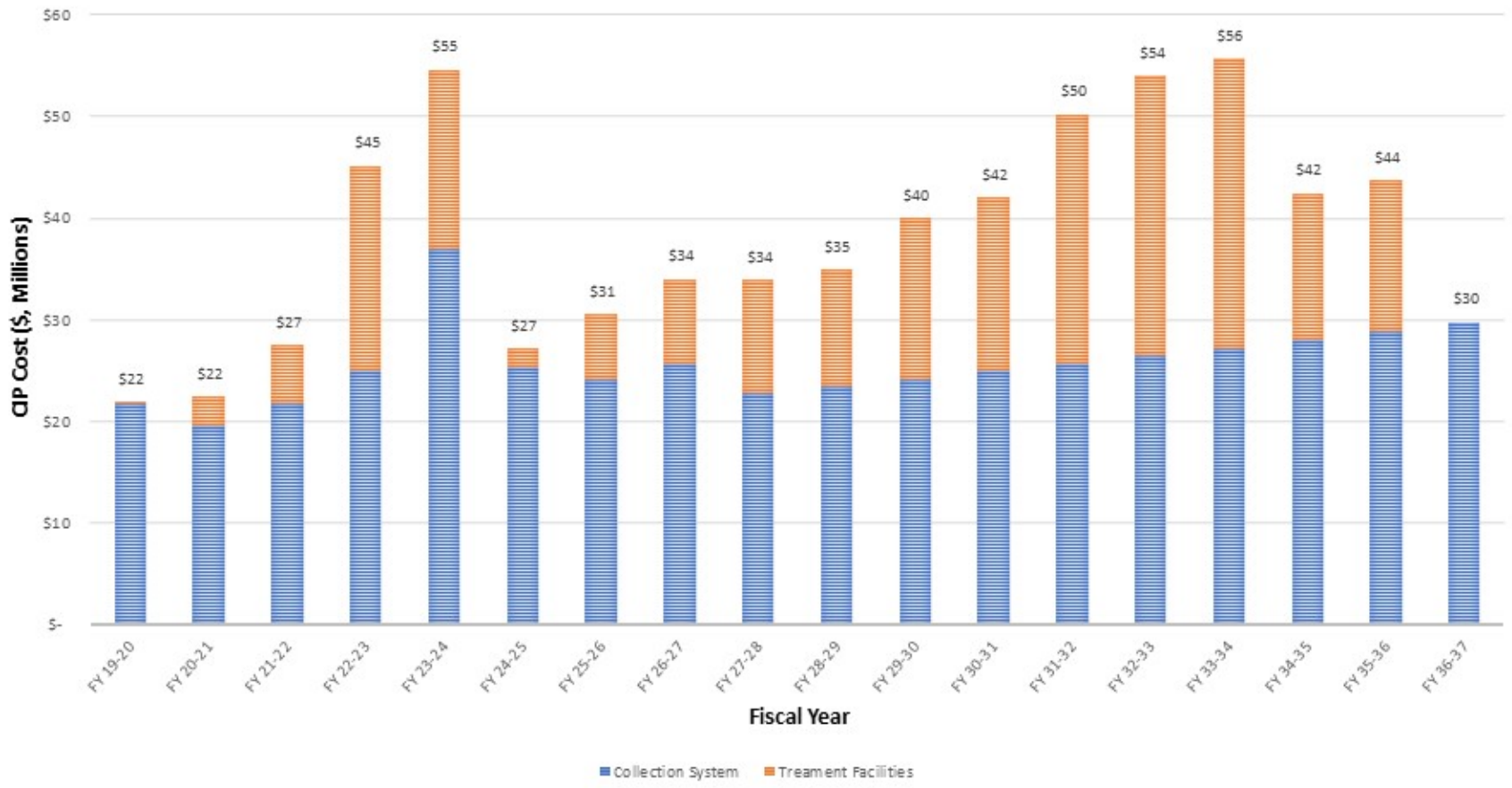


Figure 1.22 2019 Final CIP Annual Expenditure (after prioritization step)

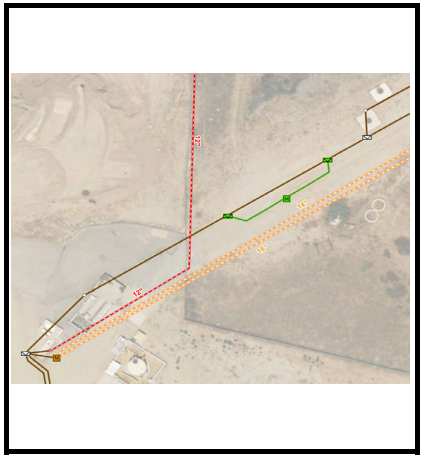
Appendix 1A

RWQCP TREATMENT FACILITIES PROJECT DESCRIPTIONS

City of Riverside
Update of the Integrated Master Plan for the Wastewater Collection System and Treatment Facilities

