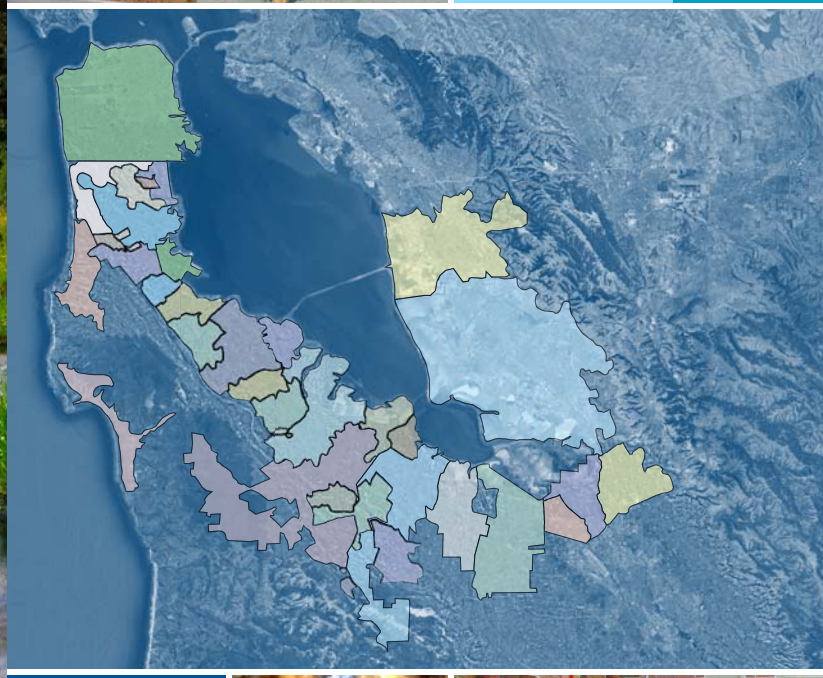
BAWSCA

Bay Area Water Supply & Conservation Agency



Long-Term Reliable Water Supply Strategy Phase I Scoping Report

CDM

consulting · engineering · construction · operations

May 27, 2010

Contents

Tables

Figures

Abbreviations

$/AF	dollars per acre-foot
AB	Assembly Bill
ABAG	Association of Bay Area Government
ACWD	Alameda County Water District
AF	acre-feet
AFY	acre-feet per year
Banks PP	Harvey O. Banks Pumping Plant
BARDP	Bay Area Regional Desalination Project
BARWC	Bay Area Recycled Water Coalition
BAWSCA	Bay Area Water Supply and Conservation Agency
Cal Water	California Water Service Company
CCI	Construction Cost Index
CCWD	Contra Costa Water District
CDP	Criterion Decision Plus
CVP	Central Valley Project
DPH	Department of Public Health
DWR	Department of Water Resources
EBMUD	East Bay Municipal Utility District
ENR	Engineering News Record
ETAW	Evapotranspiration of Applied Water
FERC	Federal Energy Relicensing Commission
FY	fiscal year
gpcd	gallons per capita per day
gpm	gallons per minute
IID	Imperial Irrigation District
ISG	Individual Supply Guarantee
Jones PP	Jones Pumping Plant
KCWA	Kern County Water Agency
LVE	Los Vaqueros Reservoir Expansion Project
mgd	million gallons per day
MID	Municipal Improvement District
MMWD	Marin Municipal Water District
MTC	Metropolitan Transportation Commission

NCCWD	North Coast County Water District
O&M	operations and maintenance
PEIR	Program Environmental Impact Report
Portfolio	water supply management portfolio
project	water supply management project
Reclamation	United States Bureau of Reclamation
RWQCP	Regional Water Quality Control Plant
RWS	Regional Water System
SB	Senate Bill
SBA	South Bay Aqueduct
SBSA	South Bayside System Authority
SBWR	South Bay Water Recycling
SCVWD	Santa Clara Valley Water District
SFPUC	San Francisco Public Utilities Commission
SMURRF	Santa Monica Urban Runoff Recycling Facility
Strategy	Long-Term Reliable Water Supply Strategy
SWP	State Water Project
SWRCB	State Water Resources Control Board
TAF	thousand acre-feet
TDS	total dissolved solids
USD	Union Sanitary District
UWMP	Urban Water Management Plan
WCIP	Water Conservation Implementation Plan
WSA	Water Supply Agreement
WSIP	Water System Improvement Program
WWTP	wastewater treatment plant
Zone 7	Alameda County Flood Control & Water Conservation District Zone 7

Executive Summary

Executive Summary

The Bay Area Water Supply and Conservation Agency's (BAWSCA's) water management objective is to ensure that a reliable, high quality supply of water is available where and when people within the BAWSCA service area need it. BAWSCA is developing a strategy to meet the projected water needs of its member agencies through 2035 and to increase their water supply reliability under normal and drought conditions. A reliable supply of water is required to support the health, safety, employment, and economic opportunities of the existing and expected future residents in the BAWSCA service area and to supply water to the agencies, businesses, and organizations that serve those communities.

The Long-Term Reliable Water Supply Strategy (Strategy) is proceeding in three phases: Phase I (now complete) defined the magnitude of the water supply issue and the scope of work for the Strategy; Phase II will continue the development of the Strategy through detailed analysis of the water supply management projects, and development of the implementation plan for the Strategy; and Phase III will include the implemention of specific water supply management projects of the Strategy.

Water Demands in the BAWSCA Service Area are Projected to be Greater than Supplies

The number of people living and working within the BAWSCA service area is projected to increase by approximately 400,000 (i.e., 22 percent) between now and 2035 (Maddaus 2009). Even after accounting for savings associated with the existing and planned water conservation activities, water demands within the BAWSCA service area are projected to exceed available supplies after 2018. Up to 25 million gallons per day (mgd) of additional water supply may be needed by 2035 to meet the needs of the current and future residents, businesses, and organizations in normal years. Even more water (i.e., up to 76 mgd) will be needed each year during extended drought conditions.

Existing Water Supplies are Subject to Reductions

The San Francisco Public Utilities Commission (SFPUC) Regional Water System provides approximately two-thirds of the BAWSCA service area water supply. This source of supply can be, and has been, affected by a variety of factors including drought, regulatory actions, policy decisions, and climate change. The extent and frequency of such impacts in the future are uncertain.[1]

[1] The July 2009 Water Supply Agreement presents the wholesale customer share of SFPUC supply under different drought conditions (City and County of San Francisco and Wholesale Customers 2009). Under normal conditions, wholesale customers receive 69.4% of the total available supply, or 184 mgd of 265 mgd. For the largest cutback evaluated, a 20% reduction in supply system-wide (212 mgd available), wholesale customers would receive 62.5% (or 132.5 mgd) of the overall SFPUC supply available. This 20% system-wide drought reduction

Many of the member agencies also have other water supply sources in addition to their SFPUC supplies. These sources of supply, especially those originating in the Delta, are also subject to cutbacks during drought, and even under normal hydrologic conditions. These reductions in supply may be even more severe than the effect on the SFPUC supply.

The Consequences of Supply Shortfalls are Regional and Severe

Without sufficient water supplies to meet projected future needs on an average annual basis, future residential and economic development could be curtailed within the BAWSCA service area and relocated elsewhere. This could mean loss of new housing, jobs, manufacturing, and community services. This could occur under normal conditions.

If the water supplies currently available to the BAWSCA member agencies continue to be unreliable and subject to cutbacks, then existing and future customers will be increasingly affected. This is not only true under normal conditions, but is exacerbated during drought events. Water supply cutbacks, when they occur, have significant economic and lifestyle impacts to residents and businesses.

The 2007 study, "An Economic Evaluation of the Water Supply Reliability Goal in the SFPUC Water System Improvement Plan," prepared by William Wade, Ph.D., a resource economist, estimated that a subset of industrial sectors that are particularly sensitive to curtailments in water supply (i.e., computer/electronic manufacturers, food and beverage manufacturers, and biotechnology) would be significantly affected by drought. The impact of a 20% water supply deficiency on shipments from these industries located in the wholesale customer service area was estimated at nearly $7.7 billion annually, for each year the drought persists. (Wade 2007)

The water supply challenges faced by the BAWSCA member agencies are regional and not limited to individual cities or water districts as the residents and voters in one community typically work or own businesses in another community within the BAWSCA service area. Therefore, a water supply shortfall in one BAWSCA agency that results in loss of jobs or other impacts can detrimentally affect the customers of another BAWSCA agency, even if that agency itself is not facing a supply shortfall.

BAWSCA's Strategy to Address the Identified Regional Water Supply Issues

BAWSCA is developing the Strategy to quantify when, where, and how much additional supply reliability and new water supplies are needed throughout the BAWSCA service area through 2035. The Strategy will then identify water supply

---

132.5 mgd) of the overall SFPUC supply available. This 20% system-wide drought reduction scenario results in a total 28% reduction in supplies for wholesale customers. Individual agency cutbacks may be higher depending on the allocation of the reduced supply.

management projects that can be cost-effectively implemented by a single member agency, by a collection of the member agencies, or by BAWSCA in an appropriate timeframe to meet the identified needs.

In all instances, and in accordance with a key BAWSCA principle, the water supply management projects that are developed as part of this Strategy will be paid for by those agencies that benefit from their development.

Actions by BAWSCA and Member Agencies are Required to Implement the Strategy

Success of the Strategy will depend on timely and appropriate actions by the BAWSCA Board and by the individual member agencies. Progress on the development of the Strategy will be monitored closely to ensure that a reliable, high quality supply of water is available where and when people within the BAWSCA service area need it.

Principles Inform Strategy Development

Based on discussions with member agency representatives, five principles have been identified that will continue to inform the development of the Strategy:

1. The Strategy must add value to BAWSCA member agency customers.

2. The Strategy must provide certainty for future planning and development.

3. The Strategy must not result in the uncompensated or involuntary reallocation of member agency assets.

4. The Strategy must be consistent with water transfer provisions of the Water Supply Agreement (WSA) between the SFPUC and its Wholesale Customers.

5. The projects that are developed as part of the Strategy will be paid for based upon cost allocation methods that will be agreed upon by BAWSCA and the member agencies.

A Wide Range of Water Supply Management Projects will be Evaluated in Phase II

The inventory of possible water supply management projects to be evaluated in Phase II was developed pursuant to the principle that no project would result in any uncompensated or involuntary reallocation of member agency assets. The project inventory was developed based on:

- Reviewing BAWSCA member agency 2005 Urban Water Management Plans (UWMPs)[2] and other publically-available documents;

- Identifying those projects that could create new sources of supply;

- Identifying those projects with a potential to increase yield beyond what an agency had planned to meet its own needs, or with a potential to accelerate the schedule to bring the supply online sooner than currently planned; and

- Incorporating review comments from BAWSCA member agencies regarding the update, addition or removal of projects to be evaluated in Phase II of the Strategy.

The identified projects are categorized based on their source of water. These potential sources include groundwater, recycled water, water transfers, surface water and reservoirs, desalination, expanded conservation, and localized water capture and reuse. Supply sources may differ in their ability to provide potable or non-potable supply or meet normal or drought year demands.

Furthermore, the identified projects have been classified based on their current level of development and location (i.e., within and outside of the BAWSCA service area), two characteristics critical to understanding how to incorporate projects into the long-term Strategy. Each project has therefore been classified as one of four types:

1. *Existing projects within the BAWSCA service area* that are under development by, or in partnership with, a BAWSCA member agency and that may have the potential to be expanded or to have the project timeline accelerated to either offset additional demand within the service area of the BAWSCA agency(ies) that is involved in the project, or to offset the demand of another BAWSCA agency(ies) through a sale, exchange, or transfer;

2. *Planned projects within the BAWSCA service area* that have been identified by a BAWSCA member agency which may have the potential to be expanded or to have the project timeline accelerated to either offset additional demand within the service area of the BAWSCA agency(ies) that is involved in the project, or to offset the demand of another BAWSCA agency(ies) through a sale, exchange, or transfer;

3. *Potential future new projects within the BAWSCA service area* that have not been specifically identified by a BAWSCA member agency to date, but that may have the potential to be developed to either offset additional demand within the service area of the BAWSCA agency(ies) that is involved in the project, or to offset the demand of another BAWSCA agency(ies) through a sale, exchange, or transfer; and

[2] Brisbane, Guadalupe Valley Municipal Improvement District, Purissima Hills Water District, Skyline County Water District (now part of California Water Service Company), and Stanford University did not complete UWMPs due to their small service areas.

4. *Existing, planned, or potential projects outside the BAWSCA service area* that may have the potential to be developed, to be expanded, or to have the project timeline accelerated to offset the demand of a BAWSCA agency(ies) through a sale, exchange, or transfer.

Strategy Evaluation Framework

In order to effectively evaluate and rank the potential water supply management projects, a decision process has been developed that is transparent, adaptable, and defensible. The decision process includes four levels of screening and evaluation:

1. *Preliminary "Fatal Flaw" Screening* – This step identifies those individual water supply management projects that either cannot be completed in time to meet the future demands of the BAWSCA member agencies within the Strategy planning horizon (i.e., by 2018 or 2035), or those projects with environmental impacts that would likely prohibit their implementation.

2. *Individual Water Supply Management Project Evaluation* – Individual water supply management projects will be grouped into supply categories (e.g., desalination, surface water, etc.). Each water supply management project will then be assessed using evaluation criteria to establish their relative ranking within each supply category. This will allow for accurate comparison of similar projects and will aid in the development of different water supply management portfolios.

3. *Portfolio Development* – Since no single water supply management project is likely to meet the future supply need, multiple water supply management projects will be combined into portfolios formulated to meet the entire supply need. Multiple portfolios will be developed to satisfy different objectives (e.g., least cost, 100% drought reliability, etc.) that will be identified for the Strategy. Additionally, because the portfolios will likely include multiple supply sources, they will increase the water supply diversity within the BAWSCA service area.

4. *Portfolio Evaluation* – This step will involve the assessment of the different water supply management portfolios based on the evaluation criteria. This will provide decision makers with the information needed to make informed decisions about supply management costs, impacts, benefits, and where to expend additional resources to gather additional information (e.g., field investigations).

Evaluation criteria have been developed to evaluate the water supply management projects and portfolios during the development of the Strategy. The proposed evaluation criteria address the Strategy planning objectives including: 1) increasing supply reliability; 2) providing a high level of water quality; 3) reducing cost impacts; 4) increasing potable water use efficiency; 5) reducing environmental impacts; and 6) increasing implementation potential.

The evaluation criteria will be used as part of an interactive decision process. BAWSCA and the member agencies will provide input on project and portfolio evaluation, criteria weighting, and other factors during the Phase II evaluation process.

Phasing of Work Streamlines Strategy Development

The Strategy is being developed in three phases. Phase I of the Strategy has been the development of the scope for the Strategy, including the development of this Report.

Phase II is the continutation of the Strategy through the development and analysis of alternative water supply management projects and groups of projects (portfolios) to meet the water supply needs of the member agencies in normal and drought years.

Developing specific recommendations and an implementation plan will require an extensive amount of analysis. This analysis is required to: 1) develop sufficient information on the water supply management projects, many of which are only identified as potential concepts, to ensure that the projects are feasible; and 2) develop a similar level of project-specific information to allow comparison between the projects.

Approach To Strategy Development Consists Of Multiple Phases

- Phase I – Scoping Report
- Phase II A – Develop Near-Term Recommendations
- Phase II B – Develop Mid-Term Projects and Conduct Field Investigations
- Phase II C – Develop Long-Term Recommendations
- Phase III – Implementation of Specific Water Supply Management Projects Identified as Part of the Strategy

Based on the information gathered for this Report (i.e., water demands, supply needs, potential projects and the evaluation framework) a phased approach seems most appropriate to identify potential opportunities to best address near-term normal and drought year supply needs, while concurrently developing a strategy to address the longer-term supply needs. The Phase II Strategy development process has three sub-phases:

- *Phase II A – Develop Near-Term Recommendations* – The work in Phase II A focuses on identifying and developing initial recommendations for implementation of near-term member agency and regional projects that will help member agencies meet normal and drought supply needs over the next decade. In addition, as part of Phase II A, recommendations will be made for potential mid-term projects that could be implemented during Phase II B or II C. Furthermore recommendations for field work that will be required to further characterize and demonstrate the feasibility of projects and will identification of the projects that will be includedin Phase II C (i.e., more detailed development and analysis) will be made in Phase II A.

- *Phase II B – Develop Mid-Term Projects and Conduct Field Investigations* –Phase II B will evaluate mid-term projects that were identified in Phase II A that should move forward as soon as possible, but that may require limited additional analysis or support. In addition, this phase includes the field and other investigations that are required to estimate certain project yields, feasibility, and cost. Phase II Bwill be performed after the initial evaluation of the project alternatives is completed in Phase II A, but could possibly occur before the completion of Phase II A. By phasing the Strategy this way, the field investigations will be focused on a limited number of potentially viable projects where the investigations are required to confirm their feasibility and other key information (i.e., yield).

- *Phase II C – Develop Long-Term Recommendations* – Phase II C will include updating of BAWSCA member agencies' supply need information and further evaluation of potential projects to meet the long-term supply out to 2035. Phase II C will also incorporate the Phase II A and Phase II B work into the development of an implementation plan to meet the near- and long-term supply needs for the member agencies for normal and drought conditions.

Phase III will be the implementation of specific water supply management projects identified as part of the Strategy. These projects may be developed by individual member agencies, groups of member agencies, or by BAWSCA and the BAWSCA board on behalf of the member agencies.

Figure ES-1 indicates the schedule for the Phase II work.

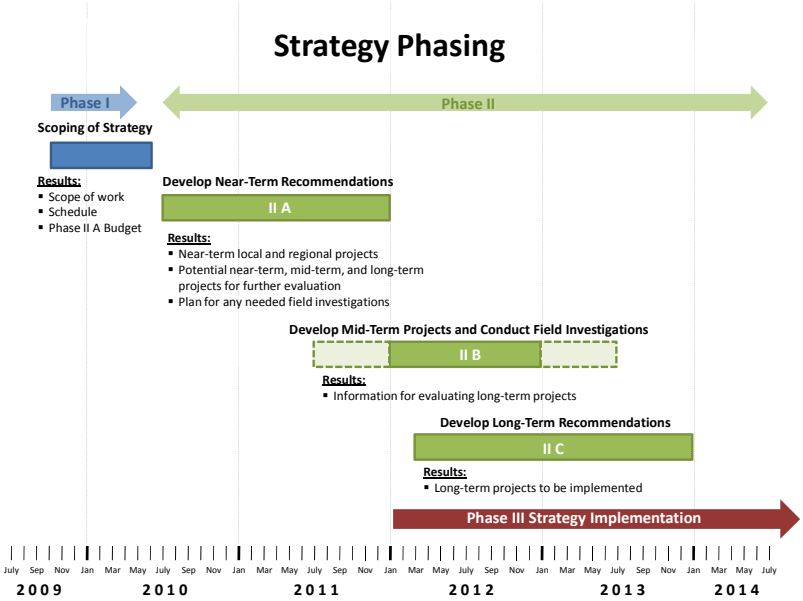


Figure ES-1
Strategy Phasing and Schedule

Phase II Scope Elements

The anticipated scope elements for Phases II A, B, and C are summarized in Table ES-1. Section 8 describes these phases and tasks in more detail.

Table ES-1: Anticipated Scope Elements	
Phase II A - Develop Near-Term Recommendations	
Task	***Description***
1	Update Water Demand and Supply Need
2	Update Agency Project Information
3	Update Regional Project Information
4	Perform Fatal Flaw Analysis and Screening of Agency and Regional Projects
5	Develop Tools to Evaluate Projects and Portfolios
6	Evaluate and Compare Projects and Portfolios
7	Develop Recommendations for Near-Term Projects, Phase II B Mid-Term Projects and Field Investigations, and Phase II C Long-Term Projects and Portfolios
8	Develop Scope and Budget for Phase II B
9	Develop Preliminary Scope and Budget for Phase II C Long-Term Recommendations
10	Prepare Phase II A Report
11	Project Management
Phase II B - Develop Mid-Term Projects and Conduct Field Investigations	
Task	***Description***
1	Finalize Work Plans, Bid Documents and Access Agreements
2	Field Investigations for Agency Projects
3	Field Investigations for Regional Projects
4	Support for Implementing Mid-Term Projects
5	Stakeholder Outreach (As needed)
6	Project Management
Phase II C – Develop Long-Term Recommendations	
Task	***Description***
1	Update Local Agency Need and Supply Information Based on Agency Updates
2	Determine Specific Supply Need by Agency and Region
3	Update Agency and Regional Project Information Based on Phase II B Field Work and Analysis
4	Update Economic Information for Agencies and Projects
5	Develop Portfolios to Address Near- and Long-term Supply Needs
6	Compare and Rank Projects and Portfolios
7	Develop Recommendations
8	Prepare Implementation Plan (Long-Term Recommendations)
9	Stakeholder Outreach
10	Project Management

The Phase II work will include additional technical expertise, including technical, environmental, and planning specialists to perform this work. The level of involvement required in each of these areas will depend on the specific projects that

are carried through the multiple phases, and level of analysis required to develop and evaluate them. The areas of expertise are summarized in Table ES-2.

Table ES-2
Technical Expertise Requirements for Phase II

Specialty	Sub-Area
Treatment Processes	Water quality
	Water treatment
	Desalination treatment
	Wastewater treatment
	Process engineers
Infrastructure	Pipeline engineers
	Electrical engineers
	Mechanical engineers
	Structural engineers
	Cost estimators
	Schedulers
Water Rights	Legal counsel
	Water rights experts
Water Transfers	Water transfer planners/facilitators
	Legal counsel
Groundwater	Groundwater modelers
	Hydrogeologists
Reservoirs	System modelers
	Hydrologists
	Distribution system modelers
Economics	Economists
	Systems engineers
	Rate specialists
Planning	Land use planners
	Water conservation specialists
	Rain/stormwater capture and greywater specialists
	Legal/institutional/permitting specialists
Environmental Analysis	California Environmental Quality Acta and National Environmental Policy Act specialists
Grant Writers	State and Federal grant specialists

Phase I Conclusions

BAWSCA members are faced with potentially significant water supply shortfalls under normal and drought conditions. The extent of the shortfalls depend on a variety of variables. BAWSCA has undertaken this project to develop a strategy for addressing member agency needs/priorities and potential future water supply projects. The Strategy will be supported by a process for formulating the projects into water supply management portfolios and systematically evaluating them against criteria that reflect BAWSCA and member agency priorities and concerns.

Phase I of the Strategy involved quantifying the projected water supply need out to 2035, defining the evaluation that will be used to evaluate and select the preferred

water supply management projects, and identifying the water supply management projects to be evaluated in Phase II. Phase I also included developing the scope for Phase II.

Even after accounting for savings associated with the existing and planned water conservation activities, water demands within the BAWSCA service area are projected to exceed available supplies after 2018. Up to 25 million gallons per day (mgd) of additional water supply may be needed by 2035 to meet the needs of the current and future residents, businesses, and organizations in normal years. Even more water (i.e., up to 76 mgd) will be needed each year during extended drought conditions.

Phase II of the Strategy will involve detailed evaluation of potential water supply management projects and will consist of the following sub-phases:

- Phase II A – Develop Near-Term Recommendations
- Phase II B – Develop Mid-Term Projects and Conduct Field Investigations
- Phase II C – Develop Long-Term Recommendations

Phase III will include the implementation of specific water supply management projects identified as part of the Strategy.

Due to the timing and magnitude of the forecasted shortages, and the time required to implement the various elements of the Strategy, rapid and efficient development of the Strategy is necessary to sustaining a safe and reliable water supply within the BAWSCA service area.

Section 1

Introduction

Section 1
Introduction

1.1 Strategy Overview

The Bay Area Water Supply and Conservation Agency's (BAWSCA's) management objective is to ensure that a reliable, high-quality supply of water is available where and when people within the BAWSCA service area need it. The Long-Term Reliable Water Supply Strategy (Strategy) will quantify the water supply need of the BAWSCA member agencies through 2035, and identify the water supply management projects (projects) necessary to meet that need. Successful implementation of the Strategy will be critical to ensuring that there will be sufficient and reliable water supplies for the BAWSCA member agencies and their customers.

1.2 Strategy Principles

Based on discussions with member agency representatives, five principles have been identified that will inform the development of the Strategy:

1. The Strategy must add value to BAWSCA member agency customers.

2. The Strategy must provide certainty for future planning and development.

3. The Strategy must not result in the uncompensated or involuntary reallocation of member agency assets.

4. The Strategy must be consistent with water transfer provisions of the Water Supply Agreement (WSA) SFPUC and its Wholesale Customers.

5. The projects that are developed as part of the Strategy will be paid for based upon cost allocation methods that will be agreed upon by BAWSCA and the member agencies.

1.3 Strategy Phasing

The Strategy is proceeding in three phases: Phase I (now complete) defined the magnitude of the water supply issue and the scope of work for the Strategy; Phase II will continue the development of the Strategy through detailed analysis of the water supply management projects, and development of the implementation plan for the Strategy; and Phase III will include the implemention of specific water supply management projects of the Strategy.

Specifically, Phase I included:

- Quantifying the magnitude and timing of the normal and drought year water need of the BAWSCA member agencies to help focus the range of water supply management projects and level of effort required for Phase II of the Strategy;

- Defining the evaluation criteria and process that will be used to evaluate and select the preferred water supply management projects in Phase II;
- Identifying the water supply management projects to be evaluated in Phase II; and
- Developing the scope, level of effort, technical resource needs and general schedule for the Phase II evaluation.

Phase II will be performed in three subphases:

- Phase II A – Develop Near-Term Recommendations
- Phase II B – Develop Mid-Term Projects and Conduct Field Investigations
- Phase II C – Develop Long-Term Recommendations

Phase III will include the implementation of the specific water supply management projects recommended in Phase II of the Strategy. These projects may be developed by individual member agencies, groups of member agencies, or by BAWSCA and the BAWSCA Board on behalf of the member agencies.

Phase I and Phase II A will be paid for and conducted by BAWSCA. The work effort for both phases will be coordinated with the BAWSCA member agencies.

1.4 Report Structure

The remainder of this report consists of the following:

- *Section 2 – Water Demands in the BAWSCA Service Area are Projected to be Greater Than Supplies* presents the timing and magnitude of the projected water supply shortfalls that have been identified within the BAWSCA service area.
- *Section 3 – The Consequences of Supply Shortfalls are Regional and Severe* discusses the local and regional consequences of these supply shortfalls.
- *Section 4 – A Variety of Potential Water Supply Management Projects are Available to Meet the Supply Need* summarizes the projects to be evaluated in Phase II.
- *Section 5 – BAWSCA Strategy for Addressing Water Supply Issues* outlines the evaluation framework to be used to determine the recommended projects to meet the identified supply needs.
- *Section 6 – Critical Ongoing Water Supply Issues to be Monitored and Addressed in Phase II* discusses the critical issues that must be monitored and assessed during the Phase II evaluation.
- *Section 7 – Strategy Phasing* presents an overview of the phasing and schedule.

- *Section 8 – Phase II Summary Scope of Work* outlines the principal work tasks for Phase II.
- *Section 9 – Technical Expertise* delineates the technical expertise that will be required for Phase II efforts.
- *Section 10 – Conclusions* identifies the conclusions from the Phase I work.
- *Section 11 – References.*
- *Appendix A – Supply Need Calculations* quantifies the 2018 and 2035 demand, available supplies, and supply need for each member agency.
- *Appendix B – Additional Information on Water Supply Management Projects* provides detail on the projects identified in Section 4.
- *Appendix C – Evaluation Framework* describes additional detail for the water supply management project and portfolio evaluation framework.

Section 2

Water Demands in the BAWSCA Service Area are Projected to be Greater Than Supplies

Section 2
Water Demands in the BAWSCA Service Area are Projected to be Greater Than Supplies

2.1 Introduction

This section presents the projected water demand, supply and supply shortfalls identified within the BAWSCA service area for future planning years 2018 and 2035.

The factors considered in the supply need analysis for this Strategy include:

- Projected future increases in population and employment, and therefore water demand, within the BAWSCA service area to 2035;
- The potential impacts of active and passive water conservation on the projected future demand;
- Impacts to the SFPUC supply to the BAWSCA agencies under varying hydrologic conditions, and as a result of climate change and regulatory and policy decisions; and
- The volume of non-SFPUC supplies currently projected to be available to the member agencies during normal years to 2035.

The Strategy does not address future drought year supply shortfalls from the non-SFPUC sources that the member agencies rely on (e.g., groundwater or local and imported surface water). Rather, the Strategy is limited to evaluating the additional water needs of the BAWSCA member agencies above and beyond their current supply portfolios during normal years, and the additional supply need during drought years based on projected cutbacks to their SFPUC supplies.

2.2 Population and Employment Projections

As part of the development of the 2009 Water Conservation Implementation Plan (WCIP), population, and employment projections for the BAWSCA member agencies were updated, primarily using Association of Bay Area Governments (ABAG) 2007 data. Based on the analyses conducted as part of the WCIP effort, population and employment are projected to grow by less than two percent per year between 2010 and 2035 (i.e., a 22% increase in population and a 45% increase in employment between 2010 and 2035; Maddaus 2009).

2.3 Projected Water Demands in the BAWSCA Service Area

This section presents the projected water demands for the BAWSCA member agencies. The water demand estimates are presented with and without conservation savings estimates that include:

- Plumbing code savings (denoted as "Passive Conservation");
- Savings based on implementation of the water conservation measures that the member agencies committed to as part of SFPUC's 2008 Water System Improvement Program (WSIP) Program Environmental Impact Report (PEIR) process (denoted as "Committed PEIR Conservation"); and
- Savings based on full implementation of the water conservation measures identified in the 2009 WCIP (also denoted as "Projected WCIP Conservation").

The demand estimates do not include additional savings associated with Senate Bill (SB) 407 (replacement of all noncompliant (low efficiency) plumbing fixtures beginning as early as 2014) or SB X7 7 (reduction of urban per capita water use by 20% no later than December 31, 2020).

2.3.1 Current Water Demands

In Fiscal Year (FY) 2008-09, total demand for the BAWSCA service area was 242 million gallons per day (mgd), the lowest demand level since FY 1997-98 (BAWSCA 2010). Voluntary water conservation targets of 10% were initiated during summer 2007, and continued into 2009.

2.3.2 Projected 2018 Water Demands

By 2018, total water demands within the BAWSCA service area, not accounting for any conservation savings, are projected to be 315 mgd (Maddaus 2009). Projected demands for individual agencies are presented in Tables A-1 and A-2 in Appendix A. After accounting for the Passive, Committed PEIR, and Projected WCIP Conservation savings, the 2018 water demand within the BAWSCA service area is projected to be 281 mgd[1] (Maddaus 2009).[2]

The 2018 water demand projection includes the following estimates of conservation savings:

- 16 mgd of Passive Conservation savings;
- 9 mgd of Committed PEIR Conservation savings; and
- 8 mgd of Projected WCIP Conservation savings.

[1] Net demand may not equal the difference in total demand and conservation estimates due to rounding.
[2] Demand estimates do not include additional savings associated with the SB 407 or SB X7 7.

Figure 2-1 presents the projected total demand for the BAWSCA member agencies with and without the various levels of conservation savings. Appendix A and the reports referenced above provide additional information on the individual agency demand and conservation elements.

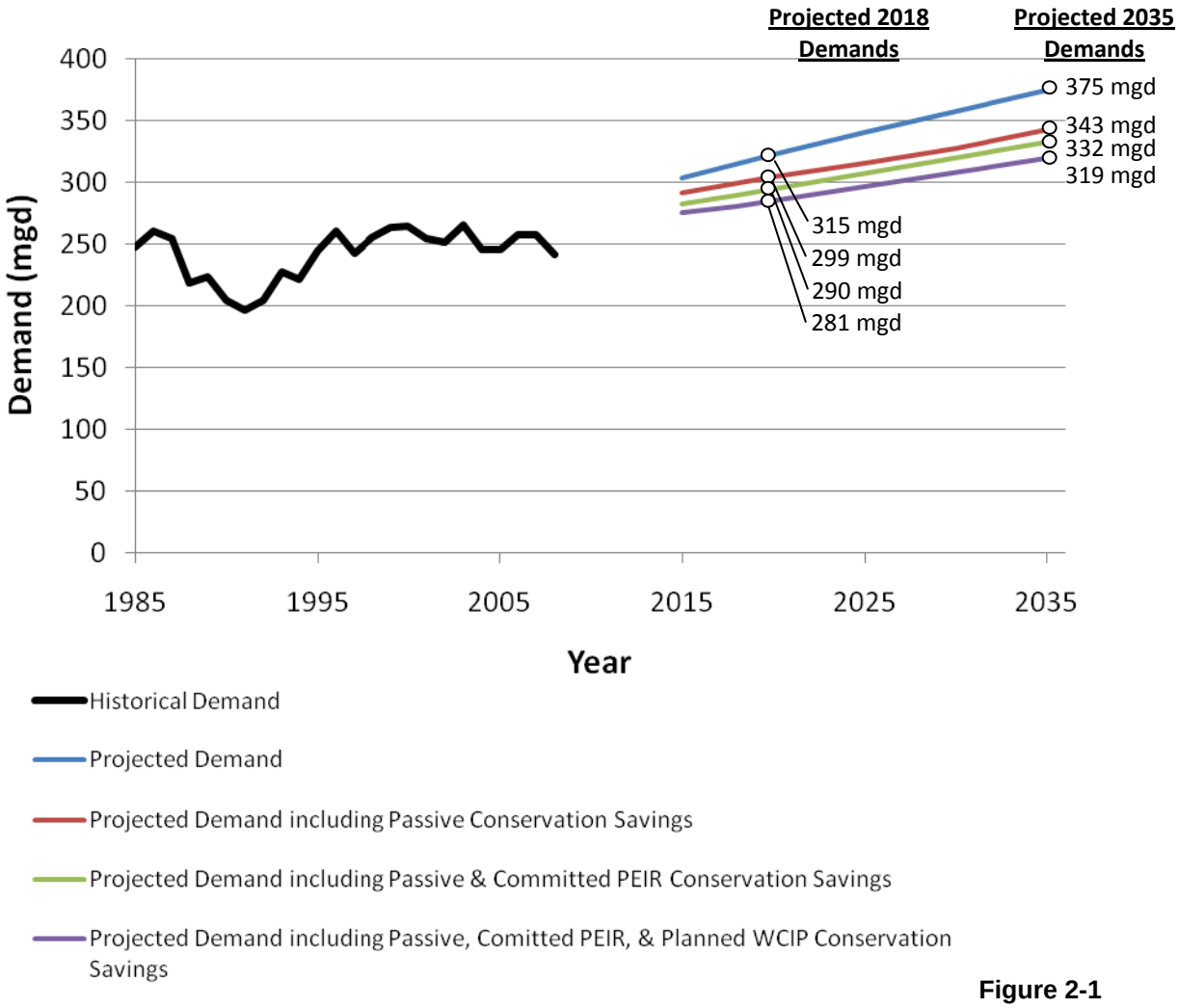


Figure 2-1
Total Projected BAWSCA Demand and Impact of Conservation Savings

2.3.3 Projected 2035 Water Demands

As shown on Figure 2-1, total water demands within the BAWSCA service area, not accounting for any conservation savings, are projected to be 375 mgd in 2035 (Maddaus 2009). After accounting for the Passive, Committed PEIR and Projected WCIP conservation savings, the water demand within the BAWSCA service area is projected to be 319 mgd in 2035 (Maddaus 2009).[3]

[3] Demand estimates do not include additional savings associated with SB 407 or SB 7X 7.

The 2035 water demand projection includes the following estimates of conservation savings:[4]

- 32 mgd of Passive Conservation savings;
- 11 mgd of Committed PEIR Conservation savings; and
- 13 mgd of Projected WCIP Conservation savings.

2.3.4 Uncertainties with Current Demand Projections

There are uncertainties associated with the current demand projections for the BAWSCA member agencies, given that:

- The agencies' 2010 Urban Water Management Plans (UWMPs), which will include updated water demand projections, are still in the process of being developed and will not be completed until 2011.
- Future developments may not be approved if inadequate supply is identified during preparation of the UWMPs or project-specific Water Supply Assessments. If actual growth patterns vary from the assumptions made in this analysis, the demand estimates will be affected.
- SB 407 will require the replacement of all noncompliant (low efficiency) plumbing fixtures beginning as early as 2014. Increases in passive conservation savings due to these upgrades may reduce future demands.
- Pursuant to SB X7 7, each agency now has the requirement of meeting a conservation goal of up to 20% by 2020. The measures identified in the 2008 WSIP PEIR and the 2009 WCIP will assist agencies to meet this target. However, in some cases, agencies may need to perform additional water conservation to achieve the target water savings.[5]

---

[4] Estimates of active conservation savings in used in 2035 demand calculations are sourced from 2030 estimates developed in the WCIP.

[5] Pursuant to SB X7 7, the state will have to reduce urban per capita water use by 20% no later than December 31, 2020, and by at least 10% no later than December 31, 2015. These water use reductions will be compared against a 10- to 15-year baseline period that ends between 2004 and 2010. SB X7 7 does not require individual urban water suppliers to reduce per capita water usage by more than 20%. However, each supplier will have to reduce daily per capita water use by at least 5%, unless their baseline water use is less than 100 gallons per capita per day (gpcd). Urban water suppliers will have to meet their own, specified water use targets, which they can establish on an individual or regional basis, using one of four methods:

1. A 20% reduction in baseline per capita water use,
2. Compliance with established performance standards (e.g., 55 gpcd for residential indoor water use),

- The ability of the agencies to fully implement the conservation measures indentified in the 2008 WSIP PEIR and the 2009 WCIP is not known and will have an impact on demand.

- Climate change may alter temperature and precipitation patterns, both of which can influence demand. These effects have not yet been evaluated.

- The recent economic downturn in California has slowed down housing project planning and construction and job creation, which have an impact on population and employment projections, and therefore water demand.

These and other factors will be monitored and evaluated during Phase II.

2.4 Projected Water Supply in the BAWSCA Service Area

This section contains information regarding the current and projected future water supplies within the BAWSCA service area.

2.4.1 Current Supply Mix

The BAWSCA member agencies used a total water supply of 242 mgd in FY 2008-09. They purchased 68% of their aggregate water supply from SFPUC. The remaining 32% of their supply consisted of a combination of groundwater, local surface water, recycled water, and other sources (desalinated brackish groundwater and imports from the Sacramento-San Joaquin Delta, either through the State Water Project [SWP] or the Central Valley Project [CVP]) (BAWSCA 2010). The water supply mix (i.e., the volumes and sources of supply) for the individual BAWSCA member agencies based on information from FY 2008-09 is presented in Figure 2-2.

3. A 5% reduction from the applicable state hydrologic region target set in the state's 20x2020 Water Conservation Plan[5], or
4. A method that will be developed by the Department of Water Resources (DWR) by December 31, 2010. Agencies failing to meet established 2015 interim targets risk losing eligibility for State water grants or loans.

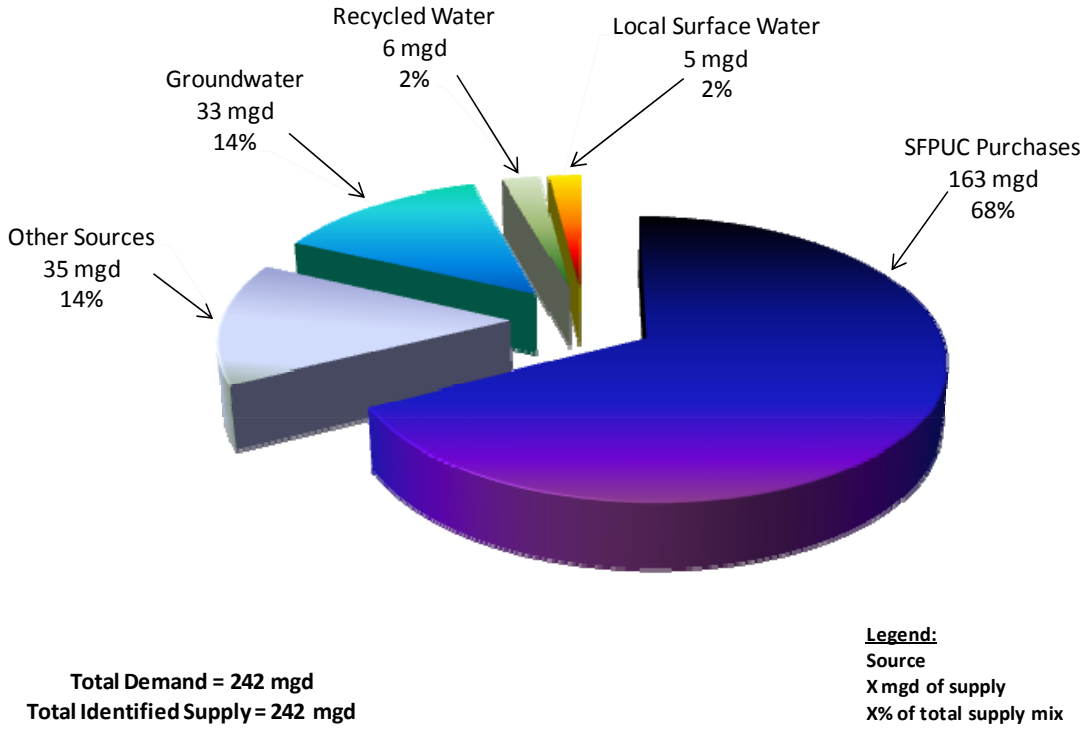


Figure 2-2
BAWSCA Supply Mix for FY 2008-09

2.4.2 Issues that Impact Current and Projected Supply Reliability

The water supplies currently available to the BAWSCA member agencies are limited, and their reliability is affected by several issues including policy decisions, hydrologic conditions, regulatory actions, climate change, and other factors. A description of each supply uncertainty and its impact on normal year and drought year supply reliability is presented below.

Although the some of the issues described below will affect a range of current supply sources, with regard to estimating the supply need of BAWSCA agencies, the Strategy will not address the impacts of any of the above issues on non-SFPUC supplies.

2.4.2.1 SFPUC Policy Decisions

As part of the WSIP PEIR process, SFPUC evaluated and unilaterally selected the Phased WSIP Variant as the preferred alternative. The Phased WSIP Variant includes full implementation of the proposed WSIP facility improvement projects to ensure that public health, seismic safety, and delivery reliability goals are achieved and that 265 mgd of water supply can be delivered through the San Francisco Regional Water System (RWS) in normal water years. However, the Phased WSIP Variant defers

decisions as to whether any supplies above 265 mgd will be delivered through the RWS to meet the projected 2030 water needs within the RWS service area until 2018.

Specifically, as part of the Phased WSIP Variant, SFPUC made the unilateral decision to limit the water supply available from the RWS to the BAWSCA member agencies to 184 mgd until at least 2018. As a result, based on current projections and in absence of increased water conservation, water demands within the BAWSCA service area will exceed available supplies by 2020.

Furthermore, SFPUC has determined that, in addition to limiting BAWSCA's aggregate deliveries to 184 mgd, it will impose an Interim Supply Limitation on each BAWSCA member agency. The sum of the individual BAWSCA member agency Interim Supply Limitations will be 184 mgd. In the event that purchases from the RWS exceed the 265 mgd limit established by SFPUC, agencies that exceed their Individual Supply Limitations will be subject to environmental surcharge fees. Individual BAWSCA agency Interim Supply Limitations and environmental surcharge fees will be set by SFPUC in December 2010.

The Phased WSIP Variant established a mid-term planning milestone in 2018 when SFPUC will reevaluate water demands in the service area through 2030 and assess whether or not to increase deliveries from the RWS. At this time, and for purposes of the Strategy, BAWSCA has assumed that deliveries from the RWS to the BAWSCA member agencies will not be in excess of 184 mgd in the future. This assumption is consistent with what the SFPUC has stated in its WSA for the proposed Treasure Island – Yerba Buena project (PBS&J 2009).

2.4.2.2 Hydrologic Conditions

California has historically experienced intermittent periods of low rainfall. At times, this has resulted in severe impacts on water supplies within the BAWSCA service area (e.g., the 1976-1977 and 1987-1992 droughts). Droughts are anticipated to occur in the future and to impact:

- ***SFPUC Supplies*** – The July 2009 "Water Supply Agreement between The City and County of San Francisco and Wholesale Customers in Alameda County, San Mateo County, and Santa Clara County (WSA)," presents the wholesale customer share of SFPUC supply under different drought conditions, including up to a 20% system-wide reductions. Based on the WSA, the distribution of water between SFPUC and the wholesale customers (BAWSCA member agencies) for various levels of system-wide drought reductions are presented in Table 2-1 below.

Table 2-1
Distribution of Available Water Under Drought Conditions As Defined in the Water Supply Agreement Between SFPUC and Wholesale Customers

Level of System Wide Reduction in Water Use Required	Share of Available Water	
	SFPUC Share	Wholesale Customers Share
5% or less	35.5%	64.5%
6% through 10%	36.0%	64.0%
11% through 15%	37.0%	63.0%
16% through 20%	37.5%	62.5%

Source: City and County of San Francisco and Wholesale Customers 2009.

The formula that allocated the wholesale customers' share of water from the RWS expired in June 2009 and is currently being re-examined by the BAWSCA agencies; however, it can be expected that individual agency cutbacks may be higher depending on the allocation of the reduced supply. As part of its WSIP, the SFPUC adopted a level of service goal, which allows for rationing up to 20% system-wide. As such, this level of drought reduction in the SFPUC supplies is included in the drought assessment of projected BAWSCA supplies in this section.

Under the 20% system-wide drought, the wholesale customers would be allocated 62.5% of the available water supply from the RWS. For example, between now and at least 2018, under the Interim Supply Limitation of total RWS deliveries of no more than 265 mgd, the wholesale customers are able to purchase up to 184 mgd from the RWS, or 69.4% of the RWS yield. With a 20% system-wide drought reduction, the resultant cutback to the wholesale customers would be a 28% (or 52 mgd) reduction in SFPUC supply.

