

TABLE OF CONTENTS

APPENDIX A RANGE OF DISCHARGE EVALUATION.....A-1

Introduction.....	A-1
Storage and Irrigation Requirements.....	A-2
Components and Alternatives.....	A-4
Headworks Expansion.....	A-6
Urban Irrigation.....	A-6
Pipelines.....	A-6
Storage Reservoirs.....	A-7
Pump Stations.....	A-7
Agricultural Irrigation.....	A-8
Environmental Impacts.....	A-8
Headworks Expansion.....	A-8
Urban Irrigation.....	A-8
Pipelines.....	A-8
Storage Reservoirs.....	A-12
Pump Stations.....	A-17
Agricultural Irrigation.....	A-20
A-Discharge.....	A-21
Socio-economics Impacts.....	A-24
Summary of Significant Impacts.....	A-25

REFERENCESA-27

Preparers.....	A-27
Reviewers.....	A-27
Team Documents.....	A-27
Other References.....	A-27

SUPPLEMENT NO. 1 - ALTERNATIVE PROJECTS CONSTRUCTION COST ESTIMATE

LIST OF TABLES

Table 1	Annual Reclamation System Requirements.....	A-3
Table 2	Annual Reclamation System Requirements.....	A-4
Table 3	Volume of Reclaimed Water Discharge.....	A-22
Table 4	Changes in Significant and Unavoidable Impacts Under the 5%, 10%, and 15% Options.....	A-25

APPENDIX A RANGE OF DISCHARGE EVALUATION

INTRODUCTION

On April 18, 1995, the Santa Rosa City Council confirmed that four primary alternatives along with the No Action (No Project) Alternative were to be evaluated equally as Project alternatives for the purposes of the Santa Rosa Subregional Long-Term Wastewater Project EIR/EIS.

- Alternative 2: South County Reclamation, focusing on expansion of agricultural irrigation and associated reclaimed water storage in areas south of Santa Rosa. Four subalternatives have been defined for Alternative 2, differing mainly in the location of reclaimed water storage.
- Alternative 3: West County Reclamation, focusing on expansion of agricultural irrigation and associated reclaimed water storage in areas west of Santa Rosa. Five subalternatives have been defined for Alternative 3, differing mainly in the location of reclaimed water storage.
- Alternative 4: Geysers Recharge, focusing on injection of reclaimed water for recharge of the geysers steamfield located in the Mayacmas Mountains.
- Alternative 5: Discharge, focusing on the discharge of reclaimed water to the Russian River at a design discharge rate of 20% of river flow. Two subalternatives have been defined for Alternative 5, differing mainly in the location of the discharge point.

For the purpose of analyzing alternatives 2 and 3 in the Project EIR/EIS (except for Alternative 5), the discharge of reclaimed water to the Russian River was maintained at a maximum design rate of 1% of average monthly river flow. Under Alternative 4, discharge would be limited to peak weather events only. Thus, alternatives 2, 3, and 4 represent a design discharge to the Russian River a maximum of 1% of river flow, while Alternative 5 represents a design discharge to the Russian River 20% of river flow. Therefore, Alternatives 2 through 5 allow the impacts associated with the range of potential design discharge rates between 1% and 20% to be evaluated in the EIR/EIS.

As an additional means of evaluating the potential impacts associated with design discharge rates between 1% and 20%, this Appendix has been prepared to identify the changes in the Project's impacts resulting from design discharge rates of 5%, 10%, and 15% in relation to the 1% design discharge rate which was the basis for analysis of project impacts from alternatives 2 and 3. These rates were selected as benchmarks

between 1 and 20% to allow evaluation of a range of options as part of environmental review and Project selection. Selection of a Project by the City may involve a design discharge rate between 1% and 20%, different from the benchmarks (for example a 6% or a 12.5% discharge rate). The benchmark options are intended to provide a frame of reference for determining which discharge rate should be incorporated in the selected Project.

Consideration of the effects of the 5%, 10%, and 15% discharge options in this Appendix is limited to alternatives 2 and 3. Alternative 1, No Action, and Alternative 4, Geysers Recharge, by definition do not have discharge options, while Alternative 5 by definition has a 20% design discharge rate.

This Appendix is divided into four sections. The first section Storage and Irrigation Requirements, identifies the requirements for reclaimed water storage and agricultural irrigation under the 5%, 10%, and 15% discharge rates. The second section, Components and Alternatives, discusses the effect of the 5%, 10%, and 15% options on the characteristics of the alternatives and project components. The third section, Environmental Impacts, addresses the changes in Project impacts resulting from implementation of these options. The fourth section presents a summary of significant impacts for the 5%, 10%, and 15% options in relation to the 1% design discharge rate.

STORAGE AND IRRIGATION REQUIREMENTS

With a 5%, 10%, or 15% design discharge rate, the reclaimed water storage and agricultural irrigation requirements for both Alternative 2 and Alternative 3 would be reduced as shown in Tables 1 and 2. The reclaimed water storage requirement would be reduced by approximately 30% with a 5% discharge rate, by just over 50% with a 10% discharge rate, and by 75% with a 15% discharge rate.

Table 1

Annual Reclamation System Requirements

System Requirements ²	Design Discharge Rate ³				
	1%	5%	10%	15%	20%
South County					
Existing Storage (MG)	1,200	1,200	1,200	1,200	1,200
New Storage (MG)	4,000	2,900	1,900	1,000	0
Total Storage (MG)	5,200	4,100	3,100	2,200	1,200
Existing Irrigation Area (acres)	5,500	5,500	5,500	5,500	5,500
Urban Irrigation Area (acres)	400	400	400	400	100
Agricultural Irrigation Area (acres)	3,800	2,600	1,600	1,400	0
South County Total Irrigation Area (acres)	9,700	8,500	7,500	7,300	5,600
South County with Sebastopol					
Existing Storage (MG)	1,200	1,200	1,200	1,200	1,200
New Storage (MG)	4,000	2,900	1,900	1,000	0
Total Storage (MG)	5,200	4,100	3,100	2,200	1,200
Existing Irrigation Area (acres)	5,500	5,500	5,500	5,500	5,500
Urban Irrigation Area (acres)	400	400	400	400	100
South County Agricultural Irrigation Area (acres)	2,600	1,300	300	<300	0
Sebastopol Agricultural Irrigation Area (acres)	2,200	2,200	2,200	2,200	0
Total Irrigation Area (acres)	10,700	9,400	8,400	<8,400	5,600

Source: Parsons Engineering Science, Inc. 1996

Notes:

1. Based on average dry weather flow of 21 mgd.
2. System requirements are defined as the storage volume and irrigation area necessary to meet the reliability requirement. The reliability requirement is that reclaimed water production exceed normal system capacity only one month in twenty.
3. Design discharge rate as a percentage of Russian River flow.

Table 2

Annual Reclamation System Requirements

System Requirements ²	Design Discharge Rate ³				
	1%	5%	10%	15%	20%
West County					
Existing Storage (MG)	1,200	1,200	1,200	1,200	1,200
New Storage (MG)	4,000	2,900	1,900	1,000	0
Total Storage (MG)	5,200	4,100	3,100	2,200	1,200
Existing Irrigation Area (acres)	5,500	5,500	5,500	5,500	5,500
Urban Irrigation Area (acres)	400	400	400	400	100
West County Agricultural Irrigation Area (acres)	6,200	4,400	2,900	1,900	0
Total Irrigation Area (acres)	12,100	10,300	8,800	7,800	5,600
West County with Sebastopol					
Existing Storage (MG)	1,200	1,200	1,200	1,200	1,200
New Storage (MG)	4,000	2,900	1,900	1,000	0
Total Storage (MG)	5,200	4,100	3,100	2,200	1,200
Existing Irrigation Area (acres)	5,500	5,500	5,500	5,500	5,500
Urban Irrigation Area (acres)	400	400	400	400	100
West County Agricultural Irrigation Area (acres)	4,300	2,600	1,000	<1,000	0
Sebastopol Agricultural Irrigation Area (acres)	2,200	2,200	2,200	2,200	0
Total Irrigation Area (acres)	12,400	10,700	9,100	<9,100	5,600

Source: Parsons Engineering Science, Inc. 1996

Notes:

1. Based on average dry weather flow of 21 mgd.
2. System requirements are defined as the storage volume and irrigation area necessary to meet the reliability requirement. The reliability requirement is that reclaimed water production exceed normal system capacity only one month in twenty.
3. Design discharge rate as a percentage of Russian River flow.

COMPONENTS AND ALTERNATIVES

Based upon the storage and irrigation requirements for the 5%, 10%, and 15% discharge rates, an engineering determination was made of the effect on each of the Project components and on the feasibility of implementing each of the alternatives under Alternative 2 and Alternative 3.

In the EIR/EIS, in Alternative 2, four alternatives have been defined, while within Alternative 3, five alternatives have been defined.

- Alternative 2A. Reservoir Site: Tolay Extended;
- Alternative 2B. Reservoir Sites: Adobe Road and Lakeville Hillside;
- Alternative 2C. Reservoir Site: Tolay Confined;
- Alternative 2D. Reservoir Sites: Sears Point and Lakeville Hillside;
- Alternative 3A. Reservoir Site: Two Rock;
- Alternative 3B. Reservoir Site: Bloomfield;
- Alternative 3C. Reservoir Site: Carroll Road;
- Alternative 3D. Reservoir Site: Valley Ford; and
- Alternative 3E. Reservoir Site: Huntley.

Principal Project components that are common to both Alternative 2 and Alternative 3 are:

- Expansion of the headworks at the Laguna Plant;
- Urban irrigation in the Fountaingrove and Bennett Valley areas;
- A transport system, consisting of transmission pipelines and pump stations, to carry the reclaimed water to storage and irrigation sites; and
- Agricultural irrigation.

Based upon the storage requirements for the 5%, 10%, and 15% discharge rates, one alternative would be eliminated from consideration and two alternatives would be modified under one or more of the options.

- Alternative 2A: Downsizing the Tolay Expanded reservoir to the 1,900 MG capacity under the 10% option or the 1,000 MG capacity under the 15% option would result in a relatively large and shallow impoundment that would have a large "dead zone" (shallow and turbid water) not available to the outlet works and irrigation pump station. The shallow water would also be warmer than deeper reservoirs, and would aggravate the growth of algae in the reservoir. For these reasons, Alternative 2A is infeasible for a 10% or 15% discharge rate, and therefore has been eliminated for any further consideration for the 10% and 15% discharge rate. However, the Tolay Expanded reservoir could be reduced to a 2,900 MG capacity without these effects and therefore Alternative 2A would be retained for consideration at a 5% discharge rate.

- Alternatives 2B and 2D: Under the 5%, 10%, and 15% options, the reservoir storage component for Alternatives 2B and 2D would be modified. For these alternatives, the Lakeville Hillside reservoir site with a capacity of 1,000 MG was paired with the Adobe Road site (3,400 MG capacity) and the Sears Point site (3,000 MG capacity) to reach the necessary 4,000 MG storage capacity required for storage at the 1% design discharge rate.

Under the 5% or 10% option, the reduced storage requirement (2,900 MG for the 5% option and 1,900 MG for the 10% option) means that the Lakeville Hillside reservoir is not needed, and therefore storage for Alternative 2B would consist only of the Adobe Road site, and storage for Alternative 2D would consist only of the Sears Point site. Under the 15% option, the storage requirement of 1,000 MG would allow any of the three sites to be used individually, so for this option Alternatives 2B and 2D would consist of the Adobe Road, Lakeville Hillside, or Sears Point site.

In addition to elimination of these reservoir sites, components considered under the 5%, 10%, and 15% options would be affected below.

Headworks Expansion

The headworks expansion, which involves the replacement of the existing influent pumps with higher capacity pumps will not change under the 5%, 10%, or 15% options, as the projected amount of influent entering the plant will not change.

Urban Irrigation

The urban irrigation component, which consists of replacement of existing water sources with reclaimed water at currently irrigated sites in the City of Santa Rosa will not change under the 5%, 10%, or 15% options.

Pipelines

The location and size of the pipelines to serve the urban irrigation sites will not change under the 5%, 10%, and 15% options. The location of pipelines to carry reclaimed water from the treatment plant to the reservoirs and from the reservoirs to the agricultural irrigation areas will not change, except that pipeline segments serving reservoirs under Alternatives 2A and 2D could be eliminated depending upon which reservoir site was chosen. The short pipeline segment from Old Lakeville Highway No. 3 to the Lakeville Hillside reservoir could be eliminated under the 5% and 10% options, and two of the pipelines serving the Lakeville Hillside, Adobe Road or Sears Point sites could be eliminated under the 15% options.

Pipeline sizes to the reservoirs would be reduced to account for the reduced volume (and flow rate) to be delivered to the reservoirs and irrigation areas. This reduction will not

result in a decrease in the width of the construction zone necessary for pipeline construction.

There will not necessarily be a reduction in the number or length of pipelines serving the agricultural irrigation areas. As indicated in the discussion of the agricultural irrigation component below, irrigation areas will not necessarily be reduced in geographic distribution, although the acreage needed for irrigation will be less under any of the discharge options. The pipelines for urban irrigation will not change under any of the options.

Storage Reservoirs

Under the 5%, 10%, and 15% options, the reduced reclaimed water storage requirement will result in a reduced reservoir size, including a lower water elevation, reduced water surface area, and a reduction in height of the main dams, as well as the back dams and saddle dams. However, because these reservoirs are to be constructed in valleys, the reduction in volume does not result in a proportional reduction in the dam height, surface water elevation, or surface area of the reservoir. These will change by only a few feet, even under the 15% option. Therefore there will not be any appreciable change in the construction zone area for any of the reservoirs due to the reduced storage volume. The diversion channels and other facilities for storm water drainage will not be altered under the 5%, 10%, or 15% options because these facilities are sized to deal with the storm water flows within the watershed and will not change as a result of reduced storage requirements. Because the location of the main dam will not be changed, the location of the access road will not be changed. Under the 10% and 15% option, the saddle dam for the Adobe Road reservoir will be eliminated.

Pump Stations

The number and location of pump stations to be considered under the 5%, 10%, and 15% options would not change, except that the pump station at the Lakeville Hillside reservoir site could be eliminated under the 5% and 10% options, and the pump stations at the Lakeville Hillside, Adobe Road, or Sears Point sites (both the reservoir pump stations and the storm water pump stations) could be eliminated under the 15% option.

Because less volume of water must be delivered from the Laguna Plant to the reservoirs and from the reservoirs to the irrigation areas, the capacity of the pump stations at the Laguna Plant and at the reservoirs will be reduced to about 70% for the 5% option, to about 50% for the 10% option, and to about 25% for the 15% option.

However, the amount of water to a given irrigation area might not be reduced under any option, even though the total volume of reclaimed water delivered for irrigation will be less. The booster pump stations serving the individual irrigation areas will not necessarily be reduced in size.

There would not necessarily be a reduction in the number of pump stations serving the agricultural irrigation areas. As indicated in the discussion of the agricultural irrigation component below, irrigation areas would not necessarily be reduced in geographic distribution, although the acreage needed for irrigation would be less under any of the discharge options.

Agricultural Irrigation

Although under the 5%, 10%, and 15% options the total acreage required for agricultural irrigation would be reduced the areas evaluated for potential agricultural irrigation would not be reduced. This is because it is not predictable which property owners will be willing to use reclaimed water. Consequently, the irrigation acreage evaluated must be larger than theoretically required. For the 5%, 10%, and 15% options, agricultural irrigation may occur in any of the areas listed for alternatives 2 and 3 in Chapter 3 of the EIR/EIS, Description of Existing System and Alternatives.

ENVIRONMENTAL IMPACTS

For each component, the changes identified in the previous section were evaluated to determine whether the impacts for the component will change from those identified for the 1% project. Socio-economic impacts, which were analyzed by alternative rather than by component are addressed at the end of this section.

Headworks Expansion

Under the 5%, 10%, and 15% options, there will be no change in this component and therefore there would be no change in the impacts from those identified for the 1% project.

Urban Irrigation

Under the 5%, 10%, and 15% options, there will be no change in this component and therefore there will be no change in the impacts from those identified for the 1% project.

Pipelines

Under the 5%, 10%, and 15% options for Alternatives 2B and 2D, elimination of the following pipeline segments will occur due to the elimination of the Adobe Road, Lakeville Hillside or Sears Point reservoirs.

- Adobe Road Reservoir
 - From Adobe Road cross country to the Adobe Road reservoir.
- Lakeville Hillside Reservoir
 - From Lakeville Highway along Old Lakeville Highway No. 3 and cross country to the Lakeville Hillside reservoir.

