

City of San José

San José/Santa Clara Water Pollution
Control Plant Master Plan

**TASK NO. 4
PROJECT MEMORANDUM NO. 5
PRIORITIZATION AND COSTS OF REHABILITATION
AND REPLACEMENT PROJECTS**

FINAL DRAFT
August 2009



in association with



CITY OF SAN JOSÉ

**SAN JOSÉ/SANTA CLARA WATER POLLUTION
CONTROL PLANT MASTER PLAN**

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TABLE OF CONTENTS

	<u>Page No.</u>
1.0 INTRODUCTION	1
2.0 BACKGROUND	1
2.1 Previous Reports	1
3.0 METHODOLOGY	3
3.1 Assets/Projects	3
3.2 Risk.....	3
3.3 Costs	4
3.4 Prioritization	6
4.0 REPAIR AND REPLACEMENT FORECASTING.....	6
5.0 CONCLUSIONS AND RECOMMENDATIONS	7

LIST OF TABLES

Table 1	Assessment Scores	3
Table 2	Cost Estimate Factors.....	5

LIST OF FIGURES

Figure 1	Total Average Annual R&R Investment (2009 Dollars).....	8
Figure 2	Total Average Annual R&R Investment (Escalated Dollars).....	9
Figure 3	Total Annual R&R Investment (Escalated Dollars)	10

PRIORITIZATON AND COSTS OF REHABILITATION AND REPLACEMENT PROJECTS

1.0 INTRODUCTION

The purpose of this project memorandum (PM) is to confirm the prioritization and implementation timing for annual investments needed for the rehabilitation and replacement (R&R) assets/projects that were identified for the City of San José's City Capital Improvement Plan (CIP) for the San José/Santa Clara Water Pollution Control Plant (WPCP). The list of R&R assets/projects presented in this PM is based on previous studies conducted for the City; namely, the Infrastructure Condition Assessment (ICA) Report by CH2M Hill (May 2007), the WPCP Process Piping Assessment (PPA) Report by CH2M Hill (February 2008), and the Headworks Condition Assessment (HCA) Technical Memorandum by Carollo Engineers (Revised Draft, July 2009). These reports present previous findings and recommendations for R&R assets/projects, prioritization, and estimated costs. Based on the initial findings of this work, the City has developed a five year, \$200 million R&R CIP, which will be reviewed and confirmed as part of this PM.

This PM is the second in a series of three asset management PMs developed as part of the San José/Santa Clara Water Pollution Control Plant Master Plan (Master Plan). The first in this series is PM 4.4 Existing Asset Management Practices Description, and the third is PM 4.6 Asset Management Program Implementation Needs.

2.0 BACKGROUND

2.1 Previous Reports

2.1.1 Infrastructure Condition Assessment Report, May 2007, CH2M Hill

The City commissioned CH2M Hill to conduct a condition assessment of the WPCP infrastructure and to identify the capital improvement projects needed to maintain the City's wastewater service for its existing customers. This report provided background information on the WPCP and the R&R norms and benchmarking in the industry. It developed a listing and description of the major facilities (assets) by process area, their condition, and potential improvements. Some assets were directly translated into projects, while others were combined into projects (i.e., Miscellaneous Support). However, no documentation exists to explain which assets were combined into projects, so there are simply numerous assets with no assigned project. Cost estimates to complete the improvements necessary for each project were provided, and a risk score was developed in order to prioritize them. The risk score included factors such as the probability of failure, including condition and redundancy, trigger factors, such as obsolescence, and the consequence of failure, including service

reliability, as well as health and safety of employees and the public. These factors were combined mathematically to produce a risk score that was ranked from highest to lowest. The risk ranking was the parameter on which project prioritization was based. Using the prioritization, an overall CIP and a suggested five (5) year CIP was developed. A final report was issued to the City in May 2007 which identified the capital investments needed to address the existing infrastructure at the WPCP.

This PM incorporates the identification of assets/projects, the development of cost estimates, and the prioritization methodology that were developed in the ICA Report as the basis for the development of the implementation timing and the annual R&R investments needed to fund the implementation schedule.

2.1.2 WPCP Process Piping Assessment, February 2008, CH2M Hill

As follow-on work to the development of the ICA Report, CH2M Hill was tasked with assessing the condition of the process piping at the WPCP. A database of process piping and valves was developed, and condition was assessed for each asset. A risk score was assigned for each asset using a very similar methodology to the one employed in the ICA Report. The risk scores were ranked from highest to lowest, and this ranking was the basis for prioritization. The recommendation of the PPA Report, which was completed in February 2008, was for the City to conduct more detailed condition assessments on the process piping and valves. This work is currently underway and will be undertaken by City staff.

Since no specific recommendations or cost estimates were developed for the R&R of the process piping, results from this report are not incorporated into this PM.

2.1.3 Headworks Condition Assessment Technical Memorandum, Revised Draft, July 2009, Carollo Engineers

Carollo Engineers developed the Draft HCA Technical Memorandum (TM) for the City in April and July 2009. The purpose of this TM was to evaluate and recommend a cost effective long-term solution for WPCP headworks operation by considering two options: (1) phased improvements to Headworks 1 and continue to operate in parallel with Headworks 2 or (2) expansion of Headworks 2 to handle all flows to the WPCP. Condition, original useful life, remaining service life, and current replacement value was evaluated for each asset. An analysis comparing the two alternatives was presented.

The ICA Report identified a New Headworks and Wet Weather Facility project that, based on the results of the HCA TM and discussions with City staff, was modified in this PM to be named the Headworks Upgrade project. The estimated cost from the ICA Report was updated in this PM, in order to be more conservative, with the higher of the two cost estimates from the HCA TM.

3.0 METHODOLOGY

3.1 Assets/Projects

The list of assets/projects that are presented in this PM were taken directly from the ICA Report, with the exception of the name modification from New Headworks and Wet Weather Facility project to Headworks Upgrade project. As discussed previously, no information from the PPA Report is included in this PM, as that report did not develop specific R&R recommendations.

The ICA Report identified 85 assets that were organized by twelve different process areas. This list is shown in Appendix A. These assets were categorized into 70 projects. This list is shown in Appendix B. Some assets, such as the Machine Shop, were not directly assigned to projects. Some projects were not linked with any specific assets, such as Civil Infrastructure. For these cases, there is no documentation linking assets and projects. Some assumptions can be made with respect to relating assets and projects. For the purposes of this PM, the 70 projects that were developed in the ICA Report will be used directly, rather than disaggregating the projects without assets or matching assets without projects. Assets without projects are shown in this PM, but do not have costs associated with them, and therefore are shown for informational purposes only. The assets/projects that were identified in the ICA Report have not been further verified or investigated as part of this PM.

3.2 Risk

The ICA Report provided an assessment for each asset/project that resulted in a risk score (except the Headworks Upgrade, Miscellaneous Support, and Civil Infrastructure projects). The assessment was divided into three categories - consequence, probability, and trigger. Each category was comprised of various factors, each with a unique weighting between 0 and 1 and a score. The scores are shown in Table 1. Weightings were assigned to each factor, and a score for each factor was assigned to each asset/project.

