Attachment 3 – Work Plan

J.B. Latham Treatment Plant Water and Energy Efficiency Project

Attachment 3 presents the Work Plan for the South Orange County Wastewater Authority (SOCWA) J.B. Latham Treatment Plant (JBLTP) Water and Energy Efficiency Project. Supporting documentation necessary to substantiate work already completed includes the following appendices to Attachment 3:

Appendix 3-A	*"J.B. Latham Treatment Plant Facility Plan, Technical Memorandum No. 7 'Key Liquid Stream Issues' and Technical Memorandum No. 9 'Energy Management'"* (Final, 2011)
Appendix 3-B	*"Technical Memorandum, Evaluation of Alternatives for Use of Digester Gas"* (Draft, 2012)
Appendix 3-C	*"SOCWA Contract Documents for Construction of J.B. Latham Treatment Plant Facility Improvements Packages A and C, Aeration Upgrades and Cogeneration Project Plans and Specifications"* (October 2014)
Appendix 3-D	*"Evaluation of the Potable and Non-Potable Water Systems at the JB Latham Treatment Plant Final Report"* (August 2014)
Appendix 3-E	*"Optimized Irrigation Plan" and SOCWA Memorandum* (December 2014)
Appendix 3-F	*CEQA Initial Study* (2012)
Appendix 3-G	*Draft Mitigated Negative Declaration* (2013)

Description of the Project:

The J.B. Latham Treatment Plant (JBLTP) Water and Energy Efficiency Project will upgrade the aeration system, install a cogeneration engine generator system, and modify landscaping to conserve water at this 13 million gallons per day capacity wastewater treatment facility owned and operated by South Orange County Wastewater Authority (SOCWA).

Aeration system improvements will involve adding new high efficiency blowers and air diffusion equipment with automated controls to maximize wastewater treatment effectiveness using less energy. Three new high efficiency, high speed turbo blowers will be installed to supply required process air demands for the aeration basins and aerated grit basins. New fine bubble air diffusers and dissolved oxygen (DO) controls, including air control valves, and air flow meters, will be installed in the existing aeration basins to greatly enhance the oxygen transfer efficiency while reducing the volume of air required and achieving full secondary treatment. These aeration system upgrades will improve process efficiency, utilizing less air with greater effectiveness to save energy while maintaining production of high quality treated wastewater effluent.

Related to the aeration system improvements, a new cogeneration engine generator will be installed to provide electrical power for the blowers. A new 633 kilowatt (kW) engine generator with selective catalytic reduction (SCR), continuous emissions monitoring system (CEMS), and heat recovery will produce electrical power for JBLTP on-site demands. The gas-engine driven generator system will be capable of operating off digester gas, natural gas, or a blend of the two. Presently, only about 65% of the digester gas produced by the existing anaerobic digesters is utilized by the inefficient existing engine-powered blower. The new cogeneration engine generator will use approximately 95% of the available digester gas, producing more power for the new high efficiency blowers as well as other plant demands. By utilizing more digester gas at JBLTP, the new cogeneration engine generator system will produce an average of approximately 570 kWh of electrical power annually. The new cogeneration system will significantly reduce greenhouse gas (GHG) emissions at JBLTP by approximately 468 metric tons per year of carbon dioxide (CO_2) (based on total CO_2 emissions for electricity plus stationary combustion with and without the Project).

Another component of the Project will modify conventional landscaping at the JBLTP site to xeriscaping to reduce and eliminate water demands. Drought-tolerant plants that reduce or eliminate the need for supplemental water from irrigation will be planted. The JBLTP utilizes both potable and non-potable water, with much of the latter used for irrigation of landscaping at the 8.3 acre site. The current and continuing drought has made conservation of both potable and non-potable water a necessity. Landscaping of the secured treatment plant is an opportunity to conserve water for other purposes. Most of the existing planted areas at the JBLTP site will be converted to xeriscaping and sustainable planted areas, or simply changed to low-maintenance, gravel covered open areas. It is estimated that these improvements will save approximately 0.373 million gallons per year (MG/yr), or 1.1 acre-feet per year (AFY).

In summary, it is estimated that the JBLTP Water and Energy Efficiency Project will:

- Conserve approximately 0.373 MG/yr of potable water;
- Utilize more digester gas, a sustainable resource, to produce approximately 570 kWh/yr of electricity, thereby lowering the plant's need to purchase utility power; and
- Reduce GHG emissions by approximately 468,000 kilograms of carbon dioxide equivalents per year (kg CO_2e/yr).

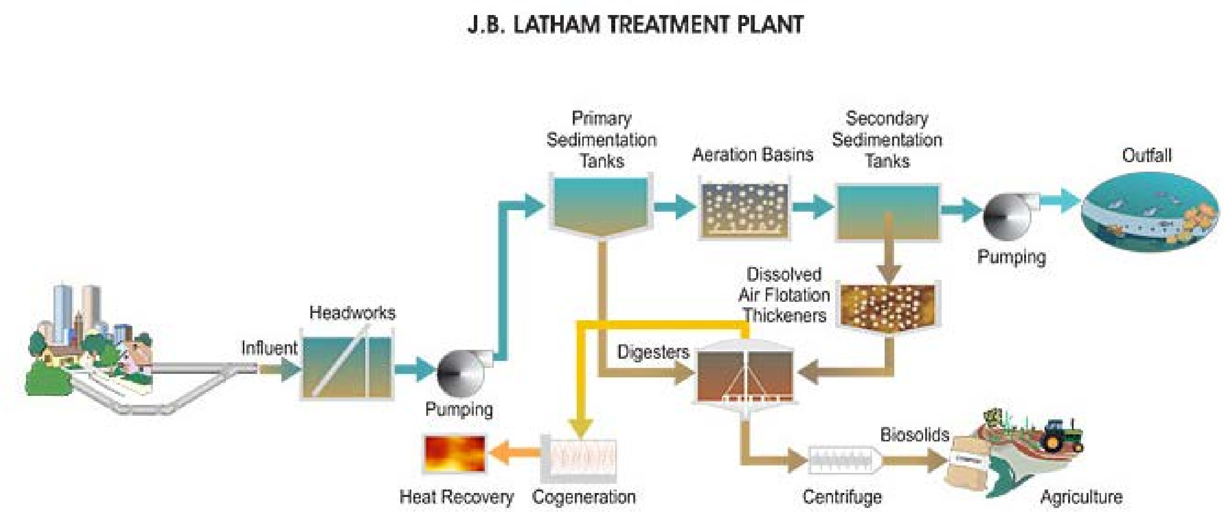
Background:

SOCWA is a Joint Powers Authority with ten member agencies, consisting of local retail water agencies and cities that provide water to their residents. A regional agency, SOCWA owns and operates four wastewater treatment plant and two ocean outfalls to meet the needs of its member agencies in south Orange County.

The SOCWA J. B. Latham Treatment Plant (JBLTP), located at 34156 Del Obispo Street in Dana Point, is a conventional activated sludge treatment facility. Wastewater generated in the service areas of the Moulton Niguel Water District, City of San Juan Capistrano, Santa Margarita Water District and the South Coast Water District is treated at the JBLTP. The JBLTP site also serves as the administrative headquarters of SOCWA, pictured on the following page.

SOCWA Headquarters at the JBLTP Site

Wastewater treatment unit operations and processes at JBLTP include screening, grit removal, primary clarification, secondary treatment (activated sludge), secondary clarification, anaerobic digestion and solids dewatering. The JBLTP treatment process schematic is illustrated below.



The liquid handling portion of the plant is normally operated as two separate plants, referred to as the (east) nine million gallons per day (mgd) side and the (west) four mgd side, bringing the plant's total design capacity to 13 mgd. Photos of the JBLTP secondary treatment facilities are shown below.

Waste sludge from secondary treatment is thickened and combined with sludge from the primary treatment process. The combined solids are anaerobically digested and then dewatered using centrifuge equipment. After the sludge is thickened, digested and dewatered, it is transported to a privately owned and operated composting facility or to a permitted sanitary landfill operated by the County of Orange. Digester gas is collected from the anaerobic digestion process and fuels an internal combustion engine used to drive an aeration blower serving the east and west aeration tanks. Waste heat from this internal combustion engine process is used to provide hot water to heat the anaerobic digesters and any excess digester gas is flared at a waste gas burner.

All effluent from JBLTP is discharged by gravity to the Pacific Ocean through the San Juan Creek Ocean Outfall. Occasionally, because of tide conditions, the effluent must be pumped out through the outfall.

This JBLTP Water and Energy Efficiency Project will be implemented as two separate construction contracts. The first will modify and upgrade the activated sludge aeration and cogeneration facilities, installing high-efficiency blowers and new cogeneration engine generator to make better use of the available digester gas. The second will install drought-tolerant, landscaping to reduce water demands at the JBLTP site.

Project Maps:

Project maps are presented on the following pages.

Figure 1 shows a map of the SOCWA service area with the jurisdictional boundaries of its ten member agencies. The four SOCWA wastewater treatment plants and collection system, along with the two ocean outfalls are shown on this map. The SOCWA service area covers about 220 square miles in south Orange County and serves approximately 500,000 people.

Figure 2 shows a map of the JBLTP Water and Energy Efficiency Project, which is located near the intersection of Pacific Coast Highway and Del Obispo Street in Dana Point, California. Major infrastructure at the JBLTP is shown on this site plan.

Project Proponent/Partner (if applicable):

South Orange County Wastewater Authority (SOCWA) is the sole proponent for the JBLTP Water and Energy Efficiency Project. No other proponents/partners are involved in the Project or will receive grant funding should the Project be selected for a grant award.

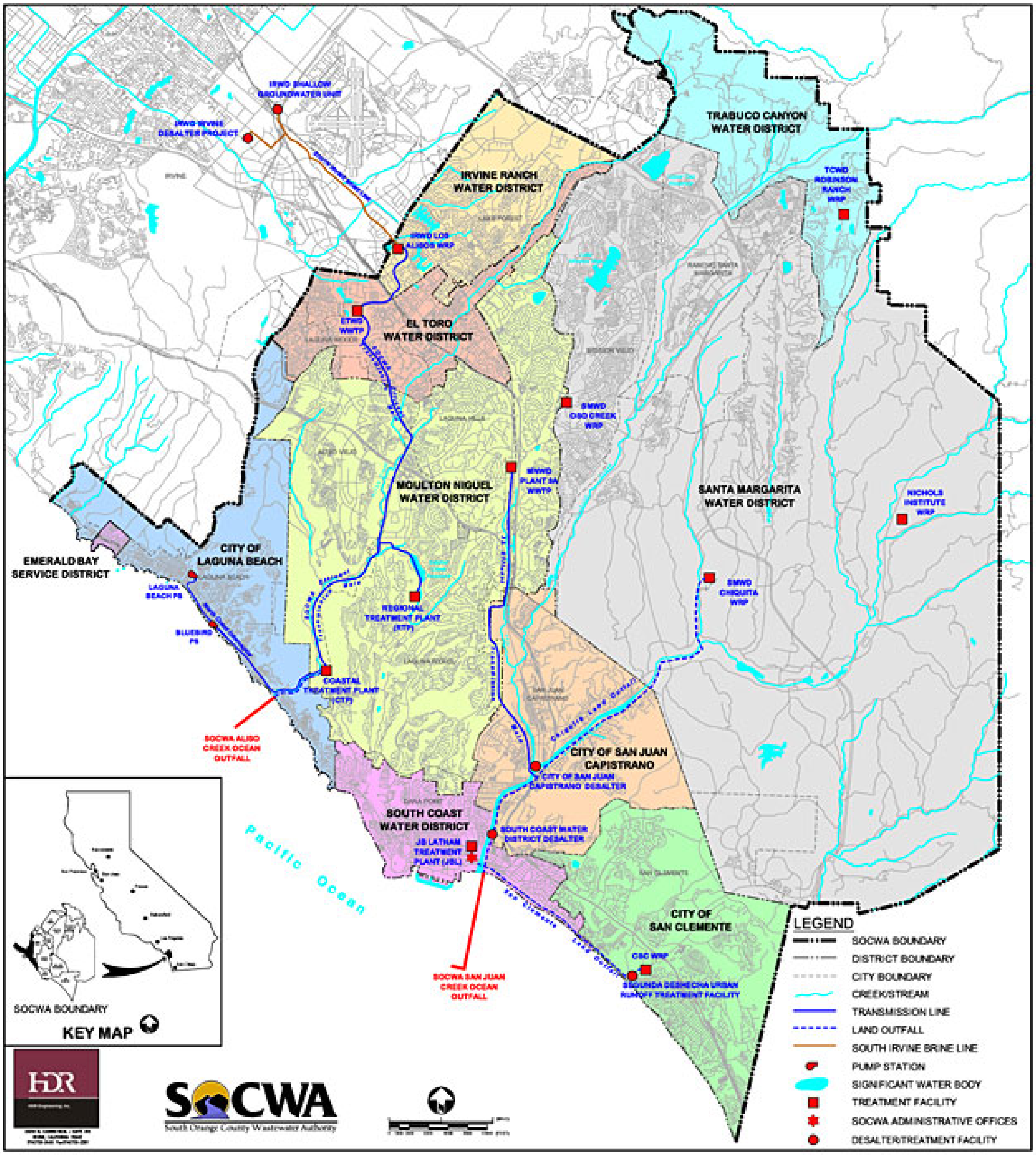


Figure 1. SOCWA Service Area, Member Agencies, and Facilities Location Map

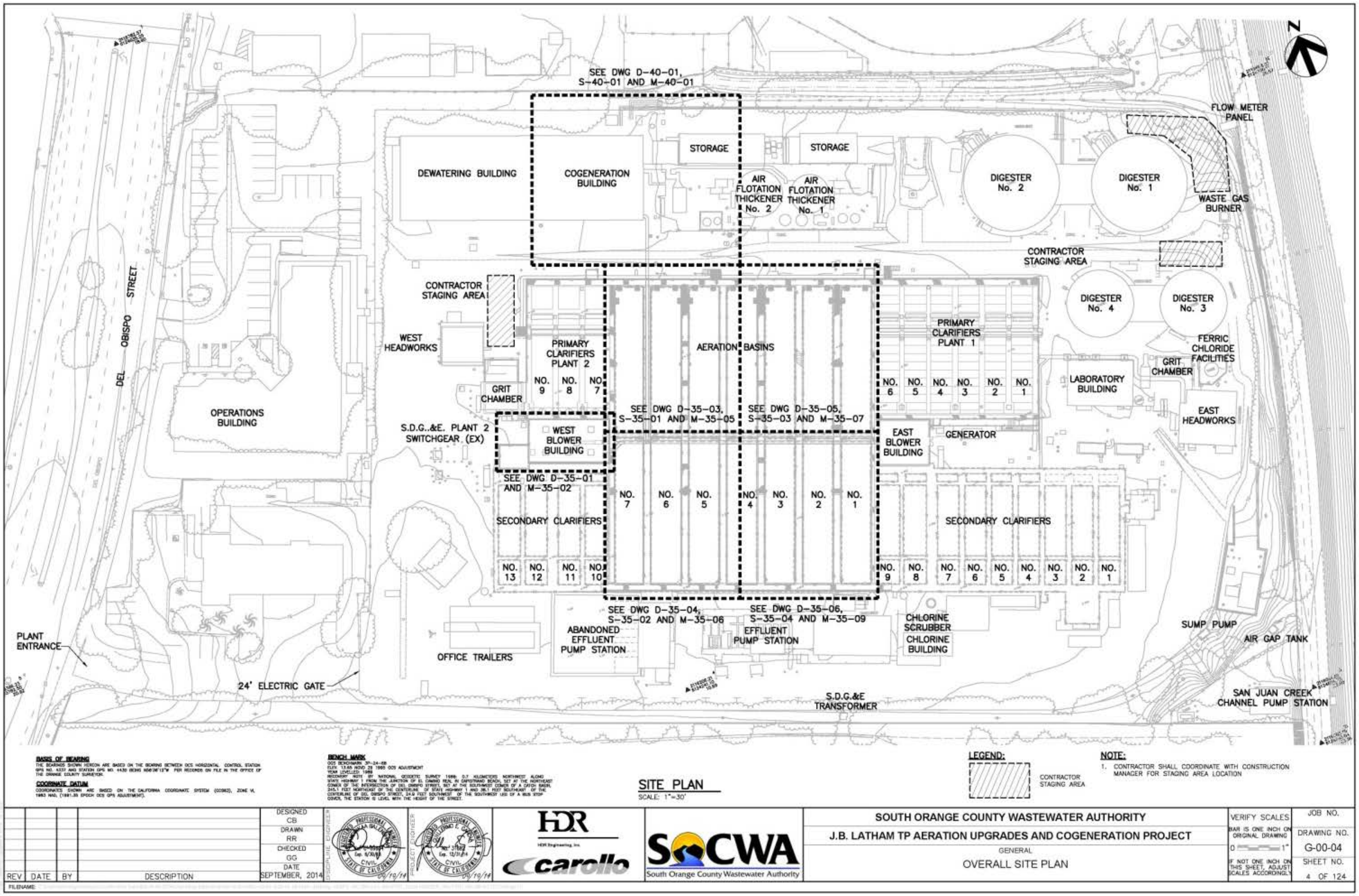


Figure 2. JBLTP Water and Energy Efficiency Project Site Plan and System Map

WORK PLAN TASKS

Task 1: Direct Project Administration and Reporting:

SOCWA staff will manage all aspects of the JBLTP Water and Energy Efficiency Project and be responsible all administration and reporting. Between 2011 and October 2014, SOCWA staff, has directed the planning, environmental compliance, and design phases of the aeration and cogeneration components of the Project. SOCWA staff received construction bids for the aeration and cogeneration facilities in November 2014. During 2014 SOCWA staff has directed the water conservation studies and associated landscape planning to facilitate the new xeriscape design. These two Project elements will be implemented as two separate construction contracts, both of which will be managed by SOCWA. SOCWA staff will be responsible for administration of the construction and start-up testing phases of the Project.

The SOCWA Director of Engineering, Brian Peck, is responsible for administration of the entire project from final design through construction and start-up. He has led the planning, environmental compliance, and design work completed to date. He is responsible for preparation of reports, engineering plans and specifications for construction of the facilities.

The SOCWA General Manager, Betty Burnet, will be the main point of contact for administration of the grant agreement, preparation of invoices, and preparation of all deliverables, reports, and supporting documentation for the Project.

Other SOCWA staff will support Mr. Peck and Ms. Burnett in the administration of this Project to ensure that it stays on schedule and within budget. Detailed funding reimbursement claims showing expenditures will be prepared by the SOCWA Purchasing Department. Administration of the Project, including information on budgeting, expenditures, schedule, and progress reporting will comply with the DWR Contracts and Invoicing Guidelines. Copies of other technical information, such as planning reports, final design plans and specifications, construction documentation, inspection and operations reports, California Labor Code Compliance documentation, and monitoring reports, will be available as needed for Project administration. Quarterly reports will be submitted with invoices as the Project progresses. A final report will be submitted at completion of the Project.

Deliverables:

- Project administration reports, including invoices, budget updates, schedule updates, and progress reports, and other supporting documentation and deliverables as required by the Grant Agreement.
- Documentation demonstrating compliance with the California Labor Code

Performance Measures:

- Timely submittal of administrative reports, invoices, and all deliverables.

Task 2: Easement(s):

No land purchases or easements are required for the JBLTP Water and Energy Efficiency Project. The Project will be located at the J.B. Latham Treatment Plant site in Dana Point, California. The JBLTP site is already owned by SOCWA.

Deliverables:

- None/not applicable.

Performance Measures:

- None/not applicable.

Task 3. Project Evaluation/Design/Engineering

SOCWA has already completed the planning and final design of the aeration and cogeneration elements of the JBLTP Water and Energy Efficiency Project. Planning of the water conservation and landscaping work is presently underway with the final design to follow. Construction will be accomplished in two separate contracts.

Facilities planning for the Project was completed in 2011 (Appendix 3-A). The JBLTP Facility Plan followed SOCWA's approval of a *Ten Year Plan*, which set forth various capital improvement projects envisioned between 2010 and 2020. In addition other prior studies focused on specific areas of the plant.

A preliminary design report *"Aeration and Cogeneration Upgrade for the J.B. Latham Treatment Plant"* was prepared in 2009 to evaluate the status of the existing activated sludge air diffuser system as well as to develop a response to the South Coast Air Quality Management District (SCAQMD) proposed emission limits under Rule 1110.2. The 2009 report recommended replacing the existing ceramic dome diffusers with membrane diffusers to achieve higher oxygen transfer rates and utilize less air by installing new high efficiency blowers. With respect to SCAQMD Rule 1110.2, the 2009 report considered construction of fuel cells to replace the existing internal combustion engine and blower.

Because these past studies were limited in scope to specific processes or regulatory changes, SOCWA embarked upon development of a comprehensive plan for JBLTP to evaluate: (1) capacity and condition of the facilities; (2) potential regulatory impacts; and (3) opportunities to improve efficiencies. The *"JBLTP Facility Plan"* (Appendix 3-A) offered a broader, integrated planning approach that identified a roadmap for upgrades and capital investment. The "JBLTP Facility Plan" is organized in a series of 12 Technical Memoranda (TM):

1. Flows and Loadings
2. Existing Facilities
3. Seismic Vulnerability/Structural Condition
4. Water Quality Regulatory Impacts

5. Air Quality Regulatory Impacts
6. Potential Liquid Trains
7. Key Liquid Stream Issues
8. Key Solids Handling Issues
9. Energy Management
10. Odor Control
11. Alternative Site Plans
12. Project Phasing

Of these, TM-7 and TM-9 form the basis of planning for the aeration and cogeneration elements of the JBLTP Water and Energy Efficiency Project.

TM-7 of the 2011 *"JBLTP Facility Plan"* evaluated the aeration system improvements and compared upgrade alternatives. Aeration requirements and air demands were calculated and the capacity of the diffusers and blowers to meet those demands was assessed. Alternatives for improving the efficiency of the aeration process were compared; an economic life cycle cost analysis was completed; and the advantages and disadvantages of the options were contrasted. Upgrades to the aeration system were recommended that included installation of new diffusers, dissolved oxygen (DO) controls, and high efficiency blowers.

TM-9 of the 2011 *"JBLTP Facility Plan"* evaluated the cogeneration system and energy management at the plant. Alternatives were developed to make better use of the available digester gas and comply with SCAQMD Rule 1110.2 for internal combustion engines. Other alternatives using fuel cells or microturbines were evaluated as well. The evaluation considered capital and annual costs and permitting requirements. Life-cycle costs for the various alternatives were compared with each other and with purchase of utility electrical power. The "Facility Plan" concluded that a firm recommendation could not be made in 2011 because of uncertainties surrounding SCAQMD Rule 1110.2.

In 2012 SOCWA embarked upon completion of the *"Evaluation of Alternative Uses for Digester Gas"* (Appendix 3-B). This study afforded SOCWA the opportunity to develop six alternatives in more detail and then led to the recommended "JBLTP Water and Energy Efficiency Project". The 2012 study recommended implementation of a new cogeneration engine generator system with digester gas conditioning, selective catalytic reduction (SCR), and continuous emissions monitoring system (CEMS). This new cogeneration system will require installation of new high efficiency blowers coupled with new air diffuser and DO controls. This new system will beneficially utilize more digester gas to generate electrical power for in-plant uses and significantly reduce energy requirements at JBLTP.

Final design of aeration and cogeneration elements of the Project and the final "engineer's estimate" for the construction cost were completed in October 2014. The final plans and specifications (Appendix 3-C) were advertised for construction bids. SOCWA received bids in November 2014 and anticipates awarding a construction contract in December 2014 and issuing a Notice to Proceed in February 2014.

With regard to the water element of the Project, SOCWA completed the "*Evaluation of the Potable and Non-Potable Water Systems at the JB Latham Treatment Plant Final Report"* (Appendix 3-D) in 2014. This evaluation confirmed the existing water systems at JBLTP, which had been constructed over many years, and helped to identify water uses and demands and also opportunities where water savings might be feasible.

SOCWA has recently evaluated landscaping modifications to change to more drought-tolerant plant and xeriscape landscaping to reduce or eliminate water demands at the JBLTP site. The "Optimized Irrigation Plan" and associated Memorandum (Appendix 3-E) assessed options, estimated costs and presented recommendations for incorporation into the Project.

SOCWA will prepare final design plans and specifications for construction of the landscaping and water system improvements at JBLTP in 2015. The final construction cost estimate will be prepared based on the final construction bid documents.

Deliverables:

- *"J.B. Latham Treatment Plant Facility Plan, Technical Memorandum No. 7 'Key Liquid Stream Issues' and Technical Memorandum No. 9 'Energy Management'"* (Appendix 3-A is complete and attached herein)
- *"Technical Memorandum, Evaluation of Alternatives for Use of Digester Gas"* (Appendix 3-B is complete and attached herein)
- *"SOCWA Contract Documents for Construction of J.B. Latham Treatment Plant Facility Improvements Packages A and C, Aeration Upgrades and Cogeneration Project Plans and Specifications"* (Appendix 3-C is complete and attached herein)
- "*Evaluation of the Potable and Non-Potable Water Systems at the JB Latham Treatment Plant Final Report"* (Appendix 3-D is complete and attached herein)
- *"Optimized Irrigation Plan" and associated SOCWA Memorandum* (Appendix 3-E is complete and attached herein)
- *"Final Plans and Specifications for Landscaping and Water System Improvements at J.B. Latham Treatment Plant"*

Performance Measurements:

- Submittal of deliverables which have already been completed.
- Submittal of final design plans and specifications for landscaping and water system improvements.

Task 4: Environmental Documentation:

In 2012 SOCWA prepared an "*Initial Study"* (Appendix 3-F) for the aeration and cogeneration components of the project. A "Notice of Intent to Adopt a Mitigated Negative Declaration" (MND) (Appendix 3-G) for the aeration and cogeneration facilities and other improvements was prepared in late 2012. The MND Notice was not adopted at that time because comments were received on the other improvements that are not part of the current Project. For purposes of the JBLTP Water and Energy Efficiency Project, the MND will be revised to omit extraneous improvements and finalized.

Another Initial Study and Mitigated Negative Declaration will be prepared for the landscaping modifications and water conservation improvements.

Together, these environmental documents will be finalized and complete compliance with the California Environmental Quality Act (CEQA). Compliance with the National Environmental Protection Act (NEPA) is not applicable to this Project.

Deliverables:
- Initial Study for the landscaping and water conservation elements of the Project, and
- Final approved Mitigated Negative Declaration for all aspects of the JBLTP Water and Energy Conservation Project.

Performance Measures:
- Submittal of the Final Mitigated Negative Declaration.

Task 5: Permitting:

The JBLTP Water and Energy Efficiency Project will require permits from the following agencies. Of these, one permit has already been secured.

- Regional Water Quality Control Board (RWQCB) National Pollutant Discharge Elimination System (NPDES)
- South Coast Air Quality Management District (SCAQMD)

SOCWA has an existing NPDES permit from the RWQCB for the entire JBLTP operation, including the JBLTP Water and Energy Efficiency Project. RWQCB Order No. R9-2012-0012 (NPDES No. CA0107417) *"Waste Discharge Requirements for the South Orange County Wastewater Authority Discharge to the Pacific Ocean Through the San Juan Creek Ocean Outfall"* was approved in 2012. The Project will require no changes in the current permit.

The SCAQMD regulates the discharge of air contaminants. Air permit regulations for internal combustion engines are strict and require best available control technology (BACT), including oxidation catalysts and SCR, plus extensive fuel conditioning to remove contaminants, such as hydrogen sulfide and siloxane. Installation of the new cogeneration engine generator will require modification of SOCWA's existing SCAQMD permit. SOCWA will submit an application for a permit to construct/operate the new cogeneration system to the SCAQMD with the associated supporting documentation and any fees.

SOCWA will inform the Orange County Fire Authority of the Project and installation of new cogeneration equipment. It is not envisioned that the Project will involve a modification of SOCWA's existing OCFA permit for digester gas utilization.

Deliverables:

- Copies of permits will be available upon request.

Performance Measures:

- Secure permits to support the Project schedule.

Task 6: Proposal Monitoring Plan:

SOCWA will prepare a monitoring plan to record and report the progress made on the performance measures under each task. Submittal dates will be tracked to conform with and maintain the Project schedule. Regular construction administration and management reports will be prepared that will describe the tasks accomplished and yet to be done, as well as the expenditures. The status of the budget will be constantly monitored as the Project moves forward.

After the Project construction and start-up are completed, the water and energy savings will be measured. The electrical power production from the cogeneration system will record the digester gas utilization and associated power generated in kWh per day. SOCWA will use this information calculate the energy savings and reduction in GHG emissions resulting from the Project.

Water conservation will be measured by meters and indicated on SOCWA's water bills. The water savings attributed to the Project will be calculated by the difference between the current, pre-Project water use and the later, post-Project water use.

Attachment 6 of this grant proposal describes the methodology for verifying the water and energy savings and GHG reduction achieved by the JBLTP Project. The monitoring plan will detail the data and tracking frequency that will be examined to report the water and energy savings and GHG reductions. All of this information will be reported to DWR as required by the terms of the guidelines for grantees and grant agreement.

Deliverables:

- Proposal Monitoring Plan

Performance Measures:

- Prepare and submit the Monitoring Plan
- Follow the Monitoring Plan procedures and submit required reports to DWR.

Task 7: Project Construction/Implementation:

A list of major tasks involved in construction and implementation of the SOCWA JBLTP Water and Energy Efficiency Project follows. Some tasks in the bid phase have already been completed.

Bid Phase

- Bid phase engineering services

- SOCWA completed the bid phase for the aeration and cogeneration components of the JBLTP Project in November 2014.
- The bid phase for the water conservation component will be done in 2015.

- Bid opening
  - SOCWA received and opened bids for the aeration and cogeneration components of the JBLTP Project on November 20, 2014.
  - The bid opening for the water conservation component of the JBLTP Project will be held in 2015.
- Notice of award
  - The construction contract award for the aeration and cogeneration components of the JBLTP Project is scheduled at the SOCWA Board of Directors meeting in December 2014.
  - The notice of award for the water conservation component of the JBLTP Project will be completed in 2015.

Construction Phase

Construction phase tasks include:

- Notice to proceed
- Construction of the facilities
- Construction management
- Start-up testing
- Substantial completion
- Punch list items
- Notice of completion and contract close-out

1. Notice to proceed (for two separate construction contracts)
   a. JBLTP Aeration Upgrades and Cogeneration Project.
      i. Notice to proceed is scheduled in February 2015.
   b. JBLTP Landscaping and Water Conservation Project.
      i. Notice to proceed is scheduled in late 2015.
2. Construction of the JBLTP Project (two separate construction contracts) – Major work items and equipment to be installed is summarized below:
   a. JBLTP Aeration Upgrades and Cogeneration Project
      i. Mobilization
      ii. Demolition
      iii. High efficiency blowers
      iv. Membrane diffusers, piping and valves

v. Cogeneration engine generator
vi. CEMS unit (continuous emissions monitoring system)
vii. Gas conditioning system
viii. Piping, valves, and mechanical appurtenances
ix. Electrical, instrumentation and controls
x. Demobilization

b. JBLTP Landscaping and Water Conservation Project
    i. Mobilization
    ii. Demolition
    iii. Irrigation system modifications
    iv. Xeriscape planting
    v. Demobilization

3. Construction management will include the following tasks for both construction contracts:
    a. Contractor contract administration: SOCWA staff will manage all aspects of the JBLTP Project and be responsible for coordination during the construction and start-up testing phases. SOCWA will provide all construction management and inspection services.
    b. Review contractor shop drawing submittals: The SOCWA construction management staff will oversee and inspect the contractor's work including shop drawing submittals.
    c. Respond to requests for information: SOCWA will coordinate requests for information with the design engineering consultant.
    d. Attend progress meetings and review pay requests: The SOCWA Project Manager will be responsible for administrating the entire project from design to construction notice to proceed through start-up. The SOCWA General Manager, with assistance from the Director of Engineering, will be the main point of contact for administration of the grant agreement, preparation of invoices, and preparation of all deliverables, reports, plans, specifications, and supporting documentation for the JBLTP Project.
    e. Inspect construction: SOCWA staff will provide all inspection services. When bids are received, reviewed and the construction contract is awarded, SOCWA will develop a construction management staff, which will include a construction resident engineer/ project manager, inspector and project administration staff.
    f. Materials testing: testing of all materials used in the construction development.
    g. Preparation of record drawings at completion of the Project.

4. Start-up testing: SOCWA operations staff, led by the Director of Operations, will coordinate the start-up and testing phase of the Project as construction nears completion. (for both construction contracts)

5. Contract close-out:
    a. Notice of substantial completion
    b. Punch list items
    c. Notice of final completion
    d. Administration of the JBLTP Project will be managed by SOCWA, and tasks include budgeting, expenditures, schedule and progress reporting. For both construction projects, status reports will be submitted with invoices as the Project progresses, and a notice of completion and final report will be submitted at the conclusion of the Project.

Deliverables:

- Advertisement for bids (for each construction contract; the aeration and cogeneration construction contract has already been advertised for bids)
- Bid results (for each construction contract) (for each construction contract; bids have already been received for the aeration and cogeneration construction contract)
- Notice of award (separate notice for each construction contract)
- Notice to proceed (separate notice for each construction contract)
- Progress payments to the contractors
- Notice of substantial completion (separate notice for each construction contract)
- Notice of completion (separate notice for each construction contract)

Performance Measures:

- Timely submittals of notices and reports.

Project Budget

The project budget is presented in Attachment 4

Schedule

The project schedule for each task in the Work Plan is presented in Attachment 5 of this grant proposal. Key milestone dates for the JBLTP Project are:

- Aeration and Cogeneration Element
    - 2011-2012: Preliminary studies
    - October 2014: Final Design
    - February 2015: CEQA Compliance (MND)
    - November 2014: Bid Phase
    - February 2015: Construction Notice to Proceed
    - September 2016: Construction Notice of Final Completion

- Landscaping and Water Conservation Element
  - 2014: Preliminary studies
  - July 2015: Final Design
  - February 2015: CEQA Compliance (MND)
  - September 2015: Bid Phase
  - November 2015: Construction Notice to Proceed
  - July 2016: Construction Notice of Final Completion

Appendix 3-A

Full report is available upon request.
The file size exceeds the upload limit of 50 MB.

South Orange County Wastewater Authority

J.B. Latham Treatment Plant Facility Plan

January 2012

SOUTH ORANGE COUNTY WASTEWATER AUTHORITY

J.B. LATHAM TREATMENT PLANT
FACILITY PLAN

SUMMARY

FINAL
2012

Engineers...Working Wonders With Water™

5075 SHOREHAM PLACE • SUITE 120 • SAN DIEGO, CALIFORNIA 92122 • (858) 505-1020 • FAX (858) 505-1015
pw://Carollo/Documents/

SOUTH ORANGE COUNTY WASTEWATER AUTHORITY

J.B. LATHAM TREATMENT PLANT
FACILITY PLAN

SUMMARY

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

APPENDICES

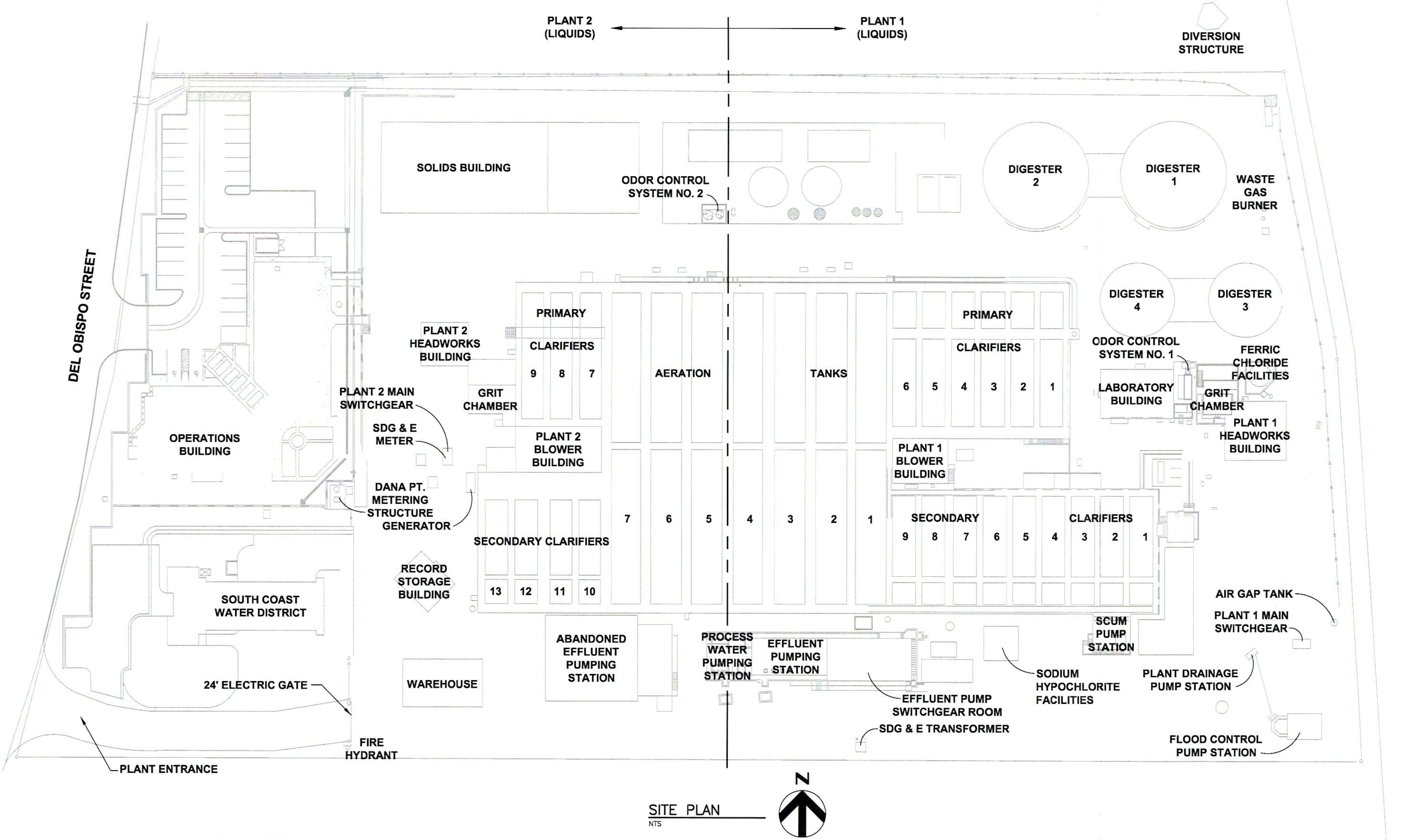
1.0 INTRODUCTION

The J.B. Latham Treatment Plant (JBLTP) is a conventional activated sludge, secondary treatment facility owned and operated by the South Orange County Wastewater Authority (SOCWA) on behalf of five member agencies. The plant consists of two liquid treatment trains, Plant 1 and Plant 2. The plants have separate service areas and they are operated independently. The solids from both plants are combined and treated through a solids processing train that includes Dissolved Air Flotation (DAF) thickeners, anaerobic digesters, and dewatering centrifuges. The treated effluent is discharged into the Pacific Ocean through the San Juan Creek Ocean Outfall.

The JBLTP also treats waste activated sludge from the Santa Margarita Water District's Oso Creek Water Reclamation Facility (Oso). The sludge is discharged to the collection system tributary to Plant 1. The JBLTP may also receive all or some portion of the sewage tributary to Oso when the facility is off-line.

The JBLTP was originally rated at 13 million gallons per day (mgd). Plant 1 is rated at 9.0 mgd and Plant 2 is rated at 4.0 mgd. The liquid treatment processes were constructed in four phases starting in years 1964, 1971, 1974 and 1978. Digesters Nos. 3 and 4 were built in 1971, and Digesters Nos. 1 and 2 were built in 1974. The Solids Building was constructed in 1986. Belt filter presses were installed to dewater the digested sludge. The presses were replaced with centrifuges in the late 1990's and early 2000's. The final major new facility, the Effluent Pump Station, was constructed in 1993.

The JBLTP is shown in Figure 1. This figure delineates the separation between Plants 1 and 2.



carollo Engineers...Working Wonders With Water™ in association with HDR Engineering, Inc.

J.B. LATHAM TREATMENT PLANT FACILITY PLAN

FIGURE 1

SOCWA

2.0 PURPOSE AND SCOPE

2.1 Past Studies

Many upgrade projects have been completed at the JBLTP over the past 10 years. The recently approved Ten Year Plan laid out a set of rehabilitation projects continuing through Fiscal Year 2019/2020. These projects focus on the preservation and improvement of existing assets.

Other studies have focused on specific areas of the plant. These include the preliminary design report Aeration and Cogeneration Upgrade for the J.B. Latham Treatment Plant, July 2009 and the J.B. Latham Treatment Plant Advanced Wastewater Treatment Facility, December 2006. The first report evaluated replacement of the aging activated sludge diffuser system as well as formulating a response to the South Coast Air Quality Management District's (SCAQMD) proposed emission limits under Rule 1110.2. The report recommended replacing the existing ceramic dome diffusers with membrane diffusers and new high efficiency blowers. With respect to Rule 1110.2, the report considered construction of two 300 kW fuel cells to replace the existing internal combustion engine and blower.

The J. B. Latham Treatment Plant Advanced Wastewater Treatment Facility study dated December 2006 considered construction of facilities to produce up to 7.5 mgd of recycled water meeting the Title 22 requirements for unrestricted use. A subsequent November 2009 report prepared in response to the Value Engineering review recommended construction of submerged membrane filtration in one aeration basin. Disinfection would be achieved with either be construction of off-site chlorine contact basins or installation of ultraviolet irradiation (UV).

SOCWA has completed a significant amount of strategic planning over the past five years regarding long-term biosolids handling. This planning has included the option of installing heat drying or advanced drying at the JBLTP to produce Class A biosolids. Planning will continue in response to regulatory and technical changes.

2.2 Purpose

The past studies have been limited in scope to specific processes or regulatory challenges. Over the past 10 years, a comprehensive plan that considers: 1) capacity and condition of the facilities; 2) potential regulatory impacts; and 3) opportunities to improve efficiencies has not been prepared. This facility plan will consider a broader, integrated planning approach. The goal is to identify a roadmap for upgrades, capital investment, and land requirements for the next 20-years.

2.3 Scope of Work

The Scope of Work for this Facility Plan is as contained in the 2010 Request for Proposals. A copy is included in Appendix A. The major tasks included:

1. Project flows and loadings.

2. Determine the current capacity. Is the current capacity adequate for existing and projected conditions?

3. Review the structural condition of the facilities. Can the structures serve their intended purpose for the foreseeable future? What investments are needed to preserve the facilities?

4. Review the seismic vulnerability of the structures. Are seismic upgrades needed for protection of staff and physical assets?

5. Project regulatory changes that would have significant impact on the JBLTP's ability to meet discharge and air quality regulations. Could significant upgrades be required that would result in cost and space impacts?

6. Develop a series of flow schematics that are capable of meeting potential upgrades needed to meet future discharge requirements.

7. Evaluate key liquid, solids, and energy management issues to improve energy and operational efficiencies. What is the best approach to handle the integrated issues of needed aeration upgrades and potential Rule 1110.2 cogeneration impacts? Could operational upgrades such as Chemically Enhanced Primary Treatment (CEPT) affect the recommendations?

8. Develop the cost and space requirements for activated sludge odor control. This is not a current requirement based on regulatory requirements or odor concerns. However, this should be considered with respect to future space requirements.

9. Develop site plans to show how recommended facilities will fit within the limited space. Will additional land be required?

10. Prepare phasing schedules to implement the recommended facilities.

3.0 TECHNICAL MEMORANDA

To complete the Scope of Work, twelve Technical Memoranda (TM) have been prepared. The titles and contents of each are summarized in Table 1. This section presents the major findings and recommendations contained in each of the twelve TMs.

3.1 TM 1 - Flows and Loadings

TM 1 summarized flows and loadings for the previous 5 calendar years. The purpose is to establish the biochemical oxygen demand (BOD), total suspended solids (TSS) and ammonia loadings for use in Carollo's Biotran process model. The model forms the basis of the subsequent process analysis, including determination of the existing treatment capacity.

Table 1 List of Technical Memoranda
J.B. Latham Treatment Plant Facility Plan
South Orange County Wastewater Authority

No.	Title	Description
1	Flows and Loadings	Summarize historical flows and loadings including average and peak month flow, biochemical oxygen demand (BOD), and total suspended solids (TSS).
2	Existing Facilities	Review of the existing treatment operation including ability to meet discharge requirements. Based on current BOD and TSS concentrations, the treatment capacity of the liquid treatment train is established.
3	Seismic Vulnerability/Structural Condition	Summary of findings and recommendations concerning the seismic and structural condition of the facilities. The findings were based on first a plant inspection and subsequent review of plans for critical areas. The TM identifies needed seismic upgrades needed for safety and concrete repair needed for preservation of the facilities.
4	Water Quality Regulatory Impacts	Analysis of potential water quality regulations that might be anticipated over the next 20 years. The probability of implementation and the impact on the JBLTP is considered.
5	Air Quality Regulatory Impacts	Similar to TM 4 except covering potential air quality regulations.
6	Potential Liquid Trains	Presentation of alternative flow schematics that address regulatory changes, consolidation of operational facilities, and emerging technologies. The potential changes and process additions are considered in TM No. 11 <u>Alternative Site Plans</u> with respect to space impacts.
7	Key Liquid Stream Issues	Evaluation of primary effluent distribution hydraulics to improve distribution to the aeration basins. Analysis of grit chamber replacement or rehabilitation to improve grit removal efficiency. Determination of costs to implement CEPT and potential energy

Table 1 List of Technical Memoranda
J.B. Latham Treatment Plant Facility Plan
South Orange County Wastewater Authority

No.	Title	Description
		savings. Analysis of potential upgrades to the aeration system. Development of space needs for recycled water facilities. Evaluation of facilities required for disinfection and dechlorination of secondary effluent discharged to the ocean outfall.
8	Key Solids Handling Issues	Evaluation of waste activated sludge thickening, digestion capacity, and sludge storage. A fifth digester is considered to provide sufficient hydraulic capacity when a large unit is out of service. Capacity for CEPT and CEPT plus Plant 3A solids is considered.
9	Energy Management	Evaluation of cogeneration alternatives including existing, adding BACT to existing, microturbines, and fuel cells. The TM summarizes energy demands including digester heat requirements. Green house gas emissions are projected. A life-cycle cost analysis compares the 20-year costs for each alternative.
10	Odor Control	Potential sizing, location, and cost for a new odor scrubber to treat the existing aeration basins.
11	Alternative Site Plans	Preparation of site plans that show the potential location of facilities identified in the previous TMs.
12	Project Phasing	Development of an implementation schedule for the recommended facilities.

Notes:

(1) CEPT - Chemically Enhanced Primary Treatment

In addition to the influent wastewater strength, the contribution of the Oso Creek Water Reclamation Facility was accounted for separately. Finally, the primary and waste activated sludge (WAS) loadings from Plant 3A were summarized. There may be cost advantages to treating the Plant 3A solids at the JBLTP and discontinuing operation of the thickening, digestion, and dewatering facilities at Plant 3A. The flows and loadings were evaluated for each separate plant. The average flow, BOD concentration, and TSS concentrations are shown on Figures 2 and 3 for Plants 1 and 2, respectively.

Over the previous 5 years, the following conclusions can be made:

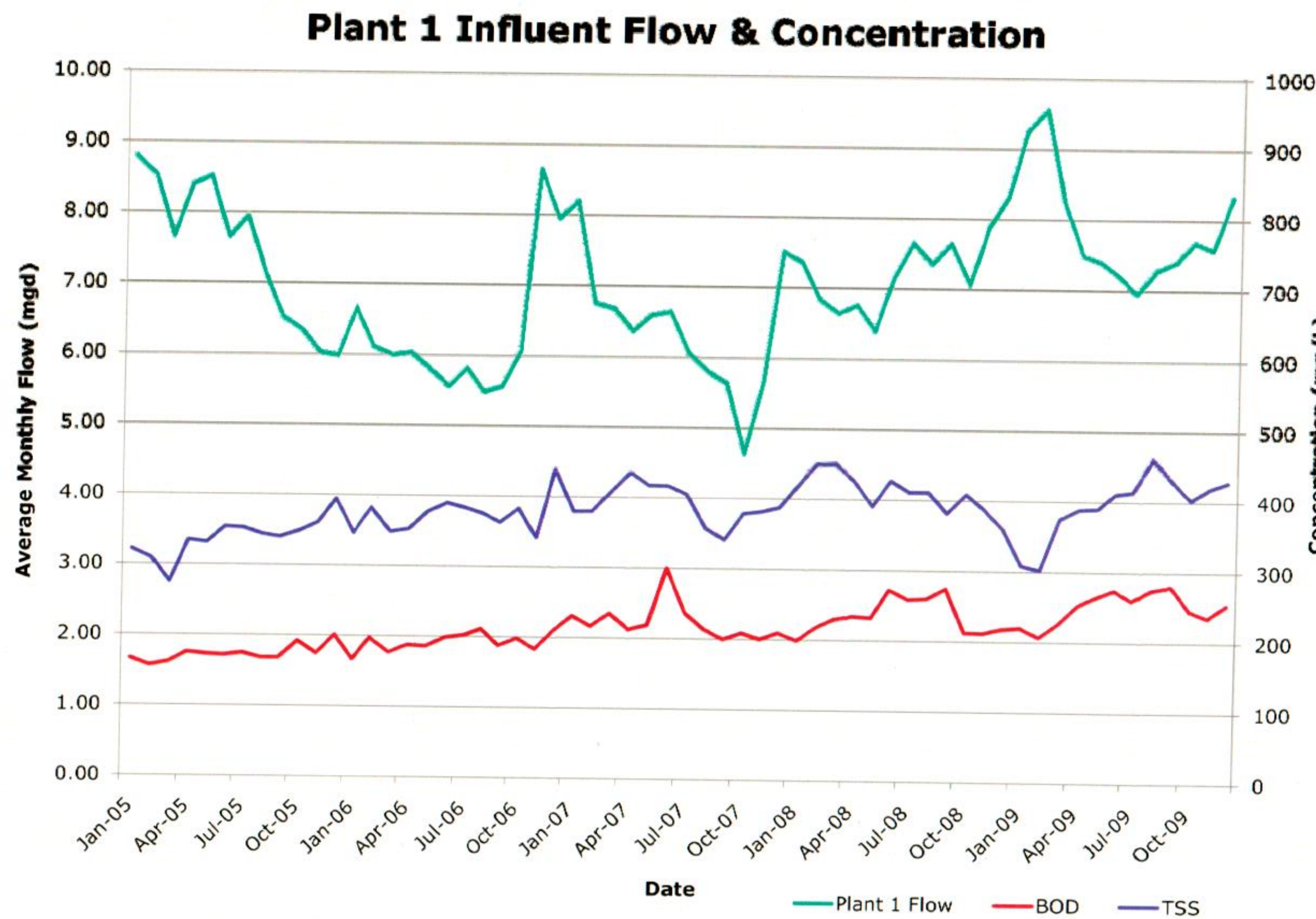
1. Flows into Plant 1 have been fairly constant. However, carbonaceous biochemical oxygen demand (CBOD) and TSS concentrations have increased. The lack of an increase in flow could be due to a combination of water conservation and drought. This results in concentrating the pollutant strength.
2. Flows into Plant 2 have decreased while CBOD and TSS concentrations have increased.
3. While concentrations and loadings for both CBOD and TSS have increased, both plants have handled these increases with minimal impact.
4. The 2007, 2008, and 2009 Plant 2 influent data is suspect. Investigation of the sampler and sampling protocol are recommended.
5. Solids from Oso have a calculable effect on Plant 1 influent TSS concentrations. However, the total effect is minimal as the solids from Oso represent only 16 percent of Plant 1 solids capacity.

3.2 TM 2 – Existing Facilities

TM 2 focused on the performance of each treatment process. With the loadings established in TM 1, the performance factors were inputted into the Biotran process model. The model was calibrated, and the recommended capacity of each plant was determined. The resulting liquid treatment capacities for Plants 1 and 2 are reported in Table 2.

Table 2 Maximum Month Plant Capacity, mgd
J.B. Latham Treatment Plant Facility Plan
South Orange County Wastewater Authority

Parameter	Plant 1	Plant 2	Combined
All Units in Service	10.2	4.2	14.4
One Plant 2 aeration basin out of service	10.2	3.6	13.8
One Plant 1 secondary clarifier out of service	9.6	4.2	13.8



PLANT 1 FLOWS AND LOADING

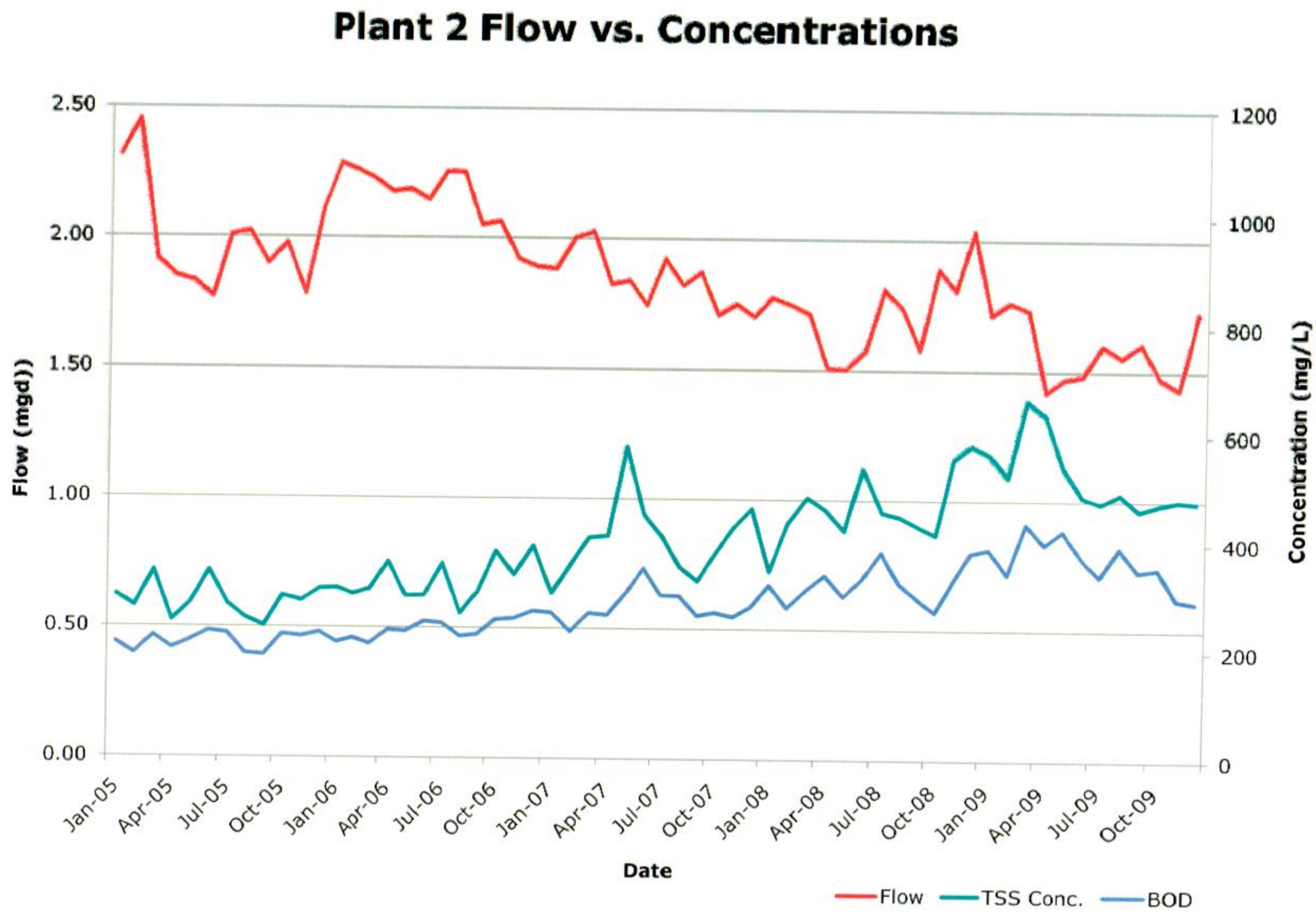
NTS

Carollo Engineers...Working Wonders With Water™ In association with HDR Engineering, Inc.

J.B. LATHAM TREATMENT PLANT FACILITY PLAN

FIGURE 2

SOCWA



PLANT 2 FLOWS AND LOADING
NTS

carollo Engineers...Working Wonders With Water™ In association with HDR Engineering, Inc.

