Dublin San Ramon Services District

Water, wastewater, recycled water

2021 Alternative Water Supply Study: A Framework for a Resilient and Sustainable Water Future

Final Report | June 2021

Brown AND Caldwell

FINAL

2021 Alternative Water Supply Study: A Framework for a Resilient and Sustainable Water Future

Prepared for
Dublin San Ramon Services District
Dublin, CA
June 2021

Katherine E. Ruby, P.E.
California License C90005
June 22, 2021

This document was prepared solely for DSRSD in accordance with professional standards at the time the services were performed and in accordance with Task Order No. 1 to the Agreement between DSRSD and Brown and Caldwell dated September 1, 2020. This document is governed by the specific scope of work authorized by DSRSD; it is not intended to be relied upon by any other party. We have relied on information or instructions provided by DSRSD and other parties and, unless otherwise expressly indicated, have made no independent investigation as to the validity, completeness, or accuracy of such information.

Brown AND Caldwell

1390 Market Street, Suite 1025
San Francisco, CA 94102
T: 415.552.5849

Acknowledgements

Brown and Caldwell and Dublin San Ramon Services District acknowledge the valuable input provided by the following agencies in developing the 2021 Alternative Water Supply Study.

- Alameda County Water District (ACWD)
- Central Contra Costa Sanitary District (CCCSD)
- Contra Costa Water District (CCWD)
- East Bay Municipal Utility District (EBMUD)
- City of Livermore
- City of Pleasanton
- Zone 7 Water Agency

This page intentionally left blank.

Table of Contents

List of Figures

List of Tables

List of Abbreviations

2015 Study	2015 Long-Term Alternative Water Supply Study
2015 Water Policy	Water Supply, Storage, Conveyance, Quality, and Conservation Policy
2019 WSE Update	2019 Water Supply Evaluation Update
2021 AWSS	2021 Alternative Water Supply Study
ACWD	Alameda County Water District
AF	acre-foot/feet
AFY	acre-feet per year
AWPF	advanced water purification facility
B	billion
BARR	Bay Area Regional Reliability
CCCSD	Central Contra Costa Sanitary District
CCWD	Contra Costa Water District
Delta	Sacramento-San Joaquin Delta
DERWA	DSRSD-EBMUD Recycled Water Authority
DPR	direct potable reuse
DSRSD	Dublin San Ramon Services District
DWR	California Department of Water Resources
EBMUD	East Bay Municipal Utility District
GHG	greenhouse gas
gpm	gallons per minute
GPQ	groundwater pumping quota
LAVWMA	Livermore-Amador Valley Water Management Agency
M	million
mgd	million gallons per day
M&I	municipal and industrial
NP	non-potable
O&M	operations and maintenance
P	potable
PFAS	Perfluoroalkyl and polyfluoroalkyl substances
RO	reverse osmosis
RWA	raw water augmentation
SBA	South Bay Aqueduct
SFPUC	San Francisco Public Utilities Commission
SRVRWP	San Ramon Valley Recycled Water Program
SWP	State Water Project
SWRCB	State Water Resources Control Board
TBD	to be determined
USD	Union Sanitary District
UWMP	urban water management plan
WSE	Water Supply Evaluation
WWTP	wastewater treatment plant
Zone 7	Zone 7 Water Agency

Executive Summary

The Dublin San Ramon Services District (DSRSD) provides potable water and recycled water to approximately 91,000 people in the City of Dublin and Dougherty Valley portion of San Ramon. DSRSD produces and distributes recycled water for irrigation uses and purchases potable water from Zone 7 Water Agency (Zone 7). DSRSD also has a groundwater pumping quota (GPQ) from the main groundwater basin, pumped on its behalf by Zone 7, the local groundwater basin manager.

Zone 7 is a State Water Project (SWP) contractor that wholesales treated water to four retail water agencies: DSRSD, City of Livermore, City of Pleasanton, and California Water Service Livermore District. As shown in Figure ES-1, the majority of Zone 7's water supply, and therefore DSRSD's water supply, is imported through the Sacramento-San Joaquin Delta (Delta) via the SWP. Zone 7 also receives local runoff from the Arroyo Valle watershed. In wet and normal years, a portion of Zone 7's surface water supply is stored in the local and non-local groundwater banks and surface water reservoirs. In dry years, Zone 7 withdraws the previously stored water to augment reduced SWP deliveries.

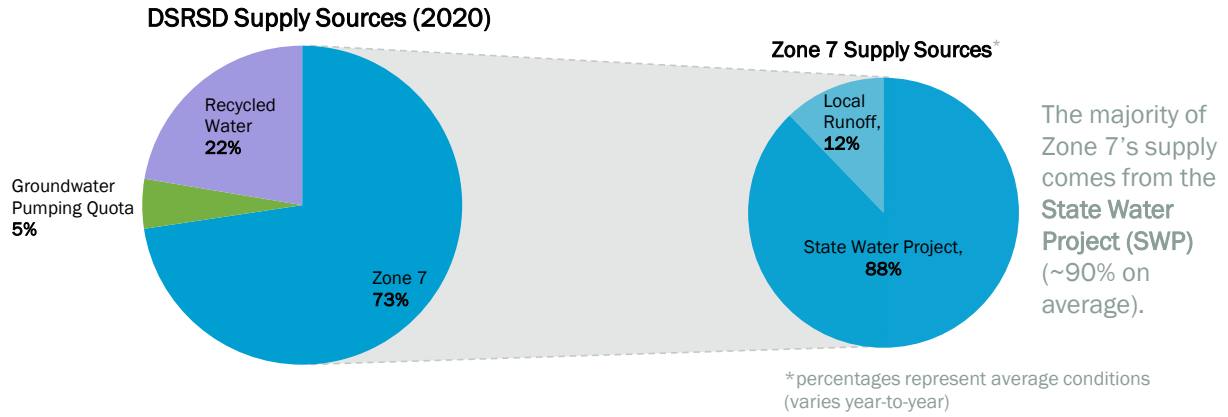


Figure ES-1. DSRSD and Zone 7 water supply sources

Note: Figure represents average conditions; Zone 7's supplies vary year-to-year based on hydrological, regulatory, and operational conditions.

In September 2015, DSRSD completed a Long-Term Alternative Water Supply Study (2015 Study) to identify conceptual alternatives for improving long-term water supply reliability. The 2015 Study was driven by the unprecedented 2012-16 drought and DSRSD's desire to reduce dependence on imported Delta water supply. In 2014, the California Department of Water Resources (DWR) announced an initial SWP allocation of zero percent, which was increased to 5 percent later in the year. The very low 2014 SWP allocation and limitations on the timing and conditions for pumping water from the Delta exposed vulnerabilities with DSRSD's heavy reliance on the SWP for bringing water supplies into the Tri-Valley.

The 2015 Study included a high-level assessment of regional and local supply alternatives that DSRSD could explore collaboratively with other neighboring water and wastewater agencies to diversify water supplies and reduce reliance on imported water supplies through the Delta. The results of the 2015 Study informed and provided the framework for DSRSD's Water Supply, Storage, Conveyance, Quality and Conservation Policy (2015 Water Policy), which was adopted by DSRSD's Board of Directors in October 2015.

Since development of the 2015 Study and 2015 Water Policy, conditions have changed substantially, including lower water demand projections; lower wastewater flows (and therefore less flow available for reuse); advancement of local and regional efforts (e.g., the Bay Area Regional Reliability [BARR] partnership); and new regulations (e.g., pending long-term water use efficiency standards and direct potable reuse [DPR] regulations). Therefore, DSRSD has prepared the *2021 Alternative Water Supply Study* (2021 AWSS)*: A Framework for a Resilient and Sustainable Water Future* to accomplish the following goals and objectives:

- Update the 2015 Study with new and refined information, including input from potential regional partners.
- Provide information to guide and inform the update of the 2015 Water Policy.
- Inform DSRSD's 2020 Urban Water Management Plan (UWMP) update.
- Support DSRSD's strategic plan goal to develop and implement an integrated recycled and potable water program.
- Provide a framework for a resilient and sustainable water future that outlines near-term and long-term strategies, accounting for future uncertainties and decision points, and informs and guides DSRSD advocacy and collaborative efforts.

Future Water Needs

DSRSD's total water demand (potable and recycled) is projected to be nearly 16,000 acre-feet per year (AFY) in 2045, representing an increase of about 3,000 AFY from 2020 (Figure ES-2). Recycled water could potentially offset about 30 percent of this increase (900 AFY) if wastewater is available. However, currently all wastewater treated at DSRSD's wastewater treatment plant (WWTP) is recycled in the peak summer months, which prompted the DSRSD-EBMUD Recycled Water Authority (DERWA)[1] to request that DSRSD and EBMUD implement a moratorium on new recycled water connections. Augmenting the recycled water supply—either through seasonal storage or a supplemental supply source (e.g., wastewater from a neighboring agency or local groundwater)—would enable expansion of the recycled water program and offset the need for additional potable water.

[1] DERWA is a Joint Powers Authority formed in 1995 by DSRSD and East Bay Municipal Utility District (EBMUD) for the purposes of producing and distributing recycled water through the San Ramon Valley Recycled Water Program. In 2014, DERWA executed agreements to extend recycled water service to the City of Pleasanton.

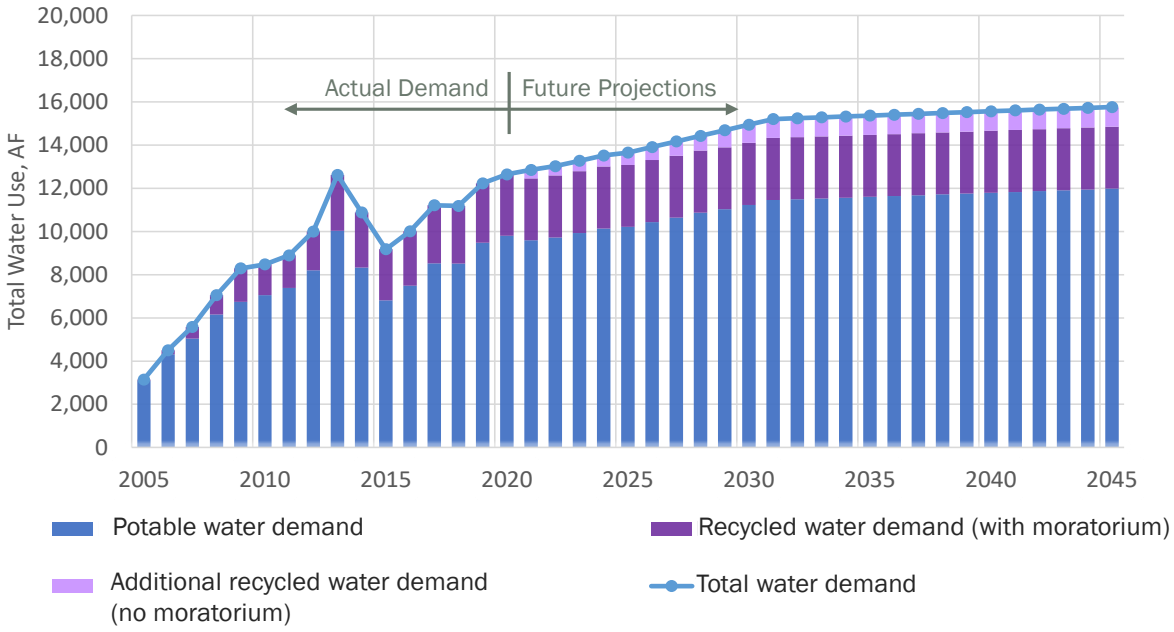


Figure ES-2. DSRSD's historical and projected future water demands

To mitigate risks associated with significant reliance on imported water supply, Zone 7 is continuing to develop local sources of water and diversify its water supply portfolio. In April 2019, Zone 7 completed its 2019 Water Supply Evaluation Update (2019 WSE Update) that documents Zone 7's supplies and demands and forecasts future scenarios based on new information and experience gained since the 2012-16 drought. The 2019 WSE Update projects shortages of up to 50 to 70 percent by 2040 in dry years under the "no new water supply projects" scenario. These shortages would translate to significant cutbacks for DSRSD, which makes up about 25 percent of Zone 7's direct demand.

The long-term reliability of the SWP, and more generally, the water conveyance capability of the Delta, is also challenged by the instability of aging levees in the Delta (including their vulnerability to seismic events, climate change, and land subsidence), regulatory uncertainty, water quality issues including saltwater intrusion, and the declining health of the Delta ecosystem. These issues directly affect DSRSD's long-term water supply reliability since a majority of Zone 7's water supply is and will continue to be tied to the Delta and SWP system.

