AECOM

City of Paso Robles
2.0-MGD Nacimiento WTP Feasibility Study

60188405

August 2011

City of Paso Robles

Christopher Alakel, PE, Water Resources Manager

AECOM

Kevin Berryhill, PE, Project Manager
Jon Hanlon, PE, Project Director

1360 East Spruce Avenue, Suite 101, Fresno, CA 93720

Table of Contents

Section 1 Introduction and Purpose 1-1

1.1 Project Background 1-1

1.2 Purpose of Report 1-1

Section 2 Project Requirements 2-1

2.1 Funding 2-1

2.2 Regulatory Requirements 2-1

2.3 Membrane Filtration 2-1

2.4 Treatment Plant Capacity 2-2

2.5 Water Quality 2-2

2.5.1 Raw Water 2-2

2.5.2 Treated Water 2-3

2.6 Treatment Plant Construction Phasing 2-3

2.7 Other Project Goals 2-3

Section 3 Process Recommendation 3-1

3.1 Chemical Pretreatment 3-1

3.2 Physical Pretreatment 3-1

3.3 Membrane Filtration 3-3

3.4 Granular Activated Carbon Post-Treatment 3-4

3.5 Disinfection 3-4

3.6 Disinfection Byproduct Control 3-5

3.7 Residuals Management 3-5

3.8 Hydraulics 3-6

3.8.1 Raw Water Supply to Clarifier 3-6

3.8.2 Membrane Feedwater Supply 3-6

3.8.3 Clearwell Configuration 3-6

3.8.4 High Service Pumping Station 3-7

3.9 Controls 3-7

Section 4 Preliminary Equipment Sizing 4-1

4.1 Pretreatment Equipment Sizing 4-1

4.2 Membrane Filtration System Sizing 4-1

4.3 GAC Process Sizing 4-1

4.4 Disinfection Process Sizing 4-1

4.5 High-Service Pumping Station Sizing 4-2
Section 5 Preliminary Site Layout 5-1
5.1 Equipment Space Requirements 5-1
5.2 Preliminary Site Plan 5-1
Section 6 Opinion of Probable Cost 6-1
6.1 Opinion of Initial Project Cost 6-1
6.2 Opinion of Operations and Maintenance Costs 6-1
6.2.1 Raw Water 6-1
6.2.2 Labor 6-1
6.2.3 Electricity 6-2
6.2.4 Chemicals 6-2
6.2.5 Laboratory Analyses 6-2
6.2.6 Carbon Replacement 6-3
6.2.7 Residuals Disposal 6-3
6.2.8 Repairs and Routine Maintenance 6-3
6.2.9 Administrative Costs 6-3

Section 1
Introduction and Purpose

1.1 Project Background

The City of Paso Robles (City) is a Project Participant in the Nacimiento Water Project (NWP) currently being implemented by the San Luis Obispo County Flood Control and Water Conservation District. The NWP is a regional water supply system that will convey raw water from Lake Nacimiento to communities in San Luis Obispo County, including the City. The City wishes to construct a water treatment plant (WTP) to treat surface water received from Lake Nacimiento, utilizing this additional water source to increase supply reliability, particularly during the summer months. However; the City is currently unable to finance construction of a treatment plant large enough to take advantage of the City's full NWP allocation, which is approximately 6 million gallons per day (MGD). Therefore, the City wishes to construct the surface water treatment facility in two phases without exceeding a total initial project cost of $10 million dollars. The City estimates that a Phase 1 treatment plant capacity of at least 2 million gallons per day (MGD) will be required to meet demand during summer months. It is anticipated that the City will construct a second, Phase 2, WTP with a capacity of approximately 4 MGD, which will operate in parallel with the Phase 1 WTP, at some time in the next ten years once sufficient funds are available.

1.2 Purpose of Report

The purpose of this report is to establish whether it is feasible for the City to construct a 2-MGD WTP within the available $10 MM budget and to estimate the ongoing operations and maintenance costs associated with the WTP.

As a necessary component of the funding feasibility evaluation, this report also presents preliminary recommendations for the treatment process train and site layout. The scope of this report did not include the detailed evaluation of the process train and site layout that would be required to optimize them for cost and operability. Should the City decide to proceed with design of the project, it is AECOM's recommendation that this study be followed by a workshop with the AECOM design team and City staff to identify which project elements warrant additional study. AECOM also recommends that, following the workshop, a more detailed Predesign Report be prepared. The purpose of the Predesign Report would be to resolve any process decisions left outstanding after the workshop and to document the more detailed sizing of the WTP components that must be completed before construction plans and specifications can be prepared.

Section 2
Project Requirements

2.1 Funding

The City has determined that approximately $10 million is available for the initial WTP project.

2.2 Regulatory Requirements

Many federal, state, and local regulations influence WTP projects. The specific regulations that are anticipated to have the greatest impact on the Paso Robles WTP Project are summarized below:

- General California regulations and statutes related to drinking water.
  - Requirement for multibarrier treatment, including both physical pathogen removal and disinfection
  - Requirement to comply with disinfection byproduct (TTHM, HAA5, chlorite, and bromate) maximum contaminant level (MCL) limitations
- California Surface Water Treatment Alternative Filtration Technology Demonstration Report
  - Includes a list of membrane filtration equipment models that have been preapproved for use by California drinking water treatment plants.
  - Specifies pathogen log removal credits, maximum membrane flux, and maximum trans-membrane pressure.
  - Specifies maximum filtrate turbidities specific to the type of alternative filtration technology being used.
  - Restates the USEPA Surface Water Treatment Rule requirement for at least 0.5 log Giardia reduction through disinfection.
- Lake Nacimiento Rule
  - Requires that the treatment process train include “coagulation, flocculation, sedimentation, filtration, and disinfection”.
  - Previous attempts by the City to obtain an exception to this rule have been unsuccessful.
  - Requires a solids removal pretreatment process upstream of membrane filtration regardless of how robust the membrane filtration and disinfection processes are.

2.3 Membrane Filtration

A predesign study prepared by Black and Veatch (Treatment Process Train and Membrane System Alternatives Evaluation, October 8, 2008) concluded that low-pressure (microfiltration or ultrafiltration)

membranes are the preferred filtration technology for treating Lake Nacimiento water. Based on the recommendations of that study, the City has decided to use low pressure membranes for filtration at the Phase 1 WTP. This study assumes that microfiltration or ultrafiltration membranes will be used and does not evaluate other filtration technologies such as granular media filters.

2.4 Treatment Plant Capacity

The City has determined that the Phase I WTP will have a gross production capacity of at least 2 million gallons per day when operating 24 hours/day. Actual net treated water production may be less than the gross capacity of the treatment plant due to the need to use treated water for backwashing of filters and other plant service needs. The actual net production capacity will depend on the hydraulic capacity of available modular, packaged treatment equipment and is anticipated to be no less than 95% of the 2-MGD goal. Additionally, the preferred operational approach (e.g. annual vs. seasonal operation, 24 hour vs. part-time, and required amount of blending) has not been determined.

While a robust WTP design is preferred, evaluating the impacts of providing redundant treatment elements is not a requirement of this study. Based on discussions with City staff, this study assumes that, in general, the City is willing to sacrifice some reliability in order to keep project costs down.

2.5 Water Quality

2.5.1 Raw Water

This study assumes that the raw Lake Nacimiento water to be treated at the WTP will have characteristics falling within the water quality parameter ranges previously measured by the County of San Luis Obispo. Lisa Wallender, Water Systems Chemist with the County of San Luis Obispo provided AECOM with the County's full Lake Nacimiento water quality database on October 26, 2010. The complete October 26, 2010 database has been included as Appendix A and the critical parameters are summarized in Table 2-1. The schedule for completion of this study did not allow for the most current County water quality records to be obtained; however, it is recommended that the latest Lake Nacimiento water quality database be obtained and evaluated prior to final design of the WTP. The data provided by the County are based on tests performed on water taken from several lake depths. Because there is no way to predict which raw water intake laterals will be used over the life of the Phase 1 WTP, the full range of water quality values from all depths has been assumed.

Parameter	Minimum Value	Maximum Value	Average Value	5th Percentile	95th Percentile
Turbidity (NTU)	0.5	44	5.3	-	18
TOC (mg/L)	2.6	6.4	3.5	-	5.3
pH	6.2	8.86	7.62	6.92	8.33
Temperature (deg. C)	6.8	26.5	14.7	10	24.5
Alkalinity (mg/L as $CaCO_3$)	74	140	104	-	130
Algal Count (No/mL)	36	4,700	888	-	2,750

2.5.2 Treated Water

The primary finished water quality requirements for the project are summarized below. While this list does not include every regulatory water quality requirement, these are anticipated to be the most challenging requirements to meet with a relatively low-cost WTP using primarily packaged equipment.

- Finished water turbidity shall not exceed 0.1 NTU 95% of the time and shall not exceed 1.0 NTU at any time.
- The finished water must carry a measureable level of residual disinfectant.
- The water present throughout the entire water distribution system, which will be comprised of a blend of treated surface water and water from the City's wells, must satisfy the requirements of the Stage 2 Disinfectants and Disinfection Byproduct Rule (Stage 2 DBP Rule).
- The treated water shall not have objectionable tastes and odors that would lead to an increase in consumer T&O complaints.

2.6 Treatment Plant Construction Phasing

The following assumptions have been made regarding the phasing and long-term operational strategy for the Phase 1 and Phase 2 treatment plants.

- The Phase 1 WTP will remain in operation during and following construction of the Phase 2 WTP. Only minor, short duration Phase 1 WTP outages will be required during construction of the Phase 2 WTP.
- It has been assumed that at build-out the Phase 1 WTP and the Phase 2 WTP will operate in a parallel configuration independently of one another. The City will have the flexibility to operate either WTP by itself or both WTPs at the same time.
- Control of the Phase 1 WTP will initially be through a control room located at the Phase 1 WTP with some functions accessible remotely through SCADA. Following construction of the Phase 2 WTP, primary control of both WTPs will be consolidated in a common control room to the extent possible.

2.7 Other Project Goals

The following goals identified by AECOM are not mandatory for the project, but meeting these goals would offer potential benefits to the City.

- If possible, construct the Phase 1 WTP so that it can remain in operation with only minor interruptions while the Phase 2 WTP is being constructed
- If possible, configure the treatment process at the Phase 1 WTP such that treatment process and operations match those of the proposed Phase 2 WTP. To the extent this is possible, operational performance at the Phase 1 WTP would validate the performance of the planned Phase 2 WTP and could possibly be used to streamline the design of the Phase 2 WTP to reduce design, construction, and operational costs. Using common processes at the two WTPs will also allow the City's operations staff to use common or similar operational procedures for the two treatment plants.

Section 3
Process Recommendation

Based on the outcome of prior screening analyses, the City is pursuing the use of low-pressure membranes for filtration, the pretreatment requirement contained in the Lake Nacimiento Rule, and the need to control DBPs and taste and odor in the finished water. As described in Section 2, it is AECOM's recommendation that the process used at the Phase 1 WTP simulate the proposed process for the Phase 2 WTP, unless prohibited by cost or other factors. The proposed process flow diagram is presented in Figure 3-1.

3.1 Chemical Pretreatment

Consistent with the recommendations made by all previous studies prepared for the City, pretreatment of the water with potassium permanganate is recommended. The potassium permanganate is expected to perform the following functions:

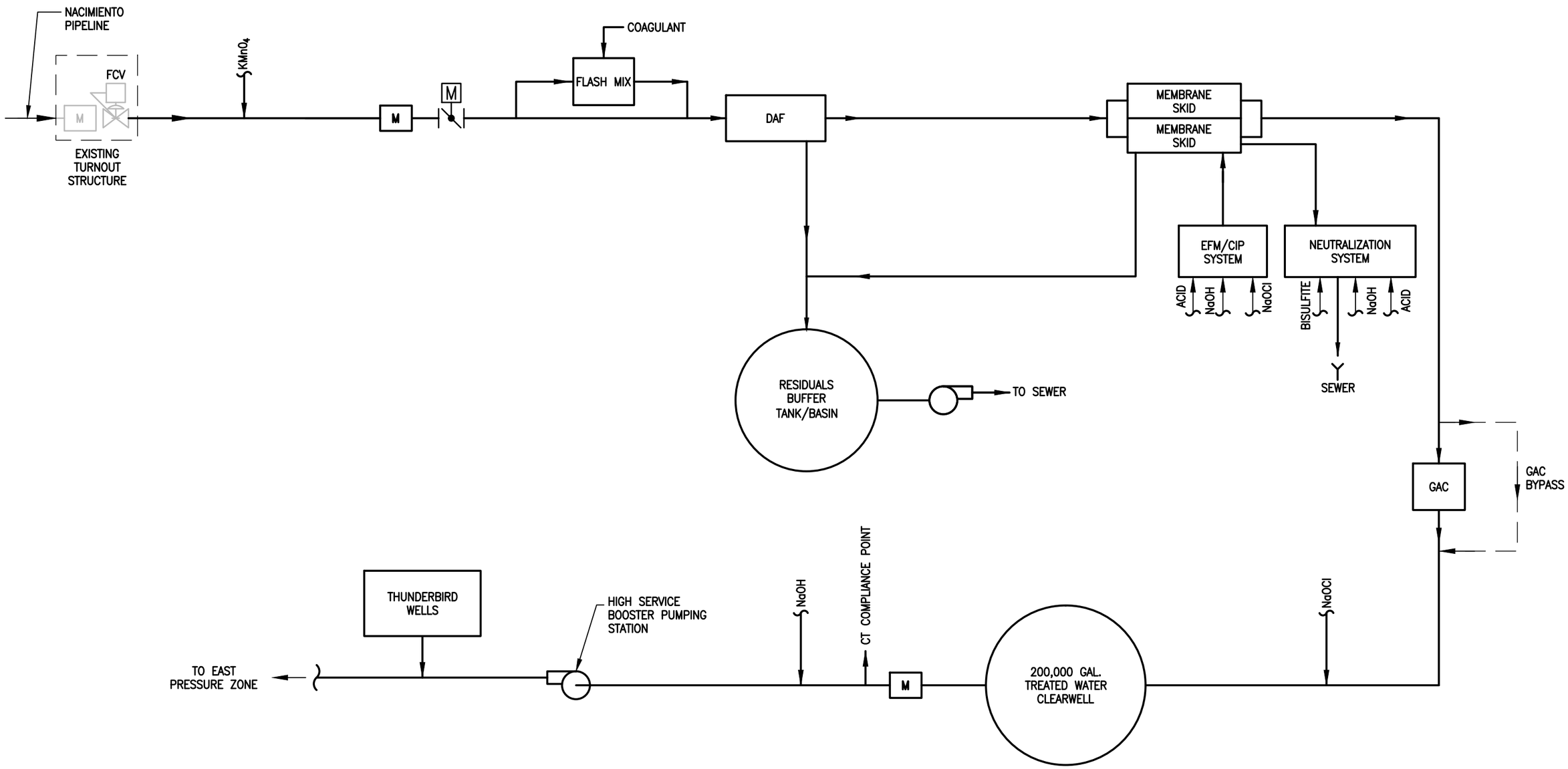
- Preoxidation of manganese in the raw water to permit its removal by downstream physical processes (also reducing risk factors for membrane fouling).
- Potential improvement in the performance of downstream physical particle removal processes.
- Preoxidation of naturally occurring organic material to reduce the subsequent chlorine demand and associated DBP formation.
- Potential increased taste and odor control.

3.2 Physical Pretreatment

The Lake Nacimiento Rule requires that the treatment process include "coagulation, flocculation, sedimentation, filtration, and disinfection". The treatment steps listed in the rule: coagulation, flocculation, and sedimentation imply that a solids settling type process is required. However, previous discussions between Black and Veatch, the City, and CDPH established that a solids floatation process such as dissolved air floatation (DAF) would meet the intent of this rule. DAF pretreatment is planned at the Phase 2 WTP.

The primary goals of pretreatment are as follows:

- To satisfy the pretreatment requirement of the Lake Nacimiento Rule.
- To remove naturally occurring organic material present in the raw water both for the general improvement in water quality and more specifically reducing DBP formation potential following disinfection. Pretreatment process organic removal will also reduce the potential for organic fouling of the membranes and may reduce the frequency of membrane chemical cleaning.
- Significantly reduce the turbidity loading on the membranes. Low pressure membranes can handle very high turbidities, but the membrane backwash and chemical cleaning requirements are typically reduced with lower influent turbidities.



CITY OF PASO ROBLES 2 MGD WATER TREATMENT PLANT PROJECT	FIGURE
PROPOSED PROCESS FLOW DIAGRAM	3-1

DWG: V:\PASO ROBLES\12345678-WTP\CAD\FIGURES\FIG 3-1.dwg USER: ThorneM
DATE: Jul 15, 2011 3:37pm XREFS: IMAGES:

- Gently remove algae without inducing algal cell lysis, reducing the risk of taste and odor problems.

It has been estimated that the DAF treatment process will be approximately $100,000 more expensive than a high-rate sedimentation process. Even with the tight project budgetary constraints, it is AECOM's opinion that the benefits of installing DAF outweigh the additional cost. The key benefits are:

- Previous treatment process evaluations have concluded that DAF will perform better than sedimentation on NWP water. This conclusion is based primarily on superior algae removal and corresponding reduction in the risk of taste and odor problems.

- If DAF is to be installed at the future Phase 2 WTP, it would be valuable to obtain full-scale operating data on the process prior to design of the Phase 2 WTP.

3.3 Membrane Filtration

There are at least two large membrane filtration system manufacturers that sell packaged, cartridge type, membrane filtration systems for potable water in the size range required by this project: Pall Corporation and Siemens Water Technologies. Pall Corporation offers both field-installed packaged systems and packaged systems that are preinstalled inside of a mobile trailer. The City is currently using one of the trailer-mounted systems to treat one of the City's groundwater wells. The characteristics of the standard packaged systems manufactured by Pall and Siemens are summarized in the table below:

System	Pall Aria AP-6	Pall Trailer System	Siemens Memcor CP72
Number of trains	2	2	2
Capacity per train	700 gpm	800 gpm	660 gpm
Max. modules per train	60	80	72
Instantaneous flux	30 gfd	23 gfd	40 gfd
Module material	PVDF	PVDF	PVDF
Degree of filtration	MF (Microza module)	MF (Microza module)	UF (L20 module)

The Pall Aria AP-6 and Siemens Memcor CP72 systems are comparable in capability and could be competitively bid. These systems are also approximately one half of the cost of the trailer mounted system and are easier to maintain due to the increased working clearances around the field installed equipment. The major advantages of the Pall trailer-mounted or skid-mounted systems include the familiarity of the City's operations personnel with the equipment and the potential ability to stock common spare parts for the existing and new systems.

All three systems include the following major components on the module skid or supplied as separate skids:

- Feed water pumps

- Automatic backwashing strainers

- Compressed air supply system

- Chemical clean-in-place system

- Clean-in-place residuals neutralization system

- Turbidimeters

- Skid flow meters

- Other ancillary instrumentation and control valves
- PLC-based controls

3.4 Granular Activated Carbon Post-Treatment

The water produced by the WTP must meet all regulatory requirements, including the disinfection byproduct maximum contaminant levels; and objectionable tastes and odors must be controlled to reduce the potential for consumer complaints. The use of granular activated carbon is very effective at meeting both of these requirements. The percentage of the water that will pass through the GAC contactors and the empty bed contact time can both be controlled to optimize the quality of the water leaving the WTP. It should be possible to satisfy the requirements of the DBP Rule by treating a large percentage of the WTP flow through the GAC without the need for blending with the Thunderbird wells. Bench-scale testing of GAC could be used to further validate the feasibility of meeting DBP Rule compliance without blending. The primary disadvantage of using GAC to meet the DBP and T&O requirements is operational costs. The ability of the GAC to adsorb contaminants from the water is depleted over time as the carbon pores become clogged and adsorption sites become occupied. The rate at which the GAC is depleted increases as the percentage of the treatment plant flow passing through the GAC vessels increases and as the empty bed contact time increases. There is no way to accurately estimate the carbon usage rate without further testing.

Other alternatives for mitigating DBP formation and taste and odor problems include the addition of powdered activated carbon to the clarification process; and ozone and advanced oxidation processes. Powdered activated carbon (PAC) is not as reliable as GAC and could create problems with other treatment processes. Ozone and advanced oxidation treatment is not feasible for the 2-MGD plant given the City's limitation on project cost. It may be possible to configure the Phase 1 WTP to permit the addition of ozone treatment at a future date. This option can be further evaluated as part of the proposed Predesign Report.

3.5 Disinfection

The WTP disinfection must meet two primary regulatory requirements:

1. Provide at least 0.5-log giardia inactivation before the water leaves the WTP
2. Provide the water entering the distribution system with a disinfectant residual that will survive to the far reaches of the system

Only two chemicals are practical for use as a residual disinfectant: free chlorine and monochloramine. The City currently maintains a free chlorine residual in the water distribution system and wants to maintain that practice in the future. Therefore, chlorine must be added to the water prior to leaving the WTP. Chlorine is also effective as a primary disinfectant for meeting the 0.5-log giardia inactivation requirement. Using chlorine, in the form of sodium hypochlorite, for both primary pathogen inactivation and residual disinfection is the lowest capital cost disinfection strategy. There are two primary disadvantages of using chlorine for primary disinfection. First, the City plans on using ozone for primary disinfection at the Phase 2 WTP. If chlorine is used for primary disinfection at the Phase 1 WTP, the disinfection process would not simulate the process anticipated at the Phase 2 WTP (ozone). Secondly, Lake Nacimiento water is expected to have high disinfection byproduct formation potential. Previous bench-scale studies have predicted that Lake Nacimiento water disinfected with chlorine will not comply with the DBP rule unless steps are taken to mitigate DBP formation.

Four DBP formation mitigation measures are proposed for the Phase 1 WTP:

1. The proposed pretreatment processes considered in this study will remove some DBP precursors and will therefore reduce the level of disinfection byproducts produced

2. This study recommends the use of post-filtration GAC contactors for both taste and odor control and DBP precursor removal. The GAC process, by itself, should be sufficient to limit DBP formation to levels complying with the DBP Rule without the need for blending with the Thunderbird wells. However, there will be a direct tradeoff between the level of GAC treatment and the ongoing GAC replacement costs. The carbon usage rate cannot be accurately estimated without further testing.

3. The volume of finished water storage will be minimized. Only the storage volume required to meet disinfection CT requirements will be provided. By not providing excessive chlorine contact time at the WTP, the level of DBPs leaving the plant should be reduced.

4. The treated surface water may be blended with groundwater from the Thunderbird wells prior to serving the first consumer. It is not anticipated that the chlorinated well water will form significant levels of DBPs, therefore the blend ratio of the two waters can be adjusted to blend down the level of DBPs in the water served to consumers.

3.6 Disinfection Byproduct Control

The first step in controlling disinfection byproducts will be the removal of DBP precursors through the DAF and membrane filtration processes. It is anticipated that these processes, by themselves, will not remove enough DBP precursors to allow the City to comply with DBP regulations. Additional control of disinfection byproducts will be accomplished using a combination of the following two methods:

1. Treating all, or a portion, of the WTP flow with GAC

2. Blending the WTP finished water with Thunderbird well water. The Black & Veatch disinfection alternatives evaluation (November 2007) predicted that the blend ratio of finished surface water to groundwater required to satisfy regulatory DBP limits would need to be no greater than 3:5. This equates to a well flow rate of 933 gallons/minute being required to blend with the design WTP production rate of 1,400 gallons/minute.

Pending the completion of further GAC bench-scale testing, it appears feasible to meet regulatory DBP requirements using either GAC or blending alone. The final decision as to what percentage of the WTP flow will be treated through GAC and what Thunderbird well blending ratio will be used can be made by the City based on economic and logistical considerations. The degree to which GAC treatment and blending are implemented can also be changed over the life of the WTP in response to changes in commodity costs, surface water quality, and well water availability.

3.7 Residuals Management

The City has stated that the residuals produced by the WTP can be discharged into the sewer system and will be accepted by the City's wastewater treatment plant. Residuals will be generated from the following processes:

Process	Volume per Cycle (gallons)	Cycle Frequency	Average Daily Volume (gallons)	Maximum Flow Rate (gpm)	Special Processing
Clarification process residuals	TBD	TBD	20,000	TBD	None
Membrane prestrainer blowdown	20	Every hour	400	100	None
Membrane backwash	1,500	Every 10 minutes	100,000	1,100	None
Membrane enhanced flux maintenance	5,000	Daily	5,000	15	pH and chlorine residual neutralization
Membrane CIP	5,000	Monthly	167	15	pH and chlorine residual neutralization

It is assumed that the nearby sewer will not accommodate the peak flow rate of 1,100 gpm. Therefore, a washwater buffer structure will be required. A 20,000 gallon below-grade concrete sump has been assumed.

3.8 Hydraulics

3.8.1 Raw Water Supply to Clarifier

The minimum hydraulic grade line at the Paso Robles Nacimiento Pipeline turnout at build-out of the Nacimiento project is 767 feet above sea level. The finished grade at the site will be at approximately 721feet above sea level. The resulting minimum available head at the turnout is therefore predicted to be 46' or 19.9 psig. This should be enough head to supply the coagulant rapid mixer and either a DAF or high-rate clarification unit. A solenoid operated flow control valve or motor operated butterfly valve with feedback from a raw water flowmeter is envisioned to control the flow of water entering the clarification unit.

