City of San José

San José/Santa Clara Water Pollution Control Plant Master Plan

TASK NO. 6
PROJECT MEMORANDUM NO. 1
CIP IMPLEMENTATION

FINAL DRAFT
May 2011

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CITY OF SAN JOSÉ

SAN JOSÉ/SANTA CLARA WATER POLLUTION CONTROL PLANT MASTER PLAN

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PROJECT MEMORANDUM NO. 1
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PLANT MASTER PLAN

GLOSSARY OF ACRONYMS AND TERMS

AB	Assembly Bill
AC	Acre
ACH	Air Changes per Hour
AD	Air Drying
ADAF	Average Day Annual Flow (Average daily flow or loading for an annual period)
ADC	Alternative Daily Cover
ADMMF	Average Day Maximum Month Flow (Peak month for each year)
ADMML	Average Day Maximum Month Load
ADWF	Average Dry Weather Flow (Average of daily influent flow occurring between May - October)
ADWIF	Average Dry Weather Influent Flow (Average of five consecutive weekday flows occurring between June - October)
ADWL	Average Dry Weather Load
ANSI	American National Standards Institute
AWTF	Advanced Water Treatment Facility
BAAQMD	Bay Area Air Quality Management District
BAB2E	Bay Area Biosolids to Energy
BACWA	Bay Area Clean Water Association
BAF	Biological Aerated Filter
BC	Brown and Caldwell
BCDC	Bay Conservation and Development Commission
BNR	Biological Nutrient Removal
BNR1	Formerly Secondary Facilities
BNR2	Formerly Nitrification Facilities
BOD	Biochemical Oxygen Demand
BTUs	British Thermal Units
CAG	Community Advisory Group
CAL OSHA	California Occupational Safety and Health Administration

CAMBI	Vendor name for a pre-processing technology
CCB	Chlorine Contact Basin
CECs	Contaminants of Emerging Concern
CEPT	Chemically Enhanced Primary Treatment
CEQA	California Environmental Quality Act
CFM	Cubic feet per minute
CH_3SH	Methyl mercaptan
CIP	Capital Improvement Program
City	City of San José
CL	Covered Lagoons
CO_2E	Carbon Dioxide Emissions
DAFT	Dissolved Air Flotation Thickener
DO	Dissolved Oxygen
DPH	Department of Public Health
D/T	Dilutions to threshold
EBOS	Emergency Basin Overflow Structure
EDCs	Endocrine Disrupting Compounds
EEC	Environmental Engineering and Contracting, Inc.
e.g.	For example
EIR	Environmental Impact Report
ELAC	Engineering, Legal, and Administrative Costs
EPA	United States Environmental Protection Agency
EQ	Equalization
etc	etcetera
Fe_2O_3	Ferric Oxide
Fe_2S_3	Ferric Sulfide
FIPS	Filter Influent Pump Station
FOG	Fats, Oils, and Grease
fps	foot per second

FRP	Fiberglass Reinforced Plastic
FYB	Fiscal Year Beginning
FWS	Food Waste Separation
GC/SCD	Gas Chromatograph/Sulfur Chemiluminescence Detector
GHG	Greenhouse Gas Emissions
gpd/ft^2	Gallons per Day per Square Foot
H_2S	Hydrogen Sulfide
H_2SO_4	Sulfuric Acid
HOCl	Hypochlorous Acid
HP	Harvest Power
HRT	Hydraulic Residence Time
HVAC	Heating Ventilation and Air Conditioning
HW	Headworks
IMLR	Internal Mixed Liquor Return
IWA	International Water Association
ISCST3	Industrial Source Complex Short-Term 3
JEPA	Joint Exercise of Power Authority
L	Liter
LFG	Landfill Gas
MAD	Mesophilic Anaerobic Digestion
MBR	Membrane Bioreactor
MD	Mechanical Dewatering
MG	Million Gallons
mgd	Million Gallons per Day
mg/L	Milligrams per Liter
MLE	Modified Ludzack - Ettinger
MLSS	Mixed Liquor Suspended Solids
MM	Million
MOP	Manual of Practice

MSW	Municipal Solid Waste
MW	Mega Watt
NAS	Nitrifying Activated Sludge
NBB	Nitrification Blower Building
NFPA	National Fire Protection Association
NH_3	Ammonia
NPDES	National Pollutant Discharge Elimination System
O&M	Operations and Maintenance
ORP	Oxidation-Reduction Potential
OUR	Oxygen Uptake Rate
PE	Primary Effluent
PEPS	Primary Effluent Pump Station
PHWWF	Peak Hour Wet Weather Flow (Peak hour flow resulting from a rainfall event)
Plant	Water Pollution Control Plant (used interchangeably with WPCP)
PM	Project Memorandum
PMP	Plant Master Plan
ppbv	Parts per billion by volume
PPCD	Pounds per capita per day
ppmv	Parts per million by volume
PS	Primary Sludge
QA/QC	Quality Assurance/Quality Control
R&R	Rehabilitation and Repair
RAS	Return Activated Sludge
RO	Reverse Osmosis
ROAP	Regional Odor Assessment Program
RSPS	Raw Sewage Pump Station
SBB	Secondary Blower Building
SC	Santa Clara
SBR	Sequencing Batch Reactor

SBWR	South Bay Water Recycling
SJ	San Jose
sf	Square Feet
SOM	Skidmore, Owings, and Merrill
SOTE	Standard Oxygen Transfer Efficiency
SRT	Solids Residence Time
SS	Suspended Solids
SSPS	Settled Sewage Pump Station
SVI	Sludge Volume Index
TAD	Thermophilic Anaerobic Digestion
TAG	Technical Advisory Group
TBL	Triple Bottom Line
TN	Total Nitrogen (organic & inorganic forms which are ammonia, nitrates, nitrite)
TSS	Total Suspended Solids
TWAS	Thickened Waste Activated Sludge
UV	Ultraviolet
VFDs	Variable Frequency Drives
VOC	Volatile Organic Compound
VSL	Volatile Solids Loading
WAS	Waste Activated Sludge
WEF	Water Environment Federation
WPCP	Water Pollution Control Plant (used interchangeably with Plant)
WWTP	Wastewater Treatment Plant

1.0 INTRODUCTION/SUMMARY

1.1 Introduction

The purpose of this project memorandum (PM) is to summarize the proposed Capital Improvement Program (CIP) implementation for the San José/Santa Clara Water Pollution Control Plant (WPCP and Plant used interchangeably) for the WPCP Plant Master Plan (PMP). Implementation of the CIP is the result of the evaluation and analysis described in the array of PMs developed in the PMP. It describes projects, their schedules, costs, and linkages with other projects over the 30-year planning period through 2040.

While it is reflective of the PMP, the CIP needs to be responsive to the various planning "trigger" issues that could impact the timing of the implementation of each project included in the CIP. Therefore, it is recommended that the CIP be reviewed and updated annually.

1.2 Summary

A CIP was developed for the PMP that identifies the capital projects required at the WPCP over the 30-year planning period through 2040. These projects are required because they respond to one of the following four needs: 1) rehabilitation and repair (R&R), 2) regulatory, 3) biosolids transition, or 4) odor control. The project cost of implementing these projects ranges from $1.8 to $2.2 billion, depending on the assumed escalation of zero (0) through two (2) percent. Project cost estimates are based on preliminary quantity takeoffs or vendor quotes, where available, to which estimating and construction contingencies are added, as well as additional costs to the owner, namely engineering, legal, administrative, and construction management.

The program costs corresponding to these four needs are shown on Figure 1. R&R is shown as two components, namely that which pertains only to the biosolids handling processes, and the combined R&R for all the remaining treatment processes.

These project costs are shown again in Figure 2, and are presented on a year-by-year cash flow basis reflecting the combined costs of all the projects, based on their assumed implementation dates. The $1,232 million in R&R includes an allowance for unspecified projects the City could expect, especially over the second half of the 30-year planning period. (Further details can be found in Section 2.8 of this PM.)

A detailed list of all the CIP projects, along with their individual project cost estimates, is presented in Appendix A. The locations of these projects on the WPCP are shown on Figure 3, where they are represented in the following three categories: 1) existing facilities to be demolished or decommissioned, 2) existing facilities to be modified, and 3) planned new facilities.

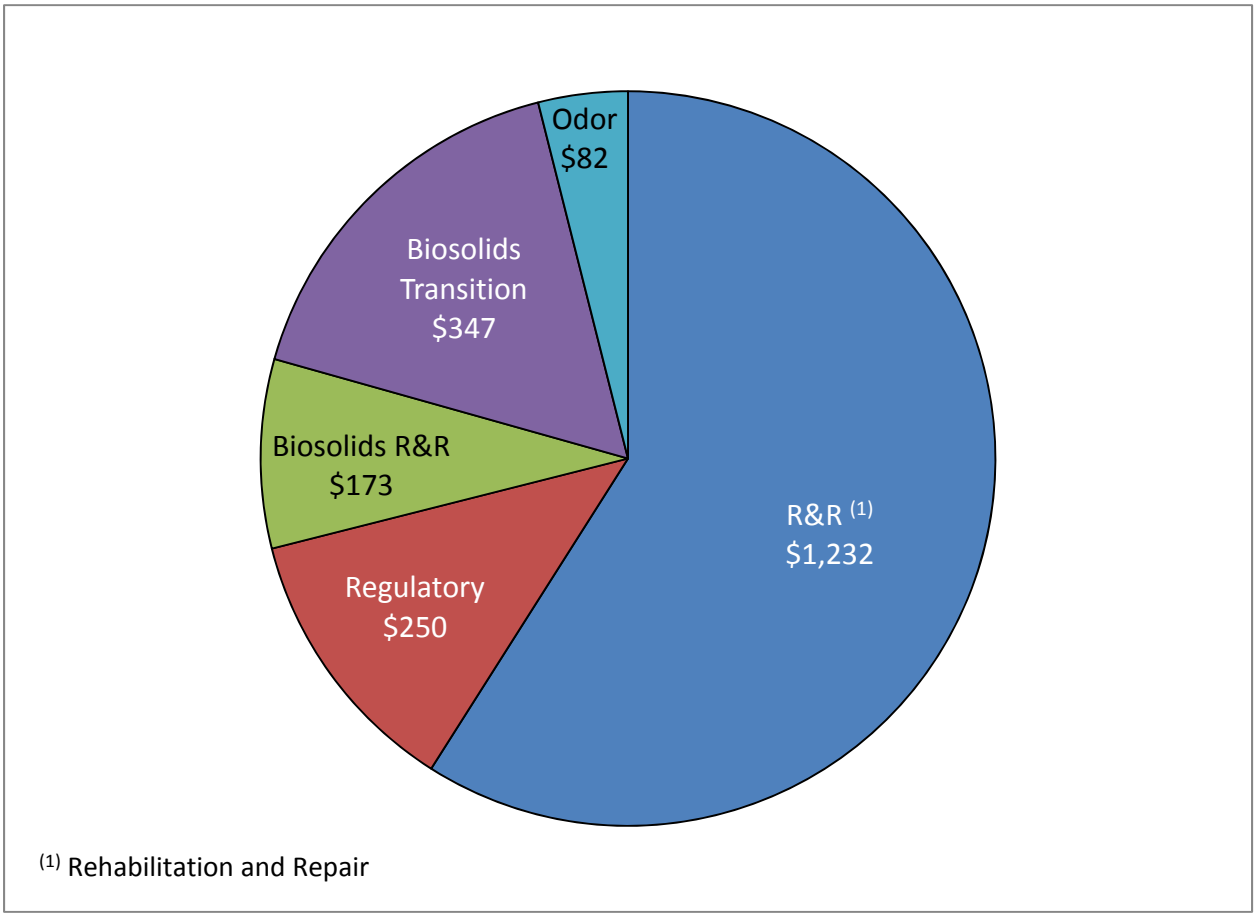

Figure 1 30-Year CIP at Two (2) Percent Escalation ($ million)

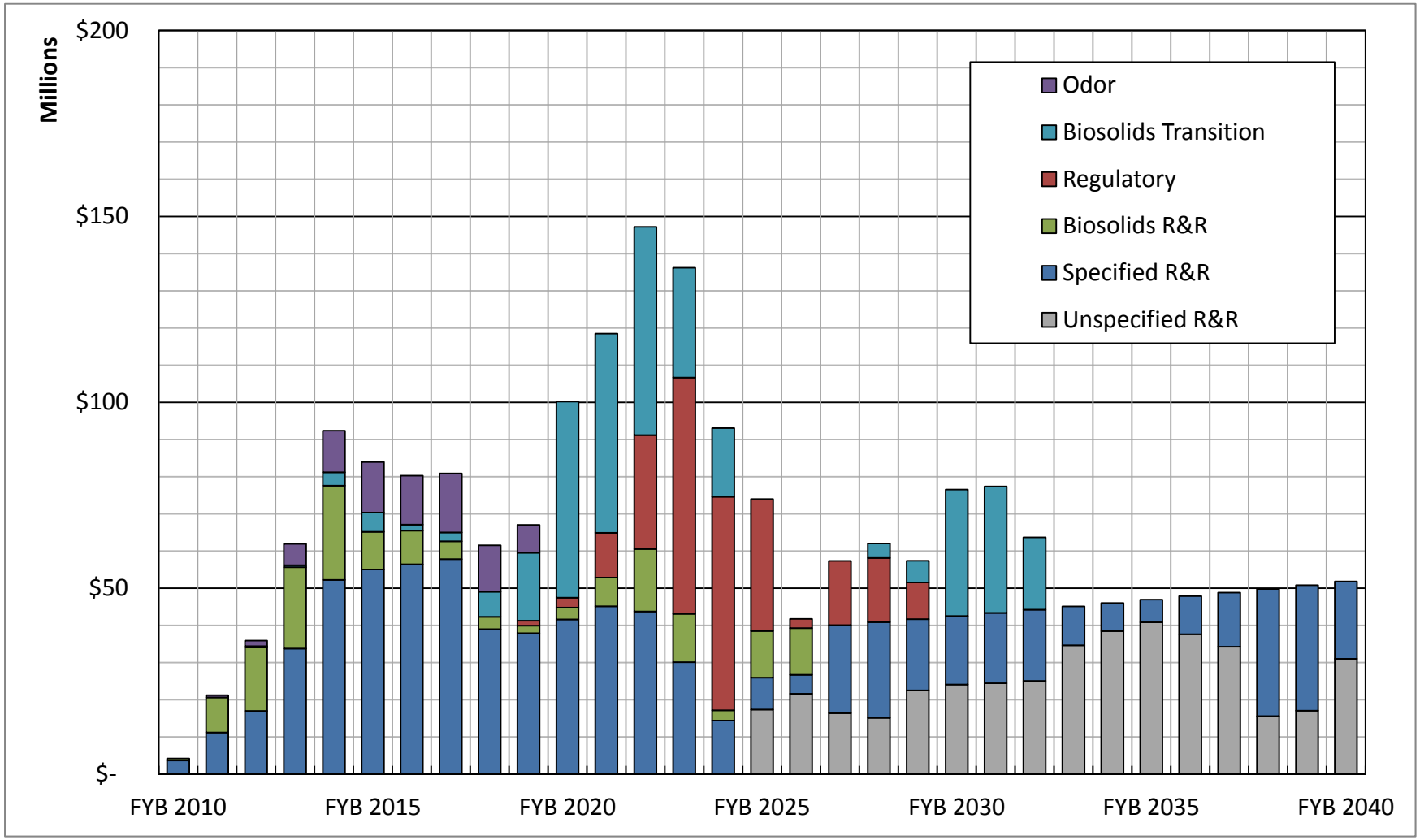

Figure 2 Annual CIP Project Costs Over the 30-year Planning Period (Two (2) Percent Escalation)

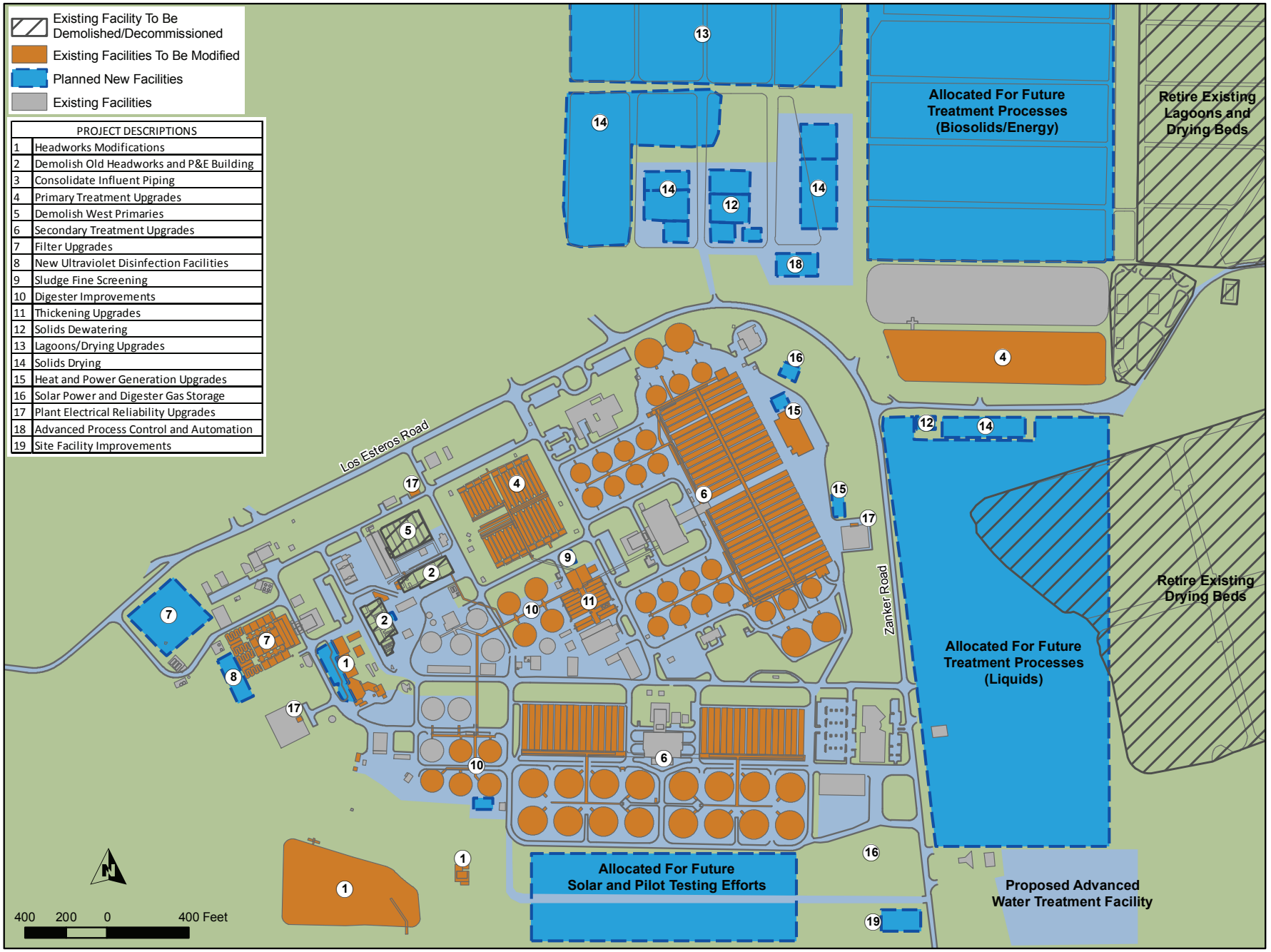

Figure 3
CIP IMPACTS TO THE WPCP
SAN JOSE/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSE

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2.0 APPROACH TO DEVELOPING CIP

2.1 Project Triggers

Capital projects were identified and defined at a planning level in response to the triggers identified during the master planning process. These triggers can be grouped into six categories of potential triggers, and include the following:

1. **Condition (Rehabilitation/Replacement)** – A *condition trigger* is assigned if the process or facility has reached the end of its economic useful life. This trigger is established based on the need to maintain that process or facility as operationally sufficient to meet mission critical reliability and performance requirements.

2. **Regulatory Requirement** – A *regulatory trigger* is assigned when the need is driven by local, state or national regulatory requirements.

3. **Economic Benefit** – An *economic benefit trigger* is assigned when a positive reduction in life-cycle costs (considering capital and O&M) can be achieved.

4. **Improved Performance Benefit** – An improved *performance benefit trigger* is assigned when there is a benefit in improved operations and maintenance performance related to overall reliability and/or reduced operational and safety-related risks.

5. **Increased Flows/Loads** – An *increased flow and load trigger* is assigned when the need is based on an increase in capacity to accommodate increases in flows or loads into the Plant.

6. **Policy Decision** – The *policy trigger* is assigned when the reason is based on a management and/or political decision from the policy-makers.

Generally, each project is driven by a primary trigger. However, since multiple triggers may be driving a particular project's need for implementation, a secondary trigger was also identified.

2.2 Project Durations

The estimate of a project's duration is comprised of 1) a planning and design component, and 2) a construction component.

A critical part of the planning and design component is demonstrating compliance with the California Environmental Quality Act (CEQA) requirements. An Environmental Impact Report (EIR) is being conducted for select projects as part of the PMP on programmatic and project levels.

- **Projects included in the PMP EIR.** These projects are not scheduled for implementation within the first five (5) years of the CIP. It is assumed that any additional CEQA compliance requirements for these projects would be performed concurrently with their design phases, i.e. no additional time allowance for this additional CEQA effort is needed.

- **Projects not included in the PMP EIR.** The CEQA requirements for CIP projects not included in the EIR, due to their nature are expected to be met through a mitigated negative declaration process (as is currently practiced by the City). The planning and design duration allocations for these particular projects should be sufficiently long to accommodate the necessary CEQA requirements concurrent with their design, i.e. no additional time needs to be allocated to CEQA.

2.3 Implementation Schedule

The project triggers define not only the need for the project, but also implementation timing. The implementation timing, together with the estimated project duration, assigns each project a start and completion date. The implementation schedule for each of the CIP projects is shown schematically as Gantt charts in Appendix B.

Alternative projects have been identified as potential replacements for a number of CIP projects, depending on future circumstances. A project alternative could replace a selected project (timing allocations permitting) for a number of reasons, such as:

- Modification of the objective, e.g. a new requirement to remove constituents of emerging concern (CECs) would require an advanced oxidation process, which could potentially replace the need for a disinfection project.

- Further research developments and/or detailed analysis favors the alternative project over the project originally included in the CIP.

While project alternatives are shown in the CIP, the cash flow estimate is reflective only of the selected projects and does not include the project costs developed for any of the listed alternatives.

2.4 Project Linkages

Many projects are linked in the sense that their implementation has a specific order in the sequence of implementing multiple projects. Because of the project's position in the sequence, a change to the implementation timing of one project would impact the timing of all the linked projects.

Some of these linkages may be quite complex, such as with the implementation of the biosolids transition projects. For example, a policy decision trigger could require the biosolids transition to be complete by 2025, which would be accomplished once the

lagoons and drying beds are retired. However, this decommissioning would only commence once the full mechanical dewatering facility is online, along with the cake storage, new covered lagoons, emergency biosolids storage, and combination of greenhouses and thermal solids drying. The mechanical dewatering, in turn, would only commence once the field dewatering (pilot) testing of the intended dewatering equipment is complete.

The example illustrates that due to the linkages between many projects, changes to the trigger for completion of a particular project may impact the implementation schedule of multiple projects.

2.5 Fiscal vs. Calendar Year

The CIP reflects project implementation schedules, and includes an annual cash flow estimate associated with these schedules. While the implementation schedule is based on calendar years, the City's financial planning is based on a fiscal year basis. The WPCP fiscal year starts on July 1st and ends on June 30th of the following year, and the nomenclature followed is to name the fiscal year according to the last date of the year, e.g. fiscal year 2020 would span the second half of 2019 and the first half of 2020.

To avoid confusion, and to have the implementation schedule consistent with the cash flow estimate, dates are shown as fiscal year beginning (FYB), i.e. FYB 2020 would represent the second half of 2020 through the first half of 2021.

2.6 Developing Project Cost Estimates

The cost estimates presented in the PMP are Class 5 and 4 level estimates developed using multiple methods and sources of information. Where available, quotes from equipment vendors were used in conjunction with preliminary quantity takeoffs to create a construction cost estimate. In addition, the cost curve approach for estimating (total cost versus process capacity curves developed from past City and other Carollo Engineers project cost data), was also used for some projects. An estimating contingency of 15% is applied to account for uncertainties in the bidding environment. A construction contingency of 25% is added to cover possible change orders that are not included as part of the original estimated construction cost.

Construction Costs developed in this manner are then escalated to the approximate mid-point of project construction in order to get a better representation of future costs at time of construction. Calculating the escalation involves the use of the ENR Construction Cost Index (ENRCCI).

Subsequently, costs to the owner, such as engineering, legal, administrative, project contingencies, and construction management costs, are added to the construction costs to arrive at total project costs.

See PM 6.2 Basis of Cost for further details on the development of project cost estimates.

2.7 Annual Project Cost Distribution: S-Curve vs. Encumbered

The project cost estimated for each of the CIP projects will typically not be expended in equal annual amounts over the project duration. Instead, the annual expenditure will typically be lower during the initial planning and design phases of the project, and then ramp up significantly during the construction phase of the project. When presented on a cumulative basis, the cash flow calculations are based on an s-curve graph (see Figure 4). This approach was applied to all the CIP projects with durations of up to 15 years.

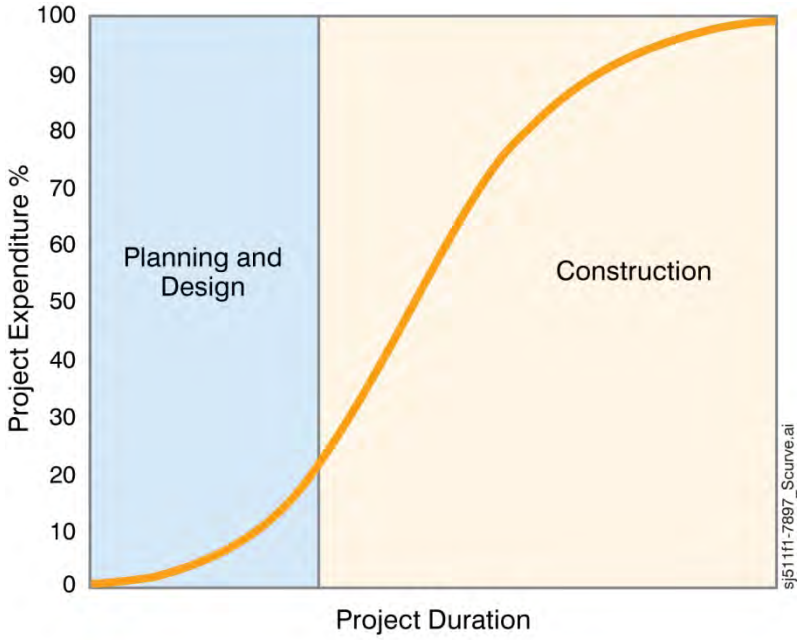

Figure 4 Schematic of S-Curve Distribution of Project Costs

A modification to this approach is to follow the s-curve distribution up to the start of the construction phase, at which point the entire remaining portion of the project cost estimate is encumbered. Some key components of the encumbered cash flow distribution are the following:

Engineering Design:	10%, evenly distributed over design phase
Engineering Services During Construction (ESDC):	8%, evenly distributed over construction phase
City Staff:	12%, evenly distributed over both phases
Construction:	70%, fully encumbered at start of construction phase

Depending on the calculation desired, either the S-Curve or Custom cash flow mode of calculation can be selected on the CIP cash flow Excel spreadsheet.

2.8 Special Project Cost Estimates

The project cost estimates were developed as shown above for all but three (3) of the CIP projects. These projects required modified cost estimating approaches, as discussed below.

Unanticipated/Critical Repairs

While the CIP defines projects anticipated over the 30-year planning period, unforeseen projects cannot be avoided. This is especially true of large treatment plants with a heavy investment in conveyance and treatment infrastructure, and complex mechanical equipment. These unanticipated projects are often critical in nature requiring urgent attention from City staff. To enable these projects to be accommodated, the CIP includes a budgetary line item for these repairs, calculated as follows:

- The annual allocation for Unanticipated/Critical Repairs is based on one (1) percent of the average annual (un-escalated) project cost estimate of the entire CIP.
- For an un-escalated total CIP cost estimate of approximately $1.7 billion, the average annual cost over the 30-year planning period is approximately $600,000.
- Assuming $600,000 for 2010, the allocations have been calculated for each subsequent year assuming a two (2) percent escalation.

Unspecified R&R (2025 through 2040)

The PMP has identified the R&R projects required over the 30-year planning period. While there are some projects identified for later implementation, there is a clear drop in R&R projects over the last compared to the first 15 years. It is likely, however, that the City would continue to have substantial R&R needs, even if specific projects have not been identified in the PMP.

To better reflect the more likely scenario, and for budgetary purposes, an approach was developed to augment the identified R&R expenses over the period 2025 through 2040. It can be described as follows:

- An average annual R&R requirement was calculated based on the total identified R&R requirements over the 30-year planning period, and 50 percent of the cost all new infrastructure planned for the plant over the same planning period. (The 50 percent estimate was derived from an asset management approach, where new structural, mechanical, and electrical infrastructure all have varying life expectancies. Coupled with the fact that new infrastructure will be implemented throughout the whole planning period, an average replacement percentage of 50 percent was estimated for the purposes of this calculation.)

- This average annual R&R requirement estimate was assumed for the midpoint of the 2025 through 2040 range, and escalated down and up at two (2) percent per annum.

- In each of the 2025 through 2040 years, the R&R estimated for identified projects was subtracted from this calculated R&R, i.e. the identified R&R was augmented to an average, more realistic R&R.

Public Art Reserve

An estimate for the Public Art Reserve was based on a percentage of the project costs estimated for new infrastructure over the 30-year planning period. These consisted of the following:

- Headworks odor control

- New filter complex

- New UV disinfection facilities

- New biosolids handling facilities, including fine screening, mechanical dewatering, cake storage, new covered lagoons, improved drying beds, and thermal and greenhouse solids drying.

One (1) percent of the project costs estimated for this new infrastructure was assumed, broken into three (3) 10-year periods.

3.0 DESCRIPTION OF PMP CIP MODEL

3.1 "Assumptions" Worksheet

The spreadsheet worksheet entitled "Assumptions" provides the user with one location where values can be input that affect all calculations performed in the model. Default values are already input in cells. The assumptions that can be modified include the following:

- "Indirect Costs," such as estimating contingency, rate of escalation to mid-point of construction, construction contingency, and project management. Additional allowances include pre-design planning, environmental planning and review, engineering design, and construction management fees. However, these are already included in the selected allowances. Refer to Section 2.6 and PM 6.2 for more details on these terms.

- "Financial Assumptions" include input cells for Project Start Year (the year from which the CIP financial analysis is conducted), and number of years for financial costs, as well as a choice for using a standard or a custom S-curve to distribute

costs over the chosen project duration. These S-curves are further explained in Section 3.4.

3.2 "Project Schedule and Cash Flow" Worksheet

The spreadsheet worksheet entitled "Project Schedule and Cash Flow" presents various details of the CIP projects. These are summarized in the following Table 1.

3.3 "Project Delivery Calculation" Worksheet

The "Project Delivery Calculation" worksheet takes the Direct Costs from the "Project Schedule and Cash Flow" worksheet and adds the Indirect Costs. All calculations performed on this worksheet take input from either the "Assumptions" or "Project Schedule and Cash Flow" worksheets.

3.4 "S-Curve – Standard" and "Encumbered – Custom" Worksheets

The S-curve spreadsheet presents the basis of calculation of annual project costs throughout the project duration for each of the CIP projects. The standard S-curve distributes the total project cost over the project duration using percentages commonly seen in construction projects.

The encumbered approach applies individual cost distribution patterns for engineering design costs, engineering services during construction (ESDC), construction costs, and costs accrued by City staff. These calculations are based on the percentage of the overall project cost assigned for each of these categories in the "Assumptions" worksheet.

No user-input is required into either of these two worksheets, i.e. input is taken from the "Assumptions" worksheet, and utilized in the "Project Schedule and Cash Flow" worksheet.

