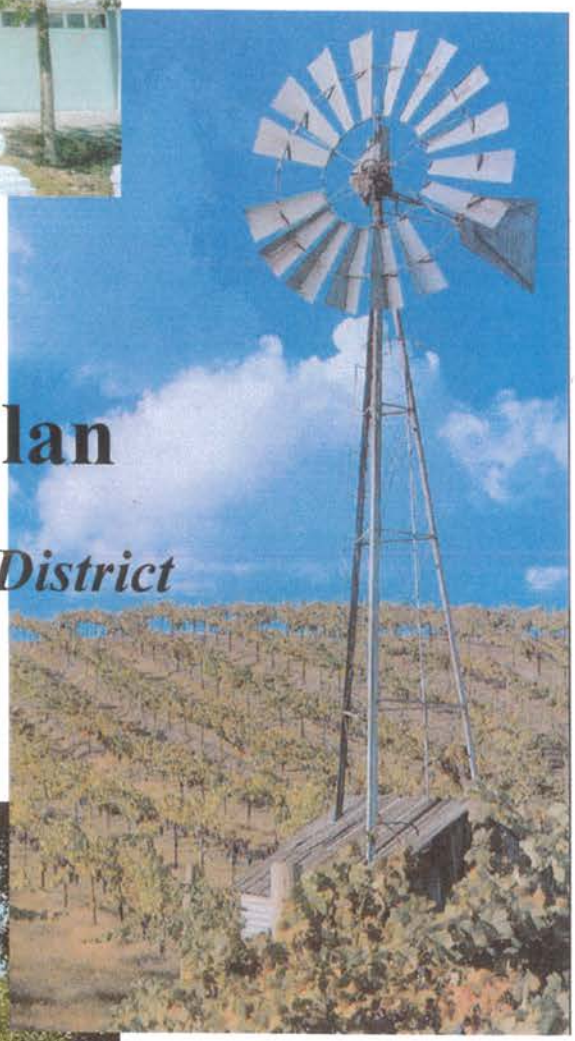

Strategic

Water Supply Plan

Valley of the Moon Water District

January 1999

Strategic
Water Supply Plan

Prepared for

Valley of the Moon Water District

Board of Directors

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Outline

Tables

Figures

* Supplied courtesy of Brelje & Race Engineers, Santa Rosa, CA

Definition of Terms

1998 CIP	1998 Valley of the Moon Five-Year Capital Improvement Program
1989 General Plan	County of Sonoma 1989 General Plan
1998 Master Plan	Brelje and Race 1998 Valley of the Moon Water District Master Plan
acre-ft	acre-feet (one acre-ft of water is the volume of water it takes to cover one acre to the depth of one foot)
BOS	Board of Supervisors of Sonoma County
CII	Commercial, institutional and industrial
District	Valley of the Moon Water District
finished water storage	potable water storage, generally in tanks
FY	fiscal year (as used herein: July 1 through June 30)
gpcd	gallons per capita per day
gpd	gallons per day, a rate of flow
gpm	gallons per minute, a rate of flow
mg	million gallons
mgd	millions of gallons per day, a rate of flow
O&M	operation and maintenance
peak month demand	the demand on the average day of the highest water use month (generally July or August)
PRMD	Permit and Resources Management Department of Sonoma County
service line	pipe connecting street main to meter
SCWA	Sonoma County Water Agency
SF	single family detached dwelling unit
SVCSD	Sonoma Valley County Sanitation District
ULF	ultra-low flow
VOM	Valley of the Moon Water District
yr	year

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1.00 Purpose

The Valley of the Moon Water District (District or VOM) is faced with several challenging variables that can significantly impact the course of water supply for its customers - both existing and future. Significant among these are the:

- impact of growth management on future demand,
- cost and availability of Russian River water and the appropriate amount to import
- cost and availability of high quality local ground water, and
- close coordination and cooperation with the City of Sonoma.

It is the purpose of this Water Supply Strategic Plan to investigate and lay out the best apparent course of action, given the current level of knowledge about these variables and to share this strategy openly with all affected and interested parties so that the needs of VOM customers are kept in mind as new and better information becomes available and as public policy evolves and is implemented.

This plan is in every sense of the word a strategic plan because it must take into account a variety of forces at work that impact these key variables (i.e. concerns about traffic and public desires regarding land use and the environment, public policy responding to same, relative feasibility of ground water use and surface supply imports including environmental impacts and possible impacts on other users, etc.). This plan should be considered a living plan subject to update, adjustment and change periodically as new information or policies occur.

2.00 Summary

In FY 1997 the District came within 6% of using all 4.7 mgd of its entitlement in the Sonoma County Water Agency Sonoma Aqueduct. Since then the District has set out on a course to rehabilitate its local well system, which at one time had a capacity of 2.2 mgd. By spring of 1999, well capacity of 1.0 mgd will have been restored and by 2002, the District hopes to have restored 2.2 mgd. This capacity should bridge the gap until the planned Sonoma Aqueduct No. 2 is available which is estimated to cost $14.8 (District share is $8.5 million) and is projected to come online in phases between 2006 and 2013. Currently, the County of Sonoma, who has land use jurisdiction throughout the District's service area, has implemented a growth management ordinance which limits residential development in the District's service area. Circa 2002 to 2004, the County will be coming out with a new General Plan. Also the Sonoma Valley County Sanitation District has a moratorium on sewer hook-ups in a portion of the District's service area.

This report examines the water requirements if growth management is extended. The findings are that if 2.6 mgd of well capacity were developed, and provided ground water of sufficient quality and quantity is available, it is probable that it would not be necessary to exercise the option of building the second aqueduct. The City of Sonoma is essentially in the very same boat as the District, so to speak, and like the District is reliant on the Sonoma Aqueduct for most of its water supply. The

influence area come under the jurisdiction of the County of Sonoma Board of Supervisors (BOS) acting through the Sonoma County Planning Commission. Commissioners are appointed by the BOS. Decisions of the Commission may be appealed to the BOS. Staff for planning matters is supplied by the Permit and Resources Management Department (PRMD).

3.10 County General Plan

The territory of the District is entirely within Planning Area #9 as that area is designated in the County General Plan. Area #9 encompasses the unincorporated territory of Sonoma Valley extending from San Pablo Bay to the South, north to Kenwood. A small portion of the southern end of Bennett Valley is also included. The most recent General Plan was adopted in 1989 (1989 General Plan) and contained a planning horizon of 2005. The plan was based on projections of 1980 Census data. Shortly after adoption, the County recognized the population projection for year 2005 was less than the actual 1989 population which became available with the 1990 Census. Inquiries with staff (Reference 2) of the PRMD indicate that a new general plan will probably not be available until 2002 - 2004.

PRMD staff (Reference 3) state that in the District's existing service area, current zoning designations in the 1989 General Plan provide for about 1,100 additional residential units starting with 1990 as the base year. As of July 1998, VOM served 8,365 dwelling units of which 486 or an average of 61 per year have been added since 1990 (see Table 1).

3.20 Growth Management

In November, 1989 the PRMD presented a growth management plan to the BOS which indicated among other things that the rate of growth in the County had far exceeded that anticipated at the time of adoption of the 1989 General Plan. In April 1992, the BOS, acting on the County Planning Commission's recommendation, adopted Ordinance No. 4527, a residential growth management plan (Reference 4). The plan was adopted as an emergency measure and states in its "findings" section:

> "The fact that the pace of residential growth is far exceeding projections is an immediate threat to the preservation of the public health, safety, or welfare.