Zone 7, in collaboration with other local and regional partner agencies, is exploring a range of new water supply, storage, and conveyance projects, to increase the long-term reliability and resilience of the Tri-Valley's water supplies.

Alternatives

DSRSD identified potential supply, storage, and conveyance options through three steps:

1. Revisited alternatives from the 2015 Study (and either screened them out or carried them forward)
2. Incorporated Zone 7's efforts
3. Explored additional projects that were not previously considered

The alternatives selected for evaluation in the 2021 AWSS are summarized in Figure ES-3. The alternatives include eight options for potable supply, storage, and conveyance—many of which are already being explored by Zone 7—and five options for non-potable supply and storage.

			Supply	Storage	Conveyance
Potable Supply, Storage, and Conveyance					
Currently being explored by Zone 7	**P-1.** DPR via Treated Water Augmentation	The most direct form of reuse, with purified water introduced directly to the drinking water distribution system. This is the only type of potable reuse that DSRSD could pursue independently. Regulations are anticipated in 2023.	✓		
	P-2. Tri-Valley Potable Reuse	Includes all regional potable reuse options (direct and indirect) being explored by Zone 7. Would utilize wastewater from DSRSD and/or Livermore's WWTP.	✓		
	P-3. Regional Desalination	Bay Area Regional Desalination Project that would utilize Contra Costa Water District's (CCWD) existing intake/water right at Mallard Slough Pump Station to treat brackish water.	✓		
	P-4. Water Transfers and Exchanges	Includes short-term transfers (as an interim solution while other projects are being developed) and possible long-term transfers.	✓		
	P-5. Intertie	New intertie between Zone 7 and EBMUD, or possibly the San Francisco Public Utilities Commission (SFPUC). Would provide an alternate means to convey water to the Tri-Valley during emergency conditions.			✓
	P-6. Delta Conveyance	Would help preserve SWP supply by protecting against earthquakes, sea level rise, and other Delta disruptions. Would also increase capacity for transfers.	✓		✓
	P-7. Sites Reservoir	New off-stream storage project northwest of Sacramento that would also provide new supply.	✓	✓	
	P-8. Los Vaqueros Reservoir Expansion and Transfer-Bethany Pipeline	Expansion of CCWD's existing Los Vaqueros Reservoir and new pipeline that would connect the reservoir to the South Bay Aqueduct and Zone 7's system. Zone 7 is exploring the project for storage and conveyance, though there is also potential for new supply.		✓	✓
Non-Potable Supply and Storage					
	NP-1. Recycled Water Storage in Chain of Lakes	Storage of tertiary treated recycled water in Lakes F or G, once Zone 7 acquires the lakes from the gravel mining companies (which may not be for decades).	✓	✓	
	NP-2. Fringe Basin Groundwater	Use of Fringe Basin groundwater (which has limited potable supply potential) to supplement the recycled water supply.	✓		
	NP-3. Groundwater from Hopyard 7 Well	Use of Zone 7's Hopyard 7 well in the Main Basin, which is unsuitable for drinking water due to elevated levels of arsenic, to supplement the recycled water supply (through blending at DSRSD's WWTP).	✓		
	NP-4. Reverse Osmosis (RO) Reject from Zone 7's Groundwater Demineralization Facility	Intercepting the brine stream from Zone 7's groundwater demineralization facility and either treating or diluting it to add to the recycled water system.	✓		
	NP-5. Wastewater from Neighboring Agency	Potential long-term agreement for wastewater from Central Contra Costa Sanitary District (CCCSD) or the City of Livermore. Both agencies are reserving wastewater for other future recycled water projects, so long-term availability is uncertain.	✓		

P = potable; NP = non-potable

Figure ES-3. Summary of 2021 AWSS potable and non-potable water alternatives

Evaluation

Alternatives were evaluated through a multi-step process, as summarized below.

1 As a first step, individual alternatives were evaluated based on their benefits and costs. Benefits and costs were informed by discussions with potential partner agencies.	Two alternatives were screened out at this stage due to high cost relative to potential benefit: **NP-1** (Recycled Water Storage in Chain of Lakes) and **NP-4** (RO Reject from Zone 7's Groundwater Demineralization Facility)
2 The remaining alternatives were combined into four portfolios, each built around a different overall goal. Each portfolio offers different amounts of supply, storage, and conveyance based on the portfolio's goal. The intent was not to select a single portfolio, but rather to see how combinations of different alternatives perform together. Zone 7's 2020 UWMP sample portfolio was included as a reference point.	Reference Portfolio: Zone 7's 2020 UWMP Sample Portfolio **P-2.** Tri-Valley Potable Reuse **and/or** **P-3.** Regional Desalination, **P-4.** Transfers *(interim)*, **P-5.** Intertie, **P-6.** Delta Conveyance, **P-7.** Sites Reservoir, **P-8.** Los Vaqueros and Transfer-Bethany Portfolio 1: Maximize DSRSD Control **P-1.** DPR via Treated Water Augmentation, **NP-2.** Fringe Basin Groundwater Portfolio 2: Maximize Resilience **P-2.** Tri-Valley Potable Reuse **or** **P-3.** Regional Desalination, **P-4.** Transfers *(interim)*, **P-6.** Delta Conveyance, **P-7.** Sites Reservoir, **P-8.** Los Vaqueros and Transfer-Bethany, **NP-2.** Fringe Basin Groundwater **or** **NP-3.** Hopyard 7 Portfolio 3: Align with DSRSD's 2015 Water Policy (as possible) **P-2.** Tri-Valley Potable Reuse, **P-3.** Regional Desalination, **P-5.** Intertie, **P-6.** Delta Conveyance, **P-7.** Sites Reservoir, **P-8.** Los Vaqueros and Transfer-Bethany, **NP-5.** Wastewater from Neighboring Agency Portfolio 4: Minimize Cost **P-6.** Delta Conveyance, **P-7.** Sites Reservoir, **NP-3.** Hopyard 7
3 The portfolios were tested against different uncertainties to determine relative risk.	**Portfolios 2 and 3** include many of the same elements as Zone 7's 2020 UWMP sample portfolio, with the addition of recycled water alternatives. These two portfolios are the most diverse and perform best under uncertainties (e.g., climate change, public acceptance, and regulatory changes), while remaining within a similar cost range. **P-1** (DPR via Treated Water Augmentation) is only included in Portfolio 1, as this portfolio seeks to maximize projects that would be directly under DSRSD's control. **P-4** (Water Transfers and Exchanges) was considered to augment SWP supply in the near-term while other projects are being developed.
4 Feasible implementation timelines for alternatives in the preferred portfolios informed near-term recommendations and the long-term strategy.	As shown in Figure ES-4, some regional projects are well underway and on track to be implemented within the next 5 to 10 years (e.g., Los Vaqueros Reservoir Expansion and Transfer-Bethany Pipeline). Other projects are less certain, with start and/or end dates dependent on various factors. Most non-potable projects could be implemented in less than five years if conditions allow for the project to move forward.

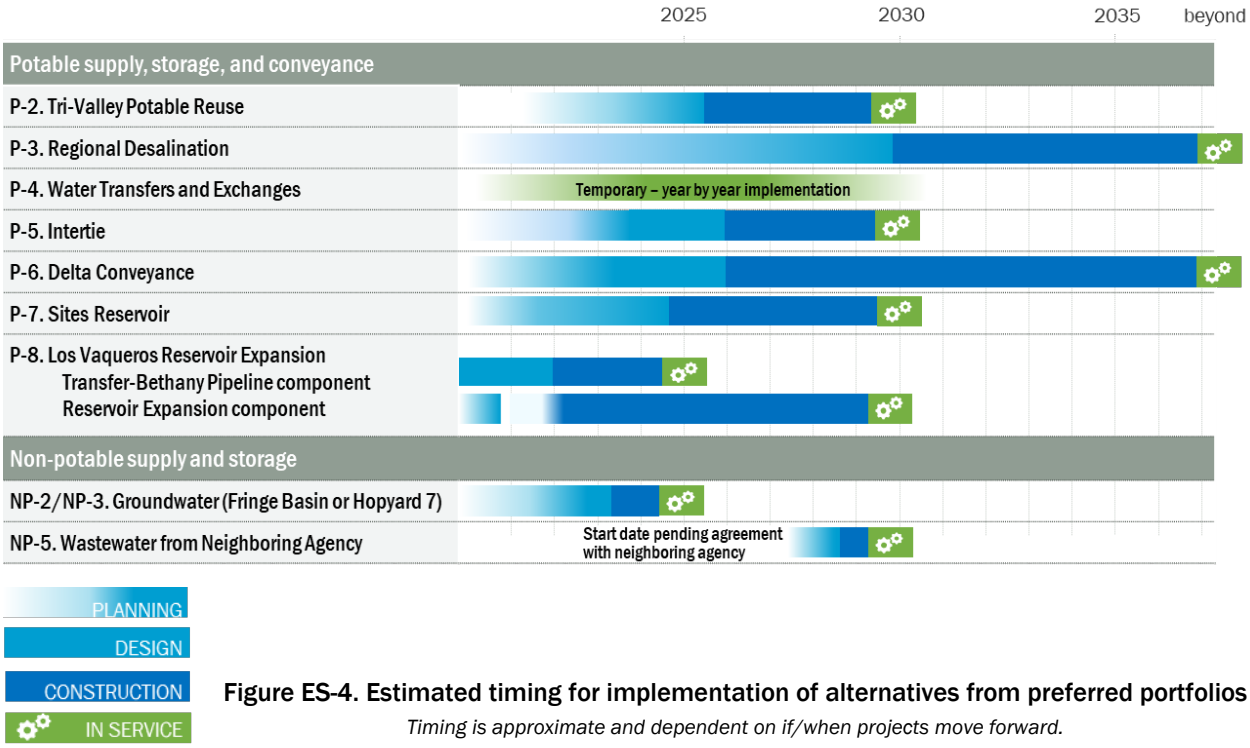


Figure ES-4. Estimated timing for implementation of alternatives from preferred portfolios

Timing is approximate and dependent on if/when projects move forward.

Based on the evaluation, the combination of alternatives in Portfolios 2 and 3 (shown to the right) offer multiple benefits and are most resilient to uncertainties. For many of these projects, additional studies are needed to further define the benefits and costs, including impacts to ratepayers. Additionally, Zone 7 plans to update its WSE later in 2021. The WSE Update will include a more robust technical and financial analysis of how various alternatives would complement existing water supplies and infrastructure and increase water resilience for the Tri-Valley. DSRSD will incorporate this information into the next update of the AWSS, which is recommended for 2023.

In the near-term, it is recommended that DSRSD continue to support Zone 7's efforts, seek supplemental non-potable supply to expand the recycled water program, and explore potential near-term pilot projects to gather information and inform longer-term decisions.

Alternatives from preferred portfolios (Portfolios 2 and 3):

P-2. Tri-Valley Potable Reuse

P-3. Regional Desalination

P-5. Intertie

P-6 and P-7. Delta Conveyance and Sites Reservoir *(best when combined)*

P-8. Los Vaqueros Reservoir Expansion and Transfer-Bethany Pipeline

NP-2/NP-3. Groundwater from Fringe Basin or Hopyard 7

NP-5. Wastewater from Neighboring Agency *(requires willing partner)*

P = potable; NP = non-potable

Key near-term recommendations:

- **Support Zone 7's efforts to pursue additional supply, storage, and conveyance.**
- **Explore near-term pilots to gather information and inform longer-term decisions.**
- **Seek supplemental non-potable supplies to expand the recycled water program.**

Recommendations

Recommended near-term actions are described below. These early steps would complement and support Zone 7's ongoing water supply efforts and inform several upcoming milestones, including Zone 7's decisions regarding continued participation in the Los Vaqueros Reservoir Expansion (2021), Sites Reservoir (2021), and Delta Conveyance (2022) projects and DSRSD's water supply contract renewal with Zone 7 (2024).

As shown in the recommended framework (Figure ES-5), DSRSD's long-term strategy will depend on outcomes of these near-term actions and other external triggers. It is recommended that DSRSD review the framework in 2023 to incorporate new information (e.g., from Zone 7's upcoming 2021 WSE Update) and lessons learned from early efforts.