Figure 2-3 compares historic SFPUC purchases by BAWSCA member agencies with the 184 mgd wholesale customer Supply Guarantee and the potential 28% drought reduction. Historic SFPUC purchases from 1980 - 2008 were greater than the estimated supply available during a 28% BAWSCA supply reduction, except in two years that occurred during the 1987 – 1992 drought.

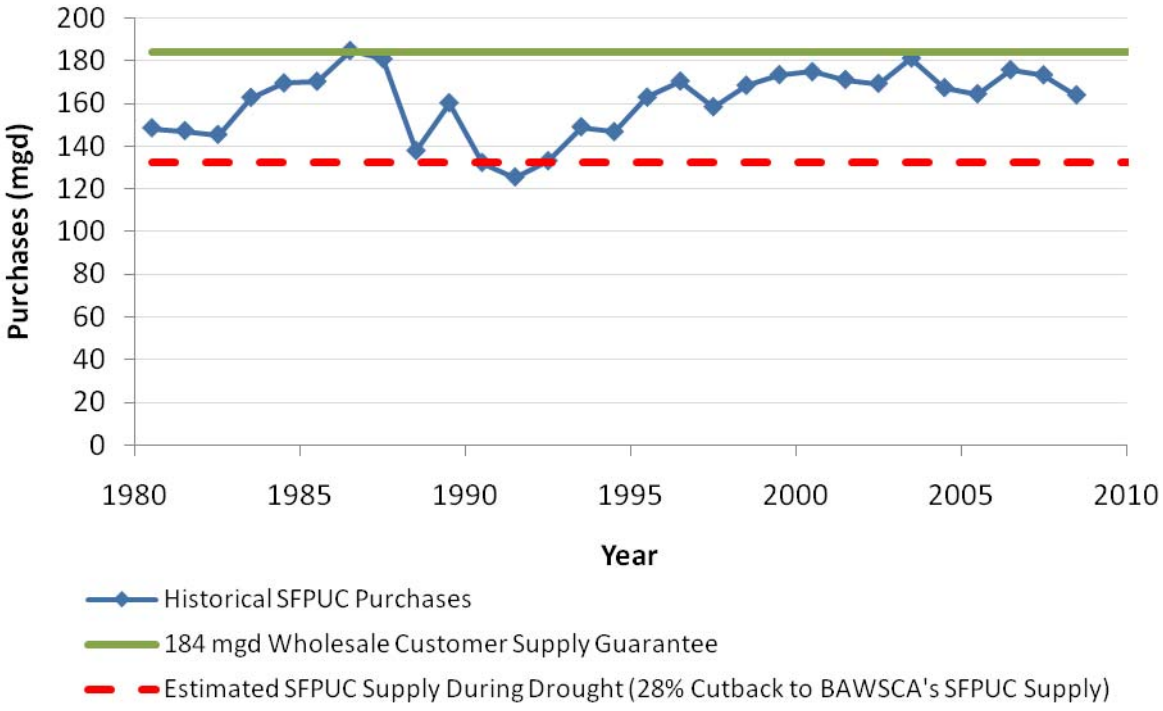


Figure 2-3
Historical BAWSCA Purchases of SFPUC Supply, Wholesale Customer Supply Guarantee, and Estimated SFPUC Supply During Drought

- ***Delta Supplies*** – The impact of drought and regulatory action on Delta supplies is significant, as illustrated by the reductions in water supplies exported from the Delta region in recent dry years. Quantification of impacts to Delta supplies is evolving and will be affected by long-term infrastructure improvements currently under consideration. Impacts to Delta supplies identified during Phase II may be incorporated during the refinement of supply projections.

- ***Local Supplies*** – Impact of droughts on member agencies local supplies will vary based on supply source. Impacts on local supplies identified by agencies during Phase II may be incorporated during the refinement of demand and supply projections.

Supply cutbacks based on hydrologic conditions, when they occur, will have significant economic and lifestyle impacts to residents and businesses. In a 2007 study of the economic impact of a drought on SFPUC supplies to BAWSCA member agencies, resource economist William Wade, Ph.D. estimated that a subset of industrial sectors that are particularly sensitive to curtailments in water supply (e.g., computer/electronic manufacturers, food and beverage manufacturers, and biotechnology) would be significantly affected by drought. The impact of a 20% water

supply deficiency on shipments from these industries located in the BAWSCA service area was estimated at nearly $7.7 billion in each year the drought persists (Wade 2007). The economic impact of reductions to non-SFPUC supplies during a drought will also be significant.

2.4.2.3 Regulatory Actions

With concerns over maintaining ecosystem health taking greater prominence, a number of regulatory actions have affected, and may affect, the amount of supplies available to the BAWSCA member agencies in the future. These regulatory actions include:

- ***Federal Energy Relicensing Commission (FERC)*** – With the recent investigation by FERC concerning potential additional instream flow requirements for fishery restoration purposes and the upcoming relicensing of Don Pedro Reservoir, there is the potential for further reductions of SFPUC deliveries to the BAWSCA member agencies. Based on SFPUC's current drought supply forecasting protocols, the recently proposed instream flow requirements would require a reduction in drought year deliveries by as much as 53% (Federal Energy and Regulatory Commission 2009).

- ***Delta Issues*** – In 2007, U.S District Court Judge Wanger rendered a decision that resulted in significant reductions in deliveries of Delta water to agricultural and municipal users (United States District Court 2007). Since 2007, other biological opinions on Delta supplies have been presented that may further reduce Delta supply reliability (National Marine Fisheries Service 2009, U.S. Fish and Wildlife Service 2008). While uncertainty in supplies from the Delta does not impact SFPUC supply, the BAWSCA member agencies that do utilize Delta supplies will be affected.

- ***Local Fishery Issues*** – Experiences of the Santa Clara Valley Water District (SCVWD), SFPUC, and the Alameda County Water District (ACWD) have highlighted the potential for local stream flow requirements to limit water supply yields of local sources. Although the magnitude is not yet known, the evaluation of local surface water and groundwater supplies will have to consider this impact on environmental flows (reductions in groundwater contribution to rivers and streams).

- ***New Delta Legislation*** – In November 2009, Governor Schwarzenegger signed a package of eight separate pieces of legislation into law. The "Delta Legislation" package addresses new water storage and conveyance facilities, urban water conservation mandates, more efficient agricultural water use, monitoring and reporting of groundwater conditions, and enforcement of water use reporting. The water conservation requirements related to SB X7 7 will directly affect BAWSCA agencies.

2.4.2.4 Climate Change

The California hydrological system is sensitive to climate change. Based on the currently available data, it is generally known that warmer temperatures combined with increasingly variable precipitation patterns will affect Bay Area water supplies as a result of reduced snowpack in the Sierra Nevada Mountains and earlier seasonal runoff. In addition, rising sea levels combined with increasingly severe storms can damage levees and cause saltwater intrusion which can affect surface and groundwater supplies.

The SFPUC conducted a specific evaluation of the potential impacts of climate change on the RWS and concluded that the potential impact of global warming on the system is not expected to affect water system operations through 2030 (SFPUC 2009a). However, SFPUC hydrologists are involved in ongoing monitoring and research regarding climate change trends and will continue to monitor the changes and predictions, particularly as these changes relate to water system operations and management of the RWS. SFPUC has developed a work plan to further advance its research on the effects of climate change on the RWS. Given that this is an area of ongoing study, the impact of climate change on the SFPUC supplies and the RWS remains a source of uncertainty.

The impacts of climate change on non-SFPUC supplies have not been fully evaluated and are still underway. Certainly, prolonged periods of low rainfall and changes in seasonal rainfall patterns may impact a wide range of supply sources for BAWSCA member agencies. Researchers are increasing their understanding of climate change impacts on sea level, snow pack-driven water supplies, and groundwater, among others. Climate change impacts on non-SFPUC supplies identified during Phase II may be incorporated during the refinement of supply projections.

2.4.2.5 Additional Factors

There are additional factors that may affect the availability of BAWSCA member agency supplies and their ability to convey those supplies. These additional factors may include:

- Restrictions on groundwater use due to saltwater intrusion, water quality issues, or ground subsidence (groundwater supply projects evaluated in Phase II will be characterized by the reliability of yield, potential impact on other groundwater basin users, and susceptibility to water quality contamination); and

- Delta system infrastructure reliability issues due to potential seismic events. During the last century, there have been more than 140 documented levee failures and island inundations in the Delta. The 2004 failure on the Upper Jones Tract resulted in 12,000 acres of inundated land and a burden on taxpayers exceeding $100 million (State of California 2005). Studies are currently being conducted to better assess the probability of Delta levee failures and the potential impact to supplies for both Bay Area and Southern California water providers.

These other factors may be qualitatively or quantitatively assessed as part of the Phase II work.

2.4.3 Projected 2018 Supply Mix

In the future, the BAWSCA member agencies are planning to supplement their current supplies with a variety of other sources, including increased use of existing sources. Based on information collected for the BAWSCA annual report and comments by member agencies, the calculated projected future aggregate supplies available to the BAWSCA member agencies in 2018 under normal conditions (and including water conservation as a source of supply) will be 315 mgd, as shown in Figure 2-4. The 2018 demand can be met with the projected supply mix during normal conditions, if demand and supply projections are correct and if the additional levels of passive and active conservation savings are met.

The projected water supply mix (i.e., the volumes and sources of supply) for the individual BAWSCA member agencies for 2018 is presented in Table A-3 of Appendix A. In most cases, agencies are projecting to increase their use of recycled water, groundwater, and SFPUC supplies from the FY 2008-09 values. Conservation commitments and projections are also noted on Figure 2-4 and in Table 2-2. Details on conservation estimates are provided in Section 2.3.

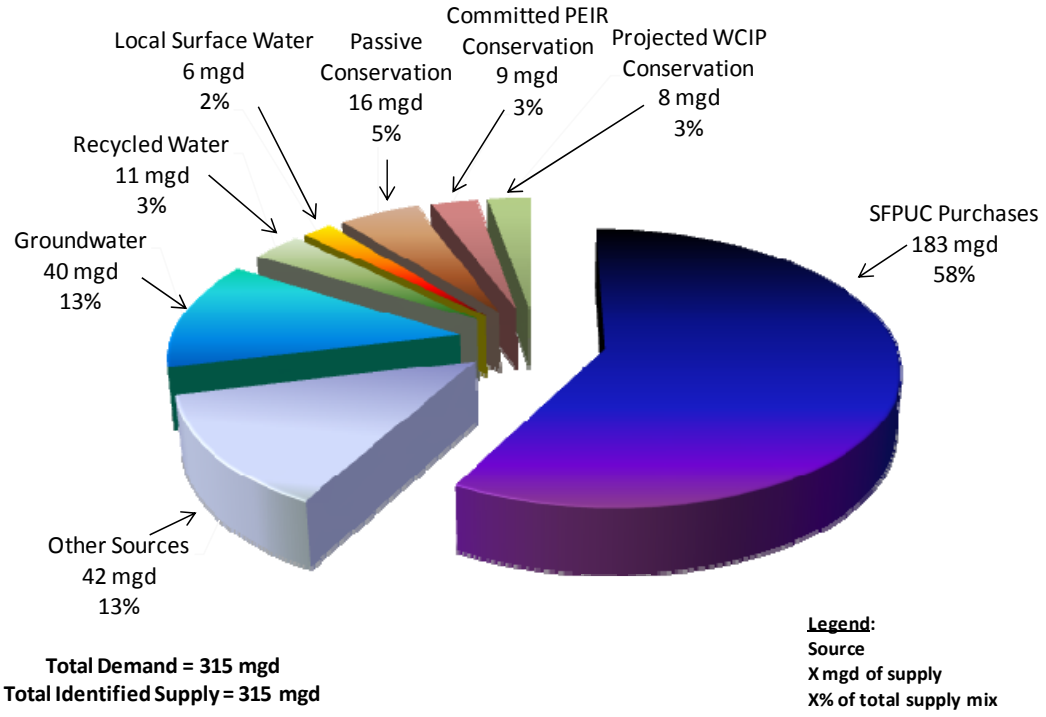


Figure 2-4
BAWSCA Projected 2018 Supply Mix During Normal Year Conditions

Figure 2-5 shows the projected water supply mix for 2018 during assumed 20% drought conditions. During a drought, SFPUC supplies available to the BAWSCA member agencies are subject to reduction. In a 20% SFPUC system-wide reduction, the maximum level of drought reduction assessed by the SFPUC, the BAWSCA agencies could be cutback an estimated 52 mgd, or approximately 28% (City and County of San Francisco and Wholesale Customers 2009). Under this drought scenario, there is up to 50 mgd of additional supply that may be needed by 2018 to meet 100% of projected demands and to fully offset the 28% reduction in SFPUC supply. If member agencies choose a reduced level of service (require some level of mandatory customer rationing) during a drought of this magnitude, then the amount of additional supply needed would be less. The Phase II effort will explore the tradeoffs between the costs of developing new supplies to meet different level-of-service goals and the economic and social impacts of not meeting different portions of the projected demands during droughts.

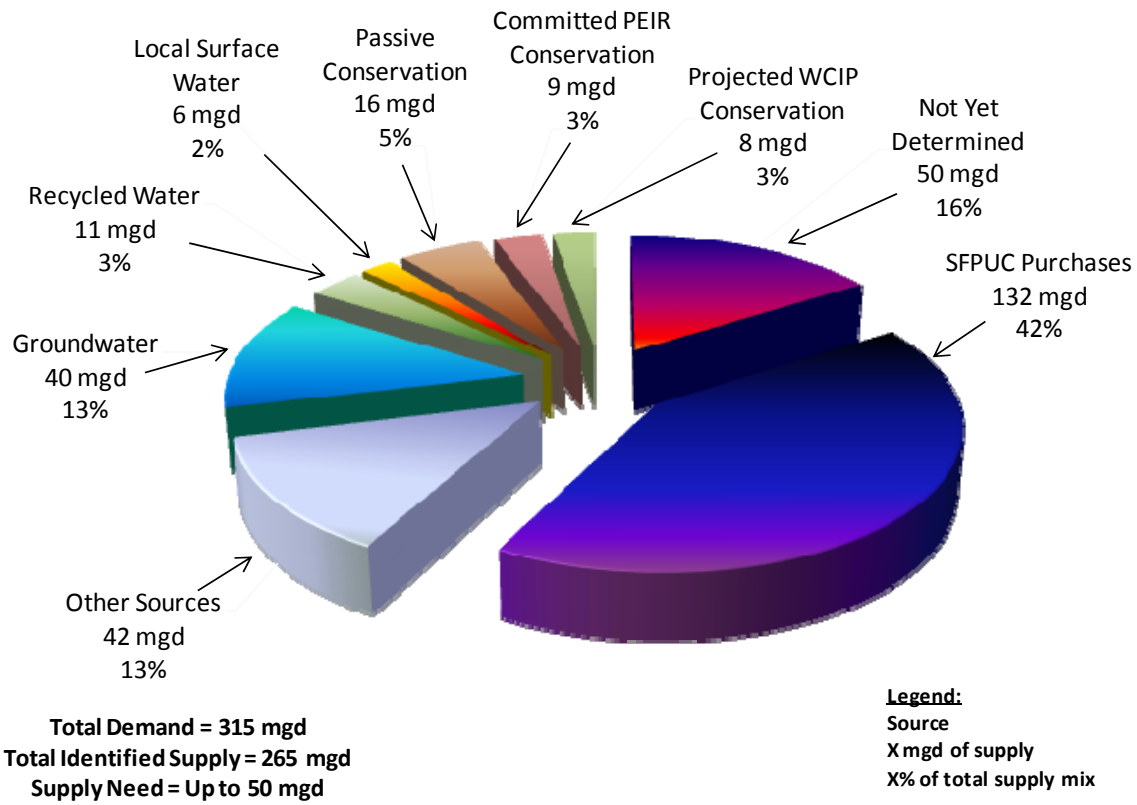
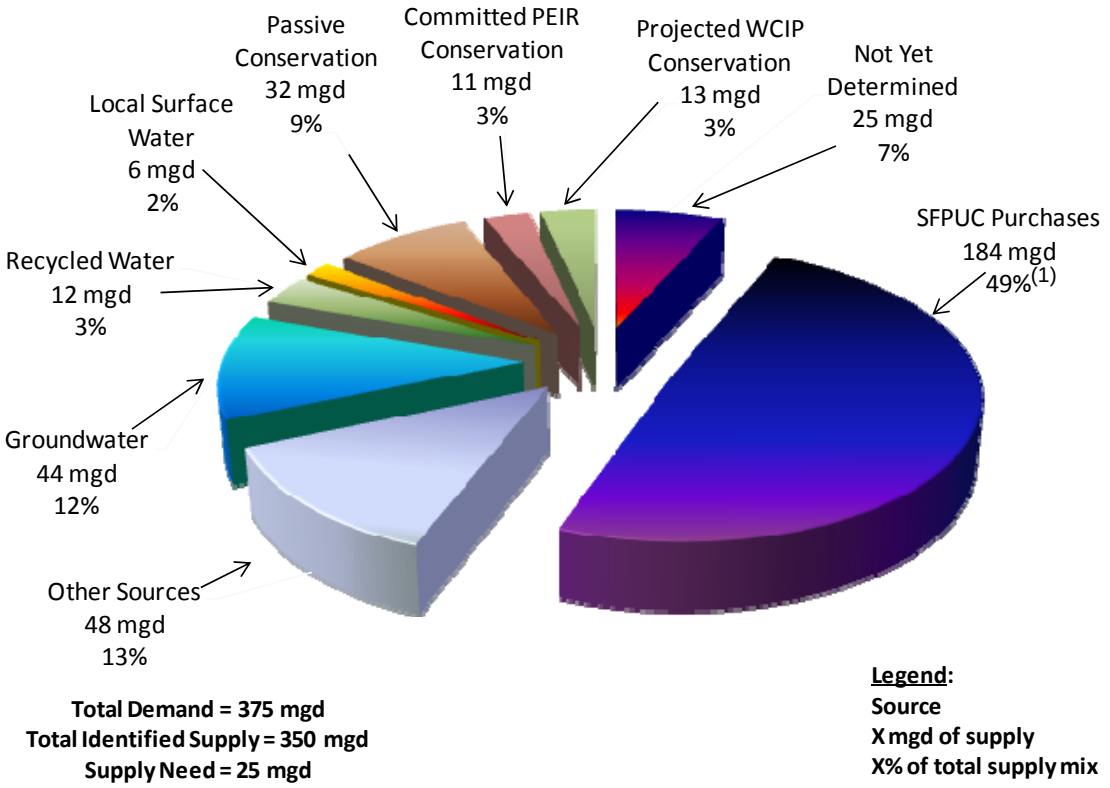


Figure 2-5
BAWSCA Projected 2018 Supply Mix During Drought Conditions

2.4.4 Projected 2035 Supply Mix

Based on information collected for the BAWSCA annual report and information provided by the member agencies, the projected future supply mix to meet the projected 2035 demand of 375 mgd is shown in Figure 2-6. The projected water supply portfolio (i.e., the volumes and sources of supply) for the individual BAWSCA member agencies for 2035 is also presented in Table A-4 of Appendix A.

In most cases, the BAWSCA member agencies are projecting to increase their use of recycled water, SFPUC supply and groundwater, as well as increase their conservation savings. However, approximately 25 mgd of supply is noted in Figure 2-6 as "Not Yet Determined." This component of supply represents the projected supply needed to meet 2035 demands in normal years after all currently known and projected supplies are accounted for. If San Jose and Santa Clara receive their contract amount of 9 mgd from the SFPUC through 2035, the supply identified as "Not Yet Determined would be reduced to 16 mgd. San Jose and Santa Clara have temporary and interruptible contracts with SFPUC to purchase water with a limit of 9 mgd between the two agencies until 2018.



(1) Total SFPUC Purchases projected for 2035 exceed 184 mgd by a small margin. For purposes of this figure, SFPUC purchases have been capped at 184 mgd and the difference has been added to the "Not Yet Determined" category.

Figure 2-6
BAWSCA Projected 2035 Supply Mix During Normal Year Conditions

Figure 2-7 shows the projected water supply mix for 2035 during assumed 20% drought conditions where SFPUC supply to BAWSCA member agencies is reduced by up to 28% (51.5 mgd). Under this drought scenario, there is up to 76 mgd of additional supply that may be needed by 2035 to meet 100% of projected demands and to fully offset the 28% reduction in SFPUC supply. If member agencies choose a reduced level of service (require some level of customer rationing) during a drought of this magnitude, then the amount of additional supply needed in 2035, as in 2018, would be less.

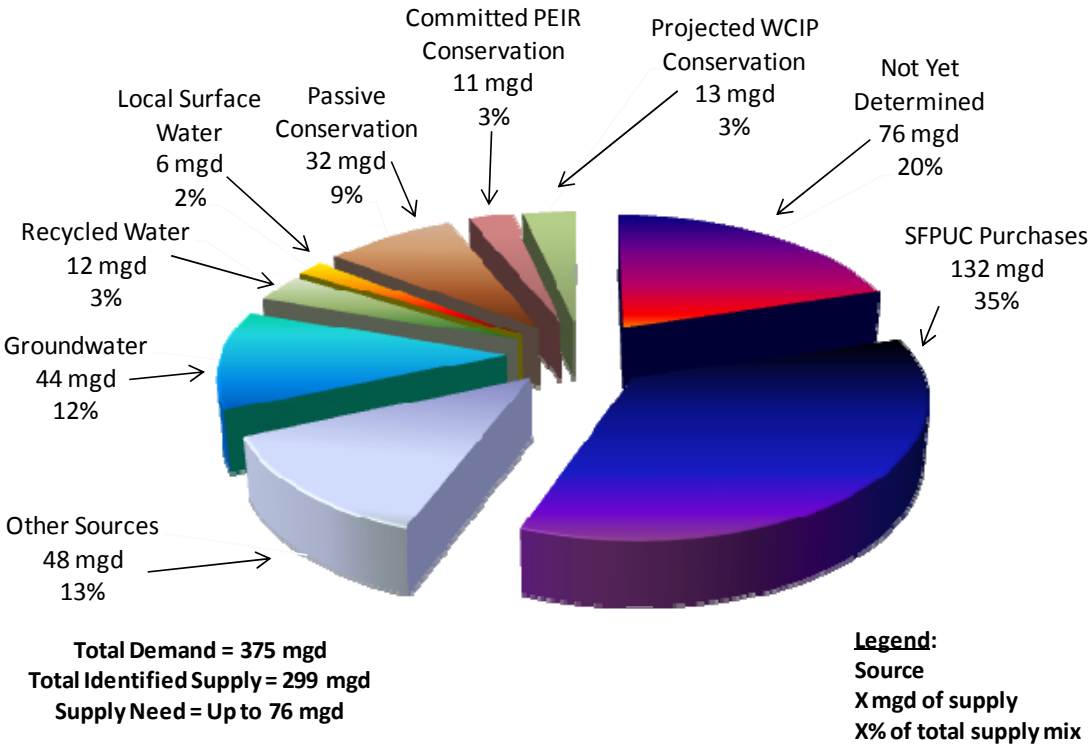


Figure 2-7
BAWSCA Projected 2035 Supply Mix during Drought Conditions

2.5 Projected Water Supply Need

This section compares the projected future supplies to demands and identifies the timing, magnitude, and consequences of future water supply shortfalls.

Figure 2-8 presents a comparison of the estimated normal year demand and supply through 2035. As can be seen in Figure 2-8, as BAWSCA agency demands increase, the additional supply need will reach up to 25 mgd in normal years by 2035, even

after accounting for conservation savings, and assuming that the availability of other local and non-SFPUC supplies does not change from current normal year projections.[6]

During a drought, the SFPUC supplies available to the BAWSCA member agencies are subject to reduction. In a 20% system-wide reduction, the maximum level of drought reduction assessed by the SFPUC, the BAWSCA agencies will be cutback an estimated 52 mgd or approximately 28% (City and County of San Francisco and Wholesale Customers 2009). Figure 2-8 shows the effect of these reductions in the context of historical and projected SFPUC purchases.

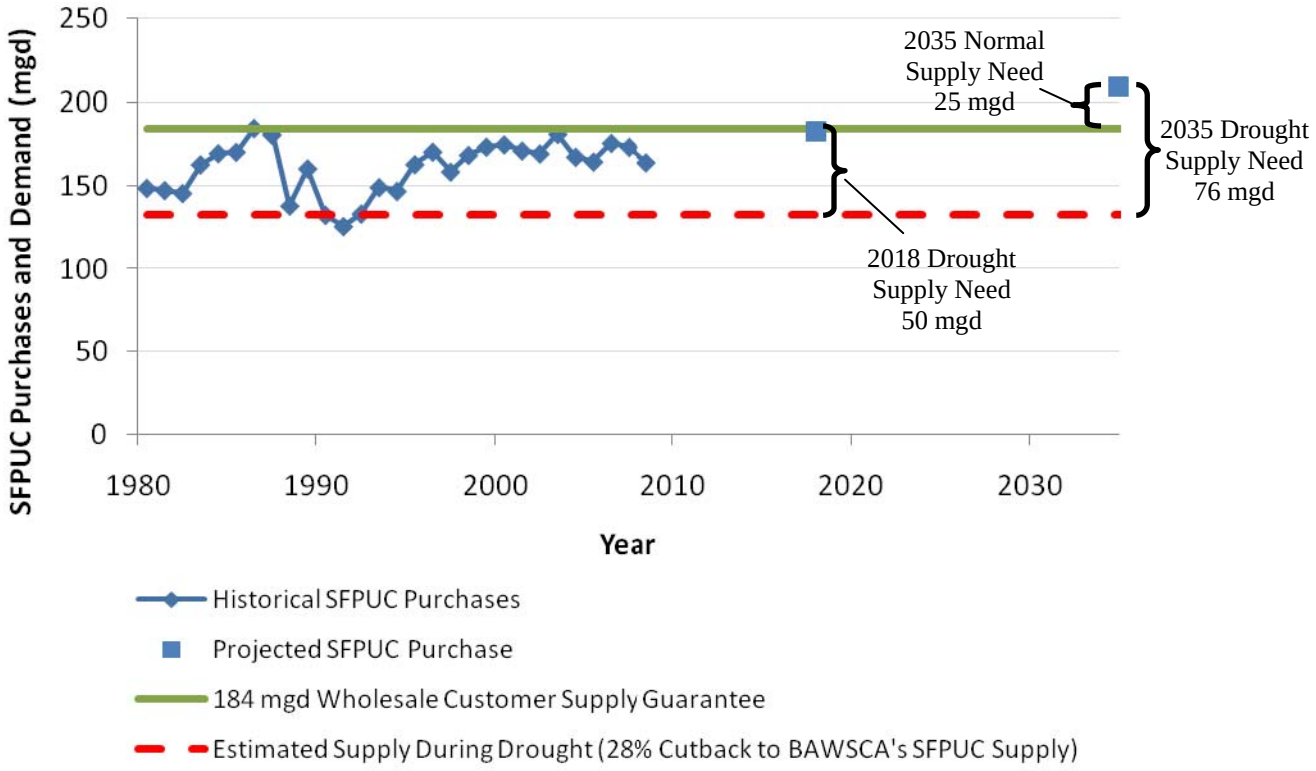


Figure 2-8
Historical BAWSCA Purchases of SFPUC Supply, Projected SFPUC Purchases, Wholesale Customer Supply Guarantee, and Estimated SFPUC Supply During Drought

Figure 2-8 shows a range of expected supply need, in 2018 and 2035, respectively, and accounting for various supply conditions. Additionally, if San Jose and Santa Clara receive their SFPUC contract amount of 9 mgd under these future conditions, the

[6] The estimated supply need presented in this analysis assumes that projections of non-SFPUC supplies do not change with drought. The Strategy does not address drought impacts on these supplies.

aggregate supply need for the BAWSCA member agencies would be reduced[7]. Appendix A provides additional detail on the information on supply need by member agency.

Table 2-2 presents the 2018 and 2035 total demand, supply mix under normal and drought conditions, and the resulting supply need.

Table 2-2
Summary of Demand, Projected Supplies, and Supply Need

	2018		***2035***	
	Normal Year Conditions (mgd)	***Drought Conditions (mgd)***	***Normal Year Conditions (mgd)***	***Drought Conditions (mgd)***
Total Demand	315	315	375	375
Passive Conservation	16	16	32	32
Committed PEIR Conservation	9	9	11	11
Projected WCIP Conservation	8	8	13	13
Net Demand(1)	281	281	320	320
Supplies				
Groundwater	40	40	44	44
Local Surface Water	6	6	6	6
Recycled Water	11	11	12	12
Other Sources	42	42	48	48
SFPUC Purchases	183	132	184	132
Total Supplies(1)	281	231	295	243
Supply Need	0	50	25(2)	76(2)

(1) Due to rounding of demand, conservation, and supply estimates, net demand and total supplies do not equal the sum of demand and supply components, respectively.

(2) Due to rounding of supply estimates, total supplies, including supply need, do not equal total demands. The 2035 supply need will range from 16-25 mgd under normal year conditions, and 67-76 mgd during drought conditions, depending upon whether San Jose and Santa Clara receive their SFPUC contract amount of 9 mgd.

It should be noted that although the focus of the Strategy is on augmenting the SFPUC supply to meet the projected increase in water demands and to increase normal and dry year reliability, it is anticipated that the effects of climate change, regulatory changes, and drought on the local and Delta supplies for some of the BAWSCA members could increase the total regional supply need during future normal and drought years. At this time, it is assumed that any reductions in other non-SFPUC supplies will be addressed by the individual BAWSCA member agencies, or the other regional supply agencies (e.g., SCVWD).

[7] San Jose and Santa Clara have temporary and interruptible contracts with SFPUC to purchase water with a limit of 9 mgd between the two agencies. Estimates of supply need may change based on the status of this contract.

2.5.1 2018 Supply Need

Based on current projections, and assuming full implementation of the identified water conservation programs, the aggregate supplies in 2018 within the BAWSCA service area will be sufficient to meet customer demand. However, the demand of some BAWSCA member agencies for SFPUC supplies already exceeds their contractual allocations (i.e., their Individual Supply Guarantees) and several others will find themselves in a similar situation by 2020, even with conservation savings.

Based on current projections, drought shortfalls from the SFPUC system will create a supply need of up to 50 mgd by 2018. However, if member agencies choose a reduced level of service (require some level of customer rationing) during a drought of this magnitude, then the projected supply need would be less. The Phase II effort will explore the tradeoffs between the costs of developing new supplies to meet different level-of-service goals and the economic and social impacts of not meeting different portions of the projected demands during droughts.

2.5.2 2035 Supply Need

Based on current projections, and assuming full implementation of the identified water conservation programs, the supply need within the BAWSCA service area will be up to 25 mgd by 2035 under normal conditions. If San Jose and Santa Clara receive their contract amount of 9 mgd from the SFPUC through 2035[8], the supply need would be reduced to 16 mgd. In this scenario, projected SFPUC purchases in 2035 would equal 193 mgd, as compared to the 184 mgd shown in Figures 2-6 and Table 2-2.

Based on current projections, drought shortfalls from the SFPUC system will increase the supply need to up to 76 mgd by 2035 during droughts to meet 100% of projected demands and to fully offset the 28% reduction in SFPUC supply. The drought supply need would be reduced to 67 mgd in 2035 if San Jose and Santa Clara receive their contract amount of 9 mgd from the SFPUC. Furthermore, if member agencies choose a reduced level of service (require some level of customer rationing) during a drought of this magnitude, then the projected supply need would be less.

[8] San Jose and Santa Clara have temporary and interruptible contracts with SFPUC to purchase water with a limit of 9 mgd between the two agencies until 2018.

Section 3

The Consequences of Supply Shortfalls are Regional and Severe

Section 3
The Consequences of Supply Shortfalls are Regional and Severe

As demonstrated in Section 2, the water demand of the BAWSCA agencies is projected to exceed supply (i.e., there will be a supply shortfall) during normal years as early as 2020. During drought years, the supply shortfall is even greater with respect to the projected demand. The consequences of supply shortfalls can be severe and have a regional impact on residences and businesses served by the BAWSCA member agencies. This section summarizes the potential impacts of supply shortfalls, both on individual agencies and the BAWSCA region, and discusses how the Strategy will address water supply need to reduce the projected supply shortfalls on both a local and regional scale.

3.1 Potential Impacts of Projected Supply Shortfalls in Future Normal Years

Without sufficient water supplies to meet projected future normal year demands, residential and economic development could be curtailed within the BAWSCA service area and potentially relocated to other parts of the State or elsewhere. This could result in loss of new housing, jobs, manufacturing, and community services.

Potential impacts from long-term, normal year water supply shortfalls are summarized below:

- *Growth Restrictions/Moratoriums* – Pursuant to SB 610 and Assembly Bill 221, Water Supply Assessments are now required for large-scale developments to ensure that an adequate long-term supply is available to meet the needs of the proposed development project and the other projected water needs within the water supplier's service area. Without a sufficient and reliable water supply, BAWSCA member agencies may not be able to provide water to, or approve, new commercial, industrial, or residential developments. Restrictions and/or moratoriums on development could have a negative impact on a cities' economic health as potential commercial and industrial interests move elsewhere to expand.

- *Increasing Water Costs* – Increases in water rates may be used to encourage the efficient use of water as supplies become limited in the future. This burden may prove difficult given the demand hardening resulting from ongoing conservation measures in the residential sector.

- *Other Economic Impacts* – Loss of commercial or industrial customers due to the restriction of growth would create a loss of jobs associated with those customers. The loss of jobs may negatively impact the amount of consumer spending in a region, potentially affecting more commercial and industrial customers.

3.2 Potential Impacts of Projected Supply Shortfalls in Future Drought Years

In addition to the issues discussed in Section 3.1 with respect to future normal year supply shortfalls, if the water supplies that are available to the BAWSCA member agencies currently and in the future are not reliable and are subject to drought cutbacks, existing as well as future customers will be increasingly affected. Water supply cutbacks, when they occur, have significant economic and lifestyle impacts to residents and businesses. In addition, drought shortage conditions can last several years, compounding the impacts and increasing the hardship on an agency's customers. Many of the technology companies located within the BAWSCA service area, including biotechnology, are critically dependent on a reliable, high-quality supply of water.

Potential impacts from water supply shortfalls caused by short-term, drought conditions are summarized below:

- *Economic Impacts* – The potential economic impacts that result from a shortage of water supply during drought periods typically include the levying of fines and penalty rates on customers for excess water use, a reduction of commercial and industrial business markets due to reductions in water supply and the increased cost of water, and costs associated with needing to rehabilitate landscaping that has been affected by drought. The impact of a 20% water supply deficiency on computer/electronics products, food and beverage, and biotechnology industries in the BAWSCA service area is estimated at nearly $7.7 billion per year, for each year that the drought persists (Wade 2007).

- *Behavioral Impacts* – In order to implement water use reductions, behavioral changes may be mandated, including establishing limits on indoor and outdoor water use (e.g., restricting landscape irrigation) and strict water rationing for non-essential water uses.

The impact of a water supply shortage, under both normal and drought conditions, on a particular BAWSCA member agency may depend on the mix of water use sectors (e.g., residential, commercial, and industrial) that the member agency serves. As conservation measures are implemented, residential demand becomes more difficult to reduce due to demand hardening. Commercial and industrial customers may not be able to endure a lengthy shortage of supply. Although water is a relatively small cost factor for most commercial and industrial customers, the availability of a reliable supply of water is critical to many of them (SFPUC 2007).

3.3 Supply Shortfalls are a Regional Issue

The water supply challenges faced by the BAWSCA member agencies are regional and not limited to individual cities or water districts. The severity of the potential drought impact to commercial and industrial sectors could cause relocation of

business for whom a reliable water supply is critical. This loss of industrial base would undoubtedly weaken the regional economy.

Furthermore, the residents and voters in one community often work or own businesses in another community within the BAWSCA service area. Therefore, a future normal year or drought year water supply shortfall in one BAWSCA agency that results in loss of jobs or other impacts can have a detrimental effect on the customers of another BAWSCA agency, even if that agency itself is not facing a supply shortfall.

Data on live-work relationships for individual cities is rarely available. However, the Metropolitan Transportation Commission (MTC), based in Oakland, CA, has developed transportation load forecasts for Bay Area counties out to a 2035 planning horizon. Using socioeconomic development data provided by ABAG and a transportation model of the Bay Area, the MTC has estimated cross-county commutes from 2010 to 2035. Although a large portion of jobs within the Alameda, San Mateo, and Santa Clara Counties are staffed by employees who reside within the same county (68%, 53%, and 83% in 2010, respectively), a significant number of jobs are staffed by employees who reside in other counties and specfically the other counties that include BAWSCA member agencies. Commute traffic between these three counties make up 11% to 31% of the out-of-county travel. Furthermore, this trend is expected to continue out to the 2035 planning horizon. Table 3-1 summarizes the percentage of commuting traffic between the three counties.

Table 3-1
Commuter Traffic Projections for
San Mateo, Santa Clara and Alameda Counties

Residence County (Travel From)	***Work County (Travel To)***	***Projections Based on ABAG Socio-Economic Data and MTC Travel Models***					
		2010	***2015***	***2020***	***2025***	***2030***	***2035***
Origin of Commutes into Alameda County (%)							
San Mateo	Alameda	2	2	2	2	2	2
Santa Clara	Alameda	9	9	9	8	7	7
Alameda	Alameda	68	68	68	69	70	71
Other	Alameda	21	21	21	21	21	20
Origin of Commutes into San Mateo County (%)							
San Mateo	San Mateo	53	54	55	57	57	57
Santa Clara	San Mateo	20	20	20	17	16	16
Alameda	San Mateo	11	11	10	10	10	10
Other	San Mateo	16	15	15	16	17	17
Origin of Commutes into Santa Clara County (%)							
San Mateo	Santa Clara	6	6	5	6	6	5
Santa Clara	Santa Clara	83	83	85	83	83	83
Alameda	Santa Clara	8	8	8	8	8	8
Other	Santa Clara	3	3	2	3	3	4

Source: MTC 2008.

3.4 Addressing Local vs. Regional Supply Shortages in the Strategy

The Strategy is designed to address the normal and drought year water supply shortages faced by the BAWSCA member agencies on both regional and individual agency levels. To ensure that the water supply management projects that are recommended as a result of the Strategy take advantage of both local and regional demand and opportunities, the following considerations will be incorporated into the Phase II evaluation:

- Both the aggregate and individual supply need of the BAWSCA member agencies for normal and drought conditions will be updated as part of Phase II.

- Existing, planned, and potential member agency projects that may impact a member agency's individual supply need will be updated to advance projects to a common level of information. Potential agency projects that could provide a regional benefit will also be included.

- Although the aggregate supply need will be considered in the development of preliminary water supply portfolios evaluated as part of Phase II, these portfolios will be refined during subsequent iterations so that the supply needs of individual member agencies are met with minimal additional infrastructure.

- Emergency interties between member agencies, and the existing SFPUC infrastructure, may be included as regional opportunities for transfer of surplus water supply.

This process will result in developing recommended water supply management projects and portfolio(s) that best meets the future supply needs of all BAWSCA member agencies in both normal and drought conditions. More detail on the tasks included in the Phase II evaluation is available in the scope summary presentation in Section 8.

Section 4

A Variety of Potential Water Supply Management Projects are Available to Meet the Supply Need

Section 4
A Variety of Potential Water Supply Management Projects are Available to Meet the Supply Need

This section summarizes the water supply management projects (projects) that could potentially be used by BAWSCA and the BAWSCA member agencies to meet the normal and/or drought supply needs identified in Section 2. These projects represent the building blocks for the water supply management portfolios (portfolios) that will be developed and evaluated in Phase II of the Strategy. Appendix B presents detailed information regarding the projects summarized herein.

4.1 Overview of Water Supply Management Projects

4.1.1 Principle and Approach to Identifying Projects

The initial inventory of possible projects to be evaluated in Phase II was developed based on the following principle:

> *"The Strategy will not result in any uncompensated or involuntary reallocation of agency assets."*

The following approach was then used to develop the initial project inventory:

- An initial project list was compiled based on review of BAWSCA member agency 2005 UWMPs[1] and other publically-available documents (many of which are more than five years old);
- Based on the document review, projects that could be potentially be developed to create a new sources of supply were identified;
- Based on the document review, potential projects were identified where either there appeared to be the potential to increase project yield beyond what an agency had planned to meet its own needs, or where the project timeline could potentially be accelerated to bring the supply online sooner than currently planned; and
- BAWSCA member agencies removed, added, and updated projects to be evaluated in Phase II of the Strategy. Projects that will not be evaluated were removed from the inventory by member agencies.

[1] Brisbane, Guadalupe Valley Municipal Improvement District, Purissima Hills Water District, Skyline County Water District (now part of California Water Service Company [Cal Water]), and Stanford University did not complete UWMPs due to their small service areas.

4.1.2 Project Classification

The projects are categorized based on the source of water. These potential sources include groundwater, recycled water, water transfers, surface water and reservoirs, desalination, expanded conservation, and localized water capture and reuse.

Figure 4-1 presents which source types provide potable and/or non-potable supply, have the ability to meet normal or drought year demands, and are located within or outside the BAWSCA service area. Some source types, based on the specific projects being evaluated, span both categories. For example, a groundwater source could be classified as a potable or a non-potable source, depending on whether it will be used as a drinking water supply or for non-potable irrigation. Potential projects will be evaluated for both normal and drought condition yield as it is possible for most projects to operate during both conditions.

Furthermore, potential projects are classified based on their existing level of study and their location, two characteristics critical to understanding how to incorporate projects into the long-term Strategy. Each project has therefore been classified as one of four types:

- *Existing projects within the BAWSCA service area* that are under development by, or in partnership with, a BAWSCA member agency and that may have the potential to be expanded and/or to have the project timeline accelerated to either offset additional demand within the service area of the BAWSCA agency(ies) that is involved in the project, or to offset the demand of another BAWSCA agency(ies) through a sale, exchange, or transfer;

- *Planned projects within the BAWSCA service area* that have been identified by a BAWSCA member agency which may have the potential to be expanded and/or to have the project timeline accelerated to either offset additional demand within the service area of the BAWSCA agency(ies) that is involved in the project, or to offset the demand of another BAWSCA agency(ies) through a sale, exchange, or transfer;

- *Potential future new projects within the BAWSCA service area* that have not been specifically identified by a BAWSCA member agency to date, but that may have the potential to be developed to either offset additional demand within the service area of the BAWSCA agency(ies) that is involved in the project, or to offset the demand of another BAWSCA agency(ies) through a sale, exchange, or transfer; and

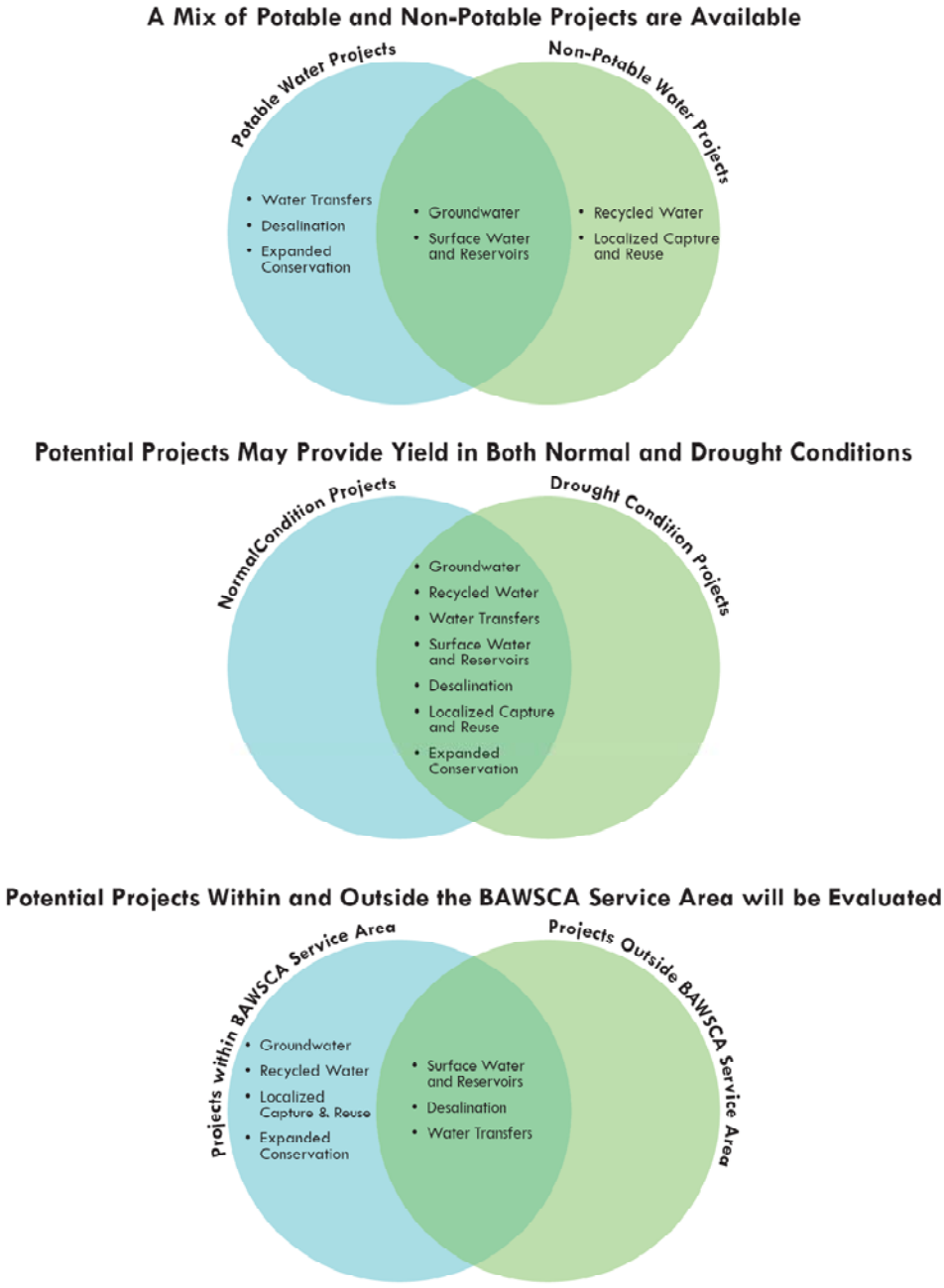


Figure 4-1
Water Supply Management Project Classifications

- *Existing, planned, or potential projects outside the BAWSCA service area* that may have the potential to be developed, to be expanded, or to have the project timeline accelerated to offset the demand of a BAWSCA agency(ies) through a sale, exchange, or transfer.

