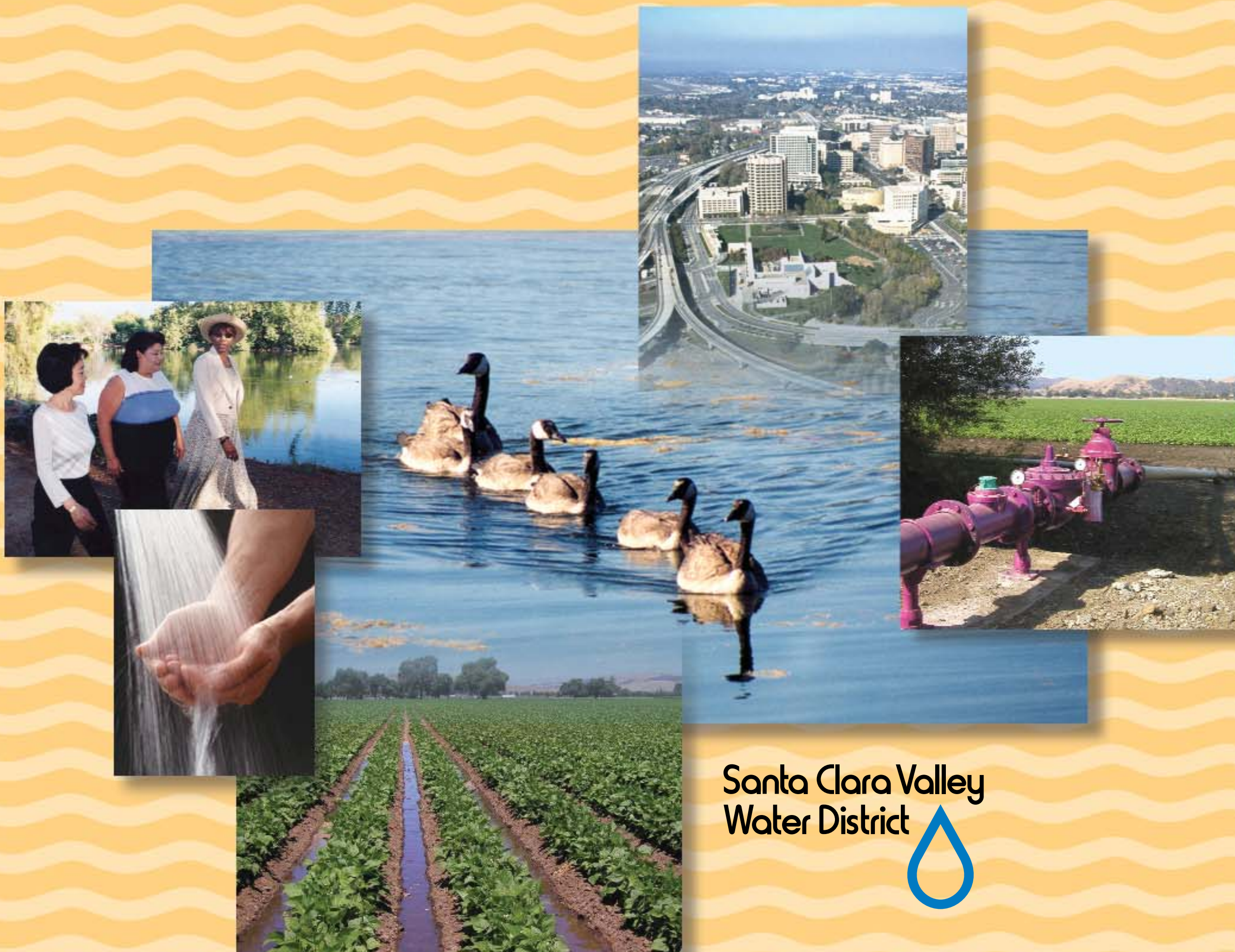
IWRP 2003

Integrated Water Resources Planning Study 2003

Appendixes



Santa Clara Valley Water District

IWRP 2003

APPENDIXES

IWRP 2003 APPENDICES: TABLE OF CONTENTS

ACRONYMS AND ABBREVIATIONS
&
GLOSSARY

Acronyms and Abbreviations

ABAG	Association of Bay Area Governments
af	acre-foot
Ag	agricultural
BAWAC	Bay Area Water Agencies Coalition
CEO	Chief Executive Officer
CEQA	California Environmental Quality Act
CIP	Capital Improvement Plan
CVP	Central Valley Project
CVPIA	Central Valley Project Improvement Act
DOF	Department of Finance
DHS	Department of Health Services
DBP	disinfection by-products
DWR	Department of Water Resources
DWSAP	Drinking Water Source Assessment and Protection
ESA	Endangered Species Act
ET	Evapotranspiration
EWA	Environmental Water Account
FAHCE	Fisheries and Aquatic Habitat Collaborative Effort
HCP/NCCP	Habitat Conservation Plan/Natural Communities Conservation Plan
IWRP	Integrated Water Resources Planning Study
O&M	operations and maintenance
MCL	maximum contaminant level
mgd	million gallons per day
M&I	municipal and industrial
MOU	Memorandum of Understanding
MTBE	methyl tertiary butyl ether
NEPA	National Environmental Policy Act
PARWQCP	Palo Alto Regional Water Quality Control Plant
PV	present value
R&D	research and development
SBA	South Bay Aqueduct
SBWRP	South Bay Water Recycling Program
SCRWA	South County Regional Wastewater Authority
SCVWD	Santa Clara Valley Water District
SFPUC	San Francisco Public Utilities Commission
SJ/SCWPCP	San Jose/Santa Clara Water Pollution Control Plant
SJWC	San Jose Water Company
SWP	State Water Project
SWPCP	Sunnyvale Water Pollution Control Plant
SWRCB	State Water Resources Control Board
TDS	total dissolved solids
TWIP	Treated Water Improvement Project
USBR	United States Bureau of Reclamation
USEPA	United States Environmental Protection Agency
UV	ultraviolet
UWMP	Urban Water Management Plan
WMI	Watershed Management Initiative
WTP	water treatment plant

Glossary of Terms

all-weather supplies	Water that is available in dry, normal, and wet years: includes conservation, recycling, and desalination.
banking	The storing, for later use, of water that might otherwise be lost.
baseline	Existing and adopted supplies, infrastructure, programs, and agreements.
Bay-Delta	The region of the Sacramento River and San Joaquin River Delta confluence. A watershed drainage that supplies about 55% of the fresh water used in California.
building blocks	Feasible projects and programs for meeting future water demands.
CALFED	A partnership of state and federal agencies working with stakeholders to restore the ecosystem of the Sacramento-San Joaquin Bay-Delta and improve the reliability and quality of water supplies for over 20 million Californians.
CALSIM II	Department of Water Resources water simulation model.
conjunctive use	A water management strategy for the coordinated use of groundwater and surface water resources.
constructed scale	A range of qualitative values converted into a range of quantitative values (e.g., best, good, fair, poor could become 100%, 75%, 50%, and 25%).
County	Santa Clara County
CVPIA	Central Valley Project Improvement Act; legislation signed into law in 1992 that mandated changes in management of the Central Valley Project, particularly for the protection, restoration, and enhancement of fish and wildlife.
dry-year yield	The average annual supply that could be expected if the 1987–1992 hydrology were repeated.
Ends Policy	A category of District Board policies, with qualitative yet specific outcomes or expectations.
EWA	Environmental Water Account; CALFED strategy to reduce conflicts between environmental needs and water project operations by providing water and flexibility through the strategically timed acquisition, storage, transfer, and release of water.

Extend	The District’s water simulation model used in the IWRP analysis.
Hetch-Hetchy supply	Water conveyed by the San Francisco Public Utilities Commission from the Hetch-Hetchy Valley in the eastern Sierra Mountains.
nonpotable	Not suitable for drinking.
portfolio	A combination of building blocks that complement each other to meet water needs with a high degree of reliability.
predictive indicators	Measures of performance that can be used to evaluate whether building blocks and water resource portfolios achieve IWRP planning objectives.
present-value dollars	The current value of one or more future cash payments, discounted at an interest rate that accounts for the time value of money.
real dollar costs	Costs that do not include the effect of general price inflation.
San Luis Reservoir	A 2 million acre-feet facility southeast of Santa Clara County, jointly owned and operated by the federal Bureau of Reclamation and the state Department of Water Resources.
scalability	Modular; able to be built in phases.
Semitropic	Semitropic Water Storage District, in southern San Joaquin Valley
spot market	Water agreements to purchase or transfer water within a one to two year period
stakeholder	Any individual or interest who will be affected by, or has an interest in, the County’s long-term water supply.
transfers	An agreement to purchase water from another water user.
yield	The amount of water deliverable from a facility in a specific interval (e.g., year).

APPENDIX: INTRODUCTION

Note: “Appendix: Introduction” contains minutes from stakeholder meetings that occurred during the IWRP 2003 process. Some of the information reflected in the minutes, such as portfolio construction and cost estimate information, was preliminary and was later refined through further analysis.

IWRP STAKEHOLDER MEETING NO. 1 MINUTES

Santa Clara Valley Water District

INTEGRATED WATER RESOURCES PLAN 2003
STAKEHOLDER MEETING NO. 1 MINUTES
Wednesday, July 25, 2001, 9 a.m. to 11:30 a.m.

MEETING SUMMARY

On July 25, 2001, the first of four stakeholder meetings was held in the boardroom of the Santa Clara Valley Water District headquarters building. The purpose of the meeting was twofold: for stakeholders to become a part of the Integrated Water Resources Planning (IWRP) process, and to have a forum to exchange comments.

Staff is in the process of updating the 1996 IWRP with a new IWRP 2003. Because stakeholders were chosen to represent various parts of the community, their comments on the IWRP 2003 components are considered representative of the community at large. This first meeting collected their interests, their general comments on the planning objectives, and their comments on each of the seven planning objectives affecting Santa Clara County. Supplementary material was provided.

ATTENDEES

	Name	Representing
Stakeholders	Margaret Bruce James Tucker Fred Fowler Roger Salstrom Nicole Sandkulla Huali Chai Michael Stanley-Jones George Belhumeur Jan Garrod Joe Gonzales Doug Nakamura Nancy Olson Kelly Crowley Randy Shipes Robin Saunders	Business Community Business Community Flood Control Advisory Committee Academic Community Other Water Agencies Environmental Groups Environmental Groups Water Retailers Agricultural Advisory Committee Agricultural Community Landscape Advisory Committee Public Advocacy Groups Environmental Groups Wastewater/Water Recycling Water Retailers
District Staff, Consultants, and Board Members	Stan Williams, Walt Wadlow, Keith Whitman, Tracy Ligon, Kent Haake, Larry Adams, Barbara Judd, Alison Russell, Amy Fowler, Susan Fitts, Phillippe Daniel (Camp Dresser & McKee), and Dan Rodrigo (Camp Dresser & McKee). Attending portions of the meeting were Director Larry Wilson, Director Greg Zlotnick, Director Tony Estremera, and Director Rosemary Kamei.	

	Name	Representing
Stakeholders Absent	Michael Carlin (Other Water Agencies), Jacqui Carr Gouveia (Homeowners), Ann Draper (County Planning), Sally Lieber (Water Commission), and Jim Gasser (Wastewater/Water Recycling)	
Observers	Trish Mulvey and Jim Bombaci	

STAKEHOLDER INTERESTS AND COMMENTS

The interests and comments of the stakeholders form the balance of this meeting summary and are presented below. Typically, stakeholders only provided comments not already presented by other stakeholders. There is a list of acronyms at the end of this document.

Interests Presented during the Introductions

Stakeholder	Representing	Interests
M. Bruce	Business Community	Business competitiveness; quality of life; reliability; water quality
J. Tucker	Business Community	Reliability; water quality; cost
F. Fowler	Flood Control Advisory Comm.	Flooding
R. Salstrom	Academic Community	Availability; water quality; reliability; background in the District's Extend simulation model
N. Sandkulla	Other Water Agencies	Representing water retailers; consistency with the BAWUA members' plans and if possible with SFPUC plans
H. Chai	Environmental Groups	Development of a balanced approach that preserves and restores the Bay
M. Stanley-Jones	Environmental Groups	Toxic contaminants; water quality; environmental justice
G. Belhumeur	Water Retailers	Reliability; water quality; cost control
J. Garrod	Agricultural Advisory Comm.	Cheap, constant supply
J. Gonzales	Agricultural Community	Constant supply of cheap water; is a user of recycled water
D. Nakamura	Landscape Advisory Comm.	Irrigation water for landscapes
N. Olson	Public Advocacy Groups	Pollution control
K. Crowley	Environmental Groups	Protecting the environment
R. Shipes	Wastewater/Water Recycling	Protection of the watershed; runoff; groundwater; recycled water
R. Saunders	Water Retailers	Long-term reliability of water supply; water quality; use of recycled water

General Comments on Planning Objectives

Stakeholder	Comments	Response
M. Bruce	Need to keep tabs on cutting-edge issues like endocrine disrupters.	Staff proposes to discuss endocrine disrupters as part of the risk analysis and as part of the description of water recycling and groundwater protection programs later on in the IWRP process.
J. Tucker	Are diversity and adaptability the same?	Diversity and adaptability are different. Diversity expresses the degree of variety of water sources. Adaptability expresses the degree of flexibility in the investments of water supply portfolios.
F. Fowler	List is fine except where is flood control?	Flood management activity is noted as a sub-objective in Objective 7: Enhance Community Benefits.
R. Salstrom	Not sure that diversity is an objective; you do it to reduce risk.	The District has a policy that states “There are a variety of supply sources” and this objective reflects that value. However, diversity is also a means to reduce risk. Therefore, staff will be careful not to impose risk scenarios on the portfolios that are already captured in this objective.
N. Sandkulla	List appears to contain the appropriate categories.	—
H. Chai	Need to ensure that in guaranteeing water supply and water quality you are including water supply and water quality for the environment; water supply for all beneficial uses; water quality for all beneficial uses.	Environmental water is considered in the District’s Fisheries and Aquatic Habitat Collaborative Effort (FAHCE) and as part of water supply operations, both of which are incorporated into the IWRP simulation modeling. Water supply and quality for the environment are captured in Objective 6: Protect the Natural Environment.

Stakeholder	Comments	Response
M. Stanley-Jones	What about equity? It may or may not be reflected in the list. Risks and benefits are equitably distributed across the customer base. For example, flood risks are distributed geographically.	Staff supports equity and sees it appropriately highlighted at the project level where land use considerations are evaluated on a site-by-site basis. However, as a planning level objective, staff believes that equity does not allow differentiation among alternatives. At this study level, staff has not been able to come up with a measurable predictive indicator for this issue that would influence an investment decision.
G. Belhumeur	Seems to incorporate everything. Water retailers are faced with cost issues, re: ratepayer impacts—that is of primary importance.	— Attentiveness to ratepayer impacts is reinforced in two ways: Objective 4: Minimize Cost Impacts and Objective 5: Maximize Adaptability.
J. Garrod	Worried about [the District's] dependence on imported water; should emphasize local water.	About 50% of the District's water is imported and 50% comes from local supplies to meet water demand. Imported water is an important District supply. It has its own risks that will be addressed in the risk analysis.
J. Gonzales	Good list; agriculture needs a reliable water supply.	Agricultural water needs are included in the District's Water Demand Study and will be part of the IWRP analysis. The IWRP process aims to ensure a reliable water supply through the year 2040.
D. Nakamura	When none of this works, how will you allocate? The "when everything goes to hell" plan.	A range of scenarios, including severe ones, will be looked at.
N. Olson	List is consistent.	—
K. Crowley	Overall it's good; echoes M. Stanley-Jones on equity of risks.	Please see response to M. Stanley-Jones, above.
R. Shipes	Does reliability consider obtainability? How will District partner with other agencies?	Yes. The IWRP's 2040 horizon recognizes an evolution of partners needed over time. Partnerships could be through agreements, memoranda of understanding, contracts, and the like.

Stakeholder	Comments	Response
R. Saunders	Need to ensure and improve water quality, not just meet minimum standards.	Agreed. This comment is consistent with District Board Policy 1.1.1 " . . . water supply meets or exceeds all applicable water quality regulatory standards . . . ."

Objective 1: Ensure Supply Reliability

Stakeholder	Comments	Response
M. Bruce	Do you consider unforeseen future growth, climate change, infrastructure failure?	Yes. Higher and lower demographic projections, climate change, and infrastructure failure will be evaluated.
J. Tucker	How does benchmark define unmet demand?	First, a projected water demand is calculated based on demographics and other considerations. Second, if the available water supply, including that available from storage, is unable to meet this projection, the benchmark defines the difference as "unmet demand."
F. Fowler	Key aspect is vulnerability to natural and man-made disaster; need to measure costs of these events; minimize vulnerability to terrorists.	There is a separate study under way to comprehensively analyze system-wide infrastructure vulnerability. In the IWRP we are intending to have a risk scenario based on infrastructure failure.
R. Salstrom	Are you looking at one or multiple scenarios of County demands? Measure the frequency and magnitude of unmet demands, and how the frequency and magnitudes change.	Staff will look at a number of scenarios of County demands in the IWRP simulation model. The model can also measure the frequency and magnitude of unmet demands and how this changes with alternative water supply portfolios.
N. Sandkulla	Where does implementability fit?	Implementability is a consideration when identifying supply options. If a project is not implementable for any number of reasons, it will most likely drop out in the first pass of the analysis, prior to screening the portfolios against planning objectives. If it's unclear as to whether a supply option is implementable at this time, such as indirect potable reuse of recycled water, implementability will be dealt with in the risk analysis.

Stakeholder	Comments	Response
	Consider what level of unmet demand, current and future, is acceptable (zero may not be realistic). Consider not just the District, but also the infrastructure that is connected to you (such as the San Francisco Public Utilities Commission [SFPUC], Central Valley Project [CVP], and the State Water Project [SWP]).	Different levels of unmet demand will be modeled that will provide insight into the trade-offs between reliability and costs. We are mindful of our connection to state, federal, and SFPUC water supply infrastructure. The sub-objective, Provide for County Demand, recognizes that water supply for some of the County residents are met by SFPUC. The District considers the needs of the County, even those currently not using District water supplies.
H. Chai	Need to change Objective 1; so, don't damage the water supply to the ecosystem. This objective will override the other objectives, including the environment. Should change this objective to include all beneficial uses.	Planning objectives need to stand alone so comparisons can be made between them in the decision-making process. For example, if we consider cost in every objective—ensure reliability in a cost-effective manner or improve water quality in a cost-effective manner—then reliability and water quality are no longer measured for their distinct values. As a result, some supply options may be undervalued from the perspective of reliability and water quality simply because they are not cost-effective. Also, when the objectives are redundant, it becomes difficult to distinguish the trade-offs between them, such as reliability vs. costs or water quality vs. costs. The same reasoning holds true for distinguishing between Objective 1: Ensure Supply Reliability and Objective 6: Protect the Natural Environment. For these reasons, Objective 6: Protect the Natural Environment is where "don't damage the water supply to the ecosystem" is expressed.
M. Stanley-Jones	Ensure sufficient supply for diverse species, including temperature and water quality. Ensure equity in benefits and risks.	This is provided through our Fisheries and Aquatic Habitat Collaborative Effort (FAHCE), which will be reflected in the IWRP and in Objective 6: Protect the Natural Environment. Yes. Equity will be addressed as part of project-level analysis.

Stakeholder	Comments	Response
J. Garrod	No one has told me that we are going to run out of water in 2020. Are we? If not, there is no big issue in front of us. Have yet to hear we won't have water.	There is considerable uncertainty in the reliability of future water supplies. The IWRP will identify many of those uncertainties and explore different strategies for meeting future water needs.
D. Nakamura	The IWRP delays the point where demand equals supply? Delays the shortfall?	The IWRP looks at current water use and future demands in the context of water supply uncertainty. Uncertainty may be due to droughts, environmental regulations, institutional barriers, changes in water demand, etc. The IWRP considers all these factors in developing a strategy to meet our future needs.
N. Olson	Is this where we consider earthquakes?	Earthquakes will be considered in a risk scenario. The impact of earthquakes is also being evaluated under a separate study—System-wide Infrastructure Vulnerability.
K. Crowley	Need to consider environmental water demand; don't overlook environmental water needs.	It is not our intent to overlook environmental water demand. See Objective 6: Protect the Natural Environment.
R. Shipes	Need to consider obtainability and the reliability of sources under different scenarios.	This will be done.
R. Saunders	Are you looking at a repeat of 1977?	The IWRP simulation model uses historical hydrology data from 1922 to present and forecasted demands. Output from the model will provide insights on how well the system performs under a repeat of different critical dry periods including 1976–1977.
Unattributed	What does "ensure reliability" mean? Where do you put construction activities? Potable reuse. Should consider a range of conditions to ensure reliability.	Dependable, consistent, and stable supply of water to retailers, raw water users, and groundwater users. We will look at construction activities in the context of site-specific projects. Indirect potable reuse is one type recycling water supply source. Agreed.

Objective 2: Ensure Supply Diversity

Stakeholder	Comments	Response
M. Bruce	Does partnership include other systems, like Hetch-Hetchy?	Yes.
F. Fowler	Is maximize diversity in conflict with [the] Control [sub-objective]?	Yes, it can conflict. Span of control is related to reliability and will be moved to Objective 1: Ensure Supply Reliability, as a sub-objective.
R. Salstrom	Need to consider that different supplies may be correlated.	Agreed. Sub-objective 1: Minimize Shared Vulnerability was developed in recognition of shared risks among different supplies.
N. Sandkulla	In evaluating diversity and other water sources, look at the infrastructure reliability of other water providers.	Throughout the IWRP process, the District intends to obtain ideas on infrastructure operations from all available sources, including District retailers, Hetch-Hetchy, State Water Project, Central Valley Project, etc.
H. Chai	Ensuring supply diversity is a good idea. Consider different treatment technologies that could stretch water supply.	Agreed. Currently, some wastewater receives advanced treatment, useful in many areas, including landscape irrigation. Treated water receives a different level of treatment. Other treatment options may be proposed within the planning horizon of this IWRP.
R. Saunders	[Re: the Control sub-objective] Some sources outside your control contribute to diversity (Hetch-Hetchy).	Agreed. See response to F. Fowler comments above.
J. Garrod	Need to politic out of our local area.	The District takes this into consideration because our water sources and system are interrelated and linked to a statewide system.

Objective 3: Ensure Water Quality

Stakeholder	Comments	Response
M. Bruce	Clarify different water quality for different end uses.	Currently the District provides raw water and groundwater for agricultural use, groundwater and treated water for urban users, and recycled water for landscape irrigation.
F. Fowler	Different standards for different end uses. Maximize reuse potential—are you talking about wastewater reuse?	Different types of water exist for different types of end use. Please see response above. Yes, wastewater reuse and any other water that can be captured and reused for varying purposes during the planning horizon to 2040.
N. Sandkulla	Consider not only existing but future water quality standards.	Predictive indicators need to be measurable. Staff can measure existing water quality parameters in relation to District goals or regulatory requirements. It's more difficult to do this for future standards. Anticipated and potential future regulations will be considered in a risk scenario.
H. Chai	Protect water quality for the ecosystem of the region; concern for the water quality of the Bay Delta. Bromide is not a good PI, since health effects of bromide are not clear and undue focus on bromide may lead to a "peripheral canal."	The bromide ion, while of no health consequence in itself, is transformed during treatment to form by-products suspected to have adverse health effects. The assessment of health effects is a delicate and uncertain science; both toxicological and epidemiological studies highlight the significance of bromide-related compounds. Due to these studies, the United States Environmental Protection Agency currently places a high priority on better understanding the health effects of brominated compounds. Due to health and regulatory concerns, CALFED has specified water quality objectives for bromide and Total Organic Carbon in its Record of Decision. Consequently, a bromide predictive indicator is supported as a water quality and public health measure. Brominated disinfection by-products are currently regulated and more stringent standards for them are anticipated.

Stakeholder	Comments	Response
M. Stanley-Jones	Consider endocrine disrupting potential.	Staff proposes to discuss endocrine disrupters as part of the risk analysis, and in the description of water recycling and in the groundwater protection programs. Staff intends to keep a watchful eye on this topic as new information is available and further analysis is conducted.
G. Belhumeur	Key concern, particularly tastes and odors.	Agreed.
J. Garrod	Educate people on how to help water quality; give financial incentives. Where does recycled water fall?	The District has various education programs, e.g., through our Public Information Office and through our Water Use Efficiency program. Recycled water will be evaluated by all the planning objectives.
J. Gonzales	Financial assistance may be necessary.	Financial help is provided to those receiving agricultural water.
N. Olson	New technology can let us test for new contaminants: What is the District doing in this area?	The District owns and operates a state-of-the-art laboratory. Staff actively participate in state and national workshops and training to keep abreast of new testing techniques and plan to continue to make use of cost-effective and innovative testing options as they become available.
K. Crowley	Maximize potential habitat for protected species: temperature and turbidity.	Natural habitat impacts are addressed in Objective 6: Protect the Natural Environment.
R. Shipes	Define the different quality that different users require; level of treatment for the type of water.	This will be done in the IWRP report describing our various sources of water and end uses.
R. Saunders	Does enhance include taste and odor control? Save the best water quality for the highest uses. Ensure but improve water quality.	District Ends Policy 2.1.1 states: "The water supply meets or exceeds all applicable water quality regulatory standards in a cost-effective manner." Taste and odor control is an example of *exceeding* water quality regulations and is a high priority of District operations. This is consistent with Board policy, operational practice, and planning for future improvements.

Objective 4: Minimize Cost Impacts

Stakeholder	Comments	Response
M. Bruce	However, this doesn't include the costs of not planning and not being proactive. Please do not dehumanize the social and institutional costs.	We are trying to avoid the costs of not planning by conducting this IWRP update. However, we still face the potential costs of getting the plan wrong. We want to address this potential cost by evaluating the effect of risks in our planning. These non-dollar issues could affect the weighting placed on the reliability objective.
J. Tucker	Benchmark is very important—range of what is cost effective.	We agree, and hope to highlight those issues in this study. Our benchmark is the baseline case, or the costs and benefits to the District and the County of taking no further actions.
R. Salstrom	$/af may be a valid measure for all the PIs in this objective.	For some supplies that provide the same amount of water regardless of water conditions, this is true. For example, some recycling can be compared on a $ per af basis because each reduces demand in all year-types. However, see below.
F. Fowler	Per capita or per household charge (rather than R. Salstrom's suggestion of $/af. If water is used effectively and usage decreases, the cost may go down even though the $/af increases).	Yes, we believe that the impact on water rates and the cost impact on the County in addition to the water rate impact are the appropriate measures to use. All af of water are not equal. Some water supplies that provide water only during wet years could have very low costs per af, but would provide water when we could not make good use of it. Other options might provide water at a higher cost per af but would provide water when it was needed.
N. Sandkulla	Look for opportunities for cost-sharing with federal and state as well as others.	Agreed.

Stakeholder	Comments	Response
M. Stanley-Jones	Need to consider equity for all users. Consider energy cost of wheeling water/imports.	The District Board has a pricing policy that incorporates four concepts: 1) Water pooling, 2) Water facilities cost pooling, 3) Water resources management, and 4) Revenue pooling. Agricultural water rates are set at 10 percent of the municipal and industrial rate in both North and South County zones. Energy costs for moving imported water will be included in the analysis.
H. Chai	Agree with M. Stanley-Jones.	—
J. Gonzales	Costs for agriculture are currently under control.	—
R. Shipes	Must weigh costs versus benefits.	Agreed. This is what we are doing.
R. Saunders	Consider the “insurance value.” How do you capture the insurance values of some options?	The IWRP will do this in a couple of ways. First, staff runs a simulation model that tells us the magnitude and frequency of water shortages through the year 2040, under various hydrologic conditions. Simulation helps the District assess how to meet County water needs through a variety of water supply options. By looking at the change in the probability of shortages, and the change in costs of expected shortages, we can get a measure of the insurance value of each option. The model will also illuminate the trade-offs between securing additional supplies (reliability) versus costs. A second way to capture insurance value is to impose various risk scenarios on the model that could jeopardize a supply (such as a major water quality problem that renders a supply unusable). Under different risk scenarios we then can see how the system performs (both in terms of supply and cost) with varying supply options and redundancy in the system. Both of these cases will shed some light about overinvesting and underinvesting in water supplies.

Objective 5: Maximize Adaptability

Stakeholder	Comments	Response
M. Bruce	Doesn't seem logical to build in a minimization of capital and infrastructure.	The decision-making tool we are developing explicitly seeks to develop these objectives and recognizes there are inherent trade-offs between them. The intent of this objective is to maximize adaptability and its effect is to limit capital and infrastructure investments. The concept favors investing in water supply options where assets can be sold and reinvested in a flexible manner to respond to changing and unanticipated water supply conditions. For example, water demands may not grow as forecasted. New technologies may develop, or new opportunities may emerge that do not require large capital investments in infrastructure. While investing in infrastructure is discouraged in this objective, it may score high in the other planning objectives. The seven planning objectives define distinct and different values that are important to the District.
J. Tucker	Not clear on the philosophy behind this; could encourage underbuilding.	Yes, it would encourage underbuilding if it were applied in isolation. However, the IWRP planning objectives work in concert with one another. The intent of the IWRP is to strike a balance among the competing planning objectives.
F. Fowler	District BUILDS infrastructure; needs capital investment.	Yes, it does. This objective gets to the issue of how much infrastructure is enough.
R. Salstrom	Can't minimize capital costs; there are trade-offs.	See above.
N. Sandkulla	Ability to stage in blocks, incrementally, is good; fixed capital investments should be "measured" rather than "minimized."	Yes, we will measure it. But when it is measured, is more capital investment better than less? If you get the same benefits, then less is better.
R. Saunders	Agree with F. Fowler and R. Salstrom	—

Objective 6: Protect the Natural Environment

Stakeholder	Comments	Response
K. Crowley	The scoring system for PIs is backward.	Corrected.
N. Sandkulla	Benefits to the local environment are different than benefits elsewhere and should be reflected in the evaluation.	Agreed. Our primary concerns are benefits to Santa Clara County.
H. Chai	Need to consider the region as a whole, not just local. Environment should not be just an afterthought. Calling the environment out as a separate objective dilutes it; it should be in the balance when looking at all of the objectives.	The District continues to participate in and support the CALFED Bay Delta Program of improving water supply reliability and water quality, and restoring ecosystem function through the CALFED Record of Decision. The District pursues a policy of maintaining a variety of water supplies, which comprises imported water, developing local supplies, including recycled water, and conservation. The District believes that the implementation of local recycling and water conservation programs improves water supply reliability of the local area and state, improves water quality of the San Francisco Bay, and contributes to long-term restoration of the Bay Delta environment. Planning objectives need to stand alone so comparisons can be made among them in the decision-making process. This methodology is discussed under Objective 1: Ensure Supply Reliability.
M. Stanley-Jones	You have soft metrics for Sub-objective 1 and 2, and hard metrics for the others. Should make the soft metrics harder—acres of habitat restored, for example. Will make suggestions.	The metrics collapse a range of time, effort, and cost, building off of environmental compliance practices. Harder measures, such as acres of habitat restored, would require more project-level data not available at the IWRP overview level.
J. Garrod	What about projects that could benefit the environment?	Sub-objective, Maximize Benefit to Habitat and the Environment, is meant to address this point.
M. Bruce	Agree with K. Crowley.	—
R. Shipes	"The right water for the right uses."	The right water for the right uses is a consideration in this IWRP process and is important in terms of protecting the local environment.