Near-term actions for DSRSD

Support Zone 7's efforts	
Advocate for Zone 7's continued participation in the Los Vaqueros Reservoir Expansion Project (including Transfer-Bethany Pipeline).	Given that this project has already completed environmental review and components can be online in the next 5 to 10 years, it offers near-term reliability and provides more certainty than projects that are still in the early planning stages. Additionally, the Transfer-Bethany Pipeline provides an alternate conveyance method to move water into the Tri-Valley.
Support Sites Reservoir with Delta Conveyance.	Sites Reservoir, a new off-stream storage project located northwest of Sacramento, would provide storage and new supply for the Tri-Valley. Because the reservoir is located north of the Delta, bundling this project with Delta Conveyance (which would help protect against sea level rise, earthquakes, and other Delta disruptions) would enable more reliable access to the supply.
Explore possible near-term pilots	
Potable reuse pilot with Alameda County Water District (ACWD), Union Sanitary District (USD), Zone 7, and the City of Livermore.	This concept would include construction of an advanced water purification pilot facility at DSRSD's WWTP. Purified water would be conveyed to ACWD via Alameda Creek, and ACWD would intercept the flow and divert it to Quarry Lakes for groundwater recharge. This pilot would provide a regional demonstration project, collect data to inform future regional potable reuse projects, and make use of wastewater effluent currently discharged to San Francisco Bay. Longer-term, this project could also include a transfer/exchange, by which ACWD would provide one of its water sources to DSRSD or Livermore (via Zone 7) in exchange for purified water.
Pilot Transfer with Zone 7 and EBMUD.	This pilot transfer would utilize DSRSD's existing emergency interties with EBMUD. Although EBMUD's distribution system has limited capacity and is not designed for long-term, every year wheeling arrangements, a short-term pilot could demonstrate viability of this concept to support future dry-year or emergency transfers and inform possible future projects (e.g., a potential EBMUD-Zone 7 emergency intertie).
Seek supplemental non-potable supply	
Work with Zone 7 to collect more data on the Fringe Basin and Hopyard 7 well.	The Fringe Basin has limited potable supply potential due to high total dissolved solids but could possibly be used to supplement the recycled water supply. Similarly, Zone 7's Hopyard 7 well in the Main Basin is not used for drinking water due to elevated levels of arsenic, though may be suitable for non-potable uses. Further investigations are needed to determine the feasible quantity and quality of groundwater that could be introduced to the recycled water system.

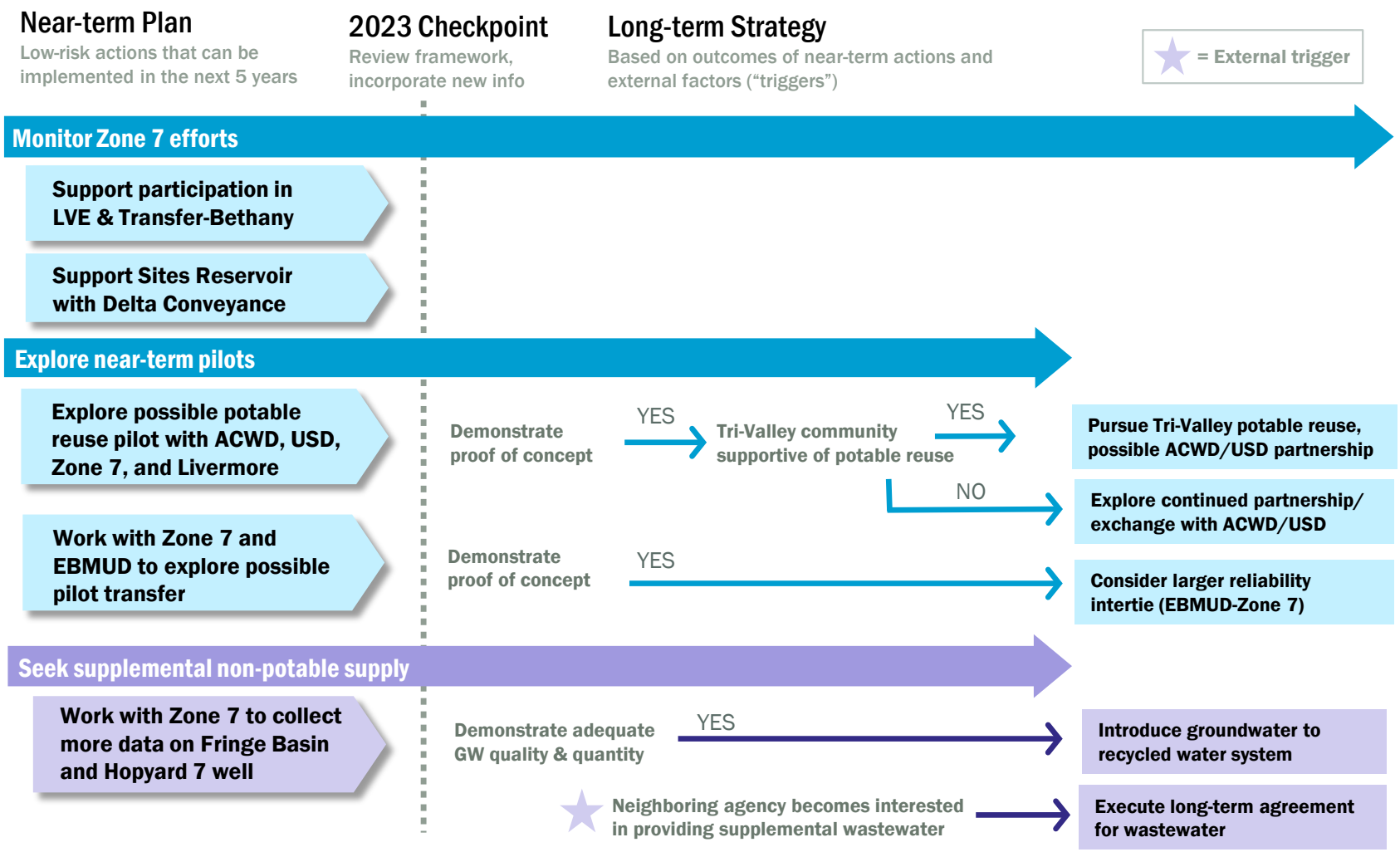


Figure ES-5. Recommended framework

Conclusions

Conditions have changed substantially since 2015. With conservation as a way of life in California, water demand projections are lower, and less wastewater is available for reuse. However, there is still potential for DSRSD to expand its recycled water program if additional supply can be added to the recycled water system. An integrated approach is needed to manage potable and recycled water supplies and make best use of available effluent.

Additionally, diverse portfolios improve resilience, enable flexibility, and reduce risk. A combination of new supply, storage, and conveyance is needed to ensure reliability, and it is recommended that DSRSD continue to pursue an "all of the above" approach towards developing potential water projects. Near-term efforts (e.g., pilot projects, groundwater studies, and Los Vaqueros Reservoir Expansion) can enable progress while longer term projects are being developed. Partnerships are key to success, as collaborative projects offer new opportunities, multiple benefits, and improved regional reliability.

The recommended framework outlines near-term and long-term strategies for a resilient and sustainable water future, accounting for key uncertainties and decision points. It is recommended that DSRSD review and update the framework in 2023 to incorporate new information.

The results of the 2021 AWSS and recommended framework were presented to DSRSD's Board of Directors on April 6, 2021 and informed DSRSD's updated Water Resiliency Policy. The new policy was adopted by DSRSD's Board of Directors on April 20, 2021, replacing the 2015 Water Policy. Key principles in the adopted Water Resiliency Policy include:

- Emphasizing the need for collaborative partnerships for building water resiliency.
- Advocating for an "all of the above approach" to pursuing a diverse portfolio of water supply, storage, and conveyance projects.
- Prioritizing local and sustainable water sources and projects that contribute to regional self-reliance, while moving away from the more prescriptive goals in the 2015 Water Policy that were based on information that has evolved or substantially changed.
- Ensuring Zone 7 water shortage allocations recognize retailer water use efficiency and investments in new water supplies.
- Advancing the development of near-term projects that could be eligible for grant funding.

The 2021 AWSS and Water Resiliency Policy will guide DSRSD efforts to work collaboratively with other partner agencies on developing water projects to address DSRSD's current and future water needs. DSRSD plans to review the 2021 AWSS and Water Resiliency Policy in 2023. As part of that review, DSRSD will evaluate progress made towards building a resilient and sustainable water future for its customers and update the framework to incorporate new information.

This page intentionally left blank.

Section 1

Introduction

The Dublin San Ramon Services District (DSRSD) provides potable water and recycled water to approximately 91,000 people in the City of Dublin and Dougherty Valley portion of San Ramon. DSRSD produces and distributes recycled water for irrigation uses and purchases potable water from Zone 7 Water Agency (Zone 7). DSRSD also has a groundwater pumping quota (GPQ) from the main groundwater basin, pumped on its behalf by Zone 7, the local groundwater basin manager.[2]

Zone 7 is a State Water Project (SWP) contractor that wholesales treated water to four retail water agencies: DSRSD, City of Livermore, City of Pleasanton, and California Water Service Livermore District. As shown in Figure 1-1, the majority of Zone 7's water supply, and therefore DSRSD's water supply, is imported through the Sacramento-San Joaquin Delta (Delta) via the SWP. Zone 7 also receives local runoff from the Arroyo Valle watershed. In wet and normal years, a portion of Zone 7's surface water supply is stored in the local and non-local groundwater banks and surface water reservoirs. In dry years, Zone 7 withdraws the previously stored water to augment reduced SWP deliveries.

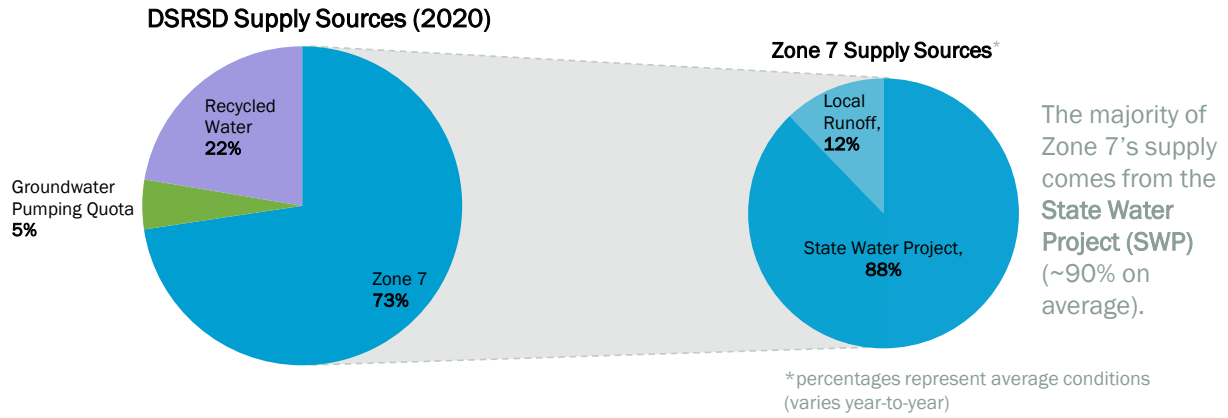


Figure 1-1. DSRSD and Zone 7 water supply sources.

Note: Figure represents average conditions; Zone 7's supplies vary year-to-year based on hydrological, regulatory, and operational conditions.

In September 2015, DSRSD completed a Long-Term Alternative Water Supply Study (2015 Study) to identify conceptual alternatives for improving long-term water supply reliability. The 2015 Study was driven by the unprecedented 2012-16 drought and DSRSD's desire to reduce dependence on imported Delta water supply. In 2014, the California Department of Water Resources (DWR) announced an initial SWP allocation of zero percent, which was increased to 5 percent later in the year. The very low 2014 SWP allocation and limitations on the timing and conditions for pumping water from the Delta exposed vulnerabilities with DSRSD's heavy reliance on the SWP for bringing water supplies into the Tri-Valley.

[2] Under DSRSD's existing water supply agreement with Zone 7, DSRSD's GPQ from the Main Basin is 645 acre-feet per year (AFY). DSRSD may extract water from the fringe basin (within Zone 7's boundary but outside the Main Basin) provided it causes no adverse impact on the Main Basin.

The 2015 Study included a high-level assessment of regional and local supply alternatives that DSRSD could explore collaboratively with other neighboring water and wastewater agencies to diversify water supplies and reduce reliance on imported water through the Delta. The results of the 2015 Study informed and provided the framework for DSRSD's Water Supply, Storage, Conveyance, Quality and Conservation Policy (2015 Water Policy), which was adopted by DSRSD's Board of Directors in October 2015 and included several aspirational goals, such as:

- At least 60 percent of total demand (potable and recycled) is satisfied by local and regional supplies.
- No more than 40 percent of total water supply (potable and recycled) comes from any one physical source.
- At least two independent conveyance systems for each water supply source to serve DSRSD's customers.