Table 1 Assessment Scores San José/Santa Clara Water Pollution Control Plant Master Plan City of San José	
Description⁽¹⁾	Score⁽¹⁾
Negligible	1
Minor	2
Moderate	4
Major	7
Critical	10

Notes:
(1) Infrastructure Condition Assessment Report by CH2M Hill, May 2007.

Six consequence factors were considered: service reliability, compliance with regulations and permits, health and safety of employees and public, ability to return asset to level of service, financial impact, and disruption to the community/public image. Four probability factors were utilized: condition assessment overall, effective operating protocols, reliability, and planned redundancy. Three trigger factors were used: capacity and utilization, obsolescence, and maintenance requirements.

The factors were mathematically combined to produce a relative risk score for each asset/project using the following equation:

$$\text{Relative Risk Score} = \sum (W_C \times S_C) \times [\sum (W_P \times S_P) + \sum (W_T \times S_T)]$$

Where:

W_C = Weight of Consequence Factor

S_C = Score of Consequence Factor

W_P = Weight of Probability Factor

S_P = Score of Probability Factor

W_T = Weight of Trigger Factor

S_T = Score of Trigger Factor

The risk scores varied between 0 and 402. The risk scores for each asset/project are shown in Appendix C. The asset/project risk scores were sorted to produce a risk ranking. Risk rankings ranged from 1 to 84. A risk ranking was assigned to the Civil Infrastructure project even though a risk assessment and score were not developed. The assessment, scores, and ranking that were presented in the ICA Report have not been further verified or investigated as part of this PM.

3.3 Costs

The ICA Report developed total capital cost estimates for each project. These costs included a variety of factors that are shown in Table 2. The factors include an escalation to mid-point of construction of 48.3 percent. In order to forecast annual R&R investments as part of this PM, the mid-point of construction escalation cost component was subtracted from the total capital cost estimate to provide unescalated total capital project cost. The final ICA Report was completed in May 2007, so it was assumed that the costs were in May 2007 dollars. Using the Engineering News Record Construction Cost Index (ENRCCI), an ENRCCI of 7942 was used for May 2007. An ENRCCI of 8534 was used for March 2009. In order to escalate the unescalated total capital project costs to current dollars, the ratio of the two ENRCCI values was applied to the unescalated total capital project costs to update the costs to March 2009 dollars.

Table 2 Cost Estimate Factors San José/Santa Clara Water Pollution Control Plant Master Plan City of San José	
Item⁽¹⁾	Value⁽¹⁾
Construction Cost	
Contractor's Overhead ⁽²⁾	10%
Contractor's Profit ⁽²⁾	5%
Contractor's Mobilization, Bonds, and Insurance ⁽²⁾	5%
Construction Contingency ⁽²⁾	20%
Location Adjustment (San Jose, CA) ⁽²⁾	16.3%
Adjustment for Market Conditions ⁽²⁾	10%
Escalation to Mid-Point of Construction	48.3%
Indirect Capital Costs	
Permitting ⁽³⁾	4%
Engineering ⁽³⁾	10.8%
Services During Construction ⁽³⁾	10.8%
Startup and Commissioning ⁽³⁾	2.7%
Land and Right of Way Acquisition ⁽³⁾	0%
Legal and Administrative ⁽³⁾	6.7%
Notes:	
(1) Infrastructure Condition Assessment Report by CH2M Hill, May 2007, Table 16-1.	
(2) Factor applied to unadjusted cost estimate in a compounded fashion.	
(3) Factor applied to Escalated Construction Cost.	

The HCA TM developed two cost estimates for the Headworks Upgrade project, for rehabilitating Headworks 1 or expanding Headworks 2 in March 2009 dollars. In order to be conservative, the higher of the two cost estimates was used as part of this PM in lieu of the estimate that was developed in the ICA Report. Brown and Caldwell is concurrently performing engineering work on all the digesters, and reviewed the unescalated total capital project costs (in March 2009 dollars) for the digesters. It was determined that the costs are adequate as planning level cost estimates. The unescalated total capital project costs are the costs that are used in the following sections of this PM. Total capital costs and unescalated total capital project costs in March 2009 dollars are shown in Appendix D.

The cost estimates presented in the ICA Report have not been further verified or investigated as part of this PM, except for the costs associated with the digester and the Headworks Upgrade projects. Prior to implementation of any of the projects, a more detailed examination of cost estimates is recommended.

3.4 Prioritization

In order to develop an implementation schedule and an annual R&R investment forecast, the projects need to be prioritized since not all projects can be implemented at the same time. In order to prioritize the projects in a logical and explainable way, a methodology was required.

3.4.1 Parameters

There are numerous parameters that can be used to prioritize assets/projects. Parameters that are often used include risk, criticality, condition, remaining useful life, and repair or replacement costs.

3.4.2 Prioritization

The ICA Report prioritized the assets/projects based on the risk score. Assets/projects were ranked from highest risk score to lowest risk score. The asset/project with the highest risk ranking was given the highest priority. Using this prioritization method, projects were selected for the suggested five (5) year CIP.

In some cases, projects with much lower risk rankings were included in the suggested five (5) year CIP based on the professional judgment of City staff. The inclusion of the low ranked projects in the suggested five (5) year CIP is inconsistent with the prioritization methodology, and to date, no documentation exists to explain the inclusion of these low priority projects. As part of the development of this PM, City staff has provided explanations for the inclusion of the projects in the suggested five (5) year CIP. The risk ranking for each project, along with a notation as to whether it was included in the ICA Report suggested five (5) year CIP and/or whether it was included in the City's actual CIP Fiscal Year 2009-2013, are shown in Appendix E. The majority of the suggested five (5) year ICA Report projects were included in the City's actual CIP Fiscal Year 2009-2013.

After discussions with City staff on May 4, 2009, it was decided that this PM would use the prioritization of projects as shown in Appendix E.

4.0 REPAIR AND REPLACEMENT FORECASTING

In order to forecast the annual investments required to implement the identified R&R assets/projects and compare that forecast to the City's current five (5) year \$200 million R&R CIP, a specific implementation time frame was evaluated. A variety of time frames including 20, 30 and 40 years was discussed with City staff on May 4, 2009. Based on this meeting, it was decided that an implementation time frame of 20 years would be used.

Assets/projects were distributed over the 20 time frame in order of their priority, which was based on the risk rank, such that the assets/projects with the highest priority were implemented first (e.g., in the earliest years of the 20 year time frame) and those with the

lowest priority were implemented last (e.g., in the last year of the 20 year time frame). The assets that were not assigned a project directly were ranked below the projects based on their risk score, from highest to lowest. Since most assets/projects will require more than one year to implement, costs were distributed over the duration of the project based on an S curve as shown in Appendix F. Best professional judgment was used to determine the project duration for each asset/project.

The unescalated total capital project costs were escalated throughout the 20 year time frame using an escalation factor of 4 percent. This escalation factor was determined by best professional judgment based on current market and economic conditions. The escalated costs were leveled throughout the 20 year period in order to allow the City to plan on investing approximately the same amount on R&R assets/projects per year, rather than having large fluctuations that could potentially make financing the projects complex.

