# SONOMA VALLEY RECYCLED WATER FEASIBILITY STUDY

By

Sonoma County Water Agency

On behalf of

Sonoma Valley County Sanitation District
Valley of the Moon Water District
City of Sonoma

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## EXECUTIVE SUMMARY

The Sonoma Valley Recycled Water Feasibility Study (Feasibility Study) was conducted by the Sonoma County Water Agency (Agency) on behalf of the Sonoma Valley County Sanitation District (SVCSD), the Valley of the Moon Water District (VOMWD), the City of Sonoma (City), and in consultation with the Sonoma Ecology Center to evaluate the feasibility of recycled water use in Sonoma Valley, California.

Agency staff has conducted this Feasibility Study in coordination with the VOMWD, the City, and the State Water Resources Control Board (SWRCB). In addition, the SWRCB has awarded a Water Recycling Facilities Planning Grant partially fund the Feasibility Study.

The purpose of this Feasibility Study is to evaluate options for expanded recycled water use in Sonoma Valley. The expanded use of recycled water in Sonoma Valley could result in significant water supply and environmental benefits. Potential benefits include environmental benefits from reduced discharges to waters of the United States, reduction of peak potable water demands on the VOMWD and the City's distribution systems including Russian River and groundwater supplies, and potential reduction of groundwater pumping for agricultural and private municipal purposes.

The Feasibility Study is organized into the following sections: Engineering Evaluation; Environmental Review (Environmental Constraints Analysis); and a Financial/Economic Evaluation. The Environmental Constraints Analysis and the Financial/Economic Analysis are contained in Appendix F and G respectively.

The Engineering Evaluation consists of a summary of water quality regulations governing recycled water use; an evaluation of recycled water supply and demand; the development of recycled water project alignments; comparison of project alignments; and a satellite treatment component. Four alignments are proposed in the evaluation. Each alignment has the potential to provide benefits to the residents in Sonoma Valley. The Agency has concludes that a satellite treatment facility in Sonoma Valley is a good idea. However, the lack information has made including the satellite treatment facility alternative, as a component of this project is not feasible at this time.

The Environmental Constraints Analysis is a preliminary assessment of proposed project components and will be used to support future environmental documentation. None of the proposed project components appears to have significant environmental constraints that preclude construction of proposed project components. For each component, potential environmental impacts may occur for traffic/transportation, noise, air quality, geology, land use, biological resources, water quality, utilities, agriculture resources, etc. Where applicable, mitigation measures would be implemented to reduce impacts to less than significant.

The Financial/Economic Analysis evaluates whether a project can be constructed given the financial resources available. Financial resources include existing funds held by the participating agencies, grants and low-interest loans obtained from state and federal agencies, and bonds issued to finance a project. For the purposes of this Feasibility Study, a hybrid of two approaches was used to evaluate which, if any, of the alignments represents the most economically sound approach to meeting the multiple project objectives at the least cost. The economic and financial analysis does not conclude which alignment is the best based upon cost. Rather, the economic and financial analysis, in conjunction with the engineering and the environmental analyses should be used to evaluate the various alignments.

The purpose of the Feasibility Study was to evaluate options for expanded recycled water use in Sonoma Valley. Analysis of engineering, environmental, and financial/economic issues has led the Agency to conclude, expanding the use of recycled water in Sonoma Valley could result in: reduced discharges to waters of the United States; reduction of peak potable water demands on the VOMWD and the City's distribution systems including Russian River and groundwater supplies; and potential reduction of groundwater pumping for agricultural and private municipal purposes.

## 1.0 INTRODUCTION

This Feasibility Study was prepared by the Sonoma County Water Agency (Agency) on behalf of the Sonoma Valley County Sanitation District (SVCSD), the Valley of the Moon Water District (VOMWD), the City of Sonoma (City), and in consultation with the Sonoma Ecology Center to evaluate the feasibility of recycled water use in Sonoma Valley, California. The SVCSD operates a treatment facility within Sonoma Valley that during certain times of the year (November through April) discharges treated wastewater to the Schell Slough, a tributary to San Pablo Bay. The purpose of this Feasibility Study is to evaluate options for expanded recycled water use within Sonoma Valley. The expanded use of recycled water in Sonoma Valley could result in significant water supply and environmental benefits.

Agency staff has conducted this Feasibility Study in coordination with the VOMWD, the City, and the State Water Resources Control Board (SWRCB); and has also consulted with the Sonoma Ecology Center. In addition, the SWRCB awarded a Water Recycling Facilities Planning Grant to partially fund the SVCSD's Feasibility Study. The scope of the Feasibility Study is described in the March 1, 2002 document entitled: *Feasibility Study Workplan, Sonoma Valley Recycled Water Project*. Each of the above-mentioned parties reviewed the workplan. In addition, to fulfill the requirements of the SWRCB grant, Agency staff provided quarterly status reports to the SWRCB detailing the progress of the study.

### 1.1 Organization of Report

The following sections are discussed in this Feasibility Study:

Section 1.0 – Introduction of the Feasibility Study, including the format of the Feasibility Study.

Section 2.0 – Background information pertinent to the Feasibility Study.

Section 3.0 – Assessment of the project needs and benefits.

Section 4.0 – Objectives of the Feasibility Study, based on the needs and benefits assessment.

Section 5.0 – Engineering evaluation regarding the feasibility of recycled water use in Sonoma Valley.

Section 6.0 – Evaluation of proposed project alignments.

Section 7.0 – Summary of the economic and financial analysis of potential project alignments.

Section 8.0 – References.

## 2.0 BACKGROUND INFORMATION

This section provides the following background information on the Feasibility Study:

- A discussion of the use of recycled water in California;
- The location of the Feasibility Study;
- A description of the SVCSD treatment facility;
- A summary of the sources of water supply in the Sonoma Valley;
- A discussion of the other existing or planned recycled water projects; and
- A summary of the public participation component of the Feasibility Study.

### 2.1 Recycled Water Use in California

Recycled water has been used throughout the world for centuries and in California as far back as the turn of the century. For example, the founders of Golden Gate Park began irrigating with untreated wastewater in 1889 to make the park soil more productive. Currently, many communities in California use recycled water for irrigation of pastures, food crops, as well as landscape irrigation of schools, parks, and golf courses. Additionally recycled water is used for recreation, habitat restoration, and commercial uses such as carpet dying, paper production, heating and cooling.

The California Department of Water Resources (DWR) Bulletin 160-98 (The California Water Plan) estimates that California's population will increase from 32 million to 47.5 million by the year 2020. This translates to a water shortfall by the year 2020 of 2.4 million acre-feet in years of average precipitation and 6.2 million acre-feet in drought years if no actions are taken to improve existing supplies (California Water Plan, DWR 1998). The use of recycled water is one of the strategies for addressing this statewide shortfall.

In April 2002, the Governor convened the 2002 California Recycled Water Task Force. The intent of the Task Force is to advise DWR on opportunities and constraints associated with increasing the use of recycled water. The Task Force has two goals for investigating water recycling. The first goal is a statewide goal to recycle a total of 700,000 acre-feet of water per year by the year 2007 and 1,000,000 acre-feet of water by the year 2010 (Section 13577, Water Code). The second goal is a recommendation of Governor Davis' Advisory Drought Planning Panel Critical Water Shortage Contingency Plan. That recommendation states "In the interest of implementing the CALFED water use efficiency program (water conservation and water recycling actions) as quickly as possible, the Panel recommends that DWR maximize use of grants, rather than capitalization loans, to bring local agencies up to base level of efficiency contemplated in the CALFED Record of Decision."

The year 2000 is the last year for which comprehensive data are available for planned use of municipal wastewater. The total amount of recycled water delivered in California is estimated by DWR to be 402,000 acre-feet per year (AFY). An acre-foot equals approximately 326,000 gallons and would serve one to two families a year (DWR, 1998).

To illustrate the widespread use of recycled water in California, the following presents a partial list of some of the entities that operate recycled water projects:

- Marin Municipal Water District
- Dublin San Ramon Service District
- Livermore Water Reclamation Plant
- South Bay Water Recycling Water Quality Control Plant
- Central Contra Costa Sanitation District
- Monterey Regional Water Pollution Control Authority
- East Bay Municipal Utilities District
- Irvine Ranch Water District
- Los Angeles County Sanitation District
- San Diego County Water Authority
- Orange County Water District
- West and Central Basin Municipal Water District
- Sonoma Valley County Sanitation District
- Airport-Larkfield-Wikiup Sanitation Zone
- City of Santa Rosa
- Town of Windsor

## 2.2 Location of Study

The Sonoma Valley is located to the north of San Francisco Bay and about 17 miles southeast of the City of Santa Rosa (Plate 1). The Sonoma Valley is bordered on the west by the Sonoma Mountains, on the east by the Mayacamas Mountains, to the south by San Pablo Bay, and the topographic divide near the unincorporated community of Kenwood is considered to delineate the northern boundary of Sonoma Valley. Sonoma Valley encompasses an area of approximately 160 square miles. Sonoma Creek is the main surface water tributary, draining water from the north to the south into the San Pablo Bay through a series of marshes and wetlands along the perimeter of San Pablo Bay (Plate 2). The Sonoma Valley Recycled Water Feasibility Study boundaries are Highway 121 to the south, Arrowhead Mountains to the east, Petaluma Mountains to the west, and the unincorporated community of Kenwood is considered to delineate the northern boundary.

SVCSD's existing reclamation users are located in the southern end of Sonoma Valley (southeast of Schellville) in the Carernos Region. The Carernos Region is located south of Highway 121, north of Hudeman Slough, east of Schell Slough, and west of the Napa River. Plate 2 illustrates the location of the existing reclamation system.

### 2.3 Sonoma Valley County Sanitation District Facilities

The sole publicly owned wastewater treatment facility within Sonoma Valley is owned and operated by the SVCSD. The SVCSD service area extends from the unincorporated communities of Glen Ellen in the north to Schellville in the south (Plate 2). The wastewater collection system consists of approximately 188 miles of pipeline and three lift stations. The collection system conveys wastewater to SVCSD's treatment facility (treatment facility) located in the southern portion of the Sonoma Valley. The treatment facility currently provides secondary level treatment of wastewater. In 2002,[1] the SVCSD served approximately 16,452 equivalent single-family dwelling units with an average dry weather flow of approximately 2.5 million gallons per day (MGD). As currently operated, effluent from the treatment facility is discharged to waters of the United States, from November through May, and is used for local agricultural operations and wetlands enhancement during the remainder of the year. Discharges to waters of the United States are regulated under a National Pollutant Discharge Elimination System (NPDES) permit administered by the California Regional Water Quality Control Board, San Francisco Bay Region (RWQCB).

Currently, the treatment facility treats water to disinfected secondary 2.3 treatment level. As a separate project, SVCSD plans to upgrade the treatment facility to a tertiary treatment level within the next two to three years. Therefore, this Feasibility Study assumes that recycled water available for this project will be treated to a tertiary level. Even with these improvements to the treatment facility, environmental regulatory requirements and constraints will continue to increase operational costs and necessitate the reduction or elimination of discharges to waters of the United States.

The treatment facility's processes consist of influent pumping, screening, influent equalization basins, grit removal, extended aerated activated sludge basins, secondary clarifiers, chlorine contact chambers, and effluent storage. It is anticipated that, within the next few years, the treatment facility will be upgraded with the installation of a filtration system, which meets Title 22 requirements for tertiary level treatment. The treatment facility's current secondary and

[1] 2002 is the latest SVCSD service information available.

future tertiary treatment facilities are designed to meet the treatment facility NPDES permit average dry weather flow of 3.0 MGD. The treatment facility has the capacity to treat up to 16.0 MGD and discharge a peak wet weather flow of approximately 11.0 to 12.0 MGD depending on discharge conditions. During wet weather events, excess flows are stored in the influent equalization basins for deferred treatment.

Table 1 summarizes the treated water quality results from the treatment facility from 1999 – 2001. The RWQCB daily effluent discharge limitations to Schell Slough for Biological Oxygen Demand (BOD) 5, total suspended solids (TSS), total coliform, and turbidity is 60 milligrams per liter (mg/L), 60 mg/L, 23 Most Probable Number per milliliter (MPN/ml), and 6 Nephalometric Turbidity Units (NTU), respectively. Table 1 also illustrates the SVCSD averaged 5 to 7 mg/L of BOD5, 1.6 to 13.3 mg/L of TSS, <2 to 8 MPN/100 mL for total coliform, and 1.3 to 6.3 NTU for turbidity.

Currently, the SVCSD has approximately 635 acre-feet of recycled water storage. This existing storage is located in the southeast area of Sonoma Valley as shown on Plate 2. The existing storage is comprised of four storage reservoirs: R1, R2, R3, and R4. All reservoirs are used to store recycled water. In addition to storing recycled water, R1 and R2 supply water to R3 and a wetland restoration project (Management Units). R3 provides water to the reclamation users (vineyard, pasturelands, and dairies) and provides pressure for the reclamation system. R4 provides additional storage and water to Ringstrom Bay and existing reclamation users (vineyards, pasturelands, dairies), and provides pressure in the reclamation system.

## 2.4 Population Projections

The following population projections are from the Agency's 2000 Urban Water Management Plan. In 2000, population estimates for the City and VOMWD were 9,282 and 20,580 correspondingly. Population projection for the year 2020 for the City and VOMWD are 13,482 and 22,810 respectively. The 2000 and the 2020 population figures for the City are based on the City's Planning Department. The 2000 and 2020 population figures for VOMWD are based upon a 0.5% annual growth. The annual growth of 0.5 percent is based upon VOMWD staff projections.

Overall, the City is expecting an increase in population of approximately 30 percent and VOMWD is expecting an increase of approximately 10 percent. Overall, Sonoma Valley is expecting an increase in population of approximately 18 percent by 2020.

## 2.5 Sources of Water Supply in Sonoma Valley

The VOMWD and the City provide retail potable water supply service within Sonoma Valley. These entities obtain most of their potable water supply from the Agency's Russian River water production facilities via the Sonoma Aqueduct. In addition, local ground water is pumped by the VOMWD and the City to supplement Russian River water, by domestic users (outside the service area for the VOMWD and the City), and by agricultural operations in Sonoma Valley. Each of these sources of water supply is summarized below.

### 2.5.1 VOWMD Water Supply

VOMWD receives water from ten turnouts along the Agency's Sonoma Aqueduct. In addition, VOMWD has five local groundwater wells with a production capacity of 1.3 MGD. Approximately 30 percent of water delivered by VOMWD in 2000 was from local groundwater sources (SCWA, 2000).

VOMWD's water distribution system is divided into three pressure zones. Pumping stations provide delivery of water to zones requiring pressures greater than that supplied by the Agency's Sonoma Aqueduct. Distribution pipelines range from 4 to 12 inches in diameter. Storage facilities owned and operated by VOMWD range from 15,000 gallons to 2 million gallons for a total storage capacity of 4.5 MG. Water demand is estimated by VOMWD to increase from 3,815 AFY in 2000 to 4,501 AFY in 2020 (SCWA, 2000).

According to VOMWD, during times of peak demand, it is difficult for VOMWD to maintain sufficient storage levels. During periods of peak demand, the Agency's Sonoma Aqueduct reaches maximum capacity and VOMWD must rely on local sources (i.e., groundwater) to meet demands. As demand increases in the future, VOMWD will increasingly rely on groundwater to meet peak demands. As a result, the VOMWD is interested in identifying options to reduce peak demands.

### 2.5.2 City of Sonoma Water Supply

The City receives water from the Agency's Sonoma Aqueduct, which is stored in two steel storage tanks (2 and 8 MG). In addition to supplies that the City receives from the Agency, the City operates three groundwater wells. The groundwater wells have a production capacity of 1.1 MGD and are used only as a backup supply due to the lower water quality of the groundwater.

The City's existing water distribution system is divided into two pressure zones. Distribution pipelines range from 1.5 to 14 inches in diameter and a pumping station provides delivery of water to zones operating at a higher pressure than those supplied directly by the Agency's Sonoma Aqueduct. Storage facilities operated by the City include five storage tanks with a total capacity of 3.2 million gallons. It is estimated by the City that water demand will increase from 2,392 AFY in 2000 to 3,544 AFY in 2020 (SCWA, 2000). The City anticipates that approximately 15 percent of this demand will be met by local groundwater sources.

According to City staff, during peak demand periods it is difficult for the City to maintain sufficient storage levels in their tanks. During these times, the Agency's Sonoma Aqueduct reaches maximum capacity and the City must rely on local sources (i.e. groundwater) to meet demands. As demands increase in the future, the City will rely increasingly on groundwater to meet peak demands. As a result, the City is interested in identifying options to reduce peak demand.

### 2.5.3 Groundwater Supply

Groundwater is increasingly being used as a source of potable and agricultural water supply in Sonoma Valley to supplement existing supplies received by VOMWD, the City, and to support vineyards development. The Agency's Sonoma Aqueduct and local groundwater supplies are becoming increasingly stressed during the summer months when demands are high. Increased groundwater use is apparently creating stressed aquifer conditions in some areas of Sonoma Valley. A comprehensive assessment of groundwater resources for the Sonoma Valley was most recently performed by DWR in 1982 (DWR, 1982). Recent assessments of groundwater resources within Sonoma Valley (SCWA, 2000) have indicated that the current understanding of groundwater resources in Sonoma Valley is outdated and incomplete. Both assessments also indicate there are localized areas of Sonoma Valley that appear to be experiencing groundwater level declines.

As mentioned above, DWR, in cooperation with the Agency, prepared Bulletin 118-4 in 1982, which was an update to a 1975 evaluation of groundwater resources in Sonoma County. Since the preparation of Bulletin 118-4, there have been significant increases in groundwater usage within many areas of Sonoma County, including the Sonoma Valley. Increased groundwater usage is primarily the result of population growth and conversion of non-irrigated open space to irrigated vineyards and other crops within Sonoma County.

In order to update DWR's 1982 assessment and to address concerns regarding water quality and water availability in the Sonoma Valley, the Agency and the United States Geological Survey (USGS) are implementing a four-year cooperative study. It is anticipated that hydrologic information collected during the study will be added to a geographic information system developed by the Agency for the Sonoma Valley. Ultimately, this information will be used to develop a computer groundwater model for the Sonoma Valley basin. It is anticipated that development of the groundwater flow model will be an iterative process, with initial model results being used to identify additional data needs. Results of the completed study will be used to assess groundwater conditions in the Sonoma Valley basin.

## 2.6 Existing and Other Planned Recycled Water Projects

In addition to the potential use of recycled water within the Sonoma Valley as contemplated by this Feasibility Study, there are other existing and planned recycled water projects for water treated by the SVCSD.

First, the SVCSD currently provides recycled water for several users (vineyards, dairies, and pasturelands) during the dry weather months, May through October. This use of recycled water is currently 1,000 to 1,200 AFY.

Second, there are plans to provide recycled water for environmental restoration as part of the Napa River Salt Marsh Restoration Project. The SVCSD is currently participating in a cooperative project with the U.S. Army Corps of Engineers (Corps), California Costal Conservancy and the California Department of Fish and Game (CDFG) to deliver recycled water for the Napa River Salt Marsh Restoration Project. Because, the Napa River Salt Marsh Restoration Project has an essentially unlimited amount of storage, treated water provided by SVCSD could be stored during the winter and reused later. Storage of treated wastewater during the winter could significantly reduce discharges to San Pablo Bay. Due to increasing regulatory constraints, it is becoming increasingly difficult for the SVCSD to meet discharge requirements; therefore, the SVCSD is looking for alternatives such as the Napa River Salt Marsh Restoration Project to further reduce discharges.

### 2.7 Public Participation

On June 20, 2002, the Agency held a public workshop, involving the City of Sonoma's City Council and the Board of Directors of the VOMWD, in Sonoma, California. The Agency's staff gave a presentation discussing 1) background information; 2) an assessment of project needs and benefits; 3) potential users of recycled water; 4) the Feasibility Study objectives; 5) the organization of the Feasibility Study; and 6) the preliminary schedule. At the workshop, the City and VOMWD were asked to support the Feasibility Study. In particular, the Agency requested that the City and VOMWD pass resolutions in support of the Feasibility Study and write letters of support.

In response, both the City and VOMWD passed resolutions in support of the Feasibility Study (Appendix A, Letters of Resolutions). The Agency also asked the City and VOMWD to provide staff support for reviewing the Feasibility Study documents, attending coordination meetings, and attending and providing support at public workshops and meetings.

A second public workshop was held on October 23, 2002, with the Sonoma Valley Citizen Advisory Commission (SVCAC). At this workshop, the Agency's staff presented: 1) background information; 2) an assessment of project needs and benefits; 3) potential users of recycled water; 4) the Feasibility Study objectives; 5) the organization of the Feasibility Study; and 6) the preliminary schedule. This workshop allowed the SVCAC and the public to express their comments and support on the Feasibility Study. Subsequent to this workshop, the SVCAC wrote a letter of support for the Feasibility Study (Appendix A).

## 3.0 ASSESSMENT OF PROJECT NEEDS AND BENEFITS

There are several constraining issues concerning recycled water use in the Sonoma Valley. These issues include:

- Constrained potable water supply from the Sonoma Aqueduct in meeting summer demand of the VOMWD and the City.

- Increased groundwater use (either for potable water supply or for agricultural purposes) is apparently creating stressed aquifer conditions in some areas of the Sonoma Valley.

- Increased environmental regulatory requirements and constraints related to the discharge of treated wastewater to waters of the United States are increasing operational costs for the SVCSD and lead to concerns about the viability of continued discharge in the future.

To address these issues, the VOMWD, the City, and the SVCSD have identified the potential use of recycled water as an option to offset peak water demand in Sonoma Valley. The increased use of recycled water within Sonoma Valley can assist in: 1) offsetting potable water use in the VOMWD and the City; 2) potentially decreasing agricultural groundwater use, thus allowing more groundwater resources to be used for domestic supply; and 3) potentially reducing or eliminating discharges to waters of the United States, thus realizing environmental benefits.

## 4.0 OBJECTIVES

The purpose of this Feasibility Study is to explore options for recycled water use and, as feasible, develop projects to facilitate recycled water use within the Sonoma Valley. Potential benefits of using SVCSD recycled water include environmental benefits from reduced discharges to waters of the United States; reduction of peak potable water demands on the VOMWD and the City's distribution systems, reduction of peak demands on Russian River water and groundwater supplies; and potential reduction of groundwater pumping for agricultural and private purposes.

The objectives of the Feasibility Study are to:

- Evaluate the technical and economic feasibility of expanded use of recycled water in the Sonoma Valley.

- Evaluate potential water supply, environmental, and economic benefits for stakeholders (e.g., VOMWD, City, SVCSD, agricultural interests, golf courses, industrial users, and other recycled user interest).

- Develop a long-term planning document that identifies a phased program that puts recycled water to beneficial use in the Sonoma Valley.

- Prepare an Environmental Impact Report (EIR) based upon the California Environmental Quality Act (CEQA) to be certified and approved by the District's Board of Directors.

## 5.0 ENGINEERING EVALUATION

The Engineering Evaluation of the Feasibility Study consists of: 1) a summary of water quality regulations governing recycled water use; 2) an evaluation of recycled water supply; 3) an evaluation of recycled water demand; 4) the development of recycled water project alternatives; 5) estimated project costs; 6) comparison of project alternatives; and 7) results of the Feasibility Study.

## 5.1 Regulations Governing Recycled Water Use

To protect public health without unnecessarily discouraging water reuse, regulatory approaches stipulate water quality standards in conjunction with requirements for treatment, sampling, and monitoring. With reclaimed water, as in many activities, a key concern is the potential risk of human exposure to pathogenic organisms. However, controlling the extent of human exposure to the reclaimed water and ensuring that the wastewater treatment system is effective and reliable can minimize health impacts (Asano, 2001).

Presently, there are no federal regulations governing water reclamation and recycled water use in the United States. However, the U.S. Environmental Protection Agency (EPA) has published guidelines for water reuse, which provides guidance to utilities, regulatory agencies and others in states where standards do not exist or are being revised or expanded. Because there are no federal regulations, the regulatory burden rests with the individual states. The California Department of Health Services (DHS) is responsible for regulating the use of recycled water. The California Regional Water Quality Control Boards issue requirements for individual projects in conformance with the DHS regulations. Title 22, Article 4, of the California Code of Regulations sets regulations for water quality standards and treatment reliability criteria for water recycling. Title 22 establishes requirements to the maximum extent practical, for the beneficial uses of recycled water for land applications, such as use for irrigation of agricultural sites, landscape irrigation, golf courses, or public access lands. Appendix B illustrates the wide variety and the level of treatment required for use applications with recycled water. However, Title 22 does not cover all potential uses of recycled water. For situations that are not specifically discussed by Title 22, DHS reviews applications on a case-by-case basis.

Title 22 sets bacteriological water quality standards based on the expected degree of public contact with recycled water. For recycled water, use applications that have a high potential of direct public contact with recycled water, Title 22 requires disinfected tertiary treatment. For applications with a lower potential of public contact, Title 22 requires secondary treatment, of which there are three different levels. These levels of secondary treatment are classified by the amount of disinfection required. Currently, the SVCSD's treatment facility treats to disinfected secondary treatment level. Once a filtration system is installed, the quality of wastewater treated by the facility will be upgraded to disinfected tertiary treatment.

In addition to establishing recycled water quality standards, Title 22 requires the preparation of an engineering report that specifies and documents the reliability and redundancy of the treatment facility for recycled water treatment and use. This assures a treatment facility has been designed for efficiency and convenience in operation and maintenance, and provides the highest possible degree of treatment under varying circumstances. DHS has requirements for the conveyance of recycled water to ensure the prevention of backflow of recycled water into potable water systems, to avoid cross-connection between the recycled and potable water systems, and to ensure proper labeling, identification, and placement of warning placards of the presence of recycled water.

The San Pablo Bay watershed is part of the San Francisco-Bay Delta estuary. Although some portions of the watershed are relatively pristine, the watershed also faces many water quality and water resources challenges. For example, San Pablo Bay and many of its tributaries have been listed as impaired for a variety of pollutants. Because of the impairment of these water bodies, the San Francisco Bay estuary has some of the most stringent regulatory discharge standards in California.

SVCSD NPDES permit regulates the discharge of treated wastewater to Schell Slough, waters of the State and the United States. During the wet weather period from November through April, treated wastewater is discharged into Schell slough (Latitude: $38^{o}$ 14' 14" and Longitude: $122^{o}$ 25' 51"). Prior to implementation of a reclamation project in May 1992, treated wastewater was discharged into Schell Slough year round. During the dry weather season, May through October discharge to Schell Slough is prohibited and the treated effluent is used for agricultural irrigation.

Schell Slough is a tidal estuary, which receives freshwater flow from Shell creek during the wet weather months. During the dry weather months, Schell Slough is a dead end slough, and is flushed only by limited tidal action. Schell Slough flows into Steamboat slough, which is tributary to San Pablo Bay by way of the Third Napa Slough, the Second Napa Slough, and the lower reaches of Sonoma Creek. Discharges to Schell Slough do not occur during the dry weather period between May and October (reclamation period), except as authorized by this permit.

The Endangered Species Act (ESA), passed by Congress in 1973, also affects wastewater discharges. The purpose of the ESA is to conserve the ecosystems upon which endangered and threatened species depend upon and to conserve and recover listed species. The ESA has also made discharging treated wastewater to waters of the United States more complex.

### 5.2 Evaluation of Recycled Water Supply

To estimate the potential availability of recycled water use in Sonoma Valley, the SVCSD, developed a Hydra Influent Model (hydraulic model) to estimate the inflow into the existing collection system under wet and dry weather conditions (Harding ESE\HDR, 2001). The hydraulic model provides an estimate of the volume of wastewater that the treatment facility expect to collect under existing and future conditions for a dry, normal, and wet year. The treatment facility influent is converted into effluent for each of these weather conditions by using a water balance model. The result of the water balance model is an annual recycled water supply curve for a particular weather condition and weather scenario.

#### 5.2.1 Influent to SVCSD Treatment Facility (Hydra Model)

The collection system hydraulic model (Hydra) uses historic facility inflow and rainfall data, from 1990 to 2001, to establish typical monthly facility inflows that can be expected for dry, normal, and wet years. The projected land use and the hydraulic model are then used to estimate the probable future treatment facility's inflow patterns. The facility inflow projections are defined as three independent flow components; dry weather, wet weather infiltration inflow, and rainfall dependent inflow and infiltration (Plate 3). The sum of these three flow components represents the typical inflow pattern into the treatment facility (HDR, 2002)

The model considers the following weather scenarios a one-in-five year event of high rainfall (a "wet" weather year that has a one-in-five chance of occurring in any year), average rainfall (an "average" weather year), and low rainfall (a "dry" weather year that occurs once every five years). Using these weather scenarios, the model simulates the SVCSD's collection system influent at different inflow conditions, (i.e., existing conditions, at build out, and the projected inflow after rehabilitation of the collection system). SVCSD's projected inflows were evaluated using a model developed by SVCSD's consultants as part of the "Wet Weather Overflow Prevention Study" (Harding ESE\HDR, 2001). For the purposes of this study, minimum and maximum supply curves were developed. Consequently, the wet weather flow reduction from potential collection system rehabilitation was not considered. In the future, as the rehabilitation process occurs, inflow into the treatment facility will need to be re-evaluated. The scenarios above create a supply curve that illustrates the upper, average, and lower limits of recycled water that potentially the treatment facility will see currently and in the future (Plates 4 & 5).

### 5.2.2 Effluent from SVCSD Treatment Facility (Water Balance Model)

Agency staff has developed a water balance model to approximate the potential availability of recycled water from the treatment facility. The water balance model utilizes the results of the Hydra model as inflow to the treatment facility and accounts for water losses and gains in the treatment and storage process (i.e., evaporation and rainfall). The results of the water balance model have been used to develop supply curves for recycled water.