DSRSD's current water supply portfolio is far from meeting the prescriptive goals established in the 2015 Water Policy, with local and regional supplies making up less than 40 percent of total, and more than 60 percent of total water supply coming from one source (SWP) (Figure 1-2).

Additionally, since development of the 2015 Study and 2015 Water Policy, conditions have changed substantially, including lower water demand projections; lower wastewater flows (and therefore less flow available for reuse); advancement of local and regional efforts (e.g., the Bay Area Regional Reliability [BARR] partnership); and new regulations (e.g., pending long-term water use efficiency standards and direct potable reuse [DPR] regulations). These changes reduce the potential for certain types of projects—for example, DSRSD has limited wastewater to pursue a large water reuse project on its own—while also opening new opportunities (e.g., participation in broader regional efforts). Therefore, DSRSD initiated the *2021 Alternative Water Supply Study* (2021 AWSS)*: A Framework for a Resilient and Sustainable Water Future* to update the 2015 Study, incorporate new information, and reflect other ongoing efforts.

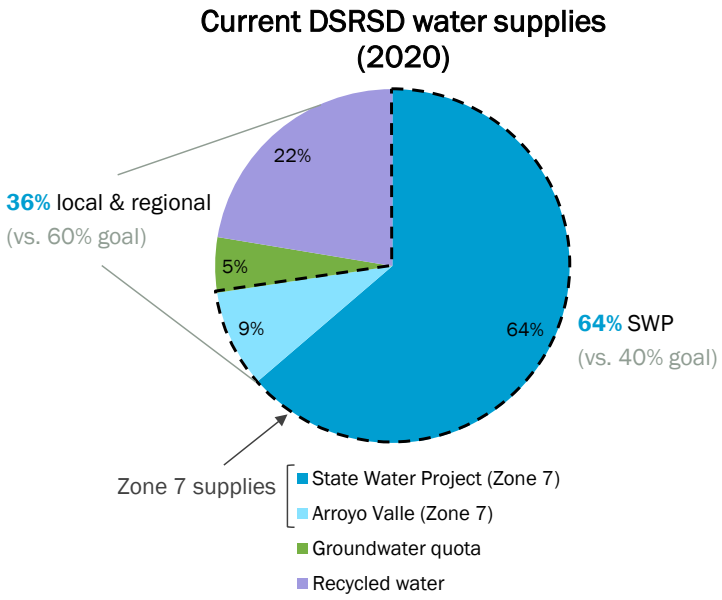


Figure 1-2. Current DSRSD water supplies compared to 2015 Water Policy goals

Changed conditions since 2015

Lower water demand projections

Water demands declined during the 2012-2016 drought and are expected to remain lower than previously projected due to 2018 legislation setting new standards for water use efficiency (Assembly Bill 1668 and Senate Bill 606). The 2015 Study relied on projections from DSRSD's 2010 Urban Water Management Plan (UWMP), which are substantially higher than current projections (Figure 1-3).

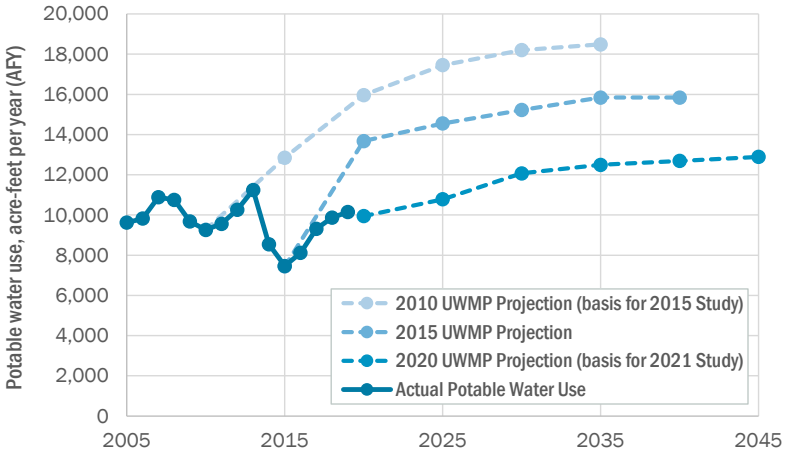


Figure 1-3. DSRSD's potable water demand

Lower wastewater projections

Improved efficiency of indoor water use has resulted in lower wastewater flows than previously projected (Figure 1-4). Less wastewater also means less water available for reuse. Although DSRSD's wastewater service area does not align with its water service area, lower indoor water use trends are occurring throughout the Tri-Valley.

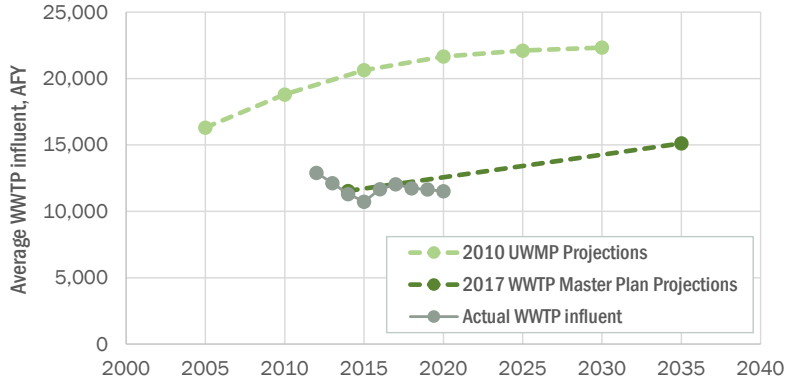


Figure 1-4. DSRSD wastewater treatment plant (WWTP) influent

Local and regional efforts

In addition to improved water use efficiency, the Tri-Valley has made progress in water supply reliability efforts—expanding recycled water, exploring additional projects (e.g., Tri-Valley Potable Reuse), and implementing lessons learned from the 2012-16 drought. Broader collaborative efforts, such as the BARR Partnership, have advanced planning for other regional projects, including the Bay Area Shared Water Access Program, which will provide a framework to help water suppliers more efficiently navigate future water transfers and exchanges, and a potential Bay Area Regional Desalination facility. Figure 1-5 presents existing regional water infrastructure and the potential types of water transfer/exchange opportunities among the BARR partners, including Zone 7.

Legislation and regulations

In addition to long-term water use efficiency legislation prompting the State to set new water use standards, the State Water Resources Control Board (SWRCB) is in the process of developing a framework for regulating DPR in California. In March 2021, SWRCB staff released an addendum to the proposed framework, including an early draft of anticipated regulatory criteria that would apply to both raw and treated water augmentation. Regulations are anticipated by December 2023.

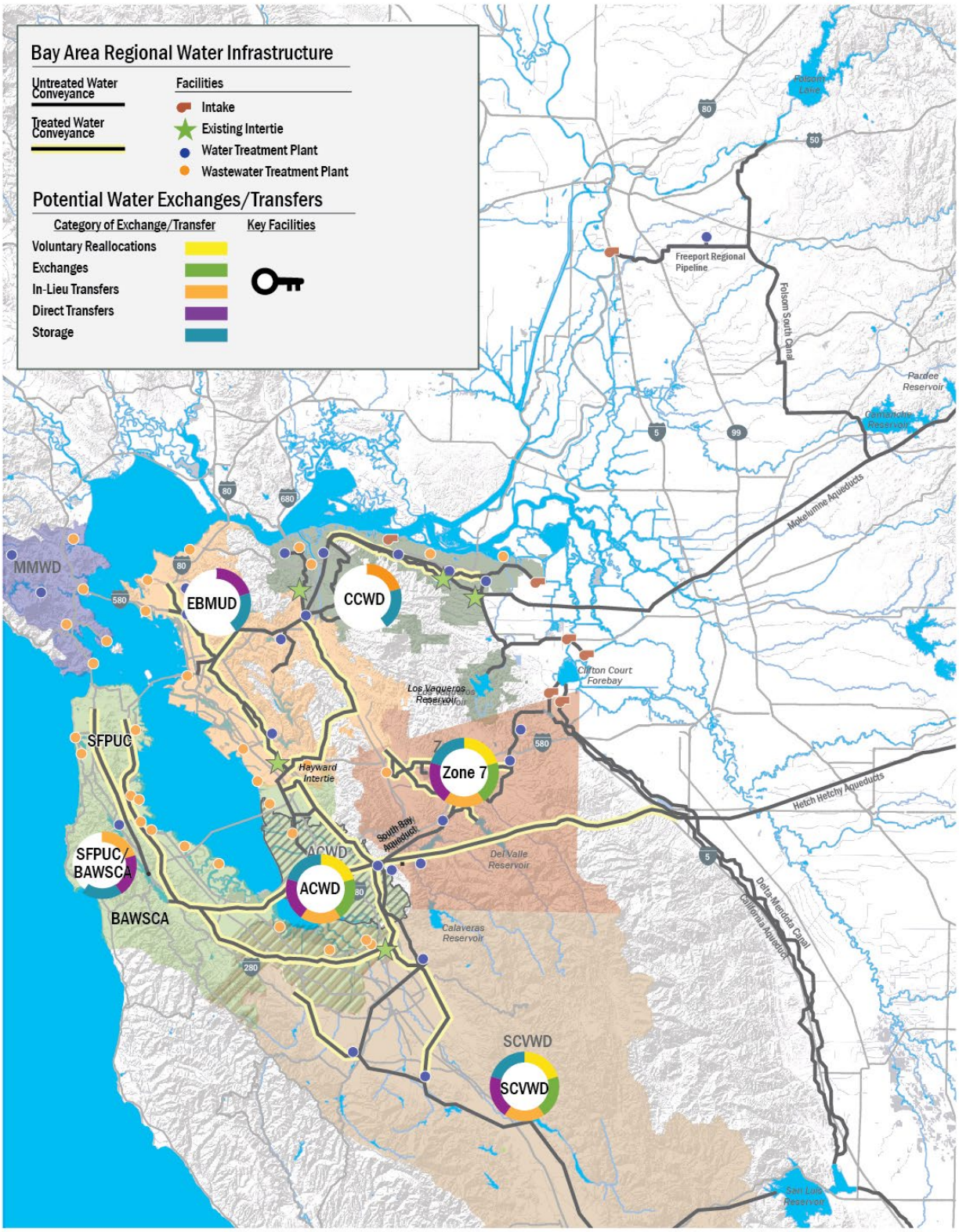


Figure 1-5. Bay Area regional water infrastructure and potential water transfer/exchange opportunities

Source: BARR Drought Contingency Plan (2017)

1.1 Purpose and Objectives

DSRSD initiated the 2021 AWSS to incorporate new and refined information about supply and demand conditions, regional projects, and proposed or pending regulations, as well as input from potential regional partners. The 2021 AWSS is intended to serve as a framework for a resilient and sustainable water future, guiding DSRSD in making near-term and long-term decisions in the face of uncertainty.

2021 AWSS objectives:

- Update the 2015 Study with new and refined information, including input from potential regional partners.
- Provide information to guide and inform the update of the 2015 Water Policy.
- Inform DSRSD's 2020 UWMP update.
- Support DSRSD's strategic plan goal to develop and implement an integrated recycled and potable water program.
- Provide a framework for a resilient and sustainable water future that outlines near-term and long-term strategies, accounting for future uncertainties and decision points, and informs and guides DSRSD advocacy and collaborative efforts.

1.2 Approach

The 2021 AWSS built upon the 2015 Study, which identified 9 water supply alternatives for DSRSD, and developed a framework for a sustainable water future through the process shown in Figure 1-6.