While complex, Ordinance 4527 essentially provides for:

- 60 dwelling unit allotments per calendar year within the Urban Service Area as shown on the 1989 General Plan Land Use Map
- 30 dwelling unit allotments per calendar year within the balance of Area #9 and limit of one dwelling unit allotment per lot
- carry-over of any unused allotments
- exceptions for second units, farm worker housing, homeless shelters, and residential community care facilities - all as provided in the Zoning Ordinance

except for: annexations and outside service agreements pending on June 9, 1998, or upon first finding that: (a) a failing septic system(s) or other unsanitary condition constitutes a hazard to the public health and safety; or (b) a significant public or social policy or need is served by providing sanitation service to the property.

In checking with the SCWA (Reference 6), it was learned SVCSD had recently sold $20.8 million in revenue bonds and had accumulated $4.6 million in capital reserves to tackle the needed improvement program.

The policy adopted by SVCSD, while not constituting a moratorium on connecting new customers within its boundary, does effectively place a 10 to possibly 15-year moratorium on new annexations and new outside services. An applicant for water service to VOM situated outside the boundary of SVCSD is impacted by the SVCSD resolution in that the ability to demonstrate satisfactory wastewater disposal is adversely affected. Small undeveloped lots are precluded from developing as the area required for a septic tank and leach field would not be available. Large lots that could not meet soil percolation requirements would also be precluded unless they could obtain a permit for complex and expensive mound sewer systems. Thus the SVCSD resolution, in essence has the same growth control impact on VOM as it does on SVCSD.

4.00 Water Use

4.10 Historic Use

Historic use of water is best portrayed by water production records. Sources of water produced is water purchased from the SCWA and delivered through the Sonoma Aqueduct and water produced from local wells. Historic production, in terms of annual use expressed in acre-ft per year and peak month use expressed in millions of gallons per day (mgd) is shown in Table 2. Source water must supply the District's average day of the peak month demand (termed peak month demand). Demand peaks above peak month demand are generally supplied from finished water storage. While the District can obtain peaking demand above peak month demand from the Sonoma Aqueduct, the current entitlement limit is stated as peak month demand and the sum of VOM's and the City of Sonoma's entitlement use up all the available capacity. Since peak month demand defines the capability of the District's sources of supply, it is this parameter that is best suited for projecting demand. A plot of historic peak month production is discussed in Section 4.42 (see Figure 7). Careful examination of changes in peak month demand from one year to the next is quite variable and tends to jump around +/- 8% or more from one year to the next. Annual demand in the most recent highest year of record, namely FY 1997, was 3,452 acre-ft, and demand during the peak month totaled 4.77 mgd. In 80% of the years, the peak month occurs in July or August. In the balance of years, the peak month is June.

The District reads meters and renders a bill to customers once every two months (bimonthly). Reading, preparing and posting bills is done virtually continuously (4 days per week). Readings taken in any month represent average use for about ½ of the District's customers over the prior 61 day

shower use.

4.40 Demand Projections

4.41 Demand Parameters

It has already been noted that peak month demand is the best parameter to use for forecasting demand (refer Section 4.10). A convenient unit parameter with which to measure peak month demand is average peak month demand for the typical single family detached home. The term ESD is used to represent this parameter. That is to say:

> *"One ESD = 490 gpd and is defined as the equivalent demand of a typical single family detached home served by VOM and expressed in terms of average day of the peak month demand (gpd)."*

The next step is to determine the relationship between peak month use for a typical single family detached home and other types of dwelling units. In addition to single family detached homes, VOM records allow breakdown of dwelling types into the following classifications:

- apartments
- mobile homes
- duplex, triplex, fourplex

The District's billing data base, however, is not currently compiled to sort on these classifications but lumps all multi-family units into one class. Therefore relative use by these classes cannot currently be determined. In the early 1990's, North Marin Water District did a study of over 20,000 dwelling units of all types (Reference 9). Relative water use ratios from that study were used to determine peak month demand for the above VOM classifications. These are shown in Table 3. Application of these ratios allows calculation of the number of ESDs in each residential classification. ESDs for the District's 208 CII accounts are directly calculated from District billing records simply by taking the peak month demand for a given CII customer and dividing by 490 gpd. A comparison of total dwellings, ESDs and connections currently served by VOM is shown in Table 4.

The SVCSD also uses ESDs to keep track of demand and determine connection fees. Breakdown among multi-family units is not quite as refined. SVCSD uses a 0.8 factor when describing per dwelling demand for apartments, town-house/condominiums, second units, and duplex/triplex/fourplex units.

In preparing the 1998 Master Plan, Brelje and Race calculated demand parameters for average day of the year, average day of the peak month and the maximum day for the typical connection. Corresponding parameters in terms of ESDs are shown in Table 5. A typical connection includes multi-family meters, CII meters, etc. Use of ESDs in making forecasts yields better and more

annual demand in terms of acre-ft/year.

The Maximum forecast assumes Sonoma Aqueduct No. 2 will be completed circa year 2013, the date forecast by the SCWA in its recent EIR (Reference 11). Since VOM's current peak month demand is essentially equal to its entitlement, it is necessary to rehabilitate local well production capacity to bridge the gap. The District's current well rehabilitation program (see Section 5.21) which is expected to redevelop 1,565 gpm (2.25 mgd) of capacity by the end of FY 2001 is assumed. Well development is cut off at this level for this is sufficient to reach year 2013. After the new aqueduct comes on-line, it is assumed well operation will be preserved in good working order and become reserve capacity to backup an aqueduct outage, water quality problem in the Russian River, etc. By 2050, overall reserve capacity is reduced to 27%.

Under the Minimum growth forecast, the District will need to rehabilitate 1,785 gpm (2.57 mgd) of capacity with the intention of relying on 2/3's of that amount or 1,190 gpm (1.71 mgd) as production capacity. One-third or 595 gpm (0.86 mgd) is assumed dedicated to reserve capacity.

5.00 Water Sources

5.10 Russian River

5.11 SCWA Master Water Supply Agreement

Since 1962 the District has obtained the majority of its supply from the SCWA via an overland aqueduct connecting to a system of aqueducts importing water from the Russian River. Water obtained from this source is governed by a master water supply agreement between SCWA and its eight "water contractors". The latter are the cities and districts that SCWA wholesales water to and include the Cities of Santa Rosa, Petaluma, Rohnert Park, Sonoma and Cotati and special districts North Marin Water, VOM and Forestville Water. These signers of the master agreement are termed the water contractors. The current version of the master agreement is the "Tenth Amended Agreement for Water Supply and Construction of the Russian River - Cotati Intertie Project" dated Nov. 14, 1997.

5.12 Entitlements of VOM and Sonoma

The agreement sets forth the water entitlements of the water contractors in terms of average day peak month demand. VOM's entitlement is 4.7 mgd which amounts to 5% of the entitlements set forth for all water contractors. The City of Sonoma's entitlement is 3.3 mgd. Together then VOM and SCWA make up 9% of all water contractor entitlements. VOM's entitlement is delivered from the Sonoma Aqueduct. The Sonoma Aqueduct commences at the booster pump station located at the east end of Spring Lake in Santa Rosa and extends to two terminal finished water tanks located in Sonoma near the eastern end of Verano Avenue. South of Trinity Oaks (near the point where the road to Glen Ellen intersects Highway 12), only the City of Sonoma and VOM take service from the Sonoma Aqueduct. The capacity of the aqueduct in this segment is designed at 8.0 mgd (peak

Forestville and Sonoma Aqueducts;

3. Aqueducts that generally benefit all contractors, (Cotati-Intertie, etc.)
4. Storage Facilities (tanks, pumps and interconnecting lines), and
5. Common Facilities (other facilities that benefit all contractors (Russian River collectors, chlorination facilities, pH adjustment facilities, emergency wells, etc.).