- Sears Point Reservoir
 - From Lakeville Highway along Cannon Lane and cross country to the Sears Point reservoir inlet (including a pipeline tunnel on the cross country segment).
 - From the Sears Point reservoir outlet cross country and along Highway 37 to Lakeville Highway.

This will result in a reduction in some impacts, but will not reduce any of the impacts identified for the 1% project to less than significant. Three categories of impacts are discussed below: less than significant, less than significant after mitigation, and significant.

Less than Significant Impacts

Only impacts associated with alternatives 2B or 2D will be reduced. The following impacts are less than significant with a 1% project, and will be reduced by the elimination of the pipeline segments leading to one of the reservoir sites under alternatives 2B or 2D in the 5%, 10%, and 15% options.

- Geology Impact 3.4.1: Unstable Slope Conditions. Pipelines in the South County are in areas of low risk of landslide, and impact will be further reduced.
- Surface Water Hydrology Impact 4.4.7: Flooding Due to Rupture of Pipelines. The elimination of pipeline segments will reduce impacts from rupture.
- Groundwater Impacts 5.4.1, 5.4.2 and 5.4.3: Degradation of Groundwater Quality and Groundwater Mounding. The elimination of pipeline segments will reduce the localized temporary impacts on ground water quality and water mounding due to pipeline rupture.
- Surface Water Quality Impacts 6.4.1, 6.4.2 and 6.4.4: Exceedence of Numeric-Based, Narrative-Based, and Sediment Criteria. The elimination of pipeline segments will reduce the localized temporary water quality impacts related to pipeline construction or pipeline rupture.
- Public Health and Safety Impact 7.4.1: Exposure to Chemicals, Radionuclides or Pathogens. The elimination of pipeline segments will reduce the localized impacts of exposure from runoff due to pipeline rupture.

- Public Health and Safety Impact 7.4.2: Construction within a Known Hazardous Waste site. The elimination of pipeline segments will eliminate potential exposure to hazardous waste along these pipelines.
- Public Health and Safety Impact 7.4.5: Exposure to a Flooding Hazard. The elimination of pipeline segments will reduce the localized impacts of exposure to flooding due to pipeline rupture.
- Energy Impact 17.4.1: Energy Requirements Exceeding Ability of Providers to Deliver. The elimination of pipeline will reduce the demand for energy.

Impacts Less than Significant After Mitigation

Only impacts associated with alternatives 2B or 2D will be reduced. The following impacts are significant, but would be reduced to less than significant with mitigation, for the 1% project. With the elimination of pipeline segments leading to one of the reservoir sites under alternatives 2B or 2D in the 5%, 10%, and 15% options, impacts will be reduced.

- Geology Impact 3.4.3: Liquefaction During an Earthquake. The amount of pipeline subject to damage from liquefaction during an earthquake due to locations in alluvial soils with shallow groundwater will be reduced.
- Geology Impact 3.4.7: Exposure to Damage Due to Expansive Soils. The amount of pipeline subject to damage from expansive soils could be reduced.
- Geology Impact 3.4.8: Exposure to Damage Due to Corrosive Soils. The amount of pipeline subject to damage from corrosive soils could be reduced.
- Jurisdictional Wetlands Resources Impact 10.4.1: Destruction of Wetlands. The elimination of pipeline segments eliminate the potential for destruction of wetlands along this segment.
- Visual Resource Impacts 14.4.2 and 14.4.3: Impacts on Scenic Landscape Units and Scenic Corridors. The elimination of Adobe Road or Lakeville Hillside pipeline segments will eliminate some impacts for Scenic Landscape Units as designated by Sonoma County. Elimination of the pipeline from the Sears Point reservoir along Highways 121 and 37 will result in the elimination of visual impacts along these Scenic Corridors designated by Sonoma County.

- Visual Resources Impact 14.4.6: Foreground Views from Private Residences. The elimination of pipeline may reduce the localized impacts on foreground views from private residences near reservoirs.
- Cultural Resource Impacts 15.4.1 and 2: Disturbance of Cultural Resources. The elimination of pipeline segments will eliminate any potential for disturbance to cultural resources, including unknown archaeological sites along these routes.
- Paleontologic Resources Impact 16.4.1: Disturbance of Paleontologic Resources. The elimination of the pipeline segments will eliminate any potential disturbance to unknown paleontological resources in the Petaluma Formation along these routes.

Impacts Significant After Mitigation

Only impacts associated with alternatives 2B or 2D will be reduced. The following impacts are significant for the 1% project. They will be reduced by elimination of pipeline segments leading to one of the reservoir sites under alternatives 2B or 2D in the 5%, 10%, and 15% options, but would still be significant.

- Transportation Impact 11.4.1: Congestion along Access Roads. The elimination of the pipeline segments will reduce the extent of roadways impacted by pipeline construction.
- Transportation Impact 11.4.2: Lane Closures. The elimination of pipeline segments, including the pipeline along Highways 121 and 37 from the Sears Point reservoir site under the 15% options for Alternative 2D would result in the elimination of these routes from the roadways impacted by lane closure.
- Air Quality Impact 12.4.1: Emissions That Exceed Threshold Levels. The elimination of pipeline may reduce the localized level of emissions generated by construction of the Project.
- Noise Impacts 13.4.1, 2 and 3: Exposure to High Noise Levels. The elimination of pipeline segments may reduce the localized level of noise generated by construction of the Project.

Impact Summary

No other impacts identified for the 1% project will be affected by the elimination of the pipelines to the Adobe Road, Lakeville Hillside, or Sears Point Reservoirs.

The reduction in pipeline size for transmission pipelines to the reservoir sites under the 5%, 10%, and 15% options will not result in a reduction in the width of the pipeline construction zone and therefore there will be no effect on impacts identified for the 1% project.

No additional impacts have been identified resulting from the elimination of the pipelines to the Adobe Road, Lakeville Hillside, or Sears Point Reservoirs, or from the reduction in transmission pipeline size.

Storage Reservoirs

Under the 5%, 10%, and 15% options for Alternatives 2B and 2D, the elimination of one of the reservoir sites (Adobe Road, Lakeville Hillside or Sears Point) from either of these Alternatives would result in a reduction in some impacts. Decreases in reservoir size will reduce the reservoir footprint, but because of reservoir geometry the water surface elevation will change by only a few feet. These changes will not reduce any of the impacts identified for the 1% project to less than significant. Some significant impacts at specific reservoir sites will, however, be eliminated. Three categories of impacts are discussed below: less than significant, less than significant after mitigation, and significant.

Less than Significant Impacts

Only impacts associated with alternatives 2B or 2D will be reduced. The following impacts are less than significant with a 1% project, but would be reduced by the elimination of one of the reservoir sites under alternatives 2B or 2D in the 5%, 10%, and 15% options.

- **Geology Impact 3.5.3: Liquefaction During an Earthquake:** The elimination of any reservoir, all of which are located in an area of low to moderate risk, will reduce the impact due to susceptibility to liquefaction under the 5%, 10% and 15% options.
- **Geology Impact 3.5.8: Exposure to Damage Due to Corrosive Soils:** The elimination of any reservoir, all of which are located in an area of low to moderate risk, will reduce the impact due to damage from corrosive soils.
- **Surface Water Hydrology Impact 4.5.6: Streambank Erosion.** The elimination of any reservoir will reduce the downstream impacts of erosion due to discharge of water from dam spillways or diversion structures, or from increased stream flow due to reservoir seepage.
- **Groundwater Impact 5.5.3: Groundwater Mounding.** The elimination of any reservoir will eliminate the potential for groundwater mounding within the vicinity of the site.

- Surface Water Quality Impacts 6.5.2 and 6.5.4: Exceedence of Narrative-Based and Sediment Criteria. Elimination of any reservoir will eliminate any impacts related to these criteria for that site.
- Terrestrial Biological Resources Impacts 8.5.2: Loss of CNPS Listed Plant Species. This impact will not be reduced because there are no listed species on the Adobe Road, Lakeville Hillside or Sears Point reservoir sites.
- Terrestrial Biological Resources Impact 8.5.4 and 8.5.5: Permanent Loss of Sensitive Terrestrial Wildlife Habitat and Permanent Loss of Sensitive Native Plant Communities. The elimination of the Lakeville Hillside reservoir site will eliminate impacts on 168 acres of Annual Grassland, 0.6 acres of Native Grassland and 11 acres of Valley Foothill Riparian habitat. Elimination of Adobe Road reservoir will eliminate impacts on 265 acres of Annual Grassland, 15.2 acres of Oak Woodland, and 61 acres of Valley Foothill Riparian habitat. Elimination of Sears Point reservoir will eliminate impacts to 388 acres of Annual Grassland, 5 acres of Oak Woodland, and 59 acres of Valley Foothill Riparian habitat.
- Terrestrial Biological Resources Impact 8.5.7: Ecological Risk to Terrestrial Plant and Wildlife Populations. The elimination of any reservoir will reduce impacts resulting from ecological risk.
- Air Quality Impact 12.5.5: Odors. The elimination of any reservoir will reduce the localized effect of odors generated by periodic draining of the reservoir.
- Energy Impact 17.5.1: Energy Requirements Exceeding Ability of Providers to Deliver. The elimination of any reservoir will reduce the demand for energy.

Impacts Less than Significant After Mitigation

Only impacts associated with alternatives 2B or 2D will be reduced. The following impacts are significant, but would be reduced to less than significant with mitigation, for the 1% project. With the elimination of one of the reservoir sites under Alternatives 2B or 2D in the 5%, 10%, and 15% options, these impacts would be further reduced.

- Geology Impact 3.5.7: Exposure to Damage Due to Expansive Soils. All of the reservoir sites considered under Alternatives 2B and 2D (Adobe Road, Lakeville Hillside, and Sears Point) are located in areas of highly expansive soils. The elimination of a reservoir will reduce the impact because only one reservoir will be affected instead of two.

- Groundwater Impacts 5.5.1 and 2: Degradation of Groundwater Quality. The elimination of any reservoir will eliminate the potential impact on existing and future wells from reservoir seepage within the vicinity of the site.
- Groundwater Impacts 5.5.4 and 5.5.5: Lowering of Groundwater Levels. The elimination of a reservoir will eliminate the potential impact from lowering of groundwater levels within the vicinity of the site.
- Public Health and Safety Impact 7.5.1: Exposure to Chemicals, Radionuclides or Pathogens. The elimination of a reservoir will eliminate the impact on existing and future wells from seepage within the vicinity of that site.
- Public Health and Safety Impact 7.5.5: Exposure to a Flooding Hazard. The elimination of a reservoir will eliminate the potential flooding impact in the area below the reservoir due to a dam failure for that site.
- Public Health and Safety Impact 7.5.6: Increased Exposure to Disease Vectors. The elimination of any of the reservoir sites will result in the elimination of potential exposure to disease vectors (i.e. mosquitoes) in the vicinity of that site.
- Terrestrial Biological Resources Impact 8.5.3: Loss of Active Raptor Nest Sites. All reservoir sites have potential habitat for raptor nests, so elimination a reservoir will reduce this potential impact.
- Aquatic Biological Resources Impacts 9.5.1, 9.5.3, 9.5.4, and 9.5.5: Loss of Endangered Threatened or Rare Aquatic Wildlife or Plants or Their Habitats. Elimination of the Lakeville Hillside and Sears Point reservoir sites will eliminate impacts to sites where California red-legged frogs occur. The Lakeville, Adobe Road and Sears Point reservoir sites do not have Northwestern pond turtle habitat. None of these sites contains a sensitive aquatic plant community. Elimination of the Adobe Road site will avoid impacts to 7,000 linear feet of Warmwater B stream habitat. Elimination of the Sears Point site will avoid impacts to 5,200 linear feet of Warmwater A habitat and 13,100 feet of Warmwater B habitat. Elimination of the Lakeville Hillside site will avoid impacts to 10,100 feet of Warmwater B habitat.
- Aquatic Biological Resources Impact 9.5.8: Decrease in Streamflows Downstream of Dam Structures. All effects at the Adobe Road, Lakeville

Hillside and Sears Point reservoirs will be avoided if these sites were eliminated.

- Jurisdictional Wetlands Resource Impact 10.5.1: Destruction of Wetlands. The elimination of the Lakeville Hillside reservoir avoid impacts of 22 acres of wetlands; the elimination of the Adobe Road or Sears Point sites will result avoid impacts to 30 acres or 53 acres of wetlands respectively.
- Cultural Resources Impacts 15.5.1,2 and 3: Disturbance of Cultural and Paleontological Resources. The elimination a reservoir will result in avoiding any potential disturbance to known or unknown cultural resources on that site. The Adobe Road, Lakeville Hillside and Sears Point sites have 23, 10, and 18 known cultural sites respectively, and each has an unknown number of additional archaeological and paleontological sites.

Impacts Significant After Mitigation

Only impacts associated with alternatives 2B or 2D will be reduced. The following impacts are significant for at least one of the reservoir sites for the 1% project. They will be reduced by elimination of reservoir sites under Alternatives 2B or 2D in the 5%, 10%, and 15% options, but would still be significant.

- Agriculture Impact 2.5.1: Loss of Farmland. Elimination of a reservoir would decrease the amount of agricultural land lost under these alternatives. The Lakeville Hillside reservoir site has 152 acres of grazing land. The Sears Point site includes 274 acres of grazing land, and the Adobe Road site contains 147 acres of grazing land and 38 acres of Farmland of Local Importance.
- Agriculture Impact 2.5.2: Cancellation of Williamson Act Contracts. The Lakeville Hillside reservoir site has 155 acres of land under Williamson Act. The Adobe Road reservoir site has 9 acres under Williamson Act Contract. The Sears Point site has no land in Williamson Act contracts.
- Geology Impact 3.5.1: Unstable Slope Conditions: All of the reservoir sites considered under Alternatives 2B and 2D (Adobe Road, Lakeville Hillside and Sears Point) are located in an area of high risk for potential landslide. With elimination of one reservoir, unstable slope conditions would need to be mitigated at one remaining reservoir instead of two.
- Surface Water Quality Impact 6.5.1: Exceedence of Numeric-Based Criteria for Ammonia, Dissolved Oxygen and Hydrogen Sulfide. The elimination of a reservoir would avoid the localized water quality impacts related to these criteria for the watershed in which that reservoir is located.

- Transportation Impact 11.5.1: Congestion along Access Roads. The elimination of any reservoir site will eliminate a roadway impacted by reservoir construction.
- Air Quality Impact 12.5.1: Emissions that Exceed Threshold Levels. The elimination of the need for two reservoirs under Alternative 2B and Alternative 2D will reduce the total level of sulfur dioxide and carbon monoxide impacts for these alternatives to less than significant. However, this will not reduce the overall level of construction impact on air quality for these alternatives to less than significant because the construction of any reservoir will still result in significant impacts due to dust generation and nitrogen oxide emissions from construction equipment and vehicle trips.
- Noise Impacts 13.5.1 and 3: Exposure to High Noise Levels. The elimination of the Lakeville Hillside, Adobe Road or Sears Point reservoir will eliminate the localized effect of noise generated by construction of this reservoir.
- Visual Resources Impact 14.5.2: Impacts on Scenic Landscape Units. The elimination of the Adobe Road reservoir will result in avoiding an of adverse effects on a designated Scenic Landscape Unit for this alternative. This was considered to be a significant and unmitigable permanent impact for the 1% project due to loss of mature trees on the site.
- Visual Resources Impact 14.5.3: Impacts on Scenic Corridors. The elimination of the Adobe Road or Sears Point reservoir will avoid adverse effects on designated Scenic Corridors for these alternatives. This was considered to be a significant and unmitigable permanent impact for the 1% project due to view obstruction and loss of mature trees on the site.
- Visual Resources Impact 14.5.5: Impacts on High Volume Travelway or Public Use Area. The elimination of the Adobe Road or Sears Point reservoir will avoid adverse effects on a high volume travelway (views of the Adobe Road site from Washington Street in Petaluma) and a public use area (views of the Sears Point site from the Roche Winery) for these alternatives. This was considered to be a significant and unmitigable permanent impact for the Sears Point site under the 1% project due to view obstruction.
- Visual Resources Impact 14.5.6: Foreground Views from Private Residences. The elimination of the Adobe Road or Sears Point reservoir would avoid adverse effects on private residences. This was considered to be a significant and unmitigable permanent impact for both sites under the 1% project due to view obstruction. The elimination of the Lakeville

Hillside reservoir will avoid adverse effects on foreground views of this site from private residences due to visual contrast.