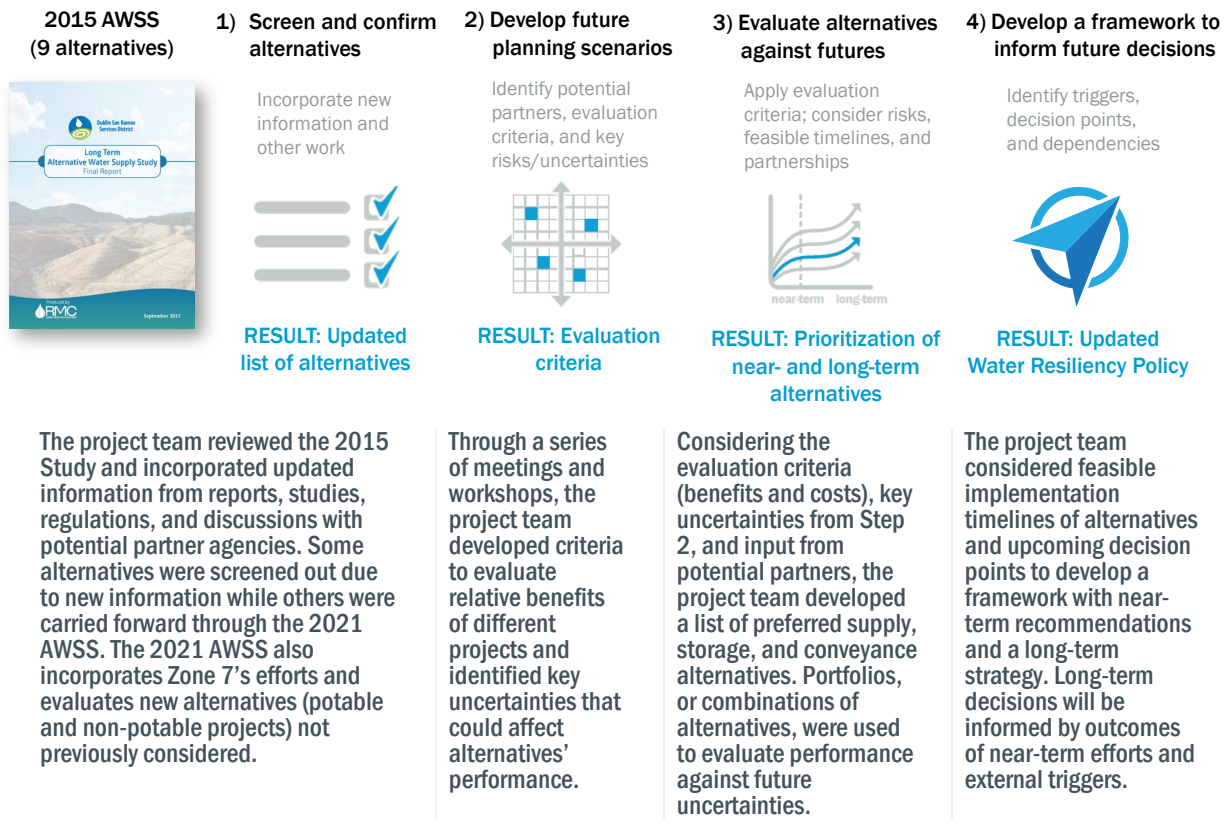


Figure 1-6. 2021 AWSS approach

This page intentionally left blank.

Section 2

Future Water Needs

Although the primary drivers for new and diversified water supplies remain the same (e.g., climate change, decreased SWP reliability), the timing and volume of projected water needs have shifted since the 2015 Study due to changed conditions, as described in Section 1. In addition to water supply, the 2021 AWSS also considers storage and conveyance needs.

2.1 DSRSD Demand for Recycled and Potable Water

The 2015 Study was developed using water demand projections from DSRSD's 2010 UWMP, which estimated a total demand (potable and recycled) of nearly 22,000 acre-feet per year (AFY) by 2025. Current projections (updated for the 2020 UWMP) expect buildout demand to be much lower and later—that is, closer to 16,000 AFY in 2045. These lower projections are largely a function of sustained water use efficiency following the 2012-16 drought and subsequent legislation making conservation a way of life in California.

With this lower demand forecast, the significance of smaller supply projects (e.g., augmenting recycled water) increases in terms of meeting demand over the next 25 years. Recycled water has the potential to offset about 30 percent (900 AFY) of the projected increase in demand. However, expansion of the recycled water program is contingent on wastewater availability, which is currently limited. The lack of wastewater has prompted a moratorium on new recycled water connections until more supply is available. Figure 2-1 shows historical and projected demand, including the portion that could be met with recycled water if the moratorium is lifted (pending supply availability).

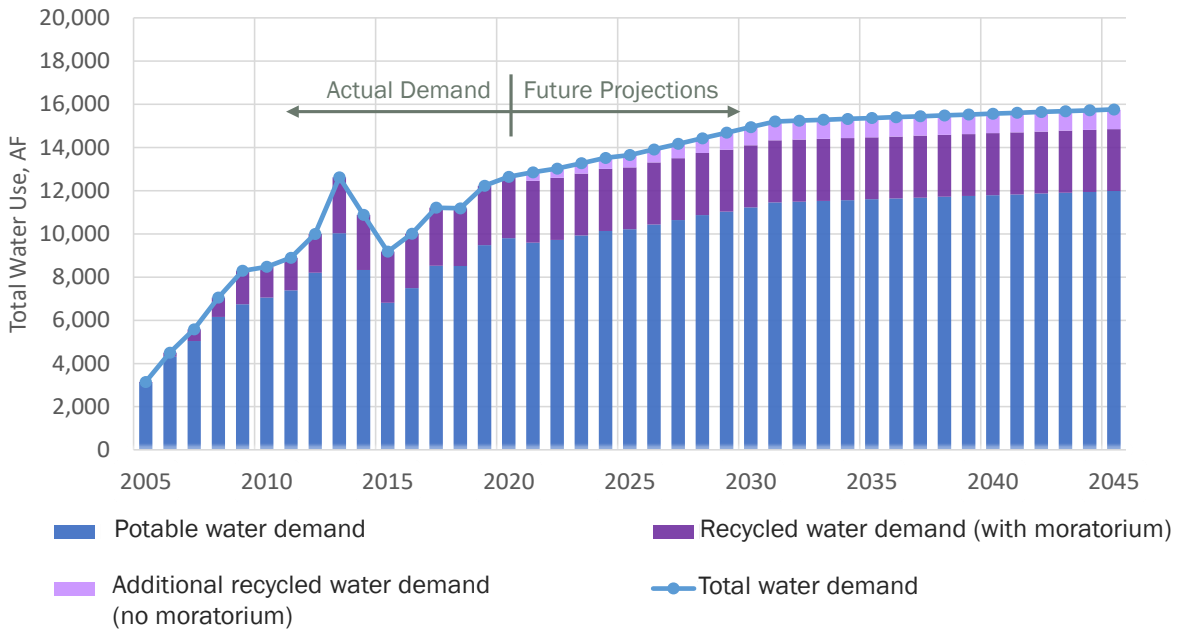


Figure 2-1. DSRSD's historical and projected future water demand

2.2 San Ramon Valley Recycled Water Program

DSRSD and the East Bay Municipal Utility District (EBMUD) formed a joint powers authority, the DSRSD-EBMUD Recycled Water Authority (DERWA), in 1995. DERWA manages the San Ramon Valley Recycled Water Program (SRVRWP), which supplies recycled water from DSRSD's WWTP to areas within DSRSD and EBMUD boundaries. As of 2014, a portion of recycled water is delivered to the City of Pleasanton under contract with DERWA. Pleasanton has first rights to the recycled water produced from its wastewater, which is treated at DSRSD's WWTP.

Currently, all wastewater that enters the DSRSD WWTP is recycled on peak irrigation days during the summer months (Figure 2-2). Therefore, on March 25, 2019, the DERWA Board adopted a resolution requesting that EBMUD and DSRSD implement a moratorium on new connections, except for those EBMUD Phase 2 connections that were already in progress. On July 7, 2020, the DSRSD Board adopted a revised Water Recycling Policy implementing the moratorium on new recycled water connections within DSRSD's water service area.

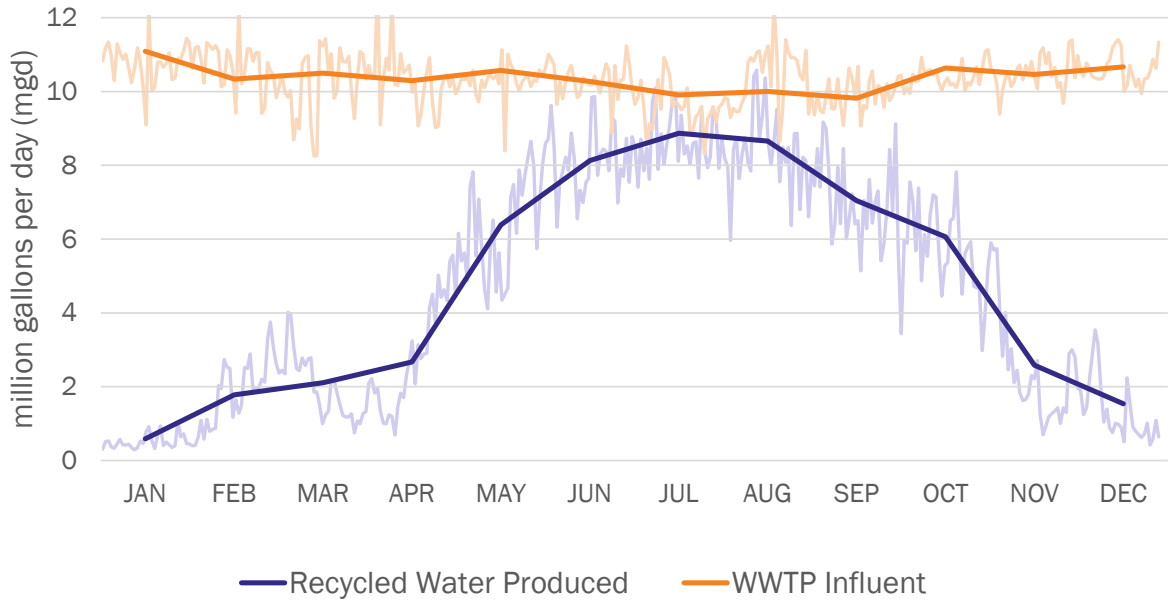


Figure 2-2. 2020 DSRSD WWTP influent and produced recycled water

Note: Monthly averages shown with darker line; daily flows shown in lighter color.

With continued indoor water use efficiency, wastewater flows may not increase significantly anytime soon. However, augmenting WWTP flows with a supplemental source (e.g., wastewater from a neighboring agency or local groundwater) or implementing seasonal storage could enable DSRSD to lift the moratorium on new recycled water customers and expand the recycled water program.

To meet potential near-term recycled water supply shortages, DERWA and Central Contra Costa Sanitary District (CCCSD) recently executed a temporary agreement to transfer recycled water to DERWA to supplement system flows through January 2024, with the potential for two 1-year extensions. However, the agreement is temporary and cannot extend beyond a total of five years unless separately negotiated. CCCSD cannot commit to a long-term arrangement at this time, due to other planned uses of their wastewater effluent.

As Pleasanton's recycled water program grows, so will the need for additional supply or seasonal storage to continue to meet existing demands for DSRSD and EBMUD. Otherwise, expansion of Pleasanton's recycled water program could reduce the amount of recycled water available for DERWA customers by up to about 600 AFY. Securing a permanent supplemental supply source would enable significant expansion of the SRVRWP (Figure 2-3).

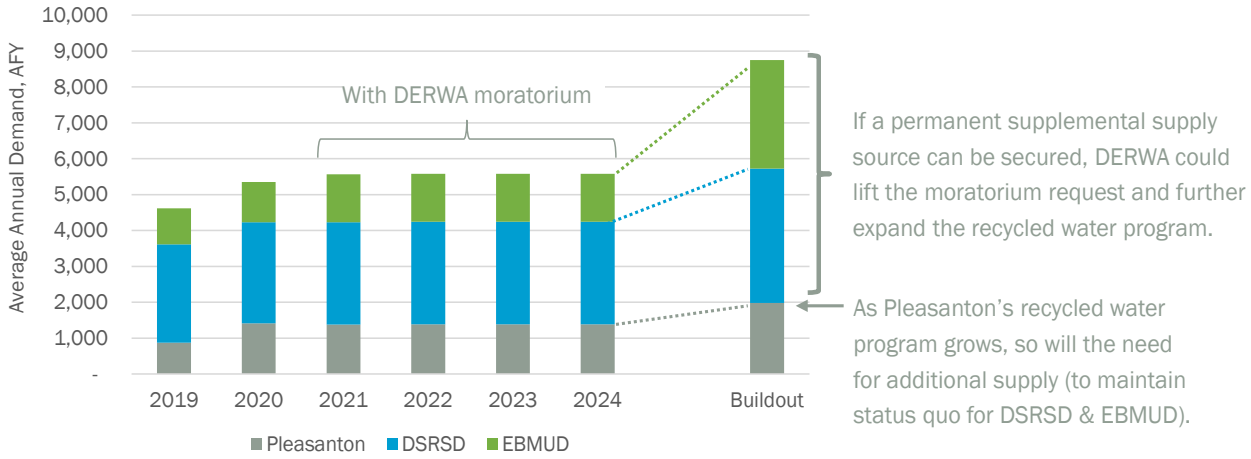


Figure 2-3. Projected DERWA recycled water demands

2.3 Long-term Needs for Potable Supply, Storage, and Conveyance

In collaboration with other local and regional partner agencies, Zone 7 is exploring a range of new water supply, storage, and conveyance projects to increase the long-term reliability and resilience of the Tri-Valley's water supplies. As estimated in Zone 7's 2019 Water Supply Evaluation (2019 WSE Update), Zone 7 could experience supply shortages up to 50 to 70 percent by 2040 in dry years under the "no new water supply projects" scenario (Figure 2-4). This would translate to significant shortages for DSRSD, which makes up about 25 percent of Zone 7's direct demand.