The method of apportioning costs and collecting revenue for each of these groups is as follows:

Group 1 - Costs are allocated uniformly and recovered via a uniform acre-ft charge paid by all contractors.

Group 2 - Costs are allocated to water contractors taking water from a particular aqueduct and then recovered by an acre-ft charge unique to each aqueduct..

Group 3 - Costs are reallocated to Group 2 type aqueducts based on the amount of entitlement water that will be passed through a given Group 3 facility and are recovered as a unique charge associated with said Group 2 facility.

Group 4 - Costs are allocated uniformly and recovered via a uniform acre-ft charge paid by all contractors (except for North Marin Water District who provides its own storage).

Group 5 - Costs are allocated uniformly and recovered via a uniform acre-ft charge paid by all contractors.

For Fiscal year (July 1, 1998 - June 30, 1999) (FY 99) direct charges paid SCWA (and type) were as follows.

	$/acre-ft	Type
– Operation and Maintenance charge (O&M)	$ 238.00	Group 1
– General Obligation Bond charge - Sonoma Aq.	0.00	Group 2
– 1971 Revenue Bonds Series 93-A		
Pipeline (Intertie Aqueduct)	8.29	Group 3
Pumping	10.09	Group 5
Storage	16.38	Group 4
– 1971 Revenue Bond 94-A		
Pumping	19.02	Group 5
Storage	7.54	Group 4
Total	$ 299.17	

Rates for a given budget year are set based on actual deliveries made in the prior year. Furthermore the capital charges are reviewed and can be revised. For instance, if at the end of any year, a rate charged for bond fund coverage is insufficient, the agreement gives SCWA the authority to assess a "pickup" payment. This payment is due by August 1st following the close of the FY. For Group 2 and 3 type charges, this pickup payment is calculated by a special formula which targets water contractors who take less water than their proportionate share as determined by entitlements and essentially brings their total payments up to what they would have paid had they taken their fair share of water. The net effect here is that there is no cost savings for reducing purchases for Group

5.14 *Proposed New Agreement*

On December 15, 1998, the SCWA certified the final EIR for the Water Supply and Transmission System Project. This project would expand the SCWA system and supplies to all water contractors. This program EIR identified $144 million (1998 dollars) in water supply and transmission system improvements to be installed over a period of 22 years (Reference 11). About $107 million of this amount is for facilities which partially benefit VOM and Sonoma. VOM's share amounts to $14.6 million (see Section 7.10). Of this amount about $3.9 million is expected to be financed by O&M surcharges and $10.7 by SCWA revenue bonds. Since these are pre-authorized bonds, no vote is required.

Formal planning for the Water Supply and Transmission System Project commenced circa 1992. In anticipation of this project, water contractors commenced negotiation of a new water supply agreement. The last draft of the new agreement is dated June 10, 1997. It provides for continuation of imported water service to VOM via expanded facilities. The draft agreement and the EIR documents provide for a new entitlement - namely 8.5 mgd and, for the first time adds an annual acre-ft limitation. Negotiation of the final agreement has been held in abeyance until the EIR process was completed.

For the past five years, SCWA, acting under its authority in the Master Agreement, and with the consent of the Water Advisory Committee, has set the O&M charge higher than needed with the aim of generating surpluses that are transferred into the Common Facilities and Storage construction funds. This allows the latter to be constructed on a pay-as-you-go basis rather than financing same with revenue bond sales. This practice is expected to continue in the new agreement.

There is a problem regarding the acre-ft limitation. The value proposed for the contract and contained in SCWA's EIR is 3,200 acre-ft. This number is meant to reflect historic demand plus the growth rate provided for by the 1989 General Plan through year 2005, the horizon contained in the 1989 General Plan. A consultant, hired by SCWA to develop the water conservation plan contained in the EIR and currently being implemented, prepared the demand forecast based on a special model and population and employment projections contained in the 1989 General Plan (Reference 12). The consultant assumed SCWA's water conservation plan would be fully implemented by 2005. That plan assumes realization of 200 acre-ft of savings per year at fruition. Implementation of the plan has been delayed and is now scheduled for the 1998 through 2009 period. In reviewing planned water supply contained in the EIR for VOM, staff of the PRMD looked at the incremental growth contained in the consultant's estimate and ascertained that it appeared to accommodate an amount of residential growth that is reasonably close to the 1989 General Plan holding capacity. The PRMD also reviewed incremental CII demand and also found it to be appropriate and likely to accommodate uses that would occur under the plan (Reference 13). It would appear the PRMD's evaluation is correct, since review of connections to VOM since 1990 are clearly within the limits prescribed by the County's Growth Management Ordinance 4527 and are well below the holding capacity defined in the 1989 General Plan. There is an error somewhere in the 3,200 acre-ft estimate and this needs to be corrected before VOM approves the new proposed agreement. VOM Directors have already taken

Agua Caliente - 140 gpm, Donald - 135 gpm, Park Ave. - 90 gpm or a total of 365 gpm or 0.53 mgd. An extended pumping test on the Mountain Ave. well revealed very little draw-down (18 feet) at 300 gpm. The well is expected to be an excellent performer and should be on-line this spring. With Mountain Ave. well, total capacity is expected to reach 665 gpm (0.96 mgd). Mountain Avenue is the first of four wells planned to be rehabilitated in the next 2 ½ fiscal years (through FY 2001). Provided 300 gpm per well can be achieved, the resulting well system capacity will be about 1,565 gpm (2.25 mgd).

Luhdorff and Scalmanini advise that as the District redevelops its wells, it build in redundancy of 33%. That is if it plans to expect reliable production capacity of 2x it should develop capacity of 3x. This reserve capacity is necessary to rest each well and provide for planned and unplanned repair and rehabilitation work including periodic cleaning, well rehabilitation work, and periodic replacements required of pumping parts and equipment. Planned rehabilitation work should be scheduled in months other than June, July and August, thus preserving standby capacity for an aqueduct outage, water quality problem in the Russian River, etc. With the rehabilitation work planned through year 2001, the District hopes to have 6.95 mgd of capacity (entitlement of 4.7 mgd plus well system capacity of 2.25 mgd). Demand projected for July 2001 is 4.84. Therefore the projected reserve is 2.11 mgd (44%). This is enough to handle the +/-8% swings that weather conditions can cause in year-to-year peak month demand and still provide a comfortable reserve to permit resting of the wells and an emergency backup supply in case of problems with deliveries from the SCWA. By comparison, local reserves maintained by other SCWA contractors in VOM's size class run from 6% to 100% of peak month demand with the average being about 41% and a median 35%. Another consideration regarding the adequate amount of reserve capacity to maintain is the fact that in the severe drought in 1996 and 1997, residential customers of Marin Municipal Water District were able to survive the drought with about 35% of their normal supply.

5.22 City of Sonoma Well Rehabilitation Program

The City of Sonoma has five wells totaling 1,230 gpm (1.77 mgd) of capacity. All but one well, which has a capacity of 140 gpm (0.2 mgd), have problems of one sort or another (produce sand, warm water, old unreliable pumps, etc. The City has just received a report from its consultant Brelje and Race which finds that demands are expected to exceed available supplies by the summer of year 2000 (Reference 15). The report recommends the City proceed with rehabilitation of four existing wells having a capacity of 940 gpm (1.4 mgd) before year 2000 and construct two new wells of 450 gpm each - one by year 2002 and the second by year 2009. This program would bring the City's total well production to 1,840 gpm (2.6 mgd). The location and capacity of the existing wells to be rehabilitated are: 2nd St. East north of bike path (480 gpm); North of Brazil St. and 4th St. intersection (140 gpm); rear of former Sonoma Bowl on Sonoma Hwy (190 gpm); and, 1st St. West northwest of Veterans Building (130 gpm). Among sites suggested for the two new wells are Depot Park (near the site of an old abandoned City well), City-owned parks, in the vicinity of First St. East, behind the Police Station or along the access road to the SCWA tanks.