J.B. LATHAM TREATMENT PLANT FACILITY PLAN

FIGURE 3

SOCWA

These capacities are reported for the maximum month, average day flow. This is consistent with the requirements contained in SOCWA's National Pollutant Discharge Elimination System (NPDES) permit. The current limit of 13 mgd is the average for any 30-day period. Even with increasing concentrations, the combined capacity still exceeds the permit limit.

Other conclusions reported in TM 2 include:

1. The treatment efficiencies for the individual processes are within normal ranges.

2. Table 2 presented the modeled flow capacities of 10.2 mgd and 4.2 mgd for Plant 1 and Plant 2, respectively. The historical peak month flow to Plant 1 was 9.6 mgd (February 2009) while the historical peak for Plant 2 was 2.5 mgd (February 2005). This indicates excess capacity in Plant 2. The ability to transfer flow from Plant 1 to Plant 2 should be considered.

3. The Oso solids make up a significant portion of the Plant 1 loading. However, the plant has handled this loading.

4. There is sufficient liquid stream capacity to handle the Plant 3A solids. However, the increased amount of WAS in the primary clarifiers could result in difficulties in managing the sludge blanket levels. This is discussed in a subsequent section. There is not sufficient digester capacity to handle the added solids. This is discussed in TM 8 Key Solids Handling Issues.

3.3 TM 3 – Structural Condition/Seismic Vulnerability

The purpose of TM 3 was to provide information to assist with the planning of facility maintenance and rehabilitation for the structures. A structural condition assessment and seismic vulnerability evaluation were conducted. The scope of work included a broad overview of all of the major structural facilities but did not include any detailed evaluation or design of repair/rehabilitation alternatives. As such, the cost estimates provided are order of magnitude costs, but do consider contingency and project costs.

In general, the condition of the JBLTP is consistent with the age of similar, Southern California treatment plants. Many portions of the plant are approaching the anticipated 50-year serviceable life of the concrete. However, the majority of the observed structures remain in good condition. A major reconstruction of the structures is not anticipated in the near future (e.g. 15 years).

Most of the deterioration observed can be attributed to hydrogen sulfide concrete corrosion and carbon steel corrosion. All of the observed deterioration can be remedied through basic repairs. An active rehabilitation program can enhance the service life of the process structures. The total cost for repairing all of the identified structural deterioration is estimated to be $1,211,000. If not addressed by repair and protective coating, this cost will increase. The deterioration could continue to the point where very costly replacement may be required. While all of the observed deterioration is recommended for repair, the following are considered as requiring a higher level of attention in the near future due to the potential for accelerated corrosion/deterioration and a reduced capacity in the deteriorated state to resist transient loads that may be caused by earthquakes:

1. Interior surface corrosion at the Plant 1 Primary Clarifiers Influent Channel, Plant 2 Headworks, the Scum Pit, and Plant 2 Headworks.
2. Wall section spalling at Plant 1 ML Channel and Plant 1 Primary Effluent Channel.
3. Pipe support repairs at the north fence and the Effluent Pump Station.
4. Bridge walkway corrosion and spalling at Plant 1 Secondary Clarifiers.

The seismic vulnerability evaluation identified some structural elements that, if uncorrected, may result in excessive localized damage during an earthquake that can threaten the life safety of the occupants and/or the operability of the process. The total cost for retrofitting all of the identified seismic vulnerabilities is estimated to be $324,500. Without the modifications, there is a risk that damage will occur, and the repair and replacement costs could be an order of magnitude higher than the retrofit costs. All of the vulnerabilities identified should be considered for seismic retrofit or other means to reduce the risk. These include:

1. Modify the process basin walkways. This work includes freeing the walkway from the walls and installing a sliding bearing plate.
2. Perform seismic retrofits for all the masonry buildings with wood roofs. This work consists of anchoring the wood members to the masonry walls.

3.4 TM 4 - Water Quality Regulatory Impacts

Regulations can be a major driver in public agency's capital improvement programs. Stringent regulations can lead to the need to add treatment processes. TM 4 reported projected changes in water quality regulations that could have an impact on the JBLTP. TM 4 summarized a range of potential effluent disposal options along with the existing regulations. It also identified regulatory changes currently being contemplated. Finally, it addresses the potential for other changes that could affect future facilities or operation.

Of the regulatory issues identified, most have a low probability of occurrence or the issues are projected to result in minimal impacts. Issues that have a high probability of occurrence and may result in potential impacts to JBLTP treatment operations include the following:

1. *Bacteriological Compliance Requirements.* As noted, it is virtually certain the renewed JBLTP NPDES permit will contain more stringent bacteriological receiving water standards and a compliance time schedule.
2. *Changes in Future Solids Handling Regulations.* A trend of increased EPA regulation on solids reporting, monitoring, treatment and stabilization, and reuse has occurred during the past two decades. This trend is likely to continue. The impact of this increased regulation on JBLTP solids handing and reuse/disposal operations is unknown, but it is likely to lead to increased treatment, increased

operations requirements, increased contractor/hauling requirements, and increased costs.

3. *CEC Monitoring and Requirements.* A number of chemicals of emerging concern (CEC) data collection efforts are underway, and it is likely that these efforts will cause increased regulatory interest in further CEC monitoring. It is also likely that additional information will be developed that better describe potential impacts associated with the CECs. This, in turn, may affect JBLTP operations and facilities needs.

Several additional issues which have unknown potential impacts on JBLTP treatment and operations include:

1. New regulated parameters or modification of existing standards governing sludge treatment, handling and reuse,
2. New federal water quality criteria or modifications of existing criteria,
3. Modifications of Ocean Plan Table B receiving water standards, and
4. Modification of Ocean Plan compliance determination protocols.

At this time, the major impact would be the more stringent bacteriological compliance requirements. However, the impact could be limited to the addition of hypochlorite to the ocean outfall. This would require construction of additional hypochlorite storage tanks and metering pumps. Depending on the needed hypochlorite dose, dechlorination may also be required. However, based on the experience at the City of San Diego's Point Loma Wastewater Treatment Plant, this should not be required. Continued attention to these issues and their possible impacts is warranted.

3.5 TM 5 – Air Quality Regulations

The purpose of TM 5 is parallel to TM 4. The JBLTP operates under the air quality permits issued and regulated by the SCAQMD. The permits cover the digester gas cogeneration system, two boilers for digester heating, two digester flares, four emergency power diesel engines, one natural gas emergency power engine, and two odor control scrubbers.

Every emission source has the potential for increased requirements including the engines, boilers, and flare. Rule 1110.2 is the immediate and potentially impactful SCAQMD action facing the JBLTP. This rule pertains to current cogeneration operation that affects the approach to using digester gas, supplemental natural gas, and purchased energy. Digester gas not used by cogeneration must be safely flared and the flare station is handled by a separate permit.

SCAQMD Rule 1110.2 compliance could result in a significant short-term impact to the JBLTP. The existing engine could require both digester gas cleaning and implementation of Best Available Control Technology (BACT). BACT has not been defined, but it may consist of addition of selective catalytic reduction (SCR) to the engine exhaust. There are few operating installations of SCR on digester gas fueled, internal combustion engines of similar size.

Rule 1110.2 was to be fully implemented by July 2011. Due to the difficulty in identifying BACT, the final rule is not scheduled to go to the SCAQMD Board until early 2012. There is a remote possibility that the more stringent requirements may not be implemented. With these uncertainties, no action should be taken at this time. If the more stringent rules are implemented, SCR should be evaluated in more detail with respect to cost, space impacts, and reliability. The additional costs for a continuous monitoring emission system (CEMS), and other staffing and reporting should be further analyzed.

3.6 TM 6 – Modified Liquid Treatment Trains

TM 6 presented potential liquid treatment trains that address:

1. Regulatory impacts identified in TM No. 4 Water Quality Regulatory Impacts.
2. Processing recycled water.
3. Consolidating operating facilities.
4. Emerging technologies.

Ten simple block diagrams are presented that graphically show how the existing treatment flow schematic could be modified to address the four items above. The modifications could consist of additional processes or modifications to the existing process basins. The block diagrams were used to develop alternative site plans presented in TM 11. The site plans will demonstrate whether the modifications and additional facilities can fit on the existing site. A listing of the schematics and the issues they address is given in Table 3.

Table 3 Process Schematics
J.B. Latham Treatment Plant Facility Plan
South Orange County Wastewater Authority

No.	Description	Driver	Description	Recycled Treatment
1	Future Regulatory Compliance	Regulations	Processes to control Contaminants of Emerging Concern (CEC). Effluent disinfection.	
2	Optimized Treatment – Improved Filterability	Recycled Water	Installation of fixed media in the Aeration Basins to support nitrification. Install Secondary Clarifier baffles and modify launders to support higher solids load. Improved filterability would allow use of conventional filters.	Allows conventional filters.
3	Optimized Treatment – Biological Nitrogen Removal (NdN)	Recycled Water	Installation of Aeration Basin anoxic zones and internal pumped recycle for biological nitrification - denitrification. Install Secondary Clarifier baffles and modify launders to support higher solids load. Improved filterability would allow use of conventional filters.	Allows conventional filters.
4A	Submerged Membrane Filters in One Aeration Basin (VE Response)	Recycled Water	Install submerged membranes in one existing aeration basin.	Replaces filters.
4B	Submerged Membranes (MBR)	Recycled Water	Conversion of system to a membrane bio-reactor (BMR). Installation of Aeration Basin anoxic zones. Install submerged membranes in the secondary clarifiers. Process would meet Title 22 filtration requirements for Unrestricted Reuse.	Replaces filters.
5A – 5C	Divert raw wastewater from Plant 1 to Plant 2 or Plant 2 to Plant 1.	Consolidation of Operating Processes	Divert flows to equalize loadings or to account for un-planned basin outage at either plant. Flow from Plant 1 can be diverted to Plant 2 by gravity (5A). Flows from either plant could be diverted to the other after influent pumping (5B and 5C).	Requires membrane filters.

Table 3 Process Schematics
J.B. Latham Treatment Plant Facility Plan
South Orange County Wastewater Authority

No.	Description	Driver	Description	Recycled Treatment
6A	Consolidated Activated Sludge Systems	Emerging Technologies	Combine Plant 1 and Plant 2 Return and Waste Sludge systems. Return Activated Sludge (RAS) from both plants would be pumped to a control structure to split the flow equally among operating Aeration Basins. All wasting would be done from this structure. Would result in one sludge system.	Requires membrane filters.
6B	Waste Activated Sludge - Solids Contact	Emerging Technologies	Take Plant 2 Aeration Basins off-line. Convert basin capacity to Anaerobic Contactor. Waste sludge is pumped directly to digesters. Reduced aeration demands and increased digester gas production.	Requires membrane filters.

3.7 TM 7 – Key Liquid Stream Issues

TM 7 reviewed six key liquid stream issues as follows:

1. Primary Effluent Distribution. This includes an analysis of the hydraulics effecting the flow distribution from the primary effluent channel into the aeration basins.
2. Grit Removal. The existing grit chambers are undersized. This section compared the cost of impaired removal efficiencies to the cost of constructing larger grit chambers.
3. Chemically Enhanced Primary Treatment (CEPT). The costs and benefits of implementing CEPT were reviewed. CEPT would reduce the demand on the aeration system. CEPT has other benefits with respect to digester gas production and other factors.
4. Aeration System Upgrades. The existing diffuser system is aging and is in need of replacement. This has been the subject of past studies. This section considered new diffusers, blowers, and implementation of CEPT.
5. Secondary Effluent Recycling. The scope of work for this task consisted of determining the space requirements for a recycled water project that would include advanced treatment processes such as microfiltration, reverse osmosis, UV disinfection, and advanced oxidation.
6. Near Term Disinfection. As discussed in TM 4, secondary effluent may require disinfection prior to discharge to the San Juan Creek Ocean Outfall. This task included developing the space requirements for the disinfection facilities.

3.7.1 Treatment Scenarios

TMs 7, 8, and 9 all evaluated alternatives based on three treatment scenarios: 1) Current; 2) Chemically Enhanced Primary Treatment (CEPT), and 3) CEPT plus the introduction of Plant 3A solids.

The Current scenario provides a baseline to compare the other two.

CEPT would provide several benefits. These include improved primary treatment efficiencies and the resultant reduction of lower BOD loading to the aeration basins. This reduces air demands and energy consumption. The production of WAS is also reduced. CEPT also increases the percentage of primary sludge in the digester feed sludge. This results in greater digester gas production, a potential benefit to cogeneration. However, the overall digester feed rate increase could impact digester capacity. These issues must be considered using an integrated analysis.

The introduction of Plant 3A solids could result in overall benefits to SOCWA. The solids generated at Plant 3A would be discharged back to the Oso-Trabuco Sewer for handling at the JBLTP. The addition of CEPT would probably be required for this scenario. The WAS does not settle as well as raw wastewater TSS in the relatively shallow primary clarifiers. CEPT aides in settling and managing of sludge blankets.

This would offer the advantages of 1) reducing operations and maintenance needs at the smaller Plant 3A facility, 2) eliminating biosolids off-site transport in roll-off bins (which involve more expensive unit disposal rates than the trailer hauling currently used at the Latham Plant), and 3) increasing the JBLTP digester gas production, benefitting a new cogeneration system.

3.7.2 Primary Effluent Distribution

The primary effluent channels for Plants 1 and 2 are both 4-feet wide and 6-feet deep. The return activated sludge (RAS) from the individual plants enters each channel at one end. It has time to mix with the primary effluent before reaching the first aeration basin for each plant (Aeration Basin 1 for Plant 1 and Aeration Basin 7 for Plant 2). The flow into the first basins, and hence the organic loading, is the highest. This has some impact on the overall process.

The flow into each aeration basin is controlled by an adjustable weir gate. Some of the aeration tanks' weir gates are equipped with rubber flaps designed to close the air space between the flow and the top of the primary effluent channel to contain foul air.

The analysis concluded the following:

1. The flap gates restrict flow and exacerbate the unequal flow distribution.
2. All of the secondary clarifier weirs should be surveyed and set to the same elevation.
3. A hydraulic model should be prepared to determine the proper weir gate elevation for each aeration basin under different scenarios of basins in and out of service.
4. The weir gate elevations should be set with the assistance of a surveyor.

3.7.3 Grit Removal

This section evaluated the cost effectiveness of new grit removal facilities to improve grit removal efficiency. This in turn would reduce the costs of digester cleaning and primary sludge pump maintenance. The scope involves:

1. An estimate of the added cost of digester cleaning and primary sludge pump maintenance associated with the current grit chamber performance.
2. An estimate of the cost to install higher efficiency grit chambers to mitigate downstream maintenance costs
3. An evaluation of other means for enhancing grit removal.

Currently grit is being removed at the plant grit chambers, but it is postulated that grit removal efficiencies are less than optimum. The current total annual cost of the lower removal efficiencies is estimated at $40,000 per year. This includes cleaning and the added equipment maintenance. If removal efficiencies could be doubled, a savings of $20,000/per year could be generated with a 20-year present worth value of $230,000.

New grit chambers are estimated to cost from $1,800,000 to $4,500,000. These costs are significantly higher than the savings resultant from more efficient grit removal. New grit chambers do not appear to be a cost effective solution.

As an alternative to new grit chambers, it may be possible to enhance the efficiency of the existing grit chambers through relatively cost effective, focus modifications. These modifications include:

1. Inlet baffling,
2. Midpoint baffle,
3. New air header with associated baffle,
4. Airflow measurement and control,
5. Modified inlet location for Plant No. 2 grit chamber,
6. Grit pump control modifications, and
7. Review of structural integrity.

Grit chamber rehabilitation is recommended as the most suitable and cost-effective approach to improving operation. The above modifications could be implemented within an estimated budget of $230,000.

3.7.4 Chemically Enhanced Primary Treatment

This section evaluated the costs to implement full scale CEPT. It would consist of new ferric chloride storage tanks, ferric chloride metering pumps, polymer storage, and polymer blending facilities. While ferric chloride is currently added to the primary clarifiers for odor control and digester gas hydrogen sulfide control, this project would provide higher levels of primary clarifier BOD and TSS removal. This would result in reduced aeration demands.

The estimated costs for CEPT are presented in Table 4.

Table 4	Present Worth of Alternatives - CEPT J.B. Latham Treatment Plant Facility Plan South Orange County Wastewater Authority		
Item	**Current**	**CEPT**	**CEPT + 3A Solids**
Capital Cost	$0	$352,500	$352,500
Present Worth of O&M	$1,486,000	$2,855,000	$2,855,000
Total Present Worth	$1,486,000	$3,207,500	$3,207,500

Notes:

(1) CEPT dose and removal efficiency is provided in Carollo's process model.

(2) The additional costs that may be required to handle increased primary solids production are not included.

(3) Operation cost for Ferric Chloride addition in the existing process is for H2S control in the digesters.

Currently the primary clarifiers are operating within their design parameters. It does not appear that CEPT is cost effective at the present time. The only reason to add CEPT would be in conjunction with the aeration upgrades, increase in digester capacity, or implementation of a new cogeneration technology. The combination of results is analyzed as part of the subsequent aeration analysis, TM 8 Key Solids Handling Issues, TM 9 Energy Management, and Section 4.0 Integrated Analysis in this summary document.

3.7.5 Aeration Upgrades

The aeration system is reaching the end of its useful life. A carefully planned aeration system upgrade is required to provide cost effective operation in the future. The intent of the aeration system upgrade is to reduce energy requirements while providing system redundancy and flexibility. This section evaluates and compares the cost effectiveness of several alternatives. The evaluation involves:

1. Develop aeration demands for the three treatment scenarios.
2. Estimate the capital cost implementing high efficiency blowers and diffusers.
3. Develop operational costs of the upgraded aeration system alternatives based on the annual average flow (Current scenario).
4. Evaluate the present worth costs.

Three aeration alternatives were developed and compared. These alternatives are summarized in Table 5.

Table 5 Aeration Alternatives J.B. Latham Treatment Plant Facility Plan South Orange County Wastewater Authority		
Alternative 1	**Alternative 2**	**Alternative 3**
1. Replace existing ceramic domes in-kind. 2. Implement BACT for the existing cogeneration engine as discussed in TM 9. 3. Upgrade aeration controls.	1. Demolish the existing engine driven blower. 2. Use existing motor driven blowers. 3. Implement fuel cells to produce electrical energy. 4. Replace the ceramic domes with high efficiency membrane disks. 5. Upgrade aeration controls.	1. Demolish the existing engine driven blower. 2. Install high efficiency turbo blowers. 3. Implement fuel cells to produce electrical energy. 4. Replace the ceramic domes with high efficiency membrane disks. 5. Upgrade aeration controls.

A present worth analysis has been prepared for each of these alternatives. The estimated capital, operations, and maintenance costs are presented in Table 6.

Table 6 Present Worth of Aeration System Evaluation
J.B. Latham Treatment Plant Facility Plan
South Orange County Wastewater Authority

Item	Alt 1	Alt 2	Alt 3
Present Worth of Capital Expenditures	$1,512,000	$1,781,000	$2,199,000
Present Worth of O&M Costs	$5,877,000	$4,612,000	$3,758,000
Total Present Worth of the Project Assuming New Cogeneration Equipment	$7,389,000	$6,393,000	$5,957,000
Total Present Worth of the Project Assuming Digester Gas is used in the Blower Engine	$1,512,000	$6,393,000	$5,957,000

Notes:

(1) Capital Costs include future blower replacement and diffuser replacement costs
(2) The costs for new cogeneration equipment assumes that all alternatives produce the same amount of usable electricity and heat for the treatment plant, and Alternative 1 requires additional natural gas to supplement that used in the blower engine.
(3) If digester gas is used in the blower engine, then there is no beneficial use of digester gas to produce usable electricity for the treatment plant.

From this analysis, Alternative 1 is by far the least costly option. However, other issues include consideration of the three treatment scenarios and the final disposition of the SCAQMD Rule 1110.2. These issues are considered in a combined evaluation in Section 4.0 Integrated Analysis.

3.7.6 Secondary Effluent Recycling

The purpose of this section was to determine space requirements for potential tertiary and advanced recycled water treatment (AWT) facilities. These treatment processes would meet the long-term requirements listed in TM 4 Water Quality Regulatory Impacts. The AWT section is only for planning purposes at this time and illustrates the space required at the treatment plant to implement any of the AWT options. Preliminary layout shows facilities were sized to produce 7.0 mgd. The AWT facilities will be built to provide product water for one end use or a combination of two end uses. The possible uses for the water are:

1. To meet Title 22 requirements for turf irrigation with TDS removal to meet Basin Plan requirements.

2. To implement groundwater injection or other advanced use.

The resulting facilities are shown on Figure 11.5 in TM 11 Alternative Site Plans.

3.7.7 Near Term Disinfection

As discussed in TM 4 Water Quality Regulatory Impacts, the secondary effluent may require disinfection prior to discharge to the San Juan Creek Ocean Outfall. There are two possibilities that could occur. The best-case scenario would be to add additional sodium hypochlorite storage and utilize the outfall pipe to provide the needed contact time. If the pipeline volume is not sufficient, a chlorine contact tank and effluent dechlorination station would possibly be required. This is the worse case scenario. The actual design disinfection standard will be implemented by the RWQCB and the design basis will be developed based on operating and test data. For this Facility Plan the worse case scenario was used. The resulting site plan is contained in Figure 11.1B in TM 11 Alternative Site Plans. The estimated capital cost for the worse case scenario is $3,168,000.

3.8 TM 8 – Key Solids Handling Issues

As discussed in TM 2, the existing solids handling facilities are operating within normal ranges. However, there are several issues that need to be addressed for the continued successful operation.

The purpose of this TM was to:

1. Evaluate alternatives for WAS thickening. The existing thickeners are in need of major rehabilitation. New technologies such as disc thickeners would reduce the existing footprint and reduce energy consumption.

2. Determine digester capacity needs based on current sludge production, increased sludge production from CEPT, and the addition of Plant 3A solids.
3. Compare digester capacity needs to current capacity including sludge storage.
4. Evaluate alternatives for increasing digestion capacity.

Key solids issues at the JBLTP include WAS thickening, digestion capacity and solids storage. The major findings are summarized below.

3.8.1 DAF Thickening

The current DAF thickeners provide good thickening but with higher electrical consumption as compared to other technologies such as disk thickeners. Replacement of the DAF thickeners with disc thickeners would also provide space for Digester 5.

Key conclusions include:

1. With upgrades to the mechanisms, equipment, and continued coating, the existing DAF thickeners should provide useful life for many years.
2. The capital cost of upgrading the DAF thickeners is estimated to be $741,000. This compares to $1,496,000 to implement disk thickeners.
3. The main advantages of the disk thickeners would be power savings and freeing of space for construction of an additional digester. Estimated power savings are $17,000 per year as compared the DAFs. The present value of 20 years of power savings ($199,000) is still less than the cost to upgrade the DAF thickeners.
4. As the capital cost is higher for the disk thickeners, the resulting cost effective analysis, even considering power savings, shows that the DAFs should continue to be operated and maintained unless construction of a new digester is an over-riding consideration.

3.8.2 Digestion

As discussed in Carollo's Digester Capacity Evaluation Report, there is marginal capacity to meet the digestion goals with the largest digester out of service for cleaning. Considering that each digester should be cleaned every four years, each of the two largest digesters would be out of service for a period of up to 60 days every two years.

Key conclusions include:

1. The existing digester capacity is marginally acceptable at current flows with only the smallest unit out of service. The limiting factor is hydraulic detention time with the largest unit out of service. This occurs for at least 60 days every two years for cleaning. The outage would be greater for major upgrades. The digestion goals are not met with a large unit out of service.

2. If wastewater flows increase in the future, Digester 5 may be required even without CEPT or CEPT plus Plant 3A solids.

3. There is insufficient digester capacity for either implementation of CEPT or CEPT plus Plant 3A solids without the fifth digester.

4. With implementation of disk thickeners and demolition of the DAFs, there is sufficient space to construct a fifth digester.

5. With construction of a fifth digester, current operating goals can be met with a larger digester out of service.

6. Class B biosolids can be achieved with construction of a fifth digester for current conditions, even with the largest unit out of service.

7. Construction of a fifth digester is estimated at $2,947,000. The annual cost of capital is $257,000.

3.8.3 Solids Storage

Currently, solids storage is provided as liquid storage in the existing digesters. The digester levels fluctuate as the centrifuges are operated and shut down. Elevated cake storage would increase effective digester capacity. However, site constraints restrict implementation. Continued liquid storage is recommended.

Key conclusions include:

1. There is insufficient space to implement elevated cake storage adjacent to the Solids Handling Building.

2. There is insufficient space within the building to implement cake storage.

3. Elevated cake storage could be constructed if the DAF tanks are replaced with disc thickeners. However, conveyance from the centrifuges to this location would be problematic and would increase operating costs. Additionally, truck access in the area would be difficult.

4. Continued liquid storage is recommended.

5. Construction of a fifth digester provides the needed liquid storage volume.

6. Converting Digester 4 as the sole over-flow digester may provide some operational benefits. Pump mixing would need to be implemented. The estimated capital cost is $632,000.

The total costs for improvements to the solids processes are provided in Table 7. The location of the recommended facilities is shown as part of TM 11.

Table 7	Solids Process Improvements Cost Estimates J.B. Latham Treatment Plant Facility Plan South Orange County Wastewater Authority
Cost Element	**Cost**
Disc Thickener Installation	$ 1,496,000
Digester 5 Installation	$ 2,947,000
Digester 4 Pump Mixing System	$ 632,000
Combined Solids Improvements Cost	$ 5,075,000

3.9 TM 9 – Energy Management

The JBLTP operates a mechanical cogeneration system. It consists of a 636 horsepower (Hp) lean-burn, internal combustion engine driving an 11,000 standard cubic feet per minute (scfm) multistage centrifugal blower. Heat is recovered from the engine and is used to heat the anaerobic digesters. While the system is nearing 20 years of operation, it is in good condition. Spare parts are available. It could continue operation into the near future.

As discussed in TM 5, the engine may be required to comply with the stringent requirements of the South Coast Air Quality Management District's (SCAQMD) Rule 1110.2 This could require implementation of BACT for the existing engine. This could consist of gas treatment and selective catalytic reduction (SCR). Alternative technologies including microturbines and fuel cells could also be considered.

This TM evaluates the cost effectiveness of each of the above options for the three treatment scenarios discussed under TM 7. The evaluations include cost, Greenhouse Gas Emissions, implementation, and other factors.

The evaluation concluded that fuel cells are more cost efficient than microturbines. The Greenhouse Gas Emissions are also lower. The TM went further in comparing the existing condition (Alternative 1) to addition of BACT (Alternative 2), and fuel cells (Alternative 3B). The life cycle cost comparison is presented in Table 8.

Table 8 Cogeneration Life Cycle Cost Comparison
J.B. Latham Treatment Plant Facility Plan
South Orange County Wastewater Authority

	Current	CEPT (1)	CEPT + 3A
Alternative No. 1 – Existing			
20-Year Cost of Energy (2)	$8,276,000	$7,919,000	$7,987,000
Base Cost (3)	$11,832,000	$11,475,000	$11,543,000

Table 8 Cogeneration Life Cycle Cost Comparison
J.B. Latham Treatment Plant Facility Plan
South Orange County Wastewater Authority

	Current	CEPT [1]	CEPT + 3A
Net Savings	$3,556,000	$3,556,000	$3,556,000
Simple Pay-Back Period (Years)	N/A	N/A	N/A
Alternative No. 2 - BACT			
20-Year Cost of Energy [2]	$11,246,000	$10,549,000	$10,618,000
Base Cost [3]	$11,832,000	$11,475,000	$11,543,000
Net Savings	$586,000	$925,000	$925,000
Simple Pay-Back Period (Years)	15.9	14.2	14.2
Alternative No. 3 - Fuel Cells			
20-Year Cost of Energy [2]	$12,598,000	$10,113,000	$9,826,000
Base Cost [3]	$11,832,000	$11,475,000	$11,543,000
Net Savings	($766,000)	$1,362,000	$1,717,000
Simple Pay-Back Period (Years)	23.3	16.5	15.8

Notes:
(1) CEPT – Chemically Enhanced Primary Treatment.
(2) Includes Net Capital Cost plus 20-years of O&M at 6% Interest.
(3) Base Cost – No Cogeneration.

The increased limits of Rule 1110.2 were to be effective July 2011. Due to uncertainties in defining BACT, this date has been delayed.

Based on the uncertainties surrounding SCAQMD Rule 1110.2, a definite recommendation cannot be made at this time. However, based principally on costs:

1. If the more stringent emission requirements are not adopted, continue operation of the existing cogeneration system (Alternative No. 1).
2. If the more stringent limits are implemented, consider adding fuel treatment and SCR as BACT (Alternative No. 2).
3. The analysis also needs to consider the costs and benefits of CEPT and CEPT plus Plant 3A. It appears that CEPT could have cost benefits. This benefit needs to consider the additional benefit of reduced aeration energy and the costs for chemical addition and construction of a fifth digester. This comparison is discussed in Section 4.0 of this report.

3.10 TM 10 – Odor Control

TM 10 summarized the current odor control programs and provides an overview of potential odor control expansions, upgrades and programs. At this time, there is no regulatory impetus to provide additional odor control. The current odor control strategy has been very effective, and the scrubbers are operating efficiently.

While not required at this time, the next level of odor control may extend to the aeration basins. The TM developed the size, recommended location, and estimated cost for this unit. The recommended location is especially important for future space planning.

The TM estimated a ventilation rate of 16,000 cubic feet per minute for a new scrubber. The estimated project cost is $4,720,000 and includes covers on the aeration basins. There is no regulatory requirement to implement this scrubber at this time. Further, the aeration basins are not a source of odor complaints.

3.11 TM 11 – Alternative Site Plans

The TMs presented alternative projects that could improve treatment efficiencies, meet potential changes in treatment limits, or allow the production of recycled water. Many of these projects would require construction of new facilities. Considering the very limited available space, space planning must be integrated with all design decisions.

The purpose of TM 11 was to present site plans incorporating the potential facilities presented within TMs 6 Modified Liquid Treatment Trains, 7 Key Liquid Stream Issues, 8 Key Solids Handling Issues, 9 Energy Management, and 10 Odor Control. These site plans will show the proposed liquid and solids upgrade combinations for all the alternatives presented in the referenced TMs. In addition to the existing site plan, a total of seven plans have been developed as summarized in Table 9. These site plans should be referred periodically as new facility needs arise to assure that they fit into the future needs.

Table 9 Site Plan Summary
J.B. Latham Treatment Plant Facility Plan
South Orange County Wastewater Authority

Name	Description
Existing Site Plan	Existing plant – corresponds with Figure 6.1.
5 Year Site Plan	Shows the projects expected to be completed or required in the next 5 years.
Site Plan 1	Site plan to remove contaminants of emerging concern – corresponds with Figure 6.2.
Site Plan 2	Production of Title 22 recycled water – corresponds with Figure 6.3.
Site Plan 3	Production of Title 22 recycled water with biological nitrification

Table 9	Site Plan Summary J.B. Latham Treatment Plant Facility Plan South Orange County Wastewater Authority
Name	**Description**
	and de-nitrification – corresponds with Figure 6.4.
Site Plan 4	Processing of waste water using MBR and recycled water production – corresponds with Figure 6.5.
Site Plan 5	Consolidated operations of Plant 1 and 2 – corresponds with Figure 6.6 through 6.9.
Site Plan 6	Activated sludge and solids contact process – corresponds with Figure 6.10.

3.12 TM 12 – Project Phasing

This Facility Plan identified many potential projects and upgrades. With respect to phasing of the potential projects, they have been grouped into three time periods. These include short-term project implemented within the next five years, mid-term projects implemented within 5 to 10 years, and long-term projects beyond 10 years. The next two time periods from 5 to 10 years and beyond 10 years include upgrades that would not be implemented unless there were changes in treatment standards or in demand for recycled water. The short-term projects are of most interest, and these are listed below.

1. Upgrade the grit removal systems at Plants 1 and 2 (TM 7).
2. Make the necessary structural repairs to extend the life of existing structures (TM 3).
3. Construct controlled flow diversion from Plant 1 to Plant 2 (TM 6).
4. Construct Digester 5 (TM 8).
5. Modify existing digesters to accommodate liquid storage (TM 8).
6. Replace the DAF thickeners with disk thickeners (TM 8).
7. Pending final action by the South Coast Air Quality Management District on Rule 1110.2, the following projects could be implemented during the next five years:
    a. Implement the aeration system upgrades (TM 7).
    b. Investigate the reliability of adding Best Available Control Technology (BACT) to the existing internal combustion engine as compared to removing the existing engine and installing fuel cells (TM 9).

The projects for all three phases are shown in Table 10.

Table 10 Project Phasing J.B. Latham Treatment Plant Facility Plan South Orange County Wastewater Authority		
Short-Term	**Mid-Term**	**Long-Term**
1. Grit Chamber Upgrades 2. Structural Rehabilitation 3. Aeration Basin Upgrades 4. Digester 5 including Disk Thickeners and Digester 4 Mixing 5. Implement Cogeneration Upgrades 6. Plant 1 to Plant 2 Flow Diversion	1. Secondary Effluent Disinfection	1. Upgrades to address one or all of the following: a. Contaminants of Emerging Concern b. Recycled Water c. Groundwater Recharge d. Nutrient Limits

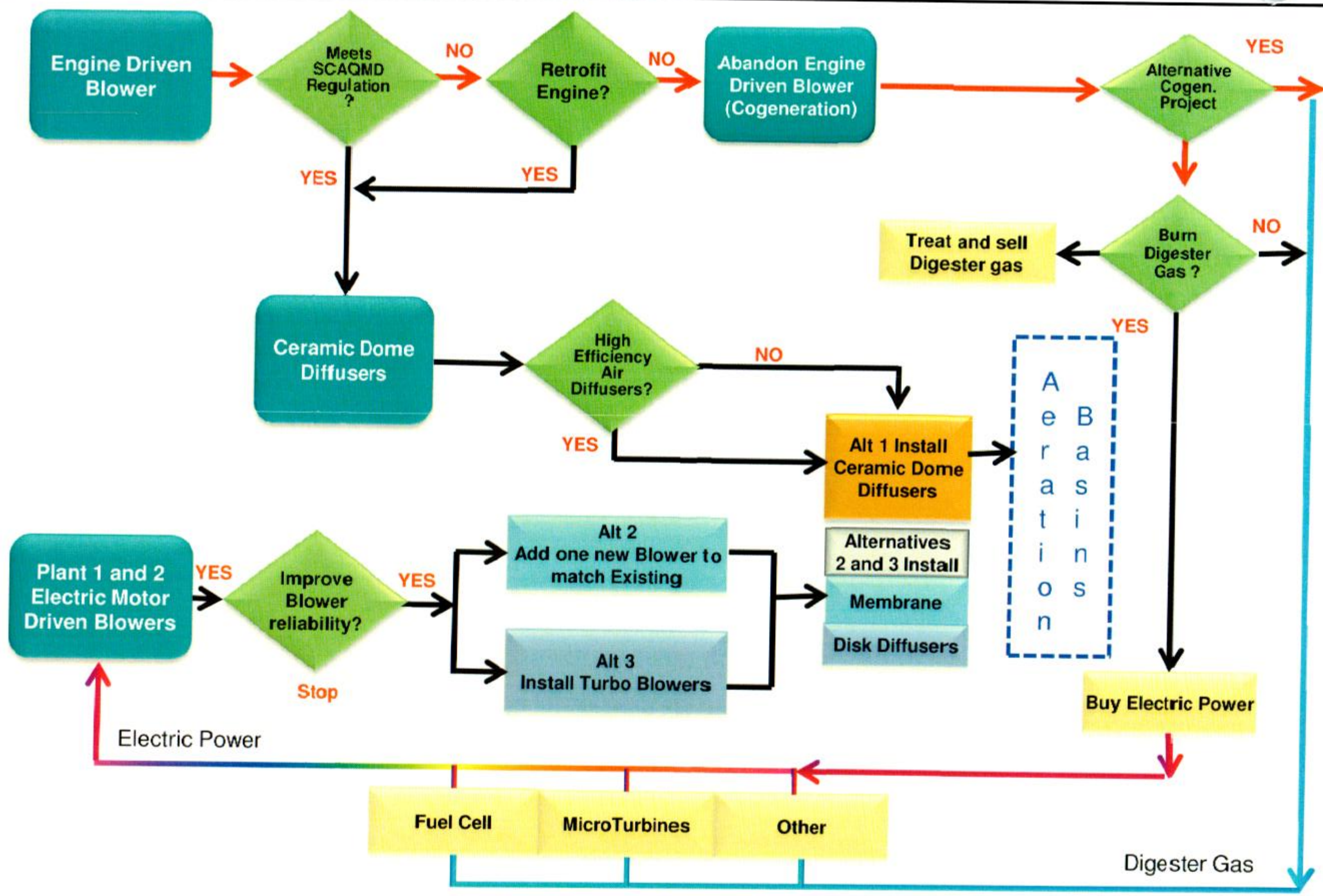
4.0 INTEGRATED ANALYSIS

The twelve TMs considered a specific scope or a specific area of the JBLTP. However, the results of TMs 7, 8, and 9 are all related. For example, a benefit of one improvement in the liquid treatment area could have cost impacts with respect to energy. The implementation of CEPT would result in greater digester gas production, a benefit to cogeneration. However, CEPT produces more sludge. The final recommendations must consider the overall life-cycle costs of the individual recommendations. This section presents that cost evaluation.

This interdependence is shown graphically on Figure 4. This represents a decision flow chart that starts with a very basic question – can the existing engine remain either as is with implementation of BACT.

If the existing engine remains, the existing engine driven blower would also remain providing the majority of the process air needed in the activated sludge process. Based on the available air, this would favor the replacement of the existing ceramic dome diffusers in-kind.

If the engine does not remain, alternative cogeneration technologies or other uses of the digester gas could be considered. With respect to aeration, the conversion from mechanical cogeneration to electrical cogeneration would allow consideration of the high efficiency, turbo blowers, and membrane diffusers discussed in TM 7.



INTEGRATED ANALYSIS FLOW CHART

NTS

carollo Engineers...Working Wonders With Water™ In association with HDR HDR Engineering, Inc.

FIGURE 4

J.B. LATHAM TREATMENT PLANT
FACILITY PLAN

SOCWA

All of these options have differing capital and annual cost considerations. Further, these costs are different for the three treatment scenarios discussed previously: 1) Current, 2) CEPT, and 3) CEPT and Plant 3A solids.

An integrated life-cycle cost comparison is provided in Table 11. This table lists the possible combination of aeration upgrades to the corresponding, applicable cogeneration alternative for the three treatment scenarios. The first two columns consist of keeping the existing mechanical cogeneration system and replacing the ceramic diffusers in-kind. Membrane diffusers, new turbo blowers, and fuel cells are shown for the final three columns. The total cost of aeration and cogeneration is given on the bottom row.

Table 11 Integrated Life-cycle Cost Comparison
J.B. Latham Treatment Plant Facility Plan
South Orange County Wastewater Authority

	Current	Current	Current	CEPT [1]	CEPT + Plant 3A
Aeration	Ceramic	Ceramic	Membrane/ Turbo	Membrane/ Turbo	Membrane/ Turbo
Capital Cost	$1,512,000	$1,512,000	$2,199,000	$2,552,500	$2,552,500
PW O&M	$5,644,000	$5,644,000	$5,504,000	$6,632,000	$6,666,000
Subtotal	$7,176,000	$7,176,000	$7,623,000	$9,184,500	$9,218,500
Cogeneration	Existing	Existing + BACT	Fuel Cells	Fuel Cells	Fuel Cells
Capital Cost	$0	$2,291,000	$5,348,000	$6,486,000	$6,486,000
PW O&M	($5,035,000)	($3,315,000)	($5,322,000)	($9,061,000)	($9,463,000)
Subtotal	($5,035,000)	($1,024,000)	$26,000	($2,575,000)	($2,977,000)
Totals	$2,141,000	$6,152,000	$7,649,000	$6,609,500	$6,241,5000

Notes:
(1) CEPT – Chemically Enhanced Primary Treatment

From this table, the following can be concluded:

1. If Rule 1110.2 limits remain unchanged, the most cost effective alternative would be to replace the existing diffusers and continue use of the existing mechanical cogeneration system.
2. If the Rule 1110.2 limits do become more stringent, consider installing BACT on the existing system. Additional investigation into the reliability of SCR is recommended.
3. Under the Current treatment scenario, the most costly alternative would be to install membrane diffusers, new turbo blowers, and fuel cells.

4. If Plant 3A solids are treated at the JBLTP, CEPT will probably be required to handle the additional WAS in the primary clarifiers. In this case, further consideration of new membrane diffusers, new turbo blowers, and fuel cells is warranted.
5. As discussed under TM 9, the existing digester gas meters should be checked for accuracy. This could affect the relative economics of fuel cells.

SOUTH ORANGE COUNTY WASTEWATER AUTHORITY

J. B. LATHAM TREATMENT PLANT FACILITY PLAN

TECHNICAL MEMORANDUM NO. 7

KEY LIQUID TREATMENT ISSUES

FINAL

September 2011

HDR carollo
Engineers...Working Wonders With Water™

5075 SHOREHAM PLACE • SUITE 120 • SAN DIEGO, CALIFORNIA 92122 • (858) 505-1020 • FAX (858) 505-1015
pw://Carollo/Documents/

SOUTH ORANGE COUNTY WASTEWATER AUTHORITY

J. B. LATHAM TREATMENT PLANT FACILITY PLAN

KEY LIQUID TREATMENT ISSUES

FINAL

TECHNICAL MEMORANDUM
NO. 7

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

SOUTH ORANGE COUNTY WASTEWATER AUTHORITY

J.B. LATHAM TREATMENT PLANT FACILITY PLAN

TECHNICAL MEMORANDUM NO. 9

ENERGY MANAGEMENT

FINAL
2011

Engineers...Working Wonders With Water™

5075 SHOREHAM PLACE • SUITE 120 • SAN DIEGO, CALIFORNIA 92122 • (858) 505-1020 • FAX (858) 505-1015
pw://Carollo/Documents/

SOUTH ORANGE COUNTY WASTEWATER AUTHORITY

J.B. LATHAM TREATMENT PLANT FACILITY PLAN

ENERGY MANAGEMENT

TECHNICAL MEMORANDUM NO. 9

TABLE OF CONTENTS

Page No.

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

Appendix 3-B

SOCWA
South Orange County Wastewater Authority

Evaluation of Alternative Uses for Digester Gas

May 2012

carollo
Engineers...Working Wonders With Water®

South Orange County Wastewater Authority

TECHNICAL MEMORANDUM

EVALUATION OF ALTERNATIVES FOR USE OF DIGESTER GAS

DRAFT
May 2012

2700 YGNACIO VALLEY ROAD, SUITE 300 • WALNUT CREEK, CALIFORNIA 94598 • (925) 932-1710 • FAX (925) 930-0208
pw://Carollo/Documents/Client/CA/SOCWA/8870A00/Deliverables/Gas Utilization TM (B)

SOUTH ORANGE COUNTY WASTEWATER AUTHORITY

TECHNICAL MEMORANDUM

EVALUATION OF ALTERNATIVES FOR USE OF DIGESTER GAS

TABLE OF CONTENTS

Page No.

LIST OF TABLES

LIST OF FIGURES

1.0 INTRODUCTION

Digester gas is used in cogeneration facilities at the South Orange County Wastewater Authority (SOCWA) Regional Treatment Plant (RTP) and J.B. Latham Treatment Plant (JBLTP). The JBLTP utilizes digester gas to operate an aeration blower. The RTP uses digester gas to operate electrical generators to produce power for the plant's electricity demands. Heat is recovered at both cogeneration facilities to heat the anaerobic digesters. The RTP engines also provide heat to a local community swimming pool.

The impending changes to Rule 1110.2, proposed by the South Coast Air Quality Management District (SCAQMD), will require implementing a new Best Available Control Technology (BACT) to improve the cogeneration facilities emissions quality. SOCWA has completed several studies that have considered selective catalytic reduction systems (SCR) installed on the existing systems, as well as alternative cogeneration technologies such as fuel cells.

1.1 Air Quality Restrictions

The engines at both treatment plants will be required to comply with the stringent requirements of the South Coast Air Quality Management District's (SCAQMD) Rule 1110.2 Internal Combustion Engines. The present implementation date is July 1, 2012. However, there is discussion within SCAQMD regarding this date. The date may be extended to allow further time for technology demonstrations to be conducted and to allow biogas engine users to comply. Current limits as well as the 2012 limits are reported in Table 1.

**Table 1 Concentration Limits, Existing Biogas Engines, Rule 1110.2 Table II
Evaluation of Alternatives for Use of Digester Gas
South Orange County Wastewater Authority**

Current Concentration Limits Effective 2010		
NO_x (ppmvd)	VOC (ppmvd)	CO (ppmvd)
bhp < 500: 45 * ECF	250	2,000
Concentration Limits Effective July 1, 2012		
NO_x (ppmvd)	VOC (ppmvd)	CO (ppmvd)
11	30	250

Notes:
NO_x: oxides of nitrogen.
VOC: volatile organic compounds.
CO: carbon monoxide.
ppmvd: parts per million volumetric dry.
bhp: brake horsepower.
ECF: Emission Correction Factor for biogas operations.

1.2 Scope

The purpose of this technical memorandum (TM) is to re-evaluate alternatives capable of meeting the proposed SCAQMD emissions requirements and to confirm the viability of SCR. Specific scope tasks include:

1. Updated review of solids and digester gas data.
2. Updated review of digester heating requirements.
3. Evaluation of SCR technology. This includes an update on the effectiveness of the technology at other installations. Capital and life cycle costs will be updated from previous reports.
4. Evaluation of Potential Utility Agreement. The local utility, Southern California Gas Company, will be contacted to determine interest in purchasing and using the digester gas to produce renewable natural gas for use in the utility distribution system.
5. Evaluation of Privatization of Digester Gas Handling. Private energy companies will be contacted to determine interest in developing privatized energy projects. These projects would use digester gas to generate power onsite. The facility would be owned and operated by a private company. Excess heat would be used for digester heating demands and SOCWA would potentially benefit from a lower electricity rate.
6. Discharge of Plant 3A Solids to Oso-Trabuco Sewer. This task will evaluate the sewer capacity to accept the solids flow from Plant 3A to the JBLTP. JBLTP's ability to handle the added loading has been evaluated previously. Consolidated treatment at the JBLTP may provide benefits associated with solids handling and treatment at Plant 3A.

2.0 SUMMARY OF FINDINGS AND RECOMMENDATIONS

The following summarizes the findings and recommendations for the RTP and JBLTP facilities.

2.1 Regional Treatment Plant

The following alternatives were analyzed for implementation at the RTP:

- Alternative 1: Remove the existing cogeneration engines and replace with two 4.0 million British Thermal Units per hour (BTU/hr) boilers.
- Alternative 2: Enter into a Power Purchase Agreement (PPA) with a private company.
- Alternative 3: Add SCR and fuel conditioning to the existing engines with a common Continuous Emissions Monitoring System (CEMS).
- Alternative 4: Add a new 800-kW engine generator with SCR to replace the existing engines.
- Alternative 5: Add three new 250-kW microturbines and a 5.0 million BTU/hr boiler to replace the existing engines.
- Alternative 6: Add three new 300-kW fuel cells and a 5.0 million BTU/hr boiler to replace the existing engines.

Alternative 4 is recommended for implementation at the RTP. The project provides the most cost effective means of utilizing digester gas at the RTP. While the existing cogeneration facility is in good operating condition, replacement provides SOCWA the opportunity to utilize available grant funds to offset the project costs, to increase the efficiency of power generation and to decrease the overall engine Operation and Maintenance (O&M) costs associated with the existing engine generators

The estimated project cost of the recommended alternative is $4,487,000. This alternative is eligible for up to $2 million in grant funding through the California Energy Commission's (CEC's) Self Generation Incentive Program (SGIP). This grant program will provide 50 percent of the funding upon successful system startup and the remaining 50 percent being paid out over the first 5 years of operation based on actual energy production. The recommended alternative has a 20-year present worth of net benefit when compared to the no cogeneration option of $5,691,000. The estimated payback period is 6 years.

2.2 J.B. Latham Treatment Plant

Multiple alternatives were also considered for digester gas use at the JBLTP. The JBLTP analysis was complicated by the fact that the cogeneration facility is also tied to the aeration system. The existing cogeneration facility utilizes an engine driven blower to provide the primary source of aeration air for the facility. Any alternative use of the gas must also consider how to meet aeration air demand by providing an electrical blower or maintaining the existing engine-blower arrangement.

Additionally, SOCWA is considering sending solids from Plant 3A through the sewer system to the JBLTP for treatment. This centralizes solids handling between the two facilities has been identified as offering operations and maintenance cost savings for SOCWA. The following digester gas use alternatives were evaluated for the JBLTP, with each alternative further analyzed for the current operating condition and for the addition of Plant 3A solids:

- Alternative 1: Remove the existing cogeneration engine and blower and use the existing boilers for digester heat demands.
- Alternative 2: Enter into a Power Purchase Agreement (PPA) with a private company.
- Alternative 3: Add SCR and fuel conditioning to the existing engine blower system and add a CEMS.
- Alternative 4: Add a new 633 kW engine generator with SCR to replace the existing engine blower.
- Alternative 5: Add three new 250 kW microturbines and remove the existing engine blower.
- Alternative 6: Add two new 300 kW fuel cells and a new 5.0 million BTU/hr boiler and remove the existing engine blower.

Each alternative was evaluated with respect to the required aeration upgrades consisting of the addition of a replacement aeration diffuser system along with installation of process dissolved oxygen controls. For all alternatives requiring the replacement of the existing engine driven blower system, the existing electric blowers are to be replaced with new high efficiency turbo blower systems. For Alternative 3, adding SCR to the existing engine blower system, replacement of the existing electric blowers is not warranted as the existing engine blower system would remain the primary source of aeration air; thus little benefit would be realized in replacing the existing electric blowers which would remain only utilized during peak aeration demand periods

The cost for the aeration system modifications as noted above has been included in the analysis, along with consideration for the electrical power demands associated with using electrical blowers and with savings associated with the diffuser and dissolved oxygen control systems also being installed. The cost of implementing chemically enhanced solids treatment (CEPT) and adding 3A solids have also been included in the analysis of each of the alternatives in order to assess the impact on the analyses of operation of the JBLTP with the additional solids. Capital and annual costs were referenced from the J.B. Latham Treatment Plant Facility Plan (Facility Plan).

Alternative 4, adding a new 633-kW engine generator with SCR, is recommended for implementation at the JBLTP along with the implementation of the Facility Plan recommended aeration system upgrades. Installing an engine generator cogeneration facility at the JBLTP provides SOCWA with the opportunity to utilize available grant funds to offset the project costs, to decouple aeration system operation with the utilization of digester gas and the need for heat generation to meet process heating needs and allows the aeration system to be operated in the most efficient manner, minimizing overall operational costs of associated with JBLTP. This alternative remains the same whether or not SOCWA proceeds with redirecting solids from Plant 3A to JBLTP for treatment. This alternative is recommended for implementation regardless if CEPT and Plant 3A solids are implemented or not. Regarding the CEPT and Plant 3A solids issue, it is recommended that SOCWA proceed with lab testing to confirm the Facility Plan assumptions regarding implementation of CEPT at JBLTP. It is further recommend that a detailed review of the overall costs and savings associated with decommissioning solids processing at Plant 3A as the savings appear, based on a very abbreviated review, to add significant additional benefit to the 20-year present worth of benefit for plant. This information would provide SOCWA with important information to support the decision whether or not to proceed with CEPT and Plant 3A solids transfer.

Table 2 provides the estimated project costs both under current operating conditions and for operation with Plant 3A solids and CEPT system operation as JBLTP.

Table 2	JBLTP Project Costs for Recommended Alternative 4 Evaluation of Alternatives for Use of Digester Gas South Orange County Wastewater Authority	
Operating Condition	**Current**	**CEPT + 3A**
Estimated Project Costs	$6,714,000	$7,068,500
20-Year Total Present Worth of Net Benefit Compared to No Cogeneration	**$3,138,000**	**$4,435,000**
Cogeneration System Payback Period (years)	8	7

This alternative is eligible for up to $1.4 million in grant funding through the CEC's Self Generation Incentive Program (SGIP). This grant program will provide 50 percent of the funding upon successful system startup and the remaining 50 percent being paid out over the first 5 years of operation based on actual energy production.

A summary of recommendations at the JBLTP are provided as follows:

- Preliminary design study to implement Alternative 4, install the new engine-generator set, and install new high-efficiency blowers. The study should include, but not be limited to, the following:
  - Identify any needed electrical upgrades to ensure the new engine-generator can provide power to Plants 1 and 2.
  - Evaluate aeration diffusers and blowers in relation to aeration demands, allowable air fluctuations through the diffusers, and the best available blower technology for meeting the demands.
  - Evaluate the most efficient means of aeration control. This may be by a cascading control of modulating valves or through an algorithm based on the most-open valve.
  - The aeration evaluation should consider reduced aeration demands if CEPT is implemented.
- Continue to evaluate adding Plant 3A solids to the JBLTP:
  - Jar testing at the JBLTP primary clarifiers.
  - Evaluate the potential cost savings if the Plant 3A solids handling facilities are shut down.

3.0 BACKGROUND

3.1 RTP Cogeneration System

The existing cogeneration system at the RTP consists of three 400-kilowatt (kW) lean burn engine-generators. The engines are Waukesha model F3521GLD-LFPS, 574 horsepower (hp) each. Each engine is coupled to a 400-kW generator, Waukesha model 1134, providing a maximum total output of 800-kW with two units operating and the third being an installed standby to allow for maintenance and unexpected failures. This system provides most of the RTP's electrical demand.

The current SCAQMD permit allows only two engines to operate at any given time. The units are fueled by a combination of digester and natural gas. They have natural gas piped to pre-combustion chambers that provides between 5 and 10 percent of the total fuel input. They are currently permitted to use up to 25 percent natural gas blended with digester gas.

The cogeneration system is an essential facility for electrical energy production and for heat for the anaerobic digesters and a local community swimming pool. The system allows the plant to have most of its power generated on site instead of purchasing it from Southern California Edison (SCE), and the cogeneration system can normally be operated during power outages to provide additional standby power for the plant.

3.2 JBLTP Cogeneration System

The cogeneration system at the JBLTP consists of a single 636 hp, lean-burn, internal combustion engine, Waukesha model No. 2895 GL. The engine operates an 11,000 standard cubic feet per minute (scfm), multi-stage centrifugal blower. Heat is recovered from the engine and is used to heat the anaerobic digesters. An existing boiler provides heat when the engine is not in operation.

Based on current emission standards, the engine must be operated at a reduced speed that reduces the blower output. Performance testing has determined that the engine output is currently 437 HP at the lower speed. This limits the digester gas input to below what is generated by the plant. Excess digester gas is routinely flared. The reduced speed operation also effects aeration requirements. During weekends and holiday periods, air must be supplemented with the existing electrical blowers to maintain dissolved oxygen concentrations. In order to maintain engine stability and emissions within required limits, the engine blower is operated at a near constant load at a constant speed. During most periods, the resulting air flow generation results in over aeration for the plant.

3.3 Past Evaluations

Previous reports, prepared by Carollo Engineers, Inc. (Carollo) and by others, have evaluated cogeneration alternatives at the JBLTP and the RTP. These reports include:

3.3.1 <u>Gas Conditioning Siloxane Removal System, August 2007, Carollo</u>

This TM evaluated alternatives for digester gas conditioning systems. Gas conditioning systems are required upstream of the cogeneration facilities to reduce hydrogen sulfide and siloxane components. Reduction of these contaminants is necessary to protect the SCR equipment and other cogeneration systems. Gas conditioning has a further benefit of reducing maintenance needs for existing cogeneration engines by improving gas quality.

The report recommended installation of a combined refrigeration and adsorption system as the most effective proven and trouble-free removal system. The system would be installed at both treatment plants. This report will carry forward with this recommendation, as further evaluation was not part of this project's scope.

3.3.2 Regional Treatment Plant AQMD Rule 1110.2 Compliance, August 2008, Carollo

This TM evaluated various alternatives to modify or replace the existing cogeneration system at the RTP in order to meet the SCAQMD emissions requirements. Alternatives evaluated included:

1. Add SCR to each existing engine and install a common Continuous Emission Monitoring System (CEMS).
2. Add a NO_xTECH System to each engine and install CEMS.
3. Phased addition of two boilers to provide heat to the digesters, install NO_xTECH System and CEMS. At the time of the report, the boilers were considered based on the approval process for the NO_xTECH system and the timing for shutting down the existing cogeneration engines.
4. Install two boilers to replace the existing cogeneration facility.
5. Add a fuel cell system and boiler to replace the existing system.