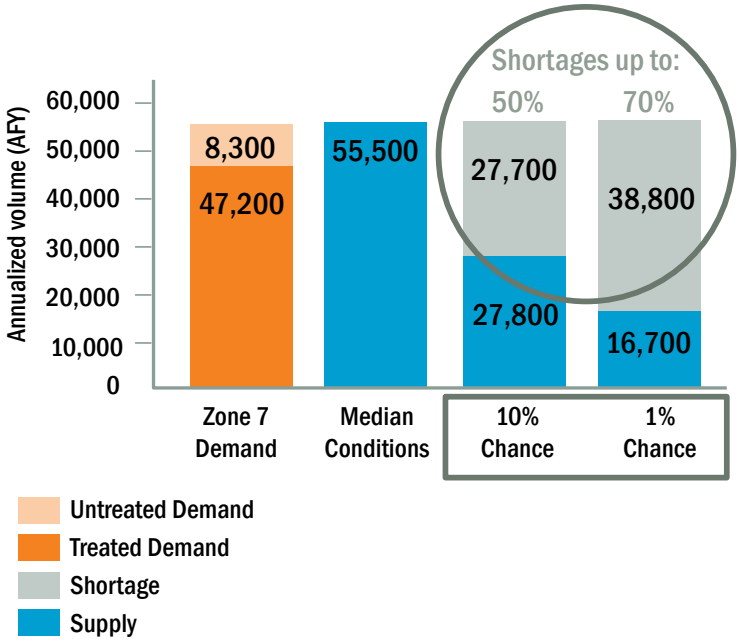
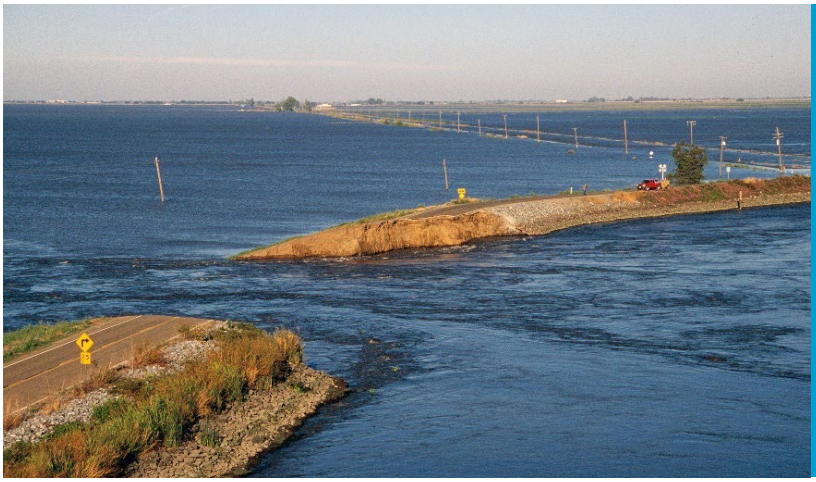


Figure 2-4. Zone 7 projected demand and available supply in 2040 (assuming no new water supply projects)

Note: Based on Zone 7's 2019 WSE Update. Zone 7 is in the process of revising supply and demand projections for the 2020 UWMP, which may shift projected shortage estimates.

In addition to water supply, new conveyance and storage are needed to reduce risk to shocks and provide operational flexibility, as learned during the 2012-16 drought. The water conveyance capability of the Delta is challenged by the instability of aging levees (including their vulnerability to seismic events, climate change, and land subsidence), regulatory uncertainty, water quality issues including saltwater intrusion, and the declining health of the Delta ecosystem. With the majority of Tri-Valley supplies being tied to the Delta and the SWP, system redundancy is important to protect against increasingly frequent disruptions. New conveyance would provide an alternative flow path in the event of Delta outages.

Similarly, new regional storage would increase operational flexibility and reliability to complement Zone 7's existing surface reservoirs and groundwater storage.



As shown in the photo to the left, Delta levees are susceptible to failure (e.g., due to earthquakes). Along with sufficient freshwater outflows, Delta levees keep salt water from the San Francisco Bay from mixing with fresh water supply. In the event of levee failure, Delta water would be unusable for an extended period.

Photo credit: California Department of Water Resources

Section 3

Potential Alternatives

DSRSD identified potential supply, storage, and conveyance options through the following three steps, as further described below.

1. Revisited alternatives from the 2015 Study,
2. Incorporated Zone 7's efforts, and
3. Explored additional projects that were not previously considered.

3.1 Screening Alternatives from 2015 Study

The Project Team reviewed alternatives and recommendations from the 2015 Study in light of new information, current conditions, and discussions with partner agencies. Some alternatives from 2015 were carried forward to the 2021 AWSS, while others were reframed or dropped from further evaluation based on new information and evolving circumstances, as summarized in Table 3-1.

Table 3-1. Summary of 2015 Study Alternatives

2015 Study Alternative	2021 AWSS Approach and Explanation
Enhanced conservation	**Incorporated as baseline assumption** (rather than separate alternatives), since long-term water use efficiency is required by 2018 State legislation (Assembly Bill 1668 and Senate Bill 606) and built into revised demand projections.
Residential turf replacement	
Rainwater capture/reuse	**Not further evaluated,** due to seasonality and lack of year-to-year availability.
Greywater capture/reuse	**Not further evaluated**, since these flows are already recycled at the District level. Reusing greywater at a household level would reduce the wastewater flows available for DERWA customers and would not generate a significant source of new supply.
Recycled water direct to residential irrigation customers	**Not further evaluated,** since current lack of wastewater and DSRSD's moratorium prevent connection of new recycled water customers. Instead, the 2021 AWSS explores augmenting the recycled water supply.
Indirect potable reuse via groundwater recharge or reservoir augmentation	**Included as Tri-Valley Potable Reuse** under Zone 7's supply alternatives to align with recent advancement of Joint Tri-Valley Potable Reuse efforts.
Direct potable reuse	**Included as treated water augmentation** (direct to DSRSD's distribution system). DPR regulations are anticipated by 2023.
Bay desalination (facility in Hayward)	**Replaced with Bay Area Regional Desalination (at Mallard Slough)** under Zone 7 options. This project leverages an existing partnership with five Bay Area agencies (including Zone 7) and has fewer permitting and environmental challenges than the Hayward location, as the Mallard Slough location utilizes an existing intake/water right and brackish water is lower cost/less energy intensive to treat.
North of Delta transfers, wheeled through EBMUD's system	**Included as broader transfer/exchange opportunities in partnership with Zone 7,** acknowledging limitations in EBMUD's wheeling capacity and ongoing efforts through the BARR partnership.
Fringe Basin groundwater *(screened out of 2015 Study due to limited potable supply potential)*	**Included as a non-potable alternative** to augment the recycled water supply in summer months.
District-wide stormwater capture *(screened out of 2015 Study due to Alameda Creek flow requirements and water rights issues)*	**Not further evaluated,** since Alameda County Water District (ACWD)—a downstream water user—has rights to local runoff that flows down Alameda Creek. Additionally, capturing stormwater could compromise fish flows in Alameda Creek.

3.2 Zone 7 Water Supply Reliability Options

In addition to the alternatives carried forward from 2015, the 2021 AWSS includes options for supply, storage, and conveyance that are currently under consideration by Zone 7 and were not previously included in the 2015 Study. Zone 7 is evaluating a broad range of projects (Table 3-2) and likely needs two or more projects to meet its Water Supply Reliability Policy goals (shown to the right). All of these projects require regional and/or statewide partners and could take 5 to 15 years to develop.

Although DSRSD would not be in a lead role, each of these projects would contribute to DSRSD's water supply reliability.

Zone 7's Water Supply Reliability Policy Goals

Meet treated water customers' water supply needs as follows:

- At least 85 percent of M&I water demands 99 percent of the time
- 100 percent of M&I water demands 90 percent of the time

M&I = municipal and industrial

Table 3-2. Zone 7's Water Supply Reliability Options

Potential Projects	Supply	Storage	Conveyance
Delta Conveyance [a]	■		■
Sites Reservoir [b]	■	■	
Los Vaqueros Reservoir Expansion and Transfer-Bethany Pipeline [b]	(see note c)	■	■
Bay Area Desalination	■		
Potable Reuse	■		
Water Transfers and Exchanges [d]	■		
Interties [b]			■

a. *Delta Conveyance (previously called the "Bay Delta Water Conveyance Tunnel" as part of the Bay Delta Conservation Plan) was included in the 2015 Study as a baseline assumption for improving reliability of the SWP, rather than a separate alternative.*
b. *New addition since 2015 Study.*
c. *Zone 7 is evaluating Los Vaqueros Reservoir Expansion and Transfer-Bethany Pipeline primarily for storage and conveyance of their existing SWP supply, though there could be potential to provide new supply as well.*
d. *Zone 7 is pursuing short-term transfers as an interim solution until other projects are online. With Delta Conveyance, Zone 7 may also be able to purchase additional yield from other SWP contractors through long-term transfers.*

3.3 Non-Potable Options

Expanding recycled water increases potable supply reliability, as serving customers from the recycled water system reduces peak potable demands and partially offsets the need for new supplemental potable supply. Therefore, the 2021 AWSS also considers alternatives that would enable DSRSD to expand the recycled water program—i.e., securing seasonal storage or supplemental non-potable supply, through the following options:

- **Storage** of tertiary treated recycled water in Chain of Lakes
- **Groundwater (non-potable)** from the Fringe Basin or Zone 7's Hopyard 7 well
- **Reverse osmosis (RO) reject** from Zone 7's groundwater demineralization facility
- **Supplemental wastewater** from a neighboring agency (CCCSD or Livermore)

3.4 Options Carried Forward for Evaluation

Table 3-3 summarizes the alternatives selected for further evaluation in the 2021 AWSS, with more detail below, including location, estimated yield, cost, and key considerations. (Cost estimates are preliminary—see Appendix C for more information). Alternatives P-2 through P-8 are options Zone 7 is currently exploring, while the other alternatives would be led by DSRSD. Nearly all alternatives, including those led by DSRSD, would involve partnerships with other agencies.

Table 3-3. Selected Alternatives for 2021 AWSS

Potable Supply, Storage, and Conveyance	Supply	Storage	Conveyance
P-1. DPR via Treated Water Augmentation	■		
P-2. Tri-Valley Potable Reuse [a]	■		
P-3. Regional Desalination [a]	■		
P-4. Water Transfers and Exchanges [a]	■		
P-5. Intertie [a]			■
P-6. Delta Conveyance [a]	■		■
P-7. Sites Reservoir [a]	■	■	
P-8. Los Vaqueros Reservoir Expansion and Transfer-Bethany Pipeline [a]	(b)	■	■
Non-Potable Supply and Storage	**Supply**	**Storage**	**Conveyance**
NP-1. Recycled Water Storage in Chain of Lakes [c]	■	■	
NP-2. Fringe Basin Groundwater	■		
NP-3. Groundwater from Hopyard 7 Well	■		
NP-4. RO Reject from Zone 7's Groundwater Demineralization Facility	■		
NP-5. Wastewater from Neighboring Agency	■		

P = potable; NP = non-potable

a. *Currently being explored by Zone 7.*

b. *Zone 7 is evaluating Los Vaqueros Reservoir Expansion and Transfer-Bethany Pipeline primarily for storage and conveyance, though there could be potential to provide new supply as well.*

c. *Storage also results in new supply, as storing tertiary treated wastewater (currently discharged to San Francisco Bay) in the winter months enables use of that supply in the summer months.*

P-1. DPR via Treated Water Augmentation

Potential Partners: DSRSD
Estimated Yield: 1,700 AFY
Capital Cost: $100 million (M)*
Unit Cost: $4,300/acre-foot (AF)*

** Costs may not capture all elements required by future regulations (anticipated in 2023). Assumes DSRSD is operating the AWPF independently, nine months out of the year. Unit cost reflects annual payment (including operations and maintenance [O&M]) over a 30-year period at 5 percent interest, divided by yield. Capital cost rounded up to the nearest $5M; unit cost rounded up to the nearest $100/AF. See Appendix C for more information.*

Description: Potable reuse via treated water augmentation (i.e., direct to DSRSD's distribution system) is the only potable reuse alternative that DSRSD could pursue independently. Treated water augmentation is the most direct form of potable reuse, with full-advanced treated supply introduced to the potable distribution system. Given DSRSD's lack of available summertime flows, this alternative includes an advanced water purification facility (AWPF) sized at 2-million gallons per day (mgd) production capacity with ozone/biological activated carbon, membrane filtration, RO, and ultraviolet-advanced oxidation process, operated 9 months out of the year (September through May). State regulations for treated water augmentation are currently being developed (anticipated by late 2023) and will require robust measures to protect public health and demonstrated technical, managerial, and financial capacity of a permit applicant.