3.8.2 Membrane Feedwater Supply

The packaged membrane filtration units described in this study typically utilize an approximately 1,100 gallon, 8 foot tall, atmospheric, feed water tank located next to the membrane skid to buffer the supply of feed water feeding the membranes. An outlet near the bottom of the feed water tank connects to a feed water pump located on the membrane skid, which boosts the available pressure enough to overcome the head loss through the prestrainer and membranes. The head available to fill the feed water tank is limited to the elevation difference between the clarification unit overflow weir and the high water level in the feed water tank. By locating the base of the clarification unit at a higher grade than the floor of the Operations/Membrane building, it should be possible to fill the membrane feed water tank by gravity. The VFD-driven membrane feed pump flow rate would be controlled to maintain a constant water level in the feed water tank.

3.8.3 Clearwell Configuration

The residual pressure downstream of the membranes typically ranges from 2 to 5 psig. This pressure is not sufficient to overcome the headloss through the GAC process and to fill an above-ground tank. Preliminary discussions with Pall Corporation indicate that increasing the membrane skid feed water pump head is not a viable alternative. Two options for overcoming the hydraulic limitations of the membranes are to: 1)

construct the clearwell partially below grade, or 2) install booster pumps between the membranes and the clearwell. A cast-in-place concrete, below-grade clearwell has been assumed.

3.8.4 High Service Pumping Station

Several viable high-service pumping station alternatives to pump water out of the clearwell into the East and West zones of the water distribution system exist.

- Construct two independent high service pumping stations, each designed to serve one of the two pressure zones.
- Construct a single high service pumping station with control valves to divert flow between the two pressure zones.
- Construct a single high service pumping station designed to supply water to only the East pressure zone. The West zone would be supplemented with surface water only through the 13th street booster pumping station.

The lowest cost alternative would be to supply treated surface water to the East pressure zone only. However; this would limit the City's operational flexibility and may create consumer perception issues since the water quality will differ significantly between the two pressure zones. Serving both pressure zones would increase the capital cost by an estimated $100,000, but would not significantly affect O&M costs.

This study assumes that only the East pressure zone will receive treated surface water and that only a single high service pumping station will be constructed. The high-service pumping station will be equipped with VFD-driven pump(s) and a flow meter controlled to maintain a constant water level in the clearwell. The City's SCADA system could be modified to tie operation of the high-service pumping stations to operation of the respective Thunderbird wells in order to obtain an acceptable blend of treated surface water and ground water.

3.9 Controls

A simple control room located inside of the Operations and Control Building has been assumed. The City will also have the option of monitoring and controlling the WTP remotely through a SCADA interface.

The WTP will include sufficient instrumentation and controls to satisfy California Department of Public Health requirements for unattended operation. It is anticipated that the City's operations staff will routinely interface with the following control functions:

- Adjust the WTP production setpoint between 1 MGD and 2 MGD. The flow through the treatment plant will be controlled primarily through the NWP turnout flow control valve and flow meter. The membrane skids will operate with a preset flow rate to match the turnout setting and the membrane skid feed pumps will trim their speed to maintain a constant preset water level in the feedwater tank. The flow from the high service pumping station will match the turnout setting and the pump speed will be trimmed to maintain a constant water level in the clearwell. The operating level in the clearwell will be established to meet disinfection CT requirements.
- Interlock operation of the high service pumping station to the Thunderbird Wells such that the high service pumping station will operate in conjunction with preselected wells.
- Adjust chlorine residual setpoint.

- Adjust coagulant dosage

The flow diverted to the GAC treatment process will be adjusted manually using manually operated butterfly valves and a flowmeter.

Section 4
Preliminary Equipment Sizing

The following sections describe preliminary process equipment sizing.

4.1 Pretreatment Equipment Sizing

In order to reduce costs, a single packaged 2-MGD clarification unit has been assumed. The cost opinions contained in this study are based on use of a single Degremont AquaPak Model AP-144 steel, packaged, high-rate DAF unit. The AP-144 is 38.5 feet long, 12 feet wide, and approximately 12 feet high.

4.2 Membrane Filtration System Sizing

Two 1-MGD membrane treatment trains have been assumed. In addition to the membrane skids, the membrane filtration system will be supplied with separate skids for the compressed air system, the chemical CIP system, and the neutralization system. Conceptual drawings provided by Pall Corporation for the AP-6 system show that a floor area of approximately 40' x 42' will be required to accommodate everything but the neutralization system. It is anticipated that the neutralization system will be installed outdoors in or near the chemical enclosure.

4.3 GAC Process Sizing

For the 2-MGD capacity being considered, the use of 12' diameter GAC contactors containing 20,000 lb of carbon each is appropriate. The vessels must be operated with at least two in parallel to handle the hydraulic loading. A total of four vessels configured in two trains of two vessels in series has been assumed. The resulting four vessels will provide an empty bed contact time of approximately 14 minutes while treating the full WTP flow.

4.4 Disinfection Process Sizing

Based on an evaluation of historical Lake Nacimiento water quality data provided by the County of San Luis Obispo, it is recommended that pH and temperature values of 8.5 and 10° C respectively be assumed for the purpose of establishing the minimum regulatory disinfection CT requirement. Using these values and assuming a chlorine residual of 1.5 leaving the finished water clearwell, a required CT of 34.8 is derived. A nominal chlorine contact time of 24 minutes is required to satisfy this CT requirement; however, the clearwell must be de-rated to account for non-optimal plug flow conditions through the tank. It is anticipated that a baffling factor of at least 0.2 can be achieved with simple separate inlet and outlet connections. A baffling factor of 0.2 increases the total required contact time to 120 minutes.

120 minutes x 1,400 gallons/minute = 168,000 gallon minimum clearwell size

If baffles are added to the clearwell, a baffling factor of at least 0.4 should be achievable. A baffling factor of 0.4 would result in a required clearwell size of approximately 84,000 gallons. An 84,000 gallon partially recessed, baffled, concrete clearwell has been assumed. It is recommended that other options be considered during final design:

- Increasing the chlorine concentration and relying on blending with Thunderbird well water with little or no chlorine to reduce the residual in the distribution system.
- Construction of a welded steel tank adequately sized for buildout conditions. Due to potential space limitations and costs associated with constructing a temporary tank, the City may prefer to build a permanent storage facility.

4.5 High-Service Pumping Station Sizing

The maximum capacity of the high service pumping station is 2 MGD at a pressure of approximately 130 psi. It has been assumed that the pumping station will consist of vertical turbine pumps suspended in the clearwell.

Section 5
Preliminary Site Layout

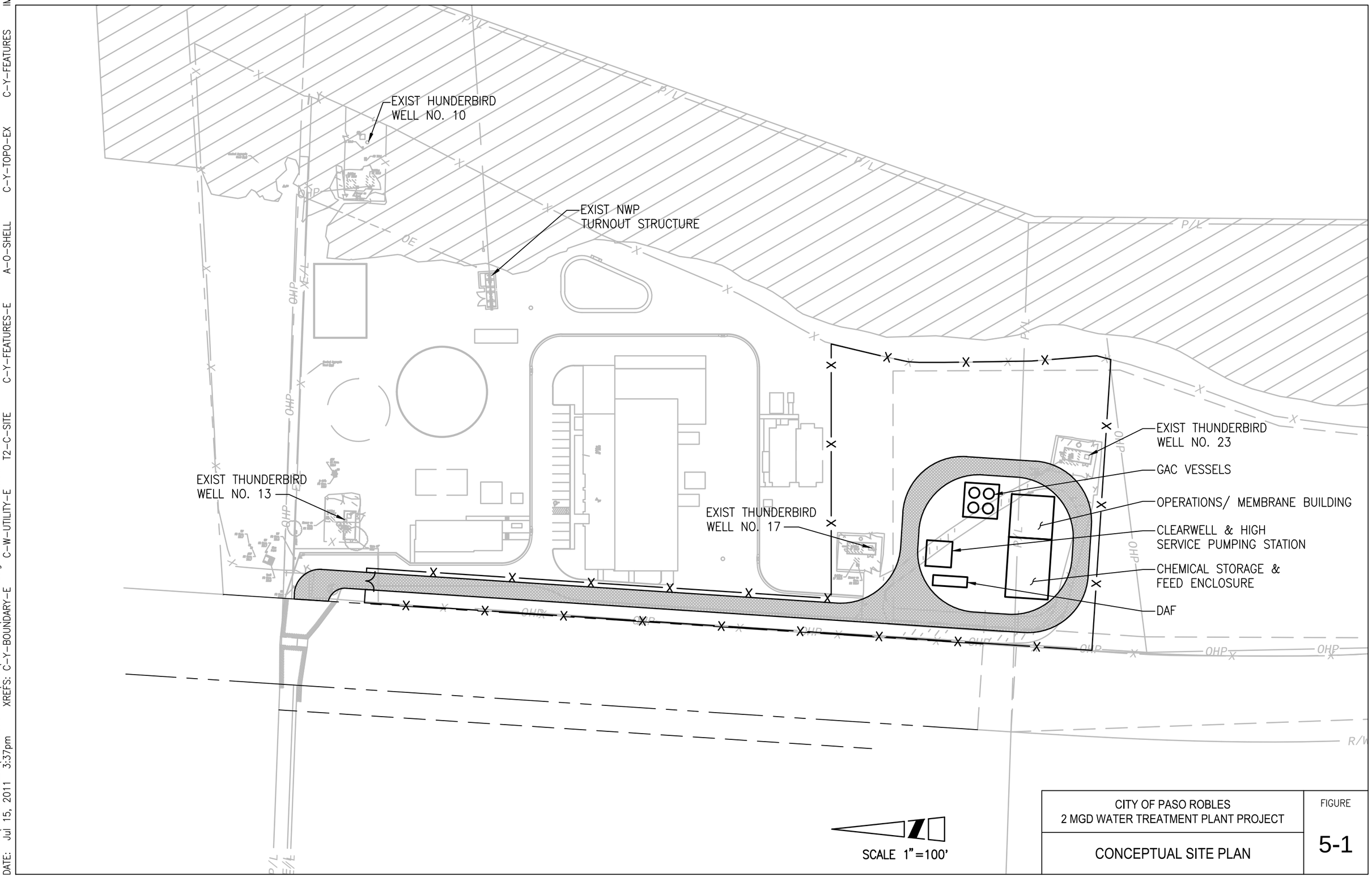
5.1 Equipment Space Requirements

The major Phase 1 WTP structures to be located on the site are as follows:

- Nacimiento Water Project Turnout Structure (existing)
- Operations and Membrane Building. The building will house the membrane skids, CIP system, compressed air system, and a small office space. It is anticipated that the building will need to be approximately 2,500 square feet in area to accommodate all of the equipment.
- Clarifier
- Chemical Storage and Feed Enclosure
- Clearwell
- High-Service Pumping Station (assumed to be installed on top of the clearwell)
- Stormwater and Tank Overflow Pond
- Electrical Switchgear

5.2 Preliminary Site Plan

Figure 5-1 illustrates one possible site plan. The primary treatment equipment is shown located near the southwestern corner of the existing Thunderbird well complex. It is anticipated that this location will be far enough removed from the location proposed for the permanent treatment plant that it will allow construction of the Phase 2 WTP to proceed while the Phase 1 WTP is in operation. By locating the DAF unit to the west of the membrane building, the approximately 5-foot natural grade difference can be used to supplement the head available at the membrane feedwater tank inlet.



CITY OF PASO ROBLES
2 MGD WATER TREATMENT PLANT PROJECT

CONCEPTUAL SITE PLAN

FIGURE
5-1

DWG: V:\PASO ROBLES\12345678-WTP\CAD\FIGURES\FIG 5-1.dwg USER: ThorneM
DATE: Jul 15, 2011 3:37pm XREFS: C-Y-BOUNDARY-E C-W-UTILITY-E T2-C-SITE
C-Y-FEATURES-E A-O-SHELL C-Y-TOPO-EX C-Y-FEATURES IMAGES

Section 6
Opinion of Probable Cost

6.1 Opinion of Initial Project Cost

The opinion of probable cost to design and construct the 2-MGD, Phase 1 WTP as described in this report is $10.6 million. A more detailed breakdown of the items included in the cost opinion is presented in Table 6-1. This project cost opinion is based on the design assumptions described in the previous sections of this study. It may be possible during the detailed design phase of the project to reduce the project cost and/or modify the WTP features included in the project to better benefit the City. A more detailed predesign study will need to be conducted to identify and evaluate potential cost savings alternatives and process improvements, and is included in our currently proposed Scope of Work for the design phase of the project.

6.2 Opinion of Operations and Maintenance Costs

A preliminary opinion of probable operations and maintenance costs is presented in Table 6-2. Several assumptions must be made in order to estimate operation and maintenance costs for the proposed WTP. Assumptions specific to each recurring cost type are described in the following sections. Below are more general assumptions applied to the overall O&M cost analysis:

1. The present worth cost is based on a 30-year service life and a real discount rate (with inflation premium removed) of 1.3%
2. The Phase 1 WTP will be operated at full capacity (2 MGD) for 24 hours per day, 6 months out of the year.
3. The WTP will be staffed for one 8-hour shift and operated unattended for the remaining 16 hours. Unattended operation is not recommended until the WTP has been in operation for several months and its reliability is established.

6.2.1 Raw Water

The City must pay for the water supplied by the Nacimiento Water Project. Evaluation of the terms of the City's water supply agreement is beyond the scope of this study. Therefore, debt service or the cost of raw water has not been included in the O&M cost opinion.

6.2.2 Labor

It is assumed that two full-time operators will be assigned to operate and maintain the WTP: one Chief Operator with a fully-burdened cost of $141,000/year and one Staff Operator with a fully-burdened cost of $72,000/year. It has been assumed that these staff will be utilized at other facilities during the 6 month period when the WTP is not in operation and that the downtime labor costs are not applied to the WTP operational budget. This results in a total annual labor cost of $106,500 for the WTP.

6.2.3 Electricity

The average cost for electricity has been assumed to be $0.12/kWh. The energy usage rate is based on the following:

- Calculation of pumping energy for the high service pumps is based on a flow rate of 1,400 gpm (2 MGD) against a pressure of 100 psi, and assumes a 75% pumping efficiency. This is approximately equivalent to 100 total pumping horsepower and results in a daily energy usage of 1,947 kWh/day.
- Energy usage for the membrane system has been assumed to be 555 kWh/day based on values provided by Siemens Memcor.
- Energy usage for the clarification system has been assumed to be 220 kWh/day based on values provided by Infilco Degremont for the AquaPak high rate DAF system.
- A 20% factor was applied to the above energy usage rates to account for site lighting and miscellaneous electrical loads.

The resulting annual energy usage cost is (1,947 + 555 + 220) x 1.2 x 0.12 x 365/2 days = $71,534

6.2.4 Chemicals

The assumed chemical usage rates are listed below. These rates are based on estimates made in the Water Treatment Plant Project Preliminary Design Report prepared by Black and Veatch and dated November 2007 and on membrane CIP chemical usage rates estimated by Siemens Memcor. There is a high level of uncertainty in these costs.

Chemical	Estimated Annual Usage (6 month operation)	Cost	Estimated Annual Cost
Potassium Permanganate (dry)	4,575 lbs		TBD
PACL (50%)	20,805 gallons		TBD
Sodium Hypochlorite (12.5%)	22,447 gallons	$2.75/gal	$61,729
Citric Acid (50%)	200 gallons		$2,200
Sulfuric Acid (50%)	170 gallons		$1,445
Sodium Hydroxide (50%)	260 gallons		$2,500
Sodium Bisulfite (50%)	90 gallons		TBD
		Total	TBD

6.2.5 Laboratory Analyses

Operation of a surface water treatment plant requires significantly more routine water quality testing than a groundwater well. The following additional monitoring requirements are anticipated:

- Monthly raw and treated water TOC ($50/sample x 24 = $1,200)
- Monthly alkalinity ($15/sample x 12 = $180)
- Quarterly THM and HAA4 ($225/sample x 4 sites = $3,600)
- Monthly effluent aluminum ($15/sample x 12 = $180)

- Raw water weekly total and E. coli ($30/sample x 52 = $1,560)
- Additional lead and copper twice per year ($30/sample x 10 = $300)

The total additional analytical cost is estimated to be $7,020. This estimate was increased to $10,000/year in the O&M cost opinion to account for sample preparation and shipping costs.

6.2.6 Carbon Replacement

It has been assumed that the GAC will need to be changed out every 6 months, which corresponds to the assumed operating season. It has also been assumed that virgin coconut shell carbon will be loaded each year. The 6-month carbon life is consistent with a study conducted on a membrane surface water treatment plant at Tejon Ranch treating State Project water from the California Aqueduct. The Tejon Ranch study was conducted to evaluate the use of GAC downstream of Pall MF membranes to control DBPs. It should be noted that this is a very rough estimate. The carbon usage rate can be expected to vary based on a number of factors, most importantly on the water to be treated. AECOM is unaware of any carbon adsorption testing having been performed on Lake Nacimiento Water. The cost for this expense item may be dramatically different from the value predicted. We have made every attempt to provide a conservative estimate, anticipating that the carbon usage estimates will be further fine-tuned during the design phase. The cost of replacement carbon has been assumed to be $1.50/lb.

The annual carbon replacement cost is estimated as: 80,000 lb/year x $1.50/lb = $120,000

6.2.7 Residuals Disposal

It has been assumed that there is no cost for disposal of the WTP residuals in the City's sewer.

6.2.8 Repairs and Routine Maintenance

An annual repair and maintenance budget of 2.5% of the project construction cost has been assumed.

6.2.9 Administrative Costs

Operation of the WTP can be expected to result in additional administrative effort for managing, reporting, etc. These costs can best be estimated by City staff and have not been included in this analysis.

Table 6-1
City of Paso Robles 2 MGD Water Treatment Plant
Initial Project Cost Opinion

Bid Item No.	Description	Engineer's Estimate ($)
1	Mobilization, Demobilization, Insurance, and Permit	300,000
2	Storm Water Pollution Control	20,000
3	Painting and Coating	100,000
4	2 MGD Clarification System (1 Train)	545,000
5	Installation of 2 MGD Clarification System	150,000
6	2 MGD Membrane Filtration System (Total for 2 Trains)	1,000,000
7	CIP Neutralization System	35,000
8	Installation of 2 MGD Membrane Filtration System	200,000
9	GAC Vessels (4 Vessels)	500,000
10	Installation of GAC Vessels	150,000
11	Recessed Concrete Clearwell	250,000
12	Operations and Control Building	400,000
13	High Service Pumping Station (2 Stations)	250,000
14	Chemical Enclosure	250,000
15	Chemical Storage Tanks and Feed Systems	600,000
16	Washwater Buffer Tank	75,000
17	Site Yard Piping	750,000
18	Site Electrical	1,000,000
19	Field Instrumentation, Controls, and Integration	750,000
20	Site Grading, Paving and Surfacing	300,000
21	Storm Water Collection System	75,000
22	Fencing	50,000
23	CPM Construction Schedule	20,000
24	Startup and Testing	40,000
25	Operation and Maintenance Manuals	20,000
26	Record Drawings	10,000
	Total Bid Amount	7,840,000
	Contingency @ 20%	1,568,000
	Engineering	750,000
	Construction Management	500,000
	Total Initial Project Cost	10,658,000

Table 6-2
City of Paso Robles 2 MGD Water Treatment Plant
Operations and Maintenance Cost Opinion (6 Mo. Operation)

Item No.	Description	Annual Cost ($)
1	NWP Charges (Not Included in Estimate)	-
2	Labor	106,500
3	Electricity	71,534
4	Chemicals (Preliminary Value)	200,000
5	Laboratory Analyses	10,000
6	Carbon Replacement	120,000
7	Residuals Disposal	-
8	Repairs and Routine Maintenance	200,000
9	Administrative Costs (Not Included in Estimate)	-
	Total Annual Operating Costs	708,034
	Present Worth of O&M Costs For 30 Year Service Life	17,496,031

UTILITY REIMBURSEMENT AGREEMENT FOR DESIGN SERVICES

This Utility Reimbursement Agreement for Design Services (Agreement) is made this 28th day of August, 2012 by and between the Central Coast Water Authority (CCWA), and the County of San Luis Obispo, a political subdivision in the State of California, (County), at Buellton, California, with reference to the following facts and intentions:

A. CCWA, organized and existing through a Joint Exercise of Powers Agreement dated August 1, 1991, operates and maintains the Coastal Branch of the State Water Project (Coastal Branch). The Coastal Branch is owned by the California Department of Water Resources (DWR). CCWA and DWR have an agreement where operation and maintenance responsibilities have been delegated from DWR to CCWA for the Coastal Branch.

B. The County intends to construct the necessary turnout facilities to activate its Shandon Turnout (Turnout) for County Service Area 16, located at Station 1245+90 on a parcel of land located in the County of San Luis Obispo, California, described as Assessor's Parcel Number of APN 017-221-003 (Turnout). The Turnout is located within an existing easement owned by DWR.

C. At the time of the original construction of the Phase 2 Coastal Branch, the County had prepared the required environmental documentation (an Environmental Impact Report, prepared in 1993) and appropriate contract provisions with DWR. In turn, DWR had completed design for the Turnout construction. However, the County elected to not move forward with DWR's construction of the Turnout at the time of the construction of the Phase 2 Coastal Branch.

D. The County desires to update the existing design for the Turnout (Turnout Project). In addition, the County desires to have CCWA directly manage the design and construction of the Turnout Project and will request DWR to delegate the Turnout Project to CCWA pursuant to the existing Operations and Maintenance Agreement between DWR and CCWA.

E. The County is responsible for updating the environmental documentation for the Turnout Project and to procure any additional land needed to construct the Turnout Project. CCWA will not be responsible for these tasks, other than to provide relevant design information.

F. The purpose of this Agreement is to describe the roles and responsibilities of CCWA and the County with respect to designing the Turnout Project. A second

agreement will be executed to describe the roles and responsibilities of DWR, CCWA and the County with respect to constructing the Turnout Project, following the completion of the design work.

NOW THEREFORE, the parties agree as follows:

I. ENGINEERING DESIGN WORK

CCWA shall update the existing DWR contract documents for the design of the Turnout Project, through retaining the services of an experienced engineering consultant. Any revision to the CCWA updated contract documents described above shall be mutually agreed upon by DWR, the County and CCWA and will constitute an approved revision of the CCWA updated contract documents described above and hereby made a part of this Agreement. No redesign or additional engineering shall be made to the CCWA updated contract documents unless approved by DWR, the County and CCWA.

II. PERFORMANCE OF WORK

CCWA agrees to coordinate performance of the described work with its own forces and to cause the described work to be performed by CCWA's consultant, retained by written contract on a continuing basis to perform work of this type, and to provide and furnish all necessary labor, materials, tools, and equipment required therefore, and to prosecute the work diligently to completion. Engineering services for locating, making of surveys, preparation of contract documents, estimates, supervision, and inspection are to be furnished by the consulting engineering firm of AECOM USA, Inc. CCWA will also coordinate review and approval of the Turnout Project design with DWR.

III. PAYMENT FOR WORK

CCWA, at the present time, does not have funds allocated in its budget to proceed with the design services for the Turnout Project. It is estimated that the cost of the work described in this Agreement is the sum of $58,673. The County agrees to advance the above sum to CCWA in order for CCWA to have sufficient funds to apply to the cost of the work to be undertaken as provided above. This sum will be deposited by the County with CCWA within 30 days after execution of this Agreement by the parties. CCWA will deposit the funds in an interest-bearing account or trust fund in a State of California or national bank in California consistent with CCWA's Practices and Policies.

CCWA will prepare and submit monthly progress bills to the County for costs incurred not to exceed CCWA's recorded costs as of the billing date less estimated credits

applicable to completed work. Payment of progress invoices not to exceed the amount of this Agreement may be made under the terms of this Agreement from the funds advanced by the County. In the event that the funds advanced are insufficient to complete the work, the County shall deposit a supplemental advance within 30 days of an invoice from CCWA. CCWA shall submit to the County a final invoice within 30 days of completion of the design of the Turnout Project.

When the work is completed, CCWA shall send the County a final invoice for reconciliation of the total sum advanced by the County. In the event actual and necessary cost of the work as established herein is less than the sum of money, including interest, advanced by the County, CCWA agrees to refund to the County the difference between the actual and necessary cost and the sum of money that was advanced. In the event that the actual and necessary cost of the work as established herein exceeds the amount of money advanced to CCWA, including interest, in accordance with the provisions of the Agreement, the County will reimburse CCWA the excess costs incurred by CCWA upon receipt of an itemized bill from CCWA.

The final billing shall be in the form of an itemized statement of the total cost of the Design of the Turnout Project, less the credits provided for in this Agreement, and less any amounts covered by progress billings and payments. However, the County shall not pay the final invoices which exceed the estimated cost of this Agreement without documentation of the reason for the increase of said cost from the CCWA and approval of documentation by the County, which shall not be unreasonably withheld.

IV. INDEMNIFICATION.

County shall defend, indemnify, and hold harmless CCWA and its agents, consultants, officers, elected officials, directors and employees from and against any and all liabilities, claims, costs, expenses, losses, and damages, including attorney's fees and costs, which arise out of, relate to or result from this Agreement and the design and construction of the Turnout Project, unless arising from CCWA's established sole active negligence or willful misconduct. This indemnification shall include, but is not be limited to, the costs, attorney's fees expenses and damages incurred by CCWA to defend any and all such claims or lawsuits, to which CCWA is made a party.