Alternative 3 was shown to be the apparent best alternative. The final recommendation of the report consisted of a phased approach. At the time of the evaluation, the effectiveness and costs for both NO_XTECH and SCR systems were unknown.

The report recommended installation of a new boiler to plan for required shutdown of the existing system. Further evaluation on the effectiveness and cost for the NO_XTECH and SCR systems was then recommended once other agencies had completed testing of the alternative systems.

3.3.3 RTP Switchgear and Cogeneration Upgrades, 2006, Carollo

The report recommended upgrades to the switchgear and engine-generator synchronizing controls to replace obsolete equipment at the RTP. Carollo was retained to complete the design of the switchgear upgrades for the existing cogeneration system. The design was completed in December 2007, but was subsequently placed on hold by SOCWA pending a decision regarding implementing a cogeneration alternative.

The project does not have a direct impact on this evaluation, but is mentioned here to maintain continuity and identify projects related to the cogeneration system. The project should be implemented if the existing engines are upgraded or replaced to meet the new emissions standards.

3.3.4 Aeration and Cogeneration Upgrade for the J.B. Latham Treatment Plant, July 2009, Black and Veatch

The report evaluated alternatives for replacing the existing engine-driven blower and alternative uses for the digester gas and cogeneration systems. Implementation of fuel cells was the best option to meet the future regulatory requirements. The fuel cell system included gas conditioning, two 300-kilowatt (kW) fuel cells, and heat recovery equipment.

3.3.5 <u>J.B. Latham Treatment Plant Facility Plan, August 2011, Carollo and HDR</u>

The Facility Plan was prepared to provide a comprehensive planning guide to assist SOCWA in identifying potential upgrades and capital investments required at the JBLTP over a 20-year implementation schedule. The plan considered capacity and condition of the existing facilities, potential regulatory requirements, and opportunities to improve efficiencies. Several TM's were prepared to discuss specific areas of the JBLTP. The report also provided an integrated analysis to evaluate the interrelated aeration and cogeneration facilities.

Under Technical Memorandum No. 7, Key Liquid Stream Issues, HDR evaluated alternatives for replacing the aeration diffusers and installing high-efficiency electrical blowers. The alternative evaluation considered the cost of power for new blowers and potential power savings from a cogeneration system providing electricity to the JBLTP or the existing blower.

The final recommendation was dependent on the outcome of Rule 1110.2 emissions requirements. With no new emissions requirements, the existing system was recommended to stay in place. With implementation of Rule 1110.2, it was recommended to install the high efficiency blowers with new aeration diffusers and evaluate alternative beneficial uses of the digester gas.

Under Technical Memorandum No. 9, Energy Management, Carollo updated and expanded the 2009 report prepared by Black and Veatch. The TM evaluated cogeneration alternatives including maintaining the existing system, upgrading the existing system with fuel treatment and SCR, or implementation of fuel cells or microturbines. These alternatives were then evaluated under different treatment scenarios for the existing condition, implementing ~~CEPT, and implementing CEPT with addition~~ of solids from Plant 3A.

The final recommendation provided a ranking of preferred alternatives to be determined based on the final emission limits set by the SCAQMD. Continued use of the existing system was recommended in the event that emissions standards do not change. Installation of SCR and gas conditioning were recommended if the new emission standards are adopted. Installation of fuel cells was the third preference, with implementation contingent on future evaluation of the reliability and operational issues associated with SCR.

The Executive Summary provided an integrated life cycle cost analysis to evaluate combined costs associated with the aeration and cogeneration facilities upgrades. With implementation of the new Rule 1110.2 requirements, installation of BACT on the existing system provided the lowest life cycle cost. If Plant 3A solids were brought to the JBLTP, installation of new blowers, diffusers, and fuel cells provided the lowest life cycle cost. Implementing CEPT was also recommended as part of bringing the solids over from Plant 3A. The recommendation is based on ensuring proper settling of the Plant 3A WAS in the primary clarifiers to avoid upsetting downstream processes.

4.0 EXISTING CONDITIONS

As part of the Facility Plan, Carollo prepared a heat demand/heat supply model to predict digester heating requirements. The model takes into account sludge type and flow, seasonal temperatures, digester operating scenarios, and the digester design criteria and materials of construction. The model can further evaluate the use of boilers, if needed, to supplement digester heating needs.

For this study, the JBLTP heating model was updated with current operating data. A new model was also created for the RTP. The following section will review historical electrical demands, solids data, digester gas production, and the digester heat demands. The information is later utilized in evaluating cogeneration alternatives for each plant.

4.1 Regional Treatment Plant

4.1.1 Existing Energy Use

Table 3 summarizes the RTP electrical energy use. The cogeneration system can produce the majority of the RTP demands, but some power must still be purchased to meet peak demands.

Table 3 RTP Existing Electricity Consumption and Production
Evaluation of Alternatives for Use of Digester Gas
South Orange County Wastewater Authority

	Peak Power Demand(1)	Average Power Consumption(1)	Average Cogeneration Power Production(1)
RTP Demand, kWh/day	26,200	5,700	17,700

Note:
(1) Information derived from SOCWA RTP 2006-2011 Utility Data.

The total cost of utility power at the RTP averages $0.107 per kilowatt-hour.

4.1.2 Solids and Digester Gas Production

The RTP receives additional sludge from SOCWA's Coastal Treatment Plant (CTP) and from the El Toro Water District (El Toro). Sludge from El Toro is trucked to the RTP at a fairly high concentration, around 5 percent. The sludge is discharged to the sludge holding tanks for blending prior to digestion.

CTP sludge is pumped at a solids concentration ranging from 1 to 2 percent. Sludge was historically pumped to the sludge holding tanks. In June 2009, piping modifications were made so the CTP solids are first sent the RTP dissolved air flotation (DAF) thickeners before digestion to reduce hydraulic loading to the digesters.

Table 4 provides a summary of the solids flow to the digesters and digester gas production from July 2009 through 2011.

Table 4	RTP Sludge and Digester Gas Production Evaluation of Alternatives for Use of Digester Gas South Orange County Wastewater Authority		
Criteria	**Value**	**Average**	**Maximum Month**
Primary Sludge	gpd	32,900	45,400
Thickened Sludge	gpd	54,000	66,800
Total Sludge	gpd	87,000	112,100
Digester Gas Production	scfm	216	238

Notes:
(1) gpd: gallons per day.
(2) scfm: standard cubic feet per minute.

4.1.3 Heat Requirements

The heat demand/heat supply model was prepared using sludge and digester gas data, available record drawing information, and data presented in the RTP AQMD Rule 1110.2 Compliance study. Drawings indicate that the digester domes are constructed of steel domes with a layer of concrete above the steel, providing a layer of insulation. The thickness of the concrete layer is assumed to be 3 inches, but could not be verified.

Pool heat demands were previously determined from daily hot water supply and return temperature readings in November 2005 and then adjusted based on the historical average monthly temperature in Laguna Beach, California.

The plant peak heat demand and supply are shown in Table 5. Digester heat demands consider all four digesters in operation. Peak demand considers winter conditions with maximum month solids loading. Average demand considers average solids loading during summer months.

Table 5	RTP Heat Demands and Supply Evaluation of Alternatives for Use of Digester Gas South Orange County Wastewater Authority	
	Average(1)	**Peak(2)**
Digester Heat Demand, BTU/hr	1,707,000	1,908,000
Pool Heat Demand, BTU/hr(2),(3)	1,370,000	1,780,000
Total Heat Demand, BTU/hr	3,077,000	3,700,000
Total Available Heat Supply, BTU/hr(3)	3,800,000	3,800,000

Note:
(1) Maximum month loading under winter temperatures, all digesters in operations.
(2) Peak pool heat demand is assumed as average demand determined from November 2005 data plus 30 percent.
(3) Referenced from RTP AQMD Rule 1110.2 Compliance, August 2008, Carollo.

The model suggests that the cogeneration system is capable of meeting the heating demands for the RTP and the swimming pool. Boilers are not installed at the RTP for supplemental heating. If the cogeneration system is not meeting the heat demands, hot water temperatures in the digesters and pool drop. Overall, it appears the system is capable of meeting heat demands but that it is at capacity under peak demand scenarios.

4.2 J.B. Latham Treatment Plant

4.2.1 Existing Energy Use

Energy demand at the JBLTP was recently reported in the Facility Plan, TM 9. Demands for the three main 480-volt (v) services were reported. There are a total of six services, with the remaining three being lower voltage services to various plant buildings. The three 480-volt services provide power to Plant 1, Plant 2, and the Effluent Pump Station. The electrical demands for these services have been updated and are listed in Table 6.

Table 6 Historical Electrical Demands – Average Day
Evaluation of Alternatives for Use of Digester Gas
South Orange County Wastewater Authority

Service	Average	Peak
Plant 1, kWh/day	8,000	15,300
Plant 2, kWh/day	4,900	6,100
Effluent Pump Station, kWh/day	294	828
Total, kWh/day	13,100	22,300

Notes:
(1) Information derived from SOCWA JBLTP 2006-2011 Utility Data.

Electrical use has resulted in a total average electricity cost of $0.128 per kilowatt-hour. The Facility Plan considered that the existing cogeneration engine blower system may be replaced with an electrical generation cogeneration system. High efficiency electrical blowers would be installed to replace the existing electric blowers and additional power requirements associated with the electric blower use versus the existing engine blower use were calculated. These demands are added to the existing demand. The power demands are provided in Table 7 for the "Current" condition and for the addition of CEPT and 3A solids at JBLTP.

Table 7 Projected Power Demands(1)
J.B. Latham Treatment Plant Facility Plan
South Orange County Wastewater Authority

	Current	CEPT(2) + 3A
Projected Electric Blower Aeration Electrical Power Demand (kWh/day)	3,700	3,300

Notes:
(1) Referenced from Facility Plan, TM 8 and TM 9, August 2011, Carollo.
(2) CEPT – Chemically Enhanced Primary Treatment.

4.2.2 Solids and Digester Gas Production

Solids handling at the JBLTP consists two dissolved air flotation (DAF) thickeners for waste activated sludge (WAS) thickening, four anaerobic digesters for solids stabilization, and three centrifuges for solids dewatering. The TM 8 of the Facility Plan considered installation of disc thickeners to replace the DAF thickeners and installation of a fifth digester to improve digester performance. Digester No. 5 would be necessary if Plant 3A solids are sent to the JBLTP.

Table 8 provides an update of sludge and gas production at the JBLTP. The table also provides the sludge estimates presented in the Facility Plan for implementing CEPT and 3A solids. Gas production values for the "CEPT + 3A" condition have been updated to assume Digester 5 is constructed and operating.

Table 8 JBLTP Sludge and Digester Gas Production
Evaluation of Alternatives for Use of Digester Gas
South Orange County Wastewater Authority

		Current		CEPT + 3A	
Criteria	Value	Average	Max Month	Average	Max Month
Primary Sludge	gpd	56,900	72,100	100,000	117,900
Thickened Sludge	gpd	19,300	26,700	30,400	39,900
Total Sludge	gpd	76,300	98,800	130,400	157,700
Digester Gas Production	scfm	115	199	182	221

Notes:
(1) gpd: gallons per day.
(2) scfm: standard cubic feet per minute.

The table provides the historical and estimated gas production but does not represent gas flow to the cogeneration system.

4.2.3 Heat Requirements

The heat demand/heat supply model created as part of the Facility Plan has been updated based on the revised sludge flows. Digesters Nos. 1, 2, and 4 have un-insulated steel domes. Digester 3 has a concrete dome. The Facility Plan recommended insulating the digester domes to reduce heat loss. Table 9 provides the projected heat demands for the insulated and non-insulated case. Heat demands for the "Current" condition are based on four operating digesters. The "CEPT + 3A" condition is based on five operating digesters.

Table 9 Projected Digester Heat Demands (BTU/day)(1)
J.B. Latham Treatment Plant Facility Plan
South Orange County Wastewater Authority

	Current	CEPT + 3A
Non-insulated Summer	1,807,300	2,624,600

Table 9	Projected Digester Heat Demands (BTU/day)(1) J.B. Latham Treatment Plant Facility Plan South Orange County Wastewater Authority	
	Current	**CEPT + 3A**
Insulated Summer	1,084,500	1,610,400
Non-insulated Winter	1,969,000	2,824,400
Insulated Winter	1,246,200	1,810,200

Notes:
(1) BTU – British Thermal Units.
(2) CEPT – Chemically Enhanced Primary Treatment.

Current heat sources include the existing cogeneration system and two boilers. Boiler No. 1 serves Digesters No. 1 and No. 2 while Boiler No. 2 serves Digesters Nos. 3 and 4. Boiler No. 1 has been converted to operate on the excess digester gas. Boiler No. 2 can only operate on natural gas. The available heat is reported in Table 10. The cogeneration heat is based on current digester gas input that was observed during the Facility Plan, a digester gas heat value of 600 BTU/hr, and 27 percent overall heat recovery.

Table 10	Existing Digester Heat Sources Evaluation of Alternatives for Use of Digester Gas South Orange County Wastewater Authority		
	Boiler No. 1(1)(2)	**Boiler No. 2(1)**	**Existing Cogeneration**
Heat Output (BTU/hr)(3)	1,540,000	1,006,000	1,420,000

Notes:
(1) Source - Aeration and Cogeneration Upgrade for the J.B. Latham Treatment Plant, July 2009.
(2) Rating is for natural gas. Output is probably reduced for digester gas due to lower methane content.
(3) BTU – British Thermal Units per Hour.

The model shows that the existing cogeneration system is not providing sufficient heat under current typical winter conditions. This agrees with staff observations and the need to operate Boiler No. 1 during winter periods.

5.0 CURRENT STATUS OF RULE 1110.2

South Coast Air Quality Management District Rule 1110 was first approved in 1990. Numerous revisions have occurred in the intervening years with the latest amendment being approved in July of 2010. The February 2008 modification significantly lowered the required limits for the internal combustion gas engines operated by SOCWA. The February 2008 amendments placed a timeline on implementation of compliance with these limits. Contingent on results of a technology evaluation, digester gas engines were to be shut down or modified to meet the new limits by July 1, 2012.

During the years between February 2008 and today, several technology assessments have been undertaken. The primary assessment has been done by Orange County Sanitation Districts (OCSD). The OCSD assessment draft report was completed and submitted for District review documenting that the technology tested which was SCR and CO oxidation catalyst systems do reduce emissions to the required limits. However, numerous exceedances were noted primarily do to short term excursions. A similar assessment has been underway on the NOxTECH technology by the Eastern Municipal Utility District on digester gas fueled engines, but this evaluation has yet to be completed. A demonstration is in the early stages of planning, funding, and implementation on the use of hydrogen injection technology by the City of San Bernardino. This evaluation is planned but not yet underway. This technology is in very early stages of development.

Due to the late completion of the SCR/CO demonstration conducted by OSCD and on the lack of results from the NOxTECH and hydrogen injection demonstrations SCAQMD staff has not been able to fully implement the rule. Discussion have been conducted by SCAQMD with effected parties concerning the lack of clear experience proving the technologies and on the costs associated with implementing the technologies. In February 2012, SCAQMD proposed several modifications to the rule that address the concerns regarding the issues experienced by the OCSD trial and allowing further time for compliance. Staff is currently holding workshops on the proposed amendments and expects to issue a final draft rule for board approval in June of 2012.

While it is not certain how the final draft rule will be structured, it is expected that the rule will to continue to require biogas engines to meet the limits listed in the February 2008 amendment but will allow a longer averaging time on the sampling. It is also likely that implementation will be required by July 1, 2015 and that a compliance plan will be required to be submitted by January 1, 2014.

Appendix A contains the current proposed February 2012 amendment, the currently implemented July 2010 rule along with proposed staff recommendations, and technology assessment documentation.

6.0 DIGESTER GAS UTILIZATION ALTERNATIVES

The following section will describe available technologies to consider as alternatives for use of digester gas at both the RTP and the JBLTP. These alternatives have been described in previous reports but are repeated here for continuity. Updates on the status of these technologies are also provided. Additionally, the alternatives that utilize the existing engines consider addition of Continuous Emissions Monitoring System (CEMS). All alternatives will require gas conditioning.

The need for digester gas conditioning and the type of treatment required is identical for all of the cogeneration technologies available for use at the SOCWA facilities. SCR, microturbines, and fuel cells all require a robust fuel treatment system including redundancy of the siloxane and hydrogen sulfide removal systems. The ability of NOxTECH units to work properly without gas treatment has not been demonstrated. As noted previously, it appears that gas treatment will likely also be required for use with NOxTECH. The recommendations in the Gas Conditioning Siloxane Removal System technical memorandum should be implemented for all proposed the alternatives. An added benefit of adding fuel treatment is that maintenance of the existing engines would significantly decrease after the recommended fuel conditioning is provided. A schematic of the fuel conditioning system is shown on Figure 1.

6.1 Selective Catalytic Reduction

Implementing SCR could allow the existing lean burn engines to remain at both plants. In addition, SCR would be required for any new engine alternative that would be considered for replacement of the existing engines. A common CEMS would be required to control the SCR emissions control devices installed on at each facility. SCR is a means of reducing nitrous oxide (NOx) emissions with the aid of a special catalyst and with a system to inject ammonia, usually in the form of urea, upstream of the catalyst. The ammonia reacts under high temperature with the catalyst to reduce NOx emissions. The urea demand is approximately 0.1 gallons per hour, so a small 300 gallon storage tank could provide more than 100 days of storage.

An oxidation catalyst upstream of SCR is also typically required for two purposes, one to lower CO concentrations to below permit required levels and two, to protect the SCR from fouling too quickly. The oxidation catalyst removes carbon monoxide (CO) and volatile organic compounds (VOCs). The complete system will effectively remove a minimum of 70 percent NOx, 80 percent CO, and 70 percent of non-methane hydrocarbons. Depending on the quantity of catalyst installed in both the SCR and CO systems, the effectiveness can be increased significantly. SCR/CO systems routinely remove 95+ percent of NOx and CO in other power generation applications.

As the need to remove more NOx increases, the need to provide feedback control on ammonia injection increases to prevent ammonia emissions from exceeding allowable limits. This is accomplished by connecting CEMS outlet data into the ammonia injection control system. Provisions for this should be provided with any SCR system installed should SOCWA decide installation of SCR on either the existing or new engines is the best alternative.

6.1.1 Technology Update

SCR currently provides the most reliable technology for BACT regarding lean burn internal combustion engines. The technology has a proven track record of performance, capital cost, and maintenance costs. As long as the gas fueling the engines is reliably free of contaminants SCR/CO catalyst systems will perform to reliably meet emission reduction requirements imposed by the pending regulations and by the possibility of future reduced emissions expected from further reductions to the Rule 1110.2 limits in the 2020 time frame.

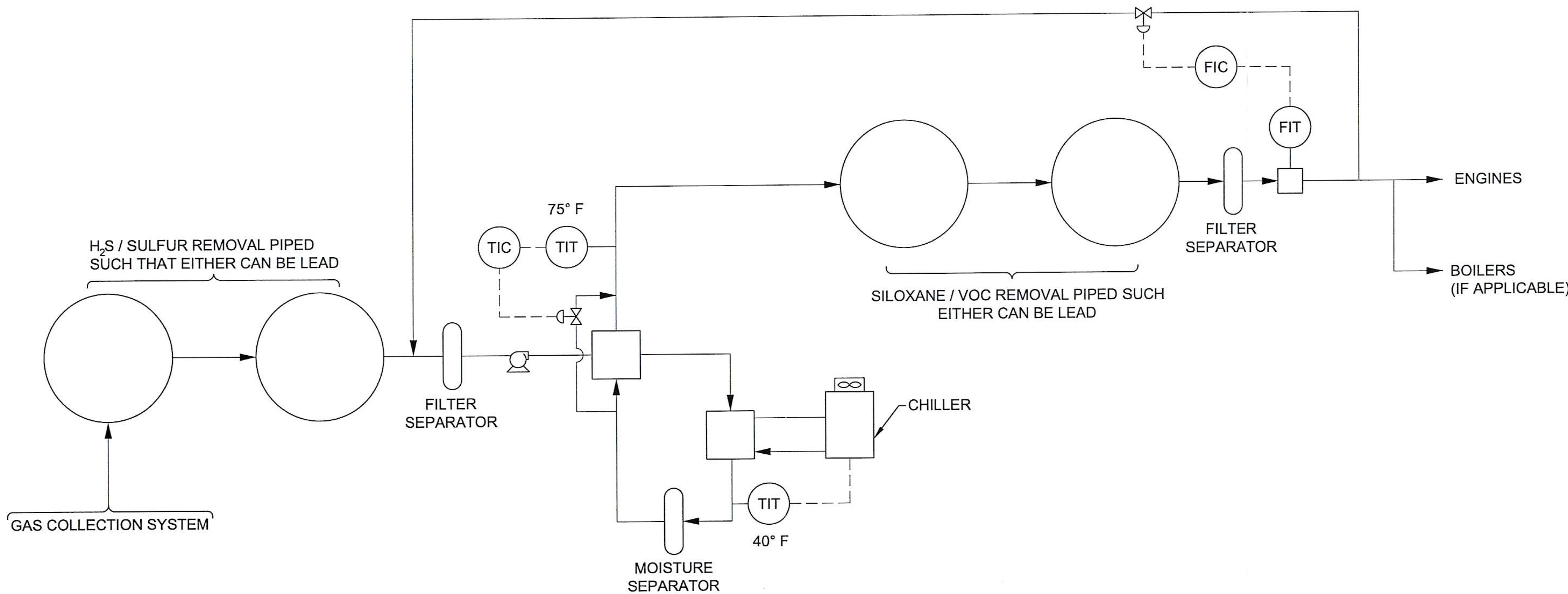


FIGURE 1

Gas Conditioning System Schematic

Evaluation of Alternatives for Use of Digester Gas

South Orange County Wastewater Authority

TECHNICAL MEMORANDUM

EVALUATION OF ALTERNATIVES
FOR USE OF DIGESTER GAS

DRAFT
May 2012

SOUTH ORANGE COUNTY WASTEWATER AUTHORITY

TECHNICAL MEMORANDUM

EVALUATION OF ALTERNATIVES FOR USE OF DIGESTER GAS

TABLE OF CONTENTS

Page No.

LIST OF TABLES

LIST OF FIGURES

1.0 INTRODUCTION

Digester gas is used in cogeneration facilities at the South Orange County Wastewater Authority (SOCWA) Regional Treatment Plant (RTP) and J.B. Latham Treatment Plant (JBLTP). The JBLTP utilizes digester gas to operate an aeration blower. The RTP uses digester gas to operate electrical generators to produce power for the plant's electricity demands. Heat is recovered at both cogeneration facilities to heat the anaerobic digesters. The RTP engines also provide heat to a local community swimming pool.

The impending changes to Rule 1110.2, proposed by the South Coast Air Quality Management District (SCAQMD), will require implementing a new Best Available Control Technology (BACT) to improve the cogeneration facilities emissions quality. SOCWA has completed several studies that have considered selective catalytic reduction systems (SCR) installed on the existing systems, as well as alternative cogeneration technologies such as fuel cells.

1.1 Air Quality Restrictions

The engines at both treatment plants will be required to comply with the stringent requirements of the South Coast Air Quality Management District's (SCAQMD) Rule 1110.2 Internal Combustion Engines. The present implementation date is July 1, 2012. However, there is discussion within SCAQMD regarding this date. The date may be extended to allow further time for technology demonstrations to be conducted and to allow biogas engine users to comply. Current limits as well as the 2012 limits are reported in Table 1.

Table 1 Concentration Limits, Existing Biogas Engines, Rule 1110.2 Table II
Evaluation of Alternatives for Use of Digester Gas
South Orange County Wastewater Authority

Current Concentration Limits Effective 2010		
NO_x (ppmvd)	VOC (ppmvd)	CO (ppmvd)
bhp < 500: 45 * ECF	250	2,000
Concentration Limits Effective July 1, 2012		
NO_x (ppmvd)	VOC (ppmvd)	CO (ppmvd)
11	30	250

Notes:
NO_x: oxides of nitrogen.
VOC: volatile organic compounds.
CO: carbon monoxide.
ppmvd: parts per million volumetric dry.
bhp: brake horsepower.
ECF: Emission Correction Factor for biogas operations.

1.2 Scope

The purpose of this technical memorandum (TM) is to re-evaluate alternatives capable of meeting the proposed SCAQMD emissions requirements and to confirm the viability of SCR. Specific scope tasks include:

1. Updated review of solids and digester gas data.
2. Updated review of digester heating requirements.
3. Evaluation of SCR technology. This includes an update on the effectiveness of the technology at other installations. Capital and life cycle costs will be updated from previous reports.
4. Evaluation of Potential Utility Agreement. The local utility, Southern California Gas Company, will be contacted to determine interest in purchasing and using the digester gas to produce renewable natural gas for use in the utility distribution system.
5. Evaluation of Privatization of Digester Gas Handling. Private energy companies will be contacted to determine interest in developing privatized energy projects. These projects would use digester gas to generate power onsite. The facility would be owned and operated by a private company. Excess heat would be used for digester heating demands and SOCWA would potentially benefit from a lower electricity rate.
6. Discharge of Plant 3A Solids to Oso-Trabuco Sewer. This task will evaluate the sewer capacity to accept the solids flow from Plant 3A to the JBLTP. JBLTP's ability to handle the added loading has been evaluated previously. Consolidated treatment at the JBLTP may provide benefits associated with solids handling and treatment at Plant 3A.

2.0 SUMMARY OF FINDINGS AND RECOMMENDATIONS

The following summarizes the findings and recommendations for the RTP and JBLTP facilities.

2.1 Regional Treatment Plant

The following alternatives were analyzed for implementation at the RTP:

- Alternative 1: Remove the existing cogeneration engines and replace with two 4.0 million British Thermal Units per hour (BTU/hr) boilers.
- Alternative 2: Enter into a Power Purchase Agreement (PPA) with a private company.
- Alternative 3: Add SCR and fuel conditioning to the existing engines with a common Continuous Emissions Monitoring System (CEMS).
- Alternative 4: Add a new 800-kW engine generator with SCR to replace the existing engines.
- Alternative 5: Add three new 250-kW microturbines and a 5.0 million BTU/hr boiler to replace the existing engines.
- Alternative 6: Add three new 300-kW fuel cells and a 5.0 million BTU/hr boiler to replace the existing engines.

Alternative 4 is recommended for implementation at the RTP. The project provides the most cost effective means of utilizing digester gas at the RTP. While the existing cogeneration facility is in good operating condition, replacement provides SOCWA the opportunity to utilize available grant funds to offset the project costs, to increase the efficiency of power generation and to decrease the overall engine Operation and Maintenance (O&M) costs associated with the existing engine generators

The estimated project cost of the recommended alternative is $4,487,000. This alternative is eligible for up to $2 million in grant funding through the California Energy Commission's (CEC's) Self Generation Incentive Program (SGIP). This grant program will provide 50 percent of the funding upon successful system startup and the remaining 50 percent being paid out over the first 5 years of operation based on actual energy production. The recommended alternative has a 20-year present worth of net benefit when compared to the no cogeneration option of $5,691,000. The estimated payback period is 6 years.

2.2 J.B. Latham Treatment Plant

Multiple alternatives were also considered for digester gas use at the JBLTP. The JBLTP analysis was complicated by the fact that the cogeneration facility is also tied to the aeration system. The existing cogeneration facility utilizes an engine driven blower to provide the primary source of aeration air for the facility. Any alternative use of the gas must also consider how to meet aeration air demand by providing an electrical blower or maintaining the existing engine-blower arrangement.

Additionally, SOCWA is considering sending solids from Plant 3A through the sewer system to the JBLTP for treatment. This centralizes solids handling between the two facilities has been identified as offering operations and maintenance cost savings for SOCWA. The following digester gas use alternatives were evaluated for the JBLTP, with each alternative further analyzed for the current operating condition and for the addition of Plant 3A solids:

- Alternative 1: Remove the existing cogeneration engine and blower and use the existing boilers for digester heat demands.
- Alternative 2: Enter into a Power Purchase Agreement (PPA) with a private company.
- Alternative 3: Add SCR and fuel conditioning to the existing engine blower system and add a CEMS.
- Alternative 4: Add a new 633 kW engine generator with SCR to replace the existing engine blower.
- Alternative 5: Add three new 250 kW microturbines and remove the existing engine blower.
- Alternative 6: Add two new 300 kW fuel cells and a new 5.0 million BTU/hr boiler and remove the existing engine blower.

Each alternative was evaluated with respect to the required aeration upgrades consisting of the addition of a replacement aeration diffuser system along with installation of process dissolved oxygen controls. For all alternatives requiring the replacement of the existing engine driven blower system, the existing electric blowers are to be replaced with new high efficiency turbo blower systems. For Alternative 3, adding SCR to the existing engine blower system, replacement of the existing electric blowers is not warranted as the existing engine blower system would remain the primary source of aeration air, thus little benefit would be realized in replacing the existing electric blowers which would remain only utilized during peak aeration demand periods

The cost for the aeration system modifications as noted above has been included in the analysis, along with consideration for the electrical power demands associated with using electrical blowers and with savings associated with the diffuser and dissolved oxygen control systems also being installed. The cost of implementing chemically enhanced solids treatment (CEPT) and adding 3A solids have also been included in the analysis of each of the alternatives in order to assess the impact on the analyses of operation of the JBLTP with the additional solids. Capital and annual costs were referenced from the J.B. Latham Treatment Plant Facility Plan (Facility Plan).

Alternative 4, adding a new 633-kW engine generator with SCR, is recommended for implementation at the JBLTP along with the implementation of the Facility Plan recommended aeration system upgrades. Installing an engine generator cogeneration facility at the JBLTP provides SOCWA with the opportunity to utilize available grant funds to offset the project costs, to decouple aeration system operation with the utilization of digester gas and the need for heat generation to meet process heating needs and allows the aeration system to be operated in the most efficient manner, minimizing overall operational costs of associated with JBLTP. This alternative remains the same whether or not SOCWA proceeds with redirecting solids from Plant 3A to JBLTP for treatment. This alternative is recommended for implementation regardless if CEPT and Plant 3A solids are implemented or not. Regarding the CEPT and Plant 3A solids issue, it is recommended that SOCWA proceed with lab testing to confirm the Facility Plan assumptions regarding implementation of CEPT at JBLTP. It is further recommend that a detailed review of the overall costs and savings associated with decommissioning solids processing at Plant 3A as the savings appear, based on a very abbreviated review, to add significant additional benefit to the 20-year present worth of benefit for plant. This information would provide SOCWA with important information to support the decision whether or not to proceed with CEPT and Plant 3A solids transfer.

Table 2 provides the estimated project costs both under current operating conditions and for operation with Plant 3A solids and CEPT system operation as JBLTP.

Table 2	JBLTP Project Costs for Recommended Alternative 4 Evaluation of Alternatives for Use of Digester Gas South Orange County Wastewater Authority	
Operating Condition	**Current**	**CEPT + 3A**
Estimated Project Costs	$6,714,000	$7,068,500
20-Year Total Present Worth of Net Benefit Compared to No Cogeneration	**$3,138,000**	**$4,435,000**
Cogeneration System Payback Period (years)	8	7

This alternative is eligible for up to $1.4 million in grant funding through the CEC's Self Generation Incentive Program (SGIP). This grant program will provide 50 percent of the funding upon successful system startup and the remaining 50 percent being paid out over the first 5 years of operation based on actual energy production.

A summary of recommendations at the JBLTP are provided as follows:

- Preliminary design study to implement Alternative 4, install the new engine-generator set, and install new high-efficiency blowers. The study should include, but not be limited to, the following:
  - Identify any needed electrical upgrades to ensure the new engine-generator can provide power to Plants 1 and 2.
  - Evaluate aeration diffusers and blowers in relation to aeration demands, allowable air fluctuations through the diffusers, and the best available blower technology for meeting the demands.
  - Evaluate the most efficient means of aeration control. This may be by a cascading control of modulating valves or through an algorithm based on the most-open valve.
  - The aeration evaluation should consider reduced aeration demands if CEPT is implemented.
- Continue to evaluate adding Plant 3A solids to the JBLTP:
  - Jar testing at the JBLTP primary clarifiers.
  - Evaluate the potential cost savings if the Plant 3A solids handling facilities are shut down.

3.0 BACKGROUND

3.1 RTP Cogeneration System

The existing cogeneration system at the RTP consists of three 400-kilowatt (kW) lean burn engine-generators. The engines are Waukesha model F3521GLD-LFPS, 574 horsepower (hp) each. Each engine is coupled to a 400-kW generator, Waukesha model 1134, providing a maximum total output of 800-kW with two units operating and the third being an installed standby to allow for maintenance and unexpected failures. This system provides most of the RTP's electrical demand.

The current SCAQMD permit allows only two engines to operate at any given time. The units are fueled by a combination of digester and natural gas. They have natural gas piped to pre-combustion chambers that provides between 5 and 10 percent of the total fuel input. They are currently permitted to use up to 25 percent natural gas blended with digester gas.

The cogeneration system is an essential facility for electrical energy production and for heat for the anaerobic digesters and a local community swimming pool. The system allows the plant to have most of its power generated on site instead of purchasing it from Southern California Edison (SCE), and the cogeneration system can normally be operated during power outages to provide additional standby power for the plant.

3.2 JBLTP Cogeneration System

The cogeneration system at the JBLTP consists of a single 636 hp, lean-burn, internal combustion engine, Waukesha model No. 2895 GL. The engine operates an 11,000 standard cubic feet per minute (scfm), multi-stage centrifugal blower. Heat is recovered from the engine and is used to heat the anaerobic digesters. An existing boiler provides heat when the engine is not in operation.

Based on current emission standards, the engine must be operated at a reduced speed that reduces the blower output. Performance testing has determined that the engine output is currently 437 HP at the lower speed. This limits the digester gas input to below what is generated by the plant. Excess digester gas is routinely flared. The reduced speed operation also effects aeration requirements. During weekends and holiday periods, air must be supplemented with the existing electrical blowers to maintain dissolved oxygen concentrations. In order to maintain engine stability and emissions within required limits, the engine blower is operated at a near constant load at a constant speed. During most periods, the resulting air flow generation results in over aeration for the plant.

3.3 Past Evaluations

Previous reports, prepared by Carollo Engineers, Inc. (Carollo) and by others, have evaluated cogeneration alternatives at the JBLTP and the RTP. These reports include:

3.3.1 Gas Conditioning Siloxane Removal System, August 2007, Carollo

This TM evaluated alternatives for digester gas conditioning systems. Gas conditioning systems are required upstream of the cogeneration facilities to reduce hydrogen sulfide and siloxane components. Reduction of these contaminants is necessary to protect the SCR equipment and other cogeneration systems. Gas conditioning has a further benefit of reducing maintenance needs for existing cogeneration engines by improving gas quality.

The report recommended installation of a combined refrigeration and adsorption system as the most effective proven and trouble-free removal system. The system would be installed at both treatment plants. This report will carry forward with this recommendation, as further evaluation was not part of this project's scope.

3.3.2 Regional Treatment Plant AQMD Rule 1110.2 Compliance, August 2008, Carollo

This TM evaluated various alternatives to modify or replace the existing cogeneration system at the RTP in order to meet the SCAQMD emissions requirements. Alternatives evaluated included:

1. Add SCR to each existing engine and install a common Continuous Emission Monitoring System (CEMS).
2. Add a NO_xTECH System to each engine and install CEMS.
3. Phased addition of two boilers to provide heat to the digesters, install NO_xTECH System and CEMS. At the time of the report, the boilers were considered based on the approval process for the NO_xTECH system and the timing for shutting down the existing cogeneration engines.
4. Install two boilers to replace the existing cogeneration facility.
5. Add a fuel cell system and boiler to replace the existing system.

Alternative 3 was shown to be the apparent best alternative. The final recommendation of the report consisted of a phased approach. At the time of the evaluation, the effectiveness and costs for both NO_XTECH and SCR systems were unknown.

The report recommended installation of a new boiler to plan for required shutdown of the existing system. Further evaluation on the effectiveness and cost for the NO_XTECH and SCR systems was then recommended once other agencies had completed testing of the alternative systems.

3.3.3 RTP Switchgear and Cogeneration Upgrades, 2006, Carollo

The report recommended upgrades to the switchgear and engine-generator synchronizing controls to replace obsolete equipment at the RTP. Carollo was retained to complete the design of the switchgear upgrades for the existing cogeneration system. The design was completed in December 2007, but was subsequently placed on hold by SOCWA pending a decision regarding implementing a cogeneration alternative.

The project does not have a direct impact on this evaluation, but is mentioned here to maintain continuity and identify projects related to the cogeneration system. The project should be implemented if the existing engines are upgraded or replaced to meet the new emissions standards.

3.3.4 Aeration and Cogeneration Upgrade for the J.B. Latham Treatment Plant, July 2009, Black and Veatch

The report evaluated alternatives for replacing the existing engine-driven blower and alternative uses for the digester gas and cogeneration systems. Implementation of fuel cells was the best option to meet the future regulatory requirements. The fuel cell system included gas conditioning, two 300-kilowatt (kW) fuel cells, and heat recovery equipment.

3.3.5 J.B. Latham Treatment Plant Facility Plan, August 2011, Carollo and HDR

The Facility Plan was prepared to provide a comprehensive planning guide to assist SOCWA in identifying potential upgrades and capital investments required at the JBLTP over a 20-year implementation schedule. The plan considered capacity and condition of the existing facilities, potential regulatory requirements, and opportunities to improve efficiencies. Several TM's were prepared to discuss specific areas of the JBLTP. The report also provided an integrated analysis to evaluate the interrelated aeration and cogeneration facilities.

Under Technical Memorandum No. 7, Key Liquid Stream Issues, HDR evaluated alternatives for replacing the aeration diffusers and installing high-efficiency electrical blowers. The alternative evaluation considered the cost of power for new blowers and potential power savings from a cogeneration system providing electricity to the JBLTP or the existing blower.

The final recommendation was dependent on the outcome of Rule 1110.2 emissions requirements. With no new emissions requirements, the existing system was recommended to stay in place. With implementation of Rule 1110.2, it was recommended to install the high efficiency blowers with new aeration diffusers and evaluate alternative beneficial uses of the digester gas.

Under Technical Memorandum No. 9, Energy Management, Carollo updated and expanded the 2009 report prepared by Black and Veatch. The TM evaluated cogeneration alternatives including maintaining the existing system, upgrading the existing system with fuel treatment and SCR, or implementation of fuel cells or microturbines. These alternatives were then evaluated under different treatment scenarios for the existing condition, implementing CEPT, and implementing CEPT with addition of solids from Plant 3A.

The final recommendation provided a ranking of preferred alternatives to be determined based on the final emission limits set by the SCAQMD. Continued use of the existing system was recommended in the event that emissions standards do not change. Installation of SCR and gas conditioning were recommended if the new emission standards are adopted. Installation of fuel cells was the third preference, with implementation contingent on future evaluation of the reliability and operational issues associated with SCR.

The Executive Summary provided an integrated life cycle cost analysis to evaluate combined costs associated with the aeration and cogeneration facilities upgrades. With implementation of the new Rule 1110.2 requirements, installation of BACT on the existing system provided the lowest life cycle cost. If Plant 3A solids were brought to the JBLTP, installation of new blowers, diffusers, and fuel cells provided the lowest life cycle cost. Implementing CEPT was also recommended as part of bringing the solids over from Plant 3A. The recommendation is based on ensuring proper settling of the Plant 3A WAS in the primary clarifiers to avoid upsetting downstream processes.

4.0 EXISTING CONDITIONS

As part of the Facility Plan, Carollo prepared a heat demand/heat supply model to predict digester heating requirements. The model takes into account sludge type and flow, seasonal temperatures, digester operating scenarios, and the digester design criteria and materials of construction. The model can further evaluate the use of boilers, if needed, to supplement digester heating needs.

For this study, the JBLTP heating model was updated with current operating data. A new model was also created for the RTP. The following section will review historical electrical demands, solids data, digester gas production, and the digester heat demands. The information is later utilized in evaluating cogeneration alternatives for each plant.

4.1 Regional Treatment Plant

4.1.1 Existing Energy Use

Table 3 summarizes the RTP electrical energy use. The cogeneration system can produce the majority of the RTP demands, but some power must still be purchased to meet peak demands.

Table 3 RTP Existing Electricity Consumption and Production
Evaluation of Alternatives for Use of Digester Gas
South Orange County Wastewater Authority

	Peak Power Demand(1)	Average Power Consumption(1)	Average Cogeneration Power Production(1)
RTP Demand, kWh/day	26,200	5,700	17,700

Note:
(1) Information derived from SOCWA RTP 2006-2011 Utility Data.

The total cost of utility power at the RTP averages $0.107 per kilowatt-hour.

4.1.2 Solids and Digester Gas Production

The RTP receives additional sludge from SOCWA's Coastal Treatment Plant (CTP) and from the El Toro Water District (El Toro). Sludge from El Toro is trucked to the RTP at a fairly high concentration, around 5 percent. The sludge is discharged to the sludge holding tanks for blending prior to digestion.

CTP sludge is pumped at a solids concentration ranging from 1 to 2 percent. Sludge was historically pumped to the sludge holding tanks. In June 2009, piping modifications were made so the CTP solids are first sent the RTP dissolved air flotation (DAF) thickeners before digestion to reduce hydraulic loading to the digesters.

Table 4 provides a summary of the solids flow to the digesters and digester gas production from July 2009 through 2011.

Table 4	RTP Sludge and Digester Gas Production Evaluation of Alternatives for Use of Digester Gas South Orange County Wastewater Authority		
Criteria	**Value**	**Average**	**Maximum Month**
Primary Sludge	gpd	32,900	45,400
Thickened Sludge	gpd	54,000	66,800
Total Sludge	gpd	87,000	112,100
Digester Gas Production	scfm	216	238

Notes:
(1) gpd: gallons per day.
(2) scfm: standard cubic feet per minute.

4.1.3 Heat Requirements

The heat demand/heat supply model was prepared using sludge and digester gas data, available record drawing information, and data presented in the RTP AQMD Rule 1110.2 Compliance study. Drawings indicate that the digester domes are constructed of steel domes with a layer of concrete above the steel, providing a layer of insulation. The thickness of the concrete layer is assumed to be 3 inches, but could not be verified.

Pool heat demands were previously determined from daily hot water supply and return temperature readings in November 2005 and then adjusted based on the historical average monthly temperature in Laguna Beach, California.

The plant peak heat demand and supply are shown in Table 5. Digester heat demands consider all four digesters in operation. Peak demand considers winter conditions with maximum month solids loading. Average demand considers average solids loading during summer months.

Table 5	RTP Heat Demands and Supply Evaluation of Alternatives for Use of Digester Gas South Orange County Wastewater Authority	
	Average(1)	**Peak(2)**
Digester Heat Demand, BTU/hr	1,707,000	1,908,000
Pool Heat Demand, BTU/hr(2),(3)	1,370,000	1,780,000
Total Heat Demand, BTU/hr	3,077,000	3,700,000
Total Available Heat Supply, BTU/hr(3)	3,800,000	3,800,000

Note:
(1) Maximum month loading under winter temperatures, all digesters in operations.
(2) Peak pool heat demand is assumed as average demand determined from November 2005 data plus 30 percent.
(3) Referenced from RTP AQMD Rule 1110.2 Compliance, August 2008, Carollo.

The model suggests that the cogeneration system is capable of meeting the heating demands for the RTP and the swimming pool. Boilers are not installed at the RTP for supplemental heating. If the cogeneration system is not meeting the heat demands, hot water temperatures in the digesters and pool drop. Overall, it appears the system is capable of meeting heat demands but that it is at capacity under peak demand scenarios.

4.2 J.B. Latham Treatment Plant

4.2.1 Existing Energy Use

Energy demand at the JBLTP was recently reported in the Facility Plan, TM 9. Demands for the three main 480-volt (v) services were reported. There are a total of six services, with the remaining three being lower voltage services to various plant buildings. The three 480-volt services provide power to Plant 1, Plant 2, and the Effluent Pump Station. The electrical demands for these services have been updated and are listed in Table 6.

Table 6 Historical Electrical Demands – Average Day
Evaluation of Alternatives for Use of Digester Gas
South Orange County Wastewater Authority

Service	Average	Peak
Plant 1, kWh/day	8,000	15,300
Plant 2, kWh/day	4,900	6,100
Effluent Pump Station, kWh/day	294	828
Total, kWh/day	13,100	22,300

Notes:
(1) Information derived from SOCWA JBLTP 2006-2011 Utility Data.

Electrical use has resulted in a total average electricity cost of $0.128 per kilowatt-hour. The Facility Plan considered that the existing cogeneration engine blower system may be replaced with an electrical generation cogeneration system. High efficiency electrical blowers would be installed to replace the existing electric blowers and additional power requirements associated with the electric blower use versus the existing engine blower use were calculated. These demands are added to the existing demand. The power demands are provided in Table 7 for the "Current" condition and for the addition of CEPT and 3A solids at JBLTP.

Table 7 Projected Power Demands(1)
J.B. Latham Treatment Plant Facility Plan
South Orange County Wastewater Authority

	Current	CEPT(2) + 3A
Projected Electric Blower Aeration Electrical Power Demand (kWh/day)	3,700	3,300

Notes:
(1) Referenced from Facility Plan, TM 8 and TM 9, August 2011, Carollo.
(2) CEPT – Chemically Enhanced Primary Treatment.

4.2.2 Solids and Digester Gas Production

Solids handling at the JBLTP consists two dissolved air flotation (DAF) thickeners for waste activated sludge (WAS) thickening, four anaerobic digesters for solids stabilization, and three centrifuges for solids dewatering. The TM 8 of the Facility Plan considered installation of disc thickeners to replace the DAF thickeners and installation of a fifth digester to improve digester performance. Digester No. 5 would be necessary if Plant 3A solids are sent to the JBLTP.

Table 8 provides an update of sludge and gas production at the JBLTP. The table also provides the sludge estimates presented in the Facility Plan for implementing CEPT and 3A solids. Gas production values for the "CEPT + 3A" condition have been updated to assume Digester 5 is constructed and operating.

Table 8 JBLTP Sludge and Digester Gas Production
Evaluation of Alternatives for Use of Digester Gas
South Orange County Wastewater Authority

		Current		CEPT + 3A	
Criteria	**Value**	**Average**	**Max Month**	**Average**	**Max Month**
Primary Sludge	gpd	56,900	72,100	100,000	117,900
Thickened Sludge	gpd	19,300	26,700	30,400	39,900
Total Sludge	gpd	76,300	98,800	130,400	157,700
Digester Gas Production	scfm	115	199	182	221

Notes:
(1) gpd: gallons per day.
(2) scfm: standard cubic feet per minute.

The table provides the historical and estimated gas production but does not represent gas flow to the cogeneration system.

4.2.3 Heat Requirements

The heat demand/heat supply model created as part of the Facility Plan has been updated based on the revised sludge flows. Digesters Nos. 1, 2, and 4 have un-insulated steel domes. Digester 3 has a concrete dome. The Facility Plan recommended insulating the digester domes to reduce heat loss. Table 9 provides the projected heat demands for the insulated and non-insulated case. Heat demands for the "Current" condition are based on four operating digesters. The "CEPT + 3A" condition is based on five operating digesters.

Table 9 Projected Digester Heat Demands (BTU/day)(1)
J.B. Latham Treatment Plant Facility Plan
South Orange County Wastewater Authority

	Current	CEPT + 3A
Non-insulated Summer	1,807,300	2,624,600

Table 9	Projected Digester Heat Demands (BTU/day)[1] J.B. Latham Treatment Plant Facility Plan South Orange County Wastewater Authority	
	Current	**CEPT + 3A**
Insulated Summer	1,084,500	1,610,400
Non-insulated Winter	1,969,000	2,824,400
Insulated Winter	1,246,200	1,810,200

Notes:
(1) BTU – British Thermal Units.
(2) CEPT – Chemically Enhanced Primary Treatment.

Current heat sources include the existing cogeneration system and two boilers. Boiler No. 1 serves Digesters No. 1 and No. 2 while Boiler No. 2 serves Digesters Nos. 3 and 4. Boiler No. 1 has been converted to operate on the excess digester gas. Boiler No. 2 can only operate on natural gas. The available heat is reported in Table 10. The cogeneration heat is based on current digester gas input that was observed during the Facility Plan, a digester gas heat value of 600 BTU/hr, and 27 percent overall heat recovery.

Table 10	Existing Digester Heat Sources Evaluation of Alternatives for Use of Digester Gas South Orange County Wastewater Authority		
	Boiler No. 1[1][2]	**Boiler No. 2[1]**	**Existing Cogeneration**
Heat Output (BTU/hr)[3]	1,540,000	1,006,000	1,420,000

Notes:
(1) Source - Aeration and Cogeneration Upgrade for the J.B. Latham Treatment Plant, July 2009.
(2) Rating is for natural gas. Output is probably reduced for digester gas due to lower methane content.
(3) BTU – British Thermal Units per Hour.

The model shows that the existing cogeneration system is not providing sufficient heat under current typical winter conditions. This agrees with staff observations and the need to operate Boiler No. 1 during winter periods.

5.0 CURRENT STATUS OF RULE 1110.2

South Coast Air Quality Management District Rule 1110 was first approved in 1990. Numerous revisions have occurred in the intervening years with the latest amendment being approved in July of 2010. The February 2008 modification significantly lowered the required limits for the internal combustion gas engines operated by SOCWA. The February 2008 amendments placed a timeline on implementation of compliance with these limits. Contingent on results of a technology evaluation, digester gas engines were to be shut down or modified to meet the new limits by July 1, 2012.

During the years between February 2008 and today, several technology assessments have been undertaken. The primary assessment has been done by Orange County Sanitation Districts (OCSD). The OCSD assessment draft report was completed and submitted for District review documenting that the technology tested which was SCR and CO oxidation catalyst systems do reduce emissions to the required limits. However, numerous exceedances were noted primarily do to short term excursions. A similar assessment has been underway on the NOxTECH technology by the Eastern Municipal Utility District on digester gas fueled engines, but this evaluation has yet to be completed. A demonstration is in the early stages of planning, funding, and implementation on the use of hydrogen injection technology by the City of San Bernardino. This evaluation is planned but not yet underway. This technology is in very early stages of development.

Due to the late completion of the SCR/CO demonstration conducted by OSCD and on the lack of results from the NOxTECH and hydrogen injection demonstrations SCAQMD staff has not been able to fully implement the rule. Discussion have been conducted by SCAQMD with effected parties concerning the lack of clear experience proving the technologies and on the costs associated with implementing the technologies. In February 2012, SCAQMD proposed several modifications to the rule that address the concerns regarding the issues experienced by the OCSD trial and allowing further time for compliance. Staff is currently holding workshops on the proposed amendments and expects to issue a final draft rule for board approval in June of 2012.

While it is not certain how the final draft rule will be structured, it is expected that the rule will to continue to require biogas engines to meet the limits listed in the February 2008 amendment but will allow a longer averaging time on the sampling. It is also likely that implementation will be required by July 1, 2015 and that a compliance plan will be required to be submitted by January 1, 2014.

Appendix A contains the current proposed February 2012 amendment, the currently implemented July 2010 rule along with proposed staff recommendations, and technology assessment documentation.

6.0 DIGESTER GAS UTILIZATION ALTERNATIVES

The following section will describe available technologies to consider as alternatives for use of digester gas at both the RTP and the JBLTP. These alternatives have been described in previous reports but are repeated here for continuity. Updates on the status of these technologies are also provided. Additionally, the alternatives that utilize the existing engines consider addition of Continuous Emissions Monitoring System (CEMS). All alternatives will require gas conditioning.

The need for digester gas conditioning and the type of treatment required is identical for all of the cogeneration technologies available for use at the SOCWA facilities. SCR, microturbines, and fuel cells all require a robust fuel treatment system including redundancy of the siloxane and hydrogen sulfide removal systems. The ability of NOxTECH units to work properly without gas treatment has not been demonstrated. As noted previously, it appears that gas treatment will likely also be required for use with NOxTECH. The recommendations in the Gas Conditioning Siloxane Removal System technical memorandum should be implemented for all proposed the alternatives. An added benefit of adding fuel treatment is that maintenance of the existing engines would significantly decrease after the recommended fuel conditioning is provided. A schematic of the fuel conditioning system is shown on Figure 1.

6.1 Selective Catalytic Reduction

Implementing SCR could allow the existing lean burn engines to remain at both plants. In addition, SCR would be required for any new engine alternative that would be considered for replacement of the existing engines. A common CEMS would be required to control the SCR emissions control devices installed on at each facility. SCR is a means of reducing nitrous oxide (NOx) emissions with the aid of a special catalyst and with a system to inject ammonia, usually in the form of urea, upstream of the catalyst. The ammonia reacts under high temperature with the catalyst to reduce NOx emissions. The urea demand is approximately 0.1 gallons per hour, so a small 300 gallon storage tank could provide more than 100 days of storage.

An oxidation catalyst upstream of SCR is also typically required for two purposes, one to lower CO concentrations to below permit required levels and two, to protect the SCR from fouling too quickly. The oxidation catalyst removes carbon monoxide (CO) and volatile organic compounds (VOCs). The complete system will effectively remove a minimum of 70 percent NOx, 80 percent CO, and 70 percent of non-methane hydrocarbons. Depending on the quantity of catalyst installed in both the SCR and CO systems, the effectiveness can be increased significantly. SCR/CO systems routinely remove 95+ percent of NOx and CO in other power generation applications.

As the need to remove more NOx increases, the need to provide feedback control on ammonia injection increases to prevent ammonia emissions from exceeding allowable limits. This is accomplished by connecting CEMS outlet data into the ammonia injection control system. Provisions for this should be provided with any SCR system installed should SOCWA decide installation of SCR on either the existing or new engines is the best alternative.

6.1.1 Technology Update

SCR currently provides the most reliable technology for BACT regarding lean burn internal combustion engines. The technology has a proven track record of performance, capital cost, and maintenance costs. As long as the gas fueling the engines is reliably free of contaminants SCR/CO catalyst systems will perform to reliably meet emission reduction requirements imposed by the pending regulations and by the possibility of future reduced emissions expected from further reductions to the Rule 1110.2 limits in the 2020 time frame.

6.1.2 Application at SOCWA Facilities

SCR will allow continued use of the existing cogeneration facilities at the JBLTP and the RTP. If the JBLTP cogeneration system is revised to an electrical generator and lean-burn engine, the SCR technology is still applicable. SCR and CO catalyst systems installed as part of any recommended alternative should contain provision to allow additional catalyst to meet potential emission limit reductions with minimum impact to the installed equipment.

6.2 NO_xTECH

The NO_XTECH system is similar to a standard SCR in that it produces a reaction that reduces NO_x emissions by injecting urea and ammonia at high exhaust temperatures. The NO_xTECH system does this in a high temperature reactor without the need for catalyst. As a result, fuel-conditioning equipment is not necessary for operation. However, limited fuel treatment is included to reduce engine maintenance as recommended in the Gas Siloxane Removal System technical memorandum. The high temperature reactor removes NOx, CO, and VOCs.

6.2.1 Technology Update

Testing has yet to be completed on an operational NOxTECH system. It is unclear how the system will perform in real world operation on exhaust from biogas fueled engine generators burning fuel containing siloxane compounds. Early results from partial testing indicate that the siloxane compounds cause significant issue within the NOxTECH reaction vessel, pointing to the likely need to include digester gas cleanup technologies prior to the engine generator similar to other technologies. Early testing is also showing that the technology cannot reliably reduce emissions to the required level to allow compliance with the current emission limits in SCAQMD Rule 1110.2. This, along with further refinement of expected purchase costs of the NOxTECH product put this technology likely on par cost wise to SCR systems. Given that the costs appear to be very similar and the uncertain ability of the technology to meet long-term emission reduction goals, it appears unlikely that this technology will provide any benefit in meeting emission reductions necessary to comply with SCAQMD Rule 1110.2 requirements.

6.2.2 Application at SOCWA Facilities

At this point, installation of NOxTECH technology is not recommended at either treatment plant. Due to the unknown outcome of existing test sites, the technology cannot be said to be more reliable or more cost effective than SCR.

6.3 Engine Generators

Reciprocating engines, developed more than 100 years ago, were the first of the fossil fuel-driven distributed generation technologies. Reciprocating engines can be found in applications ranging from fractional horsepower units to over 3-megawatts (MW) per unit.

The engine jacket water and exhaust heat from reciprocating engines is recovered in heat exchangers and used to provide heat for digester heating and/or facility hot water heating. The four leading reciprocating engine suppliers offer modern high efficiency biogas fueled units. These manufacturers include Waukesha, Caterpillar (MWM), and GE-Jenbacher. These engines convert approximately 39 to 40 percent (as a percentage of fuel input energy) to electrical output and approximately 40 percent to recoverable heat from engine jacket water and exhaust. The overall efficiency of these reciprocating engines is approximately 80 percent.

