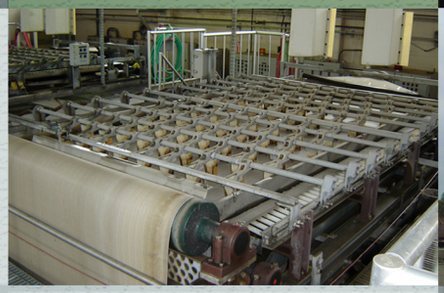
FINAL • AUGUST 2011

CITY OF STOCKTON

Regional Wastewater Control Facility

CAPITAL IMPROVEMENT and ENERGY MANAGEMENT PLAN



carollo

Engineers...Working Wonders With Water®

st711r1.psd

City of Stockton

CAPITAL IMPROVEMENT AND ENERGY MANAGEMENT PLAN

August 2011

carollo
Engineers...Working Wonders With Water™

2700 YGNACIO VALLEY ROAD • SUITE 300 • WALNUT CREEK, CALIFORNIA 94598 • (925) 932-1710 • FAX (925) 930-0208
pw://Carollo/Documents/Client/CA/Stockton/8581A00/Deliverables/CovTOC

CITY OF STOCKTON

CAPITAL IMPROVEMENT AND ENERGY MANAGEMENT PLAN

TABLE OF CONTENTS

Page No.

EXECUTIVE SUMMARY ES-1

DESCRIPTION OF THE REGIONAL WASTEWATER CONTROL FACILITY ES-1
PURPOSE OF THE NEW CAPITAL IMPROVEMENT PLAN ES-1
CONDITION OF THE EXISTING RWCF ES-3
REHABILITATION VERSUS CONSTRUCTION OF NEW FACILITIES ES-3
ALLOWANCES FOR FUTURE CITY GROWTH ES-4
PLANNING FOR POTENTIAL DISCHARGE PERMIT CHANGES ES-8
Nitrogen ES-8
Chlorine Disinfection Byproducts ES-8
Salinity ES-9
ENERGY MANAGEMENT PLAN ES-9
Current Power Usage ES-9
Energy Saving Opportunities ES-10
Energy Management Plan Recommendations ES-10
RECOMMENDED CAPITAL IMPROVEMENTS – IMMEDIATE AND NEAR-TERM PROJECTS ES-11
POTENTIAL FUTURE PROJECTS ES-13
PROJECT PHASING AND IMPLEMENTATION PLAN ES-13

CHAPTER 1 - INTRODUCTION 1-1

1.1 PURPOSE 1-1
1.2 BACKGROUND 1-1
1.3 CIP SCOPE 1-4
1.4 ACKNOWLEGEMENTS 1-6
1.5 GLOSSARY OF ABBREVIATIONS 1-7

CHAPTER 2 - PROJECTED WASTEWATER FLOWS AND LOADS 2-1

2.1 INTRODUCTION 2-1
2.2 POPULATION PROJECTIONS 2-1
2.2.1 Past Population Growth Rate Projections 2-2
2.2.2 Population Projections 2-2
2.3 HISTORICAL WASTEWATER FLOWS AND LOADS 2-6
2.3.1 Per Capita Wastewater Flows 2-6
2.3.2 Maximum Month Flow Peaking Factors 2-6
2.3.3 Per Capita Wastewater Loads 2-6
2.3.4 Maximum Month Load Peaking Factors 2-9
2.3.5 Historical Industrial Flows and Loads 2-9
2.4 PROJECTED WASTEWATER FLOWS AND LOADS 2-11
2.4.1 Approach to Flow and Load Projections 2-11
2.4.2 Projected Wastewater Flows 2-12
2.4.3 Projected Wastewater Loads 2-12
2.5 DIURNAL INFLUENT FLOW PATTERN 2-12

2.5.1 Diurnal Peaking Factors 2-14
2.6 WET WEATHER FLOW ANALYSIS 2-14
2.7 SUMMARY OF FLOW AND LOAD DESIGN CRITERIA 2-16

CHAPTER 3 - REGULATORY REQUIREMENTS 3-1

3.1 INTRODUCTION 3-1
3.2 WATER QUALITY REQUIREMENTS 3-1
3.2.1 Beneficial Uses of Receiving Waters (San Joaquin River) 3-1
3.3 CURRENT NPDES PERMIT 3-4
3.4 COMPLIANCE STRATEGIES OVERVIEW 3-4
3.5 KEY ISSUES 3-5
3.5.1 Dilution Credits 3-5
3.5.2 Groundwater Monitoring 3-6
3.5.3 Emerging Contaminants 3-6
3.5.4 Basin Plan Updates 3-7
3.5.5 State and Federal Bay-Delta Programs 3-7
3.5.6 Selenium Fish Tissue Criteria 3-7
3.6 WATER QUALITY BASED EFFLUENT LIMITS 3-7
3.6.1 Aluminum 3-7
3.6.2 Ammonia 3-10
3.6.3 Bis(2-ethylhexyl)phthalate 3-10
3.6.4 Chlorine Residual 3-11
3.6.5 Cyanide 3-11
3.6.6 Dissolved Oxygen (DO) 3-11
3.6.7 Electrical Conductivity (Salinity) 3-12
3.6.8 Manganese 3-12
3.6.9 Mercury 3-13
3.6.10 Molybdenum 3-14
3.6.11 Nitrate Plus Nitrite (Total Nitrogen) 3-14
3.6.12 Pathogens 3-15
3.6.13 pH 3-16
3.6.14 Settleable Solids 3-16
3.6.15 Temperature 3-17
3.6.16 Trihalomethanes (THMs) 3-17
3.7 CURRENT AND FUTURE REGULATORY COMPLIANCE STRATEGIES 3-18
3.7.1 Disinfection Byproducts 3-20
3.7.2 Ammonia 3-21
3.7.3 Salinity 3-22
3.7.4 Total Nitrogen 3-23
3.8 CURRENT AIR QUALITY REQUIREMENTS 3-24
3.9 FUTURE AIR QUALITY REQUIREMENTS 3-25

CHAPTER 4 - EVALUATION OF EXISTING FACILITIES 4-1

4.1 REGIONAL WASTEWATER CONTROL FACILITY OVERVIEW 4-1
4.2 PRELIMINARY TREATMENT 4-1
4.2.1 Headworks 4-1
4.2.2 Raw Sewage Pump Station 4-12
4.3 PRIMARY TREATMENT 4-16
4.3.1 Primary Clarifiers 4-16
4.4 SECONDARY TREATMENT 4-21
4.4.1 Secondary Biotowers 4-21
4.4.2 Secondary Clarifiers 4-27
4.4.3 Secondary Effluent Pumping 4-29
4.4.4 Oxidation Ponds 4-30
4.5 TERTIARY TREATMENT 4-33
4.5.1 Wetlands 4-33
4.5.2 Nitrifying Biotowers (NBTs) 4-38
4.5.3 Dissolved Air Flotation Thickeners (DAFs) 4-42
4.5.4 Tertiary Filters 4-44
4.5.5 Disinfection 4-47
4.6 SOLIDS HANDLING 4-52
4.6.1 Gravity Thickeners 4-52
4.6.2 Gravity Belt Thickeners 4-54
4.6.3 Anaerobic Digesters 4-56
4.6.4 Sludge Storage Lagoon 4-59
4.6.5 Belt Press Dewatering 4-60
4.7 SUMMARY OF TREATMENT CAPACITIES 4-66

CHAPTER 5 - ALTERNATIVES FOR AMMONIA AND NITROGEN REMOVAL 5-1

5.1 THE NEED TO EVALUATE ALTERNATIVE TREATMENT SCHEMES 5-1
5.2 EXISTING TREATMENT PROCESS DEFICIENCIES 5-2
5.3 PLANNING ASSUMPTIONS 5-2
5.4 ALTERNATIVE SECONDARY TREATMENT PROCESS SCHEMES 5-3
5.4.1 Alternative 1 – Rehabilitate Existing Processes, Convert Wetlands for Denitrification and Add Denitrification Filters if Necessary 5-3
5.4.2 Alternative 2 –Trickling Filter/Solids Contact Process to Replace NBTs 5-7
5.4.3 Alternative 3 - Replace Secondary Biotowers and NBTs with Activated Sludge Process 5-7
5.5 COST COMPARISON 5-14
5.6 QUALITATIVE COMPARISON 5-16
5.7 RECOMMENDATIONS 5-17

CHAPTER 6 - STRUCTURAL CONDITION ASSESSMENT 6-1

6.1 INTRODUCTION 6-1
6.2 SCOPE OF CONDITION ASSESSMENT 6-1
6.3 FINDINGS 6-4
6.3.1 Secondary Biotowers 6-4
6.3.2 Digesters A, B, and C 6-10
6.3.3 Headworks 6-13
6.3.4 Administration Building 6-17
6.3.5 Operations and Maintenance Building 6-18
6.3.6 Gravity Thickeners 6-22

6.3.7 Dewatering Building 6-27
6.3.8 Primary Clarifiers 6-29
6.3.9 Tertiary Filters 6-33

CHAPTER 7 - OPERATIONS SUPPORT FACILITIES ASSESSMENT 7-1

7.1 INTRODUCTION 7-1
7.2 ADMINISTRATION BUILDING 7-1
7.3 MAINTENANCE AND COLLECTION BUILDING 7-4
7.4 OPERATIONS BUILDING 7-5
7.5 TERTIARY SUPPORT BUILDING 7-7

CHAPTER 8 - SITE PLANNING 8-1

8.1 INTRODUCTION 8-1
8.2 BASE MAPPING AND AERIAL SURVEY 8-1
8.3 SITE SECURITY RECOMMENDATIONS 8-1
8.3.1 Vulnerabilities 8-4
8.3.2 Recommended Security Improvements 8-6
8.4 FLOOD PROTECTION EVALUATION 8-6
8.4.1 Flooding Scenarios 8-6
8.4.2 Collection System Flooding 8-8
8.4.3 Overland Breech 8-8
8.4.4 Analysis by Siegfried Engineering Inc. (SEI) 8-17
8.4.5 Cost Estimates for CIP 8-18
8.5 SITE ACCESS CONSIDERATIONS 8-18
8.5.1 Future Plans for State Route 4 8-19

CHAPTER 9 - CURRENT ENERGY DEMAND AND EXISTING COGENERATION FACILITIES 9-1

9.1 INTRODUCTION 9-1
9.2 CURRENT ENERGY DEMAND 9-1
9.3 EXISTING COGENERATION FACILITY 9-1
9.3.1 Estimated Digester Gas Production 9-7
9.3.2 Condition Assessment 9-7
9.3.3 Recommended Improvements 9-9

CHAPTER 10 - ALTERNATIVES TO INCREASE BIOGAS PRODUCTION 10-1

10.1 INTRODUCTION 10-1
10.2 FATS, OILS AND GREASE DIGESTION EVALUATION 10-1
10.2.1 FOG Digestion Capacity Analysis 10-2
10.2.2 Biogas and Electricity Production 10-3
10.2.3 Digestibility and Sludge Disposal 10-3
10.2.4 Economic Feasibility 10-4
10.2.5 Recommendation 10-4
10.3 FOOD WASTE DIGESTION 10-4
10.4 ALGAE BIOFUELS 10-5
10.4.1 Algae Digestion 10-5
10.4.2 Algae Biodiesel 10-9

CHAPTER 11 - EVALUATION OF COGENERATION AND BIOGAS UTILIZATION ALTERNATIVES 11-1

11.1 INTRODUCTION 11-1
11.2 DESCRIPTION OF BIOGAS UTILIZATION ALTERNATIVES 11-1
11.2.1 Alternative 1 - Base condition: Continue with existing cogeneration system with new emissions controls added when required. 11-1
11.2.2 Alternative 2: Combination of 1.4 MW Fuel Cells and Existing Engines ... 11-2
11.2.3 Alternative 3: Abandon Engine Generators and Sell Biogas Off-Site 11-5
11.2.4 Alternative 4: Abandon Engine Generators and Sell Biogas to PG&E 11-5
11.3 BIOGAS UTILIZATION ALTERNATIVES EVALUATION 11-5
11.3.1 Power Production Costs 11-5
11.3.2 Emissions 11-7
11.3.3 Recommendations 11-7

CHAPTER 12 - ENERGY EFFICIENCY MEASURES 12-1

12.1 INTRODUCTION 12-1
12.2 RECOMMENDED ENERGY EFFICIENCY MEASURES 12-1
12.2.1 EEM No. 1: Reduce Discharge Pressure of Tertiary System Air Compressors 12-3
12.2.2 EEM No. 2: Install Premium Efficiency Motors on a Replacement Basis . 12-4
12.2.3 EEM No. 3: Replace Existing HID Fixtures with High Efficiency Fluorescent Fixtures 12-6
12.2.4 EEM No. 4: Install Automatic Lighting Controls 12-8
12.2.5 EEM No. 5: Replace Tertiary Air Compressor No. 2 with a VSD Air Compressor 12-10
12.2.6 EEM No. 6: Install Higher Efficiency DAF Pressurization Pumps 12-11
12.2.7 EEM No. 7: Replace Existing Outdoor HID Lighting with LED Lighting .. 12-12
12.3 ENERGY EFFICIENCY MEASURES NOT RECOMMENDED 12-14

CHAPTER 13 - ENERGY MANAGEMENT AND CONTROL SYSTEMS 13-1

CHAPTER 14 - DEMAND RESPONSE MEASURES 14-1

14.1 DEMAND REDUCTION OPPORTUNITIES 14-1
14.2 AVAILABLE DEMAND RESPONSE PROGRAMS 14-2
14.3 DEMAND RESPONSE PROGRAM EVALUATION 14-4

CHAPTER 15 - SOLAR POWER WITH PV CELLS 15-2

15.1 INTRODUCTION 15-2
15.2 SOLAR PV SYSTEM ANALYSIS 15-2
15.3 FINANCIAL ANALYSIS 15-3
15.4 SOLAR POWER AT DELTA WATER SUPPLY PROJECT (DWSP) 15-4
15.5 RECOMMENDATIONS 15-4

CHAPTER 16 - WIND ENERGY 16-1

16.1 INTRODUCTION 16-1
16.2 WIND RESOURCE 16-1
16.3 POTENTIAL TURBINE OUTPUT 16-1
16.4 POTENTIAL WIND TURBINE LOCATIONS 16-3
16.4.1 RWCF Wind Turbine Sites 16-3

16.4.2 DWSP Wind Turbine Sites 16-3
16.5 WIND ENERGY ECONOMICS 16-3
16.6 SPECIAL ENVIRONMENTAL CONSIDERATIONS 16-5
16.6.1 Potential Bird Impacts 16-5
16.6.2 Visual Impacts 16-6

CHAPTER 17 - ENERGY PROJECT FUNDING AND FINANCING 17-1

17.1 ENERGY PROJECT GRANTS 17-1
17.1.1 "1603" Federal Tax Grant Program 17-1
17.1.2 The California Solar Initiative (CSI) 17-1
17.1.3 Self Generation Incentive Program 17-3
17.1.4 PG&E Programs 17-5
17.1.5 Energy Efficiency and Conservation Block Grant Program 17-10
17.1.6 Competitive Energy Grants 17-11
17.2 DEBT PROGRAMS FOR ENERGY PROJECTS 17-11
17.3 PUBLIC PRIVATE PARTNERSHIPS 17-13
17.3.1 Power Purchase Agreement (PPA) Providers 17-13
17.3.2 Energy Service Companies (ESCOs) 17-14
17.3.3 Private Sector Owned Projects on City Property 17-14
17.4 RECOMMENDED FUNDING SOURCES 17-15

CHAPTER 18 - ENERGY MANAGEMENT PLAN RECOMMENDATIONS 18-1

18.1 ENERGY MANAGEMENT GOALS 18-1
18.2 RECOMMENDATIONS: NEAR-TERM PROJECTS 18-1
18.3 RECOMMENDATIONS: DEFERRED PROJECTS 18-3
18.4 PROJECT DESCRIPTIONS 18-3
18.4.1 Cogeneration System 18-3
18.4.2 Fats, Oil and Grease (FOG) System 18-4
18.4.3 Energy Efficiency Measures 18-5
18.4.4 Energy Management System 18-6
18.4.5 Demand Response Program 18-6

CHAPTER 19 - CIP SUMMARY AND IMPLEMENTATION PLAN 19-1

19.1 INTRODUCTION 19-1
19.2 COST ESTIMATING FOR RECOMMENDED IMPROVEMENTS 19-1
19.2.1 Basis for Cost Estimating 19-1
19.2.2 Summary of Costs 19-2
19.3 PROJECT IMPLEMENTATION PLAN 19-2
19.3.1 Recommended CIP Project Phases 19-2
19.3.2 Implementation Plan 19-3
19.3.3 Single Contract Versus Multiple Contracts for Phase 2 19-4
19.3.4 Recommendations for Packaging Phase 2 19-5
19.3.5 List of Recommended CIP Projects 19-5
Phase 1: Immediate Projects 19-5
Phase 2A: Near-Term Projects at Main Plant 19-16
Phase 2B: Near-Term Projects at Tertiary Plant 19-20
Phase 2C: Near-Term Projects – Operations Support Facilities 19-21
Long-Term Projects 19-21
Future Permit Compliance Projects 19-22
Deferred Energy Projects 19-23

LIST OF APPENDICES

A NPDES Permit
B Title V Air Permit
C Existing Facilities Design Criteria
D Operations Support Facilities Detailed Reports
E Site Security Detailed Report (Confidential – Not Distributed)
F Flood Evaluations
G Energy Efficiency Measures Detailed Report
H Solar Power Detailed Report
I Current City CIP Projects List
J Capital Improvement and Energy Management Plan Comments

LIST OF TABLES

Table ES.1 Estimated Cost Savings from Energy Projects ES-12
Table ES.2 Recommended Capital Improvement Projects – Immediate and Near-Term ES-17
Table ES.3 Immediate and Near-Term CIP Projects by Purpose Category ES-20
Table ES.4 Recommended Capital Improvement Projects – Contingency for Future Projects ES-22
Table 2.1 Comparison of Recent Population Growth Rate Projections 2-4
Table 2.2 Historical and Projected City Population 2-5
Table 2.3 Historical Average Annual Flows, Loads, and Concentrations 2-7
Table 2.4 Historical Maximum Month Flow and Load Peaking Factors 2-8
Table 2.5 Industrial Flows and Loads (2009 Summary) 2-10
Table 2.6 Projected Average Annual and Maximum Month Flows and Loads 2-13
Table 2.7 Summary of Design Wastewater Flows and Loads 2-17
Table 3.1 Effluent Limitations for 2008 NPDES Permit 3-2
Table 3.2 Effluent Concentrations for Water Quality Pollutants 3-8
Table 3.3 Proposed Strategy for Potential Future Permit Compliance 3-19
Table 3.4 SJAPCD Emission Standards 3-26
Table 4.1 Headworks Alternatives Evaluation 4-7
Table 4.2 Raw Sewage Pump Station Design Criteria 4-13
Table 4.3 Primary Clarifier Capacity Evaluation – Current Conditions 4-17
Table 4.4 Primary Clarifier Capacity Evaluation – Projected Conditions 4-19
Table 4.5 Secondary Biotower Capacity Evaluation – Current Conditions 4-23
Table 4.6 Secondary Biotower Capacity Evaluation – Projected Conditions 4-26
Table 4.7 Secondary Clarifier Capacity Evaluation – Current Conditions 4-27
Table 4.8 Secondary Clarifier Capacity Evaluation – Projected Conditions 4-28
Table 4.9 Oxidation Pond Capacity Evaluation – Current and Projected Conditions 4-31
Table 4.10 DAF Capacity Evaluation – Current Conditions 4-43
Table 4.11 DAF Capacity Evaluation – Projected Conditions 4-44
Table 4.12 Tertiary Filter Capacity Evaluation – Current Conditions 4-45
Table 4.13 Tertiary Filter Capacity Evaluation – Projected Conditions 4-46
Table 4.14 Disinfection Alternatives Life Cycle Economic Analysis 4-51
Table 4.15 Gravity Thickener Capacity Evaluation – Current Conditions 4-52
Table 4.16 Gravity Thickener Capacity Evaluation – Projected Conditions 4-53
Table 4.17 Gravity Belt Thickener Capacity Evaluation – Current Conditions 4-55

Table 4.18 Gravity Belt Thickener Capacity Evaluation – Projected Conditions 4-56
Table 4.19 Anaerobic Digester Capacity Evaluation – Current Conditions 4-57
Table 4.20 Anaerobic Digester Capacity Evaluation – Projected Conditions 4-58
Table 4.21 Belt Filter Press Capacity Evaluation – Current Conditions..... 4-61
Table 4.22 Belt Filter Press Capacity Evaluation – Projected Conditions 4-62
Table 4.23 Assumptions for Dewatering Evaluation 4-64
Table 4.24 Economic Comparison of Dewatering Technologies 4-65
Table 4.25 Existing Facilities Treatment Capacity Rating 4-67
Table 5.1 Design Criteria for Treatment Alternative 2 – Trickling Filter/Solids Contact Process 5-10
Table 5.2 Design Criteria for Treatment Alternative 3 – Activated Sludge Process . 5-13
Table 5.3 Comparison of Capital Costs for Alternative Treatment Schemes to Achieve Biological Nutrient Removal..... 5-14
Table 5.4 Annual Operations and Maintenance Costs for Alternative Treatment Schemes to Achieve Biological Nutrient Removal..... 5-15
Table 5.5 Present Worth Analysis for Alternative Treatment Schemes to Achieve Biological Nutrient Removal..... 5-15
Table 5.6 Advantages and Disadvantages of Alternative Secondary Treatment Schemes..... 5-16
Table 8.1 Explanation of Risk Evaluation 8-4
Table 8.2 Summary of Security Vulnerabilities 8-5
Table 8.3 Overview of Vulnerabilities and Recommended Safeguards..... 8-7
Table 8.4 Conceptual Flood Protection Recommendations Budgetary Estimate 8-18
Table 9.1 Historical PG&E Electrical Energy Usage and Costs Summary 9-2
Table 9.2 Historical Cogeneration Energy Summary..... 9-2
Table 9.3 Historical Natural Gas Energy and Costs Summary..... 9-3
Table 9.4 Projected Digester Gas Production 9-8
Table 10.1 FOG Receiving Station Payback Calculation 10-4
Table 10.2 Comparison of Oil Yields 10-9
Table 11.1 Recent Fuel Cell Installations 11-4
Table 11.2 Evaluation of Biogas Utilization Alternatives to Supply Total Power to the RWCF 11-6
Table 11.3 Estimated 20-Year Average Emissions for Biogas Utilization Alternatives 11-8
Table 11.4 Non-Economic Factors for Biogas Utilization Alternatives Evaluation..... 11-9
Table 12.1 Energy Efficiency Measure Summary..... 12-2
Table 12.2 Cost Savings and Implementation Cost to Install Premium Efficiency Motors..... 12-5
Table 12.3 Energy Efficiency Measure No. 2 Two Year Incremental Summary..... 12-6
Table 12.4 Electrical Energy and Demand Savings by Replacing Light Fixtures 12-7
Table 12.5 Implementation Costs for Replacing Light Fixtures 12-8
Table 12.6 Implementation Costs for Automated Lighting Controls 12-9
Table 12.7 Implementation Costs for Tertiary Air Compressor Replacement 12-11
Table 12.8 Implementation Costs for DAF Pressurization Pump Replacements 12-12
Table 12.9 Other Energy Efficiency Measures Considered..... 12-14
Table 14.1 Benefit / Risk Comparison of PG&E's Demand Response Programs 14-3
Table 14.2 Benefit / Risk Comparison of Third Party Demand Response Programs . 14-4
Table 14.3 Expected PG&E Electrical Loads During Demand Response Events 14-6
Table 15.1 Solar PV Sites and Capacity..... 15-3
Table 16.1 Estimated Wind Turbine Capacity Factors at RWCF..... 16-2
Table 16.2 Anticipated Wind Turbine Capacity Factors at DWSP..... 16-3

Table 16.3 Preliminary Economic Analysis of a Single Wind Turbine at the RWCF .. 16-5
Table 17.1 California Solar Initiative (CSI) ... 17-2
Table 17.2 CSI Step table: CSI Rebate Levels by Incentive Step and Rebate Type . 17-3
Table 17.3 SGIP Incentive Amounts (2010) ... 17-4
Table 17.4 Energy Efficiency Measures Eligible for 2010 Retrofit Incentives ... 17-7
Table 17.5 2010 Energy Efficiency Rebates ... 17-8
Table 17.6 Debt Funding Sources for Energy Projects ... 17-12
Table 17.7 Recommended Grant Funding Sources ... 17-15
Table 17.8 Recommended Loan Funding Sources for City Financed Projects ... 17-15
Table 18.1 Power Production from Recommended Near-Term and Deferred Energy Projects ... 18-2
Table 18.2 Cost Analysis for Recommended Near-Term and Deferred Energy Projects ... 18-2
Table 19.1 Advantages/Disadvantages of Multiple Contract Versus Single Contract Approach for Phase 2 ... 19-5
Table 19.2 Recommended Capital Improvement Projects ... 19-6

LIST OF FIGURES

Figure ES.1 Existing RWCF Process Flow Diagram ... ES-2
Figure ES.2 Influent Flow Projections ... ES-5
Figure ES.3 CIP Plan Overview ... ES-6
Figure ES.4 Main Plant Improvements ... ES-7
Figure ES.5 Tertiary Plant Improvements ... ES-14
Figure ES.6 CIP Breakdown By Category ... ES-15
Figure ES.7 Recommended Implementation Schedule ... ES-16
Figure ES.8 CIP Projects Breakdown ... ES-21
Figure ES.9 Implementation Schedule ... ES-23
Figure 2.1 Population Projections ... 2-3
Figure 2.2 Industrial Flows and Loads Trends for 2009 ... 2-9
Figure 2.3 Influent Flow Trends ... 2-11
Figure 2.4 Influent Flow Projections ... 2-12
Figure 2.5 Typical Diurnal Flow Pattern ... 2-14
Figure 2.6 Wet Weather Hydrograph ... 2-15
Figure 2.7 Summary of Projected Influent Flows ... 2-16
Figure 3.1 Effluent Trihalomethane Concentrations ... 3-20
Figure 3.2 Temperature Effects on NBT Ammonia Removal ... 3-22
Figure 3.3 Seasonal Nitrate Removal in Denitrification Wetlands ... 3-23
Figure 4.1 Existing Facilities Process Flow Schematic ... 4-2
Figure 4.2 3-D Rendering of Existing Headworks ... 4-4
Figure 4.3 Original Influent Pump Station Suction Configuration ... 4-14
Figure 4.4 1962 Modifications to Influent Station Suction Pipes ... 4-15
Figure 4.5 Rendering of Primary Clarifier Covers ... 4-20
Figure 4.6 Rendering of Primary Clarifier Covers from another Perspective ... 4-20
Figure 4.7 Exterior of a Secondary Biotower ... 4-21
Figure 4.8 Existing vertical flow media ... 4-22
Figure 4.9 Tertiary Wetlands ... 4-33
Figure 4.10 Seasonal Nitrate Removal in Denitrification Wetlands ... 4-35
Figure 4.11 Channel Cut Along Levee (Resulting in Short Circuiting) ... 4-36
Figure 4.12 Schematic of Wetlands/NBT Flow Reconfiguration ... 4-37

Figure 4.13 NBT Performance 4-39
Figure 4.14 FKC Screw Press at the Sausalito-Marin City Sanitation District 4-64
Figure 4.15 Schematic of Wetlands/NBT Flow Reconfiguration 4-70
Figure 4.16 Schematic of Wetlands/NBT Flow Reconfiguration 4-71
Figure 5.1 Alternative 1 Process Flow Diagram 5-4
Figure 5.2 Treatment Alternative 1 Improvements Map 5-5
Figure 5.3 Alternative 2 Process Flow Diagram 5-8
Figure 5.4 Treatment Alternative 2 improvements Map 5-9
Figure 5.5 Alternative 3 Process Flow Diagram 5-11
Figure 5.6 Treatment Alternative 3 Improvements Map 5-12
Figure 6.1 Main Plant Structural Evaluations 6-2
Figure 6.2 Tertiary Plant Structural Evaluations 6-3
Figure 6.3 Secondary Biotowers Structural Observations 6-5
Figure 6.4 Secondary Biotowers Horizontal Concrete Band Cracking and Spalling 6-6
Figure 6.5 Secondary Biotower No. 4 Horizontal Gap 6-8
Figure 6.6 Abandoned Rock Filter Connection 6-9
Figure 6.7 Digesters A, B, and C Structural Observations 6-11
Figure 6.8 Headworks Structural Observations 6-14
Figure 6.9 Spalling at Base of South Wall in North Section of Headworks 6-16
Figure 6.10 Administration Building Structural Observations 6-19
Figure 6.11 Operations and Maintenance Building Structural Observations 6-20
Figure 6.12 Gravity Thickeners Structural Observations 6-23
Figure 6.13 Gravity Thickener No.1 Concrete Launder Deterioration 6-24
Figure 6.14 Gravity Thickener No.2 Patterned Checking of Concrete Wall 6-26
Figure 6.15 Dewatering Building Structural Observations 6-28
Figure 6.16 Primary Clarifiers Structural Observations 6-30
Figure 6.17 Corrosion of Primary Clarifier Nos. 5 and 6 Mechanisms 6-31
Figure 6.18 Tertiary Filters Above-Grade Structural Observation 6-34
Figure 6.19 Tertiary Filters Below-Grade Structural Observations 6-35
Figure 7.1 Conceptual Floor Plan and Rendering for Administration Building Expansion 7-2
Figure 7.2 Conceptual Floor Plan and Rendering for New Laboratory Building 7-3
Figure 7.3 Conceptual Floor Plan for Maintenance and Collection Building Expansion 7-6
Figure 7.4 Conceptual Floor Plan for Operations Building Accessibility Improvements 7-8
Figure 7.5 Conceptual Floor Plan for Tertiary Support Building Improvements 7-9
Figure 8.1 Main Plant Topographic Map 8-2
Figure 8.2 Tertiary Plant Topographic Map 8-3
Figure 8.3 Main Plant High Flood Wall Detail 8-9
Figure 8.4 Main Plant Low Flood Wall Detail 8-11
Figure 8.5 Main Plant New Levee Detail 8-12
Figure 8.6 Main Plant Existing Levee Improvements Detail 8-13
Figure 8.7 Pond Embankment Modifications Detail 8-14
Figure 8.8 Tertiary Plant Existing Levee Improvements Detail 8-15
Figure 8.9 Tertiary Plant Low Flood Wall Detail 8-16
Figure 9.1 Monthly Electrical Energy Consumption by Source 9-4
Figure 9.2 Annual PG&E Electrical Costs 9-4
Figure 9.3 Annual Natural Gas Energy Consumption 9-5
Figure 9.4 Annual Natural Gas Costs by Source 9-5
Figure 9.5 Percentage of Annual Electrical Energy by Source 9-6

Figure 9.6 Percentage of Electrical Energy Consumption by Function 9-6
Figure 10.1 3-D Rendering of a 10,000-gallon FOG Receiving Station 10-2
Figure 14.1 Cogeneration Electrical Output Performance During One Year 14-5
Figure 14.2 Net Benefits versus Number of Annual Demand Response Events (without emergency generator) 14-6
Figure 14.3 Net Benefits versus Number of Annual Demand Response Events (with emergency generator) 14-7
Figure 15.1 Potential Array Locations: RWCF 15-2
Figure 15.2 Delta Water Supply Project: Potential PV Cell Sites 15-5
Figure 16.1 Regional Map Showing the Meteorological Stations, RWCF, and DWSP Study Areas 16-2
Figure 16.2 Potential Wind Turbine Locations at the RWCF Site 16-4
Figure 16.3 Potential Wind Turbine Locations at the DWSP Site 16-4
Figure 16.4 Comparative Bird Kills Resulting From Various Human Activities 16-6
Figure 16.5 Rendering of a Wind Turbine at the RWCF Site 16-7
Figure 19.1 CIP Plan Overview 19-11
Figure 19.2 Main Plant Improvements 19-12
Figure 19.3 Tertiary Plant Improvements 19-13
Figure 19.4 Recommended Process Flow Diagram 19-14
Figure 19.5 Recommended Implementation Schedule 19-15

DESCRIPTION OF THE REGIONAL WASTEWATER CONTROL FACILITY

The City of Stockton (City), located in San Joaquin County, owns and operates its wastewater collection, treatment and disposal system. Through the Stockton Municipal Utilities Department (MUD), the City provides wastewater services to customers within the City boundaries, the Port of Stockton, and surrounding urbanized county areas. Wastewater treatment is provided at the Regional Wastewater Control Facility (RWCF), located adjacent to the San Joaquin River (SJR).

A diagram of the current RWCF treatment processes is shown in Figure ES.1. Wastewater treatment is provided in four basic steps:

1. Preliminary treatment: coarse screening to remove debris, and settling to remove grit (such as sand, rocks and other granular materials) to reduce wear on downstream equipment and prevent accumulation of grit in other process tanks.
2. Primary treatment: settling to remove a portion of the solids and organic matter.
3. Secondary treatment: biological reduction of organics and further removal of suspended solids from the primary effluent.
4. Tertiary treatment: biological reduction of ammonia, algae removal, filtration, and disinfection of the treated effluent prior to discharge to the SJR.

Solids are removed from the liquid stream by the primary and secondary treatment processes. The solids are processed further in three stages. First, the solids are stabilized in anaerobic digesters, which biologically reduce the organic content and volume of the solids. The water content of the digested solids is then reduced by passing them through belt filter presses. In the third step, the dewatered solids are trucked to an off-site landfill for final disposal.

The digesters also produce biogas (methane) as a byproduct of the biological process. The City's on-site cogeneration facility utilizes the biogas to produce electricity and heat for the RWCF. The cogeneration system currently produces one-third of the total power demands by utilizing biogas. Waste heat from the engines is used to heat the digesters.

PURPOSE OF THE NEW CAPITAL IMPROVEMENT PLAN

The most recent master plan for the RWCF was completed in 1999. Three major areas were addressed by the plan: expansion of treatment capacity to serve population growth, major process improvements to comply with anticipated discharge permit requirements, and improvements to the existing treatment facilities to maintain treatment reliability.

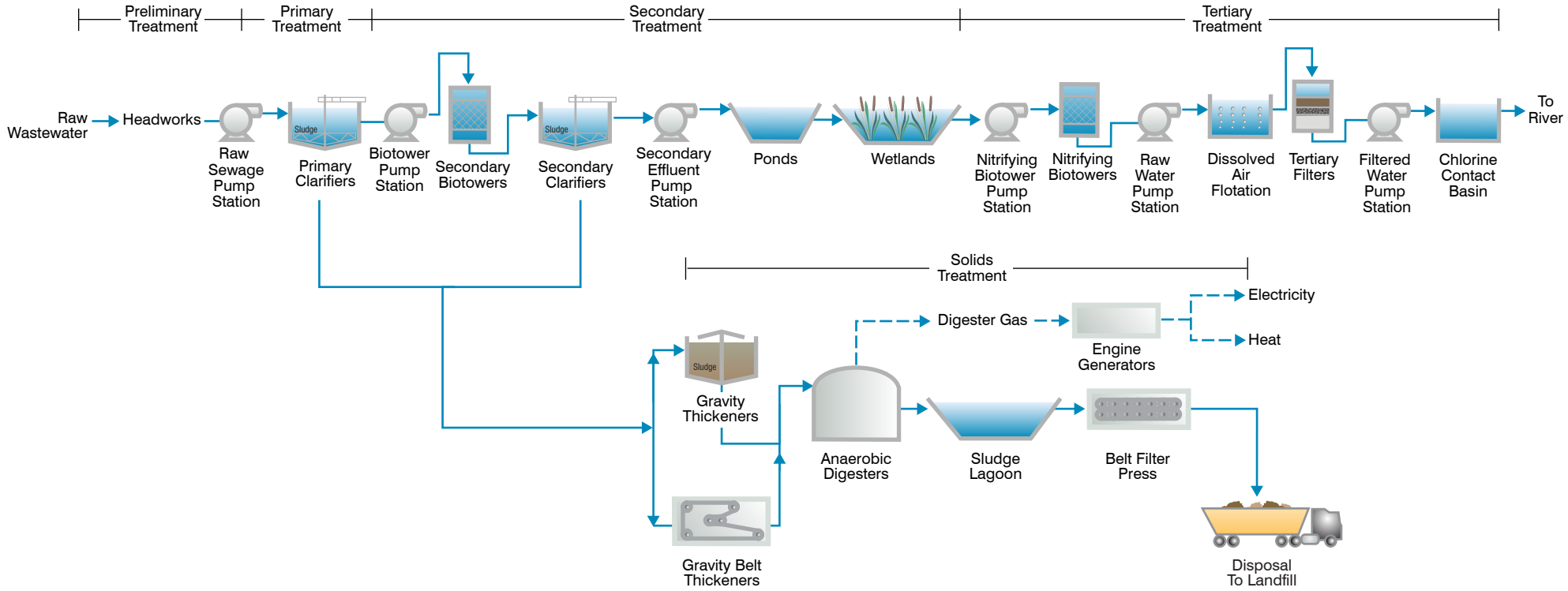


Figure ES.1
EXISTING RWCF PROCESS FLOW DIAGRAM
CAPITAL IMPROVEMENT AND ENERGY MANAGEMENT PLAN
CITY OF STOCKTON

stk411f47-8581.ai rev 4/18/11

Implementation of the 1999 master plan was postponed while the City considered the feasibility of outsourcing operations and maintenance for the RWCF. In 2003, the City elected to outsource operations of the RWCF and contracted with CH2MHill/OMI (OMI) for that purpose. Terms of the contract included operations and maintenance of the facilities and construction of RWCF improvements. OMI completed the improvements during the following five-year period. Then, in 2008, the City and OMI agreed to terminate the contract, and the City took back operation and maintenance of the RWCF.

Since resuming operation the City has been faced with a number of challenges. Some aging facilities still remain to be repaired or replaced, and some treatment process units are inefficient. Additionally, the most recent improvements did not address the likelihood of future discharge requirements and air permit limits. Major improvements to the RWCF would be required if more restrictive limits were adopted by the regulatory agencies.

To address these challenges, the City commissioned the Capital Improvement and Energy Management Plan (CIP). The primary goal of the plan is to identify, budget, and prioritize necessary improvements at the RWCF through the year 2035. The secondary objective is to identify energy development projects that will reduce energy costs and provide reliable renewable energy alternatives to the current utility provider.

CONDITION OF THE EXISTING RWCF

The original primary and secondary facilities for the RWCF were constructed in 1948. Secondary biotowers and secondary clarifiers were added in 1972, followed by the addition of tertiary facilities in 1976. The most recent upgrade was completed in 2007 under the OMI contract.

The condition assessment performed for this plan indicates that although many of the structures and equipment are beyond their typical life expectancies, most can be rehabilitated to provide reliable service through build out in 2035. However, some structures and process equipment are now obsolete and need to be replaced with technologies that are more effective.

REHABILITATION VERSUS CONSTRUCTION OF NEW FACILITIES

Given the advanced age of many of the RWCF facilities and the potential for more restrictive discharge permit limitations in the future, it would be reasonable to expect that replacing the preliminary and secondary treatment facilities with new facilities would be a viable approach. However, an evaluation performed for the CIP demonstrated that retaining the existing facilities is actually more economical than constructing new treatment facilities. Based on this evaluation, the recommended approach is to rehabilitate most of the existing facilities while replacing facilities that are obsolete.

Major rehabilitation/replacement projects in the CIP include:

- Headworks – new screens and grit removal system, new ground floor and building.
- Secondary Biotowers – replace media, distributor arms, ventilation system, and structural/seismic upgrades.
- Secondary Effluent PS – expand pumping capacity.
- Cold weather nitrifying biotower supply system – improve ammonia removal during extreme cold weather.
- Solids Dewatering – replace with new, more efficient, dewatering system.
- Anaerobic Digesters – rehabilitate Digesters A, B, and C, including new heating and mixing systems.
- Support Facilities – improve/expand operations support facilities.

In addition, several opportunities were identified to reduce or eliminate unnecessary treatment processes:

- Ammonia Removal – Reroute flow through nitrifying biotowers prior to wetlands treatment to achieve full ammonia removal in the biotowers rather than removing ammonia in the wetlands and the biotowers.
- Sludge Thickening – Thicken primary sludge in the primary clarifiers rather than using gravity thickeners and the gravity belt thickeners. This allows the oldest gravity thickener to be demolished.
- Sludge Transfer – Pump digested sludge directly to the solids dewatering system instead of pumping sludge to the dewatering system from the sludge lagoons with a dredge pump.

ALLOWANCES FOR FUTURE CITY GROWTH

Population projections presented in the CIP indicate that growth will be significantly less than estimated in the 1999 master plan. Wastewater flows have dropped during the current economic recession, and it is anticipated that it will take several years before wastewater flows begin to increase. The new flow projection (see Figure ES.2) for the current CIP indicates that wastewater flow in 2035 will reach 49.3 million gallons per day (mgd). The current permitted capacity of the RWCF is 55 mgd.

As shown in Figures ES.3 and ES.4, the CIP projects will increase the reliable capacity of the liquid and solid treatment process close to the permitted RWCF capacity of 55 mgd. These projects will improve reliability in treating existing and projected flows. No other major treatment capacity expansions are anticipated for the next 24 years.

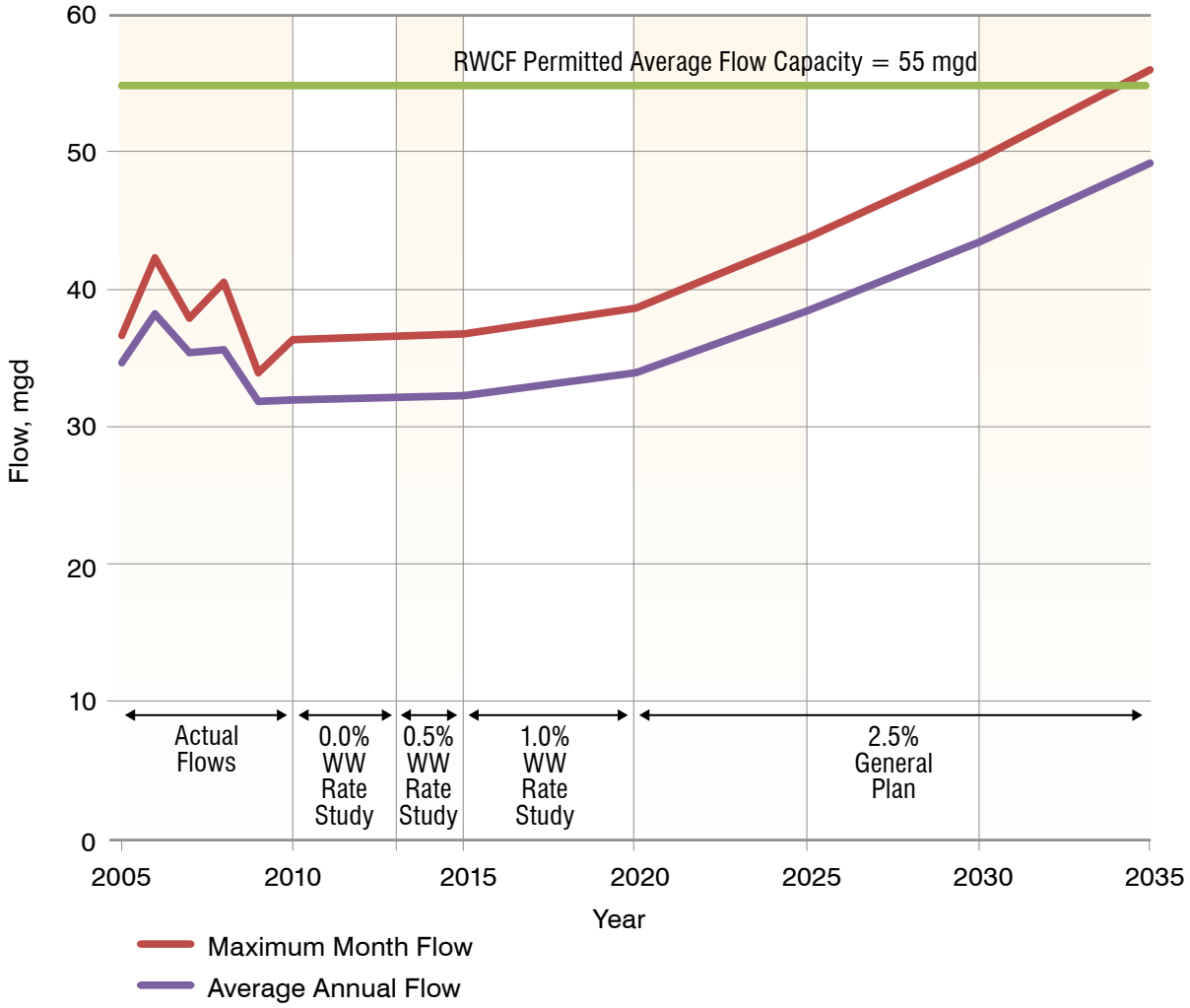
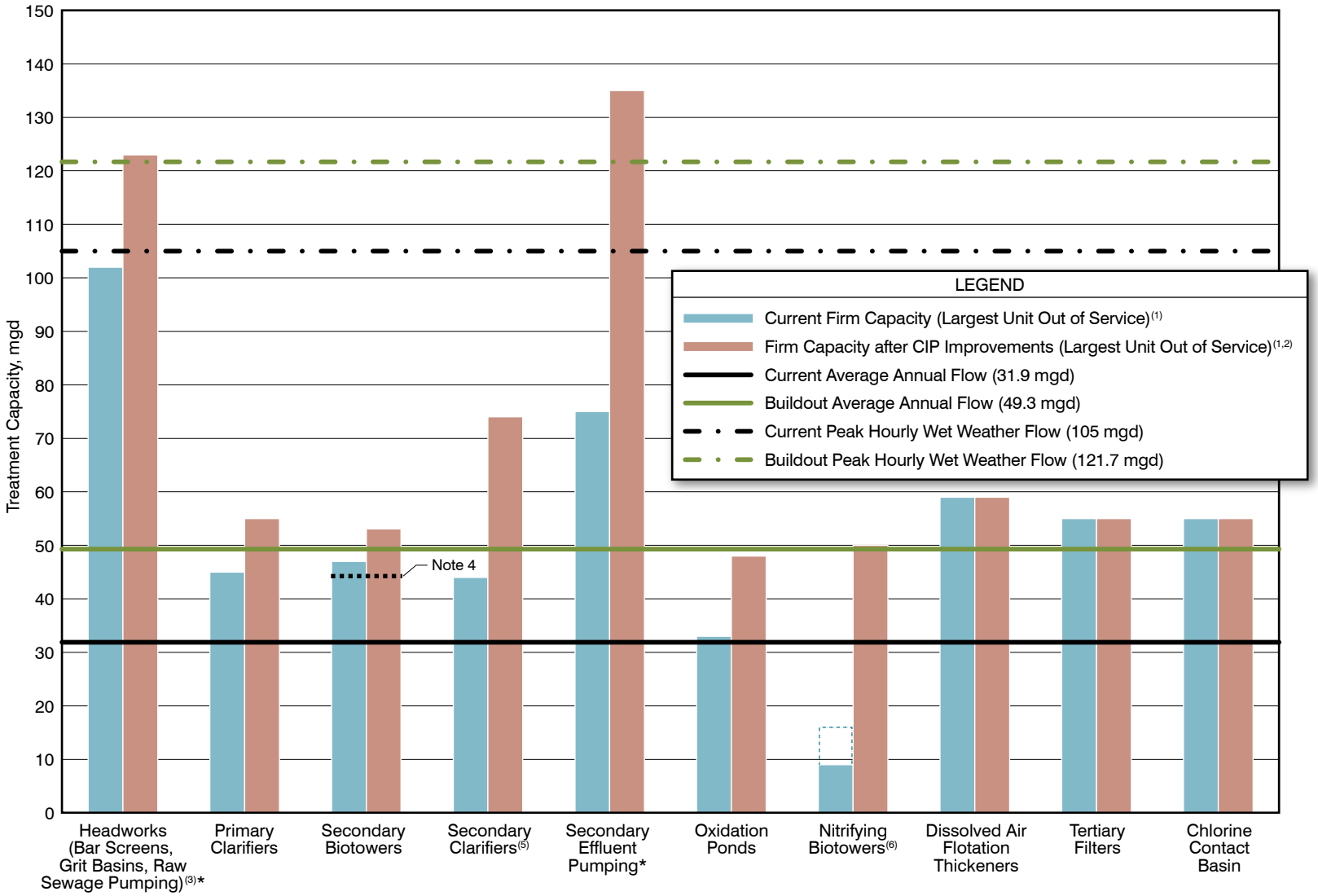


Figure ES.2
INFLUENT FLOW PROJECTIONS
CAPITAL IMPROVEMENT AND ENERGY MANAGEMENT PLAN
CITY OF STOCKTON

stk411f50-8581.ai rev 4/18/11



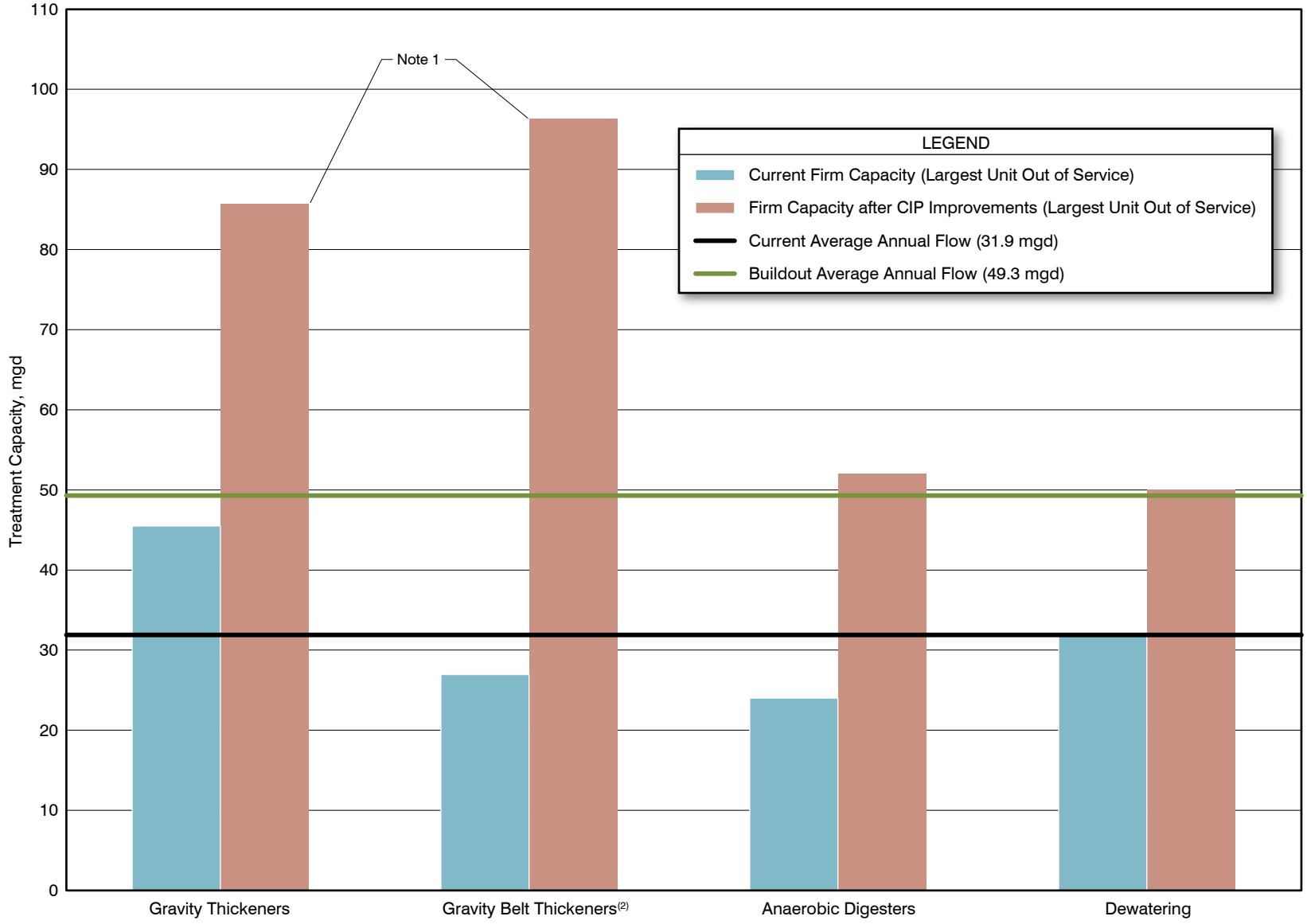
NOTES:

1. Capacities are shown with largest unit out of service except for secondary clarifiers, oxidation ponds, and chlorine contact basins which are shown with all units in service.
2. Table 4.25 presents the recommended CIP projects required to achieve the capacity shown.
3. Headworks capacity is limited by the bar screens and raw sewage pumping. Refer to Table 4.25 for the capacity of each headworks component.
4. The secondary biotowers are hydraulically limited to 47 mgd. The recommended CIP projects include relieving the hydraulic bottleneck in the secondary biotowers.
5. Secondary clarifier capacity is shown with all units in service. The current firm capacity is 33 mgd and the firm capacity after CIP improvements is 44 mgd. However, operation with the largest unit out of service is anticipated to be infrequent and will have minimal impact on overall treatment plant performance.
6. Nitrifying biotower current firm capacity ranges from 9 to 16 mgd for a temperature range of 7° to 10° C. Capacity after CIP improvements is based on three biotowers in operation at 10° C.

* Capacity rating based on peak hourly wet weather flow.

stk711f2-8581.ai

Figure ES.3
LIQUID STREAM CAPACITY SUMMARY
CAPITAL IMPROVEMENT AND
ENERGY MANAGEMENT PLAN
CITY OF STOCKTON



NOTES:

1. Thickener capacities increase because secondary sludge only will be thickened; whereas both primary sludge and secondary sludge are currently thickened.
2. Gravity belt thickeners provide additional redundancy to the gravity thickeners and therefore do not need to provide complete firm capacity for the current and buildout flows.

Figure ES.4
SOLID STREAM CAPACITY SUMMARY
CAPITAL IMPROVEMENT AND
ENERGY MANAGEMENT PLAN
CITY OF STOCKTON

stk711f3-8581.ai

PLANNING FOR POTENTIAL DISCHARGE PERMIT CHANGES

Effluent discharges to the SJR are regulated by a permit issued by the California Regional Water Quality Control Board (RWQCB) under the National Pollutant Discharge Elimination System (NPDES) permit program. The RWCF is currently operating under its 2008 permit. The RWQCB typically renews the discharge permit every 5 years. The goal of the CIP is to provide a plan to comply with existing permit conditions more reliably, as well as identify facilities that will be required to meet potential future requirements. Limits that are more restrictive may be included in the next permit renewal. Key effluent constituents that may be more strictly regulated include nitrogen, chlorine disinfection byproducts, and salinity.

Nitrogen

Effluent limits for total nitrogen (typically set at 10 mg/L-N) have become increasingly common for wastewater treatment facilities discharging to water bodies in the Central Valley. The CIP includes recommendations to address potential future nitrogen limits for the RWCF effluent. The recommended strategy to meet these potential limits is to modify the flow pattern of the existing treatment processes. With this modification, nitrogen, in the form of nitrate, can be removed through natural processes inherent in the wetlands. The wetland modification would be made before the RWQCB promulgates more restrictive permit limits. This would allow time for the city to test the nitrogen removal performance of the wetlands. Performance data from the wetlands tests would be used to set the standards for future nitrogen limits. If the tests prove successful, the RWQCB would have the basis to establish less restrictive effluent limits, resulting in substantially lower costs to the City. The City has already taken the first steps by meeting with the RWQCB staff to propose this concept. The initial response from the RWQCB was favorable.

Chlorine Disinfection Byproducts

Chlorine gas is used for effluent disinfection at the RWCF. When chlorine is added to the effluent, it reacts with residual organic compounds in the water to form disinfection byproducts (e.g. trihalomethanes, or THMs). THMs are carcinogenic at low concentrations in drinking water. Because the receiving water in the SJR has been designated by the State as a potential municipal water supply, the City's wastewater discharge permit imposes limits on THMs. THM limits in the current permit were calculated by the RWQCB by including a dilution credit for the flow in the river. However, the application of dilution credits was protested by third parties on the basis that the methods used to estimate dilution credits were not representative of the actual flow conditions in the river. The protest is under consideration by the RWQCB, but there is no definitive schedule as to when a final ruling will be made. If the protest is upheld, the dilution credit would be eliminated, and the THM limits would lower to very low levels that cannot be met with a chlorine-based disinfection system. Under these circumstances, the City would need to discontinue chlorination and add a non-chlorine based disinfection system, such as ultra violet (UV) light disinfection.

Salinity

The 2008 discharge permit for the RWCF established a performance-based annual average limit for electrical conductivity (EC) of 1,300 micro mhos per centimeter (µmho/cm). Current effluent salinity levels are within the permitted limits. Daily salinity levels from 2007 through 2009, ranged from 600 to 1,250 µmho/cm. Annual averages ranged between 1,040 to 1,090 µmhos/cm. Third parties have protested the salinity limits, contending that the limits did not comply with the Bay Delta Plan South Delta Objectives. The plan objectives have limits of 700 µmhos/cm (April through August) and 1,000 µmhos/cm (September through March), both of which are lower than the current salinity concentrations in the City's effluent. The State Water Resources Control Board (SWRCB) is in the process of reviewing salinity objectives. The state board has not established a timetable for the review, and there has been no indication as to what the future salinity limits might be. In response to a recent court decision regarding the salinity limits, the RWQCB is considering adopting a policy that would allow the RWQCB to grant a variance to the City if compliance with the future salinity limits is infeasible.

Considering these uncertainties, the recommended strategy for addressing salinity limits includes:

1. Continue working with regulatory agencies to find regional solutions and to adopt reasonable limits based on ongoing studies and research.

2. Increase usage of surface water municipal supplies to reduce salinity in the raw wastewater entering the plant. The City is already addressing this strategy with its Delta Surface Water Treatment Facility, currently under construction. The Delta Surface Water Treatment Facility will reduce use of higher salinity groundwater wells.

3. Develop a source control plan for industries and households, and consider a ban on water softeners, which discharge salt to the sewers.

4. If the preceding measures are not sufficient, apply for a salinity limit variance. Plan for a future reverse osmosis system to reduce salinity in case the variance is not granted.

ENERGY MANAGEMENT PLAN

Current Power Usage

The City currently requires an average of 3.2 megawatts (MW) of electrical power to operate the RWCF. Of this amount, 62 percent of the demand is met with self-generated power from the City's engine cogeneration system. The remaining 38 percent of the power demand is purchased from PG&E. The cogeneration system runs on two fuel sources. Approximately half of the power produced from the cogeneration system is supplied from biogas, produced by the City's anaerobic digesters. The remaining fuel is supplied from natural gas, which is purchased from the School Project for Utility Rate Reduction (SPURR)

and delivered through PG&E. Power costs in 2010 were nearly $2 million per year, of which $0.94 million per year was spent for electricity purchases and $1.04 million per year for natural gas to fuel the engines.

Energy Saving Opportunities

The energy management plan evaluated a wide range of alternatives to reduce energy and associated costs. Alternatives included:

- Augment the existing engine cogeneration system with a fuel cell system. Add additional emissions controls to existing engines when dictated by the impending new air regulations (expected in the next five years).
- Increase biogas production through an expansion of the City's current fats, oils, and grease (FOG) program. FOG collected in the city and potentially outside the city would be added directly to the anaerobic digesters to increase biogas production.
- Implement energy efficiency measures.
- Install wind-generated power at the RWCF site.
- Install solar-generated power at the RWCF site.
- Participate in PG&E's demand response program. This would result in an annual payment from PG&E to the City for committing to temporarily shutdown non-critical facilities during a power shortage.

The economic feasibility of fuel cell, solar and wind energy projects depends heavily on government subsidies. Presently, most subsidies have been suspended or are not available. The feasibility of fuel cells, wind, and solar energy can be re-evaluated in the future based on the value of future subsidies available at that time. In addition, City ownership of any of these power-generating alternatives would pose some risk. If funding levels are restored and it still appears attractive to pursue these projects, a power purchase agreement or other private/public financial arrangement should be considered as a means to shift most of the risk from the City.

Energy Management Plan Recommendations

Recommended projects for the energy plan include:

- Continue operation of the existing engine generators, adding new emissions controls when required.
- Install a FOG receiving station to increase biogas production and reduce purchased natural gas for fueling the engines.
- Implement energy efficiency measures.

- Install a computerized energy management system.
- Participate in PG&E's demand response program.

Table ES.1 summarizes the recommended energy projects, including the estimated capital costs and the power savings benefits over the next 20 years. The City's current cogeneration system will save an estimated present value of $11.7 million in energy costs over the next 20 years compared to purchasing all power from the utility. To maintain these savings, the City will need to spend approximately $2.4 million for new emissions controls, which are expected to be issued in the next 2 to 5 years, with a compliance date some 5 years later. In addition to its cogeneration system, the City has the option to invest another $3.7 million on four new energy projects. The initial investment for these projects is expected to result in a present worth value of about $7.5 million in energy savings, equivalent to $1.5 million per year.

RECOMMENDED CAPITAL IMPROVEMENTS – IMMEDIATE AND NEAR-TERM PROJECTS

The capital improvements for the RWCF include rehabilitation of existing facilities, removal or replacement of obsolete processes, new and expanded facilities, and energy projects.

The proposed approach to implementing the CIP is to group the highest priority (immediate) projects as a separate, early project phase. This will be followed by a second phase that includes other critical projects, but of a somewhat lower priority. The proposed project phases are as follows:

1. **Phase 1- Immediate Projects.** These are high priority projects to reduce health and safety risks, provide sufficient pumping capacity for peak wet weather flow conditions, and to improve reliability in meeting discharge permit limits for ammonia during cold weather periods.
2. **Phase 2 - Near-Term Projects.** These are critical projects required to maintain compliance with the NPDES permit, extend the useful life of existing facilities, and improve working conditions. Phase 2 also includes the recommended energy projects. Due to the magnitude of cost associated with Phase 2, consideration should be given to implementing these improvements in sub-phases. This concept would allow smaller contract amounts for more competitive bidding, allow specialized contractors to bid as prime contractors, and open up the possibility of alternative projective delivery methods.

   Three sub phases are proposed:

   Phase 2A: Improvements to the Main plant and energy projects.

Table ES.1 Estimated Cost Savings from Energy Projects
Capital Improvement and Energy Management Plan
City of Stockton

Project	Effective Power Demand Reduction (kW) per Project	Capital Cost ($M)	Present Worth of Energy Savings ($M)[1]
Maintain Current Cogeneration System: Utilize Existing Engines, purchase power from PG&E for the balance of the demand. Add emissions controls to engines when required.	**731[2]**	**$2.4[3]**	**$11.7**
New Energy Projects			
Fats oils and grease receiving station (FOG)[4]	109	$0.97	$2.2
Energy efficiency measures	170	$0.3	$4.9
Energy management system	0	$0.07	$0[5]
Participation in PG&E's demand response program	0[6]	$0	$0.4
Total New Energy Projects	**279**	**$1.34**	**$7.5**

Notes:

(1) Based on total demand of 3,230 kW, assuming a 5% discount rate, 20-year period and 5% per year electricity rate escalation.
(2) Power savings as the result of biogas-fueled engines. Another 1,564 kW of effective power is generated by the engines with natural gas purchased from PG&E.
(3) Includes new gas dryer.
(4) Assuming 15% increase in biogas production from the addition of FOG.
(5) Savings from the energy management system (EMS) is difficult to estimate so no savings have been included. The chief benefit of the EMS is to improve operations of the energy systems.
(6) This project does not reduce energy demand. The City receives an annual incentive of approximately $32,000 (based on Peak Day Pricing) for scheduled power outages.

Phase 2B: Improvements to the Tertiary Plant. The sites for Phases 2A and 2B are separated by the San Joaquin River, allowing for simultaneous construction with minimal interference between construction sites.

Phase 2C: Laboratory, operations, and maintenance building improvements. This approach will allow architectural/commercial building contractors to bid as a prime contractor and to complete construction sooner than the other RWCF improvements. In addition, this type of construction may be suitable for a design-build delivery approach which could save time and costs over the conventional design-bid-build method.

Site plans for the CIP projects are illustrated in Figures ES.5 through ES.7. A listing of the recommended projects is presented in Table ES.2.

Table ES.3 and Figure ES.8 present a breakdown of CIP projects by purpose category. As indicated, the largest capital expense is for rehabilitation of aging facilities (59%) and the second largest expense is for permit compliance (25%).

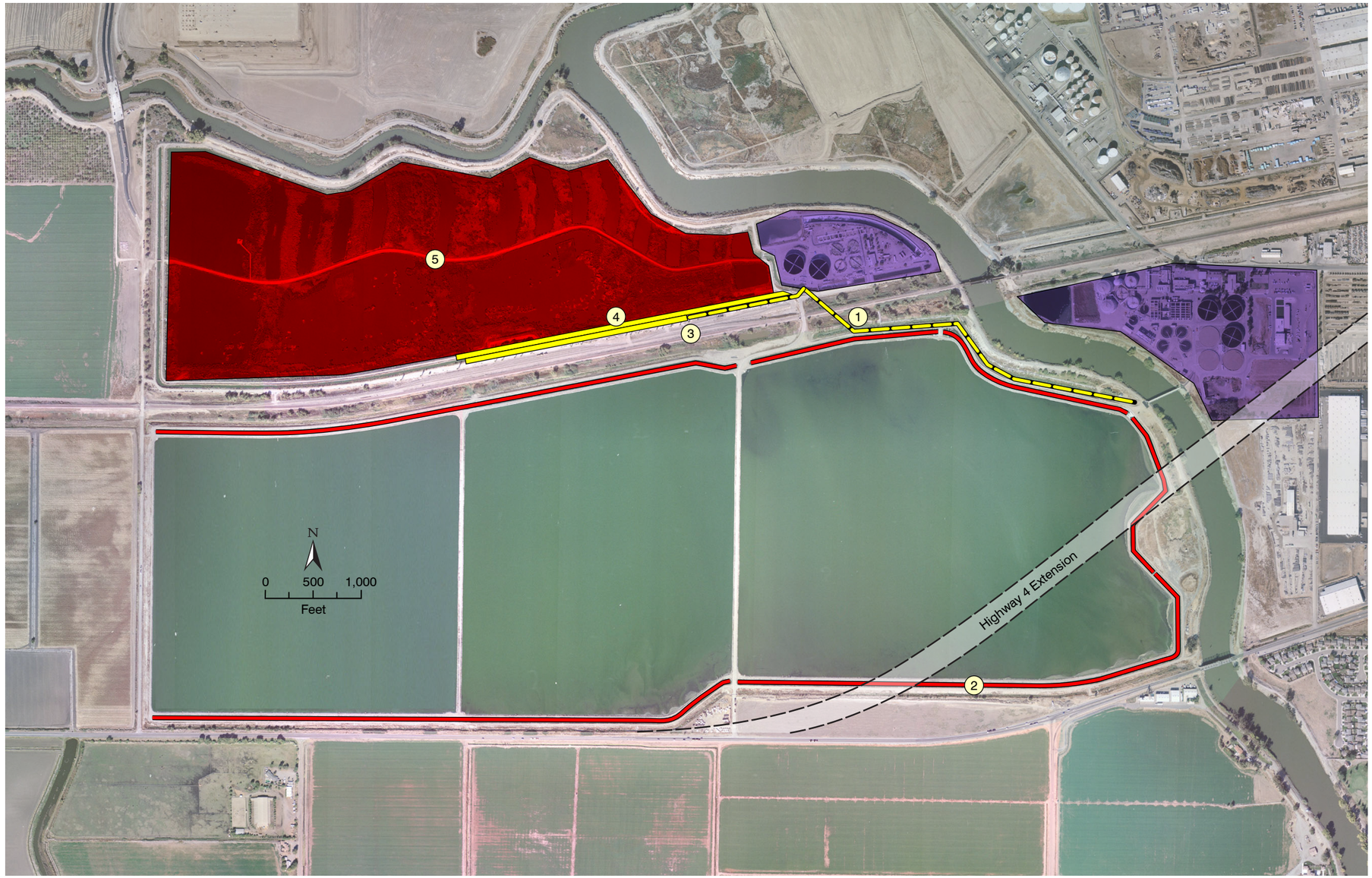
POTENTIAL FUTURE PROJECTS

Other projects were identified that may be required depending on future discharge requirements and other needs. Potential future projects are listed in Table ES.4. Due to uncertainties, these projects are included in a separate, contingent budget. Future projects are grouped into two categories:

1. **Long-Term Projects.** These are non-critical projects that may not be required in the future, or could be deferred for some time. Projects 1 and 4, odor control for the primary clarifiers and biotowers, may not be required in the future because the City recently implemented a new odor control system that may be sufficient in controlling odors without adding capital projects. Likewise, there are uncertainties in adding Project 2 (Primary Clarifiers 9 and 10) and Project 3 (Fourth Nitrifying Biotower). The need for these projects will be triggered by higher flows that come from City growth. Since the projections for economic recovery and growth in the City are relatively uncertain, the need for this project may not arise for many years.
2. **Future Permit Compliance Projects.** These projects include **i**mprovements/additions that may be required in the future to satisfy NPDES permit requirements.

PROJECT PHASING AND IMPLEMENTATION PLAN

3. The implementation schedule, shown in Figure ES.9, depicts the proposed timing of the immediate and near-term project phases. Provisional schedules for the long-term and future permit compliance projects are also included. As shown, the immediate projects would start in 2011 with an estimated completion in 2013. Near-term projects would start in 2012 and end in 2016.

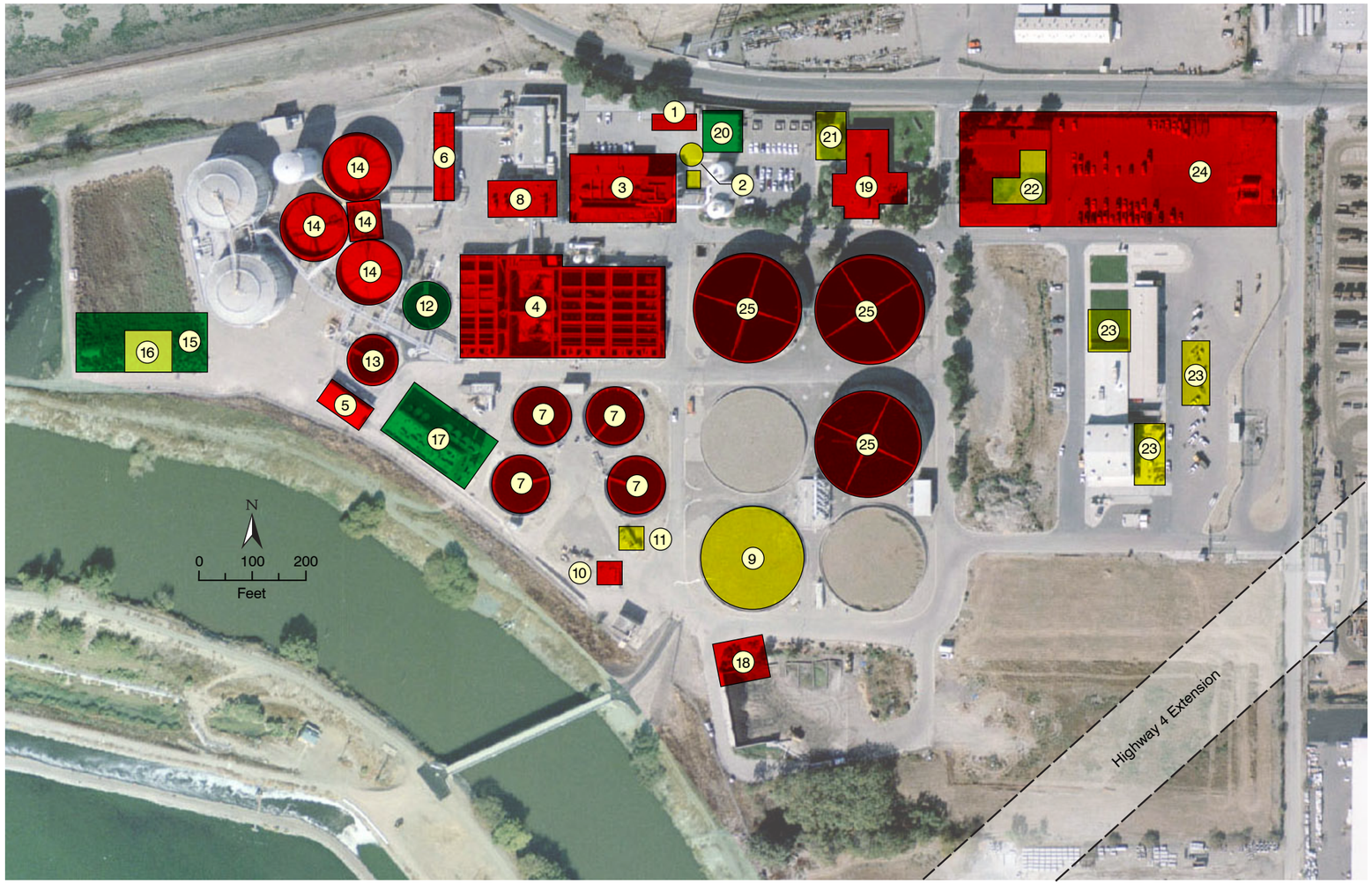


LEGEND

- Main and Tertiary Treatment Facilities
- New Construction
- Rehabilitation
- Demolition
- (1) Cold Weather NBT Supply System
- (2) Pond Transfer Structure Rehabilitation
- (3) Nitrifying Biotower Influent Channel and Pipe
- (4) Nitrifying Biotower Effluent Channel
- (5) Wetlands Rehabilitation

Figure ES.5
CIP PLAN OVERVIEW
CAPITAL IMPROVEMENT AND ENERGY MANAGEMENT PLAN
CITY OF STOCKTON

stk711f4-8581.ai



LEGEND

- Main and Tertiary Treatment Facilities
- New Construction
- Rehabilitation
- Demolition

1. Influent Box Rehabilitation
2. Auxiliary Pump Station
3. Headworks Rehabilitation
4. Primary Clarifier Rehabilitation
5. Gravity Belt Thickener Rehabilitation
6. Cogeneration Improvements - Gas Dryer
7. Secondary Clarifier Rehabilitation
8. Operations Building Rehabilitation
9. Secondary Clarifier No. 5
10. Secondary Effluent Pump Station No. 1 Rehabilitation
11. Secondary Effluent Pump Station No. 2 Replacement
12. Gravity Thickener No. 1 Demolition
13. Gravity Thickener No. 2 Rehabilitation
14. Digester A, B, C Rehabilitation
15. Sludge Lagoon Modifications
16. FOG Receiving Station
17. Demolish Dewatering Facility
18. Dewatering Facility Replacement
19. Administration Building Rehabilitation
20. Demolish Engineering Building
21. Administration Building Expansion
22. Laboratory Building
23. Maintenance and Collections Building Expansion
24. Re-configure Parking Area
25. Biotower Rehabilitation

Figure ES.6
MAIN PLANT IMPROVEMENTS
CAPITAL IMPROVEMENT AND ENERGY MANAGEMENT PLAN
CITY OF STOCKTON

st511f4-8581.ai

LEGEND

- Main and Tertiary Treatment Facilities
- New Construction
- Rehabilitation
- Demolition

1. Cold Weather NBT Supply System
2. Pond Transfer Structure Rehabilitation
3. Nitrifying Biotower Influent Channel and Pipe
4. Bulk Sodium Hypochlorite Facility
5. Third Nitrifying Biotower and Lift Station
6. Demolish/Re-Purposed Chlorine Gas Facility
7. Nitrifying Biotower Effluent Pipe
8. Nitrifying Biotower Effluent Channel
9. Wetland Rehabilitation
10. Low Lift Pump Station
11. Pipe to Dissolved Air Flotation Thickeners
12. Demolish Raw Water Pump Station
13. Dissolved Air Flotation Thickeners Rehabilitation and Pipe Lining
14. Filter Rehabilitation
15. Tertiary Support Building Rehabilitation
16. Methanol Facility (if necessary)
17. Sodium Bisulfite Facility
18. Dechlorination Building

Figure ES.7
TERTIARY PLANT IMPROVEMENTS
CAPITAL IMPROVEMENT AND ENERGY MANAGEMENT PLAN
CITY OF STOCKTON

stk711f6-8581.ai

Table ES.2 Recommended Capital Improvement Projects – Immediate and Near-Term
Capital Improvement and Energy Management Plan
City of Stockton

Recommended Improvement Projects					Estimated Capital Costs ($M)[1]	Total Capital Cost Per Phase ($M)
Phase	**Project No.**	**Process Area**	**Purpose Category**	**Project Description**		
Phase 1 - Immediate Projects						
	1.1	Site Security Improvements	E	Site Security Upgrades	$0.25	
	1.2	Bulk Hypochlorite System	A	Replace gaseous chlorine with bulk hypochlorite storage	$1.96	
	1.3	Sodium Bisulfite System	A	Replace sulfur dioxide with sodium bisulfite system	$0.45	
	1.4	Disinfection Support Facility	A	New building	$0.61	
	1.5	Cold Weather NBT Supply System	D	Add pipeline from secondary clarifiers to Nitrifying Biotowers (NBT)for temperature control, new pump station and valve vault	$5.69	
					Total Phase 1	**$8.96**
Phase 2 – Near-Term Projects						
2A – Main Plant Near-Term Improvements	2A.1	Headworks & Raw Sewage Pump Station Rehabilitation	B	Rehabilitation of existing Headworks, new mechanical and electrical equipment, and building modifications	$15.10	
	2A.2	Peak Wet Weather Pump Station and Piping	B	Peak wet weather pump station, valve vault, bypass piping	$3.23	
	2A.3	Secondary Biotowers Rehabilitation	B	Replace media, distribution arms, structural/seismic improvements	$29.73	
	2A.4	Secondary Clarifiers Rehabilitation	B	Refurbish weirs, add additional sludge pumps, and cover pump pits	$1.22	
	2A.5	Secondary Clarifiers	D	Add fifth clarifier to improve capture of secondary solids and BOD removal	$3.76	
	2A.6	Secondary Effluent Pump Station Project 2	C	Replace existing SEPS #1.	$1.18	
	2A.7	Gravity Sludge Thickeners Rehabilitation	B	Rehabilitate newer unit, demolish older unit	$0.28	

Table ES.2 Recommended Capital Improvement Projects – Immediate and Near-Term (Continued)
Capital Improvement and Energy Management Plan
City of Stockton

Recommended Improvement Projects					Estimated Capital Costs ($M)[1]	Total Capital Cost Per Phase ($M)
Phase	**Project No.**	**Process Area**	**Purpose Category**	**Project Description**		
	2A.8	Gravity Belt Thickeners Improvements	C	Use as redundant secondary sludge thickening (miscellaneous piping)	$0.21	
	2A.9	Dewatering Facility Replacement	C	Replace existing dewatering units	$7.37	
	2A.10	Anaerobic Digesters Rehabilitation	B	Rehabilitate A, B and C units for FOG addition, redundancy, and sludge storage. Add gas holding cover.	$9.94	
	2A.11	Sludge Lagoons Demolition	C	Modify to be used for digester cleaning and FOG receiving station	$0.19	
	2A.12	Fats, Oils, and Grease (FOG) Receiving Station	F	Add a FOG receiving station	$0.97	
	2A.13	Cogeneration - Gas Dryer	F	Add gas dryer for existing engines	$0.56	
	2A.14	Main Plant City Capital Improvement Plan (CIP) Projects	B	Miscellaneous projects identified in the Main Plant on the City CIP	$5.15	
	2A.15	Secondary Effluent Pump Station (SEPS) Project 1	D	Add fourth pump to existing SEPS #1 for firm peak hour capacity	$0.27	
	2A.16	Energy Efficiency Measures	F	Implement plant-wide recommended energy efficiency measures	$0.30	
	2A.17	Energy Management System	F	Install energy management system	$0.07	
	2A.18	Primary Clarifiers	B	Structural improvements and conversion of square clarifiers to round clarifiers	$2.46	
					Total Phase 2A	**$81.99**
Phase 2B – Tertiary Plant Near-Term Improvements	2B.1	Wetlands Rehabilitation & Reconfiguration	D	Reconfigure flow to use wetlands for operational flexibility and future denitrification	$7.33	
	2B.2	Third Nitrifying Biotower	D	Add third NBT for ammonia removal, including lift station	$17.76	
	2B.3	Dissolved Air Flotation Units Rehabilitation	B	Concrete rehab, reinforced concrete pipe (RCP) lining, replace pressurization systems	$6.17	

Table ES.2 Recommended Capital Improvement Projects – Immediate and Near-Term (Continued)
Capital Improvement and Energy Management Plan
City of Stockton

Recommended Improvement Projects					Estimated Capital Costs ($M)[1]	Total Capital Cost Per Phase ($M)
Phase	**Project No.**	**Process Area**	**Purpose Category**	**Project Description**		
	2B.4	Tertiary Filters Rehabilitation	B	Concrete repair, handrail, replace filter programmable logic controllers (PLCs), miscellaneous piping and equipment replacement	$3.11	
	2B.5	Tertiary Plant City CIP Projects	B	Miscellaneous projects identified in the Tertiary Plant on the City CIP	$1.71	
	2B.6	Oxidation Ponds	B	(Pond Cleaning Already Included in City Projects)	$3.83	
					Total Phase 2B	**$39.91**
Phase 2C – Operations Support Facilities	2C.1	Administration Building Expansion	E	Refurbish existing building	$2.68	
	2C.2	Laboratory Building	E	New laboratory building	$3.19	
	2C.3	Maintenance and Collection Building Expansion	E	Expand existing maintenance and collection building	$1.15	
	2C.4	Operations Building Improvements	E	Refurbish existing building	$1.09	
	2C.5	Tertiary Support Building Improvements	E	Refurbish existing building	$0.06	
					Total Phase 2C	**$8.17**
					Total Phase 2	**$130.05**
				Total Immediate and Near-Term Projects (Phases 1 and 2)		**$139.03**

Note:
(1) Based on March 2011 dollars (ENR 10,151)

Purpose Category Legend
A – Health and Safety
B – Rehabilitate Facilities
C – Replace/Eliminate Obsolete Facilities
D – Permit Compliance
E – Operation Support
F – Energy Project

Table ES.3 Immediate and Near-Term CIP Projects by Purpose Category Capital Improvement and Energy Management Plan City of Stockton		
Category	**Project Cost ($M)**	**Percent**
A – Health and Safety	3.0	2.2%
B – Rehabilitate Aging Facilities	81.9	58.9%
C – Replace/Eliminate Obsolete Facilities	9.0	6.4%
D – Permit Compliance	34.8	25.0%
E – Operations Support Facilities	8.4	6.1%
F – Energy Projects	1.9	1.4%

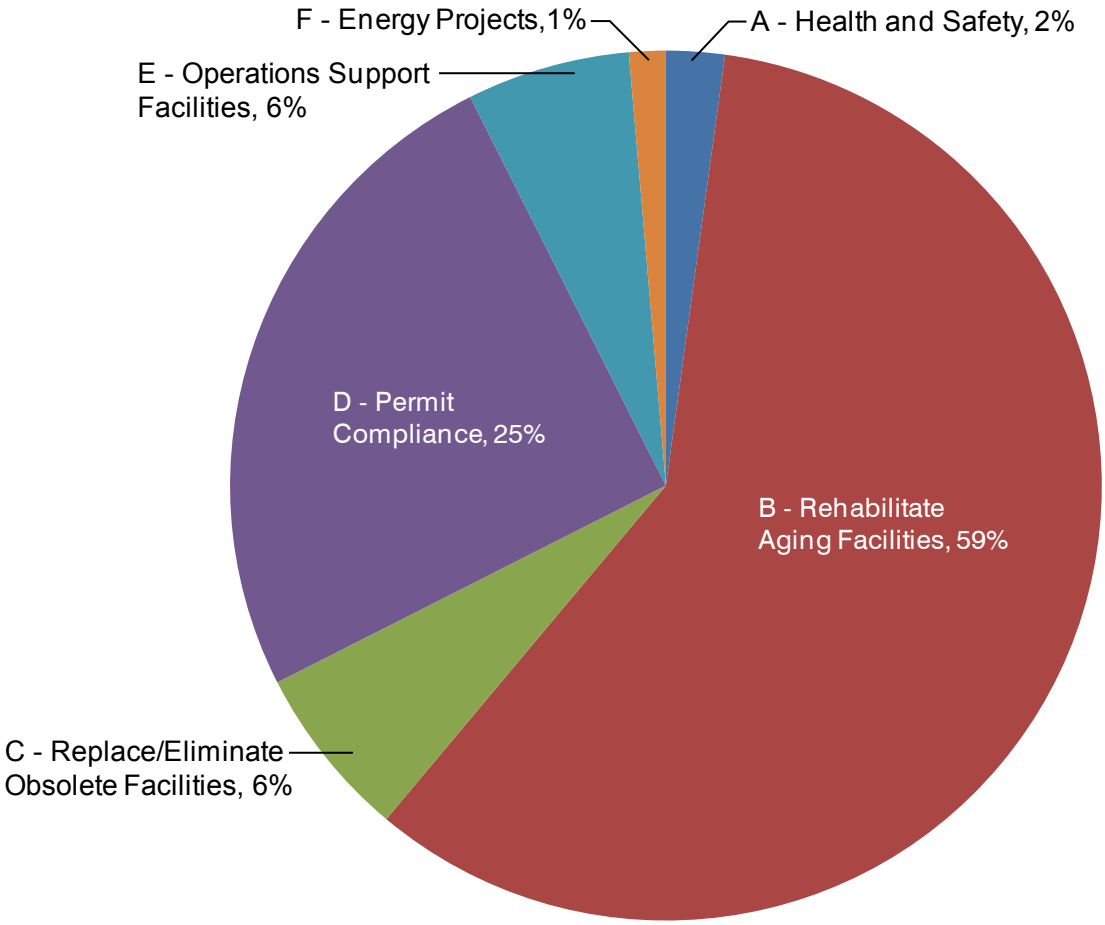


Figure ES.8
CIP BREAKDOWN BY CATEGORY
CAPITAL IMPROVEMENT AND ENERGY MANAGEMENT PLAN
CITY OF STOCKTON

stk711f7-8581.ai

Table ES.4 Recommended Capital Improvement Projects – Contingency for Future Projects
Capital Improvement and Energy Management Plan
City of Stockton

Recommended Improvement Projects					
Phase	**Project No.**	**Process Area**	**Project Description**	**Estimated Capital Costs ($M)[1]**	**Total Capital Cost Per Phase ($M)**
Long-Term Projects	1	Primary Clarifiers	Covers and Odor Control if current odor control measures are not sufficient	$5.28	
	2	Primary Clarifiers 9 & 10	Add primary clarifiers 9 & 10 if triggered by growth	$5.97	
	3	Fourth Nitrifying Biotower	Add fourth NBT for ammonia removal, if necessary	$15.70	
	4	Abandoned Rock Filters	Convert one rock filter to soil bed biofilter and demolish other two rock filters	$3.17	
				Total	**$30.12**
Future Permit Compliance Projects	1	Cogeneration – Selective Catalytic Reduction (SCR) for Existing Engines	Add SCR for existing engines	$1.68	
	2	Tertiary Filters for Denitrification	Conversion to denitrification filters if lower nitrate limits are imposed in the future	$18.38	
	3	Non-Chlorine Disinfection	Abandon chlorine and replace with ultraviolet light (UV) disinfection if dilution is removed in future discharge permits	$31.61	
				Total	**$51.67**
				Total Future Projects	**$81.79**

Note:
(1) Based on March 2011 dollars (ENR 10,151).

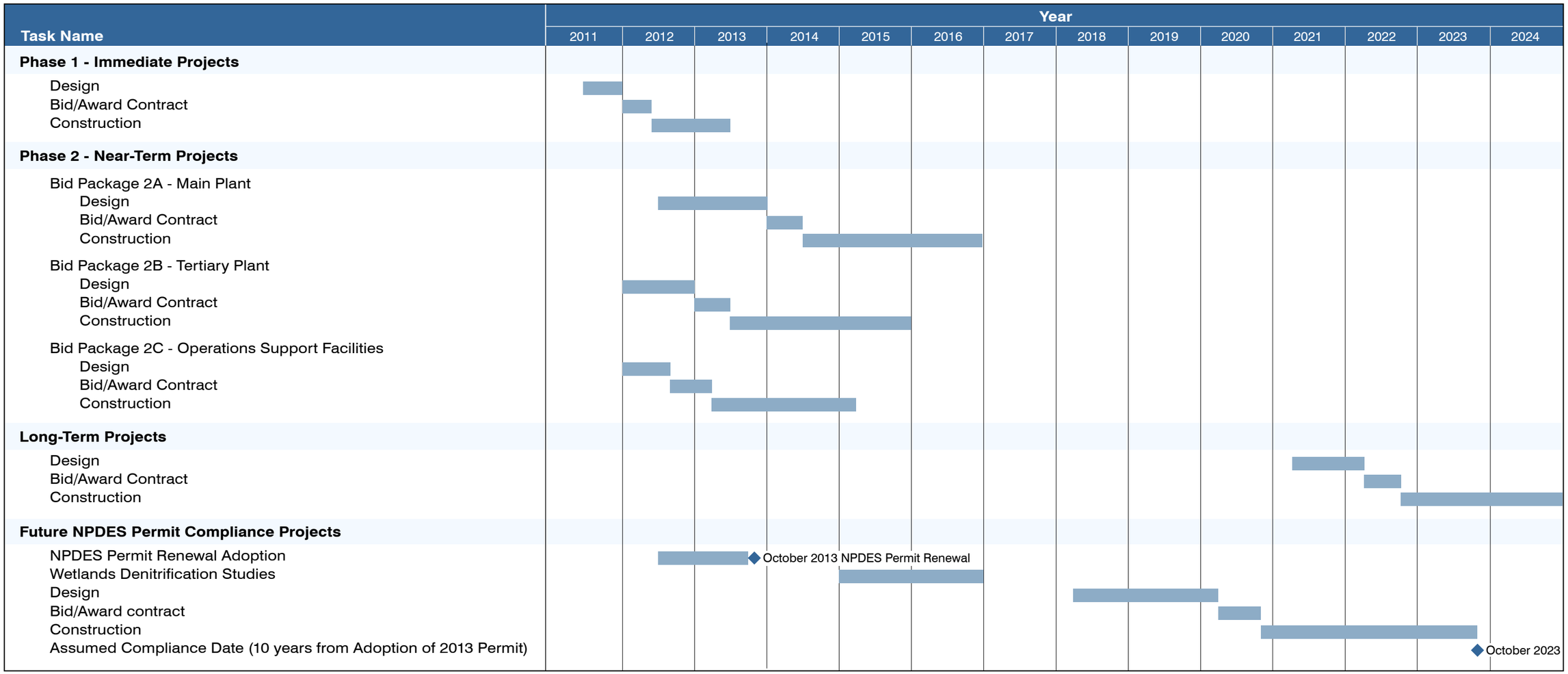


Figure ES.9
RECOMMENDED IMPLEMENTATION SCHEDULE
CAPITAL IMPROVEMENT AND ENERGY MANAGEMENT PLAN
CITY OF STOCKTON

stk711f8-8581.ai

Chapter 1

INTRODUCTION

1.1 PURPOSE

In 2010, the City of Stockton commissioned the Capital Improvement and Energy Management Plan to provide a strategy for planning and implementing improvement projects for the Regional Wastewater Control Facility (RWCF). The plan consists of two parts: the capital improvement plan (CIP), which focuses on the wastewater treatment facilities improvements; and the energy management plan, which provides an approach for developing energy sources and improving energy efficiency at the RWCF.

The goals of the RWCF Capital Improvements and Energy Management Plan include:

- Identify projects to replace or rehabilitate aging treatment facilities.
- Identify opportunities to reduce or eliminate unnecessary treatment processes to streamline operations.
- Develop an orderly plan to comply with anticipated and potential new effluent discharge requirements.
- Provide improved operations support facilities for increased efficiency and improved worker morale.
- Prepare a comprehensive CIP that reflects the priorities and funding capacity of the City.
- Develop an integrated energy program to improve efficiency and to produce additional power to reduce reliance on the external energy providers.

1.2 BACKGROUND

Two previous master plans for the RWCF were prepared – one by Metcalf and Eddy in 1987 and the other by the joint venture of Parsons Engineering Science and Carollo Engineers in 1999. The 1999 Master Plan was prepared to address three major areas: expansion to serve population growth, major process improvements to comply with more stringent discharge permit requirements, and improvements to the existing treatment facilities to maintain treatment reliability. Recommendations from the plan included reliability improvements for most of the unit processes and an expansion of the solids processing facilities. Several alternatives to meet new effluent discharge requirements for ammonia and dissolved oxygen were also evaluated. Because the effluent discharge requirements were not yet finalized, recommendations to meet the future discharge limits were not included in the 1999 Master Plan.

Capital improvement products that were recommended in the 1999 Master Plan include:

- Nitrification and Disinfection Upgrades: Discharge permit requirements adopted in the late 1990s required removal of ammonia (i.e. nitrification) and an upgrade to the disinfection system.

  Current Status: The nitrification facilities are partially completed. Further modifications and additions will be required.

- Influent Pump Station Upgrade: The first phase included new variable frequency drives to increase influent pumping capacity to 48 million gallons per day (mgd) and a peak hour wet weather flow of 85 mgd. The second phase was to increase pumping capacity to 55 mgd, with the corresponding peak flow capacity of 130 mgd.

  Current Status: Partially completed.

- Rehabilitation of Biotowers: Recommendations included new motorized distributor arms and the replacement of air supply fans and piping.

  Current Status: These improvements have not been implemented.

- New Biotower Pump Station: A new pump station was recommended as part of the 48 mgd expansion phase.

  Current Status: Completed.

- Pond Rehabilitation: Recommendations included removal of accumulated solids from Pond 1 and piping changes to route the algae float solids from the dissolved aeration flotation thickeners (DAFTs) to the anaerobic digesters. The pond has since been dredged, but the algae float continues to be discharged to the oxidation ponds for disposal. Additional recommendations included improvements to meet Division of Dam Safety (DODS) requirements.

  Current Status: Not completed.

- Primary Sludge Thickening Improvements for Seasonal Cannery Loads: Due to the uncertain future for canneries at the time, a provisional recommendation was to install ferric chloride (a coagulant) dosing system to improve primary clarifier performance. Since then, the seasonal canneries have significantly reduced or eliminated operations in Stockton.

  Current Status: Not completed.

- Primary Sludge Thickening Improvements for Non-Canning Season: Thickening primary sludge in the primary clarifiers prior to pumping the sludge to the anaerobic digesters, was recommended.

  Current Status: Not completed.

Over the following years, through 2003, the implementation of the Master Plan was put on hold. During this period, the City considered the feasibility of outsourcing operation and maintenance of the wastewater treatment facilities. Under this approach, many of the recommendations outlined in the draft master plan would be carried out by the successful bidder for the contract services. Also during this period, the anticipated new discharge permit requirements for the RWCF were adopted by the Regional Board.

In 2003, the City decided to out source the operations of the RWCF and entered into an agreement with CH2M Hill/OMI (OMI). Terms of the contract included requirements to improve the RWCF to meet the new discharge requirements.

Major improvements made by OMI included:

- Two nitrifying biotowers to remove ammonia.
- Conversion of Pond 4 from an oxidation pond to constructed wetlands.
- Addition of gravity belt thickeners to improve thickening of solids from the secondary process prior to digestion.
- A new supervisory control and data acquisition (SCADA) system.
- New motor-driven distributor arms for the secondary biotowers.
- Two new dual-media filters to match the existing tertiary filters.
- Chlorine contact basin modifications to increase capacity.
- A new utility crossing (bridge) over the San Joaquin River.
- Odor control facilities for the Headworks.

Then in 2008, the City and OMI elected to terminate the OMI operations contract and the City resumed operation of the RWCF. Since then, the City has been rebuilding its operating staff and re-assessing needs for the future. Accordingly, this CIP will identify the improvements necessary to increase the reliability of the existing facilities and meet anticipated regulatory and growth related needs.

In addition to the challenges related to the transition from private to public ownership, the City is exposed to external drivers that will affect the future of the RWCF. New effluent discharge requirements, adopted in 2008, as well as potential future limits, could trigger additional major process changes at the RWCF. For example, political pressure to improve the impaired Delta ecosystem may result in further tightening of discharge limits, which could result in costly improvements. In addition, the current economic recession and water conservation efforts have resulted in lost revenue for the City. Lastly, several of the reliability improvements recommended in the 1999 Master Plan were not implemented

during the privatization phase. These projects will need to be addressed to allow continued safe and reliable operation of the RWCF for the next 25 years.

1.3 CIP SCOPE

The scope of the Capital Improvement and Energy Management Plan includes the following tasks:

1. **Project Initiation:** Collaboration with City Staff to develop a plan for the project and establish CIP goals.

2. **Collect and Review Existing Information and Data:** Obtain historical population, flow and load data, current operations and maintenance costs, and review pertinent utility data.

3. **Flows and Loads Projections:** Evaluate historical plant influent flow and loads, industrial flow and load contributions, and determine projections for future flow and loads through buildout in the year 2035.

4. **Treatment Capacity Evaluation:** Analyze plant operating data and design criteria to assess process capacity.

5. **Identify Regulatory/Permit Requirements:** Summarize current regulatory requirements, identify potential future regulatory and permit requirements, and identify CEQA requirements and environmental constraints.

6. **Update the Condition Assessment for the RWCF:** Provide an updated condition assessment for existing facilities, evaluate major structural concerns, and assess key pipelines.

7. **Evaluate Energy Management System and Identify Energy Efficiency Measures:** Evaluate historical energy demand data, identify and recommend energy efficiency measures, and evaluate needs for an energy management system.

8. **Identify and Screen RWCF Upgrade Alternatives:** Evaluate alternative treatment strategies for ammonia and nitrogen removal, develop alternatives for rehabilitating existing facilities, and develop alternatives to modify the existing facilities to meet future potential discharge requirements.

9. **Evaluate Alternatives to Increase Digester Biogas Production:** Evaluate alternative digester feedstocks such as fats, oils, and grease, food waste, and algae for increasing digester biogas production and on-site energy production.

10. **Evaluate Biogas-Fueled Cogeneration Alternatives:** Identify existing cogeneration capacity and performance, recommend necessary modifications to the

existing cogeneration system, and compare the existing engine cogeneration system with a fuel cell cogeneration system.

11. **Evaluate Renewable Energy Alternatives:** Evaluate the feasibility of installing solar photovoltaic (PV) systems and wind turbines at the RWCF site for increasing on-site energy production.

12. **Identify Energy Funding and Financing Alternatives:** Evaluate financing options for the recommended energy projects, including power purchase agreements (PPAs), loans, and bonds, and investigate energy-related revenue-generating opportunities.

13. **Site Planning:** Provide updated aerial and base mapping, geotechnical assessment, lead and asbestos assessment, vehicle access and circulation plan, site security assessment, and incorporate past flood protection recommendations.

14. **Operations Support Facilities Assessment:** Perform architectural investigation and needs assessment for occupied spaces and develop recommendations for improved facilities and required expansions.

15. **Planning Workshops:** Conduct workshops to discuss and prioritize recommended projects.

16. **Develop Project Implementation Plan:** Provide a master schedule of recommended projects, including implementation and funding strategies.

17. **Complete CIP/Energy Management Plan Report:** Provide a draft and final report incorporating all of the above analyses and recommendations.

1.4 ACKNOWLEGEMENTS

Carollo would like to acknowledge the valuable contributions made by City of Stockton, Water Advisory Group, and Council Water Committee to the development of the Capital Improvement and Energy Management Plan. Specifically, Carollo would like to recognize the following personnel (in alphabetical order) for their efforts.

City of Stockton

Municipal Utilities Department

Kirk Cloyd
Randy Cornell
Fermin Garcia
Ali Gharegozloo
Laura Lazzelle
Mark Madison
Mike Niemann
Larry Parlin
Antonio Tovar
Mark Walker
Jeff Willet

City Council

Paul Canepa
Susan Eggman
Dale Fritchen (Council Water Committee)
Elbert Holman
Mayor Ann Johnston
Diana Lowery (Council Water Committee)
Vice Mayor Katherine Miller (Council Water Committee)

Water Advisory Group

Andrea Hurford
Doug Kuehne
Bill Loyko
Arthur Paullus
John Pulver
Jeff Sanguinetti
Lynn Sutton

Consulting Engineers

Carollo Engineers

Colin Barrett
Michael Britten
Dan Frost
Gary Deis
Dan Frost
Lydia Holmes
Kathy Marks
B Narayanan
Sarwan Wason

One Stop Security

Jason Albertson

Wetlands Consultant

Francesca Demgen

Siegfried Engineers

Paul Schneider
Tony Lopes

MDB Consulting

Mike Brown
Sandra Chow (BASE)
Ryan Ramos (Willdan)
Ricardo Sfeir (BASE)

WMB Architects

Melanie Vieux
Richard Smith (HCS)
Mitch Scheflo (Scheflo)

1.5 GLOSSARY OF ABBREVIATIONS

AA	average annual
ADA (F or L)	average day annual (flow or load)
ADMM (F or L)	average day maximum month (flow or load)
ADW (F or L)	average day dry weather (flow or load)
AEIP	air emission inventory plan
AEIR	air emission inventory report
APCD	Air Pollution Control District
APCO	Air Pollution Control Officer
AQMD	Air Quality Management District
BACT	best available control technology
BMP	best management practices
BOD_5	five-day biochemical oxygen demand
CAA	Clean Air Act
CARB	California Air Resources Board
$CBOD_5$	carbonaceous BOD5
cf	cubic feet/cubic foot
cfm	cubic feet per minute
cfs	cubic feet per second
CH_4	methane
CIWMB	California Integrated Waste Management Board
CO	carbon manoxide
CO_2	carbon dioxide
CoS	City of Stockton
CWA	Clean Water Act
cy	cubic yards
DAFT	dissolved air flotation thickener
DHS	California Department of Health Services
DO	dissolved oxygen
DWR	Department of Water Resources
EBEP	Enclosed Bays and Estuaries Plan
EDU	Equivalent Dwelling Unit
ENRCCI	ENR Construction Cost Index
EPA	Environmental Protection Agency
EQB	equalization storage basin
ft	feet
FOG	fats, oils, and grease
gal	gallons
gpcd	gallons per capita per day
gpd	gallons per day
gpd/sf	gallons per day per square foot
gpd/EDU	gallons per day per equivalent dwelling unit
gph	gallons per hour

gpm	gallons per minute
Hp	horsepower
HRT	hydraulic retention time
kcf	thousand cubic feet
kW	kilowatts
lbs BOD_5/day	pounds of 5-day biochemical oxygen demand per day
lbs BOD_5/1,000cf/day	pounds of 5-day biochemical oxygen demand per 1,000 cubic feet per day
lbs/day	pounds per day
lbs/day/sq ft	pounds per day per square feet
lbs/hr/sq ft	pound per hour per square feet
lb VS/day/cf	pounds of volatile solids per day per cubic foot
lf	linear feet
MG	million gallons
mgd	million gallons per day
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
MLSS	mixed liquor suspended solids
MLVSS	mixed liquor volatile suspended solids
MM	maximum month
mW	megawatts
NAAQS	National Ambient Air Quality Standards
NBT	nitrifying biotower
NH_3-N	ammonia-nitrogen
ng/L	nanogram per liter
NOx	nitrous oxides
NPDES	National Pollutant Discharge Elimination System
NSR	New Source Review
O&M	operation and maintenance
OSHA	Occupational Safety and Health Administration
PFRP	Process for Further Reducing Pathogens
P4	Priority Pollutant Pretreatment Program
POTW	publicly owned treatment works
ppb	parts per billion
ppd	pounds per day
PPD	Pollution Policy Document
ppd/EDU	pounds per day per equivalent dwelling unit
ppcd	pounds per capita per day
ppm	parts per million
psi	pounds per square inch
psig	pounds per square inch gauge
PSRP	Process for Significantly Reducing Pathogens
PTO	permit to operate
PHWWF	peak hour wet weather flow
$PHWWF_2$	peak hour wet weather flow for the 2-year return event

$PHVVWF_{100}$	peak hour wet weather flow for the 100-year return event
PV	photovoltaic
PWWF	peak wet weather flow
RAS	return activated sludge
RO	reverse osmosis
RWCF	Regional Wastewater Control Facility
RWQCB	Regional Water Quality Control Board
scfm	standard cubic feet per minute
SCR	selective catalytic reduction
sf	square feet
SIP	State Implementation Plan
SRT	solids retention time
STLC	soluble threshold limit concentration
SWRCB	State Water Resources Control Board
TAP	Toxics Action Plan
T-BACT	toxics best available control technology
THM	trihalomethane
TKN	total kjeldahl nitrogen
TOCL	total organic chlorine compounds
TN	total nitrogen
tpd	tons per day
TRE	toxicity reduction evaluation
TSS	total suspended solids
TTLC	total threshold limit concentration
TWAS	thickened waste activated sludge
UV	ultraviolet
µg/L	microgram per liter
VLR	volumetric loading rate
VOC	volatile organic compound
VS	volatile solids
WAG	water advisory group
WAS	waste activated sludge
WSE	water surface elevation

Chapter 2

PROJECTED WASTEWATER FLOWS AND LOADS

2.1 INTRODUCTION

The purpose of this chapter is to present flow and pollutant load projections for the RWCF. The flow and load projections performed for this analysis are complementary to the projections presented in the 2010 City of Stockton Wastewater Rate Study and the Stockton General Plan 2035 completed in 2007. The projections extend to the year 2035 in five-year increments and are used to assist in planning future facilities for the RWCF. Existing and historical data, as well as projected population growth, are used to develop the flow and pollutant load projections.

Influent wastewater flows were projected for the following conditions:

- Average annual flow (AAF): Average flow occurring over the course of the year.
- Maximum month flow (MMF): Maximum of the 30-day running average.
- Peak hour wet weather flow (PHWWF): Peak hour flow resulting from a rainfall event.
- Peak hour dry weather flow (PHDWF): Peak hour flow during a typical dry weather day.
- Minimum hour dry weather flow (MHDWF): Lowest hourly flow during a typical dry weather day.

The following conventional pollutant loads were projected for average annual (AA) and maximum month (MM) flow conditions:

- Five-day biochemical oxygen demand (BOD_5).
- Total suspended solids (TSS).
- Ammonia (NH_3).

2.2 POPULATION PROJECTIONS

This section summarizes the population and flow projections presented in the City of Stockton's most recent planning reports, the Stockton General Plan 2035 and the 2010 Wastewater Rate Study, and describes the population projections used for the CIP flow and load analysis.

2.2.1 Past Population Growth Rate Projections

The Stockton General Plan 2035 presented San Joaquin County Council of Governments (SJCOG) population projections to 2025 based on historical population data obtained from the California Department of Finance (DOF). The General Plan population growth rate projections to 2035 were determined by comparing the SJCOG population projections to other population projections for the City of Stockton and San Joaquin County published by the SJCOG, California Department of Housing and Community Development, City of Stockton building permit activity, and California DOF.

The 2010 Wastewater Rate Study by HDR presented projected customer growth rates for the City of Stockton to 2020. The projected customer growth rates published in the rate study are lower than the population projections presented in the Stockton General Plan 2035, which was published prior to the economic decline that began in 2007-2008.

The City of Stockton SJCOG, General Plan, and the Wastewater Rate Study projected growth rates for 2010 to 2035 are included in Table 2.1.

2.2.2 Population Projections

Population projections for the CIP were based on historical population data from the California DOF and a combination of customer and population growth rates from the Stockton General Plan 2035 and the 2010 Wastewater Rate Study. For this analysis, the 2011 to 2020 growth rates were based on the 2010 Wastewater Rate Study, while projections beyond 2020 were based on the Stockton General Plan 2035. As shown in Figure 2.1 and Table 2.2, the basis for the population projection is as follows:

- 0.0% from 2011 through 2013
- 0.5% from 2014 through 2015
- 1.0% from 2016 through 2020
- 2.5% from 2021 through 2035.

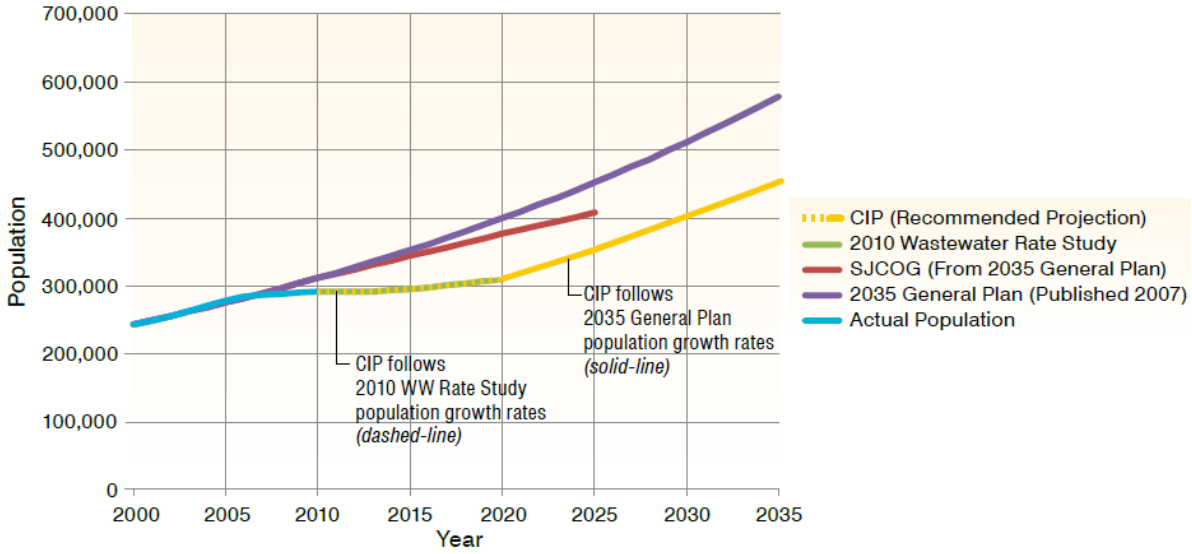


Figure 2.1 Population Projections

Applying the above population growth rates results in an increase in population of 54 percent between 2010 and 2035. Population projections in the General Plan 2035 estimated a population increase for the same period at approximately 84 percent (2.5 percent annual growth rate). However, the General Plan was published in 2007 prior to the on-going housing and economic crisis, which resulted in a decrease in annual growth rates from 2007 to 2010. The average annual growth rate from 2007 to 2010, during the economic downturn, ranged from 0.5 to 0.9 percent, whereas the average annual growth rate from 2000 to 2006, prior to the economic downturn, ranged from 1.5 to 3.1 percent, with an average of 2.4 percent. It is assumed that after the economy recovers and the housing market returns to more typical conditions, growth patterns will return to historical norms.

Table 2.1	Comparison of Recent Population Growth Rate Projections Capital Improvement and Energy Management Plan City of Stockton		
Year	SJCOG Projections (% per Year)	General Plan 2035 Projections (% per Year)	WW Rate Study Projections (% per Year)
2010	2.5	2.5	--
2011	2.0	2.5	0.0
2012	2.0	2.5	0.0
2013	2.0	2.5	0.0
2014	2.0	2.5	0.5
2015	2.0	2.5	0.5
2016	1.8	2.5	1.0
2017	1.8	2.5	1.0
2018	1.8	2.5	1.0
2019	1.8	2.5	1.0
2020	1.8	2.5	1.0
2021	1.6	2.5	--
2022	1.6	2.5	--
2023	1.6	2.5	--
2024	1.6	2.5	--
2025	1.6	2.5	--
2026	--	2.5	--
2027	--	2.5	--
2028	--	2.5	--
2029	--	2.5	--
2030	--	2.5	--
2031	--	2.5	--
2032	--	2.5	--
2033	--	2.5	--
2034	--	2.5	--
2035	--	2.5	--

Table 2.2 Historical and Projected City Population
Capital Improvement and Energy Management Plan
City of Stockton

Year	Total Population[1,2]	Assumed Annual Growth Rate (%)
1900	17,506	-
1910	23,253	2.9%
1920	40,296	5.7%
1930	47,963	1.8%
1940	54,714	1.3%
1950	70,853	2.6%
1960	86,321	2.0%
1970	107,644	2.2%
1980	149,779	3.4%
1990	210,943	3.5%
2000	243,771	1.5%
2001	249,080	2.1%
2002	255,238	2.4%
2003	262,617	2.8%
2004	271,126	3.1%
2005	278,858	2.8%
2006	284,509	2.0%
2007	287,189	0.9%
2008	288,499	0.5%
2009	290,409	0.7%
2010	292,133	0.6%
2011	292,133	0.0%
2012	292,133	0.0%
2013	292,133	0.0%
2014	293,594	0.5%
2015	295,062	0.5%
2016	298,012	1.0%
2017	300,992	1.0%
2018	304,002	1.0%
2019	307,042	1.0%
2020	310,113	1.0%
2021	317,866	2.5%
2022	325,812	2.5%
2023	333,958	2.5%
2024	342,306	2.5%
2025	350,864	2.5%
2026	359,636	2.5%
2027	368,627	2.5%
2028	377,842	2.5%
2029	387,288	2.5%
2030	396,971	2.5%
2031	406,895	2.5%
2032	417,067	2.5%
2033	427,494	2.5%
2034	438,181	2.5%
2035	449,136	2.5%

Note:
(1) Population information for years prior to 2005 was obtained from U.S. Census Bureau data. Populations from 2005 to 2010 were obtained from California DOF records.

2.3 HISTORICAL WASTEWATER FLOWS AND LOADS

Influent wastewater flows and BOD_5, TSS, and ammonia loads for the RWCF were analyzed for a five-year review period from January 2005 through December 2009. A summary of the historical average annual and maximum month flows and loads is presented in this section.

2.3.1 Per Capita Wastewater Flows

Average annual per capita flows were calculated by dividing the average annual flow for each year by the corresponding population for the same year. Average annual per capita flows are presented in Table 2.3. The per capita flow includes residential, commercial, and industrial flows.

Average annual per capita flows throughout the five year period ranged from a high of 135 gallons per capita per day (gpcd) in 2006 to a low of 110 gpcd in 2009. The decrease in per capita flow may be the result of voluntary water conservation in response to the City's water conservation program and reduced residential and commercial use of water due to economic conditions. The 2009 per capita flow of 110 gpcd was adopted as the basis for projecting flows on the assumptions that further reductions in flow due to water conservation will be balanced by increased water use caused by economic growth.

2.3.2 Maximum Month Flow Peaking Factors

Historical maximum month peaking factors are presented in Table 2.4. Maximum month peaking factors were calculated by dividing the maximum month flow by the average annual flow for each year. The largest peaking factor throughout the review period, 1.14, was used for projecting future maximum month flows.

A review of incomplete flow data from 2010 indicated that the 2010 average annual flow would be approximately 30.2 mgd, a 5% decrease in flow from the 2009 average of 31.9 mgd. This is consistent with the water usage declines discussed previously.

2.3.3 Per Capita Wastewater Loads

The influent concentrations of conventional pollutants, including BOD_5, TSS, and ammonia, were analyzed for the 2005 to 2009 review period. Per capita loads for each pollutant were calculated by dividing the annual average pollutant load for each year by the corresponding population for the same year.

Table 2.3 presents the average annual per capita BOD_5, TSS, and ammonia loads for the review period. The 2009 average annual per capita BOD5, TSS, and ammonia loads (0.28, 0.24, and 0.024 pounds per capita per day, respectively) were selected to project pollutant loads to 2035.

Table 2.3 Historical Average Annual Flows, Loads, and Concentrations
Capital Improvement and Energy Management Plan
City of Stockton

Year	2005	2006	2007	2008	2009	Average	Adopted for Projections
Population(1,2)	278,858	284,509	287,189	288,499	290,409	--	--
Influent Flow (mgd)	34.8	38.3	35.5	35.7	31.9	35.2	--
Per Capita Influent Flow (gpcd)	125	135	124	124	110	123	110
BOD_5 Load (ppd)	91,400	86,200	93,200	85,400	79,900	87,400	--
Per Capita BOD_5 Load (ppcd)	0.33	0.30	0.32	0.30	0.28	0.31	0.28
BOD_5 Concentration (mg/L)	315	266	314	286	299	296	--
TSS Load (ppd)	74,700	70,900	82,200	80,900	69,800	75,700	--
Per Capita TSS Load (ppcd)	0.27	0.25	0.29	0.28	0.24	0.26	0.24
TSS Concentration (mg/L)	258	222	277	271	262	258	--
Ammonia Load (ppd)	7,100	7,900	7,700	7,700	6,900	7,400	--
Per Capita Ammonia Load (ppcd)	0.025	0.028	0.027	0.027	0.024	0.026	0.024
Ammonia Concentration (mg/L)	25	25	26	26	26	25	--

Notes:
(1) Population data obtained from California DOF Records.
(2) Per capita flow rates were calculated based on California DOF population records for the City of Stockton, which may not match the actual service area population. Decreases or increases in service area population versus California DOF populations will result in a change in the calculated per capita values but will not affect the projected flows.

Table 2.4 Historical Maximum Month Flow and Load Peaking Factors
Capital Improvement and Energy Management Plan
City of Stockton

Year	2005	2006	2007	2008	2009	Average	Adopted for Projections[2]
Influent Flow (mgd)	36.8	42.4	38.0	40.6	34.0	38.4	--
Influent Flow Peaking Factor[1]	1.06	1.11	1.07	1.14	1.07	1.09	1.14
BOD_5 Load (ppd)	116,200	105,400	128,300	111,100	98,500	111,900	--
BOD_5 Load Peaking Factor	1.27	1.22	1.38	1.30	1.23	1.28	1.38
TSS Load (ppd)	89,800	83,800	115,900	101,000	88,500	95,800	--
TSS Load Peaking Factor	1.20	1.18	1.41	1.25	1.27	1.26	1.41
Ammonia Load (ppd)	7,900	8,900	8, 800	8,800	7,500	8,380	--
Ammonia Load Peaking Factor	1.11	1.13	1.15	1.14	1.10	1.13	1.15

Notes:

(1) Historical maximum month peaking factors were calculated by dividing the maximum month flow or load for each year by the corresponding average annual flow or load for the same year in Table 2.3.

(2) The maximum month peaking factor used for projecting maximum month flows or loads was determined as the largest maximum month flow or load peaking factor during the review period.

2.3.4 Maximum Month Load Peaking Factors

Historical maximum month peaking factors for BOD_5, TSS, and ammonia loads are presented in Table 2.4. Maximum month peaking factors were calculated using the same approach used for determining maximum month flow peaking factors.

2.3.5 Historical Industrial Flows and Loads

In addition to residential and commercial users, there are currently 32 industries that contribute wastewater to the RWCF. These industries are billed based on their flows and loads. Table 2.5 summarizes the 2009 industrial flows and loads to the RWCF. Figure 2.2 presents the seasonal variation in industrial flows and loads for 2009.

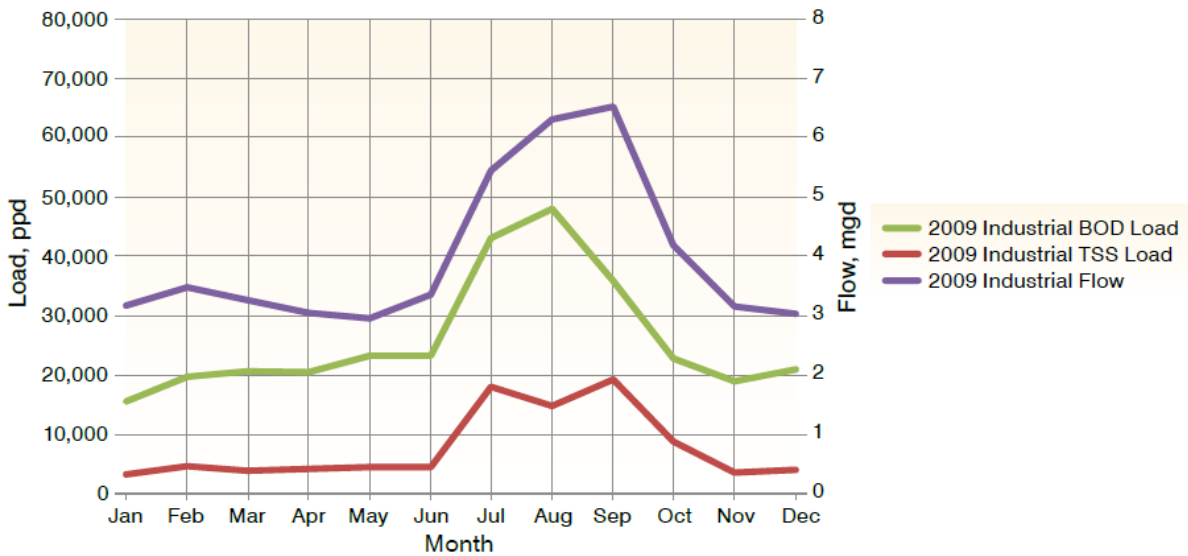


Figure 2.2 Industrial Flows and Loads Trends for 2009

In 2009, 12% of the total influent flow to the RWCF originated from industries. The percentage of BOD_5 and TSS load contributed by industries was approximately 33% and 11%, respectively. From 2008 to October 2010, flows from industries have decreased while loads are not significantly different from the loads experienced in 2005 and 2006.

Future industrial growth is anticipated after economic recovery; however, there are no available or known reports to allow for quantification of flows and loads from future industries. The SJCOG is working to update their residential and industrial growth projections. Therefore, it was assumed that industrial flows and loads will increase proportionally with population growth projections. Due to the high percentage of the BOD_5 load that is contributed from industrial users, it is important for the City to consider the impacts of additional flows and loads prior to accepting new industrial users. Additionally, the City should revisit flow and load projections when the SJCOG updated projections are completed.

Table 2.5 Industrial Flows and Loads (2009 Summary)
Capital Improvement and Energy Management Plan
City of Stockton

Industries	Average Influent Flow mgd[1]	BOD_5 ppd[2]	TSS ppd[2]
Corn Products Corp.	0.73	11,004	2,038
California Spray Dry Co.	0.09	3,378	502
Unilever Bestfoods	0.42	2,920	2,316
Campbell Soup Supply	0.41	2,448	1,225
H.J. Heinz	0.05	1,146	140
Diamond of California	0.06	1,115	241
Stockton Sanitary Wash Rack	0.00	979	10
Hormel	0.29	799	410
Tankerwash USA	0.01	459	72
Cintas Corporation	0.09	351	218
Creative Research Management	0.01	258	77
Sodexho	0.15	209	76
Angelica Textile Services	0.07	197	75
Unifirst Corp	0.04	170	54
BJJ Trucking	0.01	167	11
Zacky Kitchens	0.10	134	117
New Stockton Poultry	0.02	114	29
California Tank Lines	0.02	105	75
Grimaud Farms	0.02	66	31
Air Products	0.38	6	8
California Advanced H2O	0.08	4	5
POSDEF Company	0.03	3	8
Duraflame	0.01	3	3
American Sunny Foods	0.00	3	2
Pacific Ethanol	0.01	1	1
Niagara	0.09	1	2
Midway, Crosstown Commons	0.01	1	1
Brulin & Co.	0.00	0	0
San Joaquin County French Camp	0.30	0	0
Northern California Youth Center	0.29	0	0
Port of Stockton - Rough and Ready	0.22	0	0
Parsons Engineering Science	0.02	0	0
Total Industrial Flows and Loads	**4.0**	**26,000**	**7,700**
Percent of Influent[3]	**12.5**	**32.5**	**11.0**

Notes:

(1) Flow data provided in MG/month, converted to MGD, and averaged for all months in 2009.

(2) Pollutant data provided in 1000 lbs per month, converted to lbs per day (ppd), and averaged for all months in 2009.

(3) Percent of influent calculated by dividing the average flow or load from industry by the average annual flow or load for 2009 in Tables 2.3 and 2.4, respectively.

2.4 PROJECTED WASTEWATER FLOWS AND LOADS

Population projections were used to estimate future influent wastewater flows and loads from 2010 to 2035. Projected flows and loads will be the basis for evaluating wastewater treatment capacity for the RWCF.

2.4.1 Approach to Flow and Load Projections

Typically, average dry weather flows are used as the basis for flow projections; however, the data does not indicate a consistent dry weather trend in influent flows to the RWCF. Despite a seasonal increase in industrial flows during the summer months, the influent flow throughout the review period does not follow a consistent seasonal trend (See Figure 2.3).

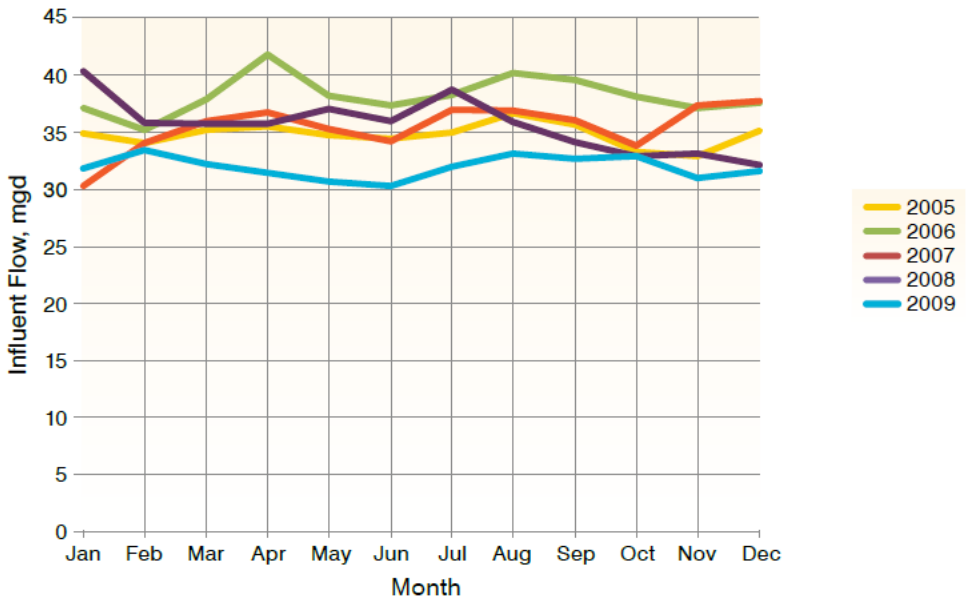


Figure 2.3 Influent Flow Trends

Although the RWCF is rated on an average dry weather flow basis, it was determined that it was more appropriate to use average annual flows for projecting flows to the RWCF.

Flow and load projections were calculated independently based on 2009 per capita flows and loads to reflect potential changes in concentration due to water conservation and current economic and housing conditions.

The largest maximum month peaking factors throughout the review period were used to calculate the projected maximum month flow and loads from the projected average annual flow and loads. Historical minimum and peak hour dry weather flow and peak wet weather flow peaking factors were used to project minimum and peak dry weather and wet weather flows from projected average annual flows.

2.4.2 Projected Wastewater Flows

Wastewater flow projections for average annual and maximum month conditions are presented in Table 2.6. The MMF was calculated using a peaking factor of 1.14 (previously presented in Table 2.4). In 2035, the AAF is projected to be 49.3 mgd. This is approximately 5 mgd less than the RWCF's permitted capacity of 55 mgd. Figure 2.4 includes a plot of the historical and projected AAFs and MMFs.

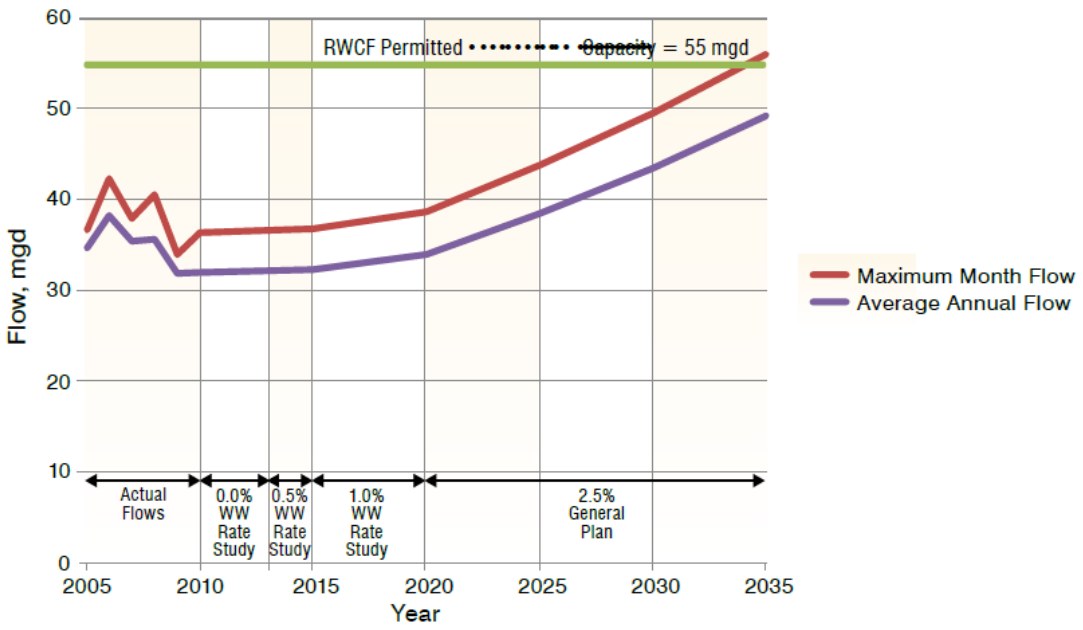


Figure 2.4 Influent Flow Projections

2.4.3 Projected Wastewater Loads

Load projections for BOD5, TSS, and ammonia for average annual and maximum month conditions are presented in Table 2.6. The average annual BOD5 load is expected to increase from approximately 80,400 lbs/day in 2010 to approximately 123,600 lbs/day in 2035. The average annual TSS load is expected to increase from approximately 70,200 lbs/day in 2010 to approximately 107,900 lbs/day in 2035. The average annual ammonia load is expected to increase from approximately 6,900 lbs/day in 2010 to approximately 10,600 lbs/day in 2035.

2.5 DIURNAL INFLUENT FLOW PATTERN

Several years of flow charts were reviewed throughout the review period to determine the typical diurnal trend in influent hourly flows. Figure 2.5 presents the typical diurnal flow pattern for influent flows to the RWCF.

Table 2.6 Projected Average Annual and Maximum Month Flows and Loads
Capital Improvement and Energy Management Plan
City of Stockton

	Current[1]	2015	2020	2025	2030	2035
Population Projection	292,133	295,062	310,113	350,864	396,971	449,136
Average Annual[2]						
Influent Flow (mgd)	31.9	32.4	34.1	38.5	43.6	49.3
BOD_5 Load (ppd)	79,900	81,200	85,300	96,500	109,200	123,600
BOD_5 Concentration (mg/L)	300	300	300	300	300	300
TSS Load (ppd)	69,800	70,900	74,500	84,300	95,400	107,900
TSS Concentration (mg/L)	262	262	262	262	262	262
NH_3-N Load (ppd)	6,900	7,000	7,300	8,300	9,400	10,600
NH_3-N Concentration (mg/L)	26	26	26	26	26	26
Maximum Month[3]						
Influent Flow (mgd)	34.0	36.9	38.7	43.8	49.6	56.1
BOD_5 Load (ppd)	98,500	111,700	117,400	132,800	150,200	170,100
BOD_5 Concentration (mg/L)	347	363	363	363	363	363
TSS Load (ppd)	88,500	100,000	105,100	118,900	134,500	152,200
TSS Concentration (mg/L)	312	325	325	325	325	325
NH_3-N Load (ppd)	7,500	8,100	8,400	9,600	10,800	12,200
NH_3-N Concentration (mg/L)	26	26	26	26	26	26
Minimum Hour Dry Weather Flow[4]						
Influent Flow (mgd)	20.3	22.0	23.2	26.2	29.7	33.5
Peak Hour Dry Weather Flow[4]						
Influent Flow (mgd)	35.4	38.2	40.2	45.5	51.5	58.2
Peak Hour Wet Weather Flow[5]						
Influent Flow (mgd)	105.0	101.7	103.7	109.0	115.0	121.7

Notes:
(1) Flows and loads for current conditions are based on 2009 data; however, hourly dry weather flows are based on representative data during the 2005-2009 review period and hourly wet weather flows are based on hourly data from the January 4th, 2008 storm event.
(2) Average annual flows (AAF) are calculated by multiplying the population by a per capita flow of 110 gpcd. AA BOD_5, TSS, and NH3-N loads calculated by multiplying the projected population by peaking factors of 0.28, 0.24, and 0.024 ppcd, respectively.
(3) Maximum month flows (MMF) are calculated by multiplying the projected AA flow by a peaking factor of 1.14. MM loads for BOD_5, TSS, and NH3-N calculated by multiplying the projected AA load by peaking factors of 1.38, 1.41, and 1.15, respectively.
(4) Minimum and peak hourly dry weather flows are calculated by applying the minimum and peak hourly dry weather flow peaking factors 0.68 and 1.18 to the projected average annual flows, respectively.
(5) Peak hourly wet weather flow projections were determined by adding the peak I/I during the January 4th, 2008 wet weather event, 63.5 mgd, to the projected peak hour dry weather flow.

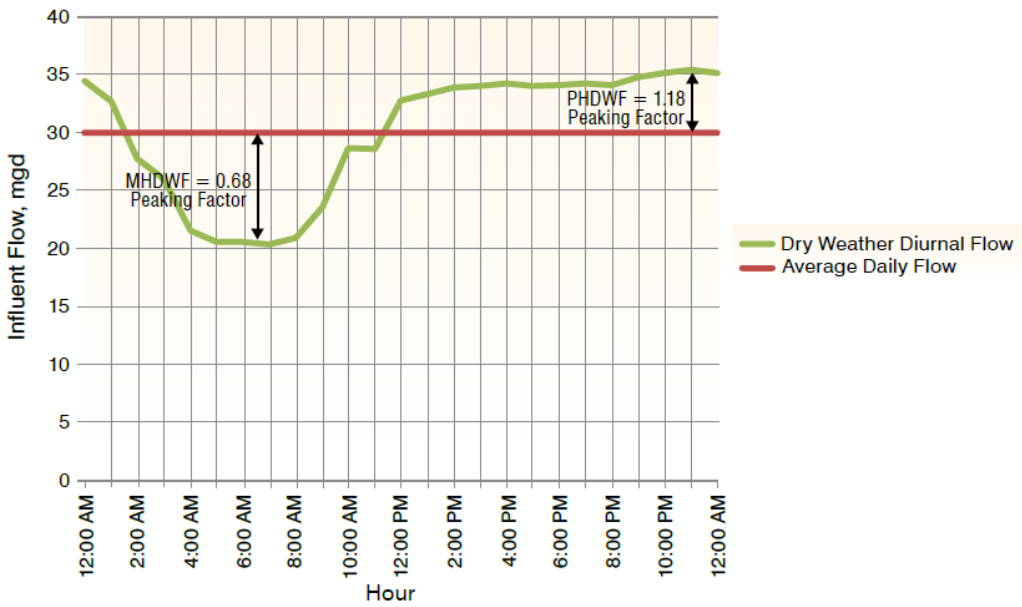


Figure 2.5 Typical Diurnal Flow Pattern

2.5.1 Diurnal Peaking Factors

Peak and minimum hourly flow peaking factors are used to determine the range of flows pumps must be able to handle on a daily basis. Peak and minimum dry weather diurnal peaking factors are calculated by dividing the peak or minimum hourly diurnal flow by the average flow for the day. Peak hour dry weather flow (PHDWF) occurs around 10PM and has a peaking factor of 1.18. Minimum hourly dry weather flow (MHDWF) occurs around 7AM and has a peaking factor of 0.68.

Using the minimum and maximum dry weather flow peaking factors, the projected 2035 average annual flow of 49.3 mgd will have a diurnal MHDWF of 33.5 mgd and a PHDWF of 58.2 mgd. Table 2.6 presents the projected minimum and peak hourly dry weather flows from 2010 to 2035.

2.6 WET WEATHER FLOW ANALYSIS

Wet weather flows were analyzed to determine the volume of inflow and infiltration (I/I) that the treatment plant receives during large rainfall events and to estimate peak influent wet weather flows to the RWCF. Hydrographs from large rainfall events were overlaid with the typical diurnal flow pattern and the area between the two curves is integrated to determine the volume of I/I that the treatment plant experiences. Preliminary and primary treatment facilities, raw sewage pumps, and related piping and hydraulic structures must be sized to adequately handle peak wet weather flows. Additionally, the ponds must have adequate capacity to store the excess volume of I/I that can't be processed by the secondary and tertiary facilities.

During the review period, the largest wet weather flows occurred on January 4th, 2008. The January 4th storm corresponded to a 2 year, 6 hour storm. The hydrograph for this wet weather event is presented in Figure 2.6. The hydrograph is superimposed over the typical diurnal flow pattern for 2008 and precipitation data for the January 4th, 2008 storm. The flow from I/I is calculated as the difference between the peak flow during the storm event and the corresponding peak hourly dry weather flow, which amounts to 63.5 mgd.

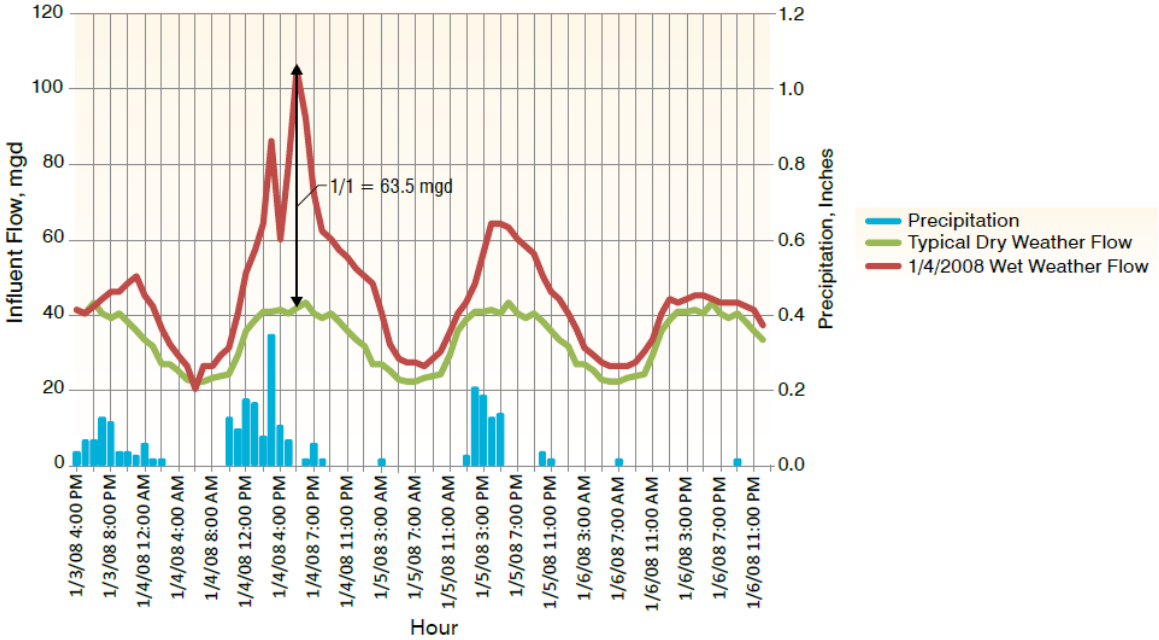


Figure 2.6 Wet Weather Hydrograph

There are two methods typically used to project PHWWFs when data from collection system flow modeling is not available. In one method, it is assumed I/I flow will increase proportionally with population growth and expansion of the sewer system. In this method, the PHWWF peaking factor from the storm event is applied to the projected hourly dry weather flows. The second method assumes the flow due to I/I will remain constant and expansion of the sewer system will not result in increased I/I. In this method, the flow due to I/I during the January 4th, 2008 storm, 63.5 mgd, is added to the projected peak hour dry weather flows. Based on discussions with City staff, it was decided that the latter method, where I/I remains constant throughout the review period, would be the most appropriate basis for wet weather flow projections. This method results in PHWWF peaking factor (PHWWF/AAF) at buildout of 2.47, which is comparable to other California Central Valley wastewater treatment facilities. The projected peak hourly wet weather flows are presented in Table 2.6.

The volume of I/I produced during the January 4th, 2008 wet weather events was estimated to be 20.8 MG. The oxidation ponds have adequate capacity to store this volume.

Discussions with City staff suggested a possible discrepancy between the wet weather flow data available and actual wet weather flows. Review of the diurnal curve for the January 2008 wet weather event indicated the Parshall flumes were functioning properly and were

not submerged; however, City staff suggested that poor hydraulic conditions in the Parshall flumes may be causing false flow recordings. To provide a more accurate wet weather flow analysis and ensure accurate flow recording in the future, it is recommended that flow meters, such as the pulse doppler insertion type, be installed in the raw sewage pump discharge pipelines to accurately measure the total flow into the RWCF during large wet weather events. Additionally, the results from an I&I study planned to occur in the upcoming wet weather season should be used to update this wet weather flow analysis.

2.7 SUMMARY OF FLOW AND LOAD DESIGN CRITERIA

A summary of existing and buildout flow and load design criteria is included in Table 2.7. The projected flow and load design criteria will be used to develop alternatives to reliably treat existing and future expected flows and loads. Figure 2.7 presents a summary of the projected average annual, maximum month, minimum hourly dry weather, peak hourly dry weather, and peak wet weather influent flows to the RWCF from 2010 to 2035.

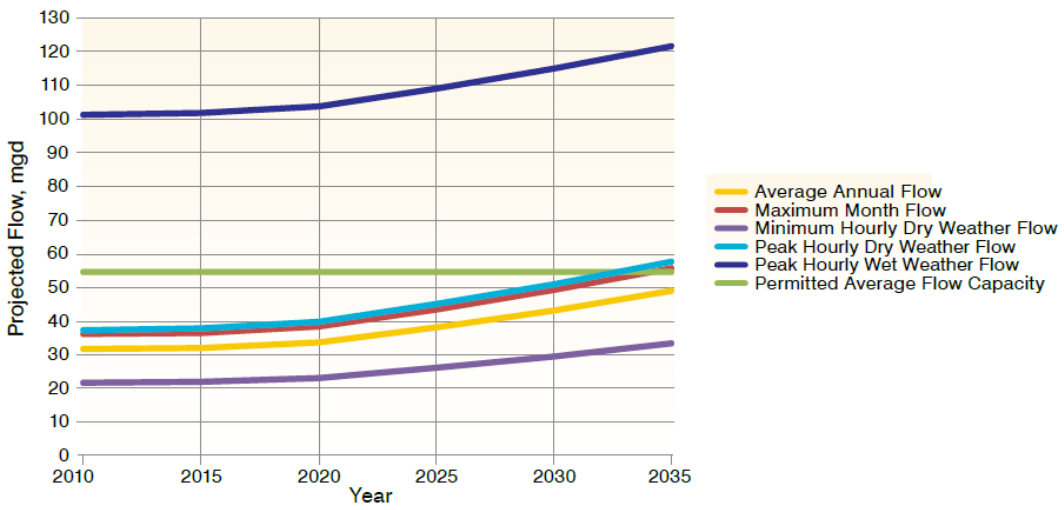


Figure 2.7 Summary of Projected Influent Flows

Table 2.7 Summary of Design Wastewater Flows and Loads
Capital Improvement and Energy Management Plan
City of Stockton

		Current Conditions[1]					Projected 2035 Values				
Parameter	**Units**	**AA**	**MM**	**MHDWF**	**PHDWF**	**PHWWF**	**AA**	**MM**	**MHDWF[2]**	**PHDWF[2]**	**PHWWF[2]**
Flow	MGD	31.9	34.0	21.3	35.4	105.0	49.3	56.1	33.5	58.2	121.7
BOD_5	ppd	79,900	98,500	---	---	---	123,600	170,100	---	---	---
TSS	ppd	69,800	88,500	---	---	---	107,900	152,200	---	---	---
Ammonia	ppd	6,900	7,500	---	---	---	10,600	12,200	---	---	---

Notes:

(1) Flows and loads for existing average annual and maximum month conditions are calculated from 2009 data. Hourly flow data for current conditions are determined from dry weather diurnal flow data during the review period and the January 4th, 2008 storm event.

(2) Dry weather hourly flow projections are calculated by applying the hourly flow peaking factors 0.68 and 1.18 to the projected average annual flow.

(3) Peak hourly wet weather flow projections were determined by adding the peak I/I during the January 4th, 2008 wet weather event, 63.5 mgd, to the projected peak hour dry weather flow.

REGULATORY REQUIREMENTS

3.1 INTRODUCTION

Regulatory requirements for the City of Stockton Regional Wastewater Control Facility (RWCF) are based on federal, state, and local requirements. Regulations apply to water discharged to “waters of the State”, application of water to land, biosolids reuse or disposal, and air quality.

3.2 WATER QUALITY REQUIREMENTS

Water quality requirements are set nationally by the Clean Water Act (CWA). The Environmental Protection Agency (EPA) has the authority to regulate discharges to the waters of the United States under the CWA. EPA also grants authority to state agencies for regulation and enforcement of water quality standards. In California, the authority that regulates discharges is the State Water Resources Control Board, which authorizes Regional Water Quality Control Boards (RWQCBs) to issue National Pollutant Discharge Elimination System (NPDES) permits.

The Clean Water Act requires the National Pollutant Discharge Elimination System (NPDES) permits to include effluent limitations that achieve technology-based standards and any more stringent limitations necessary to meet water quality standards. Table 3.1 summarized the effluent limitations for pollutants that have been identified as adversely affecting the designated beneficial uses for the San Joaquin River.

The City’s current NPDES Permit was adopted on October 23, 2008, as Waste Discharge Requirements Order No. R5-2008-0154, NPDES No. CA0079138, by the RWQCB (see Appendix A). In addition, the City was issued a Time Schedule Order (TSO) (Order No. R5-2008-0155) concurrently with the 2008 NPDES Permit because some effluent limitations were not immediately achievable. Interim effluent limitations, calculated based on RWCF performance, are only allowed by the State Implementation Plan (SIP) for the 2000 California Toxics Rule (CTR) Water Quality Objectives (WQOs).

3.2.1 Beneficial Uses of Receiving Waters (San Joaquin River)

The Regional Water Board adopted a Water Quality Control Plan (Fourth Edition, Revised in 2007) for the Sacramento and San Joaquin River Basins that designates beneficial uses, establishes water quality objectives, and contains implementation programs and policies to achieve those objectives for all waters addressed through the plan.

The beneficial uses of the San Joaquin River downstream of the RWCF river discharge are municipal and domestic supply; agricultural supply; industrial process supply; industrial service supply; water contact recreation; non-contact water recreation; migration of aquatic

Table 3.1 Effluent Limitations for 2008 NPDES Permit
Capital Improvements and Energy Management Plan
City of Stockton

Parameter	Units	Interim Effluent Limits[1]		Final Effluent Limits					
		Average Monthly	Maximum Daily	Average Monthly	Average Weekly	Maximum Daily	Instantaneous Minimum	Instantaneous Maximum	Annual Average
Aluminum, Total Recoverable	µg/L	---	2,900	311	---	750	---	---	200
Ammonia, Total (as N)	mg/L	---	---	2	---	5	---	---	---
	lbs/day [1]	---	---	917	---	2,294	---	---	---
Bis(2-ethylhexyl)phthalate	µg/L	---	5.5	1.8	---	3.6	---	---	---
Chlorodibromomethane	µg/L	---	23	5.0	---	16	---	---	---
Cyanide, Total Recoverable	µg/L	4.1	9.2	4.1	---	9.0	---	---	---
Dichlorobromomethane	µg/L	---	36	6.8	---	20	---	---	---
Manganese, Total Recoverable	µg/L	---	---	---	---	286	---	---	---
Molybdenum, Total Recoverable	µg/L	---	---	---	---	13	---	---	---
Nitrate plus Nitrite (as N)	mg/L	---	---	40	---	---	---	---	---
pH	s.u.	---	---	---	---	---	6.5	8.5	---
Total Suspended Solids (TSS)	mg/L	---	---	10	15	20	---	---	---
	lbs/day [1]	---	---	4,590	6,885	9,180	---	---	---
5-Day CBOD @ 20°C	mg/L	---	---	10	15	20	---	---	---
	lbs/day [1]	---	---	4,590	6,885	9,180	---	---	---
% Removal (BOD and TSS)	%	---	---	85	---	---	---	---	---
Total Residual Chlorine	mg/L	---	---	---	0.01 [2]	---	---	---	---
Total Coliform Organisms	MPN/100 mL	---	---	23	2.2	---	---	240	---
Average Dry Weather Flow	mgd	---	---	55 (max)	---	---	---	---	---
Dissolved Oxygen, Sep. 1- Nov. 30	mg/L	---	---	---	---	6.0 (min)	---	---	---
Dissolved Oxygen, Dec. 1 – Aug. 31	mg/L	---	---	---	---	5.0 (min)	---	---	---
Electrical Conductivity [3]	µmhos/cm	---	---	---	---	---	---	---	1,300
Mercury (Total Annual Mass)	lbs.	---	---	---	---	---	---	---	0.92 [4]
Temperature	deg F	---	---	---	---	---	---	+20 [7]	---
Turbidity	NTU	---	---	---	---	---	---	10 [8]	---

Table 3.1 Effluent Limitations for 2008 NPDES Permit
Capital Improvements and Energy Management Plan
City of Stockton

Parameter	Units	Interim Effluent Limits[1]		Final Effluent Limits					
		Average Monthly	Maximum Daily	Average Monthly	Average Weekly	Maximum Daily	Instantaneous Minimum	Instantaneous Maximum	Annual Average

Notes:
(1) Current interim limits based on Oct. 23, 2008 Time Schedule Order. To expire in October 2013.
(2) 0.01 mg/L as 4-day average, 0.02 mg/L as a 1-hr average.
(3) Limit predicated on City submitting a Salinity Plan.
(4) Interim limit until adoption of the Sacrament-San Joaquin Delta Methylmercury TMDL. Total annual mass discharge shall not exceed the value shown.
(5) Mass based effluent limitations are based on average dry weather flow of 55 mgd.
(6) Annual average effluent limitation.
(7) Effluent temperature shall not exceed receiving water temperature by more than 20 deg F. Effluent shall not cause the receiving stream temperature to rise more than 4 deg F above the natural temperature.
(8) Effluent turbidity shall also not exceed a daily average of 2 NTU, 5 NTU more than 5% of a 24-hour period, 1 NTU more than the receiving stream if the receiving stream is 0-5 NTUs, more than 20% of natural turbidity ranging from 5-50 NTUs, more than 10 NTU where natural turbidity is 5-100 NTUs, and more than 10% of natural turbidities greater than 100 NTUs.

organisms; both cold and warm freshwater aquatic habitat; spawning, reproduction, and/or early development; wildlife habitat; and navigation.

3.3 CURRENT NPDES PERMIT

Water quality based effluent limitations (WQBELs) are concentration limits placed on discharged effluent that are calculated to ensure that the receiving water will not exceed the WQO more than once in three years. When the upstream receiving water concentration for a specific constituent exceeds the WQO, the effluent limitation is set at the WQO. Interim effluent limitations are allowed when the receiving water WQO is based on the 2000 California Toxics Rule (CTR) and the discharger can demonstrate that it is infeasible to meet an effluent limitation for the toxic constituent. Interim limits for other types of WQOs can be included as part of a Time Schedule Order (TSO) that includes a compliance time schedule. Interim effluent limitations are developed based on actual treatment performance capabilities, and are only allowed for up to five years during which time the dischargers must come into compliance with the final effluent limitation. For existing TSOs, the RWQCB can grant up to one five year extension.

Effluent limitations in the current NPDES Permit are summarized in Table 3.1. The current (2008) NPDES Permit is included in Appendix A.

Minimum mandatory penalties (MMP) are required based on Senate Bill 709 (Migden Bill) for any numeric (i.e., non-narrative) violation of NPDES permit provisions. Discretionary fines are also possible above the MMP. Each numeric violation results in a $3,000 fine per occurrence.

3.4 COMPLIANCE STRATEGIES OVERVIEW

Non-compliance with the NPDES permit may result in fines, time schedule orders, or more serious legal action. It is illegal to plan for non-compliance with permit provisions. This master plan will consider existing NPDES permit requirements, impending changes to the permits, and the City's needs to accommodate changes in the volume and nature of influent wastewater. Moreover, the RWQCB could place building moratoriums on the City if the RWCF is not able to comply with the permit and building growth exacerbates any compliance problems. Compliance options should consider both regulatory options and facility improvements. Regulatory options include site-specific studies to address the applicability of WQOs to the RWCF discharge and other regional policy changes. Facility planning should also carefully consider the regulatory environment and RWCF specific and regional issues.

Two other RWQCB policies are important to consider, especially as the City considers expansions to the RWCF. The "antidegradation" policy constrains the RWQCBs from adopting NPDES permits that "degrade" waters of the state. Simply put, RWQCB actions

cannot cause receiving waters to exceed WQOs or impair known beneficial uses of those waters. In addition, the “anti-backsliding” policy does not allow NPDES permit amendments or renewals to “relax” numeric effluent limitations or discharge prohibitions of existing permits.

The current RWCF has sufficient treatment capacity and with some constituent-specific exceptions, produces effluent of high enough quality to discharge to the San Joaquin River. Although regulatory relief and source control measures may be enough for compliance for specific constituent issues, the disposal capacity issue and several specific constituent issues may require facility improvements. Of particular concern in the short term are disinfection byproducts and nitrogen. Salinity and mercury are longer-term issues that should be also considered during this capital improvement planning cycle, as significant facility improvements could be necessary.

The overall regulatory strategy should incorporate operational flexibility so that any drastic changes to regulatory requirements in the future can be more easily addressed without a major facility renovation. It is speculative to make any assessments on the regulatory environment more than five years in the future.

3.5 KEY ISSUES

Several key issues that may impact the RWCF’s discharge permit are discussed below. Each of these potential impacts should be carefully tracked through the NPDES permitting process.

3.5.1 Dilution Credits

A dilution credit is a numerical value associated with the mixing zone that accounts for the receiving water entrained into the discharge and is used in the calculation of effluent limitations on a pollutant-by-pollutant basis. Before establishing a mixing zone and dilution credit for a discharge, it must be determined if, and how much receiving water is available to dilute the discharge. The method for determining dilution effects considers tidal influences on the receiving water flow.

Current and past discharge permits from the Regional Water Board have not allowed a dilution credit for acute and chronic aquatic life criteria due to the impaired condition of the San Joaquin River, the presence of endangered species, and the lack of a reliable dilution model to demonstrate a dilution credit would be appropriate.

For human health criteria, critical environmental impacts are expected to occur far downstream from the RWCF such that complete mixing is a valid assumption. The State Implementation Plan (SIP) recommends using the harmonic mean receiving water flow and the long-term arithmetic mean to calculate a dilution credit for human health criteria constituents. The previous permit (Order No. R5-2002-0083) granted a 10:1 dilution credit and required the RWCF to conduct a human carcinogenic impact study. Based on the

findings from this study, the Regional Water Board has determined there is available dilution for human health criteria. The current permit (Order No. R5-2008-0154) grants a dilution credit of 13:1 based on updated harmonic flow and long-term arithmetic mean flow data, with a mixing zone that extends approximately 3.5 miles upstream and 1 mile downstream of the discharge into the San Joaquin River.

If the Regional Board revises its methodology for calculating dilution, the discharge limits may decrease, triggering facility improvements achieve lower total nitrogen and THM limits. For example, if dilution is disallowed and the Regional Water Board does not accept the proposed wetlands denitrification system, additional denitrification processes would be required. In addition, the RWCF would likely have to discontinue chlorine-based disinfection and construct new disinfection facilities, such as ultraviolet light disinfection. Discussion of future regulatory concerns is presented in Section 3.7.

3.5.2 Groundwater Monitoring

The RWCF currently stores digested sludge in an unlined lagoon and secondary treated effluent is treated in unlined ponds. The lagoons and ponds have the potential to degrade the quality of the underlying groundwater. Groundwater monitoring is currently required at the existing network of eighteen groundwater monitoring wells around the RWCF to monitor fourteen different constituents on a quarterly or semiannual basis.

The NPDES permit states that the RWCF's current monitoring network does not adequately characterize the variable background groundwater quality conditions in the vicinity of the RWCF, and it cannot be determined if the affected groundwater exceeds background water quality. The groundwater quality data is necessary for evaluating compliance with the Groundwater Limitations in the NPDES permit. To determine compliance with the groundwater limitations, the City submitted a work plan and time schedule that describes the installation of any additional monitoring wells and any other testing needed to effectively and fully characterize background quality conditions.

3.5.3 Emerging Contaminants

"Emerging contaminants" include endocrine disrupting compounds (EDCs), pharmaceuticals and personal care products (PPCPs), and other xenobiotics[1]. In the future, regulatory agencies may require additional treatment and removal of emerging contaminants known to be present in municipal wastewater. However, there is insufficient information at this time to plan for any future discharge regulations for emerging contaminants.

[1] A xenobiotic is a chemical found in an organism, or human body, which is not normally produced or expected to be present in the organism.

3.5.4 Basin Plan Updates

The RWQCBs are required to perform triennial reviews of the Basin Plans which are water quality control plans for watersheds within each RWQCB region. These reviews can be used to modify beneficial use designations or other specific policies. These review processes should be carefully monitored since changes in polices could significantly impact RWCF discharge limits. During the course of NPDES permit renewals, the RWQCB permit writers may defer to this process as the means to modify RWQCB policy.

3.5.5 State and Federal Bay-Delta Programs

The City may be affected by state and federal bay-delta program actions that may alter flow patterns through the Delta, and increase regulatory requirements with the goal of improving water quality. The state and federal programs may also bring opportunities for wastewater recycling, watershed ecosystem, and watershed water quality partnerships that would benefit the City.

3.5.6 Selenium Fish Tissue Criteria

The EPA has proposed a draft revised WQO for selenium. This revised fish-tissue based WQO is proposed as a better indicator of the presence of selenium in a particular water body. The draft criteria have not yet been finalized and the impact on the RWCF's ability to comply with selenium objectives is unknown at this time.

Section 3.7 in this Chapter summarizes future regulatory concerns that may require modifications to existing facilities.

3.6 WATER QUALITY BASED EFFLUENT LIMITS

This section summarizes the ability of the existing RWCF facilities to comply with current effluent limitations. Explanations for how each of effluent limitation is determined can be found in the NPDES permit in Appendix A.

Table 3.2 compares the effluent limitations for the regulated pollutants to average monthly effluent concentrations in 2009.

3.6.1 Aluminum

The secondary MCL for aluminum for the protection of the municipal water supply beneficial use is 200 micrograms per liter (µg/L) on an average annual basis. To determine toxicity to aquatic organisms, the USEPA advised that a water effects ratio (WER) be used to calculate limitations for aquatic life. Based on USEPA developed National Recommended Ambient Water Quality Criteria (NAWQC), findings from the Arid West Water Quality Research Project, and the nearby City of Manteca WER study, the Regional Water Board determined the appropriate aluminum limitations for protection of aquatic life to be 311 µg/L

Table 3.2 Effluent Concentrations for Water Quality Pollutants
Capital Improvements and Energy Management Plan
City of Stockton

Parameter	Units	Average Monthly Effluent Limit	2009 Monthly Final Effluent Concentrations												No. Exceedances
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Aluminum, Total Recoverable	µg/L	311 (2)	230	310	140	250	160	140	200	130	220	230	200	180	None
Ammonia, Total (as N)	mg/L	2	0.7	0.8	0.8	0.7	0.6	0.6	0.7	0.8	1.0	0.6	0.9	1.6	None
	lbs/day (1)	917	156	187	201	158	118	123	138	185	221	118	184	360	None
Bis(2-ethylhexyl)phthalate	µg/L	1.8 (2)	0	0	0	0	0	0	0	0	0	0	0	0	None
Chlorodibromomethane	µg/L	5.0 (2)	1.63	0.83	1.20	2.20	2.20	1.70	3.50	**15.0**	**9.70**	**16.00**	**12.00**	1.10	None (2)
Cyanide, Total Recoverable	µg/L	4.1 (1)	3.7	**5.0**	3.4	2.7	**5.1**	3.4	3.7	4.0	**7.2**	3.1	0.0	0.5	3 (3)
Dichlorobromomethane	µg/L	6.8 (2)	4.0	2.4	2.0	5.9	5.6	6.8	5.8	**8.1**	5.2	6.4	**14.0**	1.9	None (2)
Manganese, Total Recoverable	µg/L	---	---	---	---	---	---	---	---	---	---	---	---	---	No Monthly Limit
Molybdenum, Total Recoverable	µg/L	---	---	---	---	---	---	---	---	---	---	---	---	---	No Monthly Limit
Nitrate plus Nitrite (as N)	mg/L	40	23.5	23.5	18.1	12.9	14.3	7.6	8.6	14.3	23.4	24.6	19.3	22.4	None
pH	s.u.	---	---	---	---	---	---	---	---	---	---	---	---	---	No Monthly Limit
Total Suspended Solids (TSS)	mg/L	10	2.5	2.5	2.5	2.5	2.5	2.6	2.6	2.5	2.6	2.5	2.5	2.5	None
	lbs/day (1)	4,590	581	610	630	604	492	485	497	595	612	519	522	555	None
5-Day CBOD @ 20°C	mg/L	10	2	2	2	2	2	2	2	2	2	2	2	2	None
	lbs/day (1)	4,590	465	488	504	485	394	381	389	476	478	415	417	444	None
% Removal (BOD and TSS)	%	85	99.0	99.0	99.2	99.1	99.3	99.2	99.3	99.3	99.1	99.0	99.1	99.1	None
Total Residual Chlorine	mg/L	---	---	---	---	---	---	---	---	---	---	---	---	---	No Monthly Limit
Total Coliform Organisms	MPN/100 mL	23	Unk	Unk	Unk	Unk	Unk	Unk	Unk	Unk	Unk	Unk	Unk	Unk	Unknown
Average Dry Weather Flow	mgd	55 (max)	32.1	34.8	32.9	33.7	33.2	27.6	25.4	34.0	37.8	32.2	32.2	33.4	None
Dissolved Oxygen, Sep. 1-Nov. 30	mg/L	---	---	---	---	---	---	---	---	---	---	---	---	---	No Monthly Limit

Table 3.2 Effluent Concentrations for Water Quality Pollutants
Capital Improvements and Energy Management Plan
City of Stockton

Parameter	Units	Average Monthly Effluent Limit	2009 Monthly Final Effluent Concentrations												No. Exceedances
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Dissolved Oxygen, Dec. 1 – Aug. 31	mg/L	---	---	---	---	---	---	---	---	---	---	---	---	---	No Monthly Limit
Electrical Conductivity (3)	µmhos/cm	---	---	---	---	---	---	---	---	---	---	---	---	---	No Monthly Limit
Mercury (Total Annual Mass)	lbs.	---	---	---	---	---	---	---	---	---	---	---	---	---	No Monthly Limit
Temperature	deg F	---	---	---	---	---	---	---	---	---	---	---	---	---	No Monthly Limit
Turbidity	NTU	---	---	---	---	---	---	---	---	---	---	---	---	---	No Monthly Limit

Notes:
1) Interim effluent limitation.
2) Limit is based on 2013 compliance. There are no interim monthly effluent limitations.
3) EPA is currently reviewing their test method and sample preservation methods for the cyanide test.
Unk = Unknown

for average monthly effluent limitations (AMEL) and 750 µg/L for maximum daily effluent limitations (MDEL).

Based on effluent samples from 2009, it appears that the RWCF can sufficiently remove aluminum to the required effluent limits.

The current permit also allows for re-consideration of effluent aluminum limitations for aquatic life if the City were to provide additional information such as a site-specific, defensible water effects ratio study.

3.6.2 Ammonia

Nitrifying biotowers and engineered wetlands were installed at the RWCF in order to meet the previous permit effluent limitations for ammonia, an AMEL of 2 milligrams per liter (mg/L) and an MDEL of 5 mg/L. Inadequate or incomplete nitrification may result in the discharge of ammonia to the San Joaquin River, which can cause toxicity to aquatic organisms. Based on updated “real time” data for the effluent and receiving water streams, ammonia effluent limitations of 2 mg/L for AMEL and 5 mg/L for MDEL were determined to be fully protective of the beneficial uses; therefore the limitations set in the previous permit were carried forward to the current permit.

Ongoing studies to evaluate the effect of ammonia on the inhabitation of growth of freshwater diatoms in the Delta and potential impact on Delta pelagic organism decline and studies to evaluate the sensitivity of ammonia toxicity on Delta smelt may result in reconsideration of ammonia effluent limitations. The RWCF has difficulty meeting the ammonia limits under certain conditions. Further discussion regarding ammonia limitations is presented in Section 3.7 and also in Chapter 4.

3.6.3 Bis(2-ethylhexyl)phthalate

Bis(2-ethylhexyl)phthalate is used primarily as one of several plasticizer in polyvinyl chloride resins for fabricating flexible vinyl fabrics. Based on background ambient data collection performed on the San Joaquin River, the maximum observed upstream receiving water concentration was found to be 3.2 µg/L, which is above the NTR criterion for Bis(2-ethylhexyl)phthalate. The NTR criterion is 1.8 µg/L for consumption of water and aquatic organisms and 5.9 µg/L for consumption of aquatic organisms. Per the State Implementation Plan, no dilution is allowed since the arithmetic mean exceeds the Bis(2-ethylhexyl)phthalate criterion. The current permit includes a TSO to meet an AMEL and MDEL of 1.8 µg/L and 3.6 µg/L for protection of human health by October 2013. The TSO includes a temporary MDEL of 5.5 µg/L.

Based on effluent samples from 2009, it appears that the RWCF can sufficiently remove bis(2-ethylhexyl)phthalate to the required effluent limits.

3.6.4 Chlorine Residual

The RWCF uses chlorine for disinfection, which is toxic to aquatic organisms. Due to the acute toxicity of chlorine, 1-hour and 4-day effluent limitations were implemented rather than maximum daily and average monthly criteria. The 1-hour and 4-day effluent limitations are 0.02 mg/L and 0.01 mg/L, respectively.

Based on effluent samples from 2009, it appears that the RWCF is able to comply with the required effluent chlorine residual limits.

3.6.5 Cyanide

The CTR includes maximum 1-hour average and 4-day average limitations of 22 micrograms per liter (µg/L) and 5.2 µg/L, respectively, for protection of freshwater aquatic life. Data between 2002 and 2008 indicated the maximum effluent concentration of cyanide from the RWCF was 13 µg/L and the maximum concentration in the San Joaquin River upstream of the discharge was 300 µg/L. The Regional Water Board requires the RWCF to meet a MDEL of 9.0 µg/L and an AMEL of 4.1 µg/L because the RWCF contributes to an in-stream excursion of the CTR limits.

To comply with the previous 2002 NPDES permit, the City developed a pollution prevention plan for cyanide, which included a source identification study and mass balance of influent loadings. Based on the findings of this study, the Discharger concluded that 71 percent of the cyanide influent load is from residential sources, 12 percent is from commercial sources, and 7 percent is from the industrial dischargers. As such, implementation of local limits or other industrial source control may not have a significant impact in overall cyanide reduction.

To determine if the cyanide exceedences are actually a function of sample preservation techniques (“Cyanide Formation and Fate in Complex Effluents and its Relation to Water Quality,” Water and Environmental Research Foundation, 2003), the RWCF investigated the feasibility of modifying its analytical procedures.

Based on effluent samples from 2009, it appears that the RWCF exceeds the current limitations required by their discharge permit. A TSO for compliance with the cyanide effluent limitations was established in TSO No. R5-2008-0155, which requires preparation and implementation of a pollution prevention plan. However, the exceedances are likely caused by sample preservation procedures, which have since been modified. It is anticipated that the new sample preservation procedures will reduce the number of exceedances of the cyanide limit.

3.6.6 Dissolved Oxygen (DO)

Board Resolution No. R5-2005-0005 establishes a total maximum daily load (TMDL) for factors contributing to the dissolved oxygen impairment in the Stockton Deep Water Ship Channel portion of the San Joaquin River. The TMDL is applicable to the RWCF discharge,

but does not apply direct minimum limitations on DO concentrations in the effluent. However, the Basin Plan identifies objectives for dissolved oxygen in the SJR, between Turner Cut and Stockton. The previous and current NPDES permit contains effluent limitations for dissolved oxygen of 6.0 mg/L from September 1st through November 30th and 5.0 mg/L throughout the remainder of the year.

Based on effluent samples from 2005 to 2009, it appears that the RWCF is able to comply with the required effluent dissolved oxygen limits.

3.6.7 Electrical Conductivity (Salinity)

The discharge contains total dissolved solids (TDS), chlorides, and sulfates that contribute to electrical conductivity (EC). These are water quality parameters that represent the salinity of the water. Their presence in water can be growth limiting to certain agricultural crops and can affect the taste of water for human consumption. There are no USEPA water quality criteria for the protection of aquatic organisms for these constituents.

The background receiving water EC averaged 602.8 micromhos per centimeter (µmhos/cm) in the samples taken between 2002 and 2007, with a maximum of 1,169 µmhos/cm.

The current NPDES permit includes an annual average performance-based effluent limitation of 1,300 µmhos/cm for EC to protect the receiving water from further salinity degradation, based on the highest annual average effluent concentration in the data reviewed by Regional Water Board. However, there is discussion in the permit suggesting that in the future, the RWCF may be required to comply with the seasonal monthly average EC effluent limits of 700 µmhos/cm from April through August and 1,000 µmhos/cm from September through March instead, which are based on the Bay-Delta Plan water quality objectives for this geographical location. The Bay-Delta objectives are under review, but when or if the salinity objectives will be changed are unknown.

Based on data from 2007 through 2009, the RWCF can reliably meet the current effluent EC limitations; however, the RWCF is not able to meet more stringent limitations based on the Bay-Delta water quality objectives, described above.

Further discussion regarding effluent salinity limitations is presented in Section 3.7.

3.6.8 Manganese

The water quality objective for manganese contained in the Basin Plan is 50 µg/L. Based on SJR data between 2002 and 2006, the maximum effluent concentration (MEC) for manganese was 180 µg/L and the maximum observed upstream receiving water manganese concentration was 240 µg/L.

To determine the assimilative capacity of the San Joaquin River for manganese, the RWCF conducted additional upstream receiving water monitoring in 2005 and 2006. The results of

this study were provided as part of their report of waste discharge, and the arithmetic mean of the observed upstream receiving water concentration for dissolved manganese was reported as 7 µg/L. The dissolved manganese data for the receiving water indicated assimilative capacity exists in the receiving water for manganese. Therefore, a dilution credit for manganese of up to 13:1 was granted, based on the available human health dilution. Based on the allowable dilution credit, an MDEL of 1,308 µg/L was calculated. However, the Regional Water Board determined that granting of this dilution credit could allocate an unnecessarily large portion of the receiving water's assimilative capacity for manganese and could violate the Antidegradation Policy. For this reason, a performance-based MDEL for total manganese of 286 µg/L is included in NPDES permit based on Basin Plan objectives for the protection of human health.

Based on effluent samples from 2009, it appears that the RWCF is able to comply with the required effluent manganese limits.

3.6.9 Mercury

The Stockton Deep Water Ship Channel portion of the Delta Waterways, which is about 1.5 miles downstream of the discharge, has been listed as an impaired water body because of mercury. Because mercury bioaccumulates in fish tissue, the discharge of mercury to the receiving water is likely to contribute to exceedances of the toxicity objective and negatively affect beneficial uses of the receiving waters. Because the Stockton Deep Water Ship Channel has been listed as an impaired water body for mercury, the effluent discharged from the RWCF must not cause or contribute to increased mercury levels.

The current USEPA Ambient Water Quality Criteria for Protection of Freshwater Aquatic Life, continuous concentration, for mercury is 0.77 µg/L based on a 30-day average and chronic criteria. The CTR contains a human health criterion (based on a one-in-a-million cancer risk) of 0.050 µg/L for waters from which both water and aquatic organisms are consumed. Both values are controversial and subject to change. In 40 CFR Part 131, the USEPA acknowledges that the human health criteria may not be protective of some aquatic or endangered species and that "…*more stringent mercury limits may be determined and implemented through use of the State's narrative criterion.*" In the CTR, USEPA reserved the mercury criteria for freshwater and aquatic life and may adopt new criteria at a later date.

Based on data collected between 2002 and 2007, the maximum observed effluent mercury concentration was 0.013 µg/L. The interim mass-based effluent limitation of 0.92 lbs/year is based on maintaining the mercury loading at the current level until a TMDL can be established and USEPA develops mercury standards that are protective of human health. Compliance TSOs have not been included since the discharge currently meets the water quality criteria and the mass limitation. If USEPA develops new water quality standards for mercury, the Regional Water Board adopts a Delta methylmercury TMDL or if the Regional Water Board determines that a mercury offset program is feasible for dischargers subject to

a NPDES permit, this Order may be reopened to reevaluate the interim mercury mass loading limitation(s) and the need for a mercury offset program.

Based on effluent samples from 2005-2009, it appears that the RWCF is able to comply with the required effluent mercury limits. Based on recent data in November 2010, the oxidation ponds and wetlands remove a significant portion of the total mercury into the plant and are essential to meeting the current mercury limits.

3.6.10 Molybdenum

Molybdenum is a naturally occurring trace element, and one of 15 elements known to be essential to plant growth. While essential in trace concentrations, excess concentrations are known to bioaccumulate in certain plant species, causing molybdenosis in ruminants (especially cattle) grazing on forage containing concentrations above 10 parts per million (ppm). Studies indicate the impact of molybdenum contamination of forage depends on the quality and amount of irrigation water applied to the field, as well as on the type and leachability of the soil. Applying the Basin Plan "Policy for Application of Water Quality Objectives", the numeric standard that implements the narrative objective is the Agricultural Water Quality Goal of 10 µg/L.

Based on samples taken between 2002 and 2007, the MEC for molybdenum was 13 µg/L. Based on these samples, the discharge has a reasonable potential to cause or contribute to an in-stream excursion above the Basin Plan's chemical constituents objective. During the period from January 2006 through July 2006, the maximum background concentration of molybdenum was reported as 2.2 µg/L and the mean concentration was reported as 1.3 µg/L. Results of the monitoring for molybdenum in the receiving water upstream of the Facility outfall indicate the San Joaquin River has assimilative capacity for molybdenum.

The effluent limitation calculation procedures in the SIP allow for the granting of a dilution credit for molybdenum based on the harmonic mean flow of the San Joaquin River and the arithmetic mean flow of the effluent. Based on the allowable dilution credit of up to 13:1, an AMEL and MDEL of 114 µg/L and 198 µg/L, were determined. However, the Regional Water Board found that granting of this dilution credit could allocate an unnecessarily large portion of the receiving water's assimilative capacity for molybdenum and could violate the Antidegradation Policy. For this reason, a MDEL was calculated at 11 µg/L; but because it is below the MEC of 13 µg/L, the MDEL for molybdenum established in the NPDES permit is 13 µg/L.

Based on effluent samples from 2005-2009, it appears that the RWCF is able to comply with the required effluent molybdenum limits.

3.6.11 Nitrate Plus Nitrite (Total Nitrogen)

Nitrate and nitrite are known to cause adverse health effects in humans. For drinking water, the California DPH has adopted a Primary MCL at Title 22 of the CCR, for the protection of

human health for nitrate plus nitrite of 10,000 µg/L (10 mg/L). The USEPA has developed a primary MCL and a MCL goal of 1,000 µg/L for nitrite (as nitrogen). For nitrate, the USEPA has developed a Drinking Water Standards Primary MCL and an Ambient Water Quality Criteria for protection of human health non-cancerous effects of 10,000 µg/L.

Based on samples taken between 2006 and 2008, the MECs for nitrate and nitrite were determined to be 29 mg/L and 4.0 mg/L, respectively. The maximum observed upstream receiving water nitrate and nitrite concentration was 4.2 mg/L and 0.1 mg/L respectively, based on samples collected between 2002 and 2006. These results indicate that the receiving water has assimilative capacity for nitrate plus nitrite. Based on the dilution credit applicable to the human health criteria of up to 13:1, the resulting AMEL for nitrate plus nitrite was determined to be 113 mg/L. However, allocating the full assimilative capacity for nitrate plus nitrite is not consistent with the Antidegradation Policy, and based on performance data, the RWCF can meet a more stringent performance-based effluent limitation. For this reason, an MDEL for nitrate plus nitrite (as N) of 40 mg/L was included in this Order. This effluent limitation is based on the MCL and is necessary to assure the treatment process adequately nitrifies and denitrifies the waste stream to protect the potential beneficial use of municipal and domestic supply.

Based on effluent samples from 2005-2009, it appears that the RWCF is able to comply with the required effluent nitrate plus nitrite limits.

Further discussion regarding potential future changes to total nitrogen limits is discussed in Section 3.7.

3.6.12 Pathogens

The beneficial uses of the San Joaquin River include, in part, municipal and domestic supply, water contact recreation, and agricultural irrigation supply, and there is, at times, less than 20:1 dilution. To protect these beneficial uses, the Regional Water Board determined that the wastewater must be disinfected and adequately treated to prevent disease.

The principal infectious agents (pathogens) that may be present in raw sewage may be classified into three broad groups: bacteria, parasites, and viruses. Filtration is an effective means of reducing viruses and parasites from the waste stream. Tertiary treatment, consisting of chemical coagulation, sedimentation, and filtration, has been found to remove approximately 99.5 percent of viruses. Therefore, wastewater must be treated to tertiary standards (filtered), or equivalent, to protect contact recreational and food crop irrigation uses.

The California Department of Public Heath has also developed reclamation criteria (Title 22) for the reuse of wastewater. Title 22 is not directly applicable to surface waters; however, the Regional Water Board found it appropriate to apply an equivalent level of treatment to that required by DPH's reclamation criteria because the receiving water may

be used for irrigation of agricultural land and/or for contact recreation purposes. The method of treatment is not prescribed by this Order; however, wastewater must be treated to a level equivalent to that recommended by DPH for Title 22. In addition to coliform testing, turbidity specifications have been included as a second indicator of the effectiveness of the treatment process and to assure compliance with the required level of treatment. Failure of the filtration system such that virus removal is impaired would normally result in increased particles in the effluent, which result in higher effluent turbidity. Monitoring filter performance via turbidity allows for immediate detection of filter failure and rapid corrective action.

To be consistent with current Title 22 standards, the discharge permit requires a tertiary level of treatment, or equivalent, necessary to protect the beneficial uses of the receiving water. The operational requirements for turbidity have been established as follows:

- A daily average of 2 NTU
- An instantaneous maximum of 10 NTU
- No exceedances above 5 NTU for more than 5 percent of the time.

Based on effluent samples from 2008-2009, it appears that the RWCF is able to comply with the required effluent turbidity limits.

3.6.13 pH

The discharge limits are based on the Basin Plan which includes a water quality objective for surface waters that the "…pH shall not be depressed below 6.5 nor raised above 8.5. Changes in normal ambient pH levels shall not exceed 0.5 in fresh waters with designated COLD or WARM beneficial uses."

There are no known issues with meeting the effluent pH limitations.

3.6.14 Settleable Solids

For inland surface waters, the Basin Plan states that water shall not contain substances in concentrations that result in the deposition of material that causes nuisance or adversely affects beneficial uses.

Based on samples taken between 2002 and 2007, the discharge did not demonstrate a reasonable potential to cause or contribute to an in-stream excursion above the Basin Plan's narrative objectives for settleable solids. However, the current NPDES permit requires effluent monitoring and contains a receiving water limitation for Settleable Substances of to prevent deposition of material that causes nuisance or adversely affects beneficial uses. The daily, weekly, and monthly average effluent settleable solids concentration and load limitations are 20 mg/L (9,180 pounds per day [ppd]), 15 mg/L (6,885 ppd), and 10 mg/L (4,590 ppd), respectively.

Based on effluent samples from 2008-2009, it appears that the RWCF is able to comply with the required effluent settleable solids limits.

3.6.15 Temperature

The Thermal Plan requires that "*The maximum temperature shall not exceed the natural receiving water temperature by more than 20°F.*" The Thermal Plan also states that additional limitations shall be imposed when necessary to assure protection of beneficial uses. Beneficial uses applicable to San Joaquin River are migration of aquatic organisms (MIGR) both warm and cold habitats, and warm habitat spawning, reproduction, and/or early development (SPWN).

Based on temperature studies performed by RWCF and studies published in 1995 and 2006, the Regional Water Board determined that additional thermal requirements are not necessary to protect the beneficial uses of the San Joaquin River. However, the NPDES permit does retain the effluent temperature and receiving water limitations in order to comply with the Thermal Plan requirements. The limits require that the effluent temperature shall not exceed the receiving water temperature by more than 20 degrees Fahrenheit and that the effluent shall not cause the receiving stream temperature to rise more than 4 degrees Fahrenheit above the natural temperature.

There are no known issues with meeting the effluent temperature limitations.

3.6.16 Trihalomethanes (THMs)

Currently, the RWCF uses chlorine gas for disinfection and gaseous sulfur dioxide for removing chlorine prior to final discharge to the San Joaquin River. Chlorination produces disinfection byproducts (such as dichlorobromomethane and chlorodibromomethane) when chlorine reacts with organics in the wastewater. These disinfection byproducts (also known as trihalomethanes or THMs) are carcinogenic and regulated for receiving waters with municipal water supply beneficial use designations.

The CTR includes a chlorodibromomethane criterion of 0.41 µg/L and 0.56 µg/L for dichlorobromomethane for the protection of human health and is based on a one-in-a-million cancer risk for waters from which both water and organisms are consumed. The MECs for chlorodibromomethane and dichlorobromomethane were 29 µg/L and 36 µg/L, respectively, based on samples collected between 2002 and 2006 (concentrations of these compounds were not detected in receiving water samples collected during this same period). Therefore, the RWQCB determined that the discharge has a reasonable potential to cause or contribute to an in-stream excursion above the CTR criterion for chlorodibromomethane and dichlorobromomethane. A dilution credit for chlorodibromomethane of up to 13:1 can be granted, based on the available human health dilution. An AMEL and MDEL for chlorodibromomethane were calculated to be 5.0 µg/L and 16 µg/L, respectively and an AMEL and MDEL for dichlorobromomethane were calculated to be 6.8 µg/L and 20 µg/L, respectively. The CTR criterion for fish consumption only is

34 µg/L for chlorodibromomethane and 46 µg/L for dichlorobromomethane, therefore, these effluent limits are protective of human health for the consumption of fish caught within the human health mixing zone.

The RWCF is required to comply with these discharge requirements by October 1, 2013.

Further discussion regarding the ability of the RWCF to meet these future THM limitations is presented in Section 3.7.

3.7 CURRENT AND FUTURE REGULATORY COMPLIANCE STRATEGIES

This section describes the recommended strategies for addressing potential future effluent discharge requirements. There are currently three constituents with limits that the RWCF currently struggles to meet:

- Chlorodibromomethane (a disinfection byproduct)
- Dichlorobromomethane (a disinfection byproduct)
- Ammonia

There are also three key constituents which are anticipated to be subject to lower discharge limits in the near future. Most of these constituents are affected by the uncertainty regarding the dilution credit:

- Salinity
- Nitrogen (nitrate and nitrite)
- Manganese

Table 3.3 summarizes near-term and long-term strategies for achieving current and future permit compliance for these constituents. In addition to the specific strategies described in this section, the City should continue to track future regulatory trends and work with the City's legal and permitting team to plan for how these regulations could affect the RWCF. A recent amendment to the Porter Cologne Water Quality Control Act provides for up to a ten-year compliance schedule as long as the permittee makes diligent progress towards the implementation of compliance measures. Assuming the future discharge requirements are adopted in the next permit renewal in 2013, the City could have until 2023 to achieve compliance provided progress is made toward this goal. For the current TSO for THMs (chlorodibromomethane and dichlorobromomethane), the RWQCB can grant up to one five year extension; which may allow the RWCF to continue to operate under the current interim limits and give the RWCF until 2018 to meet the 2008 permit limits. If the allowable dilution for THM limitations is modified as part of the 2013 permit renewal, the RWCF could have until 2023 to meet the new limits.

Table 3.3 Proposed Strategy for Potential Future Permit Compliance Capital Improvements and Energy Management Plan City of Stockton		
Requirement	**Near-Term Strategy**	**Long-Term Strategy**
Disinfection Byproducts	• Continue chloramination. • Consider adding polymer to tertiary filters.	• Convert to non-chlorine based disinfection or scrubbing if dilution credits are disallowed.
Ammonia	• Add secondary effluent bypass pipeline to feed warmer secondary effluent to the NBTs. • Add third nitrifying biotower.	• Add fourth nitrifying biotower.
Salinity	• Lobby to maintain current discharge limit or at a minimum for a 1,100 µs/cm EC year-round. • Increase surface water supply. • Develop source control program and consider prohibiting water softeners.	• Sidestream treatment using reverse osmosis (if necessary)
Total Nitrogen	• Change flow pattern to supply oxidation pond effluent to NBTs. NBT effluent will then pass through the wetlands prior to being pumped to the DAFTs. Use wetlands for denitrification. • If dilution credit is eliminated, request winter dilution in river allowing higher seasonal nitrogen limits. • Gather nitrogen removal data from wetlands and establish performance based criterion as a baseline for establishing future nitrogen limits.	• Test supplemental carbon addition to wetlands to improve nitrogen removal. • Convert tertiary filters to deep-bed denitrifying filters (if necessary).

3.7.1 Disinfection Byproducts

The City is currently operating under interim limits for disinfection byproducts or trihalomethanes (THMs). The limits were calculated using a dilution credit for mixing in the San Joaquin River. However, the 2008 discharge permit was protested and appealed by outside agencies. The appeal states that the calculation and use of the dilution credit was not appropriate. In response, the State Water Board has remanded the permit (returned it to the Regional Water Board) for further study and revision. According to the City's legal council, Somach, Simmons and Dunn, the schedule for deciding on the applicability of the dilution credit is currently unknown, but may require several years for a final ruling. In the meantime, "final" THM limits will come into effect on October 1, 2013.

As shown in Figure 3.1, effluent dichlorobromomethane concentrations would have exceeded the 2013 monthly average effluent limitation (MDEL) of 6.8 µg/L in 12 of the last 60 months while effluent chlorodibromomethane concentrations would have exceeded the MDEL of 5.0 µg/L in 15 of the last 60 months.

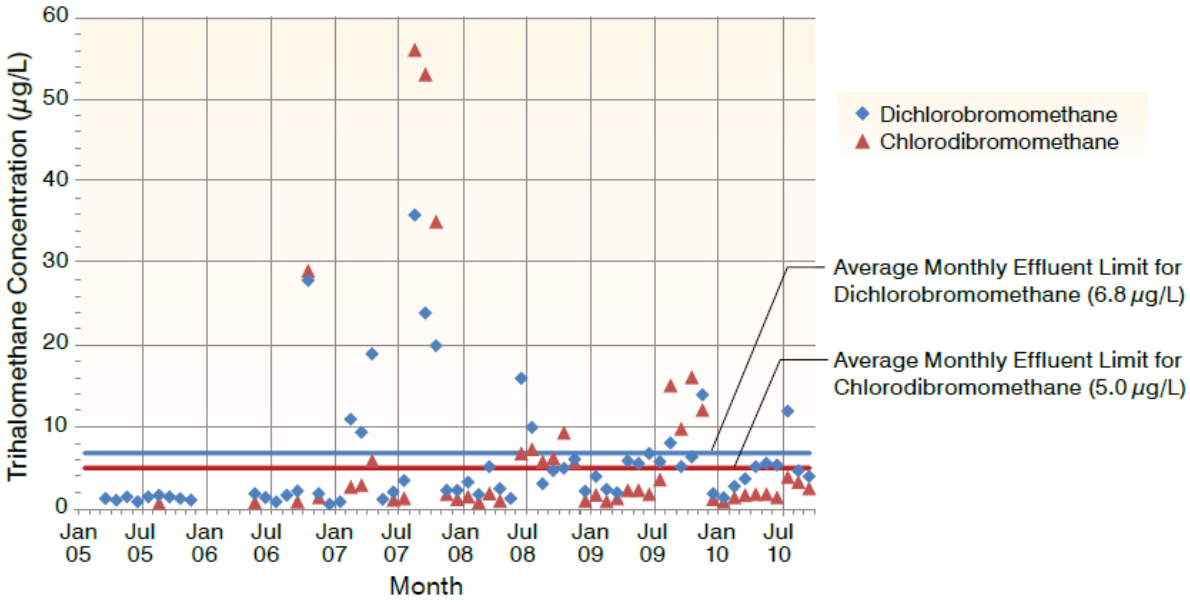


Figure 3.1 Effluent Trihalomethane Concentrations

However, there are measures that can be taken to optimize the existing filtration and disinfection systems to reduce THMs, while continuing to use a chlorine disinfectant. These measures include:

- Chloramination by adding a small dose of ammonia (City has already implemented).
- Move the chlorine dosage point downstream in the chlorine contact channel to reduce contact time and thereby reduce opportunity for THMs to form (City has already implemented). The current contact time is well above the required contact time

because influent flows to the RWCF have decreased over the past few years, below the design capacity for the chlorine contact channel.

- Improve tertiary filter performance by adding a filter aid, such as polymer. Improved filter performance will decrease organic matter in the filtered effluent thereby reducing THM formation.

Since operational changes were implemented in 2010, THM concentrations have decreased. By applying the recommendations described above, it is anticipated that the RWCF can reliably meet the 2013 final THM limits using chlorine disinfection. However, if the 13:1 dilution is no longer allowed, THM limits would be reduced to levels that can only be achieved with a non-chlorine based disinfection system (e.g. UV disinfection) or with THM scrubbing. Section 4 addresses disinfection alternatives in more detail.

3.7.2 Ammonia

The RWCF currently has an effluent ammonia limit of 2.0 mg/L (AMEL); however, other dischargers to the San Joaquin River currently have lower monthly limits. For instance, the ammonia limits for Cities of Turlock and Modesto are 1.1 mg/L (AMEL) and 0.9 mg/L (AMEL), respectively. The recently adopted ammonia limit for the Sacramento Regional Wastewater Treatment Plant is 1.8 mg/L with a compliance date of December 2020. If effluent ammonia limits were to be reduced to levels consistent with other San Joaquin River dischargers (e.g. <1.0 mg/L), the two existing nitrifying biotowers (NBTs) may not reliably provide adequate nitrification. Additional nitrifying biotowers may be required to reliably meet the lower ammonia limits.

The nitrifying organisms in NBTs are sensitive to ammonia loadings and temperature and do not perform well in extremely cold conditions. Currently, the NBT feed is downstream of the oxidation ponds and wetlands. Long detention times in the ponds and shallow depths in the wetlands cause the pond effluent temperature to approach equilibrium with atmospheric conditions thereby reducing the temperature of the NBT feed and decreasing ammonia removal performance. In January 2011, unusual cold weather conditions dropped the pond water temperature to approximately 6 to 7 degrees centigrade, which dramatically impaired nitrification in the NBTs causing effluent ammonia violations. Figure 3.2 illustrates the relationship of feed water temperature to ammonia removal performance.

The installation of a new secondary effluent bypass supply pipeline to increase the temperature of NBT feed will likely improve NBT performance, especially during cold weather conditions (see Section 3.7.4). The pipeline could also raise the temperature of the water for denitrification filters, if they are required in the future.

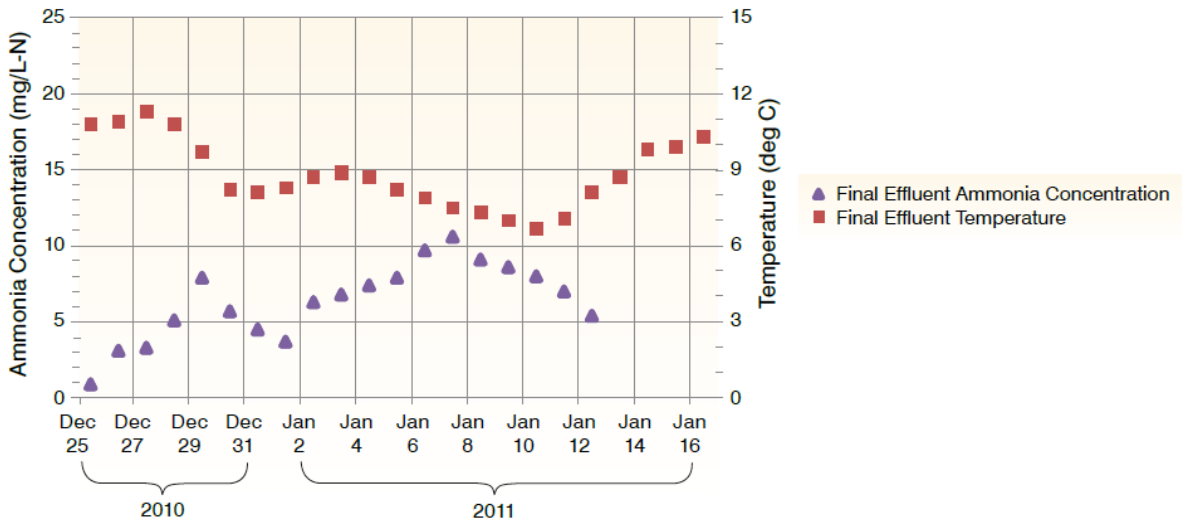


Figure 3.2 Temperature Effects on NBT Ammonia Removal

3.7.3 Salinity

Effluent salinity is a key issue for the RWCF. The current discharge permit established a performance based limit for electrical conductivity (EC) of 1,300 microSiemens per centimeter (µs/cm) on an annual average basis. From 2007 through 2009, the RWCF's effluent salinity ranged from 600 to 1,250 µs/cm EC on a daily basis with annual averages ranging from 1,040 to 1,090 µs/cm EC. The permit was contested by a outside interests because it did not comply with the Bay Delta Plan South Delta salinity objectives of 700 µs/cm from April through August and 1,000 µs/cm from September through March. The State Water Board is in the process of reviewing salinity objectives. There are no time limits for the State Water Board to rule on recommended items, so it is unknown when this issue will be resolved. Also, in response to a recent court decision regarding the salinity limits, the RWQCB is considering adopting a policy that would allow the RWQCB to grant a variance to the City if compliance with the future salinity limits is infeasible. Our proposed strategy for addressing salinity limits is in four parts:

1. Continue engaging in regional efforts and working with the regulatory agencies to find regional solutions and to adopt reasonable limits based on ongoing studies and research (such as a January 2010 study by Dr. Glenn Hoffman suggesting that a salinity limit of 1,100 µs/cm is adequate to protect agricultural uses).

2. Increase usage of surface water municipal supplies to reduce salinity from City wells. The City is currently constructing a new surface water treatment facility.

3. Develop a source control plan for industries and households, including a potential ban of water softeners.

4. If the preceding measures are not sufficient, apply for a salinity limit variance. Plan for a future reverse osmosis system to reduce salinity in case the variance is not granted.

Disposal options for the reverse osmosis reject would be explored if reverse osmosis is necessary in the future. One possible disposal method is a Zero Liquid Discharge system which would use a brine concentrator and evaporation ponds to eliminate the need for liquid brine disposal.

3.7.4 Total Nitrogen

If the RWQCB revises its methodology for calculating dilution credits or eliminates the dilution credit, nitrate removal would likely be required, which would require denitrification facilities.

A typical total nitrogen limit for wastewater treatment facilities is 10 mg/L-N. Currently, the effluent total nitrogen concentrations from the RWCF range seasonally from 10 to 25 mg/L-N. Two alternatives were considered for total nitrogen removal: denitrification in the existing wetlands and deep-bed denitrification filters.

The first alternative requires modifications to reroute pond effluent directly to the nitrifying biotowers. Effluent from the nitrifying biotower would be sent to the wetlands as shown in Figures 19.1 and 19.3 in Chapter 19. The wetlands effluent would be sent to the dissolved air flotation (DAF) units to remove algae before final filtration. Given adequate detention time, wetlands can consistently remove nitrates. As Figure 3.3 shows, nitrate removal is more effective during the warm months, generally from April through September.

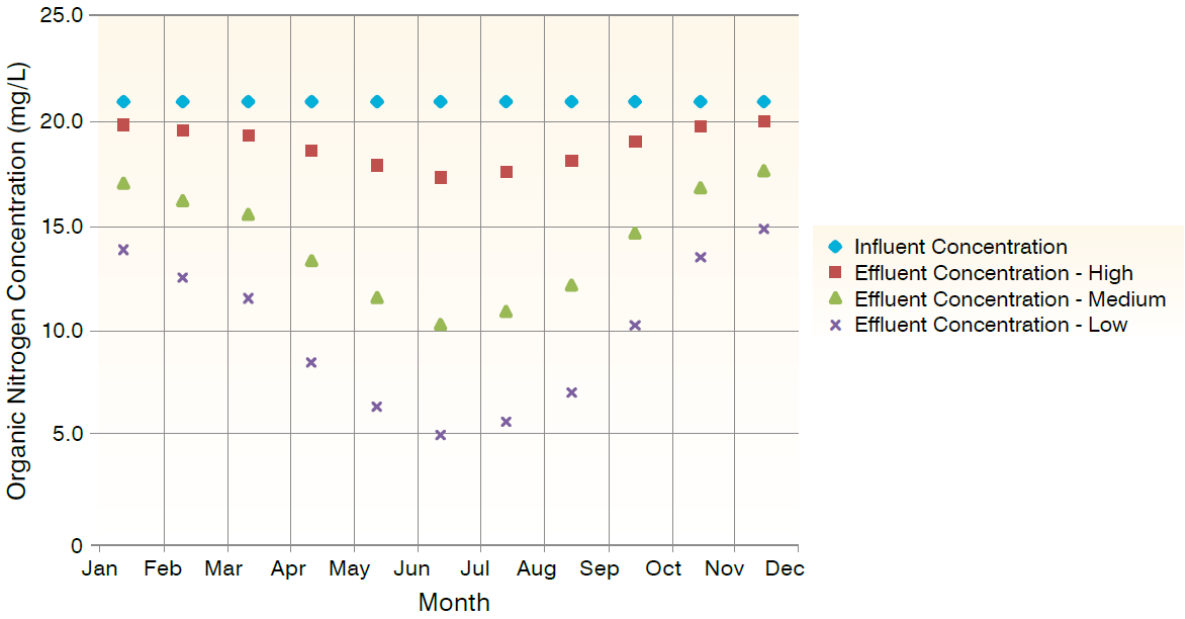


Figure 3.3 Seasonal Nitrate Removal in Denitrification Wetlands

The second alternative requires conversion of the existing tertiary dual-media filters to deep-bed denitrification filters and additional denitrifying filter capacity beyond the capacity that can be obtained with the existing filters in order to accommodate the reduction in hydraulic capacity associated with denitrifying organisms.

Both alternatives may require a supplemental carbon (e.g. methanol) storage and delivery system to improve denitrification performance to achieve the required discharge limits.

The recommended strategy for addressing the future need to remove nitrogen is to perform a pilot study that utilizes the modified wetlands for denitrification. The pilot study should operate for an extended time, at least three cold weather seasons, to experimentally determine the nitrogen removal efficiencies. If the results are favorable, the City may be able to substantiate using only wetlands for denitirification, and to establish future technology-based nitrogen limits using only wetlands for denitrification. However, if the wetlands do not perform well in removing nitrogen, especially during the cold season, then the City will need to plan for adding denitrifying filters. This basic strategy is described in more detail in Chapter 5.

3.8 CURRENT AIR QUALITY REQUIREMENTS

Several agencies at the federal, state, and local level have jurisdiction pertaining to air pollution and odor control at wastewater treatment plants. At the federal level, the major agencies are the U.S. EPA and the Occupational Safety and Health Administration (OSHA). At the state level, the applicable agencies are the California Air Resources Board (CARB) and Cal-OSHA. At the local level, it is the San Joaquin Air Pollution Control District (SJAPCD). These agencies establish ambient air quality criteria and levels of treatment necessary to protect the public health and environment both off-site and on-site of a potential source. The RWQCB also includes general nuisance (odor) provisions in NPDES permits and WDRs. These agencies also have the responsibility to permit new facilities for construction and operation and to establish new source pollutant levels and treatment requirements.