Stakeholder	Comments	Response
R. Saunders	Need to distinguish between “required” and “it would be nice.”	This distinction becomes apparent in how the objectives are weighted, a later exercise in the IWRP planning process.

Objective 7: Enhance Community Benefits

Stakeholder	Comments	Response
J. Tucker	Need to be realistic re: the District charter.	Yes. The District Act addresses the relationship of water to recreation and addresses common benefits, e.g. (Sec 5) (Sec. 11).
F. Fowler	Measure the $ value of property protected and put at risk. Does this project protect what people value and what people would not like to place at risk? Need to use comparison analysis; i.e., number of people in those properties protected or put at risk; transportation protected and the number of users of that transportation; and the $ value of commerce using that transportation.	Hard measures such as these would require more site-specific analysis not available at the IWRP overview level.
R. Salstrom	Measure the frequency and magnitude of flooding.	Beyond water supply programs, the District has staff working on the frequency and magnitude of flooding. However, such analysis is beyond the IWRP overview level. The sub-objective, Improve Flood Control, ensures a measure in our model of the flood management impacts of alternatives.
H. Chai	Protection of natural landscape and the value of open space. Nonstructural flood protection.	These values are captured in Objective 6: Protect the Natural Environment. It is not included here as well to maintain independence between objectives, as required by our decision model. The IWRP will not propose any flood protection measures per se; the flood management impacts resulting from potential water supply measures will be assessed.
M. Stanley-Jones	Number and extent of watershed councils. Are there any projects that redistribute flood control risks? Equity.	The number of watershed councils is a difficult indicator to predict in our model. Please see M. Stanley Jones's responses in the Collective Planning table and in subsequent tables for Objective 1 and Objective 4.

Stakeholder	Comments	Response
G. Belhumeur	Water quality is also a community benefit. Maximize in-County resource management.	Yes. However, the decision model requires independent objectives, so water quality is not spelled out in this objective to avoid double counting. This is proposed to occur amid partnerships.
J. Garrod	Quality of life to the community. If we fail to subsidize farmers their land will be developed, which will decrease the quality of life.	The community benefit of maintaining agriculture is recognized by the District in the form of reduced water rates, in accordance with District policy and the District Act.
K. Crowley	Community benefits include watersheds; measure the community involvement in watersheds (will make suggestions on PIs).	Please note sub-objective: Increase Recreational Benefits, and its Performance Indicator: extent of recreational access. We are hopeful the data collected on the extent of recreational access will result in a measure.
R. Shipes	Power can be saved or generated.	Energy is a cost element of water conveyance and treatment and is reflected in the Minimize Cost objective.
R. Saunders	Land surface subsidence is just NOT allowed.	The District shares your concern, as reflected in the Board's End Policy 2.2.2.3: Groundwater supplies are sustained. The CEO interpretation of this policy is that land elevation should not decrease due to subsidence caused by groundwater overdraft. The IWRP's predictive indicator does not measure land subsidence itself, since that would be an unacceptable condition. This predictive indicator measures the amount of groundwater storage above that point associated with the subsidence threshold, giving an indication of risk as groundwater storage draws near the estimated point at which an unacceptable rate of subsidence occurs.

In Addition

1. Ann Draper (County Planning) was absent but upon reading the draft minutes, forwarded these comments:

   I am not sure where this fits in, but I am interested in recycled water as a source of water. I don't think that we can presume that we will have an unending supply of fresh water; therefore, other sources will become more important. I also am interested in the projections of water supply availability. Again, I don't know that we can presume that water will always be available to meet all of our needs. If there is an upper limit to water supply, then we need to know how this would affect growth in the Valley or choices we make about water sources.

   With the thought that we may have limits on our supply, protecting our watersheds becomes very important. Over the next 20 to 50 years, the County will experience pressure to expand development potential in rural areas. These areas are watershed areas for the Valley and have been there unchallenged. How would development in those critical areas affect the watershed? Where are those critical areas to protect?

   Response:

   Recycled water projects are among the water supply alternatives that will be evaluated in the IWRP.

   Protecting our watersheds is important, even as many do not connect watersheds to tap water. Water supply projections are being developed and will be provided at a future stakeholder meeting. We are very much interested in urbanization trends and any potential effect urbanization has on groundwater recharge zones.

2. Nancy Olson (Public Advisory Groups) forwarded these comments upon reading the draft minutes:

   I've read the material you sent. I noted the statement "no comment" was included when another stakeholder had expressed her intended comment (page 3). However, I recall that twice (and I think 3 times) I agreed with a previous comment, and am shown as having no comment.

   It seems to me that when one stakeholder agrees with another (as is shown several times in the report), it gives more weight to the particular statement, and reflects a broader concern in the community at large. I recognize that it is very difficult to capture everything. Overall, I think the material is a fair report of the meeting.

   Response:

   Staff plans to better capture these distinctions in the upcoming meetings.

Acronym List

BAWUA	Bay Area Water Users Association
CALFED or CalFed	The California Policy Council and the Federal Ecosystem Directorate
CEO	Chief Executive Officer
FAHCE	Fisheries and Aquatic Habitat Collaborative Effort
IWRP	Integrated Water Resources Plan
SFPUC	San Francisco Public Utilities Commission

IWRP STAKEHOLDER MEETING NO. 2 MINUTES

INTEGRATED WATER RESOURCES PLAN 2003
STAKEHOLDER MEETING NO. 2 MINUTES

BACKGROUND

On September 26, 2001, the District held its second stakeholder meeting for IWRP 2003. This document provides a summary of the meeting and a list of stakeholder comments.

ATTENDEES

Stakeholders	George Belhumeur Joe Gonzales Nancy Olson Craig Breon Randy Shipes Robin Saunders Margaret Bruce Fred Fowler Roger Salstrom Nicole Sandkulla Huali Chai Ellen Levin Ann Draper Jim Gasser Lorrie Gervin (for Michael Stanley-Jones)
District Staff, Consultants, and Board Members	Stan Williams, Walt Wadlow, Keith Whitman, Tracy Ligon, Kent Haake, Barbara Judd, Larry Adams, Lindy Minch, Alison Russell, Amy Fowler, Phillippe Daniel (Camp Dresser & McKee), and Dan Rodrigo (Camp Dresser & McKee). Director Larry Wilson, Director Greg Zlotnick, and Director Sig Sanchez.
Stakeholders Absent	Jacqui Carr, Sally Lieber, Jan Garrod, James Tucker, and Doug Nakamura

MEETING OVERVIEW

During the September 26 stakeholder meeting IWRP team members did the following:

1. Highlighted discussion items from last meeting and the resulting changes in the planning objectives and predictive indicators.

2. Introduced the water supply outlook and the water supply options.

3. Led the stakeholders through two planning objective weighting exercises.

Review of Previous Stakeholder Meeting

The comments received in the last stakeholder meeting on the planning objectives were quickly reviewed. Changes made in response to those comments included

- Control sub-objective moved
- Water quality sub-objective changes
- Environmental objective predictive indicators corrected

Some comments recommended changes that were not in keeping with the properties of planning objectives, such as:

- Objectives must be measurable. The following items are difficult to measure at the broad planning scope of the IWRP:
    - Equity
    - Hard metrics (flood dollars, acres impacted)
    - The Next Big Thing
- Objectives must be nonredundant. The following items were suggested for inclusion under additional objectives, which was considered redundant:
    - Water quality, natural landscape as community benefits
    - Environmental beneficial uses within other objectives

Stakeholders had also asked where some items could be found in the planning objectives. Staff explained that items like endocrine disrupters and infrastructure vulnerability would be considered in the risk analysis.

The Water Supply Outlook

At the first meeting, stakeholders asked whether or when the District would “run out of water.” In response to those questions, a quick overview of the water supply outlook was provided. The District has numerous alternatives to meet future needs without “running out” of water. However, choosing among the alternatives is a big investment decision. The IWRP will develop a decision framework to help make such investment choices.

The District’s water supplies, assuming no unexpected changes in demand or supply, are sufficient to meet the needs of the County in wet and average years through the year 2040. The challenge, today as well as in the future, is meeting needs in extended dry years. In addition, risks and uncertainties challenge the water supply outlook—the vision of the future changes as time goes on. The IWRP will investigate options to maintain flexibility and reserves as the future unfolds.

Water Supply Options

A preliminary list of water supply options was presented: additional surface storage, additional conservation, desalination, changes to water system operations, South County water treatment plant, enhanced recharge, additional recycling, water transfers, and additional water banking. The stakeholders were asked to add any additional options for consideration.

Planning Objective Review and Exercises

The planning objectives were reviewed, in preparation for two objective-weighting exercises with the stakeholders. The intent of the exercises was to provide insight into the values and priorities of the stakeholders. The first exercise was a paired comparison exercise, asking for stakeholders to choose their preference between pairs of the objectives. A hand count was then made of these pair-wise votes. The second exercise provided each stakeholder with 20 colored dots. Each stakeholder was asked to assign their dots to the seven planning objectives, with no more than 5 dots per person going to any single objective. The results of these two exercises are summarized in Table AI-1. It is important to note that a distinction was made between the first and second objectives: reliability focuses on the District's ability to meet demand under normal conditions, within expected hydrologic variability. Diversity is more of an insurance measure, focusing on the ability to meet demand if the unforeseen should occur, such as infrastructure failure.

Table AI-1

PLANNING OBJECTIVE WEIGHTING EXERCISES—RESULTS

Objective	Paired Exercise Weight	Dot Exercise Weight	
Water Supply Reliability	22%	54 votes	20%
Diversity (Insurance)	20%	52	19%
Water Quality	21%	60	22%
Cost Impacts	4%	21	8%
Adaptability	4%	7	3%
Environment	18%	47	17%
Community Benefit	10%	39	12%

STAKEHOLDER COMMENTS

The comments received from the stakeholders during the second stakeholder meeting are summarized below. The comments have been consolidated into four general areas: comments regarding the presentation of comments and responses from the last meeting; comments on the water supply outlook and the water supply options; comments on the planning objectives; and comments after the weighting exercises.

Comments on Discussion of the Last Meeting

Stakeholder	Comment	Response
Margaret Bruce	Can you describe the risk analysis process?	The risk analysis will take a variety of scenarios to test the performance of the portfolios.
Margaret Bruce	What about terrorist vulnerability?	Increased security has been an action for the District since the Grand Jury raised it last year. Since 9/11, security has been looked at on a daily basis. Extensive effort has been taken on both physical and communication channels. With respect to the IWRP, security is a real element.
Huali Chai	The environmental objective is confined to Objective 6. The problem with segregating it is that water quality, reliability, and the environment are totally intertwined. By keeping the environment separate, it dilutes its importance. Is the water quality objective source water quality or drinking water quality? If talking about source water quality, that can have negative impacts on the environment. It should either be drinking water quality or water quality for all beneficial uses. We should not deplete ecosystem water for drinking water; the objective should be water quality for all uses, including the environment. Are the environmental sub-objectives sufficiently detailed?	Actually, including environmental issues among all of the objectives would dilute it. By including the environment as a stand-alone objective, it can better be tracked, evaluated, and weighed. The water quality objective reflects the quality of water delivered for agricultural and municipal & industrial (M&I) uses. We agree that Objective 6 does not adequately include all environmental concerns. Objective 6 will be changed to reflect water quality and water reliability for the environment. In the Fisheries and Aquatic Habitat Collaborative Effort (FAHCE) and other projects in our watershed, we do consider environmental water quality. We will ensure that environmental concerns regarding water quality and water reliability are included as sub-objectives with the environmental planning objective.
Fred Fowler	Huali is asking if Objective 1 and 3 are for humans only.	These objectives are for water for agricultural and M&I uses. Environmental uses will be captured in Objective 6.

Stakeholder	Comment	Response
Robin Saunders	It is hard to make these trade-off choices. Re: How is unmet demand quantified? Does that include SFPUC? Impacts of SF rate increases may shift use to District sources.	Agreed! Demand is defined as the Countywide water demand, regardless of source of supply used to meet that demand (including SFPUC). We are aware of the proposed SF rate increases and SF vulnerability, and will consider their impacts on the District.
Ann Draper	Does the water quality objective include well water? If the well doesn't meet standards do we shut them down? Does it impact permitting of septic systems?	We don't have the authority to shut down wells and are not looking to do so. But as the groundwater management agency for the County, we are aware of water quality issues such as nitrates. Our focus is to improve water quality so that it meets standards.
Robin Saunders	Note the nexus between flood control and subsidence.	Noted.
Roger Salstrom	Does water supply include water for farmers?	Yes, water demand for both agriculture and M&I uses is included.
Joe Gonzales	Agriculture in the County is decreasing. (Roger Salstrom: "So don't cut off the water you do get." Joe replied "Exactly!")	Noted.

Comments on the Water Supply Outlook and Water Supply Options

Stakeholder	Comment	Response
Roger Salstrom	What method do you use to define the long-term average water supply: average, median, or?	In our analyses, we use the historic record of 1922–98 to assess water supply reliability, not the long-term average. Wet, average, and dry year supplies are defined in the overhead slide for illustration purposes only. The wet condition is essentially what you could expect in a wet year from local supplies and our full contract entitlements. The single dry year represents a repeat of 1977 water supply. The average supply is based on an average of the supply components, which would be higher than a median supply due to the skew in hydrologic series like rainfall and streamflow.

Stakeholder	Comment	Response
Ann Draper	Do you consider the location or just the amount of water demand?	Although the water demand was projected by sub-areas (loosely equivalent to water retailer service areas), the water system simulation model uses aggregate demands for North and South County.

Questions and Comments on Planning Objectives Before the Exercises

Stakeholder	Comment	Response
Robin Saunders, Margaret Bruce, and others	Can you explain diversity versus reliability?	The reliability objective captures reliability to supply water under expected conditions, including a range of hydrology. The diversity objective captures the vulnerability to the unexpected, such as infrastructure failure.
Fred Fowler	So reliability is about meeting demands under expected conditions, while diversity is about other externalities.	
Roger Salstrom	So isn't looking at shared hydrology in Objective 2 double counting?	Agreed. That objective will be changed.
Craig Breon	Water use efficiency is not an environmental benefit itself, only if you promote efficiency in order to free up water for the environment. Need to change the measure to specify that it is freeing the water to be used for the environment.	Water use efficiency reduces agricultural and M&I water use. Due to the reduction in demand, water that otherwise would have been taken from the local or statewide resources remains in the system.
Huali Chai	Can't we try to get all the objectives?	That is the hope. However, when trade-offs have to be made, how do we balance?
Craig Breon	These things don't run along straight votes. Reality factors in. It all works out in the process.	Noted.
Fred Fowler	There is tension in making trade-offs.	Agreed.

Reactions to the Ranking/Scoring Exercises

Stakeholder	Comment	Response
Robin Saunders	I am surprised that cost scored so low. The assumption is that the District will keep costs in check; the sky is not the limit and there is a constraint.	Noted.
Fred Fowler	I am gratified that community benefits scored as high as it did. Flooding doesn't affect everyone.	Noted.
Ellen Levin	There is some overlap in the objectives, e.g., costs include environmental mitigation. It is hard to think in this manner (binary approach).	Pair-wise comparisons are painful. Keep in mind this is just a tool, and the votes are just to gather insight. The votes won't mechanically be fed into some box to come up with one answer. The alternatives analysis (model) can capture the cascade effects.
Fred Fowler	In summary: Reliability, diversity, and water quality scored in same tier. People want good clean water when they turn on the tap. The next tier, environment and community benefits, are side effects that are important. Cost ranks less important because people know that water costs are low.	Noted.
Huali Chai	The four most popular are fairly even. The message is that it's preferred to find policies and actions that balance and fill these top multiple objectives. Should maximize performance of the highest four objectives, subordinating the lowest two objectives to the others.	Noted.
Roger Salstrom	There are limits to maximizing performance; that is where costs come in. A small incremental gain is not worth exponential costs.	Noted.

Stakeholder	Comment	Response
Lorrie Gervin	Surprised that cost is so low. Usually cost is very important in projects. It is important to discuss that we are getting away from the least cost alternative.	Noted.
Nicole Sandkulla	Having done this exercise before, I am not surprised that cost ranks low. Costs show up later in the form of "what am I buying for that additional money?" It will come up as a big issue later.	Noted.
Ann Draper	Cost is complex. If you ask me what I want, I'll pick other things. I am not paying for now. It will matter later.	Noted.
Margaret Bruce	Adaptability is a capital asset management concept. Outside of the District people that work in that function, we cannot evaluate it.	Noted.
Ellen Levin	Margaret has a good point.	Noted.
Roger Salstrom	There is a value in excess capacity, but we don't want to go too far. That objective maybe should be rephrased.	Be cognizant of the dangers of overinvestment, like the stock market! We agree that there is insurance value in some excess capacity. This objective tries to ensure that flexibility is not lost through overcommitment of resources that may not be needed later.
Craig Breon	Re: the water supply options: 1) At what point do we ration or cut back? 2) What are our efficiencies compared to others? Maybe we put more effort into the system, for example, water metering in Sacramento or changing cropping of alfalfa. These changes are outside our control, and therefore there are challenges.	1) Demand cutback will be considered as an option. 2) Water efficiency measures are being considered in the CALFED process. Partnership in CALFED programs will be considered in the IWRP.

Parking Lot Comments

1. Does supply diversity include goals for recycling, desalination, and conservation?

   The IWRP analyses will consider various supply options (including additional recycling, desalination, and additional conservation) and evaluate how these options meet the IWRP planning objectives, including the Supply Diversity objective. Other than the programs already reflected in the baseline, no set target has been predetermined for the amount of any water supply options being considered.

2. Is conservation seen and measured as a source of supply or a negative demand?

   Conservation is seen as a decrease in demand.

3. There should be an overarching goal to try to satisfy and balance all objectives when choosing policies and actions. We will achieve more if our choices fulfill multiple objectives.

   Agreed.

4. At what point do you say, "We have to ration or cut back"?

   That is one of the considerations of the IWRP. That answer has not been predetermined in the IWRP analysis.

5. What is the difference in our water efficiency compared with others? Should we be putting more effort into changing patterns elsewhere?

   The District participates in the CALFED process where out-of-County water use efficiency programs are being considered. Partnerships in CALFED will be considered in the IWRP as they are identified.

6. Has there been a cost analysis of how much money it takes to develop and supply an af of water? This can be compared against the cost per af for different kinds of water use efficiencies. It might be possible, and even fairly easy, to get high water use industries to implement water efficiency measures if there were some audit service and cost comparison available. If the District could develop a ROI formula—both for internal and external users—it might even be feasible to enter into economic partnerships with businesses. (Capitalization for % return on water cost savings, etc.)

   The IWRP will calculate the incremental costs for different supplies compared to the costs of various water use efficiency programs However, there are some difficulties in quantifying a dollar per af cost of water given the dynamic nature of the water resource and the interplay among different water supply options. For example, water conservation may reduce demand and the total cost of meeting the water needs of the County, while increasing the computed dollar per af of water supply served. The IWRP analysis will consider the complete cost to the District and the community over the planning horizon of different water supply portfolios, including conservation incentive programs.

7. Is future storm water management and treatment (on site) a possible source of water supply for landscaping and on-site fire suppression water use?

One of the water conservation options under consideration is the use of rainwater harvesting for residential landscaping.

Additional Comments Received after the Meeting

- Jim Gasser comments:

Objective 6 of the IWRP planning process states, “Protect the Natural Environment.” In concept, this is a worthy objective, and environmental protection is built into the planning/implementation process by following the requirements of the California Environmental Quality Act. As a statement of Water District policy, however, it seems out of place.

To my knowledge, environmental protection is not a mandate of the Water District. Unless there is legal authority requiring environmental protection, such as contained in the California Environmental Quality Act, the District cannot be an environmental protection agency.

Furthermore, making protection of the environment a stand-alone objective seems to run counter to the Water Board Ends Policies. For example, Ends Policy E-3.1 reads in part, “the natural resources therein are protected and when appropriate enhanced or restored.” Ends Policy E-3.1.1 reads “Healthy creek and bay ecosystems are protected, enhanced, or restored as determined appropriate by the Board.” Clearly, environmental protection is a goal if it is appropriate for the actions being considered, and it is not a goal in itself.

My concern is that environmental concerns will begin to outweigh human needs. The recent water supply problem in the Klamath Basin, in which fish weighted more heavily than people, is a case in point. If you make environmental protection a primary objective, I can envision the day when you are forced to release stored water from reservoirs to maintain downstream habitat while neglecting the needs of people and agriculture.

Water Recycling and Groundwater Protection:

My second comment indirectly bears on the objectives, and derives from two Board Ends Policies. Ends Policy 2.1.5 states in part, “The groundwater basins are aggressively protected from contamination . . . .” Ends Policy 2.1.6 states in part, “Water recycling is expanded . . . .”

I strongly believe that recycling is both desirable and necessary, but you cannot have recycling without some degradation of groundwater quality. Because recycled water contains dissolved solids and other constituents, irrigation reuse of this water will add these constituents to the groundwater. Where the shallow aquifer is “good quality” water (a relative term), degradation will necessarily result.

Thus, the Board has two policies that may not be compatible in some areas of the basin. This problem needs to be carefully thought through so recycling is promoted except in those areas when groundwater degradation would otherwise occur.

<u>Response</u>:

Re: Objective 6: Protect the Natural Environment

The District's Board of Directors has adopted governance policies to guide the District in its work; to quote from Governance Policy 1: ". . . The District is a steward of the watersheds in Santa Clara County, the streams and the natural resources therein, and will strive to ensure their benefits to the community's quality of life are protected and when appropriate, enhanced or restored. Consistent with the District's primary responsibility to provide for public health and safety, water quality, and water supply, the District's approach in flood management and the water utility shall reflect an ongoing commitment to conserving the environment as a priority in the District's mission of comprehensive public service." As you can see from this quote, the District is not looking to usurp the authority of other agencies; however, the District will strive to perform its water utility and flood management missions in an environmentally responsible manner.

In addition, the District Act was amended this year to add stream stewardship to its mission. The amended bill authorizes the District to take action to carry out the specified purposes of the District, and those purposes include the enhancement, protection, and restoration of streams, riparian corridors, and natural resources.

Water Recycling and Groundwater Protection:

The District is working to identify how water recycling can be implemented so that the quality of the groundwater basins is protected. As you have stated, the District is very concerned with groundwater quality. By implementing programs to reduce total dissolved solids in wastewater, we believe it is possible to expand water recycling without degrading the groundwater basins.

IWRP STAKEHOLDER MEETING NO. 3 MINUTES

Santa Clara Valley Water District

INTEGRATED WATER RESOURCES PLAN 2003
STAKEHOLDER MEETING NO. 3 MINUTES

BACKGROUND

On January 30, 2002, the District held its third stakeholder meeting for IWRP 2003. This document provides a summary of the meeting and a list of stakeholder comments.

ATTENDEES

Stakeholders	George Belhumeur Margaret Bruce Jacqui Carr Gouveia Huali Chai Jan Garrod Jim Gasser Joe Gonzales Ellen Levin Doug Nakamura Nicole Sandkulla Robin Saunders Randy Shipes
District Staff, Consultants, and Board Members	Stan Williams, Walt Wadlow, Susan Fitts, Keith Whitman, Tracy Ligon, Kent Haake, Barbara Judd, Larry Adams, Lindy Minch, John Ryan, Amy Fowler, Marty Grimes, Phillippe Daniel (Camp Dresser & McKee), and Dan Rodrigo (Camp Dresser & McKee). Director Rosemary Kamei, Director Larry Wilson, Director Greg Zlotnick, and Director Sig Sanchez.
Stakeholders Absent	Craig Breon, Ann Draper, Fred Fowler, Sally Lieber, Nancy Olson, Roger Salstrom, Michael Stanley-Jones, and James Tucker
Visitors	Linden Skjeie and Glenn Halbrid

REVIEW OF PREVIOUS STAKEHOLDER MEETING

During the September 26 stakeholder meeting, IWRP team members did the following:

1. Highlighted discussion items from the last meeting and the resulting changes in the planning objectives and predictive indicators.

2. Introduced the water supply outlook and the water supply options.

3. Led the stakeholders through two planning objective weighting exercises.

MEETING OVERVIEW

Understanding trade-offs among the District's IWRP planning objectives was the focus of this meeting. Three sample water supply portfolios were presented, each developed around a different planning objective: Minimize Cost Impacts, Ensure Water Quality, and Protect the Natural Environment. The similarities and differences in the water supply options that make up these portfolios, and how the portfolios performed relative to the three planning objectives, were discussed so as to gain insights and feedback on the trade-offs among them. The knowledge gained from this exercise will be used to develop portfolios that balance the planning objectives. These new portfolios will be presented at the next stakeholder meeting.

STAKEHOLDER QUESTIONS AND COMMENTS

Questions and comments received from stakeholders during the third stakeholder meeting are summarized below.

Stakeholder	Comment	Response
Margaret Bruce	How do you estimate risks, threats? One of the risk examples (Tracy Ligon) used was, "Does CALFED succeed or fail?" How do you calculate risk into your assessment?	We expect to interview and get the opinions of experts on what the future of CALFED will be. We recognize that there is a lot of uncertainty and part of it is understanding what our back-up strategies will be if CALFED isn't successful. We are building in flexibility and adaptability to be able to respond to such dynamics.
Margaret Bruce	Do you have a catalog of all the different risks, human and natural, to your system and is this process incorporated in your planning process? Examples are threats to the Hetch-Hetchy system, CALFED, groundwater, etc.	With both our management and technical teams we are identifying what we are most concerned with, and the risks that we want to look at explicitly in the risk analysis. At this time, we are in the early stages of developing the risk portion of this planning effort. Our goal is to provide risk scenarios at the next stakeholder meetings.
Stan Williams	What's the difference between the past IWRP and the current IWRP?	Past IWRP: Planning horizon was 2020; it used old Bay-Delta Studies; it focused on a statistically generated once-in-100-years drought event of 10 years duration; and shortage was presented as an annual average over that 10 year drought period. Current IWRP: Planning horizon is 2040; it uses current CALFED projections and imported water availability; it uses annual time frames to update demands and conservation data; and shortages are presented on an annual basis.
Jan Jarrod	Are new contracts an option? Look at contracts and their effect on the portfolios.	Yes, but how reliable they are is another question. In our modeling we use the most recent information available on existing contract water availability. The water supply available under our contracts may also change as CALFED is implemented.

Stakeholder	Comment	Response
Doug Nakamura	How achievable is conservation? Has there been a demand hardening?	Based on the building blocks selected for IWRP 2003, all are achievable. Yes, to some degree. As more conservation is implemented in the future, demand hardening will increase also. As population, industry, and technology change, we are anticipating a continued trend of some degree of conservation, beyond that identified in our building blocks.
Doug Nakamura	What is the conservation yield expected? There are some (conservation) things that are required and some are discretionary.	Please refer to the information mailed to you as preparation for this meeting. The last part of that packet, entitled “Descriptions of the Water Supply Options Building Blocks,” lists the yields. Those conservation programs that we are committed to are included in the baseline. For example, the baseline assumes that the District’s commitment to the Best Management Practices for Water Conservation will continue throughout the planning horizon. Those conservation programs that are beyond that, those that are discretionary, are those included in the building blocks.
Jim Gasser	Who is CALFED?	CALFED is a California and federal venture headed up by the governor of California and the secretary of the Department of Interior. In this collaborative effort, the CALFED Bay-Delta Program incorporates 23 state and federal agencies to improve water supplies in California and to improve the health of the San Francisco Bay-Sacramento-San Joaquin River Delta Watershed. CALFED encourages public participation in the development and implementation of its program and the District has been an active participant in the CALFED process. In December 2000, the District's Board of Directors adopted policy principles regarding the District's interests in implementation of the CALFED program and CALFED governance.

Stakeholder	Comment	Response
Jim Gasser	What does CALFED mean?	CALFED's purpose is to develop and implement a long-term comprehensive plan that will restore ecological health and improve water management for beneficial uses of the Bay-Delta. In summer of 2000, CALFED adopted a Record of Decision (ROD) on the Final Programmatic Environmental Impact Report/Environmental Impact Statement. That ROD outlined Stage 1 actions to be implemented in the first seven years of program implementation. Stage 1 actions address problems in the four resource areas of water quality, water supply reliability, ecosystem quality, and Delta levees and channel system integrity. In the IWRP process, staff developed two supply options: CALFED Stage 1 and CALFED Stage 1, with reservoirs. The CALFED Stage 1 option includes all of the program actions (those in the ecosystem restoration program, water use efficiency program, water quality program, and conveyance improvements program—such as the Banks Pumping Plant capacity expansion, and water supply reliability assurances provision in return for support of the Environmental Water Account). The CALFED Stage 1, with reservoirs, adds three surface reservoir components: Shasta Reservoir expansion, Los Vaqueros Reservoir expansion, and Sites Reservoir.
Jim Gasser	What is the status of funding?	It does not look good. At the moment, national security leads the federal administration's funding priority. There are two CALFED authorization and funding bills going through their respective Senate and House legislative processes. On the state side, the governor's proposed FY02-03 budget contains $519.3 million for implementation of the CALFED Bay-Delta Program. However, this amount includes $101.1 million contingent upon passage of

Stakeholder	Comment	Response
		Proposition 40, the California Clean Water, Clean Air, Safe Neighborhood Parks, and Coastal Protection Act of 2002 on the March 2002 ballot.
Huali Chai	Water Quality. Which planning objectives is it located in? Quality of the product or of the source water? Ensure water product quality or water quality of the product.	The objective Ensure Water Quality addresses water quality for agricultural, municipal, and industrial uses. The objective Protect the Natural Environment addresses environmental water quality concerns.
	What is the average cost of a water bill?	A typical homeowner in Santa Clara County pays $30–$35 a month for water.
Huali Chai	Socioeconomic effects of the cost of water: socioeconomic effects should be included and could be associated with risk on tourism, populations, revenue from businesses.	Not all costs are easily captured as dollars and cents. The intent of the seven planning objectives is to capture these effects, though not always using a monetary predictive indicator.
Randy Shipes	How you work out the balance of concessions and costs among planning objectives will be very interesting.	Agreed.
Robin Saunders	Would like to see some of the details of how Low Cost got such a high environmental score.	The components of the Low Cost portfolio include conservation, recharge, and transfers, which have environmental benefits and few adverse environmental impacts.
Robin Saunders	Would like to see commonalities of all portfolios put together as a slam dunk in the baseline and get them out of the mix to simplify the process.	We did discover commonalities in the three portfolios considered so far. Rather than placing them in the baseline, we intend to keep them in the planning scenarios or portfolios. One potential plan is to select the common elements, identify them as a sure first step toward our 2040 horizon. This would give us some confidence because the common elements satisfy all of our seven planning objectives.
Jan Jarrod	Concern of 35% increase of population: justify. Climatic change considerations desired.	Population projections are taken from the State of California Department of Finance's 2040 projections. Climate change will be considered as part of the risk

IWRP STAKEHOLDER MEETING NO. 4 MINUTES

Santa Clara Valley Water District

INTEGRATED WATER RESOURCES PLAN 2003
STAKEHOLDER MEETING NO. 4 MINUTES

BACKGROUND

On May 22, 2002, the District held its fourth stakeholder meeting for IWRP 2003. This document provides a summary of the meeting and a list of stakeholder comments.