CAPITAL IMPROVEMENT PLAN

Project Identification: FI-01
Project Name: Influent Flow Metering Project
Process Area: Preliminary Treatment
Date Required Online: 12/31/2024



Problem Statement:

Despite steady population growth in the RWQCP's service area between 2005 and 2013, influent flows were on a relatively flat or declining trend. The Acorn, Arlanza, and Santa Ana (Riverside/Hillside) influent Trunk lines were hydraulically modeled to determine if each line had sufficient capacity. Hydraulic calculations showed that surcharge or near surcharge conditions may occur under high flow scenarios for all of the RWQCP's influent lines under the existing conditions at the time. A study was conducted indicating that proposed metering facilities would increase hydraulic losses in the lines, and may increase the likelihood of surcharge conditions. A bypass channel should be installed at the headworks to prevent flooding at the metering facility and all flow meters should be upgraded to electromagnetic flow meters.

Project Description:

This project requires: (1) Creation of a bypass channel in the Acorn 27" line and install a 16" electromagnetic flow meter; (2) Creation of a bypass channel in the Arlanza 51" line and install a 36" electromagnetic flow meter; (3) Creation of a bypass channel in the Santa Ana (Riverside/Hillside) 48" line and install a 36" electromagnetic flow meter.

Project Name	Project Cost ($)	Project Duration (Years)	Project Start (Year)	Project Completion (Year)
Influent Flow Metering Project	$ 6,226,800	4	12/31/2020	12/31/2024

Reimbursement Category	Percent	Cost ($)
Existing Improvements	100%	$ 6,226,800
Future Improvements	0%	$ -
New Development Service Improvements	0%	$ -
Total		$ 6,226,800

CAPITAL IMPROVEMENT PLAN

Project Identification: FI-02
Project Name: Headworks Rehabilitation
Process Area: Preliminary Treatment
Date Required Online: 12/31/2024

Problem Statement:

The current headworks area at the RWQCP was constructed in 1999 and consists of the screening room, blower room, electrical room, grit chambers, and grit pumping room. The headworks area has not received a major mechanical rehabilitation since its construction and mechanical components are showing varying levels of deterioration. The bar screens are now 18 years old and have become a maintenance problem and staff are concerned about the ability to find replacement parts. The air ducts in the screening room are corroded. The grit pump room has access hatch safety concerns and the T-Lock lining on the influent channels have failed in some areas. The septage receiving station adjacent to the headworks has many corroded components. More details provided in Volume 6, Chapter 1 - Plant Condition Assessment.

Project Description:

This project requires: (1) the replacement of the metal ducts in the screening room and the repairing of the coating on the FRP ducts; (2) the replacement of all electrical components that do not meet appropriate classification with hazardous rated equipment and seal all conduits.(3) the replacement of the bar screens and slide gates; (4) the installation of permanent stairs and landings for the grit classifiers and elevated equipment; (5) the replacement of the damaged hatch to the grit room and installation of fall protection for the opening; (6) the replacement of the plate covers with traffic-rated hatches and install vehicle bollards; (7) the replacement of corroded septage receiving station components.

Project Name	Project Cost ($)	Project Duration (Years)	Project Start (Year)	Project Completion (Year)
Headworks Rehabilitation	$ 8,782,600	4	12/31/2020	12/31/2024

Reimbursement Category	Percent	Cost ($)
Existing Improvements	100%	$ 8,782,600
Future Improvements	0%	$ -
New Development Service Improvements	0%	$ -
Total		$ 8,782,600

CAPITAL IMPROVEMENT PLAN

Project Identification: FI-03
Project Name: Headworks Screening Conveyor Replacement
Process Area: Preliminary Treatment
Date Required Online: 12/31/2024

Problem Statement:

The current headworks area at the RWQCP was constructed in 1999 and consists of the screening room, blower room, electrical room, grit chambers, and grit pumping room. The headworks area has not received a major mechanical rehabilitation since its construction and there are varying levels of deterioration for the mechanical components within this process area. As part of the condition assessment discussed in Volume 6, Chapter 1, the existing shaftless screw conveyors were identified for replacement due to excessive corrosion and general poor condition. More details is also provided in Volume 4, Chapter 4 - Preliminary Treatment.

Project Description:

This project requires the replacement of the shaftless screw screening conveyers.