The EPA issues requirements for limiting hazardous air pollutants, and sets emissions standards (NESHAPs) for major point sources. Existing facilities are subject to the federal Clean Air Act (CAA) requirements to implement maximum achievable control technology (MACT) only if a process is modified to emit toxic air contaminants above the “major” threshold (10 tons/year of a single HAP or 25 tons/year of a combination of HAPs).

CARB is the lead agency for air pollution control in California, identifying and developing air quality standards. SJAPCD administers rules and regulations, and issues permits to point sources including the RWCF. The RWCF complies with existing SJAPCD requirements. Operation of the back-up emergency diesel generators, gasoline storage tanks, and digester waste gas flare require SJAPCD permits. Expansion and upgrade of these facilities

would require continued compliance with SJAPCD standards through a permit revision process.

The SJAPCD issued a Title V Permit for the Stockton RWCF in 2010 with an expiration date of November 30, 2013 that provides general requirements in addition to specific requirements for the following facilities (See Appendix B):

- Two 450 HP Portable Emergency Standby Diesel Generators
- One 2,000 gallon Above Ground Diesel Fuel Storage Tank
- One 36 MMBUT/hr Digester Gas Fired Emergency Flare
- Three 1,408 HP Digester Gas/Natural Gas Continuous Duty Internal Combustion Engines
- One 2,550 HP Diesel Fired Emergency Standby Internal Combustion Engine
- Headworks Odor Control Facility

The current SJAPCD air emission standards for these components are presented in Table 3.4.

Improvements and changes to wastewater process and discharge location may require revised air quality permits. However, requirements of the air quality permitting process should not have an impact as large as other regulatory requirements such as water quality regulations on capital improvement planning decisions.

3.9 FUTURE AIR QUALITY REQUIREMENTS

Operation of the back-up emergency diesel generators, diesel fuel storage tanks, cogeneration engines, future backup boiler, and waste digester gas flare require San Joaquin Valley Air Pollution Control District (SJVAPCD) permits. The existing cogeneration engines and flare at the RWCF comply with existing SJVAPCD requirements. The current NOx limit for digester gas or natural gas run cogeneration engine is 0.87 g/bhp-hr. This limit will expire in November, 2013. The South Coast Air Quality Management District (SCAQMD) often takes the lead in establishing emission limits for air pollutants in California. SCAQMD has proposed a limit for NO_x emission of 11 ppm. It is expected that SJVAPCD will follow SCAQMD standards and limit the NO_x emission to 11 ppm in the next 3 to 5 years. The existing cogeneration engines would not meet this new limit without the use of new emission control system for engine exhaust.

The engines can be tuned to reduce the amount of NO_x emitted but tuning will not be adequate to meet the new limits. Selective Catalytic Reduction (SCR) technology would be required to meet the future more stringent NO_x limits. In a SCR system, exhaust gas from the combustion process is cooled and ammonia-containing air is injected into the exhaust

Table 3.4 SJAPCD Emission Standards[1]
Capital Improvements and Energy Management Plan
City of Stockton

Component	NO_x g/bhp-hr[2]	CO g/bhp-hr	VOC g/bhp-hr	SO_x g/bhp-hr	PM10 g/bhp-hr	H_2S ppmv
Digester Gas/ Natural Gas IC Engines	0.87	2.65	0.75	0.14	0.1	170
Diesel Standby IC Engine	6.20	0.34	0.33	---	0.09	---
Component	**NO_x lb/mmbtu**	**CO lb/mmbtu**	**VOC lb/mmbtu**	**SO_x lb/mmbtu**	**PM10 lb/mmbtu**	**Max Operation hrs**
Digester Gas Flare	0.06	0.3	0.03	0.08	0.02	200/year
Component	**VOC ppbv as CH_4**	**Sulfur[4] ppbv as SO_2**	**Ammonia ppmv**	**H_2S ppbv as SO_2**		
Headworks Odor Control Facility	2,657	708	1	524		
Component	**Particulate Matter gr/dscf**	**Sulfur[5] ppmv**				
Portable Standby Diesel Generators	0.1	2,000				

Notes:
(1) Major emission standards are presented in this table. Other permit requirements can be found in Appendix B.
(2) Equivalent to 65 ppmv at 15% O_2.
(3) Only CARB certified diesel fuel containing not more than 0.0015% sulfur by weight is to be used.
(4) Includes hydrogen sulfide emissions.
(5) On a dry basis averaged over 15 consecutive minutes.
Units:
g/bhp-hr = grams per brake horsepower per hour
ppmv = parts per million by volume
lb/mmbtu = pounds per million British Thermal Units
ppbv = parts per billion by volume
gr/dscf = grains per dry standard cubic feet

gas prior to it passing over a catalyst. The catalyst promotes a reaction between NOx and ammonia to form nitrogen and water vapor.

When properly designed and operated, SCR systems can reduce NO_x emissions by 50% to 90%. SCR systems do have some disadvantages. These include regular disposal of spent catalyst, high operating costs, and increased system complexity. Also, SCR systems do not currently have a long track record when used in conjunction with digester gas-fueled engines.

EVALUATION OF EXISTING FACILITIES

4.1 REGIONAL WASTEWATER CONTROL FACILITY OVERVIEW

The RWCF consists of preliminary, primary, secondary, tertiary treatment, solids handling, and cogeneration facilities. The San Joaquin River bisects the plant site. The Main Plant, on the east side of the river, consists of preliminary, primary, secondary treatment facilities (with the exception of the oxidation ponds), solids handling facilities, and cogeneration facilities. The Tertiary Plant, on the west side, consists of additional secondary facilities, tertiary facilities, and disinfection facilities. A process flow schematic is presented in Figure 4.1. Design criteria for the liquid and solid stream processes are provided in Appendix C.

The following sections present a description of each of the major wastewater treatment facilities, the results of the capacity evaluation, condition assessment, and recommended improvements. Process loading rates are presented for all units in service (AUIS) and for firm capacity with the largest unit out of service (LUOOS). Capacities were evaluated based on firm capacity. Capital costs for the recommended improvements are provided in Chapter 19.

4.2 PRELIMINARY TREATMENT

4.2.1 Headworks

The City's wastewater collection system flows to the Headworks. Equipment in the Headworks removes debris, floatables, and grit from the raw wastewater. The screened wastewater is then pumped to the primary clarifiers by the Raw Sewage Pump Station.

4.2.1.1 Facility Description

Raw sewage from 78-inch, 60-inch, and 48-inch trunk sewer lines flows into the Influent Collection Structure before entering the Headworks. The Influent Collection Structure is a buried structure located north of the Headworks. Constructed as part of the Weston Ranch Project in the early 1990's, the structure is designed to accommodate a new influent trunk line and combine all of the influent sewer lines into a single structure upstream of the Headworks influent box. The Influent Collection Structure contains slots for removable slide plates that can be used to isolate the influent trunk lines that connect the Influent Collection Structure to the Headworks. The slide plates are not normally used and are stored near the Influent Collection Structure. Wastewater from the Influent Collection Structure then flows into the Headworks where it undergoes preliminary treatment, which includes raw wastewater screening and grit removal.

The existing Headworks consists of four bar screens, six grit channels, six Parshall flumes, and four raw wastewater pumps. The mechanically cleaned bar screens remove large

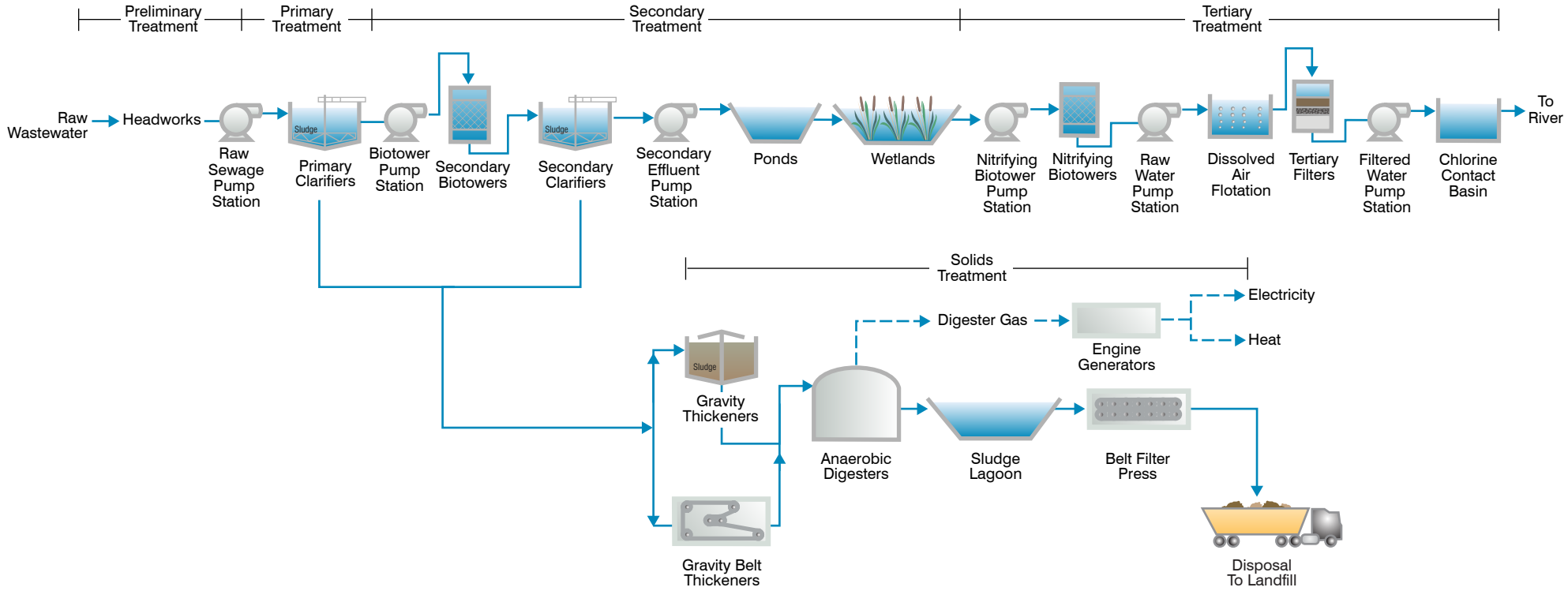


Figure 4.1
EXISTING RWCF PROCESS FLOW DIAGRAM
CAPITAL IMPROVEMENT AND ENERGY MANAGEMENT PLAN
CITY OF STOCKTON

stk411f47-8581.ai rev 4/18/11

debris from the raw wastewater to protect downstream equipment. The four existing screens are IDI climber screens. Based on a maximum design velocity through the bars of 5 feet per second, the firm capacity of the barscreens with the largest unit out of service is 150 million gallons per day (mgd) and the capacity with all four units in service is 225 mgd, which exceeds the projected peak wet weather flow of 121.7 mgd.

The grit channels remove heavy inorganic solids such as rocks, sand, and shells. Grit removal minimizes wear on downstream equipment. The grit is collected with chain and flights and removed from the channels using grit screws located in each channel. Following grit removal, the raw wastewater flow rate is measured by six Parshall flumes. The wastewater is then pumped to the primary clarifiers by four raw wastewater pumps. Grit and screenings are collected, dewatered, and hauled to a landfill.

Ferric chloride and hydrogen peroxide are added to the wastewater upstream of the bar screens to reduce odors and corrosion caused by hydrogen sulfide gas. The chemicals also improve primary treatment performance. Ventilation exhaust air from the Headworks is treated with two biological scrubbers. The scrubbers employ a packed tower process that reduces hydrogen sulfide gas and other odorous compounds from the ventilation air.

4.2.1.2 Capacity Evaluation and Condition Assessment

The original Headworks were constructed in 1947; they have been rehabilitated or modified several times over the last 60 years. The Headworks have a variety of deficiencies that affect treatment performance, reliability, and worker health and safety. The deficiencies include:

- Limited reliability for mechanical equipment
- Corroded and obsolete equipment
- Flooding
- Poor ventilation and lighting
- Septage issues

Each of these conditions is discussed below. Figure 4.2 shows several of the issues in a 3D rendering of the existing facility.

4.2.1.2.1 *Limited Reliability*

Originally, the Headworks were designed as a below-grade open-air structure. To contain severe odors and to protect the equipment from the weather, the screenings portion of the headworks was enclosed in a building. To minimize the volume of air requiring odor treatment, the building footprint was limited. The smaller footprint restricts the area available for redundant equipment.

HEADWORKS DEFICIENCIES AFFECT WORKER HEALTH AND SAFETY.

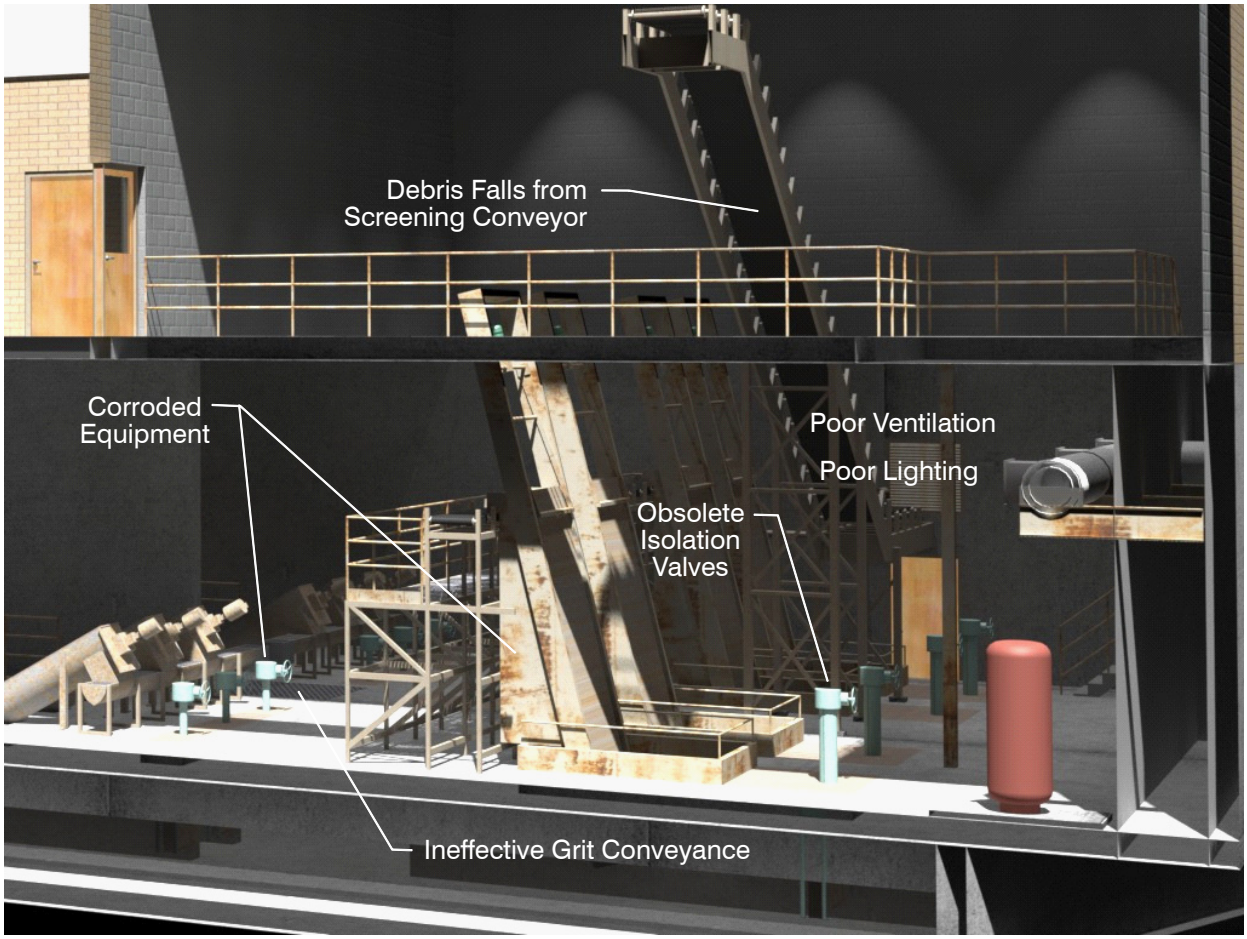


Figure 4.2
EXISTING HEADWORKS
CAPITAL IMPROVEMENT AND ENERGY MANAGEMENT PLAN
CITY OF STOCKTON

stk511f7-8581.ai

Due to the space constraints and because the screens are below grade, the screens discharge to a single belt conveyor, which discharges to a single compactor. In the present configuration, the addition of redundant equipment is not feasible due to limited space.

In addition, the belt conveyor operates at an incline to lift screenings from the mezzanine level of the structure to a point approximately 10 feet above ground level. The steep angle of the belt conveyor causes some of the soiled and potentially hazardous screenings to fall to the floor. Poor drainage from the belt is also a nuisance and potential health hazard.

4.2.1.2.2 *Corroded and Obsolete Equipment*

Corrosion of mechanical and electrical equipment is prevalent throughout the Headworks. The uncoated concrete channels also show signs of hydrogen sulfide attack and need to be repaired. The portions of the grit channels that are coated appear to be in adequate condition.

The grit removal system does not adequately convey the grit removed from the chambers to the grit hopper above. Inclined screw conveyors effectively remove the grit from the grit basins; however, the cross conveyors are worn and do not efficiently move the grit to the grit sump. The grit pumps are likely worn and also are inefficient at moving grit to the grit classifier.

Rectangular butterfly valves provide isolation of the two grit basins; however due to corrosion of the valve frames and possible concrete corrosion, the valves are inoperable. The sluice gates in the head box are in similar condition.

The influent piping has not been visually inspected; however, based on the conditions of the headworks and the condition of the piping found in other areas of the plant, it is recommended that influent piping, as well as the structural condition of the influent box structure in the parking area, be visually inspected and rehabilitated, if necessary.

4.2.1.2.3 *Flooding*

The Headworks has essentially no storage capacity. If a power outage occurs, the Headworks can quickly flood. Due to problems with the existing standby generator, the Headworks have been subjected to flooding on occasion. In addition, once flooding occurs it is difficult to drain and clean the Headworks because the grit channels are covered to control odors. The lower level of the headworks is also not equipped with drainage troughs, which limits the ability of plant staff to clean the area after a flooding event.

4.2.1.2.4 *Poor Lighting and Ventilation*

The existing lighting for the grit basin area appears to be sufficient for all maintenance activities. However, the lighting within the screening area is not adequate to allow the operations staff to service the equipment properly.

Although the ventilation system is recirculating air throughout building, the environment inside is still odorous and corrosive. Some areas of the building, such as the head box, have inadequate ventilation.

4.2.1.2.5 *Septage Issues.*

The septage receiving station is located on the East side of the plant. Septage must travel through a relatively long pipeline before it enters the Headworks. While a flushing station is provided to allow haulers to flush the pipeline after use, the odors present after septage is discharged to the Headworks indicate that the septage material is settling in the pipeline and it is decomposing. Consequently, the septage releases significant odors when it reaches the Headworks.

4.2.1.3 Headworks Alternatives

Three alternatives were evaluated to address the headworks deficiencies. Each alternative is described below. Table 4.1 summarizes these alternatives, their estimated costs, and their advantages/disadvantages.

Alternative 1: Full Rehabilitation – This alternative would include complete rehabilitation of the concrete structure, as well as replacement of all mechanical equipment within the structure. This alternative would also replace all existing equipment with the current version of existing equipment. It would not include installation of additional, redundant equipment.

A wet weather, or auxiliary, pump station, sized to pump 50 mgd, is included in the cost of this alternative The auxiliary pump station would provide the capability to bypass the Headworks during construction of the rehabilitation measures. The auxiliary pump station would remain after construction to increase the firm capacity of the existing Raw Sewage Pump Station. The pump station would be located in a below grade, circular vault Northeast of the existing Headworks. Submersible pumps in the pump station would draw directly from the Influent Collection Structure and discharge directly to the primary clarifiers.

Alternative 2: Hybrid Rehabilitation – This alternative would include complete rehabilitation of the concrete Headworks structure, as well as replacement of all mechanical equipment within the structure. This includes updating the mechanical equipment to provide redundant equipment, such as grit classifiers and screenings removal equipment.

In addition to redundant equipment, a new elevated floor will be installed at ground level to improve access to the screenings removal equipment and allow the inclined belt conveyor to be removed. A new building will be provided to accommodate the redundant screening handling equipment.

Similar to Alternative 1, a new 50 mgd wet weather pump station is included in the cost of this alternative, to provide sewage pumping during the rehabilitation.

Table 4.1 Headworks Alternatives Evaluation
Capital Improvement and Energy Management Plan
City of Stockton

Headworks Alternative	Estimated Cost[1]	Pros	Cons
Alternative 1: Full Rehabilitation - Replace equipment in kind and rehabilitate structure	$10.9 million	• Extends service life. • Least costly.	• Does not address screenings conveyance and grit equipment redundancy issues. • No improvement to working conditions and access for maintenance.
Alternative 2: Hybrid Rehabilitation - Same as Alternative 1, but also replace screening system with a new design, adds a top deck, and improves grit system	$12.5 million	• Extends service life. • Improves screenings conveyance, grit washing, and grit dewatering. • Improves worker health and safety and access for maintenance. • Provide redundancy for screen and grit handling. • $5 M less expensive than Alternative 3.	• Slightly more costly than Alternative 1. • Utilizes existing structure which is over 60 years old.
Alternative 3: Full Replacement – Replace headworks in its entirety.	$17.6 million	• Longer service life. • Solves worker health and safety issues. • State of the art facility • Improved maintenance features	• Confined work area requires complex shoring. • Increased cost to remove existing structure. • Increased construction sequencing constraints.

Note:
(1) Refer to Chapter 6 for cost estimate assumptions.

Alternative 3: Full Replacement – The existing Headworks would be demolished and a new Headworks would be constructed. The new headworks would include fully redundant preliminary treatment processes including new screens and pumps. Vortex grit basins would replace the existing gravity grit basins.

This alternative would include an auxiliary 50 mgd wet weather pump station to provide bypass pumping of the influent during the demolition of the existing and construction of the new headworks.

4.2.1.4 Recommendation

The full rehabilitation alternative was eliminated from further consideration because it does not address redundancy issues and provides only limited worker health and safety improvements. Out of the two remaining alternatives, Alternative 2 - Hybrid Rehabilitation, has the lowest cost and shares many of the same benefits with Alternative 3. Therefore, Alternative 2 is recommended.

4.2.1.5 Recommended Improvements Included in Alternative 2

This section describes the rehabilitation features including in the recommended Alternative 2 for each of the existing Headworks deficiencies.

4.2.1.5.1 *Solution to the Limited Space for Redundant Equipment.*

In order to provide space to install redundant Headworks equipment, the above grade structure would be removed and a larger building would be constructed. The new building would include a new floor at ground level. Preliminary investigations indicate the existing foundation walls are capable of supporting a metal building. Due to concerns over corrosion, alternative building materials and methods of construction will be considered. Alternative building materials presently under consideration are fiberglass reinforced plastic and concrete masonry units (cmu). Preliminary cost alternatives for Alternative 2 include the cost of a metal building.

Odors would be contained through the use of channel covers and equipment enclosures to eliminate the need to expand the odor control facilities.

4.2.1.5.2 *Solution to Screenings Issues*

Presently, the screens are designed to remove screenings from the channel to the mezzanine level. It is recommended that the screens be modified to allow screenings to be discharged at ground level. This modification will allow for increased reliability (by reducing the complexity of the screening conveyance equipment) and improved worker safety (by reducing health hazards and maintenance problems caused by falling debris and dripping sewage). Each screen should also be enclosed to prevent odorous and corrosive gates from escaping into the building. The major screen manufacturers (IDI, Mahar, and Duperon) all have the capability of lifting the screenings to grade. The new screens would also have

3/8-inch bar spacing. The 3/8-inch bar spacing would remove more debris and floatables from the raw sewage than is removed with the current screens. According to barscreen manufacturers, the new screens would have an approximate capacity of 123 to 150 mgd with one unit out of service and 164 to 200 mgd with all units in service.

4.2.1.5.3 *Solution to Screenings Conveyance*

There are several options to convey screenings from the screens to the washer compactors:

- Shaftless Screw Conveyors: Shaftless screw conveyors are a simple, proven, and reliable technology for screenings conveyance. The equipment consists of a hardened steel spiral installed in a stainless steel U-trough and driven by a motor and gearbox. The spiral rests on a replaceable ultra-high molecular weight polyethylene liner in the bottom of the U-trough. The screw conveyor is provided with removable stainless steel covers that completely enclose the screenings, containing the odors and preventing material from spilling out of the conveyor.

- Belt Conveyors: Belt conveyors are messy and require more O&M attention than screw conveyors. Screenings material placed on conveyor belt is difficult to contain, will spill over the sides of the conveyor, and requires frequent house-keeping.

- Hydraulic Sluiceway: A hydraulic sluiceway for screenings conveyance requires large amounts of flushing water. Sluiceways typically require 300 to 400 gallons per minute (gpm) amount of clean, chlorinated flush water to convey screenings properly. Although this flow would be used in a screening washing process, it would then need to be returned to the influent flow stream and re-routed through the plant process at a cost. By comparison, a typical water spray washer/compactor fed by a screw or belt conveyor would consume approximately 10 percent of the volume needed in a sluiceway application.

The recommended conveyance technology is shaftless screw conveyors. Two shaftless screw conveyors will collect the screenings from the bar screens and convey them to the screenings washer/compactors for washing and dewatering. The screen discharge chutes and conveyors will be designed to allow the screens to discharge to either of the two conveyors.

4.2.1.5.4 *Solution to Grit Basin Reliability Issues*

The existing plant has two grit basins. Each basin has three channels and three chain and flight grit collection mechanisms. The grit basins have a total capacity of 102 mgd based on a 1-hour detention time and velocity of 1.4 feet per second. Flows in excess of 102 mgd will likely result in reduced grit removal performance but should not have a significant impact on overall RWCF performance.

The grit basin channel walls were coated during the 1976 expansion. It is anticipated that the concrete surfaces which were coated will not require any additional treatment; however, this can only be confirmed by inspection after draining the basin.

Due to the extensive corrosion of mechanical equipment, it is recommended that the chain-and-flight collection mechanisms be replaced with chain and flights manufactured from fiberglass reinforced plastic, stainless steel, and/or laminated wood materials. The inclined screws that lift grit from the basins would be replaced with similar equipment. The cross conveyor currently is at the end of its useful life and is recommended for replacement with a sluiceway. Sluiceways provide efficient transport of the grit with less maintenance and wear than mechanical equipment.

The grit is presently collected in a single sump, which is not sloped. In addition, the pumps are ineffective at pumping the grit. Recommended modifications include sloping the sides of the sump and agitating the sump to liquefy the grit and improve the grit pumping performance. The pumps should be replaced with pumps specifically designed to pump grit, such as Wemco pumps.

The current grit classifier, which cleans and dewaters grit, has the capacity to treat 500 gpm. Because the existing grit classifier is corroded, it is recommended that the grit classifier be replaced. A second, redundant classifier is also recommended. All piping from the grit pumps to the grit classifier should be designed to provide access for flushing if blockages occur.

The current grit classifier room is not large enough to accommodate a second grit classifier. The new Headworks building will be large enough to accommodate two grit classifiers and two screenings washer compactors. This second alternative would also consolidate the bins for screenings and grit and allow for efficiency in the foul air system.

4.2.1.5.5 *Solution to Corroded and Obsolete Equipment*

Due to the deteriorated condition of much of the existing equipment, most of the equipment (gates, valves, piping, etc) within the headworks should be replaced. Electrical wiring that has been damaged should also be replaced.

Inspection of the influent pipes has not been possible because of corrosion in the isolation slide plate frames in the Influent Box Structure. Consequently, the slide plates will be replaced with new sluice gates during the rehabilitation project. The cost of repair for the influent lines has also been included within the projected project costs.

Flow splitting inside of the headworks is performed through a combination of hydraulic gates and square butterfly valves. The existing hydraulic gates and rectangular butterfly valves are non-operational and require replacement. These gates valves will be replaced with hydraulically driven sluice gates.

4.2.1.5.6 *Solution to Flooding Issues*

The raw sewage pump station wet well, located between the grit channels and the pump dry pit, has a small active storage volume. The small storage volume requires that the pumps closely keep pace with the influent flow to prevent flooding or emptying the wet well. In addition, if utility power is lost and the standby generator does not start immediately, flooding will occur.

The direct solution is to construct a new headworks with a wet well that is of sufficient size to provide at least 30 minutes of storage. However, this approach would be costly.

Alternatively, the pump control strategies can be fine-tuned so that the pumps track influent flow rate more closely. In addition, a high-level bypass could be constructed to connect the wet well to the new auxiliary pump station. These solutions (included in Alternative 2) would solve the flooding issues without requiring demolition of the existing Headworks (Alternative 3).

4.2.1.5.7 *Solution to Poor Lighting and Ventilation*

The existing lamps in the screen area are high above the working surface and only half of the lamps are functional. New lighting is required to allow for maintenance activities and to improve worker safety. Wall pack lighting can effectively light the screening areas. In addition wall pack lighting can be installed closer to the floor to improve serviceability. The new ground level floor, near the screens, would allow for additional overhead lighting in the screening areas. Dual switching (two lighting circuits) should be considered in the screenings areas as well as the grit area. Dual switching allows a portion of the lights to be turned off when staff is not present.

The existing ventilation system does not fully ventilate the building. Several “dead zones,” or areas of poor circulation, are present in the building. One such area is the head box, which is posted as a confined space. Rehabilitation of this area would include the concrete repair and replacement of the grating area with a solid cover. These modifications would include ventilation improvements to increase air flow under the covers as well as the working space above the covers.

Most of the channels are covered. Due to the observed corrosion within the channels, it can be surmised that there is insufficient ventilation in the area under the covers. A detailed airflow evaluation, documenting the ventilation under the channel covers as well as the “dead zones” within the working space, should be made during the final design. Due to the extensive space under the covers, multiple draw-off points should be considered for each channel.

4.2.1.5.8 *Solution to Septage Issues*

Improving the flushing system, by lengthening the flushing duration and increasing the number of flushes, is recommended to reduce the septic conditions currently experienced in the Headworks.

4.2.1.5.9 *Construction Sequencing*

The anticipated construction sequence would be to build the auxiliary pump station first. Once the pump station is complete, raw wastewater would be diverted to the new pump station. The Headworks would be completely bypassed during the rehabilitation of the Headworks. During the wet weather season, flows can be accommodated with the wet weather pump station and half of the existing headworks.

4.2.2 Raw Sewage Pump Station

The raw sewage pump station lifts screened raw wastewater from a wet well downstream of the gravity grit chambers to the primary influent distribution structure. The pump station was originally constructed in 1946. It has been modified several times since, with the last improvement made in 2000. The pump station consists of four pumps in a wet pit/dry pit configuration. There are four pumps - three rated at 34 mgd each and one at 40 mgd. The firm capacity (with the largest pump out of service) is 102 mgd, which is 20 mgd less than the projected peak wet weather flow of 121.7 mgd. Design criteria for the pump station are described in Table 4.2.

4.2.2.1 <u>Pump Station Assessment</u>

The raw sewage pump station was assessed based on a number of parameters described below.

4.2.2.1.1 *Capacity*

The firm capacity of the pump station is 102 mgd, which is 20 mgd less than the projected peak wet weather flow of 121.7 mgd. Due to the configuration of the existing wet well and dry pit space constraints, it is not feasible to install larger capacity pumps.

4.2.2.1.2 *Submergence*

The water level over the pump intake pipe, known as submergence, is important because a low submergence increases the probability that free-surface vortices will form. Free surface vortices entrain air in the pumped fluid, causing cavitation and reduced pump performance.

The wet well was originally designed with bell mouthed pump inlets, which were attached to 90-degree elbows. As shown in Figure 4.3, the elbows allowed the suction pipes to draw wastewater from near the bottom of the wet well. The submergence over the intake bells under the original pump station conditions was approximately 9 feet.

Table 4.2 Raw Sewage Pump Station Design Criteria
Capital Improvement and Energy Management Plan
City of Stockton

Criteria	Units	Pumps No. 1, 2, & 3	Pumps No. 4
Type	--	Horizontal Angle Flow	Horizontal Angle Flow
Manufacturer	--	Fairbanks Morse	Fairbanks Morse
Installation Year	--	1963	2000
Capacity(1)	flow (gpm) @ TDH (ft)	23,600 @ 41.5 ft	28,000 @ 41.5 ft
Total Pump Station Capacity	mgd	142	
Firm Pump Station Capacity (largest pump out of service)	mgd	102	
Required Submergence(2)	feet	7.9	7.3
Actual Submergence(3)	feet	5.5	5.5
NPSHa(4)	feet	38	38
NPSHr(5)	feet	--	32
NPSH Margin of Safety(6)	ratio	--	1.03
Speed (100%)	rpm	644	585
Hydraulic efficiency at 100% speed	%	82	76
Driver	bhp	300	400
Suction Piping Velocity(7)	fps	16.7	19.9
Recommended Suction Piping Velocity(8)	fps	8.0	8.0

Notes:
(1) The total dynamic head was calculated based on a system curve calculated on the static head and a spreadsheet model of the friction and minor losses in the suction and discharge piping.
(2) The required submergence to minimize surface vortices was calculated per Section 9.8.7 of the Hydraulic Institute Intake Design Standard.
(3) Actual submergence is calculated on an assumed wet well level of 73 feet, which assumes a flow of 102 mgd and 1 foot of headloss through the Parshall flumes (all six flumes in service).
(4) Net Positive Suction Head available (NPSHa) based on wet well level of 73 feet.
(5) Net Positive Suction Head required (NPSHr) data was not available for Pumps 1, 2, and 3.
(6) NPSH Margin of Safety was calculated per this formula: Margin of Safety = (NPSHa – 5 ft)/NPSHa. Desirable Margin of Safety to minimize potential for cavitation is 1.3.
(7) At pump capacity as defined above.
(8) Per Section 9.8.4.3 if the Hydraulic Institute Intake Design Standard.

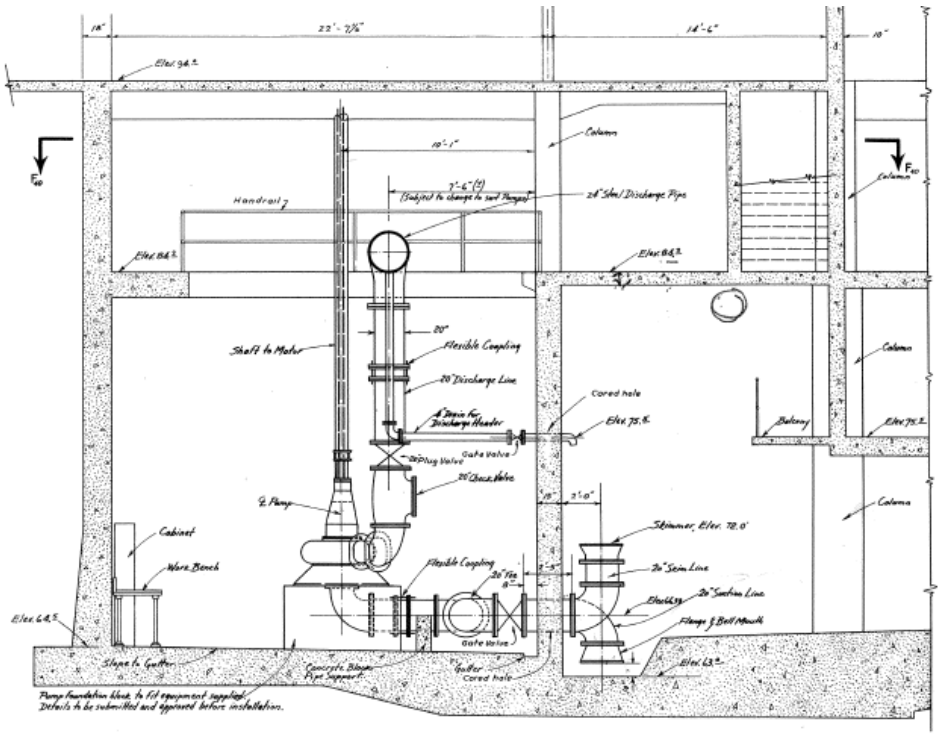


Figure 4.3 Original Influent Pump Station Suction Configuration

In 1962, the pump station was modified to accept larger influent pumps. The inlet bells and elbows were removed and replaced with flared pump inlets as shown in Figure 4.4. The pump suction modifications reduced the pump submergence from 9 feet to 5.5 feet (assuming a wet well elevation of 73 feet). Per Hydraulic Institute (HI) standards, the inlets should have a submergence of 7.3 to 7.7 feet. Because the actual submergence is less than the recommended submergence, the existing influent pumps may experience cavitation and reduced pumping performance.

4.2.2.1.3 *Net Positive Suction Head*

The net positive suction head required (NPSHr) is the suction head at which the pump performance has decreased by 3 percent due to low suction head and the resultant cavitation. To minimize cavitation, the NPSH available (NSPHa) must be greater than the NPSHr. Typically a safety factor, or margin, is applied to ensure that the potential for cavitation is minimized (see Table 4.2 for the safety margin equation).

In the case of the raw sewage pump station, NPSHr data was only available for Pump No. 4. Calculations were performed that showed that the NPSH safety margin was 1.03, which is marginal. Therefore, it is likely that cavitation is occurring due to the low suction head, and surface vortexes may also be occurring because of the low submergence conditions.

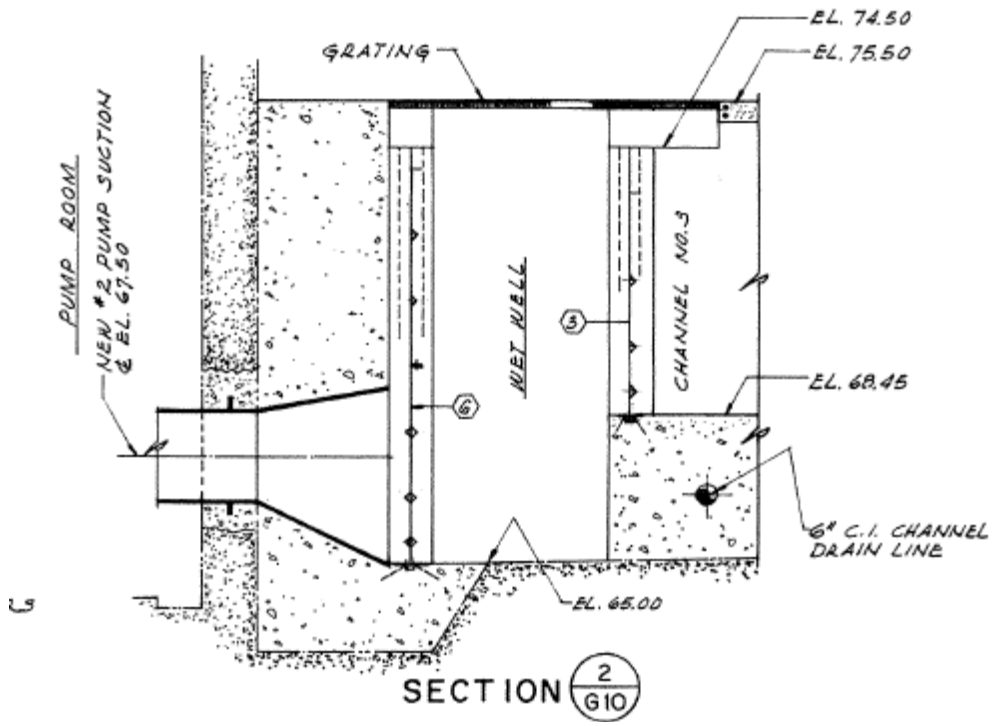


Figure 4.4 1962 Modifications to Influent Station Suction Pipes

4.2.2.1.4 *Suction Piping Velocity*

As shown in Table 4.2, the velocities in the suction piping for all four pumps are much higher than recommended velocities. The high velocity in the suction piping may be also be contributing to the submerged vortices and cavitation.

4.2.2.1.5 *Physical Condition*

Overall, the mechanical equipment in the pump station is in relatively good condition. The three oldest pumps are past their useful life, but they are performing relatively well, except for the cavitation issues. Recently, the discharge piping has been replaced and the mechanical equipment has been recoated. The three oldest pumps do not have premium efficiency motors but all four pumps are driven by VFDs.

4.2.2.1.6 *Summary*

Operations staff has indicated that cavitation is occurring in the pumps, which is consistent with the pump station analysis described above. Because the pump station wet well does not currently meet Hydraulic Institute standards, it is not recommended that the existing pumps be replaced with larger pumps to meet projected peak wet weather flows. To accommodate peak wet weather flows beyond the firm capacity of the influent pump station, the addition of an auxiliary wet weather pump station is recommended.

While the existing pump station does not meet Hydraulic Institute standards, the influent pump station has performed relatively well for the past 48 years since the wet well modifications were performed. Since the inlet conditions for the pumps will not change, cavitation will continue to occur at current levels. Regular impeller maintenance will need to continue to maintain the current pumping capacity.

4.2.2.2 Summary of Recommended Improvements

During construction of the headworks improvements, it will be necessary to provide temporary bypass pumping. Flow should be conveyed directly to the primary clarifiers. In addition, the auxiliary pump station should be designed as a permanent standby pump station to provide redundancy to the existing pump station. The auxiliary pump station should be sized for a firm capacity of 25 mgd and a total capacity of 50 mgd. At these capacities, the pump station will be able to convey peak dry weather flows during construction and additional peak wet weather flows on a permanent basis. The pump station should be designed to stay dry until needed, to reduce maintenance requirements. It is recommended that the pump station be equipped with submersible pumps designed to handle unscreened wastewater. The pumps should have both level and flow control modes to respond to changes in flow and should be equipped with variable frequency drives.

4.3 PRIMARY TREATMENT

4.3.1 Primary Clarifiers

4.3.1.1 Facility Description

Preliminary effluent and recycle streams, including belt press filtrate, gravity thickener overflow, gravity thickener filtrate, and sludge lagoon supernatant are combined at the primary influent distribution box upstream of the primary clarifiers. Primary treatment is accomplished using six rectangular and two square/circular (“squircular”) clarifiers. The primary clarifiers are designed to remove readily settleable and floatable suspended solids. By removing solids, the primary clarifiers reduce the non-soluble organic material and the five-day biological oxygen demand (BOD_5) load on downstream processes. Settling aids, including ferric chloride and polymer, are mixed with the primary influent to enhance the removal of BOD_5 and suspended solids. Ferric chloride is injected at the Headworks and polymer is injected directly upstream of the primary clarifiers. Primary effluent flows by gravity from the primary clarifiers to the secondary biotower lift station.

Primary sludge collected with chain and flight mechanisms is pumped from sludge hoppers with centrifugal sludge pumps to either gravity thickeners or gravity belt thickeners. Scum is collected in a scum sump where it is pumped to thickening facilities.

4.3.1.2 Capacity Evaluation

Primary clarifiers are rated based on surface overflow rates (flow rate divided by the surface area of the clarifier) for maximum month loading conditions. A typical design maximum surface overflow rate is 1,200 gpd/sf. However, the RWCF uses enhanced primary clarification, which improves solids removal using ferric chloride and polymer. With chemical coagulation, the acceptable overflow rate can be raised to 1,300 gpd/sf. According to plant staff, flows above 60 mgd are bypassed to the oxidation ponds. The capacity evaluation is summarized in Table 4.3. As shown in the table, the maximum capacity of the existing clarifiers is approximately 52 mgd with all units in service, including the squircular clarifiers. The current firm capacity of the primary clarifiers with the squircular clarifiers is 45.4 mgd, which is well above the current maximum month loading of 34 mgd.

Table 4.3 Primary Clarifier Capacity Evaluation – Current Conditions
Capital Improvement and Energy Management Plan
City of Stockton

	Surface Area (sf)	Overflow Rate (1) (gpd/sf)	Capacity (2) (mgd)
Current Maximum Month (AUIS) without Squircular Clarifiers	30,320	1,121	39.4
Current Maximum Month (LUOOS) without Squircular Clarifiers	25,140	1,352	32.7
Current Maximum Month (AUIS) with Squircular Clarifiers	40,120	847	52.2
Current Maximum Month (LUOOS) with Squircular Clarifiers	34,940	973	45.4

Notes:
(1) Overflow rate calculated using existing maximum month flow of 34.0 mgd and available clarifier surface area.
(2) Capacity based on a design overflow rate of 1,300 gpd/sf with the existing clarifier surface area available.

Currently, the RWCF operates with all six rectangular clarifiers. The squircular clarifiers are reserved for wet weather events only.

4.3.1.3 Condition Assessment

Primary Clarifier Nos. 1 through 4 were built in the late 1940s. Squircular clarifier Nos. 5 and 6 were built in the 1950s, and rectangular clarifier nos. 7 and 8 were added in 1993.

The following deficiencies were identified:

1. **Odors:** The RWCF performed a site-specific odor study in 2006, which indicated that the odors at the treatment plant were comprised of hydrogen sulfide, methyl mercaptan, and other reduced sulfur compounds. The majority of the odors were

released by the Headworks, the primary influent distribution structure, and the effluent launders of the primary clarifiers.

2. **Inefficient squircular clarifier sludge collection:** Operations staff has reported sludge accumulation in the corners of the squircular clarifiers.

3. **Poor sludge pumping performance:** The existing primary sludge pumps are centrifugal-type, which are not intended for primary sludge concentrations greater than 1 to 3 percent. This means that the solids cannot be thickened in the primary clarifier sludge hoppers. This limitation requires the use of another thickening process to reduce the volume of primary sludge. The preferred approach is to replace the existing pumps with progressive cavity pumps, which can handle higher sludge concentrations. This would allow the operations staff to thicken solids in the primary clarifiers.

4. **Inefficient scum collection:** The existing manual scum removal system is corroded and difficult to operate.

5. **Primary influent distribution issues:** On the discharge of each raw wastewater pump, a concrete barrier, similar to a weir, acts as a check valve to prevent backflow through pumps that are not in operation. The existing concrete weir does not prevent all backflow through the pipes. Not only is this a problem during pump maintenance activities but if the raw sewage pump turns on during this hydraulic condition, the pump shafts can break due to excessive torque. In addition, the primary influent distribution box releases large amounts of odorous and corrosive gases as the wastewater cascades over the concrete barrier.

6. Miscellaneous concrete rehabilitation

Because several of the clarifiers are over 60 years old, some of the concrete walkways, walls, and slabs need rehabilitation.

4.3.1.4 Recommended Improvements

In order to provide firm treatment capacity for the projected maximum month flow of 56.1 mgd, additional year-round clarifier capacity must be added. Table 4.4 presents the projected overflow rates and capacities (based on 1,300 gpd/sf) with the addition of two rectangular clarifiers identical in size to primary clarifiers 7 and 8. It is important to note that the additional primaries are not required until the ADMMFs exceed 52 mgd (which is not expected to occur until approximately 2030 based on the flow projections presented in Chapter 2).

Table 4.4 Primary Clarifier Capacity Evaluation – Projected Conditions Capital Improvement and Energy Management Plan City of Stockton			
Condition	**Surface Area (sf)**	**Overflow Rate (1) (gpd/sf)**	**Capacity (2) (mgd)**
Projected Maximum Month (AUIS) w/ Converted Squircular Clarifiers	38,010	1,476	49.4
Projected Maximum Month (LUOOS) w/ Converted Squircular Clarifiers	32,830	1,709	42.7
Projected Maximum Month (AUIS) w/ Clarifiers 9 &10 and Converted Squircular Clarifiers	47,610	1,178	61.9
Projected Maximum Month (LUOOS) w/ Clarifiers 9 &10 and Converted Squircular Clarifiers	42,430	1,322	55.2

Notes:
(1) Overflow rate calculated using projected maximum month flow of 56.1 mgd and available clarifier surface area.
(2) Capacity based on a design overflow rate of 1,300 gpd/sf with the future clarifier surface area available.

The recommended improvements to the deficiencies identified in the condition assessment are as follows:

1. **Odors:** Install aluminum frame, retractable fabric covers over the primary clarifiers Seal the primary influent distribution structure to prevent odors from escaping. Foul air from the primary treatment facilities would be conveyed with new blowers and foul air duct from the primary clarifiers to new soil bed biofilters built within the existing abandoned rock filters. An illustration of the covers is shown in Figures 4.5 and 4.6.

2. **Poor sludge withdrawal in the squircular clarifiers:** Convert the squircular shaped clarifiers to circular clarifiers by filling the corners with low-density concrete. This would prevent sludge from building up in the corners.

3. **Poor sludge pumping performance:** Replace the existing primary sludge pumps with progressing cavity type pumps.

4. **Inefficient scum collection:** Replace the existing scum collection system with a more efficient scum removal system.

5. **Poor primary influent distribution structure issues:** Modify existing primary influent distribution structure to hydraulically separate the piping connections from the Raw Sewage pump station and install flap gates.

6. **Concrete rehabilitation:** Re-surface deteriorated concrete in each clarifier.

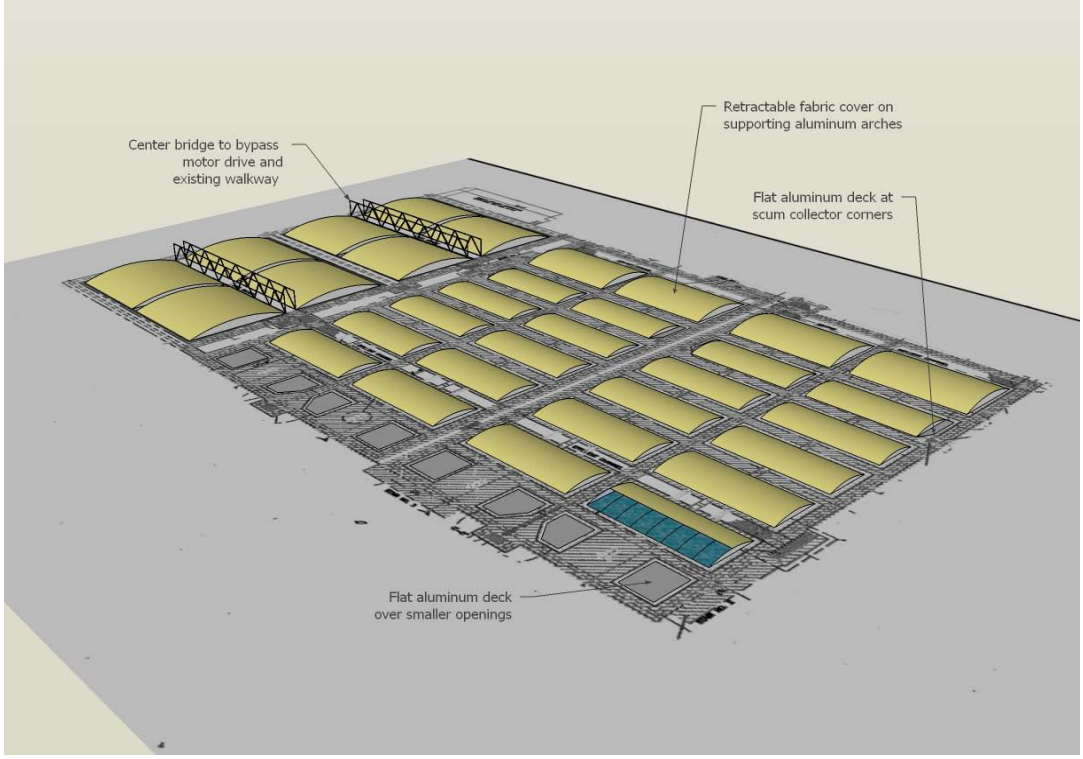


Figure 4.5 Rendering of Primary Clarifier Covers

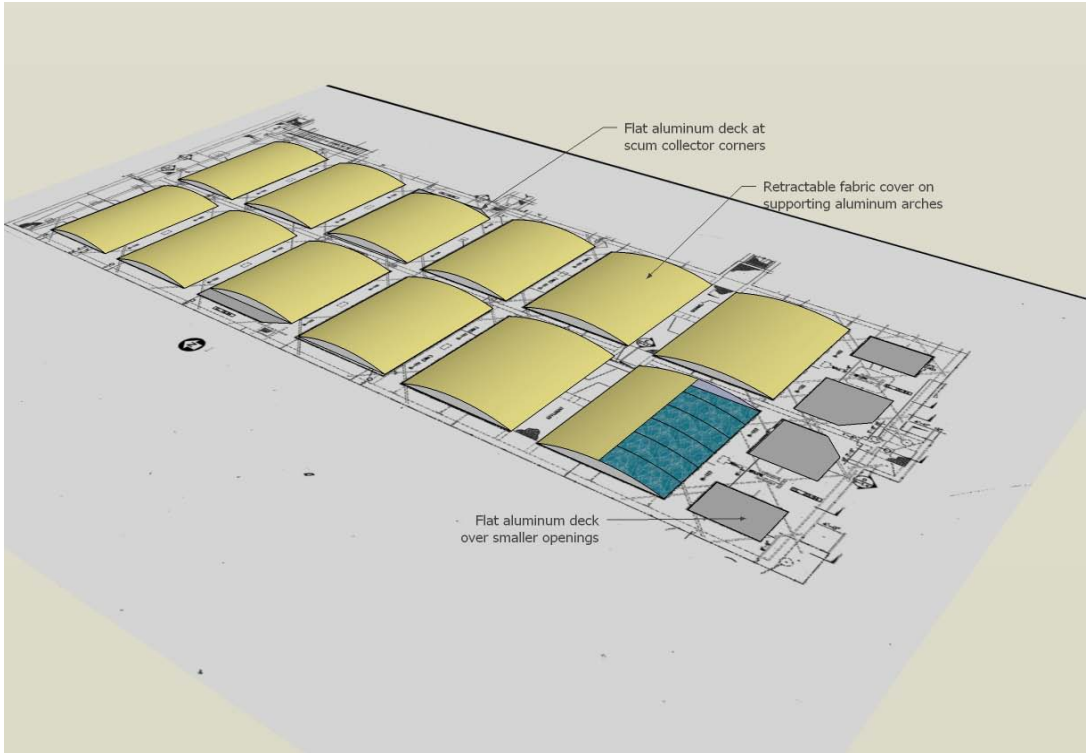


Figure 4.6 Rendering of Primary Clarifier Covers from another Perspective

4.4 SECONDARY TREATMENT

Secondary treatment facilities are designed to reduce BOD_5 concentrations in the primary effluent. The existing secondary treatment process consists of three biotowers, four secondary clarifiers, and three oxidation ponds.

4.4.1 Secondary Biotowers

4.4.1.1 Facility Description

Most of the BOD_5 reduction achieved by secondary treatment occurs in the secondary biotowers. A blend of primary effluent and biotower recycle is treated in three, 22-feet high, 166-foot diameter biotowers. The biotower lift station pumps both primary effluent and biotower effluent to the top of the biotowers. A portion of the biotower effluent is recycled to sustain an optimal and constant hydraulic loading rate to the biofilm on the biotower media. An adjustable weir in the biotower lift station allows for bypass of excess flow during peak wet weather events to the secondary effluent pump station. The biotower distributors evenly distribute the pumped primary effluent over the plastic media. The plastic media provides a home for biofilm which consume the organics in the primary effluent.

Figures 4.7 and 4.8 are photographs of the existing biotowers and plastic media.

Figure 4.7 Exterior of a Secondary Biotower

Figure 4.8 Existing vertical flow media

4.4.1.2 Capacity Evaluation

The secondary biotowers are rated based on BOD_5 loading and hydraulic loading capacity. Typical BOD loading rates for carbon oxidizing towers achieving 40-70% BOD removal range from 100 to above 200 pounds per day per thousand cubic feet (ppd/kcf) for vertical flow media. Typical hydraulic loadings range from 0.9 to 2.9 gallons per minute per square foot (gpm/sf) (WEF Manual of Practice No. 8, MOP 8). The secondary biotowers at the RWCF achieve 40-60% BOD removal, with an average in 2009 of 48%. The capacity evaluation for the secondary biotowers was based on maximum month conditions. The capacity evaluation is summarized in Table 4.5.

Currently, the biotowers are hydraulically loaded at less than 0.9 gpm/sf, which is well under the maximum hydraulic loading. Additionally, the existing biotowers are well under the allowable BOD loading (100 to 200 ppd/kcf) for biotowers achieving partial BOD removal. However, even at the reduced loading, the performance of the existing biotowers is marginal.

Table 4.5	Secondary Biotower Capacity Evaluation – Current Conditions Capital Improvement and Energy Management Plan City of Stockton				
	Flow (1) (mgd)	**Surface Area (sf)**	**Media Volume (kcf)**	**Hydraulic Loading (2) (gpm/sf)**	**BOD Loading (3) (ppd/kcf)**
Current Average Annual (AUIS)	31.9	64,927	1,428	0.34	35
Current Average Annual (LUOOS)	31.9	43,285	952	0.51	53
Current Maximum Month (AUIS)	34.0	64,927	1,428	0.36	45
Current Maximum Month (LUOOS)	34.0	43,285	952	0.55	67

Notes:
(1) Excludes recycle flow. No data on recycle flow is available to estimate the actual hydraulic loading on the biotowers. Therefore, hydraulic loadings are based on the plant influent flow and are calculated to confirm they are within the recommended range without recycle.
(2) Hydraulic loading is calculated by dividing current flow in gpm by available surface area.
(3) BOD loading calculated by dividing current load in ppd by available biotower media volume. Biotower loading calculated using current flow in mgd and biotower influent BOD concentration of 190 mg/L for average annual conditions and 227 mg/L for maximum month conditions.

Based on a maximum month allowable loading of 100 ppd/kcf and the maximum month to average annual peaking factor of 1.09 (See Chapter 2), the biotowers have an average annual capacity of 47.2 mgd with one unit out of service and a capacity of 71 mgd with all units in service. However, according to the O&M manual, if flows to and from the biotowers exceed 47 mgd, flooding biotower effluent underdrain system may occur. At 47 mgd, the maximum hydraulic loading rate to the towers would be 0.75 gpm/sf, with one unit out of service (with no recycle).

The existing hydraulic profile for the secondary biotowers indicates the secondary effluent water level in the biotower effluent collection system is 95.15 at 42 mgd. This elevation indicates that the orifices for the air supply to the media (Top of Orifice Elevation: 95.00) are completely submerged at 42 mgd. If the orifices are submerged, aeration air would not be able to reach the media which would result in anoxic conditions. This may explain the marginal BOD_5 removal performance and biotower odors. In addition the supply fans are vulnerable to flooding because the slab for the biotower supply fans is only 7 inches above the water level in the effluent collection system at 42 mgd, according to the hydraulic profile.

4.4.1.3 Condition Assessment

The existing secondary biotowers were built in the early 1970s over the foundations of the old rock filters, which were built in the late 1940s.

The following deficiencies were identified:

1. **Outdated and deteriorated plastic media:** The existing plastic media was installed in the 1972 as part of the secondary treatment expansion project. The media consists of vertical-flow type media designed for high BOD loadings (from the canneries that were discharging to the RWCF at that time). Since then, the canneries have closed and this type of media is no longer required. In addition, vertical cross flow media is more appropriate and would improve the BOD_5 removal performance. Also, the top media layers are damaged and plant staff has reported the media is brittle and unable to safely support maintenance staff and equipment.

2. **Corroded rotary distributor:** The existing distributors were installed in the early 1970s and have experienced significant corrosion.

3. **Lift station clogged screens:** Plant staff reported that the screening baskets on the suction side of the biotower lift station pumps experience occasional ragging which reduce the pump station capacity and require regular maintenance.

4. **Corroded fans:** The existing fans were installed are severely corroded, mostly due to moisture coming from the air supply channels. Many of the fans are not operational. In addition, the fans do not include dampers to control air flow, so the air supply short circuits and it is poorly distributed.

5. **Inadequate media support system:** The existing concrete columns that support the media are not adequately anchored to resist a seismic event.

6. **Hydraulic limitations:** As previously described, hydraulic calculations indicate that the secondary effluent water level in the biotower effluent channel is submerging the air supply orifices and limiting critical air supply to the media.

7. **Odors:** The RWCF operations staff performed an odor study in 2006, which indicated that some of the odors were emanating from the top surface of the secondary biotowers. Odors can be controlled somewhat by providing adequate ventilation. However, the previously described issues with the hydraulics and ventilation system are currently reducing air flow to the biotowers. In addition, the City recently began a program to add hydrogen peroxide to the influent flow to control odors. Initial trials of hydrogen peroxide have been promising. The combination of chemical addition, new media, and improved ventilation system may be sufficient to reduce odors to acceptable levels.

8. **Structural rehabilitation:** Refer to Chapter 6 for detailed structural recommendations from the on-site structural condition assessment.

4.4.1.4 Recommended Improvements

Several options were considered for accommodating the projected maximum month flows and loads to the secondary biotowers. All options include replacement of the existing vertical media with cross flow media to improve BOD_5 removal performance. Typical BOD

removal for cross flow media is 20-60 ppd/kcf (MOP 8); however, according to plastic media manufacturers, cross flow media has successfully been used in roughing applications up to 150 ppd/kcf. Five options were evaluated:

Rehabilitation of existing biotowers:

1. One rehabilitated biotower in operation.

2. Two rehabilitated biotowers in operation.

3. Three rehabilitated biotowers in operation.

Construct new biotowers:

4. Two new biotowers of smaller diameter (130').

5. Three new biotowers of smaller diameter (130').

The capacity evaluation for the above options is summarized in Table 4.6. For the projected maximum month flow, a minimum of two rehabilitated biotowers (Option 2) will be required based on an allowable BOD load of 100 ppd/kcf. For current maximum month flows, the RWCF could get by with a single biotower in operation (Option 1). A fourth biotower will not be necessary to meet the projected maximum month flow and load. New biotowers were considered for Options 4 and 5. The existing secondary biotowers would be demolished and three new smaller diameter biotowers would be constructed. In order to provide firm capacity for the projected flow and load, three 130' diameter biotowers would be required with two in operation (Option 4).

To provide adequate firm capacity (one unit out of service), the recommended approach is to rehabilitate all three biotowers (Option 3). The average annual capacity of the biotowers after the CIP improvements will be 53.3 mgd with one unit out of service and 80.0 mgd with all three units in service (based on a maximum month loading of 100 ppd/kcf and a maximum month to average annual flow peaking factor of 1.14 from Chapter 2); however, the new cross flow media is anticipated to provide a better effluent quality. If needed to reduce construction costs, rehabilitation of the biotowers could be staggered such that two of the biotowers are rehabilitated first to provide firm capacity for current loading conditions and the third biotower could be rehabilitated at a later date. The projected average annual hydraulic and BOD loading for two rehabilitated biotowers in operation would be 0.79 gpm/sf and 67 ppd/kcf, respectively.

The recommended improvements to the deficiencies identified in the condition assessment are as follows:

1. Remove existing deteriorated vertical flow media and replace with cross flow media.

2. Remove existing corroded distributors and replace with new VFD-driven distributor.

Table 4.6	Secondary Biotower Capacity Evaluation – Projected Conditions Capital Improvement and Energy Management Plan City of Stockton					
Option		**Flow (mgd)**	**Area (sf)**	**Media Volume (kcf)**	**Hydraulic Loading (1) (gpm/sf)**	**BOD Loading (2) (ppd/kcf)**
1	Current Maximum Month	34.0	21,642	476	1.09	107
	Projected Maximum Month	56.1	21,642	476	1.80	185
2	Current Maximum Month	34.0	43,285	952	0.55	67
	Projected Maximum Month	56.1	43,285	952	0.90	93
3	Current Maximum Month	34.0	64,927	1,428	0.36	45
	Projected Maximum Month	56.1	64,927	1,428	0.60	62
4	Current Maximum Month	34.0	26,546	584	0.89	110
	Projected Maximum Month	56.1	26,546	584	1.47	151
5	Current Maximum Month	34.0	39,820	876	0.59	73
	Projected Maximum Month	56.1	39,820	876	0.98	101

Notes:
(1) Hydraulic loading calculated by dividing flow in gpm by available surface area.
(2) BOD loading calculated by dividing load in ppd by available media volume. Biotower loading calculated using flow in mgd and biotower influent BOD concentration of 156 mg/L for average annual conditions and 188 mg/L for maximum month conditions based on future treatment performance.

3. Remove clogged lift station basket screeners.

4. Replace existing corroded fans with FRP fans.

5. Demolish existing media support system and replace with new support system.

6. Modify biotower underdrain and air supply system to improve air supply.

7. Perform structural rehabilitation:

    a. Install water repellant coating on interior biotower wall to prevent seepage through mortar joints on all three biotowers.

    b. Repair the cracked and spalled concrete ring walls on all three biotowers.

    c. Remove and replace the concrete channel deck on Biotower No. 4.

    d. Perform a seismic retrofit of all three biotowers.

4.4.2 Secondary Clarifiers

4.4.2.1 Facility Description

Biotower effluent, including secondary sludge that sloughs off from the biotower media, flows to the secondary clarifier distribution structure. The distribution structure splits the biotower effluent between the four secondary clarifiers. Solids that slough off the biotower media settle into the bottom of the secondary clarifiers. Centrifugal secondary sludge pumps transfer the sludge to either the gravity thickeners or gravity belt thickeners.

4.4.2.2 Capacity Evaluation

The secondary clarifiers are rated based on surface overflow rate. The recommended overflow rate for 12-foot deep clarifiers that receive trickling filter effluent is approximately 620 gpd/sf and 1,210 gpd/sf for average and maximum flow conditions, respectively. The O&M manual indicates that it is acceptable to operate at 1,400 gpm/sf, because a short-term reduction in solids separation is not critical to the performance of downstream treatment process (ponds, wetlands, dissolved air flotation, and filtration). Allowing for additional treatment that can be provided by the ponds downstream, higher overflow rates could be used. Accordingly, it was determined that an average annual and maximum month overflow rate of 1,400 gpd/sf (with one unit out of service) was appropriate for the capacity evaluation. The capacity evaluation is summarized in Table 4.7. Using an overflow rate of 1,400 gpd/sf, the capacity of the existing clarifiers is 33 mgd with one unit out of service and 44 mgd with all units in service.

Table 4.7 Secondary Clarifier Capacity Evaluation – Current Conditions
Capital Improvement and Energy Management Plan
City of Stockton

	Flow Rate (mgd)	Surface Area (sf)	Overflow Rate (1) (gpd/sf)
Current Average Annual (AUIS)	31.9	31,416	1,015
Current Average Annual (LUOOS)	31.9	23,562	1,354
Current Maximum Month (AUIS)	34.0	31,416	1,082
Current Maximum Month (LUOOS)	34.0	23,562	1,443

Note:
(1) Overflow rate calculated using existing flow and available surface area.

4.4.2.3 Condition Assessment

The existing secondary clarifiers were built in 1948. The clarifier influent and effluent piping has been modified several times over the years.

The following deficiencies were identified:

1. Corroded weirs.

2. Lack of secondary sludge pump redundancy (each clarifier only has one sludge pump).

3. Secondary sludge pump pits are uncovered and covered with bird excrement.

4. Deteriorated secondary clarifier distribution box and gates.

4.4.2.4 Recommended Improvements

The existing four secondary clarifiers are currently operating at capacity. In order to provide firm treatment capacity for the projected maximum month flow of 56.1 mgd, an additional clarifier will be required. Three options were considered for increasing the secondary clarifier capacity:

1. Add fifth 100' diameter clarifier identical to existing clarifiers.

2. Add fifth 166' diameter clarifier over abandoned rock filter.

3. Add fifth 100' diameter clarifier and sixth 166' clarifier.

Table 4.8 presents the projected overflow rates for total and firm capacities for the three options.

Table 4.8 Secondary Clarifier Capacity Evaluation – Projected Conditions Capital Improvement and Energy Management Plan City of Stockton

Option		Flow Rate (mgd)	Surface Area (sf)	Overflow Rate (gpd/sf)
1	Projected Average Annual (AUIS)	49.3	39,270	1,255
	Projected Average Annual (LUOOS)	49.3	31,416	1,569
	Projected Maximum Month (AUIS)	56.1	39,270	1,429
	Projected Maximum Month (LUOOS)	56.1	31,416	1,786
2	Projected Average Annual (AUIS)	49.3	53,058	929
	Projected Average Annual (LUOOS)	49.3	31,416	1,569
	Projected Maximum Month (AUIS)	56.1	53,058	1,057
	Projected Maximum Month (LUOOS)	56.1	31,416	1,786
3	Projected Average Annual (AUIS)	49.3	60,912	809
	Projected Average Annual (LUOOS)	49.3	39,270	1,255
	Projected Maximum Month (AUIS)	56.1	60,912	921
	Projected Maximum Month (LUOOS)	56.1	39,270	1,429

Note:
(1) Overflow rate calculated using projected flow and available surface area.

Options 1 and 2 will provide adequate total capacity for the projected maximum month flows; however, Option 1 will be at capacity at buildout while Option 2 will have additional capacity with all units in service. Based on a design overflow rate of 1,400 gpd/sf, Option 2 will provide total capacity up to 74 mgd and a firm capacity of 44 mgd. Neither Option 1 nor Option 2 provide firm capacity below 1,400 gpd/sf. However, Option 3, which is a combination of Options 1 and 2, would provide firm capacity for maximum month conditions and significantly reduce the overflow rate for average annual conditions.

Option 2 is recommended because it will provide a significant capacity increase with adding only one clarifier.

The recommended improvements to the deficiencies identified in the condition assessment are as follows:

1. Corroded weirs: Remove and replace the existing weirs.
2. Lack of secondary sludge pump redundancy: Purchase spare secondary sludge pump for reduced down time.
3. Improve the worker environment for the secondary sludge pump pit. Provide canopy covers over existing pump pits to protect from seagull droppings.
4. Deteriorated secondary clarifier distribution box and gates: Demolish and construct new secondary clarifier distribution box with motorized gates.

4.4.3 Secondary Effluent Pumping

4.4.3.1 Facility Description

Effluent from the secondary clarifiers flows to Secondary Effluent Pump Station No. 1 (SEPS 1) through a 60-inch pipe. Three pumps in SEPS 1 discharge through a 60-inch river crossing pipeline. The pump station is configured to allow a fourth pump to be easily installed. A 36-inch river crossing pipeline is also available but it is not designed to be pressurized. Both pipelines are buried under the San Joaquin River and discharge into the oxidation pond supply channel. The two pumping units in Secondary Effluent Pump Station No. 2 have limited capacity and they are obsolete.

4.4.3.2 Capacity Evaluation

As presently configured, with a total of three pumps and discharge to only the 60-inch river-crossing pipeline, the firm and total capacities of the pump station are 75 mgd and 95 mgd, respectively. If a fourth pump is installed, the firm and total capacities will both be approximately 95 mgd (at flows higher than 95 mgd, the total dynamic head from friction and minor losses is too great for the pumps to overcome). Under this configuration, an additional 27 mgd of pumping capacity is required to meet peak wet weather flows.

If the 36-inch pipeline and its appurtenances were modified to allow it to be pressurized, the firm and total capacity of the SEPS 1 would increase to approximately 75 and 108 mgd. If a fourth pump is installed at SEPS 1, the total and firm capacities would increase to 108 mgd and 132 mgd, respectively. Under this configuration, an additional 14 mgd of pumping capacity is required to meet peak wet weather flows.

4.4.3.3 Condition Assessment

Secondary Effluent Pump Station No. 1 was built in 1948 and the Secondary Effluent Pump Station No. 2 was added in 1972.

The following deficiencies were identified:

1. The 36-inch river crossing has non-pressurized manholes.
2. The SEPS 2 is obsolete and has limited functionality.

4.4.3.4 Recommended Improvements

SEPS 2 should be replaced with a new pump station. This pump station would be sized to meet peak wet weather flows and provide redundancy to SEPS 1. The pump station will also be used to pump secondary effluent directly to the NBT pump station, as described later in this chapter. The required firm and total capacity is 27 and 54 mgd, respectively.

A fourth pump should be added to SEPS 1 and the 36-inch river crossing pipeline should be pressurized to improve the SEPS 1 capacity to 108 mgd (one pump out of service) and 132 mgd (all pumps in service). Since the SEPS 1 pumps will be operating at their maximum total dynamic head in the future during high flow periods, these pumps should be replaced with slightly higher head pumps when they reach the end of their useful life.

The total future secondary effluent pumping capacity will be 135 mgd (with one pump out of service per pump station) and 186 mgd (with all pumps in service).

4.4.4 Oxidation Ponds

4.4.4.1 Facility Description

Effluent from the secondary clarifiers is pumped to 450 acres of oxidation ponds for additional secondary treatment. The microorganisms that reduce BOD_5 require oxygen. Since the ponds are not aerated, oxygen is provided through the respiration of algae that grow in the ponds. Growth of the algae depends on sunlight, which means that the performance of the oxidation ponds to varies seasonally. In addition to removing BOD_5, the ponds also provide the following benefits:

- Total mercury removal and possibly other heavy metals removal. The City performed a study in November 2010, which showed that the oxidation ponds removed approximately 65 percent of the influent total mercury.

- Dry weather flow equalization, to reduce diurnal flow variations to the downstream treatment processes.
- Attenuation of peak wet weather flows by providing flow equalization and storage during peak flow conditions.
- The capability to accommodate short-term plant shutdowns, which allows full-scale testing or maintenance work.
- Provides storage capacity to allow the City to shut down power to the downstream process, which may allow the City to participate in the PG&E Demand Response Program (see Chapter 14)

Effluent from the secondary clarifiers is pumped by Secondary Effluent Pump Station No. 1 to the pond Supply Channel that distributes flow to the three oxidation ponds. Once treated in the ponds, effluent from each pond flows to the Return Channel where it can be recycled to the Supply Channel using the Pond Circulation Pump Station or discharged to the Wetland Supply Channel. However, flow is typically sent to Pond 1 and then distributed between Ponds 2 and 3, which both discharge into the Return Channel. A portion of the pond effluent from Ponds 2 and 3 is recycled from the Pond Circulation Pump Station to the Supply Channel to blend with secondary effluent. The remaining pond effluent flows from the Return Channel to the Wetlands Supply Channel.

4.4.4.2 Capacity Evaluation

Oxidation ponds are rated based on pounds of BOD_5 applied per acre per day (ppd/ac). Allowable pond loadings vary seasonally with climate conditions. During the winter, when there are lower temperatures and less sunlight for algae growth, the allowable loading is less than during the summer, when temperature and insolation are greater. Allowable pond loadings in California typically range from a low of 40 ppd/ac during the winter to a high of at least 100 ppd/ac during the summer. Table 4.9 presents the current and projected loadings to the oxidation ponds.

Table 4.9 Oxidation Pond Capacity Evaluation – Current and Projected Conditions
Capital Improvement and Energy Management Plan
City of Stockton

	Loading on Biotowers (1) (gpm/sf)	Loading on Biotowers (1) (ppd/kcf)	Secondary Effluent Loading on Ponds (ppd/ac)
Current Average Annual	0.75	53	39
Current Maximum Month	0.56	73	56
Projected Average Annual (2)	0.79	67	41
Projected Maximum Month (2)	0.90	93	65

Notes:
(1) Loading based two biotowers in service and one unit out of service.
(2) Projected loadings based on increased performance with new media.

According to Table 4.9, the projected average annual loading will be approximately 5 ppd/ac more than the current average loading despite the increased loading on the biotowers because biotower performance will improve after the secondary biotowers are rehabilitated. The projected average annual loading is at the lower range of the allowable pond loading for winter conditions. Based on a loading of 40 ppd/ac, the current and future capacity of the ponds is approximately 33 and 48 mgd, respectively. The projected maximum month loading is less than 10 ppd/ac more than the current maximum month loading. The projected maximum month BOD loading is not anticipated to cause odor issues as maximum month BOD loads tend to occur during warmer weather when the allowable pond loading increases. Actual future BOD loadings to the ponds will vary depending on primary and secondary treatment performance, particularly the secondary biotowers.

4.4.4.3 Condition Assessment

The oxidation ponds were built in the 1920's.

The following deficiencies were identified:

1. **Deteriorated transfer structures:** The oxidation ponds have 78 transfer structures used to control flow in and out of the three ponds. The transfer structure pipes and gates are severely corroded and the wood access platforms are rotted.

2. **Erosion:** The oxidation pond levees are eroded in some areas and are in need of repair.

4.4.4.4 Recommended Improvements

Historically, the oxidation ponds have successfully operated at an average of 40 ppd/ac during cold weather. Actual performance of the biotowers will affect the loading to the oxidation ponds. In order to maintain this average loading under firm conditions at design loadings, rehabilitation of the three existing biotowers will be required. If BOD removal improves more than anticipated due to the installation of cross flow media and improvements to the air supply chambers, the BOD loading to the ponds will be less than assumed for this analysis.

If the maximum month BOD load of approximately 65 ppd/ac (See Table 4.9) occurs during cold weather months when the allowable pond loading is closer to 40 ppd/ac, supplemental pond aeration may be required in the future. Due to the anticipated improvements to secondary biotower performance with the recommended improvements, adding supplemental aeration is not recommended until improved performance of the secondary biotowers (after rehabilitation) can be quantified. However, if supplemental aeration is required in the future, it would likely consist of approximately 300 HP of pond aerators and would require improvements to the existing electrical system to support the aerators in the

ponds or pond supply channel. Costs for these future improvements were not included in the CIP.

The recommended improvements to the deficiencies identified in the condition assessment are as follows:

1. **Deteriorated transfer structures:** Repair the existing transfer structure vertical pipes and wood platforms. Remove and replace the existing gates.
2. **Erosion:** Place and compact new fill to repair eroded pond levees.

4.5 TERTIARY TREATMENT

4.5.1 Wetlands

4.5.1.1 Facility Description

Effluent from the oxidation ponds flows by gravity to the tertiary treatment facilities consisting of wetlands, nitrifying biotowers (NBTs), dissolved air flotation (DAF) units, multimedia filters, disinfection and a river discharge siphon.

Pond effluent from the Wetlands Supply Channel is distributed between the north and south wetland cells, which were constructed in the original location of the old 180-acre Oxidation Pond 4 (See Figure 4.9). The wetlands are designed primarily for suspended solids removal; however, they also provide additional BOD_5, nutrient removal, and provide habitat for migratory birds and other wildlife.

Figure 4.9 Tertiary Wetlands

4.5.1.2 Capacity Evaluation

The wetlands polish the oxidation pond effluent by removing BOD_5 and TSS. They also remove ammonia and nitrogen during the warmer months. The nutrient removal capacities of the wetlands are difficult to quantify. The removal capacities are affected by many factors including:

- Temperature.
- Loading of the constituent of concern.
- Concentrations of other constituents.
- Physical dimensions (length to width ratio, depth, etc.).
- Hydraulic retention time.
- Plants.
- Short circuiting.

Consequently, it is not possible to provide a firm capacity for the wetlands for removal of any one constituent.

Figure 4.10 shows a range of predicted wetlands effluent nitrogen concentrations if the wetlands are supplied with NBT effluent (based on empirical equations from Kadlec and Wallace, Treatment Wetlands, 2009). As shown in the figure, the effluent concentrations are correlated strongly to temperature. Literature also shows that nitrogen removal is strongly influenced by the presence of supplemental carbon in the wetlands. As discussed in Chapter 5, there are several methods of adding supplemental carbon to the ponds to increase the denitrification performance of the ponds.

In their current configuration, the wetlands provide some ammonia reduction. However, the NBTs downstream of the wetlands are the main process for reducing ammonia.

4.5.1.3 Condition Assessment

The condition assessment of the wetlands yielded the following deficiencies:

1. In the past, the wetlands were channelized in an attempt to solve hydraulic issues. The channels reduce the effective hydraulic retention time (HRT) of the wetlands by allowing secondary effluent to take a “short cut” through the wetlands instead of flow through the vegetation. Figure 4.11, shows one of the channelized sections of the wetlands.

2. The south wetland cell is normally operated at a depth of 10 to 15 inches. One of the reasons that the wetland is operated at a shallow water level is that the hydraulic control structure at the east end of the south wetland cell is not configured to provide adjustable level control. The north wetland cell’s control structure is not

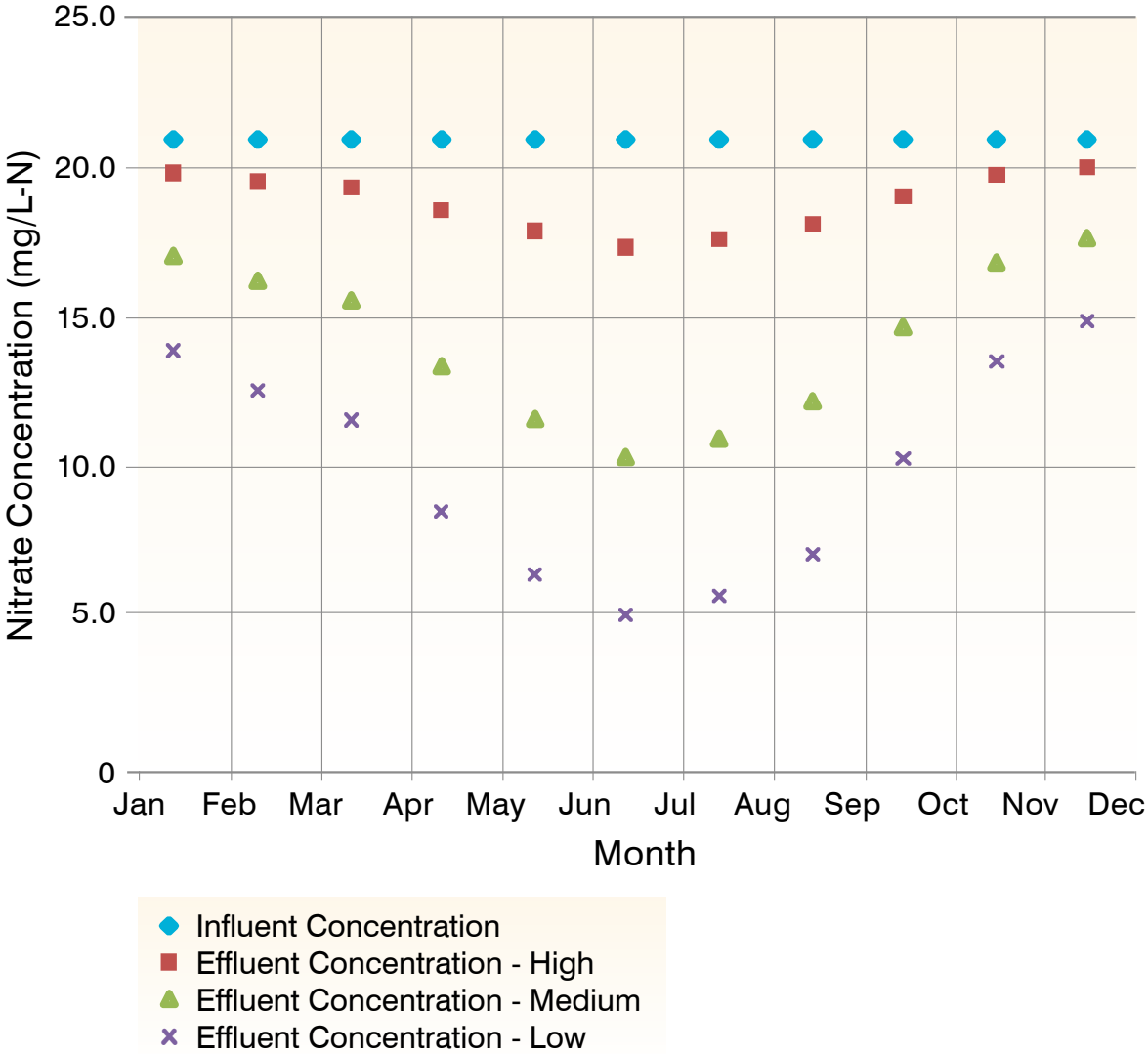


Figure 4.10
SEASONAL NITRATE REMOVAL
IN DENITRIFICATION WETLANDS
CAPITAL IMPROVEMENT AND ENERGY MANAGEMENT PLAN
CITY OF STOCKTON

Figure 4.11 Channel Cut Along Levee (Resulting in Short Circuiting)

3. easily adjustable, either. Operating the wetland at a water level of 24 to 30 inches would provide more detention time and increased nutrient removal.

4. The wetlands effluent discharge zones have been de-vegetated and allow a large amount of dead floating vegetation to leave the wetlands. The dead vegetation collects at the wetlands control structures and the NBT pump station. The vegetation adversely affects downstream operations, is a maintenance chore, and deprives the wetlands of a carbon source.

5. The public information signs are faded from the sun.

4.5.1.4 Recommended Improvements

The following improvements are recommended to correct the identified deficiencies:

- Reconfigure the wetlands and NBT feed to allow the wetlands to be used for denitrification instead of a redundant ammonia removal process. A preliminary schematic is shown in Figure 4.12 below. New channels would be constructed on the south side of the south wetlands cell to allow oxidization pond effluent to be fed directly to the NBT pump station. The NBT effluent would then be supplied to the wetlands via new channels. A new low lift pump station and pipeline would be constructed to pump wetlands effluent directly to the DAFTs. The low lift pump station would be configured so that the pumps draw directly from the wetlands. This would allow the pumps to control the water level in the wetlands without the need for weirs. The existing raw water pump station is at the end of its useful life and should be removed.

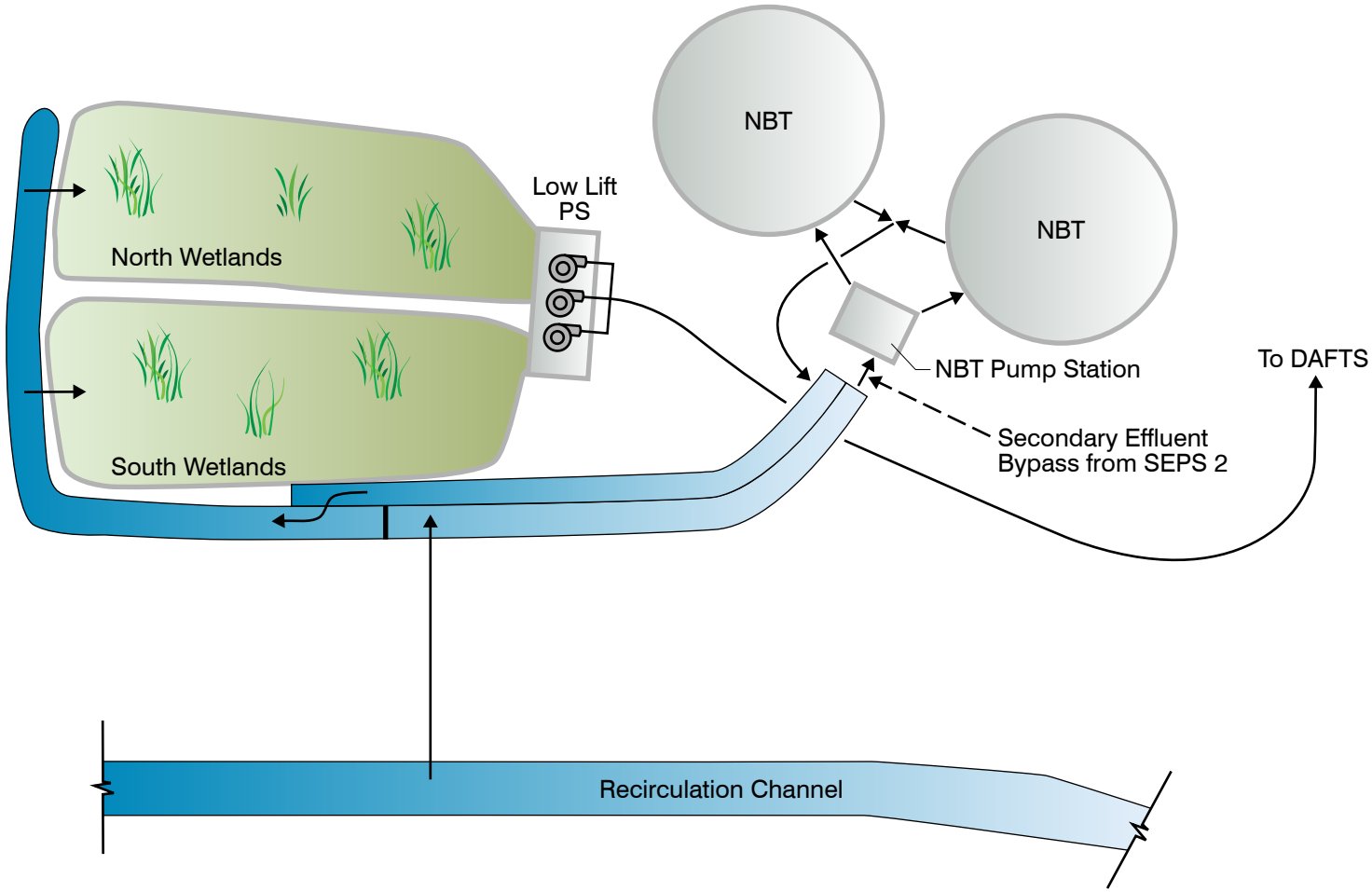


Figure 4.12
PIPING AND CHANNEL MODIFICATIONS
FOR WETLAND DENITRIFICATION
CAPITAL IMPROVEMENT AND ENERGY MANAGEMENT PLAN
CITY OF STOCKTON

stk411f15-8581.ai rev 4/11/11

- Install new traveling water screens at the new low lift pump station to allow floating vegetation to be removed.
- Perform earthwork to remove the channels from the wetlands. The new flow pattern would force the water to flow through wetland vegetation.
- Re-plant vegetation at the end of each wetland cell to filter out a portion of the dead plants, algae, and sediment. This would allow more “in-water” decomposition of the emergent vegetation biomass to provide a carbon source for nitrification.
- Replace public information signs and provide sun shades to prevent sun damage.

4.5.2 Nitrifying Biotowers (NBTs)

4.5.2.1 Facility Description

Effluent from the wetlands is conveyed in a channel to the Wetlands Pump Station, which consists of three vertical turbine pumps that lift wetland effluent to one of two, 166-foot Nitrifying Biotowers.

The NBTs are designed to oxidize most of the remaining ammonia in the wetland effluent in order to meet the ammonia discharge limit. The NBTs operate in parallel but are also configured to operate in series. A portion of the NBT effluent is recycled back to the NBTs with four NBT recycle pumps.

4.5.2.2 Capacity Evaluation

The current NPDES discharge permit allows for a maximum monthly average ammonia concentration of 2.0 mg/L. Under normal conditions, the existing nitrifying biotower process is capable of meeting this limit. However, NBTs are sensitive to ammonia loadings and temperature, and do not perform well in extremely cold weather. In particular, the correlation between effluent ammonia and NBT feed water temperature is key to the RWCF’s ability to meet its ammonia discharge limits. This issue is exacerbated by the fact that the feed water to the NBTs comes from the oxidation ponds. The ponds are large bodies of water that hold the water for several days. They will typically cool to the average ambient air temperature, and if the air temperature stays cold for a long time, the pond water will cool dramatically. All but two of the daily ammonia limit exceedances that have occurred over the past three years have occurred when the wastewater and ambient air temperature was below 10 deg C.

Temperatures have been particularly low during recent months compared to previous years. In December 2010/January 2011, an unusual cold snap dropped the pond water temperature to 7 degrees centigrade, which caused the NBT process to perform poorly, resulting in effluent discharges that exceeded ammonia limits. During this cold snap, the NBT feed water (pond effluent) temperature was below 10 deg C for 18 consecutive days,

with the lowest daily temperature being as low 6.7 deg C (as shown in Figure 4.13). The figure shows that the final effluent ammonia concentrations are inversely correlated with the temperature of the final effluent. During this 18-day period, effluent ammonia concentrations exceeded the 5 mg/L daily maximum ammonia concentration limit on all but two days.

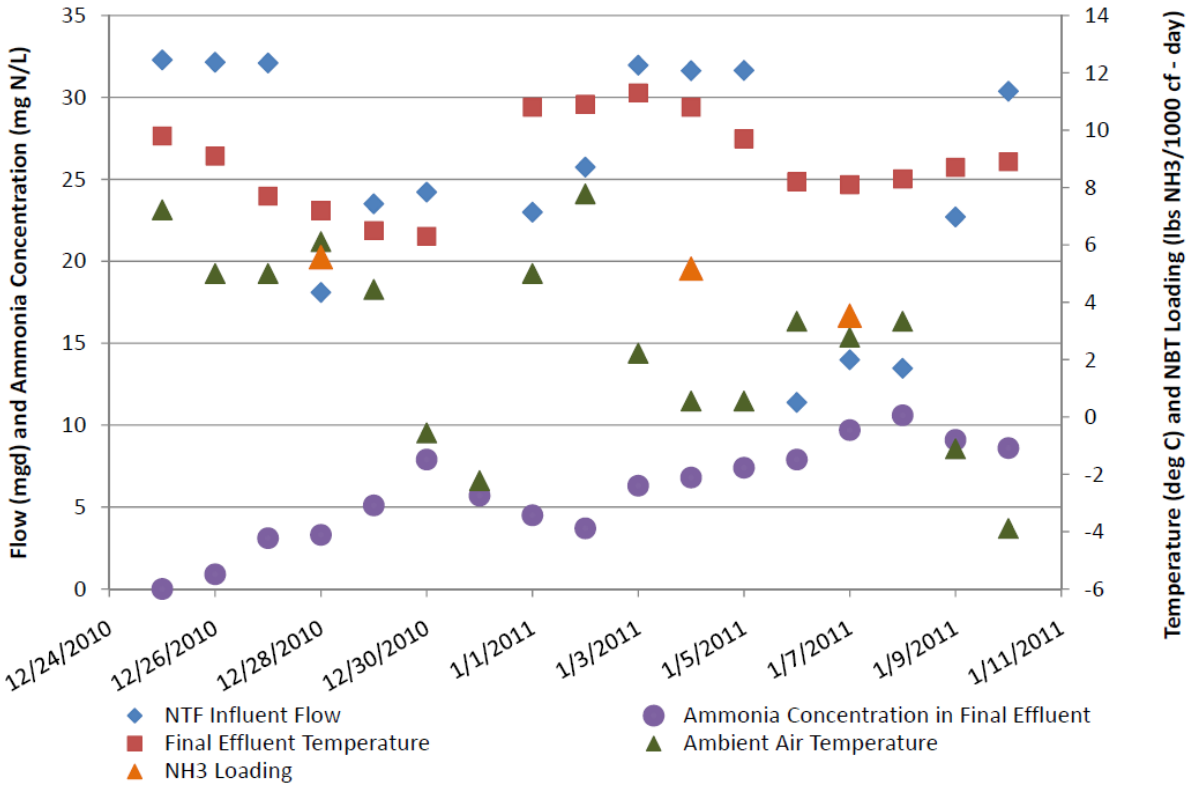


Figure 4.13 NBT Performance

The current and expected performance of the Stockton NBTs was modeled under cold weather conditions. The NBT performance was modeled in excel using the Gujer and Boller nitrification model and the Gullicks and Cleasby empirical design curves. The Gullicks and Cleasby design curves predicted full removal of ammonia, which is not the case, and were dismissed.

The Gujer and Boller model predicted ammonia fluxes into biofilm of approximately 0.72 g NH_4-N/m^2-d for temperatures of 7 degrees Celsius (interpolated). After calibrating the Gujer and Boller model based on the Stockton operating data, an actual ammonia flux at the RWCF of 0.24 g NH_4-N/m^2-d was derived. The lower flux, derived from actual operating data, was judged to be more reliable than the Gujer and Boller predictions because the temperature dependent parameters for the Gujer and Boller nitrification model were derived from empirical NBT performance at 10 degrees Celsius.

Once the model was calibrated to current operating conditions, the model was iterated to determine the capacity of the NBTs. To achieve an effluent ammonia concentration of 2 mg/L at 7 degrees C, the model estimated the capacity of each NBT to be 9 mgd. At 10 degrees C, the model estimated the capacity of each NBT to be 16 mgd. This is equivalent to an ammonia loading of 3.1 pounds per 1000 cf. The addition of a third biotower would increase the cold weather capacity to 27 mgd. To provide NBTs for the buildout flow of 49.3 mgd, a total of six NBTs (2 existing and 4 new) would be required.

4.5.2.3 Ammonia Removal Alternatives

Several alternatives to improve the RWCF's ability to meet its ammonia limit were investigated:

Construct five additional NBTs: This alternative includes the construction of 5 additional NBTs (for a total of 6 duty plus 1 standby NBTs) and two new NBT pump stations. This option is not practical or cost effective. The majority of the NBTs would only operate during a 2 to 4 week period each year.

Construct two new NBTs and provide storage for secondary effluent during cold weather: A third NBT would provide a firm capacity of 27 mgd and a fourth would provide redundancy. To enable the RWCF to continue to treat the projected average annual flow of 50 mgd, new storage basins would be constructed to store the difference between the buildout flows and the NBT capacity. Approximately 500 million gallons (MG) of storage capacity would allow the RWCF to store flows above 27 mgd for 21 days. This would allow the RWCF to avoid ammonia limit excursions during prolonged cold snaps. This storage capacity would be in addition to the existing pond and wetland storage at the plant. The stored secondary effluent could then be nitrified during warmer periods.

There is agricultural land available to the west of the plant – a 140 acre plot, with a new storage basin with an 11-foot side water depth, would provide the 500 MG of storage. Land prices in the area are approximately $10,000 to $30,000 per acre, which is equal to $1.4 to $4.2M for the 140 acre plot. Earthwork costs could be minimized by using onsite borrow material for berms. However, if the RWQCB requires a pond liner, the costs would increase significantly ($15M). For comparison, a single 166' NBT costs approximately $10 to $20M depending on contingencies.

However, it is unlikely that the new storage basins would be approved by the regulatory bodies that govern the Delta. Therefore, this alternative is not feasible.

Increase the temperature of the NBT feed: Because of the high sensitivity of nitrifier growth rates to temperature, and the sharp drop-off in this growth rate at lower temperatures, another approach to stabilizing NBT performance would be to raise the temperature of the NBT feed flow. As stated previously, the current feed to the NBTs is drawn from the oxidation ponds. Because of the large surface area of the ponds and the equilibration that happens with ambient air temperature, the NBT feed can be up to eight

degrees colder than the secondary clarifier effluent. By directly diverting a portion of the secondary effluent flow around the oxidation ponds and blending this flow with the pond effluent, the temperature of the NBT feed could be raised by several degrees. More importantly, by including provisions for positive control of the diversion flow-split (and the resulting blend), the NBT feed temperature could be controlled in the desired range, independent of the pond effluent temperature.

For this alternative, a third NBT would be constructed for to provide reliability to the existing NBTs to treat the current average annual flow of 31.9 mgd (based on the Gujer and Boller model). In the future, a fourth NBT would likely be required to provide additional capacity for the buildout average annual flow of 49.3 mgd.

The main disadvantage of this alternative is that the additional BOD_5 in the secondary effluent would cause heterotrophs to grow in the top meter or two of NBT media, which would reduce performance. However, the increased nitrifier growth rates at the higher temperature should outweigh the presence of the heterotrophs.

4.5.2.4 Condition Assessment

The nitrifying biotowers were built recently as part of the WW39 Expansion Project. The equipment and structures are relatively good condition.

The sheet metal wall was around the top of the NBTs is relatively low. This allows strong winds to adversely affect the distributor arm causing gear box failures and reduced control of the distributor.

4.5.2.5 Recommended Improvements

The recommended approach to improve the NBT performance is to construct a new pump station and pipeline to allow for bypass of secondary effluent around the oxidation ponds (along with provisions for positive control over the flow-split of bypassed flow). In addition, a third NBT should be constructed for operational reliability. Modifications to the existing secondary biotower operation are also required to improve BOD removal (to limit the BOD loading to the NBTs so that the nitrification reaction can proceed efficiently). However, improvements to the secondary biotowers are required anyways. Together, these improvements will result in a more robust and reliable nitrification process.

A temperature of 10 deg C appears to be the minimum recommended influent temperature for NBTs in literature. Based on a secondary effluent temperature of 15 deg C, a 60/40 pond effluent to secondary effluent blend is required to bring the temperature of the biotower influent to 10 deg C. With a 60/40 blend, the BOD_5 of the biotower influent will be approximately 32 mg/L. The recommended value for simultaneous BOD removal and nitrogen values is approximately 20 mg/L. This is based on recommendations in MOP and literature (including a similar cold weather plant in Canada).

The proposed SEPS 2 will be configured to supply the secondary effluent to the NBT pump station via the existing 36-inch river crossing pipeline and a new 42-inch pipeline which would be constructed between the existing pond pump house and the NBT pump station. Up to 27 mgd of secondary effluent could be diverted to the NBT pump station using SEPS 2 and the new pipeline. This would provide up to a 50/50 pond effluent to secondary effluent split, which is conservative.

The SEPS 2 would also have the capability to pump an additional 27 mgd under the river through the 36-inch pipeline. This would provide up to 54 mgd of additional secondary effluent pumping capacity, which would meet the required secondary effluent firm pumping capacity. It would also allow the plant to take down the 60-inch river force main and SEPS 1 for service during the dry weather season.

Two throttling valves would be installed on the west side of the river to allow for flow to the NBTs and ponds to be regulated. The throttling valves would be located below ground in a vault to keep them in a submerged/non-vacuum condition.

In addition, a 5 feet row of wind screen will be bolted to the top of the existing NBT perimeter walls to protect the distributor from wind loads.

4.5.3 Dissolved Air Flotation Thickeners (DAFs)

4.5.3.1 Facility Description

Nitrifying biotower effluent flows from the NBTs to the Raw Water Pump Station, which pumps nitrified effluent to up to four 85-foot diameter DAFs. The primary purpose of the DAFs is to remove algae. In addition to removing algae, the DAF process aerates the effluent, which raises the dissolved oxygen concentration prior to discharge. Float removed from the DAF tanks, consisting mostly of algae and coagulant, is pumped from the Float Pumping Station back to Pond 1.

4.5.3.2 Capacity Evaluation

Dissolved air flotation thickeners are rated based on hydraulic and solids loading rates (gpm/sf and ppd/sf respectively). According to the O&M manual, the allowable loadings to the DAF are 2.4 gpm/sf and 5.1 ppd/sf. Table 4.10 presents the capacity evaluation for the DAFs for current loading conditions.

Currently, the RWCF operates two or three DAFs depending on the algae load. This operation results in maximum month loadings less than 2.09 gpm/sf and 3.95 ppd/sf, which is within acceptable design criteria. Based on the allowable loading of 2.4 gpm/sf, the DAFTs have a capacity of 59 mgd with one DAF unit out of service and a total capacity of 78 mgd.

Table 4.10 DAF Capacity Evaluation – Current Conditions Capital Improvement and Energy Management Plan City of Stockton				
	Flow (mgd)	**Area (sf)**	**Hydraulic Loading (1) (gpm/sf)**	**Solids Loading (1) (ppd/sf)**
Current Average Annual (AUIS)	31.9	22,698	0.98	1.37
Current Average Annual (LUOOS)	31.9	17,024	1.30	1.83
Current Maximum Month (AUIS)	34.0	22,698	1.04	2.81
Current Maximum Month (LUOOS)	34.0	17,024	1.39	3.75

Notes:
(1) Hydraulic loading calculated using current flow in gpm divided by available DAF surface area.
(2) Solids loading calculated using current flow, loads, and available DAF surface area. Loads calculated using 2009 average DAF influent TSS of 36 mg/L and maximum month TSS of 67 mg/L. Average alum load of 21,631 ppd as aluminum sulfate (assuming 48.5%) and 44,814 ppd max month.

4.5.3.3 Condition Assessment

The dissolved air flotation thickeners were constructed in 1976. In 2010, all four DAF mechanisms were replaced and the concrete effluent channels on DAFs 3 & 4 were repaired.

The following deficiencies were identified:

1. Corroded concrete slabs and side walls on all four DAFs (from previous pH control chemical use).

2. Corroded concrete effluent channels on DAFs 1 & 2.

3. Corroded influent and effluent piping.

4. Inefficient pressurization system: The existing DAF pressurization system uses pressurization pumps to pressurize either DAF influent or effluent in the DAF pressurization tanks. The pressurization pumps have a capacity of 4,900 gpm at 200 ft TDH; however, based on the recommended design criteria, the pressurization pumps could be replaced with pumps sized for 1,500 gpm at 200 ft. TDH. Additionally, high pressure service air is supplied to the pressurization tanks to produce fine bubbles. The service air supplied is at approximately 125 psi, which is well above the pressurization required for the process.

5. The pressurization vessels and appurtenances are corroded and at the end of their useful life.

4.5.3.4 Recommended Improvements

Based on the capacity evaluation for projected maximum month flows presented in Table 4.11, the RWCF will likely need to operate three of the DAFs at all times. With two DAFs in operation, the hydraulic loading and solids loading exceed the recommended loading rates of 2.4 gpm/sf and 5.1 ppd/sf.

Table 4.11 DAF Capacity Evaluation – Projected Conditions
Capital Improvement and Energy Management Plan
City of Stockton

	Flow (mgd)	Area (sf)	Hydraulic Loading(1) (gpm/sf)	Solids Loading(2) (ppd/sf)
Projected Maximum Month (AUIS)	56.1	22,698	1.72	3.36
Projected Maximum Month (LUOOS)	56.1	17,024	2.29	4.47
Projected Maximum Month (2 Units in Svc)	56.1	11,349	3.43(3)	6.71(3)

Notes:
(1) Hydraulic loading calculated using projected flow in gpm divided by available DAF surface area.
(2) Solids loading calculated using current flow, loads, and available DAF surface area. Loads calculated using 2009 average DAF influent TSS of 36 mg/L and MM TSS of 67 mg/L. Average alum load of 21,631 ppd as aluminum sulfate (assuming 48.5%) and 44,814 ppd max month.
(3) Loading value exceeds allowable loading of 2.4 gpm/sf or 5.1 ppd/sf.

The recommended improvements to the deficiencies identified in the condition assessment are as follows:

1. **Corroded concrete slabs and interior side walls on all four DAFs:** Perform concrete repair and coating of all DAF slabs and the interior side walls.

2. **Corroded concrete effluent channels on DAFs 1 and 2:** Perform concrete repair and coating of the DAF channels on DAFs 1 and 2.

3. **Corroded influent and effluent reinforced concrete piping on all four DAFs:** Inspect and rehabilitate the influent and effluent pipelines for all DAFs.

4. **Pressurization system:** Remove and replace the existing DAF pressurization tanks, pumps, air receivers.

4.5.4 Tertiary Filters

4.5.4.1 Facility Description

Following the DAF process, six dual media filters, containing anthracite and sand, are used to remove the remaining solids and BOD_5 prior to disinfection. Filtered effluent is also used

to backwash the filters and for the plant 3W system. Backwash from the multimedia filters is diverted to the Backwash Lagoon and then pumped back to Oxidation Pond 1. The remaining filtered effluent not used for backwash or 3W is pumped from the Filtered Water Pump Station to the Chlorine Contact Channel.

4.5.4.2 Capacity Evaluation

The tertiary filters are rated based on hydraulic loading (gpm/sf). According to the O&M manual, the maximum design loading for the tertiary filters is 4.5 gpm/sf.

Using the maximum design loading rate of 4.5 gpm/sf, the filters could treat up to 55.1 mgd, with one unit in backwash, and up to 66 mgd with all units in operation. Table 4.12 presents the capacity evaluation for the tertiary filters based on current loading conditions. The table shows that the filters are within their design capacity of 4.5 gpm/sf.

Table 4.12 Tertiary Filter Capacity Evaluation – Current Conditions
Capital Improvement and Energy Management Plan
City of Stockton

	Flow (mgd)	Area (4) (sf)	Hydraulic Loading (5) (gpm/sf)
Current Average Annual (AUIS)(1)	31.9	10,200	2.17
Current Average Annual (LUOOS)(2)	31.9	8,500	2.61
Current Average Annual (TUOOS)(3)	31.9	6,800	3.26
Current Maximum Month (AUIS)(1)	34.0	10,200	2.32
Current Maximum Month (LUOOS)(2)	34.0	8,500	2.79
Current Maximum Month (TUOOS)(3)	34.0	6,800	3.48

Notes:
(1) Based on six total units.
(2) LUOOS refers to one unit in backwash mode.
(3) TUOOS refers to one unit in backwash and one out of service.
(4) Area based on 1,700 sf per filter unit.
(5) Hydraulic loading calculated using current flow in gpm divided by available filter surface area.

4.5.4.3 Condition Assessment

The four oldest filters were constructed in 1976. Filters 5 and 6 were constructed recently by OMI.

The following deficiencies were identified:

1. **Deteriorated concrete and joint repair:** According to plant staff, one of the construction joints between the filters has shifted (refer to Chapter 6 for more information on this issue).

2. **Guardrail:** The top of the filter concrete structure is more than 18 inches higher than the surrounding grade and does not currently have guardrail (which is required by OSHA regulations).

3. **3W pumps:** The existing 3W pumps were installed over 30 years ago and have reached the end of their useful life.

4. **Filter control system:** The existing filter controllers were installed over 30 years ago and are outdated.

5. **Miscellaneous piping, instruments, and equipment replacement:** There are various piping, instruments, and equipment that have reached the end of their useful life and require replacement.

4.5.4.4 Recommended Improvements

Based on a maximum design loading of 4.5 gpm/sf, the existing filters will provide adequate capacity for the projected maximum month flow of 56.1 mgd. The 1 mgd difference between the maximum allowable loading and the projected loading is not significant enough to warrant constructing an additional set of filters. At the projected maximum month flow, five of the six filter units will need to be in operation whereas only four of the six filter units are currently required for the maximum month flows. Table 4.13 presents the capacity evaluation for the tertiary filters for projected loading conditions.

Table 4.13 Tertiary Filter Capacity Evaluation – Projected Conditions
Capital Improvement and Energy Management Plan
City of Stockton

	Flow (mgd)	Area (4) (sf)	Hydraulic Loading (5) (gpm/sf)
Projected Average Annual (AUIS) (1)	49.3	10,200	3.36
Projected Average Annual (LUOOS) (2)	49.3	8,500	4.03
Projected Average Annual (TUOOS) (3)	49.3	6,800	5.03
Projected Maximum Month (AUIS) (1)	56.1	10,200	3.82
Projected Maximum Month (LUOOS) (2)	56.1	8,500	4.58
Projected Maximum Month (TUOOS) (3)	56.1	6,800	5.73

Notes:
(1) Based on all six units in operation.
(2) LUOOS refers to one unit in backwash mode.
(3) TUOOS refers to one unit in backwash and one out of service.
(4) Area based on 1,700 sf per filter unit.
(5) Hydraulic loading calculated using projected flow in gpm divided by available filter surface area.

The recommended improvements to the deficiencies identified in the condition assessment are as follows:

1. Deteriorated concrete and joint repair: An allowance for concrete and joint repair was included in the CIP.

2. Inadequate guardrail: Install guardrail around the perimeter of the filter structure.

3. Aged 3W pumps: Remove and replace the existing 3W pumps.

4. Aged filter controllers: Remove and replace the existing filter controllers.

5. Miscellaneous piping, instruments, and equipment replacement: An allowance for piping, instrumentation, and minor equipment replacement was included in the CIP.

4.5.5 Disinfection

4.5.5.1 Facility Description

Gaseous chlorine is dosed to the chlorine contact channel, which reacts with aqueous ammonia dosed to the Filtered Water Pump Station to form chloramines prior to river discharge. A single pass, chlorine contact canal is used year-round, treating a relatively constant flow that has been equalized by the oxidation ponds. Dechlorination with liquid sulfur dioxide is provided at the end of the chlorine contact canal. The final effluent is siphoned from the chlorine contact canal to the discharge location in the San Joaquin River.

4.5.5.2 Capacity Evaluation

The gaseous chlorine system has sufficient capacity to disinfect 55 mgd of plant flow. The existing chlorine contact channel also has capacity to treat 55 mgd based on a design detention time of 120 minutes.

4.5.5.3 Condition Assessment

The chlorine contact channel and disinfection chemical facilities were built in 1976.

The following deficiencies were identified:

1. The gaseous chlorine facilities are a safety hazard.

2. Chlorination produces haloacetic acids (HAA) and trihalomethanes (THM) which may exceed allowable limits.

3. The sulfur dioxide facilities are a safety hazard.

As discussed in Chapter 3, it appears that the RWCF can reliably meet the 2013 final THM limits using chlorine disinfection. However, if the dilution credit were discontinued, THM limits would decrease to concentrations that can only be achieved with a non-chlorine based disinfection system such as ultraviolet light (UV) disinfection or with an active THM removal system such as air stripping. Adding ammonia to form chloramines can reduce THM formation; however, if dilution credits are no longer permitted, chloramination will not be sufficient to lower THM concentrations to required concentrations.

4.5.5.4 Alternatives

Several treatment alternatives were evaluated to identify the most cost effective and reliable method for achieving disinfection credit and THM concentration requirements.

4.5.5.4.1 *Status Quo*

Keep the existing gaseous chlorine system. Install a new CMU wall and heavy hinged gates around the chlorine rail cars. This alternative has a project cost of $0.26M and an annual O&M cost of $337,000.

The primary advantage of this alternative is that the project cost is very low and the annual O&M cost is also very low. The disadvantage is that gaseous chlorine is a health hazard.

4.5.5.4.2 *Bulk Sodium Hypochlorite*

A bulk sodium hypochlorite system is a chlorine based disinfection method, which would replace the existing chlorine gas system. It would provide no THM mitigation; however, it would be significantly safer than the existing chlorine gas system.

This alternative includes bulk sodium hypochlorite tanks, a fill station, chemical transfer pumps, and chemical metering pumps. Bulk sodium hypochlorite could be delivered to the RWCF via tanker trucks and would be stored in the bulk storage tanks. This alternative has a project cost of $1.85M and an annual O&M cost of $605,000.

Advantages of hypochlorite include: proven technology for disinfection of wastewater, fewer training requirements and regulations, it is not stored pressurized; and it is safer to handle than chlorine gas. Disadvantages include: limited shelf-life, same by-product formation as chlorine gas (HAAs and THMs), potential bromate and chlorate formation, higher chemical cost, corrosiveness; potential for crystallization that can clog pipes, pumps, and valves.

4.5.5.4.3 *Onsite Generation (OSG) of Sodium Hypochlorite*

Onsite generation of sodium hypochlorite is a chlorine based disinfection method which would replace the existing chlorine gas system. It would provide no THM mitigation; however, it would be significantly safer than the existing chlorine gas system.

This alternative includes a brine dissolver/storage tank, finished brine storage tank, hydrochloric acid tank, sodium bisulfate tank, sodium hydroxide tank, sodium hypochlorite day tanks, and complete sodium hypochlorite generation equipment. The generation equipment uses membrane technology to produce sodium hypochlorite from a brine solution. The sodium hypochlorite is then metered into the system from storage tanks. There are low concentration (approximately 0.8% solution) OSG systems and high concentration (approximately 12.5% solution) OSG systems. For the scale of this system, the high concentration system has the lower life cycle cost.

This alternative has a project cost of $17.85M and an annual O&M cost of $405,000. OSG sodium hypochlorite provides the same advantages and disadvantages as bulk sodium hypochlorite with the following exceptions: bulk storage is not required for OSG therefore shelf life is not relevant; OSG has higher capital and life cycle costs; OSG systems are more complex and require more maintenance than bulk systems.

4.5.5.4.4 *Air Stripping to Remove THMs*

Air stripping may be an effective method of reducing THM concentrations in the effluent, should the dilution credit be continued by the RWQCB and the City desires to continue chlorination..

This alternative includes multiple packed towers, blowers, and a new pump station. The effluent would be pumped to the top of the packed towers, flow through the high-surface-area media of the packed tower, and drain out of the tower to the discharge point. The fans would blow air through the tower, in the opposite direction of the effluent flow, to provide the high air-water contact area required for THM removal.

This alternative has a project cost of $18.6M and an annual O&M cost of $700,000. It is a proven, high efficiency method for removing volatile organic compounds from drinking water, and has been used in drinking water treatment to remove up to 99% of THMs. Packed towers are not typically used to remove THMs from wastewater; therefore, pilot testing is recommended to characterize design parameters and understand operational challenges.

Advantages of this method include: it is a proven method of THM removal in drinking water, and good removal rates (based on recent pilot studies for the City of Turlock), and it allows for continuation of the chlorine disinfection processes. Disadvantages include: the potential for slime growth, and energy costs for effluent pumping and air blowers.

4.5.5.4.5 *Ultraviolet (UV) Disinfection*

UV disinfection would provide a non-chlorine based disinfection method, which would be implemented in lieu of a chlorination system.

This alternative includes a UV disinfection structure, disinfection equipment, mechanical piping, instrumentation and controls, and an electrical building. Although UV disinfection is a non-chlorine based form of disinfection and does not contribute to the formation of THMs, it does not provide removal of THMs either. THMs can form from chlorination used for maintenance purposes, e.g. controlling growth on clarifiers and filters. In some cases, THMs that form from maintenance chlorination alone nearly exceed permit limits; therefore, implementation of UV disinfection may require discontinuation of maintenance chlorination.

This alternative has a project cost of $35.9M and an annual O&M cost of $1,000,000. Advantages include: it is a proven technology for disinfection of wastewater; and discontinuation of chlorination will reduce THM formation within the RWCF and eliminate

the need for hazardous on-site storage of chlorine. Disadvantages include: high capital and O&M costs.

4.5.5.4.6 *Ozone Disinfection*

Ozone disinfection would provide a non-chlorine based disinfection method, which would be implemented in lieu of a chlorination system.

This alternative includes an ozone disinfection system, ozone generation building, and conversion of the existing chlorine contact basin to an ozone contactor basin. The system would provide a non-chlorine based method of disinfection and would replace the existing chlorine disinfection system. Ozone is a well-proven disinfection method for drinking water; however, unlike UV, it has a limited success rate for disinfection of wastewater. THM reduction that may be provided by ozone disinfection of wastewater is unknown as ozone produces different disinfection byproducts than chlorine. As a result, implementation of this alternative may require discontinuation of maintenance chlorination. Additionally, pilot testing is required to confirm design criteria and THM reduction (if any).

This alternative has a project cost of $44.6M and an annual O&M cost of $1,200,000. Advantages include: discontinuation of chlorination will reduce THM formation within the RWCF and the need for hazardous on-site storage of chlorine; and ozone reduces concentrations of endocrine disrupting compounds (EDCs), which are now being investigated by the State Board for regulation and health impacts to human and aquatic organisms. Disadvantages include: high life-cycle cost; limited number of ozone wastewater facilities are in operation; and possible discontinuation of all chlorination at the RCWF, which might require covering exposed clarifiers, and filters (expense not included in life-cycle cost estimate).

4.5.5.4.7 *Alternatives Cost Summary*

Table 4.14 summarizes the costs of disinfection alternatives and THM mitigation measures. Air stripping would not provide disinfection on its own, but would be required with bulk chlorine gas, bulk sodium hypochlorite, or OSG sodium hypochlorite to comply with possible future restrictions for effluent THM concentration.

4.5.5.5 *Recommended Improvements*

Switching to bulk hypochlorite is recommended because of its low capital and life cycle costs as well as improved safety over the aging chlorine gas system. If the dilution credit is continued, an air stripping pilot test is recommended to verify its effectiveness at THM removal. If the dilution credit is eliminated, then the City will be forced to a non chlorine-based disinfection system. A final review of bulk hypochlorite with air stripping versus UV disinfection should then be completed to determine the most effective method of meeting disinfection credit and THM concentration requirements.

Table 4.14 Disinfection Alternatives Life Cycle Economic Analysis
Capital Improvement and Energy Management Plan
City of Stockton

	Chlorine-Based Alternatives					Non-Chlorine Alternatives	
			On-Site Generation of Hypochlorite				
	Bulk Chlorine Gas	Bulk Hypo-chlorite	12.5%	0.8%	Air Stripping	UV Disinfection	Ozone Disinfection
Project Cost (1)	$260,000	$1,853,000	$12,854,000	$13,093,000	$18,600,000	$35,900,000	$44,600,000
Average Annual O&M (2)	$337,000	$605,000	$405,000	$591,000	$700,000	$1,000,000	$1,200,000
Net Present Worth (3)	**$4,463,000**	**$9,386,000**	**$17,898,000**	**$20,459,000**	**$27,400,000**	**$48,400,000**	**$59,600,000**

Notes:
(1) All costs are presented in April 2011 dollars (April ENR Construction Cost Index = 9027). Cost estimates are planning level cost estimates with an expected accuracy of +50% to -30%.
(2) Operations and maintenance costs are based on average flows of 55 MGD and an energy rate of $0.10 kW-hr. Costs include staff costs, electrical energy costs, chemical costs, and equipment replacement costs.
(3) NPV at 20 years with 5% interest.

4.6 SOLIDS HANDLING

4.6.1 Gravity Thickeners

4.6.1.1 Facility Description

Solids removed from the primary and secondary clarifiers are thickened in two 70-foot diameter gravity thickeners and/or two 3-meter gravity belt thickeners. Thickened sludge pumps deliver thickened sludge from the gravity thickeners to the anaerobic digesters. Overflow from the gravity thickeners is pumped from the Recycled Pump Station to the Primary Influent Distribution box.

4.6.1.2 Capacity Evaluation

The gravity thickeners are rated based on hydraulic and solids loading rates (gpd/sf and ppd/sf, respectively). According to the O&M manual, the gravity thickeners are designed for 200 gpd/sf and 33 ppd/sf, which are reasonable design criteria. Table 4.15 presents the capacity evaluation for the gravity thickeners based on current loading conditions. Overall, the thickeners are under loaded. Based on the limiting design criteria, which is the design hydraulic loading of 200 gpd/sf, the capacity of the gravity thickeners is 45.5 mgd with one unit and 79.5 mgd with both units in operation.

Table 4.15 Gravity Thickener Capacity Evaluation – Current Conditions
Capital Improvement and Energy Management Plan
City of Stockton

	Plant Flow (mgd)	Sludge Flow (1) (mgd)	Sludge Load (2) (ppd)	Area (sf)	Hydraulic Loading(3) (gpd/sf)	Solids Loading(4) (ppd/sf)
Current Average Annual (AUIS)	31.9	0.492	73,000	7,700	63.9	9.5
Current Average Annual (LUOOS)	31.9	0.492	73,000	3,850	127.8	19.0
Current Maximum Month (AUIS)	34.0	0.631	90,800	7,700	81.9	11.8
Current Maximum Month (LUOOS)	34.0	0.631	90,800	3,850	163.9	23.6

Notes:
(1) Sludge flow includes both primary and secondary sludge.
(2) Loads calculated at 1.8% solids for combined primary and secondary sludge blend.
(3) Hydraulic loading calculated using current flow in gpd and available gravity thickener surface area.
(4) Solids loading calculated using current sludge load and available gravity thickener surface area.

4.6.1.3 Condition Assessment

Gravity Thickener No. 1 was built in the 1950s and Gravity Thickener No. 2 was built in the mid 1990s.

The following deficiencies were identified:

1. **Concrete Repair:** Although previous condition assessments in 2006 and 2009 indicate the gravity thickeners steel and concrete are severely corroded, plant staff has indicated that Gravity Thickener No. 2 is in relatively good condition and requires a minimal amount of concrete rehabilitation. Gravity Thickener No. 1 is approximately 60 years old, and it would require a significant amount rehabilitation of the steel and concrete components.

4.6.1.4 Recommended Improvements

The recommended approach is to thicken primary sludge in the primary clarifiers rather than in the gravity thickeners. This will allow the gravity thickeners to be used for thickening secondary sludge captured from the biotowers (although provisions should be made to retain the flexibility of sending primary sludge to the gravity thickener for special circumstances). Based on the projected secondary sludge flow and load, only one gravity thickener unit will be required. It is recommended that the newer Gravity Thickener No. 2 be retained for secondary sludge thickening because it requires less rehabilitation than Gravity Thickener No. 1. Demolition of Gravity Thickener No. 1 will be required for construction of Primary Clarifier Nos. 9 and 10. Secondary sludge thickening redundancy will be provided by the existing gravity belt thickeners. Table 4.16 presents the capacity evaluation for the gravity thickeners for projected loading conditions. The capacity of Gravity Thickener No. 2 with secondary sludge only will be approximately 86 mgd based on a hydraulic loading of 200 gpm/sf.

Table 4.16 Gravity Thickener Capacity Evaluation – Projected Conditions
Capital Improvement and Energy Management Plan
City of Stockton

	Plant Flow (mgd)	Sludge Flow (1) (mgd)	Sludge Load (2) (ppd)	Area (sf)	Hydraulic Loading (3) (gpd/sf)	Solids Loading (4) (ppd/sf)
Projected Average Annual (1 unit in service)	49.3	0.456	30,400	3,850	118.4	7.9
Projected Maximum Month (1 unit in service)	56.1	0.629	42,000	3,850	163.4	10.9

Notes:
(1) Sludge flow includes secondary sludge only. Thickening of primary sludge is assumed to occur in the primaries.
(2) Loads calculated at 0.8% solids for secondary sludge only.
(3) Hydraulic loading calculated using projected flow in gpd and future available gravity thickener surface area.
(4) Solids loading calculated using projected sludge load and future available gravity thickener surface area.

The recommended improvements to the deficiencies identified in the condition assessment are as follows:

1. Concrete Repair: An allowance for minor concrete rehabilitation of Gravity Thickener No. 2 was included in the CIP.

2. Miscellaneous piping modifications: An allowance for minor piping modifications associated with the demolition of Gravity Thickener No. 1 and construction of future primary clarifiers was included in the CIP.

4.6.2 Gravity Belt Thickeners

4.6.2.1 Facility Description

Two gravity belt thickeners are available for thickening of primary and/or secondary sludge. Cake pumps deliver thickened sludge from the gravity belt thickeners to the anaerobic digesters. Filtrate and washwater from the gravity belt thickeners is pumped from the Recycled Pump Station to the Primary Influent Distribution box.

4.6.2.2 Capacity Evaluation

The gravity belt thickeners are rated on hydraulic and solids loading basis (gpm/m of belt width and lbs/hr/m of belt width, respectively). Typical hydraulic loading to a 3-m gravity belt thickener should be between 290 gpm and 740 gpm for municipal sludge ranging from 0.5 percent to 1.0 percent solids (MOP 8). The WEF Manual of Practice does not have specific loading information for a primary sludge/trickling filter sludge blend; however, the combined solids is currently 1.8% solids. A hydraulic loading of 200 gpm/m (600 gpm) was used as the basis for this capacity evaluation. Typical solids loading vary depending on the type of biosolids to be thickened. Typical solids loading rates for secondary biosolids range from 660 to 1,188 lbs/hr/m. A loading of 1,100 lbs/hr/m was used as the basis for this capacity evaluation. Table 4.17 presents the current capacity of the gravity belt thickeners. According to Table 4.17, the gravity belt thickeners nearly provide sufficient capacity with a single unit in operation and provide well above the necessary capacity with both units in operation. Based on the design criteria of 200 gpm/m and 1,100 lbs/hr/m, the capacity of the gravity belt thickeners is approximately 26.6 mgd with one unit in operation and 68.8 mgd with both units in operation.

4.6.2.3 Condition Assessment

The gravity belt thickeners were installed approximately 5 years ago as part of the WW39 expansion project.

The following deficiencies were identified:

1. **Pipe clogging**: According to the 2009 Condition Assessment, plant staff has experienced clogging of pipes due to grease, struvite, and snails.

Table 4.17	Gravity Belt Thickener Capacity Evaluation – Current Conditions Capital Improvement and Energy Management Plan City of Stockton					
	Plant Flow (mgd)	**Sludge Flow (1) (mgd)**	**Sludge Load (2) (ppd)**	**Belt Width (3) (m)**	**Hydraulic Loading (4) (gpm/m)**	**Solids Loading (4) (lbs/hr/m)**
Current Average Annual (AUIS)	31.9	0.492	73,000	6	56.9	507
Current Average Annual (LUOOS)	31.9	0.492	73,000	3	113.9	1,014
Current Maximum Month (AUIS)	34.0	0.631	90,800	6	73.0	631
Current Maximum Month (LUOOS)	34.0	0.631	90,800	3	146.1	1,261

Notes:
(1) Sludge flow includes secondary sludge only. Thickening of primary sludge is assumed to occur in the primaries.
(2) Loads calculated at 1.8% solids, average for 2009 for primary and secondary sludge blend.
(3) Each gravity belt thickener has a 3-m belt.
(4) Hydraulic loading calculated using current flow in gpm and available belt width assuming continuous operation 7 days per week.
(5) Solids loading calculated using current sludge load in lbs per hour and available belt width.

4.6.2.4 Recommended Improvements

The existing gravity belt thickeners are not required for normal operation. The gravity belt thickeners will be retained for redundant secondary sludge thickening when the gravity thickener is out of service. Assuming the entire future secondary sludge load is sent to the gravity belt thickeners, the loadings would be as follows:

Based on the allowable loadings of 200 gpm/m and 1,100 lbs/hr/m, the existing gravity belt thickeners would provide full redundancy for the projected flows and loads if Gravity Thickener No. 2 were to be out of service. The capacity of the gravity belt thickeners treating secondary sludge only (using 200 gpm/m, 1,100 lbs/hr/m) is approximately 96 mgd per thickener in operation. Table 4.18 presents the capacity evaluation for the gravity thickeners based on projected loading conditions.

The recommended improvements to the deficiencies identified in the condition assessment are as follows:

1. Pipe clogging: An allowance for piping modifications was included in the CIP to address clogging issues and minor changes associated with the sludge thickening recommendations.

Table 4.18 Gravity Belt Thickener Capacity Evaluation – Projected Conditions Capital Improvement and Energy Management Plan City of Stockton						
	Plant Flow (mgd)	**Sludge Flow(1) (mgd)**	**Sludge Load(2) (ppd)**	**Belt Width(3) (m)**	**Hydraulic Loading(4) (gpm/m)**	**Solids Loading(5) (lbs/hr/m)**
Projected Average Annual (AUIS)	49.3	0.456	30,400	6	52.8	211
Projected Average Annual (LUOOS)	49.3	0.456	30,400	3	105.6	422
Projected Maximum Month (AUIS)	56.1	0.629	42,000	6	72.8	292
Projected Maximum Month (LUOOS)	56.1	0.629	42,000	3	145.6	583

Notes:
(1) Sludge flow includes secondary sludge only. Additional thickening of primary sludge is not included in recommendations.
(2) Loads calculated at 0.8% solids, average for 2009 for secondary sludge only.
(3) Each gravity belt thickener has a 3-m belt.
(4) Hydraulic loading calculated using projected flow in gpm and available belt width assuming continuous operation 7 days per week.
(5) Solids loading calculated using projected sludge load in lbs per hour and available belt width.

4.6.3 Anaerobic Digesters

4.6.3.1 Facility Description

The City has two active 3-MG anaerobic digesters (Digesters 4 and 5) that are used to stabilize primary sludge and sludge from the secondary clarifiers. The digesters stabilize the volatile (biodegradable) fraction of the biosolids by taking advantage of anaerobic bacteria that convert the organic matter to methane gas, carbon dioxide, and water. The RCWF also has three older, inactive, 1.8-MG digesters (Digesters A, B and C). The inactive digesters require extensive rehabilitation before they can be reactivated. Sludge recirculation pumps and inline grinders are used to mix the digester contents and spiral heat exchangers are used to maintain mesophilic conditions for anaerobic digestion. The hot water used in the spiral heat exchangers is heated from the plant cogeneration facility. Gas produced in the digesters is stored in a gas-holding tank and equalized gas flow from the tank is delivered to the three engine-generators at the plant cogeneration facility. Digested sludge pumps have historically delivered digested sludge from the digesters to a sludge lagoon for further thickening prior to belt press dewatering.

4.6.3.2 Capacity Evaluation

The anaerobic digesters are rated on the basis of solids retention time (SRT) and organic loading (days and lbs volatile solids/cf/d, respectively). The minimum recommended SRT

for mesophilic digesters is 15 days and the maximum organic loading rate ranges from 0.12 to 0.16 lbs VS/cf/d (MOP 8). For this analysis, an allowable SRT of 15 days and 0.13 lbs VS/cf/d were used for this capacity evaluation.

The existing digesters provide adequate firm capacity for average annual loading conditions but do not provide sufficient hydraulic or organic loading capacity for firm maximum month loading conditions (i.e. the SRT is below 15 days and the volatile solids loading is above 0.13 lbs VS/cf/d). Table 4.19 presents current loadings using Digesters 4 and 5 only. Using the criteria of 15 days SRT of 0.13 lbs VS/cf/d, the average annual capacity of the existing digesters is 24.4 mgd with one unit in service and 60.9 mgd with both units in operation.

Table 4.19 Anaerobic Digester Capacity Evaluation – Current Conditions
Capital Improvement and Energy Management Plan
City of Stockton

	Plant Flow (mgd)	Sludge Flow (1) (mgd)	Volatile Solids Load (1) (ppd)	Digester Volume (kcf)	Solids Retention Time(2,3) (Days)	Organic Loading(2,4) (lbs VS/cf/d)
Current Average Annual (AUIS)	31.9	0.192	51,000	798	29.5	0.067
Current Average Annual (LUOOS)	31.9	0.192	51,000	399	14.8	0.135
Current Maximum Month (AUIS)	34.0	0.444	89,000	798	12.8	0.117
Current Maximum Month (LUOOS)	34.0	0.444	89,000	399	6.4	0.235

Notes:
(1) Based on actual average and maximum month flow and loads from 2009 data.
(2) Based on a 5% volume allowance for grit accumulation removed from digester volume (i.e. effective volumes of 758 and 379 kcf for AUIS and LUOOS, respectively).
(3) Solids retention time calculated by dividing effective volume currently available by current flow.
(4) Organic loading calculated by dividing current volatile solids loading by effective volume currently available.

4.6.3.3 Condition Assessment

Anaerobic digesters A, B, and C were built prior to 1940 as clarifiers, then were converted to anaerobic digesters in the late 1940s. New digester covers were installed on the digesters in the 1970s and the roofing on the digester covers was replaced in the 1990s. Anaerobic digesters 4 and 5 were built in the mid 1990s. A structural condition assessment indicated the digester structures are in adequate condition.

No deficiencies were identified for Digesters 4 and 5; however, the following deficiencies were identified with Digesters A, B, and C:

1. **Digester C Cover:** The steel covers on Digesters A, B, and were replaced in the 1970s; however, the roofing on the Digester C cover was replaced in the early 1990s whereas the roofing on the covers of Digesters A and B were replaced in the late 1990s. The condition of the interior side of the three digester covers is unknown as they have not been re-coated since installed in the 1970s. For planning purposes, it is assumed that one of the covers will need replacement (Digester C).

2. **Digester Appurtenances:** The digester appurtenances on the covers for Digesters A, B, and C are in poor condition.

3. **Mechanical Equipment:** The existing mixing and heating equipment are no longer functional and they have reached the end of their useful life.

4. **Piping:** The existing aboveground and underground piping associated with Digesters A, B, and C has reached the end of its useful life.

5. **Concrete Repair and Resurfacing:** A portion of the concrete walls is corroded.

6. **Electrical:** The existing electrical system has reached the end of its useful life.

4.6.3.4 Recommended Improvements

Based on the capacity evaluation, when one of the 3-MG digesters is out of service, typical allowable hydraulic and organic loading capacities are exceeded. In order to provide firm capacity for the projected digester loads, it is recommended that Digesters A, B, and C be rehabilitated. Table 4.20 presents the projected loading rates for post digester rehabilitation.

Table 4.20 Anaerobic Digester Capacity Evaluation – Projected Conditions
Capital Improvement and Energy Management Plan
City of Stockton

	Plant Flow (mgd)	Sludge Flow (mgd)	Volatile Solids Load (ppd)	Digester Volume (kcf)	Solids Retention Time (1,2) (Days)	Organic Loading (1,3) (lbs VS/cf/d)
Projected Average Annual (AUIS)	49.3	0.353	84,000	1,505	30.2	0.058
Projected Average Annual (LUOOS)	49.3	0.353	84,000	1,106	22.2	0.080
Projected Maximum Month (AUIS)	56.1	0.495	118,000	1,505	21.6	0.083
Projected Maximum Month (LUOOS)	56.1	0.495	118,000	1,106	15.9	0.112

Notes:
(1) Based on a 5% volume allowance for grit accumulation removed from digester volume.
(2) Solids retention time calculated by dividing effective volume available by projected flow.
(3) Organic loading calculated by dividing projected volatile solids loading by future effective volume available.

Based on the capacity criteria of 15 days SRT and 0.13 lbs VS/cf/d, the anaerobic digesters (Units 4, 5, A, B, and C) will have sufficient firm capacity for the projected maximum month load. The average annual capacity of the digesters after rehabilitation is approximately 52 mgd with one large digester out of service and 76 mgd with all five digesters in operation. If the City operates one of the smaller digesters (A, B, or C) as a sludge-holding tank, the digester capacities in Table 4.20 will decrease. At buildout conditions, it may be necessary to operate all three smaller digesters if one of the larger units (4 or 5) is out of service. In this case, the digester dedicated for sludge storage would need to be converted temporarily to an active digester.

The recommended improvements to the deficiencies identified in the condition assessment are as follows:

1. **Digester C Cover:** Remove and replace the steel cover on Digester C with a flexible membrane gasholder cover. It is assumed that the covers on Digesters A and B can be coated and re-used. If during inspection, it is determined that the covers on Digesters A and B need replacement, the cost for rehabilitating the digesters will increase by approximately $3.3M.
2. **Digester Appurtenances:** Remove and replace existing digester appurtenances for Digesters A, B, and C.
3. **Mechanical Equipment:** Remove and replace the existing mixing and heating systems for Digesters A, B, and C.
4. **Piping:** Remove and replace the existing piping for Digesters A, B, and C.
5. **Concrete Repair and Resurfacing:** Coat the interior walls of Digesters A, B, and C.
6. **Electrical System:** Remove and replace the existing electrical equipment associated with Digesters A, B, and C.

4.6.4 Sludge Storage Lagoon

4.6.4.1 Facility Description

A single two-acre sludge storage lagoon is used to store digested sludge prior to dewatering. Sludge from the storage lagoon is pumped, via a floating dredge, to the steel sludge storage tanks at the Sludge Filtration Building.

4.6.4.2 Capacity Evaluation

Not evaluated.

4.6.4.3 Condition Assessment

Not evaluated.

4.6.4.4 Recommendations

It is recommended that use of the existing sludge storage lagoon for digested sludge storage be discontinued and that one of the three rehabilitated digesters (Digesters A, B, or C) be used as a sludge storage tank to equalize sludge flow to the dewatering facilities. The abandoned sludge lagoon will be available as a holding pond for digester cleaning activities and for additional sludge storage redundancy.

4.6.5 Belt Press Dewatering

4.6.5.1 Facility Description

Digested sludge from the sludge lagoon is pumped to six steel tanks at the belt press dewatering facility. Sludge in the tanks is fed at a constant rate to one or two 2.2-m belt presses for further dewatering. Cake from the belt press is pumped to a loading area and hauled off-site by a private contractor. Washwater and filtrate from the belt press is recycled to the primary influent distribution structure (PID).

4.6.5.2 Capacity Evaluation

The belt filter press is rated on a hydraulic and solids loading basis (gpm/m and lbs/hr/m, respectively). According to the O&M manual, typical hydraulic and solids loading rates for belt filter presses are 21-51 gpm/m and 400-700 lbs/hr/m, respectively. Typical design hydraulic loading rates range from 49-72 gpm/m, with maximum hydraulic loading rates from 98-148 gpm/m and the typical design solids loading rates range from 328-656 lbs/hr/m, with a maximum rate of 984 lbs/hr/m (MOP 8). For this analysis, maximum hydraulic and solids loading rates of 100 gpm/m and 500 lbs/hr/m were used to evaluate belt filter press capacity. Using these loading rates, the capacity of the belt presses is approximately 32 mgd with one unit in service and 61 mgd with both units in operation. Table 4.21 presents the current belt filter press loading.

Using the assumptions presented, the existing belt filter presses provide adequate dewatering capacity; however, during maximum month loading conditions, either more belt filter press units or increased operating time are required to operate the belt filter presses at typical loading rates.

4.6.5.3 Condition Assessment

The belt filter press facility was constructed in the late 1970s.

The following deficiencies were identified with the belt filter press and belt filter press ancillary equipment:

1. **Belt Filter Press and Belt Filter Press Support Equipment:** The belt filter press equipment is over 30 years old and is in need of replacement. In addition, certain parts for the belt filter presses are no longer available.

Table 4.21	Belt Filter Press Capacity Evaluation – Current Conditions Capital Improvement and Energy Management Plan City of Stockton					
	Plant Flow (mgd)	**Sludge Flow (1) (mgd)**	**Sludge Load (1) (ppd)**	**Belt Width (2) (m)**	**Hydraulic Loading (3) (gpm/m)**	**Solids Loading (4) (lbs/hr/m)**
Current Average Annual (AUIS)	31.9	0.14	28,000	4.4	22	265
Current Average Annual (LUOOS)	31.9	0.14	28,000	2.2	44	530
Current Maximum Month (AUIS)	34.0	0.27	54,000	4.4	43	511
Current Maximum Month (LUOOS)	34.0	0.27	54,000	2.2	85	1,023

Notes:
(1) Calculated sludge flow from total sludge fed to belt presses in 2009 (21.969 MG and 3.243 MG largest MM sum) assuming operation 6 days per week at 12 hours per day. Calculated sludge load from total sludge flow and average DS %TS in 2009 of 2.4%.
(2) Each belt filter press has a 2.2-m belt.
(3) Hydraulic loading, calculated by dividing current flow in gpm by available belt width.
(4) Solids loading calculated by dividing current sludge load in lbs per hour by available belt width.

2. **Cake Pumping:** Currently, the RWCF pumps dewatered cake at high pressures from the Sludge Filtration Building approximately 600 feet to the concrete biosolids pad. Plant staff has experienced challenges pumping the thickened cake and there is a significant cost associated with this pumping.

3. **Redundant Sludge Storage:** Historically, the RWCF pumped digested sludge from the digested sludge storage lagoon to the steel sludge storage tanks at the Sludge Filtration Building. The steel storage tanks provide unnecessary redundancy for sludge storage and equalization of sludge flow to the belt filter press.

4.6.5.4 Recommended Improvements

Table 4.22 presents the loading rates for the projected loading conditions using the existing belt filter presses.

According to the calculated loading rates, the existing belt filter presses do not have adequate capacity to operate at 12 hours per day, 6 days per week. Assuming continuous operation, the average firm hydraulic and solids loading would be 110 gpm/m and 1,116 lbs/hr/m. The maximum month firm hydraulic and solids loading would be 153 gpm/m and 1,589 lbs/hr/m, respectively. It is not practical to design for continuous operation of belt filter presses; therefore, additional dewatering capacity is required.

Table 4.22	Belt Filter Press Capacity Evaluation – Projected Conditions Capital Improvement and Energy Management Plan City of Stockton					
	Plant Flow (mgd)	**Sludge Flow (mgd)**	**Sludge Load (ppd)**	**Belt Width (1) (m)**	**Hydraulic Loading (2,3) (gpm/m)**	**Solids Loading (2,4) (lbs/hr/m)**
Projected Average Annual (AUIS)	49.3	0.35	58,900	4.4	128	1,302
Projected Average Annual (LUOOS)	49.3	0.35	58,900	2.2	256	2,603
Projected Maximum Month (AUIS)	56.1	0.49	83,900	4.4	179	1,854
Projected Maximum Month (LUOOS)	56.1	0.49	83,900	2.2	359	3,708

Notes:
(1) Each belt filter press has a 2.2-m belt.
(2) Assuming operation 6 days per week at 12 hours per day or 72 hours per week.
(3) Hydraulic loading, calculated by dividing projected flow in gpm by available belt width.
(4) Solids loading calculated by dividing projected sludge load in lbs per hour by available belt width.

This section compares a new centrifuge or screw press system to replacement and expansion of the existing belt filter presses and presents the recommended improvements to the dewatering facility.

4.6.5.4.1 *Belt Filter Press Replacement/Expansion*

Belt filter presses use belts to dewater biosolids. The biosolids first pass through a gravity drainage section where water freely drains through porous belts. The thickened biosolids then enter a wedge zone where increasing pressure and shearing forces are applied via tensioning rollers and belts to release additional water from the biosolids. The final dewatered “cake” is then discharged and conveyed for reuse or disposal. The filtrate is collected and recycled to the primary influent distribution box (PID) for further treatment. BFPs require skilled operators to observe and manage several key variables, including:

- Incoming sludge characteristics.
- Polymer feed rate.
- Sludge conditioning with polymer.
- Belt speed and tensioning.

Operation of a BFP under non-optimal conditions will reduce dewatering efficiency and increase the water content in the cake. This results in an increase in the volume and mass of biosolids for disposal. Observation of the BFP and feed sludge is important for efficient and continuously optimized dewatering and cake production. Since observation of the sludge is very important to optimize the dewatered cake, unattended operation is not

recommended. In order to provide 24-hour operation of the BFP, operator attendance would be required around the clock, which represents a significant labor cost.

Data from the RWCF for 2009 indicates that the biosolids could be dewatered to 20 percent solids using a BFP. To achieve 20 percent solids, approximately 7.5 pounds of Mannich polymer, per dry ton of solids, is required.

4.6.5.4.2 *Replace Belt Filter Press with Centrifuges*

Centrifuges employ centrifugal force to dewater biosolids. The centrifugal force is generated within the centrifuge by rotating the centrifuge bowl at high speed. The sludge is pumped into the centrifuge where the high centrifugal forces separate the solids from the liquids. The separated water (centrate) is collected and discharged at one end of the centrifuge.

Centrifuges are suitable for dewatering operations that are 24 hours a day, 7 days a week. However, for this analysis, we assumed 12 hours, 7 days a week operation for all dewatering technologies.

Research from other wastewater treatment facilities has shown that centrifuges can achieve a dewatered cake between 25 and 30 percent solids, similar to a screw press. A benefit of this drier cake is a decrease in the volume and mass of dewatered cake. There is no site-specific piloting data available for the RWCF; therefore it was assumed that centrifuges would produce a dewatered cake similar to screw presses at 27.5 percent solids with an anticipated dry polymer dosage of approximately 10 pounds per dry ton required.

4.6.5.4.3 *Screw Presses to Replace Belt Filter Presses*

Screw presses are a relatively new, but proven, sludge dewatering technology. Sludge is loaded into the top of the screw press where they are pushed by a screw through a horizontal screen. Figure 4.14 is a photograph of an FKC screw press at the Sausalito-Marin City Sanitation District. The screw increases pressure on the sludge along the length of the screw press and separates the solids from the liquid. The separated water ("pressate") drains through the screen and is discharged at the bottom of the screw press, while the dewatered cake is discharged at the end of the screw press. Benefits of the screw press are a decrease in required maintenance, lower power consumption, and few mechanical parts. Disadvantages include the requirement for relatively high doses of polymer and flocculation tanks. Screw presses are suitable for continuous dewatering operations.

Pilot testing by FKC at the RWCF showed that screw presses would result in a cake between 21 to 31 percent solids depending on loading rate and polymer dose. For this analysis, it was assumed that the cake would produce dewatered cake at 27.5 percent solids. The expected dry polymer dosage required for the digested sludge is approximately 13 pounds per dry ton.

Figure 4.14 FKC Screw Press at the Sausalito-Marin City Sanitation District

4.6.5.4.4 *Recommendations*

The analysis of dewatering technologies presented below is based on current average annual biosolids cake production and the assumptions presented in Table 4.23.

Table 4.23 Assumptions for Dewatering Evaluation
Capital Improvement and Energy Management Plan
City of Stockton

Parameter	Technology	Value	Units
Cake Solids			
	BFP (1)	20	percent solids
	Centrifuge	27.5	percent solids
	Screw Press (2)	27.5	percent solids
Polymer Dosage			
	BFP (1)	7.5	lb per dry ton
	Centrifuge	10	lb per dry ton
	Screw Press (2)	13	lb per dry ton
Power Use(3)			
	BFP (1)	170	kWh per hour of operation
	Centrifuge	114	kWh per hour of operation
	Screw Press	26	kWh per hour of operation

Notes:
(1) Based on lab testing by FKC (screw presses)
(2) Based on 2009 data.
(3) Power use based on 17 dry tons per day current average annual cake production and assumes 12 hours per day, 7 days per week operation.

Table 4.24 presents the equipment and operating costs for each of the dewatering technologies.

Table 4.24 Economic Comparison of Dewatering Technologies Capital Improvement and Energy Management Plan City of Stockton

Costs	Dewatering Technology		
	BFPs	Centrifuges	Screw Presses
Total Project Cost	$4,107,000	$8,054,000	$7,370,000
Annual Power Cost(1,2)	$78,600	$53,000	$11,700
Annual Polymer Cost (1,3)	$46,500	$62,000	$124,100
Annual Dewatered Cake Hauling Cost(1,4)	$930,800	$676,900	$676,900
Total Annual Operating Cost	$1,056,000	$792,000	$812,700
Present Worth of Annual Operating Costs	$13,160,000	$9,870,000	$10,128,000
Total Present Worth	$20,340,000	$20,230,000	$19,860,000

Notes:
(1) Assumes 12 hour/6 day per week dewatering operation.
(2) Assumes 12.5 cents per kWh.
(3) Assumes $2.00/lb dry polymer for centrifuge and screw press and $2.30/lb Mannich polymer for BFP.
(4) Assumes $30 per wet ton for cake hauling costs.

Based on the economic analysis in Table 4.24, screw presses are recommended for the following reasons[1]:

- Reduced energy consumption: Screw presses require significantly less energy than the other dewatering technologies and require much less wash water than belt filter presses.
- Reduce cake pumping: The screw presses would be installed near the biosolids pad to eliminate the 600' length of piping that the biosolids are currently pumped through.
- Reduced biosolids hauling costs due to improved dewatering performance. Additionally, it is anticipated that hauling costs will increase, which would increase the hauling cost reduction benefit of using screw presses (as well as centrifuges).

The recommended improvements to the deficiencies identified in the condition assessment are as follows:

[1] It should be noted that centrifuges are a viable and reliable alternative to screw presses. Operations and maintenance staff often prefer screw presses to centrifuges because they are easier to maintain than high-speed centrifuges.

1. **Belt Filter Press and Belt Filter Press Support Equipment:** Remove the existing belt filter press and associated equipment. Install screw presses in a new building near the dewatered biosolids storage area sized to provide firm capacity for the buildout flows and loads.

2. **Cake Pumping:** Remove cake pumping equipment.

3. **Redundant Sludge Storage:** The existing sludge storage tanks will not be required in the future. Salvage existing steel dewatering tanks and use for other purposes.

4.7 SUMMARY OF TREATMENT CAPACITIES

Table 4.25 summarizes the treatment capacity ratings for each process area at the RWCF for both current and buildout conditions. Previously discussed CIP recommendations for improving treatment capacity are shown in Table 4.25 for process areas that do not currently provide sufficient capacity for the buildout flows and loads. The capacities in Table 4.25 are shown for average annual conditions and peak hourly wet weather flow conditions for the bar screens, grit channels, raw sewage pumping, and secondary effluent pumping. For capacities limited by a solids loading criteria as shown in the design criteria column of Table 4.25, the capacity was calculated for maximum month loading conditions and the corresponding average annual flow was calculated using the maximum month to average annual flow peaking factors presented in Chapter 2 (1.07 for current conditions and 1.14 for buildout conditions).

Figures 4.15 and 4.16 compare the firm capacities for each process area for current conditions and for after the recommended CIP improvements are implemented to the current and buildout average annual flows. The headworks (bar screens, grit channels, and raw sewage pumping) and secondary effluent pumping capacities are compared to the current and buildout peak hourly wet weather flow.

Table 4.25 Existing Facilities Treatment Capacity Rating
Capital Improvement and Energy Management Plan
City of Stockton

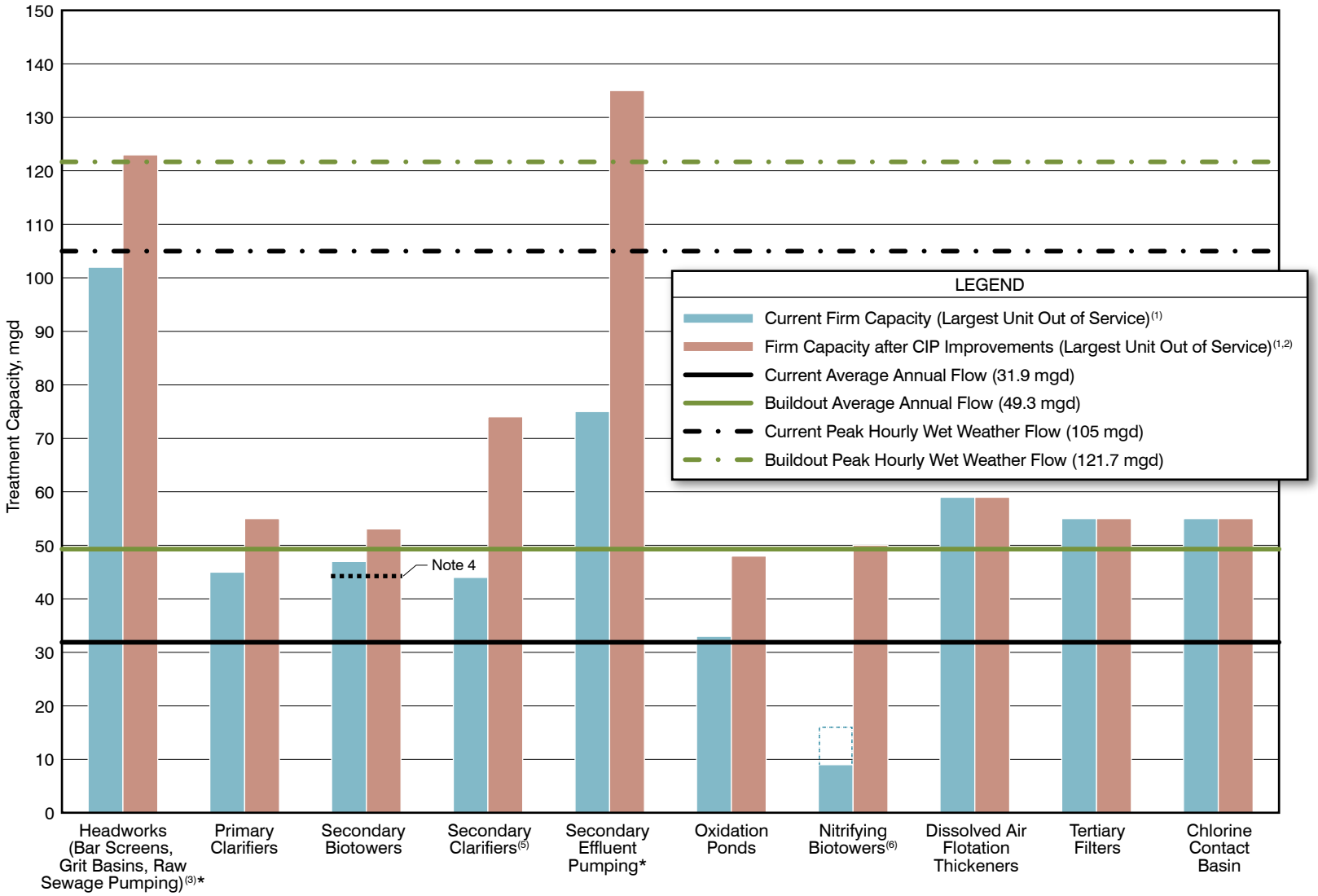
Unit Process	Current Flow	Current Capacity: One Unit Out of Service mgd	Current Capacity: All Units In Service mgd	Basis for Additional Capacity (Buildout Conditions)	Additional Buildout Capacity Required mgd	Recommended Capacity Improvement	Capacity after CIP Improvements: One Unit Out of Service mgd	Capacity after CIP Improvements: All Units In Service mgd	Limiting Design Criteria/Comments
Bar Screens	105 mgd PHWWF	150	225	121.7 mgd Buildout PHWW	---	None Required	123 to 150	164 to 200	Existing barscreen capacity based on minimum 6" freeboard and maximum 5 fps velocity through 5/8" barscreens. Barscreens to be replaced as part of Headworks Rehabilitation. Capacity after CIP improvements based on vendor quotes for new barscreens with 3/8" bar spacing.
Grit Basin	105 mgd PHWWF	85	102	121.7 mgd Buildout PHWW	See Design Criteria	None Required	85	102	Velocity of 1.4 ft/sec and 1-minute detention time. Capacities less than current and buildout flows result in decreased performance but have minimal impact on overall treatment plant performance. Firm capacity based on one out of six grit channels out of service.
Raw Sewage Pump Station	105 mgd PHWWF	102	142	121.7 mgd Buildout PHWW	19.7	Auxiliary Pump Station with Two 25-mgd Pumps	127	192	TDH = 41.5 feet. Auxiliary Pump Station will provide redundant pumping during construction. Based on firm capacity for each pump station structure.
Primary Clarifiers	31.9 mgd AAF	45	52	49.3 mgd Buildout AA	4.3	Two 4,800 sf clarifiers, Convert squircular clarifiers to circular	55	62	OFR = 1300 gpd/sf. Includes squircular clarifiers converted to circular clarifiers reducing surface area by 2,100 sf.
Secondary Biotowers	31.9 mgd AAF	47 (47 – See Comments)	71 (47 – See Comments)	49.3 mgd Buildout AA	---	Hydraulic improvements, biotower rehabilitation	53	80	OLR = 100 ppd/kcf. Current firm capacity based on 100 ppd/kcf is 47.2 mgd. However, flows above 47 mgd currently bypass the biotowers due to a hydraulic bottleneck in the secondary biotowers effluent channels.

Table 4.25 Existing Facilities Treatment Capacity Rating
Capital Improvement and Energy Management Plan
City of Stockton

Unit Process	Current Flow	Current Capacity: One Unit Out of Service mgd	Current Capacity: All Units In Service mgd	Basis for Additional Capacity (Buildout Conditions)	Additional Buildout Capacity Required mgd	Recommended Capacity Improvement	Capacity after CIP Improvements: One Unit Out of Service mgd	Capacity after CIP Improvements: All Units In Service mgd	Limiting Design Criteria/Comments
Secondary Clarifiers	31.9 mgd AAF	33	44	49.3 mgd Buildout AA	16.3	One 166' diameter clarifier	44	74	OFR = 1400 gpd/sf. Firm capacity after improvements is less than buildout flow (49.3 mgd) based on the new largest clarifier out of service. Operation at slightly higher loading rates while a clarifier is out of service is acceptable due to the infrequency of this happening and the ability for downstream processes to accommodate slightly lower clarifier performance.
Secondary Effluent Pump Station	105 mgd PHWWF	75	95	121.7 mgd Buildout PHWW	46.7	Add 35-mgd Pump to SEPS 1, Replace SEPS 2 with Two 27-mgd Pumps	135	186	CIP improvements include pressurization of the 36" river crossing pipeline. SEPS 2 will provide redundancy to SEPS 1. Firm capacity based on firm capacity for each pump station structure.
Oxidation Ponds	31.9 mgd AAF	---	33	49.3 mgd Buildout AA	16.3	None Required – See comments regarding secondary biotower improvements	---	48	40 ppd/ac for winter. Capacity increases because secondary effluent BOD concentration decreases with secondary biotower improvements (current capacity based on secondary effluent with 66 mg/L BOD_5 and capacity after CIP improvements based on 45 mg/L BOD_5).
Nitrifying Biotowers	31.9 mgd AAF	9	18	49.3 mgd Buildout AA	40.3	Add two new 166-ft diameter NBTs, construct Cold Weather NBT Supply System	50	63	Current capacity based on 2 mg/L effluent, 7 deg C winter temperature, and ammonia loading of 3.1 lbs/kcf. Current firm and total capacities of the existing nitrifying biotowers would be approximately 16 mgd and 32 mgd, respectively, at 10 deg C influent temperature. Capacity after CIP improvements based on 10 deg C winter temperature due to warmer temperature from Cold Weather NBT Supply System and two new NBTs.

Table 4.25 Existing Facilities Treatment Capacity Rating
Capital Improvement and Energy Management Plan
City of Stockton

Unit Process	Current Flow	Current Capacity: One Unit Out of Service mgd	Current Capacity: All Units In Service mgd	Basis for Additional Capacity (Buildout Conditions)	Additional Buildout Capacity Required mgd	Recommended Capacity Improvement	Capacity after CIP Improvements: One Unit Out of Service mgd	Capacity after CIP Improvements: All Units In Service mgd	Limiting Design Criteria/Comments
Dissolved Air Flotation Thickeners	31.9 mgd AAF	59	78	49.3 mgd Buildout AA	---	None Required	59	78	OFR = 2.4 gpm/sf.
Tertiary Filters	31.9 mgd AAF	55	66	49.3 mgd Buildout AA	---	None Required	55	66	OFR = 4.5 gpm/sf.
Chlorine Contact Basin	31.9 mgd AAF	---	55	49.3 mgd Buildout AA	---	None Required	---	55	Detention time = 120 minutes.
Gravity Thickeners	31.9 mgd AAF	46	80	49.3 mgd Buildout AA	3.3	None Required	---	86	OFR = 200 gpd/sf. Capacity after CIP improvements based on secondary sludge thickening only, whereas current loading includes primary sludge. One of the two gravity thickeners to be demolished for the future primary clarifiers.
Gravity Belt Thickeners	31.9 mgd AAF	27	69	49.3 mgd Buildout AA	---	None Required (See Comments)	96	201	HLR = 200 gpm/m and SLR = 1,100 lbs/hr/m. Based on continuous operation 24 hours per day 7 days per week. Gravity belt thickeners provide additional redundancy to gravity thickeners and therefore do not need to provide capacity for the total sludge flows alone. Capacity after CIP improvements based on secondary sludge only thickening.
Anaerobic Digesters	31.9 mgd AAF	24	61	49.3 mgd Buildout AA	25.3	Rehabilitate Digesters A through C	52	71	HRT = 15 days and VSLR = 0.13 ppd/cf. Based on 5% grit allowance.
Belt Presses	31.9 mgd AAF	32	61	49.3 mgd Buildout AA	17.3	Replace with Screw Press Dewatering	50	100	HLR = 100 gpm/m for existing belt filter presses at 12 hours per day, 6 days per week. Belt presses to be replaced with screw press in future. Screw press sized to provide firm capacity meeting the buildout average flow of 49.3 mgd.



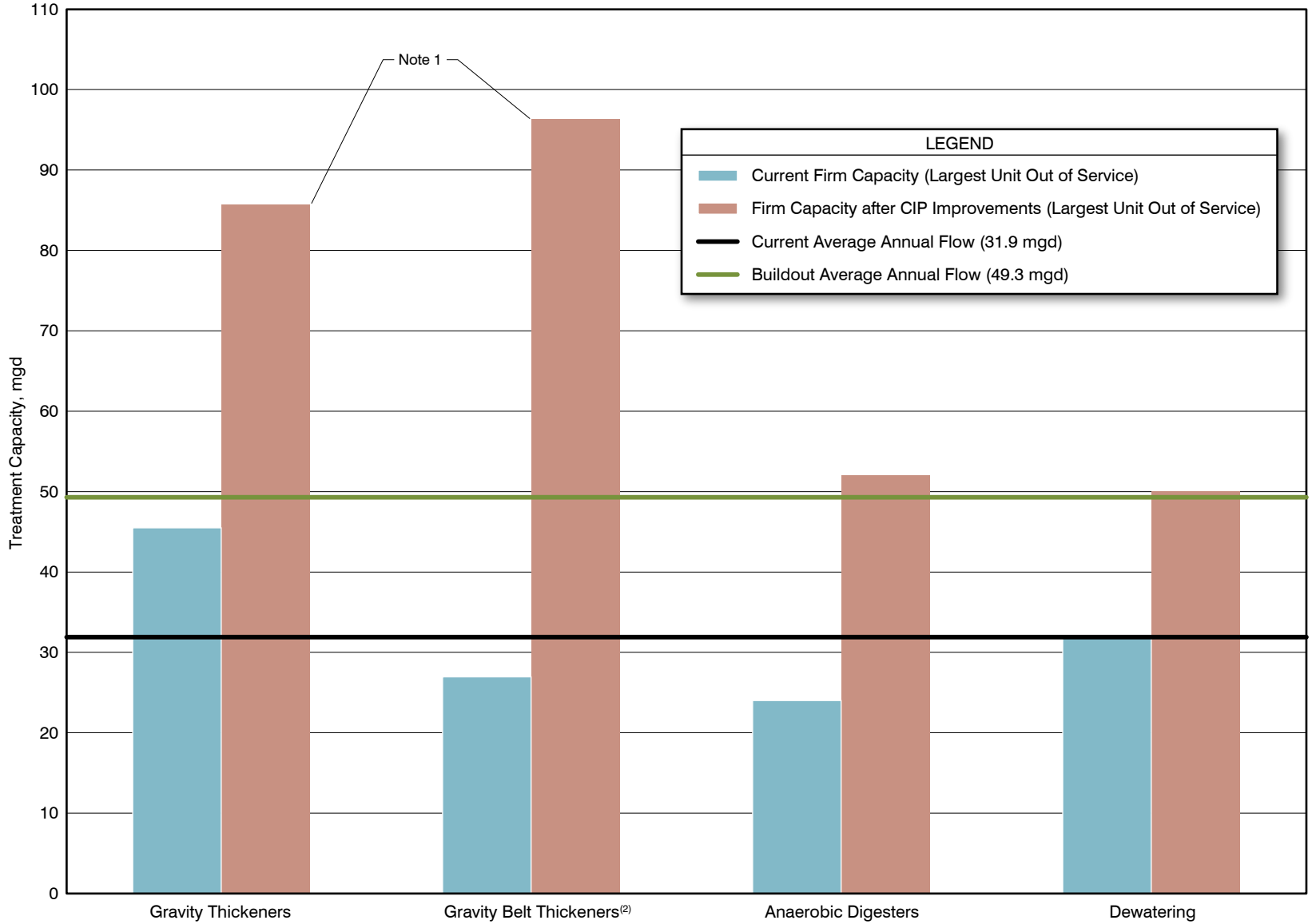
NOTES:

1. Capacities are shown with largest unit out of service except for secondary clarifiers, oxidation ponds, and chlorine contact basins which are shown with all units in service.
2. Table 4.25 presents the recommended CIP projects required to achieve the capacity shown.
3. Headworks capacity is limited by the bar screens and raw sewage pumping. Refer to Table 4.25 for the capacity of each headworks component.
4. The secondary biotowers are hydraulically limited to 47 mgd. The recommended CIP projects include relieving the hydraulic bottleneck in the secondary biotowers.
5. Secondary clarifier capacity is shown with all units in service. The current firm capacity is 33 mgd and the firm capacity after CIP improvements is 44 mgd. However, operation with the largest unit out of service is anticipated to be infrequent and will have minimal impact on overall treatment plant performance.
6. Nitrifying biotower current firm capacity ranges from 9 to 16 mgd for a temperature range of 7° to 10° C. Capacity after CIP improvements is based on three biotowers in operation at 10° C.

* Capacity rating based on peak hourly wet weather flow.

st611f1-8581.ai

Figure 4.15
LIQUID STREAM CAPACITY SUMMARY
CAPITAL IMPROVEMENT AND
ENERGY MANAGEMENT PLAN
CITY OF STOCKTON



NOTES:

1. Thickener capacities increase because secondary sludge only will be thickened; whereas both primary sludge and secondary sludge are currently thickened.
2. Gravity belt thickeners provide additional redundancy to the gravity thickeners and therefore do not need to provide complete firm capacity for the current and buildout flows.

Figure 4.16
SOLID STREAM CAPACITY SUMMARY
CAPITAL IMPROVEMENT AND
ENERGY MANAGEMENT PLAN
CITY OF STOCKTON

st611f2-8581.ai

ALTERNATIVES FOR AMMONIA AND NITROGEN REMOVAL

5.1 THE NEED TO EVALUATE ALTERNATIVE TREATMENT SCHEMES

The current biological treatment process includes secondary biotowers, secondary clarifiers, oxidation ponds, wetlands, and nitrifying biotowers. As explained in Chapter 4, each process performs key steps in the wastewater treatment process:

- **Secondary Biotowers:** Remove a large portion of the carbonaceous BOD.
- **Oxidation Ponds:** Remove additional carbonaceous BOD, inorganic compounds, and some nutrients.
- **Wetlands:** Remove additional carbonaceous BOD, inorganic compounds, suspended solids, and some nutrients. The wetlands convert some ammonia to nitrate/nitrite (partial nitrification) during the summer months. The wetlands also remove some nitrate/nitrate (denitrification) during the summer months.
- **Nitrifying Biotowers (NBT):** Convert ammonia to nitrite/nitrate year round.

The current biological treatment process is one method of meeting the current discharge permit requirements, particularly for BOD and ammonia. However, as described previously, there are certain recommended improvements necessary for the RWCF to reliably meet the current discharge requirements for ammonia. Additionally, in the future, more stringent discharge permit requirements for total nitrogen and/or ammonia may require further modifications and/or new treatment processes.

This chapter identifies and evaluates alternative treatment schemes to satisfy potential, future discharge requirements for ammonia and total nitrogen. The analysis of the treatment alternatives includes a discussion of the advantages and disadvantages of the treatment alternatives versus improving the existing biotowers. Three alternative treatment schemes are evaluated:

1. Alternative 1 – Modify Existing Processes and Add Denitrifying Filters (if necessary).
2. Alternative 2 – Trickling Filter/Solids Contact Process to Replace NBTs.
3. Alternative 3 – Replace Secondary Biotowers and NBTs with Activated Sludge.

5.2 EXISTING TREATMENT PROCESS DEFICIENCIES

The existing treatment processes have three key limitations that warrant consideration of alternative treatment processes:

1. The current NPDES discharge permit allows for a maximum monthly average effluent ammonia concentration of 2.0 mg/L. As discussed previously, NBTs are sensitive to both ammonia loadings and temperature, resulting in reduced performance in extremely cold weather. Given the poor performance of NBTs during cold weather, it is prudent to evaluate other ammonia removal processes that may be less susceptible to temperature.

2. If the Regional Water Board ultimately revises its methodology for calculating dilution, and they do not accept the proposed wetlands denitrification system, nitrate removal (denitrification) would be required. If so, then it could be more cost effective to replace the existing secondary treatment system with a new process that would remove both ammonia and nitrogen (instead of constructing a separate denitrification process).

3. As described in Chapter 4, the existing biotowers have several deficiencies that need to be addressed. The proposed alternative treatment schemes would eliminate the need for some or all of the biotowers.

5.3 PLANNING ASSUMPTIONS

The following assumptions were made when developing the alternative treatment schemes:

- The existing treatment facilities, including the biotowers, can be adequately rehabilitated to a condition consistent with a new treatment facility.
- Treatment processes would be sized for the design maximum month flow and loadings as described in Chapter 2.
- Wet weather flows higher than maximum month flows would be bypassed to Pond 1 for flow equalization (common to all alternatives).
- Average monthly ammonia effluent limits will continue to be 2.0 mg/L. Total nitrogen limits will be reduced to 10 mg/L, on an average monthly basis.

5.4 ALTERNATIVE SECONDARY TREATMENT PROCESS SCHEMES

Three alternatives were evaluated to determine the lowest cost facility that can reliably meet current discharge limits, as well as provide flexibility for future requirements for ammonia and nitrates.

5.4.1 Alternative 1 – Rehabilitate Existing Processes, Convert Wetlands for Denitrification and Add Denitrification Filters if Necessary

This alternative requires the following modifications and additions (refer to Figures 5.1 and 5.2 for the proposed treatment train and site plan). These modifications were discussed previously in Chapter 4.

- The existing treatment facilities would be fully rehabilitated (as discussed in Chapter 4)
- To meet the potential total nitrogen limits, denitrification would occur in either the wetlands or in denitrification filters constructed downstream of the nitrifying biotowers (NBTs). Revisions to the tertiary facility would also reverse the order of treatment for the wetlands and NBTs. The revision would allow the flow from the ponds to flow to the NBTs first to remove ammonia, then to the wetlands to remove nitrates.
- A new NBT would be added to satisfy current ammonia limits.
- Piping changes would also be made to convey warmer secondary effluent directly to the NBTs (bypassing the ponds) during the coldest periods of the year.

5.4.1.1 <u>Denitrification Considerations</u>

Nitrate/nitrite removal is sensitive to temperature and often requires a supplemental carbon source. Full denitrification (to permit levels) may be achieved with the wetland alone in the summer, but full denitrification is not likely during cooler weather. Supplemental carbon may be required to achieve full denitrification in either case. Some sources of supplemental carbon could be BOD from primary wastewater, methanol, chopped wetland vegetation.

Because denitrification performance in wetlands is affected by a variety of factors, the performance of the wetlands is difficult to estimate. It is possible that denitrification filters will be required in addition to the wetlands. Therefore, if denitrification is required in the future, a two phase denitrification strategy could be employed:

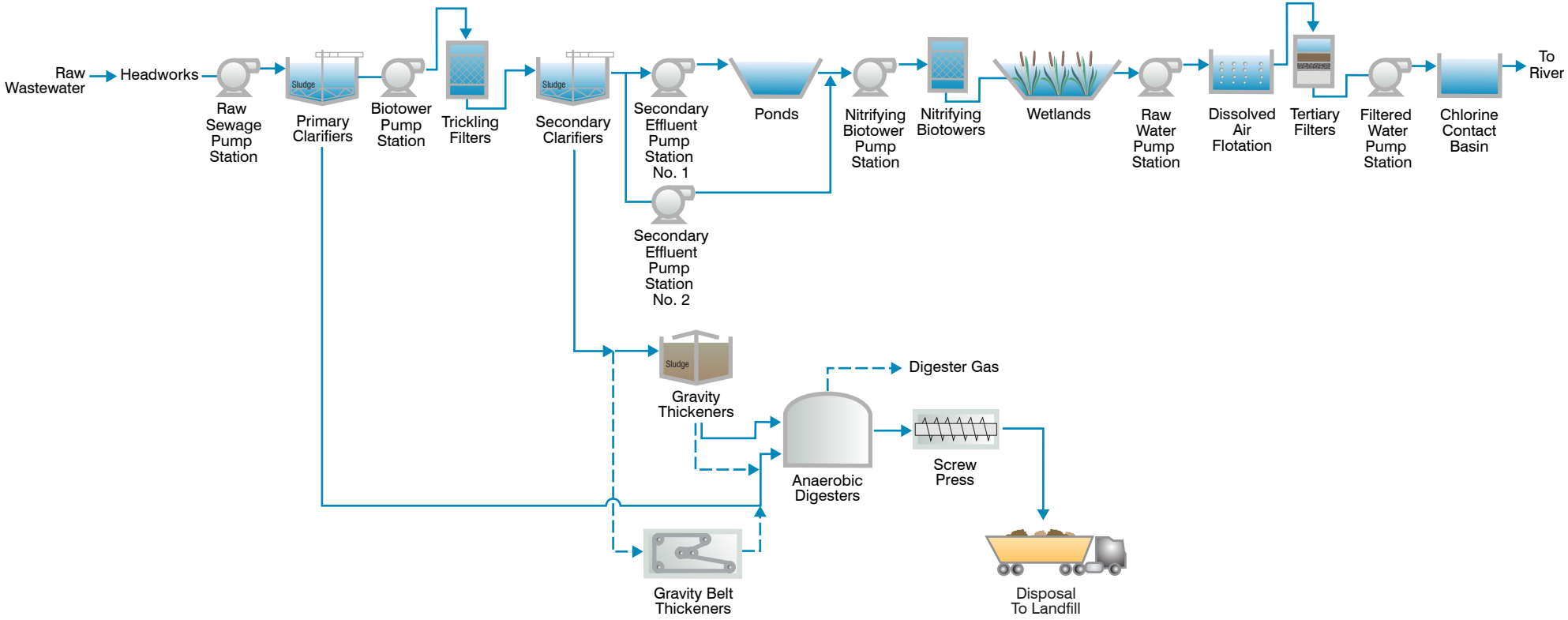
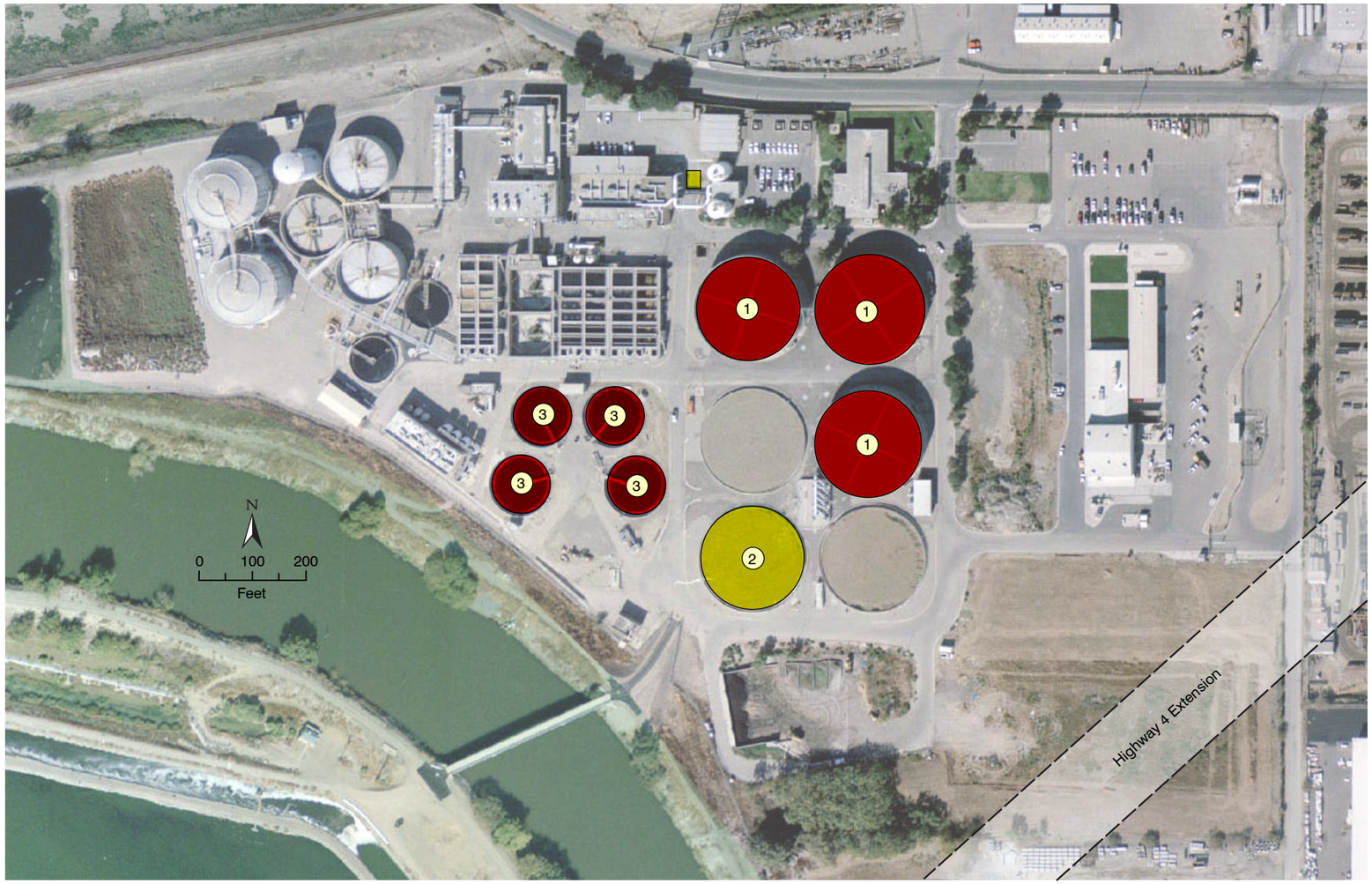


Figure 5.1
ALTERNATIVE 1 PROCESS FLOW DIAGRAM
CAPITAL IMPROVEMENT AND ENERGY MANAGEMENT PLAN
CITY OF STOCKTON

stk411f4-8581.ai



LEGEND

- New Construction
- Rehabilitation
- Demolition
- (1) Biotower Rehabilitation (3)
- (2) Secondary Clarifier No. 5
- (3) Secondary Clarifier Rehabilitation

Figure 5.2
TREATMENT ALTERNATIVE 1 IMPROVEMENTS MAP
CAPITAL IMPROVEMENT AND ENERGY MANAGEMENT PLAN
CITY OF STOCKTON

stk411f7-8581.ai rev 4/6/11

- **Phase 1:** Change process order to move wetlands downstream of NBTs, as described in Chapter 4. Add supplemental carbon facilities to the wetlands denitrification system. Several types of supplemental carbon sources would be piloted, starting with least cost systems first. Supplemental carbon systems that should be considered, but are not limited to, the following systems:

    - Vegetation chopping/grinding – Chopping or grinding floating wetlands vegetation will increase the surface area of the vegetation and increase the bioavailability of the carbon contained within the vegetation. Facilities would be added to allow the floating vegetation removed by the new traveling waterscreens to be chopped or ground into finer particles. The chopped vegetation would then be added to the influent of the wetlands. Degradation of the wetland plant matter may release some nutrients and inorganic matter that is otherwise taken up by the plant matter and harvested during the cleaning of the wetlands. The impact of this on the treatment process and the ability to meet discharge requirements is unknown.

    - Primary or secondary effluent blend – The addition of primary or secondary effluent to the wetland influent would increase the available carbon. Like chopped vegetation, this carbon source comes at relatively no cost. This supplemental carbon source would only require new infrastructure (pipelines, pumps, etc.)

    - Methanol – Methanol (CH3OH) is one of the most commonly used supplemental carbon sources at wastewater treatment plants. If methanol is required at the RWCF, several storage tanks and chemical pumps would be required. The methanol facilities could be designed to dose methanol to the wetlands and also to future denitrification filters, if required.

Study seasonal denitrification performance of wetlands over a three year period.

If wetlands denitrification performance proves adequate to meet current and anticipated discharge limits, Phase 2, as follows, will not be required.

- **Phase 2:** Construct denitrification filters. If the wetlands with supplemental carbon are not capable of meeting the nitrogen limits contained within future discharge permits, denitrification filters would be the next step. Due to the high cost associated with new filters, filters would only be implemented if Phase 1 is not effective at meeting nitrogen limits.

The denitrification filters would be comprised of the existing tertiary filters and a new bank of filters, which would be similar in size and design to the existing filters. By constructing a second bank of filters, the loading rate the new and existing filters would by reduced to half of the current loading rates (2 gpm/sf). The lower loading rates will allow the filters to be operated as biofilters where denitrifying bacteria will attach to the filter media.

5.4.2 Alternative 2 –Trickling Filter/Solids Contact Process to Replace NBTs

This alternative would consist of converting the existing secondary biotower process to a biotower/solids contact process. Under this approach, aeration basins would be added downstream of the existing secondary biotowers. The coupled biotowers and aeration basins would remove BOD and ammonia. The existing secondary clarifiers would be replaced with new clarifiers designed for the activated sludge process (lower overflow rates required). Refer to Figures 5.3 and 5.4 for the proposed treatment train and site plan. Table 5.1 includes the conceptual design criteria for this alternative.

With this scheme the existing ponds would be retained for peak flow equalization, metals removal, and for storage during voluntary power shutdowns to allow participation in the demand response program (see Chapter 14). Similar to Alternative 1, the three phase denitrification approach would still be required. The NBTs would no longer be needed because the nitrification processes would be provided by the biotower/solids contact process.

5.4.3 Alternative 3 - Replace Secondary Biotowers and NBTs with Activated Sludge Process

Under this approach, the existing secondary biotowers, secondary clarifiers, and NBTs would be replaced with the activated sludge process, designed for both nitrification and denitrification. The activated sludge process would consist of aeration basins and new secondary clarifiers designed to achieve the permit limits for ammonia and nitrates. The ponds would continue to be used for flow equalization and metals removal, but the NBTs be eliminated. Refer to Figures 5.5 and 5.6 for the proposed treatment train and site plan. Table 5.2 includes the conceptual design criteria for this alternative.

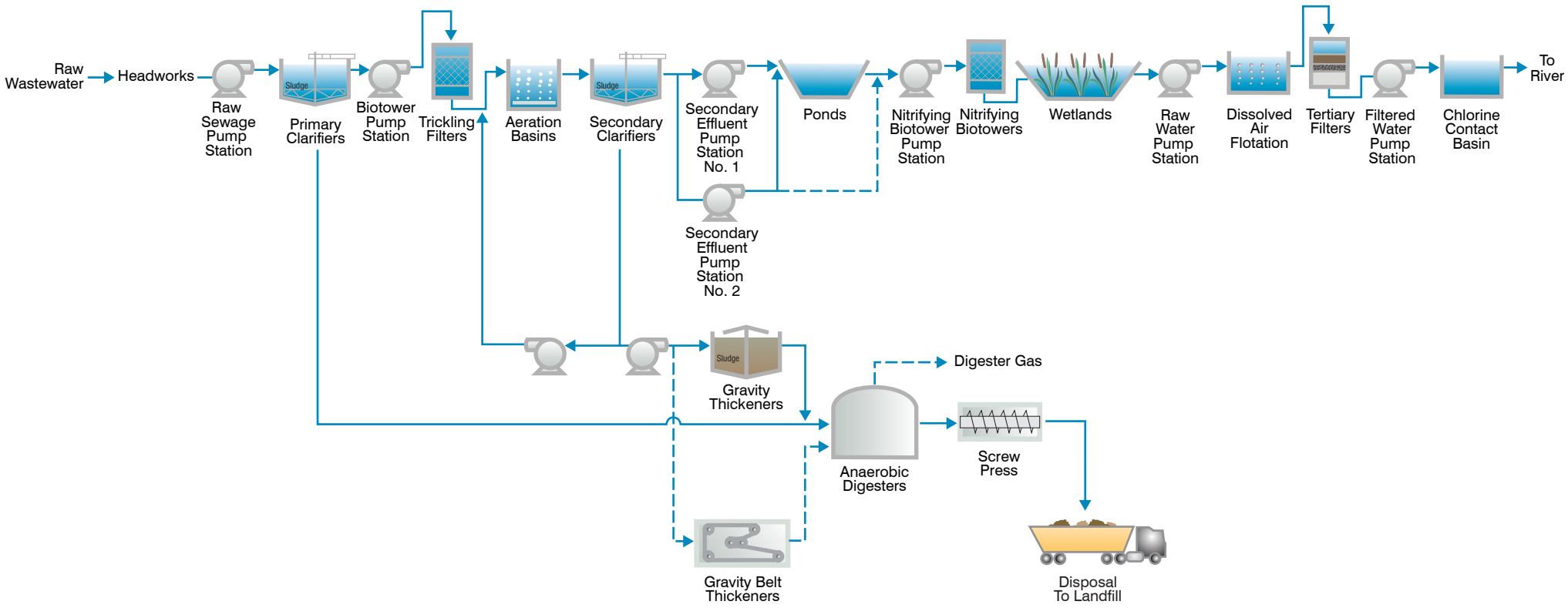


Figure 5.3
ALTERNATIVE 2 PROCESS FLOW DIAGRAM
CAPITAL IMPROVEMENT AND ENERGY MANAGEMENT PLAN
CITY OF STOCKTON

stk411f5-8581.ai rev 4/6/11

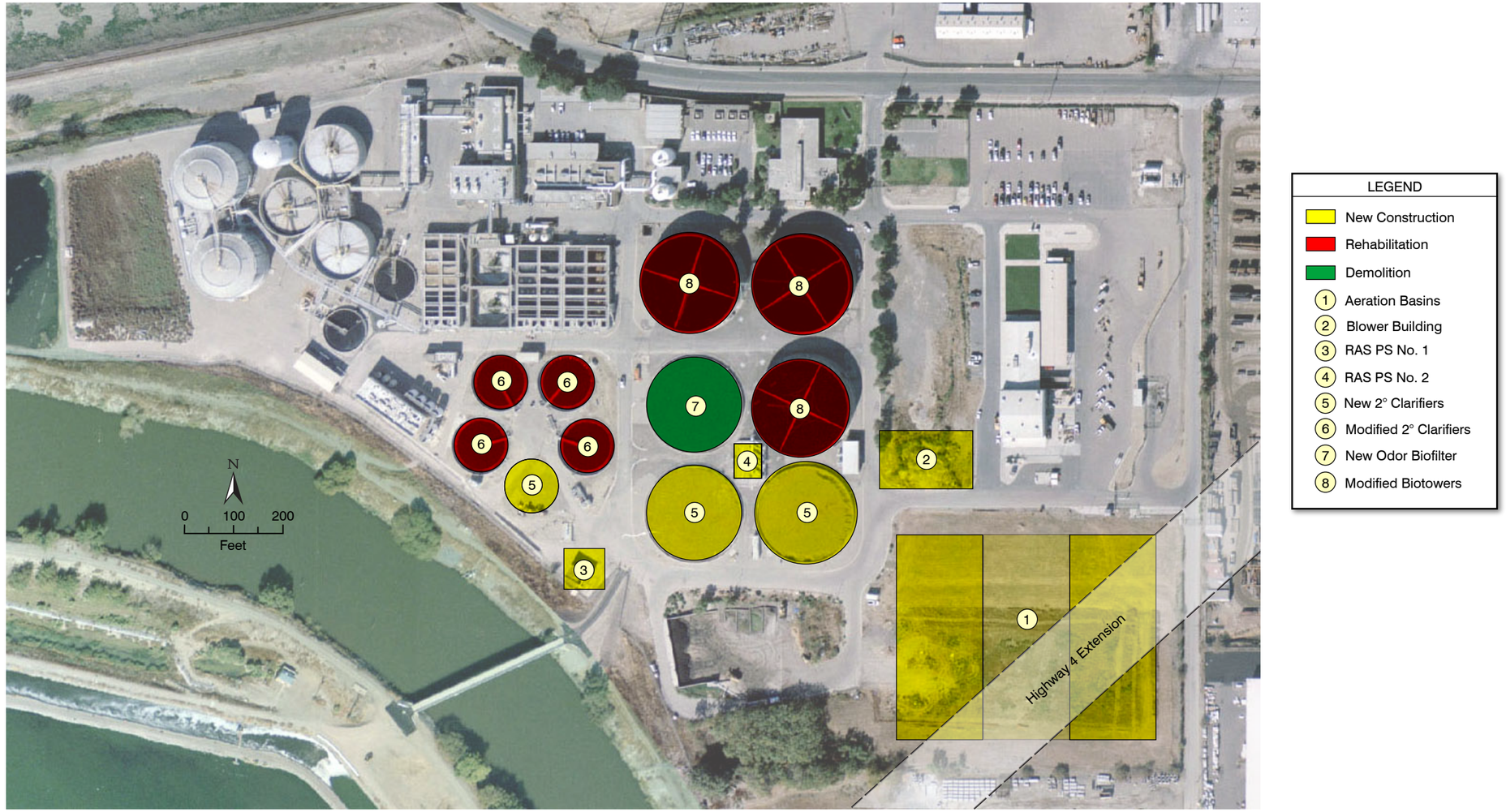


Figure 5.4
TREATMENT ALTERNATIVE 2 IMPROVEMENTS MAP
CAPITAL IMPROVEMENT AND ENERGY MANAGEMENT PLAN
CITY OF STOCKTON

stk411f9-8581.ai

Table 5.1	**Design Criteria for Treatment Alternative 2 – Trickling Filter/Solids Contact Process Capital Improvement and Energy Management Plan City of Stockton**	
Design Criteria	**Value[(1)]**	**Units**
Aeration Basins		
Number (total)	3	--
Number (in service)	2	--
Length (nominal)	230	ft
Width (nominal)	115	ft
Wide Water Depth	17	ft
Total Basin Volume (in service)	6.7	MG
Hydraulic Retention Time	2.8	hr
Mixed Liquor Suspended Solids Concentration	2,950	mg/L
Total Solids Retention Time	1.5	days
Recirculation Ratio	0.0	--
Process Air	42,140	scfm
Secondary Clarifiers		
Number (total)	7	--
Number (in service)	6	--
Diameter (nominal)	120	ft
Surface Overflow Rate	836	gpd/sf
Solids Loading	34	lb/day-sf
Clarifier Safety Factor	1.2	--

Note:
(1) At 56.1 mgd

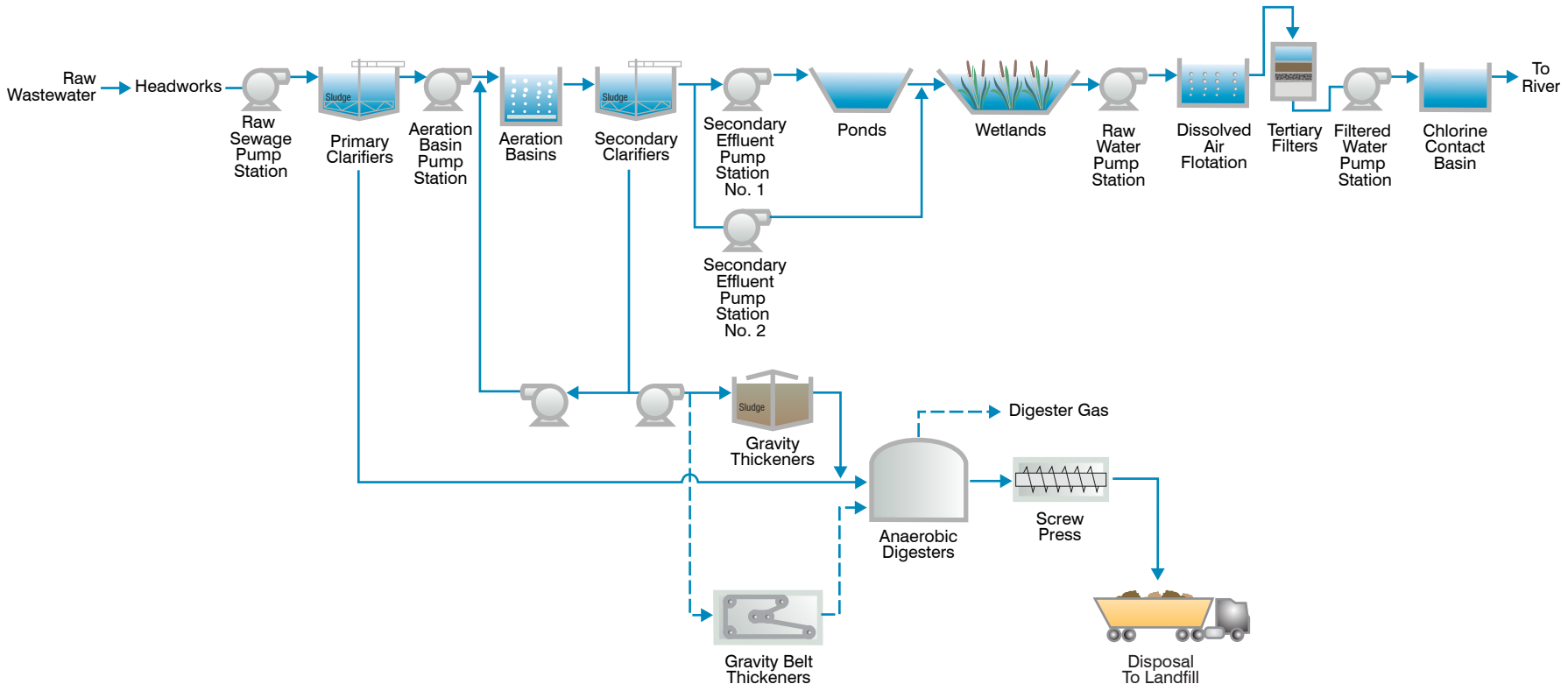


Figure 5.5
ALTERNATIVE 3 PROCESS FLOW DIAGRAM
CAPITAL IMPROVEMENT AND ENERGY MANAGEMENT PLAN
CITY OF STOCKTON

stk411f6-8581.ai rev 4/6/11

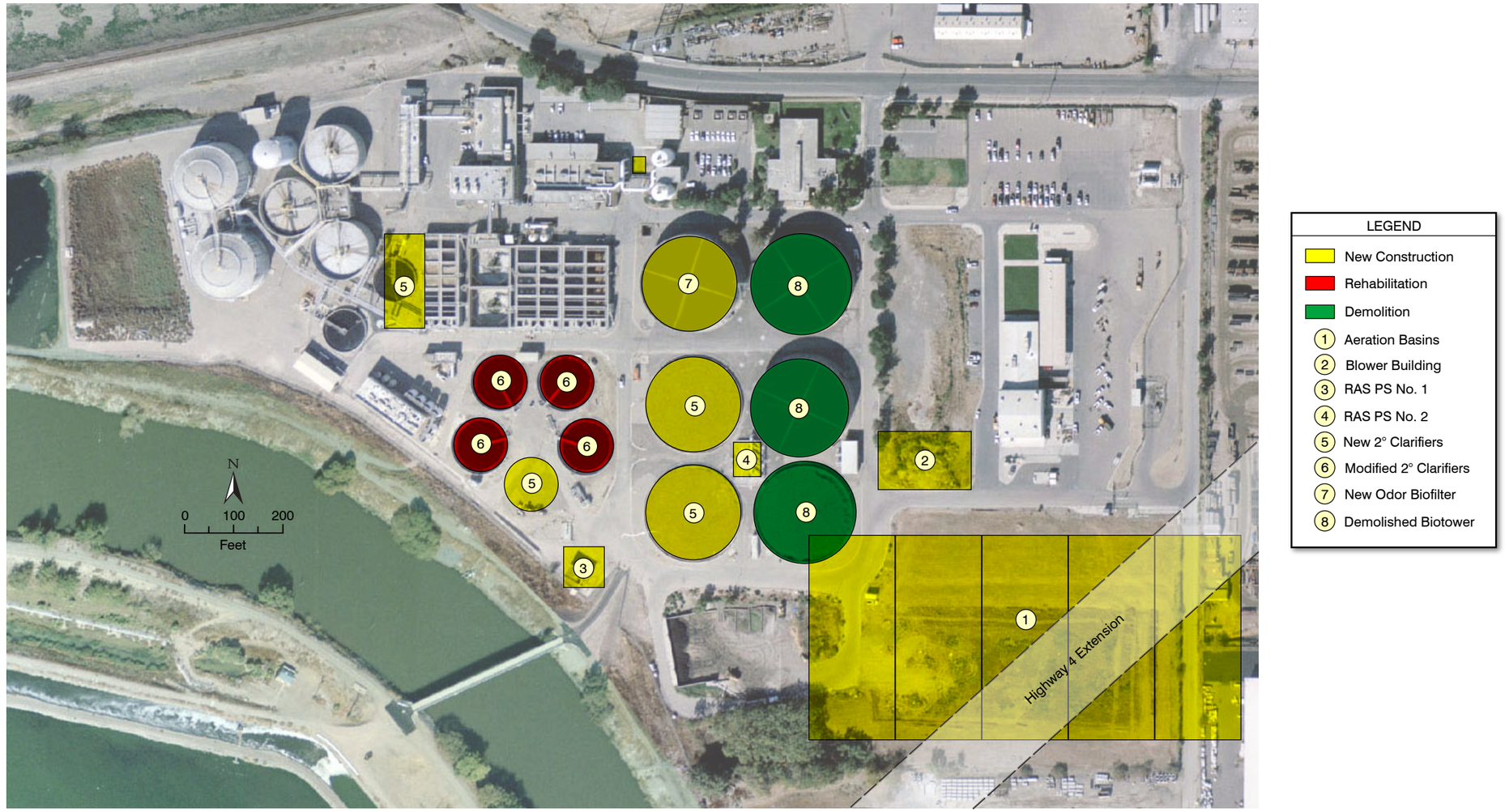


Figure 5.6
TREATMENT ALTERNATIVE 3 IMPROVEMENTS MAP
CAPITAL IMPROVEMENT AND ENERGY MANAGEMENT PLAN
CITY OF STOCKTON

stk411f8-8581.ai

Table 5.2	**Design Criteria for Treatment Alternative 3 – Activated Sludge Process** **Capital Improvement and Energy Management Plan** **City of Stockton**	
Design Criteria	**Value[1]**	**Units**
Aeration Basins		
Number (total)	5	--
Number (in service)	4	--
Length (nominal)	290	ft
Width (nominal)	145	ft
Wide Water Depth	17	ft
Total Basin Volume (in service)	21.4	MG
Hydraulic Retention Time	8.9	hr
Mixed Liquor Suspended Solids Concentration	2,950	mg/L
Total Solids Retention Time	6.6	days
Recirculation Ratio	2.0	--
Process Air	40,420	scfm
Secondary Clarifiers		
Number (total)	7	--
Number (in service)	6	--
Diameter (nominal)	120	ft
Surface Overflow Rate	835	gpd/sf
Solids Loading	34	lb/day-sf
Clarifier Safety Factor	1.2	--

Note:
(1) At 56.1 mgd

5.5 COST COMPARISON

Table 5.3 presents the preliminary capital costs for each alternative. Estimated operating and maintenance costs are presented in Table 5.4 and a present worth analysis is summarized in Table 5.5.