ATTENDEES

Stakeholders	George Belhumeur Huali Chai Jim Gasser Joe Gonzales Ellen Levin Doug Nakamura Nicole Sandkulla Robin Saunders Roger Salstrom Ann Draper Nancy Olson Craig Breon Mary Ellen Dick for Randy Shipes
District Staff, Consultants, and Board Members	Stan Williams, Walt Wadlow, Keith Whitman, Tracy Ligon, Kent Haake, Barbara Judd, Larry Adams, Lindy Minch, John Ryan, Amy Fowler, Kurt Arends, Joan Maher, Alison Russell, Phillippe Daniel (Camp Dresser & McKee), and Dan Rodrigo (Camp Dresser & McKee). Director Larry Wilson and Director Greg Zlotnick.
Stakeholders Absent	Jan Garrod, Fred Fowler, Jacqui Carr Gouveia, Margaret Bruce, Sally Lieber, Michael Stanley-Jones, and James Tucker
Observer	Kirk Miller

MEETING SUMMARY

Materials

Stakeholders were provided an updated Investment Building Block Summary (description of water supply options) by e-mail in advance of the meeting. Meeting handouts included a printout of the presentation materials, a color chart of the latest planning objectives and predictive indicators, and a table showing which building blocks were included in each portfolio.

Meeting Objectives

Three objectives were presented for the meeting:

- Present latest status of water supply portfolios.
- Develop insight into trade-offs among water supply portfolios.
- Obtain feedback on technical evaluation.

Changes Since Previous Stakeholder Meeting

Some predictive indicators have been slightly modified since the last stakeholder meeting. Predictive indicators are used to translate planning objectives into measurable benchmarks of project success. They present information on conditions and trends, and their significance. The planning objectives and predictive indicators are summarized in the table below.

Objective		Sub-Objective	Predictive Indicator	Description
1	Ensure Supply Reliability	Provide for County Water Demands	Frequency of unmet County demands	Frequency of shortages greater than 20,000 af under year 2040 conditions.
			Magnitude of unmet County demands	Average magnitude of shortages under year 2040 conditions.
		Meet Contract Obligations	Frequency of unmet contract treated water	The District has treated water contracts with County retail water agencies. This PI measures the frequency with which contracts could not be met at the year 2040 demand level.
		Maximize District Influence	Degree of District influence	A constructed scale that measures the degree to which the District can influence how an alternative is operated. Facilities operated by the District rate highest. Projects under contract with the District also rate positively. Alternatives over which the District has minimal say, such as CALFED, score lowest.
2	Ensure Supply Diversity	Provide a Variety of Sources	Local supply source as a percentage of total supply	The percentage of supply yield from the building blocks in a portfolio that comes from nonimported water sources, such as conservation and local supplies. Currently the District is reliant on roughly 50% of its supply from imports. Developing a

Objective		Sub-Objective	Predictive Indicator	Description
				variety of local resources will diversify the portfolio.
3	Ensure Water Quality	Maximize Treatability	Daily variability, algae (surface water)	A constructed scale of the degree to which an alternative improves the District's ability to treat its raw surface water, either through new treatment technologies or more consistent source water.
		Meet or Exceed Water Quality Regulations	Level of bromide (surface water)	A constructed scale measuring the degree to which an alternative lowers bromate concentrations in District treated water, either through treatment technologies, source waters with less bromides, or additional flexibility and blending opportunities.
		Protect Groundwater Quality	Impact on groundwater	A constructed scale measuring risk of groundwater contamination and impacts to nitrate concentrations.
4	Minimize Cost Impacts	Minimize Community Costs	Total present value cost of supply portfolio on Countywide basis (excluding District)	County costs include non-District share of program costs, such as recycling costs borne by the wastewater agencies, groundwater pumping costs, wastewater disposal costs, cost of shortages to the community, etc.
		Minimize District Costs	Total present value cost of supply portfolio for District only	District costs include operating, maintenance, and capital costs.
5	Maximize Adaptability	Maximize Capital Investment Flexibility	Variable cost as a percentage of total (variable + fixed) cost	A measure of whether resources have been irretrievably committed that may not be needed if situations change.
		Maximize Scalability	Degree of phased expansion	A constructed scale measuring the degree to which a project is scalable, providing flexibility in implementation timing. Costs can be avoided until the project is needed rather than paying up front for water that may not be needed for many years.

Objective		Sub-Objective	Predictive Indicator	Description
6	Protect the Natural Environment	Maximize Benefit to Habitat and the Environment	Degree of overall environmental habitat benefit	A constructed scale measuring the impacts, beneficial or negative, of an alternative on habitat, especially endangered species habitat.
		Ensure Environmental Water Quality	Impact on stream water quality	A constructed scale assessing the potential impact of an alternative on stream water quality. Two important parameters are water temperature and sediment loading.
		Maximize Efficiency of Existing Resources	Acre-feet of County demand offset by water conservation	Conservation supplants new supplies.
			Acre-feet of County demand met by recycled water	Recycling supplants new supplies.
7	Ensure Community Benefits	Increase Recreational Benefits	Degree of recreational opportunity	A constructed scale measuring the opportunity for recreational access, including hiking, boating, fishing, etc.
		Improve Flood Protection	Degree of flood protection	A constructed scale measuring the likely impact on flood potential, either by impacting reservoirs or stream systems.
		Prevent Land Surface Subsidence	Groundwater storage (as measured from the subsidence threshold)	Overdraft of the North County groundwater subbasin can lead to land surface subsidence, damaging infrastructure and increasing flood risks.

Overview of IWRP Evaluation Approach

The purpose of the IWRP is to map out a long-term, comprehensive, and flexible plan to meet future water resource needs while balancing multiple objectives.

The project is currently revising and testing the portfolios using a water system modeling tool developed by the District. At the next stakeholder meeting, staff will present an evaluation and comparison of various water supply portfolios along with a risk analysis.

Portfolio Development

A number of different types of investment building blocks are under consideration. Descriptions of each can be found in the Investment Building Block Summary file that was e-mailed to the stakeholders prior to the meeting.

Portfolios are combinations of investment building blocks. Two types of portfolios have been developed:

- Those that maximize single objectives (predictive indicators).
- Those that are hybrids (designed to meet more than one objective).

An example of a single-objective portfolio is the Groundwater Water Quality portfolio. This portfolio includes only those investment options that improve groundwater quality. Only that objective was considered in forming the portfolio.

Examples of hybrid portfolios are the water quality hybrids. Water Quality Hybrid #1 was designed to balance all three of the water quality objectives (not just one). Water Quality Hybrid #2 goes one step further by including water reliability as well. Building blocks that were neutral on water quality were added until the hybrid met the reliability objective.

More comprehensive hybrids will be developed during the risk analysis.

Portfolio Evaluation (Observations)

Since each predictive indicator has its own measure (e.g., cost in dollars, reliability in frequency of shortages), it is necessary to convert each measure into a standardized score. Each measure was converted to a 100 scale, with 100 as the best score observed for that predictive indicator measure.

Reliability Observations

- Not all portfolios are reliable.

  In the case of many of the predictive indicators, there are only a few building blocks that improve that objective. Since the single-objective portfolios only include building blocks that improve that objective, these portfolios often provide insufficient supplies to meet the reliability measure. The hybrid portfolios tend to score higher in reliability since they tend to include more building blocks and thus usually have greater water supply yields.

- Reliability can be achieved in many different ways.

  There is no single path necessary to meet reliability. The District is fortunate in that reliability can be achieved using a number of different combinations of building blocks, with each combination meeting the other planning objectives to differing degrees.

  For example, a reliable portfolio can be met that focuses on water quality objectives. This portfolio includes some conservation and recharge, an expanded participation in the Semitropic water bank, desalination, and new reservoir storage. A reliable low-cost portfolio meets reliability through a combination of conservation, recharge, additional Semitropic water banking, and water transfers. A reliable environmental hybrid portfolio adds recycled water to the mix.

Under the baseline analysis, small yet frequent shortages are anticipated for South County under future conditions in dry years. These small shortages could be easily handled with recharge and conservation, so those building blocks were included in all the reliable hybrids created so far.

- Even among reliable portfolios, different vulnerabilities to land surface subsidence remain.

  Some portfolios rely heavily on groundwater basin storage, while others do not. For example, although the low-cost portfolio meets the reliability goal without incurring subsidence, it draws down the groundwater basin much lower than the other reliable portfolios.

- Reliable portfolios have different degrees of supply diversity.

  Some of the portfolios, such as the low-cost portfolio, rely heavily on additional imported water. Other portfolios, such as the water quality hybrid portfolios, include a greater mix of building blocks and thus achieve a higher diversity score.

Water Quality Observations

- It is difficult to concurrently optimize all water quality objectives.

  Building blocks tend to improve treated water quality or groundwater water quality, but not both. Fortunately, there are many building blocks that are favorable to one water quality objective without being adverse to the other water quality objectives (i.e., they are neutral with respect to the other water quality objectives).

- Wellhead treatment (for nitrates and arsenic) and recharge improve groundwater quality.

- Storage reduces variability and bromide as it allows for blending.

- Conservation, recycling, and desalination reduce potable demand, which in turn may free up other local supplies for blending down high bromides in imported water supplies.

- Treatment, operational flexibility, and reduction in potable demand are all likely to be needed to improve water quality.

Cost Observations

- It is cost effective to meet water supply reliability. Our analysis shows that unmet demand up to about 5% can be managed through drought planning. Above 5% the community's cost of shortages exceeds the cost to invest in new sources of supply.

- As expected, the low-cost portfolio scores the highest in the minimize cost category. The portfolio draws on less expensive imports, conservation, and groundwater recharge facilities and relies heavily on groundwater pumping to meet water needs.

- Improving water quality is expensive. Because there are different water quality challenges and treatment technologies associated with groundwater and surface water quality, a multipronged approach is needed.

Environmental Observations

- There are many building blocks such as conservation, recycling, and groundwater recharge that contribute to reliability and the environment.

- Some environmental objectives conflict.

  For example, the building blocks that improve environmental water quality are those that increase reservoir storage (and thus cold pool). Reservoir storage projects tend to score poorly under the protect habitat objective due to inundation impacts of sensitive habitats (for the red-legged frog, for example).

Overview of Risk Approach

The major risk categories for the risk evaluation have been identified:

- Regulatory risks: drinking water standards, ESA restrictions
- Technology risks: membranes, conservation, power
- Market risks: recycling acceptance, transfer and banking opportunities
- Funding risks: local partnerships, CALFED
- Infrastructure risks: including the SFPUC Hetch-Hetchy system

The risk analysis will be the main focus of the next stakeholder meeting to be held on October 2.

STAKEHOLDER QUESTIONS AND COMMENTS

Questions and comments received from stakeholders during the fourth stakeholder meeting are summarized below.

Stakeholder	Comment	Response
Ann Draper	Re investment building blocks: The Recycling No. 2 includes a 30-inch trunk line. Recycled water could be growth inducing. For example, Great Oaks has a 30-inch pipeline to serve a subdivision that isn’t there.	As for the Great Oaks pipeline, that is probably more of a reflection of a service area dispute between San Jose and Great Oaks. As for this 30-inch pipeline, it is sized to feed further expansions of the recycled water system should they be built. Many of the other building blocks depend on this line for recycled water supply. There is no intent to serve lands in violation of city and County policies.
Joe Gonzales	The 30-inch pipe is already there. Coyote has a high water table.	
Ann Draper	Access to that pipeline is an issue in a greenbelt area.	
Jim Gasser	This is a nonpotable water supply—how can it be growth inducing?	
Roger Salstrom	Re Reliability planning objective: Reliability is more important than diversity. The Reliability planning objectives should have greater weights because of their values/benefits.	Noted
Ann Draper	Are the water supply needs of independent pumpers included as a demand when considering water reliability?	Yes.
Ann Draper	Re Water Quality planning objective: What about the Habitat Conservation Plan? Consider surface stream water supply and water quality.	The Water Quality objective is focused on water quality for municipal/industrial and agricultural uses. Stream needs are included under the Environmental planning objective.
Mary Ellen Dick	Are you considering additional treatment for recycled water?	Not at this point. The need for additional treatment will be considered under the risk evaluations.
Robin Saunders	Re costs: Is the cost of water averaged?	Yes, the chart showing the cost per af charged for water is an average of all District sales (treated water, North County groundwater, South County groundwater, etc).

Stakeholder	Comment	Response
Joe Gonzales	Currently, in South County the M&I rate is $130/af and $13/af for agricultural water. But this chart says the average cost to produce that water is $300/af?	Yes, on average for the District as a whole.
Roger Salstrom	So agriculture is subsidized?	Yes.
Joe Gonzales	Have you considered paying farmers to fallow agricultural land within the County during times of drought? Or permanent transfers of agricultural water or acquisition of agricultural land?	This would be a topic for the District's Agricultural Advisory Board.
Roger Salstrom	There is a significant increase in cost over time. You should look at costs under different reliabilities.	The cost of shortage to the community is high.
Robin Saunders	Next time, show actual projected North County and South County rates (instead of using the District-wide average).	We will for the typical water bills we will present later in the project. There isn't a simple rule of thumb to be applied since the price of water for each water zone depends on the costs of projects that benefit that zone.
Robin Saunders	It is getting harder to treat the north and south zones separately. For example, water recycling in South County improves water reliability in North County. There is a short-term reliability issue with SFWD due to system failure interruption and a long-term supply and pricing issue (as SFWD costs go up to pay for infrastructure improvements. I think San Jose, Santa Clara, Sunnyvale, and to a lesser extent Mt. View all could be looking to the District for added supply when the SFWD wholesale goes so high.	Noted
Robin Saunders	Re risk scenarios: One big risk not listed here is Hetch-Hetchy.	The vulnerability of the Hetch-Hetchy infrastructure has been identified as a risk concern.

Stakeholder	Comment	Response
Ellen Levin	What about demand hardening?	Demand hardening reflects the concern that as water users become more water efficient, through water-efficient devices and climate-appropriate landscaping, for example, it will become increasingly difficult for them to cut back water use in times of shortage. This difficulty is reflected in the cost of shortage values used in the IWRP. If "Smart Growth" alternatives result in increasing density of housing, that may also increase demand hardening.

Discussion 1: Recycled Water for Irrigation and Groundwater Protection

District objectives include both protecting the quality of the groundwater basin and encouraging water recycling. Most of the recycled water building blocks involve landscape or agricultural irrigation in the unconfined zone of the groundwater basin, where water can easily percolate into the potable groundwater aquifers. How do the stakeholders feel about this trade-off?

Stakeholder	Comment
Robin Saunders	The potential risk from recycled water for irrigation is different than if recycled water were used for intentional groundwater recharge. I support protecting the groundwater; however, requiring zero use of recycled water in the unconfined zone is severe. Department of Health Services has defined a threshold of concern. This topic was discussed at ACWA a couple weeks ago. The policy decision is how much recycled water can be used for irrigation before it becomes a concern. "None" is too strict a burden. We should accept the DOHS threshold.
Joe Gonzales	Potential users of recycled water are concerned over liability. If the irrigators don't use recycled water correctly they could be held liable.
Huali Chai	Advanced treatment is expensive but desirable. It increases reliability, flexibility. Define parameters for advanced treatment.

Stakeholder	Comment
Ann Draper	Regional Water Quality Control Board has new policies due out in August, for all beneficial uses including biotics. The requirements for streams are stricter than for human uses in some cases due to the sensitivities of fish.

Discussion 2: Environment Planning Objective

In forming portfolios and evaluating them using the environmental predictive indicators, it became clear that most of the building blocks scored neutral under the environmental water supply (reliability) and environmental water quality predictive indicators. For example, only additional storage was identified as improving environmental water quality, since it increases the “cold water” storage in the reservoir, increasing the releases of cold water beneficial for cold-water fisheries. In the scoring of building blocks, only those alternatives that guaranteed increased water or water quality for the environment were scored above neutral. The question was posed: Do conservation and recycling and desalination programs increase the water supply available for local streams by reducing the demand for local water to meet municipal/industrial and agricultural needs?

Stakeholder	Comment
Craig Breon	The environmental predictive indicators are confusing. You should focus on a few simple measures, such as endangered species habitat, etc.
Nicole Sandkulla	Only conserved water or recycled water that results in water clearly dedicated to the environment should be rated as valuable to stream water reliability and water quality.
	Are there any building blocks that you can add that do dedicate water to the environment such as storage or recycled water dedicated to the environment?
Mary Ellen Dick	Cold water temperatures for stream releases can also be accomplished using chillers.

IWRP STAKEHOLDER MEETING NO. 5 MINUTES

Santa Clara Valley Water District

INTEGRATED WATER RESOURCES PLAN 2003
STAKEHOLDER MEETING NO. 5 MINUTES

BACKGROUND

On October 2, 2002, the District held its fifth and final stakeholder meeting for IWRP 2003. Prior to that meeting, a series of pre-meetings were held with the stakeholders in small groups or one-on-one. This document provides a summary of the pre-meeting presentation as well as the final stakeholder meeting and the stakeholder comments from the last meeting.

ATTENDEES

Stakeholders	George Belhumeur Huali Chai Jim Gasser Joe Gonzales Ellen Levin Doug Nakamura Nicole Sandkulla Robin Saunders Roger Salstrom Ann Draper Nancy Olson Craig Breon Randy Shipes Jan Garrod Margaret Bruce Michael Stanley-Jones
District Staff, Consultants, and Board Members	Stan Williams, Walt Wadlow, Keith Whitman, Tracy Ligon, Barbara Judd, Larry Adams, John Ryan, Amy Fowler, Alison Russell, Phillippe Daniel (CDM), and Dan Rodrigo (CDM)
Stakeholders Absent	Fred Fowler, Jacqui Carr Gouveia, Sally Lieber, and James Tucker
Observer	Kirk Miller

PRE-MEETING SUMMARY

Pre-meetings were held with all available stakeholders prior to the final stakeholder meeting. The objective of the pre-meetings was to go over the IWRP evaluation framework and the technical analyses in detail and allow stakeholders a forum to get their individual technical questions answered. The IWRP evaluation framework is a structured approach to compare the performance of alternative water supply options relative to the IWRP objectives.

The planning objectives and predictive indicators, the water supply options or building blocks, and the formation of options into portfolios were all reviewed from previous stakeholder meetings. In addition, the lessons learned about what makes portfolios work well were shared:

- They are all reliable.
- They all need additional storage to be reliable.
- Storage cannot be utilized effectively without additional all-weather supplies (or supplies available in all water year types).
- In dry years, all-weather supplies and storage may still not be enough. Dry-year management like transfers or demand reduction may be needed.

The risk analysis was described, including a summary of risk scenarios analyzed. These scenarios were selected as the potential "heavy hitters," and capture a range of types of impacts to the District's water supply outlook:

- Drinking Water Quality Standards (2011)
  - 33% chance of new bromate and arsenic standards
  - 30% cutback in imports (15% cutback in imports if new reservoir and pH suppression/ultraviolet treatment on-line)
  - 10,000-af cutback in South County groundwater (no cutback if wellhead treatment)
- DWR Banks Pumping Capacity Expansion (2007)
  - 50% chance DWR unable to expand as planned
  - Decrease in available imports (alt CALSIM II run)
- Implementation Risk
  - 67% chance of lower costs for recycling, desalination, and conservation
  - 33% chance new reservoir and reservoir expansions are not doable
- Climate Change
  - 50% chance of climate change impacting District
  - 20% decrease in imported supplies by 2040 (due to reduced snowpack)
  - 10% increase in agricultural water demand by 2040
- Greater Than Expected Water Demand
  - 50% chance of higher water demand (due to increased population, smart growth, or reduced conservation savings)
  - 10% increase in M&I demand Earthquake
- Earthquake
  - 1% chance per year

- Full disruption of imported supplies for 5 months

- Endangered Species
  - 10% chance per year
  - 25% disruption in imported supplies

- San Luis Low Point
  - 20% chance per year
  - 30,000-af disruption in CVP supply

- Transfer Market
  - 25% chance per year
  - Transfers three times more expensive than expected

A flexible strategy approach was recommended for addressing this range of uncertainty. The particulars of that approach were reserved for discussion at the final stakeholder meeting.

MEETING SUMMARY

Materials

Meeting handouts included the meeting agenda and a copy of the presentation materials for the meeting. The only stakeholder who missed the pre-meetings was also given a copy of the handout from the pre-meetings.

Meeting Objectives

Three objectives were presented for the meeting:

- Summarize the water supply outlook and what that means for the future, including risk.

- Present our recommendations:
  - Actions needed through 2010
  - Options for 2020 and beyond

- Ask you for your comments on the decision evaluation framework we have developed: Does our approach to multi-objective planning under risk seem appropriate to you?

Summary of the IWRP Water Supply Evaluation Framework

The IWRP evaluation framework builds in flexibility and provides a road map to navigate uncertainty in water supply planning. The steps in the IWRP tool were reviewed from previous meetings and the pre-meeting.

The Future—Handling Uncertainties

Because of uncertainty, the IWRP 2003 strategy must be incremental and flexible. In addition to reductions in supply due to drought, a number of other factors challenge our future water supply.

- Drinking water quality is and continues to be a major concern for surface and groundwater supplies.
  - Bromide: when water with bromide is treated, the disinfection by-product bromate is formed. Bromate has been linked to kidney failures, hearing impairment, and is a suspected carcinogen.
  - Arsenic is a naturally occurring substance that has been detected in wells in Santa Clara County. A stricter arsenic standard could result in some groundwater wells being unusable without treatment or blending with water from other wells.
  - San Luis Low Point: Algae growth reduces San Luis Reservoir water quality and reliability
  - There is no single solution to water quality concerns. We need to have a multi-pronged approach: blending, water treatment, and increased operational flexibility.
- Increases in population statewide challenge the water supply reliability for urban use, agriculture, and the environment.
- There is a growing recognition of the water needs of the environment.
- The Endangered Species Act can restrict water pumped from the Bay-Delta.
- The IWRP analysis assumes that the state Department of Water Resources will be successful in expanding its Banks Pumping Plant in the Delta. If this project does not occur, imported water deliveries will be impacted.
- Infrastructure failure, including earthquake damage, poses a risk to our system and our water supplies.
- Smart growth and other land use changes can increase water demand above that which we have projected in our planning.
- It is uncertain what the impacts of changing precipitation patterns from global warming will be; however, the loss of snowpack from increased temperatures alone will decrease imported water deliveries.
- Controlling costs will be more difficult in the future since future investments will be more expensive than those available in the past.

The last IWRP used a more traditional approach to planning, and only considered the risks from historically observed hydrologic variability. IWRP 2003 considered a range of risk scenarios.

Recommendations for the Near Term, 2002–2010

To best balance the planning objectives requires a mix of additional investment types:

- Water we can depend on in all water year types, even drought, is called *all-weather supply*. All-weather supplies include conservation, desalination, and recycled water.

- Water *storage*, either through groundwater banking programs or surface storage.

- *Dry-year supplies/management*, such as water transfers or demand reduction.

How much of each, and the form of each, differs for different risk scenarios.

We currently have enough information to start responding to challenges and risks. We can meet the needs for the near term relatively simply through cost-effective, "no regrets," multiple benefit strategies.

Near-term actions fall into five broad categories: securing the foundation, reaffirming commitments, making new investments, keeping options open, and monitoring for risks and opportunities.

Securing the foundation includes protecting our existing imported and local supplies, protecting the health of the groundwater basins, maintaining our ability to provide clean safe drinking water, protecting natural habitats and resources, strengthening operational flexibility, and shoring up our existing infrastructure (the last being the focus of the District's current infrastructure reliability study).

What we have committed to in the past still makes sense: the treated water improvement projects, water banking, water conservation, and our current commitments to water recycling.

In addition to those existing investments, the following investments are recommended before 2010:

- Agricultural conservation (additional 11,000 af)

- M&I conservation (additional 17,000 af)

- Groundwater recharge (additional 20,000 af per year)

- Groundwater banking (additional 60,000 af above current level of 140,000 af)

These investments are incremental and flexible, are low cost, and have no significant adverse environmental or water quality impacts. District costs from these investments will be about $5,000,000 annually by year 2010, increasing our average cost of water by about $15/af.

Actions to keep options open include:

- Strengthen regional partnerships.

- Determine effect of recycling on groundwater quality.

- Explore opportunities for indirect potable recycling including streamflow augmentation.
- Resolve the San Luis low-point problem.
- Explore feasibility of groundwater and Bay desalination.
- Investigate blending, treatment technologies, and storage opportunities to improve drinking water quality.
- Study operational changes at existing reservoirs.

Monitoring activities include watching for risks and opportunities identified in the IWRP, such as possible changes to the water quality standards for bromate and arsenic; expansion of DWR's Banks Pumping Plant; linkage between land use and demands; CALFED; funding opportunities for water use efficiency programs; and technology changes in treatment.

Options for the Long Term

Flexibility is key. No single investment portfolio or plan can best meet all future scenarios. The IWRP must remain incremental and flexible, developing as the future unfolds. To prepare for this, map out alternatives under different planning scenarios.

We should prepare now to make the harder decisions necessary to meet needs in the long term. The IWRP decision tool helps us do that.

The potential range of additional supply investments (over baseline and near-term investments):

- Recycling = 0 to 26,000 af per year
- Desalination = 0 to 10,000 af per year
- Options transfers = 40,000 af per year dry-year supply
- Surface storage = 0 to 100,000 af (total capacity)
- New banking = 0 to 150,000 af (total capacity)

Depending on how the future develops and the resulting resource mix, the average cost, due to new investments alone, could range from $38 to $120 per af by year 2020.

Next steps:

- All stakeholder comments will be forwarded to our Board of Directors and CEO.
- New tools developed in the IWRP 2003 will be used on an ongoing basis to evaluate new challenges, opportunities, and projects.
- IWRP recommendations will be forwarded to our CEO.

Many crucial decisions will be made in the next two to four years: San Luis Low-Point Improvement Project, Infrastructure Vulnerability Study, Los Vaqueros Expansion participation, and Semitropic Water Bank vesting decision. IWRP 2003 will help us make these decisions.

Stakeholder Questions and Comments

Questions and comments received from stakeholders during the fourth stakeholder meeting are summarized below.

Discussion 1: Summary of the IWRP Evaluation Framework and the Future—Handling Uncertainties

Now that you have heard a summary of our methodology and of the challenges we face and how that translates into risk, do this method and these challenges make sense to you?

Stakeholder	Comment	Response
Margaret Bruce	I would like to reiterate something that was explained in the pre-meeting: some types of risks are rolled up into these risk scenarios. For example, terrorist attacks and other infrastructure risks are captured by the earthquake risk scenario you have included in the analysis. The random risks analysis has been quite complete.	Noted.
Craig Breon	A couple of the slides are misleading in that they talk about dry-year shortage; actually, it is multiple dry years that are a problem.	Agreed.
	ESA listings are a short-term impact; they don't last for 2 years. They really are not a long-term water supply impact but are actually more of an operational impact.	Agreed.
	My understanding is that South County currently has no treated water; it is all groundwater?	Yes. We looked at a South County water treatment plant as a potential water supply option, but currently all potable demand is met by groundwater in South County.
Jan Garrod	Now, regarding the ESA shutdown of the Delta pumps: water is lost. It flows out to the Bay.	Noted
Craig Breon	In response to Jan's comment, Craig explained that that isn't really the case for a couple of reasons. The systems can change their operations, not make upstream reservoir releases for contract delivery, for example, when the pumps are down. Also, water does have a residence time in the Delta, and doesn't immediately wash out. Short-term shortages are just operational impacts, not real water losses to the contractors.	Noted

Stakeholder	Comment	Response
Jan Garrod	For how many hours is that true? How many hours before water amounts are impacted?	Walt Wadlow explained that the answer to that question is "that depends." Usually the projects can make up for the losses, but there are situations with actual water loss.
Michael Stanley-Jones	First, I want to clarify that I represent Silicon Valley Toxics Coalition in my comments today, but I will also report back to WMI on the IWRP stakeholder process.	Noted.
	This tool allows intelligible discussion of issues.	Agreed
	Would like to comment that in the pre-meeting I asked if the "best fit" risk, if it were shown on the risk range, would fit closer to the red (worst case) or green (best case) scenario. I was told that if all the scenarios were drawn on the chart they would cluster nearer to the "best case" line than the "worst case" line.	Agreed
	Smart growth scenarios and demographics from ABAG are based on the overheated economy of the past. Projections from the City of San Jose shown to the South Bay Water Recycling Collaborative show that actual water use is not that high. You cannot rely too heavily on ABAG projections.	Noted
	An incremental approach is key. The framework is good, but you need to be careful about the quality of the data that goes into it.	Agreed
Ann Draper	I will ditto Michael's comments on need for continuous dialog on development and land use plans. There needs to be a continuous dialog with people involved in land use and development, on the type, location, and rate of development. Need to continuously verify this input.	Agreed

Stakeholder	Comment	Response
Randy Shipes	I think this is a good process.	Noted
	Need to keep in mind that technology changes—both in our ability to treat and to detect water quality constituents. This is true for all water supply, not just recycling. Need to look more at what the water quality from the Delta is, especially under future conditions. Prospects of Next Big Thing, impacts of global warming on Delta water quality.	Agreed
	Keep in mind that 70% of wastewater is from residential customers. That is a large supply of water.	Noted
Huali Chai	The slide on bromide challenges overstates the potential water quality risk. It is based on an erroneous or premature conclusion. Bromide is a naturally occurring component of saltwater. The formation of bromate depends on the water treatment process used to treat the water. It is not clear that bromate is the health risk that the slide implies. There are no respected epidemiological studies that support it is a carcinogen.	Noted
	pH suppression of the water can change the concentration of bromate that results. Also, UV may eliminate the formation of bromate. UV is also desirable for its ability to treat for cryptosporidium and giardia.	Noted
	To summarize: 1) The risk from bromide in source water may be overstated. 2) The technologic capability may be understated.	Noted
Nicole Sandkulla	The slide that states that there is "no single solution to water quality" goes back to Huali's point. This "no single solution to water quality" is an important statement, and you need to better describe that point and how you got there.	Noted

Stakeholder	Comment	Response
	"Partnerships are essential" is also a key point made by the IWRP. Again, you need to better capture this and expand on this.	Noted
Robin Saunders	The worst-case scenario is scary; Michael says that the more likely case is nearer the lower band (the best risk case). Is that true?	Yes
	Some reference has been made here to other demands on the District's money, and that is an important point: water treatment processes, infrastructure, etc. Therefore, we may need to consider the pricing elasticity of demand. If costs of supply go up that much, will that impact the demand?	Noted
	If costs of Hetch-Hetchy water are much greater than the District's water, there are retailers that may switch their supplies. If both are expensive, there may be changes in demand due to elasticity from price.	Noted
Roger Salstrom	But don't you have inventory that can cover a lot of this risk—groundwater basin storage and banking?	When we talk about shortage in the IWRP, we have already accounted for storage. Shortage is need that must either go unmet or be served from new additional water, or else we are at risk of subsidence.
Michael Stanley-Jones	One more cheer for incremental and flexible. Also, I am glad to see global warming included in the analysis. I understand why you did not capture the precipitation pattern differences that may result from global warming; however, as we learn more, we will need to relook at its impacts.	Noted

Discussion 2: Recommendations for the Near-Term

Do these near-term recommendations make sense to you? Is there anything that is a surprise? Is there anything missing?