Engines typically have availabilities of 90 percent. Exceeding this value for extended periods is difficult due to the typical routine service required as well as the time required to perform major engine services such as top end and complete engine overhauls, each of which can take several weeks to perform.

Reciprocating engines have the greatest emissions of the evaluated cogeneration technologies. Lean burn engines with the use of exhaust emission control devices (SCR/CO Systems) are the only field-proven engine technology that can meet the required emission rates when fueled with digester gas in the appropriate size range.

It should be noted that engine emission requirements have been steadily reduced throughout the country and this trend is expected to continue. This trend is expected to continue within the SCAQMD service territory as the region is impacted by strict EPA standards for Ozone emissions.

6.3.1 Technology Update

Engine generator technology has significantly advanced in the last several years due to pressure to lower emissions as well as increase operating efficiency. Technologies first developed in the automotive industry are now common in the large power generation reciprocating engine field. Several manufacturers now have engines in the 600 to 1,200-kW size range that have been completely modernized with new control systems and other internal enhancements. These new engines now have electrical generating efficiencies of approximately 40 percent, far exceeding the operating efficiency of engines of the previous generation. Similarly, most manufacturers now also offer fuel blending systems which work with the current computerized engine management systems to allow low Btu fuel sources to be continuously blended with natural gas at any percentage without compromising operation of the units. The new generation engine generators are viable technologies for consideration at SOCWA facilities when combined with SCR and CO systems to reduce emissions to the required levels.

6.3.2 Application at SOCWA Facilities

Installation of engine generators at the JBLTP was not considered under the Facility Plan due to uncertainty with emissions control equipment and the costs associated with its implementation and operation. Installation at the both the JBLTP and RTP may be warranted based on recent advances in engine technology which has significantly enhanced the efficiency of the engine generators. As a result, the outcome of a life cycle cost analysis will likely result as costs at least comparable to those of other technologies. Site constraints are not an issue at either plant as new engine generators would be located in place of the existing engine units.

6.4 Microturbines

Microturbines are essentially small gas turbines operating at very high speed to produce power and heat. Currently, there are several commercial manufacturers offering microturbine power generating units. However, only two manufacturers, Ingersoll Rand and Capstone, have experience utilizing digester gas as a fuel source.

Ingersoll Rand has optimized their design to provide a complete, factory-assembled system. Capstone sells only the microturbine units, which are subsequently packaged with compression and waste heat recovery ancillary equipment by third-party integration companies.

Capstone offers 30 and 70 kW units. The 30 kW units are too small for this application. Ingersoll Rand offers both 70 kW and 250 kW units. Over 100 Ingersoll Rand units have been installed which operate on natural gas and biogas. Currently there is a single 250 kW unit in operation using digester gas at the Lancaster WWTP in Lancaster, CA. In addition, several dozen 250 kW units are in operation in landfill gas applications in California. While either Capstone or Ingersoll Rand could be considered for the 70 kW units, pricing has been based on Ingersoll Rand for this analysis.

Microturbines typically convert 30 percent of fuel input energy to electrical output and 27 to 30 percent to recoverable exhaust heat, for a total overall efficiency of approximately 60 percent. Microturbines have the smallest footprint of all of the evaluated technologies.

Microturbines are an extremely low-emission technology. Expected emissions values for nitrous oxide (NOx) and carbon monoxide (CO) are 0.56 lb/MWh for NOx and 0.38 lb/MWh for CO. Currently microturbines can be installed in any air district in the US without added emissions control equipment requirements. This is expected to continue to be the case for the foreseeable future. Due to the fact that the emissions from microturbines are already very low, additional post engine treatment systems would provide little effective reduction in overall emissions.

6.4.1 Technology Update

Microturbine technology continues to be viable for small-scale power generation applications. Recent experience has resulted in concluding that to provide reliable operation, microturbine applications utilizing biogas require gas conditioning to remove contaminants such as sulfur compounds and siloxanes. Microturbines continue to be a viable alternative for SOCWA.

6.4.2 Application at SOCWA Facilities

Installation of microturbines at the JBLTP was considered under the Facility Plan. Installation at the RTP has not been considered in the past. The technology may be warranted based on the outcome of a life cycle cost analysis. Site constraints are an issue at both plants. Sufficient space exists for their installation if located in place of the existing engine units.

6.5 Fuel Cells

Fuel cells utilize the hydrogen present in digester gas as a fuel source through an electrochemical process. The process converts the elemental carbon and hydrogen from methane into carbon dioxide and water. In the process, electrons are released and captured as direct current (DC) electricity. The fuel cells convert approximately 47 percent of the input fuel energy to electrical energy. At least 22 percent of the input fuel energy can be recovered from exhaust heat. The fuel cells provide a total conversion efficiency of approximately 69 percent. This efficiency is higher than microturbines. More power can be generated.

Two manufacturers currently offer fuel cells for large-scale cogeneration (power and heat production): United Technologies Corporation (UTC) and Fuel Cell Energy (FCE). Both manufacturers have provided fuel cells for applications utilizing digester gas; however, only FCE has units currently in operation. Many of these units operating on biogas are located in California. FCE utilizes a more efficient fuel cell technology than UTC, providing 47 percent fuel-to-electricity efficiency versus 37 to 40 percent for UTC. Because the FCE systems have higher efficiencies and additional experience utilizing digester gas and the fact that UTC is currently not offering its units for sale using digester gas, only FCE units were considered for this evaluation. Fuel Cell Energy currently produces three unit sizes: 300 kW, 1,400 kW, and 2,800 kW. The FCE DFC300MA fuel cell sized at 300 kW was used as the basis of evaluation for this alternative based on a comparison of the available digester gas to capacity.

As fuel cells utilize the digester gas methane via an electrochemical process, fuel cells produce significantly less pollutant byproducts than combustion technologies. Fuel cells produce approximately 1/100th the emissions generated by engine-generators. Criteria emissions values for NOx and CO are 0.02 lb/MWh for NOx and 0.10 lb/MWh for CO. There are no emissions limits for fuel cells expected in the planning time frame for this project.

6.5.1 Technology Update

Fuel cell technology continues to be viable for small-scale power ultra efficient and ultra low emission power generation applications. Recent experience has resulted in a significant increase in the expense associated with first cost and maintenance of the 300 kW units while utilizing biogas requires gas. The majority of this cost impact results from the manufacturers desire to provide the larger 1.4 MW fuel cell units. As a result of this bias, they have increased costs for the smaller units. Fuel cells continue to be a viable alternative for SOCWA.

6.5.2 Application at SOCWA Facilities

Installation of fuel cells at the JBLTP and the RTP has been considered in past studies. The technology may be warranted based on the outcome of a life cycle cost analysis. However, due to the experiences gained from several recent installations of the 300 kW fuel cell units, costs of both implementation and maintenance are considerably higher than in the recent past due to concerns with dealing with contamination. Site limitations are a concern at both treatment plants however, arrangements exist in place of the existing engine units and in the immediate area surrounding these facilities.

6.6 Utility Agreement

Southern California Gas Company (SoCalGas) is in the process of developing a program to convert digester gas to biomethane. The biomethane would then be injected into the utilities natural gas distribution pipeline. SoCalGas was contacted to determine the current status of their program and to gauge their interest in implementing a project with SOCWA. SoCalGas currently has two programs in development that will allow them to convert digester gas into biomethane.

The first is known as Sustainable Southern California. Under this program, SoCalGas would own and operate the conversion equipment on site at the treatment plant. A very small leasing fee would be provided to the plant owner for the land occupied by the system. SoCalGas would maintain all rights to the renewable gas produced and no additional payments or credits would be provided to the owner. A demonstration project is underway with the city of Escondido. The program is under review by the California Public Utilities Commission (CPUC) and approval is expected by the end of 2012. SoCalGas has been allocated the ability to pursue five such projects as demonstration projects. As of March 2012, only one has been implemented. It is possible that SOCWA could participate in this demonstration program; however, there would be no value to SOCWA for the gas given to SoCalGas. Participation would solely be as a means of disposing of the unused digester gas.

The second program would provide gas processing services to the owner. SoCalGas will procure and operate the necessary gas processing equipment. A third party firm would be hired for operations. SoCalGas would be paid a fee to provide a 7.5 percent rate of return over the course of the contract. The owner would maintain rights to the renewable gas produced to use or sell. Injecting the gas into the utility distribution pipeline would have to be negotiated separately. Overall, SoCalGas is targeting large wastewater facilities producing 1 million standard cubic feet of gas per day in order for the economics to make sense. This program was initially rejected by the CPUC on the grounds that a more thorough approval process was required. SoCalGas is currently filing a formal request, with approval expected to take at least a year. Even if approved, this program would not apply to SOCWA due to the low gas production rates at the RTP and JBLTP facilities.

6.6.1 Application at SOCWA Facilities

A utility agreement is not recommended for the SOCWA treatment plants. The Sustainable Southern California program would provide no benefit to SOCWA and would result in increased energy consumption and costs as the cogeneration facilities would be removed from service. SOCWA does not qualify for the second program in terms of gas production at either facility.

6.7 Privatization

There are numerous private companies providing privatized projects to municipalities. Currently, the City of Oceanside, the City of Thousand Oaks, Inland Empire Utilities Agency, the City of San Leandro, the City of Santa Barbara, and the City of San Jose, among others, have active power purchase agreements in place. Power purchase agreements typically consist of a long-term agreement between the municipality to provide all or a portion of the digester gas produced at the facility in exchange for receiving power at a fixed rate and receiving heat generated from the generation equipment. Typical agreements provide an initial power cost close to the facilities current power costs and the agreements incorporate a fixed escalation rate. Often agreements also contain guaranteed availability agreements as well along with guarantees on the amount of digester gas that will be provided to the private company. Typically, renewable attributes associated with the generated power, RECs, are transferred to the private company as well. All costs associated with installation, operations and maintenance are born by the private company.

Several prominent private companies that routinely offer power purchase agreements to municipalities were contacted to determine interest in providing projects for RTP and JBLTP. These companies included UTS BioEnergy, California Power Partners and CHP Clean Energy. The solicitation and responses are included in Appendix B. While firm pricing was not provided, indication from the firms contacted confirms that there is strong interest in providing power purchase agreements for the RTP and JBLTP facilities. Given the costs associated with meeting current SCAQMD emission regulations, it is likely that actual solicitations would result in proposed pricing between plus 10 percent to minus 15 percent from SOCWA's current electricity rates and that the proposals would likely contain fixed escalation rates of approximately 3 percent. Technologies utilized by these firms would be dictated by economics and would include those discussed above.

7.0 ALTERNATIVE ANALYSIS

The following section presents a review of cogeneration alternatives for each plant. Alternatives have been developed based on previous work completed and updated according to the state of the current available technologies.

Capital and life cycle cost evaluations are presented in order to compare the benefits of each alternative. Assumptions used for the economic analysis are shown in Table 11.

Table 11 Criteria and Financial Assumptions
Evaluation of Alternatives for Use of Digester Gas
South Orange County Wastewater Authority

Present worth year	2012
First year of evaluation	2014
Project duration, years	20
Inflation (capital costs)	3.0%
Inflation (fuel and electricity costs)	4.0%
Inflation (O&M costs)	3.0%
Gross discount rate	6.0%
Digester Gas Lower Heating Value, Btu/scf	600
Existing Engine availability percentage	100%
New Engine availability percentage	90%
Microturbine availability percentage	95%
Fuel cell availability percentage	98%
O&M rate for existing engines with SCR alternatives $/kWh	$0.030
O&M rate for new engine with SCR alternatives $/kWh	$0.025
O&M rate for microturbine alternatives $/kWh	$0.025
O&M rate for fuel cell alternatives $/kWh	$0.054
O&M rate for fuel treatment system $/kWh	$0.010
Green Power Credit $/kWh(1)	$0.005

Note:
(1) REC value represented as $/kW-hr for sale of green power.

7.1 Regional Treatment Plant Alternatives

Previous reports had investigated NO_XTECH as an alternative to SCR with the existing engines. However, based on the current state of the technology, it is not considered in this analysis. The only viable technology available for use with the existing engine units is SCR.

7.1.1 Alternative 1 – No Cogeneration - Retire Existing Engines and Add Two Boilers

This alternative would retire the existing 400-kW cogeneration engines and add two new 4.0 million BTU/hr boilers to provide heat to the anaerobic digesters and swimming pool. The boilers would be digester gas fueled. Under this alternative, the RTP would purchase all electrical power from the local utility and would no longer have electrical power reliability, nor the economic insulation provided by generating power onsite.

The estimated total project cost for this alternative is $992,000.

7.1.2 Alternative 2 – Power Purchase Agreement

This alternative would retire the existing cogeneration facility. SOCWA would contract with a private company to install, own and operate a new cogeneration facility on-site. SOCWA would allow the facility to utilize all available digester gas. The facility would provide heat to the anaerobic digesters. SOCWA would pay the PPA provider a contracted rate for power over the life of the contract term. The cost is assumed to be 15 percent less than current utility rates, and is expected to have a fixed inflation escalation of 3 percent. These values are conservative best-case estimates used as a means of developing life cycle costs for the alternative.

There is no capital costs associated with implementing a PPA. The PPA partner would pay equipment installation and all operation and maintenance costs for the new cogeneration facility.

7.1.3 Alternative 3 - Add SCR and CEMS to Existing Engines

This alternative would retrofit the existing engines with SCR and a common CEMS. Implementation would require installation of a fuel conditioning system to remove all contaminants from the digester gas. A common CEMS would be required to control the emissions control devices installed on the existing engine-generators.

The total project cost for this alternative is $3,187,000.

7.1.4 Alternative 4 - Retire Existing Engines, add 800 kW Engine with SCR and CEMS

This alternative would retire the existing cogeneration facility and replace the engines with one new 800 kW engine generator. SCR and CEMS would be installed on the new engine. Implementation would require installation of a fuel conditioning system to remove all contaminants from the digester gas. Installing a new high-efficiency engine-generator will allow SOCWA to take advantage of the Self-Generation Incentive Program (SGIP) grant offered through the local utility. The grant would not be available to update the existing engines in Alternative 3.

The total project cost is estimated to be $4,487,000.

7.1.5 Alternative 5 - Retire Existing Engines, add Microturbines and a Boiler

This alternative would retire the existing cogeneration facility and replace the engines with three new 250-kW microturbines. A new 5 million BTU/hr boiler would be added to provide additional heat beyond what the microturbines can provide to heat the anaerobic digesters and swimming pool. Typically, natural gas would be purchased for the boiler operations as the microturbines would utilize all of the digester gas. SCAQMD does not require specific emission limits for microturbines; however, Implementation would require installation of a fuel conditioning system to remove all contaminants from the digester gas.

The total project cost is estimated to be $6,188,000.

7.1.6 Alternative 6 - Retire Existing Engines, add Fuel Cells and a Boiler

This alternative would retire the existing cogeneration facility and replace the engines with three new 300-kW fuel cell units. A new 5 million BTU/hr boiler would be added to provide additional heat beyond what the fuel cells can provide to heat the anaerobic digesters and swimming pool. Typically, natural gas would be purchased for the boiler operations. SCAQMD does not require specific emission limits for fuel cells; however, Implementation would require installation of a fuel conditioning system to remove all contaminants from the digester gas.

The total project cost for this alternative is estimated to be $12,846,000.

7.1.7 Economic Analysis

Detailed project cost estimates and 20-year life cycle economic analyses tables are provided in Appendix C. Table 12 provides a summary of the economic analyses for the six alternatives.

The economic analysis of alternatives at the RTP indicate that Alternative 4, replacing the existing cogeneration engine generators with a new 800-kW engine-generator, has the lowest present worth value, while providing a six-year payback period. This alternative takes advantage of the available SGIP grant funding to reduce the capital cost compared to retrofitting the existing engines with SCR.

Alternative 4 is recommended for implementation at the RTP. Gas conditioning, SCR, and CEMS will be required as part of the project. A typical SCR schematic is shown on Figure 2. Figure 3 provides a potential site layout for the new engine-generator and associated equipment around the existing Energy Building. Figure 4 shows an alternate site layout, with the gas conditioning equipment located near the waste gas burners.

The project will allow SOCWA to continue to utilize a cogeneration system to offset the cost of utility power at the RTP. The new engine will provide a higher operating efficiency compared to the existing engine-generators. Reduced maintenance efforts are expected compared to the existing system due to the reduction in installed equipment and the age of the existing equipment.

Table 12 Economic Analysis for Cogeneration Alternatives at RTP
Evaluation of Alternatives for Use of Digester Gas
South Orange County Wastewater Authority

Alternative	No Cogeneration; Boilers Only Facility with New Boilers	Power Purchase Agreement	Existing 400-kW Engine Generator Units with SCR	New 800-kW Engine Generator Unit with New Boiler	750-kW Microturbine System with New Boiler	900-kW Fuel Cell System with New Boiler
Estimated Cogeneration System Project Cost	$992,000	$0	$3,187,000	$4,487,000	$6,188,000	$12,846,000
Estimated SGIP Grant Funding	$0	$0	$0	($2,000,000)	($1,875,000)	($4,860,000)
Estimated Net Project Cost	**$992,000**	**$0**	**$3,187,000**	**$2,487,000**	**$4,313,000**	**$7,986,000**
Present Worth of Energy Costs	$14,951,000	$12,527,000	$7,811,000	$7,765,000	$8,995,000	$9,228,000
Total 20-Year Present Worth Costs	**$15,943,000**	**$12,527,000**	**$10,998,000**	**$10,252,000**	**$13,308,000**	**$17,214,000**
Present Worth of Net Benefit Compared to No Cogeneration System	**-**	**$3,416,000**	**$4,945,000**	**$5,691,000**	**$2,635,000**	**($1,271,000)**
Payback Period of Cogeneration System, years	**-**	**N/A**	**8**	**6**	**14**	**20+**

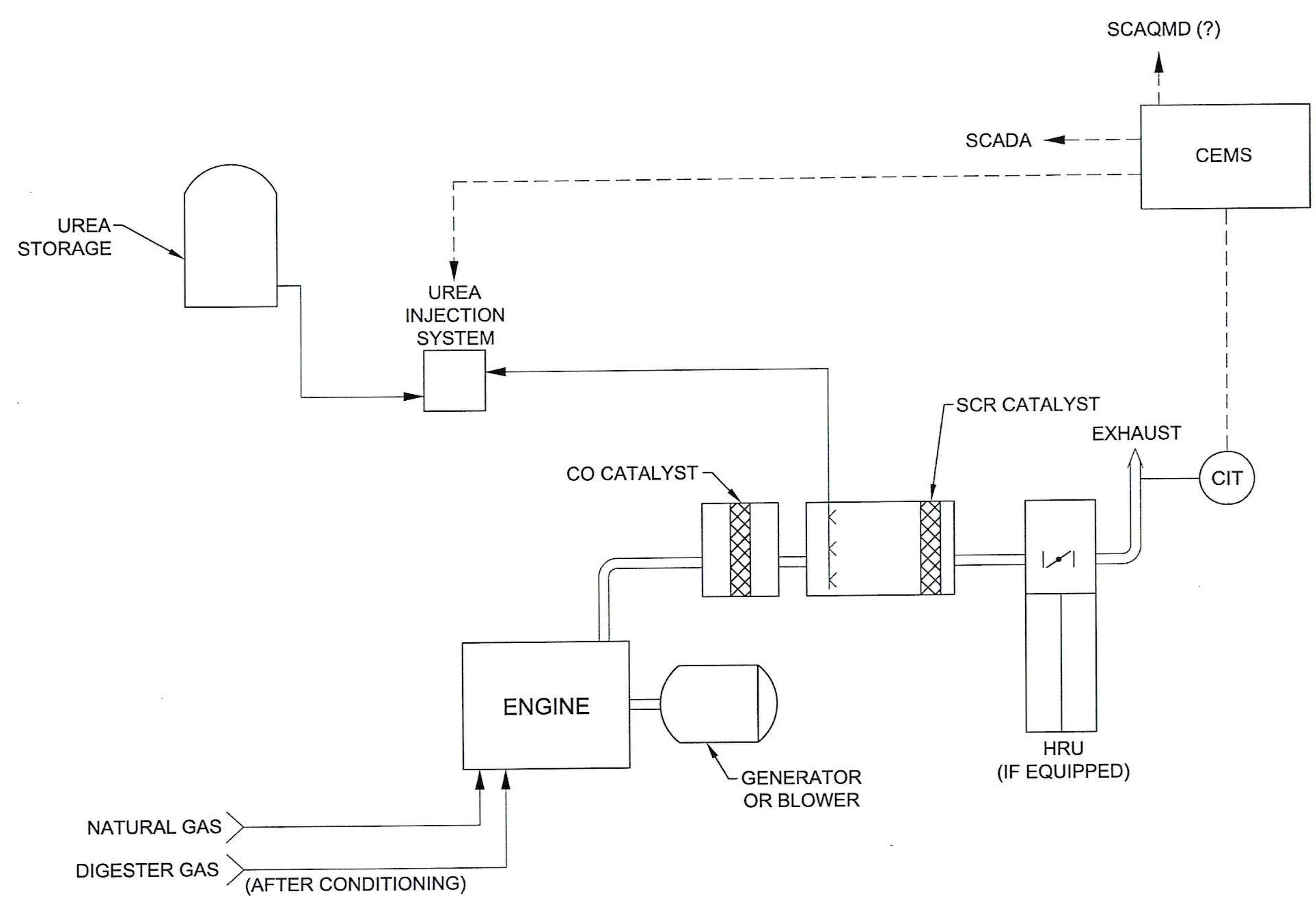
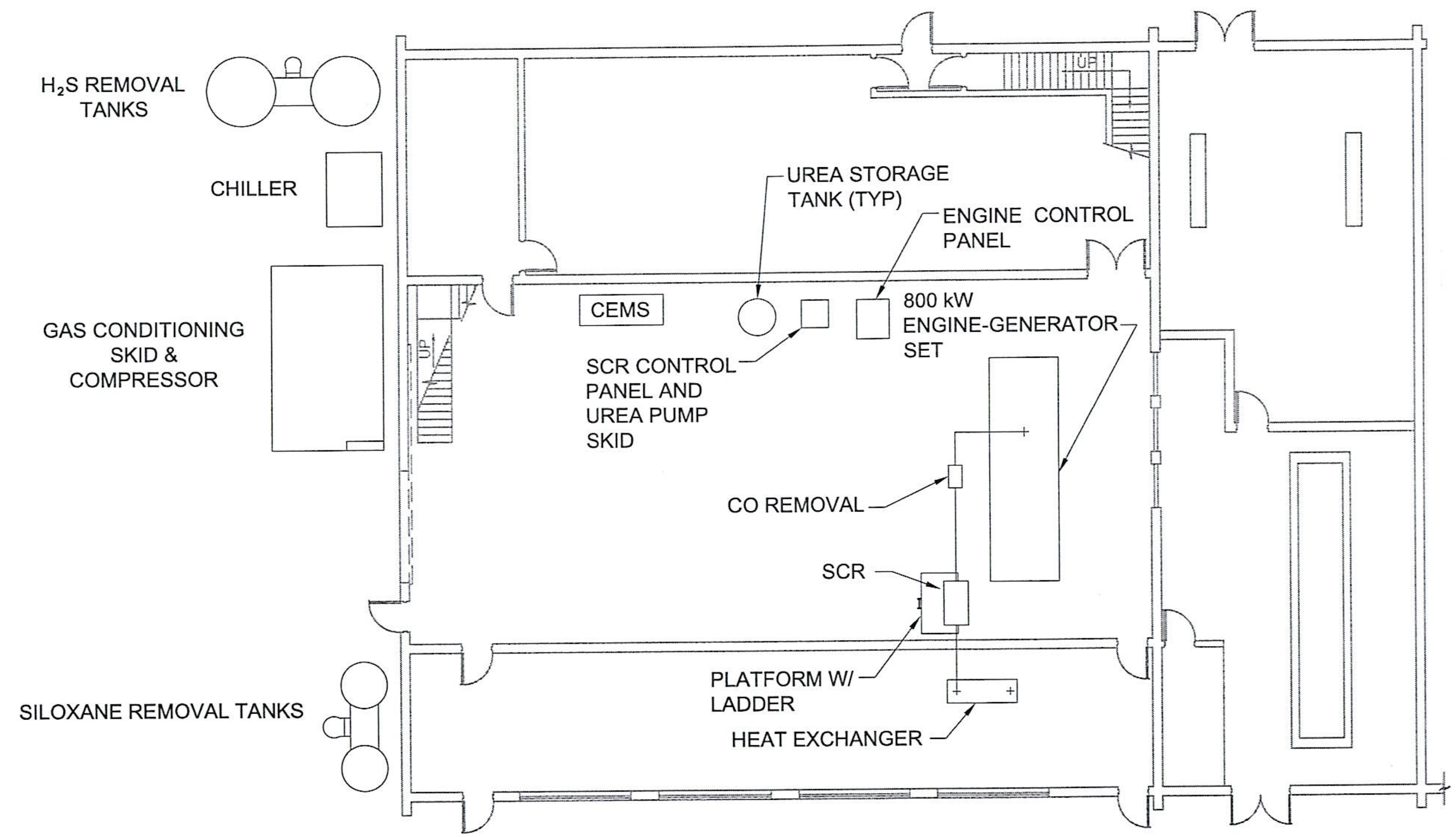


FIGURE 2
SCR & CO Removal Schematic
Evaluation of Alternatives for Use of Digester Gas



ENERGY BUILDING FIRST FLOOR PLAN

SCALE: 3/4" = 1'-0"

GRAPHIC SCALE

SCALE: 3/4" = 1'-0"

FIGURE 3

Regional Treatment Plant
New 800 kW Engine-Generator Site Plan
Evaluation of Alternatives for Use of Digester Gas

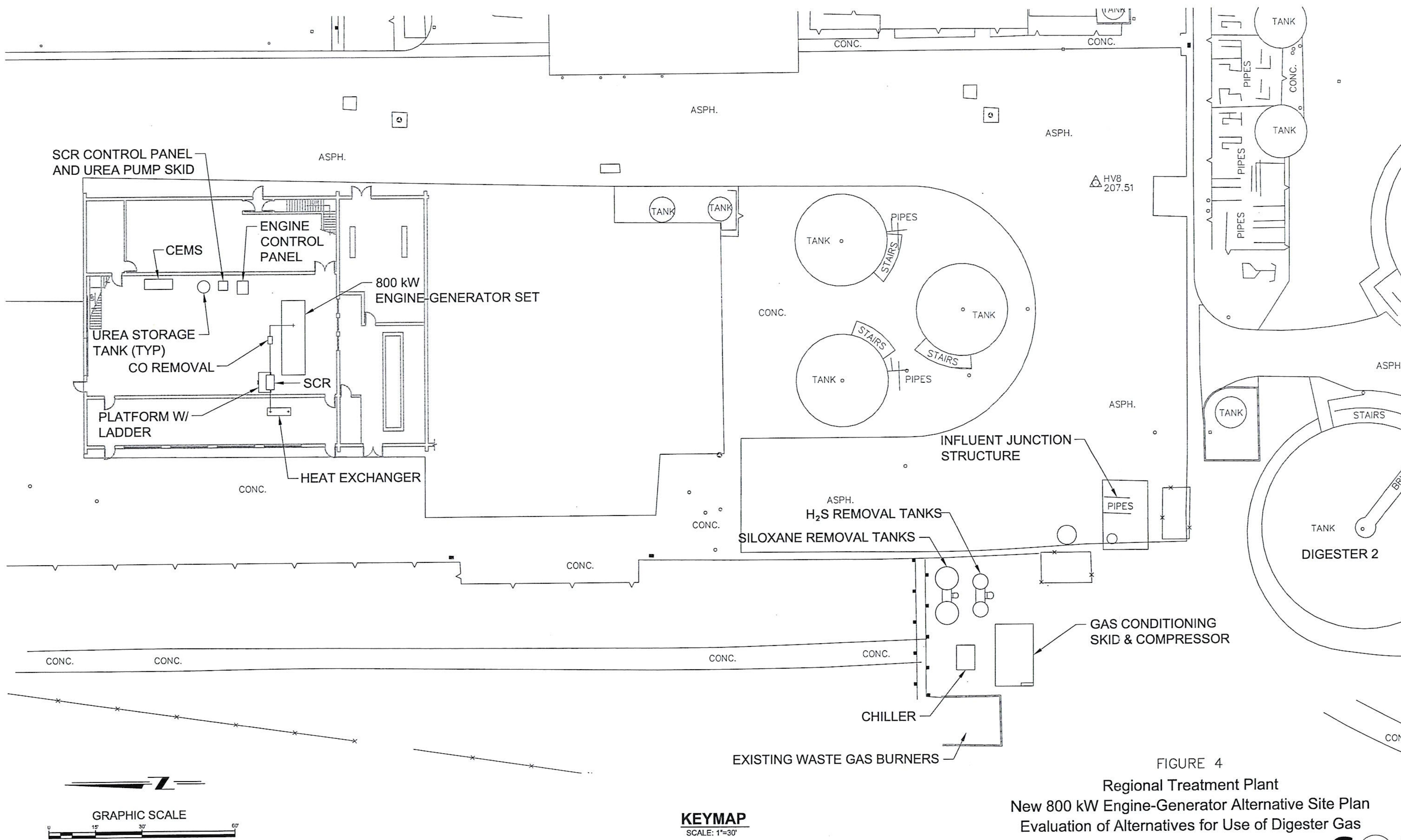


FIGURE 4

Regional Treatment Plant
New 800 kW Engine-Generator Alternative Site Plan
Evaluation of Alternatives for Use of Digester Gas

SOCWA
South Orange County Wastewater Authority
34156 Del Obispo Street • Dana Point, CA 92629

carollo
Engineers...Working Wonders With Water™

7.2 J.B. Latham Treatment Plant Alternatives

Developing alternatives for digester gas use at the JBLTP must consider the interconnected cogeneration and aeration facilities as well as the potential to import solids from Plant 3A. If the existing engine and blower system is abandoned, new high efficiency electrical blowers would be required. If Plant 3A solids are imported, it is likely that CEPT would be implemented to aid and improve solids settling.

Each of the following alternatives has been developed and evaluated for the current operating conditions and for the addition of CEPT plus the import of Plant 3A solids (CEPT + 3A). The addition of CEPT + 3A has the general effect of increasing digester gas production and slightly reducing aeration air demands. Eliminating the use of the engine driven aeration blower will require that electric blowers be utilized, as discussed previously, which will increase electricity demand at the JBLTP.

The Facility Plan recommended replacement of the existing aeration basin air diffusers due to age and condition. Implementing controls to the aeration system was also recommended. The recommendations are carried into this report. Each alternative includes these upgrades and the base cost for these modifications are not included in the analyses that follow. In addition, for options requiring the use of electric blowers, new high efficiency blowers were recommended to replace the existing electric blowers. The effected alternates include this upgrade cost. O&M expenses associated the aeration system modifications including diffusers, control and blowers when appropriate are included in the analyses.

7.2.1 Alternative 1 - Retire Existing Engine

This alternative would retire the existing engine and blower. Digester gas would be used in the existing boilers with excess digester gas being flared. New high-efficiency blowers would be installed along with new diffusers and DO controls.

There is no capital cost associated with abandoning the existing cogeneration system. The estimated project cost for the aeration blower replacement upgrades for this alternative is $622,000.

7.2.2 Alternative 2 – Power Purchase Agreement

This alternative would retire the existing engine-blower cogeneration facility. Aeration upgrades would include new blowers, diffusers and DO controls. SOCWA would contract with a private company to install, own, and operate a new cogeneration facility on-site. SOCWA would allow the facility to utilize all available digester gas. The facility would provide heat to the anaerobic digesters. SOCWA would pay the PPA provider a contracted rate for power over the life of the contract term. The cost is assumed to be 15 percent less than current utility rates, and is expected to have a fixed inflation escalation of 3 percent.

These values are conservative best-case estimates used as a means of developing life cycle costs for the alternative.

There is no capital costs associated with implementing a PPA. The PPA partner would pay equipment installation and all operation and maintenance costs for the new cogeneration facility.

7.2.3 Alternative 3 - Add SCR and CEMS to Existing Engines

This alternative would retrofit the existing engine with SCR and a common CEMS. Implementation would require installation of a fuel conditioning system to remove all contaminants from the digester gas. A common CEMS would be required to control the emissions control devices installed on the existing engine-generators. This alternative would include new diffusers and DO controls. The existing engine driven blower would be replaced/rebuilt in kind. Replacement is warranted considering the age of the equipment. The engine will be rebuilt as required.

The total project cost for this alternative is $2,358,000.

7.2.4 Alternative 4 – Retire Existing Engine and add 633 kW Engine Generator

This alternative would retire the existing engine-blower cogeneration facility and replace the facility with one new 633 kW engine generator. SCR and CEMS would be installed on the new engine. Implementation would require installation of a fuel conditioning system to remove all contaminants from the digester gas. Installing a new high-efficiency engine-generator will allow SOCWA to take advantage of the Self-Generation Incentive Program (SGIP) grant offered through the local utility. The grant would not be available to update the existing engines in Alternative 3. New high-efficiency electric blowers would provide for aeration demands. Natural gas for the existing boilers would be required for a portion of anaerobic digester heat demands.

The total project cost for the cogeneration upgrades is estimated to be $4,720,000.

7.2.5 Alternative 5 - Retire Existing Engine and add Microturbines

This alternative would retire the existing engine-blower cogeneration facility and replace the engine with two new 250-kW microturbines. Typically, natural gas would be purchased for the boiler operations as the microturbines would utilize all of the digester gas while not providing enough heat for the anaerobic digesters. SCAQMD does not require specific emission limits for microturbines; however, Implementation would require installation of a fuel conditioning system to remove all contaminants from the digester gas. New high-efficiency electric blowers would provide for aeration demands.

The total project cost is estimated to be $5,438,000.

7.2.6 Alternative 6 - Retire Existing Engines and add Fuel Cells

This alternative would retire the existing engine-blower cogeneration facility and replace the engine with two new 300-kW fuel cell units. Typically, natural gas would be purchased for the boiler operations. SCAQMD does not require specific emission limits for fuel cells; however, Implementation would require installation of a fuel conditioning system to remove all contaminants from the digester gas. Aeration upgrades would include new blowers, diffusers, and DO control.

The total project cost for this alternative is estimated to be $9,933,000.

7.2.7 Economic Analysis

Detailed project cost estimates and 20-year life cycle economic analyses tables are provided in Appendix D. Table 13 and Table 14 summarize the economic analyses for cogeneration alternatives at the JBLTP. Table 13summarizes the alternatives for the current operating condition. Table 14 summarizes the alternatives with implementation of CEPT and the addition of Plant 3A solids.

The economic analysis of alternatives at the JBLTP indicate that Alternative 4, replacement of the existing engine-blower cogeneration system with a new 633 kW engine-generator, has the lowest present worth value for both the current operations and the CEPT + 3A operating conditions. As a result, SOCWA can implement the cogeneration replacement project independent of the decision regarding CEPT and Plant 3A solids while continuing to pursue the decision of sending Plant 3A solids to the JBLTP without fear of cost impact or other implications to the cogeneration facility.

The economic analysis of alternatives at the JBLTP indicate that Alternative 4, replacement of the existing engine-blower cogeneration system with a new 633 kW engine-generator, has the lowest present worth value for both the current operations and the CEPT + 3A operating conditions. As a result, SOCWA can implement the cogeneration replacement project independent of the decision regarding CEPT and Plant 3A solids while continuing to pursue the decision of sending Plant 3A solids to the JBLTP without fear of cost impact or other implications to the cogeneration facility.

Alternative 4 is recommended for implementation at the JBLTP. Gas conditioning, SCR, and CEMS will be required as part of the project. The facility will install a new engine 633-kW engine generator at JBLTP as shown on Figure 5. This will require installation of new electrical blowers for the aeration air demands in addition to the planned diffuser and DO control upgrades.

Implementing Alternative 4 will allow SOCWA to offset electricity costs at the JBLTP, an advantage similar to the RTP cogeneration facility.

Table 13 Economic Analysis for Cogeneration Alternatives at JBLTP – Current Operations
Evaluation of Alternatives for Use of Digester Gas
South Orange County Wastewater Authority

Alternative	No Cogeneration	Power Purchase Agreement	Existing Engine Blower Cogeneration System	633-kW Engine Generator Cogeneration System	500-kW Microturbine Cogeneration System	600-kW Fuel Cell Cogeneration System
Estimated Cogeneration System Project Cost	$0	$0	$2,358,000	$4,098,000	$4,816,000	$9,311,000
Estimated Aeration Upgrades Project Cost	$2,616,000	$2,616,000	$1,994,000	$2,616,000	$2,616,000	$2,616,000
Estimated SGIP Grant Funding	$0	$0	$0	($1,424,000)	($1,125,000)	($3,078,000)
Estimated Net Project Cost	**$2,616,000**	**$2,616,000**	**$4,352,000**	**$5,290,000**	**$6,307,000**	$8,849,000
Present Worth of Energy Costs	$12,711,000	$11,564,000	$12,136,000	$6,899,000	$8,374,000	$8,058,000
Total 20-Year Present Worth Costs[(1)]	**$16,813,000**	**$15,666,000**	**$17,974,000**	**$13,675,000**	**$16,167,000**	**$118,393,000**
Present Worth of Net Benefit Compared to No Cogeneration System	-	**$1,147,000**	**($1,161,000)**	**$3,138,000**	**$646,000**	**($1,580,000)**
Payback Period of Cogeneration System, years	-	**N/A**	**20+**	**8**	**16**	**20+**

Notes:
(1) Total 20-Year Present Worth Cost includes annual costs for chemical usage associated with current or CEPT operations and a zero dollar line item for the potential annual savings at Plant 3A for ceasing solids handling at the plant. Refer to Appendix D.

Table 14 Economic Analysis for Cogeneration Alternatives at JBLTP – CEPT + 3A
Evaluation of Alternatives for Use of Digester Gas
South Orange County Wastewater Authority

Alternative	No Cogeneration	Power Purchase Agreement	Existing Engine Blower Cogeneration System	633 kW Engine Generator Cogeneration System	500 kW Microturbine Cogeneration System	600 kW Fuel Cell Cogeneration System
Estimated Cogeneration System Project Cost	$0	$0	$2,358,000	$4,098,000	$4,816,000	$9,311,000
Estimated Aeration Upgrades Project Cost	$2,616,000	$2,616,000	$1,994,000	$2,616,000	$2,616,000	$2,616,000
Estimated CEPT-3A Upgrades Project Cost	$353,500	$353,500	$353,500	$353,500	$353,500	$353,500
Estimated SGIP Grant Funding	$0	$0	$0	($1,424,000)	($1,188,000)	($3,078,000)
Estimated Net Project Cost	**$2,969,500**	**$2,969,500**	**$4,705,500**	**$5,643,500**	**$6,597,500**	**$9,202,500**
Present Worth of Energy Costs	**$12,427,000**	$10,257,000	$12,136,000	$5,318,000	$6,499,000	$6,514,000
Total 20-Year Present Worth Costs[(1)]	**$18,252,000**	$16,082,000	$19,697,000	$13,817,000	$15,952,000	$18,572,000
Present Worth of Net Benefit Compared to No Cogeneration System	-	$2,170,000	($1,445,000)	$4,435,000	$2,300,000	($320,000)
Payback Period of Cogeneration System, years	-	N/A	20+	7	12	20+

Notes:
(1) Total 20-Year Present Worth Cost includes annual costs for chemical usage associated with current or CEPT operations and a zero dollar line item for the potential annual savings at Plant 3A for ceasing solids handling at the plant. Refer to Appendix D.

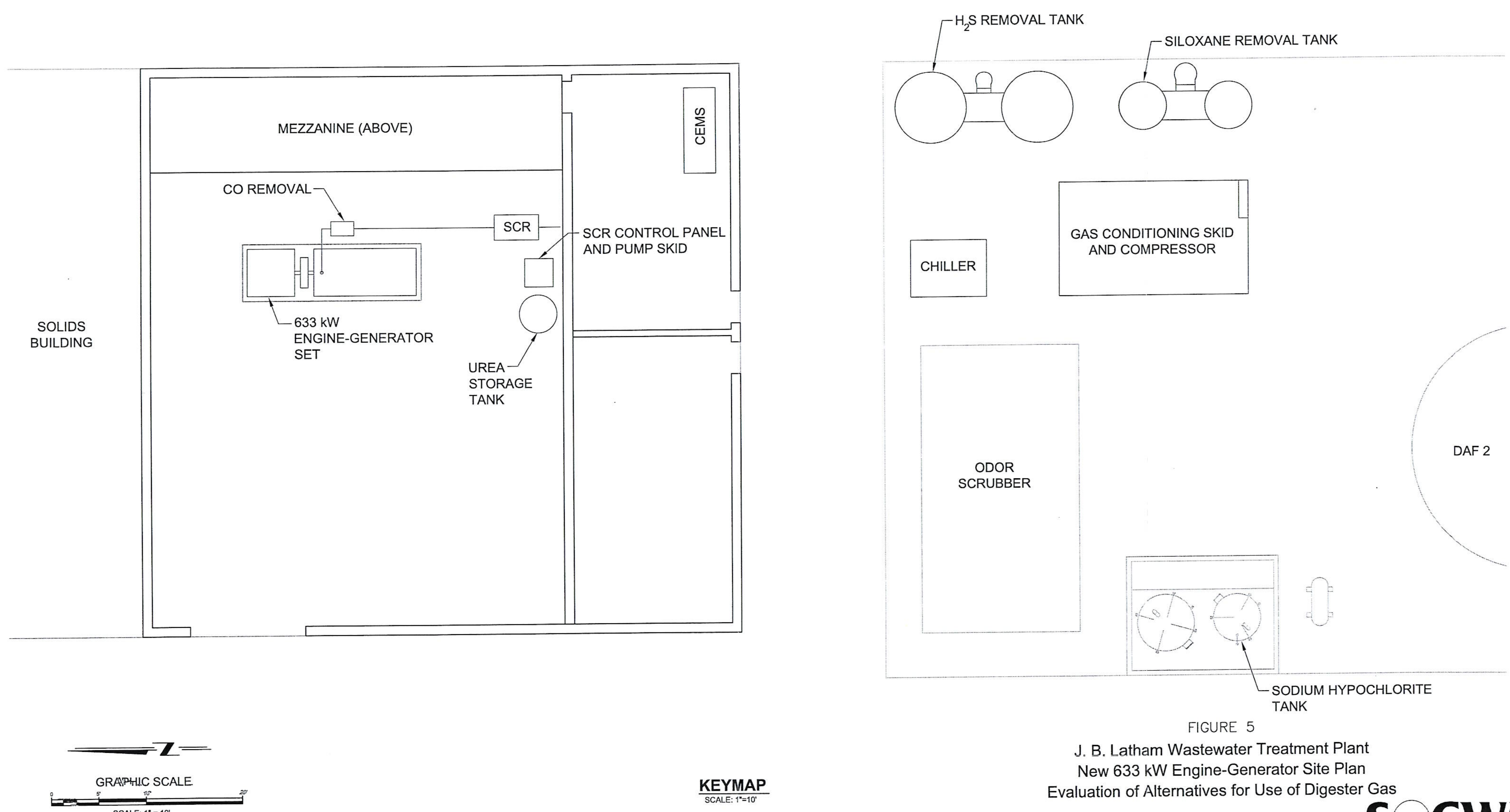


FIGURE 5

J. B. Latham Wastewater Treatment Plant
New 633 kW Engine-Generator Site Plan
Evaluation of Alternatives for Use of Digester Gas

carollo
Engineers...Working Wonders With Water™

SOCWA
South Orange County Wastewater Authority
34156 Del Obispo Street • Dana Point, CA 92629

Additional study is recommended to determine the appropriateness of CEPT + 3A modifications and on selection of equipment and control strategies for the aeration upgrades as recommended by the Facility Plan.

Discharge of Plant 3A Sludge to Oso-Trabuco Sewer

SOCWA owns and operates the Plant 3A wastewater treatment plant, located approximately 8 miles northeast of the RTP. Plant 3A has an average influent flow of approximately 2.5 million gallons per day and maintains a solids handling facility with digestion and dewatering facilities. Solids handling at the plant is cumbersome and requires special roll-off bins for storage of dewatered cake. Using the roll-off bins increases the O&M. The disposal cost for the bins is higher as compared to typical trailer storage. SOCWA recently expressed interest in evaluating the feasibility of discharging Plant 3A solids back into the sewer system through the Oso-Trabuco Interceptor (Oso). The solids would be conveyed in Oso to JBLTP for final disposal.

The Facility Plan reviewed the ability of the JBLTP to process the solids. The final recommendations concluded that while there is hydraulic capacity at JBLTP and CEPT should be provided to improve solids settling in the primary clarifiers. Construction of Digester No. 5 was recommended to maintain production of Class B solids. The report did not evaluate the sewer capacity for addition of the solids flow.

As a part of this project, Carollo was tasked with evaluating the available capacity of the Oso interceptor to determine whether there is enough capacity to convey solids from Plant 3A to JBLTP. This evaluation is meant to represent the potential capacity for adding

Plant 3A solids only, and not to be an evaluation of the interceptor's ability to handle additional flows attributed to population growth or land development. If significant land development or population growth is proposed, additional hydraulic analysis should be performed.

7.3 Background

The Oso Interceptor begins at Plant 3A and terminates at the JBLTP. Construction of the Oso occurred in two phases. Phase 1 construction on the Oso began in 1971 with a 6.6-mile section between Plant 3A to just southeast of the intersection of Camino Del Avion and Alipaz Street. In 1976, Phase 2 extended the Oso alongside the San Juan Creek Channel to connect to the JBLTP, an addition of approximately 1.7 miles. This phase included construction of a diversion structure just upstream of the JBLTP (described below). Additional relocation and diversion projects on the Oso interceptor have been completed since its initial installation, including a 1994 relocation of a portion of the interceptor to allow construction of the San Joaquin Toll Road 5 (Highway 73), and construction of a new Trabuco Creek North Siphon in 1983.

The Oso Interceptor is a gravity pipeline that is constructed primarily of vitrified clay pipe (VCP) and reinforced concrete pipe (RCP). Pipeline diameters in the gravity flow sections of the interceptor range in size from 30 inches to 48 inches. The trunk also includes two siphons, the Trabuco Creek North and South Siphons, to divert flow under Trabuco Creek. Siphon pipeline diameters range from 18 inches to 30 inches.

Flow from the Oso Interceptor enters a diversion structure prior to entering the JBLTP East Plant (Plant 1). Flow from the City of San Juan Capistrano also enters the diversion structure a JBLTP from a San Juan Capistrano owned and maintained sewer collection system.

7.4 Service Area

The Oso Interceptor provides collection and transport of wastewater from primarily residential and some commercial development within the Santa Margarita Water District (SMWD) and the Moulton Niguel Water District (MNWD). Both districts are member agencies of SOCWA. The Oso Interceptor also receives flow from the City of San Juan Capistrano (San Juan Capistrano) at the diversion structure upstream of the JBLTP. Figure 1 shows the location of the Oso Interceptor and the service areas from SMWD, MNWD, and San Juan Capistrano.

The Oso Interceptor receives wastewater flow from the SMWD via two connection points upstream of Plant 3A, but downstream of the SMWD Oso Creek Water Reclamation Facility (OCWRF). The total service area from the SMWD was estimated to be 1,284 acres. Flow from the SMWD also includes waste solids from the OCWRF. Flows from the SMWD can be diverted to Plant 3A if required, but flow is most often diverted to bypass Plant 3A for treatment at the JBLTP.

Flows from MNWD enter the sewer downstream of Plant 3A. Between Plant 3A and the JBLTP, six connections from the MNWD to the Oso Interceptor were identified. For the six service connections, the total MNWD service area that utilizes the Oso for sewage disposal was estimated to be 1,619 acres.

Wastewater flow from San Juan Capistrano is collected at the diversion structure upstream of the JBLTP. The total service area for the City was assumed based on values provided in the San Juan Capistrano Sanitary Sewer System Master Plan, an area of 3,245 acres. Table 15 provides a summary of the service areas by connection location. Figure 6 shows the service area connections by the location number as described in Table 15.

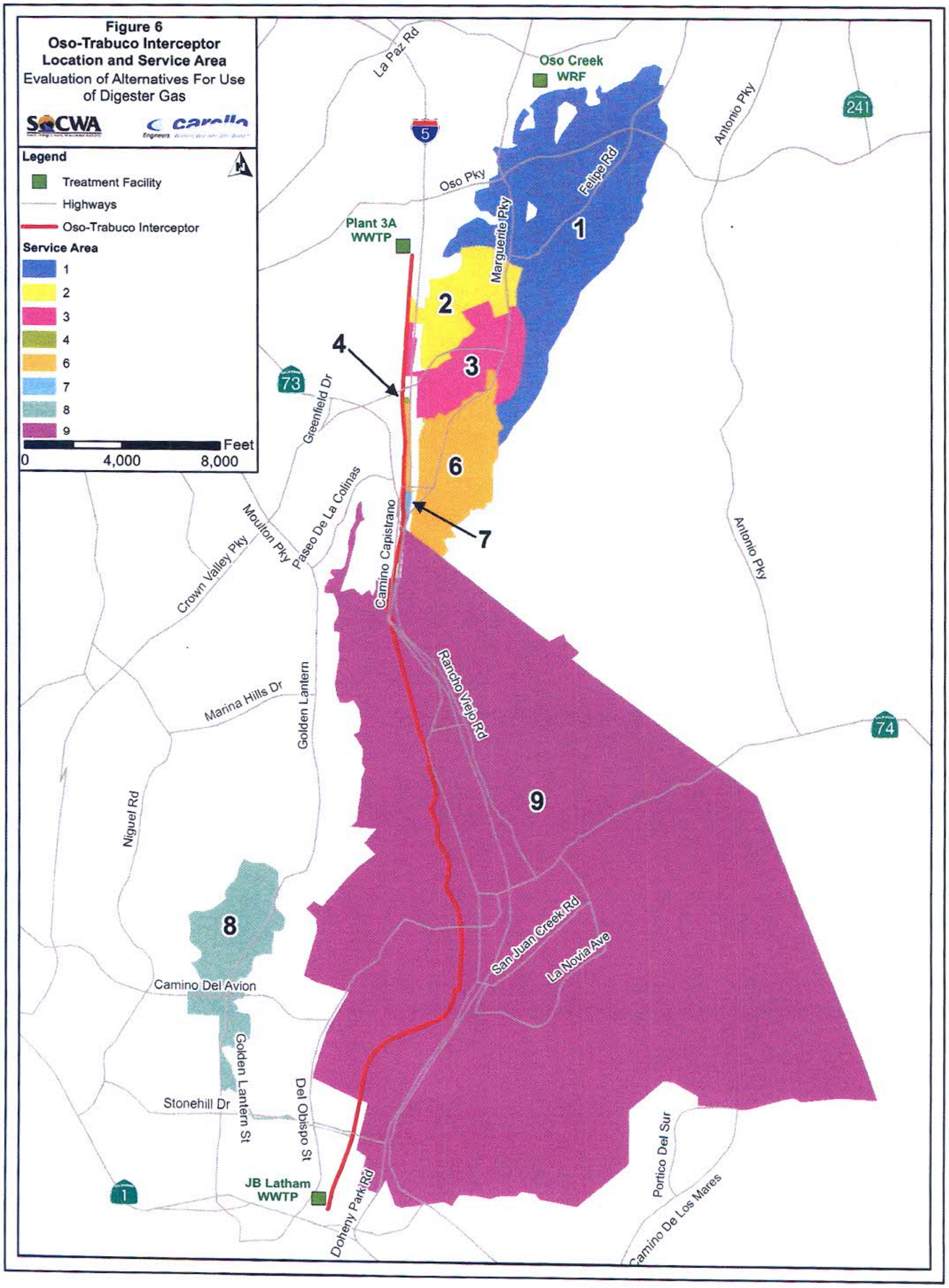


Figure 6
Oso-Trabuco Interceptor Location and Service Area
Evaluation of Alternatives For Use of Digester Gas

Table 15	Service Areas for the Oso-Trabuco Interceptor Evaluation of Alternatives for Use of Digester Gas South Orange County Wastewater Authority	
	Connection Location	**Service Area (acres)**
Santa Margarita Water District		
1	Along trunkline connecting SMWD Oso Creek Water Reclamation Facility to Plant 3A	1283.8
Moulton Niguel Water District		
2	Camino Capistrano, east of Rapid Falls Road	266.4
3	Camino Capistrano, east of Getty Drive	296.4
4	Camino Capistrano, just south of Crown Valley Pkwy	1.9
5	Intersection of Camino Capistrano and Avery Pkwy	428.6
6	Camino Capistrano, due east of the Star Drive cul-de-sac	190.8
7	Just north of virtual intersection of Camino Capistrano and Via Escolar	5.8
8	Stonehill Drive	429.5
	Subtotal	**1,619.4**
San Juan Capistrano		
9	Diversion structure upstream of JBLTP	3,245.0
	Total	**7,767.6**

Notes:
(1) Source: Connection points and service areas were determined based on a review of as-built drawings and sectional maps, provided by SOCWA, MNWD, and SMWD.
(2) Source: Wastewater service area for the City of San Juan Capistrano was provided in the San Juan Capistrano Sanitary Sewer System Master Plan.

Information related to the existing service area of the Oso Interceptor was used to perform the capacity evaluation of the Oso, described below. However, the service areas above and the capacity assessment represent existing development and flow conditions only. Future increased flows due to population growth or new development were not included in the capacity evaluation. If wastewater flows are expected to increase from these connections due to population growth or land development, additional hydraulic capacity analysis should be performed.

7.5 Wastewater Design Flows

This section summarizes the flow monitoring data collected and analyzed to perform the analysis with the hydraulic model. Once dry and wet weather flows in the Oso Interceptor were characterized, design peak wet weather flows were developed for use in the capacity evaluation. This section presents the method for development of the design flows leading to calibration and evaluation using the hydraulic model.

7.5.1 Flow Monitoring Data

Data from several different flow monitoring events was used to develop the design flows for the hydraulic model. When developing design flows based on flow monitoring data, it is preferable for the flow monitoring period to be the same for all flowmeters. Data from within the same flow monitoring period is ideal because it allows for the direct comparison of measured flow rates, velocities, water levels, and intensity and duration of rainfall events for a particular collection system. By using data from several different flow monitoring studies, conducted under variable flow and weather conditions, inherent error is introduced in the correlation of these flows between metered results. The flow monitoring data used to develop design flows for this capacity assessment does not represent an exhaustive list of all available monitoring data, but does present the best available data for flowmeter correlation and calibration of the hydraulic model.

Overall, there were four metering locations where historical flow data was available. This flow monitoring data was used in various capacities to develop design flows for the capacity assessment and to perform calibration of the model. The sewer flow monitoring locations are summarized in Table 16, and shown on Figure 7. The flowmeter pipeline diameters and available periods of flow monitoring data are also included.