Table 5.3 Comparison of Capital Costs for Alternative Treatment Schemes to Achieve Biological Nutrient Removal (1)
Capital Improvement and Energy Management Plan
City of Stockton

Treatment Element Capital Cost, $Million	Alternative 1 Rehabilitate Existing Processes and Add Denitrification Filters	Alternative 2 Trickling Filter/Solids Contact (TF/AS) Process to Replace NBTs	Alternative 3 Replace Biotowers and NBTs with Activated Sludge Process
Rehabilitate Existing Biotowers	$29.7	$29.7	--
TF/ SC Aeration Basin Basins	--	$34.6	--
RAS/WAS Pump Station	--	$8.1	$25.8
Blower Building		$8.6	$27.5
Additional Nitrifying Biotower (NBT)	$17.8	--	--
Secondary Effluent Bypass to NBTs	$5.7	--	--
BNR Aeration Basins	--	--	$76.5
Add 5th Secondary Clarifier	$3.8	--	--
TF/AS Secondary Clarifiers	--	$41.1	--
BNR Secondary Clarifiers	--	--	$41.1
Wetlands upgrades to re-direct flow	$7.3	$7.3	--
Denitrification Filters- Convert Tertiary Filters + New Denitrification Filters	$18.4	$18.4	--
Total Project Cost	**$82.7**	**$147.8**	**$170.9**

Note:
(1) Total project costs, including contingencies, engineering and legal costs.

Table 5.4 Annual Operations and Maintenance Costs for Alternative Treatment Schemes to Achieve Biological Nutrient Removal
Capital Improvement and Energy Management Plan
City of Stockton

	Annual Costs, $M/year		
Treatment Element	**Alternative 1 Rehabilitate Existing Processes and Add Denitrification Filters**	**Alternative 2 Trickling Filter/Solids Contact (TF/AS) Process to Replace NBTs**	**Alternative 3 Replace Biotowers and NBTs with Activated Sludge Process**
Biotowers	$0.6	$0.62	
TF/SC Aeration Basins		$1.69	
Nitrifying Biotowers	$0.72	$0.72	
BNR Aeration Basins			$1.64
TFAS Secondary Sed Tanks	$0.10	$0.20	
BNR Secondary Sed Tanks			$0.20
Denitrification Filters(1)	$1.13	$1.13	
Total	**$2.6**	**$4.4**	**$1.8**

Note:
(1) Annual costs for denitrification are mostly composed of methanol costs. Methanol may not be required – pending the outcome of the three phase denitrification compliance process.

Table 5.5 Present Worth Analysis for Alternative Treatment Schemes to Achieve Biological Nutrient Removal
Capital Improvement and Energy Management Plan
City of Stockton

	Costs in $M		
	Alternative 1 Rehabilitate Existing Processes and Add Denitrification Filters	**Alternative 2 Trickling Filter/Solids Contact (TF/AS) Process to Replace NBTs**	**Alternative 3 Replace Biotowers and NBTs with Activated Sludge Process**
Annual Operations and Maintenance (O&M) Costs	$2.6	$4.4	$1.8
Present Worth of O&M Costs(1)	$32.0	$54.3	$23.0
Capital Costs	$82.7	$147.8	$170.9
Total Present Worth	**$114.7**	**$202.1**	**$193.9**

Note:
(1) Total project costs, including contingencies, engineering and legal costs.

Alternative 1 has the lowest capital cost, second lowest O&M cost, and the lowest net present worth of the three alternatives. Alternative 2 has the second highest capital cost and highest annual O&M cost. Alternative 3 has the lowest annual O&M cost but has the highest capital cost.

5.6 QUALITATIVE COMPARISON

The advantages and disadvantages of each alternative are presented in Table 5.6

Table 5.6 Advantages and Disadvantages of Alternative Secondary Treatment Schemes Capital Improvement and Energy Management Plan City of Stockton

Alternative	Advantages	Disadvantages
1 - Rehabilitate Existing Processes and add Denitrification Filters when necessary	• Lowest capital cost and present worth cost. • Allows for denitrification improvements into the future. • Less disruptive to existing RWCF. • Second lowest operating costs. • Requires fewer operators and less complicated operation than an activated sludge plant.	• May require methanol for denitrification. • Relies on older structures (the biotowers) for service for the next 25 years. • NBT performance still sensitive to lower temperatures.
2 - Trickling Filter/Solids Contact Process	• Second lowest capital cost. • Less disruption to existing plant than Alternative 3.	• Requires rehab of biotowers, new aeration basins, and new secondary clarifiers. • Highest O&M and present worth costs.
3 - Activated Sludge Process	• All new structures and equipment for secondary treatment. • Supplemental carbon not anticipated. • Lowest operating costs. • Nitrification process not as susceptible to cold conditions.	• Most costly in terms of capital costs. • Aeration basins and secondary clarifiers will not fit on present site. Additional land is required. • Impacted by the future Highway 4 Project. • More difficult to operate than a biotower plant. • Ponds and DAFTs are still required.

5.7 RECOMMENDATIONS

The recommended alternative is Alternative 1. Alternative 1 has the lowest capital cost, second lowest operating costs, and lowest net present value. The current treatment processes would be upgraded, including adding provisions to convert the tertiary filters to deep-bed denitrification in the future. Denitrification filters would be required if the wetlands cannot reduce the effluent nitrogen concentrations to required levels.

STRUCTURAL CONDITION ASSESSMENT

6.1 INTRODUCTION

This Chapter presents the findings of the structural condition assessments conducted from January through March 2011 for selected buildings and structures at the City of Stockton RWCF. The purpose of this assessment is to review the general structural condition of each structure and comment on the structure's ability to function after a significant seismic event. This Chapter includes a summary of visual observations, findings and general recommendations for remediation or further investigation prepared by Siegfried Engineering. Allowances are included in the CIP to perform the recommended improvements and analyses.

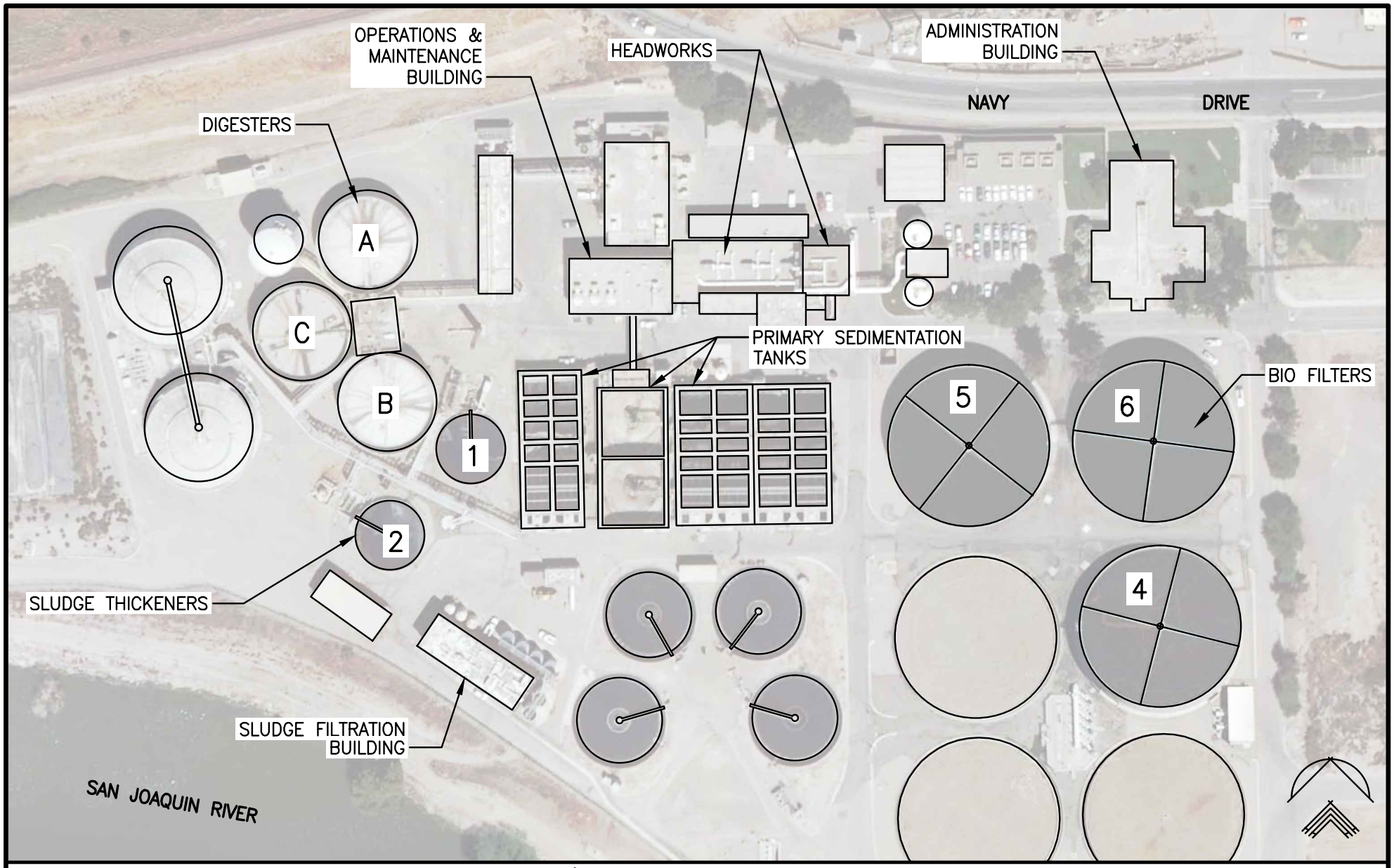
6.2 SCOPE OF CONDITION ASSESSMENT

This structural condition assessment was limited to the following structures (See Figures 6.1 and 6.2 for the locations of these structures):

- Secondary Biotowers
- Anaerobic Digesters (A, B, and C)
- Headworks
- Administration Building
- Operations and Maintenance Building
- Gravity Thickeners
- Dewatering Building
- Primary Clarifiers
- Tertiary Filters

The assessments include a visual review of each structure and a cursory review of available original construction documents. No destructive, radiographic or similar examinations were conducted. Most process-related structures were in service during field observations; therefore, some components were covered by water, filter media, or architectural materials and could not be observed.

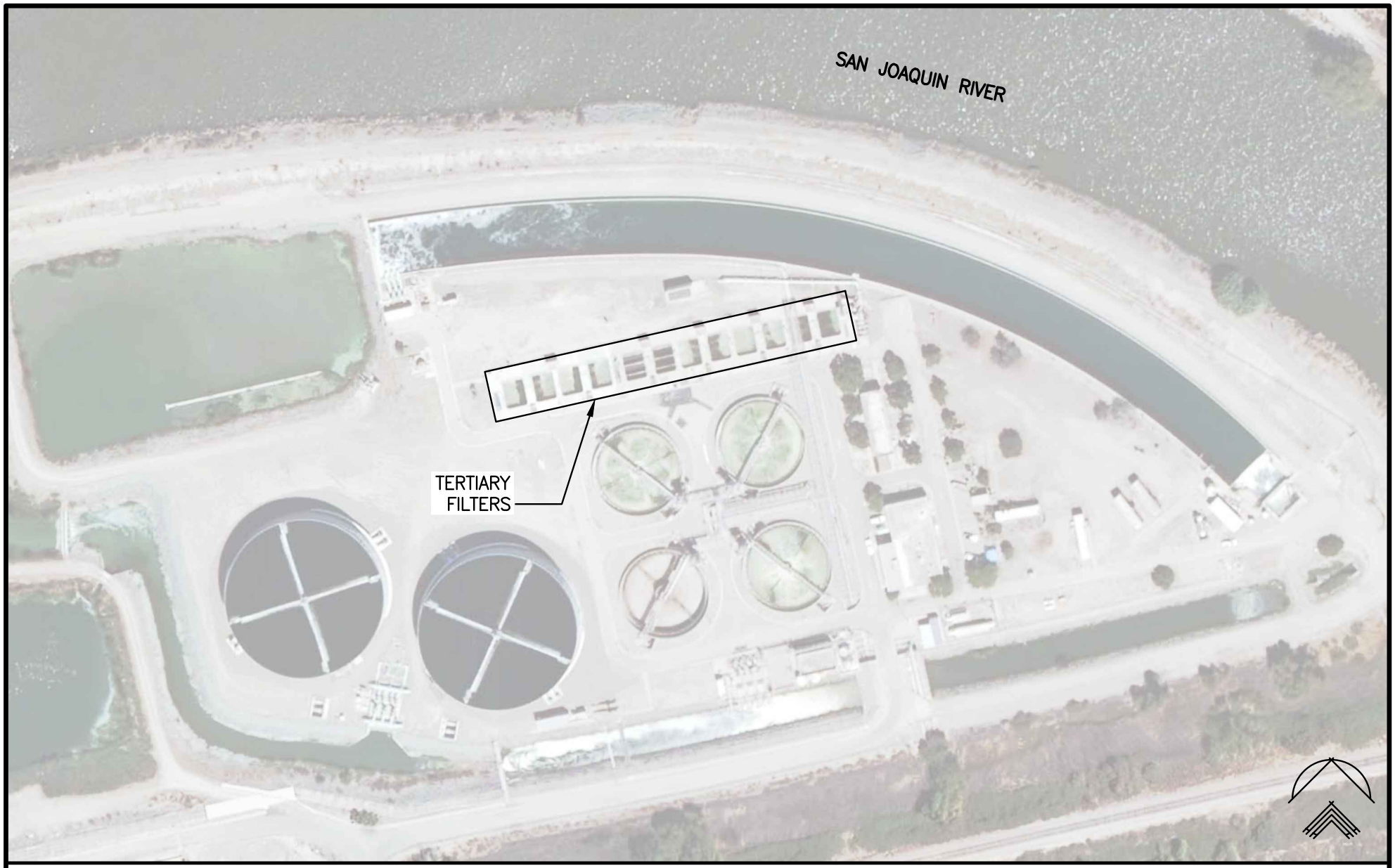
The findings of the condition assessment identify obvious weaknesses in the structure's lateral load resisting systems that might compromise its function after a significant seismic event. In most cases, these structures do not meet current building code standards for the



SIEGFRIED
CIVIL ENGINEERING
STRUCTURAL ENGINEERING
SURVEYING
PLANNING
3244 Brookside Road, Suite 100 Stockton, California 95219
209-943-2021 www.siegfriedeng.com Fx: 209-942-0214

Figure 6.1
MAIN PLANT STRUCTURAL EVALUATIONS
CAPITAL IMPROVEMENT AND ENERGY MANAGEMENT PLAN
CITY OF STOCKTON

10212EXHIBITS.dwg
stk411f26-8581.ai



SIEGFRIED
CIVIL ENGINEERING
STRUCTURAL ENGINEERING
SURVEYING
PLANNING
3244 Brookside Road, Suite 100 Stockton, California 95219
209-943-2021 www.siegfriedeng.com Fx: 209-942-0214

Figure 6.2
TERTIARY PLANT STRUCTURAL EVALUATIONS
CAPITAL IMPROVEMENT AND ENERGY MANAGEMENT PLAN
CITY OF STOCKTON

10212EXHIBITS.dwg
stk411f27-8581.ai rev 4/13/11

design and detailing of seismic load resisting systems. However, this general assessment only identifies observed and potential significant deficiencies and does not include a detailed structural analysis or evaluation per the California Building Code (CBC) and related reference documents such as ASCE/SEI 31 “Seismic Evaluation of Existing Buildings” and ASCE 41 “Seismic Rehabilitation of Existing Buildings.” These structures are not considered “Essential Services Buildings” as defined in the Essential Services Building Seismic Safety Act of 1986. Nor are they considered “Essential Facilities” (Occupancy Category IV) as defined by the 2010 CBC. They are classified as Occupancy Category III Buildings per the CBC. Therefore, seismic upgrade or “retrofit” is only required when these structures are modified or significant deficiencies are identified.

6.3 FINDINGS

The following is a summary of the observations, findings and recommendations for each structure that was assessed.

6.3.1 Secondary Biotowers

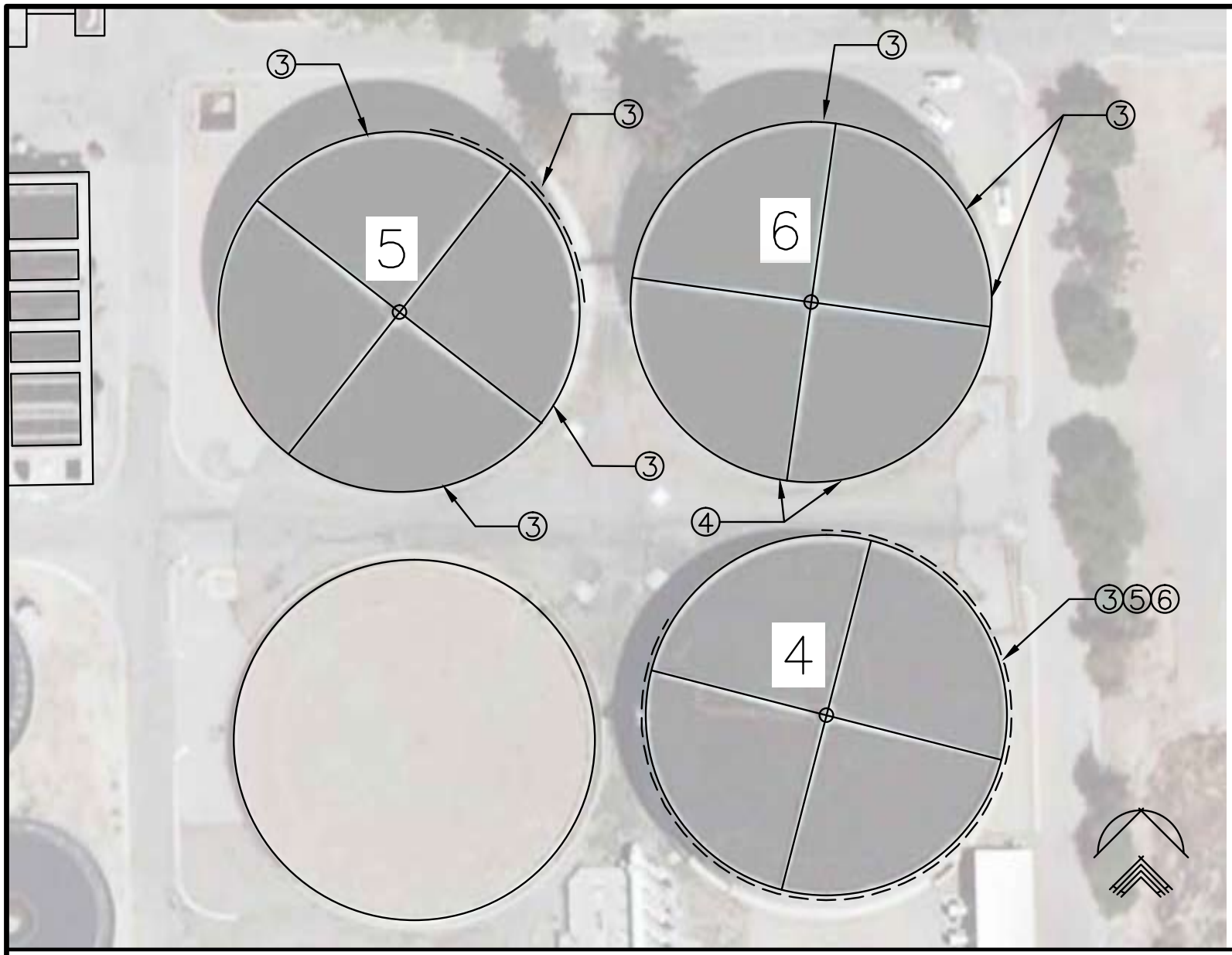
Secondary Biotowers 4, 5 and 6 were reviewed. These structures consist of vertical masonry walls constructed around 1971 on top of older concrete ring walls constructed in the late 1940’s. The perimeter walls house the biotower plastic media and related equipment. Therefore, the interior condition of the base slab and walls could not be observed.

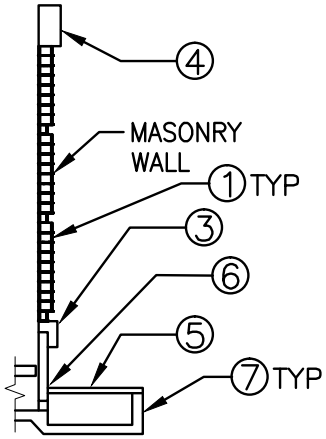
6.3.1.1 Observations

Refer to Figure 6.3 for the location of the following observation items[1]:

1. Each structure revealed ongoing seepage of moisture through the masonry walls. This seepage can, over time, weaken the mortar joints; however, no deterioration was observed at this time. The mortar joints appeared to be in good condition.
2. Few isolated cracks in the masonry units. These cracks were limited to individual masonry units and are structurally insignificant.
3. The horizontal concrete band located at the juncture between the masonry wall and original concrete wall has cracked and spalled in many locations (Figure 6.4) on all three biotowers. This appears to have been caused by deterioration from moisture intrusion and does not appear to be the result of structural forces or failures.
4. Isolated instances of spalled concrete edges around the top concrete banding ring.
5. The concrete deck constructed over the channel at the base of the biotowers is badly cracked and failing on Biotower No. 4. This appears to have been caused by the corrosion of an embedded steel pipe within the deck.

[1] The dashed lines in Figure 6.3 represent the extent or area of the item identified in the legend.





TYPICAL WALL SECTION

1. SEEPAGE THROUGH MASONRY
3. SPALLED AND/OR CRACKED CONCRETE BAND
4. SPALLED TOP RING
5. CRACKED AND/OR FAILED DECK
6. GAP BETWEEN DECK AND WALL
7. VERTICAL CRACKS

SIEGFRIED
CIVIL ENGINEERING
STRUCTURAL ENGINEERING
SURVEYING
PLANNING
3244 Brookside Road, Suite 100 Stockton, California 95219
209-943-2021 www.siegfriedeng.com Fx: 209-942-0214

Figure 6.3
SECONDARY BIOTOWERS STRUCTURAL OBSERVATIONS
CAPITAL IMPROVEMENT AND ENERGY MANAGEMENT PLAN
CITY OF STOCKTON

10212EXHIBITS.dwg
stk411f28-8581.ai rev 4/13/11

Figure 6.4
SECONDARY BIOTOWERS HORIZONTAL
CONCRETE BAND CRACKING AND SPALLING
CAPITAL IMPROVEMENT AND ENERGY MANAGEMENT PLAN
CITY OF STOCKTON

6. There is a horizontal gap between the grade level concrete decking over the perimeter channel and the filter walls around most of Biotower No. 4 (Figure 6.5). This is possibly the result of past seismic movement. See “Findings” for further discussion on this issue.

7. The short vertical wall at the outer edge of the perimeter channel has vertical cracking from three to ten feet on centers throughout most of the areas.

6.3.1.2 Findings

In reviewing the original construction documents and the observations of the unimproved biotowers (i.e., old rock biotowers), some structural concerns were identified. First, this structure has a very weak seismic load resisting system. The connection between the original concrete ring wall and the foundation is minimal and does not have the structural capacity to resist seismic loads. These connections are visible in the unimproved biotowers but are hidden from view in the biotowers investigated. Several of the visible connections are broken as shown in Figure 6.6. This condition may have contributed to the deck movement identified in Observation No. 6 above.

The second concern is in the way masonry walls were added to the concrete ring walls. Based on the original drawings, no foundation improvements were made to compensate for the additional weight of the masonry wall. Despite the lack of capacity, the foundation system appears to be functioning adequately with no obvious settlement or foundation failures thus far. Overall, these structures appear to be vulnerable to significant damage during a seismic event.

6.3.1.3 Recommendations

The following are general recommendations for the repair and further investigation of the Secondary Biotowers.

1. The spalled concrete bands identified in Observation No. 3 should be repaired and in some cases replaced to prevent further deterioration and damage.

2. The interior walls should be coated with a water repellant material to minimize the migration of water through the mortar joints.

3. The channel deck on Biotower No. 4 should be removed and replaced.

4. The vertical cracks on the perimeter channel vertical wall should be routed and pressure grouted to prevent further deterioration.

5. Further investigation, analysis and the design of seismic strengthening features is necessary to provide adequate seismic resistance for these structures.

Figure 6.5
SECONDARY BIOTOWER NO. 4 HORIZONTAL GAP
CAPITAL IMPROVEMENT AND ENERGY MANAGEMENT PLAN
CITY OF STOCKTON

Figure 6.6
ABANDONED ROCK FILTER CONNECTION
CAPITAL IMPROVEMENT AND ENERGY MANAGEMENT PLAN
CITY OF STOCKTON

6.3.2 Digesters A, B, and C

Digesters A, B and C consist of a floating steel framed roof and post tensioned concrete walls supported by concrete foundations. Digesters A and B appear to have been constructed in the late 1940's based on plans dated September, 1946. During the same time period, the upper portion of Digester C was constructed on top of an older structure. An added exterior post tensioned gunite shell was constructed over the original concrete walls for each digester around 1974 (based on October 1973 plans).

6.3.2.1 Observations

Areas observed include the exterior surface and roof top of all three digesters and the interior and attic space of Digesters A and B. At the time of the review Digester C was in service, preventing access to the interior. Interior observations were conducted from the interior floor level.

Refer to Figure 6.7 for the location of the following observation items:

1. The exterior concrete walls appear to be in good condition with only minor hairline cracking in isolated areas. Some rust stains were observed; however, they appear to have come from temporary ladder mounts and not the result of interior wall corrosion seepage.

2. The concrete wall top cap has spalled off in isolated locations. This is not structurally significant.

3. The roofing materials on each digester are aged, cracked and in need of maintenance, repair or replacement. Debris in some areas is preventing direct drainage resulting in sedimentation and vegetation growth.

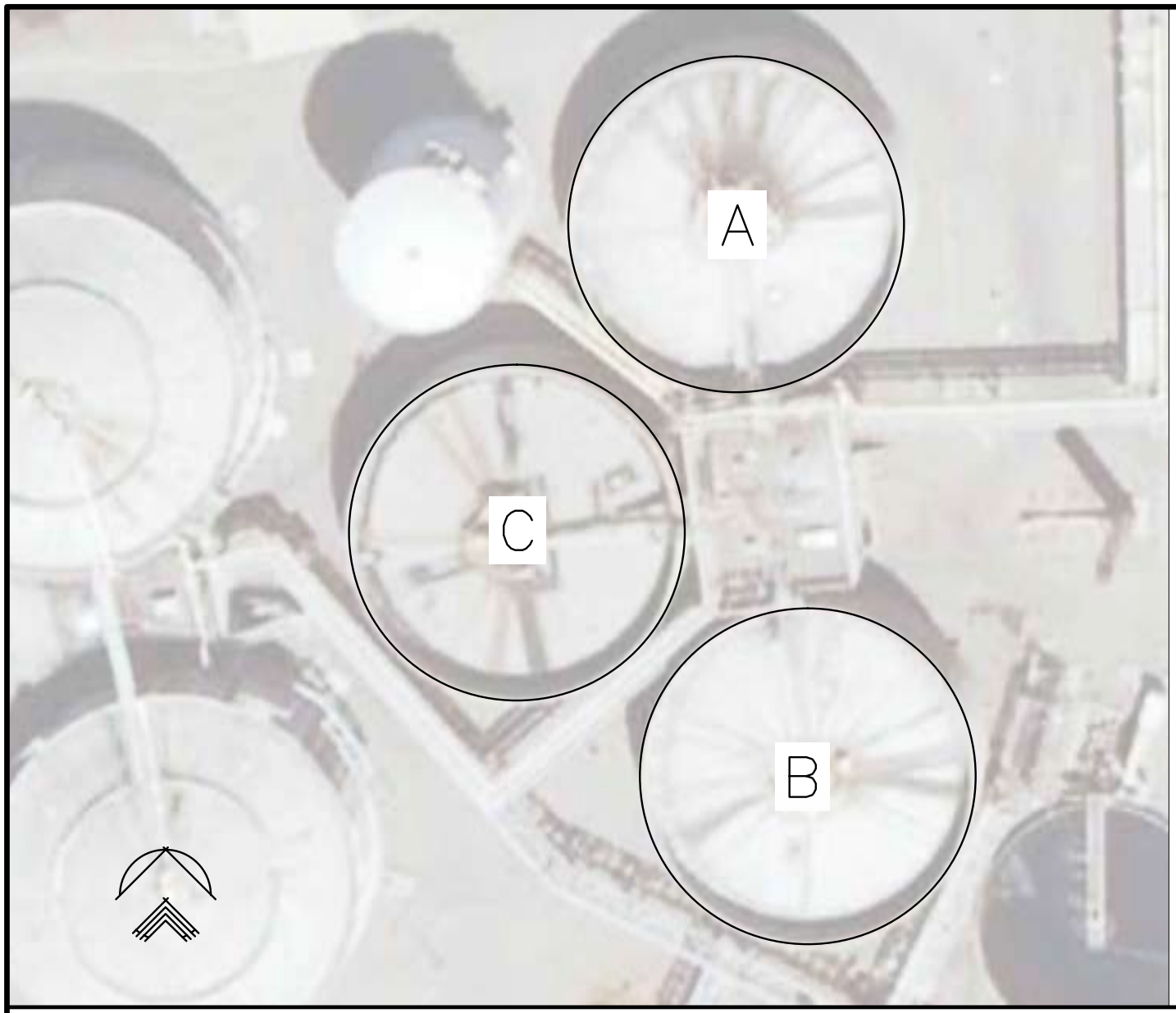
4. The visible interior surface of the original wall above the roof line has vertical cracking and pitted surfaces.

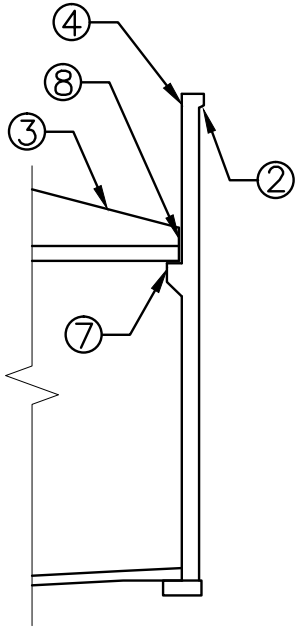
5. The interior floor slab has minor cracking in isolated areas. Some of these cracks have been previously sealed.

6. The interior wall surfaces below the roof are in relatively good condition with only minor pitting, typically less than one quarter inch wide and deep.

7. Minor spalling of the concrete roof support corbels. This is not structurally significant.

8. The perimeter roof support channel, exposed to the interior, has corrosion along the bottom flange in both Digesters A and B.





TYPICAL EXTERIOR WALL SECTION

② SPALLED CONCRETE CAP
③ AGED, CRACKED ROOFING
④ CRACKED AND PITTED WALL
⑦ MINOR SPALLING
⑧ SUPPORT CHANNEL CORROSION

SIEGFRIED
CIVIL ENGINEERING
STRUCTURAL ENGINEERING
SURVEYING
PLANNING
3244 Brookside Road, Suite 100 Stockton, California 95219
209-943-2021 www.siegfriedeng.com Fx: 209-942-0214

Figure 6.7
DIGESTERS A, B, AND C STRUCTURAL OBSERVATIONS
CAPITAL IMPROVEMENT AND ENERGY MANAGEMENT PLAN
CITY OF STOCKTON

10212EXHIBITS.dwg
stk411f29-8581.ai rev 4/13/11

9. The steel roof structure is in good condition. There is one slightly bent truss diagonal in Digester B; however, this condition is not structurally significant.

10. The center vertical Eductor Tube has some surface corrosion in both Digesters A and B. The presence of water in the center portion of the floor prevented close up examination of this condition.

6.3.2.2 Findings

Overall, Digesters A and B and the visible portions of Digester C were found to be in good structural condition. In order to sustain this condition, some maintenance items are required as indicated in the recommendation section below.

As for the seismic resistance of these structures, further analysis would be required to determine whether they can withstand current building code prescribed forces. There does not appear to be any significant inherent weaknesses; however, several areas could cause further problems during a seismic event and should be further investigated. This includes;

1. Based on original construction documents, the vertical walls for Digesters A and B are not anchored to their foundations or the interior floor slab. Since the lower six feet of these walls are below exterior grade, movement of the wall base relative to the foundation is possible but would likely be limited to small movements. This may ultimately lead to increased settlement after a seismic event but this may not cause immediate failure or loss of function for this structure.

2. Apparently, the lower half of the Digester C wall was constructed prior to 1946. No information was available to identify the construction materials and details of the original walls and foundations. The 1946 plans detail the welding of the original reinforcing bars to the newer bars. Reinforcing materials and welding techniques used at that time do not likely have the ductility necessary to maintain the integrity of this joint during a significant seismic event and could suffer some damage.

3. The floating roof structure would have a tendency to knock against the perimeter walls during a seismic event potentially damaging the wall or roof structure. Several roller devices exist around the perimeter to restrict this movement; however, there does not appear to be enough devices to prevent damage.

6.3.2.3 Recommendations

The following are general recommendations for the repair and further investigation of the Digesters.

1. Conduct additional observations of the interior of Digester C when it is out of service. Perform a detailed analysis of the structure to further evaluate its capacity to resist seismic loads.

2. Perform roofing repairs and remove drainage obstructions.

3. Route and seal cracks and resurface the interior wall surface above the roof line.

4. Route and seal cracks on the floor slab.

5. Conduct close up examinations of the perimeter roof support channel and Eductor Tube corrosion and reevaluate repair options.

6. Design and install additional perimeter roof lateral roller supports to withstand seismic loading.

6.3.3 Headworks

The Headworks structure generally consists of concrete and masonry walls, concrete floors, roof decks and foundations. A majority of the structure is below grade with the perimeter walls serving as retaining walls. The original structure was built in the late 1940's based on the 1946 plans; however, significant modifications and additions have occurred since that time. The adjoining appendages to the south consist of masonry walls and wood framed roofs. They were constructed sometime after 1946 but their age is unknown.

For the purposes of identifying different areas, sections of the building are labeled as H1, H2, etc. as depicted on Figure 6.8.

6.3.3.1 <u>Observations</u>

H1 Area:

1. The top of wall and roof edge flashing is severely corroded and in need of replacement. No resulting deterioration was observed at this time.

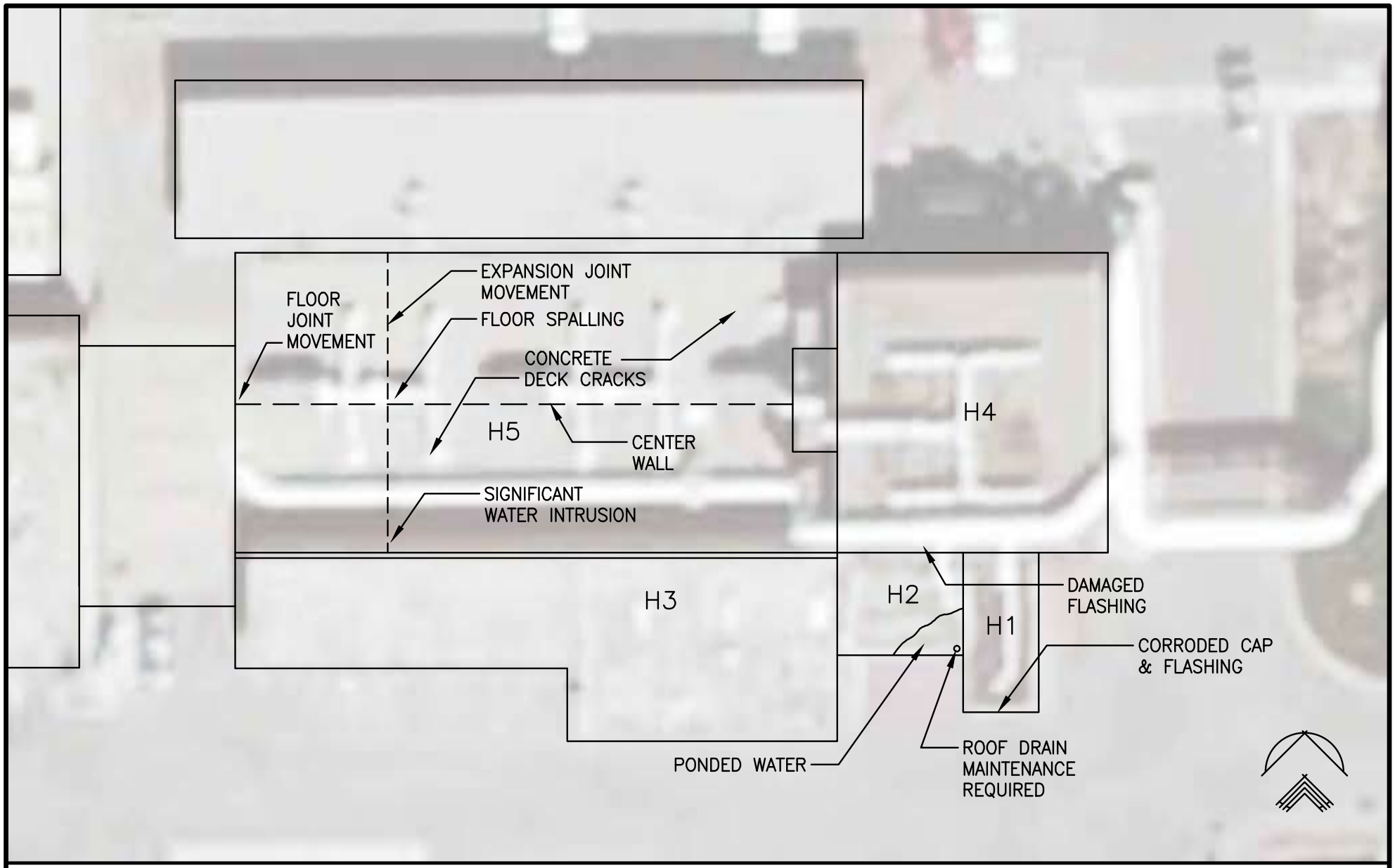
H2 Area:

2. The southeast roof drain is causing water to pond on the roof is in need of maintenance. No resulting deterioration was observed at this time. However, this could ultimately cause roof leaks, further settlement and overloading of the roof structure.

3. The top of the vertical joints on the south wall abutting areas H1 and H2 have a horizontal separation indicating possible foundation settlement. Thus far the settlement appears to be minor and no structural damage has occurred.

H3 Area:

4. This appears to be a separate building addition and is in good condition.



SIEGFRIED
CIVIL ENGINEERING
STRUCTURAL ENGINEERING
SURVEYING
PLANNING
3244 Brookside Road, Suite 100 Stockton, California 95219
209-943-2021 www.siegfriedeng.com Fx: 209-942-0214

Figure 6.8
HEADWORKS STRUCTURAL OBSERVATIONS
CAPITAL IMPROVEMENT AND ENERGY MANAGEMENT PLAN
CITY OF STOCKTON

10212EXHIBITS.dwg
stk411f30-8581.ai rev 4/13/11

H4 Area:

5. Some random light cracking of the walls and roof structure. This cracking is not structurally significant.

6. The surface of the concrete floor is worn with some cracking and spalling adjacent to floor opening edges. Some of the spalling appears to be part of a previous topping course. Subgrade recesses were filled with water, therefore inaccessible for inspection.

H5 Area:

7. Cracking on top of the roof deck spanning predominantly in the north-south direction. The cracks appeared to have been sealed in the past but are in need of resealing. The cracks do not appear to be structurally significant.

8. This area has several north-south expansion joints in the walls, floor and roof deck. The westernmost joint has separated horizontally indicating movement. The west side of the joint in the roof deck appears to have settled slightly, more significantly on the north end. Figure 6.9 shows the floor joint and spalling at the base of the south wall in the north section of the Headworks.

   During a rainstorm, a significant amount of water poured through the joint near the top of the south wall. Some water leaking through the joint in the roof deck was observed.

9. The concrete floor is worn and in similar condition to the floors in area H4.

10. The floor joints at the southwest corner of the area revealed some movement, deterioration and water infiltration from roof leakage.

6.3.3.2 Findings

1. The observed conditions in areas H1 and H2 are maintenance issues and are not structurally significant at this time.

2. The floors in areas H4 and H5 are in need of maintenance to seal cracks, repair spalling and worn surfaces in order to prevent further deterioration. No significant structural deficiencies or failures resulting from this condition were observed at this time.

3. The movement in the westerly expansion joint in Area H5 is likely the result of soil settlement caused by moisture migration into the subgrade. As revealed by water pouring through the wall, a significant amount of moisture has infiltrated behind the south wall. The water has likely migrated below the structure as well. This movement may have also opened leaks within the subgrade effluent channels

Figure 6.9
SPALLING AT BASE OF SOUTH WALL IN NORTH SECTION OF HEADWORKS
CAPITAL IMPROVEMENT AND ENERGY MANAGEMENT PLAN
CITY OF STOCKTON

introducing further moisture into the subgrade. At this time, this condition has not caused any structural failures or conditions of immediate concern. However, unless mitigated, this condition could lead to further deterioration of the structure.

4. There is one possible weakness in the buildings seismic load resisting system. The north-south shear wall between areas H4 and H5 stops at grade level and does not continue to the basement floor. In plane shear forces in this wall are likely transferred into the roof deck diaphragm over area H5 which are in turn resisted by the adjoining soils. This would result in high concentrated soil stresses near the east end of area H5. This condition must be further analyzed.

6.3.3.3 Recommendations

1. Perform maintenance and repairs as noted above for areas H1 and H2.

2. Route and seal exterior cracks on the roof deck of area H5.

3. In regards to the expansion joint movement in area H5:

    a. Re-surface, slope and seal the strip between areas H3 and H5 to provide better drainage and prevent water intrusion into the subgrade.

    b. Conduct further investigations of related underground roof drains to determine if any leaks exist in the drain pipe.

    c. Inspect the joint locations in the effluent channels when they are out of service and re-seal the joints as needed.

    d. Remove and replace the expansion joint sealants on the roof, walls and floor.

    e. Place crack monitoring gauges along the joint and monitor movement over a one year period after recommendations above have been completed.

4. Perform additional analysis of structure's seismic load resisting systems to evaluate their performance.

6.3.4 Administration Building

The Administration Building is a concrete frame building with a concrete roof deck and a concrete slab on grade. The building also has partial height masonry walls and masonry veneers. The building was constructed around 1973 based on plans dated April, 1973. A small addition consisting of masonry walls and a wood framed roof was constructed on the south end at a later date.

6.3.4.1 Observations

Refer to Figure 6.10 for the location of the following observation items:

1. The south end addition has experienced some settlement causing the top of the north-south spanning wall to move outward separating from the original building.

2. The exposed slab on grade in the mechanical room has random cracking. These cracks are not structurally significant. No other cracking in the floor tile system was observed throughout the rest of the building.

3. Minor cracking on the exposed concrete frames within the mechanical room.

6.3.4.2 Findings

Overall, the building was found to be in good structural condition. No significant cracking in the walls or frames were found. The settlement observed in the southern addition has not caused any structural deterioration at his time. However, this condition should be monitored to determine whether the settlement is ongoing and could cause further problems.

Overall, the seismic load resisting systems consist of concrete roof diaphragms and moment frames. These components provide a complete path for seismic load resistance and are in reasonably good condition. However, in reviewing the original construction documents, this building does not meet current building code seismic standards with respect to the detailing and quantity of reinforcing steel within the concrete columns. Further detailed analysis is required to determine if significant seismic damage will occur.

6.3.4.3 Recommendations

The following are general recommendations for the repair and further investigation of the Administration Building:

1. Continue to monitor settlement of the south end addition.

2. Route and seal floor slab cracks in the maintenance room to prevent further deterioration.

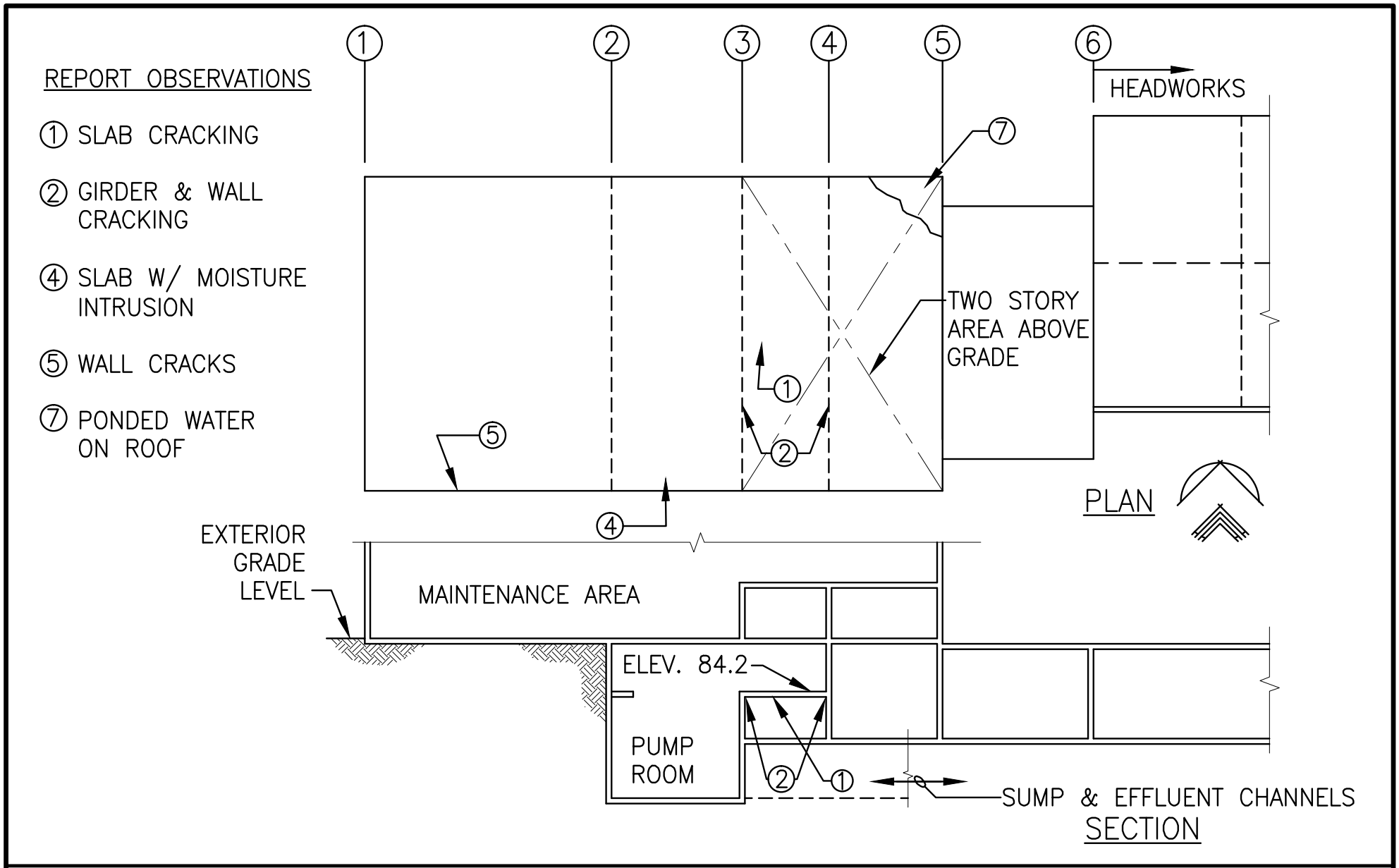
6.3.5 Operations and Maintenance Building

A majority of the Operations and Maintenance Building appears to be the original structure constructed per the 1946 plans. This is a reinforced concrete building with several levels both above and below grade as depicted on Figure 6.11. Several modifications were constructed based on plans dated in 1962 and 1973.

SIEGFRIED
CIVIL ENGINEERING
STRUCTURAL ENGINEERING
SURVEYING
PLANNING
3244 Brookside Road, Suite 100 Stockton, California 95219
209-943-2021 www.siegfriedeng.com Fx: 209-942-0214

Figure 6.10
ADMINISTRATION BUILDING STRUCTURAL OBSERVATIONS
CAPITAL IMPROVEMENT AND ENERGY MANAGEMENT PLAN
CITY OF STOCKTON

10212EXHIBITS.dwg
stk411f31-8581.ai rev 4/13/11



SIEGFRIED
CIVIL ENGINEERING
STRUCTURAL ENGINEERING
SURVEYING
PLANNING
3244 Brookside Road, Suite 100 Stockton, California 95219
209-943-2021 www.siegfriedeng.com Fx: 209-942-0214

Figure 6.11
OPERATIONS AND MAINTENANCE BUILDING
STRUCTURAL OBSERVATIONS
CAPITAL IMPROVEMENT AND ENERGY MANAGEMENT PLAN
CITY OF STOCKTON

10212EXHIBITS.dwg
stk411f32-8581.ai rev 4/13/11

6.3.5.1 Observations

Refer to Figure 6.11 for the location of the following observation items.

1. The underside of the basement slab at elevation 84.2 (per original plans) has significant cracking.

2. The girders, walls and door wall header in the same vicinity as item one above have cracking requiring further investigation.

3. Random minor cracking in slabs and girders in various areas. These cracks are structurally insignificant.

4. The underside of the slab above the south end of the pump room has some cracking and evidence or moisture intrusion and corrosion of slab reinforcement.

5. The south wall of the maintenance area has significant cracking in the vicinity of past piping penetrations. These cracks are likely older as no reflective cracking has appeared on the exterior wall surfaces suggesting the cracks occurred prior to 1973 when the masonry veneer was added.

6. Other walls around the perimeter of the maintenance area have random, structurally insignificant cracking.

7. There is a substantial amount of water ponding on the northeast corner of the roof. The roof drain appeared to be plugged and is in need of maintenance.

8. Roofing materials are aged, cracked and in need of repair or replacement.

6.3.5.2 Findings

The cracked slab at elevation 84.2 appears to be failing and is in need of replacement. No significant settlement or failure has occurred thus far; however, the floor above is not supporting any additional load at this time other than pedestrian traffic. The reinforcement has likely de-bonded from the surrounding concrete. This may have been caused by a variety of factors ranging from water intrusion to temporary overloading of the slab.

The adjoining beams and walls are also cracked but to a lesser extent. These building elements can likely be repaired in place without having to replace sections of the structure.

The seismic load resisting systems consist of concrete roof diaphragms and shear walls. These components provide a complete path for seismic load resistance and are in reasonably good condition. However, in reviewing the original construction documents, this building does not meet current building code seismic standards with respect to the detailing and quantity of reinforcing steel within the concrete columns and shear walls of the above

grade structures. This condition may be acceptable; however, further analysis is required to determine if the structure will remain functional after a significant seismic event.

Recommendations

1. Repair the cracked slab, beams and walls below the elevation 84.2 slab. This will involve some initial removal of the cracked concrete to determine if the reinforcing steel has de-bonded due to corrosion.

2. Route and seal cracks on slabs and walls throughout to prevent further deterioration.

3. Repair plugged roof drain.

4. Consult a roofing professional for repair and or replacement of roofing materials.

5. Conduct further analysis of the seismic load resisting system.

6.3.6 Gravity Thickeners

The Gravity Thickeners consist of a concrete base, perimeter concrete retaining walls and upper concrete launder overflow walls. Gravity Thickener No. 1 is the older structure. Original construction documents were not available for this structure but other plans dated in 1962 refer to it as an existing structure. Gravity Thickener No. 2 was constructed between 1995 and 1997 based on record drawings dated October 1997. A majority of the thickener structures are below grade and under water limiting visibility for inspection.

6.3.6.1 Observations

Refer to Figure 6.12 for the location of the following observation items:

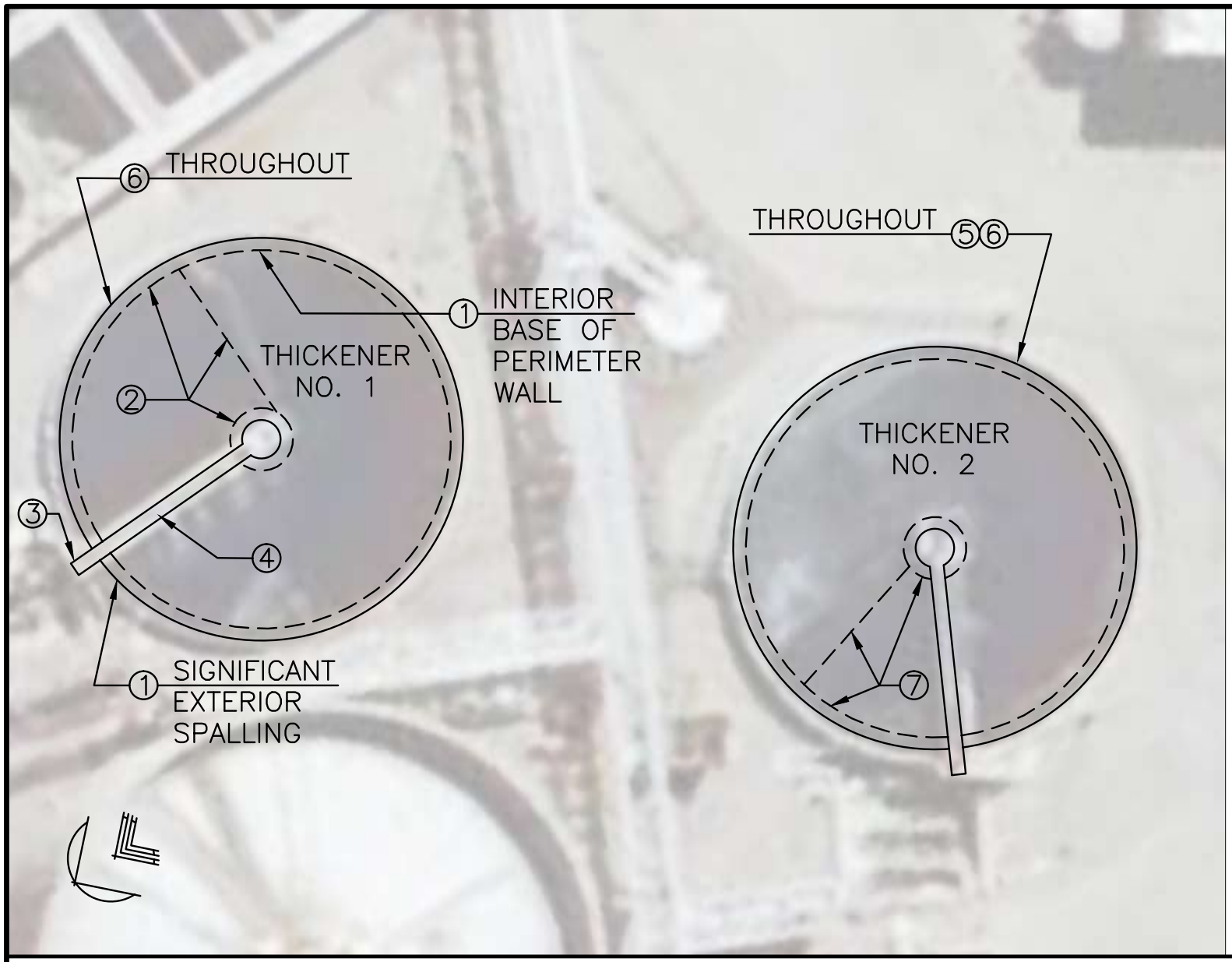
Gravity Thickener No. 1:

1. The concrete launder wall has significant deterioration in several areas as shown in Figure 6.13. In these instances the surface of the concrete has eroded or spalled exposing interior aggregate and reinforcing.

2. The steel parts of the center skimmer arm support ring, the skimmer arm and the perimeter orifice rings are severely corroded and in need of replacement.

3. The north steel access stairs have varying levels of corrosion. Though not an immediate danger, this structure is need of maintenance to prevent further damage.

4. The bridge structure spanning out to the center turnstile has noticeable sag. The girders had been coped, poorly framed and corroding near the turnstile, contributing to sag.



1. SPALLED/ERODED CONCRETE
2. STEEL CORROSION
3. STEEL STAIR CORROSION
4. BRIDGE SAG
5. BASE CHECKING
6. VERTICAL WALL CRACKS
7. STEEL CORROSION (LESS SIGNIFICANT)

SIEGFRIED
CIVIL ENGINEERING
STRUCTURAL ENGINEERING
SURVEYING
PLANNING
3244 Brookside Road, Suite 100 Stockton, California 95219
209-943-2021 www.siegfriedeng.com Fx: 209-942-0214

Figure 6.12
GRAVITY THICKENERS STRUCTURAL OBSERVATIONS
CAPITAL IMPROVEMENT AND ENERGY MANAGEMENT PLAN
CITY OF STOCKTON

10212EXHIBITS.dwg
stk411f33-8581.ai rev 4/13/11

Figure 6.13
GRAVITY THICKENER NO.1 CONCRETE LAUNDER DETERIORATION
CAPITAL IMPROVEMENT AND ENERGY MANAGEMENT PLAN
CITY OF STOCKTON

Gravity Thickener No. 2:

1. The base of the launder wall exhibits some patterned checking of the surface suggesting some moisture seepage through the base slab as shown in Figure 6.14.

2. Some hairline vertical cracking of the ring wall. This cracking is not structurally significant.

3. Some corrosion of the in-water steel components. Thus far, this corrosion is not structurally significant.

6.3.6.2 Findings

Overall, the visible portions of Gravity Thickener No. 1 are in poor condition. The inside of the perimeter launder wall is heavily eroded at the base and along the adjacent channel bottom. This has lead to minor leakage in isolated areas. The perimeter wall section at the north end of the structure has experienced significant spalling. This area is susceptible to failure and collapse which could limit thickener operations.

Gravity Thickener No. 2 is a newer structure and is in generally good condition. The base checking is not structurally significant at this time but warrants re-lining the interior base of the launder wall and channel to prevent further deterioration.

Overall, the configuration of the gravity thickener structures and review of the original construction documents does not present any inherent seismic deficiencies. Further analysis would be required to determine whether the perimeter retaining walls have sufficient reinforcement to resist anticipated seismic forces.

6.3.6.3 Recommendations

Gravity Thickener No. 1:

1. The CIP recommendations in Chapter 4 include demolition of Gravity Thickener No. 1 for future placement of Primary Clarifier Nos. 9 and 10; therefore, no modifications to the existing structure are recommended.

Gravity Thickener No. 2:

1. Re-line the base of the launder wall and channel.

2. Seal the interior face of wall in the cracked areas to reduce moisture migration into the walls.

3. Remove corrosion from skimmer parts and re-coat exposed steel.

Figure 6.14
GRAVITY THICKENER NO. 2 PATTERNED
CHECKING OF CONCRETE WALL
CAPITAL IMPROVEMENT AND ENERGY MANAGEMENT PLAN
CITY OF STOCKTON

stk411f43-8581.ai

6.3.7 Dewatering Building

The sludge filtration building is a two story structure constructed around 1976. The structure consists of concrete encased steel frames, masonry infill walls, and concrete slabs for the roof and floor decks. The central area also has an independent second floor steel mezzanine. Overall, the building's primary structural components are in good condition with some of its secondary components needing further attention as noted herein.

6.3.7.1 Observations

Refer to Figure 6.15 for the location of the following observation items:

1. The primary roof and floor girders have minor hairlines cracks which are generally structurally insignificant as the concrete in these cases only serves as fire proofing for the encased steel beams. Some of the roof girders appear to have moisture retained in the cracks from possible roof leakage.

2. The roof deck has considerable cracking around the ventilation openings in each bay, some of which exhibit signs of active roof leakage.

3. The center section of the steel mezzanine in the center of the building lacks seismic support in the north-south direction.

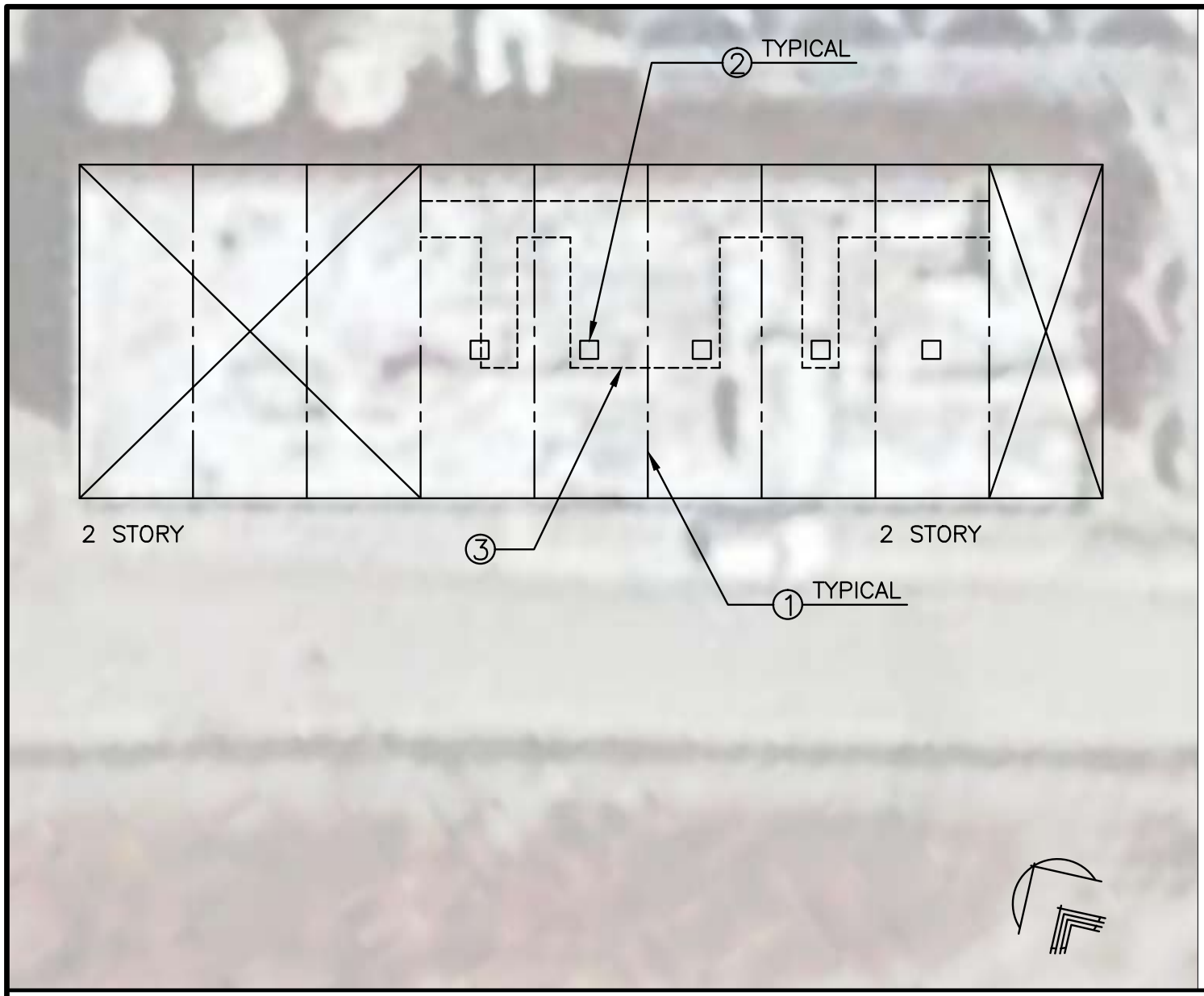
4. Some of the concrete bases supporting equipment mounts are degraded and in need of repair.

6.3.7.2 Findings

Overall, the primary structural concern for this building is the maintenance and integrity of the roof membrane. The cracking in the roofing appears to allow water infiltration into the deck and adjoining roof beams. Thus far, there has been no observed rust staining that would be an indication of steel corrosion within the concrete. However, left unattended, this condition could lead to corrosion and structural deterioration.

In general, the roof deck cracking is small enough that it is not in immediate danger of failure; however, immediate crack repair is warranted to prevent further deterioration.

The lateral load resisting system of this building consists of rigid floor and roof diaphragms with masonry shear walls. This system is in good condition and provides a complete load path for resisting seismic loads. Overall, the system should perform reasonably well during a seismic event. One possible exception is the first floor eastern most interior shear wall. This wall may be overstressed under seismic loading and the reinforcing does not conform to current building code seismic standards making this wall susceptible to damage. Further detailed analysis would be required to better assess the wall's capacity.



1. ROOF GIRDERS
2. EXHAUST FAN OPENING CRACK ROOF DECKING IN VICINITY
3. CENTER MEZZANINE IN NEED OF SEISMIC SUPPORT

SIEGFRIED
CIVIL ENGINEERING
STRUCTURAL ENGINEERING
SURVEYING
PLANNING
3244 Brookside Road, Suite 100 Stockton, California 95219
209-943-2021 www.siegfriedeng.com Fx: 209-942-0214

Figure 6.15
DEWATERING BUILDING STRUCTURAL OBSERVATIONS
CAPITAL IMPROVEMENT AND ENERGY MANAGEMENT PLAN
CITY OF STOCKTON

10212EXHIBITS.dwg
stk411f34-8581.ai rev 4/13/11

6.3.7.3 Recommendations

The CIP recommendations in Chapter 4 include demolition of the existing Dewatering Building and construction of a new Dewatering Building near the dewatered cake loading area; therefore, none of the following recommendations are included in the CIP costs.

1. Route and pressure grout the larger roof deck cracks.
2. Provide new roofing to seal the roof after crack repairs have been completed.
3. Provide further analysis and investigation of the interior shear wall.
4. Provide additional north-south seismic bracing of the steel mezzanine.
5. Repair deteriorated concrete equipment mounts.

6.3.8 Primary Clarifiers

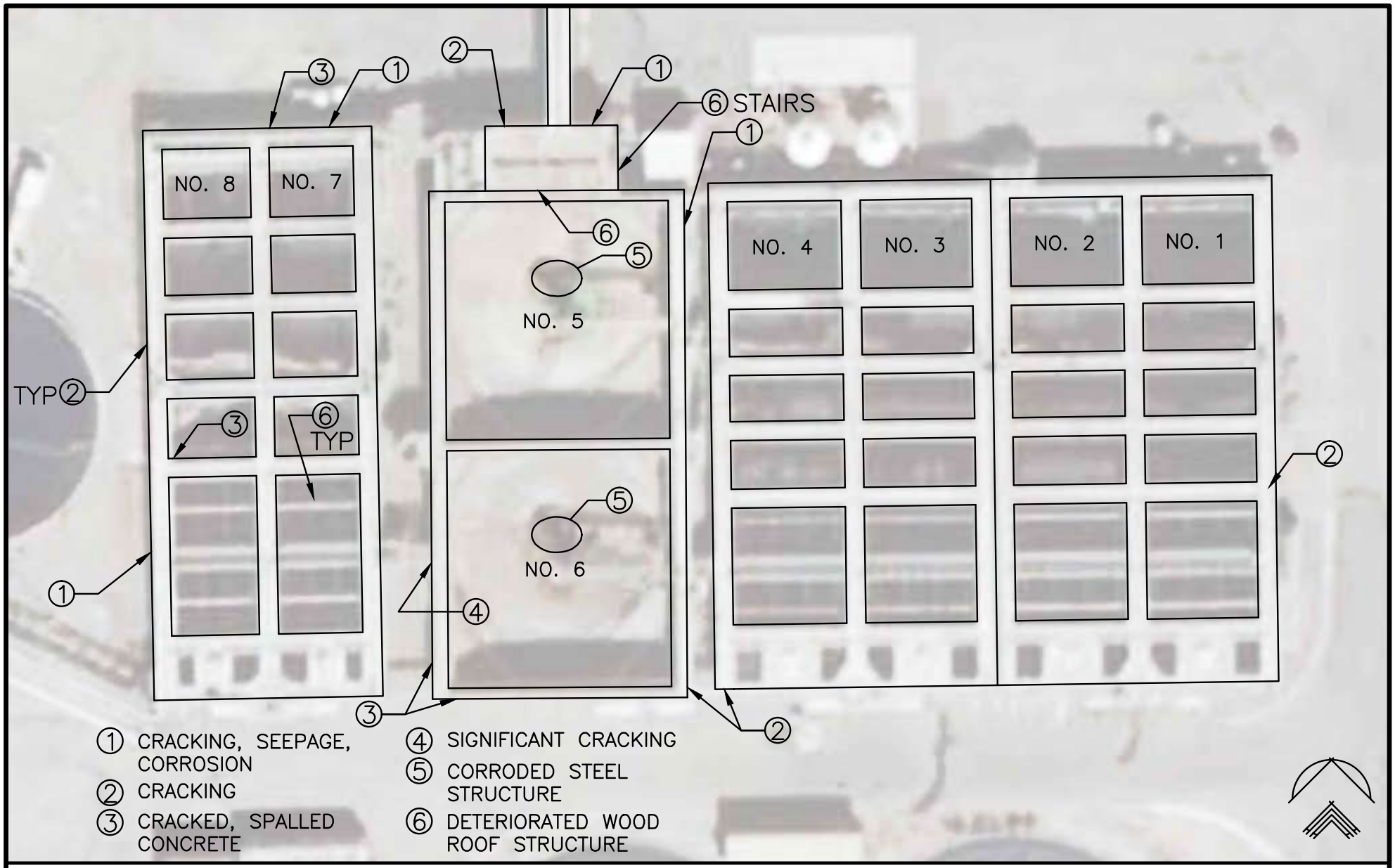
The Primary Clarifiers are reinforced concrete structures that were constructed in several stages. Clarifier Nos. 1 through 4 were constructed per the 1946 plans. Clarifier Nos. 5 and 6 were constructed prior to 1962 and Clarifier Nos. 7 and 8 were constructed between 1995 and 2002.

During the site visit Clarifier Nos. 1 through 4, 7 and 8 were in service. Clarifier Nos. 5 and 6 were not in service but were filled approximately half way with process water. Submerged areas were not available for observations.

6.3.8.1 Observations

Refer to Figure 6.16 for the location of the following observation items:

1. Cracking on the exterior wall was found in several walls where seepage was occurring. These locations also showed evidence of corrosion in the reinforcing steel within the walls.
2. Random minor cracking throughout much of the structure's walls and decks. These cracks do not reveal any seepage or corrosion and appear to be structurally insignificant.
3. Some cracked areas have also spalled sections of concrete. Some of these locations are noted on Figure 6.16. Other minor spalls were found but not identified. Overall, most of the spalling is structurally insignificant and easily repairable.
4. One location on Clarifier No. 6 has significant cracking on the west exterior wall.
5. The center turnstile steel apparatus within Clarifier Nos. 5 and 6 has significant corrosion as shown in Figure 6.17. Overall, most of the steel framing and related structures within all filters have some level of corrosion.



SIEGFRIED
CIVIL ENGINEERING
STRUCTURAL ENGINEERING
SURVEYING
PLANNING
3244 Brookside Road, Suite 100 Stockton, California 95219
209-943-2021 www.siegfriedeng.com Fx: 209-942-0214

Figure 6.16
PRIMARY CLARIFIERS STRUCTURAL OBSERVATIONS
CAPITAL IMPROVEMENT AND ENERGY MANAGEMENT PLAN
CITY OF STOCKTON

10212EXHIBITS.dwg
stk411f35-8581.ai rev 4/13/11

Figure 6.17
CORROSION OF PRIMARY CLARIFIER
NOS. 5 AND 6 MECHANISMS
CAPITAL IMPROVEMENT AND ENERGY MANAGEMENT PLAN
CITY OF STOCKTON

6. The small shed wood framed roof structure is rotted in several locations and is in poor condition.

6.3.8.2 Findings

Overall, there were no structural elements identified that have failed or deteriorated to the point where the immediate clarifier structure functions are affected. Most of the cracking and spalling observed is readily repairable and does not presently affect the structural integrity of the structures.

The areas where seepage and corrosion has occurred will require some destructive examination, removal of concrete, to determine the extent of the corrosion and repair required. The significant cracking on the west side of Clarifier No. 6 will require more significant repair.

The corroded steel structures such as the steel launders, weirs, stairs and turnstiles are generally functional features of the system that do not support significant loads or add to the structural integrity of the tanks. However, these features do require maintenance, repair and, in some cases, replacement to maintain their current functions.

The seismic load resisting systems consist of the clarifier tank walls. These components provide a complete path for seismic load resistance and, except as noted, are in reasonably good condition. In the event of a significant seismic event, it is expected that this structure would sustain some cracking and moderate damage but remain functional.

6.3.8.3 Recommendations

1. Route and pressure grout the more significant wall and decking cracks. Hairline cracks require no repair at his time but should be re-inspected periodically to monitor any changes.

2. Repair spalled concrete areas by chipping and removing loose concrete and re-pouring voided areas.

3. Chip and remove concrete adjacent to cracks with corrosion seepage for further examination and repair recommendations.

4. Remove and replace the damaged wall and deck section on the west side of Clarifier No. 6.

5. Remove and if needed replace the damaged wood roof structure.

6. Remove corrosion from the rusted steel features and apply rust inhibiting coatings or replace the elements as needed.

6.3.9 Tertiary Filters

The Tertiary Filter is a reinforced concrete structure located at the plant's Tertiary facility south of the San Joaquin River. Filter Nos. 1 through 4 were constructed around the mid 1970s based on approved plans dated in 1973. Filter Nos. 5 and 6 were constructed at a later date. All of the filters were in service; therefore, submerged areas were not available for observation.

6.3.9.1 Observations

Refer to Figures 6.18 and 6.19 for the location of the following observation items:

Above-Grade Observations:

1. The above grade concrete deck surfaces at Filters 1 through 4 are worn and have random cracking in various areas. The cracking is not structurally significant at this time.

2. The expansion joint between Filters 3A and 3B reveals both horizontal movement of approximately 1/4-inch and vertical movement on the north side of approximately 1/4-inch.

3. The exterior above grade walls are cracked in several locations. The more significant cracks are identified on Figure 6.18.

4. Several larger cracks along the north side were previously repaired and remain in good condition.

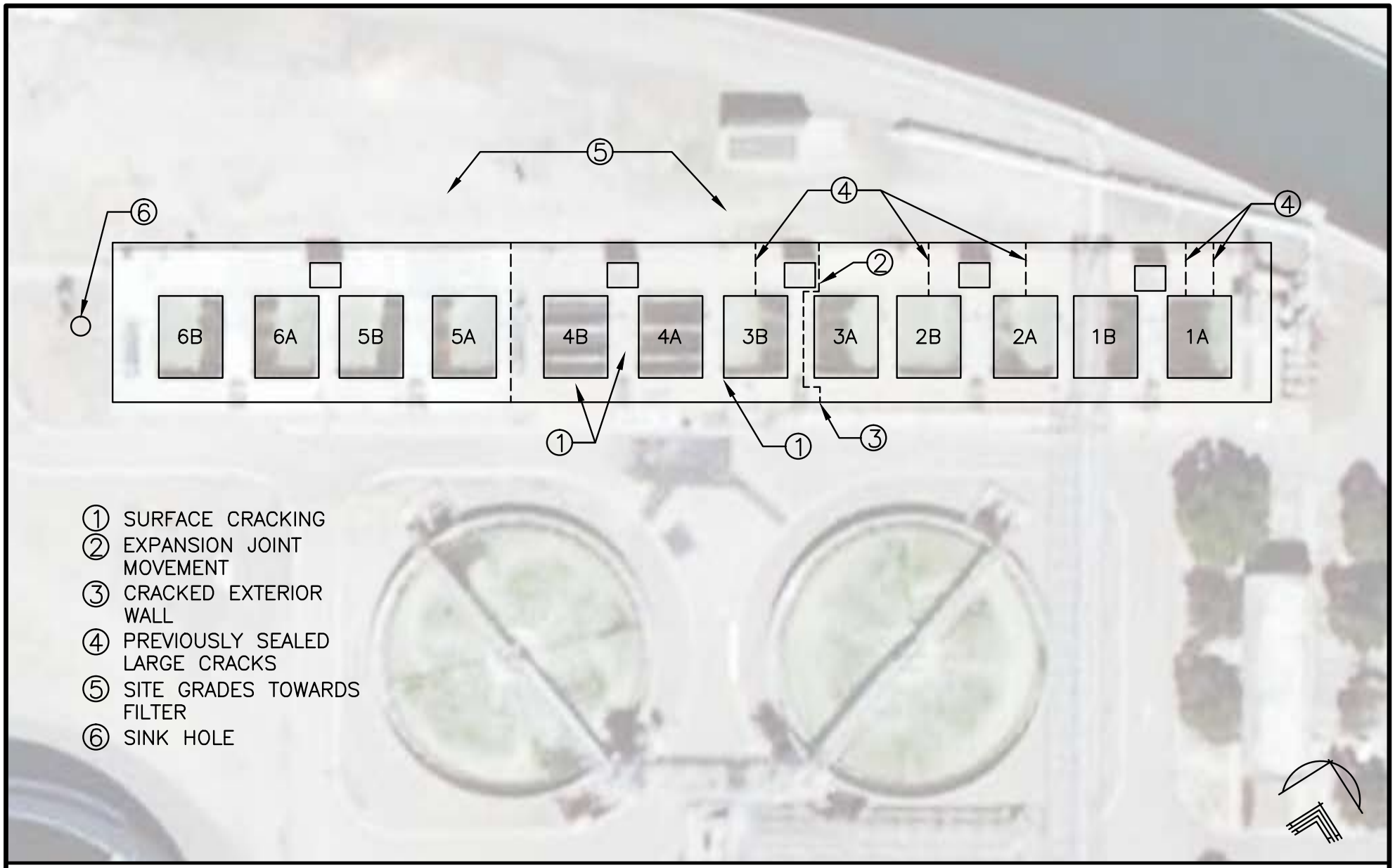
5. The open site area to the north appears to grade and drain back towards the filters.

6. A four foot deep sink hole was located in the site area just west of the filters.

Below-Grade Observations: All of the below grade observations were conducted in the stairwells and the piping chase along the north side of the filters.

1. Seepage and standing water was observed at the base of the stairwell walls. Some of the standing water may have come from recent rains as the top of the stairwell is open. However, there is active seepage from the base of the walls and the vertical wall corners.

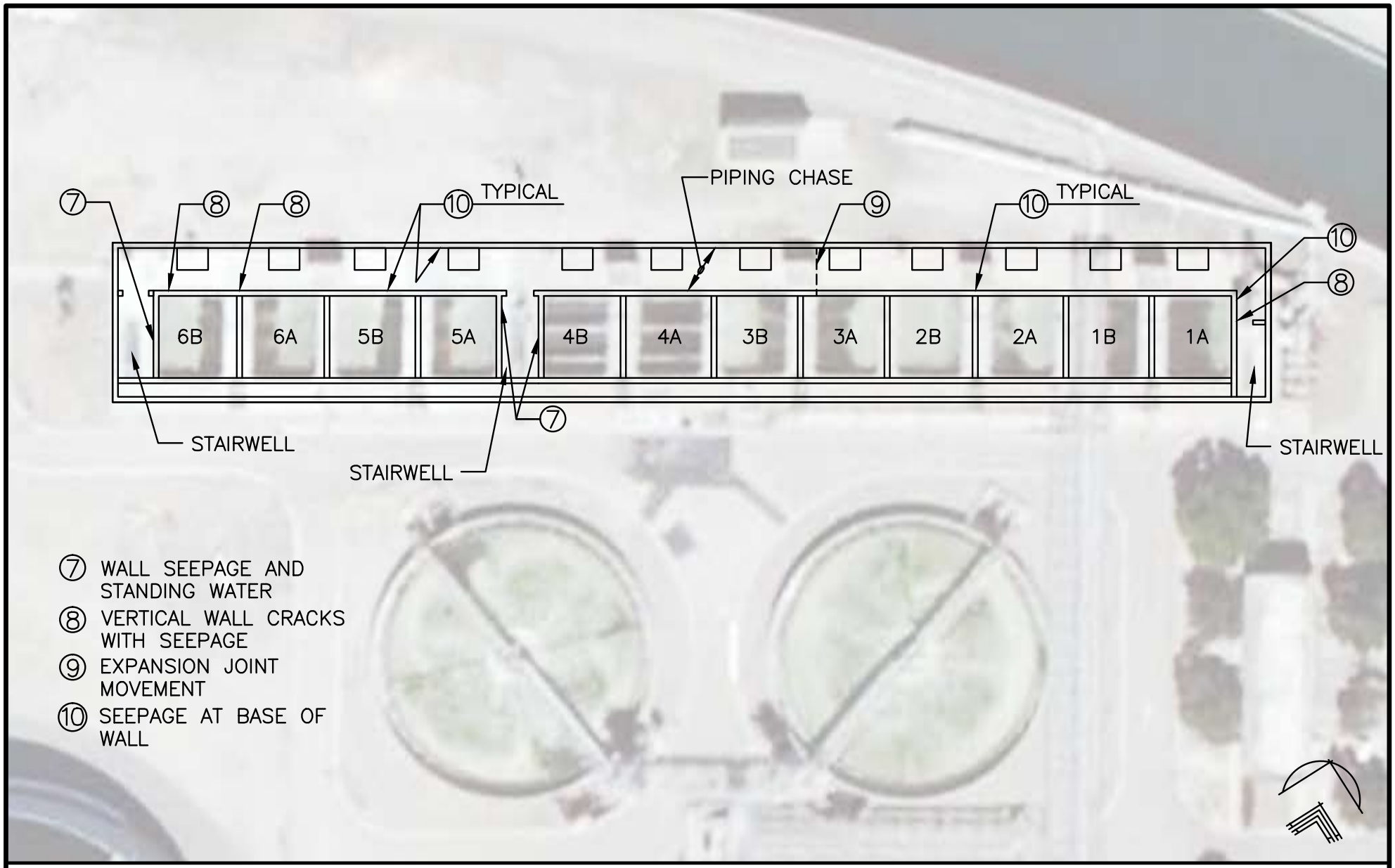
2. Several vertical cracks with active seepage were found on the filter tank walls along the south and east sides of the pipe chase.



SIEGFRIED
CIVIL ENGINEERING
STRUCTURAL ENGINEERING
SURVEYING
PLANNING
3244 Brookside Road, Suite 100 Stockton, California 95219
209-943-2021 www.siegfriedeng.com Fx: 209-942-0214

Figure 6.18
TERTIARY FILTERS ABOVE-GRADE STRUCTURAL OBSERVATIONS
CAPITAL IMPROVEMENT AND ENERGY MANAGEMENT PLAN
CITY OF STOCKTON

10212EXHIBITS.dwg
stk411f36-8581.ai rev 4/13/11



SIEGFRIED
CIVIL ENGINEERING
STRUCTURAL ENGINEERING
SURVEYING
PLANNING
3244 Brookside Road, Suite 100 Stockton, California 95219
209-943-2021 www.siegfriedeng.com Fx: 209-942-0214

Figure 6.19
TERTIARY FILTERS BELOW-GRADE STRUCTURAL OBSERVATIONS
CAPITAL IMPROVEMENT AND ENERGY MANAGEMENT PLAN
CITY OF STOCKTON

10212EXHIBITS.dwg
stk411f37-8581.ai rev 4/13/11

3. Expansion joint movement was observed on the pipe chase walls, floor and ceiling corresponding with item 2 above.

4. Moisture seepage was observed along the base of most of the filter walls.

5. It was noted that there is seepage at the base of the north pipe chase wall, possibly from either ground water or infiltration from surface runoff per item 5 above.

6.3.9.2 Findings

The above grade decking and wall cracks are not structurally significant at this time. However, they are in need of maintenance and repair in order to minimize further deterioration.

At this time, the movement of the expansion joint does not appear to have caused structural damage. The movement could be the result of subgrade saturation caused by surface runoff infiltration and/or tank leakage. This condition should be further monitored to determine the rate of movement and whether it is an active condition.

Substantial seepage is occurring through tank's vertical and horizontal joints and as well as the observed cracks. At this time no visible structural damage has occurred. However, some indications of corrosion suggest the beginning of wall deterioration. Continued seepage will deteriorate the structure further and can ultimately cause structural failure. One or two selected areas should be exposed to further evaluate the extent of corrosion. Refer to the Recommendations section below for further direction.

6.3.9.3 Recommendations

1. Route and seal cracks on the above grade deck and walls.

2. Re-seal expansion joints from both the exposed surface and the interior tank surfaces when the filters are out of service.

3. Chip and remove concrete in the vicinity of selected areas exhibiting corrosion reinforcement for further examination and recommendations.

4. Re-seal tank bottoms and walls along the interior surface of the tank to reduce seepage at wall bases and cracks. Prior to re-sealing, all cracks should be routed and pressure grouted.

5. Conduct long term monitoring of the opening expansion joint to measure and assess movement. This can be done by installing concrete crack gauges and monitoring the movement over a one year period.

6. Re-grade the site area to the north to reduce surface moisture infiltration against the north wall.

7. Excavate the sink hole to determine the potential cause. Verify no plumbing exists in this area that may have contributed to the hole. Backfill and re-compact the excavation.

OPERATIONS SUPPORT FACILITIES ASSESSMENT

7.1 INTRODUCTION

This section describes the existing operations support facilities for the City of Stockton's Regional Wastewater Control Facility (RWCF) and outlines recommended modifications to the Administration Building, Laboratory, Engineering Building, Maintenance and Collection Building, Operations Building, and Tertiary Support Building. Recommendations for architectural improvements were prepared by WMB Architects and include mechanical and plumbing recommendations by Alexander Scheflo and Associates, electrical recommendations by HCS Engineering, Inc., and structural recommendations by Siegfried Engineering. Detailed condition assessments for the Operations Support Facilities are provided in the Appendices.

7.2 ADMINISTRATION BUILDING

The existing Administration building was constructed as part of the Buildings and Additions Project in the mid-1970s. The building houses the laboratory, administrative staff offices, conference rooms, and a break room. The building has a number of constraints and issues that are described below.

Recommended modifications to address the constraints are also listed below. A conceptual floor plan and rendering for the Administration Building expansion is shown in Figure 7.1. A conceptual floor plan and rendering for the new Laboratory Building is shown in Figure 7.2. Cost estimates for the recommended improvements are presented in the Appendices.

Existing Constraints:

- The current laboratory is undersized and cannot accommodate the current and projected staff, equipment, storage, and functional requirements. Laboratory activities are currently spread out throughout the RWCF and could be more efficiently performed in a consolidated, fully functional facility.
- The laboratory performs testing on water and wastewater samples collected from sites throughout the City. New sampling receiving facilities are required that allow for expedient processing and orderly transfer of samples.
- The HVAC system for the Administration Building must be operating 24 hours per day, 7 days a week because the HVAC system is shared with the laboratory – which is always open. Ideally, the Administration Building would function solely as an office building (operating during normal business hours) which would reduce energy demands and increase the comfort level of staff.

NORTH ELEVATION CONCEPT

WEST ELEVATION CONCEPT

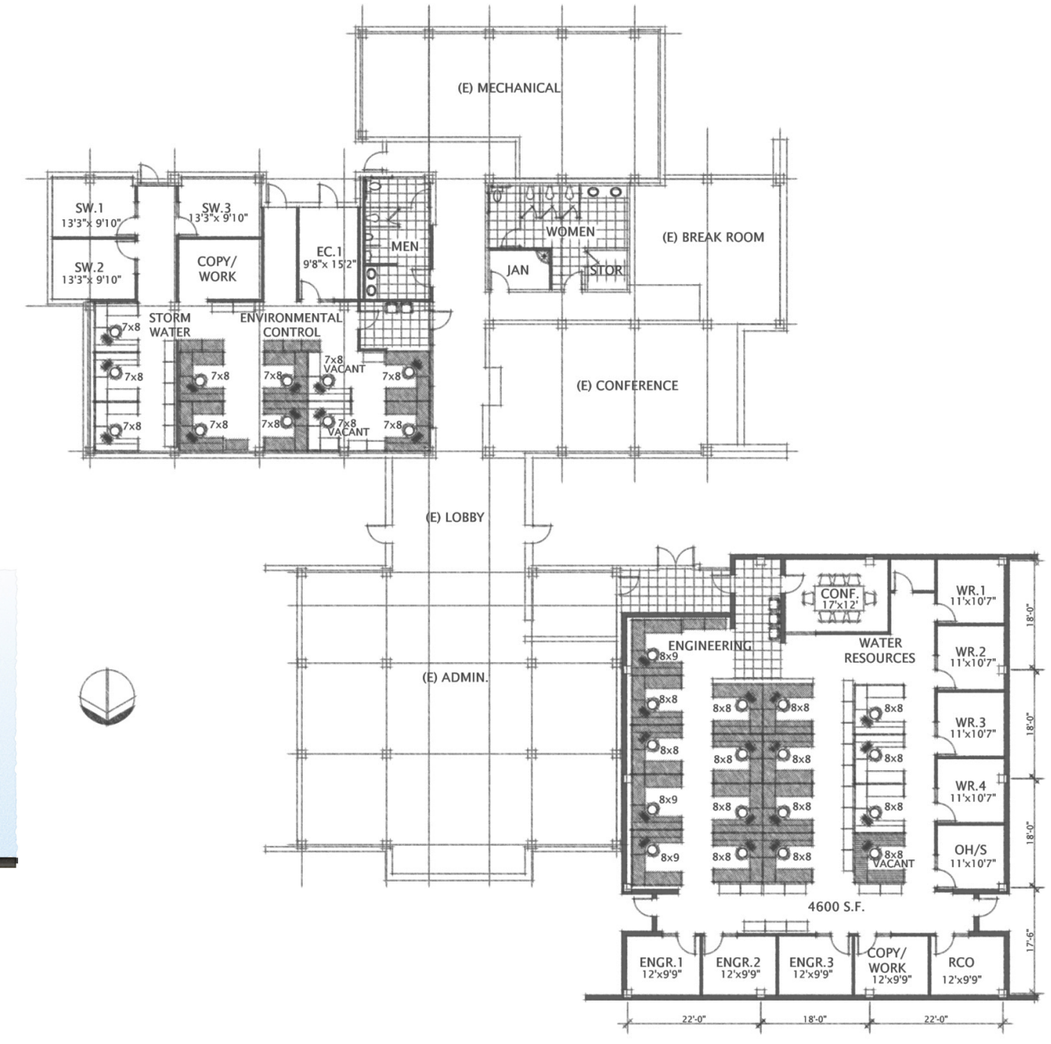


Figure 7.1
CONCEPTUAL FLOOR PLAN FOR
ADMINISTRATION BUILDING EXPANSION
CAPITAL IMPROVEMENT AND ENERGY MANAGEMENT PLAN
CITY OF STOCKTON

stk411f11-8581.ai1

NORTH ELEVATION CONCEPT

WEST ELEVATION CONCEPT

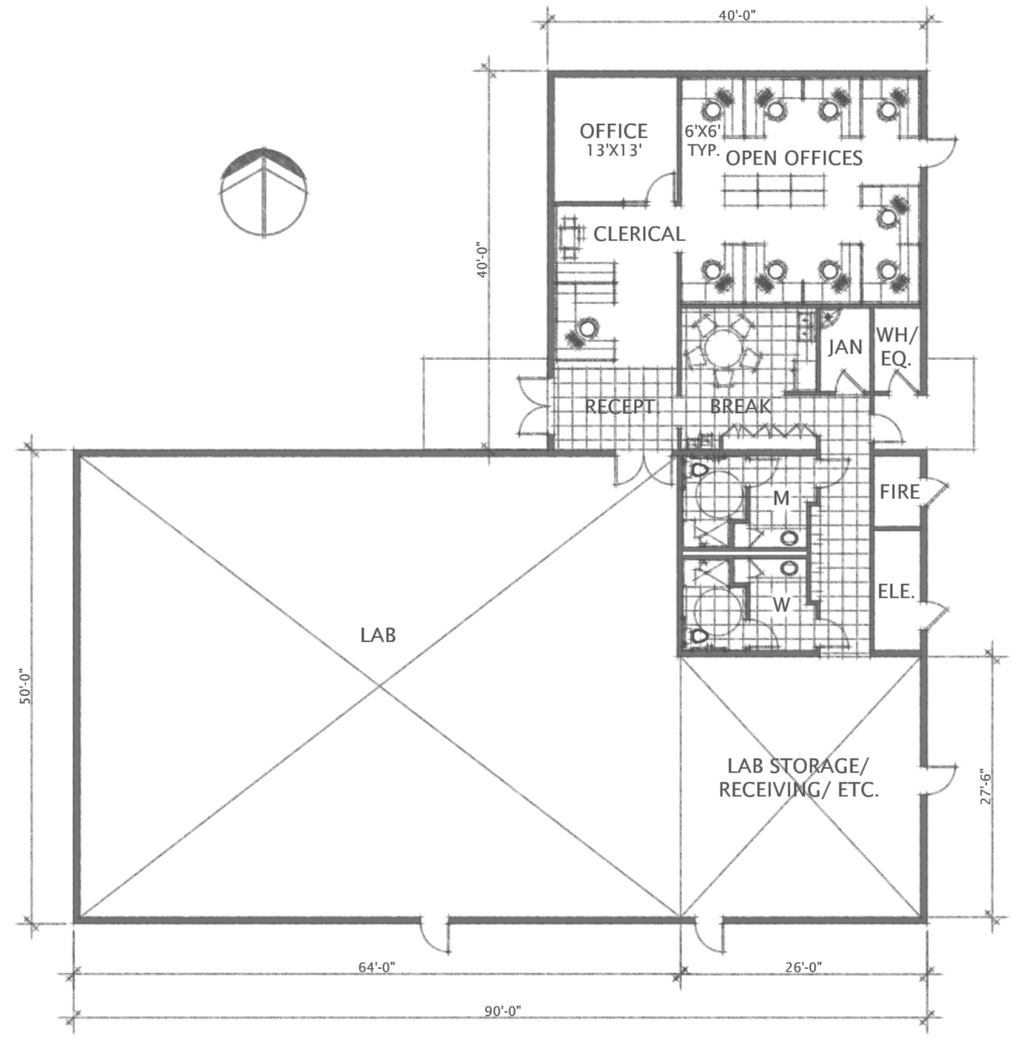


Figure 7.2
CONCEPTUAL FLOOR PLAN FOR
NEW LABORATORY BUILDING
CAPITAL IMPROVEMENT AND ENERGY MANAGEMENT PLAN
CITY OF STOCKTON

stk411f12-8581.ai1

- Administrative, Engineering, and Staff from other Divisions are located in offices spread throughout the RWCF. The area housing Environmental Control and Stormwater staff is adjacent to the Headworks and Headworks rehabilitation will result in demolition of existing office space. A consolidated facility would provide a common set of restrooms, a break room, and conference room facilities for all staff.
- The Engineering Department is located in a temporary modular facility located west of the existing Administration Building. The modular facility is cramped and additional space is required for both staff and archival storage.
- The restroom facilities do not meet Americans with Disabilities Act (ADA) accessibility and California Plumbing Code (CPC) requirements.
- The HVAC system is obsolete and is in need of a major rehabilitation.

Recommended Modifications:

- Construct a new, 6,000-square foot (sf), self-contained building to house the laboratory. The new Laboratory Building would be located in the near the existing guest parking area east of the existing Administration Building. As mandated by the City of Stockton, the Laboratory Building will be designed to achieve LEED (Leadership in Energy and Environmental Design) Silver Certification under the New Construction and Major Renovation Rating System.
- Convert existing 2,660 sf laboratory into offices to allow consolidation of staff located in offices throughout the plant.
- Construct a 4,600-sf office addition to house engineering staff.
- Remodel existing restrooms to comply with ADA requirements, CPC requirements, and allow the facilities to accommodate an increased occupant load.
- Replace the HVAC system, provide a new fire suppression system, and replace the electrical system.
- Repurpose the engineering modular structure into a record storage facility or demolish the structure.
- Implement structural recommendations per Siegfried Engineering structural condition assessment summarized in Chapter 6.

7.3 MAINTENANCE AND COLLECTION BUILDING

The existing Maintenance and Collection Building was constructed approximately 10 years ago. The building houses a maintenance shop, computer workstations for maintenance and

collections staff, a large conference room, and restrooms. The building has a number of constraints and issues that are described below.

Recommended modifications to address the constraints are also listed below. A conceptual floor plan for the Maintenance and Collection Building expansion is shown in Figure 7.3. Cost estimates for the recommended improvements are presented in the Appendices.

Existing Constraints:

- The existing building does not contain sufficient office space for the Maintenance and Collection Departments. Recently, temporary, modular buildings have been installed near the existing building to provide additional required office space. Based on this anecdotal evidence and projected occupant load calculations for office space requirements, the current building is undersized.
- Existing shop space is limited, particularly when large equipment, such as vertical turbine pumps, must be serviced in the shop. Equipment must often be stored outside, which exposes both tools and equipment to the elements.
- There is only one parking canopy structure. Expensive equipment, such as sewer Vactor trucks must be parked outside exposed to the elements.

Recommended Modifications:

- Construct a 2,400-sf building expansion and remodel a portion of the existing building. The larger building would provide the office space required to accommodate existing and future maintenance and collection system staff.
- Provide two pre-fabricated covered canopies in the Maintenance Shop and vehicle/equipment area. The canopies would protect materials, equipment, and vehicles currently exposed to the elements. The canopies would also provide additional working area for maintenance staff.
- Miscellaneous improvements including electrical improvements, an expanded fire alarm control panel, and additional exterior lighting.
- Implement structural recommendations per Siegfried Engineering structural condition assessment summarized in Chapter 6.

7.4 OPERATIONS BUILDING

The existing Operations Building was constructed as part of the Buildings and Additions Project in the mid-1970s. The building is located on top of the raw sewage pump station, between the Headworks and Cogeneration Buildings. The Operations Building houses locker rooms, the plant control room, a break room, and several offices. The building has a number of constraints and issues that are described below.

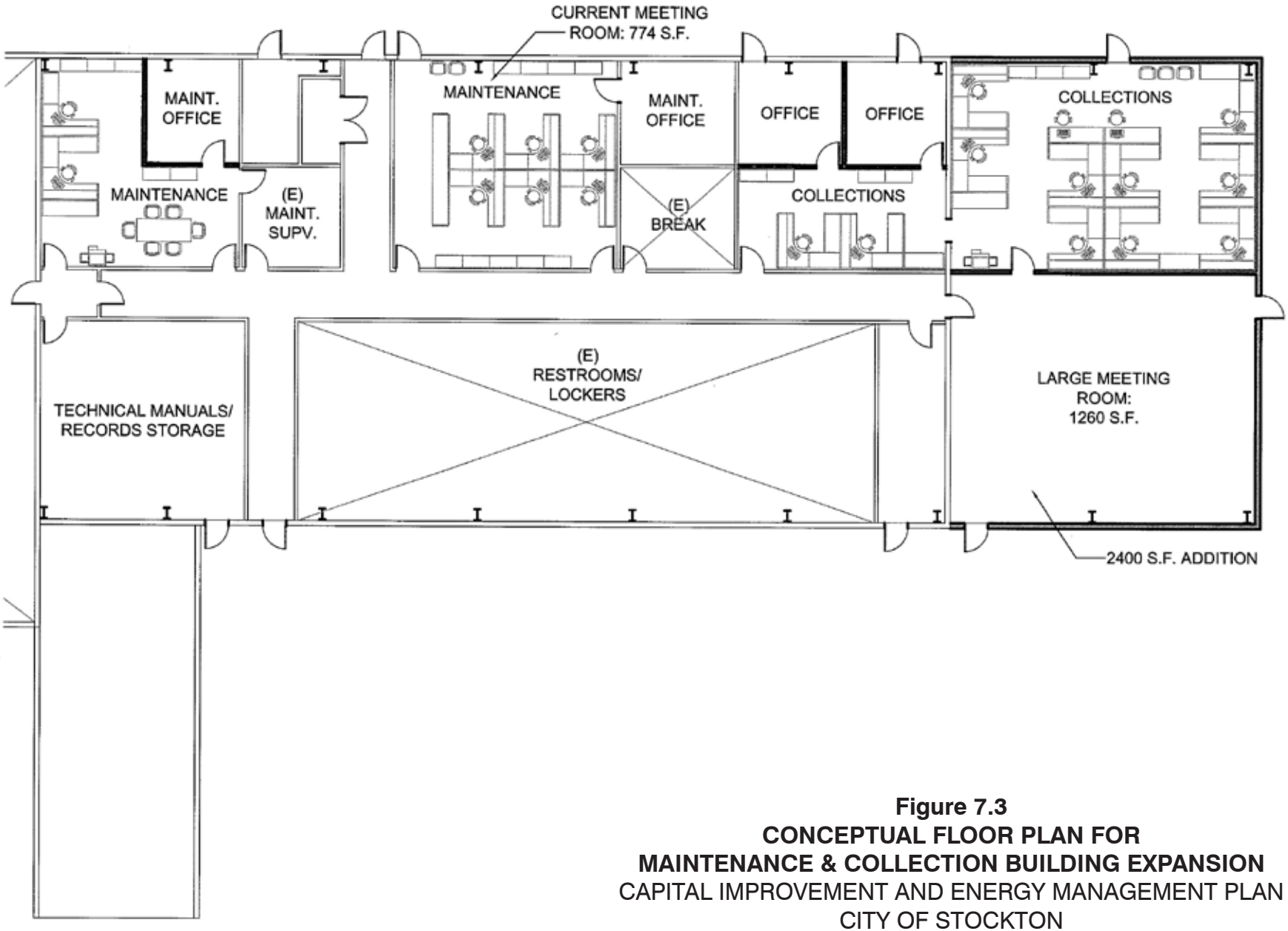


Figure 7.3
CONCEPTUAL FLOOR PLAN FOR
MAINTENANCE & COLLECTION BUILDING EXPANSION
CAPITAL IMPROVEMENT AND ENERGY MANAGEMENT PLAN
CITY OF STOCKTON

stk411f13-8581.ai rev 4/7/11

Recommended modifications to address the constraints are also listed below. A conceptual floor plan for the ground floor of the proposed first floor accessibility improvements is shown in Figure 7.4. Cost estimates for the recommended improvements are presented in the Appendices.

Existing Constraints:

- Ground floor restrooms and locker rooms do not meet ADA and CPC requirements.
- Existing elevator to the second floor offices, plant control room, and break room is non-functional.
- There is no separation between the plant control room and the break room. In addition, the interior finishes (floor, ceilings, cabinets, etc) on the second floor are worn and in need of replacement.

Recommended improvements:

- Remodel the ground floor of the building to provide restrooms and locker rooms that comply with ADA and CPC requirements.
- Remodel the second floor to provide separation between the break room and the plant control room. Provide new interior finishes.
- Rebuild the existing elevator (and elevator shaft, if necessary) to restore the elevator to a functional condition.
- Provide miscellaneous electrical, mechanical, and structural improvements.

7.5 TERTIARY SUPPORT BUILDING

The existing Tertiary Support Building was constructed as part of the original Tertiary Treatment Facility project in the mid-1970s. The building houses the tertiary plant control room, electrical equipment, restrooms, and an engine generator room. The building has a number of constraints and issues that are described below.

Recommended modifications to address the constraints are also listed below. A conceptual floor plan for the proposed modifications is shown in Figure 7.4. Cost estimates for the recommended improvements are presented in the Appendices.

Existing Constraints:

- An additional office is required for the Senior Plant Operations Supervisor at the Tertiary plant location.
- The existing engine generator room at the Tertiary plant houses equipment that is no longer in use.

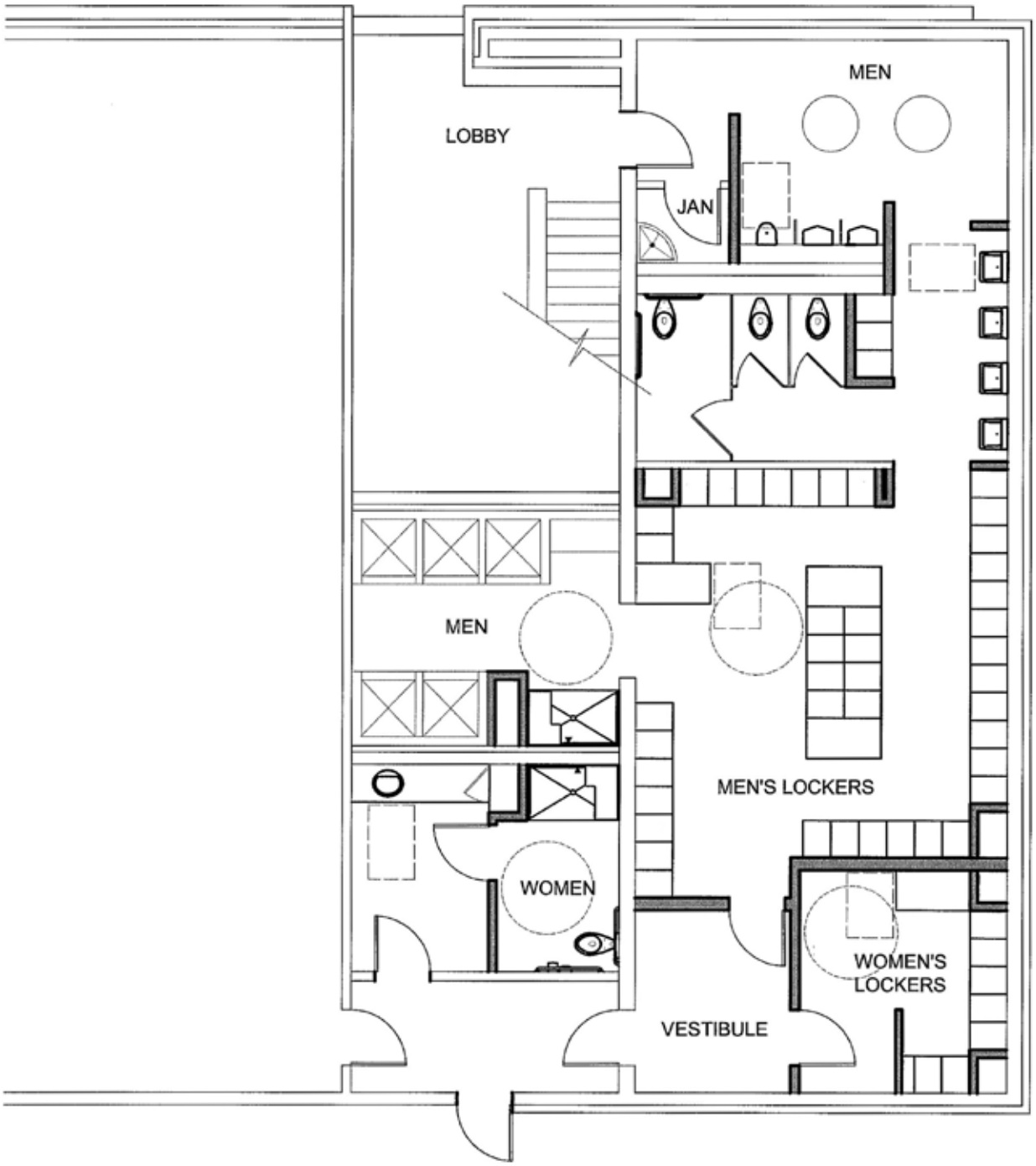


Figure 7.4
CONCEPTUAL FLOOR PLAN FOR
OPERATIONS BUILDING ACCESSIBILITY IMPROVEMENTS
CAPITAL IMPROVEMENT AND ENERGY MANAGEMENT PLAN
CITY OF STOCKTON

stk411f14-8581.ai rev 4/7/11

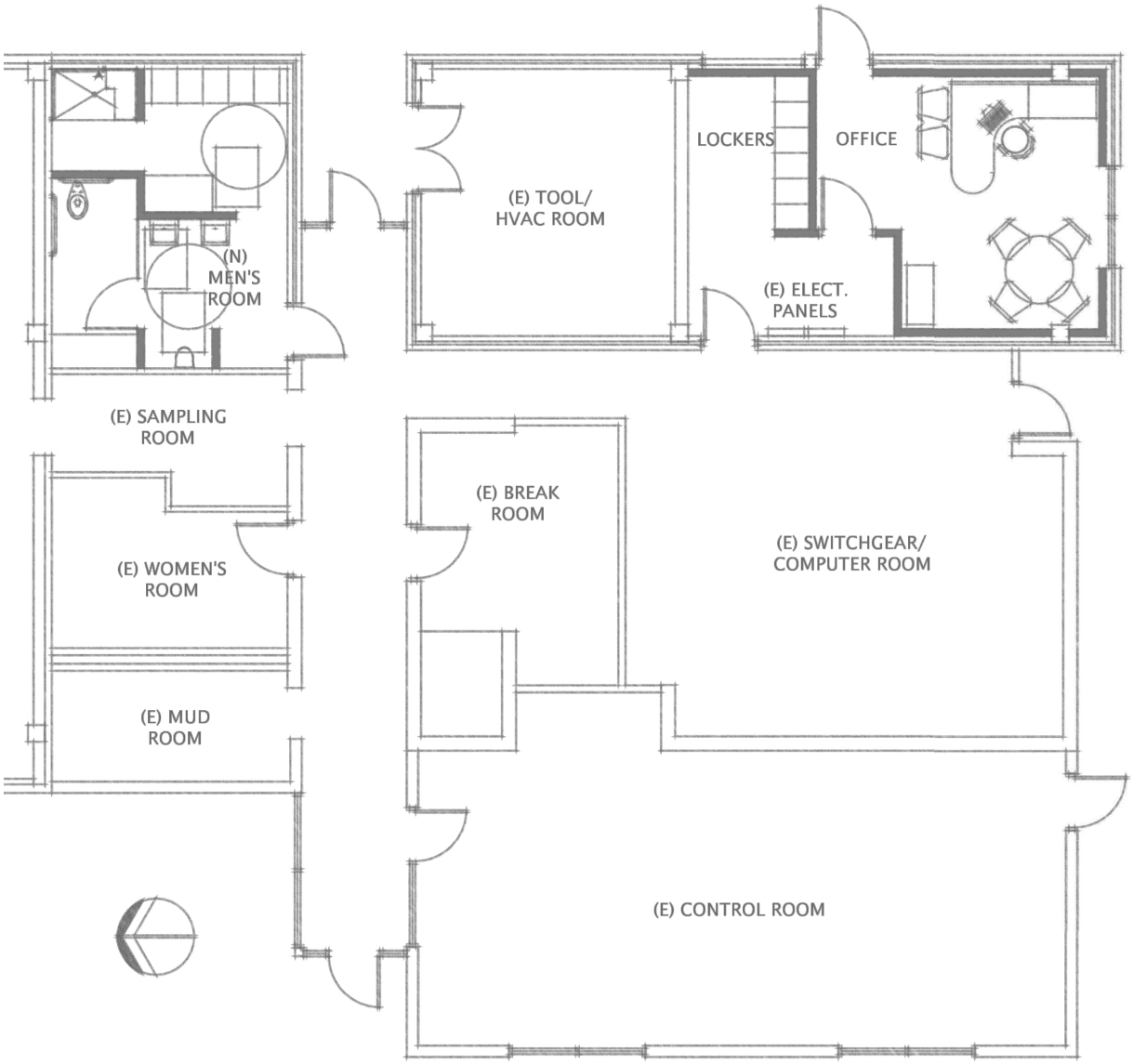


Figure 7.5
CONCEPTUAL FLOOR PLAN FOR
TERTIARY SUPPORT BUILDING IMPROVEMENTS
CAPITAL IMPROVEMENT AND ENERGY MANAGEMENT PLAN
CITY OF STOCKTON

st511f11-8581.ai

- The HVAC system does not have the capacity to cool the building sufficiently on hot summer days.

Recommended Improvements:

- Remove the existing engine generator and appurtenances. Remodel the engine generator room to allow the space to be repurposed to an office.
- Upgrade the HVAC system and perform miscellaneous electrical improvements.

SITE PLANNING

8.1 INTRODUCTION

The following sections describes the existing site conditions at the City of Stockton Regional Wastewater Control Facility (RWCF) and provides recommendations for improving security, flood protection, and vehicular access.

8.2 BASE MAPPING AND AERIAL SURVEY

A new base map was prepared for the RWCF to assist in the CIP planning process. The topographical base map encompasses the 1000 acre plant site and was produced from data obtained from aerial orthophotography. A total of 12 control points were set around the RWCF site prior to the aerial flyover in December 2010. This produced a base map with coordinates and elevations that are accurate to within 1".

Figures 8.1 and 8.2 show the base maps for the Main Plant and Tertiary Plant, respectively. The maps are at a scale of 1"=50' with contours at 2 foot intervals. The horizontal control is based on the State Plane Coordinate System California 3 (NAD83/91) and the vertical control is based on the North American Vertical Datum 1988 (NAVD88). Contours in obscured areas are dashed to indicate the need to complete field topographic surveys in these areas prior to final design.

8.3 SITE SECURITY RECOMMENDATIONS

In order to assess security threats of the RWCF, a site specific security evaluation was performed. The purpose of the evaluation was to provide recommendations for enhancing the physical security of the facility in order to better protect the Facility, its assets, personnel, and the population of the City of Stockton. This security threat assessment report details the current state of security at the RWCF, indicates vulnerabilities, and recommends enhancements based on levels of severity. The methodology used throughout this assessment is primarily qualitative, therefore annual loss expectancies and cost effectiveness of security enhancement recommendations were not performed. However, cost projections for proposed enhancements are included herein.

The security threat assessment identified vulnerabilities in the areas of public access to the Facility, video surveillance, sensitive area protection, and critical asset protection. Vulnerabilities are weaknesses susceptible to exploitation by a threat or group of threats. The recommendations provided in the following sections are intended to mitigate those vulnerabilities. The vulnerabilities identified were ranked as **Low**, **Moderate**, and **High**. Table 8.1 defines the various levels of risks.

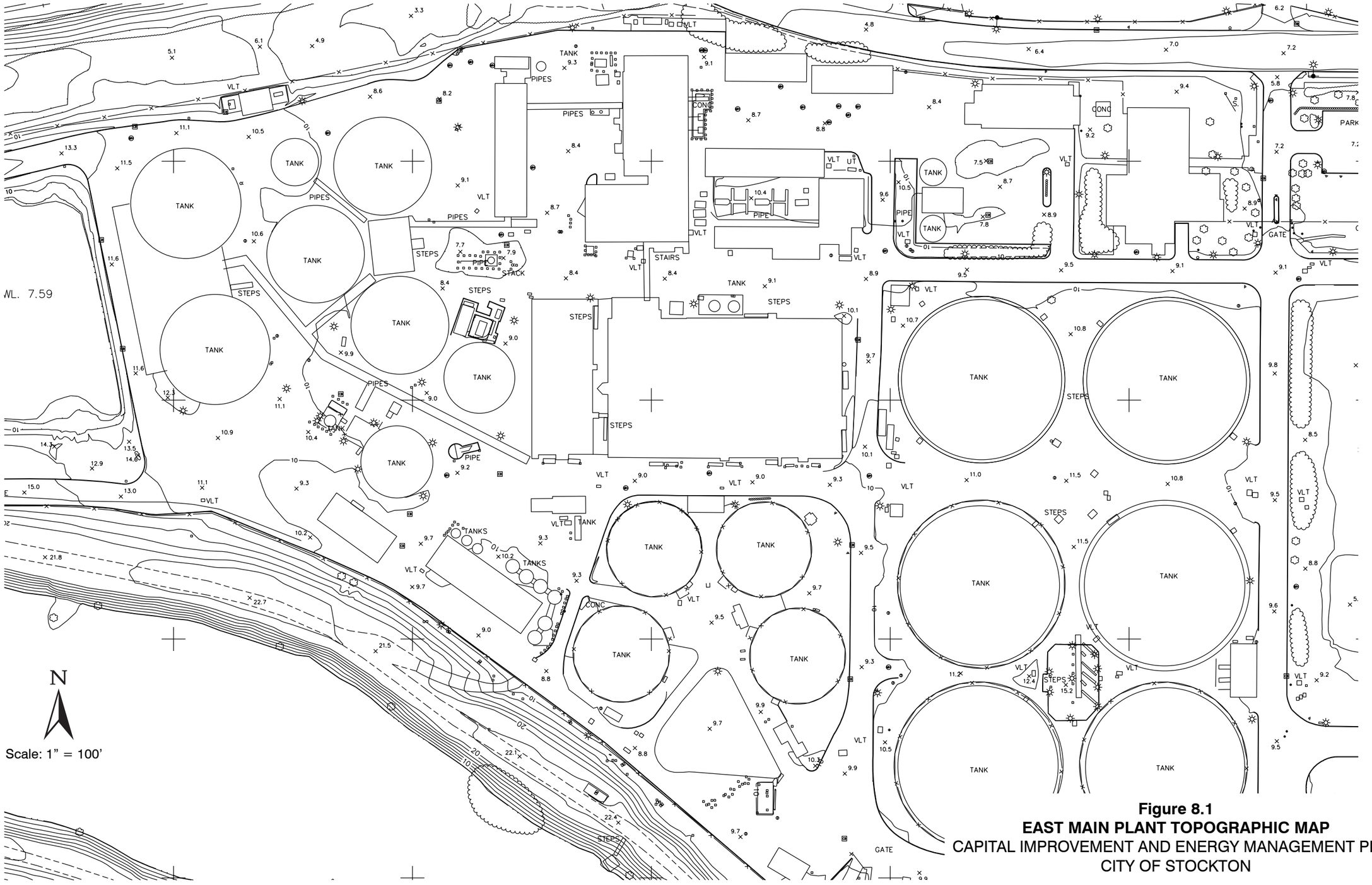


Figure 8.1
EAST MAIN PLANT TOPOGRAPHIC MAP
CAPITAL IMPROVEMENT AND ENERGY MANAGEMENT PLAN
CITY OF STOCKTON

stk411f24-8581.ai 4/12/11

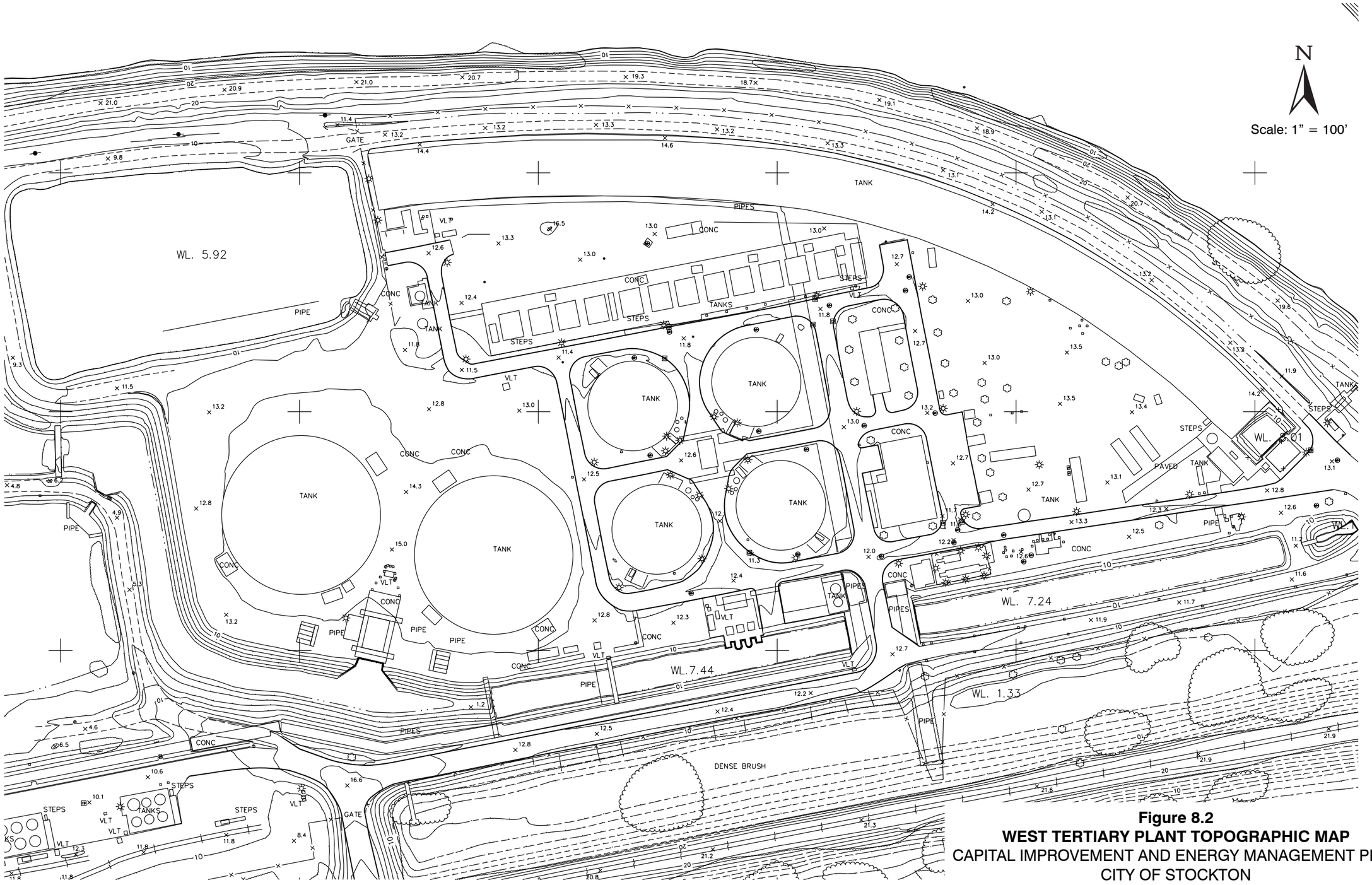


Figure 8.2
WEST TERTIARY PLANT TOPOGRAPHIC MAP
CAPITAL IMPROVEMENT AND ENERGY MANAGEMENT PLAN
CITY OF STOCKTON

stk411f25-8581.ai 4/12/11

Table 8.1	Explanation of Risk Evaluation Capital Improvement and Energy Management Plan City of Stockton	
Level of Risk	**Impact Definition**	**Risk Level Definition**
Low	• May result in the loss of some tangible assets or resources • May noticeably affect the Facility's mission, reputation or interest.	The facility's authorizing official must determine whether corrective actions are required or decide to accept the risk.
Moderate	• May result in the costly loss of tangible assets or resources. • May violate, harm, or impede the Facility's mission, reputation, or interest • May result in human injury.	Corrective actions are needed and a plan must be developed to incorporate these actions within a reasonable time frame.
High	• May result in the highly costly loss of major tangible assets or resources. • May significantly violate, harm, or impede the Facility's mission, reputation, or interest. • May result in human death or injury.	There is a strong need for immediate corrective measures. An existing system may continue to function, but a corrective action plan must be implemented as soon as possible.

8.3.1 Vulnerabilities

The methodology and approach assessing vulnerabilities at the RWCF is intended to ensure compliance with Homeland Security requirements for Water and Wastewater Systems. Existing vulnerabilities at the RWCF were identified and assigned to three major categories:

1. **Unsecured perimeter:** Impact of the unauthorized entry of any person, vehicle, or equipment onto the facility.

2. **Unsecured sensitive areas:** Impact of any unauthorized person or group gaining access to sensitive areas.

3. **Unprotected assets:** Impact of any critical asset being compromised..

A summary of these vulnerabilities are summarized in Table 8.2. A detailed security report, including a description of the vulnerabilities and associated recommendations developed by One Stop Security is on file at the RWCF but may be considered confidential by the City.

Table 8.2 Summary of Security Vulnerabilities Capital Improvement and Energy Management Plan City of Stockton	
Type of Vulnerability	**Identified Vulnerabilities**
Perimeter Unsecured	• Main Gate malfunctioning • West Gate unlocked throughout the day • South Gate lacks video surveillance and voice communication • East Gate cameras and voice communication inoperable • Railroad runs through Facility • San Joaquin River runs through Facility
Sensitive Areas Unsecured	• Liquid Chlorine Storage Tanks easily accessible, and has insufficient video surveillance • Main Switch Gear Room is key locked and lacks access control as well as video surveillance
Assets Unprotected	• Maintenance Building lacks access control and video surveillance • Storage facilities lack sufficient access control and video surveillance • Administration and surrounding buildings lack access control and video surveillance

Possible results of threat exploitation include:

- Significant casualties due to chlorine or sulfur dioxide gas.
- System-wide electrical failure causing wastewater overflows in the Collection System.
- Theft and/or vandalism to the RWCF's critical assets.
- Undetected entry of unauthorized personnel to sensitive areas.

There are two main unsecure thoroughfares that pass directly through the RWCF:

- The Burlington Northern Santa Fe (BNSF) Railway Tracks
- San Joaquin River

The facility's most critical asset is liquid chlorine railroad tanker cars, which each carry approximately 90 tons of chlorine.

8.3.2 Recommended Security Improvements

In recommending controls and alternative solutions intended to minimize or eliminate risks, the following factors were considered:

- Physical security of the RWCF, its assets and personnel.
- Effectiveness of recommended options.
- Legislation and regulations.
- Facility policy.
- Operational impact.
- Safety and reliability.

Table 8.3 provides an overview of the vulnerabilities and recommended safeguards for the facility:

One Stop Security and the City of Stockton are currently developing a Request For Proposal to implement a portion of the recommendations to eliminate some of the high risk vulnerabilities for an estimated cost of $250,000. This portion of the cost has been included in the CIP; however, there are other security recommendations included in this report that are not included in the project between One Stop Security and the City of Stockton. The costs for these other projects have not been developed and are not included in the CIP.

8.4 FLOOD PROTECTION EVALUATION

The following section summarizes the flood protection information and recommendations from recent flood protection evaluation studies. Three studies have been prepared since 2005.

- Flood Analysis Study by Kjeldsen, Sinnock, and Neudek (2005)
- Flood Protection Project by Kleinfelder-Geomatrix (2008)
- Flood Analysis by Siegfried Engineering Inc (2011)

This section summarizes the Kleinfelder-Geomatrix findings and then provides update to the Kleinfelder-Geomatrix findings based on updated analysis provided in the Siegfried Engineering report.

8.4.1 Flooding Scenarios

Approximately 300,000 people are served by the RWCF, which is located at nearly sea level. Should flooding occur, there is a significant threat to public health, water quality, and

Table 8.3	Overview of Vulnerabilities and Recommended Safeguards Capital Improvement and Energy Management Plan City of Stockton		
Vulnerability	**Risks**	**Risk Level**	**Recommended Safeguards**
Chlorine Tanker Cars	• Rail cars contain 90 tons of liquid chlorine • Easily Accessible from River or Road • Video surveillance is insufficient • No access control preventing access to rail cars	High	• **Access Control:** Install RFID credentialed containment system at exterior and interior gates. • **Surveillance:** Replace analog cameras with IP cameras at rail cars and nearby gates, install passage sensor indicator. • **PA System:** Install PA system in case evacuation is needed.
Unsecured Gates	• Persistent problems with main gate • Dagget Rd gate unlocked all day • No video or voice activated (VOX) control at South gate • East gate VOX and cameras inoperable • Utility crossing gate at River Rd and Tower Ln remains unlocked • Chlorine tanker car gate remains unlocked	High	• **Access Control:** Install RFID credentialed containment system. • **Surveillance:** Install IP cameras, VOX, and passage sensors. • **Repair:** Repair faulty gate openers. • **Gate Improvements:** Move West gate east and install RFID credentialed containment system and install new gate on northbound service road at Dagget Road, secured with padlock.
Main Switch Gear Room	• Distributes electricity to entire facility • Disruption may cause Collection system overflows • No exterior surveillance • Key locked, lacking access control	High	• **Access Control:** Install RFID credentialed containment system. • **Surveillance:** Install IP cameras on interior and exterior.
Maintenance Building	• Experiences theft of tools and equipment • Lack of video surveillance • Keylocked	High	• **Access Control:** Install RFID credentialed containment system. • **Surveillance:** Install IP cameras.
San Joaquin River	• Allows unrestricted access to critical areas	High	• **Investigate Options:** Investigate viability and cost-effectiveness of installing thermal fence.

the Bay Delta ecosystems. Recognizing the potential impacts from flooding, the City of Stockton identified two primary goals regarding flood protection at the RWCF:

- Protect the assets and facilities within the RWCF.
- Maintain operation of the treatment plant during flood conditions.

The City determined that there were two potential causes of flooding at the plant:

1. Flood waters conveyed to the plant via sewer collection system; and
2. An overland breech of a levee.

8.4.2 Collection System Flooding

Currently, the isolation gates at the raw sewage influent box upstream of the Headworks are not functional. Without functioning gates, flooding of the RWCF could occur if a significant portion of the collection system was subject to flooding. The existing gates in the influent box should be replaced with fully functional gates that can isolate the RWCF from the collection system.

8.4.3 Overland Breech

In 2009, Kleinfelder Inc. presented the City with conceptual flood protection recommendations based on a site visit and collected data (refer to the Appendices). The study was prepared under the following assumptions:

- Floodwater elevation is at 10 feet (NAVD 29).
- Subsurface conditions are similar to previous borings.
- The topography is unchanged from the available topographic maps.

Previous survey information indicated the site elevations at the RWCF vary from -2 to 13 feet. The floodwater elevation for a 100 year flood event is based on data from the 1992 United States Army Corps of Engineers (USACE) Report on Delta Hydrology. The study did not address or conduct a hydrological study, determine current topography or geotechnical data, perform pile load tests, assess penetrations in levees, or review utility maps and plans.

Kleinfelder proposed the following conceptual designs to protect the Main (Primary/Secondary treatment) Plant from flooding:

- **Construct high flood wall (Figure 8.3):** Construct a flood wall to Elevation 12 feet with a 2-foot thick footing. The footing would be supported with 50-foot deep, 14-inch square piles, and battered piles at 8’ spacing. A sheetpile cutoff wall would also be located beneath the flood wall.

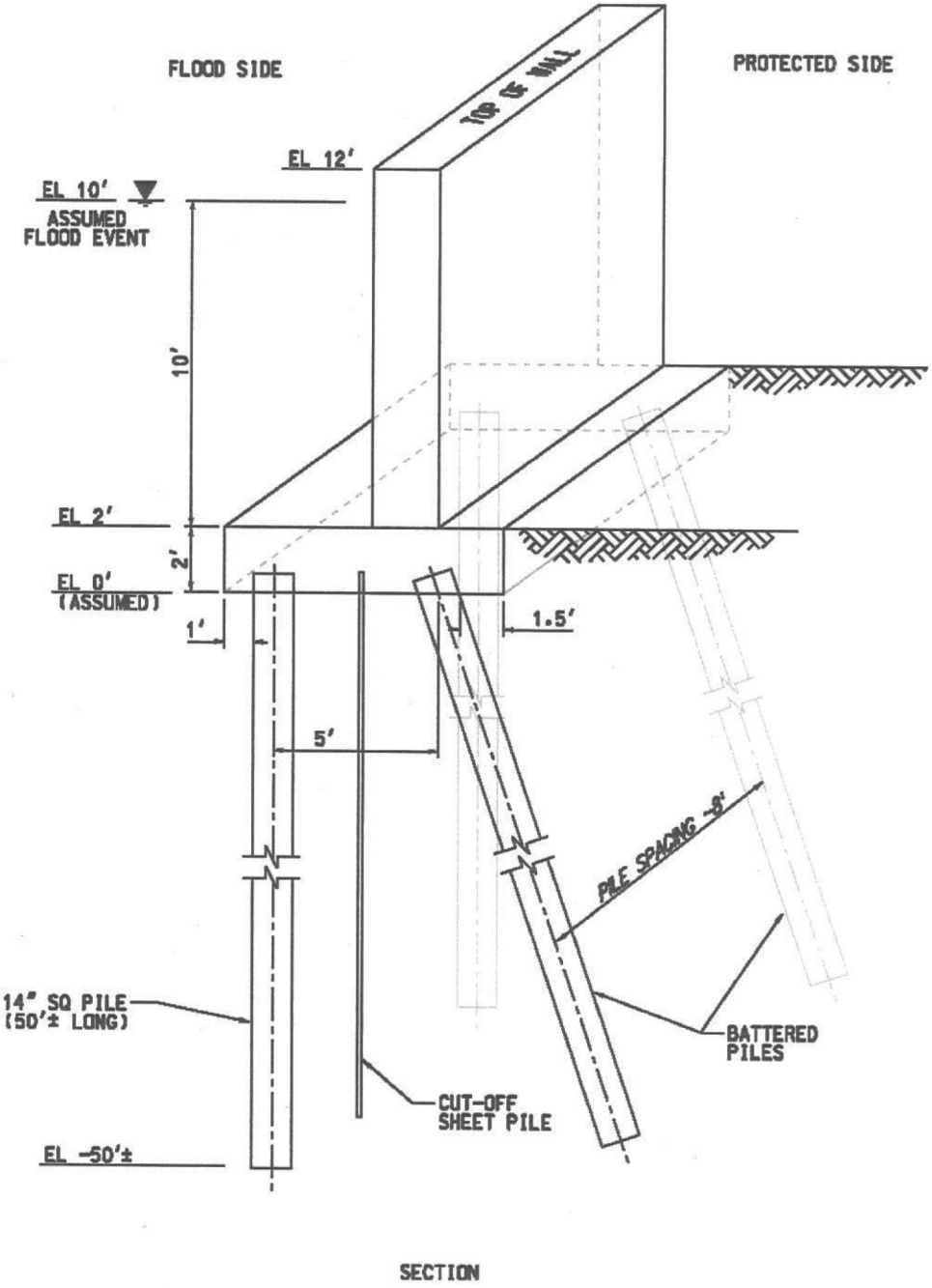


Figure 8.3
MAIN PLANT HIGH FLOOD WALL DETAIL
CAPITAL IMPROVEMENT AND ENERGY MANAGEMENT PLAN
CITY OF STOCKTON

stk411f16-8581.ai

- **Construct low flood wall (Figure 8.4):** Construct a 4 to 6 feet high flood wall with a 2-foot thick grade beam supported with 4 to 7 feet deep, 18 sq. inch piers spaced at 8 to 10 feet apart.

- **Construct new levee (Figure 8.5):** Construct a new levee to Elevation 12 feet with a top width of 16 feet, flood-side (exterior) side slope of 2:1, and plant-side (interior) side slope of 3:1, to be supported by a 47-foot deep cement slurry wall.

- **Improve existing levee (Figure 8.6):** Modify existing levee to Elevation 12 feet with a top width of 25 feet, flood-side side slopes ranging from 1.5:1 to 2.7:1, and plant-side side slope of 3.7:1, to be supported by a 47-foot deep cement slurry wall.

The following flood protection measures were proposed for the Tertiary plant:

- **Modify pond embankments (Figure 8.7):** Abandon existing levees at Elevation 8 feet on exterior side of Oxidation Pond Supply and Return Channel and raise existing levee on interior side of Oxidation Pond Supply and Return Channel to Elevation 12 feet with a top width of 16 feet and side slopes of 2:1. Create new Oxidation Pond Supply and Return Channel using the modified levee as the outside levee and construct a new levee on the interior side of the new channel to Elevation 10 feet with a top width of 12 feet. Additionally, an 18-inch thick, 47-feet deep slurry wall would need to be installed to the existing levees.

- **Improve existing levee (Figure 8.8):** Modify existing levee to Elevation 12 feet with flood-side side slopes of 2.7:1, and plant-side side slope of 2.0:1, to be supported by a cement slurry wall approximately 50 feet deep.

- **Construct low flood wall (Figure 8.9):** Build a 4-foot high flood wall with a 2-foot thick grade beam supported with 7-foot deep, 18 square inch drilled piers at 10 foot spacing.

- **Bypass oxidation ponds:** Install new piping and control structure near Oxidation Pond No. 1 to bypass the ponds when they are flooded.

The City had the following comments on the Kleinfelder presentation:

- The flood barrier for the eastern exposure of the RWCF Main Plant should be located on the western edge of pavement along Brooks Road.

- Consider reinforcing and reusing the existing wall and the exterior wall of the Administration Building for the northern exposure of the RWCF Main plant.

- Consider installing a wall along the existing fence line near the employee parking lot on the RWCF Main plant and relocate the fence to the top of the new wall.

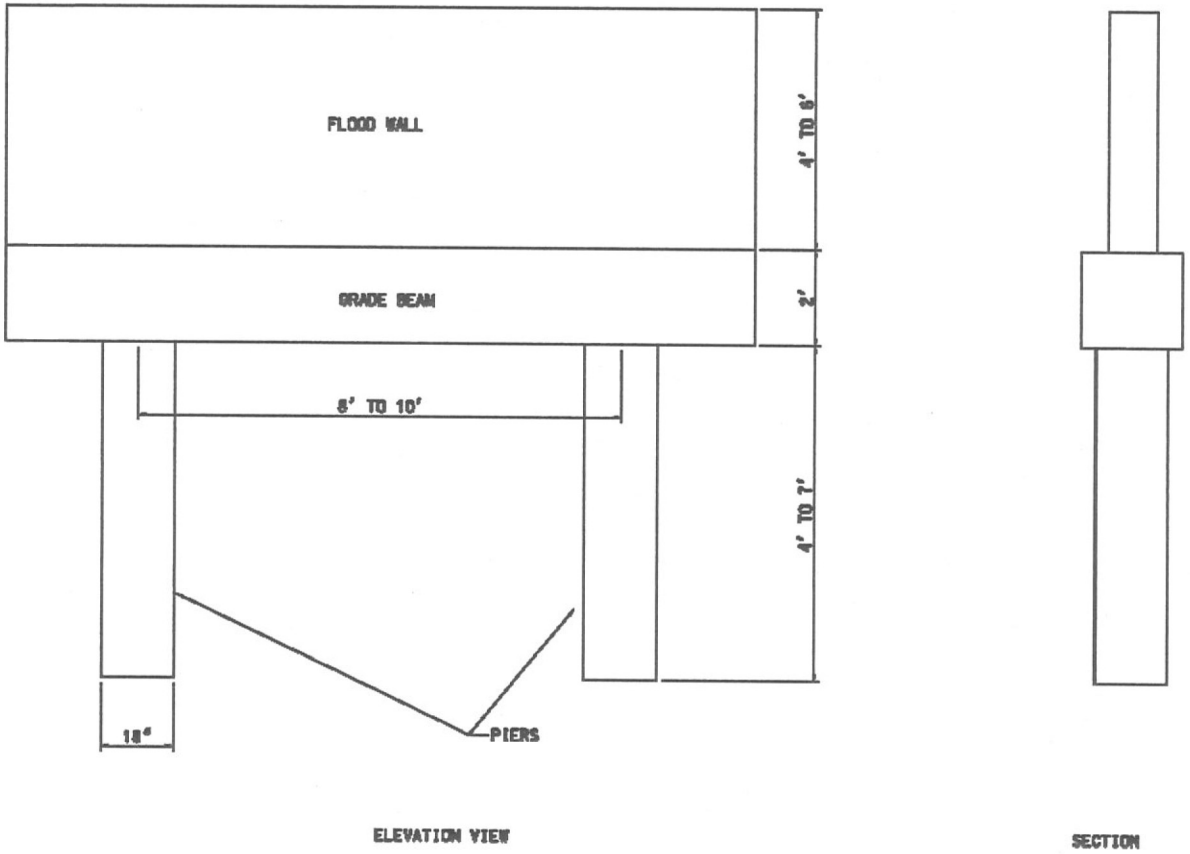
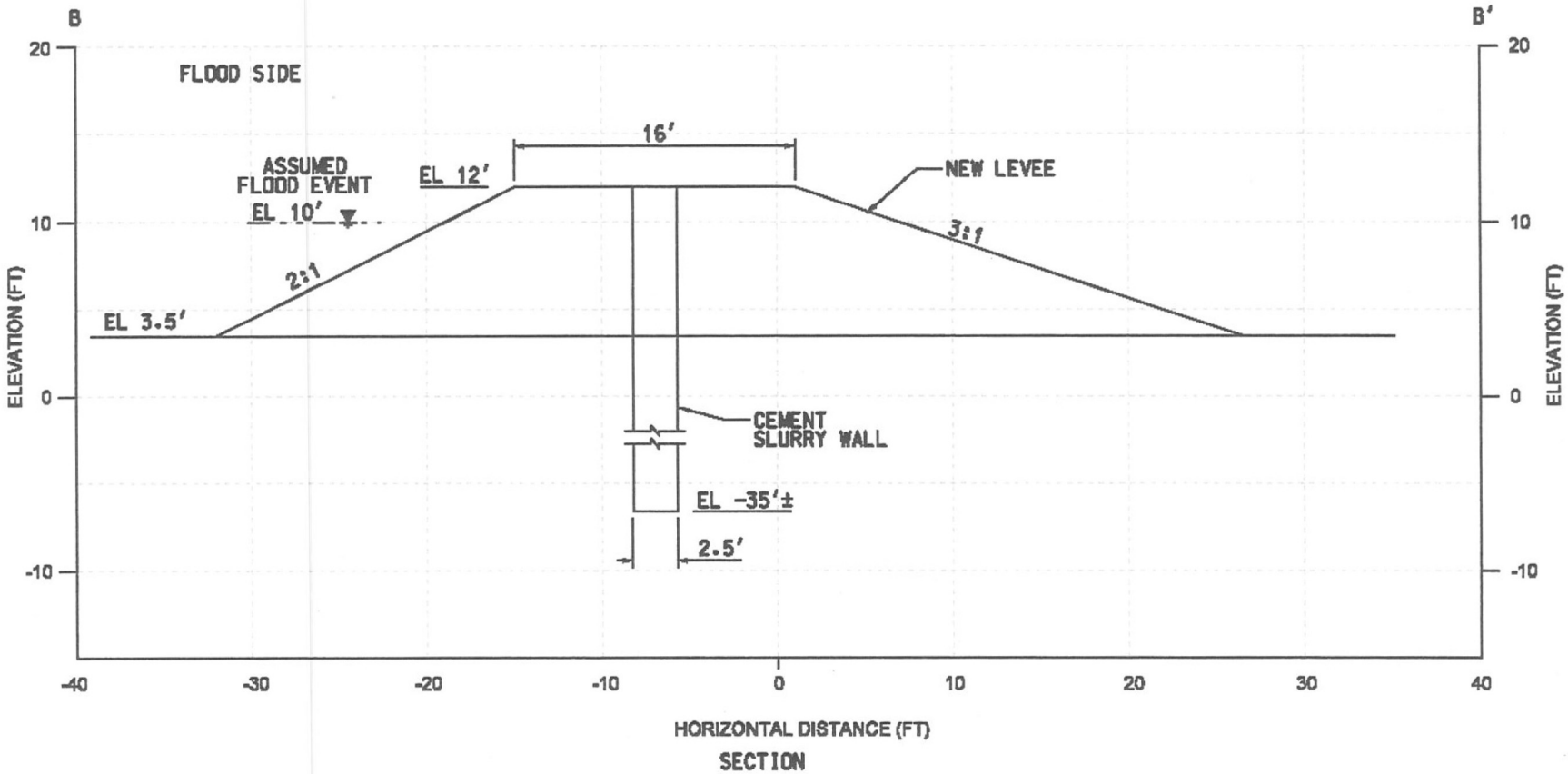


Figure 8.4
MAIN PLANT LOW FLOOD WALL DETAIL
CAPITAL IMPROVEMENT AND ENERGY MANAGEMENT PLAN
CITY OF STOCKTON

stk411f17-8581.ai

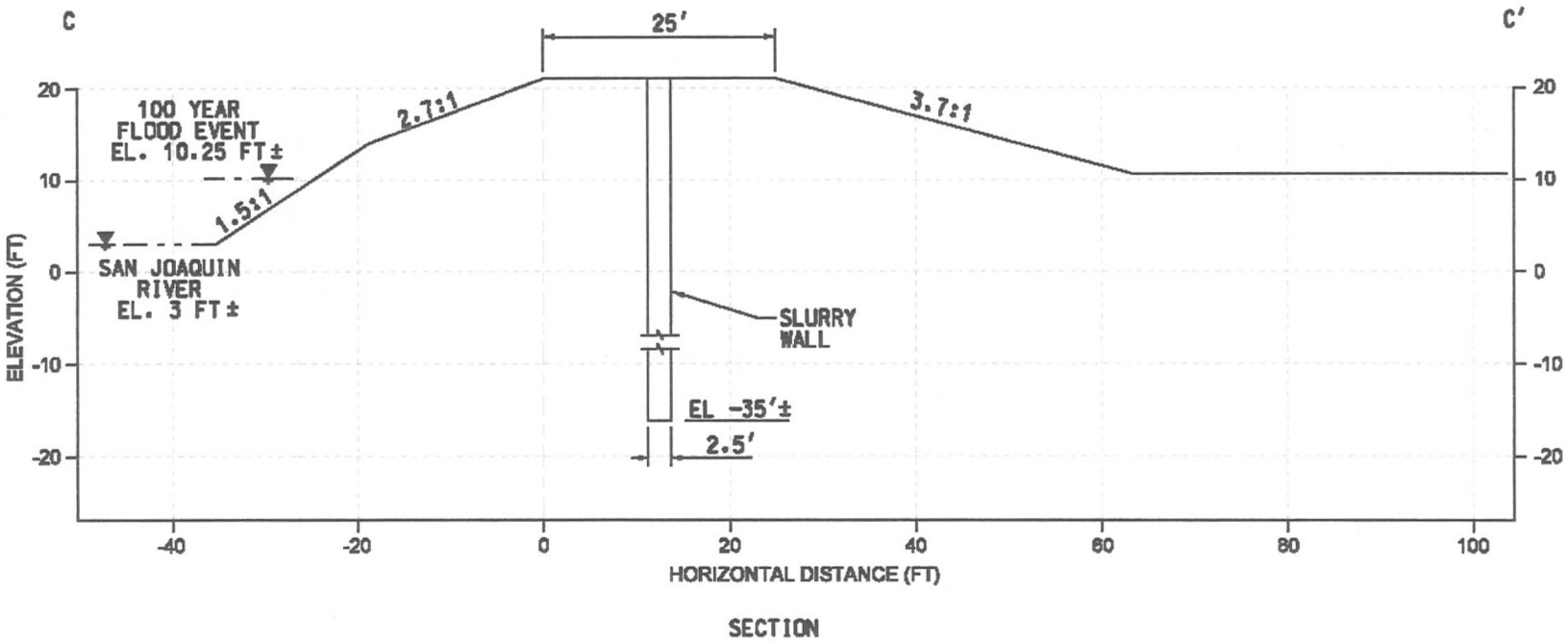


NOTE:

1. ASSUMING AN AVERAGE GROUND SURFACE ELEVATION OF ABOUT 3.5 FEET.

Figure 8.5
MAIN PLANT NEW LEVEE DETAIL
CAPITAL IMPROVEMENT AND ENERGY MANAGEMENT PLAN
CITY OF STOCKTON

stk411f18-8581.ai

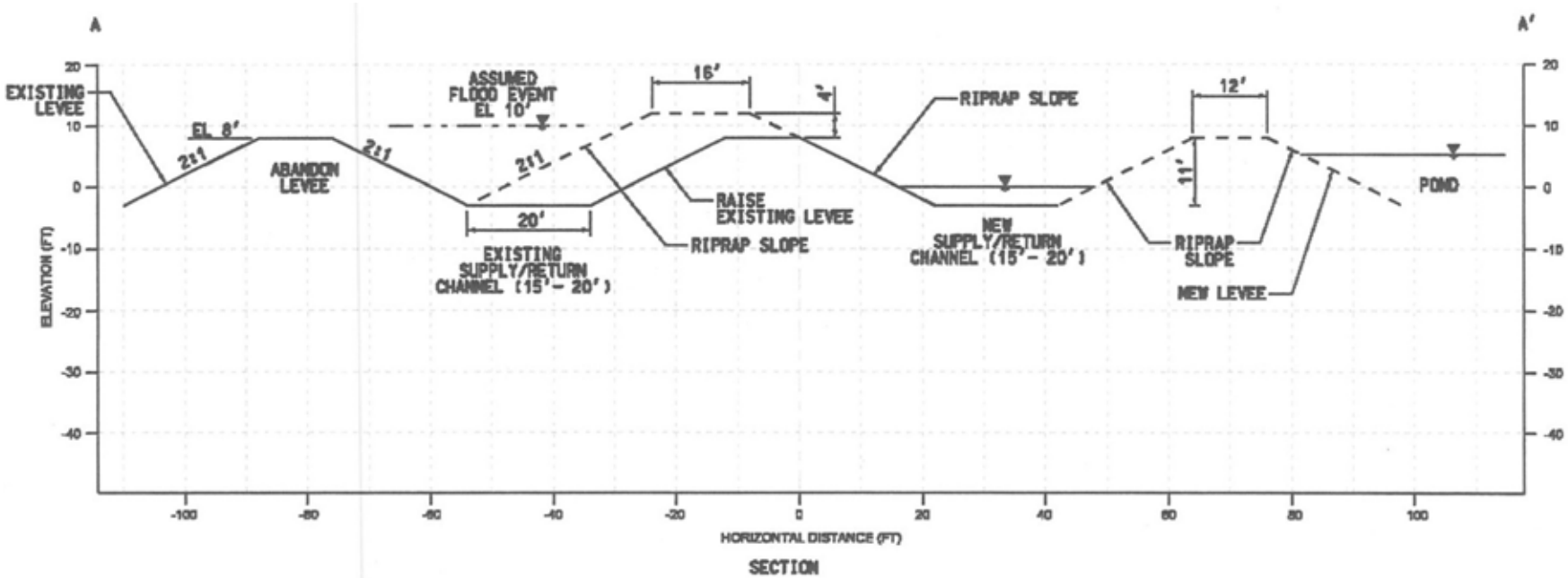


NOTES:

1. CROSS SECTION CREATED FROM TOPOGRAPHY FROM ENGINEERING SCIENCE PLANS, 1998.
2. 100 YEAR FLOOD EVENT ELEVATION IS APPROXIMATE AND WAS OBTAINED FROM DATA IN THE USACE 1992 REPORT ON DELTA HYDROLOGY.

Figure 8.6
MAIN PLANT EXISTING LEVEE IMPROVEMENTS DETAIL
CAPITAL IMPROVEMENT AND ENERGY MANAGEMENT PLAN
CITY OF STOCKTON

stk411f19-8581.ai

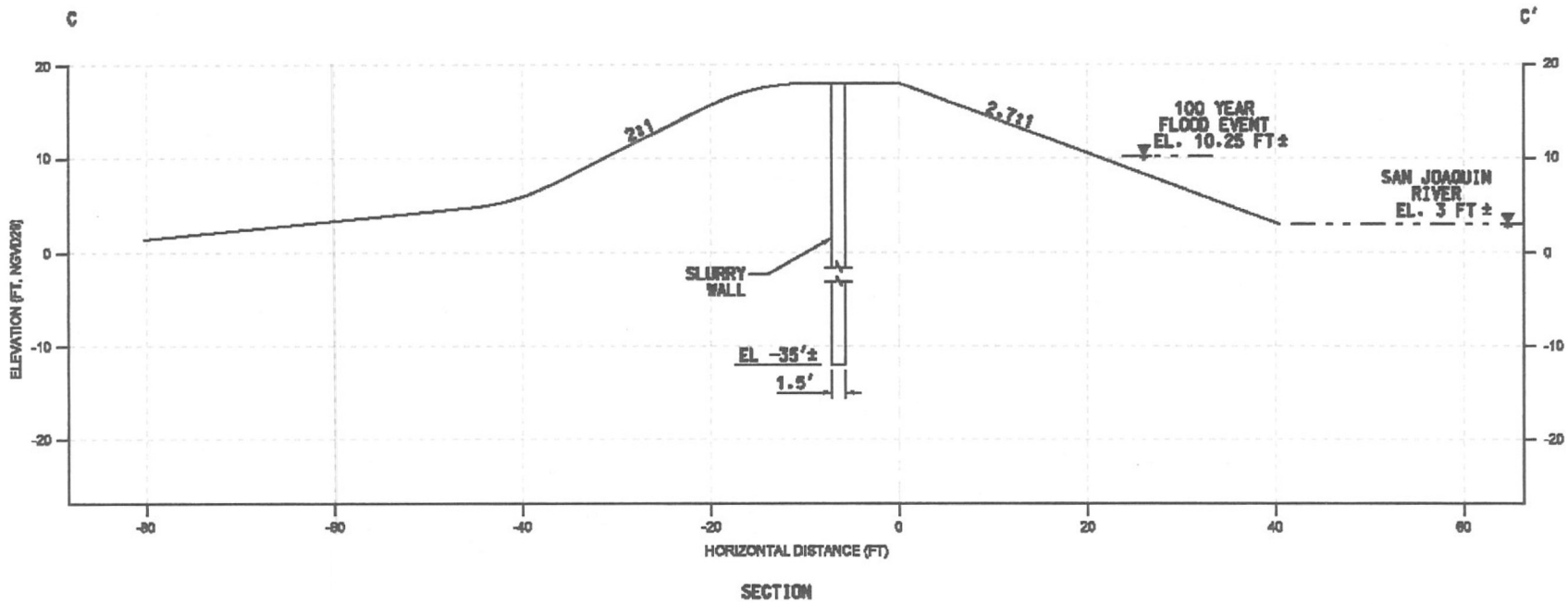


NOTES:

1. EXISTING LEVEES ARE SHOWN AS BUILT FROM BROWN AND CALDWELL CONSULTING ENGINEERS PLANS, 1963.
2. ASSUMING EXISTING LEVEE CREST ELEVATION OF 8 FEET.

Figure 8.7
POND EMBANKMENT MODIFICATIONS DETAIL
CAPITAL IMPROVEMENT AND ENERGY MANAGEMENT PLAN
CITY OF STOCKTON

stk411f20-8581.ai rev 4/8/11

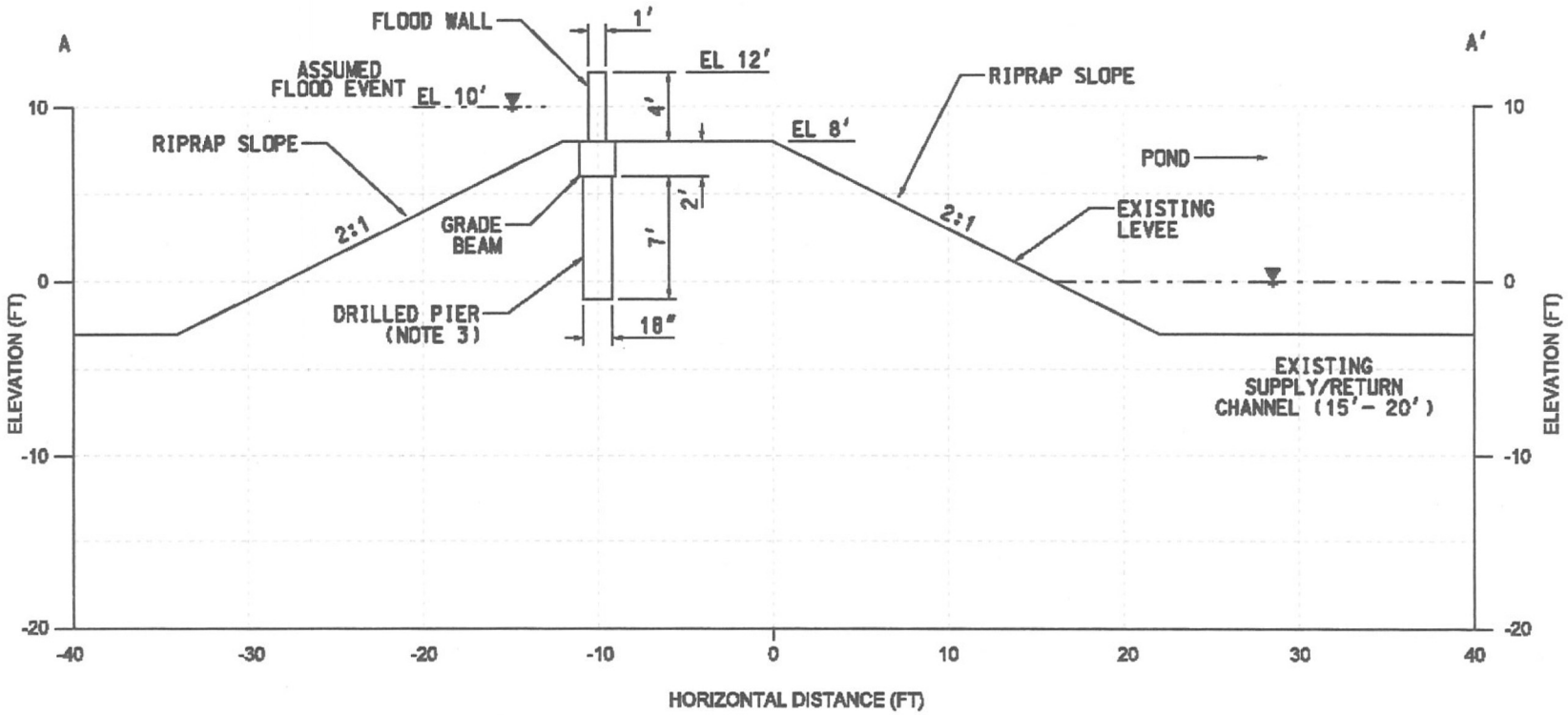


NOTES:

1. CROSS SECTION CREATED FROM TOPOGRAPHY FROM ENGINEERING SCIENCE PLANS. 1966.
2. 100 YEAR FLOOD EVENT IS APPROXIMATE AND WAS OBTAINED FROM DATA IN THE USACE 1992 REPORT ON DELTA HYDROLOGY.

Figure 8.8
TERTIARY PLANT EXISTING LEVEE IMPROVEMENTS DETAIL
CAPITAL IMPROVEMENT AND ENERGY MANAGEMENT PLAN
CITY OF STOCKTON

stk411f21-8581.ai



SECTION

NOTES:

1. EXISTING LEVEES ARE SHOWN AS BUILT FROM BROWN AND CALDWELL CONSULTING ENGINEERS PLANS, 1963.
2. ASSUMING EXISTING LEVEE CREST ELEVATION OF 8 FEET.
3. DRILLED PIERS SPACED 10 FEET ON CENTERS.

Figure 8.9
TERTIARY PLANT LOW FLOOD WALL DETAIL
CAPITAL IMPROVEMENT AND ENERGY MANAGEMENT PLAN
CITY OF STOCKTON

stk411f22-8581.ai

- Evaluate alternatives to protect the RWCF Tertiary plant or to protect the RWCF Tertiary plant and oxidation ponds. The City will evaluate the feasibility of providing flood protection to the oxidization ponds based on a variety of factors, including construction costs.
- The City and the Army Corps of Engineers have discussed the two potential flooding scenarios. The Army Corps of Engineers determined that it is the City's responsibility to replace the influent gates, and the costs would be fully borne by the City. However, the Army Corp did agree to cost sharing of a flood wall to prevent overland flooding.

8.4.4 Analysis by Siegfried Engineering Inc. (SEI)

The analysis prepared by SEI examined the current flood plain elevation in conjunction with the topographic base map prepared for this CIP. The flood elevation data was obtained from the 2009 Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM). SEI developed an alternative flood protection approach. This alternative was proposed because it may cost less to implement than the alternatives provided in the previous studies.

8.4.4.1 Main Plant

According to the SEI analysis, the Main Plant is located in FEMA FIRM Zone X, which means the plant is protected by levees from a 100-year flood event. However, Kleinfelder-GEOMATRIX recommended that additional flood protection be provided in case of a levee failure or a flood event that exceeds 100-year flood elevations.

The SEI analysis points out that most of the site is above the 100-year flood level of elevation 10. While further hydrological analysis is required to determine the effects of waves and larger flood events on the flood elevations, a flood elevation of 12 feet was assumed. To protect the Main Plant, SEI proposes the use of grading and other site improvements instead of mechanical gates or barricades, to the maximum extent possible.

8.4.4.2 Tertiary Plant

To protect the Tertiary Plant, including the oxidation ponds, the SEI recommends relying on the existing river levees (with additional improvements if necessary) and improving the existing levees that are adjacent to State Route 4 and South Daggert Rd. Improvements to these levees would be concentrated on the exterior face of the levees which are within the existing plant boundary fence.

8.4.4.3 SEI Recommendations

Prior to proceeding with a flood protection project, additional geotechnical investigations, hydrologic analyses, conceptual engineering, and cost estimate preparation must be performed. The complete SEI report is included in the appendices.

8.4.5 Cost Estimates for CIP

The City currently has a CIP line item for $227,000 for a “Main Plant Flood Study”, which is an allocation of funds for any additional flood protection study work that is recommended prior to selection of a preferred flood projection project. Because preferred flood protection project has not been selected, the City has not yet established a CIP for construction of a flood wall. However, replacement of the existing influent slide gates is included in this CIP (see previous description in Chapter 4). Replacement of these gates will allow the City to isolate the RWCF from flooding via the Collection System.

For the purposes of estimating the cost to prevent overland flooding, it was assumed that high flood walls would be built around the entire main plant and that a combination of low flood walls and slurry walls (per Alternative 1 in the Kleinfelder presentation) would be built on the existing levees around the Oxidation Ponds and Tertiary plant. As this alternative requires more infrastructure than the lower cost alternative proposed by SEI, the costs associated with this alternative are conservative and may be higher than the final flood projection project cost. The preferred flood protection approach and the costs will be updated after the Main Plant Flood Study and the EIR for the project are completed.

The estimated costs presented below are based on conceptual designs and do not consider issues such as decreased levee road widths and utility penetrations through the sheet pile cutoff walls; therefore, a 40 percent contingency was used. Table 8.4 presents the estimated flood protection costs for future planning purposes; however, these costs are not included in the CIP.

Table 8.4 Conceptual Flood Protection Recommendations Budgetary Estimate Capital Improvement and Energy Management Plan City of Stockton

	Estimated Cost $
Main Plant – High Flood Wall	$33,900,000
Tertiary Plant – Low Flood Wall & Slurry Wall Combination	$12,600,000
Oxidation Ponds – Low Flood Wall & Slurry Wall Combination	$21,300,000
Total	$67,800,000

8.5 SITE ACCESS CONSIDERATIONS

The Main Plant has two main access points on Navy Dr. Both access gates are secured with motorized gates. Visitors can park their vehicles in a lot near the western access road without entering the secure facility. Septage haulers typically enter the site using the east access road. The septage receiving station is also located before the secure motorized gate. Ideally, the new FOG receiving station would also be located outside of the secured

facility. However, because FOG is difficult to pump, particularly at low temperatures, it is recommended that the FOG facility be located as close to the Digesters as possible.

An updated site access plan for the Main Plant is shown in Figure 8.10. No major modifications to the present traffic patterns, with the exception of a loop around the new FOG facility are necessary or anticipated.

Primary access to the Tertiary Plant is via a bridge over the San Joaquin river and a paved roadway on one of the pond berms. No major changes to the Tertiary Plant traffic patterns are necessary or anticipiated with the exception of some roadway changes around new process structures. An updated site access plan for the Tertiary Plant is shown in Figure 8.11.

8.5.1 Future Plans for State Route 4

Caltrans is currently designing an extension of the State Route 4 Crosstown Freeway. The extension, or ramp, will connect the Crosstown Freeway to Navy Dr. The project includes improvements to Navy Dr, including a stoplight at the west access road (near the Administration Building). A median will also be added that will effectively prohibit left turns into the east access road. This will either force septage haulers and City trucks to use the West Access Road or make U-turns in order to utilize the East Access Road. If this arrangement is not acceptable to the City, the City should consider working with Caltrans to determine if the median can be removed or modified.

In the future, Caltrans may extend the Crosstown Freeway further, connecting the freeway to State Route 4 south of the oxidation ponds. As shown in Figure 8.10, the extension would cross over a portion of the plant site. In addition, the extension would have to cross through Oxidation Pond No. 1. If the volume of Oxidation Pond No. 1 is reduced, the RWCF would require additional capacity. The City should stay abreast of Caltrans plans for the Crosstown Freeway.

CURRENT ENERGY DEMAND AND EXISTING COGENERATION FACILITIES

9.1 INTRODUCTION

This Chapter summarizes current energy consumption for the City of Stockton Regional Wastewater Control Facility (RWCF) and describes the existing cogeneration (cogen) facilities. The purpose of the existing cogeneration system is to generate power to reduce the need to purchase power and to generate heat to meet treatment process demands.

9.2 CURRENT ENERGY DEMAND

This section summarizes the current electricity and natural gas demand for the RWCF. The annual electricity procured from PG&E is tabulated by month for the period of October 2009 through September 2010 in Table 9.1. The average daily natural and digester gas consumption and average daily electricity generated by the facility's cogen system is shown for each year of the period 2005 through 2009 in Table 9.2. Total annual natural gas consumption is tabulated by month for the period of October 2009 through September 2010 in Table 9.3.

The monthly electrical energy procured from PG&E and generated by the facility's cogen system is shown graphically in Figure 9.1. Monthly electricity costs for electricity procured from PG&E are shown in Figure 9.2. The annual natural gas consumption and costs are shown in Figures 9.3 and 9.4. The most recent complete year of data (2009) was used for the evaluation of biogas utilization alternatives in Chapter 11.

A pie chart illustrating the percentage of electrical energy consumed by source (e.g. PG&E and cogen) is presented in Figure 9.5. A pie chart illustrating the percentage of electrical energy consumption for various processes for the RWCF is shown in Figure 9.6.

9.3 EXISTING COGENERATION FACILITY

The core of the City's cogeneration facility consists of three 1,000-kilowatt (kW) engine-generator systems, manufactured by Waukesha. The design criteria for the cogeneration system is included in the Appendices. The engines use biogas from the anaerobic digesters as the primary fuel, supplemented with purchased natural gas when there is insufficient

Table 9.1	Historical PG&E Electrical Energy Usage and Costs Summary Capital Improvements and Energy Management Plan City of Stockton					
			Electricity Costs			
Month	Total Electricity Procured from PG&E (kWh)	Maximum Demand (kW)	Energy ($)	Demand ($)	Other ($)	Total ($)
Oct-09	518,312	2,148	43,303	36,728	981	81,012
Nov-09	600,468	3,006	44,065	10,755	981	55,801
Dec-09	767,823	3,390	56,598	12,441	981	70,021
Jan-10	793,751	2,280	58,879	7,843	1,014	67,736
Feb-10	693,959	4,002	51,564	13,767	1,014	66,345
Mar-10	833,952	3,564	62,805	15,254	1,014	79,073
Apr-10	691,481	2,346	52,448	10,041	1,014	63,503
May-10	480,927	2,118	40,029	28,284	1,014	69,327
Jun-10	492,536	3,564	41,007	36,056	1,110	78,173
Jul-10	679,179	2,982	55,673	28,005	1,110	84,787
Aug-10	1,023,885	2,670	84,241	24,663	1,110	110,014
Sep-10	994,251	2,748	81,058	26,997	1,110	109,165
Totals	**8,570,524**		**671,671**	**250,834**	**12,450**	**934,955**
Averages	**714,210**	**2,902**	**55,973**	**20,903**	**1,038**	**77,913**

Table 9.2	Historical Cogeneration Energy Summary Capital Improvements and Energy Management Plan City of Stockton			
Year	Natural Gas Consumption (decatherms/day)	Digester Gas Consumption (cfd)	Electrical Energy Production (kWh/day)	Average Energy Production (kW)
2005	469	589,498	59,441	2,477
2006	303	671,770	47,566	1,982
2007	100	659,622	15,573	649
2008	302	635,153	43,981	1,833
2009	427	516,314	48,058	2,002

Table 9.3 Historical Natural Gas Energy and Costs Summary
Capital Improvements and Energy Management Plan
City of Stockton

Month	Gas Consumption (therms)	PG&E Transportation Cost ($)	3rd Party Commodity Cost(1) ($)	Total Cost ($)
Oct-09	173,205	4,075	61,377	65,452
Nov-09	203,649	5,013	105,323	110,337
Dec-09	221,678	5,967	94,118	100,085
Jan-10	230,624	6,906	112,803	119,709
Feb-10	206,621	5,975	107,121	113,096
Mar-10	198,770	5,758	101,224	106,981
Apr-10	220,249	5,965	92,260	98,225
May-10	179,164	4,853	69,514	74,367
Jun-10	174,038	4,487	70,280	74,767
Jul-10	168,142	4,331	73,419	77,750
Aug-10	162,474	4,113	60,791	64,904
Sep-10	99,789	2,736	33,798	36,533
Totals	**2,238,403**	**60,178**	**982,027**	**1,042,205**
Averages	**186,534**	**5,015**	**81,836**	**86,850**

Note:

(1) Natural Gas is purchased via the School Project for Utility Rate Reduction (SPURR) program and delivered to the RWCF by PG&E. The cost of gas is estimated based on the Weighted Average Cost of Gas (WACOG) from PG&E's web site.

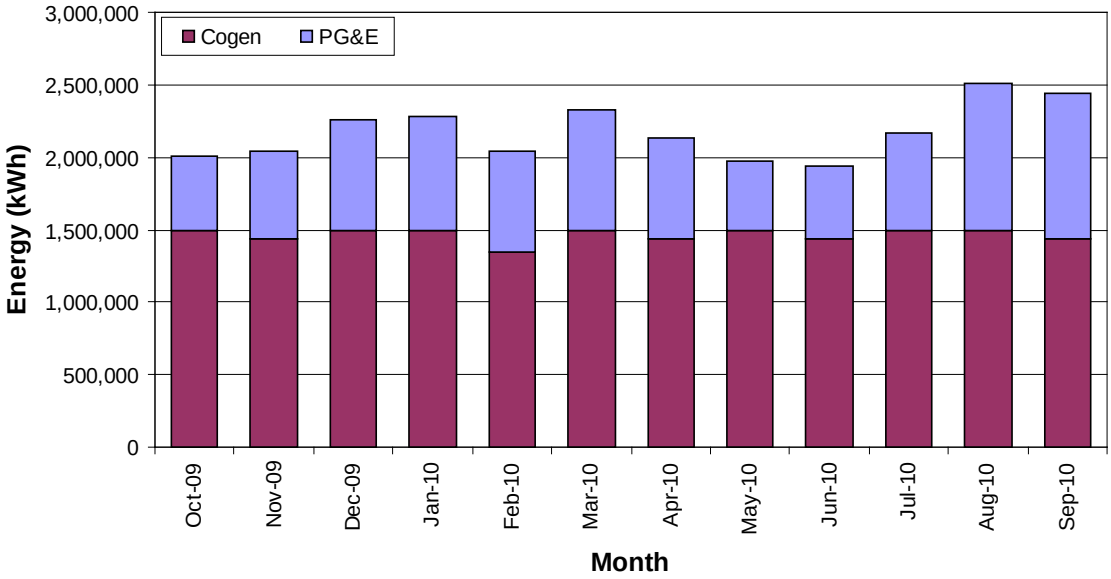


Figure 9.1 Monthly Electrical Energy Consumption by Source

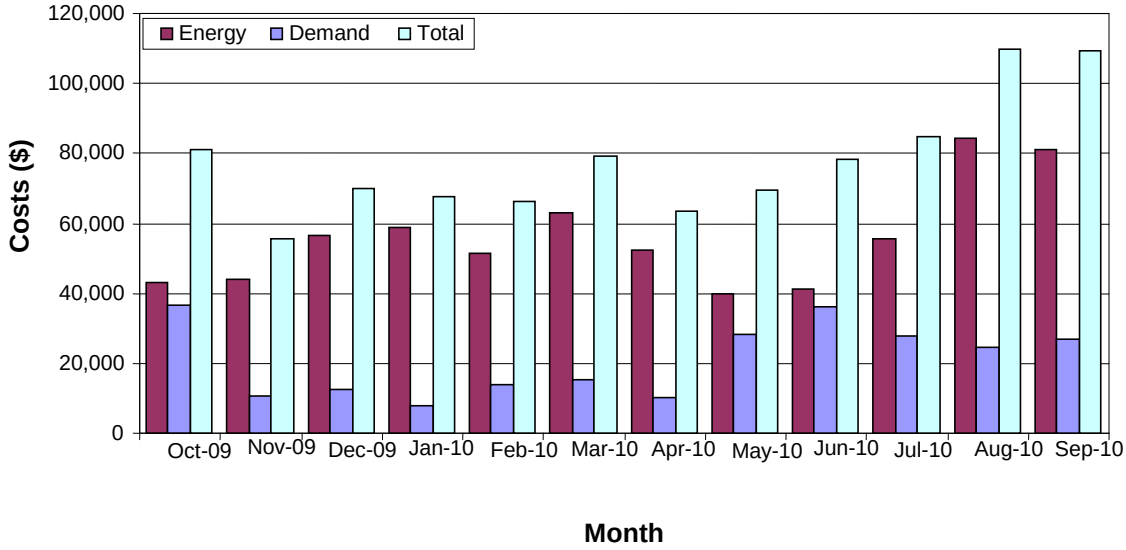


Figure 9.2 Annual PG&E Electrical Costs

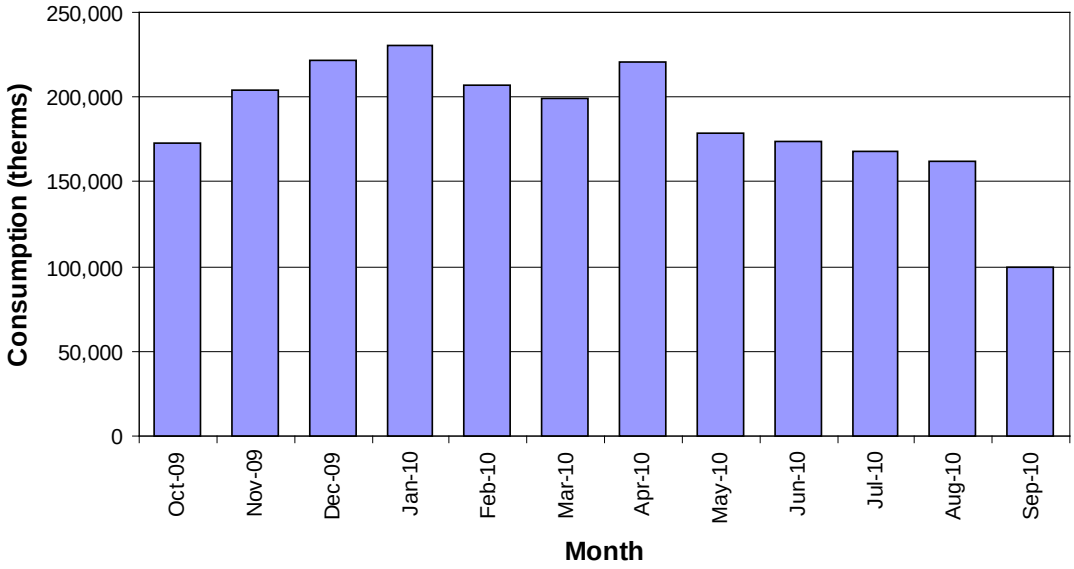


Figure 9.3 Annual Natural Gas Energy Consumption

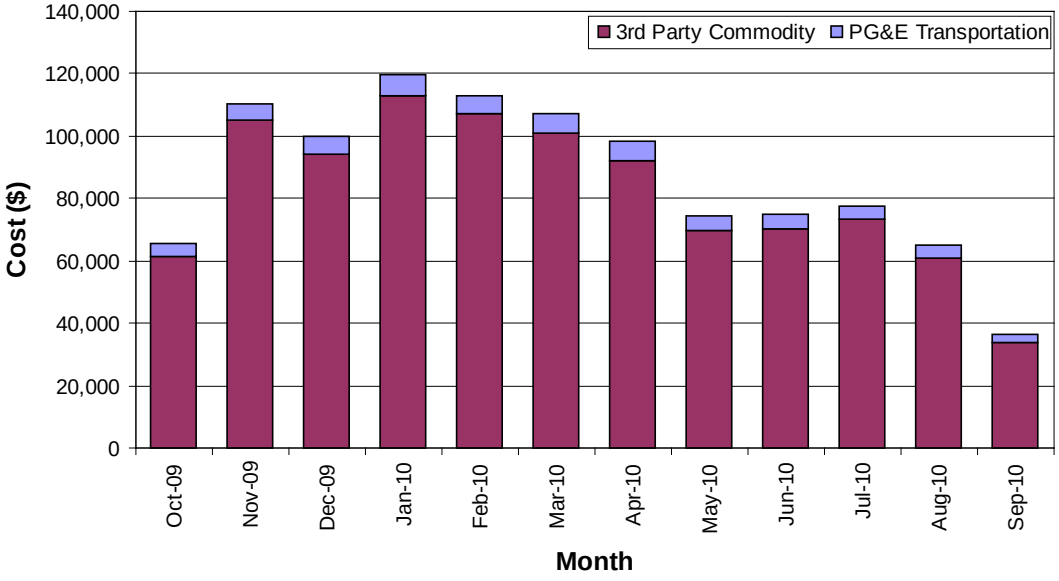


Figure 9.4 Annual Natural Gas Costs by Source

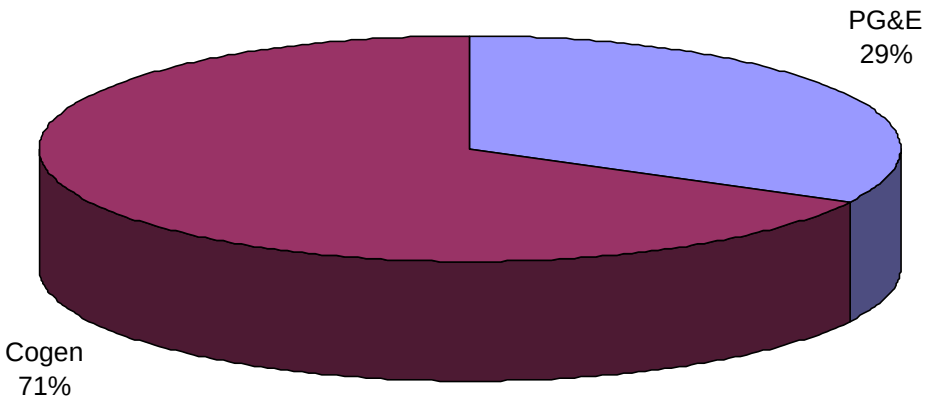


Figure 9.5 Percentage of Annual Electrical Energy by Source

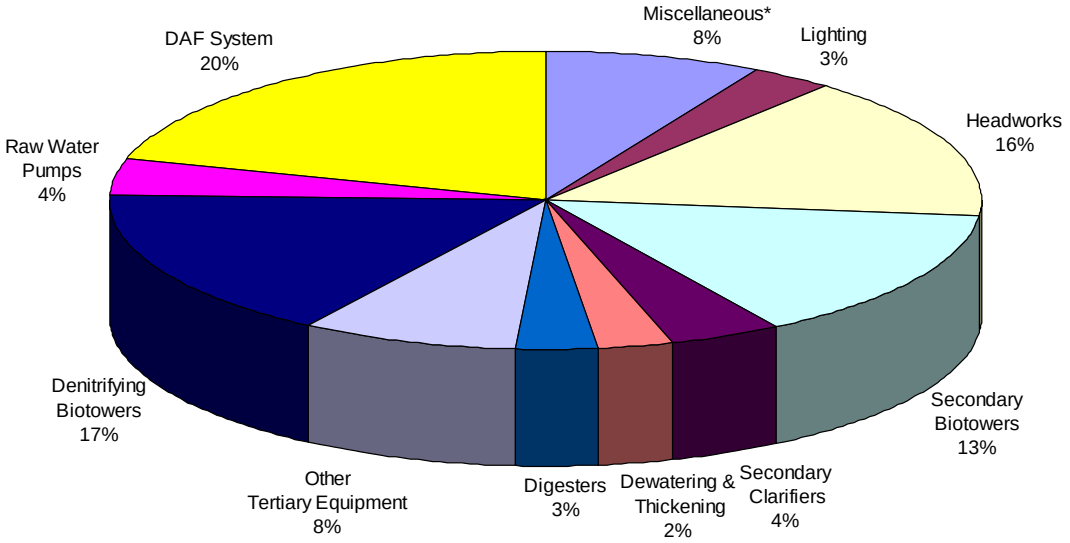


Figure 9.6 Percentage of Electrical Energy Consumption by Function

digester gas. Digester gas is cleaned to remove sulfides and siloxanes and is stored in a low pressure gas storage tank to dampen fluctuations in gas production from the digesters. The treated digester gas is then fed to the cogeneration engines.

Producing electrical power the engine generators provides the following benefits to the RWCF:

- Reduces cost of purchased electricity from PG&E.
- Serves as a backup power system in case of a PG&E power outage.
- Produces waste heat from the engines that is used heat the anaerobic digesters (instead of using natural-gas fed boilers to heat the digesters).

9.3.1 Estimated Digester Gas Production

Digester gas production is a critical factor for sizing cogeneration facilities and evaluating their economic viability. Table 9.4 presents the current and projected future digester gas production through the year 2032. Currently, there is sufficient biogas to fuel one engine full time at 80% to 90% load. As indicated in Table 9.4, the digester gas production is expected to increase at a modest rate in proportion to the wastewater flow projections. Current (2010) digester gas production is 517,000 cubic feet per day, with a heating value of about 12.1 million British thermal units per hour (BTUs/Hr). For the existing engine generators, this would be enough fuel to produce 862 kW. By the year 2032, the digester gas production is expected to increase to 761,000 cubic feet per day (cfd), which is equivalent to 1,269 kW of power production from the cogeneration system.

9.3.2 Condition Assessment

The existing engine generators were installed in 1998. As part of this CIP, the following deficiencies were identified with the existing engines:

1. The apparent fuel consumption for the engines is about 14,000 Btu/kW-hr compared to a typical value of 10,800 Btu/kW. This discrepancy could be the result of instrument error (inaccurate gas flow measurement) or poor engine fuel economy. The meter accuracy has not been checked. If the gas flow meters prove to be accurate, the poor engine fuel economy may be an indication that the engines are worn and need service. The gas flow meters should be re-calibrated. Reported gas flows before and after the re-calibration should be compared to determine if there is any apparent reduction in gas consumption.

Table 9.4	Projected Digester Gas Production Capital Improvements and Energy Management Plan City of Stockton
Year	**Digester Gas Production (scfd)**
2010	517,000
2015	543,000
2020	607,000
2025	671,000
2030	735,000
2032 (1)	761,000

Note:
(1) The cogeneration alternatives presented in Chapter 11 are evaluated based on a 20-year life cycle analysis ending in 2032.

2. The existing digester gas conditioning facility is designed to remove moisture, siloxanes, and hydrogen sulfide for approximately 1,000 cfm of digester gas. The projected digester gas production for 2032 is 761,000 cfd or 528 cfm. If the City implements a FOG receiving station, that amount of biogas could increase by 15% to approximately 600 cfm. The City currently has two 500 cfm gas dryers for removing moisture in digester gas to minimize adverse effects on engine performance. Because the firm capacity of the gas dryers is 500 cfm and the gas production exceeds 500 cfm, it is recommended that the City install a third 500 cfm gas dryer for redundancy. With the exception of the gas dryer, the existing gas conditioning system appears to have adequate capacity for the projected digester gas flows; therefore, no capacity expansion is required.

3. Throughout the 12 years of operation, the engines have been available for operation for 47 percent of the time. A typical availability for engine generators is 85 to 90 percent. A survey of five northern California wastewater treatment facilities (City of Sunnyvale, East Bay Municipal Utility District, Monterey Regional Water Pollution Control Agency, Fairfield-Suisun Sanitation District, and City of San Jose) indicated engine availabilities ranging from 85 to 95 percent. This low availability is another indication that the engine generators are not operating optimally.

4. Because of control issues, when an engine is alternating between digester gas and natural gas, it must be shut down for the switch over. If City operations staff does not manually switch the gas sources within 15 minutes, a PG&E power demand charge is triggered because more electricity must be purchased from PG&E to make up for the loss of power supplied by the engine. The PG&E power demand charge increases electricity costs considerably, reducing the savings from self power generation. This problem can be resolved by installing automated fuel switch over system that will

switch over between natural gas and digester gas within a 15 minute time period. This will eliminate the risk of triggering power demand charges.

5. For a few weeks in January 2011, all three engines were out of service. The existing digester heating system does not include standby boilers to produce heat when the engines are not operating. During this time, the City was forced to rent standby boilers to heat the digesters, preventing the anaerobic process from becoming unstable. Although this condition is a rare occurrence, adding permanent backup boilers is recommended to ensure reliable support for the anaerobic digestion process. It is typical in the wastewater industry to have standby boiler for digester heating for WWTPs with a cogeneration facility.

9.3.3 Recommended Improvements

The following improvements are recommended to the existing cogeneration system:

1. Recalibrate existing gas flow meters to confirm gas flows. Request an experienced service representative from Waukesha to inspect and check the engines. The service representative should be able to determine the reasons for poor engine fuel economy (assuming that the digester gas flow meters are found to be accurate).
2. Add a third 500 cfm gas dryer designed for redundancy.
3. Install an automated fuel switch over system for each engine to allow a quick transition between digester gas and natural gas.
4. Consider contracting with a 3rd party specialized engine firm for routine servicing, repairs, and major overhauls of the engines.
5. Install a permanent backup boiler for digester heating when the engines are not operable.
6. Provide redundant gas storage system by installing a flexible membrane digester cover on one of the three older digesters when they are rehabilitated (as recommended in Chapter 4).

ALTERNATIVES TO INCREASE BIOGAS PRODUCTION

10.1 INTRODUCTION

The RCWF currently has two anaerobic digesters in service with three out-of-service anaerobic digesters that will be rehabilitated to increase available digester capacity (see Chapter 4). This Chapter evaluates the capacity of the digesters and the feasibility of introducing alternative digester feedstocks to increase biogas production. Increased biogas production would reduce the volume of purchased natural gas required to operate the cogeneration system.

There are several sources of alternative biomass that could be fed to the digesters:

- Fats, Oils and Grease (FOG)
- Food Waste
- Algae

10.2 FATS, OILS AND GREASE DIGESTION EVALUATION

The City has already implemented an ordinance to require collection of FOG from restaurants and other businesses. Restaurants and businesses pay FOG haulers to remove the FOG from their grease traps and dispose of the FOG. Haulers typically dispose of FOG at landfills; however, it has become increasingly common for municipal wastewater treatment plants to construct FOG receiving stations as an alternative disposal site for FOG haulers. Wastewater treatment plant FOG receiving stations are designed to receive, store, and dose FOG to anaerobic digesters to increase biogas production. In addition to increasing biogas production and reducing the quantity of purchased natural gas, the municipalities typically receive a tipping fee from the FOG haulers.

There are several factors that impact the feasibility of anaerobic digestion of FOG:

- FOG Availability: There needs to be a sufficient FOG hauling market to make FOG receiving stations feasible to construct. The anticipated FOG market will impact the sizing of the FOG receiving station.
- Tipping Fees: The cost of the tipping fee ($ per gallon) impacts the likelihood that FOG haulers will deliver FOG to the FOG receiving station. Disposal costs at nearby FOG receiving stations, landfills, and biodiesel manufacturers will impact tipping fees.
- Digester Capacity: Adequate hydraulic and organic loading capacity is required in the existing anaerobic digesters.
- Gas Treatment and Cogeneration Capacity: The gas treatment and cogeneration capacity must be adequate to handle the increased biogas flow from FOG digestion.

10.2.1 FOG Digestion Capacity Analysis

The storage capacity of a FOG receiving station depends on the anticipated market for FOG and the available capacity of the existing anaerobic digesters. Typical FOG receiving stations range from 10,000 to 20,000 gallons of tank capacity. Based on typical installations in California, a conservative FOG delivery of 10,000 gallons per day (gpd) was assumed. Figure 10.1 illustrates a layout for a 10,000 gallon FOG receiving station.

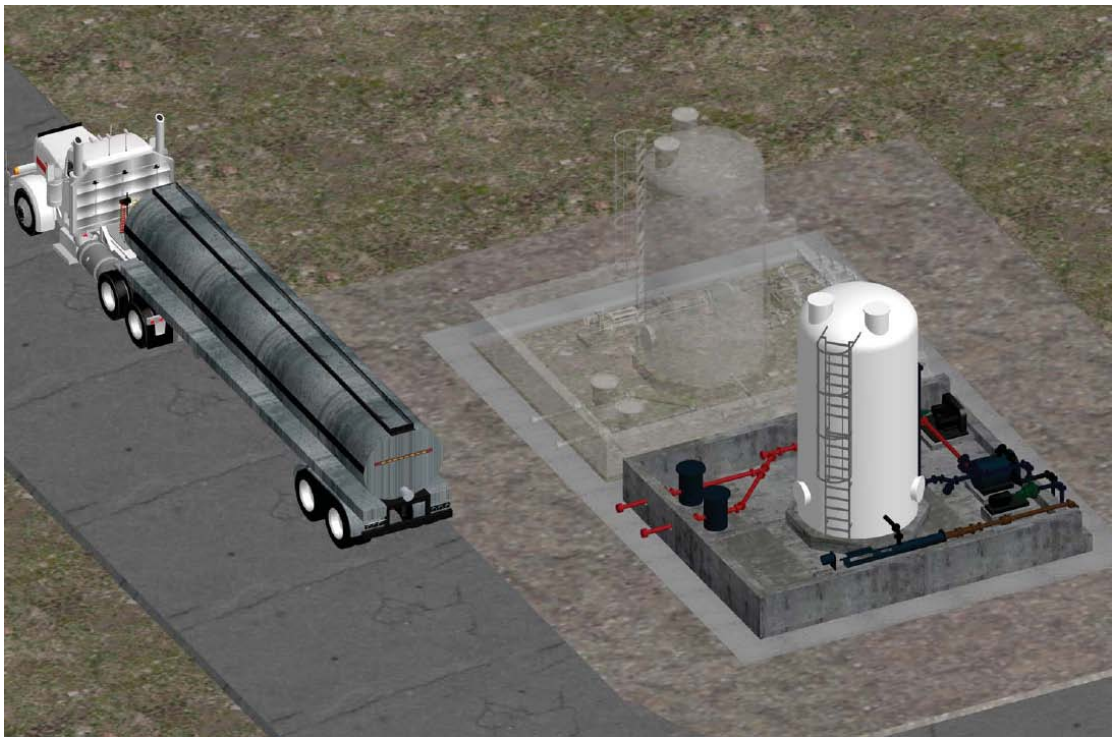


Figure 10.1 3-D Rendering of a 10,000-gallon FOG Receiving Station

Digesters 4 and 5, which are the only two active digesters, each have a capacity of 3 million gallons (MG) for a combined volume of 6 MG. If the three inactive digesters are rehabilitated as recommended, the firm capacity would increase to 7.9 MG and the total digestion capacity would increase to 10.7 MG (based on all three smaller digesters in operation and one large unit out of service for firm capacities).

In 2009, the average flow to the digesters was 0.19 mgd, which correlates to a solids retention time (SRT) of 14.8 days with one large digester out of service (and the three inactive digesters also out of service). The addition of 10,000 gpd of FOG would decrease the SRT of the single digester by 5 percent to 14.1 days. This estimated residence time is below the minimum recommended for mesophilic anaerobic digestion with or without the addition of FOG. During future conditions (based on projected maximum month loadings) with all five digesters in operation and one large unit out of service, the SRT would decrease approximately 2 percent from 15.9 days to 15.6 days. Overall, the addition of

10,000 gpd of FOG to the digesters has an insignificant impact on hydraulic retention time for both current and projected conditions (less than 5 percent).

On a volatile solids loading basis, the current average loading to the digester (with one unit out of service) would be increased by 11 percent from 0.13 lbs of volatile solids per cubic feet per day (lbs VS/cf/d) (2009 average) to 0.15 lbs VS/cf/d. The current organic loading rates under firm capacity are within the recommended loading rates for municipal wastewater sludge digestion with and without adding the FOG. Under future firm maximum month capacity conditions, the volatile solids loading would be increased from 0.11 lbs VS/cf/d to 0.12 lbs VS/cf/d (4.7 percent increase), which is within the recommended range of volatile solids loading for municipal wastewater sludge digestion. For future conditions, after the three smaller digesters are rehabilitated, the increase in volatile solids loading to the digesters due to FOG is insignificant.

The above capacities are based on all three smaller digesters in operation for future conditions. If the City operates one of the smaller digesters as a sludge holding tank, the overall digestion capacity will decrease. However, the impact of FOG on the digesters is still insignificant and is not expected to hinder digester performance. As recommended in Chapter 4, the City may need to operate all three smaller digesters for future maximum month loads if one of the larger digesters is out of service regardless of whether or not FOG is added to the digesters.

10.2.2 Biogas and Electricity Production

A survey of FOG digestion literature indicates that biogas yields could range from 15 to 20 cubic feet of biogas per pound of volatile solids destroyed (VSR). To be conservative, the lower value of 15 cf/lb VSR was used for this analysis.

Assuming 6 percent solids and 95 percent VS in TS for FOG, 10,000 gpd of FOG is equivalent to 5,545 lbs/day VS. Typical volatile solids reductions for FOG range from 80 to 90 percent, with 90 percent being more common. At 90 percent VSR and 15 cf/lb VSR, the resulting biogas production is 75,000 cfd. Based on a 2009 average biogas production of 517,000 cf/d, a 10,000 gpd FOG receiving station would increase the biogas production by approximately 15 percent. This increase in digester gas production can result in a 2,600 kWh/day or 109 kW increase in power generation and a corresponding reduction in natural gas consumption.

10.2.3 Digestibility and Sludge Disposal

Due to the high volatile solids content of FOG, there will be a minimal amount of undigested FOG remaining in the digested sludge. Based on the 10,000 gpd evaluation, the amount of digested sludge pumped to the dewatering facility would be 847 pounds per day (ppd), which is a 7 percent increase to the average annual digested sludge loading to the dewatering facility and less than a 4 percent increase to the maximum month load.

10.2.4 Economic Feasibility

Typical FOG receiving station tipping fees range from 3 cents to 11 cents per gallon depending on the geographical area and competitive FOG tipping fee pricing. Table 10.1 presents the costs and savings for a 10,000 gpd FOG receiving station based on tipping fees ranging from 2 cents to 4 cents per gallon:

Table 10.1 FOG Receiving Station Payback Calculation
Capital Improvements and Energy Management Plan
City of Stockton

COSTS			
Capital Cost		$975,000	$975,000
	TOTAL	**$975,000**	**$975,000**
ANNUAL SAVINGS			
Energy Generation Savings (1)		$105,400	$105,400
Tipping Fee (2)		2¢/gal	4¢/gal
Tipping Fee Revenue		$73,000	$146,000
	TOTAL	**$174,400**	**$251,400**
SIMPLE PAYBACK		**5.6 years**	**3.8 years**

Notes:
(1) Energy savings based on equivalent cost for purchasing natural gas.
(2) Typical FOG receiving station tipping fees range from 3¢/gal to 11¢/gal.

10.2.5 Recommendation

It is recommended that the City conduct a survey of local FOG haulers to better estimate the quantity of FOG available in the Stockton area and to assess the tipping fees of competitive FOG disposal locations. Information from the survey will be used to determine the appropriate size FOG receiving station and will help determine an attractive tipping fee for local FOG haulers. As indicated in the above analysis, the economics are still favorable (5.6 year payback) if tipping fees were to drop to 2 cents/gal. Regardless of the tipping fee, the energy generation savings from increased biogas production is substantial.

Due to the increasing interest in FOG as a new commodity, it is recommended that the City complete their survey and begin design and construction of the receiving station as soon as possible to maximize tipping fee revenue in case FOG tipping fees drop in value.

10.3 FOOD WASTE DIGESTION

There is limited industry experience with food waste receiving stations at municipal wastewater treatment plants. Due to the high level of complexity associated with receiving and pumping food waste, increased odor potential, increased maintenance, and the fact that digestion of food waste will not produce as much biogas as FOG on a volumetric basis, food waste digestion is not evaluated further. If a FOG receiving station is constructed and

is proven successful, and there is excess capacity available for additional feedstock, it would be appropriate to re-evaluate the feasibility of a food waste digestion facility.

10.4 ALGAE BIOFUELS

Recent demand for energy efficiency and greenhouse gas abatement in the wastewater industry has led to renewed interest in alternative fuel production methods, such as anaerobic digestion of algal biomass and production of biodiesel.

The RWCF has 450 acres of oxidation ponds that grow algae at various rates throughout the year depending on pond loading and climatic conditions. Current operation sends oxidation pond effluent through wetlands, nitrifying biotowers, and finally dissolved air flotation thickeners (DAFs) where algae is removed using coagulants. Currently, the algae/chemical DAF float is pumped back to the oxidation ponds for further sludge stabilization and storage. Alternate end-uses for the DAF float, such as algae digestion and algae biodiesel, can increase on-site energy production and reduce greenhouse gas emissions.

10.4.1 Algae Digestion

Algae digestion, which was first investigated more than five decades ago, involves converting solar energy stored in algal biomass during photosynthesis to usable biogas energy. The biogas energy content can then be harnessed to produce heat and electrical energy via methane cogeneration, fuel cells or other similar systems. Algae digestion may be feasible for increasing biogas production in anaerobic digesters and potentially reducing overall greenhouse gas emissions by further offsetting reliance on fossil-fuel based energy.

10.4.1.1 Algal Solids Production

Estimating the mass flow of algal biomass harvested (removed) by the DAFs is uncertain due to the recommended change in the role of the wetlands in the treatment train as a denitrification process. Additionally, the anticipated performance of the DAFs is uncertain due to a lack of available float flow and load. For the purposes of analyzing algae digestion opportunities, it was assumed that the future biomass load to the DAFs would be similar to the 2009 average with the current treatment train arrangement and that the DAFs would achieve a 90% capture.

Focusing on 2009, the oxidation pond effluent TSS ranged from 41 milligrams per liter (mg/L) to 96 mg/L during the summer. This solids production is 57 pounds per acre per day (lbs/ac-d) over the 450 acres of Ponds 1-3, which is a reasonable net algae productivity in unmixed ponds during the summer. The Raw Water (i.e. DAF influent or NBT effluent) TSS concentrations ranged from 18 mg/L in February to 62 mg/L in June. Similarly, the wetland effluent TSS concentrations (i.e. future feed to DAF) ranged from 18 mg/L in February to 59 mg/L in August. The average WE TSS concentration in 2009 was 37 mg/L, which results in a DAF TSS loading of 9,840 lbs/day.

In addition the biomass portion of the DAF float, the RWCF uses chemical coagulant (currently alum). In 2009, the average alum usage was 21,600 lbs/d (excluding water), which corresponds to an approximate alum dosage of 80 mg/L, which is typical for DAFs harvesting algae. Assuming 100 percent of the alum is bound in the DAF float and that the DAF float thickens to 3 percent solids, there is approximately 30,490 lbs/d (0.12 mgd) of DAF float available for digestion. Given the mass of algae available to be harvested and the results of laboratory and pilot algae digestion, the energy and sludge production potentials can be estimated from this data.

10.4.1.2 Algae Digestion Capacity Analysis

Digesters 4 and 5, which are the two currently functional, have a combine volume of 6 MG. With current recommendations to rehabilitate the other three existing digesters, the total digestion capacity would increase to 10.7 MG and a firm capacity of 7.9 MG. Similar to the FOG digestion analysis, the algae digestion capacity analysis is based on all three smaller digesters in service and one larger unit out of service for determining firm capacity.

In 2009, the average flow to the digesters was 0.19 mgd, which results in a SRT of 14.8 days with one digester out of service. The addition of 0.12 mgd of algae float would decrease the retention time in the digesters to 9.1 days. This estimated SRT time is below the minimum recommended for mesophilic anaerobic digestion. During future conditions with all five digesters in operation and one large unit out of service, the SRT would decrease from approximately 15.7 days to 12.7 days. In order to accommodate the entire DAF float, additional digester capacity would be required.

On a volatile solids loading basis, the loading to the digester (with one unit out of service) would be increased from 0.14 lbs VS/cf/d (2009 average) to 0.16 lbs VS/cf/d, which is a 15% increase. The current organic loading rate, based on firm capacity (with one 3 MG digester in service), exceeds the recommended loading rate for municipal wastewater sludge digestion with and without adding the DAF float. Under future firm capacity conditions, the volatile solids loading would be increased from 0.11 lbs VS/cf/d to 0.12 lbs VS/cf/d, which is within the recommended range of volatile solids loading for municipal wastewater sludge digestion.

10.4.1.3 Biogas and Electricity Production

A survey of literature indicates that methane yields from digesting algae could range from 3.2 to 5.3 cf CH_4/lb algal VS introduced for loads 0.03-0.13 lb VS/cf/d. By comparison, a recent study at the California Polytechnic State University San Luis Obispo achieved an average yield of 3.9 cf CH_4/lb VS in digesters fed with 100 percent algae. This study was consistent with others which indicate methane yield is directly proportional to the percent algae content in algae/wastewater sludge co-digestion experiments.