The boundaries of the water balance model are limited to within the treatment facility. The model is limited to volumes of water entering and exiting the treatment facility: influent volume, effluent volume, rainfall captured within the treatment facility's boundary, and evaporation of water from the uncovered basins. Seepage of water into the ground is insignificant, as the facility's basins are lined.

### 5.2.3 Design Supply Curves

Using the methodology described in Section 5.2.1, design supply curves were created for dry and average inflows for existing and buildout conditions. This range of weather and land use scenarios provides a planning basis for the potential amount of recycled water available for this project in addition to existing users and the Napa River Salt Marsh Restoration Project (Section 2.5). The following four supply curves were created: 1) existing "dry" inflow; 2) existing "average" inflow; 3) buildout "dry" inflow, and 4) buildout "average" inflow. Supply curves for existing wet and buildout-wet weather inflows were not considered in this study because dry and average inflows are considered the most conservative.

### 5.2.4 Existing Storage

As mentioned in Section 2.5, the SVCSD has approximately 635 acre-feet of storage. This existing storage is located in the southeast area of Sonoma Valley. Agency staff has also evaluated existing privately owned storage ponds in Sonoma Valley. This information guided Agency staff in determining areas where potential recycled water projects could be located. Over 400 ponds have been identified in Sonoma Valley. These ponds have approximately 540 surface acres.

## 5.3 Evaluation of Recycled Water Demand – Methodology

This section describes the methodology employed to estimate the demand for recycled water. The evaluation of recycled water demand is based upon: 1) identifying potential users by examining land use data; 2) developing a Geographic Information System (GIS) database; 3) developing recycled water demand parameters; and 4) developing demand curves for various land uses.

### 5.3.1 Land Use

The Feasibility Study area covers approximately 7,000 acres (11 square miles). The 7,000-acre area is comprised of urban, agricultural, and commercial water users. The Feasibility Study is based upon land uses specified by the general plans for the City of Sonoma and the County of Sonoma (for the unincorporated areas). Land use representing residential areas were not considered in this Feasibility Study, except for large housing tracts, which uses large amounts of water for irrigation of common landscape areas.

Potential recycled water users were identified through aerial photos, land use maps, and site visits. Once potential recycled water users are identified, Agency staff began a dialog with some of the largest potential users to assess their prospective need, suitability, and acceptance for recycled water. The estimated overall demand for recycled water was based on information obtained from these potential users.

### 5.3.2 Geographic Information System (GIS) Database

Agency staff have developed a GIS database for Sonoma Valley, which makes it possible to evaluate land use information such as; 1) SVCSD utility lines, manholes, and cleanouts; 2) pump stations, treatment facility, and sewer connections; 3) location of assessor's parcels; 4) street location and names; 5) land use and zoning; 6) topography and surface water features; and 6) groundwater wells.

The SVCSD sewer lines, manholes, and cleanouts are digitized and have been reprojected from original Computer Aided Drafting (CAD) files. The location of service connections were imported into the GIS database from the sanitation system CAD drawings and re-projected to

California State Plane NAD83. All parcels were georeferenced to USGS orthophotos. Using a database from Metroscan, parcel attributes, such as zoning and land use were determined for each parcel. The Sonoma County General Plan 1989 and the City of Sonoma General Plan 1995 were used to identify land uses in Sonoma Valley. Using several databases, approximately 500 wells in Sonoma Valley were mapped. Ground elevations were created from USGS "10-meter Digital Elevation Models (DEM)", for the entire Sonoma Valley. The elevations are based upon the National Geodetic Vertical Datum of 1929.

### 5.3.3 Recycled Water Demand Parameters

Demand curves created for the Feasibility Study are based upon several parameters including agricultural water use, urban water use, application rates, percent of acreage that is irrigated, and duration of irrigation. These factors are described below.

#### 5.3.3.1 Agricultural Water Use

To evaluate water demand for agricultural operations, several publications were reviewed for information on irrigation practices, evaporation, and evapotranspiration. These resources include DWR Bulletin 113-3 (DWR, 1975), DWR Bulletin 113-4 (DWR, 1986), and DWR California Irrigation Management Information System (CIMIS). In addition, local organizations, and background information were evaluated for information on irrigation practices in Sonoma County.

Bulletin 113-3 (Vegetative Water Use in California April 1975) and Bulletin 113-4 (Crop Water Use in California), were prepared by the Department of Water Resources in April 1975 and April 1986, respectively. These Bulletins separate California into zones of similar evaporative demand. Bulletin 113-3 indicates that Sonoma Valley is located in the North Coast Interior Valley Zone. Bulletin 114-3 provides data on evapotranspiration for principal crops in the North Coast Interior Valleys Zone.

CIMIS is an integrated network of over 100 computerized weather stations operated by DWR that are located in key agricultural and municipal sites throughout California. By measuring values for various factors, such as wind speed, air temperature, solar radiation, etc., the reference evapotranspiration can be calculated. CIMIS has 18 Reference Evapotranspiration Zones. Sonoma Valley is in Zone 5, Northern Inland Valleys (Valleys north of San Francisco).

The Sonoma County Grape Growers Association, the California Farm Bureau Federation, the University of California Cooperative Extension, and local vineyard operators were contacted for information. These groups provided information on agricultural practices in Sonoma County, and especially in Sonoma Valley. Long time residents of Sonoma Valley also provided information on agricultural practices pertaining to water demand, particularly for grapes.

#### 5.3.3.2 Urban Water Use

Commercial/Urban (Urban) users identified as potential recycled water users for the Feasibility Study are schools, golf courses, hotels, parks, homeowner associations, and athletic fields. Urban users were identified through water use records obtained from the VOMWD and the City. Potential recycled water demands are based upon water use records supplied by VOMWD and the City.

#### 5.3.3.3 Application Rate

In order to develop water demands from acreages calculated for each land uses, an application rate has to be applied to each acre. Application rates for land use in the Feasibility Study are based upon DWR Bulletin 113-3 (DWR, 1975) and information provided by local farmers in Sonoma Valley. The application rate for vineyards was verified by contacting local vineyard operators and agricultural groups. The application rate for other land uses in Sonoma Valley was compared to application rates in Bulletin 113-3. Application rates for vineyards, dairies, and pastures lands were confirmed by talking to farmers in Sonoma Valley.

#### 5.3.3.4 Percent of Acreage Irrigated

Land use data provided by Sonoma County and the Agency included acreage estimates for each land use. However, for many of the land uses, the entire area would not be irrigated. As a result, the total acreage irrigated for a particular parcel was scaled down to develop the usable fraction of land available for recycled water application. Using the approach developed in the North Bay Watershed Association Study (NBWA) in 2002 (NBWA, 2001), vineyard acreage was reduced by 20 percent, dairy by 50 percent, and pasture by 20 percent.

#### 5.3.3.5 Duration of Recycled Water Use

The application duration is based upon the irrigation season, which typically occurs from May through October. Currently, SVCSD can discharge to waters of the United States during the period of November through April. For the purpose of this Feasibility Study, the application duration period is assumed to be from May through October (6 months).

### 5.3.4 Estimated Demand Curves for Various Land Uses

The estimated demand for agricultural and urban water users was created from existing data and the methodology described in Section 5.3.3. Demand curves for agricultural crops (vineyards, pastures, dairies, etc.), were developed based on a study by the North Bay Watershed Association (NBWA 2002a) and Bulletin 113-3. The NBWA Study provided annual water uses for various crops (NBWA 2002a). Bulletin 113-3 provided monthly evapotranspiration numbers for similar crops in the North Coast Interior Valley Zone (DWR, 1975).

Urban water demands (i.e., hotels, schools, parks, homeowner associations, and athletic fields) are based on water use records, provided by VOMWD and the City. To determine the portion of potable water used for irrigation, the Agency estimated irrigation for urban users as the difference between summer usage (May through October) and winter usage (November through April). Because the water use records were provided in the form of monthly data, the demand pattern for urban use is simply the estimated irrigation use (summer minus winter usage) for a particular month divided by the number of days in the month. Based on the above information, an annual water use pattern for urban water users was created.

Overall demand curves (urban and agricultural) were developed for several project alternatives using this methodology. Appendix C includes tables showing: description of potential users, including type of use, expected annual recycled water use, and peak use for each pipeline alignment.

### 5.4 Development of Recycled Water Project Alignments

This section describes how potential recycled water projects were developed by describing: 1) the project components; 2) how pipeline alignments were identified; 3) details of each pipeline alignment; 4) the estimated recycled water demand for each alignment; and 5) an assessment of how much recycled water is available and whether additional storage beyond existing SVCSD storage is needed.

#### 5.4.1 Project Components

The major components of each potential recycled water alignments are: 1) pipelines; 2) pumping facilities; 3) service turnouts; 4) storage (if needed) beyond existing SVCSD storage facilities; and 5) satellite treatment facilities. Each of these components is described below.

**Pipelines**

This study assumes that pipelines will be constructed with Polyvinyl Chloride (PVC) pipe. The pipelines were designed to carry the daily peak flow for each alternative/weather scenario. The peak flow rate is based upon the cumulative demand from all users. The maximum velocities for the pipes are dependent upon pipe material and diameter. Preliminary analysis indicates PVC pipe sizes ranging from 4- to 14-inches in diameter.

**Pump Station**

The preliminary pump station design was based upon the 1998 Bay Area Regional Water Recycling Plan (BARWRP) study (CH2M HILL, 1998). The pump analysis was based upon total flow and head in the form of horsepower. This was done due to the numerous potential scenarios that are considered in this study. To simplify the analysis and because of the wide range of conditions, pump analyses are based upon using one pump station. It is assumed that the pump station for the recycled water distribution system will be located at the SVCSD treatment facility. Detailed design of specific pipeline alignments may indicate that multiple pump stations or a different configuration of pumping facilities is appropriate.

**Storage**

The amount of storage needed varies depending upon the alternative/weather scenario. This report identifies two types of storage: pressure-storage and capacity-storage. Storage needed to maintain pressure throughout the system is defined as pressure-storage in this Feasibility Study. It is assumed that existing storage ponds will provide pressure-storage. Capacity-storage is defined as storage needed to store water for later use (i.e., store winter water for summer use). Storage needs have been identified based upon the different alternative/weather scenarios. For most of the alternative/weather scenarios, additional capacity-storage is not needed beyond what currently exists. However, pressure-storage will be necessary to account for demand fluctuations in the distribution system.

**Service Turnouts**

Service turnouts consist of piping and associated equipment that connects the main pipelines to privately owned facilities such as storage ponds or irrigation piping. The turnouts are designed in the same manner as the main pipeline. Service turnouts will include valves, meters, and fittings necessary to control the flow of water to specific properties. Currently it is unknown which existing storage ponds will be a part of the project. As a result, the exact locations of the turnouts have not been identified. Table 2 provides information on existing pond surface areas, distance from the turnouts to the existing ponds, and the turnout's diameter.

**Satellite Treatment Facility**

NBWA conducted a feasibility study to determine the feasibility of locating a satellite treatment facility within the service area of several Agencies in the North Bay region, including the SVCSD (Appendix E, Satellite Treatment Study). The feasibility study consisted of two parts. The first part was to define satellite treatment, determine cost, and establish criteria when considering recycling as a water supply option. The second part was to apply cost assumptions and siting criteria to the study area.

The purpose of a Satellite Treatment Project is to analyze the feasibility of small, local water recycling facilities. These facilities can produce high quality recycled water near potential high-demand recycled water users. Potential users are typically located some distance from the wastewater treatment facility. A viable satellite treatment facility will provide an alternative water supply source and reduce the volume of wastewater discharge to the collection system.

Recent modeling efforts allowed the Agency to identify the locations of several potential recycled water users, as well as, several potential locations along the main sewer pipeline that have sufficient volume of wastewater for use at a satellite treatment facility. With this information, NBWA proceeded to look at the study area characteristics, applied market assessment methodology, and considered alternatives.

The study area characteristics consisted of a general hydrologic overview, land use and population trends, water supply, and wastewater disposal. The market assessment looked at the regulatory background in Sonoma Valley, water demand and costs, and potential locations for siting a satellite treatment facility. The alternatives that were analyzed were (1) no project; (2) supplying recycled water to VOMWD customers only (75.4 ac-ft) and; (3) supplying recycled water to major users in the area, including those currently using private wells (367.8 ac-ft).

Based upon the criteria described in Appendix F, results of the demand analysis for VOMWD customers only, show a satellite treatment facility with a capacity of 150,000 gallons per day (gpd) can meet the local demand (75.4 ac-ft). To supply all potential users in the area, a satellite treatment facility with a capacity of 720,000 gpd can meet the demand of the major users, including those currently using private wells. These plant capacities are compared to the cost of upgrading a centralized treatment facility (SVCSD WWTF) capacity of the same amount i.e. 150,000 gpd and 720,000 gpd.

Results of the NBWA analysis show that it is cost effective to install a satellite treatment facility with a capacity of 150,000 gpd. The results also show that it is cost effective to upgrade the treatment plant when considering a 720,000 gpd satellite treatment facility.

The satellite treatment study looked at a number of components when establishing its criteria. The criterion is design for many different situations throughout the North Bay region. As a result, the study did not take into account issues unique to Sonoma Valley. Issues not addressed in the satellite treatment study are storage, public & political opinions, and facility location.

The satellite treatment study assumes that recycled water would be served when needed. However, the satellite treatment facility will also need to treat winter flows, which will require storage for summer usage. Therefore, storage should be included as part of the analysis. The amount of storage needed for VOMWD local use only and major users in the area is assumed to be 150,000 gpd x 6 months (Nov through Apr) = 106 ac-ft and 511 ac-ft respectively. The cost of constructing a 106 ac-ft or 510 ac-ft reservoir is not included in the cost analysis. Also not apart of the study is public opinion.

The study acknowledges that only a few sites exist, near the main trunk line, that were suitable for a satellite treatment plant due to land availability and the high cost associated with land in Sonoma Valley. As a result, the most suitable location found is in a County park. Previous contact in Sonoma Valley, leads the Agency to believe that siting a satellite treatment plant in a park will be very complicated.

The Agency has concluded that the satellite treatment concept in Sonoma Valley is a good one. However, the lack of storage data and site information has made including the satellite treatment alternative, as a component of this project is not infeasible at this time. However, the Agency will review this alternative when future analysis contains information on storage and other potential siting locations.

### 5.4.2 Identification of Preliminary Alignments

Preliminary pipeline alignments were identified by considering the location of sites that utilize VOMWD or the City's water for large-scale irrigation and the location of large agricultural users that use a high volume of groundwater. In addition, the preliminary pipeline alignments were developed to minimize traffic impacts in addition to impacts to wildlife and their habitat.

Potential recycled water users were identified using the GIS database and water use records. Vineyards, dairies, pasture lands, and large urban users were identified from the database. Parcels ranging from a few acres to several thousand acres are documented. In addition, large urban water users (i.e., golf courses, parks, and schools) are documented. Water use records provided by the City and VOMWD identified urban water users (i.e., car washes, hotels, and industries) not identified in the GIS database. Water use records allowed the Agency to determine the amount of Russian River water that is used at various locations in the City and the VOMWD in the form of irrigation.

Preliminary pipeline alignments were drawn to serve as many agricultural users as possible while serving potential City or VOMWD water users in the northern portion of the Valley. As stated earlier, Sonoma Valley has numerous vineyards. Some vineyards are over 500 acres while others are considerably smaller. Plate 9 illustrates vineyards (in green) with the potential for recycled water use. Once preliminary pipelines were drawn, the impact to wildlife and their habitat was analyzed. An Environmental Constraints Analysis was prepared to identify any potentially significant environmental impacts associated with the proposed project components (Appendix D, Environmental Constrains Analysis).

Another factor that was used to identify the preliminary pipeline alignments was traffic impacts. It was determined that constructing pipelines within existing SVCSD easements would cause the least amount of impairment to traffic. In locations where SVCSD has no existing easements or right-of-way, public right-of ways (i.e., bike paths, streets, roads) were selected, if possible, for the pipeline alignments.

### 5.4.3 Description of Preliminary Alignments

The following text describes each pipeline alignments illustrated in Plate 9.

**Alignment 1A**

Pipeline Alignment 1A, approximately 6.2 miles in length, would begin at the existing SVCSD treatment facility, and extend southwest and then northwest through a vineyard to Arnold Drive. The alignment would continue north along Arnold Drive, ending at the intersection of Sperring Road and Arnold Drive. Secondary pipelines would extend from the main pipeline alignment. The first secondary pipeline would begin at the intersection of Arnold Drive and Stage Gulch Road/Hwy 116, and would continue west along Stage Gulch Road/Hwy 116, ending between Bonness Road and Donnell Road. The second secondary pipeline would begin at the intersection of Watmaugh Road and Arnold Drive, and would continue east along Watmaugh Road, ending before the intersection of Watmaugh Road and Catalina Road. The third secondary pipeline would begin at the intersection of Arnold Drive and Leveroni Road, and would continue east along Leveroni Road, ending at the intersection of Leveroni Road and Harris Road.

**Alignment 1B**

Pipeline Alignment 1B, an extension of Pipeline Alignment 1A, is approximately 5.4 miles in length. This alignment would begin at the intersection of Arnold Drive and Sperring Road. The pipeline would continue north on Arnold Drive to Orange Avenue, and then continue north on Orange Avenue to Elm Avenue. The alignment would then continue east on Elm Avenue crossing a field to Arnold Drive, and then continue north on Arnold Drive, ending at Hanna Boys Center. Secondary pipelines would extend from the main pipeline. The first secondary pipeline would begin on Arnold Drive, south of Fowler Creek Road continuing through a field to the east, and ending before Dowdall Creek. The second secondary pipeline would begin at the intersection of Fowler Creek Road and Arnold Drive, and continue west along Fowler Creek Road, ending before Westerberke Ranch Road. The third secondary pipeline would begin at the intersection of Orange Avenue and Grove Street, and continue west along Grove Street, ending west of Najm Lane. The fourth secondary pipeline would begin at the intersection of Orange Avenue and Elm, and would continue north along Orange Avenue. The secondary pipeline would then continue west on Craig Avenue and then continue north on Carriger Road, ending south of the Sonoma Mission Inn Golf and Country Club.

**Alignment 2**

Pipeline Alignment 2, approximately 5.7 miles in length, would begin at the existing SVCSD treatment facility, and extend along the SVCSD existing easement that borders the east side of Broadway/Highway 12 to Spect Road. The alignment would then continue west along Specht Road, north along Broadway, west along Napa Street, and then continue north along 1st Street West, ending at the intersection of 1st Street West and the existing bike path. Secondary pipelines would extend from the main pipeline. The first secondary pipeline would extend from the main pipeline along the SVCSD easement at San Luis Road. The secondary pipeline would continue west along San Luis Road, ending at the intersection of San Luis Road and Broadway/Highway 12. The second secondary pipeline would extend from the main pipeline along the SVCSD easement at Watmaugh Road. The secondary pipeline would continue east along Watmaugh Road East, ending at the intersection of Watmaugh Road East and 5th Street

East. The third secondary pipeline would begin at the intersection of Specht Road and Broadway/Highway 12, and would continue south on Broadway/Highway 12, ending on Broadway north of Smith Lane. The fourth secondary pipeline would begin at the intersection of Broadway/Highway 12 and Leveroni Road. This secondary pipeline would continue west on Leveroni Road, ending at the intersection of Leveroni Road and Palmer Avenue. The fifth secondary pipeline would begin at the intersection of 1st Street West and the existing bike path, continue east along the existing bike path, and end on the bike path west of Nathanson Creek. The sixth secondary pipeline would begin at the intersection of 1st Street West and the existing bike path. The secondary pipeline would continue west along the existing bike path, west through Sonoma State Historic Park, then west along the existing bike path, ending at the intersection of the bike path and 5th Street West.

**Alignment 3**

Pipeline Alignment 3, approximately 5.1 miles in length, would begin at the existing SVCSD treatment facility, and extend north along 8th Street East to the intersection of 8th Street East and Schellville Road. The alignment would then continue east through private property to Peter Road, then continue north through private property along Arroyo Seco. The alignment would then continue north along Hyde Road, and then east along Napa Road, ending east of Davitto Road. Secondary pipeline extensions would extend from the main pipeline. The first secondary pipeline would begin at the intersection of Hyde Road and Napa Road, and would continue west along Napa Road, ending at the intersection of Napa Road and Orlandi Lane. The second secondary pipeline would begin at the intersection of Napa Road and Denmark Street and would continue northwest and then west along Denmark Street to the intersection of Denmark Street and 8th Street East. The secondary pipeline would then continue south along the abandoned railroad tracks that border 8th Street East, and end along the abandoned railroad tracks north of Napa Road.

### 5.4.4 Estimated Recycled Water Demand for Alignments

Many City and VOMWD water users are located in the north and northwest area of Sonoma Valley. Agriculture water users are located mainly in the south and southeast area of Sonoma Valley. The estimated demand for each pipeline alignment, both segment and accumulative demand are illustrated in Tables 3, 4, 5, and 6. The following text describes how demand curves were calculated; the water efficiency analysis for VOMWD and the City; and a summary of recycled water demand for each alignment.

#### 5.4.4.1 Procedure for Calculating Demand Curves

Estimated demand curves for agricultural and urban users were created from existing data and the assumptions and parameters described in Section 5.3.3. Demand curves for agricultural crops (i.e., vineyards, pastures, dairies, etc.) were developed from information provided by NBWA (NBWA, 2001) and DWR Bulletin 113-3 (DWR, 1975). The NBWA study provided the annual water uses for various crops. DWR Bulletin 113-3 provided monthly evapotranspiration numbers for crops in the North Coast Interior Valley. The monthly numbers were divided by the number of days in the respective month to obtain a daily evapotranspiration rate (i.e., a monthly pattern). The monthly patterns were placed together to form an annual evapotranspiration pattern for the different crops.

Urban water usage (i.e., hotels, schools, parks, homeowner associations, and athletic fields) was based upon water use records provided by VOMWD and the City. To determine the portion of potable water that is used for irrigation, the estimated irrigation demand for urban users is assumed to be the difference between summer (May through October) and winter usages (November through April). Because the water use records were provided in the form of monthly data, the demand pattern for urban use is simply the estimated irrigation use (summer usage minus winter usage) for a particular month divided by the number of days in the month.

#### 5.4.4.2 Recycled Water Efficiency Analysis

A water-use efficiency analysis was conducted to ensure that the potential pipeline alignments maximize the offset of City and VOMWD water. Alignment 1B offsets represent those uses associated with the VOMWD. Alignment 2 offsets represent those associated with the City's usage. Alignments 1A and 3 do not include direct offset of City or VOMWD water. Tables 7 and 8 illustrate the recycled water efficiency analysis of VOMWD and the City's water usage.

VOMWD staff identified water users that would likely have large-scale irrigation use that could potentially be offset by recycled water. These large water users account for approximately 149 AFY of water usage. Large water user's total usage (148.8 AFY) is separated into winter (35.4 AFY) and summer (113.4 AFY) usage. The difference between summer and winter usage is assumed to be the amount of water used for irrigation (77.9 AFY). Based upon Table 4, the amount of VOMWD water that could be offset by the use of recycled water is 59.6 AFY.

As shown in Table 7, the Alignment 1B offset is about 76 percent of large-scale irrigation use (59.6 AFY divided by 77.9 AFY). The relatively low overall offset (2 percent) of VOMWD water, suggests that VOMWD primarily services residential users distributed over a large area rather than centralized large-scale irrigators.

The Sonoma Mission Inn Golf Course uses an estimated 266 acre-feet of groundwater per year. If this usage (266 ac-ft) could be replaced or supplemented with recycled water, the groundwater, which is offset, could be used to supplement potable waters.

Table 8 illustrates large water users in the City's service area. Large water users were assumed to be those using more than 700,000 gallons or water per year. The total usage of the large water users within the City's service area is approximately 245.3 AFY. Large water user's totals are separated between winter (48.4 AFY) and summer (196.9 AFY) usage. The difference between summer and winter usage is assumed to be the amount of water used for irrigation (148.5 AFY).

Table 8 also illustrates that 86.5 acre-feet of recycled water has been identified as a replacement source for City supplied water.

The total ratio of "recycled water use under Alignment 2" versus "large water user's irrigation demand" is 58 percent (86.5 AFY divided by 148.5 AFY). This demonstrates that Alignment 2 has identified approximately 60 percent of the irrigation water usage, supplied by the City could be replaced by recycled water. Several parks within the City are not included under Alignment 2 due to their scattered locations; distances to the main recycled water pipeline; and their individual usage being relatively small. Servicing these parks is not feasible given the construction cost to service these areas.

#### 5.4.4.3 Recycled Water Demand Summary

Recycled water demand for Alignment 1A is 100 percent agricultural use; and Alignment 1B demand is 92 percent agricultural use and 8 percent urban/commercial use. Overall, Alignment 1 (combined 1A & 1B) demand is approximately 97 percent agricultural use and 3 percent urban/commercial use; Alignment 2 demand is approximately 80 percent agricultural use and 20 percent urban/commercial use; and Alignment 3 demand is 100 percent agricultural use (Table 9).

### 5.4.5 Analysis of Recycled Water Availability

The determination of when recycled water is available is based upon the water balance model (Section 5.2.2) and the typical monthly inflows (Section 5.2.1). The typical monthly inflows were placed into the water balance model to produce typical monthly effluent patterns. As mentioned in Section 5.2.1, these typical effluent patterns are based upon the 1:5 year rainfall event for dry, normal, and wet years. These effluent patterns show when recycled water would be available.

Effluent patterns, estimated demand (Section 5.4.4), and pipeline alignments (Section 5.4.3) were used to develop a hydraulic model (Haestads WaterCAD model Version 5.0). The WaterCAD model was utilized to determine how recycled water could be apportioned among the existing SVCSD recycled water users, this project, and the potential Napa River Salt Marsh Restoration Project. For this evaluation, existing SVCSD recycled water users are assumed to have the first priority to recycled water during the summer irrigation months. It was assumed that recycled water for this project would be supplied by: 1) remaining summer water not utilized by existing recycled water users; and 2) stored winter water.

Sixteen supply and demand charts were created from the four different alignments and four different weather scenarios. Each plate illustrates a supply (SVCSD effluent), an existing demand (existing recycled water users), a project demand (potential recycled water users for this project), and a demand for the Napa River Salt Marsh Restoration Project. In addition , each chart displays the supply of recycled water, the existing demand for recycled water, the estimated demand for potential recycled water users, and the surplus of recycled water for the spring (January through April), summer (May through October), and winter (November through December) periods. Appendix D illustrates the sixteen different supply and demand charts.

### 5.4.6 Storage Requirements

The supply and demand charts (Appendix D, Plates D1 – D16), along with existing storage, allowed Agency staff to analyze storage requirements for each of the sixteen different supply and demand curves. Storage requirements for the different alignments are based upon the operational procedures of the SVCSD treatment facility. Section 6.5 of this report describes the assumptions made in determining the operational procedures.

**Alignment 1A**

Additional capacity storage is not required for the weather scenarios, existing average annual inflow, buildout low annual inflow, and buildout average annual inflow. Plate D1 illustrates that during the summer period, the SVCSD treatment facility can supply 1529 acre-feet while demand is 2,267 acre-feet. This leads to a deficit of 738 acre-feet of water. Subtracting existing storage (675 acre-feet) leaves a shortage of approximately 62 acre-feet of recycled water, which is considered within the level of uncertainty for this feasibility analysis. As a result, Alignment 1A does not appear to require additional capacity storage. A more detailed analysis of storage requirements for Alignment 1A will occur during the project design phase.

**Alignment 1B**

The comparison of the supply and demand charts for all of the weather scenarios (existing low and average annual inflows and buildout low and average annual inflows) for Alignment 1B are illustrated in Appendix D, Plates D5 through D8. Alignment 1B worst-case scenario is the existing low annual inflow (Appendix D, Plate D5). Between May and October Alignment 1B requires approximately 1,500 acre-feet of capacity storage. Subtracting the existing and equalization storage, 675-acre-feet, from the 1,500 acre-feet leaves 825 acre-feet of additional storage required for this worst-case scenario. This volume could be reduced somewhat if existing ponds were to store recycle water rather than groundwater. Seven potential storage sites have been identified (Plate 10).

In addition to capacity-storage, booster pump stations will be needed. The booster pump station(s) would likely be located adjacent to the storage site(s). These pumps are needed due to the difference in elevation between the storage location and the end user(s). Information regarding the booster pumps stations, (i.e., size, capacity, etc) will be provided when a more detailed analysis of the system is performed. Agency staff is currently talking to property owners to gage their interest in using recycled water as well as using their property as potential storage sites for Alignment 1B.

**Alignment 2**

No weather scenarios for Alignment 2 require additional capacity storage. Between May and October, the storage needed is less than storage available (Appendix D, Plates D9 through D12).

**Alignment 3**

No weather scenarios for Alignment 3 require additional capacity storage. As in Alignment 2, the storage needed is less than storage available (Appendix D, Plates D13 through D16).

## 5.5 Factors for Estimating Project Costs

Preliminary costs are based upon the 1998 BARWRP Study, "Cost Criteria for Development of Alternatives." The BARWRP study separates total cost into capital and non-capital (operations and maintenance) costs (CH2M HILL, 1998). Preliminary cost estimates, for each alignment, are shown in Tables 10, 11, 12, and 13. The following text describes the data used to calculate the Capital and Operations and Maintenance (O&M) costs.

### 5.5.1 Estimated Capital Costs

Capital costs include the cost for construction, engineering, planning, administration, and contingencies related to building recycling treatment facilities. The engineering, planning, administration, and contingency cost are estimated to be 60 percent of the construction costs (CH2M HILL, 1998). The capital cost for this Feasibility Study includes pipeline, pump station(s), appurtenant facilities, and internal facilities.