V. ARBITRATION.

All claims and disputes arising under or relating to this Agreement shall be settled by binding arbitration in Santa Barbara, California, or another location mutually agreeable to the parties. The arbitration shall be conducted on a confidential basis pursuant to the

Commercial Arbitration Rules of the American Arbitration Association. Any decision or award as a result of any such arbitration proceeding shall be in writing and shall provide an explanation for all conclusions of law and fact. The parties reserve the right to object to any individual who shall be employed by or affiliated with a competing organization or entity. An award of arbitration may be confirmed in a court of competent jurisdiction.

VI. GENERAL CONDITIONS

If the Turnout Project is canceled or modified so as to eliminate the necessity of work by CCWA, the County will notify CCWA in writing and the County reserves the right to terminate this Agreement by Amendment. The Amendment shall provide mutually acceptable terms and conditions for terminating the Agreement, including the County's payment of all CCWA costs incurred through execution of an amendment terminating this Agreement.

This Agreement constitutes the entire agreement between the parties and all prior and supersedes all contemporaneous agreements, representations and understandings of the parties. This Agreement may be altered, amended or modified only by a supplemental writing executed by the parties to this Agreement and by no other means. Each party waives their future right to claim, contest or assert that this Agreement was modified, canceled, superseded or changed by any oral agreement, course of conduct, waiver or estoppel.

IN WITNESS WHEREOF, the above parties have executed this Agreement the day and year above written.

CENTRAL COAST WATER AUTHORITY:

By: _____ Date: 8/8/12

Name: John Brady

Title: Operations Manager / Engineer

38107

036910\0032\619121.4

COUNTY OF SAN LUIS OBISPO:

By: James Patterson Date: 08/28/2012

Chairperson of the Board
County of San Luis Obispo
State of California

ATTEST:

By: JULIE L. RODEWALD Date: 08/28/2012

County Clerk and Ex-Officio Clerk
of the Board of Supervisors
County of San Luis Obispo
State of California

By: Sandy Cerrons
Deputy Clerk

APPROVED AS TO FORM AND LEGAL EFFECT:
WARREN R. JENSEN
County Counsel

By: Date: 7/19/12

Deputy County Counsel

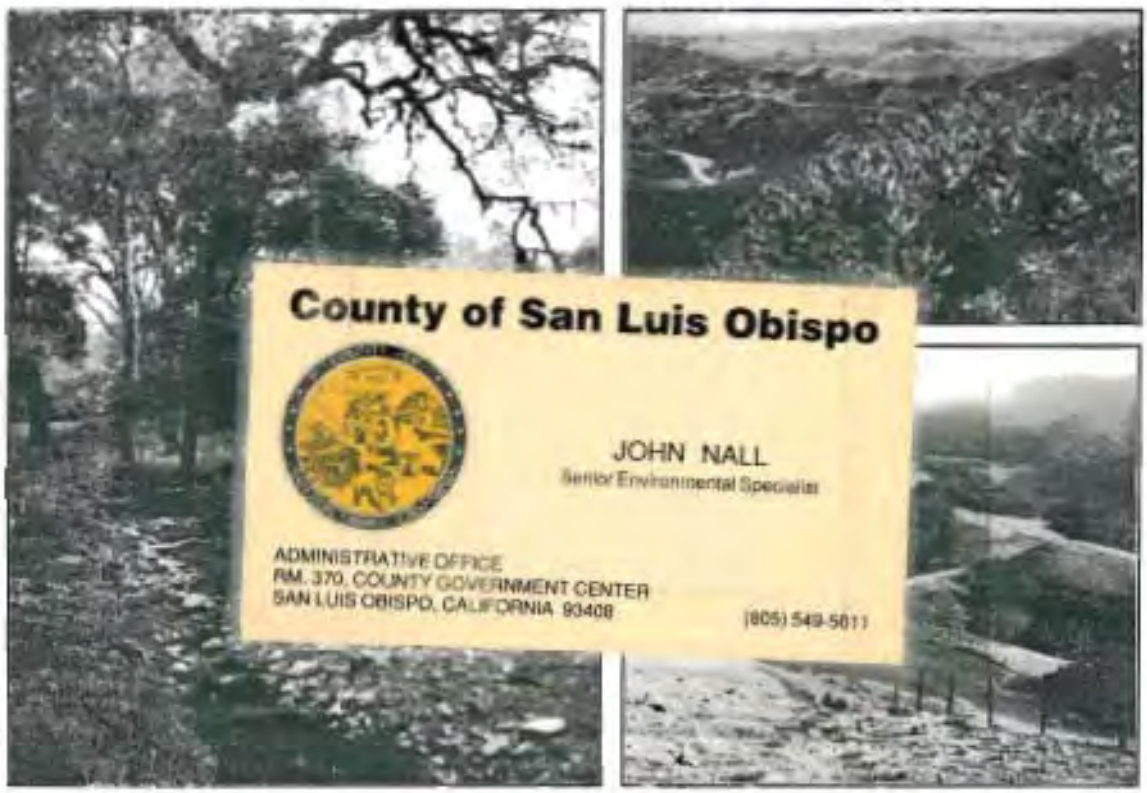
036910\0032\619121.4

W35a

Final Environmental Impact Report

State Water Project Coastal Branch (Phase II) Local Distribution Lines and Facilities

ED 90-649



County of San Luis Obispo
Office of the Environmental Coordinator
County Government Center
San Luis Obispo, CA 93408

March 1992

ERCE

Printed on Recycled Paper

Final Environmental Impact Report

State Water Project Coastal Branch (Phase II) Local Distribution Lines and Facilities ED 90-649

March 1992

Submitted to

County of San Luis Obispo
Office of the Environmental Coordinator
County Government Center
San Luis Obispo, CA 93408
(805) 549-5011
Contact: Melissa J. Mooney

Submitted by

ERCE
510 State Street Suite B
Santa Barbara, CA 93101
(805) 962-0992

TABLE OF CONTENTS

SECTION	TITLE	PAGE
	EXECUTIVE SUMMARY	ES-1
1	INTRODUCTION AND PROJECT BACKGROUND	1-1
1.1	Background	1-1
1.2	Relationship to Other Documents	1-1
1.3	Use of this Document	1-2
1.4	Organization of this Document	1-3
1.5	Revisions to the DEIR	1-3
2	PROJECT DESCRIPTION	2-1
2.1	Project Objectives	2-1
2.2	Project Location and Environmental Setting	2-1
2.3	Project Characteristics	2-1
2.3.1	Local Water Distribution Pipelines	2-3
2.3.1.1	Shandon Pipeline	2-3
2.3.1.2	North County Pipeline	2-7
2.3.1.3	Chorro Valley Pipeline	2-7
2.3.1.4	City of SLO Pipelines	2-15
2.3.1.5	SLO Country Club Area Pipeline	2-15
2.3.1.6	Lopez Pipelines	2-15
2.3.1.7	Nipomo Pipelines	2-15
2.3.2	Water Treatment Plant	2-20
2.3.2.1	General Description	2-20
2.3.2.2	General Description of the Water Treatment Processes	2-24
2.3.2.3	Water Treatment Processes at the PPWTP	2-25
2.3.2.4	Delivery and Storage of Treatment Materials	2-25
2.3.2.5	Water Treatment Facilities	2-27
2.3.3	Hydroelectric Plants	2-28
2.4	Construction Schedule	2-29
2.5	Discretionary Actions Required	2-29
3	PROJECT ALTERNATIVES	3-1
3.1	No Project	3-1
3.2	Alternative Pipeline Routes	3-3
3.2.1	Local Pipeline Route Selection Process	3-4
3.2.1.1	North County Alignment Changes	3-4
3.2.1.2	Chorro Valley Alignment Changes	3-10
3.2.1.3	Additional Alignment Changes	3-11
3.2.2	North County Alternative Pipeline Route	3-11
3.2.3	Los Osos Valley Road Pipeline Alternative	3-12
3.3	Alternative Water Supply Options	3-12
3.3.1	Whale Rock Exchange	3-17
3.3.2	Delivery of Water from Nacimiento Reservoir	3-17
3.3.3	Jack Creek Reservoir	3-19
3.3.4	Santa Rita Reservoir	3-21
3.3.5	Lopez Reservoir Enlargement	3-21
3.3.6	Wastewater Reclamation	3-21
3.3.7	Desalination	3-22
3.3.8	Increased Water Conservation	3-23
3.3.9	Other Alternatives	3.23

TABLE OF CONTENTS (Continued)

SECTION	TITLE	PAGE
3.4	Alternative WTP Facility Locations	3-25
3.4.1	Centralized Treatment Scenario	3-25
3.4.2	Decentralized Treatment Scenario	3-27
3.5	Alternative Methods of Treatment	3-28
4	ENVIRONMENTAL ANALYSIS	4.1-1
4.1	Geology, Seismicity and Soils	4.1-1
4.1.1	Existing Conditions	4.1-1
4.1.1.1	Geology	4.1-1
4.1.1.1.1	General Geology	4.1-1
4.1.1.1.2	Pipeline Segments	4.1-1
4.1.1.2	Seismicity	4.1-34
4.1.1.2.1	General Seismic Description	4.1-34
4.1.1.2.2	Seismic Hazards Associated with Pipeline Segments	4.1-39
4.1.1.3	Soils	4.1-41
4.1.2	Environmental Impacts	4.1-52
4.1.2.1	Geology	4.1-52
4.1.2.2	Seismicity	4.1-54
4.1.2.3	Soils	4.1-57
4.1.3	Mitigation Measures	4.1-60
4.1.3.1	Geology	4.1-60
4.1.3.2	Seismic	4.1-60
4.1.3.3	Soils	4.1-62
4.1.3.4	Water Treatment Plant	4.1-62
4.1.4	Residual Impacts	4.1-63
4.2	Water Resources	4.2-1
4.2.1	Existing Surface Water Conditions	4.2-1
4.2.1.1	Shandon	4.2-1
4.2.1.2	North County	4.2-2
4.2.1.3	Chorro Valley	4.2-5
4.2.1.4	SLO Pipelines	4.2-8
4.2.1.5	Country Club Pipeline	4.2-8
4.2.1.6	Lopez Pipelines	4.2-8
4.2.1.7	Nipomo Pipelines	4.2-9
4.2.1.8	Water Treatment Plant	4.2-9
4.2.2	Existing Groundwater Conditions	4.2-9
4.2.2.1	DAU 65: Upper Salinas	4.2-12
4.2.2.2	DAU 67: San Luis Obispo	4.2-12
4.2.2.3	DAU 68: Arroyo Grande	4.2-12
4.2.2.4	DAU 70: Santa Maria	4.2-13
4.2.2.5	Safe Yield and Overdraft	4.2-13
4.2.3	Environmental Impacts	4.2-16
4.2.3.1	Construction Impacts	4.2-16
4.2.3.2	Operational Impacts of Water Supply Pipelines	4.2-18
4.2.3.3	Operational Impacts of Polonio Pass Water Treatment Plant	4.2-19
4.2.4	Mitigation Measures	4.2-26
4.2.5	Residual Impacts	4.2-29
4.3	Air Quality	4.3-1
4.3.1	Existing Conditions	4.3-1
4.3.1.1	Regulatory Framework	4.3-1
4.3.1.2	Ambient Air Quality	4.3-1

TABLE OF CONTENTS (Continued)

SECTION	TITLE	PAGE
4.3.1.3	Existing Emissions	4.3-6
4.3.1.4	Climatology/Meteorology	4.3-6
4.3.2	Environmental Impacts	4.3-8
4.3.2.1	Construction Impacts	4.3-8
4.3.2.2	Operational Impacts	4.3-19
4.3.3	Mitigation Measures	4.3-25
4.3.4	Residual Impacts	4.3-28
4.4	Biological Resources	4.4-1
4.4.1	Existing Conditions	4.4-1
4.4.1.1	Shandon Pipeline	4.4-1
4.4.1.2	North County Pipeline	4.4-3
4.4.1.3	Chorro Valley Pipeline and Hydroelectric Plant	4.4-22
4.4.1.4	SLO Pipelines	4.4-48
4.4.1.5	Country Club Pipeline	4.4-54
4.4.1.6	Lopez Pipeline	4.4-56
4.4.1.7	Arroyo Grande Alternative Pipeline	4.4-58
4.4.1.8	Nipomo Pipelines	4.4-60
4.4.1.9	Water Treatment Plant	4.4-63
4.4.2	Environmental Impacts	4.4-67
4.4.2.1	Shandon Pipeline	4.4-68
4.4.2.2	North County Pipeline	4.4-68
4.4.2.3	Chorro Valley Pipeline and Hydroelectric Plant	4.4-72
4.4.2.4	SLO Pipelines (2)	4.4-78
4.4.2.5	Country Club Pipeline	4.4-81
4.4.2.6	Lopez Pipeline	4.4-81
4.4.2.7	Arroyo Grande Alternative Pipeline	4.4-81
4.4.2.8	Nipomo Pipelines	4.4-81
4.4.2.9	Water Treatment Plant	4.4-83
4.4.2.10	Summary of Impacts	4.4-84
4.4.3	Mitigation Measures	4.4-90
4.4.3.1	Regulatory and Permit Constraints	4.4-90
4.4.3.2	Mitigation Measures	4.4-91
4.4.3.2.1	General Mitigation Measures	4.4-91
4.4.3.2.2	Mitigation for Direct Impacts	4.4-94
4.4.3.2.3	Mitigation for Indirect Impacts	4.4-103
4.4.4	Residual Impacts	4.4-104
4.5	Transportation	4.5-1
4.5.1	Existing Conditions	4.5-1
4.5.1.1	Shandon	4.5-1
4.5.1.2	North County	4.5-1
4.5.1.3	Chorro Valley Pipeline	4.5-1
4.5.1.4	SLO Pipelines	4.5-2
4.5.1.5	SLO Country Club Area Pipeline	4.5-2
4.5.1.6	Lopez Pipelines	4.5-2
4.5.1.7	Nipomo Pipelines	4.5-2
4.5.1.8	Water Treatment Plant	4.5-2
4.5.2	Environmental Impacts	4.5-3
4.5.2.1	Shandon	4.5-3
4.5.2.2	North County	4.5-3
4.5.2.3	Chorro Valley Pipeline	4.5-4
4.5.2.4	SLO Pipelines	4.5-4

TABLE OF CONTENTS (Continued)

SECTION	TITLE	PAGE
4.5.2.5	SLO Country Club Area Pipeline	4.5-5
4.5.2.6	Lopez Pipelines	4.5-5
4.5.2.7	Nipomo Pipelines	4.5-5
4.5.2.8	Water Treatment Plant	4.5-5
4.5.3	Mitigation Measures	4.5-7
4.5.4	Residual Impacts	4.5-10
4.6	Visual Resources	4.6-1
4.6.1	Existing Conditions	4.6-1
4.6.1.1	Shandon	4.6-1
4.6.1.2	North County	4.6-2
4.6.1.3	Chorro Valley	4.6-2
4.6.1.4	San Luis Obispo Pipelines	4.6-3
4.6.1.5	Country Club Area	4.6-4
4.6.1.6	Lopez Pipelines	4.6-4
4.6.1.7	Nipomo Pipelines	4.6-5
4.6.1.8	Water Treatment Plant	4.6-5
4.6.1.9	Hydroelectric Plants	4.6-6
4.6.2	Environmental Impacts	4.6-6
4.6.2.1	Shandon	4.6-11
4.6.2.2	North County	4.6-11
4.6.2.3	Chorro Valley Pipeline	4.6-11
4.6.2.4	SLO Pipelines	4.6-11
4.6.2.5	Country Club Area	4.6-12
4.6.2.6	Lopez Pipelines	4.6-12
4.6.2.7	Nipomo Pipelines	4.6-12
4.6.2.8	Water Treatment Plant	4.6-12
4.6.2.9	Hydroelectric Plants	4.6-16
4.6.3	Mitigation Measures	4.6-18
4.6.4	Residual Impacts	4.6-19
4.7	Cultural Resources	4.7-1
4.7.1	Existing Conditions	4.7-1
4.7.1.1	General Overview	4.7-1
4.7.1.2	Applicable Cultural Resource Policies	4.7-2
4.7.1.3	Study Results by Pipeline Segment	4.7-6
4.7.1.3.1	Shandon	4.7-6
4.7.1.3.2	North County	4.7-6
4.7.1.3.3	Chorro Valley	4.7-7
4.7.1.3.4	SLO Pipelines	4.7-7
4.7.1.3.5	SLO Country Club Area Pipeline	4.7-7
4.7.1.3.6	Lopez Pipeline	4.7-7
4.7.1.3.7	Arroyo Grande Alternative	4.7-7
4.7.1.3.8	Nipomo Pipelines	4.7-7
4.7.1.3.9	Water Treatment Plant	4.7-7
4.7.2	Environmental Impacts	4.7-8
4.7.2.1.	Consistency with Applicable Policies	4.7-8
4.7.2.2	Potential for Resource Impacts by Pipeline Segment	4.7-8
4.7.2.2.1	North County	4.7-8
4.7.2.2.2	Chorro Valley	4.7-8
4.7.2.2.3	Lopez Pipeline	4.7-10
4.7.2.2.4	Arroyo Grande Alternative	4.7-10
4.7.2.2.5	Water Treatment Plant	4.7-10

TABLE OF CONTENTS (Continued)

SECTION	TITLE	PAGE
4.7.3	Mitigation Measures	4.7-10
4.7.4	Residual Impacts	4.7-11
4.8	Agricultural Resources	4.8-1
4.8.1	Existing Conditions	4.8-1
4.8.1.1	General Overview	4.8-1
4.8.1.2	Applicable Agricultural Policies	4.8-11
4.8.1.3	Shandon Pipeline	4.8-15
4.8.1.4	North County Pipeline	4.8-16
4.8.1.5	Chorro Valley Pipeline	4.8-16
4.8.1.6	San Luis Obispo Pipeline	4.8-20
4.8.1.7	County Club Area Pipeline	4.8-20
4.8.1.8	Lopez Pipeline	4.8-33
4.8.1.9	Nipomo Pipeline	4.8-33
4.8.1.10	Water Treatment Plant	4.8-33
4.8.2	Environmental Impacts	4.8-33
4.8.2.1	Consistency with Applicable Policies	4.8-33
4.8.2.2	Pipeline Segments	4.8-34
4.8.2.3	Conclusion	4.8-37
4.8.3	Mitigation Measures	4.8-37
4.9	Public Services	4.9-1
4.9.1	Existing Conditions	4.9-1
4.9.2	Environmental Impacts	4.9-3
4.9.3	Mitigation Measures	4.9-5
4.10	Noise	4.10-1
4.10.1	Existing Conditions	4.10-1
4.10.1.1	Characteristics and Measurement of Noise	4.10-1
4.10.1.2	Delivery Pipelines	4.10-1
4.10.1.3	Water Treatment Plant	4.10-1
4.10.1.4	Hydroelectric Plants	4.10-1
4.10.2	Environmental Impacts	4.10-2
4.10.2.1	Applicable Criteria	4.10-2
4.10.2.2	Delivery Pipelines	4.10-2
4.10.2.2.1	Shandon Pipeline	4.10-5
4.10.2.2.2	North County Pipeline	4.10-5
4.10.2.2.3	Chorro Valley Pipeline	4.10-5
4.10.2.2.4	SLO Pipelines	4.10-15
4.10.2.2.5	SLO Country Club Area Pipeline	4.10-15
4.10.2.2.6	Lopez Pipelines	4.10-18
4.10.2.2.7	Nipomo Pipelines	4.10-18
4.10.2.3	Water Treatment Plant	4.10-18
4.10.2.4	Hydroelectric Plants	4.10-18
4.10.3	Mitigation Measures	4.10-21
4.10.4	Residual Impacts	4.10-22
4.11	Land Use: Consistency With Adopted Plans and Policies	4.11-1
4.11.1	Existing Conditions	4.11-1
4.11.1.1	Shandon	4.11-1
4.11.1.2	North County	4.11-1
4.11.1.3	Chorro Valley	4.11-4
4.11.1.4	SLO Pipelines	4.11-13
4.11.1.5	Country Club Area	4.11-13
4.11.1.6	Lopez Pipelines	4.11-13

TABLE OF CONTENTS (Continued)

SECTION	TITLE	PAGE
4.11.1.7	Nipomo Pipelines	4.11-13
4.11.1.8	Water Treatment Plant (PPWTP)	4.11-18
4.11.2	Policy Framework and Land Use Consistency	4.11-18
4.11.2.1	General Goals and Policies	4.11-20
4.11.2.2	Shandon-Carrizo Planning Area	4.11-24
4.11.2.3	Salinas River Planning Area	4.11-24
4.11.2.4	City of Atascadero	4.11-24
4.11.2.5	Estero Planning Area	4.11-29
4.11.2.6	City of Morro Bay	4.11-29
4.11.2.7	San Luis Obispo Planning Area	4.11-34
4.11.2.8	San Luis Bay Planning Area	4.11-35
4.11.2.9	South County Planning Area	4.11-40
4.12	Risk of Upset	4.12-1
4.12.1	Existing Conditions	4.12-1
4.12.1.1	Chlorine (Cl_2)	4.12-1
4.12.1.2	Anhydrous Ammonia (NH_3)	4.12-2
4.12.1.3	Aluminum Sulfate (Alum) ($Al_2(SO_4)_3$)	4.12-3
4.12.1.4	Sodium Hydroxide (Caustic Soda) (NaOH)	4.12-3
4.12.1.5	Powdered Activated Carbon (PAC)	4.12-4
4.12.1.6	Ozone (O_3)	4.12-4
4.12.2	Environmental Impacts	4.12-5
4.12.2.1	Accident During Transportation to the Plant	4.12-5
4.12.2.2	Accidental Release During Unloading	4.12-8
4.12.2.3	Accidental Release During Normal Operations	4.12-9
4.12.2.4	Accidental Release During Plant Upset	4.12-9
4.12.2.5	Accidental Release Due to Catastrophe	4.12-9
4.12.2.6	Regulatory Environment	4.12-10
4.12.3	Mitigation Measures	4.12-10
4.12.4	Residual Impacts	4.12.-12
5	GROWTH INDUCEMENT	5-1
5.1	Introduction	5-1
5.2	Growth Inducement Summarized From Coastal Branch, Phase II FEIR	5-3
5.3	Methodology and Assumptions for Analyzing Growth Inducement by Service Area	5-6
5.4	Countywide Summary of Growth Inducement Potential	5-10
5.5	Growth Inducement Analysis by Area	5-16
5.5.1	SLO County's Resource Management System	5-16
5.5.2	Shandon	5-17
5.5.3	North County Pipeline	5-18
5.5.3.1	Santa Margarita	5-19
5.5.3.2	Templeton	5-19
5.5.3.3	Atascadero	5-21
5.5.3.4	Paso Robles	5-22
5.5.4	Chorro Valley Pipeline	5-24
5.5.4.1	Morro Bay	5-24
5.5.4.2	Cayucos	5-25
5.5.4.3	Los Osos	5-26
5.5.4.4	Cuesta College	5-28
5.5.4.5	California Mens Colony	5-28

TABLE OF CONTENTS (Continued)

SECTION	TITLE	PAGE
5.5.4.6	County Operations Center	5-29
5.5.5	City of San Luis Obispo (SLO Pipeline North and South)	5-30
5.5.6	Country Club Area (SLO Country Club Pipeline)	5-32
5.5.7	Lopez Pipeline	5-33
5.5.7.1	Pismo Beach	5-34
5.5.7.2	Grover City	5-34
5.5.7.3	City of Arroyo Grande	5-35
5.5.7.4	Oceano	5-36
5.5.7.5	Avila Beach	5-37
5.5.7.6	Port San Luis Harbor District	5-37
5.5.8	Nipomo Pipelines (North and South)	5-38
5.6	Mitigation Measures	5-39
5.6.1	Countywide Mitigation Measures	5-39
5.6.2	Mitigation Measures for Specific Areas	5-40
5.6.2.1	Paso Robles	5-40
5.6.2.2	City of San Luis Obispo	5-40
5.6.2.3	Los Osos	5-40
5.7	Residual Impacts	5-40
6	OTHER REQUIRED CEQA SECTIONS	6-1
6.1	Cumulative Impacts	6-1
6.1.1	Geology/Soils	6-1
6.1.2	Water Resources	6-2
6.1.3	Air Quality	6-3
6.1.4	Biology	6-4
6.1.5	Transportation	6-4
6.1.6	Aesthetics/Visual	6-5
6.1.7	Cultural Resources	6-5
6.1.8	Agricultural Resources	6-6
6.1.9	Public Services	6-6
6.1.10	Noise	6-7
6.1.11	Growth Inducement	6-7
6.2	Significant Environmental Effects Which Cannot Be Avoided if the Project Is Implemented	6-8
6.3	Beneficial Impacts	6-8
7	IDENTIFICATION OF THE ENVIRONMENTALLY SUPERIOR ALTERNATIVE	7-1
7.1	Environmentally Superior Pipeline Alignment	7-1
7.1.1	Shandon Pipeline Segment	7-2
7.1.2	North County Pipeline	7-2
7.1.3	Chorro Valley Pipeline	7-2
7.1.3.1	Los Osos Valley Road Alternative Alignment	7-4
7.1.3.2	Whale Rock Exchange	7-5
7.1.4	San Luis Obispo Pipelines North and South	7-8
7.1.5	Country Club Area	7-8
7.1.6	Lopez Pipeline	7-8
7.1.7	Nipomo	7-8
7.2	Environmentally Superior WTP Facility Location	7-8
7.3	Environmentally Superior Water Treatment Method	7-9
7.4	Environmentally Superior Water Supply Alternative	7-10