Figure 1 shows the total average annual R&R investment in five year increments over the 20 year time frame in 2009 dollars. Figure 2 shows the total average annual R&R investment in five year increments over the 20 year time frame in future or escalated dollars. Figure 3 shows the total annual R&R investment per year in future or escalated dollars over the 20 year time frame.

Appendix G lists each asset/project, its priority, the year the asset/project starts, the project duration, the years the asset/project is online, the unescalated capital project cost (2009 dollars), the escalated capital project cost in each year for each asset/project, and the total escalated capital project cost for each year.

5.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the data presented in Figure 2, the City needs to allocate on the order of \$50 +/- million dollars a year for R&R improvements over the next 20 years. This is consistent with the City's actual R&R CIP Fiscal Year 2009-2013 of \$202 million dollars at approximately \$40 million dollars of investment a year. A final CIP that includes the R&R assets/projects will be developed as a final deliverable as part of the Master Plan. The assets/projects discussed in this PM will be updated as the Master Plan moves forward as it is likely that some of the identified assets/projects may be removed from the R&R list in their entirety if certain treatment processes are to be eliminated in the future. Other assets/projects may be incorporated into process upgrades and be accounted for elsewhere in the final CIP. In addition, the R&R assets/projects shown may be reprioritized as a result of ongoing Master Plan efforts. It is recommended that the list of R&R assets/projects be reviewed annually as part of the CIP planning process.

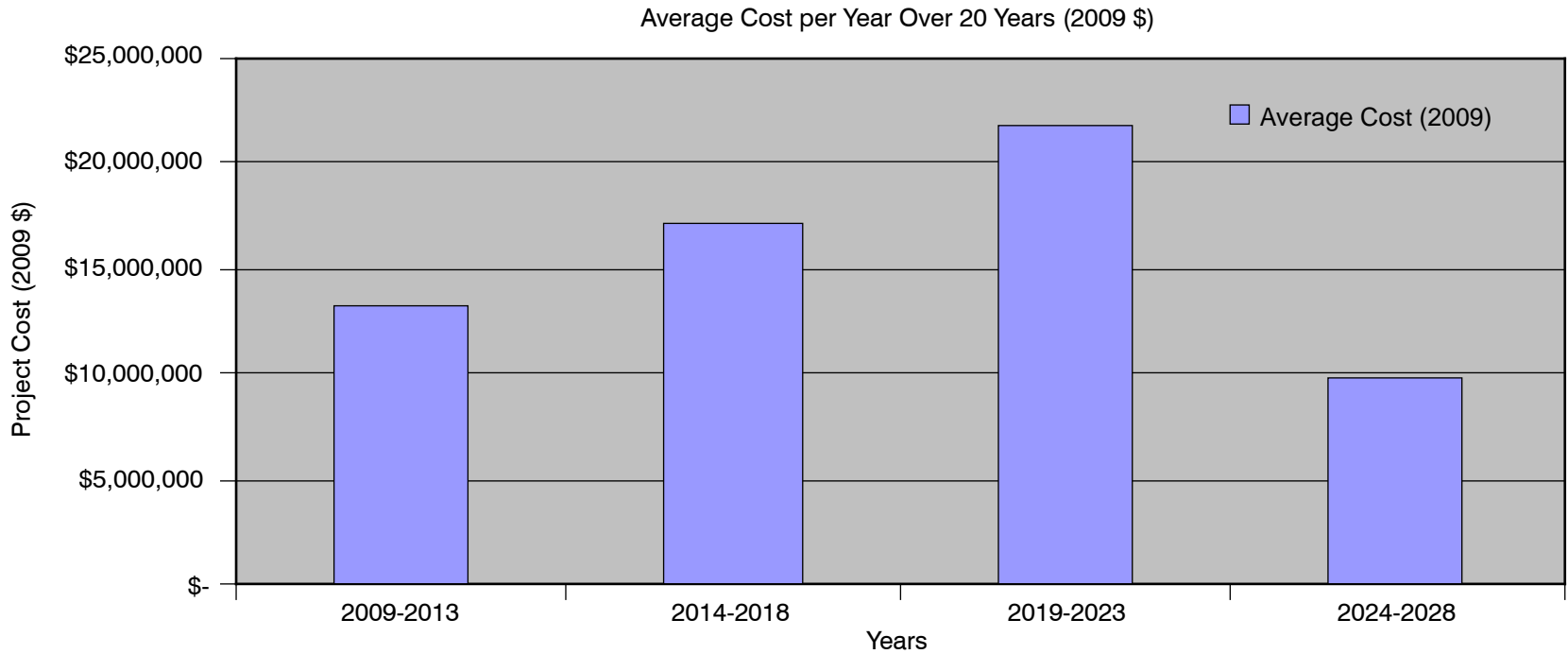


Figure 1
TOTAL AVERAGE ANNUAL R&R
INVESTMENT (2009 DOLLARS)
 SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
 CITY OF SAN JOSÉ

