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OJAI VALLEY SANITARY DISTRICT

RECLAIMED WATER FEASIBILITY/MARKETING STUDY

OJAI VALLEY SANITARY DISTRICT 1072 Tico Road Ojai, California 93023

VT-003-101-01

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OJAI VALLEY SANITARY DISTRICT

Reclaimed Water Feasibility/Marketing Study

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Reclaimed Water Feasibility/Marketing Study

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Executive Summary

Background

The Ojai Valley Sanitary District collects and treats wastewater received principally from the Ojai Valley. The OVSD Wastewater Treatment Plant is located next to the Ventura River south of Foster Park. The plant presently discharges 1.7 to 2.0 mgd of secondary effluent to the Ventura River.

The Regional Water Quality Control Board, RWQCB, issued a new NPDES permit for the plant in May 1990, which requires full tertiary treatment (filtration) of the wastewater, imposes low limits on ammonia in the effluent, and requires the District to perform studies to reduce nuisance plant growth and low oxygen problems in the Ventura River caused by the District's effluent. The Regional Water Quality Control Board also issued a Cease-and-Desist Order to the District requiring compliance by the summer of 1993.

The District has taken positive steps toward complying with the requirements of the RWQCB. The study of plant growth and low oxygen in the Ventura River has been completed. An evaluation of present plant capability and pilot studies of improved wastewater treatment processes were conducted and a preliminary engineering report on the treatment plant upgrade is complete.

Before the pilot studies were done, it was expected that a filtration process, along with other processes, could be added to the existing plant for a cost of between 5 and 7 million dollars. Unfortunately, the evaluation showed that the present plant processes are not adapted toward simply adding filtration to meet the NPDES requirements. The pilot studies and preliminary engineering report indicate rebuilding most of the treatment plant provides the best long-term solution. The cost of a total new plant upgrade is expected to be about 20 million dollars, including non-NPDES related plant improvements.

A large capital expense could be a burden on the local community which includes many retirees on a fixed income. Before committing to the expense of a new plant upgrade, the District Board wished to determine if a reclaimed water project could eliminate the need for upgrading the plant and/or generate income to offset the plant upgrade costs. This Reclaimed Water Feasibility/Marketing Study was authorized to evaluate the feasibility and benefits to the District of a reclaimed water system.

Purpose

The purpose of this study was to identify potential markets for reclaimed water within or near the District and to evaluate the feasibility and costs of implementing a reclaimed water system. Potential reclaimed water system alternatives were identified for the following categories:

- 1) Reclaimed water alternatives that would eliminate the need to upgrade the treatment plant, or reduce the costs of the plant upgrade. Such alternatives would use most or all of the reclaimed water for irrigation, discharging little or no effluent to the Ventura River.
- 2) Reclaimed water alternatives that would distribute reclaimed water produced by a plant upgraded to meet all NPDES requirements. Such alternatives may provide income to partially offset the cost of the treatment plant upgrade.

The information in this report was provided to the District Board in December 1991, prior to their decision to upgrade the treatment plant to meet all NPDES requirements. The conclusions of this report generally support the District's decision to upgrade the plant.

Potential Local Uses of Reclaimed Water

The uses of reclaimed wastewater are regulated by the State of California Department of Health Services and other agencies. Numerous regulations and guidelines exist to protect public health and the environment.

Based on current health regulations, the secondary effluent produced by the existing treatment plant can be used for the following purposes:

- 1) Spray irrigation of hay and other fodder crops.
- 2) Spray irrigation of landscaping , including golf courses (provided public access is restricted during irrigation).
- 3) Irrigation of orchards and food crops, as long as the water does not come in direct contact with the fruit to be harvested (Furrow irrigation, for example).

Tertiary treated reclaimed water can be used for any of the above purposes, plus the following additional uses:

- 1) Spray irrigation of orchards and food crops; the reclaimed water may be sprayed directly onto the fruit.
- 2) Spray irrigation of parks and school yards.
- 3) Enhanced oil field recovery operations, provided stringent water quality requirements are met.

Marketing Survey

With extensive agricultural lands in the Ojai Valley and with two local golf courses, potential markets for reclaimed water exist within or near District boundaries. To identify these markets, aerial photographs were reviewed. Aerial photos clearly show locations of orchards, irrigated turf (parks, schools and golf courses), fodder crops, row crops, and grazing land. Potential reclaimed water customers identified are shown on Plate 1, located in a pocket at the end of this report. The major areas and uses that could use reclaimed water are listed below:

- 1) Hay fields in Canada Larga;
- 2) A few orchards in the vicinity of the wastewater treatment plant;
- 3) Large orchards, primarily avocados, on the Rincon, west of Lake Casitas;
- 4) Vast citrus orchards in the eastern part of the Ojai Valley;
- 5) The Soule Park Golf Course;
- 6) The Ojai Valley Inn golf course;
- 7) Rancho Matilija existing hay fields or the proposed Farmont golf course;
- 8) Scattered areas south of the treatment plant.

The reclaimed water demand for each area was estimated based on typical demand factors for orchards (2.5 AF per acre per year), turf (3.0 AF per acre per year) and other uses. The total potential reclaimed water demand is much larger than the supply of reclaimed water from the plant. Plate 1 shows that the largest potential markets for reclaimed water are located many miles away from the treatment plant. It will not be practical to distribute reclaimed water to all of the areas identified. The goal is to deliver as much reclaimed water as possible to a compact service area thereby minimizing costs of pipelines and other facilities.

Factors that Affect Reclaimed Water Alternatives

A number of factors can influence the configuration and feasibility of a reclaimed water system within the District. Some of those major factors are briefly discussed below:

1) Seasonal Storage

Irrigation demands vary throughout the year, with highest demands occurring during the hot summer months. The treatment plant produces reclaimed water at a fairly constant rate throughout the year. (Except for short-term peaks during rainy periods.) In order to use all of the reclaimed water from the plant, a seasonal storage reservoir is necessary for storing surplus flows in winter for use during the summer.

2) Environmental Impacts on the Ventura River

Base flows in the Ventura River have been reduced below historic levels by the construction of Matilija Dam, Casitas Dam, the Robles/Casitas diversion, and increased groundwater use. Almost all of the dry period flows in the Ventura River downstream from the plant are from the OVSD treatment plant. As a result, fisheries and riparian habitat in the river may be dependent upon this discharge. A reclaimed water project that uses all of the reclaimed water produced by the plant may need to mitigate impacts on the river. This study does not evaluate the environmental impacts of a reclaimed water project. An Environmental Impact Report (EIR) will need to be prepared before implementing a reclaimed water project. The EIR will likely suggest dry season releases from the treatment plant or another source, to mitigate impacts on the river.

3) Participation by Casitas MWD

Lake Casitas is presently being operated near its safe annual yield, and mandatory water conservation has been implemented by Casitas MWD. A local reclaimed water project could supply present customers of Casitas MWD and reduce demands on Lake Casitas or other potable supplies by up to 2200 AF per year. Therefore, a reclaimed water system could benefit all customers of Casitas MWD by supplementing local water supplies. It is possible Casitas MWD and other local water agencies could participate financially in a reclaimed water project. Other water districts, most notably Metropolitan Water District of Southern California, subsidize reclaimed water projects which reduce demands on their systems and the need to develop costly new water supplies.

Besides financial participation, Casitas MWD could, if required for some projects, provide potable water to supplement reclaimed water during peak demand periods. If a minimum flow must be maintained in the Ventura River for environmental reasons, this could be met by Casitas releasing some lake water to the river in exchange for reclaimed water. For some reclaimed water alternatives to be feasible, such assistance from Casitas MWD may be essential.

4) Tertiary Treatment without Nutrient Removal

A total new plant upgrade is required primarily due to ammonia and nutrient removal requirements. Without them, adding a filtration process to the existing secondary plant may be all that is required. This would reduce upgrade costs while producing reclaimed water suitable for drip irrigation or spraying onto orchards, increasing the marketability of the water. The recently completed pilot studies did not cover tertiary treatment without ammonia and nutrient removal and specific facilities required were not determined. 5) Reduced Winter NPDES Requirements

Tertiary treatment without nutrient removal and with higher ammonia levels would be beneficial for a reclaimed water system that uses 100 percent of the plant effluent for most of the year. During wet winter periods, it would be necessary to discharge the tertiary effluent to the river unless seasonal storage is provided. For such releases to be allowed, a revised NPDES permit with less strict limits for winter discharges is required. The RWQCB has issued such permits to other districts for discharges to streams with high winter flows that dilute the effluent and minimize impacts on water quality. It is not known whether the RWQCB would consider revising the District's NPDES permit to allow discharges of tertiary treated water, without nutrient removal, to the Ventura River in winter.

Potential Reclaimed Water System Alternatives Identified

Considering the number of areas that could be served and the various issues described above, a large number of reclaimed water system alternatives are available. In this study, eleven alternatives were identified. A screening process reduced the number to three alternatives that could eliminate a total plant upgrade and two alternatives that could distribute reclaimed water from a fully upgraded plant. The screening process considered cost and feasibility.

Alternatives that Could Reduce or Eliminate a Treatment Plant Upgrade

Three alternatives were selected that appeared most capable of eliminating or reducing the costs of a treatment plant upgrade. The three preferred alternatives are described below:

Alternative A2 - Spray Fields in Canada Larga

Secondary treated reclaimed water would be used primarily to irrigate fodder crops in the Canada Larga area. Since there is not enough irrigable acreage near the plant to efficiently use all water produced by the treatment plant, more water would be applied to the fields than would be consumed by the crops. Such an application is known as a "spray field." Water not consumed by the crops or evaporated would percolate into the groundwater. Given the hilly topography, it is likely that some of the percolated water would eventually emerge from the ground and flow into Canada Larga Creek, which flows into the Ventura River. To verify the feasibility of Alternative A2, pilot studies to determine percolation rates, and whether percolated groundwater would emerge into Canada Larga Creek, and to measure the quality of such emergent water are necessary. Studies are needed to verify the project would meet state health regulations governing recharge of reclaimed water; including blending with other sources, depth to groundwater, retention time, and distance to potable water wells. The RWQCB would permit the project. The main advantage of Alternative A2 is its relatively low costs. Other than a pump station and pipelines, the major facility associated with the project is a seasonal storage reservoir. The reservoir could be located in Weldon Canyon near the spray fields (assuming a landfill is not built) or at an old Shell reservoir site southeast of the treatment plant. It is assumed that landowners in Canada Larga would be willing to use the reclaimed water to grow fodder crops, and that the District would not lease or purchase the land.

With Alternative A2, no reclaimed water would be directly discharged to the Ventura River. No other supplemental source would be available for discharge to the river to maintain riparian habitat and fisheries. Future environmental studies are needed to verify the environmental and regulatory feasibility of Alternative A2.

Alternative B1 - Secondary Reclaimed Water to the Ojai Valley

Secondary treated reclaimed water would be distributed to the Ojai Valley to irrigate citrus groves and two golf courses. Public access to the golf courses would be restricted during irrigation, and adjacent areas protected against contact with reclaimed water. To use the secondary water, farmers would need to convert their orchards to furrow irrigation. Although almost all orchards in Ojai now use drip irrigation, many of those orchards formerly used furrow irrigation and could be converted back. There are some disadvantages to furrow irrigation, as listed below:

- 1) Fields must be fairly level, with a uniform slope.
- 2) Furrow irrigation uses more water per acre than drip irrigation.
- 3) Rocky soils along the north and east rims of the valley would be difficult to irrigate.
- 4) Although furrow irrigation of citrus groves is used extensively in the Santa Clara River Valley in Ventura County, there is probably not much expertise in this method remaining in the Ojai area.
- 5) Tailwater return systems are needed to reuse agricultural runoff.
- 6) Health regulations require fencing to be placed around orchards.

If reclaimed water rates are reasonable, farmers may be willing to convert their orchards to furrow irrigation. The water allocation program recently implemented by Casitas MWD and the recently formed Ojai Basin Groundwater Management Agency may provide incentives for the use of reclaimed water. All of the reclaimed water from the OVSD treatment plant would be used if about a fourth of the orchards in East Ojai were connected to the reclaimed water system.

With Alternative B1, a pipeline and two pump stations are needed to convey the reclaimed water from the treatment plant to the East End of Ojai. A major part of the project would be a seasonal storage reservoir. A potential location has been identified

southwest of the treatment plant, at an abandoned reservoir site originally constructed and operated by Shell Oil. The dam has been partially demolished and would need to be rebuilt. A major advantage of the site is that environmental impacts from rebuilding the dam and reservoir would probably be insignificant.

Since Alternative B1 reduces water demands on Casitas MWD, it may be feasible for Casitas MWD to release some Lake Casitas water into the Ventura River near the wastewater treatment plant to meet environmental demands of the river, if any. The amount released would be lower than the reductions in water demand, resulting in a net increase in water supplies available to Casitas MWD's customers.

Alternative B1 could also supply the proposed Farmont golf course if it is approved by Ventura County. The District's costs could be reduced with Farmont as a customer. However the preferred alternatives do not depend on approval of controversial developments.

Alternative C1 - Tertiary Reclaimed Water to Rincon Orchards

With Alternative C1, the wastewater treatment plant would add tertiary treatment (filtration) but with less stringent ammonia and nutrient removal limits. The plant upgrade costs could be reduced significantly, subject to confirmation by pilot studies. The tertiary treated reclaimed water would be distributed to orchards on the Rincon, west of Lake Casitas, which are supplied by Casitas MWD at present.

The Rincon demand would use all of the plant effluent for most of the year. Seasonal storage would not be provided. Instead, some tertiary treated water would be released into the Ventura River during winter months. A revised NPDES discharge permit would be required, with reduced winter requirements.

In the summer months, demand would exceed the reclaimed water supply from the plant and a substantial potable water supplement would be required from Casitas MWD. A pipe with an "air gap" would be connected to one of their tanks to convey this supplement to the reclaimed water distribution system.

Besides the treatment plant upgrade, the major facilities would be a pipeline from the plant to the Rincon, a tank, and one or two pump stations.

Since Alternative C1 reduces water demands on Casitas MWD, it may be feasible for Casitas MWD to release some Lake Casitas water into the Ventura River near the wastewater treatment plant to meet environmental demands of the river, if any. The amount released would be lower than the reductions in water demand, resulting in a net increase in water supplies available to Casitas MWD's customers.

Cost of Reclaimed Water Alternatives that Reduce or Eliminate a Plant Upgrade

The capital and unit costs of the three alternatives are summarized below:

Alternative	Description	Capital <u>Cost</u>	Cost per ¹ Acre-Foot	Annual ² Subsidy per <u>Residence</u>
A2	Spray Fields in Canada Larga	\$10,721,000	\$649	\$96
B1	Secondary Reclaimed Water to the Ojai Valley	\$20,781,000	\$1,195	\$200
C1	Tertiary Reclaimed Water to Rincon Orchards (costs do not include tertiary treatment capital or operating costs)	\$8,880,000	\$669	\$87

¹ Total cost, no subsidy.

² Subsidy based on sale of water @ \$150/AF.

Capital costs include reclaimed water distribution and storage facilities only. Annual debt service costs are based on $7\frac{1}{2}$ percent interest with a 20-year payback. The cost per acre-foot includes operating costs and pumping costs.

Due to high capital and operating costs, none of the reclaimed water alternatives can be supported solely by water rates. Construction and operation of a reclaimed water system would need to be subsidized by the rate payers within OVSD. The annual subsidy per residence is provided in the preceding table, based on selling reclaimed water for \$150/AF.

A reclaimed water system would not be competitive nor financially self-supporting because of existing low water rates in the Ojai area. Agricultural customers within Casitas MWD at present pay as little as \$80 per acre foot for lake water. (Rates are scheduled to increase to help pay for a new filtration plant.) In contrast, the Lake Sherwood golf course in eastern Ventura County pays \$450/AF for reclaimed water received from Triunfo County Sanitation District. Reclaimed water customers typically pay a rate set at about 75 percent to 80 percent of their applicable potable rate. Customers are usually not expected to pay more for reclaimed water than for other available supplies. However, local water agencies, including Casitas MWD, could require the use of reclaimed water where available.

Other Options

The use of percolation ponds to dispose of secondary effluent was considered in the study. It was found that both the RWQCB water quality objectives for local groundwater basins, and proposed State health regulations for recharge of groundwater basins with reclaimed water would preclude use of percolation ponds in all areas except the Lower Ventura River Basin. However, that basin is small, nearly full, and percolation rates are not favorable. For these reasons the percolation option does not appear feasible for OVSD.

Other options briefly described in the report are the following:

- Discharge to the ocean through a new or existing outfall.
- Connection to the City of Ventura's sewer system.

Comparison of Water Reclamation Alternatives to Total Plant Upgrade

Based on studies by James M. Montgomery Engineers, District staff have estimated the cost to local residents of upgrading the treatment plant to meet all NPDES requirements, including nutrient removal. After construction, the cost per residence is expected to be about \$120 per year. With inflation, the relative cost will diminish over time.

The costs of a plant upgrade are compared to the cost to residents of water reclamation in the following table:

Alternative	Description	Annual Cost 1 per Residence
A2	Spray fields in Canada Larga	\$96
B1	Secondary water to Ojai Valley	\$200
C1	Tertiary water to Rincon orchards	\$177 ²
	New plant upgrade	\$120

¹ Assumes sale of water @ \$150/AF.

² includes \$90 for tertiary treatment facilities and operation.

Only Alternative A2 compares favorably with a new plant upgrade. However environmental concerns with Alternative A2 may present a fatal flaw for that alternative.

Decision to Upgrade the Treatment Plant

Although the three alternatives investigated would provide a chance of avoiding a treatment plant upgrade, each alternative has serious problems that would have to be overcome, as summarized below:

Alternative A2 - Spray Fields in Canada Larga

Given the protection granted to wetlands in the environmental/regulatory process, it is not known whether the District will be able to halt its discharges to the Ventura River. The RWQCB would probably not be willing to grant time extensions for a lengthy regulatory process. Lawsuits by local interest groups, such as Friends of the Ventura River, could delay the project for many years.

Alternative B1 - Secondary Reclaimed Water to the Ojai Valley

For Casitas MWD to agree to release water to the Ventura River, significant water rights and legal issues would need to be addressed. Once committed to maintaining riparian habitat, that responsibility could exist in perpetuity, regardless of what happens to the District's reclaimed water system. Casitas MWD would be rightfully concerned about entering into any such agreement.

Converting orchards to furrow irrigation could also present some obstacles.

Alternative C1 - Tertiary Reclaimed Water to Rincon Orchards

The recent pilot studies by JMM confirm that the existing secondary treatment processes are not well adapted to adding filtration. Even if filtration proves feasible, large amounts of chemicals would likely need to be added prior to filtration. The chemicals add to the cost of treatment and sludge disposal.