Impact Summary

No other impacts identified for the 1% project would be affected by the elimination of any of the reservoir sites.

The reduction in storage volume for other reservoir sites under both the 5%, 10%, and 15% options will not result in a reduction in the construction zone, and therefore there will have no effect on impacts identified for the 1% project for these sites. The resulting reduction in the dam heights, water surface areas, and water elevation will not be sufficient to affect the impacts identified for the 1% project.

No additional impacts have been identified resulting from either the elimination of the Lakeville Hillside, Adobe Road or Sears Point Reservoirs or the reduction in storage volume for the other reservoir sites.

Pump Stations

Under the 5%, 10%, and 15% options, the elimination of the pump station at any of the reservoir sites under Alternative 2B or 2D, and the reduction in the capacity of pump stations at the Laguna Plant and the reservoir sites will result in a reduction in some impacts, but will not reduce any of the impacts identified for the 1% project to less than significant. Three categories of impacts are discussed below: less than significant, less than significant after mitigation, and significant.

Less than Significant Impacts

Only impacts associated with alternatives 2B or 2D will be reduced. The following impacts are less than significant with a 1% project, but will be reduced by the elimination of the pump stations at one of the reservoir sites under alternatives 2B or 2D in the 5%, 10%, and 15% options.

- Geology Impact 3.6.1: Unstable Slope Conditions: The elimination of the pump station at a reservoir will reduce the low risk of damage from landslide.
- Geology Impact 3.6.3: Liquefaction During An Earthquake: The elimination of the pump station at a reservoir, which are located in areas of low to moderate risk, will reduce the impact due to susceptibility to liquefaction.
- Geology Impact 3.6.8: Exposure to Damage Due to Corrosive Soils: The elimination of the pump station at a reservoir, which are located in an area

of low to moderate risk, will reduce the impact due to damage from corrosive soils.

- **Transportation Impact 11.6.1: Congestion along Access Roads.** The elimination of the pump station at a reservoir will avoid construction traffic for that particular site.
- **Air Quality Impact 12.6.1: Emissions That Exceed Threshold Levels.** The elimination of any pump stations will eliminate construction emissions associated with the pump station.
- **Visual Resource Impact 14.6.2: Impacts on High Volume Travelways.** The elimination of the pump station at the Lakeville Hillside reservoir sites will avoid impacts for this pump station due to visual contrast. The following impact reduction applies to all reclamation alternatives.
- **Energy Impact 18.6.1: Energy Requirements Exceeding Ability of Providers to Deliver.** Reduction in pumping for the 5%, 10%, and 15% projects will also reduce the energy demand.

Impacts Less than Significant After Mitigation

Only impacts associated with alternatives 2B or 2D would be reduced. The following impacts are significant, but would be reduced to less than significant with mitigation, for the 1% project. With the elimination of pump stations at one of the reservoir sites under alternatives 2B or 2D in the 5%, 10%, and 15% options, these impacts would be reduced.

- **Geology Impact 3.6.7: Exposure to Damage Due to Expansive Soils.** Highly expansive soils are particularly common in the South County. The Lakeville Hillside reservoir, has one pump station, the Adobe Road site has two; and Sears Point has one pump station. Elimination of a reservoir will reduce the hazards at that site.
- **Public Health and Safety Impact 7.6.2: Construction within a Known Hazardous Waste site.** The elimination of pump stations at a reservoir will avoid potential exposure to hazardous waste for pump stations at that site.
- **Visual Resource Impact 14.6.2: Impacts on Scenic Landscape Units.** The elimination of pump stations at the Adobe Road and Lakeville Hillside reservoir sites will avoid impacts on Scenic Landscape Units as designated by Sonoma County.
- **Cultural Resources Impacts 15.6.1 and 2: Disturbance of Cultural Resources.** The elimination of the pump station at any of the reservoir

sites will avoid disturbance to known or unknown cultural resources on this site.

Impacts Significant After Mitigation

Only impacts associated with alternatives 2B or 2D will be reduced. The following impacts are significant for the 1% project. They will be reduced by elimination of pump stations at one of the reservoir sites under Alternatives 2B or 2D in the 5%, 10%, and 15% options, but would still be significant.

- Agriculture Impact 2.6.1: Loss of Farmland. Elimination of the pump station at any of the reservoir sites will reduce the amount of grazing land and other status farmland, but impacts will remain significant.
- Noise Impacts 13.6.1 and 13.6.3: Exposure to High Noise Levels. The elimination of pump stations at any of the reservoir sites will avoid the localized effect of noise generated by construction of those pump stations.
- Visual Resource Impact 14.6.3: Impacts on Scenic Corridors. The elimination of pump stations at the Adobe Road and Sears Point reservoir sites under Alternatives 2B or 2D would avoid impacts on Scenic Corridors designated by Sonoma County. Impacts for the Adobe Road pump station were considered to be less than significant impacts for the 1% project after mitigation. Impacts from the Sears Point pump station were considered to be significant and unmitigable due to the new electrical lines required for that pump station. Elimination of the Sears Point pump station will not affect the overall level of significance for alternatives 2B and 2D, because the Pump Station SBPS-10 sites will have significant unavoidable impacts on visual resources under these alternatives.
- Visual Resources Impact 14.6.6: Foreground Views from Private Residences. Impacts on Scenic Corridors. The elimination of pump stations at the Adobe Road Lakeville Hillside and Sears Point reservoir sites will avoid impacts on foreground views from private residences. Impacts for the Adobe Road and Lakeville Hillside pump station were considered to be less than significant impacts for the 1% project after mitigation. Impacts from the Sears Point pump station were considered to be significant and unmitigable due to the new electrical lines required for that pump station. Elimination of the Sears Point pump station will not affect the overall level of significance for alternatives 2B and 2D, because Pump Station SBPS-10 sites will have significant unavoidable impacts on visual resources under these alternatives.

The following impact reduction applies to all reclamation alternatives.

Noise Impacts 13.6.2. The reduction in the capacity of the pump stations at all reservoir sites and at the Laguna Plant will reduce the noise impacts within the vicinity of these pump stations. However, overall level of noise impact for all of the alternatives under Alternatives 2 and 3 will not be reduced to less than significant because the construction of the pump stations at the other reservoirs and Laguna Plant would still result in significant noise impacts, as will the construction and operation of the booster pump stations for all alternatives.

Impact Summary

No other impacts identified for the 1% project will be affected by the elimination of the pump station at any of the reservoir sites or by the reduction in capacity at other pump stations.

No additional impacts have been identified resulting from either the elimination of the pump stations or the reduction in pump station capacity.

Agricultural Irrigation

Under the 5%, 10%, and 15% options, there will be no change in the size or location of areas being considered for agricultural irrigation, and therefore there will be no change in impacts from those identified for the 1% project.

Since the amount of acreage to be irrigated under the 5%, 10% and 15% options is reduced from the 1% project, it is likely that the environmental impacts resulting from irrigation will also be reduced. However, because the actual properties to be irrigated are not known at this time for the 1% project or for the 5%, 10% and 15% options, it is not possible to determine the location or degree of reduced impacts. The reduction in irrigated acreage for Alternative 2, South County, will be approximately 30% under a 5% option, nearly 60% under a 10% option, and a bit over 60% with a 15% option. Acreage for Alternative 3, West County, will be reduced almost 30% for a 5% option, over 50% for the 10% option, and almost 70% for the 15% option. However, the reductions in impacts will not necessarily be reduced proportionately, and depending on the actual location and characteristics of the properties to be irrigated could be substantially more or less than the reduction in the total irrigation acreage.

The effect of agricultural irrigation associated with the 5 and 10% options on surface hydrology, surface water quality, and aquatic biological resources was evaluated based on how much land was irrigated and independent of what particular acreage was irrigated, as described in the *Water Quality and Flow Model for Irrigation/Storage Area Streams* technical report (RMA 1996), *Water Quality Impacts Analysis* technical report (Merritt Smith Consulting 1996), and the *Aquatic Biological Resources Impacts Analysis* technical report (Merritt Smith Consulting 1996). The following impacts will apply to all reclamation alternatives.

- Surface Hydrology Impact 4.7.5 and 6. Flooding and Stream Bank Erosion. Irrigation associated with the 1% project was found to have a less than significant impact. Reduced irrigation acreage will reduce any impact of irrigation on flooding and streambank erosion. Therefore, the impact of irrigation associated with the 5%, 10%, and 15% rates will also be less than significant.
- Surface Water Quality Impact 6.7.1. Exceedence of Numeric Criterion for Dissolved Copper. This impact was significant for irrigation acreage associated with the 1% project, but less than significant with mitigation. Mitigation included reducing irrigation acreage. Irrigation acreage associated with the 5%, 10%, and 15% discharge rates will have a less than significant impact on dissolved copper (Merritt Smith Consulting 1996b).

Discharge

Under the 5%, 10%, and 15% options, there would be no change from the 1% project in the size or location of the outfall structures on the Laguna. However, all of the options will substantially increase the amount of reclaimed water discharged to the Laguna. The average annual amount of reclaimed water discharged to the Laguna under the 5%, 10% and 15% options is shown in Table 3.

Table 3

Volume of Reclaimed Water Discharge

Design Discharge Rate (as a Proportion of Russian River Flow)	Average Volume of Reclaimed Water Discharged to Laguna (October - May 14)
1%	685 million gallons
5%	1,825 million gallons
10%	2,740 million gallons
15%	3,490 million gallons
No Project	3,245 million gallons
Existing Conditions	3,735 million gallons
20%	4,640 million gallons
The average volume of the Russian River from October 1 to May 14	341,000 million gallons

Source: Parsons Engineering Science, Inc. 1996

Specific impacts which will be affected by the increase in discharge of reclaimed water, as compared to the 1% design discharge are listed below. Reduction of impacts applies to all reclamation alternatives.

- Surface Water Hydrology Impacts 4.9.1 and 4.9.2: Streambank Erosion in the Laguna and the Russian River. While the stream power will increase under both the 5%, 10%, and 15% discharge options, the increase will be less than for the 20% design discharge rate under Alternative 5, which was considered to have a less than significant impact.
- Surface Water Quality Impacts 6.9.1 and 6.9.2: Exceedence of Numeric and Narrative Criteria. The discharge of additional quantities of reclaimed water to the Laguna under the 5%, 10%, and 15% options will result in the following changes in impacts as compared to those under the 1% project.
 - Dissolved Oxygen: The 5%, 10%, and 15% options will result in reductions in dissolved oxygen in the Laguna, compared to the 1% project. However, the analysis in the Water Quality Impacts Analysis technical report (Merritt Smith Consulting 1996) did not specifically evaluate the 15% option. This analysis showed that the impact of the 10% option will be less than significant, but the impact of the 20% option will be significant. Therefore, the reduction of dissolved oxygen caused by the

15% option is assumed to exceed the numeric-based criteria and therefore the impact will be considered significant.

- Cyanide: The 5%, 10%, and 15% options will result in increases in cyanide in the Laguna compared to the 1% project. For both the 10% and 15% options (but not the 5% option), the amount of total cyanide will exceed the numeric-based criteria and therefore the impact will be significant. However, with proposed mitigation (Implementing a Cyanide Source Control Program), the impact for both the 10% and 15% options will be reduced to less than significant.
- Biostimulatory Substances (Benthic and Planktonic Algae): The 5%, 10% and 15% options will result in increases over the 1% project in adverse impacts for one or more months of the years in both the Laguna and/or Santa Rosa Creek. These impacts are considered significant for all discharge options, and no mitigation has been identified that will reduce the impact to less than significant. The 5%, 10%, and 15% options will also result in decreases compared to the 1% project in the beneficial impacts during one or more months of the year for the Russian River as well as for the Laguna and Santa Rosa Creek. However, the beneficial impacts under the 5%, 10%, and 15% options will still be considered significant.
- Turbidity: The 5% and 10% options were determined to have a less than significant impact on turbidity, and the 20% Laguna discharge alternative (Alternative 5B) was found to have a significant impact on turbidity (Merritt Smith Consultants 1996b). The impact of the 15% option was not specifically evaluated, therefore the impact is assumed to be significant.
- Waste Reduction Strategy: The 5%, 10%, and 15% options would result in decreased ability (compared to the 1% project) to meet the Regional Board goal for reduction in total nitrogen and nitrogen-ammonia in both the Laguna and Santa Rosa Creek. These impacts are considered less than significant for the 5% option and significant for the 10% and 15% option. However, the proposed mitigation (Implementing a Total and Ammonia Nitrogen Source Control Program) will reduce the impact for the 10% and 15% option to less than significant.
- Toxicity: The 5% and 10% options were determined to have a less than significant impact on toxicity, and the 20% Laguna discharge alternative (Alternative 5B) was found to have a significant impact on toxicity (Merritt Smith Consultant 1996b). The impact of the 15% option was not specifically evaluated, interpolation suggests that the impact will be significant. Therefore, the impact of the 15% option is considered to be significant.

- Surface Water Quality Impact 6.9.4: Exceedence of Sediment Quality Criteria. The discharge of additional quantities of reclaimed water to the Laguna under the 5%, 10%, and 15% options will result in increases in the amount of acenaphthene, dieldrin, endrin, flouranthene, and phenathrene constituents in the sediment of receiving waters compared to the 1% project. However, the point of significance will not be exceeded for any of the discharge scenarios, and therefore the impact will be less than significant for the 5%, 10% and 15% options.

Additional information about the impacts of the 5%, 10% and 15% options on surface water quality can be found in the Water Quality Impacts Technical Report.

Socio-economics Impacts

Significant impacts were identified for Alternatives 2 and 3 related to increases in the service charge for wastewater and to loss of homes or agricultural buildings displaced by construction of the storage reservoirs.

Socio-economic Impact 18.1: Though reduced somewhat, service charge increases will probably remain significant for all reclamation alternatives.

Socio-Economic Impact 18.2: Loss of Homes. The elimination of the Adobe Road reservoir will avoid the loss of one house. This will reduce the impact for this alternative to less than significant. Neither of the other reservoirs which could be eliminated under the 5%, 10%, or 15% discharge options (Lakeville Hillside and Sears Point) involve the loss of houses. None of the other reservoir sites will be changed under the discharge options.

SUMMARY OF SIGNIFICANT IMPACTS

Table 4

Changes in Significant and Unavoidable Impacts
Under the 5%, 10%, and 15% Options

	2A	2B	2C	2D	3A	3B	3C	3D	3E
GEOLOGY, SOILS, AND SEISMICITY									
Storage Reservoirs									
3.5.1. Storage reservoirs may be located within an area of unstable slope conditions. South County reservoirs.		~	~						
SURFACE WATER QUALITY									
Discharge									
6.9.2. Biostimulatory Substances - Adverse. Design discharge component may cause narrative-based criteria to be exceeded.	#	#	#	#	#	#	#	#	#
6.9.2. Waste Reduction Strategy - Total Nitrogen - Adverse. Discharge scenarios may cause narrative-based criteria to be exceeded.	# ¹	# ¹	# ¹	# ¹	# ¹	# ¹	# ¹	# ¹	# ¹
TERRESTRIAL BIOLOGICAL RESOURCES									
8.4C. The Project plus cumulative projects may cause permanent loss of sensitive terrestrial wildlife habitat.	~	~	~	~	~	~	~	~	~
TRANSPORTATION									
Pipelines									
11.4.1. Project construction traffic may cause congestion on access roads.		~		~					
Storage Reservoirs									
11.5.1. Storage reservoir construction traffic may cause congestion in access roads.		~		~					
AIR QUALITY									
12.4.1. Emissions generated during pipeline construction may exceed threshold levels.	~	~	~	~					
NOISE									
Pipelines									
13.4.1. Construction of pipelines may expose the public to high noise levels.		~		~					

Table 4

Changes in Significant and Unavoidable Impacts
Under the 5%, 10%, and 15% Options

	2A	2B	2C	2D	3A	3B	3C	3D	3E
13.4.3. Construction of the project may cause high noise levels from the construction traffic.		~		~					
Storage Reservoirs									
13.5.1. Construction of storage reservoirs may expose the public to high noise levels.		~		~					
13.5.3. Construction of the project may cause high noise levels from the construction traffic.		~		~					
Pump Stations									
13.6.1. Construction of pump stations may expose the public to high noise levels.		~		~					
13.6.2. Operation of pump stations may expose the public to high noise levels.		~		~					
VISUAL RESOURCES									
Storage Reservoirs									
14.5.6. Reservoir sites may cause an adverse effect on foreground or middleground views from one or more private residence.		~		~					
14.6.3. The pump station component may be inconsistent with the County Open Space Element regarding Scenic Corridors.				~					
14.6.3. The pump station component may cause an adverse effect in foreground views from one or more private residences.				~					
SOCIO-ECONOMICS									
18.1. The Project may increase the service charge for wastewater.		~		~					
18.2. The Project may result in loss of homes due to construction of facilities.		@							

Source: Harland Bartholomew & Associates, Inc. 1996

Notes:

1. 10% option only.
- @ Reduction in impact changing the level of significance from significant unavoidable to less than significant.
- ~ Reduction in impact, but does not change the level of significance.
- # Increase in impact for one or more components, but does not change level of significance for alternative.