4.2 Water Supply Management Projects to be Evaluated in Phase II

Projects under consideration for each supply source (i.e., groundwater, recycled water, water transfers, surface water and reservoirs, desalination, expanded conservation, and localized water capture and reuse) are described below. Each subsection includes a table summarizing the existing, planned, and potential local and regional projects based on whether there is potentially an opportunity to:

- Augment local supply (local projects that increase water supply for the sponsoring member agency);
- Develop regional benefits (local projects that could be expanded to provide a water supply benefit for more than one member agency and projects outside the BAWSCA service area that have the potential to serve one or more member agencies); and/or
- Accelerate the project development schedule to meet an identified need[2].

The projects identified for consideration in Phase II vary in terms of the level of information that is currently available for each project. Consequently, some of the projects (e.g., water transfers and desalination[3]) are presented for consideration at a broad, conceptual level, with refined development anticipated in Phase II. Other alternatives are presented in terms of specific projects that have undergone some preliminary development and analysis by BAWSCA agencies or others. Before the projects are evaluated in Phase II, a more detailed investigation will need to be performed to develop a common level of information to allow comparison of the projects within each of the supply source groups and across the groups. It is assumed that projects moving forward in Phase II will require approval and collaboration with the owning agency, and any agency potentially affected by the project's implementation. One of the first tasks in Phase II A involves working with individual agencies to better define the existing, planned, and potential projects moving forward. This effort is described in Section 8, Phase II – Summary Scope of Work.

[2] Generally, the potential projects not specifically identified by a member agency and projects without sufficient definition were not identified as having potential for schedule acceleration.

[3] Water transfers and desalination projects have multiple components including supply source and location, conveyance, and distribution system connection point which will need more detailed evaluation in Phase II.

Appendix B includes more information on each of projects discussed in the following tables, including the currently-available data regarding project yield, schedule, and costs.

4.2.1 Groundwater Projects

Table 4-1 summarizes the groundwater projects to be evaluated in Phase II. These projects are further discussed in Appendix B (Section B.1). Many BAWSCA members currently use groundwater as an important component of their water supply portfolios. In most cases, these groundwater supplies are used to meet demand during both normal and drought years. Groundwater, if managed conjunctively with surface water sources, is a relatively drought-resistant supply and can meet both potable and non-potable water demands. If developed, a groundwater supply can also potentially be sold to, or exchanged with, other agencies in need.

Factors that affect the amount of existing and future groundwater capacity that can be developed and relied upon by a water supplier include hydrogeologic conditions, the basin safe yield, the volume of groundwater recharge, groundwater contamination, water quality, impacts of pumping on other groundwater users, potential impacts of land subsidence, and cost.

The timeframes for bringing the identified groundwater projects online varies widely. Some agencies identified near-term installation of additional wells or rehabilitation of existing wells, while others planned for increased groundwater yields to be achieved by 2030.

Table 4-1
Existing, Planned, and Potential Groundwater Projects to be Evaluated in Phase II

Agency	*Potential Water Supply Management Project Description*	*Potential Project Benefit*		
		Augment Local Supply	*Develop Asset for Regional Benefit[1]*	*Accelerate Schedule [2]*
Existing Groundwater Projects Within the BAWSCA Service Area				
Cal Water	Construct 4 wells for Cal Water's portion of the Regional Groundwater Storage & Recovery Project.[3, 4]	X	X	Both
Daly City	Construct 5 wells for Daly City's portion of the Regional Groundwater Storage & Recovery Project. [3, 4]	X	X	Both
East Palo Alto	Rehabilitate existing Gloria Bay well (currently out of service, 350 gallons per minute [gpm] capacity) and install new wells for combined supply of 1,136 acre-feet per year (AFY).[5]	X	--	Local
Milpitas	Convert use of Pinewood well from emergency only supply to normal supply.[6]	X	--	NA
Palo Alto	Rehabilitate 5 existing wells and construct 3 new wells, with a total sustainable yield of 500 AFY.	X	X	Both
San Bruno	Construct 3 wells for San Bruno's portion of the Regional Groundwater Storage & Recovery Project.[3, 4]	X	X	Both
Sunnyvale	Convert 2 standby wells to normal year supply.[7]	X	X	NA
Planned Groundwater Projects Within the BAWSCA Service Area				
Cal Water	Locate 3 sites for test wells to explore feasibility and capacity for augmenting local supply in Mid-Peninsula District.[8]	X	--	Local

Table 4-1
Existing, Planned, and Potential Groundwater Projects to be Evaluated in Phase II

Agency	***Potential Water Supply Management Project Description***	***Potential Project Benefit***		
		Augment Local Supply	***Develop Asset for Regional Benefit[1]***	***Accelerate Schedule [2]***
Daly City	Construct additional wells for emergency supply.[9]	X	--	Local
Menlo Park	Construct additional wells for emergency use [10]	X	--	Local
Mountain View	Complete 3 well rehabilitation projects by 2015.	X	--	NA
San Jose	Construct 2-3 additional wells by 2025.[11]	X	X	Both
Planned Groundwater Projects Within the BAWSCA Service Area (continued)				
Santa Clara	Increase supply through construction of 2 new wells (#32 and #34) for potential yield of 800 to 1,190 AFY (depending upon use factor). [12]	X	X	Both
Sunnyvale	Construct new wells to provide normal year supply.[7]	X	X	NA
Potential Groundwater Projects Within the BAWSCA Service Area				
Cal Water	Increase scope of groundwater investigation based on test wells to augment local supply in Mid-Peninsula District (see Cal Water entry under "Planned Groundwater Projects").	X	X	NA
Daly City	Increase yield of planned emergency wells for normal year supply (see Daly City entry under "Planned Groundwater Projects").	X	X	NA
East Palo Alto	Increase yield of new wells for normal year supply beyond 1,136 AFY (see East Palo Alto entry under "Existing Groundwater Projects").	X	X	NA
Hayward	Upgrade current emergency wells to normal year supply, up to 8,100 AFY.	X	X	NA
Menlo Park	Construct wells for normal year supply.[13]	X	X	NA
	Upgrade emergency wells to supplement normal year supply (see Menlo Park entry in "Planned Groundwater Projects").	X	X	NA
	Construct wells for irrigation supply.	X	--	NA
Milpitas	Convert Curtis well from emergency supply to normal supply.	X	X	NA
Mountain View	Convert 8 emergency wells to normal year supply; increase extraction to historic pumping rate of 1,000 AFY.	X	X	NA
Palo Alto	Convert existing or planned emergency wells to normal year supply (see Palo Alto entry under "Existing Groundwater Projects").	X	X	NA
Redwood City	Construct network of wells for normal year supply of 500 to 1,000 AFY.[14]	X	--	Local
	Increase supply from planned wells beyond 1,000 AFY.	X	X	NA
San Bruno	Increase supply beyond that proposed by Regional Groundwater Storage & Recovery Project	X	X	NA
San Jose	Increase supply from planned new wells (see San Jose entry under "Planned Groundwater Projects").	X	X	NA
Santa Clara	Increase supply from planned wells beyond 1,190 AFY (see Santa Clara entry under "Planned Groundwater Projects").	X	X	NA
Stanford	Increase use of existing wells for non-potable supply.	X	--	NA

Table 4-1
Existing, Planned, and Potential Groundwater Projects to be Evaluated in Phase II

Agency	Potential Water Supply Management Project Description	Potential Project Benefit		
		Augment Local Supply	Develop Asset for Regional Benefit[1]	Accelerate Schedule [2]
Potential Groundwater Projects Within the BAWSCA Service Area (continued)				
Sunnyvale	Expand use of converted or new wells for normal year supply (under "Existing Groundwater Projects" and "Planned Groundwater Projects".)	X	X	NA

(1) Projects that provide "regional benefit" could be local projects that could be expanded to provide a water supply benefit for more than one member agency or projects outside the BAWSCA service area that have the potential to serve one or more member agencies. In order for multiple agencies to be involved, agreements (cost, schedule, etc.), conveyance, and water quality issues may have to be addressed as part of Phase II of the Strategy.

(2) Opportunity exists to accelerate the schedule for the "local" or "regional" benefit, or "both". "NA" = Not Available, project is too ill-defined to make a determination.

(3) Source: SFPUC 2009b

(4) Source: SFPUC 2009c

(5) Source: City of East Palo Alto 2005

(6) Source: City of Milpitas 2005

(7) Source: City of Sunnyvale 2005

(8) Source: Cal Water 2007

(9) Source: City of Daly City 2005

(10) Source: Ekers 2009

(11) Source: City of San Jose 2005

(12) Source: City of Santa Clara Utility 2005

(13) Source: City of Menlo Park 2005

(14) Source: City of Redwood City 2005

4.2.2 Recycled Water Projects

Recycled water is a drought-resistant supply that, if treated to appropriate standards (i.e., Title 22 standards[4]), can meet non-potable water demands such as irrigation, industrial use, environmental restoration, and agriculture. Factors that affect the amount of recycled water that can practicably be developed at a given wastewater treatment plant (WWTP) include the volume of available wastewater supply, treatment capacity, water quality, total amount and location of demand, cost, public acceptance, and seasonal storage requirements.

Entities that participate in recycled water projects are able, or are planning, to offset their current and future potable water use by supplying recycled water to their customers. This "potable water offset" with a drought-resistant recycled water supply is a mechanism that these agencies can use to augment the reliability of their existing potable supplies. Excess recycled water supply, if developed, can potentially be sold to, or exchanged with, other agencies to offset their potable water demands. Such an exchange could occur between different BAWSCA member agencies, benefitting both the agencies and BAWSCA as a whole.

[4] Potential uses listed assume wastewater is treated to California Title 22 disinfected tertiary recycled water standards. With advanced levels of wastewater treatment, indirect potable reuse could be feasible.

The high reliability of recycled water supplies and the relatively high costs for developing these projects typically mean an agency is doing so to satisfy long-term, non-potable demands. As such, for purposes of this analysis, all recycled water projects identified for evaluation in Phase II are assumed to provide non-potable supply during both normal and drought conditions, and are not anticipated to be developed only to address drought cutbacks.

Table 4-2 summarizes the recycled water projects identified for evaluation in Phase II. Some of these projects are expansions of existing recycled water facilities, which could occur in the near- to medium-term, and others are construction of new facilities and distribution systems, which could have a longer implementation timeframe. These projects are further discussed in Appendix B (Section B.2).

Table 4-2
Existing, Planned, and Potential Recycled Water Projects to be Evaluated in Phase II

Agency	***Potential Water Supply Management Project Description***	***Potential Project Benefit***		
		Augment Local Supply	***Develop Asset for Regional Benefit[1]***	***Accelerate Schedule [2]***
Existing Recycled Water Projects Within the BAWSCA Service Area				
Mountain View	Increase recycled water purchases from the Palo Alto Regional Water Quality Control Plant (RWQCP) to 2030 projected demand of 1,800 AFY.[3]	X	X	Both
	Extend Mountain View Recycled Water Project to Sunnyvale.[3]	X	X	NA
	Extend Mountain View Recycled Water Project to Los Altos.	X	X	NA
North Coast County Water District (NCCWD)	Increase recycled water use by 170 AFY in joint project with SFPUC and Pacifica. [4]	X	--	Local
Palo Alto	Expand City's recycled water plant to serve beyond 900 AFY [5]	X	X	Both
Redwood City	Make the City's current excess treatment plant capacity (1.8 mgd) from the City/South Bayside System Authority (SBSA) recycled water plant available to outside agencies. [6]	--	X	Regional
San Jose	Increase recycled water use from South Bay Water Recycling (SBWR) by 1,950 AFY by 2030. [7]	X	X	Both
Santa Clara	Increase recycled water use through expansion of SBWR. [8]	X	X	Both
Sunnyvale	2,675 AFY of additional recycled water service from City's WWTP planned by 2028; increasing to 6,188 AFY by 2035. [9]	X	X	Both
Planned Recycled Water Projects Within the BAWSCA Service Area				
ACWD	Implement Phase 1 of 1999 Master Plan, serving 1,600 AFY of recycled water by 2020. [10]	X	X	Both
	Implement Phase 2 of 1999 Master Plan, serving an additional 1,000 AFY of recycled water by 2030.[10]	X	X	Both
Cal Water	Implement joint, two-phase recycled water project with Cities of South San Francisco and San Bruno, and SFPUC, for a total supply of 1,730 AFY. [11]	X	X	Both
Coastside	Develop recycled water project with Sewer Authority Mid-Coastside to serve 600 AFY for landscaping demand. [12]	X	--	Local
	Increase yield of recycled water project to 2,240 AFY (annual average). [13]	X	X	Both

Table 4-2
Existing, Planned, and Potential Recycled Water Projects to be Evaluated in Phase II

Agency	***Potential Water Supply Management Project Description***	***Potential Project Benefit***		
		Augment Local Supply	***Develop Asset for Regional Benefit[1]***	***Accelerate Schedule[2]***
East Palo Alto	Develop scalping plants for landscape irrigation and street sweeping for potential demand of 450 AFY. [14]	X	--	Local
Hayward	Construct new recycled water plant to deliver up to 4,600 AFY. [12, 15, 16]	X	X	Both
Millbrae	Build 1 mgd treatment plant at the City's WWTP to serve recycled water. [17]	X	X	Both
NCCWD	Increase recycled water yield by 115 AFY.	X	--	NA
Potential Recycled Water Projects Within the BAWSCA Service Area				
ACWD	Increase recycled water use beyond use estimated in 1999 Master Plan (see ACWD entry under "Planned Recycled Water Projects").	X	X	NA
Cal Water	Increase recycled water use beyond current plans with San Bruno, South San Francisco, and SFPUC (see Cal Water entry under "Planned Recycled Water Projects").	X	X	NA
Coastside	Increase recycled water use beyond 2,240 AFY (see Coastside entry under "Planned Recycled Water Projects").	X	X	NA
Daly City	Increase recycled water use to meet treatment plant capacity of 3,100 AFY (currently under development [19]).	X	X	NA
East Palo Alto	Expand scalping plants to serve recycled water beyond 450 AFY (see East Palo Alto entry under "Planned Recycled Water Projects").	X	X	NA
Hayward	Construct larger plant to supply recycled water above 4,600 AFY planned for power plant project (see Hayward entry under "Planned Recycled Water Projects"). The distribution system would need to be expanded, possibly to higher elevations, in order to secure a customer base.	X	X	NA
Millbrae	Expand new treatment plant to serve recycled water beyond planned 1 mgd capacity (see Millbrae entry under "Planned Recycled Water Projects").	X	X	NA
Mountain View	Increase use of Palo Alto recycled water above projected demand of 1,800 AFY (see Mountain View entry under "Existing Recycled Water Projects").	X	X	NA
NCCWD	Increase recycled water supply from joint project with SFPUC and Pacifica (see NCCWD entries under "Existing Recycled Water Projects" and "Planned Recycled Water Projects").	X	X	NA
Redwood City	Expand City/SBSA recycled water treatment plant capacity from 2.8 mgd to 8 mgd (current plant expansion capability). [6]	X	X	Both
San Bruno	Implement San Bruno phase of South San Francisco/San Bruno/SFPUC/Cal Water recycled water project for projected demand of 500 AFY. [11]	X	--	Local
San Francisco Airport Commission [18]	Increase recycled water use beyond 1,400 AFY (see San Francisco Airport Commission entry under "Planned Recycled Water Projects").	--	X	NA
Stanford University	Increase use of recycled water from cooling tower blowdown.	X	--	NA
	Develop a scalping plant for landscape and playfield irrigation. [19]	X	--	NA

Table 4-2
Existing, Planned, and Potential Recycled Water Projects to be Evaluated in Phase II

Agency	Potential Water Supply Management Project Description	Potential Project Benefit		
		Augment Local Supply	Develop Asset for Regional Benefit[1]	Accelerate Schedule[2]
Potential Recycled Water Projects Within the BAWSCA Service Area (continued)				
Sunnyvale	Increase recycled water from City's WWTP supply to make use of full treatment capacity (current flow averages 12.5 to 16.9 mgd) (see Sunnyvale entry under "Existing Recycled Water Projects").	X	X	NA

(1) Projects that provide "regional benefit" could be local projects that could be expanded to provide a water supply benefit for more than one member agency or projects outside the BAWSCA service area that have the potential to serve one or more member agencies. In order for multiple agencies to be involved, agreements (cost, schedule, etc.), conveyance, and water quality issues may have to be addressed as part of Phase II of the Strategy.
(2) Opportunity exists to accelerate the schedule for the "local" or "regional" benefit, or "both". "NA" = Not Available, project is too ill-defined to make a determination.
(3) Source: City of Mountain View 2005
(4) Source: BARWC 2009b
(5) Source: City of Palo Alto Utilities 2005
(6) Source: Ezell 2009
(7) Source: City of San Jose 2005
(8) Source: City of Santa Clara Water Utility 2005
(9) Source: City of Sunnyvale 2005
(10) Source: ACWD 2005
(11) Source: City of South San Francisco 2009
(12) Source: Brown and Caldwell 2009
(13) Source: Coastside County Water District 2005
(14) Source: City of East Palo Alto 2005
(15) Source: City of Hayward 2005
(16) Source: Baker 2010
(17) Source: City of Millbrae 2005
(18) Source: City of Daly City 2005
(19) Source: Stanford University 2003

4.2.3 Water Transfer Projects

There are number of water supply transfer projects that are potentially available to all of the BAWSCA member agencies to augment normal year demand, or to meet drought supply need. The types and reliability of these transfer projects vary considerably depending on the type of supply that is being transferred, the type of transfer that is being considered, when the water supply would be needed or available, and how the supply would be physically transferred to the BAWSCA service area.

Entities that participate in water transfer projects are able, or are planning, to increase their current and future potable and non-potable water supplies with a supply from outside their service area. In general, the water transfer projects under consideration are transfers of potable water supply, either as a non-physical transfer of SFPUC supply or other supplies between member agencies (i.e., "exchange transfers"), or physical transfers of potable supply from sources outside of the BAWSCA service area (i.e., "direct transfers"). However, for purposes of this analysis, water transfers may also include local transfers of non-potable supply (i.e., recycled water) between BAWSCA member agencies to meet a non-potable demand. In addition, any excess

supply generated by a water transfer can potentially be sold to, or exchanged with, other BAWSCA member agencies to increase the water supply of other agencies, benefitting both the agencies and BAWSCA as a whole.

The water transfer projects identified in Table 4-3 have been selected because there is potential that, if BAWSCA or one or more of the member agencies decided to pursue a water transfer project, additional potable water or non-potable supply could be made available (e.g., via sale, exchange or transfer) to a participating BAWSCA agency needing supply. Water transfers could be used to augment supply in both normal years and drought conditions. These opportunities will be further evaluated in Phase II. Refinement of the supply need for both normal year and drought conditions will inform which potential water transfer projects are focused on in the Strategy.

Table 4-3
Potential Water Transfer Projects to be Evaluated in Phase II

Agency	***Potential Water Supply Management Project Description***	***Potential Project Benefit***		
		Augment Local Supply	***Develop Asset for Regional Benefit[(1)]***	***Accelerate Schedule[(2)]***
Potential Water Transfer Projects Outside the BAWSCA Service Area				
Surface water diversions	Transfer of surface water rights from the Central Valley (SWP or CVP contract water or other water rights).	--	X	Regional
Stored Reservoir Water	Transfer of unused surface water stored in reservoirs that are not part of the SWP or CVP systems.	--	X	Regional
Groundwater Substitution & Stored Groundwater Purchase	Transfer or substitution of diversions from SWP, CVP, or other sources to stored groundwater by sellers, or transfer of groundwater assets from water previously stored in groundwater basin.	--	X	Regional
Crop idling/crop shifting	Transfer of surface water diversion or groundwater supply by reducing agricultural use through idling of crops, or shifting lower water use crops.	--	X	Regional
Agricultural conservation	Transfer of surface water diversion or groundwater supply through support of implementation of water conservation for agricultural and/or municipal and industrial use.	--	X	Regional

(1) Projects that provide "regional benefit" could be local projects that could be expanded to provide a water supply benefit for more than one member agency or projects outside the BAWSCA service area that have the potential to serve one or more member agencies. In order for multiple agencies to be involved, agreements (cost, schedule, etc.), conveyance, and water quality issues may have to be addressed as part of Phase II of the Strategy.

(2) Opportunity exists to accelerate the schedule for the "local" or "regional" benefit, or "both". "NA" = Not Available, project is too ill-defined to make a determination.

Appendix B (Section B.3) includes more information on supply sources and mechanisms for inter-agency transfers, and supply sources, storage requirements, conveyance requirements, and agreements necessary for out-of-service area water transfers.

4.2.4 Surface Water and Reservoir Projects

A limited number of BAWSCA member agencies currently utilize local surface water or reservoir supplies, in addition to SFPUC surface water, to help meet normal year demand, as well provide some benefit during droughts. In most cases, the surface water supplies managed by BAWSCA member agencies are captured from local creeks and treated to meet drinking water standards, or are used to help meet local irrigation demands. Due to the small watershed drainage areas, and limited storage, these supplies are relatively small.

Larger, regional reservoir projects located outside the BAWSCA service area have the potential for larger storage capacity to provide normal and drought year supply. However, in most cases, these projects have been identified to address specific supply needs for the agencies they currently serve. In addition, the source of the supply and ownership of the water that would be stored in the expanded reservoirs is an issue. Factors affecting the potential benefit for BAWSCA member agencies include supply ownership, yield, purchase cost, ability and cost to transfer these supplies to BAWSCA member agencies, and institutional and potential legal issues.

Entities that participate in surface water projects are able, or are planning, to increase their future potable water supply and to augment the reliability of their existing supplies. Excess supply, if developed, could potentially be sold to, or exchanged with, other agencies. Such an exchange could occur between different BAWSCA member agencies, benefitting both agencies and BAWSCA as a whole. Similarly, although it would be significantly more complicated, such an exchange could also occur between an entity outside the BAWSCA service area and BAWSCA and/or individual member agencies.

Table 4-4 identifies the surface water and reservoir project to be evaluated in Phase II. The high costs for developing projects of this type typically mean an agency is doing so to satisfy long-term demands. As such, for purposes of this analysis, the surface water project identified for evaluation in Phase II is assumed to provide potable supply during both normal and drought conditions, but is not anticipated to be developed only to address drought cutbacks. This project, and other reservoir projects not chosen for further evaluation in Phase II, is further discussed in Appendix B (Section B.4).

Table 4-4
Potential Surface Water and Reservoir Projects to be Evaluated in Phase II

Agency	Potential Water Supply Management Project Description[2]	Potential Project Benefit		
		Augment Local Supply	Develop Asset for Regional Benefit[1]	Accelerate Schedule[3]
Potential Surface Water and Reservoir Projects Outside the BAWSCA Service Area				
SFPUC/ Calaveras Reservoir	Potential reservoir expansion from 97 TAF to 420 TAF (total capacity), with an annual yield of 41 TAF (based on extended dry year supply).	--	X	NA

(1) Projects that provide "regional benefit" could be local projects that could be expanded to provide a water supply benefit for more than one member agency or projects outside the BAWSCA service area that have the potential to serve one or more member agencies. In order for multiple agencies to be involved, agreements (cost, schedule, etc.), conveyance, and water quality issues may have to be addressed as part of Phase II of the Strategy.

(2) TAF Capacity represents total capacity of project, in thousands of acre-feet.

(3) Opportunity exists to accelerate the schedule for the "local" or "regional" benefit, or "both". "NA" = Not Available, project is too ill-defined to make a determination.

4.2.5 Desalination Projects

Desalination is the process by which minerals are removed from water, most often used for converting seawater into potable water but also for rendering marginal quality supplies (e.g., brackish groundwater) into potable supplies. Over the last decade, membrane technology improvements and greater water resource pressures have caused desalination to advance significantly in degree of use and cost competitiveness. However, there are several technical and environmental issues that will affect the viability of desalination projects, including disposal of the concentrated brine resulting from the desalination process.

Table 4-5 identifies a number of local and regional desalination projects that could be used to meet normal system potable water demands and drought supply needs. These projects are in various stages of feasibility planning, evaluation, and pilot testing. These projects are further discussed in Appendix B (Section B.5).

Table 4-5
Potential Desalination Projects to be Evaluated in Phase II

Agency	Potential Water Supply Management Project Description	Potential Project Benefit		
		Augment Local Supply	Develop Asset for Regional Benefit[1]	Accelerate Schedule[2]
Potential Brackish Groundwater Desalination Projects Within the BAWSCA Service Area				
Dumbarton Bridge Area (west side)	Brackish Groundwater, 1 to 5 mgd.	X	X	Both
East Bay Saline Project (Bay Division Pipelines 1 & 2 at Dumbarton Point)	Brackish Groundwater, 1 to 5 mgd.	X	X	Both
NCCWD	Brackish Groundwater, 10 to 15 mgd.	X	X	Both
Potential Subsurface Slantwell Desalination Projects Within the BAWSCA Service Area				
Dumbarton Bridge Area (west side)	Seawater subsurface intake, 1 to 10 mgd.	X	X	Both
San Mateo Area	Seawater subsurface intake, 1 to 10 mgd.	X	X	Both

Table 4-5
Potential Desalination Projects to be Evaluated in Phase II

Agency	Potential Water Supply Management Project Description	Potential Project Benefit		
		Augment Local Supply	Develop Asset for Regional Benefit[1]	Accelerate Schedule[2]
Oyster Point	Seawater subsurface intake, 1 to 10 mgd.	X	X	Both
NCCWD	Seawater subsurface intake, 10 to 15 mgd.	X	X	Both
Potential Open Water Intake Desalination Projects Within the BAWSCA Service Area				
Dumbarton Bridge Area (west side)	Seawater open intake 1 to 40 mgd.	X	X	Both
San Mateo Area	Seawater open intake, 1 to 10 mgd.	X	X	Both
Oyster Point	Seawater open intake, 1 to 10 mgd.	X	X	Both
NCCWD	Seawater open intake, 10 to 15 mgd.	X	X	Both
Potential Desalination Projects Outside the BAWSCA Service Area				
Mirant Pittsburg (East Contra Costa County Pittsburg)[3]	Brackish Water open intake, 25 to 85 mgd.	X	X	Both
Delta Diablo Sanitation District[3]	Brackish Water open intake, yield to be determined	X	X	Both
Near Bay Bridge (east side)[3]	Seawater open intake, 40 to 85 mgd.	X	X	Both
Oceanside [3]	Seawater open intake, 20 to 85 mgd.	X	X	Both
San Francisco International Airport	Seawater open intake, yield to be determined	X	X	Both
Palo Alto RWQCP	Brackish Groundwater, less than 5 mgd.	X	X	Both
Donald Von Raesfeld (DVR) Energy Facility Pico Power Plant	Brackish Groundwater, less than 5 mgd.	X	X	Both
Los Esteros Power Plant	Brackish Groundwater, less than 5 mgd.	X	X	Both

[1] Projects that provide "regional benefit" could be local projects that could be expanded to provide a water supply benefit for more than one member agency or projects outside the BAWSCA service area that have the potential to serve one or more member agencies. In order for multiple agencies to be involved, agreements (cost, schedule, etc.), conveyance, and water quality issues may have to be addressed as part of Phase II of the Strategy.

[2] Opportunity exists to accelerate the schedule for the "local" or "regional" benefit, or "both". "NA" = Not Available, project is too ill-defined to make a determination.

[3] Sites that passed second tier screening during the Bay Area Regional Desalination Project. (URS 2007)

Entities that participate in desalination projects are able, or could plan to augment their current and future potable supply with a drought-resistant supply. Large and small desalination projects can be operated for either normal year supply or drought/emergency use. Both configurations will be evaluated in Phase II. If developed, excess supply can potentially be sold to, or exchanged with other agencies to increase the potable water supplies of other agencies. Such an exchange could occur between different BAWSCA member agencies, benefitting both agencies and BAWSCA as a whole. Similarly, although it would be significantly more complicated, such an exchange could also occur between an entity outside the BAWSCA service area and BAWSCA and or individual member agencies.

4.2.6 Expanded Conservation Projects

As described in the "Water Conservation Implementation Plan" (Maddaus 2009), BAWSCA and the member agencies have identified up to 23 mgd of potential conservation savings by 2030 as a result of implementing a series of water conservation measures. Additional conservation projects beyond those incorporated in the WCIP will necessarily be part of the Strategy and also will help BAWSCA agencies meet the state-wide target of a 20 percent reduction in per capita water demands by the year 2020 (SWRCB 2009)[5].

Detailed expanded conservation projects ("existing," "planned," and "potential") will be developed as part of Phase II using the WCIP as a starting point. The conservation projects that will be evaluated in Phase II may include expanded implementation of current conservation projects, and projects such as "retrofit on resale" ordinances, lawn replacement incentives, water budget rate structures, or potable water offset programs. Successful implementation of water conservation projects provides potential reductions in water demand in both normal and drought years. The potential savings from expanded conservation projects will vary by project and member agency.

Additional information on expanded conservation is located in Appendix B (Section B.6).

4.2.7 Localized Water Capture and Reuse Projects

Some potential water supply management projects do not fit within the general groups discussed in earlier sections. These other supplies have been grouped as "Localized Water Capture and Reuse Projects," and include:

- *Local rainwater and fog harvesting projects*. Projects are typically implemented at individual lots due to low water production. These projects can reduce potable water use, by saving precipitation in temporary storage for later use at the site.

- *Stormwater capture and reuse projects*. Capturing stormwater runoff via channeling or storm drain interception can provide water for aquifer recharge or for other non-potable uses. Projects can be developed on a larger scale than a rainwater harvesting project (e.g., neighborhood or development scale).

[5] Pursuant to SB X7 7, the State will have to reduce per capita water use by at least 10% no later than December 31, 2015, and by 20% by no later than December 31, 2020. These water use reductions will be compared against a 10- to 15-year baseline period that ends between 2004 and 2010. The legislation will not require individual urban water suppliers to reduce per capita water usage by more than 20%; however, each supplier will have to reduce per capita daily water use by at least 5%, unless their water use is less than 100 gpcd. Urban water suppliers will have to meet their own, specified water use targets, which can be established on an individual or regional basis, using one of four methods: (1) a 20% reduction in baseline water use; (2) compliance with established performance standards (e.g., 55 gpcd for residential indoor water use); (3) a 5% reduction from the applicable state hydrologic region target set in the "Draft 20 x 2020 Water Conservation Plan;" or (4) a method that will be developed by the Department of Water Resources by December 31, 2010.

- *Graywater (also spelled greywater, grey water, and gray water) reuse projects*. Reuse of graywater (defined as all household wastewater with the exception of water from toilets, kitchen sinks, and dishwashers), can reduce potable water use for toilet flushing and landscape irrigation.

Entities that participate in localized water capture and reuse projects can reduce their potable water demands by using a non-potable source to meet some or all of their non-potable demands. The "potable water offset" achieved with locally captured and stored water would allow BAWSCA member agencies to save their potable supplies for meeting potable demands in their service areas.

Table 4-6 provides a summary of potential localized water capture and reuse projects identified for evaluation in Phase II. These projects are further discussed in Appendix B (Section B.7). Further regional- and site-specific studies are needed to determine the viability of rainwater harvesting, stormwater capture and graywater reuse projects as a supplemental water supply. These studies could determine potential yield and identify appropriate locations and environmentally-sensitive designs. It is anticipated that most projects would likely be implemented on a local on-site level due to the low yields, not at a regional level. However, there may be opportunities for regional consistency in approach(es) to on-site projects, and regional opportunities for stormwater capture and reuse projects.

Table 4-6
Potential Localized Capture and Reuse Projects to be Evaluated in Phase II

Agency	*Potential Water Supply Management Project Description*	*Potential Project Benefit*		
		Augment Local Supply	*Develop Asset for Regional Benefit[1]*	*Accelerate Schedule[2]*
Potential Water Capture and Reuse Projects Within the BAWSCA Service Area				
--	Rainwater harvesting with local storage and use. Yield of 13,500 gallons per year for each 1,000 square feet of roof area.[3]	X	--	Local
--	Fog capture. Yield varies based on climate.	X	--	NA
--	Stormwater capture for augmented groundwater aquifer recharge.	X	X	NA
--	Stormwater capture for reuse (non-potable supply) after treatment.	X	X	NA
--	Graywater reuse for landscape irrigation or toilet flushing.	X	--	Local

[1] Projects that provide "regional benefit" could be local projects that could be expanded to provide a water supply benefit for more than one member agency or projects outside the BAWSCA service area that have the potential to serve one or more member agencies. In order for multiple agencies to be involved, agreements (cost, schedule, etc.), conveyance, and water quality issues may have to be addressed as part of Phase II of the Strategy.

[2] Opportunity exists to accelerate the schedule for the "local" or "regional" benefit, or "both". "NA" = Not Available, project is too ill-defined to make a determination.

[3] Source: GAHC 2005

4.3 Incorporating Projects into the Strategy

As part of Strategy implementation, BAWSCA, or a member agency, could participate in one or more of the projects discussed in this section by partnering with the sponsoring member agency(ies) to provide, among other things:

- Investigations to confirm available supply and potential expansion capability for normal and drought conditions;
- Funds for additional project staff, which could accelerate the project implementation schedule;
- Guidance on project implementation and best management practices;
- BAWSCA (or agency) staff support to assist in project activities (e.g., guiding planning, design, or environmental document phases, permitting, public outreach, funding requests, etc.);
- Facilitation of transfers between BAWSCA member agencies, and/or suppliers outside of the BAWSCA service area;
- Grants for project funding;
- Project financing through loans;
- Partial ownership or operation of facilities or contracts; and/or
- Funding for shared project ownership.

For desalination projects specifically, BAWSCA or member agency participation could also include:

- Investigations to confirm yields and quality of brackish and seawater desalination projects and potential expansion capability for normal and drought conditions;
- Review with the regional wastewater agencies for the potential joint use of the existing outfalls for brine disposal;
- Identify potential alternatives for brine disposal including new outfalls and use of existing brine lines in the Bay area; and
- Facilitation of discussion with BARDP members to determine whether direct participation in the regional project is of benefit to the member agencies, and whether it is feasible.

In addition to assisting implementation of individual projects as currently envisioned or designed, BAWSCA or a member agency could also choose to partner in a project to expand the yield from projects that have expansion capability. This could be

accomplished through, for example, increasing treatment capacity, identifying additional customers (demand) to be served by the project, developing storage, or providing additional supply for treatment by the project, as appropriate for the project type.

The goal of the types of participation described above would be to make additional potable and non-potable water available for sale, transfer, or exchange to BAWSCA agencies requiring additional supply. The method and conveyance for transferring the water supply benefit from a project would be determined based upon the location, supply mix, water quality requirements, and infrastructure of the individual agencies.

4.4 Key Issues for the Evaluation of Projects

Key considerations for evaluation of the various projects under consideration include the reliability and variability of the potential supply and the mechanism by which that supply could be conveyed to the agency(ies) in need. These issues are described below. These issues and others will be considered during the detailed review of projects and development of water supply portfolios in Phase II.

Appendix B outlines specific issues for each potential source of water in more detail.

4.4.1 Water Supply Reliability and Variability

The reliability and variability of supply on a daily, seasonal, or annual scale will potentially limit the types of demands that the supply can effectively support. Some key considerations include, but are not limited to:

- *Project Yield in Normal vs. Drought Conditions:* Because water supply needs will be greater during drought conditions than in normal conditions, it is important to quantify the yield of a particular project during drought conditions *and* normal conditions. If a particular project is to be operated as a dedicated drought supply, with little or no yield during normal conditions, this will affect how the project is incorporated into potential supply portfolios.

- *Continuous Source or Supply When Needed:* If a project is planned for dedicated use (e.g., recycled water for irrigation), demands must be present to make use of this supply. A project that is operated on an as-needed basis (e.g., a groundwater well used for daily peaking needs) would need to incorporate storage if the project were to be used to serve demands on a continuous basis.

- *Project Storage Needs:* Some projects may provide supply that varies seasonally or may only be available at certain times of the year. If these supplies are used to meet demands throughout the year, storage must be incorporated into the project design. The size of the storage will depend on the yield and variability characteristics. This issue primarily applies to recycled water and water transfer projects.

4.4.2 Water Supply Conveyance

Project evaluation must consider how the water generated by those projects will be conveyed, either through physical connections (i.e., direct transfers) or through agreements that transfer water (i.e., exchange transfers) to the agency(ies) in need. Some of the issues that will be evaluated and addressed in more detail in Phase II include:

- Direct transfer conveyance options, opportunities, and constraints:
  - Direct conveyance through existing BAWSCA member agency infrastructure;
  - Conveyance to BAWSCA member agencies of supplies from outside the BAWSCA service area through other Bay Area regional water systems (e.g., the East Bay Municipal Utility District [EBMUD] distribution system and interties);
  - Conveyance to a group of member agencies through the RWS infrastructure (transferring a new, non-SFPUC supply through SFPUC pipelines may involve special water quality and pipeline capacity considerations); and
  - Conveyance of regional water supply from outside of the BAWSCA service area (e.g., north of Delta, south of Delta, and Tuolumne River watershed supplies) to one or more member agencies through SCVWD, South Bay Aqueduct (SBA), or SFPUC infrastructure may involve water quality, pipeline capacity, and institutional agreement considerations.

- Exchange transfers options, opportunities, and constraints:
  - Transfer of SFPUC or other supply between BAWSCA member agencies;
  - Transfer through the SWP and/or CVP systems;
  - Requirements for agreement between agencies;
  - Duration, reliability, and strength/enforcement of agreements; and
  - Institutional and legal constraints.

Section 5

Strategy Decision Process and Evaluation Criteria

Section 5
Strategy Decision Process and Evaluation Criteria

This section presents the Strategy decision process and the criteria that will be used to evaluate and rank the water supply management projects and portfolios described in Section 4. The goals of the Strategy decision process are to:

- *Ensure a simple and transparent decision process* – The decision process has been designed to be transparent and to facilitate interaction between BAWSCA, the member agencies, decision makers, and other stakeholders as potential water supply management projects and portfolios are evaluated in Phase II.

- *Utilize an adaptive and reproducible analysis of water supply management projects* – The decision process provides a reproducible framework that can be re-evaluated and reapplied as the specifics of the water supply management projects, portfolios, and objectives evolve.

- *Create quantitative and defensible project and portfolio ranking* – The evaluation criteria and specific metrics used to distinguish water supply management projects and portfolios are mostly quantitative in nature to facilitate defensible comparisons. When quantitative metrics are not available, appropriate qualitative metrics will be identified and applied.

- *Recommend flexible and implementable strategies* – The recommended water supply management projects and portfolios must be implementable. The development of portfolios consisting of multiple projects will create a flexible strategy for meeting the future supply needs of the member agencies.

The evaluation criteria will be used as part of an interactive and iterative decision process. BAWSCA and the member agencies will have the opportunity to provide input on project and portfolio evaluation, criteria weighting, and other factors during the Phase II evaluation process.

The following subsections present the proposed decision process, the evaluation criteria that will be used to compare and rank the water supply management projects and portfolios, and a description of the application of the criteria in the decision process.

Appendix C provides additional detail on preliminary feedback from BAWSCA member agencies on the evaluation criteria. Appendix C also provides detail on decision support tools to be used in Phase II, including the risk analysis tool Criterium Decision Plus (CDP). This tool will be used to evaluate the projects and portfolios, using the criteria outlined in the decision process, while also incorporating any uncertainty in the estimates of evaluation metrics, especially those dealing with yield

in normal and drought conditions. The CDP tool will help quantify how uncertainty impacts the ranking of projects and portfolios.

5.1 Decision Process Overview

The proposed evaluation framework consists of a decision process with four iterative steps, as illustrated in Figure 5-1. The four steps to be completed in Phase II of the Strategy include:

- Step 1 – Preliminary Screening of Water Supply Management Projects
- Step 2 – Project-Level Evaluation and Ranking
- Step 3 – Portfolio Development
- Step 4 – Portfolio Evaluation

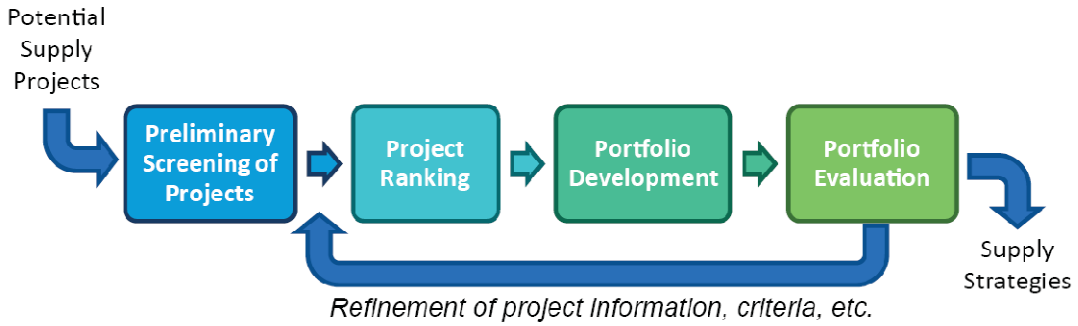


Figure 5-1
Decision Process Schematic

During each of the decision process steps, there will be opportunities for iterative assessment of projects (e.g., based on new information or project updates) and feedback between steps. This allows for the identification and modification of project uncertainties, refinement of criteria weighting, and adaptation of supply portfolios to evolving agency needs. The decision process described in this section is a modular process that will be used iteratively in Phase II to evaluate water supply management projects and portfolios. This approach also integrates well with the phasing of the Strategy presented in Section 7. Preliminary project evaluations can be done early in Phase II A, refinement of project information will occur in Phase IIB and final evaluations can be completed in Phase II C.

5.1.1 Step 1 – Preliminary Screening of Projects

A preliminary fatal flaw screening will be conducted to eliminate those water supply management projects that likely will not be able to be completed within the Strategy planning horizon of 2035, or those projects with environmental impacts that make implementation unlikely. This fatal flaw screening ensures the Phase II effort will be

focused on evaluating those water supply management projects and portfolios that have the potential to be implemented within the designated planning horizon. As part of active supply management, BAWSCA will continue to evaluate future water needs beyond 2035. Projects that are screened out in Phase II of the Strategy may be re-evaluated in the future to meet demands beyond the 2035.

5.1.2 Step 2 – Project Ranking

Individual water supply management projects will be evaluated against each other within each supply category (e.g., desalination, recycled water, surface water, etc.) for each evaluation criterion. This evaluation will compare similar projects, identify additional data needs, and aid development of portfolios. Project information used in preliminary ranking efforts may need additional refinement to better understand uncertainties associated with project yield and other characteristics and to facilitate decision making. The analysis will proceed through a few iterations.

5.1.3 Step 3 – Portfolio Development

Since no single water supply management project is likely to be able to meet the entire future supply need for BAWSCA member agencies, multiple projects will be combined into water supply management portfolios. The resulting portfolios will consist of multiple supply sources and projects, which will increase the water supply diversity within the BAWSCA service area.

The water supply management projects will be grouped into water supply management portfolios that will be designed to meet specific supply needs when and where they occur within the planning horizon of the Strategy. Additionally, the portfolios will be designed to ensure that supplies are available within close proximity, and with appropriate water quality, to meet the identified demands (i.e., local supplies and projects will help address local supply needs and regional supply projects will need to include the additional infrastructure required to move the additional supply to the areas of need). The water supply management portfolios will be refined and finalized in Phase II as part of the portfolio development step. As an example, a portfolio theme could be "Lowest Cost," which would encompass the projects with lowest life cycle cost to meet a specific demand threshold.

5.1.4 Step 4 –Portfolio Evaluation

After developing the water supply management portfolios, the next step is to evaluate and compare the portfolios. The portfolios, and the specific projects, that perform the best against the evaluation criteria will be recommended for implementation.

Decision support tools will be used to combine the raw performance of individual projects against the specific criteria, with the corresponding criteria weights, to arrive at an aggregate portfolio score. These tools can also incorporate information about any uncertainty in a project's yield or other characteristics.

Once a range of portfolios are evaluated, projects that rank consistently high or are included in a large percentage of viable portfolios, yet have uncertainty associated with project yield, may be addressed with additional refinement of project information. Any project whose ranking is significantly affected by uncertainty in project yield may also need refinement. For example, a cost-effective groundwater project that is easy to implement may have a large range of potential yield. More analysis or fieldwork may be warranted to refine the yield estimate before this project is recommended. Once the project information is refined, its ranking and value in potential supply portfolios will be reassessed to confirm that it remains a top-ranked project.

5.2 Evaluation Criteria Development

Criteria are a set of standards or measured characteristics by which different alternatives can be compared for purposes of decision making. In the context of the Strategy, criteria will be used to differentiate the positive and negative characteristics of the various water supply management projects so that a collection of projects (i.e., a water supply management portfolio) that best meet the objectives of the Strategy can be recommended.

The evaluation criteria for the Strategy decision process were developed, in part, based on input from facilitated discussions between BAWSCA and its member agencies. BAWSCA's guiding principles for the development of the Strategy, presented in Section 1, also provided an effective starting point for the identification and development of the evaluation criteria. The criteria also address the major issues that may affect the feasibility of potential supply projects as summarized in Section 5. Criteria were developed to represent the wide array of evolving issues and objectives against which potential projects will be evaluated.

In addition, to help ensure effective support for decision-making, the evaluation criteria were developed according to the following requirements:

- *Distinctive*: criteria must distinguish between one water supply management project (or portfolio) and another;
- *Measurable*: criteria must be able to be measured, either quantitatively or qualitatively, in order to determine if they are being achieved;
- *Non-Redundant*: criteria should not overlap with each other;
- *Understandable*: criteria should be readily explainable; and
- *Concise*: criteria should be kept to a manageable number.

The above principles, objectives, requirements and input, along with experience from similar regional planning efforts by agencies such as ABAG, Metropolitan Water District of Southern California, and SCVWD, were used to develop a set of criteria.