Stakeholder	Comment	Response
Ellen Levine	Can you clarify—is the San Luis low point long term or a short term?	Both.
	The near-term costs don't include the costs to implement the long-term options.	True.
Robin Saunders	Is the groundwater recharge you are recommending all for South County? Is this to make up for recharge lost in the north?	No. Both North and South County.
	Do you look at injection wells for recharge?	Not specifically.
Roger Salstrom	How does this change the 4% frequency of shortage? Statistically, I am sure it doesn't bring you down to 0%—there is some probability remaining.	With these short-term options implemented, we are reliable to meet the planning risks we have identified (which are based on a repeat of historical hydrology, for example). In reality, there remain risks from events beyond those we included in our planning.
Michael Stanley-Jones	Can you give us more information on the San Luis low point?	There is currently a San Luis Low-Point Improvement Project that is looking at 23 different alternatives, ranging from treatment to additional storage to a bypass pipeline. They will narrow these alternatives down to 6 by the end of this year.
Craig Breon	These near-term options are pretty easy—no one is likely to object to any of these. It is also interesting to note that the costs of these are pretty low, which is a surprising result. In both this one and the last IWRP, we rated cost impacts as a low priority.	Noted

Stakeholder	Comment	Response
	I am worried about where you said you are going to "fortify imported supplies." I distrust the District when it comes to imported supplies and Bay-Delta issues. Explain what you mean by "fortify." Are you looking to increase your imported water?	We are looking to secure our supply, not get more.
	Recharge capacity and general plans and the like: Why doesn't the District comment on general plans and big project EIRs? You could comment that you need a groundwater pond to offset the need for water identified as part of the EIR. For example, as part of the development require that they develop recharge. If not on-site opportunities, they could contribute land or money into a pool to develop recharge elsewhere. That way, the costs could be shared by the cities and the developers.	Noted.
	There are consequences of land use planning decisions. Does the District advise cities planning water-intensive developments of the impacts of those? For example, could let cities know that if they add golf courses those will be the first cut off in times of water supply shortage. You should use these (IWRP) tools as feedback to the cities in their land use planning.	District provides assistant to retailer's water supply assessments. Noted
Randy Shipes	The Water District does make some comments, but I know that we make lots of comments with respect to water supply impacts.	Noted
Robin Saunders	We do too. But what about developments in the confined zone where recharge doesn't help? Pool of money towards additional recharge elsewhere?	Noted
Craig Breon	Pool of money or of land.	Noted

Stakeholder	Comment	Response
Robin Saunders	Also, land use changes change the firm yield of the groundwater basin (through loss of natural recharge). Is the District looking at that?	Yes
Craig Breon	In North County, the District could identify some sites (as potential recharge sites) and have new development contribute to that, if there is no land on the development site that is suitable for a recharge facility.	Noted
Ann Draper	Waiting until the EIR is too late, and General Plan updates are infrequent. You need to talk often to both planning departments and the departments of public works. VTA has done a good job with its outreach to agencies regarding their best practices. They have done a good job of educating agencies.	Noted
Jan Garrod	When you talk about streamflow augmentation as a possibility, you are talking about augmenting streams for water supply purposes?	Yes
	Agriculture does not trust CALFED.	Noted

Discussion 3: Options for the Long Term and Next Steps

Are there any questions or comments at this point?

Stakeholder	Comment	Response
Ellen Levine	Regarding the slide that shows yields for potential future projects: This shows 100,000s of af of water. How much are you looking to get at this point?	50, 000 to 70,000 af. Some of the numbers in this table are storage capacity, not dry-year yields of water.
	Again, the costs shown in these graphs are for IWRP options only, and don’t include the costs of other projects.	Yes.

Stakeholder	Comment	Response
Margaret Bruce	When is the infrastructure vulnerability study expected to be completed? How will that feed into this?	2004.
Jan Garrod	When you say that we could sell off assets (re: groundwater banking) you mean water?	Yes.
Craig Breon	You stated that groundwater banking may not be available under risk? Which risks?	If Banks Pumping Plant is not expanded, if there are ESA pumping cutbacks, or if an earthquake cuts off imported water conveyance. Also, our ability to take from groundwater banking is tied to the SWP delivery allocations for the year, so our takes are limited by imported water availability.
	"I hate new surface storage." Local surface storage takes up habitat, and also allows you to take more water from the Delta. This is especially true when you are talking about such a large reservoir as 350,000 af, four times the size of Anderson Reservoir. At the first IWRP, everyone was against the idea of a new reservoir, due to costs, difficulty in getting permits, the 15-year lead time, environmental impacts, etc. Reservoir storage is very inflexible. San Luis Low-Point Improvement Project is also looking at the possibility of a new reservoir. Most likely the environmental community would violently oppose any new reservoir. Raising Anderson by about 80,000 af, say, would not be as bad as a new 80,000 af reservoir. That might be potentially acceptable. (If it is included with eliminating other reservoirs such as Uvas, Guadeloupe, and Almaden and could give significant habitat gain. I might consider that if I were pushed to the wall.)	Noted

Stakeholder	Comment	Response
Doug Nakamura	I was also part of the original IWRP, and we decided that we didn't need a reservoir because other alternatives were available.	Noted
Michael Stanley-Jones	First of all, I must say that there should be no jet skis on drinking water reservoirs.	Noted
	We may entertain trade-offs of reservoir expansion if it is within a watershed approach.	Noted
	What is the lead time on partnerships for storage? For example, Los Vaqueros. How far out do you have to begin your thinking?	There are critical decisions around storage coming up in 2004 through 2006.
Roger Salstrom	I would hate to think what this valley would have been like without our existing storage. We need to consider the future, and consider the plusses and minuses.	Noted
Joe Gonzales	A reservoir would give us reliability and control, as well as lake habitat and recreation.	Noted
Huali Chai	I predict that desalination will ultimately, within 20 years, solve water quality and supply problems in California. My fear is, before we get to that, we will destroy resources and later find that it wasn't necessary. Alameda County, Southern California, and other places are developing desalination, and ultimately desalination will be important to California. You talked earlier about "no regrets" options. If we want no regrets in the long term, hold off on reservoirs for 10 years and we will see desalination as an alternative.	Noted
Michael Stanley-Jones	CALFED Water Use Efficiency Subcommittee is adding desalination, probably on October 23.	Noted

Discussion 4: Final Stakeholder Comments on the IWRP Evaluation Framework

Keith Whitman asked the stakeholders for any final input: Did we leave anything out? Is there anything about the process you would have likely to have worked differently?

Stakeholder	Comment
Michael Stanley-Jones	I appreciate the tool has become an iterative process itself—it evolved into an evolving tool as new risks and opportunities arise.
	I appreciate the opportunity to be involved.
Nicole Sandkulla	We are in a changing dynamic time with respect to land use practices. You need to refine your demand projections process; in the future, look at more local planning agency level rather than just rely on ABAG.
Huali Chai	Thank you for the opportunity to participate.
	Some slides overemphasize the risks and overemphasize the shortfall from drought. Because of this, and many changes expected over the next few years, you need to constantly reassess the IWRP. (CALFED, bromide standard changes, new technologies). You will need to constantly work new developments in, not just in 5 or 10 years.
	I am opposed to new surface storage. It is damaging to the environment, and it is irreversible.
Michael Stanley-Jones	This tool is a resource you can use to educate the community. Consider rolling out this information, it can be of enormous value. For example, there are three efforts now looking at water indicators that could find this useful: Joint Venture Silicon Valley, Silicon Valley Environmental Partnership, and Sustainable Silicon Valley project.
Craig Breon	The best thing about this is that it has made it clear enough to have discussion.
	It has been less satisfying than the last time because in the last IWRP the stakeholders voted on the scenario to move forward to the Board.
	Recommend interim updates, especially when key decision points come up. Maybe yearly updates. It might be nice to have debates on key decisions, pro and con, in front of the stakeholder group.
	What got left out? More demand reduction is possible. IWRP is assuming shortages less than 5% can be managed through demand reduction, but the energy crisis showed people could cut back 10–15%. 5% is too low.

Stakeholder	Comment
Nancy Olson	Very pleased with the process and evaluation tool.
	The concern of the League of Women Voters (LWV) is communication—about what has been and what is expected to be done. Need to communicate constantly with cities, communities, and other agencies.
	LWV puts surface storage very low on our priority list. There would need to be lots of communication on why surface storage is necessary.
Jim Gasser	I would have liked to see more data.
	For near term, can't rely on future technology.
	Long-term growth in California is scary. Need water from out of state, or by tapping the north coast rivers (although that is not the job of the SCVWD).
	What is the feasibility of icebergs for water supply?
Jan Garrod	Interesting to note that everyone is optimistic except for staff, but that is their job.
	Communication is crucial.
	Should offer to assist farmers and cities to save water. Farmers cannot afford the costs of conservation (like switching to drip irrigation); agriculture needs inexpensive water to provide us with affordable food. And we don't want costs to cause farmers to leave California.
	We can't take care of our water needs locally; we need to look statewide.
	To summarize: 1) We have to look statewide. 2) We need water for everyone. 3) We need to keep costs down, especially for farmers.
Doug Nakamura	Excellent process; this process should continue.
	I want to recommend to the Board that they keep their eye on the ball.
George Belhumeur	This has been an excellent process.
	Near-term actions well-defined and supportable.
	I would have liked more information, on risk tolerance, etc.
	It is critical that the IWRP integrate decision-making with other decisions at the District.

Stakeholder	Comment
Joe Gonzales	Good process.
	Drought is a reality; storage gives control and water for the future.
Roger Salstrom	I would have liked more data.
	Keep in mind that although the incremental approach is good for the near term, it isn't always good for the long term.
	Remember that you are modeling based on historical rainfall. Statistically, precipitation could be different than that observed in the short historic record.
Randy Shipes	A caution: you are looking at a long-term problem needing short-term decisions. Costs never go down, and land never gets cheaper. Need to start the long-term solutions in the near term.
Robin Saunders	This dovetails well with the Santa Clara Master Plan adopted last June.
	We have concerns that groundwater supply be sustainable.
	I would like groundwater firm yield numbers.
Ellen Levin	I found this process very worthwhile. For me, beyond just gaining better understanding of the water supply options available to Santa Clara, I gained a much better understanding of your District, service area, and stakeholder issues. Because San Francisco and Santa Clara share customers, the value of gaining this understanding is truly immeasurable.
	I commend you for taking on this process and engaging the public so intimately. As we all know, educating the public has lasting benefits and I think you presented this topic in an understandable and effective manner. More importantly, I believe you have gained support for your short-term actions through this process.
	I would caution that as you move forward on the vulnerability study and asset management program that you continue to link those outcomes with the IWRP outcomes. As we have seen, the public can become very confused about how these efforts fit together and how they impact overall water rates.
	Finally, I would encourage you to make use of this stakeholder group in the future as issues come up to keep your constituent base informed and involved. I have been party to many of these processes in the past and I think the group you have pulled together here is a really solid, contributory group that you should take advantage of.

APPENDIX 1

DESCRIPTION OF THE EXTEND SIMULATION MODEL

DESCRIPTION OF THE EXTEND SIMULATION MODEL

The IWRP 2003 uses a computer simulation model developed by District staff, commonly referred to as “Extend.” This appendix describes how the model simulates water supply facilities operated by the District and the data assumptions for the model.

OVERVIEW

Extend is a commercially available simulation tool that uses function blocks in a two-dimensional graphical user interface environment. The program includes a large number of function blocks in its library routines, but also allows you to create new function blocks for specialized applications.

The IWRP 2003 Extend model uses an annual time step to simulate local and imported water availability and use toward defined County demands. The Extend model’s main focus is the operation of the County’s groundwater subbasins, that is, the recharging of sufficient water such that the total natural and artificial recharge balances the groundwater pumping required to meet demands on the subbasins within the bounds of operational storage capacity. Groundwater pumping is calculated as the supply necessary to meet defined annual water demands after taking into account conservation, recycled water, treated water, and other alternate supplies that are available in a current year of the simulation.

The distribution system and demands are modeled as North County/South County composites rather than as individual facilities. Although the details of reservoir operations and streamflows are lost with this approach, the modeling is greatly simplified and it makes alternative scenario testing more manageable. The Extend software is capable of running on shorter time steps; however, the effort to assemble the requisite data would be significant.

The validity of this simplified approach has been confirmed using the District’s more detailed simulation model, SYSMOD. SYSMOD uses a monthly time step and models the detailed raw water and treated water systems, including each reservoir, pipeline, and managed stream. The data requirements are significant, and the hydrologic data required only exists from 1967 forward. SYSMOD has been calibrated and verified using actual operations data.

WATER DEMAND

The demand projection for the IWRP 2003 Extend model is based on ABAG Projections 98, with conservation savings consistent with continued implementation of the Best Management Practices for Water Conservation (BMP conservation). Since ABAG projects demographics only through 2020, California Department of Finance projections for Santa Clara County population were used to extend the water demand projections through the year 2040.

OPERATIONAL STORAGE

Groundwater is a critical component of water supply in Santa Clara County. Nearly all of the water supplied to the southern portion of the County comes from the groundwater subbasins. Increasing population and competing water interests compel the District to do more with limited resources. Therefore, determining a reasonable range for the amount of groundwater that can be safely stored and withdrawn is important to allow for effective management of the groundwater subbasins and the County's water resources.

For the purposes of the IWRP simulation modeling, groundwater operational storage is a range from zero (empty) to a maximum storage capacity (full) in units of af. The Extend indexed sequential model uses this capacity as if it were a "box" that can be emptied by groundwater pumping, and filled by surface recharge and natural groundwater yield. The model also sets a maximum amount of how much can be taken out of the groundwater basins in any single year. It is assumed that subsidence would occur if pumping exceeded this maximum; therefore, the model treats any amount of groundwater pumping above this maximum as a point of subsidence (shortage). The model also considers calculations that draw the subbasin storage level down to zero and still require more groundwater pumping to be a point of subsidence.

The IWRP 2003 Extend model uses an operational groundwater storage capacity of 530,000 af: 350,000 af in the north and 180,000 af in the south. The additional single-year groundwater pumping restriction imposed by the model does not allow for more than 200,000 af of groundwater pumping to occur in a single year in the North County, and 100,000 af in the South County. The model identifies any calculated groundwater pumping above these levels as a shortage for that simulation year.

RECHARGE CAPACITY

The District's recharge facilities are a very important component of water supply operations. These facilities provide a conduit for local water (in-stream and off-stream conserved facilities) and imported water to reach the District's largest and most important storage facilities—the groundwater basins. This recharge percolation process also treats local and imported water to a potable water quality state.

The following recharge capacity values were used in the IWRP 2003:

- 95,988 af for the North County
- 42,504 af for the South County

Data from recent operation plans for recharge capacity were used as a starting point in determining the total recharge capacity for North and South County. This amount was adjusted on certain creeks to calculate recharge capacity all the way to the unconfined zone basin boundary using factors based on the distance upstream of the point of regulated recharge observation to the basin boundary divided by the entire distance length of the stream.

LOCAL SUPPLY

Local supply defines the local runoff water that has been recorded over a historic period including:

- Unregulated downstream accretion (streamflows)
- Reservoir inflow
- Natural groundwater yield

- Other local supplies (SJWC and Stanford)

The hydrologic data available for the County is limited. While there are over 128 years of continuous rainfall data at one site in San Jose, most of the streamflow and reservoir inflow data dates only as far back as the 1930s and 1940s, and records for some streams and reservoirs begin as late as 1962.

UNREGULATED DOWNSTREAM ACCRETION (STREAMFLOWS)

Local runoff that is not captured by reservoirs is termed unregulated downstream accretion or streamflow. The individual streams are combined into two groups—North County and South County unregulated streams. Unregulated streamflow for the Extend model is defined as annual values over the hydrologic period (1922–1999). Recorded data for all facilities exist from 1967 through 1999 for all unregulated streams. Data prior to 1967 has been correlated against annual rainfall at San Jose Gage 86, which contains the longest history of precipitation in the County (going back to 1875).

RESERVOIR INFLOW

Local surface water supplies also include the stream flows that feed into and out of the District's reservoirs, and water that flows overland into reservoirs. One important consideration in water supply planning is the concept of usable supply. For surface water, this means the surface flow that can be diverted to and stored in a reservoir, or diverted and put to use at a water treatment plant or groundwater recharge facility. Thus, the supply available is a function of the facilities in place to develop the supply.

The IWRP 2003 Extend model groups reservoirs into three composite sets:

- North County non-pipeline reservoirs that are not connected to a raw-water control system pipeline (Almaden, Guadalupe, Lexington, Stevens Creek).

- South County non-pipeline reservoirs that are not connected to a raw-water control system pipeline (Chesbro, Uvas).

- Pipeline reservoirs that are connected to a raw-water control system pipeline (Anderson, Calero, Coyote).

Therefore, reservoir inflow for the Extend model is defined as annual values over the hydrologic period (1922–1999) for each of these composite sets. Recorded data exists from 1967 through 1999 for all reservoirs. Data prior to 1967 has been correlated against annual rainfall at the San Jose Gage.

RESERVOIR STORAGE CAPACITY

Adjustments are made in the Extend model to account for change in reservoir storage due to sedimentation. Storage ratings have been periodically carried out that can be used to record sedimentation in each reservoir. Future expected storage has then been calculated by extrapolation. Therefore, as the Extend model simulates the District's operation in future demand years (through 2040), reservoir storage in each future demand year is adjusted by the recorded rate of sedimentation.

NATURAL GROUNDWATER YIELD

Recharge to the groundwater basin consists of both natural groundwater recharge and artificial recharge of local surface water and imported water. Natural groundwater recharge includes water recharged to the groundwater basin from direct precipitation, net leakage from pipelines, irrigation return flows, and subsurface inflows from adjacent areas. Artificial recharge is not included in natural recharge supply, as that water has already been accounted for (as either local surface or imported water supply).

Natural groundwater yield (NGWY) is defined on an annual basis for the North County and South County. The North County natural groundwater yield values are calculated using the District's Groundwater model—GMOD aerial recharge.

South County natural groundwater yield was calculated from available data as follows:

- Estimates were compiled of South County NGWY (1988–1999) from Water Utility Enterprise Reports or back-calculated using known pumping, recharge, and change in storage from groundwater elevation maps.

- Correlations were attempted for South County NGWY values to some other parameter in order to extrapolate back to 1922. The best correlation for South County NGWY was with rainfall at the Peabody station near Gilroy (Ln transformation of both variables gives R^2 = 0.63). However, the rainfall data for Peabody had several holes, as the data only went back to 1932 and several years since 1932 had no record (1959–1961, 1966, and 1968).

- For these missing years, the rainfall record at Station 86 in San Jose (with a record back to the 1800s) was correlated to the rainfall at Peabody (R^2 = 0.75), and that correlation was used to extrapolate the Peabody values, which were then used to extrapolate the NGWY value. Therefore, the years highlighted in yellow on the spreadsheet represent two correlations, giving an overall R^2 of about 0.47.

OTHER LOCAL SUPPLIES (SJWC AND STANFORD)

Other agencies in the County also develop water locally. The San Jose Water Company (SJWC) and Stanford University both hold surface water rights. Stanford's local water development is small. SJWC, however, has developed an average yield of 9,500 af from a run-of-the-river treatment facility on Saratoga Creek and from Elsman Reservoir in the Los Gatos Creek watershed. These projects are considered part of the local surface water supply available to the County. Available historic data for these two supplies have been accumulated to an annual amount. In addition, correlations to annual rainfall at San Jose Gage 86 were calculated in order to generate data for this supply back to 1922.

RECYCLING

Recycled water and conservation are the two District programs that are considered "all-weather supplies" for use efficiency. Recycled water is a local water source developed by the County's four wastewater treatment plants. The District currently subsidizes any recycled water project that offsets the need for District potable supplies at $115 per af of recycled water developed. In addition, the District is working in partnership with the SCRWA to develop further recycling projects. Since recycled water is developed from wastewater flows, its yield is not dependent on hydrologic conditions; therefore, it is a very reliable source of supply.

The baseline recycled water supply is defined as a range of values over the demand year sequence modeled (2001–2040), assuming expansion to full planned capacity by the year 2011.

TREATED WATER CAPACITIES

There are three water treatment plants currently in use:

- Rinconada (75 MGD rated maximum daily capacity)
- Penitencia (39 MGD rated maximum daily capacity)
- Santa Teresa (100 MGD rated maximum daily capacity)

The baseline assumes the Rinconada Water Treatment Plant will be expanded to 100 MGD by the year 2007 when water quality standard improvements are implemented.

Since the Extend indexed sequential model uses an annual time step, the treated water capacity for each plant needs to be defined in af per year. Water treatment plants cannot be expected to run at maximum daily capacity for 365 days per year. Therefore, assumptions of how close the District could run to full capacity have been made based on plant capacity curves provided by the Operations Planning and Analysis Unit. This data is provided on a monthly basis. Calculations were then made to convert monthly percentage of full use to af volumes of water. The monthly values were then totaled to an annual maximum treated water capacity for each plant.

The Extend indexed sequential model also allows for a different treated water capacity for each plant for every demand year in the simulation (2001–2040). The maximum capacity for each treatment plant is presented below for the demand years 2011 through 2040. The treated water capacity defined for each plant in the year 2001 is a rounded value approximating the current contracted treated water use. Between 2001 and 2011, treated water capacity is increased at a linear rate to the point of maximum capacity mentioned above. Note that Rinconada's capacity stays the same for the years 2001 through 2006—the point at which an expansion to 100 MGD is assumed to be implemented.

IMPORTED SUPPLY ALLOCATIONS

The County receives imported water from the U.S. Bureau of Reclamation's Central Valley Project (CVP), the California Department of Water Resources State Water Project (SWP), and the San Francisco Water Department's Hetch-Hetchy system in the following contract amounts:

- 152,500 af (130,000 M&I, 22,500 Ag) from CVP
- 100,000 af from SWP
- 72,000 af from Hetch-Hetchy

Annual imported allocation factors have been developed for the SWP and CVP (M&I and Ag), based on the most recent CALSIM run that reflects the current Bay-Delta Water Quality Control

Plan, CVPIA (b)(2) policy, Environmental Water Account implementation, expanded SWP pumping capacity to 8500 cfs, and Joint Point of Diversion. An allocation factor is defined for every year in the modeled hydrologic sequence (1922–1999). Imported supply for a given year of hydrology is calculated by the model as the annual allocation factor for that year times the full contract delivery for each project.

Since little information is available concerning allocation factors by hydrologic year for the Hetch-Hetchy project, allocation factors were generated in a relationship tied to the SWP allocation factors. The Hetch-Hetchy allocation factors are defined in 25% increment steps, where a factor of 1.0 (100% of normal allocation or 72,000 af) is used if the SWP allocation factor is between .76 and 1.0. A factor of .75 (75%) is used for the Hetch-Hetchy allocation if the SWP allocation factor is between .51 and .75. A factor of .5 (50%) is used if the SWP allocation goes below .5. This 25% step reduction methodology follows the allocation reductions the District has experienced in the past with Hetch-Hetchy supplies.

TRANSFERS

Long-term transfers are delivered through the SWP system. The long-term transfers are modeled as dry-year options. When transfers are defined as a building block in a portfolio, a maximum pool of water is also defined. The model can take from this pool as needed (up to a defined maximum single year withdrawal) until the pool supply is depleted.

SEMITROPIC WATER BANKING

The District has entered into a long-term agreement with the Semitropic Water Storage District (Semitropic) for participation in its Groundwater Banking and Exchange Program. The agreement reserves for the District up to 35% of the Semitropic program capacity, or 350,000 af of the total 1,000,000 af storage capacity. To date, the District has stored 140,000 af of water in the Semitropic bank. This is the level of participation that is assumed in the Extend model baseline condition.

Withdrawals (takes) will be made from the Semitropic water bank to recharge the groundwater basin as long as the groundwater basin is not full and there is remaining recharge capacity. When excess imported supplies are determined (no place to recharge or deliver to treatment plants), they are stored in the Semitropic water bank (puts).

Because of current take restrictions, the annual amount of water that can be withdrawn from the bank in the long-term drought is only about 52,000 af/year at the 350,000 af participation level. In a repeat of 1977 hydrology, only 31,500 af of water will be available with a 350,000 af bank. Maximum put and take factors are modeled in the IWRP simulation in a methodology that matches the Semitropic agreements—using the current year's SWP allocation factor, percentage of program capacity the District has agreed to, and Semitropic pumpback capacity level.

HYDROLOGIC SEQUENCE

The IWRP 2003 Extend model uses a historical hydrologic time period of 1922 through 1999. Local supplies (reservoir inflows, unregulated streamflows, and natural groundwater recharge) are obtained from observed history from 1967 to the present time. For years prior to 1967, these supplies are estimated based on rainfall.

The main modeling method for the IWRP employs an approach named “indexed-sequential”—where a given model portfolio is run sequentially through every possible set of hydrologic data available in 40-year sets (2001–2040 demand years). Since the hydrologic data includes the years 1922 through 1999, there are 78 possible sequences of data, if we allow wrap-around. Below are some examples of the 78 sequential sets to better explain how they are organized:

- Set 1—hydrologic years 1922–1961; demand years 2001–2040
- Set 2—hydrologic years 1923–1962; demand years 2001–2040
- Set 3—hydrologic years 1924–1963; demand years 2001–2040

. . .

- Set 39—hydrologic years 1960–1999; demand years 2001–2040
- Set 40—hydrologic years 1961–1999, 1922; demand years 2001–2040

. . .

- Set 78—hydrologic years 1999, 1922–1960; demand years 2001–2040

With 78 different sequences of hydrologic data, each processing through 40 demand years, an indexed-sequential model run simulates a total of 3120 years of data (78 times 40 = 3120). As the model simulates the District’s annual water supply facilities operation, it works its way through each year in the 40-year set of demand years, passing end-of-year storage (reservoirs, groundwater, and water banks) to the beginning-year storage for the following demand year in the sequence. At the end of each 40-year set (2040), initial conditions are redefined for storage; and a new set of demand years and hydrology is started. All end-of-year data generated by the Extend model is stored in global arrays within the model. At the end of the simulation, the Extend model has been programmed to write the global array data to an Excel spreadsheet for further analysis and storage.

SPATIAL LEVEL OF DETAIL

The Extend model is defined with two geographic areas: North County and South County. Water demand, reservoir storage and inflows, streamflows, recharge capacity, natural recharge, groundwater storage, etc. are all defined as North County or South County facilities. North County includes the Santa Clara Valley Subbasin while South County includes both the Coyote and the Llagas Subbasins. As is the case in the District’s operation, treated water and Hetch-Hetchy water are available only in North County.

OPERATIONAL ORDER

- SWP available water is first used to meet Penitencia Water Treatment Plant (WTP) demand.

- CVP available water is first used to meet Santa Teresa WTP demand.

There is a toggle in the program that allows the modeler to decide whether Rinconada WTP demand will be met with SWP water first, and then with CVP water (if SWP water is not sufficient alone), or vice versa. Imported water is used for recharge only after the water treatment plant needs are met.

As long as the groundwater basin has storage capacity and there is remaining recharge capacity, the model will use all available water for recharge. In other words, the model strives to keep the groundwater basin as full as it can.

Recharge needs are first met with unregulated streamflow, then non-pipeline reservoirs, then pipeline reservoirs, and then additional pipeline reservoirs (if such an alternative is being modeled). Available unused imported water will be recharged only after all local reservoir supplies have been used. If recharge capacity remains after local and imported supplies have been accounted for, then the Semitropic water bank will be used to release available water up to its maximum “take” restrictions.

APPENDIX 2

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APPENDIX 3

SCVWD IWRP 2003 RISK WORKSHOP
MEETING NOTES AND CATEGORIZATION OF RISK

SCVWD IWRP 2003 RISK WORKSHOP
MEETING NOTES AND CATEGORIZATION OF RISK
March 5, 2002

This appendix describes the risk factors that were identified for IWRP evaluation during a workshop conducted with District staff and consultants in March 2002.

GENERAL DISCUSSION OF RISK FACTORS

Risk is defined for IWRP 2003 as uncertainty revolving around several major factors. Generally, these uncertainties will lead to lower performance of water resources portfolios. The following list of significant risk factors was generated at the workshop:

1. Water transfer availability probably more important than Delta losses
2. District's ability to fund projects (financial capability, partnerships, resource constraints)
3. Outside funding for recycling and conservation
4. Legislation effects on conservation
5. Shift in retailers' use of other water supplies
6. Population/development/economy drivers on demands
7. Conservation and recycling incentives
8. Education and perception risks of recycling and conservation
9. Institutional changes impacting the District (e.g., wheeling, consolidation of retailers, adjudication of groundwater basin)
10. Hetch-Hetchy issues
11. Viability of existing contracts (SWP, CVP, Semitropic, retailers)
12. Status of Hetch-Hetchy contract, supply shifts from HH to District
13. Technology risks of surface water quality
14. Assumptions regarding performance of facilities

IWRP DRAFT RISK FACTORS, EVENTS AND IMPACTS

Based on the discussions at the workshop, the IWRP technical team developed the following draft list of events and impacts for risk factors in the areas of regulatory actions, funding, water markets, technology, climate change, and demographics.

Risk Factor	Event	Impact

Risk Factor	Event	Impact
Regulatory Risks		
ESA-Related	• Four-year agreement that ESA restrictions in Bay-Delta are not extended or are revoked (linked to success or failure of CALFED). • New ESA listings. • FAHCE renewal for existing watersheds (after 10 years), adds further ESA listings/requirements. • FAHCE impacts other watersheds not affected by current agreements.	• SWP and CVP supplies are less than anticipated, due to existing ESA listings. Delivery of transfers/banking may be more restricted. • Further SWP/CVP supply restrictions possible; more difficult CEQA process for projects such as reservoirs and transfers/banking. • Restrictions on District use of some of its local reservoirs and streams. • Restrictions on District use of some of its local reservoirs and streams.
Drinking Water Standards/Public Health	• Lower standards for bromate and microbials affecting surface water. • Lower standards for arsenic, nitrate; or creation of new standards for perchlorate, MTBE, and others affecting mainly groundwater. • NDMA, endocrine disrupters, pathogens, and VOCs limit use of recycled water, either through new standards or litigation.	• Higher District costs for treatment and/or blending of sources of water supply. • Higher costs for groundwater treatment and/or limitations on groundwater use. • Higher costs for recycled water and/or limitations on recycled water use.
Water Rights	• Phase 8 negotiations are successful.	• District could get more SWP/CVP supplies.
Funding Risks		
Local/State/ Federal Funding for Conservation and Recycling	• Local partnerships for conservation and recycling not as great as anticipated. • Success or failure of CALFED, as it pertains to funding sources.	• Higher District costs and/or lower potential in supply from conservation and recycling. • Success would lead to greater matching funds, reducing overall costs. Failure would mean costs are entirely borne locally and from District.
State/Federal	• Success or failure of CALFED,	• Success would lead to greater

Risk Factor	Event	Impact
Funding for New Surface Reservoirs	as it pertains to funding sources.	matching funds, reducing overall costs. Failure would mean costs are entirely borne locally and from District.
State/Federal Funding for Desalination	• Success or failure of CALFED, as it pertains to funding sources.	• Success would lead to greater matching funds, reducing overall costs. Failure would mean costs are entirely borne locally and from District.
Market Risks		
Conservation	• People not easily motivated to participate in conservation programs. • Legislation/certification mandating certain levels of conservation are implemented.	• Higher local/District costs to provide more incentives to conserve and/or lower conservation potential. • Greater assurance that conservation projections hold true, more potential for new conservation.
Recycling	• Recycled water produced, but not desired by customers. • Recycled water use not offsetting potable demands one for one; or creating new potable demands.	• Higher local/District costs to provide financial incentives and/or lower recycling potential. • Reduced accounting for recycled water as an offset of other supplies used for potable demand.
Shift in Retailer Use among Different Water Supplies	• Retailers take less Hetch-Hetchy, either due to outage or cost.	• Increases demand on groundwater and treated water supplies.
Transfers/Banking	• Increased competition for spot transfers. • New regulations increase carriage water requirements for all transfers going through the Delta. • Contract renewal or contract breach for option transfers and banking.	• Higher prices for transfers and/or greater restrictions in use (limits). • Transfers not as efficient (lower yields than expected). • Prices uncertain and possible supply limitations could occur.
Technology Risks		
Membrane Technology	• Advancements in RO membrane technology are made.	• Reduces capital costs for ocean desalination, groundwater desalination, or RO membrane water treatment.