To estimate methane production for the RWCF, a methane yield of 4.8 cf/lb algal VS introduced was selected as a representative long-term yield. Assuming 90 percent VS in TS

for the biomass portion of the DAF float and assuming the chemical addition is 100 percent non-volatile, the 30,490 lbs/day of DAF float expected on average is equivalent to 7,973 lbs/day VS. The resulting methane production is 38,400 cfd or approximately 59,100 cfd of biogas with 65 percent methane content. Based on a 2009 average biogas production of 517,000 cfd, algae digestion would increase the biogas production by approximately 10 percent. Assuming 560 BTU/cf and 32 percent generator efficiency, this methane can produce 2,900 kWh/d of electricity or 126 kW if operated continuously.

10.4.1.4 Digestibility and Sludge Disposal

Algae do not digest as readily as municipal sludge due to their resilient cell walls. In 2009, the volatile solids destruction in the RWCF digesters averaged 50 to 55 percent, and in the California Polytechnic State University 100 percent wastewater sludge digesters, it averaged 57 percent, which is typical of mesophilic wastewater sludge digesters with 15-20 day residence times. However, the California Polytechnic State University algae digester volatile solids destruction was only 28 percent with 100 percent algae biomass (20-day residence time, 37°C). VS destruction was found to be directly proportional to the algae content of the feed. These findings are consistent with other algae digestion research that indicating the lower digestibility of algae.

As a result of the added algae feed, with its lower digestibility, the mass of digested biosolids sent to the belt presses would increase substantially. On average, 28,100 lbs/day of undigested algae TSS would be sent to the dewatering facilities. Assuming 90 percent capture in the belt presses, the amount of biosolids that need to be hauled would increase from 87 wet tons/day in 2009 to 100 wet tons/day (13 wet tons/d or 15% increase). Similarly, the belt press filtrate flow recycled to the Headworks would increase.

Based on laboratory algal cell disruption research (Chen and Oswald 1998), the digestibility of algae might be improved, resulting in perhaps a doubling of the methane production and also improved VS destruction. Monetary and parasitic energy costs would be incurred due to the cell disruption equipment. However, this technology is not mature and is not ready for implementation.

If the coagulation reagents were organic polymers, they might contribute to biogas production or inhibit it. Similarly, the effects of alum on digestion is unknown. Although polymers are commonly used to thicken sludge prior to digestion, a laboratory study on the effect of coagulants on algae digestion is recommended.

10.4.1.5 Summary

Based on this preliminary analysis, the energy costs that would be offset by energy produced from algae-derived biogas would amount to approximately $97,000 annually at 9 cents/kWh; whereas, the costs associated with the increased amount of dewatered cake (13 wet tons/day) for hauling amounts to approximately $146,000 annually at $30/ton. This

cost does not include the construction cost for an additional digester, which would be required.

In summary, the algae digestion at the RWCF would provide the following benefits:

- Renewable fuel production.
- Reduce accumulation of biosolids in ponds (decreasing dredging required).
- Potentially increased pond treatment capacity.
- Reduce greenhouse gas emissions from ponds.

However, there are several disadvantages that impact the feasibility of implementing a full-scale algae digestion facility.

- Increased digester mixing and heating costs.
- Increased pumping costs.
- Increased dewatering costs.
- Increased sludge disposal costs.
- Reduction in digester hydraulic and volatile solids capacity (requiring the construction of an additional digester).
- Capital costs for DAF to digester pipeline.
- Ammonia inhibition due to high protein content.
- Potential coagulant effects on digestion.

Other considerations that are currently being researched that may improve the digestibility of algae; thereby increasing biogas production and reducing hauling costs of undigested volatile solids are as follows:

- Cell disruption pretreatment such as sonification or mechanical presses
- Improving carbon to nitrogen ratios via co-digestion with alternative feedstocks

Additionally, the development of algae-based total nutrient removal systems and alternative end-uses for digested algae may positively impact the economic feasibility of algae digestion. If the digesters had sufficient capacity for one digester to be dedicated to algae and other alternative feedstocks, the digested sludge from this digester could be pumped to ponds which would eliminate the costs for increased dewatering and hauling. Since the RWCF will not have the digester capacity to dedicate one entirely for alternative feedstock digestion, the capital costs associated with constructing another digester would be significant and would outweigh the benefit of increased biogas.

10.4.1.6 Recommendation

Algae digestion research has been performed primarily at lab and pilot scales with one known full-scale demonstration system in the United States at the Water Pollution Control Plant located in the City of Sunnyvale, California. Due to limited industry experience and challenges and costs associated with algae digestion, it is not recommended that the City proceed with full-scale algae digestion. However, due to the recent interest in algae-to-energy technologies and the City's existing algae harvesting infrastructure, the City is in a unique position for taking advantage of government and private research funding opportunities. The City should stay abreast of algae research and pursue grant funding for pilot studies if opportunities arise.

10.4.2 Algae Biodiesel

Commercial algae production for bio-derived fuels have become increasingly common in the last few years as oil prices have increased and as estimates of the world's petroleum supply has decreased. Seed crops such as soybean and jatropha have been the main feedstocks for biodiesel production; however, due to the higher reported potential oil yield of algae (5 to 60 times larger than terrestrial seed crops), interest in algae has grown substantially. Table 10.2 compares the productivity of algae to other biomass feedstocks:

Table 10.2 Comparison of Oil Yields
Capital Improvements and Energy Management Plan
City of Stockton

Biomass	Oil Yield (gal/ac/year)(1)
Soybean	48
Camelina	62
Sunflower	102
Jatropha	202
Oil Palm	635
Algae	1,200 (1,000-4,000)

Note:
(1) Oil yields referenced from US Department of Energy Biomass Program, National Algae Biofuels Technology Roadmap, 2010.

The relatively high reported oil yields from algae have led to widespread interest in developing algae biodiesel processing technologies. Algae biodiesel research has focused primarily on high algal productivity technologies such as open raceway ponds or closed-loop photobioreactors. Researchers are attempting to maintain and grow high oil producing algae strains, which have algae biomass productivities ranging from 134 to 178 lbs/ac/d (15 to 20 g/m^2/d); whereas, conventional oxidation ponds (such as the ones at the RWCF)

are low algal productivity systems (57 ppd/ac or 6.4 g/m^2/d) with mixed culture of wild algae strains, which are typically not ideal for algae biodiesel production facilities.

Despite billions of dollars devoted to researched algae-to-energy technologies over the last five years, there has been a surprising lack of successfully developed technologies with supporting data. To date, algae biofuel research has not been able to demonstrate that algae to biodiesel is cost effective. Most reports have indicated that the cost to produce a barrel of algae oil is approximately twice the cost of producing a barrel of fossil-fuel based oil.

Algae to biodiesel would not likely be an economically feasible venture for the City or provide a any beneficial process improvements; however, there may be the opportunity to partner with algae technology companies to pilot developing technologies. There may be public relations benefits to participating in “green” energy research and there are numerous agencies with funding available to support research efforts.

EVALUATION OF COGENERATION AND BIOGAS UTILIZATION ALTERNATIVES

11.1 INTRODUCTION

As described in Chapter 9, the City owns and operates a 3.0 MW engine-based cogeneration system. This Chapter compares other cogeneration alternatives to continued operation of the existing engine system to determine if other approaches would be more beneficial for the City over the long term. There are some issues associated with continued use of the cogeneration system – the engines have been difficult to maintain, fuel economy has been lower than industry standards, and more restrictive exhaust emissions are anticipated in a few years. Greenhouse gas emissions are also a factor in selecting the most appropriate cogeneration system. Fuel cells have a higher electrical conversion efficiency and produce significantly lower green houses gases compared to other cogeneration technologies (on a per kW basis). As air quality and greenhouse gas emission control become increasingly stringent, lower emission cogeneration technologies, such as fuel cells, may become more attractive and therefore are considered in this evaluation.

11.2 DESCRIPTION OF BIOGAS UTILIZATION ALTERNATIVES

Each alternative was structured to achieve the common goal of supplying all of the power demands for the RWCF.

The following alternatives were evaluated:

- Alternative 1: Continue with existing cogeneration system with new emissions controls added when required.
- Alternative 2: Combination of 1.4 MW fuel cells and existing engines.
- Alternative 3: Abandon engine generators and sell biogas off-site.
- Alternative 4: Abandon engine generators and sell biogas to PG&E.

11.2.1 Alternative 1 - Base condition: Continue with existing cogeneration system with new emissions controls added when required.

Under this alternative, the existing three 1 MW engines would be retained. As discussed previously in Chapter 9, it is likely that more restrictive exhaust air emissions (nitrous oxides) controls will be required. Currently, the only technology available to reach the anticipated limits is the Selective Catalytic Reduction (SCR) process. Therefore, it is assumed that SCR system would be required to continue use of the engines. The cost of a new gas dryer (as discussed in Chapters 4 and 10) and SCR system are included in this alternative.

Assuming the engines will be about 90 percent available, the power production from the engines will be short of the total demand for the RWCF. The shortfall would be made up with electrical power purchased from PG&E.

11.2.2 Alternative 2: Combination of 1.4 MW Fuel Cells and Existing Engines

This alternative was developed to take advantage of the increased electrical efficiency of fuel cell technology over the other cogeneration technologies. Fuel cells (1.4 MW) would be operated in conjunction with the existing engines. The fuel cells will operate exclusively on digester gas and engines will operate primarily on natural gas to make up the remaining power requirements for the RWCF. This alternative will meet the total energy demands for the RWCF for the first few years and will require purchasing electricity (approximately 10 percent of the RWCF's energy demand) from PG&E after the first few years of operation.

A fuel cell is an electrochemical device that combines hydrogen and oxygen to produce electricity without combustion. Similar to combustion reactions, water, carbon dioxide (CO_2), and heat are its primary by-products. Because the conversion of the fuel to energy takes place through an electrochemical process, the conversion is clean, quiet and much more efficient than combustion of the same fuel. Fuel cells can convert up to 47 percent of the fuel input energy into power (electrical efficiency) compared to 30 to 40 percent electrical efficiency for engine generators. Alternatively, because fuel cells are more efficient in converting fuel to electricity than engines, the waste heat produced by fuel cells is less than the heat produced from engines. Fuel cells can recover up to 22 percent of the input energy as recoverable heat. The overall efficiency for fuel cells is approximately 69 percent. Whereas, engine generators can recover up to 40 percent heat (thermal efficiency), which combined with the electricity conversion efficiency amounts to an overall efficiency of 70 to 80 percent.

This alternative would produce sufficient waste heat to meet the heating demand for the anaerobic digesters with some additional excess heat capacity available for other heating needs at the RWCF.

One of the major benefits of fuel cells is that they produce very low emissions. Fuel cells produce lower CO_2 and negligible quantities of CO and NO_x on a per kWh basis (assuming that additional natural gas is not required to heat the digesters). Fuel cell CO and NO_x emissions are over 90 percent less than the emissions from engines.

This alternative assumes continued operation of existing engines. Therefore, the improvements such as a SCR system to control emissions and a new gas dryer for improved reliability are included in this alternative. In addition, fuel cells require digester gas at slightly higher pressure than engines; therefore, the cost of a new gas compressor is also included in the analysis for this alternative.

Fuel cells have been operating successfully with clean, natural gas, for many years. However, digester gas fed fuel cells are still an emerging technology, and accordingly, there are some risks involved with this form of power generation:

- **Single source supplier and weak financial performance:** Fuel Cell Energy Inc. (FCE) is the only company that currently manufactures fuel cells that can run on biogas. Based on the FCE's recent filing with the Securities and Exchange Commission (SEC), the company has been operating at a substantial loss since 2008. In their most recent quarterly SEC filing (January 31, 2011), FEC stated that their quarterly net loss was $11.7 M on $28.1 M in revenue. The long term outlook of the company's financial health is unknown. However, to improve its financial backing, FCE recently sold 20 percent of its equity to POSCO, a large Korean company.

- **Dependence on grant funding:** Over the past few years fuel cells have been an attractive technology for cogeneration because of funding by the state's Self Generation Incentive Program (SGIP). While alternative 2 provides significant savings compared to the existing engine alternative, these savings assume that SGIP grant funding is available. However, the SGIP was suspended in January 1, 2011 in response to a drain of the available funds by applications filed by others. At this time there are no SGIP funds available, but it is expected that the program will be reinstated in the next few months, possibly in a different form, and possibly at reduced funding levels.

- **Limited operating history:** The first full production fuel cell system operating on digester gas was installed in 2004 at the City of Palmdale, California. Many installations have reported operating problems associated with the gas scrubbing systems and the fuel cell "stacks" (the metal core of the fuel cell that converts hydrogen gas to electricity). In addition, the systems have had problems with support systems which may trigger lengthy shutdowns of the fuel cell stacks.

- **Coordinating power production:** Coordinating power production with the utility power company to prevent nuisance shutdowns has been an operating challenge.

- **Digester gas quantity and quality**: Digester gas quantity and quality is variable depending on the performance of the anaerobic digestion process. Fuel cells require more consistent digester gas quantity and quality than engine generators. However, low pressure gas storage and a well-maintained gas scrubbing system can address these concerns.

First installations are essentially experimental, and experience from failures lead to the development of new equipment and contractual safeguards to improve system reliability. According to discussions with FCE, they believe they have resolved most of the issues described above. Whether the "bugs" have been fully solved is still uncertain. However,

many agencies have chosen the biogas fuel cell option as evidenced by several recent projects listed in Table 11.1. The most recent fuel cell installations are being developed through the power purchase agreement (PPA) approach (see discussion in Chapter 17 on PPAs) , presumably to mitigate the risks of the technology and to eliminate the need to invest large capital expenses.

Table 11.1 Recent Fuel Cell Installations
Capital Improvements and Energy Management Plan
City of Stockton

Agency	Fuel Cell Capacity, (MW)	Year of Construction
City of Tulare, CA	0.3 MW	2011
OCSD, Fountain Hills, CA	0.3 MW	2011
EMUD - Perris Valley, CA	2 - 0.3 MW	Under Construction
Olivera/GB (French Camp, CA)	1 - 1.4 MW	Under Construction
Rancho Water District, Temecula, CA	1 - 1.4 MW	Under Construction
Inland Empire, Chino, CA	1 – 2.8 MW	Under Construction
San Jose	1 – 1.4 MW	Under Construction

11.2.2.1 Mitigation of Fuel Cell Risks

If the City desires to pursue the fuel cell option to take advantage of the additional power savings, there are several approaches to mitigating the potential risk of the investment.

1. **Use the Power Purchase Agreement (PPA) approach to DBOO (Design, Build, Own, and Operate) the fuel cell project:** Under the PPA arrangement, the City would enter into an agreement with a project developer which would design, build, own, and operate the fuel cell for a set period (normally 20 years). Typical agreements are structured so the owner can purchase power from the developer at a fixed reduced rate compared to the current and projected PG&E rates with some annual escalation (2 to 3 percent). Usually the fixed rate is only marginally lower than current PG&E rates, but the margin may increase over time as utility power rates escalate at a higher annual escalation rate. The City may also have the option to buy out the fuel cell system after a specified term.

   The main advantage of the PPA approach is that it assigns a large portion of the risk to the developer, and the City would not be devoting capital to finance the project. Recent examples of public agency PPAs for fuel cells include the Inland Empire and the City of San Jose.

   The main disadvantage is that the City will likely see a much smaller benefit of power cost savings compared to full ownership of the fuel cell facility.

2. **Integrating the gas scrubbing system with the fuel cell system:** If the City chooses to own the fuel system, the risks associated with the gas scrubbing system can be reduced by requiring the fuel cell company to furnish, install, integrate, and maintain the fuel system to reduce coordination issues between the two units.

11.2.3 Alternative 3: Abandon Engine Generators and Sell Biogas Off-Site

This alternative includes removal of the engine generators under the premise that the maintenance issues cannot be resolved, or that maintenance costs are deemed excessive. In this alternative, digester gas would be scrubbed with the existing gas scrubbing system then sold off-site to the Castle and Cooke cold storage facility at the Port of Stockton. Castle and Cooke already owns a fuel cell that is currently fueled by natural gas. It was assumed for this alternative that the digester gas would be sold at a substantial discount over natural gas to make the offer attractive for Castle and Cook, recognizing that digester gas has a lower energy value and the gas quality would not be as high as natural gas. Scrubbed digester gas would be conveyed to the Castle & Cooke fuel cell via a new gas compressor and a 6-inch pipeline from the RWCF.

11.2.4 Alternative 4: Abandon Engine Generators and Sell Biogas to PG&E

This alternative is similar to Alternative 3, except digester gas would be scrubbed further to remove carbon dioxide in order to improve digester gas quality to natural gas quality, and would be pressurized and fed into the nearby natural gas PG&E main via a new 4-inch pipeline from the RWCF. Removal of carbon dioxide is required by PG&E, but it would not be required for the Castle & Cooke fuel cell in Alternative 3.

11.3 BIOGAS UTILIZATION ALTERNATIVES EVALUATION

11.3.1 Power Production Costs

An evaluation of the alternatives is presented in Table 11.2. The alternatives are compared based on total energy costs for the RWCF. The total energy costs for the RWCF may include purchasing all or part of the power required from PG&E and generating all or part of the power from the on-site cogeneration facility. As shown, Alternative 2 (Fuel Cells + Existing Engines) provides power to RWCF at the lowest cost over 20 years compared to the other alternatives. Alternative 1 (Continued use of existing engine generators) is the second most cost effective alternative. The alternatives that involve selling digester gas (Alternatives 3 and 4) provide very low cost savings because of the need to buy all the required power from PG&E, which costs more per kWh than the cost to produce power using digester gas through implementation of the other alternatives. For all alternatives, it is assumed that boilers are required either for the primary means of heating the anaerobic digesters or as a redundant means of heating the digesters when the cogeneration system is not online; therefore, boiler costs were not included in the evaluation.

Table 11.2 Evaluation of Biogas Utilization Alternatives to Supply Total Power to the RWCF
Capital Improvements and Energy Management Plan
City of Stockton

Alternatives	Economics				20-year Average Energy Generated (MWh/Yr)
	Capital Cost ($M)	Present Worth of Total Energy Cost ($M)(2)	Present Worth 20 years Savings to Supply Total Energy ($M) (3)	20-Year Average Cost of Power (¢/kWh)	
PG&E (No Cogeneration)	---	$84.8	---	22.4	0
Alternative 1: PG&E and Existing Engines w/SCR	$2.4	$73.1	---	19.5	20,100
Alternative 2: 1.4 MW Fuel Cell & Existing Engines w/SCR	$7.1 (1)	$63.4	$9.7	16.4	31,300
Alternative 2: 1.4 MW Fuel Cell **w/o SGIP grant** & Existing Engines w/SCR	$12.5	$68.8	$4.3	17.7	31,300
Alternative 3: PG&E (Sell Digester Gas to Castle & Cooke)	$1.5	$82.8	---	22.1	0
Alternative 4: PG&E (Sell Digester Gas to PG&E)	$9.1	$91.7	---	23.0	0

Notes:
(1) Includes SGIP funding for fuel cells.
(2) Represents overall plant energy costs including purchased electricity costs, cogeneration alternatives' capital and O&M costs.
(3) Present worth of energy savings is calculated as the difference in present worth of total energy cost for each alternative compared to Alternative 1. Alternative 2 is the only alternative that provides savings.

11.3.2 Emissions

In Table 11.3, greenhouse gases, CO and NOx emissions are calculated for each alternative. Greenhouse gas emissions are calculated using EPA standard reporting factors for purchased electricity usage, natural gas and digester gas consumption for power generation. The CO and NOx emissions shown in Table 11.3 are calculated based on the standard equipment product data sheets for engines with SCR, fuel cells, boilers and flares. However, CO and NOx emissions associated with purchased electricity from PG&E were not available and therefore, were not included in this analysis.

Table 11.3 shows that Alternative 2 produces approximately 29 percent less greenhouse gas quantities compared to Alternative 1 on a per MWh of on-site generated power basis (0.7 versus 0.9 lbs per MWh), which is partly attributed to the improved efficiency with fuel cells. The fuel cells in Alternative 2 produce significantly less NO_x and CO compared to the engine generators used in Alternative 1. Overall, Alternative 2 emits less greenhouse gases and regulated air pollutants than Alternative 1 because of the improved efficiency and energy conversion process for fuel cells and the decreased dependence on electricity purchased from PG&E, which emits more greenhouse gases than on-site cogeneration systems.

In addition to the economic comparison, other non-economic factors (Table 11.4) were considered when analyzing the different alternatives.

11.3.3 Recommendations

Although the fuel cell alternative could provide the most savings in power costs, there are substantial risks and upfront costs associated with the fuel cell option. However, these risks can be partially mitigated with the PPA option. Alternatively, there are also risks associated with continued dependence on the existing engine generators such as availability, maintenance issues, and future stringent exhaust emissions controls. However, these risks are tempered, from a comparative perspective, because both Alternative 1 and Alternative 2 rely on the continued operation of the existing cogeneration system.

Currently, the SGIP program is on hold and the future grant funding level for fuel cell projects will be known in a few months. Therefore, the recommended interim approach is as follows:

- Continue with the existing cogeneration system.
- Add a new gas dryer and automated fuel switch over system for the existing engines as recommended in Chapter 9.
- Add SCR when required by the San Joaquin Valley Air Pollution Control District. Based on new regulations being considered by the South Coast Air Quality Management District, SCR may be required for engines in the Central Valley within 3 to 5 years.

Table 11.3 Estimated 20-Year Average Emissions for Biogas Utilization Alternatives
Capital Improvements and Energy Management Plan
City of Stockton

Alternative	Greenhouse Gas Emissions By Source (Metric Tons CO_2 Equivalents per Year, Average 20 Years)			Tons CO_2 Equivalents per MWh Generated	Regulated Air Pollutant Emissions [4]			
	Purchased Electricity[1]	Natural Gas Usage[2]	Digester Gas Usage[3]		NO_x Emissions (lbs/Yr)	NO_x Emissions (lbs/MWh Generated)	CO Emissions (lbs/Yr)	CO Emissions (lbs/MWh Generated)
PG&E (No Cogeneration)	13,800	N/A	6,800	N/A	10,400	N/A	31,600	N/A
Alternative 1: PG&E and Existing Engines w/SCR	5,700	10,700	6,800	0.90	10,600	0.50	191,500	9.50
Alternative 2: 1.4 MW Fuel Cell & Existing Engines w/SCR	1,300	14,700	6,800	0.70	10,500	0.30	187,100	6.50
Alternative 3: PG&E (Sell Digester Gas to Castle & Cooke)	14,000	N/A	3,100	N/A	6,800	N/A	17,200	N/A
Alternative 4: PG&E (Sell Digester Gas to PG&E)	14,700	N/A	3,100	N/A	6,800	N/A	17,200	N/A

Notes:
1) Represents 20 years average GHG emissions that are associated with electricity purchased from utility per EPA standards.
2) Represents GHG emissions from Natural Gas usage for Cogeneration per EPA standards.
3) Represents GHG emissions for digester gas usage in boilers or flare or for cogeneration units.
4) Represents total emissions for the plant including emissions from boilers or cogeneration units or flare.

Table 11.4 Non-Economic Factors for Biogas Utilization Alternatives Evaluation
Capital Improvements and Energy Management Plan
City of Stockton

Alternative	Advantages	Disadvantages
1. Continued use of existing engine generators with SCR emissions controls	• Lowest capital investment. • System is already in place. • Second highest power savings. • More recovered waste heat for digester heating.	• Poor track record for availability due to breakdowns. • May require long-term maintenance contract. • Future emissions regulations will require more complex emissions controls.
2. Existing engine generators + 1.4 MW fuel cells	• Highest power savings. • Diversified power production capabilities. • Lower CO_2 emissions on a per kWh basis. • Low greenhouse gas emissions. • High efficiency in producing power. • Can be implemented by a PPA. • High availability (ranging from 95% to 98%).	• High capital investment. • Reliance on single fuel cell supplier. • Manufacturer financial stability is weak. • Technical problems consistent with an emerging technology. • Grant funds that are required for financial feasibility are not currently available. • Fuel conditioning system critical for reliable operation of fuel cell.
3. Abandon engine generators sell biogas off-site	• Engine maintenance issues are eliminated.	• Second to highest power costs.
4. Abandon Engine Generators, sell Biogas to PG&E	• Engine maintenance issues are eliminated.	• Requires complex scrubbing system to remove carbon dioxide. • Alternative with highest power costs.

- Install a boiler for redundant means of heating the anaerobic digesters when the cogeneration system is not operating.
- Consider contracting with a 3rd party for maintenance of the cogeneration equipment, including major overhauls, to improve the reliability, efficiency, and availability of the existing engines.

If the SGIP is reinstated, the City should re-evaluate the fuel cell alternative. If fuel cells are re-considered, it is recommended that a request for proposals be issued to solicit bids from PPA developers. Once the PPA bids are received, the City should evaluate the costs, advantages, and disadvantages of the PPA approach versus City ownership of the fuel cell system.

ENERGY EFFICIENCY MEASURES

12.1 INTRODUCTION

This Chapter describes the evaluation of potential energy efficiency measures (EEMs) for the RWCF. Section 12.2 presents descriptions, costs, and savings for the recommended energy efficiency measures and Section 12.3 presents other energy efficiency measures that were identified but not recommended for implementation. The complete energy efficiency analysis is contained in the Appendices.

The recommended EEMs provide the following benefits:

- Electrical energy savings of 1.5 million kWh per year.
- Reduction of facility's electrical energy consumption by 5.7 percent.
- Reduction of electricity procured from PG&E by 17.4 percent.
- Peak demand savings of approximately 140 kilowatts (kW).
- Potential cost savings of $160,000 per year.
- Total potential PG&E incentives and rebates amounting to $90,000.
- Relatively minimal required upfront capital costs, after incentives and rebates, of $300,000.
- With incentives and rebates, the overall simple payback period for the EEMs is less than 2 years.

12.2 RECOMMENDED ENERGY EFFICIENCY MEASURES

This section consists of the energy savings, energy cost savings, and implementation cost estimates for each EEM recommended for implementation at the RWCF. Implementation cost estimates are then compared to energy cost savings to calculate simple payback periods.

Seven EEMs are recommended for implementation. A summary of these measures is presented in Table 12.1 and described more fully in Sections 12.2.1 through 12.2.7. The analyses focused on installation cost and energy and cost savings. These EEMs have not been evaluated for other factors that could impact the ultimate implementation of the EEMs, such as future expansion capability, regulatory compliance and permitting, or ease and cost of maintenance. These factors should be considered prior to a final implementation decision.

Table 12.1 Energy Efficiency Measure Summary
Capital Improvement and Energy Management Plan
City of Stockton

No.	EEM No. Description	Potential Energy Savings (kWh/yr)	Peak Demand Savings (kW)	Potential Cost Savings ($/year)	Potential Incentive ($)	Installed Cost w/ Incentive ($)	Simple Payback (years)
1	Reduce Discharge Pressure of Tertiary Air Compressors	431,369	49.2	$47,062	$4,703	$4,703	0.1
2	Install Premium Efficiency Motors on a Replacement Basis(1)	61,615	4.8	$6,722	$6,025	$7,709	1.1
3	Replace Existing HID Fixtures with High Efficiency Fluorescent Fixtures	162,761	18.4	$17,757	$7,600	$29,832	1.7
4	Install Automatic Lighting Controls	80,031	0.0	$8,731	$3,557	$32,909	3.8
5	Replace Air Compressor No. 2 with a VSD Air Compressor	152,424	17.4	$16,629	$15,458	$45,792	2.8
6	Install Higher Efficiency DAF Pressurization Pumps	421,354	48.3	$45,970	$42,752	$68,498	1.5
7	Replace Existing Outdoor HID Lighting with LED Lighting	185,525	0.0	$20,241	$9,276	$115,249	5.7

Note:
(1) Two year values. Refer to Section 12.2.2 for details.

12.2.1 EEM No. 1: Reduce Discharge Pressure of Tertiary System Air Compressors

Recommended Action

Reduce the discharge pressure of the two existing Tertiary System air compressors from 118 pounds per square inch gauge (psig) to 80 psig in order to reduce their electrical energy consumption.

Background

The Tertiary System has two 150 hp air compressors that produce compressed air primarily for the DAF system, float ejectors, and instrumentation. Both compressors were observed to have a discharge pressure of about 118 psig. Compressor #1 was observed to be operating at 100 percent capacity (output), while compressor #2 was operating at about 80 percent capacity. The compressed air system includes two air-cooled after-coolers, two regenerative dryers, and storage tanks. Both air compressors operate 24 hours per day, 365 days per year for a total of 8,760 hours per year.

The Tertiary System has four Dissolved Air Flotation (DAF) thickeners that use dissolved air to separate suspended solids from wastewater. Each DAF uses a pressurization pump to pressurize incoming wetlands effluent or recycled DAF effluent to 50 psig in a mixing tank. From the air compressors, air is delivered to a 220-gallon receiver at each DAF. The air pressure of one receiver was observed to be 100 psig. The pressure drop from the compressor outlet to the local DAF air receiver is approximately 18 psi[1]. Since the DAF mixing tanks require compressed air at 50 psig, setting the air compressors' discharge pressure to 80 psig will be sufficient for DAF operating requirements. However, it is recommended to install an additional air receiver in the compressor room to compensate for the system storage capacity reduction associated with reducing the pressure.

Anticipated Savings

A reduction in the discharge pressures of the air compressors will reduce the power draw of their motors. A spot power measurement of compressor #1 found that it was drawing 133 kW while operating at full load (100 percent capacity), which is about 10 percent above its nameplate rating. Reducing the air compressors' discharge pressure from 118 psig to 80 psig will reduce power draw by approximately 19 percent.

In addition, reducing the discharge pressure is estimated to result in an annual electrical energy savings of 431,369 kWh and is estimated to lower the facility's peak demand by 49.2 kW. The estimated annual electrical energy cost savings is $47,100.

[1] It may also be possible to increase the size of the existing air piping to further reduce the pressure losses (and the required upstream pressure).

Implementation Cost

Implementation consists of adjusting the discharge pressure of the air compressors, and adding an additional storage tank. The storage tank has been sized so that the proposed compressed air system has similar storage capacity to the existing system.

It is estimated that the total cost for implementing this energy efficiency measure is $9,400. With a total annual savings in energy of approximately $47,100, the simple payback for this investment is 2.5 months.

PG&E Incentive

Based on potential energy and peak demand savings, the incentive would typically be $43,747. However, the potential incentive is capped at 50 percent of the implementation cost, which is estimated to be $4,703.

12.2.2 EEM No. 2: Install Premium Efficiency Motors on a Replacement Basis

Recommended Action

Install premium efficiency motors on a replacement basis (i.e., when the old motors wear out and need replacement).

Background

The electric motors at the RWCF were inventoried, and many motors are standard efficiency motors rather than “high efficiency” or premium efficiency motors. It is recommended that premium efficiency motors be installed in place of the existing standard efficiency motors on a replacement basis. Only motors that would have a simple payback period of less than 6 years have been included in this EEM.

Standard efficiency motors are listed in Table 12.2.

Anticipated Savings

The total annual electrical energy savings for this measure is estimated at 246,458 kWh. The peak demand savings is estimated at 28.6 kW. The total annual electrical cost savings is estimated to be $26,888.

Implementation Cost

The implementation cost for this recommendation, on a two-year basis is estimated to be $82,404. A one-time implementation of all the standard efficiency motors listed in Appendix F is estimated to be $501,315. One-time replacement of all the motors would result in a simple payback period of 18.6 years and is therefore not recommended. Implementation costs for each standard efficiency motor identified for replacement are shown in Table 12.2.

Table 12.2 Cost Savings and Implementation Cost to Install Premium Efficiency Motors
Capital Improvement and Energy Management Plan
City of Stockton

Location	Driven Equipment Description	No.	HP	Premium Efficiency Cost Adder ($/motor)	EECS ($/yr)	Total Cost Adder ($)
Headworks	Bioscrubber Fans	2	50	660	912	1,320
	Bioscrubber Fans	2	50	660	912	1,320
	Bioscrubber Recycle Pumps	2	25	206	525	412
	Conveyor	1	3	91	33	91
	Conveyor	1	5	119	46	119
	Compactor	1	10	142	23	142
	Raw Sewage Pump	1	400	4,168	762	4,168
	Barscreens	4	3	91	132	364
Primary Clarifiers	Scum Pumps	8	5	119	197	952
BioTowers	Biotower Ventilation Fans	32	5	119	2,368	3,808
	Biotower Pumps	4	350	6,465	5,880	25,860
Secondary Clarifiers	Sump Pump	1	10	142	38	142
	Effluent Pumps	3	100	1,864	1,680	5,592
Cogen Area	Air Compressor Fans	2	5	119	99	238
	Air Compressors	2	75	1,032	593	2,064
Sludge Dewatering	Odor Control Fan	1	10	142	49	142
	Belt Press Drive	1	7.5	81	46	81
	Sludge Pumps	2	5	119	113	238
	Sludge Pumps	3	15	295	234	885
Gravity-Belt Thickeners	Sludge Cake Hydraulic Pumps	2	125	348	386	696
	Filter Press Wash Pump	1	10	142	38	142
	Filter Press Scum Pump	1	10	142	38	142
	Sludge Pump	1	15	295	129	295
	Belt Thickener Drive	2	25	206	262	412
	Washwater Pump	2	5	119	92	238
Digesters	Sludge Recirculation Pumps	2	25	206	487	412
	Mixing Pumps	4	75	1,032	1,078	4,128
Tertiary Treatment	Aftercooler Fan	2	7.5	81	175	162
	Filter Water Pumps	3	125	348	1,812	1,044
	3W Pumps	2	60	871	473	1,742
	Alum Feed Pump	1	7.5	81	36	81
	Float Collectors	4	3	91	132	364
	Float Conveyors	8	7.5	81	570	648
	DAF Arm Drives	4	7.5	81	285	324
	BioTower Fans	8	5	119	737	952
	Wetlands Recycle Pumps	4	125	348	1,803	1,392
	Wetlands Hi-Lift Pumps	3	300	5,052	2,954	15,156
	Raw Water Pumps	4	100	1,864	1,671	7,456
Totals					**26,888**	**82,404**

Incremental Savings

It is recommended that premium efficiency motors be installed as the existing motors wear out. Since it may take several years to realize the savings due to this measure, incremental savings for the first two years are included here. Because it is not possible to calculate or predict which motor will burn out in a given year, it is assumed that the average standard efficiency motor lifetime is 12 years (based on information from various motor manufacturers). Electrical energy cost savings (EECS) for each motor are presented in Table 12.2.

Table 12.3 presents the two-year incremental summary for EEM No. 2:

Table 12.3 Energy Efficiency Measure No. 2 Two Year Incremental Summary Capital Improvement and Energy Management Plan City of Stockton	
Two-Year Incremental Energy Savings	61,615 kWh/year
Second Year Peak Demand Savings	4.8 kW
Two-Year Incremental Cost Savings	$6,722/year
Two-Year Incremental Cost Premium	$13,734
Incremental Simple Payback	2.0 years

PG&E Incentive

The incentive for this measure is estimated to be $6,025.

12.2.3 EEM No. 3: Replace Existing HID Fixtures with High Efficiency Fluorescent Fixtures

Recommended Action

Replace existing high intensity discharge (HID) fixtures with high efficiency fluorescent fixtures in the areas shown in Table 12.4. High efficiency fluorescent fixtures use less energy than HID fixtures while providing similar or improved light output.

Background

During the site visit the audit team observed that several areas use high intensity discharge (HID) fixtures for general lighting. High efficiency fluorescent fixtures are more efficient than HID fixtures, feature lower lumen depreciation rates, better dimming options, instant start-up and better color rendition. Because high efficiency fluorescent fixtures feature higher lamp and ballast efficacy and greater fixture efficiency, they consume less electricity than conventional HID systems to produce similar or improved light output.

High efficiency T5 fluorescent fixtures provide more light output than high efficiency T8 fluorescent fixtures. Therefore, it is recommended to replace low mounted (about 15 feet or less) HID fixtures with high efficiency T8 fluorescent fixtures. For high mounted HID fixtures

(greater than 15 feet), high efficiency T5 fluorescent fixtures are recommended as a replacement. Table 12.4 identifies the recommended areas for lighting replacement included in this EEM.

Table 12.4 Electrical Energy and Demand Savings by Replacing Light Fixtures
Capital Improvement and Energy Management Plan
City of Stockton

Area[1]	No. Fixtures	Existing Fixture	Proposed New Fixture
Operations Building – Cogen Room	24	MH400	4-T5-54
Operations Building – Pump Room	5	MH400	4-T5-54
Digester Building – Ground Floor	8	HS400	6-T8-32
Digester Building – Basement	1	MH400	4-T5-54
Digester Building – Basement	8	HS400	6-T8-32
Gravity Thickener Building	2	HS400	6-T8-32
Headworks – Odor Control Room	5	MH400	4-T5-54
Sludge Control Center – Downstairs	5	MH400	4-T5-54
Dewatering Building – Storage Room	5	MH400	6-T8-32
Dewatering Building – Upper Level	10	MH400	4-T5-54
Dewatering Building – Pump Area	3	MH400	6-T8-32

Note:

(1) Depending on the timing and implementation of the capital improvement project recommendations, some of the proposed light fixture replacements would not be recommended. For example, if the belt press dewatering building is demolished for a new screw press building, it is not recommended that the belt press dewatering building lighting be replaced.

Anticipated Savings

The electrical energy savings that can be realized by replacing HID fixtures with high efficiency fluorescent fixtures depend on the total number of fixtures illuminating the area, the fixture input wattage, and the fixture annual operating hours.

Installing high efficiency fluorescent fixtures in the recommended areas will save an estimated 162,761 kWh annually, and reduce the facility's peak demand by 18.4 kW. The electrical energy cost savings for installing high efficiency fluorescent fixtures is estimated to be $17,757 per year.

Implementation Cost

The recommendation is to replace the HID fixtures with high efficiency fluorescent fixtures. Table 12.5 summarizes these costs and presents the simple payback for these energy efficiency measures.

Table 12.5 Implementation Costs for Replacing Light Fixtures Capital Improvement and Energy Management Plan City of Stockton		
Item	**Quantity**	**Estimated Cost**
32W T8 High Efficiency Fluorescent Lamps	156	$1,175
32W T8 Electronic Ballasts (6 Lamps)	26	$1,917
32W T8 Fluorescent Fixtures (6 Lamps)	26	$4,071
54W T5 High Efficiency Fluorescent Lamps	200	$3,708
54W T8 Electronic Ballasts (4 Lamps)	50	$6,026
54W T8 Fluorescent Fixtures (4 Lamps)	50	$7,777
Installation	---	$12,758
TOTAL COST	**---**	**$37,432**
TOTAL ANNUAL COST SAVINGS	**---**	**$17,757**
SIMPLE PAYBACK	**---**	**2.1 years**

Energy Efficiency Rebate

The energy efficiency rebate for this measure is estimated to be $7,600.

12.2.4 EEM No. 4: Install Automatic Lighting Controls

Recommended Action

Install automatic lighting controls in specified areas to reduce electrical energy consumption. Analysis for this measure considers the implementation of EEM No. 3 (Replace Existing HID Fixtures with High Efficiency Fluorescent Fixtures).

Background

The audit team inventoried lighting fixtures that could benefit from lighting controls. Lighting in the specified areas was observed to be on while the areas were not occupied and/or receive ample daylight. By installing automatic lighting controls in these areas, lighting fixtures will turn off when areas are unoccupied or receive ample daylight.

Anticipated Savings

The electrical energy savings from installing automatic lighting controls depend on the total number of fixtures illuminating the area, the fixture input wattage, operating hours for lighting, and the control factor, which is defined as the percentage of time that the lights can be turned off by the automatic lighting controller. The control factors used in this analysis were taken from PG&E's 2010 Statewide Customized Offering (CR-DR) Procedures Manual for Business. Installing automatic lighting controls in the specified areas will save an estimated 80,031 kWh annually. The lighting considered in this measure will be on during peak hours. Therefore, it is

estimated that this measure will not result in peak demand savings. The total electrical cost savings for installing automatic lighting controls is estimated to be $8,731 annually.

Implementation Cost

Effective implementation of this recommendation requires selecting the appropriate automatic lighting control technology for each area. Recommended controls include:

- **Ceiling-mounted infrared sensors** with power packs (power relays) on large open spaces (e.g. open offices).
- **Wall-mounted automatic switches** for small one person offices.
- **Ultrasonic sensors** with power packs in large restrooms with stalls.
- **Daylight sensors** with power packs in areas that receive ample daylight.
- **Bi-level controllers** (dimmers) instead of power packs are recommended for high intensity discharge (HID) fixtures, so that lamps can come on to full brightness immediately.

Table 12.6 summarizes these costs and presents the simple payback for these energy efficiency measures.

Table 12.6 Implementation Costs for Automated Lighting Controls
Capital Improvement and Energy Management Plan
City of Stockton

Item	Quantity	Estimated Cost
Ceiling-Mounted Infrared Occupancy Sensors	67	$7,522
Wall-Mounted Infrared Occupancy Sensors	27	$1,835
Ultrasonic Sensors	10	$1,751
Daylight Sensors	2	$321
Power Packs	77	$2,934
Bi-Level Controllers (Include HID Dimmable Ballasts)	7	$2,329
Estimated Length of Wiring	4,000 ft	$4,000
Installation	---	$15,774
TOTAL COST	**---**	**$34,466**
TOTAL ANNUAL COST SAVINGS	**---**	**$8,731**
SIMPLE PAYBACK	**---**	**4.2 years**

Energy Efficiency Rebate

The energy efficiency rebate for installing automatic lighting controls is estimated to be $3,557.

12.2.5 EEM No. 5: Replace Tertiary Air Compressor No. 2 with a VSD Air Compressor

Recommended Action

Replace Tertiary Air Compressor No. 2 with a 150 hp variable speed drive (VSD) air compressor. A VSD rotary screw air compressor will consume less energy when operating at part-load.

Background

The Tertiary System has two 150 hp air compressors that produce compressed air primarily for the DAF system, float ejectors, and instrumentation as described previously for EEM No. 1.

The existing air compressors use inlet valves to modulate capacity, which results in relatively high power draw when operating at less than full capacity. As an example, Compressor No. 2 operating at 80 percent of capacity draws about 94 percent of full load power. It is recommended that Compressor No. 2 be replaced with a VSD air compressor. A VSD air compressor can produce compressed air more efficiently at part-load than the existing air compressor by adjusting the compressor's motor speed to compressed air demand.

Anticipated Savings

EEM No. 1 recommends reducing the air compressors' discharge pressure from 118 psig to 80 psig. To avoid double counting of the savings, the analysis of this measure was made assuming both air compressors are operating with a discharge pressure of 80 psig. At this discharge pressure Compressor No. 2 would be operating at about 75 percent capacity (about 580 acfm output), which with inlet valve modulation results in an input power draw of about 93 percent of full load. In comparison, a VSD air compressor would draw about 75.7 percent input power when operating at 75 percent capacity.

The total annual electrical energy savings is estimated at 152,424 kWh, and the peak demand savings is estimated at 17.4 kW. The associated annual electrical energy cost savings is estimated at $16,629.

Implementation Cost

The implementation cost includes the removal of Tertiary Air Compressor No. 2 and the material and installation costs for one 150 hp air-cooled VSD air compressor. Table 12.7 summarizes these costs and presents the simple payback for this energy efficiency measure.

Table 12.7 Implementation Costs for Tertiary Air Compressor Replacement Capital Improvement and Energy Management Plan City of Stockton

Item	Quantity	Estimated Cost
150 HP VSD Air Compressor (Installed)	1	$44,000
Remove Tertiary Air Compressor No. 2	1	$5,000
Engineering and Contracting (25%)	---	$12,250
TOTAL COST	**---**	**$61,250**
TOTAL ANNUAL COST SAVINGS	**---**	**$16,629**
SIMPLE PAYBACK	**---**	**3.7 years**

PG&E Incentive

The potential energy and peak demand savings results in an incentive of $15,458.

12.2.6 EEM No. 6: Install Higher Efficiency DAF Pressurization Pumps

Recommended Action

Replace the existing DAF pressurization pumps with higher efficiency pumps (or higher efficiency impellers) in order to reduce their electrical energy consumption.

Background

As previously mentioned for EEM No. 1, the Tertiary System has four (4) DAF thickeners that use dissolved air to help separate suspended solids from raw water. Each DAF uses a pressurization pump to pressurize DAF recycle water (effluent) to 50 psig in a mixing tank, where compressed air, at 50 psig, is dissolved. Because the mixing tanks need to operate at 50 psig, it may be possible to reduce the discharge pressure of the pressurization pumps to 55 psig. Replacing the existing pressurization pumps with pumps sized to provide 4,500 gpm of water with a total dynamic head (TDH) of 133 ft, operating at its optimum efficiency point, will result in significant energy savings[2]. Alternatively, new impellers could be selected to replace

[2] Additional process analysis performed subsequent to the energy analysis indicated that the pumps could be replaced with lower flow pumps (1500 gpm @ 200 ft). The energy savings from this change would be slightly greater than the numbers described in this section.

the existing impellers. This cost for this energy efficiency measure is based on the impellers being replaced on the four DAF pressurization pumps.

Anticipated Savings

Pressurization Pump No. 4 was measured to draw 165 kW, which results in an estimated pump power input of 210.8 brake horsepower (bhp). It is assumed that Pressurization Pump No. 1 is drawing a similar amount of power. A new pump selected to produce 4,500 gpm at 133 ft TDH with an efficiency of 84 percent would have a power input of 179.9 bhp. Assuming that two pressurization pumps operate 8,720 hours per year (continuous operation), the annual energy savings for this measure is estimated at 421,354 kWh and the peak demand savings is estimated at 48.32 kW. The total annual electrical cost savings is estimated at $45,970.

Implementation Cost

Implementation consists of selecting and installing new impellers on the existing Johnson vertical turbine pumps. It may be necessary to install new bowls as well as new impellers to achieve the recommended performance. Table 12.8 summarizes these costs and presents the simple payback for this energy efficiency measure.

Table 12.8 Implementation Costs for DAF Pressurization Pump Replacements
Capital Improvement and Energy Management Plan
City of Stockton

Item	Quantity	Estimated Cost
New Impellers for Pressurization Pumps	4	$80,000
Installation	---	$9,000
Engineering and Contracting (25%)	---	$22,250
TOTAL COST	**---**	**$111,250**
TOTAL ANNUAL COST SAVINGS	**---**	**$45,970**
SIMPLE PAYBACK	**---**	**2.4 years**

PG&E Incentive

The potential energy and peak demand savings results in an incentive of $42,752.

12.2.7 EEM No. 7: Replace Existing Outdoor HID Lighting with LED Lighting

Recommended Action

Replace existing outdoor pole high intensity discharge (HID) lamps and ballasts with Light Emitting Diode (LED) lamps and drivers (LED ballasts). LED lamps use less energy than HID lamps while providing the same amount of light output.

Background

The RWCF staff has retrofitted one of their outdoor pole HID lamp and ballast with an LED lamp and driver, and is planning to retrofit the remaining outdoor pole lighting. Approximately 200 outdoor lighting poles (125 tall poles and 75 short poles) were accounted for on the RWCF site. The exact number of outdoor lighting poles, fixture type and wattage could not be confirmed with facility personnel. This measure only considers the tall poles ("street lights"), which were assumed to be 400-Watt metal halide (MH) fixtures.

LED lighting consumes less energy while providing the same amount of light as HID lighting with improved uniformity, longer rated life expectancy, and instant start-up capabilities (when used with lighting controls). According to manufacturers of outdoor LED lighting, a 400-Watt MH lamp and ballast can be replaced with a 98-Watt LED lamp and driver. Replacing the outdoor pole HID lighting with LED lighting will result in significant electrical energy savings and reduced lamp replacement costs.

Anticipated Savings

The electrical energy savings from replacing HID lighting with LED lighting depends on the total number of fixtures illuminating the area, the fixture input wattage, and the fixture annual operating hours. The estimated annual electrical energy savings for retrofitting all of the outdoor area lighting is 185,525 kWh. Because the outdoor pole lighting is off during the day, this measure will not result in peak demand savings. The annual electrical cost savings is estimated to be $20,241.

Implementation Cost

The implementation cost for this measure includes the material and installation cost for a total of 125, 98-W LED retrofit kits (LED lamp and driver) and the labor to remove the existing metal halide lighting.

The estimated cost for removing the existing lighting and replacing with 125, 98-W LED retrofit kits, including installation, is $124,525. With a total cost savings of $20,241 per year, the simple payback for this EEM is 6.2 years.

PG&E Incentive

The potential incentive for this measure is estimated to be $9,276.

12.3 ENERGY EFFICIENCY MEASURES NOT RECOMMENDED

Some of the energy efficiency measures have energy savings potential but would require long payback periods. These measures are not included in the EEM analysis due to the reasons listed in Table 12.9 below.

Table 12.9 Other Energy Efficiency Measures Considered
Capital Improvement and Energy Management Plan
City of Stockton

Other Energy Efficiency Measures	Reason for Not Including in Recommendations
Install High Efficiency Pumps	This measure has a lengthy payback period of 30 years.
Replace the Pneumatic Float Ejectors in the DAF System with Pumps	This measure has a high capital cost and the economics of implementing this measure was not deemed feasible.
Replace the Existing Hot Water Boiler in the Administration Building with a High Efficiency Hot Water Boiler	The energy savings for this measure were relatively low and thus has not been included in the EEM analysis.
Install High Efficiency Packaged HVAC Units in the Administration Building when the Existing Units Reach the End of their Useful Life	The energy savings for this measure were relatively low and thus has not been included in the EEM analysis.

ENERGY MANAGEMENT AND CONTROL SYSTEMS

The existing supervisory control and data acquisition (SCADA) system was designed and programmed by MCC Control Systems (a.k.a. Meyer Control Corporation). The SCADA system utilizes fiber optic links to connect system components, such as programmable logic controllers (PLCs). Some of the capabilities of the existing SCADA system include:

- Historical and real-time influent flow rate data.
- Monitoring and trending of variable speed drive speed for various equipment (i.e., biotower pumps, influent pumps, etc.).
- Monitoring and trending of the on/off status of various equipment (i.e. DAF pumps).

The existing SCADA system could be upgraded to incorporate energy management and control features. These features would facilitate management of energy and reduce costs at RWCF and are strongly recommended.

A SCADA based energy management system should include the following software features[1]:

- Real-time monitoring, load reduction, or demand load-shedding, to take better advantage of time-of-use rate structures.
- Alarms that sound when demand target is exceeded or when a pump's (or other equipment) efficiency changes from target condition.
- Automatic filling of an equalization basin when high flow rates occur during peak power rate periods.
- Prioritized selection of the most energy-efficient (kWh/Mgal) pump.
- Equipment variable frequency drive adjustment based on influent flow rate.
- Locking out certain equipment during peak power rate periods.

Many energy management products are available in the market that can potentially be incorporated into the facility's existing SCADA to provide more efficient control. The following are just a few examples of products available.

- Wonderware InTouch HMI.
- Ovation System (from Emerson Process Management).

[1] Electric Power Research Institute (EPRI) "Quality Energy Efficiency Retrofits for Wastewater Systems, December 1998.

- Outpost2 SCADA Software (from Multitrode).
- Control Systems by Siemens.

It is recommended that City staff consult with the manufacturer of the existing SCADA system to ensure that the selected energy management software is compatible with their SCADA.

The designer of the existing SCADA system (MCC Control Systems) was asked to provide a cost estimate for upgrading the SCADA system to incorporate energy management and control features. The following presents a list of upgrades to the existing SCADA system that may result in significant energy and maintenance cost savings:

- Optimizing the Sequencing of the Primary Raw Sewage Pumps and Tertiary Raw Water Pumps
    - This requires assessing the energy performance (Gal/kWh) of the pumps by having the energy input and water flow for each pump. Depending on the flow, the most energy efficient pump will sequentially come online to meet the facility's flow demands. This can also be valuable for preventive maintenance since change in a pump's energy performance (Gal/kWh) may be a symptom of failing pumps/motor. This can trigger an alarm to sound when the pump's energy performance changes for investigation into the cause.
- Locking Out Tertiary Treatment Plant and Operating the Nitrifying Biotowers in Recirculation Mode during Summer Peak Period:
    - The SCADA system would lock out the Tertiary Treatment Plant equipment and operate the Nitrifying Biotowers in Recirculation Mode during the summer Peak period from May to October, noon to 6 p.m. Mondays through Fridays.
- Locking Out Tertiary Treatment Plant and Operating the Nitrifying Biotowers in Recirculation Mode during Demand Response Events:
    - Upon receiving an electrical signal from PG&E signifying a Demand Response Event, the SCADA system will lock out the Tertiary Treatment Plant equipment and operate the Nitrifying Biotowers in Recirculation Mode.
- Program an Electrical Energy Power (kW) Alarm:
    - This will trigger an alarm when the plant demand exceeds a pre-set amount determined by the facility.

The system could be further expanded to include assessing the energy performance of other equipment (i.e. DAF Pressurization Pumps, Air Compressors, etc.).

According to MCC Control Systems, the upgrades described above will cost approximately $70,000. The potential energy and maintenance cost savings due to implementation of the recommended upgrades is difficult to estimate because of the many variables associated with load shedding during peak load periods. A detailed analysis would need to be performed to determine the potential energy savings resulting from upgrades to the existing SCADA system. However, the analysis may have a similar cost to the upgrades described above. Consequently, the City may wish to proceed with the upgrades without a detailed study.

Chapter 14

DEMAND RESPONSE MEASURES

This chapter presents an analysis of the opportunities for participating in a demand response program to save energy costs. Demand response programs enable customers to reduce power demands during times of peak power demand in exchange for an annual payment from the power utility (PG&E).

14.1 DEMAND REDUCTION OPPORTUNITIES

Demand response is one of the available resources that California uses to plan and manage its electrical supply mix. Goals of the demand response program include:

- Improve the level of electrical service to customers.
- Avoid incremental generating capacity costs.
- Avoid energy production costs.
- Avoid transmission and distribution capacity costs.

Additionally, demand response helps increase California's electrical grid reliability by providing the California Independent System Operator (CAISO) with tools to manage demand during peak days and prevent brownouts and blackouts during emergency situations.

The City has two basic opportunities for reducing its PG&E demand. The first is operating one more of the existing cogeneration engines then is normally on-line, during the peak demand period, which is typically 4 hours a few times per year. However, until the engine reliability is improved and/or the proposed fuel cell project is implemented, the City cannot rely on this method to be available when called.

The other option, which would work now, is to shut down the non-critical functions in the tertiary treatment plant during the demand response event. The tertiary treatment plant provides the last stage of wastewater treatment prior to discharging the water into the San Joaquin River. The secondary treatment plant discharges treated wastewater to an expansive system of ponds and constructed wetlands from where the tertiary treatment plant collects the wastewater for further treatment. The ponds and wetlands have capacity to receive secondary treatment water and hold it for extended periods of time (over 6 hours) while the tertiary treatment plant is off-line.

During the demand response event, the nitrifying biotowers at the tertiary treatment plant would be operated in recirculation mode and tertiary treatment would be delayed until after the demand response event. Turning off the non-critical functions of the tertiary treatment plant would reduce power demand at the RWCF by approximately 1,180 kilowatts (kW).

The facility already has the capability to shut down the tertiary treatment plant. Therefore this recommendation is not expected to result in significant implementation costs.

The facility's minimum electrical demand from PG&E during last summer's demand response events was 1,299 kW, which is above the 1,180 kW demand reduction recommended in this measure. Therefore, it is expected that the City would receive full incentive payment for not operating the tertiary treatment plant during peak demands.

14.2 AVAILABLE DEMAND RESPONSE PROGRAMS

The City can participate in demand response by enrolling in one (or more) of the many programs that are offered through PG&E or third party aggregators. PG&E's demand response programs include:

- Peak Day Pricing (PDP).
- Demand Bidding Program (DBP).
- PeakChoice.
- Base Interruptible Program (BIP).

Under each program PG&E offers customers financial incentives that vary depending on the customer's flexibility and commitment to react to demand response events (how much load can be reduced and how fast it can be reduced). In addition to a participation incentive, PG&E offers potential customer participants a one-time Technology Incentive which would help offset the cost of "enabling" technologies that would make demand response participation easier for the customer.

Demand response payments are based on reducing the facility's draw from PG&E, which is currently about 1 MW. However, as the City implements the energy efficiency measures and renewable energy production projects recommended in this Plan, the City's power draw from PG&E will reduce, resulting in lower demand response payments.

The available programs have varying levels of reward, based on a variety of factors related to the degree to which the demand response reduction is assured by the facility and the notice and response time required of the participant. Tables 14.1 and 14.2 summarize the potential annual financial benefits from an approximate 1 MW demand response commitment and the penalties for non-performance in a selection of demand response programs available in California.

Table 14.1 compares four PG&E demand response programs. Table 14.2 summarizes two example third party aggregator's demand response programs. There are other third party aggregators as well. While the aggregator's programs may not pay as well as contracting directly with PG&E under its more aggressive programs, they have the advantage of

shouldering all of the non-performance risk, sheltering the participant for non-performance penalties.

Table 14.1 Benefit / Risk Comparison of PG&E's Demand Response Programs
Capital Improvement and Energy Management Project
City of Stockton

Demand Response Program	Financial Incentive ($/yr)	Financial Penalty ($/event)	Program Features
PeakChoice (Committed)	$68,094	$3,405	PG&E's most flexible demand response program. Customer has option of choosing: • Committed/uncommitted load reductions. • Event notice window. • Duration of event. • Events per year to participate in. • Number of consecutive days the facility is called.
Base Interruptible (BIP)	$133,812	$44,604	PG&E's most aggressive demand response program: • Requires committed load reduction. • High penalties for non-performance.
Demand Bidding (DBP)	$44,600	$0	This is PG&E's least aggressive demand response program: • No load commitment required. • No participation required.
Peak Day Pricing (PDP)	$32,094	$2,822	Unlike the previous three programs, Peak Day Pricing (PDP) is a rate schedule that has "demand response" embedded in its electric charges: • Lower energy and demand charges during summer months. • Significantly higher energy and demand charges during Peak Day Pricing (PDP) days (12 PDP days in 2010).

Table 14.2 Benefit / Risk Comparison of Third Party Demand Response Programs Capital Improvement and Energy Management Project City of Stockton			
Demand Response Program	**Financial Incentive ($/yr)**	**Financial Penalty ($/event)**	**Program Features**
EnergyConnect	$61,200	0	EnergyConnect will pay their customers based on the committed electrical load reduction: • Contract with EnergyConnect is renewed on a yearly basis. • There are no penalties for not participating in a demand response event.
EnerNOC	$43,000	0	EnerNOC will install hardware and software on site at no-cost to the facility to enable facility and EnerNOC to view real-time energy consumption: • EnerNOC pays customer quarterly based on the committed demand reduction. • Facility must have an EMS/SCADA system in place to participate under this program. • The facility must sign a 3-year contract with EnerNOC. • At the customer's discretion, EnerNOC can install hardware to automatically interact with the EMS/SCADA system to operate equipment in "demand response" mode. • There are no penalties for not participating in a demand response event.

14.3 DEMAND RESPONSE PROGRAM EVALUATION

Choosing the most beneficial demand response program requires evaluating the benefits and risks of each option. In this analysis two models where evaluated:

- The RWCF is not able to use the emergency generator during a demand response event.

- The RWCF is able to use the emergency generator during a demand response event.

The main assumption used in both models was that the single most influential variable determining the facility's capacity to react (participate) in a demand response event is cogeneration system availability. Key assumptions in this analysis are:

- Cogeneration system availability determines the facility's capacity to react to a demand response event.
- Total RWCF electrical demand is approximately 4,000 kW.

Figure 14.1 shows the distribution of electrical output from the existing cogeneration engines for the period of one year. From Figure 14.1, it is possible to determine the failure rate of the cogeneration engines.

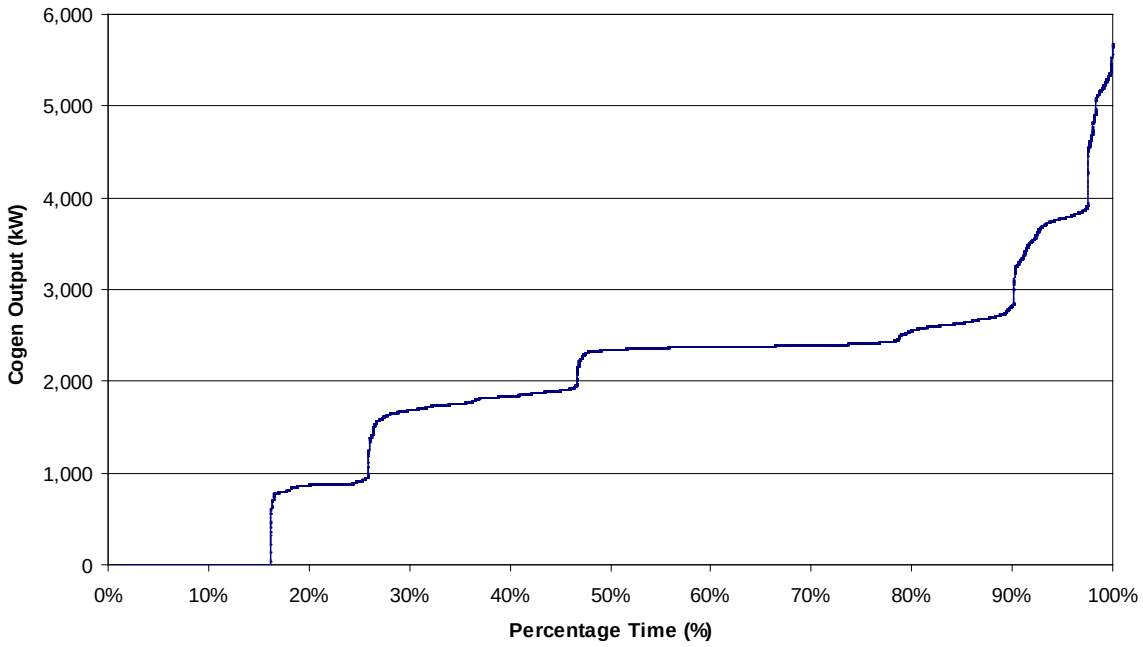


Figure 14.1 Cogeneration Electrical Output Performance During One Year

Table 14.3 summarizes the expected PG&E electrical loads during demand response events based on the cogeneration failure rate (from Figure 14.1) and implementation of the recommended short term shut down of non-critical operations at the tertiary treatment plant.

Based on the data presented on Table 14.3, two models where developed (one with and one without using the emergency generator) to compare the net benefits for each PG&E program. The results are presented in Figures 14.2 and 14.3.

Table 14.3	Expected PG&E Electrical Loads During Demand Response Events Capital Improvement and Energy Management Project City of Stockton		
Cogen Failure	**Probability[(1)]**	**PG&E Load without Emergency Generator (kW)**	**PG&E Load with Emergency Generator (kW)**
0 Cogeneration Failure	0.53	0	0
1 Cogeneration Failure	0.21	820	0
2 Cogeneration Failure	0.10	1,820	250
3 Cogeneration Failure	0.16	2,820	1,250

Note:
(1) Failure probabilities were determined from 15-minute demand data for the Cogen Plant for the period of 1 year.

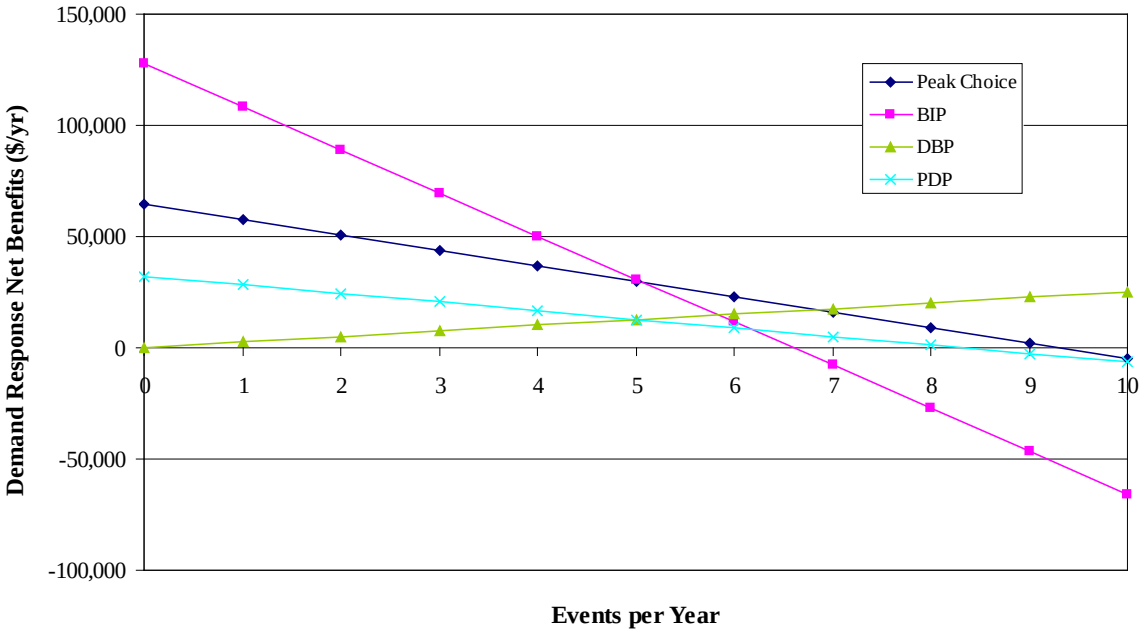


Figure 14.2 Net Benefits versus Number of Annual Demand Response Events (without emergency generator)

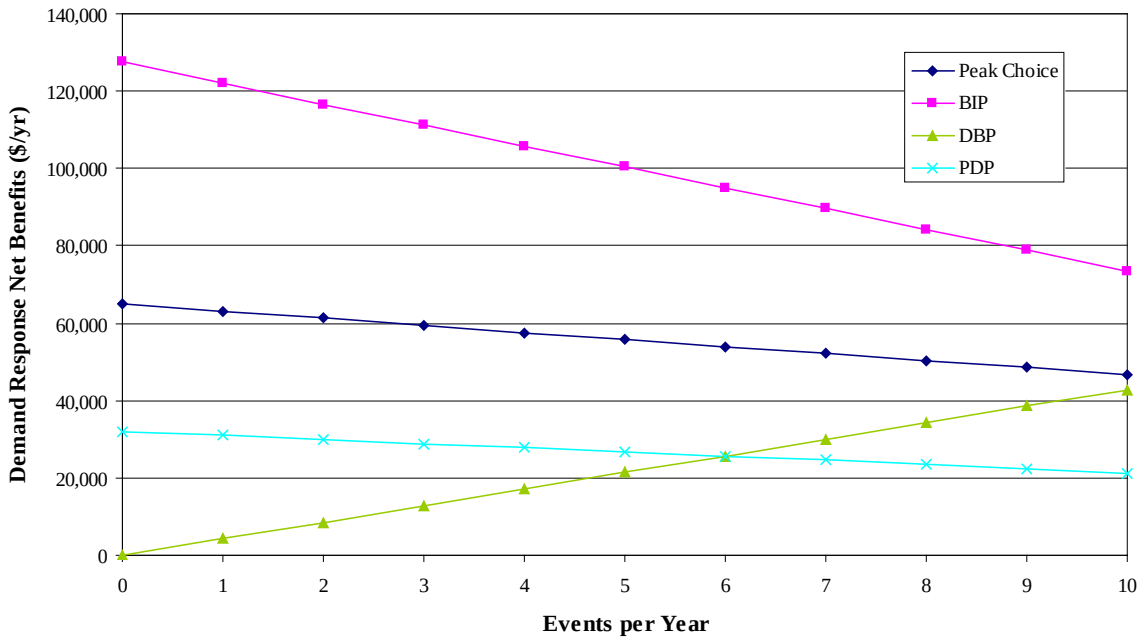


Figure 14.3 Net Benefits versus Number of Annual Demand Response Events (with emergency generator)

- Figures 14.2 and 14.3 show the net annual benefits versus the number of demand response events per year for the various programs. Under both models, the results show that the Base Interruptible Program (BIP) will likely result in the largest net benefit for the facility. Depending on the number of demand response events called during one year, BIP could generate significant savings:
  - A range of savings and costs that vary from savings of $127,000 to costs of $65,000 (under BIP, the facility would start incurring extra costs if 7 or more events are called in one year). This assumes that the emergency generator cannot be used during demand response events.
  - Savings of $73,000 to $127,000 if the emergency generator can be used during demand response events.

However, the BIP has the greatest financial penalties if the RWCF is unable to reduce power demands when required by PG&E.

To minimize the risk of penalties, mainly due to the failure rate of the cogeneration engines, it is recommended that for the short term, the City enroll in the Peak Day Pricing (PDP) demand response program. Under this program, the City will be protected from overcharges for the first year. Alternatively, the City could participate in the DBP, which has no financial penalties.

For the long term, it is recommended that the City issue a Request for Proposal (RFP) to assess the benefits of third party demand response aggregator programs. If the proposals show that the savings exceed that of the PDP or DBP, then the City can choose to enroll in one of the aggregator programs. For the long-term plan, once either the cogeneration reliability is improved and/or fuel cells are installed, the City should consider switching to the BIP. The BIP provides the most benefits if the plant is able to reliably reduce power demand when required by PG&E.

SOLAR POWER WITH PV CELLS

15.1 INTRODUCTION

This chapter summarizes the evaluation of the technical and financial feasibility of installing solar photovoltaic (PV) energy facilities at the RWCF and a cursory review of the Delta Water Supply Project (DWSP) site. The complete analysis is presented in the Appendices.

This analysis incorporates site conditions, shading constraints, and the existing electrical demand. With this information, and with additional data collected from the City, the system size, cost and electricity generation potential at the RWCF was determined. Information on solar energy at the DWSP site is also provided.

15.2 SOLAR PV SYSTEM ANALYSIS

Presently, the California Solar Initiative (CSI) Incentive Program limits the size of a PV system to a size that produces no more than 100 percent of site's annual electricity use. Because the RWCF does not have sufficient space for a PV system to generate 100 percent of the site's annual electricity, the CSI limits are not anticipated to apply to the RWCF.

Five locations at the RWCF were identified for solar PV cells at the RWCF (Figure 15.1). The estimated solar power capacity for each site is presented in Table 15.1.

Figure 15.1 Potential Array Locations: RWCF

Table 15.1 Solar PV Sites and Capacity Capital Improvement and Energy Management Plan City of Stockton	
Area	**Size (kW)**
Area 1 - Vacant Land south of Maintenance	490
Area 2 - Rock Filter Basins	240
Area 3 - Vacant Land near Pond	550
Area 4 - Roof of Maintenance	80
Area 5 - Parking Shade Structure	300

The optimal solar power project for the RWCF is a 1 megawatt (MW) system, consisting of ground mounted single axis trackers located in Areas 1, 2 and 3. This configuration is the optimal system for the site because it is the most cost effective in terms of cost per kWh produced. Renewable power projects up to 1 MW may utilize the utility grid as an energy bank, which would allow the City to store power for later use, via a program called “net metering”. The capability to match load and production is very important for solar power (and other renewable technologies that provide power intermittently). The 1 MW size also maximizes the available grant incentive because CSI payments are capped at 1MW.

Caltrans is planning a future extension of California State Route 4 in which the route would travel over the southeast corner of Area 1 and over a portion of Area 3. This extension is scheduled to be constructed in 15 to 20 years. This could impact PV systems proposed for Areas 1 and 3 and should be taken into consideration prior to implementation of this project.

A 1MW solar system at the RWCF would produce about 2,200 MWh of electricity annually. This would offset approximately 26 percent of the RCWF’s annual electricity purchase from PG&E. In addition, it would reduce the City’s annual greenhouse gas emissions by 530 metric tons (in CO_2 equivalents). The estimated installed cost for a project of this size is $5.6 million.

15.3 FINANCIAL ANALYSIS

An economic analysis was conducted to determine the net present value (NPV) of the 1 MW solar energy system at the RWCF over a 20-year period. This analysis was performed for two scenarios: City-owned and power purchase agreement (PPA). The inputs and assumptions include:

- Expenses:
  - System cost: $5,600,000.
  - O&M costs of $12,000/yr (three percent escalator).
  - Inverter replacement in year 13 - $840/kW.

- Revenues:
  - Net metering (including 25 percent peak demand shaving).
  - CSI incentive ($0.15/kWh for City owner; $0.05/kWh for third party owned).
- Discount rate: 5 percent
- Utility escalation rate: 5 percent
- Net metering on E-20 schedule.

Additional assumptions for the third party ownership scenario include:

- 13.5 cents/kWh PPA rate (three percent annual escalator).
- 30 percent investment tax credit or treasury cash grant.
- 100 percent bonus depreciation (for projects completed by December 2011).
- Federal corporate tax rate: 35 percent.
- State corporate tax rate: 8.84 percent.

Based on the above assumptions, solar power is not economically feasible at this time. The net present value (NPV) of the recommended 1MW PV system (for both the City owned and PPA scenarios) will cost approximately $1 million more than continued reliance on PG&E electricity. Because of the tax credits available to private companies, the projected cost is slightly higher for City ownership ($1.1 million for City ownership and $975,000 for private ownership under a PPA arrangement)

However, it is likely that solar power will become more cost effective in the future. Falling solar PV prices, future state incentives, and increasing utility rates may contribute to favorable economics for solar power.

15.4 SOLAR POWER AT DELTA WATER SUPPLY PROJECT (DWSP)

Based on aerial photographs, there are approximately 45 acres of unshaded, vacant land surrounding the DWSP which could accommodate up to 6 MW of ground mounted, single axis of solar energy equipment. This is depicted in Figure 15.2.

A 6 MW system at this location would cost approximately $33 million to construct. However, for similar reasons described above (net metering, CSI incentives), a 1 MW system is likely the most practical size. This size system would cost approximately $5.5 million.

15.5 RECOMMENDATIONS

Based on this preliminary technical and financial analysis and the likelihood of more attractive pricing and enhanced government subsidies in the near future, solar energy may

Figure 15.2 Delta Water Supply Project: Potential PV Cell Sites

play an important role in the City's renewable energy portfolio. When the CSI program is reopened, it is recommended that the City consider issuing a request for proposal (RFP) to have a solar PV contractor design, build, operate and own a 1 MW ground mounted, single axis tracking solar panel PV system at the RWCF and possibly the DWSP sites. This is the maximum size of a PV system that would allow net metering and be eligible for receiving CSI incentives (any increment beyond this system size would not be eligible for CSI incentives). This 1 MW system would generate approximately 2,227 MWh of electricity annually, offsetting approximately 26 percent of purchased electricity from PG&E.

Within a PPA arrangement, the developer would own and maintain the PV systems and sell electricity to the City at a pre-negotiated price. This third party ownership structure will likely result in the lowest solar energy cost to the City, because private sector owners qualify for state and federal tax incentives for which local governments do not qualify. The cost savings that the third party owner accrues may be passed on to the City. If the offered savings are enough to warrant the solar energy project, the City would have the option to enter into a PPA.

If the City would like to expand its solar power potential, the City could consider using the DWSP site for development of a PV array. This site has several acres of level, unshaded vacant land that would serve as an ideal location for ground mounted, single axis PV trackers. In addition, the site would provide an additional meter to which the City could

interconnect, net meter, and receive additional CSI incentives. The recommended system size for this site is also 1 MW, for the same reasons described for the RWCF site.

WIND ENERGY

16.1 INTRODUCTION

This section provides a preliminary evaluation of the wind energy potential for the City of Stockton's wastewater treatment plant (RWCF) and the Delta Water Supply Project (DWSP).

16.2 WIND RESOURCE

An evaluation of the wind resource at the RWCF and DWSP sites was performed based on available wind data from nearby sources. These consisted of the Stockton Airport meteorological station and two nearby wind monitoring stations from the California Irrigation Management Information System (CIMIS) network of 2-meter tall meteorological stations. Figure 16.1 shows a map of the region, including the two project sites and the three wind monitoring stations.

Our preliminary analysis indicates that the site has average wind speeds as follows:

- RWCF site: 4.7 to 5.1 meters per second (mps) (10.5 to 11.4 miles per hour (mph)).
- DWSP site: 3.6 to 3.9 mps (8.1 to 8.7 mph).

The expected winds at these locations are considered modest by typical wind energy standards. For example, mean annual 80-m winds in Altamont and Solano are typically 6-1/2-8 mps (14.5 to 17.7 mph).

If the City chooses to further pursue wind power, it is recommended that the City install a temporary tower at each site to obtain on-site measurements, which will allow the City to better define the wind resource potential before investing a significant amount of capital in a permanent turbine(s).

16.3 POTENTIAL TURBINE OUTPUT

Three turbine models were selected for evaluation based on their ability to perform well under relatively modest wind conditions: the GE-1.6/100 (1600 kW), Vestas V-100 (1815 kW) and REpower MM-100 (1800 kW) turbines. Both turbine models have standard tower heights of 80 meters (m) and rotor diameters of 100 m.

Tables 16.1 and 16.2 show simulations of gross annual energy potential for these three turbines. Because there is on-site data available, wind data from the Stockton airport was used to generate wind speed frequency distributions.

Figure 16.1 Regional Map Showing the Meteorological Stations, RWCF, and DWSP Study Areas

Table 16.1 Estimated Wind Turbine Capacity Factors at RWCF Capital Improvement and Energy Management Plan City of Stockton

Turbine Model	Low Speed (mps)	Low GCF (%)*	Annual MWh	High Speed (mps)	High GCF (%)(1)	Annual MWh
GE-1.6/100	4.68	25.2	40.3	5.09	29.2	46.7
V-100	4.68	23.5	42.7	5.09	27.2	49.4
MM-100	4.68	23.4	42.1	5.09	27.0	48.6

Note:
(1) GCF = gross capacity factor (i.e. percentage of actual output based on the anticipated wind resource as compared to the full capacity of the turbine working around the clock).

Table 16.2	Anticipated Wind Turbine Capacity Factors at DWSP Capital Improvement and Energy Management Plan City of Stockton					
Turbine Model	**Low Speed (mps)**	**Low GCF (%)***	**Annual MWh**	**High Speed (mps)**	**High GCF (%) (1)**	**Annual MWh**
GE-1.6/100	3.61	14.7	23.5	3.93	17.9	28.6
V-100	3.61	13.7	24.9	3.93	16.6	30.1
MM-100	3.61	13.6	24.5	3.93	16.5	29.7

Note:
(1) GCF = gross capacity factor (i.e. the percentage of actual output based on the anticipated wind resource as compared to the full capacity of the turbine working around the clock).

16.4 POTENTIAL WIND TURBINE LOCATIONS

16.4.1 RWCF Wind Turbine Sites

Five potential wind turbine locations at the RWCF were identified. The locations are shown on Figure 16.2. Because of “wind shading”, or a zone of lower energy wind downwind of the turbine, as few as three of the five wind turbine sites would be feasible at the RWCF site.

16.4.2 DWSP Wind Turbine Sites

The DWSP property has space for a single row of three to four turbines, aligned to minimize wake losses coming from directions other than perpendicular to the row. These are indicated on Figure 16.3

The final site selection and array should be determined based on detailed engineering and economic analyses, which would include the wake interference of turbines on each other.

16.5 WIND ENERGY ECONOMICS

Table 16.3 summarizes the preliminary economic analyses conducted for a single wind turbine project at the RWCF. The General Electric 1.6 MW wind turbine was utilized as the basis due to its higher capacity factor for the winds at the RWCF. Cost estimates are based on a similar project located near Vernalis, San Joaquin County, California. The analyses shows that the cumulative savings exceeds the wind turbine implementation cost, assuming that a SGIP grant is available for the project.

Figure 16.2 Potential Wind Turbine Locations at the RWCF Site

Figure 16.3 Potential Wind Turbine Locations at the DWSP Site

Table 16.3 Preliminary Economic Analysis of a Single Wind Turbine at the RWCF Capital Improvement and Energy Management Plan City of Stockton		
	Full SGIP	**Secondary SGIP**
Installed Cost	$5,400,000	$5,400,000
SGIP Rebate (Full)	$2,340,000	$990,000
Net Capital Cost	$3,060,000	$4,410,000
Cumulative Savings/	$7,800,000	$5,110,000
Net Present Value of Savings	$2,800,000	$1,600,000
Benefit/Cost Ratio	93%	36%

The analysis was preformed with two different levels of SGIP grants utilizing the 2010 rules (the 2011 allocation rules have not yet been published). The first assumes the wind project qualifies as the primary project for SGIP allocation purposes the second assumes that a 1.4-MW Fuel Cell project, as recommended in Chapter 11, is the primary project and the wind project is a secondary project.

The economic analysis was based on the following project assumptions:

- GE 1.6MW, XLE turbine
- Installed Cost $5,400,000
- Annual O&M: $60,000/yr ($0.016/kWh)
- Net Capacity Factor: 27.5 percent
- Annual Production (kWh): 3,854,400
- Seasonally Adjusted Value of Power ($/kWh): $0.0804
- PG&E Annual Rate of Increase, project lifetime: 5.0 percent
- Annual Inflation Rate: 3.0 percent

16.6 SPECIAL ENVIRONMENTAL CONSIDERATIONS

While all energy projects have the potential for environmental impacts, wind energy provides two that are highlighted here: wind and visual impacts.

16.6.1 Potential Bird Impacts

Bird kills from wind turbines appear to be relatively low in comparison to other human activities. Improvements in recent years, including the use of slower speed, larger turbines mounted on taller shafts which are configured in a manner that birds cannot use them as

perches or nest sites, has significantly decreased wind turbine bird death rates. Figure 16.4 illustrates the relative magnitude of bird kills from various activities.

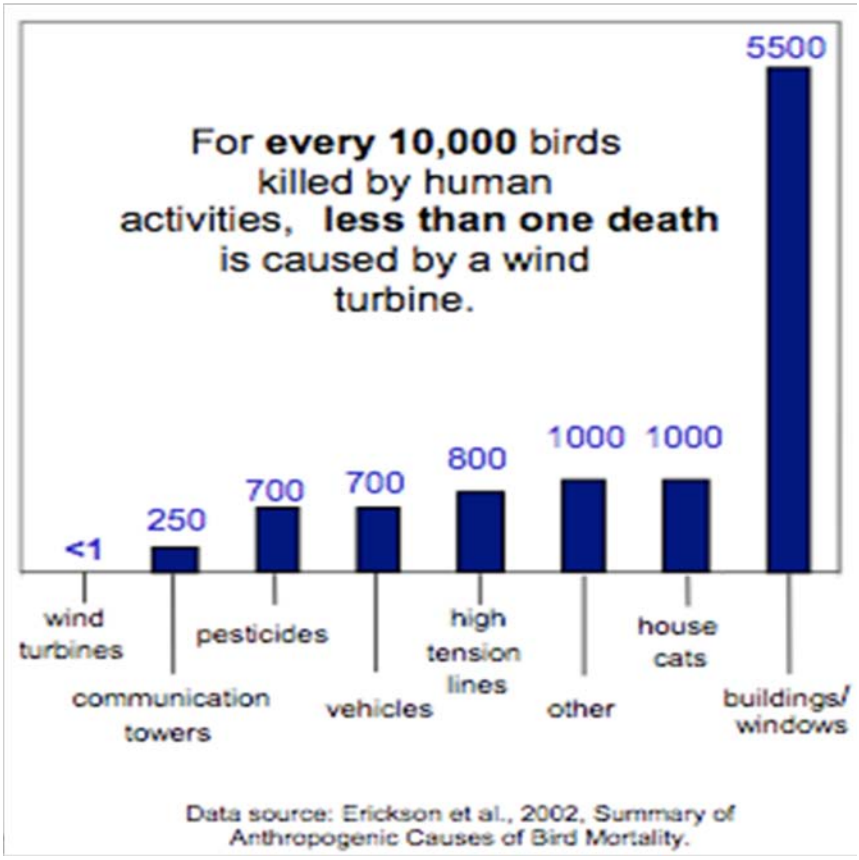


Figure 16.4 Comparative Bird Kills Resulting From Various Human Activities

Avian studies have been carried out at many wind farm sites. Bird kills per MW of installed wind turbine capacity average zero to six per year, with the exception of a single 3-turbine plant in Tennessee that has recorded 11 bird kills per MW. The National Academy of Sciences estimated in 2006 that wind energy is responsible for less than 0.003 percent of (3 of every 100,000) bird deaths caused by human (and feline) activities.

However, due to the abundance of waterfowl that pass through or reside at the ponds, careful, site-specific studies would need to be conducted to fully explore the potential impact of wind turbines on the bird population.

16.6.2 Visual Impacts

To take advantage of increasing wind speeds at higher elevations and to reduce impacts on birds, wind turbines are typically mounted of tall shafts. A typical wind turbine will reach up to 400 feet above ground level at its highest point. Because of its height and the relatively flat terrain surrounding the site, the turbine will be highly visible from the neighborhoods

surrounding the RWCF. Figure 16.5 shows a rendering of a 1.6 MW wind turbine superimposed on the RWCF site.

Similar to the effects on birds, visual impacts will need to be carefully evaluated prior to a decision to implement a wind turbine project at the RWCF.

Figure 16.5 Rendering of a Wind Turbine at the RWCF Site

ENERGY PROJECT FUNDING AND FINANCING

This Chapter describes funding sources for the energy projects described in the Plan. Section 17.1 summarizes available energy project grants. Section 17.2 describes available low cost loan programs specifically available for energy projects. Section 17.3 describes public/private partnership arrangements in which capital for the City's renewable energy project(s) is supplied by the private sector. Section 17.4 provides recommendations for financing methods.

17.1 ENERGY PROJECT GRANTS

A variety of grants are available to partially offset the capital cost of the energy projects. Some programs provide funding to all qualified applicants, up to the amount of available funding. These include:

- "1603" Grant Program
- California Solar Initiative
- Self Generation Incentive Program
- PG&E Rebates for retrofits and new construction
- Energy Efficiency and Conservation Community Block Grant Program.

Each of these grant programs is described below:

17.1.1 "1603" Federal Tax Grant Program

This grant program is only available to a private sector, taxpaying entity and is one of the most significant factors making public/private partnerships for energy projects so attractive. It is available for renewable energy generation projects, including fuel cells, solar and wind and is equal to thirty percent (30 percent) of the total capital cost of the system. This program converted pre-existing tax credits into grant payments, making it easier and less costly for recipients to use on applicable projects. To date, the 1603 program has helped encourage more than 4,000 clean energy projects. To take advantage of this program through a public/private partnership, the City would have to move quickly in procuring a private sector partner for each appropriate project as the program is only available for projects that begin construction in 2011.

17.1.2 The California Solar Initiative (CSI)

This program is overseen by the California Public Utilities Commission (CPUC) and provides incentives for solar system installations to customers of the state's three investor-owned utilities (IOUs): Pacific Gas and Electric Company (PG&E), Southern California

Edison (SCE), and San Diego Gas and Electric (SDG&E). The CSI Program provides payments for solar systems installed on existing residential homes, as well as existing and new commercial, industrial, government, non-profit, and agricultural properties within the service territories of the IOUs.

The CSI Program has a budget of $2.167 billion over 10 years, and the goal is to reach 1,940 megawatts (MW) of installed solar capacity by the end of 2016. The program is administered through three Program Administrators: PG&E, SCE, and California Center for Sustainable Energy (CCSE) in SDG&E territory.

Table 17.1 summarizes the CSI Program.

Table 17.1 California Solar Initiative (CSI) Capital Improvement and Energy Management Plan City of Stockton	
Program Authority	California Public Utilities Commission
Budget	$2,167 million
Solar Goals (MW)	1,940 MW
Scope	All systems in IOU areas except new homes
Began	January 2007

The CSI Program is designed to be responsive to economies of scale in the California solar market. As the solar market has grown, solar system costs have dropped, so incentives offered through the program decline. The CPUC divided the overall megawatt goal for the incentive program into 10 programmatic incentive level steps, and assigned a target amount of capacity in each step to receive an incentive based on dollars per-watt (for small projects less then 50 kW) or cents per-kilowatt-hour for larger projects such as those recommended in the Plan. The MW targets in each incentive step level are assigned to particular customer classes (residential, commercial, and government / non-profit) and allocated across the three IOU service territories, in proportion with each group's contribution to overall state electricity sales.

Once all the MW targets in a particular incentive step level are reserved via CSI application, which can occur at different times for each customer class in each utility service territory, the incentive level offered by the CSI Program automatically reduces to the next lower incentive step level. This creates a demand-driven incentive program that adjusts solar incentive levels based on local solar market conditions.

The current CSI incentive for governmental projects in the PG&E territory is currently in Step 8 yielding a payment of $0.15 cents for each kWh produced in the first 60 months of solar system operation. This reduces as the target MW levels are reached as shown in Table 17.2.

Table 17.2	CSI Step table: CSI Rebate Levels by Incentive Step and Rebate Type Capital Improvement and Energy Management Plan City of Stockton		
		Payments (per kWh)	
		Non-Residential	
Step	Statewide MW in Step	Commercial	Government/ Non-Profit
1	50	N/A	N/A
2	70	$0.39	$0.50
3	100	$0.34	$0.46
4	130	$0.26	$0.37
5	160	$0.22	$0.32
6	190	$0.15	$0.26
7	215	$0.09	$0.19
8	250	$0.05	$0.15
9	285	$0.03	$0.12
10	350	$0.03	$0.10

There is an application fee of $20,000, which is non-refundable if the project is cancelled. Due to recent budgetary constraints, all un-confirmed CSI MW are not guaranteed a CSI incentive at this time. However, the Program Administrator is still accepting reservation request applications. The MW amount remaining will be incentivized as funding becomes available or as projects drop out. A waiting list for megawatts that become available can be found on the Program Administrator's website.

17.1.3 Self Generation Incentive Program

The SGIP provides financial incentives for the installation of new, qualifying self-generation equipment installed to meet all or a portion of the electric energy needs of a facility and is administered by PG&E, SCE, SoCalGas and CCSE2. The SGIP was originally designed to complement the CEC's Emerging Renewables Program (ERP) by providing incentive funding to larger renewable and non-renewable self-generation units up to the first 1.0 MW in capacity.

The April 24, 2008 CPUC Decision 08-04-049 increased the incentive cap to 3.0 MW on a pilot basis contingent on available carry-over budget. On December 17, 2009 by CPUC Decision 09-12-047, the requirement for available carry-over funding was eliminated. All projects regardless of propose capacity, will be funded from the current program year budget.

Any retail electric or gas distribution customer of PG&E, SCE, SoCalGas, or SDG&E is eligible to apply as the Host Customer and receive incentives from the SGIP. The Host Customer must be the utility customer of record at the Site where the generating equipment is or will be located. In the event that the Host Customer's name is not on the utility bill, a letter of explanation is required. Said letter must address the relationship of the Host Customer to the named utility customer. Systems will be eligible for a reservation up to 12 months after receiving authorization to operate in parallel with the grid from the electric utility.

Any class of customer (industrial, agricultural, commercial or residential) is eligible to be a Host Customer in the SGIP. The Host Customer's Site must be located in the service territory of, and receive retail level electric or Gas Service from PG&E, SCE, SDG&E or SoCalGas at the Site. Municipal utility customers also served by SCE, PG&E, SDG&E or SoCalGas at the Site are eligible. The Host Customer is the incentive reservation holder. The Host Customer may also be the Applicant and/or System Owner. In the event the Host Customer or System Owner withdraws from the Project and cancels the Host Customer and System Owner Agreement that is part of the Reservation Request Form, the Host Customer alone will retain sole rights to the incentive reservation and corresponding incentive reservation number. To preserve such incentive reservation and corresponding reservation number, the Host Customer must submit a new Reservation Request Form to the Program Administrator. The Host Customer thus has the right to designate the Applicant, energy services provider, and/or system installer. As the utility customer of record, the Host Customer shall be party to the SGIP Contract.

Table 17.3 presents the SGIP incentives under the most recent program rules.

Table 17.3 SGIP Incentive Amounts (2010)
Capital Improvement and Energy Management Plan
City of Stockton

Project Size	Fuel Cell (Renewable fuel)	Wind
First MW	$4,500,000	$1,500,000
Second MW	$2,250,000	$750,000
Third	$1,125,000	$375,000

If the system is supplied by a California manufacturer, there is an additional award of 20 percent of the amount. This is applicable to the wind project, but currently there are no California manufacturers of fuel cells that can utilize biogas. Since the incentive rate is much higher for fuel cells than wind, it would be appropriate to designate the fuel cell project as the primary application (for the first megawatt and 0.4 MW of the second tier) and the wind project as the secondary application (for 0.6 MW of the second tier and 1 MW of the third tier).

The incentive is paid as a one-time payment, approximately 60 days after the project begins operation. Thus financing must be in place for the entire amount of the project initially.

Accordingly, under the 2010 rules the recommended projects would be eligible for the following amounts:

- 1.4 MW Fuel Cell as the primary SGIP application - $5,400,000 (1 MW @ $4,500,000, plus 0.4 MW @ $2,250,000)
- 1.6 MW Wind Turbine as the primary application - $2,340,000 (1 MW @ $1,500,000, plus 0.6 MW@ $750,000) times 1.2 for California supplier credit
- 1.6 MW Wind Turbine as the secondary application (behind the fuel cell) - $990,000 (0.6 MW @ $750,000, plus 1 MW at $375,000) times 1.2 for California supplier credit

However, Senate Bill (SB) 412 (Stats. 2009, ch. 182) authorized the CPUC to determine what technologies should be eligible for the Self-Generation Incentive Program (SGIP) based on greenhouse gas emissions reductions. The PUC held hearings on this throughout 2010 and it is anticipated that the new program rules will be determined later this year. Changes under consideration include:

- Reducing the payments by 10 percent per year
- Paying out the incentive as a 25 percent up front grant and 75 percent on a per kWh basis over the first 60 months (similar to the CSI grant program described above)
- Allowing other technologies (besides wind and solar) to be eligible for SGIP funding
- Separating the wind and fuel cell programs

Besides the possible separation of the wind and fuel cell programs, none of the changes under consideration appear favorable to the recommended wind and fuel cell projects.

The Program Administrators have requested suspension of the program until the new rules are finalized, but are still accepting and holding applications until a determination is made on this request. Since program awards are made on a first come, first served basis, it is important that the City file SGIP applications as soon as possible to maximize its chances for award under the old rules, which may be more favorable then the new rules.

17.1.4 PG&E Programs

PG&E provides rebates for the installation of energy saving equipment in both retrofit and new construction applications. There are various programs including the Customized Retrofit Incentive program, Energy Efficiency Rebates, the Savings by Design Program, and the Retrocommissioning Program. A summary of these programs follows, adapted from

PG&E's website. Additional information can be obtained from PG&E's website: http://www.pge.com/mybusiness/energysavingsrebates/rebatesincentives/ief/

17.1.4.1 Customized Retrofit Incentives (previously known as Non Residential Retrofit – NRR)

Some energy efficiency projects may qualify for energy efficiency incentives through the PG&E Customized Retrofit Incentives Program.

The Table 17.4 provides an illustrative (not comprehensive) list of potential energy efficiency measures that may be eligible for program incentives.

Energy efficiency measures must exceed applicable government and/or industry minimum efficiency standards to qualify for incentives and must operate and produce verifiable energy savings for at least five years. The eligible incentive is up to 50% of the total project cost, with a per site cap of $3.6 million.

17.1.4.2 Energy Efficiency Rebates

Table 17.5 provides a general overview of the available rebate rates for various energy efficient equipment. A more detailed list can be found on the PG&E web site at http://www.pge.com/mybusiness/energysavingsrebates/rebatesincentives/.

17.1.4.3 Savings by Design-Resources for Energy-Efficient New Construction for Buildings

Savings by Design is a program offered by PG&E to encourage high-performance new building design and construction for commercial buildings. The program offers building owners and their design teams a wide range of services, such as Design Assistance; Design Team Incentives; Owner Incentives; and an educational resource, Energy Design Resources.

Savings by Design offers these services for customized new construction projects that exceed California's Title 24 energy efficiency standards.

The program, administered by California's four investor-owned utilities under the auspices of the CPUC, offers owners and their design teams a variety of services. The SBD Participant's Handbook has more information on the program.

Table 17.4 Energy Efficiency Measures Eligible for 2010 Retrofit Incentives Capital Improvement and Energy Management Plan City of Stockton	
Air Conditioning & Refrigeration I Energy – $0.15/kWh Peak Demand – $100/kW	▪ High efficiency chillers ▪ Packaged air conditioners and heat pumps (>63.3 tons) ▪ Variable speed drive installations on existing air conditioning or refrigeration compressor motors ▪ Air conditioning/Refrigeration complete subsystem replacements ▪ Constant air volume to variable air volume conversions ▪ Chiller heat reclaim ▪ Evaporative cooling/pre-cooling unit installations ▪ Indirect evaporative cooling (single-stage and dual-stage) ▪ A/C compressor replacements ▪ Data center free cooling ▪ Refrigeration floating head controller installations
Air Conditioning & Refrigeration II Energy – $0.09/kWh Peak Demand – $100/kW	▪ Controls and energy management systems for HVAC or refrigeration equipment ▪ Variable speed drives on fans (supply, exhaust and cooling tower) ▪ Variable speed drives on pumps (chilled water and cooling tower) ▪ Fan, pump, and/or motor replacements ▪ Refrigeration evaporator fan controls ▪ Insulating cold surfaces (e.g., chilled/condenser water pipes, cool air ducts, tanks) ▪ Demand control ventilation installation (CO_2 sensors) ▪ Installation of high-speed cold storage doors ▪ Air conditioner air/water-side economizer installations ▪ Building shell improvements ▪ Cooling tower upgrades
Lighting Energy – $0.05/kWh Peak Demand – $100/kW	▪ Interior and exterior lighting retrofits (except screw-in CFLs) ▪ Other lighting such as HID, T5, LED or compact fluorescent lamps (CFLs) ▪ Lighting control systems ▪ LED exit signs ▪ Day lighting systems and dimmable ballast ▪ Delamping measures performed as part of integral lighting efficiency upgrade
Motors & Other Equipment Energy – $0.09/kWh Peak Demand – $100/kW	▪ Motor upgrades (all sizes) ▪ Variable speed drives (e.g., industrial fans/pumps, air compressors, etc.) ▪ Industrial process applications ▪ Industrial fan/pump replacements ▪ Trimming impeller on industrial fans and pumps ▪ Projects improving building hot water efficiency ▪ Water flow controls resulting in electric savings ▪ Exhaust hood and fan projects ▪ Window films and glazing ▪ Injection molding machines ▪ Dairy vacuum pumps/variable speed drives
Natural Gas $1.00/therm	▪ Thermal Oxidizers ▪ Boiler or furnace replacements ▪ Boiler heat recovery/economizers

Table 17.5 2010 Energy Efficiency Rebates Capital Improvement and Energy Management Plan City of Stockton	
Eligible Energy Efficient Equipment	**Rebate Amount**
Lighting	
Interior Linear Fluorescent Fixtures	$25-$200/fixture
Compact Fluorescent Fixtures (Only Completely New Fixtures)	$17-$75/fixture
Screw-In Compact Fluorescent Reflector Lamps (14-28 Watts)	$7.00/lamp
Interior/Exterior Pulse-Start Metal Halide Fixtures	$15-$150/fixture
Interior Induction Fixtures	$25-$125/fixture
Bi-Level Stairwell/Hall/Garage Fixtures	$25/fixture
T8/T5 Linear Fluorescent Lamps with Electronic Ballasts (Installed)	$4.50-$9.00/lamp
T8/T5 Linear Fluorescent Lamps with Electronic Ballasts (Delamped)	$6-$20/lamp
Cold Cathode Lamps	$4/lamp
ENERGY STAR LED fixtures (<15 Watts)	$30/fixture
High Efficiency Exit Signs	$15-$27/fixture
Occupancy Sensors	$20-$55/sensor
Photocells	$11/photocell
Time Clocks	$36/time clock
Plug Load Occupancy Sensors	$15/sensor
Heating Ventilation and Air Conditioning (HVAC)	
94% AFUE Central Natural Gas Furnace	$150-120/unit
96% AFUE Central Natural Gas Furnace	$250-300/unit
Package Terminal Air Conditioners & Package Terminal Heat Pumps	$100/unit
Variable Frequency Drives HVAC Fans with Motors (<=100 hp)	$80/hp
Variable Speed Motor Air Handler System (Climates 11, 12 & 13)	$50/unit
Refrigeration	
Efficient Evaporator Fan Motor	$35-50/motor
Evaporator Fans Controller for Walk-In Coolers	$75.00/controller
Insulation for Bare Suction Lines	$2.00/foot
Strip Curtains for Walk-In Boxes	$3.00/$ft_2$
Vending Machine Controller	$100.00/controller

Table 17.5 2010 Energy Efficiency Rebates Capital Improvement and Energy Management Plan City of Stockton	
Eligible Energy Efficient Equipment	**Rebate Amount**
Boilers and Water Heating	
Direct Contact Water Heater	$2.00/MBtuh
Pipe Insulation (minimum 1” pipe diameter)	$2.00-$4.00/foot
Process Boiler	$2.00/MBtuh
Space Heating Boiler	$1.00/MBtuh
Steam Traps – Replacement	$50-$290/unit
Storage Water Heater (EF>0.93)	$30/unit
Tank Insulation	$2.00-$4.00/ft_2

- Technical design assistance to analyze and design more energy-efficient buildings and process systems
- Owner incentives of up to $500,000 per project to help offset the investment in energy-efficient building and design, subject to project incremental costs.
- Design team incentives of up to $50,000 per project to reward designers who meet ambitious energy-efficiency goals.
- Energy Design Resources, the educational component of the Savings By Design program, offers design tools and resources for architects and engineers to support energy-efficient design efforts, including the latest energy-efficiency measurement tools, simulation software, virtual training workshops, training, newsletters and design briefs.

17.1.4.4 Retro-Commissioning Program (RCx)

RCx is a systematic process for identifying less-than-optimal performance in an existing facility’s equipment and control systems and making necessary repairs or enhancements to save energy and cost. Whereas retrofitting involves replacing outdated equipment, RCx focuses on improving the efficiency of what is already in place.

Incentives are paid directly to the customer based on achieved annual energy savings at the rate of $0.09/kWh, $1.00/therm, and $100/on-peak kW, capped at 50 percent of the measure cost. These are estimates only. PG&E finalizes the incentive amounts after completing the project approval process. In addition to the incentive, PG&E will provide diagnostic, engineering and cost estimating resources to identify and analyze potential energy saving projects from retro-commissioning measures. Other project ideas, such as retrofit, demand response, and self-generation will be identified.

In addition to receiving cash incentives, the RCx Program may offer participants:

- A more productive facility for people and products
- More efficient building operations
- Longer equipment service life
- Fewer service and maintenance calls
- Lower energy bills
- A thorough building assessment by qualified engineering professionals
- Technical support throughout the RCx implementation process

17.1.5 Energy Efficiency and Conservation Block Grant Program

The Energy Efficiency and Conservation Block Grant (EECBG) Program, funded for the first time by the American Recovery and Reinvestment Act (Recovery Act) of 2009, represents a Presidential priority to deploy the cheapest, cleanest, and most reliable energy technologies we have—energy efficiency and conservation—across the country. The Program, authorized in Title V, Subtitle E of the Energy Independence and Security Act (EISA) and signed into law on December 19, 2007, is modeled after the Community Development Block Grant program administered by the Department of Housing and Urban Development (HUD). It is intended to assist U.S. cities, counties, states, territories, and Indian tribes to develop, promote, implement, and manage energy efficiency and conservation projects and programs designed to:

- Reduce fossil fuel emissions;
- Reduce the total energy use of the eligible entities;
- Improve energy efficiency in the transportation, building, and other appropriate sectors; and
- Create and retain jobs.

Through formula and competitive grants, the Program empowers local communities to make strategic investments to meet the nation's long-term goals for energy independence and leadership on climate change.

Grants can be used for energy efficiency and conservation programs and projects communitywide, as well as renewable energy installations on government buildings. Activities eligible for use of funds include the following:

- Development of an energy efficiency and conservation strategy
- Building energy audits and retrofits, including weatherization
- Financial incentive programs for energy efficiency such as energy savings performance contracting, on-bill financing, and revolving loan funds

- Transportation programs to conserve energy and support renewable fuel infrastructure
- Building code development, implementation, and inspections
- Installation of distributed energy technologies including combined heat and power, and district heating and cooling systems
- Material conservation programs including source reduction, recycling, and recycled content procurement programs
- Reduction and capture of greenhouse gas emissions generated by landfills or similar waste-related sources
- Installation of energy efficient traffic signals and street lighting
- Installation of renewable energy technologies on government buildings
- Any other appropriate activity that meets the purposes of the program and is approved by DOE

It is our understanding that Stockton did receive an EECBG grant in excess of $1 million, but that these funds have been allocated to other City projects.

17.1.6 Competitive Energy Grants

Competitive Federal and State Grants become available from time to time to offset the cost of energy projects. In California, most energy grants are provided by the U.S. Department of Energy and the California Energy Commission, although the U.S. Department of Agriculture and others may also offer relevant opportunities. To date, the competitive programs have been targeted primarily at research and development or demonstration projects. This may be particularly appropriate for an algae energy research and development or demonstration project.

Accordingly, it would be appropriate to monitor opportunities and apply whenever an identified program fits one or more of the recommended projects and the likelihood of award is reasonable in comparison to the effort required to compete.

17.2 DEBT PROGRAMS FOR ENERGY PROJECTS

In addition to traditional debt funding sources for capital improvements at wastewater facilities, there are several financing vehicles specifically eligible for energy projects. These are summarized in Table 17.6.

Table 17.6 Debt Funding Sources for Energy Projects
Capital Improvement and Energy Management Plan
City of Stockton

Funding Source	Description	Recommended Use of Funding
CEC Low Interest Loans	CEC offers 3% annual interest rate loans that must be paid back within a maximum timeframe (~15 years). The application process is simple and inexpensive. Maximum loan is $3 million per project. These loans have a low interest rate, but require the project to be completed prior to the loan and have a maximum payback period.	Projects with proven energy and/or capacity savings are eligible, provided they meet the eligibility requirements, including: • Lighting systems • Pumps and motors • Streetlights and LED traffic signals • Automated energy management systems/controls • Building insulation • Energy generation including renewable and combined heat and power projects • Heating and air conditioning modifications • Waste water treatment equipment
PG&E's "On-bill" and "Off-bill" Financing	Utility finances capital expenditure, and owner repays the utility through a line item on the utility bill (on-bill) or a separate bill (off-bill). Maximum of $250,000 available per year. Zero interest is charged, with repayment up to a 120 month period, making this a very attractive financing source.	Recommended Energy Efficiency Measures. Energy Management and Control System.
Qualified Energy Conservation Bonds (QECBs)	Low interest (approximately 2%) bonds available to large local governments for qualified projects including projects that save energy. Requires obtaining bond allocation from the California Debt Limit Advisory Committee, a competitive process. No allocation is currently available.	Use for large, expensive projects. These have a low interest rate and do not require upfront capital. Because they require a bond issue, initial cost for investment banker, attorneys, etc. is high, so it may be impractical for small financing (under $2 to $3 million).
Finance Districts (backed by 3rd party financiers)	Allows property owners to finance investments in energy efficiency or renewable energy projects and make payments through a line item on their property tax bill. Financial obligation is tied to the property itself if the property ownership changes.	Use for supporting community-wide equipment financing programs. Third party program financier typically assumes the majority of the program planning and design, marketing, and implementation responsibilities; reducing the agency's in-house program staffing requirements.
Municipal Revolving Energy Loans	Cities develop a fund that can be used to finance energy projects at municipal facilities. The fund is replenished through savings on energy bills. This fund could be funded with the proceeds of QECB bonds.	Use for small and medium-sized projects that have long payback periods or would otherwise not be attractive to outside financing programs. Requires the development of a payment process and payment tracking system.

17.3 PUBLIC PRIVATE PARTNERSHIPS

Large capital energy projects, such as wind, solar and fuel cells, may be best financed in conjunction with a private sector partner to incorporate the tax benefits available to a private company into the project financing. Public/Private Partnerships provide a method of utilizing private sector capital to finance municipal energy projects. In addition to capital, the private sector partner typically obtains all of the required permits, installs the system and operates it for a specified term. At the end of the term, the system often reverts to the sponsoring municipality. The agreements may also include opportunities for the municipality to purchase the system prior to the end of the term.

Public/private partnerships in the energy field are of three basic types-Power Purchase Agreement (PPA) Providers, Energy Service Companies and Private Sector Renewable Energy Projects on City Property. Each is described below:

17.3.1 Power Purchase Agreement (PPA) Providers

PPAs are often used for renewable energy projects that qualify for tax incentives, have technical risks or operational complexities. Accordingly, the PPA methodology could be used to implement the fuel cell, solar and wind projects recommended in the Plan.

In this arrangement a company is selected, typically competitively, to permit, finance, design, construct, and operate a renewable energy generating system and provide the power and thermal, where applicable, to the sponsoring municipality.

The terms and conditions of the power sales are set forth in the PPA agreement, including initial pricing and escalation. This may be a set pricing and escalation indexes or may be tied to the PG&E rates which are being offset by the renewable power. There is also a site lease Agreement that sets forth the terms of the site being leased to the PPA Provider. For the fuel cell and wind projects, this amounts to relatively small sites. However, the recommended solar project requires several acres.

The advantages of a PPA include:

- Ability to utilize private sector tax incentives not available to the City
- Lower cost equipment due to volume purchasing
- PPA Provider is responsible for all project development activities (CEQA, permitting, design construction etc.) and provides all capital financing
- PPA Provider takes all technical risks and operational responsibilities
- PPA Provider is best able to respond quickly to changes in incentive programs and new opportunities

The major disadvantage is that the PPA Provider shares in the financial benefits of the project, which may reduce the total savings realized by the City, if their share is not offset by the tax incentives and other cost efficiencies. While the private partner may not be willing to allocate all of the benefits it is eligible for to offset project costs, a properly structured competition usually results in the private companies offering to share the majority of the benefits with the City.

17.3.2 Energy Service Companies (ESCOs)

ESCOs differ from PPA providers in that they are companies providing energy saving, rather than renewable energy-producing systems. ESCOs offer financing services where they pay the capital cost of an efficiency upgrade and the City either shares the resulting savings with the RSCO or pays the ESCO a fixed rate for the avoided energy for a negotiated period of time.

ESCOs require access to equipment in order to ensure maintenance, and operations are optimized to maximize ESCO's profits. ESCOs typically own the equipment for a period of time and then turn it over to the City.

This arrangement requires a set of somewhat difficult contractual arrangements. Many have resulted in disputes due to difficulty in determining whether savings resulted from the new equipment or from other factors such as reduced usage, weather, etc. Accordingly, this technique is best used only when the capital is unavailable or the efficiency measure's effectiveness is questionable. Because good financing programs exist through PG&E and the California Energy Commission and the efficiency measures recommended in this Plan are not technically complex or operationally challenging, this financing method is not recommended.

17.3.3 Private Sector Owned Projects on City Property

Valuable tax benefits favor private sector ownership and operation of complex, capital-intensive projects that produces and sells power to entities other than the city. If such a project could be located at the RWCF, developers would be willing to pay the City for use of the property. For every 100 acres of property made available, 20 to 25 MW of solar or 15 to 20 MW of wind power could be developed. Based on our experience in other California projects, this could bring $100,000 to $200,000 or more in annual lease payments (typically paid as a base, ground lease payment plus a percentage of power sales revenues) to the City.

Unfortunately, there does not appear to be any large land areas at the RWCF that are suitable for leasing to the private sector. This may be a consideration, however, at the Delta Water Supply site on Lower Sacramento Road.

17.4 RECOMMENDED FUNDING SOURCES

Table 17.7 identifies recommended grant funding sources and Table 17.8 identifies recommended loan programs.

Table 17.7 Recommended Grant Funding Sources
Capital Improvement and Energy Management Plan
City of Stockton

	California Solar Initiative (CSI)	PG&E Rebates	Self Generation Incentive Program
Efficiency		X	
Fuel Cells			X
Solar	X		
Wind			X

Table 17.8 Recommended Loan Funding Sources for City Financed Projects
Capital Improvement and Energy Management Plan
City of Stockton

	California Energy Commission Loans Per Year	PG&E's On/off Bill Finance Per Year	Qualified Energy Conservation Bonds
Loan Terms (Annual interest, Repayment term)	3%, 15 years	0%, 10 years	2%, 17 years
Efficiency Measures	x	X	
Energy Management & Control System	x	X	
FOG System	X		x
Existing Engine Improvements	X		x
Fuel Cells	X		x
Solar	X		x
Wind	X		x

ENERGY MANAGEMENT PLAN RECOMMENDATIONS

18.1 ENERGY MANAGEMENT GOALS

The RWCF requires an average of 3,200 kilowatts (kW) of electricity, with the capability of meeting a peak demand of 4,800 kW. Currently, this is met by purchases of electricity from PG&E (29%), on-site power production from bio-gas generated at the plant (23%), and natural gas (48%) supplied by PG&E through a third party provider.

The Energy Management Plan was developed to achieve the following objectives:

- Reduce energy consumption and costs.
- Enhance staff's ability to monitor and control energy usage.
- Stabilize energy costs over long term.
- Improve reliability of power service to the RWCF.
- Provide a balanced combination of energy projects for lowest cost and highest benefit.
- Exploit current and expected energy subsidies where possible.
- Evaluate available renewable energy resources (solar, wind) to supplement cogeneration and reduce reliance on natural gas purchases.

A summary of the energy recommendations, both near-term and deferred, are shown in Tables 18.1 and 18.2.

18.2 RECOMMENDATIONS: NEAR-TERM PROJECTS

The following recommendations are provided under two categories: near-term projects that can be implemented as soon as practical; and long-term projects that should be deferred until conditions for implementing them are more favorable.

Based on the preceding analyses, a diversified system of energy management components is recommended:

- Institute cost effective energy efficiency measures (EEMs) as recommended herein.
- Maximize biogas production and minimize natural gas purchases by adding fats, oils and grease (FOG) collected from restaurants and food processors to the anaerobic digesters.
- Continue operation of the City's existing cogeneration engines (with the addition of SCR air pollution control devices when required), utilizing increased amounts of biogas that are expected from the addition of FOG to the digesters.

Table 18.1 Power Production from Recommended Near-Term and Deferred Energy Projects
Capital Improvement and Energy Management Plan
City of Stockton

Energy Alternative	Gross Power, kW	Capacity Factor	Effective Power, kW	Percent of Total Power
Existing Energy Portfolio				
Engines (Biogas)	860	85 %	731	23 %
Engines (NG)	1,840	85 %	1,564	48 %
Purchased Electricity	935	---	935	29 %
Total	**3,635**	**---**	**3,230**	**100 %**
Recommended Energy Portfolio				
Engines (Biogas)	989	85 %	840	26 %
Engines (NG)	1,711	85 %	1,455	45 %
Purchased Power	765	---	765	24 %
Efficiency Measures	170	100 %	170	5 %
FOG (1)	---	---	---	---
Total	**3,635**	**---**	**3,230**	**100 %**
Deferred Energy Projects				
Fuel Cell	1,400	95 %	1330	---
Solar PV Cells	1,000	24 %	244	---
Wind Turbine	1,600	28 %	492	---

Notes:
(1) Implementation of a FOG receiving station will increases digester gas production resulting in reduced natural gas usage in engines and reduced total cost of energy.

Table 18.2 Cost Analysis for Recommended Near-Term and Deferred Energy Projects
Capital Improvement and Energy Management Plan
City of Stockton

Projects	Capital Cost	Grant/ Incentive	Net Capital Cost	Present Value of 20 years Savings Compared to Current Cogeneration System
Recommended Energy Projects				
Improvements to Existing Engines	$2,400,000	N/A	$2,400,000	No Savings (2)
Efficiency Measures	$390,000	$90,000	$300,000	$4,100,000
FOG	$975,000	N/A	$975,000	$2,200,000
Deferred Energy Projects				
Fuel Cell	$11,300,000	$5,400,000(3)	$5,900,000	$10,900,000
Wind	$5,400,000	$1,950,000(3)	$3,450,000	$1,600,000
Solar	$5,600,000	N/A	$5,600,000	($1,000,000) (1)

Notes:
(1) Solar PV project currently does not provide cost savings.
(2) There are no cost savings; however, there are significant availability and reliability benefits.
(3) The SGIP grant amount will be reduced for whichever of these two projects is done second. (e.g. the wind turbine grant is less than the fuel cell project because implementation of the fuel cell project is recommended prior to a wind turbine).

- Participate in PG&E's Demand Response Program as long as significant amounts of power are being purchased from PG&E.
- Upgrade the existing SCADA system to incorporate energy management and control functions.

18.3 RECOMMENDATIONS: DEFERRED PROJECTS

The following projects are recommended to be deferred as described below:

1. **Fuel Cells.** Currently, SGIP grants for fuel cells are suspended, but they are expected to be restored later in 2011. As discussed previously, there are risks of owning a fuel cell system. However, the fuel cell project could result in substantial energy cost savings compared to other alternatives. If funding levels are restored, the City may want to pursue the fuel cell project under the power purchase agreement (PPA) financing approach to mitigate these risks. As shown in Table 18.2, the fuel cell project provides the highest present value of energy cost savings compared to wind turbines or solar power; therefore, it is recommended that the City consider fuel cells prior to wind turbines and solar power.
2. **Wind Turbines.** SGIP grants for wind turbines are also suspended. Wind turbines appear to be a cost-effective approach for renewable energy, but environmental impacts must be addressed. If deemed appropriate by the City, further studies could be conducted to evaluate alternatives to mitigate these impacts. This project would also be affected by SGIP funding levels, which are currently undefined.
3. **Solar Power.** As described in Chapter 15, solar power is not currently advisable due to the curtailment of government subsidies. However, the funding climate should be monitored and if it is restored to at least previous levels, the City could pursue solar power through the PPA arrangement.

18.4 PROJECT DESCRIPTIONS

Recommended energy projects are described below.

18.4.1 Cogeneration System

Project Description: This project consists of continued use of the existing engine generators, with the following additions:

- Install a third 500 scfm gas dryer for redundant moisture (and some contaminant) removal.
- Install automated fuel switch over system to prevent unnecessary demand charges and improve reliability.

- Add SCR emission control when required by the San Joaquin Valley Air Pollution Control District (SJVACPD).
- Add a boiler for redundant digester heating.
- Consider contracting out maintenance and major overhauls for existing engine generators to improve reliability, efficiency, and availability.

Project Cost: $2,400,000

Recommended Funding Source: Capital Improvement Program or possibly CEC loan program.

Action Items:

1. Decide whether or not to pursue CEC loans for the engine improvement projects.
2. Design and install recommended improvements.

Time Consideration: It is recommended that these improvements to the existing engines be implemented as soon as possible because they provide necessary redundancy and ensure reliable operations of the cogeneration system. However, SCR emissions control for the existing engines should be implemented in the future when more stringent emissions controls are required by SJVAPCD.

18.4.2 Fats, Oil and Grease (FOG) System

Project Description: This project consists of adding fats, oil and grease to the bio-solids digestion system to increase biogas production, as described in Chapter 10.

Project Cost: $ 975,000

Recommended Funding Source: California Energy Commission Low Interest Loan or City Capital Improvement Program

Action Items:

1. Conduct FOG survey/feasibility review to asses FOG availability, quantity, characteristics and pricing and overall project economic feasibility.
2. If the FOG survey yields positive results:
    a. Negotiate FOG supply contracts.
    b. Apply for CEC funding.
    c. Design FOG receiving system.
    d. Construct FOG receiving system.

e. Start-up and operate system.

Time Consideration: While there are no specific deadlines affecting this project, the sooner bio-gas production at RWCF is increased; the sooner natural gas purchases can be reduced. Also, there are various biodiesel and anaerobic digestion projects under development in the Central Valley and Bay Area that, if successful, will increase demand for FOG. Accordingly this project should be implemented when possible. At the very least, the FOG survey/feasibility review should be completed soon as this will determine the viability of enhanced biogas production, which may affect the future cogeneration strategy.

18.4.3 Energy Efficiency Measures

Project Description: This program consists of implementing the following seven energy efficiency measures as fully described in Section 7:

1. Reduce discharge pressure of tertiary system air compressors
2. Install premium efficiency motors on a replacement basis
3. Replace existing HID fixtures with high efficiency fluorescent fixtures
4. Install automatic lighting controls
5. Replace Air Compressor No. 2 with a VSD air compressor
6. Install higher efficiency DAF pressurization pumps
7. Replace existing outdoor HID lighting with LED lighting

Project Cost: $300,000 (net of rebates)

Recommended Funding Source: PG&E's Rebates and on or off bill financing program.

Action Items:

1. Apply for PG&E rebates and financing.
2. Prepare designs of each measure and bid package. Note that Contractor's proposal should include their representations of energy savings to confirm the project's cost effectiveness and the Contractor's scope should require performance demonstration prior to final payment.
3. Bid out the construction.
4. Award contract and oversee selected Contractor's performance.

Time Consideration: Since these projects reduce energy usage, cost and the site's carbon footprint and PG&E's rebates and financing programs are currently available, this project should be implemented as soon as possible. Since PG&E's financing is typically limited to

$250,000 per year, this project and the energy management and control system (discussed in the next paragraph), may have to be staged over two calendar years (2011 and 2012).

18.4.4 Energy Management System

Project Description: This project consists of upgrading the City's SCADA system to include energy management and control functions as described in Section 8.

Project Cost: $70,000 +/- depending upon features required

Funding Source: PG&E's On-Bill or Off-Bill Financing Program

Action Items:

1. Apply for PG&E funding (in conjunction with efficiency measures funding described above).
2. Determine specific monitoring and control features required.
3. Procure upgrades either sole source with the existing system provider or competitively if necessary.

Time Consideration: There are no specific time related issues for this project. Since PG&E's financing is typically limited to $250,000 per year, this project and the energy efficiency measures may have to be staged over two calendar years.

18.4.5 Demand Response Program

Project Description: This program provides cash incentives to the City in exchange for its willingness to reduce electricity demand during peak demand periods as described in Section 9.

Project Cost: None

Funding Source: Not Applicable

Action Items:

1. Apply for PG&E's peak day pricing (PDP) program for 2011.
2. Issue RFP for a third party aggregator program to begin in 2012.
3. Monitor progress of energy system improvements and performance under the PDP and third party programs and switch to the higher paying base interruptible program (BIP) when appropriate.

Time Consideration: The RFP process to acquire a third party aggregator will need to begin in 2011 in order to allow the City to receive payments for the 2012 peak summer demand period. Switching to the BIP program should be done when adequate

improvements have been made to the energy production system (e.g. installation of a fuel cell system or continued improvement of the existing engine system's reliability) and/or when the City's ability to shed load by temporarily suspending non-critical activities in the tertiary treatment plant is well demonstrated under the PDP and third party aggregator programs.

CIP SUMMARY AND IMPLEMENTATION PLAN

19.1 INTRODUCTION

This Chapter presents a summary of the CIP, including cost estimates and recommendations for the Implementation Plan.

19.2 COST ESTIMATING FOR RECOMMENDED IMPROVEMENTS

This section presents the budgetary cost estimates for the CIP.

19.2.1 Basis for Cost Estimating

Cost estimates for improvements to the RWCF facilities have been prepared for each recommended alternative. Cost estimates were based on preliminary design criteria and the assumptions and findings in this Chapter. The final project costs will depend on actual labor and material costs, when the facilities are constructed, productivity, competitive market conditions, final project scope, project schedule, and other variable factors. Consequently, the final project costs may vary from the cost estimates presented in this CIP. Because of these factors, funding needs and contingencies should be considered before making specific financial decisions or establishing final budgets.

The estimates included herein are in March 2011 dollars (ENR Construction Cost Index = 10,151). The level of accuracy for construction costs varies depending on the level of detail to which the project has been defined. Feasibility studies and master plans represent the lowest level of accuracy, while pre-bid estimates (based on detailed plans and specifications) represent the highest level. The American Association of Cost Engineers (AACE) has developed the following guidelines:

Type of Estimate	Anticipated Accuracy
Order-of-Magnitude (Master Plans)	+50% to -30%
Budget Estimate (Predesign Report)	+30% to -15%
Definitive Estimate (Pre-Bid)	+15% to -5%

The estimates presented within this CIP are considered the “order-of-magnitude” accuracy level. The estimates for the majority of the projects were developed based on cost curves developed by Carollo Engineers specifically for the purpose of planning level cost estimates. The cost curves were constructed from the following categories of sources:

- **“Bid tabs" from Carollo Design Projects:** These are Carollo project costs taken from contractors’ schedule of values or contractors’ partial payment requests. These values are low-bid values.

- **Carollo Engineer's Estimates:** These are 100 percent final design cost estimates prepared by Carollo Engineers. These costs are usually higher than contractor's low bid costs. Nonetheless, they are useful data when bid tabs are not available.
- **Engineer's Estimates Prepared by Others:** The cost curve data includes several 100 percent final design cost estimates prepared by other consulting companies.

For projects that were too project specific for cost curves to apply, cost estimates were developed using quantity takeoffs and unit prices. For example, the costs of the secondary biotower improvements, which included items such as media replacement and concrete rehabilitation, were calculated in this manner.

For specialized equipment, such as digester covers for the existing digesters or covers for the existing primary clarifiers, estimates were obtained from vendors (e.g. WesTech and Eimco). For commodity items, like check valves and pipes, prices were obtained from Carollo's unit price catalog. Due to the size of the project, it was not feasible to conduct a detailed cost estimate for each every equipment item.

19.2.2 Summary of Costs

Direct costs were determined for each recommended improvement. The construction cost to rehabilitate each process area was determined by applying the following factors to the sum of the direct costs: estimating contingency (25%), sales tax (9%), general conditions (5%), and contractor overhead and profit (10%). The estimating contingency represents undeveloped or unforeseen design details at the planning stage level.

In addition, allowances for change orders (5%), engineering, construction management, legal, CEQA, and administration (20%) were added to the construction cost estimates for each of the major facility additions to determine the total project costs (or total capital costs).

Total Project Costs for each capital improvement project recommendation are summarized in Table 19.2. Detailed cost estimates for each recommended project are included in the Appendices.

19.3 PROJECT IMPLEMENTATION PLAN

19.3.1 Recommended CIP Project Phases

The proposed approach to implementing the CIP is to group the highest priority (immediate) projects as a separate, early project phase. This will be followed by a second phase that includes other critical projects, but of a somewhat lower priority. The proposed project phases are as follows:

1. **Phase 1- Immediate Projects:** High priority projects to reduce health and safety risks, to enhance security, and to improve reliability in meeting discharge permit limits for ammonia during cold weather periods.
2. **Phase 2 - Near-Term Projects:** Critical projects required to maintain compliance with the NPDES permit, provide sufficient pumping capacity for peak wet weather flow conditions, extend the useful life of existing facilities, and improve working conditions. Phase 2 also includes the recommended energy projects.
3. **Long-Term Projects:** Non-critical projects that can be deferred depending on City growth.
4. **Future Permit Compliance Projects:** Improvements and additions that may be required in the future for possible NPDES permit requirements.
5. **Deferred Energy Projects:** Energy projects that will be deferred for some time depending on the availability of grants and incentives or pending the outcome of additional studies for solar power, wind turbines, and fuel cells.

19.3.2 Implementation Plan

The implementation plan that follows was developed to provide a guide for the timing of the project phases. Figure 19.5 is a master schedule for the two CIP phases, long-term, future, and deferred energy projects identified in Section 19.3.5. This schedule was prepared under the following assumptions:

1. **Phase 1 - Immediate Projects:** Design consultant procurement would start at the beginning of FY 2011/12 (July 2011) to allow early completion of the critical projects included in this phase. Allowing for a 6 month procurement period, design would begin in January 2012. Construction would be completed by December 2013.

2. **Phase 2 - Near-Term Projects:** Phase 2 would start as soon as practical after Phase 1 to complete the important projects. It was assumed that selection of the design consultant would start in January 2012 and design is a relatively large grouping of projects that will require a long design and construction period. Allowing for an 18 month design period and a 48 month construction period. Completion of Phase 2 would occur in mid 2018.

3. **Long-Term Projects:** These projects are associated with anticipated population growth and increased flows and loads. Based on the flow and loading projections presented in Chapter 3 and the capacity information presented in Chapter 4, Phase 3 may need to be operational by 2025.

4. **Future Permit Compliance Projects:** The scheduling for this phase was selected assuming that the Regional Board would resolve the river dilution issue in the next 2 years, and the decision would be incorporated in the next permit renewal, scheduled for October 2013. It was also assumed that the City would have a 10-year

compliance date (October 2023). The start of Phase 5 was established working backwards from this date. An allowance for additional studies to achieve compliance was also included.

5. **Deferred Energy Projects:** This phase would be implemented if funding/government subsidies were to increase, making the energy projects economically feasible, and if the City makes a policy decision to pursue them. It is assumed that subsides will return in mid 2011, but this date could be earlier or substantially later depending on the economic climate of the country and state. A 1-year period was assumed for further studies and another 6 months for City approval of the projects.

19.3.3 Single Contract Versus Multiple Contracts for Phase 2

As described previously, it was assumed that Phase 2 would be delivered under a single design contract and a single construction contract. There are advantages and disadvantages of a single contract. Although easier to administrate, using a single contract would limit the number of bidders and may require a longer overall construction period. An alternative approach is to break up the phase into multiple contracts. This concept would allow smaller contract amounts to increase the number of bidders and the competition for lowest cost. This approach also allows specialized contractors to bid as prime contractors.

The proposed subdivision of Phase 2 would consist of the following Bid Packages:

Bid Package 2A	Main plant projects, including the headworks, biotowers, secondary clarifier improvements and solids handing.
Bid Package 2B	Tertiary plant projects, including wetlands improvements, 3rd NTB, DAF improvements and tertiary filter improvement.
Bid Package 2C	Operations Support Facilities, including a new lab building and additions to the administration building and maintenance building.

Bid packages A and B were selected because the sites for each package are separated by the San Joaquin River, allowing for simultaneous construction with little interference between construction sites. Bid Package C was selected to allow architectural commercial building contractors to bid as a prime contractor and to complete construction sooner than the single contract approach. In addition, this type of construction is suitable for the design-build delivery approach which could save time and costs over the conventional design-bid-build method.

Table 19.1 lists the advantages and disadvantage of the single contract and multiple contract delivery method.

Table 19.1 Advantages/Disadvantages of Multiple Contract Versus Single Contract Approach for Phase 2
Capital Improvement and Energy Management Plan
City of Stockton

Project Delivery Approach	Advantage	Disadvantage
Single Contract	• Lowest project management effort. • Coordination is the responsibility of Contractor.	• Fewer bidders, resulting in less competition and higher costs. • Typically attracts aggressive contractors. • Potentially later delivery of projects.
Multiple Contracts	• Smaller contract amounts may attract more bidders, reducing costs. • Potentially earlier completion of operation support facilities.	• Higher effort required for project management. • City is responsible for coordination of Contractors. • Multiple approvals required from City Council.

19.3.4 Recommendations for Packaging Phase 2

The multiple contract approach is the preferred project delivery method for Phase 2. The multiple contract method would likely result in the lowest construction cost, would allow concurrent construction on the Main plant and Tertiary plant without interferences between contractors, and the architectural work for the RWCF buildings could be constructed earlier.

Figure 19.5 illustrates the recommended project implementation plan for the multiple contract approach.

19.3.5 List of Recommended CIP Projects

Table 19.2 lists the recommended capital improvements for the CIP and their estimated project costs. The locations of each project are shown in Figures 19.1, 19.2, and 19.3 and the recommended process flow diagram is shown in Figure 19.4. The following is a description of each CIP project per phase. More detailed descriptions of each CIP item can be found in Chapters 4 and 18.

<u>Phase 1: Immediate Projects</u>

1.1 Site Security Improvements

This includes the improvements to some of the recommended high-level risks identified in the RWCF site security analysis.

Table 19.2 Recommended Capital Improvement Projects
Capital Improvement and Energy Management Plan
City of Stockton

Recommended Improvement Projects				Estimated Capital Costs ($M)[1]	Total Capital Cost Per Phase ($M)
Phase	**Project No.**	**Process Area**	**Project Description**		
1	1.1	Site Security Improvements	Miscellaneous site security upgrades	$0.25	
	1.2	Bulk Hypochlorite System	Replace gaseous chlorine with bulk hypochlorite storage	$1.96	
	1.3	Sodium Bisulfite System	Replace sulfur dioxide with sodium bisulfite system	$0.45	
	1.4	Disinfection Support Facility	New building	$0.61	
	1.5	Cold Weather NBT Supply System	Add pipeline from Secondary Clarifiers to Nitrifying Biotowers for temperature control, new pump station and control valve	$5.69	
				Phase 1 Total	**$8.96**
2A	2A.1	Headworks & Raw Sewage Pump Station Rehabilitation	Rehabilitation of existing Headworks, new mechanical and electrical equipment, and building modifications	$15.10	
	2A.2	Auxiliary Peak Wet Weather Pump Station and Piping	Peak wet weather pump station, valve vault, bypass piping	$3.23	
	2A.3	Secondary Biotowers Rehabilitation	Replace media, distribution arms, structural/seismic improvements	$29.73	
	2A.4	Secondary Clarifiers Rehabilitation	Refurbish weirs, add additional sludge pumps, and cover pump pits	$1.22	
	2A.5	Fifth Secondary Clarifier	Add fifth clarifier to improve capture of secondary solids and BOD removal	$3.76	
	2A.6	Secondary Effluent Pump Station Project 2	Replace existing SEPS #1.	$1.18	

Table 19.2 Recommended Capital Improvement Projects
Capital Improvement and Energy Management Plan
City of Stockton

Recommended Improvement Projects				Estimated Capital Costs ($M)[1]	Total Capital Cost Per Phase ($M)
Phase	**Project No.**	**Process Area**	**Project Description**		
	2A.7	Gravity Sludge Thickeners Rehabilitation	Rehabilitate newer unit, demolish older unit	$0.28	
	2A.8	Gravity Belt Thickeners Improvements	Use as redundant secondary sludge thickening (miscellaneous piping)	$0.21	
	2A.9	Dewatering Facility Replacement	Replace existing dewatering units	$7.37	
	2A.10	Anaerobic Digesters Rehabilitation	Rehabilitate A, B and C units for FOG addition, redundancy, and sludge storage. Add gas holding cover.	$9.94	
	2A.11	Sludge Lagoons Demolition	Modify to be used for digester cleaning and FOG receiving station	$0.19	
	2A.12	Fats, Oils, and Grease (FOG) Receiving Station	Add a FOG receiving station	$0.97	
	2A.13	Cogeneration - Gas Dryer	Add gas dryer for existing engines	$0.56	
	2A.14	Main Plant City Capital Improvement Plan (CIP) Projects	Miscellaneous projects identified in the Main Plant on the City CIP	$5.15	
	2A.15	Secondary Effluent Pump Station (SEPS) Project 1	Add fourth pump to existing SEPS #1 for firm peak hour capacity	$0.27	
	2A.16	Energy Efficiency Measures	Implement plant-wide recommended energy efficiency measures	$0.30	
	2A.17	Energy Management System	Install energy management system	$0.07	
	2A.18	Primary Clarifier Improvements	Structural improvements and conversion of square clarifiers to round clarifiers	$2.46	
				Phase 2A Total	**$81.99**

Table 19.2 Recommended Capital Improvement Projects
Capital Improvement and Energy Management Plan
City of Stockton

Recommended Improvement Projects				Estimated Capital Costs ($M)[1]	Total Capital Cost Per Phase ($M)
Phase	**Project No.**	**Process Area**	**Project Description**		
2B	2B.1	Wetlands Rehabilitation & Reconfiguration	Reconfigure flow to use wetlands for operational flexibility and future denitrification	$7.33	
	2B.2	Third Nitrifying Biotower	Add third NBT for ammonia removal, including lift station	$17.76	
	2B.3	Dissolved Air Flotation Units Rehabilitation	Concrete rehab, reinforced concrete pipe (RCP) lining, replace pressurization systems	$6.17	
	2B.4	Tertiary Filters Rehabilitation	Concrete repair, handrail, replace filter programmable logic controllers (PLCs), miscellaneous piping and equipment replacement	$3.11	
	2B.5	Tertiary Plant City CIP Projects	Miscellaneous projects identified in the Tertiary Plant on the City CIP	$1.71	
	2B.6	Oxidation Ponds Rehabilitation	Repair platforms and transfer structures (Pond Cleaning Already Included in City Projects)	$3.83	
				Phase 2B Total	**$39.91**
2C	2C.1	Admin Building Expansion	Refurbish existing building	$2.68	
	2C.2	Laboratory Building	New laboratory building	$3.19	
	2C.3	Maintenance and Collection Building Expansion	Expand existing maintenance and collection building	$1.15	

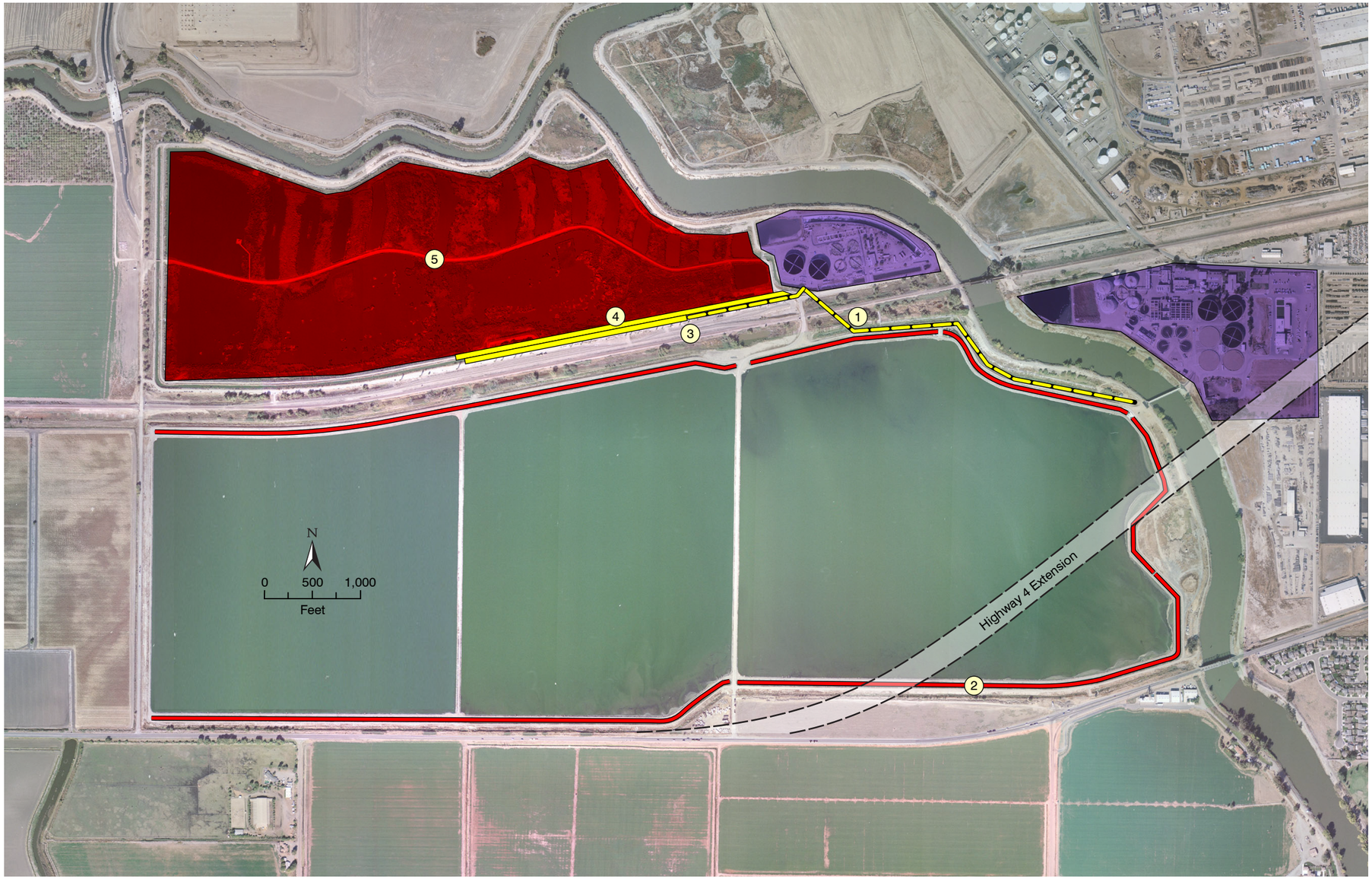
Table 19.2 Recommended Capital Improvement Projects
Capital Improvement and Energy Management Plan
City of Stockton

Phase	Project No.	Process Area	Project Description	Estimated Capital Costs ($M)[1]	Total Capital Cost Per Phase ($M)
	2C.4	Operations Building Improvements	Refurbish existing building	$1.09	
	2C.5	Tertiary Support Building Improvements	Refurbish existing building	$0.06	
				Phase 2C Total	**$8.17**
				Phase 2 Total	**$130.05**
				Phases 1 and 2 Total	**$139.03**
Long-Term Projects	1	Primary Clarifiers Odor Improvements	Covers and Odor Control if current odor control measures are not sufficient	$5.28	
	2	Primary Clarifiers 9 & 10	Add primary clarifiers 9 & 10 if triggered by growth	$5.97	
	3	Fourth Nitrifying Biotower	Add fourth NBT for ammonia removal, if necessary	$15.70	
	4	Abandoned Rock Filters Demolition	Convert one rock filter to soil bed biofilter and demolish other two rock filters	$3.17	
				Long-Term Projects Total	**$30.12**
Future Permit Compliance Projects	1	Cogeneration – Selective Catalytic Reduction (SCR) for Existing Engines	Add SCR for existing engines	$1.68	
	3	Tertiary Filters for Denitrification	Conversion to denitrification filters if lower nitrate limits are imposed in the future	$18.38	

Table 19.2 Recommended Capital Improvement Projects
Capital Improvement and Energy Management Plan
City of Stockton

Recommended Improvement Projects				Estimated Capital Costs ($M)[1]	Total Capital Cost Per Phase ($M)
Phase	**Project No.**	**Process Area**	**Project Description**		
	4	Non-Chlorine Disinfection	Abandon chlorine and replace with ultraviolet light (UV) disinfection if dilution is removed in future discharge permits	$31.61	
				Future Permit Compliance Projects Total	**$51.67**
				Total Future Projects	**$81.79**

Notes:
(1) Based on March 2011 dollars (ENR 10,151).
(2) Project costs associated with the recommended and deferred energy projects are presented in Chapter 18.

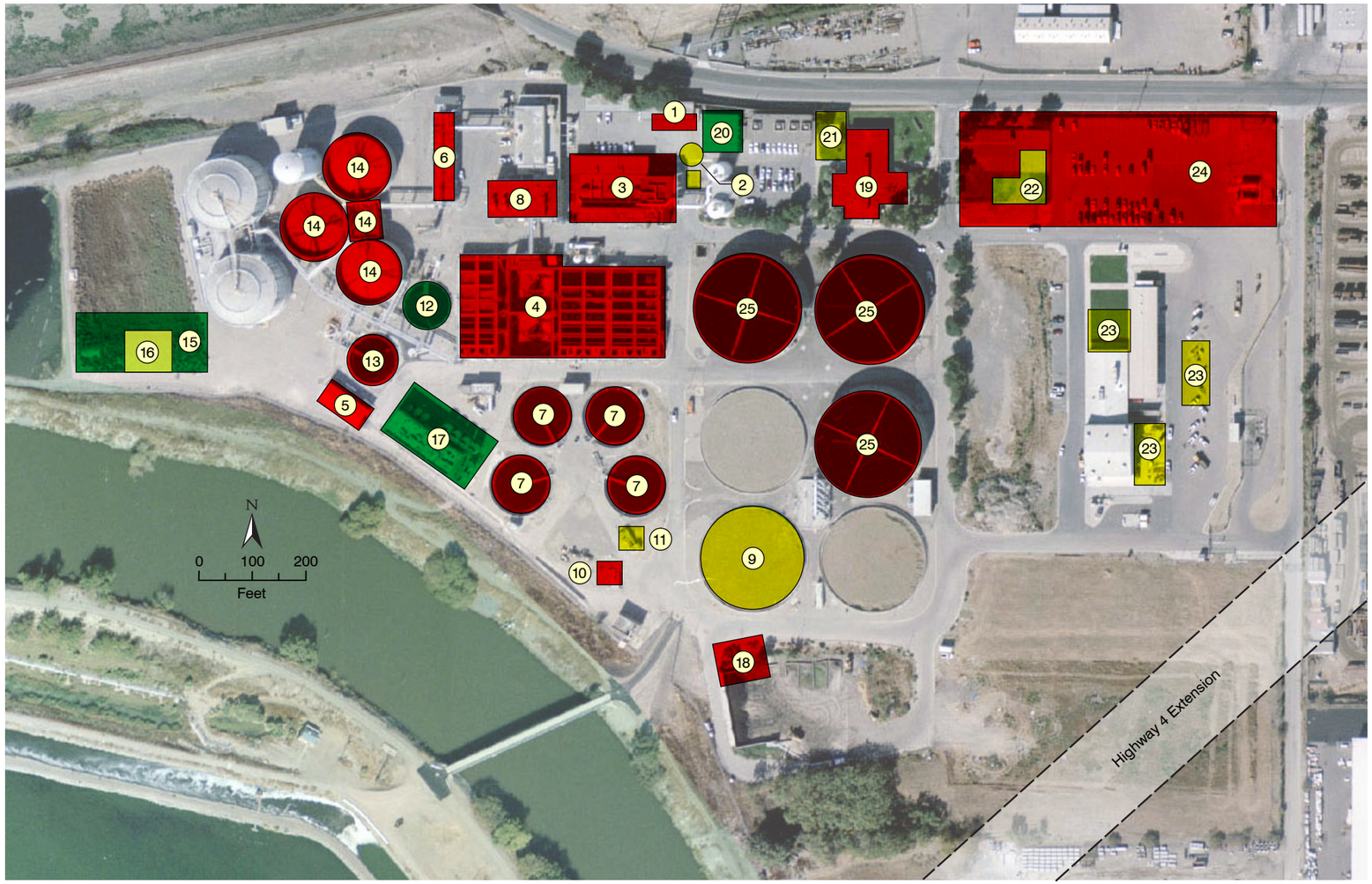


LEGEND

- Main and Tertiary Treatment Facilities
- New Construction
- Rehabilitation
- Demolition
- (1) Cold Weather NBT Supply System
- (2) Pond Transfer Structure Rehabilitation
- (3) Nitrifying Biotower Influent Channel and Pipe
- (4) Nitrifying Biotower Effluent Channel
- (5) Wetlands Rehabilitation

Figure 19.1
CIP PLAN OVERVIEW
CAPITAL IMPROVEMENT AND ENERGY MANAGEMENT PLAN
CITY OF STOCKTON

st411f51-8581.ai rev 4/20/11



LEGEND

- Main and Tertiary Treatment Facilities
- New Construction
- Rehabilitation
- Demolition

1. Influent Box Rehabilitation
2. Auxiliary Pump Station
3. Headworks Rehabilitation
4. Primary Clarifier Rehabilitation
5. Gravity Belt Thickener Rehabilitation
6. Cogeneration Improvements - Gas Dryer
7. Secondary Clarifier Rehabilitation
8. Operations Building Rehabilitation
9. Secondary Clarifier No. 5
10. Secondary Effluent Pump Station No. 1 Rehabilitation
11. Secondary Effluent Pump Station No. 2 Replacement
12. Gravity Thickener No. 1 Demolition
13. Gravity Thickener No. 2 Rehabilitation
14. Digester A, B, C Rehabilitation
15. Sludge Lagoon Modifications
16. FOG Receiving Station
17. Demolish Dewatering Facility
18. Dewatering Facility Replacement
19. Administration Building Rehabilitation
20. Demolish Engineering Building
21. Administration Building Expansion
22. Laboratory Building
23. Maintenance and Collections Building Expansion
24. Re-configure Parking Area
25. Biotower Rehabilitation

Figure 19.2
MAIN PLANT IMPROVEMENTS
CAPITAL IMPROVEMENT AND ENERGY MANAGEMENT PLAN
CITY OF STOCKTON

st511f4-8581.ai

LEGEND

- Main and Tertiary Treatment Facilities
- New Construction
- Rehabilitation
- Demolition

1. Cold Weather NBT Supply System
2. Pond Transfer Structure Rehabilitation
3. Nitrifying Biotower Influent Channel and Pipe
4. Bulk Sodium Hypochlorite Facility
5. Third Nitrifying Biotower and Lift Station
6. Demolish/Re-Purposed Chlorine Gas Facility
7. Nitrifying Biotower Effluent Pipe
8. Nitrifying Biotower Effluent Channel
9. Wetland Rehabilitation
10. Low Lift Pump Station
11. Pipe to Dissolved Air Flotation Thickeners
12. Demolish Raw Water Pump Station
13. Dissolved Air Flotation Thickeners Rehabilitation and Pipe Lining
14. Filter Rehabilitation
15. Tertiary Support Building Rehabilitation
16. Methanol Facility (if necessary)
17. Sodium Bisulfite Facility
18. Dechlorination Building

Figure 19.3
TERTIARY PLANT IMPROVEMENTS
CAPITAL IMPROVEMENT AND ENERGY MANAGEMENT PLAN
CITY OF STOCKTON

stk511f3-8581.ai

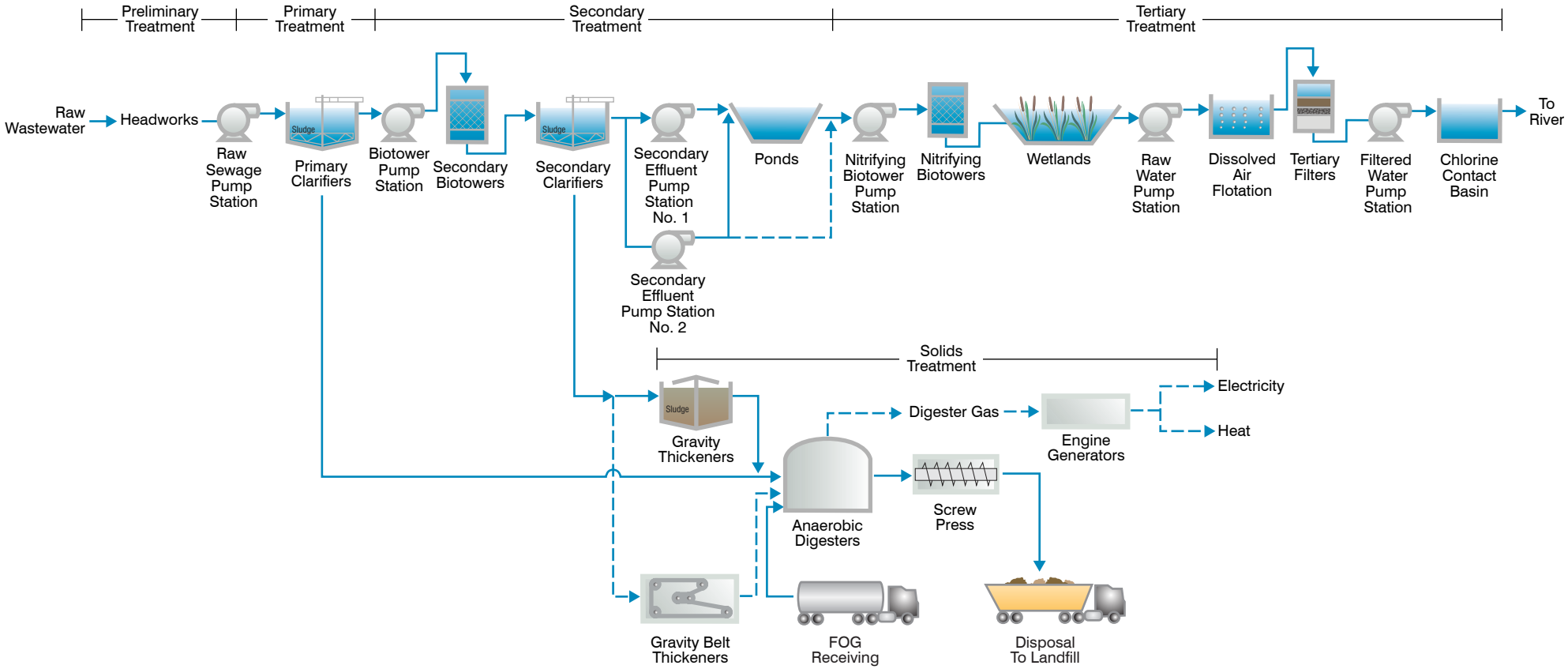


Figure 19.4
RECOMMENDED RWCF PROCESS FLOW DIAGRAM
CAPITAL IMPROVEMENT AND ENERGY MANAGEMENT PLAN
CITY OF STOCKTON

stk711f1-8581.ai

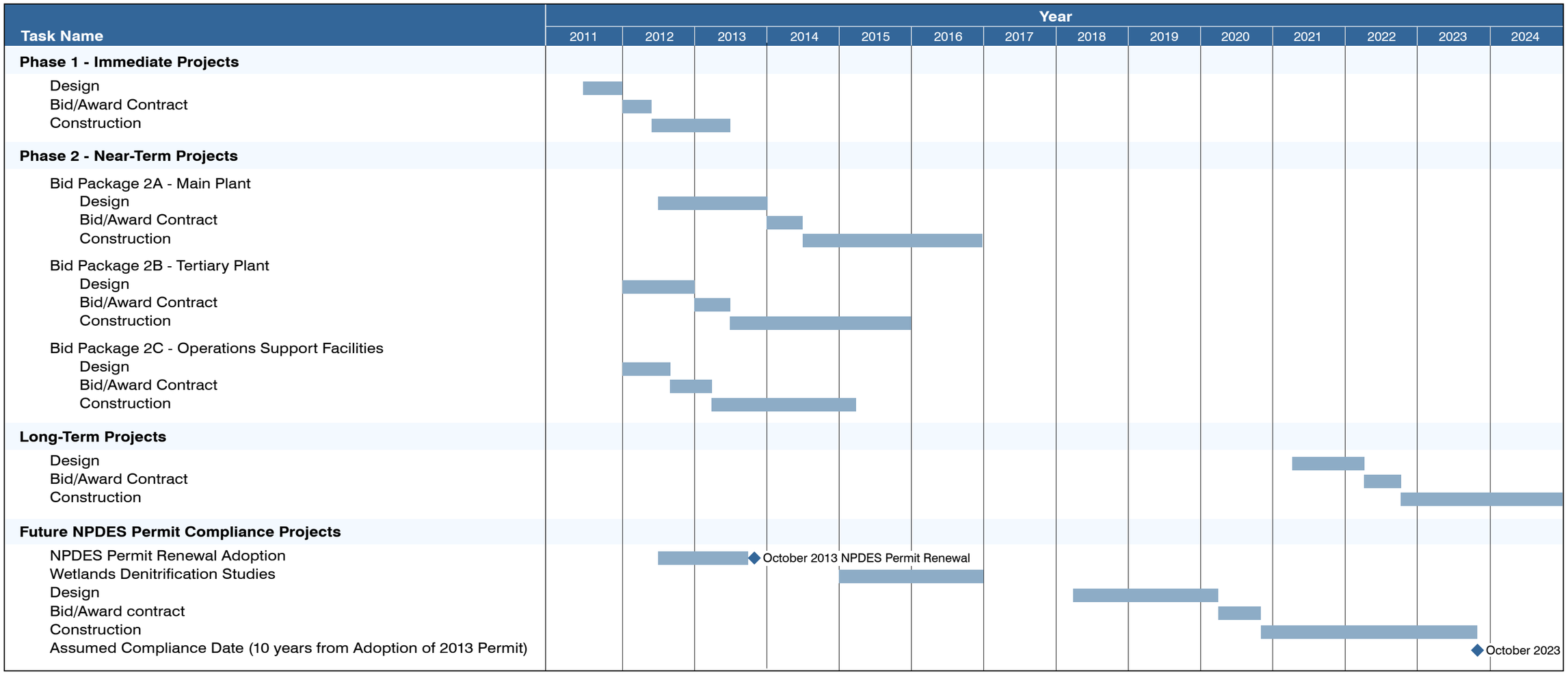


Figure 19.5
RECOMMENDED IMPLEMENTATION SCHEDULE
CAPITAL IMPROVEMENT AND ENERGY MANAGEMENT PLAN
CITY OF STOCKTON

stk411f23-8581.ai

1.2 Replacement of Chlorine Gas System with Bulk Sodium Hypochlorite System

Because of the potential hazards associated with storage of chlorine gas in a rail car, the chlorination system will be replaced with a liquid sodium hypochlorite system. The new system will include bulk storage tanks, an off-loading station, and hypochlorite pumping and distribution system.

1.3 Replacement of Sulfur Dioxide Gas System with a Bulk Sodium Bisulfite System

This project serves the same purpose as Item 1.2 except the liquid chemical is used to remove chlorine residual from the final effluent before it is discharged to the San Joaquin River.

1.4 Disinfection System Support Facilities

Support facilities include a new sampling building, chlorine residual analyzers and other control equipment.

1.5 Cold Weather NBT Supply System

This project will provide the ability to raise the temperature of the oxidation pond effluent to the nitrifying biotowers (NBTs). The bypass will operate during cold weather when ammonia removal efficiencies in the NBTs decrease. Components include a new 50 mgd secondary effluent pump station on the west side of the river that will pump a portion of the secondary effluent through the existing 36” river crossing pipeline to a new control valve and piping that allows the secondary effluent flow to either go to the NBTs or the Oxidation Ponds Supply Channel.

Phase 2A: Near-Term Projects at Main Plant

2A.1 Headworks Rehabilitation

The headworks (influent screening and grit removal) will be rehabilitated by replacing the influent screens and grit removal equipment. Structural and mechanical modifications will be made to improve the screenings and grit conveyance system. A new structure with a street level floor slab will replace the current configuration. Lighting and ventilation improvements will also be included.

2A.2 Auxiliary Pump Station

A new auxiliary pump station will be added to accommodate peak wet weather flows and to provide redundancy for the existing raw sewage pump station. In addition, the auxiliary pump station will be used as a bypass pump station during construction of the headworks rehabilitation project.

2A.3 Secondary Biotowers Rehabilitation

All three secondary biotowers will be rehabilitated. The following modifications will be made:

- Replace plastic media with cross-flow media.
- Replace distributor mechanisms.
- Replace ventilation system.
- Replace media supports.
- Revise hydraulic conditions to prevent flooding of the effluent channel.
- Repair cracks and spalling in concrete surfaces.
- Seismic upgrades to the foundation.

2A.4 Secondary Clarifier Rehabilitation

This project includes refurbishing the weirs, additional sludge pumps, and covers over pump pits for all four existing secondary clarifiers.

2A.5 Secondary Clarifier No. 5

A new 166-ft diameter secondary clarifier, including waste sludge and scum pumps, will be constructed near the current four secondary clarifiers in the location of one of the existing abandoned rock trickling filters.

2A.6 Secondary Effluent Pump Station - Part 2

The purpose of this project is to replace the pumps in Secondary Effluent Pump Station No. 1 with new higher capacity pumps. The pumps will be sized for the projected peak wet weather flow of 121.7 mgd with sufficient head to prevent the need to expand the hydraulic capacity of the existing discharge pipe that runs beneath the San Joaquin River to the Tertiary plant.

2A.7 Gravity Sludge Thickeners

Gravity Sludge Thickener No. 1 will be demolished. Unit No. 2 improvements will include concrete repair and piping modifications associated with the demolition of Unit No. 1.

2A.8 Gravity Belt Thickeners

This project includes an allowance for modifying sludge piping to and from the gravity belt thickeners related to rehabilitation and demolition of Gravity Thickener No. 1, and includes piping modifications to reduce clogging.

2A.9 Sludge Dewatering Facility Replacement

The existing belt filter press system will be demolished and replaced with a new screw press dewatering system. The screw press installation will be located at the current sludge cake storage site. New sludge piping will be added to convey sludge to the screw press facilities.

2A.10 Anaerobic Digesters Rehabilitation

Digesters A, B, and C will be rehabilitated to provide additional digestion capacity, additional biogas storage, and to provide capacity for processing fats oils and grease (FOG) that will be processed in the digesters. Improvements will include:

- Replace steel cover on Digester C with a flexible membrane cover to increase biogas storage volume.
- Replace digester mechanical equipment, including appurtenances, piping, heating and backup boiler, and mixing systems for all three digesters.
- Replace electrical systems for all three digesters.

2A.11 Sludge Lagoon Modifications

The sludge lagoon will be abandoned. However, the ponded area will be retained to store solids removed from the digesters during periodic cleaning. Sludge piping will be modified to route solids to one digester (B or C) for sludge storage prior to dewatering.

2A.12 Fats, Oils, and Grease (FOG) Receiving Station

A new FOG receiving station will be constructed to accept FOG from haulers. The system includes receiving, storage, mixing, and digester feed equipment. FOG will be fed to the digesters to increase biogas production for the cogeneration system, thereby reducing natural gas consumption.

2A.13 Cogeneration Gas Dryer

A third gas dryer will be installed to provide redundancy for removing moisture from digester gas prior to being fed to the cogeneration engines.

2A.14 Main Plant City Capital Improvement Plan (CIP) Projects

The following projects are currently included in the City's previous CIP:

- Improvements to the 60-inch river-crossing pipeline (including CIPP lining).
- Rehabilitation of Gravity Sludge Thickener No. 2 sludge collector mechanism.
- Enclosures for the Raw Sewage Pump Station Adjustable Frequency Drives.
- Repair and/or replacement of the existing primary clarifier scum collectors.
- Rebuild and replace drive for secondary clarifier collectors.
- Replace Gravity Sludge Thickener MCC.
- Connect 60 kV to SCADA.
- Dual electrical feed for Substation.
- Main Plant flood study.
- Roofing project.
- Cathodic protection repairs.
- Painting and coating.
- Paving.
- SCADA upgrades.

2A.15 Secondary Effluent Pump Station Expansion – Part 1

This project includes a fourth pump to be installed in the existing Secondary Effluent Pump Station No. 1 to handle peak wet weather flows.

2A.16 Energy Efficiency Measures

Recommended energy efficiency measures include replacing existing motors with premium efficiency motors, LED lighting replacement, reduction of the DAF pressurization system operating pressure, a higher efficiency pressurization pump for the DAF, and improvements to the Tertiary Air Compressors.

2A.17 Energy Management System

This includes an energy management system compatible with the plant SCADA system to manage and control plant-wide energy demands to identify potential energy savings.

2A.18 Primary Clarifier Improvements

This project includes the following improvements to the existing primary clarifiers:

- Fill the corners of the square/circular (squircular) clarifiers with concrete to convert them to circular clarifiers.
- Replace the existing primary sludge pumps.
- Improve flow distribution in PID structure.
- Concrete rehabilitation and repair.

Phase 2B: Near-Term Projects at Tertiary Plant

2B.1 Wetlands Rehabilitation and Reconfiguration

The flow pattern in the wetlands will be revised for operational flexibility and to use the wetlands for denitrification. Two channels will be constructed to convey pond effluent directly to the NBTs for nitrification, and also convey NBT effluent to the wetlands for denitrification. The wetlands themselves will also be reconfigured to provide a more effective flow path and planting system for denitrification. A new wetlands effluent pump station will be constructed to pump denitrified effluent to the DAFs.

2B.2 Third Nitrifying Biotower

A third NBT and a second biotower recirculation pump station will be added to improve nitrification capacity and performance during cold weather.

2B.3 Dissolved Air Flotation (DAF) System Rehabilitation

Two of the existing DAF structures will be rehabilitated, including concrete repairs to the launders. A more efficient pressurization system for all four DAF units will be replaced to reduce energy consumption. The new pressurization system is included in the list of energy efficiency measures, but the cost will be accounted for only under this project. This project also includes CIPP lining of the corroded DAF influent and effluent reinforced concrete pipe.

2B.4 Tertiary Filter Rehabilitation

Improvements include concrete repairs, construction joint repairs, replacement of No. 3 water pumps, replacement of filter controllers for the older filters, and miscellaneous piping upgrades.

2B.5 Tertiary Plant City Capital Improvement Plan (CIP) Projects

The following projects are currently included in the City's previous CIP:

- PLC replacements.
- Evaluation and repairs to the Tertiary Plant's 12 kV overhead power lines.

2B.6 Oxidation Pond Improvements

This includes repair of existing pond transfer structures and new access platforms. Pond cleaning is already included on the City's Operation and Maintenance project list.

Phase 2C: Near-Term Projects – Operations Support Facilities

2C.1 Administration Building Improvements and Expansion

This project includes improvements to the administration building heating, ventilation, and air conditioning systems, conversion of the current lab space (2,660 sf) into office space, and a 4,600 sf expansion to accommodate engineering staff.

2C.2 Laboratory Building

A new 6,000 sf laboratory building will be added. The building will provide updated working space and equipment to serve the wastewater and water testing requirements.

2C.3 Maintenance and Collection Building Expansion

This project includes a 2,400 sf expansion to the Maintenance and Collection Building and covered canopies for Maintenance equipment and vehicles.

2C.4 Operations Support Building Improvements

Remodel 3,620 sf of the existing Operations building upper and lower floors, including accessibility upgrades to the locker and restroom facilities.

2C.5 Tertiary Support Building Improvements

Remodel 383 sf of the existing Tertiary Support Building into additional office space for Tertiary Plant support.

Long-Term Projects

The following projects may be required at some time in the future depending on future flows to the RWCF or actual needs. Because future growth for the City of Stockton is uncertain, they are included as provisional CIP items.

1. Primary Clarifier Odor Improvements

This project includes installing covers on the primary clarifiers to capture odors. The CIP includes cost for complete coverage of primary clarifier open water surfaces; however, it may be determined during preliminary design that only the primary influent distribution box and discharge weirs need to be covered. This project also includes installation of foul air blowers and duct to convey foul air to a soil bed biofilter (See Long-Term Project Item 4).

2. Primary Clarifiers Nos. 9 and 10

Two new rectangular clarifiers will be added to provide firm capacity for future flows.

3. Fourth Nitrifying Biotower

A fourth nitrifying biotower (NBT) will be constructed if required for future flows and loads. The fourth NBT will share the pump station constructed under project 2B.2.

4. Abandoned Rock Filters

Two of the existing abandoned rock trickling filters will be demolished. The third abandoned rock trickling filter will be converted to a soil bed odor scrubber for treating foul air from the primary clarifiers (see Long-Term Projects Item 1).

Future Permit Compliance Projects

The following projects may be required at some time in the future depending on future effluent discharge permit requirements. Because the need for the projects is uncertain, they are included as provisional CIP items.

1. Addition of Selected Catalytic Redirection (SCR) to Engine Generators

The South Coast Air Quality Management District (SCAQMD) has proposed a limit of 11 ppm for NOx emissions from engine generators. It is expected that the San Joaquin Valley Air Pollution Control District (SJVAPCD) will follow SCAQMD standards and limit the NOx emission to 11 ppm in the next 3 to 5 years. Existing cogeneration engines would not meet this new limit without the use of new emission control systems for engine exhaust. Selective Catalytic Reduction (SCR) is currently the only known viable technology to meet the lower NOx requirement.

2. Conversion of Tertiary Filters to Denitrification Filters

This project includes conversion of the existing six tertiary filters to six deep bed denitrification filters and an additional seven deep bed denitrification filters would be added to account for lower filter hydraulic loading rates associated with denitrification treatment. These improvements would be needed if denitrification is required to meet future total nitrogen discharge limits, and if the improvements to the wetlands do not result in sufficient nitrogen removal (see Item 2B.1). The filters and wetlands will also be equipped with a methanol system to supply a carbon source to facilitate biological denitrification.

3. Conversion of Chlorination System to Ultraviolet (UV) Light Disinfection System

If the Regional Board rules to eliminate allowable dilution credits for the effluent discharge to the San Joaquin River and a THM scrubber is not determined to be feasible, non-chlorine based disinfection system will be required to meet the more stringent THM effluent

limitations. The most cost effective non-chlorine disinfection system is currently UV disinfection. Other technologies may be available in the future.

Deferred Energy Projects

The following projects will be deferred until funding levels improve or until further studies indicate that the projects are economically feasible.

1. Addition of 1.4 MW Fuel Cell to Existing Engine Generator Complex

This project would include a new 1.4 MW fuel cell system and gas conditioning system. Consideration for this project should begin if new SGIP funding levels and other incentives are established (expected this year). If the grants are available and the economics still look favorable, the City may wish to proceed with this project or the wind project (Deferred Energy Project Item 3), provided the risks have been mitigated. SGIP funding levels will play a big part in determining the economic feasibility of the project. The City should also consider a power purchase agreement (PPA) approach over the traditional city-owned approach. With the PPA method, the City would have a developer own and operate the fuel cell system. This would mitigate risks and eliminate the large capital costs associated with City ownership. Capital costs (including grants and incentives) would be covered by the fuel cell developer. However, the City's cost savings would have to be shared with the developer resulting in significantly lower savings compared to the City-owned delivery method.

2. Solar Power with PV Cells

Similar to the fuel cell project, solar power should be considered when solar grants and initiatives are better defined. This project could also be financed through a PPA.

3. Wind Turbines

Similar to the solar power project, wind turbines should be re-considered when funding levels improve. This project could also be implemented under the PPA approach.

APPENDIX A – NPDES PERMIT

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD

CENTRAL VALLEY REGION

11020 Sun Center Drive #200, Rancho Cordova, California 95670-6114
Phone (916) 464-3291 • FAX (916) 464-4645
http://www.waterboards.ca.gov/centralvalley

ORDER NO. R5-2008-0154
NPDES NO. CA0079138

WASTE DISCHARGE REQUIREMENTS FOR THE CITY OF STOCKTON REGIONAL WASTEWATER CONTROL FACILITY SAN JOAQUIN COUNTY

The following Discharger is subject to waste discharge requirements as set forth in this Order:

Table 1. Discharger Information

Discharger	City of Stockton
Name of Facility	Regional Wastewater Control Facility
Facility Address	2500 Navy Drive
	Stockton, CA 95206
	San Joaquin
The U.S. Environmental Protection Agency (USEPA) and the Regional Water Quality Control Board have classified this discharge as a major discharge.	

The discharge by the City of Stockton Regional Wastewater Control Facility from the discharge points identified below is subject to waste discharge requirements as set forth in this Order:

Table 2. Discharge Location

Discharge Point	Effluent Description	Discharge Point Latitude	Discharge Point Longitude	Receiving Water
001	Tertiary treated municipal wastewater	37º 56’ 15” N	121º 20’ 5” W	San Joaquin River

Table 3. Administrative Information

This Order was adopted by the Regional Water Quality Control Board on:	**23 October 2008**
This Order shall become effective on:	**12 December 2008**
This Order shall expire on:	**1 October 2013**
The Discharger shall file a Report of Waste Discharge in accordance with title 23, California Code of Regulations, as application for issuance of new waste discharge requirements no later than:	**180 days prior to the Order expiration date**

I, PAMELA C. CREEDON, Executive Officer, do hereby certify that this Order with all attachments is a full, true, and correct copy of an Order adopted by the California Regional Water Quality Control Board, Central Valley Region, on **23 October 2008**.

Original signed by Pamela C. Creedon

PAMELA C. CREEDON, Executive Officer

Table of Contents

I. Facility Information 3
II. Findings 3
III. Discharge Prohibitions 10
IV. Effluent Limitations and Discharge Specifications 10
A. Effluent Limitations – Discharge Point No. 001 10
1. Final Effluent Limitations – Discharge Point No. 001 10
2. Interim Effluent Limitations 12
B. Land Discharge Specifications 12
C. Reclamation Specifications 13
V. Receiving Water Limitations 14
A. Surface Water Limitations 14
B. Groundwater Limitations 16
VI. Provisions 17
A. Standard Provisions 17
B. Monitoring and Reporting Program (MRP) Requirements 21
C. Special Provisions 21
1. Reopener Provisions 21
2. Special Studies, Technical Reports and Additional Monitoring Requirements 23
3. Best Management Practices and Pollution Prevention 26
4. Construction, Operation and Maintenance Specifications 27
5. Special Provisions for Municipal Facilities (POTWs Only) 28
6. Other Special Provisions 31
7. Compliance Schedules - Not Applicable 32
VII. Compliance Determination 32

List of Tables

Table 1. Discharger Information ..... Cover
Table 2. Discharge Location ..... Cover
Table 3. Administrative Information ..... Cover
Table 4. Facility Information 3
Table 5. Basin Plan Beneficial Uses 5
Table 6. Effluent Limitations 10

List of Attachments

Attachment A – Definitions A-1
Attachment B – Map B-1
Attachment C – Flow Schematic C-1
Attachment D – Standard Provisions D-1
Attachment E – Monitoring and Reporting Program (MRP) E-1
Attachment F – Fact Sheet F-1
Attachment G – RPA Summary G-1
Attachment H – Constituents to be Monitored H-1

I. FACILITY INFORMATION

The following Discharger is subject to waste discharge requirements as set forth in this Order:

Table 4. Facility Information

Discharger	City of Stockton
Name of Facility	Regional Wastewater Control Facility
Facility Address	2500 Navy Drive
	Stockton, CA 95206
	San Joaquin County
Facility Contact, Title, and Phone	Mark Madison, Director, (209) 937-8750
Mailing Address	SAME
Type of Facility	Publicly Owned Treatment Works
Facility Design Flow	55 million gallons per day (mgd)

II. FINDINGS

The California Regional Water Quality Control Board, Central Valley Region (hereinafter Regional Water Board), finds:

A. Background. The City of Stockton (hereinafter Discharger) is currently discharging pursuant to Order No. R5-2002-0083 and National Pollutant Discharge Elimination System (NPDES) Permit No. CA0079138. The Discharger submitted a Report of Waste Discharge, dated 29 September 2006, and applied for a NPDES permit renewal to discharge up to 55 million gallons per day (mgd) of treated wastewater from the City of Stockton Regional Wastewater Control Facility**,** hereinafter Facility. The application was deemed complete on 28 February 2007.

For the purposes of this Order, references to the “discharger” or “permittee” in applicable federal and state laws, regulations, plans, or policy are held to be equivalent to references to the Discharger herein.

B. Facility Description. The Discharger owns and operates the Stockton Regional Wastewater Control Facility. The Facility provides primary treatment consisting of screening, grit removal, and primary sedimentation, and secondary treatment consisting of high rate trickling filters and secondary clarifiers. The secondary treated effluent is piped under the San Joaquin River to the tertiary level treatment facility, which consists of facultative ponds, engineered wetlands, two nitrifying biotowers, dissolved air flotation, mixed-media filters, and chlorination/dechlorination facilities. Several of the ponds are operated in a stand-by mode of operation as necessary, to achieve improved effluent quality by decreasing solids loading on the downstream treatment process, and by maintaining stable ammonia loading to the nitrifying biotowers.

Sludge is removed from the primary and secondary sedimentation processes to gravity thickeners for preliminary water removal, and then pumped to anaerobic digesters. After digestion, the treated sludge is pumped to a lagoon where anaerobic digestion continues. A dredge is used to pump the concentrated material from the bottom of the lagoon to a belt filter press and dewatered biosolids are removed by a private contractor off-site for agricultural reuse.

Wastewater is discharged from Discharge Point No. 001 (see table on cover page) to the San Joaquin River, a water of the United States, within the Sacramento-San Joaquin Delta. Attachment B provides a map of the area around the Facility. Attachment C provides a flow schematic of the Facility.

C. Legal Authorities. This Order is issued pursuant to section 402 of the federal Clean Water Act (CWA) and implementing regulations adopted by the U.S. Environmental Protection Agency (USEPA) and chapter 5.5, division 7 of the California Water Code (CWC) (commencing with section 13370). It shall serve as a NPDES permit for point source discharges from this facility to surface waters. This Order also serves as Waste Discharge Requirements (WDRs) pursuant to article 4, chapter 4, division 7 of the Water Code (commencing with section 13260).

D. Background and Rationale for Requirements. The Regional Water Board developed the requirements in this Order based on information submitted as part of the application, through monitoring and reporting programs, and other available information. The Fact Sheet (Attachment F), which contains background information and rationale for Order requirements, is hereby incorporated into this Order and constitutes part of the Findings for this Order. Attachments A through E, G, and H are also incorporated into this Order.

E. California Environmental Quality Act (CEQA). Under CWC section 13389, this action to adopt an NPDES permit is exempt from the provisions of CEQA, Public Resources Code sections 21100-21177.

F. Technology-based Effluent Limitations*.* Section 301(b) of the CWA and implementing USEPA permit regulations at section 122.44, title 40 of the Code of Federal Regulations (CFR)[1] require that permits include conditions meeting applicable technology-based requirements at a minimum, and any more stringent effluent limitations necessary to meet applicable water quality standards. The discharge authorized by this Order must meet minimum federal technology-based requirements based on Secondary Treatment Standards at Part 133. A detailed discussion of the technology-based effluent limitations development is included in the Fact Sheet (Attachment F).

G. Water Quality-based Effluent Limitations. Section 301(b) of the CWA and section 122.44(d) require that permits include limitations more stringent than applicable federal technology-based requirements where necessary to achieve applicable water quality standards. This Order contains requirements, expressed as a technology equivalence requirement that are necessary to achieve water quality standards. The Regional Water

[1] All further statutory references are to title 40 of the Code of Federal Regulations unless otherwise indicated.

Board has considered the factors listed in CWC Section 13241 in establishing these requirements. The rationale for these requirements, which consist of tertiary treatment or equivalent requirements, is discussed in the Fact Sheet.

Section 122.44(d)(1)(i) mandates that permits include effluent limitations for all pollutants that are or may be discharged at levels that have the reasonable potential to cause or contribute to an exceedance of a water quality standard, including numeric and narrative objectives within a standard. Where reasonable potential has been established for a pollutant, but there is no numeric criterion or objective for the pollutant, water quality-based effluent limitations (WQBELs) must be established using: (1) USEPA criteria guidance under CWA section 304(a), supplemented where necessary by other relevant information; (2) an indicator parameter for the pollutant of concern; or (3) a calculated numeric water quality criterion, such as a proposed state criterion or policy interpreting the State's narrative criterion, supplemented with other relevant information, as provided in 40 CFR section 122.44(d)(1)(vi).

H. Water Quality Control Plans. The Regional Water Board adopted a *Water Quality Control Plan, Fourth Edition (Revised February 2007), for the Sacramento and San Joaquin River Basins* (hereinafter Basin Plan) that designates beneficial uses, establishes water quality objectives, and contains implementation programs and policies to achieve those objectives for all waters addressed through the plan. In addition, the Basin Plan implements State Water Resources Control Board (State Water Board) Resolution No. 88-63, which established state policy that all waters, with certain exceptions, should be considered suitable or potentially suitable for municipal or domestic supply. Beneficial uses applicable to San Joaquin River are as follows:

Table 5. Basin Plan Beneficial Uses

Discharge Point	Receiving Water Name	Beneficial Use(s)
001	**San Joaquin River**	Existing: Municipal and domestic supply (MUN); agricultural supply (AGR) including both irrigation and stock watering; industrial process supply (PRO); industrial service supply (IND); water contact recreation (REC-1); non-contact water recreation (REC-2); migration of aquatic organisms (MIGR); warm freshwater aquatic habitat (WARM); cold freshwater aquatic habitat (COLD); spawning, reproduction, and/or early development (SPWN); wildlife habitat (WILD); and navigation (NAV).

The Basin Plan includes a list of Water Quality Limited Segments (WQLSs), which are defined as "…*those sections of lakes, streams, rivers or other fresh water bodies where water quality does not meet (or is not expected to meet) water quality standards even after the application of appropriate limitations for point sources (40 CFR 130, et seq.)*." The Basin Plan also states, "*Additional treatment beyond minimum federal standards will be imposed on dischargers to WQLSs. Dischargers will be assigned or allocated a maximum allowable load of critical pollutants so that water quality objectives can be met in the segment.*" The Delta is divided into multiple WQLSs. The Facility discharges directly into the southern portion and just upstream of the Stockton Deep Water Ship

Channel (DWSC). The listing for both WQLSs are applicable to the discharge. The WQLSs are 303(d) listed for: chloropyrifos, DDT, diazinon, dioxin, EC, exotic species, furan compounds, group A pesticides, mercury, pathogens, PCBs, and unknown toxicity. Effluent Limitations for EC, mercury, pathogens, and toxicity are included in this Order.

A total maximum daily load (TMDL) for oxygen demanding substances in the DWSC was adopted by the Regional Water Board on 27 January 2005 (Resolution No. R5-2005-0005). The TMDL was approved by the State Water Board on 16 November 2005 and approved by the USEPA on 27 February 2007. Wasteload allocations for oxygen demanding substances, specifically ammonia, carbonaceous biochemical oxygen demand ($CBOD_5$), and dissolved oxygen (DO), have not been apportioned; however, this Order contains effluent limits for these constituents until the Regional Water Board establishes final effluent limitations.

Requirements of this Order implement the Basin Plan.

I. **National Toxics Rule (NTR) and California Toxics Rule (CTR).** USEPA adopted the NTR on 22 December 1992, and later amended it on 4 May 1995 and 9 November 1999. About forty criteria in the NTR applied in California. On 18 May 2000 USEPA adopted the CTR. The CTR promulgated new toxics criteria for California and, in addition, incorporated the previously adopted NTR criteria that were applicable in the state. The CTR was amended on 13 February 2001. These rules contain water quality criteria for priority pollutants.

J. **State Implementation Policy.** On 2 March 2000 the State Water Board adopted the *Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California* (State Implementation Policy or SIP). The SIP became effective on 28 April 2000 with respect to the priority pollutant criteria promulgated for California by the USEPA through the NTR and to the priority pollutant objectives established by the Regional Water Board in the Basin Plan. The SIP became effective on 18 May 2000 with respect to the priority pollutant criteria promulgated by the USEPA through the CTR. The State Water Board adopted amendments to the SIP on 24 February 2005 that became effective on 13 July 2005. The SIP establishes implementation provisions for priority pollutant criteria and objectives and provisions for chronic toxicity control. Requirements of this Order implement the SIP.

K. **Compliance Schedules and Interim Requirements.** In general, an NPDES permit must include final effluent limitations that are consistent with CWA section 301 and with 40 CFR 122.44(d). There are exceptions to this general rule. The State Water Board has concluded that where the Regional Water Board's Basin Plan allows for schedules of compliance and the Regional Water Board is newly interpreting a narrative standard, it may include schedules of compliance in the permit to meet effluent limits that implement a narrative standard. See In the Matter of Waste Discharge Requirements for Avon Refinery (State Water Board Order WQ 2001-06 at pp. 53-55). See also Communities for a Better Environment et al. v. State Water Resources Control Board, 34 Cal.Rptr.3d 396, 410 (2005). The Basin Plan for the Sacramento and San Joaquin Rivers includes a provision that authorizes the use of compliance schedules in NPDES

permits for water quality objectives that are adopted after the date of adoption of the Basin Plan, which was 25 September 1995 (see Basin Plan at page IV-16). Consistent with the State Water Board's Order in the CBE matter, the Regional Water Board has the discretion to include compliance schedules in NPDES permits when it is including an effluent limitation that is a "new interpretation" of a narrative water quality objective. This conclusion is also consistent with the USEPA policies and administrative decisions. See, e.g., Whole Effluent Toxicity (WET) Control Policy. The Regional Water Board, however, is not required to include a schedule of compliance, but may issue a Time Schedule Order pursuant to Water Code section 13300 or a Cease and Desist Order pursuant to Water Code section 13301 where it finds that the discharger is violating or threatening to violate the permit. The Regional Water Board will consider the merits of each case in determining whether it is appropriate to include a compliance schedule in a permit, and, consistent with the Basin Plan, should consider feasibility of achieving compliance, and must impose a schedule that is as short as practicable to achieve compliance with the objectives, criteria, or effluent limit based on the objective or criteria.

For CTR constituents, Section 2.1 of the SIP provides that, based on a discharger's request and demonstration that it is infeasible for an existing discharger to achieve immediate compliance with an effluent limitation derived from a CTR criterion, compliance schedules may be allowed in an NPDES permit. Unless an exception has been granted under section 5.3 of the SIP, a compliance schedule may not exceed 5 years from the date that the permit is issued or reissued, nor may it extend beyond 10 years from the effective date of the SIP (or 18 May 2010) to establish and comply with CTR criterion-based effluent limitations. Where a compliance schedule for a final effluent limitation exceeds 1 year, the Order must include interim numeric limitations for that constituent or parameter. Where allowed by the Basin Plan, compliance schedules and interim effluent limitations or discharge specifications may also be granted to allow time to implement a new or revised water quality objective. This Order does not include compliance schedules and interim effluent limitations and/or discharge specifications. A detailed discussion is included in the Fact Sheet.

L. Alaska Rule. On 30 March 2000 USEPA revised its regulation that specifies when new and revised state and tribal water quality standards (WQS) become effective for CWA purposes. (40 CFR §131.21; 65 Fed. Reg. 24641 (27 April 2000).) Under the revised regulation (also known as the Alaska rule), new and revised standards submitted to USEPA after 30 May 2000 must be approved by USEPA before being used for CWA purposes. The final rule also provides that standards already in effect and submitted to USEPA by 30 May 2000 may be used for CWA purposes, whether or not approved by USEPA.

M. Stringency of Requirements for Individual Pollutants. This Order contains both technology-based and water quality-based effluent limitations for individual pollutants. The applicable technology-based effluent limitations consist of restrictions on $CBOD_5$ and total suspended solids (TSS). The applicable water quality-based effluent limitations consist of restrictions on aluminum, ammonia, bis(2-ethylhexyl)phthalate, chlorodibromomethane, cyanide, dichlorobromomethane, manganese, molybdenum, nitrate, and pathogens. This Order's technology-based pollutant restrictions implement

the minimum, applicable federal technology-based requirements. In addition, this Order includes effluent limitations for $CBOD_5$, TSS, and pathogens to meet numeric objectives or protect beneficial uses. The rationale for including these limitations is explained in the Fact Sheet (Attachment F). In addition, the Regional Water Board has considered the factors in Water Code section 13241 in establishing these requirements.

Water quality-based effluent limitations have been scientifically derived to implement water quality objectives that protect beneficial uses. Both the beneficial uses and the water quality objectives have been approved pursuant to federal law and are the applicable federal water quality standards. To the extent that toxic pollutant water quality-based effluent limitations were derived from the CTR, the CTR is the applicable standard pursuant to 40 CFR section 131.38. The scientific procedures for calculating the individual water quality-based effluent limitations are based on the CTR-SIP, which was approved by USEPA on 1 May 2001. All beneficial uses and water quality objectives contained in the Basin Plan were approved under state law and submitted to and approved by USEPA prior to 30 May 2000. Any water quality objectives and beneficial uses submitted to USEPA prior to 30 May 2000, but not approved by USEPA before that date, are nonetheless "*applicable water quality standards for purposes of the [Clean Water] Act*" pursuant to 40 CFR section 131.21(c)(1). Collectively, this Order's restrictions on individual pollutants are no more stringent than required to implement the technology-based requirements of the CWA and the applicable water quality standards for purposes of the CWA.

N. Antidegradation Policy. Section 131.12 requires that the state water quality standards include an antidegradation policy consistent with the federal policy. The State Water Board established California's antidegradation policy in State Water Board Resolution No. 68-16. Resolution No. 68-16 is consistent with the federal antidegradation policy where the federal policy applies under federal law. Resolution No. 68-16 requires that existing quality of waters be maintained unless degradation is justified based on specific findings. The Regional Water Board's Basin Plan implements, and incorporates by reference, both the state and federal antidegradation policies. As discussed in detail in the Fact Sheet (Attachment F) the permitted discharge is consistent with the antidegradation provision of section 131.12 and State Water Board Resolution No. 68-16.

O. Anti-Backsliding Requirements. Sections 402(o)(2) and 303(d)(4) of the CWA and federal regulations at title 40 CFR section 122.44(l) prohibit backsliding in NPDES permits. These anti-backsliding provisions require that effluent limitations in a reissued permit must be as stringent as those in the previous permit, with some exceptions in which limitations may be relaxed. Some effluent limitations in this Order are less stringent than those in the previous Order. As discussed in detail in the Fact Sheet (Attachment F) this relaxation of effluent limitations is consistent with the anti-backsliding requirements of the CWA and federal regulations.

P. Endangered Species Act. This Order does not authorize any act that results in the taking of a threatened or endangered species or any act that is now prohibited, or becomes prohibited in the future, under either the California Endangered Species Act (Fish and Game Code sections 2050 to 2097) or the Federal Endangered Species Act

(16 U.S.C.A. sections 1531 to 1544). This Order requires compliance with effluent limits, receiving water limits, and other requirements to protect the beneficial uses of waters of the state. The Discharger is responsible for meeting all requirements of the applicable Endangered Species Act.

Q. Monitoring and Reporting. Section 122.48 requires that all NPDES permits specify requirements for recording and reporting monitoring results. Water Code sections 13267 and 13383 authorizes the Regional Water Board to require technical and monitoring reports. The Monitoring and Reporting Program establishes monitoring and reporting requirements to implement federal and state requirements. This Monitoring and Reporting Program is provided in Attachment E.

R. Standard and Special Provisions. Standard Provisions, which apply to all NPDES permits in accordance with section 122.41, and additional conditions applicable to specified categories of permits in accordance with section 122.42, are provided in Attachment D. The discharger must comply with all standard provisions and with those additional conditions that are applicable under section 122.42. The Regional Water Board has also included in this Order special provisions applicable to the Discharger. A rationale for the special provisions contained in this Order is provided in the attached Fact Sheet.

The Regional Water Board has determined pollution prevention is necessary to achieve compliance with water quality objectives for total dissolved solids (for salinity), and mercury. In accordance with Water Code section 13263.3(d)(C), this Order requires the Discharger to develop pollution prevention plans for these pollutants.

S. Provisions and Requirements Implementing State Law. The provisions/requirements in subsections IV.C., V.B, and VI.C.4.a. of this Order are included to implement state law only. These provisions/requirements are not required or authorized under the federal CWA; consequently, violations of these provisions/requirements are not subject to the enforcement remedies that are available for NPDES violations.

T. Notification of Interested Parties. The Regional Water Board has notified the Discharger and interested agencies and persons of its intent to prescribe Waste Discharge Requirements for the discharge and has provided them with an opportunity to submit their written comments and recommendations. Details of notification are provided in the Fact Sheet of this Order.

U. Consideration of Public Comment. The Regional Water Board, in a public meeting, heard and considered all comments pertaining to the discharge. Details of the Public Hearing are provided in the Fact Sheet of this Order.

THEREFORE, IT IS HEREBY ORDERED, that Waste Discahrge Requirements Order No. R5-2002-0083 and Cease and Desist Order No. R5-2002-0084 are rescinded upon the effective date of this Order except for enforcement purposes, and, in order to meet the provisions contained in division 7 of the CWC (commencing with section 13000) and regulations adopted thereunder, and the provisions of the federal CWA and regulations and guidelines adopted thereunder, the Discharger shall comply with the requirements in this Order.

III. DISCHARGE PROHIBITIONS

A. Discharge of wastewater at a location or in a manner different from that described in the Findings is prohibited.

B. The by-pass or overflow of wastes to surface waters is prohibited, except as allowed by Federal Standard Provisions I.G. and I.H. (Attachment D).

C. Neither the discharge nor its treatment shall create a nuisance as defined in Section 13050 of the California Water Code.

D. The Discharger shall not allow pollutant-free wastewater to be discharged into the collection, treatment, and disposal system in amounts that significantly diminish the system's capability to comply with this Order. Pollutant-free wastewater means rainfall, groundwater, cooling waters, and condensates that are essentially free of pollutants.

IV. EFFLUENT LIMITATIONS AND DISCHARGE SPECIFICATIONS

A. Effluent Limitations – Discharge Point No. 001

1. Final Effluent Limitations – Discharge Point No. 001

The Discharger shall maintain compliance with the following effluent limitations at Discharge Point No. 001, with compliance measured at Monitoring Location EFF-001 as described in the attached MRP (Attachment E):

a. The Discharger shall maintain compliance with the effluent limitations specified in Table 6:

Table 6. Effluent Limitations

Parameter	Units	Effluent Limitations				
		Average Monthly	Average Weekly	Maximum Daily	Instantaneous Minimum	Instantaneous Maximum
Aluminum, Total Recoverable	µg/L	311		750		
Ammonia, Total (as N)	mg/L	2	--	5	--	--
	lbs/day[1]	917	--	2294	--	--
Bis(2-ethylhexyl)phthalate	µg/L	1.8	--	3.6	--	--

Parameter	Units	Effluent Limitations				
		Average Monthly	Average Weekly	Maximum Daily	Instantaneous Minimum	Instantaneous Maximum
Chlorodibromomethane	µg/L	5.0	--	16	--	--
Total Coliform Organisms	MPN/100ml	--	--	--	--	240
Cyanide, Total Recoverable	µg/L	4.1	--	9.0	--	--
Dichlorobromomethane	µg/L	6.8	--	20	--	--
Manganese, Total Recoverable	µg/L		--	286	--	--
Molybdenum, Total Recoverable	µg/L		--	13	--	--
Nitrate plus Nitrite (as N)	mg/L	40	--	--	--	--
pH	s.u.	--	--	--	6.5	8.5
Total Suspended Solids (TSS)	mg/L	10	15	20	--	--
	lbs/day[1]	4,590	6,885	9,180	--	--
5-Day CBOD @ 20 °C	mg/L	10	15	20	--	--
	lbs/day[1]	4,590	6,885	9,180	--	--

[1] Mass-based effluent limitations are based on a design flow of 55 mgd.

b. **Percent Removal:** The average monthly percent removal of CBOD 5-day 20°C and total suspended solids shall not be less than 85 percent.

c. **Acute Whole Effluent Toxicity.** Survival of aquatic organisms in 96-hour bioassays of undiluted waste shall be no less than:

   i. 70%, minimum for any one bioassay; and
   ii. 90%, median for any three consecutive bioassays.

d. **Temperature.** The maximum temperature of the discharge shall not exceed the natural receiving water temperature by more than 20°F.

e. **Total Residual Chlorine.** Effluent total residual chlorine shall not exceed:

   i. 0.01 mg/L, as a 4-day average; and
   ii. 0.02 mg/L, as a 1-hour average.

f. **Total Coliform Organisms.** Effluent total coliform organisms shall not exceed:

   i. 2.2 most probable number (MPN) per 100 mL, as a 7-day median; and
   ii. 23 MPN/100 mL, more than once in any 30-day period.

g. **Average Dry Weather Flow.** The Average Dry Weather Flow shall not exceed 55 mgd.

h. **Dissolved Oxygen.** The daily average effluent dissolved oxygen concentration shall not be less than 6.0 mg/L from 1 September through 30 November and 5.0 mg/L throughout the remainder of the year.

i. **Aluminum.** The discharge of total recoverable aluminum shall not exceed a concentration of 200 μg/L as an annual average.

j. **Electrical Conductivity.**

i. The electrical conductivity in the discharge shall not exceed an annual average of 1,300 µmhos/cm;

ii. If the Discharger fails to comply with the requirements in 1) or 2), below, the electrical conductivity in the discharge shall not exceed a monthly average of 700 µmhos/cm (1 April to 31 August), and 1000 µmhos/cm (1 September to 31 March):

1) The Discharger shall develop and submit a Salinity Plan as specified in Provision VI.C.3.c; and

2) The Discharger shall timely implement the Salinity Plan upon the Regional Water Board's approval. The proposed Salinity Plan will be circulated for no less than 30 days of public comment prior to the Regional Water Board's consideration of the Salinity Plan. The Regional Water Board may revise the Salinity Plan prior to final approval.

Upon determination by the Regional Water Board that the Discharger has materially failed to comply with the approved Salinity Plan due to circumstances within its control, the monthly average effluent limitations for electrical conductivity specified in j.ii., above, shall become effective immediately.

k. **Chronic Whole Effluent Toxicity.** There shall be no chronic toxicity in the effluent discharge.

2. Interim Effluent Limitations

a. **Mercury.** The total annual mass discharge of total mercury shall not exceed 0.92 pounds. This interim performance-based limitation shall be in effect until the Regional Water Board establishes final effluent limitations after adoption of the Sacramento-San Joaquin Delta Methylmercury TMDL.

B. Land Discharge Specifications

[Not Applicable]

C. Reclamation Specifications

1. Offsite use of reclaimed water covered by this Order shall be limited to dust control and compaction by building contractors, and street sweeping. Additional offsite specific reclamation uses may be approved by the Executive Officer with the submission of a written report demonstrating, to the satisfaction of the Executive Officer, that the uses will be in compliance with the terms of the Order.

2. Reclaimed water shall be chlorinated secondary treated effluent. For disinfection, the median number of total coliform organisms in the water shall not exceed 23 MPN/100 ml, as determined from the bacteriological results of the last seven days for which analyses have been completed, and the number of coliform organisms shall not exceed 240 MPN/100 ml in any two consecutive samples.

3. Reclaimed water shall meet the criteria contained in Title 22, Division 4, CCR (section 60301, et seq.).

4. Public contact with wastewater shall be precluded through such means as fences, signs, and other acceptable alternatives.

5. Controls on use for construction shall follow Guideline for Use of Reclaimed Water For Construction Purposes, as follows:

    a. Truck drivers should be instructed as to the reclamation specifications and potential health hazards involved with reuse of wastewater.
    b. Tank trucks and other equipment, which come into contact with reclaimed water, should be clearly identified with warning signs/placards.
    c. Tank trucks used for reclaimed water should be thoroughly cleaned of septage or other contaminants prior to reuse.
    d. Use of reclaimed water should not create any odor or nuisance.
    e. Ponding or runoff of reclaimed water should not occur.
    f. Aerosol formation during uses involving spraying should be minimized.
    g. Reclaimed water should be applied so as to prevent public contact with water.
    h. Reclaimed water must not be introduced into any permanent piping system and no connection shall be made between the tank truck and any part of a domestic water system.
    i. Tank trucks should be cleaned and disinfected after the project is completed.
    j. Tank trucks used to transport reclaimed water shall not be used to carry domestic water.

6. Treated wastewater discharged for reclamation for purposes not specified in this section must be regulated under separate waste discharge requirements and must meet the requirements of California Code of Regulations (CCR), Title 22.

V. RECEIVING WATER LIMITATIONS

A. Surface Water Limitations

Receiving water limitations are based on water quality objectives contained in the Basin Plan and are a required part of this Order. The discharge shall not cause the following in the San Joaquin River:

1. **Bacteria**. The fecal coliform concentration, based on a minimum of not less than five samples for any 30-day period, to exceed a geometric mean of 200 MPN/100 mL, nor more than ten percent of the total number of fecal coliform samples taken during any 30-day period to exceed 400 MPN/100 mL

2. **Biostimulatory Substances**. Water to contain biostimulatory substances which promote aquatic growths in concentrations that cause nuisance or adversely affect beneficial uses.

3. **Chemical Constituents**. Chemical constituents to be present in concentrations that adversely affect beneficial uses.

4. **Color**. Discoloration that causes nuisance or adversely affects beneficial uses.

5. **Dissolved Oxygen**:

    a. The dissolved oxygen concentration to be reduced below 6.0 mg/L any time from 1 September through 30 November.
    b. The dissolved oxygen concentration to be reduced below 5.0 mg/L at any time from 1 December through 31 August.

6. **Floating Material**. Floating material to be present in amounts that cause nuisance or adversely affect beneficial uses.

7. **Oil and Grease**. Oils, greases, waxes, or other materials to be present in concentrations that cause nuisance, result in a visible film or coating on the surface of the water or on objects in the water, or otherwise adversely affect beneficial uses.

8. **pH**. The pH to be depressed below 6.5, raised above 8.5, nor changed by more than 0.5 units. A 1-month averaging period may be applied when calculating the pH change of 0.5.

9. **Pesticides**:

    a. Pesticides to be present, individually or in combination, in concentrations that adversely affect beneficial uses;
    b. Pesticides to be present in bottom sediments or aquatic life in concentrations that adversely affect beneficial uses;

c. Total identifiable persistent chlorinated hydrocarbon pesticides to be present in the water column at concentrations detectable within the accuracy of analytical methods approved by USEPA or the Executive Officer;
d. Pesticide concentrations to exceed those allowable by applicable antidegradation policies (see State Water Board Resolution No. 68-16 and 40 CFR §131.12.).
e. Pesticide concentrations to exceed the lowest levels technically and economically achievable;
f. Pesticides to be present in concentration in excess of the maximum contaminant levels set forth in CCR, Title 22, Division 4, Chapter 15; and
g. Thiobencarb to be present in excess of 1.0 µg/L.

10. **Radioactivity**:

    a. Radionuclides to be present in concentrations that are harmful to human, plant, animal, or aquatic life nor that result in the accumulation of radionuclides in the food web to an extent that presents a hazard to human, plant, animal, or aquatic life.
    b. Radionuclides to be present in excess of the maximum contaminant levels specified in Table 64443 (MCL Radioactivity) of Section 64443 of Title 22 of the CCR.