#### 5.5.1.1 Pipeline

Pipeline costs are based upon land use, pipe diameter, and length of pipe. Land use surrounding construction corridors have a significant impact on installation costs. Pipeline construction in open country has little or no utility interference or traffic controls requirements, whereas construction in urban areas can be complicated significantly by these conditions (CH2M HILL, 1998). Pipe diameters are based upon maximum flow and velocity in the pipe. A minimum pressure of approximately 20 pound per square inch and minimum velocity of two feet per second are used as design parameters. The BARWRP study provided costs for 6-inch through 24-inch diameter pipes in 6-inch increments. In this Feasibility Study, the smallest pipe size is a diameter of 2-inches. Costs per pipe diameter for pipes smaller than 6-inches are extrapolated. In addition, costs for pipe sizes between 6-inch and 24-inch, not included in the BARWRP study, are interpolated. Pipe lengths can be seen in Tables 10, 11, 12, and 13.

#### 5.5.1.2 Pump Station

While some sources consulted established pump station cost curves based on total flow only, others considered both total flow and total head in the form of horsepower. For the purpose of this Feasibility Study, consideration of horsepower was deemed appropriate given the wide range of possible scenarios for which the model is estimating pumping costs (CH2M HILL, 1998).

Pump station cost were based on the pipe length, pipe diameter, flow, velocity, and change in elevation factors. These factors were used to determine the peak break horsepower required for each alignment. As mentioned above, the estimated costs assume that there will be one pump station per alignment and that it would be located at the treatment facility.

#### 5.5.1.3 Existing Storage

As mentioned in Section 5.4.6, Alignments 1A, 2, and 3 do not require additional capacity storage; rather, they require pressure-storage. Only Alignment 1B requires additional capacity storage. Section 5.2.4 noted that over 400 existing storage ponds have been identified within Sonoma Valley. Existing storage ponds within each Alignment's boundaries have also been identified (Table 2). The estimated cost associated with utilizing these ponds is the cost of transporting water to and from the pond (service lateral construction) and the pumping systems. The estimated cost does not include the cost of on-site irrigation distribution systems.

Some existing storage ponds may need booster pump stations in order to supply water to users that are located in the hills away from the main pipeline. The design cost associated with pipeline to storage ponds is the same design cost applied to the service turnouts.

#### 5.5.1.4 Potential Storage Sites

As described in Section 5.4.6, Alignment 1B needs approximately 825 acre-feet of additional capacity-storage. Seven potential storage sites have been identified (See Plate 10). Storage Sites 1-4 are potential reservoirs sites, sites 5 and 6 are existing abandoned tanks, and site 7 is a potential pressure-storage site. Storage Site 1 is located north of Stage Gulch Road, and west of the County Refuge Transfer Station. Storage Sites 2 and 3 are located north of Ramal Road, east of Lawler Road and west of Poehlman Road. Storage Site 4 is located north of Ramal Road, west of the Sonoma/Napa County line, east of Poehlman Road, and south of Hwy 121/12. Storage Sites 5 and 6 are two tanks abandoned by the City of Sonoma. The abandoned tanks are located on the north side of the City of Sonoma. The tanks have capacities of 0.2 MG and 0.42 MG for T1 and T2, respectively. These tanks are not large enough to provide capacity-storage, but are large enough to provide pressure-storage to the system. Currently, these tanks could provide pressure-storage for Alignment 2. However, it is possible that they could be used to supply pressure to Alignments 1A, 1B, and 3 as well. Site 7 is located on 8$^{th}$ Street East, just north of the SVCSD treatment facility. Site 7 would be used as operational storage.

The unit cost for storage at site 7 is based upon the cost for constructing similar storage facilities recently constructed by the Agency. Based on these projects, the estimated capacity-storage cost for Site 7 is approximately $17,000 per acre-foot.

The unit cost for storage for Alignment 1B is also based upon the necessary capacity and the cost for constructing similar storage facilities recently constructed by the Agency. Based on these projects, the estimated capacity-storage cost for Alignment 1B is approximately $17,000 per acre-foot.

#### 5.5.1.5 Service Turnouts

As mentioned in Section 5.4.1, service turnouts consist of piping and associated equipment that connects the main pipelines to privately owned facilities such as storage ponds or irrigation piping (Table 2). The service turnouts are designed in the same manner as the main pipeline. Service turnouts will also be comprised of the valves, meters, and fittings necessary to control the flow of water to specific properties.

#### 5.5.1.6 Internal facilities

Although the proposed project includes the cost to construct pipelines from the main distribution line to existing storage ponds, it does not include the cost for internal capital improvements (i.e., either converting or constructing new facilities for irrigation on potential user's property). The internal capital cost at the feasibility stage is difficult to quantify. The current agricultural practice of constructing new facilities (irrigation structures) or converting existing facilities for recycled water use is unknown at this time. For the purpose of this study, a distance from the main distribution line to the centroid of every parcel was calculated. The distances per alignment and a total cost were calculated. A pipe diameter of 6-inches and a unit cost of 56.00 $/ft, from 1998 BARWARP Study, was assumed for the pipeline from the main distribution line to the centriod of every parcel. The estimated total internal capital cost for Alignment 1A, 1B, 2, and 3 are $3.2, $1.3, $1.5, and $1.1 million respectively.

### 5.5.2 Operations and Maintenance Costs (Non-Capital Cost)

Non-Capital costs include operations and maintenance (O&M) for pipelines and pump stations. Preliminary non-capital costs are based upon 1998 BARWRP study. The annual O&M costs were converted to a present worth value and then added to the capital costs to derive a total present worth cost for each project alternative (CH2M HILL, 1998).

The O&M cost for pipelines includes the annual inspection and maintenance of the pipeline. The present worth of the annual O&M costs was calculated by multiplying the estimated annual cost by the present worth factor of 10.39 (CH2M HILL, 1998). Pump station O&M includes costs for labor, equipment replacement, and electrical power usage. Annual expenditures for labor and equipment replacement are based upon the initial construction cost of the pump station.

### 5.5.3 Total of Capital and Non-Capital Cost Factors

The cost summary for Alignments (without additional storage) includes onsite piping to private ponds. The onsite piping cost represents; constructing service turnouts from the main pipeline to privately owned ponds within each alignment. Tables 10 - 13 illustrate cost summaries for each alignment. Alignment 1A has the best dollar per acre-foot value of all of the alignments, followed by Alignments 2 and 3. Alignment 1B has the highest cost per acre-foot because of the need to construct additional storage. The cost of each alignment varies, depending upon the number of users and proximity of the user to the treatment facility, and to the main pipeline.

**Alignment 1A Total Capital Cost (Pipeline and Pump Station)**

As described in Section 5.4.3, the potential alignment for Alignment 1A is on the west side of Sonoma Valley. The estimated total cost of Alignment 1A is $5.82 million. Alignment 1A includes the use of approximately 1,100 acre-feet of recycled water. Table 10 presents a breakdown of the total estimated cost per pipeline segment. The breakdown includes pipeline, pump station, storage, and O&M costs. The first segment of Alignment 1A includes the cost of a main pump station at the treatment facility. Table 10 also presents the estimated cost of constructing service turnouts to existing ponds located within the service area of Alignment 1A.

**Alignment 1B Total Capital Cost**

The total estimated cost for Alignment 1B is $18.2 million. Alignment 1B includes the use of approximately 750 acre-feet of recycled water. Table 11 presents a breakdown of the total estimated cost per pipeline segment. The breakdown includes pipeline, pump station, and O&M costs. The cost associated with construction of a main pump station at the treatment facility is not included in Alignment 1B's total cost. This main pump station cost is accounted for in Alignment 1A. Table 11 also presents the estimated cost of constructing service turnouts to existing ponds located within service area of Alignment 1B.

Due to additional capacity storage needed for Alignment 1B, the cost per acre-foot of recycled water is increased by approximately 600 percent. Alignment 1B has the highest cost per acre-foot of water of all the alternatives. It is estimated that the additional storage cost for Alignment 1B is approximately $14 million while the pipeline cost is approximately $1.2 million.

**Alignment 2 Total Capital Cost (Pipeline and Pump)**

The total estimated cost for Alignment 2 is $4.2 million. Alignment 2 includes the use of approximately 440 acre-feet of recycled water. The cost per acre-foot of recycled water is small compared to the other pipeline alignments. Table 12 presents a breakdown of the total estimated cost per pipeline segment. The breakdown includes pipeline, pump station, storage, and O&M costs. The first segment of pipe in Table 12 includes the construction cost of a main pump station at the treatment facility. Table 12 also presents the estimated cost of constructing service turnouts to existing ponds located within the service area of Alignment 2.

**Alignment 3 Total Capital Cost (Pipeline and Pump)**

The total estimated cost for Alignment 3 is $4.8 million. Alignment 3 includes the use of approximately 465 acre-feet of recycled water. Table 13 presents a breakdown of the total estimated cost per pipeline segment. The breakdown includes pipeline, storage, and O&M costs. The first segment of pipe in Table 13 includes the construction cost of a main pump station at the treatment facility. Table 13 also presents the estimated cost of constructing service turnouts to existing ponds located within the service area of Alignment 3.

## 6.0 EVALUATION OF PROJECT ALIGNMENTS

This section evaluates the project alignments, identified in Section 5.4, with the following criteria: 1) technical and engineering requirements; 2) constructability; 3) compliance with regulatory requirements; 4) environmental constraints; 5) operational issues; 6) and cost.

### 6.1 Achieve Technical and Engineering Requirements

The feasibility of achieving the technical and engineering requirements of the designs is based upon the following factors: completion of treatment facility improvements and technical feasibility of the system.

#### 6.1.1 SVCSD Treatment Facility Improvement

As stated earlier, the SVCSD treatment facility is scheduled to complete its advanced wastewater treatment upgrades in the next two to three years. When the upgrades are completed, the treatment facility will begin producing tertiary treated water. This will allow many more uses of the recycled water (Appendix B, Title 22 Recycled Water Treatment and Uses). The treatment facility upgrades will benefit all alignments by providing a higher quality of recycled water.

### 6.1.2 Transmission System

Engineering requirements for the distribution system for each alignment will vary. Although, the distribution systems for all of the alignments are considered technically feasible, the engineering requirements for Alignment 1B are much greater than those of Alignments 1A, 2, and 3.

**Alignment 1A**

Alignment 1A is the simplest of all of the alignments. The difference in head required between the treatment facility and the end users is slight and the proximity of the end user to the treatment facility is small. The segment of Alignment 1A, between the treatment facility and Arnold Drive, follows an existing easement the SVCSD already owns. The remaining portion of Alignment 1A pipeline would be constructed in public right-of-ways. These factors would aid in the design of the pipeline. Short-term construction impacts would be encountered in residential areas. These impacts may include traffic, noise, air, and biological. As described in Appendix E, Environmental Constraints Analysis, these impacts would be addressed through mitigation measures.

**Alignment 1B**

Alignment 1B connects to Alignment 1A at pipeline node 25 (Plate 9). Although Alignment 1B would be much larger than Alignment 1A, the engineering requirements are similar. The Alignment 1A pump station would also provide recycled water for Alignment 1B.

Typical pipeline construction methods would be applied to Alignment 1B. Construction of the pipeline for Alignment 1B would take place in public right of ways. Short-term construction impacts would be encountered in residential areas. Impacts may include traffic, noise, air, and biological. Significant impacts would be addressed through mitigation measures (Appendix F, Environmental Constraints Analysis).

Other engineering requirements for Alignment 1B will include booster pump stations. Additional booster pump stations will be needed to distribute recycled water to end users who are located at higher elevations. These additional pump stations would be located adjacent to the capacity-storage ponds (Section 5.4.6). As a result, further engineering analyses would be needed.

**Alignment 2**

Alignment 2 would follow existing right-of-ways owned by the SVCSD. The system would also be constructed in public right-of-ways as well as on the City's property. As with Alignment 1A and 1B, typical pipeline construction methods would be used. Alignment 2 would go directly through the downtown area of the City of Sonoma. Short-term construction impacts would be encountered in the downtown area, as well as, residential areas. These impacts may include traffic, noise, air, and biological. Significant impacts would be addressed through mitigation measures (Appendix F, Environmental Constraints Analysis).

**Alignment 3**

Alignment 3 would follow existing right-of-ways the SVCSD owns, public right-of-way, and private land. Between pipeline nodes 2 and 11, Alignment 3 is on private property. In addition, the pipeline will be adjacent to Arroyo Seco. As with the previous alignments, typical pipeline construction will be used to install the pipeline adjacent to the creek. Short-term construction impacts will be encountered in residential areas. These impacts may include traffic, noise, air, and biological. Significant impacts will be addressed through mitigation measures (Appendix F, Environmental Constraints Analysis).

## 6.2 Constructability of Project Alignments

Construction of all alignments would involve standard construction methods and practices. The feasibility of constructing the different configurations are based upon potential user locations, easements, public right-of-ways, and wildlife habitat. Construction activities have the potential for causing impacts to cultural resources; traffic/transportation, public services, utilities; short-term noise, air quality, aesthetics, and recreation. Additional potential temporary environmental impacts may occur for geology, land use, hydrology/water quality, hazardous materials, mineral resources, and agriculture resources. Please refer to Appendix F (Environmental Constraints Analysis) for discussion of potential significant impacts for all proposed project components.

All of the proposed project alignments would also require installing a pipeline across several creeks and require work in or near seasonal drainages. These areas are potential wetlands or other waters of the U.S and may provide potential habitat for several listed species (Appendix F, Environmental Constraints Analysis) that could be impacted by pipeline construction. Depending upon the biological resource affected (i.e., presence of listed special status species), additional wildlife and plant surveys may be required. Depending upon the pipeline location, construction methods would be considered that reduce impacts. Where applicable, mitigation measures would be implemented to reduce impacts to be less-than-significant.

As mentioned in Section 5.4.1, the purpose of a satellite treatment facility is to produce high quality recycled water near potential high-demand recycled water users. NBWA conducted a study on satellite treatment facilities in the North Bay (Appendix E, Satellite Treatment Study). The objective of the Study was to look at the possibility of employing satellite treatment plants for recycled water use at multiple locations. The study includes alternatives development and analysis, preliminary cost estimates, as well as a general analysis of aesthetic, treatment, energy efficiency and distribution options for placing satellite treatment plants. Results of the study suggest the northern section of Sonoma Valley has some limited potential for recycled water use. However, based upon results of the Study and Agency's staff feels construction of a satellite treatment facility is not cost effective at this time.

### 6.3 Compliance with Regulatory Requirements

Compliance with the regulatory requirements for potential users of recycled water will be based upon the regulatory requirements of a number of state and local agencies. DHS developed the governing regulations, which are contained in Title 22 of the California Code of Regulations (CCR). A water reclamation permit for the SVCSD issued by the RWQCB would be necessary.

The required wastewater treatment processes and effluent quality criteria developed by DHS for water recycling are contained in the California Code of Regulations, Title 22. Title 22 defines types of recycled water based on treatment process, effluent turbidity, and effluent coliform bacteria level. The recycled water produced at the SVCSD meets the DHS requirement for restricted use recycled water. According to Title 22, recycled water appropriate for restricted use applications shall at all time is adequately oxidized and disinfected.

As described below, all potential project alignments, including the satellite treatment facility, identified in this Feasibility Study would comply with applicable regulatory requirements.

#### 6.3.1 Regulations

It is assumed that the SVCSD will continue to update its treatment process to stay current with current regulatory requirements. As previously mentioned, this study assumes the treated effluent from the SVCSD and satellite treatment facilities will be at the tertiary level.

#### 6.3.2 Water Reclamation Requirements

Permits issued by the RWQCB will be issued to SVCSD or to the end user. If the SVCSD is issued a master recycled water permit, then they will be responsible for monitoring the end user. Recycled water use permits can also be issued to the end user. In this case, the end users are responsible for monitoring.

### 6.4 Environmental Constraints Analysis

None of the proposed project components appears to have significant environmental constraints that preclude construction of proposed project components. For each proposed project component potential significant environmental impacts may occur for traffic/transportation, noise, air quality, geology, land use, aesthetic, cultural resources, biological resources, hydrology/water quality, recreation, hazards and hazardous materials, mineral resources, public services, utilities, and agriculture resources (Appendix F, Environmental Constraints Analysis). Depending upon the pipeline location, construction methods would be considered that reduce impacts, and where applicable, mitigation measures would be implemented to reduce impacts to less-than-significant. There is a potential for the proposed project components to change prior to initiation of site-specific environmental documentation. If changes occur, proposed project components would be evaluated in detail for potential significant impacts in future site-specific environmental documentation.

Based on the Environmental Constraint Analysis, it is anticipated that a project-level Environmental Impact Report (EIR) would be prepared in compliance with the California Environmental Quality Act (CEQA). Depending upon opportunities that may be available for project funding or required permitting, an appropriate site-specific environmental document in compliance with the National Environmental Policy Act (NEPA) may also be required.

## 6.5 Operational Issues

The proposed operational procedure for the SVCSD treatment facility recycled water distribution system, for the proposed Alignments 1A, 2, and 3 are as follows:

**Spring Period**

The WWTF will fill the existing reclamation reservoirs, R1, R2, R3, R4, and the proposed Hensley reservoir (used for operational storage only) during the Spring Period. Once the reservoirs are filled, surplus effluent will be discharged to either Shell Slough (WWTF normal discharge location for this period) or to the Napa-Sonoma Salt Ponds (if constructed).

**Summer Period**

The source of recycled water for the Project's potential recycled water users is the WWTF. The source of recycled water for existing recycled water users will also be WWTF recycled water not used to supply the Project's potential recycled water users. In the event, the existing recycled water users' demand is greater than the supply from the WWTF, then additional recycled water will be supplied from the existing reclamation reservoirs.

Surplus supply of recycled water, i.e. when supply of recycled water is greater than the demand for recycled water (from both existing and Project users), will be used to fill the existing reclamation reservoirs and, if surplus supply exceeds the existing reservoirs total volume, the remaining surplus supply can be discharged to Napa-Sonoma Salt Ponds (if constructed).

**Winter Period**

All surplus water (WWTF discharge and existing reservoir storage) will be discharged to either Shell Slough (WWTF normal location for winter discharge) or to the Napa-Sonoma Salt Ponds (if constructed).

The proposed operational procedure for the SVCSD treatment facility recycled water distribution system, for the proposed Alignment 1B is as follows:

**Spring Period**

The WWTF will fill the existing reclamation reservoirs; R1, R2, R3, R4, and the proposed Hensley reservoir (used for operational storage only) during the Spring Period. The WWTF will also fill additional reservoirs constructed for the Project (Project-reservoirs) during the Spring Period. Once the existing and Project reservoirs are filled, surplus water will be discharged to either Shell Slough (WWTF normal discharge location for this period) or to the Napa-Sonoma Salt Ponds (if constructed).

**Summer Period**

The source of recycled water for the Project's potential recycled water users is the WWTF and the Project-reservoirs. The source of recycled water for existing recycled water users will also be WWTF. If the existing recycled water users' demand is greater than the supply from the WWTF, then additional recycled water will be supplied from the existing reclamation reservoirs.

**Winter Period**

All surplus water (WWTF discharge and existing reservoir storage) will be discharged to either Shell Slough (WWTF normal discharge location for this period) or to the Napa-Sonoma Salt Ponds (if constructed).

**Collection System**

The SVCSD collection system experiences high infiltration/inflow (I/I) during the winter months. Currently, the treatment facility can treat 16 MGD, but has experienced storm related flows over 30 MGD. The SVCSD has embarked on an extensive capital replacement program to repair the portions of the transmission system that experience the highest I/I.

**Storage**

The remaining operational issue is storage. Sonoma Valley is known for the quality of wine grapes grown in the region. As a result, land cost is very high. Finding locations to place additional storage will be difficult. Most of the alignments do not need additional capacity-storage. However, Alignment 1B would need up to 825 acre-feet of storage. Agency's staff is currently talking to prospective landowners regarding the potential of having a storage pond on their property.

## 6.6 Total Project Cost

Comparing the costs of each of the alignment configurations involves analyzing the technical and engineering requirements, environmental concerns, operational requirements, compliance requirement, constructability, and operational issues. Table 14 summarizes the capital and O&M cost for each alignment. In addition, Tables 10, 11, 12, and 13 provide detailed cost breakdown for each alignment.

**Alignment 1A**

As described in Section 5.4.3, the potential configuration for Alignment 1A is on the west side of Sonoma Valley. The estimated total cost of Alignment 1A is $5.8 million (Table 14). The annual unit cost per acre-foot of recycled water is approximately $350 and $90 per acre-foot per year for capital and O&M costs, respectively. Alignment 1A allows the use of approximately eleven hundred acre-feet per year of recycled water, which will serve agricultural users entirely.

**Alignment 1B**

As described in Section 5.4.3, the potential configuration for Alignment 1B also lies on the west side of Sonoma Valley. The estimated total cost of Alignment 1B is $18.2 million (Table 14). As stated earlier, Alignment 1B requires up to 825 acre-feet of storage. As such, the annual unit cost of recycled water is approximately $1,600 and $130 per year for capital and O&M costs, respectively. Alignment 1B allows the use of approximately 750 acre-feet of recycled water, of which 92 percent will serve agricultural users and 8 percent will offset VOMWD potable water usage.

Overall, Alignment 1 has a total estimated cost of approximately $24.1 million, of which $15.0 million is need for storage, $9.1 million for pipeline cost, and $200,000 for O&M. The annual unit cost per acre-foot of recycled water for Alignment1is $870 and $230 per year for capital and O&M costs, respectively.

**Alignment 2**

As described in Section 5.4.3, the potential configuration for Alignment 2 lies in the middle of Sonoma Valley and runs through the City. The estimated total cost of Alignment 2 is approximately $4.2 million (Table 14). The annual unit cost per acre-foot of recycled water is approximately $640 and $140 per year for capital and O&M costs, respectively. Alignment 2 will allow the use of approximately 440 acre-feet of recycled water, of which 80 percent will serve agricultural users and 20 percent will offset potable water usage within the City.

**Alignment 3**

As described in Section 5.4.3, the potential configuration for Alignment 3 lies on the east side of the Valley. The estimated total cost of Alignment 3 is approximately $4.8 million (Table 14). The annual unit cost per acre-foot of recycled water is approximately $690 and $150 per year for capital and O&M costs, respectively. Alignment 3 will use approximately 460 acre-feet of recycled water, of which 100 percent will serve agricultural users.

## 6.7 Engineering Project Alignments Evaluation

This section summarizes each of the project alignments relative to the evaluation criteria described in Sections 6.1 through 6.6.

### Alignment 1A

- This alignment would provide approximately 1,100 AFY of recycled water to agricultural users. Alignment 1A provides for the disposal of the most recycle water of any alignment.
- The major potential benefits of this alignment would be to: 1) offset agricultural groundwater pumping thus allowing for municipal or environmental uses of this water, and 2) reduce discharges from SVCSD to San Pablo Bay.
- This alignment is technically feasible, does not have any known engineering constraints, and could be constructed with conventional methods. 65 ac-ft of storage is necessary for operational issues for this alignment.
- This alignment would meet applicable regulatory requirements.
- There appear to be no significant environmental impacts for this alignment.
- This alignment does not have any operational issues.
- The capital cost for this alignment is $5.8 million, which is higher than Alignments 2 and 3. However, the annual cost per acre-foot, $350, of Alignment 1A is the lowest of any alignment.
- The annual O&M cost for this alternative is approximately $100,000 or $90 per acre-foot

### Alignment 1B

- This alignment would provide approximately 750 AFY of recycled water to agricultural users (approximately 92 percent) and urban users (approximately 8 percent).
- The major potential benefits of this alignment would be to: 1) offset agricultural groundwater pumping thus allowing for municipal or environmental uses of this water, 2) offset VOMWD water demand; and 3) reduce discharges to San Pablo Bay.
- This alignment is technically feasible.
- Additional storage would be required for this alignment.
- There are no known engineering constraints, although the necessity of additional storage would involve significantly more engineering, right–of-way, and environmental documentation than the other alignments.

- This alignment would meet applicable regulatory requirements.
- There appear to be no significant environmental impacts for this alignment.
- This alignment does not have any operational issues.
- The capital cost for this alignment is $19 million. This alignment is the most costly at an annual cost of $1,600 per acre-foot.
- The O&M cost for this alignment is approximately $130 per acre-foot.

**Alignment 2**

- This alignment would provide approximately 440 AFY of recycled water to agricultural users (approximately 80 percent) and urban users (approximately 20 percent). Alignment 2 has the highest offset of urban/municipal water.
- The major potential benefits of this alignment would be to: 1) offset the City's water demand; 2) offset agricultural groundwater pumping thus allowing for municipal or environmental uses of this water; and 3) reduce discharges to San Pablo Bay.
- This alignment is technically feasible.
- Operational storage would be required for this alignment.
- This alignment would meet applicable regulatory requirements.
- There appear to be no significant environmental impacts for this alignment.
- This alignment does not have any operational issues.
- The capital cost for this alignment is the lowest of all alignments ($4.2 million) and has the second lowest annual cost per acre-foot ($640).
- The O&M cost for this alignment is approximately $140 per acre-foot.

**Alignment 3**

- This alignment would provide approximately 465 AFY of recycled water to agricultural users.
- The major potential benefits of this alignment would be to: 1) offset agricultural groundwater pumping thus allowing for municipal or environmental uses of this water; and 2) reduce discharges to San Pablo Bay.
- This alignment is technically feasible.

- Operational storage would be required for this alignment.
- This alignment would meet applicable regulatory requirements.
- There appears to be no significant environmental impacts for this alignment.
- This alignment does not have any operational issues.
- The capital cost for this alignment is the second lowest of all the alignments ($4.7million) and has the second highest annual cost per acre-foot ($690).
- The O&M cost for this alignment is approximately $150 per acre-foot.

### 6.8 Summary of Project Alignment

Appendix C contains tables illustrating the type of recycled water use, the expected annual recycled water use, and the peak recycled water use for each alignment. As stated earlier in this report the proposed project assumes the SVCSD would supply tertiary treated recycled water, currently it supplies disinfected secondary 2.3-treated recycled water.

The alignment's (1A, 1B, 2, & 3) shown in Plate 9 have the potential to use 2,800 AFY. Alignment 1A would use the most recycled water (approximately 1,100 acre-feet), followed by Alignments 1B, 3, and 2. Alignment 1A has the least annual cost per acre-foot of recycled water ($350 per acre-foot). Alignment 1B is the only alignment, which requires additional storage (up to 825 acre-feet) beyond what currently exists (635 acre-feet). Because of the additional storage required, Alignment 1B has the highest capital cost ($19 million) as well as the highest annual unit cost ($1600 per acre-foot). Alignment 2 has the largest offset of potable water. Twenty percent of Alternative 2's demand is for offsetting potable water. Alignment 3 would serve agricultural users only. The benefit of Alignment 3 is the potential to extend the pipeline further into the Carneros grape-growing region.

## 7.0 ECONOMIC AND FINANCIAL ANALYSIS SUMMARY

In its simplest form, an economic analysis determines if a project alignment will accomplish the project objective for the least cost, when compared to other feasible alignments that would achieve the same objective. For example, if the project objective were to provide additional water supply, the economic analysis would compare the cost of the proposed project alignment to the cost of providing additional potable water supplies by other feasible methods. Unfortunately, the traditional economic analysis is an incomplete tool for evaluating the feasibility of recycled water projects, since these projects often have several objectives.

A trend in the economic analysis of recycled water projects is to perform a comprehensive cost-benefit analysis. This method allows a variety of benefits to be considered, including environmental benefits. This method also serves to identify beneficiaries that can contribute to project costs commensurate with the benefits they receive. The primary limitation of a cost-benefit analysis is the difficulty in quantifying environmental benefits.

For the purposes of this Feasibility Study, a hybrid of the two approaches described above is used to evaluate which, if any, of the alignments represents the most economically sound approach to meeting the multiple project objectives at the least cost (Appendix G, Economic and Financial Analysis).

The cost-benefit analysis is an estimate and does not capture all the potential benefits of an alignment. The Economic and Financial Analysis (Appendix G) should be considered as one of a number of tools used to evaluate the various alignments. The cost benefit analysis will be periodically updated as conditions warrant.

## 8.0 FEASIBILITY STUDY SUMMARY

The existing average annual inflow into the SVCSD treatment facility is approximately 4,500 AFY. Currently, SVCSD supplies approximately 1,170 acre-feet of recycled water to vineyards, dairies, pastures, and wetlands in southern Sonoma Valley. The SVCSD continues to seek out prospective users who are interested in a reliable water supply for their agricultural crop.

The Alignments (1A, 1B, 2, & 3) shown in Plate 9 comprise the recommended project alternative. Each alignment would ultimately address the needs and provide the benefits described in Section 3.0. The recommended alternative helps to address concerns regarding: over-pumping of groundwater; pumping of water from local streams/creeks; maintaining fish and wildlife habitats; reliability of water supply delivered through the Agency's Sonoma Aqueduct (offsetting potable water use); and poor groundwater quality. These issues are discussed below.

The recommended alternative addresses the concern of over-pumping of groundwater. In the past few years, the number of vineyards in Sonoma Valley has increased resulting in an increase in groundwater use. Increased reliance on groundwater has caused localized decline in water levels and the possible intrusion of saline water from San Pablo Bay.

Currently the Agency, in cooperation with the United State Geological Service (USGS), is in its final year of a four-year study to characterize groundwater conditions in Sonoma Valley. The study will provide a quantitative and qualitative evaluation of groundwater pumping, the sustainable yield of the basin, and could form the basis for groundwater management activities. The recommended alternative is capable of providing a benefit to groundwater issues in Sonoma Valley by replacing groundwater with recycled water for agricultural and municipal irrigation. The increase in recycled water usage may permit the groundwater table to stabilize to a more natural state, protect against saline water intrusion, and reduce the need to capture flow from local streams/creeks. The increase in stream/creek flow will also benefit water quality issues of receiving streams of San Pablo Bay.