In recent years, the RWQCB has preferred not to issue permits with reduced winter requirements. The recent drought has shown that background stream flows can be reduced during extended winter periods. A gentle rain early or late in the season could reduce demands for irrigation without increasing stream flows.

Of the three preferred alternatives, Alternative B1 (Secondary Reclaimed Water to the Ojai Valley) is considered the most likely to meet environmental and regulatory requirements. It is also the most costly, even more costly than a new plant upgrade.

The information in this report was presented to the OVSD Board prior to their decision to upgrade the plant to meet all NPDES requirements.

Reclaimed Water Alternatives with an Upgraded Plant

With an upgraded plant, the District would also be able to implement a reclaimed water project. However, such a reclaimed water system would need to pay for itself without a subsidy from rate payers. It is not possible to deliver water to areas distant from the plant at rates competitive with current low local water rates without subsidy. Seasonal storage will also not be economical. The apparent self supporting markets are:

- 1) Oil companies south of the plant for secondary oil recovery.
- 2) Canada Larga agriculture, and orchards near the plant.
- 3) Farmont golf course.
- 4) Weldon Canyon landfill.

Of the four, oil company usage is preferable because demands are not seasonal and could offset demands being met with potable water, benefitting the local community.

If a Weldon Canyon landfill is approved, it would need only relatively minor amounts of reclaimed water, according to data in the EIR for the project. They would need to pay for any facilities required to deliver water from the plant to Weldon Canyon.

Facilities required for the landfill, however, could easily be extended to supply reclaimed water to Canada Larga. By growing crops in early spring and late fall, and leaving some land fallow in summer, optimum use could be made of the reclaimed water.

The Farmont golf course, if approved by the County of Ventura, may be required to use reclaimed water as a condition of its CUP. It would be costly to deliver water to the golf course, but Farmont officials have expressed a willingness to pay relatively high costs for reclaimed water. To make optimum use of reclaimed water, it would be preferable to supply base flows to Farmont, and have them meet peak demands from their wells.

Recommended Implementation Plan

The District faces very great demands over the next few years for building an upgraded treatment plant. While those activities are going on, local events, over which the District has little control, may determine the direction of a future reclaimed water system. The Weldon Canyon Landfill and the Farmont golf course may or may not be approved during that period. Either development could trigger, and pay for, an initial reclaimed water system. Local agencies may decide to import State Water Project water, which could increase local water rates, improving the competitiveness of reclaimed water prices.

Since the reclaimed water system could not be implemented until the new plant is operational, it is recommended that the District delay its reclaimed water projects until the plant upgrade is nearing completion. The following implementation plan is recommended:

- 1) Monitor the proposed Weldon Canyon Landfill and Farmont golf course developments. If either development moves forward, obtain funding from the developer to prepare a Water System Design Report to investigate the feasibility and costs of supplying them with reclaimed water. Pursue such a project if it is feasible and economical.
- After the plant upgrade is operational, participate in a laboratory and pilot testing 2) program with Shell Oil and/or Texaco, to determine whether the highly treated reclaimed water could be used for oil field injection. Laboratory testing performed by the oil companies could provide an indication of the feasibility of reclaimed water injection. However, full scale pilot testing should be done before implementing a full scale project. The oil companies have expressed an interest in participating in laboratory and/or pilot testing of reclaimed water used for injection. A temporary above-ground piping system could convey the reclaimed water to oil company facilities south of the plant. The oil companies would inject the water into an existing well over a period of time, to determine if the well becomes plugged or produces hydrogen sulfide gas. The oil companies should fund the majority of any pilot testing program. If reclaimed water injection is found to be feasible, the District could pursue a reclaimed water project for this purpose.
- 3) Depending upon the results of this pilot testing and the status of other proposed developments, the District could pursue delivering reclaimed water to Canada Larga for agricultural use. The upgraded plant will provide high quality water suitable for growing row crops such as strawberries and other more profitable crops that could support higher water rates and provide a better return to the District. As the plant upgrade nears completion, alternatives could be pursued with farmers in Canada Larga. Fodder crops are generally a marginal operation and the District could not expect a high return from such use. However, the Hearst Ranch, now for sale, may have new owners willing to purchase water.

In conclusion, the District should wait for other local issues to be resolved before further pursuing a reclaimed water system. When the new plant upgrade is operational, other markets for this high quality water may make a project economically feasible.

Section 1 INTRODUCTION

The Ojai Valley Sanitary District (OVSD) operates a 3.0 mgd wastewater treatment plant which serves the residents of the Ojai Valley. The plant presently produces approximately 1.7 to 2.0 mgd of secondary effluent, which is discharged into the Ventura River. A new NPDES discharge permit has been issued to OVSD by the Los Angeles Regional Water Quality Control Board (RWQCB). The permit requires tertiary treatment of the wastewater, ammonia removal, and reduction in nutrients that cause nuisance plant growth in the Ventura River. Pilot studies conducted by James M. Montgomery Engineers indicate that the existing plant needs to be completely rebuilt in order to meet the new discharge requirements.

An alternative to rebuilding the plant would be to develop a reclaimed water project wherein all of the plant effluent would be sold to agricultural or other customers instead of being discharged to the river. The purpose of this reclaimed water study was to identify water reclamation alternatives available to the District, and to evaluate the feasibility and costs of developing such a reclaimed water system. The secondary effluent presently produced by the plant has a significant potential for local reuse. Tertiary treatment of the wastewater, with or without nutrient removal, would create a larger potential market for beneficial use of the water for agricultural, industrial, or other uses. This Reclaimed Water Feasibility/Marketing Study describes the options available at both secondary and tertiary treatment levels.

Issues considered in the evaluation of the potential alternatives for a reclaimed water distribution system include the following:

- Regulatory limitations on the use of reclaimed water with various levels of treatment
- The distance from the plant to the irrigation site
- The need for seasonal storage
- Initial capital costs and long-term annual costs associated with each alternative
- Institutional issues
- Environmental issues

The environmental and regulatory issues associated with using reclaimed water for irrigation are discussed in Section 2. Sections 3, 4 and 5 review the potential local uses of reclaimed water and identify available markets.

In the study, eleven major reclaimed water system alternatives were investigated. These alternatives are discussed in Section 6 of this report. These eleven alternatives were further evaluated and narrowed down to the three apparent best alternatives that could reduce or eliminate treatment plant upgrade costs. The three preferred alternatives are discussed in detail in Section 7 of this report.

Section 8 discusses the need for seasonal storage and the sites available near the treatment plant. Section 9 covers several non-irrigation options for the disposal of reclaimed water. They include groundwater percolation, ocean discharge and connection to the City of Ventura sewer system. Section 10 describes alternatives that could distribute reclaimed water from an upgraded treatment plant. Section 11 reviews the recommended alternatives and discusses such items as timing, areas for further investigation, and actions to be taken to implement a reclaimed water system.

In preparing this report, useful information was obtained from several other reports and letters. They include the following:

"Wastewater Treatment Plant Improvements to Meet New NPDES Permit" prepared by JM Montgomery, December, 1991.

"Ventura River Study, Final Report," by JM Montgomery, dated July, 1991.

"Treatment Plant Improvements to Meet NPDES Requirements," prepared by Boyle Engineering Corporation, dated January, 1977.

"Oakview Reclamation Facilities Plan EIR," by PRC Toups, dated September, 1979.

"Water Quality Control Plan, Santa Clara River Basin," by Los Angeles Regional Water Quality Control Board.

Letter from Shell Oil Company to Boyle Engineering, dated October 1991.

Letter from Texaco to Boyle Engineering, dated October 1991.

Section 2 INSTITUTIONAL, REGULATORY AND ENVIRONMENTAL ISSUES

2.1 NPDES Permit Requirements

The Ojai Valley Sanitary District operates within the jurisdiction of the Los Angeles Regional Water Quality Control Board. The RWQCB issued a Cease-and-Desist Order to the District requiring an upgraded treatment plant by the summer of 1992. The RWQCB issued a new NPDES (National Pollutant Discharge Elimination System) permit for the Ojai Valley Wastewater Treatment Plant in May of 1990, requiring a significant upgrade of the quality of the effluent before it is discharged into the Ventura River. Following is a summary of several of the requirements of this NPDES permit. A copy of the permit is included in Appendix A.

- Secondary effluent as presently discharged from the plant may not be discharged into the Ventura River after July 1, 1993. Because of public recreational activities involving water contact downstream of the plant, the effluent must meet Title 22 requirements for full body contact, including disinfection, oxidation, coagulation, clarification, and filtration of the wastewater.
- BOD: The biochemical oxygen demand (5-day) for a 30-day average must be less than 10 mg/l with an allowable maximum of 20 mg/l. The prior NPDES permit allowed a 20 mg/l average and 30 mg/l maximum value.
- Total suspended solids: The 30-day average must be below 10 mg/l, with an allowable maximum of 15 mg/l. The previous permit allowed 30 mg/l for the 30-day average and 45 mg/l for the maximum value.
- Dissolved oxygen content: The new NPDES permit reiterates that the dissolved oxygen content of the receiving water should not fall below 7 mg/l. Dissolved oxygen levels in the effluent downstream of the plant have sometimes fallen below this limit.
- The permit requires OVSD to conduct studies and develop criteria on reducing nuisance plant growth in the Ventura River.

The new NPDES permit also imposes other effluent quality standards. The present secondary effluent produced by the plant will not meet the new NPDES requirements. Based on information provided by James M. Montgomery Consulting Engineers in their December, 1991 report regarding plant improvements required to meet the NPDES permit standards, a significant plant upgrade will be required in order to meet the required effluent quality.

2.2 Environmental Releases to the Ventura River

The OVSD Wastewater Treatment Plant presently discharges approximately 1.7 to 2.0 mgd into the Ventura River. During dry seasons this water constitutes the majority of the flow in the lower reach of the Ventura River. OVSD may be required to maintain a minimum base flow to the Ventura River to protect aquatic life and riparian habitat, although the requirement has not been definitively established at this time. The 1979 PRC Toups EIR entitled "Oakview Reclamation Facilities Plan" addressed the possible requirement for streamflow augmentation by OVSD. Following is an excerpt from Page 3-8 of that report:

"SWRCB, in a memo dated September 15, 1978, indicated that they would, as a grant condition, require the OVSD to maintain at least a 1 cfs flow in the Ventura River from May through November in full compliance with all waste discharge requirements. The OVSD provides the majority of flow in the lower Ventura River throughout much of the year. The companion Project Report (PRC Toups 1978) estimates that 0.3 cfs is removed from the lower Ventura River by riparian users. Thus, to meet the SWRCB recommendations and maintain a supply of water to the riparian users, 1.3 cfs (0.84 mgd) of wastewater must be discharged to the Ventura River during May through November. This component of the streamflow augmentation, therefore, becomes a component of any of the viable alternatives."

Summer flows in the Ventura River are now reduced below historical levels due to the construction of Matilija Lake, Lake Casitas, various diversion facilities, and due to groundwater pumping. Riparian habitat and wetlands along the river may now depend to some extent upon wastewater effluent for survival. Before implementing a reclaimed water system, the requirements of CEQA (California Environmental Quality Act) will need to be met, which will most likely require completion of an environmental impact report (EIR). The environmental studies should address whether continued releases are necessary to support habitat. Whether OVSD is obligated to maintain a supply to riparian users will also need to be confirmed. Complex legal and water rights issues are involved which need to be thoroughly investigated.

2.3 Potential Participation by Casitas Municipal Water District

The OVSD Treatment Plant presently produces approximately 2200 acre-feet of reclaimed water per year. If reclaimed water from the wastewater treatment plant is used to irrigate crops presently irrigated by water supplied by Casitas MWD, demands on Casitas MWD would be reduced by up to that amount. OVSD may be required to discharge some minimum amount to the Ventura River for environmental reasons. If the effluent is not of adequate quality to be released to the river, an arrangement might be made between OVSD and Casitas MWD whereby Casitas MWD would discharge the required flows to the river in exchange for its decreased demands resulting from reclaimed water availability. If 1.3 cfs were required to be discharged to the Ventura River for 6-months, for example, a total annual river supplement of 470 acre-feet would be required.

Casitas MWD may participate financially in a reclaimed water project that offsets demands on Lake Casitas. Other water agencies provide subsidies to encourage reclaimed water use. For example, Metropolitan Water District of Southern California's Local Projects Program provides a subsidy of \$154 per acre foot of reclaimed water sold within its service area that offsets the need for pumping water from Northern California and that reduces the need to develop additional water supplies. Certain conditions must be met to receive the subsidy. Similarly, Casitas could develop its own reclaimed water incentive program.

2.4 **Potential Participation by the City of Ventura**

OVSD currently leases the land for its wastewater treatment plant from the City of Ventura. The lease for the land includes the following clause:

"Effluent

Lessor (Ventura) has the right to take, use, or dispose of the effluent of Lessee's (OVSD's) sewage treatment plant, at its election. Lessee has the option of participating in 50 percent of the revenues therefrom. If lessee participates in the revenues, it shall share equally in the cost of any transmission, processing, or treatment of the effluent incurred by the lessor. Lessee shall dispose of the effluent in accordance with the rules and regulations of the appropriate state agencies until such time as the Lessor elects to take all or any part of the effluent."

The City of Ventura could therefore request to participate in a reclaimed water project by OVSD. Discussions with the City were not held as part of this study. Since a reclaimed water system would likely require a subsidy, it was assumed that Ventura would not participate.

Section 3

RECLAIMED WATER QUALITY AND POTENTIAL USAGE

In this study, three levels of treatment have been considered for the reclaimed water from the OVSD Wastewater Treatment Plant. The first level is secondary effluent, as now produced by the plant. The next level of treatment involves tertiary treatment (filtration) of the secondary effluent to achieve Title 22-quality effluent, but without nutrient removal. The third level includes tertiary treatment with nutrient removal to meet the new NPDES requirements.

3.1 State Health Department Requirements

Potential uses of reclaimed water depend upon the level of treatment provided. The California State Department of Health Services has established regulations regarding the use of reclaimed water for irrigation purposes. Some of the requirements of California Administrative Code, Title 22, Division 4, Chapter 3 are summarized as follows:

- 1) Reclaimed water used for spray irrigation of food crops shall be provided with full tertiary treatment (disinfected, oxidized, coagulated, clarified, filtered wastewater).
- 2) Reclaimed water used for surface irrigation of food crops shall be provided with secondary treatment (adequately disinfected and oxidized). Orchards and vineyards may be surface-irrigated with reclaimed water that has the quality at least equivalent to that of primary effluent provided that no food is harvested that has come in contact with the irrigating water or the ground.
- 3) Exceptions to the quality requirements for reclaimed water used for irrigation of food crops may be considered by the State Department of Health on an individual case basis where the reclaimed water is to be used to irrigate a food crop which must undergo extensive processing sufficient to destroy pathogenic agents before it is suitable for human consumption.
- 4) Reclaimed water used for the surface or spray irrigation of fodder, fiber and seed crops shall have a level of quality no less than that of primary effluent.

According to the provisions of Title 22, secondary effluent is not permitted to contact fruit intended for human consumption unless that fruit will be highly processed (such as canning). Tertiary-treated water (coagulated and filtered) is not subject to this restriction. Because tertiary-treated water is of higher quality than secondary treated water, tertiary-treated water may be substituted where the use of secondary water is permitted.

As far as health regulations are concerned, nutrient levels do not determine how tertiary reclaimed water can be used. Reclaimed water distribution alternatives have been developed for water receiving each of the three levels of treatment. The following is a list of potential uses for secondary- and tertiary-treated water.

Type of Use

Furrow irrigation of orchards Golf courses Landscaping Fodder crops (alfalfa, hay) Parks and school yards Spray or drip irrigation of orchards Oilfield enhanced recovery Discharge into River Minimum Level of Treatment Required

Secondary Secondary Secondary Secondary Tertiary, without nutrient removal Tertiary, without nutrient removal Tertiary, with nutrient removal Tertiary, with nutrient removal

If golf courses and landscaping use secondary effluent, public access must be restricted during irrigation, and adjacent properties must be protected against overspray or contact with reclaimed water. Otherwise, tertiary treated reclaimed water must be used.

3.2 Uses of Secondary Effluent

Use of the secondary effluent now produced by the plant has limits. It cannot be discharged into the Ventura River after July 1, 1993, and it cannot be spray irrigated directly onto fruits and vegetables intended for human consumption. Due to seasonally fluctuating irrigation demands, any alternative which uses secondary water for irrigation purposes will require seasonal storage. Nevertheless, and in spite of these limits, there is significant potential for local use of secondary effluent, as discussed below.

Furrow Irrigation of Orchards

Furrow irrigation, in contrast to spray irrigation, does not involve direct contact between the fruit on the trees and the irrigation water. Furrow irrigation has been used in the Ojai Valley in the past, but the practice has now been almost entirely replaced by drip irrigation due to inefficiencies associated with furrow irrigation.

Following is a description of furrow irrigation requirements and limitations:

1. In order for furrow irrigation to be effective, the land must have a fairly uniform, gentle slope. A significant portion of the Ojai Valley meets this criteria, and in fact has used furrow irrigation in years past. Old stand pipes and flow splitters are still visible at the edge of some of the orchards of the Ojai Valley, although

most of those orchards are now irrigated by drip systems. Orchards around the northeast perimeter of the Valley and in the Rincon area, however, cannot use furrow irrigation because of the hilly terrain where they are located.

- 2. Furrow irrigation requires more water for a given acreage than sprinklers or drip irrigation, due to percolation, evaporation, and ponding. This is not a significant drawback to the use of secondary water for furrow irrigation, since the purpose of the project would be to use as much of the plant effluent as possible to avoid discharges to the Ventura River.
- 3. Furrow irrigation is fairly labor intensive compared to drip or sprinkler systems. Ditch gates, valves, and other irrigation devices must be regularly adjusted. Furrows must be maintained in good condition. Farmers in the Ojai Valley area may no longer have the expertise to maintain and operate furrow irrigation.
- 4. Soil conditions in parts of the Ojai Valley are fairly rocky, and such areas could present some difficulty in achieving smooth furrows and avoiding areas of ponding. The soil in the west end of the valley is less rocky and more suitable for furrow irrigation.
- 5. Due to health regulations, run-off of reclaimed water from a field or orchard must be controlled by collecting the tail water and recirculating it back to the head of the furrows. This will involve the expense of a tailwater return system consisting of a small collection reservoir, a pump station, and piping.
- 6. Due to health regulations, fencing will be required around fields or orchards irrigated with secondary effluent.