Benefits: Locally generated supply produced by DSRSD; makes use of wastewater currently discharged to San Francisco Bay.

Challenges/Considerations: Regulations are still being developed, and as the most direct form of reuse, treated water augmentation will likely require stringent monitoring and operating procedures, as well as public outreach/education. Additionally, the AWPF could only operate seasonally, given DSRSD's lack of available wastewater flow in the summer months. DSRSD's agreement with DERWA to provide up to 6,420 AFY for tertiary treated recycled water may also limit effluent availability for DSRSD's reuse.

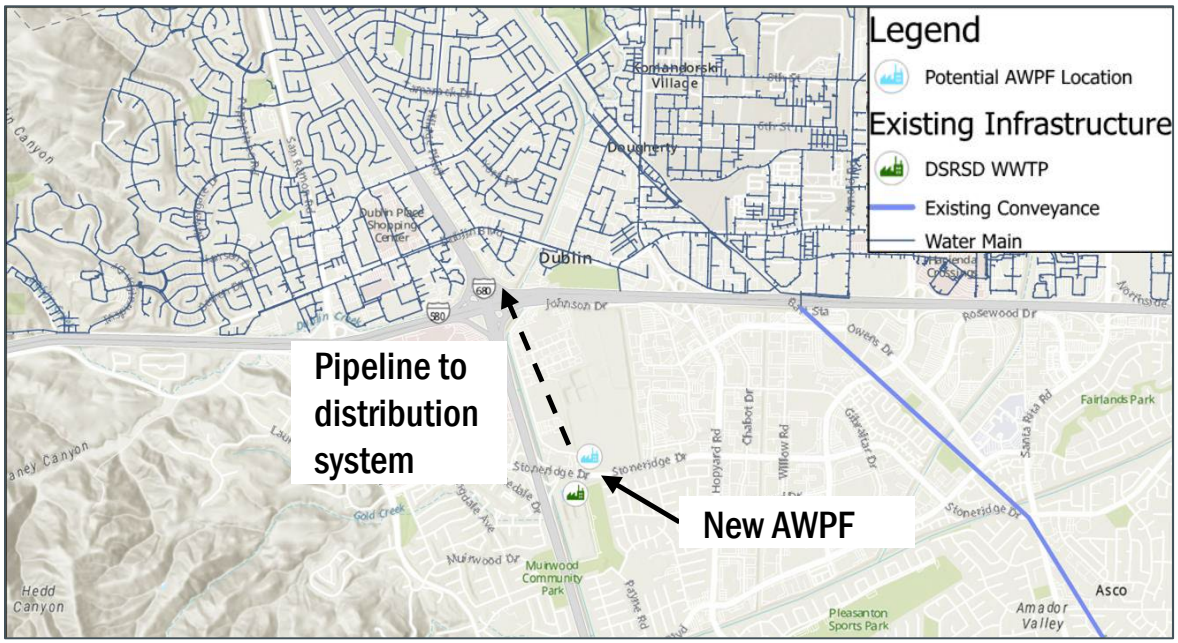


Figure 3-1. Map of potential future AWPF for treated water augmentation

P-2. Tri-Valley Potable Reuse

Description: The 2018 *Joint Tri-Valley Potable Reuse Technical Feasibility Study* evaluated a wide range of potable reuse options, utilizing wastewater from DSRSD and Livermore. Potential end uses for purified water include groundwater recharge via injection wells, groundwater recharge via Chain of Lakes, and raw water augmentation (RWA) at Zone 7's Del Valle WWTP. The study demonstrated potable reuse to be technically feasible and recommended several additional studies. This alternative includes any regional potable reuse project developed jointly with other Tri-Valley agencies.

Benefits: Local, drought resilient supply; makes use of wastewater that would otherwise be discharged to the San Francisco Bay.

Challenges/Considerations: Requires additional studies on conjunctive use and contaminant mobilization, as well as public education/outreach. For the RWA alternative, regulations are still being developed (anticipated in 2023).

Potential Partners: Zone 7 and retailers

Estimated Yield: 5,000 AFY for Zone 7 (~1,200 AFY for DSRSD)*

Capital Cost: $135-$275M**

Unit Cost: $2,800-$3,000/AF **

** Yield based on Zone 7's draft 2020 UWMP sample portfolio, assuming approximately 25 percent of the yield would go to DSRSD (based on portion of Zone 7's total direct demand).*

*** Costs from Zone 7's 2019 WSE Update and 2018 Joint Tri-Valley Potable Reuse Feasibility Study, inflated to 2021 dollars. Capital costs rounded up to the nearest $5M, unit costs rounded up to the nearest $100/AF. Represents cost for Zone 7.*

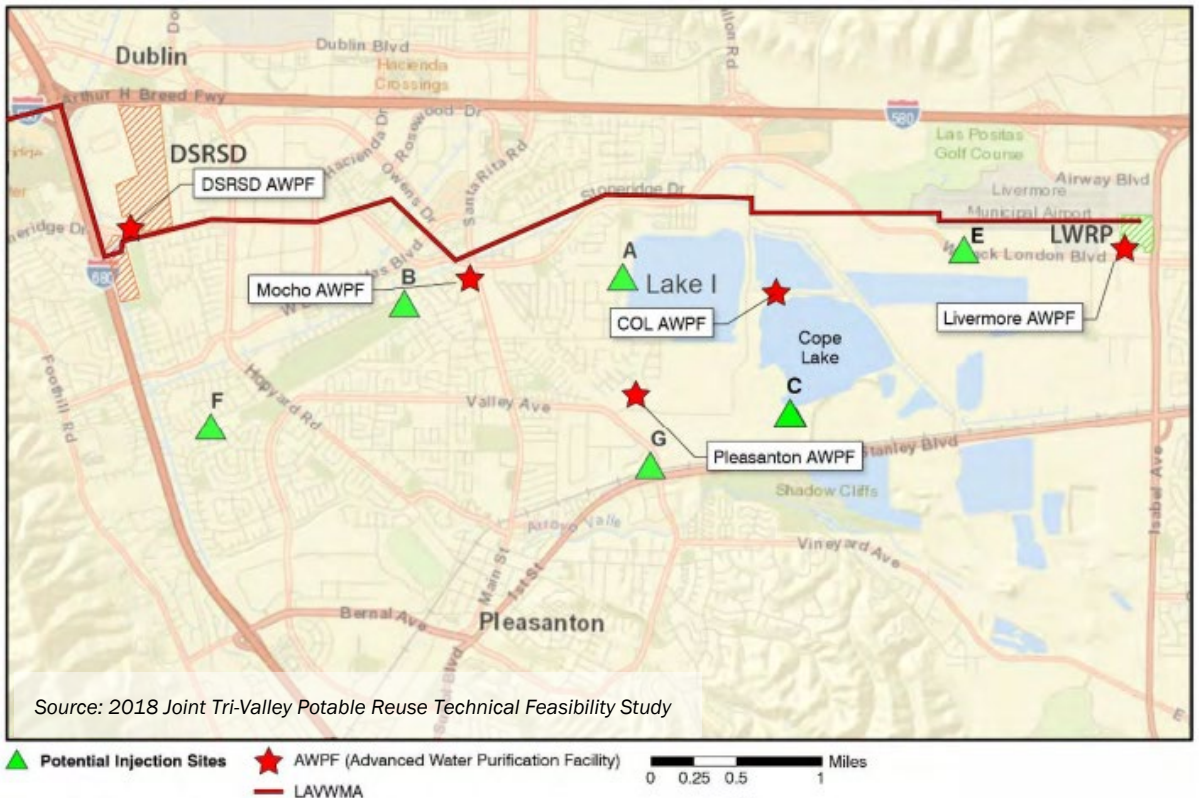


Figure 3-2. Potential delivery points for a future Tri-Valley potable reuse project

P-3. Bay Area Regional Desalination

Description: The Bay Area Regional Desalination Project would include a brackish water treatment plant at Contra Costa Water District's (CCWD) Mallard Slough Pump Station, utilizing an existing CCWD water right. Zone 7 could receive desalinated water through the South Bay Aqueduct (SBA) via exchange with CCWD, a potential new intertie with EBMUD, or possibly through the Los Vaqueros Reservoir Expansion project (conveyed via Transfer-Bethany pipeline to the SBA).

Benefits: Improves dry-year supply reliability and resilience to shocks (e.g., earthquakes), particularly if operated conjunctively with Los Vaqueros Reservoir. Brackish water treatment is more cost effective and less energy-intensive than ocean water desalination, resulting in fewer greenhouse gas emissions.

Challenges/Considerations: Potential environmental impacts have not yet been fully evaluated; may require mitigating potential fishery impacts. Additionally, new agreements and infrastructure may be needed to convey the supply.

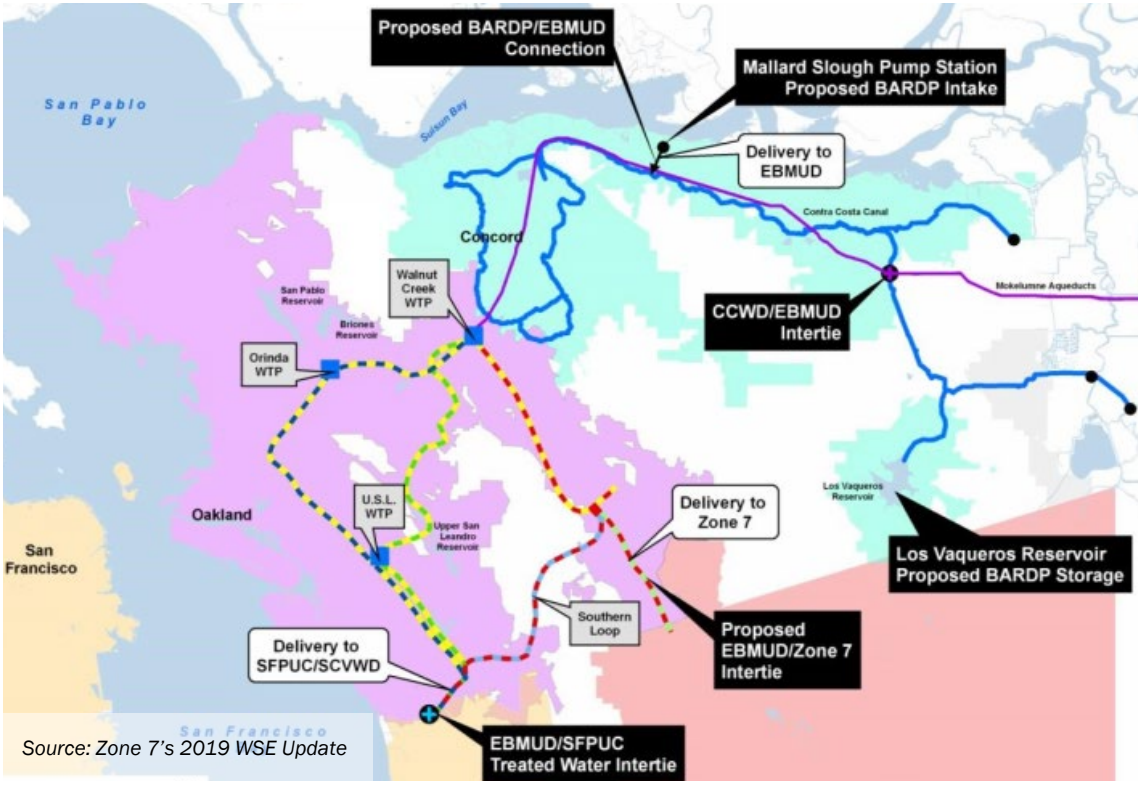
Potential Partners: Zone 7, CCWD, EBMUD, SFPUC, and Valley Water