Currently, the SVCSD, in conjunction with California Department of Fish and Game (CDFG) is managing the Hudeman Slough Mitigation and Enhancement Wetlands Project (Parsons, 2003). The project involves enhancement of diked subsaline seasonal wetlands, as well as muted tidal marsh, and creation of seasonal wetland and perennial freshwater marsh ponds using secondary disinfected 2.3 treated recycled water. A two-year monitoring study was designed to evaluate the effects of reclaimed water use within the Hudeman Slough Enhancement Wetlands using other hydrologically managed and unmanaged wetlands as reference areas (Parsons, 2003).

The Agency has notified VOMWD and the City of Sonoma of a temporary impairment of the water transmission system into Sonoma Valley. The use of recycled water could offset potable water use. The recommended alternative, shown in Plate 9, identifies potential potable water customers who irrigate large parcels, such as schools, parks, large landscaped areas (golf courses and community gardens), and agricultural users. By targeting these users, a reduction in need for potable water by using recycled water may help alleviate current problems associated with the temporary impairment. It is feasible that groundwater wells (of good water quality), which are currently being used for irrigation, may be looked upon as an additional source of potable water to be used for municipal water supply during times of peak demands.

Many residents, agricultural users (vineyards, dairies, and pastures), and public officials are aware of the water situation in Sonoma Valley. Public water forums such as the Sonoma Valley Water Summit in January 2004 have helped to increase awareness of the water resources issues within Sonoma Valley. Appendix G-4 (Economic and Financial Analysis, Letters of Support) contains letters of support, received from property, vineyard, dairy, and pastureland owners, and vineyard managers for the use of recycled water in Sonoma Valley. Many agricultural users are interested in recycled water for the primary reason of having a reliable supply of water. This awareness, has led many residents and agricultural users to look for a more reliable water supply. Public officials are also aware of the current water situation in Sonoma Valley and are looking at different tactics to offset peak demands.

The purpose of the Environmental Constraints Analysis was to describe various proposed project components identified in the Engineering Feasibility Study; discuss the methodology for determining environmental constraints associated with the various proposed project components that may be infeasible; identify any potential significant environmental constraints associated with the various proposed project components; and discuss anticipated future environmental documentation.

Results of the analysis shows that components of the proposed projects adequately passed a preliminary review and met the basic project objectives. Based upon the analysis, all proposed project components were deemed feasible. For each proposed project component, potential significant environmental impacts or benefits are noted in the Environmental Constraints Analysis.

The economic and financial analysis looked at project costs and benefits to determine if a project alignment is feasible for the objective identified in the engineering section of this study. Two economic methods were combined for the economic and financial analysis. One technique is the traditional method, which looked at a quantifiable cost and benefit analysis. The second technique is the more recent method, which looks at costs versus multiple benefits (both quantifiable and non-quantifiable). For the purpose of this Feasibility Study, a process using both methodologies is used.

As with most recycled water, projects identifying the benefits are relatively easy. However, quantifying subjective benefits is difficult to include in a cost-benefit analysis. Therefore, the economic and financial analysis does not conclude which alternative is better. Rather, the economic and financial analysis presents cost and benefits that are quantifiable and it seeks to incorporate the subjective benefits through dialogue with the engineering and the environmental analysis. From which selection of the best alternative can occur.

## 9.0 REFERENCES

Asano, Takashi, 2001, "Water From (Waste) Water – The Dependable Water Resource", Stockholm Water Symposium, August 12-18.

California Department of Water Resources, 1982; Evaluation of Ground Water Resources; Sonoma County Volume 2: Santa Rosa Plains, Bulletin 118-4, September.

California Department of Water Resources, 1975; Vegetative Water Use in Californian 1974, Bulletin 113-3 April.

California Department of Water Resources, 1986; Crop Water Use in California, Bulletin 113-4, April.

California Department of Water Resources, 1998; California Water Plan, Bulletin 160-98, April.

California Department of Water Resources, 2001; California Irrigation Management Information System (CIMIS), February.

California Department of Water Resources, 2003; Water Recycling 2030: Recommendations of California's Recycled Water Task Force, Appendix B Memorandum of Agreement Between The Department of Health Services and The State Water Resources Control Board on Use of Reclaimed Water, June 2003.

California Regional Water Quality Control Board, San Francisco Bay Region, 1998; Sonoma NPDES Permit No. CA0037800 Tentative Order, May 4.

CH2M HILL, 1998, Bay Area Regional Water Recycling Plan, Cost Criteria for Development of Alternatives, July 31.

Harding ESE Inc./HDR Engineering, Inc., 2001, Flow Data Analysis Results, Sonoma Valley County Sanitation District Wet Weather Overflow Prevention Study, December

HDR Engineering, Inc., 2002, Typical Monthly Facility Inflow Patterns, Sonoma Valley County Sanitation District Water Reclamation Feasibility Study, March.

North Bay Watershed Association, 2001, Draft TM#1 –Historical Studies and Data Collection, December 10.

North Bay Watershed Association, 2002a, Draft TM#2 – Market Assessment and Alternatives Development, June 5.

North Bay Watershed Association, 2002b, Draft TM#3 – Estimated Recycled Water Costs, August 23.

North Bay Watershed Association, 2004, Draft Satellite Treatment Plant Project, TM#3 – Sonoma Valley Analysis, December 28.

Sonoma County Water Agency, 2000, Urban Water Management Plan

Sonoma County Water Agency, 2000, Sonoma Valley Recycled Water Feasibility Study Workplan.

Parsons, Lorraine and Jessica Martini-Lamb, 2003, Sonoma County Water Agency "The Use of Reclaimed Water for Enhancement and Creating Wetlands and Wildlife Habitat: Efficacy and Effects"

WateReuse Association, Department of Health Services, Summary Table of Recycled Water Uses Allowed in California, Title 22 California Recycling Criteria, September 1998.

**TABLES**

# Table 1

## Water Quality Results (1999 - 2001)

### Sonoma Valley Recycled Water Feasibility Study

| | 1999 | 2000 | 2001 (as of July 2001) |
|---|---|---|---|
| BOD (MG/L)<br>24 hr composite, 3x weekly | <5 to 7 | 5 to 6 | <5 to 6 |
| TSS (MG/L)<br>24 hr composite, 3x weekly | 2.9 to 13.3 | 1.6 to 6.4 | 1.9 to 6.9 |
| Total Coliform* (MPN/100<br>Median conc. of the last 7 days | <2 to 8 | <2 to 2 | <2 to 8 |
| Turbidity (NTU)<br>Monthly average | 1.5 to 6.3 | 1.3 to 3.7 | 1.6 to 5.1 |

Note:

MG/L – milligrams per liter
MPN – most probable number
ML – milliliter
NTU – Nephalometric Turbidity Unit
BOD – Biological Oxygen Demand
TSS – Total Suspendible Solids

# Table 3

## Alignment 1A, Flow Per Pipeline Segment

### Sonoma Valley Recycled Water Feasibility Study

| Segment (See Plate 9) | Segment Pipe Diameter (inches) | Length (feet) | Total Length (feet) | Replacement Source (acre-feet) | | | Accumulative Project Usage (acre-feet) |
|---|---|---|---|---|---|---|---|
| | | | | Groundwater | City & VOMWD* | Local Creek | |
| Segment: WWTP - Point 1 | 14 | 3400 | 3400 | 0.00 | 0 | 81.2 | 81.20 |
| Segment: Point 1 - Point 3 | 14 | 2800 | 6200 | 6.48 | 0 | 81.2 | 87.68 |
| Segment: Point 3 - Point 5 | 14 | 3400 | 9600 | 111.48 | 0 | 122.8 | 234.28 |
| Segment: Point 5 - Point 7 | 14 | 800 | 10400 | 111.48 | 0 | 165.6 | 277.08 |
| Segment: Point 7 - Point 9 | 8 | 1800 | 12200 | 125.48 | 0 | 165.6 | 291.08 |
| Segment: Point 9 - Point 11 | 8 | 1500 | 13700 | 359.88 | 0 | 165.6 | 525.48 |
| Segment: Point 7 - Point 13 | 12 | 1300 | 15000 | 361.48 | 0 | 165.6 | 527.08 |
| Segment: Point 13 - Point 15 | 12 | 1400 | 16400 | 397.48 | 0 | 165.6 | 563.08 |
| Segment: Point 15 - Point 17 | 6 | 2300 | 18700 | 459.88 | 0 | 208.8 | 668.68 |
| Segment: Point 17 - Point 19 | 4 | 1700 | 20400 | 500.68 | 0 | 254.8 | 755.48 |
| Segment: Point 15 - Point 21 | 10 | 2700 | 23100 | 530.28 | 0 | 254.8 | 785.08 |
| Segment: Point 21 - Point 23 | 10 | 1700 | 24800 | 637.08 | 0 | 254.8 | 891.88 |
| Segment: Point 23 - Point 25 | 10 | 400 | 25200 | 662.68 | 0 | 254.8 | 917.48 |
| Segment: Point 25 - Point 26 | 6 | 2500 | 27700 | 692.28 | 0 | 254.8 | 947.08 |
| Segment: Point 26 - Point 30 | 6 | 2200 | 29900 | 802.14 | 0 | 254.8 | 1056.94 |
| Segment: Point 25 - Point 27 | 10 | 2800 | 32700 | 839.72 | 0 | 254.8 | 1094.52 |

*Note: City = City of Sonoma; VOMWD = Valley of the Moon Water District

# Table 4

## Alignment 1B, Flow Per Pipeline Segment

### Sonoma Valley Recycled Water Feasibility Study

| Segment (See Plate 9) | Segment Pipe Diameter (inches) | Pipe Segment Length (feet) | Total Length (feet) | Replacement Source (acre-feet) | | | Accumulative Project Usage (acre-feet) |
|---|---|---|---|---|---|---|---|
| | | | | Groundwater | City & VOMWD* | Local Creek | |
| Altrnernative 1-A ends @ Pt. 27 | | 32,700 | | | | | 1094.52 |
| | | | | | | | |
| Segment: Point 27 - Point 29 | 10 | 1200 | 1200 | 56.40 | 0 | 0 | 56.40 |
| | | | | | | | |
| Segment: Point 29 - Point 31 | 10 | 400 | 1600 | 56.40 | 0 | 0 | 56.40 |
| | | | | | | | |
| Segment: Point 31 - Point 32 | 4 | 500 | 2100 | 153.60 | 0 | 0 | 153.60 |
| | | | | | | | |
| Segment: Point 31 - Point 33 | 8 | 3500 | 5600 | 153.60 | 0 | 0 | 153.60 |
| | | | | | | | |
| Segment: Point 33 - Point 35 | 4 | 3800 | 9400 | 236.40 | 0 | 0 | 236.40 |
| | | | | | | | |
| Segment: Point 33 - Point 37 | 8 | 3800 | 13200 | 236.40 | 0 | 0 | 236.40 |
| | | | | | | | |
| Segment: Point 37 - Point 38 | 4 | 4100 | 17300 | 295.20 | 0 | 0 | 295.20 |
| | | | | | | | |
| Segment: Point 37 - Point 39 | 8 | 1500 | 18800 | 295.20 | 0 | 0 | 295.20 |
| | | | | | | | |
| Segment: Point 39 - Point 41 | 4 | 1000 | 19800 | 295.20 | 0 | 0 | 295.20 |
| | | | | | | | |
| Segment: Point 41 - Point 43 | 4 | 1600 | 21400 | 324.40 | 0 | 0 | 324.40 |
| | | | | | | | |
| Segment: Point 43 - Point 45 | 4 | 1200 | 22600 | 399.60 | 0 | 0 | 399.60 |
| | | | | | | | |
| Segment: Point 39 - Point 47 | 6 | 2000 | 24600 | 399.72 | 0 | 0 | 399.72 |
| | | | | | | | |
| Segment: Point 47 - Point 49 | 6 | 3300 | 27900 | 406.12 | 28.3 | 0 | 434.42 |
| | | | | | | | |
| Segment: Point 49 - Point 50 | 6 | 2200 | 30100 | 692.12 | 28.3 | 0 | 720.42 |
| | | | | | | | |
| Segment: Point 50 - Point 51 | 4 | 1600 | 31700 | 692.12 | 59.6 | 0 | 751.72 |
| | | | | | | | |
| | | | | Total Recycled Water Demand for Alternative I = | | | 1846.24 |

*Note: City = City of Sonoma; VOMWD = Valley of the Moon Water District

# Table 5

## Alignment 2, Flow Per Pipeline Segment

### Sonoma Valley Recycled Water Feasibility Study

| Segment (See Plate 9) | Pipe Segment Diameter | Pipe Segment Length | Total Length | Replacement Source (acre-feet) | | | Accumulative Project Usage |
|---|---|---|---|---|---|---|---|
| | (inches) | (feet) | (feet) | Groundwater | City & VOMWD* | Local Creek | (acre-feet) |
| Segment: WWTP - Point 1 | 10 | 1000 | 1,000 | 14.4 | 0 | 0 | 14.4 |
| Segment: Point 1 - Point 3 | 10 | 1000 | 2,000 | 14.4 | 0 | 0 | 14.4 |
| Segment: Point 3 - Point 5 | 4 | 600 | 2,600 | 14.4 | 0 | 9.6 | 24 |
| Segment: Point 3 - Point 7 | 10 | 1100 | 3,700 | 21.6 | 0 | 9.6 | 31.2 |
| Segment: Point 7 - Point 9 | 10 | 1000 | 4,700 | 23.6 | 0 | 9.6 | 33.2 |
| Segment: Point 9 - Point 11 | 10 | 1600 | 6,300 | 23.6 | 0 | 9.6 | 33.2 |
| Segment: Point 11 - Point 13 | 6 | 1200 | 7,500 | 158.78 | 0 | 9.6 | 168.38 |
| Segment: Point 11 - Point 15 | 8 | 1000 | 8,500 | 163.18 | 0 | 9.6 | 172.78 |
| Segment: Point 15 - Point 17 | 8 | 1600 | 10,100 | 197.98 | 0 | 9.6 | 207.58 |
| Segment: Point 17 - Point 19 | 4 | 2400 | 12,500 | 218.9 | 0 | 32.4 | 251.3 |
| Segment: Point 17 - Point 21 | 6 | 1700 | 14,200 | 223.3 | 0 | 32.4 | 255.7 |
| Segment: Point 21 - Point 22 | 6 | 800 | 15,000 | 223.3 | 0 | 32.4 | 255.7 |
| Segment: Point 22 - Point 24 | 4 | 1700 | 16,700 | 234.5 | 0 | 32.4 | 266.9 |
| Segment: Point 22 - Point 23 | 6 | 1900 | 18,600 | 234.5 | 34.46 | 32.4 | 301.36 |
| Segment: Point 23 - Point 25 | 6 | 3900 | 22,500 | 234.5 | 56.06 | 32.4 | 322.96 |
| Segment: Point 25 - Point 27 | 6 | 2000 | 24,500 | 254.8 | 86.5 | 32.4 | 373.7 |
| Segment: Point 27 - Point 29 | 4 | 2100 | 26,600 | 255.6 | 86.5 | 32.4 | 374.5 |
| Segment: Point 29 - Point 31 | 4 | 1700 | 28,300 | 288.4 | 86.5 | 32.4 | 407.3 |
| Segment: Point 27 - Point 33 | 4 | 2000 | 30,300 | 319.6 | 86.5 | 32.4 | 438.5 |

*Note: City = City of Sonoma; VOMWD = Valley of the Moon Water District

# Table 6

## Alignment 3, Flow Per Pipeline Segment

### Sonoma Valley Recycled Water Feasibility Study

| Segment (See Plate 9) | Pipe Segment Diameter | Pipe Segment Length | Total Length | Replacement Source (acre-feet) | | | Accumulative Project Usage |
|---|---|---|---|---|---|---|---|
| | (inches) | (feet) | (feet) | Groundwater | City & VOMWD* | Local Creek | (acre-feet) |
| **Segment: WWTP - Point 1** | **10** | 650 | 650 | 60 | 0 | 0 | 60 |
| **Segment: Point 1 - Point 3** | **10** | 2900 | 3550 | 60 | 0 | 0 | 60 |
| **Segment: Point 3 - Point 5** | **10** | 3000 | 6550 | 81.2 | 0 | 0 | 81.2 |
| **Segment: Point 5 - Point 7** | **8** | 1850 | 8400 | 110 | 0 | 0 | 110 |
| **Segment: Point 7 - Point 9** | **8** | 2200 | 10600 | 112.64 | 0 | 0 | 112.64 |
| **Segment: Point 9 - Point 29** | **4** | 800 | 11400 | 135.24 | 0 | 0 | 135.24 |
| **Segment: Point 9 - Point 11** | **8** | 1600 | 13000 | 163.36 | 0 | 0 | 163.36 |
| **Segment: Point 11 - Point 13** | **6** | 1500 | 14500 | 213.96 | 0 | 0 | 213.96 |
| **Segment: Point 13 - Point 15** | **6** | 2200 | 16700 | 277.16 | 0 | 0 | 277.16 |
| **Segment: Point 15 - Point 17** | **4** | 1800 | 18500 | 286.72 | 0 | 0 | 286.72 |
| **Segment: Point 17 - Point 19** | **4** | 2100 | 20600 | 323.12 | 0 | 0 | 323.12 |
| **Segment: Point 11 - Point 21** | **6** | 2400 | 23000 | 414.6 | 0 | 0 | 414.6 |
| **Segment: Point 21 - Point 23** | **4** | 1800 | 24800 | 432.2 | 0 | 0 | 432.2 |
| **Segment: Point 23 - Point 25** | **4** | 1200 | 26000 | 440.48 | 0 | 0 | 440.48 |
| **Segment: Point 25 - Point 27** | **4** | 1100 | 27100 | 463.68 | 0 | 0 | 463.68 |

*Note: City = City of Sonoma; VOMWD = Valley of the Moon Water District

# Table 7

## VALLEY OF THE MOON WATER DISTRICT
## SUMMARY RECYCLED WATER USE[1] "EFFICIENCY"
### Sonoma Valley Recycled Water Feasibility Study

| | | |
|---|---|---|
| | Valley of the Moon Water District Contracted Water Annual Limit, Supplied by Sonoma County Agency (acre-feet/year) | 3200 |
| | Large Water Users Total Usage[2] (acre-feet/year) | 148.8 |
| | Large Water Users Estimated Total Winter Demand, Nov - Apr (acre-feet) | 35.4 |
| | Large Water Users Estimated Total Summer Demand, May - Oct (acre-feet) | 113.4 |
| | Large Water Users Estimated Irrigation Demand[3] (acre-feet/year) | 77.9 |
| | | |
| | Alignment 1B Recycled Water[4] (acre-feet/year) | 59.6 |
| | | |
| | PERCENT OF USE | |
| | Alignment 1B Recycled Water Use vs Contracted Water (%) | 2 |
| | Alignment 1B Recycled Water Use vs Large Water Users Est. Irrigation Demand (%) | 76 |

**Note:**

1) Does not include residential

2) Large Water Users in the VOMWD area were identified by VOMWD Staff.

3) The estimated irrigation demand is the difference between summer usage (May - Oct) and winter usage (Nov - Apr).

4) Alignment 1B recycled water use represents potable water replacement

# Table 8
## CITY OF SONOMA
## SUMMARY RECYCLED WATER USE[1] "EFFICIENCY"
### Sonoma Valley Recycled Water Feasibility Study

| | |
|---|---|
| City of Sonoma Contracted Water Annual Limit, Supplied by Sonoma County Water Agency (acre-feet/year) | 3000 |
| Large Water Users Total Usage[2] (acre-feet/year) | 245.3 |
| Large Water Users Estimated Total Winter Demand, Nov - Apr (acre-feet) | 48.4 |
| Large Water Users Estimated Total Summer Demand, May - Oct (acre-feet) | 196.9 |
| Large Water Users Estimated Irrigation Demand[3] (acre-feet/year) | 148.5 |
| | |
| Alignment 2 Recycled Water[4] (acre-feet/year) | 86.5 |
| | |
| PERCENT OF USE | |
| Total Potential Recycled Water vs Contracted Water (%) | 3 |
| Alignment 2 Recycled Water Use vs Large Water Users Est. Irrigation Demand (%) | 58 |
| | |

Note:

1) Does not include residential

2) Large Water Users in the City of Sonoma were identified through water use records (over 700,000 gallons per year).

3) The estimated irrigation demand is the difference between summer usage (May - Oct) and winter usage (Nov - Apr)

4) The estimated recycled water use represents the estimated replacement of potable water in Alignment 2.

# Table 9

## Alignment Application Replacement Summary Table

### Sonoma Valley Recycled Water Feasibility Study

| Alignment | | Total Usage | Application Replacement (ac-ft) | | | Application Replacement (%) | | |
|---|---|---|---|---|---|---|---|---|
| | | (ac-ft)[1] | Groundwater[2] | City & VOMWD[3] | Creek Water[4] | Groundwater | City & VOMWD | Creek Water |
| **1A** | | 1094 | 840 | 0 | 255 | 77 | 0 | 23 |
| | | | | | | | | |
| **1B** | | 751 | 692 | 60 | 0 | 92 | 8 | 0 |
| | | | | | | | | |
| **I (A&B)** | | 1845 | 1532 | 60 | 255 | 83 | 3 | 14 |
| | | | | | | | | |
| **2** | | 438 | 320 | 87 | 32 | 73 | 20 | 7 |
| | | | | | | | | |
| **3** | | 464 | 464 | 0 | 0 | 100 | 0 | 0 |

Note:

1) ac-ft = acre-feet

2) Groundwater = Pumped ground water

3) City = City of Sonoma; VOMWD = Valley of the Moon Water District

4) Creek Water = Local creek water

# Table 10
## Alignment 1A, Estimated Total Cost
### Sonoma Valley Recycled Water Feasibility Study

| Segment (See Plate 9) | Segment Pipe Diameter | Capital Cost: Pipeline Cost | Pump Station Cost | Storage[1] | Service Laterals[2] | Total Segment Capital Cost | Accumulative Capital Cost | Total Capital Cost per acre-foot | Present Worth O&M[3] | Replacement Source (acre-feet/year): Groundwater | City & VOMWD[4] | Local Creek | Total Project Usage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (inches) | ($) | ($) | ($) | ($) | ($) | ($) | ($/acre-foot) | ($/year) | Groundwater | City & VOMWD[4] | Local Creek | (acre-feet/year) |
| Segment: WWTP - Point 1 | 14 | $315,839 | $727,966 | $1,101,880 | $44,800 | $2,190,485 | $2,190,485 | $26,976 | $47,272 | 0.00 | 0 | 81.2 | 81.20 |
| Segment: Point 1 - Point 3 | 14 | $266,399 | $124,971 | $0 | $73,600 | $464,970 | $2,655,455 | $30,286 | $8,115 | 6.48 | 0 | 81.2 | 87.68 |
| Segment: Point 3 - Point 5 | 14 | $315,839 | $163,873 | $0 | | $479,712 | $3,135,167 | $13,382 | $10,641 | 111.48 | 0 | 122.8 | 234.28 |
| Segment: Point 5 - Point 7 | 14 | $65,920 | $100,662 | $0 | $134,400 | $300,982 | $3,436,149 | $12,401 | $6,537 | 111.48 | 0 | 165.6 | 277.08 |
| Segment: Point 7 - Point 9 | 8 | $121,475 | $53,377 | $0 | | $174,852 | $3,611,001 | $12,406 | $3,466 | 125.48 | 0 | 165.6 | 291.08 |
| Segment: Point 9 - Point 11 | 8 | $102,000 | $64,401 | $0 | | $166,401 | $3,777,402 | $7,188 | $4,182 | 359.88 | 0 | 165.6 | 525.48 |
| Segment: Point 7 - Point 13 | 12 | $154,237 | $57,528 | $0 | | $211,765 | $3,989,166 | $7,568 | $3,736 | 361.48 | 0 | 165.6 | 527.08 |
| Segment: Point 13 - Point 15 | 12 | $124,600 | $85,476 | $0 | | $210,076 | $4,199,243 | $7,458 | $5,551 | 397.48 | 0 | 165.6 | 563.08 |
| Segment: Point 15 - Point 17 | 6 | $128,800 | $30,858 | $0 | | $159,658 | $4,358,900 | $6,519 | $2,004 | 459.88 | 0 | 208.8 | 668.68 |
| Segment: Point 17 - Point 19 | 4 | $98,118 | $30,739 | $0 | $156,800 | $285,657 | $4,644,558 | $6,148 | $1,996 | 500.68 | 0 | 254.8 | 755.48 |
| Segment: Point 15 - Point 21 | 10 | $191,700 | $99,888 | $0 | | $291,588 | $4,936,145 | $6,287 | $6,486 | 530.28 | 0 | 254.8 | 785.08 |
| Segment: Point 21 - Point 23 | 10 | $120,700 | $38,064 | $0 | | $158,764 | $5,094,909 | $5,713 | $2,472 | 637.08 | 0 | 254.8 | 891.88 |
| Segment: Point 23 - Point 25 | 10 | $28,400 | $3,122 | $0 | $55,200 | $86,722 | $5,181,631 | $5,648 | $203 | 662.68 | 0 | 254.8 | 917.48 |
| Segment: Point 25 - Point 26 | 6 | $164,248 | $0 | $0 | $64,400 | $228,648 | $5,410,279 | $5,713 | $0 | 692.28 | 0 | 254.8 | 947.08 |
| Segment: Point 26 - Point 30 | 6 | $171,696 | $0 | $0 | | $171,696 | $5,581,975 | $5,281 | $0 | 802.14 | 0 | 254.8 | 1056.94 |
| Segment: Point 25 - Point 27 | 10 | $229,543 | $6,491 | $0 | | $236,034 | $5,818,009 | $5,316 | $422 | 839.72 | 0 | 254.8 | 1094.52 |
| | | | | | | Total = | $5,818,009 | | $103,082.72 | 839.72 | 0 | 254.8 | 1094.52 |

Note:
1) Storage cost for Alignment 1A is allocated to first pipeline segment
2) Cost for service laterals connecting transmission pipeline to private storage (From Table 2)
3) O&M = labor and power for pump station
4) City = City of Sonoma; VOMWD = Valley of the Moon Water District

# Table 11

## Alignment 1B, Estimated Total Cost

### Sonoma Valley Recycled Water Feasibility Study

| Segment (See Plate 9) | Segment Pipe Diameter | Pipeline Cost | Pump Station Cost | Storage[1] | Service Laterals[2] | Total Segment Cost | Accumulative Cost | Total Capital Cost per acre-foot | Present Worth O&M[3] | Replacement Source (acre-feet/year) | | | Total Project Usage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (inches) | ($) | ($) | | | ($) | ($) | ($/acre-foot) | ($/year) | Groundwater | City & VOMWD[4] | Local Creek | (acre-feet/year) |
| Altrnernative 1-A ends @ Pt. 27 | | | | | | | | | | | | | |
| Segment: Point 27 - Point 29 | 10 | $68,160 | $170,531 | $932,360 | $296,800 | $1,467,851 | $1,467,851 | $26,026 | $11,074 | 56.40 | 0 | 0 | 56.40 |
| Segment: Point 29 - Point 31 | 10 | $22,720 | $49,274 | $932,360 | $0 | $1,004,354 | $2,472,206 | $43,833 | $3,200 | 56.40 | 0 | 0 | 56.40 |
| Segment: Point 31 - Point 32 | 4 | $144,734 | $0 | $932,360 | $0 | $1,077,094 | $3,549,300 | $23,107 | $0 | 153.60 | 0 | 0 | 153.60 |
| Segment: Point 31 - Point 33 | 8 | $27,200 | $83,432 | $932,360 | $0 | $1,042,992 | $4,592,292 | $29,898 | $5,418 | 153.60 | 0 | 0 | 153.60 |
| Segment: Point 33 - Point 35 | 4 | $139,840 | $91,559 | $932,360 | $110,400 | $1,274,159 | $5,866,451 | $24,816 | $5,946 | 236.40 | 0 | 0 | 236.40 |
| Segment: Point 33 - Point 37 | 8 | $206,720 | $177,001 | $932,360 | $0 | $1,316,081 | $7,182,532 | $30,383 | $11,494 | 236.40 | 0 | 0 | 236.40 |
| Segment: Point 37 - Point 38 | 4 | $150,880 | $100,274 | $932,360 | $0 | $1,183,514 | $8,366,046 | $28,340 | $6,512 | 295.20 | 0 | 0 | 295.20 |
| Segment: Point 37 - Point 39 | 8 | $97,920 | $181,217 | $932,360 | $0 | $1,211,497 | $9,577,543 | $32,444 | $11,768 | 295.20 | 0 | 0 | 295.20 |
| Segment: Point 39 - Point 41 | 4 | $44,160 | $31,021 | $932,360 | $156,800 | $1,164,341 | $10,741,884 | $36,388 | $2,014 | 295.20 | 0 | 0 | 295.20 |
| Segment: Point 41 - Point 43 | 4 | $74,814 | $74,539 | $932,360 | $23,000 | $1,104,714 | $11,846,598 | $36,518 | $4,840 | 324.40 | 0 | 0 | 324.40 |
| Segment: Point 43 - Point 45 | 4 | $44,160 | $37,624 | $932,360 | $433,600 | $1,447,744 | $13,294,342 | $33,269 | $2,443 | 399.60 | 0 | 0 | 399.60 |
| Segment: Point 39 - Point 47 | 6 | $107,520 | $95,100 | $932,360 | $0 | $1,134,980 | $14,429,322 | $36,099 | $6,176 | 399.72 | 0 | 0 | 399.72 |
| Segment: Point 47 - Point 49 | 6 | $177,408 | $260,896 | $932,360 | $0 | $1,370,664 | $15,799,986 | $36,370 | $16,942 | 406.12 | 28.3 | 0 | 434.42 |
| Segment: Point 49 - Point 50 | 6 | $143,942 | $188,252 | $932,360 | $181,600 | $1,446,154 | $17,246,140 | $23,939 | $12,225 | 692.12 | 28.3 | 0 | 720.42 |
| Segment: Point 50 - Point 51 | 4 | $114,466 | $0 | $932,360 | $0 | $1,046,826 | $18,292,966 | $24,335 | $0 | 692.12 | 59.6 | 0 | 751.72 |
| | | | | | | | | | | | | | |
| | | | | | | Total = | $18,292,966 | $24,335 | $100,051 | 692.12 | 59.6 | 0 | 751.72 |