Project Name	Project Cost ($)	Project Duration (Years)	Project Start (Year)	Project Completion (Year)
Headworks Screening Conveyor Replacement	$ 933,700	4	12/31/2020	12/31/2024

Reimbursement Category	Percent	Cost ($)
Existing Improvements	100%	$ 933,700
Future Improvements	0%	$ -
New Development Service Improvements	0%	$ -
Total		$ 933,700

City of Riverside
Update of the Integrated Master Plan for the Wastewater Collection System and Treatment Facilities

CAPITAL IMPROVEMENT PLAN

Project Identification: FI-04
Project Name: Headworks Bypass
Process Area: Preliminary Treatment

Date Required Online: 12/31/2024

Problem Statement:

The headworks facilities was constructed in 1999 and includes screening and grit removal facilities for the protection of downstream equipment and processes. Currently, there is no bar screen bypass channel or standby grit handling system (grit chamber, pumping, or washing system). However, flow can be routed to bypass the grit chambers when a unit is out of service. Under the current method of operation, all four bar screens operate continuously. Furthermore, experience has shown that when one bar screen blinds (i.e., becomes clogged by debris), the remaining screens blind shortly afterward leading to a flooded headworks. A headworks bypass channel is recommended to bypass the screens and grit basins entirely because unscreened influent can clog the grit pipes. More details is provided in Volume 4, Chapter 4 - Preliminary Treatment.

Project Description:

This project requires the installation of a bypass structure outside of the existing Headworks facility. The new bypass structure would be installed at the same location as the existing Acorn/Arlanza flowmeter and sampling structure, intercepting the Acorn/Arlanza influent line. This bypass channel would then tie-in to the effluent discharge side of the south grit chamber bypassing the entire headworks. Automatic gates would be required to facilitate bypass operation.

Project Name	Project Cost ($)	Project Duration (Years)	Project Start (Year)	Project Completion (Year)
Headworks Bypass	$ 1,070,600	4	12/31/2020	12/31/2024

Reimbursement Category	Percent	Cost ($)
Existing Improvements	100%	$ 1,070,600
Future Improvements	0%	$ -
New Development Service Improvements	0%	$ -
Total		$ 1,070,600

CAPITAL IMPROVEMENT PLAN

Project Identification: FI-05
Project Name: Headworks Grit Classifiers and Pumps
Process Area: Preliminary Treatment
Date Required Online: 12/31/2034

Problem Statement:

The current headworks area at the RWQCP was constructed in 1999 and consists of the screening room, blower room, electrical room, grit chambers, and grit pumping room. The headworks area has not received a major mechanical rehabilitation since its construction and there are varying levels of deterioration for the mechanical components within this process area. The grit chambers and grit pumping room underwent a condition assessment in 2017, and the findings recommended replacement of mechanical equipment in the next 20 years. More details provided in Volume 6, Chapter 1 - Plant Condition Assessment.

Project Description:

This project requires the replacement of: (1) Grit snails, grit classifiers (slurry cups), and grit conveyor; (2) Grit pumps; (3) Motor Control Center (MCC).

Project Name	Project Cost ($)	Project Duration (Years)	Project Start (Year)	Project Completion (Year)
Headworks Grit Classifiers and Pumps	$ 1,855,700	4	12/31/2030	12/31/2034

Reimbursement Category	Percent	Cost ($)
Existing Improvements	100%	$ 1,855,700
Future Improvements	0%	$ -
New Development Service Improvements	0%	$ -
Total		$ 1,855,700

CAPITAL IMPROVEMENT PLAN

Project Identification: FI-06
Project Name: MBR Phase II Expansion
Process Area: Secondary Treatment
Date Required Online: 12/31/2029

Problem Statement:

The current trend of water conservation resulted in lower influent flows to the RWQCP than was previously anticipated. The lower flows compounded with the City's desire to reduce O&M costs has led to plans for increasing influent flows that are sent to the MBR Train (Plant 1) and decreasing the flows that are sent to the Activated Sludge Treatment Train (Plant 2). As part of the switch over, the City is considering expanding the current MBR (Plant 1) to 32 mgd. These expansion plans were previously developed during the Phase I expansion (which was completed in the summer of 2017) and were referred to as the "Phase II" expansion. Implementation of the Phase II expansion will increase the MBR (Plant 1) treatment capacity from 26 mgd to 32 mgd. More details provided in Volume 4, Chapter 6 - Secondary Treatment.

Project Description:

This project requires: (1) the addition of one new fine screen in a space provided for in the fine screen facility; (2) the addition of one new (sixth) aeration basin in a space provided for in the Phase I design; (3) the addition of a new aeration blower in the space provided for in the Phase I design; (4) the addition of membrane cassettes in slots provided for in the Phase I design; (5) the addition of one scour aeration blower in a space provided for in the Phase I design; (6) the addition of one Return Activated Sludge recycle pump in a space provided for in the Phase I design.