REFERENCES

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TEAM DOCUMENTS

Merritt Smith Consulting. 1996a. *Aquatic Biological Resources Impacts Analysis*.

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RMA. 1996. *Water Quality and Flow Model for Irrigation/Storage Area Streams*.

**SUPPLEMENT NO. 1 -
ALTERNATIVE PROJECTS
CONSTRUCTION COST
ESTIMATE**

ALTERNATIVE PROJECTS CONSTRUCTION COST ESTIMATE

**SUPPLEMENT NO. 1
5%, 10% AND 15% ALTERNATIVES 2 AND 3 PROJECTS**

SANTA ROSA SUBREGIONAL LONG-TERM WASTEWATER PROJECT

Prepared for
City of Santa Rosa
and
U.S. Army Corps of Engineers

April 1996

Prepared by
PARSONS ENGINEERING SCIENCE, INC.
PLANNING · DESIGN · CONSTRUCTION MANAGEMENT
1301 MARINA VILLAGE PARKWAY, ALAMEDA, CA 94501 · 510/769-0100
OFFICES IN PRINCIPAL CITIES
723129/95-06

for
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ALTERNATIVE PROJECTS CONSTRUCTION COST ESTIMATE

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5%, 10% AND 15% ALTERNATIVES 2 AND 3 PROJECTS**

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TABLE OF CONTENTS

1 INTRODUCTION AND COST ESTIMATE ASSUMPTIONS.....	1-1
2 SUMMARY OF COST ESTIMATES.....	2-1
3 CONCLUSIONS.....	3-1

COST TABLES

Table 1.1	Present Worth Value of 1% Projects
Table 1.5	Present Worth Value of 5% Projects
Table 1.10	Present Worth Value of 10% Projects
Table 1.15	Present Worth Value of 15% Projects
Tables 2.1	Construction Cost Detail of 1% Projects
Tables 2.5	Construction Cost Detail of 5% Projects
Tables 2.10	Construction Cost Detail of 10% Projects
Tables 2.15	Construction Cost Detail of 15% Projects
Table 20.1	Annual Operations Cost Detail of 1% Project
Table 20.5	Annual Operations Cost Detail of 5% Project
Table 20.10	Annual Operations Cost Detail of 10% Project
Table 20.15	Annual Operations Cost Detail of 15% Project

COST FIGURES

Figure 1	Present Worth of 1%, 5%, 10% and 15% Projects.....
Figure 2	Construction Cost of 1%, 5%, 10% and 15% Projects.....
Figure 2.1	Construction Cost Detail of 1% Projects
Figure 2.5	Construction Cost Detail of 5% Projects
Figure 2.10	Construction Cost Detail of 10% Projects
Figure 2.15	Construction Cost Detail of 15% Projects

1 INTRODUCTION AND COST ESTIMATE ASSUMPTIONS

The original Cost Estimate for alternative projects, issued in November, 1995, included Alternatives 2 and 3 projects limited to a 1% river discharge element. This Supplement No. 1 to the Cost Estimate presents the project costs for the Alternatives 2 and 3 projects with a 5%, 10% and 15% river discharge element. The cost estimates for alternative projects 4, 5A and 5B remain the same.

The several assumptions and criteria identified in the Introduction of the original cost estimate issued in November 1995 also apply to these cost estimates, with the following change:

- Projects 2E and 3F, which were based on using aquifer storage and recovery (ASR), have been deleted because the BPU dropped ASR from further consideration in January 1996.

In addition, several new assumptions and criteria were used in the cost estimates for the 5%, 10% and 15% Alternatives 2 and 3 projects because the storage requirements, piping and pumping requirements, and irrigation acreage requirements would be reduced from the original 1% projects. These assumptions and criteria are as follows:

ASSUMPTIONS AND CRITERIA FOR 5% PROJECT VERSUS 1% PROJECT

5% Storage

Required new storage volume = 2,900 MG (Ref. 1)

Reservoir dams can be built lower to obtain a smaller capacity reservoir versus that required for the 1% project (i.e., 4,000 MG). Cost curves presented in the Appendix of the Cost Estimate for the 1% project were used to estimate the reduced cost of the earthwork portion of the smaller reservoirs.

Two-reservoir combinations (proposed for Alternatives 2B and 2D for the 1% project) are not needed to meet this storage requirement. Therefore, a somewhat smaller Adobe Road reservoir (maximum effective capacity 3,400 MG) or Sears Point reservoir (maximum effective capacity 3,000 MG) could be built alone, without also building Lakeville reservoir (maximum effective capacity 1,000 MG), to satisfy the lower storage requirement. Hence, Lakeville reservoir would not be built for any 5% project.

Because the BPU eliminated ASR from further consideration in January 1996, Alternatives 2E and 3F are not included.

5% Irrigation Areas

Required new irrigation acres (Ref. 1):

- a. 2,600 acres South County, or
- b. 1,300 acres South County plus 2,200 acres Sebastopol, or
- c. 4,400 acres West County, or
- d. 2,600 acres West County plus 2,200 acres Sebastopol

Options a. and b. relate to the South County (Alternative 2) projects. Options c. and d. relate to the West County (Alternative 3) projects.

Option b. was rejected because it would not be practical or cost effective to build storage in South County and irrigate only 1,300 acres in this area. Irrigation supply for the Sebastopol area can more cost-effectively be served from existing Delta Pond. Option a. was used for South County (Alternative 2) project.

Option d. was rejected because it would not be practical or cost effective to build storage in West County and irrigate only 2,600 acres in this area, and also build the Sebastopol irrigation system. It would be more cost effective to maximize nearby acreage irrigated from a West County reservoir. Option c. was used for West County (Alternative 3) project.

Therefore, for all Alternative 2 and 3 projects the Sebastopol irrigation area will be deleted.

5% Pipelines

Pipelines would still serve the entire agricultural irrigation service areas, same as for 1% project, but pipeline sizes to these areas would be reduced to account for the reduced volume (and flowrate) to actually be delivered to the major irrigation areas.

Without employing additional KYPIPE modeling, the allowable reduction in pipeline sizes was estimated. For the 5% project, the total storage volume was reduced to about 70% of that for the 1% project (from 4,000 MG to 2,900 MG). The total volume must still be moved through pipelines from storage to irrigation in the same period of time (about 6 month irrigation season), it is desirable to limit pipeline friction losses to about the same level as for the 1% project, and the same alignments and lengths of pipeline were assumed for the 5% project as for the 1% project. Therefore, it was concluded that pipeline diameters could be shifted one standard size downward for the 5% project. This would result in less expensive pipelines, although they would supply the same service areas (with less water) as those for the 1% project.

Note that, for South County Alternatives 2B and 2D, Lakeville reservoir would not be built. However, for Alternative 2B (Adobe Road) and 2D (Sears Point) it is assumed that pipelines would still be built to Lakeville and Bayflats irrigation areas in the South County.

5% Pump Stations

Because for the 5% project as compared with the 1% project less volume of water would be in storage, less volume of water must be delivered to the irrigation areas. Therefore, the pipelines and main pump stations (which deliver water from the plant to storage, and from storage to the major irrigation areas) were downsized accordingly and, therefore, would cost less. For these pump stations (which would be reduced to about 70% of the capacity of the 1% project pump stations) the cost would be reduced to about 80% of that for the 1% project pump stations.

Within the irrigation areas, the farmers would rather irrigate less acreage (if less water is available) than apply less water to the same acreage. Therefore, for a modest reduction in available water (for the 5% project vs. the 1% project) it is assumed that the booster pump stations (which deliver water to specific irrigation subareas) would be sized about the same as for the 1% project and, therefore, would cost about the same.

The number of booster pump stations would be the same as for the 1% project, except that the Sebastopol irrigation system and booster pump stations would be deleted.

5% Urban Irrigation, Direct Discharge, Geysers Project, And Headworks Improvements

No changes from the 1% cost estimate.

5% Land Purchases

The cost of Alternatives 2B and 2D would be reduced by deletion of Lakeville reservoir site.

ASSUMPTIONS AND CRITERIA FOR 10% PROJECT VERSUS 1% PROJECT

10% Storage

Required new storage volume = 1,900 MG (Ref. 1)

Reservoir dams can be built lower to obtain smaller reservoir volumes versus those required for the 1% project (i.e., 4,000 MG). Cost curves presented in the Appendix of the Cost Estimate for the 1% project were used to estimate the reduced cost of the earthwork portion of the smaller reservoirs.

Downsizing Tolay A reservoir to this size would result in a relatively large and shallow impoundment that would have a relatively low dam in comparison with the other reservoirs. Although the construction cost would be the lowest for any reservoir of this size, for its capacity the land purchase cost and mitigation measures cost would be relatively high. In addition, the shallow reservoir would have a relatively large "dead zone" (shallow and turbid water) not available to the outlet works and irrigation pump station. The shallow water

would also be warmer than deeper reservoirs, and would aggravate the growth of algae. For these reasons, Alternative 2A (Tolay A) was dropped from consideration for a 10% project.

Two-reservoir combinations (proposed for Alternatives 2B and 2D for the 1% project) are not needed to meet this storage requirement. Therefore, a somewhat smaller Adobe Road reservoir (maximum effective capacity 3,400 MG) or Sears Point reservoir (maximum effective capacity 3,000 MG) could be built alone, without also building Lakeville reservoir (maximum effective capacity 1,000 MG), to satisfy the lower storage requirement. Hence, the Lakeville reservoir would not be built for any 10% project.

Because the BPU eliminated ASR from further consideration in January 1996, Alternatives 2E and 3F are not included.

10% Irrigation Areas

Required new irrigation acres (Ref. 1):

- a. 1,600 acres South County, or
- b. 300 acres South County plus 2,200 acres Sebastopol, or
- c. 2,900 acres West County, or
- d. 1,000 acres West County plus 2,200 acres Sebastopol

Options a. and b. relate to the South County (Alternative 2) projects. Options c. and d. relate to the West County (Alternative 3) projects.

Option b. was rejected because it would not be practical or cost effective to build storage in South County and irrigate only 300 acres in this area. Irrigation supply for the Sebastopol area can more cost-effectively be served from existing Delta Pond. Option a. was used for South County (Alternative 2) project.

Option d. was rejected because it would not be practical or cost effective to build storage in West County and irrigate only 1,000 acres in this area, and irrigation supply for Sebastopol irrigation can more cost-effectively be served from existing Delta Pond. Option c. was used for West County (Alternative 3) project.

10% Pipelines

Pipelines to agricultural irrigation areas would serve greatly reduced total acreage from the 1% project and, therefore, the pipeline sizes and lengths would be reduced to account for reduced total volume (and flowrate) to actually be delivered to the irrigation areas.

In addition, the lower acreage to be irrigated must be in the vicinity of the reservoir to be cost effective. Therefore, for South County project (Option a.) involving Sears Point reservoir, pipelines and irrigation acreage in 'East of Rohnert Park' and 'North of Petaluma' areas would

be deleted. For South County project (Option a.) involving Adobe Road reservoir, pipelines and irrigation acreage in 'Lakeville' and 'Bayflats' areas would be deleted.

For West County project (Option c.), pipelines and irrigation acreage in Americano Creek or Stemple Creek drainages would be deleted depending on location of the reservoir. For Bloomfield, Carroll Road or Valley Ford reservoirs (all in Americano Creek watershed, all pipelines and acreage in Stemple Creek watershed would be deleted. For Two Rock reservoir (in Stemple Creek watershed) all pipelines and acreage in Americano Creek watershed would be deleted. For Huntley reservoir (in Stemple Creek watershed, but supplied by pipeline passing through Americano watershed) irrigation of the farthest acreage from the reservoir, in both watersheds, would be deleted.

10% Pump Stations

Because (for the 10% project vs. the 1% project) less volume of water would be in storage, less volume of water must be delivered to the irrigation service areas. Therefore, the pipelines and main pump stations (which deliver water from the plant to storage, and from storage to the major irrigation areas) were downsized accordingly and, therefore, would cost less. For these pump stations (which would be reduced to about 50% of the capacity of the 1% project pump stations) the cost would be reduced to about 66% of that for the 1% project pump stations.

Within the irrigation areas, the farmers would rather irrigate less acreage (if less water is available) than apply less water to the same acreage. Therefore, for the substantial reduction in available water (for the 10% project vs. the 1% project) it is assumed that the booster pump stations (which deliver water to specific irrigation subareas) would be downsized accordingly (or eliminated) and, therefore, would cost less. For these pump stations (which would be reduced to about 70% of the capacity of the 1% project pump stations) the cost for the pump station and the electrical service would be reduced to about 80% of that for the 1% project pump stations.

The number of booster pump stations would be reduced from the 1% project because some irrigation subareas would be eliminated, and the Sebastopol irrigation system and booster pump stations would be deleted.

10% Urban Irrigation, Direct Discharge, Geysers Project, Headworks Improvements

No changes from the 1% cost estimate.

10% Land Purchases

The cost of Alternatives 2B and 2D would be reduced by deletion of Lakeville reservoir site.

ASSUMPTIONS AND CRITERIA FOR 15% PROJECT VERSUS 1% PROJECT

15% Storage

Required new storage volume = 1,000 MG (Ref. 2)

Reservoir dams can be built lower to obtain smaller reservoir volumes versus those required for the 1% project (i.e., 4,000 MG). Cost curves presented in the Appendix of the Cost Estimate for the 1% project were used to estimate the reduced cost of the earthwork portion of the smaller reservoirs.

For the same reasons given for the 10% project above, Tolay A reservoir and, therefore, Alternative 2A, was dropped from consideration for a 15% project.

Because of the clearly exorbitant cost for such a small volume reservoir, Tolay C and, therefore, Alternative 2C, was dropped from consideration for a 15% project.

Two-reservoir combinations (proposed for Alternatives 2B and 2D for the 1% project) are not needed to meet this storage requirement. Therefore, a somewhat smaller Adobe Road reservoir (maximum effective capacity 3,400 MG) or Sears Point reservoir (maximum effective capacity 3,000 MG) or even Lakeville reservoir (maximum effective capacity 1,000 MG) could be built alone to satisfy the lower storage requirement.

Because the BPU eliminated ASR from further consideration in January 1996, Alternatives 2E and 3F are not included.

The five west county reservoirs and alternative projects could be developed at the 15% project size.

15% Irrigation Areas

Required new irrigation acres (Ref. 2):

- a. 1,400 acres South County, or
- b. 300 acres South County plus 2,200 acres Sebastopol, or
- c. 1,900 acres West County, or
- d. 1,000 acres West County plus 2,200 acres Sebastopol

Options a. and b. relate to the South County (Alternative 2) projects. Options c. and d. relate to the West County (Alternative 3) projects.

Option b. was rejected because it would not be practical or cost effective to build storage in South County and irrigate less than 300 acres in this area (and irrigation water supply for Sebastopol irrigation could more cost-effectively come from existing Delta Pond if it is to be

irrigated at all). Therefore, Sebastopol irrigation area would be deleted. Option a. was used for South County (Alternative 2) project, for irrigation of acres nearest the reservoir.

Option d. was rejected because it would not be practical or cost effective to build storage in West County and irrigate less than 1,000 acres in this area (and irrigation water supply for Sebastopol irrigation could more cost-effectively come from existing Delta Pond if it is to be irrigated at all). Therefore, Sebastopol irrigation area would be deleted. Option c. was used for West County (Alternative 3) project, for irrigation of acres nearest the reservoir.

South County and West County agricultural irrigation areas would be confined to those areas of sufficient acreage closest to the respective reservoir for the alternative project. This would be defined by eliminating pipelines from portions of the irrigation service area proposed for the 1% project.

15% Pipelines

Pipelines to agricultural irrigation areas would serve greatly reduced total acreage from the 1% project and, therefore, the pipeline sizes and lengths would be reduced to account for reduced total volume (and flowrate) to actually be delivered to the irrigation areas.