These criteria will be used to evaluate potential water supply management projects and portfolios to assess which best meet the specific objectives of BAWSCA and the member agencies.

5.3 Proposed Evaluation Criteria

The proposed evaluation criteria objectives, evaluation criteria, and evaluation metrics are discussed below and summarized in Table 5-1.

For quantitative metrics regarding supply reliability, water supply management projects will be evaluated based on volume of demand met under varying hydrologic conditions, while portfolios will be evaluated for total percentage of demand met by the specific combination of projects.

Table 5-1
Evaluation Criteria and Metrics

Criteria Objective	*Criteria*	*Metrics (For Project/For Portfolio)*
Criterion 1 - Increase Supply Reliability	Criterion 1A – Normal Year Supply	Quantitative (mgd/%): Portion of demand met in normal years in 2018 and 2035
	Criterion 1B – Drought Supply	Quantitative (mgd/%): Portion of demand met during drought of 1987 – 1992
	Criterion 1C – Supply Vulnerability	Qualitative (1-5): Estimated probability and duration of major conveyance failure
	Criterion 1D – Regulatory Vulnerability	Qualitative (1-5): Potential for regulatory decisions to impact supply reliability
Criterion 2 - Provide High Level of Water Quality	Criterion 2A – Provide High Level of Potable Water Quality	Quantitative (mg/L): Total dissolved solids (TDS) level as a surrogate for water quality. Aggregate of potable supply portfolio. Additional water quality measures may be incorporated.
	Criterion 2B – Provide High Level of Non-Potable Water Quality	Qualitative: Potential impact of water quality on groundwater
Criterion 3 - Reduce Cost of Water Supply	Criterion 3A –Life-Cycle Costs	Quantitative ($/acre-foot [AF]): Life-cycle costs including capital and operating costs
Criterion 4 - Increase Potable Water Use Efficiency	Criterion 4A – Reduce Potable Water Demand	Quantitative (mgd/%): Potable demand reduction due to conservation
	Criterion 4B – Augment Non-Potable Water Supplies	Quantitative (mgd/%): Demand met with non-potable water supply
Criterion 5 - Reduce Environmental Impacts	Criterion 5A – Reduce Greenhouse Gas Emissions	Quantitative (metric tons/ AF of Supply): Estimates of unit greenhouse gas emissions
	Criterion 5B – Reduce Impact to Groundwater Quantity and Quality	Qualitative (1-5): Potential impacts to groundwater levels, groundwater quality, or potential for subsidence
	Criterion 5C – Reduce Impact to Habitat	Qualitative (1-5): Potential impacts to habitat, such as wetlands, riparian zones, fisheries, and inundation areas.
Criterion 6 - Increase Implementation Potential	Criterion 6A – Minimize Institutional Complexity	Qualitative (1-5): Number and type of agencies and agreements involved
	Criterion 6B – Maximize Level of Local Control	Qualitative (1-5): BAWSCA and Member Agency ownership of supply projects
	Criterion 6C – Minimize Permitting Requirements	Qualitative (1-5): Permitting issues for supply projects

5.3.1 Criterion 1 - Increase Water Supply Reliability for BAWSCA Member Agencies

This criterion evaluates the reliability of potential water supply management projects and portfolios during normal year, dry year, and emergency conditions. The criteria and the associated metrics that further define this objective are shown below.

- ***Criterion 1A – Normal Year Supply Reliability*** - An estimate of the ability of a water supply management project or portfolio to meet the normal hydrologic year supply needs of BAWSCA member agencies will be measured by the portion of demand (volume or percentage for project or portfolio, respectively) met by a water supply management project or portfolio during normal hydrologic conditions by the 2018 and 2035 planning horizons. This will be a quantitative measure.

- ***Criterion 1B – Drought Supply Reliability*** - An estimate of the ability of a water supply management project or portfolio to meet the supply need during a drought will be measured by the portion of demand (volume or percentage for project or portfolio, respectively) met by a water supply management project or portfolio during the design drought (i.e., repeat of hydrology during the 1987 – 1992 drought) by the 2018 and 2035 planning horizons. The criterion of drought reliability captures whether a supply project is resistant to drought impacts. This will be a quantitative measure.

- ***Criterion 1C – Supply Vulnerability*** - The supply vulnerability is measured by the probability and duration of potential outages to a particular water supply management project or portfolio due to a major conveyance failure. This criterion captures the vulnerability of projects or portfolios to emergency outages. This metric will be a qualitative measure ranging from 1 through 5, with a score of "1" identifying the projects that are least susceptible to emergency outages and a score of "5" indicating high susceptibility to conveyance failures.

- ***Criterion 1D – Regulatory Vulnerability*** - This criterion estimates the susceptibility of a water supply management project or portfolio to interruption as a result of regulatory issues including legal, political, or environmental constraints. This metric will be a qualitative measure ranging from 1 through 5, with a score of "1" identifying the projects that are least susceptible to regulatory risk and a score of "5" indicating high susceptibility to regulatory risk.

5.3.2 Criterion 2 – Provide a High Level of Water Quality to BAWSCA Member Agencies

This criterion addresses the ability of member agencies to meet the water quality needs of their customers, both for potable and non-potable water. Thus, the criteria further refine whether a given alternative meets potable water quality objectives or other water quality objectives.

- ***Criterion 2A – Provide a High Level of Potable Water Quality*** - The criterion representing potable supply will be addressed by the quantitative metric of the aggregate water quality, measured by TDS levels, of the potable supply projects and portfolios. TDS is a surrogate for other water quality parameters representing water quality. Additional water quality measures may also be incorporated.

- ***Criterion 2B – Provide a High Level of Non-Potable Water Quality*** - For non-potable supply projects, where water quality constraints vary according to use, the metric will be a qualitative assessment of whether or not the water supply management projects and portfolios meet the minimum water quality requirement for the targeted use, and whether they pose a potential impact to other water supplies, primarily groundwater. In most cases, this metric will be used to designate whether a non-potable supply source meets Title 22 requirements, as this is a common target water quality level for a non-potable demand. This will be a qualitative measure.

5.3.3 Criterion 3 – Reduce the Cost of Water Supply

The life cycle costs, including capital, operations, and maintenance costs, for each water supply management project and portfolio will be calculated in Phase II. The performance metric will be a normalized cost presented in $/AF for each project and portfolio. The costs developed in Phase II will be planning level estimates, adequate for the level of analysis needed to support the Strategy.

5.3.4 Criterion 4 – Increase Potable Water Use Efficiency

This criterion will evaluate the impact that each water supply management project and portfolio will have on the conservation of potable water supplies. Two criteria are employed, the first dealing with the reduction of potable demand and the second addressing the augmentation of non-potable supplies.

- ***Criterion 4A – Reduce Potable Water Demand -*** Projects that include potable water conservation are given higher scores within this criterion. The performance metric associated with this criterion will be a quantitative estimate of potable demand reduction (volume or percentage for project or portfolio, respectively).

- ***Criterion 4B – Augment Non-Potable Water Supplies*** - The use of non-potable water sources will help reduce the overall potable water supply need and create a more efficient local and regional supply system. Projects and portfolios that include non-potable water supplies, commensurate with a demand for the additional non-potable water, will score well within this criterion, which was designed to measure how successful potential supply projects or portfolios are at reducing potable demands with expanded conservation projects. The quantitative metric for this criterion will be additional non-potable supply produced and utilized to offset potable demand (volume or percentage for project or portfolio, respectively).

5.3.5 Criterion 5 – Reduce Environmental Impacts of Water Supply Management Projects

With this criterion, water supply management projects and portfolios that provide environmental benefits, or have no or limited negative environmental impacts, will score better than projects that provide no benefits or result in greater environmental impacts. Environmental benefits and impacts are evaluated both within and outside of the BAWSCA service area. Potential environmental impacts are measured with three criteria, designed to be proxies for a wide range of environmental issues.

- ***Criterion 5A – Reduce Greenhouse Gas Emissions*** - The increase in greenhouse gas emissions due to a potential water supply management project or portfolio will be measured by the unit greenhouse gas emissions of the associated projects. This quantitative metric will be estimated in terms of metric tons of carbon dioxide produced, or reduced, per unit of supply.

- ***Criterion 5B – Reduce Impact to Groundwater Quantity and Quality*** - Water supply management projects that do not negatively affect groundwater supplies will be measured favorably in this criterion. A combined qualitative estimate of potential groundwater impacts will be evaluated in terms of potential reductions in groundwater levels, impacts to groundwater quality, and the risk of increase in land subsidence. This metric will be a qualitative measure ranging from 1 through 5, with a score of "1" identifying the projects with the least potential for adversely affecting groundwater quantity and quality and a score of "5" indicating high probability of adverse impacts.

- ***Criterion 5C – Reduce Impact to Habitat*** - This criterion addresses long-term impacts to the ecosystems, not short-term effects related to temporary construction activities. Water supply management projects that do not adversely affect sensitive habitat areas such as wetlands, riparian zones, potential special-status species habitat, or have significant inundation areas will be measured favorably in this criterion. A combined qualitative estimate of potential habitat impacts will be evaluated in terms of potential site acreage, proximity to sensitive habitat zones, and flood potential. This metric will be a qualitative measure ranging from 1 through 5, with a score of "1" identifying the projects with the least potential for adverse impacts to habitat and a score of "5" indicating high probability of adverse effects to terrestrial, aquatic, and riparian species.

5.3.6 Criterion 6 – Increase Implementation Potential of Water Supply Management Projects

Developing water supply solutions that can be implemented within the 2018 and 2035 planning horizons is a primary objective of the Strategy. These criteria assess the implementation potential of water supply management projects and portfolios. All of these criteria will be assessed qualitatively. Metrics for these criteria will be a qualitative assessment ranging from 1 through 5, with a score of "1" being the most favorable and a score of "5" indicating the least favorable.

- ***Criterion 6A – Minimize Institutional Complexity*** - This criterion addresses the level of institutional coordination required for implementation of a water supply management project or portfolio. A qualitative metric will be used to estimate the coordination required if multiple local or regional agencies or agreements are necessary. The projects that are assumed to require less coordination, and to receive less opposition, will score better than those that are more complex or potentially controversial.

- ***Criterion 6B – Maximize Level of Local Control of Water Supply*** - Local management of a water supply management project or portfolio will minimize dependency on imported water supplies and the drought impacts associated with those supplies. A rating scale will be developed to evaluate the amount of BAWSCA-owned or BAWSCA member-owned supply for each project. Projects that are fully owned by BAWSCA or the member agencies will score higher than supply projects owned fully or partially by other entities that might be affected by regulatory risk, multiple party agreements, and supplies that may have a higher risk of not being available further into the future, or under drought conditions.

- ***Criterion 6C – Minimize Permitting Requirements*** - This criterion addresses the objective of minimizing the regulatory and environmental permitting obstacles associated with water supply management projects or portfolios. Projects with other similar metrics (including cost) may have differing permitting requirements, which can affect their overall implementation. The performance metric is a qualitative measure of the permitting requirements of each project or portfolio.

5.4 Criteria Weighting Approach for Evaluations

In any decision-making process that involves multiple objectives, it is important to recognize that all criteria may not be equally important. Some criteria are more important to certain stakeholders than to others. To address this potential issue, the Strategy's decision process incorporates the ability to vary the relative weight, or importance, of each evaluation criterion.

The Phase II evaluation of the various water supply management projects and portfolios will begin with a simple approach where the individual criteria are equally weighted. This initial assessment using equal criteria weights will provide a baseline for subsequent sensitivity analyses during Phase II that will assess the impact of varying the weights of the various criteria.

During Phase II, multiple weighting scenarios will be explored to assess the impact of weighting criteria on the ranking of the water supply management projects and portfolios. This sensitivity analysis will provide insight as to which criteria are most important in differentiating between projects and portfolios and which projects and portfolios appear to be the most robust.

Section 6

Critical Ongoing Water Supply Issues to be Monitored and Addressed in Phase II

Section 6
Critical Ongoing Water Supply Issues to be Monitored and Addressed in Phase II

A number of factors influencing both existing and potential future supplies are in a state of change. In order to formulate a robust, cost-effective water supply strategy, it will be necessary to monitor and evaluate these factors during the analysis to be performed in Phase II and beyond. This will include the degree to which these factors are expressed under normal and drought conditions.

6.1 Summary of Major Issues

Amongst the many factors that will require consideration, eight major issues were identified as being particularly important to be tracked as part of Phase II. These nine major issues are summarized below and in Table 6-1[1]:

1. *Environmental Impact* – The environmental impacts of a potential project will be an important factor in the evaluation and ranking of projects conducted in Phase II. For example, the long-term environmental impact of a project that involves groundwater pumping (e.g., water quality and/or subsidence impacts) will be assessed in Phase II and will factor into how a particular project performs against the environmental impact criteria and associated metrics (see Section 5). Additionally, a critical part of evaluation of the desalination projects will include the analysis of methods of disposal for the concentrated brine resulting from the desalination process for either brackish or seawater sources.

2. *Infrastructure Capacity and Reliability* – The capacity limitations, condition and reliability of the water system infrastructure needed to deliver the water created by a particular project are fundamental to the assessment of the viability of that project. The degree to which a project is dependent on infrastructure that has limited additional capacity or has been identified as more vulnerable to failure will be noted during Phase II. For example, a local project may require pumping and transmission through an emergency intertie to serve another agency; the condition of the pump station, pipelines, and intertie would need to be known in order to assess delivery reliability.

3. *Institutional and Regulatory Factors* – Many of the projects will require that entities external and internal to BAWSCA grant approvals, enter into agreements, and otherwise be involved in developing projects or in supplying or using additional, and different, types of water. Many projects will require input, agreement, and formal approvals from local, state and, potentially, federal agencies. Regulations and public perception about certain issues (e.g., endocrine disrupting compounds) will also need to be tracked, as they ultimately can affect a project's viability. In

[1] These are in addition to monitoring SFPUC activities surrounding the 2018 supply limitation.

addition, some local projects will need routine maintenance that will require a stable and committed funding source. In Phase II of the Strategy, institutional and regulatory issues associated with potential projects will be identified, along with a recommended approach to address these issues as part of the Strategy implementation.

4. *Delivery Options* – Understanding BAWSCA's flexibility on utilizing alternative delivery and ownership options (e.g., BAWSCA, member agency, other agency or private) may impact projected costs and implementation schedule for certain supply projects. Such delivery methods might include design-build, design-build-operate, design-build-operate-finance and others. The delivery method may require preliminary fieldwork, engineering and environmental evaluations prior to proceeding. Delivery options and implications will be identified as part of Phase II of the Strategy.

5. *Funding Mechanisms* –There is a high priority associated with developing alternative funding opportunities and mechanisms as part of the overall Strategy development and implementation. Funding opportunities and constraints, including efficiencies associated with agencies working collectively to prepare grant funding applications, initiate necessary fieldwork, or address environmental documentation needs for potential projects, will be identified as part of Phase II of the Strategy.

6. *Legal, Organizational and Financial* – The legal, organizational, or financial constraints that exist with respect to implementing the Strategy need to be clearly understood. For example, potential issues associated with limitations on BAWSCA or another agency's ability to directly serve agency members and/or owning and operating a facility would have to be examined as part of Phase II.

7. *Agreements* – The Strategy will identify the types of agreements that would be necessary to implement a project and the likely time required to develop such agreements.

8. *Climate Change* – Climate change will, to different degrees, affect the timing and yield of various water supplies. Since the planning horizon for the Strategy extends to 2035, consideration of climate change impacts, if any, on the viability and yield of certain projects is important. In addition, the risk that existing supplies will be affected due to climate change requires monitoring. Based on review of published information, the degree to which supplies are likely to be sensitive to climate change impacts will be noted as a factor in the formulation of portfolios (e.g., supply reliability is a key evaluation criteria).

9. *Technology* – Although the Strategy is being developed today, it has to remain flexible and forward-thinking enough to take advantage of new technologies that may be sufficiently advanced to be implemented within the next 10 to 20 years. Assessing the actual benefits, the costs (including ancillary facilities and on-going

maintenance operations) and likely regulatory approval is essential to determining whether an emerging technology can be carried forward in the alternatives analysis. Changes in technology related to potential projects will be incorporated into the Strategy during Phase II to the extent that information on the costs and benefits of advancements are made available.

6.2 Tracking of Major Issues

The major issues described above must be tracked with respect to their potential impacts on various components of a project. A preliminary summary of the components of each project that may be affected by the major issues are provided in Table 6-1. The impact of the major issues on these project components will be tracked in Phase II if they may have a significant impact on the feasibility or cost of a project. The currently identified information sources that may potentially be used to track these project elements are also summarized in Table 6-1. Details on specific activities associated with the on-going issue tracking are found in the Phase II scope of work (see Section 8).

In several instances, BAWSCA member agencies will be queried to provide critical input for these major issue areas and their associated impacts on the project components. For example, for alternatives involving movement of water from one agency to another, the originating agency would be queried as to the reliability of the existing infrastructure to convey the water and the operational constraints under which the water would be supplied.

6.3 Actions by BAWSCA and Member Agencies Required to Successfully Implement Strategy

Success of the Strategy will depend on a well-defined and cooperative partnership between BAWSCA, the BAWSCA board, and the individual member agencies. The ultimate success of the Strategy will depend on individual actions taken by the member agencies and the BAWSCA board.

Water demands within the service area and progress towards developing and implementing the Strategy will be monitored closely by BAWSCA. In the event that it appears that certain necessary actions are being delayed by a member agency or groups of agencies, BAWSCA will work with the affected agencies to identify an alternative solution to meet their water needs. In this respect, the Strategy will be a convergent process that will embody a flexible and transparent process to ensure that there is a reliable supply of water where and when people within the BAWSCA service area need it.

Table 6-1
Components and Information Sources to be Tracked in Phase II to Address Major Issues

Major Issues	***Project Components to be Tracked With Respect to Major Issues***	***Currently Identified Information Sources***
Environmental Impact *How is project feasibility affected by potential impacts to the physical environment?*	Terrestrial and Aquatic Species	Reports and data from applicable federal, state, and regional resource agencies; municipal and local planning departments; preliminary models; BAWSCA member agencies studies.
	Groundwater	
	Air Quality	
	Hydrology/Water Quality	
	Hazardous Materials	
	Geology and Soils	
	Land Use/Planning	
	Visual Resources	
	Recreation	
	Transportation/Traffic	
	Utilities/Public Services	
	Noise	
	Population/Housing	
	Climate Change	
Infrastructure Reliability *Will recommended water supplies be able to be conveyed to meet demand?*	SFPUC WSIP	SFPUC staff
	Delta	DWR and Reclamation staff
	Local Systems	BAWSCA members who will be involved in alternatives requiring transfer, development or movement of water. Condition assessments and seismic analysis reports.
Institutional and Regulatory Factors *What entities external and internal to BAWSCA will need to grant approvals, enter into agreements and otherwise be necessary for supplying additional water supplies? What new issues may emerge?*	Conveyance	Agencies with the potential to convey supply between member agencies, or transfer supply to the BAWSCA service area.
	Storage	Agencies with surface water or groundwater storage that might be used to store transfer supply, including SCVWD, SFPUC, and groundwater storage in the Central Valley.
	Desalination	Meetings with local dischargers, Department of Public Health (DPH), Regional Water Quality Control Board, San Francisco Bay Conservation and Development Commission, and others.
	Recycled Water	Updates to UWMPs, Capital Improvement Programs, reports, City councils and customer surveys.
	Groundwater	SCVWD, ACWD, and Regional Board on pumping impacts.
	Emerging Contaminants and Regulation	CDM health effects and regulatory contacts at Water Research Foundation, Environmental Protection Agency (EPA), and DPH.
	Grey water: limitations of adoption and use	DPH and informal surveys of use.
	Sustained maintenance of new alternatives	Feedback from potentially implementing members regarding budgets and viability of sustained funding.

Table 6-1
Components and Information Sources to be Tracked in Phase II to Address Major Issues

Major Issues	*Project Components to be Tracked With Respect to Major Issues*	*Currently Identified Information Sources*
Delivery Options *What alternative delivery options are available that could speed schedule, reduce costs and transfer risks?*	Constraints on delivery options (e.g., legal, funding and policy)	Legal counsel opinion and Board guidance, CDM experts and member agency experience.
Funding Mechanisms *What are the funding opportunities and constraints for implementing projects?*	State-Federal grant availability	Inclusion of project description into Bay Area Integrated Regional Water Management Plan. BAWSCA and CDM contacts.
	Constraints on BAWSCA funding, ownership or operation of facilities	Legal counsel opinion.
Legal, Organizational, and Financial *What legal, organizational or financial constraints exist for implementing the strategy?*	BAWSCA legal constraints to serving member or non-member agencies	Legal counsel opinion.
	BAWSCA functional constraints on facility ownership or operations; Schedule requirements	BAWSCA self-assessment.
	Rate impact limitations amongst member agencies	BAWSCA and member agencies self-assessment with feedback from economic studies.
Agreements *What are the requirements for agreements and the time necessary to implement them for various supply alternatives?*	Types of agreements needed amongst member agencies, BAWSCA and others for projects to proceed	CDM, BAWSCA, and legal counsel opinion.
	Schedule necessary for agreements to allow timely implementation	CDM, BAWSCA, and legal counsel opinion.
Climate Change *What supplies will be available with what yield and how might the timing of that yield be affected?*	SFPUC Supply	Follow-up actions to *Final Water Supply Availability Study for City and County of San Francisco* (SFPUC 2009a).
	Delta Supplies	DWR analyses, ACWD, SCVWD and other Delta source utilities on-going monitoring
	Local Streams-Reservoirs	SCVWD, ACWD and SFPUC work plus National Oceanic and Atmospheric Administration
Technology *What new technologies will be sufficiently advanced to be implemented within the next 10 to 20 years?*	New: Availability, reliability, approvals and cost	CDM network, BAWSCA members, conferences, meetings with vendors and regulators.
	Risk tolerance for "cutting edge" alternatives	BAWSCA member inputs.

Section 7

Strategy Phasing

Section 7
Strategy Phasing

In order to achieve the management goal of ensuring "a reliable, high quality supply of water is available where and when people within the BAWSCA service area need it," BAWSCA initiated the development of the Strategy, which is progressing in the following three phases:

- Phase I – Scoping Report;
- Phase II – Development and Analysis of Alternative Water Supply Management Projects, and
- Phase III – Strategy Implementation.

7.1 Phase I

Phase I involved quantifying the magnitude and timing of the normal and drought year water need, defining the evaluation criteria and the process that will be used to evaluate and select the preferred projects, and identifying those projects that will evaluated in Phase II. This phase is currently being completed with the development of this Report, and the separate detailed scope for the proposed Phase II work.

7.2 Phase II

In order to develop specific recommendations and an implementation plan in Phase II an extensive amount of work will be required to: 1) develop sufficient information on the projects to bettert evaluate if the projects are feasible; and 2) ensure that there is a comparable level of information to allow acurate comparison between the projects.

Based on the information gathered in Phase I (e.g., demands, supply needs, potential projects) and the evaluation framework, a phased approach has been determined to be the most appropriate for expediting the decision-making process to move forward with potential near-term or mid-term projects that address the more near-term normal or drought supply needs, while still developing the longer-term strategy.

Consequently, the Phase II strategy development process has three been broken into three subphases to allow this flexibility:

- Phase II A – Develop Near-Term Project Recommendations
- Phase II B – Develop Mid-Term Projects and Conduct Field Investigations
- Phase II C – Develop Long-Term Project Recommendations

Phase II A focuses on identifying and developing initial recommendations to begin implementation of near-term member agency and regional projects that would help member agencies meet normal and drought supply needs over the next several years.

These recommendations will be based on the additional data collection and anlaysis and fatal flaw screenign that is scheduled to occur durign Phase IIA. Specifically, Phase II A will develop recommendations for:

- Possible implementation of mid-term projects during Phase II B; and
- Phase II B field work that may be required to further characterize and demonstrate the feasibility of projects, and to identify the projects that will be carried forward for evaluation in Phase II C.

Phase II B includes the possible implementation of near- and mid-term projects (i.e., such as water transfers), and the field investigations required to better refine certain project yields, feasibility and cost estimates.

Phase II C will incorporate the results of the Phase II A and Phase II B work into a final screening and evaluation of projects and portfolios and the final recommendations for the suite of projects recommended to be developed as part of the Strategy. Phase IIC will also include the development of an implementation plan to meet the near- and long-term supply needs for the member agencies for normal and drought conditions.

Figure 7-1 indicates the general schedule for the Phase II work. Phase II A is anticipated to start in late July 2010 and continue through December 2011. Phase II B could begin in mid 2011 and extend through at least the end of 2012, and possibly to mid 2013 depending on the level of field investigation required. Phase II C is anticipated to start in early 2012 and be completed by the end of 2013.

7.3 Phase III

Implementation of the near-term and mid-term projects identified in Phases II A and II B of the Strategy will occur in Phase III to meet normal and drought supply needs for individual and multiple agencies between now and 2018 or 2020. Larger, more complex projects could be developed in Phase II C to meet the long-term needs of the member agencies and BAWSCA. Figure 7-1 indicates the start of this phase as early as 2012 with continuation of the development and implementation of these projects and portfolios over many years as the supply needs for the agencies continue to increase.

Section 8 of this report presents the anticipated tasks, objectives, major activities, deliverables, and key milestones for Phase II A, and the anticipated tasks for Phases II B and II C. Section 9 identifies some of the areas of technical expertise that will be required as part of the Phase II work.

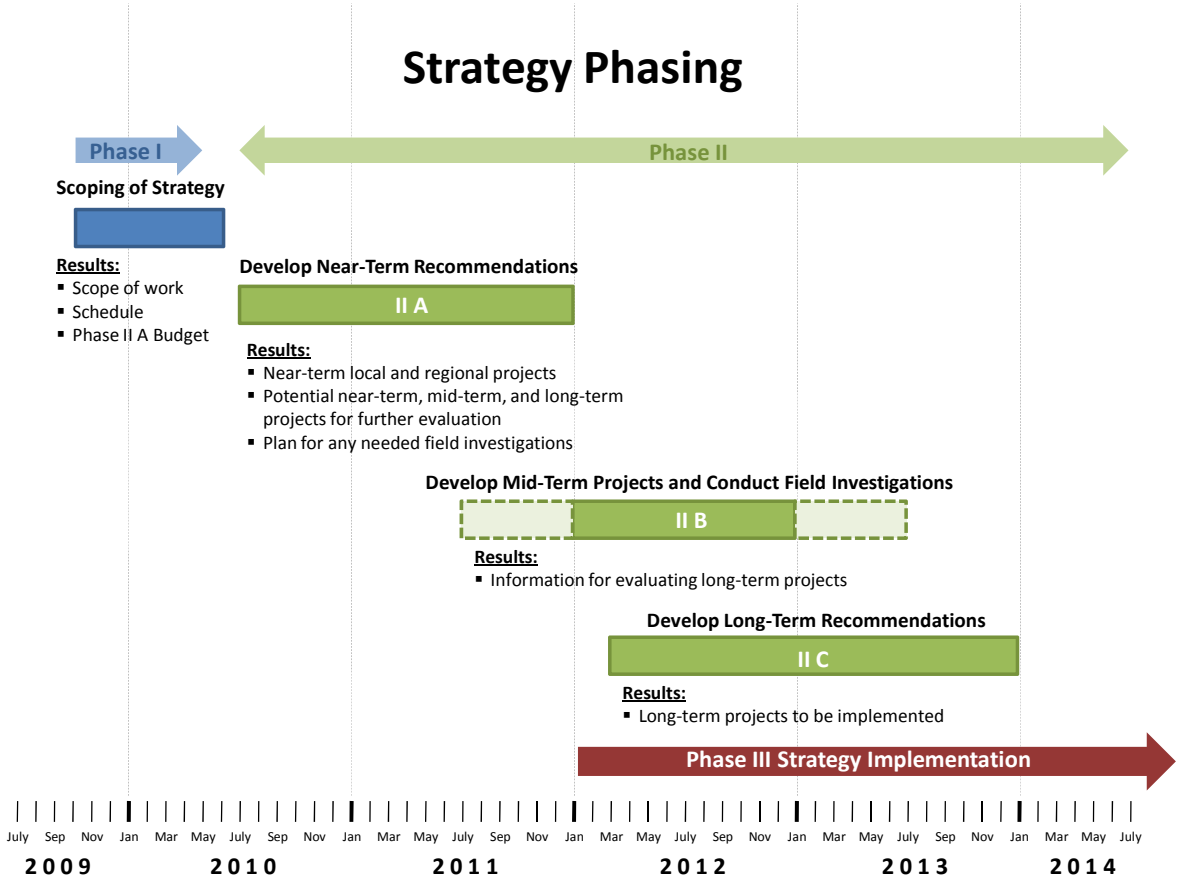


Figure 7-1
Strategy Phasing and Schedule

Section 8

Summary of Phase II Scope of Work

Section 8
Summary of Phase II Scope of Work

This section summarizes the anticipated Phase II scope of work items to develop the implementation plan for the Strategy. Phase II consists of three subphases:

- Phase II A – Develop Near-Term Recommendations
- Phase II B – Develop Mid-Term Projects and Conduct Field Investigations
- Phase II C – Develop Long-Term Recommendations

More detail on the planned subphases, including specific task objectives, background, major activities, deliverables and key milestones are presented below. Three different types of activities are included in the tasks: Major Activities – Consultant Lead; Major Activities – Agency Lead; and Optional Activities. The majority of the activities are Consultant Lead. In Task 2 there is one activity that will require the agencies to take the lead to develop the project information. This effort is not part of the consultant scope, but forms part of the basis for the assumptions in the scope of that task. The Optional Tasks provide a placeholder to provide limited consultant capacity to assist in the development of agency project information.

Additional detail for the Phase II B and Phase II C efforts will be developed during Phase II A.

8.1 Phase II A – Develop Near-Term Recommendations

A key part of the Phase II A effort is to identify and develop initial recommendations to begin implementation of near-term agency and regional projects that would help member agencies meet normal and drought supply prior to the development of mid- and long-term solutions. The near-term recommendations would be for projects that could be developed directly after, or during the completion of Phase II A. Another outcome of the Phase II A effort is the identification of 1)possible mid-term projects that could be implemented during Phase II B or II C, 2) those projects that may require field investigations in Phase II B, and 3) those projects to be further evaluated in Phase II C to meet the long-term supply needs. Phase II A is anticipated to start in July of this year and continue through December 2011.

The Phase II A tasks are summarized in Table 8-1. The indicated tasks are not necessarily listed in sequential order, as several will be developed in parallel (e.g. Project Management).

Table 8-1
Phase II A Tasks

Task	*Description*
1	Update Water Demand and Supply Need
2	Update Agency Project Information
3	Update Regional Project Information
4	Perform Fatal Flaw Analysis and Screening of Agency and Regional Projects
5	Develop Analysis Tools to Evaluate Projects and Portfolios
6	Evaluate and Compare Projects and Portfolios
7	Develop Recommendations for Near-Term Projects, Phase II B Mid-Term Projects and Field Investigations, and Phase II C Long-Term Projects and Portfolios
8	Develop Scope and Budget for Phase II B
9	Develop Preliminary Scope and Budget for Phase II C Long-Term Recommendations
10	Prepare Phase II A Report
11	Project Management

Task 1 – Update Water Demand and Supply Need

Objective:

Update the anticipated normal and drought demands as well as the timing of those demands for each of the member agencies based on the 2010 UWMP updates.

Background:

Initial information on the member agency demands and the existing water supplies have been developed as part of the Phase I effort. Each of the member agencies is currently updating their 2010 UWMPs for completion in mid 2011. In addition, the agencies will be implementing and updating information on their existing, planned, and potential new supply projects. Information developed for the 2010 UWMPs will be used to prepare the Phase II A supply need update. This data will be presented in 5 year increments out until 2035.

Major Activities – Consultant Lead:

- Review updated 2010 UWMPs, and existing water supply project information.
- Meet with agencies to confirm existing supply project information.
- Review agency assumptions for drought response and level of service.
- Update estimated supply need by agency at five year increments through 2035, including drought allocations.

Deliverables:

- Draft and final Technical Memorandum presenting the estimated supply need by agency and BAWSCA as a whole.

Task 2 – Update Agency Project Information

Objective:

Develop common level of information on agency planned and potential projects to allow fatal flaw screening in Task 4 based on updates provided by the agencies.

Background:

In addition to existing projects, planned and potential water supply management projects have been identified to meet the individual supply needs of the member agencies, or possibly provide regional benefits. These projects are at various levels of detail and development. A common level of project information is needed to accurately evaluate and compare projects in later tasks.

Major Activities – Consultant Lead:

- Develop common project requirements and survey questionnaire for agencies.
- Meet with agencies to review current information on planned and potential projects, identify additional information needs, and determine timing by the agencies to develop this information.
- Review new and updated agency information on planned and potential water supply management projects based on publically available documents.
- Identify additional information needed for each project.
- Coordinate with agencies as they develop project information, and review additional information developed on projects. Confirm that a common level of information has been developed for all projects.
- Where agency project information has not been updated, bring cost and schedule information to a common level.
- Review the potential for rainwater harvesting, greywater and stormwater use.

Major Activities – Agency Lead:

- Member agencies to develop and/or provide information on capacity, yield, cost, schedule, implementation issues, potential partners, agreements, and potential fatal flaw information for each of the local agency planned and potential projects identified in Phase I.

Optional Activities:

- Consultant team develop capacity, yield, cost, schedule, implementation issues, potential partners, agreements, and potential fatal flaw information for specific projects as requested by member agencies and approved by BAWSCA.

Deliverables:

- Draft and final Technical Memorandum presenting the updated agency project information, and additional information requirements.

Task 3 – Update Regional Project Information

Objective:

Develop common level of information on potential regional projects for fatal flaw analysis and screening in Task 4.

Background:

Several regional water supply management projects have been identified that could potentially meet the supply needs of individual or multiple member agencies under normal and/or drought conditions. These projects are at various levels of detail and development. A common level of project information is needed to accurately evaluate and compare projects in later tasks.

Major Activities – Consultant Lead:

- Develop and/or update information on potential regional water management supply projects identified in Phase I. This information will be developed from:
  - Review of publically available updated and new reports for these projects.
  - Initial assessment of potential water transfer projects.
  - Initial assessment of groundwater projects based on review of hydrogeologic information, and preliminary planning level estimates of the treatment and infrastructure costs, permitting and schedule issues, potential implementation issues, potential partners, agreements, and potential fatal flaw information.
  - Initial assessment of desalination projects based on review of hydrogeologic information, and preliminary planning level estimates of the treatment and infrastructure costs, permitting and schedule issues, potential implementation issues (i.e. brine disposal), potential partners, agreements, and potential fatal flaw information.

Deliverables:

- Draft and final Technical Memorandum presenting the regional project information.

Task 4 – Perform Fatal Flaw Analysis and Screening of Agency and Regional Projects

Objective:

Conduct a fatal flaw analysis and project screening to determine which projects should be carried forward for further development and evaluation in Tasks 5 and 6.

Major Activities – Consultant Lead:

- Identify/confirm fatal flaw screening criteria. The criteria will be finalized prior to conducting Tasks 2 and 3 in order to focus/limit the development of additional information prior to conducting the fatal flaw screening.
- Conduct fatal flaw screening of agency and regional projects based on the established criteria and the information developed in Tasks 1 through 3.
- Identify projects to be evaluated in Tasks 5 and 6.

Deliverables:

- Draft and final Technical Memorandum summarizing the fatal flaw screening and those projects to be carried forward into Tasks 5 and 6.

Task 5 – Develop Analysis Tools to Evaluate Projects and Portfolios

Objective:

Develop and test models and analysis tools to evaluate the projects carried forward from the Task 4 fatal flaw analysis and screening. These tools will help define the projects and evaluate their feasibility and reliability. These tools will be used to help compare projects and portfolios in Tasks 6 and 7.

Major Activities – Consultant Lead:

- Identify additional tools, studies or models required to help evaluate the projects and portfolios These tools and models are anticipated to include:
  - Hetch Hetchy and regional water supply model to evaluate drought year reoperation and use of local reservoir storage.
  - Groundwater model(s) to estimate potential yield and potential impacts on regional groundwater pumping and other basin users.
  - Project analysis tools, including:
    - Creation and evaluation of portfolios - Water availability/Analysis model.
    - Decision support tool – CDP
    - Risk and uncertainty analysis model - @Risk.
  - Economic impact analysis model.
  - Rate impact analysis tool.
- Develop and test models and analysis tools to help evaluate and compare projects.

Deliverables:

- Draft and final Technical Memorandum describing the recommended models, purpose of the models, cost to develop, and schedule for their development.

Task 6 – Evaluate and Compare Projects and Portfolios

Objective:

Evaluate and compare projects based on the project information developed in Tasks 2 through 4, and analysis tools developed in Task 5. This information will be used to evaluate and rank projects, and create portfolios of projects to meet established performance objectives and needs.

Major Activities – Consultant Lead:

- Refine evaluation criteria and metrics as appropriate.
- Use models and tools developed in Task 5 to update and analyze projects.
- Rank agency and regional projects (using evaluation criteria scorecard) against each other within project types (i.e., groundwater, or transfers).
- Develop performance objectives for portfolios.
- Develop initial portfolios of projects based on project ranking, and specific performance objectives for portfolios.
- Compare and rank portfolios.
- Based on preliminary comparison and ranking, revise and update portfolios to address any proposed changes in performance objectives.

Deliverables:

- Draft and final Technical Memorandum summarizing the development, comparison and ranking of projects and portfolios.

Task 7 – Develop Recommendations for Near-Term Projects, Phase II B Mid-Term Projects and Field Investigations, and Phase II C Long-Term Projects and Portfolios

Objective:

Develop recommendations for agency or regional projects to meet near-term needs, mid-term needs, projects for field investigation in Phase II B, and projects and portfolios for more detailed evaluation in Phase II C.

Major Activities – Consultant Lead:

- Develop recommendations for near-term projects to be moved into near-term Phase III implementation:

  - Agency or regional project(s) to address near-term water supply need (individual or multiple agencies).

- Develop recommendations for potential mid-term projects to be supported in Phase II B:
  - Agency project(s) to address mid-term water supply need (individual or multiple agencies).
  - Regional project(s) to address mid-term need (individual or multiple agencies).

- Recommend agency and regional projects requiring field investigations to develop sufficient information on technical feasibility, reliability, and potential yield to allow comparison with the other Phase II C projects.

- Develop recommendations for projects and portfolios to be included for evaluation in Phase II C.

Deliverables:

- Draft and Final Recommendations Report for near-term agency projects to begin implementation, mid-term projects and field investigations for Phase II B, and projects and portfolios for further evaluation in Phase II C.

Task 8 – Develop Scope and Budget for Phase II B

Objective:

Develop scope and budget for the Phase II B field investigations based on projects recommended in Task 7.

Major Activities – Consultant Lead:

- Develop preliminary work plans, for Phase II B field work, including:
  - Local groundwater projects.
  - Brackish and seawater desalination projects.
  - Other projects as identified in Phase II A.

- Initiate implementation of mid-term project(s) (e.g., water transfers).

- Identify work that would be performed by member agencies or BAWSCA.

- Identify cost allocation for Phase II B work.

- Prepare scope and budget for Phase II B work.

Deliverables:

- Draft and final scope and budget for Phase II B effort.

Key Milestone:

- Approval of Phase II B scope and budget by BAWSCA Board.

Task 9 – Develop Preliminary Scope and Budget for Phase II C Long-Term Recommendations

Objective:

Develop preliminary scope and budget for Phase II C based on the recommended projects to be carried forward into Phases II B and II C. This scope will be updated after the Phase II B work is underway and projects requiring field work are better defined and it is determined whether they are feasible for inclusion in Phase II C.

Major Activities – Consultant Lead:

- Develop the preliminary scope and budget for Phase II C based on the findings from the Phase II and Phase II B work, and the key anticipated effort to develop implementation plan(s) for the recommended projects.
- Identify preliminary cost allocation for Phase II C work.

Deliverable:

- Draft and final scope and budget for Phase II C. The scope and budget may change depending on the outcome of the Phase II B field investigations.

Key Milestone:

- Approval of Preliminary Phase II C scope and budget by BAWSCA Board.

Task 10 – Prepare Phase II A Report

Objective:

Develop summary of the information developed through the Phase II A tasks, project and portfolio recommendations, and the recommendations for the Phase II B and Phase II C efforts.

Major Activities – Consultant Lead:

- Develop summary report of the Phase II A efforts.
- Present recommendations and next steps, including Phase II B and C work and schedule.

Deliverables:

- Phase II A Report and recommendations.

Task 11 – Project Management

Objective:

Coordinate, track and streamline efforts for the Phase II A work.

Major Activities – Consultant Lead:

- Project management including monthly reporting and invoicing.
- Internal quality assurance/quality control.

- Coordination meetings with BAWSCA and member agencies.
- Coordination meetings with other agencies and stakeholders as appropriate.
- Support for BAWSCA staff for meetings, presentations and development of communication packages and information.
- Participation in agency and non-member agency presentations and meetings as requested by BAWSCA staff.

8.2 Phase II B – Develop Mid-Term Projects and Conduct Field Investigations

The purpose of Phase II B – Develop Mid-Term Projects and Conduct Field Investigations is to develop additional information on potentially viable projects which require field investigation to confirm their feasibiilty, as well as supporting the development of mid-term projects that could begin implementation during the Phase II B effort. This work could begin in early 2011, depending on the need to move either the investigations or mid-term projects forward quickly. It is anticipated that this effort will continue through 2012, and possibly to mid 2013.

The potential mid-term projects will be identified in Phase II A, as will the projects requiring field investigation. The mid-term projects could be projects that were identified in Phase II A that should move forward as soon as possible, but that may require limited additional analysis or support. The Phase II B field work is anticipated to focus primarily on evaluating the potential yield of groundwater or brackish or saline groundwater projects, and whether the development of these projects may have significant impacts on existing or planned groundwater projects, or potentially significant environmental impacts.

The key tasks anticipated for Phase II B are presented in Table 8-2.

Table 8-2
Anticipated Phase II B Tasks

Task	*Description*
1	Finalize Work Plans, Bid Documents and Access Agreements
2	Field Investigations for Agency Projects
3	Field Investigations for Regional Projects
4	Support for Implementing Mid-Term Projects
5	Stakeholder Outreach (As needed)
6	Project Management

The specific activities, milestones, deliverables and schedule for this phase of work will be developed towards the end of Phase II A.

8.3 Phase II C – Develop Long-Term Recommendations

The purpose of Phase II C is to develop an implementation plan for supply projects needed to meet the full normal and drought demands out to 2035 up the specified level-of-service goals. The implementation plan will incorporate the recommendations from Phase II A and the results from the Phase II B field investigations and near-term and mid-term projects that may have already begun implementation. Phase II C is anticipated to begin in early 2012, and extend through the end of 2013 depending on the duration of the Phase II B field investigations.

The key tasks anticipated for Phase II C are presented in Table 8-3.

Table 8-3
Anticipated Phase II C Tasks

Task	*Description*
1	Update Local Agency Need and Supply Information Based on Agency Updates
2	Determine Specific Supply Need by Agency and Region
3	Update Agency and Regional Project Information Based on Phase II B Field Work and Analysis
4	Update Economic Information for Agencies and Projects
5	Develop Portfolios to Address Near- and Long-term Supply Needs
6	Compare and Rank Projects and Portfolios
7	Develop Recommendations
8	Prepare Implementation Plan (Long-Term Recommendations)
9	Stakeholder Outreach
10	Project Management

The specific activities, milestones, deliverables and schedule for this phase of work will be developed towards the end of Phase II A, and updated based on the results from the Phase II B field investigations.

8.4 Phase II Schedule Summary

Phase II A is anticipated to start in July 2010 and continue through December 2011. Phase II B could begin in early 2011 and is anticipated to extend through at least the end of 2012, and possibly to mid 2013, depending on the level of field investigations required. Phase II C is anticipated to start in early 2012 and be completed by the end of 2013. Figure 8-1 provides a summary of the overall schedule and key milestones.

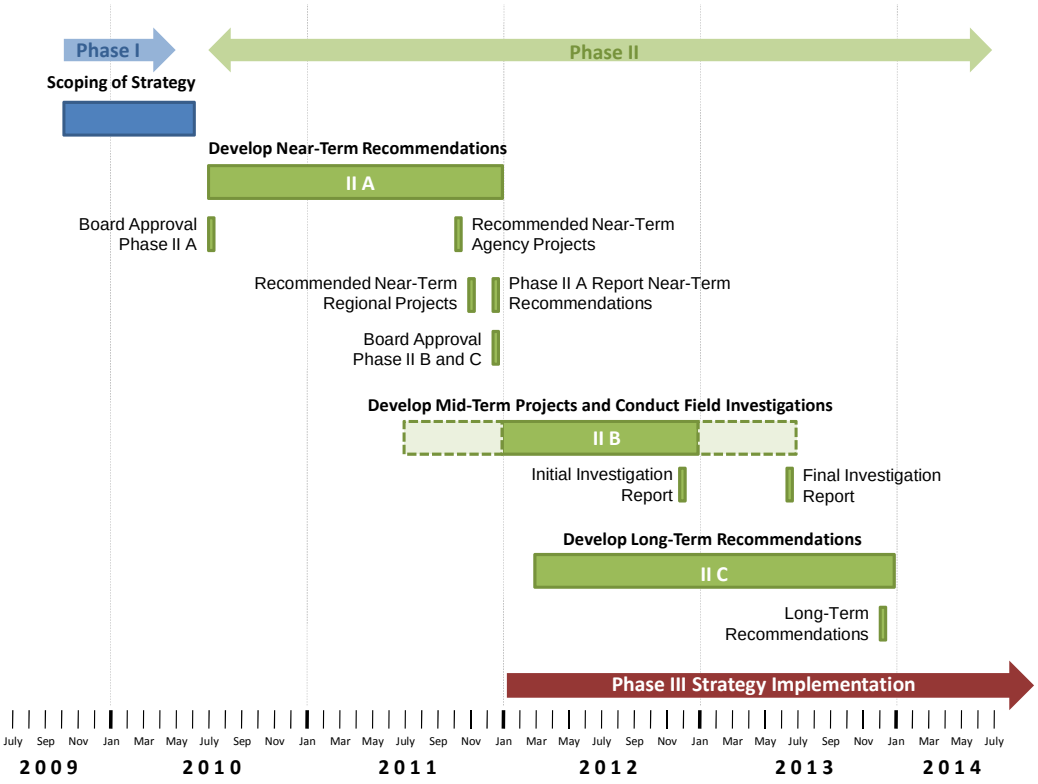


Figure 8-1
Strategy Phasing, Schedule, and Major Milestones

Section 9

Technical Expertise

Section 9
Technical Expertise

As discussed in Section 8, the Phase II work has been broken into three subphases with multiple tasks for each subphase. With the expanded level of effort for the more detailed analysis required in Phase II, it is expected that the project team will include technical, environmental, and planning specialists to perform the Phase II work. This section provides a brief summary of the technical expertise that will be required.