Converting existing citrus orchards to use secondary effluent by furrow irrigation is feasible although it would require a significant effort to educate and persuade the farmers to use it. If the practice of furrow irrigation is economically attractive due to an abundant water supply and low rates, the farmers may be willing to convert their orchards to the use of secondary effluent. Boyle staff contacted Nick Sakovich of the University of California Co-operative Extension at Ventura County, and Lyle Carson, a well-known citrus grower in the Ojai Valley, to learn their views of the feasibility of furrow irrigation in the citrus orchards in the Ojai Valley. They generally confirmed the information described above. Lyle Carson indicated that if reclaimed water were economically feasible and of adequate quality for his orchards, he would consider using it.

If furrow irrigation with reclaimed water were implemented, the District might need an irrigation coordinator to assist local farmers in converting their orchards to furrow irrigation, and to help operate their furrow irrigation systems.

Spray Fields

Another disposal method for secondary effluent is the use of spray fields, where sprinkler systems apply as much water as possible to land used to grow crops such as alfalfa or grasses. Such crops can be harvested or used directly as grazing land for livestock.

While an orchard in the Ojai Valley will use approximately 2½ acre-feet of water per acre during a year, a spray field typically receives 6 to 20 acre-feet of water per acre per year. In a spray field application, more water is typically applied to the soil than can be used by the plants, with the excess percolating into ground water or evaporating. When secondary effluent is used for a spray field, care must be taken that runoff from the field does not enter the local natural drainage course. Therefore, less water can be applied during the wet winter season than in the dry season, if runoff of secondary effluent is to be avoided. Seasonal storage would therefore be required, because the OVSD Wastewater Treatment Plant discharges effluent at a fairly constant rate year round. Seasonal storage is also referred to as "wet season storage."

State health regulations for groundwater recharge with reclaimed water also apply to spray fields. Percolated water must blend with other water supplies; the groundwater table must be a certain distance below ground; potable wells must be distant from the percolation area; and minimum underground retention times are required. These issues are described in greater detail in Section 9.1.

3.3 Uses of Tertiary Effluent

Two levels of tertiary treatment have been considered for the effluent from the OVSD Wastewater Treatment Plant. The first level includes coagulation and filtration to meet Title 22 requirements without nutrient removal. The second level requires coagulation, filtration, and nutrient removal in accordance with the NPDES permit requirements. Tertiary treated reclaimed water may be used for all applications where secondary effluent is acceptable. Unlike secondary treated water, tertiary water can be used for drip or spray irrigation of orchards. Tertiary water may also be suitable for oil field injection; although, nutrient removal will probably be needed.

Use of Tertiary Effluent for Oil Field Injection

The ten largest water users in the City of Ventura are shown on Table 3-1. The two largest water users are Shell Oil and Texaco, oil companies which produce crude oil from the Ventura Avenue oilfield north of Ventura. The oil companies inject water under high pressure into the oil bearing strata below ground to force oil to migrate to existing oil wells. This method improves the production of oil from the field and extends its life. Some research has already been done on the potential use of reclaimed water for oil field injection by the oil companies themselves. They have identified two areas of concern which must be resolved before the reclaimed water can be used. These areas of concern are 1) the plugging of pores in the underground rock

strata by suspended solids in the water and by the growth of slimes, and 2) the growth of sulfate reducing bacteria underground which feed on nutrients in the water and produce hydrogen sulfide gas.

Table 3-1

10 LARGEST WATER CUSTOMERS (1990) CITY OF VENTURA WATER DEPARTMENT

	Name	1990 AF Used	
	Shell Oil Compony	1110	
1) 0)	Shea Oil Company	1110	
2)	Texaco Producing, Inc.	993	
3)	United Foods, Inc.	211	
4)	Ventura County	172	
5)	Lemon Wood, Ltd.	114	
6)	Community Memorial Hospital	109	
7)	Ventura County Medical Center	98	
8)	Pepsi Cola Bottling Company	93	
9)	Ventura County	85	
10)	Cabrillo Co-Op HSE Corporation	83	

In September, 1991, Boyle contacted the two oil companies, Shell Oil and Texaco, regarding their potential use of reclaimed water for oil field injection. While each oil company uses substantial amounts of water every day, each expressed concern about reclaimed water quality, which could cause detrimental effects to the oil bearing strata in their well fields. Written responses from Shell and Texaco are attached in Appendix B. In order to satisfy the oil company concerns, the OVSD effluent would need to be coagulated and filtered, and would probably need to have nutrients removed. It may be possible to avoid nutrient removal by adding a bactericide to the effluent. The water quality requirements for oilfield injection are quite stringent. For example, Shell Oil allows only one part per million of total suspended solids, no bacteria, and low sulfates, nitrogen, and organics. The oil companies would need to conduct laboratory testing and pilot studies to confirm the feasibility of using the tertiary effluent for oilfield injection. Pilot tests would need to inject reclaimed water into an injection well over a long period to determine the amount of clogging.

The demand for water for oil field injection varies as new wells are drilled and old wells are abandoned. It is expected that future demands for water for injection will eventually decline as the oil field is depleted and all available oil is pumped from the ground. Also, the oil fields are sometimes shut down for repairs, and there are periods in which little or no water is used for injection. During such periods of low water use, the excess reclaimed water would need to be placed in a large storage reservoir for later use, or discharged to the Ventura River.

3.4 **Projected Reclaimed Water Supply**

Flows treated by the OVSD wastewater treatment plant average 1.7 to 2.0 mgd. Recent flows have been reduced below 2.0 mgd due to drought related water conservation measures, such as low flow toilets and showerheads, which reduce wastewater flows. The wastewater treatment plant is sized for 3.0 mgd. Given the slow rate of growth in the Ojai Valley, the 3.0 mgd capacity will not be exceeded for a long time, if ever.

For the purpose of evaluating a reclaimed water system, it has been assumed that 2.0 mgd of reclaimed water will be available. The facilities have been sized to distribute 2.0 - 3.0 mgd of effluent.

If a reclaimed water system is feasible with a supply of 2.0 mgd and is implemented, then experience suggests that reclaimed water demand will grow faster than the supply, and that increased supplies could be fully utilized.

3.5 Water Demand Factors

The following annual water use factors were used to estimate the demand from each potential customer:

Table 3-2

Water Use Demand Factors

	Annual Irrigation Demand (acre-feet per
Type of Use	acre per year)
Orchards (citrus, avocados) Alfalfa Turf (parks & golf courses) Landscaping	2.5 4.0 3.0 3.0

3.6 Monthly Demand Factors

Seasonal demands vary throughout the year, with highest demands in the hot summer months. Seasonal demand fluctuations have been published by Casitas MWD, based partly on data collected as part of the County of Ventura's water conservation program. Seasonal demand factors used as part of this study are as follows:

Table 3-3

Seasonal Irrigation Demands

Month	Peaking Factor
Januarv	0.41
February	0.41
March	1.02
April	1.03
May	1.48
June	1.45
July	1.53
August	1.37
Septembe	er 1.19
October	0.96
Novembe	r 0.68
Decembe	r 0.46

3.7 Local Water Rates

Recent Casitas MWD water rates for agricultural use are as follows:

\$80/AF	Prime Agriculture
\$125/AF	Non-Prime Agriculture

Where prime agriculture is defined as land for which long-term contracts exist with the County to reduce property taxes and maintain the land under agriculture, in accordance with the Williamson Act. The water rates are under evaluation and will likely increase to help pay for Casitas MWD's new water filtration plant.

The above water rates are fairly low, and it will be difficult to distribute reclaimed water competitive with those rates. Reclaimed water systems are typically successful in areas with high water rates. For example, reclaimed water in Triunfo County Sanitation District in the eastern part of Ventura County sells for \$450 per AF.

Section 4 EVALUATION OF RECLAIMED WATER USE FOR AGRICULTURAL IRRIGATION

4.1 IRRIGATION WATER QUALITY

Water quality for irrigation is directly related to the concentration and kind of chemical constituents present. The constituents related to water quality that may affect irrigation water suitability for crops (primarily oranges and avocados) include electrical conductivity (EC_w), sodium adsorption ratio (SAR), bicarbonates, chlorides, and boron. General University of California irrigation water quality guidelines are shown on Table 4-1. A summary of the secondary effluent quality from OVSD is presented in Table 4-2. It is not expected that tertiary treatment would significantly change constituent levels important for irrigation purposes.

Electrical Conductivity

Electrical conductivity (EC_w) is a measure of the total salt content of the irrigation water. It is expressed as millimhos per centimeter (EC_w $\times 10^3$) or micromhos per centimeter (EC_w $\times 10^6$) at 25°C. The relationship of irrigation water salinity (EC_w) to plant yield response is shown on Table 4-3. In general, the OVSD reclaimed water salinity is acceptable for the irrigation of crops produced in the project area without serious consideration for potential yield reductions. The salinity of wastewater is slightly higher than desirable (Table 4-2), and more intensive irrigation management may be required in order to control soil salinity levels. This is not anticipated to be a serious problem. Adequate rainfall in the project area would assist the salt leaching process and help to mitigate the accumulation of soluble salts in the soil profile.

TABLE 4-1

	Water Quality Guidelines		
	No	Increasing	Severe
Problem and Related Constituent	Problem	Problems	Problems
Salinitv ¹			
EC _w of irrigation water (mmhos/cm)	<0.75	0.75 - 3.0	>3.0
Permeability			
EC _w of irrigation water (mmhos/cm)	>0.5	<0.5	<0.2
adj.SAR ²	<6.0	6.0 - 9.0	>9.0
Specific ion toxicity ³ from root absorption			
Sodium (evaluated by adj.SAR)	<3.0	3.0 - 9.0	>9.04
Chloride (meq/l)	<4	4.0 - 10.0	>10
Chloride (mg/l)	<142	142 - 355	>355
Boron (mg/l)	<0.5	0.5 - 2.0	2.0 - 10.0
Foliar absorption ⁵ - sprinklers			
Sodium (meq/l)	<3.0	>3.0	
Sodium (mg/l)	<69	>69	
Chloride (meq/l)	<3.0	>3.0	
Chloride (mg/l)	<106	>106	
Miscellaneous ⁶			
NH₄-N and NO₃-N (mg/l)			
for sensitive crops	<5	5-30	>30
HCO ₃ (only with overhead sprinklers)			
(meq/l)	1.5	1.5 - 8 .5	>8.5
HCO ₃ (only with overhead sprinklers)			
(mg/l)	<90	90 - 520	>520
рН	Normal range = 6.5 - 8.4		

GUIDELINES FOR INTERPRETATION OF WATER QUALITY FOR IRRIGATION

¹Assumes water for crop plus needed water for leaching requirement will be applied. Crops vary in tolerance to salinity (mmho/cm x 640 - approximate total dissolved solids (TDS), in mg/l; mmho x 1000 = μ mhos).

²adj.SAR (adjusted sodium adsorption ratio) is calculated from a modified equation developed by U.S. Salinity Laboratory to include added effects of precipitation or dissolution of calcium in soils and related to $CO_3 + HCO_3$ concentrations. Permeability problems, related to low EC or high adj.SAR of water, can be reduced if necessary by adding gypsum. Usual application rate per acre-foot of applied water is from 200 to about 1,000 pounds. 234 pounds of 100% gypsum added to 1 acre-foot of water will supply 1 meq/l of calcium and raise the EC₂ about 0.1 mmho. In many cases, a soil application may be needed.

•••

TABLE 4-1 (continued)

³Most tree crops and woody ornamentals are sensitive to sodium and chloride. Most annual crops are not sensitive.

⁴Shrinking-swelling type soils (montmorillonite type clay minerals); higher values apply for others.

⁵Leaf areas wet by sprinklers may show a leaf burn due to sodium or chloride absorption under low-humidity/highevaporation conditions. (Evaporation increases ion concentration in water films on leaves between rotations of sprinkler heads.)

⁶Excess N may affect production or quality of certain crops, i.e., sugar beets, citrus, avocados, apricots, and grapes. (1 mh/1 NO₃-N = 2,172 N/acre-foot of applied water.) HCO₃ with overhead sprinkler irrigation may cause a white carbonate deposit to form on fruit and leaves.

- Reference: Ayers, Robert S., Quality of Water for Irrigation, <u>Journal of the Irrigation and Drainage Division</u>, ASCE, June 1977.
- Note: Interpretations are based on possible effects of constituents on crops or soils or both. Guidelines are flexible and should be modified when warranted by local experience or special conditions of crop, soil, and method of irrigation.
TABLE 4-2

SUMMARY OF EFFLUENT QUALITY FROM OVSD¹

Units	Range of Results ²
mg/l	179 - 188
mg/l	0.5 - 0.6
mg/l	95 - 108
mg/l	126 - 140
mg/l	27 - 33
mg/l	94 - 113
	7.2 - 7.6
ma/l	880 - 920
mg/l	239 - 253
dS/m	1 33 - 1 38
	122 - 132
	28.30
	2.0-0.0 6.1_6 <i>1</i>
	0.1-0.4
	Units mg/l mg/l mg/l mg/l mg/l mg/l mg/l dS/m mg/l

¹Effluent quality data is a composite of three samples taken during the last week of October 1991.

²High and low range for three samples.

TABLE 4-3

		Percent Reduc	tion in Yield	
	0%	10%	25%	50%
Crop	EC _w ²	EC _w	ECw	ECw
Beans	0.7	10	1.3	23
Bell Penner	0.9	1.3	20	2.0
Cabbage	1.1	1.7	2.0	47
Cantaloupe	1.5	2.3		
Carrot	0.7	1.0	1.7	2.7
Lettuce	0.9	1.3	2.0	3.3
Onion	0.9	1.3	2.0	3.3
Sweet Corn	1.1	1.7	2.7	4.0
Tomato	1.8	2.7	4.3	5.3
Almond	1.1	1.7		3.3
Apple	1.1	1.7		3.3
Apricot	1.1	1.7		3.3
Avocado	0.9	1.3		2.7
Citrus	1.1	2.5		5.0
Grape	1.8	2.7		5.3
Peach	1.1	1.7	**	3.3
Wainut	1.1	1.7		3.3

POTENTIAL YIELD REDUCTION OF SEVERAL CROPS AS RELATED TO THE SALINITY OF THE IRRIGATION WATER¹

¹Adapted from "Water Quality for Irrigation," by L. K. Stromberg, Farm Advisor, Fresno County, November 15, 1975.

 $^{2}\text{EC}_{w} \times 10^{3}$ is expressed in mmhos/cm at 25°C.

Sodium Adsorption Ratio

The sodium adsorption ratio (SAR) is the most reliable index of irrigation water sodium hazard to crops and soils. A moderately high SAR will not generally result in a toxic effect to most plants. However, some crops are sensitive to excess sodium. The sodium concentration in the reclaimed water source, as evaluated by SAR, is at the upper limit of acceptability. Referring to Table 4-2, the range of sodium adsorption ratios is not expected to cause adverse conditions to crop production, but should be monitored to detect significant increases. The sodium content, as evaluated by milligrams per liter, is higher than desirable in the reclaimed water. Foliar toxicity may exist due to elevated sodium concentrations; however, it is a site/crop-specific phenomenon.

A reduction in soil permeability is a major problem that occurs with irrigation water high in sodium. Applying water with an SAR below 6 does not usually result in permeability problems. If the SAR is between 6 and 9, permeability problems can occur on fine-textured soils. An SAR above 9 will likely result in permeability problems on all mineral soils except coarse, sandy soils. Permeability problems are not likely to occur in the project area as a result of sodium concentrations, based on low sodium hazards indicated by the measured sodium adsorption ratio (Table 4-2).

Bicarbonates

Bicarbonates in irrigation water applied to the soil will precipitate calcium from the cation exchange complex as relatively insoluble calcium carbonate. As exchangeable calcium is lost from the soil, the relative proportion of sodium is increased with a corresponding increase in the sodium hazard (SAR). Bicarbonates in the irrigation water contribute to the overall salinity, but, more importantly, they may result in a previously calcium-dominant soil becoming sodium dominant by precipitating the exchangeable calcium which, in turn, will reduce soil permeability.

A measure of the bicarbonate hazard in irrigation water can be expressed as the adjusted SAR. The adjusted SAR takes into account the concentration of bicarbonates in irrigation water in relation to their effect on potential increases in soil SAR. When the adjusted SAR is less than 6, soil permeability problems generally do not occur. If the adjusted SAR is between 6 and 9, permeability problems can occur on fine-textured soil. An adjusted SAR above 9 will likely result in permeability problems on mineral soils except coarse, sandy soils. Adverse impacts to soil permeability are not a major concern. Periodic soil or water treatment can be done to maintain favorable water infiltration characteristics in project soils.

High concentrations of bicarbonates in irrigation water applied by sprinklers may cause whitewashing and leaf burn. The bicarbonate content in the reclaimed water is sufficiently high to cause concern (Table 4-2).

Bicarbonates in irrigation water may also cause potential problems in micro-irrigation systems as a result of lime precipitation, which can cause emitter plugging. These potential problems are accentuated in alkaline irrigation water sources such as OVSD

reclaimed water. Lime precipitation in micro-irrigation systems may be a problem in systems installed to irrigate permanent crops (citrus/avocado) in the project area.

Chlorides

Chlorides are necessary for plant growth in relatively small amounts. However, high concentrations of chlorides can inhibit growth and result in toxicity to foliage if applied by sprinkler irrigation. Chlorides in irrigation water are specifically toxic to some plant species. The tolerance of some crops to chloride is shown on Table 4-4. The chloride concentration of the reclaimed water is slightly higher than desirable and may cause foliage toxicity problems with sprinkler irrigation of chloride-sensitive crops (Table 4-2). This is not expected to be a serious problem.

Boron

Boron in irrigation water does not have an effect on soil physical conditions, but in high concentrations it can have a toxic effect on some plants. The tolerance of some crops to boron is shown on Table 4-5. The slightly elevated boron concentration of the wastewater should not impact crop suitability/yield in the project area (Table 4-2), but monitoring to detect concentration increases is recommended.

TABLE 4-4

CHLORIDE TOLERANCE LIMITS OF SOME FRUIT CROP ROOTSTOCKS AND CULTIVARS¹

	Cl ²	
Сгор	(mg/l)	
Rootstocks		
Avocado		
West Indian	175	
Guatemalan	140	
Mexican	105	
Citrus		
Sunki mandarin grapefruit	595	
Grapefruit	595	
Cleopatra mandarin	595	
Rangpur lime	595	
Sampson tangelo	350	
Rough lemon	350	
Sour orange	350	
Ponkan mandarin	350	
Citrumelo 4475	245	
Trifoliate orange	245	
Cuban shaddock	245	
Calamondin	245	
Sweet orange	245	
Savage citrange	245	
Rusk citrange	245	
Troyer citrange	245	
Grape		
Salt Creek	910	
Dog Ridge	700	
Stone fruit	595	
Mariuanna	595	
Lovell	595	
Shalil	595	
Yunnan	175	

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TABLE 4-4 (continued)

Сгор	Cl ² (mg/l)	
Cultivars		
Berries		
Boysenberry	245	
Olallie blackberry	245	
Indian summer raspberry	105	
Grape		
Thompson seedless	455	
Perlette	455	
Cardinal	245	
Black rose	245	
Strawberry		
Lassen	175	
Shasta	105	
Shasta	105	

¹Reference: Hanson, B. and S. Grattan, Agricultural Salinity and Drainage, A User's Handbook, University of California, Davis, January 1992.