In addition, the lower acreage to be irrigated must be in the vicinity of the reservoir to be cost effective. Therefore, for South County project (Option a.) involving Sears Point or Lakeville reservoir, pipelines and irrigation acreage in 'East of Rohnert Park' and 'North of Petaluma' areas would be deleted. For South County project (Option a.) involving Adobe Road reservoir, pipelines and irrigation acreage in 'Lakeville' and 'Bayflats' areas would be deleted. Because irrigation acreage for the South County projects is nearly the same as for the 10% projects, no additional pipelines were deleted.

For West County project (Option c.), yet more pipelines and irrigation acreage in Americano Creek or Stemple Creek drainages would be deleted depending on location of the reservoir. So, for Bloomfield, Carroll Road or Valley Ford reservoirs (all in Americano Creek watershed, all pipelines and acreage in Stemple Creek watershed would be deleted. For Two Rock reservoir (in Stemple Creek watershed) all pipelines and acreage in Americano Creek watershed would be deleted. For Huntley reservoir (in Stemple Creek watershed, but supplied by pipeline passing through Americano watershed) irrigation of the farthest acreage from the reservoir, in both watersheds, would be deleted.

15% Pump Stations

Because (for the 15% project vs. the 1% project) less volume of water would be in storage, less volume of water must be delivered to the irrigation service areas. Therefore, the pipelines and main pump stations (which deliver water from the plant to storage, and from storage to the major irrigation areas) were downsized accordingly and, therefore, would cost less. For these pump stations (which would be reduced to about 25% of the capacity of the 1% project pump stations) the cost would be reduced to about 50% of that for the 1% project pump stations.

It is assumed that irrigation booster pump stations would not be needed to serve the relatively few acres for the 15% projects. Therefore, all South County and West County booster pump stations would be deleted, and the Sebastopol irrigation system and booster pump stations would be deleted.

15% Urban Irrigation, Direct Discharge, Geysers Project, Headworks Improvements

No changes from the 1% cost estimate.

15% Land Purchases

The land purchase cost for Alternatives 2B and 2D would be reduced by the construction of only one reservoir instead of two.

Because most pump station sites would be deleted, the land purchase costs would be greatly reduced over that for the 1% project.

REFERENCES FOR COST ESTIMATE ASSUMPTIONS

- (Ref. 1) From Technical Memorandum "Water Balance Model - Summary and Results," dated 26 September, 1995.
- (Ref. 2) From water balance analysis completed for 15% Project, January 1996.

2 SUMMARY OF COST ESTIMATES

Figures 1 provides a graphical summary of the present worth value of each of the alternative projects, for the 1%, 5%, 10% and 15% river discharge options of Alternatives 2 and 3 projects.

Figures 2 provides a graphical summary of the construction cost of each of the alternative projects, for the 1%, 5%, 10% and 15% river discharge options of Alternatives 2 and 3 projects.

Figure 2.1, 2.5, 2.10, and 2.15 provide a graphical summary of the construction cost for each of the alternative projects, for the 1%, 5%, 10% and 15% river discharge options of Alternatives 2 and 3 projects.

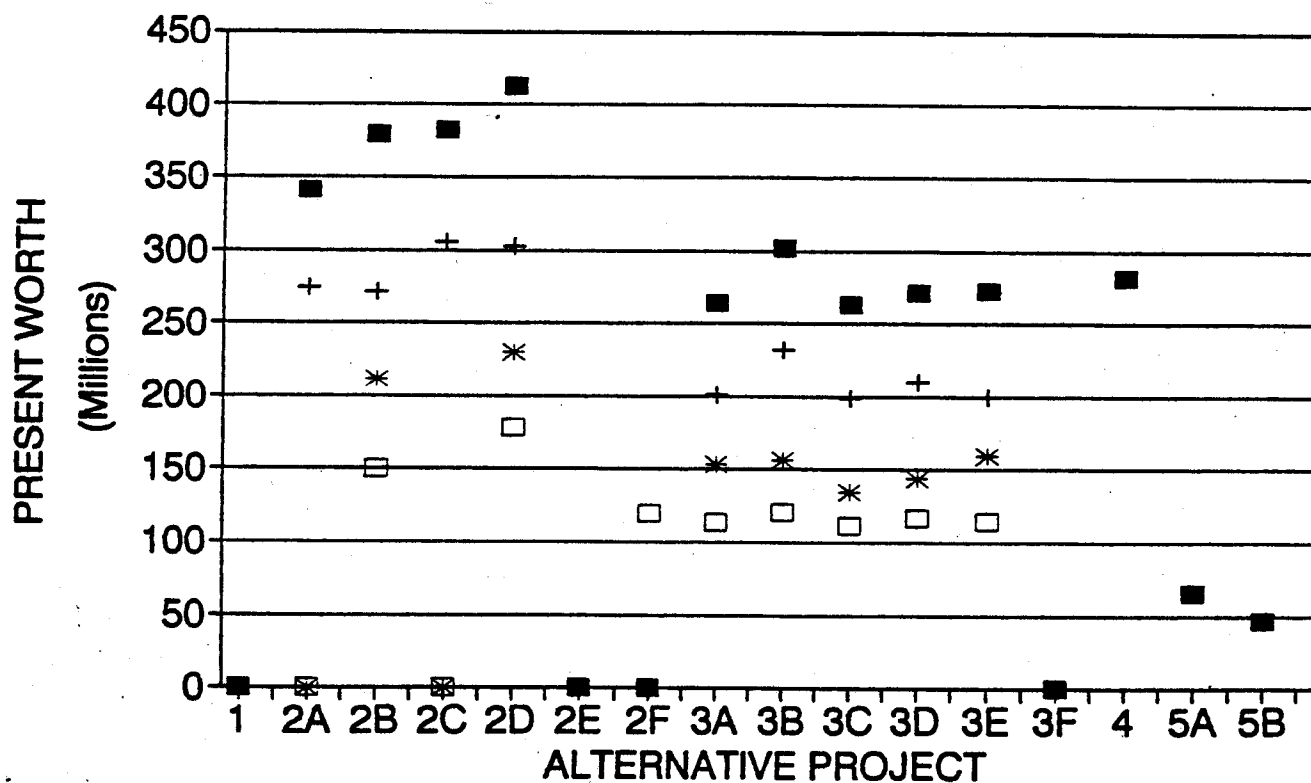
Tables 1.1, 1.5, 1.10, and 1.15 provide a summary of the construction cost, annual operations cost and present worth value of each of the alternative projects, for the 1%, 5%, 10% and 15% river discharge options of Alternatives 2 and 3 projects.

Tables 2.1, 2.5, 2.10, and 2.15 provide a detail summary of the construction cost for each of the alternative projects, for the 1%, 5%, 10% and 15% river discharge options of Alternatives 2 and 3 projects. Figures

Table 20.1, 20.5, 20.10, and 20.15 provides a summary of the projected annual operations costs for each alternative project, for the 1%, 5%, 10% and 15% river discharge options of Alternatives 2 and 3 projects.

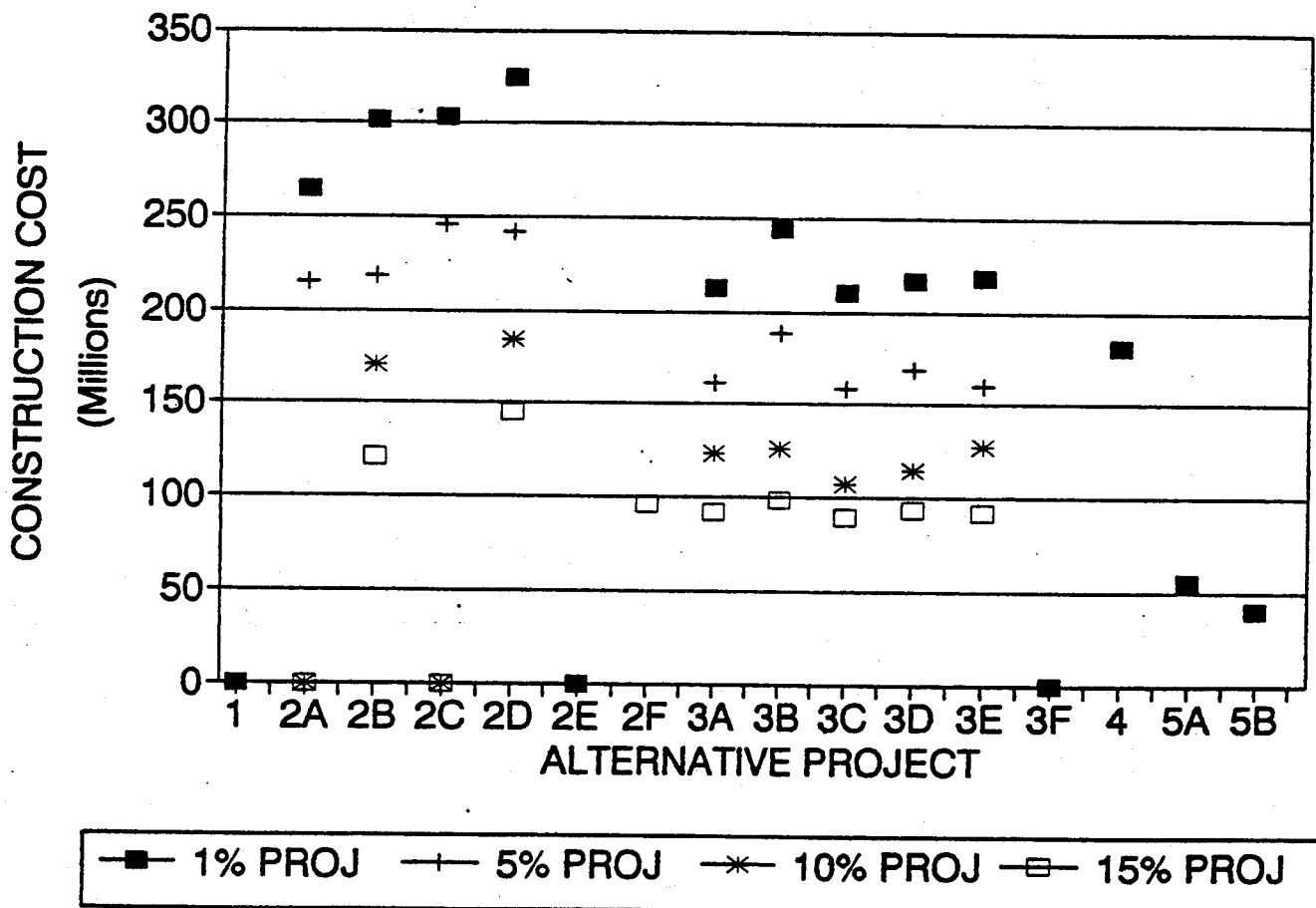
Other tables, which provide background to the above summary tables, are available under separate cost estimate supplement appendix.

FIG 1 - 1%,5%,10%&15% PROJECTS
PRESENT WORTH COST COMPARISON



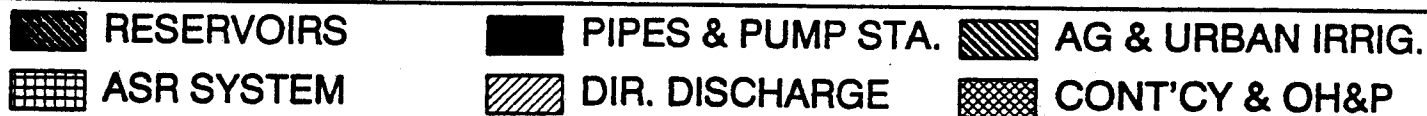
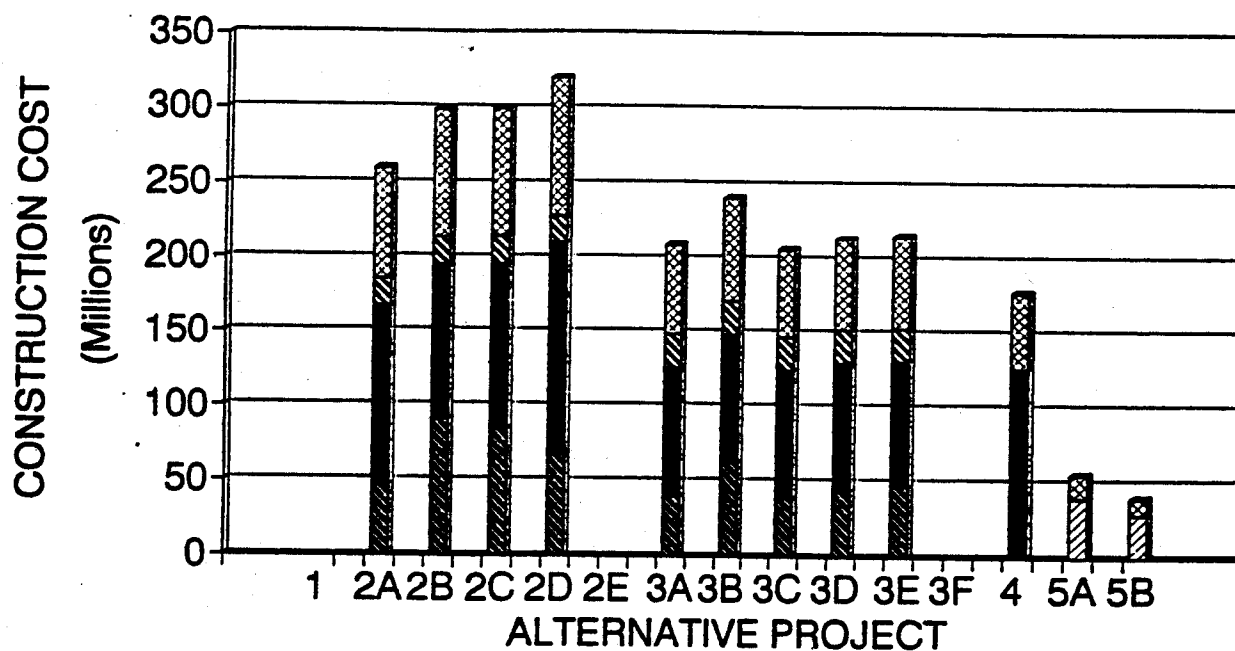
1% PROJ
 5% PROJ
 10% PROJ
 15% PROJ

FIG 2 - 1%,5%,10%&15% PROJECTS CONSTRUCTION COST COMPARISON



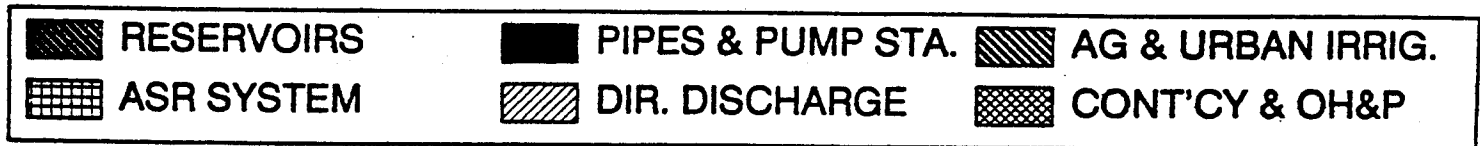
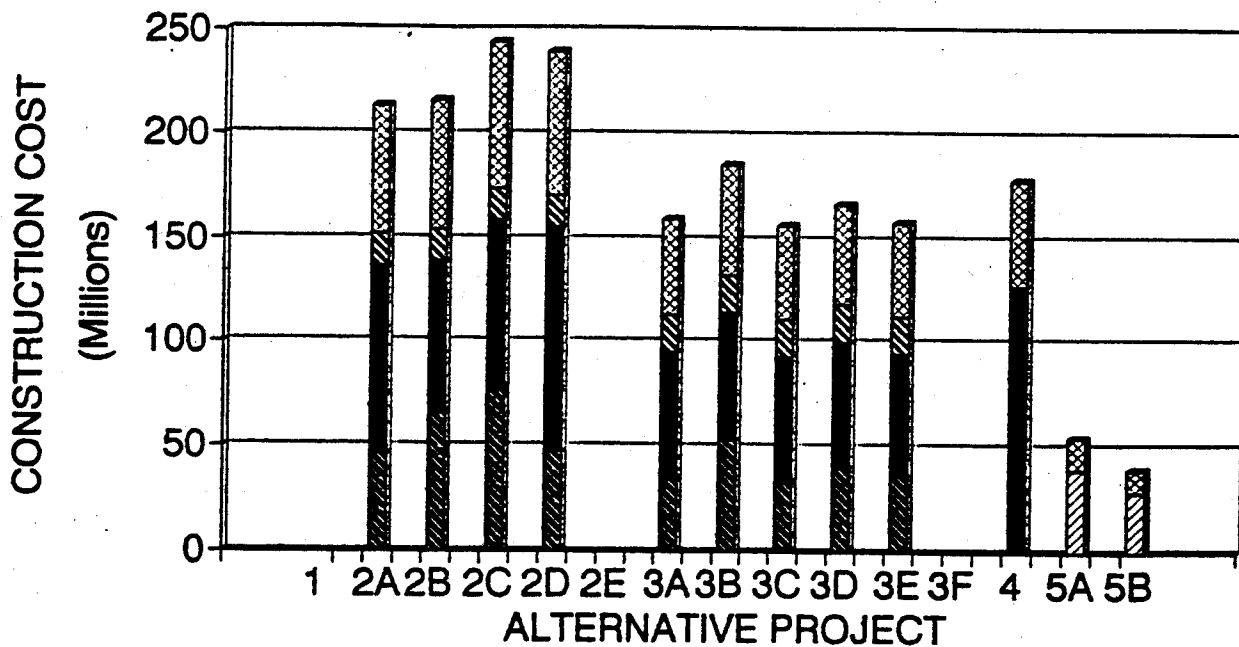
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FIGURE 2.1 1% PROJECT CONSTRUCTION COST COMPARISON