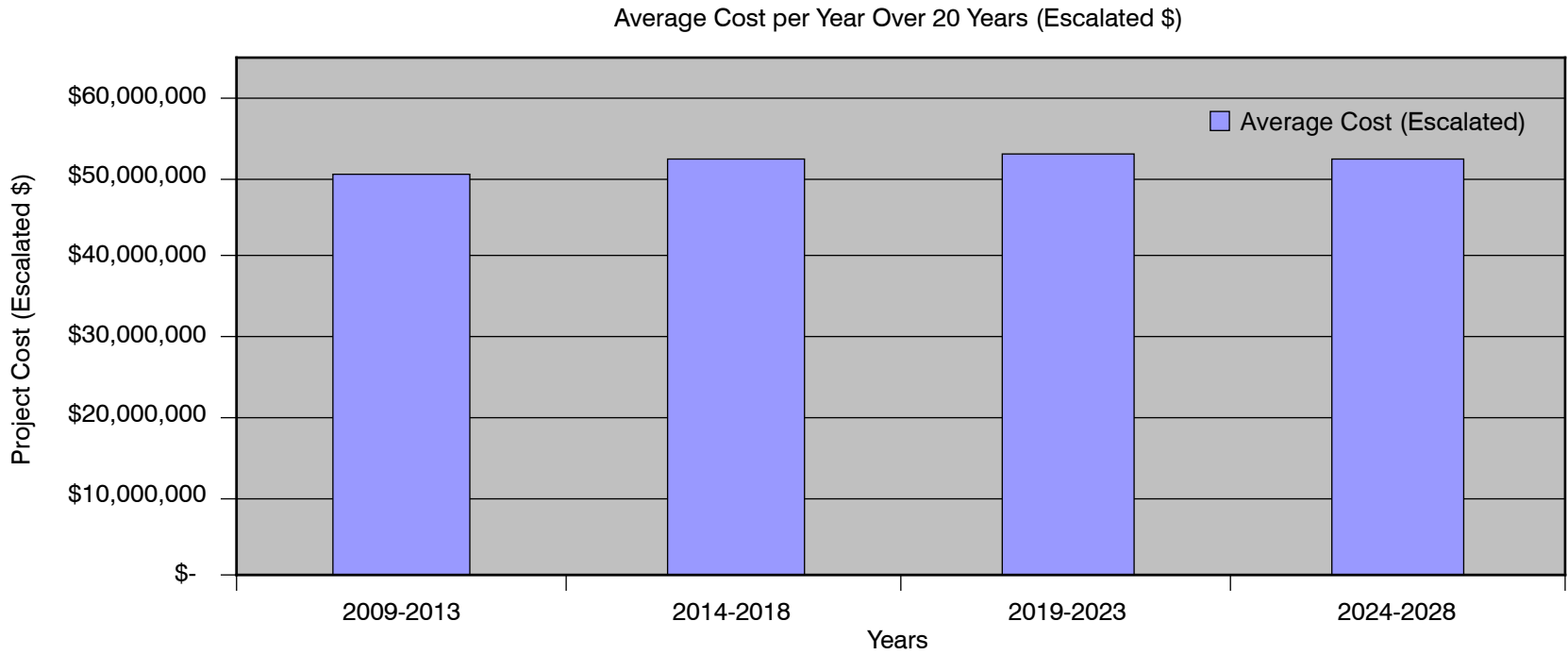


Figure 2
TOTAL AVERAGE ANNUAL R&R INVESTMENT
(ESCALATED DOLLARS)
 SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
 CITY OF SAN JOSÉ

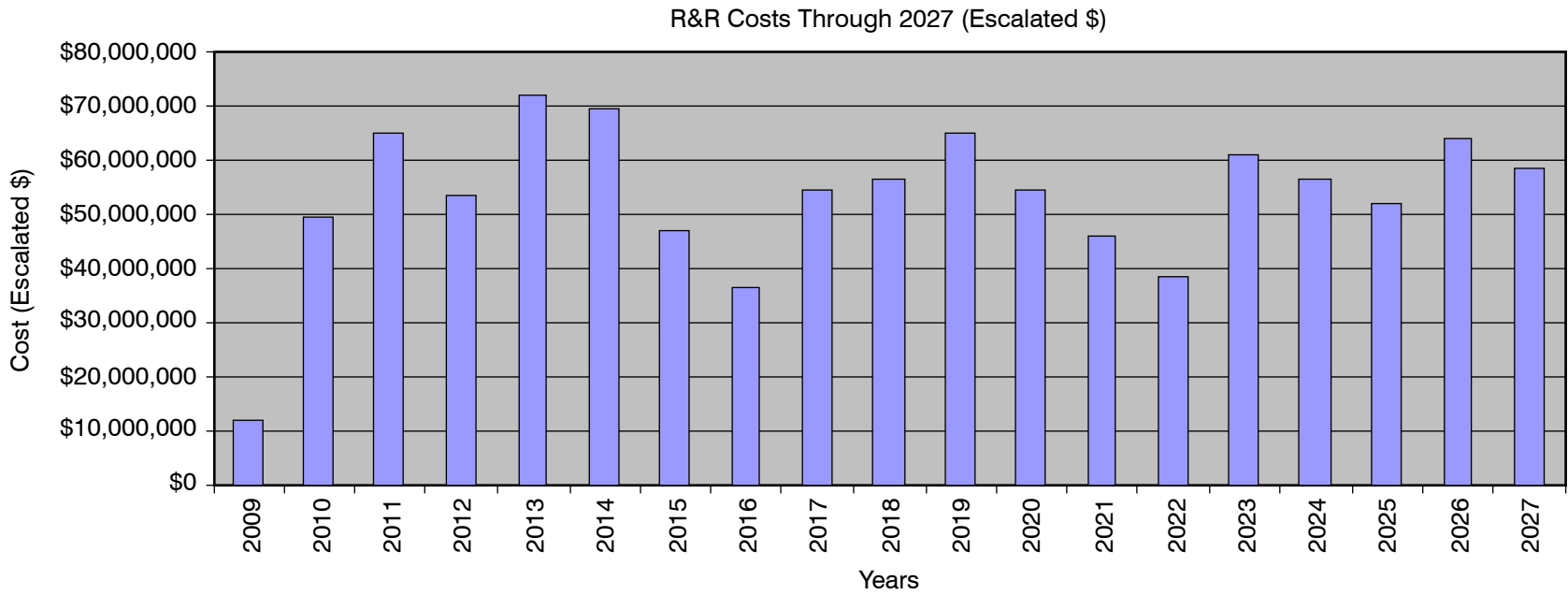


Figure 3
TOTAL ANNUAL R&R INVESTMENT
(ESCALATED DOLLARS)
 SAN JOSÉ/SANTA CLARA WPCP MASTER PLAN
 CITY OF SAN JOSÉ

APPENDIX A - ICA REPORT ASSET NAMES

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Table A1 ICA Report Asset Names San José/Santa Clara Water Pollution Control Plant Master Plan City of San José	
Number	Asset Name⁽¹⁾
1	Barscreens
2	Detritors
3	Inlet Control Structure
4	Headworks Upgrade ⁽²⁾
5	Overflow Structure
6	Aerated Grit Chambers
7	Primary Effluent Pump Station
8	P&E Building - Raw Sewage Pump Station
9	P&E Building Cogeneration
10	East Primary Clarifier 1
11	East Primary Clarifier 2
12	West Primary Clarifiers
13	Scum Handling
14	Scum Pump Station 1
15	Scum Pump Station 2
16	Aeration Building 1
17	Aeration Building 2
18	Secondary Blower Building
19	Blower Generator Building
20	Secondary Clarifiers A1-A5 and B1-B5
21	Secondary Clarifiers A6-A8 and B6-B8
22	Secondary Clarifiers A9-A11 and B9-B11
23	Secondary Clarifiers A12-A13 and B12-B13
24	Secondary Aeration Tank A
25	Secondary Aeration Tank B
26	Tertiary Blower Building
27	Nitrification Tanks A and B sides (1975)
28	Nitrification Tanks A and B sides (1984)

Table A1 ICA Report Asset Names San José/Santa Clara Water Pollution Control Plant Master Plan City of San José	
Number	Asset Name⁽¹⁾
29	Nitrification Clarifiers A1-A6 and B1-B6
30	Nitrification Clarifiers A7-A8 and B7-B8
31	Chlorine Contact Tanks
32	Treated Backwash Pump Station
33	Backwash Settling/Treatment
34	Backwash Equalization
35	Filtration Influent Pump Building
36	Filtration Treatment
37	Hypochlorite and Bisulphite Facility
38	Disinfection Building
39	Ammonia System
40	Rail Spur Unloading
41	Sulfur Dioxide Building
42	Outfall Channel
43	Recycled Water Fill Station
44	Recycled Water Transmission Pump Station
45	Digesters 1-3
46	Digester 4
47	Digesters 5-6
48	Digester 7-8
49	Digesters 9-11
50	Digesters 12-16
51	Digester Sludge Export Station
52	Digester Gas System
53	Sludge Control Building
54	Sludge Concentration Tanks
55	RSM Operations Center
56	Inactive Lagoons 5-25
57	Digester Cleaning Lagoons 1-3
58	Drying Beds
59	Flow Equalization Basin