TABLE OF CONTENTS (Continued)

SECTION	TITLE	PAGE
8	ECONOMIC ANALYSIS (PREPARED BY DWR AND SLO COUNTY ENGINEERING DEPARTMENT)	8-1
9	AGENCIES AND PERSONS CONTACTED	9-1
10	REFERENCES	10-1
11	CONSULTANT IDENTIFICATION	11-1

LIST OF FIGURES

NUMBER	TITLE	PAGE
ES-1	Local Distribution Lines and Facilities Associated with Coastal Branch Phase II	ES-2
2.2-1	Overview of State and Local Pipeline Routes, Tank Sites, and Pumping Plant Sites for SLO and Santa Barbara Counties	2-2
2.3-1	Shandon Pipeline	2-6
2.3-2	North County Pipeline, Southern Section (Santa Margarita to Atascadero)	2-8
2.3-3	North County Pipeline, Northern Section (Atascadero to Paso Robles)	2-9
2.3-4	Chorro Valley Pipeline, Eastern Section (Cuesta Tunnel to Morro Bay Segment)	2-11
2.3-5	Chorro Valley Pipeline, Western Section (Morro Bay, Cayucos, and Los Osos)	2-13
2.3-6	City of SLO Pipelines	2-16
2.3-7	SLO Country Club Area Pipeline	2-17
2.3-8	Lopez Pipelines	2-18
2.3-9	Nipomo Pipelines	2-19
2.3-10	Water Treatment Plant Site Vicinity Map	2-21
2.3-11	Tank 1 Location Proposed Site Plan	2-22
3.1-1	Alternative Coastal Branch, Phase II North County Alternative Pipeline Route	3-2
3.2-1	Adjustments to North County Pipeline Alignment (#1, 2, and 3)	3-5
3.2-2	Adjustment to North County Pipeline Alignment (#4)	3-6
3.2-3	Adjustments to Chorro Valley Pipeline, Eastern Section (#5, 6, 7, and 8)	3-7
3.2-4	Adjustments to Chorro Valley Pipeline, Western Section (#9, 10, 11, 12, 13, 14, and 15)	3-8
3.2-5	Adjustment to City of San Luis Obispo Pipeline (#16)	3-9
3.2-6	Los Osos Valley Road Pipeline Alternative	3-13
3.3-1	Probable Location of Water Treatment Plant for the Whale Rock Alternative	3-18
3.3-2	Delivery of Water from the Nacimiento Reservoir Alternative	3-20
4.1-1	Geologic Provinces of San Luis Obispo County	4.1-2
4.1-2	Geologic Map, Shandon Pipeline	4.1-4
4.1-3a	Geologic Map, North County Pipeline	4.1-7
4.1-3b	Geologic Map, North County Pipeline	4.1-9
4.1-3c	Geologic Map, North County Pipeline	4.1-11
4.1-4a	Geologic Map, Chorro Valley Pipeline (Cuesta Tunnel to Morro Bay Segment)	4.1-13

LIST OF FIGURES (Continued)

NUMBER	TITLE	PAGE
4.1-4b	Geologic Map, Chorro Valley Pipeline (Morro Bay, Cayucos, and Los Osos)	4.1-15
4.1-4c	Geologic Map, Chorro Valley Pipeline (Morro Bay to Cayucos and Los Osos)	4.1-17
4.1-5	Geologic Map, San Luis Obispo North	4.1-21
4.1-6	Geologic Map, San Luis Obispo South	4.1-23
4.1-7	Geologic Map, Country Club Area	4.1-24
4.1-8	Geologic Map, Lopez Pipeline	4.1-27
4.1-9	Geologic Map, the Arroyo Grande Alternative	4.1-29
4.1-10	Geologic Map, Nipomo and Cal Water Pipeline	4.1-30
4.1-11	Geologic Map, Water Treatment Plant Site	4.1-32
4.1-12	Seismic Zoning of San Luis Obispo County	4.1-37
4.1-13	Lineament Study of Water Treatment Facility	4.1-43
4.2-1	Rivers in San Luis Obispo County	4.2-3
4.2-2	Ground Water Basins in the Central Coastal Hydrologic Study Area	4.2-10
4.2-3	Detailed Analysis Units in San Luis Obispo and Santa Barbara Counties	4.2-11
4.3-1	California and Federal Ambient Air Quality Standards	4.3-2
4.3-2	Ozonation System	4.3-23
4.4-1	Vegetation Communities Detected Along the Shandon Pipeline	4.4-2
4.4-2	Vegetation Communities Detected Along the North County Pipeline	4.4-5
4.4-3	Vegetation Communities Detected Along the North County Pipeline	4.4-7
4.4-4	Vegetation Communities Detected Along the North County Pipeline	4.4-9
4.4-5	Sensitive Plant and Animal Species Detected Along the North County Pipeline	4.4-15
4.4-6	Sensitive Plant and Animal Species Detected Along the North County Pipeline	4.4-17
4.4-7	Sensitive Plant and Animal Species Detected Along the North County Pipeline	4.4-19
4.4-8	Vegetation Communities Detected Along the Chorro Valley Pipeline (Cuesta Tunnel to Morro Bay Segment)	4.4-23
4.4-9	Vegetation Communities Detected Along the Chorro Valley Pipeline (Cuesta Tunnel to Morro Bay Segment, Morro Bay to Los Osos Segment, and Optional Quintana Road Connection)	4.4-25
4.4-10	Vegetation Communities Detected Along the Chorro Valley Pipeline (Cuesta Tunnel to Morro Bay Segment, Including Elena Street Connection, and Morro Bay to Cayucos Segment)	4.4-27
4.4-11	Sensitive Plant and Animal Species Detected Along the Chorro Valley Pipeline (Cuesta Tunnel to Morro Bay Segment)	4.4-35
4.4-12	Sensitive Plant and Animal Species Detected Along the Chorro Valley Pipeline (Cuesta Tunnel to Morro Bay Segment, Morro Bay to Los Osos Segment, and Optional Quintana Road Connection)	4.4-37
4.4-13	Sensitive Plant and Animal Species Detected Along the Chorro Valley Pipeline (Cuesta Tunnel to Morro Bay Segment, Including Elena Street Connection, and Morro Bay to Cayucos Segment)	4.4-39
4.4-14	Vegetation Communities and Sensitive Species Detected Along the San Luis Obispo Pipeline North	4.4-49
4.4-15	Vegetation Communities Detected Along the San Luis Obispo Pipeline South	4.4-51
4.4-16	Vegetation Communities Detected Along the Country Club Pipeline	4.4-55
4.4-17	Vegetation Communities Detected Along the Lopez Pipeline	4.4-57

LIST OF FIGURES (Continued)

NUMBER	TITLE	PAGE
4.4-18	Vegetation Communities Detected Along the Arroyo Grande Alternative Pipeline	4.4-59
4.4-19	Sensitive Animal Species Detected Along the Arroyo Grande Alternative Pipeline	4.4-61
4.4-20	Vegetation Communities Detected Along the Nipomo Pipelines North and South	4.4-62
4.4-21	Vegetation Communities Detected at the Water Treatment Plant Site	4.4-64
4.4-22	Sensitive Animal Species Detected at the Water Treatment Plant Site	4.4-66
4.5-1	Areas in Traffic Control Zone	4.5-9
4.6-1a	Chorro Valley Hydroelectric Plant Site as Viewed from Restricted Access Road of Camp SLO	4.6-7
4.6-1b	Close-up of Proposed Hydroelectric Plant Site at Chorro Valley Pipeline	4.6-8
4.6-2	Proposed Hydroelectric Plant Site at SLO Northern Pipeline Terminus	4.6-9
4.6-3a	Proposed Water Treatment Plant Site at Polonio Pass Approximately 3000 Feet from Highway 46	4.6-14
4.6-3b	Close-up of Proposed Water Treatment Plant Site at Polonio Pass from Highway 46	4.6-15
4.8-1	Agricultural Preserves/LCA Contracts Adjacent to the Shandon Pipeline	4.8-5
4.8-2	Agricultural Preserves/LCA Contracts Adjacent to a Portion of the North County Pipeline	4.8-6
4.8-3	Agricultural Preserves/LCA Contracts Transected by a Portion of the Chorro Valley Pipeline	4.8-7
4.8-4	Agricultural Preserves/LCA Contracts Adjacent to the San Luis Obispo Southern Pipeline	4.8-8
4.8-5	Agricultural Preserves/LCA Contracts Adjacent to the County Club Pipeline	4.8-9
4.8.6	Agricultural Preserves/LCA Contracts Adjacent to the Lopez Pipeline	4.8-10
4.8-7	North County Pipeline (Santa Margarita to Atascadero) Existing Agriculture)	4.8-18
4.8-8	North County Pipeline (Santa Margarita to Atascadero) Prime Soils	4.8-19
4.8-9	North County Pipeline (Atascadero to Paso Robles) Existing Agriculture	4.8-21
4.8-10	North County Pipeline (Atascadero to Paso Robles) Prime Soils	4.8-23
4.8-11	Chorro Valley Pipeline (Cuesta Tunnel to Morro Bay Segment) Existing Agriculture	4.8-25
4.8-12	Chorro Valley Pipeline (Cuesta Tunnel to Morro Bay Segment) Prime Soils	4.8-27
4.8-13	Chorro Valley Pipeline (Morro Bay, Cayucos, and Los Osos) Existing Agriculture	4.8-29
4.8-14	Chorro Valley Pipeline (Morro Bay, Cayucos, and Los Osos) Prime Soils	4.8-31
4.10-1	Typical Construction Equipment Noise Generation Levels	4.10-4
4.10-2	Noise Sensitive Receptors Adjacent to the Shandon Pipeline	4.10-6
4.10-3	Noise Sensitive Receptors Adjacent to the North County Pipeline (Santa Margarita to Atascadero)	4.10-7
4.10-4	Noise Sensitive Receptors Adjacent to the North County Pipeline (Atascadero to Paso Robles)	4.10-9
4.10-5	Noise Sensitive Receptors Adjacent to the Chorro Valley Pipeline (Cuesta Tunnel to Morro Bay Segment)	4.10-11
4.10-6	Noise Sensitive Receptors Adjacent to the Chorro Valley Pipeline (Morro Bay, Cayucos, and Los Osos)	4.10-13

LIST OF FIGURES (Continued)

NUMBER	TITLE	PAGE
4.10-7	Noise Sensitive Receptors Adjacent to the City of SLO Pipelines	4.10-16
4.10-8	Noise Sensitive Receptors Adjacent to the SLO Country Club Area Pipeline	4.10-17
4.10-9	Noise Sensitive Receptors Adjacent to the Lopez Pipeline and the Arroyo Grande Alternative	4.10-19
4.10-10	Noise Sensitive Receptors Adjacent to the Nipomo Pipelines	4.10-20
4.11-1	San Luis Obispo State Water Project Planning Areas	4.11-2
4.11-2	Land Use Designations Along the Proposed Shandon Pipeline	4.11-3
4.11-3	Land Use Designations Along the Proposed North County Pipeline (Santa Margarita to Atascadero)	4.11-5
4.11-4	Land Use Designations Along the Proposed North County Pipeline (Atascadero to Paso Robles)	4.11-7
4.11-5	Land Use Designations Along the Proposed Chorro Valley Pipeline (Cuesta Tunnel to Morro Bay Segment)	4.11-9
4.11-6	Land Use Designations Along the Proposed Chorro Valley Pipeline (Morro Bay, Cayucos, and Los Osos)	4.11-11
4.11-7	Land Use Designations Along the Proposed City of SLO Pipelines	4.11-14
4.11-8	Land Use Designations Along the Proposed SLO Country Club Area Pipeline	4.11-15
4.11-9	Land Use Designations Along the Proposed Lopez Pipelines	4.11-16
4.11-10	Land Use Designations Along the Proposed Nipomo Pipelines	4.11-17
4.11-11	Land Use Map	4.11-19

LIST OF TABLES

NUMBER	TITLE	PAGE
ES-1	Summary of Environmental Impacts and Mitigation Measures	ES-4
ES-2	Conceptual Mitigation Monitoring Program for Coastal Zone Areas of SLO County	ES-25
ES-3	Conceptual Mitigation Monitoring Program for Non-Coastal Areas of SLO County	ES-26
ES-4	Conceptual Mitigation Monitoring Program for Hydroelectric Plant and the Polonio Pass Water Treatment Facility	ES-27
	ES Table Legend	ES-28
2.3-1	Local Projects & Service Areas	2-4
2.3-2	Tentative State Water Project Allocations	2-5
2.3-3	Polonio Pass Water Treatment Plant Site Design Characteristics	2-23
2.3-4	Hazardous Materials Delivery Summary for the Polonio Pass Water Treatment Plant	2-26
2.5-1	Summary of Permit Requirements	2-34
3.3-1	Alternatives to Coastal Branch, Phase II Pipeline and Mission Hills Extension for SLO County (from DWR FEIR)	3-14
3.3-2	Potential Water Supply Alternatives	3-16
4.1-1	Geologic Units, Shandon Pipeline	4.1-3
4.1-2	Geologic Units, North County Pipeline Route	4.1-6
4.1-3	Chorro Valley Pipeline Geologic Units	4.1-19
4.1-4	Geologic Units, San Luis Obispo Pipelines	4.1-22
4.1-5	Geologic Units, Country Club Area	4.1-25
4.1-6	Geologic Units, Lopez Pipelines and Arroyo Grande Alternative	4.1-28
4.1-7	Geologic Units, Nipomo Pipelines	4.1-31

LIST OF TABLES (Continued)

NUMBER	TITLE	PAGE
4.1-8	Geologic Units, Water Treatment Plant	4.1-33
4.1-9	Generalized Ground-Shaking Characteristics for Zones Based on a Magnitude 8.5 Earthquake on the San Andreas Fault and on a Magnitude 6.5 Earthquake on the Nacimiento Fault	4.1-36
4.1-10	Shandon Pipeline, Soil Characteristics	4.1-42
4.1-11	North County Pipeline, Soil Characteristics	4.1-45
4.1-12	Chorro Valley Pipeline (Coastal Part Sheets), Soil Characteristics	4.1-47
4.1-13	San Luis Obispo Pipelines, Soil Characteristics	4.1-48
4.1-14	Country Club Area Pipeline, Soil Characteristics	4.1-49
4.1-15	Lopez Pipeline and Arroyo Grande Alternative, Soil Characteristics	4.1-50
4.1-16	Nipomo Pipelines, Soil Characteristics	4.1-51
4.1-17	Water Treatment Plant, Soil Characteristics	4.1-53
4.1-18	Modified Mercalli Scale, 1956 Version	4.1-55
4.1-19	Maximum Ground Acceleration and Design Acceleration per Pipeline Segment	4.1-61
4.2-1	Summary of Peak Flows In Streams Crossed By Proposed Pipelines	4.2-6
4.2-2	Ground Water Basin Characteristics San Luis Obispo County Basins Which May Receive SWP Water	4.2-14
4.2-3	Ground Water Basin Safe Yields San Luis Obispo County	4.2-15
4.2-4	Chemicals Proposed for Regulation in 1989 - National Primary Drinking Water Regulations	4.2-20
4.2-5	Additional Chemicals Proposed for Regulation in 1990 - National Primary Drinking Water Regulations	4.2-22
4.2-6	Chlorine Disinfection By-Products: EPA's 26-City Survey	4.2-24
4.2-7	Oxidation By-Products from Ozonation Water Treatment	4.2-25
4.3-1	Product Monitoring Stations	4.3-3
4.3-2	Maximum Pollutant Concentrations Measured in San Luis Obispo County from 1985-1989	4.3-4
4.3-3	1985 Apportioned Emissions Inventory	4.3-7
4.3-4	Pipeline Construction Equipment Emission Factors	4.3-9
4.3-5	Shandon Pipeline Segment Estimated Construction Equipment Exhaust Emissions	4.3-10
4.3-6	North County Pipeline Segment Estimated Construction Equipment Exhaust Emissions	4.3-10
4.3-7	Chorro Valley Pipeline Segment Estimated Construction Equipment Exhaust Emissions	4.3-11
4.3-8	San Luis Obispo Pipeline Segment Estimated Construction Equipment Exhaust Emissions	4.3-11
4.3-9	Country Club Pipeline Segment Estimated Construction Equipment Exhaust Emissions	4.3-12
4.3-10	Lopez Pipeline Segment Estimated Construction Equipment Exhaust Emissions	4.3-12
4.3-11	Nipomo Pipeline Segment Estimated Construction Equipment Exhaust Emissions	4.3-13
4.3-12	Summary of Estimated Construction Equipment Exhaust Emissions by Pipeline Segment	4.3-13
4.3-13	Assumed Water Treatment Plant Construction Equipment Hours	4.3-15
4.3-14	Water Treatment Plant Construction Equipment Exhaust Emission Factors	4.3-16
4.3-15	Total Emissions from Water Treatment Plant Construction Equipment Exhaust	4.3-17

LIST OF TABLES (Continued)

NUMBER	TITLE	PAGE
4.3-16	Peak Daily Emissions from Water Treatment Plant Construction Equipment Exhaust	4.3-18
4.3-17	Estimated Emissions Associated with Employee and Materials Transportation During Construction of Water Treatment Plant	4.3-20
4.3-18	Emissions Associated with Water Treatment Plant Operations	4.3-22
4.3-19	Chemicals Currently Used at Water Treatment Facilities	4.3-26
4.4-1	Summary of Vegetation Impacts Along the North County Pipeline	4.4-69
4.4-2	Summary of Individual Oak Tree Impacts Associated with the Local Water Lines and Facilities	4.4-70
4.4-3	Summary of Vegetation Impacts Along the Chorro Valley Pipeline	4.4-73
4.4-4	Summary of Vegetation Impacts Along San Luis Obispo Pipeline North	4.4-79
4.4-5	Summary of Vegetation Impacts Along San Luis Obispo Pipeline South	4.4-80
4.4-6	Summary of Vegetation Impacts Along Lopez Pipeline	4.4-82
4.4-7	Summary of Vegetation Impacts Associated with the Local Water Lines and Facilities	4.4-85
4.4-8	Summary of Wetland Impacts Associated with the Local Water Lines and Facilities	4.4-86
4.4-9	Summary of Impacts to Biological Resources for the Local Water Lines and Facilities	4.4-87
4.4-10	Mitigation Requirements for Oak Tree Impacts	4.4-95
4.4-11	Mitigation Requirements for Wetland Impacts	4.4-98
4.5-1	Truck Delivery Summary for the Polonio Pass Water Treatment Plant	4.5-6
4.7-1	Potential Cultural Resource Impacts	4.7-9
4.8-1	Total Agricultural Valuations from 1976 to 1990	4.8-2
4.8-2	Comparison of County Agriculture in 1968, 1977, and 1985 (in acres)	4.8-3
4.8-3	Agricultural Preserves/Land Conservation Contracts Within or Adjacent to State Water Project Local Projects	4.8-4
4.8-4	Agricultural Areas Located Within a 50-foot Pipeline Corridor (in acres)	4.8-17
4.9-1	Projected Energy Sources for the Year 2000	4.9-2
4.10-1	Summary of Exterior Noise Standards (dBA)	4.10-3
4.11-1	Land Use Policies And Consistency Determination For The Shandon-Carrizo Planning Area	4.11-25
4.11-2	Land Use Policies and Consistency Determination for the Salinas River Planning Area	4.11-26
4.11-3	Land Use Policies and Consistency Determination for the City of Atascadero	4.11-28
4.11-4	Land Use Policies and Consistency Determination for the Estero Planning Area	4.11-30
4.11-5	Land Use Policies and Consistency Determination for the City of Morro Bay	4.11-33
4.11-6	Land Use Policies and Consistency Determination for the San Luis Obispo Planning Area	4.11-36
4.11-7	Land Use Policies And Consistency Determination for the San Luis Bay Planning Area	4.11-39
4.11-8	Land Use Policies And Consistency Determination for the South County Planning Area	4.11-41
4.12-1	Observed Health Effects and Exposure Limits of Chlorine	4.12-2
4.12-2	Observed Health Effects and Exposure Limits of Ammonia	4.12-3
4.12-3	Observed Health Effects and Exposure Limits of Ozone	4.12-5
4.12-4	Estimated Truck Miles Associated With Delivery of PPWTP Chemicals	4.12-7

LIST OF TABLES (Continued)

NUMBER	TITLE	PAGE
5.3-1	Estimated Total Water Supplies in 2010 Assuming SWP in Acre Feet per Year (AFY)	5-4
5.3-2	Per Capita Water Use Factors San Luis Obispo County	5-8
5.4-1	Status of General Plans for Cities in San Luis Obispo County	5-12
5.4-2	Summary of Issues and Mitigations in Areas Scheduled to Receive State Water	5-14
7.1-1	Impacts of North County Local Distribution Pipeline and Alternatives	7-3
7.1-2	Impacts of Chorro Valley Local Distribution Pipeline and Alternatives	7-6
8-1	Estimated Minimum Cost Per Unit of State Water By Community or Agency (Best Case)	8-2
8-2	Estimated Minimum Cost Per Unit of State Water By Community or Agency (Worst Case)	8-4

LIST OF APPENDICES (BOUND SEPARATELY)

LETTER	TITLE	
A	INITIAL STUDY AND NOTICE OF PREPARATION RESPONSES	A-1
B	AIR QUALITY CALCULATIONS	B-1
C	SOILS MAPS	C-1
D	BIOLOGICAL RESOURCES REPORT	D-1
E	SAN LUIS OBISPO COUNTY WATER SUPPLY AND DEMAND DATA	E-1
F	RESPONSES TO COMMENTS	F-1
G	MITIGATION MONITORING PLAN	G-1

WATER MASTER PLAN
FOR
SAN MIGUEL COMMUNITY SERVICES DISTRICT

MARCH 2002

PREPARED BY:
JOHN L. WALLACE AND ASSOCIATES
4115 BROAD STREET, SUITE B-5
SAN LUIS OBISPO, CA 93401

Clarion Copy

WATER MASTER PLAN

FOR

SAN MIGUEL COMMUNITY SERVICES DISTRICT

This technical memorandum presents the Water Mater Plan for the San Miguel Community Services District. The San Miguel CSD supplies its customers with domestic water service and fire protection, among other services. The current population within the San Miguel CSD boundary is approximately 1,500 and is expected to increase to 3,742 at build-out within the existing CSD boundary. As older infrastructure is replaced and new development projects are constructed, it is the San Miguel CSD's intent to construct water improvements consistent with the current and ultimate needs of the District. In to order facilitate this goal, and to adequately plan for the capital resources needed to meet this goal, the District has elected to prepare a comprehensive Water Master Plan.

Preparation of a water systems master plan will assist the District in prioritizing both present and future water system needs and set forth a mechanism for addressing those needs. Present needs addressed in the water system master plan will include the "three R's": Repair, Rehabilitation, and Replacement. Future needs will address those capital improvements required to support the anticipated growth of San Miguel through the next twenty years. The master planning process will also tie the needs assessment, both existing and future, to the budgeting process.

AUTHORIZATION AND SCOPE OF WORK

On January 9, 2001, the San Miguel CSD authorized JLWA to prepare a comprehensive water system master plan. This water master plan is prepared in accordance with JLWA's proposal dated December 1, 2000, and includes analyses of the CSD's land uses, water demands, supply, distribution, storage, and quality; and a prioritized capital improvement program. The Draft Water Master Plan was completed in July 2001, and final comments to this draft plan were received in February 2002.

DEMOGRAPHICS

The unincorporated Community of San Miguel is one of 6 urban areas within the County of San Luis Obispo Salinas River Planning Area Plan. The County Planning Department estimated the year 2000 population of the community of San Miguel to be approximately 1,245, which includes a 5% vacancy rate. The 1990 US Census estimated the population to be approximately 1,123, which means the area grew by 1.2% over a 10-year period due to the building moratorium in place from 1990 to 2000. In the summer of 2000, the Sanitary District expanded the Wastewater Treatment Plant, which allowed the moratorium to be lifted.

The 2000 US Census estimated the population to be approximately 1,427 within the San Miguel CDP[1] which is approximately the same geographical dimensions of the Community of San Miguel. However, the San Miguel CSD Service Area boundary is larger than the census CDP and the County's town Urban Reserve Line (URL) boundaries. In order to estimate 2000 population for the entire CSD boundary, the 2000 US Census was referenced and the population of the area outside the URL boundary was calculated. Based on parcel size and land use zoning the additional population was calculated to be 80 using a household per capita of 2.84. The San Miguel CSD population for 2000 is estimated to be 1,507. The URL and CSD boundaries are depicted in Figure 1.

Growth Rate

The County has a mandatory growth cap set at 2.3 percent county-wide per the Growth Management Ordinance of 1990 (amended in June 2000). This growth rate can be modified per the direction and approval of the Board of Supervisors on a yearly basis. The estimated build-out population for the community of San Miguel is 3,599, however, the additional build-out population for the areas within the CSD boundary but outside of the URL has been estimated at 145. Therefore, build-out for the San Miguel CSD Service Area is estimated at 3,744. Given the build-out population and the mandatory growth rate, the San Miguel CSD may reach build-out as late as 2040 (refer to Table 1). The projected build-out population is based on existing land uses and service area boundaries. Should land use or other demographic parameters change in the coming years, the District should make appropriate adjustments to these projections at that time.