Note:

1) Storage cost for Alternative 1B is allocated over entire alternative

2) Cost for service laterals connecting transmission pipeline to private storage (From Table 2)

3) O&M = labor and power for pump station

4) City = City of Sonoma; VOMWD = Valley of the Moon Water District

# Table 12

## Alignment 2, Estimated Total Cost

### Sonoma Valley Recycled Water Feasibility Study

| Segment (See Plate 9) | Pipe Segment Diameter | Pipeline Cost | Pump Station Cost | Storage | Service Laterals[1] | Total Segment Capital Cost | Accumulative Capital Cost | Total Capital Cost per acre-foot | Present Worth O&M[2] | Replacement Source (acre-feet/year) | | | Total Project Usage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (inches) | ($) | ($) | | | ($) | ($) | ($/acre-feet) | | Groundwater | City & VOMWD[3] | Local Creek | (acre-feet/year) |
| Segment: WWTP - Point 1 | 10 | $56,800 | $386,754 | $1,101,880 | $23,000 | $1,568,434 | $1,568,434 | $108,919 | $25,115 | 14.4 | 0 | 0 | 14.4 |
| Segment: Point 1 - Point 3 | 10 | $56,800 | $67,185 | $0 | | $123,985 | $1,692,419 | $117,529 | $4,363 | 14.4 | 0 | 0 | 14.4 |
| Segment: Point 3 - Point 5 | 4 | $47,518 | $222 | $0 | | $47,740 | $1,740,160 | $72,507 | $14 | 14.4 | 0 | 9.6 | 24 |
| Segment: Point 3 - Point 7 | 10 | $62,480 | $0 | $0 | $128,800 | $191,280 | $1,931,440 | $61,905 | $0 | 21.6 | 0 | 9.6 | 31.2 |
| Segment: Point 7 - Point 9 | 10 | $56,800 | $23,594 | $0 | | $80,394 | $2,011,834 | $60,597 | $1,532 | 23.6 | 0 | 9.6 | 33.2 |
| Segment: Point 9 - Point 11 | 10 | $140,069 | $85,891 | $0 | $23,000 | $248,960 | $2,260,794 | $68,096 | $5,578 | 23.6 | 0 | 9.6 | 33.2 |
| Segment: Point 11 - Point 13 | 6 | $115,696 | $3,501 | $0 | $220,800 | $339,997 | $2,600,790 | $15,446 | $227 | 158.78 | 0 | 9.6 | 168.38 |
| Segment: Point 11 - Point 15 | 8 | $54,400 | $38,459 | $0 | | $92,859 | $2,693,649 | $15,590 | $2,497 | 163.18 | 0 | 9.6 | 172.78 |
| Segment: Point 15 - Point 17 | 8 | $87,040 | $30,079 | $0 | | $117,119 | $2,810,769 | $13,541 | $1,953 | 197.98 | 0 | 9.6 | 207.58 |
| Segment: Point 17 - Point 19 | 4 | $88,320 | $9,776 | $0 | | $98,096 | $2,908,865 | $11,575 | $635 | 218.9 | 0 | 32.4 | 251.3 |
| Segment: Point 17 - Point 21 | 6 | $76,160 | $59,561 | $0 | | $135,721 | $3,044,586 | $11,907 | $3,868 | 223.3 | 0 | 32.4 | 255.7 |
| Segment: Point 21 - Point 22 | 6 | $35,840 | $28,420 | $0 | $73,600 | $137,860 | $3,182,446 | $12,446 | $1,846 | 223.3 | 0 | 32.4 | 255.7 |
| Segment: Point 22 - Point 24 | 4 | $78,494 | $1,752 | $0 | | $80,247 | $3,262,692 | $12,224 | $114 | 234.5 | 0 | 32.4 | 266.9 |
| Segment: Point 22 - Point 23 | 6 | $130,234 | $55,097 | $0 | | $185,331 | $3,448,023 | $11,442 | $3,578 | 234.5 | 34.46 | 32.4 | 301.36 |
| Segment: Point 23 - Point 25 | 6 | $267,322 | $66,333 | $0 | | $333,654 | $3,781,678 | $11,709 | $4,307 | 234.5 | 56.06 | 32.4 | 322.96 |
| Segment: Point 25 - Point 27 | 6 | $137,088 | $45,864 | $0 | | $182,952 | $3,964,629 | $10,609 | $2,978 | 254.8 | 86.5 | 32.4 | 373.7 |
| Segment: Point 27 - Point 29 | 4 | $77,280 | $22,570 | $0 | | $99,850 | $4,064,479 | $10,853 | $1,466 | 255.6 | 86.5 | 32.4 | 374.5 |
| Segment: Point 29 - Point 31 | 4 | $62,560 | $19,037 | $0 | | $81,597 | $4,146,076 | $10,179 | $1,236 | 288.4 | 86.5 | 32.4 | 407.3 |
| Segment: Point 27 - Point 33 | 4 | $73,600 | $0 | $0 | | $73,600 | $4,219,676 | $9,623 | $0 | 319.6 | 86.5 | 32.4 | 438.5 |
| | | | | | | Total = | $4,219,676 | $9,623 | $61,307 | 319.6 | 86.5 | 32.4 | 438.5 |

Note:

1) Storage cost for Alignment 2 is allocated to first pipeline segment

2) Cost for service laterals connecting transmission pipeline to private storage (From Table 2)

3) O&M = labor and power for pump station

4) City = City of Sonoma; VOMWD = Valley of the Moon Water District

# Table 13
## Alignment 3, Estimated Total Cost
### Sonoma Valley Recycled Water Feasibility Study

| Segment (See Plate 9) | Pipe Segment Diameter | Pipeline Cost | Pump Station Cost | Storage | Service Laterals[1] | Total Segment Capital Cost | Accumulative Capital Cost | Total Capital Cost per acre-foot | Present Worth O&M[2] | Replacement Source (acre-feet/year) | | | Total Project Usage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (inches) | ($) | ($) | | | ($) | ($) | ($/acre-feet) | ($/year) | Groundwater | City & VOMWD[3] | Local Creek | (acre-feet/year) |
| Segment: WWTP - Point 1 | 10 | $36,920.00 | $399,322.34 | $1,101,880.00 | $0 | $1,538,122 | $1,538,122 | $25,635 | $25,931 | 60 | | | 60 |
| Segment: Point 1 - Point 3 | 10 | $164,720.00 | $47,489.16 | $0.00 | $0 | $212,209 | $1,750,331 | $29,172 | $3,084 | 60 | | | 60 |
| Segment: Point 3 - Point 5 | 10 | $170,400.00 | $96,615.65 | $0.00 | $0 | $267,016 | $2,017,347 | $24,844 | $6,274 | 81.2 | | | 81.2 |
| Segment: Point 5 - Point 7 | 8 | $97,920.00 | $95,074.15 | $0.00 | $110,400 | $303,394 | $2,320,741 | $21,098 | $6,174 | 110 | | | 110 |
| Segment: Point 7 - Point 9 | 8 | $149,600.00 | $108,089.11 | $0.00 | $105,800 | $363,489 | $2,684,230 | $23,830 | $7,019 | 112.64 | | | 112.64 |
| Segment: Point 9 - Point 29 | 4 | $29,440.00 | $0.00 | $0.00 | $0 | $29,440 | $2,713,670 | $20,066 | $0 | 135.24 | | | 135.24 |
| Segment: Point 9 - Point 11 | 8 | $110,595.20 | 53,695.42 | 0.00 | $0 | $164,291 | $2,877,961 | $17,617 | $3,487 | 163.36 | | | 163.36 |
| Segment: Point 11 - Point 13 | 6 | $67,200.00 | 41,232.04 | 0.00 | $156,800 | $265,232 | $3,143,193 | $14,691 | $2,678 | 213.96 | | | 213.96 |
| Segment: Point 13 - Point 15 | 6 | $98,560.00 | 59,787.96 | 0.00 | $0 | $158,348 | $3,301,541 | $11,912 | $3,882 | 277.16 | | | 277.16 |
| Segment: Point 15 - Point 17 | 4 | $82,174.40 | $32,547.05 | $0.00 | $0 | $114,721 | $3,416,262 | $11,915 | $2,114 | 286.72 | | | 286.72 |
| Segment: Point 17 - Point 19 | 4 | $77,280.00 | $51,559.96 | $0.00 | $128,800 | $257,640 | $3,673,902 | $11,370 | $3,348 | 323.12 | | | 323.12 |
| Segment: Point 11 - Point 21 | 6 | $126,918.40 | $50,903.11 | $0.00 | $542,400 | $720,222 | $4,394,124 | $10,598 | $3,306 | 414.6 | | | 414.6 |
| Segment: Point 21 - Point 23 | 4 | $66,240.00 | $6,861.81 | $0.00 | $138,000 | $211,102 | $4,605,226 | $10,655 | $446 | 432.2 | | | 432.2 |
| Segment: Point 23 - Point 25 | 4 | $44,160.00 | $1,469.26 | $0.00 | $0 | $45,629 | $4,650,855 | $10,559 | $95 | 440.48 | | | 440.48 |
| Segment: Point 25 - Point 27 | 4 | $40,480.00 | $0.00 | $0.00 | $82,800 | $123,280 | $4,774,135 | $10,296 | $0 | 463.68 | | | 463.68 |
| | | | | | | Total = | $4,774,135 | $10,296 | $67,837 | 463.68 | | | 463.68 |

Note:

1) Storage cost for Alignment 3 is allocated to first pipeline segment

2) Cost for service laterals connecting transmission pipeline to private storage (From Table 2)

3) O&M = labor and power for pump station

4) City = City of Sonoma; VOMWD = Valley of the Moon Water District

# Table 14
## Total Estimated Cost Summary
### Sonoma Valley Recycled Water Feasibility Study

| Alignment | Total Usage (acre-feet) | Estimated Storage Requirement[1] (acre-feet) | Transmission System: Estimated Total Capital Cost[2] ($) | Transmission System: Estimated Cost per Acre-Foot[3] ($/acre-foot) | Transmission System: Estimated Present Worth O & M ($/year) | Transmission System: Estimated Present Worth O & M per acre-foot ($/acre-foot) | Percentage of Usage (%): Agricultural | Percentage of Usage (%): Muni/Urban |
|---|---|---|---|---|---|---|---|---|
| **1-A** | 1094.5 | 65 | $5,818,009 | $350 | $103,083 | $94 | 100.0 | 0.0 |
| | | | | | | | | |
| **1-B** | 751.7 | 825 | $18,292,966 | $1,600 | $100,051 | $133 | 92.1 | 7.9 |
| | | | | | | | | |
| **1 (A+B)** | 1846.2 | 890 | $24,110,975 | $870 | $203,133 | $227 | 96.8 | 3.2 |
| | | | | | | | | |
| **2** | 438.5 | 65 | $4,219,676 | $640 | $61,307 | $140 | 80.3 | 19.7 |
| | | | | | | | | |
| **3** | 463.7 | 65 | $4,774,135 | $690 | $67,837 | $146 | 100.0 | 0.0 |

**Note:**

1) The estimated Storage requirement Unit Cost is based upon the total cost per storage capacity at Oceanview Reservoir (SCWA) and R4 Reservoirs (SVCSD).

2) Total Estimated Capital Cost includes a base construction cost and an additional 28% to account for planning, engineering, administration, and permitting cost.
When land use factors are accounted for, the total estimated capital costs also includes an additional 32% for contingencies,on average.
Thus the total capital cost estimate includes an additional 60% above base construction cost.

3) Estimated annual cost is based upon amoritizing the capital cost for 40-years @ 6%.

# Table 2
## Existing Storage Ponds Per Alignment
### Sonoma Valley Recycled Water Feasibility Study

**Alignment 1A**

| Alignment | Storage Required | Unit Cost[2] | Total Reservoir Cost | Surface Area | From Node | Total Length | Pipe Size | Land Use Factors | Freeways/Highways/Railroads Factors | Hydrography Factors | Existing Utilities Corridors | Total Factor Adjustment | Total PW cost | Estimated Cost | Accum Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | RESERVOIR SITE | | | | | | | | | | | | | | |
| | (ac-ft/day) | ($/acre-feet) | ($) | (acres) | | (feet) | (inch) | | | | | | ($/linear-foot) | ($) | |
| 1A | | | | 1.59 | 3 | 1600 | 4 | 1 | 1 | 1 | 1 | 1 | 46 | $73,600 | $73,600 |
| | | | | 1.89 | 19 | 2800 | 6 | 1 | 1 | 1 | 1 | 1 | 56 | $156,800 | $230,400 |
| | | | | 4.01 | 7 | 2400 | 6 | 1 | 1 | 1 | 1 | 1 | 56 | $134,400 | $364,800 |
| | | | | 0.14 | 26 | 1400 | 4 | 1 | 1 | 1 | 1 | 1 | 46 | $64,400 | $429,200 |
| | | | | 1.06 | 25-26 | 1200 | 4 | 1 | 1 | 1 | 1 | 1 | 46 | $55,200 | $484,400 |
| | | | | 2 | 1 | 800 | 6 | 1 | 1 | 1 | 1 | 1 | 56 | $44,800 | $529,200 |
| | | | | | | | | | | | | | | | |
| Storage | 65.0 | 16,952 | 1,101,880 | | | | | | | | | | | | $1,631,080 |

**Alignment 1B**

| Alignment | Storage Required | Unit Cost[2] | Total Reservoir Cost | Surface Area | From Node | Total Length | Pipe Size | Land Use Factors | Freeways/Highways/Railroads Factors | Hydrography Factors | Existing Utilities Corridors | Total Factor Adjustment | Total PW cost | Estimated Cost | Accum Total Cost |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | RESERVOIR SITE | | | | | | | | | | | | | | |
| | (acre-feet) | ($/acre-feet) | ($) | (acres) | | (feet) | (inch) | | | | | | ($/linear-foot) | ($) | |
| 1B | | | | 2.61 | 29 | 500 | 6 | 1 | 1 | 1 | 1 | 1 | 56 | $28,000 | $28,000 |
| | | | | 2.21 | 29 | 4800 | 6 | 1 | 1 | 1 | 1 | 1 | 56 | $268,800 | $296,800 |
| | | | | 0.31 | 35 | 2400 | 4 | 1 | 1 | 1 | 1 | 1 | 46 | $110,400 | $407,200 |
| | | | | 4.07 | 41 | 2800 | 6 | 1 | 1 | 1 | 1 | 1 | 56 | $156,800 | $564,000 |
| | | | | 0.86 | 45 | 1600 | 4 | 1 | 1 | 1 | 1 | 1 | 46 | $73,600 | $637,600 |
| | | | | 1.81 | 43 | 500 | 4 | 1 | 1 | 1 | 1 | 1 | 46 | $23,000 | $660,600 |
| | | | | 1.01 | 45 | 4000 | 4 | 1 | 1 | 1 | 1 | 1 | 46 | $184,000 | $844,600 |
| | | | | 0.74 | 50 | 2000 | 4 | 1 | 1 | 1 | 1 | 1 | 46 | $92,000 | $936,600 |
| | | | | 1.15 | 45 | 2000 | 4 | 1 | 1 | 1 | 1 | 1 | 46 | $92,000 | $1,028,600 |
| | | | | 1.86 | 45 | 1500 | 6 | 1 | 1 | 1 | 1 | 1 | 56 | $84,000 | $1,112,600 |
| | | | | 2.01 | 50 | 1600 | 6 | 1 | 1 | 1 | 1 | 1 | 56 | $89,600 | $1,202,200 |
| Storage | 825.0 | 16,952 | 13,985,400 | | | | | | | | | | | | $15,187,600 |

# Table 2 (continue)
## Existing Storage Ponds per Alignment
### Sonoma Valley Recycled Water Feasibility Study

**Alignment 2**

| | | RESERVOIR SITE | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alignment | | Storage Required | Unit Cost[2] | Total Reservoir Cost | | Surface Area | From Node | Total Length | Pipe Size | Land Use Factors | Freeways/Highways/Railroads Factors | Hydrography Factors | Existing Utilities Corridors | Total Factor Adjustment | Total PW cost | Estimated Cost | Accum Total Cost |
| | | (acre-feet) | ($/acre-feet) | ($) | | (acres) | | (feet) | (inch) | | | | | | ($/linear-foot) | ($) | |
| 2 | | | | | | 0.45 | 1 | 500 | 4 | 1 | 1 | 1 | 1 | 1 | 46 | $23,000 | $23,000 |
| | | | | | | 1.2 | 7 | | | | | | | | | | |
| | | | | | | 0.75 | 7 | 2800 | 4 | 1 | 1 | 1 | 1 | 1 | 46 | $128,800 | $151,800 |
| | | | | | | 0.42 | 9-11 | | | | | | | | | | |
| | | | | | | 0.24 | 9-11 | 500 | 4 | 1 | 1 | 1 | 1 | 1 | 46 | $23,000 | $174,800 |
| | | | | | | 0.68 | 13 | | | | | | | | | | |
| | | | | | | 1.62 | 13 | | | | | | | | | | |
| | | | | | | 1.08 | 13 | 4800 | 4 | 1 | 1 | 1 | 1 | 1 | 46 | $220,800 | $395,600 |
| | | | | | | 0.15 | 22 | | | | | | | | | | |
| | | | | | | 0.5 | 22 | | | | | | | | | | |
| | | | | | | 0.04 | 22 | | | | | | | | | | |
| | | | | | | 0.15 | 22 | 1600 | 4 | 1 | 1 | 1 | 1 | 1 | 46 | $73,600 | $469,200 |
| Storage | | 65.0 | 16,952 | 1,101,880 | | | | | | | | | | | | | $1,571,080 |

**Alignment 3**

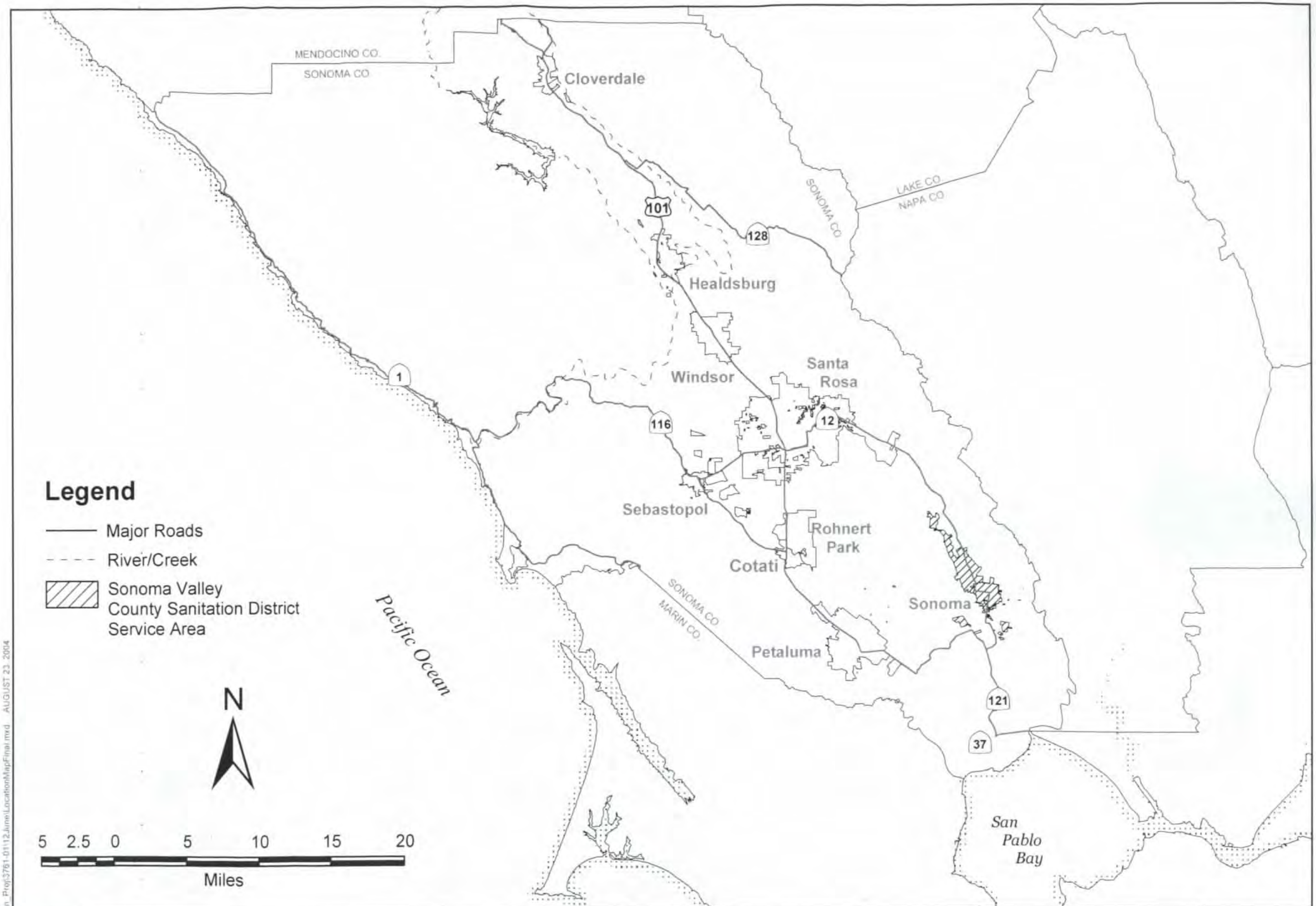
| | | RESERVOIR SITE | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alignment | | Storage Required | Unit Cost[2] | Total Reservoir Cost | | Surface Area | From Node | Total Length | Pipe Size | Land Use Factors | Freeways/Highways/Railroads Factors | Hydrography Factors | Existing Utilities Corridors | Total Factor Adjustment | Total PW cost | Estimated Cost | Accum Total Cost |
| | | (acre-feet) | ($/acre-feet) | ($) | | (acres) | | (feet) | (inch) | | | | | | ($/linear-foot) | ($) | |
| 3 | | | | | | 0.29 | 5-7 | 1200 | 4 | 1 | 1 | 1 | 1 | 1 | 46 | $55,200 | $55,200 |
| | | | | | | 0.28 | 5-7 | 1200 | 4 | 1 | 1 | 1 | 1 | 1 | 46 | $55,200 | $110,400 |
| | | | | | | 0.43 | 7 | 2000 | 4 | 1 | 1 | 1 | 1 | 1 | 46 | $92,000 | $202,400 |
| | | | | | | 0.23 | 7-9 | 300 | 4 | 1 | 1 | 1 | 1 | 1 | 46 | $13,800 | $216,200 |
| | | | | | | 5.23 | 13 | 2800 | 6 | 1 | 1 | 1 | 1 | 1 | 56 | $156,800 | $373,000 |
| | | | | | | 1.38 | 19 | 2800 | 4 | 1 | 1 | 1 | 1 | 1 | 46 | $128,800 | $501,800 |
| | | | | | | 2.12 | 21 | 6400 | 6 | 1 | 1 | 1 | 1 | 1 | 56 | $358,400 | $860,200 |
| | | | | | | 0.88 | 21 | | 4 | 1 | 1 | 1 | 1 | 1 | 46 | $0 | $860,200 |
| | | | | | | 0.88 | 21 | 4000 | 4 | 1 | 1 | 1 | 1 | 1 | 46 | $184,000 | $1,044,200 |
| | | | | | | 0.14 | 23 | 800 | 4 | 1 | 1 | 1 | 1 | 1 | 46 | $36,800 | $1,081,000 |
| | | | | | | 0.35 | 23 | 1200 | 4 | 1 | 1 | 1 | 1 | 1 | 46 | $55,200 | $1,136,200 |
| | | | | | | 0.25 | 23 | 1000 | 4 | 1 | 1 | 1 | 1 | 1 | 46 | $46,000 | $1,182,200 |
| | | | | | | 0.77 | 25-27 | 1800 | 4 | 1 | 1 | 1 | 1 | 1 | 46 | $82,800 | $1,265,000 |
| Storage | | 65.0 | 16,952 | 1,101,880 | | | | | | | | | | | | | $2,366,880 |

**NOTE:**

1) The "Total PW Cost" for pipe sizes other than 6, 8, 12, 18, & 24" were extrapolated from Table 2 in Appendix A of the Cost Critiera for Development of Alternatives report by BARWRP

2) The Storage Unit Cost is based upon the total cost per storage capacity of comparable Agency reservior projects.

# PLATES

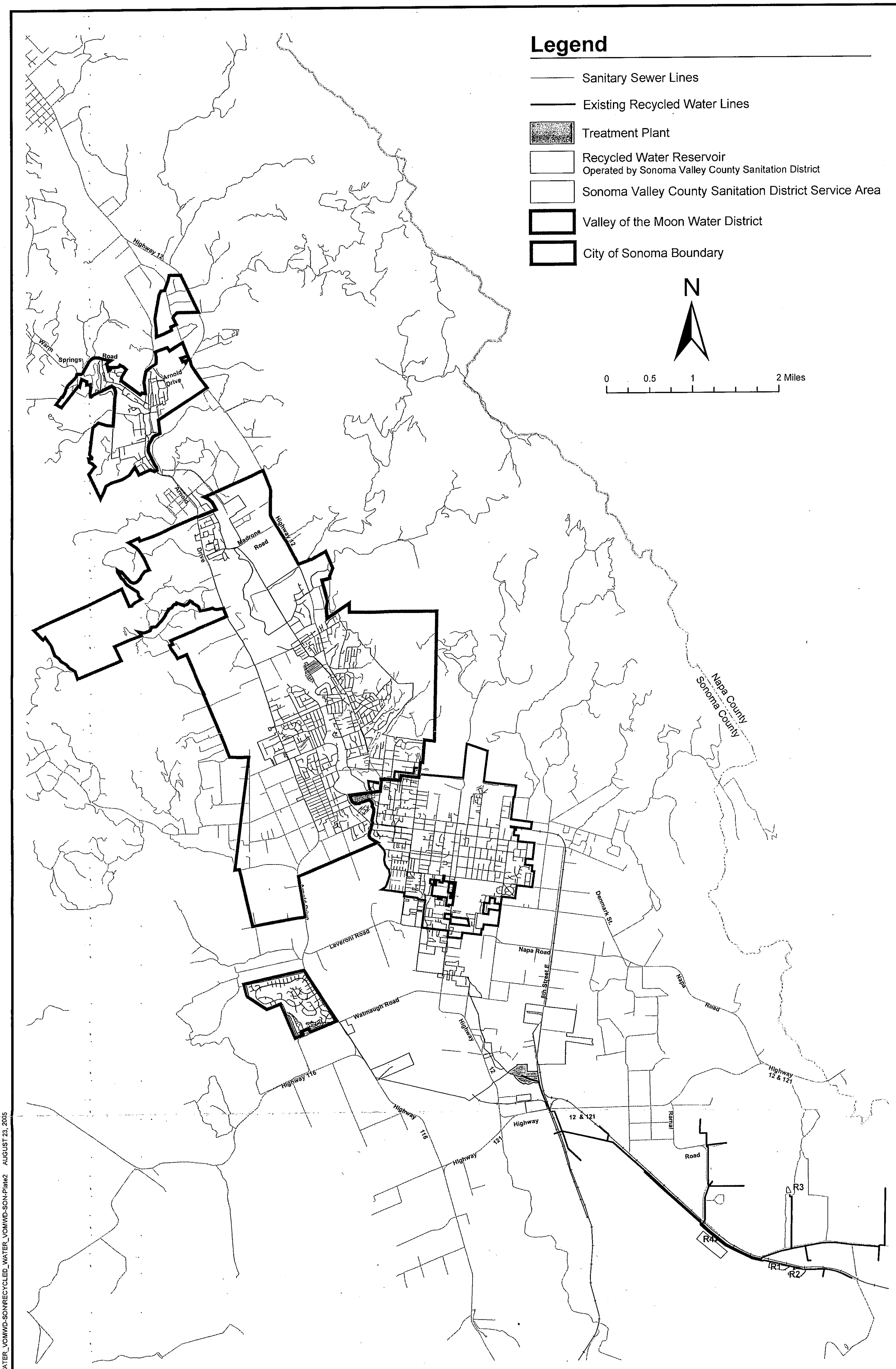



SONOMA COUNTY WATER AGENCY

REGIONAL PROJECT LOCATION MAP

Sonoma Valley Recycled Water Feasibility Study Area

PLATE 1




# Location of Existing Facilities

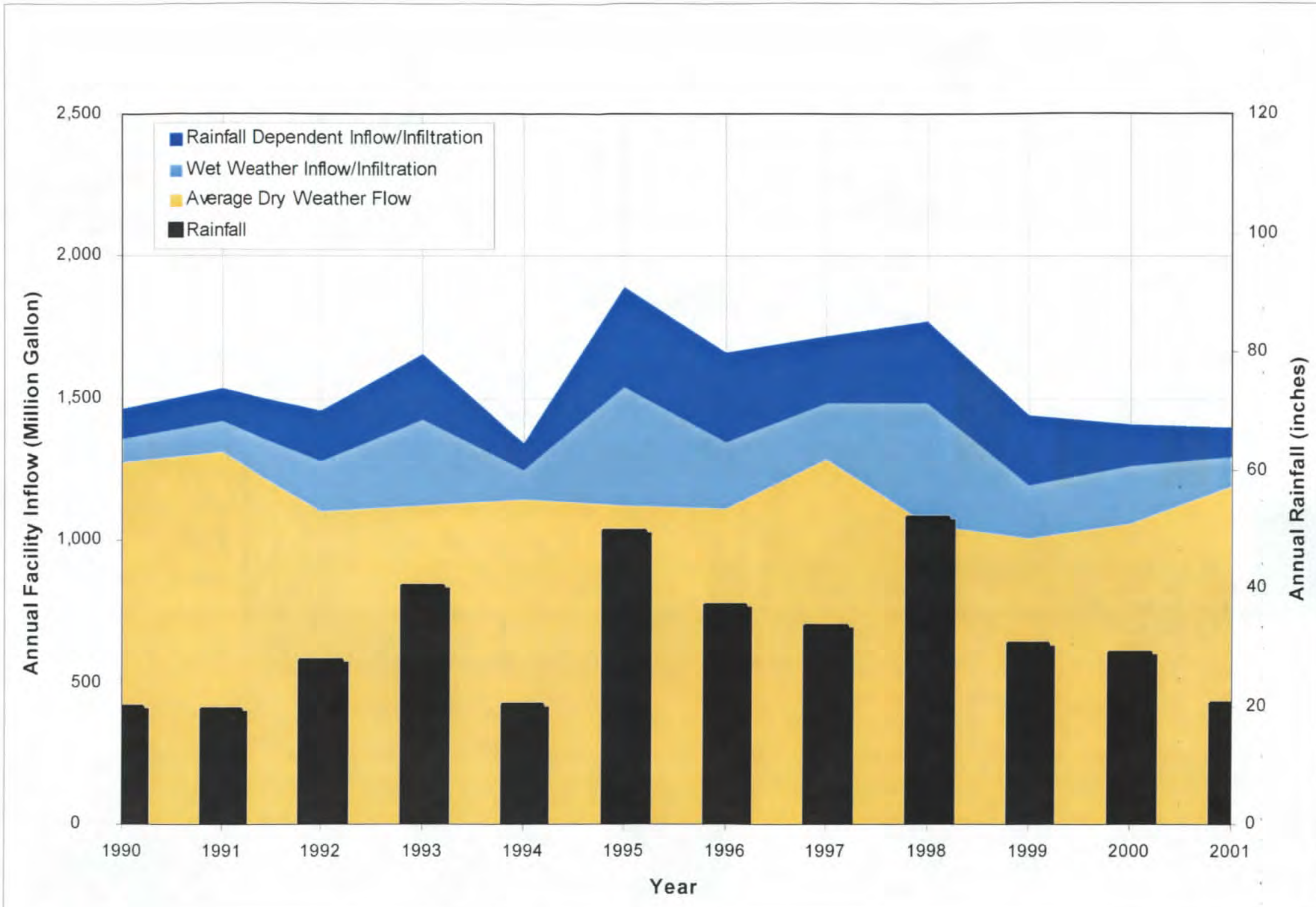
## SONOMA VALLEY COUNTY SANITATION DISTRICT