Table 16 Flowmeter Locations and Flow Monitoring Data Used to Develop Design Flows
Evaluation of Alternatives for Use of Digester Gas
South Orange County Wastewater Authority

Site No.	Meter Name	Location	Pipe Dia.	Flow Monitoring Data
1	SMWD27	Upstream of Plant 3A	27"	• February 10 - May 4, 1999
2	Camino-Cap33	Near virtual intersection of Camino Capistrano and Via Escolar	33"	• January 14 - May 5, 1999
3	SJC	Upstream of the diversion structure, along San Juan Capistrano influent trunkline	21"	• February 18-21, 2003 and February 25, 2003
4	JBLTP	Downstream of the diversion structure going into Plant 1 of the JBLTP	42"	• January 7-31, 2005 • December 15-16, 2008 • May 8 - May 9, 2010 • Daily average and peak flows between 2005 and 2009

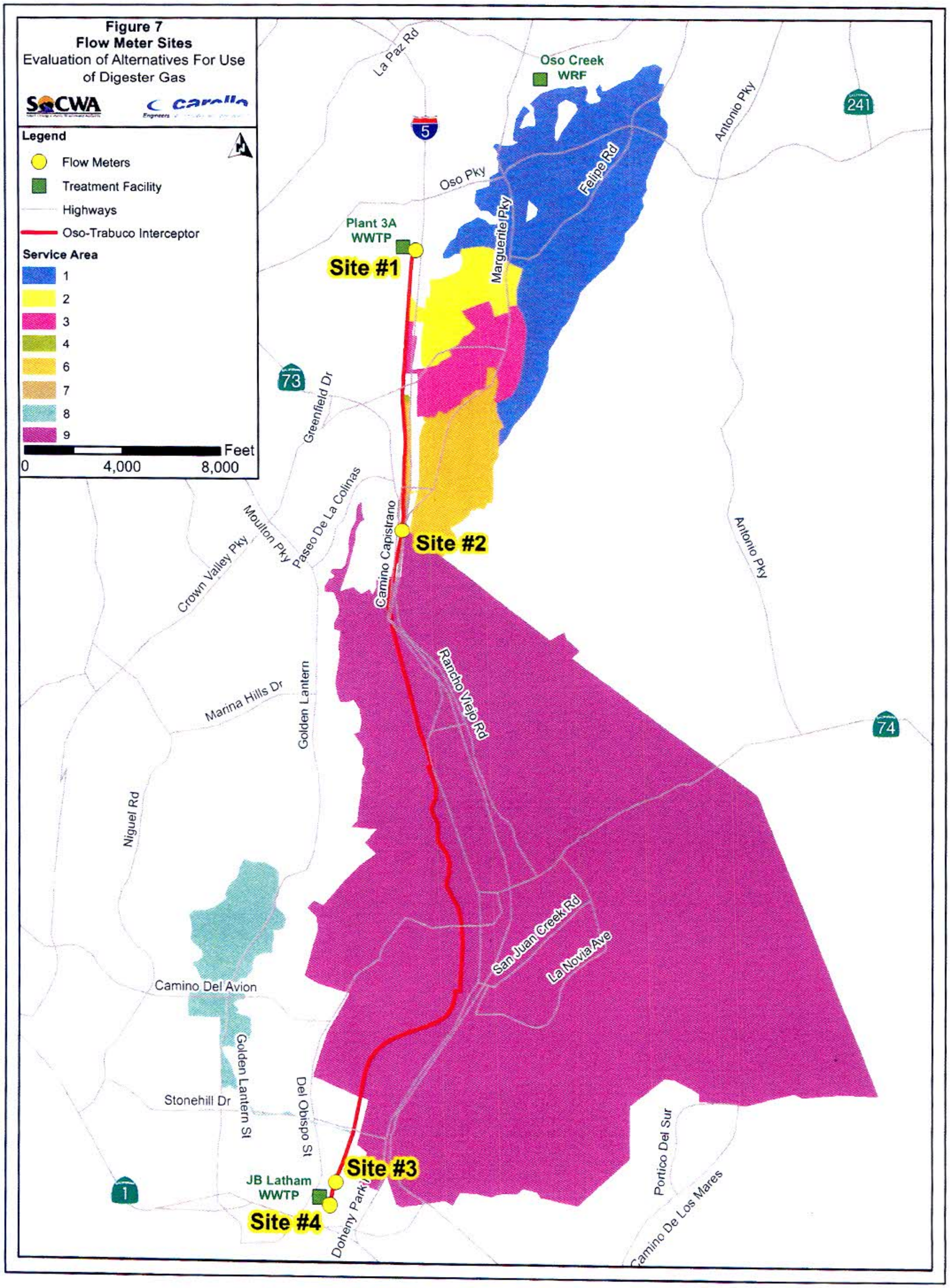


Figure 7
Flow Meter Sites
Evaluation of Alternatives For Use of Digester Gas
SOCWA
Carollo
Legend
Flow Meters
Treatment Facility
Highways
Oso-Trabuco Interceptor
Service Area
1
2
3
4
6
7
8
9
Feet
0
4,000
8,000
La Paz Rd
Oso Creek WRF
5
241
Antonio Pky
Oso Pky
Felipe Rd
Marguerite Pky
Plant 3A WWTP
Site #1
73
Greenfield Dr
Paseo De La Colinas
Moulton Pky
Camino Capistrano
Site #2
Antonio Pky
Crown Valley Pky
Rancho Viejo Rd
Marina Hills Dr
Golden Lantern
74
Niguel Rd
San Juan Creek Rd
La Novia Ave
Camino Del Avion
Golden Lantern St
Stonehill Dr
Del Obispo St
Site #3
JB Latham WWTP
Site #4
1
Doheny Park
Portico Del Sur
Camino De Los Mares

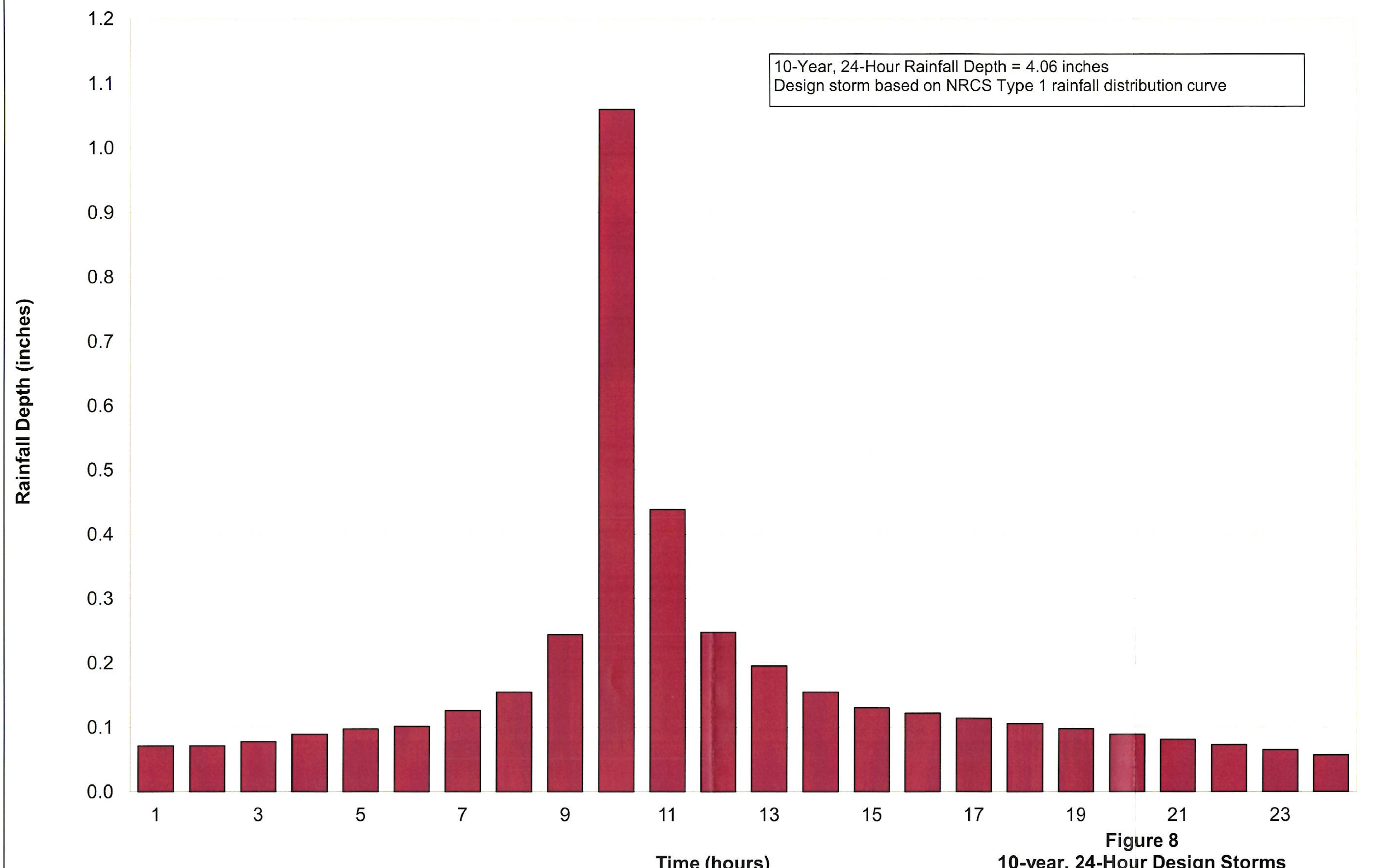


Figure 8
10-year, 24-Hour Design Storms
Evaluation of Alternatives for Use of Digester Gas
South Orange County Wastewater Authority

7.5.2 Dry Weather Flow

The average dry weather flow (ADWF) is typically defined as the average flow that occurs on a daily basis during the dry weather season. The ADWF includes the base wastewater flow generated by the City's residential, commercial, and industrial users, plus the dry weather groundwater infiltration component.

Most of the metered flow data available for analysis was available in 30-minute or 1-hour intervals. Based on these flow intervals, characteristic dry weather 24-hour diurnal flow patterns for each site were developed. This hourly flow data was then used to calibrate the hydraulic model for the observed dry weather flows during the flow monitoring periods for each meter.

Hourly patterns for weekday and weekend flows vary, and therefore it is preferable to separate weekday and weekend flows to more accurately characterize dry weather flow patterns. Separate weekday/weekend data was available for meters SMWD27 and CaminoCap33; therefore, a dry weather calibration for weekday and weekend flows was possible. However, separate flow data for the weekday/weekend condition was not available for the SJC and JBLTP flowmeters. For flowmeter SJC, only weekday data was available for use in analysis, while weekend flow data was utilized for the JBLTP. Therefore, for the SJC and JBLTP flowmeters, the available measured flows were applied to the missing flow component (weekday or weekend). While this assumption does introduce a source of incongruity for calibration, the difference, for the scope of this analysis, was minor and the percent error was still within the acceptable range for model-simulated accuracy. Additional discussion on model calibration is provided in later sections of this TM.

Appendix E contains data and graphical representations of the diurnal patterns and dry weather flow analysis for the four meter sites. For reference, the total ADWF entering the JBLTP was determined to be approximately 8.28 millions gallons per day (MGD).

7.5.3 Wet Weather Flow

Wet weather flows are characterized as the dry weather flows plus an infiltration and inflow component that occurs during and after storm events. In general, monitored flow rates during and after rainfall events can be compared to anticipated dry weather flows to determine the amount of infiltration and inflow (I/I) into the system. Infiltration is typically defined as storm water that enters the sewer system by percolating through the soil and then through defects in pipelines, manholes, and joints. Inflow is considered storm water that enters the sewer system via a storm drain cross connections, leaky manhole covers, or cleanouts.

The flow monitoring data for each flowmeter was evaluated in conjunction with historical rainfall data to determine how the collection system responded to wet weather events and to characterize the extent of I/I into the collection system. I/I parameters were developed for each flowmeter tributary for use in the hydraulic model to predict I/I during peak wet weather flows (used in capacity evaluations). By using historical rainfall data and correlating it to an I/I response, appropriate I/I parameters were determined and utilized to simulate wet weather flows in the hydraulic model.

7.5.3.1 Rainfall Data

Four significant rainfall events were used to quantify the I/I in the Oso Interceptor service area. Since the flow monitoring periods for each meter took place at different times, the rainfall events corresponding to the flow monitoring period also varied. Based on the available data in a few cases, corresponding rainfall data was provided with the flow monitoring data. When rainfall data was not provided but flow monitoring took place over the course of a storm event, historical rainfall data was retrieved online from either Wunderground.com or the California Irrigation Management Information System (CIMIS).

In order to establish a benchmark of system response to varying storm depths and intensities, it is important to classify the relative size of the major storm events that occur over the course of the flow monitoring period. Based on historical data, the National Oceanic and Atmospheric Administration (NOAA) developed frequency contour maps for given intensity and duration storm events for all areas within the Continental United States. The NOAA Rainfall Atlas Maps classify a 10-year, 24-hour storm event in Laguna Hills (City in which Plant 3A is located) as 4.06 inches in a 24-hour period. This means that in any given year, there is a 10 percent chance that 4.06 inches of rain will fall in any 24-hour period.

Table 17 provides a summary of the storm events used to determine I/I in the Oso Interceptor service area. Of the five rainfall events that occurred, two of the storms had a magnitude great enough to be classified by the NOAA. In particular, the event measured on February 25, 2003 for the San Juan Capistrano sewer basin was a 10-year event, while the January 7, 2005 event for the JBLTP basin was a 2-year event. The classification of these storms is significant because it provides a better understanding and approximation of the I/I response of the collection system for that area. The significance of the rainfall events provides added confidence that the model simulations of I/I are accurate to the extent feasible. Appendix E contains a summary and graphical representation of the wet weather flow analysis for each of the four flowmeters utilizing the storm events in Table 17.

Table 17 Storm Event Summary
Evaluation of Alternatives for Use of Digester Gas
South Orange County Wastewater Authority

Flowmeter	Storm Date	Total Rainfall (in)	Peak Intensity (in/hr)	Storm Duration (hr)	Rainfall Event Classification
SMWD27	April 11, 1999	0.81	0.15	11	<2-Year
CaminoCap33	April 11, 1999	0.81	0.15	11	<2-Year

Table 17	Storm Event Summary Evaluation of Alternatives for Use of Digester Gas South Orange County Wastewater Authority				
Flowmeter	**Storm Date**	**Total Rainfall (in)**	**Peak Intensity (in/hr)**	**Storm Duration (hr)**	**Rainfall Event Classification**
SJC	February 25, 2003	3.49	0.95	24	10-Yr, 17-Hr
JBLTP					
Storm A	December 15, 2008	1.50	0.24	21	<2-year
Storm B	January 7, 2005	5.77	0.5	96	2-Yr, 24-Hr

7.5.4 Peak Wet Weather Flow (Design Flow)

Peak wet weather flow (PWWF) is the highest observed hourly flow that occurs following the design storm event. The PWWF is particularly useful because it corresponds to elevated wet weather I/I due to increased flows in the collection system. Therefore, PWWF is typically used for performing capacity evaluations and designing sewers and lift stations. The PWWF was used as the design flow in this study, and represents the peak flows with which the Oso Interceptor capacity assessment was performed.

7.5.4.1 Design Storm

While historic rainfall events were utilized to determine the I/I parameters for each flowmeter tributary, a synthetic design storm was used to evaluate I/I response for PWWF conditions. The following section describes how the design storm is created.

Developing a design storm can be accomplished two ways. If hourly rainfall data is not available for a historical design storm event, a synthetic design storm can be used. The NOAA Atlas 14 isopluvial (rainfall total contours) map of California is used to approximate the total depth for the 10-year, 24-hour design storm. NOAA Atlas 14 serves as the industry standard for determining total rainfall depth at specified frequencies and durations in Central and Northern California. The NOAA Rainfall Atlas Maps classify a 10-year, 24-hour storm event in Laguna Hills (City in which Plant 3A is located) as 4.06 inches in a 24-hour period.

The Natural Resources Conservation Service (NRCS), formally known as the Soil Conservation Service (SCS), developed normalized rainfall hyetograph distribution curves based on the storm's geographical location. The distribution curves are applied to total storm event volumes in order to develop hourly storm event hyetographs. There are four types of rainfall distributions used to represent various regions throughout the United States (Type I, IA, II, and III). Types I and IA represent the Pacific maritime climate with wet winters and dry summers; the Oso interceptor lies geographically within the Type 1 boundary. Therefore, applying the 10-year, 24-hour intensity of 4.06 inches to the Type 1 distribution curve provides the design storm used for PWWF and capacity evaluation purposes. The design storm developed using the NRCS method is shown on Figure 8.

Flow Monitoring Site SMWD27
Wet Weather Flow Calibration: April 10-13, 1999

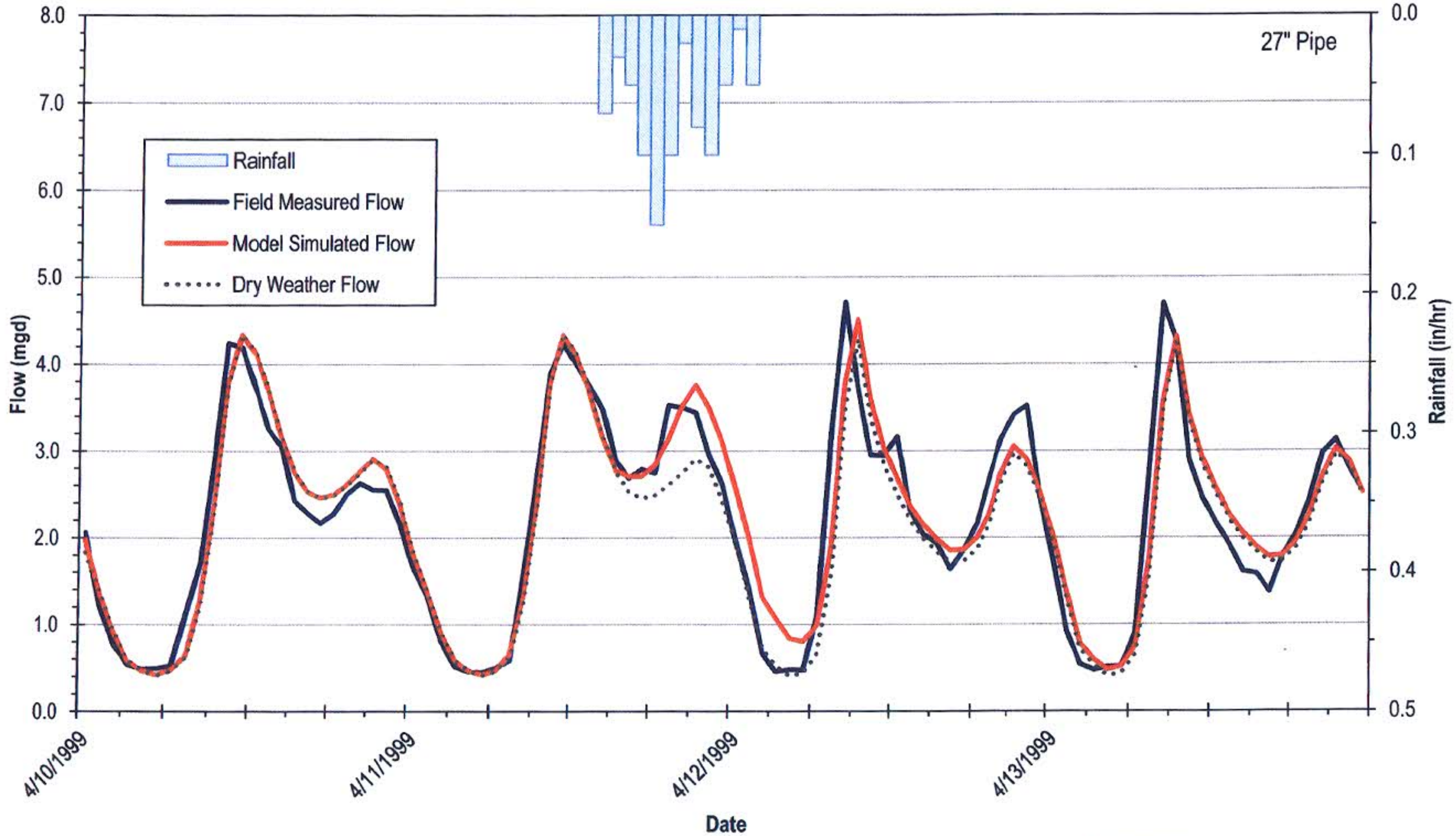


Figure 10
Wet Weather Flow Calibration of Flow Meter SMWD27
Evaluation of Alternatives for Use of Digester Gas
South Orange County Wastewater Authority

7.6 Sewer System Hydraulic Model

The following section describes the hydraulic model software, components, and calibration used to evaluate the capacity of the Oso interceptor.

7.6.1 Model Software

H_2OMAP SWMM®, by MWH Soft®, was used to assemble the hydraulic model of the Oso Interceptor. H_2OMAP SWMM® is a fully dynamic, stand alone, wastewater, and storm water modeling software application. The hydraulic modeling engine for the H_2OMAP SWMM® software package uses the Environmental Protection Agency's (EPA) Storm Water Management Model (SWMM), which is widely used throughout the world for planning, analysis, and design related to stormwater runoff, combined sewers, sanitary sewers, and other drainage systems. Version 9.0 of H_2OMAP SWMM® was used to assemble the hydraulic model.

7.6.2 Model Components

The entire length of the Oso-Trabuco interceptor, from its beginning at Plant 3A to its end at the JBLTP, was included in the hydraulic model. Additional pipelines included in the model included a short segment of the 27-inch pipeline on which meter SMWD27 was located (modeled as an influent pipeline to the Oso at its northernmost end), and the 21-inch to 30-inch pipeline from San Juan Capistrano connecting at the diversion structure. The elements included in the hydraulic model included the following:

- **Junctions.** Sewer manholes, cleanouts, as well as other locations where pipe sizes change or where pipelines intersect are represented by junctions in the hydraulic model. Required inputs for junctions include rim elevation, invert elevation, and surcharge depth (used to represent pressurized systems, such as siphons).
- **Pipes.** Gravity sewers and force mains are represented as pipes in the hydraulic model. Input parameters for pipes include length, friction factor (e.g., Manning's n for gravity mains, Hazen Williams C for force mains), invert elevations, diameter, and whether or not the pipe is a force main.
- **Outfalls.** Outfalls represent areas where flow leaves the system. For sewer system modeling, an outfall typically represents the connection to the influent pump station at a WWTP.
- **Rain Gauges.** Rain gauges are input into the hydraulic model to simulate historical or theoretical hourly rainfall events.
- **Inflows.** The following are the two types of inflow sources that were utilized in the hydraulic model:
  - <u>Dry Weather</u>: Dry weather inflows simulate base sanitary wastewater flows and represent the average flow. The dry weather flows can be multiplied by up to four

patterns that vary the flow by month, day, hour, and day of the week (e.g., weekday or weekend). The dry weather diurnal patterns are adjusted during the dry weather calibration process.

- RDII: Rainfall Derived Infiltration and Inflows (RDII) are applied in the model by assigning a unit hydrograph and a corresponding tributary area to a given junction. The unit hydrographs consists of several parameters that are used to adjust the volume of RDII that enters the system at a given location. These parameters are adjusted during the wet weather calibration process.

7.7 Model Calibration

For this project, both dry and wet weather flow monitoring were conducted. Dry weather flow (DWF) calibration ensures an accurate depiction of base wastewater flow generated within the study area. The wet weather flow (WWF) calibration consists of calibrating the hydraulic model to a specific storm event or events to accurately simulate the peak and volume of infiltration/inflow (I/I) into the sewer system. The amount of I/I is essentially the difference between the WWF and DWF components.

7.7.1 Dry Weather Flow Calibration

The DWF calibration consists of several elements: 1) dividing the sewer system into areas tributary to each of the flowmeter stations; 2) defining the flow volumes within each area; and 3) creating diurnal patterns to match the temporal distribution of flow. The diurnal curve is a pattern of hourly multipliers that are applied to the baseflow to simulate the variation in flow that occurs throughout the day.

The first step in the calibration process was to divide the Oso service area into flowmeter tributary areas. Four tributary areas were created, one for each flowmeter. The next step was to define the flow volumes within each area. Flow loading was accomplished by applying the measured dry weather flows to the nodes where inflow connections occurred proportionately by inflow area. Therefore, connections served by larger service areas were attributed a majority of the flow, while connections served by smaller service areas were attributed less flow.

If available, two diurnal curves based on the flow monitoring data were created for nodes tributary to a specific flowmeter, one representing weekday flows, and the other representing weekend flows. As described previously, a single diurnal was applied to both the weekday and weekend condition for the SJC and JBLTP flowmeters based on available data.

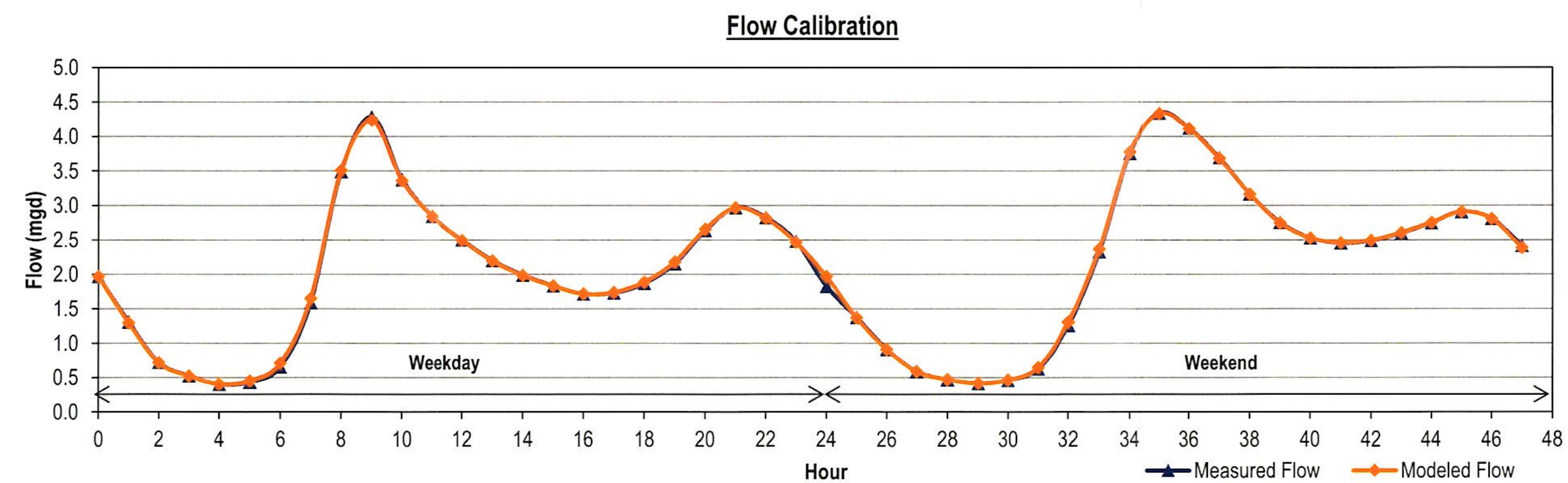
A sample of the DWF calibration for SMWD27 is presented on Figure 9, which includes the weekday and weekend diurnal curves for the area tributary. This figure shows the measured flow at the meter versus the model predicted flows for both weekday and weekend periods. The remaining DWF calibration plots are provided in Appendix E.

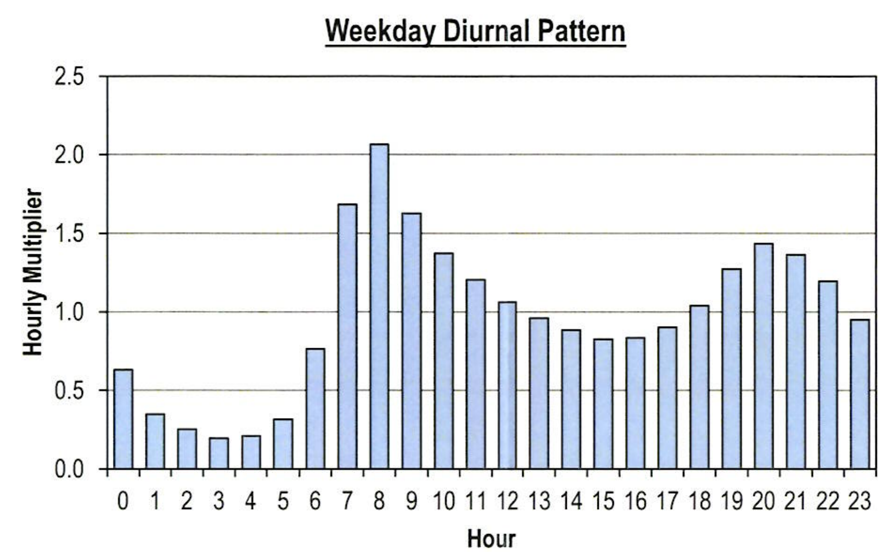
South Orange County Wastewater Authority

FLOW MONITORING SITE SMWD27 DRY WEATHER FLOW CALIBRATION

	Hour	Measured Data Flow (mgd)	Modeled Data Flow (mgd)	Diurnal Initial Curve	Diurnal Modified Curve	Diurnal Calibrated Diurnal
Weekday	0	1.972	1.970	0.63	0.63	0.63
	1	1.309	1.293	0.35	0.35	0.35
	2	0.720	0.715	0.25	0.25	0.25
	3	0.525	0.522	0.19	0.19	0.19
	4	0.404	0.406	0.21	0.21	0.21
	5	0.436	0.451	0.31	0.31	0.31
	6	0.653	0.708	0.77	0.77	0.77
	7	1.589	1.647	1.68	1.68	1.68
	8	3.492	3.508	2.06	2.06	2.06
	9	4.286	4.235	1.63	1.63	1.63
	10	3.376	3.358	1.37	1.37	1.37
	11	2.846	2.840	1.20	1.20	1.20
	12	2.499	2.493	1.06	1.06	1.06
	13	2.201	2.193	0.96	0.96	0.96
	14	1.991	1.983	0.88	0.88	0.88
	15	1.833	1.831	0.83	0.83	0.83
	16	1.715	1.715	0.83	0.83	0.83
	17	1.731	1.736	0.90	0.90	0.90
	18	1.870	1.886	1.04	1.04	1.04
	19	2.156	2.178	1.27	1.27	1.27
	20	2.639	2.655	1.43	1.43	1.43
	21	2.972	2.967	1.36	1.36	1.36
	22	2.827	2.814	1.19	1.19	1.19
	23	2.479	2.462	0.95	0.95	0.95
Weekend	24	1.828	1.966	0.66	0.66	0.66
	25	1.377	1.367	0.44	0.44	0.44
	26	0.913	0.909	0.28	0.28	0.28
	27	0.588	0.586	0.23	0.23	0.23
	28	0.469	0.469	0.20	0.20	0.20
	29	0.416	0.418	0.22	0.22	0.22
	30	0.462	0.463	0.30	0.30	0.30
	31	0.627	0.645	0.61	0.61	0.61
	32	1.258	1.307	1.12	1.12	1.12
	33	2.327	2.364	1.81	1.81	1.81
	34	3.756	3.773	2.09	2.09	2.09
	35	4.344	4.333	1.99	1.99	1.99
	36	4.121	4.113	1.78	1.78	1.78
	37	3.694	3.682	1.53	1.53	1.53
	38	3.168	3.164	1.33	1.33	1.33
	39	2.756	2.745	1.22	1.22	1.22
	40	2.528	2.527	1.18	1.18	1.18
	41	2.455	2.457	1.20	1.20	1.20
	42	2.487	2.493	1.25	1.25	1.25
	43	2.601	2.605	1.32	1.32	1.32
	44	2.748	2.751	1.40	1.40	1.40
	45	2.908	2.907	1.35	1.35	1.35
	46	2.811	2.806	1.16	1.16	1.16
	47	2.413	2.382	0.88	0.88	0.88
Average						
Weekday		**2.022**	**2.024**	**0.97**	**0.97**	**0.97**
Weekend		**2.211**	**2.218**	**1.07**	**1.07**	**1.07**
ADWF[(1)]		**2.076**	**2.079**	**1.00**	**1.00**	**1.00**
% Error						
Weekday			0.1%			
Weekend			0.3%			

Note:
1. ADWF = (5xWeekday Average + 2xWeekend Average)/7





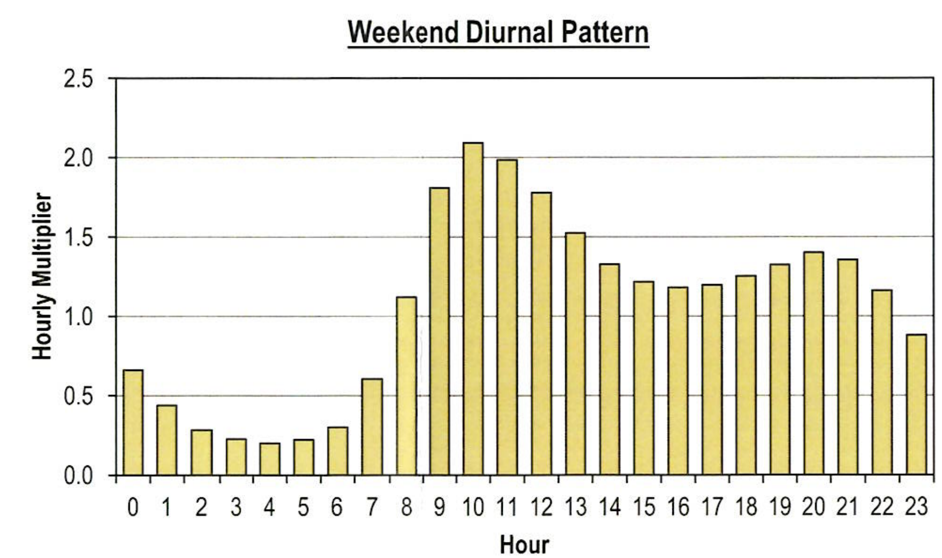


Figure 9
Dry Weather Flow Calibration of Flow Meter SMWD27
Evaluation of Alternatives for Use of Digester Gas
South Orange County Wastewater Authority

The calibration process compared the meter data with the model output. Comparisons were made for peak and average flows as well as the temporal distribution of flow. Table 18 summarizes the DWF calibration using peak and average flow results. It is industry standard practice to consider a hydraulic model to be satisfactorily calibrated when the model-simulated values are within 10 percent of the field-measured data. All of the meter sites were within 10 percent of the field-measured data for the daily average, minimum, and maximum flows. As indicated in Appendix E and Table 18, the model showed good correlation between the measured flow and simulated flow for all sites.

7.7.2 Wet Weather Flow Calibration

The WWF calibration enables the hydraulic model to accurately simulate I/I entering a sewer system during a large storm. WWF calibration consists of two steps:

1. Determining a rainfall event that characterizes the most significant impact on the sewer system facilities, preferably during wet antecedent soil moisture conditions.
2. Creating a database of I/I parameters for this rainfall event.

For the WWF calibration, a single storm event was used for each flowmeter, except for the JBLTP where two storm events were used for calibration (based on available data). For WWF calibration, model parameters for I/I are adjusted for one event so that projected flows align with measured flows. These same parameters are then used to project flows for a second measured event. If both events provide an accurate and precise estimate of the independent measured flow events, the model is calibrated. The rainfall events used for wet weather calibration are described previously, and encompass the best data based on available flow monitoring information. Therefore, the hydraulic model was calibrated to the rainfall events that occurred during these time periods.

The wet weather calibration process involves creating custom unit hydrographs for each flowmeter tributary using the "RTK Method." The RDII unit hydrograph is the summation of three separate triangular hydrographs (short-term, medium-term, and long-term), which are each defined by three parameters: R, T, and K. R represents the fraction of the rainfall over the watershed that enters the sanitary sewer system; T represents the time to peak; and K represents the ratio of the time to recession to the time to peak. Therefore, there are a total of nine variables for each RDII unit hydrograph.

The RTK values are input into the model and the parameters are adjusted until the peak I/I rate measured during the flow monitoring program are simulated for each of the series of rainfall events. Figure 10 illustrates the results for the wet weather calibration for flowmeter SMWD27 for the April 11, 1999 storm event. The remaining WWF calibration plots are provided in Appendix E.

Similar to the DWF calibration plots, the hydraulic model is considered to be calibrated when the model-simulated results are within 10 percent of the field-measured results. Comparisons were made for peak flows as well as the total volume of flow

Table 18 Summary of Dry Weather Flow Calibration Results
Evaluation of Alternatives for Use of Digester Gas
South Orange County Wastewater Authority

		Weekday Dry Weather Flow						Weekend Dry Weather Flow						Average Dry Weather Flow		
		Measured (mgd)		Modeled (mgd)		Percent Error		Measured (mgd)		Modeled (mgd)		Percent Error				
Meter	Pipe Dia. (in)	Avg.	Peak	Avg.	Peak	Avg.	Peak	Avg.	Peak	Avg.	Peak	Avg.	Peak	Measured	Modeled	% Diff.
SMWD27	27	2.02	4.29	2.02	4.24	0.1%	-1.2%	2.21	4.34	2.22	4.33	0.3%	-0.2%	2.08	2.08	0.2%
Camino-Cap33	33	4.35	8.08	4.32	8.52	-0.5%	5.4%	4.64	8.34	4.69	8.67	1.0%	4.0%	4.43	4.43	0.0%
SJC	21	-	-	-	-	-	-	3.43	5.45	3.43	5.44	0.0%	-0.2%	3.43	3.43	0.1%
JBLTP	42	-	-	-	-	-	-	8.28	13.91	8.66	13.61	4.7%	-2.2%	8.28	8.41	1.6%

measured/modeled over the course of the rainfall period. Table 19 summarizes the WWF calibration using peak flow and total volume results. As shown, all of the meter sites were within 10-percent of the field-measured data for the daily peak and total volume flows. Based on the results in Appendix E and Table 19, the model showed good correlation between the measured flow and simulated flow for all sites.

7.8 Capacity Evaluation

Following the dry and wet weather calibration, a capacity analysis of the Oso Interceptor was performed based on calculated peak wet weather design flows. The capacity analysis entailed identifying areas in the sewer system where flow restrictions occur or where pipe capacity is insufficient to convey design flows. Sewers that lack sufficient capacity to convey design flows create bottlenecks in the collection system that can potentially cause sanitary sewer overflows and other undesirable flow conditions.

7.8.1 Flow Depth Criteria (d/D)

The primary criterion used to identify a capacity deficiency in trunk sewers is the d/D ratio, which is defined as the depth (d) of flow in a pipe during peak flow conditions divided by the pipe's diameter (D). Maximum flow depth criteria for existing sanitary sewers are established based on a number of factors, including the acceptable risk tolerance of the utility, funding availability, local standards and codes, and other factors.

For the purposes of this capacity assessment, gravity pipes will be allowed to flow full, corresponding to a d/D ratio of 0.92. Pipelines flowing with a peak d/D ratio greater than 0.92 will be considered exceeding capacity and improvements will be recommended to resolve these deficiencies.

7.8.2 Boundary Conditions at JBLTP

Understanding the hydraulic grade (design water surface elevation) conditions influent to the JBLTP is a key component of understanding the available capacity of the Oso Interceptor in its lower reaches. The water surface elevation at the terminus of the Oso Interceptor, influent to LBLTP, was determined based on the hydraulic profile of the 1973 as-built drawings of the treatment plant. The drawings indicate flows from the Oso Interceptor are fed first through a bar screen and then into a grit removal basin, followed by a wet well and pump station. According to the record drawings, the operating hydraulic grade line in the grit basin was designed with a water surface elevation at 4.45 feet above mean sea level. Therefore, the hydraulic grade of the terminus of the Oso Interceptor in the hydraulic model was set as a fixed outfall with a fixed stage elevation of 4.45 feet.

A 2002 Inlet Hydraulics Study was performed by Carollo on the inlet hydraulics of Plant 1 of the JBLTP. The study concluded that the ideal operation of the grit removal basin would correspond to a higher water surface elevation in the grit chamber. If the grit basin is

Table 19 Summary of Wet Weather Flow Calibration Results(1)
Evaluation of Alternatives for Use of Digester Gas
South Orange County Wastewater Authority

Flow Monitoring Site	Field Measured Hourly Flow (mgd)	Model Simulated Peak Hourly Flow (mgd)	Percent Difference(2) (%)	Field Measured Flow Volume(3) (mgd)	Model Simulated Flow Volume(3) (mgd)	Percent Difference(2) (%)
SMWD27	4.71	4.51	-4.3%	57.86	60.75	5.0%
CaminoCap33	8.91	9.03	1.4%	118.69	127.26	7.2%
SJC	8.22	8.26	0.5%	113.11	118.08	4.4%
JBLTP						
Storm A	18.08	17.28	-4.4%	218.61	217.26	-0.6%
Storm B	17.11	17.85	4.3%	1139.24	1098.90	-3.5%

Notes:
(1) Wet weather flows are based of off historical metered flow data for a variety of storm events from 1999 to 2008.
(2) Percent difference between the average field measured and model simulated results.
(3) Flow volume over the rainfall period.

operated at a higher level than the design HGL of 4.45 feet, the available capacity of the lower reaches of the Oso Interceptor would be reduced compared to the capacity assessment provided herein. In other words, if the grit chamber is operated with a higher water surface elevation, less capacity will be available in the upstream Oso Interceptor.

7.8.3 <u>Results</u>

For the existing flow conditions described above, the design PWWF was routed through the hydraulic model. In accordance with the established flow depth criteria, the model was analyzed for pipelines where the d/D ratio met or exceeded 0.92 at any point during the simulation period.

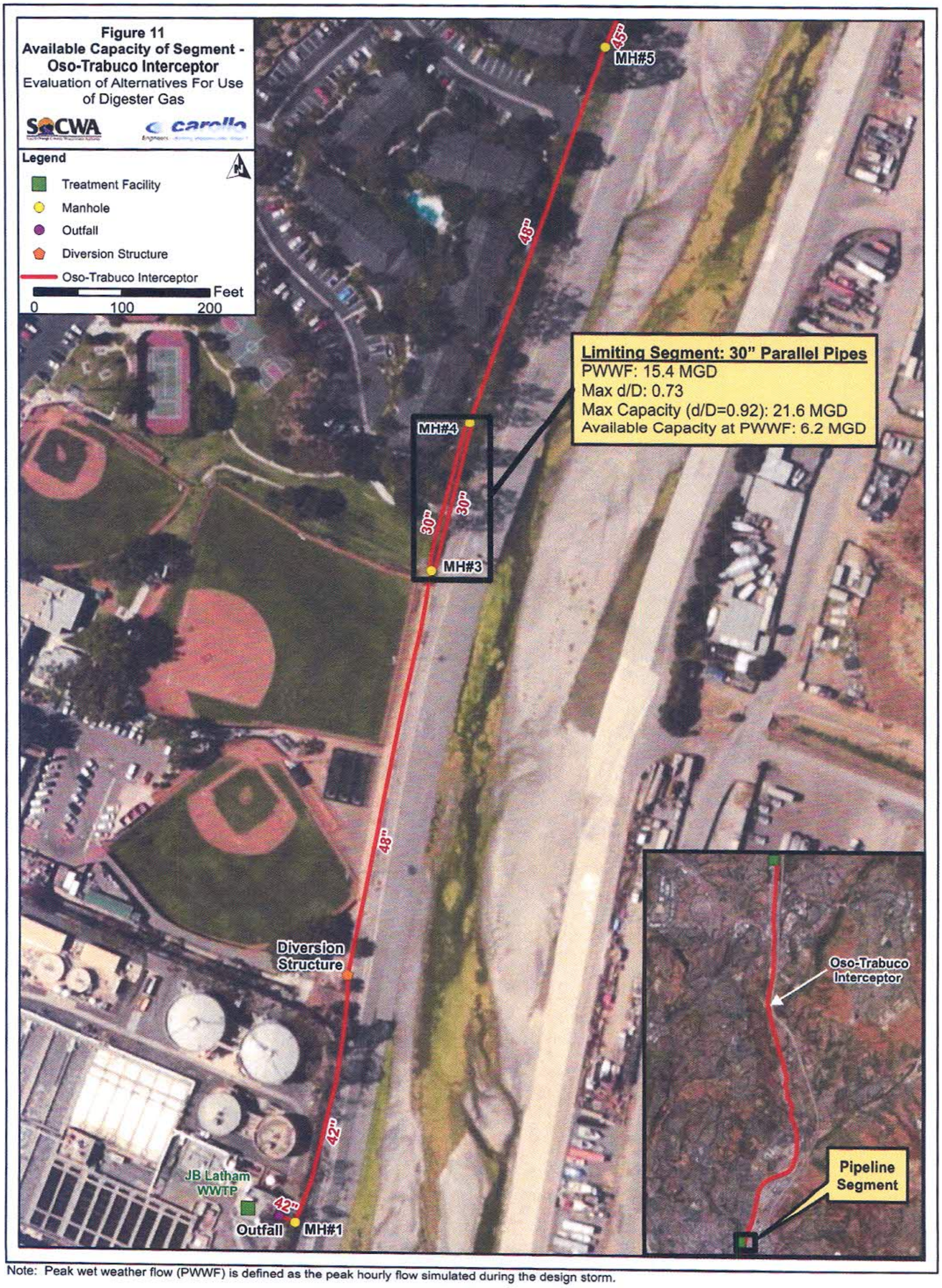
During the PWWF design flow conditions, no pipelines exceeded the flow depth planning criteria. The highest recorded d/D ratio during peak flow conditions for a gravity pipeline was 0.73. These maximum d/D ratios occurred in the 30-inch parallel pipelines approximately 475 feet upstream of the diversion structure, near the JBLTP. The two parallel lines are the remainder of an old siphon that once existed at that location. The siphon has been modified to flow by gravity to the 48-inch sewer just downstream. It is these two sewers that are the controlling segments in terms of the available capacity of the Oso Interceptor.

Figure 11 presents the existing modeled flows in the two 30-inch parallel pipelines and the estimated additional available capacity based on the results of the hydraulic model. During PWWF conditions, the modeled maximum flow through each of the pipelines was 7.7 mgd (a combined total of 15.4 mgd). Based on the hydraulic model, there is an additional available capacity of 3.1 mgd in each 30-inch diameter segment. Therefore, the total available capacity of the interceptor is approximately 6.2 mgd. The available capacity was determined based on hydraulic modeling results from the PWWF scenario assuming a maximum allowable d/D ratio of 0.92 in each pipeline.

7.8.3.1 Additional Solids Flow from Plant 3A

According to SOCWA staff, the additional solids flow from Plant 3A is approximately 130,000 gallons per day (gpd). Based on the findings of this evaluation, there is currently enough capacity in the Oso Interceptor to accommodate the additional solids flow at a constant rate of 130,000 gpd even during PWWF events.

This capacity evaluation was conducted under an existing peak wet weather design flow scenario. The PWWF scenario is a conservative estimate of available capacity, and can be viewed as the worst foreseeable case. If future flows in the Oso Interceptor are expected to increase due to population growth or new development, or from the addition of connections to the interceptor, it is recommended that a capacity assessment of the Oso Interceptor be performed to evaluate the impact of the future flows on the system. If future flows increase beyond the currently available 6.2 mgd, SOCWA may still be able to convey solids from



Note: Peak wet weather flow (PWWF) is defined as the peak hourly flow simulated during the design storm.

Plant 3 to JBLTP by limiting the discharge of solids to low flow periods, such as during the middle of the night. Additional hydraulic modeling is recommended to determine optimum solids disposal times in the event of significant increases in Oso Interceptor flows.

7.8.3.2 Minimum Velocities

It is a typical goal to maintain flow velocities greater than 2 feet per sec (ft/sec) throughout the sewer collection system to prevent solids deposition. The hydraulic model was used to predict the hourly velocities in the Oso Interceptor under average dry weather flow conditions. The average dry weather flow condition represents the existing average day (non-wet weather flow) condition in the Oso Interceptor.

Hourly velocities below 2 ft/s were identified in only two pipeline segments. These sewers comprise the stretch of the Oso-Trabuco that lies along the San Juan Creek Trail, on the southeast border of the Dana Point Community Center. The two sewers are shown on Figure 6, and include the following: (1) sewer between MH#4 and MH#3 (two parallel 30-inch pipelines), and (2) sewer between MH#3 and the diversion structure (48-inch pipeline). In both circumstances, velocities less than 2 ft/s were experienced during nighttime hours when flows into the system were at their lowest. However, the flow velocities recovered once flows into the collection system increased. The resulting average velocities in the pipelines were the following:

- 2.2 ft/s for the 30-inch parallel pipes between MH#4 and MH#3, and
- 2.6 ft/s for the 48-inch pipe between MH#3 and the diversion structure.

While the operating condition was met on average, it is recommended that the City monitor these segments to ensure that solids deposition does not inhibit flow or limit pipeline capacity. In particular, the two 30-inch parallel pipelines have the lowest capacity of the Oso Interceptor, so it will be important to maintain uninhibited flow in these segments. The fact that these pipelines are an old siphon indicates that they may require attention from SOCWA on a regular basis.

The addition of the waste solids flow from Plant 3A will increase the percent solids of the sewage flow through the Oso Interceptor, and could increase the likelihood of solids deposition in the pipeline during low flow periods. For the identified segments where velocities are below 2 ft/s, it will be important for SOCWA to monitor the effects of the additional solids flow in the pipes. If solids deposition becomes an issue, SOCWA may consider disposal of solids from Plant 3A during non-nighttime periods.

It is recommended that SOCWA conduct an inspection of the two 30-inch pipeline segments shown on Figure 6 to determine if solids deposition currently exists. If the inspection identifies that there is a significant amount of sediment in the two sewers, the frequency of regular cleaning would need to be increased to ensure proper function of the interceptor.

8.0 SUMMARY AND RECOMMENDATIONS

This study has evaluated various alternatives to determine the most cost effective method of utilizing digester gas at two of SOCWA's wastewater treatment plants, the Regional Treatment Plant and the J.B. Latham Treatment Plant. These alternatives have been evaluated considering that the South Coast Air Quality Management District will implement the proposed emissions limits for internal combustion engines described in Rule 1110.2. The new limits will require some sort of action to either replace the existing cogeneration facilities or modification to allow the existing systems to meet the emissions limits. At this point, it appears that the implementation of these limits is no longer a question of "if" they will be applied, but rather "when."

- Economic analysis of the alternatives considered both capital and operations and maintenance costs. This includes the overall cost of energy at each treatment plant, whether purchased or produced through a cogeneration facility.
- Based on the results of the analysis, the following recommendations and conclusions are made for the Regional Treatment Plant's cogeneration facility.
- Replace the existing three 400 kW engine-generators with a single 800-kW engine generator with SCR, CO and CEMS emissions control systems.
- Implementation allows the RTP to continue to generate electricity for plant power demand and provide heat to the anaerobic digesters and the community swimming pool.
- SGIP grant funds are available to reduce capital costs.

Alternatives at the JBLTP must consider effects beyond just digester gas utilization. The existing cogeneration engine is used to power the aeration blower. Therefore, any alternative must consider the necessary modifications to the aeration system. Additionally, the potential of importing solids from Plant 3A must be evaluated. Recommendations for utilization of digester gas at the JBLTP are as follows:

- Replace the existing engine-blower unit with a single 633-kW engine generator with SCR, CO and CEMS emissions control systems.
- The analysis shows that implementing the engine-generator is the best choice whether or not solids from Plant 3A are sent to the JBLTP. Further consideration for sending the solids to JBLTP should continue as a separate decision based on the potential cost savings of centralizing the solids handling at the JBLTP and discontinuing this operation at Plant 3A.
- The Oso-Trabuco Sewer has the hydraulic capacity to accept the added solids flow from Plant 3A. Potential odor concerns should be investigated, particularly during low flow periods. Peak hour flows are high enough to provide daily flushing of the line and prevent solids deposition.

- If Plant 3A solids are discharged to the Oso-Trabuco Sewer, ferric chloride addition along the sewer would help reduce odors and provide some of the chemical addition for enhanced settling (CEPT) as recommended in the Facility Plan. Additional chemical addition may still be required at the JBLTP. Jar testing is recommended to determine the applicability and dosage requirements.
- Implement dissolved oxygen controls and aeration diffuser replacement as recommended in the Facility Plan. Implementation should include a preliminary design study to determine the most cost effective diffuser technology.
- Install high-efficiency electric blowers to meet aeration air demands. Preliminary design is recommended to determine the most cost effective blower technology.
- Preliminary study of the aeration upgrades should be a comprehensive analysis encompassing alternatives for blowers, diffusers, and DO controls. This will ensure that the final project provides the highest economical benefit as well as achieving the most efficient control strategy for the aeration system.