[1] Census Designated Place is an area designated by the Department of Interior for the 2000 US Census, which is not incorporated.

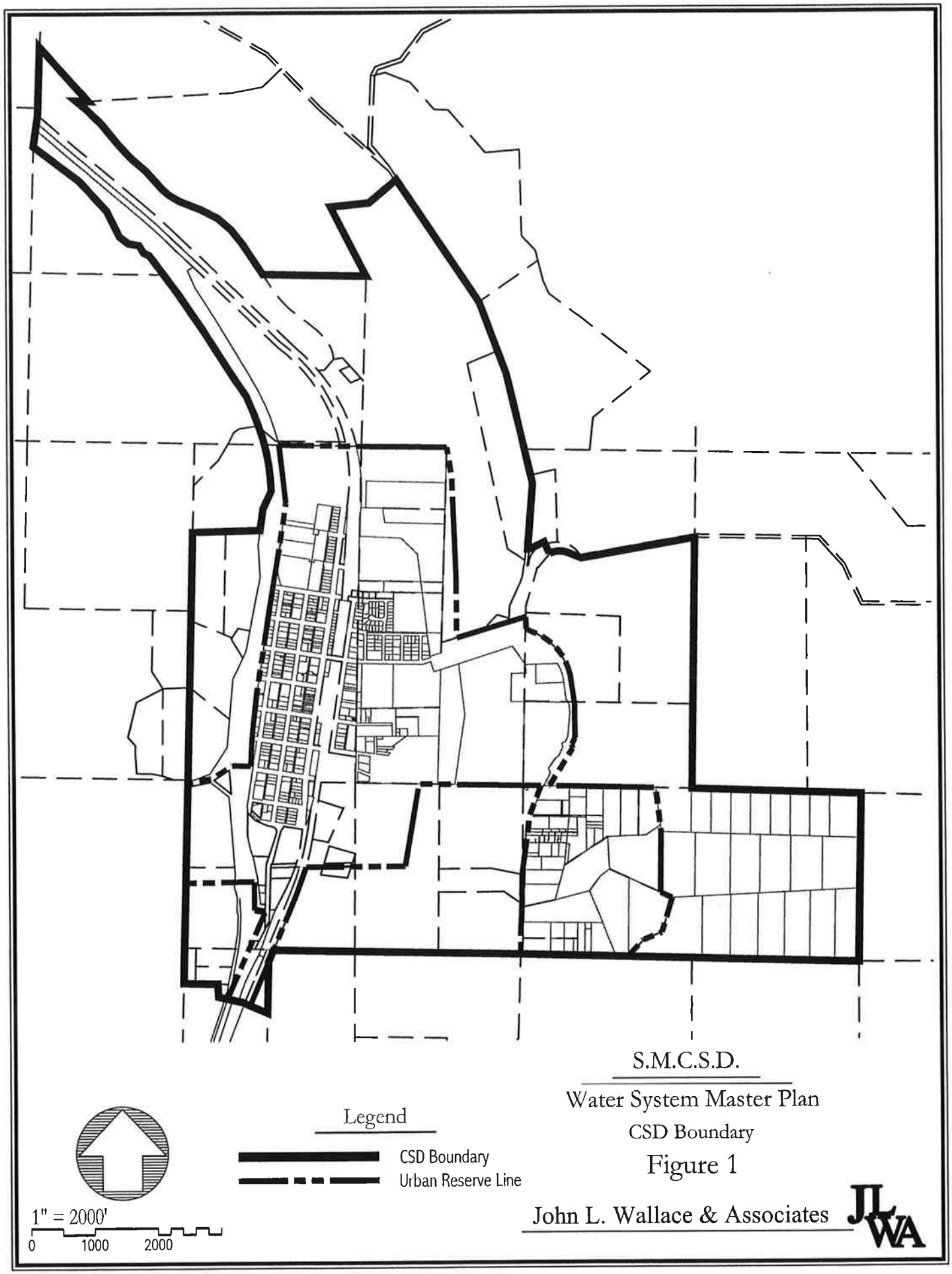

Legend
CSD Boundary
Urban Reserve Line
1" = 2000'
0
1000
2000
S.M.C.S.D.
Water System Master Plan
CSD Boundary
Figure 1
John L. Wallace & Associates
JLWA

Table 1. Projected Build-Out Capacity[1] for San Miguel CSD

Growth Rate Percentage	Year	Population [2]
Growth Rate 1.2%	1990	1,123
(Building moratorium in effect)	1991	1,128
	1992	1,210
	1993	1,217
	1994	1,225
	1995	1,228
	1996	1,235
	1997	1,239
	1998	1,242
	1999	1,245
	2000	1,507
Growth Rate 2.3% After 2000	2001	1,542
Estimate Calculated by Adding	2005	1,688
2000 US Census of 1427 plus 75	2010	1,892
to obtain the 2001 estimate.	2015	2,120
	2020	2,375
	2025	2,661
	2030	2,981
	2035	3,340
	2040	3,742

Source: Growth Rate Percentages Based on the Table C of Comparison of County and State Population Growth Rates, Actual and Projected, page 2-12 of the Inland Area Framework for Planning- Land Use Element-Circulation Element, Revised November 18, 1999,and the 2000 US Census.

Notes:

1) The growth rate is set at 2.3 percent per the Growth Management Ordinance Title 26, June 2000 and can be modified by the County Board of Supervisors on a yearly basis.
2) Population numbers from 1990-1999 were determined by San Luis Obispo County Planning Department using completed building permits. (Source: County of San Luis Obispo Planning and Building Department, Mr. John Hand, fax transmittal February 26, 2001).
3) The estimated population for 2000 is determined by combining the 2000 US Census of the San Miguel CP with additional 80 persons estimated by JLWA for the outlining areas outside the San Miguel CP.

Land Use

The San Miguel CSD Service Area covers approximately 1,530 acres. The land use zones are Residential Single Family (RSF), Residential Multi-Family (RMF), Residential Suburban (RS), Office/Professional (OP), Commercial Service (CS), Commercial Retail (CR), Recreation (REC), Public Facility (PF), Agriculture (AG), Residential Rural (RR), and Industrial (IND). The Residential land use zones and density allowed are illustrated in Table 2. The Residential Single Family area of San Miguel consists mostly of older, moderately priced housing. Several lots in the RSF zones have a second unit. Areas zoned RMF have the ability to allow up to 38 units per acre; however, the Salinas River Area Plan encourages medium density for RMF zones, which allows 26 units per acre. Approximately 20 percent of the land is zoned residential suburban, which allows one dwelling unit per acre. The land use acreage and the allowable density for San Miguel CSD are illustrated in Table 2.

Table 2. Land Use Category Acreage Breakdown And Density

Land Use Category	Zoning Areas Within San Miguel Urban Reserve Line[1] (ACRES)	Zoning Areas Within San Miguel CSD Service Area[2] (ACRES)	Density
Agriculture (AG)	0	853	
Residential Rural (RR)	0	75	
Residential Suburban (RS)	282	294	1 DU/1 ACRE
Residential Single Family (RSF)	102	112	1 DU/6000 SF
Residential Multi-Family (RMF)[3]	30	30	26 DU/1 ACRE
Office/Professional (O/P)	6	6	
Commercial Service (CS)	12	12	
Commercial Retail (CR)	33	54	
Recreation (REC)	22	27	
Public Facility (PF)	40	44	
Industrial (IND)	23	23	
Total	**550**	**1,530**	

Notes: DU = Dwelling Units
SF= Square Feet

Source:
1. Salinas River Area Plan, Table 4-1, page 4-4, 1995
2. San Miguel CSD Service Areas outside the Salinas Area Plan were calculated based on County Assessor Parcel Maps
3. Requires a minimum site area of 6,000 SF

Potential Development

The potential for growth within the San Miguel CSD Service Area lies primarily at the northern and southern ends of the boundary. The residential single family (RSF) property located south of Eleventh Street (County Assessor Parcels 021-355-01,02 and 021-361-01,02,03) has an estimated development potential of 60 residential parcels because of the existing Flood Hazard combining designation. The other area of development is located near 19th Street, at the northern end of the community, (County Assessor Parcels 021-012-01-65, and 021-013-01-57) and is subdivided into 120-units with a potential for 5 more for a total of 125 units. At full build-out this development would allow up to 355 people (2.84 persons per household).

The District has issued 14 conditional will serves for development, the 5 largest are listed below, with their approximate locations shown on Figure 2.

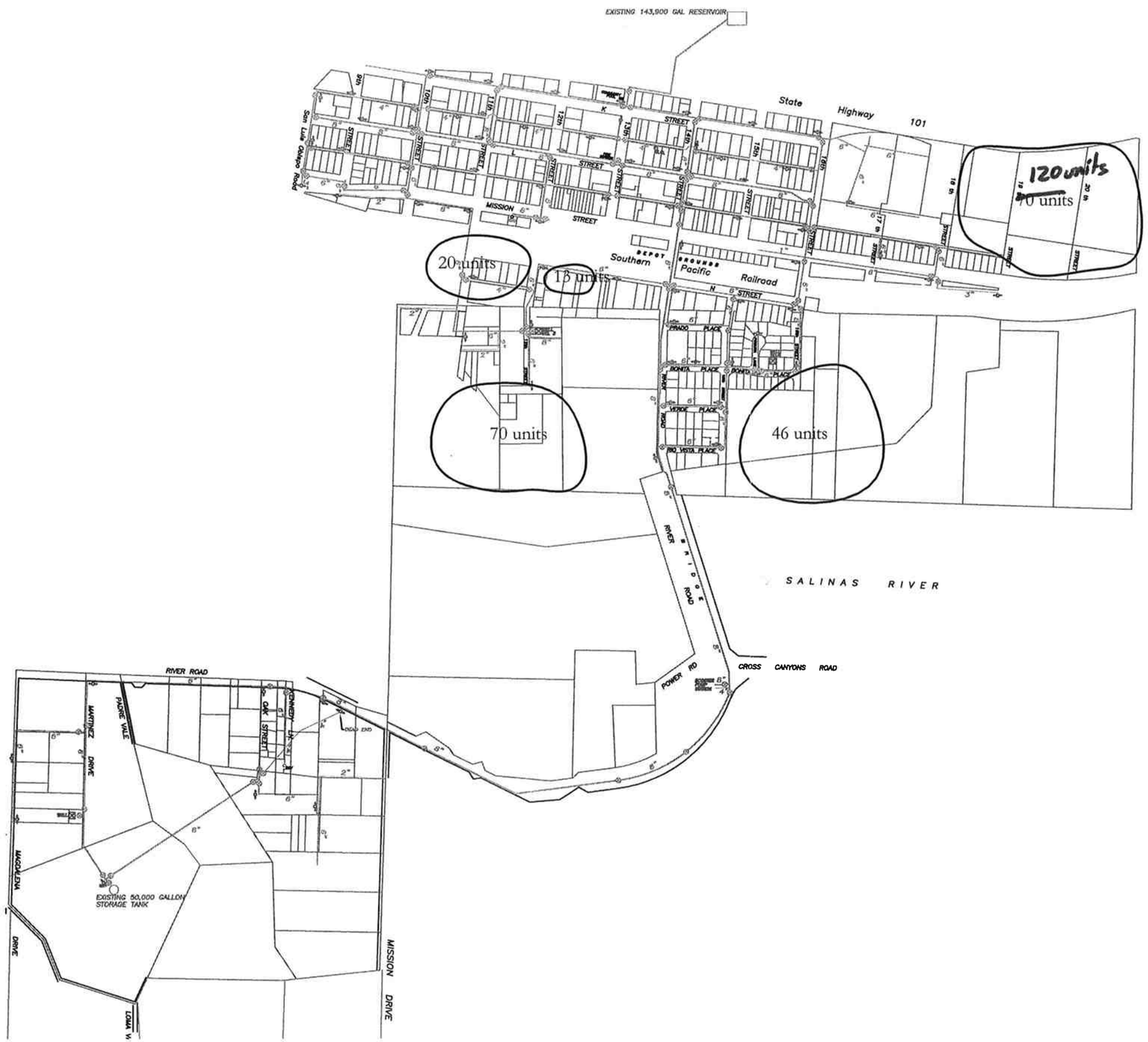
1.	Lillian Larson	120 Units
2.	End of 12th	70 Units
3.	16th & Bonita	46 Units
4.	11th & N	20 Units
5.	12th & N	13 Units

Demands from these developments were included in the future model scenarios, and recommended improvements to adequately serve the developments are included in the Capital Improvements Program.

EXISTING WATER SYSTEM

The San Miguel CSD's water system has two independent pressure zones, the San Miguel or Main Zone and the San Lawrence Terrace Zone. The zones are separated by a closed valve in River Road near the booster station, and are hydraulically separated by about 14 feet of head. The zones could be joined by building a tank in the San Miguel Zone and matching the overflow elevation of the SLT Tank. Currently two wells supply water, Well No 3, located off 12th Street, and equipped with backup power and; Well No. 4, located off Bonita Place. Both wells produce water that is of acceptable quality, though there has been an increasing trend in the radionuclides at both wells. Since both of the wells are located in the main pressure zone, the booster station on River Road delivers water from the Main Zone to the SLT zone. This booster station is not on backup power.

The Main Zone distribution system provides adequate static pressures throughout its service area. However, fire flows in the Main Zone are limited by the 6" cast iron line located near the community pool on the transmission line from the San Miguel Reservoir. The SLT Zone has static pressures that are lower than the Main Zone, though they are still acceptable, with the exception of the area near the tank. This area experiences static pressures of 20 psi or less. Overall the distribution system is adequate for every day usage, but not fire flow conditions.



San Miguel C.S.D.

Legend:

Existing Pipelines

Approximate Location of Development

Water System Master Plan

Figure 2

Future Developments

1" = 800'

0 400 800

John L. Wallace & Associates JLWA

DEMANDS

Water system demand parameters are important characteristics of water systems, as these parameters are used to size pumping, storage and distribution system facilities. Each community water system exhibits unique characteristics that must be calculated and identified in order to better evaluate existing and future water distribution system requirements.

General water demand and production definitions used in this technical memorandum are defined as follows:

- *Water Consumption.* That amount of water consumed (as measured directly through customer meters).

- *Unaccounted For Water.* The difference between the quantity of water produced and that amount of water consumed (as measured directly through customer meters).

- *Water Demand.* That amount of water consumed (as measured directly through customer meters), plus unaccounted for water in the distribution system.

- *Water Production.* That amount of water produced by the City wells and is introduced into the distribution system.

Hydraulic demand parameters are defined as follows:

- Average Day Demand (ADD). The ADD is the average water demand calculated over the year. This demand is generally determined by production records and customer meter readings or bills. The ADD is also used to determine the average per capita demand, which in turn is used to project future water system demands based on anticipated population growth. For the San Miguel CSD water service area, the present-day ADD was determined to be 0.21 mgd, based on a review of the past production records from 1997 to 2000. Summer ADD is similar to the ADD, but averaged over the three to four summer months of the calendar year.

- Maximum Day Demand (MDD). The MDD is the maximum daily production of water needed to meet the peak demand of the year. This is generally during the summer as a result of increased irrigation demand. Based on a review of actual water production records, the maximum day demand for the San Miguel CSD water service area was determined to be 2.0 times the ADD.

- Peak Hour Demand (PHD). The PHD of the system is critical in sizing water mains and pumping facilities. Peak hour demand is generally when customers will experience low service pressures in areas with undersized mains and/or lack of looped distribution pipelines. The PHD is generally determined by calculating the specific demand within the day, by monitoring tank levels and pumping records. In many municipal systems, the exact calculation of this parameter is difficult to ascertain. This was the case with San Miguel CSD. Using data from communities of similar size, a PHD factor of 3.5 (3.5 times the ADD) was assigned to the San Miguel CSD water system.

Using current population estimates and water consumption, the water demand in the San Miguel CSD service area is 139 gallons per capita per day (gpcd). At a build-out population of 3,744 with similar water usage characteristics the future ADD will increase to 0.52 mgd (582 AFY).

The San Miguel CSD has a relatively low incidence of un-accounted for water. For the two-year period beginning January 1999 and ending December 2000, 494 AF of water was produced and 443 AF of water was consumed. This is an average of 10 percent un-accounted for water, at the low end of the prevalent range of 10-15 percent stated by AWWA Manual M32.

These hydraulic parameters for existing and future (build-out) demands for the San Miguel CSD are summarized in Table 3.

Table 3. Summary of San Miguel CSD Water System Consumption

Demand Condition	San Miguel CSD Water System Demands	
	Existing (MGD)	Build-Out (MGD)
ADD	0.21	0.52
MDD	0.42	1.04
Summer ADD	0.32	0.78
PHD	0.74	1.8

Notes:
1. Existing demand based on historical records
2. Build-Out demand based on 139 gpcd
3. MDD = ADD X 2.0
4. PHD = ADD X 3.5

WATER SUPPLY

The water supply for the San Miguel CSD is obtained solely from groundwater pumping of the Paso Robles formation. There are three wells within the CSD; the two primary wells (Well No. 3 and Well No. 4) are located in the Main Zone. Well No. 5, a smaller well is located in the San Lawrence Terrace Zone. The SLT well has high nitrate levels and has been removed from service. The two active wells combined historically produce an average of 247 AFY (average for 1999 and 2000), as summarized in Table 4. The wells have a combined well pumping capacity of 1000 gpm; 600 gpm at Well No. 4 and 400 gpm at Well No. 3.

Table 4. Summary of Well Capacity and Production

Well	Capacity[1], gpm	Historical Production[2], AFY	Maximum Production[3], AFY
Well No. 3	400	110	323
Well No. 4	600	137	484
Total	**1000**	**247**	**807**

Notes: 1. Well capacity refers to the maximum pumping rating of the well
2. Historical Production is the average amount of water the wells produced in 1999 and 2000
3. Maximum production is the amount of water the wells could produce if run 12 hours per day 365 days per year

Since estimated demand at build-out is 582 AFY, the existing wells are hydraulically capable of meeting the future demands. This does not mean the water will be of acceptable quality, only that the pumps in the wells are capable of meeting the future needs. Further study is necessary to assess the safe yield of the wells, and should be included in the well siting study recommended in the capital improvement section of this technical memorandum.

The SLT Booster Station supplies water to the SLT Zone. The booster station consists of two 80 gpm pumps, one operating pump and a backup pump. These pumps are run on an alternating schedule to equalize wear. The booster station is not on emergency backup power.

Water Supply Reliability

If Well No. 4 is out of service, future maximum day demand cannot be met. To resolve this issue, the District should consider the hydraulic capacity of new wells with the smallest well capable of meeting the future maximum day demand.

DRINKING WATER STANDARDS

Drinking water standards are established by the United States Environmental Protection Agency (EPA) and by the California Department of Health Services. These federal and state agencies are responsible for ensuring that all public water systems are in compliance with the Safe Drinking Water Act (SDWA). The State of California has been consistent in applying drinking water standards as the EPA adopts them. Moreover, California has established action levels for contaminants not on the federal list. Future water quality regulations germane to San Miguel CSD are discussed herein.

Water Quality Parameters

State and Federal water standards fall into two categories:

- Primary Standards relate specifically to the health of the community as it might be affected by the water supply. Mandatory maximum contaminant levels (MCLs) are established for specific constituents.

- State Secondary Standards relate to aesthetic qualities of the water including taste, odor, color and some minerals. In California, maximum contaminant levels (MCLs) are also established for these secondary constituents.

Table 5 lists the current MCLs, which the San Miguel CSD must meet, along with other water quality parameters (secondary aesthetic standards).

FUTURE REGULATIONS

Groundwater is the only source of water to the San Miguel CSD, and none of the District's wells are under the influence of surface water. Most anticipated federal and state drinking water regulations are directed toward surface water sources or groundwater under the direct influence of surface water, and therefore will most likely not impact the San Miguel CSD. Based on conversations with the State Department of Environmental Management, the Disinfectant/Disinfection Byproduct Rule, revised Waterworks Standards, and Radionuclides Rule will pose the most significant regulatory issues to the San Miguel CSD.

Disinfectant/Disinfection Byproduct Rule

The purpose of the Rule is monitoring and reduction, as necessary, of potentially carcinogenic disinfection byproducts. The discussion herein is based on the latest draft, submitted for internal review by the Department of Environmental Management as of June 2000. The final requirements will be issued in the final Rule.

According to the latest draft, water systems with groundwater as their sole source will be required to begin sampling for trihalomethanes (THMs) and five specific haloacetic acids (HAA5) in their distribution system in January, 2004. Small groundwater systems (less than 10,000 people served) would collect a sample for measurement of total trihalomethanes (TTHMs) and HAA5 at the point in their distribution system with the longest residence time.

Table 5. 1999 Water Quality Report for the San Miguel CSD

DETECTION OF CONTAMINANTS WITH A PRIMARY DRINKING WATER STANDARD

CONTAMINANT (Reporting Units)	MCL	PHG	RANGE	AVERAGE
Arsenic (PPB)	50	---	3.2-3.9	3.6
Barium (PPB)	1000	(2000)	ND-110	55
Fluoride (PPB)	2000	1000	440-510	480
Ethylene Dibromide (EDB) (PPT)	50	(0)	ND-50	17
Gross Alpha Particle Activity (pCi/L)	15	(0)	ND-6.7+/- 3.4	4.2
Nitrate as NO3 (PPM)	45	45	14-19	17
Selenium (PPB)	50	(50)	2.4-3.2	2.8
Uranium (pCi/L)	20	(0)	7.52+/-0.111 - 12.7+/-0.192	10.5

LEAD AND COPPER

CONTAMINANT (Reporting Units)	AL	MCLG	NUMBER OF SAMPLES COLLECTED	90th PERCENTILE LEVEL DETECTED	NUMBER OF SITES FOUND ABOVE THE AL
Lead (PPB)	15	2	10	ND	0
Copper (PPB)	1300	170	10	160	0

DETECTION OF CONTAMINANTS WITH A SECONDARY DRINKING WATER STANDARD

CONTAMINANT (Reporting Units)	MCL	RANGE	AVERAGE
Chloride (PPM)	500	53-100	76
Color (CU)	15		1
Corrosivity (LI)	Noncorrosive		-0.1
Odor – Threshold	3		1
Specific Conductance (micromhos/cm)	1600	814-1130	972
Sulfate (PPM)	500	73-170	120
Turbidity (NTU)	5	0.07-0.10	0.08
Total Dissolved Solids (PPM)	1000	500-710	600

DETECTION OF CONTAMINANTS WITHOUT A DRINKING WATER STANDARD

CONTAMINANT (Reporting Units)	RANGE	AVERAGE
Alkalinity as CaCO3 (PPM)	260-270	260
Calcium (PPM)	42-56	49
Hardness (PPM)	270-360	320
Magnesium (PPM)	39-54	46
pH	7.31-7.37	7.34
Sodium (PPM)	72-100	86

μg/L = micrograms per liter
MCL = maximum contaminant level
MCLG = MCL Goal
NTU = Nephelometric Turbidity Unit
PPT = parts per trillion
pCi/L = picocuries per liter
PPB = parts per billion
N/A = not applicable
PPM = parts per million
LI = Langelier Index
ND = not detected
CU = caliometric unit

If that sample exceeds the MCL (maximum contaminant limit) established in the California Code, samples must be repeated quarterly and a yearly average computed. If this value exceeds the MCL, the Code will require notification of a violation to the Department of Environmental Management and to the public. If the yearly sample does not exceed the MCL, San Miguel CSD may adopt a reduced monitoring program and sample once per year during the month of warmest water at the point in the system with longest residence time. Any subsequent sample that exceeds the MCL would activate quarterly monitoring requirements, calculation of an annual average, and notifications as discussed above.

The TTHM and HAA5 requirements could be a potential concern for the San Miguel CSD. Both substances are formed by reactions between certain disinfectants (such as chlorine) and organic carbon. Concentrations of total organic compounds (TOC) greater than 2 mg/l can increase the potential for formation of THMs and HAAs. Values in this range are more common in surface water than in groundwater, and TOC concentrations in groundwater are generally 2 mg/l or less.

If system THMs and HAA5 approach the MCLs when the monitoring period begins, the San Miguel CSD should consider pursuing a system for THM reduction. The most effective approaches focus on removal of organic carbon from water sources. Best available technologies would include treatment with activated carbon, enhanced coagulation, or enhanced softening.

Radionuclides Rule

Radionuclides emit ionizing radiation, which can cause various kinds of cancers depending on the radionuclide a person is exposed to via drinking water. These rules cover man-made radioactivity (gross beta particle (GBP), strontium-90, tritium, and iodine-131) and naturally occurring radionuclides (gross alpha particle (GAP), radium-226, and radium-228) in drinking water. EPA is revising this regulation in accordance with the requirements of the 1986 Amendments to the SDWA and the 1996 Amendments to SDWA. The statute calls for regulation of radionuclides and a review of regulations every 6 years. EPA is reviewing the most current health, occurrence, treatment and analytical methods in revising these regulations to ensure safe drinking water protective of public health. On July 18, 1991, USEPA proposed a NPDWR for six radionuclides – radium 226, radium 228, radon, uranium, alpha, beta and photon emitter. Of these, only radon and uranium are not currently regulated. The 1996 SDWA amendments contain specific provisions for regulating an MCL for radon in drinking water and proposed regulations were published on November 2, 1999. These proposed regulations provide for an MCL of 300 pCi/L or an alternate MCL (AMCL) of 4,000 pCi/L with other multimedia mitigation measures (MMM). The MCL for gross alpha emitters remains at 15 pCi/L. Table 6 shows the proposed MCLGs and MCLs for radionuclides in water. Actual water quality data on radionuclides, provided by San Luis Obispo County, is included as Attachment A.