### Sonoma Valley Recycled Water Feasibility Study Area

SONOMA COUNTY WATER AGENCY

PLATE 2

ARCVIEW\MAPS\RECYCLED_WATER_VOMWD-SON\RECYCLED_WATER_VOMWD-SON-Plate2 AUGUST 23, 2005



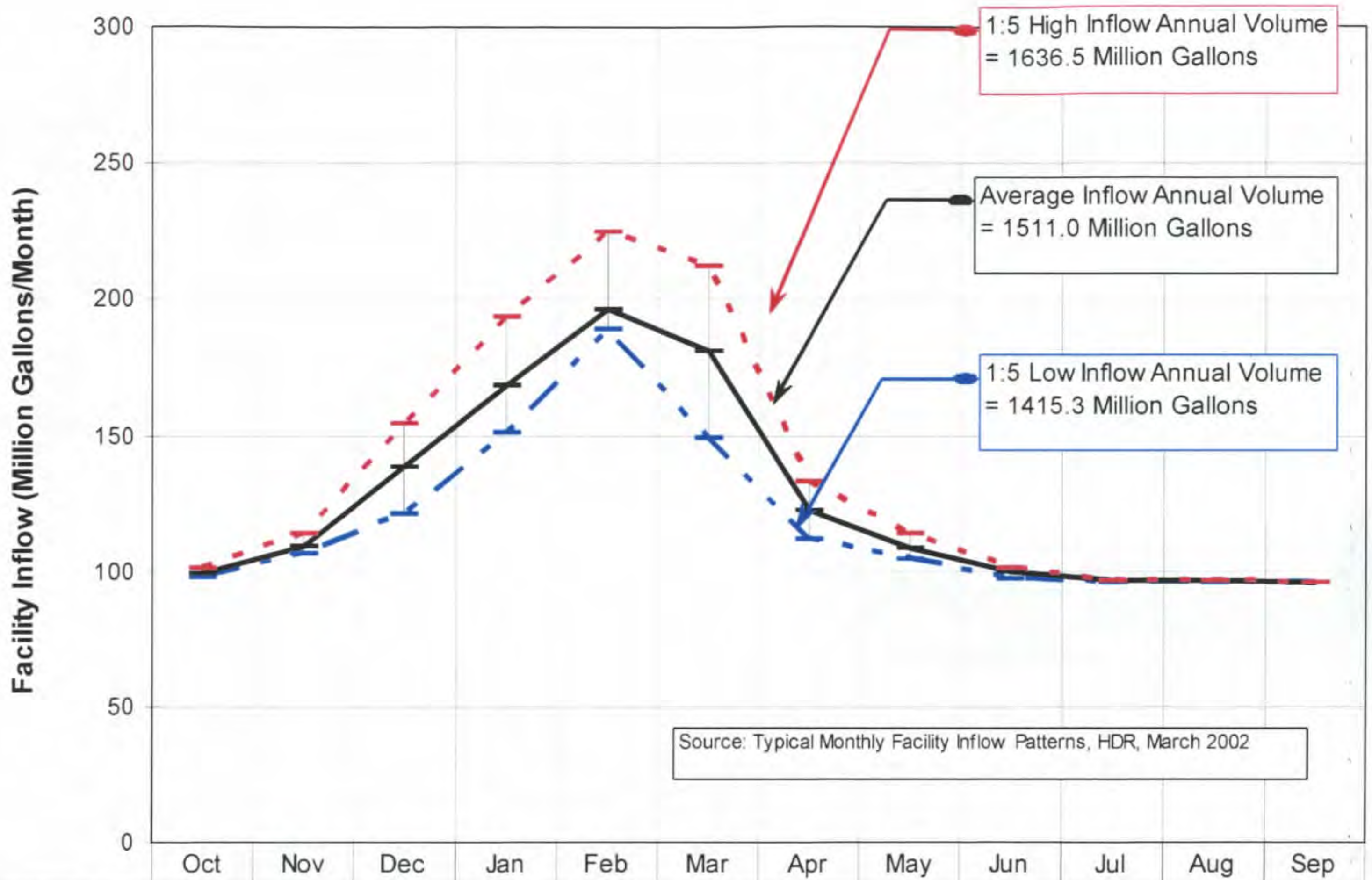

SONOMA COUNTY WATER AGENCY

# INFLUENT TO SVCSD TREATMENT FACILITY (1990 – 2001)

## Sonoma Valley Recycled Water Feasibility Study

PLATE 3

\ARCVIEW\MAPS\RECYCLED WATER VOMWD-SON\PLATES AUGUST 23, 2005



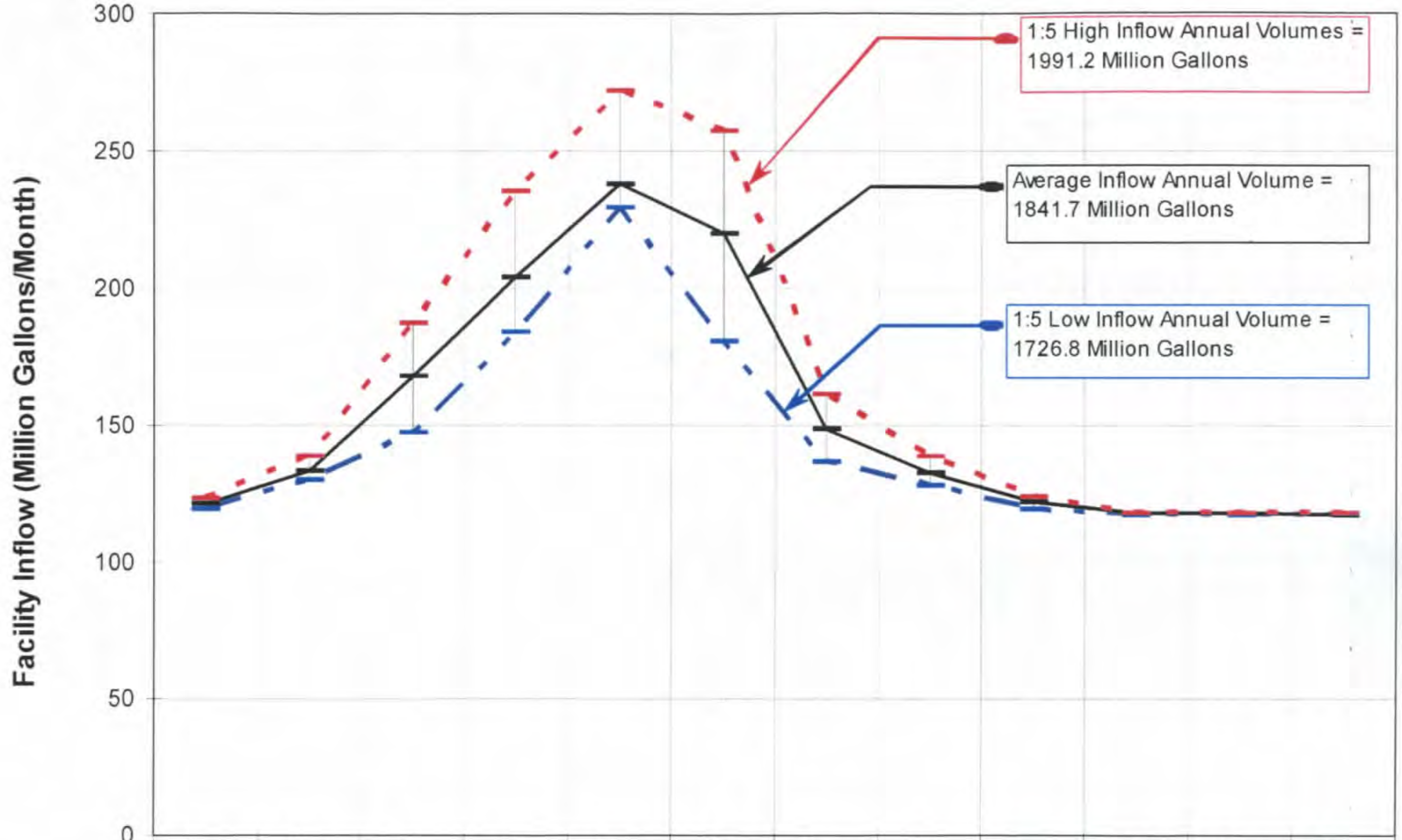

| | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1:5yr Low Inflow | 97.5 | 106.4 | 121.2 | 151.3 | 189.1 | 148.8 | 112.0 | 104.5 | 97.3 | 95.8 | 95.8 | 95.7 |
| Average Inflow | 99.4 | 109.3 | 138.3 | 168.2 | 196.1 | 181.2 | 122.3 | 108.7 | 99.6 | 96.3 | 96.1 | 96.0 |
| 1:5yr High Inflow | 100.9 | 113.9 | 154.1 | 193.9 | 224.6 | 212.5 | 133.0 | 113.5 | 101.1 | 96.5 | 96.3 | 96.1 |

SONOMA COUNTY WATER AGENCY

# EXISTING FLOWS TO TREATMENT FACILITY (1:5 RAINFALL EVENT)

## Sonoma Valley Recycled Water Feasibility Study

PLATE 4




| | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1:5yr Low Inflow | 119.4 | 130.0 | 147.6 | 184.3 | 229.5 | 180.8 | 136.6 | 127.7 | 119.1 | 117.3 | 117.3 | 117.2 |
| Average Inflow | 121.6 | 133.4 | 168.2 | 204.3 | 237.8 | 219.8 | 148.8 | 132.8 | 121.9 | 117.9 | 117.7 | 117.5 |
| 1:5yr High Inflow | 123.4 | 138.9 | 187.0 | 235.1 | 272.0 | 257.2 | 161.6 | 138.5 | 123.7 | 118.2 | 117.9 | 117.7 |

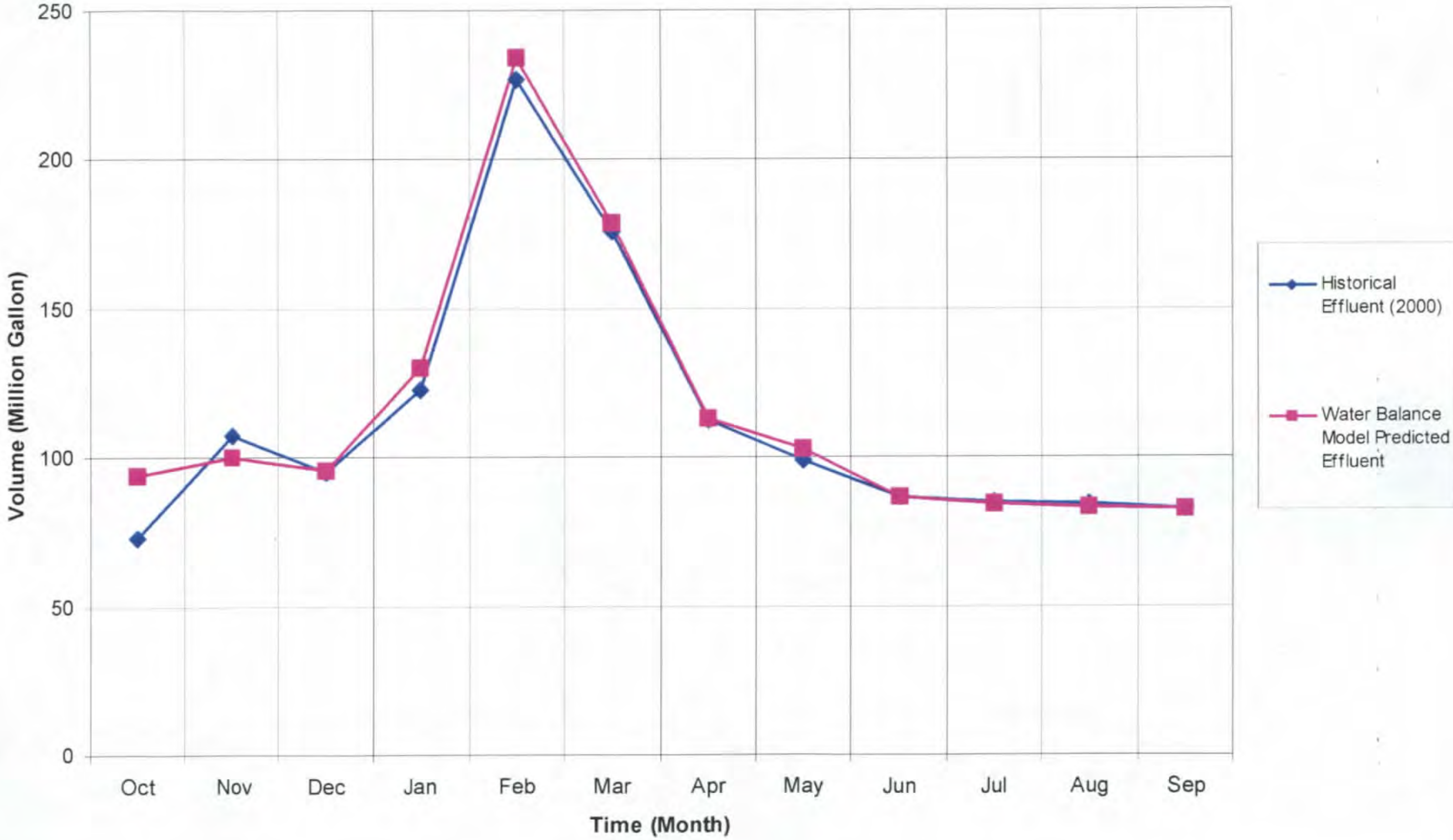


SONOMA COUNTY WATER AGENCY

BUILDOUT FLOWS INTO TREATMENT FACILITY (1:5 RAINFALL EVENT)

Sonoma Valley Recycled Water Feasibility Study

PLATE 5

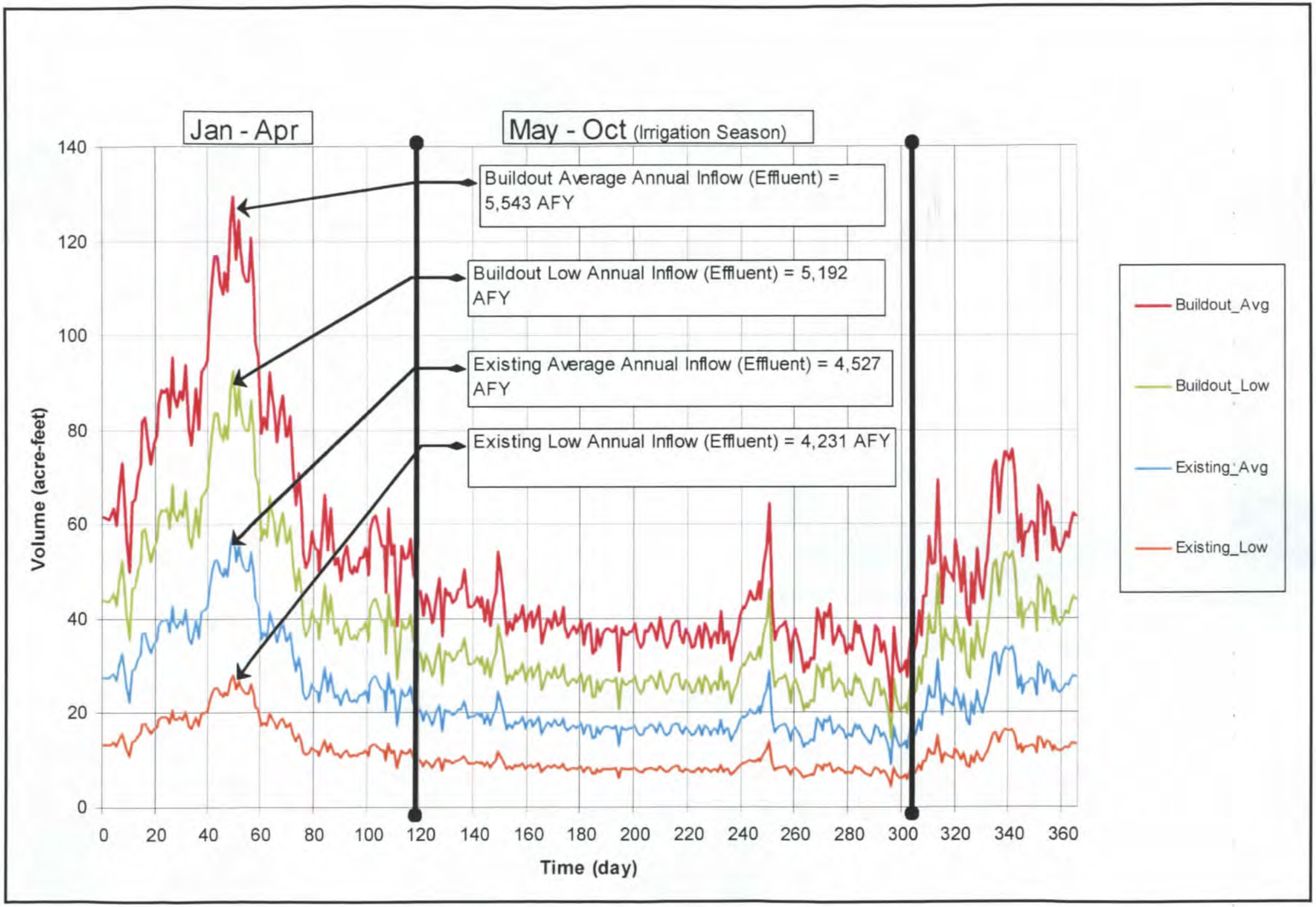



SONOMA COUNTY WATER AGENCY

SVCSD TREATMENT FACILITY EFFLUENT –vs–
WATER BALANCE MODEL PREDICTED EFFLUENT
Sonoma Valley Recycled Water Feasibility Study

PLATE
6

\ARCVIEW\MAPS\RECYCLED WATER VOMWD-SON\PLATES AUGUST 23, 2005



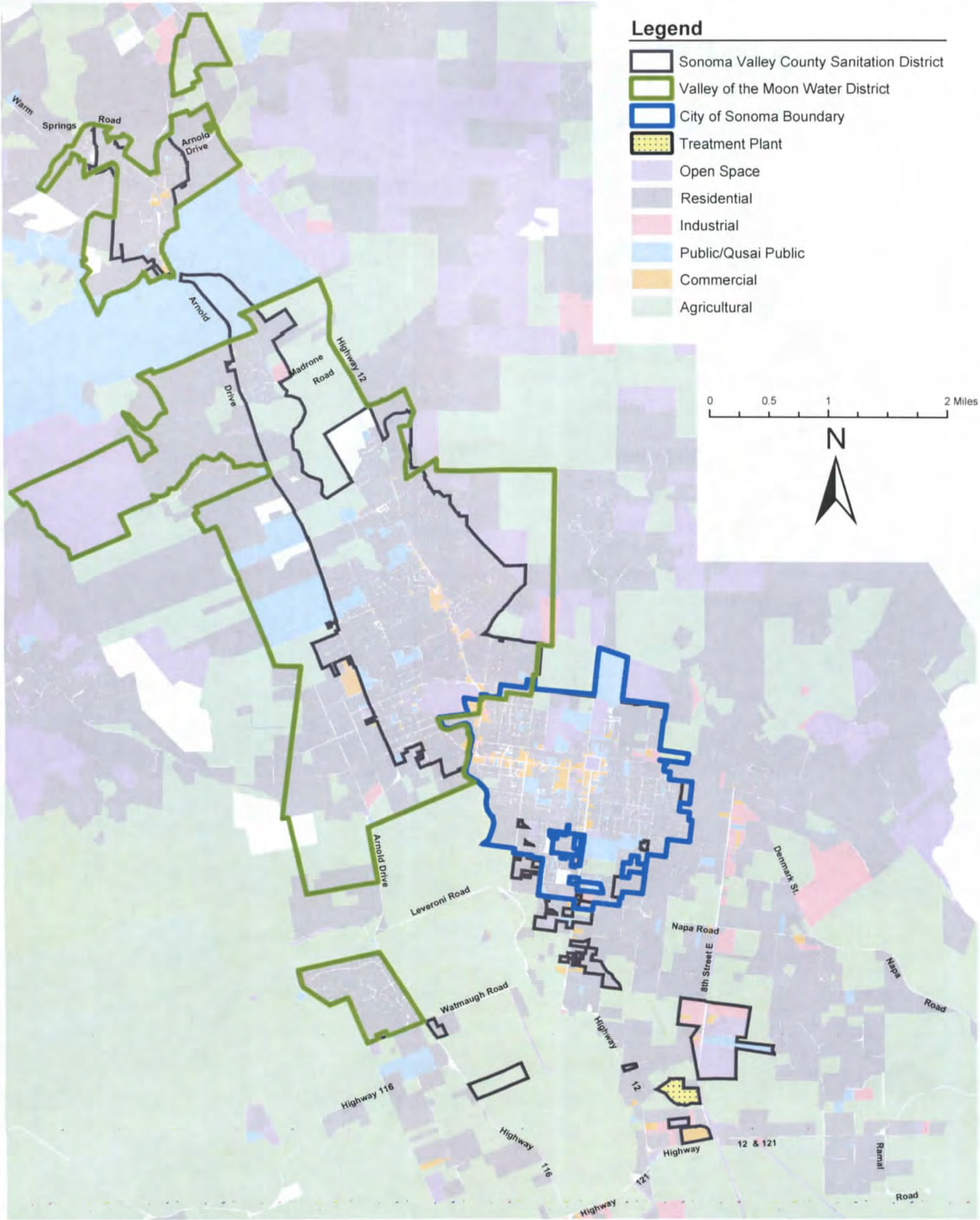



SONOMA COUNTY WATER AGENCY

# RECYCLED WATER SUPPLY CURVES

## Sonoma Valley Recycled Water Feasibility Study

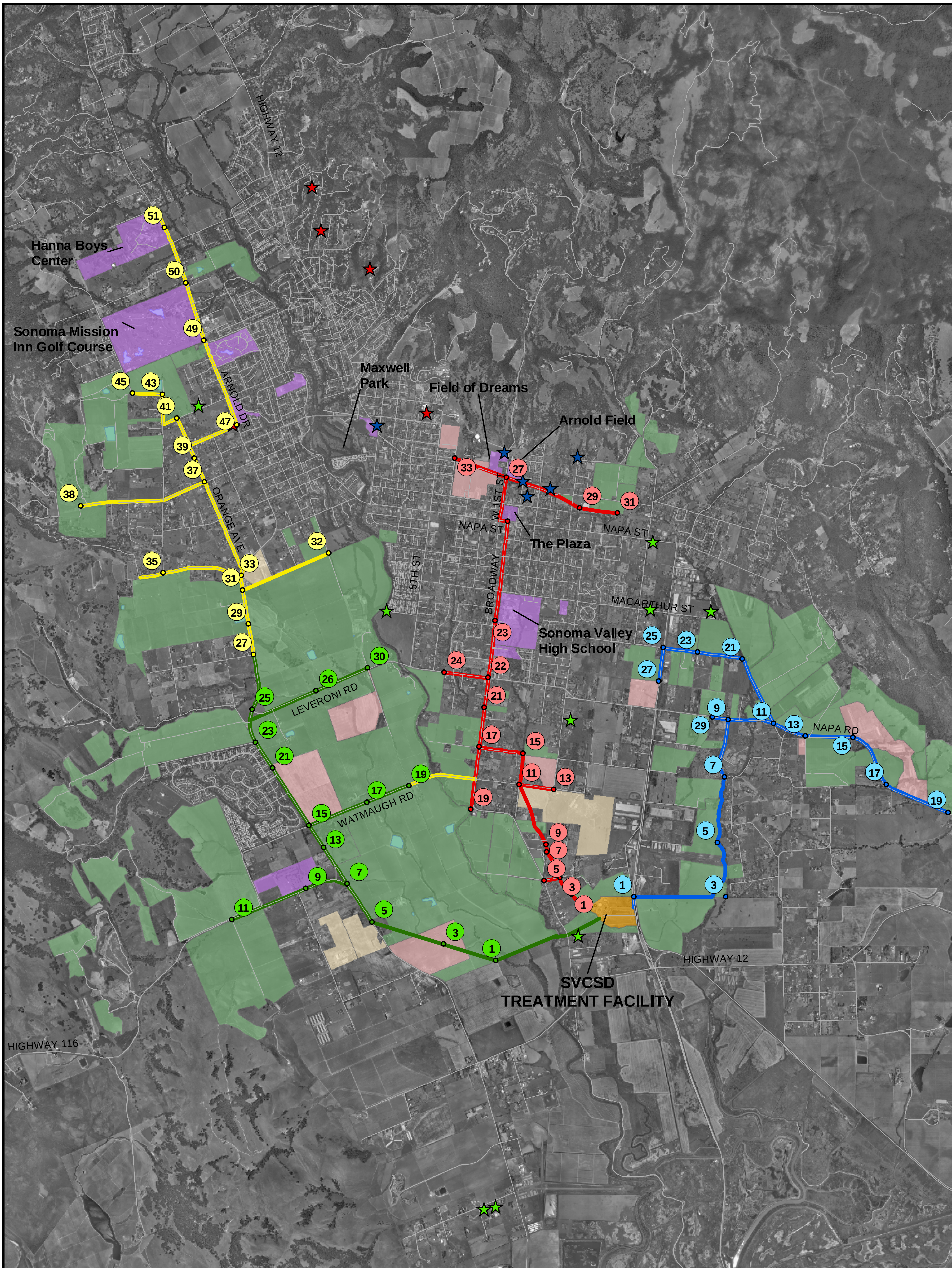
PLATE 7




SONOMA COUNTY WATER AGENCY

# GIS LAND USE MAP
## Sonoma Valley Recycled Water Feasibility Study

**PLATE 8**




## Legend

- Private Wells
- City of Sonoma (Potable Wells)
- Valley of the Moon (Potable Wells)
- Department of Water Resources (Wells)
- Pipeline Node
- Pipeline Alignment 1A
- Pipeline Alignment 1B
- Pipeline Alignment 2
- Pipeline Alignment 3
- Vineyard
- Dairy
- Non-irrigated Pasture
- Urban users
- Wastewater Treatment Plant