Table A1 ICA Report Asset Names San José/Santa Clara Water Pollution Control Plant Master Plan City of San José	
Number	Asset Name⁽¹⁾
60	Lagoons 28-59
61	Northeast Pump Station
62	Plant Storage Facility
63	Administration Building
64	Classrooms
65	Diesel Fuel
66	Electrical Shop 75
67	Electrical Sub-Station 1
68	Electrical Sub-Station 2
69	Electrical Sub-Station M1-M2
70	Environmental Services Building
71	HVAC Shop
72	IC Workshop
73	Machine Shop
74	Maintenance Shop
75	Paint Facility
76	Plant Water
77	Storage - Butler
78	Stormwater and Flood Protection Facilities
79	Training Center
80	Vehicle Services
81	Warehouse - Stores
82	Woodshop
83	Yard Piping
84	Site Power Distribution (Medium and High Voltage)
85	Civil Infrastructure
Notes: (1) Infrastructure Condition Assessment Report by CH2M Hill, May 2007, Appendix B. (2) Name modified per discussions with City staff.	

APPENDIX B - ICA REPORT PROJECT NAMES

APPENDIX B - ICA REPORT PROJECT NAMES

Table B1 ICA Report Project Names San José/Santa Clara Water Pollution Control Plant Master Plan City of San José	
Number	Project Name⁽¹⁾
1	Site Power Distribution (Medium and High Voltage)
2	Electrical Sub-Station M1-M2
3	Digester Gas System
4	Electrical Sub-Station 1
5	Electrical Sub-Station 2
6	Yard Piping
7	Outfall Channel
8	Digesters 1-3
9	Digesters 12-16
10	Digester 4
11	Digesters 5-6
12	Digesters 7-8
13	Digesters 9-11
14	Digester Sludge Export Station
15	Filtration Influent Pump Building
16	P&E Building - Raw Sewage Pump Station
17	Rail Spur Unloading
18	Primary Effluent Pump Station
19	Lagoons 28-59
20	Secondary Blower Building
21	Headworks Upgrade ⁽²⁾
22	Detritors
23	Drying Beds
24	Filtration Treatment
25	Aerated Grit Chambers
26	Chlorine Contact Tanks
27	Digester Cleaning Lagoons 1-3

Table B1 ICA Report Project Names San José/Santa Clara Water Pollution Control Plant Master Plan City of San José	
Number	Project Name⁽¹⁾
28	West Primary Clarifiers
29	Recycled Water Transmission Pump Station
30	Overflow Structure
31	P&E Building - Cogeneration
32	Sludge Control Building
33	Inlet Control Structure
34	Flow Equalization Basin
35	Backwash Settling/Treatment
36	Blower Generator Building
37	Miscellaneous Support
38	Secondary Clarifiers A1-A5 and B1-B5
39	Nitrification Clarifiers A1-A6 and B1-B6
40	Secondary Clarifiers A12, A13, B12, B13
41	Secondary Clarifiers A6-8, and B6-8
42	Secondary Clarifiers A9-11, and B9-11
43	Nitrification Clarifiers A7, A8, B7, B8
44	Disinfection Building
45	Sulfur Dioxide Building
46	Treated Backwash Pump Station
47	Tertiary Blower Building
48	East Primary Clarifiers 1
49	East Primary Clarifiers 2
50	Scum Pump Station 1
51	Scum Pump Station 2
52	Nitrification Tanks A and B Sides (1975)
53	Nitrification Tanks A and B Sides (1984)
54	Secondary Treatment Aeration Tanks A
55	Secondary Treatment Aeration Tanks B
56	RSM Operations Center
57	Sludge Concentration Tanks

Table B1 ICA Report Project Names San José/Santa Clara Water Pollution Control Plant Master Plan City of San José	
Number	Project Name⁽¹⁾
58	Backwash Equalization
59	Stormwater and Flood Protection Facilities
60	Inactive Lagoons 5-25
61	Scum Handling
62	Plant Storage Facility
63	Ammonia System
64	Hypochlorite and Bisulfite Facility
65	Aeration Building 1
66	Aeration Building 2
67	Northeast Pump Station
68	Bar Screens
69	Recycled Water Fill Station
70	Civil Infrastructure
Notes:	
(1)	Infrastructure Condition Assessment Report by CH2M Hill, May 2007, Table 16-2.
(2)	Name modified per discussions with City staff.

APPENDIX C - RISK SCORES BY ASSET

APPENDIX C - RISK SCORES BY ASSET

Table C1 Risk Scores by Asset San José/Santa Clara Water Pollution Control Plant Master Plan City of San José	
Asset Name⁽¹⁾	Risk Score⁽¹⁾
Barscreens	37
Detritors	125
Inlet Control Structure	86
Headworks Upgrade ⁽²⁾	NA
Overflow Structure	94
Aerated Grit Chambers	113
Primary Effluent Pump Station	134
P&E Building - Raw Sewage Pump Station	146
P&E Building Cogeneration	94
East Primary Clarifier 1	60
East Primary Clarifier 2	60
West Primary Clarifiers	103
Scum Handling	53
Scum Pump Station 1	60
Scum Pump Station 2	60
Aeration Building 1	38
Aeration Building 2	38
Secondary Blower Building	127
Blower Generator Building	77
Secondary Clarifiers A1-A5 and B1-B5	65
Secondary Clarifiers A6-A8 and B6-B8	65
Secondary Clarifiers A9-A11 and B9-B11	65
Secondary Clarifiers A12-A13 and B12-B13	65
Secondary Aeration Tank A	60
Secondary Aeration Tank B	60
Tertiary Blower Building	61
Nitrification Tanks A and B sides (1975)	60

Table C1 Risk Scores by Asset San José/Santa Clara Water Pollution Control Plant Master Plan City of San José	
Asset Name⁽¹⁾	Risk Score⁽¹⁾
Nitrification Tanks A and B sides (1984)	60
Nitrification Clarifiers A1-A6 and B1-B6	65
Nitrification Clarifiers A7-A8 and B7-B8	65
Chlorine Contact Tanks	111
Treated Backwash Pump Station	65
Backwash Settling/Treatment	79
Backwash Equalization	60
Filtration Influent Pump Building	150
Filtration Treatment	114
Hypochlorite and Bisulphite Facility	39
Disinfection Building	65
Ammonia System	42
Rail Spur Unloading	134
Sulfur Dioxide Building	65
Outfall Channel	185
Recycled Water Fill Station	10
Recycled Water Transmission Pump Station	98
Digesters 1-3	166
Digester 4	166
Digesters 5-6	166
Digester 7-8	166
Digesters 9-11	166
Digesters 12-16	166
Digester Sludge Export Station	150
Digester Gas System	347
Sludge Control Building	89
Sludge Concentration Tanks	60
RSM Operations Center	60
Inactive Lagoons 5-25	54
Digester Cleaning Lagoons 1-3	108
Drying Beds	116