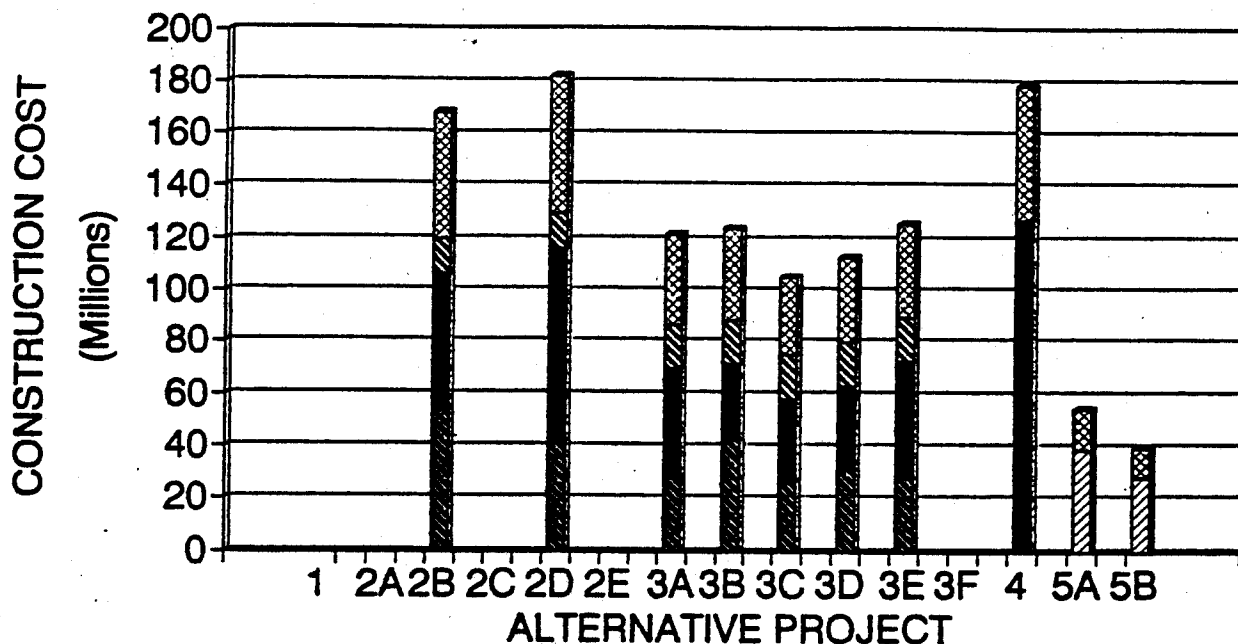
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**FIGURE 2.5 5% PROJECT
CONSTRUCTION COST COMPARISON**



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FIGURE 2.10 10% PROJECT CONSTRUCTION COST COMPARISON



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FIGURE 2.15 15% PROJECT CONSTRUCTION COST COMPARISON

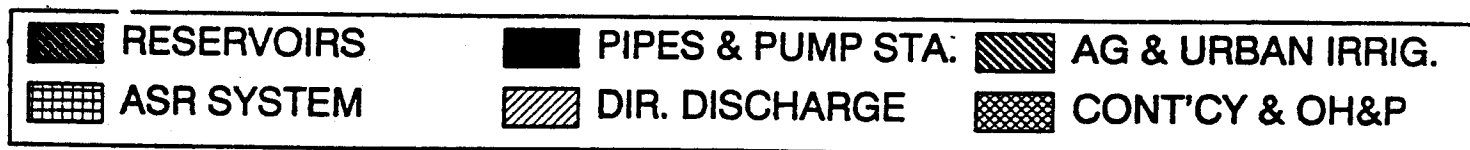
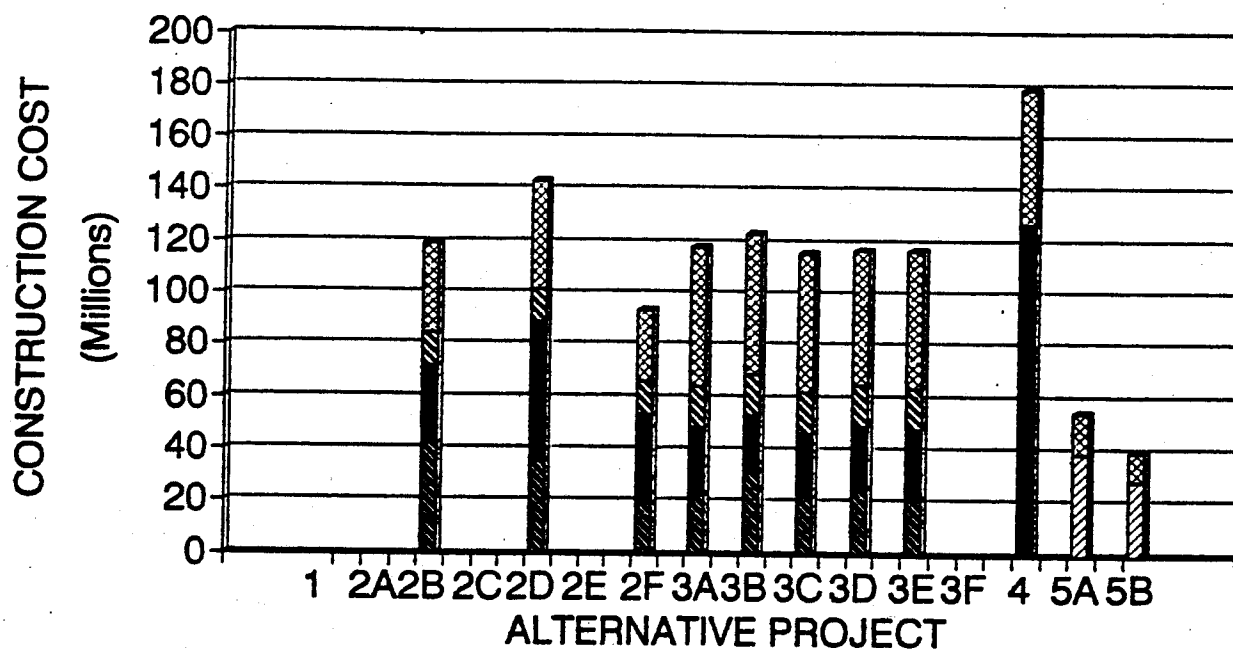


TABLE 1.1

SANTA ROSA SUBREGIONAL LONG-TERM WASTEWATER PROJECT
 ALTERNATIVE PROJECTS COST ESTIMATE - SUMMARY
 JUN 7, 1996 1% PROJECTS FOR ALTERNATIVES 2 AND 3

ALTERNATIVE PROJECT	CONSTRUCTION COST (TABLE 2) (\$1,000)	ENGINEERING, ADMIN., LEGAL (15% OF CONST. COST) (\$1,000)	LAND PURCHASE COST (TABLE 12) (\$1,000)	PROJECT CAPITAL COST (CONSTR. + ENGR. + LAND) (\$1,000)	ANNUAL OPERATIONS AND MAINT. COST (TABLE 20) (\$1,000)	TOTAL PROJECT PRESENT WORTH COST (1)(2)(3) (\$1,000)	CONTINGENCY PLAN OPERATIONS EXPENSE (TABLE 30) (\$1,000)
1 - NO PROJECT	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2A - TOLAY A	\$264,208	\$39,631	\$8,487	\$312,326	\$2,513	\$340,014	\$433
2B - ADOBE ROAD AND LAKEVILLE HILLSIDE	\$302,158	\$45,324	\$4,734	\$352,216	\$2,411	\$378,780	\$437
2C - TOLAY C	\$303,517	\$45,528	\$4,242	\$353,287	\$2,827	\$382,231	\$438
2D - SEARS POINT AND LAKEVILLE HILLSIDE	\$324,208	\$48,631	\$3,883	\$376,720	\$3,153	\$411,460	\$558
2E - ASR + SMALLER TOLAY	\$0	\$0	\$0	\$0	\$0	\$0	\$0
3A - TWO ROCK	\$212,554	\$31,883	\$1,973	\$246,410	\$1,848	\$264,568	\$297
3B - BLOOMFIELD	\$244,175	\$36,626	\$1,858	\$282,659	\$1,745	\$301,886	\$297
3C - CARROLL ROAD	\$210,043	\$31,508	\$1,907	\$243,458	\$1,753	\$262,771	\$297
3D - VALLEY FORD	\$218,888	\$32,533	\$2,057	\$251,478	\$1,785	\$271,145	\$297
3E - HUNTLEY	\$218,739	\$32,811	\$2,354	\$253,904	\$1,713	\$272,778	\$298
3F - ASR + SMALLER TWO ROCK	\$0	\$0	\$0	\$0	\$0	\$0	\$0
4 - GEYSERS RECHARGE	\$180,907	\$27,136	\$209	\$208,252	\$6,683	\$281,885	\$0
5A - DIRECT DISCHARGE TO TO RUSSIAN RIVER	\$55,583	\$8,337	\$33	\$63,953	\$97	\$65,022	\$0
5B - DIRECT DISCHARGE TO LAGUNA CREEKS	\$40,306	\$6,046	\$0	\$46,352	\$0	\$46,352	\$0

(1) ANNUAL O&M CAPITALIZED @ 6.5% INTEREST OVER 20 YEARS; PWF = 11.018

(2) DOES NOT INCLUDE CREDIT FOR ANNUAL REVENUE INCOME FROM SALE OF RECLAIMED WATER, OR VALUE OF CROPS PRODUCED DUE TO ALTERNATIVES 2A THROUGH 3F, OR VALUE OF SIGNIFICANT ELECTRICAL ENERGY PRODUCED DUE TO ALTERNATIVE 4.

(3) ASSUMES UNIFORM PUMPING ENERGY CONSUMPTION (AT DESIGN YEAR VALUE) AND ENERGY COST FOR 20 YEARS.

QCOSTTAB.1

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TABLE 1.5

SANTA ROSA SUBREGIONAL LONG-TERM WASTEWATER PROJECT
 ALTERNATIVE PROJECTS COST ESTIMATE - SUMMARY
 APRIL 25, 1996 5% PROJECT FOR ALTERNATIVES 2 AND 3

ALTERNATIVE PROJECT	CONSTRUCTION COST (TABLE 2) (\$1,000)	ENGINEERING, ADMIN., LEGAL (15% OF CONST. COST) (\$1,000)	LAND PURCHASE COST (TABLE 12) (\$1,000)	PROJECT CAPITAL COST (CONSTR. + ENGR. + LAND) (\$1,000)	ANNUAL OPERATIONS AND MAINT. COST (TABLE 20) (\$1,000)	TOTAL PROJECT PRESENT WORTH COST (1)(2)(3) (\$1,000)	CONTINGENCY PLAN OPERATIONS EXPENSE (TABLE 30) (\$1,000)
1 - NO PROJECT	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2A - TOLAY A	\$215,036	\$32,255	\$8,487	\$255,778	\$1,673	\$274,212	\$433
2B - ADOBE ROAD	\$218,233	\$32,735	\$2,906	\$253,874	\$1,618	\$271,701	\$437
2C - TOLAY C	\$245,566	\$36,835	\$4,242	\$286,643	\$1,767	\$306,112	\$438
2D - SEARS POINT	\$241,935	\$36,290	\$2,055	\$280,280	\$2,065	\$303,032	\$558
2E - ASR + SMALLER TOLAY	\$0	\$0	\$0	\$0	\$0	\$0	\$0
3A - TWO ROCK	\$161,407	\$24,211	\$1,973	\$187,591	\$1,161	\$200,383	\$297
3B - BLOOMFIELD	\$188,324	\$28,249	\$1,858	\$218,431	\$1,220	\$231,873	\$297
3C - CARROLL ROAD	\$159,008	\$23,851	\$1,907	\$184,766	\$1,226	\$198,274	\$297
3D - VALLEY FORD	\$168,844	\$25,327	\$2,057	\$196,228	\$1,246	\$209,956	\$297
3E - HUNTLEY	\$160,094	\$24,014	\$2,354	\$186,462	\$1,196	\$199,640	\$298
3F - ASR + SMALLER TWO ROCK	\$0	\$0	\$0	\$0	\$0	\$0	\$0
4 - GEYSERS RECHARGE	\$180,907	\$27,136	\$209	\$208,252	\$6,651	\$281,533	\$0
5A - DIRECT DISCHARGE TO TO RUSSIAN RIVER	\$55,583	\$8,337	\$33	\$63,953	\$97	\$65,022	\$0
5B - DIRECT DISCHARGE TO LAGUNA CREEKS	\$40,306	\$6,046	\$0	\$46,352	\$0	\$46,352	\$0

(1) ANNUAL O&M CAPITALIZED @ 6.5% INTEREST OVER 20 YEARS; PWF = 11.018

(2) DOES NOT INCLUDE CREDIT FOR ANNUAL REVENUE INCOME FROM SALE OF RECLAIMED WATER, OR VALUE OF CROPS PRODUCED DUE TO ALTERNATIVES 2A THROUGH 3F, OR VALUE OF SIGNIFICANT ELECTRICAL ENERGY PRODUCED DUE TO ALTERNATIVE 4.

(3) ASSUMES UNIFORM PUMPING ENERGY CONSUMPTION (AT DESIGN YEAR VALUE) AND ENERGY COST FOR 20 YEARS.

TABLE 1.10

SANTA ROSA SUBREGIONAL LONG-TERM WASTEWATER PROJECT
 ALTERNATIVE PROJECTS COST ESTIMATE - SUMMARY
 APRIL 25, 1996
 10% PROJECT FOR ALTERNATIVES 2 AND 3

ALTERNATIVE PROJECT	CONSTRUCTION COST (TABLE 2) (\$1,000)	ENGINEERING, ADMIN., LEGAL (15% OF CONST. COST) (\$1,000)	LAND PURCHASE COST (TABLE 12) (\$1,000)	PROJECT CAPITAL COST (CONSTR. + ENGR. + LAND) (\$1,000)	ANNUAL OPERATIONS AND MAINT. COST (TABLE 20) (\$1,000)	TOTAL PROJECT PRESENT WORTH COST (1)(2)(3) (\$1,000)	CONTINGENCY PLAN OPERATIONS EXPENSE (TABLE 30) (\$1,000)
1 - NO PROJECT	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2A - TOLAY A	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2B - ADOBE ROAD	\$170,298	\$25,544	\$2,903	\$198,743	\$1,117	\$211,051	\$437
2C - TOLAY C	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2D - SEARS POINT	\$184,310	\$27,647	\$2,047	\$214,004	\$1,390	\$229,319	\$558
2E - ASR + SMALLER TOLAY	\$0	\$0	\$0	\$0	\$0	\$0	\$0
3A - TWO ROCK	\$123,150	\$18,473	\$1,973	\$143,596	\$805	\$152,465	\$297
3B - BLOOMFIELD	\$126,069	\$18,910	\$1,858	\$146,837	\$820	\$155,872	\$297
3C - CARROLL ROAD	\$107,285	\$16,093	\$1,907	\$125,285	\$823	\$134,353	\$297
3D - VALLEY FORD	\$114,547	\$17,182	\$2,057	\$133,786	\$837	\$143,008	\$297
3E - HUNTLEY	\$127,834	\$19,175	\$2,354	\$149,363	\$845	\$158,673	\$298
3F - ASR + SMALLER TWO ROCK	\$0	\$0	\$0	\$0	\$0	\$0	\$0
4 - GEYSERS RECHARGE	\$180,907	\$27,136	\$209	\$208,252	\$6,651	\$281,533	\$0
5A - DIRECT DISCHARGE TO TO RUSSIAN RIVER	\$55,583	\$8,337	\$33	\$63,953	\$97	\$65,022	\$0
5B - DIRECT DISCHARGE TO LAGUNA CREEKS	\$40,308	\$6,046	\$0	\$46,352	\$0	\$46,352	\$0

(1) ANNUAL O&M CAPITALIZED @ 6.5% INTEREST OVER 20 YEARS; PWF = 11.018

(2) DOES NOT INCLUDE CREDIT FOR ANNUAL REVENUE INCOME FROM SALE OF RECLAIMED WATER, OR VALUE OF CROPS PRODUCED DUE TO ALTERNATIVES 2A THROUGH 3F, OR VALUE OF SIGNIFICANT ELECTRICAL ENERGY PRODUCED DUE TO ALTERNATIVE 4.