Project Name	Project Cost ($)	Project Duration (Years)	Project Start (Year)	Project Completion (Year)
MBR Phase II Expansion	$ 20,517,500	6	12/31/2023	12/31/2029

Reimbursement Category	Percent	Cost ($)
Existing Improvements	100%	$ 20,517,500
Future Improvements	0%	$ -
New Development Service Improvements	0%	$ -
Total		$ 20,517,500

City of Riverside
Update of the Integrated Master Plan for the Wastewater Collection System and Treatment Facilities

CAPITAL IMPROVEMENT PLAN

Project Identification: FI-07
Project Name: MBR Enhanced Nutrient Removal
Process Area: Secondary Treatment
Date Required Online: 12/31/2036

Problem Statement:

The EPA and other states have enacted more restrictive nutrient standards to protect aquatic organisms. California is in the process of a similar effort. Because of the anticipated Nutrient Policy a consensus was reached with the City Staff at a workshop on March 7th, 2017 that there is reason to believe nitrogen and phosphorous limits will be set at 3 mg/L Total Nitrogen (TN) and 1 mg/L Total Phosphorous (TP), respectively. In addition, an estimated enforcement date of 2035 for these nutrient limits was agreed upon. Therefore, an Enhanced Nutrient Removal upgrade of the existing MBR (Plant 1) is required to reach these new nutrient limits. More details provided in Volume 4, Chapter 6 - Secondary Treatment.

Project Description:

This project requires: (1) the construction of a new MBR Screening Facility; (2) demolition the existing MBR Screening Facility; (3) the reconfiguration of the existing anoxic zones as staged anaerobic zones; (4) the rerouting of the internal mixed liquor recycle to the anoxic zone; (5) the retrofit of the aeration basins for methanol addition; (6) the construction of methanol storage; (7) the addition of one new (seventh) aeration basin.

Project Name	Project Cost ($)	Project Duration (Years)	Project Start (Year)	Project Completion (Year)
MBR Enhanced Nutrient Removal	$ 24,207,600	7	12/31/2029	12/31/2036

Reimbursement Category	Percent	Cost ($)
Existing Improvements	100%	$ 24,207,600
Future Improvements	0%	$ -
New Development Service Improvements	0%	$ -
Total		$ 24,207,600

CAPITAL IMPROVEMENT PLAN

Project Identification: FI-08
Project Name: ACT Rehabilitation
Process Area: Secondary Treatment

Date Required Online: 12/31/2024

Problem Statement:

Biological treatment for the ACT (Plant 2) consists of six aeration basins and 4 secondary clarifiers. Aeration basins 1 and 2 were installed in 1967, aeration basins 3 and 4 were installed in 1979, and aeration basins 5 and 6 were installed in 1986. Each aaeration basin contains baffles, diffusers, inlet and outlet gates, mixers, and MLR pumps. A condition assement conducted in 2017 identified issues within the ACT. The isolation gates on the inlet to basins 5 and 6 have operational issues, the membrane diffusers are in need of replacement, and blower No. 2 is currently out of service. More details provided in Volume 6, Chapter 1 - Plant Condition Assessment.

Project Description:

This project requires: (1) the replacement of the membrane diffusers and replacement of the redwood baffles with FRP baffles; (2) the replacement or sealing off of the corroded influent gates between basins 5 and 6, if they are not needed; (3) repairs on the aeration basin (Paint the air piping, replace corroded conduits, boxes, and conduit clamps with stainless steel parts, Install kick plates on Basins 3 through 6 and replace side-mounted railings with top-mounted railings, Remove vegetation and seal openings in the adjacent gate, Repair cracks and spalls in the concrete walkways); (4) the implementation of an aeration basin concrete structure condition assessment; (5) the installation of motorized operators on gates and control valves for additional automatic control for the aeration basin.

Project Name	Project Cost ($)	Project Duration (Years)	Project Start (Year)	Project Completion (Year)
ACT Rehabilitation	$ 3,384,000	4	12/31/2020	12/31/2024

Reimbursement Category	Percent	Cost ($)
Existing Improvements	100%	$ 3,384,000
Future Improvements	0%	$ -
New Development Service Improvements	0%	$ -
Total		$ 3,384,000

CAPITAL IMPROVEMENT PLAN

Project Identification: FI-09
Project Name: ACT Mixers Rehabilitation
Process Area: Secondary Treatment
Date Required Online: 12/31/2034

Problem Statement:

Biological treatment for the ACT (Plant 2) consists of six aeration basins and 4 secondary clarifiers. Aeration basins 1 and 2 were installed in 1967, aeration basins 3 and 4 were installed in 1979, and aeration basins 5 and 6 were installed in 1986. Each aeration basin contains baffles, diffusers, inlet and outlet gates, mixers, and MLR pumps. A condition assement conducted in 2017 determined that the floating mixers would reach the end of their life in the next 20 years and reccommened that they be replaced. More details provided in Volume 6, Chapter 1 - Plant Condition Assessment.

Project Description:

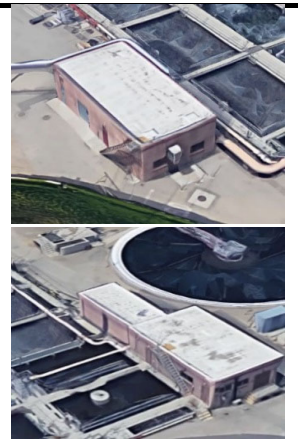
This project requires the replacement of the floating mixers.