The level of involvement required in each of these areas will depend on the specific projects, and the level of analysis required in order to develop and evaluate them. The areas of expertise are summarized in Table 9-1.

Table 9-1
Technical Expertise Requirements for Phase II

Specialty	***Sub-Area***
Treatment Processes	Water quality
	Water treatment
	Desalination treatment
	Wastewater treatment
	Process engineers
Infrastructure	Pipeline engineers
	Electrical engineers
	Mechanical engineers
	Structural engineers
	Cost estimators
	Schedulers
Water Rights	Legal counsel
	Water rights experts
Water Transfers	Water transfer planners/facilitators
	Legal counsel
Groundwater	Groundwater modelers
	Hydrogeologists
Reservoirs	System modelers
	Hydrologists
	Distribution system modelers
Economics	Economists
	Systems engineers
	Rate specialists
Planning	Land use planners
	Water conservation specialists
	Rain/stormwater capture and graywater specialists
	Legal/institutional/permitting specialists
Environmental Analysis	California Environmental Quality Act/National Environmental Policy Act specialists
Grant Writers	State and Federal grant specialists

Section 10

Conclusions

Section 10
Conclusions

BAWSCA members are faced with potential significant water supply shortfalls under normal and drought conditions. The extent of that shortfall will depend on a range of variables. BAWSCA has undertaken this project to develop the Strategy for addressing member agency needsand priorities for future water supply, and evaluating potential future supply projects.

Phase I of the Strategy involved quantifying the projected water supply need through 2035, defining the evaluation process that will be used to evaluate and select the preferred water supply management projects, and identifying the water supply management projects to be evaluated in Phase II. Phase I also included developing the scope for Phase II.

Even after accounting for savings associated with the existing and planned water conservation activities, water demands within the BAWSCA service area are projected to exceed available supplies after 2018. Up to 25 million gallons per day (mgd) of additional water supply may be needed by 2035 to meet the needs of the current and future residents, businesses, and organizations in normal years. Even more water (i.e., up to 76 mgd) will be needed each year during extended drought conditions.

Phase II of the Strategy will involve detailed evaluation of potential water supply management projects and will consist of the following sub-phases:

- Phase II A – Develop Near-Term Recommendations
- Phase II B – Develop Mid-Term Projects and Conduct Field Investigations
- Phase II C – Develop Long-Term Recommendations

Phase III will include the implementation of specific water supply management projects identified as part of the Strategy.

The approach will be supported by a process for formulating project alternatives into water supply portfolios and systematically evaluating them against criteria which reflect BAWSCA and member agency priorities and concerns.

Due to the projected shortages and the time required to implement various supply strategy elements, rapid development of the strategy is necessary to sustain a safe and reliable supply.

Section 11

References

Section 11
References

ACWD. 2001. Alameda County Water District Groundwater Management Policy. Accessed February 24, 2010. Available at: http://www.acwd.org/engineering/groundwater_docs/Groundwater%20Management%20Policy%202001.pdf.

ACWD. 2005. *Urban Water Management Plan 2006-2010.*

Baker, David R. 2010. Calpine gets OK for Hayward plant with CO{-2} cap. *SFGate.com.* February 5, 2010. Available at http://www.sfgate.com/cgi-bin/article.cgi?f=/c/a/2010/02/05/BUG91BSNBI.DTL.

BARWC. 2009a. *San Francisco Bay Area Recycled Water Coalition Project Summary.* Accessed on December 3, 2009. Available at: http://www.barwc.org/files/BARWC_11_x_17_Flyer_082409.pdf.

BARWC. 2009b. *North Coast County Water District Recycled Water Project Flyer.* Accessed on December 3, 2009. Available at: http://www.barwc.org/files/nccwd_BARWCflyer_1Final.pdf.

BAWSCA. 2007. *Comments on the Draft Program Environmental Impact Report for the San Francisco Public Utilities Commission's Water System Improvement Program Volume I.* October 1, 2007.

BAWSCA, 2010. *BAWSCA Annual Survey FY 2008-09.* January 2010.

Brown and Caldwell. 2009. *Technical Memorandum No. 1, Updated Wholesale Recycled Water Potential.* Prepared for Bay Area Water Supply and Conservation Agency. August 7, 2009.

California Water Service Company. 2005. *2005 Urban Water Management Plan Bear Gulch District.* December 31, 2005.

California Water Service Company. 2006. *2006 Urban Water Management Plan South San Francisco District.* December 15, 2006.

California Water Service Company. 2007. *2007 Urban Water Management Plan Mid-Peninsula District.* December 21, 2007.

CDM. 2003. *Bay Area Water Users Association Water Quality Evaluation for a Dry Year Water Transfer.* October 6, 2003.

CDM. 2009. *Delta Water Supply Reliability Study, Final Report.* Prepared for Alameda County Water District, Santa Clara Valley Water District, and Zone 7 Water Agency. May 2009.

City and County of San Francisco and Wholesale Customers. 2009. *Water Supply Agreement between the City and County of San Francisco and Wholesale Customers in Alameda County, San Mateo County, and Santa Clara County*. July 2009.

City of Daly City. 2005. *2005 Urban Water Management Plan*.

City of East Palo Alto. 2005. *2005 Urban Water Management Plan*. Prepared by IRM. Adopted January 3, 2006.

City of Hayward. 2005. *City of Hayward 2005 Urban Water Management Plan*. December 2005.

City of Menlo Park. 2005. *Urban Water Management Plan 2005*. December 2005.

City of Millbrae. 2005. *City of Millbrae 2005 Urban Water Management Plan*. December 2005.

City of Milpitas. 2005. *2005 Urban Water Management Plan*. December 6, 2005.

City of Mountain View. 2005. *2005 Urban Water Management Plan*. November 15, 2005.

City of Palo Alto. 2009. *City of Palo Alto Recycled Water Project Initial Study/Mitigated Negative Declaration*. Prepared by RMC. March 2009. Accessed March 10, 2010. Available at: http://www.cityofpaloalto.org/civica/filebank/blobdload.asp?BlobID=15163.

City of Palo Alto Utilities. 2005. *City of Palo Alto Utilities 2005 Urban Water Management Plan*. October 2005.

City of Redwood City. 2005. 2005 *Urban Water Management Plan*. December 19, 2005.

City of San Jose. 2005. *2005 Urban Water Management Plan for City of San Jose Municipal Water System*. December 2005.

City of San Jose. 2009. *Draft Envision San Jose 2040 General Plan Update.* http://www.sanjoseca.gov/planning/gp_update/draftplan.asp. October 2009.

City of Santa Clara Water Utility. 2005. *City of Santa Clara 2005 Urban Water Management Plan*. November 15, 2005.

City of South San Francisco. 2009. *Recycled Water Facility Plan, City of South San Francisco in coordination with the California Water Service Company, the San Francisco Public Utilities Commission, and the City of San Bruno, Draft*. Prepared by Carollo Engineers. August 2009.

City of Sunnyvale. 2005. *2005 Urban Water Management Plan*. December 2005.

Coastside County Water District. 2005. *2005 Urban Water Management Plan*.

Ekers, Lisa. 2009. (City of Menlo Park). Personal communication to A. Dutton, BAWSCA, San Mateo, California. November 9, 2009.

Ezell, Justin. 2009. (Public Works Superintendent, Water Utility Services Division, City of Redwood City). Personal communication to A. Loutsch, CDM, Walnut Creek, California. September 28, 2009.

Federal Energy and Regulatory Commission. 2009. Direct Testimony of Daniel B. Steiner. Turlock Irrigation District and Modesto Irrigation District, Project Nos. 2299-065 and 2299-053. Accessed April 13, 2010. Available at : http://www.ferc.gov/docs-filing/elibrary.asp.

Freeman, Gregory, Myasnik Poghosyan and Matthew Lee. 2008. *Where Will We Get the Water? Assessing Southern California's Future Water Strategies.* Los Angeles County Economic Development Corporation. Accessed March 10, 2010. Available at: http://www.laedc.org/reports/consulting/2008_SoCalWaterStrategies.pdf.

Green Affordable Housing Coalition (GAHC). *Rainwater Harvesting*. Published December 2005. Accessed on February 18, 2010. Available at: http://frontierassoc.net/greenaffordablehousing/FactSheets/GAHCfactsheets/29%20Rainwater%20Harvesting%20final.pdf.

Maddaus Water Management and Brown and Caldwell. 2009. *Water Conservation Implementation Plan, Final Report*. Prepared for Bay Area Water Supply and Conservation Agency. September 2009.

Maddison, Mark and Henriette Emond. 2008. *Stormwater Capture, Reuse and Treatment for Multipurpose Benefits.* ASCE World Environment and Water Resources Congress 2008 Ahupua'a.

Metropolitan Transportation Commission. 2008. *Transportation 2035 Plan for the San Francisco Bay Area: Travel Forecasts Data Summary*. December 2008.

National Marine Fisheries Service. 2009. *Endangered Species Act Section 7 Consultation. Biological Opinion and Conference Opinion on the Long-term Operations of the Central Valley and State Water Project*. National Marine Fisheries Southwest Region. June 4, 2009.

PBS&J. 2009. *Final Water Supply Assessment for the Proposed Treasure Island – Yerba Buena Island Project.* Prepared in coordination with the San Francisco Public Utilities Commission. November 2009.

Santa Monica Public Works Civil Engineering. 2010. *SMURFF: Santa Monica Urban Runoff Recycling Facility*. City of Santa Monica. Accessed March 10, 2010. Available at: http://www.santa-monica.org/Departments/PublicWorks/ContentCivEng.aspx?id=7796.

SFPUC. 2007. *Measures to Reduce the Economic Impacts of a Drought-Induced Water Shortage in the SF Bay Area.* Prepared by Public Financial Management and Bay Area Economic Forum. Available at: http://www.bayeconfor.org/media/files/pdf/HetchHetchyDroughtImpacts-SFPUC-FINAL.pdf. May 3, 2007.

SFPUC. 2009a. *Final Water Supply Availability Study for City and County of San Francisco.* Prepared by PBS & J. October 2009.

SFPUC. 2009b. *WSIP Quarterly Report (1st Quarter FY 2009-2010), Regional Projects Status*. Accessed November 19, 2009. Available at: http://sfwater.org/detail.cfm/MC_ID/35/MSC_ID/395/MTO_ID/651/C_ID/4807.

SFPUC. 2009c. *Regional Groundwater Storage and Recovery Project*. Available at:http://sfwater.org/msc_main.cfm/MC_ID/13/MSC_ID/427.

Smith, David, Virginia Porter, Whitman Manley, Phyllis Stanin, and Valerie Young. 2010. *Water Group Summary Report for the Saltworks Proposal in Redwood City, CA.* Prepared for Hart Howerton, Ltd. and the City of Redwood City. January 22, 2010. Accessed March 10, 2010. Available at: http://www.redwoodcity.org/phed/planning/saltworks/pdf/tier_one/rc_tier_one_water_demand_supply_summary.pdf

Stanford University. 2003. Stanford University, Water Conservation, Reuse and Recycling Master Plan, Final. Prepared by Maddaus Water Management and Stanford University. Available at http://lbre.stanford.edu/sem/sites/all/lbre-shared/files/docs_public/FINALStanfordConservation_Recommended_Plan10_16_033%5B1%5D.pdf. October 2003.

State of California. 2005. *Flood warnings: Responding to California's flood crisis.* Water Resources Agency, Dept. of Water Resources, Sacramento, CA.

State Water Resources Control Board. 2009. *20x2020 Water Conservation Plan*. April 30, 2009. Accessed on February 18, 2010. Available at: http://www.swrcb.ca.gov/water_issues/hot_topics/20x2020/docs/comment043009/202020_final_report_draft.pdf

United Nations Office for the Coordination of Humanitarian Affairs. 2009. *IRIN: humanitarian new and analysis*. "Cape Verde: can fog solve water shortages?" January 9, 2009.

URS. 2007. *Volume I: Bay Area Regional Desalination Project Feasibility Study*. Prepared for Contra Costa Water District, EBMUD, SFPUC, and Santa Clara Valley Water District. July 2007.

U. S. District Court, Eastern District of California. 2007. *Interim Remedial Order Following Summary Judgment and Evidentiary Hearing*. Natural Resources Defense

Council, et al., v. Dirk Kempthorne, California Department of Water Resources, State Water Contractors, San Luis & Delta-Mendota Water Authority. Available at: http://www.fws.gov/sacramento/es/documents/OCAP_Final_Interim_Relief_Court_Order_12-14-07.pdf. December 14, 2007.URS. 2007. *Volume I: Bay Area Regional Desalination Project Feasibility Study*. Prepared for Contra Costa Water District, EBMUD, SFPUC, and Santa Clara Valley Water District. July 2007.

U.S. Department of the Interior, Bureau of Reclamation and California Department of Water Resources. 1986. *Agreement Between the United States of America and the State of California for Coordinated Operation of the Central Valley Project and the State Water Project.*

U.S. Department of the Interior, Bureau of Reclamation, Contra Costa Water District, and Western Area Power Administration. 2009. *Los Vaqueros Reservoir Expansion Project Draft Environmental Impact Statement/Environmental Impact Report.* February 2009. Available at: http://www.lvstudies.com/documents.asp.

U.S. Fish and Wildlife Service. 2008. *Formal Endangered Species Act Consultation on the Proposed Coordinated Operations of the Central Valley Project (CVP) and State Water Project (SWP)*. Memorandum to Operation Manager, Bureau of Reclamation, Central Valley Operations Office, Sacramento, CA. Fish and Wildlife Service Region 8.

Wade, William W., Ph.D. 2007. *An Economic Evaluation of the Water Supply Reliability Goal in the SFPUC Water System Improvement Plan.* Report to the San Francisco Bay Area Water Supply & Conservation Agency. May 2005.

Appendix A

Supply Need Calculations

Appendix A
Supply Need Calculations

A.1 Introduction

This appendix provides tables of projected demand, supplies, and calculated supply need for each BAWSCA agency.

A.2 Demand Projections by Member Agency

Tables A-1 and A-2 summarize demand projections for each BAWSCA member agency for the time period 2010 to 2035 in five-year increments. The demand data in Table A-1 does not include conservations savings associated with Passive Conservation measures. Table A-2 does include these savings.

A.3 Supply Mix and Supply Need Projections by Member Agency

Tables A-3 and A-4 summarize supply projections for each BAWSCA member agency for 2018 and 2035, respectively.

Table A-1

BAWSCA Water Conservation Implementation Plan Demand Projections (No Passive Conservation)

Service Area	Demand Projections (mgd)				
	2015	2020	2025	2030	2035
Alameda County Water District	56.11	59.08	62.16	65.41	68.70
Brisbane and Guadalupe Valley MID[1]	1.08	1.15	1.20	1.24	1.28
Burlingame, City of[2]	4.97	5.32	5.58	5.83	6.06
Cal Water - All Districts+Skyline	42.97	44.91	46.55	47.76	49.08
Coastside County Water District	2.85	2.93	3.00	3.07	3.12
Daly City, City of	10.00	10.89	11.21	11.53	11.87
East Palo Alto, City of	3.68	4.61	5.04	5.29	5.58
Estero MID/Foster City	6.05	6.37	6.63	6.89	7.09
Hayward, City of	23.69	26.07	28.85	31.75	34.43
Hillsborough, Town of	3.87	3.94	3.94	3.98	4.01
Menlo Park, City of	4.06	4.28	4.46	4.67	4.87
Mid-Peninsula Water Distinct	3.94	4.13	4.27	4.45	4.59
Millbrae, City of	3.45	3.60	3.73	3.86	3.98
Milpitas, City of	14.28	15.48	16.70	17.92	19.12
Mountain View, City of	13.38	14.25	15.07	15.85	16.61
North Coast County Water District[3]	3.87	3.96	4.04	4.10	4.18
Palo Alto, City of	15.39	15.99	16.56	17.05	17.57
Purissima Hills Water District	2.82	2.99	3.14	3.29	3.44
Redwood City, City of	13.64	14.14	14.84	15.49	16.16
San Bruno, City of	4.57	4.82	5.06	5.29	5.51
San Jose, City of (portion of north San Jose)[4]	7.60	9.08	10.23	11.43	12.52
Santa Clara, City of	29.38	31.12	32.70	34.33	35.64
Stanford University	5.31	5.85	6.45	7.10	7.80
Sunnyvale, City of	25.93	27.04	28.15	29.18	30.21
Westborough Water District	1.07	1.08	1.08	1.09	1.09
TOTAL	**303.9**	**323.1**	**340.6**	**357.9**	**374.5**

Source: BAWSCA Water Conservation Implemenation Plan, 2009, unless footnoted otherwise

Footnotes:

(1) Revised per Brisbane/GVMID, 5/10/10

(2) Revised per Burlingame, 5/11/10

(3) Revised per NCCWD, 5/25/10

(4) San Jose projections, which are only for a portion of north San Jose served by San Francisco Regional Water System, have been updated to reflect demand for all sources (groundwater and recycled water) as well as the Oct. 2009 Draft Envision San Jose 2040 General Plan Update

Table A-2

BAWSCA Water Conservation Implementation Plan Demand Projections (Including Passive Conservation)

Service Area	Demand Projections (mgd)				
	2015	2020	2025	2030	2035
Alameda County Water District	53.72	55.55	57.53	59.83	62.73
Brisbane and Guadalupe Valley MID[1]	1.00	1.05	1.07	1.09	1.12
Burlingame, City of[2]	4.88	5.11	5.24	5.39	5.59
Cal Water - All Districts+Skyline	40.82	41.79	42.58	43.12	44.24
Coastside County Water District	2.74	2.77	2.80	2.83	2.87
Daly City, City of	9.37	9.90	9.97	10.08	10.36
East Palo Alto, City of	3.49	4.36	4.71	4.88	5.12
Estero MID/Foster City	5.85	6.08	6.25	6.45	6.64
Hayward, City of	22.86	24.91	27.37	30.01	32.65
Hillsborough, Town of	3.79	3.82	3.80	3.81	3.84
Menlo Park, City of	3.96	4.13	4.27	4.44	4.62
Mid-Peninsula Water Distinct	3.72	3.82	3.88	3.99	4.10
Millbrae, City of	3.28	3.35	3.43	3.50	3.61
Milpitas, City of	13.72	14.62	15.54	16.49	17.48
Mountain View, City of	12.83	13.39	13.94	14.48	15.16
North Coast County Water District[3]	3.70	3.70	3.70	3.70	3.76
Palo Alto, City of	14.72	15.02	15.32	15.60	16.04
Purissima Hills Water District	2.80	2.97	3.12	3.27	3.42
Redwood City, City of	12.82	13.00	13.36	13.73	14.27
San Bruno, City of	4.24	4.33	4.42	4.53	4.70
San Jose, City of (portion of north San Jose)[4]	7.37	8.55	9.50	10.52	11.49
Santa Clara, City of	28.68	30.01	31.21	32.51	33.73
Stanford University	5.15	5.62	6.15	6.74	7.40
Sunnyvale, City of	24.71	25.18	25.70	26.24	27.06
Westborough Water District	1.00	0.97	0.96	0.94	0.94
TOTAL	**291.2**	**304.0**	**315.8**	**328.2**	**342.9**

Source: BAWSCA Water Conservation Implemenation Plan, 2009, unless footnoted otherwise

Footnote:

(1) Revised per Brisbane/GVMID, 5/10/10

(2) Revised per Burlingame, 5/11/10

(3) Revised per NCCWD, 5/25/10

(4) San Jose projections, which are only for a portion of north San Jose served by San Francisco Regional Water System, have been updated to reflect demand for all sources (groundwater and recycled water) as well as the Oct. 2009 Draft Envision San Jose 2040 General Plan Update

Table A-3
BAWSCA Member Agency Projected Demands, Supplies, and Supply Need for 2018
(mgd)

Member Agency	SFPUC Supply Guarantee	2018 Projected Demand Before Passive Cons. (1)	2018 Projected Passive Conservation (1)	2018 Projected Demand After Passive Cons.	2018 Projected Use of Local & Other Sources						2018 Projected SFPUC Purchases	2018 Projected Need For Water
					Ground Water	Surface Water	Recycled Water	Other Sources	Committed PEIR Conservation (2008)(1)	Projected WCIP Conservation (1) (2009)		
Alameda County Water District(2)	13.76	57.89	3.07	54.82	10.81	3.00	0.00	22.83	3.00	1.42	13.76	0.00
Brisbane and Guadalupe Valley MID(3)	0.98	1.12	0.08	1.04	0.00	0.00	0.00	0.00	0.03	0.06	0.95	0.00
Burlingame, City of(4)	5.23	5.22	0.16	5.06	0.00	0.00	0.00	0.00	0.10	0.15	4.82	0.00
Cal Water - All Districts+Skyline	35.68	44.13	2.73	41.40	1.37	1.37	0.00	0.00	1.46	1.14	36.06	0.00
Coastside County Water District	2.18	2.89	0.14	2.75	0.20	0.19	0.00	0.00	0.12	0.07	2.18	0.00
Daly City, City of(5)	4.29	10.53	0.85	9.68	4.25	0.00	0.03	0.00	0.32	0.42	4.66	0.00
East Palo Alto, City of	1.96	4.24	0.23	4.01	0.30	0.00	0.00	0.00	0.12	0.19	3.40	0.00
Estero MID/Foster City	5.90	6.25	0.26	5.99	0.00	0.00	0.00	0.00	0.00	0.17	5.82	0.00
Hayward, City of(6)		25.11	1.03	24.08	0.00	0.00	0.00	0.00	0.43	0.73	22.92	0.00
Hillsborough, Town of	4.09	3.91	0.10	3.81	0.00	0.00	0.00	0.00	0.24	0.06	3.51	0.00
Menlo Park, City of	4.46	4.19	0.13	4.06	0.00	0.00	0.00	0.00	0.08	0.08	3.90	0.00
Mid-Peninsula Water Distinct	3.89	4.05	0.28	3.77	0.00	0.00	0.00	0.00	0.05	0.11	3.61	0.00
Millbrae, City of	3.15	3.54	0.22	3.32	0.00	0.00	0.00	0.00	0.10	0.09	3.13	0.00
Milpitas, City of	9.23	15.00	0.44	14.56	0.00	0.00	1.39	3.67	0.29	0.41	8.80	0.00
Mountain View, City of	13.46	13.90	0.73	13.17	0.16	0.00	1.00	1.20	0.18	0.38	10.26	0.00
North Coast County Water District(7)	3.84	3.92	0.21	3.70	0.00	0.00	0.00	0.00	0.00	0.12	3.58	0.00
Palo Alto, City of	17.08	15.75	0.85	14.90	0.00	0.00	0.76	0.00	0.45	0.36	13.33	0.00
Purissima Hills Water District	1.63	2.92	0.01	2.91	0.00	0.00	0.00	0.00	0.06	0.08	2.77	0.00
Redwood City, City of	10.93	13.94	1.01	12.93	0.00	0.00	1.00	0.00	0.66	0.42	10.85	0.00
San Bruno, City of	3.25	4.72	0.42	4.30	1.74	0.00	0.00	0.00	0.09	0.17	2.30	0.00
San Jose, City of (portion of north San Jose)(8)		8.50	0.41	8.09	2.03	0.00	1.13	0.00	0.14	0.29	4.50	0.00
Santa Clara, City of(8)		30.42	0.94	29.48	15.83	0.00	3.73	4.08	0.68	0.66	4.50	0.00
Stanford University(9)	3.03	5.63	0.20	5.43	0.00	1.70	0.00	0.26	0.37	0.26	2.84	0.00
Sunnyvale, City of	12.58	26.59	1.61	24.98	3.18	0.00	1.49	9.86	0.43	0.58	9.44	0.00
Westborough Water District	1.32	1.07	0.09	0.98	0.00	0.00	0.00	0.00	0.01	0.03	0.94	0.00
Totals		**315.45**	**16.20**	**299.25**	**39.86**	**6.26**	**10.54**	**41.90**	**9.41**	**8.45**	**182.83**	**0.00**

Notes
(1) Source: BAWSCA WCIP (2009)
(2) Due to supply restrictions on its Delta supplies, ACWD's SFPUC purchase has been fixed at their individual supply assurance with the balance being taken from "other sources"
(3) Revised per Brisbane/GVMID, 5/10/10
(4) Revised per Burlingame, 5/11/10
(5) Reflects use of supplies in the absence of a put or take scenario for the conjunctive use program. During operation of the conjunctive use program, the range of SFPUC purchases could be anticipated between 5.04 mgd and 7.48 mgd.
(6) Agency does not have an Individual Supply Guarantee.
(7) Revised per NCCWD, 5/25/10
(8) San Jose and Santa Clara have temporary and interruptible contracts with SFPUC to purchase water with a limit of 9 mgd between the two agencies.
(9) Stanford University is in the process of a comprehensive study for campus water demand projections and supply options.

Table A-4
BAWSCA Member Agency Projected Demands, Supplies, and Supply Need for 2035 (mgd)

Member Agency	SFPUC Supply Guarantee	2035 Projected Demand Before Passive Cons. [1]	2035 Projected Passive Conservation [1]	2035 Projected Demand After Passive Cons.	Local & Other Sources							2035 Projected SFPUC Purchases	2035 Projected Need For Water
					Ground Water	Surface Water	Recycled Water	Other Sources	Committed PEIR Conservation (2008)[1, 2]	Projected WCIP Conservation (2009)[1, 2]	Sub-Total Other Supply		
Alameda County Water District [3]	13.76	68.70	5.97	62.73	15.28	3.00	1.40	24.00	3.14	2.15	48.97	13.76	0.00
Brisbane and Guadalupe Valley MID[4]	0.98	1.28	0.15	1.12	0.00	0.00	0.00	0.00	0.03	0.08	0.10	0.98	0.04
Burlingame, City of[5]	5.23	6.06	0.47	5.59	0.00	0.00	0.00	0.00	0.13	0.21	0.34	5.23	0.01
Cal Water - All Districts+Skyline	35.68	49.08	4.85	44.24	1.37	1.37	0.00	0.00	1.65	1.51	5.90	35.68	2.66
Coastside County Water District	2.18	3.12	0.25	2.87	0.03	0.04	0.00	0.00	0.13	0.08	0.28	2.18	0.42
Daly City, City of [6,7]	4.29	11.87	1.51	10.36	4.48	0.00	0.00	0.00	0.31	0.51	5.30	4.29	0.77
East Palo Alto, City of	1.96	5.58	0.46	5.12	0.30	0.00	0.00	0.00	0.15	0.30	0.75	1.96	2.41
Estero MID/Foster City	5.90	7.09	0.46	6.64	0.00	0.00	0.00	0.00	0.00	0.25	0.25	5.90	0.48
Hayward, City of[8]		34.43	1.78	32.65	0.00	0.00	0.00	0.00	0.64	1.23	1.87	30.78	0.00
Hillsborough, Town of	4.09	4.01	0.18	3.84	0.00	0.00	0.00	0.00	0.31	0.08	0.39	3.45	0.00
Menlo Park, City of	4.46	4.87	0.24	4.62	0.00	0.00	0.00	0.00	0.11	0.12	0.23	4.39	0.00
Mid-Peninsula Water Distinct	3.89	4.59	0.49	4.10	0.00	0.00	0.00	0.00	0.05	0.15	0.20	3.89	0.01
Millbrae, City of	3.15	3.98	0.37	3.61	0.00	0.00	0.00	0.00	0.10	0.11	0.21	3.15	0.24
Milpitas, City of	9.23	19.12	1.63	17.48	0.00	0.00	1.77	7.13	0.33	0.72	9.94	7.54	0.00
Mountain View, City of	13.46	16.61	1.45	15.16	0.06	0.00	0.00	1.30	0.18	0.59	2.12	13.04	0.00
North Coast County Water District	3.84	4.18	0.42	3.76	0.00	0.00	0.00	0.00	0.00	0.15	0.15	3.61	0.00
Palo Alto, City of	17.08	17.57	1.54	16.04	0.00	0.00	0.76	0.00	0.46	0.51	1.73	14.30	0.00
Purissima Hills Water District	1.63	3.44	0.02	3.42	0.00	0.00	0.00	0.00	0.07	0.15	0.22	1.63	1.57
Redwood City, City of	10.93	16.16	1.88	14.27	0.00	0.00	1.00	0.00	0.70	0.60	2.31	10.93	1.04
San Bruno, City of	3.25	5.51	0.80	4.70	0.00	0.00	0.00	0.00	0.09	0.22	0.32	3.25	1.14
San Jose, City of (portion of north San Jose)[10]		12.52	1.03	11.49	2.31	0.00	2.01	0.00	0.17	0.67	5.16	4.5 - 0	1.83-6.34
Santa Clara, City of [10, 11]		35.64	1.91	33.73	17.51	0.00	4.02	5.85	0.83	1.02	29.23	4.5 - 0	0-4.5 [7]
Stanford University[12]	3.03	7.80	0.40	7.40	0.00	1.93	0.00	0.00	0.48	0.33	2.73	3.03	1.64
Sunnyvale, City of	12.58	30.21	3.15	27.06	2.60	0.00	1.50	9.90	0.43	0.81	15.24	11.82	0.00
Westborough Water District	1.32	1.09	0.15	0.94	0.00	0.00	0.00	0.00	0.01	0.03	0.04	0.90	0.00
Totals	**161.91**	**374.50**	**31.55**	**342.94**	**43.94**	**6.34**	**12.46**	**48.18**	**10.50**	**12.58**	**134.00**	**185.69 [13]**	**14.26 - 23.27**

Notes
(1) Source: BAWSCA WCIP (2009)
(2) Values associated with conservation savings in 2030 due to model limitations.
(3) Due to supply restrictions on its Delta supplies, ACWD's SFPUC purchase has been fixed at their individual supply assurance with the balance being taken from "other sources."
(4) Revised per Brisbane/GVMID, 5/10/10
(5) Revised per Burlingame, 5/12/10
(6) Reflects use of supplies in the absence of a put or take scenario for the conjunctive use program. During operation of the conjunctive use program, the range of SFPUC purchases could be anticipated between 5.04 mgd and 7.48 mgd.
(7) Daly City's 2035 groundwater supply is expected to be in the range of 4.25 to 4.71 mgd.
(8) Agency does not have an Individual Supply Guarantee.
(9) Revised per NCCWD, 5/25/10
(10) San Jose and Santa Clara have temporary and interruptible contracts with SFPUC to purchase water with a limit of 9 mgd between the two agencies.
(11) In the event that SFPUC limits its supply to Santa Clara, there is a possibility that Santa Clara could increase its use of groundwater (up to 22.01 mgd) and other supplies (up to 10.35 mgd) to offset the loss of the SFPUC supply. Increases in groundwater production in the Santa Clara groundwater basin would require
(12) Stanford University is in the process of a comprehensive study for campus water demand projections and supply options.
(13) Current estimates of SFPUC Purchases are projected to exceed 184 mgd in 2035 by a small margin. In the event that this situation actually occurs, Section 3.02 and Attachment D of the July 2009 Water Sales Agreement present the required procedures for a pro-rate reduction of Wholesale Customers' Individual Supply Guarantees. At this time and for the ease of presentation, projected SFPUC Purchases have been capped at 184 mgd in Figure 2-6 with the volumetric difference added to the "Not Yet Determined" category."

Appendix B

Additional Information on Water Supply Management Projects

Appendix B
Additional Information on Water Supply Management Projects

This appendix provides additional detail on the water supply management projects described in Section 4.

B.1 Groundwater Projects

B.1.1 Groundwater Projects to be Evaluated in Phase II

Tables B-1 through B-3 summarize currently-available information regarding the groundwater projects identified for evaluation in Phase II. Figure B-1 presents the location of the identified groundwater projects. These projects have been selected because there is potential that, if BAWSCA or one or more of the member agencies became a partner in one of these projects, additional potable or non-potable supply could be made available (i.e., via sale, exchange, or transfer) to a participating BAWSCA agency needing supply. The groundwater projects can generally be grouped as follows:

- *Existing projects within the BAWSCA service area* that are under development by, or in partnership with, a BAWSCA member agency and that may have the potential to be expanded and/or to have the project timeline accelerated to either offset additional demand within the service area of the BAWSCA agency(ies) that is involved in the project, or to offset the demand of another BAWSCA agency(ies) through a sale, exchange, or transfer;

- *Planned projects within the BAWSCA service area* that have been identified by a BAWSCA member agency which may have the potential to be expanded and/or to have the project timeline accelerated to either offset additional demand within the service area of the BAWSCA agency(ies) that is involved in the project, or to offset the demand of another BAWSCA agency(ies) through a sale, exchange, or transfer; and

- *Potential future new projects within the BAWSCA service area* that have not been specifically identified by a BAWSCA member agency to date, but that may have the potential to be developed to either offset additional demand within the service area of the BAWSCA agency(ies) that is involved in the project, or to offset the demand of another BAWSCA agency(ies) through a sale, exchange, or transfer.

Information contained in this section is based on member agency UWMPs[1] , communication with BAWSCA staff, and individual agency documents, as noted in the text and tables. The groundwater projects described in Tables B-1 through B-3 are

[1] Brisbane, Guadalupe Valley Municipal Improvement District, Purissima Hills Water District, Skyline County Water District (now part of Cal Water), and Stanford University did not complete UWMPs due to their small service areas.

in varying stages of planning or design and there are varying levels of detail regarding well and aquifer yields, treatment capacity, cost[2] and schedule for each project are available from the reviewed documents. Where available, pumping capacity in mgd and annual production in AFY have been included.

Tables B-1 through B-3 also identify whether the groundwater projects can augment local supply or provide a regional supply benefit, and whether a potential opportunity exists to accelerate the project schedule. Generally, the potential projects not specifically identified by a member agency and projects without sufficient definition were not identified as having potential for schedule acceleration.

B.1.1.1 Existing Groundwater Projects Within the BAWSCA Service Area

Based on available published information, Table B-1 summarizes the existing groundwater water projects in the BAWSCA service area that are being planned for expansion and where there may be the potential, as part of the Strategy, for the projects to be expanded or to have the project timeline accelerated to offset additional demand.

The timeframes for bringing the groundwater projects online varies widely. For example, Cal Water, Daly City, and San Bruno are planning for construction of the Regional Groundwater Storage and Recovery Project to be complete by 2015, while the other agencies do not have a schedule in place for their projects.

B.1.1.2 Planned Groundwater Projects Within the BAWSCA Service Area

Table B-2 summarizes planned groundwater projects that have been identified by a BAWSCA member agency and that may have the potential, as part of the Strategy, to be expanded or to have the project timeline accelerated to create either local or regional benefit. The majority of this information is based on the 2005 UWMPs. In most cases, information regarding these potential projects (e.g., potential aquifer yield, water quality, and design or construction schedules) has not been published.

B.1.1.3 Potential Groundwater Projects Within the BAWSCA Service Area

Table B-3 presents potential groundwater projects that were not specifically identified by a BAWSCA member agency to date, but have been identified herein as projects which may have the potential to be developed to offset additional demand of one or more BAWSCA agency(ies).

[2] Costs were not available for most of the projects. Where available, costs were adjusted to January 2010 dollars based on the Engineering News Record (ENR) Construction Cost Index (CCI) for San Francisco. Unit costs were not developed due to the lack of available information about operations and maintenance (O&M) costs for most of the projects.

Table B-1
Existing Groundwater Projects Within BAWSCA Service Area to be Evaluated in Phase II

Agency	Potential Water Supply Management Project Description	Potential Project Benefit			Comments / Potential Issues
		Augment Local Supply	Develop Asset for Regional Benefit[1]	Accelerate Schedule [2]	
Cal Water	Construct 4 wells for Cal Water's portion of the Regional Groundwater Storage & Recovery Project.[3,4]	X	X	Both	• Regional project with SFPUC, Daly City, and San Bruno to install a total of 16 new wells to provide 7.2 mgd of supply during dry years. • Individual yield for Cal Water has not been identified. • Design and environmental review scheduled to be complete in Fall 2011 and Fall 2012, respectively. Construction scheduled from 2011 to 2015. • Construction costs for the entire regional project estimated at $37 million; total project costs estimated at $55 million. (2010 dollars) • Potential for regional benefit identified by SFPUC in project description document and WSIP quarterly report.
Daly City	Construct 5 wells for Daly City's portion of the Regional Groundwater Storage & Recovery Project.[3,4]	X	X	Both	• Regional project with SFPUC, Cal Water, and San Bruno to install a total of 16 new wells to provide 7.2 mgd of supply during dry years. • Individual yield for Daly City has not been identified. • Design and environmental review scheduled to be complete in Fall 2011 and Fall 2012, respectively. Construction scheduled from 2011 to 2015. • Construction costs for the entire regional project estimated at $37 million; total project costs estimated at $55 million. (2010 dollars) • Potential for regional benefit identified by SFPUC in project description document and WSIP quarterly report.
East Palo Alto	Rehabilitate existing Gloria Bay well (currently out of service, 350 gpm capacity) and install new wells for combined supply of 1,136 AFY.[5]	X	--	Local	• Potential yield is unknown. • Potential effects on surrounding groundwater wells from pumping were not addressed in UWMP. • Yield, schedule, and cost need to be confirmed.

Table B-1
Existing Groundwater Projects Within BAWSCA Service Area to be Evaluated in Phase II

Agency	***Potential Water Supply Management Project Description***	***Potential Project Benefit***			***Comments / Potential Issues***
		Augment Local Supply	***Develop Asset for Regional Benefit[1]***	***Accelerate Schedule [2]***	
Milpitas	Convert use of Pinewood well from emergency only supply to normal supply.[6]	X	--	NA	• Amount of supply available from Pinewood well has not been assessed. • Well is already permitted for unlimited use by DPH. • Milpitas policy is to use groundwater only for emergencies. • Potential capacity is dependent on the amount of natural and/or artificial recharge, carryover groundwater storage, and depth to groundwater. • Yield, schedule, and cost need to be confirmed.
Palo Alto	Rehabilitate 5 existing wells and construct 3 new wells, with a total sustainable yield of 500 AFY.	X	X	Both	• The existing wells are not in good condition. Major repair and upgrades are needed for the wells to provide either emergency or normal use. The existing wells are currently permitted for emergency use. • Maximum extraction for the eight wells will be limited to 1,500 AFY from the basin, once every three years. • Potential capacity is dependent on the amount of natural and/or artificial recharge, carryover groundwater storage, and depth to groundwater. • Yield, schedule, and cost need to be confirmed.
San Bruno	Construct 3 wells for San Bruno's portion of the Regional Groundwater Storage & Recovery Project.[3,4]	X	X	Both	• Regional project with SFPUC, Cal Water, and Daly City to install a total of 16 new wells to provide 7.2 mgd of supply during dry years. • Individual yield for San Bruno has not been identified. • Design and environmental review scheduled to be complete in Fall 2011 and Fall 2012, respectively. Construction scheduled from 2011 to 2015. • Construction costs for the entire regional project estimated at $37 million; total project costs estimated at $55 million. (2010 dollars) • Potential for regional benefit identified by SFPUC in project description document and WSIP quarterly report.

Table B-1
Existing Groundwater Projects Within BAWSCA Service Area to be Evaluated in Phase II

Agency	Potential Water Supply Management Project Description	Potential Project Benefit			Comments / Potential Issues
		Augment Local Supply	Develop Asset for Regional Benefit[1]	Accelerate Schedule [2]	
Sunnyvale	Convert 2 standby wells to normal year supply.[7]	X	X	NA	• Potential supply available and potential effects on groundwater basin were not evaluated. • Potential capacity is dependent on the amount of natural and/or artificial recharge, carryover groundwater storage, and depth to groundwater. • Yield, schedule, and cost need to be confirmed.

(1) Projects that provide "regional benefit" could be local projects that could be expanded to provide a water supply benefit for more than one member agency or projects outside the BAWSCA service area that have the potential to serve one or more member agencies. In order for multiple agencies to be involved, agreements (cost, schedule, etc.), conveyance, and water quality issues may have to be addressed as part of Phase II of the Strategy.

(2) Opportunity exists to accelerate the schedule for the "local" or "regional" benefit, or "both". "NA" = Not Available, project is too ill-defined to make a determination.

(3) Source: SFPUC 2009b

(4) Source: SFPUC 2009c

(5) Source: City of East Palo Alto 2005

(6) Source: City of Milpitas 2005

(7) Source: City of Sunnyvale 2005

Table B-2
Planned Groundwater Projects Within BAWSCA Service Area to be Evaluated in Phase II

Agency	Potential Water Supply Management Project Description	Potential Project Benefit			Comments / Potential Issues
		Augment Local Supply	Develop Asset for Regional Benefit[1]	Accelerate Schedule[2]	
Cal Water	Locate 3 sites for test wells to explore feasibility and capacity for augmenting local supply in Mid-Peninsula District.[3]	X	--	Local	• Yield of potential wells expected to be very low. • Yield, schedule, and cost need to be confirmed.
Daly City	Construct additional wells for emergency supply.[4]	X	--	Local	• Daly City will assess emergency well sites for potential yield and space for well head treatment and disinfection. • Relationship with and effects on Regional Groundwater Storage and Recovery Project are unknown. • Yield, schedule, and cost need to be confirmed.
Menlo Park	Construct additional wells for emergency use [5]	X	--	Local	• Sites, potential yield, and feasibility have not been evaluated. • Yield, schedule, and cost need to be confirmed.
Mountain View	Complete 3 well rehabilitation projects by 2015.	X	--	NA	• Yield, schedule, and cost need to be confirmed.

Table B-2
Planned Groundwater Projects Within BAWSCA Service Area to be Evaluated in Phase II

Agency	Potential Water Supply Management Project Description	Potential Project Benefit			Comments / Potential Issues
		Augment Local Supply	Develop Asset for Regional Benefit[1]	Accelerate Schedule[2]	
San Jose	Construct 2-3 additional wells by 2025.[6]	X	X	Both	• San Jose projects an increase in total groundwater supply of 1,800 AFY by 2030. • Potential effects on groundwater basin of that projected supply increase were not identified. • Potential capacity is dependent on the amount of natural and/or artificial recharge, carryover groundwater storage, and depth to groundwater. • Yield, schedule, and cost need to be confirmed.
Santa Clara	Increase supply through construction of 2 new wells (#32 and #34) for potential yield of 800 to 1,190 AFY (depending upon use factor). [7]	X	X	Both	• Santa Clara's groundwater supplies (existing and new wells) would increase an additional 5,000 AFY by 2030. Difference between this amount and the yield of the two new wells was not explained in the UWMP. • Potential capacity is dependent on the amount of natural and/or artificial recharge, carryover groundwater storage, and depth to groundwater. • Yield, schedule, and cost need to be confirmed.
Sunnyvale	Construct new wells to provide normal year supply.[8]	X	X	NA	• This project is an alternative to converting existing standby wells to provide normal year supply. • Potential supply available and potential effects on groundwater basin have not yet been evaluated. • Potential capacity is dependent on the amount of natural and/or artificial recharge, carryover groundwater storage, and depth to groundwater. • Yield, schedule, and cost need to be confirmed.

(1) Projects that provide "regional benefit" could be local projects that could be expanded to provide a water supply benefit for more than one member agency or projects outside the BAWSCA service area that have the potential to serve one or more member agencies. In order for multiple agencies to be involved, agreements (cost, schedule, etc.), conveyance, and water quality issues may have to be addressed as part of Phase II of the Strategy.

(2) Opportunity exists to accelerate the schedule for the "local" or "regional" benefit, or "both". "NA" = Not Available, project is too ill-defined to make a determination.

(3) Source: Cal Water 2007

(4) Source: City of Daly City 2005

(5) Source: City of Menlo Park 2005

(6) Source: City of San Jose 2005

(7) Source: City of Santa Clara Utility 2005

(8) Source: City of Sunnyvale 2005

Table B-3
Potential Groundwater Projects Within BAWSCA Service Area to be Evaluated in Phase II

Agency	***Potential Water Supply Management Project Description***	***Potential Project Benefit***			***Comments / Potential Issues***
		Augment Local Supply	***Develop Asset for Regional Benefit[1]***	***Accelerate Schedule[2]***	
Cal Water	Increase scope of groundwater investigation based on test wells to augment local supply in Mid-Peninsula District (see Cal Water entry in Table B-2).	X	X	NA	• Feasibility of potential project has not been evaluated. • Yield, schedule, and cost need to be developed.
Daly City	Increase yield of planned emergency wells for normal year supply (see Daly City entry in Table B-2).	X	X	NA	• Feasibility of potential project has not been evaluated. • Yield, schedule, and cost need to be developed.
East Palo Alto	Increase yield of new wells for normal year supply beyond 1,136 AFY (see East Palo Alto entry in Table B-1).	X	X	NA	• Feasibility of potential project has not been evaluated. • Yield, schedule, and cost need to be developed.
Hayward	Upgrade current emergency wells to normal year supply, up to 8,100 AFY.	X	X	NA	• Five emergency wells are certified by DPH for short duration emergency use only; would require change in status. • The Niles Cone Basin is actively managed by ACWD. Potential impacts to users in the Niles Cone Basin will need to be addressed. • Feasibility of potential project has not been evaluated. • Yield, schedule, and cost need to be developed.
Menlo Park	Construct wells for normal year supply.[3]	X	X	NA	• Possible but not planned because of low quality and presence of existing well users. • Amount of recharge that can be safely recovered without inducing seawater intrusion and subsidence will depend on pumping from all users in basin. • Due to groundwater hardness, well water would likely require blending prior to potable use. • Yield, schedule, and cost need to be confirmed.
	Upgrade emergency wells to supplement normal year supply (see Menlo Park entry in Table B-2).	X	X	NA	• Feasibility of potential project has not been evaluated. • Yield, schedule, and cost need to be developed.
	Construct wells for irrigation supply.	X	--	NA	• Feasibility of potential project has not been evaluated. • Yield, schedule, and cost need to be developed.