11. **Suspended Sediments**. The suspended sediment load and suspended sediment discharge rate of surface waters to be altered in such a manner as to cause nuisance or adversely affect beneficial uses.

12. **Settleable Substances**. Substances to be present in concentrations that result in the deposition of material that causes nuisance or adversely affects beneficial uses.

13. **Suspended Material**. Suspended material to be present in concentrations that cause nuisance or adversely affect beneficial uses.

14. **Taste and Odors**. Taste- or odor-producing substances to be present in concentrations that impart undesirable tastes or odors to fish flesh or other edible products of aquatic origin, or that cause nuisance, or otherwise adversely affect beneficial uses.

15. **Temperature**. The Thermal Plan is applicable to this discharge. The Thermal Plan requires that the discharge shall not cause the following in the San Joaquin River:

    a. The creation of a zone, defined by water temperatures of more than 1°F above natural receiving water temperature, which exceeds 25 percent of the cross-sectional area of the river channel at any point; and

    b. A surface water temperature rise greater than 4°F above the natural temperature of the receiving water at any time or place;

16. **Toxicity**. Toxic substances to be present, individually or in combination, in concentrations that produce detrimental physiological responses in human, plant, animal, or aquatic life.

17. **Turbidity**. The turbidity to increase as follows:

    a. More than 1 Nephelometric Turbidity Unit (NTU) where natural turbidity is between 0 and 5 NTUs.
    b. More than 20 percent where natural turbidity is between 5 and 50 NTUs.
    c. More than 10 NTU where natural turbidity is between 50 and 100 NTUs.
    d. More than 10 percent where natural turbidity is greater than 100 NTUs.

    When wastewater is treated to a tertiary level (including coagulation) or equivalent, a 1-month averaging period may be used when determining compliance with this Receiving Surface Water Limitation for turbidity.

B. Groundwater Limitations

1. Release of waste constituents from any storage, treatment, or disposal component associated with the Facility shall not cause or contribute to, in combination with other sources of the waste constituents, groundwater within influence of the Facility to contain:

    a. Taste or odor-producing constituents, toxic substances, or any other constituents, in concentrations that cause nuisance or adversely affect beneficial uses;

    b. Waste constituent concentrations in excess of water quality objectives or background water quality, whichever is greater; and

    c. Waste constituent concentrations in excess of the concentrations specified below or background water quality, whichever is greater:

        i. Fecal coliform organisms median of 2.2 MPN/100 mL over any seven-day period; and

        ii. Nitrate plus Nitrite as nitrogen of 10 mg/L.

2. Groundwater Limitations B.1.b and c become effective upon completion of the requirements specified in Provision VI.C.2.c of this Order.

VI. PROVISIONS

A. Standard Provisions

1. The Discharger shall comply with all Standard Provisions included in Attachment D of this Order.

2. The Discharger shall comply with the following provisions:

   a. If the Discharger's wastewater treatment plant is publicly owned or subject to regulation by California Public Utilities Commission, it shall be supervised and operated by persons possessing certificates of appropriate grade according to Title 23, CCR, Division 3, Chapter 26.

   b. After notice and opportunity for a hearing, this Order may be terminated or modified for cause, including, but not limited to:

      i. violation of any term or condition contained in this Order;

      ii. obtaining this Order by misrepresentation or by failing to disclose fully all relevant facts;

      iii. a change in any condition that requires either a temporary or permanent reduction or elimination of the authorized discharge; and

      iv. a material change in the character, location, or volume of discharge.

      The causes for modification include:

      - *New regulations.* New regulations have been promulgated under Section 405(d) of the Clean Water Act, or the standards or regulations on which the permit was based have been changed by promulgation of amended standards or regulations or by judicial decision after the permit was issued.

      - *Land application plans.* When required by a permit condition to incorporate a land application plan for beneficial reuse of sewage sludge, to revise an existing land application plan, or to add a land application plan.

      - *Change in sludge use or disposal practice.* Under 40 CFR 122.62(a)(1), a change in the Discharger's sludge use or disposal practice is a cause for modification of the permit. It is cause for revocation and reissuance if the Discharger requests or agrees.

      The Regional Water Board may review and revise this Order at any time upon application of any affected person or the Regional Water Board's own motion.

   c. If a toxic effluent standard or prohibition (including any scheduled compliance specified in such effluent standard or prohibition) is established under Section 307(a) of the CWA, or amendments thereto, for a toxic pollutant that is present in

the discharge authorized herein, and such standard or prohibition is more stringent than any limitation upon such pollutant in this Order, the Regional Water Board will revise or modify this Order in accordance with such toxic effluent standard or prohibition.

The Discharger shall comply with effluent standards and prohibitions within the time provided in the regulations that establish those standards or prohibitions, even if this Order has not yet been modified.

d. This Order shall be modified, or alternately revoked and reissued, to comply with any applicable effluent standard or limitation issued or approved under Sections 301(b)(2)(C) and (D), 304(b)(2), and 307(a)(2) of the CWA, if the effluent standard or limitation so issued or approved:

   i. contains different conditions or is otherwise more stringent than any effluent limitation in the Order; or

   ii. controls any pollutant limited in the Order.

   The Order, as modified or reissued under this paragraph, shall also contain any other requirements of the CWA then applicable.

e. The provisions of this Order are severable. If any provision of this Order is found invalid, the remainder of this Order shall not be affected.

f. The Discharger shall take all reasonable steps to minimize any adverse effects to waters of the State or users of those waters resulting from any discharge or sludge use or disposal in violation of this Order. Reasonable steps shall include such accelerated or additional monitoring as necessary to determine the nature and impact of the non-complying discharge or sludge use or disposal, and adequate public notification to downstream water agencies or others who might contact the non-complying discharge.

g. The Discharger shall ensure compliance with any existing or future pretreatment standard promulgated by USEPA under Section 307 of the CWA, or amendment thereto, for any discharge to the municipal system.

h. The discharge of any radiological, chemical or biological warfare agent or high-level, radiological waste is prohibited.

i. A copy of this Order shall be maintained at the discharge facility and be available at all times to operating personnel. Key operating personnel shall be familiar with its content.

j. Safeguard to electric power failure:

   i. The Discharger shall provide safeguards to assure that, should there be reduction, loss, or failure of electric power, the discharge shall comply with the terms and conditions of this Order.

ii. Upon written request by the Regional Water Board the Discharger shall submit a written description of safeguards. Such safeguards may include alternate power sources, standby generators, retention capacity, operating procedures, or other means. A description of the safeguards provided shall include an analysis of the frequency, duration, and impact of power failures experienced over the past 5 years on effluent quality and on the capability of the Discharger to comply with the terms and conditions of the Order. The adequacy of the safeguards is subject to the approval of the Regional Water Board.

iii. Should the treatment works not include safeguards against reduction, loss, or failure of electric power, or should the Regional Water Board not approve the existing safeguards, the Discharger shall, within 90 days of having been advised in writing by the Regional Water Board that the existing safeguards are inadequate, provide to the Regional Water Board and USEPA a schedule of compliance for providing safeguards such that in the event of reduction, loss, or failure of electric power, the Discharger shall comply with the terms and conditions of this Order. The schedule of compliance shall, upon approval of the Regional Water Board, become a condition of this Order.

k. The Discharger, upon written request of the Regional Water Board, shall file with the Board a technical report on its preventive (failsafe) and contingency (cleanup) plans for controlling accidental discharges, and for minimizing the effect of such events. This report may be combined with that required under Regional Water Board Standard Provision VI.A.2.m.

The technical report shall:

i. Identify the possible sources of spills, leaks, untreated waste by-pass, and contaminated drainage. Loading and storage areas, power outage, waste treatment unit outage, and failure of process equipment, tanks and pipes should be considered.

ii. Evaluate the effectiveness of present facilities and procedures and state when they became operational.

iii. Predict the effectiveness of the proposed facilities and procedures and provide an implementation schedule containing interim and final dates when they will be constructed, implemented, or operational.

The Regional Water Board, after review of the technical report, may establish conditions which it deems necessary to control accidental discharges and to minimize the effects of such events. Such conditions shall be incorporated as part of this Order, upon notice to the Discharger.

l. A publicly owned treatment works (POTW) whose waste flow has been increasing, or is projected to increase, shall estimate when flows will reach hydraulic and treatment capacities of its treatment and disposal facilities. The projections shall be made in January, based on the last 3 years' average dry

weather flows, peak wet weather flows and total annual flows, as appropriate. When any projection shows that capacity of any part of the facilities may be exceeded in 4 years, the Discharger shall notify the Regional Water Board by 31 January. A copy of the notification shall be sent to appropriate local elected officials, local permitting agencies and the press. Within 120 days of the notification, the Discharger shall submit a technical report showing how it will prevent flow volumes from exceeding capacity or how it will increase capacity to handle the larger flows. The Regional Water Board may extend the time for submitting the report.

m. The Discharger shall submit technical reports as directed by the Executive Officer. All technical reports required herein that involve planning, investigation, evaluation, or design, or other work requiring interpretation and proper application of engineering or geologic sciences, shall be prepared by or under the direction of persons registered to practice in California pursuant to California Business and Professions Code, sections 6735, 7835, and 7835.1. To demonstrate compliance with Title 16, CCR, sections 415 and 3065, all technical reports must contain a statement of the qualifications of the responsible registered professional(s). As required by these laws, completed technical reports must bear the signature(s) and seal(s) of the registered professional(s) in a manner such that all work can be clearly attributed to the professional responsible for the work.

n. Laboratories that perform sample analyses must be identified in all monitoring reports submitted to the Regional Water Board and USEPA.

o. The Discharger shall conduct analysis on any sample provided by USEPA as part of the Discharge Monitoring Quality Assurance (DMQA) program. The results of any such analysis shall be submitted to USEPA's DMQA manager.

p. Effluent samples shall be taken downstream of the last addition of wastes to the treatment or discharge works where a representative sample may be obtained prior to mixing with the receiving waters. Samples shall be collected at such a point and in such a manner to ensure a representative sample of the discharge.

q. All monitoring and analysis instruments and devices used by the Discharger to fulfill the prescribed monitoring program shall be properly maintained and calibrated as necessary, at least yearly, to ensure their continued accuracy.

r. The Discharger shall file with the Regional Water Board technical reports on self-monitoring performed according to the detailed specifications contained in the Monitoring and Reporting Program attached to this Order.

s. The results of all monitoring required by this Order shall be reported to the Regional Water Board, and shall be submitted in such a format as to allow direct comparison with the limitations and requirements of this Order. Unless otherwise specified, discharge flows shall be reported in terms of the monthly average and the daily maximum discharge flows.

t. The Regional Water Board is authorized to enforce the terms of this permit under several provisions of the CWC, including, but not limited to, sections 13385, 13386, and 13387.

u. For POTWs, prior to making any change in the point of discharge, place of use, or purpose of use of treated wastewater that results in a decrease of flow in any portion of a watercourse, the Discharger must file a petition with the State Water Board, Division of Water Rights, and receive approval for such a change (CWC section 1211).

v. In the event the Discharger does not comply or will be unable to comply for any reason, with any prohibition, maximum daily effluent limitation, 1-hour average effluent limitation, or receiving water limitation contained in this Order, the Discharger shall notify the Regional Water Board by telephone (916) 464-3291 within 24 hours of having knowledge of such noncompliance, and shall confirm this notification in writing within 5 days, unless the Regional Water Board waives confirmation. The written notification shall include the information required by Attachment D, Section V.E.1 [40 CFR section 122.41(l)(6)(i)].

B. Monitoring and Reporting Program (MRP) Requirements

1. The Discharger shall comply with the MRP, and future revisions thereto, in Attachment E of this Order.

C. Special Provisions

1. Reopener Provisions

a. This Order may be reopened for modification, or revocation and reissuance, as a result of the detection of a reportable priority pollutant generated by special conditions included in this Order. These special conditions may be, but are not limited to, fish tissue sampling, whole effluent toxicity, monitoring requirements on internal waste stream(s), and monitoring for surrogate parameters. Additional requirements may be included in this Order as a result of the special condition monitoring data.

b. Conditions that necessitate a major modification of a permit are described in 40 CFR section 122.62, including:

i. If new or amended applicable water quality standards are promulgated or approved pursuant to Section 303 of the CWA, or amendments thereto, this permit may be reopened and modified in accordance with the new or amended standards.

ii. When new information, that was not available at the time of permit issuance, would have justified different permit conditions at the time of issuance.

c. **Mercury, Total.** If a TMDL program is adopted, this Order may be reopened to modify the interim mass effluent limitation (higher or lower) or impose an effluent concentration limitation if necessary to implement the provisions of the TMDL program as adopted, and approved by the State Water Board, Office of Administrative Law, and US EPA. If the Regional Water Board determines that a mercury offset program is feasible for dischargers subject to a NPDES permit, then this Order may be reopened to reevaluate the interim mercury mass loading limitation(s) and the need for a mercury offset program for the Discharger.

d. **Pollution Prevention.** This Order requires the Discharger to update and implement its salinity and mercury pollution prevention plans (*Pollution Prevention Plan Implementation for Total Dissolved Solids* [salinity]*, Mercury and Group A Pesticides,* February 2005). Based on the success of these pollution prevention plans, this Order may be reopened for addition and/or modification of effluent limitations and requirements for these constituents.

e. **Whole Effluent Toxicity.** As a result of a Toxicity Reduction Evaluation (TRE), this Order may be reopened to include a chronic toxicity limitation, a new acute toxicity limitation, and/or a limitation for a specific toxicant identified in the TRE. Additionally, if the State Water Board revises the SIP's toxicity control provisions that would require the establishment of numeric chronic toxicity effluent limitations, this Order may be reopened to include a numeric chronic toxicity effluent limitation based on the new provisions.

f. **Water Effects Ratios (WER) and Metal Translators.** A default WER of 1.0 has been used in this Order for calculating CTR criteria and Basin Plan objectives for applicable priority pollutant inorganic constituents. If the Discharger performs defensible water effect ratio studies to determine site-specific WERs and/or site-specific dissolved-to-total metal translators, this Order may be reopened to modify the effluent limitations for the applicable constituents. Or should an independent scientific peer review of the Arid West Water Quality Research Project technical report, *Evaluation of the EPA Recalculation Procedure in the Arid West Technical Report,* produce defensible findings that update the national ambient water quality criteria for aluminum, this Order may be reopened to modify the effluent limitations for aluminum.

g. **Best Practicable Treatment and Control Assessment.** This Order requires the Discharger to submit a corrective action plan and implementation schedule for necessary modifications to any of the Facility's storage, treatment, or disposal components where the groundwater monitoring results exceed either the background monitoring results (i.e. monitoring well MW-15 or MW-16) or groundwater water quality objectives. Based on a review of the results of the report and the analytical groundwater quality monitoring results, this Order may be reopened for addition of groundwater limitations for protection of beneficial uses.

h. **Central Valley Drinking Water Policy**. If water quality objectives are adopted for organic carbon, nutrients, salinity, bromide, or pathogens to protect drinking water supplies in the Central Valley Region, this Order may be reopened for addition and/or modification of effluent limitations and requirements, as appropriate, to require compliance with the applicable water quality objectives.

i. **Ammonia Studies.** The ammonia effluent limitations in this Order are based on USEPA's recommended National Ambient Water Quality Criteria for protection of freshwater aquatic life. However, studies are ongoing to evaluate the effect of ammonia on the inhibition of growth of freshwater diatoms in the Delta, as well as, studies to evaluate the sensitivity of delta smelt to ammonia toxicity. Based on the result of these or other studies, this Order may be reopened to modify the ammonia effluent limitations, as appropriate.

j. **Regional Monitoring Program.** The State and Regional Water Boards are committed to creation of a coordinated Regional Monitoring Program to address receiving water monitoring in the Delta for all Water Board regulatory and research programs. When a Regional Monitoring Program becomes functional, this permit may be reopened to make appropriate adjustments in permit-specific monitoring to coordinate with the Regional Monitoring Program."

k. **The Bay-Delta Plan**. The South Delta salinity standards are currently under review by the State Water Board in accordance with implementation provisions contained in the Bay-Delta Water Quality Control Plan. This review in process includes an updated independent scientific investigation of irrigation salinity needs in the southern Delta. If applicable water quality objectives of the Bay-Delta Plan are adopted, this Order may be reopened for addition and/or modification of effluent limitations and requirements, as appropriate.

2. Special Studies, Technical Reports and Additional Monitoring Requirements

a. **Chronic Whole Effluent Toxicity.** For compliance with the Basin Plan's narrative toxicity objective, this Order requires the Discharger to conduct chronic whole effluent toxicity testing, as specified in the Monitoring and Reporting Program (Attachment E, Section V). Furthermore, this Provision requires the Discharger to investigate the causes of, and to identify corrective actions to reduce or eliminate, effluent toxicity. If the discharge exceeds the toxicity numeric monitoring trigger established in this Provision, the Discharger is required to initiate a Toxicity Reduction Evaluation (TRE), in accordance with an approved updated TRE Work Plan, and to take actions to mitigate the impact of the discharge and prevent reoccurrence of toxicity. This Provision also requires the Discharger to update and submit its TRE Work Plan, conditionally approved by the Executive Officer in November 2003, based on the findings of the recent TRE investigation and the effectiveness of the newly implemented toxicity controls. In addition, this Provision includes procedures for accelerated chronic

toxicity monitoring and TRE initiation. The Discharger shall conform with the following conditons:

i. **Update Toxicity Reduction Evaluation (TRE) Work Plan. Within 120 days of the effective date of this Order,** the Discharger shall submit to the Regional Water Board an updated TRE Work Plan for approval by the Executive Officer. The TRE Work Plan shall outline the procedures for identifying the source(s) of, and reducing or eliminating effluent toxicity. The TRE Work Plan must be developed in accordance with USEPA guidance[2].

ii. **Accelerated Monitoring and TRE Initiation.** When the numeric toxicity monitoring trigger is exceeded during regular chronic toxicity monitoring, and the testing meets all test acceptability criteria, the Discharger shall initiate accelerated monitoring as required in the Accelerated Monitoring Specifications. WET testing results exceeding the monitoring trigger during accelerated monitoring demonstrates a pattern of toxicity and requires the Discharger to initiate a TRE to address the effluent toxicity.

iii. **Numeric Monitoring Trigger.** The numeric toxicity monitoring trigger is > **1 TUc** (where TUc = 100/NOEC). The monitoring trigger is not an effluent limitation; it is the toxicity threshold at which the Discharger is required to begin accelerated monitoring and initiate a TRE.

iv. **Accelerated Monitoring Specifications.** If the monitoring trigger is exceeded during regular chronic toxicity testing, within 14 days of notification by the laboratory of the test results, the Discharger shall initiate accelerated monitoring. Accelerated monitoring shall consist of four (4) chronic toxicity tests in a 6-week period (i.e., one test every 2 weeks) using the species that exhibited toxicity. The following protocol shall be used for accelerated monitoring and TRE initiation:

a) If the results of four (4) consecutive accelerated monitoring tests do not exceed the monitoring trigger, the Discharger may cease accelerated monitoring and resume regular chronic toxicity monitoring. However, notwithstanding the accelerated monitoring results, if there is adequate evidence of a pattern of effluent toxicity, the Executive Officer may require that the Discharger initiate a TRE.

b) If the source(s) of the toxicity is easily identified (i.e., temporary plant upset), the Discharger shall make necessary corrections to the facility and shall continue accelerated monitoring until four (4) consecutive accelerated tests do not exceed the monitoring trigger. Upon confirmation that the effluent toxicity has been removed, the Discharger may cease accelerated monitoring and resume regular chronic toxicity monitoring.

[2] See Attachment F (Fact Sheet) Section VII.B.2.a. for a list of USEPA guidance documents that must be considered in development of the TRE Workplan.

c) If the result of any accelerated toxicity test exceeds the monitoring trigger, the Discharger shall cease accelerated monitoring and initiate a TRE to investigate the cause(s) of, and identify corrective actions to reduce or eliminate effluent toxicity. Within thirty (30) days of notification by the laboratory of the test results exceeding the monitoring trigger during accelerated monitoring, the Discharger shall submit a TRE Action Plan to the Regional Water Board including, at minimum:

1) Specific actions the Discharger will take to investigate and identify the cause(s) of toxicity, including TRE WET monitoring schedule;
2) Specific actions the Discharger will take to mitigate the impact of the discharge and prevent the recurrence of toxicity; and
3) A schedule for these actions.

b. **Effluent and Receiving Water Characterization Study.** An effluent and receiving water monitoring study is required to ensure adequate information is available for the next permit renewal. During the third year of this permit term, the Discharger shall conduct monthly monitoring of the effluent at EFF-001 and of the receiving water at RSW-001 for all priority pollutants and other constituents of concern as described in Attachment H. Dioxin and Furan sampling shall be performed only twice during the year, as described in Attachment H. The report shall be completed in conformance with the following schedule.

Task	Compliance Date
Submit Work Plan and Time Schedule	No later than 2 years 6 months from adoption of this Order
Conduct monthly monitoring	During third year of permit term
Submit Final Report	6 months following completion of final monitoring event

c. **Time Schedule for Compliance with Groundwater Limitations and Best Practicable Treatment and Control.** State Water Board Resolution 68-16 (Antidegradaion Policy) requires best practicable treatment or control of the discharge necessary to assure that, *"(a) a pollution or nuisance will not occur and (b) the highest water quality consistent with maximum benefit to the people of the State will be maintained."* In general, an exceedance of a water quality objective in the Basin Plan constitutes "pollution". The Discharger currently stores digested sludge in an unlined lagoon and secondary treated effluent is contained in unlined ponds. These activities may have the potential to cause degradation of the underlying groundwater and groundwater monitoring results obtained within the Facility have at times exceeded the applicable water quality objectives for TDS and nitrate. However, more data is needed to make this determination because the Discharger's current monitoring network does not adequately characterize the variable background groundwater quality conditions in the vicinity of the Facility, and it cannot be determined if the affected groundwater exceeds background water quality, which is necessary for evaluating compliance with the Groundwater Limitations in this Order.

Therefore, to determine compliance with Groundwater Limitations V.B.1.b and c of this Order, the Discharger must submit a work plan and time schedule that describes the installation of any additional monitoring wells and any other testing needed to effectively and fully characterize background quality conditions. If the background water quality investigation indicates that the discharge has caused a violation of the Groundwater Limitations, the Discharger must also submit a BPTC Evaluation Work Plan that sets forth a comprehensive technical evaluation and time schedule to implement or modify Facility as necessary to comply with the Antidegradation Policy.

The Discharger shall comply with the following schedule:

Task	Compliance Date
1 - Submit Work plan and Time Schedule for preparation of background groundwater quality characterization.	**Within 3 months** following the effective date of this Order.
2 - Submit Background Groundwater Quality Characterization Technical Report.	No longer than **2.5 years** after commencement of the study.
3 - Submit Work plan and Time Schedule for BPTC Technical Evaluation.	**60 days** following approval of the Background Groundwater Quality Characterization Technical Report.
4 – Submit BPTC Technical Evaluation Study.	As established by Task 3 and following approval of the work plan and time schedule
5 - Implement necessary modifications to achieve BPTC.	As established by Task 4 and following approval of technical evaluation and time schedule.

3. Best Management Practices and Pollution Prevention

a. **Pollution Prevention Plan for Mercury.** The Discharger shall update and implement the pollution prevention plan for mercury ("Mercury and Group A Pesticides", February 2005) in accordance with CWC section 13263.3(d)(3). The minimum requirements for the pollution prevention plan are outlined in the Fact Sheet, Attachment F, Section VI.B.3.b. The updated plan shall be completed and submitted **within 6 months of the effective date of this Order** for approval.

b. **Salinity Reduction Goal.** The Discharger shall provide annual reports demonstrating reasonable progress in the reduction of salinity in its discharge to the San Joaquin River. The Regional Water Board finds that an annual average salinity goal of the maximum weighted average electrical conductivity of the City of Stockton's water supply (e.g. 273 µmhos/cm in March 2005), plus an increment of 500 µmhos/cm for typical consumptive use, is a reasonable intermediate goal that can be achieved through the proper implementation of a pollution prevention plan. The Discharger shall submit annual progress reports in accordance with the Monitoring and Reporting Program (Attachment E, Section X.D.1.).

c. **Salinity Plan.** The Discharger shall develop and implement a Salinity Plan to reduce its salinity impacts to the Delta in accordance with conditions i-iv below.

i. The Discharger shall implement all reasonable steps to obtain alternative, lower salinity water supply sources; and

ii. The Discharger shall develop and implement a salinity source control program that will identify and implement measures to reduce salinity in discharges from residential, commercial, industrial, and infiltration sources in an effort to meet the salinity reduction goal specified in previous Provision VI.C.3.b of this Order. As a part of its source control program, the Discharger shall update and implement its pollution prevention plan for salinity ("Pollution Prevention Plan Implementation for Total Dissolved Solids" [salinity], February 2005) in accordance with CWC section 13263.3(d)(3) (See section VI.B.3.b of the Fact Sheet for minimum requirements); and

iii. The Discharger shall participate financially in the development of the Central Valley Salinity Management Plan at a level commensurate with its contributions of salinity to the Delta; and

iv. The Discharger shall comply with the following schedule:

Task	Compliance Date
1 - Submit to the Regional Water Board for approval by the Executive Officer a draft Salinity Work Plan to reduce salinity impacts to the Delta.	**Within 6 months** following the effective date of this Order.
2 - Submit Final Salinity Work Plan.	No longer than **60 days** following approval of Task 1.

4. Construction, Operation and Maintenance Specifications

a. **Treatment Pond Operating Requirements.**

i. Public contact with wastewater shall be precluded through such means as fences, signs, and other acceptable alternatives.

ii. Ponds shall be managed to prevent breeding of mosquitoes. In particular,

a) An erosion control program should assure that small coves and irregularities are not created around the perimeter of the water surface.
b) Weeds shall be minimized.
c) Dead algae, vegetation, and debris shall not accumulate on the water surface.

iii. Freeboard shall never be less than 2 feet (measured vertically to the lowest point of overflow) as a monthly average and never less than 1 feet at any time.

iv. Objectionable odors originating at this facility shall not be perceivable beyond the limits of the wastewater treatment and disposal areas (or property owned by the Discharger).

v. As a means of discerning compliance with the previous Pond Operating Requirements a.iv., the dissolved oxygen content in the upper zone (1 foot) of wastewater in the ponds shall not be less than 1.0 mg/L.

vi. Ponds shall not have a pH less than 6.5 or greater than 9.0.

5. Special Provisions for Municipal Facilities (POTWs Only)

a. **Pretreatment Requirements**

i. The Discharger shall implement its approved pretreatment program and the program shall be an enforceable condition of this Order. If the Discharger fails to perform the pretreatment functions, the Regional Water Board, the State Water Board or the USEPA may take enforcement actions against the Discharger as authorized by the CWA.

ii. The Discharger shall enforce the Pretreatment Standards promulgated under sections 307(b), 307(c), and 307(d) of the Clean Water Act. The Discharger shall perform the pretreatment functions required by 40 CFR Part 403 including, but not limited to:

a) Adopting the legal authority required by 40 CFR 403.8(f)(1);

b) Enforcing the Pretreatment Standards of 40 CFR 403.5 and 403.6;

c) Implementing procedures to ensure compliance as required by 40 CFR 403.8(f)(2); and

d) Providing funding and personnel for implementation and enforcement of the pretreatment program as required by 40 CFR 403.8(f)(3).

iii. The Discharger shall implement, as more completely set forth in 40 CFR 403.5, the necessary legal authorities, programs, and controls to ensure that the following incompatible wastes are not introduced to the treatment system, where incompatible wastes are:

a) Wastes which create a fire or explosion hazard in the treatment works;

b) Wastes which will cause corrosive structural damage to treatment works, but in no case wastes with a pH lower than 5.0, unless the works is specially designed to accommodate such wastes;

c) Solid or viscous wastes in amounts which cause obstruction to flow in sewers, or which cause other interference with proper operation or treatment works;

d) Any waste, including oxygen demanding pollutants (BOD, etc.), released in such volume or strength as to cause inhibition or disruption in the treatment works, and subsequent treatment process upset and loss of treatment efficiency;

e) Heat in amounts that inhibit or disrupt biological activity in the treatment works, or that raise influent temperatures above 40°C (104°F), unless the Regional Water Board approves alternate temperature limits;

f) Petroleum oil, non-biodegradable cutting oil, or products of mineral oil origin in amounts that will cause interference or pass through;

g) Pollutants which result in the presence of toxic gases, vapors, or fumes within the treatment works in a quantity that may cause acute worker health and safety problems; and

h) Any trucked or hauled pollutants, except at points predesignated by the Discharger.

iv. The Discharger shall implement, as more completely set forth in 40 CFR 403.5, the legal authorities, programs, and controls necessary to ensure that indirect discharges do not introduce pollutants into the sewerage system that, either alone or in conjunction with a discharge or discharges from other sources:

a) Flow through the system to the receiving water in quantities or concentrations that cause a violation of this Order; or

b) Inhibit or disrupt treatment processes, treatment system operations, or sludge processes, use, or disposal and either cause a violation of this Order or prevent sludge use or disposal in accordance with this Order.

b. **Sludge/Biosolids Discharge Specifications**

i. Collected screenings, residual sludge, biosolids, and other solids removed from liquid wastes shall be disposed of in a manner approved by the Executive Officer, and consistent with *Consolidated Regulations for Treatment, Storage, Processing, or Disposal of Solid Waste,* as set forth in Title 27, CCR, Division 2, Subdivision 1, section 20005, et seq. Removal for further treatment, disposal, or reuse at sites (i.e., landfill, composting sites, soil amendment sites) that are operated in accordance with valid waste discharge requirements issued by a Regional Water Board will satisfy these specifications.

ii. Sludge and solid waste shall be removed from screens, sumps, ponds, clarifiers, etc. as needed to ensure optimal plant performance.

iii. The treatment of sludge generated at the Facility shall be confined to the Facility property and conducted in a manner that precludes infiltration of waste constituents into soils in a mass or concentration that will violate Groundwater Limitations V.B. In addition, the storage of residual sludge, solid waste, and biosolids on Facility property shall be temporary and controlled, and contained in a manner that minimizes leachate formation and precludes infiltration of waste constituents into soils in a mass or concentration that will violate Groundwater Limitations V.B.

iv. The use and disposal of biosolids shall comply with existing Federal and State laws and regulations, including permitting requirements and technical standards included in 40 CFR Part 503. If the State Water Board and the Regional Water Board are given the authority to implement regulations contained in 40 CFR Part 503, this Order may be reopened to incorporate appropriate time schedules and technical standards. The Discharger must comply with the standards and time schedules contained in 40 CFR Part 503 whether or not they have been incorporated into this Order.

c. **Biosolids Disposal Requirements**

i. The Discharger shall comply with the Monitoring and Reporting Program for biosolids disposal contained in Section IX.A of Attachment E.

ii. Any proposed change in biosolids use or disposal practice from a previously approved practice shall be reported to the Executive Officer and USEPA Regional Administrator at least **90 days** in advance of the change.

iii. The Discharger is encouraged to comply with the “Manual of Good Practice for Agricultural Land Application of Biosolids” developed by the California Water Environment Association.

d. **Biosolids Storage Requirements**

i. Facilities for the storage of Class B biosolids shall be located, designed and maintained to restrict public access to biosolids.

ii. Biosolids storage facilities shall be designed and maintained to prevent washout or inundation from a storm or flood with a return frequency of 100 years.

iii. Biosolids storage facilities, which contain biosolids, shall be designed and maintained to contain all storm water falling on the biosolids storage area during a rainfall year with a return frequency of 100 years.

iv. Biosolids storage facilities shall be designed, maintained and operated to minimize the generation of leachate.

e. **Collection System.** On 2 May 2006, the State Water Board adopted State Water Board Order 2006-0003, a Statewide General WDR for Sanitary Sewer Systems. The Discharger shall be subject to the requirements of Order 2006-0003 and any future revisions thereto. Order 2006-0003 requires that all public agencies that currently own or operate sanitary sewer systems apply for coverage under the General WDR. The Discharger has applied for and has been approved for coverage under State Water Board Order 2006-0003 for operation of its wastewater collection system.

   Regardless of the coverage obtained under Order 2006-0003, the Discharger's collection system is part of the treatment system that is subject to this Order. As such, pursuant to federal regulations, the Discharger must properly operate and maintain its collection system [40 CFR section 122.41(e)], report any non-compliance [40 CFR section 122.41(l)(6) and (7)], and mitigate any discharge from the collection system in violation of this Order [40 CFR section 122.41(d)].

f. **Turbidity Operational Requirements.** The Discharger shall operate the treatment system to ensure that the turbidity measured at EFF-001, as described in the MRP (Attachment E), shall not exceed:

   i. 2 NTU as a daily average, and
   ii. 5 NTU more than 5 percent of the time within a 24-hour period, and
   iii. 10 NTU, at any time.

6. Other Special Provisions

a. Wastewater shall be oxidized, coagulated, filtered, and adequately disinfected pursuant to the California Department of Public Health (DPH) reclamation criteria, CCR, Title 22, Division 4, Chapter 3, (Title 22), or equivalent.

b. The treatment and storage facilities shall be designed, constructed, operated, and maintained to prevent inundation or washout due to floods with a 100-year return frequency

c. In the event of any change in control or ownership of land or waste discharge facilities presently owned or controlled by the Discharger, the Discharger shall notify the succeeding owner or operator of the existence of this Order by letter, a copy of which shall be immediately forwarded to the Regional Water Board.

   To assume operation under this Order, the succeeding owner or operator must apply in writing to the Executive Officer requesting transfer of the Order. The request must contain the requesting entity's full legal name, the State of incorporation if a corporation, address and telephone number of the persons responsible for contact with the Regional Water Board and a statement. The statement shall comply with the signatory and certification requirements in the Federal Standard Provisions (Attachment D, Section V.B.) and state that the new owner or operator assumes full responsibility for compliance with this Order. Failure to submit the request shall be considered a discharge without

requirements, a violation of the California Water Code. Transfer shall be approved or disapproved in writing by the Executive Officer.

7. Compliance Schedules - Not Applicable

VII. COMPLIANCE DETERMINATION

Compliance with the effluent limitations contained in section IV of this Order will be determined as specified below:

A. **$CBOD_5$ and TSS Effluent Limitations (Section IV.A.1.b and IV.A.1.c)**. Compliance with the final effluent limitations for CBOD and TSS required in sections IV.A.1.b. and IV.A.1.c shall be ascertained by 24-hour composite samples. Compliance with effluent limitations IV.A.1.c for percent removal shall be calculated using the arithmetic mean of 20°C CBOD (5-day) and total suspended solids in effluent samples collected over a monthly period as a percentage of the arithmetic mean of the values for influent samples collected at approximately the same times during the same period.

B. **Aluminum Effluent Limitations (Section IV.A.1.a)**. Compliance with the final effluent limitations for aluminum can be demonstrated using either total or acid-soluble (inductively coupled plasma/atomic emission spectrometry or inductively coupled plasma/mass spectrometry) analysis methods, as supported by USEPA's Ambient Water Quality Criteria for Aluminum document (EPA 440/5-86-008), or other standard methods that exclude aluminum silicate particles as approved by the Executive Officer.

C. **Total Mercury Mass Loading Effluent Limitations (Section IV.B.2.d)**. The procedures for calculating mass loadings are as follows:

1. The total pollutant mass load for each individual calendar month shall be determined using an average of all concentration data collected that month and the corresponding total monthly flow. All monitoring data collected under the monitoring and reporting program, pretreatment program and any special studies shall be used for these calculations.
2. In calculating compliance, the Discharger shall count all non-detect measures at one-half of the detection level. If compliance with the effluent limitation is not attained due to the non-detect contribution, the Discharger shall improve and implement available analytical capabilities and compliance shall be evaluated with consideration of the detection limits.

D. **Total Coliform Organisms Effluent Limitations (Section IV.A.1.j)**. For each day that an effluent sample is collected and analyzed for total coliform organisms, the 7-day median shall be determined by calculating the median concentration of total coliform bacteria in the effluent utilizing the bacteriological results of the last 7 days

E. **Total Residual Chlorine Effluent Limitations (Section IV.A.1.g)**. Continuous monitoring analyzers for chlorine residual or for dechlorination agent residual in the effluent are appropriate methods for compliance determination. A positive residual dechlorination agent in the effluent indicates that chlorine is not present in the discharge, which demonstrates compliance with the effluent limitations. This type of monitoring can also be used to prove that some chlorine residual exceedances are false positives. Continuous monitoring data showing either a positive dechlorination agent residual or a chlorine residual at or below the prescribed limit are sufficient to show compliance with the total residual chlorine effluent limitations, as long as the instruments are maintained and calibrated in accordance with the manufacturer's recommendations.

Any excursion above the 1-hour average or 4-day average total residual chlorine effluent limitations is a violation. If the Discharger conducts continuous monitoring and the Discharger can demonstrate, through data collected from a back-up monitoring system, that a chlorine spike recorded by the continuous monitor was not actually due to chlorine, then any excursion resulting from the recorded spike will not be considered an exceedance, but rather reported as a false positive.

F. **Mass Effluent Limitations.** The mass effluent limitations contained in Final Effluent Limitations IV.A.1.h are based on the permitted average dry weather flow and calculated as follows:

Mass (lbs/day) = Flow (mgd) x Concentration (mg/L) x 8.34 (conversion factor)

If the effluent flow exceeds the permitted average dry weather flow during we-weather seasons, the effluent mass limitations contained in Final Effluent Limitations IV.A.1.a shall not apply.

G. **Average Dry Weather Flow Effluent Limitations**. The Average Dry Weather Flow represents the average dry weather flow discharged by the Facility (i.e. daily average flow when groundwater is at or near normal and runoff is not occurring). Compliance with the Average Dry Weather Flow effluent limitations will be determined annually based on the average daily flow over three consecutive dry weather months (e.g. July, August, and September).

H. **Chronic Whole Effluent Toxicity Effluent Limitation.** Compliance with the accelerated monitoring and TRE/TIE provisions of Provision VI.C.2.a shall constitute compliance with effluent limitation IV.A.1.k for chronic whole effluent toxicity.

ATTACHMENT A – DEFINITIONS

Arithmetic Mean (μ), also called the average, is the sum of measured values divided by the number of samples. For ambient water concentrations, the arithmetic mean is calculated as follows:

Arithmetic mean = $\mu = \Sigma x / n$ where: Σx is the sum of the measured ambient water concentrations, and n is the number of samples.

Average Monthly Effluent Limitation (AMEL): the highest allowable average of daily discharges over a calendar month, calculated as the sum of all daily discharges measured during a calendar month divided by the number of daily discharges measured during that month.

Average Weekly Effluent Limitation (AWEL): the highest allowable average of daily discharges over a calendar week (Sunday through Saturday), calculated as the sum of all daily discharges measured during a calendar week divided by the number of daily discharges measured during that week.

Best Practicable Treatment or Control (BPTC): BPTC is a requirement of State Water Resources Control Board Resolution 68-16 – "Statement of Policy with Respect to Maintaining High Quality of Waters in California" (referred to as the "Antidegradation Policy"). BPTC is the treatment or control of a discharge necessary to assure that, *"(a) a pollution or nuisance will not occur and (b) the highest water quality consistent with maximum benefit to the people of the State will be maintained."* Pollution is defined in CWC Section 13050(l). In general, an exceedance of a water quality objective in the Basin Plan constitutes "pollution".

Bioaccumulative pollutants are those substances taken up by an organism from its surrounding medium through gill membranes, epithelial tissue, or from food and subsequently concentrated and retained in the body of the organism.

Carcinogenic pollutants are substances that are known to cause cancer in living organisms.

Coefficient of Variation (*CV*) is a measure of the data variability and is calculated as the estimated standard deviation divided by the arithmetic mean of the observed values.

Daily Discharge: Daily Discharge is defined as either: (1) the total mass of the constituent discharged over the calendar day (12:00 am through 11:59 pm) or any 24-hour period that reasonably represents a calendar day for purposes of sampling (as specified in the permit), for a constituent with limitations expressed in units of mass or; (2) the unweighted arithmetic mean measurement of the constituent over the day for a constituent with limitations expressed in other units of measurement (e.g., concentration).

The daily discharge may be determined by the analytical results of a composite sample taken over the course of one day (a calendar day or other 24-hour period defined as a day) or by the

arithmetic mean of analytical results from one or more grab samples taken over the course of the day.

For composite sampling, if 1 day is defined as a 24-hour period other than a calendar day, the analytical result for the 24-hour period will be considered as the result for the calendar day in which the 24-hour period begins.

Detected, but Not Quantified (DNQ) are those sample results less than the RL, but greater than or equal to the laboratory's MDL.

Dilution Credit is the amount of dilution granted to a discharge in the calculation of a water quality-based effluent limitation, based on the allowance of a specified mixing zone. It is calculated from the dilution ratio or determined through conducting a mixing zone study or modeling of the discharge and receiving water.

Effluent Concentration Allowance (ECA) is a value derived from the water quality criterion/objective, dilution credit, and ambient background concentration that is used, in conjunction with the coefficient of variation for the effluent monitoring data, to calculate a long-term average (LTA) discharge concentration. The ECA has the same meaning as waste load allocation (WLA) as used in USEPA guidance (Technical Support Document For Water Quality-based Toxics Control, March 1991, second printing, EPA/505/2-90-001).

Enclosed Bays means indentations along the coast that enclose an area of oceanic water within distinct headlands or harbor works. Enclosed bays include all bays where the narrowest distance between the headlands or outermost harbor works is less than 75 percent of the greatest dimension of the enclosed portion of the bay. Enclosed bays include, but are not limited to, Humboldt Bay, Bodega Harbor, Tomales Bay, Drake's Estero, San Francisco Bay, Morro Bay, Los Angeles-Long Beach Harbor, Upper and Lower Newport Bay, Mission Bay, and San Diego Bay. Enclosed bays do not include inland surface waters or ocean waters.

Estimated Chemical Concentration is the estimated chemical concentration that results from the confirmed detection of the substance by the analytical method below the ML value.

Estuaries means waters, including coastal lagoons, located at the mouths of streams that serve as areas of mixing for fresh and ocean waters. Coastal lagoons and mouths of streams that are temporarily separated from the ocean by sandbars shall be considered estuaries. Estuarine waters shall be considered to extend from a bay or the open ocean to a point upstream where there is no significant mixing of fresh water and seawater. Estuarine waters include~~d~~, but are not limited to, the Sacramento-San Joaquin Delta, as defined in Water Code section 12220, Suisun Bay, Carquinez Strait downstream to the Carquinez Bridge, and appropriate areas of the Smith, Mad, Eel, Noyo, Russian, Klamath, San Diego, and Otay rivers. Estuaries do not include inland surface waters or ocean waters.

Inland Surface Waters are all surface waters of the State that do not include the ocean, enclosed bays, or estuaries.

Instantaneous Maximum Effluent Limitation: the highest allowable value for any single grab sample or aliquot (i.e., each grab sample or aliquot is independently compared to the instantaneous maximum limitation).

Instantaneous Minimum Effluent Limitation: the lowest allowable value for any single grab sample or aliquot (i.e., each grab sample or aliquot is independently compared to the instantaneous minimum limitation).

Maximum Daily Effluent Limitation (MDEL) means the highest allowable daily discharge of a pollutant, over a calendar day (or 24-hour period). For pollutants with limitations expressed in units of mass, the daily discharge is calculated as the total mass of the pollutant discharged over the day. For pollutants with limitations expressed in other units of measurement, the daily discharge is calculated as the arithmetic mean measurement of the pollutant over the day.

Median is the middle measurement in a set of data. The median of a set of data is found by first arranging the measurements in order of magnitude (either increasing or decreasing order). If the number of measurements (n) is odd, then the median = $X_{(n+1)/2}$. If n is even, then the median = $(X_{n/2} + X_{(n/2)+1})/2$ (i.e., the midpoint between the $n/2$ and $n/2+1$).

Method Detection Limit (MDL) is the minimum concentration of a substance that can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero, as defined in title 40 of the Code of Federal Regulations, Part 136, Attachment B, revised as of 3 July 1999.

Minimum Level (ML) is the concentration at which the entire analytical system must give a recognizable signal and acceptable calibration point. The ML is the concentration in a sample that is equivalent to the concentration of the lowest calibration standard analyzed by a specific analytical procedure, assuming that all the method specified sample weights, volumes, and processing steps have been followed.

Mixing Zone is a limited volume of receiving water that is allocated for mixing with a wastewater discharge where water quality criteria can be exceeded without causing adverse effects to the overall water body.

Not Detected (ND) are those sample results less than the laboratory's MDL.

Ocean Waters are the territorial marine waters of the State as defined by California law to the extent these waters are outside of enclosed bays, estuaries, and coastal lagoons. Discharges to ocean waters are regulated in accordance with the State Water Board's California Ocean Plan.

Persistent pollutants are substances for which degradation or decomposition in the environment is nonexistent or very slow.

Pollutant Minimization Program (PMP) means waste minimization and pollution prevention actions that include, but are not limited to, product substitution, waste stream recycling, alternative waste management methods, and education of the public and businesses. The goal of the PMP shall be to reduce all potential sources of a priority pollutant(s) through

pollutant minimization (control) strategies, including pollution prevention measures as appropriate, to maintain the effluent concentration at or below the water quality-based effluent limitation. Pollution prevention measures may be particularly appropriate for persistent bioaccumulative priority pollutants where there is evidence that beneficial uses are being impacted. The Regional Water Board may consider cost effectiveness when establishing the requirements of a PMP. The completion and implementation of a Pollution Prevention Plan, if required pursuant to Water Code section 13263.3(d), shall be considered to fulfill the PMP requirements.

Pollution Prevention means any action that causes a net reduction in the use or generation of a hazardous substance or other pollutant that is discharged into water and includes, but is not limited to, input change, operational improvement, production process change, and product reformulation (as defined in Water Code section 13263.3). Pollution prevention does not include actions that merely shift a pollutant in wastewater from one environmental medium to another environmental medium, unless clear environmental benefits of such an approach are identified to the satisfaction of the State or Regional Water Board.

Reporting Level (RL) is the ML (and its associated analytical method) chosen by the Discharger for reporting and compliance determination from the MLs included in this Order. The MLs included in this Order correspond to approved analytical methods for reporting a sample result that are selected by the Regional Water Board either from Appendix 4 of the SIP in accordance with section 2.4.2 of the SIP or established in accordance with section 2.4.3 of the SIP. The ML is based on the proper application of method-based analytical procedures for sample preparation and the absence of any matrix interferences. Other factors may be applied to the ML depending on the specific sample preparation steps employed. For example, the treatment typically applied in cases where there are matrix-effects is to dilute the sample or sample aliquot by a factor of ten. In such cases, this additional factor must be applied to the ML in the computation of the RL.

Satellite Collection System is the portion, if any, of a sanitary sewer system owned or operated by a different public agency than the agency that owns and operates the wastewater treatment facility that a sanitary sewer system is tributary to.

Source of Drinking Water is any water designated as municipal or domestic supply (MUN) in a Regional Water Board Basin Plan.

Standard Deviation (σ) is a measure of variability that is calculated as follows:

$$\sigma = (\sum[(x - \mu)^2]/(n - 1))^{0.5}$$

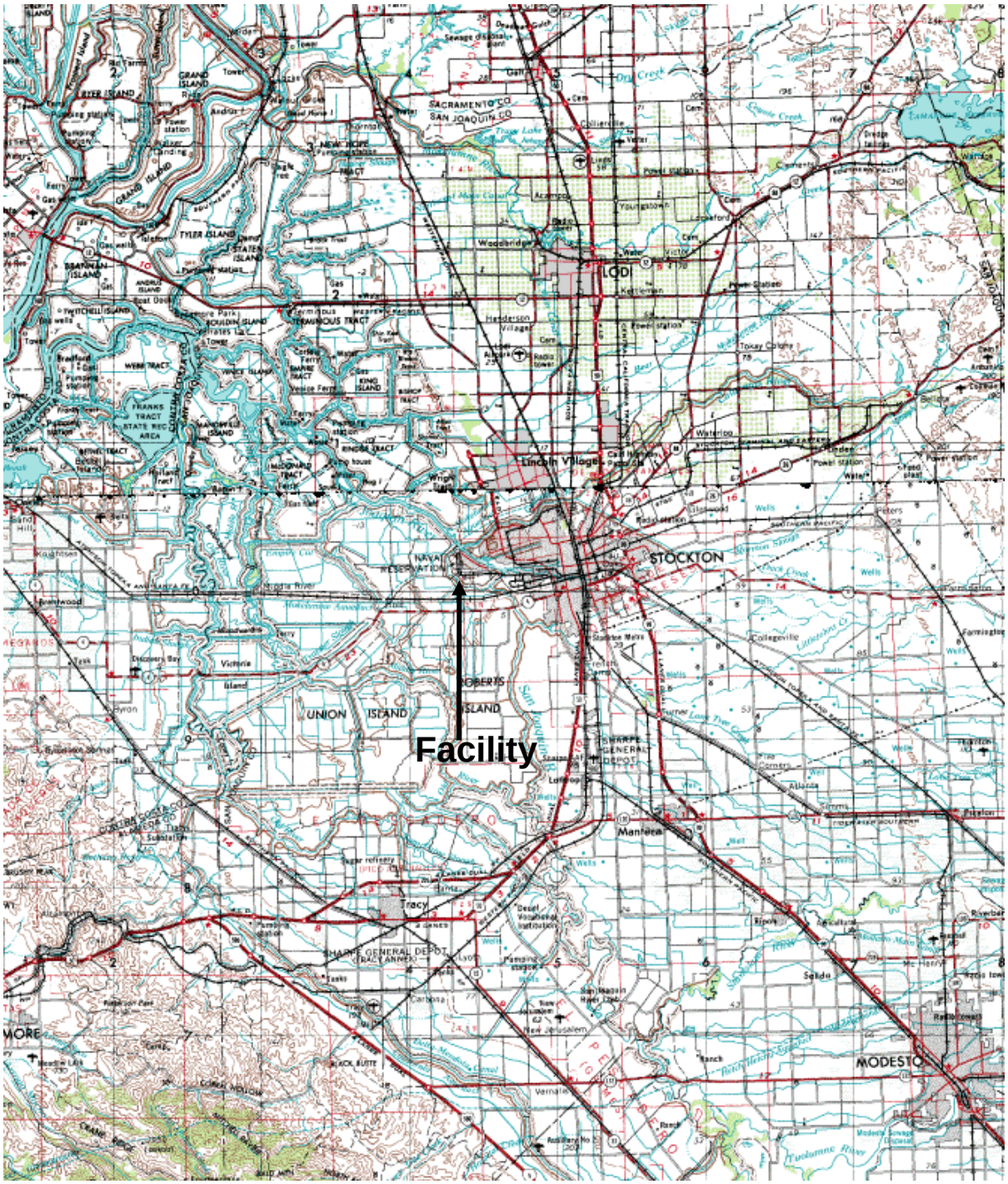
where:

x is the observed value;
μ is the arithmetic mean of the observed values; and
n is the number of samples.

Toxicity Reduction Evaluation (TRE) is a study conducted in a step-wise process designed to identify the causative agents of effluent or ambient toxicity, isolate the sources of toxicity, evaluate the effectiveness of toxicity control options, and then confirm the reduction in toxicity. The first steps of the TRE consist of the collection of data relevant to the toxicity, including

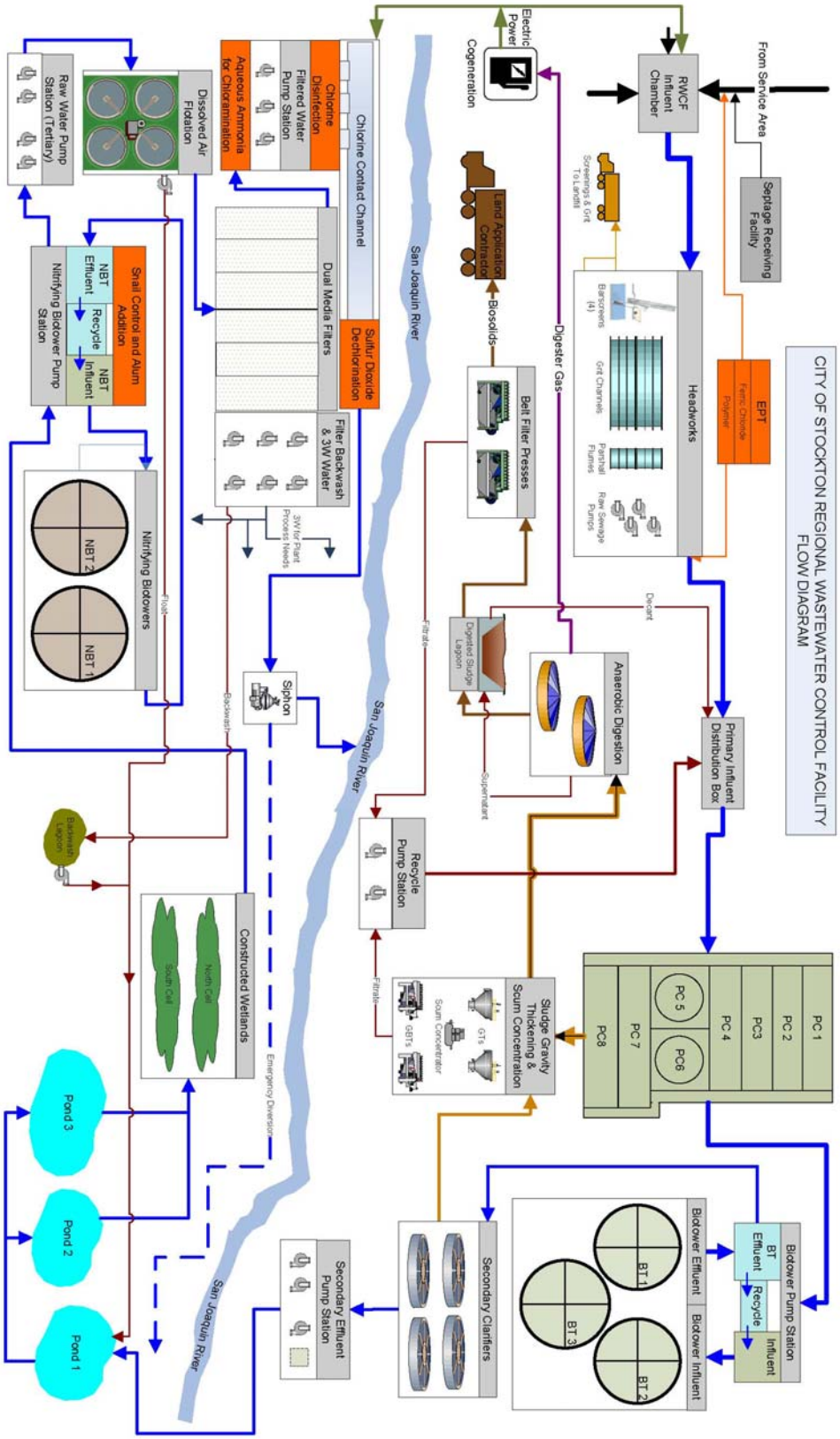
additional toxicity testing, and an evaluation of facility operations and maintenance practices, and best management practices. A Toxicity Identification Evaluation (TIE) may be required as part of the TRE, if appropriate. (A TIE is a set of procedures to identify the specific chemical(s) responsible for toxicity. These procedures are performed in three phases (characterization, identification, and confirmation) using aquatic organism toxicity tests.)

ATTACHMENT B – MAP



Drawing Reference: **STOCKTON WEST (CA)** U.S.G.S TOPOGRAPHIC MAP 7.5 MINUTE QUADRANGLE *Photorevised 1987* *Not to scale*	**SITE LOCATION MAP** CITY OF STOCKTON REGIONAL WASTEWATER CONTROL FACILITY SAN JOAQUIN COUNTY	N W E S

ATTACHMENT C – FLOW SCHEMATIC



ATTACHMENT D – STANDARD PROVISIONS

I. STANDARD PROVISIONS – PERMIT COMPLIANCE

A. Duty to Comply

1. The Discharger must comply with all of the conditions of this Order. Any noncompliance constitutes a violation of the Clean Water Act (CWA) and the California Water Code and is grounds for enforcement action, for permit termination, revocation and reissuance, or modification; or denial of a permit renewal application. (40 CFR §122.41(a).)

2. The Discharger shall comply with effluent standards or prohibitions established under Section 307(a) of the CWA for toxic pollutants and with standards for sewage sludge use or disposal established under Section 405(d) of the CWA within the time provided in the regulations that establish these standards or prohibitions, even if this Order has not yet been modified to incorporate the requirement. (40 CFR §122.41(a)(1).)

B. Need to Halt or Reduce Activity Not a Defense

It shall not be a defense for a Discharger in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this Order. (40 CFR §122.41(c).)

C. Duty to Mitigate

The Discharger shall take all reasonable steps to minimize or prevent any discharge or sludge use or disposal in violation of this Order that has a reasonable likelihood of adversely affecting human health or the environment. (40 CFR §122.41(d).)

D. Proper Operation and Maintenance

The Discharger shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the Discharger to achieve compliance with the conditions of this Order. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. This provision requires the operation of backup or auxiliary facilities or similar systems that are installed by a Discharger only when necessary to achieve compliance with the conditions of this Order. (40 CFR §122.41(e).)

E. Property Rights

1. This Order does not convey any property rights of any sort or any exclusive privileges. (40 CFR §122.41(g).)

2. The issuance of this Order does not authorize any injury to persons or property or invasion of other private rights, or any infringement of state or local law or regulations. (40 CFR §122.5(c).)

F. Inspection and Entry

The Discharger shall allow the Regional Water Board, State Water Board, United States Environmental Protection Agency (USEPA), and/or their authorized representatives (including an authorized contractor acting as their representative), upon the presentation of credentials and other documents, as may be required by law, to (40 CFR §122.41(i); Wat. Code, §13383):

1. Enter upon the Discharger's premises where a regulated facility or activity is located or conducted, or where records are kept under the conditions of this Order (40 CFR §122.41(i)(1));

2. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this Order (40 CFR §122.41(i)(2));

3. Inspect and photograph, at reasonable times, any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this Order (40 CFR §122.41(i)(3)); and

4. Sample or monitor, at reasonable times, for the purposes of assuring Order compliance or as otherwise authorized by the CWA or the Water Code, any substances or parameters at any location. (40 CFR §122.41(i)(4).)

G. Bypass

1. Definitions

   a. “Bypass” means the intentional diversion of waste streams from any portion of a treatment facility. (40 CFR §122.41(m)(1)(i).)

   b. “Severe property damage” means substantial physical damage to property, damage to the treatment facilities, which causes them to become inoperable, or substantial and permanent loss of natural resources that can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production. (40 CFR §122.41(m)(1)(ii).)

2. Bypass not exceeding limitations. The Discharger may allow any bypass to occur which does not cause exceedances of effluent limitations, but only if it is for essential maintenance to assure efficient operation. These bypasses are not subject to the provisions listed in Standard Provisions – Permit Compliance I.G.3, I.G.4, and I.G.5 below. (40 CFR §122.41(m)(2).)

3. Prohibition of bypass. Bypass is prohibited, and the Regional Water Board may take enforcement action against a Discharger for bypass, unless (40 CFR §122.41(m)(4)(i)):

    a. Bypass was unavoidable to prevent loss of life, personal injury, or severe property damage (40 CFR §122.41(m)(4)(i)(A));

    b. There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass that occurred during normal periods of equipment downtime or preventive maintenance (40 CFR §122.41(m)(4)(i)(B)); and

    c. The Discharger submitted notice to the Regional Water Board as required under Standard Provisions – Permit Compliance I.G.5 below. (40 CFR §122.41(m)(4)(i)(C).)

4. The Regional Water Board may approve an anticipated bypass, after considering its adverse effects, if the Regional Water Board determines that it will meet the three conditions listed in Standard Provisions – Permit Compliance I.G.3 above. (40 CFR §122.41(m)(4)(ii).)

5. Notice

    a. Anticipated bypass. If the Discharger knows in advance of the need for a bypass, it shall submit a notice, if possible at least 10 days before the date of the bypass. (40 CFR §122.41(m)(3)(i).)

    b. Unanticipated bypass. The Discharger shall submit notice of an unanticipated bypass as required in Standard Provisions - Reporting V.E below (24-hour notice). (40 CFR §122.41(m)(3)(ii).)

H. Upset

Upset means an exceptional incident in which there is unintentional and temporary noncompliance with technology based permit effluent limitations because of factors beyond the reasonable control of the Discharger. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation. (40 CFR §122.41(n)(1).)

1. Effect of an upset. An upset constitutes an affirmative defense to an action brought for noncompliance with such technology based permit effluent limitations if the requirements of Standard Provisions – Permit Compliance I.H.2 below are met. No determination made during administrative review of claims that noncompliance was

caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review. (40 CFR §122.41(n)(2).).

2. Conditions necessary for a demonstration of upset. A Discharger who wishes to establish the affirmative defense of upset shall demonstrate, through properly signed, contemporaneous operating logs or other relevant evidence that (40 CFR §122.41(n)(3)):

   a. An upset occurred and that the Discharger can identify the cause(s) of the upset (40 CFR §122.41(n)(3)(i));

   b. The permitted facility was, at the time, being properly operated (40 CFR §122.41(n)(3)(ii));

   c. The Discharger submitted notice of the upset as required in Standard Provisions – Reporting V.E.2.b below (24-hour notice) (40 CFR §122.41(n)(3)(iii)); and

   d. The Discharger complied with any remedial measures required under Standard Provisions – Permit Compliance I.C above. (40 CFR §122.41(n)(3)(iv).)

3. Burden of proof. In any enforcement proceeding, the Discharger seeking to establish the occurrence of an upset has the burden of proof. (40 CFR §122.41(n)(4).)

II. STANDARD PROVISIONS – PERMIT ACTION

A. General

This Order may be modified, revoked and reissued, or terminated for cause. The filing of a request by the Discharger for modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance does not stay any Order condition. (40 CFR §122.41(f).)

B. Duty to Reapply

If the Discharger wishes to continue an activity regulated by this Order after the expiration date of this Order, the Discharger must apply for and obtain a new permit. (40 CFR §122.41(b).)

C. Transfers

This Order is not transferable to any person except after notice to the Regional Water Board. The Regional Water Board may require modification or revocation and reissuance of the Order to change the name of the Discharger and incorporate such other requirements as may be necessary under the CWA and the Water Code. (40 CFR §122.41(l)(3); § 122.61.)

III. STANDARD PROVISIONS – MONITORING

A. Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity. (40 CFR §122.41(j)(1).)

B. Monitoring results must be conducted according to test procedures under Part 136 or, in the case of sludge use or disposal, approved under Part 136 unless otherwise specified in Part 503 unless other test procedures have been specified in this Order. (40 CFR §122.41(j)(4); §122.44(i)(1)(iv).)

IV. STANDARD PROVISIONS – RECORDS

A. Except for records of monitoring information required by this Order related to the Discharger's sewage sludge use and disposal activities, which shall be retained for a period of at least 5 years (or longer as required by Part 503), the Discharger shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this Order, and records of all data used to complete the application for this Order, for a period of at least three (3) years from the date of the sample, measurement, report or application. This period may be extended by request of the Regional Water Board Executive Officer at any time. (40 CFR §122.41(j)(2).)

B. Records of monitoring information shall include:

1. The date, exact place, and time of sampling or measurements (40 CFR §122.41(j)(3)(i));

2. The individual(s) who performed the sampling or measurements (40 CFR §122.41(j)(3)(ii));

3. The date(s) analyses were performed (40 CFR §122.41(j)(3)(iii));

4. The individual(s) who performed the analyses (40 CFR §122.41(j)(3)(iv));

5. The analytical techniques or methods used (40 CFR §122.41(j)(3)(v)); and

6. The results of such analyses. (40 CFR §122.41(j)(3)(vi).)

C. Claims of confidentiality for the following information will be denied (40 CFR §122.7(b)):

1. The name and address of any permit applicant or Discharger (40 CFR §122.7(b)(1)); and

2. Permit applications and attachments, permits and effluent data. (40 CFR §122.7(b)(2).)

V. STANDARD PROVISIONS – REPORTING

A. Duty to Provide Information

The Discharger shall furnish to the Regional Water Board, State Water Board, or USEPA within a reasonable time, any information which the Regional Water Board, State Water Board, or USEPA may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this Order or to determine compliance with this Order. Upon request, the Discharger shall also furnish to the Regional Water Board, State Water Board, or USEPA copies of records required to be kept by this Order. (40 CFR §122.41(h); Wat. Code, §13267.)

B. Signatory and Certification Requirements

1. All applications, reports, or information submitted to the Regional Water Board, State Water Board, and/or USEPA shall be signed and certified in accordance with Standard Provisions – Reporting V.B.2, V.B.3, V.B.4, and V.B.5 below. (40 CFR §122.41(k).)

2. All permit applications shall be signed by either a principal executive officer or ranking elected official. For purposes of this provision, a principal executive officer of a federal agency includes: (i) the chief executive officer of the agency, or (ii) a senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency (e.g., Regional Administrators of USEPA). (40 CFR §122.22(a)(3).).

3. All reports required by this Order and other information requested by the Regional Water Board, State Water Board, or USEPA shall be signed by a person described in Standard Provisions – Reporting V.B.2 above, or by a duly authorized representative of that person. A person is a duly authorized representative only if:

    a. The authorization is made in writing by a person described in Standard Provisions – Reporting V.B.2 above (40 CFR §122.22(b)(1));

    b. The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity such as the position of plant manager, operator of a well or a well field, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters for the company. (A duly authorized representative may thus be either a named individual or any individual occupying a named position.) (40 CFR §122.22(b)(2)); and

    c. The written authorization is submitted to the Regional Water Board and State Water Board. (40 CFR §122.22(b)(3).)

4. If an authorization under Standard Provisions – Reporting V.B.3 above is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of Standard

Provisions – Reporting V.B.3 above must be submitted to the Regional Water Board and State Water Board prior to or together with any reports, information, or applications, to be signed by an authorized representative. (40 CFR §122.22(c).)

5. Any person signing a document under Standard Provisions – Reporting V.B.2 or V.B.3 above shall make the following certification:

   "I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations." (40 CFR §122.22(d).)

C. Monitoring Reports

1. Monitoring results shall be reported at the intervals specified in the Monitoring and Reporting Program (Attachment E) in this Order. (40 CFR §122.22(l)(4).)

2. Monitoring results must be reported on a Discharge Monitoring Report (DMR) form or forms provided or specified by the Regional Water Board or State Water Board for reporting results of monitoring of sludge use or disposal practices. (40 CFR §122.41(l)(4)(i).)

3. If the Discharger monitors any pollutant more frequently than required by this Order using test procedures approved under Part 136 or, in the case of sludge use or disposal, approved under Part 136 unless otherwise specified in Part 503, or as specified in this Order, the results of this monitoring shall be included in the calculation and reporting of the data submitted in the DMR or sludge reporting form specified by the Regional Water Board. (40 CFR §122.41(l)(4)(ii).)

4. Calculations for all limitations, which require averaging of measurements, shall utilize an arithmetic mean unless otherwise specified in this Order. (40 CFR §122.41(l)(4)(iii).)

D. Compliance Schedules

Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule of this Order, shall be submitted no later than 14 days following each schedule date. (40 CFR §122.41(l)(5).)

E. Twenty-Four Hour Reporting

1. The Discharger shall report any noncompliance that may endanger health or the environment. Any information shall be provided orally within 24 hours from the time the Discharger becomes aware of the circumstances. A written submission shall

also be provided within five (5) days of the time the Discharger becomes aware of the circumstances. The written submission shall contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance. (40 CFR §122.41(l)(6)(i).)

2. The following shall be included as information that must be reported within 24 hours under this paragraph (40 CFR §122.41(l)(6)(ii)):

   a. Any unanticipated bypass that exceeds any effluent limitation in this Order. (40 CFR §122.41(l)(6)(ii)(A).)

   b. Any upset that exceeds any effluent limitation in this Order. (40 CFR §122.41(l)(6)(ii)(B).)

3. The Regional Water Board may waive the above-required written report under this provision on a case-by-case basis if an oral report has been received within 24 hours. (40 CFR §122.41(l)(6)(iii).)

F. Planned Changes

The Discharger shall give notice to the Regional Water Board as soon as possible of any planned physical alterations or additions to the permitted facility. Notice is required under this provision only when (40 CFR §122.41(l)(1)):

1. The alteration or addition to a permitted facility may meet one of the criteria for determining whether a facility is a new source in section 122.29(b) (40 CFR §122.41(l)(1)(i)); or

2. The alteration or addition could significantly change the nature or increase the quantity of pollutants discharged. This notification applies to pollutants that are not subject to effluent limitations in this Order. (40 CFR §122.41(l)(1)(ii).)

3. The alteration or addition results in a significant change in the Discharger's sludge use or disposal practices, and such alteration, addition, or change may justify the application of permit conditions that are different from or absent in the existing permit, including notification of additional use or disposal sites not reported during the permit application process or not reported pursuant to an approved land application plan. (40 CFR §122.41(l)(1)(iii).)

G. Anticipated Noncompliance

The Discharger shall give advance notice to the Regional Water Board or State Water Board of any planned changes in the permitted facility or activity that may result in noncompliance with General Order requirements. (40 CFR §122.41(l)(2).)

H. Other Noncompliance

The Discharger shall report all instances of noncompliance not reported under Standard Provisions – Reporting V.C, V.D, and V.E above at the time monitoring reports are submitted. The reports shall contain the information listed in Standard Provision – Reporting V.E above. (40 CFR §122.41(l)(7).)

I. Other Information

When the Discharger becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or in any report to the Regional Water Board, State Water Board, or USEPA, the Discharger shall promptly submit such facts or information. (40 CFR §122.41(l)(8).)

VI. STANDARD PROVISIONS – ENFORCEMENT

A. The Regional Water Board is authorized to enforce the terms of this permit under several provisions of the Water Code, including, but not limited to, sections 13385, 13386, and 13387.

VII. ADDITIONAL PROVISIONS – NOTIFICATION LEVELS

A. Publicly-Owned Treatment Works (POTWs)

All POTWs shall provide adequate notice to the Regional Water Board of the following (40 CFR §122.42(b)):

1. Any new introduction of pollutants into the POTW from an indirect discharger that would be subject to sections 301 or 306 of the CWA if it were directly discharging those pollutants (40 CFR §122.42(b)(1)); and

2. Any substantial change in the volume or character of pollutants being introduced into that POTW by a source introducing pollutants into the POTW at the time of adoption of the Order. (40 CFR §122.42(b)(2).)

3. Adequate notice shall include information on the quality and quantity of effluent introduced into the POTW as well as any anticipated impact of the change on the quantity or quality of effluent to be discharged from the POTW. (40 CFR §122.42(b)(3).)

ATTACHMENT E – MONITORING AND REPORTING PROGRAM

Table of Contents

Attachment E – Monitoring and Reporting Program (MRP) E-2
I. General Monitoring Provisions E-2
II. Monitoring Locations E-3
III. Influent Monitoring Requirements E-4
A. Monitoring Location INF-001 ..... E-4
IV. Effluent Monitoring Requirements E-4
A. Monitoring Location EFF-001 ..... E-4
V. Whole Effluent Toxicity Testing Requirements E-6
VI. Land Discharge Monitoring Requirements – Not Applicable E-9
VII. Reclamation Monitoring Requirements E-9
A. Monitoring Location REC-001 ..... E-9
VIII. Receiving Water Monitoring Requirements – Surface Water and Groundwater E-9
A. Monitoring Location RSW-001 through RSW-008 ..... E-9
B. Visual Observations RSW-002, RSW-002A, and RSW-003 ..... E-10
C. Groundwater Monitoring E-11
IX. Other Monitoring Requirements E-11
A. Biosolids E-11
B. Municipal Water Supply E-12
C. Secondary Effluent – Monitoring Location EFF-002 ..... E-13
D. Wastewater in Facultative Ponds - Monitoring Locations PND-001 through PND-003. ..... E-13
X. Reporting Requirements E-14
A. General Monitoring and Reporting Requirements E-14
B. Self Monitoring Reports (SMRs) E-15
C. Discharge Monitoring Reports (DMRs) E-18
D. Other Reports E-18

List of Tables

Table E-1. Monitoring Station Locations E-3
Table E-2. Influent Monitoring E-4
Table E-3. Effluent Monitoring E-4
Table E-4. Chronic Toxicity Testing Dilution Series E-8
Table E-5. Reclamation Monitoring Requirements E-9
Table E-6. Receiving Water Monitoring Requirements E-9
Table E-7. Groundwater Monitoring Requirements E-11
Table E-8. Municipal Water Supply Monitoring Requirements E-12
Table E-9. Secondary Effluent Monitoring Requirements E-13
Table E-10. Pond(s) Monitoring Requirements E-13
Table E-11. Monitoring Periods and Reporting Schedule E-17
Table E-12. Reporting Requirements for Special Provisions Progress Reports E-18

ATTACHMENT E – MONITORING AND REPORTING PROGRAM (MRP)

The Code of Federal Regulations section 122.48 requires that all NPDES permits specify monitoring and reporting requirements. Water Code Sections 13267 and 13383 also authorize the Regional Water Quality Control Board (Regional Water Board) to require technical and monitoring reports. This MRP establishes monitoring and reporting requirements, which implement the federal and state regulations.

I. GENERAL MONITORING PROVISIONS

A. Samples and measurements taken as required herein shall be representative of the volume and nature of the monitored discharge. All samples shall be taken at the monitoring locations specified below and, unless otherwise specified, before the monitored flow joins or is diluted by any other waste stream, body of water, or substance. Monitoring locations shall not be changed without notification to and the approval of this Regional Water Board.

B. Chemical, bacteriological, and bioassay analyses shall be conducted at a laboratory certified for such analyses by the State Department of Health Services. In the event a certified laboratory is not available to the Discharger, analyses performed by a noncertified laboratory will be accepted provided a Quality Assurance-Quality Control Program is instituted by the laboratory. A manual containing the steps followed in this program must be kept in the laboratory and shall be available for inspection by Regional Water Board staff. The Quality Assurance-Quality Control Program must conform to USEPA guidelines or to procedures approved by the Regional Water Board.

C. All analyses shall be performed in a laboratory certified to perform such analyses by the California Department of Health Services. Laboratories that perform sample analyses shall be identified in all monitoring reports.

D. Appropriate flow measurement devices and methods consistent with accepted scientific practices shall be selected and used to ensure the accuracy and reliability of measurements of the volume of monitored discharges. All monitoring instruments and devices used by the Discharger to fulfill the prescribed monitoring program shall be properly maintained and calibrated as necessary to ensure their continued accuracy. All flow measurement devices shall be calibrated at least once per year to ensure continued accuracy of the devices.

E. Monitoring results, including noncompliance, shall be reported at intervals and in a manner specified in this Monitoring and Reporting Program.

II. MONITORING LOCATIONS

The Discharger shall establish the following monitoring locations to demonstrate compliance with the effluent limitations, discharge specifications, and other requirements in this Order:

Table E-1. Monitoring Station Locations

Discharge Point Name	Monitoring Location Name	Monitoring Location Description
--	INF-001	Location where a representative sample of the facility's influent can be obtained, prior to any additives, treatment processes, and plant return flows.
001	EFF-001	Location where a representative sample of the facility's effluent can be obtained prior to discharge into the receiving water. [Latitude: 37° 56' 15"; Longitude: 121° 20' 5"]
--	EFF-002	Location where a representative sample of the facility's secondary effluent can be obtained prior to transfer to the tertiary treatment plant, which includes facultative ponds surrounded by distribution canals.
--	PND-001 - 003	Location where a representative sample of the facultative ponds' wastewater can be obtained prior to transfer to the wetlands
--	RSW-001	San Joaquin River and Bowman Road, 8.0 miles south of Discharge Point No. 001.
--	RSW-002	San Joaquin River and Highway 4, 0.5 miles south of Discharge Point No. 001.
--	RSW-002A	San Joaquin River and Burns Cutoff, 0.5 miles north of Discharge Point No. 001.
--	RSW-003	San Joaquin River at Deep Water Channel, 1.5 miles north of Discharge Point No. 001.
--	RSW-004	San Joaquin River at Light 45, 2.5 miles north of Discharge Point No. 001.
--	RSW-005	San Joaquin River at Light 41, 3.5 miles north of Discharge Point No. 001.
--	RSW-006	San Joaquin River at Light 36, 5.0 miles north of Discharge Point No. 001.
--	RSW-007	San Joaquin River at Light 24, 7.3 miles north of Discharge Point No. 001.
--	RSW-008	San Joaquin River at Light 18, 9.0 miles north of Discharge Point No. 001.
--	RGW-XX	Monitoring wells MW-1 through MW-3 and MW5 through MW-18, and any other well subsequently installed for the study required in Provision VI.C.2.c. of this Order
--	REC-001	Reclaimed water prior to use.
--	BIO-001	Biosolids prior to removal from the facility.
--	SPL-001	Location where a representative sample of the municipal supply water can be obtained. If this is impractical, water quality data provided by the water supplier(s) may be used, as long as results are flow weighted.

III. INFLUENT MONITORING REQUIREMENTS

A. Monitoring Location INF-001

1. The Discharger shall monitor influent into the facility at INF-001 as follows:

Table E-2. Influent Monitoring

Parameter	Units	Sample Type	Minimum Sampling Frequency	Required Analytical Test Method
Flow	mgd	Meter	Continuous	
Carbonaceous Biochemical Oxygen Demand (CBOD) (5-day @ 20 Deg. C)	mg/L	24-hr Composite[1]	1/day	
Total Suspended Solids (TSS)	mg/L	24-hr Composite[1]	1/day	
pH	Standard Units	Meter	Continuous	
Electrical Conductivity	µmhos/cm @ 25°C	Grab	1/month	
Total Dissolved Solids		Grab	1/month	

[1] 24-hour flow proportional composite.

IV. EFFLUENT MONITORING REQUIREMENTS

A. Monitoring Location EFF-001

1. The Discharger shall monitor the Facility's effluent at EFF-001 as follows. If more than one analytical test method is listed for a given parameter, the Discharger must select from the listed methods and corresponding minimum level.

Table E-3. Effluent Monitoring

Parameter	Units	Sample Type	Minimum Sampling Frequency	Required Analytical Test Method
Flow	mgd	Meter	Continuous	
Chlorine, Total Residual[1]	mg/L	Meter	Continuous	
Na_2HSO_3	mg/L	Grab	Daily	
SO_2	mg/L	Grab	Daily	
Temperature[2]	°F	Meter	Continuous	
Turbidity	NTU	Meter	Continuous	
pH	standard units	Meter	Continuous	

Parameter	Units	Sample Type	Minimum Sampling Frequency	Required Analytical Test Method
Carbonaceous Biochemical Oxygen Demand (5-day @ 20 Deg. C) ($CBOD_5$)	mg/L	24-hr Composite[7]	1/day	
Total Suspended Solids (TSS)	mg/L	24-hr Composite[7]	1/day	
Total Coliform Organisms	MPN/100 mL	Grab	1/day	
Settleable Solids	mL/L	Grab	1/day	
Dissolved Oxygen	mg/L	Grab	1/day[8]	
Ammonia Nitrogen, Total (as N) [3, 4]	mg/L	24-hr Composite[7]	1/day[8]	[11]
Nitrate Nitrogen, Total (as N) [5]	mg/L	24-hr Composite[7]	1/week	
Nitrite Nitrogen, Total (as NO_3) [5]	mg/L	24-hr Composite[7]	1/week	
Total Kjeldahl Nitrogen	mg/L	24-hr Composite[7]	1/week	
Oil and Grease	mg/L	Grab	1/week	
Electrical Conductivity @ 25 Deg. C	µmhos/cm	Grab	1/week	
Total Dissolved Solids (TDS)	mg/L	Grab	1/week	
Total Organic Carbon	mg/L	24-hr Composite[7]	1/month	
Aluminum, Total Recoverable	µg/L	24-hr Composite[7]	1/month	
Cyanide, Total Recoverable[5]	µg/L	Grab	1/month	[10]
Mercury, Total	ng/L	Grab	1/month	EPA Method 1631[9]
Mercury, Methyl	ng/L	Grab	1/month	EPA Method 1630[9]
Manganese, Dissolved and Total Recoverable	µg/L	24-hr Composite[7]	1/month	
Molybdenum, Total Recoverable	µg/L	24-hr Composite[7]	1/month	
Bis-2 (ethylhexyl) phthalate[5]	µg/L	Grab	1/month	
Chlorodibromomethane[5]	µg/L	Grab	1/month	
Dichlorobromomethane[5]	µg/L	Grab	1/month	
Standard Minerals[6]	mg/L	Grab	1/year	
Hardness (as $CaCO_3$)	mg/L	Grab	1/month	
Alkalinity	mg/L	Grab	1/month	

1 Total chlorine residual must be monitored with a method sensitive to and accurate at the permitted level of 0.01 mg/L.
2 Effluent temperature monitoring shall be at the Discharge Point location.
3 Concurrent with whole effluent toxicity monitoring.
4 Report as total.
5 Priority pollutants include all 126 priority pollutants listed in the California Toxics Rule (40 CFR 131.38). For priority pollutant constituents with effluent limitations, detection limits shall be below the effluent limitations. If the lowest minimum level (ML) published in Appendix 4 of the Policy for Implementation of Toxics Standards

for Inland Surface Waters, Enclosed Bays, and Estuaries of California (State Implementation Plan or SIP) is not below the effluent limitation, the detection limit shall be the lowest ML. For priority pollutant constituents without effluent limitations, the detection limits shall be equal to or less than the lowest ML published in Appendix 4 of the SIP.

6 Standard minerals shall include the following: boron, calcium, iron, magnesium, potassium, sodium, chloride, manganese, phosphorus, total alkalinity (including alkalinity series), and hardness, and include verification that the analysis is complete (i.e., cation/anion balance).

7 24-hour flow proportioned composite.

8 Daily from 1 September through 1 March, twice weekly remainder of the year.

9 Unfiltered methylmercury and total mercury samples shall be taken using clean hands/dirty hands procedures, as described in U.S. EPA method 1669: *Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria Levels,* for collection of equipment blanks (section 9.4.4.2), and shall be analyzed by U.S. EPA method 1630/1631 (Revision E) with a method detection limit of 0.02 ng/l for methylmercury and 0.2 ng/l for total mercury.

10 As specified in 40 CFR Part 136; or samples taken at the effluent without preservatives, may be analyzed for cyanide within 15 minutes from collection and must be performed by a laboratory certified for such analyses by the State Department of Public Health.

11 The reporting limit shall be at or below 0.5 mg/L.

12 Calculated measurements may be used.

V. WHOLE EFFLUENT TOXICITY TESTING REQUIREMENTS

A. **Acute Toxicity Testing.** The Discharger shall conduct acute toxicity testing to determine whether the effluent is contributing acute toxicity to the receiving water. The Discharger shall meet the following acute toxicity testing requirements:

1. *Monitoring Frequency* – The Discharger shall perform weekly acute toxicity testing, concurrent with effluent ammonia sampling.

2. *Sample Types* – For static non-renewal and static renewal testing, the samples shall be flow proportional 24-hour composites and shall be representative of the volume and quality of the discharge. The effluent samples shall be taken at the effluent monitoring location EFF-001.

3. *Test Species* – Test species shall be rainbow trout (*Oncorhynchus mykiss*).

4. *Methods* – The acute toxicity testing samples shall be analyzed using EPA-821-R-02-012, Fifth Edition and its subsequent amendments or revisions. Temperature, total residual chlorine, and pH shall be recorded at the time of sample collection. No pH adjustment may be made unless approved by the Executive Officer.

5. *Test Failure* – If an acute toxicity test does not meet all test acceptability criteria, as specified in the test method, the Discharger must re-sample and re-test as soon as possible, not to exceed 7 days following notification of test failure.

B. **Chronic Toxicity Testing**. The Discharger shall conduct three species chronic toxicity testing to determine whether the effluent is contributing chronic toxicity to the receiving water. The Discharger shall meet the following chronic toxicity testing requirements:

1. *Monitoring Frequency* –The Discharger shall perform quarterly three species chronic toxicity testing.

2. *Sample Types* – Effluent samples shall be flow proportional 24-hour composites and shall be representative of the volume and quality of the discharge. The effluent samples shall be taken at EFF-001. The receiving water control shall be a grab sample obtained from the RSW-001 sampling location.

3. *Sample Volumes* – Adequate sample volumes shall be collected to provide renewal water to complete the test in the event that the discharge is intermittent.

4. *Test Species* – Chronic toxicity testing measures sublethal (e.g., reduced growth, reproduction) and/or lethal effects to test organisms exposed to an effluent compared to that of the control organisms. The Discharger shall conduct chronic toxicity tests with:

   - The cladoceran, water flea, *Ceriodaphnia dubia* (survival and reproduction test);
   - The fathead minnow, *Pimephales promelas* (larval survival and growth test); and
   - The green alga, *Selenastrum capricornutum* (growth test).

5. *Methods* – The presence of chronic toxicity shall be estimated as specified in *Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, Fourth Edition,* EPA/821-R-02-013, October 2002 and its subsequent amendments or revisions.

6. *Reference Toxicant* – As required by the SIP, all chronic toxicity tests shall be conducted with concurrent testing with a reference toxicant and shall be reported with the chronic toxicity test results.

7. *Dilutions* – The chronic toxicity testing shall be performed using the dilution series identified in Table E-4, below. The receiving water control shall be used as the diluent (except for *Selenastrum capricornutum* testing), unless initial tests results indicate that the receiving water is toxic. For *Selenastrum capricornutum* testing, laboratory control water may be used as the diluent.

   If the receiving water is toxic, laboratory control water may be used as the diluent, in which case, the receiving water should still be sampled and tested to provide evidence of its toxicity.

8. *Test Failure* –The Discharger must re-sample and re-test as soon as possible, but no later than fourteen (14) days after receiving notification of a test failure. A test failure is defined as follows:

   a. The reference toxicant test or the effluent test does not meet all test acceptability criteria as specified in the *Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, Fourth Edition*,

EPA/821-R-02-013, October 2002 (Method Manual), and its subsequent amendments or revisions; or

b. The percent minimum significant difference (PMSD) measured for the test exceeds the upper PMSD bound variability criterion in Table 6 on page 52 of the Method Manual. (A retest is only required in this case if the test results do not exceed the monitoring trigger specified in Special Provisions VI.C.2.a.iii.)

Table E-4. Chronic Toxicity Testing Dilution Series

Sample	Dilutions (%)					Controls	
	100	50	25	12.5	6.25	Receiving Water	Laboratory Water
% Effluent	100	50	25	12.5	6.25	0	0
% Receiving Water[1]	0	50	75	87.5	93.75	100	0
% Laboratory Water	0	0	0	0	0	0	100

1. If receiving water is toxic, laboratory water may be used as the diluent as described in EPA method 821-R-02-013 Section 7.12.

C. **WET Testing Notification Requirements**. The Discharger shall notify the Regional Water Board within 24-hrs after the receipt of test results exceeding the monitoring trigger during regular or accelerated monitoring, or an exceedance of the acute toxicity effluent limitation.

D. **WET Testing Reporting Requirements**. All toxicity test reports shall include the contracting laboratory's complete report provided to the Discharger and shall be in accordance with the appropriate "Report Preparation and Test Review" sections of the method manuals. At a minimum, whole effluent toxicity monitoring shall be reported as follows:

1. **Chronic WET Reporting.** Regular chronic toxicity monitoring results shall be reported to the Regional Water Board within 30 days following completion of the test, and shall contain, at minimum:

   b. The results expressed in TUc, measured as 100/NOEC, and also measured as $100/LC_{50}$, $100/EC_{25}$, $100/IC_{25}$, and $100/IC_{50}$, as appropriate;

   c. The statistical methods used to calculate endpoints;

   d. The statistical output page, which includes the calculation of the percent minimum significant difference (PMSD);

   e. The dates of sample collection and initiation of each toxicity test; and

   f. The results compared to the numeric toxicity monitoring trigger.

   Additionally, the monthly discharger self-monitoring reports shall contain an updated chronology of chronic toxicity test results expressed in TUc, and organized by test species, type of test (survival, growth or reproduction), and monitoring frequency, i.e., either quarterly, monthly, accelerated, or TRE.

2. **Acute WET Reporting.** Acute toxicity test results shall be submitted with the monthly discharger self-monitoring reports and reported as percent survival.

3. **TRE Reporting.** Reports for Toxicity Reduction Evaluations shall be submitted in accordance with the schedule contained in the Discharger's approved TRE Work Plan.

4. **Quality Assurance (QA).** The Discharger must provide the following information for QA purposes:
   a. Results of the applicable reference toxicant data with the statistical output page giving the species, NOEC, LOEC, type of toxicant, dilution water used, concentrations used, PMSD, and dates tested.
   b. The reference toxicant control charts for each endpoint, which include summaries of reference toxicant tests performed by the contracting laboratory.
   c. Any information on deviations or problems encountered and how they were dealt with.

VI. LAND DISCHARGE MONITORING REQUIREMENTS – NOT APPLICABLE

VII. RECLAMATION MONITORING REQUIREMENTS

A. Monitoring Location REC-001

1. The Discharger shall monitor reclaimed water at REC-001 as follows:

Table E-5. Reclamation Monitoring Requirements

Parameter	Units	Sample Type	Minimum Sampling Frequency	Required Analytical Test Method
Volume Used	mgd	Estimated	1/day	--
Total Coliform Organisms	MPN/100ml	Grab	2/week	

VIII. RECEIVING WATER MONITORING REQUIREMENTS – SURFACE WATER AND GROUNDWATER

A. Monitoring Location RSW-001 through RSW-008

1. The Discharger shall monitor the San Joaquin River at Monitoring Locations RSW-001 through RSW-008 as follows:

Table E-6. Receiving Water Monitoring Requirements[8]

Parameter	Units	Sample Type	Minimum Sampling Frequency	Required Analytical Test Method
River Flow	cubic feet/sec	Meter	15-minute intervals	[1]
Dissolved Oxygen	mg/L	Grab	1/week (or 1/month)[2]	
pH[3]	Standard Units	Grab	1/week (or 1/month)[2]	

Parameter	Units	Sample Type	Minimum Sampling Frequency	Required Analytical Test Method
Temperature[3]	°F (°C)	Grab	1/week (or 1/month)[2]	
Turbidity	NTUs	Grab	1/week (or 1/month)[2]	
Electrical Conductivity @ 25 Deg. C	µmhos/cm	Grab	1/week (or 1/month)[2]	
Total Dissolved Solids	mg/L	Grab	1/week (or 1/month)[2]	
Fecal Coliform Organisms	MPN/100 mL	Grab	1/week (or 1/month)[2]	
Volatile Suspended Solids	mg/L	Grab	1/week (or 1/month)[2]	
Total Suspended Solids	mg/L	Grab	1/week (or 1/month)[2]	
$CBOD_5$	mg/L	Grab	1/week (or 1/month)[2]	
Total Kjeldahl Nitrogen	mg/L	Grab	1/week (or 1/month)[2]	
Nitrate Nitrogen, Total (as N)	mg/L	Grab	1/week (or 1/month)[2]	
Nitrite Nitrogen, Total (as NO_3)	mg/L	Grab	1/week (or 1/month)[2]	
Ammonia Nitrogen, Total (as N)[3]	mg/L	Grab	1/week (or 1/month)[2,5]	[7]
	mg/L	Grab	Weekly[6]	[7]
Chlorophyll	mg/L	Grab	1/week (or 1/month)[2]	
Pheophytin	mg/L	Grab	1/week (or 1/month)[2]	
Hardness (as $CaCO_3$)	mg/L	Grab	1/month	
Alkalinity	mg/L	Grab	1/month	
Trihalomethanes[4]	µg/L	Grab	1/quarter	

1 Flow information reported to the Discharger by the USGS, collected from the flow monitoring station located approximately 500 feet south of the outfall. Flow will continue to be recorded in 15-minute intervals and reported to the Regional Water Board within self-monitoring report as a daily net flow value.

2 During the portion of the year from 1 May through 30 November or when dissolved oxygen levels are less than 5 mg/L, Stations RSW-001 through RSW-008 shall be sampled weekly at low slack tide, when practical (between 8:00 and 11:00 am). From 1 December through 30 April, sampling frequency shall be monthly.

3 Temperature and pH shall be collected at the time of ammonia monitoring to allow for determination of ammonia toxicity.

4 Trihalomethanes include bromoform, chloroform, dichlorobromomethane, and chlorodibromomethane. Concentrations of each constituent shall be separately monitored and reported.

5 Monitoring locations RSW-005 through RSW-008

6 Monitoring locations RSW-001 through RSW-004

The method detection limit shall be at or below 0.1 mg/L.

In the event that unsafe conditions exist (e.g. high flows in San Joaquin River) on scheduled sampling days, sampling shall be rescheduled. Should unsafe conditions prohibit the collection of samples at the frequency defined in this table, this shall be noted in the self monitoring report and sampling shall resume at the frequency defined in this table as soon as conditions allow.

B. Visual Observations RSW-002, RSW-002A, and RSW-003

1. In conducting the weekly receiving water sampling, a log shall be kept of the receiving water conditions throughout the reach bounded by RSW-002, RSW-002A,

and RSW-003. A description, including at the minimum, the presence or absence of the following shall be recorded and summarized in the monthly self-monitoring reports.

a. Floating or suspended matter;
b. Discoloration;
c. Bottom deposits;
d. Aquatic life;
e. Visible films, sheens, or coatings;
f. Fungi, slimes, or objectionable growths; and
g. Potential nuisance conditions.

C. Groundwater Monitoring

1. The Discharger shall continue the groundwater monitoring program established under Order No. R5-2002-0083 (consisting of groundwater monitoring wells MW-1, MW-2, MW-3, and MW-5 through MW-18). Groundwater monitoring of MW-1, MW-2, MW-3, and MW-5 through MW-18 shall include, at a minimum, the following:

Table E-7. Groundwater Monitoring Requirements

Parameter	Units	Sample Type	Minimum Sampling Frequency	Required Analytical Test Method
Groundwater elevation	feet	Grab	1/quarter or 2/year[1]	
Total Dissolved Solids	mg/L	Grab	1/quarter or 2/year[1]	
Ammonia, Total (as N)	mg/L	Grab	1/quarter or 2/year[1]	
Nitrate (as N)	mg/L	Grab	1/quarter or 2/year[1]	
Nitrite (as N)	mg/L	Grab	1/quarter or 2/year[1]	
Total Kjeldahl nitrogen	mg/L	Grab	1/quarter or 2/year[1]	
pH	standard units	Grab	1/quarter or 2/year[1]	
Electrical Conductivity @ 25 Deg. C	µmhos/cm	Grab	1/quarter or 2/year[1]	
Fecal Coliform Organisms	MPN/100mL	Grab	1/quarter or 2/year[1]	
Boron	mg/L	Grab	1/quarter or 2/year[1]	
Chloride	mg/L	Grab	1/quarter or 2/year[1]	
Dissolved Iron	mg/L	Grab	1/quarter or 2/year[1]	
Dissolved Manganese	mg/L	Grab	1/quarter or 2/year[1]	
Sodium	mg/L	Grab	1/quarter or 2/year[1]	

[1] MW-1, MW-2, MW-10, MW-12, MW-13, MW-15, and MW-17 shall be monitored quarterly; all other wells shall be monitored twice per year.

IX. OTHER MONITORING REQUIREMENTS

A. Biosolids

1. Monitoring Location BIO-001

a. A composite sample of sludge shall be collected annually at Monitoring Location BIO-001 in accordance with USEPA's POTW Sludge Sampling and Analysis Guidance Document, August 1989, and tested for priority pollutants listed in 40 CFR section 122 Appendix D, Tables II and III (excluding total phenols).

b. A composite sample of sludge shall be collected when sludge is removed from the facility for disposal in accordance with USEPA's POTW Sludge Sampling and Analysis Guidance Document, August 1989, and tested for the metals listed in Title 22.

c. Sampling records shall be retained for a minimum of **5 years**. A log shall be kept of sludge quantities generated and of handling and disposal activities. The frequency of entries is discretionary; however, the log should be complete enough to serve as a basis for part of the annual report.

d. The Discharger shall monitor twice per year and submit characterization of the sludge quality, including sludge percent solids and quantitative results of chemical analysis for the priority pollutants listed in 40 CFR 122 Appendix D, Tables II and III (excluding total phenols). Suggested methods for analysis of sludge are provided in USEPA publications titled "Test Methods for Evaluating Solid Waste: Physical/Chemical Methods" and "Test Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater". Recommended analytical holding times for sludge samples should reflect those specified in 40 CFR 136.6.3(e). Other guidance is available in USEPA's POTW Sludge Sampling and Analysis Guidance Document, August 1989.

B. Municipal Water Supply

1. Monitoring Location SPL-001

The Discharger shall monitor the Municipal Water Supply at SPL-001 as follows. A sampling station shall be established where a representative sample of the municipal water supply can be obtained. Municipal water supply samples shall be collected at approximately the same time as effluent samples.

Table E-8. Municipal Water Supply Monitoring Requirements

Parameter	Units	Sample Type	Minimum Sampling Frequency	Required Analytical Test Method
Total Dissolved Solids[1]	mg/L	Grab	1/quarter	
Electrical Conductivity @ 25 Deg. C[1]	µmhos/cm	Grab	1/quarter	
Standard Minerals[2]	mg/L	Grab	1/year	

1. If the water supply is from more than one source, the total dissolved solids and electrical conductivity shall be reported as a weighted average and include copies of supporting calculations.
2. Standard minerals shall include all major cations and anions and include verification that the analysis is complete (i.e., cation/anion balance).

C. Secondary Effluent – Monitoring Location EFF-002

1. The Discharger shall monitor the Facility's secondary effluent at EFF-002 as required in Table E-10.

Table E-9. Secondary Effluent Monitoring Requirements

Parameter	Units	Sample Type	Minimum Sampling Frequency	Required Analytical Test Method
Total Dissolved Solids	mg/L	Grab	1/week	
Ammonia (as N)	mg/L	Grab	1/month	
Nitrate (as N)	mg/L	Grab	1/month	
Nitrite (as N)	mg/L	Grab	1/month	
Total Kjeldahl Nitrogen	mg/L	Grab	1/month	
pH	standard units	Grab	1/week	
Electrical Conductivity @ 25 Deg. C	µmhos/cm	Grab	1/week	
Fecal Coliform Organisms	MPN/100mL	Grab	1/month	
Boron	mg/L	Grab	1/month	
Chloride	mg/L	Grab	1/month	
Dissolved Iron	mg/L	Grab	1/month	
Dissolved Manganese	mg/L	Grab	1/month	
Sodium	mg/L	Grab	1/month	

D. Wastewater in Facultative Ponds - Monitoring Locations PND-001 through PND-003.

1. At a minimum, the Discharger shall monitor wastewater impounded in each Facility pond(s) at PND-001 through PND-003 as required in Table E-11, below. Grab samples shall be collected from each pond during the specified sampling frequency and combined to create one composite sample.

Table E-10. Pond(s) Monitoring Requirements

Parameter	Units	Sample Type	Minimum Sampling Frequency	Required Analytical Test Method
Dissolved Oxygen[1]	mg/L	Grab	1/week	
pH	Standard Units	Grab	1/week	
Freeboard	feet	--	1/week	
Available Storage Volume	Acre-feet	--	1/month	
BOD 5-day @ 20ºC	mg/L	Grab	1/week	
Total Dissolved Solids	mg/L	Grab	1/week	
Electrical Conductivity	umhos/cm	Grab	1/week	
Ammonia (as N)	mg/L	Grab	1/month	
Nitrate (as N)	mg/L	Grab	1/month	
Nitrite (as N)	mg/L	Grab	1/month	

Total Kjeldahl Nitrogen	mg/L	Grab	1/month	
Fecal Coliform Organisms	MPN/100mL	Grab	1/month	
Boron	mg/L	Grab	1/month	
Chloride	mg/L	Grab	1/month	
Dissolved Iron	mg/L	Grab	1/month	
Dissolved Manganese	mg/L	Grab	1/month	
Sodium	mg/L	Grab	1/month	

1. Samples shall be collected at a depth of one foot from each pond in use, opposite the inlet. Samples shall be collected between 0700 and 0900 hours.

X. REPORTING REQUIREMENTS

A. General Monitoring and Reporting Requirements

1. The Discharger shall comply with all Standard Provisions (Attachment D) related to monitoring, reporting, and recordkeeping.

2. Upon written request of the Regional Water Board, the Discharger shall submit a summary monitoring report. The report shall contain both tabular and graphical summaries of the monitoring data obtained during the previous year(s).

3. **Compliance Time Schedules.** For compliance time schedules included in the Order, the Discharger shall submit to the Regional Water Board, on or before each compliance due date, the specified document or a written report detailing compliance or noncompliance with the specific date and task. If noncompliance is reported, the Discharger shall state the reasons for noncompliance and include an estimate of the date when the Discharger will be in compliance. The Discharger shall notify the Regional Water Board by letter when it returns to compliance with the compliance time schedule.

4. The Discharger shall report to the Regional Water Board any toxic chemical release data it reports to the State Emergency Response Commission within 15 days of reporting the data to the Commission pursuant to section 313 of the "Emergency Planning and Community Right to Know Act" of 1986.

5. **Reporting Protocols.** The Discharger shall report with each sample result the applicable Reporting Level (RL) and the current Method Detection Limit (MDL), as determined by the procedure in Part 136.

   The Discharger shall report the results of analytical determinations for the presence of chemical constituents in a sample using the following reporting protocols:

   a. Sample results greater than or equal to the RL shall be reported as measured by the laboratory (i.e., the measured chemical concentration in the sample).

   b. Sample results less than the RL, but greater than or equal to the laboratory's MDL, shall be reported as "Detected, but Not Quantified," or DNQ. The estimated chemical concentration of the sample shall also be reported.

For the purposes of data collection, the laboratory shall write the estimated chemical concentration next to DNQ as well as the words "Estimated Concentration" (may be shortened to "Est. Conc."). The laboratory may, if such information is available, include numerical estimates of the data quality for the reported result. Numerical estimates of data quality may be percent accuracy (± a percentage of the reported value), numerical ranges (low to high), or any other means considered appropriate by the laboratory.

c. Sample results less than the laboratory's MDL shall be reported as "Not Detected," or ND.

d. Dischargers are to instruct laboratories to establish calibration standards so that the Minimum Level (ML) value (or its equivalent if there is differential treatment of samples relative to calibration standards) is the lowest calibration standard. At no time is the Discharger to use analytical data derived from *extrapolation* beyond the lowest point of the calibration curve.

6. **Multiple Sample Data.** When determining compliance with an AMEL, AWEL, or MDEL for priority pollutants and more than one sample result is available, the Discharger shall compute the arithmetic mean unless the data set contains one or more reported determinations of "Detected, but Not Quantified" (DNQ) or "Not Detected" (ND). In those cases, the Discharger shall compute the median in place of the arithmetic mean in accordance with the following procedure:

   a. The data set shall be ranked from low to high, ranking the reported ND determinations lowest, DNQ determinations next, followed by quantified values (if any). The order of the individual ND or DNQ determinations is unimportant.

   b. The median value of the data set shall be determined. If the data set has an odd number of data points, then the median is the middle value. If the data set has an even number of data points, then the median is the average of the two values around the middle unless one or both of the points are ND or DNQ, in which case the median value shall be the lower of the two data points where DNQ is lower than a value and ND is lower than DNQ.

B. Self Monitoring Reports (SMRs)

1. At any time during the term of this permit, the State or Regional Water Board may notify the Discharger to electronically submit Self-Monitoring Reports (SMRs) using the State Water Board's California Integrated Water Quality System (CIWQS) Program Web site (http://www.waterboards.ca.gov/ciwqs/index.html). Until such notification is given, the Discharger shall submit hard copy SMRs. The CIWQS Web site will provide additional directions for SMR submittal in the event there will be service interruption for electronic submittal.

2. Monitoring results shall be submitted to the Regional Water Board by the **first day** of the second month following sample collection. Quarterly and annual monitoring results shall be submitted by the **first day of the second month following each calendar quarter, semi-annual period, and year**, respectively.

3. In reporting the monitoring data, the Discharger shall arrange the data in tabular form so that the date, the constituents, and the concentrations are readily discernible. The data shall be summarized in such a manner to illustrate clearly whether the discharge complies with waste discharge requirements. The highest daily maximum for the month, monthly and weekly averages, and medians, and removal efficiencies (%) for BOD and Total Suspended Solids, shall be determined and recorded as needed to demonstrate compliance.

4. With the exception of flow, all constituents monitored on a continuous basis (metered), shall be reported as daily maximums, daily minimums, and daily averages; flow shall be reported as the total volume discharged per day for each day of discharge.

5. If the Discharger monitors any pollutant at the locations designated herein more frequently than is required by this Order, the results of such monitoring shall be included in the calculation and reporting of the values required in the discharge monitoring report form. Such increased frequency shall be indicated on the discharge monitoring report form.

6. A letter transmitting the self-monitoring reports shall accompany each report. Such a letter shall include a discussion of requirement violations found during the reporting period, and actions taken or planned for correcting noted violations, such as operation or facility modifications. If the Discharger has previously submitted a report describing corrective actions and/or a time schedule for implementing the corrective actions, reference to the previous correspondence will be satisfactory. The transmittal letter shall contain the penalty of perjury statement by the Discharger, or the Discharger's authorized agent, as described in the Standard Provisions.

7. SMRs must be submitted to the Regional Water Board, signed and certified as required by the Standard Provisions (Attachment D), to the address listed below:

   Regional Water Quality Control Board
   Central Valley Region
   11020 Sun Center Dr., Suite #200
   Rancho Cordova, CA 95670-6114

8. Monitoring periods and reporting for all required monitoring shall be completed according to the following schedule:

Table E-11. Monitoring Periods and Reporting Schedule

Sampling Frequency	Monitoring Period Begins On…	Monitoring Period	SMR Due Date
Continuous	**First day of calendar month following effective date of this Order**	All	Submit with monthly SMR
1/day	**First day of calendar month following effective date of this Order**	(Midnight through 11:59 PM) or any 24-hour period that reasonably represents a calendar day for purposes of sampling.	Submit with monthly SMR
1/week	**First Sunday following first day of calendar month following permit effective date**	Sunday through Saturday	Submit with monthly SMR
1/month	First day of calendar month following permit effective date	First day of calendar month through last day of calendar month	First day of second calendar month following month of sampling
1/quarter	Closest of 1January, 1 April, 1 July, or 1 October following permit effective date	1 January through 31 March 1 April through 30 June 1 July through 30 September 1 October through 31 December	May 1 of the same year August 1 of the same year November 1 of the same year February 1 of the next year
2/year	Closest of 1 January or 1 July following permit effective date	1 January through 30 June 1 July through 31 December	August 1 of the same year February 1 of the next year
1/year	1 January following permit effective date	1 January through 31 December	February 1 of the next year

C. Discharge Monitoring Reports (DMRs)

1. As described in Section X.B.1 above, at any time during the term of this permit, the State or Regional Water Board may notify the Discharger to electronically submit SMRs that will satisfy federal requirements for submittal of Discharge Monitoring Reports (DMRs). Until such notification is given, the Discharger shall submit DMRs in accordance with the requirements described below.

2. DMRs must be signed and certified as required by the standard provisions (Attachment D). The Discharger shall submit the original DMR and one copy of the DMR to the address listed below:

Standard Mail	FedEx/UPS/ Other Private Carriers
State Water Resources Control Board Division of Water Quality c/o DMR Processing Center PO Box 100 Sacramento, CA 95812-1000	State Water Resources Control Board Division of Water Quality c/o DMR Processing Center 1001 I Street, 15th Floor Sacramento, CA 95814

3. All discharge monitoring results must be reported on the official USEPA pre-printed DMR forms (EPA Form 3320-1). Forms that are self-generated cannot be accepted unless they follow the exact same format as EPA form 3320-1.

D. Other Reports

1. **Progress Reports.** As specified in Special Provisions VI.C.3.b, progress reports shall be submitted in accordance with the following reporting requirements. At minimum, the progress reports shall include a discussion of the status in the reduction of salinity, whether the Discharger is on taskto meet the salinity goal, and the remaining tasks to meet the salinity goal.

Table E-12. Reporting Requirements for Special Provisions Progress Reports

Special Provision	Reporting Requirements
Annual Progress Reports for Salinity Reduction Goal (Provision VI.C.3.b)	**1 December**, annually

2. Within **60 days** of permit adoption, the Discharger shall submit a report outlining minimum levels, method detection limits, and analytical methods for approval, with a goal to achieve detection levels below applicable water quality criteria. At a minimum, the Discharger shall comply with the monitoring requirements for CTR constituents as outlined in Section 2.3 and 2.4 of the *Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California*, adopted 2 March 2000 by the State Water Resources Control Board. All peaks identified by analytical methods shall be reported.

3. The Discharger's sanitary sewer system collects wastewater using sewers, pipes, pumps, and/or other conveyance systems and directs the raw sewage to the wastewater treatment plant. A "sanitary sewer overflow" is defined as a discharge to ground or surface water from the sanitary sewer system at any point upstream of the wastewater treatment plant. Sanitary sewer overflows are prohibited by this Order. All violations must be reported as required in Standard Provisions. Facilities (such as wet wells, regulated impoundments, tanks, highlines, *etc*.) may be part of a sanitary sewer system and discharges to these facilities are not considered sanitary sewer overflows, provided that the waste is fully contained within these temporary storage facilities.

4. **Annual Operations Report**. By **30 January** of each year, the Discharger shall submit a written report to the Executive Officer containing the following:

   a. The names, certificate grades, and general responsibilities of all persons employed at the Facility.

   b. The names and telephone numbers of persons to contact regarding the plant for emergency and routine situations.

   c. A statement certifying when the flow meter(s) and other monitoring instruments and devices were last calibrated, including identification of who performed the calibration.

   d. A statement certifying whether the current operation and maintenance manual, and contingency plan, reflect the wastewater treatment plant as currently constructed and operated, and the dates when these documents were last revised and last reviewed for adequacy.

   e. The Discharger may also be requested to submit an annual report to the Regional Water Board with both tabular and graphical summaries of the monitoring data obtained during the previous year. Any such request shall be made in writing. The report shall discuss the compliance record. If violations have occurred, the report shall also discuss the corrective actions taken and planned to bring the discharge into full compliance with the waste discharge requirements.

5. **Annual Pretreatment Reporting Requirements.** The Discharger shall submit annually a report to the Regional Water Board, with copies to USEPA Region 9 and the State Water Board, describing the Discharger's pretreatment activities over the previous 12 months. In the event that the Discharger is not in compliance with any conditions or requirements of this Order, including noncompliance with pretreatment audit/compliance inspection requirements, then the Discharger shall also include the reasons for noncompliance and state how and when the Discharger shall comply with such conditions and requirements.

   An annual report shall be submitted by **28 February** and include at least the following items:

a. A summary of analytical results from representative, flow proportioned, 24-hour composite sampling of the POTW's influent and effluent for those pollutants USEPA has identified under Section 307(a) of the CWA which are known or suspected to be discharged by industrial users.

   Sludge shall be sampled during the same 24-hour period and analyzed for the same pollutants as the influent and effluent sampling and analysis. The sludge analyzed shall be a composite sample of a minimum of 12 discrete samples taken at equal time intervals over the 24-hour period. Wastewater and sludge sampling and analysis shall be performed at least annually. The discharger shall also provide any influent, effluent or sludge monitoring data for nonpriority pollutants which may be causing or contributing to Interference, Pass-Through or adversely impacting sludge quality. Sampling and analysis shall be performed in accordance with the techniques prescribed in 40 CFR 136 and amendments thereto.

b. A discussion of Upset, Interference, or Pass-Through incidents, if any, at the treatment plant, which the Discharger knows or suspects were caused by industrial users of the POTW. The discussion shall include the reasons why the incidents occurred, the corrective actions taken and, if known, the name and address of, the industrial user(s) responsible. The discussion shall also include a review of the applicable pollutant limitations to determine whether any additional limitations, or changes to existing requirements, may be necessary to prevent Pass-Through, Interference, or noncompliance with sludge disposal requirements.

c. The cumulative number of industrial users that the Discharger has notified regarding Baseline Monitoring Reports and the cumulative number of industrial user responses.

d. An updated list of the Discharger's industrial users including their names and addresses, or a list of deletions and additions keyed to a previously submitted list. The Discharger shall provide a brief explanation for each deletion. The list shall identify the industrial users subject to federal categorical standards by specifying which set(s) of standards are applicable. The list shall indicate which categorical industries, or specific pollutants from each industry, are subject to local limitations that are more stringent than the federal categorical standards. The Discharger shall also list the noncategorical industrial users that are subject only to local discharge limitations. The Discharger shall characterize the compliance status through the year of record of each industrial user by employing the following descriptions:

   i. complied with baseline monitoring report requirements (where applicable);
   ii. consistently achieved compliance;
   iii. inconsistently achieved compliance;
   iv. significantly violated applicable pretreatment requirements as defined by 40 CFR 403.8(f)(2)(vii);

v. complied with schedule to achieve compliance (include the date final compliance is required);
vi. did not achieve compliance and not on a compliance schedule; and
vii. compliance status unknown.

A report describing the compliance status of each industrial user characterized by the descriptions in items iii. through vii. above shall be submitted for each calendar quarter **within 21 days of the end of the quarter**. The report shall identify the specific compliance status of each such industrial user and shall also identify the compliance status of the POTW with regards to audit/pretreatment compliance inspection requirements. If none of the aforementioned conditions exist, at a minimum, a letter indicating that all industries are in compliance and no violations or changes to the pretreatment program have occurred during the quarter must be submitted. The information required in the fourth quarter report shall be included as part of the annual report. This quarterly reporting requirement shall commence upon issuance of this Order.

e. A summary of the inspection and sampling activities conducted by the Discharger during the past year to gather information and data regarding the industrial users. The summary shall include:

i. the names and addresses of the industrial users subjected to surveillance and an explanation of whether they were inspected, sampled, or both and the frequency of these activities at each user; and
ii. the conclusions or results from the inspection or sampling of each industrial user.

f. A summary of the compliance and enforcement activities during the past year. The summary shall include the names and addresses of the industrial users affected by the following actions:

i. Warning letters or notices of violation regarding the industrial users' apparent noncompliance with federal categorical standards or local discharge limitations. For each industrial user, identify whether the apparent violation concerned the federal categorical standards or local discharge limitations.
ii. Administrative orders regarding the industrial users noncompliance with federal categorical standards or local discharge limitations. For each industrial user, identify whether the violation concerned the federal categorical standards or local discharge limitations.
iii. Civil actions regarding the industrial users' noncompliance with federal categorical standards or local discharge limitations. For each industrial user, identify whether the violation concerned the federal categorical standards or local discharge limitations.
iv. Criminal actions regarding the industrial users noncompliance with federal categorical standards or local discharge limitations. For each industrial user, identify whether the violation concerned the federal categorical standards or local discharge limitations.

v. Assessment of monetary penalties. For each industrial user identify the amount of the penalties.
vi. Restriction of flow to the POTW.
vii. Disconnection from discharge to the POTW.

g. A description of any significant changes in operating the pretreatment program which differ from the information in the Discharger's approved Pretreatment Program including, but not limited to, changes concerning: the program's administrative structure, local industrial discharge limitations, monitoring program or monitoring frequencies, legal authority or enforcement policy, funding mechanisms, resource requirements, or staffing levels.

h. A summary of the annual pretreatment budget, including the cost of pretreatment program functions and equipment purchases.

Duplicate signed copies of these Pretreatment Program reports shall be submitted to the Regional Water Board and the:

State Water Resources Control Board
Division of Water Quality
P.O. Box 944213
Sacramento, CA 94244-2130

and the

Regional Administrator
U.S. Environmental Protection Agency W-5
75 Hawthorne Street
San Francisco, CA 94105

ATTACHMENT F – FACT SHEET

Table of Contents

Attachment F – Fact Sheet F-3
I. Permit Information F-3
II. Facility Description F-4
A. Description of Wastewater and Biosolids Treatment or Controls F-4
B. Discharge Points and Receiving Waters F-5
C. Summary of Existing Requirements and Self-Monitoring Report (SMR) Data F-5
D. Compliance Summary F-7
E. Planned Changes F-8
III. Applicable Plans, Policies, and Regulations F-8
A. Legal Authority F-8
B. California Environmental Quality Act (CEQA) F-8
C. State and Federal Regulations, Policies, and Plans F-8
D. Impaired Water Bodies on CWA 303(d) List F-11
E. Other Plans, Policies and Regulations F-12
IV. Rationale For Effluent Limitations and Discharge Specifications F-12
A. Discharge Prohibitions F-13
B. Technology-Based Effluent Limitations F-14
1. Scope and Authority F-14
2. Applicable Technology-Based Effluent Limitations F-14
C. Water Quality-Based Effluent Limitations (WQBELs) F-15
1. Scope and Authority F-15
2. Applicable Beneficial Uses and Water Quality Criteria and Objectives F-16
3. Determining the Need for WQBELs F-22
4. WQBEL Calculations F-48
5. Whole Effluent Toxicity (WET) F-52
D. Final Effluent Limitations F-54
1. Mass-based Effluent Limitations F-54
2. Averaging Periods for Effluent Limitations F-54
3. Satisfaction of Anti-Backsliding Requirements F-55
4. Satisfaction of Antidegradation Policy F-56
E. Interim Effluent Limitations F-58
F. Land Discharge Specifications F-58
G. Reclamation Specifications F-58
V. Rationale for Receiving Water Limitations F-59
A. Surface Water F-59
B. Groundwater F-62
VI. Rationale for Monitoring and Reporting Requirements F-67
A. Influent Monitoring F-67
B. Effluent Monitoring F-68
C. Whole Effluent Toxicity Testing Requirements F-68
D. Receiving Water Monitoring F-68
1. Surface Water Monitoring and Visual Observations F-68
2. Groundwater Monitoring F-68
E. Other Monitoring Requirements F-69

VII. Rationale for Provisions F-70
A. Standard Provisions F-70
B. Special Provisions F-70
1. Reopener Provisions F-70
2. Special Studies, Technical Reports, and Additional Monitoring Requirements F-72
3. Best Management Practices and Pollution Prevention F-76
4. Construction, Operation, and Maintenance Specifications F-78
5. Special Provisions for Municipal Facilities (POTWs Only) F-78
6. Other Special Provisions F-79
7. Compliance Schedules – Not Applicable F-79
VIII. Public Participation F-79
A. Notification of Interested Parties F-80
B. Written Comments F-80
C. Public Hearing F-80
D. Waste Discharge Requirements Petitions F-80
E. Information and Copying F-81
F. Register of Interested Persons F-81
G. Additional Information F-81

List of Tables

Table F-1. Facility Information F-3
Table F-2. Historic Effluent Limitations and Monitoring Data F-5
Table F-3. Summary of Technology-based Effluent Limitations F-15
Table F-4. Summary of Ammonia Effluent Limit Derivations F-27
Table F-5. Salinity Water Quality Criteria/Objectives F-41
Table F-6. Summary of Annual Electrical Conductivity Effluent Concentrations F-45
Table F-7. WQBEL Calculations for Aluminum F-50
Table F-8. WQBEL Calculations for Bis(2-ethylhexyl)Phthalate F-50
Table F-9. WQBEL Calculations for Chlorodibromomethane F-51
Table F-10. WQBEL Calculations for Dichlorobromomethane F-51
Table F-11. WQBEL Calculations for Cyanide F-51
Table F-12. Summary of Final Effluent Limitations F-57
Table F-13. Summary of Groundwater Conditions F-65

ATTACHMENT F – FACT SHEET

As described in section II of this Order, this Fact Sheet includes the legal requirements and technical rationale that serve as the basis for the requirements of this Order.

This Order has been prepared under a standardized format to accommodate a broad range of discharge requirements for dischargers in California. Only those sections or subsections of this Order that are specifically identified as "not applicable" have been determined not to apply to this Discharger. Sections or subsections of this Order not specifically identified as "not applicable" are fully applicable to this Discharger.

I. PERMIT INFORMATION

The following table summarizes administrative information related to the facility.

Table F-1. Facility Information

WDID	5B390107001
Discharger	City of Stockton
Name of Facility	Regional Wastewater Control Facility
Facility Address	2500 Navy Drive
	Stockton, CA 95206
	San Joaquin County
Facility Contact, Title and Phone	Mark Madison, Director, (209) 937-8750
Authorized Person to Sign and Submit Reports	Mark Madison, Director, (209) 937-8750
Mailing Address	SAME
Billing Address	SAME
Type of Facility	Publicly Owned Treatment Works
Major or Minor Facility	Major
Threat to Water Quality	1
Complexity	A
Pretreatment Program	Yes
Reclamation Requirements	No
Facility Permitted Flow	55 million gallons per day (mgd)
Facility Design Flow	55 mgd
Watershed	Sacramento-San Joaquin Delta
Receiving Water	San Joaquin River
Receiving Water Type	Sacramento-San Joaquin Delta

A. The City of Stockton (hereinafter Discharger) is the owner and operator of the City of Stockton Regional Wastewater Control Facility (hereinafter Facility), a publicly owned treatment works (POTW).

For the purposes of this Order, references to the "discharger" or "permittee" in applicable federal and state laws, regulations, plans, or policy are held to be equivalent to references to the Discharger herein.

B. The Facility discharges wastewater to the San Joaquin River, a water of the United States, and is currently regulated by Order No. R5-2002-0083, which was adopted on 26 April 2002 and expired on 1 April 2007. Further, Cease and Desist Order No. R5-2002-0084 (CDO) was adopted by the Regional Water Board on 26 April 2002, and establishes a time schedule for the Discharger to comply with ammonia effluent limitations established in Order No. R5-2002-0083. The Orders were petitioned by the Discharger on 28 May 2002 and on 17 October 2002. The State Water Board granted Stay Order WQO 2002-0018 for portions of Order No. R5-2002-0083 and the CDO. On 2 May 2003, the Discharger filed a Motion for Preliminary Injunction/Order Requiring Stay until 5 September 2003, which the Superior Court upheld on 26 June 2003. The terms and conditions of the current Order have been automatically continued and remain in effect until new Waste Discharge Requirements and NPDES permit are adopted pursuant to this Order. However, as a result of the State Water Board Order and the Court Order, the compliance date for the final ammonia effluent limitations were extended to 10 August 2008, and the compliance date for meeting the tertiary treatment requirements was extended to 25 September 2007.

C. The Discharger filed a report of waste discharge and submitted an application for renewal of its Waste Discharge Requirements (WDRs) and National Pollutant Discharge Elimination System (NPDES) permit on 29 September 2006. Supplemental information was requested on 26 February 2007, and received on 28 February 2007. A site visit was conducted on 21 April 2006 to observe operations and collect additional data to develop permit limitations and conditions.

II. FACILITY DESCRIPTION

The Discharger provides sewerage service for the City of Stockton, the Port of Stockton, and surrounding urbanized San Joaquin County areas. The Facility serves a population of approximately 326,000, and discharges intermittently up to 55 mgd tertiary-level treated effluent to the San Joaquin River, within the Sacramento-San Joaquin Delta. The Facility average daily flow rate is approximately 31.7 mgd, and the maximum annual average effluent discharge was 36.37 mgd.

A. Description of Wastewater and Biosolids Treatment or Controls

The Facility is bifurcated by the San Joaquin River; the main facility (primary and secondary treatment facilities, and sludge processing facilities) is located east of the river and the tertiary treatment facility is located west of the river. At the main facility, the primary treatment processes consist of screening, grit removal, and primary sedimentation. The secondary treatment processes consist of high rate trickling filters and secondary clarifiers. Sludge is removed from the primary and secondary sedimentation processes to gravity thickeners for preliminary water removal, and then pumped to anaerobic digesters. After digestion, the treated sludge is pumped to a sludge lagoon where anaerobic digestion continues. A dredge is used to pump the

concentrated material from the bottom of the lagoon to a belt filter press, and dewatered biosolids are removed by a private contractor off-site for agricultural reuse.

From the main facility, the secondary-treated effluent is piped under the San Joaquin River to the tertiary treatment facility, which consists of unlined facultative oxidation ponds, engineered wetlands, two nitrifying biotowers, dissolved air flotation, mixed-media filters, and chlorination/dechlorination facilities. Several of the facultative ponds are operated in a stand-by mode of operation as necessary, to achieve improved effluent quality by decreasing solids loading on the downstream treatment process, and by maintaining stable ammonia loading to the nitrifying biotowers.

B. Discharge Points and Receiving Waters

1. The Facility is located in T1N, R6E, MDB&M, as shown in Attachment B, a part of this Order.

2. Tertiary-level treated municipal wastewater is discharged at Discharge Point No. 001 to the San Joaquin River, a water of the United States at latitude 37° 56’ 15” N and longitude 121° 20’ 05” W.

C. Summary of Existing Requirements and Self-Monitoring Report (SMR) Data

Effluent limitations/discharge specifications contained in the existing Order for discharges from Discharge Point No. 001 and representative monitoring data from the term of the previous Order are as follows:

Table F-2. Historic Effluent Limitations and Monitoring Data

Parameter	Units	Effluent Limitation			Monitoring Data (From 1 May 2002 – 31 January 2007)		
		Average Monthly	Average Weekly	Maximum Daily	Highest Average Monthly Discharge	Highest Average Weekly Discharge	Highest Daily Discharge
Total Coliform[1]	MPN/100 mL	--	2.2[2]	23	--	50[2]	130
Total Coliform[3]	MPN/100 mL	23[4]	--	240	4[4]	--	1600
Turbidity[1,6]	NTU	--	2	10	--	35	58
Total Suspended Solids	mg/L	30	45	60	21	30	48
	lbs/day[6]	45,300	67,900	90,600	5,016	7,134	9,782
Settleable Matter	mL/L/hr	0.1	--	0.5	0.055	--	0.2
Oil and Grease	mg/L	10	--	15	9.5	--	14
	lbs/day[6]	4,600	--	6,900	2278	--	3234
Ammonia-N	mg/L	2	--	5	28	--	29
	lbs/day[6]	917	--	2,294	8,915	--	12,002
Copper[1]	µg/L	5.2	--	10.4	2.9	--	2.9
	lbs/day[6]	2.4	--	4.8	0.74	--	0.74
Copper[3]	µg/L	--	--	35	--	--	6
	lbs/day	--	--	16	--	--	2.19
Cyanide[1]	µg/L	4	--	9.2	8	--	13

Parameter	Units	Effluent Limitation			Monitoring Data (From 1 May 2002 – 31 January 2007)		
		Average Monthly	Average Weekly	Maximum Daily	Highest Average Monthly Discharge	Highest Average Weekly Discharge	Highest Daily Discharge
	lbs/day[6]	1.8	--	4.2	1.51	--	1.51
Cyanide[3]	µg/L	--	--	24	8	--	8
	lbs/day[6]	--	--	11	2.26	--	2.26
Chloroform	µg/L	52	--	129	21	--	21
	lbs/day[6]	24	--	59	5.09	--	5.09
Dichloromethane	µg/L	11	--	25	J 0.48	--	J 0.48
	lbs/day[6]	5	--	11.5	0.136	--	0.136
Trichloroethylene	µg/L	14.5	--	34	ND	--	ND
	lbs/day[6]	6.7	--	15.6	ND	--	ND
Bromodichloromethane	µg/L	--	--	82	--	--	36
	lbs/day[6]	--	--	37.6	--	--	16.5
Dibromochloromethane	µg/L	--	--	23	--	--	29
	lbs/day[6]	--	--	10.6	--	--	5.59
1,1-Dichloroethylene	µg/L	--	--	14.5	--	--	ND
	lbs/day[6]	--	--	6.7	--	--	ND
Tetrachloroethylene	µg/L	--	--	14.5	--	--	J 0.09
	lbs/day[6]	--	--	6.7	--	--	0.023
Bis (2-ethylhexyl) phthalate	µg/L	--	--	48	--	--	5.5
	lbs/day[6]	--	--	22	--	--	1.7
Diazinon	µg/L	--	--	0.1	--	--	J 0.155
	lbs/day[6]	--	--	0.046	--	--	0.039
DDT[1]	lbs/year	--	--	ND[7]	--	--	ND
DDT[3]	lbs/year	--	--	7.5[8]	--	--	ND
Endrin Aldehyde[1]	lbs/year	--	--	ND[7]	--	--	ND
Endrin Aldehyde[3]	lbs/year	--	--	12.9[8]	--	--	ND
Lindane[1]	lbs/year	--	--	ND[7]	--	--	ND
Lindane[3]	lbs/year	--	--	3.2[8]	--	--	ND
Mercury	lbs/year	--	--	0.92[8]	--	--	0.537
CBOD[9,10]	mg/L	10	20	25	9.78	17.17	25
	lbs/day[6]	4,590	9,170	11,500	2,655	4,753	8,173
CBOD[9,11]	mg/L	15	23	30	8.85	12.71	16
	lbs/day[6]	6,880	10,600	13,800	1,934	2,839	4,443
CBOD[9,12]	mg/L	20	30	50	18.07	22.4	30
	lbs/day[6]	9,170	13,800	22,900	5,335	7,213	9,621
Chlorine Residual	mg/L	--	0.01[13]	0.02[14]	--	0	0
	lbs/day[6]	--	4.6[13]	--	--	0	--
Dissolved Oxygen	mg/L	--	--	[15]	--	--	1.8[16]
pH	standard units	--	--	[17]	--	--	5.5 – 8.5[18]
CBOD Removal	%	85[19]	--	--	93.6[20]	--	--
TSS Removal	%	85[19]	--	--	92.3[20]	--	--
Flow	mgd	--	--	[21]	--	--	55
Acute Toxicity	% Survival	--	--	[22]	--	--	70[23]

Parameter	Units	Effluent Limitation			Monitoring Data (From 1 May 2002 – 31 January 2007)		
		Average Monthly	Average Weekly	Maximum Daily	Highest Average Monthly Discharge	Highest Average Weekly Discharge	Highest Daily Discharge
Temperature	°F	--	--	[24]	--	--	15.2[25]

ND – Not Detected
1 Final limit became effective 1 May 2006.
2 Applied as a 7-day median.
3 Interim limit effective until 1 May 2006.
4 Applied as a monthly median.
5 Turbidity shall not exceed 5 NTU 5% of the time or 10 NTU at any given time monitored continuously.
6 Based upon a permitted flow of 55 mgd.
7 Non-detectable (ND). The Discharger shall use EPA standard analytical techniques that have the lowest practical levels for DDT, endrin aldehyde, and lindane with minimum acceptable reporting levels of 0.01 µg/L, 0.01 µg/L, and 0.02 µg/L, respectively. Detectable concentrations of these pollutants less than cited lowest practical levels shall be considered in compliance with this effluent limitation.
8 Yearly total as calculated per Effluent Limitation B.11 of Order No. R5-2002-083.
9 5-day, 20°C, carbonaceous biochemical oxygen demand, ascertained by 24-hour composite.
10 Effective 1 April through 31 October, and became effective 25 September 2007.
11 Effective 1 November through 30 November.
12 Effective 1 December through 31 March.
13 Applied as a 4-day average effluent limitation.
14 Applied as a 1-hour average effluent limitation.
15 Effective 1 January 2003, the Discharger shall maintain minimum daily average effluent DO concentration of 6.0 mg/L from 1 September through 30 November and 5.0 mg/L throughout the remainder of the year.
16 Minimum daily discharge of the monitoring data.
17 Effective 1 April 2007, the discharge shall not have a pH less than 6.5 nor greater than 8.5. Prior to 1 April 2007, the discharge shall not have a pH less than 6.0 nor greater than 8.5. Individual excursions below or above the prescribed minimum and maximum pH limitations shall not exceed 60 minutes, respectively. The total duration of excursions shall not exceed 1% of the discharge time within the reporting period. The Discharger shall conduct an internal review and report the reasons for any individual excursion exceeding 30 minutes in duration to the Regional Water Board within the self-monitoring report.
18 Range of pH values of the monitoring data.
19 The arithmetic mean of 20°C CBOD (5-day) and total suspended solids in effluent samples collected over a monthly period shall not exceed 15 percent of the arithmetic mean of the values for influent samples collected at approximately the same times during the same period (85 percent removal).
20 Minimum monthly percent removal of the monitoring data.
21 The average dry weather discharge flow shall not exceed 55 mgd. The peak wet weather discharge flow shall not exceed 67 mgd.
22 Survival of aquatic organisms in 96-hour bioassays of undiluted waste shall not be less than 70% for any one bioassay and 90% median for any three or more consecutive bioassays.
23 Minimum percent survival of the monitoring data.
24 The maximum effluent temperature shall not exceed the natural receiving water temperature by more than 20°F.
25 Maximum difference between the effluent temperature and the natural receiving water temperature.

D. Compliance Summary

Record of Violations (1 January 2000 – 30 April 2008)									
Year:	2000	2001	2002	2003	2004	2005	2006	2007	2008
Coliform	2	0	1	0	0	2	1	0	0
$CBOD_5$	0	0	0	0	0	0	1	0	0
Dibromochloromethane	0	0	0	0	0	0	1	6	0

E. Planned Changes

[Not Applicable]

III. APPLICABLE PLANS, POLICIES, AND REGULATIONS

The requirements contained in this Order are based on the applicable plans, policies, and regulations identified in section II of the Limitations and Discharge Requirements (Findings). This section provides supplemental information, where appropriate, for the plans, policies, and regulations relevant to the discharge.

A. Legal Authority

See Limitations and Discharge Requirements - Findings, Section II.C.

B. California Environmental Quality Act (CEQA)

See Limitations and Discharge Requirements - Findings, Section II.E.

C. State and Federal Regulations, Policies, and Plans

1. **Water Quality Control Plans**. The Regional Water Board adopted a *Water Quality Control Plan, Fourth Edition (Revised February 2007), for the Sacramento and San Joaquin River Basins* (Basin Plan) that designates beneficial uses, establishes water quality objectives, and contains implementation programs and policies to achieve those objectives for all waters addressed through the plan. In addition, State Water Board Resolution No. 88-63 requires that, with certain exceptions, the Regional Water Board assign the municipal and domestic supply use to water bodies that do not have beneficial uses listed in the Basin Plan. The beneficial uses of the San Joaquin River downstream of the discharge are municipal and domestic supply; agricultural supply; industrial process supply; industrial service supply; water contact recreation; non-contact water recreation; migration of aquatic organisms; both cold and warm freshwater aquatic habitat; spawning, reproduction, and/or early development; wildlife habitat; and navigation.

   The Basin Plan on page II-1.00 states: "*Protection and enhancement of existing and potential beneficial uses are primary goals of water quality planning…*" and with respect to disposal of wastewaters states that "...*disposal of wastewaters is [not] a prohibited use of waters of the State; it is merely a use which cannot be satisfied to the detriment of beneficial uses.*"

   The federal CWA section 101(a)(2), states: "*it is the national goal that wherever attainable, an interim goal of water quality which provides for the protection and propagation of fish, shellfish, and wildlife, and for recreation in and on the water be achieved by July 1, 1983.*" Federal regulations, developed to implement the requirements of the CWA, create a rebuttable presumption that all waters be designated as fishable and swimmable. Federal regulations, 40 CFR sections 131.2

and 131.10, require that all waters of the state regulated to protect the beneficial uses of public water supply, protection and propagation of fish, shell fish and wildlife, recreation in and on the water, agricultural, industrial and other purposes including navigation. Section 131.3(e), 40 CFR, defines existing beneficial uses as those uses actually attained after 28 November 1975, whether or not they are included in the water quality standards. Federal regulation, 40 CFR section 131.10 requires that uses be obtained by implementing effluent limitations, requires that all downstream uses be protected, and states that in no case shall a state adopt waste transport or waste assimilation as a beneficial use for any waters of the United States.

This Order contains effluent limitations requiring a tertiary level of treatment, or equivalent, which is necessary to protect the beneficial uses of the receiving water. The Regional Water Board has considered the factors listed in CWC section 13241 in establishing these requirements, as discussed in more detail in the Fact Sheet, Attachment F, Section IV.

2. **Thermal Plan.** The State Water Board adopted a *Water Quality Control Plan for Control of Temperature in the Coastal and Interstate Water and Enclosed Bays and Estuaries of California* (Thermal Plan) on 18 May 1972, and amended this plan on 18 September 1975. This plan contains temperature objectives for surface waters, including estuaries. The Thermal Plan specifically includes the Sacramento-San Joaquin Delta within the definition of an estuary. The Discharger discharges tertiary-level treated wastewater effluent to San Joaquin River, within the legal boundary of the Delta as defined by Section 12220 CWC. The Discharger is considered to be an "Existing Discharger of Elevated Temperature Waste" as described in the Thermal Plan. Thus the Thermal Plan requirements for discharges to estuaries are applicable to this discharge. Requirements of this Order implement the Thermal Plan, and are described as follows:

   a. The maximum temperature shall not exceed the natural receiving water temperature by more than 20ºF.

   b. Elevated temperature waste discharge either individually or combined with other discharges shall not create a zone, defined by water temperatures of more than 1ºF above natural receiving water temperature, which exceeds 25 percent of the cross-sectional area of a main river channel at any point.

   c. No discharge shall cause a surface water temperature rise greater than 4ºF above the natural temperature of the receiving waters at any time or place.

   d. Additional limitations shall be imposed when necessary to assure protection of beneficial uses.

   The Discharger has conducted two site-specific temperature studies, a far-field study (November 1995) and a near-field study (May 2006), to assess any possible thermal impacts of the discharge into the San Joaquin River on migrating fish, including possible stress effects on reproduction or early-life fish development. Based on the results of both these studies, this Order does not impose additional temperature

limitations; however, this Order does implement the requirements of the Thermal Plan (see sections IV.C.3.aa and V.A.1.o of this Fact Sheet for further discussion).

3. **Bay-Delta Plan.** The *Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary* (Bay-Delta Plan) was adopted in May 1995 by the State Water Board superseding the 1991 Bay-Delta Plan. The Bay-Delta Plan identifies the beneficial uses of the estuary and includes objectives for flow, salinity, and endangered species protection.

   The Bay-Delta Plan attempts to create a management plan that is acceptable to the stakeholders while at the same time is protective of beneficial uses of the San Joaquin River. The State Water Board adopted Decision 1641 (D-1641) on 29 December 1999. D-1641 implements flow objectives for the Bay-Delta Estuary, approves a petition to change points of diversion of the Central Valley Project and the State Water Project in the Southern Delta, and approves a petition to change places of use and purposes of use of the Central Valley Project. The water quality objectives of the Bay-Delta Plan are implemented as part of this Order.

4. **Antidegradation Policy.** See Limitations and Discharge Requirements – Findings, Section II.N; and Section IV.D.4 of this Fact Sheet.

5. **Anti-Backsliding Requirements.** See Limitations and Discharge Requirements – Findings, Section II.O; and Section IV.D.3 of this Fact Sheet.

6. ***Emergency Planning and Community Right to Know Act***. CWC section 13263.6(a) requires that "*the Regional Water Board shall prescribe effluent limitations as part of the waste discharge requirements of a POTW for all substances that the most recent toxic chemical release data reported to the state emergency response commission pursuant to Section 313 of the Emergency Planning and Community Right to Know Act of 1986 (42 U.S.C. Sec. 11023) (EPCRA) indicate as discharged into the POTW, for which the State Water Board or the Regional Water Board has established numeric water quality objectives, and has determined that the discharge is or may be discharged at a level which will cause, have the reasonable potential to cause, or contribute to, an excursion above any numeric water quality objective.*"

   The EPCRA Section 313 toxic chemical release data report indicates that acetaldehyde, ammonia, chlorine, chromium compounds, lead, mercury, MTBE, and zinc compounds discharge into the Discharger's collection system. The Regional Water Board has adopted numeric receiving water objectives for acetaldehyde, ammonia, chlorine, chromium compounds, lead, mercury, MTBE, and zinc compounds in the Water Quality Control Plan for the Central Valley Basin (Basin Plan). A reasonable potential analysis was conducted as specified in Section 1.3 of the SIP with the available data. As detailed in Section IV of this Fact Sheet, available effluent quality data indicate that effluent concentrations of ammonia, and chlorine do have a reasonable potential to cause or contribute to an excursion above numeric water quality objectives within the Basin Plan. Effluent limitations for ammonia, and chlorine are included in this permit pursuant to CWC Section

13263.6(a), and an interim effluent mass limitation for mercury (total) has been established in this Order to maintain the Discharger's current mercury loading to the San Joaquin River.

7. **Stormwater Requirements.** USEPA promulgated federal regulations for storm water on 16 November 1990 in 40 CFR Parts 122, 123, and 124. The NPDES Industrial Storm Water Program regulates storm water discharges from wastewater treatment facilities. Wastewater treatment plants are applicable industries under the stormwater program and are obligated to comply with the federal regulations. No storm water is directly discharged from the Facility, and therefore, coverage of stormwater discharges from the Facility is not necessary.

8. **Endangered Species Act.** See Limitations and Discharge Requirements – Findings, Section II.P.

D. Impaired Water Bodies on CWA 303(d) List

1. Under Section 303(d) of the 1972 Clean Water Act, states, territories and authorized tribes are required to develop lists of water quality limited segments. The waters on these lists do not meet water quality standards, even after point sources of pollution have installed the minimum required levels of pollution control technology. On 30 November 2006 USEPA gave final approval to California's 2006 Section 303(d) List of Water Quality Limited Segments. The Basin Plan references this list of Water Quality Limited Segments (WQLSs), which are defined as "…*those sections of lakes, streams, rivers or other fresh water bodies where water quality does not meet (or is not expected to meet) water quality standards even after the application of appropriate limitations for point sources (40 CFR 130, et seq.)*." The Basin Plan also states, "*Additional treatment beyond minimum federal standards will be imposed on dischargers to [WQLSs]. Dischargers will be assigned or allocated a maximum allowable load of critical pollutants so that water quality objectives can be met in the segment.*" The Delta is divided into multiple WQLSs. The Facility discharges directly into the southern portion and just upstream of the Stockton Deep Water Ship Channel (DWSC). The listing for both WQLSs are applicable to the discharge. The WQLSs are 303(d) listed for: chloropyrifos; DDT; diazinon; dioxin; electrical conductivity (EC); exotic species; furan compounds; group A pesticides; mercury; pathogens; PCBs; and unknown toxicity.

2. **Total Maximum Daily Loads.** The USEPA requires the Regional Water Board to develop total maximum daily loads (TMDLs) for each 303(d) listed pollutant and water body combination. The DWSC is located directly downstream of the discharge location and is 303(d) listed for dissolved oxygen (DO).

   A TMDL for oxygen demanding substances in the DWSC was adopted by the Regional Water Board on 27 January 2005 (Resolution No. R5-2005-0005). The TMDL was approved by the State Water Board on 16 November 2005 and approved by the USEPA on 27 February 2007. The wasteload allocations contained in the TMDL for the Stockton Regional Wastewater Facility are equal to the effluent limitations that were in effect when the TMDL was adopted for oxygen demanding

substances, specifically ammonia, $CBOD_5$, and DO. Until wasteload allocations are adopted by Regional Water Board, this Order contains effluent limitations requiring a tertiary-level treatment, or equivalent, which is necessary to protect the beneficial uses of the receiving water. For DO and ammonia, this Order retains the effluent limits from previous Order No. R5-2002-0083 (see section IV.C).

E. Other Plans, Policies and Regulations

1. The discharge authorized herein and the treatment and storage facilities associated with the discharge of treated municipal wastewater, except for discharges of residual sludge and solid waste, are exempt from the requirements of Title 27, California Code of Regulations (CCR), section 20005 *et seq*. (hereafter Title 27). The exemption, pursuant to Title 27 CCR section 20090(a), is based on the following:

   a. The waste consists primarily of domestic sewage and treated effluent;

   b. The waste discharge requirements are consistent with water quality objectives; and

   c. The treatment and storage facilities described herein are associated with a municipal wastewater treatment plant.

2. The State Water Board adopted the *Water Quality Control Policy for the Enclosed Bays and Estuaries of California* (see Limitations and Discharge Requirements – Findings, Section II.J). The requirements within this Order are consistent with its policy.

IV. RATIONALE FOR EFFLUENT LIMITATIONS AND DISCHARGE SPECIFICATIONS

Effluent limitations and toxic and pretreatment effluent standards established pursuant to Sections 301 (Effluent Limitations), 302 (Water Quality Related Effluent Limitations), 304 (Information and Guidelines), and 307 (Toxic and Pretreatment Effluent Standards) of the Clean Water Act (CWA) and amendments thereto are applicable to the discharge.

The Federal CWA mandates the implementation of effluent limitations that are as stringent as necessary to meet water quality standards established pursuant to state or federal law [33 U.S.C., §1311(b)(1)(C); 40 CFR, §122.44(d)(1)]. NPDES permits must incorporate discharge limits necessary to ensure that water quality standards are met. This requirement applies to narrative criteria as well as to criteria specifying maximum amounts of particular pollutants. Pursuant to Federal regulations, 40 CFR §122.44(d)(1)(i), NPDES permits must contain limits that control all pollutants that "*are or may be discharged at a level which will cause, have the reasonable potential to cause, or contribute to an excursion above any state water quality standard, including state narrative criteria for water quality*." Federal regulations, 40 CFR, §122.44(d)(1)(vi), further provide that "[w]*here a state has not established a water quality criterion for a specific chemical pollutant that is present in an effluent at a concentration that causes, has the reasonable potential to cause, or contributes to an excursion above a narrative criterion within an applicable State water quality standard, the permitting authority must*

establish effluent limits."

The CWA requires point source discharges to control the amount of conventional, non-conventional, and toxic pollutants that are discharged into the waters of the United States. The control of pollutants discharged is established through effluent limitations and other requirements in NPDES permits. There are two principal bases for effluent limitations: 40 CFR §122.44(a) requires that permits include applicable technology-based limitations and standards, and 40 CFR §122.44(d) requires that permits include water quality-based effluent limitations to attain and maintain applicable numeric and narrative water quality criteria to protect the beneficial uses of the receiving water where numeric water quality objectives have not been established. The Regional Water Board's Basin Plan, page IV-17.00, contains an implementation policy ("Policy for Application of Water Quality Objectives") that specifies that the Regional Water Board "*will, on a case-by-case basis, adopt numerical limitations in orders which will implement the narrative objectives*." This policy complies with 40 CFR §122.44(d)(1). With respect to narrative objectives, the Regional Water Board must establish effluent limitations using one or more of three specified sources, including (1) USEPA's published water quality criteria, (2) a proposed state criterion (*i.e*., water quality objective) or an explicit state policy interpreting its narrative water quality criteria (*i.e*., the Regional Water Board's "Policy for Application of Water Quality Objectives")(40 CFR §§122.44(d)(1) (vi) (A), (B) or (C)), or (3) an indicator parameter. The Basin Plan contains a narrative objective requiring that: "*All waters shall be maintained free of toxic substances in concentrations that produce detrimental physiological responses in human, plant, animal, or aquatic life*" (narrative toxicity objective). The Basin Plan requires the application of the most stringent objective necessary to ensure that surface water and groundwater do not contain chemical constituents, discoloration, toxic substances, radionuclides, or taste and odor producing substances that adversely affect beneficial uses. The Basin Plan states that material and relevant information, including numeric criteria, and recommendations from other agencies and scientific literature will be utilized in evaluating compliance with the narrative toxicity objective. The Basin Plan also limits chemical constituents in concentrations that adversely affect surface water beneficial uses. For waters designated as municipal, the Basin Plan specifies that, at a minimum, waters shall not contain concentrations of constituents that exceed Maximum Contaminant Levels (MCL) of CCR Title 22. The Basin Plan further states that, to protect all beneficial uses, the Regional Water Board may apply limits more stringent than MCLs.

A. Discharge Prohibitions

1. **Prohibition III.A (No discharge or application of waste other than that described in this Order**). This prohibition is based on CWC Section 13260 that requires filing of a report of waste discharge (ROWD) before discharges can occur. The Discharger submitted a ROWD for the discharges described in this Order; therefore, discharges not described in this Order are prohibited.

2. **Prohibition III.B (No bypasses or overflow of untreated wastewater, except under the conditions allowed by Federal Standard Provisions I.G. and I.H. in Attachment D of this permit).** As stated in Section I.G of Attachment D, Standard

Provisions, this Order prohibits bypass from any portion of the treatment facility. Federal regulations, 40 CFR 122.41 (m), define "bypass" as the intentional diversion of waste streams from any portion of a treatment facility. This section of the federal regulations, 40 CFR 122.41 (m)(4), prohibits bypass unless it is unavoidable to prevent loss of life, personal injury, or severe property damage. In considering the Regional Water Board's prohibition of bypasses, the State Water Board adopted a precedential decision, Order No. WQO 2002-0015, which cites the federal regulations, 40 CFR 122.41(m), as allowing bypass only for essential maintenance to assure efficient operation.

3. **Prohibition III.C (No controllable condition shall create a nuisance).** This prohibition is based on CWC Section 13050 that requires water quality objectives established for the prevention of nuisance within a specific area. The Basin Plan prohibits conditions that create a nuisance.

4. **Prohibition III.D (No inclusion of pollutant free wastewater shall cause improper operation of the Facility's systems).** This prohibition is based on CFR Part 122.41 et seq. that requires the proper design and operation of treatment facilities.

B. Technology-Based Effluent Limitations

1. Scope and Authority

Regulations promulgated in section 125.3(a)(1) require technology-based effluent limitations for municipal dischargers to be placed in NPDES permits based on Secondary Treatment Standards or Equivalent to Secondary Treatment Standards.

The Federal Water Pollution Control Act Amendments of 1972 (PL 92-500) established the minimum performance requirements for POTWs [defined in section 304(d)(1)]. Section 301(b)(1)(B) of that Act requires that such treatment works must, as a minimum, meet effluent limitations based on secondary treatment as defined by the USEPA Administrator.

Based on this statutory requirement, USEPA developed secondary treatment regulations, which are specified in Part 133. These technology-based regulations apply to all municipal wastewater treatment plants and identify the minimum level of effluent quality attainable by secondary treatment in terms of biochemical oxygen demand (BOD_5), total suspended solids (TSS), and pH.

2. Applicable Technology-Based Effluent Limitations

a. **Carbonaceous Biochemical Oxygen Demand (5-Day @ 20°C) ($CBOD_5$) and Total Suspended Solids (TSS).** Federal regulations, 40 CFR, Part 133, establish the minimum weekly and monthly average level of effluent quality attainable by secondary treatment for $CBOD_5$ and TSS. Tertiary treatment is necessary to protect the beneficial uses of the receiving stream and the final effluent limitations for $CBOD_5$ and TSS are based on the technical capability of

the tertiary process. BOD_5 is a measure of the amount of oxygen used in the biochemical oxidation of organic matter; the CBOD test is used as a substitute for BOD. The secondary and tertiary treatment standards for $CBOD_5$ and TSS are indicators of the effectiveness of the treatment processes. The principal design parameter for wastewater treatment plants is the daily $CBOD_5$ and TSS loading rates and the corresponding removal rate of the system. In applying CFR 40 Part 133 for weekly and monthly average $CBOD_5$ and TSS limitations, the application of tertiary treatment processes results in the ability to achieve lower levels for $CBOD_5$ and TSS than the secondary standards currently prescribed; therefore these limitations have been revised to 15 mg/L (weekly average) and 10 mg/L (monthly average), which is technically based on the capability of a tertiary system. In addition to these limits, a daily maximum effluent limitation of 20 mg/L for $CBOD_5$ and for TSS is included in this Order to ensure that the treatment works are not organically overloaded and operate in accordance with design capabilities.

Also, 40 CFR 133.102, in describing the minimum level of effluent quality attainable by secondary treatment, states that the 30-day average percent removal shall not be less than 85 percent. This Order contains a limitation requiring an average of 85 percent removal of $CBOD_5$ and TSS over each calendar month.

b. **Flow.** The Facility is designed to provide a tertiary level of treatment for up to a design flow of 55 mgd. Therefore, this Order contains an Average Dry Weather Flow effluent limit of 55 mgd.

c. The final technology-based effluent limitations required by this Order are summarized below in Table F-3

Table F-3. Summary of Technology-based Effluent Limitations

Parameter	Units	Effluent Limitations				
		Average Monthly	Average Weekly	Maximum Daily	Instantaneous Minimum	Instantaneous Maximum
CBOD 5-day @ 20°C	mg/L	10	15	20		
Total Suspended Solids	mg/L	10	15	20		
Flow	mgd			55[1]		
85% Removal of CBOD 5-day @ 20ºC and Total Suspended Solids						

[1] Average dry weather flow

C. Water Quality-Based Effluent Limitations (WQBELs)

1. Scope and Authority

As specified in section 122.44(d)(1)(i), permits are required to include WQBELs for pollutants (including toxicity) that are or may be discharged at levels that cause, have reasonable potential to cause, or contribute to an in-stream excursion above any state water quality standard. The process for determining reasonable potential

and calculating WQBELs when necessary is intended to protect the designated uses of the receiving water as specified in the Basin Plan, and achieve applicable water quality objectives and criteria that are contained in other state plans and policies, or any applicable water quality criteria contained in the California Toxics Rule (CTR) and National Toxics Rule (NTR) (see Limitations and Discharge Requirements – Findings, Section II.I).

2. Applicable Beneficial Uses and Water Quality Criteria and Objectives

a. **Receiving Water.** The receiving stream is the San Joaquin River, just upstream of the Stockton Deep Water Ship Channel (DWSC), and a portion of the Delta Waterways. The beneficial uses of the receiving water are described above in Section III.C.1 of this Fact Sheet.

b. **Hardness.** While no effluent limitation for hardness is necessary in this Order, hardness is critical to the assessment of the need for, and the development of, effluent limitations for certain metals. The *California Toxics Rule* and the *National Toxics Rule* contain water quality criteria for seven metals that vary as a function of hardness, the lower the hardness the lower the water quality criteria. The hardness-dependent metal criteria include cadmium, copper, chromium III, lead, nickel, silver, and zinc.

Effluent limitations for the discharge must be set to protect the beneficial uses of the receiving water for all discharge conditions. In the absence of the option of including condition-dependent, "floating" effluent limitations that are reflective of actual hardness conditions at the time of discharge, effluent limitations must be set using a reasonable worst-case condition in order to protect beneficial uses for all discharge conditions. The SIP does not address how to determine hardness for application to the equations for the protection of aquatic life when using hardness-dependent metals criteria. It simply states, in Section 1.2, that the criteria shall be properly adjusted for hardness using the hardness of the receiving water. The CTR requires that, for waters with a hardness of 400 mg/L (as $CaCO_3$), or less, the actual ambient hardness of the surface water must be used. It further requires that the hardness values used must be consistent with the design discharge conditions for design flows and mixing zones.[1] The CTR does not define whether the term "ambient," as applied in the regulations, necessarily requires the consideration of upstream as opposed to downstream hardness conditions.

The point in the receiving water affected by the discharge is downstream of the discharge. As the effluent mixes with the receiving water, the hardness of the receiving water can change. Therefore, it is appropriate to use the ambient hardness downstream of the discharge that is a mixture of the effluent and receiving water for the determination of the CTR hardness-dependent metals criteria. Recent studies indicate that using the lowest recorded receiving water hardness for establishing water quality criteria is not always protective of the

[1] See 40 CFR 131.38(c)(4)(i)

receiving water under various mixing conditions (e.g. when the effluent hardness is less than the receiving water hardness). The studies evaluated the relationships between hardness and the CTR metals criterion that is calculated using the CTR metals equation. The equation describing the total recoverable regulatory criterion, as established in the CTR, is as follows:

$$\text{CTR Criterion} = e^{m[\ln(H)]+b} \qquad \text{(Equation 1)}$$

Where:

H = Design Hardness
b = metal- and criterion-specific constant
m = metal- and criterion-specific constant

The constants “m” and “b” are specific to both the metal under consideration, and the type of total recoverable criterion (i.e. acute or chronic). The metal-specific values for these constants are provided in the CTR at paragraph (b)(2), Table 1.

The relationship between the Design Hardness and the resulting criterion in Equation 1 can exhibit either a downward-facing (i.e., concave downward) or an upward-facing (i.e., concave upward) curve depending on the values of the criterion-specific constants. The curve shapes for acute and chronic criteria for the metals are as follows:

Concave Downward: cadmium (chronic), chromium (III), copper, nickel, and zinc

Concave Upward: cadmium (acute), lead, and silver (acute)

For those contaminants where the regulatory criteria exhibit a concave downward relationship as a function of hardness, use of the lowest recorded effluent hardness for establishment of water quality objectives is fully protective of all beneficial uses regardless of whether the effluent or receiving water hardness is higher. Use of the lowest recorded effluent hardness is also protective under all possible mixing conditions between the effluent and the receiving water (i.e., from high dilution to no dilution). Therefore, for cadmium (chronic), chromium (III), copper, nickel, and zinc, the reasonable worst-case ambient hardness can be estimated by using the lowest effluent hardness. The water quality criteria for these metals were calculated for this Order using Equation 1 and a reported minimum effluent hardness of 98 mg/L as $CaCO_3$, based on 247 samples obtained by the Discharger between 1 May 2002 and 31 January 2007.

For those metals where the regulatory criteria exhibit a concave upward relationship as a function of hardness, water quality objective based on either the effluent hardness or the receiving water hardness alone, would not be protective under all mixing scenarios. Instead, both the hardness of the receiving water and the effluent is required to determine the reasonable worst-case ambient hardness. In this case, using the lowest upstream receiving water hardness in Equation 2, below, is protective if the effluent hardness is ALWAYS higher than

the receiving water hardness. Under circumstances where the effluent hardness is not ALWAYS higher than the receiving water hardness, it may be appropriate to use the highest reported upstream receiving water hardness in Equation 2. The following equation provides fully protective water quality criteria for those metals that exhibit a concave upward relationship.

$$\text{CTR Criterion} = \left[\frac{m}{H_{rw}} \cdot \left(H_{eff} - H_{rw} \right) + 1 \right] \cdot e^{m \cdot \ln(H_{rw}) + b} \qquad \text{(Equation 2)}$$

Where:

H_{eff} = lowest recorded effluent hardness
H_{rw} = lowest recorded receiving water hardness
b = metal- and criterion-specific constant
m = metal- and criterion-specific constant

Therefore, for cadmium (acute), lead, and silver (acute) water quality criteria were calculated using Equation 2 with a lowest reported effluent hardness of 98 mg/L as $CaCO_3$ and a highest and lowest reported receiving water hardness of 240 and 90 mg/L as $CaCO_3$, respectively, based on twelve samples taken between January 2002 and December 2002.

c. **Assimilative Capacity/Mixing Zone.** Section 1.4.2 of the SIP specifies the requirements for establishing mixing zones and dilution credits. The allowance of mixing zones and dilution credits is discretionary and is determined on a discharge-by-discharge basis.

A dilution credit is a numerical value associated with the mixing zone that accounts for the receiving water entrained into the discharge. The dilution credit is a value used in the calculation of effluent limitations. Dilution credits may be limited or denied on a pollutant-by-pollutant basis.

Before establishing a mixing zone and dilution credit for a discharge, it must first be determined if, and how much receiving water is available to dilute the discharge. For determining year round mixing zones, the mixing zone and dilution credits must be determined using the parameters specified in Table 3 of Section 1.4.2.1 of the SIP.

The dilution method provided in the SIP assumes a constant diluting flow in the river, which is normal for most discharges. However, because the San Joaquin River is tidal, the flow of dilution water varies with the tidal cycle, resulting in river flow stagnation and very little dilution of effluent. Data provided by USGS Site No. 11304810 provides tidally filtered mean daily discharge data for the San Joaquin River just upstream of the discharge location. Receiving water flow data from 20 August 1995 through 20 September 2007 indicate a minimum tidally filtered daily discharge flow rate of -264 cubic feet per second (cfs) that occurred

on 22 August 2007. Further, a minimum 7-day average tidally filtered daily discharge flow rate of -58.43 cfs was recorded on the date ending 24 August 2007. These negative flow rates indicate low flow conditions in the receiving water and substantial tidal influence, which could result in multiple periods of flow stagnation and little to no dilution. Additionally, tidal action impacts receiving water with multiple doses of the effluent as the river flows downstream past the discharge, reverses moving upstream past the discharge a second time, then again reverses direction and passes the discharge point a third time as it moves down the river.

Evaluation of Available Dilution for Acute and Chronic Aquatic Life Criteria. During the previous permit renewal for Order No. R5-2002-0083, a "Box Model" by Jones & Stokes was created to attempt to quantify the effect of the multiple doses of effluent to the receiving water. However, due to the impaired condition of the San Joaquin River, the presence of endangered species, and the uncertainty regarding the reliability and accuracy of this "Box Model" study of the discharge and receiving water, the Regional Water Board did not grant dilution credits and mixing zones for the acute and chronic aquatic life criteria. The Discharger has not provided additional information to adequately demonstrate that dilution credits for the acute and chronic aquatic life criteria are appropriate. Therefore, this Order does not allow any dilution credits in the calculations of water quality-based effluent limitations based on acute and chronic aquatic life criteria.

Evaluation of Available Dilution for Priority Pollutant Human Health Criteria. For human health criteria, critical environmental impacts are expected to occur far downstream from the source such that complete mixing is a valid assumption. With regard to completely mixed discharges the SIP states, "*For completely-mixed discharges…the amount of receiving water available to dilute the effluent shall be determined by calculating the dilution ratio (i.e. the critical receiving water flow divided by the effluent flow)…*" The SIP recommends using the harmonic mean receiving water flow and the long-term arithmetic mean to calculate a dilution credit for human health criteria constituents. The previous permit, Order No. R5-2002-0083, granted a 10:1 dilution credit based on the San Joaquin River flows measured slightly upstream of the discharge during the period from November 1995 through June 2000 (848 cfs), which was the only data at that time, and the permitted design flow of 55 mgd (or 85 cfs). Order No. R5-2002-0083 also provisionally required the Discharger to conduct a human carcinogenic impact study that included at a minimum: 1) a human carcinogenic mixing zone evaluation and 2) an additive human carcinogenicity analysis to evaluate the relative carcinogenic risk of the combined discharge of multiple human carcinogens into the San Joaquin River. Order No. R5-2002-0083 required the human carcinogenic mixing zone evaluation to include, at minimum, a hydraulic analysis of the effluent discharged into the receiving water over a variety of flow conditions to delineate the extent of the corresponding human carcinogen criteria mixing zone.

In compliance, the Discharger submitted the "Evaluation of San Joaquin River Tidal Flow Dilution at the Stockton Regional Wastewater Control Facility" (Jones and Stokes, May 2005*),* and the human carcinogenic impact study final report, *Stockton Regional Wastewater Control Facility Human Carcinogen Impact Study Phase 2A: Basin Plan Calculation of Additive Toxicity Ratio* (EOA,Inc., 17 May 2006). In these studies, the Discharger tracked tidal movement during various tidal stages, estimated the cumulative tidal flow volume that moved past the discharge, analyzed the long-term average dilution flow, and evaluated the upstream flow at Vernalis combined with the diversions in the Old River to estimate the net flows within the vicinity of the discharges. Based on the findings of this study, there is available dilution for human health criteria.

The San Joaquin River flow data obtained slightly upstream of the discharge during the period from 20 August 1995 through 25 March 2008 was used to calculate the harmonic mean receiving water flow, as recommended in the SIP. The harmonic mean calculation is one over the average of the reciprocals of the running average flow rates; however, the strong tidal influence exerted on the San Joaquin River flows within the area of the discharge complicates this calculation. The calculation is relatively straightforward during the positive San Joaquin River flows, which occurs during the ebb-tide flows; however, the calculation is complex during the negative San Joaquin River flows, which may occur during flood-tide flows or drought years. When negative flow rate values occur, the "running average flow rate" can be positive or negative, and the average of the reciprocals of the running average flow rates can be close to zero. Thus, the harmonic mean calculated value may be artificially high or low (i.e. the harmonic mean of 1.01 and -1.00 is –202, or using the absolute value, the harmonic mean is 1.005). Each tidal period (either ebb-tide or flood-tide) is 6.2 hours, the daily tidal cycle is 24.8 hours, and the full lunar cycle is 28 days; therefore, using a 28-day running average flow rate in the harmonic mean calculation is appropriate to account for negative flows, which equates to an harmonic mean of 647 cfs. Based on the harmonic flow of 647 cfs (November 1995 to 25 March 2008) and a long-term arithmetic mean of 48.6 cfs (1 May 2002 to 31 January 2007), a dilution credit of up to 13.3:1 may be allowed. Based on the findings of the human carcinogenic mixing zone evaluation study and the human carcinogenic impact study, a dilution credit of 13:1 is protective of the MUN beneficial use. Therefore, the proposed Order grants a 13:1 dilution credit applicable to the human health criteria, with a mixing zone that extends approximately 3.5 miles upstream and 1 mile downstream of the discharge (within this section of the San Joaquin River, the downstream is wider than the upstream section). The estimated size of the mixing zone is based on the May 2005 study that estimated the tidal movement up and downstream from the discharge. The 13:1 dilution likely occurs much closer to the point of discharge. There are no known drinking water intakes in the vicinity of the discharge.

Evaluation of Available Dilution for Agricultural Water Quality Objectives. For constituents where water quality criteria are based on agricultural water quality objectives, critical environmental impacts are expected to occur far downstream from the source such that complete mixing is a valid assumption.

Regarding the application of a mixing zone, the TSD states that," …*the presence of mixing zones should not result in significant health risks, when evaluated using reasonable assumptions about exposure pathways. . .*". As previously stated, there are no known drinking water intakes in the vicinity of the discharge, but there is one agricultural water intake located near the discharge, which is used for flood irrigation in the spring time (depending on crop rotations). However, because protection of agricultural beneficial uses is based upon the long-term effects, for purposes of establishing WQBELs in this Order, dilution credits may be granted based on the San Joaquin River harmonic flow and a long-term arithmetic mean discharge (See Evaluation of Available Dilution for Priority Pollutant Human Health Criteria). Therefore, this Order grants a 13:1 dilution credit applicable to those constituents where water quality criteria are based on agricultural water quality objectives.

In granting a mixing zone, the SIP states that a mixing zone shall be as small as practicable, and meet the conditions provided in Section 1.4.2.2 as follows:

"A: A mixing zone shall not:

(1) compromise the integrity of the entire water body;
(2) cause acutely toxic conditions to aquatic life passing through the mixing zone;
(3) restrict the passage of aquatic life;
(4) adversely impact biologically sensitive or critical habitats, including, but not limited to, habitat of species listed under federal or State endangered species laws;
(5) produce undesirable or nuisance aquatic life;
(6) result in floating debris, oil, or scum;
(7) produce objectionable color, odor, taste, or turbidity;
(8) cause objectionable bottom deposits;
(9) cause nuisance;
(10) dominate the receiving water body or overlap a mixing zone from different outfalls; or
(11) be allowed at or near any drinking water intake. A mixing zone is not a source of drinking water. To the extent of any conflict between this determination and the Sources of Drinking Water Policy (Resolution No. 88-63), this SIP supersedes the provisions of that policy."

This Order only allows a mixing zone for human health and agricultural criteria (i.e. long-term criteria). This Order does not allow mixing zones for compliance with aquatic toxicity criteria. The mixing zone is as small as practicable, will not compromise the integrity of the entire water body, restrict the passage of aquatic life, dominate the waterbody or overlap existing mixing zones from different outfalls. No drinking water intakes are located within the mixing zone and the mixing zone does not overlap a mixing zone from a different outfall.

The discharge will not cause acutely toxic conditions to aquatic life passing through the mixing zone, because this Order does not allow an acute mixing zone and requires compliance with an acute toxicity effluent limitation and

requires acute bioassays using 100% effluent. Compliance with the acute toxicity effluent limitation assures the effluent is not acutely toxic.

The discharge will not adversely impact biologically sensitive or critical habitats, including, but not limited to, habitat of species listed under federal or State endangered species laws, because this Order does not allow mixing zones for compliance with aquatic toxicity criteria. The Discharger must meet stringent end-of-pipe effluent limitations for constituents that demonstrated reasonable potential to exceed aquatic toxicity criteria (i.e. ammonia, aluminum, cyanide, total residual chlorine).

The discharge will not produce undesirable or nuisance aquatic life, result in floating debris, oil, or scum, produce objectionable color, odor, taste, or turbidity, cause objectionable bottom deposits, or cause nuisance, because this Order requires end-of-pipe effluent limitations (e.g. for biochemical oxygen demand and total suspended solids) and discharge prohibitions to prevent these conditions from occurring.

As suggested by the SIP, in determining the extent of or whether to allow a mixing zone and dilution credit, the Regional Water Board has considered the presence of pollutants in the discharge that are carcinogenic, mutagenic, teratogenic, persistent, bioaccumulative, or attractive to aquatic organisms, and concluded that the allowance of the mixing zone and dilution credit is adequately protective of the beneficial uses of the receiving water.

The mixing zone therefore complies with the SIP. The mixing zone also complies with the Basin Plan, which requires that the mixing zone not adversely impact beneficial uses. Beneficial uses will not be adversely affected for the same reasons discussed above. In determining the size of the mixing zone, the Regional Water Board has considered the procedures and guidelines in the EPA's Water Quality Standards Handbook, 2d Edition (updated July 2007), Section 5.1, and Section 2.2.2 of the Technical Support Document for Water Quality-based Toxics Control (TSD). The SIP incorporates the same guidelines.

3. Determining the Need for WQBELs

a. CWA section 301 (b)(1) requires NPDES permits to include effluent limitations that achieve technology-based standards and any more stringent limitations necessary to meet water quality standards. Water quality standards include Regional Water Board Basin Plan beneficial uses and narrative and numeric water quality objectives, State Water Board-adopted standards, and federal standards, including the CTR and NTR. The Basin Plan includes numeric site-specific water quality objectives and narrative objectives for toxicity, chemical constituents, and tastes and odors. The narrative toxicity objective states: "*All waters shall be maintained free of toxic substances in concentrations that produce detrimental physiological responses in human, plant, animal, or aquatic life.*" (Basin Plan at III-8.00.) With regards to the narrative chemical constituents objective, the Basin Plan states that waters shall not contain chemical

constituents in concentrations that adversely affect beneficial uses. At minimum, "…*water designated for use as domestic or municipal supply (MUN) shall not contain concentrations of chemical constituents in excess of the maximum contaminant levels (MCLs)*" in Title 22 of CCR. The narrative tastes and odors objective states: "*Water shall not contain taste- or odor-producing substances in concentrations that impart undesirable tastes or odors to domestic or municipal water supplies or to fish flesh or other edible products of aquatic origin, or that cause nuisance, or otherwise adversely affect beneficial uses.*"

b. Federal regulations require effluent limitations for all pollutants that are or may be discharged at a level that will cause or have the reasonable potential to cause, or contribute to an in-stream excursion above a narrative or numerical water quality standard. Based on information submitted as part of the application, in studies, and as directed by monitoring and reporting programs, the Regional Water Board finds that the discharge has a reasonable potential to cause or contribute to an in-stream excursion above a water quality standard for aluminum, ammonia, bis (2-ethylhexyl) phthalate, chlorine (total residual), chlorodibromomethane, cyanide, dichlorobromomethane, electrical conductivity, manganese, molybdenum, and nitrate plus nitrite. Water quality-based effluent limitations (WQBELs) for these constituents are included in this Order. A summary of the reasonable potential analysis (RPA) is provided in Attachment G, and a detailed discussion of the RPA for each constituent is provided below.

c. The Regional Water Board conducted the RPA in accordance with Section 1.3 of the SIP. Although the SIP applies directly to the control of CTR priority pollutants, the State Water Board has held that the Regional Water Board may use the SIP as guidance for water quality-based toxics control.[2] The SIP states in the introduction "*The goal of this Policy is to establish a standardized approach for permitting discharges of toxic pollutants to non-ocean surface waters in a manner that promotes statewide consistency."* Therefore, in this Order the RPA procedures from the SIP were used to evaluate reasonable potential for both CTR and non-CTR constituents.

d. WQBELs were calculated in accordance with section 1.4 of the SIP, as described in Section IV.C.4 of this Fact Sheet.

e. **Aluminum.** The Secondary MCL for aluminum for the protection of the MUN beneficial use is 200 µg/L. In addition, USEPA developed National Recommended Ambient Water Quality Criteria (NAWQC) for protection of freshwater aquatic life for aluminum, and the recommended four-day average (chronic) and one-hour average (acute) criteria are 87 µg/L and 750 µg/L, respectively. However, information contained in the footnotes to the NAWQC indicate that the development of the chronic criterion was based on specific receiving water conditions where there is low pH (below 6.5) and low hardness levels (below 50 mg/L as CaCO3). The San Joaquin River (SJR) has been measured to have hardness values—typically between 57 and 152 mg/L as

[2] See, Order WQO 2001-16 (Napa) and Order WQO 2004-0013 (Yuba City).

$CaCO_3$. Because the hardness values in the SJR are higher (which decreases the toxic effects to aquatic life) than the water hardness values in which the criterion was developed, USEPA advises that a water effects ratio (WER) might be appropriate to better reflect the actual toxicity of aluminum to aquatic organisms.

In May 2006, the Arid West Water Quality Research Project produced a research report, *Evaluation of the EPA Recalculation Procedure in the Arid West Technical Report*, to update NAWQC based on more recent data, and to recalculate these NAWQC to reflect the resident species observed in arid West receiving waters. This research report states that "*speciation and/or complexation of aluminum is highly dependent on ambient water quality characteristics and ultimately determines the mechanism of toxicity. [Increased] Concentrations of calcium in the water was shown to decrease toxic effects to fish."* Based on the Arid West Technical Report, the Chronic Aluminum (total) Criterion Value is calculated as 1954 µg/L for a mean hardness value of 272 mg/L as $CaCO_3$, which is similar to the WER value calculated in Manteca's Phase II WER Study.

The City of Manteca completed an aluminum WER study (12 April 2007) for the San Joaquin River near its discharge point, which is located upstream of the Discharger's outfall. The Manteca WER study, which may be used to calculate a WER for the City of Manteca's discharge, indicated that a WER of 22.7 can be applied to the chronic criterion for aluminum. Since the characteristics of the river (e.g. hardness and pH) near Manteca are similar to those near the City of Stockton, the results of the Manteca WER study put into question the applicability of the stringent CCC recommended by the NAWQC for aluminum. Using the WER adjustment in accordance with the SIP, the applicable water quality criteria for aluminum for chronic exposure becomes 22.7 x 87 µg/L or 1975 µg/L.

Although the Arid West Technical Report has not been approved by USEPA nor has it received independent scientific peer review, based on its findings and the Manteca WER study, the Regional Water Board finds that there is uncertainty of the appropriateness of using the chronic criterion recommended in the NAWQC (87 µg/L). Therefore, for this RPA for aluminum, an acute and chronic criterion of 750 µg/L was used for protection of aquatic life and the secondary MCL of 200 µg/L was used for protection of MUN.

Based on 21 samples collected between 29 January 2002 and 2 August 2006, the MEC for aluminum was 2,900 µg/L. The maximum observed upstream receiving water aluminum concentration was 1,800 µg/L, based on 19 samples collected between 20 March 2002 and 2 August 2006. Therefore, aluminum in the discharge has a reasonable potential to cause or contribute to an in-stream excursion above a level necessary to protect aquatic life and the MUN beneficial use.

Based on the above information, using the chronic criterion recommended in the NAWQC (87 µg/L) is not appropriate for the receiving water. Therefore, this Order contains a final Average Monthly Effluent Limitation (AMEL) and Maximum

Daily Effluent Limitation (MDEL) for aluminum of 311 µg/L and 750 µg/L, respectively, based on USEPA's NAWQC of 750 ug/L for the protection of freshwater aquatic life (See Table F-7 of this Fact Sheet for WQBEL calculations). This Order also contains an annual average effluent limitation of 200 µg/L for aluminum, based on the Secondary MCL, for protection of the MUN beneficial use. In addition, this Order includes a reopener to consider a revision of the final effluent limitations for aluminum if additional information is provided by the Discharger, such as submission of a defensible water effects ratio study or defensible findings from an independent scientific peer review of the Arid West Technical Report, particularly the updated national ambient water quality criteria contained in Chapter 3 of that report.

Based on the sample results in the effluent, it appears that the Discharger may be in immediate non-compliance upon issuance of the permit. New or modified control measures may be necessary in order to comply with the effluent limitations, and the new or modified control measures cannot be designed, installed and put into operation within 30 calendar days. Furthermore, the effluent limitations for aluminum are a new regulatory requirement within this permit, which becomes applicable to the waste discharge with the adoption of this Order, which was adopted after 1 July 2000. Therefore, a compliance time schedule for compliance with the aluminum effluent limitations is established in TSO No. R5-2008-0155 in accordance with CWC section 13300, that requires preparation and implementation of a pollution prevention plan in compliance with CWC section 13263.3.

f. **Ammonia Nitrogen, Total (as N)***.* Untreated municipal wastewater contains ammonia. Nitrification is a biological process that converts ammonia to nitrite and nitrite to nitrate. Denitrification is a process that converts nitrate to nitrite or nitric oxide and then to nitrous oxide or nitrogen gas, which is then released to the atmosphere. The previous permit, Order No. R5-2002-0083, contained final effluent limitations for ammonia (as N), an AMEL of 2 mg/L (917 lbs/day) and an MDEL of 5 mg/L (2,294 lbs/day), and contained a provisional requirement to evaluate the effects that a nitrification facility would have and what additional treatment may be necessary. Because the Discharger could not immediately comply with the final effluent limitations, the Regional Water Board also issued Cease and Desist Order (CDO) No. R5-2002-0084 to provide a compliance schedule for construction and operation of the nitrification facilities. The CDO required full compliance with the ammonia limitations by 1 April 2007. The Discharger petitioned the State Water Board requesting review of these Orders. In response to the Discharger's petition, the State Water Board granted a stay for portions of the existing permit and the CDO (See previous section I.B of this Fact Sheet), and as a result, extended the compliance date with these ammonia effluent limitations to 10 August 2008. The Discharger has since added nitrification facilities, which include nitrifying biotowers and engineered wetlands; thus, the Discharger now nitrifies to remove ammonia from the waste stream to meet the ammonia limits in Order No. R5-2002-0083.

Inadequate or incomplete nitrification may result in the discharge of ammonia to the receiving stream. Ammonia is known to cause toxicity to aquatic organisms in surface waters. Discharges of ammonia would violate the Basin Plan narrative toxicity objective. Therefore, the discharge has the reasonable potential to cause or contribute to an exceedance of the Basin Plan's narrative toxicity objective. Applying CFR Part 122.44(d)(1)(vi)(B), it is appropriate to use USEPA's Ambient National Water Quality Criteria for the Protection of Freshwater Aquatic Life for ammonia, which was developed to be protective of aquatic organisms.

USEPA's *Ambient Water Quality Criteria for the Protection of Freshwater Aquatic Life*, for total ammonia, recommends acute standards (1-hour average; criteria maximum concentration) based on pH, and chronic standards (30-day average, criteria continuous concentration) based on pH and temperature. It also recommends a maximum four-day average concentration of 2.5 times the criteria continuous concentration. USEPA found that as pH increased, both the acute and chronic toxicity of ammonia increased. Salmonids were more sensitive to acute toxicity effects than other species. However, while the acute toxicity of ammonia was not influenced by temperature, it was found that invertebrates and young fish experienced increasing chronic toxicity effects with increasing temperature. The beneficial uses of the San Joaquin River downstream of the discharge include migration of aquatic organisms, and spawning, reproduction, and/or early development. Thus, because the presence of salmonids and early fish life stages in San Joaquin River within the vicinity of the discharge is well-documented, the recommended criteria for waters where salmonids and early life stages are present were used. USEPA's recommended criteria are shown below:

$$CCC_{30-day} = \left(\frac{0.0577}{1+10^{7.688-pH}} + \frac{2.487}{1+10^{pH-7.688}} \right) \times MIN\left(2.85, 1.45 \cdot 10^{0.028(25-T)}\right), \text{ and}$$

$$CMC = \left(\frac{0.275}{1+10^{7.204-pH}} + \frac{39.0}{1+10^{pH-7.204}} \right),$$

where T is in degrees Celsius

Previous Order No. R5-2002-0083 demonstrated that the effluent discharge has reasonable potential to exceed ammonia water quality criteria in the receiving water through four separate methods: (1) identifying toxicity in the RWCF effluent using "real-time" data (ammonia, pH, and temperature occurring simultaneously), (2) identifying toxicity in the receiving water using "real-time" data, (3) showing reasonable potential based on critical conditions that are a combination of worst-case observations, and (4) evaluation based on the expected receiving water pH and temperature occurring under drought flow conditions. The complex derivation of the final ammonia effluent limitations were based on these four methods and the Discharger's cost-effective analysis of upgrading the Facility. As a result, previous Order No. R5-2002-0083 required the same ammonia-N effluent limits as the 1994 permit, MDEL of 5 mg/L and an AMEL of 2 mg/L, which became effective August 2008. By letter dated 22 March 2002, EPA

Region IX concurred with the methodology for calculating the WQBELs for ammonia.

Since issuance of the previous Order No. R5-2002-0083, additional "real time" data for both the effluent and receiving water was obtained, and therefore, the effluent and receiving water monitoring data from September 1992 through December 2007 were evaluated to determine the accuracy of the evaluation of the acute and chronic ammonia criteria. An acute ammonia toxicity criterion was calculated for each receiving water pH value using the CMC equation based on salmonids present. A chronic toxicity criterion was calculated for each paired receiving water 30-day average temperature and pH using the CCC equation based on early life stages present. A total of 619 receiving water ammonia concentration samples (either R2 or R2a, whichever was greater) were compared to its paired acute and 30-day average chronic criteria for ammonia. Table F-4 below lists the occurrences where the receiving water ammonia concentration exceeded the ammonia criteria.

Table F-4. Summary of Ammonia Effluent Limit Derivations

Date	Year Hydrological Type	Ammonia Concentrations (mg/L as N)			Ammonia Criteria (mg/L as N)	
		Effluent Daily	Receiving Water Daily	Receiving Water Monthly Average	Acute	30-day Average Chronic
Jan-00	Above Normal	24.7	5.9	5.9	17.5	5.1
Jan-04	Dry	24.4	6.5	4.4	13	4.2
Feb-04	Dry	26	7.2	4.9	13.5	4.1
Feb-04	Dry	26	4.3	5.2	12	3.4
Feb-04	Dry	25.2	5.5	5.5	12.8	3.4

As indicated in Table F-4 above, at times the chronic criterion was exceeded in the receiving water. However, these exceedances occurred during periods of high effluent concentrations of ammonia, as much as five times the MDEL allowed in the previous Order. As previously discussed in this Fact Sheet, the Discharger upgraded the Facility in September 2006 to meet the final ammonia effluent limits. Further evaluation of 72 paired effluent and receiving water samples obtained after the Facility's upgrade (18 September 2006) yields a maximum daily effluent concentration value of 12.5 mg/L and an average value of 3.37 mg/L, and a receiving water maximum concentration of 0.9 mg/L and an average value of 0.35 mg/L. Based on this evaluation, the ammonia effluent limitations at a MDEL of 5 mg/L and an AMEL of 2 mg/L are fully protective of the beneficial uses, and therefore, this Order carries forward these limitations from the previous Order.

Research has demonstrated that ammonia can inhibit growth of marine diatoms at ammonia concentrations in the receiving water much lower than ammonia concentrations that impact fish species. Studies are in progress examining possible impacts of ammonia on growth of fresh water diatoms that exist in the

Delta in the vicinity of this discharge. The Delta has a relative low primary productivity for an estuarine environment. If ammonia inhibition of fresh water diatoms does occur, it is possible that lowered primary productivity from diatom inhibition could be a contributing factor to Delta pelagic organism decline. Studies are ongoing to evaluate the effect of ammonia on the inhibition of growth of freshwater diatoms in the Delta, as well as, studies to evaluate the sensitivity of delta smelt to ammonia toxicity. Based on the result of these or other studies, this Order may be reopened to reconsider the ammonia effluent limitations.

g. **Bis (2-ethylhexyl) phthalate.** Bis (2-ethylhexyl) phthalate is used primarily as one of several plasticizers in polyvinyl chloride (PVC) resins for fabricating flexible vinyl products. According to the Consumer Product Safety Commission, USEPA, and the Food and Drug Administration, these PVC resins are used to manufacture many products, including soft squeeze toys, balls, raincoats, adhesives, polymeric coatings, components of paper and paperboard, defoaming agents, animal glue, surface lubricants, and other products that must stay flexible and noninjurious for the lifetime of their use. The State MCL for bis (2-ethylhexyl) phthalate is 4 µg/L and the USEPA MCL is 6 µg/L. The NTR criterion for human health protection for consumption of water and aquatic organisms is 1.8 µg/L and for consumption of aquatic organisms only is 5.9 µg/L. The previous Order contained a daily maximum effluent limitation of 48 µg/L.

The MEC for bis (2-ethylhexyl) phthalate was 5.5 µg/L, based on 61 samples collected between 1 May 2001 and 14 June 2006, while the maximum observed upstream receiving water bis (2-ethylhexyl) phthalate concentration was 3.2 µg/L, based on 21 samples collected between 22 May 2002 and 15 November 2006. Therefore, the discharge has a reasonable potential to cause or contribute to an in-stream excursion above the NTR criterion for bis (2-ethylhexyl) phthalate.

Section 1.4.3.2 of the SIP states that the ambient background concentration shall be set equal to the arithmetic mean of the individual reported measure or estimated concentration. All ambient background samples were reported below the reported detection limits (non-detects) except for the sample obtained on 10 November 2004, and therefore, the arithmetic mean concentration is set at that concentration value of 3.2 µg/L. Per the SIP, no dilution is allowed since the arithmetic mean exceeds the bis (2-ethylhexyl) phthalate criterion. This Order includes an AMEL and MDEL for bis (2-ethylhexyl) phthalate of 1.8 µg/L and 3.6 µg/L, respectively, based on the NTR criterion for the protection of human health (see Table F-8 for WQBEL calculations).

Based on the sample results in the effluent, it appears that the Discharger may be in immediate non-compliance upon issuance of the permit. New or modified control measures may be necessary in order to comply with the effluent limitations, and the new or modified control measures cannot be designed, installed and put into operation within 30 calendar days. Furthermore, the effluent limitations for bis (2-ethylhexyl) phthalate are a new regulatory requirement within this permit, which becomes applicable to the waste discharge with the adoption of this Order, which was adopted after 1 July 2000. Therefore,

a compliance time schedule for compliance with the bis (2-ethylhexyl) phthalate effluent limitations is established in TSO No. R5-2008-0155 in accordance with CWC section 13300, that requires preparation and implementation of a pollution prevention plan in compliance with CWC section 13263.3.

h. **Chlorodibromomethane (Dibromochloromethane).** A performance-based MDEL of 23 µg/L was applied in the previous Order and monitoring requirements were established to evaluate the reasonable potential of chlorodibromomethane to exceed water quality criteria. The CTR includes a chlorodibromomethane criterion of 0.41 µg/L for the protection of human health and is based on a one-in-a-million cancer risk for waters from which both water and organisms are consumed. The MEC for chlorodibromomethane was 29 µg/L, based on 60 samples collected between 20 March 2002 and 15 November 2006 while concentrations were not detected in 26 receiving water samples (non-detects) collected during this same period. The reported detection levels ranged from 0.5 µg/L to 0.03 µg/L; accordingly, the ambient background concentration was set at 0.03 µg/L (per SIP section 1.4.3.2). Therefore, the discharge has a reasonable potential to cause or contribute to an in-stream excursion above the CTR criterion for chlorodibromomethane.

A dilution credit for chlorodibromomethane of up to 13:1 can be granted, based on the available human health dilution (see Section IV.C.2.c). An AMEL and MDEL for chlorodibromomethane of 5.0 µg/L and 16 µg/L, respectively, are included in this Order based on the CTR criterion for the protection of human health (see Table F-9 for WQBEL calculations). These more stringent effluent limitations are necessary to be consistent with the SIP and the antidegradation requirements. The CTR criterion for fish consumption only is 34 µg/L, therefore, these effluent limits are protective of human health for the consumption of fish caught within the human health mixing zone.

Based on the sample results in the effluent, it appears that the Discharger may be in immediate non-compliance upon issuance of the permit. New or modified control measures may be necessary in order to comply with the effluent limitations, and the new or modified control measures cannot be designed, installed and put into operation within 30 calendar days. Furthermore, the effluent limitations for chlorodibromomethane are a new regulatory requirement within this permit, which becomes applicable to the waste discharge with the adoption of this Order, which was adopted after 1 July 2000. Therefore, a compliance time schedule for compliance with the chlorodibromomethane effluent limitations is established in TSO No. R5-2008-0155 in accordance with CWC section 13300, that requires preparation and implementation of a pollution prevention plan in compliance with CWC section 13263.3.

i. **Chlorine Residual.** The Discharger uses chlorine for disinfection, which is extremely toxic to aquatic organisms. The Discharger uses a sulfur dioxide process to dechlorinate the effluent prior to discharge to the San Joaquin River. Due to the existing chlorine use and the potential for chlorine to be discharged, the discharge has a reasonable potential to cause or contribute to an in-stream

excursion above the Basin Plan's narrative toxicity objective.

The USEPA *Technical Support Document for Water Quality-Based Toxics Control* [EPA/505/2-90-001] contains statistical methods for converting chronic (4-day) and acute (1-hour) aquatic life criteria to average monthly and maximum daily effluent limitations based on the variability of the existing data and the expected frequency of monitoring. However, because chlorine is an acutely toxic constituent that can and will be monitored continuously, an average 1-hour limitation is considered more appropriate than a maximum daily limitation; and a 4-day limitation is considered more appropriate than an average monthly effluent limitation. Therefore, an average 1-hour effluent limitation of 0.02 mg/L and an average 4-day effluent limitation of 0.01 mg/L for chlorine are included in this Order based on the criteria. Based on data reported during the previous permit term, it appears as if the Discharger can immediately comply with these new effluent limitations for chlorine residual.

The chlorine residual limitations required in this Order are protective of aquatic organisms in the undiluted discharge. If compliance is maintained, the Regional Water Board does not anticipate residual chlorine impacts to benthic organisms.

j. **Chloride. (see Subsection aa, below, for Salinity)**

k. **Chloroform. (see Subsection gg, below, for Total Trihalomethanes)**

l. **Copper, Total Recoverable.** The CTR includes hardness-dependent criteria for the protection of freshwater aquatic life for copper. The criteria for copper are presented in dissolved concentrations. USEPA recommends conversion factors to translate dissolved concentrations to total concentrations. The USEPA default conversion factors for copper in freshwater are 0.96 for both the acute and the chronic criteria. Using the reasonable worst-case ambient hardness, estimated here as the lowest effluent hardness (98 mg/L as $CaCO_3$), and the USEPA recommended dissolved-to-total translator, the applicable chronic criterion (maximum 4-day average concentration) is 9.17 µg/L and the applicable acute criterion (maximum 1-hour average concentration) is 13.74 µg/L, as total recoverable.

The MEC for total copper was 6.3 µg/L, based on 67 samples collected between 20 March 2002 and 10 January 2007, while the maximum observed upstream receiving water total copper concentration was 5 µg/L, based on 10 samples collected between 20 March 2002 and 4 December 2002. Therefore, the discharge does not demonstrate reasonable potential to cause or contribute to an in-stream excursion above the CTR criteria for copper.

Therefore, based on new information and the procedures established in Section 1.3 of the SIP for determining reasonable potential, the discharge no longer demonstrates reasonable potential to exceed water quality criteria for copper. The removal of the effluent limitations for copper is in compliance with 40 CFR 122.44(l)(2)(i)(B)(1).

m. **Cyanide, Total Recoverable.** The CTR includes maximum 1-hour average and 4-day average cyanide concentrations of 22 µg/L and 5.2 µg/L, respectively, for the protection of freshwater aquatic life. The MEC for cyanide was 13 µg/L, based on 120 samples collected between 20 January 2002 and 30 June 2008, while the maximum observed upstream receiving water cyanide concentration was 300 µg/L, based on 10 samples collected between 20 March 2002 and 4 December 2002. Therefore, the discharge has a reasonable potential to cause or contribute to an in-stream excursion above the CTR criteria for cyanide. Previous Order No. R5-2002-0083 contains final limits for cyanide that became effective 1 May 2006, an AMEL of 4.0 µg/L and a MDEL of 9.2 µg/L. However, based on the procedures in the SIP, and on recent effluent data, this Order contains cyanide effluent limitations recalculated as an MDEL at 9.0 µg/L and an AMEL at 4.1 µg/L (see Table F-11 for WQBEL calculations).

To comply with the requirements of the previous Order No. R5-2002-0083, the Discharger developed a pollution prevention plan for cyanide, which included a source identification study and mass balance of influent loadings. Based on the findings of this study, the Discharger concluded that 71% of the cyanide influent load is from residential sources, 12% is from commercial sources, and 7% is from the industrial dischargers. As such, implementation of local limits or other industrial source control may not have a significant impact in overall cyanide reduction.

To determine if the cyanide exceedences are actually a function of sample preservation techniques ("Cyanide Formation and Fate in Complex Effluents and its Relation to Water Quality," Water and Environmental Research Foundation, 2003), the Discharger is currently investigating the feasibility of modifying its analytical procedures. In addition to modifying analytical procedures, which in the City's case would require construction of new laboratory facilities, the City will also evaluate operational modifications that can be made to their filtration and disinfection facilities to reduce cyanide formation. The City will also evaluate the benefits and feasibility of switching its current chlorine-based disinfection system to alternative disinfection, and if necessary, construct alternative disinfection facilities. The previous Order No. R5-2002-0083 cyanide effluent limitation has been modified in this Order, and based on the sample results in the effluent, it appears that the Discharger may be in immediate non-compliance upon issuance of the permit. Because new or modified control measures may be necessary as proposed in order to comply with the effluent limitations, and the new or modified control measures cannot be designed, installed and put into operation within 30 calendar days, a compliance time schedule for compliance with the cyanide effluent limitations is established in TSO No. R5-2008-0155 in accordance with CWC section 13300, that requires preparation and implementation of a pollution prevention plan in compliance with CWC section 13263.3.

n. **Diazinon.** The Basin Plan requires the Regional Water Board to consider relevant numerical criteria and guidelines developed by other agencies in determining compliance with the narrative toxicity objective (Basin Plan, IV-17.00). In March 2000, the California Department of Fish and Game (DFG)

established acute and chronic criteria for diazinon to protect fresh water aquatic life. The acute (1-hour average) and chronic (4-day average) criteria are 0.08 µg/L and 0.05 µg/L, respectively. Order No. R5-2002-0083 established a MDEL of 0.1 µg/L.

The MEC for diazinon was <0.25 µg/L, based on 57 samples collected between 22 May 2002 and 10 January 2007, and no diazinon concentrations was detected in the upstream receiving water monitoring results, <0.25 µg/L, based on three samples collected between 22 May 2002 and 13 November 2002. Based on new information and the procedures established in Section 1.3 of the SIP for determining reasonable potential, the discharge no longer demonstrates reasonable potential to exceed water quality criteria for diazinon. The removal of the effluent limitations for diazinon is in compliance with 40 CFR 122.44(l)(2)(i)(B)(1).

o. **Dichlorobromomethane (Bromodichloromethane).** A performance-based MDEL of 82 µg/L was applied in the previous Order and monitoring requirements were established to evaluate the reasonable potential of dichlorobromomethane to exceed water quality criteria. The CTR includes a dichlorobromomethane criterion of 0.56 µg/L for the protection of human health and is based on a one-in-a-million cancer risk for waters from which both water and organisms are consumed. The MEC for dichlorobromomethane was 36 µg/L, based on 82 samples collected between 20 March 2002 and 13 May 2008; while dichlorobromomethane concentrations were not detected in the upstream receiving water monitoring samples. Therefore, the discharge demonstrates a reasonable potential to cause or contribute to an in-stream excursion above the CTR criterion for dichlorobromomethane.

A dilution credit for dichlorobromomethane of up to 13:1 can be granted, based on the available human health dilution (see Section IV.C.2.c). An AMEL and MDEL for dichlorobromomethane of 6.8 µg/L and 20 µg/L, respectively, are included in this Order based on the CTR criterion for the protection of human health (See Table F-10 for WQBEL calculations). These more stringent effluent limitations are necessary to be consistent with the SIP and antidegradation requirements. The CTR criterion for fish consumption only is 46 µg/L, therefore, these effluent limits are protective of human health for the consumption of fish caught within the human health mixing zone.

Based on the sample results in the effluent, it appears that the Discharger may be in immediate non-compliance upon issuance of the permit. New or modified control measures may be necessary in order to comply with the effluent limitations, and the new or modified control measures cannot be designed, installed and put into operation within 30 calendar days. Furthermore, the effluent limitations for dichlorobromomethane are a new regulatory requirement within this permit, which becomes applicable to the waste discharge with the adoption of this Order, which was adopted after 1 July 2000. Therefore, a compliance time schedule for compliance with the dichlorobromomethane effluent limitations is established in TSO No. R5-2008-0155 in accordance with

CWC section 13300, that requires preparation and implementation of a pollution prevention plan in compliance with CWC section 13263.3.

p. **1,1-Dichloroethylene (1,1-DCE).** The CTR includes a 1,1-dichloroethylene criterion of 0.057 µg/L for the protection of human health and is based on a one-in-a-million cancer risk for waters from which both water and organisms are consumed. Based on performance data collected between April 1994 and April 2000, the previous order established an interim MDEL of 14.5 µg/L.

1,1-dichloroethylene was not detected in the effluent and the maximum detection level was <0.06 µg/L, based on 68 samples collected between 20 March 2002 and 10 January 2007. Also, 1,1-dichloroethylene was not observed in the upstream receiving water concentration and the maximum detection level was <0.06 µg/L, based on 26 samples collected between 20 March 2002 and 15 November 2006. Based on new information and the procedures established in Section 1.3 of the SIP for determining reasonable potential, the discharge no longer demonstrates reasonable potential to exceed water quality criteria for 1,1-dichloroethylene. The removal of the effluent limitations for 1,1-dichloroethylene is in compliance with 40 CFR 122.44(l)(2)(i)(B)(1).

q. **Dichloromethane (Methylene Chloride).** The CTR includes a criterion of 4.7 µg/L for dichloromethane for the protection of human health and is based on a one-in-a-million cancer risk for waters from which both water and organisms are consumed. Previous Order No. R5-2002-0083 established an MDEL of 25 µg/L, and an AMEL of 14.5 µg/L.

Dichloromethane was not detected in the effluent and the maximum detection level was <0.5 µg/L, based on 68 samples collected between 20 March 2002 and 10 January 2007. The maximum observed upstream receiving water dichloromethane concentration was 0.12 µg/L, based on 10 samples collected between 20 March 2002 and 4 December 2002. Based on new information and the procedures established in Section 1.3 of the SIP for determining reasonable potential, the discharge no longer demonstrates reasonable potential to exceed the CTR criterion for dichloromethane. Therefore, effluent limitations are not necessary. The removal of the effluent limitations for dichloromethane is in compliance with 40 CFR 122.44(l)(2)(i)(B)(1).

r. **Dissolved Oxygen.** Board Resolution No. R5-2005-0005 was adopted on 27 January 2005 by the Regional Water Board, and approved by the USEPA on 7 February 2007. Board Resolution No. R5-2005-0005 establishes a TMDL for factors contributing to the dissolved oxygen impairment in the Stockton Deep Water Ship Channel portion of the San Joaquin River. The TMDL is applicable to the Facility's discharge, but does not apply direct minimum limitations on DO concentrations in the effluent. However, the Basin Plan identifies objectives for dissolved oxygen in the SJR, between Turner Cut and Stockton. The previous permit, Order No. R5-2002-0083, contained effluent limitations for dissolved oxygen of 6.0 mg/L from 1 September through 30 November and 5.0 mg/L throughout the remainder of the year.

The minimum DO concentration observed was 1.8 mg/L based on 1,498 samples collected between 1 May 2002 through 31 January 2007. The discharge demonstrates reasonable potential to exceed water quality objectives contained in the Basin Plan. Therefore, the daily minimum effluent limitations for dissolved oxygen contained in the previous permit, Order No. R5-2002-0083, are retained in this Order, and are based on the Basin Plan water quality objectives for dissolved oxygen concentrations in the San Joaquin River.

s. **Electrical Conductivity. (see Subsection bb., below, for Salinity)**

t. **Manganese, Total Recoverable.** The applicable water quality objective for manganese contained in Table III-1 of the Basin Plan is 50 µg/L (as dissolved). In the absence of a specific translator for manganese, a translator of 1 is assumed (i.e., the applicable objective for manganese in the total form is equal to 50 µg/L). The MEC for manganese was 180 µg/L (reported as total), based on 23 samples collected between 29 January 2002 and 14 November 2006. The maximum observed upstream receiving water manganese concentration was 240 µg/L (as total), based on 10 samples collected between 20 March 2002 and 4 December 2002.