Risk Factor	Event	Impact
New Conservation Technology	• New conservation devices are introduced (e.g., ultra-ultra-low-flush toilets, landscaping irrigation rain gauges).	• Increases the potential for conservation.
Power	• Changes in power costs.	• New forms of power or changes in power markets could lower power requirements.
Other Risks		
Climate Change	• Warmer/drier climate. • Raising sea level.	• Higher-than-expected water demands, lower-than-expected snow pack—which reduces imported supplies. • Introduction of more saline waters into the Bay-Delta or local groundwater. Reduces Bay-Delta exports due to increased carriage water requirements to meet Delta standards
Demographic/ Economic Development	• Lower-than-expected development or shift to lower water use types of development (such as higher density housing). • Higher-than-expected development.	• Lower-than-expected water demands. • Higher-than-expected water demands.

INFORMATION ON RISK PROBABILITIES AND CONSEQUENCES

INFORMATION ON RISK PROBABILITIES AND CONSEQUENCES

Detailed interviews were conducted with District staff and subject experts to determine the range of impacts that the IWRP draft risk factors (described earlier in this appendix) could have on the District's water supply and cost. Through the interview process and staff analysis the risk factors were evaluated for their potential probabilities and consequences.

In order to keep the process and evaluation manageable, only the most significant risk factors were selected for final evaluation. This document describes the final list of risk factors, the process used to evaluate them, and the evaluation findings.

FINAL RISK FACTORS

The final risk factors can be categorized into three basic types:

- Discrete risks—events that have a specific time or date associated with the risk factor. These include new drinking water quality standards anticipated in 2011, and expansion of the H.O. Banks pumping plant not completed by 2008 as anticipated.
- Continuous risks—events that are long-term in nature and run the full course of the planning horizon. These include climate change and greater-than-expected water demand.
- Random risks—events that can happen with some probability at any time during the planning horizon. These include an earthquake that disrupts imported water supplies, a halt in Delta export pumping to protect endangered fish species, San Luis low-point disruption in CVP supply, and market/contract cost increases for water transfers.

Each type of risk was handled differently in the evaluation.

EVALUATION APPROACH

The following describes how each risk type was evaluated using the District's Extend model. Based on the combinations of the two discrete risks and two continuous risks (each being binary in nature), and a combination of random risks there are 32 possible combinations.

As with the earlier modeling used to determine the portfolio scores by planning objectives and predictive indicators, the risk analysis modeling also uses the indexed-sequential method. This preserves the sequence of hydrologic data from 1922–1999 throughout the planning period of 2001–2040.

Discrete Risks

The following discrete risk scenarios were run, triggered by the indicated dates. The discrete risks were run as independent scenarios; as such, determining the probability of occurrence was not required for the modeling but rather to illustrate the probability of each event occurring.

- Drinking water quality standards (anticipated date 2011):
  - Bromate and arsenic standards do not change, leading to no impact to the District's imported and groundwater supplies. (67% probability of occurrence)
  - Bromate and arsenic standards are more stringent, leading to a 10% cutback of SWP and CVP supplies for portfolios without new surface storage; 5% cutback of SWP and CVP supplies for portfolios with new surface storage and treatment options (UV); 10,000 af cutback in South County groundwater supplies with no groundwater well treatment or recharge; 0% cutback in groundwater supplies with groundwater well treatment and recharge. (33% probability of occurrence)
- H. O. Banks capacity expansion (anticipated date 2007):
  - The Banks Pumping Plant is expanded as planned by DWR, and as assumed in the IWRP baseline modeling. (50% probability of occurrence)
  - DWR is unable to expand the pumping plant, reducing imported water availability over that assumed in the baseline (as per alternate CALSIM II analysis). (50% probability of occurrence)

Continuous Risks

The following continuous risk scenarios were run. As with discrete risks, the continuous risks were run as independent scenarios; as such, determining the probability of occurrence was not required for the modeling but rather to illustrate the probability of each event occurring.

- Climate change
  - Occurs gradually, ramping up to an eventual 20% decrease in imported supplies by 2040; increase in agricultural demand by 10% by 2040. (50% probability of occurrence)
  - Does not occur, no change in supplies or agricultural demand. (50% probability of occurrence)
- Greater-than-expected water demand
  - 10% higher than expected M&I demands due to demographic changes (either greater population and stronger long-term economy or smart-growth implementation) and 10,000 af less effective conservation savings than expected. (50 % probability of occurrence)
  - No change in demands or conservation. (50 % probability of occurrence)

Random Risks

Using Monte Carlo simulation, each risk analysis run also included the following random events:

- Earthquake
  - 1% chance that a full disruption of imported supplies (SWP, CVP, transfers, and Semitropic) occurs for duration of 5 months.
- Endangered species
  - 10% chance that a 25% disruption in imported supplies (SWP, CVP, transfers, and Semitropic) occurs.
- San Luis Low Point
  - 20% chance that a 30,000 af disruption in CVP supply occurs.
- Market/contract cost increases for transfers
  - 25% chance that the cost of water transfers will be three times greater than expected.

MODEL RUNS

Of the 19 portfolios previously evaluated, six were carried through the risk analysis:

- Baseline
- Hybrid Portfolio #1: Ensure Water Quality
- Hybrid Portfolio #2: Protect the Natural Environment
- Hybrid Portfolio #3: Minimize Cost Impacts
- Hybrid Portfolio #4: Environment and Water Quality
- Hybrid Portfolio #5: Water Quality and Environment

Six portfolios and 32 risk combinations resulted in 192 model runs. Each run included analyzing each of the 40 years in the planning horizon (2001 through 2040) under 78 different hydrologic "years" of data (1922 through 1999), resulting in 3120 "years" in each run.

Within each of the 192 model runs, the Monte Carlo approach was used to model the four different random events. To ensure sufficient sample size for the Monte Carlo sampling technique to be valid, the analysis was repeated 16 times within each run. Thus, 16 iterations × 32 risk scenarios × 3120 analysis years per run = 1.6 million "years" of analysis for each portfolio, or 9.6 million "years" of data total. With so many runs, not all predictive indicators could be tracked through the risk analysis. The risk analysis focused on average and maximum shortage and number of shortages and the total District and County present value costs. The shortages were tracked by decade of the planning horizon to further aid analysis.

APPENDIX 4

ECONOMIC ANALYSIS

ECONOMIC ANALYSIS

This appendix presents the economic methodology used in the evaluation of IWRP water supply building blocks and portfolios.

INTRODUCTION AND GENERAL ECONOMIC PRACTICE

The economic method used in the IWRP evaluation addresses these three important issues:

1. Costs and benefits should reflect the time value of money.

2. Benefits (in this case water supply yield) should be compared on a consistent basis, to address hydrology impacts and usage patterns.

3. Projects that have different life cycles need to be converted to some common time period for proper evaluation.

Time Value of Money

There are two basic approaches that are widely used to estimate a project's cost-effectiveness. They are: (1) the net present value (NPV); and (2) the benefit-cost (B/C) ratio. The NPV approach takes benefits less costs to determine the net value. The B/C ratio takes benefits divided by costs, where the value of anything over 1.0 indicates that the project is beneficial. Both approaches have merits. The NPV gives one a feel for the magnitude of net benefits, whereas the B/C ratio does not. However, the B/C ratio indicates the level of cost-effectiveness on a relative scale, whereas the NPV does not. When feasible, both approaches should be used.

Standard to both approaches is the need to reflect the time value of money. This is often referred to as present value. Assuming investment opportunities with a positive return, money available today is worth more than money available in the future. One dollar today may be invested and grow to (1 + *r*) dollars a year from today, where *r* is the discount rate. Typically the discount rate is equal to the interest rate. An amount, *x* dollars, to be received in *n* years in the future has a present value of *x* / (1 + *r*)*n*. The present value of a stream of costs can be expressed as

(1) $$PVC_r^0 = \sum_{t=0}^{n} \frac{(C_t)}{(1+r)^t}$$

While the present value of a stream of benefits can be expressed as

(2) $$PVB_r^0 = \sum_{t=0}^{n} \frac{(B_t)}{(1+r)^t}$$

where *C* equals costs; *B* equals benefits; *r* is the discount rate; and *t* is the year. The NPV is, therefore, the difference between equations (1) and (2).

Table A4-1 shows two hypothetical projects compared to each other using NPV and B/C ratio.

Table A4-1

EXAMPLE OF NET PRESENT VALUE AND B/C RATIO CALCULATIONS

Water Project A		Water Project B	
Sum of PV Total Costs	$1.45 million	Sum of PV Total Costs	$3.05 million
Sum of PV Total Benefits	$2.17 million	Sum of PV Total Benefits	$4.07 million
NPV	$0.75 million	NPV	$1.02 million
B/C Ratio	1.5	BC Ratio	1.3

In this example, Project A has a greater B/C ratio, but Project B has a greater NPV. The choice between A and B would depend on whether or not net benefits (or profits) in absolute terms are more important than the relative cost-effectiveness between the two projects. For public policy, often the magnitude of benefits (profits) is not as important as the relative cost-effectiveness.

Nominal vs. Real Dollars

Costs and benefits can be expressed in nominal or real dollars. Nominal dollars include inflation, whereas real dollars do not. From 1970 to 1990, the nominal per capita income rose more than fourfold, but purchasing power did not. When prices inflate, the purchasing power of a dollar declines, and vice versa. To control for this phenomenon, nominal dollars can be converted to real dollars, removing the effects of price inflation. A potential pitfall when converting cost and benefits to real terms (net of inflation) is using an inappropriate discount rate. It is critical that the units of economic measurement are consistent. If dollars are in nominal terms, the r in equations (1) and (2) should represent the nominal discount rate. If dollars are in real terms, the r should represent the real discount rate. Nominal and real dollars are different from present value dollars discussed previously. The following definitions illustrate the differences among nominal, real, and present value dollars:

Nominal dollar costs. These are costs expressed in dollars, the level of which will be set in the years in which they are spent. These dollars include the effect of inflation. For example, labor costs or construction material costs may increase at the same rate as the general price level. If such an item costs $100 today, it will cost $103 dollars next year, $106 the year after, and so on. Thus the nominal costs will vary in part according to the year in which they are spent, and typically will be spent over a number of years into the future (future cost stream).

Real dollar costs. These are costs that do not include the effect of general price inflation. If costs increase with the general price level, then the real dollar costs will not change. The item in the previous example will cost $100 per year in real dollars, year in and year out. The only time real dollar costs will go up over time is if the cost is assumed to rise faster than the general rate of inflation. For example, some analysts have argued that over time, the cost of water transfers will increase faster than the general price level, reflecting an increasing scarcity of water supply. However, cost streams that become fixed in nominal value at a particular time will be reduced in real value. For example, annual interest payments on a loan of $10,000 at 7% are fixed at $700 per year at the time that the loan is taken out. Thus, the interest payment will be $700 per year in nominal terms; the amount will not be increased with the general price level. In order to change this nominal price stream to real dollars, it will need to be deflated by the inflation rate. In the first year of the loan, the real interest payment will be $700; in the second year, it will be $680 ($700 / 1.03); in the third year, $660 ($680 / 1.03); and so on.

Present value dollars. These costs differ from the two previous types of costs. Nominal and real costs are typically a stream of costs that occur over future years. Present value dollars reduce those streams of costs to a single value in a single year for comparison purposes. Typically, costs are discounted to the year in which a study is being conducted. This is accomplished by using a discount rate that accounts for the time value of money. The discount rate used is usually the interest rate. However, interest rates also come in "nominal" and "real" varieties. The nominal interest rate (which is what is usually described as "the interest rate") consists of two discrete parts: the real interest rate, and the inflation rate. When nominal costs are being discounted to present value dollars, the nominal interest rate should be used. When real costs are being discounted to present value dollars, the real interest rate should be used.

Choosing whether to present dollars in nominal or real terms depends greatly on what the analysis is being used for. Usually, real dollars are used to compare projects on a relative basis, or for projecting "real" costs over time. Many economists prefer real dollars because the compounding nature of inflation masks the change in costs due to the new investments alone. Assuming a planning horizon of 40 years, 3% inflation would dominate the total cost of any alternative.

However, for rate studies, both real and nominal dollars are typically used. The masking effect of inflation for rate calculations is mitigated to some extent because dollars for new projects are added to the costs of the existing rate base, and these costs are fixed in nominal terms. Rate increases presented in real terms give decision-makers and customers a sense of the rate impact from new investments alone, and allow a ready comparison to today's rates. On the other hand, rate increases presented in nominal dollars may unduly concern decision-makers and customers, because rate increases that do no more than match the increase in the general price level will result in almost a fourfold increase in rates over a 40-year analysis period. However, a forecast of a steady level of rates in real terms may provide decision-makers with the impression that rates will not increase. By providing the rate forecast in nominal terms, analysts provide a sense of what the projected rate might actually be like in a given forecast year (including inflation), and ensure that decision-makers understand that a rate level that is constant in real terms will still result in rate increases, but that these will not exceed the increase in the general price level. Generally, both approaches should be used when looking at future year rates.

ECONOMIC METHOD FOR IWRP

The District has constructed alternative water resources portfolios (complete packages of various water supply and management options) to meet different planning objectives. Examples of these objectives include ensuring supply reliability, meeting water quality regulations, protecting the environment, and diversity. To determine the economic trade-offs of meeting these objectives, the District should use the total present value cost for each portfolio. The present value cost represents the stream of future annual costs over the 40-year planning period, discounted to reflect the time value of money.

However, when comparing the economic merits of individual supply options within a portfolio for recommended implementation, a different approach is needed. In standard economic practice, comparing relative cost-effectiveness between projects is done using the B/C ratio. However, this approach requires that both costs and benefits be expressed in terms of dollars. For water supply projects, the benefit is the water supply produced. Some economists have suggested that water supply be converted into a monetary value. This is easier said than done, however. It requires agreement on what the value of water is. Further complicating this issue is the fact that for some uses of water, there is no viable substitute—making economic estimates of “value” more difficult. To get around this issue, water engineers and planners have used unit cost as a metric for determining relative cost-effectiveness between projects. Unit cost divides the total cost of the project (over its life) by the quantity of water produced (over its life). The lower the unit cost, the more cost-effective the project. However, it is important that this unit cost be calculated correctly. In many cases, the unit cost is not calculated using standard economic principles.

Another unique aspect of water resources economics relates to hydrology impacts and the usage pattern of the supply yield. For example, assume there are two projects that can produce a maximum supply yield of 100 af per year (af/y)—but one project can only produce the supply during wet years, while the other supplies water during all year types. If the demand for water is greater during dry years (or droughts), then the project that can produce the supply during all years is more beneficial. To ensure a consistent economic comparison, supply yields need to be estimated statistically under all hydrologic and usage patterns. In addition, water supply is only beneficial if it is consumed or stored (for later use). If more water is produced than needed or can be stored, then that amount of extra supply has little or no value. In the District’s case, if remaining surplus supplies can be sold on the market, then there would be value to the surplus supply.

The following summarizes the economic method used for the District’s update of its IWRP. It presents the logic and assumptions for estimating unit cost and the method for data input into the District’s water supply simulation tool, Extend. Extend is being used to estimate supply yield and total cost of alternative water resources portfolios. These portfolios are combinations of individual water supply options (e.g., recycling, surface storage, treatment, desalination, etc.) and demand-side management programs (e.g., conservation) that are designed to meet multiple objectives.

Basic Economic Assumptions

The following basic economic assumptions were used for this economic analysis:

- Nominal interest rate (and discount rate) of 7%.
- Inflation rate of 3%.
- Real interest rate (and discount rate) of 3.9%.
- For capital projects, project life generally ranges from 25 to 50 years, depending on type of project.

Present Value Dollars for Portfolio Comparison

When comparing portfolios to each other, the District should use total present value dollars. For this analysis, the nominal interest rate is assumed to be 7%. Combined with an assumed inflation rate of 3%, this results in a real interest rate of 3.9%. If all future costs are consistent (e.g., either all in nominal dollars or all in real dollars), then the present value costs will be the same (assuming the correct interest/discount rate is used).

In the case of the IWRP, it was decided to express all future costs in real terms (excluding inflation). This had the advantage of allowing the District to move the timing of specific supply projects backward or forward without having to adjust escalation factors for inflation. Since all future costs are presented in real terms, the discount rate should reflect the real interest rate of 3.9%.

The following summarizes the basic steps to arrive at the present value cost for a representative portfolio:

1. Estimate District's current, existing annual costs (base case) in real dollars.

2. Estimate capital costs and start year of construction for each new water supply/treatment option in portfolio.

3. Finance capital costs of new options using nominal interest rate (7%) over the useful life of the project to get starting year annual cost; then discount that annual cost in subsequent years by 3% per year in order to keep annual capital costs in real dollars.

4. Estimate the annual O&M costs in real dollars for each new supply/treatment option in portfolio.

5. Add annualized capital costs with the annual O&M costs to get total annual costs for new supply/treatment options.

6. Add total annual costs of all new options together with current, existing annual costs (base case) to get overall total annual costs.

7. Discount stream of overall total annual costs by real discount rate (3.9%) in order to get the total present value cost for portfolio.

However, when evaluating the District's rate impact, future year dollars (presented in both real and nominal terms) will be used. This will give the District a rate of change for its projected costs. When presented in real dollars, the rate of change will indicate the change over current year dollars as a result of implementing the new projects in the portfolio. When presented in nominal dollars, the rate of change will indicate the change over current year dollars as a result of both implementing the new projects in the portfolio and the compounding effects of inflation.

Without a full, detailed rate evaluation, two approaches will be used to calculate a "proxy" for District and Countywide rate impacts. To estimate a District proxy rate, the total annual costs for just the District will be divided by expected District water sales. This calculation assumes that all revenue collected by the District is provided from the sale of water, which is not the case. However, this assumption (if applied uniformly across all portfolios) will provide a consistent comparison.

To determine a Countywide rate impact, the total costs (both District and County) will be added and then divided by total retail water demand. This will then be converted to an average household water bill. This calculation again assumes that all revenues of water retailers are provided from water sales. However, as with the District rate proxy, this proxy will allow for consistent comparisons for the portfolios.

For District and Countywide comparisons, future rates will be expressed in both nominal and real dollars.

Differences in Project Life (End-Point Issue)

The District's planning horizon for the update of the IWRP is 2040. Some of the water supply options under consideration provide benefits over a relatively short time period, while other options provide benefits longer than the planning horizon of the study. For example, investments in water conservation programs may only provide water savings for 5 to 10 years, while investments in water storage facilities (dams and reservoirs) may have design lives that are much longer (usually 50 years). Other water supply options may have expected useful lives in between these two extremes. Because the District is limiting its analysis to the 40-year planning horizon, how can the costs of a short-lived supply option be compared to an option with a very long useful life?

For short-lived programs, the answer is to repeat the programs where the repetition is technologically feasible or practical. In the District's case, almost all of the short-lived programs are conservation measures. To determine whether these conservation measures were repeatable, the market penetration of the measure was examined. For example, it would not be feasible to assume that an ultra-low-flush toilet retrofit program would be repeatable throughout the 40 years. This is because the combination of the plumbing code (requiring conserving toilets in all new construction) and past toilet retrofits has started to saturate the market. Continuing the toilet retrofit program would not be efficient because at some near point in time, existing conserving toilets would be retrofitted (replaced) by new conserving toilets (thus not saving any water).

However, a conservation measure such as installing evapotranspiration-controlled irrigation timers would be an example of something repeatable. Since this represents new technology, the market penetration would remain high throughout the 40 years. The conclusion was that all of the District's future conservation programs (beyond those identified in the BMPs) identified in the IWRP would be repeatable.

For long-lived programs, it is important to include the value of any useful life that will continue to exist after the study period. It is possible that the IWRP might examine two portfolios of water management options that provide equal reliability at the same costs. However, one of them may consist of options that will need to be replaced soon after the study period, while the other may consist of options that will provide benefits long after the end of the study period. Obviously, all other things being equal, the option with the greater residual benefits is much more valuable. One way to reflect this would be to extend the length of the study period indefinitely. However, that poses additional computational and forecasting problems. A more common alternative is to estimate the remaining benefit (or residual value) after the planning horizon. This is very difficult to do with any accuracy, so a common approach is to develop the equivalent of depreciation over the life of the project and use the undepreciated balance remaining at the end of the project period as an estimate of the residual benefit. In the District's analysis this would have the disadvantage that whenever the timing of a project was changed, the estimate of the residual value would also need to be changed to reflect the changing remaining life.

The alternative that was finally chosen was a variant of the residual benefit approach. First, the annual capital cost of each project was developed by calculating the nominal annual bond amortization cost. To do this, it was assumed that the bond life equaled the useful life of the option, and that the option was constructed today. Then these annualized costs were deflated in subsequent years by the assumed inflation rate in order to convert costs into real dollars; that is, for year one the annual capital cost was equal to the annual bond amortization cost; for year two it was this cost reduced for the effect of inflation for one year, and for year three, reduced by the effect of two years' worth of inflation, and so on. Once the cost stream is expressed in real terms, it can be moved in time without having to readjust for inflation. In addition, because the annual cost stream is only incurred when the project is assumed to be operating, the costs included in the analysis are equivalent to the total costs minus the residual value estimate.

Unit Cost for Supply Option Comparison

As stated previously, when comparing portfolios the total present value costs should be used. However, when comparing specific water supply options (or projects) the unit cost approach should be used. This is necessary because without a relative comparison, the different sizes of the supply options would make cost comparisons difficult. For example, a water supply option may produce 10,000 af/y of supply and cost $3.5 million (in present value dollars), while a water conservation program may save 3,000 af/y at a total present value cost of $1.8 million. Since the supply yields (benefits) are different, drawing conclusions from a comparison of costs alone is difficult.

Unit cost has another application as well. It can be used to incrementally build portfolios that are designed to be least-cost in nature. Once all supply options are converted to unit cost, they can be incrementally added, from lowest to highest unit cost, until the projected need (i.e., water demand) is satisfied. This ensures that the lower-cost options are explored before the higher-cost options are needed.

However, in many cases the unit cost is not calculated correctly. One typical mistake that is often made is the incorrect use of supply yield (the denominator of the unit cost). As stated previously, supply is only beneficial if used or stored. In many cases, unit cost is calculated using maximum production supply, rather than beneficially used supply. This can overstate the cost-effectiveness of this option (if production is greater than demand). There may also be hydrologic limitations on the supply. For example, a surface reservoir may have the capacity to provide a maximum annual supply yield of 50,000 af/y; but its supply depends on capturing water that is affected by hydrology. If a series of dry years occurs, this reservoir may not have the water to deliver the maximum capacity.

The following example is used to illustrate this issue. Assume two different supply projects that are both brought on-line at the same time to meet the same water demand. Both projects have a maximum capacity of 100,000 af/y, but have different total costs. One project produces the same supply in all years, whether it's needed or not; the other project is limited in its ability to produce supply hydrologically. Table A4-2 summarizes this information and presents the different unit cost calculations.

Table A4-2

COMPARING UNIT COST OF TWO SUPPLY PROJECTS WITH DIFFERENT YIELD PATTERNS

Hydrology	Demand Needs (af)	Supply Project A (af)		Supply Project B (af)	
		Production	Used	Production	Used
Wettest Quartile	0	100,000	0	100,000	0
Wetter Than Normal	50,000	100,000	50,000	100,000	50,000
Dryer Than Normal	75,000	100,000	75,000	50,000	50,000
Driest Quartile	100,000	100,000	100,000	0	0
Statistical Average	56,250	100,000	56,250	62,500	25,000
Present Value Total Cost		$50,000,000		$30,000,000	
Production Unit Cost[1]		$500		$300	
Average Yield Unit Cost[2]		$500		$480	
Beneficial Use Unit Cost[3]		$889		$1,200	

[1] PV total cost divided by maximum year production supply.
[2] PV total cost divided by statistical average of supply production.
[3] PV total cost divided by statistical average of used supply.

This example demonstrates how a simple unit cost, where costs are divided by production supply, can give a misleadingly low unit cost. This example also demonstrates how project comparisons can be skewed if the unit cost is not correctly calculated. If Production or Average Yield unit cost calculations were used, Project B would be selected over Project A. But when the proper Beneficial Use unit cost calculation is used, Project A is more cost-effective. However, this example does not take into account the value of storage. If unused supply produced by both Project A or B could be stored, then the unit cost would be lowered.

To address the issue of differing supply patterns due to hydrology and need, the District should use its Extend model (which can simulate both demand and hydrologic variability of supply) to estimate the supply for each option.

Another fatal flaw in unit cost calculations is the improper handling of the time value of money. Just as in B/C analysis, costs and benefits should be brought back to present value dollars. In many cases, only costs in the unit cost calculation are brought back to present value dollars. The proper calculation of unit cost should also discount water. Although it may seem counterintuitive to discount water, as many believe the “value” of water will increase over time, it is merely a formula to ensure that when unit costs are multiplied by the projected supply yield, the result will be the total present value cost of the project. This approach is typically called levelized unit cost. The formula for levelized unit cost is

(3) $$LUC_r^0 = \frac{\sum_{t=0}^{n} PV(C_t)}{\sum_{t=0}^{n} PV(Q_t)}$$

where $PV(C_t)$ is the present value of costs (see equation (2) for detail computation); $PV(Q_t)$ is the present value of water yield; *r* is the discount rate; and *t* is time.

As mentioned previously, it is important to ensure that all costs are expressed in the same dollar measure (including or excluding inflation). If the cost estimates exclude inflation, then the discount rate should also be reduced to exclude the effect of inflation. For this analysis, the levelized unit cost was calculated in real dollars.

Water Shortage Costs

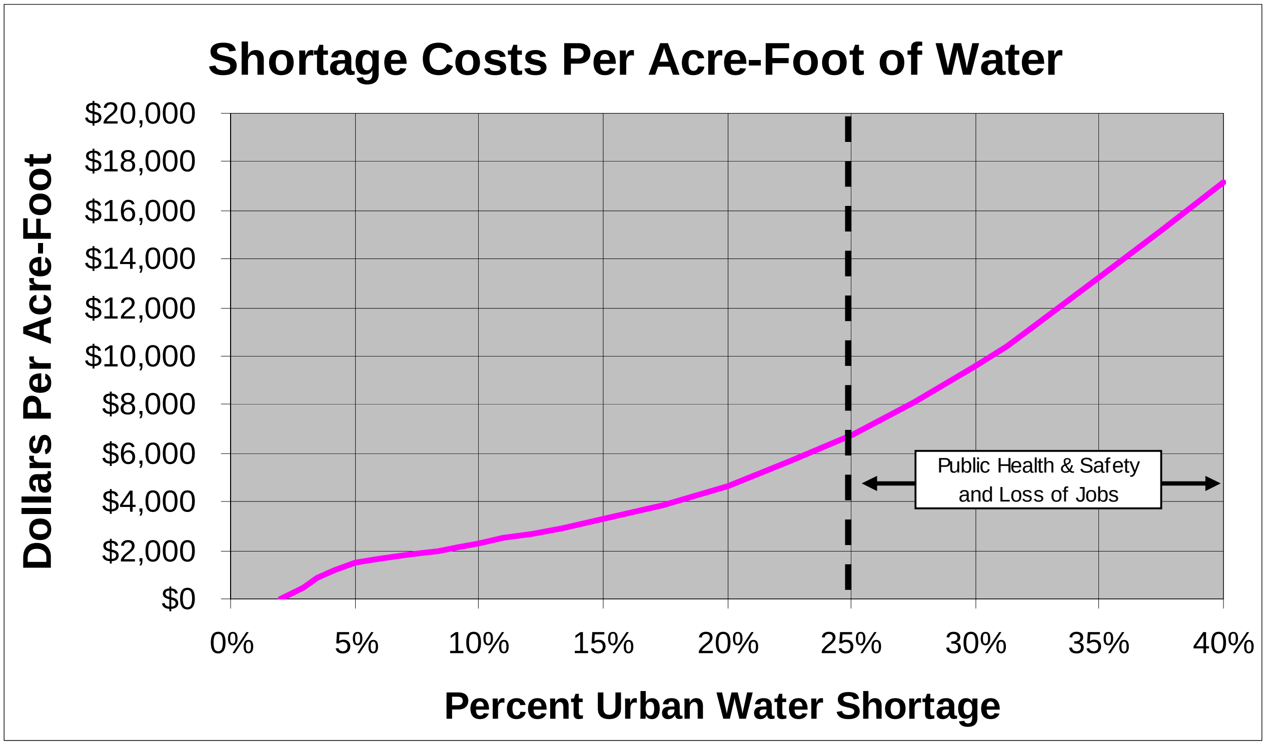
The District chose not to set a hard reliability goal for the water resources portfolios to meet. Rather, the District wanted to examine the trade-offs between reliability, cost, water quality, protecting the environment, and other objectives. However, when evaluating the costs of portfolios that have different levels of reliability, it is important that any supply shortage be converted into dollars at the end of the analysis. Resource economists have long believed that significant supply shortages do in fact lead to significant economic consequences. Real examples of this can be illustrated during the 1976–77 and 1988–1992 California droughts. During these droughts, several California communities saw lost jobs, impacts to agricultural and landscape nursery industries, and scale-backs to water-intensive industries. Furthermore, these quantified impacts do not include all societal impacts, such as damages to residential landscaping or impacts to overall quality of life. These societal impacts are just as real and can add up to significant dollars.

There are several techniques to arriving at the cost of water shortages. Some involve calculating real impacts, as mentioned above, and simulating those impacts using future drought events. Consumer surplus is another way to estimate shortage costs. This technique involves estimating the demand elasticity for water and imposing restrictions on the supply side of the equation. Both these techniques have been used in the past. A third way is to estimate consumers' willingness to pay to "avoid" shortages. Contingent valuation surveys are used to solicit responses from consumers in a scientific manner. Contingent valuation is a proven economic/social method that has been used to estimate the value of less-tangible resources, such as the value of recreation, the value of preserving the natural environment, and water shortages.

The District's Extend model can simulate the use of a portfolio of supplies to meet forecast demands, and estimate the level of shortages that will result. Any level of shortages will have a cost to the local community. If the shortage is small, the costs will also be small, as households adjust to reduce water uses that are of limited importance to them. Shortages of greater magnitude will have more significant costs to the community.

To estimate shortage costs to the County, data on unit cost shortages were input into the Extend model. A function that related the unit shortage cost to the percent of demand that was unable to be met at times of shortage was used. As expected, this function estimates a zero cost at very low levels of shortage, and increases to much higher levels as the size of the shortage increases. The shape of the cost function is shown in Figure A4-1.

Figure A4-1. COST OF URBAN WATER SHORTAGES



This cost function is estimated based on a number of analyses developed for Metropolitan Water District of Southern California (MWDSC), but modified to reflect characteristics of the water consumers within Santa Clara Valley Water District. The first analysis was presented as a part of the State Water Contractors' (SWC) testimony filed in the State Water Resources Control Board's hearings for Bay-Delta water quality standards in 1987.[1] This reported a survey that was conducted to determine the amount that residential water users were willing to pay to avoid shortages. While this study concentrated on water users in the south of the state, the analysis also investigated water users in the Bay Area, and found that there was no significant difference between the two.