"Outside" Measures:

1. Large landscape water audits	10
2. CII irrigation system upgrades	10
3. Low water use landscape ordinance	10
4. Water efficient landscaping & irrigation system incentives	20
Sub-total	50
Total	240
Water Savings Goal	200

In addition the District has a budget plan to invest $400,000 in replacement of Polybutelene service lines. This is expected to reduce the amount of unmetered water (the difference between production and sales). Unmetered water currently amounts to 12% of water produced. Most water contractors are experiencing unmetered water in the area of 9%. VOM's high number is expected due to the premature failure of service lines (pipeline connecting customer's meter to the street main) constructed of Polybutelene. For the past 15 years or so, the District has experienced an increasing number of service line failures. In the early 1970's, when the price of copper pipe skyrocketed, many water utilities turned to a new product - Polybutelene - for new service lines. These have proven not to meet the manufacturers claims and many services have become oxidized and brittle with age and tend to fail prematurely at points of stress - such as where the pipe connects to the meter curb stop in the meter box. Failures in FY 1998 amounted to 130 services. The District has recently hired an outside contractor to replace Polybutelene services in those areas expected to experience high failure rates. In 1995, the District, rather than waiting for breaks, replaced 26 service lines in Oak Knolls subdivision. Of these, 13 (50%) were found to be leaking. None of the leaks were surfacing. The leak rates, based on visual observation, varied up to 3 gpm.

The overall savings achieved from the SCWA water conservation program are estimated to be 200 acre-ft per year or 0.18 mgd average annual production. This equates to 0.18 mgd of on-going annual savings. Peak month savings are estimated to be the same. No attenuation of the 0.18 mgd savings is assumed since the target of the program is principally inside water use and leak control. These demands do not vary seasonally. The District's Polybutelene replacement program is expected to lower the unmetered percentage. The combined effect of this program and periodic water distribution system audits followed up by appropriate leak detection and control as envisioned in the SCWA water conservation plan is postulated to drop unmetered water percentage to 9%. At year 2050 level of development, the combination of these two conservation efforts is estimated to amount to 0.35 mgd in savings. This is not a well studied estimate at this point and should be considered a rough estimate until better data is developed. The true success of these programs needs to be monitored and analyzed to ascertain what the actual savings will be.

5.40 Reclamation

No reclamation and reuse of treated waste water for urban purposes is currently practiced or available in the District service area. The SVCSD is providing reclaimed water free of charge for

improvements that would benefit VOM. Table 10 lists these elements of the Water Supply and Transmission System Project and shows how they are allocated to VOM (also refer to Section 5.13). The amount allocated to VOM is $14.6 million of which $8.5 million or 58% is for construction of Sonoma Aqueduct No. 2, an aqueduct that parallels the existing Sonoma Aqueduct from Pythian Road where it intersects Hwy 12 to Sonoma Tank near the east end of Verano Avenue. Construction of the latter is phased and currently is planned to be constructed between 2006 and 2013.

Similarly costs allocated to Sonoma are estimated at about $11.8 million. Clearly the District needs the City as a partner to help pay for the second aqueduct if it is ever built and visa versa and if one opts for meeting future needs by reconstructing a viable local well capacity then the other does too. Only lack of available ground water of sufficiently good quality would change this picture and given the evidence from the various studies that have been done, it appears that is not likely to happen.

7.20 VOM Well System Capital and Operating Costs

VOM came within 6% of reaching its SCWA entitlement limit of 4.7 mgd in July 1996. In the last two years, the District rehabilitated 0.53 mgd of well capacity and is in the process of rehabilitating additional wells in order to provide a reliable supply until expanded service from the new aqueduct is available. If the current growth management efforts of the County continue, and if reliable and sufficient quantities of ground water suitable for domestic quality are available, VOM may not require the new aqueduct. Out of necessity and reasonable prudence the District has therefore embarked on a program of well rehabilitation. In addition the District faces needs for added finished water (tank) storage for existing as well as new customers, pumps, pipelines, etc.

The capital cost of a well system involves initial rehabilitation/construction of the well, zone specific monitoring wells in order to both properly design certain wells (particularly wells on the valley floor) so that they will not harm shallow well owners, periodic rehabilitation work required over the 40 year life of a municipal well, periodic pump replacement (pumps and pump parts wear out in about 15 years), replacement of the well after its useful life, and ground water monitoring, analysis and management in order to operate the well without over drafting the ground water table in the zone from which they draw water. Currently the District has four wells which range in capacity from 90 gpm to 300 gpm. Typical life cycle cost of a 300 gpm well is $487,000 (see Table 11). Current O&M cost history is shown in Table 12 and amounts to $117/acre-ft of water produced. The bulk of O&M cost (76%) is for energy to run the pumps. Calculating the equal annual equivalent of life cycle capital costs using a useful life of 40 years and interest rate of 5%, dividing by the yield (which is reduced by 33% to account for rest periods and down-time on the wells), and adding the O&M unit cost yields a rough estimate of the present worth unit cost of water, namely $205/acre-ft. Currently VOM is paying $299/acre-ft for SCWA water of which $277/acre-ft is avoidable by lowering purchase volume. The apparent savings is at least $72/acre-ft. This is not an apples vs. apples comparison for the SCWA life cycle and resulting unit costs have not been calculated but if they were they would undoubtedly be higher than current costs.

to be served in a given storage zone but other factors also come into play such as fire flows. The latter have a large impact on small tanks and much less of an impact on large tanks. Suffice to say, following the 1998 Master Plan recommendations and holding the unit storage per ESD constant for new customers added under both forecasts yields local storage (sans SCWA storage) of 573 gallons/ESD for all customers for the Maximum Growth forecast and 603 gallons/ESD for the Minimum forecast. By comparison, using the criteria suggested by Brelje and Race in the 1998 Master Plan for calculating a reasonable amount of storage yields about 693 as the required amount. If SCWA storage at Eldridge and Sonoma (apportioned to VOM on an entitlement basis) are added, projected storage increases to a total of about 1,300 gallons/ESD under either forecast alternative. Not all of the storage at Eldridge and very little of the storage at Sonoma is effective or available to the District however, and it is felt that additional network analyses need to be done to determine the correct amount and scheduling of storage.

7.50 Capital Cost Recovery and Unit Costs

Table 17 sets forth a detailed summary of all capital costs for the two forecasts and shows the expected method of financing and expected cost recovery. A total of $29.5 million is required for the Maximum forecast vs. $20.1 million for the Minimum forecast. While a sizable portion of these costs are financed by SCWA, a total of $14 million to $15 million (essentially the same for each alternative) must be financed by the District. The reason for this is that although $8.5 million for the second aqueduct is avoided, financing for same is provided by SCWA. Just how to finance these local costs is beyond the scope of this study. A detailed financial plan is needed. An important input to such a plan is a detailed schedule of expected capital outlays. Near-term needs must then be broken out and financing alternatives analyzed. Pay-as-you-go financing would also be analyzed, although this approach can unfairly burden current rate payers.