3.5 Special Project Cost Calculation Worksheets

Two separate worksheets are dedicated to the specific project cost calculations required for the following projects:

- Unanticipated/Critical Repairs
- Public Art Reserve

For each of these projects annual costs are calculated over the 30-year planning period, and do not follow either the S-Curve or Encumbered cost distribution approaches. Since their cost distribution approach is different from other CIP projects, they are highlighted (different color) in the "Project Schedule and Cash Flow" worksheet.

Note: Since the "Remaining R&R (2025 through 2040)" project cost distribution is also calculated differently, it is similarly highlighted.

Table 1 Column Descriptions of the "Project Schedule and Cash Flow" Worksheet San José/Santa Clara Water Pollution Control Plant Master Plan City of San José	
Column	**Description**
A	Miscellaneous explanatory notes.
B	Project Category, i.e. either R&R (category 1 or 7), regulatory (category 2), biosolids R&R (category 3), biosolids transition (category 4), or odor (category 5).
C	Project IDs, a numerical assignment to facilitate cross-reference with individual project descriptions.
D	Project titles.
E & F	Project primary and secondary triggers.
G & H	Linkages with other projects.
I	Reference PM where further background information on the project can be obtained.
J	Project start year; years indicated in red are calculated based on a linkage to another project.
K	Planning and Design duration.
L	CEQA duration; due to the programmatic and project level EIR being conducted for select projects, and the anticipated Negative Declaration of the remaining projects, all additional time necessary for CEQA compliance is included in the Planning and Design durations, i.e., all CEQA durations set to zero.
M & N	Construction duration and total project duration.
O	Project year online, calculated from preceding entries.
P	Direct Cost estimate; this subtotal is captured in the "Project Delivery Calculation" worksheet where indirect costs are added.
Q	Construction Cost, i.e. including estimating and construction contingencies; no escalation added. (From "Project Delivery Calculation" worksheet.)
R	Escalated Construction Cost. (From "Project Delivery Calculation" worksheet.)
S	Escalated Project Cost. (From "Project Delivery Calculation" worksheet.)
T to AX	Distribution of Escalated Project Cost over the project years, according to either the S-curve or Encumbered distribution approaches.
AY & AZ	Totals and auditing check.
BA	5-year totals.
Note: Rows 134 to 178 are various manipulations and combinations of the cost estimates required for generating various summary breakdown graphs, and special cost estimates.	

3.6 Graphs Worksheets

In addition to the above project cost calculation worksheets, the CIP model has worksheets that graphically show the results. These include:

- **Gantt Charts.** For the projects under each process area, the Gantt charts depict the project schedules for each of the CIP projects. These charts extend from the year 2010 through 2040.
- **Annual CIP cost distribution**. This graph presents the total annual project costs expended for all the CIP projects from 2010 through 2040. The bars are further divided according to the project category (see Column B in the "Project Schedule and Cash Flow" worksheet).
- **Annual O&M Cost Distribution**. This graph presents the annual O&M costs for all the CIP projects from 2010 through 2040. The detailed cost estimates are calculated in a separate model.

4.0 PROJECT DESCRIPTIONS

The project descriptions, triggers, and other details for each of the CIP projects are summarized in Appendix C. The appendix also includes figures depicting the part of the plant affected by each CIP.

5.0 APPROACH TO DEVELOPING O&M PROJECTIONS

Operations and maintenance (O&M) costs were developed for the San Jose/Santa Clara WPCP through the 30-year planning period, taking into consideration the impacts of the CIP on the treatment processes. The O&M cost impacts were developed using a six-step process, as follows:

Step 1: The current O&M costs were delineated by process area to establish baseline costs.

Step 2: From these, baseline unit costs were developed using treated flow and load parameters.

Step 3: Unit costs were developed for new and modified treatment processes.

Step 4: Variable cost components for non-process related O&M costs were identified and projected.

Step 5: Future O&M costs were then projected for all of these cost categories using flow and load parameters as applicable.

Step 6: To account for cost escalation, an O&M escalation factor was applied to the cumulative annual O&M costs.

5.1 Baseline O&M Costs

In order to establish baseline O&M data, five years of plant operations cost data were obtained. Two categories of cost data were evaluated:

- Process Operations Costs.
- Additional Services Costs.

Process Operations Costs

The City WPCP operations costs were extracted from the City accounting system and categorized using account number and the account ledger. These costs were then categorized by group, process area, and cost type to obtain the annual costs. Analysis of annual costs from FYB 2004 to FYB 2008 revealed significant variation in annual process costs. Upon discussion with WQCP staff, these variations were attributed to various process improvements implemented over the five year period. Therefore, FYB 2008 costs were recommended as the baseline costs from which future cost impacts should be developed.

The WPCP tracks the secondary treatment costs for its two treatment trains, BNR 1 and BNR 2 separately. Unit costs for the secondary process are shown for both BNR 1 and BNR 2 based on City-provided data.

All uncategorized function costs were allocated to each process area using a weighted average of the allocated costs. Appendix D provides the detailed allocation of costs. Using the flow and load parameters for FYB 2008, the unit costs were developed for each of the unit processes. The identified unit costs are presented in Table 2.

Additional Services Costs

In addition to the process costs, the WPCP incurs approximately $27 million for additional services provided by other City departments, regulations and research, laboratory and other costs. Details of these costs are provided in Appendix E.

5.2 O&M Impacts of CIP Projects

Specific process changes that will result from the CIP projects are expected to have O&M cost impacts at the WPCP. The process changes expected to impact O&M include the following:

- Secondary Treatment
- Disinfection
- Solids Processing and Disposal

Table 2 Baseline O&M Unit Costs San José/Santa Clara Water Pollution Control Plant Master Plan City of San José			
Process	**Total Cost [(1)]**	**Unit Cost**	**Unit**
Primary	$6,413,581	145	$ per mgd
Secondary (BNR 1)	10,318,527	234	$ per mgd
Nitrification (BNR 2)	5,552,241	126	$ per mgd
Filtration	3,624,596	82	$ per mgd
Disinfection	3,599,726	82	$ per mgd
Sludge Processing	5,746,311	105	$ per DT
Residual Solids Management	2,137,093	57	$ per DT
Hauling	1,435,326	58	$ per DT
SBWR	1,270,754	268	$ per mgd
Additional Services	27,600,000	---	---
Total	**$67,698,156**		

Note:
(1) Values have been adjusted to distribute unallocated costs using a weighted average of all other costs.

In addition to specific process changes, modifications to the plant electricity and blower systems are expected to result in change in cost for the secondary and disinfection processes.

Secondary Treatment Impacts

The WPCP may be required to meet more stringent effluent nitrogen standards in the future. Whether these standards are imposed or not has an impact on the O&M cost projections. Figure 5 below summarizes the potential effluent nitrogen standards and associated process changes.

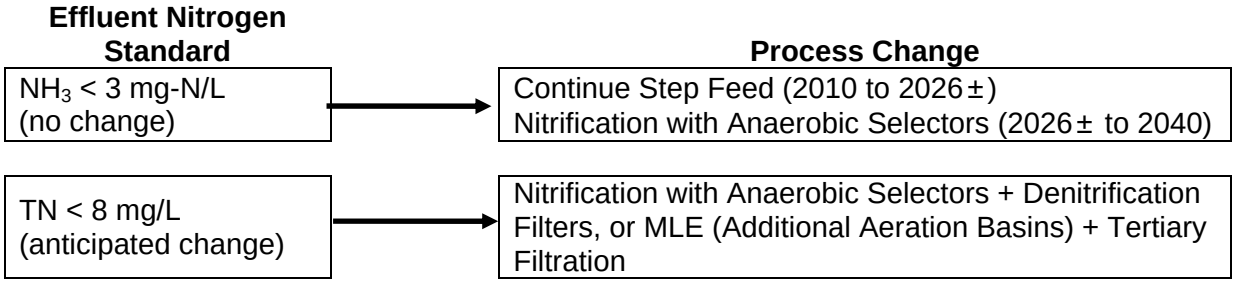

Figure 5 Process Changes to Accommodate Effluent Nitrogen Standard Possibilities

Even if the effluent nitrogen standard remains the same, the secondary treatment process would need to be converted to Nitrification with Anaerobic Selectors (NAS) around 2026 to accommodate the projected flow increases. This change is expected to increase the process chemical cost by $2.75 million per year.

In addition, the energy and blower system modifications are expected to increase the process energy utilization by 26 percent over the master planning horizon. Of this 26 percent energy increase, 10 percent is attributed to increase in flow whilst the remaining 16 percent is attributed to the proposed process modifications.

The increase in chemical and energy use results in an increase in unit cost to $301 per mgd for the secondary process and $133 per mgd for the nitrification process.

Disinfection Impacts

Various drivers were identified for transitioning from sodium hypochlorite to UV disinfection. It was assumed the transition would be made by 2030. This process change will result in a change in unit cost from $81 per mgd to approximately $21 per mgd.

Solids Processing and Disposal Impacts

Several solids processing upgrades are anticipated as part of the master plan CIP. These include addition of solids fine screening, mechanical dewatering, and heat and greenhouse drying. These upgrades will provide the WPCP with a variety of disposition options to select from.

The flowchart in Figure 6 presents the solid processing and disposal options, and shows 100 percent of the solids will be fine screened and dewatered. The dewatered solids will then either be hauled offsite for a combination of disposal to landfill, soil augmentation, and composting, or dried further on site.

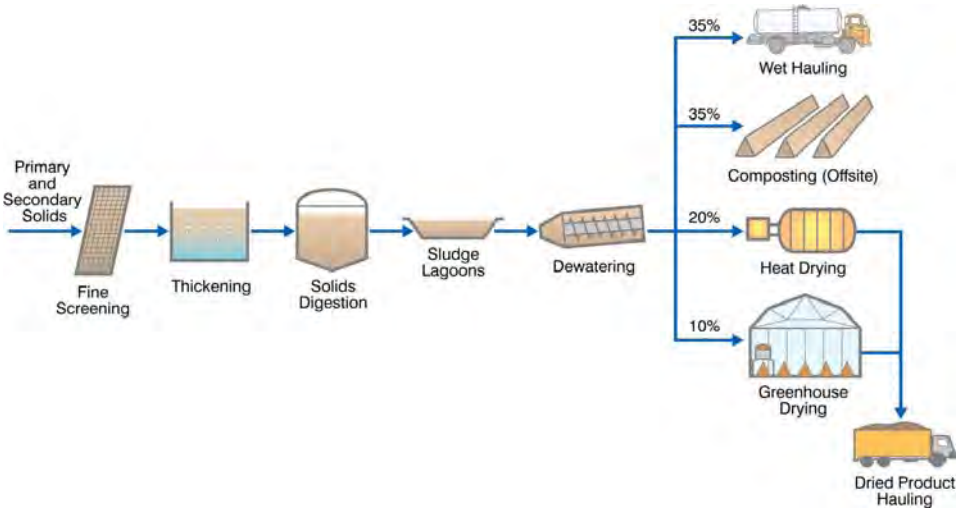

Figure 6 Solids Processing and Disposal Options Flowchart

Table 3 summarizes the various solids processing and disposal options to be brought online starting in 2023. The table presents the projected year online, the percent of WPCP solids to be treated and disposed using the option, and the cost per dry ton (DT) for processing and disposal.

Table 3 Solids Processing and Disposal Unit Costs
San José/Santa Clara Water Pollution Control Plant Master Plan
City of San José

Solids Processing Method	Year Online	Percent Solids Treated	Unit Processing Cost ($/DT)	Disposal Method	Unit Disposal Cost ($/DT)
Fine Screening	2023	100%	$986	Landfill at 25 percent solids(1)	$235
Dewatering	2023	100%	$72	---	---
Post-Dewatering Disposition:					
- Composting	2023	35%	$260 (2)	N/A(2)	N/A
- Direct Wet Hauling	2023	35%	N/A	Landfill at 25 percent solids(3)	$235
- Heat Drying	2025	20%	$54	Landfill at over 80 percent solids(4) (5)	$20
- Greenhouse Drying	2025	10%	$156	Landfill at over 80 percent solids(5)	$20

Notes:
(1) Disposal cost presented is the average cost for 25 percent solids developed in TM 5.2.
(2) Composting is assumed offsite and includes hauling. Processing cost presented is an average cost for off-site composting.
(3) A percent of the dewatered solids is assumed to be hauled at 25 percent solids at the average cost of hauling developed in TM 5.2. The cost presented is an average for land application and landfill.
(4) Heat drying assumes that excess heat is available to heat up to 25 percent of the total solids. If less than 25 percent of the solids is being treated using heat drying, only 10 percent of the estimated power is needed.
(5) Heat and greenhouse dried solids are comprised of very fine material that can be beneficially reused. It is assumed that the end product will be beneficially reused for agricultural or commercial landscaping and be hauled offsite at a net cost of $20 per DT.

In addition to solids processing and disposal impacts resulting from the various CIP projects, there is uncertainty surrounding the continued hauling of WPCP solids to the Newby Island Landfill. In order to account for potential cost impacts resulting from change in landfill location, the average hauling cost for 80 percent solids was used to project hauling cost unless otherwise modified by process change.

During the period from 2023 to 2025, the City plans to decommission the existing sludge lagoons. During this period, it is assumed that the City will dewater approximately 150 DT of solids from the retired sludge lagoons as follows:

- 80 percent of the sludge will go through mechanical dewatering, and
- 20 percent will be dewatered using contract dewatering.

In 2023 and 2024, 50 percent of the dewatered solids will be hauled to landfill as 25 percent wet cake and 50 percent dried in the sludge drying beds. The drying beds will be decommissioned in 2025 and the dewatered solids processing and disposal methods presented in Table 3 will be utilized. Contract dewatering is estimated to cost $665,000 per year in 2023 and 2024.

5.3 O&M Forecast

Following development of unit O&M costs for FYB 2008 and development of unit costs for O&M impacts resulting from process changes, the O&M through FYB 2039 was forecast for the WPCP. Two scenarios were projected:

- Baseline Scenario.
- Process Change Scenario.

Baseline Scenario

The baseline scenario assumes that no process change will occur and the O&M cost increase will be a result of increase in future flow and load only.

Since process unit costs were developed on $/mgd and $/DT bases, individual labor, power, and chemical estimates were not developed and forecast for each process. The O&M forecast assumes that the total process-related O&M cost will increase proportionate to flow and load increases. The process unit costs were therefore forecast for the baseline scenario by multiplying the process unit cost by the projected flow or load for that year.

Process Change Scenario

The process change scenario assumes that the CIP projects will be implemented as scheduled and the processes discussed in section 5.2 will observe change in cost as the process modifications come online.

The process change O&M forecast assumes that the total process-related O&M cost will increase proportionate to flow and load increases until the process change occurs, at which time the unit cost will change. Following change in unit cost, the costs continue to increase proportionate to flow and load increases. Table 4 summarizes the various unit cost changes and the year in which the change occurs.

Table 4 Unit Cost Changes Resulting from Process Changes
San José/Santa Clara Water Pollution Control Plant Master Plan
City of San José

Process	Year Online	Unit Cost	
		Prior to Process Change	Following Process Change (1)
Primary	---	$145	$151
Secondary (BNR 1)	---	234	273
Nitrification (BNR 2)	---	126	168
Filtration	---	82	88
Disinfection	2030	82	21
Fine Screening	2023	---	1221
Dewatering	2023	---	72
Sludge Processing	---	105	105
Residual Solids Management - Sludge Lagoons + Drying Beds	---	57	57
Heat Drying	2025	---	54
Composting	2023	---	260
Greenhouse Drying	2025	---	156
Hauling			
Dry Hauling (2)	---	58	64
Wet Hauling	2023	---	235
Heat and Greenhouse Solid Hauling	2025	---	64
SBWR	---	268	268

Notes:
(1) Includes cost adjustments resulting from increase in chemical and power consumption for secondary treatment and filtration.
(2) Includes increase in cost due to use of average hauling cost instead of continued haul to Newby Island Landfill.

Additional Services Cost Forecast

Many of the additional service costs were not assumed to increase with change in flow and load. However, based on City staff input, costs such as regulatory and laboratory costs were projected to increase at three percent per year. The cost categories that were expected to increase year over year are as follows:

- Regulations and research
- Watershed enforcement
- Pollution prevention
- Laboratory
- Communications
- Outreach

This cost increase was assumed for both the baseline and process change scenarios.

Cost Inflation

In order to account for the impact of cost inflation, all of the process O&M costs and the additional services costs were assumed to increase at a three percent inflation rate each year. The three percent inflation rate is based on the historical average consumer price index (CPI) increase.

O&M Cost Summary

The O&M costs at the WPCP will change as the flows and loads increase and the CIP projects are implemented. Using unit costs and projected flows and loads, the baseline and process change O&M costs were projected from FYB 2010 to FYB 2039. Table 5 summarizes the cost projection in five year increments for the baseline and process change scenarios. Detailed projections are presented in Appendix F.

6.0 RECOMMENDATIONS

This CIP model was developed based on numerous discussions with a wide cross-section of WPCP staff. While it aims to identify projects at the WPCP over the next 30 years there is greater knowledge of the projects required in the initial than later years. We recommend that the project triggers be re-evaluated annually and the model updated to reflect any possible changes. The model has already been used to develop the current 5-year CIP, and through annual revision it can be kept up to date and facilitate the development of future immediate-term CIPs.

Table 5 Summary of Project O&M Costs Through the PMP Planning Period
San José/Santa Clara Water Pollution Control Plant Master Plan
City of San José

	FYB 2010	FYB 2015	FYB 2020	FYB 2025	FYB 2030	FYB 2035	FYB 2040
Baseline Scenario							
Process Costs	$40.8	$44.0	$47.6	$50.6	$53.7	$56.4	$59.5
Additional Costs	$27.9	$29.9	$32.1	$34.6	$37.6	$41.0	$45.0
Total Cost (2010 Dollars)	$68.7	$73.9	$79.7	$85.3	$91.3	$97.5	$104.5
Total Cost (Escalated at 3 Percent)	$70.8	$88.2	$110.3	$136.8	$169.8	$210.2	$261.3
Process Change Scenario							
Process Costs	$41.3	$44.7	$48.3	$56.4	$60.8	$63.9	$67.3
Additional Costs	$27.9	$29.9	$32.1	$34.6	$37.6	$41.0	$45.0
Total Cost (2010 Dollars)	$69.2	$74.6	$80.4	$91.0	$98.3	$104.9	$112.3
Total Cost (Escalated at 3 Percent)	$71.3	$89.0	$111.3	$146.0	$182.9	$226.2	$280.8

Note:
(1) All costs presented are in $ million.

APPENDIX A – PMP CIP

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Notes	Project Category	Project ID	Project Title (Descriptive)	Primary Trigger	Secondary Trigger	Is the project linked to another project?	What project is this project linked to?	Project Start Year	Planning Design	CEQA	Construction	Project Duration	Year on Line	Total Project Cost (Escalated) 2%
			HEADWORKS											
	1	1	HW Enhancements Phase 1 and 2 (EBOS and Lamplighter connection)	Condition (R&R)	Improved Performance Benefit	No		2010	2	0	2	4	2014	6,700,000
	1	2	Miscellaneous HW1 Repairs	Condition (R&R)	Improved Performance Benefit	No		2011	4	0	4	8	2019	5,900,000
	1	3	Headworks No. 2 Modifications	Condition (R&R)	Improved Performance Benefit	Yes	4	2011	2	0	5	7	2018	62,600,000
No longer includes Odor Master Plan	5	4	Headworks Odor Control	Policy Decision	None	Yes	3	2011	2	0	5	7	2018	22,700,000
	5	5	Expand and Line Raw Equalization Basin to 10 MG	Condition (R&R)	Economic Benefit	No		2011	2	0	3	5	2016	9,000,000
	1	6	Demo HW 1	Policy Decision	None	No		2036	2	0	3	5	2041	11,500,000
	1	7	Refurbish/Demo P&E Building	Policy Decision	None	No		2036	2	0	3	5	2041	11,300,000
	1	8	Consolidate Influent Piping	Improved Performance Benefit	None	No		2033	4	0	4	8	2041	21,500,000
			PRIMARY TREATMENT											
	1	9	East Primaries Steel Conversion (included in East Primaries project)	Condition (R&R)	None	No		2012	2	0	1	3	2015	0
	1	10	East Primaries Steel Conversion, Coating Rehabilitation, Concrete Repair, and Seismic Modifications for Odor Control	Condition (R&R)	None	No		2012	2	0	6	8	2020	50,100,000
	5	11	Primary Treatment Odor Control	Policy Decision	None	No		2012	2	0	6	8	2020	49,900,000
	1	12	Tunnel Rehabilitation: West Primaries	Condition (R&R)	None	No		2012	2	0	3	5	2017	1,800,000
	1	13	Tunnel Rehabilitation: East Primaries	Condition (R&R)	None	No		2012	2	0	6	8	2020	2,400,000
	1	14	Iron Salt Facilities (EBOS and primaries)	Regulatory	Improved Performance Benefit	No		2011	1	0	1	2	2013	2,500,000
	1	15	Demo West Primaries	Policy Decision	None	No		2036	2	0	3	5	2041	22,100,000
	1	16	Additional 12 MG PE Equalization Basin	Improved Performance Benefit	Economic Benefit	Yes	29	2028	2	0	3	5	2033	21,600,000
			SECONDARY TREATMENT											
	1	17	Secondary Air Plenum Filtration	Improved Performance Benefit	Economic Benefit	No		2010	0	0	1	1	2011	1,700,000
All 16 BNR2 clarifiers connected.	1	18	Connect BNR1 and BNR2 Clarifiers	Improved Performance Benefit	Economic Benefit	No		2011	2	0	3	5	2016	14,600,000
	1	19	Connect Aeration Headers	Economic Benefit	Improved Performance Benefit	No		2015	2	0	2	4	2019	4,700,000
	1	20	Aeration Tank Rehabilitation (BNR 1 and BNR 2)	Condition (R&R)	Improved Performance Benefit	No	103	2015	2	0	6	8	2023	62,100,000
Updated based on Condition Assesment Report. Used per clarifier repair cost.	1	21	Rehab of Remaining Secondary Clarifiers (BNR 2)	Condition (R&R)	Improved Performance Benefit	No		2011	3	0	5	8	2019	13,200,000
	1	22	CFD Modeling and Rehab of 1 Secondary Clarifier	Condition (R&R)	Improved Performance Benefit	No		2011	1	0	1	2	2013	1,200,000
Updated based on BNR2 estimate by AECOM, and new clarifier mechanisms. CH2MHill in process of developing a BNR1 estimate.	1	23	Rehab of Remaining Secondary Clarifiers (BNR 1)	Condition (R&R)	Improved Performance Benefit	No		2014	3	0	7	10	2024	28,900,000
	1	24	Conversion to Fine Bubble Diffusers	Improved Performance Benefit	Economic Benefit	No		2012	3	0	7	10	2022	35,400,000
Chlorine spray-down systems.	1	25	Foam and Scum Control	Improved Performance Benefit	None	No		2014	1	0	1	2	2016	1,400,000
Surface wasting installations (assume 4 total in channels).	1	26	Nocardia Control	Improved Performance Benefit	None	No		2014	2	0	2	4	2018	7,700,000
	1	27	*Field Verification of Foam and Scum Control Options*	Improved Performance Benefit	Economic Benefit	No		2011	1	0	0	1	2012	1,100,000
Alternative 1	1	28	Conversion to NAS (NH3<3 mg-N/L regulation)*	Increased Flows and Loads	None	No		2021	2	0	3	5	2026	0
Alternative 2	2	29	Conversion to NAS (TN<8 mg/L regulation)	Regulatory	Increased flows and loads	Yes	16, 35	2021	2	0	3	5	2026	68,000,000
Alternative 3	2	30	Conversion to MLE (TN<8 mg-N/L regulation)*	Regulatory	Increased flows and loads	Yes	36	2021	2	0	3	5	2026	0
			FILTRATION AND DISINFECTION											
	1	31	Underdrain and Media (remaining Bank A 7 filters)	Condition (R&R)	Improved Performance Benefit	No		2012	1	0	2	3	2015	3,200,000
	1	32	Miscellaneous Filtration Repairs	Condition (R&R)	None	Yes	35	2011	4	0	11	15	2026	12,200,000
	1	33	*Field Verification of Alternative Filter Technology*	Improved Performance Benefit	None	No		2012	2	0	3	5	2017	3,200,000
	1	34	Underdrain and Media (1 filter) + field verification	Condition (R&R)	Improved Performance Benefit	No		2010	1	0	0	1	2011	400,000
Alternative 1	2	35	New Filters: 128 mgd Tetra Denite plus 52 mgd New Tertiary (NAS mode only)	Regulatory	Condition (R&R)	Yes	29, 32	2019	4	0	3	7	2026	132,600,000
Alternative 2	1	36	New Tertiary Filters: 180 mgd (Nova filters assumed; MLE mode, or other triggers)*	Condition (R&R)	None	Yes	40	2019	4	0	3	7	2026	0
Alternative 1 (Purchase HOCl, PHWWF in CCBs)	1	37	Construct Additional Chlorine Contact Basin Capacity (155mgd)	Improved Performance Benefit	Policy Decision	Yes	39	2026	2	0	2	4	2030	0
Alternative 2 (On-site HOCl, PHWWF in CCBs)	1	38	On-site HOCl + Construct Additional Chlorine Contact Basin Capacity (155mgd)	Improved Performance Benefit	Policy Decision	Yes	39	2024	2	0	4	6	2030	0
Alternative 3 (UV + 155mgd PHWWF in CCBs)	2	39	New Ultraviolet Disinfection Facilities	Economic Benefit	Regulatory	Yes	37, 38, 40	2024	2	0	4	6	2030	49,400,000
Alternative 4	2	40	Peroxide	Regulatory	Improved Performance Benefit	Yes	39, 41	2029	2	0	4	6	2035	0
Alternative 4	1	41	Ozone*	Regulatory	Economic Benefit	Yes	40	2029	2	0	4	6	2035	0
			BIOSOLIDS											
From O&M Budget	3	42	Inactive Lagoons Rehabilitation Phase 1	Regulatory	None	Yes	43	2011	2	0	3	5	2016	13,900,000
From O&M Budget	3	43	Inactive Lagoons Rehabilitation Phase 2	Regulatory	None	Yes	42	2011	2	0	3	5	2016	13,900,000
	4	44	WAS and PS Fine screening	Policy Decision	Improved Performance Benefit	Yes	59	2019	2	0	2	4	2023	11,800,000
Construction Contract No. 1	3	45	Digester Gas Manifold and Tunnel Improvements	Condition (R&R)	None	No		2011	1	0	1	2	2013	14,700,000
Excludes removal of redundant piping (performed in Const. Contr. 1)	3	46	Tunnel Rehabilitation: Digesters and DAFT	Condition (R&R)	None	No		2012	5	0	5	10	2022	6,800,000
Construction Contract No. 2; Includes Piloting	3	47	Digester Cover and Mixing Upgrades (4 digesters)	Condition (R&R)	Improved Performance Benefit	Yes	50	2011	1	0	3	4	2015	29,000,000
Pre-Purchase Contract No. 1	3	48	Digester Mixing Equipment 1 (LM mixer)	Condition (R&R)	Improved Performance Benefit	No		2011	1	0	1	2	2013	400,000
Pre-Purchase Contract No. 2	3	49	Digester Mixing Equipment 2 (Draft tube mixer)	Condition (R&R)	Improved Performance Benefit	No		2011	1	0	1	2	2013	700,000
	3	50	Digester Cover and Mixing Upgrades (3 digesters)	Condition (R&R)	Improved Performance Benefit	Yes	47, 51	2020	1	0	3	4	2024	26,000,000
	3	51	Digester Cover and Mixing Upgrades (3 digesters)	Condition (R&R)	Improved Performance Benefit	Yes	50	2024	1	0	2	3	2027	27,900,000
Construction Contract No. 3; Includes Odor Control and Piloting	3	52	DAFT Final Upgrades (6 DAFTs)	Condition (R&R)	Improved Performance Benefit	Yes	54	2010	2	0	1	3	2013	4,600,000
Construction Contract No. 4	3	53	Digester Heating Upgrades	Condition (R&R)	Improved Performance Benefit	No		2010	2	0	1	3	2013	700,000
Construction Contract No. 5	3	54	Struvite Control Chemical Feed	Condition (R&R)	Improved Performance Benefit	Yes	52	2011	1	0	1	2	2013	200,000
CROWN, OpenCel, or CAMBI	3	55	*Digestion Pre-Treatment Field Verification*	Improved Performance Benefit	None	No		2013	3	0	3	6	2019	11,400,000
	3	56	FOG Receiving Station and 1/2-Mile Access Road (pilot breakout unnecessary)	Economic Benefit	Policy Decision	No		2013	2	0	2	4	2017	9,200,000
	3	57	14-inch digested sludge line replacement (parallel pipe)	Condition (R&R)	None	Yes	59	2019	2	0	2	4	2023	12,900,000
	4	58	*Sludge Dewatering Field Verification*	Policy Decision	None	No		2015	1	0	1	2	2017	2,300,000
	4	59	2/3 Full Mechanical Dewatering (Centrifuges) plus feed storage tank	Policy Decision	None	Yes	44, 57, 60, 62, 63, 88, 93	2017	2	0	4	6	2023	84,700,000
	4	60	Cake Storage	Policy Decision	None	Yes	59	2017	2	0	4	6	2023	15,100,000
	4	61	1/3 Full Mechanical Dewatering (Centrifuges)	Policy Decision	None	Yes	65, 68	2028	2	0	3	5	2033	41,900,000
	4	62	Lagoons/Drying Bed Retirement	Condition (R&R)	Policy Decision	Yes	59, 67, 80	2023	1	0	1	2	2025	3,000,000
	4	63	2/3 Covered lagoons (180 days storage)	Policy Decision	Improved Performance Benefit	Yes	59, 64	2017	2	0	3	5	2022	32,000,000
	4	64	Emergency Biosolids Storage	Policy Decision	Improved Performance Benefit	Yes	63	2017	2	0	4	6	2023	7,600,000
	4	65	1/3 Covered lagoons (180 days storage)	Policy Decision	Improved Performance Benefit	Yes	61	2028	2	0	3	5	2033	19,800,000
	4	66	*Sludge Drying Field Verification*	Policy Decision	Improved Performance Benefit	Yes	67	2018	2	0	0	2	2020	1,800,000
	4	67	2/3 Thermal Drying for 20% of solids stream	Policy Decision	Improved Performance Benefit	Yes	62, 66	2020	2	0	3	5	2025	68,500,000
	4	68	1/3 Thermal Drying for 20% of solids stream	Policy Decision	Improved Performance Benefit	Yes	61	2028	2	0	3	5	2033	27,700,000
Locate South of new 12 MG PE EQ basin; could start anytime	4	69	*Biosolids Greenhouse Demonstration Project (w/ BFPs)*	Policy Decision	Improved Performance Benefit	No		2012	2	0	2	4	2016	9,000,000
	4	70	2/3 Greenhouse: Full Scale (w/o dewatering)	Policy Decision	Improved Performance Benefit	Yes	62	2020	2	0	3	5	2025	13,300,000
	4	71	1/3 Greenhouse: Full Scale (w/o dewatering)	Policy Decision	Improved Performance Benefit	Yes	61	2028	2	0	3	5	2033	7,800,000
			COMBINED HEAT AND POWER											