N

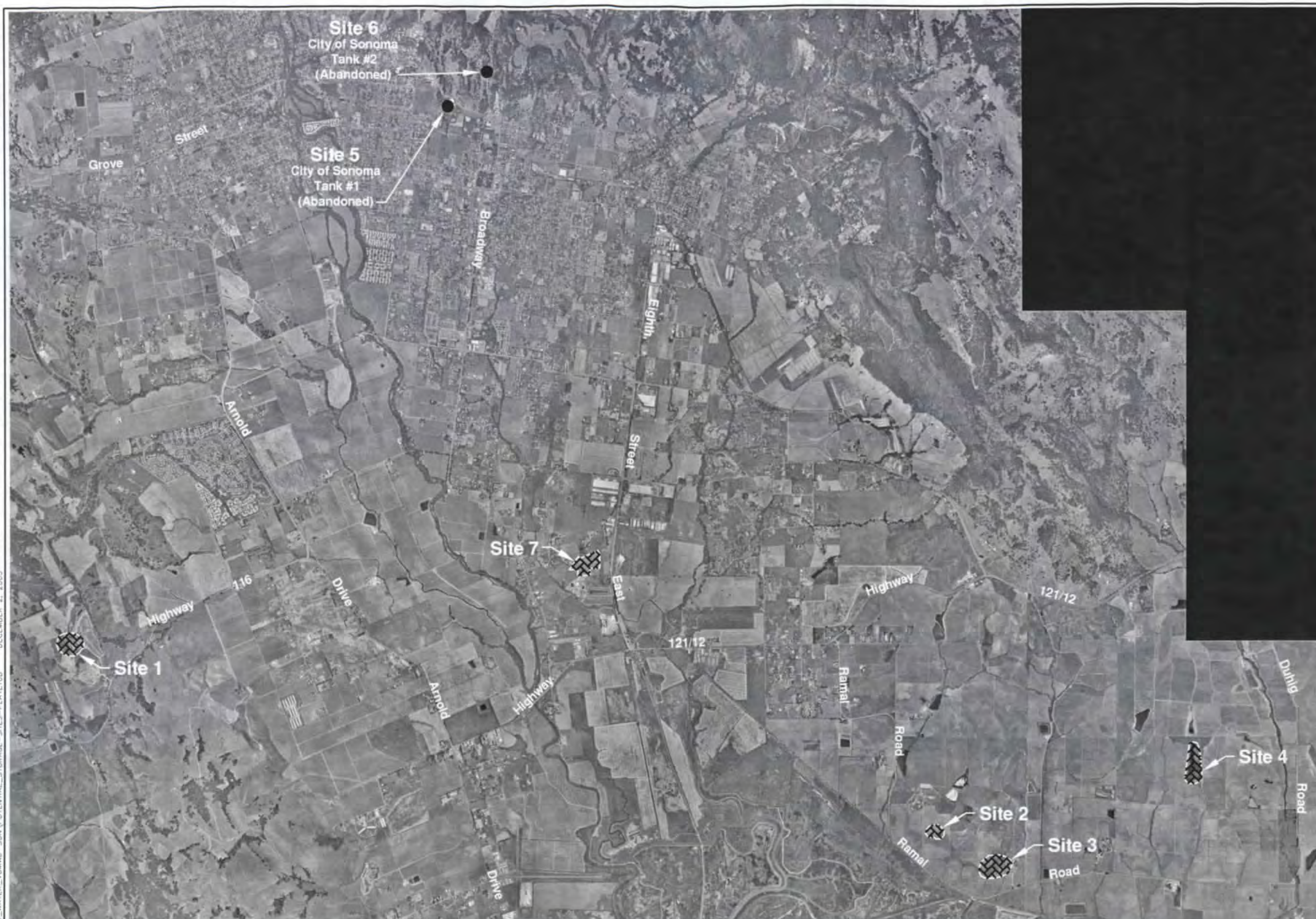
0 0.5 1 1.5 2 Miles

SONOMA COUNTY WATER AGENCY

# PROPOSED PIPELINE ALIGNMENTS

Sonoma Valley Recycled Water Feasibility Study Area

PLATE 9




SONOMA COUNTY WATER AGENCY

POTENTIAL STORAGE SITES
Sonoma Valley Recycled Water Feasibility Study

PLATE 10

\ARCVIEW\MAPS\RECYCLED_WATER_VOMWD-SON\POTENTIAL_STORAGE_SITES-PLATE10B DECEMBER 2, 2005

# APPENDIX A

# LETTERS AND RESOLUTIONS OF SUPPORT

# CITY OF SONOMA

## RESOLUTION NO. 62 - 2002

## A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF SONOMA SUPPORTING THE SONOMA VALLEY COUNTY SANITATION DISTRICT IN CONDUCTING A RECYCLED WATER FEASIBILITY STUDY; DIRECTING THE CITY MANAGER TO DRAFT LETTERS OF SUPPORT FOR SONOMA VALLEY COUNTY SANITATION DISTRICT GRANT FUNDING REQUESTS; AND DIRECTING THE CITY MANAGER TO PROVIDE STAFF SUPPORT TO THE SONOMA VALLEY COUNTY SANITATION DISTRICT FOR REVIEW OF STUDY DOCUMENTS AND IN SUPPORT OF PUBLIC OUTREACH EFFORTS

**WHEREAS,** Sonoma Valley water supplies, including the Sonoma County Water Agency's water transmission system and local groundwater, are constrained during peak water use periods; and

**WHEREAS,** the Sonoma Valley County Sanitation District produces recycled water for beneficial reuse; and

**WHEREAS,** the Sonoma Valley County Sanitation District currently provides recycled water for agricultural use, and for environmental enhancements; and

**WHEREAS,** the use of recycled water can offset potable water uses in the Sonoma Valley including use of the Sonoma County Water Agency's water transmission system by the City of Sonoma and the Valley of the Moon Water District, and use of local groundwater supplies; and

**WHEREAS,** the use of recycled water can provide benefits which include: increasing the reliability of local water supplies, offsetting water transmission system use and groundwater use during peak demand periods, reducing surface discharges to local waterways, and providing water for environmental enhancement and restoration; and

**WHEREAS,** the Sonoma Valley County Sanitation District's Board of Directors has directed staff to develop a recycled water project in the Sonoma Valley to beneficially use recycled water for urban, commercial, environmental, and agricultural purposes; and

**WHEREAS,** Sonoma Valley County Sanitation District staff have embarked on a feasibility study to identify potential alternatives that use recycled water for beneficial purposes within the Sonoma Valley; and

**WHEREAS,** it would benefit the City of Sonoma and the Valley of the Moon Water District to participate in a recycled water use study in the Sonoma Valley because use of recycled water can provide water supply, sanitation, and environmental benefits to Sonoma Valley residents.

**NOW, THEREFORE BE IT RESOLVED** that the City Council of the City of Sonoma approves the following actions:

1. Supports the Sonoma Valley County Sanitation District in conducting a recycled water feasibility study.

2. Directs the City Manager to draft letters of support for the Sonoma Valley County Sanitation District's grant funding requests.

3. Directs the City Manager to provide staff support to the Sonoma Valley County Sanitation District for review of study documents and in support of public outreach efforts.

**PASSED, APPROVED AND ADOPTED** this 7th day of August 2002 by the following vote:

| | | |
|---|---|---|
| AYES: | COUNCILMEMBERS: | Ashford, Costello, Brown, Barnett |
| NOES: | COUNCILMEMBERS: | None |
| ABSENT: | COUNCILMEMBERS: | Mazza |
| ABSTAIN: | COUNCILMEMBERS: | None |

RF Ashford

DICK ASHFORD, VICE MAYOR

ATTEST:

Gay Rainsbarger

GAY RAINSBARGER, CITY CLERK

*VALLEY OF THE MOON WATER DISTRICT*
A Public Agency Established in 1962
19039 Bay Street • P.O. Box 280
El Verano, CA 95433-0280
Phone: (707) 996-1037
Fax: (707) 996-7615



August 19, 2002

Randy Poole, General Manager
Sonoma County Water Agency
P.O. Box 11628
Santa Rosa, CA 95406

Re: Resolution No. 020702, Supporting the Sonoma Valley County Sanitation District Efforts in Conducting a Recycled Water Feasibility Study for a Reclaimed Water Project within the Valley of the Moon Water District

Dear Mr. Poole:

Enclosed for your files, is an original of Resolution No. 020702, A Resolution of the Valley of the Moon Water District Board of Directors, adopted July 30, 2002:

1. Supporting the Sonoma Valley County Sanitation District Efforts in Conducting a Recycled Water Feasibility Study for a Reclaimed Water Project within the Valley of the Moon Water District.
2. Supporting Appropriate Grant Funding for a Cost Effective Recycled Water Project.
3. Authorizing Staff to Assist in the Recycled Water Feasibility Study and to Participate in Public Outreach Efforts to Promote a Cost Effective Recycled Water Project to Benefit the Valley of the Moon Water District.

If you should have any question, please call. Thank you.

Sincerely,

Shari Walk

Shari Walk
Deputy Board Secretary

# RESOLUTION NO. 020702

## A RESOLUTION OF THE VALLEY OF THE MOON WATER DISTRICT BOARD OF DIRECTORS:

1. SUPPORTING THE SONOMA VALLEY COUNTY SANITATION DISTRICT EFFFORTS IN CONDUCTING A RECYCLED WATER FEASIBILITY STUDY FOR A RECLAIMED WATER PROJECT WITHIN THE VALLEY OF THE MOON WATER DISTRICT

2. SUPPORTING APPROPRIATE GRANT FUNDING FOR A COST EFFECTIVE RECYCLED WATER PROJECT

3. AUTHORIZING STAFF TO ASSIST IN THE RECYCLED WATER FEASIBILITY STUDY AND TO PARTICIPATE IN PUBLIC OUTREACH EFFORTS TO PROMOTE A COST EFFECTIVE RECYCLED WATER PROJECT TO BENEFIT THE VALLEY OF THE MOON WATER DISTRICT

**WHEREAS,** the Sonoma Valley water supplies, consist of the Sonoma County Water Agency's water production and transmission system, and local groundwater, and;

**WHEREAS,** these supplies are currently constrained during peak water use periods and droughts, and also may not be sufficient to serve future needs, and;

**WHEREAS,** the Sonoma Valley County Sanitation District currently produces recycled water for beneficial reuse for agriculture and environmental purposes, and;

**WHEREAS,** the use of recycled water can offset potable water uses in the Sonoma Valley, including use of the Sonoma County Water Agency's water production and transmission facilities by the Valley of the Moon Water District and City of Sonoma, and also reduce the use of local groundwater supplies, and;

**WHEREAS,** the use of recycled water can provide benefits which include: increasing the reliability of local water supplies, offsetting water production and transmission system demands and groundwater use during peak demand periods, reducing surface discharges to local waterways, and providing additional water for environmental enhancement and restoration, and;

**WHEREAS,** the Sonoma Valley County Sanitation District's Board of Directors has directed staff to develop a recycled water project in the Sonoma Valley to beneficially use recycled water for urban, commercial, environmental, and agricultural purposes, and;

**WHEREAS,** the Sonoma Valley County Sanitation District has embarked on a feasibility study to identify potential alternatives that use recycled water for beneficial purposes within the Sonoma Valley, and;

**WHEREAS**, a recycled water use study in the Sonoma Valley could result in a cost-effective recycled water project to offset the use of potable water, and provide other benefits such as improved sanitation and environmental programs to Sonoma Valley Residents within the Valley of the Moon Water District;

**NOW, THEREFORE BE IT RESOLVED** that the Board of Directors of the Valley of the Moon Water District hereby resolves to:

1. Support the Sonoma Valley County Sanitation District in conducting a recycled water feasibility study.

2. Support Appropriate Grant Funding for a Cost Effective Recycled Water Project

3. Direct staff to assist the Sonoma Valley County Sanitation District by reviewing study documents and supporting public outreach efforts.

THIS RESOLUTION PASSED AND ADOPED THIS 30th DAY OF JULY 2002, by the following votes:

| | |
|---|---|
| Director Bramfitt | Aye |
| Director Prushko | Aye |
| Director Kenny | Aye |
| Director Willer | Aye |
| Director Woods | Aye |

By Mark Bramfitt
President

By Shari Walk
Secretary

AYES 5 NOES 0 ABSTAIN 0 ABSENT 0

I HEREBY CERTIFY: The foregoing Resolution was duly adopted at a regular meeting of the board of Directors of Valley of the Moon Water District held on the 30th day of July, 2002, of which meeting all Directors were duly notified and at which meeting a quorum was present at all times and acting.

By Shari Walk
Secretary

# SONOMA VALLEY CITIZENS ADVISORY COMMISSION





January 23, 2003

Mr. Randy Poole, General Manager
Sonoma County Water Agency
P.O. Box 11628
Santa Rosa, CA 95406

**RE: Sonoma Valley Recycled Water Feasibility Study**

Dear Mr. Poole:

The Sonoma Valley Citizens Advisory Commission (SVCAC) would like to thank the Sonoma Valley County Sanitation District staff for their presentation to us regarding the Sonoma Valley Recycled Water Feasibility Study.

We believe that the use of recycled water can provide benefits to the Sonoma Valley, including:

- Offsetting SCWA transmission system use and local groundwater use during peak demand periods, thereby increasing the reliability of water supplies.
- Reducing surface discharges to local waterways.
- Providing water for environmental enhancement and restoration.

We are very interested in understanding how to balance these potential uses for reclaimed water, and how the needed storage and distribution systems will be financed.

The SVCAC supports the District in conducting the study, and we look forward to reviewing the results.

Sincerely,

Mark Bramfitt

Mark Bramfitt
Chair

cc: First District Supervisor Valerie Brown, County of Sonoma
Mayor Dick Ashford, City of Sonoma

# SONOMA VALLEY CITIZENS ADVISORY COMMISSION

COPY



January 22, 2003

The Honorable Barbara Boxer
US Senate
Washington, DC 20510

**Re: California Affordable Quantity And Quality Water Act (CAL-AQQWA)**

Dear Senator Boxer:

The Sonoma Valley Citizens Advisory Commission (SVCAC) supports your proposed legislation titled the California Affordable Quantity and Quality Water Act (CAL-AQQWA).

Your bill addresses the urgent need for infrastructure funding for water reclamation projects in California. These projects have great value in reducing discharges to natural waterways, reducing reliance on limited groundwater and riparian water sources and assuring reliable water resources for communities.

The CAL-AQQWA bill will enable a number of strategic water reuse projects in our area to advance, including the Sonoma Valley Recycled Water Project.

Any action you can take to increase the level of funding for this and similar projects is very much appreciated.

Thank you for your efforts to address these funding needs, and add our organization to your list of supporters for this important legislation.

Sincerely-

Mark Bramfitt

Mark Bramfitt
Chair

cc: First District Supervisor Valerie Brown, County of Sonoma
Randy Poole, General Manager, Sonoma County Water Agency
Mayor Dick Ashford, City of Sonoma

# APPENDIX B

# TITLE 22 POTENTIAL USES OF RECYCLED WATER

# Recycled Water Use Allowed In California[1]

| | Treatment Level | | | |
|---|---|---|---|---|
| **Irrigation** | Disinfected Tertiary Recycled Water | Disinfected Secondary-2.2 Recycled Water | Disinfected Secondary-23 Recycled Water | Undisinfected Secondary Recycled Water |
| Food crops where recycled water contacts the edible portion of the crop, including all root crops | **Allowed** | Not allowed | Not allowed | Not allowed |
| Parks and playgrounds | **Allowed** | Not allowed | Not allowed | Not allowed |
| School yards | **Allowed** | Not allowed | Not allowed | Not allowed |
| Residential landscaping | **Allowed** | Not allowed | Not allowed | Not allowed |
| Unrestricted access golf courses | **Allowed** | Not allowed | Not allowed | Not allowed |
| Any other irrigation uses not prohibited by other provisions of the California Code of Regulations | **Allowed** | Not allowed | Not allowed | Not allowed |
| Food crops where edible portion is produced above ground and not contacted by recycled water | **Allowed** | **Allowed** | Not allowed | Not allowed |
| Cemeteries | **Allowed** | **Allowed** | **Allowed** | Not allowed |
| Freeway landscaping | **Allowed** | **Allowed** | **Allowed** | Not allowed |
| Restricted access golf courses | **Allowed** | **Allowed** | **Allowed** | Not allowed |
| Ornamental nursery stock and sod farms | **Allowed** | **Allowed** | **Allowed** | Not allowed |
| Pasture for milk animals | **Allowed** | **Allowed** | **Allowed** | Not allowed |
| Nonedible vegetation with access control to prevent use as a park, playground or school yard | **Allowed** | **Allowed** | **Allowed** | Not allowed |
| Orchards with no contact between edible portion and recycled water | **Allowed** | **Allowed** | **Allowed** | **Allowed** |
| Vineyards with no contact between edible portion and recycled water | **Allowed** | **Allowed** | **Allowed** | **Allowed** |
| Non food-bearing trees, including Christmas trees not irrigated less than 14 days before harvest | **Allowed** | **Allowed** | **Allowed** | **Allowed** |
| Fodder crops (e.g. alfalfa) and fiber crops (e.g. cotton) | **Allowed** | **Allowed** | **Allowed** | **Allowed** |
| Seed crops not eaten by humans | **Allowed** | **Allowed** | **Allowed** | **Allowed** |
| Food crops that undergo commercial pathogen-destroying processing before consumption by humans | **Allowed** | **Allowed** | **Allowed** | **Allowed** |
| Ornamental nursery stock, sod farms not irrigated less than 14 days before harvest | **Allowed** | **Allowed** | **Allowed** | **Allowed** |
| **Supply for Impoundment** | Disinfected Tertiary Recycled Water | Disinfected Secondary-2.2 Recycled Water | Disinfected Secondary-23 Recycled Water | Undisinfected Secondary Recycled Water |
| Non-restricted recreational impoundments, with supplemental monitoring for pathogenic organisms | **Allowed**[2] | Not allowed | Not allowed | Not allowed |
| Restricted recreational impoundments and publicly accessible fish hatcheries | **Allowed** | **Allowed** | Not allowed | Not allowed |
| Landscape impoundments without decorative fountains | **Allowed** | **Allowed** | **Allowed** | Not allowed |
| **Supply for cooling or air conditioning** | Disinfected Tertiary Recycled Water | Disinfected Secondary-2.2 Recycled Water | Disinfected Secondary-23 Recycled Water | Undisinfected Secondary Recycled Water |
| Industrial or commercial cooling or air conditioning involving cooling tower, evaporative condenser, or spraying that creates a mist | **Allowed**[3] | Not allowed | Not allowed | Not allowed |
| Industrial or commercial cooling or air conditioning not involving cooling tower, evaporative condenser, or spraying that creates a mist | **Allowed** | **Allowed** | **Allowed** | Not allowed |
| **Other Uses** | Disinfected Tertiary Recycled Water | Disinfected Secondary-2.2 Recycled Water | Disinfected Secondary-23 Recycled Water | Undisinfected Secondary Recycled Water |
| Groundwater recharge | **Allowed under special case by case permits by RWQCBs**[4] | | | |
| Flushing toilets and urinals | **Allowed** | Not allowed | Not allowed | Not allowed |
| Priming drain traps | **Allowed** | Not allowed | Not allowed | Not allowed |
| Industrial process water that may contact workers | **Allowed** | Not allowed | Not allowed | Not allowed |
| Structural fire fighting | **Allowed** | Not allowed | Not allowed | Not allowed |
| Decorative fountains | **Allowed** | Not allowed | Not allowed | Not allowed |
| Commercial laundries | **Allowed** | Not allowed | Not allowed | Not allowed |
| Consolidation of backfill material around potable water pipelines | **Allowed** | Not allowed | Not allowed | Not allowed |
| Artificial snow making for commercial outdoor uses | **Allowed** | Not allowed | Not allowed | Not allowed |
| Commercial car washes not done by hand & excluding the general public from washing process | **Allowed** | Not allowed | Not allowed | Not allowed |
| Industrial process water that will not come into contact with workers | **Allowed** | **Allowed** | **Allowed** | Not allowed |
| Industrial boiler feed | **Allowed** | **Allowed** | **Allowed** | Not allowed |
| Nonstructural fire fighting | **Allowed** | **Allowed** | **Allowed** | Not allowed |
| Backfill consolidation around nonpotable piping | **Allowed** | **Allowed** | **Allowed** | Not allowed |
| Soil compaction | **Allowed** | **Allowed** | **Allowed** | Not allowed |
| Mixing concrete | **Allowed** | **Allowed** | **Allowed** | Not allowed |
| Dust control on roads and streets | **Allowed** | **Allowed** | **Allowed** | Not allowed |
| Cleaning roads, sidewalks and outdoor work areas | **Allowed** | **Allowed** | **Allowed** | Not allowed |
| Flushing sanitary sewers | **Allowed** | **Allowed** | **Allowed** | **Allowed** |

*Note:*

*1)* *Source*: This chart is an informal summary of the uses allowed based on the California Department of Health Services Title 22, Article 4 Code of Regulations' June 2001 version.

*2)* With "conventional tertiary treatment." Additional monitoring for two years or more is necessary with direct filtration

*3)* Drift eliminators and/or biocides are required if public or employees can be exposed to mist.

*4)* Refer to Groundwater Recharge Guidelines

# APPENDIX C

# POTENTIAL USERS, ANNUAL USE, AND PEAK USE

## ALIGNMENT 1A

## POTENTIAL USERS, ANNUAL USE, AND PEAK USE

# Sonoma Valley Recycled Water Feasibility Study
## Alternative I-A
## Estimated Demands

Segment: WWTP - Point 1

| Category | ID # | Description | Acres | Fraction of Area for Recycled Water Use | Applied Acres | Application Rate | Application Duration | Demand | Demand | Node |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | (acres) | (AF/acre) | (months) | (AFY) | (mgd) | |
| 2 | 84a | Vineyard | 203 | 0.8 | 162.4 | 0.5 | 6 | 81.2 | 0.072495 | 1 |
| | | | | | | | Total = | 81.2 | 0.072495 | |

Segment: Point 1 - Point 3

| Category | ID # | Description | Acres | Fraction of Area for Recycled Water Use | Applied Acres | Application Rate | Application Duration | Demand | Demand | Node |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | (acres) | (AF/acre) | (months) | (AFY) | (mgd) | |
| 7 | 49 | on Irrigated Pastu | 81 | 0.8 | 64.8 | 0.1 | 6 | 6.48 | 0.005785 | 3 |
| | | | | | | | Total = | 6.48 | 0.005785 | |

Segment: Point 3 - Point 5

| Category | ID # | Description | Acres | Fraction of Area for Recycled Water Use | Applied Acres | Application Rate | Application Duration | Demand | Demand | Node |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | (acres) | (AF/acre) | (months) | (AFY) | (mgd) | |
| 5 | 1 | Dairy | 32 | 0.5 | 16 | 3 | 6 | 48 | 0.042854 | 5 |
| 5 | 9 | Dairy | 38 | 0.5 | 19 | 3 | 6 | 57 | 0.05089 | 5 |
| 2 | 84b | Vineyard | 104 | 0.8 | 83.2 | 0.5 | 6 | 41.6 | 0.037141 | 5 |
| | | | | | | | Total = | 146.6 | 0.130885 | |

Segment: Point 5 - Point 7

| Category | ID # | Description | Acres | Fraction of Area for Recycled Water Use | Applied Acres | Application Rate | Application Duration | Demand | Demand | Node |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | (acres) | (AF/acre) | (months) | (AFY) | (mgd) | |
| 2 | 84d | Vineyard | 107 | 0.8 | 85.6 | 0.5 | 6 | 42.8 | 0.038212 | 7 |
| | | | | | | | Total = | 42.8 | 0.038212 | |

Segment: Point 7 - Point 9

| Category | ID # | Description | Acres | Fraction of Area for Recycled Water Use | Applied Acres | Application Rate | Application Duration | Demand | Demand | Node |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | (acres) | (AF/acre) | (months) | (AFY) | (mgd) | |
| 8 | 1 | Golf (now Vineyar | 35 | 0.8 | 28 | 0.5 | 6 | 14 | 0.012499 | 9 |
| | | | | | | | Total = | 14 | 0.012499 | |

Note: Golf Course Owner will not use on course, but will use on 35 acres of Vineyards

Segment: Point 9 - Point 11

| Category | ID # | Description | Acres | Fraction of Area for Recycled Water Use | Applied Acres | Application Rate | Application Duration | Demand | Demand | Node |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | (acres) | (AF/acre) | (months) | (AFY) | (mgd) | |
| 2 | 65 | Vineyard | 200 | 0.8 | 160 | 0.5 | 6 | 80 | 0.071424 | 11 |
| 2 | Fosters | Vineyard | 386 | 0.8 | 308.8 | 0.5 | 6 | 154.4 | 0.137848 | 11 |
| | | | | | | | Total = | 234.4 | 0.209273 | |

Segment: Point 7 - Point 13

| Category | ID # | Description | Acres | Fraction of Area for Recycled Water Use | Applied Acres | Application Rate | Application Duration | Demand | Demand | Node |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | (acres) | (AF/acre) | (months) | (AFY) | (mgd) | |
| 7 | 87 | on Irrigated Pastu | 20 | 0.8 | 16 | 0.1 | 6 | 1.6 | 0.001428 | 13 |
| | | | | | | | Total = | 1.6 | 0.001428 | |

Segment: Point 13 - Point 15

| Category | ID # | Description | Acres | Fraction of Area for Recycled Water Use | Applied Acres | Application Rate | Application Duration | Demand | Demand | Node |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | (acres) | (AF/acre) | (months) | (AFY) | (mgd) | |
| 2 | 79a | Vineyard | 90 | 0.8 | 72 | 0.5 | 6 | 36 | 0.032141 | 15 |
| | | | | | | | Total = | 36 | 0.032141 | |

# Sonoma Valley Recycled Water Feasibility Study
## Alternative I-A
## Estimated Demands

Segment: Point 15 - Point 17

| Category | ID # | Description | Acres | Fraction of Area for Recycled Water Use | Applied Acres | Application Rate | Application Duration | Demand | Demand | Node |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | (acres) | (AF/acre) | (months) | (AFY) | (mgd) | |
| 2 | 79b | Vineyard | 156 | 0.8 | 124.8 | 0.5 | 6 | 62.4 | 0.055711 | 17 |
| 2 | 84e | Vineyard | 108 | 0.8 | 86.4 | 0.5 | 6 | 43.2 | 0.038569 | 17 |
| | | | | | | | Total = | 105.6 | 0.09428 | |

Segment: Point 17 - Point 19

| Category | ID # | Description | Acres | Fraction of Area for Recycled Water Use | Applied Acres | Application Rate | Application Duration | Demand | Demand | Node |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | (acres) | (AF/acre) | (months) | (AFY) | (mgd) | |
| 2 | 79c | Vineyard | 54 | 0.8 | 43.2 | 0.5 | 6 | 21.6 | 0.019285 | 19 |
| 2 | 84c | Vineyard | 115 | 0.8 | 92 | 0.5 | 6 | 46 | 0.041069 | 19 |
| 2 | 1000 | Vineyard | 48 | 0.8 | 38.4 | 0.5 | 6 | 19.2 | 0.017142 | 19 |
| | | | | | | | Total = | 86.8 | 0.077495 | |

Segment: Point 15 - Point 21

| Category | ID # | Description | Acres | Fraction of Area for Recycled Water Use | Applied Acres | Application Rate | Application Duration | Demand | Demand | Node |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | (acres) | (AF/acre) | (months) | (AFY) | (mgd) | |
| 2 | 79d | Vineyard | 74 | 0.8 | 59.2 | 0.5 | 6 | 29.6 | 0.026427 | 21 |
| | | | | | | | Total = | 29.6 | 0.026427 | |

Segment: Point 21 - Point 23

| Category | ID # | Description | Acres | Fraction of Area for Recycled Water Use | Applied Acres | Application Rate | Application Duration | Demand | Demand | Node |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | (acres) | (AF/acre) | (months) | (AFY) | (mgd) | |
| 2 | 82d | Vineyard | 199 | 0.8 | 159.2 | 0.5 | 6 | 79.6 | 0.071067 | 23 |
| 2 | 82e | Vineyard | 47 | 0.8 | 37.6 | 0.5 | 6 | 18.8 | 0.016785 | 23 |
| 2 | 82f | Vineyard | 21 | 0.8 | 16.8 | 0.5 | 6 | 8.4 | 0.0075 | 23 |
| | | | | | | | Total = | 106.8 | 0.095351 | |

Segment: Point 23 - Point 25

| Category | ID # | Description | Acres | Fraction of Area for Recycled Water Use | Applied Acres | Application Rate | Application Duration | Demand | Demand | Node |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | (acres) | (AF/acre) | (months) | (AFY) | (mgd) | |
| 2 | 80a | Vineyard | 64 | 0.8 | 51.2 | 0.5 | 6 | 25.6 | 0.022856 | 25 |
| | | | | | | | Total = | 25.6 | 0.022856 | |

Segment: Point 25 - Point 26

| Category | ID # | Description | Acres | Fraction of Area for Recycled Water Use | Applied Acres | Application Rate | Application Duration | Demand | Demand | Node |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | (acres) | (AF/acre) | (months) | (AFY) | (mgd) | |
| 2 | 79d | Vineyard | 74 | 0.8 | 59.2 | 0.5 | 6 | 29.6 | 0.026427 | 26 |
| | | | | | | | Total = | 29.6 | 0.026427 | |

Segment: Point 26 - Point 30

| Category | ID # | Description | Acres | Fraction of Area for Recycled Water Use | Applied Acres | Application Rate | Application Duration | Demand | Demand | Node |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | (acres) | (AF/acre) | (months) | (AFY) | (mgd) | |
| 2 | 79f | Vineyard | 73 | 0.8 | 58.4 | 0.5 | 6 | 29.2 | 0.02607 | 30 |
| 2 | 80b | Vineyard | 190 | 0.8 | 152 | 0.5 | 6 | 76 | 0.067853 | 30 |
| 7 | 41 | on Irrigated Pastu | 58 | 0.8 | 46.4 | 0.1 | 6 | 4.64 | 0.004143 | 30 |
| | | | | | | | Total = | 109.84 | 0.098065 | |