Cogeneration Study SOCWA (JBLTP Current)
Alternative 2
Existing Engine Blower Cogen System

Life Cycle Present Worth of Annual Costs

Year	Average	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Operation Data											
Average Digester Gas Available (million Btus)	36,266	36,266	36,266	36,266	36,266	36,266	36,266	36,266	36,266	36,266	36,266
Boiler Fuel Consumed (million Btus)	713	713	713	713	713	713	713	713	713	713	713
New Cogen Fuel Consumed (million Btus)	34,240	34,240	34,240	34,240	34,240	34,240	34,240	34,240	34,240	34,240	34,240
Total Fuel Consumed (million Btus)	34,953	34,953	34,953	34,953	34,953	34,953	34,953	34,953	34,953	34,953	34,953
Natural Gas Consumed (million Btus)	-	-	-	-	-	-	-	-	-	-	-
Digester Gas Consumed (million Btus)	34,953	34,953	34,953	34,953	34,953	34,953	34,953	34,953	34,953	34,953	34,953
Flared Digester Gas (million Btus)	1,313	1,313	1,313	1,313	1,313	1,313	1,313	1,313	1,313	1,313	1,313
Cogen Heat Generated (million Btus)	15,408	15,408	15,408	15,408	15,408	15,408	15,408	15,408	15,408	15,408	15,408
Peak Electricity Required by Plant (kW)	1,052	1,052	1,052	1,052	1,052	1,052	1,052	1,052	1,052	1,052	1,052
Average Electricity Required by Plant (kW)	701	701	701	701	701	701	701	701	701	701	701
Net Electrical Generation From Digester Gas (kW)	-	-	-	-	-	-	-	-	-	-	-
Parasitic Electrical Usage (kW)	-	-	-	-	-	-	-	-	-	-	-
Electricity Generated (MW-hrs)	-	-	-	-	-	-	-	-	-	-	-
Electricity Purchased (MW-hrs)	4,791	4,791	4,791	4,791	4,791	4,791	4,791	4,791	4,791	4,791	4,791
Required plant heat - (million Btus)	15,978	15,978	15,978	15,978	15,978	15,978	15,978	15,978	15,978	15,978	15,978
Excess boiler heat req'd (million Btus)	570	570	570	570	570	570	570	570	570	570	570
Daily peak heat demand, million Btu/hr	2.11	2.11	2.11	2.11	2.11	2.11	2.11	2.11	2.11	2.11	2.11
Cogen heating capacity, million Btu/hr	1.76	1.76	1.76	1.76	1.76	1.76	1.76	1.76	1.76	1.76	1.76
Excess (Required boiler make up) peak day, million Btu/hr	(0.35)	(0.35)	(0.35)	(0.35)	(0.35)	(0.35)	(0.35)	(0.35)	(0.35)	(0.35)	(0.35)
Costs/(Revenues) for project											
Natural gas costs	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Base Cost for electricity	$ 987,647	$ 663,338	$ 689,872	$ 717,467	$ 746,165	$ 776,012	$ 807,052	$ 839,334	$ 872,908	$ 907,824	$ 944,137
Revenue for generated electricity	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Revenue for Green Power Credit	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
O&M costs for fuel treatment facilities	$ 48,321	$ 35,966	$ 37,045	$ 38,156	$ 39,301	$ 40,480	$ 41,694	$ 42,945	$ 44,233	$ 45,560	$ 46,927
O&M costs for engine generator facilities	$ 169,123	$ 125,880	$ 129,657	$ 133,546	$ 137,553	$ 141,679	$ 145,930	$ 150,308	$ 154,817	$ 159,461	$ 164,245
Total Annual Costs	$ 1,205,090	$ 825,184	$ 856,573	$ 889,169	$ 923,019	$ 958,171	$ 994,676	$ 1,032,587	$ 1,071,958	$ 1,112,846	$ 1,155,310
Present Worth of Annual Costs	$ 606,789	$ 734,411	$ 719,195	$ 704,305	$ 689,733	$ 675,473	$ 661,517	$ 647,858	$ 634,490	$ 621,407	$ 608,603
TOTAL PRESENT WORTH	$12,135,774										
Annualized Total Project Capital Cost	$ 211,281	$ 211,281	$ 211,281	$ 211,281	$ 211,281	$ 211,281	$ 211,281	$ 211,281	$ 211,281	$ 211,281	$ 211,281
Annualized Total Project Benefit	$ (428,725)	$ (373,127)	$ (377,983)	$ (382,984)	$ (388,135)	$ (393,440)	$ (398,905)	$ (404,534)	$ (410,332)	$ (416,303)	$ (422,454)
COST FOR ELECTRICITY											
Power Generation Cost, $/kWh	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000
Power Purchase Cost, $/kWh	$0.206	$0.138	$0.144	$0.150	$0.156	$0.162	$0.168	$0.175	$0.182	$0.189	$0.197
TOTAL COST OF OPTION	$ 14,493,274										
Waukesha Engine Blower 455 kW per unit											
Number of Units		1	1	1	1	1	1	1	1	1	1
Number of Units Operating		1	1	1	1	1	1	1	1	1	1
Fuel rate, Btu/kW-hr		10,100	10,100	10,100	10,100	10,100	10,100	10,100	10,100	10,100	10,100
Cogeneration heat recovery/fuel input		45%	45%	45%	45%	45%	45%	45%	45%	45%	45%
Power output, kW		455	455	455	455	455	455	455	455	455	455
Operating hours per year		7,446	7,446	7,446	7,446	7,446	7,446	7,446	7,446	7,446	7,446
Project cost estimate, 2012 dollars	$2,357,500	$2,357,500	$0	$0	$0	$0	$0	$0	$0	$0	$0
Grant, 2011 dollars	$0	$0	$0	$0	$0	$0	$0				
Emissions Offsets, 2012 dollars		$0									
Net Project Costs, 2012 dollars	$2,357,500										

Cogeneration Study SOCWA (JBLTP Current)
Alternative 2
Existing Engine Blower Cogen System

Year	Average	Life Cycle Present Worth of Annual Costs 2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Operation Data											
Average Digester Gas Available (million Btus)	36,266	36,266	36,266	36,266	36,266	36,266	36,266	36,266	36,266	36,266	36,266
Boiler Fuel Consumed (million Btus)	713	713	713	713	713	713	713	713	713	713	713
New Cogen Fuel Consumed (million Btus)	34,240	34,240	34,240	34,240	34,240	34,240	34,240	34,240	34,240	34,240	34,240
Total Fuel Consumed (million Btus)	34,953	34,953	34,953	34,953	34,953	34,953	34,953	34,953	34,953	34,953	34,953
Natural Gas Consumed (million Btus)	-	-	-	-	-	-	-	-	-	-	-
Digester Gas Consumed (million Btus)	34,953	34,953	34,953	34,953	34,953	34,953	34,953	34,953	34,953	34,953	34,953
Flared Digester Gas (million Btus)	1,313	1,313	1,313	1,313	1,313	1,313	1,313	1,313	1,313	1,313	1,313
Cogen Heat Generated (million Btus)	15,408	15,408	15,408	15,408	15,408	15,408	15,408	15,408	15,408	15,408	15,408
Peak Electricity Required by Plant (kW)	1,052	1,052	1,052	1,052	1,052	1,052	1,052	1,052	1,052	1,052	1,052
Average Electricity Required by Plant (kW)	701	701	701	701	701	701	701	701	701	701	701
Net Electrical Generation From Digester Gas (kW)	-	-	-	-	-	-	-	-	-	-	-
Parasitic Electrical Usage (kW)	-	-	-	-	-	-	-	-	-	-	-
Electricity Generated (MW-hrs)	-	-	-	-	-	-	-	-	-	-	-
Electricity Purchased (MW-hrs)	4,791	4,791	4,791	4,791	4,791	4,791	4,791	4,791	4,791	4,791	4,791
Required plant heat - (million Btus)	15,978	15,978	15,978	15,978	15,978	15,978	15,978	15,978	15,978	15,978	15,978
Excess boiler heat req'd (million Btus)	570	570	570	570	570	570	570	570	570	570	570
Daily peak heat demand, million Btu/hr	2.11	2.11	2.11	2.11	2.11	2.11	2.11	2.11	2.11	2.11	2.11
Cogen heating capacity, million Btu/hr	1.76	1.76	1.76	1.76	1.76	1.76	1.76	1.76	1.76	1.76	1.76
Excess (Required boiler make up) peak day, million Btu/hr	(0.35)	(0.35)	(0.35)	(0.35)	(0.35)	(0.35)	(0.35)	(0.35)	(0.35)	(0.35)	(0.35)
Costs/(Revenues) for project											
Natural gas costs	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Base Cost for electricity	$ 987,647	$ 981,903	$ 1,021,179	$ 1,062,026	$ 1,104,507	$ 1,148,687	$ 1,194,635	$ 1,242,420	$ 1,292,117	$ 1,343,801	$ 1,397,554
Revenue for generated electricity	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Revenue for Green Power Credit	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
O&M costs for fuel treatment facilities	$ 48,321	$ 48,335	$ 49,785	$ 51,279	$ 52,817	$ 54,402	$ 56,034	$ 57,715	$ 59,446	$ 61,229	$ 63,066
O&M costs for engine generator facilities	$ 169,123	$ 169,173	$ 174,248	$ 179,475	$ 184,860	$ 190,405	$ 196,118	$ 202,001	$ 208,061	$ 214,303	$ 220,732
Total Annual Costs	$ 1,205,090	$ 1,199,410	$ 1,245,212	$ 1,292,780	$ 1,342,183	$ 1,393,494	$ 1,446,786	$ 1,502,136	$ 1,559,624	$ 1,619,334	$ 1,681,352
Present Worth of Annual Costs	$ 606,789	$ 596,070	$ 583,804	$ 571,798	$ 560,046	$ 548,544	$ 537,285	$ 526,264	$ 515,476	$ 504,916	$ 494,579
TOTAL PRESENT WORTH	$12,135,774										
Annualized Total Project Capital Cost	$ 211,281	$ 211,281	$ 211,281	$ 211,281	$ 211,281	$ 211,281	$ 211,281	$ 211,281	$ 211,281	$ 211,281	$ 211,281
Annualized Total Project Benefit	$ (428,725)	$ (428,789)	$ (435,314)	$ (442,035)	$ (448,958)	$ (456,088)	$ (463,432)	$ (470,997)	$ (478,788)	$ (486,813)	$ (495,079)
COST FOR ELECTRICITY											
Power Generation Cost, $/kWh	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000	$0.000
Power Purchase Cost, $/kWh	$0.206	$0.205	$0.213	$0.222	$0.231	$0.240	$0.249	$0.259	$0.270	$0.280	$0.292
TOTAL COST OF OPTION	$ **14,493,274**										
Waukesha Engine Blower	455 kW per unit										
Number of Units		1	1	1	1	1	1	1	1	1	1
Number of Units Operating		1	1	1	1	1	1	1	1	1	1
Fuel rate, Btu/kW-hr		10,100	10,100	10,100	10,100	10,100	10,100	10,100	10,100	10,100	10,100
Cogeneration heat recovery/fuel input		45%	45%	45%	45%	45%	45%	45%	45%	45%	45%
Power output, kW		455	455	455	455	455	455	455	455	455	455
Operating hours per year		7,446	7,446	7,446	7,446	7,446	7,446	7,446	7,446	7,446	7,446
Project cost estimate, 2012 dollars	$2,357,500	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Grant, 2011 dollars	$0										
Emissions Offsets, 2012 dollars											
Net Project Costs, 2012 dollars	$2,357,500										

Cogeneration Study SOCWA (JBLTP Current)
Alternative 2
Existing Engine Blower Cogen System

Plant CO_2e Emissions											
Plant Electricity Usage, metric-ton/yr	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580
Plant Natural Gas Usage, metric-ton/yr	-	-	-	-	-	-	-	-	-	-	-
Plant Digester Gas Usage for Boiler, metric-ton/yr											
CO_2 Emissions (Biogenic)	38	38	38	38	38	38	38	38	38	38	38
CH_4 and N_2O Emissions	0	0	0	0	0	0	0	0	0	0	0
Plant Digester Gas Usage for Cogeneration, metric-ton/yr											
CO_2 Emissions (Biogenic)	1,783	1,783	1,783	1,783	1,783	1,783	1,783	1,783	1,783	1,783	1,783
CH_4 and N_2O Emissions	2	2	2	2	2	2	2	2	2	2	2
Plant Digester Gas Flare, metric-ton/yr											
CO_2 Emissions (Biogenic)	68	68	68	68	68	68	68	68	68	68	68
CH_4 and N_2O Emissions	0	0	0	0	0	0	0	0	0	0	0
ssions (Electricity + Stationary Combustion), metric-ton/yr:	3,471	3,471	3,471	3,471	3,471	3,471	3,471	3,471	3,471	3,471	3,471
hold Check - Stationary Combustion ONLY), metric-ton/yr:	1,891	1,891	1,891	1,891	1,891	1,891	1,891	1,891	1,891	1,891	1,891
Plant Emissions of NOx and CO											
Cogen lb/MWh											
NOx 0.07 (NOx at 0.07 lb/MWh)	237	237	237	237	237	237	237	237	237	237	237
CO 0.20 (CO at 0.2 lb/MWh)	678	678	678	678	678	678	678	678	678	678	678
Boiler lb/Mbtu											
NOx 0.035 (boiler 30 ppmv, 3% O2)	25	25	25	25	25	25	25	25	25	25	25
CO 0.110 (boiler at 150 ppmv, 3% O2)	78	78	78	78	78	78	78	78	78	78	78
Flare lb/Mbtu (Estimate for enclosed flare)											
NOx 0.06	79	79	79	79	79	79	79	79	79	79	79
CO 0.2	263	263	263	263	263	263	263	263	263	263	263
Total, lb/yr											
NOx	341	341	341	341	341	341	341	341	341	341	341
CO	1,019	1,019	1,019	1,019	1,019	1,019	1,019	1,019	1,019	1,019	1,019

Cogeneration Study SOCWA (JBLTP Current)
Alternative 2
Existing Engine Blower Cogen System

Plant CO_2e Emissions											
Plant Electricity Usage, metric-ton/yr	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580	1,580
Plant Natural Gas Usage, metric-ton/yr	-	-	-	-	-	-	-	-	-	-	-
Plant Digester Gas Usage for Boiler, metric-ton/yr											
CO_2 Emissions (Biogenic)	38	38	38	38	38	38	38	38	38	38	38
CH_4 and N_2O Emissions	0	0	0	0	0	0	0	0	0	0	0
Plant Digester Gas Usage for Cogeneration, metric-ton/yr											
CO_2 Emissions (Biogenic)	1,783	1,783	1,783	1,783	1,783	1,783	1,783	1,783	1,783	1,783	1,783
CH_4 and N_2O Emissions	2	2	2	2	2	2	2	2	2	2	2
Plant Digester Gas Flare, metric-ton/yr											
CO_2 Emissions (Biogenic)	68	68	68	68	68	68	68	68	68	68	68
CH_4 and N_2O Emissions	0	0	0	0	0	0	0	0	0	0	0
ssions (Electricity + Stationary Combustion), metric-ton/yr:	3,471	3,471	3,471	3,471	3,471	3,471	3,471	3,471	3,471	3,471	3,471
;hold Check - Stationary Combustion ONLY), metric-ton/yr:	1,891	1,891	1,891	1,891	1,891	1,891	1,891	1,891	1,891	1,891	1,891

Plant Emissions of NOx and CO

Cogen	lb/MWh												
NOx	0.07	(NOx at 0.07 lb/MWh)	237	237	237	237	237	237	237	237	237	237	237
CO	0.20	(CO at 0.2 lb/MWh)	678	678	678	678	678	678	678	678	678	678	678
Boiler	lb/Mbtu												
NOx	0.035	(boiler 30 ppmv, 3% O2)	25	25	25	25	25	25	25	25	25	25	25
CO	0.110	(boiler at 150 ppmv, 3% O2)	78	78	78	78	78	78	78	78	78	78	78
Flare	lb/Mbtu	(Estimate for enclosed flare)											
NOx	0.06		79	79	79	79	79	79	79	79	79	79	79
CO	0.2		263	263	263	263	263	263	263	263	263	263	263
Total, lb/yr													
NOx			341	341	341	341	341	341	341	341	341	341	341
CO			1,019	1,019	1,019	1,019	1,019	1,019	1,019	1,019	1,019	1,019	1,019

Cogeneration Study SOCWA (JBLTP Current)
Alternative 3
633 kW Engine Generator Cogen System

Life Cycle Present Worth of Annual Costs

Year	Average	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Operation Data											
Average Digester Gas Available (million Btus)	36,266	[illegible]	[illegible]	36,266	36,266	36,266	36,266	36,266	36,266	36,266	36,266
Boiler Fuel Consumed (million Btus)	-	[illegible]	[illegible]	-	-	-	-	-	-	-	-
New Cogen Fuel Consumed (million Btus)	43,713	[illegible]	[illegible]	43,713	43,713	43,713	43,713	43,713	43,713	43,713	43,713
Total Fuel Consumed (million Btus)	43,713	[illegible]	[illegible]	43,713	43,713	43,713	43,713	43,713	43,713	43,713	43,713
Natural Gas Consumed (million Btus)	7,447	[illegible]	[illegible]	7,447	7,447	7,447	7,447	7,447	7,447	7,447	7,447
Digester Gas Consumed (million Btus)	36,266	[illegible]	[illegible]	36,266	36,266	36,266	36,266	36,266	36,266	36,266	36,266
Flared Digester Gas (million Btus)	-	[illegible]	[illegible]	-	-	-	-	-	-	-	-
Cogen Heat Generated (million Btus)	17,485	[illegible]	[illegible]	17,485	17,485	17,485	17,485	17,485	17,485	17,485	17,485
Peak Electricity Required by Plant (kW)	1,052	[illegible]	[illegible]	1,052	1,052	1,052	1,052	1,052	1,052	1,052	1,052
Average Electricity Required by Plant (kW)	701	[illegible]	[illegible]	701	701	701	701	701	701	701	701
Net Electrical Generation From Digester Gas (kW)	570	[illegible]	[illegible]	570	570	570	570	570	570	570	570
Parasitic Electrical Usage (kW)	63	[illegible]	[illegible]	63	63	63	63	63	63	63	63
Electricity Generated (MW-hrs)	4,242	[illegible]	[illegible]	4,242	4,242	4,242	4,242	4,242	4,242	4,242	4,242
Electricity Purchased (MW-hrs)	1,902	[illegible]	[illegible]	1,902	1,902	1,902	1,902	1,902	1,902	1,902	1,902
Required plant heat - (million Btus)	15,978	[illegible]	[illegible]	15,978	15,978	15,978	15,978	15,978	15,978	15,978	15,978
Excess boiler heat req'd (million Btus)	-	[illegible]	[illegible]	-	-	-	-	-	-	-	-
Daily peak heat demand, million Btu/hr	2.11	[illegible]	[illegible]	2.11	2.11	2.11	2.11	2.11	2.11	2.11	2.11
Cogen heating capacity, million Btu/hr	2.00	[illegible]	[illegible]	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Excess (Required boiler make up) peak day, million Btu/hr	(0.12)	[illegible]	[illegible]	(0.12)	(0.12)	(0.12)	(0.12)	(0.12)	(0.12)	(0.12)	(0.12)
Costs/(Revenues) for project											
Natural gas costs	$ 89,946	[illegible]	[illegible]	$ 65,340	$ 67,954	$ 70,672	$ 73,499	$ 76,439	$ 79,496	$ 82,676	$ 85,983
Base Cost for electricity	$ 1,266,478	[illegible]	[illegible]	$ 920,021	$ 956,822	$ 995,095	$ 1,034,898	$ 1,076,294	$ 1,119,346	$ 1,164,120	$ 1,210,685
Revenue for generated electricity	$ (874,405)	[illegible]	[illegible]	$ (635,203)	$ (660,611)	$ (687,036)	$ (714,517)	$ (743,098)	$ (772,822)	$ (803,735)	$ (835,884)
Revenue for Green Power Credit	$ (34,156)	[illegible]	[illegible]	$ (24,813)	$ (25,805)	$ (26,837)	$ (27,911)	$ (29,027)	$ (30,188)	$ (31,396)	$ (32,652)
O&M costs for fuel treatment facilities	$ 67,181	$ 50,004	$ 51,504	$ 53,049	$ 54,640	$ 56,279	$ 57,968	$ 59,707	$ 61,498	$ 63,343	$ 65,243
O&M costs for engine generator facilities	$ 167,952	$ 125,009	$ 128,759	$ 132,622	$ 136,601	$ 140,699	$ 144,920	$ 149,267	$ 153,745	$ 158,358	$ 163,108
Total Annual Costs	$ 682,995	$ 475,813	$ 493,095	$ 511,016	$ 529,600	$ 548,872	$ 568,857	$ 589,582	$ 611,076	$ 633,366	$ 656,484
Present Worth of Annual Costs	$ 344,957	$ 423,472	$ 414,012	$ 404,773	$ 395,748	$ 386,933	$ 378,322	$ 369,911	$ 361,695	$ 353,668	$ 345,828
TOTAL PRESENT WORTH	$6,899,138										
Annualized Total Project Capital Cost	$ 295,343	$ 295,343	$ 295,343	$ 295,343	$ 295,343	$ 295,343	$ 295,343	$ 295,343	$ 295,343	$ 295,343	$ 295,343
Annualized Total Project Benefit	$ 288,140	$ 79,456	$ 96,198	$ 113,662	$ 131,879	$ 150,880	$ 170,699	$ 191,369	$ 212,928	$ 235,411	$ 258,858
COST FOR ELECTRICITY											
Power Generation Cost, $/kWh	$0.138	$0.120	$0.121	$0.123	$0.125	$0.126	$0.128	$0.130	$0.132	$0.134	$0.136
Power Purchase Cost, $/kWh	$0.206	$0.138	$0.144	$0.150	$0.156	$0.162	$0.168	$0.175	$0.182	$0.189	$0.197
TOTAL COST OF OPTION	$ 10,194,607										
Jenbaucher Engine Generator 633 kW per unit											
Number of Units		1	1	1	1	1	1	1	1	1	1
Number of Units Operating		1	1	1	1	1	1	1	1	1	1
Fuel rate, Btu/kW-hr		9,274	9,274	9,274	9,274	9,274	9,274	9,274	9,274	9,274	9,274
Cogeneration heat recovery/fuel input		40%	40%	40%	40%	40%	40%	40%	40%	40%	40%
Power output, kW		633	633	633	633	633	633	633	633	633	633
Operating hours per year		7,446	7,446	7,446	7,446	7,446	7,446	7,446	7,446	7,446	7,446
Project cost estimate, 2012 dollars	$4,719,720	$4,719,720	$0	$0	$0	$0	$0	$0	$0	$0	$0
Grant, 2011 dollars	-$1,424,250	-$712,125	-$142,425	-$142,425	-$142,425	-$142,425	-$142,425				
Emissions Offsets, 2012 dollars		$0									
Net Project Costs, 2012 dollars	$3,295,470										

← Heat; ← Avg. Power Demand = 6141 MWh/yr; ← Gen. Power; 6144 MWh/yr ≠ check; 4242 MW-hrs/yr ÷ (24 hr/day)(365 day/yr)(1 MW/1000 kW) = 484.25 = 484 kW produced

Cogeneration Study SOCWA (JBLTP Current)
Alternative 3
633 kW Engine Generator Cogen System

Life Cycle Present Worth of Annual Costs

Year	Average	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Operation Data											
Average Digester Gas Available (million Btus)	36,266	36,266	36,266	36,266	36,266	36,266	36,266	36,266	36,266	36,266	36,266
Boiler Fuel Consumed (million Btus)	-	-	-	-	-	-	-	-	-	-	-
New Cogen Fuel Consumed (million Btus)	43,713	43,713	43,713	43,713	43,713	43,713	43,713	43,713	43,713	43,713	43,713
Total Fuel Consumed (million Btus)	43,713	43,713	43,713	43,713	43,713	43,713	43,713	43,713	43,713	43,713	43,713
Natural Gas Consumed (million Btus)	7,447	7,447	7,447	7,447	7,447	7,447	7,447	7,447	7,447	7,447	7,447
Digester Gas Consumed (million Btus)	36,266	36,266	36,266	36,266	36,266	36,266	36,266	36,266	36,266	36,266	36,266
Flared Digester Gas (million Btus)	-	-	-	-	-	-	-	-	-	-	-
Cogen Heat Generated (million Btus)	17,485	17,485	17,485	17,485	17,485	17,485	17,485	17,485	17,485	17,485	17,485
Peak Electricity Required by Plant (kW)	1,052	1,052	1,052	1,052	1,052	1,052	1,052	1,052	1,052	1,052	1,052
Average Electricity Required by Plant (kW)	701	701	701	701	701	701	701	701	701	701	701
Net Electrical Generation From Digester Gas (kW)	570	570	570	570	570	570	570	570	570	570	570
Parasitic Electrical Usage (kW)	63	63	63	63	63	63	63	63	63	63	63
Electricity Generated (MW-hrs)	4,242	4,242	4,242	4,242	4,242	4,242	4,242	4,242	4,242	4,242	4,242
Electricity Purchased (MW-hrs)	1,902	1,902	1,902	1,902	1,902	1,902	1,902	1,902	1,902	1,902	1,902
Required plant heat - (million Btus)	15,978	15,978	15,978	15,978	15,978	15,978	15,978	15,978	15,978	15,978	15,978
Excess boiler heat req'd (million Btus)	-	-	-	-	-	-	-	-	-	-	-
Daily peak heat demand, million Btu/hr	2.11	2.11	2.11	2.11	2.11	2.11	2.11	2.11	2.11	2.11	2.11
Cogen heating capacity, million Btu/hr	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Excess (Required boiler make up) peak day, million Btu/hr	(0.12)	(0.12)	(0.12)	(0.12)	(0.12)	(0.12)	(0.12)	(0.12)	(0.12)	(0.12)	(0.12)
Costs/(Revenues) for project											
Natural gas costs	$ 89,946	$ 89,422	$ 92,999	$ 96,719	$ 100,588	$ 104,612	$ 108,796	$ 113,148	$ 117,674	$ 122,381	$ 127,276
Base Cost for electricity	$ 1,266,478	$ 1,259,112	$ 1,309,477	$ 1,361,856	$ 1,416,330	$ 1,472,983	$ 1,531,903	$ 1,593,179	$ 1,656,906	$ 1,723,182	$ 1,792,109
Revenue for generated electricity	$ (874,405)	$ (869,319)	$ (904,092)	$ (940,256)	$ (977,866)	$ (1,016,981)	$ (1,057,660)	$ (1,099,966)	$ (1,143,965)	$ (1,189,723)	$ (1,237,312)
Revenue for Green Power Credit	$ (34,156)	$ (33,958)	$ (35,316)	$ (36,729)	$ (38,198)	$ (39,726)	$ (41,315)	$ (42,967)	$ (44,686)	$ (46,474)	$ (48,333)
O&M costs for fuel treatment facilities	$ 67,181	$ 67,201	$ 69,217	$ 71,293	$ 73,432	$ 75,635	$ 77,904	$ 80,241	$ 82,648	$ 85,128	$ 87,682
O&M costs for engine generator facilities	$ 167,952	$ 168,002	$ 173,042	$ 178,233	$ 183,580	$ 189,087	$ 194,760	$ 200,603	$ 206,621	$ 212,819	$ 219,204
Total Annual Costs	$ 682,995	$ 680,460	$ 705,326	$ 731,117	$ 757,866	$ 785,611	$ 814,388	$ 844,237	$ 875,198	$ 907,313	$ 940,626
Present Worth of Annual Costs	$ 344,957	$ 338,168	$ 330,684	$ 323,374	$ 316,231	$ 309,253	$ 302,435	$ 295,773	$ 289,264	$ 282,904	$ 276,690
TOTAL PRESENT WORTH	$6,899,138										
Annualized Total Project Capital Cost	$ 295,343	$ 295,343	$ 295,343	$ 295,343	$ 295,343	$ 295,343	$ 295,343	$ 295,343	$ 295,343	$ 295,343	$ 295,343
Annualized Total Project Benefit	$ 288,140	$ 283,310	$ 308,808	$ 335,396	$ 363,121	$ 392,030	$ 422,172	$ 453,599	$ 486,365	$ 520,526	$ 556,140
COST FOR ELECTRICITY											
Power Generation Cost, $/kWh	$0.138	$0.138	$0.140	$0.143	$0.145	$0.147	$0.150	$0.152	$0.155	$0.158	$0.161
Power Purchase Cost, $/kWh	$0.206	$0.205	$0.213	$0.222	$0.231	$0.240	$0.249	$0.259	$0.270	$0.280	$0.292
TOTAL COST OF OPTION	$ **10,194,607**										
Jenbaucher Engine Generator (633 kW per unit)											
Number of Units		1	1	1	1	1	1	1	1	1	1
Number of Units Operating		1	1	1	1	1	1	1	1	1	1
Fuel rate, Btu/kW-hr		9,274	9,274	9,274	9,274	9,274	9,274	9,274	9,274	9,274	9,274
Cogeneration heat recovery/fuel input		40%	40%	40%	40%	40%	40%	40%	40%	40%	40%
Power output, kW		633	633	633	633	633	633	633	633	633	633
Operating hours per year		7,446	7,446	7,446	7,446	7,446	7,446	7,446	7,446	7,446	7,446
Project cost estimate, 2012 dollars	$4,719,720	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Grant, 2011 dollars	-$1,424,250										
Emissions Offsets, 2012 dollars											
Net Project Costs, 2012 dollars	$3,295,470										

Cogeneration Study SOCWA (JBLTP Current)
Alternative 3
633 kW Engine Generator Cogen System

Plant CO_2e Emissions											
Plant Electricity Usage, metric-ton/yr	627	627	627	627	627	627	627	627	627	627	627
Plant Natural Gas Usage, metric-ton/yr	486	486	486	486	486	486	486	486	486	486	486
Plant Digester Gas Usage for Boiler, metric-ton/yr											
CO_2 Emissions (Biogenic)	-	-	-	-	-	-	-	-	-	-	-
CH_4 and N_2O Emissions	-	-	-	-	-	-	-	-	-	-	-
Plant Digester Gas Usage for Cogeneration, metric-ton/yr											
CO_2 Emissions (Biogenic)	1,888	1,888	1,888	1,888	1,888	1,888	1,888	1,888	1,888	1,888	1,888
CH_4 and N_2O Emissions	2	2	2	2	2	2	2	2	2	2	2
Plant Digester Gas Flare, metric-ton/yr											
CO_2 Emissions (Biogenic)	-	-	-	-	-	-	-	-	-	-	-
CH_4 and N_2O Emissions	-	[illegible]	[illegible]	-	-	-	-	-	-	-	-
ssions (Electricity + Stationary Combustion), metric-ton/yr:	3,003	[illegible]	[illegible]	3,003	3,003	3,003	3,003	3,003	3,003	3,003	3,003
shold Check - Stationary Combustion ONLY), metric-ton/yr:	2,376	[illegible]	[illegible]	2,376	2,376	2,376	2,376	2,376	2,376	2,376	2,376
Plant Emissions of NOx and CO											
Cogen lb/MWh											
NOx 0.07 (NOx at 0.07 lb/MWh)	330	[illegible]	[illegible]	330	330	330	330	330	330	330	330
CO 0.20 (CO at 0.2 lb/MWh)	943	[illegible]	[illegible]	943	943	943	943	943	943	943	943
Boiler lb/Mbtu											
NOx 0.035 (boiler 30 ppmv, 3% O2)	-	[illegible]	[illegible]	-	-	-	-	-	-	-	-
CO 0.110 (boiler at 150 ppmv, 3% O2)	-	[illegible]	[illegible]	-	-	-	-	-	-	-	-
Flare lb/Mbtu (Estimate for enclosed flare)											
NOx 0.06	-	-	-	-	-	-	-	-	-	-	-
CO 0.2	-	-	-	-	-	-	-	-	-	-	-
Total, lb/yr											
NOx	330	330	330	330	330	330	330	330	330	330	330
CO	943	943	943	943	943	943	943	943	943	943	943

Savings/Reduction =
3471 (from Alt. 2 existing)
-3003
468 Metric tons/yr

Cogeneration Study SOCWA (JBLTP Current)
Alternative 3
633 kW Engine Generator Cogen System

Plant CO_2e Emissions											
Plant Electricity Usage, metric-ton/yr	627	627	627	627	627	627	627	627	627	627	627
Plant Natural Gas Usage, metric-ton/yr	486	486	486	486	486	486	486	486	486	486	486
Plant Digester Gas Usage for Boiler, metric-ton/yr											
CO_2 Emissions (Biogenic)	-	-	-	-	-	-	-	-	-	-	-
CH_4 and N_2O Emissions	-	-	-	-	-	-	-	-	-	-	-
Plant Digester Gas Usage for Cogeneration, metric-ton/yr											
CO_2 Emissions (Biogenic)	1,888	1,888	1,888	1,888	1,888	1,888	1,888	1,888	1,888	1,888	1,888
CH_4 and N_2O Emissions	2	2	2	2	2	2	2	2	2	2	2
Plant Digester Gas Flare, metric-ton/yr											
CO_2 Emissions (Biogenic)	-	-	-	-	-	-	-	-	-	-	-
CH_4 and N_2O Emissions	-	-	-	-	-	-	-	-	-	-	-
ssions (Electricity + Stationary Combustion), metric-ton/yr:	3,003	3,003	3,003	3,003	3,003	3,003	3,003	3,003	3,003	3,003	3,003
shold Check - Stationary Combustion ONLY), metric-ton/yr:	2,376	2,376	2,376	2,376	2,376	2,376	2,376	2,376	2,376	2,376	2,376

Plant Emissions of NOx and CO

Cogen	lb/MWh												
NOx	0.07	(NOx at 0.07 lb/MWh)	330	330	330	330	330	330	330	330	330	330	330
CO	0.20	(CO at 0.2 lb/MWh)	943	943	943	943	943	943	943	943	943	943	943
Boiler	lb/Mbtu												
NOx	0.035	(boiler 30 ppmv, 3% O2)	-	-	-	-	-	-	-	-	-	-	-
CO	0.110	(boiler at 150 ppmv, 3% O2)	-	-	-	-	-	-	-	-	-	-	-
Flare	lb/Mbtu	(Estimate for enclosed flare)											
NOx	0.06		-	-	-	-	-	-	-	-	-	-	-
CO	0.2		-	-	-	-	-	-	-	-	-	-	-
Total, lb/yr													
NOx			330	330	330	330	330	330	330	330	330	330	330
CO			943	943	943	943	943	943	943	943	943	943	943

Appendix 3-C

Complete documents available upon request. The file size exceeds 50 MB, which is the DWR upload limit.

SOCWA

South Orange County Wastewater Authority

CONTRACT DOCUMENTS

FOR CONSTRUCTION
OF

J. B. LATHAM TREATMENT PLANT FACILITY IMPROVEMENTS PACKAGES A AND C

BIDDING AND CONTRACT REQUIREMENTS
GENERAL AND SPECIAL PROVISIONS

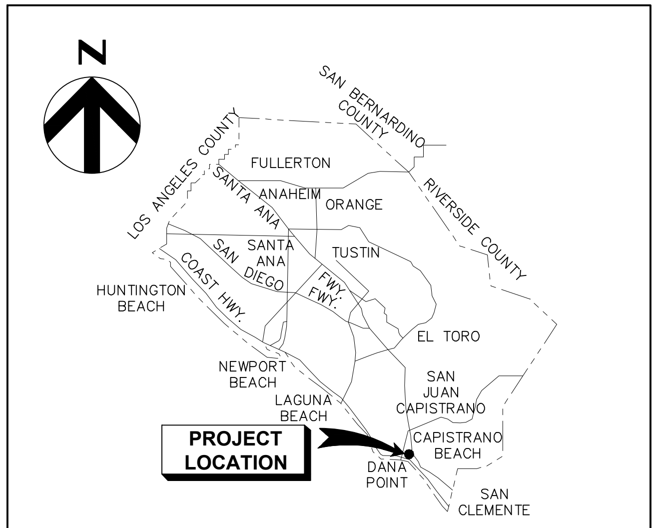
OCTOBER 2014

SOUTH ORANGE COUNTY WASTEWATER AUTHORITY
DANA POINT, CALIFORNIA

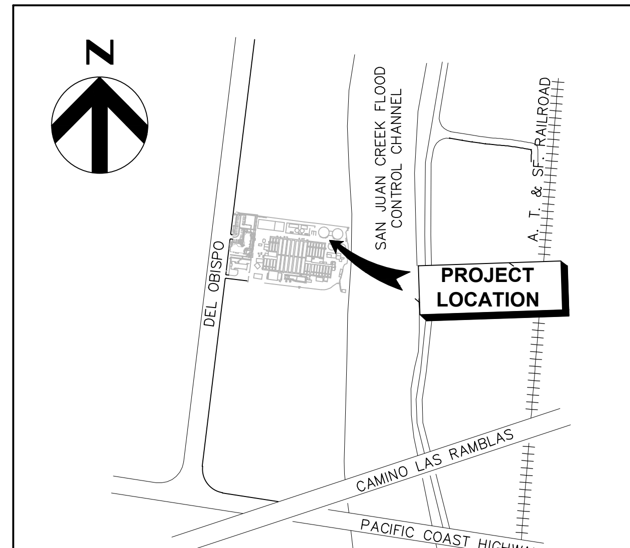
34156 DEL OBISPO STREET, DANA POINT, CA 92629 (949) 234-5400

J. B. LATHAM
TREATMENT PLANT
AERATION UPGRADES AND COGENERATION PROJECT

SEPTEMBER 26, 2014



VICINITY MAP
NO SCALE



LOCATION MAP
NO SCALE

SOCWA
South Orange County Wastewater Authority

APPROVED BY:
SOUTH ORANGE COUNTY WASTEWATER AUTHORITY

BRIAN PECK DATE:
DIRECTOR OF ENGINEERING
C 42765 EXP: 03-21-2014

REGISTERED PROFESSIONAL ENGINEER
GUILLERMO E. GARCIA
No. 31682
Exp. 12/31/14
CIVIL
STATE OF CALIFORNIA

HDR
HDR Engineering, Inc.

09/26/14
GUILLERMO E. GARCIA DATE:
PROJECT MANAGER
CE 31682 EXP: 12-31-2014

SOCWA

South Orange County Wastewater Authority

JB Latham WTP

Aeration Upgrades and Cogeneration Project

Specifications

August 2014

REGISTERED PROFESSIONAL ENGINEER
GUILLERMO E. GARCIA
No. 31682
Exp. 12/31/14
CIVIL
STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER
JEFFREY A. WEISHAAR
No. 75245
CIVIL
STATE OF CALIFORNIA
08/7/2014

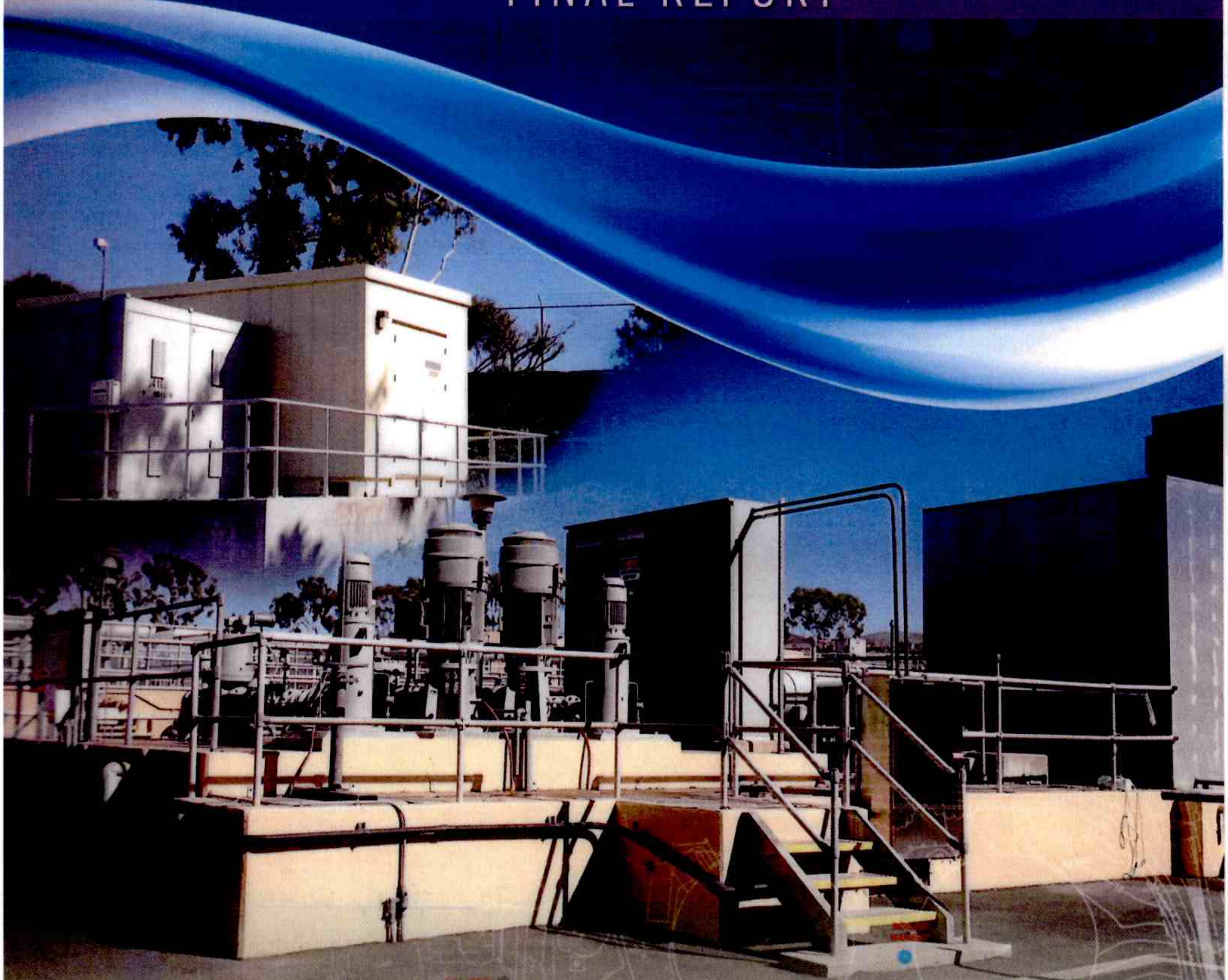
HDR

carollo
Engineers...Working Wonders With Water™

Appendix 3-D

EVALUATION OF THE POTABLE AND NON-POTABLE WATER SYSTEMS AT THE JB LATHAM TREATMENT PLANT

FINAL REPORT



PREPARED FOR:

SOCWA
South Orange County Wastewater Authority

SOUTH ORANGE COUNTY WASTEWATER AUTHORITY
34156 DEL OBISPO STREET
DANA POINT, CA 92629
(949) 234-5411

PREPARED BY:

PACE
Advanced Water Engineering

17520 NEWHOPE STREET, SUITE 200
FOUNTAIN VALLEY, CA 92708
714.481.7300 | WWW.PACEWATER.COM

A461 | AUGUST 2014

EVALUATION OF THE POTABLE AND NON-POTABLE WATER SYSTEMS AT THE JB LATHAM TREATMENT PLANT

FINAL REPORT

August 5, 2014

Prepared For:

SOCWA
South Orange County Wastewater Authority

Mr. Brian Peck, PE
South Orange County Wastewater Authority
34156 Del Obispo Street
Dana Point, CA 92629
Phone (949) 234-5411

Prepared By:

PACE
Advanced Water Engineering

Pacific Advanced Civil Engineering, Inc.
17520 Newhope Street, Suite 200
Fountain Valley, CA 92708
714-481-7300

Contact Person:

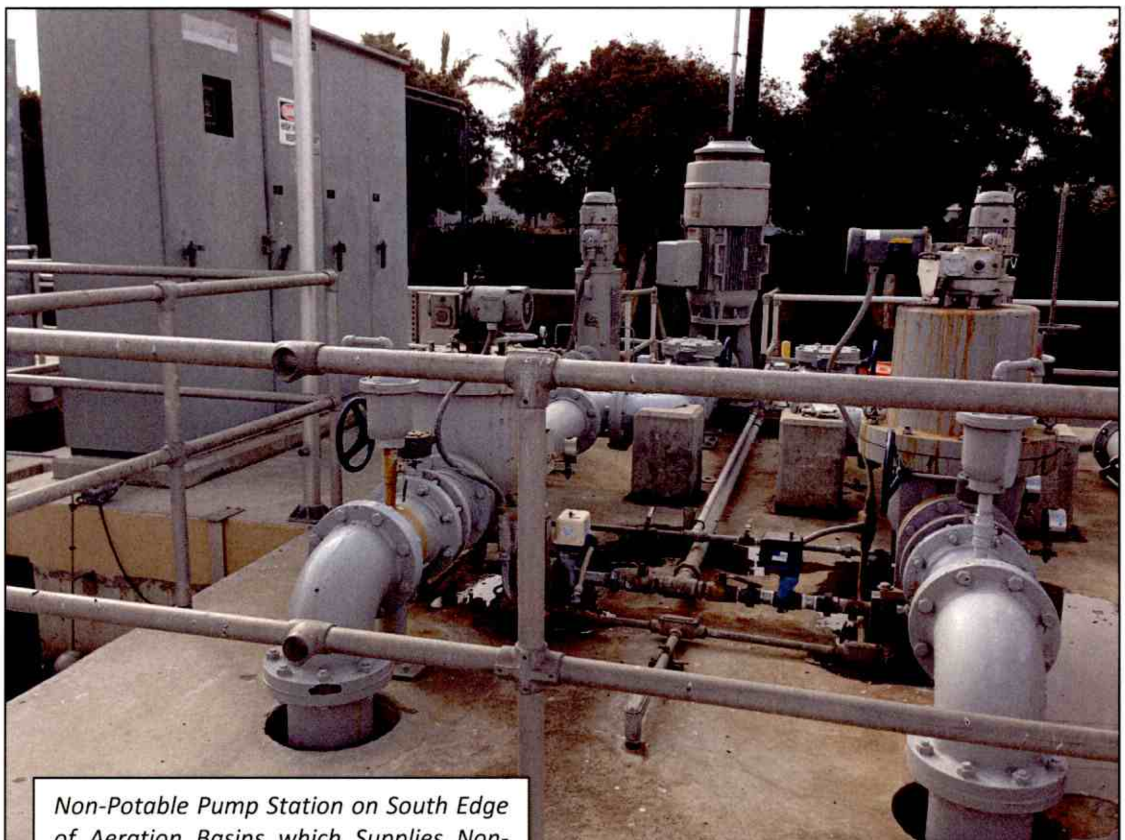
Andy Komor, PE
Zirang Song, PE - PACE

PACE JN A461

Table of Contents

I. Background

The J.B. Latham Wastewater Treatment Plant was constructed in 1964 and has been expanded and upgraded many times over 50 years. Both potable and non-potable water systems have also been modified and expanded more than 10 times. There are as-built plans for potable and non-potable water systems but there is no complete overall master potable and non-potable water plan showing current piping and valve information. For the ease of plant operation and future expansion, PACE has included information and backup documentation to provide updated potable and non-potable record plans as well as water usage, piping improvement study. SOCWA is seeking to inventory and catalog its water and recycled water systems in AutoCAD for future planning use, conflict identification for facility upgrades and to evaluate the current water usage strategies in order to develop a generalized plan for more efficient water usage on the facility site.



Non-Potable Pump Station on South Edge of Aeration Basins which Supplies Non-Potable Water to Dozens of Demands within the Plant including Irrigation

Potable Water System

One of Two Potable Water Air-Gap Structures with Pump Station to Supply Potable Demands

The Plant's potable water source is from a South Coast Water District (SCWD) pipeline with two separate air gap locations. One is at the back of sludge treatment building and the other is at the southeast corner of the Plant near secondary clarifier No 9. Uses include a wide range of activities including safety eye wash stations, shop operations, lab operations, engine operation, odor scrubbing system, restrooms, etc. Potable water piping has been installed over a series of contracts and maintenance projects. The location of many underground waterlines is not fully known and may require renovation.

Non-Potable Water System

The Largest Non-Potable Demands at the Plant Include Headworks Screen Washing (shown herein), Centrifuge Spray Water, and Irrigation

The non-potable water system is supplied by disinfected secondary effluent at the south side of the Plant and is serving the irrigation needs for the site's landscaped areas. The non-potable water pipeline was constructed at the beginning of the facility for foam spray and modified every decade since then to the present. Similar to the potable water pipelines, there is no good record available for the non-potable water piping system. In some areas the specific location of piping is unknown and no as-builts or legacy data is available.

II. Documentation Review and References

To prepare more complete potable and non-potable record drawings, it is necessary to review all as-built plans provided by SOCWA Engineering Department, related to potable and non-potable water system construction events and expansions. The as-built plans were reviewed are:

LIQUID (AS-BUILT PLAN BOOK 1)

1964 – CSJC - WATER POLLUTION CONTROL FACILITY

1971 – CSJC - WATER POLLUTION CONTROL FACILITY MOD

1974 – SERRA - WATER POLLUTION CONTROL FACILITY MOD – phase II

1978 – SERRA - WATER POLLUTION CONTROL FACILITY MOD – phase III

1991 – SERRA – THE EFFLUENT PUMPING STATION – VOLUME III

LIQUID (AS-BUILT PLAN BOOK 2)

1989 – SERRA – FERROUS CHLORIDE STORAGE TANK PLAN & SECTIONS

1996 – SERRA – 4.0 MGD HEADWORKS BUILDING AND DIGESTER COVER MODIFICATIONS

1997 – SERRA – EASTSIDE HEADWORKS BUILDING, ODOR CONTROL SYSTEM AND DIGESTER MODIFICATIONS

SOLID (AS-BUILT PLAN BOOK)

1985 – SERRA – JBLTP ODOR REDUCTION AND SOLIDS HANDLING FACILITIES

1990 – SERRA – JBLTP IMPROVEMENTS TO ANAEROBIC DIGESTERS

2000 – SERRA – JBLTP SOLIDS HANDLING FACILITY UPGRADE VOLUME II

2002 – SOCWA – ODOR SCRUBBER REPLACEMENT PART C – DRAWINGS VOLUME II

AS-BUILT PLANS IN A CD

1987 – SERRA – JBLTP AERATION SYSTEM, NON-POTABLE WATER SYSTEM AND WEST HEADWORKS IMPROVEMENTS

In addition to the above mentioned as-built plans, site observations from two site walks and inputs from SOCWA staff were also a major part of the information sources for both potable and non-potable water systems.

III. Existing Potable and Non-Potable Documentation

Base Map Preparation

Two new base maps for existing potable and non-potable water systems were generated with a JBLTP site background AutoCAD base file generated by Robert J. Lung & Associates on 06-20-2013. These maps are referred to as "Existing Potable Water Piping Plan" and Existing Non-Potable Water Piping Plan". In these AutoCAD base maps, to be transferred to SOCWA for GIS Mapping and operational use including updating for future projects, contain pipelines and texts assigned in different layers and colors for ease operation and future revision or management.

Existing Potable Water Piping Plan

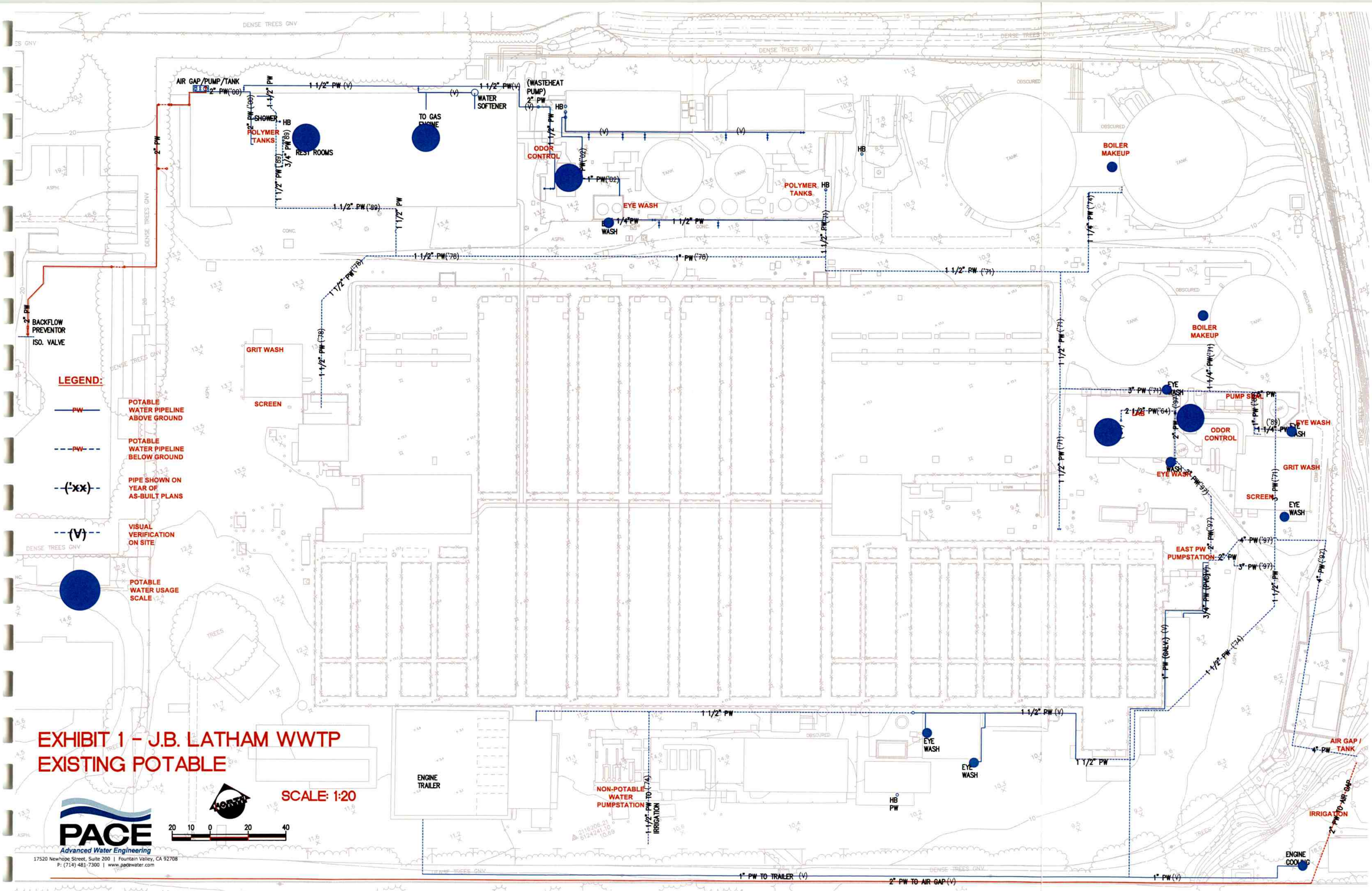
The existing potable water piping plan is generated based on all the previous as-built plan sets, client's input in two site meetings, site walks, and plan markups. To clearly show information sources on the existing piping plan, the year of the original as-built plan set referenced was included on the plan for each pipeline, so that each pipeline can be identified and traced back to original plan set listed in Section II. To provide a relative scale and location of potable water demand, blue color shaded circles were added to the plan identified as "Potable Water Usage Scale". Major uses of potable water in JBLTP are polymer tanks, gas engine, odor control units, eye wash stations, boiler makeup, lab and restrooms.

Other information like pipe sizes, above ground piping, or below ground piping is also shown on the plan. Without extensive pot-hole investigations provided at the site, all pipe locations are approximate based on previous as-built plans, interviews, and site observations. The value of potholing and subterranean surveys is likely low compared to running new parallel small-diameter piping systems in the future to replace the existing. The existing potable water use is very minimal compared to non-potable use on the site. The opportunity to convert additional systems to non-potable is limited to potentially gas engine cooling.

Existing Non-Potable Water Piping Plan

Similar to the existing potable water piping plan, the existing non-potable water piping plan was generated based on all the previous as-built plan sets, client's input in two site meetings, site walks, and plan markups. The year of the original as-built plan set was also included on the plan for each pipeline. The non-potable water system is shown in purple color and the water usage scale are circles in different sizes related to water flow/demand. The major usages of non-potable water in JBTP shown in larger scale circle sizes shown are solids handling, screens in the two headworks, and site landscape irrigation. Other smaller scale demands are polymer tanks, grit washing in the two headworks, water spray in the four digesters, and pump seals in pump rooms.

Other information like pipe sizes, above ground piping, or below ground piping is also shown on the plan. Without extensive pot-hole investigations provided at the site, all pipe locations are approximate based on previous as-built plans, interviews, and site observations. The value of potholing and subterranean surveys is likely low compared to running new parallel small-diameter piping systems in the future to replace the existing.


LEGEND:
POTABLE WATER PIPELINE ABOVE GROUND
POTABLE WATER PIPELINE BELOW GROUND
PIPE SHOWN ON YEAR OF AS-BUILT PLANS
VISUAL VERIFICATION ON SITE
POTABLE WATER USAGE SCALE
BACKFLOW PREVENTOR
ISO. VALVE
AIR GAP/PUMP/TANK
SHOWER
POLYMER TANKS
REST ROOMS
TO GAS ENGINE
WATER SOFTENER
(WASTEHEAT PUMP)
ODOR CONTROL
EYE WASH
POLYMER TANKS
BOILER MAKEUP
GRIT WASH
SCREEN
PUMP SEAL
EAST PW PUMPSTATION
ENGINE TRAILER
NON-POTABLE WATER PUMPSTATION
IRRIGATION
AIR GAP / TANK
ENGINE COOLING
1" PW TO TRAILER (V)
2" PW TO AIR GAP (V)
EXHIBIT 1 - J.B. LATHAM WWTP
EXISTING POTABLE
SCALE: 1:20
PACE
Advanced Water Engineering
17520 Newhope Street, Suite 200 | Fountain Valley, CA 92708
P: (714) 481-7300 | www.pacewater.com

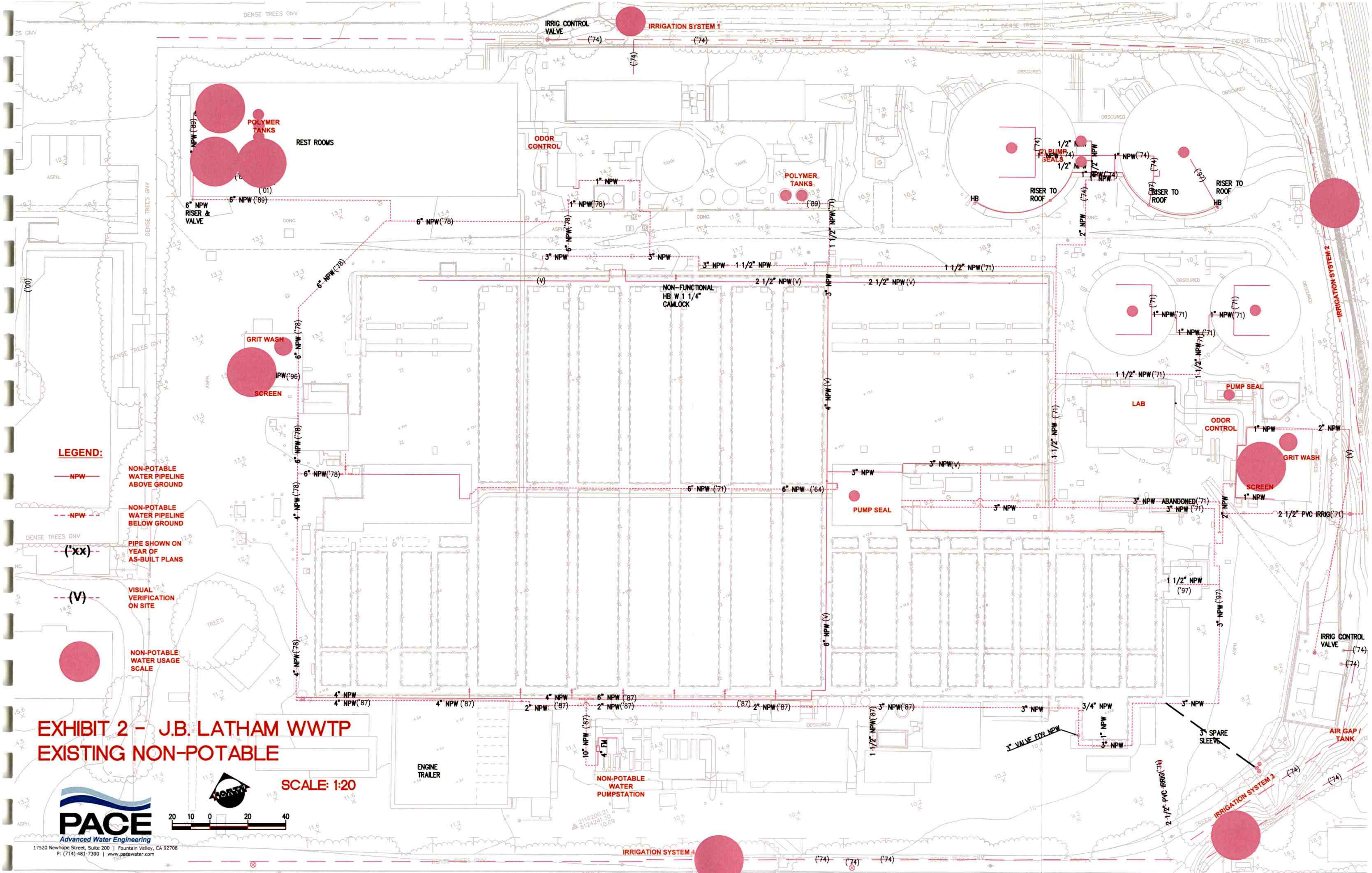


EXHIBIT 2 - J.B. LATHAM WWTP
EXISTING NON-POTABLE
SCALE: 1:20
LEGEND:
NPW
NON-POTABLE WATER PIPELINE ABOVE GROUND
NPW
NON-POTABLE WATER PIPELINE BELOW GROUND
('xx')
PIPE SHOWN ON YEAR OF AS-BUILT PLANS
(V)
VISUAL VERIFICATION ON SITE
NON-POTABLE WATER USAGE SCALE
IRRIGATION SYSTEM 1
IRRIGATION SYSTEM 2
IRRIGATION SYSTEM 3
IRRIGATION SYSTEM 4
IRRIG CONTROL VALVE
POLYMER TANKS
REST ROOMS
ODOR CONTROL
PUMP SEALS
RISER TO ROOF
GRIT WASH
SCREEN
NON-FUNCTIONAL HB W 1 1/4" CAMLOCK
LAB
PUMP SEAL
AIR GAP / TANK
3" SPARE SLEEVE
3" VALVE FOR NPW
ENGINE TRAILER
NON-POTABLE WATER PUMPSTATION
6" NPW RISER & VALVE
6" NPW ('78)
6" NPW ('89)
4" NPW ('87)
6" NPW ('71)
6" NPW ('64)
1 1/2" NPW ('71)
2 1/2" NPW (V)
2 1/2" PVC IRRIG ('71)
3" NPW ABANDONED ('71)
1 1/2" NPW ('97)
3" NPW ('87)
10" NPW ('87)
4" FM
DENSE TREES GNV
TREES
PACE
Advanced Water Engineering
17520 Newhope Street, Suite 200 | Fountain Valley, CA 92708
P: (714) 481-7300 | www.pacewater.com
NORTH

IV. Proposed Reconstruction Plans

The existing potable and non-potable distribution systems are currently functional and supply adequate pressure to the necessary demands. The existing distribution systems in some instances are outdated and could fail in the next 10 years. More importantly, during problems with plant operation where water needs to be turned off, it is often difficult or impossible to close a valve to isolate the system because such a valve cannot be located. Also, if a system break occurs, it will be very difficult to track where the leak/break is located in the current configuration, with all distribution piping below ground and covered in asphalt with little to no documentation of location.