MWDSC also used these results to guide its planning efforts. Based in large part on that analysis, MWDSC uses $3,000 per af as a rule-of-thumb measure of the benefits of avoiding shortages. The MWDSC analysis was updated to reflect the mix of customers served by Santa Clara Valley Water District, the current level of conservation, and inflation that has occurred since the original study. This analysis resulted in a series of estimates that increased as the level of the shortage increased. That is, the cost of a 20% shortage is more than twice as much as the cost of a 10% shortage. This is to be

[1] Metropolitan Water District of Southern California, SWC Exhibit Number 54, *Economic Value of Reliable Water Supplies for Residential Water Users in the State Water Project Service Area,* prepared by Richard T. Carson and Robert C. Mitchell, June, 1987.

expected, because with a 10% shortage consumers can reduce their water use through actions that are less costly. As a shortage deepens, the actions needed will become more costly. At 25% shortages and greater, urban areas will experience public health and safety problems and significant loss of jobs.

Recent actions taken to protect environmental resources have degraded water supply reliability. As a method for determining the loss to consumers of these actions, regulators have used estimates of short-term price elasticities. The price elasticities adopted by regulators have varied from 0.2 through 0.1. Using this basis for estimation, the CVPIA results are consistent with values for new supplies ranging from $464 per af for Central Valley cities to $3,330 per af for Central Coast cities served by the Coastal Branch of the State Water Project. This variation in the value of reliability results from the variation in the expected price of existing water deliveries. Where the current water prices are higher, the lower-valued uses of water have (or will soon have) been eliminated, and so the cost of shortages will be higher accordingly.[2]

ECONOMIC DATA INPUTS FOR EXTEND MODEL

Categories of Cost

Costs for the IWRP were split into the following categories:

- Existing (baseline) or new
- Fixed or variable
- District or County (local)
- Cost of shortage

Because the District was interested in estimating a total cost picture, existing costs based on its current operations were projected into the future. These costs include such things as remaining bond or debt service costs for existing capital projects, purchase of imported water, variable costs for treatment, operation costs for reservoirs, and labor costs. Even without new investments in treatment or water supply, these baseline costs are expected to increase in real dollars until the District pays off its remaining bond and debt service for existing capital. Then the baseline costs will start to decrease.

New costs were estimated based on identified water supply and treatment options that the District could develop in the future to meet its objectives. Costs for these new investments, where appropriate, were split into District costs and County (local) costs. District costs represent those costs that would be incurred directly by the District, such as a new water treatment plant, a new surface reservoir, or the portion of a conservation program needed for implementation. County costs include groundwater pumping, the local portion of conservation and recycling costs, wastewater costs, and any costs due to water supply shortages. Costs were also split into fixed (occurs every year regardless of the volume of water production) and variable (tied to the volume of water produced in

[2] This analysis was presented in the *Central Valley Improvement Act Programmatic Environmental Impact Statement, Draft Methodology/Modeling Technical Appendix, Municipal Water Costs*, September, 1997.

a given year). Annual capital cost payments are an example of fixed costs, while O&M costs are an example of variable costs.

For new supply and treatment options, economic data on capital costs, O&M costs, project timing, and supply yield were collected from a variety of sources within the District. In some cases, supplemental data was collected from outside consultants. Because the District has ongoing programs for water conservation and recycling, project data for these options was more specific in nature. For other supply options, such as desalination, CALFED, or new surface storage, data was more preliminary in nature. Table A4-3 lists the sources of data for the various supply options used for the economic analysis for the IWRP update.

Table A4-3

SUMMARY OF DATA SOURCES FOR ECONOMIC ANALYSIS

Supply Type	Project Name	Data Source	Electronic File
Conservation		Jerry De La Piedra Robert Siegfried	M&I Conservationbuilding blocks.xls, Agbuildingblockprograms.xls
Recycled Water		Ray Wong	IWRP Revised Recycled Nov.21 2001.xls
Desalination	Desalination—Groundwater (9 mgd) Desalination—Bay (9 mgd)	CDM CDM	
Treatment	 District Treatment Plants Wellhead Treatment UV Treatment	Tracy Ligon Phillippe Daniel (CDM) Tracy Ligon Tracy Ligon	 Cost data for UV HH Uvas wellhead, etc.doc Arsenicnitrate Removal.xls Cost data for UV HH Uvas wellhead, etc.doc
Storage	Sediment Removal (20 kaf stor.) Uvas Expansion Calero Expansion	Tracy Ligon Tracy Ligon Tracy Ligon	Cost data for UV HH Uvas wellhead, etc.doc Cost data for UV HH Uvas wellhead, etc.doc Cost data for UV HH Uvas wellhead, etc.doc
New Surface Reservoir	Alternative 1—100,000 af Alternative 2—350,000 af	Tracy Ligon Tracy Ligon	
Recharge	Instream Recharge—West Instream Recharge—Ford Instream Recharge—So Co Pond Recharge—No Co Pond Recharge—So Co (15 acres)	Tracy Ligon Tracy Ligon Tracy Ligon Tracy Ligon Tracy Ligon	 Cost of Sth Cnty Recharge Pond.xls
Transfers	Options Spot—Critically Dry	Lynn Hurley D. Rodrigo (CDM) Wendy Illingworth	 IMPORTSH.XLS
Banking	Semitropic—Addit 60,000 af Semitropic—Addit 210,000 af	Lynn Hurley Lynn Hurley	Imported Water IWRP Info December 6 01.xls Imported Water IWRP Info December 6 01.xls
Other	Westside Hetch-Hetchy Intertie	Tracy Ligon	Cost data for UV HH Uvas wellhead, etc.doc
CALFED	Alternative—Urban Alternative—Environment	Dan Rodrigo (CDM) Dan Rodrigo (CDM)	CALFED.XLS CALFED.XLS

After the data was collected for each supply option, costs were annualized and input into the Extend model for comprehensive simulation of the portfolios. Three different techniques were used to annualize the costs. This was necessary because of the nature of the supply option and the level of specificity in the project cost information.

Water Conservation Cost Inputs

Because water conservation projects had relatively short project lives, they were assumed to be repeated throughout the planning horizon of 40 years. This required a special calculation in order to get annualized costs. The following steps were used to calculate the annualized costs for conservation, using the Evapotranspiration-Linked (Eto) Controllers for residential customers as an example. This approach is also summarized in Table A4-4. In this example, the District costs would be $400,000 per year to save 560 af/y of water. This project was assumed to last eight years. The savings build up to a maximum of 4,480 af/y, after which the savings start to degrade as the units' useful life erodes. By year 18, the savings are eliminated. Because we assumed that this program could be repeated every nine years, the following steps were completed to arrive at an annualized cost for maintaining the maximum savings of 4,480 af/y:

Step 1: Estimate the net present value (NPV) of costs and water saved using a net discount rate of 3.9%.

Step 2: Calculate the levelized unit cost ($/af) by dividing the NPV of cost by the NPV of water saved.

Step 3: Use the ramp-up of water saved until it reaches the maximum, and then hold the maximum throughout the planning period.

Step 4: Multiply the levelized unit cost by the repeated water savings in order to get annualized cost.

Table A4-4

EXAMPLE CALCULATION OF ANNUALIZED COST FOR WATER CONSERVATION

Eto-Linked Controllers for Residential				
Year	**Cost**	**Water Saved (af/y)**	**Input into EXTEND**	
			Water (af/y)	**Annualized Cost**
1	$400,000	560	560	$56,913
2	$400,000	1,120	1,120	$113,826
3	$400,000	1,680	1,680	$170,738
4	$400,000	2,240	2,240	$227,651
5	$400,000	2,800	2,800	$284,564
6	$400,000	3,360	3,360	$341,477
7	$400,000	3,920	3,920	$398,390
8	$400,000	4,480	4,480	$455,302
9	$400,000	4,480	4,480	$455,302
10		4,480	4,480	$455,302
11		3,920	4,480	$455,302
12		3,360	4,480	$455,302
13		2,800	4,480	$455,302
14		2,240	4,480	$455,302
15		1,680	4,480	$455,302
16		1,120	4,480	$455,302
17		560	4,480	$455,302
18		0	4,480	$455,302
NPV	$3,389,985	33,355		
Levelized Unit Cost ($/af)		$102		

This approach was used for all water conservation projects, both agricultural and M&I. These individual conservation projects were then combined to formulate packages of conservation programs based on their cost—ranging from lowest to highest for the District and/or County. It is also important to note that these costs are assumed to be fixed in nature. Table A4-5 summarizes the conservation programs.

Table A4-5

SUMMARY OF WATER CONSERVATION PROGRAMS

Conservation Program	Water Saved (af/y)	District Unit Cost	County Unit Cost	Total Unit Cost
1. Ag. Moisture Monitoring Equip. Loans	1,500	$6	$342	$348
2. Ag. Total Irrigation Management	8,869	$36	$16	$52
3. Ag. Existing Equip. Repair Loans	500	$162	$699	$861
4. M&I. Comm. & Ind. Eto Controllers	5,243	$17	$38	$55
5. M&I. Residential Eto Controllers	4,480	$102	$0	$102
6. M&I. Dual-Flush Ultra-Low Flush Toilets	6,398	$161	$340	$501
7. M&I. Residential Washer Rebates	204	$367	$1,836	$2,203
8. M&I. Pool Cover Incentives	158	$543	$532	$1,075
9. M&I. Residential Landscape Incentives	58	$1088	$1,939	$3,027

Water Recycling Cost Inputs

The recycled water programs differ from the conservation programs in that they have a large up-front investment, longer start-up periods, and a longer life span. Because of these differences, a different approach was used to calculate annualized costs. District staff identified 12 new building blocks (projects) for water recycling and one existing building block for the base case. For each project, capital costs and O&M costs were estimated. In addition, the construction date (project timing) was also identified. The following represent the major assumptions regarding the cost analysis for recycling projects:

- There are no grants or financial assistance from outside sources (sensitivity analysis will be done to evaluate the cost impact of such financial assistance).
- The cost of water recycling (both capital and operating costs) is split evenly between the District and local (e.g., the wastewater agency).
- It takes three years to construct the project, at which time no water production occurs.
- After construction is complete, it takes three years for water production to ramp up to its ultimate supply, accounting for the time it takes to sign up customers for the recycled water.
- Projects are financed using a nominal interest rate of 7% over the life of the project in order to get the first year's annualized capital costs.

- Annual capital costs in subsequent years are discounted by the rate of inflation (3%) to keep all dollars in real terms for the planning period.

Table A4-6 summarizes the water recycling building blocks.

Table A4-6

RECYCLED WATER PROJECT BUILDING BLOCKS

Building Block	Project Name	Source	Quantity (af/y)	Total Cost	District's Share
(Baseline)	SBWRP In-fill	SBWRP	7,100	$89,527,811	$33,049,320
Block 10	Central Coyote	SBWRP	3,000	$36,166,864	$18,083,432
Block 11	South Coyote and Morgan Hill	SBWRP	3,163	$60,772,189	$30,386,095
Block 12	San Jose Main Line #2	SBWRP	1,918	$124,706,509	$62,353,254
Block 13	Coyote Research Park at Santa Teresa	SBWRP	2,500	$41,651,183	$20,825,592
Block 14	Almaden Spur	SBWRP	1,500	$17,930,266	$8,965,133
Block 15	Treatment Plant Northwest Extension	SCRWA/ SBWRP	1,846	$67,170,836	$33,585,418
Block 16	Treatment Plant Northeast Extension	SCRWA/ SBWRP	6,036	$76,227,236	$38,113,618
Block 17	Treatment Plant Southeast Extension	SCRWA/ SBWRP	2,168	$26,387,506	$13,193,753
Block 18	Treatment Plant Southwest Extension	SCRWA/ SBWRP	4,167	$54,608,372	$27,304,186
Block 19	Sunnyvale Extension	Sunnyvale WPCP	1,000	$18,131,581	$9,065,790
Block 20	Sunnyvale/Mountain View Extension	Sunnyvale WPCP	1,000	$18,131,581	$9,065,790
Block 21	Palo Alto Extension	Palo Alto WPCP	4,700	$85,170,000	$42,585,000

To illustrate how annual capital costs were calculated for water recycling, the following example is used:

Project Information

- Central Coyote, which is planned in conjunction with the South Bay Water Recycling Project.

- Expected ultimate yield of 3,000 af/y.

- Total capital cost of $36,166,864.

- 50% of cost goes to District; other 50% is local.

Note: This method of costing for recycled water considers a two-year “ramp up” period where CIP costs begin before the project produces yield. If we had similar cost information for other types of building block supply, we would have calculated costs with this “ramp up” for the other building blocks as well.

To calculate the annual cost in real dollars for the District, the following steps were completed:

Step 1: Divide $36 million in total capital cost by 2 in order to get District share ($18 million).

Step 2: Divide $18 million in District cost by 3 years, to reflect construction time. This $6 million represents the first year capital cost to be financed.

Step 3: Finance first $6 million at 7% for 30 years to get annual capital cost of $486,000. This is the annual capital cost for the first year.

Step 4: To get the annual capital cost for the second year, the first year’s cost is discounted by inflation (to keep costs in real terms), and then the next $6 million of financing cost is added. This total is ($486,000 – 3%) + $486,000 = $957,000.

Step 5: To get the third year’s annual cost, the second year’s cost is discounted by inflation, and then the final $6 million of financing cost is added. This total is ($957,000 – 3%) + $486,000 = $1,414,000.

Step 6: For each subsequent year, the annual capital costs are discounted by 3% to keep costs in real terms throughout the planning period.

Other Supply Project Costs

In addition to conservation and recycling, there are a number of other supply options the District may consider in its IWRP. These include: desalination, addition surface reservoirs, groundwater recharge, treatment options, CALFED, water transfers, and others. For many of these options, only preliminary estimates of yield and cost were known. As such, the calculations of annual cost were more simplified than for conservation and recycling.

The general steps to calculate the annual capital cost were:

Step 1: Estimate capital cost for each option.

Step 2: Finance capital cost for life of project (varies depending on option) to get first year’s annual cost.

Step 3: For subsequent years, annual capital cost is discounted by inflation rate to keep costs in real terms throughout the planning period.

Table A4-7 summarizes the dry-year yield and capital cost for these other supply and treatment options.

Table A4-7

ECONOMIC ASSUMPTIONS FOR OTHER SUPPLY/TREATMENT OPTIONS

Alternative Type	Alternative Name	Dry-Year Supply	District Capital Costs	Non-District County Costs	Project Life	O&M ($/af)
Desalination	Groundwater	5,000	$46,000,000		30	$330
	Bay	5,000	$71,530,000		30	$750
Treatment	Rinconada to 120 mgd[1]	NA	$40,250,000		30	$32
	So. Co. WTP (25 mgd)[2]	NA	$73,300,000	$15,000,000	30	$149
	Wellhead (1 mgd)	NA	$12,250,000	$12,250,000	30	$50
	UV Treatment	NA	$25,620,000		30	$200
Storage	Sediment Removal (20 taf)	4,000	$1,000,000,000		50	$0
	Uvas Expansion	4,000	$113,120,000		50	$5
	Calero Expansion	2,000	$121,500,000		50	$5
New Reservoirs	Alternative 1—100,000 af	20,000	$500,000,000		50	$20
	Alternative 2—350,000 af	70,000	$725,000,000		50	$20
Recharge	Instream Recharge—West	2,100	$6,000,000		30	$5
	Instream Recharge—Ford	2,000	$8,700,000		30	$5
	Instream Recharge—So. County	2,400	$7,050,000		30	$5
	Pond Recharge—No. County	3,900	$9,500,000		30	$5
	Pond Recharge—So. Co. (15 ac)	11,000	$4,450,000		30	$5
Transfers[3]	Options	100,000	$5,000,000		50	$200
	Spot—Critically Dry	60,000				$225
Banking	Semitropic—Add. 60,000 af	6,700	$8,040,000		30	C
	Semitropic—Add. 210,000 af	23,600	$28,140,000		30	C
Re-operations	Hetch-Hetchy Intertie[4]	NA	$55,500,000	$6,617,000	50	$25
	CALFED[5] Stage I[6]	1,900	$41,055,000	119,595,000	50	$0
	CALFED Stage I + Reservoirs[7]	9,500	$58,535,000	170,515,000	50	$0
	Lexington Reservoir Pipeline	NA	$15,000,000		30	$70
	Groundwater Pumping	NA	$6,000,000		30	$70

Notes:

[1] Includes $22 million for plant and $18.25 million for pipes.
[2] Includes $60 million for plant, $13.3 million for pipelines, and $15 million for retail agency modifications.
[3] $50 fixed charge is not escalated per year, cost when water taken is escalated at rate of inflation.
[4] Total cost of intertie project $39.7 million, shared equally between Hetch-Hetchy and SCVWD. In addition, District cost to size and upgrade District-owned Vasona pump station and pipeline to accommodate intertie is $35.4 million. In-county BAWUA water agencies allocated 1/3 of Hetch-Hetchy cost.
[5] CALFED costs assumed to be allocated 25% to State and 25% to local agencies. SCVWD share is .025% of local agency share. Other County costs reflect estimated County share of state costs
[6] Project cost $7.5 billion.
[7] Project cost $2.8 billion in addition to the $7.5 billion for the Stage I option.
C The O&M levels for Semitropic are complicated by differing put ($77.78) and take ($123) costs, that are also subject to a fixed minimum.

Cost Savings Due to Conservation

Because water conservation actually reduces demand for water, there are a number of other cost issues that need to be incorporated into the economic model. Conservation not only reduces the need for supply, but also reduces the wastewater costs, groundwater pumping costs, and need for District treatment. The savings from conservation were calculated using the Extend model. The following summarizes how these savings were calculated.

Wastewater Treatment Costs: Importing additional surface water results in additional wastewater to be treated by the wastewater agencies. For comparative ranking, this could be treated as an additional County cost associated with imported water, or an additional County savings associated with conservation. In this analysis it was decided that wastewater would be an additional cost for additional imported water. An estimate of $50 per af was used as the variable wastewater costs. Therefore, for all imported water provided by the District (including water transfers and Semitropic), an additional $50 per af was added to the cost.

Groundwater Pumping: Similarly, anything that reduces groundwater use will have the effect of saving groundwater-pumping costs for others in the County (either farmers or retail water suppliers). Once again, this can be represented as an additional cost related to groundwater use, or an additional savings to programs that reduce groundwater use. In this case it was decided to use reduced groundwater pumping as a savings for conservation programs, because the reduction will be different whether the conservation program is an irrigation program or an M&I program. For agricultural conservation programs, an assumed $70 per af was subtracted from the conservation cost in order to reflect the savings to farmers from reduced groundwater pumping. For M&I conservation, the estimate of retail municipal groundwater pumping cost was used (multiplied by the proportion of M&I water that was delivered from the groundwater basin). This proportion was obtained from the Water Utility Enterprise Report (see Table A4-8).

District Treatment Costs: This cost savings only applies to M&I conservation, because the District does not provide treated water to its agricultural customers. For M&I conservation, the variable treatment costs ($32 per af) were weighted by the proportion of treated water to total M&I deliveries, as reported in the Water Utility Enterprise Report, to represent the savings due to conservation (see Table A4-8).

Table A4-8

ESTIMATION OF COST SAVINGS RELATED TO CONSERVATION PROGRAMS

Category of Savings	Source of Savings	Gross Savings ($/af)	Weighting	Net Savings ($/af)
Agriculture	Non-District GW Pumping	$70	100%	$70
M&I	Non-District GW Pumping	$69	57%*	$39
M&I	District Treatment	$32	43%*	$14

* Derived from the ratio of in-County groundwater and treated water delivered, as estimated for 2001 in the Water Utility Enterprise Report, August, 2001.

APPENDIX 5

DESCRIPTION OF BUILDING BLOCKS

DESCRIPTION OF BUILDING BLOCKS

IWRP 2003 identified 46 feasible projects and programs for meeting future water demands. These represent "building blocks" from which water resource portfolios were constructed. This appendix describes the various types of building blocks and gives a detailed description of each one.

BUILDING BLOCK CATEGORIES

The 46 building blocks fall into five major categories:

- All-Weather Supplies—These building blocks include Conservation, Recycling, and Desalination (building blocks No. 1 to No. 23).
- Storage—These building blocks include Reservoir Storage (storage enhancements and new reservoir options), Recharge, and Banking (building blocks No. 24 to No. 35).
- Dry-Year Supplies—Building blocks include Transfers (No. 36 and No. 37), which are transfer options and the spot market. In the analysis, only option transfers (No. 36) was treated as a predefined building block, while both spot market transfers and demand reduction were reserved as means to meet any remaining shortages in the model simulation.
- Treatment—The Treatment building blocks are included for surface water, groundwater, and recycled water (No. 38 to No. 41).
- Re-operations—The Re-operations building blocks include pipeline interties, blending water sources, and interconnecting groundwater and treated water supplies (No. 42 to No. 46).

THE 46 BUILDING BLOCKS

All-Weather Supplies

1. Conservation: Ag

Moisture-Monitoring Equipment Loans: These loans promote the utilization of moisture-monitoring equipment. Examples would be consoles that assess plant water status of vineyards and orchards, and tensiometers (soil-water content measurers) to assess soil moisture status for all crops. Field mapping technologies such as electric conductivity and magnetic induction mapping will enable growers to tune their irrigation and fertilization operations to account for the spatial variability of their soils.

2. Conservation: Ag

Total Irrigation Management: Employ an irrigation consultant to consult with growers prior to each irrigation event (exceptions being light irrigations for germination or transplanting). Consultation will cover current state of available soil moisture, extent of irrigation, and use of CIMIS (California Irrigation Management Information System) data to ascertain whether irrigation is necessary or to estimate the time span until the next irrigation. Additional weather stations are intended to enable the consultant to access accurate data for mesoclimatic areas from San Martin south to the County line. A similar consultation program has been under way in the wine industry since 2001.

Soil and Water Amendment Incentives: Provide amendments such as gypsum, organic matter, or fertilizers. The amendments are intended to enhance infiltration or to increase the crops' water use efficiency.

New Equipment Purchase Loans: These are basically intended to aid growers who want to convert from sprinkler to drip irrigation systems.

3. *Conservation: Ag*

Existing Equipment Repair Loans: Loans would be made on a low-interest or interest-free basis to cover maintenance of existing irrigation equipment. Examples are reconditioning sprinkler heads, changing worn sprinkler head nozzles, and reconditioning a well that pumps sand.

4. *Conservation: M&I*

Commercial and Industrial Eto controllers: (Eto is short for "evapotranspiration," which indicates the water requirements of plants by species, as measured in inches.) The Evapotranspiration Controller Pilot Program for commercial properties will target participants in the top 20 percent of the water users in Santa Clara County and will be used to determine the amount of outdoor water savings that can occur with the use of Eto controller technology.

Cooling Tower Rebates: Rebates for equipment upgrades to make cooling towers more water-efficient are being offered to businesses within Santa Clara County.

Commercial and Industrial Irrigation Sub-Meters: Rebates or other incentives to install irrigation sub-meters would be offered to commercial and industrial properties with large landscapes. By expanding a one-meter system to include one or more irrigation sub-meters, analyses of sub-metered irrigation water can be compared to the site's overall water usage.

Prerinse Kitchen Sprayers: Through a grant given to the California Urban Water Conservation Council, the District is offering the installation of 1,000 water-efficient prerinse spray valves, at no cost, to restaurants within Santa Clara County.

5. *Conservation: M&I*

Residential Eto controllers: The Evapotranspiration Controller Pilot Program for residential properties will target participants in the top 20 percent of the residential water users in Santa Clara County and will be used to determine the amount of outdoor water savings that can occur with the use of Eto controller technology.

6. *Conservation: M&I*

Dual-Flush Ultra-Low-Flush Toilets for Multi-Family and Single-Family Dwellings: The District is considering a possible future pilot program to evaluate a dual-flush toilet, which is already being used in other areas of the world with serious water shortages. The dual-flush toilet allows users to choose either a partial 0.8-gallon flush or a full 1.6-gallon flush, depending on need.

Residential Graywater Rebates: The District may consider in the future offering a rebate to residents or businesses for using "graywater" (untreated wastewater from bathtubs, showers, bathroom washbasins, clothes washers, and laundry tubs) for landscape irrigation purposes.

Waterless Urinals for Airports and Malls: The District is considering a pilot study to evaluate the effectiveness of using "waterless" urinals for commercial applications, such as airports and malls. These urinals use no water at all, replacing the current 1.6–gallons-per-flush or higher flushing urinals.

Commercial and Industrial Water-Efficient Dishwashers: This project would provide rebates to commercial and industrial customers in Santa Clara County for the purchase of water-efficient dishwashers, replacing old, inefficient models.

7. *Conservation: M&I*

Residential Dishwasher Rebates: This project would provide rebates to residential customers in Santa Clara County for the purchase of water-efficient dishwashers, replacing old, inefficient models.

8. *Conservation: M&I*

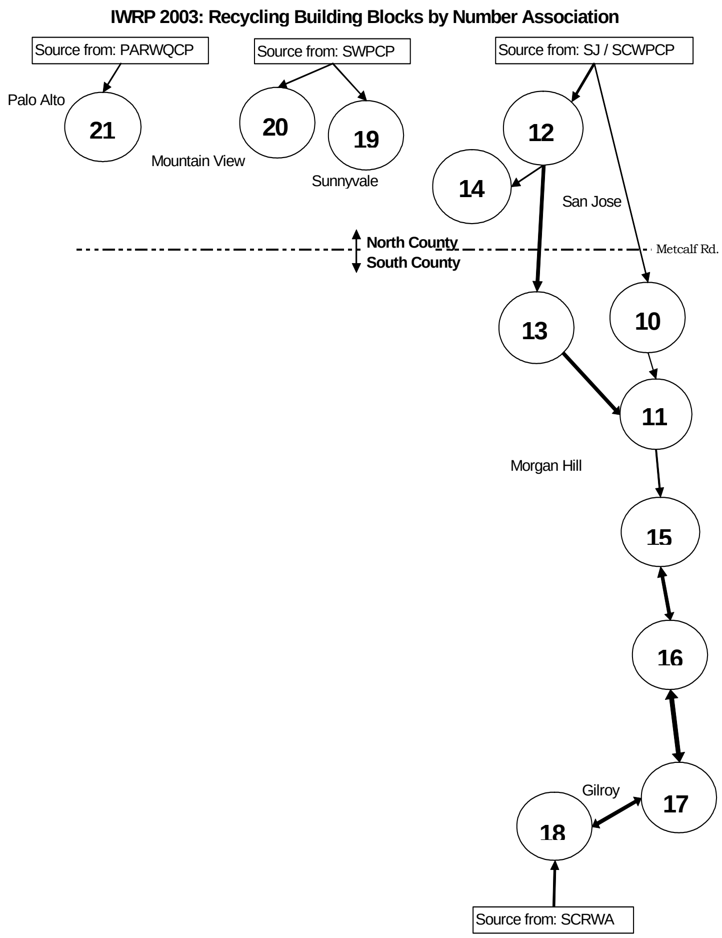
Pool Cover Incentives: This project would look at providing incentives for pool owners (both commercial and residential) to purchase pool covers, which help save water by preventing evaporation.

Commercial and Industrial Landscape Incentives: This project would provide commercial and industrial business owners incentives to make their large landscapes as water-efficient as possible, through irrigation systems, water-efficient plants, and other water-efficiency measures.

9. *Conservation: M&I*

Residential Landscape Incentives: This project would provide incentives to residents for making their landscaping as water-efficient as possible through water-wise planting, replacing turf with xeriscape or permeable hardscape, utilizing rain sensors, etc

Rainwater Harvesting System Rebates: This project would look at providing rebates to residential customers for utilizing rainwater-harvesting systems (cisterns, barrels, or storage tanks) for landscape irrigation.



10. *Recycling: SBWRP Central Coyote Including Bernal Customers*

This building block calls for a 30-inch trunk line, extending 3.5 miles along Monterey Highway from Calpine Metcalf Energy Center to the center of Coyote Valley. The line would serve golf courses, business parks, agricultural farmlands, office buildings, industrial processes, schools, and parks in the Coyote Valley and the Bernal area.

11. *Recycling: SBWRP South Coyote and Morgan Hill*

This building block includes a continuation of the 30-inch trunk line from building block No. 10. This 30-inch trunk line and another 42-inch trunk line (described in building block No. 13) will merge at Cochrane Road into a 54-inch trunk line to serve agricultural farmlands, parks, schools, and business parks customers.

12. *Recycling: SBWRP San Jose Main No. 2*

Designed to ensure reliability of the South Bay Water Recycling Program, flows from a 42-inch trunk line in this building block would supplement the volume needed to push deliveries beyond building block No. 11, toward Gilroy. Components would include the San Jose-1 King Road Alignment, San Jose-3 Via Del Oro Alignment, and new pump and storage facilities. Potential customers would be along the Via Del Oro Alignment to include schools, parks, and business parks.

13. *Recycling: SBWRP Coyote Research Park at Santa Teresa*

This building block would extend the 42-inch trunk line (from building block No. 12) 8 miles. The line would continue from the Via Del Oro Alignment along Santa Teresa Boulevard to serve golf courses, business parks, agricultural farmlands, office buildings, industrial processes, and parks in the planned Coyote Valley Research Park (CVRP). It would also serve Santa Teresa customers and the Cinnabar Golf Course.

14. *Recycling: SBWRP Almaden Spur*

Branching off from the Via Del Oro Alignment (of building block No. 12) and continuing along Santa Teresa Boulevard to serve golf courses, parks, and schools, the Almaden Spur Alignment consists of 5 miles of 16-inch line and 3 miles of 12-inch line.

15. *Recycling: SCRWA/SBWRP Northwest Extension*

This building block calls for a 3-mile continuation of the combined flows of building block No. 11's 54-inch trunk line along the Santa Clara Conduit corridor. The line would serve mostly agricultural farmland.

16. *Recycling: SCRWA/SBWRP Northeast Extension*

To serve mostly agricultural farmland, this building block calls for reduction of the 54-inch trunk line of building block No. 15 to a 48-inch trunk line. This slightly smaller line, 4 miles long, is sited along the Santa Clara Conduit corridor. This area may be served by SCRWA and/or SBWRP.

17. *Recycling: SCRWA/SBWRP Southeast Extension*

With a 1-mile extension, the 48-inch line of building block No. 16 reduces here to a 42-inch line along the Santa Clara Conduit corridor. This building block would serve mostly agricultural farmlands. This area may be served by SCRWA and SBWRP

18. *Recycling: SCRWA/SBWRP Southwest Extension*

Continuing in a mostly agricultural farmland area, this building block contains a 30-inch line that extends 4 miles along the Santa Clara Conduit corridor. This area may be served by SCRWA and SBWRP.

19. *Recycling: Sunnyvale Extension*

Here, the main recycled line would be extended into the central and southern part of the City. A new 12-inch line would deliver recycled water to the landscapes of business parks, schools, parks, highways, and streets.

20. Recycling: Sunnyvale/Mountain View Extension

This building block calls for a 12-inch spur into Moffett Field/NASA Ames, from an existing 24-inch recycled water line located in the City of Mountain View. The 12-inch spur would deliver recycled water to business parks, schools, parks, highway landscaping, and street medians.

21. Recycling: Palo Alto Extension

A new 36-inch main trunk line would convey recycled water from the Palo Alto Water Quality Control Plant for distribution into the Foothill Main, the Mountain View Main, the North 101 Main/Palo Alto Loop, and the Mountain View Extension. This building block would deliver recycled water to the landscapes of golf courses, schools, parks, streets, highways, cemeteries, and business parks, as well as to industrial cooling processes.

22. Desalination: Groundwater (9 mgd)

This desalination alternative considers treating brackish groundwater. It would require connection to the treated water distribution system and a facility plant in the North County with brine disposal (most likely to the Bay).

23. Desalination: Bay (9 mgd)

This desalination alternative considers treating Bay water and would require the infrastructure cited for building block No. 22. In addition, this alternative would require an intake facility in the Bay.