²Chloride concentration of the irrigation water.

TABLE 4-5

RELATIVE TOLERANCE OF SEVERAL CROPS TO BORON IN IRRIGATION WATER^{1,2}

Sensitive	Semi Tolerant	Tolerant
0.5 - 1.0 mg/l	1.0 - 2.0 mg/l	2.0 - 4.0 mg/
Lemon	Lima Bean	Carrot
Grapefruit	Sweet Potato	Lettuce
Avocado	Bell Pepper	Cabbage
Orange	Tomato	Onion
Apricot	Field Pea	Melon
Peach	Radish	Asparagus
Cherry	Sweet Pea	
Grape	Potato	
Apple		
Pear		
Plum		
Navy Bean		
Walnut		
Peach		
Almond		

¹Adapted from USDA Technical Bulletin No. 448.

²In each group the plants named first are considered as being more sensitive and those named last more tolerant.

4.2 Irrigation Water Suitability

The suitability of the OVSD reclaimed water is summarized on Figure 4-1. The irrigation water quality with regard to conductivity (C) and sodium hazard (S) is determined by plotting corresponding values on this figure. Potential soil management and crop production problems that can arise as a result of irrigating with water of a certain quality can thus be determined.

The wastewater falls in the C3-S2 classification. Water with this quality should be used only on soils with no restrictive layers so that salt leaching can be accomplished. Water penetration problems may develop on fine-textured soils unless gypsum is present. Plants with low salt tolerance, such as citrus/avocados, are generally considered suitable in the lower ranges of this classification.



Leaching is a percolation process whereby excess irrigation water passes through the root zone and thus moves soluble salts downward to prevent their accumulation in harmful concentrations. This process maintains a favorable salt balance in the root zone. It requires leaching an equal or greater amount of salt from the soil in the drainage water than that introduced by irrigation water. The leaching requirement is defined as the fraction of irrigation water that must be leached through the root zone to maintain soil salinity at a specified level. The leachate moves out of the root zone as drainage water.

The leaching fraction required to maintain a suitable salt balance can be calculated analytically if the electrical conductivity of both irrigation and drainage water is known. The University of California has published guidelines based on irrigation water electrical conductivity versus potential yield reduction and leaching fraction which is required to maintain a favorable salt balance in the soil. The leaching requirement is expressed as the percentage of water applied in excess of the irrigation water application requirement that is needed to maintain a favorable salt balance without exceeding crop salt tolerance levels.

Groundwater in the Ojai Valley has better quality when compared to reclaimed water. However, application of reclaimed water to supplement the irrigation water sources should not cause serious problems with crop suitability or production.

Section 5 PRELIMINARY MARKET SURVEY

5.1 Methodology

Potential reclaimed water customers were identified by studying aerial photographs of agricultural areas within a reasonable distance of the plant. The areas studied extended from the Santa Barbara County Line on the west, to the east end of the Ojai Valley, and south to the ocean. The following types of potential customers were identified:

- Orchards
- Large landscaped areas
- Golf courses
- Fodder crops
- Row crops
- Grazing lands

The potential customers were marked on a large map (Plate 1) at a scale of $1^{"} = 2,000'$, which covered the study area. Plate 1 (enclosed in a pocket at the end of this report) outlines the orchards, hay fields, etc. which could receive reclaimed water. The total land area of each customer was found by planimetering. An estimate was made of the effective irrigable area, which generally ranged from 70 percent to 95 percent of the total area. Plate 1 shows each potential customer labeled with its total area and a customer number. Customer numbers beginning with O are associated with the Ojai Valley; customers beginning with R are associated with the Rincon area; and customers beginning with V are along the Ventura River south of the plant, or in Canada Larga.

By inspection of Plate 1, it is evident that the largest areas of agricultural demand, such as on the Rincon and in the Ojai Valley, are several miles distant from the OVSD Wastewater Treatment Plant. There is not enough potential demand in Canada Larga and in the Ventura River Valley near the plant to use all of the effluent for irrigation. Previous studies may have over-estimated the potential irrigable acreage in Canada Larga Canyon. Although the area dedicated to agricultural use in Canada Larga is quite large, the flat areas suitable for growing crops total only about 300 acres. The majority of the remaining area consists of hillsides suitable primarily for grazing. Near the mouth of Canada Larga are about 110 additional irrigable acres.

5.2 Potential Markets Found

The following major irrigation areas were identified in the survey.

- Canada Larga hay fields
- Orchards in the east end of the Ojai Valley
- Orchards on the Rincon

- Soule Park Golf Course
- Ojai Valley Inn golf course
- Rancho Matilija hay fields or proposed Farmont golf course

Boyle contacted some land owners in these areas to determine their interest in receiving reclaimed water, and to learn details on their actual water usage. Following is a brief summary of discussions with some of the potential reclaimed water users.

Canada Larga Ranch

The Canada Larga Ranch lies near the mouth of Canada Larga, and includes approximately 160 acres of land which is presently dry farmed, which could be irrigated. Mr. Schull Bonsall, the owner, provided a letter of intent to OVSD dated October 9, 1979, to receive reclaimed water from the treatment plant. At that time, the unit price of reclaimed water was expected by Mr. Bonsall to be around \$34 per acre-foot. Mr. Bonsall recently indicated that he is still willing to accept reclaimed water to irrigate his land if it is available.

George Hearst Ranch

The Hearst Ranch is located at the east end of Canada Larga Canyon and includes approximately 100 acres of land that is dry farmed. The Hearst Ranch is presently for sale. Potential buyers have contacted Boyle about the availability of reclaimed water. The Hearst Ranch may be able to use reclaimed water, depending upon the status of the sale of the ranch.

Soule Park Golf Course

The Soule Park Golf Course is owned by the County of Ventura and leased to Mr. Yamada and Mr. Hasegawa, who operate it. The golf course consists of 130 acres of irrigated turf, with about 35 percent of the water needs supplied by Casitas MWD and the remainder supplied by an on-site well. The manager of the golf course, Jim Allen, expressed interest in using reclaimed water to irrigate the Soule Park Golf Course.

Soule Park

Soule Park is owned and operated by the County of Ventura, and lies immediately adjacent to the Soule Park Golf Course. Soule Park consists of approximately 30 acres of irrigated turf, which is irrigated by a local well, with peak demands supplied by Casitas MWD. Casitas MWD supplies about 35 percent of the irrigation demand for the park. This totaled approximately 37 acre-feet between July 1990 and June 1991.

Ojai Valley Inn and Country Club

The Ojai Valley Inn and Country Club's golf course has 130 acres of irrigated turf. The manager of the country club, Sam Williamson, estimates that 2 1/2 acre-feet of water per acre is used each year to irrigate the golf course. All of the water now used to irrigate the golf course is supplied by Casitas MWD, through a pipeline with a capacity of

2,000 gpm at 175 psi pressure. The country club presently purchases water from Casitas MWD for \$314 per acre-foot. Mr. Williamson is considering having a well constructed to decrease the dependency of the golf course on Casitas MWD water.

Senior Canyon Mutual Water Company

The Senior Canyon Mutual Water Company is located in the northeast corner of the Ojai Valley and serves both agricultural and residential customers. The water supply is obtained from a local well operated by the company, with peak demands supplemented by Casitas MWD. Supplying reclaimed water to the Senior Canyon Mutual Water Company customers would displace little Casitas MWD water demand and would compete with the Company; therefore, the Company has expressed little interest in reclaimed water.

Rancho Matilija

Up to about 400 acres of fodder crops can potentially be grown in Rancho Matilija, generally north and west of the exclusive gated homes there. The land has been leased for such use in recent years. Even if the proposed Farmont golf course is built, Farmont intends to continue agricultural operations around the golf course.

To the west of Rancho Matilija are large fields that appear to have been used for agriculture. However the lands to the west of Rancho Matilija are in the Lake Casitas watershed and are now owned by the U.S. Bureau of Reclamation. Such lands have been taken out of agricultural production to protect water quality in Lake Casitas.

Farmont Golf Course

The Farmont Corporation is proposing to construct a new golf course near Rancho Matilija, approximately 1 1/2 miles north of Lake Casitas and west of the Ventura River. According to information provided by the Farmont Corporation, the golf course will contain about 90 acres of area needing irrigation. The project description of the golf course states that the Farmont Corporation wishes to irrigate the golf course with reclaimed water purchased from OVSD, and that about 300 acre-feet per year may be needed.

Proposed Weldon Canyon Landfill

The February 1991 Draft EIR for the proposed Weldon Canyon Landfill provides an estimate of total water needs of the landfill, including potable uses, as summarized below:

Table 5-1

Potential Landfill Water Demand

Year	Million Gallons per Year	AF per Year
1992	0.45	1.4
1994	2.65	8.0
2010	3.92	12.0
2029	4.80	15.0

Such low water demands would not use a significant amount of the reclaimed water. The Weldon Canyon Landfill was therefore not considered to be a potential customer and would not be served by any of the alternatives studied in this report.

The Draft EIR may underestimate the amount of water needed for grading and landfill operations. Within Las Virgenes Municipal Water District, the largest reclaimed water customer is the Calabasas Landfill, which uses more water than golf courses.

Based on our preliminary marketing survey, it is apparent that adequate local irrigation demand exists to use all of the reclaimed water produced by the OVSD Wastewater Treatment Plant. However, most of the potential demand is several miles from the plant. Substantial capital investment will be required to serve those demand areas.

Section 6

RECLAIMED WATER DISTRIBUTION SYSTEM ALTERNATIVES

Due to the wide range of locations of potential reclaimed water customers, a large number of distribution system configurations are possible. The definition of the various reclaimed water system alternatives depends upon the following factors:

- Will the reclaimed water receive secondary treatment or tertiary treatment?
- Will nutrients, such as nitrate and phosphate, be removed from the effluent?
- Can 100 percent of the reclaimed water be used during dry months, or must some minimum flow be maintained in the Ventura River?
- If summer releases to the Ventura River must be maintained, would Casitas MWD supply that water, in exchange for reduced demands on Lake Casitas?
- During the winter rainy season, when demand is low for reclaimed water, can tertiary treated reclaimed water without nutrient removal be discharged into the Ventura River, or would seasonal storage be required?
- What regulatory requirements does each level of treatment satisfy?

Different answers to these questions result in differing reclaimed water system alternatives. These questions form the basis of a "decision tree" used to define the basic reclaimed water system alternatives. This decision tree is shown in Figure 6-1. The decision tree identifies five basic alternatives (A through E); variations are possible within each alternative. Table 6-1 summarizes the five basic alternatives and their characteristics.

Each basic alternative can be separated into different subalternatives representing variations in distribution system facilities. The subalternatives are identified numerically; for example, Alternatives A1 and A2 represent different distribution systems that accomplish Alternative A. The alternatives identified and considered in this study are summarized below.

<u>Alternative</u>	Description
A1	Supply secondary effluent to Canada Larga and Rancho Matilija, with seasonal storage
A2	Supply secondary effluent to hay fields in Canada Larga (spray field option), with seasonal storage
B1	Supply secondary effluent to golf courses and orange groves in the Ojai Valley, with seasonal storage
B2	Supply secondary effluent to the Farmont golf course, golf courses and orchards in the Ojai Valley, with seasonal storage

FIGURE 6-1



TABLE 6-1

SUMMARY OF TREATMENT AND DISCHARGE CHARACTERISTICS FOR THE RECLAMATION ALTERNATIVES

						Ventura Riv	er Discharge	
Ait.	Treatment	Nutrient Removal	Seasonal Storage	Peak with Potable	Minimum Summer Releases	Summer Release Source	Winter Discharge	NPDES ^a Discharge Permit
A	Secondary	No	Yes	Minor	No	None	None	None ^b
в	Secondary	No	Yes	Minor	Yes	Casitas	None	None
С	Tertiary	No	No	Yes	Yes	Casitas	Yes	Revised
D	Tertiary	No	Yes	Minor	Yes	Casitas	None	None
Ε	Tertiary	Yes	No	Minor	TBD	Tertiary Effluent	Yes	Latest Permit

TBD = to be determined

^a Water reclamation permit required for all alternatives.

^b Permit required for spray field disposal.

- C1 Supply Title 22 tertiary effluent to avocado orchards on the Rincon, without seasonal storage
- C2 Supply Title 22 tertiary effluent to orange groves and golf courses in the Ojai Valley, without seasonal storage
- C3 Supply Title 22 tertiary effluent to orange groves and golf courses in the western part of the Ojai Valley, without seasonal storage
- D1 Supply Title 22 tertiary effluent to orchards on the Rincon, with seasonal storage
- D2 Supply Title 22 tertiary effluent to oil companies south of the plant, with seasonal storage
- E1 Supply NPDES tertiary effluent to agricultural areas near the plant
- E2 Supply NPDES tertiary effluent to oil companies south of the plant

Table 6-2 provides a preliminary cost summary of all eleven alternatives for comparison purposes. The cost per acre-foot represents all cost associated with the reclaimed water system, including pumping and O&M, but does not include treatment costs. The cost per ERU in the far right column represents the subsidy per family required to support the reclaimed water system. The cost per ERU in Table 6-2 was based on assumed water rates of \$150/AF for agriculture, \$150/AF for oil company use, and \$150/AF for landscaping (golf course) use. Obviously, if reclaimed water rates were higher, the cost per ERU (and per residence) would be reduced; however, the above rates were assumed to be reasonable for screening purposes.

Cost estimates provided in this report represent an order of magnitude level of accuracy, ranging from negative 30 percent to plus 50 percent. Preliminary engineering has not been done for any of the alternatives, and would be required in order to refine the cost estimates. Capitalization costs are based on $7\frac{1}{2}$ percent interest with a 20-year payback period. Cost estimates are based on an ENR-CCI - Los Angeles of 6100 (end of 1991).

For all alternatives with seasonal storage, the pipeline from the plant to the seasonal storage reservoir was sized for 8 mgd to account for wet weather inflows.

For each of the alternatives, the following information is provided on the following pages:

- A summary sheet for the project which describes the major features, the level of treatment, amount of reclaimed water it supplies, and cost data;
- A topographic map showing the service area and layout of the major facilities;
- A graph showing the monthly irrigation demand for the project, compared to the available monthly supply from the plant. This graph also indicates the volume of seasonal storage required.

* Costs shown do not include costs to expand WWTP for tertiary treatment.

** ERU = Equivalent Residence Unit (11,700 ERUs presently in OVSD)

Cost per ERU based on reclaimed water rate of \$150/AF.

Alter- native	Treat- ment	Area Served	Capital Cost (x \$1000)	Annual Delivery (AF/Yr)	Cost per AF (\$/AF)	Cost per ERU (\$/ERU)	**)
A1	S	Canada Larga, Rancho Matilija	13,680	2,240	790	123	
A2	S	Canada Larga	10,721	2,240	649	96	
B1	S	Ojai Orchards, Golf Courses	20,781	2,240	1,195	200	
B2	S	Ojai, Rancho Matilija	18,850	2,240	1,105	182	
C1	T-22	Rincon Orchards	8,880	1,970	669	87	*
C2	T-22	Ojai Orchards, Golf Courses	11,891	2,240	751	115	*
C3	T-22	Meiner's Oaks Orchards	9,721	1,983	739	100	*
D1	T-22	Rincon Orchards	15,203	2,240	936	150	*
D2	T-22	Oil Well Injection	7,768	2,240	340	36	*
E1	T-NR	Canada Larga	2,049	849	352	15	*
E2	T-NR	Oil Well Injection	1,590	1,766	168	3	*

TABLE 6-2 OVSD RECLAIMED WATER MARKETING STUDY **COST SUMMARY OF ALTERNATIVES**

ALTERNATIVE A1 Secondary Reclaimed Water to Canada Larga and Rancho Matilija

Project Description

The existing treatment plant would not be upgraded. Pipelines and a pump station would supply reclaimed water to Canada Larga and to Rancho Matilija for irrigation. A seasonal storage reservoir would be constructed at the old Shell Taylor No. 2 Reservoir site. All of the secondary effluent produced by the plant would be used for irrigation and no effluent would be discharged into the Ventura River. Alternative A1 assumes that no releases to the Ventura River would be required for environmental reasons.

Treatment Level

Secondary

Water Supply	Acre-Feet/Year
Direct Reclaimed Water Use	1,866
From Storage	378
Potable Supplement	0
Total Usage	2,244
Reclaimed Water to Ventura River:	0

Financial Data

Total Capital Cost:	\$13,679,000
Annual Cost:	\$1,342,000
Cost Per Acre-Foot of Water:	\$790



SEASONAL WATER USE WITH ALTERNATIVE A1 SECONDARY RECLAIMED WATER TO CAÑADA LARGA AND RANCHO MATILIJA SECONDARY TREATMENT OF RW, SEASONAL STORAGE AT SHELL RESERVOIR



FIGURE 6-3

ALTERNATIVE A2 Spray Fields at Canada Larga

Project Description

The existing treatment plant would not be upgraded. Pipelines and a pump station would supply reclaimed water to Canada Larga to an area to be converted to spray fields, and to nearby orchards for irrigation. Fodder crops would be grown in the spray fields. A seasonal storage reservoir (wet season storage) would be constructed at Weldon Canyon, or possibly at the Shell Taylor No. 2 reservoir site. All secondary reclaimed water produced at the OVSD plant would be used for irrigation and no effluent would be discharged into the Ventura River. Alternative A2 assumes that no releases to the Ventura River would be required for environmental reasons. No Casitas irrigation demands would be offset.

Treatment Level

Secondary

Water Supply	Acre-Feet/Year
Direct Reclaimed Water Use	1,855
From Storage	388
Potable Supplement	
Total Usage	2,243
Reclaimed Water to Ventura River:	0

Financial Data

Total Capital Cost:	\$10,721,000
Annual Capital Cost:	\$1,052,000
Cost Per Acre-Foot of Water:	\$649





SEASONAL WATER USE WITH ALTERNATIVE A2 SPRAY FIELDS AT CAÑADA LARGA SEASONAL STORAGE AT WELDON CYN., SECONDARY TREATMENT OF RW



FIGURE 6-5

ALTERNATIVE B1 Secondary Reclaimed Water to the Ojai Valley

Project Description

The existing treatment plant would not be upgraded. Secondary effluent from the wastewater treatment plant would be used to irrigate the orchards at the east end of the Ojai Valley, the Soule Park Golf Course and the Ojai Valley Inn golf course. The system would include two pump stations, a seasonal storage reservoir at the Shell Taylor No. 2 reservoir site, a reclaimed water storage tank at the east end of the Ojai Valley, and a micro-screening facility at the reservoir outlet. The demand on Lake Casitas would be reduced and it is assumed that Casitas MWD would release potable water to the Ventura River if required for environmental reasons.