Table C1 Risk Scores by Asset San José/Santa Clara Water Pollution Control Plant Master Plan City of San José	
Asset Name⁽¹⁾	Risk Score⁽¹⁾
Flow Equalization Basin	86
Lagoons 28-59	132
Northeast Pump Station	38
Plant Storage Facility	50
Administration Building	123
Classrooms	70
Diesel Fuel	30
Electrical Shop 75	29
Electrical Sub-Station 1	223
Electrical Sub-Station 2	223
Electrical Sub-Station M1-M2	359
Environmental Services Building	99
HVAC Shop	29
IC Workshop	29
Machine Shop	29
Maintenance Shop	29
Paint Facility	29
Plant Water	63
Storage - Butler	29
Stormwater and Flood Protection Facilities	57
Training Center	50
Vehicle Services	25
Warehouse - Stores	36
Woodshop	25
Miscellaneous Support	NA
Yard Piping	212
Civil Infrastructure	0
Site Power Distribution (Medium and High Voltage)	402
Notes:	
(1) Infrastructure Condition Assessment Report by CH2M Hill, May 2007, Appendix B.	
(2) Name modified per discussions with City staff.	
(3) NA = Not Available	

APPENDIX D - ORIGINAL AND REVISED COSTS BY PROJECT

APPENDIX D - ORIGINAL AND REVISED COSTS BY PROJECT

Table D1 Original and Revised Costs by Project San José/Santa Clara Water Pollution Control Plant Master Plan City of San José		
Project Name⁽¹⁾	Total Capital Cost (Original) (millions)⁽¹⁾	Unescalated Total Capital Project Cost (millions)⁽²⁾
Site Power Distribution (Medium and High Voltage)	\$50.8	\$36.7
Electrical Sub-Station M1-M2	\$19.2	\$13.9
Digester Gas System	\$9.9	\$7.2
Electrical Sub-Station 1	\$9.6	\$7.0
Electrical Sub-Station 2	\$9.6	\$7.0
Yard Piping	\$47.6	\$34.4
Outfall Channel	\$2.1	\$1.5
Digesters 1-3	\$14.5	\$10.5
Digesters 12-16	\$22.8	\$16.6
Digester 4	\$4.8	\$3.5
Digesters 5-6	\$9.7	\$7.0
Digesters 7-8	\$9.7	\$7.0
Digesters 9-11	\$13.7	\$9.9
Digester Sludge Export Station	\$12.4	\$9.0
Filtration Influent Pump Building	\$16.0	\$11.6
P&E Building - Raw Sewage Pump Station	\$8.8	\$6.4
Rail Spur Unloading	-	-
Primary Effluent Pump Station	\$2.2	\$1.6
Lagoons 28-59	\$38.6	\$33.5
Secondary Blower Building	\$51.2	\$37.1
Headworks Upgrade ⁽³⁾	\$34.8	\$54.4
Headworks Upgrade ⁽³⁾	-	\$10.1
Headworks Upgrade ⁽³⁾	-	\$23.6
Detritors	\$0.5	- ⁽⁴⁾

Table D1 Original and Revised Costs by Project San José/Santa Clara Water Pollution Control Plant Master Plan City of San José		
Project Name⁽¹⁾	Total Capital Cost (Original) (millions)⁽¹⁾	Unescalated Total Capital Project Cost (millions)⁽²⁾
Drying Beds	\$21.1	\$18.3
Filtration Treatment	\$48.1	\$34.8
Aerated Grit Chambers	\$0.5	- ⁽⁴⁾
Chlorine Contact Tanks	-	-
Digester Cleaning Lagoons 1-3	\$21.5	\$18.7
West Primary Clarifiers	\$24.1	\$17.5
Recycled Water Transmission Pump Station	\$6.9	\$5.0
Overflow Structure	-	-
P&E Building - Cogeneration	\$44.1	\$32.0
Sludge Control Building	\$8.5	\$6.1
Inlet Control Structure	\$0.6	- ⁽⁴⁾
Flow Equalization Basin	\$2.6	\$2.3
Backwash Settling/Treatment	\$5.7	\$4.1
Blower Generator Building	\$15.6	\$11.3
Miscellaneous Support	\$2.6	\$1.9
Secondary Clarifiers A1-A5 and B1-B5	\$13.3	\$9.6
Nitrification Clarifiers A1-A6 and B1-B6	\$24.8	\$18.0
Secondary Clarifiers A12, A13, B12, B13	\$9.0	\$6.5
Secondary Clarifiers A6-8, and B6-8	\$8.0	\$5.8
Secondary Clarifiers A9-11, and B9-11	\$5.4	\$3.9
Nitrification Clarifiers A7, A8, B7, B8	\$8.4	\$6.1
Disinfection Building	-	-
Sulfur Dioxide Building	-	-
Treated Backwash Pump Station	\$4.8	\$3.5
Tertiary Blower Building	\$22.0	\$15.9
East Primary Clarifiers 1	\$21.6	\$15.7
East Primary Clarifiers 2	\$21.6	\$15.7
Scum Pump Station 1	\$0.2	\$0.1

Table D1 Original and Revised Costs by Project San José/Santa Clara Water Pollution Control Plant Master Plan City of San José		
Project Name⁽¹⁾	Total Capital Cost (Original) (millions)⁽¹⁾	Unescalated Total Capital Project Cost (millions)⁽²⁾
Scum Pump Station 2	\$0.2	\$0.1
Nitrification Tanks A and B Sides (1975)	\$16.8	\$12.2
Nitrification Tanks A and B Sides (1984)	\$5.9	\$4.3
Secondary Treatment Aeration Tanks A	\$38.7	\$28.0
Secondary Treatment Aeration Tanks B	\$38.7	\$28.0
RSM Operations Center	\$2.0	\$1.7
Sludge Concentration Tanks	\$8.8	\$6.3
Backwash Equalization	\$3.1	\$2.2
Stormwater and Flood Protection Facilities	\$30.2	\$21.9
Inactive Lagoons 5-25	\$100.1	\$86.9
Scum Handling	\$4.7	\$3.4
Plant Storage Facility	-	-
Ammonia System	-	-
Hypochlorite and Bisulfite Facility	\$13.9	\$10.7
Aeration Building 1	-	-
Aeration Building 2	-	-
Northeast Pump Station	-	-
Bar Screens	\$0.3	- ⁽⁴⁾
Recycled Water Fill Station	-	-
Civil Infrastructure	\$3.9	\$2.8

Notes:

- (1) Infrastructure Condition Assessment Report by CH2M Hill, May 2007, Table 16-2. May 2007 dollars. Includes 48.3% mid-point escalation component.
- (2) 48.3% mid-point escalation component removed. Prorated to March 2009 dollars.
- (3) Name modified per discussions with City staff.
- (4) Cost to address this project assumed to be included in the Headworks Upgrade project.