Table B-3
Potential Groundwater Projects Within BAWSCA Service Area to be Evaluated in Phase II

Agency	***Potential Water Supply Management Project Description***	***Potential Project Benefit***			***Comments / Potential Issues***
		Augment Local Supply	***Develop Asset for Regional Benefit[1]***	***Accelerate Schedule[2]***	
Milpitas	Convert Curtis well from emergency supply to normal supply.	X	X	NA	• Treatment system not yet installed. Well will require iron and manganese treatment to be permitted for unlimited use. • Potential supply available from Curtis well not identified. • As of 2005, Milpitas policy was to use groundwater only for emergencies. • Feasibility of potential project has not been evaluated. • Potential capacity is dependent on the amount of natural and/or artificial recharge, carryover groundwater storage, and depth to groundwater. • Pump station will be required to deliver the water. No schedule developed at this time due to funding issues. • Yield, schedule, and cost need to be developed.
Mountain View	Convert 8 emergency wells to normal year supply; increase extraction to historic pumping rate of 1,000 AFY.	X	X	NA	• Multiple dry year yield can be 1,000 AFY. Average year yield is unknown. • Feasibility of potential project has not been evaluated. • Potential yield may depend on groundwater quality. The City has received complaints regarding taste and turbidity with increased groundwater use. • Potential capacity is dependent on the amount of natural and/or artificial recharge, carryover groundwater storage, and depth to groundwater. • Yield, schedule, and cost need to be developed.
Palo Alto	Convert existing or planned emergency wells to normal year supply (see Palo Alto entry in Table B-1).	X	X	NA	• Feasibility of potential project has not been evaluated. • Potential capacity is dependent on the amount of natural and/or artificial recharge, carryover groundwater storage, and depth to groundwater. • Yield, schedule, and cost need to be developed.
Redwood City	Construct network of wells for normal year supply of 500 to 1,000 AFY.[4]	X	--	Local	• Local aquifers are considered marginal sources but may be adequate to provide small amounts of supplemental water. • Water quality is acceptable for potable and irrigation uses, but would require treatment and blending for aesthetics. • Acceptable sites have not been identified. • Yield, schedule, and cost need to be confirmed.

Table B-3
Potential Groundwater Projects Within BAWSCA Service Area to be Evaluated in Phase II

Agency	Potential Water Supply Management Project Description	Potential Project Benefit			Comments / Potential Issues
		Augment Local Supply	Develop Asset for Regional Benefit[1]	Accelerate Schedule[2]	
	Increase supply from planned wells beyond 1,000 AFY.	X	X	NA	• Feasibility of potential project has not been evaluated. • Yield, schedule, and cost need to be developed.
San Bruno	Increase supply beyond that proposed by Regional Groundwater Storage & Recovery Project.	X	X	NA	• Feasibility of potential project has not been evaluated. • Yield, schedule, and cost need to be developed.
San Jose	Increase supply from planned new wells (see San Jose entry in Table B-2).	X	X	NA	• Feasibility of potential project has not been evaluated. • Potential capacity is dependent on the amount of natural and/or artificial recharge, carryover groundwater storage, and depth to groundwater. • Yield, schedule, and cost need to be developed.
Santa Clara	Increase supply from planned wells beyond 1,190 AFY (see Santa Clara entry in Table B-2).	X	X	NA	• Feasibility of potential project has not been evaluated. • Potential capacity is dependent on the amount of natural and/or artificial recharge, carryover groundwater storage, and depth to groundwater. • Yield, schedule, and cost need to be developed.
Stanford University	Increase use of existing wells for non-potable supply.	X	--	NA	• Feasibility of potential project has not been evaluated. • Potential capacity is dependent on the amount of natural and/or artificial recharge, carryover groundwater storage, and depth to groundwater. • Yield, schedule, and cost need to be developed.
Sunnyvale	Expand use of converted or new wells for normal year supply (see Sunnyvale entries in Tables B-1 and B-2).	X	X	NA	• Feasibility of potential project has not been evaluated. • Potential capacity is dependent on the amount of natural and/or artificial recharge, carryover groundwater storage, and depth to groundwater. • Yield, schedule, and cost need to be developed.

(1) Projects that provide "regional benefit" could be local projects that could be expanded to provide a water supply benefit for more than one member agency or projects outside the BAWSCA service area that have the potential to serve one or more member agencies. In order for multiple agencies to be involved, agreements (cost, schedule, etc.), conveyance, and water quality issues may have to be addressed as part of Phase II of the Strategy.

(2) Opportunity exists to accelerate the schedule for the "local" or "regional" benefit, or "both". "NA" = Not Available, project is too ill-defined to make a determination.

(3) Source: City of Menlo Park 2005

(4) Source: City of Redwood City 2005

B.1.2 Potential Issues Associated with Developing Groundwater Projects

Potential issues affecting groundwater project implementation are described below.

- *Normal year yield and drought supply availability* – Due to hydrologic, water quality, and regional pumping impacts, there is a limit to the increase in available groundwater capacity for most agencies. However, there are a number of member agencies with more productive groundwater basins that may be interested in expanding their groundwater use for their own, or regional, benefit. Ultimately, yield is limited by the amount of groundwater basin recharge. Projects that incorporate an increase in recharge, like stormwater capture, can potentially realize higher extraction yields.

- *Future supply from SCVWD for the common customers* - Several of the common SFPUC/SCVWD customers currently rely on supply from the local groundwater basins that SCVWD manages. SCVWD is currently updating its long-term planning document in which it will address how the needs of water customers in Santa Clara County will be met. The results of this work, and any impact to the groundwater supply to the common customers, are not yet known.

- *Cost effectiveness* – Currently the cost of smaller local groundwater supplies is relatively high due to infrastructure and treatment costs and limited yields. However, with the significant identified increases in SFPUC charges for wholesale supply over the next 10 years, groundwater projects may become more cost effective.

- *Project funding* – Given the current economic climate and the infrastructure/treatment costs associated with the groundwater projects, many agencies are reducing or postponing their spending on capital projects until revenues increase, or more state or federal funding or grants may become available.

- *Agreements or negotiation with outside agencies or partners* – If groundwater supplies are developed within or outside the BAWSCA service area, agreements will need to be developed to formalize the quantity, timing, and availability during normal and drought year conditions to purchase or exchange this supply and convey it to the member agencies.

B.1.3 Addressing Groundwater Projects in Phase II

As shown in Tables B-1 through B-3, significant data gaps exist for the potential groundwater projects. The Phase II efforts related to groundwater projects will bring them to a common level of information so that they can be compared within the groundwater supply group, and also fairly compared with other water supply management projects. The Phase II efforts will include developing and/or obtaining information on:

- Potential for groundwater use expansion, and potential impacts on other groundwater users, or the region;
- Water quality and availability for these projects;
- Excess available extraction capacity (beyond that necessary to serve already dedicated/identified users);
- Capital costs;
- O&M costs; and
- Project schedule and potential for schedule acceleration.

B.2 Recycled Water Projects

B.2.1 Recycled Water Projects to be Evaluated in Phase II

Tables B-4 through B-6 summarize available information regarding the recycled water projects identified for evaluation in Phase II. Figure B-2 presents the locations of the identified recycled water projects. These projects have been selected because there is potential that, if BAWSCA or one or more of the member agencies became a partner in one of these projects, additional potable or non-potable supply could be made available (i.e., via sale, exchange, or transfer) to a participating BAWSCA agency needing supply. The recycled water projects can be generally grouped as follows:

- *Existing projects within the BAWSCA service area* that are under development by, or in partnership with, a BAWSCA member agency and that may have the potential to be expanded and/or to have the project timeline accelerated to either offset additional demand within the service area of the BAWSCA agency(ies) that is involved in the project, or to offset the demand of another BAWSCA agency(ies) through a sale, exchange, or transfer;
- *Planned projects within the BAWSCA service area* that have been identified by a BAWSCA member agency and that may have the potential to be expanded and/or to have the project timeline accelerated to either offset additional demand within the service area of the BAWSCA agency(ies) that is involved in the project, or to offset the demand of another BAWSCA agency(ies) through a sale, exchange, or transfer; and
- *Potential future new projects within the BAWSCA service area* that have not been specifically identified by a BAWSCA member agency to date, but that may have the potential to be developed to either offset additional demand within the service area of the BAWSCA agency(ies) that is involved in the project, or to offset the demand of another BAWSCA agency(ies) through a sale, exchange, or transfer.

Information contained in this section is based on the BAWSCA Updated Wholesale Recycled Water Potential Project "Technical Memorandum No. 1" (Brown and

Caldwell 2009), member agency UWMPs[3], Bay Area Recycled Water Coalition (BARWC) materials and staff communication, and individual agency documents, as noted in the text and tables. The recycled water projects described in Tables B-4 through B-6 are in varying stages of planning or design and there are varying levels of detail regarding demand, treatment capacity, annual supply and demand, cost[4], and schedule for each project. Where available, treatment plant capacity (in mgd) and annual production rates (in AFY) have been included. In most cases, seasonal storage is not associated with these types of projects, which would allow production capacity to be utilized year round to increase the annual production.

Tables B-4 through B-6 also identify whether the projects can augment local supply or regional supply benefit, and whether a potential opportunity exists to accelerate the project schedule. Generally, the potential projects not specifically identified by a member agency, and projects without sufficient definition, were not identified as having potential for schedule acceleration.

B.2.1.1 Existing Recycled Water Projects Within the BAWSCA Service Area

Based on available published information, Table B-4 summarizes the existing recycled water projects in the BAWSCA service area that are being planned for expansion and where there is the potential, as part of the Strategy, for the projects to be expanded or to have the project timeline accelerated to offset additional demand.

The timeframes for bringing the expansion projects online vary widely. For example, the Redwood City Recycled Water Project is currently operating and has available capacity that Redwood City could potentially utilize to serve additional customers within its service area, or sell to another agency (Ezell 2009). Phase 3 of Palo Alto's Recycled Water Project is currently planned to begin in Spring 2010 and to be completed in 2011 (City of Palo Alto 2009). In contrast, NCCWD's project design is complete; however, no construction schedule has been published (BARWC 2009a). The other recycled water projects listed are currently not projected to be online until 2020 through 2028 (Brown and Caldwell 2009).

B.2.1.2 Planned Recycled Water Projects Within the BAWSCA Service Area

Table B-5 summarizes planned recycled water projects that have been identified by a BAWSCA member agency and that may have the potential to be expanded or to have the project timeline accelerated to create either local or regional benefit. These include recycled water projects associated with ACWD, Cal Water, Coastside, the Cities of East Palo Alto, Hayward, Millbrae, NCCWD, and the San Francisco International Airport Commission (not a BAWSCA member agency, but receives SFPUC supply).

---

[3] Brisbane, Guadalupe Valley Municipal Improvement District, Purissima Hills Water District, Skyline County Water District (now part of Cal Water), and Stanford University did not complete UWMPs due to their small service areas.

[4] Costs were adjusted to January 2010 dollars based on the ENR CCI for San Francisco. Unit costs were not developed due to the lack of available information about O&M costs for most of the projects.

None of these planned recycled water projects has a design or construction schedule in place. The treatment plant capacity information is not available for many of the projects, only the annual recycled water production.

B.2.1.3 Potential Recycled Water Projects Within the BAWSCA Service Area

Table B-6 presents potential recycled water projects not specifically identified by a BAWSCA member agency to date, but that have been identified herein as projects which may have the potential to be developed to offset additional demand for one or more BAWSCA agency(ies).

Table B-4
Existing Recycled Water Projects Within the BAWSCA Service Area to be Evaluated in Phase II

Agency	Potential Water Supply Management Project Description	Potential Project Benefit			Comments / Potential Issues
		Augment Local Supply	Develop Asset for Regional Benefit[1]	Accelerate Schedule[2]	
Mountain View	Increase recycled water purchases from the Palo Alto RWQCP to 2030 projected demand of 1,800 AFY.[3]	X	X	Both	• As of 2009, recycled water use in Mountain View was less than 1,000 AFY. • Additional users have not been identified. • Potential for regional benefit identified by Mountain View in UWMP. • Customers, demand, schedule, and cost need to be confirmed.
	Extend Mountain View Recycled Water Project to Sunnyvale. [3]	X	X	NA	• Potential feasibility was not evaluated. • Potential for regional benefit identified by Mountain View in UWMP. • Customers, demand, schedule, and cost need to be developed.
	Extend Mountain View Recycled Water Project to Los Altos.	X	X	NA	• Project has not been discussed with Los Altos. • Customers, demand, schedule, and cost need to be confirmed.
NCCWD	Increase recycled water use by 170 AFY in joint project with SFPUC and Pacifica. [4]	X	--	Local	• Design is complete. [4] • Capital Cost: $9.9 million.[5] (2010 dollars) • O&M costs and construction schedule are not available.
Palo Alto	Expand City's recycled water plant to serve beyond 900 AFY.	X	X	Both	• Additional users and demand for expansion beyond 900 AFY have not been identified. • Potential for regional benefit identified by Palo Alto in UWMP. • Customers, demand, schedule, and cost for project expansion need to be developed.

Table B-4
Existing Recycled Water Projects Within the BAWSCA Service Area to be Evaluated in Phase II

Agency	Potential Water Supply Management Project Description	Potential Project Benefit			Comments / Potential Issues
		Augment Local Supply	Develop Asset for Regional Benefit[1]	Accelerate Schedule[2]	
Redwood City	Make the City's current excess treatment plant capacity (1.8 mgd) from the City/SBSA recycled water plant available to outside agencies. [6]	--	X	Regional	• Additional environmental analysis and permit amendments needed to serve recycled water outside Redwood City. • Costs to outside agencies include construction to connect to Redwood City and purchase cost per AF of recycled water. • Potential for regional benefit identified by Redwood City staff. • Customers, demand, schedule, and cost need to be developed.
San Jose	Increase recycled water use from SBWR by 1,950 AFY by 2030. [7]	X	X	Both	• Potential recycled water use increase of 2,722 to 3,002 AFY by 2035. [8] • Cost sharing agreement with SCVWD needed for indirect potable reuse program. [8] • Customers, demand, schedule, and cost need to be developed.
Santa Clara	Increase recycled water use through expansion of SBWR. [8]	X	X	Both	• Potential increase in recycled water use ranges from 650 to 900 AFY by 2035. [8, 9] • Cost sharing agreement needed with SCVWD for indirect potable reuse program. [8] • Customers, schedule, and cost need to be developed.
Sunnyvale	2,675 AFY of additional recycled water service from City's WWTP planned by 2028; increasing to 6,188 AFY by 2035. [8]	X	X	Both	• Additional storage and pumping facilities would be required to meet the 2000 Recycled Water Master Plan goals. [10] • Public perception about use at parks and schools. • Possible extensions to serve the south end of Sunnyvale and also Cupertino and Los Altos may be evaluated in the future. [10] • Potential for regional benefit identified by Sunnyvale in UWMP. • Customers, demand, schedule, and cost need to be developed.

[1] Projects that provide "regional benefit" could be local projects that could be expanded to provide a water supply benefit for more than one member agency or projects outside the BAWSCA service area that have the potential to serve one or more member agencies. In order for multiple agencies to be involved, agreements (cost, schedule, etc.), conveyance, and water quality issues may have to be addressed as part of Phase II of the Strategy.

[2] Opportunity exists to accelerate the schedule for the "local" or "regional" benefit, or "both". "NA" = Not Available, project is too ill-defined to make a determination.

[3] Source: City of Mountain View 2005

[4] Source: BARWC 2009b

[5] Source: BARWC 2009a

[6] Source: Ezell 2009

[7] Source: City of San Jose 2005

[8] Source: Brown and Caldwell 2009

[9] Source: City of Santa Clara Water Utility 2005

[10] Source: City of Sunnyvale 2005

Table B-5
Planned Recycled Water Projects Within the BAWSCA Service Area to be Evaluated in Phase II

Agency	Potential Water Supply Management Project Description	Potential Project Benefit			Comments / Potential Issues
		Augment Local Supply	Develop Asset for Regional Benefit[1]	Accelerate Schedule [2]	
ACWD	Implement Phase 1 of 1999 Master Plan, serving 1,600 AFY of recycled water by 2020. [3]	X	X	Both	• ACWD and Union Sanitary District (USD) are updating the 1999 Master Plan, including a complete review of potential demands, alignments, and implementation timelines. This information will be incorporated into the Strategy in June/July 2010. • No expansion planned in next 10 years due to expected cost and lack of large potential recycled water users in service area. [4] • Source of recycled water is USD, from Alvarado WWTP and/or the construction of a satellite treatment plant in southern Fremont. Satellite treatment plant would require substantial landscaping demands in place close to facility. • Customers, demand, schedule, and cost need to be developed.
	Implement Phase 2 of 1999 Master Plan, serving an additional 1,000 AFY of recycled water by 2030. [3]	X	X	Both	• ACWD and USD are updating the 1999 Master Plan, including a complete review of potential demands, alignments, and implementation timelines. This information will be incorporated into the Strategy in June/July 2010. • No expansion planned in next 10 years due to expected cost and lack of large potential recycled water users in service area. [4] • Source of recycled water is Union Sanitary District, from Alvarado WWTP and/or the construction of a satellite treatment plant in southern Fremont. Satellite treatment plant would require substantial landscaping demands in place close to facility. • Customers, demand, schedule, and cost need to be developed.

Cal Water	Implement joint, two-phase recycled water project with Cities of South San Francisco and San Bruno, and SFPUC, for a total supply of 1,730 AFY. (5)	X	X	Both	• No schedule at this time; design to last 18 months; construction to last two years. • Potential implementation issues include securing funding and developing a cost share agreement between partners including the South San Francisco/San Bruno Water Quality Control Plant. • Potential for regional benefit identified by Cal Water in feasibility study. • Capital cost estimate is $87.8 million (2010 dollars).
Coastside	Develop recycled water project with Sewer Authority Mid-Coastside to serve 600 AFY for landscaping demand. (4)	X	--	Local	• Requires agreements with Sewer Authority Mid-Coastside and its member agencies. • Project requires WWTP upgrade to tertiary treatment. • Schedule and cost need to be confirmed.
	Increase yield of recycled water project to 2,240 AFY (annual average). (6)	X	X	Both	• Potential customers for demand above 600 AFY have not been evaluated. • Project would require agreements with Sewer Authority Mid-Coastside and its member agencies. • Feasibility study indicated costs of plant upgrades to produce 2,240 AFY were $5.7-6.3 million and $350,000-400,000 per year for operations & maintenance (2010 dollars). • Customers, demand, schedule, and cost need to be confirmed.
East Palo Alto	Develop scalping plants for landscape irrigation and street sweeping for potential demand of 450 AFY. (7)	X	--	Local	• Small-scale membrane plants would be constructed on or near an existing sewer line where demand is high. • Requires land acquisition. • Customers, demand, schedule, and cost need to be developed.
Hayward	Construct new recycled water plant to deliver up to 4,600 AFY. (4, 8, 9)	X	X	Both	• Approved Calpine power plant would use 3,920 AFY (3.5 mgd). 680 AFY of supply would be available for additional users; however those users have not been identified. • Construction could begin in late 2010. (9) • Capital cost estimates range from $6.0 to $18.5 million (2010 dollars). Range of capacity for that estimate is unclear. • Potential obstacles include whether the city can negotiate a favorable agreement with Calpine. • Customers, schedule, and cost need to be confirmed.
Millbrae	Build 1 mgd treatment plant at the City's WWTP to serve recycled water. (10)	X	X	Both	• Potential users were not identified. • Estimated capital costs for planning, storage, and distribution system were $8.3 million with $70,000/yr for O&M (2010 dollars). • Customers, demand, and schedule need to be developed.

NCCWD	Increase recycled water yield by 115 AFY.	X	--	NA	• Potential users are identified in the Phase 2 expansion. • Construction costs estimated as $7.35 million (2010 dollars). • Schedule is dependent upon funding availability.

(1) Projects that provide "regional benefit" could be local projects that could be expanded to provide a water supply benefit for more than one member agency or projects outside the BAWSCA service area that have the potential to serve one or more member agencies. In order for multiple agencies to be involved, agreements (cost, schedule, etc.), conveyance, and water quality issues may have to be addressed as part of Phase II of the Strategy.

(2) Opportunity exists to accelerate the schedule for the "local" or "regional" benefit, or "both". "NA" = Not Available, project is too ill-defined to make a determination.

(3) Source: ACWD 2005

(4) Source: Brown and Caldwell 2009

(5) Source: City of South San Francisco 2009

(6) Source: Coastside County Water District 2005

(7) Source: City of East Palo Alto 2005

(8) Source: City of Hayward 2005

(9) Source: Baker 2010

(10) Source: City of Millbrae 2005

Table B-6
Potential Recycled Water Projects Within the BAWSCA Service Area to be Evaluated in Phase II

Agency	***Potential Water Supply Management Project Description***	***Potential Project Benefit***			***Comments / Potential Issues***
		Augment Local Supply	***Develop Asset for Regional Benefit(1)***	***Accelerate Schedule (2)***	
ACWD	Increase recycled water use beyond use estimated in 1999 Master Plan (see ACWD entry in Table B-5).	X	X	NA	• Feasibility of potential project has not been evaluated. • Customers, demand, schedule, and cost need to be developed.
Cal Water	Increase recycled water use beyond current plans with San Bruno, South San Francisco, and SFPUC (see Cal Water entry in Table B-5).	X	X	NA	• Feasibility of potential project has not been evaluated. • Customers, demand, schedule, and cost need to be developed.
Coastside	Increase recycled water use beyond 2,240 AFY (see Coastside entry in Table B-5).	X	X	NA	• Feasibility of potential project has not been evaluated. • Customers, demand, schedule, and cost need to be developed.
Daly City	Increase recycled water use to meet treatment plant capacity of 3,100 AFY (currently under development(3).	X	X	NA	• Feasibility of potential project has not been evaluated. • Customers, demand, schedule, and cost need to be developed.
East Palo Alto	Expand scalping plants to serve recycled water beyond 450 AFY (see East Palo Alto entry in Table B-5).	X	X	NA	• Feasibility of potential project has not been evaluated. • Customers, demand, schedule, and cost need to be developed.
Hayward	Construct larger plant to supply recycled water above 4,600 AFY planned for power plant project (see Hayward entry in Table B-5).	X	X	NA	• Feasibility of potential project has not been evaluated. • The distribution system would need to be expanded, possibly to higher elevations, in order to secure a customer base. • Customers, demand, schedule, and cost need to be developed.

Table B-6
Potential Recycled Water Projects Within the BAWSCA Service Area to be Evaluated in Phase II

Agency	Potential Water Supply Management Project Description	Potential Project Benefit			Comments / Potential Issues
		Augment Local Supply	Develop Asset for Regional Benefit[1]	Accelerate Schedule [2]	
Millbrae	Expand new treatment plant to serve recycled water beyond planned 1 mgd capacity (see Millbrae entry in Table B-5).	X	X	NA	• Feasibility of potential project has not been evaluated. • Customers, demand, schedule, and cost need to be developed.
Mountain View	Increase use of Palo Alto recycled water above projected demand of 1,800 AFY (see Mountain View entry in Table B-4).	X	X	NA	• Feasibility of potential project has not been evaluated. • Customers, demand, schedule, and cost need to be developed.
NCCWD	Increase recycled water supply from joint project with SFPUC and Pacifica (see NCCWD entries in Tables B-4 and B-5).	X	X	NA	• Feasibility of potential project has not been evaluated. • Customers, demand, schedule, and cost need to be developed.
Redwood City	Expand City/SBSA recycled water treatment plant capacity from 2.8 mgd to 8 mgd (current plant expansion capability). [4]	X	X	Both	• Plant is designed to be expandable to 8 mgd. • Customers, demand, schedule, and cost need to be developed.
San Bruno	Implement San Bruno phase of South San Francisco/San Bruno/SFPUC/Cal Water recycled water project for projected demand of 500 AFY. [5]	X	--	Local	• Feasibility study was completed and the San Bruno demand area was deemed not cost effective. • Feasibility of potential project could be reevaluated. • Schedule and cost would need to be reevaluated.
Stanford University	Increase use of recycled water from cooling tower blowdown.	X	--	NA	• Feasibility of potential project has not been evaluated. • Customers, demand, schedule, and cost need to be developed.
	Develop a scalping plant for landscape and playfield irrigation. [6]	X	--	NA	• Small-scale membrane plants would be constructed on or near an existing sewer line where demand is high. • Feasibility of potential project has not been evaluated. • Customers, demand, schedule, and cost need to be developed.
Sunnyvale	Increase recycled water from City's WWTP supply to make use of full treatment capacity (current flow averages 12.5 to 16.9 mgd) (see Sunnyvale entry in Table B-4).	X	X	NA	• Feasibility of potential project has not been evaluated. • Customers, demand, schedule, and cost need to be developed.

Table B-6
Potential Recycled Water Projects Within the BAWSCA Service Area to be Evaluated in Phase II

Agency	Potential Water Supply Management Project Description	Potential Project Benefit			Comments / Potential Issues
		Augment Local Supply	Develop Asset for Regional Benefit[1]	Accelerate Schedule [2]	

(1) Projects that provide "regional benefit" could be local projects that could be expanded to provide a water supply benefit for more than one member agency or projects outside the BAWSCA service area that have the potential to serve one or more member agencies. In order for multiple agencies to be involved, agreements (cost, schedule, etc.), conveyance, and water quality issues may have to be addressed as part of Phase II of the Strategy.

(2) Opportunity exists to accelerate the schedule for the "local" or "regional" benefit, or "both". "NA" = Not Available, project is too ill-defined to make a determination.

(3) Source: City of Daly City

(4) Source: Ezell 2009

(5) Source: City of South San Francisco 2009

(6) Source: Stanford University 2003

B.2.2 Potential Issues Associated with Developing Recycled Water Projects

Potential issues affecting recycled water project implementation are described below.

- *Cost effectiveness* – Recycled water projects can require substantial infrastructure improvements, including treatment improvements at wastewater treatment plants, storage facilities, pumping plants, and new conveyance facilities (for separate potable and non-potable water distribution). Recycled water projects sometimes have limited demand depending upon the quality of water produced, and the potential customers within a cost-effective area of service. In addition, the seasonal nature of a large portion of the recycled demand (i.e., irrigation) can significantly increase costs, as distribution facilities have to be sized to meet the peak seasonal demand, and treatment facilities must either be sized to meet the peak seasonal demand or have seasonal storage that allows year-round production at lower rates. Although groundwater recharge using recycled water could potentially reduce the need for surface storage, significant water treatment requirements, permitting issues, and additional infrastructure needs would have to be considered.

- *Project funding* – Given the potential infrastructure needs described above, costs for recycled water projects can be significant. In the current economic climate, some agencies are postponing capital projects until their revenues increase, more state and federal funding or grants become available, or until rate increases become more palatable to their customers.

- *Agreements or negotiation with outside agencies or partners* – Although several BAWSCA member agencies are responsible for both water and wastewater service in their jurisdiction, others are participating in these recycled water projects as strictly the water retailer. For example, Coastside County Water District's project would require an agreement with Sewer Authority Mid-Coastside and its other member agencies.

- *Public acceptance* – Some recycled water projects in the Bay Area have encountered public health and safety concerns regarding water quality and contact with children, pets, and the environment. Other public concerns in the Peninsula area have included effects on property values where recycled water is used and an adequate level of public involvement in the decision to use recycled water.

B.2.3 Addressing Recycled Water Projects in Phase II

As shown in Tables B-4 through B-6, significant data gaps exist for the potential recycled water projects. The Phase II efforts related to recycled water projects will bring them to a common level of information so that they can be compared within the recycled water supply group, and also fairly compared with other water supply management projects. The Phase II efforts will include obtaining and/or updating information on:

- Project treatment capacity;
- Excess available capacity (beyond that necessary to serve already dedicated/identified users);
- Potential market demand;
- Facilities requirements;
- Capital costs;
- O&M costs;
- Potential funding options; and
- Project schedule.

B.3 Water Transfer Projects

Water transfer projects typically include several key elements. First, there has to be a supply source that can be transferred either as a direct transfer, or as an exchange transfer. Second, depending on the location of the supply source and the timing and availability of this supply, storage may be critical to ensure the availability of the supply when it is needed (i.e., seasonally or during dry periods), provide capture of a limited supply, or to offset a seasonal demand.

Third, for direct transfers, conveyance is required to move the water from its source into the BAWSCA service area. For supplies originating outside the Bay Area, the primary conveyance options into the Bay Area are the RWS, the SBA portion of the SWP system (which is connected to the ACWD and SCVWD systems), and the San Felipe portion of the Bureau of Reclamation (Reclamation) CVP system (which is connected to the southern portion of the SCVWD system). Figure B-3 shows the location of the major transmission facilities that could be used to transfer supply from the Sacramento and San Joaquin valleys into the Bay Area, including the SBA,

Reclamation/SCVWD, and SFPUC systems. Transfers of supply from other entities within the Bay Area, but outside of the BAWSCA service area, could potentially rely on the existing infrastructure (i.e., conveyance and interconnections) to wheel water into the BAWSCA service area.

Fourth, all water transfers projects require some type of contractual agreement(s) between involved parties. Some of the agreements and mechanisms are already in place to allow water transfers between the BAWSCA member agencies (e.g., the July 2009 WSA between SFPUC and the wholesale customers). However, even in the case of inter-agency transfers within the BAWCSA service area, specific inter-agency agreements would still be needed to initiate an exchange or transfer. In order to import supplies from outside the BAWSCA service area, a number of additional agreements would be needed to secure, store, and transfer the supply, which could add significant time and complexity to the development of a successful water transfer project. Table B-7 Summarizes these potential water transfer projects.

Table B-7
Potential Water Transfer Projects Outside the BAWSCA Service Area to be Evaluated in Phase II

Supply Type	***Potential Water Supply Management Project Description***	***Potential Project Benefit***			***Comments / Potential Issues***
		Augment Local Supply	***Develop Asset for Regional Benefit(1)***	***Accelerate Schedule(2)***	
Surface water diversions	Transfer of surface water rights from the Central Valley.	--	X	Regional	• Limited reliable drought or normal year supply available to non-SWP or CVP contractors. • Pre-1914 rights have higher reliability and higher cost than CVP or SWP supplies. • Requires transfer through either SBA or Reclamation/SCVWD transmission facilities to the Bay Area. Ability to move transfer water will require available capacity in the SWP/CVP system. These types of transfers would have the lowest priority for excess system capacity. • Requires direct transfer from ACWD or SCVWD systems to member agencies, or • Exchange transfer of SFPUC contract supply for ACWD or common SFPUC/SCVWD customers.
Stored Reservoir Water	Transfer of unused surface water stored in reservoirs that are not part of the SWP or CVP systems.	--	X	Regional	• Limited reliable drought or normal year supply available to non-SWP or CVP contractors. • Requires transfer through either SBA or Reclamation/SCVWD transmission facilities to the Bay Area. Ability to move transfer water will require available capacity in the SWP/CVP system. These types of transfers would have the lowest

Table B-7
Potential Water Transfer Projects Outside the BAWSCA Service Area to be Evaluated in Phase II

Supply Type	***Potential Water Supply Management Project Description***	***Potential Project Benefit***			***Comments / Potential Issues***
		Augment Local Supply	***Develop Asset for Regional Benefit[1]***	***Accelerate Schedule[2]***	
					priority for excess system capacity. • Requires direct transfer from ACWD or SCVWD systems to member agencies, or • Exchange transfer of SFPUC contract supply for ACWD or common SFPUC/SCVWD customers.
Groundwater Substitution & Stored Groundwater Purchase	Transfer or substitution of diversions from SWP, CVP, or other sources to stored groundwater by sellers, or transfer of groundwater assets from water previously stored in groundwater basin.	--	X	Regional	• Limited reliable drought or normal year supply available to non-SWP or CVP contractors. • Requires transfer through either SBA or Reclamation/SCVWD transmission facilities to the Bay Area. Ability to move transfer water will require available capacity in the SWP/CVP system. These types of transfers would have the lowest priority for excess system capacity. • Requires direct transfer from ACWD or SCVWD systems to member agencies, or • Exchange transfer of SFPUC contract supply for ACWD or common SFPUC/SCVWD customers.
Crop idling/crop shifting	Transfer of surface water diversion or groundwater supply by reducing agricultural use through idling of crops, or shifting lower water use crops	--	X	Regional	• Requires transfer through either SBA or Reclamation/SCVWD transmission facilities to the Bay Area. Ability to move transfer water m require available capacity in the SWP/CVP system. These types of transfers would have the lowest priority for excess system capacity. • Requires direct transfer from ACWD or SCVWD systems to member agencies, or • Exchange transfer of SFPUC contract supply for ACWD or common SFPUC/SCVWD customers. • Potential local environmental and land use impacts.

Table B-7
Potential Water Transfer Projects Outside the BAWSCA Service Area to be Evaluated in Phase II

Supply Type	Potential Water Supply Management Project Description	Potential Project Benefit			Comments / Potential Issues
		Augment Local Supply	Develop Asset for Regional Benefit[1]	Accelerate Schedule[2]	
Agricultural conservation	Transfer of surface water diversion or groundwater supply through support of implementation of water conservation for agricultural and/or municipal and industrial use.	--	X	Regional	• Interest and participation required by district, cities, and/or growers, to accept economic incentives to implement additional conservation measures. • Depending on where the supply is located, transfer through the direct or exchange transfer could go through SWP or Reclamation facilities to the Bay Area, or potentially through the RWS. • Ability to move transfer water may require available capacity in the SWP/CVP system. These types of transfers would have the lowest priority for excess system capacity.

(1) Projects that provide "regional benefit" could be local projects that could be expanded to provide a water supply benefit for more than one member agency or projects outside the BAWSCA service area that have the potential to serve one or more member agencies. In order for multiple agencies to be involved, agreements (cost, schedule, etc.), conveyance, and water quality issues may have to be addressed as part of Phase II of the Strategy.

(2) Opportunity exists to accelerate the schedule for the "local" or "regional" benefit, or "both". "NA" = Not Available, project is too ill-defined to make a determination.

B.3.1 Overview of Water Transfer Options to be Evaluated in Phase II

The water transfer options discussed in this section have been selected because there is potential that, if BAWSCA or one or more of the member agencies decided to pursue a water transfer project, additional potable water or non-potable supply could be made available (e.g., via sale, exchange, or transfer) to a participating BAWSCA agency needing supply. Table B-7 summarizes currently-available information regarding the general water transfer options, by source of supply, that are identified for evaluation in Phase II.

The water transfer options that will be evaluated in Phase II can be generally grouped as follows:

- *Transfer of supply between BAWSCA member agencies* under the conditions of the WSA, where this transfer could include SFPUC supply, or supply from development of existing, planned, or potential local supply projects (e.g., recycled water or groundwater), or water transferred into the BAWSCA service area; or

- *Transfer of supply from outside the BAWSCA service area* that may have the potential to move water into the BAWSCA service area to offset the demand of a BAWSCA agency(ies) through a direct or exchange transfer.

The water transfer options described in this section are different in nature than the projects specifically identified by the BAWSCA member agencies in the groundwater and recycled project sections. As briefly discussed above, there are source, storage, conveyance, and agreement elements to water transfer projects. Different combinations of those elements can constitute different projects. As part of the Phase II effort, the availability of the different supply sources will be identified, as well as the existing storage facilities that might provide improved reliability for a specific supply. In addition, the conveyance alternatives and the agreements associated with the wheeling of the water supply will be assessed to develop the best combinations of these elements so that specific water transfer projects can be evaluated in Phase II.

B.3.2 Water Transfer Options Associated With the Transfer of Supply Between BAWSCA Member Agencies

As described below, pursuant to the WSA, BAWSCA member agencies can transfer SFPUC supply, or other supplies, amongst each other.

B.3.2.1 Supply Sources for Inter-Agency Transfers

Water transfers between BAWSCA member agencies from supply sources within the BAWSCA service area may include either 1) temporary or permanent transfer of SFPUC supply within the restrictions of the WSA, or 2) transfer of a new supply developed within or outside the BAWSCA service area and independent of the SFPUC supply. These transfers could be either direct or exchange transfers and could be designed to meet normal or drought demand.

The reliability of any inter-agency transfer project will depend on a) the reliability of the supply source, b) the ability to transfer the supply to the member agency(ies) when needed, and c) the ability to store the supply either locally or nearer the source of the supply.

It is anticipated that the majority of inter-agency transfer projects that would be pursued would be for potable water supply. However, agencies in close proximity to each other may be able to physically transfer recycled water or poorer quality groundwater for non-potable use.

B.3.2.2 Mechanism for Inter-Agency Transfers

There are three primary forms of transfer between BAWSCA member agencies that are addressed in the WSA, including:

- Permanent transfer of a portion of an Individual Supply Guarantee (ISG);
- Drought transfers; and
- Wheeling of a non-SFPUC supply though the SFPUC system.

Pursuant to Article 3, Section 3.04 of the WSA, any BAWSCA agency that has an ISG may transfer a portion of it to one or more BAWSCA member agencies. Such transfers are permanent and without additional penalties or additional charges from the SFPUC. The SFPUC will not unreasonably withhold or deny transfer approval. This transfer mechanism can be used if a BAWSCA agency has an ISG in excess of its SFPUC purchases, either because of that agency's contract capacity or because that agency has developed or acquired another supply and chooses to sell a portion of its ISG.

Transfer of SFPUC supply drought allocations between the BAWSCA agencies are governed by Section 3.11(C) and the Tier 1 Shortage Plan. In the event that SFPUC declares a drought emergency under California Water Code Sections 350 et seq., the Tier 1 Shortage Plan allows transfer of shortage allocations among BAWSCA member agencies.

Pursuant to the WSA, BAWSCA member agencies can also wheel water through the SFPUC system from sources outside of the SFPUC system. Section 3.12 of the WSA states that "the SFPUC will not deny use of Regional Water System unused capacity for wheeling when such capacity is available for wheeling purposes during periods when the SFPUC has declared a water shortage emergency…." Specific conditions apply including:

- Reasonable wheeling charges;
- Loss of wheeled water stored in SFPUC reservoirs that spill;
- Wheeled water will not unreasonably impact fish and wildlife resources in the RWS reservoirs, diminish the quality of delivered water, or increase the risk of exotic species impairing RWS operations; and
- Priority is given to wheeling by Wholesale Customers over arrangements for third party public entities.

B.3.3 Water Transfer Options Associated With Supplies Outside the BAWSCA Service Area

A water supply management project that includes a transfer of supply into the BAWCSA service area from outside the BAWSCA service area may incorporate some or all of the following key elements of a water supply transfer:

- Supply source;
- Storage;
- Conveyance; and
- Agreements.

Each of these is discussed in more detail below.

B.3.3.1 Supply Sources for Out-Of-Service Area Water Transfers

A water transfer generally involves an interested seller reducing water use to make water available to other entities. The seller must take action to reduce consumptive water use, or identify unused supply, in order to have water available for transfer.

The supply sources associated with an out-of-service area transfer may include surface water runoff/diversions, surface water storage, groundwater, or supplies freed up by reduction in water demand (i.e., reductions in agricultural demand through crop-shifting, and cropland idling or fallowing,, or through agricultural water conservation). These sources are described in more detail below.

Surface Water Diversions

The majority of the water supply within the State of California originates as surface water diversions. In order to ensure the reasonable and beneficial use of this water, in 1914 the State of California established a review, licensing and permitting process for water rights associated with these diversions. There is a hierarchy associated with the pre- and post-1914 water rights, and also the right's priority at the time of receiving a permit from the State of California. In general the pre-1914 rights have a higher priority than post-1914 rights. Occasionally, surface water diversion rights, either pre- or post-1914, become available for purchase from the owners of those rights. These supplies, if imported into the BAWSCA service area, could potentially augment either or both normal and drought supplies.

Both the State of California and Reclamation have surface water diversion rights that serve as the source of supply for the state and federal water projects in California (i.e. the SWP and the CVP, respectively). The majority of the large water transfers currently being looked at within the state are the contracts associated with the SWP and CVP water rights. During dry years, and sometimes normal years, the state and federal contractors are seeing their contract deliveries reduced due to limited river flows and environmental and legislative restrictions on pumping from the Delta. A program has been developed to allow willing sellers (contractors) within the SWP and CVP systems to sell available supply to other contractors, or to non-SWP or non-CVP contractors. The SWP and CVP contractors have first rights for purchasing those transfer supplies, which limits the ability of non-SWP and non-CVP contractors to purchase this water. In addition, the operators of the state and federal systems, and their contractors have first rights for use of the capacity of those systems to deliver contract and transfer water.

Stored Reservoir Water

Water rights holders or owners may make water available from unused surface water stored in reservoirs owned by local agencies (i.e., those that are not part of the CVP or SWP systems). If an agency releases water that was stored in a reservoir to make it available for a transfer, the reservoir is drawn down. To refill the reservoir, the seller must prevent some flow from going downstream. Sellers must refill the storage at a

time when downstream users would not have otherwise captured the water, either in downstream CVP or SWP reservoirs or with CVP or SWP pumps in the Delta. Typically, refill can only occur during Delta excess conditions (when there is more water than the CVP and SWP can pump).[5] The frequency and duration of when excess conditions exist, and the storage available will determine how reliable this supply will be under drought conditions.

Groundwater Substitution

Groundwater substitution transfers occur when a seller opts to forego their use of surface water supplies (these could be SWP or CVP contracts, or other water rights) and pumps an equivalent amount of groundwater as an alternative supply. These transfers typically involve agricultural users; therefore, water from this acquisition method is typically only available during the irrigation season of April through October. Furthermore, while the water may be available at the start of the irrigation season, if the water then needs to be transferred through the Delta, the current biological opinions regarding the Delta dictate that transfers cannot move through the Delta until July (when the "transfer window" begins). This constraint on the timing of the water availability and the transport of that water means that this option would likely also require some sort of storage.

Since groundwater substitution transfers require increased withdrawal of water from a groundwater basin, this option is only viable for sellers in basins that are not in a state of groundwater overdraft or in areas where the water supplier determines that the water transfer would not contribute to the groundwater overdraft.

Stored Groundwater Purchase

Entities may be willing to sell groundwater assets that they have stored in a groundwater bank such as the Semitropic or Kern County Water Agency (KCWA) banking projects. However, the opportunities to purchase this type of stored groundwater are very limited, and typically the water is only available in Kern County. The water is typically delivered to the buyer by exchanging SWP or CVP contract supplies at San Luis Reservoir.

Cropland Idling/Crop Shifting

Cropland idling and crop shifting transfers come from water that would otherwise have been used for agricultural production. These transfers involve:

- Cropland idling transfers involve paying farmers to idle land that they would otherwise have placed in production. The quantity of water available for sale (i.e., the water that would have otherwise been used to irrigate crops grown on that land) is based on the former crop's evapotranspiration of applied water (ETAW).

[5] Delta excess water conditions, also referred to as unbalanced conditions, are defined in the Coordinated Operation Agreement as "periods when it is agreed that releases from upstream reservoirs plus unregulated flow exceed Sacramento Valley in-basin uses, plus exports." (U.S. Department of the Interior, Bureau of Reclamation and California Department of Water Resources 1986)

Most cropland idling transfers have historically involved rice because it has a high ETAW, but other crops can also be idled.

- Crop shifting transfers, can occur when farmers shift from growing a higher water use crop to a lower water use crop. The quantity of water available is the difference in ETAW between the higher water need crop to the lower water need crop. Accounting for the amount of water made available in this type of transfer is more difficult that in a crop idling transfer. Farmers generally rotate between several crops, and it is may not be clear what crop type the farmer would have planted in the year of the transfer. These uncertainties require a substantial amount of information from the seller, including historic cropping patterns and five years of historical water use data.

Similar to groundwater substitution transfers, cropland idling and crop shifting water is available at the beginning of the irrigation season (April) but, if it needs to be transferred through the Delta, it cannot be moved through the Delta until July. Storing water in upstream reservoirs is extremely unlikely on the Sacramento River, and difficult on other rivers. But unlike groundwater substitution, cropland idling or crop shifting cannot wait to start until Delta conveyance or other conveyance capacity is available. For transfers on the Sacramento River, and other transfers if storage agreements cannot be negotiated, the crop must be idled or shifted for the entire season even when the water cannot be stored. Without storage, the water received would be only a fraction of the water made available through this action.

Agricultural Water Conservation Transfers
Agricultural water conservation transfers could occur if an entity provides an irrigation district or farmer with economic incentives to encourage them to voluntarily implement water conservation measures at no cost to them.

A specific example of the this would be where BAWSCA member agencies could provide economic incentives to encourage Tuolumne Irrigation District and/or Modesto Irrigation District, the Cities of Modesto and Turlock, or individual growers, canners, and orchardists to implement water conservation measures at no cost to them, that would save both money and water, with resulting benefits to all stakeholders (BAWSCA 2007). The water that was freed up through this process would both serve to increase supplies to the BAWSCA member agencies and to increase flows downstream of Don Pedro dam.

These types of agricultural water conservation transfer arrangements are now in place in California on a much larger scale. For example, the Imperial Irrigation District (IID) has contracted to transfer over 300,000 AFY to San Diego and other coastal cities served by the Metropolitan Water District of Southern California. IID's "Efficiency Conservation Definite Plan" adopted in May 2007 contains very detailed analyses of the costs/benefits and water savings achievable by a range of irrigation efficiency measures.

B.3.3.2 Storage Requirements for Out-Of-Service Area Water Transfers

As discussed above, many of the supply sources for out-of-service area transfers are only available seasonally and may not be available during drought periods. In order to ensure that the supply is available when needed, many of the transfer options would need to include either groundwater or surface water storage.