An alternative to the current distribution system setup would be to reconstruct both potable and non-potable water systems in a loop configuration above ground and around the plant, and connected to locations of the plant based on site geographic conditions and the current water use facilities locations. The proposed reconstruction piping are along the site perimeter walls since most of the potable and non-potable water uses are along the perimeter of JBLTP, and it will be much more convenient for the proposed installation without disturbing the current plant operation. There are also exists piping racks and concrete walls to secure such piping, and a 3" spare sleeve is present below the asphalt on the southeast section of the plant to connect some demands there.

Examples of Potential Opportunity for Reuse of Exterior Loop System Wall Mounted Racks to Route New Distribution Systems Around Exterior of Plant

Potable Water Piping Reconstruction Plan

A proposed potable piping network to replace much of the outdated and unknown location of underground potable piping mains is to loop a new main line with two feeder locations from existing air gap / pump station locations. Such a system could serve all potable water demands with branches and valves above ground. If one of the two supplying sources is out of service, it can be closed off by valves and the other air gap / pump station can be used. Most of the proposed pipe will be above ground so the future maintenance will be easy. We recommend using stainless steel pipes due to the longevity and relative lost cost for small pipe sizes. The estimated construction cost is approximately $200,000 for the potable reconstruction piping in 2014 dollars as shown in Table 1. Building both systems, the potable and non-potable, at the same time may reduce the cost estimate shown.

Table 1: Proposed Rough Cost Estimate for Exterior Looped Potable Water Distribution System and Branch Connections and Valves

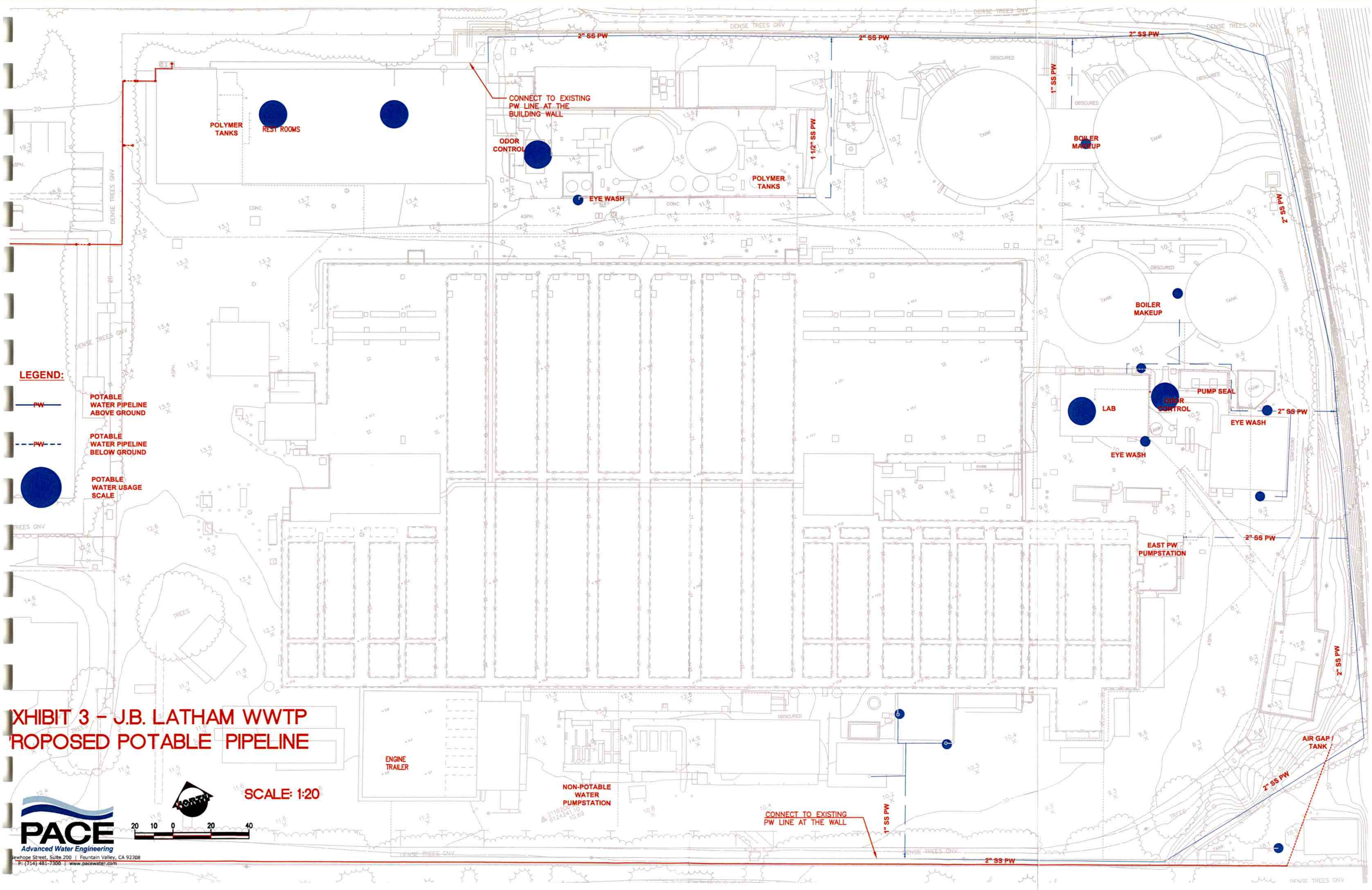
Proposed Piping Construction Cost Estimate	JB Latham Wastewater Treatment Plant Proposed Potable water pipelines			
CONSTRUCTION TYPE	**UNIT**	**$/UNIT**	**#**	**COST**
GENERAL				**$25,000**
Mobilization	lump sum	$5,000	1	$5,000
Equipment Rental	wks	$1,000	4	$4,000
Superintendent Oversight	man hrs	$100	160	$16,000
CIVIL				**$117,000**
Excavation/Backfill	ft^3	$10	950	$9,500
Demolition and Disposal	Lot	$5,000	1	$5,000
Re-paving	ft^2	$30	475	$14,250
Pipe Trench Gravel Bedding	ft^3	$15	240	$3,600
2" SS underground pipe	ft	$50	205	$10,250
2" SS above ground pipe inc. pipe supports	ft	$60	1080	$64,800
1 1/2" SS underground pipe	ft	$45	100	$4,500
1" SS underground pipe	ft	$30	170	$5,100
1" SS above ground pipe inc. pipe supports	ft	$35	90	$3,150
2" Gate Valve and Fitting	EA	$700	2	$1,400
1 1/2" Gate Valve and Fitting	EA	$500	1	$500
1" Gate Valve and Fittings	EA	$200	2	$400
SUBTOTAL				**$142,000**
Contractor Overhead 15%				$21,300
Bonding/Insurance 3%				$4,260
SUBTOTAL II				**$167,560**
Contingency 10%				$16,756
TOTAL				**$184,316**

Non-Potable Water Piping Reconstruction Plan

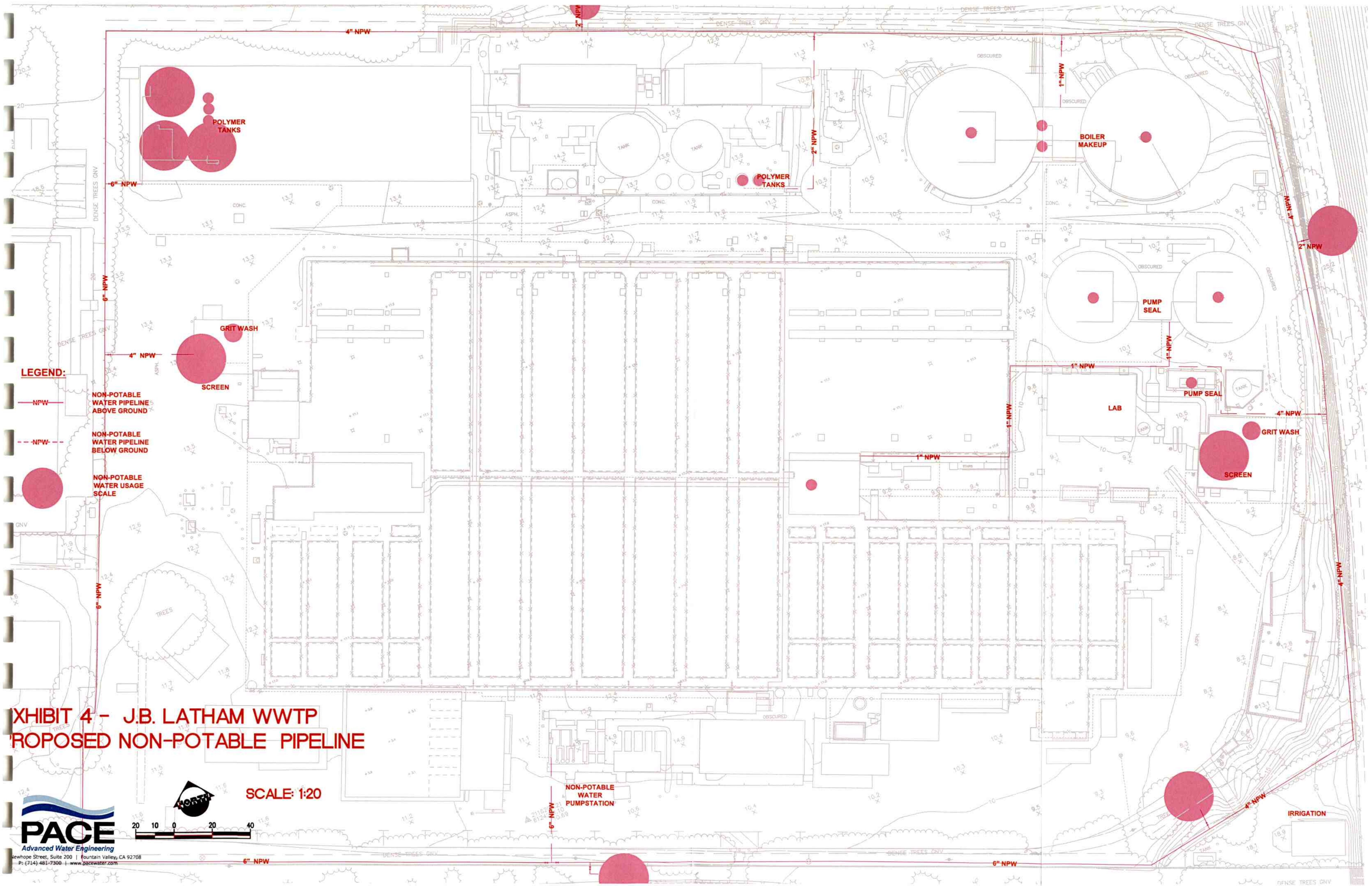
The proposed non-potable water piping distribution system would be similar to and installed alongside the proposed potable piping along the plant's perimeter walls. The branch-off locations will be different then the potable piping based on the water demand locations, but many of the connections will be close to the main line loop including the centrifuges and headworks screens. The irrigation system will be connected along the perimeter. Even though there is only one non-potable water supply source which is the pumpstation at the existing chlorine contact tanks, the proposed looped piping will have the ability to isolate branches if there are damages in the branch pipeline and will not affect other areas of service. Based on the current non-potable water demands, 6" and 4" pipes are proposed for the main loop. The estimated construction cost is approximately $400,000 for the non-potable reconstruction piping in 2014 as shown in Table 2. Building both systems, the potable and non-potable, at the same time may reduce the cost estimate shown.

Table 2: Proposed Rough Cost Estimate for Exterior Looped Non-Potable Water Distribution System and Branch Connections and Valves

Proposed Piping Construction Cost Estimate	JB Latham Wastewater Treatment Plant Proposed Non-potable water pipelines			
CONSTRUCTION TYPE	**UNIT**	**$/UNIT**	**#**	**COST**
GENERAL				**$25,000**
Mobilization	lump sum	$5,000	1	$5,000
Equipment Rental	wks	$1,000	4	$4,000
Superintendent Oversight	man hrs	$100	160	$16,000
CIVIL				**$271,825**
Excavation/Backfill	ft^3	$10	860	$8,600
Demolition and Disposal	Lot	$5,000	1	$5,000
Re-paving	ft^2	$30	430	$12,900
Pipe Trench Gravel Bedding	ft^3	$15	215	$3,225
6" HDPE underground pipe	ft	$100	55	$5,500
6" Above ground pipe inc. pipe supports	ft	$120	1030	$123,600
4" HDPE underground pipe	ft	$80	100	$8,000
4" Above ground pipe inc. pipe supports	ft	$100	1050	$105,000
2" HDPE underground pipe	ft	$50	160	$8,000
1" HDPE underground pipe	ft	$25	115	$2,875
1" Above ground pipe inc. pipe supports	ft	$35	210	$7,350
6" Gate Valve and Flanges	EA	$1,500	2	$3,000
4" Gate Valve and Flanges	EA	$1,000	2	$2,000
2" Gate Valve and Fitting	EA	$700	5	$3,500
1" Gate Valve and Fittings	EA	$200	1	$200
SUBTOTAL				**$296,825**
Contractor Overhead 15%				$44,524
Bonding/Insurance 3%				$8,905
SUBTOTAL II				**$350,254**
Contingency 10%				$35,025
TOTAL				**$385,279**



XHIBIT 3 – J.B. LATHAM WWTP
'ROPOSED POTABLE PIPELINE


XHIBIT 4 - J.B. LATHAM WWTP
ROPOSED NON-POTABLE PIPELINE
LEGEND:
NPW
NON-POTABLE WATER PIPELINE ABOVE GROUND
NPW
NON-POTABLE WATER PIPELINE BELOW GROUND
NON-POTABLE WATER USAGE SCALE
POLYMER TANKS
POLYMER TANKS
BOILER MAKEUP
PUMP SEAL
PUMP SEAL
LAB
GRIT WASH
SCREEN
GRIT WASH
SCREEN
IRRIGATION
NON-POTABLE WATER PUMPSTATION
4" NPW
6" NPW
2" NPW
1" NPW
SCALE: 1:20
NORTH
20 10 0 20 40
PACE
Advanced Water Engineering
Newhope Street, Suite 200 | Fountain Valley, CA 92708
P: (714) 481-7300 | www.pacewater.com

Memorandum

DATE: December 8, 2014

TO: File

FROM: James L Burror, Jr., P.E., Director of Operations

SUBJECT: Evaluation of Xeriscape Water Impacts from New Landscaping

BACKGROUND:

The South Orange County Wastewater Authority (SOCWA) is planning for the replacement of its landscaping for the Administrative Building serving SOCWA's four (4) treatment facilities. There were two options investigated:

1) Optimize existing landscaping and irrigation system
2) Replace the existing landscaping and irrigation with a Xeriscape landscaping and irrigation system

ANALYSIS:

Option 1 - Optimize existing landscaping and irrigation system

A recent audit was conducted to optimize the existing landscaping and irrigation system for SOCWA's Administrative Building. The results of the audit concluded that water usage could be reduced by 20%, or 115.5 HCF/yr (86,400 gal/yr.). The report titled "Optimized Irrigation Plan" December 2014 prepared by Eco Green Team's Certified Auditor is attached for reference. The estimated cost for this effort is minimal.

Option 2 - Optimize existing landscaping and irrigation system

A recent design was prepared to replace the existing landscaping and irrigation system for SOCWA's Administrative Building. The plan would install landscaping with low to very low water use landscaping, also known as Xeriscape. The landscaping would also incorporate California friendly plants but maintain the mature trees at the site. According to the Yield and Reliability Demonstrated in Xeriscape Final Report Metro Water Conservation, Incorporated (MWCI) December 2004, Xeriscape type landscaping requires 0.8 to 2.9 gallons per square foot. At 2.9 gallons per square foot, the 0.332 acres of landscaping would require about 60 HCF/yr of water, or 90% less water than today's landscaping. The estimated cost for replacement of the landscaping is $120,000. The Landscaping plan and the report titled "Yield and Reliability Demonstrated in Xeriscape" Final Report Metro Water Conservation, Incorporated (MWCI) December 2004 are attached for reference.

RESULTS:

SOCWA is seeking to replace its landscaping with Xeriscape type landscaping. The estimated savings from reduced water demand is $3,000 per year. The payback period is nearly 40 years without rebates and grants. However, in light of the extraordinary drought conditions in California, SOCWA will proceed with these landscaping improvements to save about 400,000 gallons per year. SOCWA staff will also seek grants and rebates to offset it costs to reduce the payback period.

<u>Attachments</u>

1) "Optimized Irrigation Plan" December 2014 prepared by Eco Green Team
2) Xeriscape Landscape Plans prepared by Eco Green Team
3) Yield and Reliability Demonstrated in Xeriscape" Final Report Metro Water Conservation, Incorporated (MWCI) December 2004

INITIAL STUDY

SOCWA (South Orange County Wastewater Authority), Dana Point, California

1. **PROJECT**: J. B. Latham Treatment Plant Facility Improvements

2. **CONTACT PERSON & PHONE**: Brian Peck, P.E., Director of Engineering, (949) 234-5400

3. **PROJECT LOCATION**: The project proposes to upgrade existing facilities at the J. B. Latham Treatment Plant. All proposed improvements are within previously developed areas within (or immediately adjacent to) the boundaries of the existing J. B. Latham Treatment Plant. The 8.3-acre plant site is located at 34156 Del Obispo Street, Dana Point, in Orange County, California. The Treatment Plant location is shown in Exhibits 1 through 3. Exhibit 4 depicts current facilities.

4. **PROJECT DESCRIPTION**:

The J.B. Latham Treatment Plant facility improvements consist of nine major elements throughout the existing plant site. Each of the nine elements is described below. The locations of proposed facilities are shown in Exhibit 5.

Project Elements

1. Retrofit of Existing Aeration Basins

The J. B. Latham Treatment Plant includes seven aeration basins constructed between 1964 and 1979. The project includes installation of new high efficiency air diffusers. The existing gas driven aeration blower will be replaced with high efficiency turbo electric driven blowers. The efficiency of the new aeration equipment will dramatically decrease the oxygen needed for the process. This reduction (coupled with modification of the co-generation system – see Element 2, below) will significantly improve the energy efficiency of the treatment plant's operations. A new control system for the aeration basins will also improve effluent quality by avoiding dramatic changes in the diurnal dissolved oxygen levels.

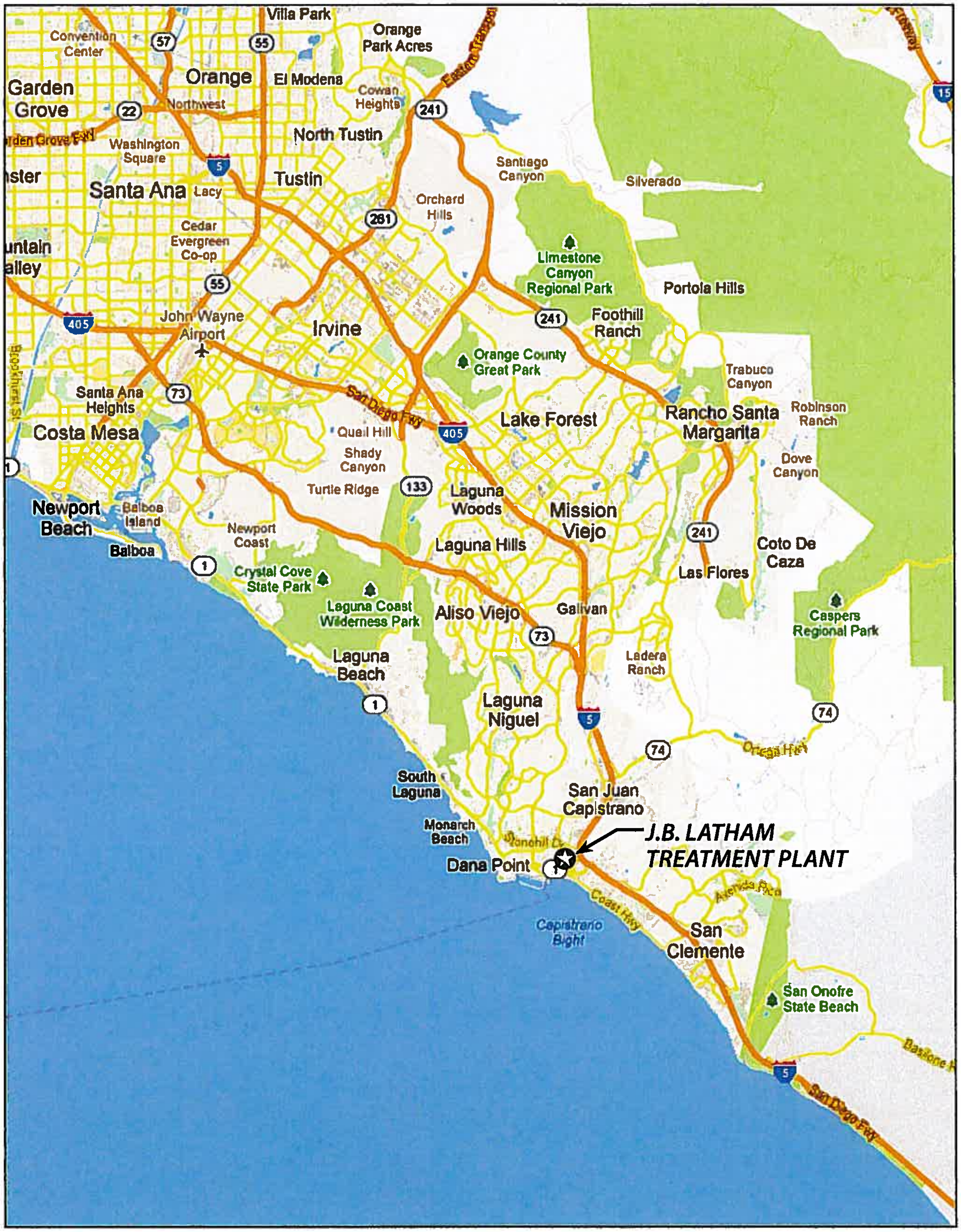
Work associated with this improvement is largely mechanical, involving replacement of diffusers and piping in each basin, along with the blowers and some electrical work. Minor structural work may be involved to modify existing concrete bases. Removal and replacement of aeration equipment in each basin will require use of a crane (one day per basin).

2. Reconstruction of Co-generation System

The original co-generation system was constructed in 1989. The digester gas driven blower will be replaced with high efficiency turbo electric driven blowers. A new digester gas driven engine generator will be installed. This new unit will (a) allow for a higher utilization of digester gas produced at the facility, (b) comply with amended SCAQMD Rule 1110.2, (c) reduce air contaminant discharges, and (d) decrease consumption of electrical power from the San Diego Gas and Electric grid.

The new facilities will be entirely within an existing building, with the exception of a small portion of non-mechanical equipment (e.g., storage tanks) to be located outside the building. Concrete (2 to 3 trucks) will be poured to create new housekeeping pads outside the existing building. This will be accomplished by a 4 person crew, a fork lift and a boom truck. The improvement

J.B. LATHAM TREATMENT PLANT FACILITY IMPROVEMENTS

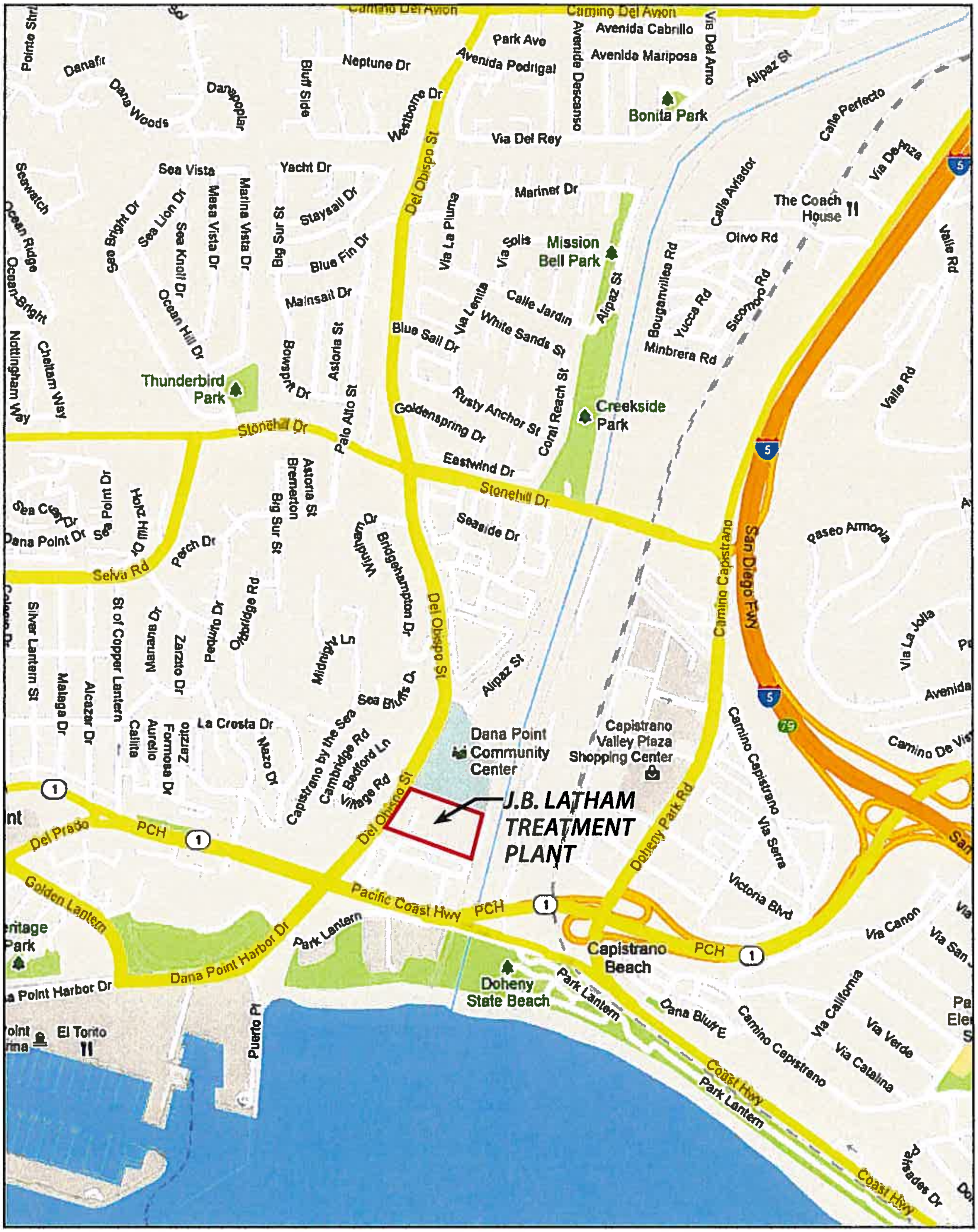


Source: Google Maps 2012

N

Exhibit 1
Regional Location

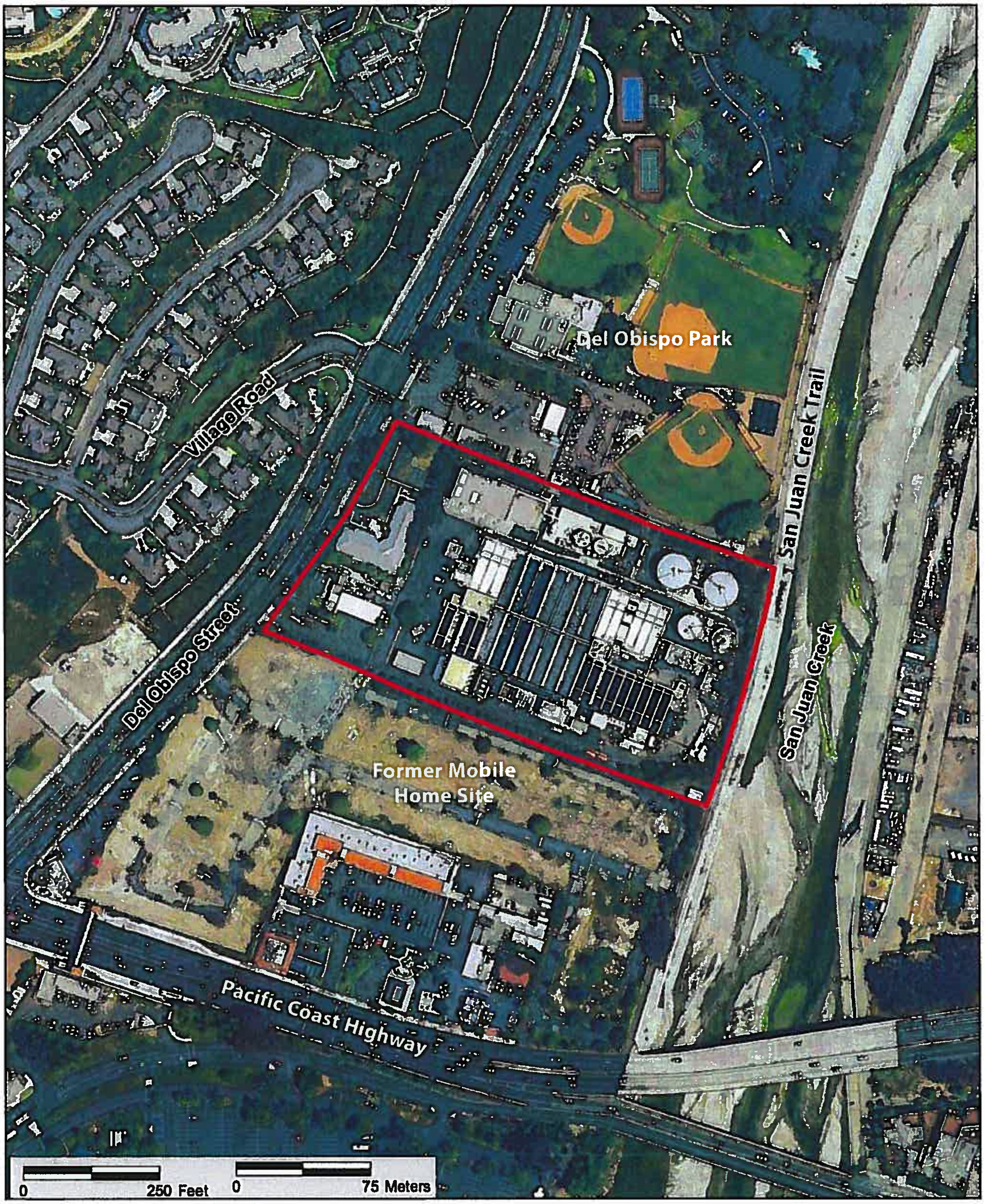
J.B. LATHAM TREATMENT PLANT FACILITY IMPROVEMENTS



Source: Google Maps 2012

N

Exhibit 2
Project Vicinity



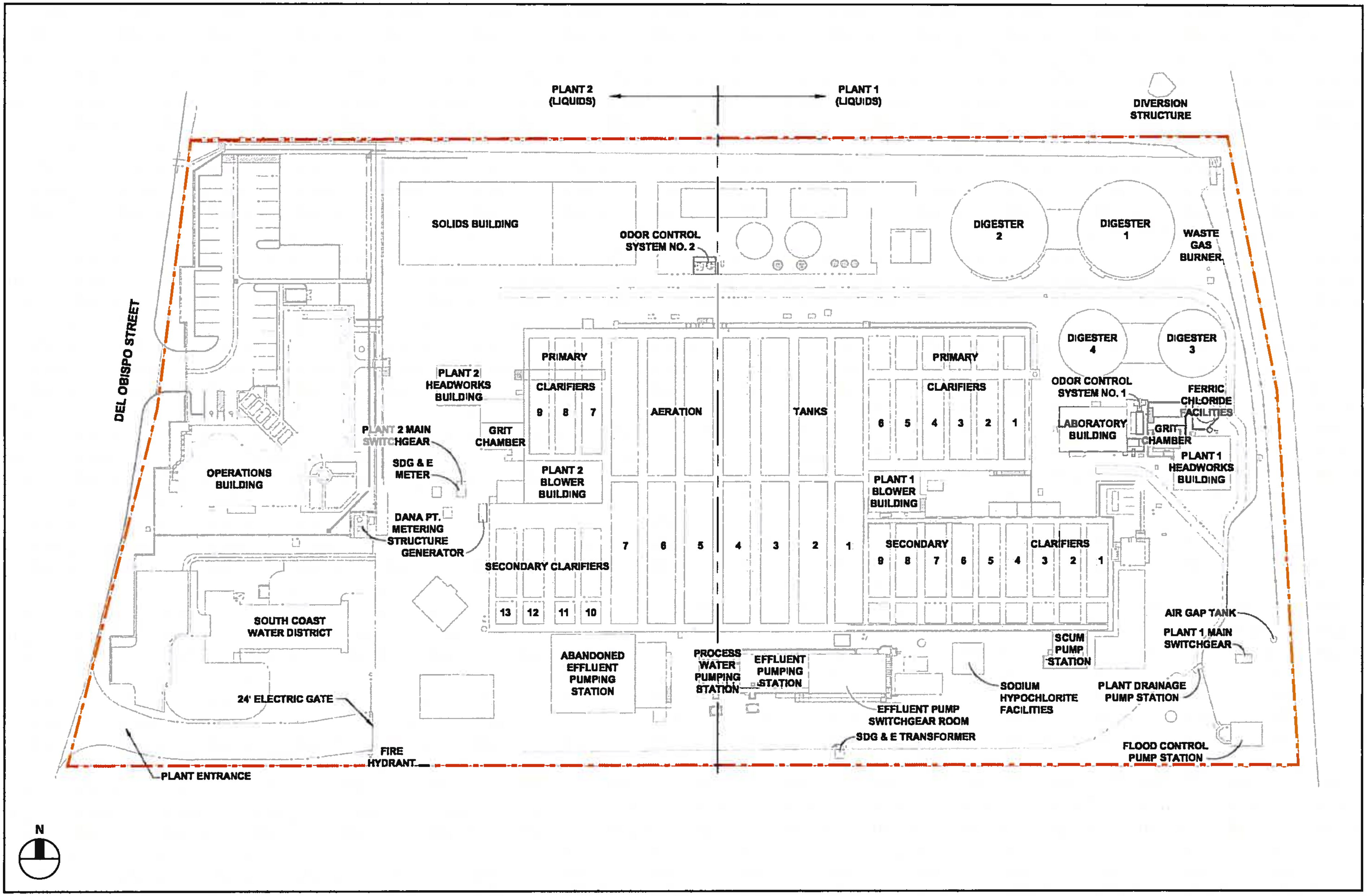
Source: Aerial Express, 2010; PCR Services Corp., 2012

N

Exhibit 3

Aerial View of J. B. Latham Treatment Plant

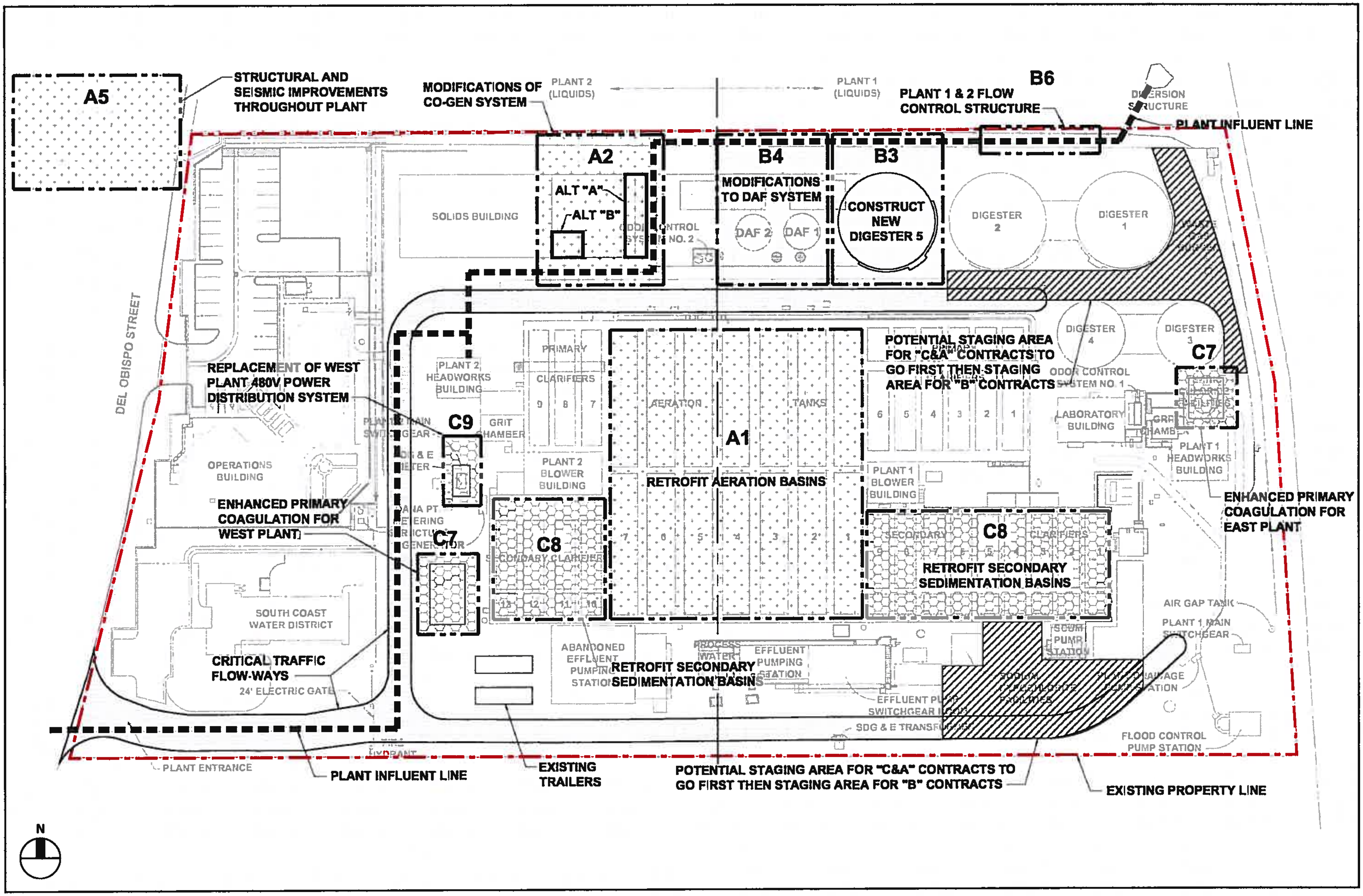
J.B. LATHAM TREATMENT PLANT FACILITY IMPROVEMENTS



Source: Carollo Engineers

Exhibit 4
Existing Facilities

J.B. LATHAM TREATMENT PLANT FACILITY IMPROVEMENTS



Source: Carollo Engineers

Exhibit 5
Proposed Facilities

also includes installation of a new electrical distribution panel and control panel, requiring an electrical crew of 3 persons using the same equipment.

3. Construction of a Fifth Anaerobic Digester

A new anaerobic digester will be constructed to provide a more stable digestion process. The existing digestion system does not have sufficient detention time, particularly when one unit is removed from service. Addition of a new digester will allow a more uniform stabilization process while allowing a more regular digester cleaning program. It also allows one of the existing small digesters to be dedicated to solids storage. This is critical in allowing the plant to deal with potential disruptions in biosolids being hauled away from the plant.

Digester No.5 will resemble existing Digesters No.1 and No.2 in its dimensions. The new unit will have a diameter of sixty-five feet with a sidewall depth of thirty six feet. The walls of the new digester will extend thirty-two feet above the surrounding ground level (similar to the existing Digesters No.1 and No.2). The unit will be constructed directly to the west of Digester No.2 (see Exhibit 5). Construction requires excavation to a depth of approximately fifteen feet. A fifteen foot high building (concrete slab and walls) with a floor area of 600 square feet would be built near Digester No.5. This building would house a natural gas boiler for heating the digester as well as digester heating pumps. Digested sludge and recirculation pumps would be installed on small pads outside the structures similar to the existing installation.

Construction of the digester will require stabilization of the sandy substrate through methods that have the potential to generate low levels of vibration (e.g. placement of stone columns). A similar potential exists for the placement of sheet piles associated with construction of the 600 square feet building. The project includes vibration monitoring in the residential neighborhood nearest the site, to ensure vibration levels from neither activity exceed significance thresholds (see discussion in Section 5.11, Noise).

4. Modification of Existing Thickening and Digestion Systems

Two dissolved air flotation (DAF) thickening systems installed in the early 1970's are now near the end of their useful life. The existing units will be refurbished including the replacement of mechanical and electrical equipment, sand blasting and recoating of the basin surfaces.

5. Implementation of Structural & Seismic Improvements

The main structural component of the J. B. Latham Treatment Plant was constructed between 1964 and 1985. Although most of the structural work remains in good condition, several areas suffer from hydrogen sulfide concrete corrosion and carbon steel corrosion. These deficiencies require correction before they induce higher levels of deterioration throughout the plant. Evaluation of the plant has also revealed structural elements that are vulnerable to damage during a seismic event. This damage could result in impacts to life safety of facility occupants as well as disruptions in the treatment process. This element of the project consists of over 25 small structural and seismic repairs. Structural improvements largely involve the use of epoxy products over small areas. A few of these repairs require sandblasting areas of concrete surface.

6. Construction of a Plant1/Plant2 Flow Control Structure

The J.B. Latham Treatment Plant consists of two more or less autonomous plants, serving different parts of SOCWA's service area. Plant 1, which occupies the eastern portion of the site, has a 9 mgd capacity. Plant 2 occupies the western portion of the site and has a capacity of 4 mgd but normally runs at half capacity. The two plants operate independently, but under certain conditions (storm events that generate high flows in the portion of the service area treated by Plant 1), Plant 1 is overloaded, while Plant 2 remains underutilized. A flow control structure would allow effective diversion of influent flows from Plant 1 to Plant 2, in turn, allowing more reliable operation while reducing the probability of high suspended solids in the effluent during wet weather events.

This project element consists of two components: (*i*) construction of a new vault for flow metering, and (*ii*) replacement of a sluice gate at the existing diversion structure. The diversion structure is located just outside the northeast corner of the J.B. Latham Treatment Plant site. (It is the only element of the project that is not entirely within the existing treatment plant site.) The control vault will be located inside the treatment plant site (near the northeast corner) and is anticipated to be a concrete structure that will extend approximately three feet above the ground surface and 17 feet below the surface. Replacement of the sluice gate entails removal and replacement of existing mechanical parts only. No grading or trenching will occur that might result in erosion or sedimentation. (This offsite improvement is located in a depressed area that drains into the treatment plant site, away from the berm separating the plant from San Juan Creek; there is therefore no potential for offsite activities to adversely affect the creek.) This improvement will require short-term nighttime construction activities. The project will integrate noise attenuation methods (use of sound-attenuation blankets) to reduce temporary noise generated by offsite equipment (boom truck). (See discussion in Section 5.11, Noise.)

7. Implementation of Chemically Enhanced Primary Treatment

Chemically enhanced primary treatment (CEPT) is proposed at the J. B. Latham Treatment Plant as a means of reducing aeration demands while increasing the generation of digester gas. A decreased aeration demand in turn lowers energy use at the plant, while increased production of digester gas provides additional potential for onsite energy generation. The enhanced treatment will also result in greater suppression of sulfides, in turn reducing the load on odor control scrubbers. The enhanced process involves adding ferric chloride and polymer to the discharge side of the raw wastewater pumps at both Plant 1 and Plant 2.

The proposed enhancement calls for construction of two chemical handling systems, one each for Plant 1 and Plant 2 (see Exhibit 5 for locations). Each chemical system would consist of one ferric tank, three ferric metering pumps, one polymer tank and one polymer blender/feeder. The equipment would be located in new concrete containment areas with approximate dimensions of 20 feet by 30 feet and excavation to an approximate depth of three feet.

8. Retrofit of Secondary Sedimentation Basins

The Treatment Plant includes thirteen rectangular secondary sedimentation basins, originally installed between 1964 and 1979. The existing equipment is largely original. This equipment is becoming prone to sporadic failures due to age. Retrofit of the basins includes replacement of several components: chain and flight sludge collectors, rotating scum removal eirs, telescoping valves, and metallic effluent launders. Most of this work is mechanical in nature to replace in-kind existing equipment. No structural work is proposed. All work will occur within the footprint of the existing basins.

9. Replacement of 480-Volt Power Distribution System in Plant 2

The Treatment Plant's 480 volt power grid has experienced diminishing reliability due to both age (originally installed between 1971 and 1979) and environmental corrosion. The older Plant 1 power distribution system was rebuilt in 2010. Replacement of the Plant 2 system in a temperature controlled enclosure will improve long-term system reliability. The new equipment will include energy monitoring systems that will allow staff to reduce energy intensive activities during periods of peak electrical demand. The new equipment will also be arc flash resistant, an improvement that will enhance safety for operational staff.

Reconstruction of the Plant 2 power distribution system includes construction of an environmentally controlled electrical enclosure for the main switchgear. An existing 600 square foot building will be removed to make way for the new enclosure which will be a prefabricated structure approximately 17 feet in height, 600 square feet in area and constructed on a new concrete pad. The depth of excavation for the new pad will not exceed 3 feet.

Project Phasing

Construction is scheduled to begin in January 2014 and end in June 2016. The entire project is anticipated to have a construction period of 30 months, with various elements being developed sequentially. The project's nine elements will be constructed in three phases as depicted in the table below. Phases A and C will likely be constructed concurrently within a 14-month period, followed by the elements of Phase B. Element B6, Plants 1 & 2 Flow Control Structure, may be constructed concurrently with Phases A and C, but the Anaerobic Digester (Element B3) cannot begin until Modification/Replacement of the DAF Thickener (B4) is complete. Thus, Phase B will occur in sub-phases. Phase B is anticipated to occur over an 18 month period, with construction of the Anaerobic Digester (B3) taking up the greatest share of this time (estimated 18 months). The sequence of project elements is influenced primarily by staging constraints onsite.

Table 1
Construction Phasing

Element No.	Phase	Project Element
1	A	Aeration Basin Retrofit
2	A	Cogeneration System Reconstruction
3	B	Anaerobic Digester No. 5 Construction
4	B	DAF Thickener Modification/Replacement
5	A	Structural & Seismic Improvements
6	B	Plants 1 & 2 Flow Control Structure Construction
7	C	Chemically Enhanced Primary Treatment Implementation
8	C	Secondary Sedimentation Basin Retrofit
9	C	Plant 2 480-volt Power Distribution System Replacement

Construction Staging

Construction staging will occur in two designated areas onsite, both identified in Exhibit 5. Staging of equipment and materials for all proposed improvements will take place entirely onsite, with the exception of the installation of the new sluice gate for the Diversion Structure as part of Project Element 6. The existing gate (to be replaced at the same location) is just outside the Treatment Plant's northeast corner (see Exhibit 5). Installation of the sluice gate will require use of a boom truck for a brief period (four days) which will access the installation site from the San Juan Creek recreational trail, entering the trail once at the beginning of the installation period and once again when installation is completed. The truck will remain at the site, off trail, during the four-day work period.

5. **PROJECT SETTING**: The site of the J.B. Latham Treatment Plant has been the site of waste water treatment facilities since the 1950's. Exhibit 6 illustrates the land use designations for the site and its surroundings as depicted in the City of Dana Point General Plan. The Treatment Plant site is designated Community Facility (CF). Neighboring parcels to the north are designated Recreation Open Space (R/OS), as is the San Juan Creek to the east. The property immediately to the south is designated Commercial/Residential (C/R). Properties

Source: City of Dana Point

Exhibit 6
General Plan Land Use Designations

across the street, west of Del Obispo Street, are designated Residential (Res 8.5-7). Zoning for the site is Quasi-Public Facilities. The neighboring park to the north is zoned Recreation, and the vacant property to the south is zoned Mixed Use Residential/Commercial18 DU/AC.

5.0 RESPONSES TO ENVIRONMENTAL CHECKLIST QUESTIONS

5.1 AESTHETICS

Issues:	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
I. AESTHETICS. Would the project:				
a) Have a substantial adverse effect on a scenic vista?				X
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?				X
c) Substantially degrade the existing visual character or quality of the site and its surroundings?				X
d) Create a new source of substantial light or glare that would adversely affect day or nighttime views in the area?				X

Would the project:

a) Have a substantial adverse effect on a scenic vista?

No Impact. Significant scenic resources, including scenic vistas, are defined by the City of Dana Point General Plan and Dana Point Specific Plan. The Circulation Element of the General Plan identifies Del Obispo Street as a Scenic Highway. This designation signifies that the street is subject to design provisions in the Urban Design Element of the General Plan. The Urban Design Element specifies landscape treatments for scenic highways (landscape trees, parkways and medians). Public streets and rights-of-way, especially arterials, are generally considered to be public view corridors from which to view scenic vistas or visually significant features in the landscape.

Exhibit 7 presents views of the J.B. Latham Treatment Plant from various viewpoints. **Exhibit 7a** shows the current view of the Treatment Plant from Del Obispo Street. As seen in the exhibit, very little of the site is visible from the street. The single-story SOCWA Operations Building, a portion of the parking lot and landscaped areas are visible behind the wall that fronts the site. A portion of the beige Solids Building is discernible behind trees to the left (east) of the Operations Building. The very limited visibility of the site from the Del Obispo right-of-way, as shown in this exhibit, indicates that none of the proposed improvements will be visible from the public viewshed along the Del Obispo Street right-of-way. All proposed improvements, including the proposed new digester (the tallest of the proposed new facilities) will be obscured from view by existing structures from this view corridor.

Exhibit7b presents the view of the treatment plant as seen from the vacant property to the south (formerly the site of Marina Mobile Home Estates). It is expected that this land will be developed

J.B. LATHAM TREATMENT PLANT FACILITY IMPROVEMENTS

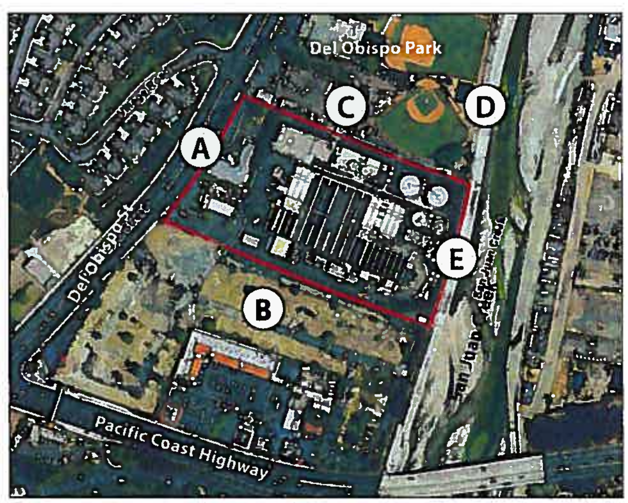
A. View from Del Obispo Street

B. View from Vacant Mobile Home Site

C. View from Del Obispo County Park

D. View from San Juan Creek Trail

E. View from San Juan Creek Trail



Key Map

Exhibit 7
Views of the Project Site

with a new mixed commercial-residential use in the next ten years. The view from this site shows the well-developed landscaping within the treatment plant along its southern boundary and elsewhere within the treatment plant's interior. The row of mature Eucalyptus trees inside the treatment plant's surrounding wall screens most of the plant's facilities from view. The tallest of existing facilities (Digesters 1 and 2) are on the north side of the plant and not visible from the property to the south. The new digester (which will be identical in height, mass and distance from the property line to Digesters 1 and 2) will likewise be imperceptible from this location. All other proposed facilities will be equally out of sight, being well below the sightline and within the footprint of existing facilities.

Exhibit 7c presents a view of the treatment plant from Del Obispo Community Park. Digesters 1 and 2 are visible above the outfield fence of the south-facing baseball field. Digester 5 will be similar in appearance and will be sited in the approximate location indicated in the exhibit. The new digester will be identical to the two existing digesters in scale, color and materials. It will be installed with additional landscape trees, similar to the existing Eucalyptus trees that currently soften the visual backdrop behind the playing fields, to form an evenly spaced, vertical screen between the recreational site and the treatment plant facilities.

As is evident from Exhibit 7c, Digester 5 will be visible but is consistent with the site's current visual character and with views of the Treatment Plant from the north. The height and mass of the proposed tank do not exceed that of the existing tanks. The new tank will not obstruct a scenic vista (it will hide a portion of the Plant 1 Blower Building and some distant trees), but its addition to the site does not introduce a visual element that significantly alters the local viewshed. Nor does it obscure views to features that are significant to the quality of the viewshed, or which constitute significant visual resources, such as expansive views to the ocean. While the new tank adds visible mass to the assemblage of already existing facilities, it does not obstruct important views or substantially alter the viewshed in a way that significantly damages scenic resources.

Exhibit 7d presents a view of the Treatment Plant as seen from the public recreational trail that parallels the channel of San Juan Creek. From this view, looking south toward the ocean and across the playfield of Del Obispo Park, Digesters 1 and 2 are visible, partially screened by trees. The site of Digester 5 is indicated to the right (west) of the two existing digester tanks. As is apparent from the exhibit, the new digester tank will be consistent in scale with the existing facilities. It will block views of distant trees in the vicinity of Doheny State Beach, but will not obscure a significant scenic vista or significantly alter the character of the visual landscape.

Exhibit 7e is a second view of the Treatment Plant from the San Juan Creek recreational trail. From this location a direct view into the site is available to passing pedestrians and cyclists, seen between the landscaping that screens the site along its eastern boundary. The aeration basins visible in this view are proposed to be retrofit with membrane diffusers and high efficiency turbo blowers. These improvements will not alter the appearance of facilities as seen from offsite. No other proposed improvements (aside from the new digester tank) will alter the visual appearance of the site or its facilities as seen from offsite.

The Treatment Plant site is not visible from other significant public viewpoints, or in some cases, is visible only as a very minor element in the landscape. It is not visible from the pedestrian bridge at Coast Highway. A portion of the site is visible to motorists on Coast Highway (a brief passing view is available as the highway crosses the creek).

The Dana Point Specific Plan identifies significant public viewpoints in the residential areas to the west of Del Obispo Street. The Specific Plan identifies a 'Primary Inland View to Harbor' from the vicinity of Crystal Cove Park (accessed from Via Elevado) and Seaview Park (accessed from Manzanita Drive). The treatment plant is not visible from either of these locations. The public trail to Seaview Park from Village Drive offers views oriented down coast (to the south), but the treatment plant site is not a prominent feature, is too far inland to affect the coastal view, and is only visible from a single point along the trail as a minor component in the inland landscape. None of the structures within the plant are prominent or even clearly distinguishable in the viewshed.

The Specific Plan also identifies a 'Secondary View' location in the vicinity of the Calle La Primavera/La Cresta Drive intersection. But there are no views of the treatment plant from this area. Portions of the treatment plant are partially visible between buildings and through the landscaping in residential areas on the higher elevations of Capistrano by the Sea, but there is no vista or public viewpoint from the public streets in the vicinity of this residential area upslope and to the west of Del Obispo Drive. In the very limited views that exist from these streets the treatment plant is a minor component of the visual landscape dominated by the much larger industrial yards on the other side of San Juan Creek. (The creek itself is not visible.)

b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?

No Impact. There are no historic buildings, trees, rock outcroppings or other significant scenic resources that will be affected by the project's proposed facilities. The facilities will not significantly affect views of any significant scenic resources offsite.

c) Substantially degrade the existing visual character or quality of the site and its surroundings?

No Impact. Proposed facilities are similar to already existing facilities onsite and will be similar in visual character. The visual character of the site and of its surroundings will not be substantially changed or degraded.

d) Create a new source of substantial light or glare that would adversely affect day or nighttime views in the area?