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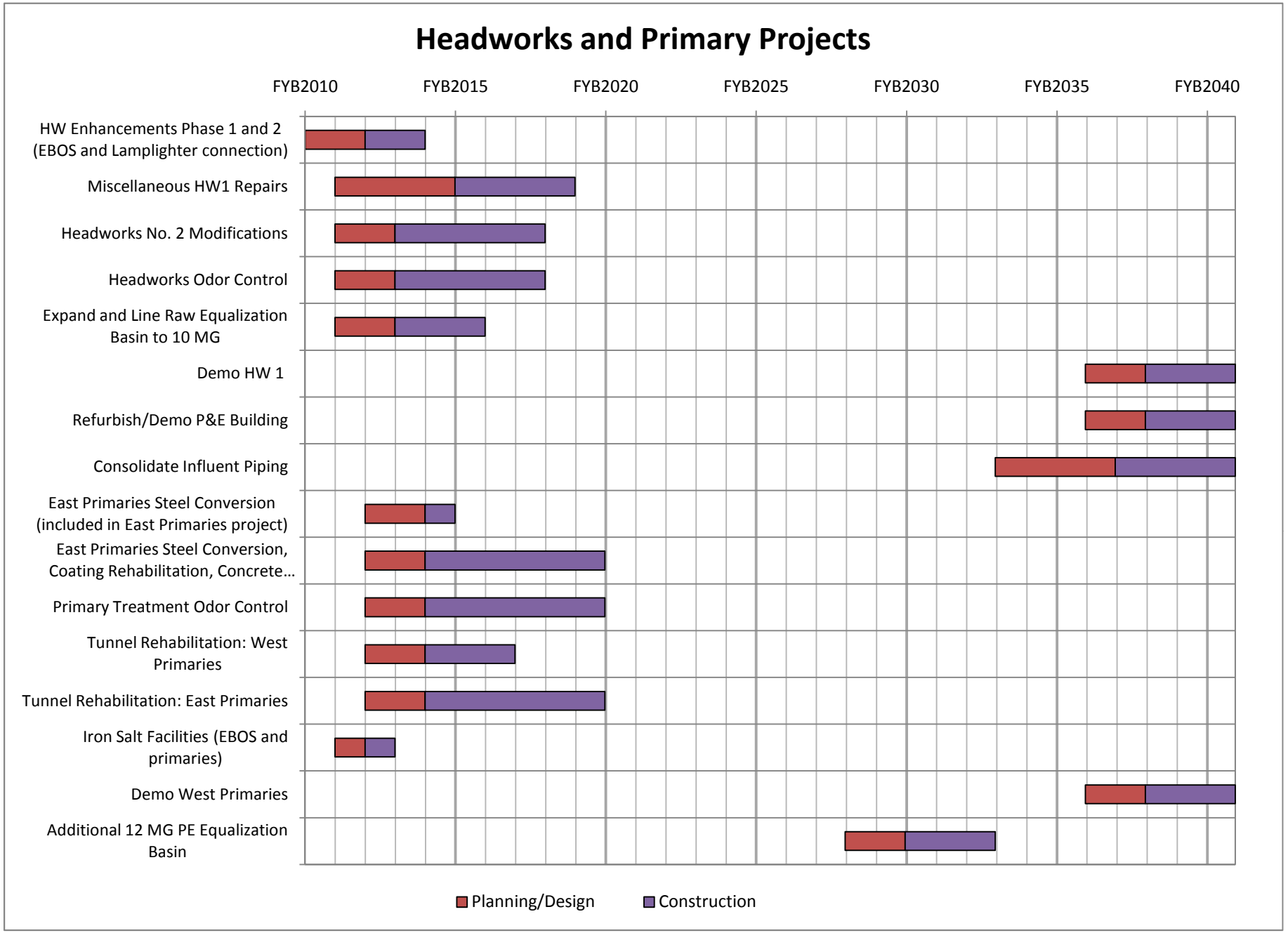
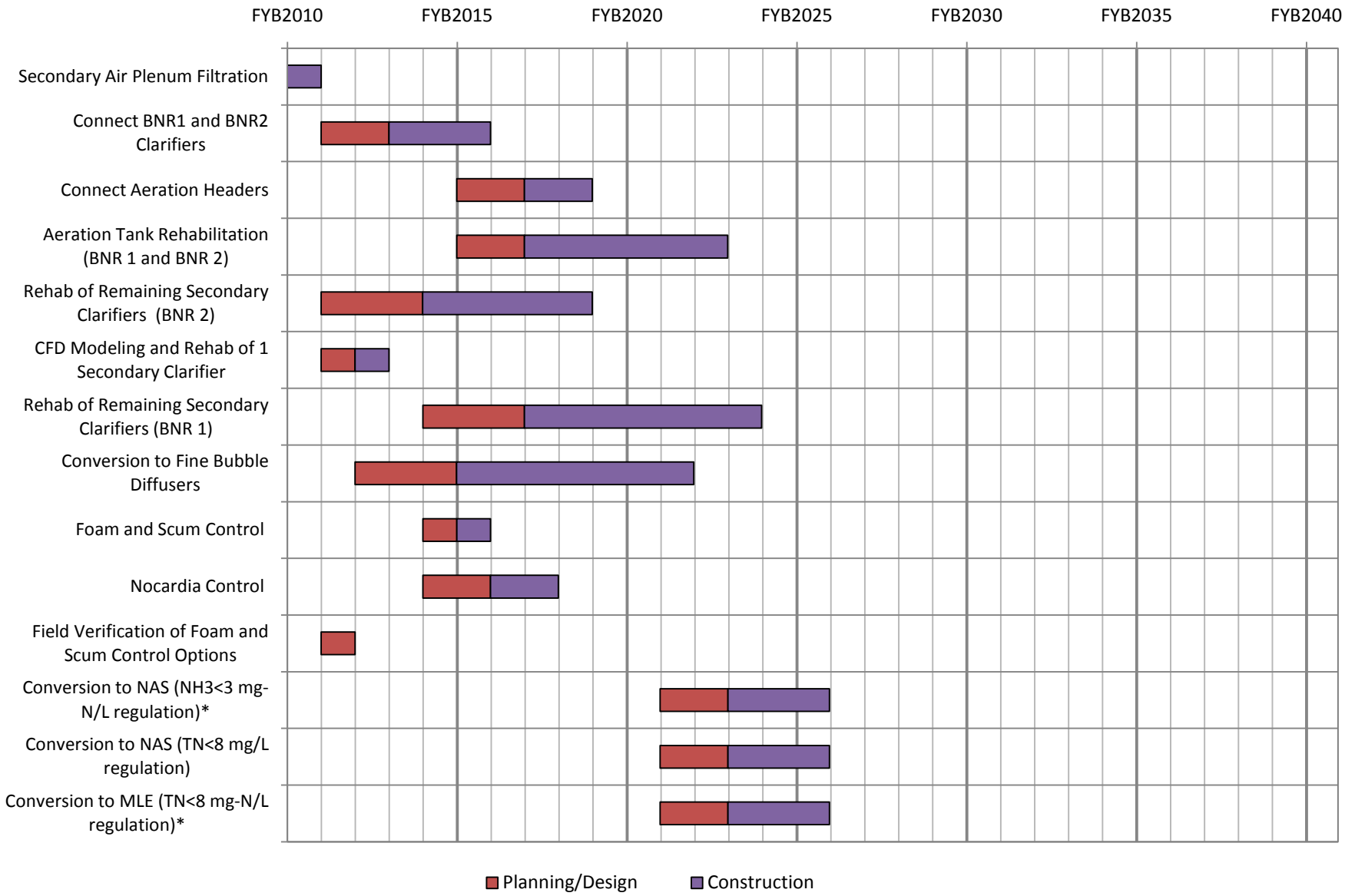
Notes	Project Category	Project ID	Project Title (Descriptive)	Primary Trigger	Secondary Trigger	Is the project linked to another project?	What project is this project linked to?	Project Start Year	Planning Design	CEQA	Construction	Project Duration	Year on Line	Total Project Cost (Escalated) 2%
	1	72	Energy Strategic Plan	Improved Performance Benefit	None	No		2011	1	0	0	1	2012	400,000
	1	73	Fuel cell	Condition (R&R)	Regulatory	No		2011	1	0	0	1	2012	1,400,000
	1	74	Plant Electrical Reliability (PER) - 4.6 MW Gas Turbine Phase 1 (w/o gas storage)	Condition (R&R)	Improved Performance Benefit	No		2012	3	0	3	6	2018	36,000,000
	1	75	Gas Turbine Phase 2 (9.2 MW)	Condition (R&R)	Regulatory	No		2020	1	0	4	5	2025	39,000,000
	1	76	Gas Turbine Phase 3 (4.6 MW)	Condition (R&R)	Regulatory	No		2030	1	0	4	5	2035	23,700,000
Included in Plant Electrical Reliability	1	77	Digester Gas Storage, Compressors, and Piping	Improved Performance Benefit	None	Yes	80	2025	2	0	3	5	2030	15,300,000
Previously included in Plant Infrastructure Improvements, but now stand alone	1	78	Solar Power Facility Phase 1 (1 MW) - PPA	Economic Benefit	Policy Decision	Yes	79	2010	2	0	0	2	2012	800,000
	1	79	Solar Power Facility Phase 1 (1 MW) - Direct Purchase	Economic Benefit	Policy Decision	Yes	78	2013	2	0	3	5	2018	7,300,000
	1	80	Solar Power Facility Phase 2 (5 MW)	Policy Decision	Economic Benefit	Yes	62, 77	2025	2	0	3	5	2030	42,300,000
			ELECTRICAL											
	1	81	PER - 115 kV Breaker Replacement	Condition (R&R)	Improved Performance Benefit	No		2014	1	0	0	1	2015	2,900,000
	1	82	PER - M1, M2, M3 Switchgear Replacement	Condition (R&R)	Improved Performance Benefit	No		2011	1	0	1	2	2013	500,000
	1	83	PER - MCC H1, H2, J1, J2	Condition (R&R)	Improved Performance Benefit	No		2011	1	0	0	1	2012	200,000
	1	84	PER - MCC Phase II Replacements	Condition (R&R)	Improved Performance Benefit	No		2010	1	0	1	2	2012	300,000
	1	85	PER - S11 Switchgear Replacement	Condition (R&R)	Improved Performance Benefit	No		2013	1	0	1	2	2015	9,900,000
	1	86	PER - S40 and G3 Switchgear Update	Condition (R&R)	Improved Performance Benefit	No		2011	1	0	3	4	2015	14,200,000
	1	87	PER - Standby Generator (Admin Building)	Condition (R&R)	Improved Performance Benefit	No		2010	1	0	1	2	2012	600,000
Timing of switchgear project is linked to mechanical dewatering	1	88	Double-ended substation with switchgear for solids handling processes	Increased Flows and Loads	Improved Performance Benefit	Yes	59	2017	2	0	3	5	2022	4,000,000
			ADVANCED PROCESS CONTROL AND AUTOMATION											
Field investigation and system integration	1	89	Advanced Process Control and Automation	Condition (R&R)	Policy Decision	No		2011	5	0	5	10	2021	7,100,000
	1	90	Master Plan for Automation/ Info and Knowledge Management	Condition (R&R)	Policy Decision	No		2011	2	0	0	2	2013	1,400,000
	1	91	Meter Validation and Replacement Program	Condition (R&R)	Policy Decision	No		2011	2	0	2	4	2015	1,100,000
	1	92	EG2 & EG3 Engine Control Panel Upgrade	Condition (R&R)	Improved Performance Benefit	No		2011	0	0	1	1	2012	200,000
	1	93	Side stream Nitrogen removal	Improved Performance Benefit	Economic Benefit	Yes	59	2020	2	0	1	3	2023	0
			SITE FACILITY IMPROVEMENTS											
	1	94	HVAC Upgrades (P&E Office and Admin/Secondary Service Wing)	Condition (R&R)	Improved Performance Benefit	No		2011	0	0	1	1	2012	200,000
	1	95	Cooling Tower Replacement (Secondary)	Condition (R&R)	Improved Performance Benefit	No		2011	1	0	1	2	2013	2,600,000
	1	96	Nitrification Building Chiller Replacement	Condition (R&R)	Improved Performance Benefit	No		2011	1	0	1	2	2013	200,000
	1	97	Handrail Replacement	Condition (R&R)	None	No		2011	5	0	0	5	2016	5,000,000
Roads and Landscaping (includes Railroad Spur Replacement)	1	98	Site Facility Improvements - Phase 1	Condition (R&R)	Policy Decision	Yes	99	2011	5	0	10	15	2026	9,100,000
Roads and Landscaping	1	99	Site Facility Improvements - Phase 2	Condition (R&R)	Policy Decision	Yes	98	2026	5	0	10	15	2041	12,200,000
	1	100	Yard Piping	Condition (R&R)	None	No		2011	5	0	10	15	2026	16,500,000
	1	101	Unanticipated/Critical Repairs	Condition (R&R)	None	No		2010	0	0	31	31	2041	25,427,664
	7	102	Remaining R&R (2025 through 2040)	Condition (R&R)	None	No		2025	0	0	16	16	2041	416,006,376
	1	103	Tunnel Rehabilitation: BNR 1	Condition (R&R)	None	Yes	20, 104	2015	2	0	6	8	2023	7,400,000
	1	104	Tunnel Rehabilitation: BNR 2	Condition (R&R)	None	Yes	103	2018	2	0	3	5	2023	2,900,000
Need cost	1	105	3W Pump Station Improvements	Condition (R&R)	None	No		2015	0	0	3	3	2018	1,100,000
	1	106	Warehousing Facility Additions	Improved Performance Benefit	None	No		2016	1	0	1	2	2018	2,100,000
Includes site facility plan, and architectural treatment (if any)	1	107	Support Building Improvements Phase 1	Condition (R&R)	Policy Decision	No		2016	3	0	5	8	2024	25,600,000
	1	108	Support Building Improvements Phase 2	Condition (R&R)	Policy Decision	No		2025	3	0	5	8	2033	33,700,000
	1	109	Support Buildings Improvements Phase 3	Condition (R&R)	Policy Decision	No		2033	3	0	5	8	2041	39,500,000
	1	110	Public Art Reserve - 2010 to 2020	Policy Decision	None	No		2010	5	0	5	10	2020	1,140,600
	1	111	Public Art Reserve - 2021 to 2030	Policy Decision	None	No		2020	5	0	5	10	2030	3,763,800
	1	112	Public Art Reserve - 2031 through 2040	Policy Decision	None	No		2030	5	0	6	11	2041	534,600
			SOUTH BAY WATER RECYCLING											
	1	113	Revised South Bay Action Plan - SBWR Extension	Improved Performance Benefit	None	No		2011	3	0	3	6	2017	2,200,000
			PLANT RECORD DRAWINGS PROGRAM											
	1	114	Plant Record Drawings Program	Condition (R&R)	Policy Decision	No		2010	4	0	0	4	2014	4,400,000
			TOTAL											**$ 2,081,373,041**
		*	Estimated but not included in total											

APPENDIX B – CIP PROJECTS GANTT CHARTS

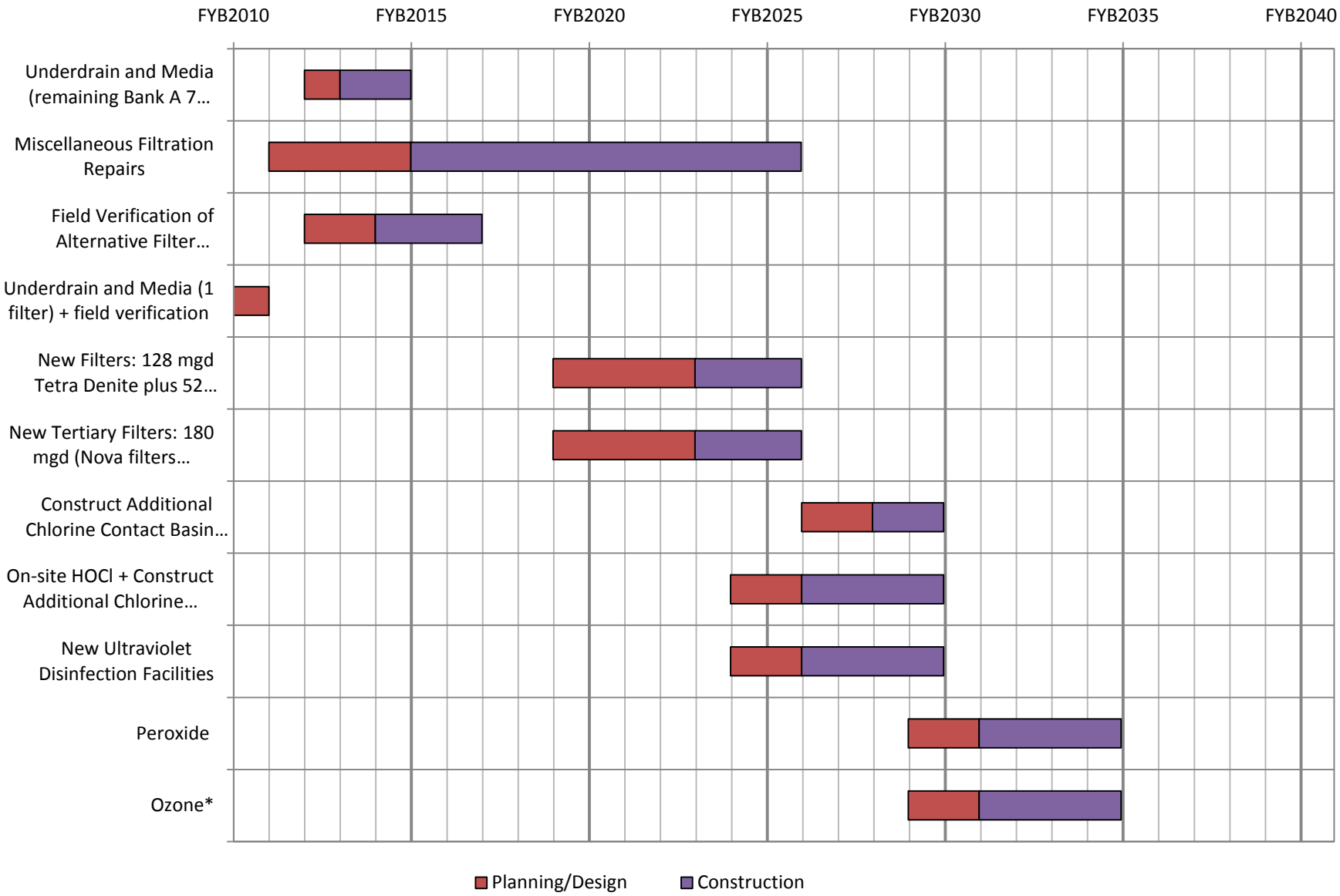
Figure B-1 Headworks and Primary Projects
Figure B-2 Secondary Projects
Figure B-3 Filtration and Disinfection Projects
Figure B-4 Biosolids Projects
Figure B-5 Energy, Electrical, and Automation Projects
Figure B-6 Site Improvements and Other Projects

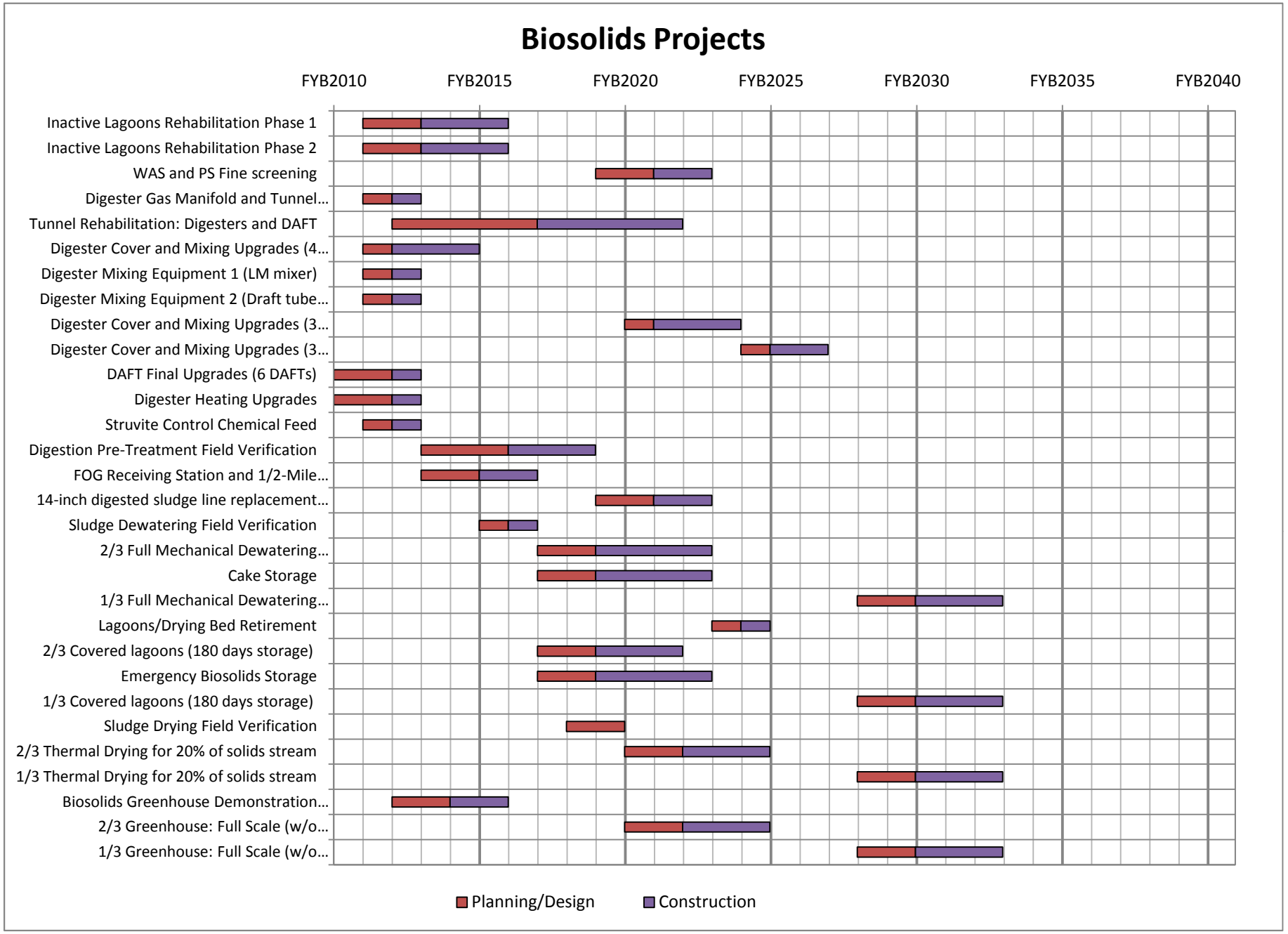

Headworks and Primary Projects
FYB2010
FYB2015
FYB2020
FYB2025
FYB2030
FYB2035
FYB2040
HW Enhancements Phase 1 and 2 (EBOS and Lamplighter connection)
Miscellaneous HW1 Repairs
Headworks No. 2 Modifications
Headworks Odor Control
Expand and Line Raw Equalization Basin to 10 MG
Demo HW 1
Refurbish/Demo P&E Building
Consolidate Influent Piping
East Primaries Steel Conversion (included in East Primaries project)
East Primaries Steel Conversion, Coating Rehabilitation, Concrete…
Primary Treatment Odor Control
Tunnel Rehabilitation: West Primaries
Tunnel Rehabilitation: East Primaries
Iron Salt Facilities (EBOS and primaries)
Demo West Primaries
Additional 12 MG PE Equalization Basin
Planning/Design
Construction

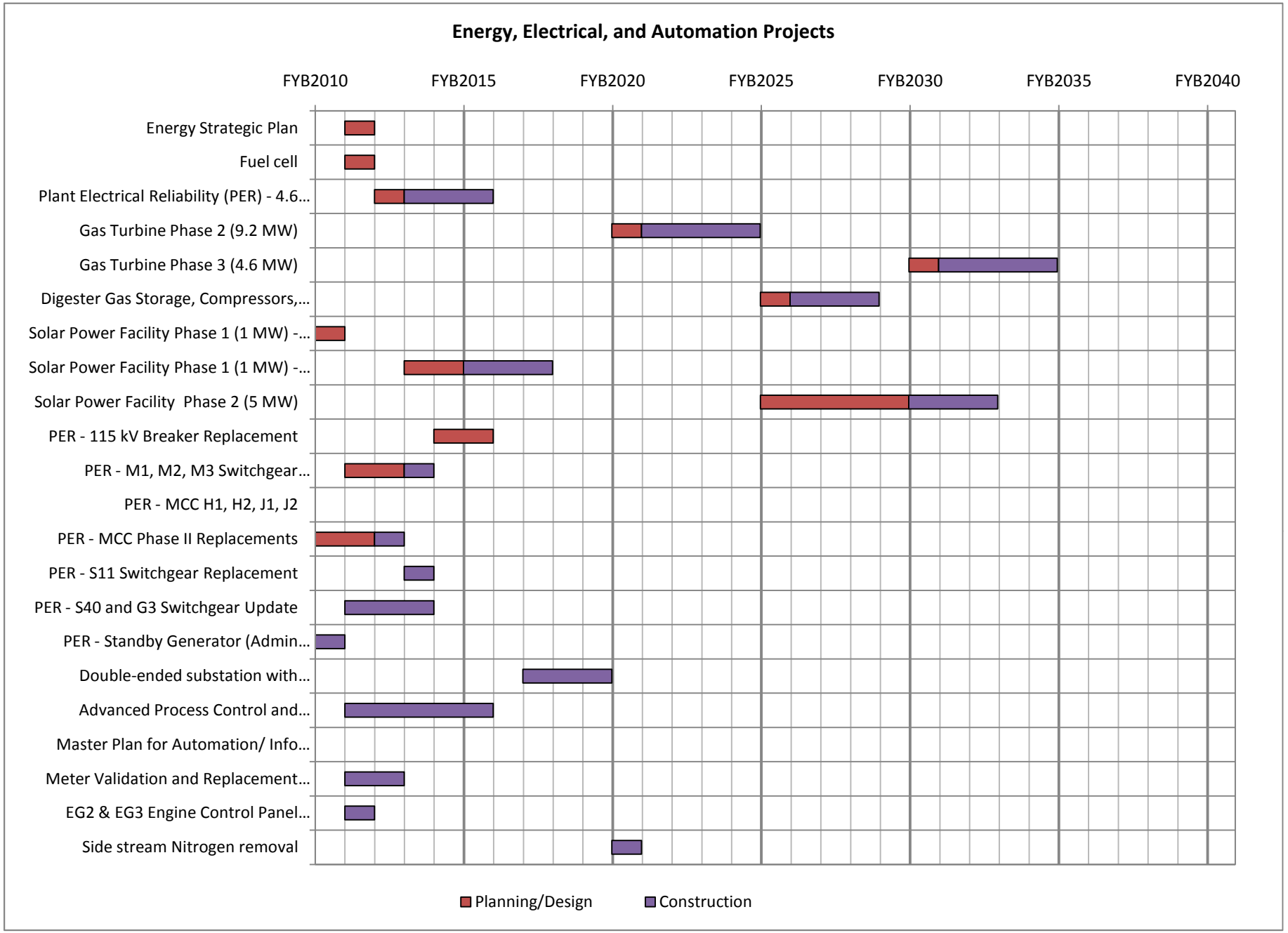
Secondary Projects

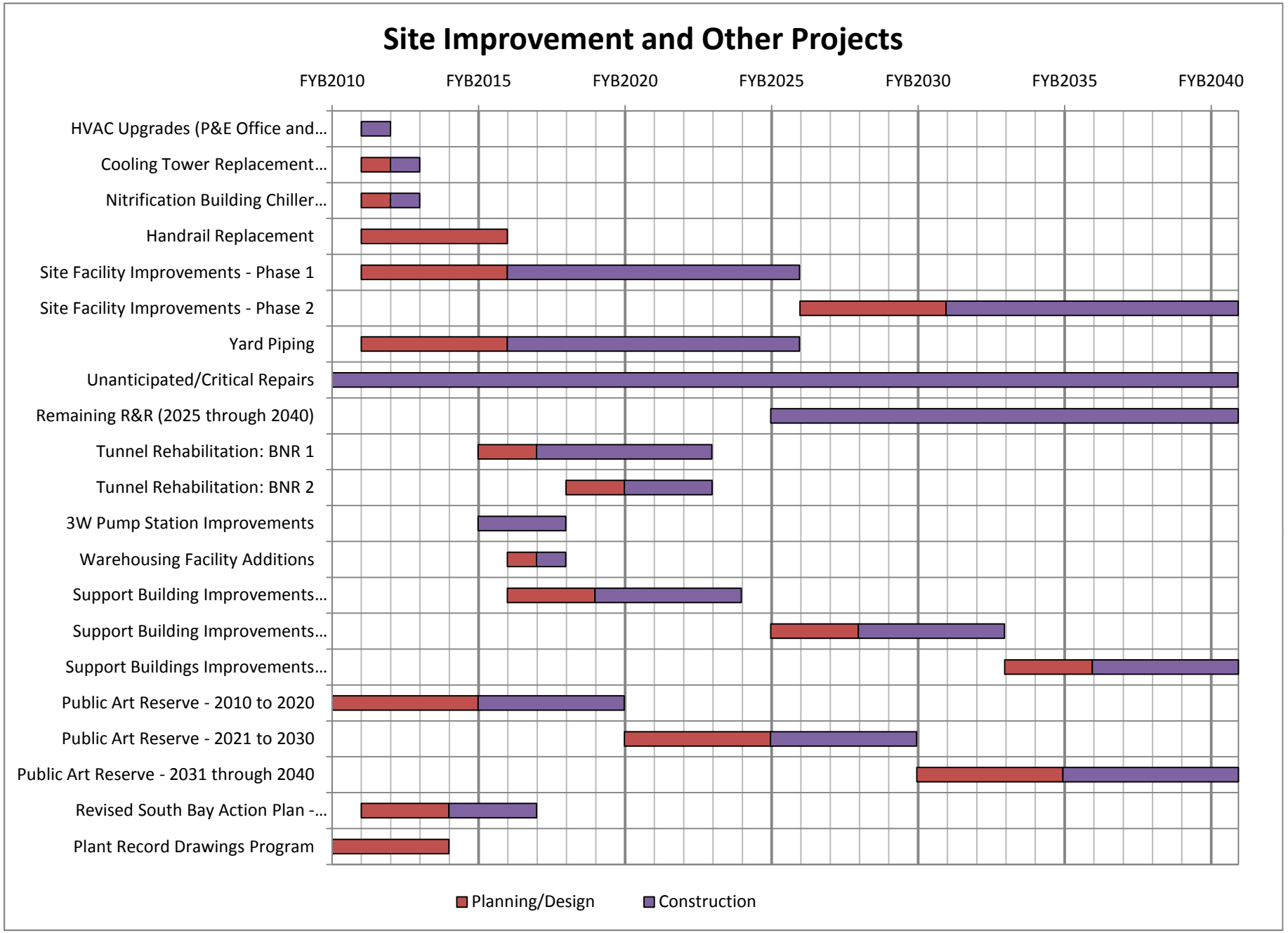


Filtration and Disinfection Projects




Biosolids Projects
FYB2010
FYB2015
FYB2020
FYB2025
FYB2030
FYB2035
FYB2040
Inactive Lagoons Rehabilitation Phase 1
Inactive Lagoons Rehabilitation Phase 2
WAS and PS Fine screening
Digester Gas Manifold and Tunnel...
Tunnel Rehabilitation: Digesters and DAFT
Digester Cover and Mixing Upgrades (4...
Digester Mixing Equipment 1 (LM mixer)
Digester Mixing Equipment 2 (Draft tube...
Digester Cover and Mixing Upgrades (3...
Digester Cover and Mixing Upgrades (3...
DAFT Final Upgrades (6 DAFTs)
Digester Heating Upgrades
Struvite Control Chemical Feed
Digestion Pre-Treatment Field Verification
FOG Receiving Station and 1/2-Mile...
14-inch digested sludge line replacement...
Sludge Dewatering Field Verification
2/3 Full Mechanical Dewatering...
Cake Storage
1/3 Full Mechanical Dewatering...
Lagoons/Drying Bed Retirement
2/3 Covered lagoons (180 days storage)
Emergency Biosolids Storage
1/3 Covered lagoons (180 days storage)
Sludge Drying Field Verification
2/3 Thermal Drying for 20% of solids stream
1/3 Thermal Drying for 20% of solids stream
Biosolids Greenhouse Demonstration...
2/3 Greenhouse: Full Scale (w/o...
1/3 Greenhouse: Full Scale (w/o...
Planning/Design
Construction