(3) ASSUMES UNIFORM PUMPING ENERGY CONSUMPTION (AT DESIGN YEAR VALUE) AND ENERGY COST FOR 20 YEARS.

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QCOST10%.1

TABLE 1.15

SANTA ROSA SUBREGIONAL LONG-TERM WASTEWATER PROJECT
 ALTERNATIVE PROJECTS COST ESTIMATE - SUMMARY
 APRIL 27, 1996 15% PROJECT FOR ALTERNATIVES 2 AND 3

ALTERNATIVE PROJECT	CONSTRUCTION COST (TABLE 2) (\$1,000)	ENGINEERING, ADMIN., LEGAL (15% OF CONST. COST) (\$1,000)	LAND PURCHASE COST (TABLE 12) (\$1,000)	PROJECT CAPITAL COST (CONSTR. + ENGR. + LAND) (\$1,000)	ANNUAL OPERATIONS AND MAINT. COST (TABLE 20) (\$1,000)	TOTAL PROJECT PRESENT WORTH COST (1)(2)(3) (\$1,000)	CONTINGENCY PLAN OPERATIONS EXPENSE (TABLE 30) (\$1,000)
1 - NO PROJECT	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2A - TOLAY A	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2B - ADOBE ROAD	\$121,339	\$18,201	\$2,900	\$142,440	\$661	\$149,723	\$437
2C - TOLAY C	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2D - SEARS POINT	\$145,258	\$21,789	\$2,045	\$169,092	\$795	\$177,851	\$558
2E - ASR + SMALLER TOLAY	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2F - LAKEVILLE	\$98,058	\$14,409	\$1,174	\$111,641	\$700	\$119,353	\$500
3A - TWO ROCK	\$91,736	\$13,760	\$1,973	\$107,469	\$512	\$113,111	\$297
3B - BLOOMFIELD	\$98,385	\$14,758	\$1,858	\$115,001	\$524	\$120,774	\$297
3C - CARROLL ROAD	\$89,440	\$13,416	\$1,907	\$104,763	\$531	\$110,814	\$297
3D - VALLEY FORD	\$93,916	\$14,087	\$2,057	\$110,060	\$536	\$115,966	\$297
3E - HUNTLEY	\$91,973	\$13,796	\$2,354	\$108,123	\$533	\$113,996	\$298
3F - ASR + SMALLER TWO ROCK	\$0	\$0	\$0	\$0	\$0	\$0	\$0
4 - GEYSERS RECHARGE	\$180,907	\$27,136	\$209	\$208,252	\$6,651	\$281,533	\$0
5A - DIRECT DISCHARGE TO TO RUSSIAN RIVER	\$55,583	\$8,337	\$33	\$63,953	\$97	\$65,022	\$0
5B - DIRECT DISCHARGE TO LAGUNA CREEKS	\$40,306	\$6,046	\$0	\$46,352	\$0	\$46,352	\$0

(1) ANNUAL O&M CAPITALIZED @ 6.5% INTEREST OVER 20 YEARS; PWF = 11.018

(2) DOES NOT INCLUDE CREDIT FOR ANNUAL REVENUE INCOME FROM SALE OF RECLAIMED WATER, OR VALUE OF CROPS PRODUCED DUE TO ALTERNATIVES 2A THROUGH 3F, OR VALUE OF SIGNIFICANT ELECTRICAL ENERGY PRODUCED DUE TO ALTERNATIVE 4.

(3) ASSUMES UNIFORM PUMPING ENERGY CONSUMPTION (AT DESIGN YEAR VALUE) AND ENERGY COST FOR 20 YEARS.

(4) ANNUAL OPERATIONS EXPENSES AND CONTINGENCY PLAN EXPENSES WERE ESTIMATED FOR ALTERNATIVE 2F.

PARSONS ENGINEERING SCIENCE, INC.

QCOST15%.1

TABLE 2.1

SANTA ROSA SUBREGIONAL LONG-TERM WASTEWATER PROJECT
CONSTRUCTION COST ESTIMATE - SUMMARY TABLE
MAIN FACILITIES AND COMPONENTS
JUN 7, 1998 1% PROJECT FOR ALTERNATIVES 2 AND 3

ALTERNATIVE PROJECT	RESERVOIRS (TABLE 3) (\$1,000)	PIPELINES (TABLE 4) (\$1,000)	PUMP STATIONS (TABLE 5) (\$1,000)	AGRICULTURAL IRRIGATION AREAS (TABLE 6) (\$1,000)	URBAN IRRIGATION (TABLE 7) (\$1,000)	ASR SYSTEM (TABLE 8) (\$1,000)	DIRECT DISCHARGE (TABLE 9) (\$1,000)	UTILITY SERVICES (TABLE 10) (\$1,000)	HEADWORKS IMPROVEMENTS (TABLE 11) (\$1,000)	SUBTOTAL CONSTRUCTION COST (\$1,000)	CONSTRUCTION CONTINGENCY (25% OF SUBTOTAL) (\$1,000)	CONTRACTOR'S EXPENSES, OH&P (15% OF SUBTOTAL) (\$1,000)	TOTAL PROJECT CONSTRUCTION COST (\$1,000)
1 - NO PROJECT	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2A - TOLAY A	\$46,384	\$68,482	\$38,820	\$8,352	\$12,812	\$0	\$0	\$17,080	\$780	\$188,720	\$47,180	\$28,308	\$264,208
2B - ADOBE ROAD AND LAKEVILLE HILLSIDE	\$71,078 \$19,164	\$52,504	\$38,865	\$8,352	\$12,812	\$0	\$0	\$12,082	\$780	\$215,827	\$53,957	\$32,374	\$302,158
2C - TOLAY C	\$84,158	\$60,228	\$38,308	\$8,352	\$12,812	\$0	\$0	\$12,151	\$780	\$216,788	\$54,200	\$32,520	\$303,517
2D - BEARS POINT AND LAKEVILLE HILLSIDE	\$47,648 \$19,164	\$68,348	\$52,403	\$8,352	\$12,812	\$0	\$0	\$22,058	\$780	\$231,578	\$57,894	\$34,738	\$324,208
2E - ASR + SMALLER TOLAY	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
3A - TWO ROCK	\$38,884	\$51,280	\$28,025	\$12,152	\$12,812	\$0	\$0	\$7,081	\$780	\$151,824	\$37,956	\$22,774	\$212,554
3B - BLOOMFIELD	\$82,231	\$48,030	\$30,325	\$12,152	\$12,812	\$0	\$0	\$7,071	\$780	\$174,411	\$43,603	\$28,182	\$244,175
3C - CARROLL ROAD	\$38,418	\$48,335	\$30,482	\$12,152	\$12,812	\$0	\$0	\$7,032	\$780	\$150,031	\$37,508	\$22,505	\$210,043
3D - VALLEY FORD	\$43,288	\$47,852	\$30,882	\$12,152	\$12,812	\$0	\$0	\$7,034	\$780	\$154,820	\$38,730	\$23,238	\$216,888
3E - HUNTLEY	\$46,853	\$48,580	\$30,018	\$12,152	\$12,812	\$0	\$0	\$7,027	\$780	\$158,242	\$39,561	\$23,438	\$218,738
3F - ASR + SMALLER TWO ROCK	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
4 - GEYSERS RECHARGE	\$0	\$78,388	\$38,885	\$0	\$0	\$0	\$0	\$15,045	\$780	\$129,218	\$32,305	\$18,383	\$180,907
5A - DIRECT DISCHARGE TO RUSSIAN RIVER	\$0		\$0	\$0	\$0	\$0	\$38,812	\$0	\$780	\$39,702	\$9,928	\$5,888	\$55,583
5B - DIRECT DISCHARGE TO LAGUNA CREEKS	\$0	\$0	\$0	\$0	\$0	\$0	\$28,000	\$0	\$780	\$28,780	\$7,198	\$4,318	\$40,308

COSTS BASIS IS SEPT 1985 ENR CONSTRUCTION COST (SAN FRANCISCO) INDEX - APPROX. 8500.

QCOSTTAB.2

PARSONS ENGINEERING SCIENCE, INC.

TABLE 2.5

SANTA ROSA SUBREGIONAL LONG-TERM WASTEWATER PROJECT
CONSTRUCTION COST ESTIMATE - SUMMARY TABLE
MAIN FACILITIES AND COMPONENTS
MAR 5, 1995

5% PROJECT FOR ALTERNATIVES 2 AND 3

ALTERNATIVE PROJECT	RESERVOIRS (TABLE 3) (\$1,000)	PIPELINES (TABLE 4) (\$1,000)	PUMP STATIONS (TABLE 5) (\$1,000)	AGRICULTURAL IRRIGATION AREAS (TABLE 6) (\$1,000)	URBAN IRRIGATION (TABLE 7) (\$1,000)	ASR SYSTEM (TABLE 8) (\$1,000)	DIRECT DISCHARGE (TABLE 9) (\$1,000)	UTILITY SERVICES (TABLE 10) (\$1,000)	HEADWORKS IMPROVEMENTS (TABLE 11) (\$1,000)	SUBTOTAL CONSTRUCTION COST (\$1,000)	CONSTRUCTION CONTINGENCY (25% OF SUBTOTAL) (\$1,000)	CONTRACTOR'S EXPENSES, O&M (15% OF SUBTOTAL) (\$1,000)	TOTAL PROJECT CONSTRUCTION COST (\$1,000)
1 - NO PROJECT	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2A - TOLAY A	\$45,824	\$47,800	\$25,225	\$3,956	\$12,812	\$0	\$0	\$17,080	\$790	\$153,597	\$38,399	\$23,040	\$215,036
2B - ADOBE ROAD	\$65,391	\$38,700	\$24,170	\$3,956	\$12,812	\$0	\$0	\$12,082	\$790	\$155,881	\$38,970	\$23,382	\$218,233
2C - TOLAY C	\$75,910	\$43,100	\$28,885	\$3,956	\$12,812	\$0	\$0	\$12,151	\$790	\$175,404	\$43,851	\$26,311	\$245,566
2D - SEARS POINT	\$46,725	\$49,700	\$36,770	\$3,956	\$12,812	\$0	\$0	\$22,058	\$790	\$172,811	\$43,203	\$25,922	\$241,935
2E - ASR + SMALLER TOLAY	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
3A - TWO ROCK	\$33,818	\$36,000	\$17,540	\$7,250	\$12,812	\$0	\$0	\$7,081	\$790	\$115,291	\$28,823	\$17,294	\$161,407
3B - BLOOMFIELD	\$92,554	\$34,700	\$18,340	\$7,250	\$12,812	\$0	\$0	\$7,071	\$790	\$134,517	\$33,628	\$20,178	\$188,324
3C - CARROLL ROAD	\$32,446	\$33,700	\$18,847	\$7,250	\$12,812	\$0	\$0	\$7,032	\$790	\$113,577	\$28,394	\$17,037	\$159,008
3D - VALLEY FORD	\$38,570	\$33,200	\$18,847	\$7,250	\$12,812	\$0	\$0	\$7,034	\$790	\$120,603	\$30,151	\$18,080	\$168,844
3E - HUNTLEY	\$35,841	\$31,600	\$18,033	\$7,250	\$12,812	\$0	\$0	\$7,027	\$790	\$114,353	\$28,588	\$17,153	\$160,094
3F - ASR + SMALLER TWO ROCK	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
4 - GEYSERS RECHARGE	\$0	\$76,399	\$38,985	\$0	\$0	\$0	\$0	\$15,045	\$790	\$129,219	\$32,305	\$19,383	\$180,907
5A - DIRECT DISCHARGE TO RUSSIAN RIVER	\$0		\$0	\$0	\$0	\$0	\$38,912	\$0	\$790	\$39,702	\$9,926	\$5,955	\$55,583
5B - DIRECT DISCHARGE TO LAGUNA CREEKS	\$0	\$0	\$0	\$0	\$0	\$0	\$28,000	\$0	\$790	\$28,790	\$7,198	\$4,319	\$40,308

COSTS BASIS IS SEPT 1995 ENR CONSTRUCTION COST (SAN FRANCISCO) INDEX - APPROX. 6500.

OCOST5%.2

PARSONS ENGINEERING SCIENCE, INC.

TABLE 2.10

SANTA ROSA SUBREGIONAL LONG-TERM WASTEWATER PROJECT
CONSTRUCTION COST ESTIMATE - SUMMARY TABLE
MAIN FACILITIES AND COMPONENTS
MAR 7, 1988
10% PROJECT FOR ALTERNATIVES 2 AND 3

ALTERNATIVE PROJECT	RESERVOIRS (TABLE 3) (\$1,000)	PIPELINES (TABLE 4) (\$1,000)	PUMP STATIONS (TABLE 5) (\$1,000)	AGRICULTURAL IRRIGATION AREAS (TABLE 6) (\$1,000)	URBAN IRRIGATION (TABLE 7) (\$1,000)	ASR SYSTEM (TABLE 8) (\$1,000)	DIRECT DISCHARGE (TABLE 9) (\$1,000)	UTILITY SERVICES (TABLE 10) (\$1,000)	HEADWORKS IMPROVEMENTS (TABLE 11) (\$1,000)	SUBTOTAL CONSTRUCTION COST (\$1,000)	CONSTRUCTION CONTINGENCY (25% OF SUBTOTAL) (\$1,000)	CONTRACTOR'S EXPENSES, O&M (15% OF SUBTOTAL) (\$1,000)	TOTAL PROJECT CONSTRUCTION COST (\$1,000)
1 - NO PROJECT	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2A - TOLAY A	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2B - ADOBE ROAD	\$53,807	\$18,108	\$22,370	\$1,880	\$12,812	\$0	\$0	\$12,062	\$700	\$121,849	\$30,410	\$18,248	\$170,288
2C - TOLAY C	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2D - BEARS POINT	\$41,787	\$34,743	\$17,570	\$1,880	\$12,812	\$0	\$0	\$22,058	\$700	\$131,850	\$32,913	\$19,748	\$184,310
2E - ASR	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
3A - TWO ROCK	\$27,547	\$20,887	\$13,240	\$5,507	\$12,812	\$0	\$0	\$7,081	\$700	\$67,864	\$21,881	\$13,185	\$123,150
3B - BLOOMFIELD	\$42,300	\$12,129	\$9,440	\$5,507	\$12,812	\$0	\$0	\$7,071	\$700	\$80,049	\$22,512	\$13,807	\$126,088
3C - CARROLL ROAD	\$26,880	\$14,384	\$9,447	\$5,507	\$12,812	\$0	\$0	\$7,032	\$700	\$76,632	\$19,158	\$11,485	\$107,285
3D - VALLEY FORD	\$31,338	\$14,481	\$9,847	\$5,507	\$12,812	\$0	\$0	\$7,034	\$700	\$81,819	\$20,455	\$12,273	\$114,547
3E - HUNTLEY	\$27,608	\$22,233	\$15,333	\$5,507	\$12,812	\$0	\$0	\$7,027	\$700	\$81,310	\$22,828	\$13,887	\$127,834
3F - ASR	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
4 - GEYSERS RECHARGE	\$0	\$76,388	\$36,886	\$0	\$0	\$0	\$0	\$15,045	\$700	\$129,218	\$32,305	\$19,383	\$180,907
5A - DIRECT DISCHARGE TO RUSSIAN RIVER	\$0		\$0	\$0	\$0	\$0	\$38,912	\$0	\$700	\$39,702	\$9,926	\$5,955	\$55,583
5B - DIRECT DISCHARGE TO LAGUNA CREEKS	\$0	\$0	\$0	\$0	\$0	\$0	\$28,000	\$0	\$700	\$28,700	\$7,198	\$4,318	\$40,308

COSTS BASIS IS SEPT 1985 ENR CONSTRUCTION COST (SAN FRANCISCO) INDEX - APPROX. 8500.