Table 6. Proposed MCLGs and MCLs for Radionuclides

Contaminant	MCLG	MCL
Radium-226	Zero	20 pCi/L
Radium-228	Zero	20 pCi/L
Radon-222	Zero	200 or 300 pCi/L
Uranium	Zero	20 μg/L
Beta and photon emitters	Zero	4 mrem/year
Adjusted gross alpha emitters	Zero	15 pCi/L

San Miguel Well Water Radionuclides

The presence of gross alpha emitters approaching the MCL in the San Miguel water supply, is of growing concern. The presence of gross alpha emitters is from naturally occurring decay of Uranium-238 and Thorium-232. The two wells operated by the San Miguel CSD show increasing levels of gross alpha particles through the years, although the average is currently below the proposed MCL. Several of these samples indicate gross alpha levels in exceedence of the proposed MCL of 15 pCi/L. Well No. 4 gross alpha levels have an average of about 12 pCi/L as of October 2000; however, there are 5 recorded instances when the proposed MCL was exceeded in the previous 5 years. The uranium levels at Well No. 4 are below the proposed MCL and show a decreasing trend, with an average of about 10 μg/L. Well No. 3 gross alpha levels have an average of about 15 pCi/L as of October 2000; however, the proposed MCL was exceeded 7 times in the previous 8 years. Uranium levels at Well No. 3 show an increasing trend, with an average of about 12 μg/L. All of the uranium results have remained below the proposed MCL of 20 μg/L.

Treatment for radionuclides could include ion exchange, lime softening, and reverse osmosis. All such treatment technologies will be costly, and will generate undesirable sludges and/or brine waste streams. Prior to exploring any treatment technologies, it is recommended that the District explore its existing Paso Robles formation water supply for better water quality. In general, this well siting study should be performed as follows:

1. Collect ground water information on wells in the vicinity of San Miguel;
2. Define the hydrogeologic setting for San Miguel;
3. Determine where productive wells could be sited;
4. Perform a water quality survey of wells in the area;
5. Identify which aquifer has the most favorable water quality based on existing well information;
6. Perform field exploration based on above findings.

The focus and intent of this well siting study will be to identify the most desirable location(s) within the San Miguel area to site new water wells. It is known that there are many wells installed in the Paso Robles formation, which do not exhibit high levels of radionuclides.

Such attempts to identify better sources of water should be made prior to any consideration of water treatment of the existing water supply. As mentioned earlier, this report should also address Basin safe yield, and hydraulic pumping capacities of future wells. This recommended study is included in the Capital Improvement Program.

Waterworks Standards

According to the draft revision to the Waterworks Standards submitted for State review on February 1, 2001, water systems must be designed to provide a minimum pressure of 30 psi throughout the distribution system at all times (except under fire flow conditions). Since the San Miguel CSD system has historically experienced pressures in and below this range in the SLT Zone, this requirement presents a significant concern. Options for providing reliable system pressures in excess of 30 psi are addressed in the distribution system section of the Water Master Plan.

WATER STORAGE

This section describes the existing storage facilities, recommended storage requirements, and recommendations for future storage improvements.

Existing

El 765 El 760

There are two storage facilities in San Miguel, providing a total of 194,000 gallons of storage. The San Miguel Reservoir, a concrete lined, covered and buried reservoir that provides 143,800 gallons of storage capacity, is located on the west side of Highway 101. The San Lawrence Terrace Tank, a welded steel tank with a capacity of 50,000 gallons, is located in the San Lawrence Terrace area. This tank sits at an elevation approximately 15 feet higher than the San Miguel Reservoir does. This elevation difference creates the need for two pressure zones in the system, as described earlier in this technical memorandum.

Storage Requirements

There are three components to water storage: 1) short-term outage; 2) fire storage; and 3) operational storage. Each is described in greater detail below, and summarized in Table 7. The total storage needs for the District are calculated by adding these three components together.

Short-term outage storage is intended to provide for conditions such as extended power outages, line breaks, pump failures, and similar problems. Most water planners accept that during emergencies, supply per capita may be reduced to minimum levels. Typically, on that basis, an emergency storage volume of 50 gpcd for three days is accepted as a reasonable value. Adequate emergency storage should be available in each pressure zone to account for booster system failure. Currently the District needs 226,000 gallons for emergency storage. At build-out, this storage requirement increases to 562,000 gallons.

Fire storage is the volume of water needed to control an anticipated fire in a building or group of buildings. The determination for this storage is based upon a recommended flow rate, its

duration, and a minimum residual pressure as established by the agency of interest. The mill, an old wood structure, establishes the peak fire flow for San Miguel. The fire flow required is 4500 gpm for four hours. The corresponding fire storage requirement is 1.08 million gallons.

Operational storage is the amount of water needed to equalize the daily supply and demand. Without this storage, water production facilities large enough to meet the instantaneous peak demands of the system would be required. With adequate operating storage, well pumps can operate at the daily average rate, while storage facilities meet the hourly peaks. This operating method also prevents the unnecessary use of additional well pumps at times when electrical rates are the highest.

An acceptable estimate for operational storage is approximately 25% of the total water use for any given day. AWWA M-32 recommends operational storage of 20 to 25 percent of the ultimate ADD or 15 percent of MDD. Using the criteria of 25 percent of ADD the minimum design operational storage for each pressure zone is determined by multiplying the build-out average day demand for the given zone by 25%. The total minimum operational storage currently required is 52,000 gallons. This increases to 130,000 gallons at build-out.

Table 7. Storage Requirements

	Current Needs, gal			Build-out Needs, gal		
	Main	**SLT**	**Total**	**Main**	**SLT**	**Total**
Emergency	214,300	11,700	226,000	538,600	23,400	562,000
Fire	1,080,000	120,000	1,080,000[1]	1,080,000	120,000	1,080,000[1]
Operational	46,000	6,000	52,000	118,000	12,000	130,000
Total	**1,340,300**	**137,700**	**1,358,000**	**1,736,600**	**155,400**	**1,772,000**

Notes: 1. Only the largest fire flow requirement is included in the total storage needed.

Storage Recommendations

Currently the District has a combined storage capacity of 193,800 gallons. This amount of storage is insufficient for the existing system operational and short-term outage demands, let alone fire suppression demands. At 1,500 people, the estimated operational and short-term outage demands are around 278,000 gallons, translating into a present-day shortage of 84,000 gallons again not, accounting for fire suppression storage. The required fire storage, based on the District's fire demand of 4,500 gpm for a 4-hour duration, is 1,080,000 gallons. Thus, the current total storage deficit is 1.2 million gallons.

Building a new 1.62 million gallon storage tank at the current site of the San Miguel Reservoir, and a 100,000 gallon tank in the San Lawrence Terrace area can rectify the future deficit. This would provide for 0.15 MG storage in the SLT Zone and 1.62 MG storage in the Main Zone, for a total of 1.77 MG storage. By matching overflow elevations on all of the tanks, the system can be operated as one pressure zone. This recommendation requires the eventual abandonment of the San Miguel Reservoir, since its current overflow elevation is lower than the SLT Tank. It is noted that existing and future storage deficits are primarily due

to the large fire storage volume required for the flour mill. JLWA's recommendations for storage are based on this most conservative parameter.

DISTRIBUTION

This section describes the existing distribution system, model development and calibration, design criteria, and overall system performance.

Existing Facilities

The San Miguel distribution system consists of two independent pressure zones, the San Miguel Zone and the San Lawrence Terrace Zone. In 1995 major improvements were made to the distribution system, including new 8" and 6" PVC water mains. An inventory of the existing pipeline network by pipe diameter is summarized in Table 8. The existing distribution system has the following breakdown based on pipe material: 1,854 LF Cement Mortar Lined Ductile Iron, 10,344 LF Asbestos Cement, 17,816 LF Cement Mortar Lined Cast Iron, and 25,105 LF PVC.

Table 8. Existing Pipeline Inventory

Diameter	Length (feet)
<4"	9,098
6"	31,824
8"	14,197
TOTAL	**55,119**

Design Requirements

The design requirements for the water distribution system relate primarily to the flow and pressure delivered by the system. Pressures below 30 psi are not acceptable in a municipal water system. Ideally, normal operating (static) pressures will be within the range of 40 to 80 psi. This is the range that most people find comfortable and which will serve most fire sprinkler systems. Pressures within the 30 to 35 psi range are acceptable but less than desirable. Pressures higher than 80 psi are acceptable within the distribution system, but should be reduced to 80 psi at the service connection to prevent water hammer effects or leakage through rapidly-weakening washers and seats.

The flow requirements examined in the network model include fire flow, maximum day demand, peak hour demand, and average daily demand. The various flow scenarios are summarized as follows:

1) Fire flow: Residential fire flow of 1,500 gpm, commercial fire flow of 3,500 gpm, and a maximum fire flow of 4,500 gpm for the mill, were modeled and deficiencies were noted. In accordance with UFC requirements, no more than 1,000 gpm was extracted from any single hydrant. It was assumed that maximum day demand was occurring concurrent with the fire flow.

2) Maximum Day Demand: Domestic demand was distributed throughout the District service area based on the existing demand distribution apparent from the meter database. As described previously, the peaking factor applied to the ADD to reach the MDD was 2.0.

3) Peak Hour Demand: This demand condition was used to identify system deficiencies at the maximum domestic use. As described previously, a peaking factor of 3.5 was applied to the ADD.

4) Average Daily Demand: This flow condition was used to evaluate the system subject to the most common conditions.

Hydraulic parameters and design criteria are summarized in Table 9. The following parameters were employed to identify deficient conditions for each run of the model:

1. Domestic pressures below 30 psi were highlighted in each run.

2. Pipeline velocities exceeding 5 feet per second (fps) were identified. In general, velocities higher than 5 fps create excessive pressure losses.

3. During fire flow model runs, pressures below 20 psi at any node in the system were identified in accordance with Fire Chief requirements.

Table 9. Summary of Hydraulic Parameters and Design Criteria

Hydraulic Parameters and Design Criteria	Value
Fire Flow Requirements	Residential – 1,500 gpm Commercial – 2,500 gpm School – 3,500 gpm Flour Mill – 4,500 gpm
Maximum Day Demand Factor	2.0 times ADD
Peak Hour Demand Factor	3.5 times ADD
Minimum Service Pressure @ ADD	40 psi
Minimum Service Pressure @ MDD	30 psi
Minimum Residual Pressure (@ MDD and fire flow conditions)	20 psi
Pipeline Velocity @ ADD	5 ft/s
Pipeline Velocity @ MDD	< 10 ft/s

System Demands

User demands were assigned to the system based on meter records obtained from San Luis Obispo County from 1997 to the present. For residential users, an average consumption rate was determined for each of the zones based on the billing information. For the public authority and business accounts, an average demand was developed for each user based on actual previous usage. These averages were then assigned to the closest node in the system. Care was taken to assign the demands to the correct pipe, to reflect actual demands on the system. Unless a user has been connected to the assessment district improvements, that user's demand was assigned to the older pipeline.

Model Calibration

As part of the calibration process, fire hydrant tests were conducted on Thursday, June 7, 2001. Present at the tests were representatives from JLWA, County Operations, and the San Miguel CSD. The fire flow test is conducted by measuring the static pressure in the system prior to flowing the fire hydrant. The hydrant is then opened fully, and actual fire flow is measured. Once the hydrant flow has stabilized the residual pressure in the system is measured at the same locations as the static pressure. The field measurements are then compared to the model output.

If the model does not accurately reproduce the fire flow tests, several parameters can be adjusted, including elevations, demands, and internal pipe roughness, represented by the Hazen-Williams roughness coefficient. Select elevation data points throughout the system were field checked by JLWA surveyors, and demands were based on billing records obtained from the County, leaving the internal roughness to be adjusted. The Hazen-Williams roughness coefficients ("C" factor) for the pipelines in the model were based on known established ranges of values, and were calibrated to match the residual pressure readings of the field tests. The calibrated model matches the actual system performance to within an acceptable margin of error. Table 10 summarizes the calibration results, using the following roughness values:

- 145 for PVC
- 130 for Asbestos Cement
- 130 for Cement Mortar Lined Ductile Iron
- 120 for Cement Mortar Lined Cast Iron

Table 10. Results of Model Calibration

Test Fire Hydrant	Flow (gpm)	Tested Pressure (psi)			Model Pressure (psi)		
		Static	Residual	Δ	Static	Residual	Δ
9th Street and L Street	790	56	44	12	55	41	14
16th Street and K Street	720	48	34	14	45	32	13
13th Street and N Street	845	60	45	15	58	39	17
15th Street and Verde Place	845	62	47	15	59	42	17
River Road and Oak Road	560	42	29	13	39	33	6
Magdalena Drive	455	43	31	12	43	34	9

As shown the model emulates field headloss for the fire flow tests accurately (within 3 psi) for 5 of the 6 tests. The model and field results at River Road and Oak Road were different by 7 psi, the most of any test. Attempts to rectify this anomaly were made, and all system parameters were verified. It is suspected the discrepancy may be the result of a partially closed valve, or other restriction in the vicinity of the tested hydrant, creating a greater headloss in the field. However, this does not affect the recommendations of this study.

System Performance

Overall, the existing distribution system within the Main Zone is adequate for daily operations; only during fire flow conditions do system deficiencies become apparent. During fire flow conditions, the system is unable to deliver the required flow, because of the 6" line near the community pool. This bottleneck prevents adequate fire flow throughout the entire Main Zone. In the SLT Zone the static pressures near the tank are below acceptable levels (pressures of less than 20 psi were observed during the field tests). Other deficiencies and recommendations for correcting them are discussed in greater detail in the Capital Improvements Program section of this report.

CAPITAL IMPROVEMENTS PROGRAM

With a few exceptions, the existing water system meets average day demands adequately; however, there are deficiencies under fire flow conditions. The existing system is unable to deliver the required fire flows of 1,500 gpm in existing residential areas, 3,500 gpm for commercial areas, the school, and the mission, and 4,500 gpm for the mill. Most of the capital improvements are to correct these deficiencies. Figures 3, 4 and 5 depict the recommended improvements in the Main Zone and SLT Zone respectively, and Table 11 summarizes the estimated costs. Table 11 places these recommended improvements into priority 1 through 4; however, no specific time line is specified.

Herein the alley located immediately west of L Street will be referred to as the L Street Alley and the alley located immediately west of Mission Street will be referred to as the Mission Alley.

Transmission Line Improvement I

The 6" transmission line in 13th Street near the Community Pool creates a bottleneck to the entire system preventing residential fire flows from being met. Upgrading this 90 feet of pipe to 16" will improve fire flows throughout the existing service area.

Transmission Line Improvement II

By increasing the diameter of the transmission line (between the storage reservoir and the distribution system) from 8" to 16", the system can meet existing residential fire flows throughout the existing San Miguel Zone service area. This improvement will serve as a backbone for the future needs of San Miguel, and with further upgrades, fire flows at the mill, school and Mission will be met. Without this upgrade the system cannot provide fire flows to these locations. All subsequent recommendations are based on this improvement being completed.

New San Miguel Storage Tank

As discussed in the storage section, the District has a build-out storage deficit of 1.6 MG. By building a new storage tank in the San Miguel Zone, sized to meet future storage requirements, and matching the overflow elevation of the SLT Tank, the pressure zones can be combined, thus eliminating the need for the booster station. Further study must be done to select an appropriate tank site. However, through discussions with the San Miguel CSD, additional land can likely be obtained adjacent to the existing tank site.

13th Street Improvement
Increase the diameter of the existing 6" cast iron pipeline to 8" PVC from K Street to the Mission Street. This project will add redundancy and reliability to the system in conjunction with the North Mission Street and South Mission Street projects. This helps create a strong backbone from the San Miguel Reservoir to meet fire flows throughout the existing distribution system, and for future development.

North K Street Improvement
Increase pipeline from 6" cast iron to 8" PVC. This improvement will take advantage of the increased diameter of the transmission line from the San Miguel Reservoir, and will allow fire flow requirements to be met at the mill and the school. The 8" upgrade is sufficient if the new tank is built, and its overflow elevation matched to the existing SLT Tank. If it is not built, the North Mission Street Improvement I will need to be initiated to meet the fire flows to the mill.

South K Street Improvement
Increase pipeline from 13th to 9th from 6" cast iron to 8" PVC and install new 8" PVC from 9th Street to San Luis Obispo Road to meet the fire flow requirements at the Mission. Similar to the North K Street Improvement, this project will meet the fire flows if the new San Miguel tank is built; otherwise the South Mission Street Improvement must be initiated to maintain residual pressures above 20 psi during fire flow demands.

An alternative for the South K Street Improvement is to substitute 12" PVC for the 8" PVC from 13th Street to 10th Street. This should be done if commercial development is considered viable to the west of US 101. This recommendation is also based on the assumption that all new commercial development is sprinklered such that fire flows will be around 1500 gpm. This 12" line should be provided from K Street west to the future commercial development, in addition to the 12" line in K Street.

North Mission Street Improvement I
Install new 8" PVC from 13th Street to 16th Street. This project will allow fire flows to be met at the mill in conjunction with the North K Street Improvements project, and will add a level of reliability to the system. This project will also provide a strong link for future development of the area north of the school. The existing 6" cast iron line in the Mission Alley should be abandoned in place.

South Mission Street Improvement
Install new 8" PVC from 13th Street to 10th Street and replace the existing 6" PVC with 8" PVC from 10th Street to San Luis Obispo Road. This project is similar in scope to the North Mission Street Improvement I project, adding reliability and redundancy for the Mission fire flows. The waterlines in the Mission Alley should be abandoned.

An alternative for the Mission Street Improvements is to replace the existing waterlines located in the Mission Alley with a new 8" PVC line. This will make access for meter reading and maintenance more difficult. However, this will have lower initial capital costs than the proposed improvements, because the proposed improvements require moving meters and service connections from the Alley to Mission Street, and will require the new 8" lines on 13th Street and 16th Street to be extended to Mission Street.

North Mission Street Improvement II
Increase the diameter of the existing 6" asbestos cement pipe (from 16th to 18th Street) with a new 10" PVC line. This project will allow residential fire flows to be met at the future Lillian Larson development, and should be built as development occurs.

If development does not occur, maintain the existing 6" line in the alley from 16th to 18th Street and upgrade the 6" asbestos cement pipe in Mission Street (from 16th to 18th Street) to an 8" PVC line extending to 19th Street.

SLT Tank Transmission Line I
Increase size of the outlet from the SLT Tank. The current outlet is 6" diameter, which is inadequate for providing fire flows to the SLT Area, the existing outlet should be replaced with a 12" line.

New SLT Storage Tank
The SLT area is also deficient in storage, and needs a larger tank to meet fire flow requirements in the immediate area. Although the pressure zones may be combined, the SLT tank must be able to supply a proportionate amount of storage to meet needs in the surrounding area. A 100,000 gallon tank will meet these needs, providing a total of 150,000 gallons of storage in the area.

SLT Tank Transmission Line II
Upgrading the diameter of the existing 6" line to 8" from the tank to Oak Street, down Oak Street to River Road and north on River Road to the existing 8" PVC. This will allow the new SLT Tank to contribute to fire flows in the San Miguel area, and provide adequate fire flow in the SLT area.

SLT Loop I
Connect the 4" asbestos cement line that currently dead ends north of Kennedy Lane, with the 8" PVC line in River Road, using a new 8" PVC line. This will improve circulation and fire flow capability in the area.

SLT Loop II
Create a loop by installing 8" PVC pipeline from Martinez Drive to Magdalena Drive, which will allow fire flows to be met along Magdalena Drive.

SLT Extension
Extend an 8" PVC line east on Magdelena Drive to serve the area east of the SLT water storage tank, as development occurs there. To increase reliability, this line should be looped with a new 8" line in Mission Drive, see Figure 5 for the layout of this improvement. Given the low density in the area, an alternative to this project is to place each of the lots on independent wells.

Hydropnuematic Zone
Create a Hydropnuematic Zone in the northern section of the SLT area. Currently the static pressures in this area are below acceptable levels, and even with proposed SLT improvements to enhance fire flows in the SLT area, the system cannot provide required fire flows to the homes in the area. By adding a pump station and hydropnuematic tank, pressures in the area can be boosted to acceptable levels, and fire flows can be met.

New Wells
Location and screened depth of new wells will need to be studied to ensure future water quality. A study of groundwater issues, especially the presence of radionuclides, must be carried out to locate wells that will meet water quality standards. The CIP includes anticipated costs for the study, plus costs for two new wells. This study should be conducted on a first priority basis.

Connect Users
Existing water service meters need to be moved to the mains recently installed as part of the 1995 assessment. This should be conducted on a first priority basis. We understand the District is scheduling this work this year.

Replace and/or Relocate Hydrants
Fire hydrants should be connected to the largest line possible in the vicinity. For instance, near the intersection of Mission and San Luis Obispo Road, there is a wharf head hydrant connected to a 3" line. This should be replaced with a standard hydrant and connected to the 6" line that is in the vicinity. Figures 3 and 4 have the locations for new hydrants indicated.

Water Meter Replacement
When existing meters need to be replaced, or new meters are brought on line, the District should consider adding automatic meter reading (AMR) technology. AMR has many forms from touch pads to radio frequency (RF) transponders to satellite uplinks. The RF transponders seem to be the best tradeoff between cost, ease of use, and reliability. This technology is available from several manufacturers including Ramar, Itron, and Sensus. An added benefit is the District does not need to purchase the AMR system with the meters. Both Badger and Metron-Farnier produce meters that can be easily retrofitted with the RF transponder. Before the District begins installing new meters a more detailed analysis of the feasibility of AMR technology should be performed. After selecting the most appropriate system, meters can then be selected that are compatible with the AMR system.

Table 11
Capital Improvement Projects

Project #	Title	Description	Zone	Quantity	Length (Ft)	Old Diameter (in)	New Diameter (in)	Street	Location	Construction Cost ($)		Subtotal ($)	Total Project Cost ($)[1]	Function
First Priority														
1	Transmission Line Improvement I	Upgrade 6" CI Transmission Line	SM		90	6	16	13th Street	Adjacent to Community Pool	130	LF	11,700	16,380	Meet Fire Flows
2	Transmission Line Improvement II	New 16" Transmission Line	SM		1,020	8	16		West of US 101	130	LF	132,600	185,640	Meet Fire Flows
3	New Storage Tank	1.62 MG Storage Tank	SM	1.62					West of US 101	1	gal	1,620,000	2,268,000	Meet Storage Deficiencies
4	SLT Tank Transmission Line I	Increase Size of Outlet at Existing Tank	SLT		75	6	12		At SLT Tank	100	LF	7,500	10,500	Meet Fire Flows
Second Priority														
5	New SLT Storage Tank	0.10 MG SLT Tank	SLT	0.10					SLT Area	1	gal	100,000	140,000	Meet Storage Deficiencies
6A	Well Study	Water Quality Study										-	7,500	
6B	New Wells	Construct 2 New Wells w/ Standy Power		2					To Be Determined	200,000	EA	400,000	560,000	
7	Hydropnuematic Zone	Create New Pressure Zone Near SLT Tank	SLT	1					SLT Area	20,000	EA	20,000	28,000	Create Adequate Static Pressures
8	North K Street Improvement	Upgrade 6" CI Line	SM		2,275	6	8[2]	K Street	From 13th Street to K Street	90	LF	204,750	286,650	Meet Fire Flows at School and Mill
9	South K Street Improvement	Upgrade 6" CI Line	SM		3,150	6	8	K Street	From 13th Street to San Luis Obispo Road	90	LF	283,500	396,900	Meet Fire Flows at Mission
10	13th Street Improvement	Upgrade 6" CI Line	SM		830	6	8	13th Street	From K Street to Mission Street	90	LF	74,700	104,580	Meet Fire Flows
11	SLT Loop I	Create Loop	SLT		75		8	River Road	River Road near Mission Drive	70	LF	5,250	7,350	Add Redundancy to System
12	SLT Tank Transmission Line I	Upgrade 6" Lines	SLT		2,400	6	8	Oak Street	From SLT Tank to Oak to River Road	70	LF	168,000	235,200	Meet Fire Flows
Third Priority														
13	North Mission Improvement I	Upgrade 6" Line	SM		1,450	6	8	Mission Street	From 13th Street to K Street	90	LF	130,500	182,700	Meet Mill Fire Flows and Add Redundancy
14	South Mission Improvement	New 8" Line	SM		2,231	varies	8	Mission Street	From 13th Street to San Luis Obispo Road	90	LF	200,790	281,106	Meet Mission Fire Flows
15	SLT Loop II	Create Loop	SLT		675		8	Magdalena Drive	From Martinez Drive to Magdalena Drive	70	LF	47,250	66,150	Add Redundancy to System and Meet Fire Flows on Magdalena
Fourth Priority														
16	North Mission Improvement II	Upgrade 6" CI Line	SM		1,430	6	10	Mission Street	From 16th Street to Development	110	LF	157,300	220,220	Meet Fire Flows at Lillian Larson Development
17	SLT Extension	New 8" PVC Line	SLT		10,300	-	8	Magdalena	Eastern Portion of SLT	90	LF	927,000	1,297,800	Extend Service to New Development
18	Replace and/or Relocate Hydrants	New Fire Hydrant		4		-	-			3,500	EA	14,000	14,000[3]	Meet Fire Flows and/or Comply with Fire Code Standards
											TOTAL	$4,504,840	$6,306,776	

1. Total includes a 40 percent allowance over construction cost for preliminary engineering, design engineering, administration construction management and inspection costs.
2. Upsize to 12" diameter if comercial development west of US 101 will occur.
3. 40 percent allowance not necessary for this work.