Treatment Level

Secondary

Water Supply	Acre-Feet/Year
Direct Reclaimed Water Use	1,855
From Storage	388
Potable Supplement	0
Total Usage	2,243
Reclaimed Water to Ventura River:	. 0

Financial Data

Total Capital Cost:	\$20,781,000
Annual Capital Cost:	\$2,038,000
Cost Per Acre-Foot of Water:	\$1,195



SEASONAL WATER USE WITH ALTERNATIVE B1 SECONDARY RECLAIMED WATER TO THE OJAI VALLEY SECONDARY TREATMENT OF RW, SEASONAL STORAGE



FIGURE 6-7

ALTERNATIVE B2 Secondary Reclaimed Water to Ojai Valley and Rancho Matilija

Project Description

The existing treatment plant would not be upgraded. Secondary effluent from the wastewater treatment plant would be used to irrigate the Farmont golf course, in addition to the areas included in Alternative B1: the Soule Park and Ojai Valley Inn golf courses and Ojai Valley orchards. The system would include two pump stations, the Shell Reservoir, and 19 miles of pipeline. Also included would be a reclaimed water storage tank in Ojai Valley and a microscreening facility at the Shell Reservoir outlet. The demand on Lake Casitas would be reduced and it is assumed that Casitas MWD would release potable water to the Ventura River if required for environmental reasons.

Treatment Level

Secondary

Reclaimed Water Supply	Acre-Feet/Year
Direct Reclaimed Water Use	1,855
From Storage	388
Potable Supplement	0
Total Usage	2,243
Reclaimed Water to Ventura River:	0

Financial Data

Total Capital Cost:	\$18,850,000
Annual Capital Cost:	\$1,849,000
Cost Per Acre-Foot of Water:	\$1,105



SEASONAL WATER USE WITH ALTERNATIVE B2 SECONDARY RECLAIMED WATER TO OJAI VALLEY & RANCHO MATILIJA SECONDARY TREATMENT OF RW, SEASONAL STORAGE



FIGURE 6-9

ALTERNATIVE C1 Tertiary Reclaimed Water to Rincon Orchards

Project Description

The treatment plant would be upgraded to provide tertiary treatment, but without nutrient removal. Orchards in the Rincon area west of Casitas Pass would receive tertiary treated reclaimed water for irrigation. During winter months, the supply would exceed the demand and some reclaimed water would be discharged to the Ventura River. For Alternative C1 a revised NPDES permit with reduced requirements for winter discharges would be required. A new pipeline would parallel an existing Casitas MWD potable line and intercept existing laterals to the orchards. A pump station would be constructed near the wastewater treatment plant, and a storage tank would be constructed in the Rincon area. A potable supplement would be required from Casitas MWD in peak summer demand months.

Treatment Level

Title 22 Tertiary, without nutrient removal

Water Supply	Acre-Feet/Year
Direct Reclaimed Water Use	1,970
From Storage	0
Potable Supplement	<u>931</u>
Total Usage	2,901
Reclaimed Water to Ventura River:	274

Financial Data

Total Capital Cost:	\$8,880,000*
Annual Capital Cost:	\$870,000
Cost Per Acre-Foot of Water:	\$669

* Does not include cost for plant upgrade to provide Title 22 tertiary treatment.



SEASONAL WATER USE WITH ALTERNATIVE C1 TERTIARY RECLAIMED WATER TO RINCON ORCHARDS TERTIARY TREATMENT OF RW, NO SEASONAL STORAGE



FIGURE 6-11

ALTERNATIVE C2 Tertiary Reclaimed Water to Ojai Valley

Project Description

The treatment plant would be upgraded to provide tertiary treatment, but without nutrient removal. Orchards in the east end of the Ojai Valley and the Soule Park and Ojai Valley Inn golf courses would receive tertiary treated reclaimed water for irrigation. During winter months, little reclaimed water would be discharged to the Ventura River due to the large irrigation demand, which could use all plant effluent in average winter months. However, during very wet periods, demand would be reduced to the point that some river discharges would be necessary. For Alternate C2 a revised NPDES permit with reduced requirements for winter discharges would be required. A potable supplement from Casitas MWD would be required in the summer to meet peak demands. Facilities would include a water tank in the Ojai Valley, two pump stations, and a pipeline.

Treatment Level

Title 22 Tertiary, without nutrient removal

Water Supply	Acre-Feet/Year
Direct Reclaimed Water Use	2,240
From Storage	0
Potable Supplement	<u>3,773</u>
Total Usage	6,017
Reclaimed Water to Ventura River:	0

Financial Data

Total Capital Cost:	\$11,891,000
Annual Capital Cost:	\$1,167,000
Cost Per Acre-Foot of Water:	\$751



SEASONAL WATER USE WITH ALTERNATIVE C2 TERTIARY RECLAIMED WATER TO OJAI VALLEY TERTIARY TREATMENT OF RW, NO SEASONAL STORAGE



FIGURE 6-13
ALTERNATIVE C3 Tertiary Reclaimed Water to Meiners Oaks

Project Description

The treatment plant would be upgraded to provide tertiary treatment, but without nutrient removal. Orchards and the Ojai Valley Inn golf course in the western part of Ojai and in the Meiners Oaks area would receive reclaimed water. Facilities would include a pipeline and pump station. Reclaimed Water would be discharged to the Ventura River in the winter, with no seasonal storage provided. For Alternative C3 a revised NPDES permit with reduced requirements for winter discharges would be required.

Treatment Level

Title 22 Tertiary, without nutrient removal

Water Supply	Acre-Feet/Year
Direct Reclaimed Water Use	1,983
From Storage	0
Potable Supplement	<u>991</u>
Total Usage	2,974
Reclaimed Water to Ventura River:	261

Financial Data

Total Capital Cost:	\$9,721,000
Annual Capital Cost:	\$954,000
Cost Per Acre-Foot of Water:	\$739





FIGURE 6-15

ALTERNATIVE D1 Tertiary Reclaimed Water to Rincon Orchards, with Seasonal Storage

Project Description

Identical to Alternative C1, but includes seasonal storage at the Shell Taylor No. 2 reservoir site. No reclaimed water would be discharged to the Ventura River. The demand on Lake Casitas would be reduced and it is assumed that Casitas MWD would release some potable water to the Ventura River if required for environmental reasons.

Treatment Level

Title 22 Tertiary, without nutrient removal

Water Supply	Acre-Feet/Year
Direct Reclaimed Water Use	1,970
From Storage	274
Potable Supplement	<u>657</u>
Total Usage	2,901
Reclaimed Water to Ventura River:	0

Financial Data

Total Capital Cost:	\$15,203,000
Annual Capital Cost:	\$1,491,000
Cost Per Acre-Foot of Water:	\$936



SEASONAL WATER USE WITH ALTERNATIVE D1 TERTIARY RECLAIMED WATER TO RINCON ORCHARDS WITH SEASONAL STORAGE TERTIARY TREATMENT OF RW, SEASONAL STORAGE



FIGURE 6-17

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ALTERNATIVE D2 Oil Well Injection with Tertiary Reclaimed Water without Nutrient Removal

Project Description

The treatment plant would be upgraded to provided tertiary treatment, but without nutrient removal. Reclaimed water from the wastewater treatment plant would be used for oil field injection to enhance secondary oil recovery. Facilities would include a pipeline, pump station, and seasonal storage reservoir at the Shell Taylor No. 2 reservoir site. The demand on Lake Casitas would be reduced and it is assumed that Casitas MWD would release some potable water to the Ventura River if required for environmental reasons.

Treatment Level

Title 22 Tertiary

Water Supply Direct Reclaimed Water Use	Acre-Feet/Year 2,240
From Storage	subject to oil field scheduling
Potable Supplement	variable
Total Usage	2,240
Reclaimed Water to Ventura River:	0

Financial Data

Total Capital Cost:	\$7,768,000
Annual Capital Cost:	\$762,000
Cost Per Acre-Foot of Water:	\$340



SEASONAL WATER USE WITH ALTERNATIVE D2 OIL WELL INJECTION OF TERTIARY RECLAIMED WATER WITHOUT NUTRIENT REMOVAL TERTIARY TREATMENT OF RW, SEASONAL STORAGE



FIGURE 6-19

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ALTERNATIVE E1 NPDES Tertiary Reclaimed Water to Canada Larga

Project Description

The treatment plant would be upgraded to meet the new NPDES permit requirements. Reclaimed water would be used to irrigate crops in the Canada Larga area, with unused water discharged to the Ventura River. Facilities would include a pipeline, pump station, but no storage reservoir. If reclaimed water must be discharged to the Ventura River in the dry months for environmental purposes it is assumed 1.3 cfs from May to November would meet that need. The irrigation demand would be limited so that during peak summer periods, an adequate reclaimed water supply would be available for the river.

Treatment Level

Full Tertiary Treatment with Nutrient Removal

Water Supply	Acre-Feet/Year
Direct Reclaimed Water Use	850
From Storage	0
Potable Supplement	<u>0</u>
Total Usage	850
Reclaimed Water to Ventura River:	1,390

Financial Data

Total Capital Cost:	\$2,049,000*
Annual Capital Cost:	\$201,000
Cost Per Acre-Foot of Water:	\$352

* Does include the cost to upgrade plant for full tertiary treatment with nutrient removal.



SEASONAL WATER USE WITH ALTERNATIVE E1 NPDES TERTIARY RECLAIMED WATER TO CAÑADA LARGA TERTIARY TREATMENT OF RW, YEAR-ROUND FLOW TO RIVER



FIGURE 6-21

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ALTERNATIVE E2 NPDES Tertiary Reclaimed Water for Oil Field Use

Project Description

The treatment plant would be upgraded to meet the new NPDES permit requirements. The tertiary treated reclaimed water would be supplied to the oil companies for oil field injection. If reclaimed water must be discharged to the Ventura River for environmental purposes, it is assumed 1.3 cfs from May to November would meet that need.

Treatment Level

Full Tertiary Treatment with Nutrient Removal

Water Supply	Acre-Feet/Year
Direct Reclaimed Water Use	1,766
From Storage	0
Potable Supplement	<u>0</u>
Total Usage	1,766
Reclaimed Water to Ventura River:	474

Financial Data

Total Capital Cost:	\$1,590,000*
Annual Capital Cost:	\$156,000
Cost Per Acre-Foot of Water:	\$168

* Does not include the cost to upgrade plant for full tertiary treatment with nutrient removal.



SEASONAL WATER USE WITH ALTERNATIVE E2 NPDES TERTIARY RECLAIMED WATER FOR OIL FIELD USE TERTIARY TREATMENT OF RW, NO SEASONAL STORAGE



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Section 7

PREFERRED ALTERNATIVES THAT COULD REDUCE OR ELIMINATE A TREATMENT PLANT UPGRADE

Of the eleven alternatives identified, several could use all secondary water produced by the plant and would eliminate the need to upgrade the plant. Several others would reduce the cost of the plant upgrade by eliminating the need for nutrient removal, although tertiary filters would still need to be added. One of the purposes of this study was to find out if more economical alternatives exist that would eliminate the need for a total new plant upgrade. To provide the District with the information needed to make a decision on whether to upgrade the plant, the three best alternatives that could eliminate a plant upgrade were selected for further study. To select the three best alternatives, the eleven alternatives were screened according to overall cost, institutional feasibility, type of demand served, and potential reclaimed water demand. Considering the RWQCB's timetable, preference was given to alternatives that do not rely on controversial developments such as the Farmont golf course. Based on that evaluation, Alternatives A2, B1, and C1 were selected for further study. This section provides a description of those three alternatives and a list of capital improvement costs for each. A later section describes reclaimed water system alternatives that would use reclaimed water produced by a new upgraded treatment plant.

7.1 Alternative A2 - Spray Fields in Canada Larga

Alternative A2 would dispose of the secondary effluent at spray fields used to irrigate fodder crops in Canada Larga. The wastewater treatment plant would continue to be used without major modifications. Since secondary effluent cannot be discharged into the Ventura River, seasonal storage (also referred to as "wet-season storage" for spray field applications) would need to be provided. Two or more sites for seasonal storage may be available, as discussed in a later section.

If all of the suitable acreage in Canada Larga were irrigated with reclaimed water, the application rate would be approximately 6.5 acre-feet per acre per year. Alfalfa crops only need about 4.0 acre-feet per acre per year. Therefore, some of the applied water would percolate into the ground. Berms would need to be constructed around the fields to prevent runoff of reclaimed water. Natural upslope drainage would need to be diverted around the fields. The following points can be made about Alternative A2:

- 1. The irrigation demands of crops grown on the available acreage could not utilize all of the effluent (assuming a supply of 2.0 mgd).
- 2. Some water would percolate into groundwater, perhaps emerging as rising water in Canada Larga Creek, which flows into the Ventura River. This raises water quality concerns which would be considered by RWQCB during their permitting process.

- 3. Although the soil could potentially adsorb nutrients in the reclaimed water, some nitrates could be present in any emerging waters, potentially contributing to nuisance plant growth in the Ventura River.
- 4. Pilot studies and chemical analysis would need to be performed in order to verify the allowable percolation rates and the potential for nutrient removal within the soil.
- 5. State health regulations on recharge of groundwater with reclaimed water would need to be addressed, including blending with other water sources, distance to potable wells, retention time, and depth to groundwater.
- 6. Alternative A2 would not directly allow for much expansion in future disposal capacity; however, new reclaimed water markets may ultimately be developed to utilize future growth in effluent flows.
- 7. With Alternative A2, OVSD would no longer discharge to the Ventura River. Riparian habitat could be affected, which may not be environmentally acceptable.
- 8. Runoff of reclaimed water used for irrigation purposes must be controlled. Berms and dikes would be needed at the perimeters of the fields to prevent runoff. A tailwater return system would need to be installed to reuse runoff water.

Facilities required with Alternative A2 are listed in Table 7-1, along with estimated costs. Among the facilities required will be a microscreen facility, which would be located near the seasonal storage reservoir outlet, and which would remove algae and other materials from the stored water so it would not plug irrigation systems.

The major unknowns with Alternative A2 are the following:

- 1. Can the District stop all discharges to the Ventura River?
- 2. Would the RWQCB allow spray fields in Canada Larga?

7.2 Alternative B1 - Secondary Effluent to Orchards in Ojai

A vast potential market for reclaimed water exists in the eastern part of the Ojai Valley. Two golf courses and numerous citrus orchards could utilize reclaimed water. By utilizing secondary effluent, the existing treatment plant would not require major modifications. Since secondary effluent can no longer be discharged into the Ventura River, seasonal storage would need to be provided to store flows during the wet winter months. Two or more sites for seasonal storage may be available, as discussed in a later section.

TABLE 7-1 Alternative A2 Cost Summary

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	Length	Diameter		
<u>Pipeline</u>	Feet	Inches	<u>\$/Foot</u>	<u>Total \$</u>
Plant to Weldon Reservoir	6000	20	125	750,000
Plant to Canada Larga	8000	14	87	696,000
Within Canada Larga	8000	8	56	448,000
				1,894,000
Pump Station				250,000
Seasonal Storage Reservoir at W	eldon Canyo	n		5,000,000
Microscreen Facility				250,000
Total Construction Cost				7,394,000
Engineering (20 percent)				1,479,000
Contingency (25 percent)				1,848,000
Total Capital Cost				\$10,721,000

All of the present and projected future reclaimed water supplies could be used in the Ojai Valley. However, nearly all of the orchards in the Ojai Valley now use drip irrigation. Secondary effluent tends to plug drip systems. Due to health regulations, secondary effluent cannot be sprayed directly onto fruit. Most of the drip systems use micro-sprinklers that can spray water onto low-hanging fruit.

In order to use secondary effluent, the citrus orchards in Ojai would need to convert to furrow irrigation. Local farmers may resist conversion to furrow irrigation for the following reasons:

- 1. Furrow irrigation uses more water than drip irrigation;
- 2. Farmers have invested money in their existing drip systems;
- 3. Local expertise to operate furrow irrigation systems may not be readily available;
- 4. Some areas in the north and east parts of the Ojai Valley are rocky and may be unsuitable for furrow irrigation.

A field survey of the citrus orchards in the Ojai Valley revealed evidence of previous furrow irrigation and orchards were found that still use furrow irrigation. Financial incentives would be required in order to convince the farmers to convert to furrow irrigation. The District may need an irrigation coordinator to assist the farmers in operating their irrigation systems.

When using reclaimed water, runoff must be controlled. Berms and dikes would be required at strategic locations around irrigated fields, and a tailwater return system installed to reuse any water flowing off the fields.

A major advantage of Alternative B1 is that existing potable water demand would be directly offset. Use of reclaimed water could reduce local water demand by up to 2200 AF/Yr, however, demand reductions on Lake Casitas would be considerably less than 2000 AF/Yr, due to present use of groundwater and surface diversions in the service area. The actual reduction in Casitas MWD demand would depend on which orchards would convert to reclaimed water use, and is not presently known. In exchange for reduced demand, it is suggested that Casitas MWD make water from Lake Casitas available to OVSD for discharge into the Ventura River if required for environmental purposes. Although some valuable lake water would be lost to the ocean, local water supplies would be supplemented by about 2000 acre-feet per year, more than making up for releases to the river. This concept was presented to Casitas MWD staff on November 18, 1991, by OVSD General Manager and Boyle Engineering.

Alternative B1 could also provide water to the proposed Farmont golf course near Rancho Matilija. A Ventura County ordinance requires new golf courses to use reclaimed water if available. Participation by Farmont could provide financial benefits to OVSD and should be encouraged. However, reclaimed water use by Farmont would not offset any demands now supplied by Casitas MWD. The overall benefit of Alternative B1 to Casitas MWD would be reduced if the Farmont golf course is served.

Facilities required with Alternative B1 are listed in Table 7-2, along with estimated costs. Among the facilities required will be a microscreen facility to remove algae and other materials from water stored in the seasonal reservoir.

State regulations are not clear about importing and using irrigation water that does not meet Basin Plan groundwater quality objectives. Such uses are approved on a case-by-case basis depending upon the benefits of the project when the RWQCB issues a water reclamation permit. The RWQCB may view furrow irrigation, in this case, as a percolation disposal method, and may not permit such use in the eastern part of the Ojai groundwater basin.