Transfers of surface water diversions can include groundwater storage in the vicinity of the river diversion points, such as the KCWA and Semitropic water banks. When excess supply is available water is stored in the water bank. During dry periods or when pumping from the Delta is reduced or curtailed, the banked water can be pumped out of the basin. In the case of a transfer the seller rather than taking the delta diversion the contract supply is pumped from the groundwater bank, and the entity receiving the transfer supply receives water pumped from the Delta. For agencies in the Bay Area this supply would be conveyed either through the SWP or CVP facilities to a location where they can move the transfer supply into their water systems.

Existing groundwater storage in the Bay Area could also potentially be used to store water that may be imported by the BAWSCA agency(ies) to meet seasonal or drought needs. The SCVWD operation of its groundwater basins, through recharge of local runoff and SBA and CVP supplies, is an example of conjunctive management of groundwater and surface water supplies.

B.3.3.3 Conveyance Requirements for Out-Of-Service Area Water Transfers

The supplies sources discussed above generally originate in the following areas:

- North of the Delta;
- South of the Delta;
- Tuolumne River watershed; and
- San Francisco Bay Area (outside of BAWSCA service area).

How these potential supplies could be directly transferred into the Bay area is a function of source location, possible storage requirements or options (groundwater or surface water), existing conveyance infrastructure, and the institutional and infrastructure constraints associated with conveying the water.

The potential methods of directly importing the transfer water that will be evaluated as part of Phase II are described below.

Potential Transfer to the BAWSCA Service Area through the SBA and/or CVP/SCVWD Systems

The supplies discussed in Section B.3.3.1 that originate either north or south of the Delta would need to be transported to the BAWSCA service area. This would most

likely have to occur either through the SBA to ACWD or SCVWD or via the San Felipe portion of the CVP to the SCVWD system. At a minimum, wheeling agreements would be required with DWR for transfers through the SBA (to ACWD or SCVWD), and with Reclamation and SCVWD to wheel CVP water to SCVWD.

Water purchased from sellers north of the Delta generally must move through the Delta and then through the SWP's delta pump station (Harvey O. Banks Pumping Plant [Banks PP]) or the CVP's delta pump station (C.W. "Bill" Jones Pumping Plant [Jones PP]). Non-SWP and non-CVP contractors can also wheel water through the SWP or CVP projects; however, they have the lowest priority for transfer of the supply. There must be sufficient capacity to transfer the existing contractors supply, and such transfers are subject to a wheeling charge.

Transferred water from north of the Delta is more frequently pumped through the Banks PP because the Jones PP generally operates at maximum capacity to meet CVP needs, even during drier years. The recent biological opinions on the long-term operations of the CVP and SWP include provisions for up to 600,000 AF of transfers that can only be pumped from July through September (U.S. Fish and Wildlife Service 2008, National Marine Fisheries Service 2009).

Transfers from sources south of the Delta do not need to be moved through the Delta. However, regardless of the source, BAWSCA or the member agencies would have to develop agreements and/or water supply exchanges with SWP and CVP contractors in order move water into the Bay Area through the SBA to either ACWD or SCVWD, and/or through the CVP to San Luis Reservoir and then to the SCVWD system through the Reclamation San Felipe project. The ability to move transfer water through the SWP and/or CVP will require available system capacity. These types of transfers would have the lowest priority for excess system capacity.

The following are specific examples of how water might hypothetically be transferred into the BAWSCA service area through existing systems:

- ACWD is currently the only BAWSCA member agency with the ability to perform a direct transfer of supply from the SWP. ACWD could theoretically purchase additional SWP supply from another SWP contractor and this additional supply could then be conveyed to ACWD through the SBA, assuming there was capacity in the SBA to import those additional supplies. Having backfilled its supplies, ACWD could then theoretically transfer part of its SFPUC supply to the BAWSCA member agencies, although there are water quality and other constraints on their ability or willingness to enact such an exchange.

- Transfers through SCVWD could be directly transferred to their treated water customers or through groundwater extraction by the common SCVWD/SFPUC customers. Specifically,

1. SCVWD receives supply from both the SWP and CVP. The Cities of Milpitas, Mountain View, and Sunnyvale receive treated SWP or CVP water and could receive transferred supply directly from SCVWD.

2. Several of the common SFPUC and SCVWD customers also pump groundwater, which is recharged with a combination of local surface water runoff and SWP and CVP supplies. These agencies may be able to receive transferred supply through this recharge and extraction of groundwater.

Potential Transfers through the RWS

Another potential method for transferring water into the Bay Area would be to directly import it using the RWS. The types of transfers during normal or drought conditions will most likely be limited to two options:

- Agricultural conservation; or
- Transfer of purchased water through the SBA into San Antonio Reservoir.

The first option, the agricultural conservation supply, if coming from the Tuolumne River watershed, could be transferred through the SFPUC system, and could be conveyed directly to the individual member agencies through existing turnouts.

The second option, purchased supply from willing sellers either north or south of the Delta, would be transported into the SFPUC San Antonio Reservoir from the SBA during dry-year or drought events. This could be a purchase of SWP contract supply from another SWP contractor, or transfer of the other types of source water described previously. Such a purchase and transfer into San Antonio Reservoir of a limited amount of water was completed in 1991 and 1995 to help improve water supply conditions during the extended drought from 1987 through 1994 (CDM 2003).

Due to the difference in water quality between the Delta supply and Hetch Hetchy supply the second type of transfer may not be approved by SFPUC except during drought events, or regional water supply emergencies. A preliminary study was prepared in 2003 addressing the potential for these types of transfers (CDM 2003). The approach appears feasible, and regulatory compliance appeared to be achievable. However, additional water quality, potential public health concerns, treatment options, and operational concerns would need to be addressed more fully to determine the feasibility, availability of supply, and cost for this type of transfer.

Regional Transfers from within the Bay Area to the BAWSCA Service Area

A number of potential water supply management projects have been identified that would require transfer of supply from agencies within the Bay Area, but outside of the BAWSCA service area. Conveyance may be possible through the water distribution systems and interties of other regional water agencies. An example would be transfer of desalination supply from the Sacramento River into the Contra Costa Water District (CCWD) system, transfer to EBMUD, and then to Hayward. The

specific transfer mechanisms and types of agreements will depend on a number of factors, including:

- Location of the supply source;
- Water quality;
- Quantity;
- Time of year and duration when transfer water is available and needed;
- Storage and hydraulic capacity available through the wheeling agency's system; and
- Other limitations that may affect quantity and timing of the transfers.

Most of the large regional water systems including EBMUD, CCWD, ACWD, and SCVWD have some type of emergency or other connection between their agencies. For example, CCWD and EBMUD have emergency connections, as do EBMUD and the City of Hayward. If capacity exists and the agencies are willing, this would potentially allow transfer of new supply from CCWD or EBMUD to the SFPUC system through the City of Hayward, or exchange of SFPUC supply between member agencies. Similarly, if additional supply were available in the Livermore Valley it could potentially be conveyed through the SBA (if capacity was available) to either ACWD and the SFPUC system, or SCVWD where supply could be conveyed to the SFPUC/SCVWD common customers.

These regional interconnections currently exist primarily to address emergency conditions and local loss of supply. Making this part of normal year, or even dry year, transfers will require extensive discussions with each of the potential agencies involved and evaluation of the potential physical and water quality limitations in implementing the transfers.

B.3.3.4 Agreements Needed for Out-Of-Service Area Water Transfers

The transfer of water from outside of the BAWSCA service area into the BAWSCA service area would require cooperation and several different types of agreements with several entities potentially including:

- BAWSCA member agencies;
- SFPUC;
- Other local water agencies;
- Entities that might provide infrastructure and capacity for wheeling of water including DWR for the SWP, Reclamation for the CVP, and ACWD or SCVWD once the supply is in the Bay Area; and

- Agencies selling supply and storing it either locally or regionally.

Several of the issues that must be addressed as part of the identification and negotiation of these agreements are:

- Types and duration of the agreements or contracts, or operating conditions such as change in use permits;
- Ownership of the transfer agreements (i.e., is it better to have SCVWD or ACWD own the transfer agreements than a non-CVP or non-SWP contractor);
- Costs associated with the services provided under the agreements and potential penalty provisions;
- Complexity of involvement of multiple entities;
- Reliability and availability of the proposed transfer supply;
- Available of transfer capacity in the system;
- Authority of the agencies to enter into agreements; and
- Strength of, and ability to enforce, the provisions of the agreements.

B.3.4 Potential Issues Associated with Developing Water Transfer Projects

Potential issues affecting the implementation of water transfer projects are described below.

- *Transfer Supply Availability* – Transfers will have varying levels of reliability, for both normal and drought conditions, depending on their location and the characteristics of the supply source being considered. Key components of the reliability of any given supply is whether regional storage capacity is available that can be used to store seasonal supply, and whether there is transmission capacity available to transfer the supply when needed.
- *Cost effectiveness* – The total costs associated with water transfers must be determined, including purchase, possible storage, transfer, or wheeling costs to the BAWSCA member agencies. These costs will vary depending on the type and location of the supply source, and the agreements and infrastructure required to wheel the transfer supplies to the BAWSCA service area. One issue that may affect the cost will be whether there are contract requirements requiring payment for supply even if the supply is not taken every year, or maintaining wheeling capacity through other agency water systems.
- *Timing for Implementation* - A potential key advantage of water transfers is that in many cases they do not require construction of infrastructure facilities to obtain,

treat, and convey these supplies, and so may be able to be implemented more rapidly than those requiring large infrastructure improvements.

- *Project funding* – Alternatives for funding the purchase of transfer supply will be important and will require evaluation of the benefits of developing long-term contracts to minimize cost impacts to the participating agencies.

- *Agreements or negotiation with outside agencies or partners* – Any water transfer will require several agreements for the purchase, storage, wheeling, etc., of a given supply. Negotiation of such agreements can be difficult and complex and will depend on having many willing partners. A key part of the successful negotiations will be clearly defining the objectives for the use of the transfer projects, and the potential impacts on reliability, cost, and operational limitations that by be proposed by sellers or the wheeling agencies.

B.3.5 Addressing Water Transfer Projects in Phase II

Significant issues, uncertainties, and data gaps exist for most of the potential water transfer options. The Phase II efforts related to water transfer projects will bring them to a common level of information so that they can be compared within the water transfer group, and also fairly compared with other water supply management projects. The Phase II efforts will include obtaining and/or updating information on:

- Identifying the interest of BAWSCA member agencies in possibly participating in water transfers;

- Determining whether and how BAWSCA member agencies might be able to participate in water transfers;

- Identify type and availability of water transfer supply sources and availability of transfer capacity during normal and drought conditions;

- Identify duration of potential contract and purchase agreements;

- Identify potential purchase, transfer, and wheeling costs for delivery to the Bay Area and to member agencies;

- Identify transfer institutional, contract, and facility requirements;

- Identify and confirm options for transport of all types of transfers to the member agencies, types of agreements required;

- Identify districts or other entities that may be interested in potential Agricultural Conservation in the Tuolumne River watershed, and determine treatment requirements and wheeling costs required to allow conveyance through SFPUC system; and

- Further explore potential drought transfers into storage in San Antonio reservoir.

B.4 Surface Water and Reservoir Projects

B.4.1 Surface Water and Reservoir Projects to be Evaluated in Phase II

Table B-8 summarizes available information regarding the surface water project identified for evaluation in Phase II. This project has been selected because there is potential that if BAWSCA or one or more of the member agencies became a partner in this project, additional potable or non-potable supply could be made available (i.e., via sale, exchange or transfer) to a participating BAWSCA agency needing supply. The surface water project can be generally categorized as follows:

- *Potential project outside the BAWSCA service area* that may have the potential to be developed, to be expanded, and/or to have the project timeline accelerated to offset the demand of a BAWSCA agency(ies) through a sale, exchange, or transfer.

Table B-8
Potential Surface Water and Reservoir Projects Outside the BAWSCA Service Area to be Evaluated in Phase II

Agency/Project	*Potential Water Supply Management Project Description*[2]	*Augment Local Supply*	*Develop Asset for Regional Benefit*[1]	*Accelerate Schedule*[3]	*Comments/Potential Issues*
SFPUC/ Calaveras Reservoir	Potential reservoir expansion from 97 TAF to 420 TAF (total capacity), with an annual yield of 41 TAF (based on extended dry year supply).	--	X	NA	• SFPUC only moving forward with 97 TAF replacement dam. [4] Costs and yield for expanded dam unknown. • SFPUC has not made a decision on whether the new dam will be constructed to allow enlargement in the future. • Part of SFPUC system for transfer and storage of Hetch Hetchy supply. Additional yield would be from transfer and storage during wet years or potentially member agency water stored during drought events. • Environmental and water rights associated with future expansion may limit additional supply yield during normal and drought conditions. • Depending on the environmental review of the proposed smaller project, flows currently diverted from local streams for storage in Calaveras may be reduced, reducing the existing system yield. • Capital cost estimate of $542 million (based on enlargement from 97 TAF to 420 TAF).[5] • Cost estimated at $970 per AF (does not include cost of water to fill reservoir) (2010 dollars), or updated costs for dam expansion. [5]

[1] Projects that provide "regional benefit" could be local projects that could be expanded to provide a water supply benefit for more than one member agency or projects outside the BAWSCA service area that have the potential to serve one or more member agencies. In order for multiple agencies to be involved, agreements (cost, schedule, etc.), conveyance, and water quality issues may have to be addressed as part of Phase II of the Strategy.

Table B-8 Potential Surface Water and Reservoir Projects Outside the BAWSCA Service Area to be Evaluated in Phase II					
Agency/Project	**Potential Water Supply Management Project Description[2]**	**Augment Local Supply**	**Develop Asset for Regional Benefit[1]**	**Accelerate Schedule[3]**	**Comments/Potential Issues**

(2) TAF Capacity represents total capacity of project.
(3) Opportunity exists to accelerate the schedule for the "local" or "regional" benefit, or "both". "NA" = Not Available, project is too ill-defined to make a determination.
(4) Timing is contingent upon a number of factors, including completion of feasibility studies, financing, environmental documentation, permitting, and project approval.
(5) Costs were adjusted to January 2010 dollars based on the ENR CCI for San Francisco. Unit costs were based on a 30-year period and 5 percent interest rate.

Additional surface water and reservoir projects not considered for evaluation in Phase II are described below. The surface water and reservoir projects described in this section are in varying stages of planning or design. Information contained in this section was gathered from the various agency documents, as noted in the text and table. Table B-8 identifies current issues and data gaps for the project, which may need to be addressed as part of Phase II.

Table B-8 also identifies whether the project provides a local supply and/or regional supply benefit, and whether an opportunity exists to accelerate the project schedule. Generally, potential projects without sufficient definition where not identified as having potential for schedule acceleration.

Costs were adjusted to January 2010 dollars based on the ENR CCI for San Francisco.

B.4.1.1 Potential Surface Water and Reservoir Projects Outside the BAWSCA Service Area

There are three regional reservoir projects that have been identified for possible expansion that are outside of the BAWSCA service area. These include:

- Los Vaqueros Reservoir Expansion (CCWD);
- Del Valle Reservoir Expansion (SWP); and
- Calaveras Reservoir Expansion (SFPUC).

Los Vaqueros Reservoir Expansion

The Los Vaqueros Reservoir, located in eastern Contra Costa County (Brentwood), was constructed by CCWD in 1998 to improve the drinking water quality and drought supply reliability for its 550,000 customers. The reservoir has a current storage capacity of 100 TAF.

The Los Vaqueros Expansion (LVE) study, sponsored by CCWD, is the furthest along in the planning process and, at this point in time, has the shortest projected implementation time frame of the reservoir projects discussed herein. The LVE study

team identified four alternatives in its Draft Environmental Impact Statement/ Environmental Impact Report, released in February 2009. Alternative 1, identified as the "Proposed Action," would increase the storage of Los Vaqueros Reservoir from 100 TAF to 275 TAF to provide environmental water for the SWP and federal CVP operations and to increase the supply reliability for the SBA Contractors (including ACWD). Implementation would require significant State and/or Federal cost sharing partners. (U.S. Department of the Interior, Bureau of Reclamation, CCWD, and Western Area Power Administration 2009)

CCWD approached the three SBA contractors (ACWD, Alameda County Flood Control and Water Conservation District – Zone 7 [Zone 7], and SCVWD) to determine their interest in partnering on this project. To date, none of the three agencies have expressed an interest to CCWD to participate in the LVE project.

If the LVE were to be implemented with support of three SBA contractors, a new pipeline connection from the LVE to the SBA would be constructed, in addition to the enlargement of the reservoir and construction of addition pipeline and pumping facilities. This could allow water stored in the reservoir to be transferred to all or some of the SBA contractors. However, without the participation of the SBA contractors, CCWD may only build a smaller project, and not provide the connection to the SBA, and therefore no connection to BAWSCA member agencies.

Even if the SBA contractors did participate in LVE, it is questionable whether that participation could result in additional supply to BAWSCA agencies. The SBA conveys SWP water, the reliability of which has been significantly affected over the last three years and in previous dry periods. Furthermore, other than ACWD, no other BAWSCA member agency is a direct SWP contractor (i.e., the joint customers receive Delta water, but SCVWD is the contractor). Therefore, even if BAWSCA or the other member agencies could secure a contract for Delta supplies, there would be significant constraints on conveying Delta supplies through the SBA, unless it was done via an exchange. This issue is discussed in more detail in Section B.3.

Del Valle Reservoir Expansion

Lake Del Valle is located in the Livermore Valley. The lake and dam are part of the SWP, and were created in 1968 as part of the SBA project providing SWP contract water to Zone 7, ACWD, and SCVWD. The lake has a current capacity of 77 TAF; however, a portion of this storage (25 to 40 TAF) is reserved for flood control storage. The SFPUC Hetch Hetchy aqueduct passes under, but does not connect to, the lake.

In 2008, the Del Valle Reservoir Expansion alternatives, initially developed in a 2001 study, were revisited by the SBA Contractors as part of a joint water supply strategy to increase storage at Del Valle Reservoir. The potential sources of supply to fill the additional storage included additional runoff from Arroyo Valle, surplus Delta water, and other water purchases. Five alternatives were evaluated, including three alternatives that would modify the storage at Del Valle Reservoir, one alternative to re-operate the reservoir to provide additional supply, and one alternative to construct

another reservoir in a nearby valley. Of these alternatives, the development of a new 15 TAF Upper Del Valle Reservoir was determined to be the most feasible project. (CDM 2009)

However, the estimated increase in yield associated with constructing the Upper Del Valle Reservoir and filling it with only local runoff is very small (i.e., only 0.7 TAF per year), which makes this project extremely expensive (i.e., with a unit cost ranging from $12,000 to $13,000 per AF, in 2010 dollars). To increase the yield, additional supply would have to be purchased from the SWP or another source, and even then, it is unlikely that the SWP or SBA customers would move forward without significant State and/or Federal funding.

In addition, this project only addresses storage of SWP water for the three SBA contractors. Any increase in yield would only be available for the SBA contractors. If operational storage space were available, the BAWSCA member agencies would have to purchase supply and convey it through the SBA for temporary storage in the available space. As with the LVE, any supply added to the system by BAWSCA would have to be transported into the BAWSCA service area through the SBA, and would require further transfers through either ACWD or SCVWD to reach a BAWSCA member agency.

Calaveras Reservoir Expansion

The Calaveras Reservoir is a SFPUC storage reservoir located in the Sunol Valley area spanning both Alameda and Santa Clara Counties. The reservoir has a capacity of 97 TAF. However, due to seismic concerns with the existing Calaveras Dam, the water level is currently being kept at lower elevations, significantly reducing the reservoir storage capacity.

The potential Calaveras Reservoir Expansion project that has been examined by SFPUC could involve an increase in capacity from the existing size of 97 TAF to 420 TAF. The California Division of Safety of Dams identified potential seismic concerns with the existing dam, which prompted SFPUC to evaluate alternatives for dam replacement at both the original size and a larger size of 420 TAF. An approach to expand the reservoir capacity up to 420 TAF considered increasing the overall deliveries to the BAWSCA member agencies to meet identified future water supply needs.

Currently, the SFPUC has prepared an Environmental Impact Report to address the potential environmental impacts of the current project, which is to replace the existing dam with a new, seismically stable dam that provides 97 TAF of storage capacity (i.e., no storage increase) and that addresses the seismic concerns with the existing dam. As part of its evaluation, the SFPUC is evaluating whether to construct a dam that would allow for structural enlargement in the future, without having to construct a new dam. If the decision is made not to include the ability to expand the dam in the future, construction costs for enlargement would be much greater that presented in Table B-8.

B.4.2 Potential Issues Associated with Developing Surface Water and Reservoir Projects

In general, for the reasons discussed below, the regional reservoir expansion projects discussed above will most likely not be viable for BAWSCA.

- The scope of the LVE goes beyond what CCWD is currently planning to implement to meets its own need is unlikely unless the SBA contractors participate in the project. Even if such an expansion is practical from a cost standpoint, it probably could not be started until 5 to 10 years after completion of CCWD's current reservoir expansion project. This would likely move the schedule for implementation of a project to support BAWSCA member agencies beyond 2020 to 2025. Due to the schedule and low likelihood of participation by the SBA contractors, this project will not be evaluated in Phase II of the Strategy.

- The Del Valle Reservoir Expansion is very costly on a per AF basis due to the small yield. It is unlikely that the SWP or SBA customers would move forward without significant State and Federal funding. For these reasons, this project will not be evaluated in Phase II of the Strategy.

- For either LVE or the Del Valle Reservoir Expansion, any supply that BAWSCA might be allowed to store in the reservoir would have to be transported into the BAWSCA service area through the SWP and the SBA, and then would require further transfers through either ACWD or SCVWD to reach a BAWSCA agency. It may be prohibitively costly and time-consuming to accomplish all the necessary agreements and transfers, considering institutional, permitting, and wheeling arrangements, as well as existing SBA system capacity, water quality, and other constraints. For these reasons, this project will not be evaluated in Phase II of the Strategy.

- Calaveras Reservoir Expansion is not occurring as part of this phase of the SFPUC seismic improvements for the dam. Expansion beyond the current 97 TAF capacity of Calaveras Reservoir, even if practical from a cost standpoint, probably could not be started until 5 to 10 years after completion of the current dam construction work. This would likely move the schedule for implementation of a project to support BAWSCA member agencies beyond 2020 to 2025. However, until the decision by the SFPUC on the dam design, this project is being kept as a potential project for evaluation in Phase II of the Strategy.

B.4.3 Addressing Surface Water and Reservoir Projects in Phase II

There are data gaps in the understanding of the potential for the Calaveras Reservoir Expansion project. These gaps would need to be filled in order to fairly compare this project with others during Phase II, such as:

- Currently, SFPUC is only examining a 97 TAF replacement reservoir in the Calaveras Reservoir Expansion project. However, SFPUC has not yet made a decision as to whether the new dam design will include the ability to be enlarged in the future;

- Potential funding options;

- Project schedules; and

- Evaluation of projects based on potential for connection to the BAWSCA service area and member agencies.

B.5 Desalination Projects

B.5.1 Desalination Projects to be Evaluated in Phase II

Tables B-9 and B-10 summarize available information regarding the desalination projects that have been identified for evaluation in Phase II. Figure B-4 presents the location of the identified desalination projects, both within and outside of the BAWSCA service area. These projects have been selected because there is potential that if BAWSCA or one or more of the member agencies became a partner in one of these projects, additional potable supply could be made available (i.e., via sale, exchange, or transfer) to a participating BAWSCA agency needing supply. The desalination projects can generally be grouped as follows:

- *Potential future new projects within the BAWSCA service area that have not* been specifically identified by a BAWSCA member agency to date, but that may have the potential to be developed to either offset additional demand within the service area of the BAWSCA agency(ies) that is involved in the project, or to offset the demand of another BAWSCA agency(ies) through a sale, exchange, or transfer; and

- *Existing, planned, or potential projects outside the BAWSCA service area* that may have the potential to be developed and/or expanded, or to have the project timeline accelerated to meet normal or drought demand of a BAWSCA agency(ies) through a sale, exchange, or transfer.

The desalination projects in Tables B-9 and B-10 are in varying stages of planning or design and there are varying levels of detail regarding demand, treatment capacity[6], annual supply and demand, cost, and schedule for each project are available from the reviewed documents. Information contained in this section was gathered from member agency UWMPs, Bay Area Regional Desalination Project (BARDP) materials and staff communication, and individual agency documents, as noted in the text and tables.

[6] In Tables B-9 and B-10, treatment plant capacity in mgd is presented as a range. These projects could be operated under any hydrological condition (e.g., dry, normal or wet year) though this decision would depend on economic and other considerations.

Tables B-9 and B-10 also identify whether the projects augment the local supply and/or provide regional supply benefit, and whether an opportunity exists to accelerate the project schedule. Generally, the potential for project acceleration was not selected for the less defined projects and projects that were scheduled to be completed within the next year or two were not included.

The desalination projects described in this section are different than the projects specifically identified by the BAWSCA member agencies in the groundwater and recycled project sections. This is due to the different intakes, brine disposal, storage, conveyance, and wheeling agreement elements that may result in numerous combinations and, therefore, different projects. An initial part of Phase II will focus on developing the best combinations of these elements for further analysis.

B.5.1.1 Potential Desalination Projects Within the BAWSCA Service Area

In order to assess the feasibility of new local and/or regional desalination projects that could potentially be located within the BAWSCA service area, an initial review was performed of available information on groundwater hydrogeology, local groundwater yields, alternative intake and treatment processes, and institutional and permitting requirements. Based on that initial assessment, three types of potential new local desalination projects have been identified below and are summarized in Table B-9:

- Brackish groundwater wells;
- Seawater from groundwater slant wells under the Bay; and
- Seawater through open water intakes.

Brackish groundwater wells would likely have the lowest capital and operational costs. There would be less pretreatment required as compared to a seawater intake system, and lower costs for membrane treatment due to the lower salinity levels. However, hydrogeologic conditions along the Bay suggest that a well, or combination of wells, could be limited to production capacities between 1 and 5 mgd. Hydrogeologic conditions for locations along the North San Mateo Coast have not been evaluated but were assumed to have similar production capacities between 1 and 5 mgd.

Groundwater slant wells could be drilled under the Bay or offshore. The advantages of slant wells include potentially higher pumping capacity if they can access higher production and recharge groundwater zones, and less pretreatment required than an open intake system. However, the geology and hydrogeology under the Bay is more unknown than onshore conditions; therefore, the potential yields are even more uncertain. Hydrogeologic conditions for the North San Mateo Coast locations have not been evaluated, but may be viable.

Open water intakes are possible and are being pursued for the BARDP and Marin Municipal Water District (MMWD) desalination projects. Open water intakes have the advantage of larger capacity withdrawals than either brackish groundwater alternatives or slant wells. These types of intakes, however, present numerous challenges because they 1) involve more extensive permitting, 2) have higher energy consumption, 3) increase capital and operating costs, and 4) are opposed by many environmental groups, including groups which have filed lawsuits against the proposed MMWD and southern California desalination facilities that have gone through the EIR review process.

Table B-9
Potential Desalination Projects Within the BAWSCA Service Area to be Evaluated in Phase II

Project Type by Area	***Potential Water Supply Management Project Description***	***Potential Project Benefit***			***Comments/Potential Issues***
		Augment Local Supply	***Develop Asset for Regional Benefit[1]***	***Accelerate Schedule[2]***	
Brackish Groundwater Wells					
Dumbarton Bridge Area (west side)	Brackish Groundwater, 1 to 5 mgd.	X	X	Both	• Available yield, potential impact on near-by wells, and source water quality have not been evaluated. • Brine discharge permitting may be difficult. • The long-term hydraulic capacity available in WWTP outfalls and the willingness of the regional agency to allow use of these facilities for brine discharge need to be evaluated.
East Bay Saline Project (Bay Division Pipelines 1 & 2 at Dumbarton Point)	Brackish Groundwater, 1 to 5 mgd.	X	X	Both	• Available yield, potential impact on near-by wells, and source water quality have not been evaluated. • Brine discharge permitting may be difficult. • Potential impact to Niles Cone Basin will need to be evaluated. • The long-term hydraulic capacity available in WWTP outfalls and the willingness of the regional agency to allow use of these facilities for brine discharge need to be evaluated.

Table B-9
Potential Desalination Projects Within the BAWSCA Service Area to be Evaluated in Phase II

Project Type by Area	***Potential Water Supply Management Project Description***	***Potential Project Benefit***			***Comments/Potential Issues***
		Augment Local Supply	***Develop Asset for Regional Benefit[1]***	***Accelerate Schedule[2]***	
NCCWD	Brackish Groundwater, 10 to 15 mgd.	X	X	Both	• NCCWD is developing a conceptual plan for a brackish desalination project with a capacity of 10 to 15 mgd. • Available yield, potential impact on near-by wells, and source water quality have not been evaluated. • Potential demand and permitting requirements have not been evaluated. • Costs are dependent on degree of salinity, and cost estimates have not been developed. • Infrastructure requirements to move treated water to the RWS have not been determined. • The long-term hydraulic capacity available in WWTP outfalls and the willingness of the regional agency to allow use of these facilities for brine discharge need to be determined. • NCCWD will look for partners to assist with project funding.
Subsurface Slant Wells					
Dumbarton Bridge Area (west side)	Seawater subsurface intake, 1 to 10 mgd.	X	X	Both	• Available yield, potential impact on near-by wells, and source water quality have not been evaluated. • Brine discharge permitting may be difficult. • Potential for surface water influence will increase pre-treatment requirements. • Potential for salt water intrusion into on-shore aquifers. Salt intrusion and/or water supply impacts to Niles Cone would require full mitigation to ACWD. • The long-term hydraulic capacity available in WWTP outfalls and the willingness of the regional agency to allow use of these facilities for brine discharge need to be evaluated.
San Mateo Area	Seawater subsurface intake, 1 to 10 mgd	X	X	Both	• Available yield, potential impact on near-by wells, and source water quality have not been evaluated. • Brine discharge permitting may be difficult. • Potential for surface water influence may increase pre-treatment requirements. • Potential for salt water intrusion into on-shore aquifers. • The long-term hydraulic capacity available in WWTP outfalls and the willingness of the regional agency to allow use of these facilities for brine discharge need to be evaluated.

Table B-9
Potential Desalination Projects Within the BAWSCA Service Area to be Evaluated in Phase II

Project Type by Area	Potential Water Supply Management Project Description	Potential Project Benefit			Comments/Potential Issues
		Augment Local Supply	Develop Asset for Regional Benefit[1]	Accelerate Schedule[2]	
Oyster Point	Seawater subsurface intake, 1 to 10 mgd.	X	X	Both	• Available yield, potential impact on near-by wells, and source water quality have not been evaluated. • Brine discharge permitting may be difficult. • Potential for surface water influence may increase pre-treatment requirements. • Potential for salt water intrusion into on-shore aquifers. • The long-term hydraulic capacity available in WWTP outfalls and the willingness of the regional agency to allow use of these facilities for brine discharge need to be evaluated.
NCCWD	Seawater subsurface intake, 10 to 15 mgd.	X	X	Both	• Available yield, potential impact on near-by wells, and source water quality have not been evaluated. • Potential demand and permitting requirements have not evaluated. • Infrastructure requirements to move treated water to the RWS have not been determined. • Capital and operating costs will be higher than for brackish water treatment and have not been evaluated. • The long-term hydraulic capacity available in WWTP outfalls and the willingness of the regional agency to allow use of these facilities for brine discharge need to be evaluated.
Open Water Intakes					
Dumbarton Bridge Area (west side)	Seawater open intake 1 to 40 mgd.	X	X	Both	• Permitting requirements and issues have not been evaluated. • Long-term reliability of intake screens will have to be evaluated. • The long-term hydraulic capacity available in WWTP outfalls and the willingness of the regional agency to allow use of these facilities for brine discharge need to be evaluated. • Source water quality and variation (proximity to existing WWTP outfall) will need to be evaluated.

Table B-9
Potential Desalination Projects Within the BAWSCA Service Area to be Evaluated in Phase II

Project Type by Area	***Potential Water Supply Management Project Description***	***Potential Project Benefit***			***Comments/Potential Issues***
		Augment Local Supply	***Develop Asset for Regional Benefit[1]***	***Accelerate Schedule[2]***	
San Mateo Area	Seawater open intake, 1 to 10 mgd.	X	X	Both	• Permitting requirements and issues have not been evaluated. • Long-term reliability of intake screens will have to be evaluated. • The long-term hydraulic capacity available in WWTP outfalls and the willingness of the regional agency to allow use of these facilities for brine discharge need to be evaluated. • Source water quality and variation (proximity to existing WWTP outfall) will need to be evaluated.
Oyster Point	Seawater open intake, 1 to 10 mgd.	X	X	Both	• Permitting requirements and issues have not been evaluated. • Long-term reliability of intake screens will have to be evaluated. • The long-term hydraulic capacity available in WWTP outfalls, and the willingness of the regional agency to allow use of these facilities for brine discharge need to be evaluated. • Source water quality and variation (proximity to existing WWTP outfall) will need to be evaluated.
NCCWD	Seawater open intake, 10 to 15 mgd.	X	X	Both	• NCCWD is developing a conceptual plan for a seawater desalination project with a capacity of 10 to 15 mgd. • Potential demand and permitting requirements have not evaluated. • Infrastructure requirements to move treated water to the RWS have not been determined. • Capital and operating costs will be higher than for brackish water treatment and have not been developed. • NCCWD is working to develop a renewable energy source because the Coastal Commission is requesting the project have a zero carbon footprint. • NCCWD will look for partners to assist with project funding.

[1] Projects that provide "regional benefit" could be local projects that could be expanded to provide a water supply benefit for more than one member agency or projects outside the BAWSCA service area that have the potential to serve one or more member agencies. In order for multiple agencies to be involved, agreements (cost, schedule, etc.), conveyance, and water quality issues may have to be addressed as part of Phase II of the Strategy.

[2] Opportunity exists to accelerate the schedule for the "local" or "regional" benefit, or "both". "NA" = Not Available, project is too ill-defined to make a determination.

Several potential locations for future desalination facilities within the BAWSCA service area have been identified, as shown on Figure B-4, based on preliminary review of hydrological conditions along the western edge of the Bay[7], potential WWTP outfalls for a co-located brine discharge, and possible locations for connection within the BAWSCA service areas and to the RWS. Specific locations near existing wastewater outfalls selected for possible future consideration include 1) the area near the Dumbarton Bridge with a nearby existing outfall from the wastewater treatment plant in Palo Alto, 2) areas near the San Mateo Bridge with nearby existing outfalls from the wastewater treatment plant serving Redwood City, San Carlos, and San Mateo (SBSA), and 3) in South San Francisco just north of San Francisco International Airport near the existing outfall from the South San Francisco/San Bruno wastewater treatment plant.

Both East Palo Alto[8] and NCCWD have considered desalination projects. Potential projects for East Palo Alto have been incorporated into the general locations indicated in Table B-9, and the potential NCCWD projects are listed specifically in Table B-9. Desalination projects developed within the BAWSCA service area could vary significantly in size. For example, brackish groundwater projects could range in size from 1 to 15 mgd, while larger seawater intake projects could be over 40 mgd.[9]

B.5.1.2 Potential Desalination Projects Outside of the BAWSCA Service Area

BARDP is evaluating the potential to develop one or two desalination plants to produce potable water in the Bay Area for normal, drought or emergency conditions. The current participating agencies include CCWD, EBMUD, SFPUC[10], and SCVWD. These agencies are evaluating the feasibility of plant capacities of 20 to 65 mgd, which could provide a combination of normal and drought supply to several agencies. The participating agencies would either directly receive desalinated water or exchange other water between them. If these projects are proven to be cost effective, BAWSCA and the member agencies can evaluate if they may want to participate independent of SFPUC.

Table B-10 summarizes eight of the BARDP projects outside the BAWSCA service area, which are shown on Figure B-4. The BARDP evaluation process started in 2003 with the screening of 22 potential sites. The 2007 feasibility study screened and ranked combinations of location, operation, and conveyance scenarios according to six issues: environmental, permitting, institutional/legal, cost, public perception, and reliability. The highest ranked was a 65 mgd facility in the City of Pittsburg, co-located with the

[7] Locations in the South Bay have been already evaluated by SCVWD and locations in the East Bay have been evaluated already by ACWD.

[8] Specifically, East Palo Alto has noted interest in developing brackish groundwater desalination and/or bay water desalination for potential supply of 1 mgd (City of East Palo Alto 2005).

[9] Note that in Section B.5.1.2, certain projects are listed that were originally part of the BARDP project but were dropped. These could be reclassified as projects within the BAWSCA service area but are discussed in this next section for consistency with the BARDP analysis.

[10] BAWSCA currently participates via SFPUC as it pays two-thirds share of SFPUC costs.

existing Mirant Power Plant (East Contra Costa Site).[11] The following higher-ranked locations from the BARDP evaluation are shown on Figure B-4, and will be evaluated in Phase II:

- East Contra Costa Site (Mirant Pittsburg);
- Delta Diablo Sanitation District Site;

Table B-10
Potential Desalination Projects Outside of BAWSCA Service Area to be Evaluated in Phase II

Project Location	Potential Water Supply Management Project Description	Potential Project Benefit			Comments/Potential Issues
		Augment Local Supply	Develop Asset for Regional Benefit(1)	Accelerate Schedule (2)	
Mirant Pittsburg (East Contra Costa County Pittsburg)(3)	Brackish Water open intake, 25 to 85 mgd	X	X	Both	• Direct and/or exchange transfer option will have to be evaluated. • Requires a "use" permit. • Without a Delta transfer, emergency water conveyance to SFPUC would be limited. • Fish intake is a concern. • Brine disposal and intake could pose environmental problems. • New pumping plant and two miles of new pipelines would be needed. • Conveyance pipelines crossing major faults are subject to seismic risks. • Long-term reliability of intake screens needs to be evaluated.
Delta Diablo Sanitation District(3)	Brackish Water open intake, yield to be determined	X	X	Both	• Direct and/or exchange transfer option will have to be evaluated. • Without a Delta transfer, emergency water conveyance to SFPUC would be limited. • New pumping plant and five miles of new pipelines would be needed. • Requires a "use" permit. • Fish intake is a concern. • Brine disposal and intake could pose environmental problems. • Uncertain if the load for a large facility is available. • Conveyance pipelines crossing major faults are subject to seismic risks. • Long-term reliability of intake screens needs to be evaluated.

[11] BARDP is currently testing different pretreatment and treatment technologies, brine discharge quality, and entrainment avoidance technologies, and developing design criteria. After the pilot study is complete, a detailed site selection study is needed to identify a proposed site, preliminary layout, and conceptual engineering design for the facilities. Additionally, hazardous waste and geotechnical investigations would be required for the selected site or sites, and a blending study would be needed to evaluate the potential water sources and water quality of any transfer waters. The costs estimates will be updated after the completion of the pilot testing.

Table B-10
Potential Desalination Projects Outside of BAWSCA Service Area to be Evaluated in Phase II

Project Location	***Potential Water Supply Management Project Description***	***Potential Project Benefit***			***Comments/Potential Issues***
		Augment Local Supply	***Develop Asset for Regional Benefit[1]***	***Accelerate Schedule [2]***	
Near Bay Bridge (east side) [3]	Seawater open intake, 40 to 85 mgd	X	X	Both	• Direct and/or exchange transfer option will have to be evaluated. • Close proximity to existing WWTP outfall may be a permitting issue. • Without a Delta transfer, emergency water conveyance to SFPUC would be limited. • Higher cost due to high salinity at intake. • Potential environmental impact on eelgrass. • Potential water quality issue with location in industrial area. • Conveyance pipelines crossing major faults are subject to seismic risks. • Long-term reliability of intake screens needs to be evaluated.
Oceanside [3]	Seawater open intake, 20 to 85 mgd	X	X	Both	• Modeling studies on brine mixing would be required. • Potential "right-of-way," geotechnical/seismic, and space issues. • Require hydraulic analysis to determine which customers could receive this supply. • Potential proximity to WWTP may be a water quality and permitting issue. • Intertie capacity of 30 mgd would limit transfer of water to East Bay. • Higher cost due to high salinity ocean water. • Proximity to national park may be a permitting issue. • Without a Delta transfer, emergency water conveyance to east bay would be limited. • Vulnerable to natural disasters associated with coastline facilities. • Conveyance pipelines crossing major faults are subject to seismic risks. • Long-term reliability of intake screens needs to be evaluated.
San Francisco International Airport	Seawater open intake, yield to be determined	X	X	Both	• High total suspended solids. • Long-term reliability of intake screens needs to be evaluated. • Higher cost due to higher salinity at intake, and higher pre-treatment costs. • "High-profile" area may create public acceptance issue.

Table B-10
Potential Desalination Projects Outside of BAWSCA Service Area to be Evaluated in Phase II

Project Location	***Potential Water Supply Management Project Description***	***Potential Project Benefit***			***Comments/Potential Issues***
		Augment Local Supply	***Develop Asset for Regional Benefit[1]***	***Accelerate Schedule [2]***	
Palo Alto RWQCP	Brackish Groundwater, less than 5 mgd	X	X	Both	• Public perception that groundwater is polluted. • Supply subject to drought. • Potential for salt water intrusion into on-shore aquifers. • Limited capacity for a regional supply. • Brine discharge in South Bay may be a greater environmental and permitting issue.
DVR Energy Facility Pico Power Plant	Brackish Groundwater, less than 5 mgd	X	X	Both	• Limited capacity for a regional supply. • Supply subject to drought. • Potential for salt water intrusion into on-shore aquifers is a concern. • Brine discharge in South Bay may be a greater environmental and permitting issue. • Existing power plant outfall is a potential brine disposal method, but would require further study and modified permit. • Public perception that groundwater is polluted at Los Esteros.
Los Esteros Power Plant	Brackish Groundwater, less than 5 mgd	X	X	Both	• Limited capacity for a regional supply. • Supply subject to drought. • Potential for salt water intrusion into on-shore aquifers is a concern. • Brine discharge in South Bay may be a greater environmental and permitting issue. • Existing power plant outfall is a potential brine disposal method, but would require further study and modified permit.

[1] Projects that provide "regional benefit" could be local projects that could be expanded to provide a water supply benefit for more than one member agency or projects outside the BAWSCA service area that have the potential to serve one or more member agencies. In order for multiple agencies to be involved, agreements (cost, schedule, etc.), conveyance, and water quality issues may have to be addressed as part of Phase II of the Strategy.

[2] Opportunity exists to accelerate the schedule for the "local" or "regional" benefit, or "both". "NA" = Not Available, project is too ill-defined to make a determination.

[3] Sites that passed second tier screening in BARDP. (URS 2007)

- Near Bay Bridge Site; and
- Oceanside Desalination Site.

Figure B-4 indicates the location of lower ranked sites also included in the BARDP evaluation, but that may also be evaluated during Phase II of this project.[12] These projects include:

- San Francisco International Airport;
- Palo Alto RWQCP;
- DVR Energy Facility; and
- Los Esteros Power Plant.

The BARDP would require a hydraulic connection and/or ability to exchange water between partner agencies. Depending on the desired capacity, the required level of new construction of interconnected pipelines and pump stations will vary.

B.5.2 Potential Issues Associated with Developing Desalination Projects

Potential issues affecting desalination project implementation are described below.

- *Yield and drought supply availability* – Although desalination is considered a drought resistant supply, there are current unknowns relative to the hydrogeology, water quality, and regional pumping impacts that may limit groundwater pumping and the long-term yields are uncertain. Additional investigations and analysis, potentially including field investigations, may be required to confirm these project yields.
- *Permitting and environmental constraints* – Open water desalination projects face a number of environmental and permitting concerns which can affect the viability and cost of these types of desalination projects. Open water intakes are not an ideal approach, as discussed in Section B.5.1.2, with respect to permitting, energy use, and opposition by many environmental special interest groups.
- *Ability to use potential excess hydraulic capacity in existing WWTP outfalls for brine disposal* – A critical part of evaluation of the desalination projects will include the analysis of methods of disposal for the concentrated brine resulting from the desalination process for either brackish or seawater sources. Costs and permitting requirements may be reduced significantly if excess hydraulic capacity is available. However, those regional wastewater agencies must be willing to allow blending and use of the outfall piping and dissipation structures.
- *Cost effectiveness* – Currently the cost of the desalination projects is relatively high due to the infrastructure and treatment needs, and potentially limited yields for the brackish wells. A number of issues will affect cost including:

[12] These could be considered to be within the BAWSCA service area but had originated within BARDP hence are listed here.

- *Intakes* - Construction and maintenance of the intakes (open seawater intake or wells) that are required to move the water to a treatment facility, for the infrastructure to connect to the agency, and for disposal of the concentrated brine from the treatment process.[13]

- *Operational strategy choice* – Production costs are influenced by duration and flow of each plant, e.g., whether the plants should be continuously base loaded or used only during supply shortages. While these plants cannot be fully mothballed, production could be reduced significantly during normal years to reduce this cost. Yet, this reduction in production will also significantly increase the unit cost, as the production cost and amortization of capital costs will not be reduced as significantly as the reduction in production.

- *Level of Treatment* – A regional project utilizing existing SFPUC transmission facilities to convey desalinated water may face resistance from SFPUC, especially to meet normal year demand, due to water quality concerns (e.g., while meeting drinking water standards, the desalinated water is not as high quality as that from the Hetch Hetchy system). This may require greater levels of water treatment to match the SFPUC quality.

- *Project funding* – Given the infrastructure, including treatment costs associated with the desalination projects, and current economic climate many agencies are reducing or postponing their spending on capital projects until revenues increase, or more state or federal funding or grants may become available.

- *Flow peaking options* – As with other supply projects, such as groundwater, which could be based loaded (maintain relatively constant production throughout the year), additional seasonal storage would not be needed, such as may be required for water transfers. The desalination facilities do not need to be designed to meet peak demands, as those peaks could be picked up through the SFPUC supply.

- *Other* – A more detailed analysis would be required to confirm the feasibility of the subsurface intake locations and to identify potential permitting challenges and costs of the open water intake locations in order to better compare these alternatives with other regional water supply management projects.