Energy, Electrical, and Automation Projects
FYB2010
FYB2015
FYB2020
FYB2025
FYB2030
FYB2035
FYB2040
Energy Strategic Plan
Fuel cell
Plant Electrical Reliability (PER) - 4.6...
Gas Turbine Phase 2 (9.2 MW)
Gas Turbine Phase 3 (4.6 MW)
Digester Gas Storage, Compressors,...
Solar Power Facility Phase 1 (1 MW) -...
Solar Power Facility Phase 1 (1 MW) -...
Solar Power Facility Phase 2 (5 MW)
PER - 115 kV Breaker Replacement
PER - M1, M2, M3 Switchgear...
PER - MCC H1, H2, J1, J2
PER - MCC Phase II Replacements
PER - S11 Switchgear Replacement
PER - S40 and G3 Switchgear Update
PER - Standby Generator (Admin...
Double-ended substation with...
Advanced Process Control and...
Master Plan for Automation/ Info...
Meter Validation and Replacement...
EG2 & EG3 Engine Control Panel...
Side stream Nitrogen removal
Planning/Design
Construction


Site Improvement and Other Projects
FYB2010
FYB2015
FYB2020
FYB2025
FYB2030
FYB2035
FYB2040
HVAC Upgrades (P&E Office and...
Cooling Tower Replacement...
Nitrification Building Chiller...
Handrail Replacement
Site Facility Improvements - Phase 1
Site Facility Improvements - Phase 2
Yard Piping
Unanticipated/Critical Repairs
Remaining R&R (2025 through 2040)
Tunnel Rehabilitation: BNR 1
Tunnel Rehabilitation: BNR 2
3W Pump Station Improvements
Warehousing Facility Additions
Support Building Improvements...
Support Building Improvements...
Support Buildings Improvements...
Public Art Reserve - 2010 to 2020
Public Art Reserve - 2021 to 2030
Public Art Reserve - 2031 through 2040
Revised South Bay Action Plan -...
Plant Record Drawings Program
Planning/Design
Construction

APPENDIX C – PROJECT DESCRIPTIONS

APPENDIX C
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ID Number	Project Name
1	HW Enhancements Phases 1 and 2, EBOS Improvements and Lamplighter Connection
2	Miscellaneous Headworks 1 Repairs
3	Headworks 2 Modifications
4	Headworks Odor Control
5	Expand and Line Raw EQ Basin to 10 MG
6	Demo HW1
7	Refurbish/Demo P&E Building
8	Consolidate Influent Piping
9	East Primaries Steel Conversion (included in East Primaries Project)
10	East Primaries Steel Conversion, Coating Rehabilitation, Concrete Repair, and seismic modifications for odor control
11	Primary Treatment Odor Control
12	Tunnel Rehab West Primaries
13	Tunnel Rehab East Primaries
14	Iron Salt Facilities (EBOS and Primaries)
15	Demo West Primaries
16	Additional 12 MG PE EQ Basin
17	Secondary Air Plenum Filtration
18	Connect BNR1 and BNR2 Clarifiers
19	Connect Aeration Headers
20	Aeration Tank Rehabilitation – BNR 1 and 2
21	Rehabilitation of remaining secondary clarifiers BNR 2
22	CFD Modeling and rehab of 1 secondary clarifier
23	Rehabilitation of remaining secondary clarifiers BNR 1
24	Conversion to Fine Bubble Diffusers
25	Foam and Scum Control
26	*Nocardia* Control
27	Field Verification of Foam and Scum Control Options
28	Conversion to NAS (NH3 < 3mg-N/L regulation)

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ID Number	Project Name
29	Conversion to NAS (TN < 8 mg-N/L regulation)
30	Conversion to MLE (TN<8 mg-N/L)
31	Underdrain and Media (Remaining 7 Bank A filters)
32	Miscellaneous Filtration Repairs
33	Field Verification of Alternative Filter Technology
34	Underdrain and Media (1 filter) + Field Verification
35	New filters: 128 mgd Tetra Denite plus 58 mgd New tertiary
36	New Tertiary Filters: 180 mgd (Nova Filters assumed; MLE mode, or other triggers)
37	Additional Chlorine Contact Basin Capacity (155 mgd)
38	Onsite HOCL plus Additional Chlorine Contact Basins (155 mgd)
39	New UV Disinfection Facilities
40	Peroxide
41	Ozone
42	Inactive Lagoons Rehabilitation Phase 1
43	Inactive Lagoons Rehabilitation Phase 2
44	WAS and PS Fine Screening
45	Digester Gas Manifold and Tunnel Improvements
46	Tunnel Rehabilitation: Digesters and DAFT
47	Digester Cover and Mixing Upgrades (4 digesters)
48	Digester Mixing Equipment 1 (LM mixer)
49	Digester Mixing Equipment 2 (Draft tube mixer)
50	Digester Cover and Mixing Upgrades (3 digesters)
51	Digester Cover and Mixing Upgrades (3 digesters)
52	DAFT Final Upgrades (6 DAFTs)
53	Digester Heating Upgrades
54	Struvite Control Chemical Feed
55	Digester Pretreatment Field Verification
56	FOG receiving station and access road
57	14-inch Digested Sludge Line Addition (parallel pipe)
58	Sludge Dewatering Field Verification
59	2/3 Full Mechanical Dewatering (Centrifuges) Plus Feed Storage Tank
60	Cake Storage
61	1/3 full Mechanical Dewatering (Centrifuges)

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INDEX

ID Number	Project Name
62	Lagoons and Drying Beds Retirement
63	2/3 Covered Lagoons (180 days storage)
64	Emergency Biosolids Storage
65	1/3 Covered Lagoons (180 days storage)
66	Sludge Drying Field Verification
67	2/3 Thermal Drying for 20% solids streams
68	1/3 Thermal Drying for 20% solids streams
69	Biosolids Greenhouse Demonstration Project with BFPs
70	2/3 Full Scale Greenhouse without Dewatering
71	1/3 Full Scale Greenhouse without Dewatering
72	Energy Strategic Plan
73	Fuel Cell
74	Plant Electrical Reliability (PER) – 4.6 MW Gas Turbine Phase 1 (w/o gas storage)
75	Gas Turbine Phase 2 (9.2 MW)
76	Gas Turbine Phase 3 (4.6 MW)
77	Digester Gas Storage, Compressors, and Piping
78	Solar Power Facility Phase 1 (1 MW) - PPA
79	Solar Power Facility Phase 1 (1 MW) – Direct Purchase
80	Solar Power Facility Phase 2 (5 MW)
81	PER - 115 kV Breaker Replacement
82	PER - M1, M2, M3 Switchgear Replacement
83	PER - MCC H1, H2, J1, J2
84	PER - MCC Phase II Replacements
85	PER - S11 Switchgear Replacement
86	PER - S40 and G3 Switchgear Update
87	PER - Standby Generator (Admin Building)
88	Double-Ended Substation with Switchgear for Solids Handling Processes
89	Advanced Process Control and Automation
90	Master Plan for Automation/ Info and Knowledge Management
91	Meter Validation and Replacement Program
92	EG2 & EG3 Engine Control Panel Upgrade
93	Side Stream Nitrogen Removal
94	HVAC Upgrades (P&E Office and Admin/Secondary Service Wing)

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ID Number	Project Name
95	Cooling Tower Replacement (Secondary)
96	Nitrification Building Chiller Replacement
97	Handrail Replacement
98	Site Facility Improvements - Phase 1
99	Site Facility Improvements - Phase 2
100	Yard Piping
101	Unanticipated/Critical Repairs
102	Remaining R&R (2025 through 2040)
103	Tunnel Rehabilitation: BNR 1
104	Tunnel Rehabilitation: BNR 2
105	3W Pump Station Improvements
106	Warehousing Facility Additions
107	Support Building Improvements Phase 1
108	Support Building Improvements Phase 2
109	Support Building Improvements Phase 3
110	Public Art Reserve - 2010 to 2020
111	Public Art Reserve - 2021 to 2030
112	Public Art Reserve - 2031 through 2040
113	Revised South Bay Action Plan - SBWR Extension
114	Plant Record Drawings Program

ID Number	1
Project Name:	HW Enhancements Phases 1 and 2, EBOS Improvements and Lamplighter Connection
Process Area:	Headworks
Primary Trigger:	Condition (R&R)
Secondary Trigger:	Improved Performance Benefit
Project Start Year:	2010
Project End Year:	2014

Project Justification: Condition (R&R) and improved performance benefit.

The WPCP has two headworks (HW) facilities, namely HW1 and HW2. HW1 was built in the mid-1950s and early 1960s, and HW2 was built in 2008. A recent analysis (Headworks Condition Assessment, 2009) shows that it is economically beneficial to the WPCP to improve the functional reliability of HW2 to accommodate all dry weather flows to the plant, and subsequently decommission HW1 altogether.

Before HW1 can be decommissioned, there are three main issues that need to be addressed so that HW2 reliably performs all the dry weather functions of HW1:

- Recycle flows that are currently returned only to HW1
- The addition of a 96-inch diameter connection pipeline along with modifications to the Raw Sewage Distribution Structure (California Structure) to enable simultaneous pumping of RSPS1 and RSPS2

Deposition in the EBOS which may cause operational problems at the HW2 screening facility when re-suspended.

Project Description: Headworks Enhancements Phase 1 will allow HW2 to become the duty headworks, without the need to operate Raw Sewage Pump Station No. 1 (RSPS1). It will also allow RSPS 1 and 2 to operate in parallel, and prepare HW2 to ultimately become the only operating headworks.

The project entails the following:

- Raw sewage distribution structure modifications (addition of a motorized sluice gate) and the addition of a 96-inch diameter connection pipeline to the RSPS1 Distribution Structure
- Re-routing recycle flows and filter backwash overflow from Headworks 1 to other structures
- Re-routing P&E cooling water from Headworks 1 to RSPS1 small wetwell

Headworks Enhancements Phase 2 entails further improvements to the front-end of the plant, and consist of the following:

- Emergency Basin Overflow Structure (EBOS) improvements. These include the installation of a baffle wall and sluice gate to increase flow velocities through this structure. These improvements reduce solids settling upstream of HW2, and allow for easier maintenance.
- Connection of the Lamplighter force main to the Santa Clara No. 2 structure. This simplifies flow routing and therefore, reduces solids settling.

Figure 1
HW ENHANCEMENTS PHASE 1 AND 2
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

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ID Number	2
Project Name:	Miscellaneous Headworks 1 Repairs
Process Area:	Headworks
Primary Trigger:	Condition (R&R)
Secondary Trigger:	Improved Performance Benefit
Project Start Year:	2011
Project End Year:	2019

Project Justification: Condition (R&R) and improved performance benefit.

The WPCP has two headworks (HW) facilities HW1 and HW 2. HW1 was built in the mid-1950s and early 1960s, and HW2 was built in 2008. A recent analysis (Headworks Condition Assessment, 2009) shows that it is economically beneficial to improve the functional reliability of HW2 to accommodate all dry weather flows to the plant, and subsequently decommission HW1 altogether. The Headworks Enhancement Project, implemented over two phases, will allow this operational change, with HW2 the duty headworks for the majority of the time. This will limit the operational time required of HW1. However, HW1 still needs to be maintained in a functional condition, at least until HW2 is modified to become the only headworks facility. Therefore, there are several projects that need to be implemented at HW1. While these have been identified, since HW1 will not be in operation for the majority of the year, only those elements that are absolutely necessary will be implemented.

Project Description: The repairs required to keep HW1 operational until such time as HW2 becomes the only headworks facility at the WPCP, are the following:

- Bar screens – rehabilitation and repair of four existing bar screens
- Aerated grit tank classifiers, discharge valves, and channel gate valves – replacement of aeration grit train grit classifiers 3 and 4 with cyclones, replacement of discharge valves for raw sewage pumps 5 and 6, channel gate valves 1 and 2.
- Structural rehabilitation – includes concrete surface repair and submerged concrete coating of various structures.
- Rehabilitation of various process piping

Figure 2
MISCELLANEOUS HW1 REPAIRS
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

sj411f53-7897C00-209.ai

ID No.	3
Project Name:	Headworks 2 Modifications
Process Area:	Headworks
Primary Trigger:	Condition (R&R)
Secondary Trigger:	Improved Performance Benefit
Project Start Year:	2011
Project End Year:	2018

Project Justification: Condition (R&R) and improved performance benefit.

The original HW1 was built in the mid 1950s and early 1960s to handle 167 mgd average dry weather flow (ADWF) and 271 mgd PHWWF. HW2 was built in 2008 and was designed to operate in parallel with HW1 to handle a combined Peak Hour Wet Weather Flow (PHWWF) of 400 mgd. The capacities of the facilities are such that either facility can accommodate average dry weather flows, but both facilities currently need to be operated in parallel to accommodate peak wet weather flows.

Operating two headworks facilities simultaneously requires more effort on the part of plant personnel than operating a single headworks facility, due to the physical separation between the two facilities and the fact that more equipment is operating than is optimally needed to treat the incoming flow. Furthermore, a recent analysis of the headworks facilities completed in 2009 (Headworks Condition Assessment) identified HW1 as having structures and equipment that are aging and deteriorating and require more excessive repairs and replacement. The age and vintage of the HW1 equipment means that not only is excessive labor spent on maintaining old equipment, but that this equipment, even when operating well, does not remove rags and grit from the wastewater as effectively as the newer equipment at HW2. This additional material finds it way into downstream process tankage, such as the anaerobic digesters, and effectively reduces treatment capacity of those downstream processes.

A 30-year present worth analysis showed it more expensive to maintain and operate HW1 in conjunction with HW2 until 2040 than the total cost to decommission HW1 and modify HW2 instead. Therefore, HW2 will be modified to serve as the sole headworks facilities. Once this project is complete, HW1 can be decommissioned.

Project Description: Modifications to HW2 entail the following:

- Two 84” pipelines (or a single 120” pipeline) between the emergency basin overflow structure (EBOS) and the headworks influent well
- Screenings facility
- Screenings handling facilities
- Expansion of grit removal facilities
- Expansion of grit handling facilities
- Expansion of Raw Sewage Pump Station (RSPS) No. 2
- Additional electrical equipment to be installed in the existing electrical building

Figure 3
HEADWORKS NO. 2 MODIFICATIONS
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

sj411f74-7897C00-209.ai

ID Number	4
Project Name:	Headworks Odor Control
Process Area:	Condition (R&R)
Primary Trigger:	Policy Decision
Secondary Trigger:	None
Project Start Year:	2011
Project End Year:	2018

Project Justification: Policy Decision.

Part of the WPCP vision is to be a good neighbor with respect to odor, noise, and aesthetics. Additionally, the WPCP development master plan includes bringing the public closer to the plant's treatment processes. The headworks treats raw sewage, and is therefore one of the critical processes that requires odor control.

Project Description: This project entails the installation of covers over select junction boxes, the screens, and screenings and grit collection areas of the headworks complex, along with the necessary concrete and steel corrosion protection. Furthermore, it entails the installation of conduits for the collected foul air, and combination biological-chemical treatment scrubbers. This project will likely be implemented simultaneously with the HW2 modifications project.

Figure 4
HEADWORKS ODOR CONTROL
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

sj411f8-7897C00-209.ai

ID No.	5
Project Name:	Expand and Line Raw EQ Basin to 10 MG
Process Area:	Headworks
Primary Trigger:	Condition (R&R)
Secondary Trigger:	Increased Flows and Loads
Project Start Year:	2011
Project End Year:	2016

Project Justification: Condition (R&R) and increased flows and loads.

Analysis of wet weather flows as part of the Plant Master Plan (PMP) shows that the Peak Hour Wet Weather Flow (PHWWF) can be as high as 450 mgd. The plant hydraulic evaluation has indicated that this flow needs to be lowered to a maximum of 400 mgd to be accommodated in the various downstream conveyance and treatment processes. Therefore, 50 mgd of the PHWWF needs to be intercepted an stored until the peak flow period has passed, after which the stored wastewater will be reintroduced to the treatment plant. This can be accomplished by increasing the storage in the existing raw EQ basin from 8 to 10 MG.

In addition, the EQ basin is currently unlined, and will be an odor source until it is cleaned. By providing a lining and the necessary spraydown system, the cleaning process will be more automated and more efficient.

Project Description: This project entails expanding the volume of the equalization (EQ) basin by 25% to 10 MG, which can be accomplished in two ways:

1. The basin currently has an overflow weir at an elevation of 6.00. Raising the elevation of the overflow weir to 7.00 will provide an additional 1 foot depth of storage.

2. Currently, the average bottom floor elevation is 0.4. A minimum amount of excavation would be required to increase the depth of the basin by 1 foot, to bring its average bottom floor elevation to -0.6.

In addition, the project entails providing the basin with a concrete liner and spraydown systems to facilitate cleaning after equalized flows are drained and returned to the treatment plant.

Figure 5
EXPAND AND LINE RAW EQ BASIN
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

sj411f54-7897C00-209.ai

ID No.	6
Project Name:	Demo HW1
Process Area:	Headworks
Primary Trigger:	Policy Decision
Secondary Trigger:	None
Project Start Year:	2036
Project End Year:	2041

Project Justification: Policy Decision. HW1 is an old facility which will require a large investment to maintain in an operable condition. Therefore, HW2 will be modified to take over the full function of this facility, which will render HW1 obsolete.

This facility will be demolished to make available valuable space in a very congested part of the treatment plant, which could be used for other facilities, such as centralized odor control, warehousing, etc.

Project Description: Once modifications to HW2 are complete it will become the duty headworks, and HW1 will be decommissioned. Decommissioning will entail demolishing the concrete structures for bar screens and screenings handling, grit collection and handling, and the Raw Sewage Pump Station No. 1 (RSPS 1) infrastructure.

Figure 6
DEMOLISH HW1
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

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ID No.	7
Project Name:	Refurbish/Demo P&E Building
Process Area:	Headworks
Primary Trigger:	Policy Decision
Secondary Trigger:	None
Project Start Year:	2036
Project End Year:	2041

Project Justification: Policy Decision. The cogeneration equipment currently in the P&E building will be replaced with more efficient gas turbine units which will be located at a different location on the WPCP site. This could render the P&E building obsolete.

This facility could be refurbished to make better use of the current building, or demolished to make available valuable space in a very congested part of the treatment plant, which then could be used for other facilities, such as centralized odor control, warehousing, etc.

Project Description: The P&E building houses cogeneration equipment at the WPCP. These units will be replaced with more efficient gas turbine units at a different location on the WPCP. The decommissioning of the engines, in conjunction with decommissioning of RSPS 1, will make this building obsolete.

Figure 7
REFURBISH/DEMOLISH P&E BUILDING
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

sj511f10-7897c00-209.ai

ID No.	8
Project Name:	Consolidate Influent Piping
Process Area:	Headworks
Primary Trigger:	Improved Performance Benefit
Secondary Trigger:	None
Project Start Year:	2033
Project End Year:	2041

Project Justification: Improved Performance Benefit. The current configuration of raw sewage influent pipelines is complicated, being the result of a number of projects over the years. Influent flows entering the plant from the East are routed South to Emergency Basin Overflow Structure (EBOS) and then flow North to HW2. During low flows, the plant has experienced excessive settling of raw sewage solids in the pipeline to EBOS.

Rerouting the plant influent lines will simplify the configuration and minimize settling. This project will ease operations and provide improved control of influent flows.

Project Description: This project entails re-routing and modifications to a number of influent pipelines to the plant.

Flows from the Alviso/Los Esteros Forcemains will be collected in a common pipeline and diverted from the influent IOJS into the headworks well at Headworks No. 2. This flow will be metered and added to the raw sewage flow. Similarly, Stormwater Pump Station flows will be re-routed to the same location, but will not be metered. Filter Building Drainage Pump Station flows into IOJS will be diverted as part of the recycle flow project.

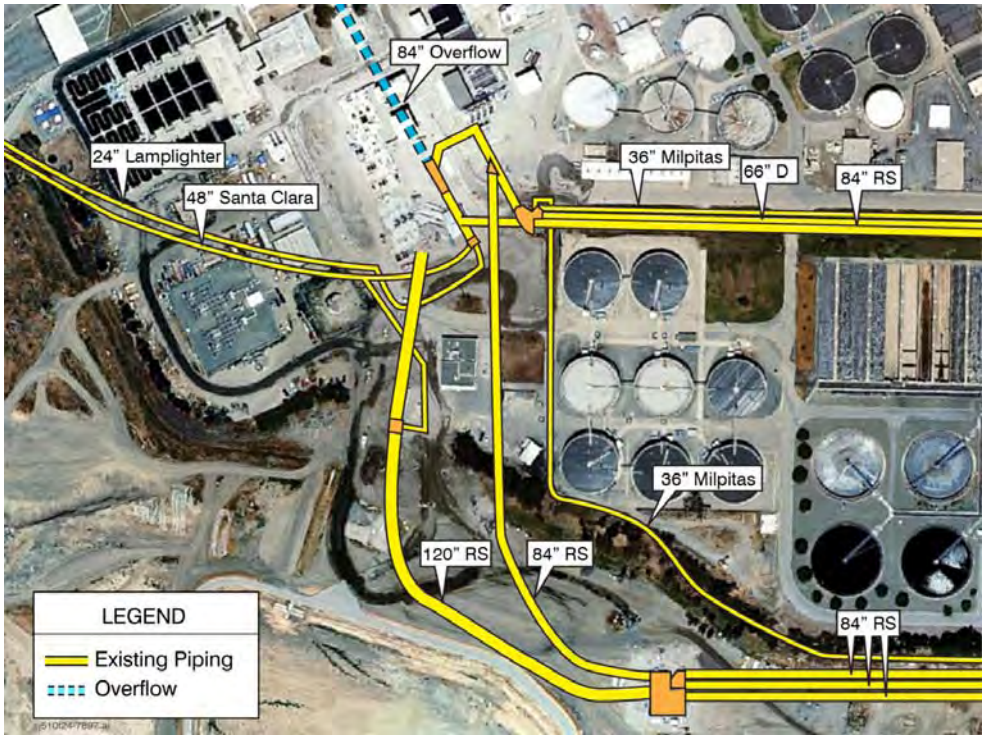
Milpitas Forcemain No. 1 and supernatant flows will be re-routed to a box near Zanker Road. Supernatant flows will be metered and a sampling station will be added. From the box, these flows will go through a 48-inch pipeline and connect with Interceptor No. 1.

Milpitas No. 2 flows will be intercepted at the south side of the plant and be redirected into the Interceptor Junction Structure.

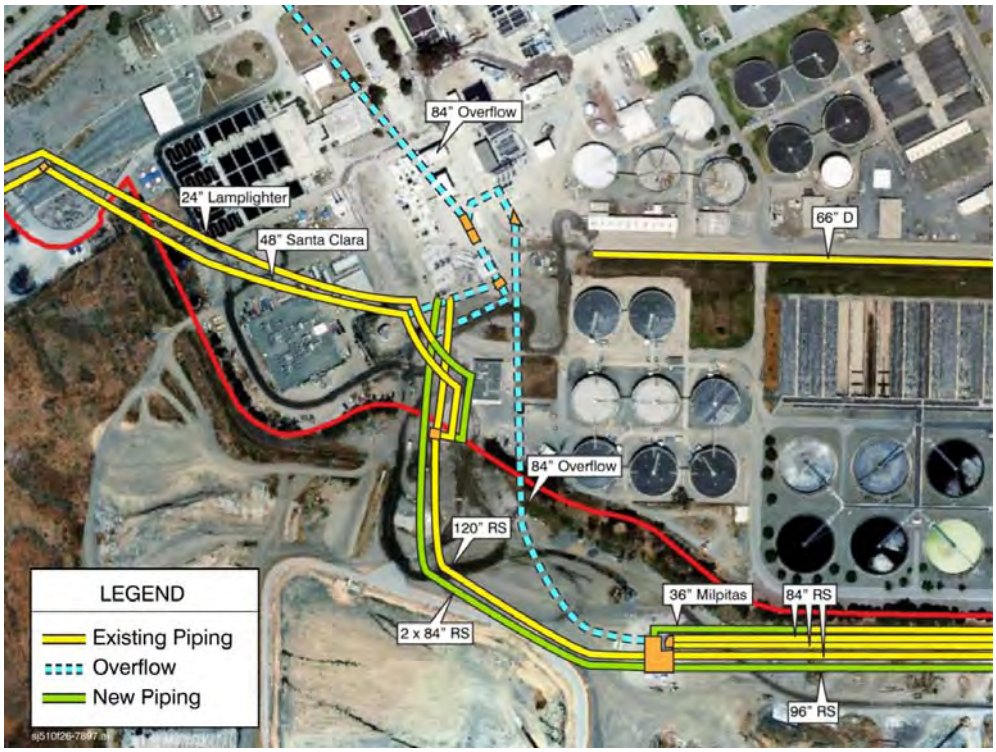
Interceptors Nos. 1 though 4 will be shifted in order to redirect flows into EBOS and abandon the 84-inch interceptor into the Milpitas Structure. Interceptor No. 1 will be connected to Interceptor No. 2, allowing Interceptor No. 1 to flow to the Interceptor Junction Structure and on to EBOS. Similarly, Interceptor No. 2 will be connected to Interceptor No. 3, and Interceptor No. 3 will be re-connected to Interceptor No. 4. A new 96-inch pipeline will be constructed to bring Interceptor No. 4 flows into the spare connection of EBOS Compartment B.

The 84-inch pipeline between EBOS Compartment C and the intertie junction box, as well as the Milpitas structure, the 84-inch pipeline between Santa Clara No. 1 and IOJS, the 66-inch pipeline between this 84-inch pipeline and the Milpitas structure, and the 78-inch pipeline between IOJS and the influent channel will all remain in place to serve as emergency plant bypass.

Existing Influent Piping configuration:



Consolidated and Simplified Influent Piping configuration:



ID No.	9 (included in Project No. 10)
Project Name:	East Primaries Steel Conversion (included in East Primaries Project)
Process Area:	Primary Treatment
Primary Trigger:	Condition (R&R)
Secondary Trigger:	None (for Primary Clarifier Upgrades, Improved Performance Benefit)
Project Start Year:	2012
Project End Year:	2015

Project Justification: See Project Number 10.

Project Description: See Project Number 10.

Figures 9 and 10
EAST PRIMARIES CONCRETE REPAIR AND STEEL CONVERSION
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

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ID No.	10
Project Name:	East Primaries Steel Conversion, Coating Rehabilitation, Concrete Repair, and seismic modifications for odor control
Process Area:	Primary Treatment
Primary Trigger:	Condition (R&R)
Secondary Trigger:	None (for Primary Clarifier Upgrades, Improved Performance Benefit)
Project Start Year:	2012
Project End Year:	2020

Project Justification: Condition (R&R).

The WPCP has two banks of primary treatment clarifiers, namely the West and East Primary Clarifiers. Due to their age, condition, and treatment limitations, the West Primaries are to be decommissioned. There East Primaries will therefore be the only primary treatment units remaining, and will need to be upgraded to remain in full use. The *Infrastructure Condition Assessment* Report (May 2007) by CH2MHILL, and the *Condition Assessment of Four Primary Settling Tanks* (Oct 2009) by V&A assessed the condition of the East Primaries and observed that there were a number of areas that needed to be addressed including civil, architectural, mechanical, instrumentation and controls, electrical, structural components, and corrosion control.

In addition, provisions will be made for the incorporation of odor control facilities (i.e. covers, ducting, etc.).

Project Description: The project entails rehabilitation of the East Primary Clarifiers, including:

- Complete replacement of all mechanical, electrical, and controls equipment
- Refurbishment and coating of concrete
- Structural modifications to accommodate odor control covers (odor control facilities will be implemented as a separate project)

This work will be conducted in four phases, one quadrant at a time over an 8-year period. During this time, the West Primary Clarifiers will be utilized as needed until construction is complete, after which they will be de-commissioned.

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ID No.	11
Project Name:	Primary Treatment Odor Control
Process Area:	Primary Treatment
Primary Trigger:	Policy Decision
Secondary Trigger:	None
Project Start Year:	2012
Project End Year:	2020

Project Justification: Policy Decision.

Part of the WPCP vision is to be a good neighbor with respect to odor, noise, and aesthetics. Additionally, the WPCP development master plan includes bringing the public closer to the plant's treatment processes. The Primary Treatment area treats screened raw influent, and is one of the critical processes that require odor control.

Project Description: This project entails the installation of covers over the East Primary Clarifiers, including select inlet and outlet junction boxes, along with the necessary concrete and steel corrosion protection. Furthermore, it entails the installation of conduits for the collected foul air, and combination biological-chemical treatment scrubbers. This project will likely be implemented simultaneously with the East Primaries upgrades project.

Figure 11
PRIMARY TREATMENT ODOR CONTROL
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

sj411f13-7897C00-209.ai

ID No.	12
Project Name:	Tunnel Rehab West Primaries
Process Area:	Site Facility Improvements
Primary Trigger:	Condition (R&R)
Secondary Trigger:	None
Project Start Year:	2012
Project End Year:	2017

Project Justification: Condition (R&R).

The West Primary Clarifiers have a tunnel system that houses the sludge and tank drain pipelines, valves, pumps, and controls. These tunnels extend to the digester complex where primary sludge is treated further, and to the headworks, where tanks are drained to for maintenance purposes. These tunnels were constructed in the 1960s, and are in need of structural repair, coatings, and the removal of obsolete pipelines. Although the West Primaries are to be decommissioned in the medium term, they will form an integral part of the treatment system until the upgrades on the East Primaries have been completed. This tunnel rehabilitation project will provide safe operating conditions necessary for the next 10 years.

Project Description: This project entails rehabilitation of the West Primary tunnel complex, and is comprised of:

1. Structural concrete repair and coatings
2. Removal of abandoned pipelines.

Figure 12
TUNNEL REHABILITATION - WEST PRIMARIES
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

sj411f56-7897C00-209.ai

ID No.	13
Project Name:	Tunnel Rehab East Primaries
Process Area:	Site Facility Improvements
Primary Trigger:	Condition (R&R)
Secondary Trigger:	None
Project Start Year:	2012
Project End Year:	2020

Project Justification: Condition (R&R).

The East Primary Clarifiers have a tunnel system that houses the sludge and tank drain pipelines, valves, pumps, and controls. These tunnels extend to the digester complex where primary sludge is treated further. These tunnels were constructed in the 1960s and 1970s, and are in need of structural repair, coatings, and the removal of obsolete pipelines. The East Primaries are the only pretreatment facilities at the WPCP, and form an integral part of the treatment train.

Project Description: This project entails rehabilitation of the East Primary tunnel complex, and is comprised of:

1. Structural concrete repair and coatings
2. Removal of abandoned pipelines.

Figure 13
TUNNEL REHABILITATION - EAST PRIMARIES
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

sj411f57-7897C00-209.ai

ID No.	14
Project Name:	Iron Salt Facilities (EBOS and Primaries)
Process Area:	Primary Treatment
Primary Trigger:	Regulatory
Secondary Trigger:	Improved Performance Benefit
Project Start Year:	2011
Project End Year:	2013

Project Justification: Regulatory and improved performance benefit.

The addition of iron salts to influent wastewater is commonly used in the industry to chemically enhance the precipitation of solids. This increased removal in the primary treatment phase has a number of benefits, the first being a decreased organic load on the secondary treatment process. Since aeration requires a very large energy input, reducing the organic load through chemically enhanced precipitation in the upstream process will result in a large O&M savings for the plant.

In addition, an increase in primary settled sludge would increase the feedstock to the digesters resulting in increased gas production. Iron salts are also very effective in binding and precipitating phosphorus, which prevents the phosphorus from forming struvite depositions, which are a costly O&M issue in digesters.

Additionally, iron salts will reduce the future costs for the plant to draw off and treat foul air as well as to minimize the corrosive impacts of H_2S generation. Limiting the formation and presence of H_2S at the plant also positively affects the health and safety of plant personnel.

Project Description: This project entails the implementation of an iron salt feed station, consists of a chemical storage tank, a concrete containment structure, a metal roof structure with open sides, and a receiving station to offload chemicals from delivery trucks. It also includes the pumps, piping, and instrumentation to dose and deliver the chemical solution to the incoming wastewater, as well as safety systems associated with chemical handling facilities, such as eyewash/shower stations.