The major unknowns of Alternative B1 are the following:

- 1. Would Casitas MWD agree to release potable water into the Ventura River, if required?
- 2. Would farmers in Ojai be willing to convert to furrow irrigation?

7.3 Alternative C1 - Tertiary Effluent to the Rincon

A vast potential reclaimed water market exists on the Rincon, west of Lake Casitas. Large avocado orchards have been planted along with some citrus orchards. The terrain is predominantly hilly, with much of the avocados planted on Class 6 agricultural land. At present, most of the water used to irrigate the orchards is supplied by Casitas MWD. Class 6 agricultural land is not supposed to be served with water from Lake Casitas according to Bureau of Reclamation grant restrictions.

Casitas MWD has an existing pipeline that serves the Rincon and coastal areas. This alternative would parallel that pipeline and connect existing service laterals to the reclaimed water system. A reclaimed water tank would be built just below a Casitas MWD potable tank west of Casitas Pass. A supplement pipe with an air-gap would be provided between the two tanks so that potable water can be added to the reclaimed system in the summer when there is not enough reclaimed water to meet irrigation demands. Reclaimed water would provide a year-round base flow to the orchards, with summer peak demands met by supplemental potable water, as shown in Figure 6-11. In the winter, especially during wet periods, the demand would be lower than the supply of reclaimed water and some effluent would be discharged to the Ventura River. Seasonal storage would not be included with alternative C1.

Furrow irrigation of steep hillsides on the Rincon is not considered feasible. Drip irrigation, including use of micro spray emitters which can spray water on fruit, must continue in use there. To use reclaimed water on the Rincon, tertiary treatment must be provided in order to meet health regulations. It has been assumed that a filtration process can be added to the existing plant without requiring rebuilding of the plant. Such a process may provide water meeting Title 22 requirements, but without nutrient removal. Pilot testing is needed to verify that filtration, without nutrient removal, could be accomplished without rebuilding the plant. Such a test was not included in the recent pilot test program conducted by James M. Montgomery Engineers. Filtration alone would not meet the ammonia and nutrient limitations of the NPDES permit. In

TABLE 7-2 Alternative B1 Cost Summary

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	Length	Diameter		
<u>Pipeline</u>	Feet	Inches	\$/Foot	<u>Total \$</u>
Plant to Reservoir	12,000	20	125	1,500,000
Plant to Ojai Valley Inn	40,000	16	99	3,960,000
Ojai Valley Inn to Tank	26,500	16	99	2,624,000
Laterals	22,000	6	42	924,000
				9,008,000
Pump Stations				
Plant	3200 gpm		•	350,000
Ojai Valley Inn	3200 gpm			300,000
				650,000
Microscreen Facility				200,000
Seasonal Storage Reserve	<u>oir</u>			
Shell Reservoir				4,000,000
Steel Tank				
250,000 gal @ \$1.00/gal				250,000
Irrigation Systems				
Tailwater Pump Back Syste	ms 560 acres @ \$	600/acre		224.000
Conversion to Furrow Irriga	tion			0
				224,000
Total Construction Cost				14,332,000
Engineering (20 per	cent)			2,866,000
Contingency (25 per	rcent)			3,583,000
Total Capital	Cost			\$20,781,000

order for this alternative to be feasible, the RWQCB would need to issue a new NPDES permit with reduced requirements for wintertime releases. Reduced winter discharge requirements have been approved by the RWQCB in other areas. Discussions with RWQCB staff to verify the feasibility of reduced permit requirements for winter discharges would be required.

The reclaimed water system would reduce demand on Casitas MWD supplies by nearly 2000 acre-feet per year and would benefit Casitas MWD by providing an additional net source of water in the District. As with Alternative B1, Casitas MWD would be requested to provide 300-400 acre-feet/year of lake water to OVSD for release to the Ventura River.

Facilities required with Alternative C1 are listed in Table 7-3, along with estimated costs. Among the facilities required will be a microscreen facility to remove algae and other materials from water stored in the seasonal reservoir. If winter discharges to the river are approved, Alternative C1 avoids the costs of seasonal storage, but adds the cost of tertiary treatment. Table 7-3 does not include capital costs for the plant upgrade to provide Title 22 tertiary treatment.

The major unknowns of this alternative are the following:

- 1. Is Title 22 tertiary treatment feasible and economical if nutrient removal requirements are eliminated?
- 2. Would the RWQCB approve a revised NPDES permit with reduced winter discharge requirements?
- 3. Would Casitas MWD provide water for release to the Ventura River?

7.4 Issues to be Addressed for the Preferred Alternatives

Although Alternatives A2, B1, and C1 were tentatively selected as preferred alternatives that would eliminate the need for a total new plant upgrade, there are a number of unanswered questions to be resolved before the implementing one of those alternatives. These remaining questions for the three alternatives include:

- 1. Must a minimum flow be provided to the Ventura River for environmental reasons?
- 2. Would Casitas MWD agree to release flows to the river and/or share costs with OVSD for those alternatives reducing demand on Casitas?
- 3. Is tertiary treatment feasible and economical if nutrient removal requirements are eliminated?
- 4. Would the RWQCB approve a revised NPDES permit with reduced winter discharge requirements?

TABLE 7-3 Alternative C1 Cost Summary

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Pipeline	Length <u>Feet</u>	Diamet Inche	er <u>s \$/Foot</u>	<u>Total \$</u>
To Casitas Pass	s 32,500	14	89	2,892,000
To Rincon	11,500	12	78	897,000
To Tank	15,000	16	99	1,485,000
				5,274,000
Pump Station	2000 gpm			350,000
<u>Tank</u>	500,000 gal @ \$1.00/gal			500,000
Total Constructi Enginee	ion Cost ring (20 percent)			6,124,000 1,225,000
Conunge	ency (25 percent)			1,531,000
Т	otal Capital Cost			\$8,880,000

- 5. Would the farmers in the Ojai Valley convert to furrow irrigation?
- 6. If furrow irrigation is used in the Ojai Valley, will the RWQCB accept furrow irrigation with secondary effluent in the Ojai Valley?
- 7. Can OVSD acquire the Shell Taylor No. 2 reservoir site or some other seasonal storage reservoir site?
- 8. Would the RWQCB accept the project proposed as the best alternative?

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Section 8 SEASONAL STORAGE SITES

Several potential seasonal storage reservoir sites were identified. The OVSD treatment plant has large rates of inflow during rainy periods, with a peak inflow of up to 8 mgd (perhaps 10 mgd during the "floods of 92"). Under such conditions, a reservoir near the plant is preferable. Two favorable sites near the plant have been identified. Some sites identified in previous studies were not considered because of the presence of oak woodlands and/or riparian habitat and such environmentally sensitive sites would be difficult to develop.

8.1 Shell Taylor No. 2 Reservoir

This site is a former State of California registered dam constructed by Shell Oil as a sump. Shell no longer uses the reservoir and a large "notch" has been cut in the dam. The site is fairly close to the wastewater treatment plant. The major advantage of this site is that the environmental impacts would probably be insignificant. On a typical dam site, with riparian habitat and wetlands, the environmental and regulatory process can be long and difficult. Considering the timetable set by the District's cease-and-desist order, any environmentally benign site is preferable. A major concern at this site is the potential of contaminated soils remaining from oilfield operations.

A field visit to the site confirmed that extensive work is required to rebuild the dam. To be conservative, it was assumed that the existing dam would have to be completely reconstructed at an estimated cost of approximately \$4,000,000. The dam site is presently leased to Shell Oil Company by the landowner and OVSD would need to purchase or lease the site. Although Shell Oil has no plans to use the reservoir to impound water, they do plan to use it as a drilling pad to construct one or more oil or injection wells. If OVSD wishes to acquire the site for a reservoir, the District would need to act before Shell Oil commits resources to the drilling.

8.2 Weldon Canyon

This site is presently being proposed for a landfill by Waste Management Inc. If their proposal to build a landfill is not approved, the site may become available for use by OVSD. The topography appears favorable and the location is good. Compared to other canyons nearby, the habitat value appears to be less significant. A site in the north fork of the canyon would avoid some unfavorable geology (mapped landslides) along the entrance to the canyon. Geologic studies would need to be done to verify the feasibility of the site.

It is estimated that construction of a dam at the Weldon Canyon site would cost approximately \$5,000,000. The land is presently owned by Schull Bonsall, who also owns land in and around Canada Larga Canyon.

This site may be attractive for Alternative A2 because of the proximity to Canada Larga and because the same landowner who owns the site would also be receiving reclaimed water.

8.3 Other Potential Reservoir Sites

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Other sites in the general vicinity of the plant appear to have many oak trees and significant riparian habitat, based on review of aerial photographs.

Section 9 OTHER OPTIONS AVAILABLE

Besides upgrading the treatment plant and/or implementing a reclaimed water system, other options are available to OVSD. Some of these options are briefly discussed below. Although these options were not investigated in depth as part of this report, they are described for the sake of completeness.

9.1 Percolation Ponds

A possible alternative to upgrading the plant would be to discharge the plant's secondary effluent into percolation basins. The effluent would then percolate through the surface soil into a groundwater basin. There are several issues which must be considered in order to use percolation as an effluent disposal option. These considerations include:

- State health regulations.
- Potential percolation sites.
- Quality of reclaimed water in comparison with groundwater basin plan objectives.
- Percolation rates of native soils.
- Depth of the groundwater table below the surface.

Percolation Pond Sites

Three groundwater basins exist within a reasonable distance of the OVSD Wastewater Treatment Plant in which percolation ponds could be considered. They are the Ojai Basin, the Lower Ventura River Basin, and the Upper Ventura River Basin.

Quality of Reclaimed Water Versus Basin Plan Objectives

The RWQCB has established water quality objectives for groundwater basins within the area of the OVSD Wastewater Treatment Plant which are described in "Water Quality Control Plan, Santa Clara River Basin 4A." The RWQCB would have to approve any plan to percolate effluent into the groundwater table. A major criteria is the quality of the effluent relative to the quality of existing groundwater. The quality of the effluent must meet or exceed the basin plan objectives.

Some of the major water constituents which RWQCB evaluates when comparing effluent quality with existing groundwater quality are total dissolved solids (TDS), sulfate, chloride, and boron content. The following table summarizes the groundwater basin objectives established by RWQCB, and the existing OVSD effluent quality.

TABLE 9-1 Comparison of Water Quality -GW Basin Objectives vs. OVSD Effluent

GW Basin Objectives	TDS (ppm)	Sulfate (ppm)	Chloride (ppm)	Boron (ppm)	
Ojai Subarea - West of San Antonio/ Senior Canyon Creeks	1000	300	200	0.5	
 East of San Antonio/ Senior Canyon Creek 	700	200	50	0.5	
Upper Ventura River Subunit	800	300	100	0.5	
Lower Ventura River Submit	no further degradation allowed				
OVSD Effluent from WWTP*	750-900 2	225-250 1	20-140	0.6-0.7	

* From 1989 OVSD Records

The RWQCB water quality objectives are generally not met by the plant effluent, except possibly in the Lower Ventura River Basin. RWQCB would probably be reluctant to permit percolation of the secondary effluent. An exception might be made for the west portion of the Ojai Basin, for which only the boron objectives are slightly exceeded. Higher boron levels can adversely affect orchards irrigated with groundwater.

Percolation Rates of Native Soils

Percolation rates in the various groundwater basins surrounding the OVSD Wastewater Treatment Plant were not measured in this study. A 1977 Boyle report investigated percolation rates near the OVSD treatment plant and found them to be low.

The state department of health services regulates recharge of reclaimed water into underground aquifers. The present requirements for recharge are summarized in Table 9-2. The requirements vary depending upon level of treatment, percolation rates, distance to nearby wells, and underground retention times. Disinfected secondary effluent can be percolated provided the groundwater table does not come within 20 feet of the ground surface, or 50 feet if the percolation rate is between 0.2 and 0.3 inches per minute.

One potential percolation site is located in the Ventura River bottom near Meiners Oaks. Adequate land area is available and percolation rates appear favorable due to sandy soil. As shown in Figure 9-1, the water table comes within 20 feet of the surface during wet periods and health regulations would not allow percolation under those conditions.

Project Category	I	11		IV	V
	Surface Spreading			Direct Injection	
Maximum Reclaimed Water in Extracted Well Water (%)	50	20	20	20	50
Depth to Groundwater (ft) at Initial Percolation Rates of:					
<0.2 in/min	10	10	20	50	na
<0.3 in/min	20	20	50	100	na
Retention Time Underground					
(months)	6	6	12	12	12
Horizontal Separation (ft)	500	500	1000	1000	2000
Required Treatment					
Primary	Х	Х	Х	Х	Х
Secondary	Х	Х	Х	Х	Х
Filtration	Х	Х			Х
Disinfection	Х	Х	Х		Х
Organics Removal	Х				x

TABLE 9-2 Proposed State Requirements for Groundwater Recharge with Reclaimed Wastewater

na - not applicable

Based on the criteria discussed above, percolation ponds do not appear to be a feasible option for disposal of secondary effluent.

9.2 Discharge of Effluent Into the Ocean

The present secondary effluent from the OVSD Wastewater Treatment Plant could be piped southward to the Pacific Ocean and discharged without further treatment. Because of swimming at the beach and the restrictions on body contact with secondary effluent, the



FIGURE 9-1

effluent would have to be piped a significant distance off-shore to be discharged. The construction of this outfall line would be quite expensive, and requires a permit from the California Coastal Commission. An outfall was constructed in 1965 to serve the former Seaside Wastewater Treatment Plant, but this existing outfall is only about one-half mile long and may be deteriorated. This alternative was not part of the scope of this study but is mentioned for the sake of completeness.

9.3 Connection to City of Ventura Sewer System

OVSD could convey effluent to the City of Ventura for treatment by the City's existing Eastside Water Reclamation Facility rather than construct improvements to the OVSD Wastewater Treatment Plant. This option was considered in a report prepared by Boyle in 1977 on potential methods of disposing of the effluent, and still appears feasible. The Eastside W.R.F. is rated at 14 mgd, with existing flows at approximately 8 mgd. The plant appears to have adequate capacity to accept flows from OVSD. A pipeline would be constructed to convey effluent from the OVSD Wastewater Treatment Plant to the City of Ventura Seaside Transfer Station, where the effluent would then be pumped east to the Eastside W.R.F. OVSD would pay the City of Ventura for the costs of treating the effluent and for capacity. This alternative would also include considerations of flow equalization and other operational concerns, and institutional issues. The City of Ventura and OVSD would need to establish terms and conditions acceptable to both parties for the treatment of effluent from OVSD by the city. Ventura is now starting studies to evaluate their future treatment needs and the timing would be good to consider this option. OVSD effluent would contribute relatively high-quality water to Ventura's reclaimed water system, presently used to irrigate golf courses and landscaping.

Previous studies showed this alternative to be costly due to the connection fees required and the cost of the pipeline to Ventura. Environmental impacts on the Ventura River resulting from halting discharges would need to be addressed.

Investigation of this alternative was beyond the scope of this study; it is mentioned only for the sake of completeness.

Section 10

RECLAIMED WATER ALTERNATIVES WITH AN UPGRADED PLANT

10.1 Decision to Upgrade the Wastewater Treatment Plant

Although any of the three alternatives selected for study would provide the best chance of avoiding a treatment plant upgrade, if implemented, each alternative has serious problems to be overcome, as discussed in the previous sections.

Based on studies by James M. Montgomery Engineers, District staff have estimated the cost to local residents of upgrading the plant to meet all NPDES requirements, including nutrient removal, at \$20 million. The additional cost per residence is expected to be about \$120 per year.

Of the three alternatives that would eliminate a plant upgrade, only Alternative A2 - Spray Fields in Canada Larga - compares favorably with the cost of a new plant. However, that alternative will also be the most difficult to implement due to the environmental concerns related to the Ventura River. Alternative B1 (Secondary Reclaimed Water to the Ojai Valley) is considered the most likely to meet environmental and regulatory hurdles; however, it is much more costly than a new plant upgrade.

The information in this report was presented to the OVSD Board in December, 1991, prior to their decision to upgrade the plant to meet the NPDES requirements. The results of this study support the Board's decision to upgrade the plant.

10.2 Reclaimed Water Alternatives with an Upgraded Plant

The decision to upgrade the plant does not eliminate the possibility of selling reclaimed water. In fact, the more highly treated water would be more marketable, perhaps being suitable for growing strawberries or for oil company use. (Although reduced nutrients will reduce the selffertilizing quality of the reclaimed water for irrigation).

After upgrading the plant, the District would have no incentive to subsidize a reclaimed water system. A subsidy for a reclaimed water system only makes sense if it would reduce or eliminate the cost of a plant upgrade. Therefore any reclaimed water system implemented with a new plant upgrade would need to pay for itself. Reclaimed water rates would need to cover the cost of facilities, pumping, and operation of the system, leaving some profit for the District. However rates would not need to cover the cost of treatment or nutrient removal, since that would be required in any case.

Without a subsidy, it will not be economical to deliver water to areas distant from the plant. Reclaimed water will not be able to compete with present supplies in the Ojai Valley north of Foster Park and on the Rincon. An upgraded plant reclaimed water system could supply the following:

- 1. Agricultural areas near the plant, including Canada Larga.
- 2. Oil companies south of the plant.
- 3. Farmont golf course, provided Farmont would pay for the long pipeline required.
- 4. Potential future landscaping by Caltrans along Highway 33.

The two alternatives that supply those areas have been defined as Alternative E1 and E2 in Section 6. A more detailed description of the two alternatives is provided below. Farmont golf course is not included with either alternative, but is considered separately.

10.3 Alternative E1 - Upgraded Plant, Reclaimed Water to Canada Larga

Tertiary treated reclaimed water would be delivered to orchards near the plant, and to Canada Larga. If 1.3 CFS would need to be released to the Ventura River in summer, to meet environmental requirements, about 1.16 mgd of the 2.0 mgd reclaimed water supply would be available for sale. The farms would be required to receive the reclaimed water at a fairly uniform flow throughout the day, and to provide any storage required.

The two major areas that could use the water are the Bonsall Ranch in Canada Larga, and the George Hearst property near the east end of Canada Larga Canyon. Both are currently dry farmed with fodder crops. The Hearst property is currently for sale and potential buyers have contacted Boyle about the availability of water. One potential buyer wanted to establish a nursery there. Fodder crops are marginal operations and could probably not pay a high rate for reclaimed water and the District's net income would probably be low. The reclaimed water produced by an upgraded plant would be suitable for growing row crops, including strawberries and other more profitable crops. Such use could support a higher water rate and provide more income for the District.