As for cost recovery, Table 17 shows District connection fees are expected to cover 78% to 67% of the costs (Maximum and Minimum forecast respectively). Revenues from customers must cover the balance or 22% to 33% respectively. This balance is true only if projected costs are closely tracked and connection fees set accordingly, following the District's policy that new growth pay the full cost of expanding utility plant capacity required to serve same. Concurrent with this study, the District's connection fees have been analyzed and found to be in need of upward adjustment. If the District converts the capacity charge component of the connection fee to an ESD basis, a fee increase of about 9% is indicated. For the purposes of this analysis, such an adjustment has been assumed.

Equal annual equivalent costs divided by the potential annual yield of each alternative is shown in Table 18 for capital costs required to expand capacity and the water supply portion of same. This allows a comparison of the cost efficiency of each alternative. While the Minimum forecast results in avoidance of $9.3 to $8.0 million depending on whether one is talking about all expansion costs or just water supply expansion costs, the resulting unit cost of water developed on an annualized basis varies from $432 to $353/acre-ft for the Maximum forecast (again depending on whether one is talking about all expansion costs or just water supply expansion costs) vs. $640 to $504/acre-ft for the Minimum forecast. This demonstrates the economy of scale disadvantage of the

and must rehabilitate/construct well capacity sufficient to bridge the gap until additional capacity is available from SCWA via Sonoma Aqueduct No. 2. Increased reliability of service in case of an aqueduct outage or shortage of water in the Russian River argues for maintaining local well production capability solely on its own merits. Should the County extend its growth management efforts in the upcoming General Plan revision (circa year 2002-2004), it is entirely possible that the need to construct Sonoma Aqueduct No. 2. may be avoided. On the other hand, while return to use of some local ground water appears feasible and even economically attractive, uncertainties nevertheless exist over issues of quality, and possibly competition. Co-operative monitoring of ground water conditions by all users should allow a much more accurate evaluation within the next five or so years. Given the uncertainties surrounding growth management, the availability of adequate quantities of high quality ground water, and the important roles that the County of Sonoma and Sonoma Valley County Sanitation District play with regard to VOM service, it is prudent that the District preserve its option to be a participant with the City of Sonoma in Sonoma Aqueduct No.2.

9.20 Recommended Actions

The following actions are recommended:

1. Have a financial plan prepared to determine how to best meet future financial obligations both for local capital improvements and for obligations expected under the SCWA agreement.
2. Posture the District squarely behind the County of Sonoma regarding land use decision making by adopting a regulation that prohibits making a commitment to an applicant for water service unless the County first approves the project/building requested by the applicant.
3. Revise connection charges to assure new growth is paying its own way and convert to an ESD basis to bring greater accuracy and equity to allocation of costs between user classes.
4. Take the lead with the City of Sonoma and local agricultural interests in establishing a cooperative ground water monitoring and management program in the Valley.
5. Closely coordinate and cooperate with the City of Sonoma in sharing the available SCWA Aqueduct capacity in the most optimum way.
6. Keep well informed on County land use policy - particularly the upcoming round of planning on the next General Plan and keep the County informed of the District's water supply situation. What the County decides on land use in the new General Plan could materially alter the water supply strategy.
7. Ask SCWA to do some "what if" analyses on a number of scenarios: how best to utilize storage at Eldridge and Sonoma tanks; energy cost trade-offs of adding a mainline booster or boosters to increase the velocities and hence capacity of the existing aqueduct; advantage/feasibility of scheduling a portion of the Sonoma Aqueduct sooner; and pre-agreed operational rules aimed at protecting both Sonoma and VOM in the event of entitlement encroachment.

Tables

Table 1
Dwelling Units Served

FY Ending	Multi-fmly	SF (1)	All Dwellings	Added/yr
1990	2,140	5,739	7,879	
1991	2,190	5,809	7,999	120
1992	2,220	5,842	8,062	63
1993	2,270	5,867	8,137	75
1994	2,281	5,914	8,195	58
1995	2,317	5,928	8,245	50
1996	2,359	5,925	8,284	39
1997	2,368	5,962	8,330	46
1998	2,387	5,978	8,365	35
Total				486
Avg/yr				61

Notes:
(1) SF means single family detached dwelling unit.
These make up 72% of all dwellings served.

Table 2
Historic Water Production

	Annual, acre-ft				Peak Month, mgd		
FY Endi	SCW	Wells	Total	Mont	SCW	Wells	Total
1975	1,607	293	1,90	Aug	1.8	0.7	2.5
1976	1,680	309	1,98	Aug	1.8	0.7	2.5
1977	1,334	239	1,57	Jul	1.9	0.9	2.8
1978	1,262	37	1,29	Jun	1.9	0.0	2.0
1979	1,685	42	1,72	Jun	2.3	0.0	2.4
1980	1,806	85	1,89	Jul	2.5	0.0	2.5
1981	2,111	10	2,12	Jun	3.2	0.0	3.2
1982	2,000	31	2,03	Jul	2.9	0.1	3.1
1983	2,052	10	2,06	Aug	2.8	0.1	3.0
1984	2,262	11	2,27	Aug	3.1	0.0	3.1
1985	2,424	10	2,43	Jul	3.2	0.0	3.2
1986	2,493	8	2,50	Jun	3.4	0.0	3.4
1987	2,739	11	2,75	Jul	3.4	0.0	3.4
1988	2,767	36	2,80	Aug	3.2	0.1	3.4
1989	2,600	119	2,71	Aug	3.0	0.4	3.4
1990	2,978	35	3,01	Jul	3.7	0.2	3.9
1991	2,990	5	2,99	Jul	4.0	0.0	4.0
1992	2,886	3	2,88	Jun	4.1	0.0	4.1
1993	2,976	5	2,98	Aug	3.9	0.0	3.9
1994	3,243	18	3,26	Aug	4.3	0.0	4.4
1995	3,170	54	3,22	Aug	4.3	0.1	4.5
1996	3,144	125	3,26	Aug	4.2	0.0	4.2
1997	3,054	398	3,45	Jul	4.4	0.3	4.7
1998	2,728	417	3,14	Jul	4.0	0.3	4.4

Note: Water Production as measured by master meters located
Aqueduct turnouts and District we

Table 3
Distribution of Peak Month Demand by Customer Class

Type of Dwelling	Number(1)	%	Ratio(2)	gpd(3)
Apartments	780	9%	0.47	230
Mobile Homes	679	8%	0.51	250
THCs, Duplex, Triplex, etc. (4)	928	11%	0.80	392
SF detached (5)	5,978	71%	1.00	490
Total	8,365	100%		

Notes:
(1) District sales records
(2) Ratio determined from Reference 9 (North Marin Water District study of over 20,000 dwelling units of all kinds.)
(3) SF value held constant (see Note 5), other values determined as prorata share of SF.
(4) THCs = townhouses and condominiums
(5) Determined from analysis of FY 1998 - 5/8ths inch sales records. Study examined water use of 5,177 SF homes.