Project Name	Project Cost ($)	Project Duration (Years)	Project Start (Year)	Project Completion (Year)
ACT Mixers Rehabilitation	$ 532,000	4	12/31/2030	12/31/2034

Reimbursement Category	Percent	Cost ($)
Existing Improvements	100%	$ 532,000
Future Improvements	0%	$ -
New Development Service Improvements	0%	$ -
Total		$ 532,000

CAPITAL IMPROVEMENT PLAN

Project Identification: FI-10
Project Name: ACT RAS/WAS Pump Station Rehabilitation
Process Area: Secondary Treatment
Date Required Online: 12/31/2024



Problem Statement:

The RAS and WAS pumping for the ACT (Plant 2) is located in two belowground pump stations located on either side of the aeration basins. The RAS/WAS Pump Room (PS 16) was installed in 1986 and is located below the old aeration blower room. The RAS pump room (PS 10) was installed in 1967 and is adjacent to Aeration Basin 6, near the primary clarifiers. A condition assessment conducted in 2017 identified issues within the RAS/WAS pump station. The electrical components have been modified several times, and the variable frequency Drives (VFDs) have reached the end of their useful life and are in need of replacement. The structural elements of both facilities are original and require some structural rehabilitation. More details provided in Volume 6, Chapter 1 - Plant Condition Assessment.

Project Description:

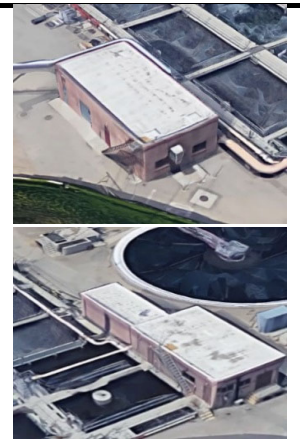
This project requires: (1) the replacement of the VFDs and MCCs and reconfiguration of the MCCs along the room's walls; (2) the replacement or repair of the corroded roof members near the roof leak; (3) the Installation of fall protection around the opening; (4) the removal of the abandoned WAS pumps; (5) the replacement of the drain pump.

Project Name	Project Cost ($)	Project Duration (Years)	Project Start (Year)	Project Completion (Year)
ACT RAS/WAS Pump Station Rehabilitation	$ 2,073,200	4	12/31/2020	12/31/2024

Reimbursement Category	Percent	Cost ($)
Existing Improvements	100%	$ 2,073,200
Future Improvements	0%	$ -
New Development Service Improvements	0%	$ -
Total		$ 2,073,200

CAPITAL IMPROVEMENT PLAN

Project Identification: FI-11
Project Name: ACT RAS/WAS Pumps Replacement
Process Area: Secondary Treatment
Date Required Online: 12/31/2034



Problem Statement:

The RAS and WAS pumping for the ACT (Plant 2) is located in two belowground pump stations located on either side of the aeration basins. The RAS/WAS Pump Room (PS 16) was installed in 1986 and is located below the old aeration blower room. The RAS pump room (PS 10) was installed in 1967 and is adjacent to Aeration Basin 6, near the primary clarifiers. A condition assessment conducted in 2017 identified that the RAS pumps and valves, and the WAS pumps will reach their end of life in the next 20 years and recommends that they be replaced. In addition, the condition assessment recommended the replacement of some electrical components that will reach the end of their useful life. More details provided in Volume 6, Chapter 1 - Plant Condition Assessment.

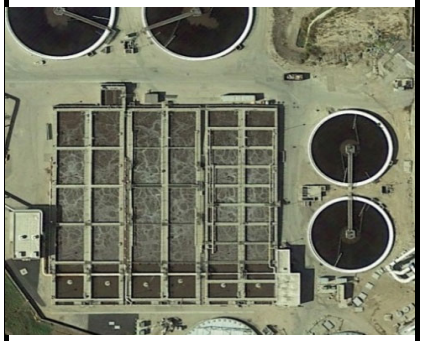
Project Description:

This project requires: (1) the replacement of RAS pumps and valves(that have not been replaced recently); (2) the replacement of the WAS pumps; (3) the replacement of the MCCs in PS 10; (4) the installation of LED lights for PS 10 and PS 16.