To determine the assimilative capacity of the San Joaquin River for manganese, the Discharger conducted additional upstream receiving water monitoring during the period 7 December 2005 through 2 August 2006, and measured manganese as total and dissolved. The results of this study were provided as part of their report of waste discharge, and the arithmetic mean of the observed upstream receiving water concentration for dissolved manganese was reported as 7 µg/L. The dissolved data for the receiving water indicates assimilative capacity exists in the receiving water for manganese. Therefore, a dilution credit for manganese of up to 13:1 can be granted, based on the available human health dilution (as discussed in Section IV.C.2.c above). In accordance with 40 CFR 122.45(c), the WQBEL in dissolved form was converted to the total form using the assumed translator of one. Based on the allowable dilution credit, an MDEL of 1308 µg/L is calculated. However, the Regional Water Board finds that granting of this dilution credit could allocate an unnecessarily large portion of the receiving water's assimilative capacity for manganese and could violate the Antidegradation Policy. For this reason, a performance-based effluent limitation (mean plus 3.3 standard deviations) is included in this Order., An MDEL for total manganese of 286 µg/L is included in this Order based on Basin Plan objectives for the protection of human health. Based on the sample results for the effluent, it appears the Discharger can meet this new limitation.

u. **Mercury, Total.** The current USEPA Ambient Water Quality Criteria for Protection of Freshwater Aquatic Life, continuous concentration, for mercury is 0.77 µg/L (30-day average, chronic criteria). The CTR contains a human health criterion (based on a one-in-a-million cancer risk) of 0.050 µg/L for waters from which both water and aquatic organisms are consumed. Both values are controversial and subject to change. In 40 CFR Part 131, USEPA acknowledges that the human health criteria may not be protective of some aquatic or

endangered species and that "…*more stringent mercury limits may be determined and implemented through use of the State's narrative criterion.*" In the CTR, USEPA reserved the mercury criteria for freshwater and aquatic life and may adopt new criteria at a later date.

From 20 March 2002 through 10 January 2007, the Discharger collected 67 effluent samples for total mercury. The maximum observed effluent mercury concentration was 0.013 µg/L (March 2002). The Stockton Deep Water Ship Channel portion of the Delta Waterways, which is about 1.5 miles downstream of the discharge, has been listed as an impaired water body pursuant to Section 303(d) of the Clean Water Act because of mercury. Mercury bioaccumulates in fish tissue, and therefore, the discharge of mercury to the receiving water is likely to contribute to exceedances of the narrative toxicity objective and impacts on beneficial uses. Because the Stockton Deep Water Ship Channel has been listed as an impaired water body for mercury, the discharge must not cause or contribute to increased mercury levels.

The SIP, Section 1.3, requires the establishment of an effluent limitation for a constituent when the receiving stream background water quality exceeds an applicable criterion or objective. Order No. R5-2002-0083 established a mass-based effluent limitation of 0.92 lbs/year for mercury based on the average flow rate for the period (33.2 mgd) and average discharge concentration for the period (0.0094 µg/L). In addition, the Discharger was required to perform an offset program feasibility and development study with the intention of mitigating the mass loading of mercury in effluent above the interim mass limitation. The Facility submitted the study in September 2006. The study identifies potentially feasible and unlikely feasible offset projects. The feasibility is primarily associated with legal liability concerns, regulatory constraints, applicable policies, and unwilling landowners. The report concludes that due to the uncertainty as to the viability of any offset projects, any future TMDL requirements, and future offset policies, it would be premature to propose permit conditions based on the current report. Therefore, the interim mass-based effluent limitation of 0.92 lbs/year is retained in this Order. This limitation is based on maintaining the mercury loading at the current level until a TMDL can be established and USEPA develops mercury standards that are protective of human health. Compliance time schedules have not been included since the discharge currently meets the water quality criteria and the mass limitation. If USEPA develops new water quality standards for mercury, the Regional Water Board adopts a Delta methylmercury TMDL or if the Regional Water Board determines that a mercury offset program is feasible for dischargers subject to a NPDES permit, this Order may be reopened to reevaluate the interim mercury mass loading limitation(s) and the need for a mercury offset program. The previous Order No. R5-2002-0083 established a mercury banking program to allow the Discharger to comply with the terms of that Order, to allow for growth, and to do so in a way that effectively removes the mercury from the watershed. The mercury banking program accumulated the difference between the interim mass limit (0.92 lbs/year) and the mercury mass discharges below that limit, and allowed the accumulative total (banked mercury loadings) to be used to offset mercury loads

above the interim mass limit. At the time the interim mass limit was established, there was relatively little mercury monitoring data to evaluate whether the Discharger could comply with the mass limit over the long term. Based on 67 analytical monitoring results for total mercury collected by the Discharger from 22 May 2002 through 10 January 2007, the annual mass discharge of total mercury was significantly below the 0.92 lbs/year interim limit, and thus, demonstrate that the Discharger can easily meet the mercury interim limit. Therefore, the mercury banking provisions are not necessary.

v. **Molybdenum, Total Recoverable.** Molybdenum is a naturally occurring trace element, and one of 15 elements known to be essential to plant growth. While essential in trace concentrations, excess concentrations are known to bioaccumulate in certain plant species, causing molybdenosis in ruminants (especially cattle) grazing on forage containing concentrations above 10 parts per million (ppm). Studies indicate the impact of molybdenum contamination of forage depends on the quality and amount of irrigation water applied to the field, as well as on the type and leachability of the soil. *Water Quality for Agriculture,* Food and Agriculture Organization of the United Nations—Irrigation and Drainage Paper No. 29, Rev. 1 (R.S. Ayers and D.W. Westcot, Rome, 1985), recommends that the molybdenum concentration in waters used for agricultural irrigation not exceed 10 µg/L. Applying the Basin Plan "Policy for Application of Water Quality Objectives", the numeric standard that implements the narrative objective is the Agricultural Water Quality Goal of 10 µg/L.

The MEC for molybdenum was 13 µg/L, based on 68 samples collected between 19 November 2002 and 10 January 2007. Therefore, the discharge has a reasonable potential to cause or contribute to an in-stream excursion above the Basin Plan's chemical constituents objective. During the period from January 2006 through July 2006, the maximum background concentration of molybdenum was reported as 2.2 µg/L (2 July 2006), and the mean concentration was reported as 1.3 µg/L considering 8 sampling events. Results of the monitoring for molybdenum in the receiving water upstream of the Facility outfall indicate the San Joaquin River has assimilative capacity for molybdenum.

As discussed in Section IV.C.2.c. above, the effluent limitation calculation procedures in Section 1.4 of the SIP allow for the granting of a dilution credit for molybdenum based on the harmonic mean flow of the San Joaquin River and the arithmetic mean flow of the effluent. Based on the allowable dilution credit of up to 13:1, an AMEL and MDEL of 114 µg/L and 198 µg/L, is calculated respectively. However, the Regional Water Board finds that granting of this dilution credit could allocate an unnecessarily large portion of the receiving water's assimilative capacity for molybdenum and could violate the Antidegradation Policy. Using a statistical method (mean plus 3.3 standard deviations), the MDEL is calculated at 11 µg/L; but because it is below the MEC of 13 µg/L, the MDEL for molybdenum established in this Order is 13 µg/L, which is the MEC.

w. **Nitrate plus Nitrite (as N).** Untreated domestic wastewater contains ammonia. Nitrification is a biological process that converts ammonia to nitrite and nitrite to nitrate. Denitrification is a process that converts nitrate to nitrite or nitric oxide and then to nitrous oxide or nitrogen gas, which is then released to the atmosphere. Nitrate and nitrite are known to cause adverse health effects in humans. The California DPH has adopted a Primary MCL at Title 22 of the CCR, Table 64431-A, for the protection of human health for nitrate plus nitrite (sum as nitrogen) of 10,000 µg/L.

USEPA has developed a primary MCL and a MCL goal of 1,000 µg/L for nitrite (as nitrogen). For nitrate, USEPA has developed a Drinking Water Standards Primary MCL and an Ambient Water Quality Criteria for protection of human health non-cancerous effects of 10,000 µg/L. Furthermore, recent toxicity studies have indicated a possibility that nitrate is toxic to aquatic organisms.

Inadequate or incomplete denitrification may result in the discharge of nitrate and/or nitrite to the receiving stream. The conversion of ammonia to nitrites and the conversion of nitrites to nitrates present a reasonable potential for the discharge to cause or contribute to an in-stream excursion above the Primary MCLs for nitrate plus nitrite.

Previous Order No. R5-2002-0083 required the Discharger to evaluate existing and future levels of nitrate in the discharge to determine if it would cause or contribute to an in-stream excursion above a narrative or numeric water quality standard. The Discharger submitted the final report, *Nitrate Analysis for the Stockton Regional Wastewater Control Facility*, dated December 2004. The Discharger states in this report that as the Facility's nitrification system is completed and ammonia concentrations are nitrified, the resulting "*effluent nitrate will likely exceed the MCL value of 10 mg/L during most of the year*". . . but "*will be less than 10 mg/L during the summer months, when the pond removal of both ammonia and nitrate is greatest*. " The Discharger added nitrification facilities, which include biological trickling filter towers with plastic filter medium and engineered wetlands. Both nitrification facilities were on-line by 18 September 2006.

Subsequent samples (72 total) obtained by the Discharger from 18 September 2006 through 31 January 2008, resulted in MECs for nitrate and nitrite of 29 mg/L (29 January 2007) and 4.0 mg/L (14 March 2007), respectively, and a total of 384 samples obtained during this same period resulted in a MEC for ammonia of 17 mg/L (6 January 2007). Based on this data, the discharge has a reasonable potential to cause or contribute to an in-stream excursion above the nitrate plus nitrite criterion.

The maximum observed upstream receiving water nitrate and nitrite concentration was 4.2 mg/L and 0.1 mg/L respectively, based on 162 samples collected between 20 March 2002 and 9 January 2006. These results indicate that the receiving water has assimilative capacity for nitrate plus nitrite. Based on the dilution credit applicable to the human health criteria and the fact that

modeling and field observations have shown that complete mixing is assured prior to the nearest possible drinking water intake, a dilution credit of up to 13:1 may be allowed (see Section IV.C.2.c of this Fact Sheet) in calculation of the WQBELs for nitrate plus nitrite, resulting in an AMEL for nitrate plus nitrite of 113 mg/L. However, allocating the full assimilative capacity for nitrate plus nitrite is not consistent with the Antidegradation Policy (Resolution 68-16), and based on Facility performance, the Discharger can meet a more stringent performance-based effluent limitation. For this reason, a statistically calculated (mean plus 3.3 standard deviations) performance-based effluent limitation is included in this Order. Therefore, based on a mean of 14.8 µg/L and the standard deviation of 7.45 µg/L, an MDEL for nitrate plus nitrite (as N) of 40 mg/L is included in this Order. This effluent limitation is based on the MCL and is necessary to assure the treatment process adequately nitrifies and denitrifies the waste stream to protect the potential beneficial use of municipal and domestic supply.

x. **Oil and Grease.** Untreated domestic wastewater contains oil and grease. The Basin Plan includes a water quality objective for oil and grease in surface waters, which states: "*Waters shall not contain oils, greases, waxes, or other materials in concentrations that cause nuisance, result in a visible film or coating on the surface of the water or on objects in the water, or otherwise adversely affect beneficial uses*". The previous Order included numeric monthly average and daily maximum effluent limitations of 10 mg/L and 15 mg/L, respectively, to implement the Basin Plan's narrative objective for oil and grease. The antidegradation provisions of the State Water Resources Control Board Resolution No. 68-16 state that: " *Any activity which produces or may produce a waste or increased volume or concentration of waste and which discharges or proposes to discharge to existing high quality waters will be required to meet waste discharge requirements which will result in the best practicable treatment or control of the discharge necessary to assure that (a) a pollution or nuisance will not occur and (b) the highest water quality consistent with maximum benefit to the people of the State will be maintained*." Based on effluent monitoring data obtained from 1 January 2003 through 31 January 2008, a MEC of 14 mg/L and a highest monthly average of 9.5 mg/L have been reported by the Discharger. Therefore, the discharge does not demonstrate a reasonable potential to cause or contribute to an in-stream excursion above the Basin Plan's narrative objective for oil and grease and floating material. This Order removes the effluent limitations for oil and grease based on new information consistent with anti-backsliding requirements of 40 CFR 122.44(l)(2)(i)(B)(*1*). The Regional Water Board finds removing the effluent limitations for oil and grease is consistent with the antidegradation provisions of 40 CFR 131.12 and State Water Board Resolution 68-16. Any impact on existing water quality will be insignificant

y. **Pathogens**. The beneficial uses of the San Joaquin River include, in part, municipal and domestic supply, water contact recreation, and agricultural irrigation supply, and there is, at times, less than 20:1 dilution. To protect these beneficial uses, the Regional Water Board finds that the wastewater must be disinfected and adequately treated to prevent disease. The principal infectious agents (pathogens) that may be present in raw sewage may be classified into

three broad groups: bacteria, parasites, and viruses. Tertiary treatment, consisting of chemical coagulation, sedimentation, and filtration, has been found to remove approximately 99.5% of viruses. Filtration is an effective means of reducing viruses and parasites from the waste stream. The wastewater must be treated to tertiary standards (filtered), or equivalent, to protect contact recreational and food crop irrigation uses.

The California Department of Public Heath (DPH) (formally the Department of Health Services) has developed reclamation criteria, CCR, Division 4, Chapter 3 (Title 22), for the reuse of wastewater. Provision G.1 of the previous Order No. R5-2002-0083 required the Discharger to treat wastewater to Title 22 treatment requirements (or equivalent) by 1 May 2006, which was extended to 25 September 2007 by State Water Board Stay Order and the Court Order. The Discharger has complied with Provision G.1 and currently treats effluent to Title 22 treatment requirements. Title 22 requires that for spray irrigation of food crops, parks, playgrounds, schoolyards, and other areas of similar public access, wastewater be adequately disinfected, oxidized, coagulated, clarified, and filtered, and that the effluent total coliform levels not exceed 2.2 MPN/100 mL as a 7-day median. As coliform organisms are living and mobile, it is impracticable to quantify an exact number of coliform organisms and to establish weekly average limitations. Instead, coliform organisms are measured as a most probable number and regulated based on a 7-day median limitation.

Title 22 also requires that recycled water used as a source of water supply for non-restricted recreational impoundments be disinfected tertiary recycled water that has been subjected to conventional treatment. A non-restricted recreational impoundment is defined as "*…an impoundment of recycled water, in which no limitations are imposed on body-contact water recreational activities.*" Title 22 is not directly applicable to surface waters; however, the Regional Water Board finds that it is appropriate to apply an equivalent level of treatment to that required by DPH's reclamation criteria because the receiving water may be used for irrigation of agricultural land and/or for contact recreation purposes. The stringent disinfection criteria of Title 22 are appropriate since the undiluted effluent may be used for the irrigation of food crops and/or for body-contact water recreation. Coliform organisms are intended as an indicator of the effectiveness of the entire treatment train and the effectiveness of removing other pathogens. The method of treatment is not prescribed by this Order; however, wastewater must be treated to a level equivalent to that recommended by DPH.

In addition to coliform testing, turbidity specifications have been included as a second indicator of the effectiveness of the treatment process and to assure compliance with the required level of treatment. The previous Order No. R5-2002-0083 established effluent limitations for turbidity, including a weekly average of 2 nephelometric turbidity units (NTU), and a daily maximum of 10 NTU. The previous Order No. R5-2002-0083 also prohibited the effluent from exceeding 5 NTU more than 5 percent of the time, and prohibited the effluent from exceeding 10 NTU at any given time if the effluent was continuously monitored. Failure of the filtration system such that virus removal is impaired

would normally result in increased particles in the effluent, which result in higher effluent turbidity. Turbidity has a major advantage for monitoring filter performance, allowing immediate detection of filter failure and rapid corrective action. Coliform testing, by comparison, is not conducted continuously and requires several hours, to days, to identify high coliform concentrations. The limitations in the previous Order No. R5-2002-0083 were solely an operational check to ensure the treatment system was functioning properly and could meet the limits for total coliform organisms. The effluent limitations were not intended to regulate turbidity in the receiving water. Rather, turbidity should be an operational parameter to determine proper system function and not a WQBEL. Therefore, to ensure compliance with the DPH recommended Title 22 disinfection criteria, this Order contains operational turbidity specifications to be met prior to disinfection in lieu of effluent limitations (See Special Provisions VI.C.5.f. Turbidity Operational Requirements in the Limitations and Discharge Requirements section of this Order).

To be consistent with current DPH guidance the operational requirements for turbidity have been established as 2 NTU as a daily average, an instantaneous maximum of 10 NTU, and shall not exceed 5 NTU more than 5 percent of the time. This Order contains effluent limitations and requires a tertiary level of treatment, or equivalent, necessary to protect the beneficial uses of the receiving water. The Regional Water Board has previously considered the factors in CWC section 13241.

z. **Pesticides.** For DDT, Endrin Aldehyde, and Lindane, the CTR includes a criterion of 0.00059 µg/L, 0.76 µg/L, and 0.019 µg/L, respectively, for the protection of human health and is based on a one-in-a-million cancer risk for waters from which both water and organisms are consumed. Based upon available dilution, previous Order No. R5-2002-0083 established maximum yearly total of non-detects (ND) for DDT, Endrin Aldehyde, and Lindane based on the minimum acceptable reporting levels of <0.01 µg/L, <0.01 µg/L, and <0.02 µg/L, respectively.

These pesticides were not detected (<0.002 µg/L) in 66 effluent monitoring samples collected between 20 March 2002 and 26 December 2006. Concentrations of these pesticides were not observed (<0.002 µg/L) in 25 upstream receiving water samples collected between 20 March 2002 and 15 November 2006. Based on new information and the procedures established in Section 1.3 of the SIP for determining reasonable potential, the discharge no longer demonstrates reasonable potential to exceed water quality criteria for DDT, Endrin Aldehyde, and Lindane. The removal of the effluent limitations for these pesticides is in compliance with 40 CFR 122.44(l)(2)(i)(B)(1).

aa. **pH.** The Basin Plan includes a water quality objective for surface waters (except for Goose Lake) that the "…*pH shall not be depressed below 6.5 nor raised above 8.5. Changes in normal ambient pH levels shall not exceed 0.5 in fresh waters with designated COLD or WARM beneficial uses.*" Effluent Limitations for pH are included in this Order based on the Basin Plan objectives for pH.

bb. **Salinity.** The discharge contains total dissolved solids (TDS), chloride, sulfate, and electrical conductivity (EC). These are water quality parameters that are indicative of the salinity of the water. Their presence in water can be growth limiting to certain agricultural crops and can affect the taste of water for human consumption. There are no USEPA water quality criteria for the protection of aquatic organisms for these constituents. The Basin Plan contains a chemical constituent objective that incorporates State MCLs, contains a narrative objective, and contains numeric water quality objectives for EC, TDS, sulfate, and chloride. Table F-5 below summarizes salinity water quality objectives/criteria and effluent concentration values.

Table F-5. Salinity Water Quality Criteria/Objectives

Parameter	Agricultural WQ Goal[1]	Bay-Delta Plan	Secondary MCL[2]	Effluent	
				Avg	Max
EC (µmhos/cm)	Varies[3]	700 (1 Apr-31 Jul) 1000 (1 Aug – 31 Mar)	900, 1600, 2200	1205	1518
TDS (mg/L)	Varies	N/A	500, 1000, 1500	668	730
Sulfate (mg/L)	Varies	N/A	250, 500, 600	120	180
Chloride (mg/L)	Varies	N/A	250, 500, 600	178	210

1 Agricultural water quality goals based on *Water Quality for Agriculture*, Food and Agriculture Organization of the United Nations—Irrigation and Drainage Paper No. 29, Rev. 1 (R.S. Ayers and D.W. Westcot, Rome, 1985)

2 The secondary MCLs are stated as a recommended level, upper level, and a short-term maximum level.

3 The EC level in irrigation water that harms crop production depends on the crop type, soil type, irrigation methods, rainfall, and other factors. An EC level of 700 umhos/cm is generally considered to present no risk of salinity impacts to crops. However, many crops are grown successfully with higher salinities.

The State Water Board's Bay-Delta Plan establishes water quality objectives at various "compliance points" in the estuary to protect beneficial uses. The Bay-Delta Plan at page 10 states: "The water quality objectives in this plan apply to waters of the San Francisco Bay system and the legal Sacramento-San Joaquin Delta, as specified in the objectives. Unless otherwise indicated, water quality objectives cited for a general area, such as for the southern Delta, are applicable for all locations in that general area and compliance locations will be used to determine compliance with the cited objectives." What constitutes "in that general area" is not defined in the Plan.

The two nearest Bay Delta Plan compliance points are the San Joaquin River at Brandt Road Bridge, south of the discharge point along the San Joaquin River, and the San Joaquin River at Prisoner's Point, toward San Francisco Bay from the discharge point. Stockton's discharge is located between these two compliance points. The San Joaquin River at Brandt Bridge and at the discharge point is largely unchanged. The River flows in a relatively shallow, winding channel, and there are not major diversions or tributaries to the River between Brandt Bridge and Stockton. The Brandt Bridge compliance point is established to protect agricultural irrigation uses, and seasonally varies from 700 to 1000 µmhos/cm. The primary use of River Water at both locations is agricultural

irrigation. In contrast, the Prisoner's Point compliance point is located along the Stockton Deep Water Ship Channel where the San Joaquin River has been deepened and straightened. At Prisoner's Point there is seasonally a significant flow of Sacramento River water moving cross-Delta to the pumps near Tracy. The Prisoner's Point compliance point requires the April – May salinity to be maintained at 440 µmhos/cm or less, and is set to protect fish and wildlife beneficial uses. The water quality objectives prescribed for Brandt Road Bridge are judged to be applicable at the site of the Stockton discharge, as being in the "general area" of the compliance point and as having similar River and beneficial use conditions that would make the Brandt Road objective appropriate for beneficial use protection at the discharge point.

i. **Chloride**. The secondary MCL for chloride is 250 mg/L, as a recommended level, 500 mg/L as an upper level, and 600 mg/L as a short-term maximum. The recommended agricultural water quality goal for chloride, that would apply the narrative chemical constituent objective, is 106 mg/L as a long-term average based on Water Quality for Agriculture, Food and Agriculture Organization of the United Nations—Irrigation and Drainage Paper No. 29, Rev. 1 (R.S. Ayers and D. W. Westcot, Rome, 1985). The 106 mg/L water quality goal is intended to protect against adverse effects on sensitive crops when irrigated via sprinklers.

   Chloride concentrations in the effluent ranged from 130 mg/L to 210 mg/L, with an average of 177.5 mg/L, for 12 samples collected by the Discharger from 29 January 2002 through 4 December 2002. Background concentrations in the San Joaquin River ranged from 38 mg/L to 140 mg/L, with an average of 108 mg/L, for 11 samples collected by the Discharger from 20 March 2002 through 4 December 2002. Both the receiving water and the effluent concentrations exceed the agricultural water quality goal of 106 mg/L.

ii. **Electrical Conductivity (EC)**. The secondary MCL for EC is 900 µmhos/cm as a recommended level, 1600 µmhos/cm as an upper level, and 2200 µmhos/cm as a short-term maximum. The agricultural water quality goal, that would apply the narrative chemical constituents objective, is 700 µmhos/cm as a long-term average based on Water Quality for Agriculture, Food and Agriculture Organization of the United Nations—Irrigation and Drainage Paper No. 29, Rev. 1 (R.S. Ayers and D.W. Westcot, Rome, 1985). The Bay-Delta Plan's seasonal salinity objectives for the San Joaquin River at Brandt Bridge are 700 µmhos/cm from April through August, and 1000 µmhos/cm from September through March. These objectives are applicable throughout the general geographic area, and, therefore, apply to the Facility's discharge.

   A review of the Discharger's monitoring reports for the last six years (2002 through 2007) shows an average effluent EC of 1205 µmhos/cm, with a range from 946 µmhos/cm to 1518 µmhos/cm for 290 samples. These levels exceed the applicable objectives. The background receiving water EC averaged 602.8 µmhos/cm in 192 sampling events collected by the

Discharger from 20 March 2002 through 9 January 2007, with a maximum high of 1169 µmhos/cm. These data show that the receiving water frequently has no assimilative capacity for EC.

iii. **Sulfate**. The secondary MCL for sulfate is 250 mg/L as a recommended level, 500 mg/L as an upper level, and 600 mg/L as a short-term maximum. Sulfate concentrations in the effluent ranged from 10 mg/L to 180 mg/L, with an average of 119.8 mg/L, for 12 samples collected by the Discharger from 29 January 2002 through 4 December 2002. Background concentrations in the San Joaquin River ranged from 37 mg/L to 130 mg/L, with an average of 86.7 mg/L, for 10 samples collected by the Discharger from 20 March 2002 through 4 December 2002. These concentrations do not exceed the secondary MCL recommended level of 250 mg/L.

iv. **Total Dissolved Solids (TDS)**. The secondary MCL for TDS is 500 mg/L as a recommended level, 1000 mg/L as an upper level, and 1500 mg/L as a short-term maximum. The recommended agricultural water quality goal for TDS, that would apply the narrative chemical constituent objective, is 450 mg/L as a long-term average based on Water Quality for Agriculture, Food and Agriculture Organization of the United Nations—Irrigation and Drainage Paper No. 29, Rev. 1 (R.S. Ayers and D.W. Westcot, Rome, 1985). Water Quality for Agriculture evaluates the impacts of salinity levels on crop tolerance and yield reduction, and establishes water quality goals that are protective of the agricultural uses. The 450 mg/L water quality goal is intended to prevent reduction in crop yield, i.e., a restriction on use of water, for salt-sensitive crops. Only the most salt sensitive crops require irrigation water of 450 mg/L or less to prevent loss of yield. Most other crops can tolerate higher TDS concentrations without harm; however, as the salinity of the irrigation water increases, more crops are potentially harmed by the TDS, or extra measures must be taken by the farmer to minimize or eliminate any harmful impacts.

The average TDS effluent concentration was 668 mg/L; concentrations ranged from 550 mg/L to 730 mg/L for 12 samples collected by the Discharger from 29 January 2002 through 4 December 2002. These concentrations exceed the applicable water quality objectives. The background receiving water TDS ranged from 260 mg/L to 590 mg/L, with an average of 434 mg/L in 10 sampling events performed by the Discharger from 20 March 2002 through 4 December 2002. These data indicate the receiving water frequently exceeds water quality objectives and lacks assimilative capacity for TDS.

As required by previous Order No. R2-2002-0083, the Discharger completed a Wastewater Treatment Feasibility Study (June 2004) and pollution prevention plan (February 2005) for TDS. In the June 2004 report, the Discharger states “it could be argued that the effluent discharge for Stockton’s RWCF helps maintain water quality objectives of the Delta.”, that “the Discharge will not impact this [Southern one-third of the Delta that is 303(d)

listed] impaired area", and that "further treatment for TDS is unnecessary." However, in both reports, the Discharger provided the following alternatives that could further reduce salinity in the discharge if required:

- Source control:
  1) Actively monitor TDS levels in its drinking water supply wells and reduce the groundwater supply and supplement with surface water if groundwater TDS levels exceed the secondary MCL water quality objective; and
  2) Develop an industrial outreach program to encourage industrial users to reduce TDS levels in the influent.
- Salinity removal processes: Add a pressure driven membrane system to the current treatment process train; however this alternative may pose additional issues with the disposal of the reject brine. Additionally, an estimated $295 million would be required to add these advanced treatment facilities, and annual operation and maintenance costs are estimated at an additional $21.6 million per year. (see section v. Salinity Effluent Limitations below for further discussion)
- Local ordinances: Develop local regulations to ban installation and use of new and existing water softeners and local industrial TDS limits to reduce concentrations in the influent.

v. **Salinity Effluent Limitations.** Effluent limitations based on the MCL, the agricultural water quality goal, or the Basin Plan would likely require construction and operation of a reverse osmosis treatment plant. The State Water Board, in Water Quality Order 2005-005 (for the City of Manteca), states, "…*the State Board takes official notice [pursuant to Title 23 of California Code of Regulations, Section 648.2] of the fact that operation of a large-scale reverse osmosis treatment plant would result in production of highly saline brine for which an acceptable method of disposal would have to be developed. Consequently, any decision that would require use of reverse osmosis to treat the City's municipal wastewater effluent on a large scale should involve thorough consideration of the expected environmental effects."* The State Water Board states in that Order, "*Although the ultimate solution to southern Delta salinity problems have not yet been determined, previous actions establish that the State Board intended for permit limitations to play a limited role with respect to achieving compliance with the EC water quality objectives in the southern Delta*." The State Water Board goes on to say, "*Construction and operation of reverse osmosis facilities to treat discharges…prior to implementation of other measures to reduce the salt load in the southern Delta, would not be a reasonable approach."* In addition, the State Board expressed concerns about costs of reverse osmosis; the same considerations apply to this Facility.

The Regional Water Board, with cooperation of the State Water Board, has begun the process to develop a new policy for the regulation of salinity in the Central Valley. In a statement issued at the 16 March 2006, Regional Water Board meeting, Board Member Dr. Karl Longley recommended that the

Regional Water Board continue to exercise its authority to regulate discharges of salt to minimize salinity increases within the Central Valley. Dr. Longley stated, "*The process of developing new salinity control policies does not, therefore, mean that we should stop regulation salt discharges until a possible interim approaches to continue controlling and regulating salts in a reasonable manner, and encourage all stakeholder groups that may be affected by the Regional Board's policy to actively participate in policy development*."

As previously described, effluent data for EC and TDS indicate that effluent concentrations continue to be at levels of concern that may affect beneficial uses of the San Joaquin River. Therefore, this Order includes an annual average performance-based effluent limitation of 1300 µmhos/cm for EC to protect the receiving water from further salinity degradation, based on the highest annual average effluent concentration (see Table F-6 below). However, should the Discharger fail to implement the provisional requirements specified in Provision VI.C.3.c of this Order, then this Order requires the Discharger to comply with the seasonal monthly average EC effluent limits of 700 µmhos/cm from April through August and 1000 µmhos/cm from September through March instead, which are based on the Bay-Delta Plan water quality objectives for this geographical location. The Bay-Delta objectives are under review, but when or if the salinity objectives will be changed is unknown. The Regional Water Board must implement water quality objectives as they exist at this time.

Compliance with these effluent limitations and the requirements of Provision VI.C.3.c will result in a salinity reduction in the effluent discharged to the receiving water; however, the discharge may cause or contribute to an exceedance of a water quality objective for salinity until adequate measures are implemented to meet those objectives.

Table F-6. Summary of Annual Electrical Conductivity Effluent Concentrations

Electrical Conductivity (µmhos/cm)				
Year	**Count**	**Min**	**Avg**	**Max**
2002	40	1144	1264	1420
2003	50	1072	1195	1370
2004	50	1073	1209	1455
2005	48	1004	1229	1355
2006	50	968	1180	1518
2007	52	909	1089	1254

cc. **Settleable Solids.** For inland surface waters, the Basin Plan states that "[w]ater shall not contain substances in concentrations that result in the deposition of material that causes nuisance or adversely affects beneficial uses The previous permit, Order No. R5-2002-0083, required a daily maximum effluent limitation of 0.5 ml/L and a monthly average effluent limit of 0.1 ml/L for settleable solids. Analytical monitoring results obtained since issuance of the previous permit

showed that settleable solids concentration values in 1487 samples monitored during the period from 1 May 2002 through 31 January 2007 did not exceed the effluent limitations. Therefore, the discharge does not demonstrate a reasonable potential to cause or contribute to an in-stream excursion above the Basin Plan's narrative objectives for settleable solids. Based on this new information, this Order does not include effluent limitations for settleable solids; however, this Order requires effluent monitoring and contains a receiving water limitation for Settleable Substances to prevent deposition of material that causes nuisance or adversely affects beneficial uses as described further in section V.A. of this Fact Sheet.

dd. **Temperature**. The Thermal Plan requires that "*The maximum temperature shall not exceed the natural receiving water temperature by more than 20°F.*" Therefore, to ensure compliance with the Thermal Plan, an effluent limitation for temperature is included in this Order.

The Thermal Plan also states "Additional limitations shall be imposed when necessary to assure protection of beneficial uses." In part, beneficial uses applicable to San Joaquin River are migration of aquatic organisms (MIGR) both warm and cold habitats, and warm habitat spawning, reproduction, and/or early development (SPWN).

Previous permits, Orders No. 94-324 and R5-2002-0083, required the Discharger to evaluate the effect of its thermal discharge to migrating fish both within the vicinity of the discharge and downstream (or upstream due to tidal influences), with particular attention being paid to those periods when San Joaquin River flow is lowest and/or San Joaquin River or effluent temperature are highest. In compliance, the Discharger submitted in November 1995 (*Temperature Plan,* Systech 1995) and again in May 2006 (*Potential Thermal Effects of Stockton Regional Wastewater Control Facility Discharge on Migrating Fish in the San Joaquin River,* Jones and Stokes 2006) temperature studies to the Regional Water Board, USEPA, NOAA Fisheries, US Fish and Wildlife Services, and California Department of Fish and Game. These studies, based on data collected between 1988 through 1994 (for November 1995 report) and 2001 through 2005 (for May 2006 report) evaluated potential added stresses from the thermal discharge on the San Joaquin River and the potentially consequential near-field or far-field effects on adult and juvenile Chinook salmon and other migrating fish (i.e. delta smelt, splittail, etc.). Based on these reports, the Regional Water Board finds that additional thermal requirements are not necessary to protect the beneficial uses of San Joaquin River; comments were not received from the other state or federal agencies. Therefore, this Order does not contain additional temperature limitations; however, this Order does retain the previous permit, Order No. R5-2002-0083, temperature effluent and receiving water limitations to comply with the Thermal Plan requirements.

ee. **Tetrachloroethylene (PCE).** The NTR includes a tetrachloroethylene criterion of 0.8 µg/L for the protection of human health, based on a one-in-a-million cancer risk for waters from which both water and aquatic organisms are consumed.

Based upon available dilution, Order No. R5-2002-0083 established an MDEL of 14.5 µg/L.

Tetrachloroethylene was not detected in the effluent discharge, based on 65 samples collected between 20 March 2002 and 10 January 2007, while the maximum observed upstream receiving water tetrachloroethylene concentration was <0.04 µg/L, based on 26 samples collected between 20 March 2002 and 15 November 2007. Therefore, the discharge does not demonstrate a reasonable potential to cause or contribute to an in-stream excursion above the NTR criterion for tetrachloroethylene. Based on new information and the procedures established in Section 1.3 of the SIP for determining reasonable potential, the discharge no longer demonstrates reasonable potential to exceed water quality criteria for tetrachloroethylene. The removal of the effluent limitations for tetrachloroethylene is in compliance with 40 CFR 122.44(l)(2)(i)(B)(1).

ff. **Trichloroethylene (TCE).** The CTR includes a trichloroethylene criterion of 2.7 µg/L for the protection of human health and is based on a one-in-a-million cancer risk for waters from which both water and organisms are consumed. Based upon available dilution, the previous order established an AMEL and MDEL of 14.5 µg/L and 34 µg/L, respectively.

Trichloroethylene was not detected (<0.05 µg/L) in 64 effluent monitoring samples collected between 20 March 2002 and 10 January 2007. Concentrations of trichloroethylene was not observed (<0.2 µg/L) in 26 upstream receiving water samples collected between 20 March 2002 and 15 November 2006. Based on new information and the procedures established in Section 1.3 of the SIP for determining reasonable potential, the discharge no longer demonstrates reasonable potential to exceed water quality criteria for trichloroethylene. The removal of the effluent limitations for trichloroethylene is in compliance with 40 CFR 122.44(l)(2)(i)(B)(1).

gg. **Toxicity.** See Section IV.C.5. of the Fact Sheet regarding whole effluent toxicity.

hh. **Total Trihalomethanes (THMs).** Information submitted by the Discharger indicates that the effluent contains THMs, including chloroform. The Basin Plan contains the narrative “chemical constituent” objective that requires, at a minimum, that waters with a designated MUN use not exceed California MCLs. In addition, the chemical constituent objective prohibits chemical constituents in concentrations that adversely affect beneficial uses. The California primary MCL for total THMs is 100 µg/L. The USEPA primary MCL for total THMs is 80 µg/L, which was effective on January 1, 2002 for surface water systems that serve more than 10,000 people. Pursuant to the Safe Drinking Water Act, DHS must revise the current total THMs MCL in Title 22, CCR to be as low or lower than the USEPA MCL. Total THMs include bromoform, dichlorobromomethane, chloroform, and chlorodibromomethane. The Cal/EPA Office of Environmental Health Hazard Assessment (OEHHA) has published the Toxicity Criteria Database, which contains cancer potency factors for chemicals, including

chloroform, that have been used as a basis for regulatory actions by the regional boards, departments, and offices within Cal/EPA. This cancer potency factor is equivalent to a chloroform concentration in drinking water of 1.1 µg/L (ppb) at the 1-in-a-million cancer risk level with an average daily consumption of two liters of drinking water over a 70-year lifetime.

MUN is a designated beneficial use of the Delta. However, there are no known active drinking water intakes in the San Joaquin River for several miles downstream of the discharge, and chloroform is a non-conservative pollutant. Therefore, to protect the MUN beneficial use of the receiving waters, the Regional Water Board finds that, in this specific circumstance, application of the USEPA MCL for total THMs for the effluent is appropriate, as long as the receiving water does not exceed the OEHHA cancer potency factor's equivalent receiving water concentration at a reasonable distance from the outfall. Typically, in NPDES permits, the OEHHA public health goal is not used to base effluent limitations when there are no active drinking water intakes in the vicinity of the discharge, because chloroform is a volatile organic constituent that will degrade in the environment. If there are no intakes near the discharge, the MCL for total THMs is used with receiving water monitoring for chloroform to determine if the constituent is degrading in the environment before reaching any drinking water intakes.

The MEC for total THMs was 78 µg/L, based on 64 samples. There is only one detection of any of the THMs in the background receiving water (chloroform includes an estimated concentration (i.e. j-flag) of 0.3 µg/L. Therefore, total THMs in the discharge does not have a reasonable potential to cause or contribute to an in-stream excursion above the USEPA primary MCL for total THMs and an effluent limitation is not necessary. The previous Order No. R5-2002-0083 included an effluent limitation for chloroform based on EPA's National Ambient Water Quality Criteria for chloroform (i.e. 5.7 µg/L for consumption of water and organisms). However, USEPA has reserved the National Ambient Water Quality Criteria for water and fish for chloroform and is developing new criteria. Therefore, the primary MCL for total THMs is used to regulate chloroform in NPDES permits at this time. Since the discharge does not have reasonable potential to exceed the primary MCL for total THMs, the effluent limitations for chloroform have not been carried forward to this Order. The removal of the effluent limitations for chloroform is in compliance with 40 CFR 122.44(l)(2)(i)(B)(1).

4. WQBEL Calculations

a. As discussed in Section IV.C.3 above, the annual average effluent limitation for aluminum was based on the Secondary MCL, for protection of the MUN beneficial use, and applied directly. For nitrate plus nitrite, and manganese, performance-based effluent limitation were calculated as the mean plus 3.3 standard deviations based on the most recent monitoring data. For molybdenum, a performance-based effluent limitation was established as the maximum effluent concentration based on the most recent monitoring data.

For EC, a performance-based effluent limitation was established as the highest annual average effluent concentration based on the most recent monitoring data. For ammonia, total coliform, dissolved oxygen, pH, temperature, and chlorine residual, the effluent limitations from the previous Order were carried over.

b. Effluent limitations for aluminum, bis(2-ethylhexyl)phthalate, chlorodibromomethane, cyanide, and dichlorobromomethane were calculated in accordance with section 1.4 of the SIP. The following paragraphs describe the methodology used for calculating effluent limitations for these parameters.

c. **Effluent Limitation Calculations.** In calculating maximum effluent limitations, the effluent concentration allowances were set equal to the criteria/standards/objectives.

$$ECA_{acute} = CMC \qquad ECA_{chronic} = CCC$$

For the human health, agriculture, or other long-term criterion/objective, a dilution credit can be applied. The ECA is calculated as follows:

$$ECA_{HH} = HH + D(HH - B)$$

where:

ECA_{acute} = effluent concentration allowance for acute (1-hour average) toxicity criterion

$ECA_{chronic}$ = effluent concentration allowance for chronic (4-day average) toxicity criterion

ECA_{HH} = effluent concentration allowance for human health, agriculture, or other long-term criterion/objective

CMC = criteria maximum concentration (1-hour average)

CCC = criteria continuous concentration (4-day average, unless otherwise noted)

HH = human health, agriculture, or other long-term criterion/objective

D = dilution credit

B = maximum receiving water concentration

Acute and chronic toxicity ECAs were then converted to equivalent long-term averages (LTA) using statistical multipliers and the lowest is used. Additional statistical multipliers were then used to calculate the maximum daily effluent limitation (MDEL) and the average monthly effluent limitation (AMEL).

Human health ECAs are set equal to the AMEL and a statistical multiplier is used to calculate the MDEL.

$$AMEL = mult_{AMEL}\left[\min\left(\overbrace{M_A ECA_{acute}}^{LTA_{acute}}, M_C ECA_{chronic}\right)\right]$$

$$MDEL = mult_{MDEL}\left[\min\left(M_A ECA_{acute}, \underbrace{M_C ECA_{chronic}}_{LTA_{chronic}}\right)\right]$$

$$MDEL_{HH} = \left(\frac{mult_{MDEL}}{mult_{AMEL}}\right) AMEL_{HH}$$

where: $mult_{AMEL}$ = statistical multiplier converting minimum LTA to AMEL
$mult_{MDEL}$ = statistical multiplier converting minimum LTA to MDEL
M_A = statistical multiplier converting CMC to LTA
M_C = statistical multiplier converting CCC to LTA

WQBELs were calculated for aluminum, bis(2-ethylhexyl) phthalate, chlorodibromomethane, cyanide, and dichlorobromomethane as follows in Tables F-7 through F-11, below.

Table F-7. WQBEL Calculations for Aluminum

	Acute	Chronic
Criteria (µg/L) [1]	750	750
Dilution Credit	No Dilution	No Dilution
ECA	750	750
ECA Multiplier	0.22	0.40
LTA	168.39	303.21
AMEL Multiplier (95th%)	1.85	[2]
AMEL (µg/L)	**311**	[2]
MDEL Multiplier (99th%)	4.45	[2]
MDEL (µg/L)	**750**	[2]

[1] USEPA Ambient Water Quality Criteria
[2] Limitations based on acute LTA (Acute LTA < Chronic LTA)

Table F-8. WQBEL Calculations for Bis(2-ethylhexyl)Phthalate

	Human Health
Criteria (mg/L)	1.8
Dilution Credit	0
ECA	1.8
AMEL (mg/L)[1]	**1.8**
MDEL/AMEL Multiplier[2]	2.01
MDEL (mg/L)	**3.6**

[1] AMEL = ECA per section 1.4.B, Step 6 of SIP
[2] Assumes sampling frequency n<=4. Uses MDEL/AMEL multiplier as determined in Step 5 of Section 1.4 of the SIP.

Table F-9. WQBEL Calculations for Chlorodibromomethane

	Human Health
Criteria (mg/L)	0.41
Dilution Credit	13:1
ECA	4.97
AMEL (mg/L)[1]	**5.0**
MDEL/AMEL Multiplier[2]	3.29
MDEL (mg/L)	**16**

[1] AMEL = ECA per section 1.4.B, Step 6 of SIP
[2] Assumes sampling frequency n<=4. Uses MDEL/AMEL multiplier as determined in Step 5 of Section 1.4 of the SIP.

Table F-10. WQBEL Calculations for Dichlorobromomethane

	Human Health
Criteria (mg/L)	0.56
Dilution Credit	13:1
ECA	6.8
AMEL (mg/L)[1]	**6.8**
MDEL/AMEL Multiplier[2]	3.01
MDEL (mg/L)	**20**

[1] AMEL = ECA per section 1.4.B, Step 6 of SIP
[2] Assumes sampling frequency n<=4. Uses MDEL/AMEL multiplier as determined in Step 5 of Section 1.4 of the SIP.

Table F-11. WQBEL Calculations for Cyanide

	Acute	Chronic
Criteria (µg/L)[1]	22	5.2
Dilution Credit	No Dilution	No Dilution
ECA	22	5.2
ECA Multiplier	0.27	0.46
LTA	5.85	2.40
AMEL Multiplier (95th%)	[2]	1.70
AMEL (µg/L)	[2]	**4.1**
MDEL Multiplier (99th%)	[2]	3.76
MDEL (µg/L)	[2]	**9.0**

[1] USEPA Ambient Water Quality Criteria
[2] Limitations based on chronic LTA (Chronic LTA < Acute LTA)

5. Whole Effluent Toxicity (WET)

For compliance with the Basin Plan's narrative toxicity objective, this Order requires the Discharger to conduct whole effluent toxicity testing for acute and chronic toxicity, as specified in the Monitoring and Reporting Program (Attachment E, Section V.). This Order also contains effluent limitations for acute toxicity and requires the Discharger to implement best management practices to investigate the causes of, and identify corrective actions to reduce or eliminate effluent toxicity.

a. **Acute Aquatic Toxicity.** The Basin Plan contains a narrative toxicity objective that states, "*All waters shall be maintained free of toxic substances in concentrations that produce detrimental physiological responses in human, plant, animal, or aquatic life.*" (Basin Plan at III-8.00) The Basin Plan also states that, "…*effluent limits based upon acute biotoxicity tests of effluents will be prescribed where appropriate*…". USEPA Region 9 provided guidance for the development of acute toxicity effluent limitations in the absence of numeric water quality objectives for toxicity in its document titled "Guidance for NPDES Permit Issuance", dated February 1994. In section B.2. "Toxicity Requirements" (pgs. 14-15) it states that, "*In the absence of specific numeric water quality objectives for acute and chronic toxicity, the narrative criterion 'no toxics in toxic amounts' applies. Achievement of the narrative criterion, as applied herein, means that ambient waters shall not demonstrate for acute toxicity: 1) less than 90% survival, 50% of the time, based on the monthly median, or 2) less than 70% survival, 10% of the time, based on any monthly median. For chronic toxicity, ambient waters shall not demonstrate a test result of greater than 1 TUc."* Effluent limitations for acute toxicity have been included in this Order as follows:

   Survival of aquatic organisms in 96-hour bioassays of undiluted waste shall be no less than:

   Minimum for any one bioassay---------- 70%
   Median for any three or more consecutive bioassays --------- 90%

   The previous permit, Order No. R5-2002-0083, contained these same acute toxicity requirements. Based on the weekly acute toxicity test results conducted during December 2003 through January 2007, the Discharger demonstrated compliance with these acute toxicity requirements.

b. **Chronic Aquatic Toxicity.** Based on 116 monthly samples for whole effluent chronic toxicity testing performed by the Discharger from 2 February 2002 through 20 June 2006, the Discharger reported a maximum toxicity result for algal cell density, performed on *Selenastrum capricoruntum*, of greater than 16 TU_c. The Discharger conducted accelerated chronic toxicity testing for *Selenastrum capricornutum* as a result of final effluent toxicity, and conducted the required TIE studies. In January 2005, the Phase I TIE indicated that the effluent contaminant(s) responsible for chronic toxicity to *Selenestrum capricornutum* were primarily organic in nature (January and March 2005, TIE of the City of Stockton Effluent Toxicity to *Selenastrum capricornutum,* Pacific

EcoRisk). Subsequently, Phase II TIE procedures were initiated to identify the organic compound(s) responsible for final effluent toxicity; however, the testing indicated that the toxicity was not persistent (Phase II TIE of Stockton Effluent Toxicity to *Selenastrum capricornutum,* April 2005, Pacific EcoRisk). In total, during the period from March 2002 through March 2007, the Discharger conducted 132 WET tests and 9 TIE tests for Selenastrum capricornutum.

In April 2007, the Discharger concluded the TRE, and submitted the evaluation report to the Regional Water Board, *Assessment of the City of Stockton's Historic Whole Effluent Toxicity Testing and Toxicity Reduction Evaluation Programs for Selenastrum capriconutum*, Jones & Stokes Associates. The TRE identified the toxicant in the *Selenastrum capriconutum* bioassay as ammonia. Recent Facility upgrades that included new nitrification facilities are expected to reduce the occurrence of the toxicant ammonia, and as a result, subsequent accelerated monitoring concluded in October 2007 without further *Selenastrum capricornutum* (algae) toxicity.

Other WET testing data also demonstrated that the effluent discharge from the Facility has reasonable potential to cause or contribute to an in-stream excursion above the Basin Plan's narrative toxicity objective. During the period from 5 March 2002 through 13 June 2006, 52 samples resulted in a maximum toxicity of survival and growth for *Ceriodaphnia dubia* of 2 TU_c and 25 samples resulted in a maximum toxicity of 4 TU_c. No dilution has been granted for the chronic condition. Therefore, chronic toxicity testing results exceeding 1 chronic toxicity unit (TUc) demonstrates the discharge has a reasonable potential to cause or contribute to an exceedance of the Basin Plan's narrative toxicity objective.

Based upon the findings of the extensive WET testing and TIE/TRE, the WET procedure in the MRP allows the removal of the toxicant ammonia prior to conducting the WET analysis.

Numeric chronic WET effluent limitations have not been included in this Order. The SIP contains implementation gaps regarding the appropriate form and implementation of chronic toxicity limits. This has resulted in the petitioning of a NPDES permit in the Los Angeles Region[3] that contained numeric chronic toxicity effluent limitations. To address the petition, the State Water Board adopted WQO 2003-012 directing its staff to revise the toxicity control provisions in the SIP. The State Water Board states the following in WQO 2003-012*, "In reviewing this petition and receiving comments from numerous interested persons on the propriety of including numeric effluent limitations for chronic toxicity in NPDES permits for publicly-owned treatment works that discharge to inland waters, we have determined that this issue should be considered in a regulatory setting, in order to allow for full public discussion and deliberation. We intend to modify the SIP to specifically address the issue. We anticipate that*

[3] In the Matter of the Review of Own Motion of Waste Discharge Requirements Order Nos. R4-2002-0121 [NPDES No. CA0054011] and R4-2002-0123 [NPDES NO. CA0055119] and Time Schedule Order Nos. R4-2002-0122 and R4-2002-0124 for Los Coyotes and Long Beach Wastewater Reclamation Plants Issued by the California Regional Water Quality Control Board, Los Angeles Region SWRCB/OCC FILES A-1496 AND 1496(a)

review will occur within the next year. We therefore decline to make a determination here regarding the propriety of the final numeric effluent limitations for chronic toxicity contained in these permits." The process to revise the SIP is currently underway. Proposed changes include clarifying the appropriate form of effluent toxicity limits in NPDES permits and general expansion and standardization of toxicity control implementation related to the NPDES permitting process. Because the toxicity control provisions in the SIP are under revision, it is infeasible to develop numeric effluent limitations for chronic toxicity. Therefore, this Order requires that the Discharger meet best management practices for compliance with the Basin Plan's narrative toxicity objective, as allowed under 40 CFR 122.44(k).

To ensure compliance with the Basin Plan's narrative toxicity objective, the Discharger is required to conduct chronic whole effluent toxicity testing, as specified in the Monitoring and Reporting Program (Attachment E, Section V.). Furthermore, Special Provisions VI.C.2.a. of this Order requires the Discharger to investigate the causes of, and identify and implement corrective actions to reduce or eliminate effluent toxicity. If the discharge demonstrates a pattern of toxicity exceeding the numeric toxicity monitoring trigger, the Discharger is required to initiate a Toxicity Reduction Evaluation (TRE), in accordance with an approved TRE work plan. The numeric toxicity monitoring trigger is not an effluent limitation, it is the toxicity threshold at which the Discharger is required to perform accelerated chronic toxicity monitoring, as well as, the threshold to initiate a TRE if a pattern of effluent toxicity has been demonstrated.

D. Final Effluent Limitations

1. Mass-based Effluent Limitations

Title 40 CFR 122.45(f)(1) requires effluent limitations be expressed in terms of mass, with some exceptions, and 40 CFR 122.45(f)(2) allows pollutants that are limited in terms of mass to additionally be limited in terms of other units of measurement. This Order includes effluent limitations expressed in terms of mass and concentration. In addition, pursuant to the exceptions to mass limitations provided in 40 CFR 122.45(f)(1), some effluent limitations are not expressed in terms of mass, such as pH and temperature, and when the applicable standards are expressed in terms of concentration (e.g., CTR criteria and MCLs) and mass limitations are not necessary to protect the beneficial uses of the receiving water.

Mass-based effluent limitations were calculated for TSS, $CBOD_5$ and ammonia based upon the permitted average dry weather flow allowed in Section IV.A.1.g. of the Limitations and Discharge Requirements.

2. Averaging Periods for Effluent Limitations

Title 40 CFR 122.45 (d) requires average weekly and average monthly discharge limitations for publicly owned treatment works (POTWs) unless impracticable. However, for toxic pollutants and pollutant parameters in water quality permitting, the

USEPA recommends the use of a maximum daily effluent limitation in lieu of average weekly effluent limitations for two reasons. "*First, the basis for the 7-day average for POTWs derives from the secondary treatment requirements. This basis is not related to the need for assuring achievement of water quality standards. Second, a 7-day average, which could comprise up to seven or more daily samples, could average out peak toxic concentrations and therefore the discharge's potential for causing acute toxic effects would be missed.*" (TSD, pg. 96) This Order utilizes maximum daily effluent limitations in lieu of average weekly effluent limitations for aluminum, ammonia, manganese, molybdenum, bis(2-ethylhexyl)phthalate, chlorodibromomethane, cyanide, and dichlorobromomethane as recommended by the TSD for the achievement of water quality standards and for the protection of the beneficial uses of the receiving stream. Furthermore, for TSS, $CBOD_5$, pH, and total coliform organisms, weekly average effluent limitations have been replaced or supplemented with effluent limitations utilizing shorter averaging periods. The rationale for using shorter averaging periods for these constituents is discussed in Attachment F, Section IV.C.3., above.

3. Satisfaction of Anti-Backsliding Requirements

Some effluent limitations in this Order are less stringent than those in the previous permit, Order No. R5-2002-0083. However, since the issuance of Order No. R5-2002-0083, the Discharger upgraded the Facility to provide a higher level of treatment, including a tertiary filtration system. Based upon this new information, as discussed below, this relaxation of effluent limitations is consistent with the anti-backsliding requirements of the CWA and federal regulations.

The previous permit, Order No. R5-2002-0083, established effluent limitations for chloroform; copper; diazinon; dichloromethane; 1,1-dichloroethylene; 4,4-DDT; endrin aldehyde; lindane; oil and grease; settleable matter; tetrachloroethylene (PCE); and trichloroethylene (TCE). Based on new information gathered over the term of Order No. R5-2002-0083, the discharge does not demonstrate reasonable potential to exceed the applicable water quality criteria/objective for these constituents. The removal of these effluent limitations is consistent with the anti-backsliding provisions, and the antidegradation provisions of 40 CFR 131.12 and State Water Resources Control Board Resolution 68-16. Any impact on existing water quality will be insignificant.

Order No. R5-2002-0083 contained effluent limitations for turbidity. The limitations were solely an operational check to ensure the treatment system was functioning properly and could meet the limits for total coliform organisms. The effluent limitations were not intended to regulate turbidity in the receiving water. Rather, turbidity is an operational parameter to determine proper system functioning and not a WQBEL.

This Order contains operational requirements for turbidity to be met prior to disinfection in lieu of effluent limitations. However, the operational requirements in this Order are an equivalent limitation that is not less stringent than the effluent

limitations required in the previous Order No. R5-2002-0083, and therefore does not constitute backsliding.

The proposed revised operational requirements for turbidity are the same as the effluent limitations in Order No. R5-2002-0083 (See Special Provisions VI.C.5.f. Turbidity Operational Requirements). These revisions are consistent with state regulations implementing recycled water requirements.

The revision in the turbidity limitation is consistent with the antidegradation provisions of 40 CFR 131.12 and State Water Board Resolution 68-16 because this Order imposes equivalent or more stringent requirements than Order No. R5-2002-0083 and therefore does not allow degradation.

4. Satisfaction of Antidegradation Policy

Resolution 68-16 and 40 CFR section 131.12 require the Regional Board, in regulating discharge of waste, to maintain high quality waters of the state until it is demonstrated that any change in quality will be consistent with maximum benefit to the people of the state, will not unreasonably affect beneficial uses, and will not result in water quality less than that described in the Regional Water Board's policies (e.g., quality that exceeds water quality objectives). Resolution 68-16 requires the discharge be regulated to meet best practicable treatment or control to assure that pollution or nuisance will not occur and the highest water quality consistent with the maximum benefit to the people of the state be maintained.

Policies and procedures for complying with this directive are set forth in the Basin Plan. Resolution 68-16 is applied on a case-by-case, constituent-by-constituent basis in determining whether a certain degree of degradation can be justified. It is incumbent upon the Discharger to provide technical information for the Regional Water Board to evaluate

Surface Water. With regards to surface water, the receiving water may exceed applicable water quality objectives for certain constituents as described in this Order. However, this Order and TSO Order R5-2008-0155 require the Discharger, in accordance with specified compliance schedules, to meet requirements that will result in the use of best practicable treatment or control of the discharge and will result in compliance with water quality objectives, with the exception of dissolved oxygen. This Order also establishes interim effluent limitations and compliance schedules for pollutants that cannot immediately be controlled to prevent any additional degradation of surface water by these pollutants. The total allowable discharge of 55 mgd has not been increased from the previous permit, Order No. R5-2002-0083, and therefore, does not cause additional degradation beyond that allowed in the previous permit. The discharge is consistent with Resolution 68-16 and 40 CFR section 131.12 because this Order requires the discharger to meet requirements that will result in best practicable treatment or control to assure that pollution or nuisance will not occur. Some degradation is consistent with maximum benefit to the people of the state because the discharge allows for economic or social development in the area.

Groundwater. Groundwater monitoring has been conducted around the Facility; however, additional groundwater quality monitoring results are needed. In addition, certain aspects of wastewater treatment and control practices may not be justified as representative of Best Practicable Treatment and Control (BPTC). Reasonable time is necessary to gather specific information about the Facility to make informed, appropriate, long-term decisions. This Order, therefore, establishes some groundwater limitations to assure protection of beneficial uses of groundwater (see section V.B in the Limitations and Discharge Requirements section of this Order), provisionally requires the Discharger to a corrective action plan and implementation schedule for necessary modifications (see section VI.C.2.c in the Limitations and Discharge Requirements section of this Order), and includes a reopener to consider a revision or addition of the final groundwater limitations if necessary when additional analytical monitoring results or other information are obtained. During this period, degradation may occur from certain constituents, but cannot exceed water quality objectives (or natural background water quality should it exceed objectives) or cause nuisance. For additional information see Section V.B of this Fact Sheet.

Summary of Final Effluent Limitations
Discharge Point No. 001

Table F-12. Summary of Final Effluent Limitations

Parameter	Units	Effluent Limitations				
		Average Monthly	Average Weekly	Maximum Daily	Instantaneous Minimum	Instantaneous Maximum
Aluminum, Total Recoverable	µg/L	311	200[8]	750	--	--
Ammonia Nitrogen, Total (as N)	mg/L	2	--	5	--	--
	lbs/day[2]	917	--	2294	--	--
Bis(2-ethylhexyl)phthalate	µg/L	1.8	--	3.6	--	--
Chlorodibromomethane	µg/L	5.0	--	16	--	--
Chlorine, Total Residual	µg/L	--	0.01[3]	0.02[1]	--	--
Coliform, Total[4]	MPN/100ml	--		--	--	240
Cyanide, Total Recoverable	µg/L	4.1	--	9.0	--	--
Dichlorobromomethane	µg/L	6.8	--	20	--	--
Dissolved Oxygen	mg/L	--	--	--	[7]	--
Flow	mgd	--	--	55[9]	--	--
Manganese, Total Recoverable	µg/L			286		
Molybdenum, Total Recoverable	µg/L		--	13	--	--
Nitrate plus Nitrite (as N)	mg/L	40	--	--	--	--
pH	s.u.	--	--	--	6.5	8.5
Temperature	°F	--	--	[5]	--	--
TSS[6]	mg/L	10	15	20	--	--

Parameter	Units	Effluent Limitations				
		Average Monthly	Average Weekly	Maximum Daily	Instantaneous Minimum	Instantaneous Maximum
	lbs/day[2]	4590	6885	9180	--	--
$CBOD_5$[6]	mg/L	10	15	20	--	--
	lbs/day[2]	4590	6885	9180	--	--

[1] Applied as an average 1-hour limitation.
[2] Mass-based effluent limitations are established using the following formula:
Mass (lbs/day) = flow rate (mgd) x 8.34 x effluent limitation (mg/L)
where: Mass = mass limitation for a pollutant (lbs/day)
Effluent limitation = concentration limit for a pollutant (mg/L)
Flow rate = average dry weather flow (55 mgd)
[3] Applied as a 4-day average limitation.
[4] Effluent total coliform also shall not exceed i.) 2.2 MPN/100ml, as a 7-day median; and ii). 23 MPN/100ml, more than once in any 30-day period.
[5] The maximum effluent temperature shall not exceed the natural receiving water temperature by more than 20°F.
[6] In addition to concentration-based effluent limitations, the arithmetic mean of TSS or $CBOD_5$ in effluent samples collected over a monthly period shall not exceed 15 percent of the arithmetic mean of the values for influent samples collected at approximately the same time during the same period (85 percent removal).
[7] The Discharger shall maintain a minimum daily average effluent DO concentration of 6.0 mg/L from 1 September through 30 November and 5.0 mg/L from 1 December through 31 August.
[8] Annual Average
[9] Average Dry Weather Flow

E. Interim Effluent Limitations

1. **Mercury.** See Section IV.C.3.s. for the rationale for the interim effluent limitations for mercury

F. Land Discharge Specifications

[Not Applicable]

G. Reclamation Specifications

For Order No. R5-2002-0083, the Discharger had requested to be allowed to supply chlorinated secondary treated wastewater for specific reclamation uses, including limited on-site uses such as dust control and compaction by building contractors, street sweeping, and landscape irrigation, in addition to wastewater being used to irrigate 16 acres of agricultural land adjacent to the Facility, which is regulated by WDR Order No. 95-183.

Reclaimed water is required to meet the criteria contained in Title 22, Division 4, CCR (section 60301, et seq.). This Order retains the reclamation requirements contained in the previous Order *to reduce public health concerns and comply with the requirements of Title 22 California Code of Regulations.*

Treated wastewater discharged for reclamation purposes not specified in this Order must be approved by the Executive Officer, or regulated under separate waste discharge requirements, and must meet the requirements of CCR, Title 22.

V. RATIONALE FOR RECEIVING WATER LIMITATIONS

Basin Plan water quality objectives to protect the beneficial uses of surface water and groundwater include numeric objectives and narrative objectives, including objectives for chemical constituents, toxicity, and tastes and odors. The toxicity objective requires that surface water and groundwater be maintained free of toxic substances in concentrations that produce detrimental physiological responses in humans, plants, animals, or aquatic life. The chemical constituent objective requires that surface water and groundwater shall not contain chemical constituents in concentrations that adversely affect any beneficial use or that exceed the maximum contaminant levels (MCLs) in Title 22, CCR. The tastes and odors objective states that surface water and groundwater shall not contain taste- or odor-producing substances in concentrations that cause nuisance or adversely affect beneficial uses. The Basin Plan requires the application of the most stringent objective necessary to ensure that surface water and groundwater do not contain chemical constituents, toxic substances, radionuclides, or taste and odor producing substances in concentrations that adversely affect domestic drinking water supply, agricultural supply, or any other beneficial use.

A. Surface Water

1. CWA sections 303(a-c), requires states to adopt water quality standards, including criteria where they are necessary to protect beneficial uses. The Regional Water Board adopted water quality criteria as water quality objectives in the Basin Plan. The Basin Plan states that "*[t]he numerical and narrative water quality objectives define the least stringent standards that the Regional Water Board will apply to regional waters in order to protect the beneficial uses*." The Basin Plan includes numeric and narrative water quality objectives for various beneficial uses and water bodies. This Order contains Receiving Surface Water Limitations based on the Basin Plan numerical and narrative water quality objectives for bacteria, biostimulatory substances, color, chemical constituents, dissolved oxygen, floating material, oil and grease, pH, pesticides, radioactivity, suspended sediment, settleable substances, suspended material, tastes and odors, temperature, toxicity, and turbidity.

   Numeric Basin Plan objectives for bacteria, dissolved oxygen, pH, temperature, and turbidity are applicable to this discharge and have been incorporated as Receiving Surface Water Limitations. Rationale for these numeric receiving surface water limitations are as follows:

   a. **Bacteria.** The Basin Plan includes a water quality objective that "*[I]n water designated for contact recreation (REC-1), the fecal coliform concentration based on a minimum of not less than five samples for any 30-day period shall not exceed a geometric mean of 200/100 mL, nor shall more than ten percent of the total number of samples taken during any 30-day period exceed 400/100 mL*." Numeric Receiving Water Limitations for bacteria are included in this Order and are based on the Basin Plan objective.

b. **Biostimulatory Substances**. The Basin Plan includes a water quality objective that "*[W]ater shall not contain biostimulatory substances which promote aquatic growths in concentrations that cause nuisance or adversely affect beneficial uses."* Receiving Water Limitations for biostimulatory substances are included in this Order and are based on the Basin Plan objective.

c. **Chemical Constituents**. The Basin Plan includes a water quality objective that *"[W]aters shall not contain chemical constituents in concentrations that adversely affect beneficial uses."* Receiving Water Limitations for chemical constituents are included in this Order and are based on the Basin Plan objective.

d. **Color**. The Basin Plan includes a water quality objective that "*[W]ater shall be free of discoloration that causes nuisance or adversely affects beneficial uses."* Receiving Water Limitations for color are included in this Order and are based on the Basin Plan objective.

e. **Dissolved Oxygen.** The Basin Plan includes a water quality objective that "*[W]ithin the legal boundaries of the Delta, the dissolved oxygen concentrations shall not be reduced below: 7.0 mg/L in the Sacramento River (below the I Street Bridge) and in all Delta waters west of the Antioch Bridge; 6.0 mg/L in the San Joaquin River (between Turner Cut and Stockton, 1 September through 30 November); and 5.0 mg/L in all other Delta waters except those bodies of water which are constructed for special purposes and from which fish have been excluded or where the fishery is not important as a beneficial use*." Numeric Receiving Water Limitations for dissolved oxygen are included in this Order and are based on the Basin Plan objective.

f. **Floating Material**. The Basin Plan includes a water quality objective that *"[W]ater shall not contain floating material in amounts that cause nuisance or adversely affect beneficial uses."* Receiving Water Limitations for floating material are included in this Order and are based on the Basin Plan objective.

g. **Oil and Grease**. The Basin Plan includes a water quality objective that *"[W]aters shall not contain oils, greases, waxes, or other materials in concentrations that cause nuisance, result in a visible film or coating on the surface of the water or on objects in the water, or otherwise adversely affect beneficial uses."* Receiving Water Limitations for oil and grease are included in this Order and are based on the Basin Plan objective.

h. **pH.** The Basin Plan includes water quality objective that *"[T]he pH shall not be depressed below 6.5 nor raised above 8.5. Changes in normal ambient pH levels shall not exceed 0.5 in fresh waters with designated COLD or WARM beneficial uses*" This Order includes receiving water limitations for both pH range and pH change and are based on the Basin Plan objective.

The Basin Plan allows an appropriate averaging period for pH change in the receiving stream. Since there is no technical information available that indicates that aquatic organisms are adversely affected by shifts in pH within the 6.5 to 8.5 range, an averaging period is considered appropriate and a monthly averaging

period for determining compliance with the 0.5 receiving water pH limitation is included in this Order.

i. **Pesticides**. The Basin Plan includes a water quality objective for pesticides beginning on page III-6.00. Receiving Water Limitations for pesticides are included in this Order and are based on the Basin Plan objective.

j. **Radioactivity**. The Basin Plan includes a water quality objective that *"[R]adionuclides shall not be present in concentrations that are harmful to human, plant, animal or aquatic life nor that result in the accumulation of radionuclides in the food web to an extent that presents a hazard to human, plant, animal or aquatic life."* The Basin Plan states further that *"[A]t a minimum, waters designated for use as domestic or municipal supply (MUN) shall not contain concentrations of radionuclides in excess of the maximum contaminant levels (MCLs) specified in Table 4* [currently referred to as Table 64443] *(MCL Radioactivity) of Section 64443 of Title 22 of the California Code of Regulations…"* Receiving Water Limitations for radioactivity are included in this Order and are based on the Basin Plan objective.

k. **Suspended Sediments.** The Basin Plan includes a water quality objective that *"[T]he suspended sediment load and suspended sediment discharge rate of surface waters shall not be altered in such a manner as to cause nuisance or adversely affect beneficial uses"* Receiving Water Limitations for suspended sediments are included in this Order and are based on the Basin Plan objective.

l. **Settleable Substances.** The Basin Plan includes a water quality objective that *"[W]aters shall not contain substances in concentrations that result in the deposition of material that causes nuisance or adversely affects beneficial uses."* Receiving Water Limitations for settleable substances are included in this Order and are based on the Basin Plan objective.

m. **Suspended Material.** The Basin Plan includes a water quality objective that *"[W]aters shall not contain suspended material in concentrations that cause nuisance or adversely affect beneficial uses."* Receiving Water Limitations for suspended material are included in this Order and are based on the Basin Plan objective.

n. **Taste and Odors**. The Basin Plan includes a water quality objective that *"[W]ater shall not contain taste- or odor-producing substances in concentrations that impart undesirable tastes or odors to domestic or municipal water supplies or to fish flesh or other edible products of aquatic origin, or that cause nuisance, or otherwise adversely affect beneficial uses."* Receiving Water Limitations for taste- or odor-producing substances are included in this Order and are based on the Basin Plan objective.

o. **Temperature.** The Thermal Plan is applicable to this discharge. The thermal Plan requires that the discharge shall not cause the following in San Joaquin River:

i. *"The creation of a zone, defined by water temperatures of more than 1ºF above natural receiving water temperature, which exceeds 25 percent of the cross-sectional area of the river channel at any point.*

ii. *A surface water temperature rise greater than 4ºF above the natural temperature of the receiving water at any time or place."*

Numeric receiving Water Limitations for temperature are included in this Order and are based on the Thermal Plan requirements.

p. **Toxicity**. The Basin Plan includes a water quality objective that *"[A]ll waters shall be maintained free of toxic substances in concentrations that produce detrimental physiological responses in human, plant, animal, or aquatic life."* Receiving Water Limitations for toxicity are included in this Order and are based on the Basin Plan objective.

q. **Turbidity.** The Basin Plan includes a water quality objective that "*[I]ncreases in turbidity attributable to controllable water quality factors shall not exceed the following limits:*

- *Where natural turbidity is between 0 and 5 Nephelometric Turbidity Units (NTUs), increases shall not exceed 1 NTU.*
- *Where natural turbidity is between 5 and 50 NTUs, increases shall not exceed 20 percent.*
- *Where natural turbidity is between 50 and 100 NTUs, increases shall not exceed 10 NTUs.*
- *Where natural turbidity is greater than 100 NTUs, increases shall not exceed 10 percent*."

A numeric Receiving Surface Water Limitation for turbidity is included in this Order and is based on the Basin Plan objective for turbidity.

B. Groundwater

1. **Basin Plan, Beneficial Uses, and Regulatory Considerations.** The beneficial uses of the underlying ground water are municipal and domestic supply, industrial service supply, industrial process supply, and agricultural supply.

Basin Plan water quality objectives for groundwater include narrative objectives for toxicity, chemical constituents, and tastes and odors. The toxicity objective requires that groundwater be maintained free of toxic substances in concentrations that produce detrimental physiological responses in humans, plants, animals, or aquatic life. The chemical constituent objective states groundwater shall not contain chemical constituents in concentrations that adversely affect any beneficial use. The tastes and odors objective prohibits taste- or odor-producing substances in concentrations that cause nuisance or adversely affect beneficial uses. The Basin Plan also establishes numerical water quality objectives for bacteria, chemical

constituents, and radioactivity in groundwater designated as municipal supply; these include, at a minimum, compliance with MCLs in Title 22 of the CCR. Additionally, the bacteria objective prohibits coliform organisms at or above 2.2 MPN/100 mL.

The Basin Plan requires the application of the most stringent objective necessary to ensure that waters do not contain chemical constituents, toxic substances, radionuclides, taste- or odor-producing substances, or bacteria in concentrations that adversely affect municipal or domestic supply, agricultural supply, industrial supply or some other beneficial use.

2. **Antidegradation.** The antidegradation directives of State Water Board Resolution No. 68-16, "Statement of Policy With Respect to Maintaining High Quality Waters in California," or "Antidegradation Policy" require that waters of the State that are better in quality than established water quality objectives be maintained "*consistent with the maximum benefit to the people of the State."* Some degradation of the groundwater for certain constituents is consistent with maximum benefit to the people of California because the technology, energy, and waste management advantages of municipal water treatment plants far outweigh the environmental impact of a community that would otherwise be reliant on numerous domestic wells. Economic prosperity of local communities is of maximum benefit to the people of California, and therefore, sufficient reason to accommodate this wastewater discharge provided terms of reasonable degradation are defined and met.

3. **Wastewater Storage.** The Discharger utilizes an unlined sludge lagoon located within the secondary treatment facility on the east side of the San Joaquin River, and three unlined facultative oxidation ponds located on the west side of the San Joaquin River that store treated domestic waster before the tertiary treatment process. Domestic wastewater contains constituents of concern such as total dissolved solids (TDS), specific conductivity (EC), pathogens, nitrates, organics, metals, and oxygen demanding substances (BOD).

   Within the eastern portion of the Facility, digested "*sludge is pumped to a sludge lagoon where it is allowed to concentrate. A dredge is used to pump settled and concentrated material off the bottom of the lagoon*. . ." (ROWD, September 2006) Within the western portion of the Facility, "*Effluent is introduced into a recirculation canal at the northeast corner of Pond #1 [located adjacent to the San Joaquin River], from where it flows south and then west around the perimeter of Ponds #1-3. Control gates along the recirculation canal are opened or closed as needed to introduce effluent to the south end of the facultative ponds. Similar flow control gates are located at a lower elevation along the northern edge of the facultative ponds and allow pond water into a recirculation canal parallel to the facultative pond's northern edges. . . .A perimeter groundwater interceptor drainage ditch is located outside the recirculation canal south of the facultative ponds and a subsurface interceptor drain is located west of the recirculation canal west of Pond #3*." From the interceptor ditch, "*captured groundwater is pumped back to the recirculation canal. . . Water from the facultative ponds entering the north recirculation canal can be directed via pipeline northward to another recirculation canal that delivers water to the west end of the engineered wetlands*." (Condor Earth Technologies, Inc. 22 September 2006)

Treated domestic sewage in the unlined lagoon, recirculation canals, or facultative ponds, may result in an increase in the concentration of constituents of concern in groundwater, and therefore, the previous Order No. R5-2002-0083 required the Discharger to design and construct a network of groundwater monitoring wells that includes "*one or more background monitoring wells and a sufficient number of designated monitoring wells to evaluate performance of best practicable control technology (BPCT) measures and to determine if the discharge has degraded groundwater*."

4. **Groundwater Quality.** By 17 December 2003, the Discharger installed fourteen monitoring wells (MW1 – MW14), and to identify background groundwater quality, two additional monitoring wells were installed (MW15 and MW16). Surface water samples were also obtained from the San Joaquin River near (1) Garwood Bridge, (2) the intersection of San Joaquin River and Burns Cutoff, (3) Pond No. 2, (4) the Agricultural Ditch West of Pond #3, and (5) Pump Station near Oxidation Pond #1. In 2005, two additional monitoring wells were installed, MW-17 and MW-18. MW-17 was installed down gradient (east) of MW-13, which contained nitrate concentrations that exceed the MCL. MW-18 was installed outboard of the recirculation canal to relocate MW-4, which may have been influenced by, or directly hydraulically connected to, the recirculation canal and therefore may not be representative of groundwater conditions (Geotechnical Consultants, Inc. 2004, Condor Earth Technologies, Inc. 2006). The secondary-level treated effluent discharged through the recirculation canal and stored in the facultative ponds was not monitored.

   Quarterly samples of electrical conductivity (EC), total dissolved solids (TDS), ammonia, nitrate as nitrogen, Total Kjeldahl Nitrogen (TKN), and total coliform were collected. Water quality as indicated by the analytical results shows high levels of EC and TDS in monitoring wells MW-1, MW-2, MW-3, MW-4, MW-5, MW-6, MW-7, MW-12, MW-13, MW-17, and MW-18. Analytical results also show high levels of nitrate in monitoring wells MW-10 and MW-13, and high levels of total coliform in monitoring wells MW-7, MW-8, MW-9, MW-13, and MW-17. Table F-13 below summarizes the range of the data from the period of December 2004 through June 2006 for some monitoring wells.

   Monitoring well MW-4 is located between the recirculation canal and the groundwater interceptor drain, and therefore, may not represent groundwater conditions. Monitoring wells MW-8, MW-9, MW-11, and MW-14 are located close to the San Joaquin River and reflect the influence of fresh water recharge from the river, and therefore, also may not represent groundwater conditions. MW-1, MW-2, and MW-10 are also located along the western side of the San Joaquin River. However, MW-1 and MW-2, located on the eastern side of Pond #1 and along the recirculation canal, contain higher EC and TDS levels than the San Joaquin River, which suggests that these wells may be hydraulically and chemically influenced by Pond #1 or the recirculation canal. No known samples were obtained from Pond #1 nor the secondary effluent to conclude differently, and the single sample obtained from Pond #2, which contained EC and TDS concentrations at 1100 and 600 mg/L, respectively, is insufficient data to make informed, appropriate determinations. MW-10, located near an effluent canal, contains high levels of nitrate, which

suggests that it may be hydraulically and chemically influenced by the effluent. (Geotechnical Consultants, Inc. 2004, Condor Earth Technologies, Inc. 2006)

Table F-13. Summary of Groundwater Conditions

Parameter	Water Quality Objectives	Background Monitoring Wells		Groundwater Monitoring Wells Near Ponds						Monitoring Wells at Secondary Facility		
				Between Ponds & SJR		South of Ponds		West of Ponds		Sludge Lagoon	East of Clarifiers	
		MW-15	MW-16	MW-1	MW-2	MW-3	MW-5	MW-6	MW-7	MW-12	MW-13	MW-17
EC (umhos/cm)	700[2]	1012 - 1662	1056 - 1922	1478 - 2886	1544 - 2869	1750 - 1800	1830 - 2492	1197 - 1940	1462 - 2233	1211 - 2305	1640 - 2976	1293 - 2322
	900, 1600, 2200[3]											
TDS (mg/L)	450[2]	870 - 1170	1170 - 1220	1440 - 1510	1430 - 1570	990 - 1040	1490 - 1570	1130 - 1250	1200 - 1290	1020 - 1420	1670 - 2050	1430 - 1730
	500, 1000, 1500[3]											
Ammonia as N	1.5	-0.2 to 10.6	-0.2 to 0.3	-0.2 to 3.8	-0.2 to 0.6	-0.2 to 0.7	-0.2 to 0.4	-0.2 to 0.3	-0.2 to 0.4	-0.2 to 2.2	-0.2 to 1.5	-0.2 to 0.2
Nitrate as N (mg/L)	10[1]	-0.1 to 22.2	-0.1	-0.1 to 0.2	-1	-0.1	-0.1 to 1.2	-0.1	-0.1	-0.1	0.6 to 38.6	1.1 to 7.5
TKN	--	-0.5	<0.5	0.5	0.6	-0.5	1.1	0.5	-0.5	6	-0.5	0.6
Total Coliform (MPN/100 mL)	<2.2[4]	23 - 7000	-2 to 80	-2 to 70	-2 to 13	-2 to 50	-2 to 23	-2 to 80	-2 to 11100	-2 to 3.6	-2 to 24000	-2 to 80

1. USEPA Drinking Water Standards (Primary Maximum Contaminant Level)
2. Agricultural water quality goals based on *Water Quality for Agriculture*, Food and Agriculture Organization of the United Nations—Irrigation and Drainage Paper No. 29, Rev. 1 (R.S. Ayers and D.W. Westcot, Rome, 1985) Agricultural water quality goals listed provide no restrictions on crop type or irrigation methods for maximum crop yield. Higher concentrations may require special irrigation methods to maintain crop yields or may restrict types of crops grown.
3. Department of Public Health Secondary MCLs. The secondary MCLs are stated as a recommended level, upper level, and a short-term maximum level.
4. Basin Plan water quality objective for MUN beneficial use.

5. **Background Conditions.** The Facility is located in the San Joaquin Delta, and the Facility is bifurcated by the San Joaquin River. In general, areas of poor water quality with high salinity exist throughout the Delta subbasin. TDS values range from 210 to 7800 mg/L and average about 1190 mg/L. Areas of elevated chloride and nitrate occur in several areas within the subbasin. (California's Groundwater, Bulletin 118, 20 January 2006) Monitoring results obtained along this segment of the San Joaquin River indicate an average TDS value of about 400 mg/L, which is significantly lower than the subbasin levels. Land use to the west of the Facility is predominately agricultural, and land use to the east of the Facility is mixed uses of agricultural and municipal supply water. "*Groundwater flow occurs primarily through fine-grained sand and silty sand channel deposits found as laterally discontinuous lenses and stingers set within clays. The approximate depth of the silty channel deposits is on the order of 150 feet. The upper aquifer has poor transmissivity and low storage.*" (Geotechnical Consultants, Inc. 2004)

   By definition background groundwater conditions are those pollutants that are present in the groundwater that are not attributable to the Facility's activities. Rather, these conditions are outside the influence of the Facility, and may be caused by local geophysical, hydrological, and meteorological process, and wildlife and

outside anthropogenic activities. The Discharger installed two background monitoring wells, MW-15 and MW-16. "*Background well MW-15 is located 1700 feet upgradient of the ponds to the south, and background well MW-16 is located 2500 feet downgradient of the ponds to the west. . . MW-15 is a true background well, uninfluenced by the presence of the ponds*." (Condor Earth Technologies, Inc. September 2006) These background monitoring wells are located on the western side of the San Joaquin River. Previous Table F-13 summarizes the range of data obtained in the background monitoring wells MW-15 and MW-16, which, at times, exceed water quality objectives. No known background monitoring well was installed on the eastern side of the San Joaquin River.

The Basin Plan stipulates that when the background condition(s) is less stringent than the numeric water quality objective, the background condition supercedes the numeric water quality objective. Therefore establishing the numeric level at which constituents of concern are present in the groundwater with no influence from the Facility is relevant in determining if the discharge degrades groundwater and in evaluating the performance of the Facility's BPCT measures. Since anthropogenic activities do not affect all aspects of water quality, it is possible that background water quality conditions can exist for one constituent but not for another, and therefore, generalizations about the subbasin water quality conditions may not adequately protect the beneficial uses. For instance, the high levels of EC and TDS at MW-1 and MW-2 and the high levels of nitrates in MW-10 and MW-13 indicate possible localized impacts. The Discharger's groundwater condition study states "*the geology creates a situation where there is considerable variability and poor interconnection between groundwater at different places*." (Condor Earth Technologies, Inc. September 2006)

6. **Groundwater Limits.** In allowing a discharge, the Regional Water Board must comply with CWC Section 13263 in setting appropriate conditions. The Regional Water Board is required, relative to the groundwater that may be affected by the discharge, to implement the Basin Plan and consider the beneficial uses to be protected along with the water quality objectives essential for that purpose. The Regional Water Board need not authorize the full utilization of the waste assimilation capacity of the groundwater (CWC 13263(b)) and must consider other waste discharges and factors that affect that capacity.

   TDS and EC concentrations in nearly all wells, including at times the background wells, exceed water quality objectives. However, high TDS and EC concentration values in localized areas such as monitoring wells MW-1 and MW-2 located between Pond #1 and the San Joaquin River on the western portion of the Facility, indicate that the treated domestic wastewater may be impacting groundwater. Further indications that MW-1 and MW-2 may be locally impacted comes from a hydrograph study finding that states "there is a net hydrostatic pressure gradient towards the river from the ponds." (Condor Earth Technologies, Inc. September 2006) Also, nitrate concentration values in MW-10 located near the San Joaquin River and the effluent discharge on the western portion of the Facility indicate that certain wastewater control practices may not be justified as representative of Best Practicable Treatment and Control (BPTC). On the eastern portion of the Facility,

high TDS and EC concentrations in MW-12, MW-13 and MW-17 and high nitrate concentrations in MW-13 and MW-17 indicate that certain aspects of wastewater treatment and control practices also may not be justified as representative of BPTC, or certain operation and maintenance practices may not be justified as best management practices. Still, insufficient data has been reported to establish background groundwater conditions, even though it appears that groundwater in the aquifer beneath the Facility may be impacted for beneficial uses. Though groundwater monitoring has been conducted around the Facility, additional background groundwater quality data are needed to establish the most appropriate groundwater limits. Reasonable time is necessary to gather specific information about the Facility to make informed, appropriate, long-term decisions.

Therefore, this Order provisionally requires the Discharger to install additional monitoring wells and any other testing needed to effectively and fully characterize background quality conditions. Based on this information, the Discharger must technically evaluate the Facility's processes or storage areas and submit a time schedule to implement or modify BPTCs as necessary. This Order also contains narrative and numeric groundwater limitations that become effective upon completion of the background quality condition and BPTC evaluation studies. This Order contains a reopener to add or modify groundwater limitations as necessary.

In addition, this Order requires the continued monitoring of the groundwater monitoring network to monitor the impact of the discharge and help develop long-term groundwater limits. This Order also requires monitoring of the secondary effluent transported to the facultative ponds to measure concentrations of certain constituents contained in the treated domestic wastewater, and of the pond water to determine whether degradation of the groundwater for certain constituents from percolation of the treated domestic wastewater stored in the unlined facultative ponds is consistent with maximum benefit to the people of California, and thus, complies with Antidegradation Policy.

VI. RATIONALE FOR MONITORING AND REPORTING REQUIREMENTS

Section 122.48 requires that all NPDES permits specify requirements for recording and reporting monitoring results. Water Code sections 13267 and 13383 authorizes the Regional Water Board to require technical and monitoring reports. The Monitoring and Reporting Program (MRP), Attachment E of this Order, establishes monitoring and reporting requirements to implement federal and state requirements. The following provides the rationale for the monitoring and reporting requirements contained in the MRP for this facility.

A. Influent Monitoring

1. Influent monitoring is required to collect data on the characteristics of the wastewater and to assess compliance with effluent limitations (e.g., BOD_5 and TSS reduction requirements). Influent monitoring requirements for flow, pH, CBOD5, TSS, EC, and TDS are retained from previous Order No. R5-2002-0083.

B. Effluent Monitoring

1. Pursuant to the requirements of 40 CFR §122.44(i)(2) effluent monitoring is required for all constituents with effluent limitations. Effluent monitoring is necessary to assess compliance with effluent limitations, assess the effectiveness of the treatment process, and to assess the impacts of the discharge on the receiving stream. Because the effluent data submitted by the Discharger did not demonstrate reasonable potential for barium, chromium VI, chloroform, copper, DDT, dichloromethane, endrin aldehyde, lead, lindane, TCE, PCE, or 1,1-dichloroethylene, specific effluent monitoring requirements for these parameters were removed. These parameters will continue to be monitored annually as part of the priority pollutant monitoring. Effluent monitoring requirements from the previous order for the remaining parameters are carried over to assess compliance with effluent limitations. Monitoring requirements for aluminum, dissolved oxygen, and manganese are established or modified from the previous order to assess compliance with newly established effluent limitations. Monitoring requirements for methyl-mercury, sulfur dioxide, and sodium biosulfate have been added to assess the impacts of the discharge on the receiving stream. A special study requires monitoring of priority pollutants (Provision VI.C.2.d) to assess reasonable potential to exceed water quality criteria for these parameters.

C. Whole Effluent Toxicity Testing Requirements

1. **Acute Toxicity.** Consistent with the requirements contained in previous Order No. R5-2002-0083, weekly 96-hour bioassay testing is required to demonstrate compliance with the effluent limitation for acute toxicity.

2. **Chronic Toxicity.** Chronic whole effluent toxicity testing has been retained from previous Order No. R5-2002-0083 to demonstrate compliance with the Basin Plan's narrative toxicity objective.

D. Receiving Water Monitoring

1. Surface Water Monitoring and Visual Observations

a. Receiving water monitoring and visual observations are necessary to assess compliance with receiving water limitations and to assess the impacts of the discharge on the receiving stream to assess reasonable potential to exceed water quality criteria for these parameters. Receiving water monitoring is carried over from the previous Order.

2. Groundwater Monitoring

a. Section 13267 of the California Water Code states, in part, *"(a) A Regional Water Board, in establishing…waste discharge requirements… may investigate the quality of any waters of the state within its region*" and "*(b) (1) In conducting an investigation…, the Regional Water Board may require that any person who…*

discharges… waste…that could affect the quality of waters within its region shall furnish, under penalty of perjury, technical or monitoring program reports which the Regional Water Board requires. The burden, including costs, of these reports shall bear a reasonable relationship to the need for the report and the benefits to be obtained from the reports." In requiring those reports, the Regional Water Board shall provide the person with a written explanation with regard to the need for the reports, and shall identify the evidence that supports requiring that person to provide the reports. The Monitoring and Reporting Program (Attachment E) is issued pursuant to California Water Code Section 13267. The groundwater monitoring and reporting program required by this Order and the Monitoring and Reporting Program are necessary to assure compliance with these waste discharge requirements. The Discharger is responsible for the discharges of waste at the Facility subject to this Order.

b. This Order requires the Discharger to continue groundwater monitoring as established under previous Order No. R5-2002-0083 and includes a regular schedule of groundwater monitoring in the attached Monitoring and Reporting Program. The groundwater monitoring reports are necessary to evaluate impacts to waters of the State to assure protection of beneficial uses and compliance with Regional Water Board plans and policies, including Resolution No. 68-16. Evidence in the record includes effluent monitoring data that indicates the presence of constituents that may degrade groundwater and surface water. For additional information see previous Section V.B of this Fact Sheet.

E. Other Monitoring Requirements

1. **Reclamation Monitoring**
   Reclamation monitoring is required to ensure compliance with Effluent Limitations and Discharge Specifications IV.C. in the Limitations and Discharge Requirements section of this Order.

2. **Biosolids Monitoring**
   Biosolids monitoring is required to ensure compliance with the biosolids disposal requirements (Special Provisions VI.C.5.b, c, and d). Biosolids disposal requirements are imposed pursuant to 40 CFR Part 503 to protect public health and prevent groundwater degradation.

3. **Water Supply Monitoring**
   Water supply monitoring is required to evaluate the source of constituents in the wastewater.

4. **Monitoring of Secondary Effluent and Facultative Ponds**
   Monitoring of the secondary effluent and the wastewater in the facultative ponds are necessary to assess the impacts of the percolate to groundwater. Secondary effluent and pond monitoring are new requirements in this Order because the localized background groundwater conditions have not been determined, which is necessary to ensure compliance with the Groundwater Limitations V.B in the

Limitations and Discharge Requirements section of this Order. For additional information see sections V.B. and VII.B.2.c. of this Fact Sheet.

VII. RATIONALE FOR PROVISIONS

A. Standard Provisions

Standard Provisions, which apply to all NPDES permits in accordance with section 122.41, and additional conditions applicable to specified categories of permits in accordance with section 122.42, are provided in Attachment D. The discharger must comply with all standard provisions and with those additional conditions that are applicable under section 122.42.

Section 122.41(a)(1) and (b) through (n) establish conditions that apply to all State-issued NPDES permits. These conditions must be incorporated into the permits either expressly or by reference. If incorporated by reference, a specific citation to the regulations must be included in the Order. Section 123.25(a)(12) allows the state to omit or modify conditions to impose more stringent requirements. In accordance with section 123.25, this Order omits federal conditions that address enforcement authority specified in sections 122.41(j)(5) and (k)(2) because the enforcement authority under the Water Code is more stringent. In lieu of these conditions, this Order incorporates by reference Water Code section 13387(e).

B. Special Provisions

1. Reopener Provisions

a. **Special Provisions VI.C.1.a. & b.** These provisions are based on CFR Part 123 and allow future modification of this Order and its effluent limitations as necessary in response to updated WQOs that may be established in the future.

b. **Mercury, Total.** This provision allows the Regional Water Board to reopen this Order in the event a mercury TMDL program is adopted. In addition, this Order shall be reopened if the Regional Water Board determines that a mercury offset program is feasible for dischargers subject to a NPDES permits.

c. **Pollution Prevention.** This Order requires the Discharger to update and implement the salinity and mercury pollution prevention plans (PPP) following CWC section 13263.3(d)(3). This reopener provision allows the Regional Water Board to reopen this Order for addition and/or modification of effluent limitations and requirements for these constituents based on a review of the pollution prevention plans and success in the implementation of these plans.

d. **Whole Effluent Toxicity.** This Order requires the Discharger to investigate the causes of, and identify corrective actions to reduce or eliminate effluent toxicity through a Toxicity Reduction Evaluation (TRE). This Order may be reopened to include a numeric chronic toxicity limitation, a new acute toxicity limitation, and/or

a limitation for a specific toxicant identified in the TRE. Additionally, if a numeric chronic toxicity water quality objective is adopted by the State Water Board, this Order may be reopened to include a numeric chronic toxicity limitation based on that objective.

e. **Water Effects Ratio (WER) and Metal Translators.** A default WER of 1.0 has been used in this Order for calculating CTR criteria and Basin Plan objectives for ammonia or applicable priority pollutant inorganic constituents. If the Discharger performs defensible water effect ratio studies to determine site-specific WERs and/or site-specific dissolved-to-total metal translators, this Order may be reopened to modify the effluent limitations for applicable constituents. Accordingly, this provision allows the Regional Water Board to reopen this Order to modify the applicable effluent limitations in the event that the Discharger conducts and completes these studies, or based upon an independent scientific peer review's defensible findings that update the national ambient water quality criteria for aluminum.

f. **Best Practicable Treatment or Control Assessment.** This Order requires the Discharger to complete and submit a correction action plan and implementation schedule for necessary modifications to any of the Facility's storage, treatment, or disposal components where the groundwater monitoring results exceed either the background monitoring results or the appropriate numeric groundwater water quality objectives that are adequately protective of the beneficial uses. This reopener provision allows the Regional Water Board to reopen this Order for addition and/or modification of the groundwater limitations and requirements based on this report and the site-specific objectives for protection of the beneficial uses.

g. **Central Valley Drinking Water Policy (Special Provisions VI.C.1.i.)**. The Regional Water Board is currently working with stakeholders to develop a Drinking Water Policy for the Central Valley. Based on the current schedule, the Basin Plan may be proposed to be amended in 2009 or 2010 to incorporate water quality objectives for the protection of drinking water supplies. A reopener has been included in the Order to allow the Regional Water Board to reopen the permit to include appropriate effluent limitations, as appropriate, to require compliance with these objectives.

h. **Ammonia Studies.** The Regional Water Board contracted with researchers at the University of California, Davis Aquatic Toxicology Laboratory to initiate studies to evaluate the potential effects of ammonia on delta smelt. This reopener provision allows the Regional Water Board to reopen this Order for addition and/or modification of the ammonia limitations and requirements based on this report or based upon other defensible scientific findings.

i. **Regional Monitoring Program.** The State and Regional Water Boards are committed to creation of a coordinated Regional Monitoring Program to address receiving water monitoring in the Delta for all Water Board regulatory and research programs. This reopener provision allows the Regional Water Board to

reopen this Order to make appropriate adjustments in permit-specific monitoring to coordinate with the Regional Monitoring Program.

i. **The Bay-Delta Plan**. The South Delta salinity standards are currently under review by the State Water Board in accordance with implementation provisions contained in the Bay-Delta Water Quality Control Plan. This review in process includes an updated independent scientific investigation of irrigation salinity needs in the southern Delta. A reopener has been included in the Order to allow the Regional Water Board to reopen the permit to include appropriate effluent limitations, as appropriate, to require compliance with these objectives.

2. Special Studies, Technical Reports, and Additional Monitoring Requirements

a. **Chronic Whole Effluent Toxicity Requirements.** The Basin Plan contains a narrative toxicity objective that states, "*All waters shall be maintained free of toxic substances in concentrations that produce detrimental physiological responses in human, plant, animal, or aquatic life.*" (Basin Plan at III-8.00.) To comply with Provision G.12 in the previous permit, Order No. R5-2002-0083, the Discharger submitted a TRE/TIE Work Plan, dated 26 July 2002. On 27 March 2003, Regional Water Board staff provided comments regarding the TIE/TRE Work Plan and the Discharger's subsequent Technical Memorandum dated 11 December 2002, and requested the Discharger to update the TIE/TRE Work Plan accordingly. Subsequently, the Discharger submitted the revised TIE/TRE Work Plan on 10 December 2003, and the Executive Officer conditionally approved the work plan on 4 May 2004.

In April 2007, the Discharger concluded the TRE, and submitted the evaluation report to the Regional Water Board, *Assessment of the City of Stockton's Historic Whole Effluent Toxicity Testing and Toxicity Reduction Evaluation Programs for Selenastrum capriconutum*, Jones & Stockes Associates. The TRE identified the toxicant in the *Selenastrum capriconutum* bioassay as ammonia. Recent Facility upgrades that included new nitrification facilities were expected to reduce the occurrence of the toxicant ammonia. Subsequent accelerated monitoring concluded in October 2007 without further *Selenastrum capricornutum* (algae) toxicity, and, therefore, confirmed the TRE findings.

This provision requires the Discharger to update its TRE Work Plan in accordance with USEPA guidance. In addition, the provision provides a numeric toxicity monitoring trigger and requirements for accelerated monitoring, as well as, requirements for TRE initiation if a pattern of toxicity has been demonstrated.

Monitoring Trigger. A numeric toxicity monitoring trigger of > 1 TUc (where TUc = 100/NOEC) is applied in the provision, because this Order does not allow any dilution for the chronic condition. Therefore, a TRE is triggered when the effluent exhibits a pattern of toxicity at 100% effluent.

Accelerated Monitoring. The provision requires accelerated WET testing when a regular WET test result exceeds the monitoring trigger. The purpose of accelerated monitoring is to determine, in an expedient manner, whether there is a pattern of toxicity before requiring the implementation of a TRE. Due to possible seasonality of the toxicity, the accelerated monitoring should be performed in a timely manner, preferably taking no more than 2 to 3 months to complete.

The provision requires accelerated monitoring consisting of four chronic toxicity tests every 2 weeks using the species that exhibited toxicity. Guidance regarding accelerated monitoring and TRE initiation is provided in the *Technical Support Document for Water Quality-based Toxics Control, EPA/505/2-90-001, March 1991* (TSD). The TSD at page 118 states, "EPA recommends if toxicity is repeatedly or periodically present at levels above effluent limits more than 20 percent of the time, a TRE should be required." Therefore, four accelerated monitoring tests are required in this provision. If no toxicity is demonstrated in the four accelerated tests, then it demonstrates that toxicity is not present at levels above the monitoring trigger more than 20 percent of the time (only 1 of 5 tests are toxic, including the initial test). However, notwithstanding the accelerated monitoring results, if there is adequate evidence of a pattern of effluent toxicity (i.e. toxicity present exceeding the monitoring trigger more than 20 percent of the time), the Executive Officer may require that the Discharger initiate a TRE.

See the WET Accelerated Monitoring Flow Chart (Figure F-1), below, for further clarification of the accelerated monitoring requirements and for the decision points for determining the need for TRE initiation.

TRE Guidance. The Discharger is required to update its TRE Work Plan in accordance with USEPA guidance. Numerous guidance documents are available, as identified below:

- *Toxicity Reduction Evaluation Guidance for Municipal Wastewater Treatment Plants,* EPA/833B-99/002, August 1999.

- Generalized Methodology for Conducting Industrial TREs, EPA/600/2-88/070, April 1989.

- *Methods for Aquatic Toxicity Identification Evaluations: Phase I Toxicity Characterization Procedures,* Second Edition, EPA/600/6-91/005F, February 1991.

- *Toxicity Identification Evaluation: Characterization of Chronically Toxic Effluents, Phase I*, EPA/600/6-91/005F, May 1992.

- *Methods for Aquatic Toxicity Identification Evaluations: Phase II Toxicity Identification Procedures for Samples Exhibiting acute and Chronic Toxicity,* Second Edition, EPA/600/R-92/080, September 1993.

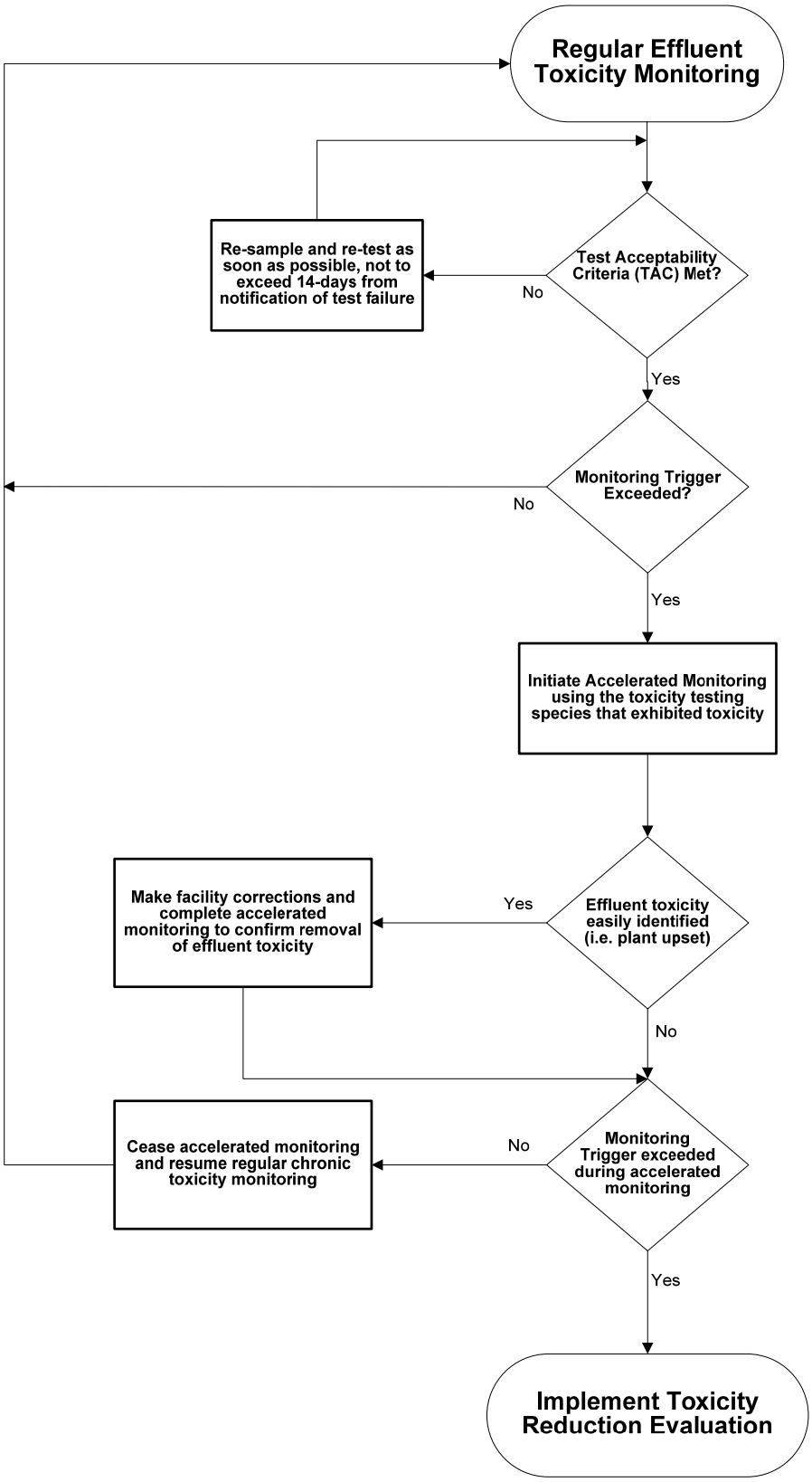
- *Methods for Aquatic Toxicity Identification Evaluations: Phase III Toxicity Confirmation Procedures for Samples Exhibiting Acute and Chronic Toxicity*, Second Edition, EPA/600/R-92/081, September 1993.

- *Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms*, Fifth Edition, EPA/821/R-02/012, October 2002.

- *Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms*, Fourth Edition, EPA/821/R-02/013, October 2002.

- *Technical Support Document for Water Quality-based Toxics Control,* EPA/505/2-90/001, March 1991.

Figure F-1
WET Accelerated Monitoring Flow Chart



b. **Effluent and Receiving Water Characterization Study.** An effluent and receiving water monitoring study is required to ensure adequate information is available for the next permit renewal.

c. **Time Schedule for Compliance with Groundwater Limitations and Best Practicable Treatment or Control (BPTC).** The previous permit required the Discharger to install a groundwater monitoring network, including the characterization of background groundwater quality. To comply, the Discharger installed 18 monitoring wells, which includes the background groundwater quality monitoring well, MW-15. Quarterly monitoring results from 30 December 2003, through 5 February 2008, indicated that the Facility's storage, treatment, or disposal components may have degraded the underlying groundwater quality. Therefore this provision is necessary to prevent further degradation of the underlying groundwater within the influences of the Facility, and to ensure that the Beneficial Uses of the groundwater are protected. For additional information see previous Section V.B of this Fact Sheet.

3. Best Management Practices and Pollution Prevention

a. **Pollution Prevention Plan (PPP) for Mercury.** The Discharger shall update and implement its PPP for mercury (*Pollution Prevention Plan Implementation for Total Dissolved Solids* [salinity]*, Mercury and Group A Pesticides,* February 2005), in accordance with CWC section 13263.3(d)(1)(D). The interim effluent limitation for mercury limits the mass loading to current levels. The PPP for mercury is necessary to ensure that the discharge of this pollutant does not increase pending the development of TMDLs.

b. **CWC section 13263.3(d)(3) Pollution Prevention Plans.** The pollution prevention plans required for mercury and salinity [measured as electrical conductivity] shall, at a minimum, meet the requirements outlined in CWC section 13263.3(d)(3). The minimum requirements for the pollution prevention plans include the following:

i. An estimate of all of the sources of a pollutant contributing, or potentially contributing, to the loadings of a pollutant in the treatment plant influent.

ii. An analysis of the methods that could be used to prevent the discharge of the pollutants into the Facility, including application of local limits to industrial or commercial dischargers regarding pollution prevention techniques, public education and outreach, or other innovative and alternative approaches to reduce discharges of the pollutant to the Facility. The analysis also shall identify sources, or potential sources, not within the ability or authority of the Discharger to control, such as pollutants in the potable water supply, airborne pollutants, pharmaceuticals, or pesticides, and estimate the magnitude of those sources, to the extent feasible.

iii. An estimate of load reductions that may be attained through the methods identified in subparagraph ii.

iv. A plan for monitoring the results of the pollution prevention program.

v. A description of the tasks, cost, and time required to investigate and implement various elements in the pollution prevention plan.

vi. A statement of the Discharger's pollution prevention goals and strategies, including priorities for short-term and long-term action, and a description of the Discharger's intended pollution prevention activities for the immediate future.

vii. A description of the Discharger's existing pollution prevention programs.

viii. An analysis, to the extent feasible, of any adverse environmental impacts, including cross-media impacts or substitute chemicals that may result from the implementation of the pollution prevention program.

ix. An analysis, to the extent feasible, of the costs and benefits that may be incurred to implement the pollution prevention program.

c. **Salinity Reduction Goal.** In an effort to monitor progress in reducing salinity discharges to the San Joaquin River, the Discharger shall provide annual reports demonstrating reasonable progress in the reduction of salinity in its discharge to the San Joaquin River. An annual average salinity goal of the maximum weighted average electrical conductivity of the City of Stockton's water supply (i.e. 273 µmhos/cm in March 2005), plus an increment of 500 µmhos/cm for typical consumptive use, has been established as a reasonable goal during the term of this permit. The annual reports shall be submitted in accordance with the Monitoring and Reporting Program (Attachment E, Section X.D.1.).

d. **Salinity Plan.** The Regional Water Board, with cooperation of the State Water Board, has begun the process to develop a new policy for the regulation of salinity in the Central Valley. As previously described in this Fact Sheet, effluent data for EC and TDS indicate that effluent concentrations continue to be at levels of concern that may affect beneficial uses of the San Joaquin River. Therefore, this Order requires the Discharger to develop a Salinity Plan to reduce its salinity impacts to the San Joaquin River, which at a minimum must include source control measures, contributing financially in the development of the Central Valley Salinity Management Plan, and as reasonably possible, changing to water supplies with lower salinity. In addition, the Discharger is required to update and implement its pollution prevention plan for salinity in accordance with CWC section 13263.3(d)(3), and to implement pollution prevention measures to reduce the salinity in its discharge to the San Joaquin River.

The Antidegradation Policy (Resolution No. 68-16) requires that the Discharger implement best practicable treatment or control (BPTC) of its discharge. For salinity, the Regional Water Board is limiting effluent salinity of municipal

wastewater treatment plants to an increment of 500 µmhos/cm over the salinity of the municipal water supply or at existing levels. Based on the available data submitted by the Discharger, the highest concentration of EC reported was 273 µmhos/cm, based on 14 samples taken between September 2002 and June 2006. See previous section, "Salinity Production Goal", for additional information.

4. Construction, Operation, and Maintenance Specifications

a. **Treatment Pond Operating Requirements.** Requirements for the operation and maintenance of the treatment ponds are established to prevent flooding, reduce nuisances, and reduce public health concerns.

5. Special Provisions for Municipal Facilities (POTWs Only)

a. **Pretreatment Requirements.**

i. CWA Section 307(b), and CFR Part 403, require publicly owned treatment works to develop an acceptable industrial pretreatment program. A pretreatment program is required to prevent the introduction of pollutants and prevent pass through of pollutants that exceed water quality objectives, standards or permit limitations. Pretreatment requirements are imposed pursuant to CFR Part 403.

ii. The Discharger shall implement and enforce its approved pretreatment program and is an enforceable condition of this Order. If the Discharger fails to perform the pretreatment functions, the Regional Water Board, the State Water Board or the USEPA may take enforcement actions against the Discharger as authorized by the CWA.

b. **Biosolids (Special Provisions VI.C.5.b-d).** The use, disposal, or storage of biosolids is regulated under federal and state laws and regulations, including permitting requirements and technical standards included in 40 CFR Part 503. The Discharger is required to comply with the standards and time schedules contained in 40 CFR Part 503.

Title 27, CCR, Division 2, Subdivision 1, section 20005 establishes approved methods for the disposal of collected screenings, residual sludge, biosolids, and other solids removed from liquid wastes. This Order includes requirements to ensure the Discharger disposes of solids in compliance with State and federal regulations.

c. **Collection System.** The Discharger's collection system is part of the treatment system that is subject to the Order 2006-0003, adopted by the State Water Board in May 2006; this Order is a Statewide General WDR for Sanitary Sewer Systems. Therefore, the Discharger shall be subject to the requirements of Order 2006-0003 and any future revisions thereto. Pursuant to federal regulations, the Discharger must properly operate and maintain its collection

system [CFR Part 122.41(e)], report any non-compliance [CFR parts 122.41(l)(6) and (7)], and mitigate any discharge from the collection system in violation of this Order [CFR Part 122.41(d)].

d. **Turbidity Operational Requirements.** Turbidity specifications have been included in this Order as a second indicator of the effectiveness of the treatment process and to assure compliance with the required level of treatment. Failure of the filtration system such that virus removal is impaired would normally result in increased particles in the effluent, which result in higher effluent turbidity. Turbidity has a major advantage for monitoring filter performance, allowing immediate detection of filter failure and rapid corrective action. These operational turbidity specifications are necessary to assess compliance with the DPH recommended Title 22 disinfection criteria. For further information see previous section IV.C.3.w. of this Fact Sheet.

6. Other Special Provisions

a. **Tertiary Treatment.** To protect public health and safety, the Discharger is to comply with DHS reclamation criteria, CCR Title 22, Division 4, Chapter 3, or equivalent.

b. To protect public health and safety, treatment and storage facilities shall be designed, constructed, operated, and maintained to prevent inundation or washout due to floods with a 100-year return frequency.

c. **Ownership Change.** Sections 122.41(l)(3) and 122.61 of the CFR establish requirements for the transfer of an NPDES permit. Special Provision VI.C.6.c of this Order requires the Discharger to comply with federal regulations for the transfer of NPDES permits in the event of a change of ownership.
.

7. Compliance Schedules – Not Applicable

VIII. PUBLIC PARTICIPATION

The California Regional Water Quality Control Board, Central Valley Region (Regional Water Board) is considering the issuance of waste discharge requirements (WDRs) that will serve as a National Pollutant Discharge Elimination System (NPDES) permit for the City of Stockton Regional Wastewater Control Facility. As a step in the WDR adoption process, the Regional Water Board staff has developed tentative WDRs. The Regional Water Board encourages public participation in the WDR adoption process.

A. Notification of Interested Parties

The Regional Water Board has notified the Discharger and interested agencies and persons of its intent to prescribe waste discharge requirements for the discharge and has provided them with an opportunity to submit their written comments and recommendations. Notification was provided through publication in the Stockton Record.

B. Written Comments

The staff determinations are tentative. Interested persons are invited to submit written comments concerning these tentative WDRs. Comments must be submitted either in person or by mail to the Executive Office at the Regional Water Board at the address above on the cover page of this Order.

To be fully responded to by staff and considered by the Regional Water Board, written comments should be received at the Regional Water Board offices by 5:00 p.m. on **22 September 2008**

C. Public Hearing

The Regional Water Board will hold a public hearing on the tentative WDRs during its regular Board meeting on the following date and time and at the following location:

Date: 23/24 October 2008
Time: 8:30 am
Location: Regional Water Quality Control Board, Central Valley Region
11020 Sun Center Dr., Suite #200
Rancho Cordova, CA 95670

Interested persons are invited to attend. At the public hearing, the Regional Water Board will hear testimony, if any, pertinent to the discharge, WDRs, and permit. Oral testimony will be heard; however, for accuracy of the record, important testimony should be in writing.

Please be aware that dates and venues may change. Our Web address is http://www.waterboards.ca.gov/rwqcb5/ where you can access the current agenda for changes in dates and locations.

D. Waste Discharge Requirements Petitions

Any aggrieved person may petition the State Water Resources Control Board to review the decision of the Regional Water Board regarding the final WDRs. The petition must be submitted within 30 days of the Regional Water Board's action to the following address:

State Water Resources Control Board
Office of Chief Counsel

P.O. Box 100, 1001 I Street
Sacramento, CA 95812-0100

E. Information and Copying

The Report of Waste Discharge (RWD), related documents, tentative effluent limitations and special provisions, comments received, and other information are on file and may be inspected at the address above at any time between 8:30 a.m. and 4:45 p.m., Monday through Friday. Copying of documents may be arranged through the Regional Water Board by calling 916-464-3291.

F. Register of Interested Persons

Any person interested in being placed on the mailing list for information regarding the WDRs and NPDES permit should contact the Regional Water Board, reference this facility, and provide a name, address, and phone number.

G. Additional Information

Requests for additional information or questions regarding this order should be directed to Ms. Gayleen Perreira at 916-464-4824.

ATTACHMENT G - REASONABLE POTENTIAL SUMMARY

Constituent	Units	MEC	B	C	CMC	CCC	Water & Org	Org. Only	Basin Plan	MCL	Reasonable Potential
Aluminum	µg/L	1,900	1,800	87	750[1]	87[2]	--	--	--	200	Yes
Ammonia	µg/L	31,000	1,400	370	2,140[1,3]	370[4,5]	--	--	--	--	Yes
Antimony	µg/L	0.7	0.5	6	--	--	14	4,300	--	6	No
Arsenic	µg/L	4.4	4.1	10	340	150	--	--	--	10	No
Barium	µg/L	26	72	1,000	--	--	--	--	--	1,000	No
Bis(2-Ethylhexyl)Phthalate	µg/L	5.5	3.2	1.8	--	--	1.8	5.9	--	4	Yes
Bromoform	µg/L	0.8	<0.03	4.3	--	--	4.3	360	--	80	No
Cadmium	µg/L	0.04	<0.1	2.27	4.03	2.42	--	--	--	5	No
Carbofuran	µg/L	2.3	<5	18	--	--	--	--	--	18	No
Chloride	µg/L	210,000	140,000	106,000	860,000[1]	230,000[2]	--	--	--	210000	No
Chlorodibromomethane	µg/L	29	<0.03	0.41	--	--	0.41	34	--	80	Yes
Chloroform	µg/L	21	0.3	80	--	--	--	--	--	80	No
Chromium (total)	µg/L	1.2	3.8	50	--	--	--	--	--	50	No
Chromium (VI)	µg/L	1.2	0.41	11.43	16.29	11.43	--	--	--	50	No
Copper	µg/L	6	5	8.53	13.74	9.17	1,300	--	--	1,000	No
Cyanide	µg/L	13	300	5.2	22	5.2	700	220,000	--	150	Yes
Dichlorobromomethane	µg/L	28	0.07	0.56	--	--	0.56	46	--	80	Yes
Diethyl Phthalate	µg/L	6	<2	23,000	--	--	23,000	120,000	--	--	No
Fluoride	µg/L	600	400	2,000	--	--	--	--	--	2,000	No
Iron, dissolved	µg/L	<12	100	300	--	--	--	--	--	300	No
Lead	µg/L	0.81	1.1	2.78	61.42	3.10	--	--	--	15	No
Manganese	µg/L	170	240	50	--	--	--	--	--	50	Yes
Mercury	µg/L	0.011	0.0088	0.05	1.40[1]	0.77[2]	0.05	0.051	--	2	No

Constituent	Units	MEC	B	C	CMC	CCC	Water & Org	Org. Only	Basin Plan	MCL	Reasonable Potential
Methyl Chloride	µg/L	0.7	<0.5	3	--	--	--	--	--	3[7]	No
Methyl tert-butyl ether	µg/L	2	3.4	5	151,000[1]	51,000[2]	--	--	--	5	No
Methylene Blue Activated Substances	µg/L	200	NA	500	--	--	--	--	--	500	No
Methylene Chloride	µg/L	0.48	0.12	4.7	--	--	4.7	1,600	--	5	No
Molybdenum	µg/L	13	NA	10	--	--	--	--	--	10[6]	Yes
Nickel	µg/L	5	6.4	47.7	461.22	51.28	610	4,600	--	100	No
Nitrate	µg/L	29,000	4,200	10,000	--	--	--	--	--	10,000	Yes
Nitrite	µg/L	2,300	100	1,000	--	--	--	--	--	1,000	Yes
Phosphorus	µg/L	3,900	300	0.14	--	--	--	--	--	0.14[12]	No
Selenium	µg/L	2	2	5	20	5	--	--	--	20[6]	No
Silver	µg/L	0.4	0.03	3.39	3.90	--	--	--	--	100	No
Sulfate	µg/L	180,000	130,000	250,000	--	--	--	--	--	250,000	No
Tetrachloroethylene	µg/L	0.09	<0.04	0.8	--	--	0.8	8.85	--	5	No
Thallium	µg/L	0.3	0.1	1.7	1,400	40	1.7	6.3	--	2	No
Toluene	µg/L	3.6	<0.5	150	--	--	6,800	200,000	--	150	No
Trichloroethylene	µg/L	<0.05	0.2	2.7	--	--	2.7	81	--	5	No
Zinc	µg/L	20	9	117.78	117.78	109.58	--	--	--	5,000	No

General Notes: All inorganic concentrations are given as a total recoverable.
Although a RPA of all priority pollutants, and other constituents, were conducted, the Reasonable Potential Summary only displays the RPA results for those constituents where concentrations were detected either in the effluent (MEC) or in the background (B).

MEC = Maximum Effluent Concentration
B = Maximum Receiving Water Concentration or lowest detection level, if non-detect
C = Criterion used for Reasonable Potential Analysis
CMC = Criterion Maximum Concentration (CTR criterion unless otherwise noted)
CCC = Criterion Continuous Concentration (CTR criterion unless otherwise noted)
Water & Org= Water and Organism Criterion Concentration (CTR or NTR)
Basin Plan = Numeric Site-specific Basin Plan Water Quality Objective
MCL = Drinking Water Standards Maximum Contaminant Level
NA – Not available
ND – Reported as non-detect

Footnotes:
(1) USEPA National Recommended Ambient Water Quality Standard, 1-hour average
(2) USEPA National Recommended Ambient Water Quality Standard, 4-day average
(3) Salmonids present and maximum permitted effluent pH of 8.5
(4) USEPA National Recommended Ambient Water Quality Standard, 30-day average
(5) Early Life Stages (ELS) present and maximum allowable effluent pH of 8.5 and maximum allowable 30-day rolling averageR-1 temperature of 8.02°C(6) Ayers, R.S. and D.W. Westcot, Water Quality for Agriculture, Food and Agriculture Organization of the United Nations – Irrigation and Drainage Paper No. 29, Rev. 1, Rome (1985)
(7) USEPA Drinking Water Health Advisory or Suggested No-Adverse-

Constituent	Units	MEC	B	C	CMC	CCC	Water & Org	Org. Only	Basin Plan	MCL	Reasonable Potential

Response Levels (SNARLs) for toxicity other than cancer risk
(8) USEPA IRIS Reference Dose for white phosphorous. The Regional Board staff are still considering the applicability and relationship of this criterion to total phosphorus.

Attachment H - Constituents to be monitored

			Controlling Water Quality Criterion for Surface Waters			
CTR #	Constituent	CAS Number	Basis	Criterion Concentration (ug/L or noted) (1)	Criterion Quantitation Limit (ug/L or noted)	Suggested Test Methods
VOLATILE ORGANICS						
28	1,1-Dichloroethane	75343	Primary MCL	5	0.5	EPA 8260B
30	1,1-Dichloroethene	75354	National Toxics Rule	0.057	0.5	EPA 8260B
41	1,1,1-Trichloroethane	71556	Primary MCL	200	0.5	EPA 8260B
42	1,1,2-Trichloroethane	79005	National Toxics Rule	0.6	0.5	EPA 8260B
37	1,1,2,2-Tetrachloroethane	79345	National Toxics Rule	0.17	0.5	EPA 8260B
75	1,2-Dichlorobenzene	95501	Taste & Odor	10	0.5	EPA 8260B
29	1,2-Dichloroethane	107062	National Toxics Rule	0.38	0.5	EPA 8260B
	cis-1,2-Dichloroethene	156592	Primary MCL	6	0.5	EPA 8260B
31	1,2-Dichloropropane	78875	Calif. Toxics Rule	0.52	0.5	EPA 8260B
101	1,2,4-Trichlorobenzene	120821	Public Health Goal	5	0.5	EPA 8260B
76	1,3-Dichlorobenzene	541731	Taste & Odor	10	0.5	EPA 8260B
32	1,3-Dichloropropene	542756	Primary MCL	0.5	0.5	EPA 8260B
77	1,4-Dichlorobenzene	106467	Primary MCL	5	0.5	EPA 8260B
17	Acrolein	107028	Aquatic Toxicity	21	2	EPA 8260B
18	Acrylonitrile	107131	National Toxics Rule	0.059	2	EPA 8260B
19	Benzene	71432	Primary MCL	1	0.5	EPA 8260B
20	Bromoform	75252	Calif. Toxics Rule	4.3	0.5	EPA 8260B
34	Bromomethane	74839	Calif. Toxics Rule	48	1	EPA 8260B
21	Carbon tetrachloride	56235	National Toxics Rule	0.25	0.5	EPA 8260B
22	Chlorobenzene (mono chlorobenzene)	108907	Taste & Odor	50	0.5	EPA 8260B
24	Chloroethane	75003	Taste & Odor	16	0.5	EPA 8260B
25	2- Chloroethyl vinyl ether	110758	Aquatic Toxicity	122 (3)	1	EPA 8260B
26	Chloroform	67663	OEHHA Cancer Risk	1.1	0.5	EPA 8260B
35	Chloromethane	74873	USEPA Health Advisory	3	0.5	EPA 8260B
23	Dibromochloromethane	124481	Calif. Toxics Rule	0.41	0.5	EPA 8260B
27	Dichlorobromomethane	75274	Calif. Toxics Rule	0.56	0.5	EPA 8260B
36	Dichloromethane	75092	Calif. Toxics Rule	4.7	0.5	EPA 8260B
33	Ethylbenzene	100414	Taste & Odor	29	0.5	EPA 8260B
88	Hexachlorobenzene	118741	Calif. Toxics Rule	0.00075	1	EPA 8260B
89	Hexachlorobutadiene	87683	National Toxics Rule	0.44	1	EPA 8260B
91	Hexachloroethane	67721	National Toxics Rule	1.9	1	EPA 8260B
94	Naphthalene	91203	USEPA IRIS	14	10	EPA 8260B
38	Tetrachloroethene	127184	National Toxics Rule	0.8	0.5	EPA 8260B
39	Toluene	108883	Taste & Odor	42	0.5	EPA 8260B
40	trans-1,2-Dichloroethylene	156605	Primary MCL	10	0.5	EPA 8260B
43	Trichloroethene	79016	National Toxics Rule	2.7	0.5	EPA 8260B
44	Vinyl chloride	75014	Primary MCL	0.5	0.5	EPA 8260B
	Methyl-tert-butyl ether (MTBE)	1634044	Secondary MCL	5	0.5	EPA 8260B
	Trichlorofluoromethane	75694	Primary MCL	150	5	EPA 8260B
	1,1,2-Trichloro-1,2,2-Trifluoroethane	76131	Primary MCL	1200	10	EPA 8260B
	Styrene	100425	Taste & Odor	11	0.5	EPA 8260B
	Xylenes	1330207	Taste & Odor	17	0.5	EPA 8260B

SEMI-VOLATILE ORGANICS						
60	1,2-Benzanthracene	56553	Calif. Toxics Rule	0.0044	5	EPA 8270C
85	1,2-Diphenylhydrazine	122667	National Toxics Rule	0.04	1	EPA 8270C
45	2-Chlorophenol	95578	Taste and Odor	0.1	2	EPA 8270C
46	2,4-Dichlorophenol	120832	Taste and Odor	0.3	1	EPA 8270C
47	2,4-Dimethylphenol	105679	Calif. Toxics Rule	540	2	EPA 8270C
49	2,4-Dinitrophenol	51285	National Toxics Rule	70	5	EPA 8270C
82	2,4-Dinitrotoluene	121142	National Toxics Rule	0.11	5	EPA 8270C
55	2,4,6-Trichlorophenol	88062	Taste and Odor	2	10	EPA 8270C
83	2,6-Dinitrotoluene	606202	USEPA IRIS	0.05	5	EPA 8270C
50	2-Nitrophenol	25154557	Aquatic Toxicity	150 (5)	10	EPA 8270C
71	2-Chloronaphthalene	91587	Aquatic Toxicity	1600 (6)	10	EPA 8270C
78	3,3'-Dichlorobenzidine	91941	National Toxics Rule	0.04	5	EPA 8270C
62	3,4-Benzofluoranthene	205992	Calif. Toxics Rule	0.0044	10	EPA 8270C
52	4-Chloro-3-methylphenol	59507	Aquatic Toxicity	30	5	EPA 8270C
48	4,6-Dinitro-2-methylphenol	534521	National Toxics Rule	13.4	10	EPA 8270C
51	4-Nitrophenol	100027	USEPA Health Advisory	60	5	EPA 8270C
69	4-Bromophenyl phenyl ether	101553	Aquatic Toxicity	122	10	EPA 8270C
72	4-Chlorophenyl phenyl ether	7005723	Aquatic Toxicity	122 (3)	5	EPA 8270C
56	Acenaphthene	83329	Taste and Odor	20	1	EPA 8270C
57	Acenaphthylene	208968	No Criteria Available		10	EPA 8270C
58	Anthracene	120127	Calif. Toxics Rule	9,600	10	EPA 8270C
59	Benzidine	92875	National Toxics Rule	0.00012	5	EPA 8270C
61	Benzo(a)pyrene (3,4-Benzopyrene)	50328	Calif. Toxics Rule	0.0044	0.1	EPA 8270C
63	Benzo(g,h,i)perylene	191242	No Criteria Available		5	EPA 8270C
64	Benzo(k)fluoranthene	207089	Calif. Toxics Rule	0.0044	2	EPA 8270C
65	Bis(2-chloroethoxy) methane	111911	No Criteria Available		5	EPA 8270C
66	Bis(2-chloroethyl) ether	111444	National Toxics Rule	0.031	1	EPA 8270C
67	Bis(2-chloroisopropyl) ether	39638329	Aquatic Toxicity	122 (3)	10	EPA 8270C
68	Bis(2-ethylhexyl) phthalate	117817	National Toxics Rule	1.8	3	EPA 8270C
70	Butyl benzyl phthalate	85687	Aquatic Toxicity	3 (7)	10	EPA 8270C
73	Chrysene	218019	Calif. Toxics Rule	0.0044	5	EPA 8270C
81	Di-n-butylphthalate	84742	Aquatic Toxicity	3 (7)	10	EPA 8270C
84	Di-n-octylphthalate	117840	Aquatic Toxicity	3 (7)	10	EPA 8270C
74	Dibenzo(a,h)-anthracene	53703	Calif. Toxics Rule	0.0044	0.1	EPA 8270C
79	Diethyl phthalate	84662	Aquatic Toxicity	3 (7)	2	EPA 8270C
80	Dimethyl phthalate	131113	Aquatic Toxicity	3 (7)	2	EPA 8270C
86	Fluoranthene	206440	Calif. Toxics Rule	300	10	EPA 8270C
87	Fluorene	86737	Calif. Toxics Rule	1300	10	EPA 8270C
90	Hexachlorocyclopentadiene	77474	Taste and Odor	1	1	EPA 8270C
92	Indeno(1,2,3-c,d)pyrene	193395	Calif. Toxics Rule	0.0044	0.05	EPA 8270C
93	Isophorone	78591	National Toxics Rule	8.4	1	EPA 8270C
98	N-Nitrosodiphenylamine	86306	National Toxics Rule	5	1	EPA 8270C
96	N-Nitrosodimethylamine	62759	National Toxics Rule	0.00069	5	EPA 8270C
97	N-Nitrosodi-n-propylamine	621647	Calif. Toxics Rule	0.005	5	EPA 8270C
95	Nitrobenzene	98953	National Toxics Rule	17	10	EPA 8270C
53	Pentachlorophenol	87865	Calif. Toxics Rule	0.28	0.2	EPA 8270C
99	Phenanthrene	85018	No Criteria Available		5	EPA 8270C
54	Phenol	108952	Taste and Odor	5	1	EPA 8270C
100	Pyrene	129000	Calif. Toxics Rule	960	10	EPA 8270C

INORGANICS						
	Aluminum	7429905	Ambient Water Quality	87	50	EPA 6020/200.8
1	Antimony	7440360	Primary MCL	6	5	EPA 6020/200.8
2	Arsenic	7440382	Ambient Water Quality	0.018	0.01	EPA 1632
15	Asbestos	1332214	National Toxics Rule/ Primary MCL	7 MFL	0.2 MFL >10um	EPA/600/R-93/116(PCM)
	Barium	7440393	Basin Plan Objective	100	100	EPA 6020/200.8
3	Beryllium	7440417	Primary MCL	4	1	EPA 6020/200.8
4	Cadmium	7440439	Public Health Goal	0.07	0.25	EPA 1638/200.8
5a	Chromium (total)	7440473	Primary MCL	50	2	EPA 6020/200.8
5b	Chromium (VI)	18540299	Public Health Goal	0.2	0.5	EPA 7199/ 1636
6	Copper	7440508	National Toxics Rule	4.1 (2)	0.5	EPA 6020/200.8
14	Cyanide	57125	National Toxics Rule	5.2	5	EPA 9012A
	Fluoride	7782414	Public Health Goal	1000	0.1	EPA 300
	Iron	7439896	Secondary MCL	300	100	EPA 6020/200.8
7	Lead	7439921	Calif. Toxics Rule	0.92 (2)	0.5	EPA 1638
8	Mercury	7439976	TMDL Development		0.0002 (11)	EPA 1669/1631
	Manganese	7439965	Secondary MCL/ Basin Plan Objective	50	20	EPA 6020/200.8
9	Nickel	7440020	Calif. Toxics Rule	24 (2)	5	EPA 6020/200.8
10	Selenium	7782492	Calif. Toxics Rule	5 (8)	5	EPA 6020/200.8
11	Silver	7440224	Calif. Toxics Rule	0.71 (2)	1	EPA 6020/200.8
12	Thallium	7440280	National Toxics Rule	1.7	1	EPA 6020/200.8
	Tributyltin	688733	Ambient Water Quality	0.063	0.002	EV-024/025
13	Zinc	7440666	Calif. Toxics Rule/ Basin Plan Objective	54/ 16 (2)	10	EPA 6020/200.8
PESTICIDES - PCBs						
110	4,4'-DDD	72548	Calif. Toxics Rule	0.00083	0.02	EPA 8081A
109	4,4'-DDE	72559	Calif. Toxics Rule	0.00059	0.01	EPA 8081A
108	4,4'-DDT	50293	Calif. Toxics Rule	0.00059	0.01	EPA 8081A
112	alpha-Endosulfan	959988	National Toxics Rule	0.056 (9)	0.02	EPA 8081A
103	alpha-Hexachlorocyclohexane (BHC)	319846	Calif. Toxics Rule	0.0039	0.01	EPA 8081A
	Alachlor	15972608	Primary MCL	2	1	EPA 8081A
102	Aldrin	309002	Calif. Toxics Rule	0.00013	0.005	EPA 8081A
113	beta-Endosulfan	33213659	Calif. Toxics Rule	0.056 (9)	0.01	EPA 8081A
104	beta-Hexachlorocyclohexane	319857	Calif. Toxics Rule	0.014	0.005	EPA 8081A
107	Chlordane	57749	Calif. Toxics Rule	0.00057	0.1	EPA 8081A
106	delta-Hexachlorocyclohexane	319868	No Criteria Available		0.005	EPA 8081A
111	Dieldrin	60571	Calif. Toxics Rule	0.00014	0.01	EPA 8081A
114	Endosulfan sulfate	1031078	Ambient Water Quality	0.056	0.05	EPA 8081A
115	Endrin	72208	Calif. Toxics Rule	0.036	0.01	EPA 8081A
116	Endrin Aldehyde	7421934	Calif. Toxics Rule	0.76	0.01	EPA 8081A
117	Heptachlor	76448	Calif. Toxics Rule	0.00021	0.01	EPA 8081A
118	Heptachlor Epoxide	1024573	Calif. Toxics Rule	0.0001	0.01	EPA 8081A
105	Lindane (gamma-Hexachlorocyclohexane)	58899	Calif. Toxics Rule	0.019	0.019	EPA 8081A
119	PCB-1016	12674112	Calif. Toxics Rule	0.00017 (10)	0.5	EPA 8082
120	PCB-1221	11104282	Calif. Toxics Rule	0.00017 (10)	0.5	EPA 8082

121	PCB-1232	11141165	Calif. Toxics Rule	0.00017 (10)	0.5	EPA 8082
122	PCB-1242	53469219	Calif. Toxics Rule	0.00017 (10)	0.5	EPA 8082
123	PCB-1248	12672296	Calif. Toxics Rule	0.00017 (10)	0.5	EPA 8082
124	PCB-1254	11097691	Calif. Toxics Rule	0.00017 (10)	0.5	EPA 8082
125	PCB-1260	11096825	Calif. Toxics Rule	0.00017 (10)	0.5	EPA 8082
126	Toxaphene	8001352	Calif. Toxics Rule	0.0002	0.5	EPA 8081A
	Atrazine	1912249	Public Health Goal	0.15	1	EPA 8141A
	Bentazon	25057890	Primary MCL	18	2	EPA 643/ 515.2
	Carbofuran	1563662	CDFG Hazard Assess.	0.5	5	EPA 8318
	2,4-D	94757	Primary MCL	70	10	EPA 8151A
	Dalapon	75990	Ambient Water Quality	110	10	EPA 8151A
	1,2-Dibromo-3-chloropropane (DBCP)	96128	Public Health Goal	0.0017	0.01	EPA 8260B
	Di(2-ethylhexyl)adipate	103231	USEPA IRIS	30	5	EPA 8270C
	Dinoseb	88857	Primary MCL	7	2	EPA 8151A
	Diquat	85007	Ambient Water Quality	0.5	4	EPA 8340/ 549.1/HPLC
	Endothal	145733	Primary MCL	100	45	EPA 548.1
	Ethylene Dibromide	106934	OEHHA Cancer Risk	0.0097	0.02	EPA 8260B/ 504
	Glyphosate	1071836	Primary MCL	700	25	HPLC/ EPA 547
	Methoxychlor	72435	Public Health Goal	30	10	EPA 8081A
	Molinate (Ordram)	2212671	CDFG Hazard Assess.	13	2	EPA 634
	Oxamyl	23135220	Public Health Goal	50	20	EPA 8318/ 632
	Picloram	1918021	Primary MCL	500	1	EPA 8151A
	Simazine (Princep)	122349	USEPA IRIS	3.4	1	EPA 8141A
	Thiobencarb	28249776	Basin Plan Objective/ Secondary MCL	1	1	HPLC/ EPA 639
16	2,3,7,8-TCDD (Dioxin)	1746016	Calif. Toxics Rule	1.30E-08	5.00E-06	EPA 8290 (HRGC) MS
	2,4,5-TP (Silvex)	93765	Ambient Water Quality	10	1	EPA 8151A
	Diazinon	333415	CDFG Hazard Assess.	0.05	0.25	EPA 8141A/ GCMS
	Chlorpyrifos	2921882	CDFG Hazard Assess.	0.014	1	EPA 8141A/ GCMS

OTHER CONSTITUENTS						
	Ammonia (as N)	7664417	Ambient Water Quality	1500 (4)		EPA 350.1
	Chloride	16887006	Agricultural Use	106,000		EPA 300.0
	Flow			1 CFS		
	Hardness (as $CaCO_3$)			5000		EPA 130.2
	Foaming Agents (MBAS)		Secondary MCL	500		SM5540C
	Nitrate (as N)	14797558	Primary MCL	10,000	2,000	EPA 300.0
	Nitrite (as N)	14797650	Primary MCL	1000	400	EPA 300.0
	pH		Basin Plan Objective	6.5-8.5	0.1	EPA 150.1
	Phosphorus, Total (as P)	7723140	USEPA IRIS	0.14		EPA 365.3
	Specific conductance (EC)		Agricultural Use	700 umhos/cm		EPA 120.1
	Sulfate		Secondary MCL	250,000	500	EPA 300.0
	Sulfide (as S)		Taste and Odor	0.029		EPA 376.2
	Sulfite (as SO_3)		No Criteria Available			SM4500-SO3
	Temperature		Basin Plan Objective	^{o}F		
	Total Disolved Solids (TDS)		Agricultural Use	450,000		EPA 160.1

FOOTNOTES:

(1) - The Criterion Concentrations serve only as a point of reference for the selection of the appropriate analytical method. They do not indicate a regulatory decision that the cited concentration is either necessary or sufficient for full protection of beneficial uses. Available technology may require that effluent limits be set lower than these values.

(2) - Freshwater aquatic life criteria for metals are expressed as a function of total hardness (mg/L) in the water body. Values displayed correspond to a total hardness of 40 mg/L.

(3) - For haloethers

(4) - Freshwater aquatic life criteria for ammonia are expressed as a function of pH and temperature of the water body. Values displayed correspond to pH 8.0 and temperature of 22 C.

(5) - For nitrophenols.

(6) - For chlorinated naphthalenes.

(7) - For phthalate esters.

(8) - Basin Plan objective = 2 ug/L for Salt Slough and specific constructed channels in the Grassland watershed.

(9) - Criteria for sum of alpha- and beta- forms.

(10) - Criteria for sum of all PCBs.

(11) - Mercury monitoring shall utilize "ultra-clean" sampling and analytical methods. These methods include:

Method 1669: Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria Levels, US EPA; and

Method 1631: Mercury in Water by Oxidation, Purge and Trap, and Cold Vapor Atomic Fluoresence, US EPA

Dioxin and Furan Sampling

Section 3 of the State Implementation Plan requires that each NPDES discharger conduct sampling and analysis of dioxin and dibenzofuran congeners. Dioxin and Furan sampling shall be conducted in the effluent and receiving water once during dry weather and once during wet weather.

Each sample shall be analyzed for the seventeen congeners listed in the table below. High Resolution GCMS Method 8290, or another method capable of individually quantifying the congeners to an equivalent detection level, shall be used for the analyses.

For each sample the discharger shall report:

- The measured or estimated concentration of each of the seventeen congeners
- The quantifiable limit of the test (as determined by procedures in Section 2.4.3, No. 5 of the SIP)
- The Method Detection Level (MDL) for the test

The TCDD equivalent concentration for each analysis calculated by multiplying the concentration of each congener by the Toxicity Equivalency Factor (TEF) in the following table, and summing the resultant products to determine the equivalent toxicity of the sample expressed as 2,3,7,8-TCDD.

Congener	TEF
2,3,7,8TetraCDD	1
1,2,3,7,8-PentaCDD	1.0
1,2,3,4,7,8-HexaCDD	0.1
1,2,3,6,7,8-HexaCDD	0.1
1,2,3,7,8,9-HexaCDD	0.1
1,2,3,4,6,7,8-HeptaCDD	0.01
OctaCDD	0.0001
2,3,7,8-TetraCDF	0.1
1,2,3,7,8-PentaCDF	0.05
2,3,4,7,8-PentaCDF	0.5
1,2,3,4,7,8-HexaCDF	0.1
1,2,3,6,7,8-HexaCDF	0.1
1,2,3,7,8,9-HexaCDF	0.1
2,3,4,6,7,8-HexaCDF	0.1
1,2,3,4,6,7,8-HeptaCDF	0.01
1,2,3,4,7,8,9-HeptaCDF	0.01
OctaCDF	0.0001

APPENDIX B – TITLE V AIR PERMIT

San Joaquin Valley
AIR POLLUTION CONTROL DISTRICT

HEALTHY AIR LIVING™

JUN 1 0 2010

Mark Madison
Stockton RWCF
2500 Navy Dr
Stockton CA 95206-1121

Re: Notice of Final Action - Title V Permit Renewal
District Facility # N-811
Project # N-1082072

Dear Mr. Madison:

The District has issued the Final Renewed Title V Permit for Stockton RWCF. The preliminary decision for this project was made on April 22, 2010. No comments were received subsequent to the District preliminary decision.

The public notice for issuance of the Final Renewed Title V Permit will be published approximately three days from the date of this letter.

Thank you for your cooperation in this matter. Should you have any questions, please contact Mr. Jim Swaney, Permit Services Manager, at (559) 230-5900.

Sincerely,

David Warner
Director of Permit Services

Attachments

cc: Juscelino Siongco, Permit Services Engineer

Seyed Sadredin
Executive Director/Air Pollution Control Officer

Northern Region
4800 Enterprise Way
Modesto, CA 95356-8718
Tel: (209) 557-6400 FAX: (209) 557-6475

Central Region (Main Office)
1990 E. Gettysburg Avenue
Fresno, CA 93726-0244
Tel: (559) 230-6000 FAX: (559) 230-6061

Southern Region
34946 Flyover Court
Bakersfield, CA 93308-9725
Tel: 661-392-5500 FAX: 661-392-5585

www.valleyair.org www.healthyairliving.com

Printed on recycled paper.

San Joaquin Valley
AIR POLLUTION CONTROL DISTRICT

HEALTHY AIR LIVING™

JUN 1 0 2010

Gerardo C. Rios, Chief
Permits Office (AIR-3)
U.S. EPA - Region IX
75 Hawthorne St.
San Francisco, CA 94105

Re: Notice of Final Action - Title V Permit Renewal
District Facility # N-811
Project # N-1082072

Dear Mr. Rios:

The District has issued the Final Renewed Title V Permit for Stockton RWCF. The preliminary decision for this project was made on April 22, 2010. No comments were received subsequent to the District preliminary decision.

The public notice for issuance of the Final Renewed Title V Permit will be published approximately three days from the date of this letter.

I would like to thank you and your staff for working with us. We appreciate your concurrence with this action. Should you have any questions, please contact Mr. Jim Swaney, Permit Services Manager, at (559) 230-5900.

Sincerely,

David Warner
Director of Permit Services

Attachments

cc: Juscelino Siongco, Permit Services Engineer

Seyed Sadredin
Executive Director/Air Pollution Control Officer

Northern Region
4800 Enterprise Way
Modesto, CA 95356-8718
Tel: (209) 557-6400 FAX: (209) 557-6475

Central Region (Main Office)
1990 E. Gettysburg Avenue
Fresno, CA 93726-0244
Tel: (559) 230-6000 FAX: (559) 230-6061

Southern Region
34946 Flyover Court
Bakersfield, CA 93308-9725
Tel: 661-392-5500 FAX: 661-392-5585

www.valleyair.org www.healthyairliving.com

Printed on recycled paper.

San Joaquin Valley
AIR POLLUTION CONTROL DISTRICT

HEALTHY AIR LIVING™

JUN 1 0 2010

Mike Tollstrup, Chief
Project Assessment Branch
Air Resources Board
P O Box 2815
Sacramento, CA 95812-2815

Re: Notice of Final Action - Title V Permit Renewal
District Facility # N-811
Project # N-1082072

Dear Mr. Tollstrup:

The District has issued the Final Renewed Title V Permit for Stockton RWCF. The preliminary decision for this project was made on April 22, 2010. No comments were received subsequent to the District preliminary decision.

The public notice for issuance of the Final Renewed Title V Permit will be published approximately three days from the date of this letter.

I would like to thank you and your staff for working with us. Should you have any questions, please contact Mr. Jim Swaney, Permit Services Manager, at (559) 230-5900.

Sincerely,

David Warner
Director of Permit Services

Attachments

cc: Juscelino Siongco, Permit Services Engineer

Seyed Sadredin
Executive Director/Air Pollution Control Officer

Northern Region
4800 Enterprise Way
Modesto, CA 95356-8718
Tel: (209) 557-6400 FAX: (209) 557-6475

Central Region (Main Office)
1990 E. Gettysburg Avenue
Fresno, CA 93726-0244
Tel: (559) 230-6000 FAX: (559) 230-6061

Southern Region
34946 Flyover Court
Bakersfield, CA 93308-9725
Tel: 661-392-5500 FAX: 661-392-5585

www.valleyair.org www.healthyairliving.com

Printed on recycled paper.

Stockton Record

SAN JOAQUIN VALLEY
AIR POLLUTION CONTROL DISTRICT
NOTICE OF FINAL DECISION TO ISSUE
RENEWED FEDERALLY MANDATED OPERATING PERMIT

NOTICE IS HEREBY GIVEN that the San Joaquin Valley Air Pollution Control District has made its final decision to issue the renewed Federally Mandated Operating Permit to Stockton RWCF for its wastewater treatment facility, 2500 Navy Dr, Stockton, California.

The District's analysis of the legal and factual basis for this proposed action, project #N-1082072, is available for public inspection at http://www.valleyair.org/notices/public_notices_idx.htm and the District office at the address below. For additional information regarding this matter, please contact Mr. Jim Swaney, Permit Services Manager, at (559) 230-5900, or contact David Warner, Director of Permit Services, in writing at SAN JOAQUIN VALLEY AIR POLLUTION CONTROL DISTRICT, 1990 E. GETTYSBURG AVE, FRESNO, CA 93726-0244.

SAN JOAQUIN VALLEY
AIR POLLUTION CONTROL DISTRICT

Final Title V Permit Renewal Evaluation
Stockton RWCF
N-811

TABLE OF CONTENTS

I. PROPOSAL 2
II. FACILITY LOCATION 2
III. EQUIPMENT LISTING 3
IV. GENERAL PERMIT TEMPLATE USAGE 3
V. SCOPE OF EPA AND PUBLIC REVIEW 3
VI. FEDERALLY ENFORCEABLE REQUIREMENTS 3
VII. REQUIREMENTS NOT FEDERALLY ENFORCEABLE 6
VIII. PERMIT REQUIREMENTS 6
IX. PERMIT SHIELD 18
X. PERMIT CONDITIONS 18
XI. ATTACHMENTS 18

A. RENEWED TITLE V OPERATING PERMIT
B. PREVIOUS TITLE V OPERATING PERMIT
C. DETAILED FACILITY LIST

TITLE V PERMIT RENEWAL EVALUATION

Wastewater Treatment Facility

Engineer: Juscelino Siongco
Date: June 9, 2010

Facility Number: N-811
Facility Name: Stockton RWCF
Mailing Address: 2500 Navy Dr
Stockton, CA 95206-1191

Contact Name: Laura Lazzelle
Phone: (209) 937-8852

Responsible Official: Mark Madison
Title: Director of Municipal Utilities

Project # : N-1082072
Deemed Complete: June 23, 2008

I. PROPOSAL

Stockton RWCF was issued a Title V permit on September 23, 1999. As required by District Rule 2520, the applicant is requesting a permit renewal. The existing Title V permit shall be reviewed and modified to reflect all applicable District and federal rules updated, removed, or added since the issuance of the initial Title V permit.

The purpose of this evaluation is to provide the legal and factual basis for all updated applicable requirements and to determine if the facility will comply with these updated requirements. It also specifically identifies all additions, deletions, and/or changes made to permit conditions or equipment descriptions.

II. FACILITY LOCATION

Stockton RWCF is located at 2500 Navy Dr, Stockton, CA.

III. EQUIPMENT LISTING

A detailed facility printout listing all permitted equipment at the facility is included as Attachment A.

IV. GENERAL PERMIT TEMPLATE USAGE

The applicant is requesting to use the following model general permit Templates:

The applicant does not propose to use any model general permit templates.

V. SCOPE OF EPA AND PUBLIC REVIEW

Certain segments of the proposed Renewed Operating Permit are based on model general permit templates that have been previously subject to EPA and public review. The terms and conditions from the model general permit templates are included in the proposed permit and are not subject to further EPA and public review.

For permit applications utilizing model general permit templates, public and agency comments on the District's proposed actions are limited to the applicant's eligibility for model general permit template, applicable requirements not covered by the model general permit template, and the applicable procedural requirements for issuance of Title V Operating Permits.

The applicant is not requesting any model general permit templates. Therefore, all federally enforceable conditions in this current Title V permit will be subject to EPA and public review.

VI. FEDERALLY ENFORCEABLE REQUIREMENTS

A. Rules Updated

- District Rule 2201, New and Modified Stationary Source Review Rule (amended December 19, 2002 ⇒ September 21, 2006)
- District Rule 4101, Visible Emissions (amended November 15, 2001 ⇒ amended February 17, 2005)
- District Rule 4601, Architectural Coatings (amended October 31, 2001 ⇒ amended December 17, 2009)

- District Rule 4621, Gasoline Transfer Into Stationary Storage Containers, Delivery Vessels, and Bulk Plants
  (amended June 18, 1998 ⇒ amended December 20, 2007)

- District Rule 4622, Transfer of Gasoline Into Vehicle Fuel Tanks
  (amended September 19, 2002 ⇒ amended December 20, 2007)

- District Rule 4702, Internal Combustion Engines
  (amended August 21, 2003 ⇒ amended January 18, 2007)

- District Rule 8011, General Requirements
  (adopted November 15, 2001 ⇒ amended August 19, 2004)

- District Rule 8021, Construction, Demolition, Excavation, Extraction, and Other Earthmoving Activities
  (adopted November 15, 2001 ⇒ amended August 19, 2004)

- District Rule 8031, Bulk Materials
  (adopted November 15, 2001 ⇒ amended August 19, 2004)

- District Rule 8041, Carryout and Trackout
  (adopted November 15, 2001 ⇒ amended August 19, 2004)

- District Rule 8051, Open Areas
  (adopted November 15, 2001 ⇒ amended August 19, 2004)

- District Rule 8061, Paved and Unpaved Roads
  (adopted November 15, 2001 ⇒ amended August 19, 2004)

- District Rule 8071, Unpaved Vehicle/Equipment Traffic Areas
  (adopted November 15, 2001 ⇒ amended September 16, 2004)

- 40 CFR Part 61, Subpart M, National Emission Standard for Asbestos
  (amended September 18, 2003)

- 40 CFR Part 82, Subpart B, Stratospheric Ozone
  (amended November 9, 2007)

- 40 CFR Part 82, Subpart F, Stratospheric Ozone
  (amended June 8, 2008)

- 40 CFR Part 63, Subpart ZZZZ, National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines
  (amended January 18, 2008)

B. Rules Not Updated

- District Rule 1100, Equipment Breakdown (amended December 17,1992)
- District Rule 1160, Emission Statements (adopted November 18, 1992)
- District Rule 2010, Permits Required (amended December 17, 1992)
- District Rule 2020, Exemptions (amended December 19, 2002)
- District Rule 2031, Transfer of Permits (amended December 17, 1992)
- District Rule 2040, Applications (amended December 17, 1992)
- District Rule 2070, Standards for Granting Applications (amended December 17, 1992)
- District Rule 2080, Conditional Approval (amended December 17, 1992)
- District Rule 2520, Federally Mandated Operating Permits (amended June 21, 2001)
- District Rule 4201, Particulate Matter Concentration (amended December 17, 1992)
- District Rule 4202, Particulate Matter - Emission Rate (amended December 17, 1992)
- District Rule 4311, Flares (adopted June 20, 2002)
- District Rule 4701, Internal Combustion Engines (amended August 21, 2003)
- District Rule 4801, Sulfur Compounds (amended December 17, 1992)
- 40 CFR Part 60, Subpart IIII, Standards of Performance for Stationary Compression Ignition Internal Combustion Engines

- 40 CFR Part 60, Subpart JJJJ, Standards of Performance for Stationary Spark Ignition Internal Combustion Engines

VII. REQUIREMENTS NOT FEDERALLY ENFORCEABLE

For each Title V source, the District issues a single permit that contains the Federally Enforceable requirements, as well as the District-only requirements. The District-only requirements are not a part of the Title V Operating Permits. The terms and conditions that are part of the facility's Title V permit are designated as "Federally Enforceable Through Title V Permit."

For this facility, the following are not federally enforceable and will not be discussed in further detail:

A. District Rule 4102, Nuisance

a. N-811-0-3, Facility-Wide Requirements

- Condition 42 of the permit is based on this rule.

b. N-811-25-2, 2550 bhp Detroit Diesel Emergency Standby IC Engine

- Condition 3 of the permit is based on this rule.

VIII. PERMIT REQUIREMENTS

The purpose of this evaluation is to review changes to federally enforceable requirements; therefore, this compliance section will only address rules that have been amended or added since the issuance of the initial Title V permit.

A. District Rule 2201 - New and Modified Stationary Source Review Rule

District Rule 2201 has been amended since this facility's initial Title V permit was issued. This Title V permit renewal does not constitute a modification per section 3.26, defined as an action including at least one of the following items:

1) Any change in hours of operation, production rate, or method of operation of an existing emissions unit, which would necessitate a change in permit conditions.
2) Any structural change or addition to an existing emissions unit which would necessitate a change in permit conditions. Routine replacement shall not be considered to be a structural change.

3) An increase in emissions from an emissions unit caused by a modification of the Stationary Source when the emissions unit is not subject to a daily emissions limitation.
4) Addition of any new emissions unit which is subject to District permitting requirements.
5) A change in a permit term or condition proposed by an applicant to obtain an exemption from an applicable requirement to which the source would otherwise be subject.

Therefore, the updated requirements of this rule are not applicable at this time.

B. District Rule 2520 - Federally Mandated Operating Permits

Section 9.3.2 requires that periodic monitoring be performed if none is associated with a given emission limit to assure compliance.

a. N-811-26-2, Headworks Facility

The permit unit has emissions limits for VOC and Ammonia (NH_3) but no periodic monitoring. Therefore, periodic monitoring for VOC will consists of quarterly monitoring with a portable analyzer. Ammonia will require annual source testing using BAAQMD ST-1B test method.

- Conditions 7, 8, and 9 of the permit ensure compliance with this rule.

C. District Rule 4101 - Visible Emissions

Section 5.0 prohibits the discharge of any air contaminant for a period or periods aggregating more than 3 minutes in any one hour which is as dark or darker in shade as that designated as No. 1 on the Ringelmann Chart; or is of such opacity as to obscure an observer's view to a degree equal to or greater than the smoke described in Section 5.1 of Rule 4101.

a. N-811-0-3, Facility-Wide Requirements

- Condition 22 of the permit ensures compliance with this rule.

D. District Rule 4601 - Architectural Coatings

This rule limits the emissions of VOC's from architectural coatings. It requires limiting the application of any architectural coating to no more than what is listed in the Table of Standards (Section 5.0). This rule further specifies labeling requirements, coatings thinning recommendations, and storage

requirements. The following changes were included in the latest rule amendment that resulted in adding new permit requirements and/or revising current permit requirements:

- The tables outlining the VOC content of different specialty coatings has been largely replaced with the Table of Standards in Section 5.0.
- New labeling, reporting, test methodology and other requirements have been incorporated into the rule in order to allow California Air Resources Board (CARB) to administer the Averaging Program as detailed in Section 8.0.

a. N-811-0-3 – Facility-Wide Requirements

- Conditions 23, 24, and 25 on the proposed permit assure compliance with this rule.

E. District Rule 4621 - Gasoline Transfer into Stationary Storage Containers, Delivery Vessels and Bulk Plants

This rule limits VOC emissions from stationary storage containers, delivery vessels, and bulk plants and to provide the administrative requirements for determining compliance. The rule was amended in December 20, 2007.

a. N-811-13-3, 2,000 Gallon Aboveground Convault Gasoline Storage Tank with Phase I and Phase II Vapor Recovery

- Conditions 1, 2, and 8 through 16 of the permit ensure compliance with this rule.

F. District Rule 4622 - Gasoline Transfer into Motor Vehicle Fuel Tanks

This rule limits emissions of gasoline vapors from the transfer of gasoline into motor vehicle fuel tanks. The rule was amended in December 20, 2007.

a. N-811-13-3, 2,000 Gallon Aboveground Convault Gasoline Storage Tank with Phase I and Phase II Vapor Recovery

- Conditions 4, 6, 14, and 16 through 34 of the permit ensure compliance with this rule.

G. District Rule 4702–Internal Combustion Engines–Phase 2

The purpose of this rule is to limit the emissions of nitrogen oxides (NO_X), carbon monoxide (CO), and volatile organic compounds (VOC) from internal combustion engines. The rule was amended in January 18, 2007 to address the following. The definition of Certified Compression-Ignited Engine was modified to include a Code of Federal Regulation citation. Exemption was added for engines used in retracting arresting gear cables used to stop military naval aircraft after landing. A compliance deadline for engines used exclusively in agricultural operation was extended for one year. Engines operated with an APCO certified exhaust control system were exempted from submitting an emission control plan. Certified compression ignition engines were exempted from compliance testing. A portable NO_X analyzer was allowed for Agriculture Operation (AO) spark-ignited engines to initially show compliance with the emission standards until a source test can be arranged. Representative testing for spark-ignited engines were allowed. A District certification program was established to verify the control efficiency of exhaust control systems.

The following permit requirements ensure compliance with this rule:

a. N-811-11-4 and -12-4, 450 bhp Caterpillar Portable Emergency Standby Diesel-Fired IC Engine

   - Conditions 4 through 10 on the proposed permit ensure compliance with this rule.

b. N-811-19-6, 193 bhp John Deere Diesel-Fired IC Engine

   - Conditions 2, 3, 6, and 7 on the proposed permit ensure compliance with this rule.

c. N-811-21-4, -22-4, and -23-4, 1408 bhp Waukesha Digester Gas/Natural Gas-Fired Lean Burn Precombustion Type IC Engine with Siloxane Scrubber

   - Conditions 1, 8, and 18 through 22 on the proposed permit ensure compliance with this rule.

d. N-811-25-2, 2550 hp Detroit Diesel Diesel-Fired Emergency Standby IC Engine

   - Conditions 7 through 14 on the proposed permit ensure compliance with this rule.

H. District Rule 8011 - General Requirements

The purpose of Regulation VIII (Fugitive PM10 Prohibitions) is to reduce ambient concentrations of fine particulate matter (PM10) by requiring actions to prevent, reduce or mitigate anthropogenic fugitive dust emissions. The Rules contained in this Regulation have been developed pursuant to United States Environmental Protection Agency guidance for Serious PM10 Nonattainment Areas. The rules are applicable to specified anthropogenic fugitive dust sources. Fugitive dust contains PM10 and particles larger than PM10. Controlling fugitive dust missions when visible emissions are detected will not prevent all PM10 emissions, but will substantially reduce PM10 emissions.

The provisions of this rule are applicable to specified outdoor fugitive dust sources. The definitions, exemptions, requirements, administrative requirements, recordkeeping requirements, and test methods set forth in this rule are applicable to all Rules under Regulation VIII (Fugitive PM10 Prohibitions) of the Rules and Regulations of the San Joaquin Valley Unified Air Pollution Control District.

a. N-811-0-3, Facility-Wide Requirements

- Conditions 29 through 34 of the permit ensure compliance with this rule.

I. District Rule 8021 - Construction, Demolition, Excavation, Extraction, and Other Earthmoving Activities

The purpose of this rule is to limit fugitive dust emissions from construction, demolition, excavation, extraction, and other earthmoving activities.

This rule applies to any construction, demolition, excavation, extraction, and other earthmoving activities, including, but not limited to, land clearing, grubbing, scraping, travel on site, and travel on access roads to and from the site. This rule also applies to the construction of new landfill disposal sites or modification to existing landfill disposal sites prior to commencement of landfilling activities.

Section 5.0 requires that no person shall perform any construction, demolition, excavation, extraction, or other earthmoving activities unless the appropriate requirements in sections 5.1 and 5.2 are sufficiently implemented to limit VDE to 20% opacity. In addition to the requirements of this rule, a person shall comply with all other applicable requirements of Regulation VIII.

a. N-811-0-3, Facility-Wide Requirements

- Condition 29 of the permit ensures compliance with this rule.

J. District Rule 8031 - Bulk Materials

The purpose of this rule is to limit fugitive dust emissions from the outdoor handling, storage, and transport of bulk materials.

This rule applies to the outdoor handling, storage, and transport of any bulk material.

Section 5.0 requires that no person shall perform any outdoor handling, storage, and transport of bulk materials unless the appropriate requirements in Table 8031-1 of this rule are sufficiently implemented to limit VDE to 20% opacity or to comply with the conditions for a stabilized surface as defined in Rule 8011. In addition to the requirements of this rule, a person shall comply with all other applicable requirements of Regulation VIII.

a. N-811-0-3, Facility-Wide Requirements

- Condition 30 of the permit ensures compliance with this rule.

K. District Rule 8041 - Carryout and Trackout

The purpose of this rule is to limit fugitive dust emissions from carryout and trackout.

This rule applies to all sites that are subject to Rules 8021 (Construction, Demolition, Excavation, Extraction, and other Earthmoving Activities), 8031 (Bulk Materials), and 8071 (Unpaved Vehicle and Equipment Traffic Areas) where carryout or trackout has occurred or may occur.

Section 5.0 requires that an owner/operator shall sufficiently prevent or cleanup carryout and trackout as specified in sections 5.1 through 5.8. In addition to the requirements of this rule, a person shall comply with all other applicable requirements of Regulation VIII. The use of blower devices, or dry rotary brushes or brooms, for removal of carryout and trackout on public roads is expressly prohibited. The removal of carryout and trackout from paved public roads does not exempt an owner/operator from obtaining state or local agency permits which may be required for the cleanup of mud and dirt on paved public roads.

a. N-811-0-3, Facility-Wide Requirements

- Condition 31 of the permit ensures compliance with this rule.

L. District Rule 8051 - Open Areas

The purpose of this rule is to limit fugitive dust emissions from open areas.

This rule applies to any open area having 3.0 acres or more of disturbed surface area, that has remained undeveloped, unoccupied, unused, or vacant for more than seven days.

Section 5.0 requires that whenever open areas are disturbed or vehicles are used in open areas, the owner/operator shall implement one or a combination of control measures indicated in Table 8051-1 to comply with the conditions of a stabilized surface at all times and to limit VDE to 20% opacity. In addition to the requirements of this rule, a person shall comply with all other applicable requirements of Regulation VIII.

a. N-811-0-3, Facility-Wide Requirements

- Condition 32 of the permit ensures compliance with this rule.

M. District Rule 8061 - Paved and Unpaved Roads

The purpose of this rule is to limit fugitive dust emissions from paved and unpaved roads by implementing control measures and design criteria.

This rule applies to any new or existing public or private paved or unpaved road, road construction project, or road modification project.

a. N-811-0-3, Facility-Wide Requirements

- Condition 33 of the permit ensures compliance with this rule.

N. District Rule 8071 - Unpaved Vehicle/Equipment Traffic Area

The purpose of this rule is to limit fugitive dust emissions from unpaved vehicle and equipment traffic areas by implementing control measures and design criteria.

This rule applies to any unpaved vehicle/equipment traffic area of 1.0 acre or larger.

a. N-811-0-3, Facility-Wide Requirements

- Condition 34 of the permit ensures compliance with this rule.

- **40 CFR Part 60, Subpart IIII, Standards of Performance for Stationary Compression Ignition Internal Combustion Engines**

The provisions of this subpart are applicable to owners, and operators of stationary compression ignition (CI) internal combustion engines (ICE) that commence construction after July 11, 2005 where the stationary CI ICE are manufactured after April 1, 2006 and are not fire pump engines, or manufactured as a certified National Fire Protection Association (NFPA) fire pump engine after July 1, 2006. It is also applicable to owners and operators of stationary CI ICE that modify or reconstruct their stationary CI ICE after July 11, 2005.

a. N-811-11-4 and -12-4, 450 bhp Caterpillar Portable Emergency Standby Diesel-Fired IC Engine

The engines at this facility are existing stationary compression ignition internal combustion engines that do not meet the above applicability requirements. Therefore, this subpart is not applicable and no further discussion is required.

b. N-811-19-6, 193 bhp John Deere Diesel-Fired IC Engine

The engine at this facility is an existing stationary compression ignition internal combustion engine that do not meet the above applicability requirements. Therefore, this subpart is not applicable and no further discussion is required.

c. N-811-25-2, 2550 bhp Detroit Diesel Diesel-Fired Emergency Standby IC Engine

The engine at this facility is an existing stationary compression ignition internal combustion engine that do not meet the above applicability requirements. Therefore, this subpart is not applicable and no further discussion is required.

O. 40 CFR Part 60, Subpart JJJJ, Standards of Performance for Stationary Spark Ignition Internal Combustion Engines

The provisions of this subpart are applicable to owners, and operators of stationary spark ignition (SI) internal combustion engines (ICE) that

commence construction after June 12, 2006, where the stationary SI ICE are manufactured on or after July 1, 2007, for engines with a maximum engine power greater than or equal to 500 hp (except lean burn engines with a maximum engine power greater than or equal to 500 hp and less than 1,350 hp); on or after January 1, 2008, for lean burn engines with a maximum engine power greater than or equal to 500 hp and less than 1,350 hp; on or after July 1, 2008, for engines with a maximum engine power less than 500 hp; or on or after January 1, 2009, for emergency engines with a maximum engine power greater than 25 hp. It is also applicable to owners and operators of stationary SI ICE that commences modification or reconstruction after June 12, 2006.

a. N-811-21-4, -22-4, and -23-4, 1408 bhp Waukesha Digester Gas/Natural Gas-Fired Lean Burn Precombustion Type IC Engine with Siloxane Scrubber

   The engines at this facility are existing stationary spark ignition internal combustion engines that do not meet the above applicability requirements. Therefore, this subpart is not applicable and no further discussion is required.

P. 40 CFR Part 63, Subpart ZZZZ, National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines

Subpart ZZZZ establishes national emission limitations and operating limitations for hazardous air pollutants (HAP) emitted from stationary reciprocating internal combustion engines (RICE) located at major and area sources of HAP emissions. This subpart also establishes requirements to demonstrate initial and continuous compliance with the emission limitations and operating limitations.

§6585(b) states, "A major source of HAP emissions is a plant site that emits or has the potential to emit any single HAP at a rate of 10 tons (9.07 megagrams) or more per year or any combination of HAP at a rate of 25 tons (22.68 megagrams) or more per year, except that for oil and gas production facilities, a major source of HAP emissions is determined for each surface site."

§6585(c) states, "An area source of HAP emissions is a source that is not a major source."

The facility is not a major source of HAP as defined in §6585(b). Therefore, this facility is an area source of HAP emissions.

§6590(a) states, "An affected source is any existing, new, or reconstructed stationary RICE located at a major or area source of HAP emissions, excluding stationary RICE being tested at a stationary RICE test cell/stand."

§6590(a)(1) defines the criteria for an existing stationary RICE as follows:

(i) For stationary RICE with a site rating of more than 500 brake horsepower (HP) located at a major source of HAP emissions, a stationary RICE is existing if you commenced construction or reconstruction of the stationary RICE before December 19, 2002.

(ii) For stationary RICE with a site rating of less than or equal to 500 brake HP located at a major source of HAP emissions, a stationary RICE is existing if you commenced construction or reconstruction of the stationary RICE before June 12, 2006.

(iii) For stationary RICE located at an area source of HAP emissions, a stationary RICE is existing if you commenced construction or reconstruction of the stationary RICE before June 12, 2006.

(iv) A change in ownership of an existing stationary RICE does not make that stationary RICE a new or reconstructed stationary RICE.

This facility is an area source of HAP emissions. The engines at this facility have not commenced construction or reconstruction on or after June 12, 2006. Therefore, the engines at this facility meet the definition of an existing stationary RICE as defined in §6590(a)(1)(iii).

§6590(b)(3) states that the following engines do not have to meet the requirements of this subpart and of subpart A of this part:

- stationary RICE which is an existing spark ignition 4 stroke rich burn (4SRB) stationary RICE located at an area source,
- existing spark ignition 4SRB stationary RICE with a site rating of less than or equal to 500 brake HP located at a major source, an existing spark ignition 2 stroke lean burn (2SLB) stationary RICE,
- existing spark ignition 4 stroke lean burn (4SLB) stationary RICE,
- existing compression ignition (CI) stationary RICE,
- existing emergency stationary RICE,
- existing limited use stationary RICE, or
- existing stationary RICE that combusts landfill gas or digester gas equivalent to 10 percent or more of the gross heat input on an annual basis

The engines at this facility are existing emergency stationary RICE, existing limited use stationary RICE, and existing spark ignition 4 stroke lean burn (4SLB) stationary RICE. Therefore, the engines do not have to meet the requirements of this subpart and of subpart A of this part. No further discussion is required.

Q. 40 CFR Part 64, Compliance Assurance Monitoring (CAM)

40 CFR Part 64 requires Compliance Assurance Monitoring (CAM) for units that meet the following three criteria:

1) the unit must have an emission limit for the pollutant;
2) the unit must have add-on controls for the pollutant; these are devices such as flue gas recirculation (FGR), baghouses, and catalytic oxidizers; and
3) the unit must have a pre-control potential to emit of greater than the major source thresholds.

a. N-811-11-4 and -12-4, 450 bhp Caterpillar Portable Emergency Standby Diesel-Fired IC Engine

   Units N-811-11 and -12 are not subject to CAM because they do not have any add-on controls.

b. N-811-13-3, One 2000 Gallon Above Ground Convault Gasoline Storage Tank Served by Phase I and Phase II Vapor Recovery System

   The above ground gasoline storage tank is not subject to CAM because it does do not have emission limits for VOC.

c. N-811-18-4, 36 MMBtu/hr John Zink Digester Gas-Fired Emergency Flare

   The John Zink emergency flare is a back-up control device that will incinerate digester gases during emergencies where the gases could not be combusted by the facility's digester gas/internal combustion engines. The emergency flare is not subject to CAM since the emissions unit does not have add-on controls.

d. N-811-19-6, 193 hp John Deere Diesel-Fired Low-Use IC Engine

   This engine is not subject to CAM since it does not have add-on controls.

e. N-811-21-4, -22-4, and -23-4, 1408 hp Waukesha Digester/Natural Gas-Fired Lean Burn IC Engines

These engines are not subject to CAM since they do not have add-on controls.

f. N-811-25-2, 2,550 hp Detroit Diesel Diesel-Fired Emergency Standby IC Engine

This engine is not subject to CAM since it does not have add-on controls.

g. N-811-26-2, Headworks Facility

The permit unit has emissions limits for VOC, NH_3, H_2S, and sulfur compounds. Sulfur compounds are composed of 99% H_2S. The permit unit uses two bioscubbers to control VOC, Sulfur Compounds, NH_3, and H_2S emissions. The pre-control VOC, NH_3, and H_2S potential emissions from Project #N-1041402 were estimated to be 3,650 lb-VOC/yr, 12,739 lb-NH_3/year and 251,401 lb-H_2S/year. Sulfur compounds (carbonyl sulfide, carbon disulfide, and methyl mercaptan) excluding H_2S were estimated to be 1,335 lb/yr.

VOC emissions are less than the major source threshold of 50,000 lb/yr. Sulfur compounds and NH_3 emissions are less than the major source threshold of 200,000 lb/yr (100 tons/yr). Therefore, the permit unit is not subject to CAM for VOC, sulfur compounds, and NH_3 emissions.

The permit unit is subject to CAM for H_2S since H_2S with pre-control emissions exceeding major source threshold for H_2S of 200,000 lb/yr (100 tons per year).

Pre-control H_2S (PE1) concentration provided by applicant = 98500 ppbv
Molecular weight of H_2S = 34.08 lb/lb-mol
Air Flow Rate = 55000 ft^3/min

$PE1_{H2S}$ = [(Influent Concentration (ppbv)/10^9) x Air Flow Rate (cfm) x (1 lb-mol/386 ft^3) x molecular weight (lb/lb-mol) x 60 min/hr) x (8760 hr/yr)]

= [(98500 ppbv/10^9) x (55000 ft^3/min) x (1 lb-mol/386 ft^3) x 34.08 lb/lb-mol x 60 min/hr x 8760 hr/yr]
= 251,400 lb-H_2S/yr = 125 ton-H_2S/yr > 100 ton/yr threshold

To satisfy CAM requirements, the current weekly monitoring of H_2S effluent concentration at the exit of each biofilter will be revised to daily monitoring. Since the post-control H_2S emissions at 99% control will be reduce to 2,514 lb-H_2S/yr or (524 ppbv as SO_2)[1] which less than the major threshold, a more frequent monitoring than daily monitoring is not required.

- Conditions 5 and 6 of the permit unit ensure compliance with this requirement.

IX. PERMIT SHIELD

A permit shield legally protects a facility from enforcement of the shielded regulations when a source is in compliance with the terms and conditions of the Title V permit. Compliance with the terms and conditions of the Operating Permit is considered compliance with all applicable requirements upon which those conditions are based, including those that have been subsumed.

A. Requirements Addressed by Model General Permit Templates

The applicant does not propose to use any model general permit templates.

X. PERMIT CONDITIONS

See Attachment A - Renewed Title V Operating Permit.

XI. ATTACHMENTS

A. Renewed Title V Operating Permit
B. Previous Title V Operating Permit
C Detailed Facility List

[1] At 99% control, the post-project H_2S emissions concentration is 985.0 ppbv with a molecular weight of 34.08 lb/lb-mol. This emissions factor is converted such that the factor is referenced as all SO_2: 985.0 ppbv x (34.08 lb-H_2S/lb-mol ÷ 64.06 lb-SO_2/lb-mol) = 524 ppbv as SO_2.

ATTACHMENT A

Renewed Title V Operating Permit

San Joaquin Valley
AIR POLLUTION CONTROL DISTRICT

HEALTHY AIR LIVING™

Permit to Operate

FACILITY: N-811 **EXPIRATION DATE:** 11/30/2013

LEGAL OWNER OR OPERATOR: STOCKTON RWCF
MAILING ADDRESS: 2500 NAVY DRIVE
STOCKTON, CA 95206

FACILITY LOCATION: 2500 NAVY DR
STOCKTON, CA 95206

FACILITY DESCRIPTION: WASTEWATER TREATMENT FACILITY

The Facility's Permit to Operate may include Facility-wide Requirements as well as requirements that apply to specific permit units.

This Permit to Operate remains valid through the permit expiration date listed above, subject to payment of annual permit fees and compliance with permit conditions and all applicable local, state, and federal regulations. This permit is valid only at the location specified above, and becomes void upon any transfer of ownership or location. Any modification of the equipment or operation, as defined in District Rule 2201, will require prior District approval. This permit shall be posted as prescribed in District Rule 2010.

Seyed Sadredin
Executive Director / APCO

David Warner
Director of Permit Services

Jun 9 2010 2:04PM – SIONGCOJ

Printed on recyclad paper.