Table 4
Comparison of Existing Dwellings, ESDs and Connections

	Dwellings (1)	ESDs (2)	Connections
Residential			
Apartments	780	367	
Mobile Homes	679	346	
THCs, Duplex, Triplex, etc. (3)	928	742	
Sub-Total, Multiples	2,387	1,455	369
SF detached	5,978	5,978	5,978
Sub-Total	8,365	7,433	6,347
CII		1,325	208
Total	8,365	8,758	6,555

Notes:
(1) District sales records
(2) Residential ESDs calculated by multiplying the ratio values in Table 3 x number of dwelling units in that class. The CII ESD value is calculated by dividing current avg. peak month CII consumption by 490 gpd, the value of 1 ESD.
(3) THCs = townhouses and condominiums

Table 5
Demand Parameters and Peaking Ratios

	Brelje & Race 1998 MP Study		This Study (3)	
	gpd/Connection (1)	Pk Factor (2)	gpd/ESD	Pk Factor
Annual	450	1.0	290	1.0
Peak Month	675	1.5	490	1.7
Max day (4)	1,350	3.0	870	3.0

Notes:
(1) The Brelje & Race values include unmetered water
(2) Pk Factor means peaking factor and is determined using annual demand as base demand.
(3) "This Study" values exclude unmetered water as the forecast incorporates same as a separate item.
(4) Max day for ESD use was assummed to be equal to 3 x the annual demand parameter.

Table 6
Forecast of Annual Demand Under Sonoma County Ord. 4527

Element of Ord. 4527	ESDs/yr	Note
VOM's share of annual residential limit	48	(1)
Exceptions to residential limit	10	(2)
Commercial (15% of total demand)	10	(3)
Total	68	

Notes:

(1) Based on estimate prepared by Brelje & Race, Reference 1.
(2) Exceptions for second units, farm worker housing, homeless shelters and residential community care facilities.
(3) Historically CII has explained15% of all water use. It is assumed this share will continue into the future.

Table 7
Peak Month Demand Forecasts, mgd

		Forecast	
	Existing	Minimum (1)	Maximum (2)
Residential (3)	3.61	5.16	7.23
CII	0.64	0.90	1.28
Less Conservation (4)	0.00	0.18	n/a
Sub-total	4.26	5.88	8.50
Unmetered (5)	0.51	0.53	n/a
Total Demand	4.77	6.41	8.50

Notes:

(1) Growth Mgt. Ord. 4527 (assumed in place for 52 yrs)
(2) Dist. Sphere of Influence used by Brelje & Race
(3) The Min. forecast includes 0.09 mgd for demand expected from existing customers whose dwellings are occupied only part-time or who have a spring or private well on their property. The District currently has 355 single family dwellings (6% of all SF units) that are unoccupied for 2 months or more during each yr as determined by absence of water passing through the meter). Furthermore, the District has 418 customers served by 5/8ths inch meters that have double check valves. These primarily represent customers who have a spring, creek or private well. As housing becomes more scarce and as wells deteriorate and need repair, it is estimated that reliance on the District will increa This latent demand equates to about 0.09 mgd. It is assumed th 80% of this demand or 147 ESDs will come online within 52 yrs
(4) For Min. forecast, it is assumed that the 200 acre-ft/yr (0.18 mgd of savings projected by SCWA from a VOM water conservation program investment of $600,000. Also a reduction in unmetered of 25% (12% to 9%) is anticipated due to the $400,000 Polybutel replacement program. Conservation and leak reductions are ignored in Max. forecast to be consistant w. Brelje & Race forec
(5) For Min. forecast, existing Unmetered water = 12%, then assum to drop to 9% due to PB service line replacements and leak repa

Table 8
Forecast of Sources of Supply to Meet Peak Month Demand, mgd

Source	Existing	Future Minimum (1)	Future Maximum (2)
SCWA Aqueducts (3)	4.24	4.70	8.50
Production Wells (4)	0.53	1.71	0.00
Recycled Water (5)	0.00	0.00	0.00
Sub-Total	4.77	6.41	8.50
Reserves:			
Wells (6)	0.00	0.86	2.25
Aqueduct	0.46	0.00	0.00
Total Reserves - mgd	0.46	0.86	2.25
Total Reserves - % of Demand	10%	13%	27%
Total (7)	5.23	7.27	10.75
Expansion Capacity		2.04	5.53

Notes:
(1) Growth Mgt. Ord. 4527 (assumed in place for 52 yrs)
(2) Dist. Sphere of Influence used by Brelje & Race
(3) At this level of planning, the Maximum demand alt. includes the currently planned entitlement expansion of 80% (3.8 mgd) for a total of 8.5 mgd.
(4) Production wells are wells that are used on a more or less regular basis year in and year out to help meet demand. Production well capacity is selected to achieve a total supply of 6.41 mgd under the Minimum alt.
(5) No recycled water opportunities have been identified to date, but it is possible that recycled water made available to vineyards or recreation areas may free up some well capacity for municipal purposes.
(6) If wells are used for production, it is assumed an additional 50% of well capacity should be developed to allow proper resting, rotation and rehab. of wells and to cover unplanned outages. This equates to a well redundancy factor of 1/3.
(7) SCWA Entitlement

"Existing" and "Minimum"	4.7	mgd
"Maximum"	8.5	mgd

Table 9
Annual Demand Forecasts, acre-ft

	Existing	Forecast Minimum (1)	Forecast Maximum (2)
Residential (3)	2,616	3,676	5,395
CII (3)	466	752	952
Less Conservation (4)	0	200	n/a
Sub-total	3,082	4,228	6,348
Unmetered (5)	370	381	n/a
Total Demand (6)	3,452	4,608	6,348

Notes:
(1) Growth Mgt. Ord. 4527 (assumed in place for 52 yrs)
(2) Dist. Sphere of Influence used by Brelje & Race
(3) Same as Table 8 except demand is based on 290 gpd/ESD for th Minimum forecast and 450 gpd/connection for the Maximum fore
(4) SCWA program
(5) Existing unmetered is 12% and is assumed to drop to 9%.
(6) Existing is annual demand experienced in 1997

Table 10
SCWA Water Supply and Transmission System Capital Costs
(1998 dollars)

	Total	VOM Share	
	$	%	$
Common Facilities (1)	40,599,600	4.4%	1,798,562
Storage Facilities (1)	32,950,000	4.4%	1,459,685
Water Conservation (1)	15,000,000	4.4%	664,500
Oakmont Pipeline (2)	1,800,000	57.4%	1,033,784
Mirabel - Cotati Pipeline (2)	2,071,000	57.4%	1,189,426
Sonoma Aqueduct No.2 (2)	14,780,000	57.4%	8,488,514
Sub-Total	107,200,600		$14,634,470

Notes:

(1) VOM's share based on proposed new acre-ft entitlement of 3,200 acre-ft, namely 4.4%. Actual cost will be based on VOM's actual annual purchases from SCWA. For FY 1997, these amounted to 5.9%. If VOM dropped its purchases by 1,000 acre-ft/yr, it's share would approximate 4.1%, therefore 4.4% is believed to be a reasonable estimate.

(2) Based on peak month entitlements contained in proposed new agreement, namely 8.5 mgd for VOM and 6.3 mgd for Sonoma.

Table 11
Life Cycle Cost of 300 gpm Well

Item	Cost	Note
Initial Construction	250,000	(1)
Periodic rehabilitation and repair	90,000	(2)
Pump replacement	80,000	(3)
Monitoring/planning	67,000	(4)
Life Cycle Capital Costs (1998 dollars)	487,000	
Annualized Capital Cost	28,381	(5)
Annual Production, acre-ft/yr	322	(6)
Annualized Capital Cost, $/acre-ft	$88	
Operation & Maintenance Cost, $/acre-ft	$117	
Total Unit Cost, $/acre-ft	$205	

Notes:

(1) Estimate by Luhdorff & Scalmanini

(2) Assume 40 year life and rehab expense of $30,000 every 10 yr

(3) Estimate 15 yr life for pump and bowl, $30,000 replacement co

(4) Offsite monitoring and planning: i.e. share of $62,000 zone specific monitor well (50% and share of $180,000 overall ground water monitoring and management planning effort (20%)

(5) Fully amortized capital cost: term 40 years, interest 5%.