APPENDIX E - PROJECT PRIORITIZATION

APPENDIX E - PROJECT PRIORITIZATION

Table E1 Project Prioritization San José/Santa Clara Water Pollution Control Plant Master Plan City of San José					
Asset/Project⁽¹⁾	Risk Ranking⁽¹⁾	Included in Recommended 5 Year CIP⁽¹⁾	Included in Actual 5 Year CIP⁽²⁾	Cost Included in Actual 5 Year CIP⁽²⁾	Remarks⁽²⁾
Site Power Distribution (Medium and High Voltage)	1	Yes	Yes	See remarks	\$61.35M has been allocated in the 5-Year CIP for projects related to Electrical Reliability Improvements. Improvement needs for this asset will be addressed as part of that work.
Electrical Sub-Station M1-M2	2	Yes	Yes	See remarks	\$61.35M has been allocated in the 5-Year CIP for projects related to Electrical Reliability Improvements. Improvement needs for this asset will be addressed as part of that work.
Digester Gas System	3	Yes	Yes	\$10.3M	
Electrical Sub-Station 1	4	Yes	Yes	See remarks	\$61.35M has been allocated in the 5-Year CIP for projects related to Electrical Reliability Improvements. Improvement needs for this asset will be addressed as part of that work.
Electrical Sub-Station 2	5	Yes	Yes	See remarks	\$61.35M has been allocated in the 5-Year CIP for projects related to Electrical Reliability Improvements. Improvement needs for this asset will be addressed as part of that work.
Yard Piping	6	Yes	Yes	\$17.25M	
Outfall Channel	7	No	No	-	

Table E1 Project Prioritization San José/Santa Clara Water Pollution Control Plant Master Plan City of San José					
Asset/Project⁽¹⁾	Risk Ranking⁽¹⁾	Included in Recommended 5 Year CIP⁽¹⁾	Included in Actual 5 Year CIP⁽²⁾	Cost Included in Actual 5 Year CIP⁽²⁾	Remarks⁽²⁾
Digesters 1-3	8	Yes	Yes	See remarks	\$43.5M has been allocated in the 5-year CIP for overall digester rehabilitation. Improvement needs for this asset will be addressed as part of that work.
Digesters 12-16	9	Yes	Yes	See remarks	\$43.5M has been allocated in the 5-year CIP for overall digester rehabilitation. Improvement needs for this asset will be addressed as part of that work.
Digester 4	10	Yes	Yes	See remarks	\$43.5M has been allocated in the 5-year CIP for overall digester rehabilitation. Improvement needs for this asset will be addressed as part of that work.
Digesters 5-6	11	Yes	Yes	See remarks	\$43.5M has been allocated in the 5-year CIP for overall digester rehabilitation. Improvement needs for this asset will be addressed as part of that work.
Digesters 7-8	12	Yes	Yes	See remarks	\$43.5M has been allocated in the 5-year CIP for overall digester rehabilitation. Improvement needs for this asset will be addressed as part of that work.
Digesters 9-11	13	Yes	Yes	See remarks	\$43.5M has been allocated in the 5-year CIP for overall digester rehabilitation. Improvement needs for this asset will be addressed as part of that work.
Digester Sludge Export Station	14	Yes	No	-	On hold pending completion of the Plant Master Plan
Filtration Influent Pump Building	15	No	No	-	
P&E Building - Raw Sewage Pump Station	16	Yes	No	-	The raw sewage pumps have been rebuilt over the years and there are currently no plans in the next five years to replace the pumps.

Table E1 Project Prioritization San José/Santa Clara Water Pollution Control Plant Master Plan City of San José					
Asset/Project⁽¹⁾	Risk Ranking⁽¹⁾	Included in Recommended 5 Year CIP⁽¹⁾	Included in Actual 5 Year CIP⁽²⁾	Cost Included in Actual 5 Year CIP⁽²⁾	Remarks⁽²⁾
Rail Spur Unloading	17	No	No	-	
Primary Effluent Pump Station	18	No	No	-	
Lagoons 28-59	19	No	No	-	
Secondary Blower Building	20	Yes	Yes	See remarks	Actual 5-year CIP includes projects to replace MCCs H and J (part of the \$61.35M budget for Electrical Reliability Improvements). Some of the improvements were included in this year's CIP (FY08/09). This includes a feasibility study to replace the existing air plenum, replacement of a waste heat recovery boiler, and field investigation on the condition of the existing engine foundations.
Headworks Upgrade	21	No	Yes	\$4.5M	Enhancement to the new Headworks to allow for independent operation of the new Headworks.
Detritors	22	No	No	-	
Drying Beds	23	Yes	No	-	On hold pending completion of the Plant Master Plan
Filtration Treatment	24	Yes	Yes	\$15.6M	Actual 5-year CIP includes projects to replace the filter influent, drain, surface wash, and backwash valves that are leaking and to replace the filter media and filter drain tiles.
Aerated Grit Chambers	25	No	No	-	
Chlorine Contact Tanks	26	No	No	-	

Table E1 Project Prioritization San José/Santa Clara Water Pollution Control Plant Master Plan City of San José					
Asset/Project⁽¹⁾	Risk Ranking⁽¹⁾	Included in Recommended 5 Year CIP⁽¹⁾	Included in Actual 5 Year CIP⁽²⁾	Cost Included in Actual 5 Year CIP⁽²⁾	Remarks⁽²⁾
Digester Cleaning Lagoons 1-3	27	Yes	No	-	On hold pending completion of the Plant Master Plan
West Primary Clarifiers	28	No	No	-	
Recycled Water Transmission Pump Station	29	No	No	-	
Overflow Structure	30	No	No	-	
P&E Building - Cogeneration	31	Yes	Yes	See remarks	There is budget in the 5-year CIP for P&E Office HVAC upgrade (\$35,000) and replacement of MCC E (part of the \$61.35M budget for Electrical Reliability Improvements).
Sludge Control Building	32	Yes	Yes	\$1.1M	Actual 5-year CIP includes a project to replace the piping, valves, and equipment associated with the pressure flow system for the dissolved air flotation process.
Inlet Control Structure	33	No	No	-	
Flow Equalization Basin	34	No	No	-	
Backwash Settling/ Treatment	35	No	No	-	

Table E1 Project Prioritization San José/Santa Clara Water Pollution Control Plant Master Plan City of San José					
Asset/Project⁽¹⁾	Risk Ranking⁽¹⁾	Included in Recommended 5 Year CIP⁽¹⁾	Included in Actual 5 Year CIP⁽²⁾	Cost Included in Actual 5 Year CIP⁽²⁾	Remarks⁽²⁾
Blower Generator Building	36	Yes	No	-	Will consider including budget in the next CIP planning cycle to replace the waste heat recovery unit for Engine Generator EG-1.
Miscellaneous Support	37	Yes	No	-	Additional office space in the Administration Building will be available once the Environmental Services Building is repaired. This project to improve the HVAC system in the Training Trailer has been put on hold.
Secondary Clarifiers A1-A5 and B1-B5	38	Yes	Yes	See remarks	\$15M has been allocated in the 5-Year CIP to rehabilitate the Secondary and Nitrification clarifiers and replace the clarifier mechanisms. Improvement needs for this asset will be addressed as part of that work.
Nitrification Clarifiers A1-A6 and B1-B6	39	Yes	Yes	See remarks	\$15M has been allocated in the 5-Year CIP to rehabilitate the Secondary and Nitrification clarifiers and replace the clarifier mechanisms. Improvement needs for this asset will be addressed as part of that work.
Secondary Clarifiers A12, A13, B12, B13	40	No	Yes	See remarks	\$15M has been allocated in the 5-Year CIP to assess and rehabilitate the Secondary and Nitrification clarifiers and replace the clarifier mechanisms, as needed. Improvement needs for this asset will be addressed as part of that work.
Secondary Clarifiers A6-8, and B6-8	41	No	Yes	See remarks	\$15M has been allocated in the 5-Year CIP to assess and rehabilitate the Secondary and Nitrification clarifiers and replace the clarifier mechanisms, as needed. Improvement needs for this asset will be addressed as part of that work.