Segment: Point 25 - Point 27

| Category | ID # | Description | Acres | Fraction of Area for Recycled Water Use | Applied Acres | Application Rate | Application Duration | Demand | Demand | Node |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | (acres) | (AF/acre) | (months) | (AFY) | (mgd) | |
| 2 | 80c | Vineyard | 94 | 0.8 | 75.2 | 0.5 | 6 | 37.6 | 0.033569 | 27 |
| | | | | | | | Total = | 37.6 | 0.033569 | |

**Alternative I-A Total = 1094.52**

## ALIGNMENT 1B

## POTENTIAL USERS, ANNUAL USE, AND PEAK USE

# Sonoma Valley Recycled Water Feasibility Study
## Alternative I-B
## Estimated Demands

Segment: Point 27 - Point 29

| Category | ID # | Description | Acres | Fraction of Area for Recycled Water Use | Applied Acres | Application Rate | Application Duration | Demand | Demand | Node |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | (acres) | (AF/acre) | (months) | (AFY) | (mgd) | |
| 2 | 82a | Vineyard | 141 | 0.8 | 112.8 | 0.5 | 6 | 56.4 | 0.050354 | 29 |
| | | | | | | | Total = | 56.4 | 0.050354 | |

Segment: Point 29 - Point 31

| Category | ID # | Description | Acres | Fraction of Area for Recycled Water Use | Applied Acres | Application Rate | Application Duration | Demand | Demand | Node |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | (acres) | (AF/acre) | (months) | (AFY) | (mgd) | |
| NA | | | 0 | 0.8 | 0 | 0.5 | 6 | 0 | 0 | 31 |
| | | | | | | | Total = | 0 | 0 | |

Segment: Point 31 - Point 32

| Category | ID # | Description | Acres | Fraction of Area for Recycled Water Use | Applied Acres | Application Rate | Application Duration | Demand | Demand | Node |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | (acres) | (AF/acre) | (months) | (AFY) | (mgd) | |
| 2 | 80d | Vineyard | 243 | 0.8 | 194.4 | 0.5 | 6 | 97.2 | 0.08678 | 32 |
| | | | | | | | Total = | 97.2 | 0.08678 | |

Segment: Point 31 - Point 33

| Category | ID # | Description | Acres | Fraction of Area for Recycled Water Use | Applied Acres | Application Rate | Application Duration | Demand | Demand | Node |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | (acres) | (AF/acre) | (months) | (AFY) | (mgd) | |
| NA | | | 0 | 0.8 | 0 | 0.5 | 6 | 0 | 0 | 33 |
| | | | | | | | Total = | 0 | 0 | |

Segment: Point 33 - Point 35

| Category | ID # | Description | Acres | Fraction of Area for Recycled Water Use | Applied Acres | Application Rate | Application Duration | Demand | Demand | Node |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | (acres) | (AF/acre) | (months) | (AFY) | (mgd) | |
| 2 | 82b | Vineyard | 156 | 0.8 | 124.8 | 0.5 | 6 | 62.4 | 0.055711 | 35 |
| 2 | 82c | Vineyard | 51 | 0.8 | 40.8 | 0.5 | 6 | 20.4 | 0.018213 | 35 |
| | | | | | | | Total = | 82.8 | 0.073924 | |

Segment: Point 33 - Point 37

| Category | ID # | Description | Acres | Fraction of Area for Recycled Water Use | Applied Acres | Application Rate | Application Duration | Demand | Demand | Node |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | (acres) | (AF/acre) | (months) | (AFY) | (mgd) | |
| NA | | | 0 | 0.8 | 0 | 0.5 | 6 | 0 | 0 | 37 |
| | | | | | | | Total = | 0 | 0 | |

Segment: Point 37 - Point 38

| Category | ID # | Description | Acres | Fraction of Area for Recycled Water Use | Applied Acres | Application Rate | Application Duration | Demand | Demand | Node |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | (acres) | (AF/acre) | (months) | (AFY) | (mgd) | |
| 2 | 1001 | Vineyard | 147 | 0.8 | 117.6 | 0.5 | 6 | 58.8 | 0.052497 | 38 |
| | | | | | | | Total = | 58.8 | 0.052497 | |

Segment: Point 37 - Point 39

| Category | ID # | Description | Acres | Fraction of Area for Recycled Water Use | Applied Acres | Application Rate | Application Duration | Demand | Demand | Node |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | (acres) | (AF/acre) | (months) | (AFY) | (mgd) | |
| NA | | | 0 | 0.8 | 0 | 0.5 | 6 | 0 | 0 | 39 |
| | | | | | | | Total = | 0 | 0 | |

# Sonoma Valley Recycled Water Feasibility Study
## Alternative I-B
## Estimated Demands

**Segment: Point 39 - Point 41**

| Category | ID # | Description | Acres | Fraction of Area for Recycled Water Use | Applied Acres | Application Rate | Application Duration | Demand | Demand | Node |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | (acres) | (AF/acre) | (months) | (AFY) | (mgd) | |
| NA | | | 0 | 0.8 | 0 | 0.5 | 6 | 0 | 0 | 41 |
| | | | | | | | Total = | 0 | 0 | |

**Segment: Point 41 - Point 43**

| Category | ID # | Description | Acres | Fraction of Area for Recycled Water Use | Applied Acres | Application Rate | Application Duration | Demand | Demand | Node |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | (acres) | (AF/acre) | (months) | (AFY) | (mgd) | |
| 2 | 52 | Vineyard | 73 | 0.8 | 58.4 | 0.5 | 6 | 29.2 | 0.02607 | 43 |
| | | | | | | | Total = | 29.2 | 0.02607 | |

**Segment: Point 43 - Point 45**

| Category | ID # | Description | Acres | Fraction of Area for Recycled Water Use | Applied Acres | Application Rate | Application Duration | Demand | Demand | Node |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | (acres) | (AF/acre) | (months) | (AFY) | (mgd) | |
| 2 | 66 | Vineyard | 188 | 0.8 | 150.4 | 0.5 | 6 | 75.2 | 0.067139 | 45 |
| | | | | | | | Total = | 75.2 | 0.067139 | |

**Segment: Point 39 - Point 47**

| Category | ID # | Description | Acres | Fraction of Area for Recycled Water Use | Applied Acres | Application Rate | Application Duration | Demand | Demand | Node |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | (acres) | (AF/acre) | (months) | (AFY) | (mgd) | |
| Ernie Smith Park | | | | | | | | 0.12 | 0.000107 | 47 |
| | | | | | | | Total = | 0.12 | 0.000107 | |

Note: Ernie Smith Park average annual usage is 0.24 ac-ft/yr, use half of average demand

**Segment: Point 47 - Point 49**

| Category | ID # | Description | Acres | Fraction of Area for Recycled Water Use | Applied Acres | Application Rate | Application Duration | Demand | Demand | Node |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | (acres) | (AF/acre) | (months) | (AFY) | (mgd) | |
| 2 | 103 | Vineyard | 16 | 0.8 | 12.8 | 0.5 | 6 | 6.4 | 0.005714 | 49 |
| Altimira Jr High | | | | | | | | 11.1 | 0.00991 | 49 |
| Sonoma Greens HOA | | | | | | | | 17.2 | 0.015356 | 49 |
| | | | | | | | Total = | 34.7 | 0.015624 | |

Note: Altamira Jr High average annual usage is 20.4 ac-ft/yr. Based upon water use records, irrigation was calculated to be 11.1 ac-ft/yr.

Note: SG HOA average annual usage is 26.43 ac-ft/yr. Based upon water use records, irrigation was calculated to be 17.2 ac-ft/yr.

**Segment: Point 49 - Point 50**

| Category | ID # | Description | Acres | Fraction of Area for Recycled Water Use | Applied Acres | Application Rate | Application Duration | Demand | Demand | Node |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | (acres) | (AF/acre) | (months) | (AFY) | (mgd) | |
| 2 | 49 | Vineyard | 50 | 0.8 | 40 | 0.5 | 6 | 20 | 0.017856 | 50 |
| Sonoma Mission Inn Golf Course | | | | | | | 6 | 266 | 0.237485 | 50 |
| | | | | | | | Total = | 286 | 0.255341 | |

SMI Course use 86.86 MG/Yr, based upon VOMWD records.

**Segment: Point 50 - Point 51**

| Category | ID # | Description | Acres | Fraction of Area for Recycled Water Use | Applied Acres | Application Rate | Application Duration | Demand | Demand | Node |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | (acres) | (AF/acre) | (months) | (AFY) | (mgd) | |
| Hanna Boys Center | | | | | | | | 31.3 | 0.027945 | 51 |
| | | | | | | | Total = | 31.3 | 0.027945 | |

Note: Hanna Boys Center average annual usage is 50.7 ac-ft/yr. Based upon water use records, irrigation was calculated to be 31.3 ac-ft/yr.

**Alternative I-B Total = 751.72**

## ALIGNMENT 2

## POTENTIAL USERS, ANNUAL USE, AND PEAK USE

# Sonoma Valley Recycled Water Feasibility Study
## Alternative II
### Estimated Demands

**Segment: WWTP - Point 1**

| Category | ID # | Category Description | Acres | Fraction of Area for Recycled Water Use | Applied Acres | Application Rate | Application Duration | AnnualDemand | Peak Demand | Node |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | (acres) | (AF/acre) | (months) | (AFY) | (mgd) | |
| 2 | 2 | Vineyard | 36 | 0.8 | 28.8 | 0.5 | 6 | 14.4 | 0.012856 | 1 |
| | | | | | | | Total = | 14.4 | 0.012856 | |

**Segment: Point 1 - Point 3**

| Category | ID # | Category Description | Acres | Fraction of Area for Recycled Water Use | Applied Acres | Application Rate | Application Duration | AnnualDemand | Peak Demand | Node |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | (acres) | (AF/acre) | (months) | (AFY) | (mgd) | |
| NA | | | | | | | | | | 3 |
| | | | | | | | Total = | 0 | 0 | |

**Segment: Point 3 - Point 5**

| Category | ID # | Category Description | Acres | Fraction of Area for Recycled Water Use | Applied Acres | Application Rate | Application Duration | AnnualDemand | Peak Demand | Node |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | (acres) | (AF/acre) | (months) | (AFY) | (mgd) | |
| 2 | 1200 | Vineyard | 24 | 0.8 | 19.2 | 0.5 | 6 | 9.6 | 0.008571 | 5 |
| | | | | | | | Total = | 9.6 | 0.008571 | |

**Segment: Point 3 - Point 7**

| Category | ID # | Category Description | Acres | Fraction of Area for Recycled Water Use | Applied Acres | Application Rate | Application Duration | AnnualDemand | Peak Demand | Node |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | (acres) | (AF/acre) | (months) | (AFY) | (mgd) | |
| 2 | 104 | Vineyard | 18 | 0.8 | 14.4 | 0.5 | 6 | 7.2 | 0.006428 | 7 |
| | | | | | | | Total = | 7.2 | 0.006428 | |

**Segment: Point 7 - Point 9**

| Category | ID # | Category Description | Acres | Fraction of Area for Recycled Water Use | Applied Acres | Application Rate | Application Duration | AnnualDemand | Peak Demand | Node |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | (acres) | (AF/acre) | (months) | (AFY) | (mgd) | |
| 2 | 14 | Vineyard | 5 | 0.8 | 4 | 0.5 | 6 | 2 | 0.001786 | 9 |
| | | | | | | | Total = | 2 | 0.001786 | |

**Segment: Point 9 - Point 11**

| Category | ID # | Category Description | Acres | Fraction of Area for Recycled Water Use | Applied Acres | Application Rate | Application Duration | AnnualDemand | Peak Demand | Node |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | (acres) | (AF/acre) | (months) | (AFY) | (mgd) | |
| NA | | | | | | | | | | 11 |
| | | | | | | | Total = | 0 | 0 | |

**Segment: Point 11 - Point 13**

| Category | ID # | Category Description | Acres | Fraction of Area for Recycled Water Use | Applied Acres | Application Rate | Application Duration | AnnualDemand | Peak Demand | Node |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | (acres) | (AF/acre) | (months) | (AFY) | (mgd) | |
| 5 | 16 | Dairy | 89 | 0.5 | 44.5 | 3 | 6 | 133.5 | 0.119189 | 13 |
| 7 | 21 | Non Irrig Pasture | 21 | 0.8 | 16.8 | 0.1 | 6 | 1.68 | 0.0015 | 13 |
| | | | | | | | Total = | 135.18 | 0.119189 | |

**Segment: Point 11 - Point 15**

| Category | ID # | Category Description | Acres | Fraction of Area for Recycled Water Use | Applied Acres | Application Rate | Application Duration | AnnualDemand | Peak Demand | Node |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | (acres) | (AF/acre) | (months) | (AFY) | (mgd) | |
| 2 | 26 | Vineyard | 11 | 0.8 | 8.8 | 0.5 | 6 | 4.4 | 0.003928 | 15 |
| | | | | | | | Total = | 4.4 | 0.003928 | |

# Sonoma Valley Recycled Water Feasibility Study
## Alternative II
### Estimated Demands

**Segment: Point 15 - Point 17**

| Category | ID # | Category Description | Acres | Fraction of Area for Recycled Water Use | Applied Acres | Application Rate | Application Duration | AnnualDemand | Peak Demand | Node |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | (acres) | (AF/acre) | (months) | (AFY) | (mgd) | |
| 2 | 57 | Vineyard | 87 | 0.8 | 69.6 | 0.5 | 6 | 34.8 | 0.031069 | 17 |
| | | | | | | | Total = | **34.8** | **0.031069** | |

**Segment: Point 17 - Point 19**

| Category | ID # | Category Description | Acres | Fraction of Area for Recycled Water Use | Applied Acres | Application Rate | Application Duration | AnnualDemand | Peak Demand | Node |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | (acres) | (AF/acre) | (months) | (AFY) | (mgd) | |
| 2 | 1201 | Vineyard | 52.3 | 0.8 | 41.84 | 0.5 | 6 | 20.92 | 0.018677 | 19 |
| 2 | 1203 | Vineyard | 39.5 | 0.8 | 31.6 | 0.5 | 6 | 15.8 | 0.014106 | 19 |
| 2 | 1204 | Vineyard | 17.5 | 0.8 | 14 | 0.5 | 6 | 7 | 0.00625 | 19 |
| | | | | | | | Total = | **43.72** | **0.039033** | |

**Segment: Point 17 - Point 21**

| Category | ID # | Category Description | Acres | Fraction of Area for Recycled Water Use | Applied Acres | Application Rate | Application Duration | AnnualDemand | Peak Demand | Node |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | (acres) | (AF/acre) | (months) | (AFY) | (mgd) | |
| 2 | 13 | Vineyard | 5 | 0.8 | 4 | 0.5 | 6 | 2 | 0.001786 | 21 |
| 2 | 1205 | Vineyard | 6 | 0.8 | 4.8 | 0.5 | 6 | 2.4 | 0.002143 | 21 |
| | | | | | | | Total = | **4.4** | **0.001786** | |

**Segment: Point 21 - Point 22**

| Category | ID # | Category Description | Acres | Fraction of Area for Recycled Water Use | Applied Acres | Application Rate | Application Duration | AnnualDemand | Peak Demand | Node |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | (acres) | (AF/acre) | (months) | (AFY) | (mgd) | |
| NA | | Vineyard | 28 | 0.8 | 22.4 | 0.5 | 6 | 0 | 0 | 22 |
| | | | | | | | Total = | **0** | **0** | |

**Segment: Point 22 - Point 24**

| Category | ID # | Category Description | Acres | Fraction of Area for Recycled Water Use | Applied Acres | Application Rate | Application Duration | AnnualDemand | Peak Demand | Node |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | (acres) | (AF/acre) | (months) | (AFY) | (mgd) | |
| 2 | 37 | Vineyard | 28 | 0.8 | 22.4 | 0.5 | 6 | 11.2 | 0.009999 | 24 |
| | | | | | | | Total = | **11.2** | **0.009999** | |

**Segment: Point 22 - Point 23**

| Category | ID # | Category Description | Acres | Fraction of Area for Recycled Water Use | Applied Acres | Application Rate | Application Duration | AnnualDemand | Peak Demand | Node |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | (acres) | (AF/acre) | (months) | (AFY) | (mgd) | |
| SV High | | | | | | | | 28.9 | 0.025802 | 23 |
| Adele Harrison Jr High | | | | | | | | 5 | 0.004464 | 23 |
| Prestwood Elem | | | | | | | | 0.56 | 0.0005 | 23 |
| | | | | | | | Total = | **34.46** | **0.030766** | |

Note: SV High average annual usage is 41 ac-ft/yr. Based upon water use records, irrigation was calculated to be 28.9 ac-ft/yr.
Note: Adele Harrison Jr High average annual usage 17.4 ac-ft/yr. Based upon water use records, irrigation was calculated to be 5 ac-ft/yr
Note: Prestwood Elem average annual usage is 1.7 ac-ft/yr. Based upon water use recoreds, irrigation was calculated to be 0.56 ac-ft/yr

**Segment: Point 23 - Point 25**

| Category | ID # | Category Description | Acres | Fraction of Area for Recycled Water Use | Applied Acres | Application Rate | Application Duration | AnnualDemand | Peak Demand | Node |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | (acres) | (AF/acre) | (months) | (AFY) | (mgd) | |
| Plaza | | | | | | | | 14 | 0.012499 | 25 |
| Sonoma Valley Inn | | | | | | | | 7.6 | 0.006785 | 25 |
| | | | | | | | Total = | **21.6** | **0.012499** | |

Note: Plaza 026 & 028 average annual usage is 16.5 ac-ft/yr, estimate 85% goes to irrigation
Note: SV Inn average annual irrigation usage was calculated to be 7.6 ac-ft/yr

# Sonoma Valley Recycled Water Feasibility Study
## Alternative II
### Estimated Demands

**Segment: Point 25 - Point 27**

| Category | ID # | Category Description | Acres | Fraction of Area for Recycled Water Use | Applied Acres | Application Rate | Application Duration | AnnualDemand | Peak Demand | Node |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | (acres) | (AF/acre) | (months) | (AFY) | (mgd) | |
| Arnold Field | | | | | | | 6 | 14.2 | 0.012678 | 27 |
| Hughes Field | | | | | | | 6 | 3.7 | 0.003303 | 27 |
| Teeter Field | | | | | | | 6 | 4 | 0.003571 | 27 |
| Depot Park | | | 0 | 0.8 | 0 | 3 | 6 | 8.5 | 0.007589 | 27 |
| Field of Dreams | | | 10 | 0.8 | 8 | 3 | 6 | 24 | 0.021427 | 27 |
| | | | | | | | **Total =** | **54.4** | **0.012678** | |

Note: Depot Park usage is based upon current water use records.

**Segment: Point 27 - Point 29**

| Category | ID # | Category Description | Acres | Fraction of Area for Recycled Water Use | Applied Acres | Application Rate | Application Duration | AnnualDemand | Peak Demand | Node |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | (acres) | (AF/acre) | (months) | (AFY) | (mgd) | |
| 2 | 6 | Vineyard | 2 | 0.8 | 1.6 | 0.5 | 6 | 0.8 | 0.000714 | 29 |
| | | | | | | | **Total =** | **0.8** | **0.000714** | |

**Segment: Point 29 - Point 31**

| Category | ID # | Category Description | Acres | Fraction of Area for Recycled Water Use | Applied Acres | Application Rate | Application Duration | AnnualDemand | Peak Demand | Node |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | (acres) | (AF/acre) | (months) | (AFY) | (mgd) | |
| 2 | 24 | Vineyard | 11 | 0.8 | 8.8 | 0.5 | 6 | 4.4 | 0.003928 | 31 |
| 2 | 30 | Vineyard | 13 | 0.8 | 10.4 | 0.5 | 6 | 5.2 | 0.004643 | 31 |
| 2 | 38 | Vineyard | 28 | 0.8 | 22.4 | 0.5 | 6 | 11.2 | 0.009999 | 31 |
| 2 | 41 | Vineyard | 30 | 0.8 | 24 | 0.5 | 6 | 12 | 0.010714 | 31 |
| | | | | | | | **Total =** | **32.8** | **0.029284** | |

**Segment: Point 27 - Point 33**

| Category | ID # | Category Description | Acres | Fraction of Area for Recycled Water Use | Applied Acres | Application Rate | Application Duration | AnnualDemand | Peak Demand | Node |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | (acres) | (AF/acre) | (months) | (AFY) | (mgd) | |
| 6 | 6 | Irrigated Pasture | 14 | 0.8 | 11.2 | 2.5 | 6 | 28 | 0.024998 | 33 |
| Vallejo State Park | | Non Irrigated Past | 40 | 0.8 | 32 | 0.1 | 6 | 3.2 | 0.002857 | 33 |
| | | | | | | | **Total =** | **31.2** | **0.024998** | |

**Alternative II Total Usage (ac-ft/yr) = 442.16**

## ALIGNMENT 3

## POTENTIAL USERS, ANNUAL USE, AND PEAK USE

# Sonoma Valley Recycled Water Feasibility Study
## Alternative III
## Estimated Demands

**Segment: WWTP - Point 1**

| Category | ID # | Description | Acres | Fraction of Area for Recycled Water Use | Applied Acres | Application Rate | Application Duration | Demand | Demand | Node |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | (acres) | (AF/acre) | (months) | (AFY) | (mgd) | |
| 2 | 61 | Vineyard | 150 | 0.8 | 120 | 0.5 | 6 | 60 | 0.053568 | 1 |
| | | | | | | | Total = | **60** | **0.053568** | |

**Segment: Point 1 - Point 3**

| Category | ID # | Description | Acres | Fraction of Area for Recycled Water Use | Applied Acres | Application Rate | Application Duration | Demand | Demand | Node |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | (acres) | (AF/acre) | (months) | (AFY) | (mgd) | |
| NA | | | | | | | | | | 3 |
| | | | | | | | Total = | **0** | **0** | |

**Segment: Point 3 - Point 5**

| Category | ID # | Description | Acres | Fraction of Area for Recycled Water Use | Applied Acres | Application Rate | Application Duration | Demand | Demand | Node |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | (acres) | (AF/acre) | (months) | (AFY) | (mgd) | |
| 2 | 99 | Vineyard | 8 | 0.8 | 6.4 | 0.5 | 6 | 3.2 | 0.002857 | 5 |
| 2 | 47 | Vineyard | 45 | 0.8 | 36 | 0.5 | 6 | 18 | 0.01607 | 5 |
| | | | | | | | Total = | **21.2** | **0.018927** | |

**Segment: Point 5 - Point 7**

| Category | ID # | Description | Acres | Fraction of Area for Recycled Water Use | Applied Acres | Application Rate | Application Duration | Demand | Demand | Node |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | (acres) | (AF/acre) | (months) | (AFY) | (mgd) | |
| 2 | 40 | Vineyard | 29 | 0.8 | 23.2 | 0.5 | 6 | 11.6 | 0.010356 | 7 |
| 2 | 1018 | Vineyard | 43 | 0.8 | 34.4 | 0.5 | 6 | 17.2 | 0.015356 | 7 |
| | | | | | | | Total = | **28.8** | **0.025713** | |

**Segment: Point 7 - Point 9**

| Category | ID # | Description | Acres | Fraction of Area for Recycled Water Use | Applied Acres | Application Rate | Application Duration | Demand | Demand | Node |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | (acres) | (AF/acre) | (months) | (AFY) | (mgd) | |
| 2 | 1014 | Vineyard | 6.6 | 0.8 | 5.28 | 0.5 | 6 | 2.64 | 0.002357 | 9 |
| | | | | | | | Total = | **2.64** | **0.002357** | |

**Segment: Point 9 - Point 29**

| Category | ID # | Description | Acres | Fraction of Area for Recycled Water Use | Applied Acres | Application Rate | Application Duration | Demand | Demand | Node |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | (acres) | (AF/acre) | (months) | (AFY) | (mgd) | |
| 2 | 1012 | Vineyard | 36.5 | 0.8 | 29.2 | 0.5 | 6 | 14.6 | 0.013035 | 29 |
| 2 | 1013 | Vineyard | 20 | 0.8 | 16 | 0.5 | 6 | 8 | 0.007142 | 29 |
| | | | | | | | Total = | **22.6** | **0.020177** | |

**Segment: Point 9 - Point 11**

| Category | ID # | Description | Acres | Fraction of Area for Recycled Water Use | Applied Acres | Application Rate | Application Duration | Demand | Demand | Node |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | (acres) | (AF/acre) | (months) | (AFY) | (mgd) | |
| 2 | 10 | Vineyard | 4 | 0.8 | 3.2 | 0.5 | 6 | 1.6 | 0.001428 | 11 |
| 2 | 12 | Vineyard | 5 | 0.8 | 4 | 0.5 | 6 | 2 | 0.001786 | 11 |
| 2 | 1006 | Vineyard | 61.3 | 0.8 | 49.04 | 0.5 | 6 | 24.52 | 0.021891 | 11 |
| | | | | | | | Total = | **28.12** | **0.025106** | |

**Segment: Point 11 - Point 13**

| Category | ID # | Description | Acres | Fraction of Area for Recycled Water Use | Applied Acres | Application Rate | Application Duration | Demand | Demand | Node |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | (acres) | (AF/acre) | (months) | (AFY) | (mgd) | |
| 2 | 1007 | Vineyard | 53.5 | 0.8 | 42.8 | 0.5 | 6 | 21.4 | 0.019106 | 13 |
| 2 | 53 | Vineyard | 73 | 0.8 | 58.4 | 0.5 | 6 | 29.2 | 0.02607 | 13 |
| | | | | | | | Total = | **50.6** | **0.045176** | |

# Sonoma Valley Recycled Water Feasibility Study
## Alternative III
## Estimated Demands

**Segment: Point 13 - Point 15**

| Category | ID # | Description | Acres | Fraction of Area for Recycled Water Use | Applied Acres | Application Rate | Application Duration | Demand | Demand | Node |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | (acres) | (AF/acre) | (months) | (AFY) | (mgd) | |
| 2 | 1010 | Vineyard | 70 | 0.8 | 56 | 0.5 | 6 | 28 | 0.024998 | 15 |
| 2 | 1011 | Vineyard | 88 | 0.8 | 70.4 | 0.5 | 6 | 35.2 | 0.031427 | 15 |
| | | | | | | | **Total =** | **63.2** | **0.056425** | |

**Segment: Point 15 - Point 17**

| Category | ID # | Description | Acres | Fraction of Area for Recycled Water Use | Applied Acres | Application Rate | Application Duration | Demand | Demand | Node |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | (acres) | (AF/acre) | (months) | (AFY) | (mgd) | |
| 2 | 1008 | Vineyard | 23.9 | 0.8 | 19.12 | 0.5 | 6 | 9.56 | 0.008535 | 17 |
| | | | | | | | **Total =** | **9.56** | **0.008535** | |

**Segment: Point 17 - Point 19**

| Category | ID # | Description | Acres | Fraction of Area for Recycled Water Use | Applied Acres | Application Rate | Application Duration | Demand | Demand | Node |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | (acres) | (AF/acre) | (months) | (AFY) | (mgd) | |
| 2 | 1009 | Vineyard | 91 | 0.8 | 72.8 | 0.5 | 6 | 36.4 | 0.032498 | 19 |
| | | | | | | | **Total =** | **36.4** | **0.032498** | |

**Segment: Point 11 - Point 21**

| Category | ID # | Description | Acres | Fraction of Area for Recycled Water Use | Applied Acres | Application Rate | Application Duration | Demand | Demand | Node |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | (acres) | (AF/acre) | (months) | (AFY) | (mgd) | |
| 2 | 56 | Vineyard | 87 | 0.8 | 69.6 | 0.5 | 6 | 34.8 | 0.031069 | 21 |
| 2 | 1005 | Vineyard | 133 | 0.8 | 106.4 | 0.5 | 6 | 53.2 | 0.047497 | 21 |
| 2 | 1015 | Vineyard | 8.7 | 0.8 | 6.96 | 0.5 | 6 | 3.48 | 0.003107 | 21 |
| | | | | | | | **Total =** | **91.48** | **0.081673** | |

**Segment: Point 21 - Point 23**

| Category | ID # | Description | Acres | Fraction of Area for Recycled Water Use | Applied Acres | Application Rate | Application Duration | Demand | Demand | Node |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | (acres) | (AF/acre) | (months) | (AFY) | (mgd) | |
| 2 | 43 | Vineyard | 39 | 0.8 | 31.2 | 0.5 | 6 | 15.6 | 0.013928 | 23 |
| 2 | 96 | Vineyard | 5 | 0.8 | 4 | 0.5 | 6 | 2 | 0.001786 | 23 |
| | | | | | | | **Total =** | **17.6** | **0.015713** | |

**Segment: Point 23 - Point 25**

| Category | ID # | Description | Acres | Fraction of Area for Recycled Water Use | Applied Acres | Application Rate | Application Duration | Demand | Demand | Node |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | (acres) | (AF/acre) | (months) | (AFY) | (mgd) | |
| 2 | 1016 | Vineyard | 11.7 | 0.8 | 9.36 | 0.5 | 6 | 4.68 | 0.004178 | 25 |
| 2 | 1017 | Vineyard | 9 | 0.8 | 7.2 | 0.5 | 6 | 3.6 | 0.003214 | 25 |
| | | | | | | | **Total =** | **8.28** | **0.007392** | |

**Segment: Point 25 - Point 27**

| Category | ID # | Description | Acres | Fraction of Area for Recycled Water Use | Applied Acres | Application Rate | Application Duration | Demand | Demand | Node |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | (acres) | (AF/acre) | (months) | (AFY) | (mgd) | |
| 2 | 42 | Vineyard | 34 | 0.8 | 27.2 | 0.5 | 6 | 13.6 | 0.012142 | 27 |
| 2 | 96 | Vineyard | 24 | 0.8 | 19.2 | 0.5 | 6 | 9.6 | 0.008571 | 27 |
| | | | | | | | **Total =** | **23.2** | **0.020713** | |

**Alternative III Total = 463.68**