(6) Operating at 300 gpm for 2/3's of year.

Table 12
Cost to Operate Local Wells

Item	Cost (1)	%
Electrical Energy	58,086	76%
Labor (2)	7,816	10%
Water Quality Testing	5,309	7%
Operating Materials	3,109	4%
Chemicals (chlorine)	2,505	3%
Total	$76,825	100%
Total Production, acre-ft	660	
Unit Cost, $/acre-ft	$117	

Notes:

(1) Based on actual cost of operating Donald, Park and Agua Caliente wells for 18 month period (July 1997 through December 1998). Note: wells were operating only part of the time during this period due to upgrade and rehabilitation work.

(2) Includes payroll additives and overheads of 47%

Table 13
Capital Cost of Well System
(Planning Period = 52 years, 1998 level cost)

Item	Amount, $	Note
Initial well rehab. and construction (7 wells)	1,050,000	(1)
Zone specific monitoring wells	186,000	(2)
Ongoing & periodic well rehab. work	1,144,000	(3)
Pump replacement	572,000	(4)
Future well replacement (at end of useful life)	825,000	(5)
Ground water master planning/monitoring/analysis	180,000	(6)
Sub-Total	3,957,000	
Contingency, 10%	395,700	
Total	4,352,700	

Notes:

(1) The water supply forecast indicates maximum well capacity of 2.57 capacity is needed. One third of this amount is dedicated to reserve or redundant capacity in order to assure the reliability of well production. It is assumed the typical well will produce 166 gpm. This is based on the existing production experience with Donald, Park and Aqua Caliente wells (365 gpm) and the assumed production of 300 gpm from Mtn. Ave. Therefor 7 additional wells are needed. Estimated initial cost is $150,000 per well. Total number of wells in system is est'd at: 11 If future wells can be assumed to yield 300 gpm on average, only four additional wells would be needed. Cost per well would be higher, about $250,000 but other costs which vary as a function of the number of wells would decrease and overall, capital costs are estimated at $4.0 million.

(2) Assumes three will ultimately be needed @ $62,000 ea.

(3) During an average municipal well life of 40 years, the well will need to be rehabilitated periodically. $20,000 every 10 years is advised. (Source: Larry Ernst, Luhdorff & Scalmanini.

(4) Est'd life of typical well pump & bowl installation w. drops is 15 yrs @ is 15yrs @ $15,000 ea (Source: Bill Gustavson, Luhdorff & Scalmanini).

(5) It is estimated that 50% of all wells will have to be replaced within the 52 yr planning period.

(6) Initially ground water master plans should be generated every 2 yrs and then drop to 5 years. These will analyze and report on condition of various monitored ground water zones and will dictate ground water management.

Table 14
Local Water System Capital Costs

	Amount (1)	Notes
Storage	3,850,000	(2)
Well Rehab/replacement	4,352,700	(4)
Pumping Plants	450,000	(3)
Supervisory Control	316,000	(3)
Mains	5,500,000	(3)
Polybutylene Replacements	400,000	(5)
Seismic Retrofit & Misc.	500,000	(5)

Notes:
(1) Costs are not additive as sum differs depending on which growth alternative is assumed
(2) From 1998 Brelje & Race Master Plan
(3) 1998 Master Plan by Brelje and Race
(4) See Table 13
(5) Based on VOM Capital Improvement Plan

Table 15
Future Capital Costs and Cost Allocations
(Post 1998 Capital Requirements, all in 1998 dollars)

I. SCWA Planned Water System Improvement Allocations:

	Total	New Growth's Share		Forecast Alternative		
	$	%	$	Max.(w. Aq.)	Min. (w/o Aq.)	Notes
Common Facilities	1,798,562	100.00%	1,798,562	1,798,562	1,798,562	(1)
Storage Facilities	1,459,685	100.00%	1,459,685	1,459,685	1,459,685	(1)
Water Conservation	664,500	100.00%	664,500	664,500	664,500	(1)
Oakmont Pipeline	1,033,784	100.00%	1,033,784	1,033,784	1,033,784	(2)
Mirabel - Cotati Pipeline	1,189,426	100.00%	1,189,426	1,189,426	1,189,426	(3)
Sonoma Aqueduct No.2	8,488,514	100.00%	8,488,514	8,488,514	0	(4)
Sub-Total	14,634,470		$14,634,470	14,634,470	6,145,957	
II. Local Water System Improvement Allocations:						
Storage	3,850,000	46.23%	1,780,000	1,780,000	897,120	(5)
Well Rehab/replacement	4,352,700	100.00%	4,352,700	3,817,369	4,352,700	(6)
Pumping Plants	450,000	50.00%	225,000	225,000	225,000	(7)
Supervisory Control	316,000	90.00%	284,400	284,400	284,400	(7)
Mains	5,500,000	37.00%	2,035,000	2,035,000	1,526,250	(8)
Polybutylene Replacements	400,000	20.00%	80,000	80,000	80,000	(9)
Seismic Retrofit & Misc.	500,000	0.00%	0	0	0	(10)
Sub-Total	15,368,700		8,757,100	8,221,769	7,365,470	
III. Total:			23,391,570	22,856,240	13,511,427	

Notes:

(1) Repayment of these facilities is included in the O & M rate.

(2) This pipeline has already been built. SCWA plans to purchase this pipeline from Santa Rosa and recover fair share cost from VOM.

(3) In order to keep the option open to construct the second Sonoma Aqueduct, it is necessary upstream capacity be built in this pipeline for VOM. It is planned to be constructed before So. Aq. No. 2.

(4) The allocation for the w/o Aq. alt. is assumed to be "0" based on the assumption that the Minimum growth alt. will not require water in excess of what can be rehabilitated/constructed locally.

(5) From 1998 Brelje & Race Master Plan. For the Minimum alt., storage cost is multiplied times 0.50 to account for lower storage required. See Table 16 for derivation.

(6) See Table 13 for derivation. For the "w. Aq. Alt", well rehab is cut off at 1,565 gpm (2.25 mgd) while waiting for the second aqueduct to come online. This will assure the District a minimum reserve of 31%. while waiting for the aqueduct. By 2050, assuming wells are maintained, the reserve drops to 26%. Under the "w/o Aq." alt., a total of 1,785 gpm (2.57 mgd) of well capacity is needed. Since production capacity must be reliable, 1/3 of this amount or 595 gpm (0.86 mgd) is dedicated to reserve and 2/3rds or 1,190 gpm (1.71 mgd) is dedicated to production. Actual use of all wells is rotated to give all wells a a rest and to cover down time for repairs, rehab., etc. This reserve will also assure the District has sufficient capacity to accommodate the emergency loss of the largest well, assumed to be 300 gpm. Luhdorff and Scalmanini advise that the 1/3 rule and coverage for loss of the largest pump are essential criteria to assure a reliable ground water supply.

(7) 1998 Brelje and Race Master Plan. New growth's share split 50/50 between supply and distribution.

(8) 1998 Brelje & Race Master Plan contains total cost and is an update of 1992 Report. Allocation to new growth based on 1992 report. Allocation to Minimum Alternative dropped by 25% to account for lower growth under that alternative.

(9) The polybutylene service line replacement program is being done to remedy breaks and leakage occurring with this material. 20% is allocated to leak reduction. This in turn frees up water for new connectors.

(10) Based on VOM Capital Improvement Plan.

Table 16
Existing and Proposed New Storage
(As recommended in Reference 1 but modified for the Minimum Growth Alt.)