No Impact. The project does not include any significant new sources of light. Proposed facilities will not result in additional significant outdoor lighting.

5.2 AGRICULTURAL RESOURCES

Issues:	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
II. AGRICULTURE RESOURCES. In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Dept. of Conservation as an optional model to use in assessing impacts on agriculture and farmland. Would the project:				
a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?				X

Issues:	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?				X
c) Involve other changes in the existing environment, which due to their location or nature, could result in conversion of Farmland, to non-agricultural use?				X

Would the project:

a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?

No Impact. The project site is already developed in an urbanized area and will not convert any designated farmlands.

b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?

No Impact. The project is not located on or near any properties zoned for agricultural use or under Williamson Act contract.

c) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use?

No Impact. The nature of the project is such that it will not change the existing environment in any way that would affect farmland. In addition, there are no farmlands or agricultural uses in the vicinity.

5.3 AIR QUALITY

Issues:	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
III. AIR QUALITY. Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations. Would the project:				
a) Conflict with or obstruct implementation of the applicable air quality plan?				X
b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?				X
c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is nonattainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?				X

Issues:	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
d) Expose sensitive receptors to substantial pollutant concentrations?				X
e) Create objectionable odors affecting a substantial number of people?				X

A technical assessment of the project's air quality emissions was prepared to evaluate potential impacts to air quality (Mestre Greve Associates, 2012a). The assessment quantified the project's projected emissions for several pollutants generated by construction activities as well as long-term emissions after project completion. Emissions were gauged against criteria and standards of local, State and Federal agencies, and impacts were evaluated in terms of localized significance thresholds, regional (basin wide) conditions, and greenhouse gas emissions. The study also included a Clean Air Act general conformity analysis.

The Treatment Plant is within the South Coast Air Basin, managed by the South Coast Air Quality Management District. The air basin has been designated 'non-attainment' status for ozone and particulates (PM10 and PM25) by the State (California Air Resources Board) and U.S. EPA, and 'attainment/maintenance' status for carbon monoxide and nitrogen dioxide by U.S. EPA.

The assessment quantified the project's emissions from both construction activities and long-term operations after construction. Construction emissions were calculated based on the major emission-generating equipment that would be used to implement each of the nine project elements. Thresholds for significance of construction impacts consider emissions in terms of pounds per day. The analysis examined worst-case daily emissions and considered that some construction activities (Phases A and C) would overlap. Construction emissions are shown in **Table 2** below. The assessment found that construction emissions for all 5 critical pollutants will be well below the thresholds of significance for construction emissions.

TABLE 2
CONSTRUCTION EMISSIONS AND THRESHOLDS

Pollutant	Threshold of Significance for South Coast Basin (lbs/day)	Peak Construction Emissions (lbs/day)	Exceeds Threshold?
Carbon Monoxide (CO)	550	19.01	NO
Oxides of Nitrogen (NO_x)	100	34.10	NO
Particulate Matter (PM_{10})	150	2.08	NO
Particulate Matter ($PM_{2.5}$)	55	1.83	NO
Reactive Organic Gases (ROG)	75	46.80	NO
Sulfates (SO_x)	150	0.04	NO

Onsite construction emissions were calculated and compared to Local Significance Thresholds (LSTs) to determine if nearby sensitive receptors would experience short-term impacts. The applicable LSTs for the nearest residences (approximately 500 feet from the site) will not be exceeded, due to the relatively small scale of the project and its considerable distance from the neighborhood.

Moreover, the project will result in a net ***reduction*** of operational emissions compared to existing conditions, because several of the project elements will operate with greater efficiency than existing facilities, and therefore consume less energy. (Specifically, project elements 1, 2, 4, 7 and 8 are expected to result in an overall decrease in electrical energy use at the plant; see Project Description; see also Section 2.3 of the technical Air Quality study (in Attachment 1).

The technical study also identifies the amount of Greenhouse Gas (GHG) emissions that would be generated during the project's construction phases. The principal source of greenhouse gas emissions (by far) will be diesel-powered construction equipment and other combustion sources (generators and vehicles) emitting carbon dioxide. Greenhouse gas emissions (carbon dioxide, methane and nitrous oxide) were calculated based on the level and type of equipment that will be used during construction phases. Methods for assessing greenhouse gas emission impacts call for annualizing construction emissions over the life of the project (per SCAQMD). The project's annualized construction emissions are presented in **Table 3**, below, in terms of CO_2EQ, Carbon Dioxide Equivalent units that include emissions of carbon dioxide, methane and nitrous oxide.

As indicated previously, the project will result in a reduction in energy consumption. In particular, Project Element 2, Cogeneration System Reconstruction, will reduce the amount of electricity purchased from the grid, with a savings of approximately 2,889 megawatt-hours per year after project implementation. The project will thus reduce green house gas emissions compared to current emissions. When the project's annualized construction emissions are combined with its reduction in operational emissions, the net reduction in greenhouse gas emissions is more than 1,000 metric tons per year. Thus, the project will have a beneficial effect on greenhouse gas emissions.

TABLE 3
GREENHOUSE GAS EMISSIONS

Activity	Construction GHG Emissions CO_2 EQ (Metric Tons)
Annualized Construction Emissions	20.29
Annual Operational Emission Reduction	1,028.44
Net Annual Emission Reduction	**1,008.15**

NOTE: CO_2 EQ = Carbon Dioxide equivalent units and includes emissions of CO_2, CH_4 and N_20.

The technical study performed a General Conformity analysis to determine if the project conforms to the Federal Clean Air Act. Procedures for this analysis require an evaluation of the project's emissions of each criteria pollutant for which the air basin has been designated non-attainment or maintenance status. The air basin is in serious non-attainment for ozone and PM_{10}, non-attainment for $PM_{2.5}$, and maintenance for CO and NO_2. To be in conformance, the project's emissions must not exceed the *de minimis* thresholds for these pollutants and the ozone precursors (VOC and NO_x) must not exceed 10 percent of the regional inventory. As shown in **Table 4**, project emissions are well below these thresholds.

TABLE 4
PROJECT EMISSIONS AND CONFORMITY THRESHOLDS

Pollutant	De Minimis Threshold Tons/Year[1]	Project Emissions (Tons/Year)	Exceeds Threshold?
Carbon Monoxide (CO)	100	3.47	NO
Oxides of Nitrogen (NO_x)	25	6.22	NO
Particulate Matter (PM_{10})	70	0.38	NO
Particulate Matter ($PM_{2.5}$)	100	0.33	NO
Volatile Organic Compounds (VOC)	25	8.54	NO

[1] De Minimis Thresholds for SCAQMD (Source: 40 CFR 93.153 (b)(2)).

Would the project:

a) Conflict with or obstruct implementation of the applicable air quality plan?

No Impact. The project will not obstruct implementation of the South Coast Air Quality Management Plan. Rather it is consistent with the plan in that construction emissions are well below the significance thresholds put forth by the plan, and operational emissions will result in a net reduction in emissions. The facility improvements will not increase the capacity of the treatment plant and are not growth-inducing.

b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?

No Impact. The project's emissions are well below emission standards and will not contribute substantially to an air quality violation.

c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is nonattainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?

No Impact. The project's emissions are not cumulatively considerable for non-attainment pollutants.

d) Expose sensitive receptors to substantial pollutant concentrations?

No Impact. The project's construction emissions will not expose sensitive receptors to substantial pollutant concentrations.

e) Create objectionable odors affecting a substantial number of people?

No Impact. None of the project elements will generate odors over existing conditions.

5.4 BIOLOGICAL RESOURCES

Issues:	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
IV. BIOLOGICAL RESOURCES. Would the project:				
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?				X
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?				X
c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?				X
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?				X
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?				X
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?				X

The J.B. Latham Treatment Plant site is entirely developed with wastewater treatment facilities. There are no native habitats, natural communities or sensitive plant or animal species onsite. The locations within the site that are proposed for the new and/or upgraded facilities are all already occupied by existing facilities of the treatment plant. Vegetation within the Treatment Plant site is limited to small landscaped areas with exotic ornamental plant material and eucalyptus trees that border the property on its north, east and west sides. The remainder of the site is covered with buildings, treatment facilities or other hardscape.

San Juan Creek, which is immediately to the east of the Treatment Plant, has no riparian habitat within or adjacent to its channel along this reach adjacent to the site. The project therefore poses no risk to offsite habitat either from the proposed facilities or their construction. Nor will the proposed improvements result in operational changes to the treatment plant's facilities that might potentially impact biological resources indirectly, either by inducing growth in sensitive areas within the SOCWA service area or by the alteration of natural systems (e.g., the redirection of storm flows or changes in the amount or quality of discharge from SOCWA's facilities; see discussion of Hydrology and Water Quality below in Section 5.8).

Would the project:

a) Have a substantial adverse effect, either directly or through habitat modifications, on

any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?

No Impact. The proposed improvements will not affect any candidate, sensitive or special status species, either directly or indirectly through modifications to natural habitat. There are no sensitive species onsite (none have been observed, or are likely to occur), nor is there any designated critical habitat or other native habitats in proximity that might be disturbed by construction activities. The Endangered Species Act 'species list' published by U.S. Fish & Wildlife Service, and the Department of Fish and Game's California Natural Diversity Database species occurrences for the Dana Point quadrangle were both reviewed as part of this assessment. There is no potential for species identified in the lists to occur onsite, due to the absence of habitat of any kind within the treatment plant. All of the species identified in both lists have specialized habitat requirements (an underlying cause of their endangered or rare status) and none of these requirements are met onsite or within neighboring properties that might be indirectly affected by project construction activities.

b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?

No Impact. The locations of proposed facilities do not support any riparian habitat or other sensitive natural communities. There are no riparian habitats or other sensitive natural communities in proximity that might be affected by the proposed improvements.

c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?

No Impact. The proposed improvements will have no impact on federally protected wetlands. All areas affected by the proposed improvements are already occupied by facilities of the existing Treatment Plant. The improved facilities have no potential to impact wetlands offsite or to impact surface waters that drain into wetlands. Thus, no impacts are anticipated on jurisdictional or federally protected wetlands.

d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?

No Impact. All activities associated with the proposed improvements will occur in areas devoid of habitat (of either native or ornamental vegetation). The project will not affect (either directly or indirectly) any nearby habitats used by migratory birds, including migratory shorebirds or other birds that might use the San Juan Creek. The project will not result in removal of any trees (native or ornamental) that might be used by nesting migratory birds. Vegetation onsite is limited to a few ornamental shrub species and Eucalyptus trees which line the site's perimeter. The Eucalyptus trees are a linear landscape feature (not a grove or stand) that is isolated from any foraging habitat that might be suitable for raptors. Due to the highly urbanized character of the site and its surroundings, and the level of activities immediately offsite (public ballfields with night lighting during the nesting season), the few trees onsite are unlikely to provide suitable nesting habitat for migratory species. The absence of nesting species during several site visits concurrent with the nesting season (mid-February through late August) confirmed the lack of use by migrants. None of the proposed facilities have the potential to inhibit the movement of migratory birds (either by their height or by introducing glare or artificial lighting).

e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?

No Impact. The project does not conflict with any local policies or ordinances protecting biological resources.

f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?

No Impact. The proposed facilities will not conflict with the provisions of an HCP or NCCP. As indicated above in response to question 5.4 (a), the project will have no impact on sensitive species or their habitats, including species and habitats which are subject to protection under an HCP or NCCP.

5.5 CULTURAL RESOURCES

Issues:	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
V. CULTURAL RESOURCES. Would the project:				
a) Cause a substantial adverse change in the significance of a historical resource as defined in § 15064.5?				X
b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to § 15064.5?		X		
c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?		X		
d) Disturb any human remains, including those interred outside of formal cemeteries?		X		

A Phase 1 Cultural Resources Assessment (PCR, July 1012, in Attachment A) was conducted to determine the potential for the project to impact historical, archaeological and paleontological resources. The scope and methods of the assessment were designed to comply with CEQA as well as NEPA, Section 106. The study included a cultural resources records search through the California Historical Resources Information System – South Central Coastal Information Center, a review of the California Points of Historical Interest (CPHI), the California Historical Landmarks (CHL), the California Register of Historical Resources (California Register), the National Register of Historic Places (National Register), the California State Historic Resources Inventory (HRI), a Sacred Lands file search through the California Native American Heritage Commission and follow-up Native American consultation, a paleontological records search through the Natural History Museum of Los Angeles County, and an onsite survey by qualified field archaeologists.

The Area of Potential Effects (APE) defined for the project encompasses the 8.3-acre footprint of the J.B. Latham Treatment Plant, with a vertical depth up to 30 feet. While several of the proposed improvements will have no subsurface component, the subsurface components of at least one component (the anaerobic digester) may reach a maximum depth of 30 feet.

According to the records search results, the entire APE has been previously surveyed by an archaeologist. Seven previous surveys encompassed portions or the entirety of the APE. All of these studies yielded no cultural resources within the APE and the immediate vicinity. No archaeological resources exist on the surface within the APE , because the area is entirely developed with treatment plant facilities. While it is possible that prehistoric inhabitants utilized the APE, any resources that may have existed have likely been displaced or buried by the alluvial floodplain deposits resulting from the Los Angeles flood of 1938. A geotechnical study of the site reveals that the vertical APE consists of 60 feet of sandy alluvium overlain with 1.5 feet of imported fill material (Ninyo & Moore, 2012; G.A. Nicoll and Associates, Inc., 1983). No paleontological resources are located on the surface of the APE (owing to its developed condition) and, given the recent age of the sandy alluvium that underlies the site, it is unlikely that paleontological resources exist at depth within the APE.

Based on these results, the assessment found that the project will have no adverse effect to a known historic property pursuant to Section 106/NEPA and will not cause a substantial adverse change to the significance of a known historical, archaeological or paleontological resource, or human remains, pursuant to CEQA. Given the depth of recently deposited alluvium, the absence of any resources encountered during previous field investigations within the APE, and the thoroughly developed condition of the APE, it is considered very unlikely that cultural resources will be impacted by the project, or by similar undertakings within the APE.

However, the following mitigation measures are recommended to ensure that no significant impacts occur in the unlikely event that historical resources, archaeological resources, paleontological resources or human remains are encountered during construction activities.

Mitigation Measure 1: If historical or archaeological resources are encountered during implementation of the undertaking, ground-disturbing activities shall temporarily be redirected from the vicinity of the find. SOCWA shall immediately notify a qualified archaeologist of the find. The qualified archaeologist shall then comply with procedures outlined in 36 CFR 800.13. The archaeologist shall coordinate with SOCWA as to the immediate treatment of the find until a proper site visit and/or evaluation is made by the archaeologist. The archaeologist shall be consulted and approve any additional studies, treatment, and evaluations of cultural resources. The archaeologist shall also determine the need for archaeological monitoring for any additional ground-disturbing activities in the area of the find thereafter.

Mitigation Measure 2: The qualified archaeologist shall prepare a final report about the find to be filed with SOCWA and the CHRIS-SCCIC. The report shall include documentation and interpretation of resources recovered. Interpretation will include full evaluation of the eligibility with respect to the California Register of Historical Resources and the National Register of Historic Places. The landowner, in consultation with the archaeologist, shall designate repositories to curate the archaeological material in the event that resources are recovered.

Mitigation Measure 3: If paleontological resources are encountered during implementation of the undertaking, ground-disturbing activities shall temporarily be redirected from the vicinity of the find. SOCWA shall immediately notify a qualified paleontologist of the find. The paleontologist shall coordinate with SOCWA as to the immediate treatment of the find until a proper site visit and/or evaluation is made by the paleontologist. The paleontologist shall determine the appropriate treatment of the find which may include preservation in place or, if necessary, removal. At the paleontologist's discretion and to reduce any construction delay, the grading and excavation contractor shall assist in removing rock samples for initial processing. Any fossils encountered and recovered shall be prepared to the point of identification and catalogued before they are donated to their final repository. Any fossils collected shall be donated to a public, non-profit institution with a research interest in the materials, such as the Natural History

Museum of Los Angeles County. Accompanying notes, maps, and photographs shall also be filed at the repository. The paleontologist shall also determine the need for paleontological monitoring for any additional ground-disturbing activities in the area of the find thereafter.

Mitigation Measure 4: Following the completion of the above measures, the paleontologist shall prepare a report summarizing the results of the monitoring and salvaging efforts, the methodology used in these efforts, as well as a description of the fossils collected and their significance. The report shall be submitted by SOCWA to the CRO, the Natural History Museum of Los Angeles County, and representatives of other appropriate or concerned agencies to signify the satisfactory completion of the project and required mitigation measures.

Mitigation Measure 5: If human remains are encountered unexpectedly during implementation of the proposed project, State Health and Safety Code Section 7050.5 requires that no further disturbance shall occur until the County Coroner has made the necessary findings as to origin and disposition pursuant to PRC Section 5097.98. If the remains are determined to be of Native American descent, the coroner has 24 hours to notify the Native American Heritage Commission (NAHC). The NAHC shall then identify the person(s) thought to be the Most Likely Descendent (MLD). The MLD may, with the permission of the land owner, or his or her authorized representative, inspect the site of the discovery of the Native American remains and may recommend to the owner or the person responsible for the excavation work means for treating or disposing, with appropriate dignity, the human remains and any associated grave goods. The MLD shall complete their inspection and make their recommendation within 48 hours of being granted access by the land owner to inspect the discovery. The recommendation may include the scientific removal and nondestructive analysis of human remains and items associated with Native American burials. Upon the discovery of the Native American remains, the landowner shall ensure that the immediate vicinity, according to generally accepted cultural or archaeological standards or practices, where the Native American human remains are located, is not damaged or disturbed by further development activity until the landowner has discussed and conferred, as prescribed in this mitigation measure, with the MLD regarding their recommendations, if applicable, taking into account the possibility of multiple human remains. The landowner shall discuss and confer with the descendants all reasonable options regarding the descendants' preferences for treatment.

Whenever the NAHC is unable to identify a MLD, or the MLD identified fails to make a recommendation, or the landowner or his or her authorized representative rejects the recommendation of the descendants and the mediation provided for in Subdivision (k) of Section 5097.94, if invoked, fails to provide measures acceptable to the landowner, the landowner or his or her authorized representative shall inter the human remains and items associated with Native American human remains with appropriate dignity on the property in a location not subject to further and future subsurface disturbance.

Would the project:

a) Cause a substantial adverse change in the significance of a historical resource as defined in § 15064.5?

No Impact. There are no significant historical resources in the project area that would be adversely affected by the proposed facilities.

b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to § 15064.5?

Potentially Significant Unless Mitigation Incorporated. The likelihood of encountering archaeological resources within the project area is considered very low. However, in the unlikely event that resources are encountered during ground disturbance associated with construction, implementation of measures prescribed in Mitigation Measures 1 and 2 identified above will ensure any potential impacts are mitigated to a level below significant.

c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?

Potentially Significant Unless Mitigation Incorporated. The likelihood of encountering paleontological resources within the project area is considered very low. However, in the unlikely event that resources are encountered during ground disturbance associated with construction, implementation of measures prescribed in Mitigation Measures 3 and 4 identified above will ensure any potential impacts are mitigated to a level below significant.

d) Disturb any human remains, including those interred outside of formal cemeteries?

Potentially Significant Unless Mitigation Incorporated. Potential disturbance of human remains is addressed in Mitigation Measure 5 above. Implementation of this measure will ensure impacts are mitigated to a level below significant, in the unlikely event human remains are encountered.

5.6 GEOLOGY AND SOILS

Issues:	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
VI. GEOLOGY AND SOILS - Would the project:				
a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury or death involving:				
i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.				X
ii) Strong seismic ground shaking?			X	
iii) Seismic-related ground failure, including liquefaction?		X		
iv) Landslides?				X
b) Result in substantial soil erosion or the loss of topsoil?				X

Issues:	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?		X		
d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?				X
e) Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water?				X

Responses to the following questions are based on several geotechnical studies prepared specifically to address facilities at the treatment plant (Ninyo & Moore, 2004; 2007, 2008, 2012; G.A. Nicoll and Associates, Inc., 1983; CH2MHill, 2006). The technical studies focus on geologic and soils conditions at the J.B. Latham Treatment Plant site. In addition, a technical study was prepared to identify the need for structural repairs and seismic retrofits of existing facilities at the plant, as a means of defining the scope of Project Element 5, Structural and Seismic Improvements (Carollo Engineers, 2011).

Would the project:

a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury or death involving:

i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.

No Impact. The project area is not identified as a State of California Earthquake Fault Zone (formerly known as an Alquist-Priolo Special Studies Zone). No known active seismic faults traverse the project area. Therefore, there is no potential for adverse effects resulting from ground rupture (Ninyo & Moore, 2004, p. 10).

ii) Strong seismic ground shaking?

Less Than Significant Impact. The project is located in the seismically active southern California region and would likely be subject to ground shaking, potentially exposing proposed facilities to seismic hazards. While no known active seismic faults traverse the project area, the project is within 50 miles of several known potential sources of strong shaking, including the offshore segment of the Newport-Inglewood fault system located approximately 4 miles west of the site Clemente. Other potentially active faults in the region include the Whittier, San Andreas, San Jacinto, Malibu-Coast-Raymond, Palos Verdes, San Gabriel, and Sierra Madre-Santa Susana-Cucamonga faults.

As a standard condition of approval, the project will be required to conform to the recommendations of the geotechnical reports (Ninyo & Moore, 2004, 2007, 2012; G. A. Nicoll & Associates, 1983; CH2MHill, 2006) related to structures located in Seismic Zone IV, and to comply with the California Building Code (CBC). Conformance with these engineering standards in the design of proposed facilities will reduce the effects of seismic ground shaking to less than significant levels.

iii) Seismic-related ground failure, including liquefaction?

Potentially Significant Unless Mitigation Incorporated. The State of California Seismic Hazards Zones map (CDMG, 1999) identifies the J.B. Latham Treatment Plant site within a mapped liquefaction hazard zone. Liquefaction is the loss of strength of cohesionless soils when the pore water pressure in the soil becomes equal to the confining pressure. It generally occurs as a "quicksand" type of ground failure caused by strong ground shaking. The primary factors influencing liquefaction potential include groundwater, soil type, relative density of the sandy soils, confining pressure, and the intensity and duration of ground shaking. According to geotechnical investigations prepared for the project, site conditions (historic high groundwater and the presence of deep alluvial soils) render the site susceptible to liquefaction during a seismic event (Ninyo & Moore, 2012). For the project's new structures and facilities, potential hazards related to liquefaction can be reduced to a less than significant level through feasible measures. For minor improvements that require the placement or replacement of shallow footings, feasible measures include excavation, treatment and recompaction of fill material to an approximate depth of 3 feet below grade and conformance with CBC requirements.

Because of its structural mass, the anaerobic digester (Project Element 2), unlike other project elements, will require more extensive methods to mitigate potential liquefaction impacts. Feasible methods to mitigate liquefaction were identified in a geotechnical study which specifically addresses the new digester (Ninyo & Moore, April 2012), and include (*i*) the use of deep pile foundations to support the digester tank, or (*ii*) densification of underlying soils through ground improvement techniques. A variety of ground improvement methods have proven feasible in applications similar to the proposed digester tank. These include ground improvement by stone columns, aggregate piers, pressure grouting or the use of steel casing 'Tubex' piles. Each of these methods has the ability to mitigate liquefaction impacts to a level below significant. The method chosen and the detailed design, including construction procedures, equipment, and the size and spacing of the ground improvement locations will be prepared by a specialty contractor to ensure that mitigation meets design standards of the California Building Code.

> **Mitigation Measure 6:** Design and construction of Digester 5 shall include detailed procedures and specifications prepared by a specialty contractor for ground improvement by stone columns (or other feasible methods) in accordance with recommendations of the geotechnical investigation prepared for this project element (Ninyo & Moore, 2012) and design standards of the California Building Code.

Potential hazards resulting from other forms of seismic-related ground failure can be reduced to a level below significant through compliance with seismic requirements of the California Building Code and site specific recommendations of the geotechnical investigations. Compliance with these requirements and recommendations is a standard component of project design.

iv) Landslides?

No Impact. There is no potential for landslide hazards at the Treatment Plant site because of the site's flat and graded terrain. The site and its surroundings are well outside areas subject to earthquake-induced landslides mapped by the State of California Seismic Hazards Zones map (CDMG, 1999).

b) Result in substantial soil erosion or the loss of topsoil?

No Impact. Soil disturbance will be limited to excavation to place or replace foundations for improvements in very limited areas associated with individual improvements. No grading or major soil disturbance is proposed. Soils onsite consist of imported fill and (at depth) alluvium. Topsoil is not present. Erosion will be addressed through the Statewide Construction General NPDES Permit, which requires implementation of appropriate erosion control, sediment control, tracking control, non-storm water management, waste management and material management Best Management Practices (BMPs) to prevent discharges of pollution from construction activities. Construction BMPs will also be implemented to comply with requirements of the South Orange County Municipal NPDES Stormwater Permit.

c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?

Potentially Significant Unless Mitigation Incorporated. The potential for liquefaction and mitigation are discussed above (a) (iii). Geotechnical studies indicate that the site may be subjected to up to approximately 3 to 5 feet of lateral displacement during a significant seismic event (Ninyo & Moore, 2004). The ground surface at the site is also susceptible to ground subsidence or seismically induced localized bearing failure during a major seismic event (if groundwater levels retain their historic high). These constraints can be effectively managed through fairly standard methods of site preparation and project design to ensure that hazards are avoided. Compliance with the California Building Code and with recommendations of geotechnical studies for the project will ensure avoidance of significant adverse impacts.

The project has no potential to introduce hazards related to landslide, either on- or off-site (see response to (a)(iv).

d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?

No Impact. Soils at shallow depths onsite are predominately fine to coarse grained granular soils with a low expansion potential. No special treatment or mitigation measures are necessary (CH2MHILL, 2006, page 4-6).

e) Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water?

No Impact. The project does not involve septic tanks or alternative waste water disposal systems.

5.7 HAZARDS AND HAZARDOUS MATERIALS

Issues:	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
VII. HAZARDS AND HAZARDOUS MATERIALS. Would the project:				
a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?				X
b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?				X

Issues:	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?				X
d) Be located on a site included on a list of hazardous materials sites compiled pursuant to Government Code section 65962.5, and as a result, create a significant hazard to the public or the environment?				X
e) For a project located within an airport land use plan or where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?				X
f) For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?				X
g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?				X
h) Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?				X

Would the project:

a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?

No Impact. The proposed Chemically Enhanced Primary Treatment (CEPT) facilities will make use of ferric chloride and liquid polymer. Both of these chemicals are currently used at the treatment site. Their use with the new CEPT facilities will result in delivery of one additional truck load every one to two months, along with storage of an additional 5,000 gallons (approximately) in a new storage tank on site. Ferric chloride is considered a hazardous material and is treated with special precautions in its transport, use and storage. Transport occurs in accordance with procedures established by the Department of Transportation. The ferric chloride system onsite is designed to meet requirements of the Uniform Fire Code for hazardous chemicals, including but not limited to secondary containment. The ferric chloride system is reviewed by the Orange County Fire Authority during design and after completion of construction. The type of liquid polymer used at the treatment plant is inert. Nevertheless, it is treated as a hazardous substance similar to ferric chloride in the design of facilities for its storage and use. Use of these two chemicals for the new CEPT system will not fundamentally alter the methods of transport, storage and handling practices currently in effect at the site, and therefore will not introduce a new source of risk or hazard.

b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?

No Impact. The treatment plant is designed to capture spills (hazardous or otherwise) from all existing facilities onsite. The secondary containment capacity of the site is sufficient to accommodate a worst-case upset or accident that includes all existing and proposed facilities. The proposed facilities will not introduce a new source of hazard or an increased level of hazard.

c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?

No Impact. The proposed facilities will not emit hazardous emissions or involve the handling of acutely hazardous materials (see response to 5.7(a) above). The nearest school is at Capistrano Beach Calvary Church, 0.33 mile from the treatment plant site, in Capistrano Beach and on the other side of San Juan Creek from the project site.

d) Be located on a site included on a list of hazardous materials sites compiled pursuant to Government Code section 65962.5, and as a result, create a significant hazard to the public or the environment?

No Impact. The J.B. Latham Treatment Plant is not identified as a hazardous materials site.

e) For a project located within an airport land use plan or where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?

No Impact. The project area is not located within an airport land use plan or within two miles of a public airport and would not result in a safety hazard for people residing or working in the project area. John Wayne Airport (Santa Ana), located 20 miles northwest of the project area, is the nearest airport (commercial or general aviation).

f) For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?

No Impact. The project's proposed facilities are not located within the vicinity of a private airstrip and would not result in a safety hazard for people residing or working in the project area.

g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?

No Impact. The proposed improvements will not affect emergency response plans or evacuation procedures or routes.

h) Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?

No Impact. The project is not in or near a wildland area or a high fire hazard area.

5.8 HYDROLOGY AND WATER QUALITY

Issues:	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
VIII. HYDROLOGY AND WATER QUALITY. Would the project:				
a) Violate any water quality standards or waste discharge requirements?				X

Issues:	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of preexisting nearby wells would drop to a level that would not support existing land uses or planned uses for which permits have been granted)?				X
c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner that would result in substantial erosion or siltation on or off site?				X
d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding on or off site?				X
e) Create or contribute runoff water that would exceed the capacity of existing or planned storm water drainage systems or provide substantial additional sources of polluted runoff?				X
f) Otherwise substantially degrade water quality?				X
g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?				X
h) Place within a 100-year flood hazard area structures that would impede or redirect flood flows?			X	
i) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?			X	
j) Inundation by seiche, tsunami, or mudflow?				X

Would the project:

a) Violate any water quality standards or waste discharge requirements?

No Impact. Several regulatory mechanisms and procedures are already in place to ensure that the project does not violate any water quality standards or waste discharge requirements. The J.B. Latham Treatment Plant operates under the San Juan Creek Ocean Outfall NPDES Permit, which requires implementation of appropriate erosion control, sediment control, tracking control, non-storm water management, waste management and material management Best Management Practices (BMPs) to prevent discharges of pollution from construction activities. Construction BMPs will also be implemented to comply with requirements of the South Orange County Municipal NPDES Stormwater Permit.

After construction, there will be no discharge or other potential water quality impacts associated with the new and/or rehabilitated facilities. The J.B. Latham Treatment Plant is already managed to avoid water quality impacts. Surface drainage from the entire site, including where the new facilities are proposed, is collected and sent through the site's treatment facilities. The site is designed to contain runoff and the containment capacity exceeds the maximum capacity of all existing treatment facilities onsite. Moreover, the treatment plant is designed to direct any runoff that enters the site from offsite, as well as runoff generated onsite, to pass-through outlets that conduct flows directly into the creek. The site thus acts as a conduit for runoff and floodwaters (e.g., from a major storm event) rather than a barrier to flows. The existing containment capacity is sufficient to include spills from Digester 5 spills in addition to existing digesters and other facilities. Post-construction BMPs are already implemented at the site. The one proposed improvement located outside the treatment plant site (replacement of a sluice gate, an element of Project Element 6) is sited in an area that drains into the plant site, west of the berm that separates the site hydrologically from San Juan Creek.

b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of preexisting nearby wells would drop to a level that would not support existing land uses or planned uses for which permits have been granted)?

No Impact. The project will not affect groundwater recharge or aquifers. No portion of the project is within an area designated as a Sole Source Aquifer.

c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner that would result in substantial erosion or siltation on or off site?

No Impact. No features of the project will alter the course of a stream or river.

d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding on or off site?

No Impact. Construction of proposed facilities will not alter existing drainage patterns. Nor will it affect any streams or rivers. None of the project features will create or contribute to an increase in runoff. Proposed facilities proposed will be sited in an area that is already covered by impervious surfaces with runoff managed onsite (see response to (a) above).

e) Create or contribute runoff water that would exceed the capacity of existing or planned storm water drainage systems or provide substantial additional sources of polluted runoff?

No Impact. See response to (d) above.

f) Otherwise substantially degrade water quality?

No Impact. See response to (a) above.

g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?

No Impact. The project does not propose housing.

h) Place within a 100-year flood hazard area structures that would impede or redirect flood flows?

Less Than Significant Impact. San Juan Creek is immediately east of the Treatment Plant site. Approximately ¾ of the Treatment Plant site falls within areas mapped by FEMA as a "special flood hazard area subject to inundation by the 1% annual chance flood". This area is within Zone A, identified by FEMA as an area for which the base flood elevation has not been determined. The westernmost ¼ of the site falls within Zone X, an area identified by FEMA as an area of either 0.2% annual chance flood; 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; or an area protected by levees from 1% annual chance flood.

The proposed improvements will not significantly alter local hydrological conditions or increase the risk of damage from floods. The project's physical changes will not significantly alter the overall footprint of facilities onsite and will therefore not introduce significant new barriers to flows in the event of a flood. Of the nine project elements, five will replace existing facilities within their current footprints (Project Elements 1, 2, 5, 6, 7 and 8); the new tank for Digester 5 (Project Element 3) will introduce less than 4,000 square feet of structure. Project Element 9 involves construction of a new electrical building (approximately 600 square feet) but removes one existing building of 600 square feet. The minor increase in the overall structural square footage across the entire 8.3-acre site is not great enough to significantly impede or redirect flood flows in the event of a 1% annual chance flood.

i) Expose people or structures to a significant risk of loss, injury or death involving flooding.

Less Than Significant Impact. See response to (h) above.

j) Inundation by seiche, tsunami, or mudflow?

No Impact. The site is not subject to seiche, tsunami or mudflow.

5.9 LAND USE AND PLANNING

Issues:	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
IX. LAND USE AND PLANNING. Would the project:				
a) Physically divide an established community?				X
b) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?				X
c) Conflict with any applicable habitat conservation plan or natural community conservation plan?				X

Would the project:

Issues:	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact

a) Physically divide an established community?

No Impact. The proposed improvements will not physically divide an established community. All facilities are proposed within (or immediately adjacent to) the existing Treatment Plant, a long-established use.

b) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?

No Impact. The project is not in conflict with any land use plan, policy, or regulation. The proposed improvements will not alter the nature of the current use which is consistent with existing land use plans applicable to the site and its activities.

For a discussion of the project's consistency with other plans (e.g., South Coast Air Quality Management Plan), see the Air Quality section 5.2, and other sections of this Initial Study.

c) Conflict with any applicable habitat conservation plan or natural community conservation plan?

No Impact. The proposed facilities will not conflict with the provisions of an HCP or NCCP. As indicated above in response to question 5.4 (a) related to Biological Resources, the project will have no impact to natural habitats, including those subject to protection under the NCCP.

5.10 MINERAL RESOURCES

Issues:	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
X. MINERAL RESOURCES. Would the project:				
a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?				X
b) Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan?				X

Would the project:

a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?

No Impact. The site of proposed facilities has been previously graded and committed to urban land use. No known mineral resources underlie the project area. The Treatment Plant is not a viable mineral extraction site.

b) Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan?

No Impact. There are no locally important mineral resource recovery sites underlying the Treatment Plant.

5.11 NOISE

Issues:	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
XI. NOISE. Would the project result in:				
a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?				X
b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?			X	
c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?				X
d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?			X	
e) For a project located within an airport land use plan, or where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?				X
f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?				X

A technical noise assessment (Mestre Greve Associates, 2012b) was prepared for this Initial Study to address potential noise and vibration impacts of the project on neighboring land uses. The assessment found that the project will not increase long-term noise levels in the local acoustic environment, either onsite or at nearby properties. None of the facilities or equipment proposed for the project will introduce a new source of noise at the site. In some cases, the new and improved facilities will result in a slight reduction in noise, due to the use of quieter, more efficient pumps, etc. This slight decrease in ambient noise levels will not be noticeable offsite, inasmuch as the current level of noise generated from the existing facilities is now scarcely audible from very few locations.

The Noise Ordinance of the City of Dana Point establishes maximum noise levels that are not to be exceeded in residential areas. For the hours between 7AM and 10PM, noise must not exceed 55 dBA for more than 30 minutes in a given hour (referred to as the L50 standard) in outdoor residential areas. The maximum noise level (noise of any duration) for this same time period must not exceed 75 dBA. During night time hours, between 10PM and 7AM, the standard is lower: 50 dBA (for any 30 minute period) and 70 dBA as the maximum level of any duration. The noise ordinance exempts construction noise, as long as it conforms to permitted hours between 7AM and 8PM on weekdays or Saturday. (Construction noise is not exempt on Sunday and federal holidays.)

The project will generate temporary noise during the construction phase. The nearest noise-sensitive land use is the neighborhood of single-family homes on Del Obispo Street across from the treatment plant. The noise assessment therefore evaluated the projected levels of construction noise at these homes to gauge the project's potential impacts. Ambient noise levels under current conditions in this neighborhood were measured during a typical weekday, revealing that roadway noise from Del Obispo Street currently generates noise at a level of 62 dBA (L50), with an Lmax or peak noise level of 91 dBA. The homes along Del Obispo Street have a soundwall which provides a noise reduction of 5 dB. Therefore, the noise levels in the rear yard areas are about 57 dBA (L50) with a Lmax level of 86 dBA. The current ambient level exceeds the L50 standard of 55 dBA imposed by the noise ordinance. The impacts of roadway noise are not governed by the noise ordinance, but are usually managed through land use planning with setbacks and noise barriers adjacent to high-volume roadways.

The technical noise assessment projected the levels of noise that would result from the use of various types of construction equipment likely to be used during one or more construction phases. The level of noise from each type of equipment, projected to be audible at the nearest residences, is shown in **Table 5.**

TABLE 5
PROJECTED CONSTRUCTION NOISE AT NEAREST RESIDENCES

	Projected		Greater Than Ambient?		10dBA > Ambient?	
	Lmax	L50	Lmax	L50	Lmax	L50
Phase A						
Concrete Truck (A1)	64	59	No	Yes	No	No
Boom Truck (A1)	70	57	No	Yes	No	No
Crane (A1)	70	57	No	Yes	No	No
Fork Lift (A1)	54	4	No	No	No	No
Concrete Truck (A2)	64	59	No	Yes	No	No
Fork Lift (A2)	54	4	No	No	No	No
Boom Truck (A2)	70	57	No	Yes	No	No
Sand Blasting (A5)	**81**	**73**	**No**	**Yes**	**No**	**Yes**
All Combined	*81*	*74*	*No*	*Yes*	*No*	*Yes*
Phase B						
Boom Truck (B4)	70	57	No	Yes	No	No
Sand Blasting (B4)	**81**	**73**	**No**	**Yes**	**No**	**Yes**
Fork Lift (B4)	54	4	No	No	No	No
Concrete Saw (B4)	70	50	No	No	No	No
Boom Truck (B6)	**70**	**57**	**No**	**Yes**	**No**	**No**
Concrete Truck (B6)	64	59	No	Yes	No	No
Jackhammering (B4)	72	61	No	Yes	No	No
Stone Columns (B3)	72	66	No	Yes	No	No
All Combined	*81*	*74*	*No*	*Yes*	*No*	*Yes*

Phase C						
Bulldozer (C7)	70	59	No	Yes	No	No
Backhoe (C7/C9)	66	54	No	No	No	No
Concrete Truck (C7)	64	59	No	Yes	No	No
Boom Truck (C7/C8/C9)	70	57	No	Yes	No	No
Jackhammering (C7/C8)	72	61	No	Yes	No	No
Crane (C8)	70	57	No	Yes	No	No
All Combined	*72*	*67*	*No*	*Yes*	*No*	*No*
Ambient Noise Levels	**86**	**57**				

Source: Mestre Greve Associates, 2012b

Construction at the treatment plant will be limited to weekdays and daytime hours (generally between 7AM and 4PM), and would therefore be exempt from the City Noise Ordinance. Nevertheless, in evaluating potential noise impacts on residential neighbors, the noise assessment considered an increase of 10 dBA over ambient noise levels as a threshold to identify construction noise that might potentially impact the neighborhood. A noise level of 10 dBA over existing ambient noise levels is approximately 67 dBA (L50). If this level of noise were experienced indoors, it would be comparable to a television at moderate volume. Noise at this level is not detrimental to human health. It will not lead to hearing loss or significantly interfere with speech. Over a prolonged period of time (for 30 minutes in an hour, and potentially for several hours) a rear yard level of 67 dBA (L50) is unlikely to be a major annoyance to residents. Although this temporary noise is not equivalent to a significant environmental impact, the project has purposefully integrated methods to attenuate noise during construction to ensure that ambient noise levels are not greater than 67 dBA (L50), or approximately 10 dBA above current ambient levels as measured at the exterior yard of the nearest residence. Only one activity (sandblasting) has the potential to generate noise that will be greater than 10 dBA above the 57 dBA ambient noise level at the nearest residence. Sandblasting will occur in both Phases A and B, in association with two different project elements (Project Element 4, Modification of the DAF Thickening System, and Project Element 5, Structural & Seismic Improvements). Use of sound attenuating methods during sandblasting onsite will effectively reduce noise levels by 10 dBA or more (see discussion in (d) below).

Construction traffic (trucks and other vehicles used by construction workers) is estimated to average around 12 vehicles per day, with peak rates of 20 to 24 vehicles per day. This increase in traffic volume will increase local roadway noise less than 0.1 dB, a magnitude that is not large enough to result in an audible increase in roadway noise over current conditions.

Would the project result in:

a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?

No Impact. The project will not generate noise levels that exceed standards. The improved facilities will not introduce new noise sources or increase noise over current levels. In fact, ambient noise at the Treatment Plant will be slightly reduced as a result of the improvements. Some noise generated during the construction phase will increase ambient noise levels. These construction-related increases, being temporary, are exempt from the Noise Ordinance and its standards, and do not constitute a significant environmental impact. Nevertheless, the project will integrate measures to attenuate construction noise from the loudest sources to approximately 63 dBA, or 6 dBA above ambient. See response to (d) below.

b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?

Less Than Significant Impact. Construction of Digester 5 will require the setting of deep foundations (owing to the sandy alluvium that underlies the site). In order to avoid the noise impacts of pile driving, SOCWA plans to use a ground improvement technique called vibro replacement, or 'stone columns' to provide stability for the foundations. The stone column method uses vibration, at depth, to inject crushed stone into the subsurface to densify and thus reinforce granular soils.

Potential vibration impacts from the placement of stone columns for the Digester 5 foundation were assessed in the technical noise study (Mestre Greve, 2012b). Vibration impacts are measured in terms of peak particle velocity (PPV), a measure of vibratory motion in units of inches per second. Caltrans has developed an applicable threshold for vibration damage potential to residential and commercial structures of 0.5 in/sec. A PPV of 0.01 is considered to be barely perceptible by humans, but well below the threshold of incurring structural damage. The residences nearest to the J.B. Latham Treatment Plant are approximately 600 feet away. At this distance the vibration level is projected to be 0.008 inches per second. This level is below the 0.04 perceptibility threshold and well below the threshold of 0.5 in/sec for structural damage.

Sheet piles will also be installed temporarily during construction of Digester 5 (to protect adjacent facilities onsite). The technical assessment modeled vibration levels of sheet pile installation and found that vibration at the nearest residences will be 0.010 in/sec, a level that is also well below thresholds for damage and perceptibility. The assessment also looked at the potential for vibration to impact structures onsite (e.g., SOCWA's office building) and found that vibration levels from both stone columns and sheet piles will be well below the thresholds for structural damage and perceptibility. In order to ensure that the modeled vibration levels are indeed accurate (and that there will be no impacts related to vibration from either source) the project will include vibration monitoring in the residential neighborhood, in the vicinity of the nearest homes, during the placement of both stone columns and sheet piles. In the case that vibration is found to exceed the perceptibility threshold of 0.04 inches per second, the methods and/or equipment will be immediately modified to reduce vibration below the 0.04 level.

c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?

No Impact. Ambient noise levels onsite after construction are expected to be slightly reduced as a result of the proposed improvements.

d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?

Less Than Significant Impact. Implementation of the project has the potential to result in a temporary increase in the ambient noise levels above existing levels, due to noise generated during construction. Construction noise will not exceed established standards or violate the local noise ordinance. The increased level of noise is not permanent and will not result in significant long-term impacts to the acoustic environment. The source of greatest noise will be sandblasting which will be used in association with two improvements, (Project Elements No. 4, modification of the thickening and digestion systems, and No. 5, structural and seismic improvements). The use of a sandblaster for these combined elements will likely occur intermittently during some parts of each day over a period up to ten weeks. The project's construction phases will integrate the use of sound blankets as moveable noise barriers to be relocated as work progresses to obstruct the line-of-sight from the sandblast area to residences to the west. Sound blankets with a minimum STC

(Sound Transmission Class) rating of 27 will reduce the noise levels at the residences by more than 10 dB. While the reduced level of noise will be above current ambient noise levels for a brief period of time, noise will be reduced to a level that is unlikely to be found annoying to most residents.

Construction of a flow control structure (Project Element 6) includes activities that must be performed at night (during the period of night-time low flows) and requires the use of a boom truck. The boom, which is powered by the truck's engine, will generate noise that is not exempt from the Noise Ordinance, being after 10 PM. Noise from the boom truck's engine must therefore be attenuated, so as not to exceed the 50 dBA (L50) and 70 dBA (Lmax) standards for residential areas established by the ordinance. Attenuation will be achieved by the placement of sound blankets near the engine that breaks the line-of-sight to the residential neighborhood. This method will attenuate to a reduced noise level of 47 dBA (L50) and 60 dBA (Lmax), thus conforming to the Ordinance standards and falling below the level of a significant noise impact.

e) For a project located within an airport land use plan, or where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?

No impact. The project area is not within an airport land use plan or within two miles of a public or public use airport (the nearest airport, John Wayne Airport, is 20 miles away).

f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?

No Impact. The project is not located within the vicinity of a private airstrip and would not expose people residing or working in the project area to excessive noise levels.

5.12 POPULATION AND HOUSING

Issues:	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
XII. POPULATION AND HOUSING. Would the project:				
a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of road or other infrastructure)?				X
b) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?				X
c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?				X

Would the project:

a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of road or other infrastructure)?

No Impact. The proposed improvements will not induce population growth, either directly or indirectly. The project does not propose to develop new homes or businesses. The improvements will not increase the treatment plant's capacity (the plant's current average daily capacity of 13 MGD will remain unchanged).

b) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?

No Impact. The proposed facilities will not displace housing of any kind.

c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?

No Impact. Construction of the proposed facilities will not displace anyone.

5.13 PUBLIC SERVICES

Issues:	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
XIII. PUBLIC SERVICES. Would the project: a) Result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, the need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:				
Fire protection?				X
Police protection?				X
Schools?				X
Parks?				X
Other public facilities?				X

Would the Project:

a) Result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, the need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:

No Impact. The proposed improvements will not increase the demand for new government facilities related to fire protection, police protection, schools, parks or other public facilities. The project will not result in an increase in local population or in increased demand for the use of any of these local or regional services.

5.14 RECREATION

Issues:	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
XIV. RECREATION. Would the project:				
a) Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?				X
b) Does the project include recreational facilities or require the construction or expansion of recreational facilities that have an adverse physical effect on the environment?				X

Would the project:

a) Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?

No Impact. Improvements at the Treatment Plant will have no effect on the use of neighborhood and regional parks and recreational sites.

b) Does the project include recreational facilities or require the construction or expansion of recreational facilities that have an adverse physical effect on the environment?

No Impact. The project does not include recreational facilities. It will not increase the demand or need for expanded recreational facilities, as it will not result in an increase in the local population.

5.15 TRANSPORTATION/TRAFFIC

Issues:	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
XV. TRANSPORTATION/TRAFFIC. Would the project:				
a) Cause an increase in traffic that is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, the volume to capacity ratio on roads, or congestion at intersections)?				X
b) Exceed, either individually or cumulatively, a level of service standard established by the county congestion management agency for designated roads or highways?				X

Issues:	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?				X
d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?			X	
e) Result in inadequate emergency access?				X
f) Result in inadequate parking capacity?				X
g) Conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., bus turnouts, bicycle racks)?				X

Would the project:

a) Cause an increase in traffic that is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, the volume to capacity ratio on roads, or congestion at intersections)?

<u>No Impact</u>. Proposed improvements at the Treatment Plant will have no effect on traffic, the number of vehicle trips, or road capacity. The project will not generate new trips. It will therefore not contribute to existing or future traffic conditions or affect the level of service on any roadways. During the installation of proposed facilities there will be a very small increase in vehicle trips by construction workers, with an average of about 12 vehicles per day and an estimated maximum of around 24 vehicles per day. This increase will be short-term and immeasurably small relative to traffic volumes and conditions on local roadways.

b) Exceed, either individually or cumulatively, a level of service standard established by the county congestion management agency for designated roads or highways?

<u>No Impact</u>. See response to (a) above.

c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?

<u>No Impact.</u> The project will have no effect on air traffic. The proposed facilities are not in the vicinity of an airport or under a flight path. The project will not generate increased air traffic.

d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?

<u>Less Than Significant Impact.</u> The project will not modify the design or configuration of any roadways or access driveways. Delivery of some oversize parts (for the digester tank) will require use of a 40-foot flatbed truck (perhaps on 5 occasions) Standard methods for accommodating such

oversize vehicles on public streets (such as flagging by certified personnel in accordance with city and CalTrans procedures) will ensure that these deliveries do not create traffic hazards.

e) Result in inadequate emergency access?

No Impact. The project will not alter circulation patterns or increase traffic levels. Nor will proposed infrastructure affect any proposed emergency access routes.

f) Result in inadequate parking capacity?

No Impact. The project will have no effect on parking capacity. It will not increase parking demands nor will it alter existing parking facilities.

g) Conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., bus turnouts, bicycle racks)?

No Impact. The proposed facilities are confined to the Treatment Plant site and will have no effect on facilities related to alternative transportation. Nor will they conflict with adopted policies, plans or programs supporting alternative transportation.

5.16 UTILITIES AND SERVICE SYSTEMS

Issues:	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
XVI. UTILITIES AND SERVICE SYSTEMS. Would the project:				
a) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?				X
b) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?				X
c) Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?				X
d) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?				X
e) Result in a determination by the wastewater treatment provider that serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?				X
f) Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?				X
g) Comply with federal, state, and local statutes and regulations related to solid waste?				X

Would the project:

a) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?

No Impact. Proposed improvements will enhance operations at the J.B. Latham Treatment Plant, which operates in compliance with California's Wastewater Reclamation Criteria, Title 22, Division 4 of the California Administration Code (Title 22).

b) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?

No Impact. The project proposes to upgrade and improve facilities expansion of existing wastewater treatment facilities. Potential environmental effects are discussed throughout this Initial Study (see Section 5.17, Mandatory Findings of Significance, below).

c) Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?

No Impact. The proposed expansion will not require construction of any new storm water facilities.

d) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?

No Impact. The project will not increase demands for water supply.

e) Result in a determination by the wastewater treatment provider that serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?

No Impact. The project will not increase the demand for wastewater treatment.

f) Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?

No Impact. The project will not increase the generation of solid waste material.

g) Comply with federal, state, and local statutes and regulations related to solid waste?

No Impact. The project will not generate solid waste material.

5.17 MANDATORY FINDINGS OF SIGNIFICANCE

Issues:	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
XVII. MANDATORY FINDINGS OF SIGNIFICANCE a) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat or a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?				X
b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current project, and the effects of probable future projects.)				X
c) Does the project have environmental effects that will cause substantial adverse effects on human beings, either directly or indirectly?				X

Explanations to (a) through (c):

a) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat or a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?

No Impact. The project has no potential to degrade the quality of the environment. It will not affect fish or wildlife species or their habitats, nor will it affect fish or wildlife populations. It will have no effect on native plant or animal communities or rare or endangered species. It will not eliminate important examples of California history or prehistory. The project is extremely limited in its physical effects, being entirely confined to small areas within the existing J. B. Latham Treatment Plant. All areas affected by the proposed improvements are already occupied by facilities of the existing Treatment Plant.

b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current project, and the effects of probable future projects.)

No Impact. The project has no substantial impacts that would be cumulatively considerable in combination with other projects.

c) Does the project have environmental effects that will cause substantial adverse effects on human beings, either directly or indirectly?

No Impact. Proposed improvements will not adversely affect human beings. As discussed above, the project will have no significant, long-term adverse effects.

DETERMINATION

I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because measures that avoid or reduce impacts to a level below significance have been incorporated into the project. Therefore, a Mitigated Negative Declaration will be prepared.

Brian Peck, P.E.
Director of Engineering
South Orange County Wastewater Authority

6.0 REFERENCES

California Department of Conservation, Division of Maps and Geology, State of California, 2001. Seismic Hazard Zones Map, Dana Point Quadrangle, 7.5-Minute Series.

City of Dana Point, General Plan,

CH2MHill, December 2006. Preliminary Design Report, J.B. Latham Treatment Plant, Advanced Wastewater Treatment Facility. Prepared for South Orange County Wastewater Authority.

G. A. Nicoll and Associates, Inc., August 1983. Geotechnical Investigation, Proposed Sludge Dewatering and Energy Building, Regional Solids Treatment Facility, San Juan Capistrano, California. Prepared for Lowry and Associates.

Mestre Greve Associates, 2009a. Air Quality Assessment for J.B. Latham Treatment Plant Facility Improvements Project. Prepared for Ed Almanza & Associates.

Mestre Greve Associates, 2009b. Noise Assessment for J.B. Latham Treatment Plant Facility Improvements Project. Prepared for Ed Almanza & Associates.

Ninyo & Moore, April, 2011. Geotechnical Evaluation, Preliminary Design of Digester No. 5, J.B. latham Treatment Plant, Dana Point, California. Prepared for Lee & Ro, Inc.

Ninyo & Moore, December 2004. Geotechnical Evaluation, Fuel/Oil Container Pad, J.B. Latham Treatment Plant, Dana Point, California. Prepared for South Orange County Wastewater Authority.

Ninyo & Moore, July 2007. Geotechnical Evaluation, Power and Pumping Upgrades, J.B. Latham Treatment Plant, Dana Point, California. Prepared for Malcolm Pirnie.

PCR, 2012. Phase I Cultural and Paleontological Resources Assessment for J.B. Latham Treatment Plant Facility Improvements Project. Prepared for Ed Almanza & Associates.

SOCWA
South Orange County Wastewater Authority

NOTICE OF INTENT TO ADOPT A MITIGATED NEGATIVE DECLARATION

South Orange County Wastewater Authority
34156 Del Obispo Street
Dana Point, California 92629

▪**Subject**: Proposed facility improvements at the J. B. Latham Treatment Plant, owned and operated by the South Orange County Wastewater Authority (SOCWA), located at 34156 Del Obispo Street in Dana Point, Orange County, California.

NOTICE IS HEREBY GIVEN that the South Orange County Wastewater Authority (SOCWA) has prepared and intends to adopt a Mitigated Negative Declaration (MND) in connection with proposed improvements at the J. B. Latham Treatment Plant. The MND identifies potential effects with respect to cultural resources and geology and soils. The MND also includes mitigation measures that will ensure that the proposed project will not result in any significant adverse effects on the environment. The Initial Study which serves as the basis for the MND is available for public review and can be found on the SOCWA website at http://socwa.com/. . . and at the SOCWA Operational Headquarters located at 34156 Del Obispo Street, Dana Point, California.

PROJECT DESCRIPTION: The project consists of improvements and upgrades to existing wastewater treatment facilities at the J. B. Latham Treatment Plant. Several features of the Treatment Plant are obsolete and/or have reached the limits of their lifetime and now warrant replacement or upgrades. All proposed improvements are within the footprint of existing facilities in (or immediately adjacent to) the J. B. Latham Treatment Plant. Proposed improvements include nine elements:

1. Retrofit of Existing Aeration Basins
2. Reconstruction of Co-generation System
3. Construction of a Fifth Anaerobic Digester
4. Modification of Existing Thickening and Digestion Systems
5. Implementation of Structural & Seismic Improvements
6. Construction of a Plant1/Plant2 Flow Control Structure
7. Implementation of Chemically Enhanced Primary Treatment
8. Retrofit of Secondary Sedimentation Basins
9. Replacement of 480-Volt Power Distribution System

The entire project is anticipated to have a construction period of 30 months. Construction is scheduled to begin in January 2014 and end in June 2016.

PUBLIC REVIEW PERIOD: the public review period for the draft MND is from Friday, November 2, 2012 to Monday, December 3, 2012.

PROJECT MANAGER: Mr. Brian Peck, Director of Engineering; phone: (949) 234-5411; e-mail: bpeck@socwa.com; Fax number: (949) 489-0130; mailing address: SOCWA, 34156 Del Obispo Street, Dana Point, California.

NOTICE IS FURTHER GIVEN that SOCWA invites members of the general public to review and comment on this environmental documentation. Written comments may be mailed, e-mailed, or faxed to the project manager. SOCWA will conduct one or more public meetings at future dates to be determined to consider adoption of the Mitigated Negative Declaration.

By order of Brian Peck, P.E.
Director of Engineering