Basis of Capital Improvement Program Costs

The capital improvement program (CIP) costs were developed based on engineering judgment, confirmed bid prices for similar work in the Central Coast area, consultation with vendors and contractors, established budgetary unit prices for the work, and other reliable sources. Hard construction costs are escalated by a factor of 1.4, to allow budget for preliminary engineering, engineering, administration, construction management and inspection costs. All CIP costs are expressed in Year 2001 dollars, using an ENR Construction Cost Index of **6288**, and will need to be escalated to the year or years scheduled for the work. The units costs for pipe upgrades include new water services, valves, and hydrants where required. The unit cost for new pipe includes only the proposed pipeline, valves, and appurtenant connections.

Impact fees for future development were calculated based on the percentage increase in population included in the San Miguel CSD (e.g. build out population is 3742 current population is 1542 representing an increase of 58.8 percent). Capital improvement projects that are being recommended to accommodate future growth (such as the new storage tanks), will be funded in part by these impact fees. To spread these fees in an equitable manner each development will be charged a fee based on the number of equivalent development units (EDUs) for the development. Based on 2.84 persons pre EDU there is a potential for 775 new EDUs in the San Miguel CSD, giving a fee of $2,578 per EDU. Table 12 shows the breakdown for each project and what it will contribute to the impact fees.

Table 12. Development Impact Fees

	Project	Total ($)	User Impact (%)	User Impact ($)
1	Transmission Line Improvement I	16,380	58.8	9,631
2	Transmission Line Improvement II	185,640	58.8	109,156
3	New Storage Tank	2,268,000	58.8	1,333,584
4	SLT Tank Transmission Line I	10,500	0	0
5	New SLT Storage Tank	140,000	58.8	82,320
6A	Well Study	7,500	58.8	4,410
6B	New Wells	560,000	58.8	329,280
7	Hydropnuematic Zone	28,000	0	0
8	North K Street Improvement	286,650	0	0
9	South K Street Improvement	396,900	0	0
10	13th Street Improvement	104,580	0	0
11	SLT Loop I	7,350	0	0
12	SLT Tank Transmission Line I	235,200	0	0
13	North Mission Improvement I	182,700	0	0
14	South Mission Improvement	281,106	0	0
15	SLT Loop II	66,150	0	0
16	North Mission Improvement II	220,220	58.8	129,489
17	SLT Extension	1,297,800	0	0
18	Replace and/or Relocate Hydrants	14,000	0	0
			TOTAL	**$1,997,871**

San Miguel C.S.D.

Legend:

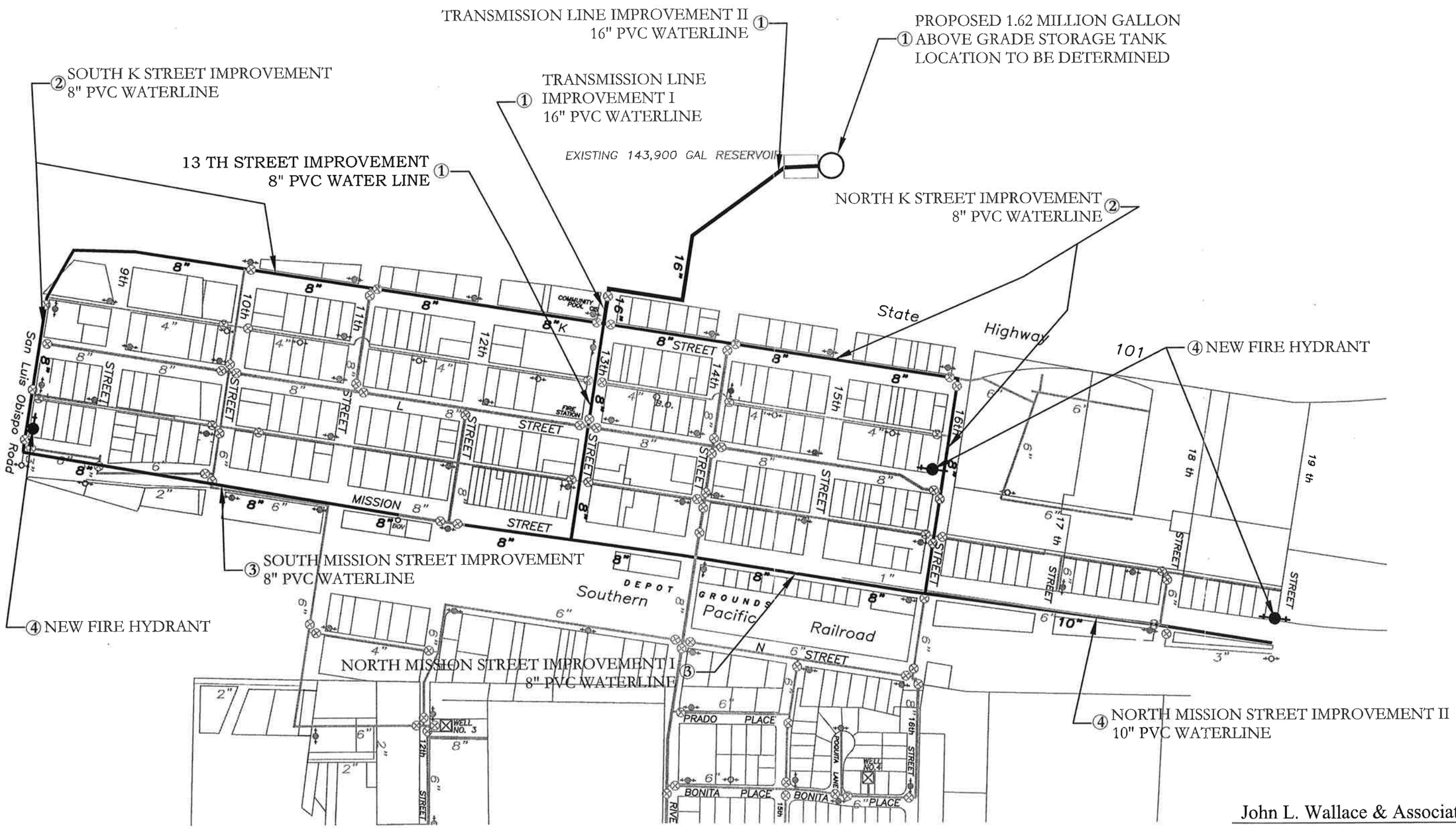
- Proposed Pipelines
- Existing Pipelines
- ② Priority of Improvement

1" = 400'
0 200 400

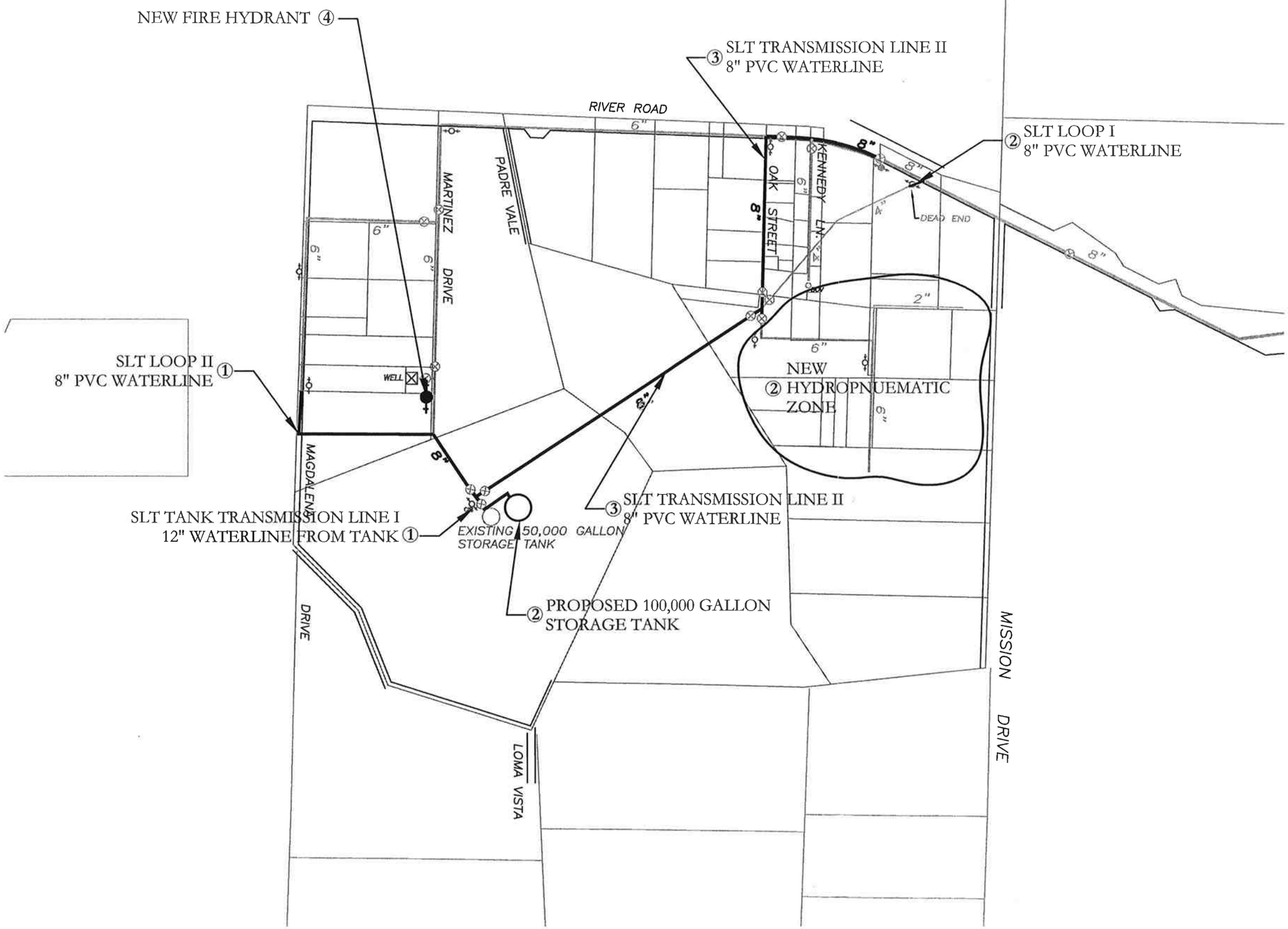
Water System Master Plan

Figure 3

Capital Improvement Projects



John L. Wallace & Associates JLWA



San Miguel C.S.D.

Legend:

- Proposed Pipelines
- Existing Pipelines
- ② Priority of Improvement

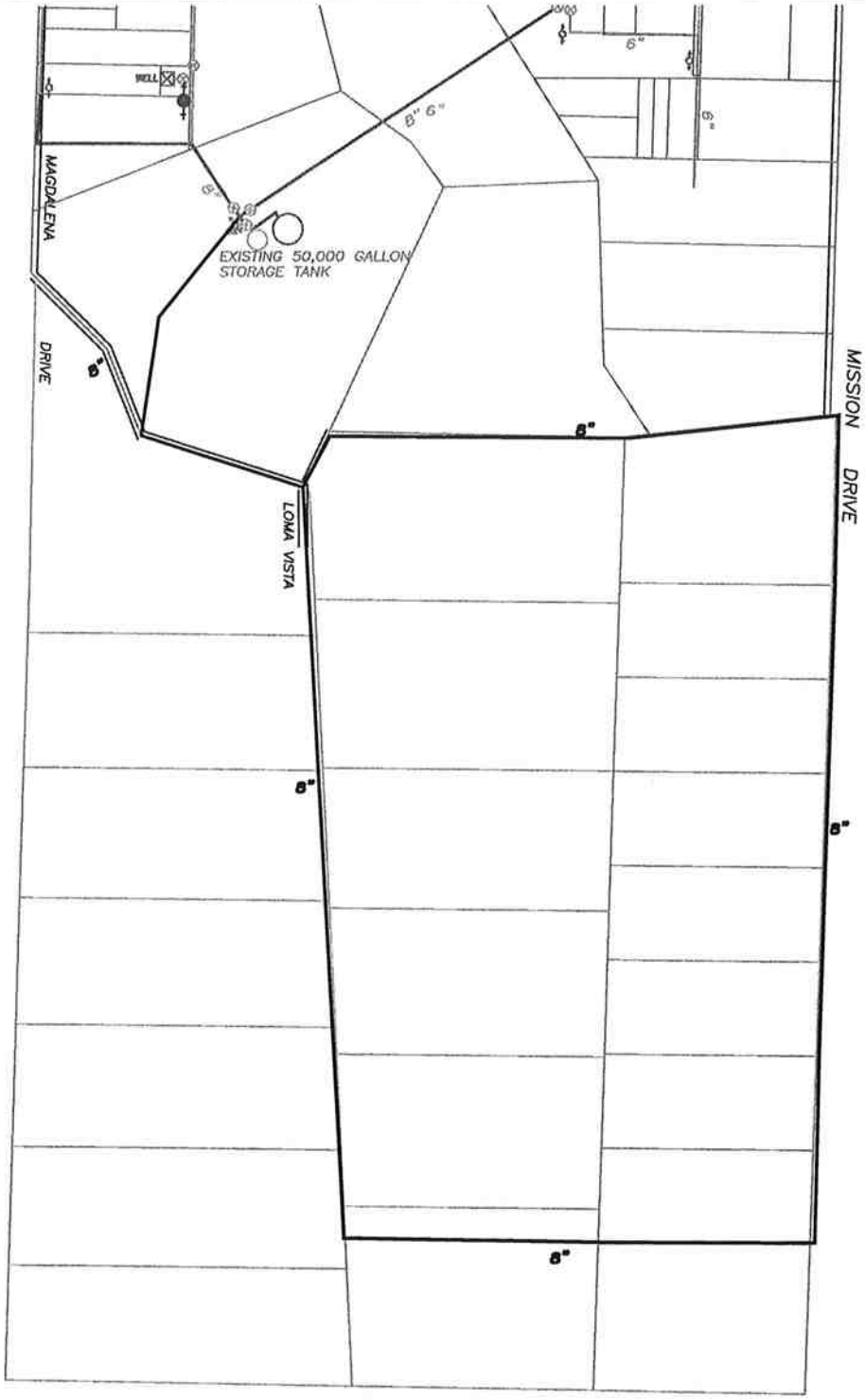
Water System Master Plan

Figure 4

San Lawrence Terrace
Capital Improvement Projects

1" = 400'
0 200 400

John L. Wallace & Associates JLWA



Legend:

SLT Extension Project
CIP Proposed Pipeline
Existing Pipeline

1" = 600'

0 300 600

S.M.C.S.D.

Water System Master Plan

SLT Extension Project

Figure 5

John L. Wallace & Associates

Attachment A

Uranium and Gross Alpha

Particle Analytical Data

Wells 3 and 4

Radioactivity Data - Gross Alpha (pCi/L)

State Maximum based on the average of four consecutive quarters

Gross Alpha

Area	Apr-84	Jul-84	Oct-84	Dec-84	Apr-85	Jul-85	Oct-85	Feb-88	Apr-88	Jul-88	Jan-89	Apr-89	Aug-89	Jun-91	Sep-91	Jan-92	Apr-92	May-92	Jul-92	Oct-92	Jan-93	Apr-93	Jul-93	Oct-93
SM1			0.2		5	8.8	-0.4									13.06	4.76		10					
SM2	6.1		-1.4	3.1	7.3	4.3																		
SM3	1.4	5	2.7	1.6	0.8	8	1.5	-1.6	4.3	2.6	5.5	3				9.87	0.56		16	8	7	8	9	15
SM4														8.69	0.00	5.43	4.76			7	13	12	10	10
SM4A-Deep													4						11					
SM4B-Shallow													3						13					
SM5A-284'																11.19		17	33		18	39	24	9
SM5B-350'																5.80		2	12		9	9	17	7
SM5C-528'																2.93		2	5		8	4	7	6
SLT	6.3		5.3	6.2	3.1	7.8	-1.0	-8	2.3							7.44	0.56		7	11				
Adobe																								
State Max	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15

Gross Alpha (Continued)

Area	Apr-95	Jul-95	Oct-95	Jan-96	Apr-96	Jul-96	Oct-96	Feb-97	Apr-97	Jul-97	Oct-97	Jan-98	Apr-98	Jul-98	Oct-98	Jan-99	Apr-99	Jul-99	Oct-99	Jan-00	Jan-00	Apr-00	Jul-00	Oct-00
SM1																								
SM2																								
SM3	11		18	9		9	13	10	8	10	8	12	9	13.4	16.2	12.3	15.2	18	19.2	12.6	12.6	14.9	9.4	10
SM4	11		15	9	12	11	8	10	10	11	7	13	6	8.5	13.7	15.6	11.4	15.5	6.1	11.9	11.9	18.5	8.6	16.4
SM4A-Deep	12		8								6	8	8	8.5				9.1	5.3	7.9	7.9			
SM4B-Shallow	6		11								8	7	7	5.6				15.6	6.5	7.1	7.1			
SM5A-284'	34	30	43								31	24	21	12.7				13.7	7.3	19	19			
SM5B-350'	14	16	13								12	11	12	17.1				14.5	13.5	13.2	13.2			
SM5C-528'	14	12	6								6	7	7	8.5				10.3	7.8	6.9	6.9			
SLT	19	19		21	21	23	14	19	10	15	16	17	11	26.2	22.6	17.2	17.9	13.7	16.6	31.2	31.2	10.7	23.3	10.6
Adobe											15	17	16	19.2				15	14.4	6.1	6.1			

State Maximum based on the average of four consecutive quarters

Radioactivity Data - Uranium (pCi/L)

Uranium

Area	Jun-91	Jan-92	Apr-92	May-92	Jul-92	Oct-92	Jan-93	Apr-93	Jul-93	Oct-93	Apr-95	Jul-95	Oct-95	Jan-96	Apr-96	Jul-96	Oct-96	Feb-97	Apr-97	Jul-97	Oct-97	Jan-98	Apr-98	Jul-98
SM1																								
SM3		5				13	9	9	11	11	14		8	12		14	15	14	8	15	15	12	14	11.4
SM4	11	6				15	13	14	13	12	13		10	14	11	11	14	12	10	13	10	12	12	9.34
SM5A-284'					23		34	33	21	35	30	32	23								20	23	29	10.8
SM5B-350'					15		14	9	7	13	14	11	10								14	12	12	12.4
SM5C-528'					8		11	8	9	7	11	6									9	8	9	7.61
SLT		8							13		13			18	18	18	17	24	17	15	20	10	16	15.7
SM4A					14						9		6								6	7	9	7.56
SM4B					11						11		7								9	10	9	9
Adobe																					17	9	15	13
State Max	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20

County Wells

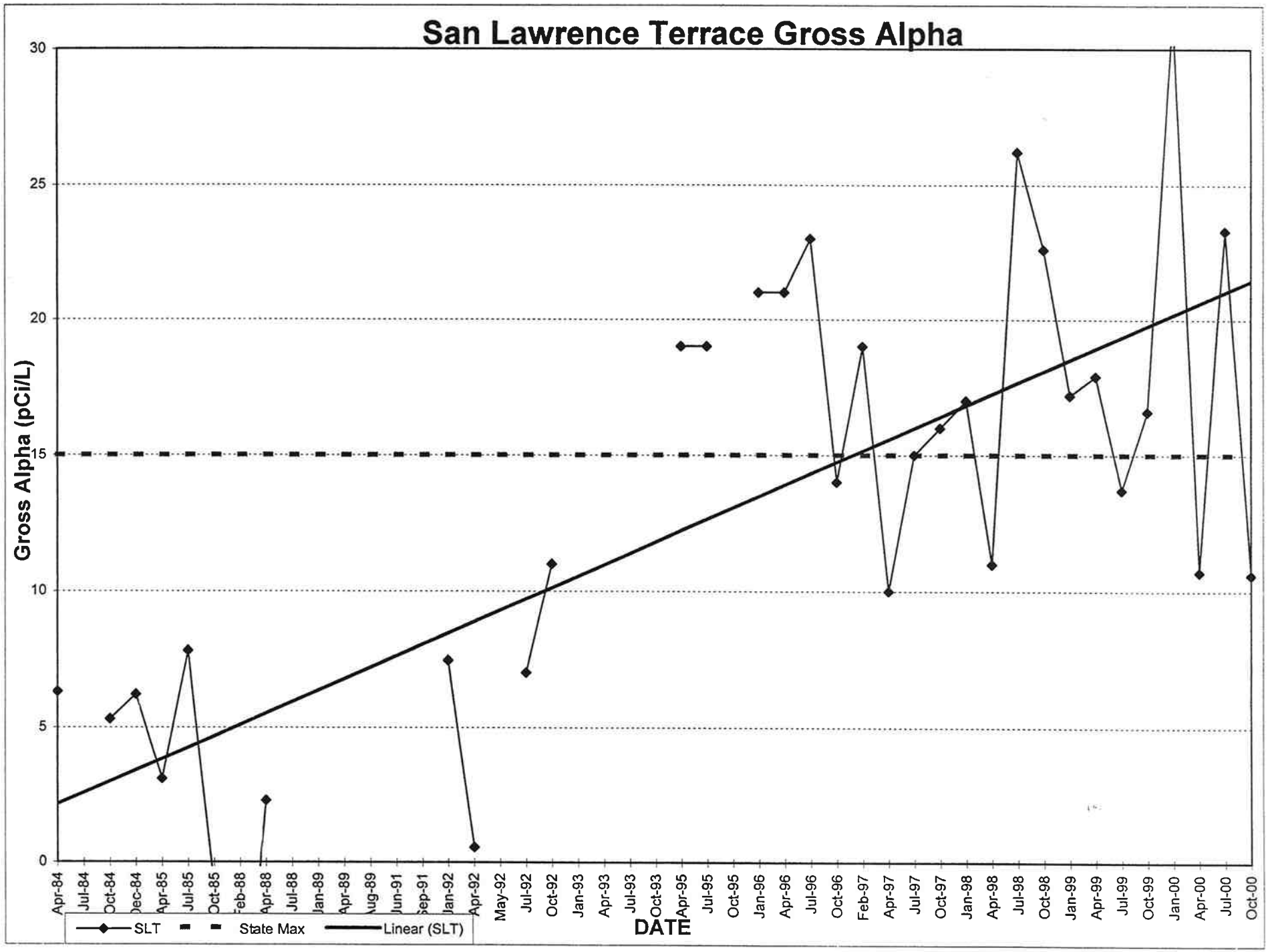
1 San Miguel Well 1
2 San Miguel Well 3
3 San Miguel Well 4
4 San Miguel Well 5 (New well)
SLT San Lawrence Terrace