Tank	Existing Storage	Capacity, mg: Type of Proposed Storage: Replacement	Supplemental/New	Customer Allocation: Existing	Future	Stor. Needed for Min. Growth Alt.
Replacements/Addition						
Boyes Springs Villag	0.015	0.160		0.160		
Crest 1	0.150		1.000	1.150		
Glen Ellen			1.000		1.000	0.504
Trinity Oaks	0.030	0.100		0.100		
Crest 2			1.000		1.000	0.504
Sobre Vista 2	0.210	0.140	0.014	0.014	0.140	0.071
Cavedale			1.000		1.000	0.504
Moon Mtn			0.160		0.160	0.081
Other Existing	0.200			0.200		
Temelec 1	0.200			0.200		
Temelec 2	1.000			1.000		
Donald	0.200			0.200		
Michael	0.015			0.015		
Boyes	0.210			0.210		
Chestnut	0.320			0.320		
Sobre Vista 1	0.030			0.030		
Hanna	2.000			2.000		
Saddle (Glen Ellen)	0.150			0.150		
Totals, mg:						
Existing Storage	4.730					
Total Future Storage for Existing Customers				5.749		
Future Storage for New Development (Maximum Growth Alt.)					3.300	
Future Storage for New Development (Minimum Growth Alt.)						1.663

Recap, Avg Storage per ESD:

	ESDs	Storage/ESD, gallon: Existing	Future
Maximum Growth Alt. (1989 Brelje & Race Plan):			
Existing ESDs	8,758	656	
Future ESDs	7,027		470
Total	15,786	573	
Minimum Growth Alt.			
Existing ESDs	8,758	656	
Future ESDs	3,536		470
Total	12,294	603	
Storage Required/ESD if Brelje and Race's criteria met (1)		693	
Additional Storage Hypothetically available in Eldride and Sonoma Tanks (2)			
Maximmum Growth Alt.		655	
Minimum Growth Alt.		841	
Total Hypothetical Storage Availabl			
Maximmum Growth Alt.		1,228	
Minimum Growth Alt.		1,444	

Notes:
(1) Sum of 25% of max. day demand per ESD, plus 100% of avg. day demand/ESD plus residential fire flow of 1,000 gpm for 2 hrs (no concurrent events/ta
(2) Total of 18 mg x District's entitlement share devided by total ESDs in year 205

Table 17
Recap of Total Capital Costs and Cost Recovery
(1998 dollars)

Item	Group (1)	Amount, $ (or %) Max. Forecast (w. Aq.)	%	Min. Forecast (w/o Aq.)	%	Note
SCWA Capital Costs						
Costs paid via water rate paid						
Common Facilities	1	1,798,562	46%	1,798,562	46%	(2)
Storage Facilities	1	1,459,685	37%	1,459,685	37%	(2)
Water Conservation	1	664,500	17%	664,500	17%	(2)
Sub-total		3,922,747	100%	3,922,747	100%	
Costs to be financed with SCWA Revenue Bonds						
Oakmont Pipeline	1 or 3	1,033,784	10%	1,033,784	46%	(3)
Mirabel - Cotati Pipeline	3	1,189,426	11%	1,189,426	54%	(4)
Sonoma Aqueduct No.2	3	8,488,514	79%	0	0%	(4)
Sub-total		10,711,723	100%	2,223,209	100%	
Local Capital Costs						
Storage		3,850,000	26%	2,967,120	21%	(5)
Well Rehab/replacement		3,817,369	26%	4,352,700	31%	(6)
Pumping Plants		450,000	3%	450,000	3%	(5)
Supervisory Control		316,000	2%	316,000	2%	(5)
Mains		5,500,000	37%	4,991,250	36%	(5)
Polybutylene Replacements		400,000	3%	400,000	3%	(7)
Seismic Retrofit & Misc.		500,000	3%	500,000	4%	(8)
Sub-total		14,833,369	100%	13,977,070	100%	
Recap and Method of Financing						
Portion to be financed by SCWA O&M charges		3,922,747	13%	3,922,747	19%	(9)
Portion to be financed by SCWA Revenue bonds		10,711,723	36%	2,223,209	11%	(10)
Portion to be financed by VOM		14,833,369	50%	13,977,070	69%	(11)
Total of all Capital costs		29,467,840	100%	20,123,027	100%	
Cost Recovery						
New Growth Connection Fees						
Capacity Charges		20,748,012		12,450,627		(12)
Front foot Charges		2,108,227		1,060,800		(13)
Sub-total		22,856,240	78%	13,511,427	67%	
Rates & Charges to Customers		6,611,600	22%	6,611,600	33%	
Total Cost Recovery		29,467,840	100%	20,123,027	100%	

Notes:

(1) See Section 5.13 for explanation of groups of costs contained in the SCWA water supply agreement.
(2) For a number of years now, SCWA has funded Common Facilities and Storage costs by surcharging the O&M rate. This "pay as you go" approach is endorsed by the Water Advisory Committee and is expected to continue. Water Conservation was added by Amendment 10 as an authorized O&M cost.
(3) This pipeline has already been built. SCWA plans to purchase this pipeline from Santa Rosa and recover cost as a storage facility item (it feeds Eldridge Tanks) or via repayment agreement with VOM. The latter is assumed.
(4) That portion of cost allocated to VOM based on entitlement.
(5) Based on Brelje and Race 1998 Master Plan.
(6) Capital costs for well system based on cost estimates provided by Luhdorff and Scalmanini.
(7) Based on VOM Capital Improvement Plan
(8) Based on VOM Capital Improvement Plan
(9) Assumes O&M charges will continue to be surcharge to pay for Common and Storage facilities and Water Conservation as you go
(10) Assumes Mirabel-Cotati Pipeline and Sonoma Aqueduct No. 2 will be financed with SCWA revenue bonds and that Oakmont Pipeline share will be repaid via some debt instrument between SCWA and VOM
(11) This is VOMs responsibility to finance. A bundled Joint Powers Authority Revenue bond issue or Installmen Purchase Certificates seem most likely or possibly "pay-as-you-go" from surplus revenues combined with net out of pocket savings in source water production vs. purchase. A financial plan is needed to find best solution.
(12) Assumes capacity charges are increased about 10% to assure new growth pays its fair share of capital expansion costs.
(13) Assumes front foot charges continue to be levied. Analysis shows that front foot charges yield $300/ESD.

Table 18
Equal Annual Equivalent and Water Costs

	Growth Alternative					
	Maximum (1)	Minimum (2)	Net Savings	% Change	Inc./Dec.	Note
New Water Supply Developed	2,896	1,156				(3)
Capital Costs Required to Provide Expanded Capacity:						(4)
Total	22,856,240	13,511,427	9,344,813	41%	Decrease	(5)
Equal Annual Equivalent	1,251,990	740,112	511,878	41%	Decrease	(6)
Unit Cost per Acre-ft	432	640		48%	Increase	
Water Supply Portion of Capital Costs Required to Provide Expanded Capacity:						(7)
Total	18,594,040	10,640,857	7,953,183	43%	Decrease	
Equal Annual Equivalent	1,018,521	582,871	435,649	43%	Decrease	
Unit Cost per Acre-ft	352	504		43%	Increase	

Notes:
(1) Assumes Sonoma Aqueduct No. 2 is required and built
(2) Assumes Sonoma Aqueduct No. 2 is not required or built and that supplemental well water will suffice
(3) Acre-ft of new demand
(4) Capital cost of storage, distribution and supply allocated to new growth.
(5) Costs for both options include the cost of maintaining the option of building So. Aq. No. 2
(6) Term used to calculate equal annual equivalent is 50 yrs, discount rate = 5%
(7) Supply only