Figure 14
IRON SALT FACILITIES
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

sj411f58-7897C00-209.ai

ID No.	15
Project Name:	Demo West Primaries
Process Area:	Primary Treatment
Primary Trigger:	Policy Decision
Secondary Trigger:	None
Project Start Year:	2036
Project End Year:	2041

Project Justification: Policy Decision.

The West Primaries are one of the oldest treatment facilities at the WPCP, which will require large investment to rehabilitate. The WPCP has a much newer East Primaries facility which provides the treatment plant with sufficient primary treatment. The West Primaries will be put in use during the rehabilitation period of the East Primaries, after which it will be decommissioned. Demolition of the facility will free up space in a congested part of the treatment plant. This available space can be used for centralized odor control, storage, warehousing, etc.

Project Description: Once modifications to East Primary Clarifiers are complete it will become the duty primaries, and the West Primary clarifiers will be decommissioned. Decommissioning will entail demolishing the concrete structures for West Primaries.

Figure 15
DEMOLISH WEST PRIMARIES
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

sj411f15-7897C00-209.ai

ID No.	16
Project Name:	Additional 12 MG PE EQ Basin
Process Area:	Primary Treatment
Primary Trigger:	Improved Performance Benefit
Secondary Trigger:	Economic Benefit
Project Start Year:	2028
Project End Year:	2033

Project Justification: Improved performance and economic benefit.

Currently, primary effluent is equalized on a daily basis to minimize the impact of diurnal loading to the secondary system. Daily flow equalization (EQ) allows for a more consistent loading pattern to the secondary system. Implementing load equalization will improve the efficiency of the secondary treatment process and thereby reduce aeration costs. Currently, the WPCP has a 16 MG EQ basin, but an additional 12 MG EQ basin is required.

Project Description: The new 12 million gallon (MG) primary effluent (PE) equalization (EQ) basin will mirror the existing 16 MG PE basin and will be located just South of the existing basin. A new pipeline (60-inch diameter) will carry flows to and from the basin to the existing Primary Effluent Pump Station (PEPS).

Figure 16
ADDITIONAL 12 MG PE EQUALIZATION BASIN
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

sj411f16-7897C00-209.ai

ID No.	17
Project Name:	Secondary Air Plenum Filtration
Process Area:	Secondary Treatment
Primary Trigger:	Improved Performance Benefit
Secondary Trigger:	Economic Benefit
Project Start Year:	2010
Project End Year:	2011

Project Justification: Improved performance benefit and economic benefit.

The Secondary Blower Building (SBB) and Building 40 blowers provide aeration air to the BNR1 secondary treatment system. The SBB blowers are the preferred operational blowers because they are smaller, allowing a wider range of aeration supply compared to the Building 40 blowers, and because they are engine driven, using a combination of digester and landfill gas instead of generated (loss of efficiency) or purchased electrical power. However, these blowers were installed in the 1960s, and require continued maintenance and care.

The air plenum is the inlet system to these blowers, and requires adequate filtration to both protect the blowers and ensure their optimal performance. This project is part of the on-going maintenance required of the blowers.

Project Description: This project entails modifications and repairs to the SBB air plenum filtration system, and forms part of the on-going maintenance required for this blower facility.

Figure 17
SECONDARY AIR PLENUM FILTRATION
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

sj411f59-7897C00-209.ai

ID No.	18
Project Name:	Connect BNR1 and BNR2 Clarifiers
Process Area:	Secondary Treatment
Primary Trigger:	Improved Performance Benefit
Secondary Trigger:	Economic Benefit
Project Start Year:	2011
Project End Year:	2016

Project Justification: Improved performance benefit and economic benefit.

The secondary treatment system consists of aeration basins and secondary clarifiers, with pumping systems that return most of the settled sludge from the clarifiers to the aeration basins. A key feature of the operation of this system is control of the mixed liquor formed in the aeration basins so that it will effectively separate into its liquid and sludge components. Since secondary clarifiers are an expensive investment, these treatment systems are designed to minimize the number of clarifiers required, while being able to meet the treatment objectives.

This project connects the BNR2 clarifiers to the BNR1 secondary system, thereby doubling the number of clarifiers available to the BNR1 system during the low-flow times of the year when the BNR2 aeration basins would not need to be operational. This connection would prolong the period annually when only the BNR1 aeration basins need to be operational, with significant energy and manpower cost savings.

Project Description: This project consists of the construction of the following:

- Pipelines that would carry mixed liquor from BNR1 to the BNR2 secondary clarifiers
- Pipelines that would carry RAS from BNR2 to BNR1. (WAS from the BNR2 would be pumped directly to the DAFTs for thickening before digestion.)

Figure 18
CONNECT BNR 1 AND BNR 2 CLARIFIERS
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

sj411f75-7897C00-209.ai

ID No.	19
Project Name:	Connect Aeration Headers
Process Area:	Secondary Treatment
Primary Trigger:	Economic Benefit
Secondary Trigger:	Improved Performance Benefit
Project Start Year:	2015
Project End Year:	2019

Project Justification: Economic benefit and improved performance benefit.

Secondary process aeration blowers are located in three (3) separate locations: 1) secondary blower building (SBB), 2) Building 40, and 3) nitrification blower building (NBB). Currently, the blowers from SBB and Building 40 are connected by an air header that serves BNR 1. There is no connection to NBB, which means the BNR 1 blowers cannot be used to aerate BNR 2 aeration basins and vice-versa. Providing this connection would provide operational flexibility to provide the most energy-efficient process aeration.

Project Description: The project entails the construction of a 60-inch aeration connection header between the SBB/Building 40 blowers and the NBB blowers.

Figure 19
CONNECT AERATION HEADERS
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

sj411f76-7897C00-209.ai

ID No.	20
Project Name:	Aeration Tank Rehabilitation – BNR 1 and 2
Process Area:	Secondary Treatment
Primary Trigger:	Condition (R&R)
Secondary Trigger:	Improved Performance Benefit
Project Start Year:	2015
Project End Year:	2023

Project Justification: Condition (R&R) and improved performance benefit.

The BNR1 and BNR2 aeration basins were constructed in phases between the 1960s and 1980s. These basins are the mainstay of the WPCP treatment process, and need to be in operation for decades to come. Due to their age, and the aggressive and corrosive environment they operate in, extensive rehabilitation is required. The aeration diffuser system for these basins will be replaced (separate project), which will further optimize process performance, and significantly reduce plant energy requirements. Any modifications to this rehabilitation project will be done with those associated piping changes in mind.

Project Description: This project consists of ongoing maintenance work to rehabilitate the concrete, replace corroded piping to suit the new aeration diffuser system, and various other components, such as valves.

Figure 20
AERATION TANK REHABILITATION
(BNR 1 AND 2)
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

sj411f60-7897C00-209.ai

ID No.	21
Project Name:	Rehabilitation of remaining secondary clarifiers BNR 2
Process Area:	Secondary Treatment
Primary Trigger:	Condition (R&R)
Secondary Trigger:	Improved Performance Benefit
Project Start Year:	2011
Project End Year:	2019

Project Justification: Condition (R&R) and improved performance benefit.

The WPCP has 26 clarifiers associated with the secondary aeration basins (or BNR1) and 16 clarifiers associated with the nitrification aeration basins (or BNR2). These clarifiers, together with the aeration basins, are at the core of the treatment process, and need to be operational for decades to come. Performance of the nitrification and secondary clarifiers directly affects the performance of the filters, and ultimately the quality of final effluent. The first of these clarifiers was constructed in the 1960s, and for operational continuity, that design has been adopted for all the secondary clarifiers constructed thereafter, with minor modifications.

This clarifier performance can likely be improved through hydraulic modeling and the selective placement of baffles in the clarifiers to reduce short-circuiting. These improvements, combined with the ongoing replacement of corroded and worn components, will ensure the optimal and reliable performance of the clarifiers into the future.

Project Description: This project entails the implementation of the modifications necessary to improve performance following CFD modeling and piloting on the remaining 15 BNR2 secondary clarifiers. In addition, it entails mechanical and structural rehabilitation, including the replacement of sludge collector mechanisms, access bridges, launders, gates and operators, and other equipment as needed.

Figure 21
REHABILITATION OF REMAINING SECONDARY CLARIFIERS (BNR 2)
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

sj411f61-7897C00-209.ai

ID No.	22
Project Name:	CFD Modeling and rehab of 1 secondary clarifier
Process Area:	Secondary Treatment
Primary Trigger:	Condition (R&R)
Secondary Trigger:	Improved Performance Benefit
Project Start Year:	2011
Project End Year:	2013

Project Justification: Condition (R&R) and improved performance benefit.

The WPCP has 26 clarifiers associated with the secondary aeration basins (or BNR1) and 16 clarifiers associated with the nitrification aeration basins (or BNR2). These clarifiers, together with the aeration basins, are at the core of the treatment process, and need to be operational for decades to come. Performance of the nitrification and secondary clarifiers directly affects the performance of the filters, and ultimately the quality of final effluent. The first of these clarifiers was constructed in the 1960s, and for operational continuity, that design has been adopted for all the secondary clarifiers constructed thereafter, with minor modifications.

This clarifier performance can likely be improved through hydraulic modeling and the selective placement of baffles in the clarifiers to reduce short-circuiting. These improvements, combined with the ongoing replacement of corroded and worn components, will ensure the optimal and reliable performance of the clarifiers into the future.

Project Description: This project entails the modeling through computational fluid dynamics (CFD) of the secondary clarifiers, followed by the modification and rehabilitation of one of the BNR2 clarifiers. The performance of this clarifier will be monitored, and further adjustments will be made, as necessary. These performance modifications, along with mechanical and structural rehabilitation, including the replacement of sludge collector mechanisms, access bridges, launders, gates and operators, and other equipment as needed, will then be incorporated into the overall clarifier rehabilitation project (separate project).

Figure 22
CFD MODELING AND REHABILITATION OF
1 SECONDARY CLARIFIER (BNR 2)
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

sj411f62-7897C00-209.ai

ID No.	23
Project Name:	Rehabilitation of remaining secondary clarifiers BNR 1
Process Area:	Secondary Treatment
Primary Trigger:	Condition (R&R)
Secondary Trigger:	Improved Performance Benefit
Project Start Year:	2014
Project End Year:	2024

Project Justification: Condition (R&R) and improved performance benefit.

The WPCP has 26 clarifiers associated with the secondary aeration basins (or BNR1) and 16 clarifiers associated with the nitrification aeration basins (or BNR2). These clarifiers, together with the aeration basins, are at the core of the treatment process, and need to be operational for decades to come. Performance of the nitrification and secondary clarifiers directly affects the performance of the filters, and ultimately the quality of final effluent. The first of these clarifiers was constructed in the 1960s, and for operational continuity, that design has been adopted for all the secondary clarifiers constructed thereafter, with minor modifications.

This clarifier performance can likely be improved through hydraulic modeling and the selective placement of baffles in the clarifiers to reduce short-circuiting. These improvements, combined with the ongoing replacement of corroded and worn components, will ensure the optimal and reliable performance of the clarifiers into the future.

Project Description: This project entails the implementation of the modifications necessary to improve performance following CFD modeling and piloting, on the 26 BNR1 secondary clarifiers. In addition, it entails mechanical and structural rehabilitation, including the replacement of sludge collector mechanisms, access bridges, launders, gates and operators, and other equipment as needed.

Figure 23
REHABILITATION OF REMAINING SECONDARY CLARIFIERS (BNR 1)
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

sj411f63-7897C00-209.ai

ID No.	24
Project Name:	Conversion to Fine Bubble Diffusers
Process Area:	Secondary Treatment
Primary Trigger:	Improved Performance Benefit
Secondary Trigger:	Economic Benefit
Project Start Year:	2012
Project End Year:	2022

Project Justification: Improved performance benefit and economic benefit.

The secondary treatment aeration system, which is used to provide oxygen for the activated sludge process, accounts for a large portion of the plant's overall energy usage, and as such, this system has been a primary focus of energy-saving efforts.

Over the last several years, the existing coarse air piping and diffuser systems at approximately half of the plant's aeration basins have been replaced with fine bubble diffuser systems. Fine bubble diffusers increase the transfer efficiency of oxygen into the wastewater, resulting in less air needed to treat the wastewater and a lower energy requirement.

Determining the most appropriate diffuser membranes for the particular wastewater treated at the WPCP will require a testing phase. From these tests, the membrane diffuser that is found to perform best at the plant will be used in the conversion of the remaining aeration basins to fine bubble diffusion.

In addition, baffle walls in the aeration basins will provide better separation between adjacent treatment zones, greatly improving the ability to allow different process conditions (such as dissolved oxygen level) to be maintained in different compartments of the basins. The level of process control that these baffle walls help achieve is crucial in meeting likely future nutrient removal requirements, and it is appropriate to install them while modifications to the fine bubble diffusion system are being made. This improvement will also help produce a better-settling sludge, which in turn will lead to better-performing secondary clarifiers and filters.

Project Description: This project entails the conversion of approximately 24 aeration basins from coarse bubble diffusion to fine bubble diffusion. Depending on the analysis, it may also entail substituting existing fine bubble diffusers in the remaining aeration basins to a different, more efficient and durable type of diffuser.

In addition, this project involves the construction of fiberglass reinforced panel (FRP) baffle walls in the aeration basins to provide better compartmentalization of the aeration basins needed for operation in certain process modes.

Figure 24
CONVERSION TO FINE BUBBLE DIFFUSERS
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

sj411f64-7897C00-209.ai

ID No.	25
Project Name:	Foam and Scum Control
Process Area:	Secondary Treatment
Primary Trigger:	Improved Performance Benefit
Secondary Trigger:	None
Project Start Year:	2014
Project End Year:	2016

Project Justification: Improved performance benefit.

In biological activated sludge treatment processes, nuisance organisms such as *Nocardiaform*, which tend to float, can accumulate in the aeration basins. If allowed to build up, foam can overflow the basins and cover walkways, creating hazardous, slippery conditions. It can limit access to equipment, causing severe operating problems. In addition, if a significant portion of the activated sludge solids inventory becomes trapped in the foam layer, control of the secondary treatment process can be impaired. This foam would progress to the DAFT and digester processes, causing major process upsets. This is a problem encountered at many treatment plants, and is vital that it be addressed at the WPCP.

Project Description: This project entails the construction of a chlorine spray system in either the aeration basins, or the secondary clarifiers. This method to control *Nocardiaform* is typical at wastewater treatment plants, and has been successfully demonstrated at the WPCP.

Figures 25 and 27
FOAM AND SCUM CONTROL
(FIELD VERFICATION AND FINAL INSTALLATION)
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

sj411f65-7897C00-209.ai

ID No.	26
Project Name:	*Nocardia* Control
Process Area:	Secondary Treatment
Primary Trigger:	Improved Performance Benefit
Secondary Trigger:	None
Project Start Year:	2014
Project End Year:	2018

Project Justification: Improved performance benefit.

In biological activated sludge treatment processes, nuisance organisms such as *Nocardiaform*, which tend to float, can accumulate in the aeration basins. If allowed to build up, foam can overflow the basins and cover walkways, creating hazardous, slippery conditions. It can limit access to equipment, causing severe operating problems. In addition, if a significant portion of the activated sludge solids inventory becomes trapped in the foam layer, control of the secondary treatment process can be impaired. This foam would progress to the DAFT and digester processes, causing major process upsets. This is a problem encountered at many treatment plants, and is vital that it be addressed at the WPCP.

Project Description: This project entails the construction of four foam overflow weirs, with associated wet wells, pumps, and pipelines. These units will be installed either in the aeration basin outlet channels, or in the RAS wetwells, pending detailed analysis. These units will prevent the proliferation of nuisance foam-causing bacteria by constantly removing them from the treatment process.

Figure 26
NOCARDIA CONTROL
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

sj411f77-7897C00-209.ai

ID No.	27
Project Name:	Field Verification of Foam and Scum Control Options
Process Area:	Secondary Treatment
Primary Trigger:	Improved Performance Benefit
Secondary Trigger:	Economic Benefit
Project Start Year:	2011
Project End Year:	2012

Project Justification: Improved performance benefit and economic benefit.

In biological activated sludge treatment processes, nuisance organisms such as *Nocardiaform*, which tend to float, can accumulate in the aeration basins. If allowed to build up, foam can overflow the basins and cover walkways, creating hazardous, slippery conditions. It can limit access to equipment, causing severe operating problems. In addition, if a significant portion of the activated sludge solids inventory becomes trapped in the foam layer, control of the secondary treatment process can be impaired. This foam would progress to the DAFT and digester processes, causing major process upsets. This is a problem encountered at many treatment plants, and is vital that it be addressed at the WPCP.

The selection of the foam control approaches most appropriate at the WPCP is best accomplished through the piloting of some of the most feasible technologies. While full-scale application of any technology always has risks of not performing as expected, piloting on a small scale will significantly increase the likelihood of success.

Project Description: This project entails the installation of different small-scale foam and scum control technologies in the secondary treatment system, prior to the construction of full-scale installations (separate projects).

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ID No.	28
Project Name:	Conversion to NAS (NH3 < 3mg-N/L regulation)
Process Area:	Secondary Treatment
Primary Trigger:	Increased Flows and Loads
Secondary Trigger:	None
Project Start Year:	2021
Project End Year:	2026

Project Justification: Increased flows and loads. If TN removal were not required in the future, the existing activated sludge secondary system (step-feed) would provide sufficient process capacity. However, based on the flow and loading projections, step-feed would only be sufficient until approximately 2026 +/-. After that time, the existing tankage would be converted to nitrification with anaerobic selector (NAS) to provide sufficient capacity for 2040 flows.

Project Description: The project would consist of creating an anaerobic zone occupying 25% of the aeration tank volume. This would involve structural modifications to existing tankage to create the anaerobic zones, anaerobic zone mixers, additional RAS pumping, additional blowers, and fine bubble diffusers.

Figure 28
CONVERSION TO NAS NH3
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

sj411f17-7897C00-209.ai

ID No.	29
Project Name:	Conversion to NAS (TN < 8 mg-N/L regulation)
Process Area:	Secondary Treatment
Primary Trigger:	Regulatory
Secondary Trigger:	Increased Flows and Loads
Project Start Year:	2021
Project End Year:	2026

Project Justification: Regulatory and increased flows and loads. Meeting a plant final effluent requirement of TN< 8mg/L would be accomplished in two phases. The first entails converting the existing tankage to nitrification with anaerobic selector (NAS) to provide sufficient capacity for 2040 flows. This would be followed with denitrification as a second step.

Project Description: The project would consist of creating an anaerobic zone occupying 25% of the aeration tank volume. This would involve structural modifications to existing tankage to create the anaerobic zones, anaerobic zone mixers, additional RAS pumping, additional blowers, and fine bubble diffusers.

In addition, to meet a TN<8mg-N/L, follow-up denitrification step would be required, namely 36,000 sf denitrification filters (with methanol addition), and additional 11,000 sf tertiary filters. This project is described separately.

Selection of NAS as the secondary treatment process precludes the selection of MLE.

Figure 29
CONVERSION TO NAS TN8
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

sj411f18-7897C00-209.ai

ID No.	30
Project Name:	Conversion to MLE (TN<8mg-N/L)
Process Area:	Secondary Treatment
Primary Trigger:	Regulatory
Secondary Trigger:	Increased Flows and Loads
Project Start Year:	2021
Project End Year:	2026

Project Justification: Regulatory and increased flows and loads. If TN removal becomes necessary due to regulatory changes, the MLE process, together with tertiary filtration, would provide sufficient treatment to meet TN<8 mg/L.

Project Description: The project would consist of creating an anoxic zone occupying 20% of the aeration tank volume, and the addition of a carbon source. This would involve structural modifications to existing tankage to create the anoxic zone, anoxic zone mixers, include the addition of aeration basins, additional RAS pumps, additional blowers and fine bubble diffusers, new IMLR pumps, and a new methanol feed system.

In addition, a separate project would be required to provide 36,000 sf of tertiary filters to meet the final effluent TN<8mg-N/L requirement.

Selection of MLE as the secondary treatment process precludes the selection of NAS.

Figure 30
CONVERSION TO MLE
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

sj411f19-7897C00-209.ai

ID No.	31
Project Name:	Underdrain and Media (Remaining 7 Bank A filters)
Process Area:	Filtration and Disinfection
Primary Trigger:	Condition (R&R)
Secondary Trigger:	Improved Performance Benefit
Project Start Year:	2012
Project End Year:	2015

Project Justification: Condition (R&R) and improved performance benefit.

The existing filter complex, constructed in the 1970s, is in significant need of refurbishment. The filtration media, consisting of anthracite and sand, needs to be replaced. The media will initially be replaced on one of the filters, along with the underdrain system, and the operation and performance of the filter will be monitored. The performance improvements resulting from this upgrade will help the City establish the preferred upgrade approach to a portion or all of the remainder of the filters.

Project Description: This project entails the replacement of the underdrain system and media of the 7 remaining Bank A filters (separate project).

ID No.	32
Project Name:	Miscellaneous Filtration Repairs
Process Area:	Filtration and Disinfection
Primary Trigger:	Condition (R&R)
Secondary Trigger:	None
Project Start Year:	2011
Project End Year:	2026

Project Justification: Condition (R&R).

Secondary effluent filtration will always be required to meet reuse water requirements, and at least partially to ensure Bay discharge is well within the conformance requirements set by the WPCP's NPDES permit. Partial filtration will likely transition to full filtration in the future to accommodate growth in reuse water production, and to meet likely total nitrogen (TN) limits expected within the next three permit cycles.

The existing filter complex, constructed in the 1970s, is in significant need of refurbishment. While the underdrain systems and filtration media replacement will be conducted under a separate project, there are numerous other refurbishments needed to keep the filtration facility operational. Depending on how new filtration technology develops over the next years, it is possible that a replacement filter complex will be constructed. The filtration repairs under this project are aimed at keeping the facility operational through transition to a new filter complex.

Project Description: This project entails the reparations required through transition to a new filter complex, and include valve replacement, electrical control replacement, and concrete repair.

ID No.	33
Project Name:	Field Verification of Alternative Filter Technology
Process Area:	Filtration and Disinfection
Primary Trigger:	Improved Performance Benefit
Secondary Trigger:	None
Project Start Year:	2012
Project End Year:	2017

Project Justification: Improved performance benefit.

Secondary effluent filtration will always be required to meet reuse water requirements, and at least partially to ensure Bay discharge is well within the conformance requirements set by the WPCP's NPDES permit. Partial filtration will likely transition to full filtration in the future to accommodate growth in reuse water production, and to meet likely total nitrogen (TN) limits expected within the next three permit cycles.

The WPCP has several filtration options available one of which includes rehabilitation of the existing filters. The existing filter complex, constructed in the 1970s, is in significant need of refurbishment. Other technologies such as wire mesh filter etc. are potential alternatives to the existing dual-media filtration system. Field verification would be utilized to determine the technology that is most suitable for the needs of the WPCP's secondary effluent (for both Bay discharge and recycled water).

Project Description: This project entails the field verification of up to three filtration technologies based upon a screening process of available equipment.

ID No.	34
Project Name:	Underdrain and Media (1 filter) + Field Verification
Process Area:	Filtration and Disinfection
Primary Trigger:	Condition (R&R)
Secondary Trigger:	Improved Performance Benefit
Project Start Year:	2010
Project End Year:	2011

Project Justification: Condition (R&R) and improved performance benefit.

The existing filter complex, constructed in the 1970s, is in significant need of refurbishment. The filtration media, consisting of anthracite and sand, needs to be replaced. The media will initially be replaced on one of the filters, along with the underdrain system, and the operation and performance of the filter will be monitored. The performance improvements resulting from this upgrade will help the City establish the preferred upgrade approach to a portion or all of the remainder of the filters.

Project Description: This project entails the replacement of the underdrain system and media of one filter initially, and monitoring of the performance. This would be a precursor project to underdrain and media replacement for the 7 remaining Bank A filters (separate project).

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Figures 31, 32, 33, and 34
FILTER UPGRADES, REPAIR AND
FIELD VERFICATION OF TECHNOLOGY
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

sj411f66-7897C00-209.ai

ID No.	35
Project Name:	New filters: 128 mgd Tetra Denite plus 58 mgd New tertiary
Process Area:	Filtration and Disinfection
Primary Trigger:	Regulatory
Secondary Trigger:	None
Project Start Year:	2019
Project End Year:	2026

Project Justification: Regulatory requirement.

If the WPCP were to proceed with Nitrification with Anaerobic Selector (NAS) as the secondary treatment alternative, and the regulations required a TN<8 mg/L, then an additional denitrification step would be required. Additionally, the WPCP would need to filter its entire secondary effluent stream in order to meet this regulatory requirement (for Bay discharge). Denite filters present a method of meeting both of these requirements in a single step. Recycled water would not require a denitrification step, but would require tertiary filtration. Therefore, a combination of tertiary and denite filters would be required to meet the regulations.

Project Description: The project would provide for denitrification of a portion of the secondary treated effluent and new facilities for tertiary filtration. This would result in the addition of 142 mgd denitrification filters (Bay discharge) and 58 mgd of tertiary filtration (recycled water). For cost estimating purposes, the Tetra Denite Filter was assumed for denitrification, but other alternatives would also be considered.

Figure 35
NEW FILTER FACILITY
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

sj411f20-7897C00-209.ai

ID No.	36
Project Name:	New Tertiary Filters: 180 mgd (Nova Filters assumed; MLE mode, or other triggers)
Process Area:	Filtration and Disinfection
Primary Trigger:	Condition (R&R)
Secondary Trigger:	None
Project Start Year:	2019
Project End Year:	2026

Project Justification: Condition (R&R).

Currently, the WPCP can meet its effluent discharge requirements with filtration of only a portion of its secondary effluent stream. While it may be possible at times to meet effluent discharge requirements without any filtration, variability in the secondary effluent TSS concentration, which is inherent to the wastewater treatment process, suggests that at least a portion of the effluent stream should be filtered in order to consistently meet waste discharge requirements. Thus, the WPCP needs to maintain a filtration facility. In the future, the WPCP may be driven to filter its entire effluent. The drivers to filter the entire secondary effluent stream are the following:

- Future requirements for CEC removal
- WPCP moving towards UV disinfection
- Regulation of TN<8 mg/L
- All effluent going to reuse; filtration is a Title 22 requirement

Existing filters require significant investment for refurbishment (CH2MHILL Condition Assessment Report, 2007). These include architectural, structural, mechanical, and instrumentation and controls upgrades. An alternative is to construct a new filtration facility using a new technology, such as wire mesh filtration.

Project Description: This project would consist of the construction of a 180 mgd filter facility at the WPCP. The filter manufacturer most suited for the WPCP will need to be determined based on the results of the Filter Field Verification project (separate project).

Figure 36
NEW TERTIARY FILTERS
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

sj411f21-7897C00-209.ai

ID No.	37
Project Name:	Additional Chlorine Contact Basin Capacity (155 mgd)
Process Area:	Filtration and Disinfection
Primary Trigger:	Improved Performance Benefit
Secondary Trigger:	Policy Decision
Project Start Year:	2026
Project End Year:	2030

Project Justification: Improved performance benefit and policy decision.

Currently peak flows and filter bypass flows are disinfected either at the filter influent pump station (FIPS) or in the artesian slough. The City has an objective to disinfect all flows in contact basins, including PHWWF, since it is difficult to maintain consistent contact time in the artesian slough. The existing chlorine contact basins have adequate capacity to treat maximum month flows, but not peak hour flows. Thus, the WPCP would need to construct additional chlorine contact basins to disinfect peak hour flows.

Project Description: This project would consist of the construction of a 155 mgd peak hour wet weather flow (PHWWF) chlorine contact basin.

Figure 37
ADDITIONAL CHLORINE CONTACT BASINS
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

sj411f22-7897C00-209.ai

ID No.	38
Project Name:	Onsite HOCL plus Additional Chlorine Contact Basins (155 mgd)
Process Area:	Filtration and Disinfection
Primary Trigger:	Improved Performance Benefit
Secondary Trigger:	Policy Decision
Project Start Year:	2024
Project End Year:	2030

Project Justification: Improved performance benefit and policy decision.

Currently, all hypochlorite used for final disinfection of the final effluent is purchased and stored onsite. However, there is a financial benefit to generating the hypochlorite onsite as it is needed.

In addition, peak flows and filter bypass flows are disinfected either at the filter influent pump station (FIPS) or in the artesian slough. The City has an objective to disinfect all flows in contact basins, including PHWWF, since it is difficult to maintain consistent contact time in the artesian slough. The existing chlorine contact basins have adequate capacity to treat maximum month flows, but not peak hour flows. Thus, the WPCP would need to construct additional chlorine contact basins to disinfect peak hour flows.

Project Description: This project would consist of the construction of an onsite hypochlorite generation facility, and an additional 155 mgd chlorine contact basin to accommodate peak hour wet weather flows (PHWWFs). The onsite generation facility would consist of tube-type electrolytic cells, storage tanks for salt and brine solutions, and appurtenances.

Figure 38
ONSITE HOCL PLUS ADDITIONAL CCBs
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

sj411f9-7897C00-209.ai

ID No.	39
Project Name:	New UV Disinfection Facilities
Process Area:	Filtration and Disinfection
Primary Trigger:	Improved Performance Benefit
Secondary Trigger:	Policy Decision
Project Start Year:	2024
Project End Year:	2030

Project Justification: Economic Benefit and Policy Decision. It is more cost effective on a life cycle cost basis to provide disinfection using a new UV system than using the existing hypochlorite system. In addition, transitioning to UV disinfection instead of continuing with the existing hypochlorite disinfection would also have the following benefits:

- Help the WPCP meet its goal of reducing chemical use
- Could potentially aid the WPCP in transitioning to advanced oxidation, if combined with peroxide, should the WPCP be presented with new regulations governing CECs.

Project Description: This project would replace the current hypochlorite disinfection system, and would consist of the construction of the following:

- Two new UV channels and associated equipment to disinfect 35 mgd recycled water
- Five new UV channels and associated equipment to disinfect 145 mgd discharge
- Two new chlorine contact basins for the continued hypochlorite disinfection of peak hour wet weather flows (PHHWFs) in excess of the capacity of this UV facility

Figure 39
NEW UV DISINFECTION FACILITIES
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

sj411f23-7897C00-209.ai

ID No.	40
Project Name:	Peroxide
Process Area:	Filtration and Disinfection
Primary Trigger:	Regulatory
Secondary Trigger:	Improved Performance Benefit
Project Start Year:	2029
Project End Year:	2035

Project Justification: Regulatory and Improved Performance Benefit. While future CEC regulations may require full secondary effluent filtration, filtration alone will likely not be sufficient to remove CECs to acceptable levels. An advanced oxidation process, such as the addition of hydrogen peroxide to a UV system, ozone, or peracetic acid, would be required. If the WPCP is faced with impending CECs regulations, a peroxide dosing facility would only be implemented if the WPCP transitions to UV disinfection. Otherwise a different advanced oxidation process will be required.

Project Description: This project would consist of a peroxide storage and containment facility, along with metering pumps and piping. Peroxide would be added to augment UV disinfection. However, because of the uncertainty associated with the removal of contaminants of emerging concern (CECs), a UV/peroxide oxidation facility would not be implemented until further detailed studies are performed.

Figure 40
PEROXIDE
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

sj411f24-7897C00-209.ai

ID No.	41
Project Name:	Ozone
Process Area:	Filtration and Disinfection
Primary Trigger:	Regulatory
Secondary Trigger:	Economic Benefit
Project Start Year:	2029
Project End Year:	2035

Project Justification: Regulatory and Economic benefit. While future CEC regulations may require full secondary effluent filtration, filtration alone will likely not be sufficient to remove CECs to acceptable levels. An advanced oxidation process (AOP), such as the addition of hydrogen peroxide to a UV system, ozone, or peracetic acid, would be required. An ozone system would not only provide sufficient advanced oxidation, but would also replace the existing hypochlorite disinfection system. If the WPCP is faced with impending CECs regulations, an ozone dosing facility would only be implemented if the WPCP does not transition to UV.

The advantages of an ozone system over other AOP/disinfection systems are as follows:

- Destroys pathogens completely
- Destroys 90 to 99 percent endocrine disrupting compounds (EDCs)
- Improves dissolved oxygen levels in effluent
- Low chemical cost compared to alternative systems

Project Description: This project would consist of ozone generators, an ozone transfer system (e.g., nozzles or diffusers), reactor basin, and contact basins.