If 1.16 mgd is available, the District could sell about 850 AF/Yr of reclaimed water throughout the year, based on typical seasonal irrigation demands. This quantity could be increased if crops are grown in early spring and late fall, with land left fallow in the peak summer months. The supply would be more than adequate for the Canada Larga area, depending on the types of crops grown.

Facilities would include a storage pond at the plant, a pump station, and a pipeline to the boundary of the Hearst property. Facilities and costs are summarized in Table 10-1. Delivered costs would be about \$350 per acre-foot. Costs could be reduced if water were received at the western boundary of the Bonsall property, and if the users built the pipeline to the Hearst property.

TABLE 10-1

Costs for Alternative E1 Upgraded Plant - Reclaimed Water to Canada Larga

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Capital Costs	Amount
Pipeline 18,500 Ft. of 8" Pipe @ \$56/Ft. Storage Pond - with plastic liner Pump Station Total Construction Cost	\$1,036,000 150,000 <u>180,000</u> \$1,366,000
Eng., Admin., Inspection, etc. (20%) Contingency (25%) Total Project Cost	273,000 <u>410,000</u> \$2,049,000
Annual Debt Service (7.5% over 20 yrs.)	\$201,000
Cost per Acre-Foot	
Acre-teet sold per year	850 AF
Debt Service per AF Pumping Costs per AF O & M Costs per AF Delivered Cost per AF	\$236 \$56 <u>\$60</u> \$352

10.4 Alternative E2 - Upgraded Plant, Reclaimed Water for Oilfield Use

High quality tertiary-treated water would be delivered to oil companies south of the wastewater treatment plant. Both Shell Oil and Texaco could use the water for their oilfield injection operations.

Both companies have expressed concern about the quality of reclaimed water. The nutrients and suspended solids can plug wells and cause bacteria growth which can result in hydrogen sulfide production. Although testing of reclaimed water for oilfield use has been done, the consensus is that laboratory testing and full scale pilot studies are needed to verify the suitability of reclaimed water for oilfield injection.

Pilot studies must wait until after completion of the treatment plant upgrade when sufficient, fully treated water will be available for testing. The oil companies would select an injection well for testing supplied by temporary piping.

The oil companies would conduct and monitor the tests with their own personnel and expertise probably for several months. The oil companies would judge the suitability of reclaimed water for their purposes.

It is expected that oil companies would fund most of the pilot testing program, but financial arrangements would need to be established in an agreement with the District. The District would probably provide the water for testing without charge, for a limited period.

If the pilot testing is successful, permanent facilities would be sized to deliver about 2.5 - 3.0 mgd to the oil companies. In winter, injection demands could potentially use all of the supply from the plant. In the summer, if water must be released to the Ventura River, deliveries would be reduced.

Facilities would consist of a pipeline and pump station to deliver water to the oil companies. Since the oil companies have vast amounts of storage, the District need not provide storage, but can deliver the water at a fairly constant rate. Facilities and costs are summarized in Table 10-2. Delivered cost would be under \$200 per acre-foot.

10.5 Farmont Golf Course

The proposed Farmont golf course could be supplied with either Alternative E1 or E2, with reduced deliveries to other customers. Farmont plans to irrigate about 90 acres, having an annual demand of about 270 AF/Yr. Peak daily demand for such a golf course would normally be about 540,000 gallons per day. It would be preferable for OVSD to provide a base flow and have the golf course meet its peak demands with its own supplies. This approach reduces construction cost. A supply capacity of 0.36 mgd (250 gpm) would meet most of their needs even in hot summer months. The District could supply water at a constant 24-hour flow. Farmont plans to construct some large ponds which can be used for daily regulation storage, so that water supplied in the daytime can be used to irrigate at night.

TABLE 10-2

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Costs for Alternative E2 Upgraded Plant - Reclaimed Water for Oilfield Use

Capital Costs	Amount
Pipeline 10,000 Ft. of 12" Pipe @ \$78/Ft. Pump Station Wet Well Total Construction Cost	\$780,000 180,000 <u>100,000</u> \$1,060,000
Eng., Admin., Inspection, etc. (20%) Contingency (25%) Total Project Cost	212,000 <u>318,000</u> \$1,590,000
Annual Debt Service (7.5% over 20 yrs.)	\$156,000
Cost per Acre-Foot	
Acre-feet sold per year	1,766 AF
Debt Service per AF Pumping Costs per AF O & M Costs per AF Delivered Cost per AF	\$88 \$20 _ <u>\$60</u> \$168
Facilities and costs to supply Farmont are summarized in Table 10-3. Delivered cost would be quite high, about \$1,300 per acre-foot. However, this cost is comparable to the cost of imported State Project water being considered by local water agencies. Reclaimed water rates would need to be negotiated, to allow a profit to OVSD to help offset treatment plant costs. It would be expected for Farmont to help finance the reclaimed system.

The EIR for the Farmont golf course has yet to be issued. If the development is approved by the County of Ventura it would be expected for Farmont Corporation to entirely fund a Water System Design Report, to be prepared by consultants under contract to OVSD, which would detail facilities and costs to supply the golf course. This is a standard procedure at many water districts. Such a Water System Design Report could also investigate the feasibility of reducing costs to Farmont by also supplying water to the Ojai Valley Inn.

10.6 Weldon Canyon Landfill

If the Weldon Canyon Landfill is approved for construction, and if reclaimed water is needed there, Waste Management Inc. would be expected to entirely fund a Water System Design Report which would investigate the facilities and costs to distribute reclaimed water to the landfill. If feasible, they would be expected to pay for any facilities required to distribute water to the landfill.

TABLE 10-3

Cost of Distribution to Farmont Golf Course

Capital Costs	<u>Amount</u>
Pipeline 39,000 Ft. of 6" Pipe @ \$42/Ft.	\$1,638,000
Pump Station No. 1	160,000
Pump Station No. 2	160,000
Wet Well	<u>100,000</u>
Total Construction Cost ^a	\$2,058,000
Eng., Admin., Inspection, etc. (20%)	412,000
Contingency (25%)	<u>618,000</u>
Total Project Cost	\$3,088,000
Annual Debt Service (7.5% over 20 yrs.)	\$303,000
Cost per Acre-Foot	
Acre-feet sold per year	270 AF
Debt Service per AF	\$1,120
Pumping Costs per AF	\$116
O & M Costs per AF	<u>\$60</u>
Delivered Cost per AF	\$1,296

^a Based on supplying peak monthly demands of 250 gpm. Farmont to supply shortterm peaks above 250 gpm from its own water supplies.

Section 11 RECOMMENDED PLAN OF ACTION

11.1 Recommended Action

By upgrading the treatment plant to meet all NPDES requirements, the District can eventually implement a reclaimed water system that will provide an economic return. The higher level of treatment will increase the marketability of the water for customers who would be willing to pay reasonable rates for the water.

While the District implements its plant upgrade, several local events will occur which may affect the future of reclaimed water systems. They include:

- 1. The proposed Farmont golf course. If the development is approved, the District should obtain funding from the developer to prepare a Water System Design Report to investigate the feasibility and costs of supplying reclaimed water to the golf course. The District may want to suggest to the County that funding a Water System Design Report for reclaimed water be made a condition for acceptance of the project.
- 2. The proposed Weldon Canyon Landfill. If the landfill is approved, the District should obtain funding to prepare a Water System Design Report. The District could provide water to the landfill if it benefits the rest of the District's customers. Significant construction water demands would probably existing during initial construction of the landfill.
- 3. New ownership of Hearst Ranch. The District should initiate contact with any new landowners in the Canada Larga area.
- 4. Caltrans has expressed interest in obtaining water for future landscaping along Highway 33. The District should maintain contact with Caltrans.

After the new plant is operational, the District should approach the oil companies about pilot testing of the upgraded effluent for oilfield injection. Such a program will finally verify whether or not reclaimed water can be used for secondary oil recovery.

After the above events take place, local farmers could be contacted to purchase reclaimed water. If they grow more profitable crops, a more adequate water rate could be negotiated.

In summary, OVSD should wait for one or two years before initiating a reclaimed water system. Events beyond the District's control may determine the customers. By choosing its service area wisely, a reclaimed water system can be developed that will provide the maximum return.

11.2 Implementation Plan

After the District selects its final service area, a number of tasks will be required:

- 1. Complete preliminary engineering of the facilities.
- 2. Prepare an EIR for the reclamation project, to determine the amount of water that must remain in the Ventura River.
- 3. Prepare a Title 22 Engineering Report.
- 4. Obtain a Water Reclamation Permit from RWQCB.
- 5. Execute agreements with potential customers.
- 6. Complete an agreement with any water district in whose boundaries reclaimed water will be sold (required by law).
- 7. Prepare plans and specifications for facilities.
- 8. Construct the facilities.

APPENDIX A

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STATE OF CALIFORNIA CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD LOS ANGELES REGION

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ORDER NO. <u>90-062</u> NPDES NO. <u>CA0053961</u>

WASTE DISCHARGE REQUIREMENTS FOR OJAI VALLEY SANITARY DISTRICT WASTEWATER TREATMENT PLANT

The California Regional Water Quality Control Board, Los Angeles Region, finds:

- Ojai Valley Sanitary District (formerly known as Oakview Sanitary District) operates the Ojai Valley Wastewater Treatment Plant which discharges wastes under waste discharge requirements contained in Order No. 84-72 (NPDES Permit No. CA0053961) adopted by this Board on September 17, 1984.
- 2. Ojai Valley Sanitary District has filed a report of waste discharge and has applied for renewal of its waste discharge requirements and National Pollutant Discharge Elimination System Permit (NPDES).
- 3. Ojai Valley Wastewater Treatment Plant is located at 6363 North Ventura Avenue, Ventura, and has a design capacity of 3.0 million gallons per day. The plant discharges an average of 2.11 million gallons per day (mgd) of treated municipal wastewater to Ventura River, a water of the United States, at a point located upstream of Canada Larga Road (latitude 34° 20' 33'', longitude 119° 17' 26'') above the tidal prism. Attachment 1 shows the Plant Location Map.
- 4. Currently, wastewater treatment at the plant consists of: primary clarification for solids removal; biological treatment using oxidation towers for BOD removal; nitrification for oxidation of ammonia into nitrates/nitrites in rotating biological contactors (RBC); secondary clarification; chlorination; and dechlorination. Attachment 2 shows the liquid process flow diagram.

Sludge is digested anaerobically in a two-stage process and is then periodically pumped to sludge drying beds. Dried sludge is made available to commercial landscapers and the remainder is hauled to a landfill.

5. The Board adopted a revised Water Quality Control Plan for Santa Clara River Basin on March 27, 1978. The Water Quality Control Plan contains water quality objectives for the Ventura River.

May 21, 1990

Ojai Valley Sanitary District Wastewater Treatment Plant Order No. 90-062

- 6. The beneficial uses of the receiving waters are: contact and non-contact water recreation, agricultural and industrial service supplies, groundwater recharge, freshwater replenishment, wildlife habitat, warm and cold freshwater habitats, fish spawning and migration; and, within the tidal prism, contact and non-contact water recreation, marine and saline water habitats, commercial ocean and sport fishing, and shellfish harvesting.
- 7. The Ventura River flows about 5 miles from the treatment plant through the Ventura River Valley to the ocean. At its mouth, the river traverses an alluvial delta and forms a lagoon at the ocean shore. This lagoon is generally closed by a sand bar during low flow months, although during winter months the bar may be breached by high river flows. The upper end of the lagoon is included within the Emma Wood State Beach-Ventura River Group Camp. The lower end of the lagoon is included within the City of San Buenventura's Seaside Wilderness Park.

Due to the development of both private and public recreational facilities downstream of the discharge, the use of the river for water-contact recreation, particularly at the mouth, has been significantly increasing. Since there is public contact in the receiving water, the quality of wastewater discharged to the Ventura River must be that of reclaimed water used as source of supply in nonrestricted recreational impoundments. Title 22 of the California Code of Regulation requires that such reclaimed water shall be at all times an adequately disinfected, oxidized, coagulated, clarified, <u>filtered</u> wastewater. Therefore, there is the need for the wastewater discharged to Ventura River to be filtered such that no health hazard is created.

- 8. The wastes discharged have occasionally increased the ambient receiving water temperature by more than the 5°F objective contained in the Water Quality Control Plan, particularly during the coldest months of the year when ambient receiving water temperatures are the lowest. However, such a temperature increase would not adversely impact the beneficial uses provided receiving water temperatures do not exceed 80°F and fluctuations of receiving water temperature is less than 5°F within any given 24-hour period.
- 9. The wastes discharged have occasionally decreased the ambient receiving water pH levels by more than the 0.5 pH unit objective contained in the Water Quality Control Plan. However, such a pH change would not adversely impact the

Ojai Valley Sanitary District Wastewater Treatment Plant Order No. 90-062

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beneficial uses provided receiving water pH levels remain within the range of 6.5 to 8.5 and fluctuations of receiving water pH is less than 0.5 pH units within any given 24-hour period.

- 10. During summer and winter months, the dissolved oxygen concentration of the receiving waters below the discharge point has been found to fall below the 7.0 mg/l objective contained in the Water Quality Control Plan for cold water streams. This dissolved oxygen depression may be due to the wastes discharged, since the dissolved oxygen concentration upstream of the discharge point consistently remains above 7.0 mg/l. However, further studies are required to determine the specific factor(s) responsible for the low dissolved oxygen concentrations in the receiving waters.
- 11. Nuisance growths of aquatic plants have been observed in the receiving waters below the discharge point. These nuisance growths may be due to high nutrient levels (for example, nitrogen and phosphorous compounds) in the wastes discharged, since excessive plant growth is not observed upstream of the discharge point. However, additional studies are required to determine the specific factor(s) responsible for promoting this excessive plant growth and establish appropriate effluent or receiving water limit(s) to mitigate this problem
- 12. The requirements contained in this Order, as they are met, will be in conformance with the goal of the Water Quality Control Plan and will protect and maintain the beneficial uses of the receiving waters.
- 13. Effluent limitations, national standards of performance, toxic and pretreatment effluent standards established pursuant to Sections 208(b), 301, 302, 303(d), 304, 306, and 307 of the Federal Clean Water Act and amendments thereto are applicable to the discharges to navigable waters and tributaries thereto.
- 14. This discharge is subject to EPA's proposed 304(h) regulations. The proposed 304(h) regulations prescribe biological and other laboratory testing procedures and toxicity limits, particularly for chronic toxicity, for the implementation of EPA's "Policy for the Development of Water Quality Based Permit Limitations for Toxic Pollutants" (49 FR 9016, dated March 9, 1984).

Ojai Valley Sanitary District Wastewater Treatment Plant Order No. 90-062

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- 15. Sewage sludge use and disposal practices at this facility are subject to Section 405 (d) of the Clean Water Act and regulations promulgated thereunder.
- 16. The issuance of waste discharge requirements for this discharge is exempt from the provisions of Chapter 3 (commencing with Section 21100) of Division 13 of the Public Resources Code (California Environmental Quality Act) in accordance with Water Code Section 13389.

The Board has notified the discharger and interested agencies and persons of its intent to issue waste discharge requirements for this discharge and has provided them with an opportunity to submit their written views and recommendations.

The Board, in a public hearing, heard and considered all comments pertaining to the discharge and to the tentative requirements.

This Order shall serve as a National Pollutant Discharge Elimination system permit pursuant to Section 402 of the Federal Clean Water Act or amendments thereto, and shall take effect at the end of ten days from the date of its adoption provided the Regional Administrator, EPA, has no objections.

IT IS HEREBY ORDERED that Ojai Valley Sanitary District, in order to meet the provisions contained in Division 7 of the California Water Code and regulations adopted thereunder, and the provisions of the Federal Clean Water Act and regulations and guidelines adopted thereunder, shall comply with the following:

A. NATURE OF WASTE DISCHARGE

Wastes discharged shall be limited to treated municipal wastewater only, as proposed.

B. <u>EFFLUENT LIMITATIONS</u>

1. The discharge of an effluent in excess of the following limits is prohibited:

<u>Constituents</u>	Units of	Discharge L	imitations
	<u>measurements</u>	<u>30-Day Ave</u>	<u>Maximum</u>
BOD ₅ 20°C	mg/l	10	20
	lbs/day*	250	500

Ojai Valley Sanitary District Wastewater Treatment Plant Order No. 90-062

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	Units of	Discharge	E Limitations
<u>Constituents</u> <u>me</u>	<u>asurements</u>	<u> 30-Day Av</u>	<u>re Maximum</u>
Suspended solids	mg/l	10	15
	lbs/day*	250	375
Oil and Grease	mg/l	10	15
	lbs/day*	250	375
Settleable Solids	ml/l	0.1	0.2
Detergents	mg/l	0.5	0.5
(as MBAS)	lbs/day*	12.5	12.5
Residual Chlorine	mg/l		0.1
Total Dissolved	mg/l	1,500	1,500
Solids	lbs/day*	37,530	37,530
Chloride	mg/l	600	600
	lbs/day*	15,010	15,010
Sulfate	mg/l	600	600
	lbs/day*	15,010	15,010
Boron	mg/l	1.5	1.5
	lbs/day*	37.5	37.5
Fluoride	mg/l	1.0	1.0
	lbs/day*	25.0	25.0

* Based on a maximum flow of 3 mgd.

- 2. The acute toxicity of the effluent shall be such that the average survival in the undiluted effluent for any three (3) consecutive 96-hour static or continuous flow bioassay tests shall be at least 90%, with no single test less than 70% survival.
- 3. The arithmetic mean of BOD₅20⁰C and suspended solids values <u>by weight</u>, for effluent samples collected in a period of 30 consecutive calendar days shall not exceed 15 percent <u>by weight</u>, of the arithmetic mean of BOD₅20^oC and suspended solids values, respectively, <u>by weight</u>, for influent samples collected at approximately the same times during the same period.

Ojai Valley Sanitary District Wastewater Treatment Plant Order No. 90-062

- 4. The pH of wastes discharged shall at all times be within the range of 6.5 to 8.5.
- 5. Wastes discharged to watercourses shall at all times be adequately disinfected. For the purpose of this requirement, the wastes shall be considered adequately disinfected if at some point in the treatment process the median number of coliform organisms does not exceed 2.2 per 100 milliliters and the number of coliform organisms does not exceed 23 per 100 milliliters in more than one sample within any 30-day period. The median value shall be determined from the bacteriological results of the last 7 days for which analyses have been completed. Samples shall be collected at a time when wastewater flow and characteristics are most demanding on the treatment facilities and disinfection processes.
- 6. Wastes discharged to watercourses shall have received treatment equivalent to that of filtered wastewater. Filtered wastewater means oxidized, coagulated, clarified wastewater which has been passed through natural undisturbed soils or filter media, such as sand or diatomaceous earth, so that the turbidity as determined by an approved laboratory method does not exceed an average <u>daily</u> operating turbidity of 2 turbidity units and does not exceed 5 turbidity units more than 5 percent of the time during any 24 hour period.
- 7. The temperature of wastes discharged shall not exceed 80°F; except when the ambient temperature of the receiving waters is higher than 80°F, the temperature of the wastes discharged shall not exceed the ambient temperature of the receiving waters.
- Radioactivity in the waste discharged shall not exceed the limits specified in Title 17, Chapter 5, Subchapter 4, Group 3, Article 3, Section 30269, of the California Code of Regulations, or subsequent revisions.