Project Name	Project Cost ($)	Project Duration (Years)	Project Start (Year)	Project Completion (Year)
ACT RAS/WAS Pumps Replacement	$ 1,142,000	4	12/31/2030	12/31/2034

Reimbursement Category	Percent	Cost ($)
Existing Improvements	100%	$ 1,142,000
Future Improvements	0%	$ -
New Development Service Improvements	0%	$ -
Total		$ 1,142,000

Project Identification: FI-12
Project Name: ACT Enhanced Nutrient Removal
Process Area: Secondary Treatment
Date Required Online: 12/31/2036



Problem Statement:

The EPA and other states have enacted more restrictive nutrient standards to protect aquatic organisms. California is in the process of a similar effort. Because of the anticipated Nutrient Policy a consensus was reached with the City Staff at a workshop on March 7th, 2017 that there is reason to believe nitrogen and phosphorous limits will be set at 3 mg/L Total Nitrogen (TN) and 1 mg/L Total Phosphorous (TP), respectively. In addition, an estimated enforcement date of 2035 for these nutrient limits was agreed upon. Therefore, an Enhanced Nutrient Removal upgrade of the existing ACT (Plant 2) is required to reach these new nutrient limits. More details provided in Volume 4, Chapter 6 - Secondary Treatment.

Project Description:

This project requires: (1) the reconfiguration of the existing anoxic zones as staged anaerobic zones; (2) the rerouting of the internal mixed liquor recycle to the anoxic zone; (3) the retrofit of the granular media filters to denitrifying filters for methanol addition; (4) the construction of methanol storage.

Project Name	Project Cost ($)	Project Duration (Years)	Project Start (Year)	Project Completion (Year)
ACT Enhanced Nutrient Removal	$ 24,205,000	7	12/31/2029	12/31/2036

Reimbursement Category	Percent	Cost ($)
Existing Improvements	100%	$ 24,205,000
Future Improvements	0%	$ -
New Development Service Improvements	0%	$ -
Total		$ 24,205,000

CAPITAL IMPROVEMENT PLAN

Project Identification: FI-13
Project Name: Tertiary Filter Replacement and CCB Retrofits
Process Area: Tertiary Treatment
Date Required Online: 12/31/2023

Problem Statement:

The RQWCP contains 16 tertiary filters. Filters 1 through 8 were installed in 1981; Filters 9 and 10 were installed in 1982; and Filters 11 through 16 were added in 1990. The filter building contains the filter pumping and piping along with a control room. The existing filters are not user friendly and are therefore expensive and difficult to operate. Additionally, CCB1 and CCB3 require rehabilitation. Rusting was observed on various conduit fittings, weatherproof switches/receptacle faceplates, control panel enclosures, light poles/bases, and conduit claps of both basins. O&M staff also indicated that CCB 2's cover is in need of replacement. More details provided in Volume 6, Chapter 1 - Plant Condition Assessment.

Project Description:

This project requires: FILTER REPLACEMENT 1) the replacement of membrane cover for CCB 1 and CCB 2; (2) the replacement of the gates and all mechanical equipment for CCB 1 and CCB 3; (3) the replacement of expansion joint sealant for CCB 3's cover; (4) the replacement of CCB 3's corroded electrical outlets and junction boxes; (5) the replacement of HVAC units for CCB 1 and CCB 2; (6) the conversion of all lighting to LED lighting.

Project Name	Project Cost ($)	Project Duration (Years)	Project Start (Year)	Project Completion (Year)
Tertiary Filter Replacement and CCB Retrofits	$ 6,119,100	3	12/31/2020	12/31/2023

Reimbursement Category	Percent	Cost ($)
Existing Improvements	100%	$ 6,119,100
Future Improvements	0%	$ -
New Development Service Improvements	0%	$ -
Total		$ 6,119,100

CAPITAL IMPROVEMENT PLAN

Project Identification: FI-14
Project Name: CCB Rehabilitation
Process Area: Tertiary Treatment

Date Required Online: 12/31/2034

Problem Statement:

CCB 1 was installed in 1981, CCB 2 was previously offline and was brought online in 2017 under the Phase I expansion, and CCB 3 was installed in 1990. CCB 1 is located on the northeast end of the tertiary filter building and is covered with a plastic membrane. CCB 2 is located near the MBR filter units and is covered with a plastic membrane. CCB 3 is located west of the tertiary filters and is covered with a concrete slab. The condition assessment conducted in 2017 identified that, based on the Chlorine Contact Basin assets' ages and condition, the following assets are recommended for replacement over the next 20 years: MCCs, Flash mixers, and sample pumps. More details provided in Volume 6, Chapter 1 - Plant Condition Assessment.

Project Description:

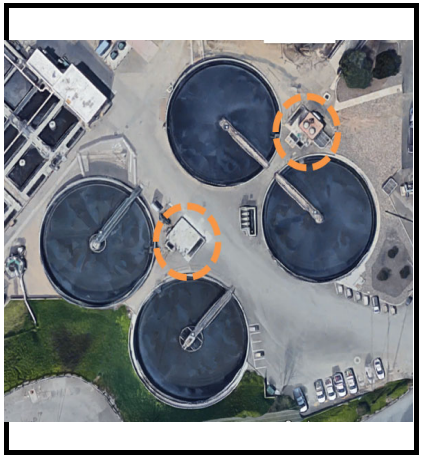
This project requires the replacement of all MCCs, flash mixers, and sample pumps for all CCBs.