San Joaquin Valley
Air Pollution Control District

FACILITY: N-811-0-3 **EXPIRATION DATE:** 11/30/2013

FACILITY-WIDE REQUIREMENTS

1. The owner or operator shall notify the District of any breakdown condition as soon as reasonably possible, but no later than one hour after its detection, unless the owner or operator demonstrates to the District's satisfaction that the longer reporting period was necessary. [District Rule 1100, 6.1; San Joaquin County Rule 110] Federally Enforceable Through Title V Permit
2. The District shall be notified in writing within ten days following the correction of any breakdown condition. The breakdown notification shall include a description of the equipment malfunction or failure, the date and cause of the initial failure, the estimated emissions in excess of those allowed, and the methods utilized to restore normal operations. [District Rule 1100, 7.0; San Joaquin County Rule 110] Federally Enforceable Through Title V Permit
3. The owner or operator of any stationary source operation that emits more than 25 tons per year of nitrogen oxides or reactive organic compounds, shall provide the District annually with a written statement in such form and at such time as the District prescribes, showing actual emissions of nitrogen oxides and reactive organic compounds from that source. [District Rule 1160, 5.0] Federally Enforceable Through Title V Permit
4. Any person building, altering or replacing any operation, article, machine, equipment, or other contrivance, the use of which may cause the issuance of air contaminants or the use of which may eliminate, reduce, or control the issuance of air contaminants, shall first obtain an Authority to Construct (ATC) from the District unless exempted by District Rule 2020 (12/19/02). [District Rule 2010, 3.0 and 4.0; and 2020] Federally Enforceable Through Title V Permit
5. The permittee must comply with all conditions of the permit including permit revisions originated by the District. All terms and conditions of a permit that are required pursuant to the Clean Air Act (CAA), including provisions to limit potential to emit, are enforceable by the EPA and Citizens under the CAA. Any permit noncompliance constitutes a violation of the CAA and the District Rules and Regulations, and is grounds for enforcement action, for permit termination, revocation, reopening and reissuance, or modification; or for denial of a permit renewal application. [District Rules 2070, 7.0; 2080; and 2520, 9.8.1 and 9.12.1] Federally Enforceable Through Title V Permit
6. A Permit to Operate or an Authority to Construct shall not be transferred unless a new application is filed with and approved by the District. [District Rule 2031] Federally Enforceable Through Title V Permit
7. Every application for a permit required under Rule 2010 (12/17/92) shall be filed in a manner and form prescribed by the District. [District Rule 2040] Federally Enforceable Through Title V Permit
8. The operator shall maintain records of required monitoring that include: 1) the date, place, and time of sampling or measurement; 2) the date(s) analyses were performed; 3) the company or entity that performed the analysis; 4) the analytical techniques or methods used; 5) the results of such analysis; and 6) the operating conditions at the time of sampling or measurement. [District Rule 2520, 9.4.1] Federally Enforceable Through Title V Permit
9. The operator shall retain records of all required monitoring data and support information for a period of at least 5 years from the date of the monitoring sample, measurement, or report. Support information includes copies of all reports required by the permit and, for continuous monitoring instrumentation, all calibration and maintenance records and all original strip-chart recordings. [District Rule 2520, 9.4.2] Federally Enforceable Through Title V Permit

FACILITY-WIDE REQUIREMENTS CONTINUE ON NEXT PAGE

10. The operator shall submit reports of any required monitoring at least every six months unless a different frequency is required by an applicable requirement. All instances of deviations from permit requirements must be clearly identified in such reports. [District Rule 2520, 9.5.1] Federally Enforceable Through Title V Permit

11. Deviations from permit conditions must be promptly reported, including deviations attributable to upset conditions, as defined in the permit. For the purpose of this condition, promptly means as soon as reasonably possible, but no later than 10 days after detection. The report shall include the probable cause of such deviations, and any corrective actions or preventive measures taken. All required reports must be certified by a responsible official consistent with section 10.0 of District Rule 2520 (6/21/01). [District Rules 2520, 9.5.2 and 1100, 7.0] Federally Enforceable Through Title V Permit

12. If for any reason a permit requirement or condition is being challenged for its constitutionality or validity by a court of competent jurisdiction, the outcome of such challenge shall not affect or invalidate the remainder of the conditions or requirements in that permit. [District Rule 2520, 9.7] Federally Enforceable Through Title V Permit

13. It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of the permit. [District Rule 2520, 9.8.2] Federally Enforceable Through Title V Permit

14. The permit may be modified, revoked, reopened and reissued, or terminated for cause. The filing of a request by the permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance does not stay any permit condition. [District Rule 2520, 9.8.3] Federally Enforceable Through Title V Permit

15. The permit does not convey any property rights of any sort, or any exclusive privilege. [District Rule 2520, 9.8.4] Federally Enforceable Through Title V Permit

16. The Permittee shall furnish to the District, within a reasonable time, any information that the District may request in writing to determine whether cause exists for modifying, revoking and reissuing, or terminating the permit or to determine compliance with the permit. Upon request, the permittee shall also furnish to the District copies of records required to be kept by the permit or, for information claimed to be confidential, the permittee may furnish such records directly to EPA along with a claim of confidentiality. [District Rule 2520, 9.8.5] Federally Enforceable Through Title V Permit

17. The permittee shall pay annual permit fees and other applicable fees as prescribed in Regulation III of the District Rules and Regulations. [District Rule 2520, 9.9] Federally Enforceable Through Title V Permit

18. Upon presentation of appropriate credentials, a permittee shall allow an authorized representative of the District to enter the permittee's premises where a permitted source is located or emissions related activity is conducted, or where records must be kept under condition of the permit. [District Rule 2520, 9.13.2.1] Federally Enforceable Through Title V Permit

19. Upon presentation of appropriate credentials, a permittee shall allow an authorized representative of the District to have access to and copy, at reasonable times, any records that must be kept under the conditions of the permit. [District Rule 2520, 9.13.2.2] Federally Enforceable Through Title V Permit

20. Upon presentation of appropriate credentials, a permittee shall allow an authorized representative of the District to inspect at reasonable times any facilities, equipment, practices, or operations regulated or required under the permit. [District Rule 2520, 9.13.2.3] Federally Enforceable Through Title V Permit

21. Upon presentation of appropriate credentials, a permittee shall allow an authorized representative of the District to sample or monitor, at reasonable times, substances or parameters for the purpose of assuring compliance with the permit or applicable requirements. [District Rule 2520, 9.13.2.4] Federally Enforceable Through Title V Permit

22. No air contaminants shall be discharged into the atmosphere for a period or periods aggregating more than 3 minutes in any one hour which is as dark or darker than Ringelmann #1 or equivalent to 20% opacity and greater, unless specifically exempted by District Rule 4101 (2/17/05). If the equipment or operation is subject to a more stringent visible emission standard as prescribed in a permit condition, the more stringent visible emission limit shall supersede this condition. [District Rule 4101] Federally Enforceable Through Title V Permit

FACILITY-WIDE REQUIREMENTS CONTINUE ON NEXT PAGE

23. No person shall manufacture, blend, repackage, supply, sell, solicit or apply any architectural coating with a VOC content in excess of the corresponding limit specified in the Table of Standards of District Rule 4601 (12/17/09) for use or sale within the District. [District Rule 4601, 5.1] Federally Enforceable Through Title V Permit

24. All VOC-containing materials for architectural coatings subject to Rule 4601 (12/17/09) shall be stored in closed containers when not in use. [District Rule 4601, 5.4] Federally Enforceable Through Title V Permit

25. The permittee shall comply with all the Labeling and Test Methods requirements outlined in Rule 4601 sections 6.1 and 6.3 (12/17/09). [District Rule 4601, 6.1 and 6.3] Federally Enforceable Through Title V Permit

26. With each report or document submitted under a permit requirement or a request for information by the District or EPA, the permittee shall include a certification of truth, accuracy, and completeness by a responsible official. [District Rule 2520, 9.13.1 and 10.0] Federally Enforceable Through Title V Permit

27. If the permittee performs maintenance on, or services, repairs, or disposes of appliances, the permittee shall comply with the standards for Recycling and Emissions Reduction pursuant to 40 CFR 82, Subpart F. [40 CFR 82 Subpart F] Federally Enforceable Through Title V Permit

28. If the permittee performs service on motor vehicles when this service involves the ozone-depleting refrigerant in the motor vehicle air conditioner (MVAC), the permittee shall comply with the standards for Servicing of Motor Vehicle Air Conditioners pursuant to all the applicable requirements as specified in 40 CFR 82, Subpart B. [40 CFR 82, Subpart B] Federally Enforceable Through Title V Permit

29. Disturbances of soil related to any construction, demolition, excavation, extraction, or other earthmoving activities shall comply with the requirements for fugitive dust control in District Rule 8021 unless specifically exempted under Section 4.0 of Rule 8021 (8/19/04) or Rule 8011 (8/19/04). [District Rule 8021 and 8011] Federally Enforceable Through Title V Permit

30. Outdoor handling, storage and transport of any bulk material which emits dust shall comply with the requirements of District Rule 8031, unless specifically exempted under Section 4.0 of Rule 8031 (8/19/04) or Rule 8011 (8/19/04). [District Rule 8031 and 8011] Federally Enforceable Through Title V Permit

31. An owner/operator shall prevent or cleanup any carryout or trackout in accordance with the requirements of District Rule 8041 Section 5.0, unless specifically exempted under Section 4.0 of Rule 8041 (8/19/04) or Rule 8011 (8/19/04). [District Rule 8041 and 8011] Federally Enforceable Through Title V Permit

32. Whenever open areas are disturbed or vehicles are used in open areas, the facility shall comply with the requirements of Section 5.0 of District Rule 8051, unless specifically exempted under Section 4.0 of Rule 8051 (8/19/04) or Rule 8011 (8/19/04). [District Rule 8051 and 8011] Federally Enforceable Through Title V Permit

33. Any paved road or unpaved road shall comply with the requirements of District Rule 8061 unless specifically exempted under Section 4.0 of Rule 8061 (8/19/04) or Rule 8011 (8/19/04). [District Rule 8061 and Rule 8011] Federally Enforceable Through Title V Permit

34. Any unpaved vehicle/equipment area that anticipates more than 75 vehicle trips per day shall comply with the requirements of Section 5.1.1 of District Rule 8071. Any unpaved vehicle/equipment area that anticipates more than 100 vehicle trips per day shall comply with the requirements of Section 5.1.2 of District Rule 8071. All sources shall comply with the requirements of Section 5.0 of District Rule 8071 unless specifically exempted under Section 4.0 of Rule 8071 (9/16/04) or Rule 8011 (8/19/04). [District Rule 8071 and Rule 8011] Federally Enforceable Through Title V Permit

35. Any owner or operator of a demolition or renovation activity, as defined in 40 CFR 61.141, shall comply with the applicable inspection, notification, removal, and disposal procedures for asbestos containing materials as specified in 40 CFR 61.145 (Standard for Demolition and Renovation). [40 CFR 61 Subpart M] Federally Enforceable Through Title V Permit

FACILITY-WIDE REQUIREMENTS CONTINUE ON NEXT PAGE

36. The permittee shall submit certifications of compliance with the terms and standards contained in Title V permits, including emission limits, standards and work practices, to the District and the EPA annually (or more frequently as specified in an applicable requirement or as specified by the District). The certification shall include the identification of each permit term or condition, the compliance status, whether compliance was continuous or intermittent, the methods used for determining the compliance status, and any other facts required by the District to determine the compliance status of the source. [District Rule 2520, 9.16] Federally Enforceable Through Title V Permit

37. The permittee shall submit an application for Title V permit renewal to the District at least six months, but not greater than 18 months, prior to the permit expiration date. [District Rule 2520, 5.2] Federally Enforceable Through Title V Permit

38. When a term is not defined in a Title V permit condition, the definition in the rule cited as the origin and authority for the condition in a Title V permits shall apply. [District Rule 2520, 9.1.1] Federally Enforceable Through Title V Permit

39. Compliance with permit conditions in the Title V permit shall be deemed in compliance with the following SIP requirement: San Joaquin Rule 110 . A permit shield is granted from these requirements. [District Rule 2520, 13.2] Federally Enforceable Through Title V Permit

40. Compliance with permit conditions in the Title V permit shall be deemed in compliance with the following applicable requirements: SJVUAPCD Rules 1100, sections 6.1 and 7.0 (12/17/92); 2010, sections 3.0 and 4.0 (12/17/92); 2031 (12/17/92); 2040 (12/17/92); 2070, section 7.0 (12/17/92); 2080 (12/17/92); 4101 (2/17/05); 4601, sections 5.1, 5.2, 5.3, 5.8 and 8.0 (12/17/09); 8021 (8/19/04); 8031 (8/19/04); 8041 (8/19/04); 8051 (8/19/04); 8061 (8/19/04); and 8071 (9/16/04). A permit shield is granted from these requirements. [District Rule 2520, 13.2] Federally Enforceable Through Title V Permit

41. The reporting periods for the Report of Required Monitoring and the Compliance Certification Report begin September 23 of every year, unless alternative dates are approved by the District Compliance Division. These reports are due within 30 days after the end of the reporting period. [District Rule 2520] Federally Enforceable Through Title V Permit

42. No air contaminant shall be released into the atmosphere which causes a public nuisance. [District Rule 4102]

43. When applicable to 40 CFR Part 68, a subject facility shall submit to the proper authority a Risk Management Plan when mandated by the regulation. [40 CFR Part 68] Federally Enforceable Through Title V Permit

San Joaquin Valley
Air Pollution Control District

PERMIT UNIT: N-811-11-4 **EXPIRATION DATE:** 11/30/2013

EQUIPMENT DESCRIPTION:
450 HP CATERPILLAR MODEL 3406 DITA, S/N 75Z1640, PORTABLE EMERGENCY STANDBY DIESEL-FIRED IC ENGINE POWERING AN ELECTRICAL GENERATOR

PERMIT UNIT REQUIREMENTS

1. Sulfur compound emissions shall not exceed 0.2% by volume, 2000 ppmv, on a dry basis averaged over 15 consecutive minutes. [San Joaquin County Rule 407] Federally Enforceable Through Title V Permit
2. Particulate matter emissions shall not exceed 0.1 gr/dscf in concentration at the point of discharge. [District Rule 4201] Federally Enforceable Through Title V Permit
3. Only CARB certified diesel fuel containing not more than 0.0015% sulfur by weight is to be used. [District Rule 4801 and San Joaquin County Rule 407 and 17 CCR 93115] Federally Enforceable Through Title V Permit
4. This engine shall be operated only for testing and maintenance of the engine, required regulatory purposes, and during emergency situations. Operation of the engine for maintenance, testing, and required regulatory purposes shall not exceed 20 hours per calendar year. [District Rule 4702 and 17 CCR 93115] Federally Enforceable Through Title V Permit
5. This engine shall be equipped with an operational non-resettable elapsed time meter or other APCO approved alternative. [District Rule 4702 and 17 CCR 93115] Federally Enforceable Through Title V Permit
6. An emergency situation is an unscheduled electrical power outage caused by sudden and reasonably unforeseen natural disasters or sudden and reasonably unforeseen events beyond the control of the permittee. [District Rule 4702] Federally Enforceable Through Title V Permit
7. This engine shall not be used to produce power for the electrical distribution system, as part of a voluntary utility demand reduction program, or for an interruptible power contract. [District Rule 4702] Federally Enforceable Through Title V Permit
8. This engine shall be operated and maintained in proper operating condition as recommended by the engine manufacturer or emissions control system supplier. [District Rule 4702] Federally Enforceable Through Title V Permit
9. During periods of operation for maintenance, testing, and required regulatory purposes, the permittee shall monitor the operational characteristics of the engine as recommended by the manufacturer or emission control system supplier (for example: check engine fluid levels, battery, cables and connections; change engine oil and filters; replace engine coolant; and/or other operational characteristics as recommended by the manufacturer or supplier). [District Rule 4702] Federally Enforceable Through Title V Permit
10. The permittee shall maintain monthly records of emergency and non-emergency operation. Records shall include the number of hours of emergency operation, the date and number of hours of all testing and maintenance operations, the purpose of the operation (for example: load testing, weekly testing, rolling blackout, general area power outage, etc.) and records of operational characteristics monitoring. For units with automated testing systems, the operator may, as an alternative to keeping records of actual operation for testing purposes, maintain a readily accessible written record of the automated testing schedule. [District Rule 4702 and 17 CCR 93115] Federally Enforceable Through Title V Permit

PERMIT UNIT REQUIREMENTS CONTINUE ON NEXT PAGE

11. Compliance with permit conditions in the Title V permit shall be deemed compliance with the following applicable requirements of SJVUAPCD Rule 4201(amended 12/17/92), and San Joaquin County Rule 407. A permit shield is granted from these requirements. [District Rule 2520, 13.2] Federally Enforceable Through Title V Permit

San Joaquin Valley
Air Pollution Control District

PERMIT UNIT: N-811-12-4 **EXPIRATION DATE:** 11/30/2013

EQUIPMENT DESCRIPTION:
450 HP CATERPILLAR MODEL 3406TA, S/N 75Z01455, PORTABLE EMERGENCY STANDBY DIESEL-FIRED IC ENGINE POWERING AN ELECTRICAL GENERATOR

PERMIT UNIT REQUIREMENTS

1. Sulfur compound emissions shall not exceed 0.2% by volume, 2000 ppmv, on a dry basis averaged over 15 consecutive minutes. [San Joaquin County Rule 407] Federally Enforceable Through Title V Permit
2. Particulate matter emissions shall not exceed 0.1 gr/dscf in concentration at the point of discharge. [District Rule 4201] Federally Enforceable Through Title V Permit
3. Only CARB certified diesel fuel containing not more than 0.0015% sulfur by weight is to be used. [District Rule 4801 and San Joaquin County Rule 407 and 17 CCR 93115] Federally Enforceable Through Title V Permit
4. This engine shall be operated only for testing and maintenance of the engine, required regulatory purposes, and during emergency situations. Operation of the engine for maintenance, testing, and required regulatory purposes shall not exceed 20 hours per calendar year. [District Rule 4702 and 17 CCR 93115] Federally Enforceable Through Title V Permit
5. This engine shall be equipped with an operational non-resettable elapsed time meter or other APCO approved alternative. [District Rule 4702 and 17 CCR 93115] Federally Enforceable Through Title V Permit
6. An emergency situation is an unscheduled electrical power outage caused by sudden and reasonably unforeseen natural disasters or sudden and reasonably unforeseen events beyond the control of the permittee. [District Rule 4702] Federally Enforceable Through Title V Permit
7. This engine shall not be used to produce power for the electrical distribution system, as part of a voluntary utility demand reduction program, or for an interruptible power contract. [District Rule 4702] Federally Enforceable Through Title V Permit
8. This engine shall be operated and maintained in proper operating condition as recommended by the engine manufacturer or emissions control system supplier. [District Rule 4702] Federally Enforceable Through Title V Permit
9. During periods of operation for maintenance, testing, and required regulatory purposes, the permittee shall monitor the operational characteristics of the engine as recommended by the manufacturer or emission control system supplier (for example: check engine fluid levels, battery, cables and connections; change engine oil and filters; replace engine coolant; and/or other operational characteristics as recommended by the manufacturer or supplier). [District Rule 4702] Federally Enforceable Through Title V Permit
10. The permittee shall maintain monthly records of emergency and non-emergency operation. Records shall include the number of hours of emergency operation, the date and number of hours of all testing and maintenance operations, the purpose of the operation (for example: load testing, weekly testing, rolling blackout, general area power outage, etc.) and records of operational characteristics monitoring. For units with automated testing systems, the operator may, as an alternative to keeping records of actual operation for testing purposes, maintain a readily accessible written record of the automated testing schedule. [District Rule 4702 and 17 CCR 93115] Federally Enforceable Through Title V Permit

PERMIT UNIT REQUIREMENTS CONTINUE ON NEXT PAGE

11. Compliance with permit conditions in the Title V permit shall be deemed compliance with the following applicable requirements of SJVUAPCD Rule 4201(amended 12/17/92), and San Joaquin County Rule 407. A permit shield is granted from these requirements. [District Rule 2520, 13.2] Federally Enforceable Through Title V Permit

San Joaquin Valley
Air Pollution Control District

PERMIT UNIT: N-811-13-3 **EXPIRATION DATE:** 11/30/2013

EQUIPMENT DESCRIPTION:
ONE (1) 2,000 GALLON ABOVE GROUND CONVAULT GASOLINE STORAGE TANK SERVED BY COAXIAL PHASE I VAPOR RECOVERY SYSTEM (G-70-97) AND ONE (1) NOZZLE SERVED BY OPW BALANCE PHASE II VAPOR RECOVERY SYSTEM (G-70-116-B)

PERMIT UNIT REQUIREMENTS

1. The operator shall not store gasoline in or otherwise use or operate any gasoline delivery vessel unless such vessel is designed and maintained to be vapor tight. Any delivery vessel into which gasoline vapors have been transferred shall be filled only at a loading facility that is equipped with a certified system that prevents at least 95% by weight of the gasoline vapors displaced from entering the atmosphere. [District NSR Rule and 4621, 5.2.2] Federally Enforceable Through Title V Permit
2. Any open vent pipe on a stationary aboveground gasoline storage tank shall be equipped with a certified pressure-vacuum relief valve set at eight ounces per square inch, unless otherwise specified in the applicable CARB executive order, and provided that such setting will not exceed the vessel's maximum pressure rating. The vent pipes may be manifolded, as per the applicable CARB executive order, to a single pressure-vacuum relief valve meeting the aforementioned specifications. [District NSR Rule and 4621, 5.1.2] Federally Enforceable Through Title V Permit
3. The vapor recovery systems and their components shall be installed, operated, and maintained in accordance with the State certification requirements. [District NSR Rule] Federally Enforceable Through Title V Permit
4. The district shall be notified by the permittee 15 days prior to each test. The test results shall be submitted to the District no later than 30 days after each test. [District NSR Rule and District Rule 4622] Federally Enforceable Through Title V Permit
5. This gasoline storage and dispensing equipment shall not be used in retail sales, where gasoline dispensed by the unit is subject to payment of California sales tax on gasoline sales. [District Rule 2520, 9.1] Federally Enforceable Through Title V Permit
6. To ensure that all components of the certified Phase II vapor recovery system are maintained in proper operating condition, the non-retail service station operator shall conduct a maintenance inspection one day per month. [District Rule 4622, 5.4.2] Federally Enforceable Through Title V Permit
7. The operator shall maintain all records of required monitoring data, facility monthly gasoline throughput, and support information for District inspection for a period of five years. [District Rule 2520, 9.4.2] Federally Enforceable Through Title V Permit
8. Loading and vapor collection equipment shall be maintained and operated such that there are no liquid component leaks under any conditions, nor any excess organic liquid drainage at disconnect. [District Rule 4621, 5.0] Federally Enforceable Through Title V Permit
9. The operator shall not transfer or permit the transfer of gasoline from any delivery vessel into any stationary storage container unless such container is equipped with a permanent submerged fill pipe and a certified Phase I vapor recovery system which is maintained and operated according to the manufacturers specifications. [District Rule 4621, 5.1.1] Federally Enforceable Through Title V Permit

PERMIT UNIT REQUIREMENTS CONTINUE ON NEXT PAGE

10. No gasoline delivery vessel shall be operated or be allowed to operate unless valid State of California decals are displayed on the cargo tank, which attest to the vapor integrity of the tank. [District Rule 4621, 5.2.1] Federally Enforceable Through Title V Permit

11. The hatch on a delivery vessel shall not be opened for visual inspection unless at least three minutes have elapsed since loading or unloading has stopped. The dome hatch, once opened, shall not be held open longer than three minutes. [District Rule 4621, 5.2.3] Federally Enforceable Through Title V Permit

12. Gasoline vapors from this unit shall not be purged into the atmosphere. [District Rule 4621, 5.2.4] Federally Enforceable Through Title V Permit

13. The vapor recovery system shall not create a backpressure in excess of the pressure limits of the delivery vessel certification leak test (18 inches water column). [District Rule 4621, 5.2.5] Federally Enforceable Through Title V Permit

14. The Reid Vapor Pressure of gasoline stored at this facility shall be determined in accordance with ASTM D 5191. [District Rule 4621, 6.2.1 and 4622, 6.3.3] Federally Enforceable Through Title V Permit

15. When determining vapor leaks with a portable analyzer the following must occur: 1) The probe inlet shall be 2.5 cm from the potential leak source. 2) The probe shall be moved slowly (approximately 4 cm/sec). If there is any meter deflection at the potential leak source, the probe shall be moved to locate the point of highest meter response. 3) To the greatest extent possible, the probe inlet shall be positioned in the path of the vapor flow from a leak so as to maximize the measured concentration. 4) The detector response time must be equal to or less than 30 seconds and the detector shall not probe any potential leak source for longer than twice the detector response time. 5) As an alternative to the preceding procedures, operators may use the soap bubble method described in the Alternative Screening Procedure in EPA Method 21. [District Rule 4621, 6.2.2] Federally Enforceable Through Title V Permit

16. The test method to determine vapor tightness of delivery vessels and storage tanks shall be EPA Method 21. [District Rule 4621, 6.2.3 and District Rule 4622, 6.3.4] Federally Enforceable Through Title V Permit

17. The operator shall not transfer or permit the transfer of gasoline from a stationary storage container into a motor vehicle fuel tank with a capacity of greater than five (5) gallons unless the gasoline dispensing unit used to transfer the gasoline from the stationary storage container to the motor vehicle fuel tank is equipped with and has in operation a certified Phase II vapor recovery system. [District Rule 4622, 5.1] Federally Enforceable Through Title V Permit

18. The operator of this gasoline dispensing facility, which has installed a permitted certified Phase II vapor recovery system, shall continue to use such system and shall maintain the system and all of its components in good repair in order that such system can continue to comply with the certification recovery efficiency. Any certified Phase II vapor recovery system that has been installed shall not be removed regardless of the amount of gasoline dispensed or how the gasoline is delivered to the facility. [District Rule 4622, 5.3] Federally Enforceable Through Title V Permit

19. The owner/operator of a gasoline dispensing facility shall implement a periodic maintenance inspection program and document the program in an operation and maintenance (O&M) manual for the certified Phase II vapor recovery system. The O&M manual shall be kept at the facility and made available to any person who operates, inspects, maintains, repairs, or tests the equipment at the facility as well as to the District personnel upon request. The O&M manual shall contain detailed instructions that ensure proper operation and maintenance of the certified Phase II vapor recovery system and its components in compliance with all applicable rules and regulations. The manual shall, at a minimum, include the following current information: 1) All applicable ARB Executive Orders, Approval Letters, and District Permits. 2) The manufacturer's specifications and instructions for installation, operation, repair, and maintenance required pursuant to ARB Certification Procedure CP-201, and any additional instruction provided by the manufacturer. 3) System and/or component testing requirements, including test schedules and passing criteria for each of the standard tests listed in Section 6.0. The owner/operator may include any non-ARB required diagnostic and other tests as part of the testing requirements. 4) Protocol for performing periodic maintenance inspections including the components to be inspected and the defects requiring repair. 5) Additional O&M instructions, if any, that are designed to ensure compliance with the applicable rules, regulations, ARB Executive Orders, and District permit conditions, including replacement schedules for failure or wear prone components. [District Rule 4622, 5.4.1] Federally Enforceable Through Title V Permit

PERMIT UNIT REQUIREMENTS CONTINUE ON NEXT PAGE

20. Any equipment with a major defect, which is identified during the periodic maintenance inspections, shall be removed from service and, when repaired, duly entered into the O&M manual. The person conducting the inspections shall, at a minimum, verify the following during inspections: 1) That the fueling instructions are clearly displayed with the appropriate toll-free complaint phone number and toxic warning signs. 2) That the following nozzle components are in place and in good condition as specified in ARB Executive Orders: faceplate/facecone, bellows, latching device spring, vapor check valve, spout (proper diameter/vapor collection holes), insertion interlock mechanism, automatic shut-off mechanism, hold open latch. 3) That the hoses are not torn, flattened or crimped. 4) That the vapor path does not contain more than 100 ml of liquid and that the vapor path shall be inspected at least once per calendar month. 5) That the vapor-processing unit is functioning properly. 6) Phase I vapor recovery system components that are functionally part of the Phase II vapor recovery system shall be inspected. The person conducting this inspection shall, at a minimum, verify the following; 1) That the fill caps and vapor caps are not missing, damaged, or loose. 2) That the fill cap gasket and vapor cap gaskets are not missing or damaged. 3) That the fill adapter and vapor adapter are securely attached to the risers. 4) That, where applicable, the spring-loaded submerged fill tube seals properly against the coaxial tubing, and the dry break (poppet-valve) is not missing or damaged. 5) That the submerged fill tube is not missing or damaged. [District Rule 4622, 5.4.3] Federally Enforceable Through Title V Permit

21. The operator shall not operate any certified Phase II vapor recovery system or any portion thereof that has a defect listed in Section 94006 of Title 17 of the California Code of Regulations, or an equipment defect that is identified in any applicable ARB Executive Order, until the defect has been repaired, replaced, or adjusted as necessary to correct the defect, and the District has reinspected the system or has authorized its use pending reinspection. Such authorization shall not include the authority to operate the equipment prior to the correction of the defective components. [District Rule 4622, 5.5] Federally Enforceable Through Title V Permit

22. The operator, upon identification of any of the defects described in the previous permit condition, shall tag "Out-of-Order" all dispensing equipment for which vapor recovery has been impaired. The tagged equipment shall be rendered inoperable and the tag(s) shall not be removed until the defective equipment has been repaired, replaced, or adjusted, as necessary. In the case of defects identified by the District, tagged equipment shall be rendered inoperable, and the tag shall not be removed until the District has been notified of the repairs, and/or the District has inspected and authorized the tagged equipment for use. [District Rule 4622, 5.6] Federally Enforceable Through Title V Permit

23. All certified Phase II vapor recovery systems and gasoline dispensing equipment shall be maintained to have no leaks. [District Rule 4622, 5.7] Federally Enforceable Through Title V Permit

24. No person shall top off a motor vehicle fuel tank. [District Rule 4622, 5.9] Federally Enforceable Through Title V Permit

25. The operator shall not tamper with, or permit tampering with, the system in a manner that would impair the operation or effectiveness of the certified Phase II vapor recovery system. [District Rule 4622, 5.11] Federally Enforceable Through Title V Permit

26. All liquid removal devices required by ARB Executive Order shall be maintained to achieve a minimum liquid removal rate of five milliliters per gallon. This standard shall apply at dispensing rates exceeding five gallons per minute, unless a higher removal rate is specified in the applicable Executive Order. [District Rule 4622, 5.12] Federally Enforceable Through Title V Permit

27. Verification must be provided that the certified Phase II vapor recovery system shall meet or exceed the requirements of the tests required of this Permit to Operate. These test results shall be dated and shall contain the names, addresses, and telephone numbers of the companies responsible for system installation and testing. [District Rule 4622, 6.1.3] Federally Enforceable Through Title V Permit

PERMIT UNIT REQUIREMENTS CONTINUE ON NEXT PAGE

28. A person who performs repairs on any certified Phase I or Phase II vapor recovery system shall provide to the operator a repair log, which the operator shall maintain on the premises and which shall include all of the following; 1) Date and time of each repair. 2) The name of the person(s) who performed the repair, and, if applicable, the name, address and phone number of the person's employer. 3) Description of service performed. 4) Each component that was repaired, serviced, or removed. 5) Each component that was installed as replacement, if applicable. 6) Receipts or other documents for parts used in the repair and, if applicable, work orders which shall include the name and signature of the person responsible for performing the repairs. [District Rule 4622, 6.1.4] Federally Enforceable Through Title V Permit

29. An operator shall comply with the following certified Phase II vapor recovery system performance verification requirements. 1) The operator shall conduct a Static Leak Test of the certified Phase II vapor recovery system at least once every twelve months. 2) The operator shall conduct a Dynamic Back-Pressure Test of the certified Phase II vapor recovery system at least once every twelve months. 3) For certified Phase II vapor recovery systems with bellows-less nozzles, the operator shall conduct an Air-to-Liquid Volume Ratio Test at least once every six months. 4) For certified Phase II vapor recovery systems with a liquid removal device required by ARB Executive Orders, the operator shall conduct a Liquid Removal Test whenever the liquid in the vapor path exceeds 100 ml of liquid. The amount of liquid in the vapor path shall be determined by lowering the gasoline dispensing nozzle into a container until such time that no more liquid drains from the nozzle. The amount of liquid drained into the container shall be measured using a graduated cylinder or graduated beaker. [District Rule 4622, 6.2.1] Federally Enforceable Through Title V Permit

30. The operator shall require that the person responsible for the Phase II vapor recovery system performance tests shall use calibrated equipment meeting the calibration range and calibration intervals specified by the manufacturer. This person shall also have completed a District-approved training program or the District's orientation class for testing and any subsequent required refresher class(es). [District Rule 4622, 6.2.2 and 6.2.3] Federally Enforceable Through Title V Permit

31. The operator shall notify the District at least 15 days prior to any compliance testing required of this PTO. [District Rule 4622, 6.2.4] Federally Enforceable Through Title V Permit

32. Each certified Phase II vapor recovery system shall be tested within 60 days of completion of installation or major modification. [District Rule 4622, 6.2.5] Federally Enforceable Through Title V Permit

33. All tests shall be conducted in accordance with the latest version of the following ARB approved test methods, or their equivalents as approved by the U.S. Environmental Protection Agency (EPA), ARB, and the APCO; 1) Static Leak Test for Aboveground Tanks, ARB TP-201.3B. 2) Dynamic Back-Pressure Test, ARB TP-201.4. 3) Air-to-Liquid Volume Ratio Test, ARB TP-201.5. 4) Liquid Removal Test, ARB TP-201.6 [District Rule 4622, 6.3.1] Federally Enforceable Through Title V Permit

34. For those vapor recovery systems whose ARB Executive Orders specify different tests to be performed instead of, or in addition to, the referenced test methods, or which, by their design, preclude the use of the referenced test methods, shall be tested in accordance with the test procedures specified in the applicable ARB Executive Orders or their equivalents as approved by the APCO, ARB, and EPA. [District Rule 4622, 6.3.2] Federally Enforceable Through Title V Permit

35. Compliance with permit conditions in the Title V permit shall be deemed compliance with the following requirements: SJVUAPCD Rules 4621 (as amended June 18, 1998). A permit shield is granted from these requirements. [District Rule 2520, 13.2] Federally Enforceable Through Title V Permit

San Joaquin Valley
Air Pollution Control District

PERMIT UNIT: N-811-18-4 **EXPIRATION DATE:** 11/30/2013

EQUIPMENT DESCRIPTION:
36 MMBTU/HR JOHN ZINK MODEL ZTOF DIGESTER GAS FIRED EMERGENCY FLARE

PERMIT UNIT REQUIREMENTS

1. The NOx emission concentration shall not exceed 0.06 lb/mmbtu of heat input. [District NSR Rule] Federally Enforceable Through Title V Permit
2. The CO emission concentration shall not exceed 0.3 lb/mmbtu of heat input. [District NSR Rule] Federally Enforceable Through Title V Permit
3. The VOC emission concentration shall not exceed 0.03 lb/mmbtu of heat input. [District NSR Rule] Federally Enforceable Through Title V Permit
4. The SOx emission concentration shall not exceed 0.08 lb/mmbtu of heat input. [District NSR Rule] Federally Enforceable Through Title V Permit
5. The PM10 emission concentration shall not exceed 0.02 lb/mmbtu of heat input. [District NSR Rule] Federally Enforceable Through Title V Permit
6. Operation of the flare for maintenance and testing purposes shall not exceed 200 hours per year. [District NSR Rule] Federally Enforceable Through Title V Permit
7. Operation of the flare, for other than maintenance purposes, shall be limited to emergency use. [District NSR Rule] Federally Enforceable Through Title V Permit
8. The flare shall utilize a natural gas or LPG fired pilot. [District NSR Rule] Federally Enforceable Through Title V Permit
9. The flare shall operate with smokeless combustion. [District NSR Rule] Federally Enforceable Through Title V Permit
10. Records of the hours of emergency and non-emergency operation, the fuel consumption, in BTUs, and the nature of the emergency situation shall be kept. The records shall be retained for a minimum of five years and shall be made available for District inspection upon request. [1070 and 4311, 6.2.3] Federally Enforceable Through Title V Permit
11. The flame shall be present at all times when combustible gases are vented through the flare. [District Rule 4311, 5.2] Federally Enforceable Through Title V Permit
12. The outlet shall be equipped with an automatic ignition system, or shall operate with a pilot flame present at all times when combustible gases are vented through the flare, except during purge periods for automatic-ignition equipped flares. [District Rule 4311, 5.3] Federally Enforceable Through Title V Permit
13. Except for flares equipped with a flow-sensing ignition system, a heat sensing device such as a thermocouple, ultraviolet beam sensor, infrared sensor, or an equivalent device, capable of continuously detecting at least one pilot flame or the flare flame is present shall be installed and operated. [District Rule 4311, 5.4] Federally Enforceable Through Title V Permit
14. Flares that use flow-sensing automatic ignition systems and which do not use a continuous flame pilot shall use purge gas for purging. [District Rule 4311, 5.5] Federally Enforceable Through Title V Permit

San Joaquin Valley
Air Pollution Control District

PERMIT UNIT: N-811-19-6 **EXPIRATION DATE:** 11/30/2013

EQUIPMENT DESCRIPTION:
193 HP JOHN DEERE MODEL #6466A DIESEL-FIRED LOW-USE IC ENGINE WITH A TURBOCHARGER AND AFTERCOOLER POWERING A SLUDGE DREDGE

PERMIT UNIT REQUIREMENTS

1. The engine shall not be operated more than 20 hours during any one calendar year. [District Rule 4701, 4702, and 17 CCR 93115] Federally Enforceable Through Title V Permit
2. This engine shall be equipped with an operational non-resettable elapsed time meter or other APCO approved alternative. [District Rule 4702 and 17 CCR 93115] Federally Enforceable Through Title V Permit
3. This engine shall be operated and maintained in proper operating condition as recommended by the engine manufacturer or emissions control system supplier. [District Rule 4702] Federally Enforceable Through Title V Permit
4. Particulate matter emissions shall not exceed in concentration at the point of discharge 0.1 gr/dscf. [District Rule 4201] Federally Enforceable Through Title V Permit
5. Only CARB certified diesel fuel containing not more than 0.0015% sulfur by weight is to be used. [District Rule 4801 and San Joaquin County Rule 407 and 17 CCR 93115] Federally Enforceable Through Title V Permit
6. During periods of operation for maintenance, testing, and required regulatory purposes, the permittee shall monitor the operational characteristics of the engine as recommended by the manufacturer or emission control system supplier (for example: check engine fluid levels, battery, cables and connections; change engine oil and filters; replace engine coolant; and/or other operational characteristics as recommended by the manufacturer or supplier). [District Rule 4702] Federally Enforceable Through Title V Permit
7. The permittee shall maintain a record of the cumulative annual hours of operation. The record shall be updated each time the engine is operated. Records shall include the number of hours of operation, the date and number of hours of all testing and maintenance operations, the purpose of the operation (for example: dredging, maintenance testing, etc.) and records of operational characteristics monitoring. For units with automated testing systems, the operator may, as an alternative to keeping records of actual operation for testing purposes, maintain a readily accessible written record of the automated testing schedule. [District Rule 4701, 4702, and 17 CCR 93115] Federally Enforceable Through Title V Permit
8. Compliance with permit conditions in the Title V permit shall be deemed compliance with the following applicable requirements of SJVUAPCD Rule 4201 and San Joaquin County Rule 407. A permit shield is granted from these requirements. [District Rule 2520, 13.2] Federally Enforceable Through Title V Permit

San Joaquin Valley
Air Pollution Control District

PERMIT UNIT: N-811-21-4 **EXPIRATION DATE:** 11/30/2013

EQUIPMENT DESCRIPTION:
1,408 HP WAUKESHA MODEL L7042GLD DIGESTER GAS/NATURAL GAS-FIRED LEAN BURN PRECOMBUSTION CHAMBER TYPE IC ENGINE WITH SILOXANE SCRUBBER POWERING AN ELECTRICAL GENERATOR (DUAL SILOXANE FILTER SYSTEM (SCRUBBER) USED TO SCRUB THE DIGESTER GAS PRIOR TO COMBUSTION IN ENGINES N-811-21-2, -22-2, & -23-2)

PERMIT UNIT REQUIREMENTS

1. The permittee shall install and operate a nonresettable fuel meter and a nonresettable elapsed operating time meter. In lieu of installing a nonresettable fuel meter, the owner or operator may use a non-resettable elapsed operating time meter in conjunction with the engine manufacturer's maximum rated fuel consumption to determine monthly fuel usage. [District Rule 4702] Federally Enforceable Through Title V Permit
2. The NOx emissions shall not exceed 0.87 grams/bhp-hr (65 ppmv @ 15% O2). [District NSR Rule and 4702] Federally Enforceable Through Title V Permit
3. The CO emissions shall not exceed 2.65 grams/bhp-hr. [District NSR Rule] Federally Enforceable Through Title V Permit
4. The VOC emissions shall not exceed 0.75 grams/bhp-hr. [District NSR Rule] Federally Enforceable Through Title V Permit
5. The SOx emissions shall not exceed 0.14 grams/bhp-hr. [District NSR Rule] Federally Enforceable Through Title V Permit
6. The PM10 emissions shall not exceed 0.1 grams/bhp-hr. [District NSR Rule] Federally Enforceable Through Title V Permit
7. The hydrogen sulfide concentration of the influent digester gas shall not exceed 170 ppmv prior to combustion. [District NSR Rule] Federally Enforceable Through Title V Permit
8. Source testing to demonstrate compliance with the NOx, CO, VOC, SOx and PM10 limits of this permit shall be conducted at least once every 24 months. [District NSR Rule, 4701, and 4702] Federally Enforceable Through Title V Permit
9. Source testing shall be conducted using the methods and procedures approved by the District. The District must be notified 30 days prior to any compliance source test, and a source test plan must be submitted for approval 15 days prior to testing. [District Rule 1081] Federally Enforceable Through Title V Permit
10. The results of each source test shall be submitted to the District within 60 days thereafter. [District Rule 1081] Federally Enforceable Through Title V Permit
11. Sampling facilities for source testing shall be provided in accordance with the provisions of District Rule 1081 (as amended 12/16/93). [District Rule 1081] Federally Enforceable Through Title V Permit
12. Source testing for NOx shall be conducted utilizing CARB method 100 or EPA method 7E. [District Rule 4701] Federally Enforceable Through Title V Permit
13. Source testing for CO shall be conducted utilizing CARB method 100 or EPA method 10. [District Rule 4701] Federally Enforceable Through Title V Permit

PERMIT UNIT REQUIREMENTS CONTINUE ON NEXT PAGE

14. Source testing for VOC emission concentration shall be conducted utilizing EPA method 25 or EPA method 18, referenced as methane. [District Rule 4701] Federally Enforceable Through Title V Permit

15. Source testing for SOx shall be conducted utilizing EPA method 8 and ARB method 100. [District Rule 4801 and San Joaquin County Rule 407] Federally Enforceable Through Title V Permit

16. Source testing for PM10 emissions shall be conducted utilizing CARB method 501 in conjunction with CARB method 5, EPA methods 201 and 202 or EPA methods 201A and 202. If the facility agrees that the PM10 emissions are equal to the total particulate matter emissions then source testing for PM10 may be conducted utilizing CARB method 5 including the back half or CARB method 17 including the back half. [District NSR Rule] Federally Enforceable Through Title V Permit

17. The permittee shall monitor the hydrogen sulfide influent concentration on a daily basis with the use of a Draeger tube or District approved equivalent method. [District NSR Rule] Federally Enforceable Through Title V Permit

18. The permittee shall monitor and record the stack concentration of NOx at least once every calendar quarter (in which a source test is not performed) using a portable emission monitor that meets District specifications. All emission readings shall be taken with the unit operating either at conditions representative of normal operations or conditions specified in the permit-to-operate. The analyzer shall be calibrated, maintained, and operated in accordance with the manufacturer's specifications and recommendations or a protocol approved by the APCO. Emission readings taken shall be averaged over a 15 consecutive-minute period by either taking a cumulative 15 consecutive-minute sample reading or by taking at least five (5) readings, evenly spaced out over the 15 consecutive-minute period. [District Rules 4701 and 4702] Federally Enforceable Through Title V Permit

19. The permittee shall monitor and record the stack concentration of O2 at least once every month using a portable emissions monitor that meets District specifications. [In-stack O2 monitors may be allowed if approved by the APCO]. Monitoring shall not be required if the engine is not in operation, i.e. the engine need not be started solely to perform monitoring. Monitoring shall be performed within 1 day of restarting the engine unless monitoring has been performed within the last month. [District Rules 4701 and 4702] Federally Enforceable Through Title V Permit

20. The exhaust gas O2 concentration shall be maintained between 8.83 to 9.20 % O2 for digester gas and between 9.55% to 9.89% for natural gas. [District Rules 4701 and 4702] Federally Enforceable Through Title V Permit

21. If the concentration, as measured by the portable analyzer, is outside the permitted range, the permittee shall return the O2 to within the acceptable range as soon as possible, but no longer than 8 hours after detection. If the portable analyzer readings continue outside the permitted range after 8 hours, the permittee shall notify the District within the following 1 hour, and conduct a certified source test within the 60 days of the first exceedance. In lieu of conducting a source test, the permittee may stipulate a violation has occurred, subject to enforcement action. The permittee must then correct the violation, show compliance has been re-established, and resume monitoring procedures. If the deviations are the result of a qualifying breakdown condition pursuant to Rule 1100, the permittee may fully comply with Rule 1100 in lieu of performing the notification and testing required by this condition. [District Rules 4701 and 4702] Federally Enforceable Through Title V Permit

22. The permittee shall maintain records of: (1) the date and time of O2 and NOx measurements, (2) the O2 and NOx concentration in percent, (3) make and model of exhaust gas analyzer, (4) exhaust gas analyzer calibration records, and (5) a description of any corrective action taken to maintain the emissions limits with the acceptable range. [District Rules 4701 and 4702] Federally Enforceable Through Title V Permit

23. Records of the quantity and type of fuel burned, in BTUs, the influent hydrogen sulfide concentration, and of the annual SOx emissions shall be kept. [District NSR Rule] Federally Enforceable Through Title V Permit

24. All records shall be retained for a minimum of 5 years, and shall be made available for District inspection upon request. [District Rule 1070 and 2520, 9.4.2] Federally Enforceable Through Title V Permit

San Joaquin Valley
Air Pollution Control District

PERMIT UNIT: N-811-22-4 **EXPIRATION DATE:** 11/30/2013

EQUIPMENT DESCRIPTION:
1,408 HP WAUKESHA MODEL L7042GLD DIGESTER GAS/NATURAL GAS-FIRED LEAN BURN PRECOMBUSTION CHAMBER TYPE IC ENGINE WITH SILOXANE SCRUBBER POWERING AN ELECTRICAL GENERATOR (DUAL SILOXANE FILTER SYSTEM (SCRUBBER) USED TO SCRUB THE DIGESTER GAS PRIOR TO COMBUSTION IN ENGINES N-811-21-2, -22-2, & -23-2)

PERMIT UNIT REQUIREMENTS

1. The permittee shall install and operate a nonresettable fuel meter and a nonresettable elapsed operating time meter. In lieu of installing a nonresettable fuel meter, the owner or operator may use a non-resettable elapsed operating time meter in conjunction with the engine manufacturer's maximum rated fuel consumption to determine monthly fuel usage. [District Rule 4702] Federally Enforceable Through Title V Permit
2. The NOx emissions shall not exceed 0.87 grams/bhp-hr (65 ppmv @ 15% O2). [District NSR Rule and 4702] Federally Enforceable Through Title V Permit
3. The CO emissions shall not exceed 2.65 grams/bhp-hr. [District NSR Rule] Federally Enforceable Through Title V Permit
4. The VOC emissions shall not exceed 0.75 grams/bhp-hr. [District NSR Rule] Federally Enforceable Through Title V Permit
5. The SOx emissions shall not exceed 0.14 grams/bhp-hr. [District NSR Rule] Federally Enforceable Through Title V Permit
6. The PM10 emissions shall not exceed 0.1 grams/bhp-hr. [District NSR Rule] Federally Enforceable Through Title V Permit
7. The hydrogen sulfide concentration of the influent digester gas shall not exceed 170 ppmv prior to combustion. [District NSR Rule] Federally Enforceable Through Title V Permit
8. Source testing to demonstrate compliance with the NOx, CO, VOC, SOx and PM10 limits of this permit shall be conducted at least once every 24 months. [District NSR Rule, 4701, and 4702] Federally Enforceable Through Title V Permit
9. Source testing shall be conducted using the methods and procedures approved by the District. The District must be notified 30 days prior to any compliance source test, and a source test plan must be submitted for approval 15 days prior to testing. [District Rule 1081] Federally Enforceable Through Title V Permit
10. The results of each source test shall be submitted to the District within 60 days thereafter. [District Rule 1081] Federally Enforceable Through Title V Permit
11. Sampling facilities for source testing shall be provided in accordance with the provisions of Rule 1081 (as amended 12/16/93). [District Rule 1081] Federally Enforceable Through Title V Permit
12. Source testing for NOx shall be conducted utilizing CARB method 100 or EPA method 7E. [District Rule 4701] Federally Enforceable Through Title V Permit
13. Source testing for CO shall be conducted utilizing CARB method 100 or EPA method 10. [District Rule 4701] Federally Enforceable Through Title V Permit

PERMIT UNIT REQUIREMENTS CONTINUE ON NEXT PAGE

14. Source testing for VOC emission concentration shall be conducted utilizing EPA method 25 or EPA method 18, referenced as methane. [District Rule 4701] Federally Enforceable Through Title V Permit

15. Source testing for SOx shall be conducted utilizing EPA method 8 and ARB method 100. [District Rule 4801 and San Joaquin County Rule 407] Federally Enforceable Through Title V Permit

16. Source testing for PM10 emissions shall be conducted utilizing CARB method 501 in conjunction with CARB method 5, EPA methods 201 and 202 or EPA methods 201A and 202. If the facility agrees that the PM10 emissions are equal to the total particulate matter emissions then source testing for PM10 may be conducted utilizing CARB method 5 including the back half or CARB method 17 including the back half. [District NSR Rule] Federally Enforceable Through Title V Permit

17. The permittee shall monitor the hydrogen sulfide influent concentration on a daily basis with the use of a Draeger tube or District approved equivalent method. [District NSR Rule] Federally Enforceable Through Title V Permit

18. The permittee shall monitor and record the stack concentration of NOx at least once every calendar quarter (in which a source test is not performed) using a portable emission monitor that meets District specifications. All emission readings shall be taken with the unit operating either at conditions representative of normal operations or conditions specified in the permit-to-operate. The analyzer shall be calibrated, maintained, and operated in accordance with the manufacturer's specifications and recommendations or a protocol approved by the APCO. Emission readings taken shall be averaged over a 15 consecutive-minute period by either taking a cumulative 15 consecutive-minute sample reading or by taking at least five (5) readings, evenly spaced out over the 15 consecutive-minute period. [District Rules 4701 and 4702] Federally Enforceable Through Title V Permit

19. The permittee shall monitor and record the stack concentration of O2 at least once every month using a portable emissions monitor that meets District specifications. [In-stack O2 monitors may be allowed if approved by the APCO]. Monitoring shall not be required if the engine is not in operation, i.e. the engine need not be started solely to perform monitoring. Monitoring shall be performed within 1 day of restarting the engine unless monitoring has been performed within the last month. [District Rules 4701 and 4702] Federally Enforceable Through Title V Permit

20. The exhaust gas O2 concentration shall be maintained between 8.83 to 9.20 % O2 for digester gas and between 9.55% to 9.89% for natural gas. [District Rules 4701 and 4702] Federally Enforceable Through Title V Permit

21. If the concentration, as measured by the portable analyzer, is outside the permitted range, the permittee shall return the O2 to within the acceptable range as soon as possible, but no longer than 8 hours after detection. If the portable analyzer readings continue outside the permitted range after 8 hours, the permittee shall notify the District within the following 1 hour, and conduct a certified source test within the 60 days of the first exceedance. In lieu of conducting a source test, the permittee may stipulate a violation has occurred, subject to enforcement action. The permittee must then correct the violation, show compliance has been re-established, and resume monitoring procedures. If the deviations are the result of a qualifying breakdown condition pursuant to Rule 1100, the permittee may fully comply with Rule 1100 in lieu of performing the notification and testing required by this condition. [District Rules 4701 and 4702] Federally Enforceable Through Title V Permit

22. The permittee shall maintain records of: (1) the date and time of O2 and NOx measurements, (2) the O2 and NOx concentration in percent, (3) make and model of exhaust gas analyzer, (4) exhaust gas analyzer calibration records, and (5) a description of any corrective action taken to maintain the emissions limits with the acceptable range. [District Rules 4701 and 4702] Federally Enforceable Through Title V Permit

23. Records of the quantity and type of fuel burned, in BTUs, the influent hydrogen sulfide concentration, and of the annual SOx emissions shall be kept. [District NSR Rule] Federally Enforceable Through Title V Permit

24. All records shall be retained for a minimum of 5 years, and shall be made available for District inspection upon request. [District Rule 1070 and 2520, 9.4.2] Federally Enforceable Through Title V Permit

San Joaquin Valley
Air Pollution Control District

PERMIT UNIT: N-811-23-4 **EXPIRATION DATE:** 11/30/2013

EQUIPMENT DESCRIPTION:
1,408 HP WAUKESHA MODEL L7042GLD DIGESTER GAS/NATURAL GAS-FIRED LEAN BURN PRECOMBUSTION CHAMBER TYPE IC ENGINE WITH SILOXANE SCRUBBER POWERING AN ELECTRICAL GENERATOR (DUAL SILOXANE FILTER SYSTEM (SCRUBBER) USED TO SCRUB THE DIGESTER GAS PRIOR TO COMBUSTION IN ENGINES N-811-21-2, -22-2, & -23-2)

PERMIT UNIT REQUIREMENTS

1. The permittee shall install and operate a nonresettable fuel meter and a nonresettable elapsed operating time meter. In lieu of installing a nonresettable fuel meter, the owner or operator may use a non-resettable elapsed operating time meter in conjunction with the engine manufacturer's maximum rated fuel consumption to determine monthly fuel usage. [District Rule 4702] Federally Enforceable Through Title V Permit
2. The NOx emissions shall not exceed 0.87 grams/bhp-hr (65 ppmv @ 15% O2). [District NSR Rule and 4702] Federally Enforceable Through Title V Permit
3. The CO emissions shall not exceed 2.65 grams/bhp-hr. [District NSR Rule] Federally Enforceable Through Title V Permit
4. The VOC emissions shall not exceed 0.75 grams/bhp-hr. [District NSR Rule] Federally Enforceable Through Title V Permit
5. The SOx emissions shall not exceed 0.14 grams/bhp-hr. [District NSR Rule] Federally Enforceable Through Title V Permit
6. The PM10 emissions shall not exceed 0.1 grams/bhp-hr. [District NSR Rule] Federally Enforceable Through Title V Permit
7. The hydrogen sulfide concentration of the influent digester gas shall not exceed 170 ppmv prior to combustion. [District NSR Rule] Federally Enforceable Through Title V Permit
8. Source testing to demonstrate compliance with the NOx, CO, VOC, SOx and PM10 limits of this permit shall be conducted at least once every 24 months. [District NSR Rule, 4701, and 4702] Federally Enforceable Through Title V Permit
9. Source testing shall be conducted using the methods and procedures approved by the District. The District must be notified 30 days prior to any compliance source test, and a source test plan must be submitted for approval 15 days prior to testing. [District Rule 1081] Federally Enforceable Through Title V Permit
10. The results of each source test shall be submitted to the District within 60 days thereafter. [District Rule 1081] Federally Enforceable Through Title V Permit
11. Sampling facilities for source testing shall be provided in accordance with the provisions of District Rule 1081 (as amended 12/16/93). [District Rule 1081] Federally Enforceable Through Title V Permit
12. Source testing for NOx shall be conducted utilizing CARB method 100 or EPA method 7E. [District Rule 4701] Federally Enforceable Through Title V Permit
13. Source testing for CO shall be conducted utilizing CARB method 100 or EPA method 10. [District Rule 4701] Federally Enforceable Through Title V Permit

PERMIT UNIT REQUIREMENTS CONTINUE ON NEXT PAGE

14. Source testing for VOC emission concentration shall be conducted utilizing EPA method 25 or EPA method 18, referenced as methane. [District Rule 4701] Federally Enforceable Through Title V Permit

15. Source testing for SOx shall be conducted utilizing EPA method 8 and ARB method 100. [District Rule 4801] Federally Enforceable Through Title V Permit

16. Source testing for PM10 emissions shall be conducted utilizing CARB method 501 in conjunction with CARB method 5, EPA methods 201 and 202 or EPA methods 201A and 202. If the facility agrees that the PM10 emissions are equal to the total particulate matter emissions then source testing for PM10 may be conducted utilizing CARB method 5 including the back half or CARB method 17 including the back half. [District NSR Rule] Federally Enforceable Through Title V Permit

17. The permittee shall monitor the hydrogen sulfide influent concentration on a daily basis with the use of a Draeger tube or District approved equivalent method. [District NSR Rule] Federally Enforceable Through Title V Permit

18. The permittee shall monitor and record the stack concentration of NOx at least once every calendar quarter (in which a source test is not performed) using a portable emission monitor that meets District specifications. All emission readings shall be taken with the unit operating either at conditions representative of normal operations or conditions specified in the permit-to-operate. The analyzer shall be calibrated, maintained, and operated in accordance with the manufacturer's specifications and recommendations or a protocol approved by the APCO. Emission readings taken shall be averaged over a 15 consecutive-minute period by either taking a cumulative 15 consecutive-minute sample reading or by taking at least five (5) readings, evenly spaced out over the 15 consecutive-minute period. [District Rules 4701 and 4702] Federally Enforceable Through Title V Permit

19. The permittee shall monitor and record the stack concentration of O2 at least once every month using a portable emissions monitor that meets District specifications. [In-stack O2 monitors may be allowed if approved by the APCO]. Monitoring shall not be required if the engine is not in operation, i.e. the engine need not be started solely to perform monitoring. Monitoring shall be performed within 1 day of restarting the engine unless monitoring has been performed within the last month. [District Rules 4701 and 4702] Federally Enforceable Through Title V Permit

20. The exhaust gas O2 concentration shall be maintained between 8.83 to 9.20 % O2 for digester gas and between 9.55% to 9.89% for natural gas. [District Rules 4701 and 4702] Federally Enforceable Through Title V Permit

21. If the concentration, as measured by the portable analyzer, is outside the permitted range, the permittee shall return the O2 to within the acceptable range as soon as possible, but no longer than 8 hours after detection. If the portable analyzer readings continue outside the permitted range after 8 hours, the permittee shall notify the District within the following 1 hour, and conduct a certified source test within the 60 days of the first exceedance. In lieu of conducting a source test, the permittee may stipulate a violation has occurred, subject to enforcement action. The permittee must then correct the violation, show compliance has been re-established, and resume monitoring procedures. If the deviations are the result of a qualifying breakdown condition pursuant to Rule 1100, the permittee may fully comply with Rule 1100 in lieu of performing the notification and testing required by this condition. [District Rules 4701 and 4702] Federally Enforceable Through Title V Permit

22. The permittee shall maintain records of: (1) the date and time of O2 and NOx measurements, (2) the O2 and NOx concentration in percent, (3) make and model of exhaust gas analyzer, (4) exhaust gas analyzer calibration records, and (5) a description of any corrective action taken to maintain the emissions limits with the acceptable range. [District Rules 4701 and 4702] Federally Enforceable Through Title V Permit

23. Records of the quantity and type of fuel burned, in BTUs, the influent hydrogen sulfide concentration, and of the annual SOx emissions shall be kept. [District NSR Rule] Federally Enforceable Through Title V Permit

24. All records shall be retained for a minimum of 5 years, and shall be made available for District inspection upon request. [District Rule 1070 and 2520, 9.4.2] Federally Enforceable Through Title V Permit

San Joaquin Valley
Air Pollution Control District

PERMIT UNIT: N-811-25-2 **EXPIRATION DATE:** 11/30/2013

EQUIPMENT DESCRIPTION:
2,550 HP DETROIT DIESEL MODEL T1637K16 DIESEL-FIRED EMERGENCY STANDBY IC ENGINE POWERING A 1750 KW ELECTRICAL GENERATOR

PERMIT UNIT REQUIREMENTS

1. Particulate matter emissions shall not exceed 0.1 grains/dscf in concentration. [District Rule 4201] Federally Enforceable Through Title V Permit
2. This engine shall be equipped with either a positive crankcase ventilation (PCV) system that recirculates crankcase emissions into the air intake system for combustion, or a crankcase emissions control device of at least 90% control efficiency. [District NSR Rule] Federally Enforceable Through Title V Permit
3. The exhaust stack shall vent vertically upward. The vertical exhaust flow shall not be impeded by a rain cap (flapper ok), roof overhang, or any other obstruction. [District Rule 4102]
4. Only CARB certified diesel fuel containing not more than 0.0015% sulfur by weight is to be used. [District NSR Rule, 4801 and 17 CCR 93115] Federally Enforceable Through Title V Permit
5. Emissions from this IC engine shall not exceed any of the following limits: 6.2 g-NOx/bhp-hr, 0.34 g-CO/bhp-hr, or 0.33 g-VOC/bhp-hr. [District NSR Rule, 13 CCR 2423 and 17 CCR 93115] Federally Enforceable Through Title V Permit
6. Emissions from this IC engine shall not exceed 0.09 g-PM10/bhp-hr based on USEPA certification using ISO 8178 test procedure. [District NSR Rule, Rule 4102 and 13 CCR 2423 and 17 CCR 93115] Federally Enforceable Through Title V Permit
7. This engine shall be operated only for testing and maintenance of the engine, required regulatory purposes, and during emergency situations. Operation of the engine for maintenance, testing, and required regulatory purposes shall not exceed 50 hours per calendar year. [District Rule 4702 and 17 CCR 93115] Federally Enforceable Through Title V Permit
8. This engine shall be equipped with an operational non-resettable elapsed time meter or other APCO approved alternative. [District Rule 4702 and 17 CCR 93115] Federally Enforceable Through Title V Permit
9. An emergency situation is an unscheduled electrical power outage caused by sudden and reasonably unforeseen natural disasters or sudden and reasonably unforeseen events beyond the control of the permittee. [District Rule 4702] Federally Enforceable Through Title V Permit
10. This engine shall not be used to produce power for the electrical distribution system, as part of a voluntary utility demand reduction program, or for an interruptible power contract. [District Rule 4702] Federally Enforceable Through Title V Permit
11. This engine shall be operated and maintained in proper operating condition as recommended by the engine manufacturer or emissions control system supplier. [District Rule 4702] Federally Enforceable Through Title V Permit

PERMIT UNIT REQUIREMENTS CONTINUE ON NEXT PAGE

12. During periods of operation for maintenance, testing, and required regulatory purposes, the permittee shall monitor the operational characteristics of the engine as recommended by the manufacturer or emission control system supplier (for example: check engine fluid levels, battery, cables and connections; change engine oil and filters; replace engine coolant; and/or other operational characteristics as recommended by the manufacturer or supplier). [District Rule 4702] Federally Enforceable Through Title V Permit

13. The permittee shall maintain monthly records of emergency and non-emergency operation. Records shall include the number of hours of emergency operation, the date and number of hours of all testing and maintenance operations, the purpose of the operation (for example: load testing, weekly testing, rolling blackout, general area power outage, etc.) and records of operational characteristics monitoring. For units with automated testing systems, the operator may, as an alternative to keeping records of actual operation for testing purposes, maintain a readily accessible written record of the automated testing schedule. [District Rule 4702 and 17 CCR 93115] Federally Enforceable Through Title V Permit

14. All records shall be maintained and retained on-site for a minimum of five (5) years, and shall be made available for District inspection upon request. [District Rule 4702 and 17 CCR 93115] Federally Enforceable Through Title V Permit

San Joaquin Valley
Air Pollution Control District

PERMIT UNIT: N-811-26-2 **EXPIRATION DATE:** 11/30/2013

EQUIPMENT DESCRIPTION:
HEADWORKS FACILITY WITH EMISSIONS CONTROLLED BY TWO CUSTOM HARRINGTON ENVIRONMENTAL ENGINEERING BIOSCRUBBERS (55,000 CFM COMBINED RATING)

PERMIT UNIT REQUIREMENTS

1. Volatile Organic Compound (VOC) emissions, from each biofilter controlling the headworks, shall not exceed 2,657 ppbv (as CH4). [District NSR Rule] Federally Enforceable Through Title V Permit
2. Sulfur Compound emissions (including Hydrogen Sulfide emissions), from each biofilter controlling the headworks, shall not exceed 708 ppbv (as SO2). [District NSR Rule] Federally Enforceable Through Title V Permit
3. Ammonia emissions, from each biofilter controlling the headworks, shall not exceed 1 ppmv. [District NSR Rule] Federally Enforceable Through Title V Permit
4. Hydrogen Sulfide emissions, from each biofilter controlling the headworks, shall not exceed 524 ppbv (as SO2). [District NSR Rule and 40 CFR 64] Federally Enforceable Through Title V Permit
5. The permittee shall monitor the hydrogen sulfide effluent concentration at the exit of each biofilter on a daily basis. The hydrogen sulfide concentration shall be determined via the use of a portable analyzer, Draeger tube, or District approved equivalent method. [District NSR Rule and 40 CFR 64] Federally Enforceable Through Title V Permit
6. The permittee shall maintain a daily record of the hydrogen sulfide effluent concentration at each biofilters exhaust. [District Rule 2520, 9.3.2 and 40 CFR 64] Federally Enforceable Through Title V Permit
7. The permittee shall monitor the VOC concentration at the exit of each biofilter on a quarterly basis. The VOC concentration shall be determined via the use of a portable analyzer or District approved equivalent method. [District Rule 2520, 9.3.2] Federally Enforceable Through Title V Permit
8. This unit shall be tested for compliance with the Ammonia (NH3) emissions limit at least once every 12 months. [District Rule 2520, 9.3.2] Federally Enforceable Through Title V Permit
9. Ammonia (NH3) emissions for source test purposes shall be determined using BAAQMD ST-1B or District approved equivalent method. [District Rule 2520, 9.3.2] Federally Enforceable Through Title V Permit
10. Source testing shall be conducted using the methods and procedures approved by the District. The District must be notified at least 30 days prior to any compliance source test, and a source test plan must be submitted for approval at least 15 days prior to testing. [District Rule 1081] Federally Enforceable Through Title V Permit
11. The results of each source test shall be submitted to the District within 60 days thereafter. [District Rule 1081] Federally Enforceable Through Title V Permit
12. All records shall be retained for a period of at least 5 years and shall be made available for District inspection upon request. [District Rule 2520, 9.4.2] Federally Enforceable Through Title V Permit

ATTACHMENT B

Previous Title V Operating Permit

San Joaquin Valley
Air Pollution Control District

FACILITY: N-811-0-2 **EXPIRATION DATE:** 11/30/2013

FACILITY-WIDE REQUIREMENTS

1. The owner or operator shall notify the District of any breakdown condition as soon as reasonably possible, but no later than one hour after its detection, unless the owner or operator demonstrates to the District's satisfaction that the longer reporting period was necessary. [District Rule 1100, 6.1; County Rules 110 (Fresno, Stanislaus, San Joaquin); 109 (Merced); 113 (Madera); and 111 (Kern, Tulare, Kings)] Federally Enforceable Through Title V Permit
2. The District shall be notified in writing within ten days following the correction of any breakdown condition. The breakdown notification shall include a description of the equipment malfunction or failure, the date and cause of the initial failure, the estimated emissions in excess of those allowed, and the methods utilized to restore normal operations. [District Rule 1100, 7.0; County Rules 110 (Fresno, Stanislaus, San Joaquin); 109 (Merced); 113 (Madera); and 111 (Kern, Tulare, Kings)] Federally Enforceable Through Title V Permit
3. The owner or operator of any stationary source operation that emits more than 25 tons per year of nitrogen oxides or reactive organic compounds, shall provide the District annually with a written statement in such form and at such time as the District prescribes, showing actual emissions of nitrogen oxides and reactive organic compounds from that source. [District Rule 1160, 5.0] Federally Enforceable Through Title V Permit
4. Any person building, altering or replacing any operation, article, machine, equipment, or other contrivance, the use of which may cause the issuance of air contaminants or the use of which may eliminate, reduce, or control the issuance of air contaminants, shall first obtain an Authority to Construct (ATC) from the District unless exempted by District Rule 2020 (3/21/02). [District Rule 2010, 3.0 and 4.0; and 2020] Federally Enforceable Through Title V Permit
5. The permittee must comply with all conditions of the permit including permit revisions originated by the District. All terms and conditions of a permit that are required pursuant to the Clean Air Act (CAA), including provisions to limit potential to emit, are enforceable by the EPA and Citizens under the CAA. Any permit noncompliance constitutes a violation of the CAA and the District Rules and Regulations, and is grounds for enforcement action, for permit termination, revocation, reopening and reissuance, or modification; or for denial of a permit renewal application. [District Rules 2070, 7.0; 2080; and 2520, 9.8.1 and 9.12.1] Federally Enforceable Through Title V Permit
6. A Permit to Operate or an Authority to Construct shall not be transferred unless a new application is filed with and approved by the District. [District Rule 2031] Federally Enforceable Through Title V Permit
7. Every application for a permit required under Rule 2010 (12/17/92) shall be filed in a manner and form prescribed by the District. [District Rule 2040] Federally Enforceable Through Title V Permit
8. The operator shall maintain records of required monitoring that include: 1) the date, place, and time of sampling or measurement; 2) the date(s) analyses were performed; 3) the company or entity that performed the analysis; 4) the analytical techniques or methods used; 5) the results of such analysis; and 6) the operating conditions at the time of sampling or measurement. [District Rule 2520, 9.4.1] Federally Enforceable Through Title V Permit
9. The operator shall retain records of all required monitoring data and support information for a period of at least 5 years from the date of the monitoring sample, measurement, or report. Support information includes copies of all reports required by the permit and, for continuous monitoring instrumentation, all calibration and maintenance records and all original strip-chart recordings. [District Rule 2520, 9.4.2] Federally Enforceable Through Title V Permit

FACILITY-WIDE REQUIREMENTS CONTINUE ON NEXT PAGE

10. The operator shall submit reports of any required monitoring at least every six months unless a different frequency is required by an applicable requirement. All instances of deviations from permit requirements must be clearly identified in such reports. [District Rule 2520, 9.5.1] Federally Enforceable Through Title V Permit

11. Deviations from permit conditions must be promptly reported, including deviations attributable to upset conditions, as defined in the permit. For the purpose of this condition, promptly means as soon as reasonably possible, but no later than 10 days after detection. The report shall include the probable cause of such deviations, and any corrective actions or preventive measures taken. All required reports must be certified by a responsible official consistent with section 10.0 of District Rule 2520 (6/21/01). [District Rules 2520, 9.5.2 and 1100, 7.0] Federally Enforceable Through Title V Permit

12. If for any reason a permit requirement or condition is being challenged for its constitutionality or validity by a court of competent jurisdiction, the outcome of such challenge shall not affect or invalidate the remainder of the conditions or requirements in that permit. [District Rule 2520, 9.7] Federally Enforceable Through Title V Permit

13. It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of the permit. [District Rule 2520, 9.8.2] Federally Enforceable Through Title V Permit

14. The permit may be modified, revoked, reopened and reissued, or terminated for cause. The filing of a request by the permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance does not stay any permit condition. [District Rule 2520, 9.8.3] Federally Enforceable Through Title V Permit

15. The permit does not convey any property rights of any sort, or any exclusive privilege. [District Rule 2520, 9.8.4] Federally Enforceable Through Title V Permit

16. The Permittee shall furnish to the District, within a reasonable time, any information that the District may request in writing to determine whether cause exists for modifying, revoking and reissuing, or terminating the permit or to determine compliance with the permit. Upon request, the permittee shall also furnish to the District copies of records required to be kept by the permit or, for information claimed to be confidential, the permittee may furnish such records directly to EPA along with a claim of confidentiality. [District Rule 2520, 9.8.5] Federally Enforceable Through Title V Permit

17. The permittee shall pay annual permit fees and other applicable fees as prescribed in Regulation III of the District Rules and Regulations. [District Rule 2520, 9.9] Federally Enforceable Through Title V Permit

18. Upon presentation of appropriate credentials, a permittee shall allow an authorized representative of the District to enter the permittee's premises where a permitted source is located or emissions related activity is conducted, or where records must be kept under condition of the permit. [District Rule 2520, 9.13.2.1] Federally Enforceable Through Title V Permit

19. Upon presentation of appropriate credentials, a permittee shall allow an authorized representative of the District to have access to and copy, at reasonable times, any records that must be kept under the conditions of the permit. [District Rule 2520, 9.13.2.2] Federally Enforceable Through Title V Permit

20. Upon presentation of appropriate credentials, a permittee shall allow an authorized representative of the District to inspect at reasonable times any facilities, equipment, practices, or operations regulated or required under the permit. [District Rule 2520, 9.13.2.3] Federally Enforceable Through Title V Permit

21. Upon presentation of appropriate credentials, a permittee shall allow an authorized representative of the District to sample or monitor, at reasonable times, substances or parameters for the purpose of assuring compliance with the permit or applicable requirements. [District Rule 2520, 9.13.2.4] Federally Enforceable Through Title V Permit

22. No air contaminants shall be discharged into the atmosphere for a period or periods aggregating more than 3 minutes in any one hour which is as dark or darker than Ringelmann #1 or equivalent to 20% opacity and greater, unless specifically exempted by District Rule 4101 (11/15/01). If the equipment or operation is subject to a more stringent visible emission standard as prescribed in a permit condition, the more stringent visible emission limit shall supersede this condition. [District Rule 4101, and County Rules 401 (in all eight counties in the San Joaquin Valley)] Federally Enforceable Through Title V Permit

FACILITY-WIDE REQUIREMENTS CONTINUE ON NEXT PAGE

23. No person shall manufacture, blend, repackage, supply, sell, solicit or apply any architectural coating with a VOC content in excess of the corresponding limit specified in the Table of Standards of District Rule 4601 (10/31/01) for use or sale within the District. [District Rule 4601, 5.1] Federally Enforceable Through Title V Permit

24. All VOC-containing materials for architectural coatings subject to Rule 4601 (10/31/01) shall be stored in closed containers when not in use. [District Rule 4601, 5.4] Federally Enforceable Through Title V Permit

25. The permittee shall comply with all the Labeling and Test Methods requirements outlined in Rule 4601 sections 6.1 and 6.3 (10/31/01). [District Rule 4601, 6.1 and 6.3] Federally Enforceable Through Title V Permit

26. With each report or document submitted under a permit requirement or a request for information by the District or EPA, the permittee shall include a certification of truth, accuracy, and completeness by a responsible official. [District Rule 2520, 9.13.1 and 10.0] Federally Enforceable Through Title V Permit

27. If the permittee performs maintenance on, or services, repairs, or disposes of appliances, the permittee shall comply with the standards for Recycling and Emissions Reduction pursuant to 40 CFR 82, Subpart F. [40 CFR 82 Subpart F] Federally Enforceable Through Title V Permit

28. If the permittee performs service on motor vehicles when this service involves the ozone-depleting refrigerant in the motor vehicle air conditioner (MVAC), the permittee shall comply with the standards for Servicing of Motor Vehicle Air Conditioners pursuant to all the applicable requirements as specified in 40 CFR 82, Subpart B. [40 CFR 82, Subpart B] Federally Enforceable Through Title V Permit

29. Disturbances of soil related to any construction, demolition, excavation, extraction, or other earthmoving activities shall comply with the requirements for fugitive dust control in District Rule 8021 unless specifically exempted under Section 4.0 of Rule 8021 (11/15/01) or Rule 8011 (11/15/01). [District Rule 8021 and 8011] Federally Enforceable Through Title V Permit

30. Outdoor handling, storage and transport of any bulk material which emits dust shall comply with the requirements of District Rule 8031, unless specifically exempted under Section 4.0 of Rule 8031 (11/15/01) or Rule 8011 (11/15/01). [District Rule 8031 and 8011] Federally Enforceable Through Title V Permit

31. An owner/operator shall prevent or cleanup any carryout or trackout in accordance with the requirements of District Rule 8041 Section 5.0, unless specifically exempted under Section 4.0 of Rule 8041 (11/15/01) or Rule 8011 (11/15/01). [District Rule 8041 and 8011] Federally Enforceable Through Title V Permit

32. Whenever open areas are disturbed or vehicles are used in open areas, the facility shall comply with the requirements of Section 5.0 of District Rule 8051, unless specifically exempted under Section 4.0 of Rule 8051 (11/15/01) or Rule 8011 (11/15/01). [District Rule 8051 and 8011] Federally Enforceable Through Title V Permit

33. Any paved road or unpaved road shall comply with the requirements of District Rule 8061 unless specifically exempted under Section 4.0 of Rule 8061 (11/15/01) or Rule 8011 (11/15/01). [District Rule 8061 and Rule 8011] Federally Enforceable Through Title V Permit

34. Any unpaved vehicle/equipment area that anticipates more than 75 vehicle trips per day shall comply with the requirements of Section 5.1.1 of District Rule 8071. Any unpaved vehicle/equipment area that anticipates more than 100 vehicle trips per day shall comply with the requirements of Section 5.1.2 of District Rule 8071. All sources shall comply with the requirements of Section 5.0 of District Rule 8071 unless specifically exempted under Section 4.0 of Rule 8071 (11/15/01) or Rule 8011 (11/15/01). [District Rule 8071 and Rule 8011] Federally Enforceable Through Title V Permit

35. Any owner or operator of a demolition or renovation activity, as defined in 40 CFR 61.141, shall comply with the applicable inspection, notification, removal, and disposal procedures for asbestos containing materials as specified in 40 CFR 61.145 (Standard for Demolition and Renovation). [40 CFR 61 Subpart M] Federally Enforceable Through Title V Permit

FACILITY-WIDE REQUIREMENTS CONTINUE ON NEXT PAGE

36. The permittee shall submit certifications of compliance with the terms and standards contained in Title V permits, including emission limits, standards and work practices, to the District and the EPA annually (or more frequently as specified in an applicable requirement or as specified by the District). The certification shall include the identification of each permit term or condition, the compliance status, whether compliance was continuous or intermittent, the methods used for determining the compliance status, and any other facts required by the District to determine the compliance status of the source. [District Rule 2520, 9.16] Federally Enforceable Through Title V Permit

37. The permittee shall submit an application for Title V permit renewal to the District at least six months, but not greater than 18 months, prior to the permit expiration date. [District Rule 2520, 5.2] Federally Enforceable Through Title V Permit

38. When a term is not defined in a Title V permit condition, the definition in the rule cited as the origin and authority for the condition in a Title V permits shall apply. [District Rule 2520, 9.1.1] Federally Enforceable Through Title V Permit

39. Compliance with permit conditions in the Title V permit shall be deemed in compliance with the following outdated SIP requirements: Rule 401 (Madera, Fresno, Kern, Kings, San Joaquin, Stanislaus, Tulare and Merced), Rule 110 (Fresno, Stanislaus, San Joaquin), Rule 109 (Merced), Rule 113 (Madera), and Rule 111 (Kern, Tulare, Kings). A permit shield is granted from these requirements. [District Rule 2520, 13.2] Federally Enforceable Through Title V Permit

40. Compliance with permit conditions in the Title V permit shall be deemed in compliance with the following applicable requirements: SJVUAPCD Rules 1100, sections 6.1 and 7.0 (12/17/92); 2010, sections 3.0 and 4.0 (12/17/92); 2031 (12/17/92); 2040 (12/17/92); 2070, section 7.0 (12/17/92); 2080 (12/17/92); 4101 (11/15/01); 4601, sections 5.1, 5.2, 5.3, 5.8 and 8.0 (10/31/01); 8021 (11/15/01); 8031 (11/15/01); 8041 (11/15/01); 8051 (11/15/01); 8061 (11/15/01); and 8071 (11/15/01). A permit shield is granted from these requirements. [District Rule 2520, 13.2] Federally Enforceable Through Title V Permit

41. The reporting periods for the Report of Required Monitoring and the Compliance Certification Report begin September 23 of every year, unless alternative dates are approved by the District Compliance Division. These reports are due within 30 days after the end of the reporting period. [District Rule 2520] Federally Enforceable Through Title V Permit

42. No air contaminant shall be released into the atmosphere which causes a public nuisance. [District Rule 4102]

San Joaquin Valley
Air Pollution Control District

PERMIT UNIT: N-811-11-3 **EXPIRATION DATE:** 11/30/2013

EQUIPMENT DESCRIPTION:
450 HP CATERPILLAR MODEL 3406 DITA, S/N 75Z1640, PORTABLE EMERGENCY STANDBY DIESEL-FIRED IC ENGINE POWERING AN ELECTRICAL GENERATOR

PERMIT UNIT REQUIREMENTS

1. Sulfur compound emissions shall not exceed 0.2% by volume, 2000 ppmv, on a dry basis averaged over 15 consecutive minutes. [San Joaquin County Rule 407] Federally Enforceable Through Title V Permit
2. Particulate matter emissions shall not exceed 0.1 gr/dscf in concentration at the point of discharge. [District Rule 4201] Federally Enforceable Through Title V Permit
3. Unit shall be fired only on ARB regulated diesel fuel with a sulfur content of less than 0.05% by weight. The operator shall maintain copies of all fuel invoices and supplier certifications. [District Rule 4801 and San Joaquin County Rule 407] Federally Enforceable Through Title V Permit
4. The engine shall be operated only for maintenance, testing, and required regulatory purposes, and during emergency situations. Operation of the engine for maintenance, testing, and required regulatory purposes shall not exceed 200 hours per year. [District Rule 4701] Federally Enforceable Through Title V Permit
5. Compliance with permit conditions in the Title V permit shall be deemed compliance with the following applicable requirements of SJVUAPCD Rule 4201(amended 12/17/92), and San Joaquin County Rule 407. A permit shield is granted from these requirements. [District Rule 2520, 13.2] Federally Enforceable Through Title V Permit
6. The permittee shall maintain annual operating records to include the total hours of operation, the type and quantity (cubic feet of gas) of fuel used, the purpose for operating the engine, all hours of non-emergency and emergency operation. This information shall be submitted to the District upon request and at the end of each calendar year in a manner and form approved by the APCO. [District Rule 4701, 6.2.2] Federally Enforceable Through Title V Permit

San Joaquin Valley
Air Pollution Control District

PERMIT UNIT: N-811-12-3 **EXPIRATION DATE:** 11/30/2013

EQUIPMENT DESCRIPTION:
450 HP CATERPILLAR MODEL 3406TA, S/N 75Z01455, PORTABLE EMERGENCY STANDBY DIESEL-FIRED IC ENGINE POWERING AN ELECTRICAL GENERATOR

PERMIT UNIT REQUIREMENTS

1. Sulfur compound emissions shall not exceed 0.2% by volume, 2000 ppmv, on a dry basis averaged over 15 consecutive minutes. [San Joaquin County Rule 407] Federally Enforceable Through Title V Permit
2. Particulate matter emissions shall not exceed 0.1 gr/dscf in concentration at the point of discharge. [District Rule 4201] Federally Enforceable Through Title V Permit
3. Unit shall be fired only on ARB regulated diesel fuel with a sulfur content of less than 0.05% by weight. The operator shall maintain copies of all fuel invoices and supplier certifications. [District Rule 4801 and San Joaquin County Rule 407] Federally Enforceable Through Title V Permit
4. The engine shall be operated only for maintenance, testing, and required regulatory purposes, and during emergency situations. Operation of the engine for maintenance, testing, and required regulatory purposes shall not exceed 200 hours per year. [District Rule 4701] Federally Enforceable Through Title V Permit
5. Compliance with permit conditions in the Title V permit shall be deemed compliance with the following applicable requirements of SJVUAPCD Rule 4201(amended 12/17/92), and San Joaquin County Rule 407. A permit shield is granted from these requirements. [District Rule 2520, 13.2] Federally Enforceable Through Title V Permit
6. The permittee shall maintain annual operating records to include the total hours of operation, the type and quantity (cubic feet of gas) of fuel used, the purpose for operating the engine, all hours of non-emergency and emergency operation. This information shall be submitted to the District upon request and at the end of each calendar year in a manner and form approved by the APCO. [District Rule 4701, 6.2.2] Federally Enforceable Through Title V Permit

San Joaquin Valley
Air Pollution Control District

PERMIT UNIT: N-811-13-2 **EXPIRATION DATE:** 11/30/2013

EQUIPMENT DESCRIPTION:
ONE (1) 2,000 GALLON ABOVE GROUND CONVAULT GASOLINE STORAGE TANK SERVED BY COAXIAL PHASE I VAPOR RECOVERY SYSTEM (G-70-97) AND ONE (1) NOZZLE SERVED BY OPW BALANCE PHASE II VAPOR RECOVERY SYSTEM (G-70-116-B)

PERMIT UNIT REQUIREMENTS

1. The operator shall not store gasoline in or otherwise use or operate any gasoline delivery vessel unless such vessel is designed and maintained to be vapor tight. Any delivery vessel into which gasoline vapors have been transferred shall be filled only at a loading facility that is equipped with a certified system that prevents at least 95% by weight of the gasoline vapors displaced from entering the atmosphere. [District NSR Rule and 4621, 5.2.2] Federally Enforceable Through Title V Permit
2. Any open vent pipe on a stationary aboveground gasoline storage tank shall be equipped with a certified pressure-vacuum relief valve set at eight ounces per square inch, unless otherwise specified in the applicable CARB executive order, and provided that such setting will not exceed the vessel's maximum pressure rating. The vent pipes may be manifolded, as per the applicable CARB executive order, to a single pressure-vacuum relief valve meeting the aforementioned specifications. [District NSR Rule and 4621, 5.1.2] Federally Enforceable Through Title V Permit
3. The vapor recovery systems and their components shall be installed, operated, and maintained in accordance with the State certification requirements. [District NSR Rule] Federally Enforceable Through Title V Permit
4. The district shall be notified by the permittee 15 days prior to each test. The test results shall be submitted to the District no later than 30 days after each test. [District NSR Rule and District Rule 4622] Federally Enforceable Through Title V Permit
5. This gasoline storage and dispensing equipment shall not be used in retail sales, where gasoline dispensed by the unit is subject to payment of California sales tax on gasoline sales. [District Rule 2520, 9.1] Federally Enforceable Through Title V Permit
6. To ensure that all components of the certified Phase II vapor recovery system are maintained in proper operating condition, the non-retail service station operator shall conduct a maintenance inspection one day per month. [District Rule 4622, 5.4.2] Federally Enforceable Through Title V Permit
7. The operator shall maintain all records of required monitoring data, facility monthly gasoline throughput, and support information for District inspection for a period of five years. [District Rule 2520, 9.4.2] Federally Enforceable Through Title V Permit
8. Loading and vapor collection equipment shall be maintained and operated such that there are no liquid component leaks under any conditions, nor any excess organic liquid drainage at disconnect. [District Rule 4621, 5.0] Federally Enforceable Through Title V Permit
9. The operator shall not transfer or permit the transfer of gasoline from any delivery vessel into any stationary storage container unless such container is equipped with a permanent submerged fill pipe and a certified Phase I vapor recovery system which is maintained and operated according to the manufacturers specifications. [District Rule 4621, 5.1.1] Federally Enforceable Through Title V Permit

PERMIT UNIT REQUIREMENTS CONTINUE ON NEXT PAGE

10. No gasoline delivery vessel shall be operated or be allowed to operate unless valid State of California decals are displayed on the cargo tank, which attest to the vapor integrity of the tank. [District Rule 4621, 5.2.1] Federally Enforceable Through Title V Permit

11. The hatch on a delivery vessel shall not be opened for visual inspection unless at least three minutes have elapsed since loading or unloading has stopped. The dome hatch, once opened, shall not be held open longer than three minutes. [District Rule 4621, 5.2.3] Federally Enforceable Through Title V Permit

12. Gasoline vapors from this unit shall not be purged into the atmosphere. [District Rule 4621, 5.2.4] Federally Enforceable Through Title V Permit

13. The vapor recovery system shall not create a backpressure in excess of the pressure limits of the delivery vessel certification leak test (18 inches water column). [District Rule 4621, 5.2.5] Federally Enforceable Through Title V Permit

14. The Reid Vapor Pressure of gasoline stored at this facility shall be determined in accordance with ASTM D 5191. [District Rule 4621, 6.2.1 and 4622, 6.3.3] Federally Enforceable Through Title V Permit

15. When determining vapor leaks with a portable analyzer the following must occur: 1) The probe inlet shall be 2.5 cm from the potential leak source. 2) The probe shall be moved slowly (approximately 4 cm/sec). If there is any meter deflection at the potential leak source, the probe shall be moved to locate the point of highest meter response. 3) To the greatest extent possible, the probe inlet shall be positioned in the path of the vapor flow from a leak so as to maximize the measured concentration. 4) The detector response time must be equal to or less than 30 seconds and the detector shall not probe any potential leak source for longer than twice the detector response time. 5) As an alternative to the preceding procedures, operators may use the soap bubble method described in the Alternative Screening Procedure in EPA Method 21. [District Rule 4621, 6.2.2] Federally Enforceable Through Title V Permit

16. The test method to determine vapor tightness of delivery vessels and storage tanks shall be EPA Method 21. [District Rule 4621, 6.2.3 and District Rule 4622, 6.3.4] Federally Enforceable Through Title V Permit

17. The operator shall not transfer or permit the transfer of gasoline from a stationary storage container into a motor vehicle fuel tank with a capacity of greater than five (5) gallons unless the gasoline dispensing unit used to transfer the gasoline from the stationary storage container to the motor vehicle fuel tank is equipped with and has in operation a certified Phase II vapor recovery system. [District Rule 4622, 5.1] Federally Enforceable Through Title V Permit

18. The operator of this gasoline dispensing facility, which has installed a permitted certified Phase II vapor recovery system, shall continue to use such system and shall maintain the system and all of its components in good repair in order that such system can continue to comply with the certification recovery efficiency. Any certified Phase II vapor recovery system that has been installed shall not be removed regardless of the amount of gasoline dispensed or how the gasoline is delivered to the facility. [District Rule 4622, 5.3] Federally Enforceable Through Title V Permit

19. The owner/operator of a gasoline dispensing facility shall implement a periodic maintenance inspection program and document the program in an operation and maintenance (O&M) manual for the certified Phase II vapor recovery system. The O&M manual shall be kept at the facility and made available to any person who operates, inspects, maintains, repairs, or tests the equipment at the facility as well as to the District personnel upon request. The O&M manual shall contain detailed instructions that ensure proper operation and maintenance of the certified Phase II vapor recovery system and its components in compliance with all applicable rules and regulations. The manual shall, at a minimum, include the following current information: 1) All applicable ARB Executive Orders, Approval Letters, and District Permits. 2) The manufacturer's specifications and instructions for installation, operation, repair, and maintenance required pursuant to ARB Certification Procedure CP-201, and any additional instruction provided by the manufacturer. 3) System and/or component testing requirements, including test schedules and passing criteria for each of the standard tests listed in Section 6.0. The owner/operator may include any non-ARB required diagnostic and other tests as part of the testing requirements. 4) Protocol for performing periodic maintenance inspections including the components to be inspected and the defects requiring repair. 5) Additional O&M instructions, if any, that are designed to ensure compliance with the applicable rules, regulations, ARB Executive Orders, and District permit conditions, including replacement schedules for failure or wear prone components. [District Rule 4622, 5.4.1] Federally Enforceable Through Title V Permit

PERMIT UNIT REQUIREMENTS CONTINUE ON NEXT PAGE

20. Any equipment with a major defect, which is identified during the periodic maintenance inspections, shall be removed from service and, when repaired, duly entered into the O&M manual. The person conducting the inspections shall, at a minimum, verify the following during inspections: 1) That the fueling instructions are clearly displayed with the appropriate toll-free complaint phone number and toxic warning signs. 2) That the following nozzle components are in place and in good condition as specified in ARB Executive Orders: faceplate/facecone, bellows, latching device spring, vapor check valve, spout (proper diameter/vapor collection holes), insertion interlock mechanism, automatic shut-off mechanism, hold open latch. 3) That the hoses are not torn, flattened or crimped. 4) That the vapor path does not contain more than 100 ml of liquid and that the vapor path shall be inspected at least once per calendar month. 5) That the vapor-processing unit is functioning properly. 6) Phase I vapor recovery system components that are functionally part of the Phase II vapor recovery system shall be inspected. The person conducting this inspection shall, at a minimum, verify the following; 1) That the fill caps and vapor caps are not missing, damaged, or loose. 2) That the fill cap gasket and vapor cap gaskets are not missing or damaged. 3) That the fill adapter and vapor adapter are securely attached to the risers. 4) That, where applicable, the spring-loaded submerged fill tube seals properly against the coaxial tubing, and the dry break (poppet-valve) is not missing or damaged. 5) That the submerged fill tube is not missing or damaged. [District Rule 4622, 5.4.3] Federally Enforceable Through Title V Permit

21. The operator shall not operate any certified Phase II vapor recovery system or any portion thereof that has a defect listed in Section 94006 of Title 17 of the California Code of Regulations, or an equipment defect that is identified in any applicable ARB Executive Order, until the defect has been repaired, replaced, or adjusted as necessary to correct the defect, and the District has reinspected the system or has authorized its use pending reinspection. Such authorization shall not include the authority to operate the equipment prior to the correction of the defective components. [District Rule 4622, 5.5] Federally Enforceable Through Title V Permit

22. The operator, upon identification of any of the defects described in the previous permit condition, shall tag "Out-of-Order" all dispensing equipment for which vapor recovery has been impaired. The tagged equipment shall be rendered inoperable and the tag(s) shall not be removed until the defective equipment has been repaired, replaced, or adjusted, as necessary. In the case of defects identified by the District, tagged equipment shall be rendered inoperable, and the tag shall not be removed until the District has been notified of the repairs, and/or the District has inspected and authorized the tagged equipment for use. [District Rule 4622, 5.6] Federally Enforceable Through Title V Permit

23. All certified Phase II vapor recovery systems and gasoline dispensing equipment shall be maintained to have no leaks. [District Rule 4622, 5.7] Federally Enforceable Through Title V Permit

24. No person shall top off a motor vehicle fuel tank. [District Rule 4622, 5.9] Federally Enforceable Through Title V Permit

25. The operator shall not tamper with, or permit tampering with, the system in a manner that would impair the operation or effectiveness of the certified Phase II vapor recovery system. [District Rule 4622, 5.11] Federally Enforceable Through Title V Permit

26. All liquid removal devices required by ARB Executive Order shall be maintained to achieve a minimum liquid removal rate of five milliliters per gallon. This standard shall apply at dispensing rates exceeding five gallons per minute, unless a higher removal rate is specified in the applicable Executive Order. [District Rule 4622, 5.12] Federally Enforceable Through Title V Permit

27. Verification must be provided that the certified Phase II vapor recovery system shall meet or exceed the requirements of the tests required of this Permit to Operate. These test results shall be dated and shall contain the names, addresses, and telephone numbers of the companies responsible for system installation and testing. [District Rule 4622, 6.1.3] Federally Enforceable Through Title V Permit

PERMIT UNIT REQUIREMENTS CONTINUE ON NEXT PAGE

28. A person who performs repairs on any certified Phase I or Phase II vapor recovery system shall provide to the operator a repair log, which the operator shall maintain on the premises and which shall include all of the following; 1) Date and time of each repair. 2) The name of the person(s) who performed the repair, and, if applicable, the name, address and phone number of the person's employer. 3) Description of service performed. 4) Each component that was repaired, serviced, or removed. 5) Each component that was installed as replacement, if applicable. 6) Receipts or other documents for parts used in the repair and, if applicable, work orders which shall include the name and signature of the person responsible for performing the repairs. [District Rule 4622, 6.1.4] Federally Enforceable Through Title V Permit

29. An operator shall comply with the following certified Phase II vapor recovery system performance verification requirements. 1) The operator shall conduct a Static Leak Test of the certified Phase II vapor recovery system at least once every twelve months. 2) The operator shall conduct a Dynamic Back-Pressure Test of the certified Phase II vapor recovery system at least once every twelve months. 3) For certified Phase II vapor recovery systems with bellows-less nozzles, the operator shall conduct an Air-to-Liquid Volume Ratio Test at least once every six months. 4) For certified Phase II vapor recovery systems with a liquid removal device required by ARB Executive Orders, the operator shall conduct a Liquid Removal Test whenever the liquid in the vapor path exceeds 100 ml of liquid. The amount of liquid in the vapor path shall be determined by lowering the gasoline dispensing nozzle into a container until such time that no more liquid drains from the nozzle. The amount of liquid drained into the container shall be measured using a graduated cylinder or graduated beaker. [District Rule 4622, 6.2.1] Federally Enforceable Through Title V Permit

30. The operator shall require that the person responsible for the Phase II vapor recovery system performance tests shall use calibrated equipment meeting the calibration range and calibration intervals specified by the manufacturer. This person shall also have completed a District-approved training program or the District's orientation class for testing and any subsequent required refresher class(es). [District Rule 4622, 6.2.2 and 6.2.3] Federally Enforceable Through Title V Permit

31. The operator shall notify the District at least 15 days prior to any compliance testing required of this PTO. [District Rule 4622, 6.2.4] Federally Enforceable Through Title V Permit

32. Each certified Phase II vapor recovery system shall be tested within 60 days of completion of installation or major modification. [District Rule 4622, 6.2.5] Federally Enforceable Through Title V Permit

33. All tests shall be conducted in accordance with the latest version of the following ARB approved test methods, or their equivalents as approved by the U.S. Environmental Protection Agency (EPA), ARB, and the APCO; 1) Static Leak Test for Aboveground Tanks, ARB TP-201.3B. 2) Dynamic Back-Pressure Test, ARB TP-201.4. 3) Air-to-Liquid Volume Ratio Test, ARB TP-201.5. 4) Liquid Removal Test, ARB TP-201.6 [District Rule 4622, 6.3.1] Federally Enforceable Through Title V Permit

34. For those vapor recovery systems whose ARB Executive Orders specify different tests to be performed instead of, or in addition to, the referenced test methods, or which, by their design, preclude the use of the referenced test methods, shall be tested in accordance with the test procedures specified in the applicable ARB Executive Orders or their equivalents as approved by the APCO, ARB, and EPA. [District Rule 4622, 6.3.2] Federally Enforceable Through Title V Permit

35. Compliance with permit conditions in the Title V permit shall be deemed compliance with the following requirements: SJVUAPCD Rules 4621 (as amended June 18, 1998). A permit shield is granted from these requirements. [District Rule 2520, 13.2] Federally Enforceable Through Title V Permit

San Joaquin Valley
Air Pollution Control District

PERMIT UNIT: N-811-18-3 **EXPIRATION DATE:** 11/30/2013

EQUIPMENT DESCRIPTION:
36 MMBTU/HR JOHN ZINK MODEL ZTOF DIGESTER GAS FIRED EMERGENCY FLARE

PERMIT UNIT REQUIREMENTS

1. The NOx emission concentration shall not exceed 0.06 lb/mmbtu of heat input. [District NSR Rule] Federally Enforceable Through Title V Permit
2. The CO emission concentration shall not exceed 0.3 lb/mmbtu of heat input. [District NSR Rule] Federally Enforceable Through Title V Permit
3. The VOC emission concentration shall not exceed 0.03 lb/mmbtu of heat input. [District NSR Rule] Federally Enforceable Through Title V Permit
4. The SOx emission concentration shall not exceed 0.08 lb/mmbtu of heat input. [District NSR Rule] Federally Enforceable Through Title V Permit
5. The PM10 emission concentration shall not exceed 0.02 lb/mmbtu of heat input. [District NSR Rule] Federally Enforceable Through Title V Permit
6. Operation of the flare for maintenance and testing purposes shall not exceed 200 hours per year. [District NSR Rule] Federally Enforceable Through Title V Permit
7. Operation of the flare, for other than maintenance purposes, shall be limited to emergency use. [District NSR Rule] Federally Enforceable Through Title V Permit
8. The flare shall utilize a natural gas or LPG fired pilot. [District NSR Rule] Federally Enforceable Through Title V Permit
9. The flare shall operate with smokeless combustion. [District NSR Rule] Federally Enforceable Through Title V Permit
10. Records of the hours of emergency and non-emergency operation, the fuel consumption, in BTUs, and the nature of the emergency situation shall be kept. The records shall be retained for a minimum of five years and shall be made available for District inspection upon request. [1070 and 4311, 6.2.3] Federally Enforceable Through Title V Permit
11. The flame shall be present at all times when combustible gases are vented through the flare. [District Rule 4311, 5.2] Federally Enforceable Through Title V Permit
12. The outlet shall be equipped with an automatic ignition system, or shall operate with a pilot flame present at all times when combustible gases are vented through the flare, except during purge periods for automatic-ignition equipped flares. [District Rule 4311, 5.3] Federally Enforceable Through Title V Permit
13. Except for flares equipped with a flow-sensing ignition system, a heat sensing device such as a thermocouple, ultraviolet beam sensor, infrared sensor, or an equivalent device, capable of continuously detecting at least one pilot flame or the flare flame is present shall be installed and operated. [District Rule 4311, 5.4] Federally Enforceable Through Title V Permit
14. Flares that use flow-sensing automatic ignition systems and which do not use a continuous flame pilot shall use purge gas for purging. [District Rule 4311, 5.5] Federally Enforceable Through Title V Permit

San Joaquin Valley
Air Pollution Control District

PERMIT UNIT: N-811-19-5 **EXPIRATION DATE:** 11/30/2013

EQUIPMENT DESCRIPTION:
193 HP JOHN DEERE MODEL #6466A DIESEL-FIRED LOW-USE IC ENGINE WITH A TURBOCHARGER AND AFTERCOOLER POWERING A SLUDGE DREDGE

PERMIT UNIT REQUIREMENTS

1. The engine shall not be operated more than 1,000 hours during any one calendar year. [District Rule 4701] Federally Enforceable Through Title V Permit
2. The engine shall be equipped with a non-resettable totalizing hour meter. [District Rule 4701] Federally Enforceable Through Title V Permit
3. Sulfur compound emissions shall not exceed 0.2% by volume, 2000 ppmv, on a dry basis averaged over 15 consecutive minutes. [San Joaquin County Rule 407] Federally Enforceable Through Title V Permit
4. Particulate matter emissions shall not exceed in concentration at the point of discharge 0.1 gr/dscf. [District Rule 4201] Federally Enforceable Through Title V Permit
5. Unit shall be fired only on diesel fuel with a sulfur content of less than 0.05% by weight. [San Joaquin County Rule 407] Federally Enforceable Through Title V Permit
6. The operator shall maintain copies of all fuel invoices and supplier certifications. [District Rule 2520, 9.3.2] Federally Enforceable Through Title V Permit
7. If this unit is operated more than 500 hours in any 12 month period, the operator shall perform a source test for particulate emissions within 60 days from the date this limit is exceeded. A source test for particulate emissions conducted within the 24 months prior to permit issuance shall be considered compliance with this testing requirement. Source testing for particulate matter shall be performed according to EPA Method 5, stack gas velocity by EPA Method 2, and the stack gas moisture content by EPA Method 4. If the PM test result is less than or equal to 0.06 grain/dscf, then testing shall occur not less than once every 5 years. Otherwise testing shall occur not less than once every 24 months. [District Rule 2520, 9.3.2] Federally Enforceable Through Title V Permit
8. Source testing shall be conducted using the methods and procedures approved by the District. The District must be notified 30 days prior to any compliance source test, and a source test plan must be submitted for approval 15 days prior to testing. [District Rule 1081] Federally Enforceable Through Title V Permit
9. The results of each source test shall be submitted to the District within 60 days thereafter. [District Rule 1081] Federally Enforceable Through Title V Permit
10. Permittee shall maintain a record of the cumulative annual hours of operation. The record shall be updated each time the engine is operated. [District Rule 4701] Federally Enforceable Through Title V Permit
11. Compliance with permit conditions in the Title V permit shall be deemed compliance with the following applicable requirements of SJVUAPCD Rule 4201 and San Joaquin County Rule 407. A permit shield is granted from these requirements. [District Rule 2520, 13.2] Federally Enforceable Through Title V Permit

San Joaquin Valley
Air Pollution Control District

PERMIT UNIT: N-811-21-3 **EXPIRATION DATE:** 11/30/2013

EQUIPMENT DESCRIPTION:
1,408 HP WAUKESHA MODEL L7042GLD DIGESTER GAS/NATURAL GAS-FIRED LEAN BURN PRECOMBUSTION CHAMBER TYPE IC ENGINE WITH SILOXANE SCRUBBER POWERING AN ELECTRICAL GENERATOR (DUAL SILOXANE FILTER SYSTEM (SCRUBBER) USED TO SCRUB THE DIGESTER GAS PRIOR TO COMBUSTION IN ENGINES N-811-21-2, -22-2, & -23-2)

PERMIT UNIT REQUIREMENTS

1. The permittee shall install and operate a nonresettable fuel meter and a nonresettable elapsed operating time meter. In lieu of installing a nonresettable fuel meter, the owner or operator may use a non-resettable elapsed operating time meter in conjunction with the engine manufacturer's maximum rated fuel consumption to determine monthly fuel usage. [District Rule 4702] Federally Enforceable Through Title V Permit
2. The NOx emissions shall not exceed 0.87 grams/bhp-hr (65 ppmv @ 15% O2). [District NSR Rule and 4702] Federally Enforceable Through Title V Permit
3. The CO emissions shall not exceed 2.65 grams/bhp-hr. [District NSR Rule] Federally Enforceable Through Title V Permit
4. The VOC emissions shall not exceed 0.75 grams/bhp-hr. [District NSR Rule] Federally Enforceable Through Title V Permit
5. The SOx emissions shall not exceed 0.14 grams/bhp-hr. [District NSR Rule] Federally Enforceable Through Title V Permit
6. The PM10 emissions shall not exceed 0.1 grams/bhp-hr. [District NSR Rule] Federally Enforceable Through Title V Permit
7. The hydrogen sulfide concentration of the influent digester gas shall not exceed 170 ppmv prior to combustion. [District NSR Rule] Federally Enforceable Through Title V Permit
8. Source testing to demonstrate compliance with the NOx, CO, VOC, SOx and PM10 limits of this permit shall be conducted at least once every 24 months. [District NSR Rule, 4701, and 4702] Federally Enforceable Through Title V Permit
9. Source testing shall be conducted using the methods and procedures approved by the District. The District must be notified 30 days prior to any compliance source test, and a source test plan must be submitted for approval 15 days prior to testing. [District Rule 1081] Federally Enforceable Through Title V Permit
10. The results of each source test shall be submitted to the District within 60 days thereafter. [District Rule 1081] Federally Enforceable Through Title V Permit
11. Sampling facilities for source testing shall be provided in accordance with the provisions of District Rule 1081 (as amended 12/16/93). [District Rule 1081] Federally Enforceable Through Title V Permit
12. Source testing for NOx shall be conducted utilizing CARB method 100 or EPA method 7E. [District Rule 4701] Federally Enforceable Through Title V Permit
13. Source testing for CO shall be conducted utilizing CARB method 100 or EPA method 10. [District Rule 4701] Federally Enforceable Through Title V Permit

PERMIT UNIT REQUIREMENTS CONTINUE ON NEXT PAGE

14. Source testing for VOC emission concentration shall be conducted utilizing EPA method 25 or EPA method 18, referenced as methane. [District Rule 4701] Federally Enforceable Through Title V Permit

15. Source testing for SOx shall be conducted utilizing EPA method 8 and ARB method 100. [District Rule 4801 and San Joaquin County Rule 407] Federally Enforceable Through Title V Permit

16. Source testing for PM10 emissions shall be conducted utilizing CARB method 501 in conjunction with CARB method 5, EPA methods 201 and 202 or EPA methods 201A and 202. If the facility agrees that the PM10 emissions are equal to the total particulate matter emissions then source testing for PM10 may be conducted utilizing CARB method 5 including the back half or CARB method 17 including the back half. [District NSR Rule] Federally Enforceable Through Title V Permit

17. The permittee shall monitor the hydrogen sulfide influent concentration on a daily basis with the use of a Draeger tube or District approved equivalent method. [District NSR Rule] Federally Enforceable Through Title V Permit

18. The permittee shall monitor and record the stack concentration of NOx at least once every calendar quarter (in which a source test is not performed) using a portable emission monitor that meets District specifications. All emission readings shall be taken with the unit operating either at conditions representative of normal operations or conditions specified in the permit-to-operate. The analyzer shall be calibrated, maintained, and operated in accordance with the manufacturer's specifications and recommendations or a protocol approved by the APCO. Emission readings taken shall be averaged over a 15 consecutive-minute period by either taking a cumulative 15 consecutive-minute sample reading or by taking at least five (5) readings, evenly spaced out over the 15 consecutive-minute period. [District Rules 4701 and 4702] Federally Enforceable Through Title V Permit

19. The permittee shall monitor and record the stack concentration of O2 at least once every month using a portable emissions monitor that meets District specifications. [In-stack O2 monitors may be allowed if approved by the APCO]. Monitoring shall not be required if the engine is not in operation, i.e. the engine need not be started solely to perform monitoring. Monitoring shall be performed within 1 day of restarting the engine unless monitoring has been performed within the last month. [District Rules 4701 and 4702] Federally Enforceable Through Title V Permit

20. The exhaust gas O2 concentration shall be maintained between 8.83 to 9.20 % O2 for digester gas and between 9.55% to 9.89% for natural gas. [District Rules 4701 and 4702] Federally Enforceable Through Title V Permit

21. If the concentration, as measured by the portable analyzer, is outside the permitted range, the permittee shall return the O2 to within the acceptable range as soon as possible, but no longer than 8 hours after detection. If the portable analyzer readings continue outside the permitted range after 8 hours, the permittee shall notify the District within the following 1 hour, and conduct a certified source test within the 60 days of the first exceedance. In lieu of conducting a source test, the permittee may stipulate a violation has occurred, subject to enforcement action. The permittee must then correct the violation, show compliance has been re-established, and resume monitoring procedures. If the deviations are the result of a qualifying breakdown condition pursuant to Rule 1100, the permittee may fully comply with Rule 1100 in lieu of performing the notification and testing required by this condition. [District Rules 4701 and 4702] Federally Enforceable Through Title V Permit

22. The permittee shall maintain records of: (1) the date and time of O2 and NOx measurements, (2) the O2 and NOx concentration in percent, (3) make and model of exhaust gas analyzer, (4) exhaust gas analyzer calibration records, and (5) a description of any corrective action taken to maintain the emissions limits with the acceptable range. [District Rules 4701 and 4702] Federally Enforceable Through Title V Permit

23. Records of the quantity and type of fuel burned, in BTUs, the influent hydrogen sulfide concentration, and of the annual SOx emissions shall be kept. [District NSR Rule] Federally Enforceable Through Title V Permit

24. All records shall be retained for a minimum of 5 years, and shall be made available for District inspection upon request. [District Rule 1070 and 2520, 9.4.2] Federally Enforceable Through Title V Permit

San Joaquin Valley
Air Pollution Control District

PERMIT UNIT: N-811-22-3 **EXPIRATION DATE:** 11/30/2013

EQUIPMENT DESCRIPTION:
1,408 HP WAUKESHA MODEL L7042GLD DIGESTER GAS/NATURAL GAS-FIRED LEAN BURN PRECOMBUSTION CHAMBER TYPE IC ENGINE WITH SILOXANE SCRUBBER POWERING AN ELECTRICAL GENERATOR (DUAL SILOXANE FILTER SYSTEM (SCRUBBER) USED TO SCRUB THE DIGESTER GAS PRIOR TO COMBUSTION IN ENGINES N-811-21-2, -22-2, & -23-2)

PERMIT UNIT REQUIREMENTS

1. The permittee shall install and operate a nonresettable fuel meter and a nonresettable elapsed operating time meter. In lieu of installing a nonresettable fuel meter, the owner or operator may use a non-resettable elapsed operating time meter in conjunction with the engine manufacturer's maximum rated fuel consumption to determine monthly fuel usage. [District Rule 4702] Federally Enforceable Through Title V Permit
2. The NOx emissions shall not exceed 0.87 grams/bhp-hr (65 ppmv @ 15% O2). [District NSR Rule and 4702] Federally Enforceable Through Title V Permit
3. The CO emissions shall not exceed 2.65 grams/bhp-hr. [District NSR Rule] Federally Enforceable Through Title V Permit
4. The VOC emissions shall not exceed 0.75 grams/bhp-hr. [District NSR Rule] Federally Enforceable Through Title V Permit
5. The SOx emissions shall not exceed 0.14 grams/bhp-hr. [District NSR Rule] Federally Enforceable Through Title V Permit
6. The PM10 emissions shall not exceed 0.1 grams/bhp-hr. [District NSR Rule] Federally Enforceable Through Title V Permit
7. The hydrogen sulfide concentration of the influent digester gas shall not exceed 170 ppmv prior to combustion. [District NSR Rule] Federally Enforceable Through Title V Permit
8. Source testing to demonstrate compliance with the NOx, CO, VOC, SOx and PM10 limits of this permit shall be conducted at least once every 24 months. [District NSR Rule, 4701, and 4702] Federally Enforceable Through Title V Permit
9. Source testing shall be conducted using the methods and procedures approved by the District. The District must be notified 30 days prior to any compliance source test, and a source test plan must be submitted for approval 15 days prior to testing. [District Rule 1081] Federally Enforceable Through Title V Permit
10. The results of each source test shall be submitted to the District within 60 days thereafter. [District Rule 1081] Federally Enforceable Through Title V Permit
11. Sampling facilities for source testing shall be provided in accordance with the provisions of Rule 1081 (as amended 12/16/93). [District Rule 1081] Federally Enforceable Through Title V Permit
12. Source testing for NOx shall be conducted utilizing CARB method 100 or EPA method 7E. [District Rule 4701] Federally Enforceable Through Title V Permit
13. Source testing for CO shall be conducted utilizing CARB method 100 or EPA method 10. [District Rule 4701] Federally Enforceable Through Title V Permit

PERMIT UNIT REQUIREMENTS CONTINUE ON NEXT PAGE

14. Source testing for VOC emission concentration shall be conducted utilizing EPA method 25 or EPA method 18, referenced as methane. [District Rule 4701] Federally Enforceable Through Title V Permit

15. Source testing for SOx shall be conducted utilizing EPA method 8 and ARB method 100. [District Rule 4801 and San Joaquin County Rule 407] Federally Enforceable Through Title V Permit

16. Source testing for PM10 emissions shall be conducted utilizing CARB method 501 in conjunction with CARB method 5, EPA methods 201 and 202 or EPA methods 201A and 202. If the facility agrees that the PM10 emissions are equal to the total particulate matter emissions then source testing for PM10 may be conducted utilizing CARB method 5 including the back half or CARB method 17 including the back half. [District NSR Rule] Federally Enforceable Through Title V Permit

17. The permittee shall monitor the hydrogen sulfide influent concentration on a daily basis with the use of a Draeger tube or District approved equivalent method. [District NSR Rule] Federally Enforceable Through Title V Permit

18. The permittee shall monitor and record the stack concentration of NOx at least once every calendar quarter (in which a source test is not performed) using a portable emission monitor that meets District specifications. All emission readings shall be taken with the unit operating either at conditions representative of normal operations or conditions specified in the permit-to-operate. The analyzer shall be calibrated, maintained, and operated in accordance with the manufacturer's specifications and recommendations or a protocol approved by the APCO. Emission readings taken shall be averaged over a 15 consecutive-minute period by either taking a cumulative 15 consecutive-minute sample reading or by taking at least five (5) readings, evenly spaced out over the 15 consecutive-minute period. [District Rules 4701 and 4702] Federally Enforceable Through Title V Permit

19. The permittee shall monitor and record the stack concentration of O2 at least once every month using a portable emissions monitor that meets District specifications. [In-stack O2 monitors may be allowed if approved by the APCO]. Monitoring shall not be required if the engine is not in operation, i.e. the engine need not be started solely to perform monitoring. Monitoring shall be performed within 1 day of restarting the engine unless monitoring has been performed within the last month. [District Rules 4701 and 4702] Federally Enforceable Through Title V Permit

20. The exhaust gas O2 concentration shall be maintained between 8.83 to 9.20 % O2 for digester gas and between 9.55% to 9.89% for natural gas. [District Rules 4701 and 4702] Federally Enforceable Through Title V Permit

21. If the concentration, as measured by the portable analyzer, is outside the permitted range, the permittee shall return the O2 to within the acceptable range as soon as possible, but no longer than 8 hours after detection. If the portable analyzer readings continue outside the permitted range after 8 hours, the permittee shall notify the District within the following 1 hour, and conduct a certified source test within the 60 days of the first exceedance. In lieu of conducting a source test, the permittee may stipulate a violation has occurred, subject to enforcement action. The permittee must then correct the violation, show compliance has been re-established, and resume monitoring procedures. If the deviations are the result of a qualifying breakdown condition pursuant to Rule 1100, the permittee may fully comply with Rule 1100 in lieu of performing the notification and testing required by this condition. [District Rules 4701 and 4702] Federally Enforceable Through Title V Permit

22. The permittee shall maintain records of: (1) the date and time of O2 and NOx measurements, (2) the O2 and NOx concentration in percent, (3) make and model of exhaust gas analyzer, (4) exhaust gas analyzer calibration records, and (5) a description of any corrective action taken to maintain the emissions limits with the acceptable range. [District Rules 4701 and 4702] Federally Enforceable Through Title V Permit

23. Records of the quantity and type of fuel burned, in BTUs, the influent hydrogen sulfide concentration, and of the annual SOx emissions shall be kept. [District NSR Rule] Federally Enforceable Through Title V Permit

24. All records shall be retained for a minimum of 5 years, and shall be made available for District inspection upon request. [District Rule 1070 and 2520, 9.4.2] Federally Enforceable Through Title V Permit

San Joaquin Valley
Air Pollution Control District

PERMIT UNIT: N-811-23-3 **EXPIRATION DATE:** 11/30/2013

EQUIPMENT DESCRIPTION:
1,408 HP WAUKESHA MODEL L7042GLD DIGESTER GAS/NATURAL GAS-FIRED LEAN BURN PRECOMBUSTION CHAMBER TYPE IC ENGINE WITH SILOXANE SCRUBBER POWERING AN ELECTRICAL GENERATOR (DUAL SILOXANE FILTER SYSTEM (SCRUBBER) USED TO SCRUB THE DIGESTER GAS PRIOR TO COMBUSTION IN ENGINES N-811-21-2, -22-2, & -23-2)

PERMIT UNIT REQUIREMENTS

1. The permittee shall install and operate a nonresettable fuel meter and a nonresettable elapsed operating time meter. In lieu of installing a nonresettable fuel meter, the owner or operator may use a non-resettable elapsed operating time meter in conjunction with the engine manufacturer's maximum rated fuel consumption to determine monthly fuel usage. [District Rule 4702] Federally Enforceable Through Title V Permit
2. The NOx emissions shall not exceed 0.87 grams/bhp-hr (65 ppmv @ 15% O2). [District NSR Rule and 4702] Federally Enforceable Through Title V Permit
3. The CO emissions shall not exceed 2.65 grams/bhp-hr. [District NSR Rule] Federally Enforceable Through Title V Permit
4. The VOC emissions shall not exceed 0.75 grams/bhp-hr. [District NSR Rule] Federally Enforceable Through Title V Permit
5. The SOx emissions shall not exceed 0.14 grams/bhp-hr. [District NSR Rule] Federally Enforceable Through Title V Permit
6. The PM10 emissions shall not exceed 0.1 grams/bhp-hr. [District NSR Rule] Federally Enforceable Through Title V Permit
7. The hydrogen sulfide concentration of the influent digester gas shall not exceed 170 ppmv prior to combustion. [District NSR Rule] Federally Enforceable Through Title V Permit
8. Source testing to demonstrate compliance with the NOx, CO, VOC, SOx and PM10 limits of this permit shall be conducted at least once every 24 months. [District NSR Rule, 4701, and 4702] Federally Enforceable Through Title V Permit
9. Source testing shall be conducted using the methods and procedures approved by the District. The District must be notified 30 days prior to any compliance source test, and a source test plan must be submitted for approval 15 days prior to testing. [District Rule 1081] Federally Enforceable Through Title V Permit
10. The results of each source test shall be submitted to the District within 60 days thereafter. [District Rule 1081] Federally Enforceable Through Title V Permit
11. Sampling facilities for source testing shall be provided in accordance with the provisions of District Rule 1081 (as amended 12/16/93). [District Rule 1081] Federally Enforceable Through Title V Permit
12. Source testing for NOx shall be conducted utilizing CARB method 100 or EPA method 7E. [District Rule 4701] Federally Enforceable Through Title V Permit
13. Source testing for CO shall be conducted utilizing CARB method 100 or EPA method 10. [District Rule 4701] Federally Enforceable Through Title V Permit

PERMIT UNIT REQUIREMENTS CONTINUE ON NEXT PAGE

14. Source testing for VOC emission concentration shall be conducted utilizing EPA method 25 or EPA method 18, referenced as methane. [District Rule 4701] Federally Enforceable Through Title V Permit

15. Source testing for SOx shall be conducted utilizing EPA method 8 and ARB method 100. [District Rule 4801] Federally Enforceable Through Title V Permit

16. Source testing for PM10 emissions shall be conducted utilizing CARB method 501 in conjunction with CARB method 5, EPA methods 201 and 202 or EPA methods 201A and 202. If the facility agrees that the PM10 emissions are equal to the total particulate matter emissions then source testing for PM10 may be conducted utilizing CARB method 5 including the back half or CARB method 17 including the back half. [District NSR Rule] Federally Enforceable Through Title V Permit

17. The permittee shall monitor the hydrogen sulfide influent concentration on a daily basis with the use of a Draeger tube or District approved equivalent method. [District NSR Rule] Federally Enforceable Through Title V Permit

18. The permittee shall monitor and record the stack concentration of NOx at least once every calendar quarter (in which a source test is not performed) using a portable emission monitor that meets District specifications. All emission readings shall be taken with the unit operating either at conditions representative of normal operations or conditions specified in the permit-to-operate. The analyzer shall be calibrated, maintained, and operated in accordance with the manufacturer's specifications and recommendations or a protocol approved by the APCO. Emission readings taken shall be averaged over a 15 consecutive-minute period by either taking a cumulative 15 consecutive-minute sample reading or by taking at least five (5) readings, evenly spaced out over the 15 consecutive-minute period. [District Rules 4701 and 4702] Federally Enforceable Through Title V Permit

19. The permittee shall monitor and record the stack concentration of O2 at least once every month using a portable emissions monitor that meets District specifications. [In-stack O2 monitors may be allowed if approved by the APCO]. Monitoring shall not be required if the engine is not in operation, i.e. the engine need not be started solely to perform monitoring. Monitoring shall be performed within 1 day of restarting the engine unless monitoring has been performed within the last month. [District Rules 4701 and 4702] Federally Enforceable Through Title V Permit

20. The exhaust gas O2 concentration shall be maintained between 8.83 to 9.20 % O2 for digester gas and between 9.55% to 9.89% for natural gas. [District Rules 4701 and 4702] Federally Enforceable Through Title V Permit

21. If the concentration, as measured by the portable analyzer, is outside the permitted range, the permittee shall return the O2 to within the acceptable range as soon as possible, but no longer than 8 hours after detection. If the portable analyzer readings continue outside the permitted range after 8 hours, the permittee shall notify the District within the following 1 hour, and conduct a certified source test within the 60 days of the first exceedance. In lieu of conducting a source test, the permittee may stipulate a violation has occurred, subject to enforcement action. The permittee must then correct the violation, show compliance has been re-established, and resume monitoring procedures. If the deviations are the result of a qualifying breakdown condition pursuant to Rule 1100, the permittee may fully comply with Rule 1100 in lieu of performing the notification and testing required by this condition. [District Rules 4701 and 4702] Federally Enforceable Through Title V Permit

22. The permittee shall maintain records of: (1) the date and time of O2 and NOx measurements, (2) the O2 and NOx concentration in percent, (3) make and model of exhaust gas analyzer, (4) exhaust gas analyzer calibration records, and (5) a description of any corrective action taken to maintain the emissions limits with the acceptable range. [District Rules 4701 and 4702] Federally Enforceable Through Title V Permit

23. Records of the quantity and type of fuel burned, in BTUs, the influent hydrogen sulfide concentration, and of the annual SOx emissions shall be kept. [District NSR Rule] Federally Enforceable Through Title V Permit

24. All records shall be retained for a minimum of 5 years, and shall be made available for District inspection upon request. [District Rule 1070 and 2520, 9.4.2] Federally Enforceable Through Title V Permit

San Joaquin Valley
Air Pollution Control District

PERMIT UNIT: N-811-25-1 **EXPIRATION DATE:** 11/30/2013

EQUIPMENT DESCRIPTION:
2,550 HP DETROIT DIESEL MODEL T1637K16 DIESEL-FIRED EMERGENCY STANDBY IC ENGINE POWERING A 1750 KW ELECTRICAL GENERATOR

PERMIT UNIT REQUIREMENTS

1. Particulate matter emissions shall not exceed 0.1 grains/dscf in concentration. [District Rule 4201] Federally Enforceable Through Title V Permit
2. The engine shall be equipped with a positive crankcase ventilation (PCV) system or a crankcase emissions control device of at least 90% control efficiency. [District NSR Rule] Federally Enforceable Through Title V Permit
3. The exhaust stack shall not be fitted with a rain cap or similar device which would impede vertical exhaust flow. [District Rule 4102]
4. Only CARB certified fuel containing not more than 0.05% sulfur by weight shall be utilized. [District NSR Rule and 4102] Federally Enforceable Through Title V Permit
5. The NOx emissions shall not exceed 6.2 g/bhp-hr. [District NSR Rule] Federally Enforceable Through Title V Permit
6. The CO emissions shall not exceed 0.34 g/bhp-hr. [District NSR Rule] Federally Enforceable Through Title V Permit
7. The VOC emissions shall not exceed 0.33 g/bhp-hr. [District NSR Rule] Federally Enforceable Through Title V Permit
8. The PM10 emissions shall not exceed 0.09 g/bhp-hr based on U.S. E.P.A. certification using the ISO 8178 test procedure. [District NSR Rule and 4102] Federally Enforceable Through Title V Permit
9. The engine shall be operated only for maintenance, testing, and required regulatory purposes, and during emergency situations. Operation of the engine for maintenance, testing, and required regulatory purposes shall not exceed 200 hours per year. [District NSR Rule and District Rule 4701] Federally Enforceable Through Title V Permit
10. The permittee shall maintain records of the hours of emergency and non-emergency operation. Records shall include the date, the number of hours of operation, the purpose of operation (e.g., load testing, weekly testing, rolling blackout, general area of power outage, etc.), and the sulfur content of the diesel fuel used. Such records shall be retained on-site for a period of at least five years and shall be made available for District inspection upon request. [District Rule 1070 and 2520, 9.3.2 and 9.4.2] Federally Enforceable Through Title V Permit

San Joaquin Valley
Air Pollution Control District

PERMIT UNIT: N-811-26-1 **EXPIRATION DATE:** 11/30/2013

EQUIPMENT DESCRIPTION:
HEADWORKS FACILITY WITH EMISSIONS CONTROLLED BY TWO CUSTOM HARRINGTON ENVIRONMENTAL ENGINEERING BIOSCRUBBERS (55,000 CFM COMBINED RATING)

PERMIT UNIT REQUIREMENTS

1. Volatile Organic Compound (VOC) emissions, from each biofilter controlling the headworks, shall not exceed 2,657 ppbv (as CH4). [District NSR Rule] Federally Enforceable Through Title V Permit
2. Sulfur Compound emissions (including Hydrogen Sulfide emissions), from each biofilter controlling the headworks, shall not exceed 708 ppbv (as SO2). [District NSR Rule] Federally Enforceable Through Title V Permit
3. Ammonia emissions, from each biofilter controlling the headworks, shall not exceed 1 ppmv. [District NSR Rule] Federally Enforceable Through Title V Permit
4. Hydrogen Sulfide emissions, from each biofilter controlling the headworks, shall not exceed 524 ppbv (as SO2). [District NSR Rule] Federally Enforceable Through Title V Permit
5. The permittee shall monitor the hydrogen sulfide effluent concentration at the exit of each biofilter on a weekly basis. The hydrogen sulfide concentration shall be determined via the use of a portable analyzer, Draeger tube, or District approved equivalent method. [District NSR Rule] Federally Enforceable Through Title V Permit
6. The permittee shall maintain a weekly record of the hydrogen sulfide effluent concentration at each biofilters exhaust. [District Rule 2520, 9.3] Federally Enforceable Through Title V Permit
7. All records shall be retained for a period of at least 5 years and shall be made available for District inspection upon request. [District Rule 2520, 9.4] Federally Enforceable Through Title V Permit

ATTACHMENT C

Detailed Facility List

Detailed Facility Report

For Facility=811 and excluding Deleted Permits
Sorted by Facility Name and Permit Number

STOCKTON RWCF	FAC # **N 811**	TYPE: **TitleV**	EXPIRE ON: 11/30/2013
2500 NAVY DR	STATUS: **A**	TOXIC ID: **21210**	AREA: 9 / 302
STOCKTON, CA 95206	TELEPHONE: **2094665261**		INSP. DATE: 07/10

PERMIT NUMBER	FEE DESCRIPTION	FEE RULE	QTY	FEE AMOUNT	FEE TOTAL	PERMIT STATUS	EQUIPMENT DESCRIPTION
N-811-11-4	450 bhp IC engine	3020-10 D	1	479.00	479.00	A	450 HP CATERPILLAR MODEL 3406 DITA, S/N 75Z1640, PORTABLE EMERGENCY STANDBY DIESEL-FIRED IC ENGINE POWERING AN ELECTRICAL GENERATOR
N-811-12-4	450 bhp IC engine	3020-10 D	1	479.00	479.00	A	450 HP CATERPILLAR MODEL 3406TA, S/N 75Z01455, PORTABLE EMERGENCY STANDBY DIESEL-FIRED IC ENGINE POWERING AN ELECTRICAL GENERATOR
N-811-13-3	1 Nozzle	3020-11 A	1	34.00	34.00	A	ONE (1) 2,000 GALLON ABOVE GROUND CONVAULT GASOLINE STORAGE TANK SERVED BY COAXIAL PHASE I VAPOR RECOVERY SYSTEM (G-70-97) AND ONE (1) NOZZLE SERVED BY OPW BALANCE PHASE II VAPOR RECOVERY SYSTEM (G-70-116-B)
N-811-18-4	36,000 kBtu/hr burner	3020-02 H	1	1,030.00	1,030.00	A	36 MMBTU/HR JOHN ZINK MODEL ZTOF DIGESTER GAS FIRED EMERGENCY FLARE
N-811-19-6	193 bhp IC engine	3020-10 B	1	117.00	117.00	A	193 HP JOHN DEERE MODEL #6466A DIESEL-FIRED LOW-USE IC ENGINE WITH A TURBOCHARGER AND AFTERCOOLER POWERING A SLUDGE DREDGE
N-811-21-4	1,408 bhp IC engine	3020-10 F	1	749.00	749.00	A	1,408 HP WAUKESHA MODEL L7042GLD DIGESTER GAS/NATURAL GAS-FIRED LEAN BURN PRECOMBUSTION CHAMBER TYPE IC ENGINE WITH SILOXANE SCRUBBER POWERING AN ELECTRICAL GENERATOR (DUAL SILOXANE FILTER SYSTEM (SCRUBBER) USED TO SCRUB THE DIGESTER GAS PRIOR TO COMBUSTION IN ENGINES N-811-21-2, -22-2, & -23-2)
N-811-22-4	1,408 bhp IC engine	3020-10 F	1	749.00	749.00	A	1,408 HP WAUKESHA MODEL L7042GLD DIGESTER GAS/NATURAL GAS-FIRED LEAN BURN PRECOMBUSTION CHAMBER TYPE IC ENGINE WITH SILOXANE SCRUBBER POWERING AN ELECTRICAL GENERATOR (DUAL SILOXANE FILTER SYSTEM (SCRUBBER) USED TO SCRUB THE DIGESTER GAS PRIOR TO COMBUSTION IN ENGINES N-811-21-2, -22-2, & -23-2)
N-811-23-4	1,408 bhp IC engine	3020-10 F	1	749.00	749.00	A	1,408 HP WAUKESHA MODEL L7042GLD DIGESTER GAS/NATURAL GAS-FIRED LEAN BURN PRECOMBUSTION CHAMBER TYPE IC ENGINE WITH SILOXANE SCRUBBER POWERING AN ELECTRICAL GENERATOR (DUAL SILOXANE FILTER SYSTEM (SCRUBBER) USED TO SCRUB THE DIGESTER GAS PRIOR TO COMBUSTION IN ENGINES N-811-21-2, -22-2, & -23-2)
N-811-25-2	2,550 bhp IC engine	3020-10 F	1	749.00	749.00	A	2,550 HP DETROIT DIESEL MODEL T1637K16 DIESEL-FIRED EMERGENCY STANDBY IC ENGINE POWERING A 1750 KW ELECTRICAL GENERATOR
N-811-26-2	187.5 electric motor hp	3020-01 D	1	314.00	314.00	A	HEADWORKS FACILITY WITH EMISSIONS CONTROLLED BY TWO CUSTOM HARRINGTON ENVIRONMENTAL ENGINEERING BIOSCRUBBERS (55,000 CFM COMBINED RATING)

Detailed Facility Report

For Facility=811 and excluding Deleted Permits
Sorted by Facility Name and Permit Number

PERMIT NUMBER	FEE DESCRIPTION	FEE RULE	QTY	FEE AMOUNT	FEE TOTAL	PERMIT STATUS	EQUIPMENT DESCRIPTION

Number of Facilities Reported: 1

APPENDIX C – EXISTING FACILITIES DESIGN CRITERIA

Table 1 Summary of Existing Facilities Process Design Criteria
Capital Improvement and Energy Management Plan
City of Stockton

Item	Units	Value [1]
LIQUID TREATMENT SYSTEM		
Preliminary Treatment		
Bar Screens		
Type	--	Climber
Number	--	4
Channel Width	ft	6
Channel Depth	ft	6.25
Bar Spacing	in	5/8
Maximum Headloss	in	6
Motor Horsepower	HP	3
Screenings Compactor		
Type	--	Ram-Type
Number	--	1
Drive	HP	3
Grit Channels		
Type	--	Gravity
Number	--	6
Length	ft	67
Width	ft	4
Depth	ft	5.4
Forward Velocity at Maximum Rate	fps	1.4
Collector Type	--	Chain and Flight
Grit Dewatering	--	Screw
Influent Flow Measurement		
Type	--	Parshall Flume
Number	--	6
Throat Width	ft	2
Upstream Channel Depth	ft	2.67
Effective Range of Measurement	mgd	1-17
Capacity, ea.	mgd	19
Head at Capacity	ft	2.4
Raw Sewage Pumps		
Type	--	Mixed Flow, End Suction
Number (1 and 2)	--	2
Nameplate Capacity, ea.	mgd	34
Number (3 and 4)	--	2
Nameplate Capacity, ea.	mgd	37
Drive Type	--	VFD
Drive		
Pumps 1 and 2	HP	300
Pump 3	HP	350
Pump 4	HP	400
Pump Control	--	Bubbler/Transmitter

Primary Treatment		
Primary Clarifiers (1-4)		
Type	--	Rectangular
Number	--	4
Length	ft	140
Width	ft	37
Side Water Depth	ft	14
Weir Length	ft	240
Primary Clarifiers (5-6)		
Type	--	Squircular
Number	--	2
Length & Width	ft	70
Side Water Depth	ft	14
Weir Length	ft	260
Primary Clarifiers (7-8)		
Type	--	Rectangular
Number	--	2
Length	ft	160
Width	ft	30
Side Water Depth	ft	14
Weir Length	ft	320
Total Surface Area	sf	40,120
Total Volume	MG	4.2
Total Weir Length	ft	2,120
Surface Loading Rate		
Average Flow	gpd/sf	1,300
Peak Flow	gpd/sf	2,000
Hydraulic Detention Time		
Average Flow	hrs	2.5
Peak Flow	hrs	1.5
Weir Loading Rate		
Average Flow	gpd/ft	19,100
Peak Flow	gpd/ft	22,200
Primary Sludge Pumps		
Type	--	Centrifugal
Number	--	8
Nameplate Capacity, ea.	gpm	600
TDH	ft	37
Drive, ea.	HP	10
Primary Scum Pumps		
Number	--	8
Type	--	Progressing Cavity
Nameplate Capacity, ea.	gpm	50
TDH	ft	115.5
Drive, ea.	HP	5
Secondary Treatment		
Biotowers		
Number	--	3
Diameter	ft	166
Height	ft	24
Media		

Type	--	Vertical Flow
Specific Area	sf/cf	27
Depth	ft	22
Total Volume	kcf	1,425
Surface Area	sf	21,600
Hydraulic Loading Rate	gpm/sf	0.75
BOD_5 Loading Rate		
Average Flow Conditions		
Summer	lbs/1000cf/d	93
Winter	lbs/1000cf/d	74
Peak Flow Conditions		
Summer	lbs/1000cf/d	96
Winter	lbs/1000cf/d	109
Ventilation Fans		
Type	--	Belt
Number	--	8
Capacity, ea.	cfm	12,500
Drive	HP	5
Biotower Recirculation Pump Station		
Type	--	Vertical Turbine Mixed Flow
Number	--	4
Nameplate Capacity, ea.	mgd	26
TDH	ft	55
Driver	HP	350
Secondary Clarifiers		
Type	--	Circular
Number	--	4
Diameter	ft	100
Side Water Depth	ft	12
Total Surface Area	sf	31,400
Detention Time		
Average Flow Conditions	hrs	1.4
Peak Flow Conditions	hrs	0.9
Surface Overflow Rate		
Average Flow Conditions	gpd/sf	1,525
Peak Flow Conditions	gpd/sf	2,481
Secondary Sludge Pumps		
Type	--	Screw Centrifugal
Number	--	4
High Operating Conditions	--	
Capacity	gpm	380
TDH	ft	88
Low Operating Conditions		
Capacity	gpm	114
TDH	ft	37
Driver	HP	15
Secondary Effluent Pump Station #1		
Pump Type	--	Axial Flow
Number	--	3
Nameplate Capacity, ea.	mgd	34.6

TDH	ft	15
Driver	HP	100
Secondary Effluent Pump Station #2		
Pump Type	--	Constant Speed Centrifugal
Number	--	2
Nameplate Capacity, ea.	mgd	10
Driver	HP	40
Oxidation Ponds		
Pond 1		
Surface Area	ac	190
Depth	ft	4.6-6.2
Nominal Volume	ac-ft	700
Pond 2		
Surface Area	ac	125
Depth	ft	8-8.7
Nominal Volume	ac-ft	900
Pond 3		
Surface Area	ac	135
Depth	ft	8
Nominal Volume	ac-ft	1,000
Sidewall Slope	ft:ft	2:1
Total Pond Surface Area	ac	450
Total Pond Volume	MG	847
Pond Circulation Pump Station		
Type	--	Constant Speed Centrifugal
Number	--	4
Nameplate Capacity, ea.	mgd	60
TDH	ft	4.5
Driver	HP	100
Pond Effluent Pump Station		
Type	--	Vertical, Mixed Flow, Centrifugal
Number	--	1
Driver	HP	40
Pond Drainage Pumps		
Type	--	Vertical, Single-Stage
Number	--	4
Driver		
Pump A	HP	7.5
Pump B	HP	15
Pump C	HP	20
Pump D	HP	20
Tertiary Treatment		
Wetlands		
Number	--	1
Surface Area	ac	180
Depth	ft	10
Wetlands Hi-Lift Pumps		

Type	--	Vertical Mixed Flow
Number	--	3
Capacity	gpm	20,000
TDH	ft	50
Driver	HP	300
Wetlands Recycle Pumps		
Type	--	Vertical Mixed Flow
Number	--	4
Capacity	gpm	10,000
TDH	ft	40
Driver	HP	150
Tertiary Raw Water Pump Station		
Pump Type	--	Axial Flow
Number	--	2
Nameplate Capacity, ea.	mgd	13.75
TDH	ft	11
Number	--	2
Nameplate Capacity, ea.	mgd	21.5
TDH	ft	13
Driver	HP	100
Nitrifying Biotowers		
Number	--	2
Diameter	ft	166
Media		
Type	--	Cross Flow
Surface Area	sf/cf	65
Depth	ft	22
Hydraulic Loading Rate		
Parallel	gpm/sf	1.39
Series	gpm/sf	0.92
Ventilation Fans		
Number, ea.	--	4
Capacity, ea.	scfm	7,200
Driver	HP	5
Dissolved Air Flotation		
Number	--	4
Diameter	ft	85
Side Water Depth	ft	7
Surface Area, ea.	sf	5,675
Solids Loading Rate	lbs/sf/d	5.1
Assumed Float Concentration	mg/L	3.0
Assumed Float Weight	lbs/cf	41
Peak Float Discharge Rate	gpm	600
Hydraulic Loading Rate	gpm/sf	2.4
Pressurized Flow	gpm	4,500
Maximum Pressure	psig	80
Maximum Air Flow	scfm	80
Minimum Air to Solids Ratio	lbs/lbs	0.179
Pressurization Pumps		
Number	--	4
Capacity	gpm	4,500

TDH		ft	191
Driver		HP	300
Float Pumps			
Number		--	3
Capacity		gpm	500
TDH		ft	185
Driver		HP	40
Effluent Filtration			
Type		--	Dual Media (Two-Celled)
Number		--	6
Width		ft	34
Length		ft	50
Surface Area, ea.		sf	1,700
Media Depth			
Anthracite Coal (2.50 mm)		ft	4
Sand (0.8 – 1.0 mm)		ft	1.5
Gravel		ft	0.67
Filtration Rate	(5 in service, 1 in backwash)	gpm/sf	4.5
Backwash			
Air Blower			
Type		--	Centrifugal
Number		--	1
Backwash Rate		scfm/sf	4
Capacity		scfm	3,400
Driver		HP	200
Water Supply			
Backwash Rate			
Minimum		gpm/sf	13.0
Maximum		gpm/sf	26.0
Capacity			
Minimum		mgd	16.0
Maximum		mgd	32.0
Backwash Water Pumps			
Type		--	Single-stage, constant speed
Number		--	2
Capacity		mgd	16
TDH		ft	28
Driver		HP	125
Filtered Water Pump Station			
Pump Type		--	Fixed Speed Axial Flow
Number		--	1
Nameplate Capacity, ea.		mgd	27.4
TDH		ft	25
Driver		HP	125
Pump Type		--	Variable Speed Axial Flow
Number		--	2

Nameplate Capacity, ea.	mgd	27.4
TDH	ft	25
Driver	HP	125
Disinfection		
Chlorine Contact Canal		
Length	ft	1,030
Average Width	ft	19.3
Depth	ft	7.6
Volume (without weir extension)	MG	1.13
Volume (with weir extension)	MG	4.58
Detention Time @ 55 MGD (with weir extension)	min	120
Post Aeration Blowers		
Type	--	Centrifugal
Number	--	2
Capacity	scfm	3,400
TDH	psi	4.5
Driver	HP	100
Final Effluent Discharge Siphon		
Pump Type	--	Vacuum
Number	--	1
Nameplate Capacity, ea.	cfm	130
Number	--	2
Nameplate Capacity, ea.	cfm	10.5
SOLIDS HANDLING SYSTEM		
Sludge Thickening		
Type	--	Gravity
Number	--	2
Diameter	ft	70
Side Water Depth	ft	10
Cone Depth	ft	6
Surface Area, ea.	sf	3,850
Hydraulic Loading Rate	gpd/sf	200
Maximum Solids Loading Rate	lbs/sf/d	33
Thickened Sludge Pumps		
Type	--	Progressing Cavity
Number	--	4
Number of Stages	--	2
Capacity	gpm	80-375
TDH	ft	139
Driver	HP	30
Thickened Scum Pumps		
Type	--	Progressing Cavity
Number	--	
Number of Stages	--	2
Capacity	gpm	30-100
TDH	ft	139
Driver	HP	10
Type	--	Gravity Belt
Number	--	2

Belt Width	m	3
Belt Speed	m/min	0.0-6.0
Belt Drive	HP	25
GBT Feed Sludge Pumps		
Type	--	Progressing Cavity
Number	--	3
Capacity	gpm	200
TDH	ft	92
Driver	HP	15
GBT Sludge Cake Pumps		
Type	--	Twin-Cylinder Piston
Number	--	2
Capacity	gpm	6.6-103
Driver	HP	125
Anaerobic Digestion		
Digesters A, B, & C		
Cover Type	--	Floating
Diameter	ft	100
Side Water Depth	ft	30
Nominal Volume, ea.	MG	1.75
Digesters 4&5		
Cover Type	--	Fixed
Diameter	ft	110
Side Water Depth	ft	42
Nominal Volume, ea.	MG	3.0
Solids Loading Rate		
Minimum	lbs VSS/cf/d	0.07
Maximum	lbs VSS/cf/d	0.11
Solids Retention Time		
Minimum	days	21
Maximum	days	28-32
Volatile Solids Reduction	%	50
Digester Gas Production		
Minimum Flow Rate	cf/d	670,000
Maximum Flow Rate	cf/d	1,269,000
Production Rate	scfh/lb VSR	15
Digester Heating Requirements		
Minimum Heat Demand	MBTU/hr	4,700-5,400
Maximum Heat Demand	MBUT/hr	4,400-6,900
Digester Mixing Pumps		
Type	--	Screw Centrifugal
Number	--	4
Capacity	gpm	7,500
TDH	ft	19
Driver	HP	75
Bottom Sludge Pumps		
Type	--	Progressive Cavity
Number	--	2
Capacity	gpm	80-300
TDH	ft	116

Driver	HP	30
Sludge Recirculation Pumps		
Type	--	Recessed Impeller Centrifugal
Number	--	2
Capacity	gpm	500
TDH	ft	42/24
Driver	HP	25
Heat Exchangers		
Type	--	Spiral
Number	--	2
Capacity	BTU/hr	2,000,000
Sludge Flow Rate	gpm	500
Hot Water Flow Rate	gpm	250
Digester Gas Storage		
Type	--	Dry-Seal Gas Holder
Number	--	1
Diameter	ft	50
Height	ft	50
Nominal Volume	Cf	50,000
Design Pressure	in w.c.	10.0
Operating Pressure	in w.c.	6.0
Post Digestion Thickening		
Type	--	Lagoon
Area	ac	2.0
Depth	ft	12
Volume	MG	6.76
Sludge Dredge Pumping		
Type	--	Centrifugal
Number	--	1
Capacity	gpm	1,400
TDH	ft	100
Dewatering		
Type	--	Belt Filter Press
Number	--	2
Belt Width	m	2.2
Upper Belt Length	m	20.1
Lower Belt Length	m	15.5
Belt Speed	m/min	0.0-6.0
Driver	HP	25
Sludge Day Tanks		
Type	--	Lined Steel
Number	--	6
Diameter	ft	15
Height	ft	14.5
Capacity	gal	21,500
BFP Feed Sludge Pumps		
Type	--	Progressing Cavity
Number	--	3
Capacity	gpm	200

TDH	ft	92
Driver	HP	15
BFP Sludge Cake Pumps		
Type	--	Twin-Cylinder Piston
Number	--	2
Capacity	gpm	6.6-103
Driver	HP	125
Cogeneration		
Engine Type	--	Reciprocating Gas
Configuration	--	V-12
Number	--	3
Speed	rpm	1,200
Nominal Capacity, ea.	kW@0.8 PF	1,000
Combustion	--	Naturally-Aspirated
Standby Generator		
Engine Type	--	Diesel
Configuration	--	V-16
Number	--	1
Speed	rpm	1,800
Nominal Capacity, ea.	kW@0.8 PF	1,600
Combustion	--	Turbo Charged

Note:

1. Values obtained from design criteria in available Contract Documents and the 2008 Unit Process Control Plan (UPCP).

APPENDIX D – OPERATIONS SUPPORT FACILITIES DETAILED REPORTS

MUD Regional Wastewater Control Facility
Capital Improvement Plan Project

Mechanical and Plumbing
Evaluation and Report

PREPARED BY:

MITCH SCHEFLO
Mechanical Engineer # 025588
ALEXANDER SCHEFLO & ASSOCIATES
2926 Pacific Avenue
Stockton, Ca 95204
(209) 948-9761

28 April 2011

Project Summary

Title: Stockton MUD Regional Wastewater Control Facility

Tertiary Plant Building

Description of Work:

Interior Modifications.

Observed Conditions:

Mechanical

The existing mechanical system consists of the following:

1. Switch Gear: Dx air handler with duct furnace.
2. Locker, Restrooms, Dayroom, and hallway: Dx air handler with duct furnace.
3. Control Room (This was an addition from the original building.): Rooftop gas/electric unit.

The zoning and temperature control at Systems #1 and #2 look good. The third system serving the control room does not have adequate capacity. Staff indicated that when the outside air temperature is above 90 Degrees F the unit cannot maintain a comfortable space temperature. This room has a lot of west facing glazing.

At the southeast corner of the building there is an emergency generator room. It appears that fuel tank and generator have been abandoned. The room has multiple make-up air louvers at the exterior walls.

Plumbing

The domestic plumbing system is serviced by a 2" domestic water and a 4" sanitary sewer service at the east side of the building.

The plumbing fixtures at the restroom areas consist of wall hung flush valve toilets, urinals, and wall hung lavatories.

Recommendations:

Mechanical

1. Existing systems #1 and #2 should be serviced; changing filters and verifying refrigerant charge.
2. System #3 cooling capacity should be reviewed and unit changed out with the proper tonnage. Unit should be constructed with special coating to prevent corrosion because of the corrosive atmosphere.
3. At the newly converted office space a new HVAC system will be required. The system can be a split system gas fired system with furnace in one of the following locations:
   a. Existing mechanical room.
   b. Furnace closet in the space.
   c. Above new ceiling.
   The new equipment should be provided with special corrosion resistant coating.

Plumbing

1. Upgrade plumbing fixtures per quantities required by CPC and ADA standards.
2. Provide gas and condensate to new HVAC equipment.

Cost Estimate

- HVAC and Plumbing: $82,500.00
- Engineering Fees: $4,950.00

Project Summary

Title: Stockton MUD Regional Wastewater Control Facility

Collection and Maintenance Building

Description of Work:

2,400 sq. ft. expansion for offices and meeting room.

Observed Conditions:

Mechanical

From visual observation the mechanical system consists of the following:

1. Administration Area: Gas-fired multi-zone unit at the administration area.
2. Locker Room: 100% direct/indirect evaporative make-up air unit with 100% outside air, gas fired with direct/indirect evaporative cooling module.
3. Shop Area: Gas fired unit heaters.

The mechanical system was installed in approximately 2007/2008 and appears to be in good working condition.

Plumbing

The domestic plumbing system is being served by a 2-1/2" domestic water line and a 12" sanitary sewer line with 3" and 4" laterals into the building.

The sanitary sewer line into the maintenance shop has a sand oil trap on it before it enters the sewer main.

Natural gas service is a 2" line with a pressure reducing valve, and is located on the west side of the building.

The building is fully fire sprinklered with the riser located in a utility room at the east side of the building.

Recommendations:

Mechanical

Since all the systems are self-contained, the addition will have no impact on the operation of the existing systems. The new addition can be served by another gas-fired multi-zone unit or multiple package gas/electric units to meet zoning requirements. The HVAC units should be constructed with a special coating to prevent corrosion because of the corrosive atmosphere.

Plumbing

The 2-1/2" service line should be adequate for the proposed addition. In case there is any sinks in the final design.

Regarding the sewer service, it should be adequate in case there is any sinks in the final design.

The fire sprinkler riser can be used for addition. Lines will need to be extended to the new addition and provided with expansion joints.

Since the gas service is a 2" line with a pressure reducing valve there should be adequate gas service for the addition. The line can be routed within the ceiling from the regulator to the addition. An expansion joint will be required at the wall of the addition and existing building.

Cost Estimate

- HVAC and Plumbing: $43,400.00
- Engineering Fees: $3,000.00

Project Summary

Title: Stockton MUD Regional Wastewater Control Facility.

Administration Building

Description of Work:

Remodel the existing lab into office space.
Add 4600 square feet of office space.
Remodel the restrooms to make them accessible.

Observed Conditions:

Mechanical

The existing mechanical system consists of the following:

1. Chiller *(Refer to Picture#1)*.
2. Gas Fired Hot Water Boiler *(Refer to Picture #2 & 3)*.
3. Chilled Water Pump
4. Hot Water Pump
5. Central Air Handler with Chilled Water Coil
6. Return Fan *(Refer to Picture #4)*.
7. Hot Water Reheat Coils at each zone for heat.
8. Return Plenum System

When the investigation field trip was conducted the space temperature was comfortable, but there was an objectionable smell in the building. The boiler and chiller have been updated from the original installation. The rest of the system is approximately 38 years old and has reached the end of its service life.

Currently the air handler has a chilled water coil that cools the supply air down (Would assume system has a reset that will set discharge air temperature based on the outside air temperature.) to satisfy the zone requiring cooling and the other zones requiring heat are heated up with a zone heating coil in the space.

Per conversation with staff the ductwork was cleaned a couple of years ago and the lining material on the insulation was disturbed. When the system was started up the duct insulation loosened up and plugged the coils. This problem was supposedly rectified, but there are probably insulation fibers exposed in the ducts. Over time this insulation could become air borne and will collect on the heating coils.

The zoning provided by these heating coils look good as there is a heating coil per exposure and type of occupancy.

The existing HVAC system utilizes a central return for most of the return with door louvers being used to relieve the air into the corridor where it migrates back to the central return. *(Refer to Picture #5)*.

The lab area had a fume hood that looks like it is the original.

The chiller and boiler have been updated from the original installation. The chiller is a nominal 60 ton, and the boiler has input capacity of 720,000 Btuh with output of ±540,000 Btuh. It was noticed that the chiller does not have a cooling tower and uses domestic water as a condenser and dumps it to drain. *(Refer to Picture #6)*. This is against City policy. The pumps are also showing excessive rusting. *(Refer to Picture #7)*.

The controls for the building are Powers pneumatic. Much of the pneumatic tubing is leaking causing the valves to not perform as designed.

Plumbing

The existing plumbing system consists of the following:

1. 2" water service at the south side of the building.
2. 4" sanitary sewer at the south side of the building.
3. 4" lab sanitary sewer at the south side of the building.
4. 4" storm drain at the west side of the building.
5. Lab area has the following:

a. Natural gas outlets.
b. Compressed air.
c. Vacuum air.
d. Cold water.
e. Hot water.
f. Sewer/Vent pipe manufactured for lab use.

The restrooms utilize wall mounted flush valve water closets, counter lavatories at the Womens R/R and wall hung lavatories at the Mens R/R. Outside the restroom area there is an electric drinking fountain. The restrooms do not meet current plumbing code quantities of fixture fixtures or handicap standards.

Recommendations/Impact of Addition to Existing Building:

Mechanical

The mechanical system needs to be upgraded. Because of the corrosive environment and bad air quality precautions should be taken to minimize their impact. The following are two options for replacing the mechanical system:

Central Plant:

Re-use existing chiller and review the possibility of using the existing boiler. With the current floor plan the lab did not require heat, but since the lab is being converted to office there will be an additional heating load that is not currently present, plus the new addition load. Replace pumps as they are rusting. *(Refer to Picture # 7)*. Provide cooling tower for chiller that is constructed of fiberglass with as few metallic parts as possible.

Option #1: Existing Building and Addition:
Air Handler/Return Fan: Replace existing center air handler with fan coils, one per zone, located within the raised ceiling area of the corridor. Provide fixed outside to these fan coils. Outside air should be taken from the North to avoid drawing air from the sewer plant. Condition of ductwork should be reviewed to see if it can be re-used (exposed duct insulation). If it is damaged ductwork it should be replaced.

Option #2: Existing Building: *(I recommend this option.)*
Provide a new rooftop variable volume air handler with chilled water coil, hot water coil, and return fan. Supply and return fan to be provided with a variable frequency drives, outside air to be taken from the northerly direction. Provisions to be made to prevent corrosion of the unit and it's components. (Heresite coated coils; minimum amount of exposed metal to minimize corrosion).

Variable volume boxes with reheat coils in the space for temperature control. Special attention to be made to maintain minimum air circulation rates to make sure the space does not become stuffy.

As mentioned in Option #1, the ductwork should be reviewed to see if it has exposed insulation, if so, all ductwork should be replaced.

Addition:
A second variable volume air handler system similar to the unit being added at the existing building shall be provided for the addition.

Controls:
The controls should be changed out to a DDC (Direct Digital Control) system per City standards.

Plumbing

The plumbing at the restrooms need to be upgraded per current CPC quantities and ADA standards. All services to the existing lab area should be removed or capped off behind the finished surface.

Cost Estimate:

- HVAC and Plumbing: $317,500.00 *(Total replacement using exiting chiller.)*
- Engineering Fees: $20,000.00

Project Summary

Title: Stockton MUD Regional Wastewater Control Facility: Operations Main Building

Operations Building

Description of Work:

Interior Remodel.

Observed Conditions:

Mechanical

The existing mechanical system consists of the following:

1. Chiller
2. Boiler
3. Rooftop Air Handler with Chilled Water Coil
4. Heating Coils at each zone.
5. Ducted return system.
6. Ducted exhaust system at 1st floor lockers.

At the time of the inspection the space was on the cool side. Staff indicated all control of the system was done at a remote location. Staff went on to say that the control of the space does not match the needs of the occupants. Staff would manually turn the control system on and off at the control panel.

The heating coils used for heating and zone control (Have probably not been maintained.) and are more than likely dirty restricting air flow. At the first floor locker hallway a ceiling was opened up and it looked like the coil had been leaking? (See picture #8.)

Plumbing

The domestic plumbing system is serviced by a 2" domestic water line and a 4" sanitary sewer line both at the south side of the building.

The plumbing fixtures consist of wall mounted flush valve water closets and urinals. There are circular wash fountains in addition to wall hung lavatories. One of the lavatories had the bottom of the basin broken out and shower stalls were being used for storage.

None of the plumbing fixtures were handicap complaint.

Recommendations:

Mechanical

1. Clean existing heating coils in space, and review control valve for proper operation.
2. Coordinate control with remote location so that control of the system meets the needs of the occupants.
3. Review ventilation at locker/restrooms to confirm minimum ventilation rates are being met.
4. Provide cooling only split system HVAC unit for elevator equipment room.

Plumbing

1. Upgrade plumbing fixtures per quantities required by CPC and ADA Standards.

Cost Estimate:

- HVAC and Plumbing: $ 50,000.00
- Engineering Fees: $3,000.00

Project Summary

Title: Stockton MUD Regional Wastewater Control Facility.

New Lab Building

Description of Work:

Construct a new 6,000 sq. ft. lab building.

Observed Conditions:

None.

Mechanical / Plumbing Work:

Provide mechanical system meeting the needs of the occupants. Design to be LEED Silver compliant.

Recommendations:

Mechanical

Special consideration shall be used in specifying equipment/systems that are efficient. Laboratories are notorious for using a lot of energy because of the high ventilation rates required.

The HVAC system will have the following components:

1. Two air handlers located within the mechanical room or on the roof as follows:
   a. Laboratory Area: Air handler with 100% outside-air and a variable frequency drive that will vary airflow based on the required exhaust in the space. (Minimum ventilation rates will be maintained.)
   b. Office Area: Air handler with variable volume boxes and reheat coils for control. Variable frequency drives will be provided on both the supply and return fans to maintain pressure in the space.
2. Chiller.
3. Boiler; condensing type.
4. Cooling tower; flat plate heat exchanger.
5. Hot water, chilled water, and cooling tower pumps.
6. Fume hoods that are efficient reducing quantities of exhaust/make-up air.
7. At critical areas special dampers to maintain air pressure relationships between adjacent spaces.
8. Redundancy of equipment should be reviewed with occupants as some of the experiments may be temperature sensitive.

Plumbing

Domestic plumbing fixtures will be specified as a reduced flow fixture to meet requirements of LEED.

The plumbing system will have the following components:

1. Domestic sewer and water.
2. Acid waste.
3. Neutralization tank.
4. Compressed air piping.
5. Natural gas piping.
6. Ionized water piping.

Utilities: Water, sewer, and gas can be extended from the existing locations to service the building.

LEED Certification

The following points are LEED points that will try to be achieved:

1. WE C3 1, 3,2 Water Use Reduction 20% / 30%
2. WE Credit 1.1 and 1.2 Water Efficient Landscaping can be achieved with a smart condensate recovery deisgn. In wet labs there is typically a significant amount of condensate generated from air handlers.

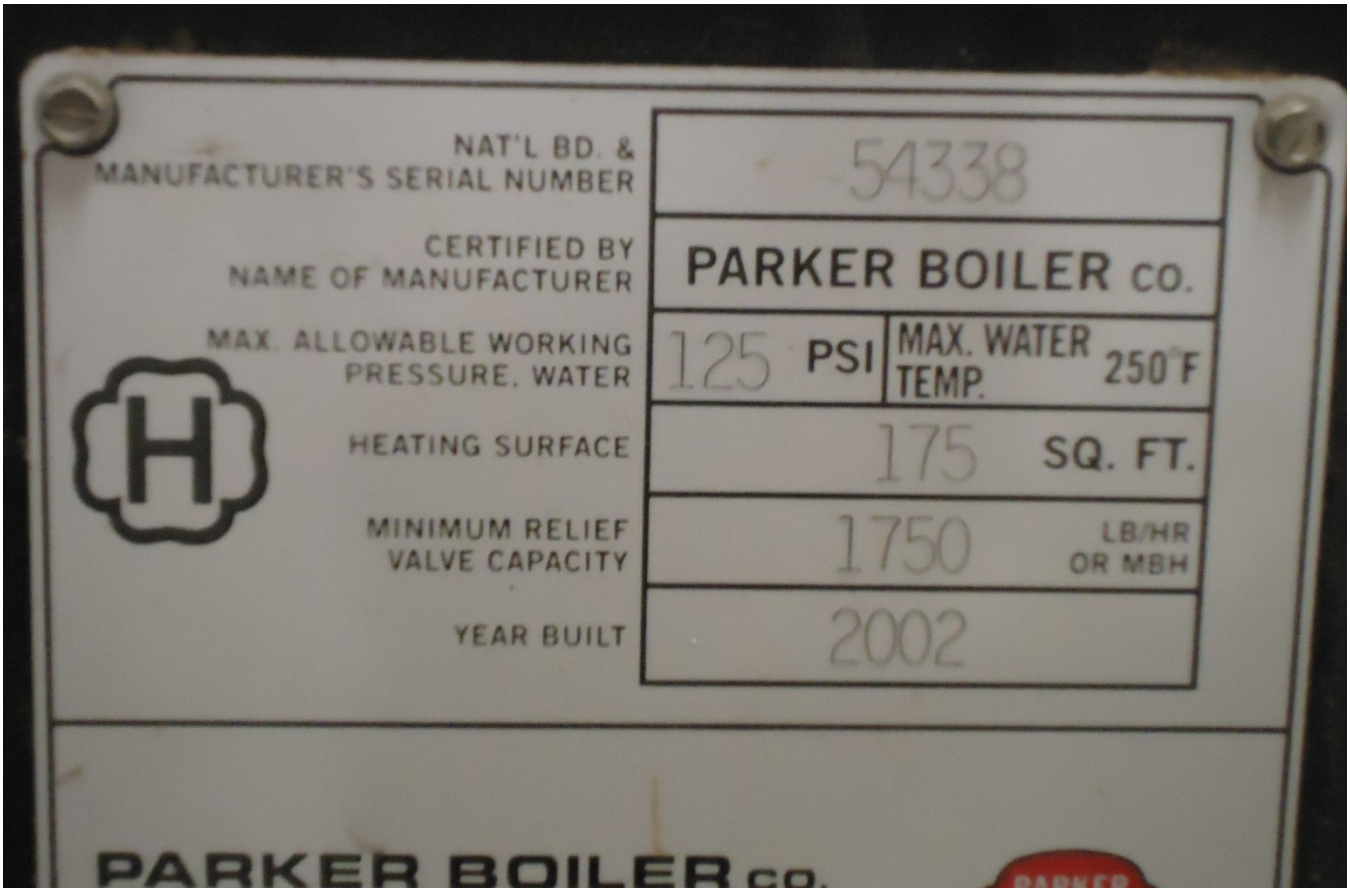
3. WE 3.1 and 3.2 Water Use Reduction is hard to achieve in labs because of the high water demands.
4. EA Credit 1
    - Lab and non-lab zoning.
    - Energy efficient glazing.
    - Exterior louvers and sun shades.
    - Energy recovery system.
    - Variable speed exhaust system.
    - Occupancy and photo sensors.
    - High performance hoods.
5. EA c1.1 to 1.5 optimize energy performance.
6. EA Credit 3 Additional Commissioning is necessary to ensure the HVAC system is balanced properly.
7. EA Credit 5 Laboratory buildings require a higher level of monitoring than is provided by most building control systems for fume hood controls, and room pressurization. Other ideas include:
    - Using electronic air cleaners to help minimize air resistance from filters.
    - Maintaining effective filter replacement schedules.
    - Insulating hot water, steam, and chilled water piping.
    - Using control systems for variable speed drives on pumps, fans and compressors only if the controls are maintained and calibrated regularly.
    - Keeping condenser water as cool as possible but not less than 20 Degrees F above chilled water supply temperature.
    - Reusing wasted heat with a heat recovery system.
    - Installing an economizer at the boiler. The water-side economizer will help with humidity controls.
    - Maintaining hot water for washing hands at 105 Degrees F.
    - Using local hot water tanks at kitchens, rest rooms, and other areas instead of central hot water.
    - For plumbing systems, installing ultra-low-flow toilets (0.5 gallons per flush) and automated controls such as infrared sensors for faucets.
    - Implementing a cascade airflow from offices to labs.
    - Installing HVAC system can be sized for 70-80% of peak ventilation. Small, single-room labs should be sized for 100% capacity without downsizing.
    - Carefully considering the number of fume hoods necessary. Each hood uses as much energy in a year as an entire house.
8. Carbon Dioxide Sensor (EQ Credit 1) -- This is an easy credit to achieve:
9. Increase ventilation rates (EQ Credit 2)
10. Construction IAQ Management Plan During Construction (EQ Credit 3.1)
11. Construction IAQ Management Plan After Construction (EQ Credit 3.1)
12. Thermal Comfort (EQ Credit 7.1, 7.2) -- A humidification system may be necessary to meet the technical requirements for specific equipment. Including a humidification system adds value for occupant comfort.

Cost Estimate:

- HVAC and Plumbing Construction Costs: $300,000.00
- Engineering and LEED Documentation Fees: $21,500.00

Picture #1 - Chiller

Picture #2 - Boiler



Picture #3 - Boiler

Picture #4 - Return Fan

Picture #5 - Door Louvers for Return

Picture #6 - Condenser Water to Drain

Picture # 7 - Corroded Pump

HCS ENGINEERING, INC.

CONSULTING ELECTRICAL ENGINEERING.

4512 FEATHER RIVER DRIVE, SUITE F
STOCKTON, CA 95219
(209) 478-8270
FAX (209) 478-2169

Project Summary

Title. Stockton MUD Regional Wastewater Control Facility Operations Main Building and Tertiary Plant Building

Administration Building

Description

Remodel the existing lab into office space
Add 4600 square feet of office space.
Remodel the restrooms to make them accessible

Observed Conditions

The administration building is powdered from substation 30 with a 600 amp 480 volt service.

Existing lighting is a mixture of prismatic fluorescent troffers and parabolic louvered troffers. There are incandescent down lights inside and outside that are broken that need to be replaced.

Emergency lighting needed to be replaced.

The existing air conditioning is on a central chiller and boiler.

The electrical panels for the building are in the chiller room and have very little Code clearance. The expansions will require two new electrical panels that will be installed in expansion

Electrical Work

Provide a new pad mount transformer to power the building and remove it from the substation 30.

Replace the broken down lights outside the building

Replace the lighting in the lab area with parabolic fixtures

Provide new parabolic louvered fluorescent fixtures in the new offices spaces. Provide new outlets in offices spaces and conduits for the City's IT department to install phone and data.

Provide power to new air conditioning for the expansion.

Replace the egress lighting.

HCS ENGINEERING, INC.

CONSULTING ELECTRICAL ENGINEERING.

4512 FEATHER RIVER DRIVE, SUITE F
STOCKTON, CA 95219
(209) 478-8270
FAX (209) 478-2169

Add power for new exhaust fans as required.

Cost Estimate

Electrical service work.	$35,000
Electrical work inside building.	$70,000
Conduit for City IT Department.	$1,000
Removals to allow for construciton.	$10,00
Total.	$107,000
Engineering fee.	$6800

HCS ENGINEERING, INC.

Consulting Electrical Engineering.

4512 Feather River Drive, Suite F
Stockton, CA 95219
(209) 478-8270
Fax (209) 478-2169

Project Summary

Title. Stockton MUD Regional Wastewater Control Facility Operations Main Building and Tertiary Plant Building

New Lab Building

Description of Work

Construct a new lab building.

Observed Conditions

Rework of parking lot lighting may be required depending upon the final configuration of the building.

Electrical Work.

Construct a new lab building. Complete with distribution panels, electrical panels, lighting, outlets, connection to lab equipment (some relocated and some new). Install power to Break room equipment. Connect the HVAC equipment.

Connect the lab building to the new substation installed for the administration building

Install conduit and cabinets for the City's IT department

LEED Certification

The following points could be gained by the electrical systems

SS4.3. We can design for electric vehicle charging outlets if this credit is designed. This would be part of 3 points designed into the site. Construction cost is $6,000 per pedestal.

SS8. We will design to reduce light pollution. 1 point. No cost impact

EA Pre 1. We will include basic commissioning in the design of the lighting system. No cost impact.

HCS ENGINEERING, INC.

Consulting Electrical Engineering.

4512 Feather River Drive, Suite F
Stockton, CA 95219
(209) 478-8270
Fax (209) 478-2169

EA2. On-site renewable energy. The estimated electrical load for the 6000 sf lab is 84000 watts. For EA2 credit, we need to consider on generation of

1 point = 1% or 840 watts
2 points =. 3% or 2520 watts
3 points =. 5% or 4200 watts
4 points =. 7% or 5880 watts
5 points = 9% or 7560 watts
6 points = 11% or 9240 watts
7 points = 13% or 10920 watts

The rough cost of the system is $10/watt for construction. So 1 point would cost approximately $8400 for the first point. At 7 points, the cost would be $109,200 or $15,600 per point.

EA3. We can include advanced commissioning in the lighting system controls. 1 point. Cost impact of $5,000.

IEQ6.1. We will design for control ability of the lighting system. 1 point. Cost impact, $250 per workstation

Cost Estimate

Construct new building.

$94,000 plus options above

Engineering fees would be 6% of the final system costs. Depending upon the LEED systems selected.

HCS ENGINEERING, INC.

CONSULTING ELECTRICAL ENGINEERING.

4512 FEATHER RIVER DRIVE, SUITE F
STOCKTON, CA 95219
(209) 478-8270
FAX (209) 478-2169

Project Summary

Title. Stockton MUD Regional Wastewater Control Facility
Operations Main Building and Tertiary Plant Building

Operations Building 1st Floor

Description of Work

Remodel restrooms for accessibility
Create a new Women's locker room

Observed Conditions
Existing lighting is surface mount wrap around lenses fixtures
There were many damaged lenses.
Emergency lighting needed to be replaced

Electrical Work
Modifications to the existing lighting or replacement of the Existing lighting
Add lighting to remodel areas
Replace the egress lighting
Add power for new exhaust fans as required

Cost Estimate

Lighting ($1620 sf at $5/sf).	$8100
Connections to fans.	$1000
Removals to allow for construciton.	$1000
Total.	$10,100
Engineering fee.	$1000

HCS ENGINEERING, INC.

CONSULTING ELECTRICAL ENGINEERING.

4512 FEATHER RIVER DRIVE, SUITE F
STOCKTON, CA 95219
(209) 478-8270
FAX (209) 478-2169

Project Summary

Title. Stockton MUD Regional Wastewater Control Facility
Operations Main Building and Tertiary Plant Building

Operations Building 2nd Floor

Description of Work

Tenant improvement to the second floor control room area to create dedicated work spaces. Either cubicle or individual offices.

Observed Conditions

Existing lighting is recessed troffers with prismatic lenses
Existing elevator was not operational

Electrical Work

Modifications to the existing lighting or replacement of the Existing lighting to light the cubicles/office spaces
Add receptacles
Add conduit and raceway for the City's IT depart to install phone and data system cabling.
Disconnect and connect the elevator main feed

Cost Estimate

Reswitch lighting.	$500
Install outlets and raceways for IT.	$1000
Removals to allow for construciton.	$1000
Disconnect and reconnect elevator.	$2500
Total.	$5,000
Engineering fee.	$1,000

HCS ENGINEERING, INC.

CONSULTING ELECTRICAL ENGINEERING.

4512 FEATHER RIVER DRIVE, SUITE F
STOCKTON, CA 95219
(209) 478-8270
FAX (209) 478-2169

Project Summary

Title. Stockton MUD Regional Wastewater Control Facility Operations Main Building and Tertiary Plant Building

Maintenance Collections Building Expansion

Description of Work

Add onto the maintenance and collections building

Observed Conditions
Existing lighting is recessed prismatic lensed troffers

Electrical Work
Add an electrical panel, lighting, connections to HVAC equipment
Expand the existing fire alarm control panel
Add exterior lighting to the new exterior canopies.

Cost Estimate

Electrical for the expansion.	$70,000
Lighting for canopies.	$4,000
Total.	$74,000
Engineering fee.	$5,000

HCS ENGINEERING, INC.

CONSULTING ELECTRICAL ENGINEERING.

4512 FEATHER RIVER DRIVE, SUITE F
STOCKTON, CA 95219
(209) 478-8270
FAX (209) 478-2169

Project Summary

Title. Stockton MUD Regional Wastewater Control Facility Operations Main Building and Tertiary Plant Building

Tertiary Building

Description of Work

Tenant improvement to the control building to create dedicated office space.

Observed Conditions

The concept is to convert the existing generator room into an office. The generator has been disconnected and abandoned in place. The generator and its fuel systems need to be removed. There are a lot of electrical panels and UPS equipment in the room against the interior wall at are still in operation.

Existing lighting is recessed direct/indirect fluorescent troffers.

Electrical Work

Remove the existing generator and fuel systems. Remove the industrial lighting in the space

Add lighting to match hallways and control room

Add receptacles

Add power for a new air conditioner for this room

Add conduit and raceway for the City's IT depart to install phone and data system cabling.

Cost Estimate

Remove the Generator	$2000
Install new lighting.	$1500
Install power and raceways for IT.	$1000
Removals to allow for construciton.	$1000
Total.	$5500
Engineering fee.	$1,000

APPENDIX F – FLOOD EVALUATIONS

Stockton Municipal Utility District
Regional Wastewater Control Facility
Flood Analysis
Prepared by Siegfried Engineering Inc.
April 25, 2011

Purpose

The purpose of this analysis is to evaluate past flood study information for the City of Stockton Municipal Utility District (MUD) Regional Wastewater Control Facility (Facility) and to update or augment the information with recent flood data and potential alternative improvements to provide the Facility with an acceptable level of protection from a 100 year flood event. The previous flood analysis information was obtained from an April, 2005 study prepared by Kjeldsen, Sinnock, Neudeck Consulting Engineers and Land Surveyors Inc. (KSN) of the tertiary plant and ponds lying southerly and westerly of the San Joaquin River and a 2008 "Flood Protection Project" Appendix E presentation prepared by Kleinfelder-Geomatrix (KLN-GEO). This analysis prepared by Siegfried Engineering Inc. (SEI) specifically examines current flood plain elevation data in conjunction with a current aerial topographic survey prepared in March of 2011 by SEI. A levee stability analysis will require additional geotechnical studies and evaluation to determine the strength and stability of levees along the San Joaquin River, Burns Cutoff, and along the southern and western perimeters of the tertiary treatment facility and the ponds.

Methodology

SEI prepared a horizontal and vertical control network throughout the Facility and supervised the preparation of a current aerial topography map of the plant. The basis of the aerial mapping is the City of Stockton horizontal control datum tied to NAD 83 and the NAVD 1988 vertical datum. The flood elevation data was obtained from Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) updated effectively in October of 2009. The current FEMA-FIRM information is based on NAVD 1988 elevation data and is therefore compatible with the SEI topography map prepared I March of 2011. The current 2009 FEMA-FIRM information is the basis for the elevation information included in this analysis. The studies prepared by KSN and KLN-GEO were both considered and incorporated in this analysis including the analysis of the Facility intake manifold system which was mentioned in the KLN-GEO presentation. This analysis does not address changes in flood elevations due to potential changes in sea level resulting from climate change.

Flood Protection Discussion

The Facility is divided into two distinct areas for the purposes of this analysis. The areas encompassing the tertiary treatment plant and the ponds lying southerly and westerly of the San Joaquin River and south of Burns Cutoff are susceptible to flooding from a break in the San Joaquin River levee and other levee systems lying south of the MUD treatment

plant. The tertiary treatment plant and the ponds are separated from the MUD main plant by the San Joaquin River. The main treatment plant may be susceptible to flooding coming from the area easterly of the main plant and from a levee break of the San Joaquin River.

Both areas are adjacent to the San Joaquin River and are protected by the levees containing the river. The levees along the San Joaquin River and Burns Cutoff currently provide adequate height to protect all areas of the Facility from a 100 year storm event in the river and cutoff. The levees however must be further analyzed and strengthened if necessary to provide an adequate level of safety. The observation, inspection, and analysis of these levees must be ongoing and on a regularly scheduled basis.

Tertiary Plant and Ponds Southerly and Westerly of the San Joaquin River and Burns Cutoff

The tertiary plant and the ponds are threatened by flooding from the south and west. The base flood elevation as published by the FEMA-FIRM is an elevation of 9.0 NAVD 1988 (See Attachment "A"). The existing external levee elevations on the southerly and westerly boundary of site range from 9.2 to 12.2. The previous studies contained alternatives including the construction of flood walls or the reconstruction of the levees surrounding the tertiary plant and the ponds. The KSN analysis indicated improvement to the exterior levee system on the south (adjacent to State Route 4) and west (adjacent to South Dagget Road) perimeter while the KLN-GEO presentation indicated the potential of improving the levees adjacent to the Atchison Topeka and Santa Fe Rail Road that bisects the plant. The studies identified in both analyses could theoretically provide the flood safety required.

We recommend that an additional alternative be considered that we believe could save substantially on the cost of the project. The description of the proposed alternative is as follows with schematic cross sections of the proposed alternative located in Attachment "D":

- Limit the work to the southern perimeter along State Hwy 4 and the western perimeter along South Dagget Road. The levees along this perimeter should be heightened to an elevation of 12 to provide 3 feet of freeboard from the 100 year flood event.

- Work should be concentrated on the exterior face of the levee which is well within the existing boundary fence and minimizes the disruption to plant operations.

- The area under the proposed levee footprint expansion should be cleared of all vegetation, scarified, and recompacted as directed by the geotechnical engineer.

- Soil should be placed starting at the toe of the levee expansion and compacted under the supervision and testing of the geotechnical engineer.

- Rock slope protection should be placed on the exterior slope of the levee and keyed into the existing ground (See Site Plan in Attachment "B" and Attachment "D" for Cross Sections). The rock slope protection will serve as protection against wave motion in storm events and minimize operation and maintenance cost associated with the levee.

- Analysis should be completed on the proposed levee geometry and design and a cement or Bentonite slurry wall should be constructed as part of the levee improvement if required by the geotechnical investigation.

- The top surface of the newly constructed levee could be paved with asphalt concrete paving or with geotextile fabric and a Class II aggregate base surface.

- The area within the railroad right of way along the western perimeter along South Dagget Road should be improved with a levee constructed as previously detailed (see Attachment "C" and Sections "N" and "O"). The construction of levees in these areas will eliminate the need to improve the levees running easterly adjacent to the railroad corridor. This will save time, materials, and money associated with the project.

- Storm drain culverts with flap gates should be installed as necessary to allow drainage to be conveyed under the levees.

- Additional analysis and design must be completed to properly design modifications to the small storm drain ponds and pumps which currently exist north and south of the railroad tracks adjacent to South Dagget Road.

MUD Main Plant Located Easterly and Northerly of the San Joaquin River

The MUD main plant is mapped as Zone X on the FEMA FRIM, meaning it is in an area protected by levees from a "100 year" flood event. The KLN-GEO presentation recommends enhanced flood protection of this site due to the potential economic and environmental damage that would occur in the event of a levee failure. This condition would be caused by levee failures occurring on the adjacent San Joaquin River or the easterly Mormon Slough or Stockton Diverting Canal.

Stockton Municipal Utility District
Regional Wastewater Control Facility
Flood Analysis
Prepared by Siegfried Engineering Inc.
April 25, 2011

In general, flood protection features for this site as recommended by KLN-GEO include strengthening of the San Joaquin River Levee and the construction of flood walls and flood gates around the Facility. These features will provide enhanced flood protection. The following provides for some refinement of these concepts based on new topographical data and updated FIRM's.

The base flood elevation in the Stockton Deep Water Channel is elevation 10, NAVD 1988 (as shown on Attachment "A"). A majority of the main plant is at or above elevation 10. The actual height of the proposed flood wall will require further analysis of potential water surface elevations, wave run-up projections and erosion adjacent to flood walls. For the purposes of this analysis, we have assumed a minimum flood wall height of 12.0.

Attachments "E" and "F" schematically detail improvements required to achieve an elevation of 12.0. We recommend that a grading, roadway, and site improvements be utilized wherever possible to provide flood protection. Avoidance of the use of mechanical gates or barricades to provide flood protection will save money involved in operation and maintenance of the facilities as well as the possibility of the occurrence of a mechanical failure to the gate or barricade. Attachment "F" provides a schematic detail of a roadway improvement that could avoid the use of gates or barricades. Additional Facility improvements to the site including the addition of building and other facilities may require revision to the schematic plan. The work schematically shown in Attachments "E" and "F" are similar to the KLN-GEO presentation, but provide for grading and site improvements that could eliminate the need for mechanical gates.

Recommendations

The next steps in moving forward with the flood protection project should consist of a more detailed feasibility study including:

- Preparation of a geotechnical analysis, investigation, and report for determining the detailed requirements for the proposed flood improvements. This work would also include geotechnical recommendations for construction of walls, levees and other flood protection features required to further develop the design concepts.

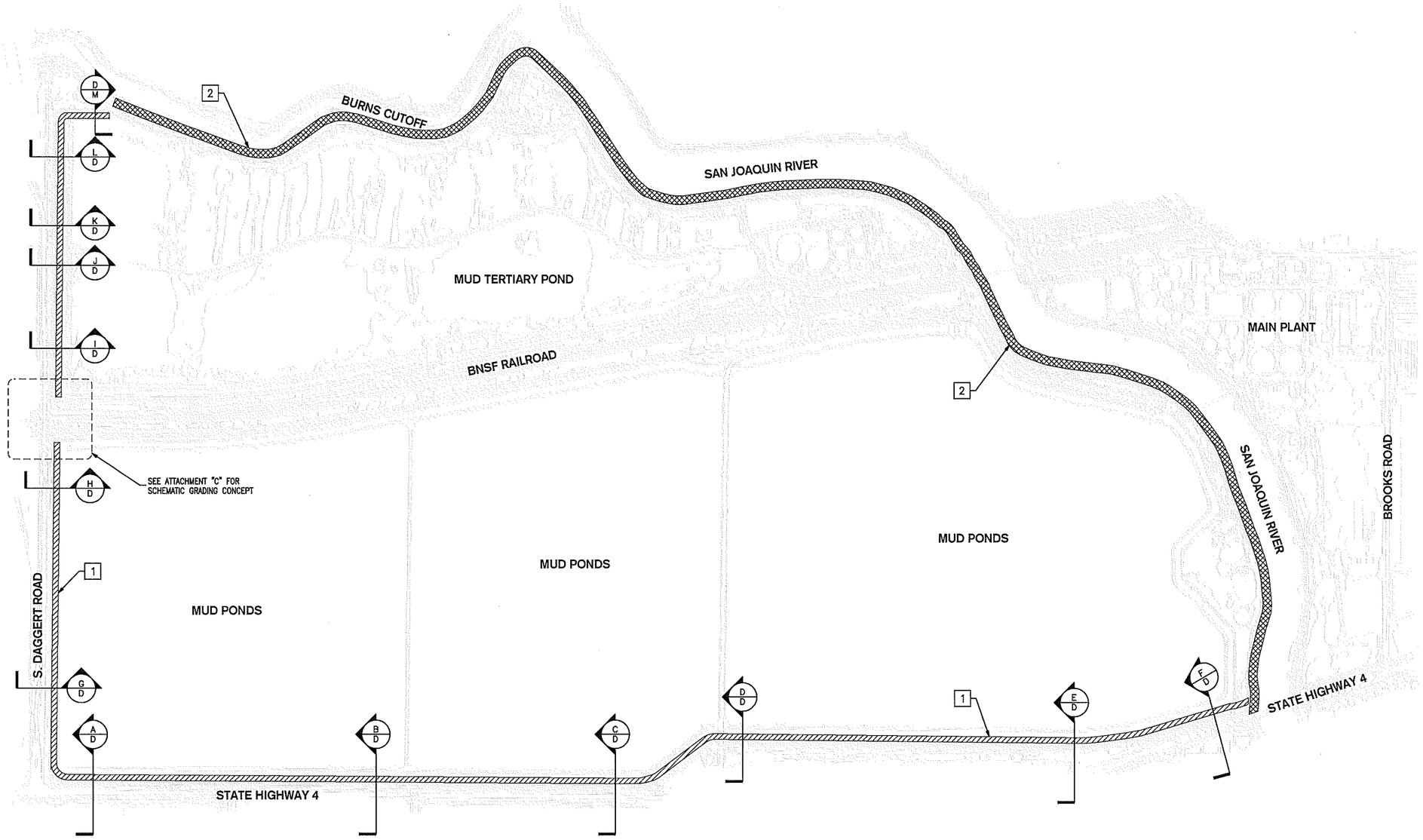
- Preparation of additional hydrology and hydraulic analysis of the main plant area and validation of the flood elevations in Zone X as discussed in this analysis.

- Preparation and further development of the design concepts. This will include collection of the utility plans and maps for the areas affected by the proposed

flood protection improvements and the preliminary design of improvements around the utilities including but not limited to the Facilities Influent Manifold.

- Preparation of a cost/feasibility analysis of the proposed improvements based on the further developed design concepts.

BASED ON NAVD 1988 DATUM



LEGEND:

POTENTIAL SAN JOAQUIN RIVER LEVEE IMPROVEMENTS BASED ON ADDITIONAL GEOTECHNICAL ANALYSIS AND INVESTIGATION

STATE HIGHWAY 4 AND SOUTH DAGGET ROAD PERIMETER LEVEE IMPROVEMENTS BASED ON ADDITIONAL GEOTECHNICAL ANALYSIS AND INVESTIGATION

A — SECTION IDENTIFIER
D — ATTACHMENT IDENTIFIER

NOTES:

1. CONSTRUCT EXTERIOR LEVEE IMPROVEMENTS SEE SECTION 'A' THRU 'O' IN ATTACHMENT "D" WITH ACTUAL DESIGN BASED ON ADDITIONAL GEOTECHNICAL ANALYSIS AND INVESTIGATION
2. CONSTRUCT SAN JOAQUIN RIVER LEVEE IMPROVEMENTS WITH ACTUAL DESIGN BASED ON ADDITIONAL GEOTECHNICAL ANALYSIS AND INVESTIGATION

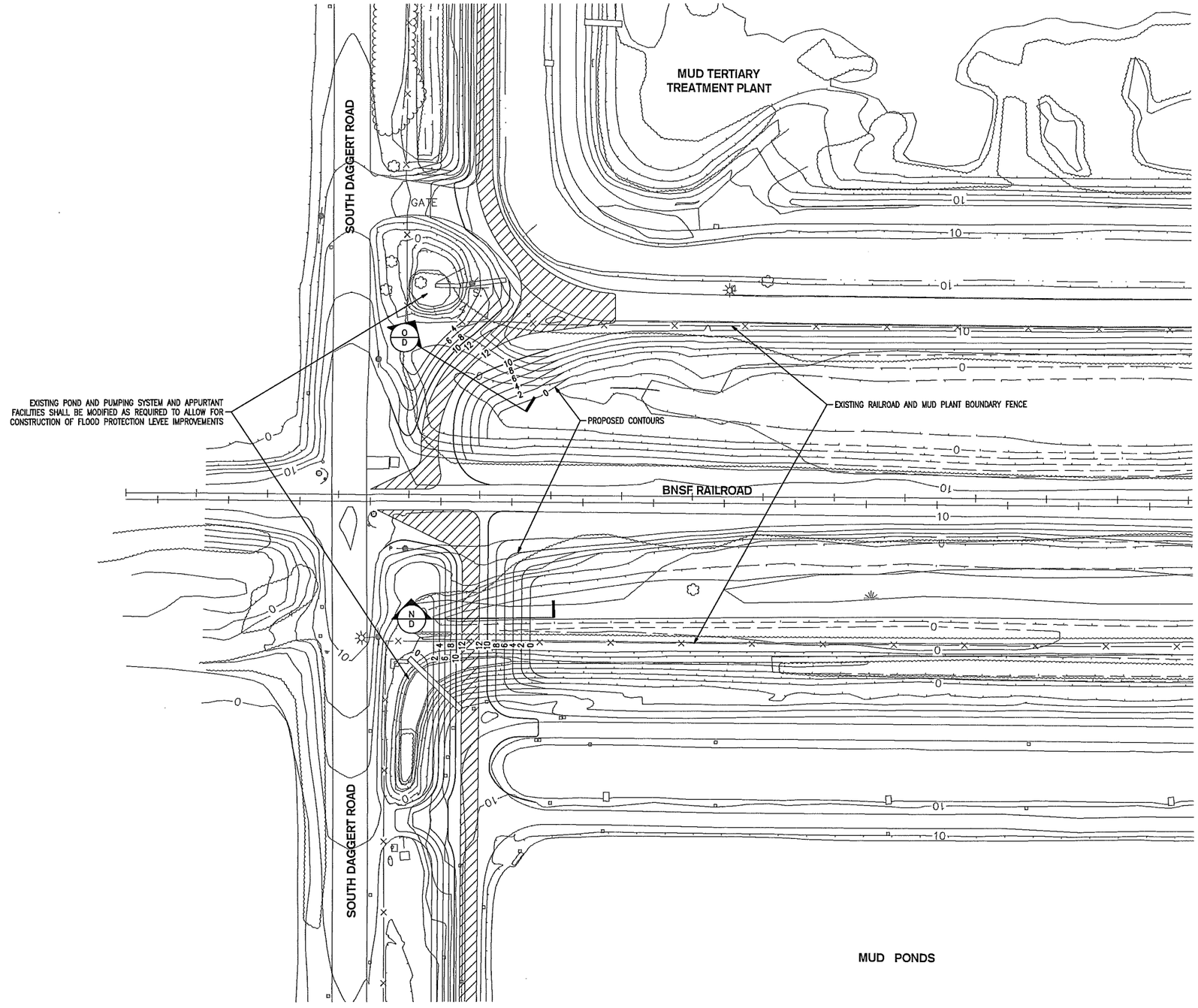
0' 400' 800'
SCALE: 1"=400'

ATTACHMENT "B" - STOCKTON MUD TERTIARY PLANT AND PONDS FLOOD PROTECTION EXHIBIT

Stockton, California

SIEGFRIED
CIVIL ENGINEERING
STRUCTURAL ENGINEERING
SURVEYING
PLANNING
3244 Brookside Road, Suite 100 Stockton, California 95219
209-943-2021 www.siegfriedeng.com Fx: 209-942-0214

April 25, 2011



BASED ON NAVD 1988 DATUM

LEGEND:

SOUTH DAGGET ROAD PERIMETER LEVEE IMPROVEMENTS BASED ON ADDITIONAL GEOTECHNICAL ANALYSIS AND INVESTIGATION

A / D — SECTION IDENTIFIER / ATTACHMENT IDENTIFIER

0' 20' 40' 80'

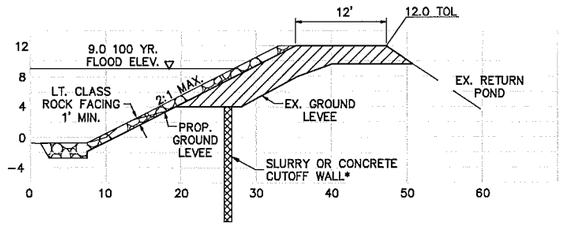
SCALE: 1"=40'

ATTACHMENT "C" - STOCKTON MUD BNSF RAILROAD AREA FLOOD PROTECTION EXHIBIT

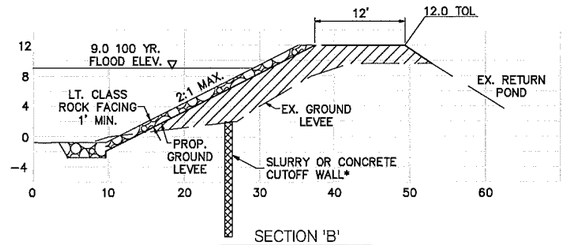
Stockton, California

SIEGFRIED
CIVIL ENGINEERING
STRUCTURAL ENGINEERING
SURVEYING
PLANNING
8244 Brookside Road, Suite 100 Stockton, California 95219
209-943-2021 www.siegfriedeng.com Fx: 209-942-0214

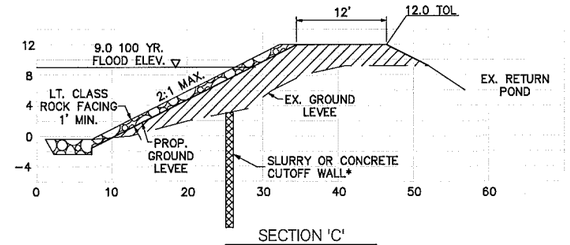
April 26, 2011



SECTION 'A'
SCALE: 1" = 10'



SECTION 'B'
SCALE: 1" = 10'



SECTION 'C'
SCALE: 1" = 10'

BASED ON NAVD 1988 DATUM

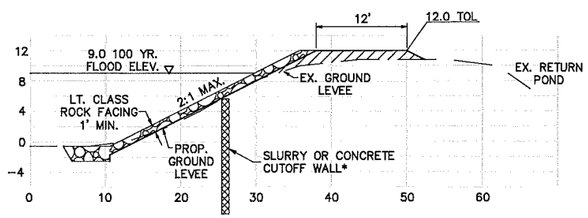
LEGEND:

- LEVEE FILL
- ROCK SLOPE PROTECTION
- POTENTIAL SLURRY WALL

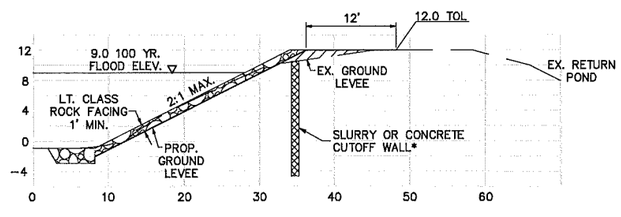
NOTES:

* ACTUAL DEPTH AS SPECIFIED BY THE GEOTECHNICAL ENGINEER.

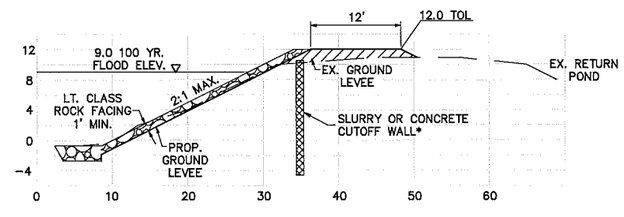
1. PERIMETER LEVEE IMPROVEMENTS SHALL BE BASED ON ADDITIONAL GEOTECHNICAL ANALYSIS AND INVESTIGATION.



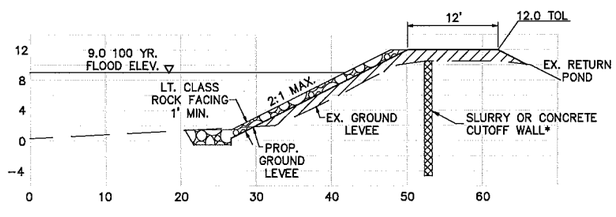
SECTION 'D'
SCALE: 1" = 10'



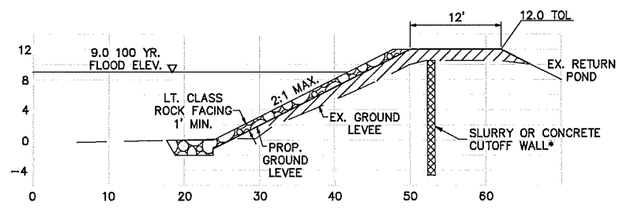
SECTION 'E'
SCALE: 1" = 10'



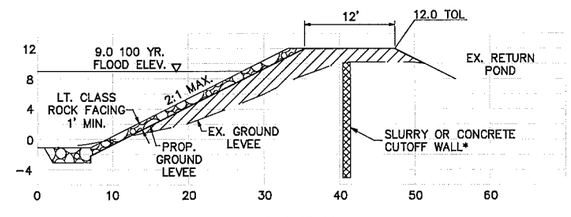
SECTION 'F'
SCALE: 1" = 10'



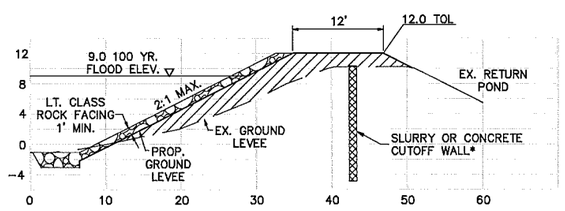
SECTION 'G'
SCALE: 1" = 10'



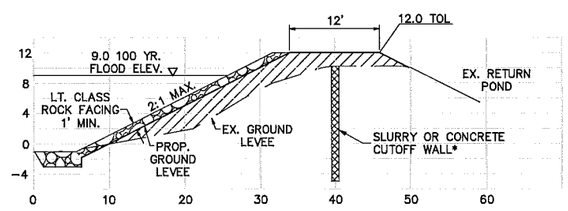
SECTION 'H'
SCALE: 1" = 10'



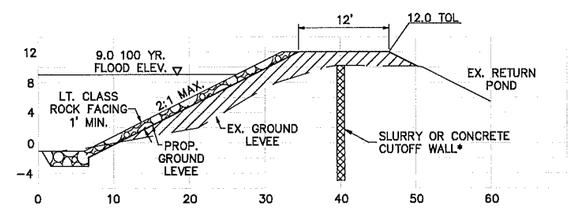
SECTION 'I'
SCALE: 1" = 10'



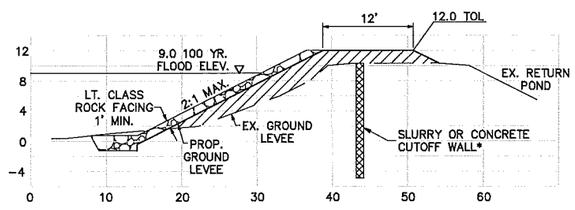
SECTION 'J'
SCALE: 1" = 10'



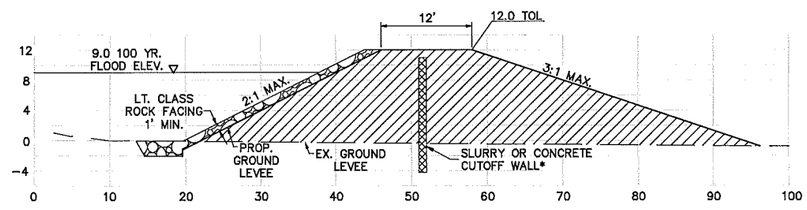
SECTION 'K'
SCALE: 1" = 10'



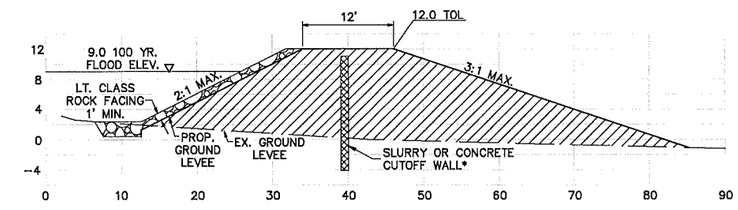
SECTION 'L'
SCALE: 1" = 10'



SECTION 'M'
SCALE: 1" = 10'



SECTION 'N'
SCALE: 1" = 10'



SECTION 'O'
SCALE: 1" = 10'

ATTACHMENT "D" - SECTIONS 'A'-'O'

Stockton, California

SIEGFRIED
CIVIL ENGINEERING
STRUCTURAL ENGINEERING
SURVEYING
PLANNING
3244 Brookside Road, Suite 100 Stockton, California 95219
209-943-2021 www.siegfriedeng.com Fx: 209-942-0214

April 26, 2011

BASED ON NAVD 1988 DATUM

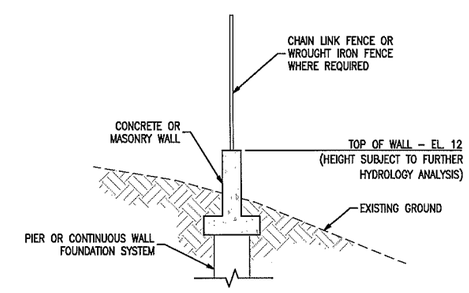
LEGEND:

FLOOD WALL WITH CHAIN LINK FENCE OR WROUGHT IRON FENCE, CONSTRUCT ON TOP OF FLOOD WALL

POTENTIAL SAN JOAQUIN RIVER LEVEE IMPROVEMENTS BASED ON ADDITIONAL GEOTECHNICAL ANALYSIS AND INVESTIGATION

NOTES:

1. CONSTRUCT FLOOD WALL WITH CHAIN LINK FENCE ON TOP PER WALL DETAIL.
2. CONSTRUCT FLOOD WALL PER DETAIL 'A' WITH A WROUGHT IRON FENCE. ALTERNATE IN PLACE OF CHAIN LINK FENCE AS SHOWN IN DETAIL 'A'.
3. CONSTRUCT FLOOD WALL TO AN APPROXIMATE ELEVATION OF 12. FINAL HEIGHT IS SUBJECT TO FURTHER HYDROLOGY ANALYSIS.
4. CONSTRUCT SAN JOAQUIN RIVER LEVEE IMPROVEMENTS AS DIRECTED BY THE GEOTECHNICAL ENGINEER.



(A) FLOOD WALL DETAIL
SCALE: NTS

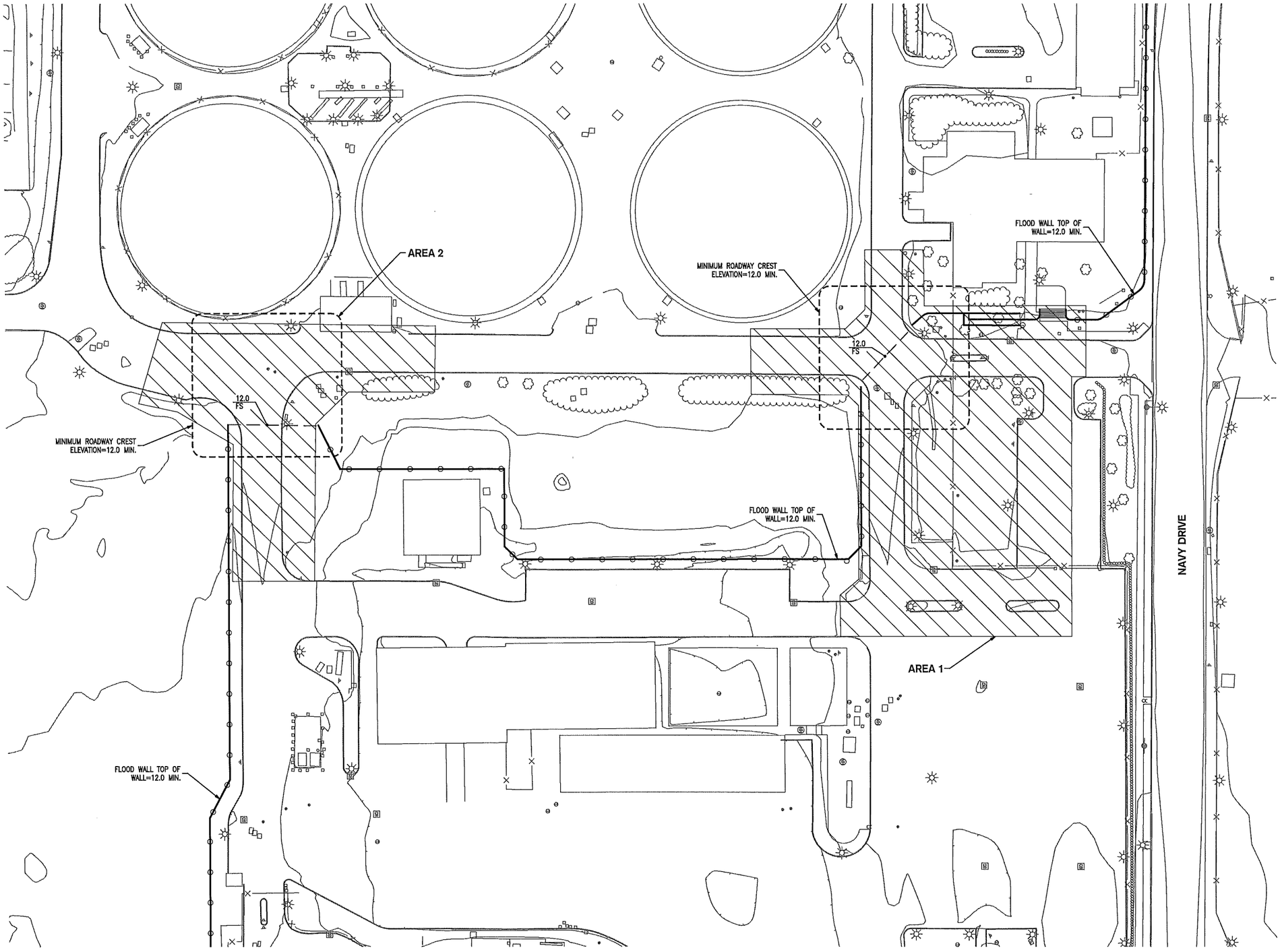
0' 50' 100' 200'
SCALE: 1"=100'

ATTACHMENT "E" - STOCKTON MUD MAIN PLANT SITE PLAN EXHIBIT

Stockton, California

SIEGFRIED
CIVIL ENGINEERING
STRUCTURAL ENGINEERING
SURVEYING
PLANNING
3244 Brookside Road, Suite 100 Stockton, California 95219
209-943-2021 www.siegfriedeng.com Fx: 209-942-0214

April 25, 2011



BASED ON NAVD 1988 DATUM

AREA 1:

MODIFY/RECONSTRUCT:
SURFACE IMPROVEMENTS INCLUDING CURB, GUTTER, SIDEWALK, ROADWAY PAVEMENT, ADA ACCESS RAMPS, PEDESTRIAN STAIRS, LIGHTING, LANDSCAPING, AND APPURTENANT FACILITIES TO PROVIDE ROADWAY CREST ELEVATION IN EXCESS OF 12.0 MINIMUM.

AREA 2:

MODIFY/RECONSTRUCT:
SURFACE IMPROVEMENTS INCLUDING CURB, GUTTER, SIDEWALK, ROADWAY PAVEMENT, LIGHTING, LANDSCAPING, AND APPURTENANT FACILITIES TO PROVIDE ROADWAY CREST ELEVATION IN EXCESS OF 12.0 MINIMUM.

NOTE:

1. CONFORMATION OF ELEVATION 12 IS PENDING FURTHER HYDROLOGY ANALYSIS.

0' 20' 40' 80'
SCALE: 1"=40'

ATTACHMENT "F" - STOCKTON MUD MAIN PLANT GRADING EXHIBIT (NO MECHANICAL GATE)

Stockton, California

SIEGFRIED
CIVIL ENGINEERING
STRUCTURAL ENGINEERING
SURVEYING
PLANNING
3244 Brookside Road, Suite 100 Stockton, California 95219
209-943-2021 www.siegfriedeng.com Fx: 209-942-0214

April 25, 2011

KLEINFELDER • Geomatrix
A Joint Venture Partnership

STOCKTON REGIONAL WASTEWATER CONTROL FACILITY FLOOD PROTECTION PROJECT

KLEINFELDER • Geomatrix
A Joint Venture Partnership

Statement of Problem

- The only wastewater treatment plant for the Stockton area (over 300,000 residents)
- Positioned near minimum mean sea level elevation
- Subject to multiple flooding scenarios
- Flooding would result in major threats to public health, water quality, and Delta ecosystems

KLEINFELDER • Geomatrix
A Joint Venture Partnership

Basic Objectives of Preliminary Draft PIR

- Develop conceptual designs of measures that would reduce flood hazards at wastewater treatment plant facility.

KLEINFELDER • Geomatrix
A Joint Venture Partnership

Team Considered:

- Floodwall around the plant site
- Fixes to the tertiary pond levees
- Rehabilitation of the river levees near the facility

KLEINFELDER • Geomatrix
A Joint Venture Partnership

Scope of the PIR Study

- Make site visit - performed December 12, 2008
- Collect available information - provided February, 2009
- Review information – completed February, 2009
- Develop conceptual designs and cost estimates for alternatives - ongoing
- Prepare Preliminary Draft PIR – ongoing

KLEINFELDER • Geomatrix
A Joint Venture Partnership

Purpose of this Meeting:

- To present conceptual designs developed to date
- Receive feedback on conceptual designs
- Brainstorm alternatives and discuss advantages/disadvantages
- Choose design alternatives to carry forward through PIR development
- Discuss additional data needs/unknowns

KLEINFELDER • Geomatrix
A Joint-Venture Partnership

Major Assumptions

- Flood water at elevation 10 feet (NAVD 29)
- Subsurface conditions similar to those encountered in previous borings (only 6 borings and 3 CPTs go to 50 feet or deeper)
- Site topography unchanged from available maps

Basic Criteria

- Locations of major underground infrastructure considered in design
- Minor underground infrastructure can be relocated
- Avoid concepts with major demolition/plant disruption

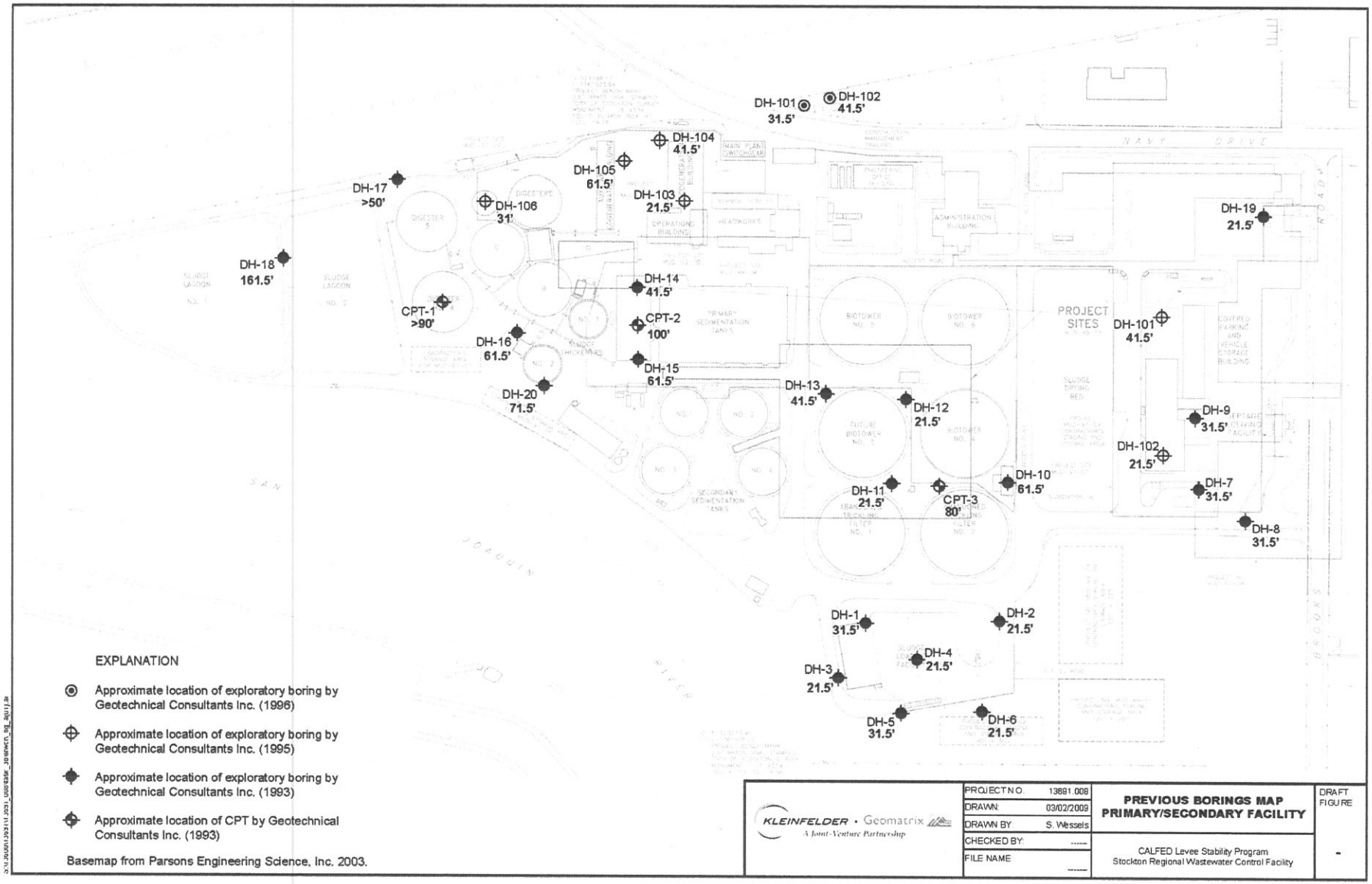
KLEINFELDER • Geomatrix
A Joint Venture Partnership

Plant Site

- Site elevations vary from about -2 to 13 feet (NAVD 29)

KLEINFELDER • Geomatrix
A Joint-Venture Partnership

Locations of Previous Borings



KLEINFELDER • Geomatrix
A Joint Venture Partnership

Representative Log

LOG OF DRILL HOLE

JOB NO.: SF93015
PROJECT: Stockton RWCF Expansion
LOCATION:
DRILLING METHOD: Rotary Wash

LOGGED BY: V. Thilakaratne
CHECKED BY: T. Huber

DRILL HOLE NO.: 16
DRILLING DATE: July 21, 1993
ELEVATION: 9 feet
DATUM:

DEPTH (FEET)	SAMPLE	BLOW COUNT	TORVANE SHEAR STRENGTH (PSF)	POCKET PENETROMETER COMP. STRENGTH (TSF)	PHOTOVAC TIP READING (PPM)	GRAPHIC LOG	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT (%)	ATTERBERG LIMITS: PLASTIC LIMIT (%)	UNCONFINED SHEAR STRENGTH (PSF)	ADDITIONAL TESTS
		37					SANDY LEAN CLAY (CL) with gravel, brown, damp, medium stiff (fill).	115	19	35	21		
		8		2.0			Becoming sandy at 4 feet. Dark brown, damp, very stiff, not sandy.						
							Streaks of sand at 8 1/2 feet.						
10							Pieces of concrete, wood fragments. Concrete, from 8 1/2 to 13 feet (fill).						
		37		1.5			LEAN CLAY (CL) gray-brown, moist, stiff.	98	28			1000	
20		14					Yellowish-brown, medium stiff to soft.						
		42		2.8			With dark brown streaks, very stiff.	98	26				
30		62					CLAYEY SAND (SC) brown with dark brown mottling, moist, very dense, fine grained sand.	104	23				
		43		2.5 3.0			LEAN TO FAT CLAY (CL/CH) green-gray, moist, very stiff.	96	28				
40		47					POORLY GRADED SAND (SP) green-gray, wet, dense, medium grained sand, some 1/4" thick clay seams.						
		21					SILTY SAND (SM) green-gray, wet, medium dense, fine grained sand, very silty.						
50		76					POORLY GRADED SAND (SP) green-gray, wet, very dense, medium grained sand.						
							SILTY SAND (SM) green-gray, wet, very dense, fine grained sand.						

SHEET 1 of 2

LEGEND TO LOGS ON PLATE A-2

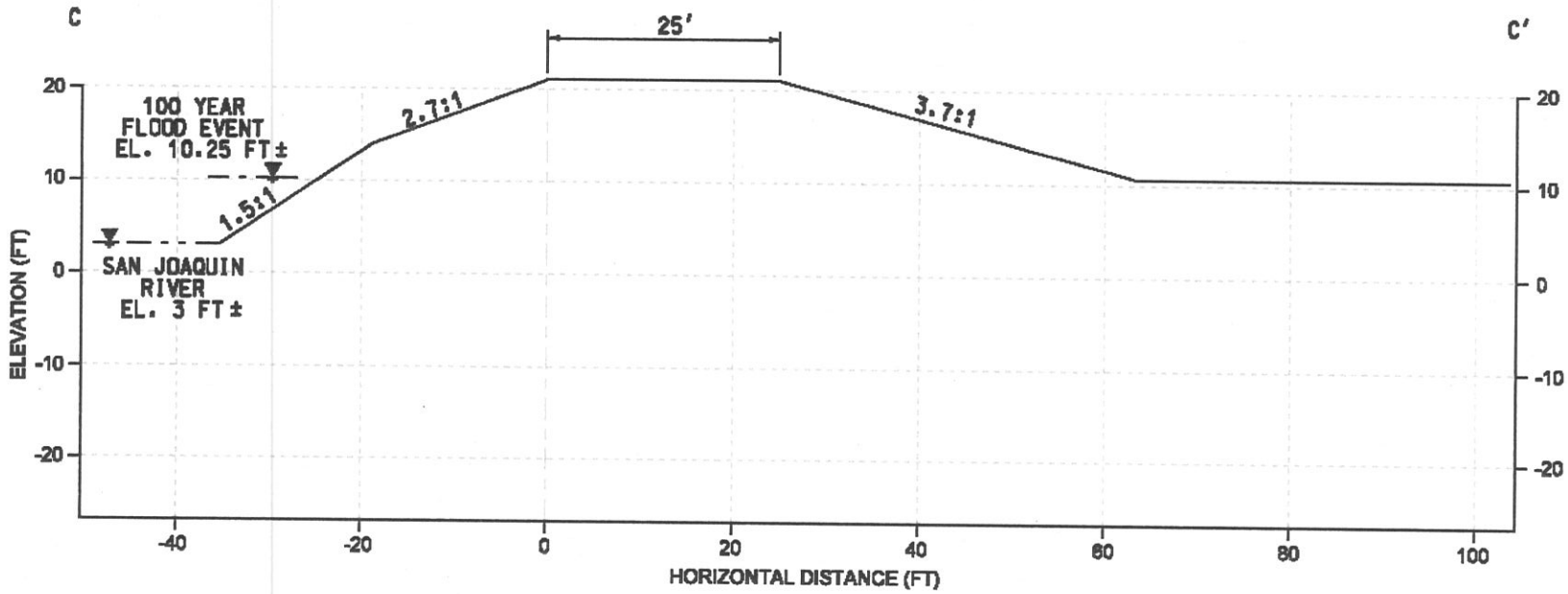
PLATE A-1.16

KLEINFELDER • Geomatrix
A Joint Venture Partnership

Existing Levee Conditions

KLEINFELDER • Geomatrix
A Joint Venture Partnership

Existing Levee Conditions



SECTION C-C'

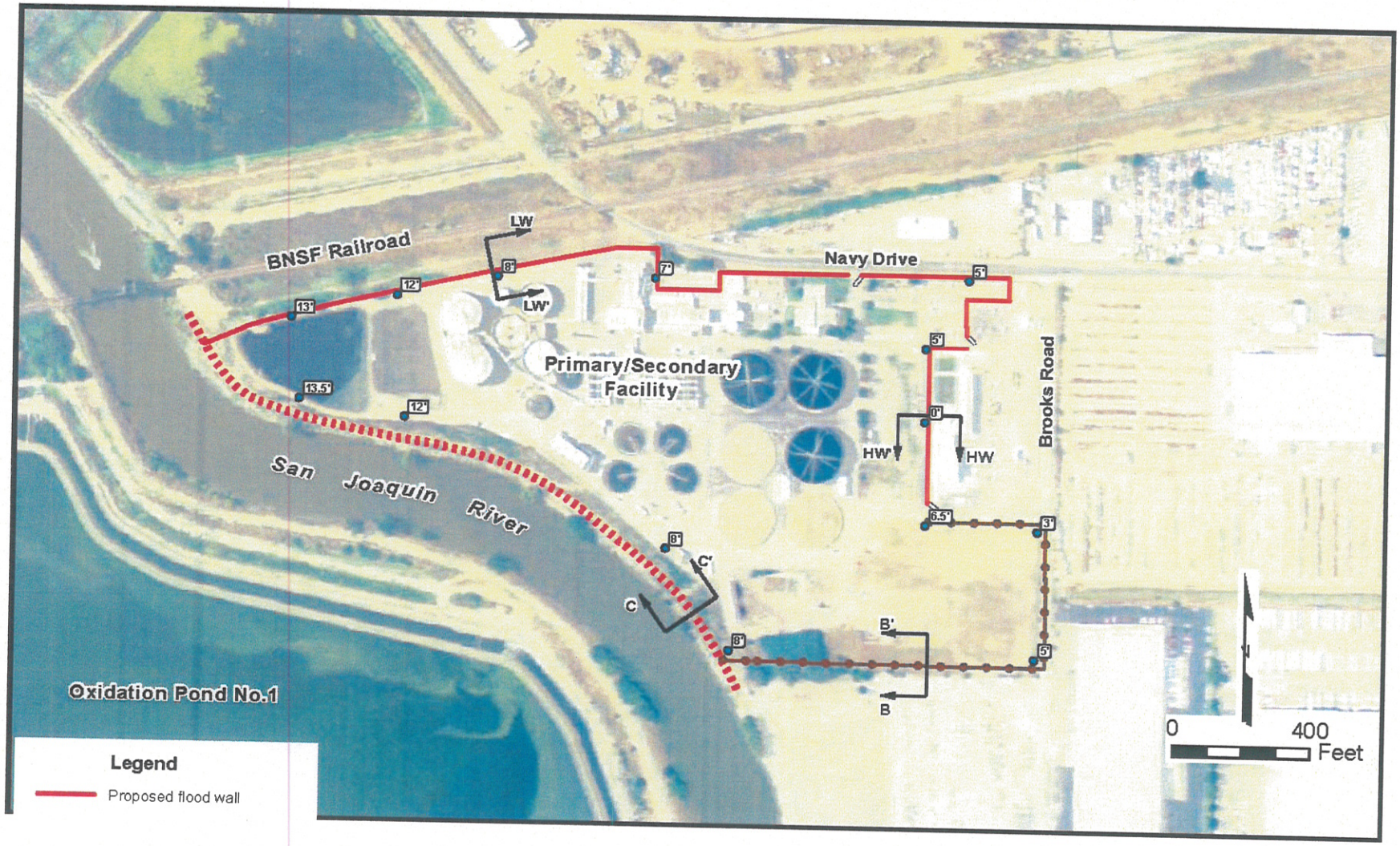
NOTES:

1. CROSS SECTION CREATED FROM TOPOGRAPHY FROM ENGINEERING SCIENCE PLANS, 1998.
2. 100 YEAR FLOOD EVENT ELEVATION IS APPROXIMATE AND WAS OBTAINED FROM DATA IN THE USACE 1992 REPORT ON DELTA HYDROLOGY.