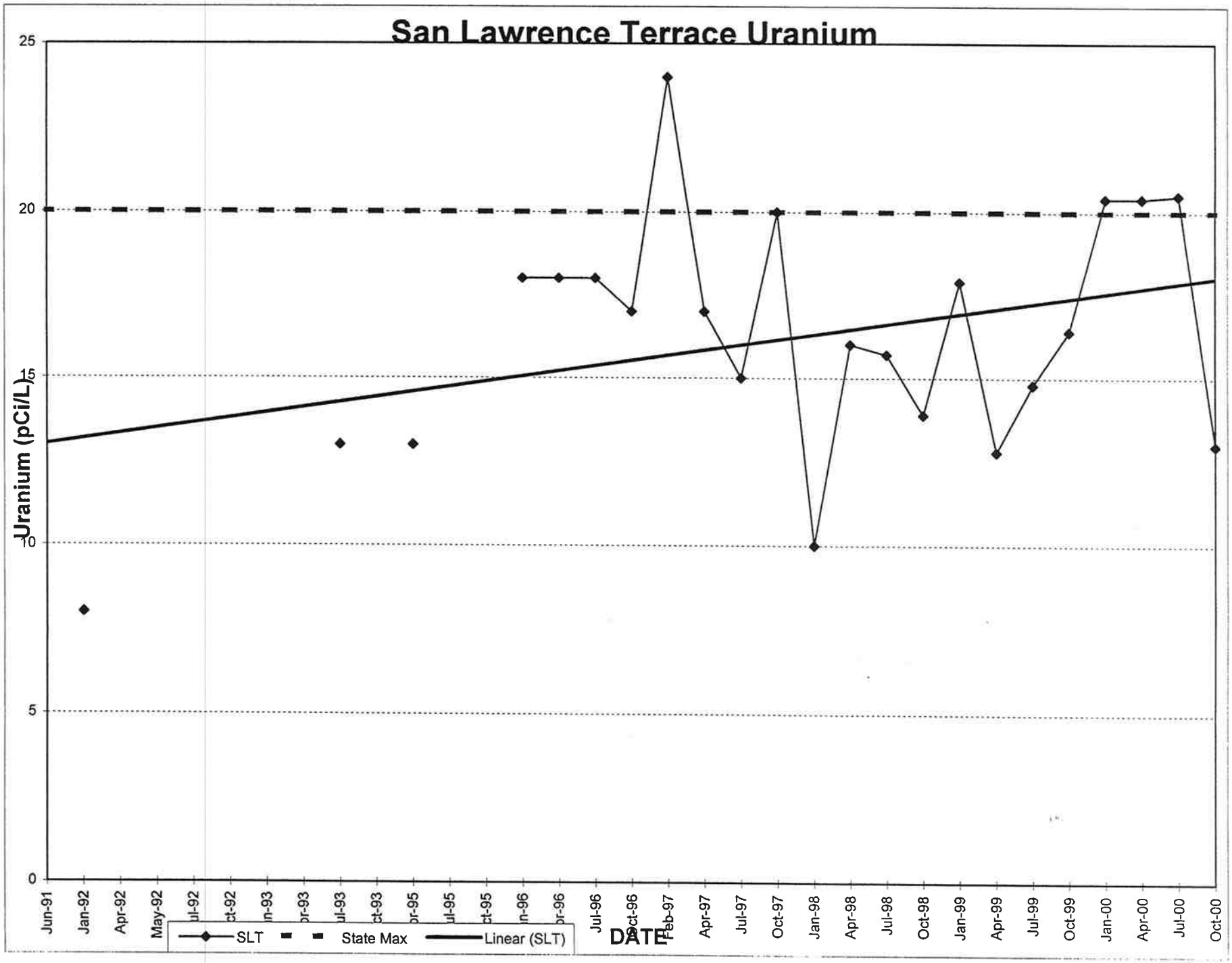
Private Wells

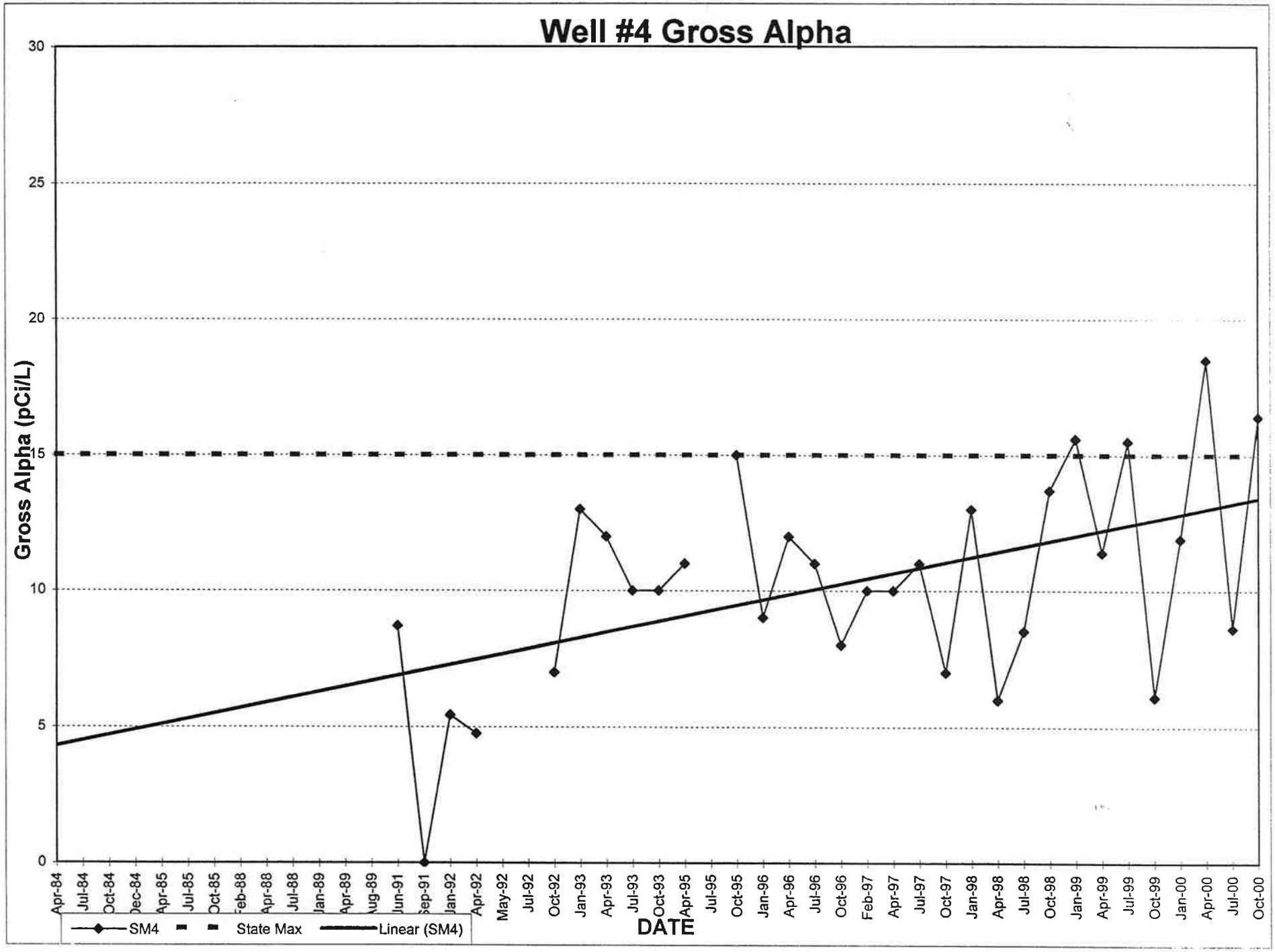
1 Johns Well
2 Branch Well
3 Wolf Well
4 Jensen Well
5 Blank Well
6 Adobe

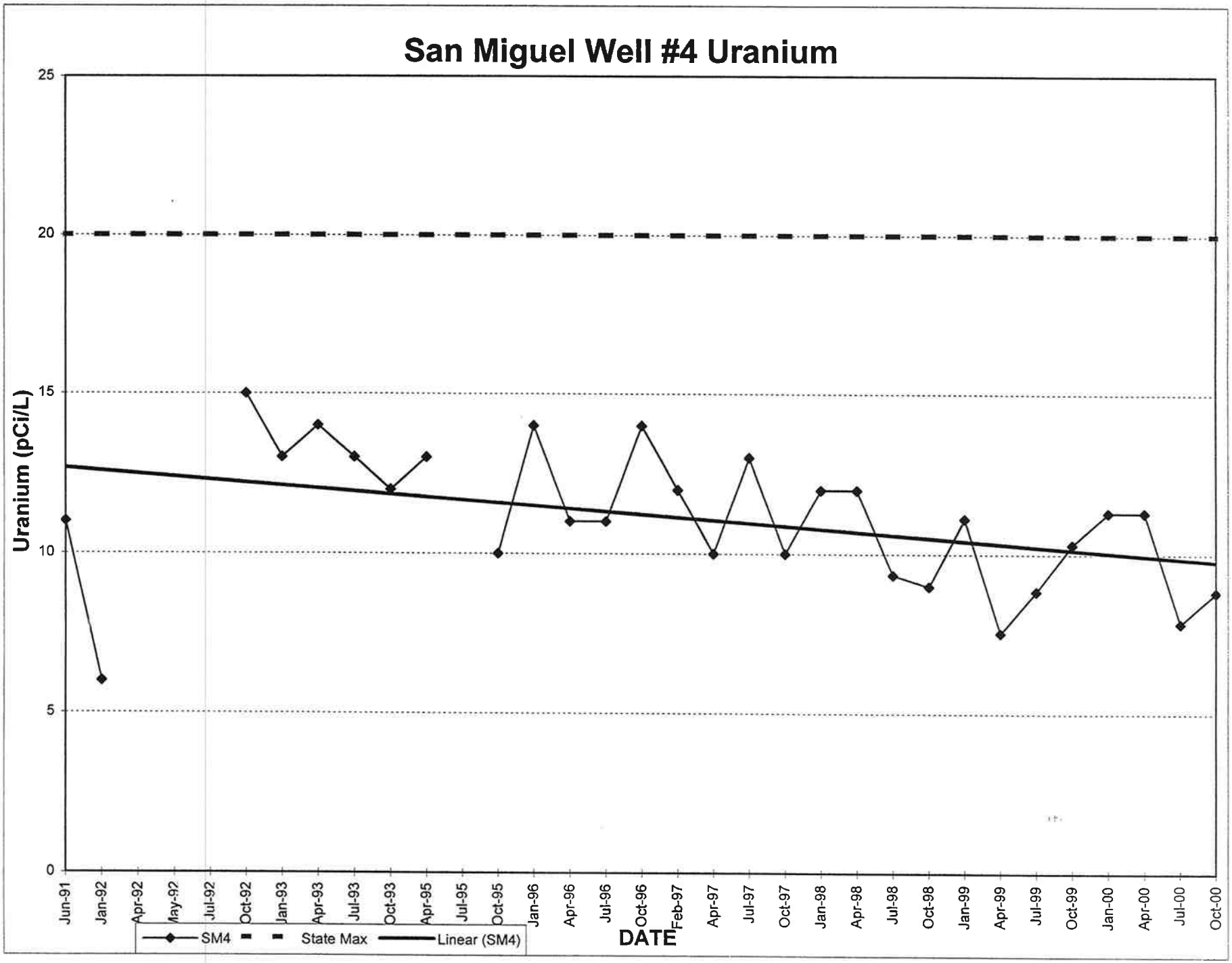
Uranium (Continued)

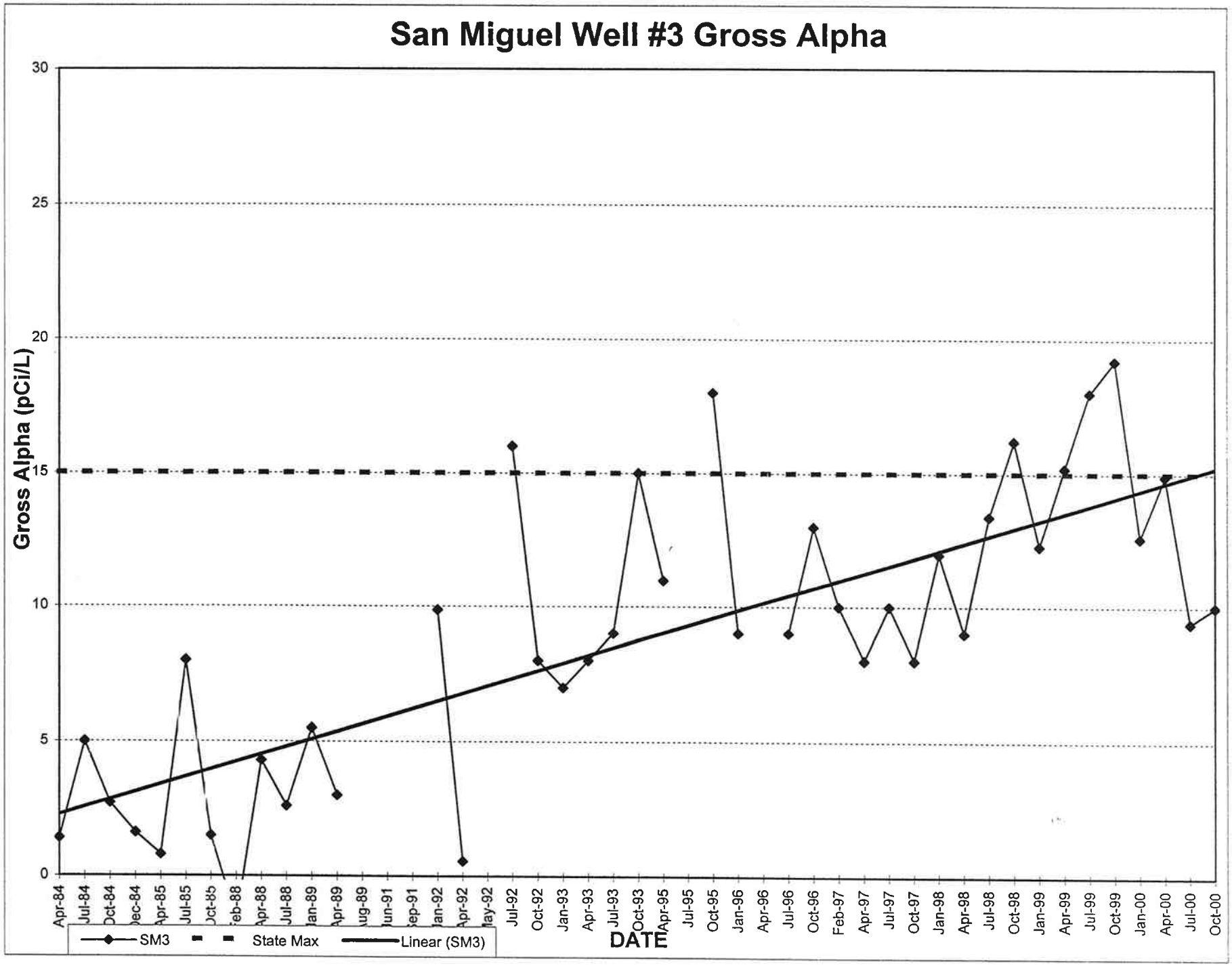
Area	Oct-98	Jan-99	Apr-99	Jul-99	Oct-99	Jan-00	Apr-00	Jul-00	Oct-00
SM1									
SM3	10.9	12.7	9.68	11.7	12.5	12.5	12.5	9.72	14
SM4	8.98	11.1	7.52	8.83	10.3	11.3	11.3	7.83	8.8
SM5A-284'				12.3	11.1	26.3			
SM5B-350'				13.9	17.4	16.2			
SM5C-528'				6.86	8.38	8.09			
SLT	13.9	17.9	12.8	14.8	16.4	20.4	20.4	20.5	13
SM4A				6.7	7.93	7.38			
SM4B				8.33	9.89	9.63			
Adobe				14.1	14.4	15.6			
State Max	20	20	20	20	20	20	20	20	20

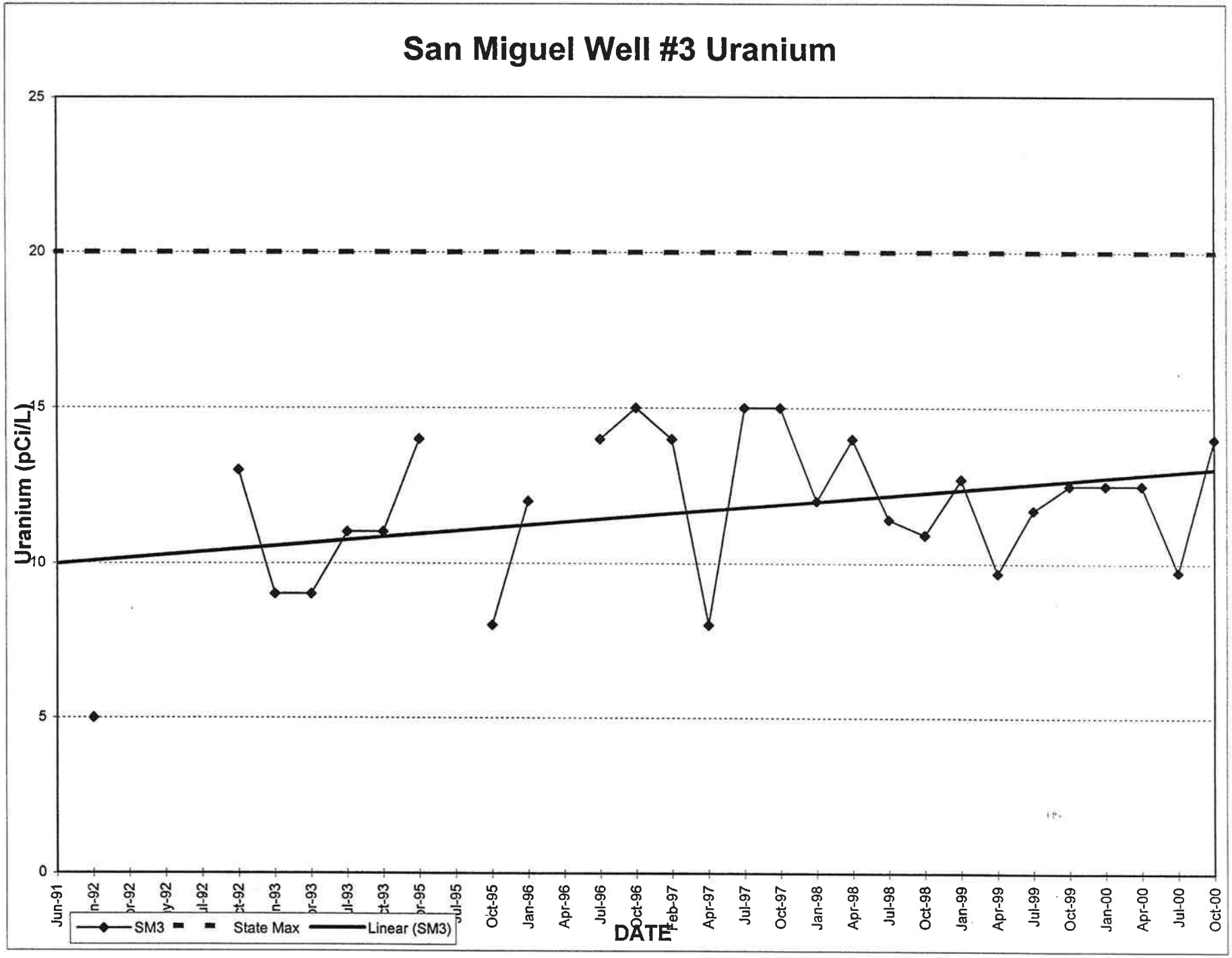

San Lawrence Terrace Gross Alpha
Gross Alpha (pCi/L)
30
25
20
15
10
5
0
Apr-84
Jul-84
Oct-84
Dec-84
Apr-85
Jul-85
Oct-85
Feb-88
Apr-88
Jul-88
Jan-89
Apr-89
Aug-89
Jun-91
Sep-91
Jan-92
Apr-92
May-92
Jul-92
Oct-92
Jan-93
Apr-93
Jul-93
Oct-93
Apr-95
Jul-95
Oct-95
Jan-96
Apr-96
Jul-96
Oct-96
Feb-97
Apr-97
Jul-97
Oct-97
Jan-98
Apr-98
Jul-98
Oct-98
Jan-99
Apr-99
Jul-99
Oct-99
Jan-00
Apr-00
Jul-00
Oct-00
DATE
SLT
State Max
Linear (SLT)


San Lawrence Terrace Uranium
Uranium (pCi/L)
25
20
15
10
5
0
Jun-91
Jan-92
Apr-92
May-92
Jul-92
Oct-92
Jan-93
Apr-93
Jul-93
Oct-93
Apr-95
Jul-95
Oct-95
Jan-96
Apr-96
Jul-96
Oct-96
Feb-97
Apr-97
Jul-97
Oct-97
Jan-98
Apr-98
Jul-98
Oct-98
Jan-99
Apr-99
Jul-99
Oct-99
Jan-00
Apr-00
Jul-00
Oct-00
DATE
SLT
State Max
Linear (SLT)


Well #4 Gross Alpha
Gross Alpha (pCi/L)
30
25
20
15
10
5
0
Apr-84
Jul-84
Oct-84
Dec-84
Apr-85
Jul-85
Oct-85
Feb-88
Apr-88
Jul-88
Jan-89
Apr-89
Aug-89
Jun-91
Sep-91
Jan-92
Apr-92
May-92
Jul-92
Oct-92
Jan-93
Apr-93
Jul-93
Oct-93
Apr-95
Jul-95
Oct-95
Jan-96
Apr-96
Jul-96
Oct-96
Feb-97
Apr-97
Jul-97
Oct-97
Jan-98
Apr-98
Jul-98
Oct-98
Jan-99
Apr-99
Jul-99
Oct-99
Jan-00
Apr-00
Jul-00
Oct-00
DATE
SM4
State Max
Linear (SM4)


San Miguel Well #4 Uranium
Uranium (pCi/L)
25
20
15
10
5
0
Jun-91
Jan-92
Apr-92
May-92
Jul-92
Oct-92
Jan-93
Apr-93
Jul-93
Oct-93
Apr-95
Jul-95
Oct-95
Jan-96
Apr-96
Jul-96
Oct-96
Feb-97
Apr-97
Jul-97
Oct-97
Jan-98
Apr-98
Jul-98
Oct-98
Jan-99
Apr-99
Jul-99
Oct-99
Jan-00
Apr-00
Jul-00
Oct-00
DATE
SM4
State Max
Linear (SM4)


San Miguel Well #3 Gross Alpha
Gross Alpha (pCi/L)
30
25
20
15
10
5
0
Apr-84
Jul-84
Oct-84
Dec-84
Apr-85
Jul-85
Oct-85
Feb-88
Apr-88
Jul-88
Jan-89
Apr-89
Aug-89
Jun-91
Sep-91
Jan-92
Apr-92
May-92
Jul-92
Oct-92
Jan-93
Apr-93
Jul-93
Oct-93
Apr-95
Jul-95
Oct-95
Jan-96
Apr-96
Jul-96
Oct-96
Feb-97
Apr-97
Jul-97
Oct-97
Jan-98
Apr-98
Jul-98
Oct-98
Jan-99
Apr-99
Jul-99
Oct-99
Jan-00
Apr-00
Jul-00
Oct-00
DATE
SM3
State Max
Linear (SM3)


San Miguel Well #3 Uranium
Uranium (pCi/L)
25
20
15
10
5
0
Jun-91
Oct-95
Jan-96
Apr-96
Jul-96
Oct-96
Feb-97
Apr-97
Jul-97
Oct-97
Jan-98
Apr-98
Jul-98
Oct-98
Jan-99
Apr-99
Jul-99
Oct-99
Jan-00
Apr-00
Jul-00
Oct-00
DATE
SM3
State Max
Linear (SM3)

STATE CONTROLLER
COUNTY BUDGET ACT
(1985)

COUNTY OF SAN LUIS OBISPO
STATE OF CALIFORNIA

DISTRICT BUDGET FORM
SCHEDULE 16

SAN LUIS OBISPO COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT
GENERAL FUND
DISTRICT BUDGET DETAIL

BUDGET FOR FISCAL YEAR 2012-13

GOVERNING BOARD:
BOARD OF SUPERVISORS...X
OTHER APPOINTED.....
OTHER ELECTED.....

FUND	ASSESSED VALUATION AND DEBT SERVICE TAX RATE SUMMARY							
	ASSESSED VALUATION		DELINQUENCY		MEANS OF FINANCING VOTER APPROVED DEBT			
	SECURED	UNSECURED	SECURED	UNSECURED	SECURED	UNSECURED	TOTAL	TAX RATE
1300000000 SLO FLOOD CONTRL AND WATER CONSV. CONTINUED								

SUMMARY OF FINANCING REQUIREMENTS

SUMMARY OF FINANCING REQUIREMENTS (7)		ACTUAL COST 2010-11 (8)	ACTUAL. . .X ESTIMATED. . . COST 2011-12 (9)	ESTIMATES REQUEST. . . RECOM'D. . .X 2012-13 (10)	APPROVED/ ADOPTED BY BOARD 2012-13 (11)	FUND IDENTIFICATION OTHER THAN GENERAL FUND (12)
(5XXXXXX)						
GENERAL	450R140101	84,859	103,478	28,900	28,900	
COUNTYWIDE OVERHEAD	450R140120	33,014	5,012	19,300	19,300	
SB 2557	450R140121	26,162	23,793	23,800	23,800	
CONTRIBUTION TO ISF/NEW EQUIP	450R140106	0	10,305	20,000	20,000	
PUBLIC COMMENT/INFORMATION	450R140103	4,105	3,609	19,800	19,800	
MASTER WATER PLAN COORD.	450R140201	153,269	86,861	0	0	
SWP-COASTAL BR. ANALYSIS/BUY-IN	450R140202	117,921	4,279	22,100	22,100	
WATER CONSERVATION MANGMNT	450R140203	6,488	4,013	17,000	17,000	
IRWM EFFORTS	450R1402XX	67,961	155,736	504,200	504,200	
GROUNDWATER BASIN EFFORTS	450R1402XX	8,415	9,869	231,000	231,000	
RECYCLED WATER STUDY	450R140218	0	0	218,000	218,000	
SALT & NUTRIENT PLANNING EFFORT	450R140219	0	0	2,000	2,000	
HYDROLOGIC DATA	450R140301-20	353,964	303,510	418,900	418,900	
PRELIMINARY ANALYSIS/USGS	450R140401	36,723	33,427	38,800	38,800	
RESOURCE MGMT SYSTEM	450R140407	5,128	2,909	14,400	14,400	
WRAC - COORDINATION	450R140408	50,882	47,928	41,000	41,000	
PASO ROBLES GROUNDWATER BASIN	450R140503	637	259	0	0	
PASO ROBLES BASIN GROUNDWTR	300398	33,285	1,332	0	0	
PASO ROBLES GRDWTR BSN AGMT	450R140516	1,120	59,852	0	0	
RCD MOBILE LAB EVALUATIONS	450R140566	21,714	31,245	33,800	33,800	
PUBLIC INQUIRY (FLOOD CONTROL)	450R140105	1,697	502	6,200	6,200	
COMMUNITY DRAINAGE/COORDINATIC	450R1405XX	64,956	44,337	146,400	146,400	
TOTAL OPERATING COSTS		1,072,300	932,256	1,805,600	1,805,600	
TOTAL BUDGET REQUIREMENTS - THIS PAGE		1,072,300	932,256	1,805,600	1,805,600	