B.5.3 Addressing Desalination Projects in Phase II

The desalination projects have a number of significant issues and uncertainties regarding supply quantity available for the lesser cost brackish projects, versus the higher cost and potentially much larger seawater Bay intake projects. The Phase II efforts related to desalination projects will bring them to a common level of information so that they can be compared within the desalination supply group, and

[13] To reduce the costs and permitting requirements required to construct a new open discharge disposal system into the Bay it would be preferable to be able to use excess capacity in either the regional WWTP outfalls, or power plant outfalls and intakes.

fairly compared with other water supply management projects. The Phase II efforts will include:

- Evaluating the yield and water quality associated with brackish and seawater wells;
- Identification of potential interest by member agencies, and potential other partners;
- Discussions with BARDP partners regarding potential direct participation in BARDP projects;
- Confirmation of whether excess capacity exists with the regional WWTP outfalls, and the willingness of those agencies to allow joint use of the outfall pipelines and discharge structures.
- Identification of potential alternatives for brine disposal including new outfalls and use of existing brine lines in the Bay area;
- Identification of additional permitting requirements and/or studies that would be required to allow joint use of the outfalls;
- Discussions with SFPUC regarding use of the SFPUC transmission for transfer of desalination supplies to member agencies;
- Development of information to a common level to allow comparison within the desalination projects, and with the other project types, including:
  - Capital costs;
  - O&M costs; and
  - Project schedule and potential for project acceleration; and
- Evaluation of projects based on potential for connection to the BAWSCA service area and member agencies.

B.6 Expanded Conservation Projects

B.6.1 Expanded Conservation Projects to be Evaluated in Phase II

Water conservation will continue to be a critical component of each agency's future water supply portfolio. Additional conservation projects beyond those incorporated in the WCIP will necessarily be part of the Strategy and also will help BAWSCA agencies meet the state-wide target of a 20 percent reduction in per capita water

demands by the year 2020 (SWRCB 2009)[14]. The expanded conservation projects can be generally grouped as follows:

- *Existing projects within the BAWSCA service area* that are under development by, or in partnership with, a BAWSCA member agency and that may have the potential to be expanded and/or to have the project timeline accelerated to either offset additional demand within the service area of the BAWSCA agency(ies) that is involved in the project, or to offset the demand of another BAWSCA agency(ies) through a sale, exchange, or transfer;

- *Planned projects within the BAWSCA service area* that have been identified by a BAWSCA member agency and that may have the potential to be expanded and/or to have the project timeline accelerated to either offset additional demand within the service area of the BAWSCA agency(ies) that is involved in the project, or to offset the demand of another BAWSCA agency(ies) through a sale, exchange, or transfer; and

- *Potential future new projects within the BAWSCA service area* that have not been specifically identified by a BAWSCA member agency to date, but that may have the potential to be developed to either offset additional demand within the service area of the BAWSCA agency(ies) that is involved in the project, or to offset the demand of another BAWSCA agency(ies) through a sale, exchange, or transfer.

Detailed expanded conservation projects ("existing," "planned," and "potential") will be developed as part of Phase II using the WCIP as a starting point. The conservation projects that will be evaluated in Phase II may include expanded implementation of current conservation projects, and projects such as "retrofit on resale" ordinances, lawn replacement incentives, water budget rate structures, or potable water offset programs.

Successful implementation of water conservation projects provides potential reductions in water demand in both normal and drought years. The potential savings from expanded conservation projects will vary by project and member agency. Outdoor landscaping (using potable supply) represents as much as 40 percent of total existing residential demands (SWRCB 2009). Therefore, projects that limit or eliminate the use of potable water for outdoor landscape irrigation could provide significant

[14] Pursuant to SB X7 7, the State will have to reduce per capita water use by at least 10% no later than December 31, 2015, and by 20% by no later than December 31, 2020. These water use reductions will be compared against a 10- to 15-year baseline period that ends between 2004 and 2010. The legislation will not require individual urban water suppliers to reduce per capita water usage by more than 20%; however, each supplier will have to reduce per capita daily water use by at least 5%, unless their water use is less than 100 gpcd. Urban water suppliers will have to meet their own, specified water use targets, which can be established on an individual or regional basis, using one of four methods: (1) a 20% reduction in baseline water use; (2) compliance with established performance standards (e.g., 55 gpcd for residential indoor water use); (3) a 5% reduction from the applicable state hydrologic region target set in the "Draft 20 x 2020 Water Conservation Plan;" or (4) a method that will be developed by DWR by December 31, 2010.

water savings. Likewise, savings from projects that require high efficiency indoor fixtures as part of a "retrofit on resale" program may be as high as 25 percent of existing residential demands. SB 407 will require the replacement of all noncompliant (low efficiency) plumbing fixtures beginning as early as 2014, although programs could be developed to realize the savings from these retrofits even sooner.

B.6.2 Potential Issues Associated With Developing Expanded Conservation Projects

The implementation of more extreme, or non-traditional, water conservation projects requires a shift in the population's perspective on landscaping and a change in consumer behavior for indoor water savings. These conservation projects are easier to implement during droughts when people are motivated to save water, but it may be more difficult to retain the changes and attitudes during non-drought years. In general, implementation of any water conservation program requires an aggressive regional public education campaign and typically some sort of pricing mechanism (e.g., incentive rebates, inclining block rates, or budget-based rate structures that penalize high water use). Successful implementation also requires effective project management, enforcement, and penalties.

B.6.3 Addressing Expanded Conservation Projects in Phase II

As part of the Phase II evaluation, a portfolio of expanded water conservation measures will be developed that, if implemented, will help BAWSCA member agencies meet their future conservation targets. Phase II will leverage recent work on conservation programs to identify which expanded conservation projects are best suited to meet the future conservation goals of BAWSCA and its member agencies. The Phase II efforts may include obtaining, refining, and/or updating information on:

- Implementation potential by member agency for individual conservation measures;
- Potential water savings by conservation measure;
- Groups of conservations measures that complement each other for greater water savings;
- Costs of implementation by conservation measure;
- Potential funding options; and
- Project schedule.

B.7 Localized Water Capture and Reuse Projects

B.7.1 Localized Water Capture and Reuse Projects to be Evaluated in Phase II

Table B-11 provides a summary of potential localized water capture and reuse projects identified for evaluation in Phase II. All projects in this water supply management category are grouped as:

- *Potential future new projects within the BAWSCA service area* that have not been specifically identified by a BAWSCA member agency to date, but that may have the potential to be developed to either offset additional demand within the service area of the BAWSCA agency(ies) that is involved in the project, or to offset the demand of another BAWSCA agency(ies) through a sale, exchange, or transfer.

Additional detail on each type of localized water capture and reuse project is provided below.

Table B-11
Localized Water Capture and Reuse Projects to be Evaluated in Phase II

Agency	Potential Water Supply Management Project Description	Potential Project Benefit			Comments / Potential Issues
		Augment Local Supply	Develop Asset for Regional Benefit[1]	Accelerate Schedule[2]	
--	Rainwater harvesting with local storage and use. Yield of 13,500 gallons per year for each 1,000 square feet of roof area. [3]	X	--	Local	• Seasonality of rainfall and intermittent availability make storage the limiting factor in feasibility. High cost of large storage vessels. • Relatively low yield. • High initial, maintenance, and replacement costs of storage components.
--	Fog capture. Yield varies based on climate.	X	--	NA	• Relatively low yield. • High initial, maintenance, and replacement costs of capture and storage components.
--	Stormwater capture for augmented groundwater aquifer recharge.	X	X	NA	• Seasonality of rainfall and intermittent availability make storage the limiting factor in feasibility. • Feasible sites must have access to both stormwater supply and groundwater basin storage. • Treatment of captured stormwater may be needed due to water quality issues. • High cost of maintenance and replacement of groundwater recharge and extraction infrastructure.

--	Stormwater capture for reuse (non-potable supply) after treatment.	X	X	NA	• Seasonality of rainfall and intermittent availability make storage the limiting factor in feasibility. • Treatment needs depend on water quality of captured runoff. • High initial, maintenance, and replacement costs of capture, treatment, and storage infrastructure.
--	Graywater reuse for landscape irrigation or toilet flushing.	X	--	Local	• Limited to on-site use due to infeasibility of conveyance offsite. • Relatively low yield and potentially high cost of infrastructure. • Permitting requirements and water quality issues not evaluated.

(1) Projects that provide "regional benefit" could be local projects that could be expanded to provide a water supply benefit for more than one member agency or projects outside the BAWSCA service area that have the potential to serve one or more member agencies. In order for multiple agencies to be involved, agreements (cost, schedule, etc.), conveyance, and water quality issues may have to be addressed as part of Phase II of the Strategy.

(2) Opportunity exists to accelerate the schedule for the "local" or "regional" benefit, or "both". "NA" = Not Available, project is too ill-defined to make a determination.

(3) Source: GAHC 2005

B.7.1.1 Local Rainwater and Fog Harvesting Projects

On-Site Rainwater Capture Projects

These projects involve capturing or "harvesting" rainwater from rooftops, and storing it in aboveground or underground tanks. The water is then available for non-potable uses at the same property, which reduces potable water use. Rainwater harvesting can reduce potable water demand if it replaces indoor uses like toilet flushing. It also reduces the volume of stormwater runoff generated from development, and is considered a component of "low impact development." In California, DPH considers harvested rainwater an auxiliary water supply source much like an irrigation well, if it is captured for use at a home for irrigation (Smith et al 2010).

For residences, rainwater that runs off a roof and through gutter downspouts can be stored for later use. A diverter can send the first few gallons of runoff into a drainage system and the rest can be captured in cisterns or rain barrels. For larger-scale commercial applications, roof runoff is captured in cisterns constructed in basements or underground with pumps and controls. Water is then used for non-potable purposes, such as irrigation, car washing, clothes washing, toilet flushing, swimming pools, and process water at commercial and industrial sites.

Rainwater harvesting systems have been implemented successfully in Oregon, Texas, Washington, and Melbourne, Australia. For 1,000 square feet of roof, every inch of rainfall can produce up to 600 gallons of rainwater (GAHC 2005). Residential barrels available for individual downspouts store about 50 to 60 gallons with cost starting at $100 per barrel, while more expensive tanks of several thousand gallons can be placed

under decks or other structures. On-site residential storage can only capture a limited quantity of potential supply. Commercial applications are similarly limited by storage capacity, although underground cisterns may be more financially feasible.

Fog Capture Projects

Fog harvesting refers to the capturing water from fog using large pieces of vertical canvas or nets to make the fog condense into droplets of water and flow down towards a collection trough below the canvas, which then conveys the water through pipes to holding tanks. Fog harvesting provides similar potable demand reduction benefits as rainwater capture, but requires more extensive infrastructure.

To be viable, fog capture requires appropriate climatic (fog) conditions to generate adequate water. Such projects may be best suited along the western side of the Peninsula in the vicinity of BAWSCA member agencies of Coastside and Daly City.

Fog capture yield is highly dependent on site-specific conditions. Fog capture nets (200 square meters in total surface area) used in a Cape Verde, Africa project produced more than 1,000 gallons of water, with each net costing $800 (United Nations 2009).

B.7.1.2 Stormwater Capture and Reuse Projects

The capture and reuse of stormwater can enhance water supply, even if only during certain times of year. Stormwater that may cause flooding or overburden a stormwater collection system can be converted to an asset. Stormwater runoff is typically channeled to a drainage system that collects stormwater and disposes of it. In the Bay Area, most stormwater runoff ultimately drains to the San Francisco Bay.

The opportunity exists to capture this water and use it to supplement local water supplies, either by augmenting recharge of a groundwater basin with an associated potential for extraction from the basin, or as a direct source of water after treatment. Projects utilizing this water resource exist throughout California, including ACWD current efforts to divert flows from the Alameda Creek Flood Control Channel for recharging the underlying Niles Cone Groundwater Basin (ACWD 2001).

Treatment needs will depend on the land uses within areas generating the stormwater runoff and whether the water is used for recharge or direct use. Capturing storm runoff from relatively unpopulated watersheds may not need treatment to be used in a groundwater recharge project. Some urban runoff is sufficiently contaminated that it would require treatment before being delivered underground or reused. Treatment and delivery of this type of runoff would be similar to the recycled water projects discussed in Section B.2.

Stormwater Capture and Groundwater Recharge Projects

One method of utilizing captured stormwater involves percolation or injection into the ground using recharge ponds or injection wells, respectively. Recharging captured stormwater can replenish groundwater supplies at a much higher rate than

would occur naturally through infiltration of precipitation and runoff. The feasibility of stormwater capture with augmented recharge depends on having a stormwater source and an acceptable groundwater basin recharge location within close proximity to each other.

A suitable aquifer for groundwater recharge would be identified. Then, its boundaries would be established to protect against contamination, and exclusive rights to the groundwater would be obtained. The pumps, pipes, and other infrastructure necessary to efficiently use the water would be installed. After the facility is constructed, the operating costs will vary depending on the type of facility.

ACWD utilizes stormwater capture to increase groundwater recharge as part of their groundwater management activities. The Niles Cone Groundwater Basin, which ACWD relies on for its groundwater supply, is recharged through percolation of both rainfall and applied water, and also through percolation of water diverted from Alameda Creek to ACWD's groundwater recharge ponds. The groundwater basin recharge supports extraction of water by ACWD supply wells and helps to maintain a healthy groundwater resource (ACWD 2001).

Although individual groundwater recharge projects vary in potential based on local hydrology and scale, stormwater capture has the potential of providing large amounts of water during a typical rainy season. Small projects may take the form of low impact best management practices that capture runoff from a specific development site. Large projects are designed to capture up to 40,000 AFY. Example projects in Southern California include the Inland Empire Utility Agency's water recharge project that will capture 15,000 to 20,000 AFY and the Coachella Valley Water District's project in La Quinta that will capture 40,000 AFY via 39 recharge basins on 165 acres (Freeman et al 2008).

The current projects in Southern California that capture runoff in the mountains and direct it to high percolation areas have minimal adverse environmental impact. In fact, projects such as the spreading grounds preserved by the Pomona Valley Protective Association, in Pomona, California, have operated successfully for almost a century. In urbanized areas, there is an opportunity to improve the environment by removing contaminants from urban stormwater runoff.

NCCWD is developing a conceptual plan that would combine stormwater capture with Phases 3 and 4 of its recycled water system and a basin recharge/extraction project. Pacifica's storm water system is along the path of future recycled water pipeline alignments. The project essentially captures stormwater and pumps it to a proposed finishing pond on NCCWD property where it would recharge the existing groundwater basin for extraction, treatment, and use downstream.

Stormwater Capture and Treatment Projects

Another method of capturing stormwater for reuse is by intercepting a storm drainage system, treating the captured flow, and reusing the water as a non-potable

supply (Madison and Emond 2008). This method is practical for urban settings, and utilizes the collection infrastructure of the existing storm drain system. Reducing wet weather flows also benefits wastewater agencies through the reduced need for additional treatment capacity, capital cost savings, and reduced operations and maintenance costs. Any stormwater management program would require coordination with the Regional Water Quality Control Board.

The Santa Monica Urban Runoff Recycling Facility (SMURRF) in Southern California consists of a five-stage treatment facility including microfiltration and ultraviolet disinfection. SMURRF collects dry weather urban runoff from Santa Monica's major storm drains, and treats the runoff for uses such as irrigation and indoor toilet flushing (Santa Monica Public Works 2010).

B.7.1.3 Graywater Reuse Projects

Graywater is considered all household wastewater with the exception of water from toilets, kitchen sinks, and dishwashers. Graywater gets its name from its cloudy appearance and from its status as being neither fresh nor contaminated sewage wastewater. Graywater is generated from domestic fixtures such as bathroom sinks, washing machines, showers, and bathtubs, and is permitted for reuse on-site for landscape irrigation or, possibly, toilet flushing.

The State of California does not legally preclude graywater use. Graywater systems are allowed except where a local agency prohibits its. SB 1258, passed in 2008, authorizes a city, county, or other local agency to adopt building standards that prohibit the use of graywater or building standards that are more restrictive than the State requirements. Use of graywater is regulated in California by Chapter 16 of the California Plumbing Code. All graywater systems in California must have bypass valves installed that allow the homeowner to discharge the graywater to the sanitary sewer during maintenance. This bypass requirement sometimes makes the graywater system vulnerable to "operator error."

Connections to existing plumbing can convey graywater from inside the home to outside for irrigation. Pipes then convey the water to subsurface locations throughout the landscaping. Water is introduced directly to the biologically-active topsoil layer where soil bacteria can quickly break organic matter down, rendering the nutrients available to plants.

Point-of-use systems utilizing graywater have been used in other countries and are generating more interest locally. For example, fixtures such as bathroom sink/toilet combinations with a built-in cistern have been available in other countries for years. Similar graywater systems for bathroom sinks divert sink water through a sanitizing device that cleans and filters the water. The water then is stored in a reservoir under the sink, and when the connected toilet flushes, water is pumped from the reservoir to the flush tank. This product is appropriate for residential as well as commercial, industrial, and institutional uses that have regular tank toilets.

Typically, graywater makes up 50 to 80 percent of residential wastewater generated from the home. There are seasonal constraints on graywater used for irrigation. Irrigation demands are lower during winter months, thus requiring graywater to be discharged into the customer's sewer system, and higher during summer months, possibly requiring supplemental potable water. Using graywater from the bathroom sink for toilet flushing could save the majority of potable water use associated with toilets, depending on the quantity of graywater generated from the sink.

B.7.2 Potential Issues Associated with Developing Localized Water Capture and Reuse Projects

Potential issues associated with developing rainwater harvesting, stormwater capture and graywater projects are presented below and summarized in Table B-11.

B.7.2.1 Potential Issues Associated with Rainwater Harvesting Projects

Potential issues affecting rainwater harvesting project implementation include:

- *Costs* – Costs for residential rain barrels or other storage may be out of reach for many residents unless subsidized.
- *Rainwater availability and potential yield* – The intermittence and seasonality (relatively low rainfall amounts during irrigation season) of water available from rainwater harvesting presents a challenge. Water will only be available when storm events occur, but large quantities will be available at those times. It is not clear what the potential yield may be for on-site systems in the Bay Area.
- Storage capacity – Ability to store collected water would address the rainwater availability issue to some extent, and increase the yield. However, the cost and space requirements for a large amount of storage may be prohibitive for an on-site system.

B.7.2.2 Potential Issues Associated with Stormwater Capture Projects

Potential issues affecting stormwater capture project implementation include:

- *Suitable locations* – For a regional stormwater capture project, a suitable site(s) must be identified with access to a stormwater source and a nearby storage option – a groundwater basin or water treatment plant and surface storage.
- *Precipitation variability* – Precipitation occurs seasonally in the Bay Area, and large volumes will be produced intermittently from storm events. The amount of available storage will be the limiting factor in determining yield.
- *Water quality* – Use of the water for recharge or drinking water would require studies to ensure that water quality (level of treatment) was acceptable.
- *Costs* – A stormwater capture project incurs large initial costs for identifying and procuring an appropriate location(s) and construction of the necessary infrastructure. After the facility is constructed, O&M costs will vary depending on

the type of facility. For example, O&M costs may be low if recharge can occur by gravity; however, a spreading basin can require significant maintenance to optimize the permeability of the soil which increases costs.

- *Environmental review process* – The environmental review process, particularly for larger regional projects, could require three to five years to implement.

- *Regulatory Requirements* – Stormwater management projects will require coordination and review with the Regional Water Quality Control Board and related agency stormwater permits.

B.7.2.3 Potential Issues Associated with Graywater Projects

Potential issues affecting graywater project implementation include:

- *Site constraint*s – Graywater systems must have a site-specific design and installation. Soils may be too permeable or not permeable enough to allow for efficient outdoor irrigation. Large areas are required for an effective irrigation system, with enough soil and plants to process the graywater.

- *Logistical and regulatory constraints* – Graywater is untreated water, and must be managed appropriately to avoid health and safety impacts. If pumping is required, filters are needed; filter maintenance can be high due to high solids content in the water. Stored water should be used within 24 hours as bacteria can multiply to sewage levels quickly. Graywater cannot be applied on lawns or on fruits and vegetables that are eaten raw; no graywater-human contact should occur. Utilizing graywater for irrigation requires use of appropriate non-toxic indoor cleaning products, and it must be diverted to the sewer when washing diapers or if water came in contact with someone with an infectious disease.

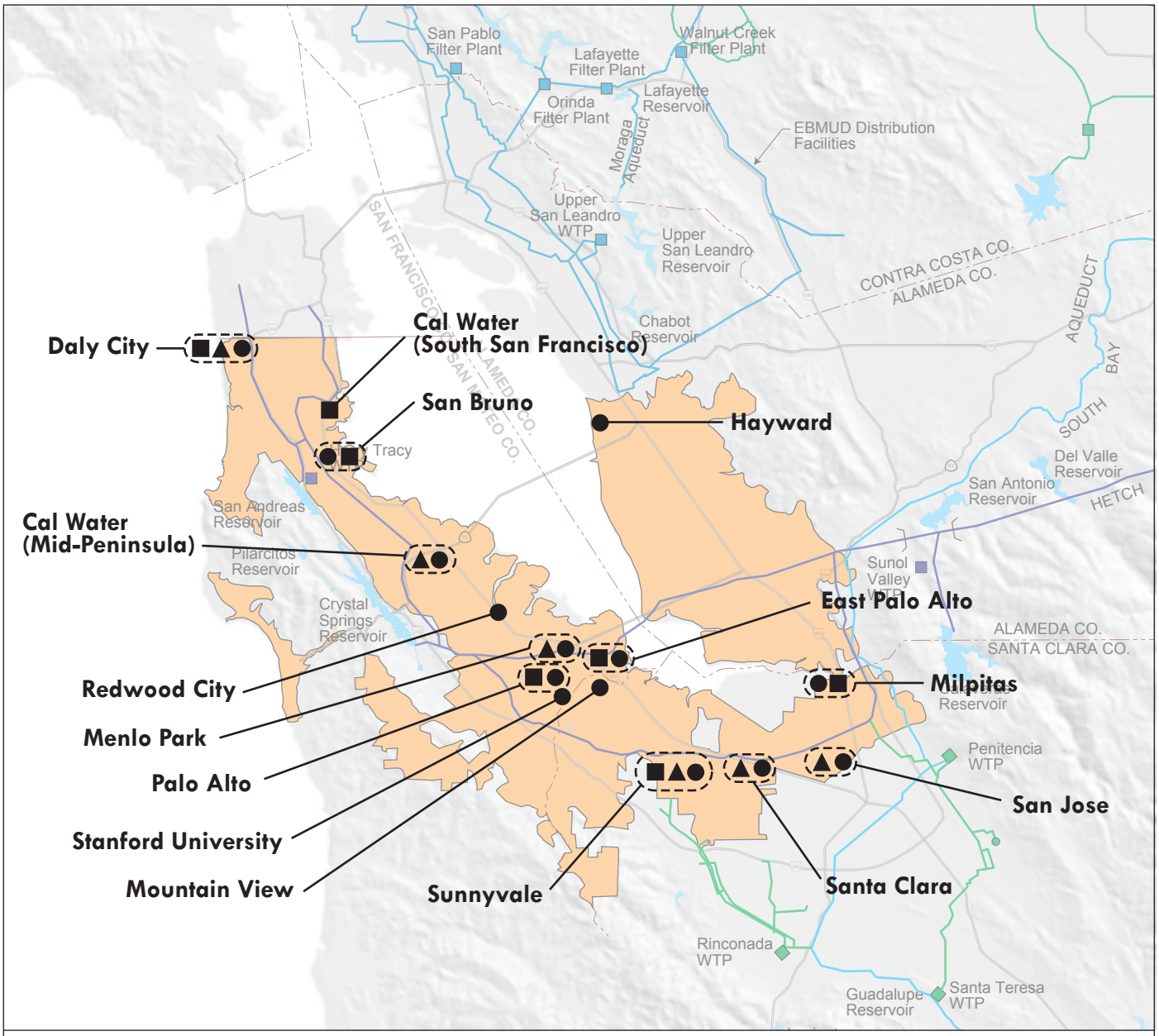
- *Developing technology* – Graywater technology is improving but has had limited application in the Bay Area, and its feasibility for larger scale implementation is still unknown.

- *Costs* – Graywater has limited value during times outside the irrigation season, such as during cool or wet weather; other than if used for toilet flushing or non-potable indoor uses. Therefore, systems installed in residential areas can be costly to homeowners but provide only negligible water savings. Incentive programs may be needed to encourage homeowners to utilize graywater systems.

B.7.3 Addressing Localized Water Capture and Reuse Projects in Phase II

Significant uncertainties and data gaps exist for localized water capture and reuse projects. The Phase II efforts related to localized water capture and reuse projects will bring them to a common level of information where they can be compared with other water supply management projects. The Phase II efforts will include:

- Exploring where similar projects have been successful and if they compare favorably to the Bay Area;
- Assessing permitting/legal/environmental issues that would prohibit the implementation of these projects;
- Estimating water savings involved with home- and neighborhood-sized projects;
- Estimating costs associated with these projects on multiple scales; and
- Consulting ACWD on the ongoing costs and yield of their stormwater capture project.



Legend

- BAWSCA Member Agencies
- Existing Groundwater Project within the BAWSCA Service Area
- Planned Groundwater Project within the BAWSCA Service Area
- Potential Groundwater Project within the BAWSCA Service Area

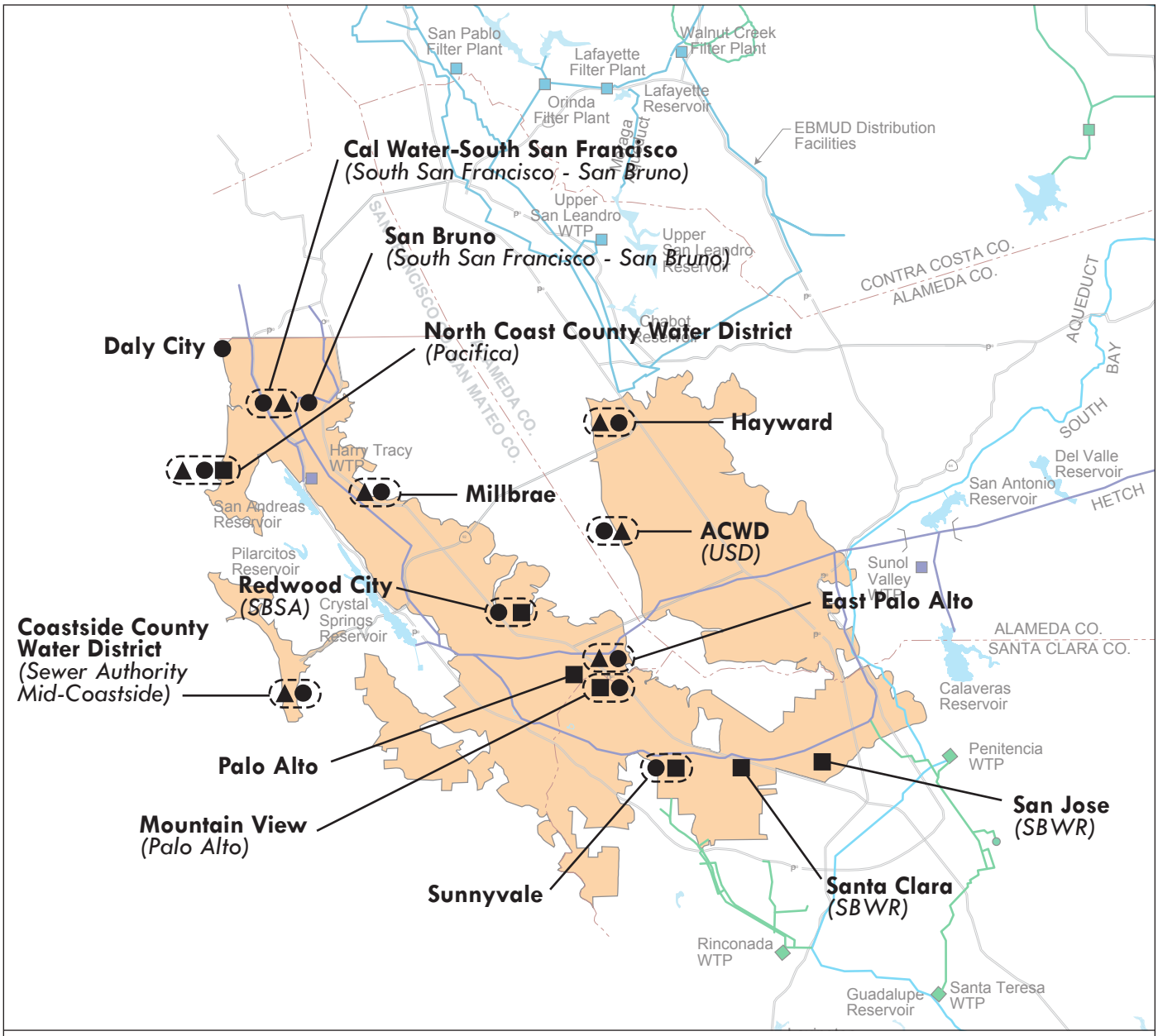
ACWD = Alameda County Water District

Cal Water = California Water Service Company

W:\REPORTS\BAWSCA\Summary Report_Apr10\Graphics\FigB-1_Potential Groundwater Projects.ai 04/30/10 JJT

CDM

Figure B-1
Existing, Planned, and Potential Groundwater Projects to be Evaluated in Phase II



Legend

- BAWSCA Member Agencies
- Existing Recycled Water Project within the BAWSCA Service Area
- Planned Recycled Water Project within the BAWSCA Service Area
- Potential Recycled Water Project within the BAWSCA Service Area

Bold Text = Member Agency

(Italic Text) = Participating Wastewater Agency if not the BAWSCA member agency

ACWD = Alameda County Water District

Cal Water = California Water Service Company

SBSA = South Bayside System Authority

SBWR = South Bay Water Recycling

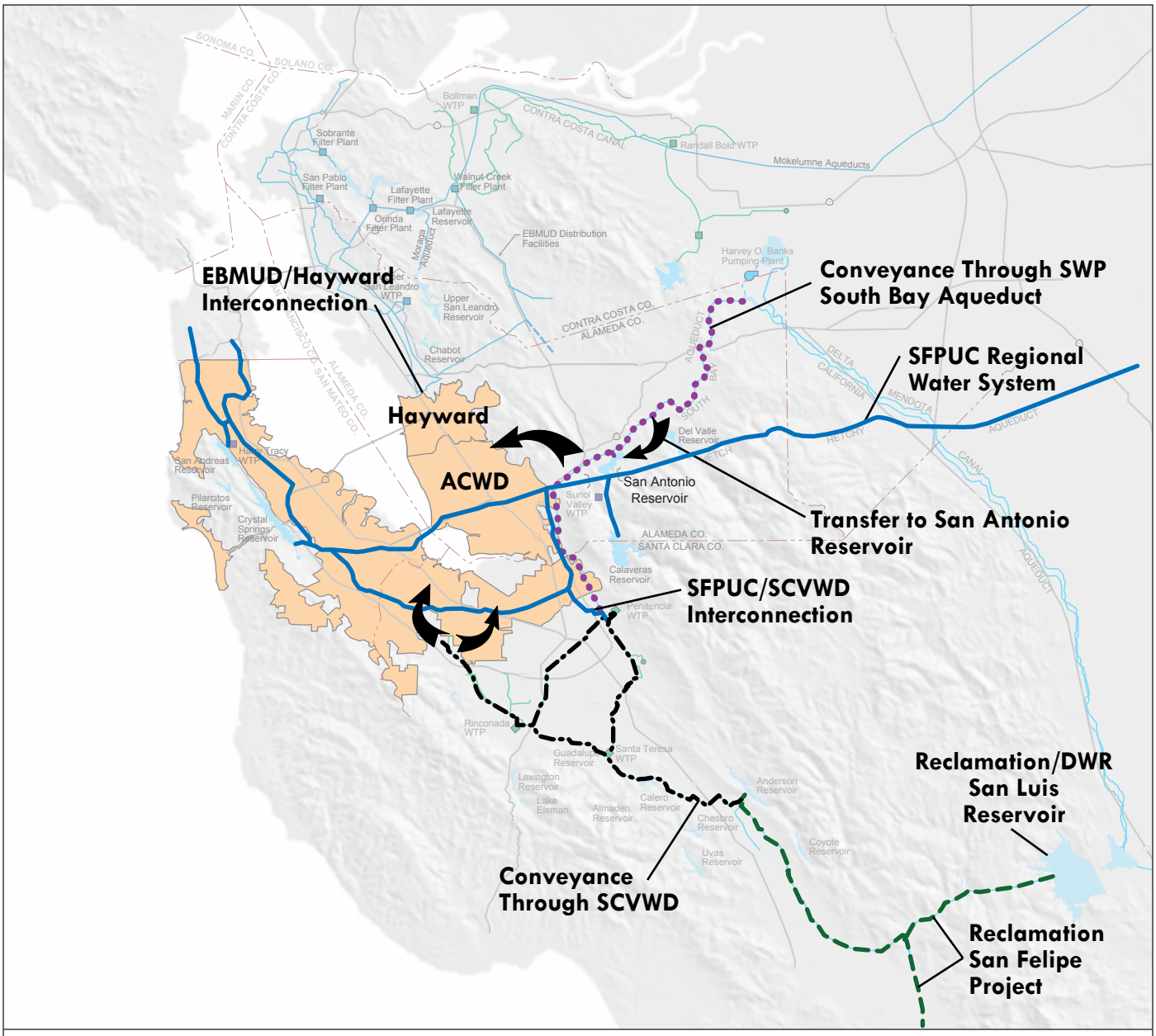
USD = Union Sanitary District

[1] San Francisco International Airport Commission is not a BAWSCA member agency, but receives San Francisco Public Utilities Commission supply.

W:\REPORTS\BAWSCA\Summary Report_Apr10\Graphics\FigB-2_Potential Recycled Water Projects.ai 04/30/10 JJT

CDM

Figure B-2
Existing, Planned, and Potential Recycled Water Projects to be Evaluated in Phase II



Legend

- BAWSCA Member Agencies
- ACWD = Alameda County Water District
- DWR = Department of Water Resources
- Reclamation = Bureau of Reclamation
- SCVWD = Santa Clara Valley Water District
- SFPUC = San Francisco Public Utilities Commission
- SWP = State Water Project

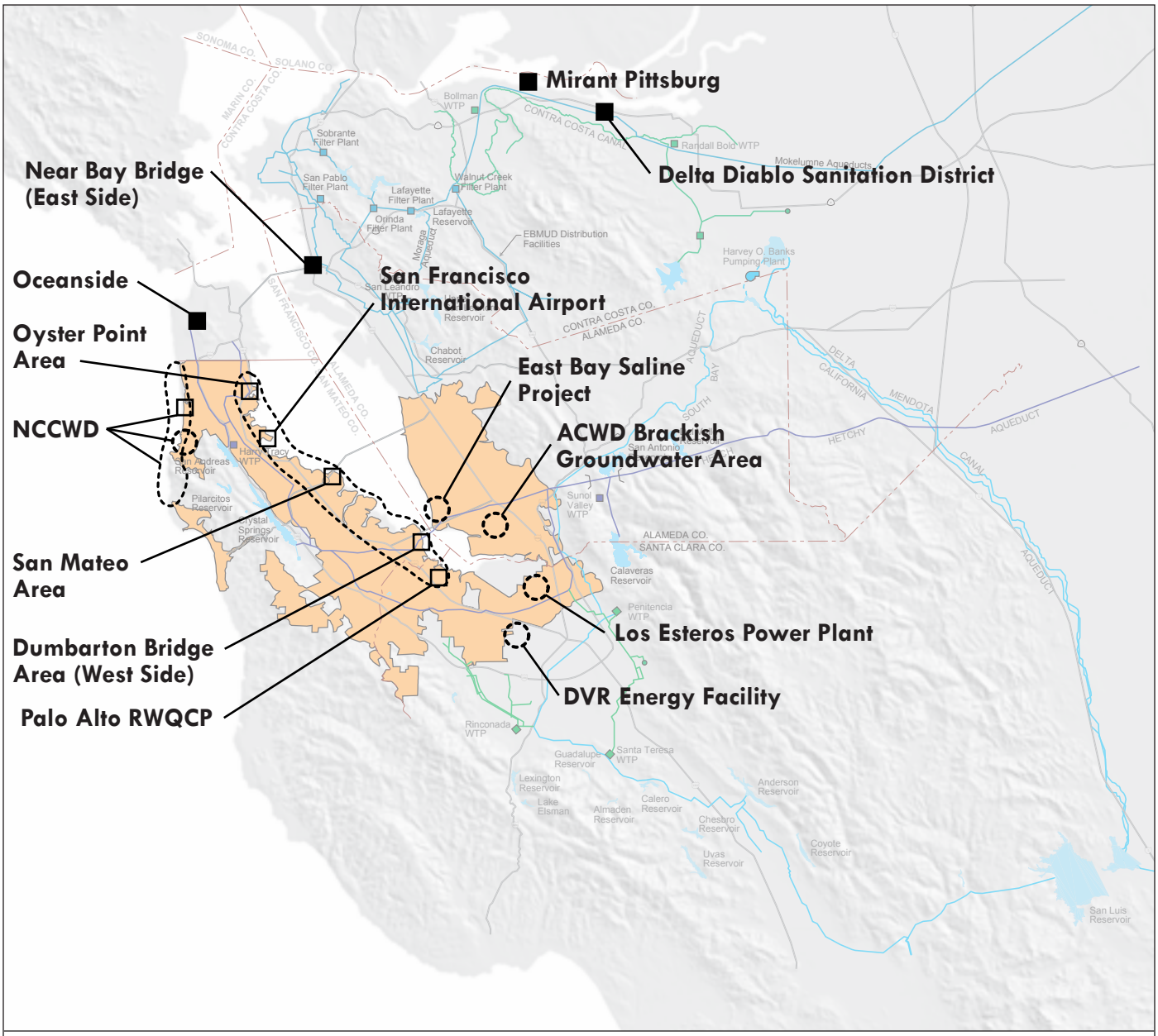
Conveyance Facilities

- SFPUC
- Reclamation
- SCVWD
- SWP

W:\REPORTS\BAWSCA\Summary Report_Apr10\Graphics\FigB-3_Poten Water Transfer Projects OUTSIDE BAWSCA Service Area.ai 04/29/10 JJT

CDM

Figure B-3
Potential Water Transfer Conveyance Facilities Outside BAWSCA's Service Area to be Evaluated in Phase II



Legend

- BAWSCA Member Agencies
- Seawater Intake within the BAWSCA Service Area (General Locations)
- Brackish Groundwater Intake within the BAWSCA Service Area (General Locations)
- Potential Desalination Projects outside the BAWSCA Service Area (Projects that passed BARDP 2nd screenings)

BARDP = Bay Area Regional Desalination Project

DVR = Donald Von Raesfeld

NCCWD = North Coast County Water District

RWQCP = Regional Water Quality Control Plant

W:\REPORTS\BAWSCA\Summary Report_Apr10\Graphics\FigB-4_Poten Desal Proj WITHIN and OUTSIDE BAWSCA Service Area.ai 04/30/10 JJT

CDM

Figure B-4
Potential Desalination Projects Within and Outside BAWSCA's Service Area to be Evaluated in Phase II

Appendix C

Evaluation Framework

Appendix C
Evaluation Framework

This appendix presents additional information on the Strategy decision process and the criteria that will be used to evaluate and rank the water supply management projects and portfolios. More information on the decision process is provided in Section 5.

C.1 Preliminary Feedback from Member Agencies on Evaluation Criteria

A series of meetings were held between BAWSCA and the member agencies in the Fall of 2009 to, among other things, solicit feedback regarding the evaluation criteria to be used to evaluate the potential water supply management projects as part of the Strategy. The evaluation criteria discussed during these meetings are presented below.

- Added drought and normal year supply
- Schedule for becoming operational
- Capital cost, operating cost and present value
- Ownership, contractual and institutional characteristics
- Water quality appropriate for intended use
- Environmental permit requirements
- Carbon footprint
- Distance from center of demand[1]
- Added useful reliability & redundancy[1]

The suggestions and comments collected from the member agencies were used in developing the proposed evaluation criteria to be used in Phase II. These criteria are presented in Section 4.4.

C.2 Evaluation Criteria Structure

Evaluation criteria used in the Strategy decision process are categorized into six criteria objectives, represented by one or more criterion. Individual criterion help define the criteria objective in more specific terms. For each criterion, an evaluation measure, or metric, is specified. The metric is used to indicate to what degree a specific objective of a criterion is being achieved. The evaluation metrics for the criteria may be quantitative or qualitative in nature. For qualitative performance measures, the rating score for each water supply management project or portfolio will

[1] Evaluation criteria suggested by BAWSCA member agencies.

be relative to the scores of other projects and portfolios, and will be developed though an iterative process that will incorporate input from BAWSCA and member agencies.

The first estimates of a criterion metric of a project that has incomplete information may include a range of values. The impact of that range on the ranking results could be evaluated and then used to determine whether further effort should be made to refine the metric. This work will be completed in Phase II.

C.3 Phase II Evaluation Tools

To support a Strategy decision process that is simple, transparent and defensible, the planning team will utilize several quantitative tools to evaluate and present the water supply management portfolios in Phase II.

C.3.1 Criterium Decision Plus

The commercial software, CDP, developed by Infoharvest, Inc., will be used to rank the water supply management portfolios based on the aggregate of each portfolio's performance against the individual evaluation criteria (i.e. the "performance measure"). The CDP software tool converts the individual criterion evaluation metrics, which often have different units, into standardized scores so that the performance measures can be added together. By summing the performance measures, and comparing the totals, the portfolios can then be ranked, the uncertainties associated with each portfolio can be quantified, and the tradeoffs between the alternatives can be clearly evaluated. This technique is called Multi-Attribute Rating and is illustrated in Figure C-1.

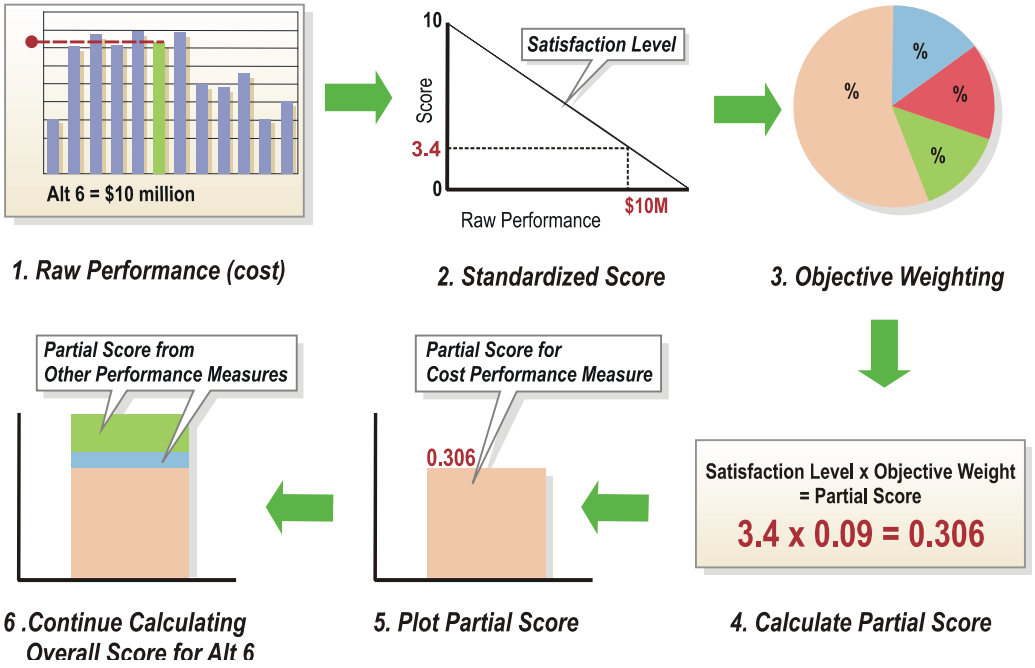


Figure C-1
Multi-Attribute Rating Method

The following process description walks through an example of how the CDP program evaluates a portfolio:

1. The raw performance of the portfolios against a given evaluation criteria is compared. In the example shown in Figure C-1, Portfolio 6 has a raw life cycle cost (or cost metric performance) of $10 million.

2. The raw metric score for each criterion is then standardized into comparable numeric scores (i.e. a value between 0 and 10, with a higher score indicating a better performance). In this example, Portfolio 6 has a relatively high cost when compared to the other portfolios, so the standardized score for Portfolio 6 is 3.4, which is indicative of a fairly low performance against this criterion.

3. In the next steps, the partial score is calculated based on the standardized score for each criterion and the weight assigned to that criterion. In this example, the cost criterion was given a weight of 9 percent (out of a possible 100 percent). The partial score for Portfolio 6 against this criterion is the standardized score (3.4) multiplied by the criterion weight (0.09) which equals 0.306.

4. The partial score of 0.306 for Portfolio 6 is plotted, and this procedure is then repeated for all of the other criteria against which Portfolio 6 (and all the other portfolios) is being compared until a total score for each portfolio is calculated.

The planning team will use the CDP analysis process to develop overall scores for each water supply management portfolio to support the comparison of portfolios, and guide the ultimate decision making as to which water supply management projects and portfolios to select for further evaluation and investigation or Phase III implementation.

C.3.2 Water Availability Spreadsheet Model

To ensure that the various water supply management portfolios developed for evaluation have the ability to meet the aggregate BAWSCA member agency supply need as well as the individual member agency supply needs, a water availability spreadsheet will be developed. The water availability spreadsheet will track the availability of individual supplies during normal and drought years, and allow for water transfers through existing infrastructure and interties. The spreadsheet tool will take into account which agencies benefit from specific water supply management projects and portfolios that support the objective of creating supplies with proximity to demand centers, and identify any spatial dependence of supply projects and supply need.

C.3.3 Analytical Tools

Some water supply management projects, if recommended in the Phase II study, may require evaluation of routing or hydraulic limitations. This would occur where there may not be existing infrastructure capacity to transfer supply either through the SFPUC system or between agencies to the agencies needing additional supply. If this evaluation is found to be necessary, analytical tools such as hydraulic models, systems models, or simpler capacity spreadsheet models will be identified and used to assess transfers of water to and between agencies, and/or through agency systems. These tools will also be helpful in assessing water quality performance measures through the use of mass balance calculations.

consulting • engineering • construction • operations