The ozone project would not proceed if the WPCP implements UV disinfection since advanced oxidation treatment will be provided through UV/peroxide treatment.

Figure 41
OZONE
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

sj411f25-7897C00-209.ai

ID No.	42
Project Name:	Inactive Lagoons Rehabilitation Phase 1
Process Area:	Biosolids
Primary Trigger:	Regulatory
Secondary Trigger:	None
Project Start Year:	2011
Project End Year:	2016

Project Justification: Regulatory requirement.

Lagoons 1-3, 5-7, 9-12 and 13-25 (referred to as inactive lagoons) contain biosolids that have been stored for over 25 years.

Any biosolids removed from the inactive lagoons must be characterized and managed in compliance with Title 22 of the California Code of Regulations (CCR – hazardous waste management regulations). Biosolids determined to be non-hazardous may be disposed of as ADC in a Class III landfill. If disposal through land application is selected, the material must comply with USEPA's Part 503 Title 40 of the Code of Federal Regulations (CFR), as well as various state and local rules. If the biosolids are determined to be hazardous per the characteristics specified in 22 CCR 66261, a variance can be requested for reclassification of the biosolids as a non-hazardous waste or modification to certain hazardous waste management requirements.

In 1998, the City sampled and analyzed biosolids from Lagoons 13-19, since it was the intent at the time to use and/or dispose of the material in these lagoons first. The results from the sampling efforts indicated that the biosolids could potentially be classified based on lead results, but not upon the cadmium results. However, it was recognized that a more thorough assessment of all the inactive lagoons would need to be performed before a final recommendation could be made. Most recently, the WPCP plant staff re-distributed the biosolids in each of the inactive lagoons, which would necessitate further assessment of the re-configured biosolids.

The resolution of the legacy biosolid issues is the first phase of the transition from the current biosolids processing operation. This transition process will not only include changes in the treatment processes used to stabilize and dry the biosolids generated, but will also include a more diversified portfolio of disposition options than the current Newby landfill alternative. This is important for several reasons: (1) Newby landfill is expected to close in the 2025 timeframe; (2) the City has a sustainability goal to increase the recycling of by-products from the WPCP operation; and (3) there is a need to provide more flexibility to provide diversion of the dried biosolids on short notice.

Project Description: To be determined based upon the results of the field testing work that is currently being performed, but could range from leave in place, or haul to offsite disposal.

ID No.	43
Project Name:	Inactive Lagoons Rehabilitation Phase 2
Process Area:	Biosolids
Primary Trigger:	Regulatory
Secondary Trigger:	None
Project Start Year:	2011
Project End Year:	2016

Project Justification: Regulatory requirement.

Lagoons 1-3, 5-7, 9-12 and 13-25 (referred to as inactive lagoons) contain biosolids that have been stored for over 25 years.

Any biosolids removed from the inactive lagoons must be characterized and managed in compliance with Title 22 of the California Code of Regulations (CCR – hazardous waste management regulations). Biosolids determined to be non-hazardous may be disposed of as ADC in a Class III landfill. If disposal through land application is selected, the material must comply with USEPA's Part 503 Title 40 of the Code of Federal Regulations (CFR), as well as various state and local rules. If the biosolids are determined to be hazardous per the characteristics specified in 22 CCR 66261, a variance can be requested for reclassification of the biosolids as a non-hazardous waste or modification to certain hazardous waste management requirements.

In 1998, the City sampled and analyzed biosolids from Lagoons 13-19, since it was the intent at the time to use and/or dispose of the material in these lagoons first. The results from the sampling efforts indicated that the biosolids could potentially be classified based on lead results, but not upon the cadmium results. However, it was recognized that a more thorough assessment of all the inactive lagoons would need to be performed before a final recommendation could be made. Most recently, the WPCP plant staff re-distributed the biosolids in each of the inactive lagoons, which would necessitate further assessment of the re-configured biosolids.

The resolution of the legacy biosolid issues is the first phase of the transition from the current biosolids processing operation. This transition process will not only include changes in the treatment processes used to stabilize and dry the biosolids generated, but will also include a more diversified portfolio of disposition options than the current Newby landfill alternative. This is important for several reasons: (1) Newby landfill is expected to close in the 2025 timeframe; (2) the City has a sustainability goal to increase the recycling of by-products from the WPCP operation; and (3) there is a need to provide more flexibility to provide diversion of the dried biosolids on short notice.

Project Description: To be determined based upon the results of the field testing work that is currently being performed, but could range from leave in place, or haul to offsite disposal.

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Figures 42 and 43
INACTIVE LAGOONS REHABILITATION PHASES 1 AND 2
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

sj411f26-7897C00-209.ai

ID No.	44
Project Name:	WAS and PS Fine Screening
Process Area:	Biosolids
Primary Trigger:	Policy Decision
Secondary Trigger:	Improved Performance Benefit
Project Start Year:	2019
Project End Year:	2023

Project Justification: Policy decision and improved performance benefit. The removal of debris typical in wastewater is important relative to biosolids quality and its acceptability for reuse. When comparing sludge screening versus raw influent fine screening the analysis showed that screening of the Waste Activated Sludge and Primary Sludge is significantly less in capital cost than fine screening of full plant influent. Removing debris from the solids streams will provide a higher quality biosolids end product, thereby increasing final biosolids disposition options available to the WPCP.

Project Description: This project entails a 1.8 mgd capacity fine screening facility, which includes equipment, a structure to house the equipment, and odor control facilities. For cost estimating purposes a step screen technology was assumed, but further assessment of technologies would be completed as part of the preliminary design.

Figure 44
WAS AND PS FINE SCREENING
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

sj411f27-7897C00-209.ai

ID No.	45
Project Name:	Digester Gas Manifold and Tunnel Improvements
Process Area:	Biosolids
Primary Trigger:	Condition (R&R)
Secondary Trigger:	None
Project Start Year:	2011
Project End Year:	2013

Project Justification: Condition (R&R).

The digester gas piping manifold is located in a below-grade pipe tunnel. A major portion of the digester gas piping was installed using mechanical couplings (Victaulic) to join the pipe spools. These Victaulic connections have developed leaks, likely because this type of coupling does not seal well in low-pressure gas applications. The leaking digester gas manifold is a safety hazard and presents a potential explosive atmosphere. To replace this pipeline, a new digester gas manifold with dual pipes will be constructed above ground, allowing plant staff to maintain one pipe while the other pipe remains in operation.

Project Description: This project includes a new above ground gas manifold, removal of other hazardous piping form the tunnels, sealing the tunnels from other classified areas, and relocating some ventilation intakes.

The new gas manifold system will include installing one 30-inch manifold pipe that will connect to all digester gas laterals. In addition, there will be two, 24-inch branch lines that connect to the gas manifold pipe. It includes minor improvements to individual digester gas piping to improve safety and condensate removal (all digesters but 5,6,7, and 8 being modified in CIP No. 46). These improvements include constructing redundant PRV and flame arrester assemblies, replacing manual condensate drip traps with automatic barometric traps, and adding condensation removal at all low points.

Figures 45 and 46
DIGESTER GAS MANIFOLD AND TUNNEL IMPROVEMENTS
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

sj411f67-7897C00-209.ai

ID No.	46
Project Name:	Tunnel Rehabilitation: Digesters and DAFT
Process Area:	Biosolids
Primary Trigger:	Condition (R&R)
Secondary Trigger:	None
Project Start Year:	2012
Project End Year:	2022

Project Justification: Condition (R&R).

The Digesters and DAFT tunnel system houses the sludge and tank drain pipelines, and various valves, pumps, and controls. These tunnels were constructed in the 1960s, and are in need of structural repair and coatings. The removal of obsolete pipelines for these tunnels will be conducted under a separate project.

Project Description: This project entails rehabilitation of the Digesters and DAFT tunnel complex, and is comprised of structural concrete repair and coatings.

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ID No.	47
Project Name:	Digester Cover and Mixing Upgrades (4 digesters)
Process Area:	Biosolids
Primary Trigger:	Condition (R&R)
Secondary Trigger:	Improved performance benefit
Project Start Year:	2011
Project End Year:	2015

Project Justification: Condition (R&R) and improved performance benefit.

The WPCP has a total of sixteen digesters, all of which were built between 1956 and 1983. Eleven of the digesters were constructed in 1970 or before. Currently, five of these digesters – Digesters 2, 4, 5, 6, and 8 – are not in service because of various structural issues primarily related to the age and condition of the steel floating covers. Because Digesters 1, 3, 7, 9, 10, and 11 are similar in age to the five digesters currently out of service, there are concerns with the overall reliability of these digesters, and it is believed that the steel floating covers at these digesters are nearing the end of their useful life. Given the condition of the existing digesters, reliability and redundancy in the digestion process is a major concern.

In addition, the gas mixing system for the existing digesters does not provide sufficient mixing energy when compared to current design standards. The digester rehabilitation project would include replacement of the mixers. Replacement of the mixer will reduce the frequency of digester cleaning and increase digester gas production.

Project Description: This project includes installing new covers and mixers on Digesters 5, 6, 7, and 8. The upgrades will consist of replacing existing floating covers with concrete, submerged fixed covers, installing gas lances, draft tube assemblies lined with Kynar (interior only), new compressors, replacing the existing 10-inch hose lateral piping with 16-inch SST lateral piping, constructing redundant PRV and flame arrester assemblies, and installing new condensate tanks.

Figure 47
DIGESTER COVER AND MIXING UPGRADES
(4 DIGESTERS)
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

sj411f68-7897C00-209.ai

ID No.	48
Project Name:	Digester Mixing Equipment 1 (LM mixer)
Process Area:	Biosolids
Primary Trigger:	Condition (R&R)
Secondary Trigger:	Improved performance benefit
Project Start Year:	2011
Project End Year:	2013

Project Justification: Condition (R&R) and improved performance benefit.

The WPCP has a total of sixteen digesters, all of which were built between 1956 and 1983. Eleven of the digesters were constructed in 1970 or before. Currently, five of these digesters – Digesters 2, 4, 5, 6, and 8 – are not in service because of various structural issues primarily related to the age and condition of the steel floating covers. Because Digesters 1, 3, 7, 9, 10, and 11 are similar in age to the five digesters currently out of service, there are concerns with the overall reliability of these digesters, and it is believed that the steel floating covers at these digesters are nearing the end of their useful life. Given the condition of the existing digesters, reliability and redundancy in the digestion process is a major concern.

In addition, the gas mixing system for the existing digesters does not provide sufficient mixing energy when compared to current design standards. The digester rehabilitation project would include replacement of the mixers. Replacement of the mixer will reduce the frequency of digester cleaning and increase digester gas production.

Project Description: This project includes pre-purchase of sole-sourced linear motion digester mixing equipment the City wishes to pilot test.

Figures 48 and 49
DIGESTER MIXING EQUIPMENT
(LM MIXER AND DRAFT TUBE MIXER)
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

sj511f1-7897c00-209.ai

ID No.	49
Project Name:	Digester Mixing Equipment 2 (Draft tube mixer)
Process Area:	Biosolids
Primary Trigger:	Condition (R&R)
Secondary Trigger:	Improved performance benefit
Project Start Year:	2011
Project End Year:	2013

Project Justification: Condition (R&R) and improved performance benefit.

The WPCP has a total of sixteen digesters, all of which were built between 1956 and 1983. Eleven of the digesters were constructed in 1970 or before. Currently, five of these digesters – Digesters 2, 4, 5, 6, and 8 – are not in service because of various structural issues primarily related to the age and condition of the steel floating covers. Because Digesters 1, 3, 7, 9, 10, and 11 are similar in age to the five digesters currently out of service, there are concerns with the overall reliability of these digesters, and it is believed that the steel floating covers at these digesters are nearing the end of their useful life. Given the condition of the existing digesters, reliability and redundancy in the digestion process is a major concern.

In addition, the gas mixing system for the existing digesters does not provide sufficient mixing energy when compared to current design standards. The digester rehabilitation project would include replacement of the mixers. Replacement of the mixer will reduce the frequency of digester cleaning and increase digester gas production.

Project Description: This project includes pre-purchase of sole-sourced mechanical draft tube digester mixing equipment the City wishes to pilot test.

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ID No.	50
Project Name:	Digester Cover and Mixing Upgrades (3 digesters)
Process Area:	Biosolids
Primary Trigger:	Condition (R&R)
Secondary Trigger:	Improved performance benefit
Project Start Year:	2020
Project End Year:	2024

Project Justification: Condition (R&R) and improved performance benefit.

The WPCP has a total of sixteen digesters, all of which were built between 1956 and 1983. Eleven of the digesters were constructed in 1970 or before. Currently, five of these digesters – Digesters 2, 4, 5, 6, and 8 – are not in service because of various structural issues primarily related to the age and condition of the steel floating covers. Because Digesters 1, 3, 7, 9, 10, and 11 are similar in age to the five digesters currently out of service, there are concerns with the overall reliability of these digesters, and it is believed that the steel floating covers at these digesters are nearing the end of their useful life. Given the condition of the existing digesters, reliability and redundancy in the digestion process is a major concern.

In addition, the gas mixing system for the existing digesters does not provide sufficient mixing energy when compared to current design standards. The digester rehabilitation project would include replacement of the mixers. Replacement of the mixer will reduce the frequency of digester cleaning and increase digester gas production.

Project Description: This project includes installing new covers and mixers on 3 additional digesters. The upgrades will consist of replacing existing floating covers with concrete, submerged fixed covers, installing gas lances, draft tube assemblies lined with Kynar (interior only), new compressors, replacing the existing 10-inch hose lateral piping with 16-inch SST lateral piping, constructing redundant PRV and flame arrester assemblies, and installing new condensate tanks.

Figure 50
DIGESTER COVER AND MIXING UPGRADES
(3 DIGESTERS)
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

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ID No.	51
Project Name:	Digester Cover and Mixing Upgrades (3 digesters)
Process Area:	Biosolids
Primary Trigger:	Condition (R&R)
Secondary Trigger:	Improved performance benefit
Project Start Year:	2024
Project End Year:	2027

Project Justification: Condition (R&R) and improved performance benefit.

The WPCP has a total of sixteen digesters, all of which were built between 1956 and 1983. Eleven of the digesters were constructed in 1970 or before. Currently, five of these digesters – Digesters 2, 4, 5, 6, and 8 – are not in service because of various structural issues primarily related to the age and condition of the steel floating covers. Because Digesters 1, 3, 7, 9, 10, and 11 are similar in age to the five digesters currently out of service, there are concerns with the overall reliability of these digesters, and it is believed that the steel floating covers at these digesters are nearing the end of their useful life. Given the condition of the existing digesters, reliability and redundancy in the digestion process is a major concern.

In addition, the gas mixing system for the existing digesters does not provide sufficient mixing energy when compared to current design standards. The digester rehabilitation project would include replacement of the mixers. Replacement of the mixer will reduce the frequency of digester cleaning and increase digester gas production.

Project Description: This project includes installing new covers and mixers on 3 additional digesters. The upgrades will consist of replacing existing floating covers with concrete, submerged fixed covers, installing gas lances, draft tube assemblies lined with Kynar (interior only), new compressors, replacing the existing 10-inch hose lateral piping with 16-inch SST lateral piping, constructing redundant PRV and flame arrester assemblies, and installing new condensate tanks.

Figure 51
DIGESTER COVER AND MIXING UPGRADES
(3 DIGESTERS)
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

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ID No.	52
Project Name:	DAFT Final Upgrades (6 DAFTs)
Process Area:	Biosolids
Primary Trigger:	Condition (R&R), Policy Decision
Secondary Trigger:	Improved performance benefit
Project Start Year:	2010
Project End Year:	2013

Project Justification: Condition (R&R), policy decision, and improved performance benefit.

The DAFT equipment is aging, and replacement of pumps, piping, valves, equipment, and instrumentation and controls is needed. Upgrades to the DAFT pressurization system will be sized to accommodate a future co-thickening project of primary sludge and waste activated sludge in the DAFT units. Co-thickening in the DAFTs reduces the flow rate to the digesters, which increases the capacity of the digesters.

If these projects are not completed, the reliability of the DAFT equipment will be significantly reduced. A decrease in DAFT performance will increase the hydraulic loading to the digesters, which will decrease digester performance, affecting digester gas production and the sludge lagoons.

Part of the WPCP vision is to be a good neighbor with respect to odor, noise, and aesthetics. Additionally, the WPCP development master plan includes bringing the public closer to the plant's treatment processes. DAFT is one of the critical processes that require odor control.

Project Description: Six of the existing DAFT units will be upgraded and odor containment and treatment will be provided. The thickening modifications include new DAFT feed pumps, new float pumps, retrofits for a blend tank system, new polymer system, saturation system upgrades, and piping modifications associated with all upgrades. The odor containment modifications include covers, air ducting, and fans for DAFT tanks. Odor treatment includes addition of a biofilter. Saturation system upgrades include six new saturation pressure tanks. Tank covers will be aluminum panels that are easy to remove for maintenance purposes.

Figure 52
DAFT FINAL UPGRADES (6 DAFTS)
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

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ID No.	53
Project Name:	Digester Heating Upgrades
Process Area:	Biosolids
Primary Trigger:	Condition (R&R)
Secondary Trigger:	Improved performance benefit
Project Start Year:	2010
Project End Year:	2013

Project Justification: Condition (R&R) and improved performance benefit.

The WPCP has a total of sixteen digesters, all of which were built between 1956 and 1983. The heating system is a fundamental component of the digestion process, and any inefficiency would greatly reduce their treatment capacity. Given the condition of the existing digesters, reliability and redundancy in the digestion process is a major concern.

Project Description: This project entails piping, equipment, and control modifications to the individual digester heat supply systems. This includes installing individual flow controllers at each digester load circuit and removing flow restriction orifices in the common pipes of each load circuit.

Figures 53 and 54
DIGESTER HEATING UPGRADES AND STRUVITE CONTROL FEED
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

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ID No.	54
Project Name:	Struvite Control Chemical Feed
Process Area:	Biosolids
Primary Trigger:	Improved performance benefit
Secondary Trigger:	None
Project Start Year:	2011
Project End Year:	2013

Project Justification: Improved performance benefit.

The digestion process creates ideal conditions for the formation of struvite. Struvite has been identified as a significant issue at the WPCP. It reduces process performance by formation of scales that clog digester pipelines and cause wear and tear of equipment components. Implementation of struvite removal technology would greatly benefit the performance of the biosolids process equipment.

Project Description: This project would be implemented only if pilot testing confirms the performance of proprietary chemicals for struvite control.

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ID No.	55
Project Name:	Digester Pretreatment Field Verification
Process Area:	Biosolids
Primary Trigger:	Improved performance benefit
Secondary Trigger:	None
Project Start Year:	2013
Project End Year:	2019

Project Justification: Improved performance benefit. The existing sludge stabilization process is single-stage mesophilic anaerobic digestion. Modifications to the digesters and the DAFTs have been identified that would increase the digester capacity, increase digester gas production, and improve operational reliability. These modifications will all be implemented as part of a number of separate projects.

Digester efficiency can be improved further, and digester gas production increased further, by additional processing of the sludge prior to digestion. There are a number of pre-processing technologies available, such as CAMBI, CROWN, and OpenCEL, although this is a field of technology that is largely still being developed. Therefore, it is appropriate that one or more of these technologies be field tested at the WPCP before implementation at the full scale.

CAMBI is provisionally selected for the field verification phase, and provides a number of advantages:

- Digester feed concentration is as high as 8 to 12 percent, which requires fewer digesters.
- With fewer digesters needed for primary sludge and WAS, more digesters are available for FOG, food and other import materials. Alternatively, fewer digesters would be required for rehabilitation/restoration at potentially significant savings.
- Enhanced digestion is provided, and Class A product is produced if both the primary sludge and WAS are treated through the CAMBI process.
- Gas production is increased.
- Dewaterability of the digested sludge is improved even with low-energy devices like belt filter presses. (Aberdeen, Scotland, produces greater than 30 percent cake using belt filter presses.)

Project Description: This project entails the field testing of a digester pretreatment technology such as CAMBI. Components include:

- sludge screening
- sludge feed storage
- pre-dewatering
- high-pressure steam system
- multiple CAMBI vessels
- post CAMBI cooling, and
- post CAMBI dilution system.

Figure 55
DIGESTION PRE-TREATMENT FIELD VERIFICATION
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

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ID No.	56
Project Name:	FOG receiving station and access road
Process Area:	Biosolids
Primary Trigger:	Economic benefit
Secondary Trigger:	Policy decision
Project Start Year:	2013
Project End Year:	2017

Project Justification: Economic benefit and policy decision.

Accepting FOG at the WPCP will enhance gas production and increase energy and heat production. A FOG receiving station is needed to provide a dedicated receiving point for haulers bringing FOG to the WPCP. It would provide some storage capacity, and the capability to distribute and monitor the flow of FOG to the digesters.

Project Description: This project entails the construction of a FOG (Fats, Oils, Grease) receiving station, feed piping from the receiving station to the digesters accepting FOG, and a ½-mile of access road improvements.

Figure 56
FOG FACILITY, ACCESS ROAD
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

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ID No.	57
Project Name:	14-inch Digested Sludge Line Addition (parallel pipe)
Process Area:	Biosolids
Primary Trigger:	Condition (R&R)
Secondary Trigger:	None
Project Start Year:	2019
Project End Year:	2023

Project Justification: Condition (R&R).

Digested sludge is pumped by the Digested Sludge Export Pump Station (DSEPS) to the Residual Solids Management (RSM) facility through a single pipeline. Due to the potential for struvite build up in this line, a parallel 14" digested sludge line is required to provide much-needed redundancy to a critical component of the treatment train.

Project Description: This project would consist of addition of a new 14" diameter sludge line to be installed parallel to the existing digested sludge pipeline.

Figure 57
14-INCH DIGESTED SLUDGE LINE ADDITION
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

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ID No.	58
Project Name:	Sludge Dewatering Field Verification
Process Area:	Biosolids
Primary Trigger:	Policy Decision
Secondary Trigger:	None
Project Start Year:	2015
Project End Year:	2017

Project Justification: Policy decision.

The existing process train does not include mechanical dewatering. Digested sludge is stored in lagoons and subsequently dried in open air drying beds. This current mode of operation is not consistent with future proposed adjacent land uses. Some form of mechanical dewatering will be required to replace the current drying bed operation. Because of the multiple options of mechanical dewatering available, some form of extended field testing will be required prior to final technology selection.

Project Description: This project entails field verification of various mechanical sludge dewatering process technologies to determine which is most suited to the WPCP. Once the technology has been selected, it will be implemented at full scale (separate project).

Figure 58
SLUDGE DEWATERING FIELD VERIFICATION
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

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ID No.	59
Project Name:	2/3 Full Mechanical Dewatering (Centrifuges) Plus Feed Storage Tank
Process Area:	Biosolids
Primary Trigger:	Policy Decision
Secondary Trigger:	None
Project Start Year:	2017
Project End Year:	2023

Project Justification: Policy Decision. The existing process train does not include mechanical dewatering. Digested sludge is stored in lagoons and subsequently dried in open air drying beds. This current mode of operation is not consistent with future proposed adjacent land uses. Some form of mechanical dewatering will be required to replace the current drying bed operation..

Project Description: This project entails the installation of mechanical dewatering units, such as centrifuges or belt filter presses, a feed storage tank for biosolids prior to dewatering, and polymer storage and dosage facilities and solids conveyance systems, all housed in an odor-controlled building. The selection of appropriate equipment will be based on the findings of the field verification project, and would be implemented in two phases over the 30-year planning period. This project constitutes the first phase, capable of processing 2/3 of the projected planning period solids loading.

Figure 59

ID No.	60
Project Name:	Cake Storage
Process Area:	Biosolids
Primary Trigger:	Policy Decision
Secondary Trigger:	None
Project Start Year:	2017
Project End Year:	2023

Project Justification: Policy Decision. The existing process train does not include mechanical dewatering. Digested sludge is stored in lagoons and subsequently dried in open air drying beds. This current mode of operation is not consistent with future proposed adjacent land uses. Some form of mechanical dewatering will be required to replace the current drying bed operation. A storage facility will be required to hold dewatered cake prior to off-site transfer and on-site drying.

Project Description: Cake storage would be implemented as a single project, sufficient for dewatered cake over the full 30-year planning period.

Figure 60
CAKE STORAGE
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

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ID No.	61
Project Name:	1/3 full Mechanical Dewatering (Centrifuges)
Process Area:	Biosolids
Primary Trigger:	Policy Decision
Secondary Trigger:	None
Project Start Year:	2028
Project End Year:	2033

Project Justification: Policy decision. The existing process train does not include mechanical dewatering. Digested sludge is stored in lagoons and subsequently dried in open air drying beds. This current mode of operation is not consistent with future proposed adjacent land uses. Some form of mechanical dewatering will be required to replace the current drying bed operation.

Project Description: This project entails the installation of the remaining 1/3 of mechanical dewatering units (either centrifuges or belt filter presses, whichever were installed during the first phase), and additional polymer storage and dosage facilities and solids conveyance systems, all housed the odor-controlled building constructed during the first phase. This project constitutes the second phase, capable of processing the remaining 1/3 of the projected planning period solids loading.

Figure 61
1/3 FULL MECHANICAL DEWATERING (CENTRIFUGES)
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

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ID No.	62
Project Name:	Lagoons and Drying Beds Retirement
Process Area:	Biosolids
Primary Trigger:	Condition (R&R)
Secondary Trigger:	Policy Decision
Project Start Year:	2023
Project End Year:	2025

Project Justification: Condition and policy decision. The existing process train entails digested sludge stored in lagoons and subsequently dried in open air drying beds. Future biosolids alternatives would include mechanical dewatering, and mechanical drying for at least a portion of the WPCP's biosolids. Once the mechanized facilities are in place, solids from the lagoons and drying beds would be removed and disposed of, and the facilities would no longer be necessary for the WPCP's operations.

Project Description: This project entails emptying the existing lagoons of their biosolids content, partially to the drying beds for solar drying, partially through contract mechanical dewatering, and partially through use of the newly constructed plant mechanical dewatering facilities. As the lagoons are emptied, and fewer drying beds are required, the air-dried solids from the drying beds will be hauled offsite, and the drying beds will no longer be in service.

All future earthwork required for the retired lagoons and drying beds will be conducted by future developers.

Figure 62
LAGOONS AND DRYING BEDS RETIREMENT
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

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ID No.	63
Project Name:	2/3 Covered Lagoons (180 days storage)
Process Area:	Biosolids
Primary Trigger:	Policy Decision
Secondary Trigger:	Improved Performance Benefit
Project Start Year:	2017
Project End Year:	2022

Project Justification: Policy Decision and Improved Performance. Currently, digested sludge is stored in lagoons and subsequently dried in open air drying beds. However, this mode of operation is not consistent with future proposed adjacent land uses. While the biosolids handling facilities will transition to a mechanized system, retaining some of the lagoons provides a valuable "wide-spot" in the overall sludge treatment process train. Therefore, a smaller volume of lagoons, with improvements, will be retained for storage of digested solids prior to dewatering. These lagoons would be designed with covers to provide odor control.

Project Description: The project would entail the construction, lining and covering of new lagoons sufficient for a six-month storage volume. This would be the first of two stages, providing sufficient storage to accommodate 180 days of digested solids.

Figure 63
2/3 COVERED LAGOONS
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

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ID No.	64
Project Name:	Emergency Biosolids Storage
Process Area:	Biosolids
Primary Trigger:	Policy Decision
Secondary Trigger:	Improved Performance Benefit
Project Start Year:	2017
Project End Year:	2023

Project Justification: Policy Decision and Improved Performance. Currently, digested sludge is stored in lagoons and subsequently dried in open air drying beds. However, this mode of operation is not consistent with future proposed adjacent land uses. While the biosolids handling facilities will transition to a mechanized system, retaining some of the storage beds provides a valuable "wide-spot" following sludge dewatering. Therefore, a smaller area of paved biosolids storage beds will be retained for storage of dewatered solids.

Project Description: The project would involve construction of paved biosolids storage beds that would be sized for 30 days of storage (based on projected 2040 average annual loading) of dewatered biosolids produced by the new mechanical dewatering facility.

Figure 64
EMERGENCY BIOSOLIDS STORAGE
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

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ID No.	65
Project Name:	1/3 Covered Lagoons (180 days storage)
Process Area:	Biosolids
Primary Trigger:	Policy Decision
Secondary Trigger:	Improved Performance Benefit
Project Start Year:	2028
Project End Year:	2033

Project Justification: Policy decision and improved performance benefit. Digested sludge is stored in lagoons and subsequently dried in open air drying beds. This current mode of operation is not consistent with future proposed adjacent land uses. Based on discussions with plant operating staff it was determined that lagoons provide a valuable "wide-spot" in the overall sludge treatment process train. Therefore, it was recommended that a smaller volume of lagoons be retained for storage of digested solids prior to dewatering. These lagoons would be designed with covers to provide odor control and additional sludge stabilization.

Project Description: The project would entail the construction, lining and covering of the remaining lagoons required to provided a six-month storage volume. This would be the second phase of the project, providing the remaining 1/3 capacity required to meet the 2040 loading.

Figure 65
1/3 COVERED LAGOONS
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

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ID No.	66
Project Name:	Sludge Drying Field Verification
Process Area:	Biosolids
Primary Trigger:	Policy Decision
Secondary Trigger:	Improved Performance Benefit
Project Start Year:	2018
Project End Year:	2020

Project Justification: Policy Decision and Improved Performance. The existing final dewatering process utilizes open air solar drying in earthen beds. The WPCP has committed to moving out of this mode of operation, transitioning partially to mechanical heat drying. The most efficient approach for this transition would be to field-verify different heat drying units, and to design the full-scale facility based on these results.

Project Description: The project would consist of field verification to determine the process and technology most appropriate for mechanical heat drying. A temporary facility will be constructed to receive a portion of the dewatered solids from the new mechanical dewatering facility.

Figure 66
SLUDGE DRYING FIELD VERIFICATION
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

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ID No.	67
Project Name:	2/3 Thermal Drying for 20% solids streams
Process Area:	Biosolids
Primary Trigger:	Policy Decision
Secondary Trigger:	Improved Performance Benefit
Project Start Year:	2020
Project End Year:	2025

Project Justification: Policy Decision and Improved Performance. The existing final dewatering process utilizes open air solar drying in earthen beds. The WPCP has committed to moving out of this mode of operation, transitioning partially to mechanical thermal drying.

Project Description: Following field verification, the project would entail the implementation of a full-scale mechanical thermal drying facility, constructed in two phases. During this first phase, thermal drying units would be installed in a new covered facility with odor control. It would have sufficient capacity to accommodate 2/3 of 20% of the biosolids stream anticipated for the 30-year period.

Figure 67
2/3 THERMAL DRYING
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

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ID No.	68
Project Name:	1/3 Thermal Drying for 20% solids streams
Process Area:	Biosolids
Primary Trigger:	Policy Decision
Secondary Trigger:	Improved Performance Benefit
Project Start Year:	2028
Project End Year:	2033

Project Justification: Policy Decision and Improved Performance. The existing final dewatering process utilizes open air solar drying in earthen beds. The WPCP has committed to moving out of this mode of operation, transitioning partially to mechanical thermal drying.

Project Description: This project is the continuation of the initial full-scale thermal drying facility, and entails the construction of additional thermal drying equipment sufficient to accommodate the remaining 1/3 of 20% of the biosolids stream anticipated for the 30-year period.

Figure 68
1/3 THERMAL DRYING
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

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ID No.	69
Project Name:	Biosolids Greenhouse Demonstration Project with BFPs
Process Area:	Biosolids
Primary Trigger:	Policy Decision
Secondary Trigger:	Improved Performance Benefit
Project Start Year:	2012
Project End Year:	2016

Project Justification: Policy Decision and Improved Performance. The existing final dewatering process utilizes open air solar drying in earthen beds. The WPCP has committed to moving out of the existing open air solar drying beds operation by transitioning to mechanical dewatering, followed by drying operations for a portion of the dewatered solids stream. Covered greenhouses would allow continued solar drying, even during the wet months of the year, and would be equipped with odor control equipment.