Project Name	Project Cost ($)	Project Duration (Years)	Project Start (Year)	Project Completion (Year)
CCB Rehabilitation	$ 1,005,300	4	12/31/2030	12/31/2034

Reimbursement Category	Percent	Cost ($)
Existing Improvements	100%	$ 1,005,300
Future Improvements	0%	$ -
New Development Service Improvements	0%	$ -
Total		$ 1,005,300

CAPITAL IMPROVEMENT PLAN

Project Identification: FI-15
Project Name: First Primary Sludge Pumping Rehabilitation
Process Area: Solids Treatment and Handling
Date Required Online: 12/31/2023



Problem Statement:

Primary sludge pumping consists of two belowground pump rooms located near the primary clarifiers: Primary Sludge Pumping Structure No. 1 was installed in 1967, and Primary Sludge Pumping Structure No. 2 was installed in 1986. Both rooms were rehabilitated in the past with new pumping units. No. 1 includes an aboveground brick building, while No. 2 is completely underground. A condition assessment conducted in 2017 revealed several issues with primary sludge pumping. Both pump rooms are extremely congested, with No. 2 more congested than No. 1. Furthermore, the scum pits are uncovered, and the walls have exposed aggregate. Paint on the pump room walls is peeling, and the rooms have poor ventilation. As a result, corrosion in the rooms is an issue. Many valves are corroded and some are frozen (according to staff input). The doors to the pump rooms are also corroded

Project Description:

This project requires the following improvements to be made: (1) Installing fall protection around all access hatches; (2) Covering the scum pits and improve the grating for traffic loads;(3) Inspecting the condition of the scum pit concrete for both stations; (4) Removing the abandoned steam generator; (5) Improving site lighting in the stairways; (6) Replacing the MCC. This project requires an overhaul on the Primary Sludge Pumping Structure at No. 1 by completing the following: (1) Bring the electrical components up to code and relocate them out of the pump room; (2) Replace pumps with smaller or fewer units; (3) Replace piping and valves; (4) Paint the room, recoat all piping that isn't replaced, and replace the door; (5) Replace the fan with a larger unit to meet ventilation requirements; (6) Add a lifting crane. This project requires repairs to primary sludge pumping structure No. 2 by completing the following: (1) Paint the room, recoat all piping, and replace the door; (2) Replace the frozen valves and paint the piping; (3)

Project Name	Project Cost ($)	Project Duration (Years)	Project Start (Year)	Project Completion (Year)
First Primary Sludge Pumping Rehabilitation	$ 1,876,200	4	12/31/2019	12/31/2023

Reimbursement Category	Percent	Cost ($)
Existing Improvements	100%	$ 1,876,200
Future Improvements	0%	$ -
New Development Service Improvements	0%	$ -
Total		$ 1,876,200

CAPITAL IMPROVEMENT PLAN

Project Identification: FI-16
Project Name: Second Primary Sludge Pumping Rehabilitation
Process Area: Solids Treatment and Handling
Date Required Online: 12/31/2032

Problem Statement:

Primary sludge pumping consists of two below ground pump rooms located near the primary clarifiers: Primary Sludge Pumping Structure No. 1 was installed in 1967, and Primary Sludge Pumping Structure No. 2 was installed in 1986. Both rooms were rehabilitated in the past with new pumping units. No. 1 includes an aboveground brick building, while No. 2 is completely underground. A condition assessment conducted in 2017 revealed several issues with primary sludge pumping. Both pump rooms are extremely congested, with No. 2 more congested than No. 1. Furthermore, the scum pits are uncovered, and the walls have exposed aggregate. Poor ventilation has caused significant corrosion issues. More details provided in Volume 6, Chapter 1 - Plant Condition Assessment.

Project Description:

This project requires the following improvements to be made: (1) Rehabilitate Pump Room No. 2 and reconfigure it with fewer or smaller pumps; (2) Install an additional access hatch; (3) Resurface the scum pit concrete and install a protective liner; (4) Perform a study to further investigate corrosion on the primary effluent pipe's crown; (5) Study the extent of building modifications needed in order to relocate the electrical equipment; (6) As part of this effort, identify requirements for the ceiling height, door width, and ventilation.

Project Name	Project Cost ($)	Project Duration (Years)	Project Start (Year)	Project Completion (Year)
Second Primary Sludge Pumping Rehabilitation	$ 749,500	4	12/31/2028	12/31/2032

Reimbursement Category	Percent	Cost ($)
Existing Improvements	100%	$ 749,500
Future Improvements	0%	$ -
New Development Service Improvements	0%	$ -
Total		$ 749,500

City of Riverside
Update of the Integrated Master Plan for the Wastewater Collection System and Treatment Facilities

CAPITAL IMPROVEMENT PLAN

Project Identification: FI-17
Project Name: WAS Thickening Project
Process Area: Solids Treatment and Handling

Date Required Online: 12/31/2024

Problem Statement:

The WAS thickening area which was constructed in 1986, consists of two Dissolved Air Flotation Thickeners (DAFTs) and a control building. A condition assessment conducted in 2017 identified several issues requiring rehabilitation. Additionally, the DAFTs design criteria indicate they are operating near their rated capacity with no redundancy. To provide redundancy for the WAS thickening process, it is recommended that mechanical thickening units be placed in the existing Dewatering Building and that the DAFTs be used as standby thickening units. Rotary Drum Thickeners and Rotary Screw Thickeners are the preferred equipment. More details provided in Volume 5, Chapter 4 - Solids Production and Thickening.