OCOST10%.2

PARSONS ENGINEERING SCIENCE, INC.

TABLE 2.15

SANTA ROSA SUBREGIONAL LONG-TERM WASTEWATER PROJECT
CONSTRUCTION COST ESTIMATE - SUMMARY TABLE
MAIN FACILITIES AND COMPONENTS
MAR 5, 1998 15% PROJECT FOR ALTERNATIVES 2 AND 3

ALTERNATIVE PROJECT	RESERVOIRS (TABLE 3) (\$1,000)	PIPELINES (TABLE 4) (\$1,000)	PUMP STATIONS (TABLE 5) (\$1,000)	AGRICULTURAL IRRIGATION AREAS (TABLE 6) (\$1,000)	URBAN IRRIGATION (TABLE 7) (\$1,000)	ASR SYSTEM (TABLE 8) (\$1,000)	DIRECT DISCHARGE (TABLE 9) (\$1,000)	UTILITY SERVICES (TABLE 10) (\$1,000)	HEADWORKS IMPROVEMENTS (TABLE 11) (\$1,000)	SUBTOTAL CONSTRUCTION COST (\$1,000)	CONSTRUCTION CONTINGENCY (25% OF SUBTOTAL) (\$1,000)	CONTRACTOR'S EXPENSES, O&M (15% OF SUBTOTAL) (\$1,000)	TOTAL PROJECT CONSTRUCTION COST (\$1,000)
1 - NO PROJECT	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2A - TOLAY A	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2B - ADOBE ROAD	\$42,197	\$14,408	\$7,758	\$1,881	\$12,812	\$0	\$0	\$7,027	\$790	\$88,671	\$21,888	\$13,001	\$121,338
2C - TOLAY C	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2D - SEARS POINT	\$35,531	\$28,584	\$8,352	\$1,881	\$12,812	\$0	\$0	\$17,008	\$790	\$103,758	\$25,939	\$15,563	\$145,258
2E - ASR	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2F - LAKEVILLE	\$19,184	\$18,938	\$7,220	\$1,881	\$12,812	\$0	\$0	\$7,007	\$790	\$88,613	\$17,153	\$10,282	\$88,098
3A - TWO ROCK	\$22,180	\$12,112	\$8,320	\$4,278	\$12,812	\$0	\$0	\$7,058	\$790	\$85,528	\$14,382	\$8,828	\$81,738
3B - BLOOMFIELD	\$30,853	\$8,828	\$7,470	\$4,278	\$12,812	\$0	\$0	\$7,048	\$790	\$70,275	\$17,568	\$10,541	\$88,385
3C - CARROLL ROAD	\$21,728	\$8,803	\$7,470	\$4,278	\$12,812	\$0	\$0	\$7,007	\$790	\$83,888	\$15,972	\$8,583	\$88,440
3D - VALLEY FORD	\$24,841	\$8,535	\$7,720	\$4,278	\$12,812	\$0	\$0	\$7,008	\$790	\$87,083	\$16,771	\$10,082	\$83,916
3E - HUNTLEY	\$20,703	\$12,782	\$7,345	\$4,278	\$12,812	\$0	\$0	\$7,007	\$790	\$85,885	\$16,424	\$8,854	\$81,873
3F - ASR	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
4 - GEYSERS RECHARGE	\$0	\$78,388	\$38,885	\$0	\$0	\$0	\$0	\$15,045	\$790	\$129,218	\$32,305	\$18,383	\$180,807
5A - DIRECT DISCHARGE TO RUSSIAN RIVER	\$0	\$0	\$0	\$0	\$0	\$0	\$38,812	\$0	\$790	\$39,702	\$9,928	\$5,955	\$55,583
5B - DIRECT DISCHARGE TO LAGUNA CREEKS	\$0	\$0	\$0	\$0	\$0	\$0	\$28,000	\$0	\$790	\$28,790	\$7,198	\$4,318	\$40,308

COSTS BASIS IS SEPT 1995 ENR CONSTRUCTION COST (SAN FRANCISCO) INDEX - APPROX. 8500.

QCOST15%.2

PARSONS ENGINEERING SCIENCE, INC.

TABLE 20.5

SANTA ROSA SUBREGIONAL LONG-TERM WASTEWATER PROJECT
 OPERATIONS AND MAINTENANCE COSTS - SUMMARY
 APRIL 29, 1986 5% PROJECT FOR ALTERNATIVES 2 AND 3

ALTERNATIVE PROJECT	RESERVOIR MAINTENANCE COSTS (TABLE 20.1) (\$1,000)	PIPELINE MAINTENANCE COSTS (TABLE 20.2) (\$1,000)	PUMPING EQUIPMENT MAINTENANCE COSTS (TABLE 20.3) (\$1,000)	IRRIGATION AREAS O&M AND MONITORING COSTS (TABLE 6.2) (\$1,000) (1)(2)(3)	ASR WELLS MAINTENANCE COSTS (TABLE 20.5) (\$1,000)	PUMPING POWER ANNUAL COSTS (TABLE 20.7) (\$1,000)	TOTAL ANNUAL O&M COSTS (\$1,000)
1 - NO PROJECT	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2A - TOLAY A	\$22	\$57	\$130	\$205	\$0	\$1,259	\$1,673
2B - ADOBE ROAD	\$22	\$55	\$178	\$205	\$0	\$1,158	\$1,618
2C - TOLAY C	\$22	\$56	\$194	\$205	\$0	\$1,290	\$1,767
2D - SEARS POINT	\$22	\$58	\$178	\$205	\$0	\$1,802	\$2,085
2E - ASR + SMALLER TOLAY	\$0	\$0	\$0	\$0	\$0	\$0	\$0
3A - TWO ROCK	\$20	\$58	\$146	\$205	\$0	\$732	\$1,161
3B - BLOOMFIELD	\$20	\$60	\$146	\$205	\$0	\$789	\$1,220
3C - CARROLL ROAD	\$20	\$58	\$154	\$205	\$0	\$789	\$1,226
3D - VALLEY FORD	\$20	\$58	\$154	\$205	\$0	\$809	\$1,246
3E - HUNTLEY	\$20	\$58	\$138	\$205	\$0	\$775	\$1,198
3F - ASR + SMALLER TWO ROCK	\$0	\$0	\$0	\$0	\$0	\$0	\$0
4 - GEYSERS RECHARGE	\$0	\$31	\$37	\$0	\$0	\$6,583	\$6,651 (5)
5A - DIRECT DISCHARGE TO RUSSIAN RIVER	\$0	\$20	\$8	\$0	\$0	\$69	\$97
5B - DIRECT DISCHARGE TO LAGUNA CREEKS	\$0	\$0	\$0	\$0	\$0	\$0	\$0

(1) BASED ON QUESTA ENGINEERING ESTIMATE OF ANNUAL OPERATIONS COSTS.
 COSTS FOR FIRST FIVE YEARS OF IRRIGATION SYSTEM IMPLEMENTATION AND DEVELOPMENT
 ARE INCLUDED IN TABLE 6 AS CAPITAL COSTS.

(2) INCLUDES NO INCENTIVE PAYMENTS TO FARMERS TO TAKE RECLAIMED WATER.

(3) ASSUMES NO ANNUAL COSTS FOR REPLACEMENT OF ON-FARM IRRIGATION PIPING.

(4) ASSUMES URBAN IRRIGATION PROJECTS FOR ALTERNATIVES 2A THRU 3F ONLY.

(5) ANNUAL COST IF IGNORE VALUE OF INCREASED GEYSERS ENERGY PRODUCTION. SEE TABLE 20.7.

(6) ANNUAL PUMPING COST BASED ON THE RATIO OF IRRIGATED ACRES FOR 5% PROJECT TO 1% PROJECT.

TABLE 20.10

SANTA ROSA SUBREGIONAL LONG-TERM WASTEWATER PROJECT
 OPERATIONS AND MAINTENANCE COSTS - SUMMARY
 APRIL 15, 1986 10% PROJECT FOR ALTERNATIVES 2 AND 3

ALTERNATIVE PROJECT	RESERVOIR MAINTENANCE COSTS (TABLE 20.1) (\$1,000)	PIPELINE MAINTENANCE COSTS (TABLE 20.2) (\$1,000)	PUMPING EQUIPMENT MAINTENANCE COSTS (TABLE 20.3) (\$1,000)	IRRIGATION AREAS O&M AND MONITORING COSTS (TABLE 6.2) (\$1,000) (1)(2)(3)	ASR WELLS MAINTENANCE COSTS (TABLE 20.5) (\$1,000)	PUMPING POWER ANNUAL COSTS (TABLE 20.7) (\$1,000)	TOTAL ANNUAL O&M COSTS (\$1,000)
1 - NO PROJECT	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2A - TOLAY A	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2B - ADOBE ROAD	\$22	\$29	\$89	\$205	\$0	\$772	\$1,117
2C - TOLAY C	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2D - SEARS POINT	\$22	\$38	\$57	\$205	\$0	\$1,068	\$1,390
2E - ASR + SMALLER TOLAY	\$0	\$0	\$0	\$0	\$0	\$0	\$0
3A - TWO ROCK	\$20	\$35	\$57	\$205	\$0	\$488	\$805
3B - BLOOMFIELD	\$20	\$20	\$49	\$205	\$0	\$526	\$820
3C - CARROLL ROAD	\$20	\$23	\$49	\$205	\$0	\$526	\$823
3D - VALLEY FORD	\$20	\$24	\$49	\$205	\$0	\$539	\$837
3E - HUNTLEY	\$20	\$38	\$65	\$205	\$0	\$517	\$845
3F - ASR + SMALLER TWO ROCK	\$0	\$0	\$0	\$0	\$0	\$0	\$0
4 - GEYSERS RECHARGE	\$0	\$31	\$37	\$0	\$0	\$6,583	\$6,651 (5)
5A - DIRECT DISCHARGE TO RUSSIAN RIVER	\$0	\$20	\$8	\$0	\$0	\$69	\$97
5B - DIRECT DISCHARGE TO LAGUNA CREEKS	\$0	\$0	\$0	\$0	\$0	\$0	\$0

(1) BASED ON QUESTA ENGINEERING ESTIMATE OF ANNUAL OPERATIONS COSTS.
 COSTS FOR FIRST FIVE YEARS OF IRRIGATION SYSTEM IMPLEMENTATION AND DEVELOPMENT
 ARE INCLUDED IN TABLE 6 AS CAPITAL COSTS.

(2) INCLUDES NO INCENTIVE PAYMENTS TO FARMERS TO TAKE RECLAIMED WATER.

(3) ASSUMES NO ANNUAL COSTS FOR REPLACEMENT OF ON-FARM IRRIGATION PIPING.

(4) ASSUMES URBAN IRRIGATION PROJECTS FOR ALTERNATIVES 2A THRU 3F ONLY.

(5) ANNUAL COST IF IGNORE VALUE OF INCREASED GEYSERS ENERGY PRODUCTION. SEE TABLE 20.7.

(6) ANNUAL PUMPING COST BASED ON THE RATIO OF IRRIGATED ACRES FOR 10% PROJECT TO 1% PROJECT.

TABLE 20.15

SANTA ROSA SUBREGIONAL LONG-TERM WASTEWATER PROJECT
 OPERATIONS AND MAINTENANCE COSTS - SUMMARY
 APRIL 15, 1986 15% PROJECT FOR ALTERNATIVES 2 AND 3

ALTERNATIVE PROJECT	RESERVOIR MAINTENANCE COSTS (TABLE 20.1) (\$1,000)	PIPELINE MAINTENANCE COSTS (TABLE 20.2) (\$1,000)	PUMPING EQUIPMENT MAINTENANCE COSTS (TABLE 20.3) (\$1,000)	IRRIGATION AREAS O&M AND MONITORING COSTS (TABLE 6.2) (\$1,000) (1) (2) (3)	ASR WELLS MAINTENANCE COSTS (TABLE 20.5) (\$1,000)	PUMPING POWER ANNUAL COSTS (TABLE 20.7) (\$1,000)	TOTAL ANNUAL O&M COSTS (\$1,000)
1 - NO PROJECT	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2A - TOLAY A	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2B - ADOBE ROAD	\$22	\$29	\$57	\$205	\$0	\$348	\$661
2C - TOLAY C	\$0	\$0	\$0	\$0	\$0	\$0	\$0
2D - SEARS POINT	\$22	\$38	\$49	\$205	\$0	\$481	\$795
2E - ASR + SMALLER TOLAY	\$0	\$0	\$0	\$0	\$0	\$0	\$0
3A - TWO ROCK	\$20	\$19	\$49	\$205	\$0	\$219	\$512
3B - BLOOMFIELD	\$20	\$13	\$49	\$205	\$0	\$237	\$524
3C - CARROLL ROAD	\$20	\$20	\$49	\$205	\$0	\$237	\$531
3D - VALLEY FORD	\$20	\$19	\$49	\$205	\$0	\$243	\$536
3E - HUNTLEY	\$20	\$26	\$49	\$205	\$0	\$233	\$533
3F - ASR + SMALLER TWO ROCK	\$0	\$0	\$0	\$0	\$0	\$0	\$0
4 - GEYSERS RECHARGE	\$0	\$31	\$37	\$0	\$0	\$6,583	\$6,651 (5)
5A - DIRECT DISCHARGE TO RUSSIAN RIVER	\$0	\$20	\$8	\$0	\$0	\$69	\$97
5B - DIRECT DISCHARGE TO LAGUNA CREEKS	\$0	\$0	\$0	\$0	\$0	\$0	\$0

(1) BASED ON QUESTA ENGINEERING ESTIMATE OF ANNUAL OPERATIONS COSTS.
 COSTS FOR FIRST FIVE YEARS OF IRRIGATION SYSTEM IMPLEMENTATION AND DEVELOPMENT
 ARE INCLUDED IN TABLE 6 AS CAPITAL COSTS.

(2) INCLUDES NO INCENTIVE PAYMENTS TO FARMERS TO TAKE RECLAIMED WATER.

(3) ASSUMES NO ANNUAL COSTS FOR REPLACEMENT OF ON-FARM IRRIGATION PIPING.

(4) ASSUMES URBAN IRRIGATION PROJECTS FOR ALTERNATIVES 2A THRU 3F ONLY.

(5) ANNUAL COST IF IGNORE VALUE OF INCREASED GEYSERS ENERGY PRODUCTION. SEE TABLE 20.7.

(6) ANNUAL PUMPING COST BASED ON THE RATIO OF IRRIGATED ACRES FOR 15% PROJECT TO 1% PROJECT.

3 CONCLUSION

Several observations and conclusions can be drawn by review of the figures based on the tables presented in this Cost Estimate Supplement.

- The relative position of the alternatives on Figure 1 is nearly identical to the relative positions on Figure 2, indicating that construction cost dominates the present worth value of the projects. This is true except for Alternative 4.
- Note that Alternative 4 is about equivalent in present worth value to the average of the 1% West County alternatives; whereas, from Figure 2, the construction cost of Alternative 4 is closer to that of the 5% West County alternatives. This reflects the substantially higher operations and maintenance cost (primarily due to higher pumping costs) for Alternative 4 in relation to the other projects.
- Once the river discharge allowance exceeds about 6%, Alternative 4 becomes the most expensive project. Alternative 4 is more expensive than any 10% or 15% project.
- Note the change in cost for any given alternative as the river discharge allowance is increased from 1% to 5% to 10% and then to 15% of river flowrate.
- For the 10% and 15% alternative projects, Alternatives 2A and 2C are deleted due to the very shallow and uneconomical condition of the Tolay reservoirs.
- Alternative projects 2E and 3F have been deleted due to the BPU dropping the ASR component in January 1996.
- The West County alternatives have consistently less cost than the South County alternatives.
- For the 15% river discharge option, a new Alternative 2F is proposed because Lakeville reservoir alone would satisfy the storage requirement. The construction cost of Alternative 2F is the least costly South County alternative, and is nearly equivalent to the West County alternatives.
- The 5% South County alternatives 2A through 2D are nearly equivalent in cost to the 1% West County alternatives.
- The 10% South County alternatives 2A through 2D are nearly equivalent in cost to the 5% West County alternatives.
- The 15% South County alternatives 2A through 2D are nearly equivalent in cost to the 10% West County alternatives.
- Alternative 2D is always the most expensive Alternatives 2 or 3 project.

- Alternative 3C is always the least expensive Alternatives 2 or 3 project.
- Direct river discharge Alternative 5B is always the least expensive project.