KLEINFELDER • Geomatrix
A Joint Venture Partnership

Conceptual Design of Flood Protection Measures

- Plan of measures



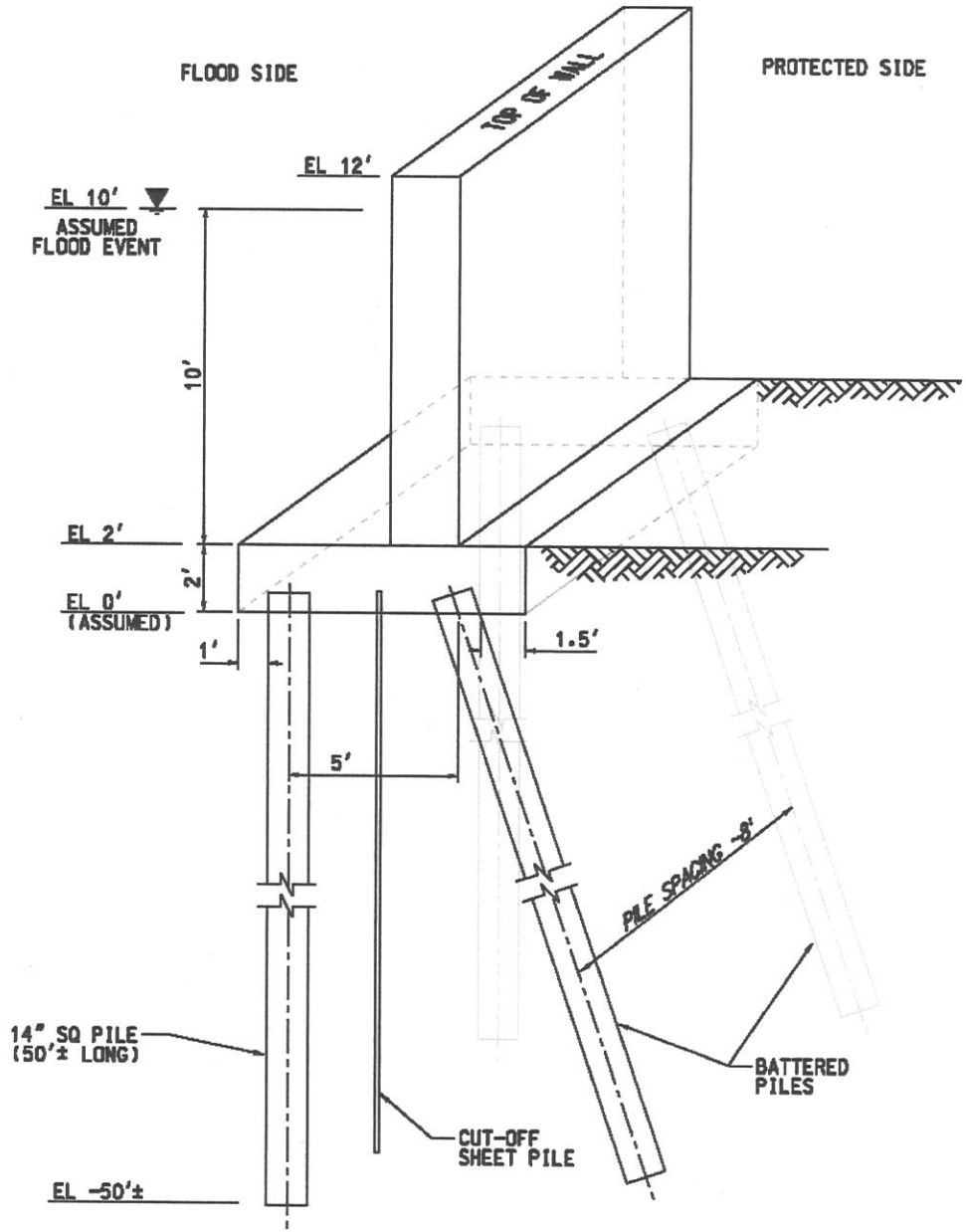
KLEINFELDER • Geomatrix
A Joint Venture Partnership

High Wall

KLEINFELDER • Geomatrix
A Joint Venture Partnership

Conceptual Design Floodwalls

- High Wall



SECTION HW-HW'

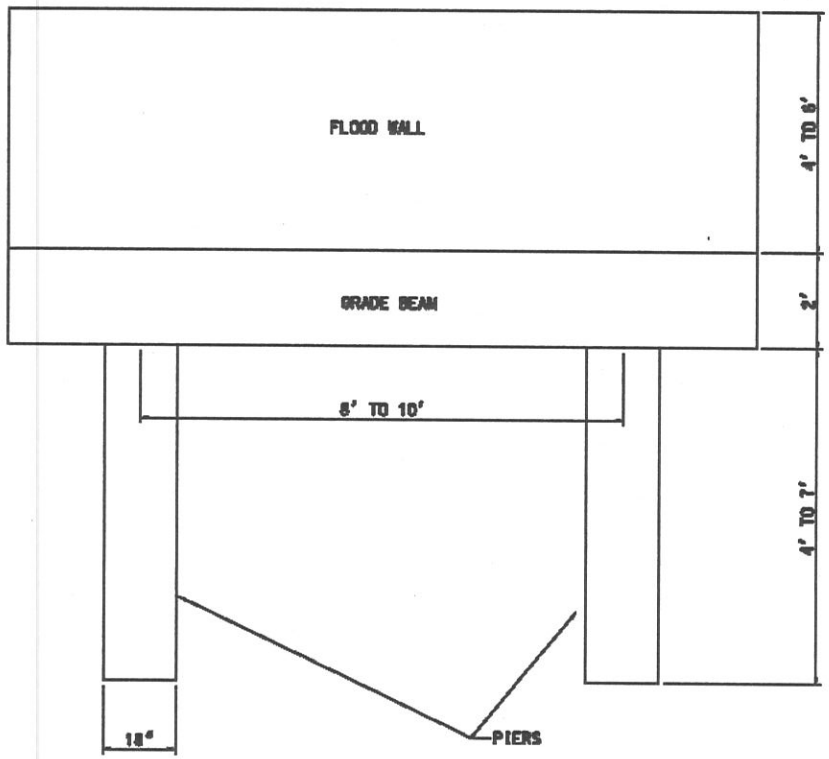
KLEINFELDER • Geomatrix
A Joint-Venture Partnership

Low Wall

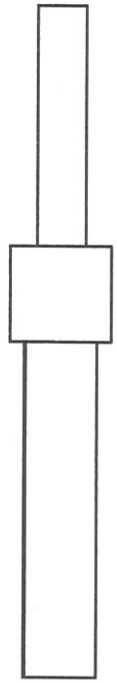
KLEINFELDER • Geomatrix
A Joint Venture Partnership

Conceptual Design Floodwalls

- Low wall



ELEVATION VIEW



SECTION LW-LW'

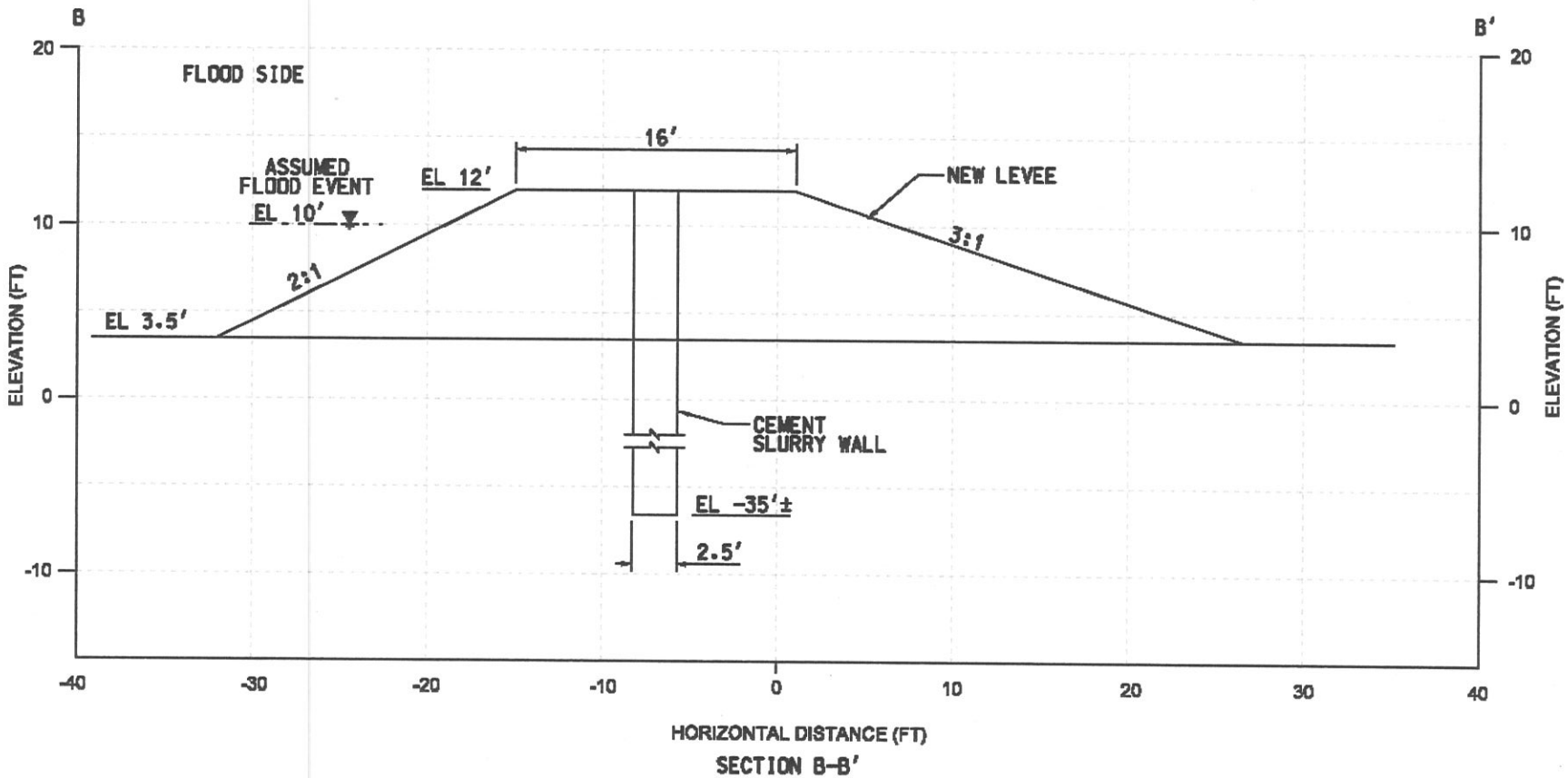
KLEINFELDER • Geomatrix
A Joint Venture Partnership

New Levee

KLEINFELDER • Geomatrix
A Joint Venture Partnership

Levees

- New levee

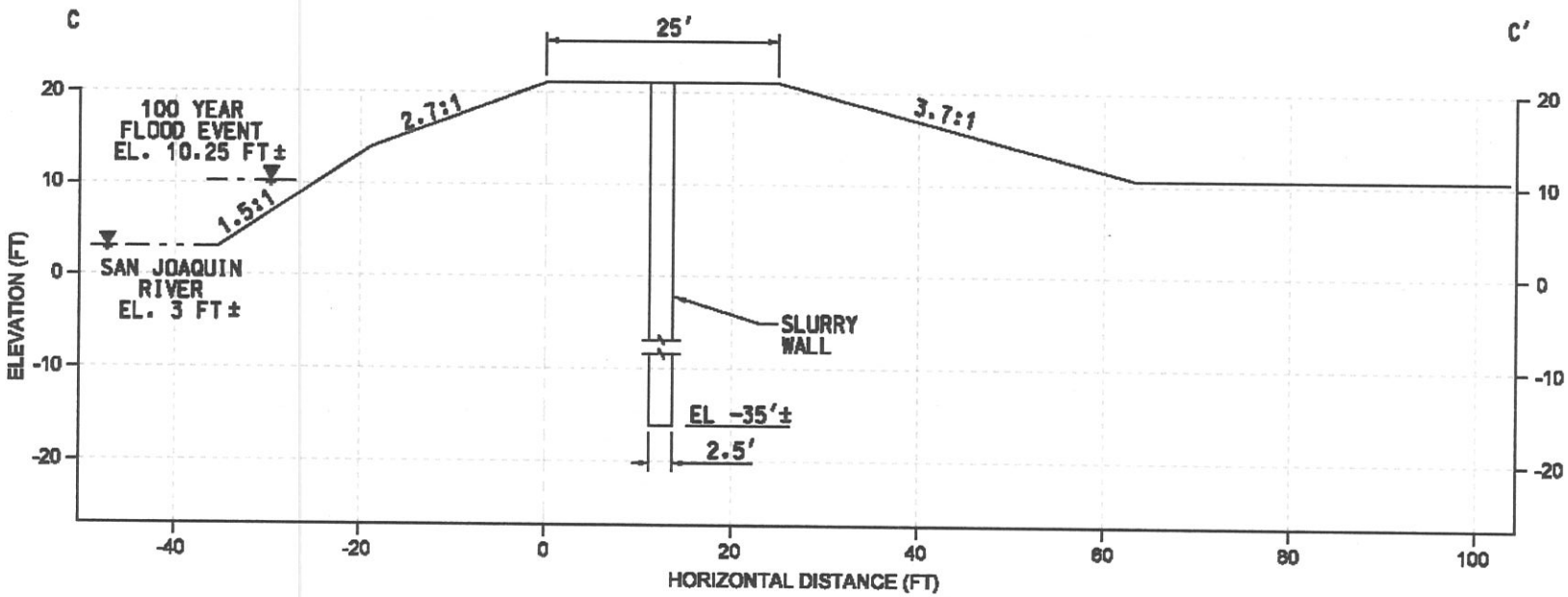


NOTE:

1. ASSUMING AN AVERAGE GROUND SURFACE ELEVATION OF ABOUT 3.5 FEET.

KLEINFELDER • Geomatrix
A Joint Venture Partnership

Improve Existing Levee



SECTION C-C'

NOTES:

1. CROSS SECTION CREATED FROM TOPOGRAPHY FROM ENGINEERING SCIENCE PLANS, 1998.
2. 100 YEAR FLOOD EVENT ELEVATION IS APPROXIMATE AND WAS OBTAINED FROM DATA IN THE USACE 1992 REPORT ON DELTA HYDROLOGY.

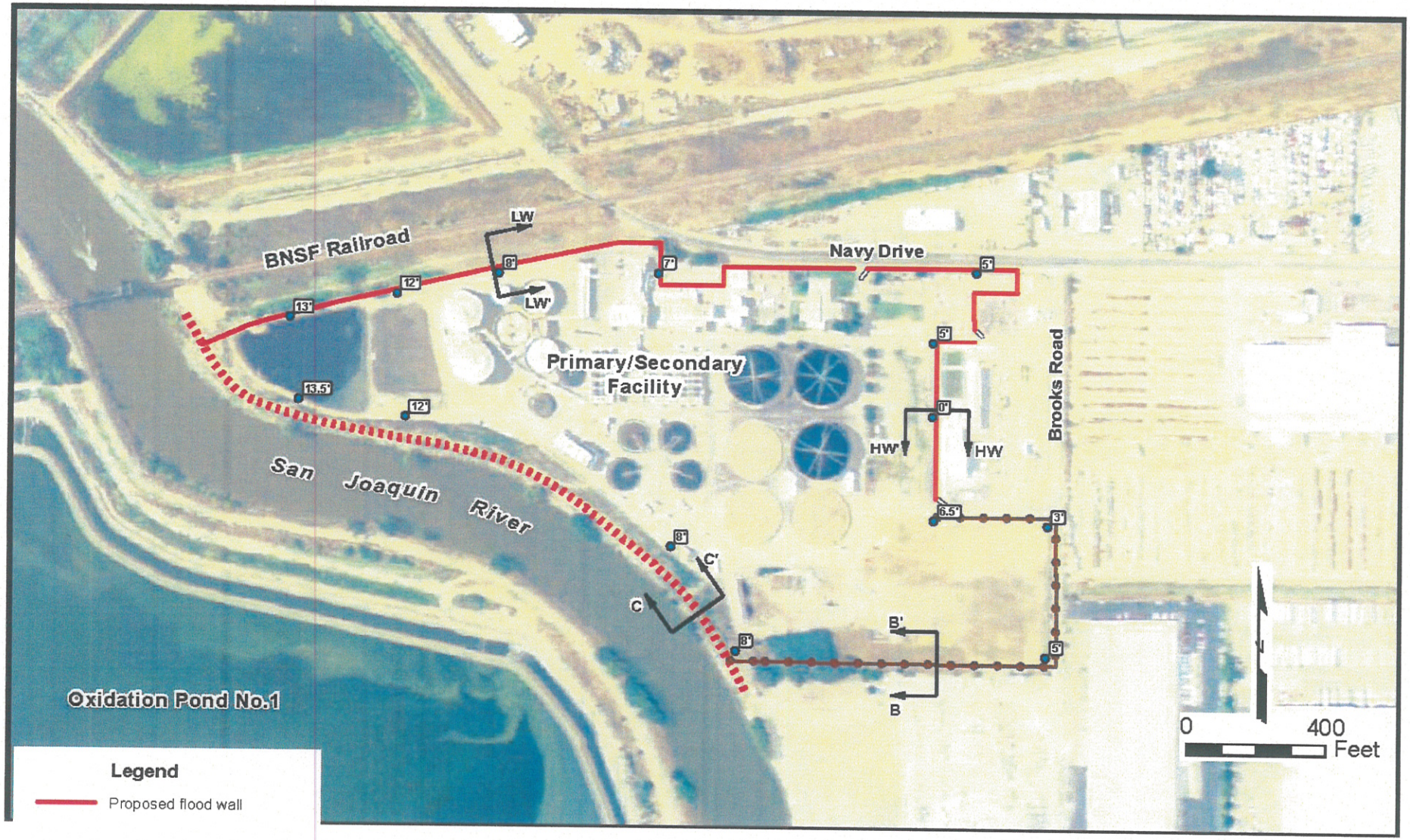
KLEINFELDER • Geomatrix
A Joint Venture Partnership

Significant Issues

- Influent manifold could cause internal flooding
- No control of influent to plant
- All subsurface penetrations must be identified and mitigated
- Utilities must be relocated
- Limited room in some areas

KLEINFELDER • Geomatrix
A Joint-Venture Partnership

Influent Manifold

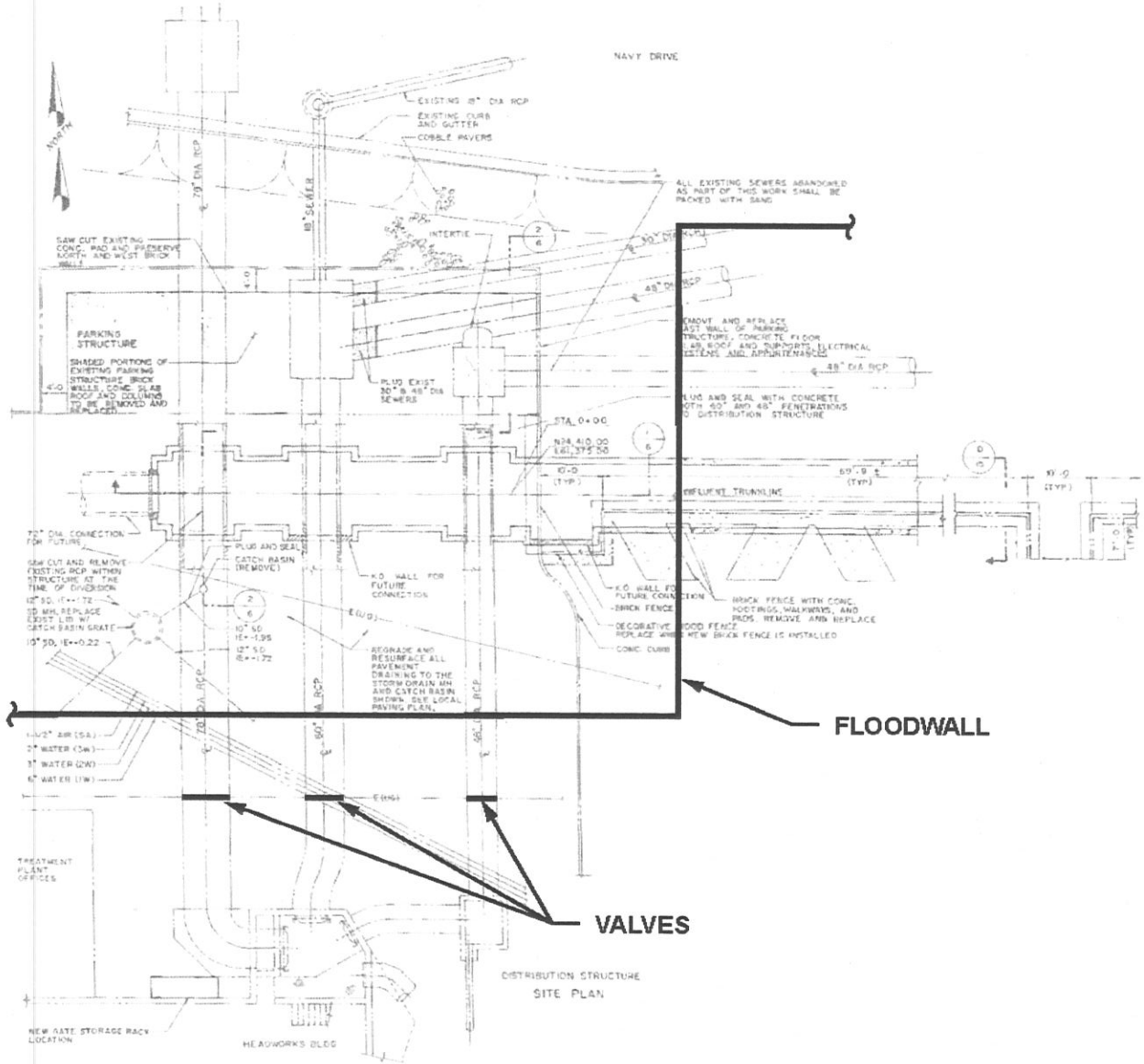


KLEINFELDER • Geomatrix
A Joint-Venture Partnership

Influent Manifold

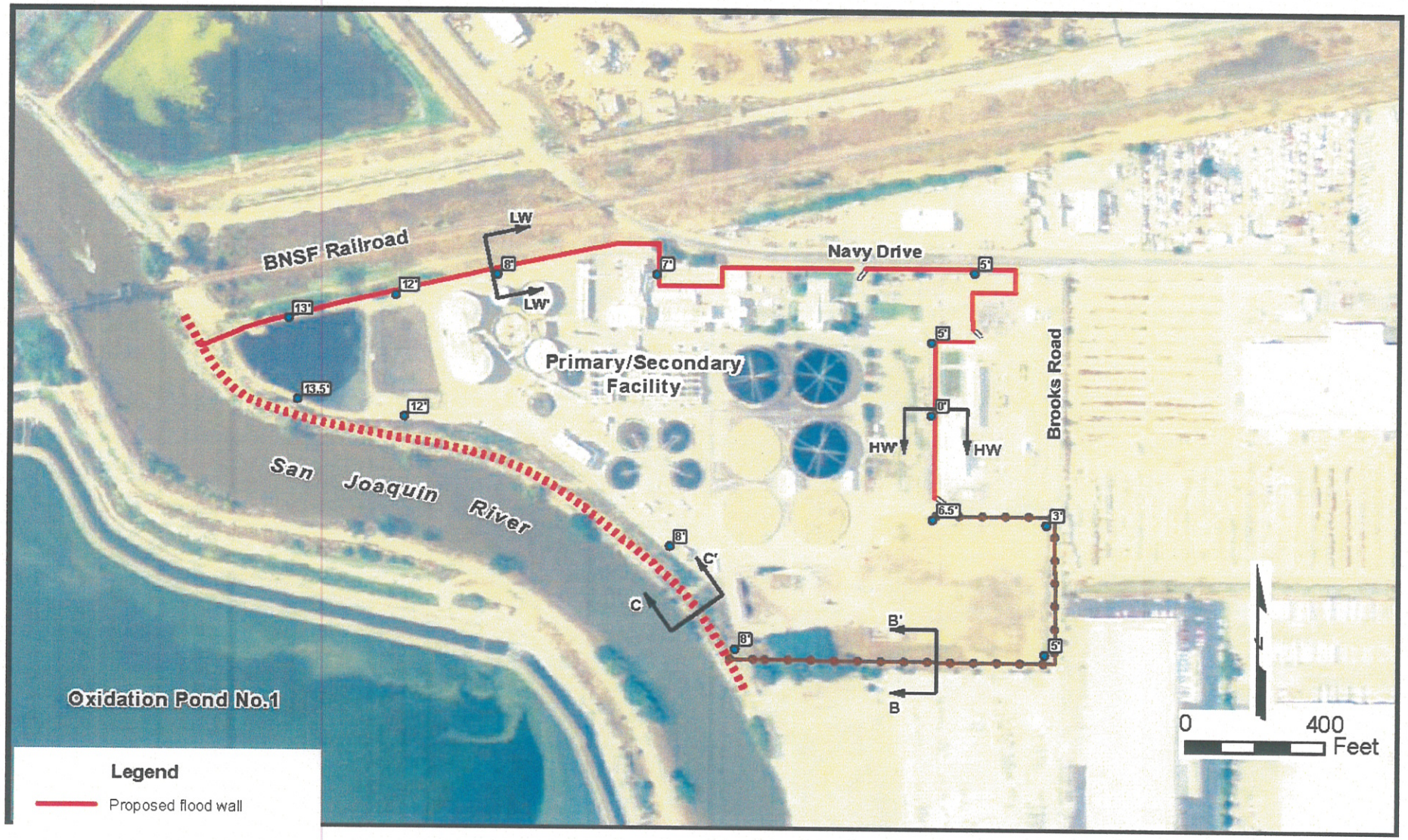
KLEINFELDER • Geomatrix
A Joint Venture Partnership

Influent Manifold



KLEINFELDER • Geomatrix
A Joint-Venture Partnership

Influent Manifold

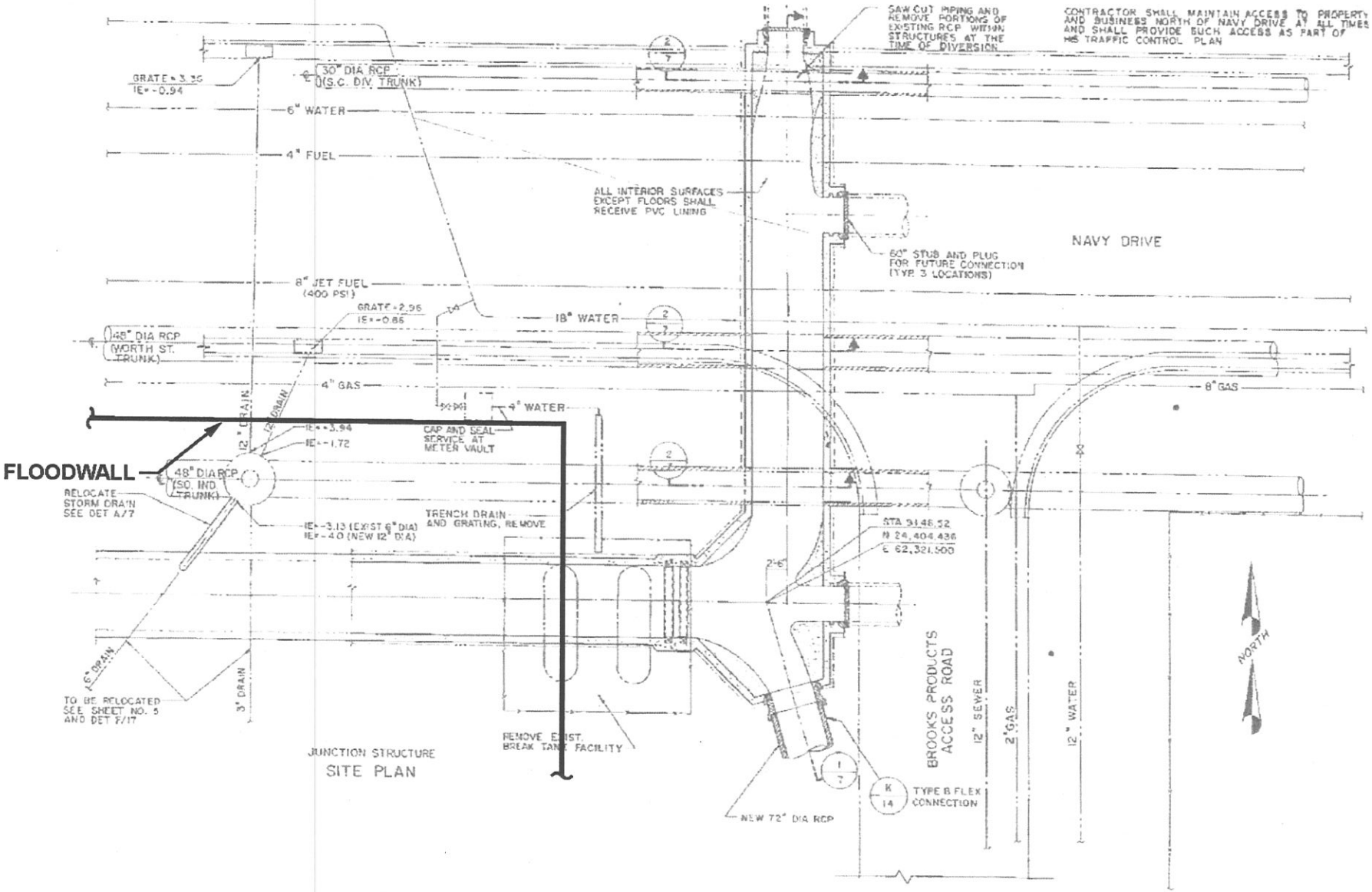


KLEINFELDER • Geomatrix
A Joint-Venture Partnership

Influent Manifold

KLEINFELDER • Geomatrix
A Joint-Venture Partnership

Influent Manifold



KLEINFELDER • Geomatrix
A Joint Venture Partnership

Tertiary Ponds

- Crest elevation of levees – 8 feet

KLEINFELDER • Geomatrix
A Joint-Venture Partnership

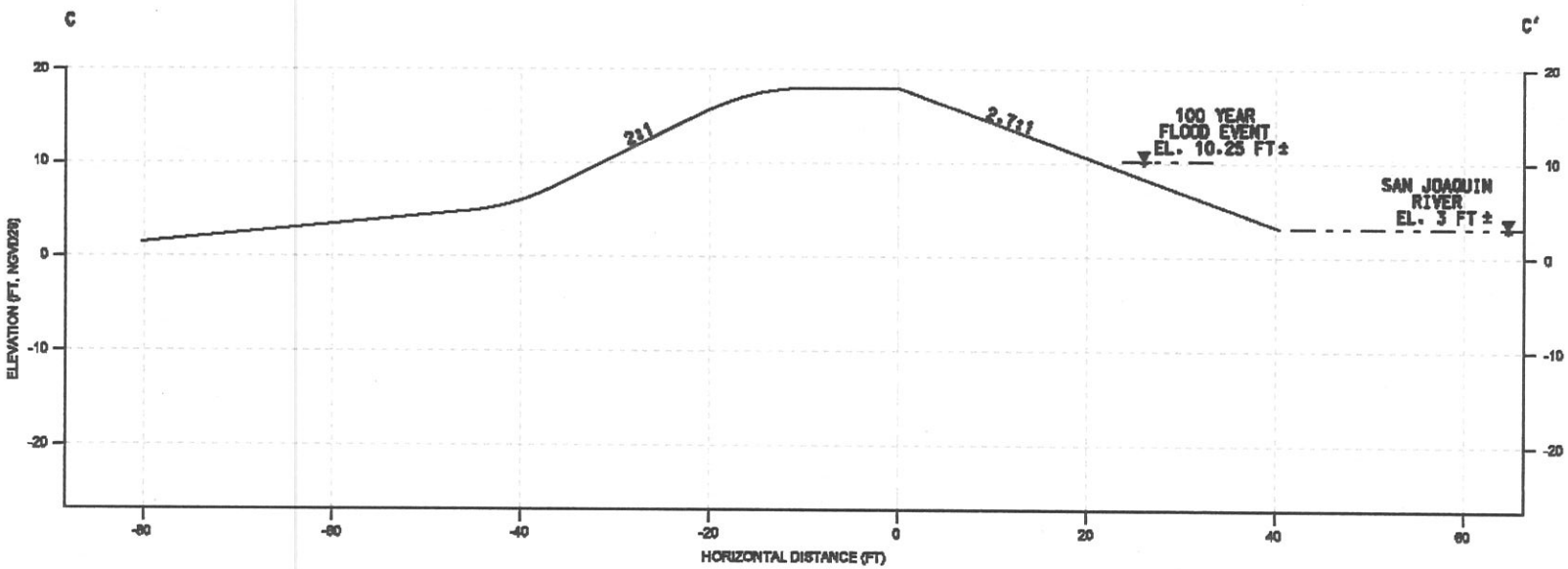
Existing Levees

- San Joaquin

KLEINFELDER • Geomatrix
A Joint Venture Partnership

Condition of Existing Levees

- San Joaquin



SECTION C-C'

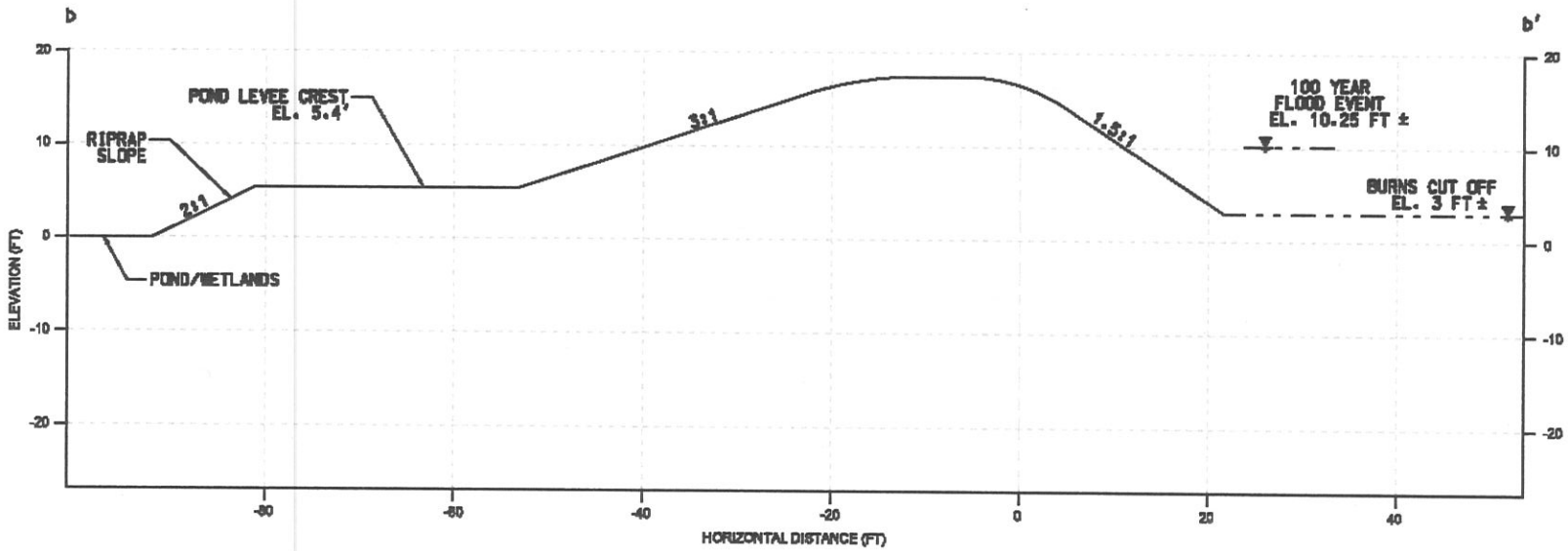
NOTES:

1. CROSS SECTION CREATED FROM TOPOGRAPHY FROM ENGINEERING SCIENCE PLANS. 1968.
2. 100 YEAR FLOOD EVENT IS APPROXIMATE AND WAS OBTAINED FROM DATA IN THE USACE 1992 REPORT ON DELTA HYDROLOGY.

KLEINFELDER • Geomatrix
A Joint-Venture Partnership

Condition of Existing Levees

- Burns Cutoff



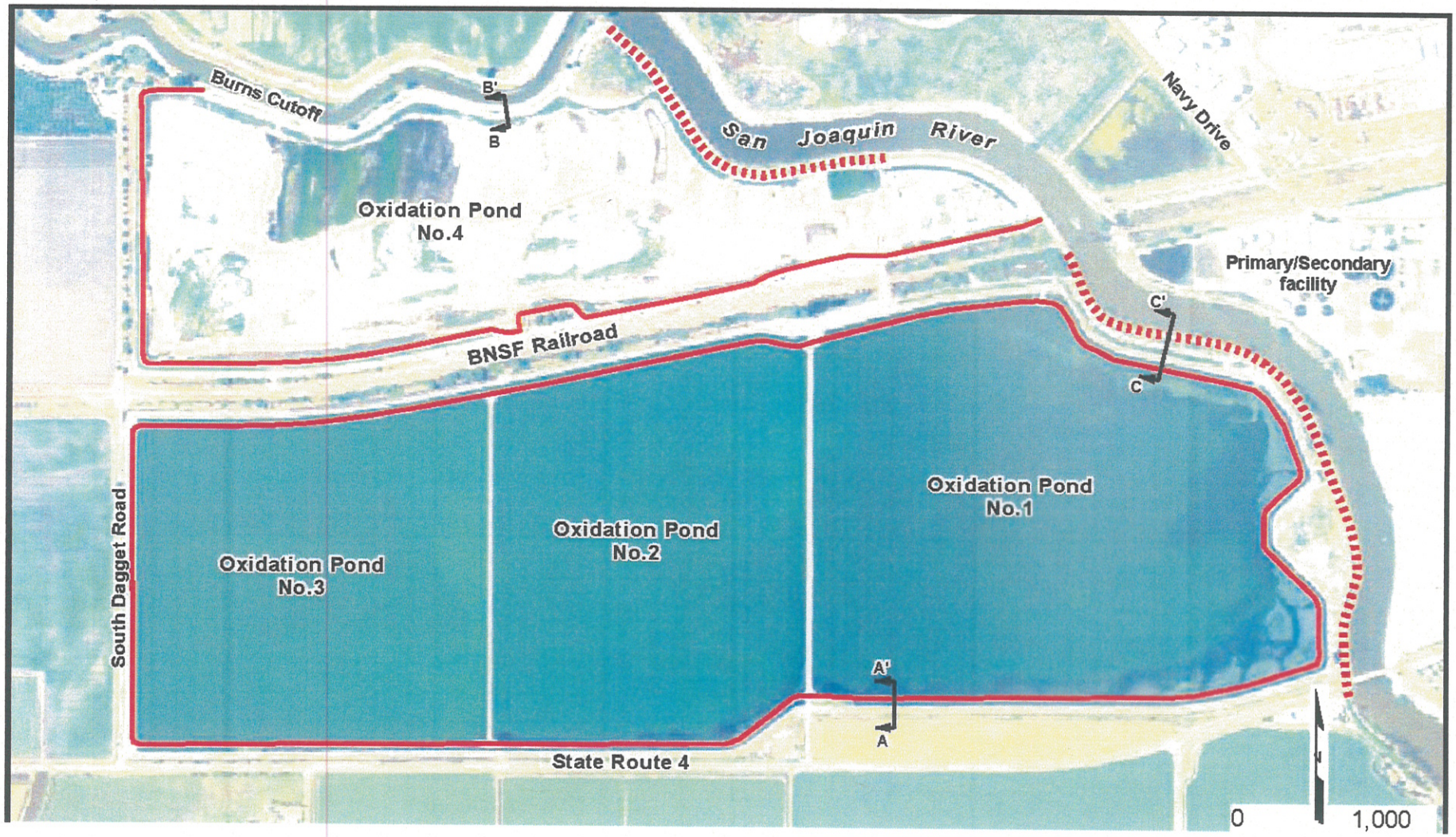
SECTION B-B'

NOTES:

1. CROSS SECTION CREATED FROM TOPOGRAPHY FROM ENGINEERING SCIENCE PLANS. 1968.
2. 100 YEAR FLOOD EVENT IS APPROXIMATE AND WAS OBTAINED FROM DATA IN THE USACE 1992 REPORT ON DELTA HYDROLOGY.

KLEINFELDER • Geomatrix
A Joint Venture Partnership

Alternative 1
Modifying Pond Embankments

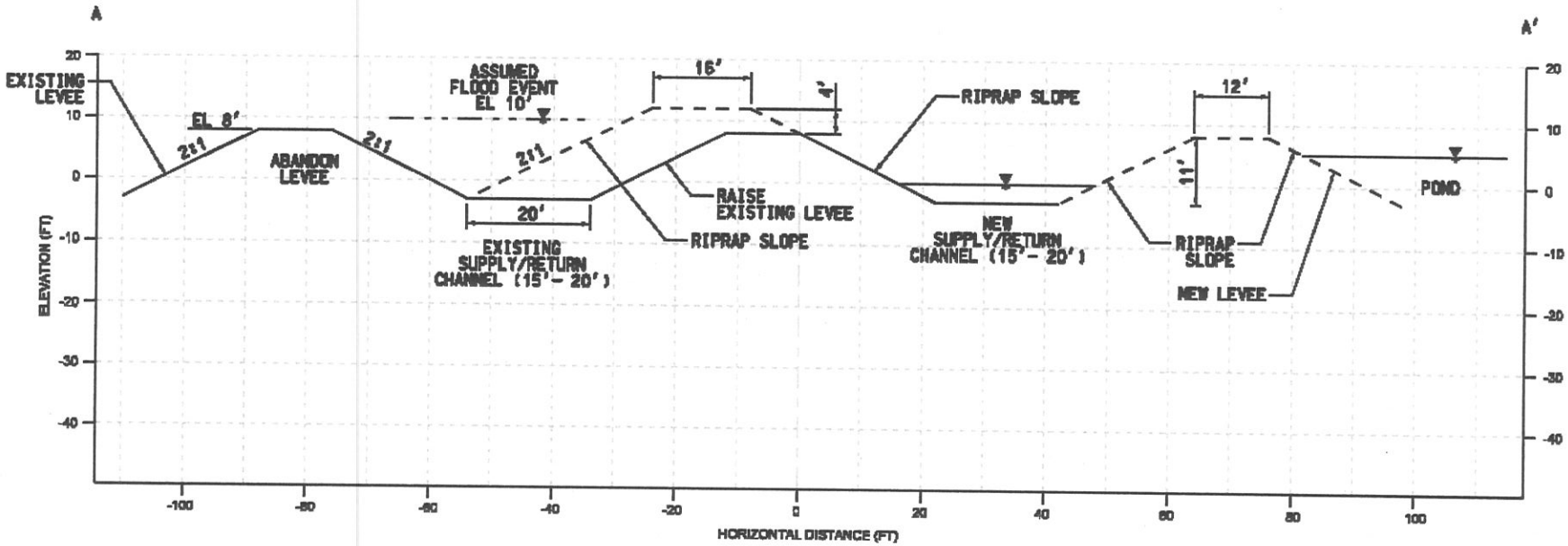


KLEINFELDER • Geomatrix
A Joint-Venture Partnership

Alternative 1
Modifying Pond Embankments

KLEINFELDER • Geomatrix
A Joint Venture Partnership

Alternative 1
Modifying Pond Embankments



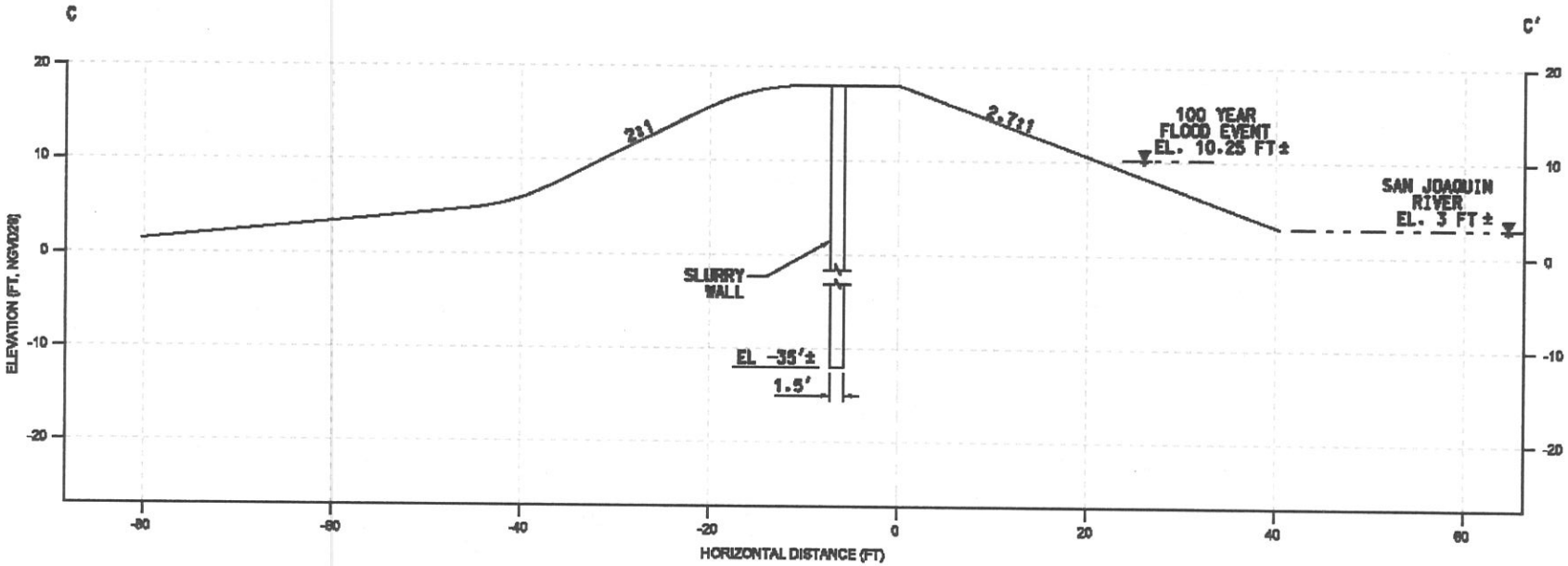
SECTION A-A'

NOTES:

1. EXISTING LEVEES ARE SHOWN AS BUILT FROM BROWN AND CALDWELL CONSULTING ENGINEERS PLANS, 1963.
2. ASSUMING EXISTING LEVEE CREST ELEVATION OF 8 FEET.

KLEINFELDER • Geomatrix
A Joint Venture Partnership

Levee Improvements



SECTION C-C'

NOTES:

1. CROSS SECTION CREATED FROM TOPOGRAPHY FROM ENGINEERING SCIENCE PLANS. 1968.
2. 100 YEAR FLOOD EVENT IS APPROXIMATE AND WAS OBTAINED FROM DATA IN THE USACE 1992 REPORT ON DELTA HYDROLOGY.

KLEINFELDER • Geomatrix
A Joint Venture Partnership

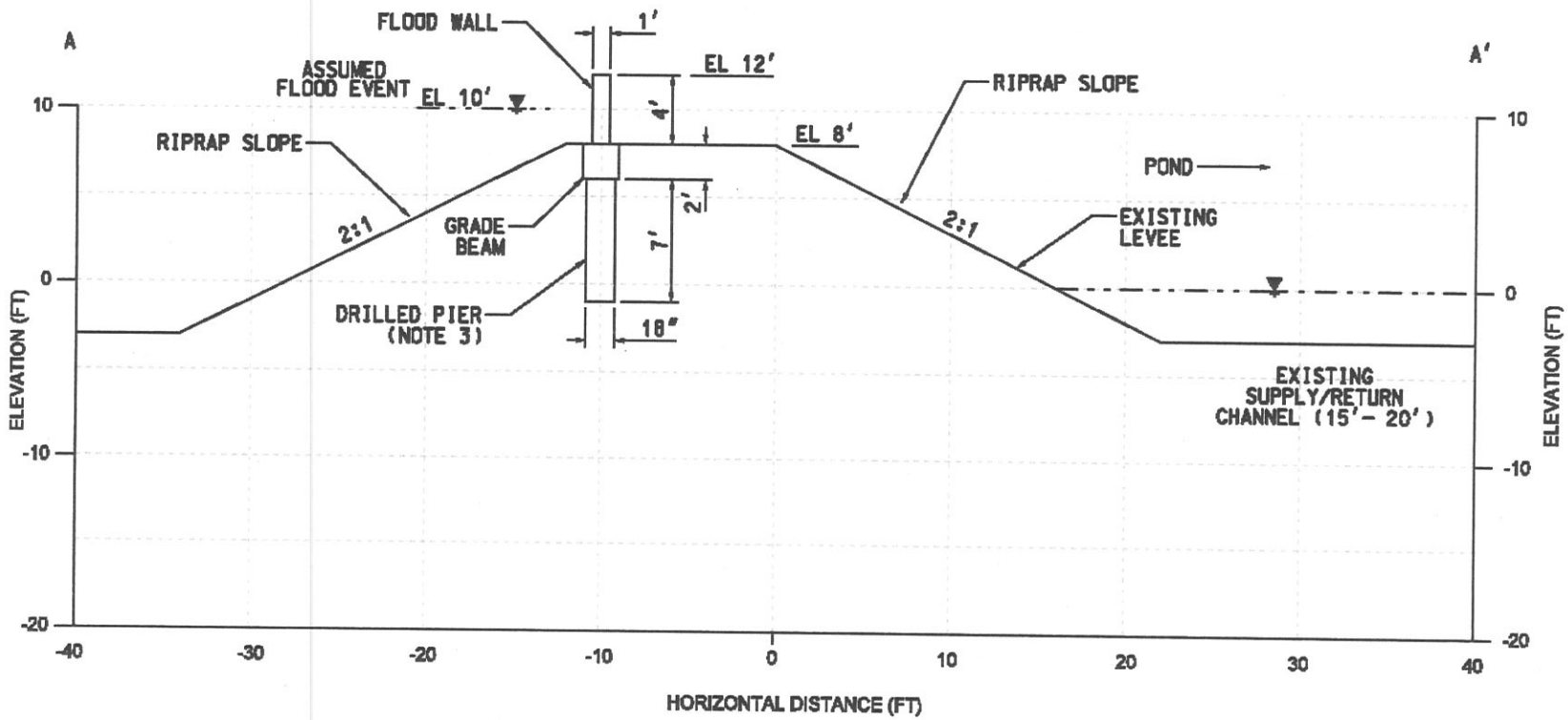
Alternative 2
Constructing Low Floodwalls

KLEINFELDER • Geomatrix
A Joint-Venture Partnership

Alternative 2
Constructing Low Floodwalls

KLEINFELDER • Geomatrix
A Joint-Venture Partnership

Alternative 2
Constructing Low Floodwalls



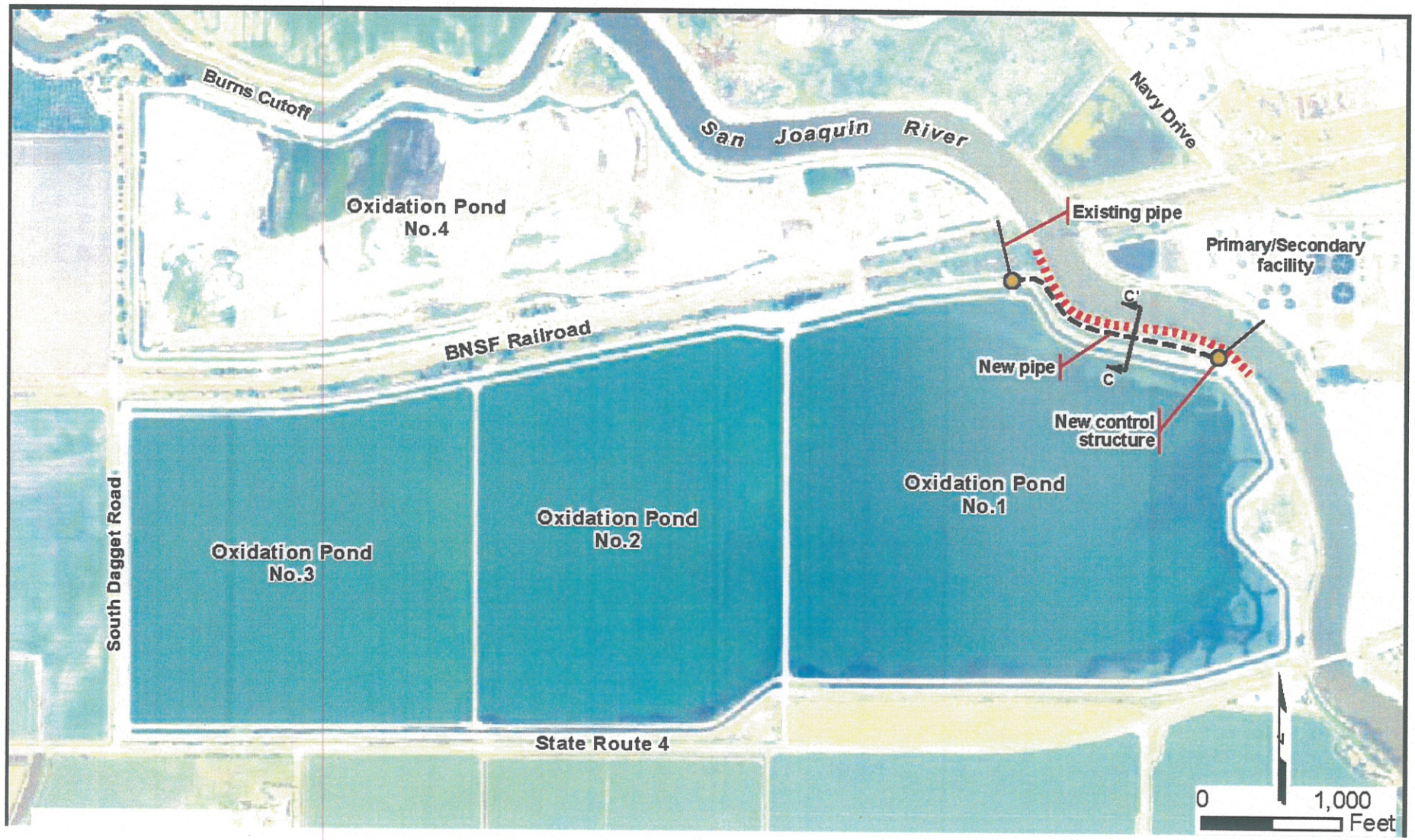
SECTION A-A'

NOTES:

1. EXISTING LEVEES ARE SHOWN AS BUILT FROM BROWN AND CALDWELL CONSULTING ENGINEERS PLANS, 1963.
2. ASSUMING EXISTING LEVEE CREST ELEVATION OF 8 FEET.
3. DRILLED PIERS SPACED 10 FEET ON CENTERS.

KLEINFELDER • Geomatrix
A Joint Venture Partnership

Alternative 3
Bypass Tertiary Ponds



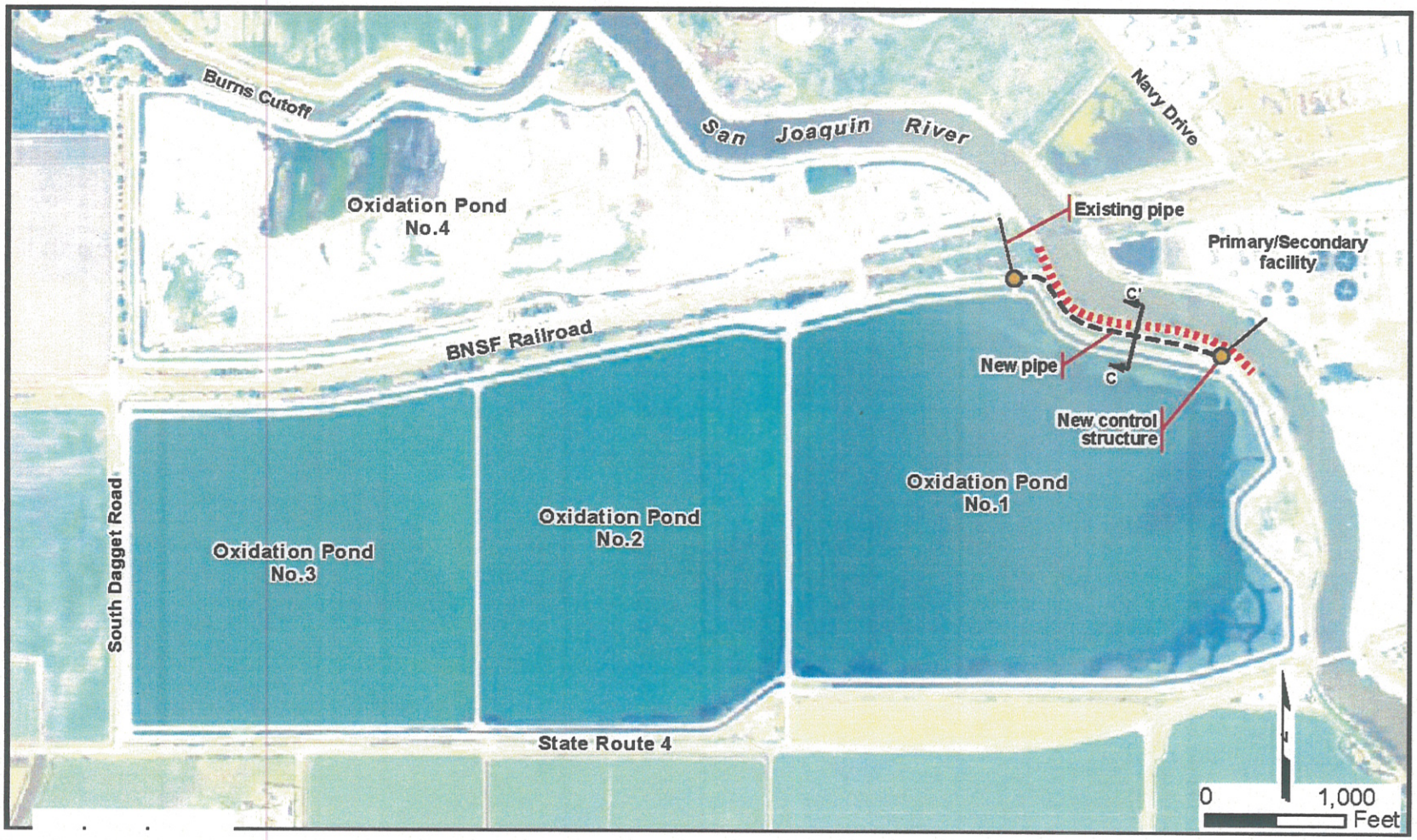
KLEINFELDER • Geomatrix
A Joint-Venture Partnership

Alternative 3
Bypass Tertiary Ponds

KLEINFELDER • Geomatrix
A Joint Venture Partnership

Other Alternatives

- Combinations of components of alternatives 1, 2, and 3



KLEINFELDER • Geomatrix
A Joint-Venture Partnership

Potential Issues

- Reduced plant operation flexibility
- Potential hazard from levee failure

KLEINFELDER • Geomatrix
A Joint Venture Partnership

Data Gaps

- Hydrological study
- Current topographic survey
- Utility maps and plans (active and abandoned)
- Penetration assessment
- Geotechnical data and evaluations
- Pile load tests

KLEINFELDER • Geomatrix
A Joint Venture Partnership

Discussions?

City of Stockton

APPENDIX G – ENERGY EFFICIENCY MEASURES DETAILED REPORT

August 2011

pw://Carollo/Documents/Client/CA/Stockton/8581A00/Deliverables/AppendCoverSheets.docx (Final)

ENERGY EFFICIENCY MEASURES DETAILED REPORT

This Appendix is a more detailed report to support Chapter 12 of the CIP and describes the energy efficiency measures (EEM) that could be implemented at the RWCF to reduce power consumption. Section 12.1 presents the recommended EEMs for implementation. Section 12.2 describes other EEMs that were considered but not recommended at this time.

12.1 RECOMMENDED ENERGY EFFICIENCY MEASURES

This Section presents the energy savings, energy cost savings, and implementation cost estimates for each Energy Efficiency Measure (EEM) recommended for implementation at the RWCF. Implementation cost estimates are compared to energy cost savings to calculate simple payback periods.

Seven EEMs are recommended for implementation. A summary of these measures is presented in Table 12.1. These analyses focused on installation cost and energy and cost savings. These EEMs have not been evaluated for other factors that could impact the ultimate implementation of the EEMs, such as future expansion capability, regulatory compliance and permitting, ease and cost of maintenance, etc. These factors should be considered prior to a final implementation decision.

Table 12.1 Energy Efficiency Measure Summary
Capital Improvement and Energy Management Plan
City of Stockton

EEM No. Description	Potential Energy Savings kWh/yr	Peak Demand Savings kW	Potential Cost Savings $/year	Potential Incentive $	Installed Cost w/ Incentive $	Simple Payback w/ Incentive years
1. Reduce Discharge Pressure of Tertiary System Air Compressors	431,369	49.2	$47,062	$4,703	$4,703	0.1
2. Install Premium Efficiency Motors on a Replacement Basis*	61,615	4.8	$6,722	$6,025	$7,709	1.1
3. Replace Existing HID Fixtures with High Efficiency Fluorescent Fixtures	162,761	18.4	$17,757	$7,600	$29,832	1.7
4. Install Automatic Lighting Controls	80,031	0.0	$8,731	$3,557	$32,909	3.8
5. Replace Air Compressor No. 2 with a VSD Air Compressor	152,424	17.4	$16,629	$15,458	$45,792	2.8
6. Install Higher Efficiency DAF Pressurization Pumps	421,354	48.3	$45,970	$42,752	$68,498	1.5
7. Replace Existing Outdoor HID Lighting with LED Lighting	185,525	0.0	$20,241	$9,276	$115,249	5.7

Note:
* Two year values. Refer to Section 12.1.2 for details.

12.1.1 EEM No. 1 - Reduce Discharge Pressure of Tertiary System Air Compressors

Recommended Action

Reduce the discharge pressure of the two Quincy air compressors from 118 psig to 80 psig in order to reduce their electrical energy consumption.

Estimated Electrical Energy Savings	=	431,369 kWh/yr
Estimated Peak Demand Savings	=	49.2 kW
Estimated Electrical Cost Savings	=	$47,062/yr
Estimated Implementation Cost	=	$9,406
Simple Payback Period	=	0.2 years
Potential Incentive	=	$4,703
Simple Payback Period w/ Incentive	=	0.1 years

Background

The Tertiary System has two 150 hp Quincy air compressor that produce compressed air primarily for the DAF system, float ejectors, and instrumentation. The details of the two air compressors are summarized in Table 12.2. Both compressors were observed to have a discharge pressure of about 118 psig. Compressor #1 was observed to be operating at 100% capacity (output), while compressor #2 was operating at about 80% capacity. The compressed air system includes two air-cooled after-coolers, two Pneumatech regenerative dryers, and storage tanks. Both air compressors operate 24 hours per day, 365 days per year for a total of 8,760 hours per year.

Table 12.2 Summary of Air Compressor Details
Capital Improvement and Energy Management Plan
City of Stockton

Make and Model Number	Compressor Type	Motor Power (hp)	Capacity Control	Rated Motor Power (bhp)	Rated Output (acfm)
Quincy QNW-751-DAS	Rotary Screw	150	Inlet Modulation	159 @ 100 psig	760 @ 100 psig

The Tertiary System has four (4) DAF thickeners that use dissolved air to help separate suspended solids from raw water. Each DAF uses a pressurization pump to pressurize DAF recycle water (effluent) to 50 psig in a mixing tank, where compressed air, at 50 psig, is dissolved. From the air compressors, air is delivered to a 220 gallon receiver at each DAF. The air pressure of one receiver was observed to be 100 psig. This shows that the pressure drop from the compressor outlet to the local DAF air receiver is about 18 psi. Since the DAF mixing

tanks need compressed air at 50 psig, setting the air compressors' discharge pressure to 80 psig should be high enough to satisfy the DAF operating requirements. It is recommended to install an additional air receiver in the compressor room to compensate for the system storage capacity reduction associated with reducing the pressure.

Anticipated Savings

A reduction in the discharge pressures of the air compressors will reflect in lower power draws of their motors. A spot power measurement of compressor #1 found that it was drawing 133 kW while operating at full load (100% capacity), which is about 10% above its nameplate rating. Reducing the air compressors' discharge pressure from 118 psig to 80 psig will reduce their power draw by approximately 19%.

Reducing the discharge pressure of the air compressor is estimated to result in an annual electrical energy savings of 431,369 kWh/yr and is estimated to reduce the facility's peak demand by 49.2 kW. The estimated electrical energy cost savings is $47,062/yr.

Implementation Cost

Implementation consists of adjusting the discharge pressure of the air compressors, and adding an additional storage tank. The storage tank has been sized so that the proposed compressed air system has similar storage capacity to the existing system. It is estimated that it will take approximately 3 hours at $75/man-hour (using an air compressor technician) to make the adjustments to the compressors. The cost of the additional storage tanks is from a storage tank vendor. The installation cost of the storage tanks is from the 2010 RS Means Mechanical Cost Data Guidebook. Engineering and contracting cost of 25% of the above material and labor costs is included.

(1) 600 gallon air receiver & shipping	$ 3,800
Installation of air receiver, including fittings	$ 3,500
(3) hour air compressor technician	$ 225
25% engineering and contracting	$ 1,881
Total Cost	**$ 9,406**

The total cost savings of $47,062/yr will pay for the implementation cost of $9,406 in about 0.2 years.

PG&E Incentive

The potential energy and peak demand savings results in an incentive of $43,747. However, the potential incentive is capped at 50% of the implementation cost, which is estimated to be $4,703.

Additional Findings:

1. Based on the air compressors ratings and observed operating conditions, the two air compressors are estimated to be compressing 1,350 acfm of air. According to the O&M

manual, the two DAF units should be consuming about 101 acfm (~100 scfm), which would leave the consumers of about 1,250 acfm of air unaccounted for. The other pneumatic devices listed in the O&M manual are the float ejectors, filter isolation valves, and backwash air control valves. With the information at hand, it cannot be determined if these devices are large consumers of compressed air. If the other consumer of compressed air cannot operate at the recommended lower air pressure (~70 psig), then it is recommended to reduce the air compressors' discharge pressure to the lowest level that permits reliable operation of these devices.

2. The two Quincy compressors (model QNW-751-NAS, S/N 000122 and 000123) are rated to produce compressed air at 100 psig, but are currently producing air at 118 psig. According to the local Quincy compressor vendor, Air Perfection Inc., running the compressors at this discharge pressure increases the motor load into its service factor. This statement is supported by a spot power measurement of Compressor #1, which showed it was drawing 133 kW while at 100% capacity. Running these compressors at 118 psig increases the operating (energy) costs and maintenance costs and reduces their life spans.

12.1.2 EEM No. 2 – Install Premium Efficiency Motors on a Replacement Basis

Recommended Action

Install premium efficiency motors on a replacement basis (i.e. when the motors wear out). The two-year incremental replacement savings summary is shown below.

Estimated Two Year Electrical Energy Savings	=	61,615 kWh/yr
Estimated Second Year Peak Demand Savings	=	4.8 kW
Estimated Two Year Electrical Cost Savings	=	$6,722/yr
Two Year Incremental Cost Premium	=	$13,734
Simple Payback Period	=	2.0 years
Potential Incentive	=	$6,025
Simple Payback Period w/ Incentive	=	1.1 years

Background

The electric motors at the facility were inventoried, and many standard efficiency motors were identified. Some of the existing motors inventoried are "high efficiency" or premium efficiency. It is recommended that premium efficiency motors be installed in place of the existing standard efficiency motors on a replacement basis. Only motors that would have a simple payback period of less than 6 years have been included in this measure.

Depending on the horsepower rating of a given premium efficiency motor, operating efficiencies may be from 1% to 5% higher than the operating efficiencies of the existing motors. In general,

as premium efficiency motors increase in horsepower, their operating efficiencies compared to existing motor efficiencies decrease. Normally, a cost premium (or cost differential) must be paid if premium efficiency motors are chosen over standard efficiency motors. The estimated efficiencies of the existing motors, potential increase in efficiency, and cost premium for motors with various horsepower ratings are summarized in Table 12.3. A listing of the standard efficiency motors at the facility, which are recommended to be replaced with premium efficiency motors, can be found in Table 12.4.

Anticipated Savings

The data in Table 12.3 is used in the energy and cost savings calculations for this recommendation. It should be noted that tabulated values from the table have been obtained from a software package called MotorMaster+, which is distributed by Motor Challenge Information Clearinghouse. If the City is interested in obtaining this software package, at no cost, please call (800) 862-2086 or it can be downloaded at the Department of Energy (DOE) web site:

http://www1.eere.energy.gov/industry/bestpractices/software.html.

The software can help the identify premium efficiency motors that are equivalent to the existing standard efficiency motors.

The total electrical energy savings for this measure is estimated at 246,458 kWh/yr. The peak demand savings is estimated at 28.6 kW. The total electrical cost savings is estimated to be $26,888 per year. A summary of these electrical energy and demand savings is provided in Table 12.4. A summary of the electrical energy cost savings is provided in Table 12.5.

Implementation Cost Premium

Implementation cost is based on the cost premium for installing premium efficiency motors over standard efficiency motors, and is shown in Table 12.3. The implementation cost is based on the assumption that premium efficiency motors will be installed as the standard efficiency motors wear out.

The implementation cost premium for this recommendation, on a two-year basis is estimated to be $82,404. A one-time implementation of all the motors listed in Table 3.1.2-3 is estimated to be $501,315. One-time replacement of all the motors would result in a simple payback period of 18.6 years and is therefore not recommended.

Incremental Savings

It is recommended that premium efficiency motors be installed as the existing motors wear out. Since it may take several years to realize the savings due to this measure, incremental savings for the first two years are included here. Because it is not possible to calculate or predict which motor will burn out in a given year, it is assumed that the average standard efficiency motor lifetime is 12 years (based on information from various motor manufacturers).

The two year incremental summary for this measure is:

Two Year Incremental Energy Savings	=	61,615 kWh/yr
Second Year Peak Demand Savings	=	4.8 kW
Two Year Incremental Cost Savings	=	$6,722/yr
Two Year Incremental Cost Premium	=	$13,734
Incremental Simple Payback	=	2.0 years

PG&E Incentive

The incentive for this measure is estimated to be $6,025. The incentive for this measure is based on the current California Appliance Efficiency Regulations 2010 baseline of standard efficiency motors. Please be aware that this baseline will change over time to premium efficiency motors and will affect the estimated incentive for this measure.

The US Department of Energy (DOE) offers information regarding energy efficient motors. The fact sheets are called “Buying an Energy-Efficient Electric Motor” and “Determining Electric Motor Load and Efficiency.” They can be downloaded at the following addresses:

http://www1.eere.energy.gov/industry/bestpractices/pdfs/mc-0382.pdf
http://www1.eere.energy.gov/industry/bestpractices/pdfs/10097517.pdf

Table 12.3 Motor Efficiency Lookup Table
Capital Improvement and Energy Management Plan
City of Stockton

Horsepower Rating (hp)	**Standard Motor Efficiency**	**Proposed Premium Efficiency**	**Estimated Cost Premium** ($)
1	0.801	0.857	111
1.5	0.838	0.866	176
2	0.847	0.885	191
3	0.863	0.897	91
5	0.872	0.901	119
7.5	0.887	0.918	81
10	0.895	0.920	142
15	0.904	0.922	295
20	0.906	0.931	271
25	0.916	0.934	206
30	0.918	0.938	644
40	0.926	0.942	733
50	0.928	0.944	660
60	0.934	0.948	871
75	0.936	0.954	1,032
100	0.939	0.954	1,864
125	0.942	0.955	348
150	0.946	0.958	2,547
200	0.948	0.963	2,638
250	0.950	0.962	4,500
300	0.953	0.962	5,052
350	0.953	0.962	6,465
400	0.954	0.961	4,168
450	0.956	0.961	802
500	0.957	0.961	6,449

Notes:

(1) Values in the table can be obtained from the MotorMaster+ 4.0 software program.

(2) Premium efficiency motors (better efficiency than high efficiency) are available from 1 hp to 500 hp.

(3) Standard motor efficiencies cited here are average values from California Title 20 Appliance Efficiency Regulations (http://www.energy.ca.gov/appliances/index.html. Standard efficiency values cited by Title 20 vary based on the number of poles as well as whether the motors are open drip-proof or totally enclosed fan-cooled.

(4) Premium motor efficiencies cited here are average values from MotorMaster+ 4.0. Premium efficiency values cited by NEMA (National Electrical Manufacturers Association) vary based on the number of poles as well as whether the motors are open, drip-proof or totally enclosed fan-cooled. The values given here approximate the average values cited by NEMA (http://www.nema.org/premiummotors).

Table 12.4 Electrical Energy and Demand Savings By Using Premium Efficiency Motors
Capital Improvement and Energy Management Plan
City of Stockton

Location	Driven Equipment Description	N	HP (hp)	EF_C	EF_P	LF	H (hr/yr)	UF/ CF	EES (kWh/yr)	DS (kW)
Headworks	Bioscrubber Fans	2	50	0.928	0.944	0.70	8,760	1.00	8,355	1.0
	Bioscrubber Recycle Pumps	2	25	0.916	0.934	0.70	8,760	1.00	4,812	0.5
	Conveyor	1	3	0.863	0.897	0.70	8,760	0.50	301	0.0
	Conveyor	1	5	0.872	0.901	0.70	8,760	0.50	422	0.0
	Compactor	1	10	0.895	0.920	0.70	8,760	0.15	208	0.0
	Raw Sewage Pump	1	400	0.954	0.961	0.70	8,760	0.50	6,986	0.8
	Barscreens	4	3	0.863	0.897	0.70	8,760	0.50	1,206	0.1
Primary Clarifiers	Scum Pumps	8	5	0.872	0.901	0.75	8,760	0.25	1,809	0.2
BioTowers	Ventilation Fans	32	5	0.872	0.901	0.75	8,760	0.75	21,709	2.5
	Pumps	4	350	0.945	0.962	0.42*	8,760	0.75	53,892	6.2
Secondary Clarifiers	Sump Pump	1	10	0.895	0.920	0.70	8,760	0.25	347	0.0
	Effluent Pumps	3	100	0.939	0.954	0.70	8,760	0.67	15,396	1.8
Cogen Area	Air Compressor Fans	2	5	0.872	0.901	0.75	8,760	0.50	905	0.1
	Air Compressors	2	75	0.936	0.954	0.55*	8,760	0.50	5,434	0.6
Sludge Dewatering	Odor Control Fan	1	10	0.895	0.920	0.60	4,160	0.80	452	0.1
	Belt Press Drive	1	7.5	0.887	0.918	0.60	4,160	0.80	425	0.1
	Sludge Pumps	2	5	0.855	0.901	0.70	4,160	0.80	1,038	0.2
	Sludge Pumps	3	15	0.895	0.922	0.70	4,160	0.67	2,143	0.5
Gravity-Belt Thickeners	Sludge Cake Hydraulic Pumps	2	125	0.942	0.955	0.50	8,760	0.30	3,541	0.4
	Filter Press Wash Pump	1	10	0.895	0.920	0.70	8,760	0.25	347	0.0
	Filter Press Scum Pump	1	10	0.895	0.920	0.70	8,760	0.25	347	0.0
	Sludge Pump	1	15	0.904	0.922	0.70	8,760	0.80	1,185	0.1
	Belt Thickener Drive	2	25	0.916	0.934	0.70	8,760	0.50	2,406	0.3
	Washwater Pump	2	5	0.872	0.901	0.70	8,760	0.50	844	0.1
Digesters	Sludge Recirc. Pumps	2	25	0.916	0.934	0.65*	8,760	1.00	4,468	0.5
	Mixing Pumps	4	75	0.936	0.954	0.50*	8,760	0.50	9,880	1.1
Tertiary Treatment	Aftercooler Fan	2	7.5	0.900	0.918	0.75	8,760	1.00	1,602	0.2
	Filter Water Pumps	3	125	0.942	0.955	0.70	8,760	0.67	16,609	1.9
	3W Pumps	2	60	0.934	0.948	0.70	8,760	0.50	4,340	0.5
	Alum Feed Pump	1	7.5	0.887	0.918	0.70	8,760	0.25	327	0.0
	Float Collectors	4	3	0.863	0.897	0.70	8,760	0.50	1,206	0.1
	Float Conveyors	8	7.5	0.887	0.918	0.70	8,760	0.50	5,225	0.6
	DAF Arm Drives	4	7.5	0.887	0.918	0.70	8,760	0.50	2,612	0.3
	BioTower Fans	8	5	0.872	0.901	0.70	8,760	1.00	6,754	0.8
	Wetlands Recycle Pumps	4	125	0.942	0.955	0.70	8,760	0.50	16,526	1.9
	Wetlands Hi-Lift Pumps	3	300	0.953	0.962	0.70	8,760	0.67	27,079	3.1
	Raw Water Pumps	4	100	0.939	0.954	0.70	8,760	0.50	15,320	1.7
Totals									**246,458**	**28.6**

*Based on observations made during the facility or the audit team's measured and logged data

N = number of motors, HP = horse power, EF_C = efficiency of current motor, EF_P = efficiency of premium motor,

LF = load factor, H = annual operating hours, UF = utility factor, CF = coincidence factor,

EES = electrical energy savings, DS = peak demand savings

Table 12.5 Cost Savings and Implementation Cost to Install Premium Efficiency Motors
Capital Improvement and Energy Management Plan
City of Stockton

Location	Driven Equipment Description	N	HP (hp)	Unit Cost Premium ($/motor)	EECS ($/yr)	IC ($)
Headworks	Bioscrubber Fans	2	50	660	912	1,320
	Bioscrubber Fans	2	50	660	912	1,320
	Bioscrubber Recycle Pumps	2	25	206	525	412
	Conveyor	1	3	91	33	91
	Conveyor	1	5	119	46	119
	Compactor	1	10	142	23	142
	Raw Sewage Pump	1	400	4,168	762	4,168
	Barscreens	4	3	91	132	364
Primary Clarifiers	Scum Pumps	8	5	119	197	952
BioTowers	Biotower Ventilation Fans	32	5	119	2,368	3,808
	Biotower Pumps	4	350	6,465	5,880	25,860
Secondary Clarifiers	Sump Pump	1	10	142	38	142
	Effluent Pumps	3	100	1,864	1,680	5,592
Cogen Area	Air Compressor Fans	2	5	119	99	238
	Air Compressors	2	75	1,032	593	2,064
Sludge Dewatering	Odor Control Fan	1	10	142	49	142
	Belt Press Drive	1	7.5	81	46	81
	Sludge Pumps	2	5	119	113	238
	Sludge Pumps	3	15	295	234	885
Gravity-Belt Thickeners	Sludge Cake Hydraulic Pumps	2	125	348	386	696
	Filter Press Wash Pump	1	10	142	38	142
	Filter Press Scum Pump	1	10	142	38	142
	Sludge Pump	1	15	295	129	295
	Belt Thickener Drive	2	25	206	262	412
	Washwater Pump	2	5	119	92	238
Digesters	Sludge Recirculation Pumps	2	25	206	487	412
	Mixing Pumps	4	75	1,032	1,078	4,128
Tertiary Treatment	Aftercooler Fan	2	7.5	81	175	162
	Filter Water Pumps	3	125	348	1,812	1,044
	3W Pumps	2	60	871	473	1,742
	Alum Feed Pump	1	7.5	81	36	81
	Float Collectors	4	3	91	132	364
	Float Conveyors	8	7.5	81	570	648
	DAF Arm Drives	4	7.5	81	285	324
	BioTower Fans	8	5	119	737	952
	Wetlands Recycle Pumps	4	125	348	1,803	1,392
	Wetlands Hi-Lift Pumps	3	300	5,052	2,954	15,156
	Raw Water Pumps	4	100	1,864	1,671	7,456
Totals					**26,888**	**82,404**

N = number of motors, HP = horse power, EECS = electrical energy cost savings, IC = implementation cost premium

12.1.3 EEM No. 3 – Replace Existing HID Fixtures with High Efficiency Fluorescent Fixtures

Recommended Action

Replace existing high intensity discharge (HID) fixtures with high efficiency fluorescent fixtures in the areas shown in Table 12.6. High efficiency fluorescent fixtures use less energy than HID fixtures while providing similar or improved light output.

Estimated Electrical Energy Savings	=	162,761 kWh/yr
Estimated Peak Demand Savings	=	18.4 kW
Estimated Electrical Cost Savings	=	$17,757/yr
Estimated Implementation Cost	=	$37,432
Simple Payback Period	=	2.1 years
Energy Efficiency Rebate	=	$7,600
Simple Payback Period w/ Rebate	=	1.7 years

Background

During the site visit the audit team observed that the areas listed in Table 12.6 use high intensity discharge (HID) fixtures for general lighting. High efficiency fluorescent fixtures are more efficient than HID fixtures, feature lower lumen depreciation rates, better dimming options, instant start-up and better color rendition. Because high efficiency fluorescent fixtures feature higher lamp and ballast efficacy and greater fixture efficiency, they consume less electricity than conventional HID systems to produce similar or improved light output.

Table 12.7 compares light output, fixture input wattage and life expectancy of typical HID fixtures and high efficiency fluorescent fixtures. Please note that the net light output (Net Design Pupil Lumens) of high efficiency lighting fixtures is higher than the net light output of standard efficiency fixtures. Replacing the HID fixtures with high efficiency fluorescent fixtures will result in significant electrical energy savings.

High efficiency T5 fluorescent fixtures provide more light output than high efficiency T8 fluorescent fixtures, as shown in Table 12.7. Therefore it is recommended to replace low mounted (about 15 feet or less) HID fixtures with high efficiency T8 fluorescent fixtures. For high mounted HID fixtures (greater than 15 feet), high efficiency T5 fluorescent fixtures are recommended as a replacement.

Table 12.6 Electrical Energy and Demand Savings by Replacing Light Fixtures
Capital Improvement and Energy Management Plan
City of Stockton

Area	Existing Fixtures*	Proposed Fixtures	Number of Fixtures**	Operating Hours* (h/yr)	EES (kWh/yr)	DS (kW)
Operations Building						
Cogen Area	MH400	4-T5-54	24	8,760	47,514	5.4
Pump Room	MH400	4-T5-54	5	8,760	9,899	1.1
Digester Building						
Ground Floor	HS400	6-T8-32	8	8,760	19,622	2.2
Basement	MH400	4-T5-54	1	8,760	1,980	0.2
Basement	HS400	6-T8-32	8	8,760	19,622	2.2
Primary/Secondary Plant						
Gravity Thickener Building	HS400	6-T8-32	2	8,760	4,906	0.6
Headworks						
Odor Control Room	HS400	4-T5-54	5	8,760	9,899	1.1
Sludge Control Center						
Downstairs	MH400	4-T5-54	5	8,760	9,899	1.1
Poly System Building						
Storage Room	MH400	6-T8-32	5	8,760	12,264	1.4
Upper Level Belt Room	MH400	4-T5-54	10	8,760	19,798	2.3
Small Pump Area	MH400	6-T8-32	3	8,760	7,358	0.8
Total			**76**		**162,761**	**18.4**

HS400 = 400-Watt high pressure sodium, MH400 = 400-Watt metal halide, 6-T8-32 = 6-lamp 32-Watt T8 fluorescent fixture, 4-T5-54 = 4-lamp 54-Watt T5 fluorescent fixture, EES = electrical energy savings, DS = peak demand savings.

*Existing fixtures and operating hours were estimated

**These are the number of fixtures that were on during the facility visit. Only savings for these fixtures have been considered.

Table 12.7 Comparison of Typical HID and Fluorescent Fixtures[1]
Capital Improvement and Energy Management Plan
City of Stockton

	Standard Efficiency Fixtures		High Efficiency Replacements	
Fixture Type	**MH400**	**HS400**	**4-T5-54**	**6-T8-32**
Initial Lamp Output (lumens)	36,000	50,000	20,000	18,000
Design (40% of Life) Lamp Output (lumens)	24,000	45,000	19,000	16,920
Lamp Life (hours)	20,000	24,000	20,000	25,000
Fixture Input Wattage (Watts)	460	460	234	180
Fixture Efficiency (%)	70	70	93	93
Design Lumens from Fixture (lumens)	16,800	31,500	17,670	15,736
Conversion Factor (standard to pupil lumens)	1.49	0.64	1.83	1.62
Net Design Pupil Lumens	**25,032**	**20,160**	**32,336**	**25,492**

[1]Data shown in Table 12.7 is based on a study by Energy Design Resources, Design Brief: High-Intensity Fluorescents, 2001 Financial Times Energy, Inc., and information provided by lighting manufacturers. The design brief can be downloaded for free at: http://www.energydesignresources.com/resource/30/. All lamp data was gathered from lighting vendor information such as Grainger Catalog.

HS400 = 400-Watt high pressure sodium, MH400 = 400-Watt metal halide, 6-T8-32 = 6-lamp 32-Watt T8 fluorescent fixture, 4-T5-54 = 4-lamp 54-Watt T5 fluorescent fixture

Anticipated Savings

The electrical energy savings that can be realized by replacing HID fixtures with high efficiency fluorescent fixtures depend on the total number of fixtures illuminating the area, the fixture input wattage, and the fixture annual operating hours.

Installing high efficiency fluorescent fixtures in the areas listed in Table 12.6 will save an estimated 162,761 kWh/yr, and reduce the facility's peak demand by 18.4 kW. The electrical energy cost savings for installing high efficiency fluorescent fixtures is estimated to be $17,757 per year.

Implementation Cost

It is recommended to replace the HID fixtures with high efficiency fluorescent fixtures. All implementation costs are derived from cost estimating manuals such as RS Means Electrical Cost Data 2010 Guidebook and Grainger catalog. Applicable state and local taxes have been added to the material costs. Installation costs include overhead, profit and location mark up based on facility location. The implementation cost can be itemized as follows:

(156) 32-Watt, T8 high efficiency fluorescent lamps	$ 1,175
(26) 6-Lamp, 32-Watt T8 electronic ballasts	$ 1,917
(26) 6-Lamp, 32-Watt T8 fluorescent fixtures	$ 4,071
(200) 54-Watt, T5 high efficiency fluorescent lamps	$ 3,708
(50) 4-Lamp, 54-Watt T5 electronic ballasts	$ 6,026
(50) 4-Lamp, 54-Watt T5 fluorescent fixtures	$ 7,777
Installation Costs	$12,758
Total Cost	**$37,432**

The total cost savings of $17,757/yr would pay for the total estimated implementation cost of $37,432 in approximately 2.1 years.

Energy Efficiency Rebate

The energy efficiency rebate for this measure is estimated to be $7,600.

Note: Some areas, for example many of the rooms in the Headworks Building, were locked during the facility visit. Lighting could not be collected from these areas or obtain from facility personnel. If these areas use HID fixtures, there may be additional energy savings if the facility replaces the HID fixtures with high efficiency fluorescent fixtures.

12.1.4 EEM No. 4 – Install Automatic Lighting Controls

Recommended Action

Install automatic lighting controls in the areas identified in Table 12.8 to reduce electrical energy consumption.

Estimated Electrical Energy Savings	=	80,031 kWh/yr
Estimated Peak Demand Savings	=	0 kW
Estimated Electrical Cost Savings	=	$8,731/yr
Estimated Implementation Cost	=	$36,466
Simple Payback Period	=	4.2 years
Potential Energy Efficiency Rebate	=	$3,557
Simple Payback Period w/ Rebate	=	3.8 years

Note: Analysis for this measure considers the implementation of *EEM No. 3 "Replace Existing HID Fixtures with High Efficiency Fluorescent Fixtures"*.

Background

During the site visit, the audit team inventoried lighting fixtures that could benefit from lighting controls. Lighting in the areas identified in Table 12.8 were observed to be on while the areas were not occupied and/or receive ample day light. By installing automatic lighting controls in these areas, lighting fixtures will turn off when areas are unoccupied or receive ample daylight. Table 12.8 also shows the different types of lighting fixtures used in each area, area operating hours, control factor (percent of time lights will be turned off), and the recommended technology to control the lighting fixtures.

Anticipated Savings

The electrical energy savings that can be realized by installing automatic lighting controls depend on the total number of fixtures illuminating the area, the fixture input wattage, operating hours for lighting, and the control factor, which is defined as the percentage of time that the lights can be turned off by the automatic lighting controller. The control factors used in this analysis were taken from PG&E's 2010 Statewide Customized Offering (CR-DR) Procedures Manual for Business (Section 2.2.9 Lighting – Lighting Controls) and are provided in Table 12.9.

Installing automatic lighting controls in the areas listed in Table 12.9 will save an estimated 80,031 kWh/yr. The lighting considered in this measure will be on during peak hours. Therefore it is estimated that this measure will not result in peak demand savings. The total electrical cost savings for installing automatic lighting controls is estimated to be $8,731 per year.

Implementation Cost

Effective implementation of this recommendation requires selecting the appropriate automatic lighting control technology for each area. Typically, it is recommended to install:

- Ceiling-mounted infrared sensors with power packs (power relays) on large open spaces (e.g. open offices)
- Wall-mounted automatic switches for small one person offices

- Ultrasonic sensors with power packs in large restrooms with stalls
- Daylight sensors with power packs in areas that receive ample daylight
- Bi-level controllers (dimmers) instead of power packs are recommended for high intensity discharge (HID) fixtures, so that lamps can come on to full brightness immediately

Table 12.8 summarizes the type of lighting control that is recommended in each area.

All implementation costs are derived from cost estimating manuals, such as 2010 RS Means Electrical Cost Data Guidebook and Grainger catalog. Applicable state and local taxes have been added to the material costs. Installation costs include overhead and profit. The implementation cost can be itemized as follows:

(67) Ceiling-mounted infrared occupancy sensors	$ 7,522
(27) Wall-mounted infrared occupancy sensors	$ 1,835
(10) Ultrasonic sensors	$ 1,751
(2) Daylight sensors	$ 321
(77) Power packs	$ 2,934
(7) Bi-level controllers (include HID dimmable ballasts)	$ 2,329
(4,000 ft, estimated) Wiring	$ 4,000
Installation Costs	$15,774
Total Cost	**$36,466**

The total cost savings of $8,731/yr would pay for the total estimated implementation cost of $36,466 in approximately 4.2 years.

Energy Efficiency Rebate

The energy efficiency rebate for installing automatic lighting controls is estimated to be $3,557.

Notes:

1. Some areas, for example many of the rooms in the Headworks Building, were locked during the facility visit. Lighting could not be collected from these areas or obtain from facility personnel. There may be additional energy savings from using lighting controls in these areas.

2. For safety reasons, not all fixtures are recommended to be controlled. The amount of fixtures recommended to be controlled is based on how much light an area receives from nearby lighting (lighting in areas close by that are not controlled with sensors). In Table 3.1.4-1 column “N” includes the number of controlled fixtures and column “N_T” includes the total number of fixtures in the area.

Notations Used In Tables:

n-CF23	=	23-Watt compact fluorescent, n lamps per fixture
n-CF28	=	28-Watt compact fluorescent, n lamps per fixture
n-T8-32	=	32-Watt T8 fluorescent (with electronic ballast), n lamps per fixture
n-T5-54	=	54-Watt T5 fluorescent (with electronic ballast), n lamps per fixture
n-F-34	=	34-Watt T12 fluorescent (with magnetic ballast), n lamps per fixture
n-F-60	=	60-Watt T12 fluorescent (with magnetic ballast), n lamps per fixture
MH175	=	175-Watt metal halide
H300	=	300-Watt halogen
W	=	Wall-mounted Occupancy Sensor
C	=	Ceiling-mounted Occupancy Sensor
U	=	Ultrasonic Occupancy Sensor
D	=	Day Light Sensor
N_T	=	total number of fixtures in area
N	=	number of controlled fixtures
IR	=	input rating of lamp (including ballast)
CTF	=	control factor; CT = control type
H	=	annual operating hours
EES	=	electrical energy savings

Table 12.8 Electrical Energy Savings from Automated Lighting Controls
Capital Improvement and Energy Management Plan
City of Stockton

Area	Fixture Type*	N_T	N	IR (W)	CTF**	CT	H* (h/yr)	EES (kWh/yr)
Tertiary Area								
Control Room	2-F-34	4	4	38	0.45	W	8,760	1,198
Control Room	2-T8-32	1	1	30	0.45	W	8,760	237
Control Room	2-F-34	1	1	38	0.45	W	8,760	300
Control Room	2-F-34	1	1	38	0.45	W	8,760	300
Control Room	2-F-34	1	1	38	0.45	W	8,760	300
Control Room	2-F-34	1	1	38	0.45	W	8,760	300
Control Room	2-F-34	1	1	38	0.45	W	8,760	300
Float Pump Bldg.	MH175	7	7	210	0.50	D	8,760	3,220[§]
Break Room	F-34	4	4	38	0.25	C	8,760	333
Electrical Room	4-F-34	3	3	38	0.45	W	4,380	899
Restroom	CF28	2	2	30	0.45	U	8,760	237
Restroom	CF28	2	2	30	0.45	U	8,760	237
Locker Room	CF28	2	2	30	0.45	U	8,760	237
Locker Room	2-F-34	2	2	38	0.45	U	8,760	599
Compressor Rm.	2-F-34	12	6	38	0.45	C	8,760	1,798
Digester Building								
Ground Floor	6-T8-32	8	4	180	0.45	C	8,760	2,838
Basement	6-T8-32	9	4	180	0.45	C	8,760	2,838
MCC Room	3-F-34	2	2	38	0.45	W	8,760	899
Admin and Lab Building								
Office	2-T8-32	4	4	30	0.30	W	2,340	168
Office	2-T8-32	4	4	30	0.30	W	2,340	168
Office	2-T8-32	4	4	30	0.30	W	2,340	168
Office	2-T8-32	4	4	30	0.30	W	2,340	168
Office	2-T8-32	6	6	30	0.30	C	2,340	253
Office	2-T8-32	6	6	30	0.30	C	2,340	253
Office	2-T8-32	4	4	30	0.30	W	2,340	168
Office	2-T8-32	4	4	30	0.30	W	2,340	168
Open Office	2-T8-32	8	8	30	0.15	C	2,600	187
Open Office	2-T8-32	6	6	30	0.15	C	2,600	140
Copy Room	2-T8-32	2	2	30	0.35	W	2,600	109
Break Room	4-T8-32	7	7	30	0.25	C	2,600	546
Restroom	2-T8-32	3	3	30	0.45	U	2,600	211
Restroom	2-T8-32	4	4	30	0.45	U	2,600	281
Lab	4-T8-32	17	17	30	0.15	C	2,600	796
Sink Area	3-T8-32	2	2	30	0.15	C	2,080	56
Trace Analysis	4-T8-32	12	12	30	0.15	C	2,600	562
Office	4-T8-32	4	4	30	0.30	W	2,600	374
Sample Room	4-T8-32	3	3	30	0.30	W	2,080	225
Chemical Storage	3-T8-32	4	4	30	0.45	W	2,080	337

*Fixtures and annual operating hours were estimated.

** The control factors used in this analysis were taken from PG&E's 2010 Statewide Customized Offering (CR-DR) Procedures Manual for Business (Section 2.2.9 Lighting – Lighting Controls) and are provided in Table 3.1.4-2.

[§]Electrical energy savings is 50% less due to bi-level controllers.

Table 12.8 Electrical Energy Savings from Automated Lighting Controls (Continued)
Capital Improvement and Energy Management Plan
City of Stockton

Area	Fixture Type*	N_T	N	IR (W)	CTF**	CT	H* (h/yr)	EES (kWh/yr)
Mobile Office Building								
Office	3-T8-32	2	2	30	0.30	W	2,340	126
Office	3-T8-32	2	2	30	0.30	W	2,340	126
Office	3-T8-32	1	1	30	0.30	W	2,340	63
Office	3-T8-32	3	3	30	0.30	W	2,340	190
Open Office	3-T8-32	36	36	30	0.15	C	2,340	1,137
Hallway	3-T8-32	2	2	30	0.25	C	2,340	105
Headworks								
Odor Control Rm.	4-T5-54	7	3	180	0.45	C	8,760	2,767
Odor Control Rm.	2-T8-32	1	1	30	0.45	C	8,760	237
Operations Building								
Cogen Room	4-T5-54	24	10	180	0.45	C	8,760	9,224
Air Comp. Rm.	2-T8-32	9	4	30	0.45	C	8,760	946
Open Office	2-T8-32	16	10	30	0.15	C	8,760	788
Control Room	2-T8-32	16	8	30	0.45	C	8,760	1,892
Sub 10	2-T8-32	5	5	30	0.45	C	8,760	1,183
Operators Office	3-T8-32	4	4	30	0.30	W	2,340	253
Open Office	T8-32	14	14	30	0.15	C	4,380	276
Open Office	3-T8-32	8	8	30	0.15	C	4,380	473
Break Room	3-T8-32	5	5	30	0.25	C	8,760	986
Common Area	2-T8-32	3	3	30	0.25	C	8,760	394
File Room	H300	4	4	300	0.35	W	8,760	3,679
Pump Room	CF23	3	3	25	0.45	C	8,760	296
Pump Room	4-T5-54	8	3	180	0.45	C	8,760	2,767
Secondary Effluent Pump Control Area	T8-32	4	3	30	0.45	C	8,760	355
Restroom	2-F-34	6	6	38	0.45	U	8,760	1,798
Restroom	2-T8-32	1	1	30	0.45	U	8,760	237
Restroom	3-T8-32	1	1	30	0.45	U	8,760	355
Auxiliary Maintenance Building								
Air Comp. Rm.	3-F-34	7	3	38	0.45	C	8,760	1,348
Shop Area	2-F-60	12	8	65	0.45	C	3,744	1,752
Dryer Control Rm.	2-F-60	6	4	65	0.45	C	8,760	2,050
Dryer Area	2-T8-32	12	8	30	0.45	C	8,760	1,892
Cooling Pump Rm.	3-F-34	3	3	38	0.45	C	8,760	1,348
Sludge Control Center								
Downstairs	4-T5-54	10	4	180	0.45	C	8,760	6,390

*Fixtures and annual operating hours were estimated.

** The control factors used in this analysis were taken from PG&E's 2010 Statewide Customized Offering (CR-DR) Procedures Manual for Business (Section 2.2.9 Lighting – Lighting Controls) and are provided in Table 3.1.4-2.

Table 12.8 Electrical Energy Savings from Automated Lighting Controls (Continued) Capital Improvement and Energy Management Plan City of Stockton								
Area	**Fixture Type***	**N_T**	**N**	**IR (W)**	**CTF****	**CT**	**H* (h/yr)**	**EES (kWh/yr)**
Poly System Bldg								
SUB 30 Room	2-T8-32	10	5	30	0.45	C	8,760	1,183
MCC Room 10 B-2	2-T8-32	6	4	30	0.45	C	8,760	946
Storage Room	6-T8-32	5	3	180	0.45	W	8,760	2,129
Control Room	2-T8-32	10	5	30	0.45	C	8,760	1,183
Locker Room	2-T8-32	1	1	30	0.45	C	8,760	237
Side Room	2-T8-32	4	4	30	0.15	W	8,760	315
Lower Level Belt	2-T8-32	3	2	30	0.45	C	8,760	473
Upper Level Belt	4-T5-54	10	5	180	0.45	C	8,760	4,612
Rest Room	2-T8-32	1	1	30	0.45	U	8,760	237
Break Room	2-T8-32	2	2	30	0.25	U	8,760	263
Poly Pump Area	2-T8-32	13	5	30	0.45	C	8,760	1,183
Small Pump Area	6-T8-32	3	3	180	0.45	C	8,760	2,129
Totals								**80,031**

*Fixtures and annual operating hours were estimated.

** The control factors used in this analysis were taken from PG&E's 2010 Statewide Customized Offering (CR-DR) Procedures Manual for Business (Section 2.2.9 Lighting – Lighting Controls) and are provided in Table 12.9.

Table 12.9 Occupancy Sensors Reduction in Operating Time Capital Improvement and Energy Management Plan City of Stockton					
Space Type	**% Savings**	**Space Type**	**% Savings**	**Space Type**	**% Savings**
Assembly	45	Industrial	45	Restroom	45
Break Rm.	25	Kitchen	30	Retail	15
Classroom	30	Library	15	Stair	25
Computer Rm.	35	Lobby	25	Storage	45
Conference	35	Lodging (Guest Rooms)	45	Technical Area	35
Dinning	35	Open Office	15	Warehouses	45
Gymnasium	35	Private Office	30	Other	15
Hallway	25	Process	45	Parking Garage	15
Hospital Rm.	45	Public Assembly	35		

12.1.5 EEM No. 5 - Replace Air Compressor No. 2 with a VSD Air Compressor

Recommended Action

Replace air compressor No. 2 with a 150 hp variable speed drive (VSD) air compressor. A VSD rotary screw air compressor will consume less energy when operating at part-load.

Estimated Electrical Energy Savings	=	152,424 kWh/yr
Estimated Peak Demand Savings	=	17.4 kW
Estimated Electrical Cost Savings	=	$16,629/yr
Estimated Implementation Cost	=	$61,250

Simple Payback Period	=	3.7 years
Potential Incentive	=	$15,458
Simple Payback Period w/ Incentive	=	2.8 years

Background

The Tertiary System has two 150 hp Quincy air compressor that produce compressed air primarily for the DAF system, float ejectors, and instrumentation. The details of the two air compressors are summarized in Table 12.10. Both compressors were observed to have a discharge pressure of about 118 psig. Compressor #1 was observed to be operating at 100% capacity (output), while Compressor #2 was operating at about 80% capacity. The compressed air system includes two air-cooled after-coolers, two Pneumatech regenerative dryers, and storage tanks. Both air compressors operate 24 hours per day, 365 days per year for a total of 8,760 hours per year.

Table 12.10 Summary of Tertiary Air Compressor Details
Capital Improvement and Energy Management Plan
City of Stockton

Make and Model Number	Compressor Type	Motor Power (hp)	Capacity Control	Rated Motor Power (bhp)	Rated Output (acfm)
Quincy QNW-751-DAS	Rotary Screw	150	Inlet Modulation	159 @ 100 psig	760 @ 100 psig

The existing Quincy air compressors use inlet valves to modulate capacity, which results in relatively high power draw when operating at less than full capacity. As an example, Compressor No. 2 operating at 80% of capacity draws about 94% of full load power. It is recommended that Compressor No. 2 be replaced with a VSD air compressor. A VSD air compressor can produce compressed air more efficiently at part-load than the existing air compressor by adjusting the compressor's motor speed to compressed air demand.

Figure 12.1 Tertiary Air Compressor #2 and Desiccant Dryer

Anticipated Savings

EEM No. 1 recommends reducing the air compressors' discharge pressure from 118 psig to 80 psig. To avoid an overlap of savings, this measure's analysis assumes that both air compressors are operating with a discharge pressure of 80 psig. At this discharge pressure Compressor No. 2 would be operating at about 75% capacity (about 580 acfm output), which with inlet valve modulation results in an input power draw of about 93% of full load. In comparison, a VSD air compressor would draw about 75.7% input power when operating at 75% capacity.

The total annual electrical energy savings is estimated at 152,424 kWh/yr, and the peak demand savings is estimated at 17.4 kW. The associated annual electrical energy cost savings is estimated at $16,629 per year.

Implementation Cost

The implementation cost includes the removal of air compressor No. 2 and the material and installation costs for one 150 hp air-cooled VSD air compressor. The implementation cost is based on a quote from a VSD air compressors vendor and RSMeans Mechanical Cost Data guide 2010. The engineering and contracting costs are estimated to be 25% of the material and labor costs.

(1) 150 hp VSD air compressor, installed.....$ 44,000
Removal of air compressor No.2.....$ 5,000
Engineering and contracting (25% of above costs).....$ 12,250
Total Cost.....$ 61,250

The total cost savings of $16,629/yr will pay for the implementation cost of $61,250 in about 3.7 years.

PG&E Incentive

The potential energy and peak demand savings results in an incentive of $15,458.

Note: According to Air Perfection, both air compressors (S/N 000122 and 000123) are early 1980 vintage.

12.1.6 EEM No. 6 – Install Higher Efficiency DAF Pressurization Pumps

Recommended Action

Replace the existing DAF pressurization pumps with higher efficiency pumps (or higher efficiency impellers) in order to reduce their electrical energy consumption.

Estimated Electrical Energy Savings	=	421,354 kWh/yr
Estimated Peak Demand Savings	=	48.3 kW
Estimated Electrical Cost Savings	=	$45,970/yr
Estimated Implementation Cost	=	$111,250
Simple Payback Period	=	2.4 years
Potential Incentive	=	$42,752
Simple Payback Period w/ Incentive	=	1.5 years

Background

The Tertiary System has four (4) DAF thickeners that use dissolved air to help separate suspended solids from raw water. Each DAF uses a pressurization pump to pressurize DAF recycle water (effluent) to 50 psig in a mixing tank, where compressed air, at 50 psig, is dissolved. The pumps are operational 24 hours per day, 365 days per year, except for short periods when the nitrifying bio-towers undergo a snail control process. Pump design information is shown in Table 12.11 below. The specifications of the existing pumps were obtained during the audit and from the Unit Process Control Plan (UPCP) – August 2008, provided by the City of Stockton.

Table 12.11 Specifications of Existing DAF Pumps
Capital Improvement and Energy Management Plan
City of Stockton

Pump	N	HP	Manufacturer & Pump Type	Design Conditions		
				Flow	Head	Efficiency
DAF Pressurization	4	300	Johnson Pump Co. Vertical Turbine, 2-stage	4,500 gpm	191 ft	81%

While at the plant, the audit team observed DAF units #1 and 4 operating under the conditions shown in Table 12.12. DAF units #2 and 3 were not operating. The operating pressures were read from analog pressure gages. A photo of one of the DAF pressurization pumps and mixing tanks is shown in Figure 12.2.

Because the mixing tanks need to operate at 50 psig, it should be possible to reduce the discharge pressure of the pressurization pumps to 55 psig. Replacing the existing pressurization pumps with pumps sized to provide 4,500 gpm of water with a total dynamic head (TDH) of 133 feet, operating at its optimum efficiency point, will result in significant energy savings. Alternatively, new impellers could be selected to replace the existing impellers.

Table 12.12 Observed Operating Conditions of DAF Pumping Systems Capital Improvement and Energy Management Plan City of Stockton		
DAF Unit	**Pump Discharge Pressure**	**Mixing Tank Pressure**
1	70 psig	55 psig
4	65 psig	50 psig

Figure 12.2 DAF Pressurization Pump (right) and Mixing Tank (center)

Anticipated Savings

Pressurization pump #4 was measured to draw 165 kW, which results in an estimated pump power input of 210.8 bhp. It is assumed that the pressurization pump for unit #1 is drawing a similar amount of power. A new pump selected to produce 4500 gpm at 133 ft TDH with an efficiency of 84% would have a power input of 179.9 bhp. Assuming that two pressurization pumps operate 8,720 hours per year, the annual energy savings for this measure is estimated at 421,354 kWh per year and the peak demand savings is estimated at 48.32 kW. The total electrical cost savings is estimated at $45,970 per year.

Implementation Cost

Implementation consists of selecting and installing new impellers on the existing Johnson vertical turbine pumps. It may be necessary to install new bowls as well as new impellers to

achieve the recommended performance. Engineering and contracting cost of 25% of the above material and labor costs is included.

New impellers for four pressurization pumps	$ 80,000
Installation	$ 9,000
25% engineering and contracting	$ 22,250
Total Cost	**$111,250**

The total cost savings of $45,970/yr will pay for the implementation cost of $111,250 in about 2.4 years.

PG&E Incentive

The potential energy and peak demand savings results in an incentive of $42,752.

Notes:

1. According to the pump curve (Figure 12.3 on the following page), the observed discharge pressures of 65 and 70 psig, and a static head of 6 feet (vertical distance from well water level to pump discharge) the flow rate two pumps should be 4925 gpm and 4800 gpm, respectively. Under these conditions and pump efficiencies of 74% and 77%, respectively, the pumps should be drawing about 263 bhp. But the spot power measurement of pump #4 indicates a pump input power of about 210 bhp. There are potentially a number of reasons for the discrepancy in pump power inputs, but the most likely is that the original pump curve is no longer accurate. According to the available documents, the Johnson vertical turbine pumps were installed in 1977 and it is possible that the bowls, impellers, or both bowls and impellers have been replaced.

2. A number of pump manufacturers, such as American-Marsh, Fairbanks Morse, Griswold, and Layne/Verti-Line, offer vertical turbine pumps with an efficiency of 84% or greater at 4,500 gpm and 133 ft TDH.

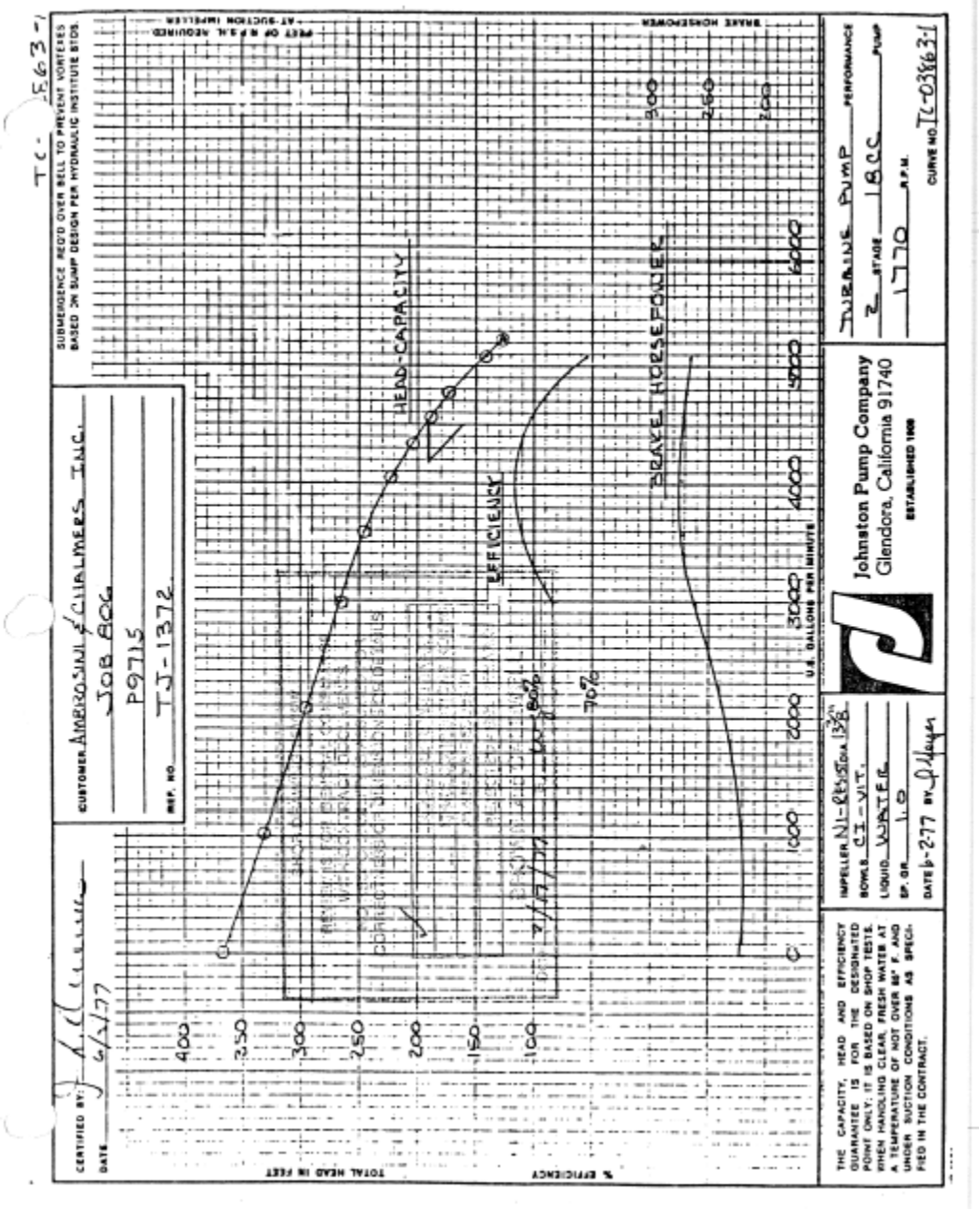


Figure 12.3 Pump Curve for Existing 300-hp DAF Pressurization Pumps

12.1.7 EEM No. 7 – Replace Existing Outdoor HID Lighting with LED Lighting

Recommended Action

Replace existing outdoor pole high intensity discharge (HID) lamps and ballasts with Light Emitting Diode (LED) lamps and drivers (LED ballasts). LED lamps use less energy than HID lamps while providing the same amount of light output.

Estimated Electrical Energy Savings	=	185,525 kWh/yr
Estimated Peak Demand Savings	=	0 kW
Estimated Electrical Cost Savings	=	$20,241/yr
Estimated Implementation Cost	=	$124,525
Simple Payback Period	=	6.2 years
Potential Incentive	=	$9,276
Simple Payback Period w/ Incentive	=	5.7 years

Background

The facility has retrofitted one of their outdoor pole HID lamp and ballast with an LED lamp and driver, and is planning to retrofit the remaining outdoor pole lighting. During the facility visit approximately 200 outdoor lighting poles (125 tall poles and 75 short poles) were accounted for. The exact number of outdoor lighting poles, fixture type and wattage could not be confirmed with facility personnel. This measure only considers the tall poles ("street lights"), which are estimated to have 400-Watt metal halide (MH) fixtures.

LED lighting consumes less energy while providing the same amount of light as HID lighting with improved uniformity, longer rated life expectancy, and instant start-up capabilities when used with lighting controls[2]. According to a few manufacturers of outdoor LED lighting, a 400-Watt MH lamp and ballast can be replaced with a 98-Watt LED lamp and driver. Replacing the outdoor pole HID lighting with LED lighting will result in significant electrical energy savings and reduced lamp replacement costs.

Anticipated Savings

The electrical energy savings that can be realized by replacing HID lighting with LED lighting depends on the total number of fixtures illuminating the area, the fixture input wattage, and the fixture annual operating hours. The estimated electrical energy savings for retrofitting the facility outdoor area lighting is 185,525 kWh per year. Because the outdoor pole lighting is off during the day, this measure will not result in peak demand savings. The electrical cost savings is estimated to be $20,241 per year.

Implementation Cost

[2] US DOE, "LED Application Series: Outdoor Area Lighting", http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/outdoor_area_lighting.pdf

The implementation cost for this measure includes the material and installation cost for 125 98-Watt LED retrofit kits (LED lamp and driver) and the labor to remove the existing metal halide lighting. All implementation costs are derived from cost estimating manuals such as RS Means Electrical Cost Data 2010 Guidebook and Grainger catalog. The implementation cost can be itemized as follows:

(125) 98-Watt, LED retrofit kits.....$ 83,750
Removal/Installation Costs.....$ 40,775
Total Costs.....$ 124,525

The total cost savings of $20,241/yr would pay for the total estimated implementation cost of $124,525 in approximately 6.2 years.

The life cycle implementation cost for this measure is estimated to be $21,250. The total cost savings of $20,241/yr would pay for the total estimated life cycle implementation cost of $21,250 in approximately 1.0 years.

PG&E Incentive

The potential incentive for this measure is estimated to be $9,276.

Note: As of the date this report was submitted, the facility has not confirmed the assumptions made in this measure.

12.2 ENERGY EFFICIENCY MEASURES NOT RECOMMENDED

This Section provides some general information about other energy efficiency measures (OEEMs) identified at this facility. Some of the measures proposed by the facility have energy savings potential, but would require long simple payback periods. These measures are not included in the EEM analysis due to the reasons listed in Table 12.13 below.

Table 12.13 Other Energy Efficiency Measures Considered
Capital Improvement and Energy Management Plan
City of Stockton

OEEM		
No.	**Description**	**Reason for Not Including in EEM Analysis**
1.	Install High Efficiency Pumps	This measure has a lengthy payback period of 30 years.
2.	Replace the Pneumatic Float Ejectors in the DAF System with Pumps	This measure has a high capital cost and the economics of implementing this measure was not deemed feasible.
3.	Replace the Existing Hot Water Boiler in the Administration Building with a High Efficiency Hot Water Boiler	The energy savings for this measure was insignificant and thus has not been included in the EEM analysis.
4.	Install High Efficiency Packaged HVAC Units in the Administration Building as the Existing Units Wear Out	The energy savings for this measure was insignificant and thus has not been included in the EEM analysis.

OEEM No. 1 – Install Higher Efficiency Pumps

The use of higher efficiency pumps will reduce the power consumed by the pumps. Based on data obtained during the audit of the facility and pump curves provided by the facility's design engineers, it was determined that pumping efficiency improvements can be made to some of the pumps utilized by the facility. The pumps listed in Table 12.14 are operational 24 hours per day, 365 days per year, for a total of 8,760 hours per year.

Higher efficiency pumps can provide the same amount of output water flow with lower electrical energy consumption, resulting in energy savings. Pump suppliers manufacture a wide variety of pumps that can satisfy the basic specifications (flow and head) as the current pumps but with higher pump efficiencies. The audit team was provided with pump curves for the pumps shown in Table 12.2.1-1. Pump curves for the current pumps are shown in Figures 12.4 through 12.8.

Table 12.14 Pump Specifications
Capital Improvement and Energy Management Plan
City of Stockton

Pump	N	HP	Design Conditions		Manufacturer & Pump Type	Existing Pump Efficiency	Baseline Pump Efficiency
			Flow	Head			
			(gpm)	(ft)		(%)	(%)
Raw Sewage Pumps	2	300	23,600	41	Fairbanks Morse *(Mixed flow horizontal, end suction)*	0.82	0.789
Raw Sewage Pump	1	350	26,000	42	Fairbanks Morse *(Mixed flow horizontal, end suction)*	0.82	0.785
Raw Sewage Pump	1	400	26,000	45	Fairbanks Morse *(Mixed flow horizontal, end suction)*	0.82	0.792
Wetlands Hi-Lift Pumps	3	300	20,000	50	Cascade *(Vertical mixed flow)*	0.90	0.821
Wetlands Recycle Pumps	4	125	10,000	40	Cascade *(Vertical mixed flow)*	0.92	0.644
Filtered Water Pumps	3	125	23,000	13	Cascade *(Vertical mixed flow)*	0.66	0.92

Based on the specified pump conditions (flow, head and pump type) for the existing pumps, the pump software "Pumping System Assessment Tool (PSAT)" was used to determine the baseline pump efficiency. A search was performed to identify whether there were higher efficiency pumps capable of providing the specified pump conditions. Table 12.15 summarizes the energy savings for the recommended high efficiency pumps.

Table 12.15 High Efficiency Pump Energy Savings Capital Improvement and Energy Management Plan City of Stockton						
Pumps	**N_C**	**HP**	**Existing Pump Efficiency**	**Proposed Pump Efficiency**	**Electrical Energy Savings**	**Demand Reduction**
			(%)	(%)	(kWh/yr)	(kW)
Raw Sewage Pumps	2	300	0.82	0.85	104,126	11.9
Raw Sewage Pump	1	350	0.82	0.86		
Raw Sewage Pump	1	400	0.82	0.87		
Wetlands Hi-Lift Pumps	3	300	0.90	*No change recommended. These pumps are high efficiency already.*		
Wetlands Recycle Pumps	4	125	0.92			
Filtered Water Pumps	3	125	0.66			
Totals					**104,126**	**11.9**

The total electrical energy savings for installing higher efficiency raw sewage pumps is estimated at 104,126 kWh/yr. The peak demand savings is estimated at 11.9 kW. The total electrical cost savings is estimated at $11,360 per year.

The total implementation cost for replacing the existing raw sewage pumps with the proposed high efficiency pumps is estimated at $350,000. The estimated total cost savings of $11,360/yr would pay for the implementation cost including incentive in about 30 years.

It is recommended that high efficiency pumps be installed as the existing pumps wear out (i.e. on a replacement basis). Thus, the implementation cost would be the cost premium for installing high efficiency pumps over standard efficiency pumps.

This measure may qualify for a utility incentive of $10,560.

Notes:

1. This analysis only considers the pumps that the audit team received pump specifications for. There are many other pumps in the wastewater treatment facility which have not been included in this analysis due to insufficient data which may change the economic feasibility of this recommendation.

2. Various pump manufacturers manufacture suitable pumps that can satisfy design conditions and operate at a higher efficiency than the current pumps. It is strongly encouraged to solicit competitive bids from several vendors.

3. It is recommended that high efficiency pumps be installed as the existing pumps wear out (i.e. on a replacement basis). Thus, the implementation cost would be the cost premium for installing high efficiency pumps over standard efficiency pumps.

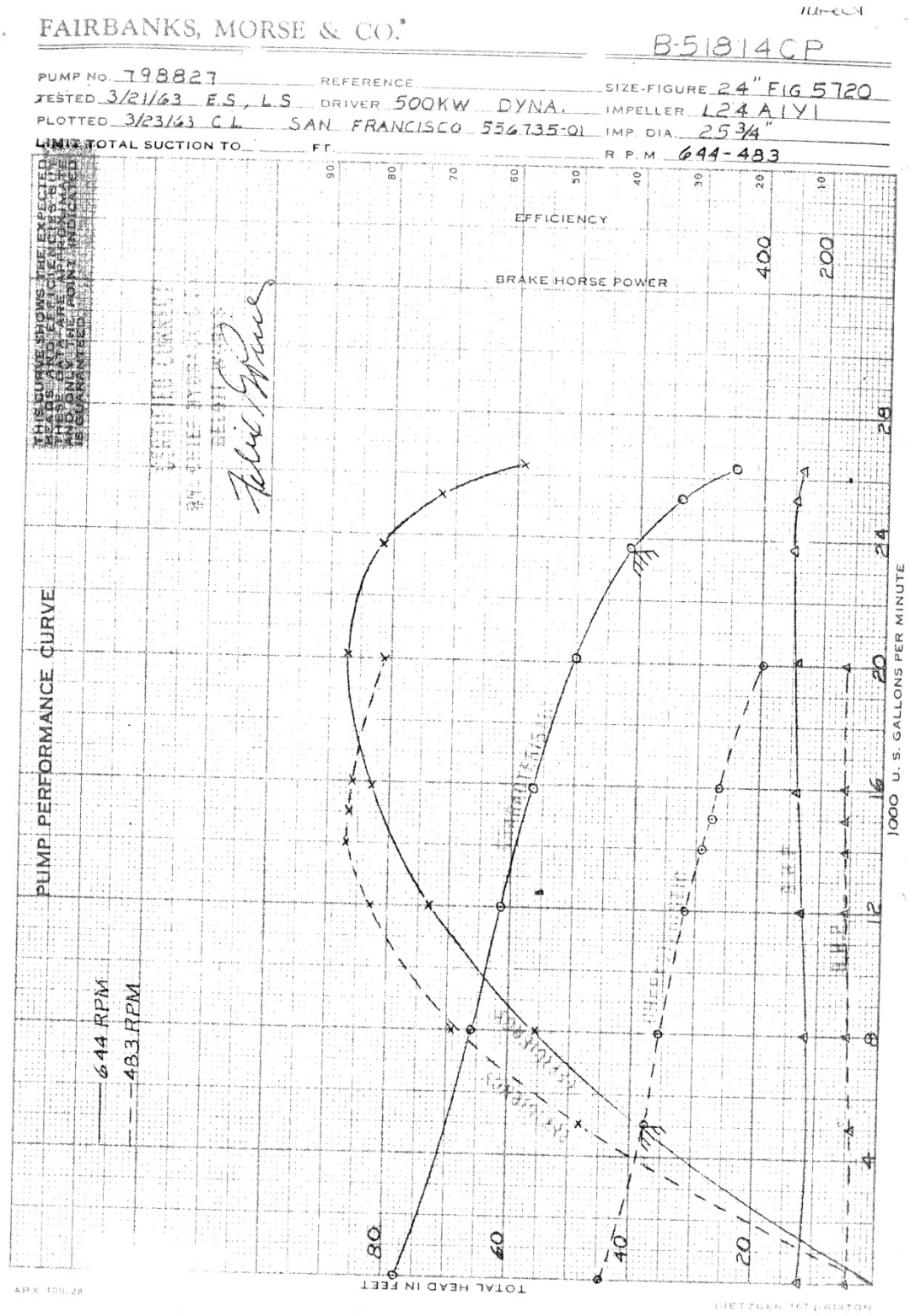


Figure 12.4 Pump Curve for Existing 300-hp Raw Sewage Pumps

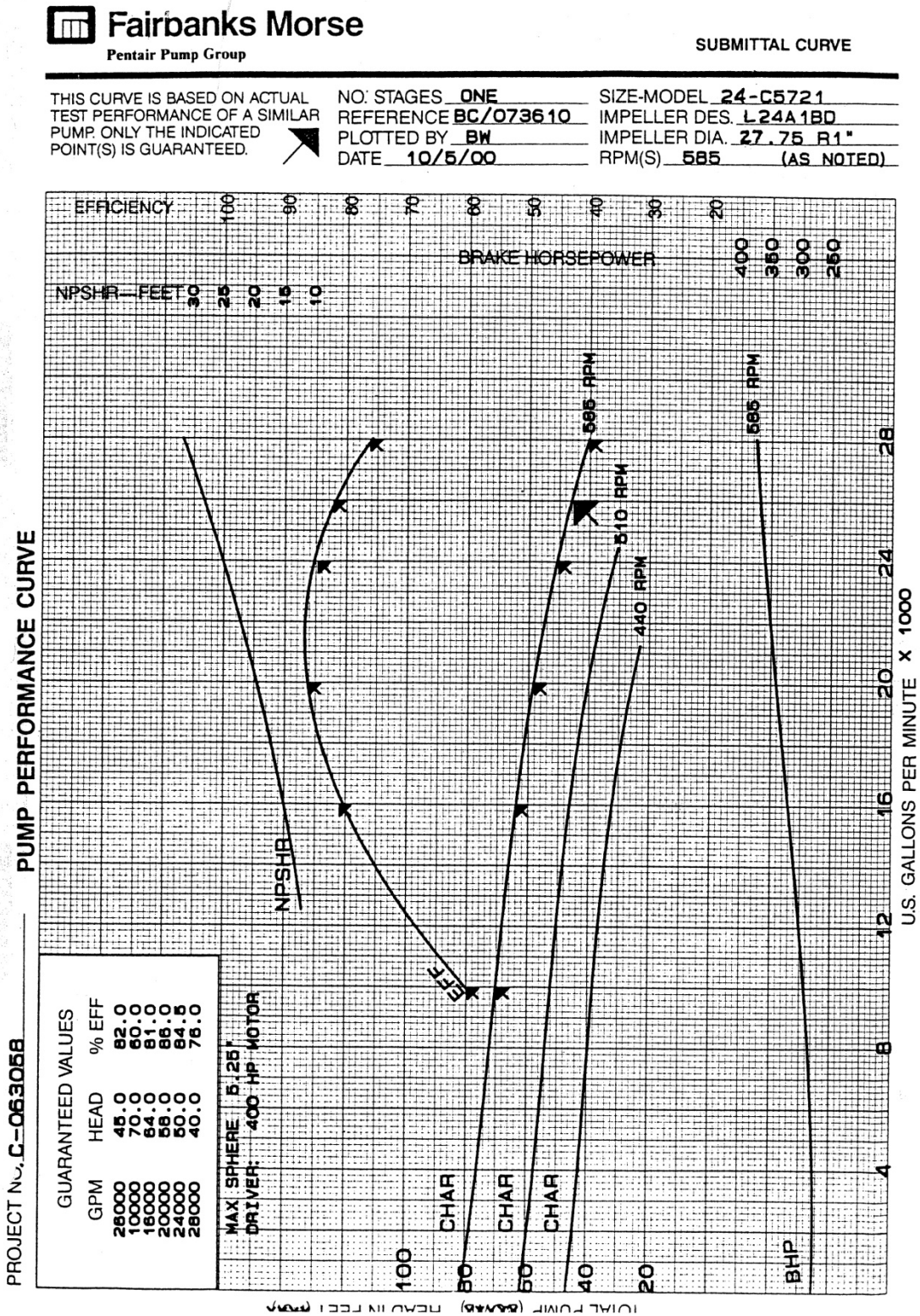


Figure 12.5 – Pump Curve for Existing 350-hp and 400-hp Raw Sewage Pumps

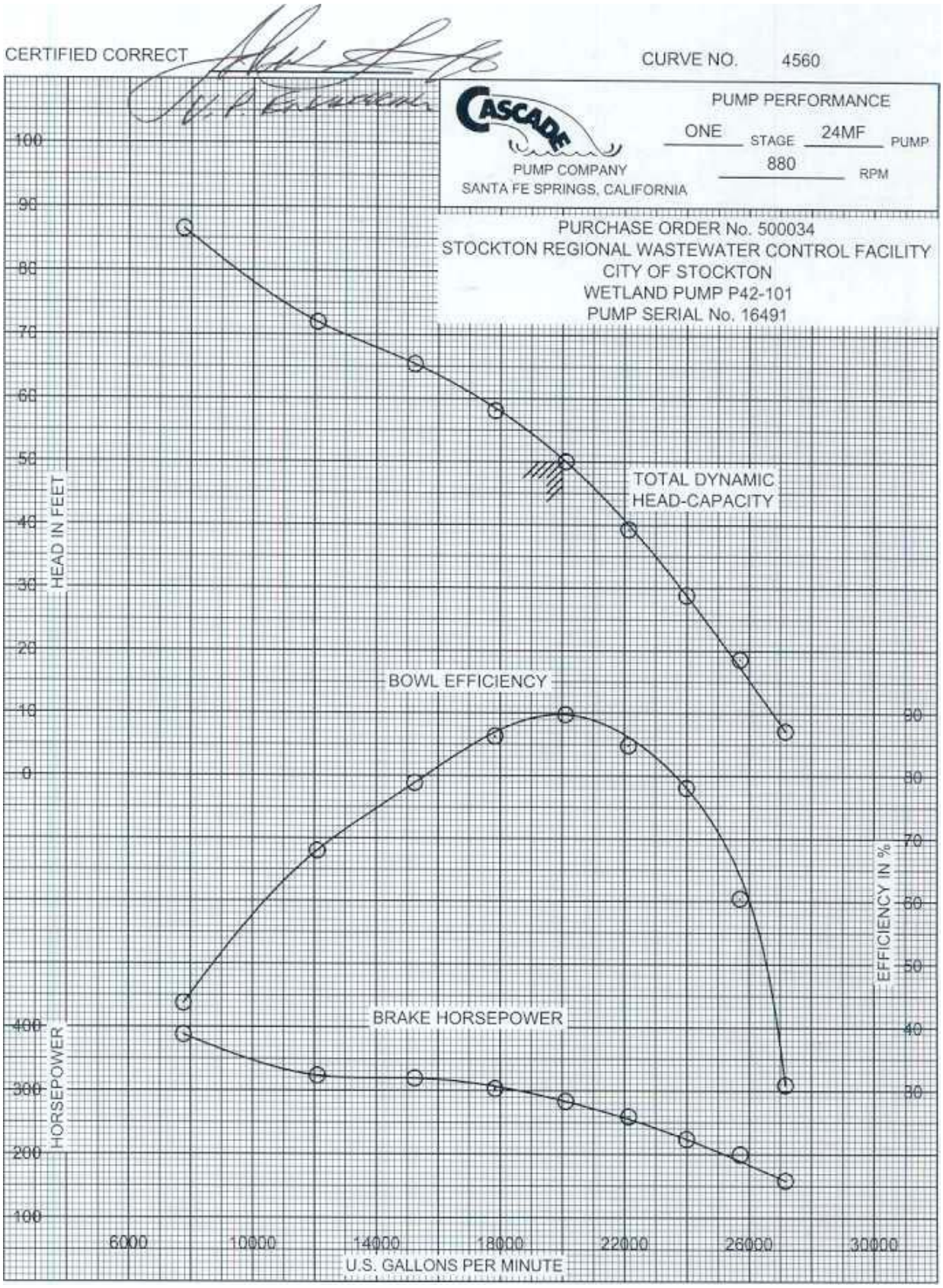


Figure 12.6 – Pump Curve for Existing 300-hp Wetlands Hi-Lift Pumps

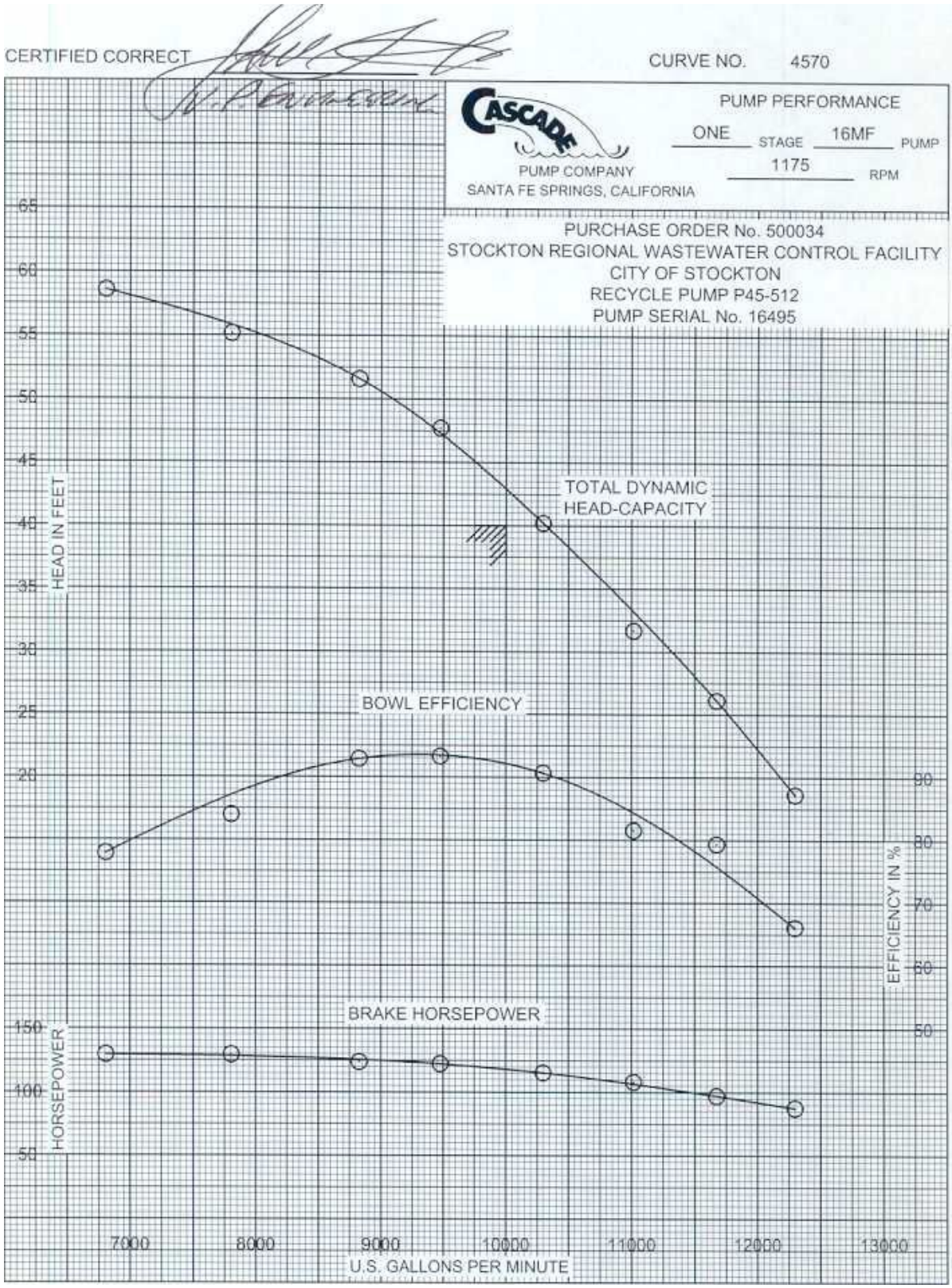


Figure 12.7 – Pump Curve for Existing 300-hp Wetlands Recycle Pumps

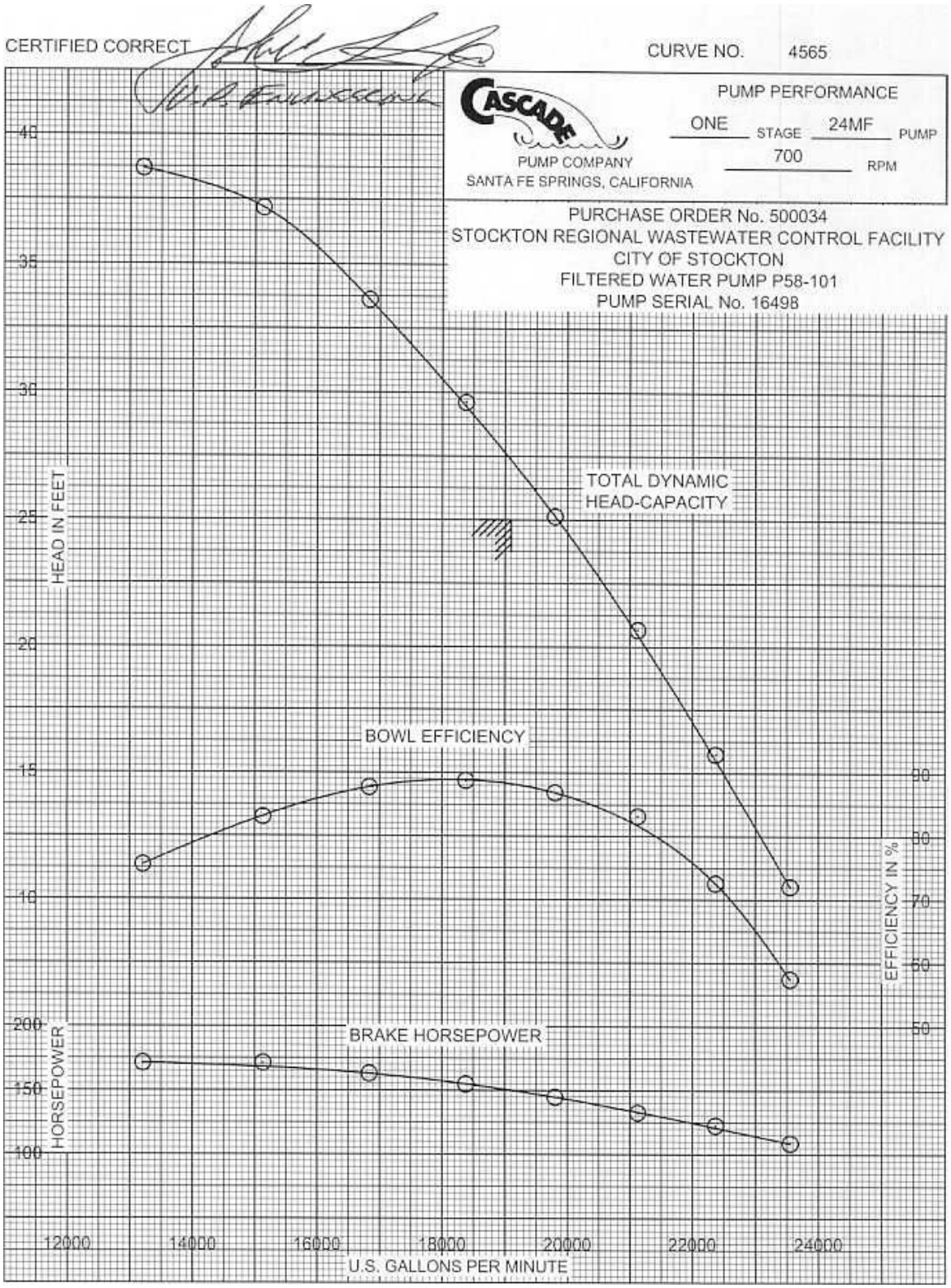


Figure 12.8 – Pump Curve for Existing 125-hp Filtered Water Pumps

OEEM No. 2 - Replace the Pneumatic Float Ejectors in the DAF System with Pumps

The Tertiary System has two 150 hp Quincy air compressor that produce compressed air primarily for the DAF system, float ejectors, filter isolation valves, backwash air control valves, and instrumentation. According to the O&M manual, each DAF system has two float ejectors and each ejector is rated at 150 gpm. The ejectors receive float and sludge via a screw conveyor. The float and sludge is stored in a sealed tank, and when the liquid inside the tank reaches a certain level compressed air is introduced to pump out the float and sludge to the float pumping station. The ejectors typically discharge float and sludge once per minute.

The compressed air draw of the float ejectors is not given in the O&M manual, but information from Yeomans Pumps gives a range of 60 to 108 acfm for an ejector rated at 150 gpm. Based on the current performance of the two Quincy air compressors, the power to produce an average of 84 acfm of compressed air is estimated at 15.6 kW. An electric motor-driven pump would draw about 1.5 kW under the same conditions (150 gpm @ 30 feet of head).

Assuming that four float ejectors are in use at any given time and that they are discharging (using compressed air) 25% of the time, then the electrical energy savings from replacing the ejectors with pumps is estimated at 123,500 kWh per year. This measure is estimated to reduce the facility's peak demand by 14.1 kW. The estimated electrical energy cost savings is $13,474/yr.

There are a number of ways to implement this measure, but each will involve a sump(s) to collect float and sludge from the screw conveyors, electric motor-driven pump(s), level controller(s), and piping to the float pumping station. It is roughly estimated that this may cost $165,000, but the details of the system would need to be evaluated in more detail.

<u>PG&E Incentive</u>

The potential energy and peak demand savings results in an incentive of $12,525. Note that the potential incentive is limited to 50% of the implementation cost.

OEEM No. 3 – Replace the Existing Hot Water Boiler in the Administration Building with a High Efficiency Hot Water Boiler

While at the facility, the audit team was unable to gain access to the roof Administration building to observe and inventory the HVAC equipment. HVAC information was requested from facility maintenance personnel on several occasions, but the information was not provided by this report's deadline. It is our understanding that the Administration building is heated by hot water produced by a hot water boiler. This measure will try to estimate the potential energy savings from replacing the existing hot water boiler with a higher efficiency boiler.

First, this analysis considers the hot water boiler to have a standard efficiency of 80%. This boiler could be replaced with a high efficiency, condensing hot water boiler. Typical high efficiency, condensing hot water boilers have an efficiency of 92%.

Next, energy consumption for both standard efficiency and high efficiency cases were estimated using eQuest™ (a DOE 2.2 based software for hourly analysis of energy use of commercial and residential buildings) to simulate a model of the Administration Building. From the simulation, the estimated energy consumption for the standard efficiency hot water boiler and the high efficiency condensing hot water boiler is 1,140 and 992 therms per year, respectively. Based on the simulation, the estimated natural gas savings from replacing the standard efficiency hot water boiler with a high efficiency, condensing hot water boiler is 148 therms per year.

OEEM No. 4 – Install Higher Efficiency Packaged HVAC Units in the Administration Building as the Existing Units Wear Out

While at the facility, the audit team was unable to gain access to the roof Administration building to observe and inventory the HVAC equipment. HVAC information was requested from facility maintenance personnel on several occasions, but the information was not provided by this report's deadline. With the understanding that we cannot make specific recommendations due to the lack of HVAC data, we have attempted to provide the facility with generalized recommendation for future HVAC unit purchases.

First, it is assumed that the existing HVAC units meet the minimum energy efficiency performance required by Title 24, which is an EER of 9.7 for roof top units (RTUs). Next, the energy consumption for baseline (standard efficiency) and new higher efficiency packaged HVAC units were estimated using eQuest™ (a DOE 2.2 based software for hourly analysis of energy use of commercial and residential buildings) to simulate a model of the Administration Building. From the simulation, the estimated energy consumption for the standard efficiency HVAC units and the higher efficiency HVAC units is 33,560 and 29,060 kWh per year, respectively. Based on the simulation, if all of the existing standard efficiency HVAC units were to be replaced with higher efficiency HVAC units the annual energy savings is estimated at 4,500 kWh per year.

The facility provided the audit team with a listing of the HVAC units throughout their facility, but the individual units for the Administration Building could not be determined. Due to the minimal electrical energy savings for this measure, it is recommended that high efficiency HVAC units be installed as the existing HVAC units require replacement.

APPENDIX H – SOLAR POWER DETAILED REPORT

SOLAR POWER

This Appendix provides supplemental information to Chapter 15 of the CIP and provides a technical and financial feasibility evaluation of installing solar photovoltaic (PV) energy facilities at the Regional Water Control Facility (RWCF). In addition, we performed a cursory review of the Delta Water Supply Project (DWSP) site to estimate the generation potential and costs of a PV system at that site. To complete this task we visited the facility and collected information about site conditions, shading constraints, and the existing electrical demand. With this information, and with additional data collected from the City, we estimated the system size and electricity generation potential from each site.

The section is structured in three main subsections. Section 15.1 presents assumptions that were used to evaluate sites and estimate the system size and electricity generation. This section includes a discussion of the types of PV systems recommended for the RWCF facilities, presents the representative PV equipment used in the analyses, and discusses the factors that were considered when identifying potential locations for PV arrays.

Section 15.2 summarizes the findings from the site assessments. This section includes a review of the total kW capacity and potential electricity generation (kWh) from the proposed PV systems. This section also provides an estimated installed cost for the systems.

Section 15.3 includes a discussion of the site-specific information from the solar analysis. This section also presents more detail about the proposed PV array location(s) including the shading constraints, roof condition, existing electrical demand, and estimated generation potential at each site.

Table 15.1 shows the estimated PV system sizes for five primary areas at the RCWF as well as RCWF's Pond 1 and the DWSP. The PV systems were sized to maximize generation from the available space. The recommended system size for the RCWF is 1 Megawatt (MW) (1.21 MW DC) of solar capacity that would generate approximately 2,227 MWhs of electricity annually.

Based on this site feasibility and financial analysis it is recommended that, if sufficiently motivated to pursue a solar PV system despite the lower NPV compared to the status quo, the City issue a Request for Proposal (RFP) to have a solar PV contractor design, build, operate and own a 1 MW AC of ground mounted, single axis tracking PV systems. These systems would be spread out amongst the vacant field south of the Maintenance

Table 15.1 Summary of PV Potential at City of Stockton RWCF Locations
Capital Improvements and Energy Management Plan
City of Stockton

Site	Historical Annual Electricity Use (1) (kWh)	PV Capacity (kW - DC)	Estimated Annual Electricity Generation from PV (2) (kWh)	Estimated Installed Cost (3) ($)	Site's Annual Electricity Usage Supplied by PV (4) (%)
Stockton RWCF	**8,570,524**	**2,015**	**3,485,576**	**$9,134,040**	**41%**
Recommended System Size (5)		1,210	2,226,802	$5,605,500	26%
Area 1 Vacant land south of collections and maintenance building		595	1,095,015	$2,707,250	
Area 2 Rock filter basins		194	357,030	$882,700	
Area 3 Vacant land between Pond 1 and River		674	1,239,943	$3,165,790	
Area 4 Roof of Collections and Maintenance Building		94	123,295	$366,600	
Area 5 Main Parking Lot		361	491,778	$1,570,350	
Other Areas for Consideration - Pond 1					
Alternative 1- Single axis tracking built in drained pond basin		2,296	4,225,470	$10,446,800	49%
Alternative 2 - Fixed tilt PV system built on piers in water		6,075	8,881,462	$38,265,210	104%
Delta Water Supply Project	N/A				
Recommended size		1,210	2,226,802	$ 5,505,500	N/A
Maximum size		7,260	13,360,812	$ 33,033,000	N/A

Notes:
(1) Electricity use for one full year starting in October 2009 and ending in September 2010.
(2) Estimated electricity generation modeled in PV simulation software.
(3) System cost estimated from industry experience.
(4) % calculated by dividing (d) the PV electricity generation by (a) the historical annual electricity purchases.
(5) The recommended system size of 1.21 MW DC would be spread over Areas 1, 2, and 3.

and Collections Building, the Rock Basin area, and the vacant land located between Pond 1 and the river. This is the maximum size of a PV system that would be eligible for receiving CSI incentives (any increment beyond this system size would not be eligible for CSI incentives). This 1 MW system would generate approximately 2,227 MWh of electricity annually. At the time of this report, the CSI incentives for non-residential projects in PG&E service territory have been suspended. However, the solar industry anticipates that the incentives will be reinstated in the near future.

In addition, Caltrans is proposing a future extension of California State Route 4 in which the route would travel over the southeast corner of Area 1 and over Area 3. This extension, if it were to proceed, is scheduled to be constructed in 15 to 20 years. This could impact PV systems proposed for Areas 1 and 3 and should be taken into consideration prior to installation in these locations because relocating the PV systems to accommodate the SR 4 extension would be economically prohibitive.

Within a PPA arrangement, the developer would own and maintain the PV systems and sell electricity to the City at a pre-negotiated price. This third party ownership structure may result in the loWet PV energy cost to the City, because private sector owners qualify for state and federal tax incentives for which local governments do not qualify. The cost savings that the third party owner accrues will be passed on to the City.

Based on the financial analysis, the net present value (NPV) of a third party owned system with a PPA is higher than the NPV of purchasing the solar PV system outright and both of these scenarios have a lower NPV than the status quo (no solar PV system). However, falling solar PV module prices along with the prospects of additional state incentives (California Governor Jerry Brown has proposed a Feed-in-Tariff for distributed renewable energy – targeting solar PV) and increasing utility rates will trend future PPA prices toward grid parity. Table 15.2 shows the Net Present Value of the PV systems relative to the status quo.

If the City would like to explore additional solar PV potential, it is recommended that the City consider using the water treatment facility (Delta Water Supply Project) on North Lower Sacramento Road as the location for development. This site has several acres of level, unshaded vacant land that would serve as an ideal location for ground mounted, single axis PV tracking system. In addition, this site would provide an additional meter to which the City could interconnect, net meter, and receive additional CSI incentives. The recommended system size for this site is also 1 MW AC (system size cap for CSI Incentives).

Table 15.2 Net Present Value Comparison Capital Improvements and Energy Management Plan City of Stockton			
		Net Present Value	
Area	PV System Size (DC)	Third Party	City Owned
Area 1 Vacant Land south of Maintenance	595	($368,809)	($423,503)
Area 2 Rock Filter Basins	194	($120,249)	($139,007)
Area 3 Vacant Land near Pond 1	674	($489,814)	($574,077)
Area 4 Roof of Maintenance	94	($96,262)	($113,717)
Area 5 Parking Shade Structure	361	($452,480)	($548,643)
Aggregate 1 MW PV System	1210	($973,963)	($1,111,023)

If the City wanted additional solar PV development beyond 1 MW of solar at each location (RCWF and Delta Water Supply Project), it should consider leasing vacant or underutilized City land at these two locations to a solar developer who in turn would build and operated a solar PV facility and sell the power directly to PG&E. This type of leasing arrangement is common for utility scale PV systems and can provide an additional revenue stream for the City.

15.1 PV SYSTEM ANALYSIS

The analyses conducted for this feasibility study are based on the solar PV system design assumptions described below, which include the types of systems used in the analyses, specifications on the representative equipment, and factors considered when selecting potential array locations. If the City implements the proposed project, contractors may provide designs that vary from the representative system used in these analyses. Energy production and cost may vary depending on the design specifications.

15.2 PV MOUNTING

15.2.1 Ground Mounted Systems

Ground mounted systems were specified for locations with large areas of unshaded ground space suitable for PV equipment. For these ground-mounted systems, a single-axis tracking system was assumed to maximize the output of these arrays. Single-axis tracking systems rotate around one axis and follow the sun from east-to-Wet as the day progresses. Some PV developers may recommend dual-axis tracking system, which not only track the sun from east-to-Wet, but also tracks the sun as it moves higher and lower in the sky throughout the course of the year.

Single axis trackers were specified for the analyses because they produce approximately 20 to 25 percent more electricity than a fixed angle ground mount system, but they are not

as expensive as dual-axis tracking systems and require less maintenance. Because ground mounted systems are typically more expensive than roof mounted systems due to the need to construct the supporting structures, it is likely that developers will want to offset the additional costs of the ground mount structure by investing in tracking systems that produce more electricity than fixed tilt systems. However, depending on the developers' preference and the economics of their development package, they may decide to use a fixed tilt system for ground mounted units.

There are geotechnical and environmental considerations that must be addressed during the construction of ground mount systems, such as the suitability of the soil for foundation support and site contamination. Geotechnical and environmental evaluation of the sites is not part of the scope of this evaluation. The City should complete an appropriate evaluation of the geotechnical and environmental conditions of these sites prior to constructing ground mounted PV systems.

15.2.2 Roof Mounted Systems

Roof mounted PV systems were specified for RWCF buildings with sufficient unshaded roof space, specifically the Maintenance and Collections Building and adjacent Vehicle Storage Building. It was assumed that arrays mounted on flat roofs would be installed with a racking system parallel to the roof surface with a few inches separating the modules from the roof. This mounting practice is the simplest and typically the least expensive mounting arrangement, and it allows air to circulate below the modules which keeps them cooler and allows them to operate more efficiently than flush-mounted arrays. The roof slope provides the tilt that helps optimize electricity production, and the single plane arrangement allows the most panels per square foot of roof space while also minimizing aesthetic concerns. Developers' selection of tilt angle may differ depending on the racking systems they use.

15.2.3 Parking Shade Structures

Parking shade structures were specified for the parking lot at the northeast corner of the RWCF which has large unshaded parking. The parking shade structures would face approximately south (i.e. the long edge of the shade structure runs east-Wet), and it was assumed that the shade structure would have a slope of three degrees. This architecture allows for a continuous surface of PV modules and efficient use of structure area. In addition, the tilt will allow water to run off the array and prevent debris and dust accumulation that may hinder system performance.

Parking shade structures are typically about 10 to 20 percent more expensive than roof mounted systems.

15.3 REPRESENTATIVE PV EQUIPMENT

15.3.1 PV Modules

Solarworld SW 245 modules were the representative module for this analysis. These 3.3 foot x 5.5 foot modules have a rating of 219.6 watts under the California Energy Commission's (CEC) photovoltaic module PVUSA Test Conditions (PTC). This module has an efficiency rating of 14.5 percent, which is comparable to other equivalently-sized polycrystalline modules from different manufacturers. Module cost and availability at the time of installation will be the main considerations for the final module selection.

15.3.2 Inverters

Inverters from SatCon were used as the representative inverters for the analyses because SatCon produces a wide range of inverters with high conversion efficiencies.

15.3.3 Mounting and Racking

No assumptions were made about the racking or the mounting system brands because it has little effect on potential electricity generation. When evaluating racking systems, the City should be aware that modules should be well ventilated. It is also helpful to have modules mounted in such a way that they can be cleaned relatively easily.

15.4 PV SITE ASSESSMENTS

During site visits, the WE Team identified potential locations for PV arrays. When identifying suitable locations, the Team considered shading constraints, array orientation, roof condition, electrical configuration and estimated cost.

15.4.1 Shading

Areas selected as potential locations for PV had more than 95 percent access to full sun. Shading of PV modules and arrays can cause disproportional reductions in power output: in extreme cases, 10 percent shading can reduce power output by as much as 90 percent. For this reason, only areas that received nearly un-obstructed sun between 9:00 am and 3:00 pm were considered as primary areas.

Typical shading constraints include rooftop equipment, trees, and sections of the building shading the lower roofs. Additional PV system design considerations beyond generally avoiding shading from equipment, trees, and taller sections of buildings, include allowing sufficient space to access and repair rooftop equipment and weighing the benefit of tree shade that may reduce air conditioning load during the summer. It is recommended that the City evaluate the possibility of trimming or removing trees on a site-by-site basis.

15.4.2 Array Orientation

Areas selected as potential locations allow arrays to be oriented towards the south, southwest, southeast, or west. PV arrays are most efficient if they are oriented due south. Southwestern and Western orientations are more appealing than southeastern and eastern orientations because the former create the most electricity in the afternoon during times of peak electricity demand.

15.4.3 Structural Analysis

PV systems on ground mount PV systems and parking shade structures would be installed on top of a structure specifically designed to accommodate PV modules. The final design of these structures will be the responsibility of the selected PV developer. Therefore, a structural analysis of new parking shade and ground mount structures is not provided in this report.

Roof condition and age was assessed at the Maintenance and Collections Building. However, a structural analysis was not included in the scope of this feasibility assessment. Prior to installing a PV system, the City should conduct a comprehensive analysis to determine the acceptable load for each rooftop, parking shade structure, and ground mounted structure.

The PV system with aluminum racking that WE recommends for roof-mounted PV systems weighs less than four pounds per square foot. In most cases, PV arrays weigh less than the collateral load a building is designed to withstand, so issues with the structural stability of the roof are not common.

15.4.4 Electrical Review

A preliminary review of the electrical system and an assessment of the annual electricity demand and utility cost data was performed for the RWCF site. The site contains multiple electrical substations that can serve as the interconnection point for the PV system. A complete electrical review is required to determine the appropriate location to interconnect the proposed PV system into the electrical grid and to assess the capacity of the RWCF's electrical system.

15.4.5 Weather Data

Potential electricity generation is affected by local weather patterns. Factors that are particularly important include the number of cloudy days and average temperatures. Panels are most efficient on sunny days that are not too hot. We used Sacramento weather data as an approximation of the local weather patterns in Stockton. Stockton weather may vary slightly from weather at the Sacramento, but the Sacramento weather data is sufficient to obtain a reasonable result.

15.5 PV SYSTEM ELECTRICITY GENERATION SOFTWARE

We used PVWatts, a PV generation simulation software, to estimate the annual electricity generation of the proposed PV systems. The software estimates the electricity generation of the system based on inputs such as geographical location, array orientation, array tilt, and weather data.

15.6 SYSTEM COSTS

We estimated the installed cost of the PV systems including labor and materials based on discussions with industry contacts. These system costs assume a minimum size of 500 kW across the RCWF facility. The estimated baseline installed cost for the different system types is listed in Table 15.3 below. Site specific conditions may increase the estimated system costs from what is listed in the table below.

Table 15.3 Estimated PV System Costs
Capital Improvements and Energy Management Plan
City of Stockton

System Type	Estimated System Cost ($/watt DC)
Roof Top	$3.90
Single Axis Tracking Ground Mount	$4.55
Parking Structure	$4.35
Pier Mounted Fixed Tilt	$6.30

15.7 SUMMARY OF FINDINGS

For the RWCF, we reviewed the electricity usage and projected the annual electricity generation from the proposed systems based on the preliminary PV system designs. This section summarizes the PV findings for all proposed sites.

15.7.1 Annual Electricity Use

Pacific Gas and Electric Co. (PG&E) provides electricity to the RWCF. As shown in Table 15.4, during the most recent one-year period from October 2009 – September 2010, the RWCF purchased 8.57 gigawatt-hours (GWh) of electricity from PG&E at a cost of $1,019,000. On average, the City paid 11.8 cents per kWh for electricity during that period.

Presently, the California Solar Initiative (CSI) Incentive Program limits the PV System to a size that produces no more than 100 percent of site's annual electricity use. However, the RWCF does not have sufficient space for a PV system to generate 100 percent of the site's annual electricity and therefore it is not the limiting factor in determining PV system size.

Table 15.4 Annual Electricity Data for RWCF [(1)] Capital Improvements and Energy Management Plan City of Stockton				
		Annual Data (2009 – 2010) [(1)]		
Site	**PG&E Rate Schedule**	**Electricity Purchased *kWh***	**Charges *$***	**Annual Avg. Rate *$/kWh***
Regional Water Control Facility	E20	8,570,524	$1,018,896	$0.118

Note:
(1) Table reports electricity use and electricity cost data for one full year; starting in October 2009 and ending in September 2010.

15.7.2 PV Electricity Generation and System Cost

Table 15.5 shows the estimated electricity generation and the proposed PV system sizes at five distinct locations at the RWCF. In addition, the table shows the solar PV cost and potential for the RWCF Pond 1 and the Delta Water Supply Project site.

The recommended system is 1.21 MW DC (1 MW CEC-AC) system consisting of ground mounted single axis trackers located in three areas of the RWCF – the Vacant Land south of the Maintenance and Collections Building, the Rock Filter Basins, and the Vacant Land between Pond 1 and the San Joaquin River. This system type and size is the optimal system for the site because it is the most cost effective in terms of cost per kWh produced while maximizing the available CSI incentive (incentives for solar PV is capped at 1MW CEC-AC).

Based on the typical access to sun at these sites, this generating capacity would produce about 2,227 MWh of electricity annually. This is approximately 26 percent of the RCWF's annual electricity purchase from PG&E. In addition, it would reduce the City's annual GHG emissions by 529 metric tons CO_2.[1] The estimated installed cost for a project of this size is $5.6 million.

[1] California Public Utilities Commission (CPUC)-approved ClimateSmart electric emissions rate of 0.524 lbs CO_2 per kWh

Table 15.5 PV Project Electricity Generation Potential and Cost Capital Improvements and Energy Management Plan City of Stockton			
Site	**PV Peak Capacity (kW-DC)**	**Estimated Annual PV Generation (kWh)**	**Estimated Installed Cost ($)**
Stockton RWCF Total	**1,918**	**3,307,061**	**$8,692,690**
Recommended System Size(1)	**1,210**	**2,226,802**	**$5,605,500**
Area 1 Vacant land south of collections and maintenance building	595	1,095,015	$2,707,250
Area 2 Rock filter basins	194	357,030	$882,700
Area 3 Vacant land between Pond 1 and River	674	1,239,943	$3,165,790
Area 4 Roof of Collections and Maintenance Building	94	123,295	$366,600
Area 5 Main Parking Lot	361	491,778	$1,570,350
Other Areas for Consideration - Pond 1			
Alternative 1 Fixed tilt PV system built on piers in water	6,075	8,881,462	$38,265,210
Alternative 2 Single axis tracking built in drained pond basin 2	2,296	4,225,470	$10,446,800
Delta Water Supply Project Site			
Recommended size	1,210	2,226,802	$5,505,500
Maximum size	7,260	13,360,812	$33,033,000

Notes:
(1) The recommended system would consist of ground mounted, single axis trackers in Areas 1, 2, and 3 totaling 1,210 kW-DC (1 MW CEC-AC).
(2) The cost does not include building berm and draining area to accommodate PV system

15.7.3 Financial Assessment

A cash flow analysis was conducted to determine the net present value (NPV) of three scenarios over a 20 year period. The assessment was performed for two scenarios: City-owned and power purchase agreement (PPA):

- Status Quo (no solar PV system)
- City-owned solar PV system (1 MW CEC-AC)
- Third Party owned 1 MW CEC-AC (through a Power Purchase Agreement - PPA)

The assumptions include:

- Expenses
  - System cost: Varies by Area
  - Interconnection: $1,000
  - Permitting: $400
  - O&M costs of $12,095/yr (three percent escalator)
  - Inverter Replacement in Year 13 - $700/kW
- Revenues
  - Net Metering (including 25 percent peak demand shaving)
  - CSI Incentive ($0.15/kWh for City owner; $0.05/kWh for Third Party Owned)
- Discount rate: 5 percent
- Utility escalation rate: 5 percent
- Net metering on E-20 schedule

Additional assumptions for the third party ownership scenario include:

- 13.5 cents/kWh PPA rate (three percent annual escalator)
- 30 percent Investment Tax Credit or Treasury Cash Grant
- 100 Percent Bonus Depreciation (for projects completed by December 2011)
- Federal Corporate Tax Rate: 35 percent
- State Corporate Tax Rate: 8.84 percent

Based on the cash flow analysis, it is projected that the net present value (NPV) of the PV systems (for both a City owned system and a third party owned system through a power purchase agreement or lease) outlined in this report will be lower than the status quo (City continues with PG&E and on site co-generation). Table 15.6 shows the NPV of the PV systems relative to the status quo.

Table 15.6 Net Present Value Comparison
Capital Improvements and Energy Management Plan
City of Stockton

Area	PV System Size (DC)	Net Present Value	
		Third Party	City Owned
Area 1 Vacant Land south of Maintenance	595	($368,809)	($423,503)
Area 2 Rock Filter Basins	194	($120,249)	($139,007)
Area 3 Vacant Land near Pond 1	674	($489,814)	($574,077)
Area 4 Roof of Maintenance	94	($96,262)	($113,717)
Area 5 Parking Shade Structure	361	($452,480)	($548,643)

However, the cash flow analysis depends greatly on the system cost and PPA rate which in turn depends on the PV module market prices, the number and identity of the bidders (a more competitive bid will result in a lower system cost and lower PPA rate), availability of credit and the salvage value of the system. All these factors can potentially result in a higher NPV for installing a PV system over the status quo.

15.7.4 Recommendations

Based on this site feasibility and financial analysis, it is recommended that, if sufficiently motivated to pursue a solar PV system despite the lower NPV compared to the status quo, the City issue a Request for Proposal (RFP) to have a solar PV contractor design, build, operate and own a 1.21 MW DC of ground mounted, single axis tracking PV systems. These systems would be spread out amongst the vacant field south of the Maintenance and Collections Building, the Rock Basin area, and the vacant land located between Pond 1 and the river. This is the maximum size of a PV system that would be eligible for receiving CSI incentives (any increment beyond this system size would not be eligible for CSI incentives). This 1.21 MW system would generate approximately 2,227 MWh of electricity annually. At the time of this report, the CSI incentives for non-residential projects in PG&E service territory have been suspended. However, the solar industry anticipates that the incentives will be reinstated in the near future.

In addition, Caltrans is proposing a future extension of California State Route 4 in which the route would travel over the southeast corner of Area 1 and over Area 3. This extension, if it were to proceed, is scheduled to be constructed in 15 to 20 years. This would impact PV systems proposed for Areas 1 and 3 and should be taken into consideration prior to installation in these locations because relocating the PV systems to accommodate the SR 4 extension would be economically prohibitive.

Within a PPA arrangement, the developer would own and maintain the PV systems and sell electricity to the City at a pre-negotiated price. This third party ownership structure may result in the loWet PV energy cost to the City, because private sector owners qualify for state and federal tax incentives for which local governments do not qualify. The cost savings that the third party owner accrues will be passed on to the City.

Based on the financial analysis, the net present value (NPV) of a third party owned system with a PPA is higher than the NPV of purchasing the solar PV system outright and both of these scenarios have a lower NPV than the status quo (no solar PV system). However, falling solar PV module prices along with the prospects of additional state incentives (California Governor Jerry Brown has proposed a Feed-in-Tariff for distributed renewable energy – targeting solar PV) and increasing utility rates will trend future PPA prices toward grid parity. Table 2 shows the Net Present Value of the three scenarios.

If the City would like to explore additional solar PV potential, it is recommended that the City consider using the water treatment facility (Delta Water Supply Project) on North Lower

Sacramento Road as the location for development. This site has several acres of level, unshaded vacant land that would serve as an ideal location for ground mounted, single axis PV trackers. In addition, this site would provide an additional meter to which the City could interconnect, net meter, and receive additional CSI incentives. The recommended system size for this site is 1.21 MW DC (system size cap for CSI Incentives).

15.8 SITE SPECIFIC SOLAR ANALYSES

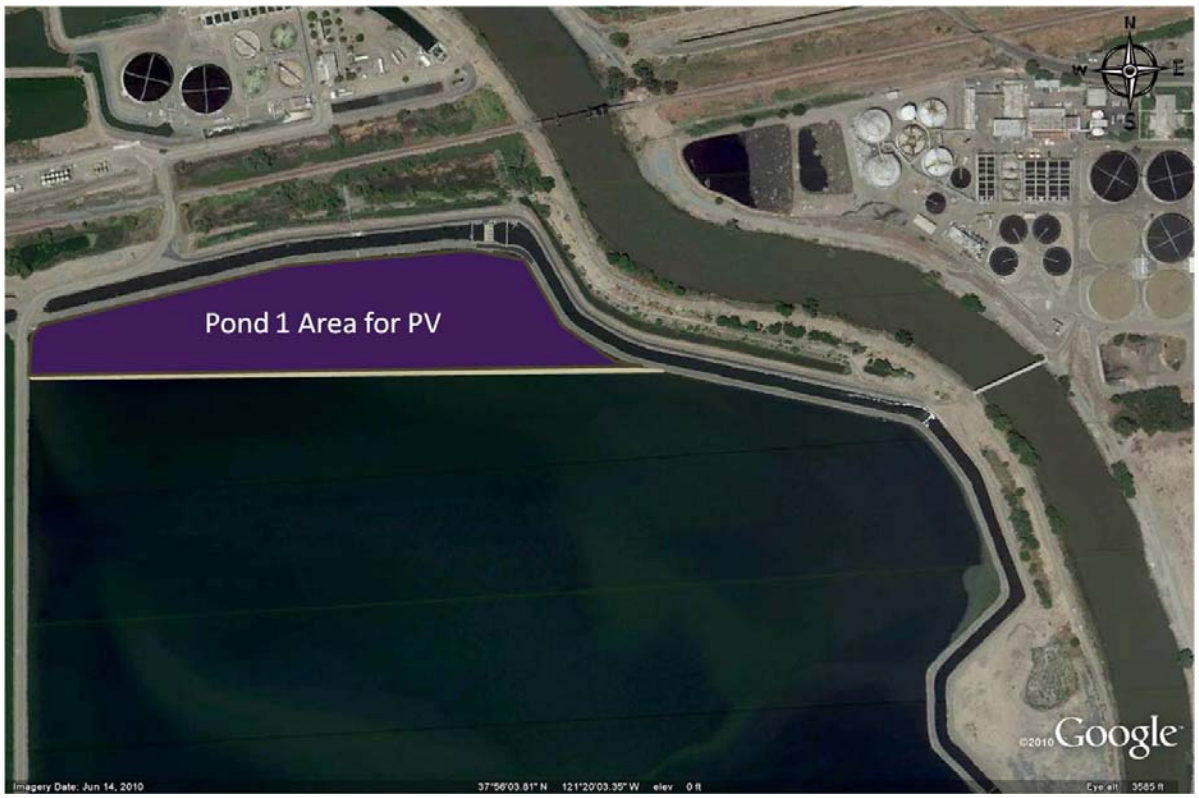
The Regional Water Control Facility (RWCF) is located at 2500 Navy Dr. in Stockton, CA and consists of administrative buildings, water processing towers and basins, settling ponds and vacant land. The identified PV systems consist of five separate Areas shown on the Figure 15.1 and described below.

- Area 1: Vacant land south of Maintenance and Collections Building – ground mounted, single axis trackers
- Area 2: Rock filter basin– ground mounted, single axis trackers.
- Area 3: Vacant land between Pond 1 and the San Joaquin River – ground mounted, single axis trackers.
- Area 4: Roof top of the Maintenance and Collections Building – roof top mounted, fixed tilt system.
- Area 5: Main parking lot – parking shade structure mounted fixed tilt system.

Figure 15.1 Potential Array Location: RWCF

In addition, solar PV mounted within 17 acres of the northern most portion of Pond 1 was evaluated to determine the cost effectiveness of placing a solar PV system in this area. The area under consideration is shown in Figure 15.2.

Figure 15.2 Pond 1: Area Under Consideration



The identified PV systems installed at the RWCF (not including Pond 1) could provide about 2.02 MW of solar capacity, producing sufficient electricity to offset approximately 40 percent of annual electricity usage of the RWCF and reducing the associated GHG emissions by 828 metric tons CO_2e.

Lastly, the Delta Water Supply Project (DWSP), located on the West side of Lower Sacramento Road north of Eight Mile Road in Stockton, was also evaluated to determine the potential capacity, generation, and preliminary costs of installing solar PV at the site. The DWSP site would be a separate generation facility and would not count towards the CSI incentive cap at the RWCF.

15.8.1 Electrical Review

Table 15.7 presents the annual electricity use and electricity cost data for RWCF between October 2009 and September 2010.

Table 15.7 Annual Electricity Use: Regional Water Control Facility Capital Improvements and Energy Management Plan City of Stockton	
Annual Electricity Use	**Annual Electricity Expenses**
(kWh)	($)
8,570,524	$1,018,896

15.8.2 Potential Array Locations

15.8.2.1 Vacant Land South of Maintenance and Collections Buildings (Area 1)

As shown in Figure 15.2, there is a parcel of vacant land south of the Maintenance and Collections Building. This area (Area 1) is a mostly level grass field with no shading constraints except for vegetation on the southern fence line of the property. Figure 15.3 shows the potential layout for the recommended ground mounted single axis tracker PV array.

15.8.2.2 Shading

There are no significant shading constraints at this location. The ground-mounted units would be located far enough from the southern property line so the trees and other vegetation would not cast a shadow on the solar modules.

15.8.2.3 Site Condition

The PV systems would be mounted in the field and the City would want to conduct an assessment of the vacant lot before installing the PV array to ensure the soil is not contaminated and to ensure that the ground can properly support the ground mounted trackers. The southeast portion of Area 1 is in the path of a proposed extension California State Route 4 (SR4) (if built, construction would take place in 15 to 20 years). A PV system installed in this Area would be adversely impacted by the SR 4 extension. Relocating the PV system to an alternate location in the future to accommodate the SR 4 extension would be economically prohibitive.

15.8.2.4 Electricity Generating Potential

The PV system located in Area 1 is sized to maximize electricity generation from the available space. Based on the typical annual access to sun, it is estimated that this 595 kW system would produce about 1,095,000 kWh of electricity annually.

Table 15.8	**Annual Electricity Purchased from PG&E: Regional Water Control Facility[(1)] Capital Improvements and Energy Management Plan City of Stockton**
	Maximum System Size
PV Capacity (kW DC)	595
Annual Electricity Generation (kWh)	1,095,015
System Cost ($)	$2,707,250

Note:
(1) Solarworld SW 245 modules; ground mounted system single axis tracking tilted at 0°

Figure 15.3 Potential Array Location: Vacant Land South of Maintenance and Collections Building (Area 1)

15.8.3 Rock Filter Basins (Area 2)

The City is planning demolish and clear the existing rock filter basins (Area 2). This area would serve as an ideal location for solar PV as it is level with no shading constraints except for the towers east of the basins. Figure 15.4 shows the potential layout for the recommended ground mounted single axis tracker PV array.

15.8.4 Shading

There are no significant shading constraints at this location. The ground-mounted units would be located such that the tower to the east will not cast a shadow on the solar modules.

15.8.5 Site Condition

The PV systems would be mounted in the area that would formerly have been the two south Rock Basins. The City would want to conduct an assessment of the former Rock Basins prior to installing the PV array to ensure the area is not contaminated and to ensure that the ground can properly support the ground mounted trackers.

15.8.6 Electricity Generating Potential

The PV system located in Area 2 is sized to maximize electricity generation from the available space. Based on the typical annual access to sun, it is estimated that this 194 kW system would produce about 357,030 kWh of electricity annually.

Table 15.9 Estimated PV System Size: Rock Filter Basins(1)
Capital Improvements and Energy Management Plan
City of Stockton

	Maximum System Size
PV Capacity (kW DC)	194
Annual Electricity Generation (kWh)	357,030
System Cost ($)	$882,700

Note:
(1) Solarworld SW 245 modules; ground mounted system single axis tracking tilted at 0°.

Figure 15.4 Potential Array Location: Rock Basins (Area 2)

15.8.7 Vacant Land between Pond 1 and San Joaquin River (Area 3)

Presently, there is approximately 5 acres of vacant land between Pond 1 and the San Joaquin River (Area 3) that is being used as a bone yard. This area would serve as an ideal location for solar PV as it is mostly level with no shading constraints. Figure 15.5 shows the potential layout for the recommended ground mounted single axis tracker PV array.

15.8.7.1 Shading

There are no significant shading constraints at this location. The ground-mounted units would be located far enough from the berm that separates the area from the river so it would not cast a shadow on the solar modules.

15.8.7.2 Site Condition

The PV systems would be ground mounted and the City would want to conduct an assessment of the vacant lot` before installing the PV array to ensure the soil is not contaminated and to ensure that the ground can properly support the ground mounted trackers. Area 3 is in the path of a proposed extension California State Route 4 (SR4) (if built, construction would take place in 15 to 20 years). A PV system installed in this Area would be adversely impacted by the SR 4 extension. Relocating the PV system to an alternate location in the future to accommodate the SR 4 extension would be economically prohibitive.

15.8.7.3 Electricity Generating Potential

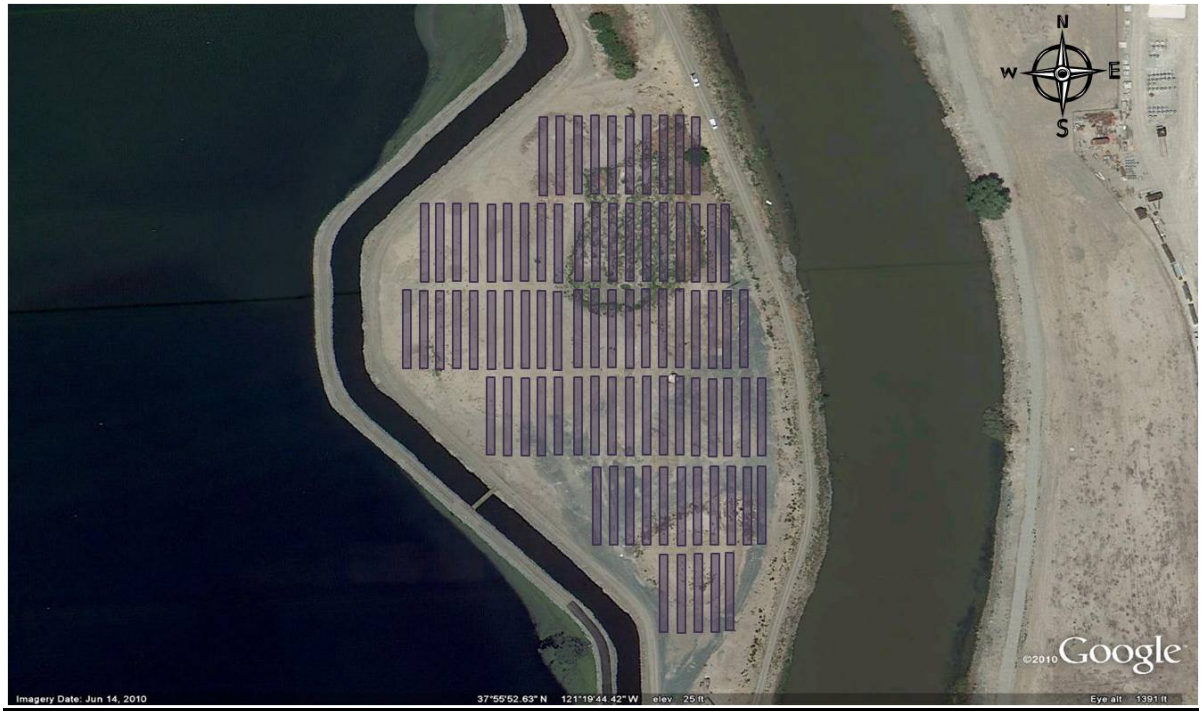
The PV system located in Area 3 is sized to maximize electricity generation from the available space. Based on the typical annual access to sun, it is estimated that this 674 kW system would produce about 1,240,000 kWh of electricity annually.

Table 15.10 Estimated PV System Size: Vacant Land between Pond 1 and San Joaquin River[(1)]
Capital Improvements and Energy Management Plan
City of Stockton

	Maximum System Size
PV Capacity (kW DC)	674
Annual Electricity Generation (kWh)	1,239,943
System Cost ($)	$3,165,790

Note:
(1) Solarworld SW 245 modules; ground mounted system single axis tracking tilted at 0° .

Figure 15.5 Potential Array Location: Vacant Land between Pond 1 and River (Area 3)



15.8.8 Roof Top of Maintenance and Collections Building (Area 4)

The Maintenance and Collections Building (Area 4) and the adjacent Vehicle Storage Building features sufficient unshaded roof area for a solar PV system. Figure 15.6 shows the potential layout for the recommended roof mounted PV array.

15.8.8.1 Shading

There are only minor shading constraints at this site including roof top HVAC units, vents, and stacks. In addition, the southernmost building casts a shadow on the adjacent building to the north. The PV arrays would be laid out in a manner that would avoid shading from these obstructions.

15.8.8.2 Site Condition

The roof at the Maintenance and Collections Building is 12 years old and the roof of the Vehicle Storage Building is 13 years old. The PV systems will be mounted to the roof of the Maintenance and Collections Building using a penetrating racking system while the Vehicle Storage Building will feature a non-penetrating racking system that mounts to the standing seam metal roof. It is recommended that the City assess the structural integrity of all the roofs and determine the remaining useful life before installing PV arrays.

15.8.8.3 Electricity Generating Potential

The PV system located in Area 4 is sized to maximize electricity generation from the available space. Based on the typical annual access to sun, it is estimated that this 94 kW system would produce about 123,300 kWh of electricity annually.

Table 15.11 Estimated PV System Size – Maintenance and Collections Building(1)
Capital Improvements and Energy Management Plan
City of Stockton

	Maximum System Size
PV Capacity (kW DC)	94
Annual Electricity Generation (kWh)	123,295
System Cost ($)	$366,600

Note:
(1) Solarworld SW 245 modules; roof mounted parallel to roof surface (near 0°).

Figure 15.6 Potential Array Location: Maintenance and Collections Building (Area 4)

15.8.8.4 Main Parking Lot (Area 5)

The parking area on the northeast corner of the RWCF (Area 5) site is suitable for a PV system and would take the form of parking shade structures. This area would serve as an ideal location for solar PV as it is level with no shading constraints (other than light pole that would have to be removed to accommodate the shade structure. Figure 15.7 shows the potential layout for the recommended parking shade mounted PV array.

15.8.8.5 Shading

There are no significant shading constraints at this location. The parking shade structure would displace the light poles currently in the parking lot. The required lighting would be replaced by light fixtures mounted to the underside of the canopy.

15.8.8.6 Site Condition

The PV systems would be mounted in the parking lot and the City would want to conduct an assessment before installing the PV array to ensure the ground can properly support the parking shade structure.

15.8.8.7 Electricity Generating Potential

The PV system located in Area 5 is sized to maximize electricity generation from the available space. Based on the typical annual access to sun, it is estimated that this 361 kW system would produce about 491,800 kWh of electricity annually.

Table 15.12 Estimated PV System Size; Main Parking Lot(1)
Capital Improvements and Energy Management Plan
City of Stockton

	Maximum System Size
PV Capacity (kW DC)	361
Annual Electricity Generation (kWh)	491,778
System Cost ($)	$1,570,350

Note:
(1) Solarworld SW 245 modules; parking shade structure tilted at 3$^{o.}$

Figure 15.7 Potential Array Location: Main Parking Lot (Area 5)

15.8.9 Northern Portion of Pond 1

The City has considered utilizing a portion of Pond 1 for placement of solar PV systems. For this report, two scenarios were analyzed: one in which the section of the pond is drained and single axis trackers are ground mounted; the second in which a fixed tilt PV system is mounted on piers in the water. Figure 15.11 shows the potential layout for grounded mounted, single axis PV tracker and Figure 15.12 shows the potential layout for a fixed tilt PV system mounted on piers in the water.

15.8.9.1 Shading

There are no significant shading constraints at this location. The single axis PV trackers would be offset from the pond wall sufficiently to prevent shading. The fixed tilt system would rise above the water line and surrounding land to avoid shading.

15.8.9.2 Site Condition

Under the drained pond scenario, the single axis PV tracker would be mounted in the drained pond area. In addition, measures would have to be taken to prevent water from accumulating in the below grade area where the PV system would be sited. It is recommended that the City conduct an assessment of the Pond area before installing the PV array to ensure the newly drained ground can properly support the tracking system.

Under the pond remaining filled scenario, the fixed tilt PV system would be built on piers in the water. It is recommended that the City conduct an assessment of the Pond before installing the PV array to ensure the ground below the water can cost effectively support the PV system.

15.8.9.3 Electricity Generating Potential

The PV system located in Pond 1 is sized to maximize electricity generation from the available space. Based on the typical annual access to sun, it is estimated that a single axis tracking system (2,296 kW) system would produce about 4,225,000 kWh of electricity annually. The fixed tilt system (6,075 kW) would produce 8,881,000 kWh of electricity annually.

Table 15.13 Estimated PV System Size: Pond 1[(1)]
Capital Improvements and Energy Management Plan
City of Stockton

	Alternative 1 - Single Axis Tracker	Alternative 2 - Fixed Tilt
PV Capacity (kW DC)	2,296	6,075
Annual Electricity Generation (kWh)	4,225,470	8,881,462
System Cost ($)	$10,446,800	$38,265,210

Note:
(1) Solarworld SW 245 modules; Single axis tracker tilted at 0° and fixed tile structure tilted at 3°.

Figure 15.8 Pond 1 Pier Mounted Single Axis Tracking System

Figure 15.9 Pond 1 Pier Mounted Fixed Tilt System

15.8.10 Delta Water Supply Project

The water treatment plant located on Lower Sacramento Road north of Eight Mile Road is a favorable location for a solar PV system. It features several acres of unshaded, flat land on

which to place ground mounted, single axis trackers. A review of the electrical system for this site was not evaluated. It is recommended that prior to moving forward with a solar PV generating system at this site that a full electrical system review be undertaken.

15.8.10.1 Shading

There are no significant shading constraints at this location. The single axis PV trackers would be offset any shading elements (buildings, vegetation, etc.) sufficiently to prevent shading.

15.8.10.2 Site Condition

The PV systems would be ground mounted and the City would want to conduct an assessment of the vacant lot before installing the PV array to ensure the soil is not contaminated and to ensure that the ground can properly support the ground mounted trackers.

15.8.10.3 Electricity Generating Potential

The PV system located at the Delta Water Supply Project site is sized up to the CSI Incentive Cap which is 1 MW CEC-AC (in this case approximately 1.21 MW DC). The site electricity usage is unknown at the time of this report since the facility is still under construction. However, it is anticipated that the facility electricity usage will not be the limiting factor for properly sizing a potential solar PV system. Based on the typical annual access to sun, it is estimated that a single axis tracking system (1,161 kW) system would produce about 2,137,000 kWh of electricity annually.

The Delta Water Supply Project site can accommodate significantly more than 1 MW of solar PV capacity. Based on aerial photographs, there appears to be approximately 45 acres of unshaded, vacant land surrounding the facility which could accommodate 6 MW DC of solar.

Table 15.14 Estimated PV System Size: Delta Water Supply Project Site(1)
Capital Improvements and Energy Management Plan
City of Stockton

	1 MW CEC-AC	Maximum System Size
Area (acres)	7.5	45
PV Capacity (kW DC)	1210	7260
Annual Electricity Generation (kWh)	2,226,802	13,360,812
System Cost ($)	$5,505,500	$33,033,000

Note:
(1) Solarworld SW 245 modules; ground mounted system single axis tracking tilted at 0°

Figure 15.10 Delta Water Supply Project: Areas for Consideration

APPENDIX I – CURRENT CITY CIP PROJECTS LIST

carollo
Engineers...Working Wonders With Water™

PROJECT : CITY OF STOCKTON
CIP AND ENERGY MANAGEMENT PLAN
JOB # : 8581A00
LOCATION : STOCKTON, CA
ELEMENT # : 2A.14
ELEMENT # : MAIN PLANT CITY CIP PROJECTS

ITEM	DESCRIPTION	QUAN	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	60" RIVER CROSSING FORCEMAIN	1	LS	$260,000	$260,000	
2	CONNECTION OF 60KV TO SCADA	1	LS	$78,000	$78,000	
3	DUAL ELECTRICAL FEED FOR SUBSTATION	1	LS	$302,000	$302,000	
4	GRAVITY THICKENER NO.2 SLUDGE COLLECTOR MECHANISM REHAB	1	LS	$125,000	$125,000	
5	MAIN PLANT FLOOD STUDY	1	LS	$341,000	$341,000	
6	RAW SEWAGE PUMP AFD'S ENCLOSURE	1	LS	$76,000	$76,000	
7	ROOFING PROJECT	1	LS	$300,000	$300,000	
8	RWCF CATHODIC PROTECTION REPAIRS	1	LS	$241,000	$241,000	
9	RWCF PAINTING AND COATING	1	LS	$750,000	$750,000	
10	RWCF PAVING	1	LS	$1,000,000	$1,000,000	
11	RWCF SCADA UPGRADES	1	LS	$1,300,000	$1,300,000	
12	SCUM THICKENER REPAIRS/REPLACEMENTS	1	LS	$189,000	$189,000	
13	SECONDARY CLARIFIER COLLECTORS - REBUILD AND REPLACE DRIVE	1	LS	$100,000	$100,000	
14	THICKENER MCC REPLACEMENT	1	LS	$85,000	$85,000	
	TOTAL PROJECT COST					**$5,147,000**

Engineers...Working Wonders With Water™

PROJECT : CITY OF STOCKTON
CIP AND ENERGY MANAGEMENT PLAN
JOB # : 8581A00
LOCATION : STOCKTON, CA
ELEMENT # : 2B.5
ELEMENT # : TERTIARY PLANT CITY CIP PROJECTS

ITEM	DESCRIPTION	QUAN	UNIT	UNIT COST	SUBTOTAL	TOTAL
1	PLC REPLACEMENT AT TERTIARY PLANT	1	LS	$1,484,000	$1,484,000	
2	TERTIARY 12 KV OVERHEAD POWERLINES EVALUATION AND REPAIRS	1	LS	$227,000	$227,000	
	TOTAL PROJECT COST					**$1,711,000**

APPENDIX J - CAPITAL IMPROVEMENT AND ENERGY MANAGEMENT PLAN COMMENTS

Arthur L. Paullus WAG Member
3174 Stanfield Dr., Stockton CA 95209
clipper35@juno.com ✧ 209-451-2192 ✧ Cell 951-837-7133

July 6, 2011

Re: **Capital Improvement and Energy Management Plan Comments**

Responses to comments, by Carollo Engineers, are included below in blue, italics font.

After reading through this document this project is badly needed to bring the Regional Wastewater Control Facility (RWCF) up to date so that it can be operated more effectively and efficiently.

General observation of the Executive Summary.

- What facilities are required to meet future regulatory requirements?
- What facilities are required to meet future demands?
- What facilities need rehabilitation and/or replacement?
- What facilities may not be required to meet regulatory requirements or demands?

It would be helpful if the above were in a single table in the executive summary.

Table ES.2 includes a column with a letter that indicates the purpose of each project.

A = Health and Safety
B = Rehabilitate Facilities
C = Replace/Eliminate Obsolete Facilities
D = Permit Compliance (e.g. regulatory requirements)
E = Operation Support
F – Energy Project

"Develop an integrated energy program to improve efficiency and to produce additional power to reduce reliance on the external energy providers." pg 1-1

These were identified but not explained or explored in the report summary, add reason for not including. See recommendations 18.3 and tables 18.1 and 18.2 page 18-3.

- Why isn't the proposed energy facilities (i.e., wind and/or solar) included in the energy projects cost analysis in the executive summary?

- Has the use third generator during PG&E's peak period been explored? What is the reliability of this operational scheme and it's costs impact?
- Has power purchases from a third party power provider such as Modesto Irrigation District and wheeled through PG&E's system been explored?

The energy recommendations from chapter 18 are summarized in the executive summary.

The wind and solar energy facilities were not included in the executive summary because these facilities are not economically viable at this time.

Alternative 1 (refer to Section 11.2.1) assumes that all three of the existing cogeneration engines would be available 90% of the time, which would include operation of all three engines during peak demand periods. With proper maintenance, 90% availability is feasible.

Power purchases from a third party were not explored during the development of the CIP because this arrangement was not allowed at the time the CIP project started. The State of California's Direct Access Program, which allowed customers to purchase electric supplies from third party, was suspended to new retail customers in 2001. Recently, State Bill 695 reopened the Direct Access Program on a limited basis. However, PG&E website states that the Direct Access Program is still suspended for retail customers. In addition, the Modesto Irrigation District is not a Registered Energy Service Provider and cannot participate in the program.

If the RO facility is built to reduce salinity, how will the reject (RO wastewater) be disposed of? Section 3.7.3, pg 3-22 and 24, Table 3-3, pg 3-19.

- Can this reject waste be treated to reduce its volume so a smaller amount can better be disposed of?
- Even with only a portion of the flow is to be treated there will be still be a waste product to be dealt with.

Reject waste can be treated to reduce its volume. For example, a brine concentrator and evaporation ponds are used at CDCR's Deuel Vocational Institute (DVI) in Tracy, CA. Similar technologies and final disposal options for the remaining liquid/solids will be explored if reverse osmosis is required in the future.

***"Identify opportunities to reduce or eliminate unnecessary treatment processes to streamline operations."* pg 1-1**

- This statement was made and it would be helpful if this was discussed and put into a table.

A paragraph was added to the executive summary to address this comment.

"2.6 WET WEATHER FLOW ANALYSIS"

- Why the high flow rate for ***"Peak Hour Wet Weather Flow?"*** pg 2-14 and section 2-6, pg 2-17
- What is the impact to the RWCF treatment process for this peak hour wet weather flow?

The ratio between peak hour wet weather flow rate and average flow rate of 2.5 is similar to other Cities in the Central Valley (e.g. Turlock) and is common for older Cities. Many Cities and wastewater agencies in the Bay Area have ratios that exceed 5.0.

The impact of the peak hour flows on wastewater processes is described in Chapter 4. Because the plant has the benefit of millions of gallons of equalization storage in the oxidation ponds, the wet weather flows only affect processes upstream of the oxidation ponds. Influent pumping, primary clarifiers, and secondary effluent pumping are the processes most affected by the peak hour wet weather flows.

This appears to be an extra cost burden and potential regulatory violations to the CoS RWCF.

- What is the status of the "Inflow/Infiltration Study" that is planned?
- If the I/I were reduced wouldn't this reduce the need to expand some of the RWCF facilities that is required to meet wet weather flow conditions?

Elevations (60 to 75 ft range) shown on "1962 Modifications to Influent Station Suction Pipes" seems to be incorrect, pg 4-14.

- Is this even the right drawing?

The figure at the bottom of pg 4-14 is a closeup view of the pump intake in the wetwell. Refer to the comment response below for an explanation of the elevations.

Also noticed questionable elevations (84.2ft) for the Operations and Maintenance building on figure 6.11. Again it appears that some type of elevation error was made on these 1962 drawings.

Here is an excerpt from the Design Report for the 2003 Expansion that explains the vertical datum chronology for the plant (the excerpt has been edited for brevity).

> *The original vertical datum the City used was an assumed elevation of 100 feet at a local monument near City Hall. In 1982, the city converted to NGVD29 (adjusted by NGS in 1967) and established a conversion factor of -86.32 to convert the old city elevations to the new city vertical datum. There were a few adjustments made until 1996, when the City decided to locally adjust the vertical datum, still based on NGVD29, not NAVD88. The City calls this vertical datum "COS96 Local Adjustment."*

Summary of Recommended Improvements for the headworks indicates the pumps should be "flow-controlled, and equipped with variable speed drives."

- Shouldn't this be "Level controlled to respond to changes in flow, and equipped with variable speed drives?" pg 4-16

The pumps will be level controlled until flows exceed the capacity of the existing pump station and then it will be flow controlled, via the new auxiliary pump station.

"EEM No. 5: Replace Tertiary Air Compressor No. 2 with a VSD Air Compressor." pg 12-11

- Would it be an easier installation and just as operationally economical to use a VFD instead of a VSD? A VFD would be less maintenance than a VSD.
- Is a VSD generic term for all variable speed drives?

These comments are both correct. VSD is a term that encompasses several methods of varying the speed of rotating equipment. VFDs are the most economical VSD for air compressers. Therefore, it is likely that a VFD would used to vary the speed of the air compressor.

"Figure 19.4 RECOMMENDED RWCF PROCESS FLOW DIAGRAM"

- FOG Receiving Station not shown on diagram.

The FOG Receiving Station has been added to the process flow diagram.

COMMENTS ON DRAFT CIP EXECUTIVE SUMMARY PREPARED BY CAROLLO

May 17, 2011

By: Lynn Sutton, Member of the Water Advisory Group

1. On Page ES-3, second paragraph, the last sentence reads ..."Major improvements to the RWCF would be required **if** more restrictive limits are adopted by the regulatory agencies." When I see the word "if", this tells me that there may be or not be more restrictive limits imposed. If you truly mean this, then why is Carollo recommending millions of dollars of improvements for immediate and near term projects that possibly may not be required? Now it may be that Carollo does in fact believe that it is a forgone conclusion that the more restrictive limits will be imposed when a new permit is issued in 2013. If this is your true feeling, then state it in the report and remove any words like "if" that clearly implies uncertainty. The City of Stockton has hired Carollo to provide professional engineering services that their staff does not have experience and background to provide. Therefore, this report should have a minimum amount of uncertainties in it that could have a significant impact on the CIP costs.

2. On Page ES-4, it states the "potential discharge permit changes". If there is uncertainty as to what the more restrictive discharge requirements the RWQCB will impose on the City, in order to eliminate the wasting of construction money as much as possible, shouldn't the City wait on any CIP work (including design) until after the new permit has been issued in 2013?

3. On Page ES-6, there is a paragraph covering salinity. In a recent article in our local paper, a judge ruled against the RWQCB on the imposing of salinity requirements. You should update this paragraph to address this.

4. On Page ES-7, Carollo suggests energy saving opportunities. I believe Larry Parlin forwarded to Carollo a report prepared by Mark McElyea (an interested citizen) that summarized his investigation of the viability of fuel cells using sewer gas. After calling many treatment facilities in California, Mark found that other wastewater treatment plants were having major problems with fuel cells that were acquired under the said government subsidy program. The problems were so great that is was concluded that such fuel cells were not viable as an energy source. Carollo states on Page ES-8 that the determining the feasibility of fuel cells can be re-evaluated in the future based on future subsidies only. No mention is made of the fact that fuel cells at present (and most likely in the future) appear not to be a wise choice. I am not suggesting that Carollo should have accepted McElyea's report at face value, but I would have expected that Carollo would have done their own investigation. If such an investigation corroborated McElyea's report, then Carollo should have stated the facts in the CIP report.

Response to Comments by Lynn Sutton, Member of the Water Advisory Group

By: Colin Barrett, Carollo Engineers

1. The immediate and near-term projects in the CIP are required to allow the RWCF to reliably meet the effluent limits contained within the City's existing discharge permit.

   More restrictive discharge permit requirements may be imposed by the RWQCB in the future. The discharge permit requirements are controlled by the RWQCB, State and Federal Courts, and outside interests. Therefore, improvements to meet potential future discharge permit requirements should be planned for, but not implemented until required. Accordingly, improvements necessary to meet future permit requirements are described in the CIP. However, these improvements are provisionary and should not be included in the City's budget unless required by the Regional Water Quality Control Board.

2. Refer to the response to comment No. 1.

3. The paragraphs regarding the salinity limits have been updated per this comment. As a result of the court decision, the RWQCB is considering adopting a salinity limit variance program. The program would allow cities in the Central Valley, such as Stockton, to apply for variances if the costs of complying with the salinity limits (e.g. installing reverse osmosis) are infeasible.

4. The executive summary, chapter 11, and chapter 18 have been updated to reflect the risk associated with fuel cells.

5. The improvements contained within the immediate and near-term phases of the CIP are the minimum necessary improvements required to allow the RWCF to reliably meet the effluent limits contained within its existing discharge permit. Cost estimates for the CIP are planning level estimates. There may be opportunities to refine and potentially reduce costs during the design phase when the projects are more defined.

Why did a lay person have to do the investigative work that should have been done by Carollo?

5. This comment is directed to MUD staff, not Carollo. The City is presently going through some very tough economic times. There is the real possibility of the City having to declare bankruptcy. Unemployment in Stockton is twice the national average. The City has been high on the list for home foreclosures in the entire country. A large number of citizens in Stockton are having a real tough time making ends meet. The draft CIP report recommends that over the next five years about $139,000,000 is to be spent on plant improvements. This is a lot of money. The City will probably sell revenue bonds to pay the cost, and the sewer service rate to citizens of the community will go up significantly. Is it possible that staff or Carollo could identify the bare essentials of improvements needed to meet the anticipated new permit requirements, and hold off on all other non-essentials improvements for a period of five to ten years? This would lessen the future financial burden on the citizens of the community.

   I recommend that staff instruct Carollo to add another section to the CIP report identify the absolute minimum improvements and their costs that need to be made to the plant over the next five years to address anticipated new permit requirements. Non-permit items should be listed as future improvements to be constructed when the community can afford them. I believe the City Council would appreciate this additional analysis.

The above are my comments based on my preliminary review of the draft CIP report. In its current draft form, I cannot support any motion by the WAG to recommend acceptance by the City Council.

File: Word-COMMENTS ON DRAFT CIP EXECUTIVE SUMMARY PREPARED