Project Description: This project entails the construction of two full-scale field demonstration greenhouse facilities, including the necessary dewatering equipment. The purpose of this field demonstration project would be to determine whether this technology is scalable to a larger operation.

Figure 69
BIOSOLIDS GREENHOUSE
DEMONSTRATION PROJECT WITH BFPs
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

sj411f41-7897C00-209.ai

ID No.	70
Project Name:	2/3 Full Scale Greenhouse without Dewatering
Process Area:	Biosolids
Primary Trigger:	Policy Decision
Secondary Trigger:	Improved Performance Benefit
Project Start Year:	2020
Project End Year:	2025

Project Justification: Policy Decision and Improved Performance. The existing final dewatering process utilizes open air solar drying in earthen beds. The WPCP has committed to moving out of the existing open air solar drying beds operation by transitioning to mechanical dewatering, followed by drying operations for a portion of the dewatered solids stream. Covered greenhouses would allow continued solar drying, even during the wet months of the year, and would be equipped with odor control equipment.

Project Description: Following the field demonstration of two greenhouses, this project entails the construction of additional greenhouses to augment the initial two field-demonstration greenhouses, and provide the remaining 2/3 of the anticipated 30-year greenhouse capacity. Unlike the initial two greenhouses that had their own dewatering facilities, the dewatered solids stream feeding the greenhouses of this project would be generated by the new mechanical dewatering facility.

Figure 70
2/3 GREENHOUSE FULL SCALE
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

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ID No.	71
Project Name:	1/3 Full Scale Greenhouse without Dewatering
Process Area:	Biosolids
Primary Trigger:	Policy Decision
Secondary Trigger:	Improved Performance Benefit
Project Start Year:	2028
Project End Year:	2033

Project Justification: Policy Decision and Improved Performance. The existing final dewatering process utilizes open air solar drying in earthen beds. The WPCP has committed to moving out of the existing open air solar drying beds operation by transitioning to mechanical dewatering, followed by drying operations for a portion of the dewatered solids stream. Covered greenhouses would allow continued solar drying, even during the wet months of the year, and would be equipped with odor control equipment.

Project Description: This project entails the construction of the remaining 1/3 of the anticipated 30-year greenhouse capacity. The dewatered solids stream feeding the greenhouses of this project would be generated by the new mechanical dewatering facility.

Figure 71
1/3 GREENHOUSE FULL SCALE
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

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ID No.	72
Project Name:	Energy Strategic Plan
Process Area:	Combined Heat and Power
Primary Trigger:	
Secondary Trigger:	
Project Start Year:	2011
Project End Year:	2012

Project Justification:.

Project Description:

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ID No.	73
Project Name:	Fuel Cell
Process Area:	Combined Heat and Power
Primary Trigger:	Regulatory Requirement
Secondary Trigger:	Improved Performance Benefit
Project Start Year:	2011
Project End Year:	2012

Project Justification: Regulatory and Improved performance benefit.

The WPCP currently uses a combination of digester gas, purchased landfill gas, and natural gas to generate power onsite using engine-generators in Building 40 and the P&E Building. While the existing systems currently meet Bay Area Air Quality Management District emission regulations, it is anticipated that these regulations will be tightened in the near future to align more closely with those already being enforced in the South Coast Air Quality Management District (SCAQMD). Analysis indicated that while the economics favored continued use of the existing engine-generators, the aforementioned regulatory considerations could require the WPCP to replace or retrofit these engine-generators as soon as 2015. As a result, implementation of lower emission technologies, including fuel cells and gas turbines, was recommended.

The advantages of a fuel cell versus replacement or retrofit of the existing engine-generators include:

1. Higher efficiency which results in more power generated for the same quantity of gas
2. Substantially lower emissions
3. CARB 2007 certified which simplifies the permitting process
4. Smaller capital investment required

Installation of a fuel cell cogeneration facility will enable the WPCP to:

1. Add another “green” resource to the WPCP power profile
2. Minimize the projected shortfall in onsite generating capacity with respect to total WPCP power demand
3. Reduce electric power costs.

Project Description: The project would consist of the construction of a 1.4 MW fuel cell cogeneration facility, digester gas treatment system, and hot water heat recovery system on a concrete slab on grade outside of the existing Building 40. To preserve capital and take advantage of available tax credits, the project will be implemented through a power purchase agreement (PPA).

Figure 73
FUEL CELL
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

sj411f79-7897C00-209.ai

ID No.	74
Project Name:	Plant Electrical Reliability (PER) – 4.6 MW Gas Turbine Phase 1 (w/o gas storage)
Process Area:	Combined Heat and Power
Primary Trigger:	
Secondary Trigger:	
Project Start Year:	2012
Project End Year:	2018

Project Justification:

Project Description:

Figure 74
PLANT ELECTRICAL RELIABILITY - 4.6 MW GAS TURBINE
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

sj411f71-7897C00-209.ai

ID No.	75
Project Name:	Gas Turbine Phase 2 (9.2 MW)
Process Area:	Combined Heat and Power
Primary Trigger:	Condition (R&R)
Secondary Trigger:	Regulatory Requirement
Project Start Year:	2020
Project End Year:	2025

Project Justification: Condition (R&R) and regulatory.

The WPCP currently uses a combination of digester gas, purchased landfill gas, and natural gas to generate power onsite using engine-generators in Building 40 and the P&E Building. While the existing systems currently meet Bay Area Air Quality Management District emission regulations, it is anticipated that these regulations will be tightened in the near future to align more closely with those already being enforced in the South Coast Air Quality Management District (SCAQMD). Analysis indicates that while the economics favored continued use of the existing engine-generators, the aforementioned regulatory considerations could require the WPCP to replace or retrofit these engine-generators as soon as 2015. As a result, implementation of lower emission technologies including fuel cells and gas turbines was recommended.

Gas turbines provided a greater present worth benefit to the WPCP when compared to new engine-generators and direct purchase fuel cells. The advantages of gas turbines versus replacement or retrofit of the existing engine-generators include:

1. Higher efficiency which results in more power generated for the same quantity of gas
2. Substantially lower emissions
3. Equipment consolidation based on larger size availability

Installation of gas turbines will enable the WPCP to:

1. Add another “green” resource to the WPCP power profile
2. Minimize the projected shortfall in onsite generating capacity with respect to total WPCP power demand

Reduce electric power costs

Project Description: Gas Turbine Phase 2 (9.2 MW) includes the following:

- Construction of two 4.6 MW recuperated gas turbine systems
- Construction of appurtenances including exhaust heat recovery and hot water pumping for two 4.6 MW recuperated gas turbine systems

Installation of future gas turbines should be revisited to determine whether changes in grant funding opportunities favor fuel cells or other advanced technologies.

Figure 75
GAS TURBINE - PHASE 2 (9.2 MW)
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

sj411f45-7897C00-209.ai

ID No.	76
Project Name:	Gas Turbine Phase 3 (4.6 MW)
Process Area:	Combined Heat and Power
Primary Trigger:	Condition (R&R)
Secondary Trigger:	Regulatory Requirement
Project Start Year:	2030
Project End Year:	2035

Project Justification: Condition (R&R) and regulatory.

The WPCP currently uses a combination of digester gas, purchased landfill gas, and natural gas to generate power onsite using engine-generators in Building 40 and the P&E Building. While the existing systems currently meet Bay Area Air Quality Management District emission regulations, it is anticipated that these regulations will be tightened in the near future to align more closely with those already being enforced in the South Coast Air Quality Management District (SCAQMD). Analysis indicates that while the economics favored continued use of the existing engine-generators, the aforementioned regulatory considerations could require the WPCP to replace or retrofit these engine-generators as soon as 2015. As a result, implementation of lower emission technologies including fuel cells and gas turbines was recommended.

Gas turbines provided a greater present worth benefit to the WPCP when compared to new engine-generators and direct purchase fuel cells. The advantages of gas turbines versus replacement or retrofit of the existing engine-generators include:

1. Higher efficiency which results in more power generated for the same quantity of gas
2. Substantially lower emissions
3. Equipment consolidation based on larger size availability

Installation of gas turbines will enable the WPCP to:

1. Add another “green” resource to the WPCP power profile
2. Minimize the projected shortfall in onsite generating capacity with respect to total WPCP power demand
3. Reduce electric power costs

Project Description: Gas Turbine Phase 3 (4.6 MW) includes the following:

- Construction of one 4.6 MW recuperated gas turbine system
- Construction of appurtenances including exhaust heat recovery and hot water pumping for one 4.6 MW recuperated gas turbine system

Installation of future gas turbines should be revisited to determine whether changes in grant funding opportunities favor fuel cells or other advanced technologies.

Figure 76
GAS TURBINE - PHASE 3 (4.6 MW)
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

sj411f46-7897C00-209.ai

ID No.	77
Project Name:	Digester Gas Storage, Compressors, and Piping
Process Area:	Combined Heat and Power
Primary Trigger:	Improved Performance Benefit
Secondary Trigger:	None
Project Start Year:	2019
Project End Year:	2024

Project Justification: Improved Performance Benefit. The solar photovoltaic (PV) projects will enable the WPCP to harness solar energy, and minimize the projected shortfall in onsite power generating capacity with respect to total WPCP power demand. Since solar PV technologies can only generate power when the sun is shining, the installation of a high-pressure gas storage system will enable:

1. Digester gas to be stored during the day while the solar PV supplies WPCP energy demands, and utilization of the stored gas at night when solar PV is unavailable
2. Digester gas to be stored during high production periods and utilized during low production periods to minimize the impact of seasonal and diurnal variability in gas production
3. Additional feedstocks to be processed and digester gas to be stored during times of low diurnal power demands

Project Description: The project would involve:

- Installation of a 40,000 cubic foot, 250 psig gas storage sphere
- Installation of a 1,200 scfm, 250 psig gas compressor system
- Associated digester gas piping to and from the storage facility

Figure 77
DIGESTER GAS STORAGE FACILITY
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

sj411f42-7897C00-209.ai

ID No.	78
Project Name:	Solar Power Facility Phase 1 (1 MW) - PPA
Process Area:	Combined Heat and Power
Primary Trigger:	
Secondary Trigger:	
Project Start Year:	2010
Project End Year:	2012

Project Justification:

Project Description:

Figure 78
SOLAR POWER FACILITY PHASE 1 - PPA
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

sj411f72-7897C00-209.ai

ID No.	79
Project Name:	Solar Power Facility Phase 1 (1 MW) – Direct Purchase
Process Area:	Combined Heat and Power
Primary Trigger:	
Secondary Trigger:	
Project Start Year:	2013
Project End Year:	2018

Project Justification:

Project Description:

Figure 79
SOLAR POWER FACILITY PHASE 1 - DIRECT PURCHASE
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

sj411f73-7897C00-209.ai

ID No.	80
Project Name:	Solar Power Facility Phase 2 (5 MW)
Process Area:	Combined Heat and Power
Primary Trigger:	Policy Decision
Secondary Trigger:	None
Project Start Year:	2019
Project End Year:	2024

Project Justification:

Policy Decision. The installation of a solar PV facility would form part of the WPCP goals of maximizing the use of "green" energy, achieving energy self-sufficiency, and optimizing costs. This project constitutes the final phase of the solar PV implementation plan, and would:

1. Add another "green" energy resource to the WPCP power profile
2. Minimize the projected shortfall in onsite generating capacity with respect to total WPCP power demand
3. Reduce electric power costs

Project Description: This project includes the installation of a 5 MW solar photovoltaic (PV) facility.

Figure 80
SOLAR POWER FACILITY PHASE 2 - 5MW
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

sj411f47-7897C00-209.ai

ID No.	81
Project Name:	PER - 115 kV Breaker Replacement
Process Area:	Electrical
Primary Trigger:	Condition (R&R)
Secondary Trigger:	Improved Performance Benefit
Project Start Year:	2014
Project End Year:	2015

Project Justification:

Project Description:.

Figure 81

ID No.	82
Project Name:	PER - M1, M2, M3 Switchgear Replacement
Process Area:	Electrical
Primary Trigger:	Condition (R&R)
Secondary Trigger:	Improved Performance Benefit
Project Start Year:	2011
Project End Year:	2013

Project Justification:

Project Description:.

Figure 82

ID No.	83
Project Name:	PER - MCC H1, H2, J1, J2
Process Area:	Electrical
Primary Trigger:	Condition (R&R)
Secondary Trigger:	Improved Performance Benefit
Project Start Year:	2011
Project End Year:	2012

Project Justification:

Project Description:.

Figure 83

ID No.	84
Project Name:	PER - MCC Phase II Replacements
Process Area:	Electrical
Primary Trigger:	Condition (R&R)
Secondary Trigger:	Improved Performance Benefit
Project Start Year:	2010
Project End Year:	2012

Project Justification:

Project Description:.

Figure 84

ID No.	85
Project Name:	PER - S11 Switchgear Replacement
Process Area:	Electrical
Primary Trigger:	Condition (R&R)
Secondary Trigger:	Improved Performance Benefit
Project Start Year:	2013
Project End Year:	2015

Project Justification:

Project Description:.

Figure 85

ID No.	86
Project Name:	PER - S40 and G3 Switchgear Update
Process Area:	Electrical
Primary Trigger:	Condition (R&R)
Secondary Trigger:	Improved Performance Benefit
Project Start Year:	2011
Project End Year:	2015

Project Justification:

Project Description:.

Figure 86

ID No.	87
Project Name:	PER - Standby Generator (Admin Building)
Process Area:	Electrical
Primary Trigger:	Condition (R&R)
Secondary Trigger:	Improved Performance Benefit
Project Start Year:	2010
Project End Year:	2012

Project Justification:

Project Description:.

Figure 87

ID No.	88
Project Name:	Double-Ended Substation with Switchgear for Solids Handling Processes
Process Area:	Electrical
Primary Trigger:	Increased Flows and Loads
Secondary Trigger:	Improved Performance Benefit
Project Start Year:	2017
Project End Year:	2022

Project Justification: Increased flows and loads and improved performance benefit. Biosolids handling is currently a non-mechanized operation, consisting of lagoons and drying beds. With the transition to mechanized solids handling, an electrical supply system will be required to the new facilities.

Project Description:.

The transition from lagoons and drying beds to mechanized dewatering and drying will require electrical supply facilities of approximately 1 MW. The existing WPCP electrical system is being converted to a ring bus system. A supply point to the solids handling processes will tie into that system, and will consist of switchgear, transformers, motor control centers (MCCs), and connecting cables and conduits.

Figure 88
DOUBLE-ENDED SUBSTATION FACILITY
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

sj411f11-7897C00-209.ai

ID No.	89
Project Name:	Advanced Process Control and Automation
Process Area:	Advanced Process Control and Automation
Primary Trigger:	Condition (R&R)
Secondary Trigger:	Policy Decision
Project Start Year:	2011
Project End Year:	2021

Project Justification: Condition (R&R) and policy decision.

The WPCP is a highly automated facility controlled by DCS. However, the current system is outdated and no longer supported by the vendor. In addition, there are new sensors and analyzers that are more accurate and reliable. Furthermore, the implementation of computerized process models would facilitate real-time simulation, which could be used for advanced process control, and would optimize energy and plant operating scenarios.

Project Description: This project consists of two parts:

1. Field investigation of existing Distributed Control Systems (DCS), data acquisition systems (meters, sensors, gauges, etc.), and control units (valves, pumps, etc.).
2. Design and implementation of improved, more automated control systems.

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ID No.	90
Project Name:	Master Plan for Automation/ Info and Knowledge Management
Process Area:	Advanced Process Control and Automation
Primary Trigger:	Condition (R&R)
Secondary Trigger:	Policy Decision
Project Start Year:	2011
Project End Year:	2013

Project Justification:.

Project Description: The project would consist of conducting a study and creating a Information and Data Management Master Plan.

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ID No.	91
Project Name:	Meter Validation and Replacement Program
Process Area:	Advanced Process Control and Automation
Primary Trigger:	Condition (R&R), Policy Decision
Secondary Trigger:	Improved Performance Benefit
Project Start Year:	2011
Project End Year:	2015

Project Justification: Condition (R&R), policy decision, and improved performance benefit.

Most of the flow meters at the WPCP have been operating for more than 30 years. Some of them have been installed incorrectly, or are beyond their useful life. With changes to the plant process over the past 30 years, some of the meters might not be appropriate for present operating conditions, leading to inaccurate measurements. This affects plant operation, effectiveness of energy conservation measures, and decisions for future upgrades to plant processes.

Older meters also have increased maintenance requirements that increase work backlog for instrumentation staff.

Project Description: As part of the project, the existing flow meters at the WPCP will be evaluated for accuracy, reliability, and correct installations. The maintenance records will be reviewed to identify meters having frequent maintenance requirements and high parts costs, and the remaining useful life of the meters will also be determined. Where applicable, the existing meters will be repaired and tweaked. If meters need replacement, new meters will be evaluated for accuracy, technology appropriateness, and a testing plan will be implemented. Based on the results of testing, specifications and procurement schedule for installation of new flow meters will be created.

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ID No.	92
Project Name:	EG2 & EG3 Engine Control Panel Upgrade
Process Area:	Advanced Process Control and Automation
Primary Trigger:	Condition (R&R)
Secondary Trigger:	Improved Performance Benefit
Project Start Year:	2011
Project End Year:	2012

Project Justification: Condition (R&R) and improved performance benefit.

The WPCP currently uses a combination of digester gas, purchased landfill gas, and natural gas to generate power onsite using engine-generators in Building 40 and the P&E Building. While the existing systems currently meet Bay Area Air Quality Management District emission regulations, it is anticipated that these regulations will be tightened in the near future to align more closely with those already being enforced in the South Coast Air Quality Management District (SCAQMD). Analysis indicates that while the economics favored continued use of the existing engine-generators, the aforementioned regulatory considerations could require the WPCP to systematically replace or retrofit these engine-generators in the near future. Since the engine generators in the P&E Building are being phased out, it is vital that the existing three engine generators in Building 40 be in reliable working condition. This project is part of ongoing maintenance and upgrades to ensure this.

Project Description: This project entails upgrades to the electrical control panel of 2 of the 3 engine generators in Building 40.

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ID No.	93
Project Name:	Side Stream Nitrogen Removal
Process Area:	Advanced Process Control and Automation
Primary Trigger:	Improved Performance Benefit
Secondary Trigger:	Economic Benefit
Project Start Year:	2020
Project End Year:	2023

Project Justification: Improved performance and economic benefit.

The current lagoon biosolids treatment system has a solids retention time of 2-3 years. While it also produces a supernatant stream that is returned to the main treatment plant, it is not a high-strength stream, and can be accommodated relatively easily. However, with the transition to a mechanized solids treatment process, the centrate stream from the dewatering process is a concentrated ammonia stream, that incurs a significant additional loading on the treatment process. This load would be mitigated by the implementation of a side-stream nitrogen removal treatment process.

Project Description: This project entails the construction of a separate treatment process that would treat the high-strength centrate stream from the new digested solids dewatering stream. It would produce a treated effluent stream that would be discharged to the main treatment plant, without imposing an inordinate load. There are a number of different treatment technologies that would be considered, although their general approach is similar, namely an aeration basin(s) and secondary clarifier(s) aimed primarily at nitrifying and partially denitrifying the high-strength ammonia stream. The waste biosolids stream would be discharged to the DAFTs for thickening, followed by the regular biosolids treatment train.

Figure 93
SIDE STREAM NITROGEN REMOVAL
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

sj411f48-7897C00-209.ai

ID No.	94
Project Name:	HVAC Upgrades (P&E Office and Admin/Secondary Service Wing)
Process Area:	Site Facility Improvements
Primary Trigger:	Condition (R&R)
Secondary Trigger:	Improved Performance Benefit
Project Start Year:	2011
Project End Year:	2012

Project Justification: Condition (R&R) and improved performance benefit.

This is part of ongoing HVAC maintenance and upgrades to office and service facilities.

Project Description: This project entails heating, ventilation, and air conditioning (HVAC) upgrades to:

1. P&E Building office
2. Administration Building
3. Secondary (BNR1) Service Wing

Figure 94
HVAC UPGRADES
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

sj511f4-7897c00-209.ai

ID No.	95
Project Name:	Cooling Tower Replacement (Secondary)
Process Area:	Site Facility Improvements
Primary Trigger:	Condition (R&R)
Secondary Trigger:	Improved Performance Benefit
Project Start Year:	2011
Project End Year:	2013

Project Justification: Condition (R&R) and improved performance benefit.

The SBB supplies aeration air to the aeration basins and mixing air to the channels of BNR1. These blowers are engine-driven, utilizing primarily digester gas and landfill gas. Heat from this process is salvaged and used at the treatment plan. All of this forms part of the WPCP's ability to reduce its reliance on purchased power and heat. Part of this energy and heat system involves a cooling tower, which would be replaced under this project, and is necessary as part of regular maintenance and repair.

Project Description: This project entails replacing the cooling tower in the Secondary Blower Building (SBB).

Figure 95
COOLING TOWER REPLACEMENT
(SECONDARY)
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

sj511f5-7897c00-209.ai

ID No.	96
Project Name:	Nitrification Building Chiller Replacement
Process Area:	Site Facility Improvements
Primary Trigger:	Condition (R&R)
Secondary Trigger:	Improved Performance Benefit
Project Start Year:	2011
Project End Year:	2013

Project Justification: Condition (R&R) and improved performance benefit.

This is part of ongoing HVAC maintenance and upgrades to the BNR2 office and service facilities.

Project Description: This project entails the replacement of the heating, ventilation, and air conditioning (HVAC) chiller in the Nitrification Building (part of the BNR2 complex).

Figure 96
NITRATION BUILDING CHILLER REPLACEMENT
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

sj411f80-7897C00-209.ai

ID No.	97
Project Name:	Handrail Replacement
Process Area:	Site Facility Improvements
Primary Trigger:	Condition (R&R)
Secondary Trigger:	None
Project Start Year:	2011
Project End Year:	2016

Project Justification: Condition (R&R).

The safety of plant staff is a primary concern for the WPCP. Since many of the facilities at the treatment plant are old, this program ensures handrails are replaced in a timely fashion, especially if a specific project in an area where handrails need to be replaced is scheduled far into the future.

Project Description: This project entails the replacement of handrails at structures:

1. Do not have a modification or renovation project identified for that complex.
2. Safety concerns require handrail replacement even if a later modification or renovation project has been identified for that complex

Figure 97
HAND RAIL REPLACEMENT
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

sj511f7-7897c00-209.ai

ID No.	98
Project Name:	Site Facility Improvements - Phase 1
Process Area:	Site Facility Improvements
Primary Trigger:	Condition (R&R)
Secondary Trigger:	Policy Decision
Project Start Year:	2011
Project End Year:	2026

Project Justification: Condition (R&R) and policy decision.

The current WPCP main operations area has very basic landscaping. This project enhances that landscaping around the perimeter, and around the Administration and Environmental Services Buildings. In addition, the project provides for continued R&R of existing roads along within the main operations area.

Project Description: Landscaping improvements, primarily along the perimeter of the WPCP main operations area, include grass and trees/shrubs with associated irrigation, and perimeter fencing.

Improvement of roadways in the WPCP main operations area.

Figure 98
SITE FACILTY IMPROVEMENTS - PHASE 1
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

sj411f49-7897C00-209.ai

ID No.	99
Project Name:	Site Facility Improvements - Phase 2
Process Area:	Site Facility Improvements
Primary Trigger:	Condition (R&R)
Secondary Trigger:	Policy Decision
Project Start Year:	2026
Project End Year:	2041

Project Justification: Condition (R&R) and policy decision. There is currently no landscaping in these areas. This project provides along the perimeter, and around the Administration and Environmental Services Buildings. In addition, the project provides for continued R&R of existing roads along within the main operations area.

Project Description: The project entails landscaping improvements, primarily along the southern perimeter of the new biosolids handling area, and the expanded operations area directly east of Zanker road, across from the main plant secondary treatment processes. It includes grass and trees/shrubs with associated irrigation, and perimeter fencing.

Improvement of roadways in the WPCP main operations area.

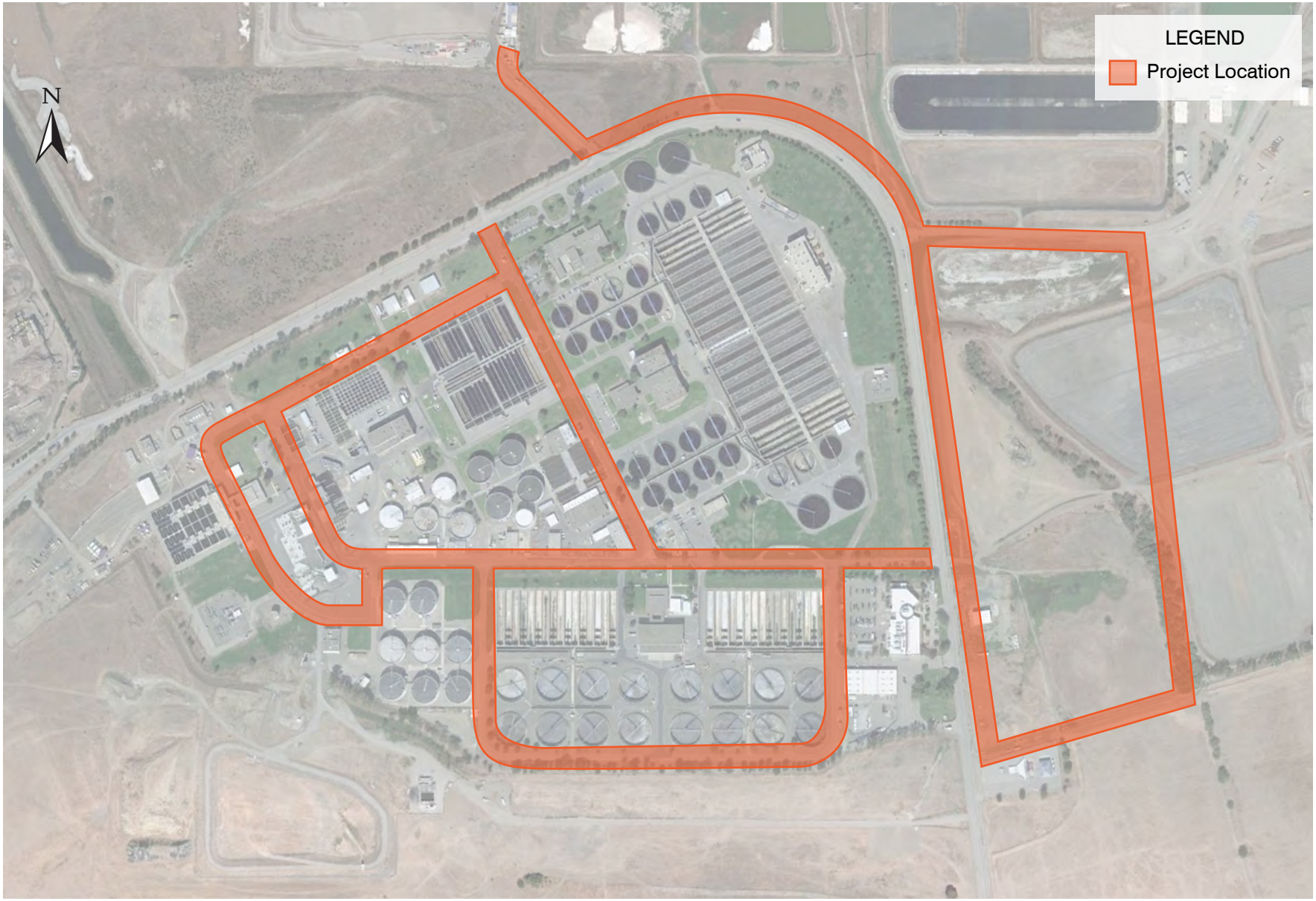

Figure 99
SITE FACILTY IMPROVEMENTS - PHASE 2
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

sj411f51-7897C00-209.ai

ID No.	100
Project Name:	Yard Piping
Process Area:	Site Facility Improvements
Primary Trigger:	Condition (R&R)
Secondary Trigger:	None
Project Start Year:	2011
Project End Year:	2026

Project Justification: Condition (R&R).

This project is part of ongoing maintenance and upgrades to ensure staff safety and reliable plant performance. Where feasible, the WPCP will consider transitioning to grouping smaller diameter, non-gravity flow pipelines covered trench-type corridors, i.e. utili-dors, as part of this maintenance and upgrade program.

Project Description: This project entails the continued replacement of pipelines, or portions of pipelines, that:

1. Have a record of repeated breakages.
2. Due to their age and function need to be replaced as a preventative action.

ID No.	101
Project Name:	Unanticipated/Critical Repairs
Process Area:	Site Facility Improvements
Primary Trigger:	Condition (R&R)
Secondary Trigger:	None
Project Start Year:	2010
Project End Year:	2041

Project Justification: Condition (R&R).

The WPCP has identified in its master plan the projects required to accommodate flow and load increases over the next 30 years, anticipated regulatory requirements, and deal with aging infrastructure. However, a facility of this magnitude and complexity will invariably encounter breakages that could compromise staff safety and plant operation. Therefore, it is vital, and common for all treatment facilities to recognize that breakages will occur, and the necessity of having the ability to perform the required repairs.

Project Description: This project entails a category of undefined and unanticipated repairs that are critical to the continued safety and operation of the treatment facility.

ID No.	102
Project Name:	Remaining R&R (2025 through 2040)
Process Area:	Site Facility Improvements
Primary Trigger:	Condition (R&R)
Secondary Trigger:	None
Project Start Year:	2025
Project End Year:	2041

Project Justification: Condition (R&R).

Project Description: .

Figures 100, 101, and 102
YARD PIPING, UNANTICIPATED REPAIRS, AND REMAINING R&R (2025-2040)
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

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ID No.	103
Project Name:	Tunnel Rehabilitation: BNR 1
Process Area:	Site Facility Improvements
Primary Trigger:	Condition (R&R)
Secondary Trigger:	None
Project Start Year:	2015
Project End Year:	2023

Project Justification: Condition (R&R).

BNR1 has a tunnel system that houses the aeration pipelines, RAS and tank drain pipelines, valves, pumps, and controls. These tunnels link the Secondary Blower Building (SBB) to the aeration basins. They were constructed in the 1960s and 1970s, and are in need of structural repair, coatings, and the removal of obsolete pipelines. The secondary treatment system is a key treatment component of the facility, and the continued, safe functioning of the tunnels is of vital importance.

Project Description: This project entails rehabilitation of the BNR1 tunnel complex, and is comprised of:

1. Structural concrete repair and coatings
2. Removal of abandoned pipelines.

Figure 103
TUNNEL REHABILITATION - BNR 1
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

sj411f81-7897C00-209.ai

ID No.	104
Project Name:	Tunnel Rehabilitation: BNR 2
Process Area:	Site Facility Improvements
Primary Trigger:	Condition (R&R)
Secondary Trigger:	None
Project Start Year:	2018
Project End Year:	2023

Project Justification: Condition (R&R).

BNR2 has a tunnel system that houses the aeration pipelines, RAS and tank drain pipelines, valves, pumps, and controls. These tunnels link the Nitrification Blower Building (NBB) to the aeration basins. They were constructed in the 1980s, and are in need of structural repair, coatings, and the removal of obsolete pipelines. The secondary treatment system is a key treatment component of the facility, and the continued, safe functioning of the tunnels is of vital importance.

Project Description: This project entails rehabilitation of the BNR2 tunnel complex, and is comprised of:

1. Structural concrete repair and coatings
2. Removal of abandoned pipelines.

Figure 104
TUNNEL REHABILITATION - BNR 2
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

sj411f82-7897C00-209.ai

ID No.	105
Project Name:	3W Pump Station Improvements
Process Area:	Site Facility Improvements
Primary Trigger:	Condition (R&R)
Secondary Trigger:	None
Project Start Year:	2015
Project End Year:	2018

Project Justification: Condition (R&R).

The 3W system at the WPCP is a pressurized distribution system, providing 3W at the required water pressure at numerous locations across the main operations area. This is non-potable water, typically used various treatment processes and select cleaning applications.