C. <u>RECEIVING WATER LIMITATIONS</u>

1. The wastes discharged shall not cause the pH of the receiving water to be less than 6.5 nor more than 8.5. The wastes discharged shall not change the normal ambient pH levels by more than 0.2 units within any given 24-hour period in receiving waters with designated marine or saline beneficial uses, nor by more than 0.5 units

Ojai Valley Sanitary District Wastewater Treatment Plant Order No. 90-062

within any given 24-hour period in receiving waters with designated cold or warm beneficial uses.

- 2. The wastes discharged shall not increase the receiving water temperature at any time or place by more than 5°F above natural receiving water temperature; except when ambient receiving water is less than 60°F, the wastes discharged shall not increase the receiving water temperature above 70°F. The wastes discharged shall not increase the temperature of the receiving waters at any time or place by more than 5°F within any given 24-hour period.
- 3. The wastes discharged shall not contain biostimulatory substances in concentrations that promote aquatic growths to the extent that such growths cause nuisance or adversely affect beneficial uses of the receiving waters.
- 4. The wastes discharged shall not cause the un-ionized ammonia concentration in the receiving waters to exceed 0.025 mg/l.
- 5. The wastes discharged shall not cause the dissolved oxygen concentration of the receiving waters to be depressed below 7.0 mg/l, except when natural conditions cause lesser concentrations, in which case the wastes discharged shall not cause any further reduction in the dissolved oxygen concentration of the receiving waters.
- 6. The wastes discharged shall not cause foaming in the receiving water beyond the immediate area of the discharge.
- 7. The wastes discharged shall not alter the natural taste, odor, and color of fish or other edible products used for human consumption, and shall not cause nuisance or adversely effect beneficial uses.
- 8. The wastes discharged shall not produce concentrations of toxic substances in the receiving waters that are toxic to or produce detrimental physiological responses in human, plant, animal or aquatic life.
- 9. Wastes discharged shall not result in problems due to breeding of mosquitoes, gnats, black flies, midges, or other pests.

Ojai Valley Sanitary District Wastewater Treatment Plant Order No. 90-062

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D. PRETREATMENT REQUIREMENTS

- 1. This Order includes the discharger's pretreatment program as previously submitted to this Board. Any change to the program shall be reported to the Board in writing and shall not become effective until approved by the Executive Officer.
- 2. The discharger shall be responsible for the performance of all pretreatment requirements contained in Federal Regulations 40 CFR Part 403 and shall be subject to enforcement actions, penalties, fines, and other remedies as provided in the Federal Clean Water Act, as amended. The discharger shall implement and enforce its approved Pretreatment Program. Enforcement actions may be initiated against an industrial user for noncompliance with acceptable standards and requirements as provided in the Federal Clean Water Act.
- 3. The discharger shall enforce the requirements promulgated under sections 307(b), 307(c), 307(d), and 402(b) of the Federal Clean Water Act. The discharger shall cause industrial users subject to the Federal Categorical Standards to achieve compliance no later than the date specified in those requirements or, in the case of a new industrial user, upon commencement of the discharge.
- 4. The discharger shall perform the pretreatment functions as required in Federal Regulations 40 CFR Part 403 including, but not limited to:
 - a. Implement the necessary legal authorities as provided in 40 CFR 403.8 (f) (1);
 - b. Enforce the pretreatment requirements under 40 CFR 403.5 and 403.6;
 - c. Implement the programmatic functions as provided in 40 CFR 403.8(f) (2); and
 - d. Provide the requisite funding of personnel to implement the pretreatment program as provided in 40 CFR 403.8(f) (3).
- 5. The discharger shall submit annually a report to the Regional Board with copies to the State Board and to the Environmental Protection Agency, Region IX, describing

Ojai Valley Sanitary District Wastewater Treatment Plant Order No. 90-062

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the discharger's pretreatment activities over the previous twelve months. In the event the discharger is not in compliance with any conditions or requirements of this permit, then the discharger will also include the reasons for noncompliance and state how and when the discharger shall comply with such conditions and requirements. This annual report is due on March 1 of each year and shall contain, but not be limited to, the information required in the attached "Requirements for Pretreatment Annual Report."

E. <u>REQUIREMENTS AND PROVISIONS</u>

- 1. This Order includes the attached "Standard Provisions and General Monitoring and Reporting Requirements" ("Standard Provisions"). If there is any conflict between provisions stated hereinbefore and said "Standard Provisions", those provisions stated hereinbefore prevail.
- 2. Standby or emergency power facilities and/or storage capacity or other means shall be provided so that in the event of plant upset or outage due to power failure or other cause, discharge of raw or inadequately treated sewage does not occur.
- 3. The discharger shall comply with all existing Federal and State laws and regulations that apply to its sewage sludge use and disposal practices and with the technical standards in Section 405 (d) of the Federal Clean Water Act when promulgated.
- 4. This Order includes the "Requirements for Sludge Reporting". The discharger must submit all required information and comply with the monitoring, reporting, and recordkeeping programs as specified in these requirements.
- 5. If an applicable "acceptable" management practice or numerical limitation for pollutants in sewage sludge promulgated under Section 405 (d) (2) of the Clean Water Act, as amended by the Water Quality Act. of 1987, is more stringent than the sludge pollutant limit or acceptable management practice in this permit, this permit may be reopened to include requirements promulgated under Section 405 (d) (2). Regardless of whether or not the permit is modified, the discharger

Ojai Valley Sanitary District Wastewater Treatment Plant Order No. 90-062

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shall comply with the limitations by no later than the compliance deadline specified in the applicable regulations as required by Section 405 (d) (2) (D) of the Clean Water Act.

6. If results of the special study on nuisance growth problems warrants imposition of effluent and/or receiving water limits on nutrients, this permit may be reopened to include nutrient limitations.

F. <u>EXPIRATION DATE</u>

This Order expires August 10, 1994.

The discharger must file a Report of Waste Discharge in accordance with Title 23, California Code of Regulations, not later than 180 days in advance of the expiration date as application for issuance of new waste discharge requirements.

G. <u>RESCISSION</u>

Order No. 84-72, adopted by this Board on September 17, 1984, is hereby rescinded except for enforcement purposes.

I, Robert P. Ghirelli, Executive Officer, do hereby certify that the foregoing is a full, true and correct copy of an Order adopted by the California Regional Water Quality Control Board, Los Angeles Region, on May 21, 1990.

Robert P. Hlinelli

ROBERT P. GHIRELLI, D.Env. Executive Officer



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LOCATION MAP FROM U.S. GEOLOGICAL SURVEY MAP 1967 OJAI VALLEY WASTEWATER TREATMENT PLANT VENTURA, VENTURA CO. CALIFORNIA

ATTACHMENT 1



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State of California

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD LOS ANGELES REGION

ORDER NO. <u>90-063</u>

REQUIRING OJAI VALLEY SANITARY DISTRICT TO CEASE AND DESIST FROM DISCHARGING WASTEWATER CONTRARY TO REQUIREMENTS PRESCRIBED BY THE CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD, LOS ANGELES REGION

(CI 4245)

(CA0053961)

(M 4245)

The California Regional Water Quality Control Board, Los Angeles Regional, finds:

- 1. Ojai Valley Sanitary District (District) operates the Ojai Valley Wastewater Treatment Plant which discharges wastes under waste discharge requirements contained in Order No. 90-062 adopted by this Board on May 21, 1990. That Order also serves as a National Pollutant Discharge Elimination System permit (NPDES Permit No. CA0053961).
- 2. The waste discharge requirements in Order No. 90-062 provide, in part, the following:
 - "B. EFFLUENT LIMITATIONS
 - 1. The discharge of an effluent in excess of the following limits is prohibited:

	The iter of	<u>Discharge Li</u>	mitations
<u>Constituents</u>	measurements	<u> 30-Day Ave</u>	Maximum
BOD ₅ 20°C	mg/l lbs/day*	10 250	20 500
Suspended solid	ls mg/l lbs/day*	10 250	15 375
Settleable Soli	ids ml/l	0.1	0.2

- * Based on a maximum flow of 3 mgd.
 - 6. Wastes discharged to watercourses shall have received treatment equivalent to that of filtered

Ojai Valley Sanitary District Wastewater Treatment Plant Cease and Desist Order No. 90-063

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wastewater. Filtered wastewater means oxidized, coagulated, clarified wastewater which has been passed through natural undisturbed soils or filter media, such as sand or diatomaceous earth, so that the turbidity as determined by an approved laboratory method does not exceed an average <u>daily</u> operating turbidity of 2 turbidity units and does not exceed 5 turbidity units more than 5 percent of the time during any 24 hour period.

C. <u>RECEIVING WATER LIMITATIONS</u>

- 4. The wastes discharged shall not cause the unionized ammonia concentration in the receiving waters to exceed 0.025 mg/l."
- 3. Ojai Valley Wastewater Treatment Plant discharges an average of 2.11 million gallons per day of secondary treated municipal wastewater to Ventura River. Currently, wastewater treatment at the plant consists of primary clarification for solids removal; biological treatment using oxidation towers for BOD removal; nitrification using rotating biological contactors (RBC) for oxidation of ammonia into nitrates/nitrites; secondary clarification; chlorination; and dechlorination.
- 4. Because of increasing water-contact recreational use of the receiving water downstream of the discharge, Order No. 90-062 requires the District to discharge only filtered and disinfected secondary treated wastewater pursuant to Title 22 of the California Code of Regulations. Without filtration facilities in place, the discharger will not be able to comply with this requirement. The District will also not be able to comply with effluent limits for BOD, suspended solids, and turbidity, as these limits are not attainable without filtration facilities.
- 5. The District may not be able to comply at all times with receiving water limit of 0.025 mg/l for un-ionized ammonia without modifications in the treatment process. Although the District was consistently in compliance with the effluent limitation of 10 mg/l ammonia nitrogen in 1989, about 30 percent of the receiving water samples exceeded the new unionized ammonia limit. Currently, ammonia is added to the wastewater after nitrification to aid disinfection with chlorine. Addition of filtration to the process will have an impact on the necessary modifications.

Ojai Valley Sanitary District Wastewater Treatment Plant Cease and Desist Order No. 90-063

- 6. In a letter dated April 16, 1990, the District submitted a schedule for the construction of filtration facilities. It is estimated that it would take the District three (3) years to acquire funding, design, bid and construct, start up, and reach operational level of the filtration facilities; and to achieve full compliance with the new more stringent requirements.
- 7. On March 12, 1990, the District applied for funding of the filtration facilities and other plant improvement from the State Revolving Fund.
- 8. This enforcement action by a regulatory agency is exempt from the provisions of the California Environmental Quality Act (Public Resources Code, Section 21100, et. seq.) in accordance with Section 15321, Chapter 3, Title 14, California Code of Regulations.

The Board has notified the discharger and interested agencies and persons of its intent to consider at its regular meeting the issuance of a Cease and Desist Order concerning violations and/or threatened violations of the waste discharge requirements.

The Board, in a public hearing, heard and considered all testimony pertinent to this matter. All Orders referred to above and records of hearings and testimony therein are included herein by reference.

In accordance with Section 13301 of the California Water Code, it is hereby ordered that Ojai Valley Sanitary District shall comply with the following:

- 1. Cease and desist from discharging wastes or threatening to discharge wastes in violation of waste discharge requirements listed in Finding No. 2 by July 1, 1993.
- 2. Submit to the Regional Board quarterly progress reports on construction of the filtration facilities and process modifications. The reports shall be submitted on the fifteenth day of the following month after the quarter. The first progress report is due on October 15, 1990.
- 3. Comply immediately with the following interim effluent limits:

Ojai Valley Sanitary District Wastewater Treatment Plant Cease and Desist Order No. 90-063

CA0053961

	<u>Discharge Limitations</u>			
	Units of	30-Day	7-Day	Daily
<u>Constituents</u>	measurements	<u>Average</u>	<u>Average</u>	Maximum
BOD ₅ 20°C	mg/l	20	30	
-	lbs/day*	500	750	1,000
Suspended	mg/l	30	45	
solids	lbs/day*	750	1,130	1,130
Settleable solids	ml/l	0.1		0.3
Ammonia	mg/l			10
nitrogen	lbs/day*	250		250
Turbidity	turbidity units	10		18

* Based on a maximum flow of 3 mgd.

All other limitations, provisions, and requirements contained in Order No. 90-062 which are not in conflict with this Cease and Desist Order remain in full force and effect.

I, Robert P. Ghirelli, Executive Officer, do hereby certify that the foregoing is a full, true and correct copy of an Order adopted by the California Regional Water Quality Board, Los Angeles Region, on May 21, 1990.

Robert P. Ahirelli

ROBERT P. GHIRELLI, D. Env. Executive Officer

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APPENDIX B

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Response from Oil Companies

Shell Western E&P Inc.

An Affiliate of Shell Oil Company

P.O. Box 11164 Bakersfield, CA 93389

October 7, 1991

Mr. James M. Kentosh Project Manager Boyle Engineering Corporation Suite 201 5851 Thille Street Ventura, CA 93003

Dear Mr. Kentosh:

SUBJECT: RECLAIMED WATER FROM THE OJAI VALLEY SANITATION DISTRICT VENTURA FIELD VENTURA COUNTY, CALIFORNIA

In response to your September 20th request, the following information is being submitted. We hope you will find this information useful in conducting a reclaimed water feasibility and marketing study. Shell Western E&P Inc. (SWEPI) would be interested in using reclaimed water as a supplement to Lake Casitas water provided it is compatible, of sufficient quantity, cost effective and does not compromise the current Lake Casitas allocation.

SWEPI is currently using 20,000 to 30,000 barrels of Lake Casitas water per day for secondary oil recovery operations in the Ventura field. New projects currently in the planning stage, are projected to increase the peak demand to 50,000 to 60,000 barrels per day.

The Lake Casitas water enters the Ventura field through a 16" pipeline and is blended with produced water in a 5000 barrel tank. The blended water is pumped from the 5000 barrel tank to two separate injection facilities. The water is chemically treated with chlorine dioxide to control sulfate reducing bacteria and scale inhibitor to prevent the precipitation of scale. Suspended solids are removed by both DE and sand filters. This treatment process is successful in maintaining the water quality within the following guidelines:

Sulfate Reducing Bacteria	< 10,000 colonies per milliliter
H2S	< 1 part per million
Total Suspended Solids	< 1 part per million
Corrosion	< 5 mils per year

Determining the suitability of new sources (e.g. Ojai Valley Sanitation District's effluent) for waterflooding purposes requires laboratory compatibility testing with existing supplies. The tendency for scale precipitation and bacteria growth are the two major concerns. Eliminating the potential for growing sulfate reducing bacteria is critical due the generation of hydrogen sulfide gas.

I hope you find this information useful in your evaluation. If you have additional questions, please contact G. M. Golich of my staff at (805) 326-5519.

. . .

Very truly yours,

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FOR S. B. Pontious Division Production Manager West Coast Production Division

GMG:yh



Texaco Exploration and Production Inc PO Box 811 Ventura CA 93002 895 648-8444

October 28, 1991

Mr. James M. Kentosh, P.E. Boyle Engineering Corporation Suite 201 5851 Thille Street Ventura, CA 93003

RE: Ojai Valley Sanitary District Potential Use of Reclaimed Water by Texaco

We have reviewed your request of September 27, 1991 for data related to the use of water within our oilfield operations and are pleased to provide you with the following information in the same format as in your letter.

The potential of using reclaimed water from the Ojai Valley 1. Sanitary District (OVSD) was reviewed in 1989. The chemical constituents of the OVSD water presented several areas of concern. The high levels of nitrogen and organic material would promote bacteria growth in our injection water. High bacteria and high suspended solids will mechanically plug off our injection wells. Another concern is the potential presence of viruses in the plant This latter constituent could affect the health and effluent. safety of our employees since direct contact with the effluent water would be unavoidable. Additionally, the costs to develop this source (pipeline, pumps and other facilities) would be significant.

2. The average water usage from 1986 through August 1991 is shown below.

	Water Source	(Barrels	per day)
Year	Field	Fresh	Total
1986	60,000	37,300	97,300
1987	58,600	27,500	86,100
1988	63,600	29,400	93,000
1989	61,600	27,100	88,700
1990	63,800	22,100	85,900
1991	61,600	21,100	82,700

3. The majority of our water needs are met within our field from lease production wells, brine water source wells and occasionally a rain water collection facility. Fresh water is purchased for use as potable water in our field offices, for fire protection and for makeup water in the waterflood.

4. Attached is a 1990 geochemical analysis of the City water that is primarily used as makeup water in our injection system.

5. Field produced water is passed through several cleaning and chemical treatment points before merging with the fresh water. The combined waters are then passed through sand filters and finally through diatomaceous earth (DE) filters to remove total suspended solids (TSS) prior to injection down the wells. The TSS at the inlet to the sand filters range between 12-15 ppm and are less than 1 ppm at the DE outlet.

6. High Water quality is critical to our successful waterflood operations. Our water quality criteria includes low total suspended solids, zero to low bacteria (sulfate reducer's, E.Coli etc), zero H₂S, low sulfates, nitrogen and organics, low corrosion rates and low scaling tendencies.

7. Attached is a generalized flow diagram for the Ventura Avenue Field water distribution system. The City water source tanks are located on Ventura Avenue, all the other tanks and facilities are located in the field.

8. Chemical treatment of the injection water is done at various points in the system to control bacteria, scaling and reduce and/or remove other unwanted constituents. Chemicals used include polymers, bacteriacides, scale inhibitors, corrosion inhibitors emulsion breakers and surfactants.

9. Texaco is exploring other alternatives as they relate to conserving water resources. Utilization of OVSD reclaimed water would require overcoming some major obstacles as indicated above.

If you have any further questions please contact Mrs. V. L. Burns at (805) 648-8324.

Very truly yours,

Kevin D. Smith Ventura Area Manager

VLB:clb attachments



ER and PROCESS. ALYSIS REPORT MER: TEXACO PRODUCING INC. EASE: WATERFLOOD MA NO: MARK GANDRAU/38G JUST NO: 22529 EPORTED: 05/04/90 JORDER NO: 90-05-010



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