Table E1 Project Prioritization San José/Santa Clara Water Pollution Control Plant Master Plan City of San José					
Asset/Project⁽¹⁾	Risk Ranking⁽¹⁾	Included in Recommended 5 Year CIP⁽¹⁾	Included in Actual 5 Year CIP⁽²⁾	Cost Included in Actual 5 Year CIP⁽²⁾	Remarks⁽²⁾
Secondary Clarifiers A9-11, and B9-11	42	No	Yes	See remarks	\$15M has been allocated in the 5-Year CIP to assess and rehabilitate the Secondary and Nitrification clarifiers and replace the clarifier mechanisms, as needed. Improvement needs for this asset will be addressed as part of that work.
Nitrification Clarifiers A7, A8, B7, B8	43	No	Yes	See remarks	\$15M has been allocated in the 5-Year CIP to assess and rehabilitate the Secondary and Nitrification clarifiers and replace the clarifier mechanisms, as needed. Improvement needs for this asset will be addressed as part of that work.
Disinfection Building	44	No	No	-	
Sulfur Dioxide Building	45	No	No	-	
Treated Backwash Pump Station	46	No	No	-	
Tertiary Blower Building	47	Yes	No	-	Improvement needs will be evaluated and considered in the next CIP planning cycle.
East Primary Clarifiers 1	48	Yes	Yes	See remarks	\$12.4M has been allocated in the 5-year CIP to rehabilitate the clarifiers and replace the clarifier mechanisms with stainless steel components. Improvement needs for this asset will be addressed as part of that work.

Table E1 Project Prioritization San José/Santa Clara Water Pollution Control Plant Master Plan City of San José					
Asset/Project⁽¹⁾	Risk Ranking⁽¹⁾	Included in Recommended 5 Year CIP⁽¹⁾	Included in Actual 5 Year CIP⁽²⁾	Cost Included in Actual 5 Year CIP⁽²⁾	Remarks⁽²⁾
East Primary Clarifiers 2	49	Yes	Yes	See remarks	\$12.4M has been allocated in the 5-year CIP to rehabilitate the clarifiers and replace the clarifier mechanisms with stainless steel components. Improvement needs for this asset will be addressed as part of that work.
Scum Pump Station 1	50	No	No	-	
Scum Pump Station 2	51	No	No	-	
Nitrification Tanks A and B Sides (1975)	52	Yes	Yes	See remarks	Actual 5-year CIP includes projects to replace the valves and operators on the RAS lines and air lines that feed the tanks. Some of the improvements identified in the ICA report were awarded this fiscal year. This includes adding a gate and replacing piping and valves along influent and mixed liquor channels (approx. \$2M).
Nitrification Tanks A and B Sides (1984)	53	No	Yes	See remarks	Actual 5-year CIP includes projects to replace the valves and operators on the RAS lines and air lines that feed the tanks. Some of the improvements identified in the ICA report were awarded this fiscal year. This includes adding a gate and replacing piping and valves along influent and mixed liquor channels (approx. \$2M).
Secondary Treatment Aeration Tanks A	54	Yes	Yes	See remarks	There are ongoing maintenance work to rehabilitate concrete, replace piping and valves, etc.

Table E1 Project Prioritization San José/Santa Clara Water Pollution Control Plant Master Plan City of San José					
Asset/Project⁽¹⁾	Risk Ranking⁽¹⁾	Included in Recommended 5 Year CIP⁽¹⁾	Included in Actual 5 Year CIP⁽²⁾	Cost Included in Actual 5 Year CIP⁽²⁾	Remarks⁽²⁾
Secondary Treatment Aeration Tanks B	55	Yes	Yes	See remarks	There are ongoing maintenance work to rehabilitate concrete, replace piping and valves, etc.
RSM Operations Center	56	No	No	-	
Sludge Concentration Tanks	57	No	No	-	
Backwash Equalization	58	No	No	-	
Stormwater and Flood Protection Facilities	59	No	No	-	
Inactive Lagoons 5-25	60	Yes	No	-	On hold pending completion of the Plant Master Plan
Scum Handling	61	No	No	-	
Plant Storage Facility	62	No	No	-	
Ammonia System	63	No	No	-	
Hypochlorite and Bisulfite Facility	64	Yes	No	-	Project was awarded for construction this fiscal year; bid price was \$7.7M.

Table E1 Project Prioritization San José/Santa Clara Water Pollution Control Plant Master Plan City of San José					
Asset/Project⁽¹⁾	Risk Ranking⁽¹⁾	Included in Recommended 5 Year CIP⁽¹⁾	Included in Actual 5 Year CIP⁽²⁾	Cost Included in Actual 5 Year CIP⁽²⁾	Remarks⁽²⁾
Aeration Building 1	65	No	No	-	
Aeration Building 2	66	No	No	-	
Northeast Pump Station	67	No	No	-	
Bar Screens	68	No	Yes	See remarks	\$5M is allocated in the 5-Year CIP to begin addressing improvement needs for the old headworks. Improvement needs for this asset will be addressed as part of that work.
Recycled Water Fill Station	69	No	No	-	
Civil Infrastructure	70	No	No	-	
Notes: (1) Infrastructure Condition Assessment Report by CH2M Hill, May 2007, Table 16-2. (2) Per City Staff.					

Project Memorandum No. 5
APPENDIX F - S CURVE

Project Memorandum No. 5
APPENDIX F - S CURVE

Project Duration (Years)	Proportion of Project Cost Spent in Years											Total
	0	1	2	3	4	5	6	7	8	9	10	
1	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
2	0%	30%	70%	0%	0%	0%	0%	0%	0%	0%	0%	100%
3	0%	10%	45%	45%	0%	0%	0%	0%	0%	0%	0%	100%
4	0%	10%	35%	35%	20%	0%	0%	0%	0%	0%	0%	100%
5	0%	1%	9%	35%	35%	20%	0%	0%	0%	0%	0%	100%
6	0%	1%	1%	8%	35%	35%	20%	0%	0%	0%	0%	100%
7	0%	1%	2%	7%	20%	30%	25%	15%	0%	0%	0%	100%
8	0%	1%	2%	7%	10%	15%	25%	25%	15%	0%	0%	100%
9	0%	1%	2%	5%	7%	10%	15%	25%	20%	15%	0%	100%
10	0%	1%	1%	2%	5%	7%	12%	15%	22%	20%	15%	100%

APPENDIX G - ANNUAL R&R FORECAST