Project Description:

This project requires: (1) WAS thickening equipment to be installed inside the existing dewatering building, on the east side; (2) the rehabilitation of DAFT No.2 (that includes but is not limited to repairing corrosion on the internal mechanism and then recoating it, as well as painting the piping, pressure tank, decking, and outdoor equipment); (3) the implementation of a seismic evaluation of the DAF mechanism connection; (4) the removal of abandoned equipment in the building and demolition of unused pump pads; (5) the removal of the unused chemical tank; (6) the upgrade of the ventilation system to allow to declassify the electrical room; (7) the installation of a cover for the DAF tanks; (8) the replacement of the DAF No. 1 drive; (9) the replacement of the polymer pumping systems; (10) the addition of LED lights and replacement of the windows and doors of the building.

Project Name	Project Cost ($)	Project Duration (Years)	Project Start (Year)	Project Completion (Year)
WAS Thickening Project	$ 8,028,800	4	12/31/2020	12/31/2024

Reimbursement Category	Percent	Cost ($)
Existing Improvements	100%	$ 8,028,800
Future Improvements	0%	$ -
New Development Service Improvements	0%	$ -
Total		$ 8,028,800

CAPITAL IMPROVEMENT PLAN

Project Identification: FI-18
Project Name: First AWT Project
Process Area: Effluent Disinfection and Discharge

Date Required Online: 12/31/2034

Problem Statement:

The average total dissolved solids (TDS) increase from 2011 to May 2017 was 4 mg/L·yr. The current assumption is that TDS will continue to increase at a similar rate. Under the 4 mg/L·yr TDS increase assumption, a study conducted in 2017 selected Reverse osmosis (RO) as the primary AWT technology to reduce TDS in the effluent. The study identified one project to be implemented during the planning period to maintain National Pollutant Discharge Elimination System (NPDES) compliance with the effluent TDS discharge limit of 650 mg/L. Follow on projects would be implemented as needed to maintain the effluent TDS below the limit by increasing the desalting capacity. The first project would be the construction of the RO treatment facility and the associated pipeline. More details provided in Volume 4, Chapter 8 - Advanced Water Treatment.

Project Description:

This project requires the installation of an on-site RO treatment facility and the construction of two parallel 4-mile-long brine discharge pipelines to Inland Empire Brine Line.

Project Name	Project Cost ($)	Project Duration (Years)	Project Start (Year)	Project Completion (Year)
First AWT Project	$ 38,615,700	7	12/31/2027	12/31/2034

Reimbursement Category	Percent	Cost ($)
Existing Improvements	100%	$ 38,615,700
Future Improvements	0%	$ -
New Development Service Improvements	0%	$ -
Total		$ 38,615,700

CAPITAL IMPROVEMENT PLAN

Project Identification: FI-19
Project Name: Levee Rehabilitation Phase II
Process Area: Miscellaneous
Date Required Online: 12/31/2031

Problem Statement:

The RWQCP property line along the north edge of the plant is bounded by a roughly 4,800 ft levee built to protect the plant from the Santa Ana River. In 2015, Tetra Tech submitted a PDR describing the rehabilitations that would be required to protect the RWQCP from a 100-year storm event. As a result of the PDR, the levee rehabilitation work was divided into two phases. Phase 1 improvements consist of floodwall protection improvements to protect from the 100-year flood water surface elevation, and these improvements have been completed. Phase 2 improvements are to remedy the scour protection deficiency along the levee for the 100-year flood event. The Phase 2 improvements are to be designed and completed as a future project due to environmental permitting and funding needs.

Project Description:

Phase 2 construction work will consist of grouting the existing rip rap embankment from approximately station 27+00 to upstream of the project limits. This will require the grouting of the toe scour protection below the channel invert. Additional details are included in Volume 4, Chapter 11 - Capital Project Studies.

Project Name	Project Cost ($)	Project Duration (Years)	Project Start (Year)	Project Completion (Year)
Levee Rehabilitation Phase II	$ 9,364,800	7	12/31/2024	12/31/2031

Reimbursement Category	Percent	Cost ($)
Existing Improvements	100%	$ 9,364,800
Future Improvements	0%	$ -
New Development Service Improvements	0%	$ -
Total		$ 9,364,800