Currently, the 3W system demand is lower than the preferred operation flows of these pumps, and as a result, the pumps are experiencing severe cavitation issues. This is an inappropriate application of these pumps, which needs to be resolved to avoid potential worker safety, and damage to the facilities.

Project Description: This project entails the hydraulic modeling of the Plant No.3 water (3W) system, and modifications or replacement of the 3W pumps.

Figure 105
3W PUMP STATION IMPROVEMENTS
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

sj511f6-7897c00-209.ai

ID No.	106
Project Name:	Warehousing Facility Additions
Process Area:	Site Facility Improvements
Primary Trigger:	Improved Performance Benefit
Secondary Trigger:	None
Project Start Year:	2016
Project End Year:	2018

Project Justification: The existing facility needs to be upgraded to better facilitate the receipt, processing, storage, and distribution of deliveries. There is currently no protection against inclement weather during off- and on-loading. There is no off-road parking and no provision of basic services to after-hour delivery truck arrivals.

Project Description: The project would provide a new central warehouse and load-out area, where equipment and supplies will be stored temporarily before being moved to the various storage facilities for each treatment unit process.

Figure 106
WAREHOUSE FACILITY
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

sj411f50-7897C00-209.ai

ID No.	107
Project Name:	Support Building Improvements Phase 1
Process Area:	Site Facility Improvements
Primary Trigger:	Condition (R&R)
Secondary Trigger:	Policy Decision
Project Start Year:	2016
Project End Year:	2024

Project Justification: Condition (R&R) and policy decision. The existing facilities are generally old and in need of refurbishment. In addition, due to the history of systematic expansion and development of the treatment plant, the support facilities are widely dispersed across the plant. The WPCP stands to gain potentially from systematically centralizing their support facilities, thereby increasing staff efficiency, and avoiding the duplication of certain facilities, such as workshops and storage facilities.

Project Description: This project entails improvements to the existing administration, office, workshop, and storage facilities at the WPCP main operations areas.

ID No.	108
Project Name:	Support Building Improvements Phase 2
Process Area:	Site Facility Improvements
Primary Trigger:	Condition (R&R)
Secondary Trigger:	Policy Decision
Project Start Year:	2025
Project End Year:	2033

Project Justification: Condition (R&R) and policy decision. The existing facilities are generally old and in need of refurbishment. In addition, due to the history of systematic expansion and development of the treatment plant, the support facilities are widely dispersed across the plant. The WPCP stands to gain potentially from systematically centralizing their support facilities, thereby increasing staff efficiency, and avoiding the duplication of certain facilities, such as workshops and storage facilities.

Project Description: This project entails improvements to the existing administration, office, workshop, and storage facilities at the WPCP main operations areas.

ID No.	109
Project Name:	Support Building Improvements Phase 3
Process Area:	Site Facility Improvements
Primary Trigger:	Condition (R&R)
Secondary Trigger:	Policy Decision
Project Start Year:	2033
Project End Year:	2041

Project Justification: Condition (R&R) and policy decision. The existing facilities are generally old and in need of refurbishment. In addition, due to the history of systematic expansion and development of the treatment plant, the support facilities are widely dispersed across the plant. The WPCP stands to gain potentially from systematically centralizing their support facilities, thereby increasing staff efficiency, and avoiding the duplication of certain facilities, such as workshops and storage facilities.

Project Description: This project entails improvements to the existing administration, office, workshop, and storage facilities at the WPCP main operations areas.

Figures 107, 108, 109
SUPPORT BUILDINGS IMPROVEMENTS - PHASES 1, 2, AND 3
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

sj411f28-7897C00-209.ai

ID No.	110
Project Name:	Public Art Reserve - 2010 to 2020
Process Area:	Site Facility Improvements
Primary Trigger:	Policy Decision
Secondary Trigger:	None
Project Start Year:	2010
Project End Year:	2020

Project Justification: .

Project Description: .

ID No.	111
Project Name:	Public Art Reserve - 2021 to 2030
Process Area:	Site Facility Improvements
Primary Trigger:	Policy Decision
Secondary Trigger:	None
Project Start Year:	2021
Project End Year:	2030

Project Justification: .

Project Description: .

ID No.	112
Project Name:	Public Art Reserve - 2031 through 2040
Process Area:	Site Facility Improvements
Primary Trigger:	Policy Decision
Secondary Trigger:	None
Project Start Year:	2031
Project End Year:	2041

Project Justification: .

Project Description: .

Figures 110, 111, and 112
PUBLIC ART RESERVE
SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
CITY OF SAN JOSÉ

sj511f9-7897c00-209.ai

ID No.	113
Project Name:	Revised South Bay Action Plan - SBWR Extension
Process Area:	South Bay Water Recycling
Primary Trigger:	Improved Performance Benefit
Secondary Trigger:	None
Project Start Year:	2011
Project End Year:	2017

Project Justification: .

Project Description: .

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ID No.	114
Project Name:	Plant Record Drawings Program
Process Area:	Plant Record Drawings Program
Primary Trigger:	
Secondary Trigger:	
Project Start Year:	2010
Project End Year:	2014

Project Justification: .

Project Description: .

APPENDIX D – O&M COST DETAIL

2009 Costs

Process Area	Utilities (Wat+Gar)	Utilities (Gas+Elec)	Salary/Benefits	Other	Mach & Equip	Chemicals	Total
Primary	$0	$933,335	$2,160,779	$573,515	$141,166	$0	$3,808,795
Secondary (BNR 1)	17,761	1,506,213	2,862,244	1,401,977	57,043	0	$5,845,238
Nitrification (BNR 2)	8,880	2,040,466	2,046,132	161,230	0	21,427	$4,278,135
Copper Redn	0	0	51,150	31	0	0	$51,181
Filtration	8,880	263,907	1,890,708	213,869	0	0	$2,377,364
Disinfection	5,920	14,577	1,696,308	173,234	0	424,664	$2,314,703
Sludge Processing	5,920	1,177,934	2,151,818	418,097	38,907	0	$3,792,676
RSM	0	0	845,741	925,519	0	92,782	$1,864,042
SBWR	0	238,160	662,353	29,837	0	0	$930,350
CIP/Design/Engineering/Modifications	0	96,551	127,566	212,792	0	0	$436,909
Environmental Enforcement/Regulatory	0	141,609	72,059	1,856	0	0	$215,524
Plant-wide Infrastructure	4,620	0	2,148,214	2,524,163	751,613	0	$5,428,610
Plant-wide Electricty	0	0	260,927	259,274	0	0	$520,201
Administration/Supervision/Training	0	0	3,089,462	3,284,624	0	0	$6,374,086
Blank/Budget Load	50,219	0	0	1,332,130	0	276,278	$1,658,627
	$102,200	$6,412,752	$20,065,461	$11,512,148	$988,729	$815,151	$39,896,441
Actual 2009	$40,799,923						$903,482 Net Added to Other

O&M Cost Projection

	Utilities (Wat+Gar)	Adjusted Utilities (Wat+Gas_	Utilities (Gas+Elec)	Adjusted Utilities (Gas+Elec)	Salary/Benefits	Adjusted Salary/Benefits	Other	Adjusted Other	Mach & Equip	Adjusted Mach & Equip	Chemicals	Adjusted Chemicals
Primary	0	0	933,335	969,335	2,160,779	3,028,554	573,515	1,827,057	141,166	588,636	0	0
Secondary (BNR 1)	17,761	38,326	1,506,213	1,564,309	2,862,244	4,011,729	1,401,977	4,466,304	57,043	237,859	0	0
Nitrification (BNR 2)	8,880	19,162	2,040,466	2,119,169	2,046,132	2,867,864	161,230	513,633	0	0	21,427	32,413
Filtration	8,880	19,162	263,907	274,086	1,890,708	2,650,021	213,869	681,326	0	0	0	0
Disinfection	5,920	12,775	14,577	15,139	1,696,308	2,377,550	173,234	551,875	0	0	424,664	642,388
Sludge Processing	5,920	12,775	1,177,934	1,223,368	2,151,818	3,015,994	418,097	1,331,939	38,907	162,235	0	0
RSM	0	0	0	0	845,741	1,185,393	925,519	2,948,443	0	0	92,782	140,351
SBWR	0	0	238,160	247,346	662,353	928,356	29,837	95,052	0	0	0	0
Copper Redn	0		0		51,150		31		0		0	
All Other	54,839		238,160		5,698,228		8,518,321		751,613		276,278	

2009 OPERATING COSTS

	Utilities (Wat+Gar)	Utilities (Gas+Elec)	Salary/Benefits	Other	Mach & Equip	Chemicals	TOTAL	Unit Cost in 2009 $$
Primary	0	969,335	3,028,554	1,827,057	588,636	0	6,413,581	145
Secondary (BNR 1)	38,326	1,564,309	4,011,729	4,466,304	237,859	0	10,318,527	234
Nitrification (BNR 2)	19,162	2,119,169	2,867,864	513,633	0	32,413	5,552,241	126
Filtration	19,162	274,086	2,650,021	681,326	0	0	3,624,596	82
Disinfection	12,775	15,139	2,377,550	551,875	0	642,388	3,599,726	82
Sludge Processing	12,775	1,223,368	3,015,994	1,331,939	162,235	0	5,746,311	105
Residual Solids Management	0	0	1,185,393	2,948,443	0	140,351	2,838,861	115
Hauling							1,435,326	58
SBWR	0	247,346	928,356	95,052	0	0	1,270,754	268
Other							27,600,000	
TOTAL	102,200	6,412,752	20,065,461	12,415,630	988,729	815,151	68,399,923	

APPENDIX E – ADDITIONAL SERVICES

"Out-side Fence" Costs									
		2009	2010	2015	2020	2025	2030	2035	2040
City Wide Overhead		6,000,000	6,000,000	6,000,000	6,000,000	6,000,000	6,000,000	6,000,000	6,000,000
Central Mgmt & Admin Svcs		800,000	800,000	800,000	800,000	800,000	800,000	800,000	800,000
Central Dpt HR Svcs		500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000
Central Dpt Budget & Fiscal Svcs		1,400,000	1,400,000	1,400,000	1,400,000	1,400,000	1,400,000	1,400,000	1,400,000
Safety & Enviro Compliance		250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000
Enviro Mgmt Systems		400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000
Sustainability		700,000	700,000	700,000	700,000	700,000	700,000	700,000	700,000
Plant Mstr Plan		300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000
MIS		700,000	700,000	700,000	700,000	700,000	700,000	700,000	700,000
Engr Svcs		2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000
Recyled Water O&M		2,800,000	2,800,000	2,800,000	2,800,000	2,800,000	2,800,000	2,800,000	2,800,000
Water Efficiency		150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Regulations & Research	3.00%	1,000,000	1,030,000	1,194,052	1,384,234	1,604,706	1,860,295	2,156,591	2,500,080
Watershed & Enforcement	3.00%	4,500,000	4,635,000	5,373,235	6,229,052	7,221,179	8,371,326	9,704,661	11,250,362
Pollution Prevention	3.00%	800,000	824,000	955,242	1,107,387	1,283,765	1,488,236	1,725,273	2,000,064
Lab	3.00%	4,100,000	4,223,000	4,895,614	5,675,359	6,579,296	7,627,208	8,842,024	10,250,329
Communicatinos	3.00%	700,000	721,000	835,837	968,964	1,123,295	1,302,206	1,509,614	1,750,056
Outreach	3.00%	500,000	515,000	597,026	692,117	802,353	930,147	1,078,296	1,250,040
Other		27,600,000	27,948,000	29,851,007	32,057,113	34,614,595	37,579,417	41,016,459	45,000,932

APPENDIX F – O&M COST PROJECTIONS

"Out-side Fence" Costs

		2009	2010	2015	2020	2025	2030	2035	2040
City Wide Overhead		6,000,000	6,000,000	6,000,000	6,000,000	6,000,000	6,000,000	6,000,000	6,000,000
Central Mgmt & Admin Svcs		800,000	800,000	800,000	800,000	800,000	800,000	800,000	800,000
Central Dpt HR Svcs		500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000
Central Dpt Budget & Fiscal Svcs		1,400,000	1,400,000	1,400,000	1,400,000	1,400,000	1,400,000	1,400,000	1,400,000
Safety & Enviro Compliance		250,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000
Enviro Mgmt Systems		400,000	400,000	400,000	400,000	400,000	400,000	400,000	400,000
Sustainability		700,000	700,000	700,000	700,000	700,000	700,000	700,000	700,000
Plant Mstr Plan		300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000
MIS		700,000	700,000	700,000	700,000	700,000	700,000	700,000	700,000
Engr Svcs		2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000
Recyled Water O&M		2,800,000	2,800,000	2,800,000	2,800,000	2,800,000	2,800,000	2,800,000	2,800,000
Water Efficiency		150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Regulations & Research	3.00%	1,000,000	1,030,000	1,194,052	1,384,234	1,604,706	1,860,295	2,156,591	2,500,080
Watershed & Enforcement	3.00%	4,500,000	4,635,000	5,373,235	6,229,052	7,221,179	8,371,326	9,704,661	11,250,362
Pollution Prevention	3.00%	800,000	824,000	955,242	1,107,387	1,283,765	1,488,236	1,725,273	2,000,064
Lab	3.00%	4,100,000	4,223,000	4,895,614	5,675,359	6,579,296	7,627,208	8,842,024	10,250,329
Communicatinos	3.00%	700,000	721,000	835,837	968,964	1,123,295	1,302,206	1,509,614	1,750,056
Outreach	3.00%	500,000	515,000	597,026	692,117	802,353	930,147	1,078,296	1,250,040
Other		27,600,000	27,948,000	29,851,007	32,057,113	34,614,595	37,579,417	41,016,459	45,000,932

O&M Resulting from Process Change

	Utilities (Wat+Gar)	Utilities (Gas+Elec)	Salary/Benefits	Other	Mach & Equip	Chemicals	Unit Cost in 2009 $$	Unit	
Primary	0	1,219,757	3,028,554	1,827,057	588,636	0	151	Per MGD	
Secondary (BNR 1)	38,326	1,928,640	4,011,729	4,466,304	237,859	1,375,000	273	Per MGD	
Nitrification (BNR 2)	19,162	2,612,727	2,867,864	513,633	0	1,407,413	168	Per MGD	
Filtration	19,162	521,917	2,650,021	681,326	0	0	88	Per MGD	
Disinfection	12,775	15,139	2,377,550	551,875	0	642,388	82	Per MGD	
On-Site Hypo Generation							36	Per MGD	*Add in costs for onsite hypo generation
UV							21	Per MGD	
Peroxide							79	Per MGD	
Fine Screening							1,221	Per MGD	
Sludge Processing	12,775	1,223,368	3,015,994	1,331,939	162,235	0	105	Per Ton	
Solids Management - Lagoons	0	0	592,696	1,474,221	0	70,175	57	Per Ton	
Solids Management - Drying Beds	0	0	592,696	1,474,221	0	70,175	57	Per Ton	
Dewatering							72	Per Ton	
Drying							54	Per Ton	*Assumes that excess heating available for upto 25% thermal drying. Only 10% needed if less.
Greenhouses							156	per Ton	
Hauling (Wet)							235	per Ton	
Composting							260	per Ton	
Hauling (Dried)							64	per Ton	
SBWR	0	247,346	928,356	95,052	0	0	268	Per MGD	

Change in O&M	Percent Increase in Total	Percent Attributable to Flow/Load		Percent Attributable to Utilities (Gas+Elec)
Primary	29%	10%	90%	26%
Secondary	26%	10%	90%	23%
Nitrification	26%	10%	90%	23%
Copper Redn	0%	10%	90%	0%
Filtration	100%	10%	90%	90%
Disinfection	0%	0%	100%	0%
Sludge Processing	75%	100%	0%	0%
RSM	0	100%	0%	0%
SBWR	250%	100%	0%	0%

Percent Lagoon	0.5
Percent DB	0.5

San Jose/Santa Clara WPCP
O M Cost Model

	ADWF	Percent per Year	Solids Into Digester	Percent per Year	Solids to Lagoon (DT/Day)	Percent per Year	Hauling (DT/Day)	Percent per Year	Recycled Water	Percent per Year
2010	121		150		67.8		67.8		13	
2015	128	1.2%	159.5	1.3%	72.1	1.3%	72.1	1.3%	22	14%
2020	137	1.4%	167	0.9%	75.5	0.9%	75.5	0.9%		
2025	143	0.9%	177.5	1.3%	80.2	1.3%	80.2	1.3%	40	8%
2030	151	1.1%	187	1.1%	84.5	1.1%	84.5	1.1%		
2035	158	0.9%	196	1.0%	88.6	1.0%	88.6	1.0%		
2040	166	1.0%	206	1.0%	93.1	1.0%	93.1	1.0%	54	2%

Rate of Change

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2030	2035	2040
Flow	121.0	122.4	123.8	125.2	126.6	128.0	129.8	131.6	133.4	135.2	137.0	138.2	139.4	140.6	141.8	143.0	151.0	158.0	166.0
SBWR	13.0	14.8	16.6	18.4	20.2	22.0	23.8	25.6	27.4	29.2	31.0	32.8	34.6	36.4	38.2	40.0	44.7	49.3	54.0
Solids In to Digesters	150.0	151.9	153.8	155.7	157.6	159.5	161.0	162.5	164.0	165.5	167.0	169.1	171.2	173.3	175.4	177.5	187.0	196.0	206.0
Solids Out of	67.8	68.6	69.4	70.2	70.9	72.1	73.1	74.1	75.1	76.1	75.5	76.1	76.8	77.5	78.1	80.2	84.5	88.6	93.1

Sludge Lagoons

Solids to Lagoons	67.8	68.6	69.4	70.2	70.9	72.1	73.1	74.1	75.1	76.1	75.5	76.1	76.8	77.5	78.1	80.2	84.5	88.6	93.1

Dewatering

Percentage	100%
Start Year	2023
Start Year for Other So	2025

Dewatered Solids	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	137.0	137.6	80.2	84.5	88.6	93.1
Dewatered Solids to Drying Beds	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	68.5	68.8	0.0	0.0	0.0	0.0
Dewatered Solids to Wet Hauling	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	68.5	68.8	0.0	0.0	0.0	0.0
Dewatered Solids to Other	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	80.2	84.5	88.6	93.1

Solids Transition Period - For Existing Lagoon Retirement

Mechanical Dewaterin	80%
Contract Dewatering	20%

	2023	2024
Wet Solids from Lagoons Retired (mg/yr)	108.5	108.5
% Solids	6%	6%
Dry Solids (tons/yr)	74.4	74.4
Mechanical Dewaterin	59.5	59.5
Contract Dewatering	14.9	14.9

San Jose/Santa Clara WPCP
O M Cost Model

Drying Beds
Dewatered Solids to Drying Beds
Percentage 50%

Dewatered Solids to Drying Beds	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	68.5	68.8	0.0	0.0	0.0	0.0

Total Solids to Drying Beds	67.8	68.6	69.4	70.2	70.9	72.1	73.1	74.1	75.1	76.1	75.5	76.1	76.8	68.5	68.8	0.0	0.0	0.0	0.0

Other

	Year	Percentage of Solids not Treated at Drying
Greenhouse	2025	10%
Compost	2023	35%
Hauling (Wet)	2023	35%
Thermal	2025	20%

Greenhouse	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.0	8.5	8.9	9.3
Compost	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	28.1	29.6	31.0	32.6
Hauling (Wet)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	68.5	68.8	28.1	29.6	31.0	32.6
Thermal Drying	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.0	16.9	17.7	18.6

Hauling (Dried)*	67.8	68.6	69.4	70.2	70.9	72.1	73.1	74.1	75.1	76.1	75.5	76.1	76.8	68.5	68.8	0.0	0.0	0.0	0.0

*Assumes that all solids to drying beds will be hauled off-site at average rate until 2025.

Hauling (Dried)**	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	24.1	25.4	26.6	27.9

*Assumes that all solids to greenhouse and thermal drying will be handled on-site at $20/DT. Offsite hauling costs assumed to be zero

Fine Screening Dry Tonnage	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.5

San Jose/Santa Clara WPCP
O M Cost Model

Product	Location	$/DT	$/WT	Annual Cost	Daily Cost	DT Solids	
Current Operation (Newby)	Newby Landfill	58	23	1,420,000	3890.411	67.07605	80% Solids
Land App (Local - Silva Ranch)	Silva Ranch, Herald	50	40	1,220,000	3342.466	66.84932	
Landfill (Local - Manteca)	Manteca	82	66	2,010,000	5506.849	67.1567	
Landfill (Local - Vasco)	Vasco, Livermore	55	44	1,350,000	3698.63	67.24782	
Landfill (Remote - Salinas)	Salinas	74	59	1,800,000	4931.507	66.64198	
Land App (Local - Silva Ranch)	Silva Ranch, Herald	160	40	3,910,000	10712.33	66.95205	25% Solids
Landfill (Local - Vasco)	Vasco, Livermore	176	44	4,300,000	11780.82	66.93649	
Landfill (Remote - Salinas)	Salinas	235	59	5,770,000	15808.22	67.26902	
Landfill (Local - Manteca)	Manteca	263	66	6,430,000	17616.44	66.98266	
Land App (Remote - Gerlach, NV)	Gerlach, NV	340	85	8,310,000	22767.12	66.96213	

Composting Alternative	Location	$/DT
Composting (Off-Site - Synagro, Kern)	Synagro, Kern	340
Composting (Off-Site - Synagro, Merced)	Synagro, Merced	180
Composting (Off-Site)	TBD	260
Composting (On-Site)	SJ/SC WPCP	288
None		0

Disposal Alternative	$/DT
Land Application	50.00
Land Fill (Average Cost)	70.33
Newby Landfill	58.00

Notes:
Hauling cost for dried taken as average of 80% solids disposal costs = $64/DT
Average of Landfill and Land App for 25% solids from Table above

San Jose/Santa Clara WPCP
O M Cost Model

O&M Costs	Electrical Use, $/dry ton	Labor, $/dry ton	Maintenance, $/dry ton	Chemical, $/DT	Hauling, $/DT	Total, $/dry ton
Dewatering (centrifuges)	$0.56	$13.05	$41.10	$17.00		**$71.71**
Thermal Drying	$22.04	$13.05	$39.14			**$74.23**
Greenhouses	$98.29	$13.05	$44.68			**$156.02**
Fine Screening (per DT screened)	$54.79	$547.95	$383.56		$234.80	**$1,221.10**

Assumptions
Electrical - $0.105/kWh
Labor - $100,000 per year
93 dry tons per day to digesters
55 percent volatile solids reduction in digesters
Maintenance Cost = 1 percent per year of capital cost

Dewatering
Electrical - 0.45 hp/gpm
Chemical - $17/DT
Feed Sludge flow = 620 gpm
Labor = 2 people per year

Thermal Drying
Electricity = $22.04/dry ton From Vendor
Labor = 2 people per year

Greenhoues
Electrical - $98.29/dry ton (vendor quote)
Labor = 2 people per year

Fine Screening (per DT of screened solids)
Electrical - $10,000 per year
Labor - 1.0 FTE at $100,000/year
Hauling - Assumed higher than typical cost for hauling. Average of 25% hauling costs to account for nastiness factor countered by drier solids.
Maintenance - Assume 1% per year of $7M construction cost

Alternative - Adjustment for Change in Flow and Load

FLOWS AND LOADS

		FYB 2010	FYB 2015	FYB 2020	FYB 2025	FYB 2030	FYB 2035	FYB 2040
Flow	(mgd)	121	128	137	143	151	158	166
Sludge Processing	(DTPD)	150	160	167	178	187	196	206
Residual Solids Management	(DTPD)	68	72	75	80	85	89	93
Hauling	(DTPD)	68	72	75	80	85	89	93
SBWR	(mgd)	13	22	31	40	45	49	54

COST PROJECTIONS

	O&M Cost									
O&M Cost Projection	($/MG)	($/DT)	FYE 2009	FYB 2010	FYB 2015	FYB 2020	FYB 2025	FYB 2030	FYB 2035	FYB 2040
Primary	$145		6,413,581	6,413,581	6,784,615	7,261,658	7,579,687	8,003,725	8,374,759	8,798,797
Secondary (BNR 1)	$234		10,318,527	10,318,527	10,915,466	11,682,960	12,194,623	12,876,839	13,473,779	14,155,995
Nitrification (BNR 2)	$126		5,552,241	5,552,241	5,873,445	6,286,422	6,561,739	6,928,830	7,250,034	7,617,124
Filtration	$82		3,624,596	3,624,596	3,834,284	4,103,882	4,283,614	4,523,256	4,732,944	4,972,586
Disinfection	$82		3,599,726	3,599,726	3,807,975	4,075,723	4,254,222	4,492,220	4,700,469	4,938,467
Sludge Processing		$105	5,746,311	5,746,311	6,110,244	6,397,559	6,799,801	7,163,734	7,508,513	7,891,600
Residual Solids Management		$115	2,838,861	2,838,861	3,018,655	3,160,598	3,359,318	3,539,113	3,709,445	3,898,702
Hauling		$58	1,435,326	1,435,326	1,526,230	1,597,996	1,698,469	1,789,373	1,875,493	1,971,181
SBWR	$268		1,270,754	1,270,754	2,150,507	3,030,260	3,910,013	4,366,181	4,822,349	5,278,517
Sub-total			40,799,923	40,799,923	44,021,421	47,597,058	50,641,486	53,683,272	56,447,783	59,522,971
Other			27,600,000	27,948,000	29,851,007	32,057,113	34,614,595	37,579,417	41,016,459	45,000,932
TOTAL W/ ADJUSTMENT			68,399,923	68,747,923	73,872,427	79,654,171	85,256,080	91,262,689	97,464,242	104,523,903
Rate of Escalation			3.0%							
Escalation Factor			1.00	1.03	1.19	1.38	1.60	1.86	2.16	2.50
Escalated Cost			$68,399,923	$70,810,361	$88,207,541	$110,260,002	$136,810,981	$169,775,485	$210,190,533	$261,318,155

Alternative - Process Change

ASSUMPTIONS

Secondary/Nitrification	2026	○ MLE ◉ NAS
Disinfection Alternative (Please Select)	UV	
Start Year	2030	
AOP (Peroxide - Only Applicable to UV Alternative)	2041	
Solids Processing		
Fine Screening	2023	
Dewatering*	2023	
Thermal Drying*	2025	
Greenhouses*	2025	
Composting	2023	
Composting Alternative* *Includes Hauling	Composting (Off-Site)	
Dewatered Solids to Drying Beds (for 2023 and 2024)	50%	
Contract Dewatering for Lagoon Retirement	2023	
Percent Sent to Contract Dewatering	80%	

	Year	Breakdown of Solids	Disposal Cost	Disposal
Greenhouse	2025	10%	$64	Miscelaneous handling of dried materials. Assumes end product will be reused (e.g.:commercial landscaping).
Compost	2023	35%	$260	Composting (Off-Site)
Hauling (Wet)	2023	35%	$235	Average of 25% Solid Landfill Options
Thermal	2025	20%	$64	Miscelaneous handling of dried materials. Assumes end product will be reused (e.g.:commercial landscaping).
		100%		

FLOWS AND LOADS

		FYB 2010	FYB 2015	FYB 2020	FYB 2025	FYB 2030	FYB 2035	FYB 2040
Flow	(mgd)	121	128	137	143	151	158	166
Solids In	(DTPD)	150	160	167	178	187	196	206
Solids Out	(DTPD)	68	72	75	80	85	89	93
Fine Screening	(DTPD - Fine Screened)	0.3	0.4	0.4	0.4	0.4	0.4	0.5
Dewatering	(DTPD)	0	0	0	80	85	89	93
Solids Management - Lagoons	(DTPD)	68	72	75	80	85	89	93
Solids Management - Drying Be	(DTPD)	68	72	75	0	0	0	0
Thermal Drying	(DTPD)	0	0	0	16	17	18	19
Greenhouses	(DTPD)	0	0	0	8	8	9	9
Hauling (Wet)	(DTPD)	0	0	0	28	30	31	33
Composting	(DTPD)	0	0	0	28	30	31	33
Hauling (Dry)	(DTPD)	68	72	75	0	0	0	0
SBWR	(mgd)	13	22	31	40	45	49	54
AWTF	(mgd)	0	10	20	20	20	20	20

COST PROJECTIONS

Process Area	O&M Cost ($/MG)	($/DT)	FYE 2009	FYB 2010	FYB 2015	FYB 2020	FYB 2025	FYB 2030	FYB 2035	FYB 2040	
Primary	$151		6,413,581	6,664,004	7,049,525	7,545,195	7,875,641	8,316,236	8,701,757	9,142,353	
Secondary (BNR 1)	$273		10,318,527	10,318,527	10,915,466	11,682,960	12,194,623	15,047,409	15,744,971	16,542,185	
Nitrification (BNR 2)	$168		5,552,241	5,552,241	5,873,445	6,286,422	6,561,739	9,260,667	9,689,969	10,180,601	
Filtration	$88		3,624,596	3,872,427	4,096,452	4,384,483	4,576,504	4,832,533	5,056,557	5,312,586	
Disinfection	$82		3,599,726	3,599,726	3,807,975	4,075,723	4,254,222	0	0	0	
On-Site Hypo Generation	$0		0	0	0	0	0	0	0	0	
UV (Bay Discharge)	$21		0	0	0	0	0	822,807	840,863	866,656	
UV (SBWR)	$21		0	0	0	0	0	190,871	226,981	263,092	
Ozone or Peroxide	$79		0	0	0	0	0	0	0	0	
Fine Screening		$1,221	0	0	0	0	174,617	184,386	192,934	202,703	
Sludge Processing		$105	5,746,311	5,746,311	6,110,244	6,397,559	6,799,801	7,163,734	7,508,513	7,891,600	
Solids Management - Lagoons		$57	2,137,093	1,419,430	1,509,328	1,580,299	1,679,659	1,769,557	1,854,722	1,949,351	
Solids Management - Drying Beds [4], [3]		$57	2,137,093	1,419,430	1,509,328	1,580,299	0	0	0	0	
Dewatering [2], [3]		$72	0	0	0	0	2,099,820	2,212,205	2,318,675	2,436,975	
Thermal Drying		$54	0	0	0	0	318,546	335,595	351,747	369,693	
Greenhouses		$156	0	0	0	0	456,888	481,341	504,507	530,248	
Hauling (Wet)		$235	0	0	0	0	2,406,555	2,535,357	2,657,379	2,792,960	
Contract Dewatering/Hauling (Wet - Lagoons) [1]											
Composting		$260	0	0	0	0	2,664,839	2,807,465	2,942,583	3,092,715	
Hauling (Drying Bed Dried)		$64	0	1,435,326	1,678,853	1,757,796	0	0	0	0	
Handling (Thermal/Greenhouse Dried)		$64	0	0	0	0	406,935	428,714	449,347	472,273	
SBWR	$268		1,270,754	1,270,754	2,150,507	3,030,260	3,910,013	4,366,181	4,822,349	5,278,517	
Sub-total			40,799,923	41,298,176	44,701,122	48,320,996	56,380,404	60,755,058	63,863,856	67,324,506	
Budget Adjustment			27,600,000	27,948,000	29,851,007	32,057,113	34,614,595	37,579,417	41,016,459	45,000,932	
TOTAL W/ ADJUSTMENT			68,399,923	69,246,176	74,552,128	80,378,109	90,994,998	98,334,475	104,880,315	112,325,438	
Rate of Escalation			3.0%								
Escalation Factor			1.00	1.03	1.19	1.38	1.60	1.86	2.16	2.50	
Escalated Cost			$68,399,923	$71,323,562	$89,019,140	$111,262,101	$146,020,260	$182,931,090	$226,183,971	$280,822,620	$4,857,430,864
Incremental Increase			0	2,923,639	20,619,217	42,862,178	77,620,337	114,531,167	157,784,048	212,422,697	

Notes:
(1) Contract dewatering occurs only in in 2023/2024. Not seen in 5-year Summary.
(2) 80% of the solids from lagoon retirement is dewatered in the new dewatering facility.
(3) 50% solids dewatered in 2023 and 2024 are sent to drying beds and dry hauled while 50% is direclty wet hauled.
(4) Drying bed use stops in 2025.