Storage

24. Storage Enhancements: Sediment Removal from Local Reservoirs

Over time, silt accumulates in reservoirs and reduces the usable reservoir capacity. Since the District's reservoirs were built, their combined capacity has declined from an estimated 168,258 af to 160,585 af. At this rate, the reservoir capacities would decrease to 148,620 af by the year 2040. Removing sediment within the reservoirs could restore their previous capacity, an equivalent of 20,000 af of "lost" storage.

25. Storage Enhancements: Uvas Reservoir Expansion

The project proposes raising Uvas Dam from its present height of 110 feet to a new height of 157 feet. With a maximum water surface elevation of 534 feet, Uvas Reservoir yield could expand from 4,700 af to 11,500 af. Raw water conveyed from Uvas Reservoir to Llagas Creek could assist groundwater recharge, and a pipeline extension to the raw water distribution system would allow for more local surface water to be directed to the water treatment plants.

26. Storage Enhancements: Calero Reservoir Expansion

Another alternative is the proposed expansion of Calero Reservoir. Due to the low yield of the Calero watershed, an expanded Calero Reservoir would not increase the dry-year yield captured. However, this reservoir expansion would provide increased carryover storage.

27. *New Surface Storage: Alternative 1—100,000 af*

The conceptual basis for building blocks No. 27 and No. 28 is the District's 1992 reservoir study. These building blocks are based on a new reservoir near the existing Pacheco Reservoir. The site provides favorable topography, good availability of quality construction materials, and distance from the Calaveras fault. The reservoir would function as an "off-stream" facility, storing imported water from the District's existing Central Valley Project contract. The site could accommodate a reservoir sized anywhere between 100,000 af and 400,000 af in capacity. There is an array of environmental concerns at this site. There are no public roads or utilities within the proposed site.

Reservoirs ranging in capacity from 100,000 af to 350,000 af were evaluated to test how they performed in water resource portfolios.

28. *New Surface Storage: Alternative 2—350,000 af*

This building block is a higher-capacity alternative for building block No. 27, above.

29. *Recharge: Instream Recharge—West County*

Five additional inflatable dams are identified for Saratoga Creek, along with additional inflatable dams on the west side creeks of Calabazas, Regnart, San Tomas, and Rodeo.

30. *Recharge: Instream Recharge—Ford*

Three additional North County inflatable dams are proposed upstream of Ford Road, on Lower Coyote Creek.

31. *Recharge: Instream Recharge—South County*

Inflatable dams are planned to enhance recharge in South County. The geologically preferred instream recharge sites are along the East Little Llagas Creek, the Llagas Creek, and Coyote Creek (at Burnett Avenue and at the golf course entrance).

32. *Recharge: Pond Recharge—North County*

An additional pond recharge area in North County, of approximately 10 acres of undeveloped land, would allow for maintenance access and 5 acres of groundwater recharge.

33. *Recharge: Pond Recharge—South County (15 acres)*

Additional pond recharge area in South County, of approximately 34 acres of undeveloped land, would allow for maintenance access and 15 acres of groundwater recharge. Ideal sites would be in a 4-square-mile area surrounding San Martin Avenue and US Highway 101.

34. Banking: Semitropic—Adds 60,000 af

Water storage allows surplus water in one year to be carried over to another year(s) when it is needed either due to drought or system constraints such as facility limitations or raw water quality problems. Water banking, a form of water storage, is generally composed of two distinct operations. The first involves delivery of water to a water storage bank, typically during normal and wet years. However, water may be banked to accommodate surplus water generated by facility limitations (i.e., water cannot be taken into an area and therefore must be banked elsewhere) or due to limitations on time of use such as might occur during the planting season. The second operation is recovery of the banked water (or a portion of it) for delivery when requested, typically in dry years. Banking programs commonly involve either actual groundwater recharge of the surplus water or "in lieu" recharge through direct use of the delivered surface water in lieu of groundwater pumping. During return years, banked water can be returned by returning stored groundwater or, in the case involving State Water Project or Central Valley Project water, stored water may be returned via the aqueduct or canals via an exchange.

This and the following building block differ in their volume of storage in the Semitropic program. The District currently has 140,000 af stored in this groundwater bank in Kern County. An additional 60,000 af would result in a Semitropic bank of about 200,000 af. Yet an addition of 210,000 af would result in reaching the maximum of 350,000 af storage allocated to the District. The District currently has the option to participate in the Semitropic Banking Program up to a maximum of 350,000 af. The deadline for firming up the District's participation level is January 2006.

35. Banking: Semitropic—Adds 210,000 af

This building block is an additional capacity option for No. 34 above.

Dry-Year Supplies

36. Transfers: Options—Dry Year

These transfers are modeled as District-initiated transfers taken whenever there is unmet recharge or treated water demand in the County. The transfers are limited to 20,000 af in any one year, with a maximum of 200,000 af total, taken through the San Felipe Project facilities.

37. Transfers: Spot—Critically Dry Year

Conceptually, these transfers were modeled after the Department of Water Resources Drought Water Bank. In critically dry years, up to 60,000 af a year is to be taken through the State Water Project facilities. Critically dry years are defined as those years in which the Central Valley Project deliveries are cut back to health and safety levels, or below the 75% M&I floor.

Treatment

38. Treatment: Rinconada Water Treatment Plant (WTP) to 120 mgd

This project increases the capacity of the Rinconada WTP from 100 mgd to 120 mgd. Land is available at the WTP for future construction and housing of filters and an additional clarifier. Hydraulic analyses would be required to evaluate: (a) whether replacing or adding piping within the plant is necessary; (b) how the raw water distribution system might be updated to best supply the larger WTP; and (c) whether additional treated water storage would be indicated. This building block assumes an expansion of the treated water pipeline would be required.

39. Treatment: South County WTP (25 mgd cap)

A new 25 mgd WTP is proposed in the proximity of Half Road and San Martin Avenue, adjacent to the Santa Clara Conduit. This building block would also require treated water pipelines to deliver the water to the Morgan Hill and Gilroy retailer distribution systems. Ideally, the plant would be located so that it could also be gravity fed from Anderson Reservoir.

40. Treatment: Wellhead Treatment (20 mgd cap)

Approximately 23 municipally owned wells are targeted. Though arsenic concentrations are currently nondetectable and are not of concern, the construction of reverse osmosis water filtration and treatment equipment is proposed due to its ability to remove a wide array of inorganic and organic compounds including arsenic and nitrates. Reverse osmosis treatment has been selected as a hedge against state regulations that may change. Those regulations could adversely affect a less comprehensive filtration and treatment process.

41. Treatment: Ultraviolet (UV) Disinfection

Ultraviolet disinfection coupled with ozonation enables greater flexibility in handling source water quality conditions. This treatment scheme provides a multibarrier disinfection treatment process, reduces the formation of bromate by allowing lower ozone doses during high-bromide events, and inactivates cryptosporidium.

Re-operations

42. Re-operations: Westside Hetch-Hetchy Intertie

For the District, the intertie could provide emergency back-up supply, either scheduled or unplanned, and potentially provide for long-term water supply reliability and improved water quality. The intertie involves the extension of a District treated water pipeline along Fremont Boulevard in Cupertino to the Hetch-Hetchy Bay Division Pipelines 3 and 4.

43. CALFED Stage 1

This CALFED alternative includes most projects that are part of CALFED Record of Decision on Stage 1 Implementation: ecosystem restoration; water use efficiency; water transfers; watershed management; the Environmental Water Account; drinking water quality program; levees protection; and conveyance programs. These projects are being implemented over seven years beginning in the year 2000. This building block is included in all portfolios.

44. CALFED Stage 1 + Reservoirs

This CALFED alternative includes all of building block No. 43 plus potential CALFED projects, including Shasta enlargement, in-Delta storage, Sites Reservoir, and the expansion of Los Vaqueros Reservoir. These are projects that either expand existing facilities or build new facilities as part of the CALFED Record of Decision.

45. Re-operations: Lexington Reservoir Pipeline

The District is exploring the means and ways to improve operational flexibility within our existing water supply system. Two projects are being considered. This one provides a raw water pipeline from Lexington Reservoir to the Rinconada Water Treatment Plant. This building block would improve water supply reliability, ensuring that an alternative raw water source exists for the west side retailers.

46. Re-operations: Groundwater Pumping

This building block calls for the District to become a groundwater pumper to meet a number of objectives including improved system flexibility, reliability, emergency back-up supply, water quality, and reduced cost.

RATIONALE FOR BUILDING BLOCKS RATINGS

RATIONALE FOR BUILDING BLOCKS RATINGS

This appendix describes the rationale used to rate the building blocks for each predictive indicator.

PORTFOLIO-LEVEL RATINGS

Most of the predictive indicators were used to rate individual building blocks. Some predictive indicators, however, cannot be applied at the building block level and are only meaningful when used to rate portfolios. The following sub-objectives and their predictive indicators were measured through the simulation modeling of portfolios only:

- Reliability: Provide for County Water Demands/Frequency and magnitude of unmet County demand
- Reliability: Meet Contract Obligations/Frequency and magnitude of unmet contract treated water
- Diversity: Provide a Variety of Sources/Local supplies as a percentage of total supply
- Cost: Minimize Community Costs/Total present value cost of supply portfolio for community
- Cost: Minimize District Costs/Total present value cost of supply portfolio for District
- Adaptability: Maximize Capital Investment Flexibility/Variable cost as a percentage of total (variable + fixed) cost
- Environment: Maximize Efficiency of Existing Resources/Acre-feet of Countywide demand offset by water conservation and met by recycled water
- Community: Groundwater storage at the end of a multiyear drought

BUILDING BLOCK RATINGS

Qualitative indices were developed for the nine remaining sub-objectives and their predictive indicators:

- Reliability: Maximize District Influence/Degree of District influence
- Water Quality: Maximize Treatability/Daily variability and algae in surface water
- Water Quality: Meet or Exceed Water Quality Regulations/Level of bromide in surface water
- Water Quality: Protect Groundwater Quality/Impact on groundwater
- Adaptability: Maximize Scalability/Degree of phased expansion
- Environment: Maximize Benefit to Habitat and the Environment/Degree of overall environmental habitat benefit

- Environment: Ensure Environmental Water Quality/Impact on stream water quality
- Community: Increase Recreational Benefits/Degree of recreational opportunity
- Community: Improve Flood Protection/Degree of flood protection

The building blocks were assessed and rated by the technical team members who have the greatest amount of familiarity with and expertise regarding the building block projects and their potential impacts on the predictive indicators.

Table A5-1 displays the qualitative values defined for each building block. Defined values in this table range between 0 and 4 where

0 = significant adverse impact
1 = somewhat adverse impact
2 = neutral impact
3 = somewhat beneficial impact
4 = significant beneficial impact

Table A5-1

QUALITATIVE INDICES FOR THE REMAINING PREDICTIVE INDICATORS

Building Blocks		Reliability-Dist. Influence	WQ Variability	WQ Bromide	WQ GW	Scalability-Adaptability	Env. CEQA	Env. WQ	Env. Effic.	Community Recreation	Community Flood
Conservation Ag	Moisture monitoring equip loans	1	2	3	2	4	4	2	4	2	2
Conservation Ag	Total irrigation management	1	2	3	2	4	4	2	4	2	2
Conservation Ag	Existing equip repair loans	1	2	3	2	4	4	2	4	2	2
Conservation M&I	Comm & Ind. Eto controllers	1	2	3	2	4	4	2	4	2	2
Conservation M&I	Residential Eto controllers	1	2	3	2	4	4	2	4	2	2
Conservation M&I	Dual-flush ultra-low-flush toilets	1	2	3	2	4	4	2	4	2	2
Conservation M&I	Residential dishwasher rebates	1	2	3	2	4	4	2	4	2	2
Conservation M&I	Pool cover incentives	1	2	3	2	4	4	2	4	2	2
Conservation M&I	Residential landscape incentives	1	2	3	2	4	4	2	4	2	2
Recycling	SBWRP Central Coyote	2	2	3	0	3	1	2	4	2	2
Recycling	SBWRP South Coyote/MH	2	2	3	1	3	2	2	4	2	2
Recycling	SBWRP San Jose Main #2	2	2	3	1	3	2	2	4	2	2
Recycling	SBWRP Coyote Research Pk	2	2	3	0	3	2	2	4	2	2
Recycling	SBWRP Almaden Spur	2	2	3	2	3	2	2	4	2	2
Recycling	SCRWA/SBWRP NW extens.	2	2	3	1	3	2	2	4	2	2
Recycling	SCRWA/SBWRP NE extens.	2	2	3	2	2	2	2	4	2	2
Recycling	SCRWA/SBWRP SE extens.	2	2	3	2	3	2	2	4	2	2
Recycling	SCRWA/SBWRP SW extens.	2	2	3	2	2	2	2	4	2	2
Recycling	Sunnyvale extens.	2	2	3	2	3	2	2	4	2	2
Recycling	Sunnyvale/MV extens.	2	2	3	2	3	2	2	4	2	2
Recycling	Palo Alto extens.	2	2	3	2	2	2	2	4	2	2
Desalination	Desalination—GW (9 mgd)	4	4	4	2	2	1	2	4	2	2
Desalination	Desalination—Bay (9 mgd)	4	4	4	2	2	0	2	4	2.5	2
Treatment	Rinconada to 120 mgd	4	2	2	2	1	1	2	2	2	2
Treatment	So. Co. WTP (25 mgd cap)	4	2	2	2	0	1	2	2	2.5	2
Treatment	Wellhead treatment (20 mgd cap)	3	2	2	4	3	2	2	2	2	2
Treatment	UV	4	2	4	2	2	2	2	2	2	2
Storage Enhancements	Sediment removal (20 kaf stor.)	4	2	2	2	4	4	3	2	2	3
Storage Enhancements	Uvas expansion	4	3	3	3	0	1	3	2	4	4
Storage Enhancements	Calero	4	3	3	3	0	0	3	2	4	3
New Surface Storage	Alternative 1—100,000 af	4	3	3	3	0	0	1	2	3.5	2

Building Blocks		Reliability-Dist. Influence	WQ Variability	WQ Bromide	WQ GW	Scalability-Adaptability	Env. CEQA	Env. WQ	Env. Effic.	Community Recreation	Community Flood
New Surface Storage	Alternative 2—350,000 af	3	3	3	3	0	0	1	2	3.5	2
Recharge	Instream recharge—West	4	2	2	3	2	3	2	2	3	1
Recharge	Instream recharge—Ford Rd.	4	2	2	3	2	1	0	2	3	1
Recharge	Instream recharge—So. Co.	4	2	2	4	2	2	2	2	3	1
Recharge	Pond recharge—No. Co.	4	2	2	3	3	3	2	2	3.5	2
Recharge	Pond recharge—So. Co. (15 acres)	4	2	2	4	3	3	2	2	3.5	2
Transfers	Options	3	1	1	2	3	2	2	3	2	2
Transfers	Spot—critically dry	1	0	0	2	4	2	2	3	2	2
Banking	Semitropic—addit 60,000 af	3	0	0	2	3	2	2	2	2	2
Banking	Semitropic—addit 210,000 af	3	0	0	2	3	2	2	2	2	2
Re-operations	Westside Hetch-Hetchy intertie	3	4	4	2	1	1	2	2	2	2
Re-operations	CALFED—Stage 1 + Reservoirs	0	3	3	2	0	0	1	2	3	2
Re-operations	CALFED—Stage 1	0	1	1	2	0	3	2	2	2	2
Re-operations	Lexington pipeline reservoir	4	3	3	2	1	2	2	2	3	1
Re-operations	Groundwater pumping	4	3	3	2	2	2	2	2	2	2

The building block ratings shown in Table A5-1 are explained in detail below:

RELIABILITY: Maximize District Influence.

The level of District influence is an assessment of the District's ability to ensure the availability and operational capability of supply deliveries to meet demand.

- Building blocks scoring 4—significant beneficial impact:
  - Small reservoir expansions
  - Recharge facilities
  - Desalination
  - Water treatment facilities

  Building blocks that scored high for this predictive indicator include those that are completely owned and operated by the District and have a developed customer base.

- Building blocks scoring 3—somewhat beneficial impact:
  - Semitropic Banking Program, which already has an agreement in place
  - Large joint reservoir that would involve other agencies or partners like the Environmental Water Account
  - Option transfers

  These building blocks include those that are backed by strong contractual agreements and partnerships.

- Building blocks scoring 2—neutral impact:
  - Recycled water

  Building blocks receiving a neutral score are those that may have third-party barriers as in the case of recycling where strong contractual agreements are likely but there is uncertainty about the potential market.

- Building blocks scoring 1—somewhat adverse impact:
  - Water conservation
  - Spot market transfers

  Adverse impact building blocks include projects in which the District could invest but ultimately the decision to implement rests with the end user, such as water conservation and the spot market.

- Building blocks scoring 0—significant adverse impact:
  - CALFED

  Projects scoring 0 are those that the District could influence to a certain extent but with no significant role as a decision maker in adopting a program, project, or measure, as is the case with the CALFED alternative.

WATER QUALITY: Maximize Treatability/Minimize variability and algae in source water.

Source water quality dictates the types and complexity of treatment processes that must be used to remove contaminants. Higher quality source water improves the effectiveness of water treatment plants and reduces the margin of excursion above normal levels that plant operators need to react to. Both algae and seasonal/daily variability of source water adversely impact treatabililty.

- Building blocks scoring 4—significant beneficial impact:
  - Desalination
  - UV water treatment
  - Large reservoir
  - Hetch-Hetchy intertie

  Projects scored a 4 that improve source water by blending water or shifting operations to take advantage of higher quality water when it is available, or that improve water quality through an effective treatment process.

- Building blocks scoring 3—somewhat beneficial impact:
  - Small reservoir expansion or addition
  - CALFED Urban alternative
  - Re-operations

  Projects scored a 3 that can improve water quality to some extent, have some flexibility to blend water supplies or shift operations to optimize water quality.

- Building blocks scoring 2—neutral impact:
  - Conservation
  - Recycled water
  - Water treatment
  - Groundwater recharge

  Many projects do not have any impact on surface water or an ability to mitigate for surface water quality variability. These building blocked scored neutral (2) and include:

- Building blocks scoring 1—somewhat adverse impact:
  - Option transfers

- Building blocks scoring 0—significant adverse impact:
  - Spot transfers
  - Semitropic banking

  Projects scoring below neutral are projects that rely on imports, especially during dry years when water quality is the poorest.

WATER QUALITY: Meet or Exceed Water Quality Regulations/Levels of bromide in surface water.

Bromide in the District source water presents challenges when attempting to achieve increased levels of disinfection while limiting disinfection by-products. As the District shifts to ozone, compliance with the 10 parts per billion bromate drinking water standard will be challenging. (Stage 2 Disinfectant/Disinfection By-Products Rule.) Bromide occurs naturally in the Bay-Delta waters, the source of District imported water supplies.

- Building blocks scoring 4—significant beneficial impact:

    - Desalination
    - Water treatment technology for surface water
    - A large reservoir
    - Re-operations

    Projects scored 4 that improve source water by replacing it with other higher quality sources, blend source water or shift operations to take advantage of higher quality water when it is available, or through an effective treatment process.

- Building blocks scoring 3—somewhat beneficial impact:

    - Conservation
    - Recycled water
    - Small reservoirs
    - CALFED stage 1 with reservoirs

    Projects that can improve water quality to some extent because there is a limited opportunity to blend source water or re-operate for water quality optimization include the smaller reservoirs and CALFED Urban. Recycled water and water conservation projects also score 3 because those building blocks can supplant local supplies that can then be freed up and used to blend down bromide in source water.

- Building blocks scoring 2—neutral impact:

    - Groundwater wellhead treatment
    - Groundwater recharge

    Some building blocks scored neutral because they don't apply to surface water.

- Building blocks scoring 1—somewhat adverse impact:

    - Option transfers

- Building blocks scoring 0—significant adverse impact:

    - Spot transfers
    - Semitropic banking

    The lowest scoring building blocks are those associated with Bay-Delta imports, the source of bromides. These projects include groundwater banking in Semitropic, dry-year transfers, and the spot market.

WATER QUALITY: Protect Groundwater Quality/Impact on groundwater.

In managing the groundwater basin, the District is concerned with a number of potential threats to groundwater quality. The District has an active monitoring program and has identified nitrate and arsenic as two of the leading constituents that could significantly impair water quality and impact groundwater supplies.

- Building blocks scoring 4—significant beneficial impact:

    - Wellhead treatment
    - Groundwater recharge in South County

    Projects that either provide wellhead treatment or dilute nitrate and arsenic concentrations in groundwater scored high.

- Building blocks scoring 3—somewhat beneficial impact:

    - Reservoir storage
    - Groundwater recharge in North County

    Because nitrate and arsenic do not pose as great a threat in the northern Santa Clara subbasin, recharge projects in North County rated 3. Reservoir storage also rated 3 since these facilities can be operated to dilute constituents in groundwater supplies.

- Building blocks scoring 2—neutral impact:

    - Conservation
    - Some recycled water
    - Surface water treatment
    - Desalination
    - Groundwater banking outside the County
    - Water transfers
    - CALFED

    Many building blocks, such as surface water treatment, conservation, desalination, groundwater banking outside the County, and water transfers received a neutral rating because they have no direct impact on groundwater quality.

- Building blocks scoring 1—somewhat adverse impact:

    - Recycled water

    Recycling building blocks were looked at uniquely under this predictive indicator. The key criterion was protecting groundwater supplies from recycled water infiltration. Each recycled water project was evaluated and rated according to proximity to the confined and unconfined zones. The most sensitive areas are in the forebays and unconfined zones. A secondary consideration was wastewater quality effluent, which varies for the three wastewater treatment facilities that produce recycled water.

- Building blocks scoring 0—significant adverse impact:

    - Recycled water

    These include the recycled water projects in the unconfined zones.

ADAPTABILITY: Maximize Scalability/Degree of phased expansion.

Scalability is an indicator of how well a level of investment matches with actual real-time need. Projects scored high if they can be phased in or out over time to match water demand or water year type.

- Building blocks scoring 4—significant beneficial impact:
  - Conservation
  - Sediment removal in reservoirs
  - Spot transfers

  These projects are very scalable and can be timed in the amount needed very easily.

- Building blocks scoring 3—somewhat beneficial impact:
  - Recycled water pipeline extensions
  - Option transfers
  - Semitropic banking
  - Wellhead treatment

  Projects that are complementary, modular, or add-ons to existing operations and facilities scored 3.

- Building blocks scoring 2—neutral impact:
  - Some recycled water
  - Groundwater recharge

  Groundwater facilities and some recycled water projects scored neutral.

- Building blocks scoring 1—somewhat adverse impact
  - Surface water treatment

  Surface treatment that requires large capital expense and time to implement scored as somewhat adverse.

- Building blocks scoring 0—significant adverse impact:
  - New water treatment plant
  - Reservoir storage
  - CALFED

  At the other end of the spectrum, building blocks that require huge fixed capital investments, such as a new water treatment facility, and reservoir storage facilities rated 0.

ENVIRONMENT: Maximize Benefit to Habitat and the Environment/Degree of overall environmental habitat benefit.

This predictive indicator captures important environmental regulatory concerns such as the significance of environmental impacts used in CEQA and NEPA, and benefits to species concerns.

- Building blocks scoring 4—significant beneficial impact:

  - Conservation
  - Sediment removal

  Conservation programs were given the score of 4 since conservation reduces the need for structural solutions, diversion of water supplies, and discharge of wastewater to the Bay. Sediment removal, unlike reservoir expansion or construction, has fewer "footprint" impacts and the increased storage does benefit sensitive species.

- Building blocks scoring 3—somewhat beneficial impact:

  - Groundwater recharge

  Recharge increases riparian habitats and thus was given a value of 3. The exception was the Ford Road ponds, which were rated a 1 due to significant sensitive species impacts.

- Building blocks scoring 2—neutral impact:

  - Recycled water
  - Water treatment
  - Transfers
  - Banking

  Although recycling also reduces diversion and discharge, the construction of recycled water distribution systems does have habitat impacts. These conflicting habitat impacts result in a combined rating of neutral. The exception was Recycling No. 2, which requires pipeline construction along Coyote Creek and thus would have significant riparian impacts. The habitat impacts from Semitropic enlargement and transfers were considered neutral since these projects are essentially relocation of existing supplies with no new impacts.

- Building blocks scoring 1—somewhat adverse impact:

  - Groundwater desalination
  - Recycled water No. 2

  Groundwater desalination scored a 1 due to negative brine disposal impacts.

- Building blocks scoring 0—significant adverse impact:

  - Reservoirs
  - Bay desalination

  Projects that have impacts as defined under CEQA were rated as either a 0 or a 1, depending on the significance of likely impacts. Reservoir projects and Bay desalination both received a score of 0 because of impacts on endangered or threatened species.

While the Bay desalination has not been sited, it would probably require a footprint in or near sensitive Bay wetlands.

ENVIRONMENT: Ensure Environmental Water Quality/Impact on stream water quality.

- Building blocks scoring 4—significant beneficial impact:

  None.

- Building blocks scoring 3—somewhat beneficial impact:

  - Reservoir storage enhancement

  Storage enhancements for existing reservoirs increase cold-water pools and thus were rated a 3.

- Building blocks scoring 2—neutral impact:

  - Conservation
  - Recycled water
  - Desalination
  - Water treatment
  - Groundwater recharge
  - Transfers
  - Banking

  Most projects are neutral with respect to aquatic water quality since they have no physical connection to streams or creeks.

- Building blocks scoring 1—somewhat adverse impact:

  - New reservoirs
  - CALFED stage 1 with reservoirs

  New reservoirs create “hungry water” downstream and thus were rated 1.

- Building blocks scoring 0—significant adverse impact:

  - Ford Road recharge ponds

  The Ford Road building block increases thermal loading with significant impacts to sensitive cold-water fisheries, and thus was rated 0.

ENVIRONMENT: Maximize Efficiency of Existing Resources/Acre-feet of Countywide demand offset by water conservation and met by recycled water

This predictive indicator is used to measure water use efficiency—measured in terms of water conserved and demand offset by recycled water.

- Building blocks scoring 4—significant beneficial impact:

- Conservation
- Recycled water
- Desalination

Projects that directly reduce the need for potable water and reduce wastewater flows, such as conservation and recycling, were given the highest rating.

- Building blocks scoring 3—somewhat beneficial impact:

  - Water transfers
  - CALFED

  Transfers were rated 3 since they represent a shift from a lower beneficial use demand (agricultural water use) to municipal/industrial water use.

  A slightly positive score was given to the CALFED alternatives since they include conservation and recycling and other projects as well.

- Building blocks scoring 2—neutral impact:

  - Banking
  - Reservoir storage
  - Water treatment

  The remaining projects do not change the efficiency of how we use water, and were considered neutral.

- Building blocks scoring 1—somewhat adverse impact:

  None.

- Building blocks scoring 0—significant adverse impact:

  None.

COMMUNITY: Increase Recreational Benefits/Degree of recreational opportunity.

Recreation considerations include motor boating and other types of boating, fishing, hiking, bike trails, birding, picnicking, and aesthetics. No body contact at water bodies is allowed. Ratings assume recreational opportunities are developed as part of projects where feasible.

- Building blocks scoring 4—significant beneficial impact:

  - Uvas and Calero reservoirs expansion

  Uvas and Calero reservoirs expansion scored 4 because of multiple water and land recreation opportunities.

- Building blocks scoring 3—somewhat beneficial impact:

  - New in-County reservoir
  - CALFED

- ◦ Instream recharge
- ◦ Bay desalination
- ◦ New South County treatment facility

The in-County reservoir is more likely to be located in a remote site with less accessibility to County visitors so it rated a 3. Out-of-County reservoirs such as CALFED Stage 1 with reservoirs scored lower since there is no guaranteed recreational use. Recharge ponds and will likely be designed with multiple land recreational uses in mind, scoring a 3.

Instream recharge may have some marginal benefit depending on access; if no access, no value. Recycling pipelines that connect to trails may provide hiking and biking trail value (pipelines using existing streets do not). Bay desalination and a new South County treatment facility would likely be designed with recreational features. Sediment removal at existing reservoirs may have a little recreational value, depending on site.

- Building blocks scoring 2—neutral impact:

  - ◦ Conservation
  - ◦ Water transfers
  - ◦ Water banking
  - ◦ Groundwater desalination
  - ◦ Water treatment
  - ◦ Expansion of Rinconada

  These projects all scored neutral because these building blocks have no recreational value.

- Building blocks scoring 1—somewhat adverse impact:

  None.

- Building blocks scoring 0—significant adverse impact:

  None.

COMMUNITY: Improve Flood Protection/Degree of flood protection.

Very few projects could increase flood protection beyond the reservoir building blocks that would be designed as multifunctional facilities.

- Building blocks scoring 4—significant beneficial impact:

  Expanding Uvas has the most flood protection benefits.

- Building blocks scoring 3—somewhat beneficial impact:

  Other reservoir enhancement

  Building blocks scoring 2—neutral impact:

  - ◦ Conservation

- Recycled water
  - Water treatment
  - Transfers
  - Banking

  Many building block projects are neutral to flooding impacts.

- Building blocks scoring 1—somewhat adverse impact:

  - Groundwater recharge

  Instream recharge and instream augmentation using recycled water would be of special risk since it adds more water near the Bay, in areas prone to flooding.

- Building blocks scoring 0—significant adverse impact:

  None.

APPENDIX 6

HYBRID PORTFOLIO CONSTRUCTION AND EVALUATION

HYBRID PORTFOLIO CONSTRUCTION AND EVALUATION

This appendix provides further details about the construction of the hybrid portfolios and the building blocks used in each hybrid. In addition, this appendix includes a detailed discussion of how the five hybrid portfolios performed in relation to the IWRP 2003 planning objectives.

CONSTRUCTING HYBRID PORTFOLIOS

As a first step for building hybrids, portfolios were developed that concentrated on the IWRP planning objectives. One lesson learned in building these single-focus portfolios was the importance of meeting demand, so all the hybrids were designed to meet a reliability target.

The number of building blocks that have positive impacts on the Ensure Community Benefits planning objective was insufficient to build a reliable hybrid, so a hybrid was not developed for this objective. Therefore, three hybrid portfolios were developed initially, concentrating on three of the planning objectives: Ensure Water Quality, Protect the Natural Environment, and Minimize Cost Impacts.

These choices for initial hybrid portfolio development are consistent with the direction given in the second stakeholder meeting where planning objectives were prioritized by two weighting exercises. The results of these weighting exercises are summarized in the Meeting No. 2 notes included in Appendix: Introduction. The Ensure Supply Reliability, Ensure Water Quality, and Protect the Natural Environment planning objectives were ranked by stakeholders as the most important planning objectives (along with Ensure Supply Diversity).

Although the Minimize Cost Impacts objective scored significantly lower, it is still an important planning objective worth evaluating closely for several reasons. Cost (especially the cost of shortages) does impact the community and the ability of the District to meet all other planning objectives. Several stakeholders commented about the low ranking of the cost planning objective, acknowledging that although it was ranked low, it will become a more important consideration when the easy and inexpensive options are exhausted. Another stakeholder speculated that cost ranked low because the stakeholders assume that the District will keep costs in check.

Two additional hybrid portfolios were constructed for further comparison. These last two hybrid portfolios used various combinations of building blocks from the environment and water quality hybrid portfolios, trying to find a better balance to meet these two objectives that tend to conflict with each other, as will be discussed later in this appendix. These two hybrids were generated by an iterative modeling process that tested several combinations of building blocks, looking for a mix that shows that the value each building block supply provides on its own can be greatly enhanced by implementing it in tandem with other compatible water supplies.

BUILDING BLOCKS USED IN EACH HYBRID PORTFOLIO

Table A6-1 displays which building blocks were used in each of the five hybrid portfolios.

Table A6-1

BUILDING BLOCKS USED IN EACH HYBRID PORTFOLIO

			1 = used				
	Building Block Type	**Description**	Water Quality Hybrid	Protect Natural Environment	Low-Cost Hybrid	Environment and Water Quality	Water Quality and Environment
1	Conservation Ag	Moisture monitoring equip loans	1	1	1	1	1
2	Conservation Ag	Total irrigation management	1	1	1	1	1
3	Conservation Ag	Existing equip repair loans	1	1	1	1	1
4	Conservation M&I	Comm & Ind. Eto controllers	1	1	1	1	1
5	Conservation M&I	Residential Eto controllers	1	1	1	1	1
6	Conservation M&I	Dual-flush ultra-low-flush toilets	1	1	1	1	1
7	Conservation M&I	Residential dishwasher rebates	1	1		1	
8	Conservation M&I	Pool cover incentives	1	1		1	
9	Conservation M&I	Residential landscape incentives	1	1		1	
10	Recycling	SBWRP Central Coyote		1		1	1
11	Recycling	SBWRP South Coyote/MH		1		1	
12	Recycling	SBWRP San Jose Main #2		1		1	1
13	Recycling	SBWRP Coyote Research Pk		1		1	1
14	Recycling	SBWRP Almaden Spur		1		1	1
15	Recycling	SCRWA/SBWRP NW extens.		1		1	
16	Recycling	SCRWA/SBWRP NE extens.		1		1	
17	Recycling	SCRWA/SBWRP SE extens.		1		1	
18	Recycling	SCRWA/SBWRP SW extens.		1		1	
19	Recycling	Sunnyvale extens.	1	1		1	1
20	Recycling	Sunnyvale/MV extens.	1	1		1	1
21	Recycling	Palo Alto extens.	1	1		1	1
22	Desalination	Desalination—GW (9 mgd)	1		1	1	1
23	Desalination	Desalination—Bay (9 mgd)	1			1	1
24	Storage Enhancements	Sediment removal (20 taf stor.)					
25	Storage Enhancements	Uvas expansion	1		1	1	1
26	Storage Enhancements	Calero expansion	1			1	1
27	New Surface Storage	Alternative 1—100,000 af					

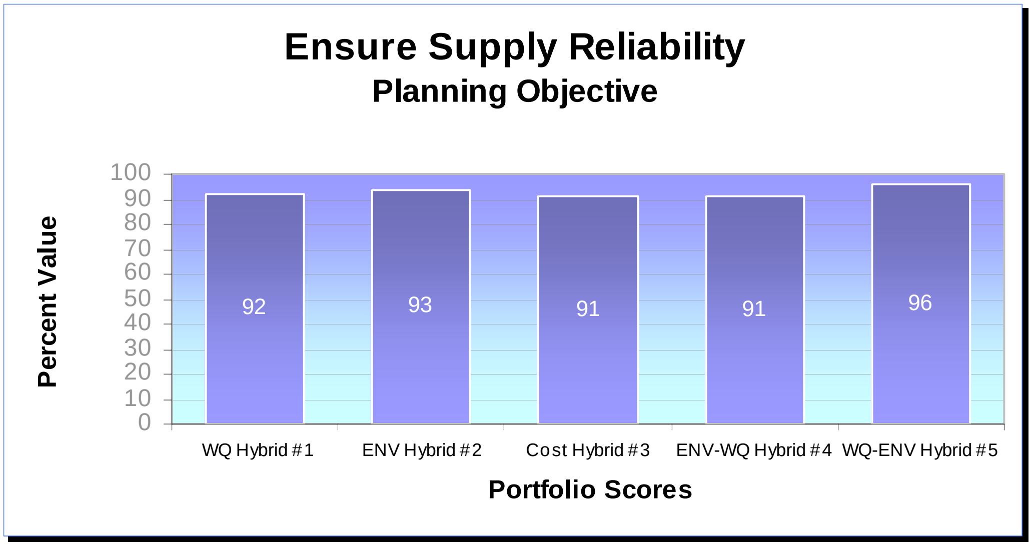
			1 = used				
	Building Block Type	**Description**	Water Quality Hybrid	Protect Natural Environment	Low-Cost Hybrid	Environment and Water Quality	Water Quality and Environment
28	New Surface Storage	Alternative 2—350,000 af	1				
29	Recharge	Instream recharge—West	1	1	1	1	1
30	Recharge	Instream recharge—Ford					
31	Recharge	Instream recharge—So. Co.	1	1	1	1	1
32	Recharge	Pond recharge—No. Co.	1	1	1	1	1
33	Recharge	Pond recharge—So. Co. (15 acres)	1	1	1	1	1
34	Transfers	Options	1	1	1	1	1
35	Transfers	Spot—critically dry					
36	Banking	Semitropic—add. 60,000 af				1	
37	Banking	Semitropic—add. 210,000 af		1	1		1
38	Treatment	Rinconada to 120 mgd					
39	Treatment	So. Co. WTP (25 mgd cap)					
40	Treatment	Wellhead treatment (20 mgd cap)	1			1	1
41	Treatment	UV	1			1	1
42	Re-operations	Westside Hetch-Hetchy intertie	1			1	
43	Re-operations	CALFED Stage 1	1			1	
44	Re-operations	CALFED Stage 1 and reservoir	1	1	1	1	1
45	Re-operations	Lexington as a pipeline reservoir	1			1	1
46	Re-operations	GW to treatment plants	1			1	1

HYBRID PORTFOLIO EVALUATION FOR EACH PLANNING OBJECTIVE

Ensure Supply Reliability

All of the hybrid portfolios were designed to achieve supply reliability (no Countywide water shortages greater than 20,000 af/yr) under all hydrologic conditions. This shortage limit goal is the major predictive indicator for this planning objective. No portfolio gets a perfect score (100%), as shown in Figure A6-1 below, because the other two predictive indicators (level of District influence and treated water contracts) were not fully achieved under all hydrologic conditions for each of the portfolios.

Figure A6-1



Ensure Water Quality

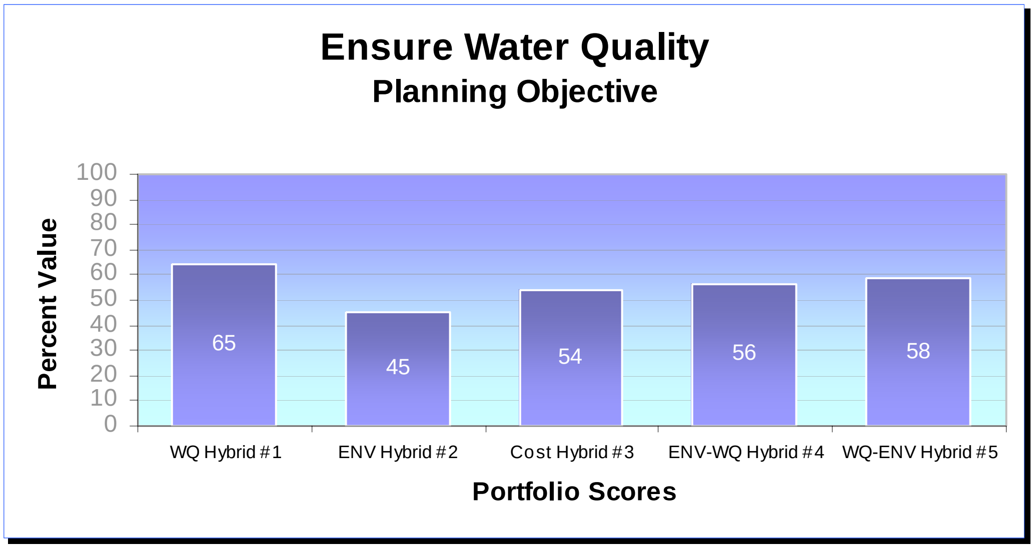
The Ensure Water Quality planning objective is very challenging and requires a multi-pronged approach of protecting source water quality (e.g., Delta source water quality standards), removing and inactivating contaminants through treatment (e.g., UV treatment, wellhead treatment), and matching water quality to type of use (e.g., recycled water for agriculture frees up local supplies that can be used to dilute bromides in imported water).

Overall, it is difficult to concurrently meet all three water quality objectives:

- Maximize treatability
- Meet or exceed water quality regulations
- Protect groundwater quality

Many of the building blocks that score well for meeting groundwater quality score poorly for surface water quality. Hence none of the hybrid portfolios score extremely well for this planning objective when all three predictive indicators are weighted and averaged together.

Figure A6-2



Looking at Figure A6-2, the Ensure Water Quality portfolio (hybrid #1) scores the highest for this planning objective criterion. The large local reservoir building block allows for the storage of wet-year imported water during the time when the water quality is typically better.

The Hybrid #2—Protect the Natural Environment portfolio scores the lowest of the five hybrids for a number of reasons:

- It doesn't have any treatment building blocks.
- There is no additional reservoir storage to retain higher quality water.
- It relies on a large Semitropic banking program in dry years when water quality is low.
- Many of its recycled water building blocks could jeopardize groundwater quality.

The Hybrid #3—Minimize Cost Impact portfolio scores better than the environment portfolio because there is not as much recycled water and it has some reservoir expanded storage. However, it is heavily dependent on dry-year Delta water.

Hybrids #4 and #5 are building block combinations that attempt to balance the environmental/water quality objectives. They do show improvements over the low-cost hybrid and environment hybrid. These two portfolios score similarly, each having some treatment and storage building blocks. These portfolios also illustrate that building blocks can effectively maximize/minimize an objective while at the same time performing neutrally or negatively with respect to another objective.

Making improvements to all of the water quality objectives requires bringing on a host of projects that are very different for surface water, groundwater, and recycled water. What scores high for one predictive indicator often scores neutral for another predictive indicator. For example, wellhead treatment scores neutral for maximize treatability whereas it scores high for groundwater quality. Many of these projects are expensive and have a negative impact on the environment, which will be explained further in the sections below. This shows inherent trade-offs between objectives, which complicates the decision-making process.

Ensure Supply Diversity

Diversity means not putting all our eggs in one basket. Water supply diversity helps reduce the County's exposure to the risk of any given supply investment not performing up to expectations.

The following items can be used to construct strong water resource diversity:

- Interchangeable types of supplies through interties
- Re-operations
- Developing a variety of water sources

As examples, developing desalination is a new untapped source and recycled water currently represents only 2% of the District's water supply portfolio.

Figure A6-3

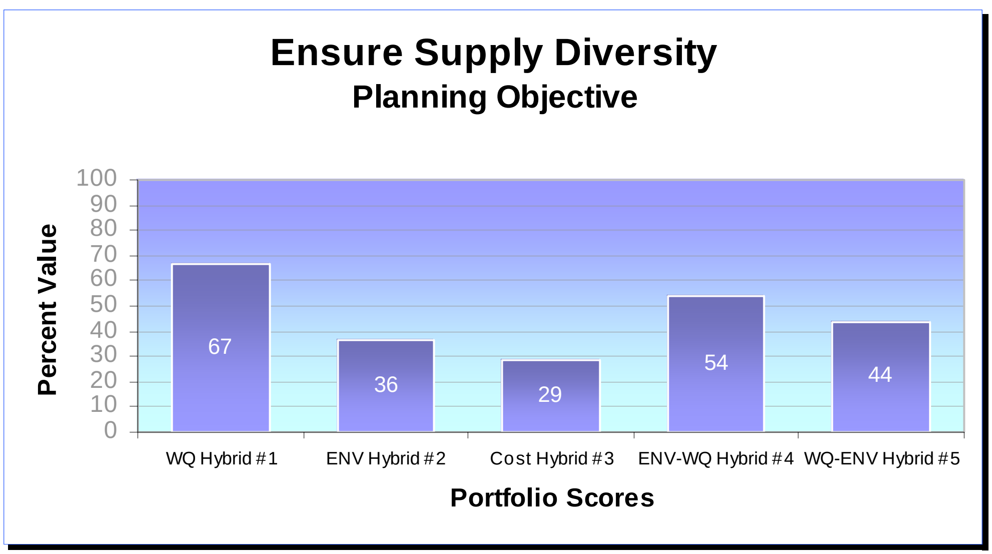


Figure A6-3 displays the scores for all five hybrid portfolios for the Ensure Supply Diversity planning objective. This planning objective is calculated for each hybrid portfolio based on the average yield of local supply (non-Delta related) building blocks. Therefore, the higher the average yield of local building blocks, the higher the score for this planning objective.

The Hybrid #1—Ensure Water Quality portfolio is the top scorer for this planning objective. This hybrid portfolio has a large local storage component, a variety of local all-weather supplies and relies less on dry-year imports.

The Hybrid #3—Minimize Cost Impact portfolio has the lowest score for this planning objective. This hybrid portfolio has a large focus on imported water (banking and transfers) especially in dry years when the Delta is strained the most, and minimal all-weather supplies to keep costs down.

The Hybrid #2—Protect the Natural Environment portfolio scores low. Although it has plenty of all-weather supplies, it relies on a large Semitropic bank (which is not considered a diversified supply with its dependence on the Delta) and no local surface storage development.

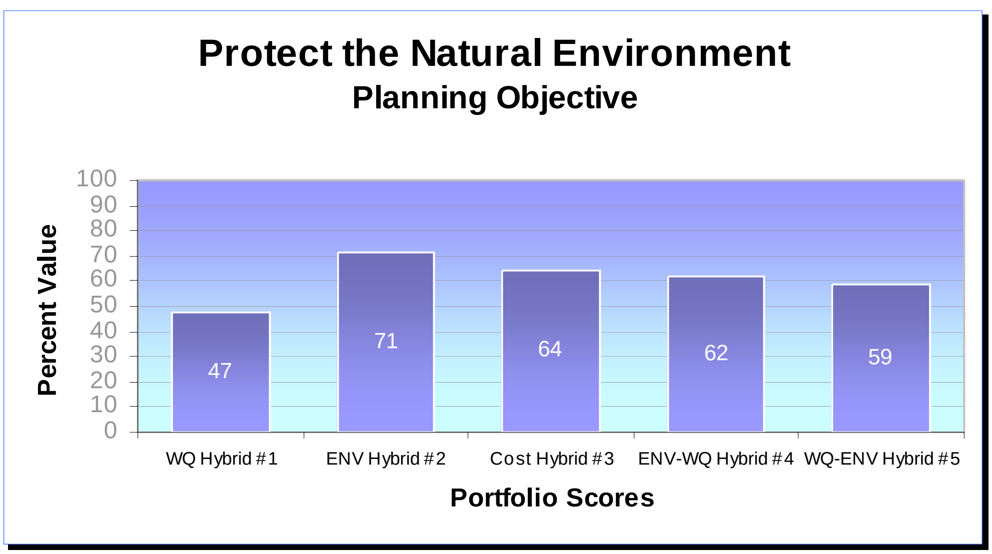
The Hybrid #4—Environment and Water Quality portfolio improves over the environment portfolio due to expanded local storage, desalination, and treatment building blocks.

The Hybrid #5—Water Quality and Environment portfolio has less local all-weather supplies (e.g., recycling) and therefore scores lower than Hybrid #4.

Protect the Natural Environment

As would be expected, the Hybrid #2—Protect the Natural Environment portfolio scores highest for this planning objective. However, it is difficult for the portfolios to meet all three environmental objectives because some building blocks score well for one of the environmental predictive indicators but not for another. Thus, as shown in Figure A6-4, the highest score among all five hybrid portfolios is only 71 out of 100.

Figure A6-4



Expansion of reservoirs illustrates the point of conflicting predictive indicators. Reservoirs score high under the environmental water quality predictive indicator because raising dams creates deeper reservoirs where cooler water temperatures can be maintained and ultimately released to downstream creeks, which is beneficial for fish habitats. However, additional storage inundates land and can negatively impact sensitive species and habitat.

The Hybrid #3—Minimize Cost Impact portfolio scores relatively high for this planning objective because there are no significant infrastructure all-weather supplies and a large part of the storage building blocks used for this portfolio (Semitropic banking) has undergone and withstood the CEQA test.

The Hybrid #1—Ensure Water Quality portfolio scores lowest for this planning objective because it has some infrastructure-intensive all-weather supplies and includes the largest new local surface storage building block.

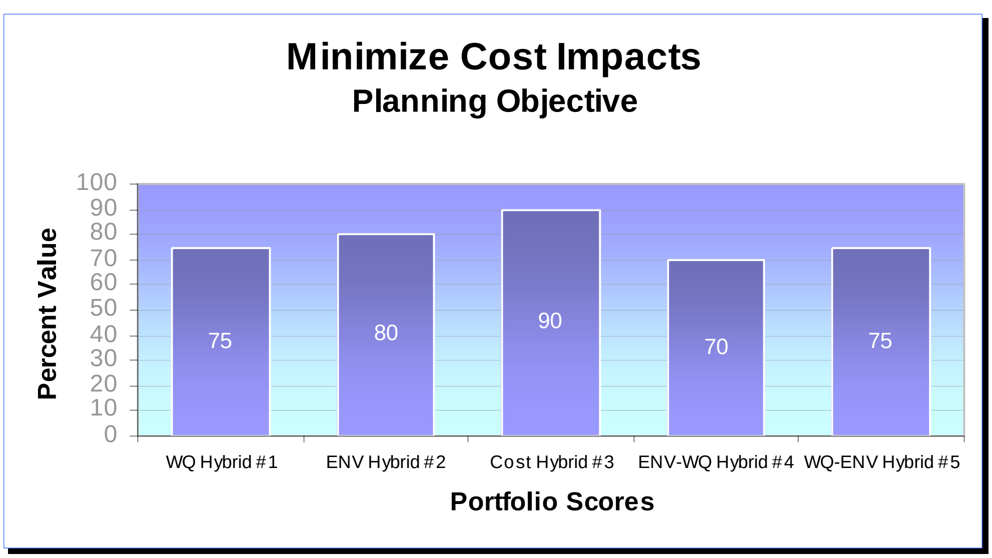
The Hybrid #4—Environment and Water Quality portfolio starts with the environment portfolio and adds some building blocks to improve water quality (local expansion of reservoirs), which adversely impacts the environment. Therefore, its score for this planning objective is lower than the environment-only portfolio.

The Hybrid #5—Water Quality and Environment portfolio scores very close to Hybrid #4 because both have a common water quality/environment theme using different building blocks and a shift of emphasis. The slightly higher score for Hybrid #4 reflects the fact that it has more recycled water, which scores high under the environment objective. This portfolio uses a large Semitropic bank in place of the large new local reservoir used in Hybrid #1, which also raises its score for this planning objective relative the Hybrid #1.

Minimize Cost Impacts

The performance measurement for the Minimize Cost Impacts planning objective was the total present value cost to the District and the community over the 40-year planning period indexed sequential model run. Costs were estimated for capital, O&M costs, and supply purchase and program costs. Each building block has costs defined in terms of capital expenses and per af of use expenses by demand year. The Extend model calculated average cost by demand year for the entire indexed sequential simulation, and then a total present value cost analysis was applied. Also note that the cost calculated for each of the portfolios includes baseline cost.

Figure A6-5



As designed, the Hybrid #3—Minimize Cost Impact portfolio had the highest score (lowest cost). This was due to an emphasis on building blocks that are not capital intensive and rely on imported transfers and groundwater banking programs vs. surface storage, all of which have lower costs. This portfolio also relied more on the groundwater basin.

Excluding the low-cost portfolio, as shown in Figure A6-5 the range of scores (70–80) is fairly narrow for the other hybrid portfolios. The initial single-focus portfolios had a much larger range of scores because the cost of shortage—which can become extremely significant in all the unreliable portfolios, whereas the five hybrid portfolios were designed to be reliable.

As a further aid in understanding the differences in cost among the five hybrid portfolios, Table A6-2 shows the actual present value cost calculated.

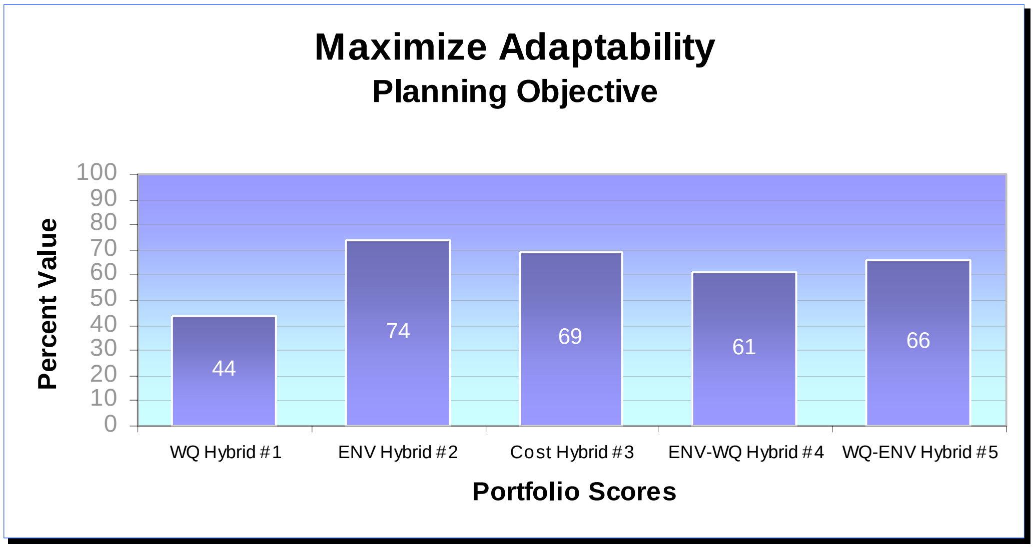
Table A6-2

Hybrid Portfolio	County PV Costs	District PV Costs	Total PV Costs
Hybrid #1—Enhance Water Quality	$1,998,683,364	$3,430,714,604	$5,429,397,968
Hybrid #2—Protect the Natural Environment	$2,214,097,889	$2,671,554,759	$4,885,652,648
Hybrid #3—Maximize Cost Impact	$1,977,637,236	$2,615,644,519	$4,593,281,755
Hybrid #4—Environment and Water Quality	$2,208,400,043	$3,205,318,149	$5,413,718,192
Hybrid #5—Water Quality and Environment	$2,097,654,890	$3,122,149,126	$5,219,804,016
Baseline	$2,630,840,694	$2,338,420,647	$4,969,261,341

Maximize Adaptability

This planning objective has two predictive indicators—maximize capital investment flexibility and maximize scalability, with scalability weighted at 90%. A constructed scale was developed to determine how well each building block met the scalability predictive indicator. The capital investment flexibility predictive indicator was calculated by a ratio of present value variable cost to total present value cost.

Figure A6-6



As shown in Figure A6-6, the Hybrid #2—Protect the Natural Environment portfolio scores highest under the Maximize Adaptability planning objective. Like the adaptability portfolio, Hybrid #2 contains similar scalable building blocks. Both portfolios include projects that can be phased in with need (conservation and recycling), or sold off if not needed. The big investment in ponds is a land purchase that can be resold, and Semitropic banking assets can be sold as was done with the Environmental Water Account.

The Hybrid #3—Maximize Cost Impact portfolio, Hybrid #4—Environment and Water Quality portfolio, and Hybrid #5—Water Quality and Environment portfolio all have varying degrees of conservation, recycled water, and recharge ponds that all contribute well to the Maximize Adaptability planning objective. These three portfolios also include some surface storage building blocks that require large fixed capital investments that lower their score. Fixed costs can be troublesome if future conditions change, because they cannot be avoided (much like a fixed mortgage payment).

The Hybrid #1—Ensure Water Quality portfolio scores the lowest because it relies heavily on capital-intensive building blocks such as desalination and a new local reservoir.

Maximize Community Benefits

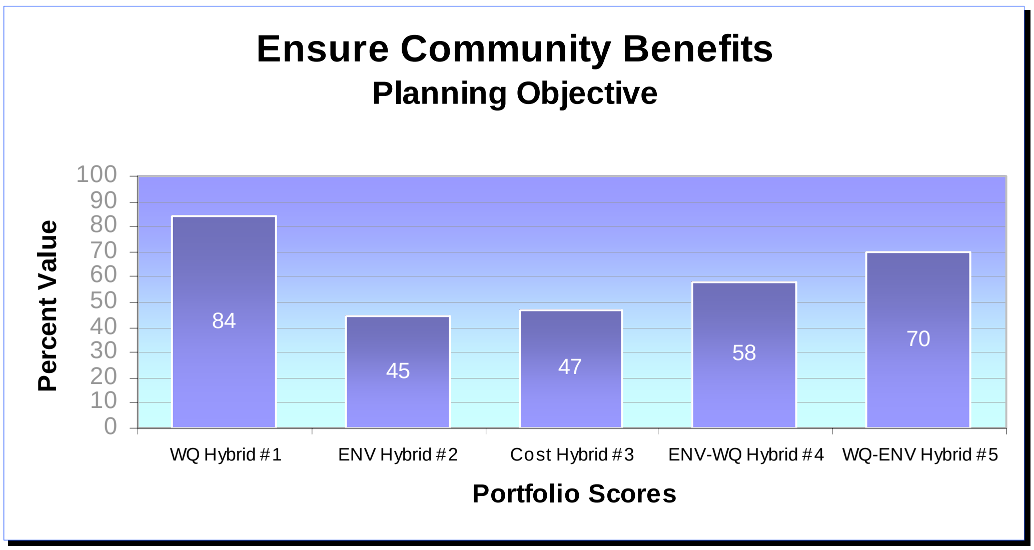
This planning objective has three predictive indicators:

- Increase recreational benefits
- Improve flood protection
- Prevent land surface subsidence

This planning objective is heavily weighted by the subsidence predictive indicator (60%). In addition, all of the hybrid portfolios score very close together for the recreation and flood protection predictive indicators (with the exception that the Hybrid #1—Ensure Water Quality portfolio scores somewhat better for recreation than the other portfolios). Therefore, the subsidence predictive indicator strongly determines the results for this planning objective. The subsidence predictive indicator is based on the North County basin storage level in the indexed sequential model run year where demand year 2040 ends with the hydrologic long-term drought sequence 1987–1991—which represents an indicator of how close the portfolio case is to a threshold of land subsidence.

Figure A6-7 displays the scores for each of the hybrid portfolios for this planning objective.

Figure A6-7



This planning objective result shows how different combinations of storage, all-weather supplies, and transfers work well in combination to prevent subsidence in a long-term drought.

The Hybrid #1—Ensure Water Quality portfolio provides the best community benefits when subsidence prevention, recreation, and flood protection are all considered. Hybrids #2 and #3 provide the least community benefits, mainly because the basin comes close to a point of subsidence in the threshold year set used. Hybrid #4 provides a moderate community benefit for this planning objective, and Hybrid #5 scores quite well for this planning objective.

APPENDIX 7

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APPENDIX 8

SCENARIO PERFORMANCE PER PLANNING OBJECTIVES

SCENARIO PERFORMANCE PER PLANNING OBJECTIVES

All of the scenario response portfolios were built to achieve a high level of reliability up to the year 2020. The selection and combination of building blocks in each portfolio were also evaluated and scored using the IWRP planning objectives with one exception. The Ensure Community Benefits objective was not included in the evaluation because its predictive indicators measure 2040 performance and were less meaningful for this 2020 evaluation. Table A8-1 summarizes how the portfolios performed against planning objectives and illustrates, once again, the many trade-offs inherent in multi-objective planning.

Table A8-1

SCENARIO PLANNING PORTFOLIOS AND PLANNING OBJECTIVES

Portfolio	What's in the Portfolio	Ensure Supply Diversity	Ensure Water Quality	Minimize Cost Impacts	Protect the Natural Environment	Maximize Adaptability
Random Risks -------------------- Climate Change (Shown together because these two portfolios have identical building blocks)	Transfers, Re-operations	Scores very low because it lacks local project development.	Scores neutral because the portfolio contains transfers that can lower water quality, and re-operation projects that improve system flexibility to mix and match supplies for water quality objectives.	Lowest cost since it requires fewest investments of all the scenario planning portfolios to achieve reliability.	Scores high because no major capital-intensive projects are needed, includes projects with no adverse environmental impacts.	Scores high since the majority of investments occur only in years when supplies are needed.
Water Quality Standards	Transfers, Re-operations, Treatment, Reservoir Storage, Desalination	Scores high because the portfolio relies on local projects.	Achieves the highest quality water of all scenario response portfolios.	Scores lowest of all portfolios since it contains expensive treatment and storage projects.	Scores low because improvements include large local capital projects like desalination and surface storage.	Scores low since larger projects require huge capital outlays.

Portfolio	What's in the Portfolio	Ensure Supply Diversity	Ensure Water Quality	Minimize Cost Impacts	Protect the Natural Environment	Maximize Adaptability
No Banks Pumping Plant Permit Alternative 1	Transfers, Re-operations, Desalination	Scores low but slightly higher than the random risk portfolio because it includes a modest level of local development in desalination.	Scores high because desalination can be blended with lower quality water or it can be used as a sole source providing high-quality drinking water.	Moderate cost due to combination of low-cost transfers and re-operations with higher cost desalination.	Scores relatively high depending on the siting and brine disposal issues associated with desalination.	Scores fairly high because it maximizes use of the transfer market.
No Banks Pumping Plant Permit Alternative 2	Transfers, Re-operations, Banking	Scores lower than Banks Alternative 1 because it relies heavily on imported water supplies.	Scores low because the only projects that help quality are re-operations.	Lower in cost compared to Banks Alternative 1.	Scores higher than Banks Alternative 1 because it requires no intensive capital projects.	Scores very high since investments are timed with when supplies are needed.
Demand Alternative 1	Transfers, Re-operations, Recycling, Desalination	Fairly high score as it focuses on local supply enhancement.	High scoring in water quality with the combined help of re-operations and desalination.	High costs associated with larger investments in recycling and desalination.	Scores relatively high depending on the siting and brine disposal issues associated with desalination.	Scores fairly high because high-cost capital project, like recycling, can be phased in as needed to meet future demands.
Demand Alternative 2	Transfers, Re-operations, Banking, Desalination	Slightly lower score than Demand Alternative 1 because it substitutes imported banking program over local development of recycling.	Water quality score drops compared to Demand Alternative 1 due to poorer quality of imported banking water.	Costs are moderate as banking program is substituted for recycling.	Scores relatively high depending on the siting and brine disposal issues associated with desalination.	Scores slightly higher than Demand Alternative 1 since banking programs can sell off assets if supplies are not needed.

Portfolio	What's in the Portfolio	Ensure Supply Diversity	Ensure Water Quality	Minimize Cost Impacts	Protect the Natural Environment	Maximize Adaptability
Climate Change + No Banks Alternative 1	Transfers, Re-operations, Reservoir Storage, Desalination	Scores high because the portfolio relies on local projects.	High water quality score because re-operations, storage, and desalination combined offer source alternatives and flexible operations for improved water quality.	Costs are high due to reservoir.	Scores low because large local capital projects like desalination and surface storage have the greatest potential negative impacts on the environment.	Scores low because of large fixed capital outlay.
Climate Change + No Banks Alternative 2	Transfers, Re-operations, Banking, Recycling	Scores lower than Alternative 1 because it is more reliant on Delta supplies.	Water quality scores lower than Alternative 1 because two key water quality projects, surface storage and desalination, are replaced by lower quality banking water plus recycled water that may have negative impacts on groundwater quality.	Costs are reduced substantially compared to Alternative 1 because banking is cheaper than a reservoir.	Scores high because of insignificant negative environmental impacts, and recycled water benefits Bay habitat.	Scores high because projects can be timed and implemented with need.

APPENDIX 9

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