Estimated Yield: 5,000 AFY for Zone 7 (~1,200 AFY for DSRSD)*

Capital Cost: $90M (Zone 7's share) **

Unit Cost: $2,000/AF or $2,500/AF (with treated water intertie) for Zone 7**

** Yield based on Zone 7's draft 2020 UWMP sample portfolio, assuming approximately 25 percent of the yield would go to DSRSD (based on portion of Zone 7's total direct demand).*
***Cost from Zone 7's 2019 WSE Update, inflated to 2021 dollars. Capital cost rounded up to the nearest $5M, unit costs rounded up to the nearest $100/AF. $2,000/AF represents cost of raw water delivered upstream of Zone 7's treatment plants; $2,500/AF represents cost of treated water delivered through potential EBMUD-Zone 7 intertie.*



Source: Zone 7's 2019 WSE Update

Figure 3-3. Potential Bay Area Regional Desalination Project facilities

P-4. Water Transfers and Exchanges (short-term and long-term)

Potential Partners: Zone 7 and willing seller(s)

Estimated Yield: 5,000 AFY for Zone 7 (~1,200 AFY for DSRSD)*

Capital Cost: $0.5M (short-term) to $115M (long-term) for Zone 7 **

Unit Cost: $500-$1,200/AF for Zone 7 **

** Yield based on Zone 7's draft 2020 UWMP sample portfolio, assuming approximately 25 percent of the yield would go to DSRSD (based on portion of Zone 7's total direct demand).*

***Costs from Zone 7's 2019 WSE Update, inflated to 2021 dollars. Low end of capital cost rounded to the nearest $0.5M; high end rounded up to the nearest $5M; unit costs rounded up to the nearest $100/AF.*

Description: Water transfers enable willing sellers, who have rights to a water supply, to make water available to sell to a willing buyer, provided there is no adverse impact to other water rights holders or the environment. A water exchange is similar to a water transfer, with a pre-negotiated amount of water "returned" to the seller in a future year (could be on a 1-to-1 basis or an uneven exchange where the buyer returns only a portion of the purchased quantity).

There are many different types of water transfers. The most common water transfers involve surface water that would otherwise have been directly diverted by the seller, stored water in a reservoir, or using groundwater in lieu of surface water (to "free up" the surface water for use by the buyer), and more. Each water transfer is unique and depends on the underlying water rights and other factors, such as the ability to convey the water to the buyer.

Zone 7 is considering short-term transfers with SWP contractors or other agencies as a temporary solution until longer-term projects come online. In general, short-term transfers between SWP contractors are relatively straightforward to implement, though prices are driven by market conditions and can be highly variable (e.g., Zone 7 purchased water through an exchange with Napa County for $230/AF in 2020 and is planning to purchase water from Mojave Water Agency for up to $1,000/AF in 2021). Other types of short-term transfers (i.e., with non-SWP contractors) generally require additional reviews and approvals and may be subject to timing limitations (i.e., a designated "Delta transfer window") and carriage water losses for moving water across the Delta, meaning Zone 7 may only receive 65 to 70 percent of the water purchased.

Zone 7 is also exploring opportunities for long-term transfers. Historically, opportunities for long-term transfers have been very limited, due to challenges finding a willing seller and more complex regulatory requirements. However, the recent Water Management Tools Amendment to the SWP Water Supply Contracts may facilitate future long-term transfers, which could augment Zone 7's SWP supply. In addition, the BARR Shared Water Access Program is intended to provide a framework to help Bay Area water agencies, including Zone 7, more efficiently navigate future water transfers and exchanges (see Figure 1-5 on page 1-4).

Benefits: Short-term transfers provide near-term, temporary supply and can generally be implemented quickly (within a year); leverages existing infrastructure.

Challenges/Considerations: Short-term transfers are only intended as an interim solution and complexity varies by type of transfer. Price can vary widely year-to-year, based on market conditions, and certain types of transfers are subject to significant carriage water losses for moving water across the Delta (30 to 35 percent). Other factors include Delta pumping limitations that can impact when the transfer water can be delivered to the buyer. Long-term transfers are less common and more difficult due to stringent regulatory requirements and challenges finding a willing seller.

P-5. Intertie

Description: Zone 7 is exploring a 30-inch diameter, seven-mile pipeline to connect EBMUD's treated water distribution system to the west side of Zone 7's transmission system. The project would provide an alternate means to convey water to Zone 7 during emergency conditions, such as droughts or Delta/SBA outages.

Zone 7 is also considering an alternative intertie with the San Francisco Public Utilities Commission (SFPUC), as described in the BARR Drought Contingency Plan, though this has not been studied in as much detail.

Benefits: Provides reliability during droughts, earthquakes, or other outage conditions; facilitates water transfers between Zone 7 and EBMUD (both directions).

Potential Partners: Zone 7 and EBMUD (or SFPUC)

Estimated Capacity: 10-25 mgd (depending on EBMUD's wheeling capacity)

Capital Cost: $55M (for Zone 7)*

** Cost from Zone 7's Fiscal Year 2018/2019 Water System Capital Improvement Plan (CIP) and 2019 WSE Update, converted to 2021 dollars.*

Challenges/Considerations: Use of the intertie could be limited by EBMUD's wheeling capacity, and construction through an urban area presents potential challenges. Unless paired with a new supply source (e.g., the Bay Area Regional Desalination Project), this alternative would provide new conveyance only.

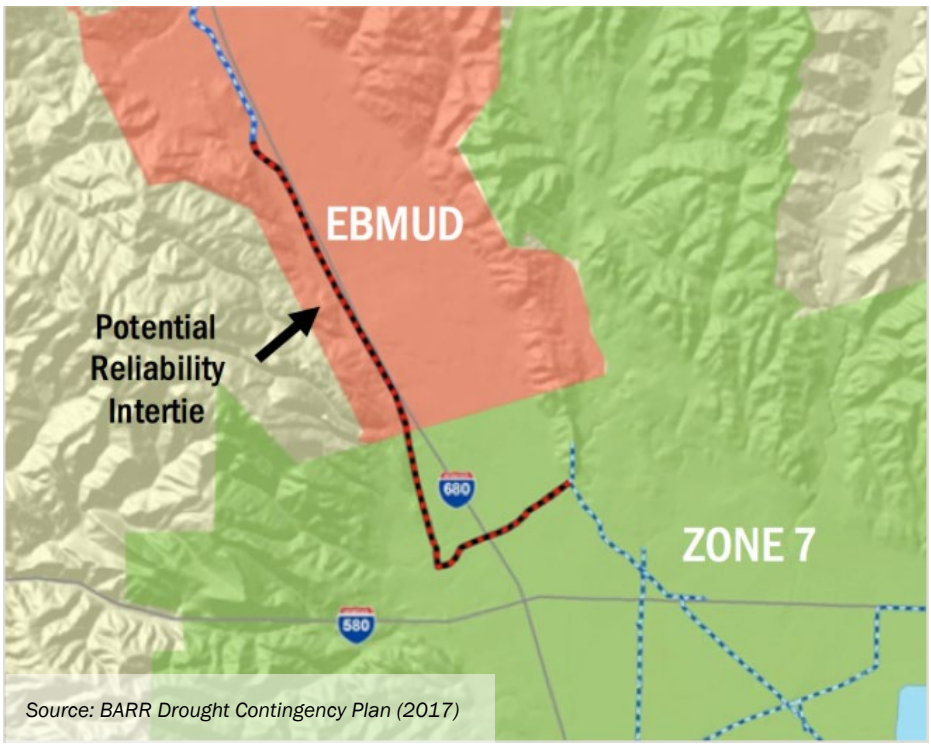


Figure 3-4. Potential future EBMUD-Zone 7 intertie

P-6. Delta Conveyance

Description: The Delta Conveyance project would help protect Delta water supplies and infrastructure from climate change impacts (e.g., sea level rise and saltwater intrusion) and other disruptions (e.g., earthquakes or levee failure). The current proposal includes one 42-mile tunnel with 6,000 cubic feet per second capacity. Although the project does not come with a new source of supply, the SWP's export capability has been decreasing over time and is expected to further decline (due to regulatory constraints, environmental flows, and aging infrastructure). Delta Conveyance would protect against further declines by improving operational flexibility.

Benefits: Preserves SWP supply, increases capacity for transfers from north of the Delta, and protects against earthquakes, saltwater intrusion, and other disruptions.

Challenges/Considerations: Project is large and complex with many partners; still requires environmental review and state/federal approval; could take 15 or more years to implement.

Potential Partners: Zone 7, DWR, and other statewide partners

Estimated Yield: To be determined (TBD). ***As an initial estimate, if Delta Conveyance prevents a 5 percent decline in SWP reliability, this would equate to ~4,000 AFY for Zone 7 (~1,000 AFY for DSRSD)****

Capital Cost: $220M (Zone 7's share) **

Unit Cost: $2,000/AF for Zone 7 (based on assumed yield) **

**The potential increase in SWP reliability from Delta Conveyance will be determined once operational and permitting terms are better defined. Zone 7's 2020 UWMP assumes no yield at this time, to be conservative. ** Zone 7's share, as noted in the 2019 WSE Update, was adjusted proportionally based on revised cost of Delta Conveyance ($15.9B) compared to CA Water Fix ($16.7B in 2017 dollars). Unit cost adjusted assuming 4,000 AFY of yield (compared to 11,000 AFY assumed in 2019 WSE Update). Costs will continue to be refined as project develops. Capital cost rounded up to the nearest $5M and unit costs rounded up to the nearest $100/AF.*

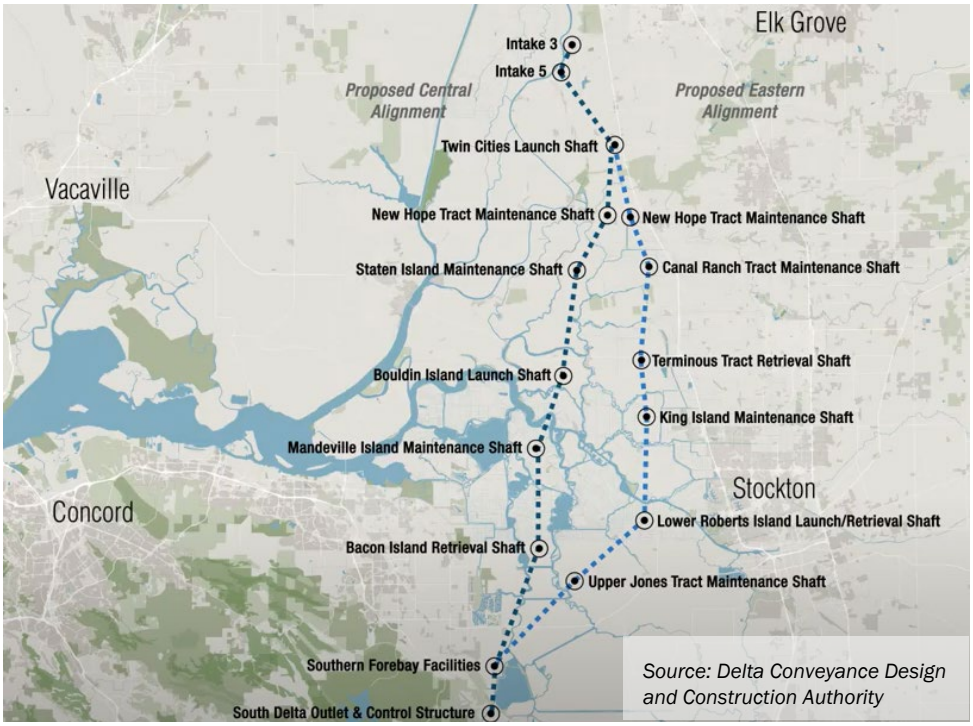


Figure 3-5. Possible alignments for Delta Conveyance Project

P-7. Sites Reservoir

Description: Sites Reservoir is a proposed 1.5 million AF off-stream reservoir, 75 miles northwest of Sacramento. Sites is intended to store excess flows (mostly during wet years) to make more water available during dry years. The reservoir is intended to supplement and optimize use of Shasta Reservoir (part of the Central Valley Project) and Oroville Reservoir (a SWP facility). Additionally, a portion of storage space and annual water supply is reserved for environmental purposes.

Benefits: Provides water supply, north of Delta storage, and dry-year reliability; off-stream storage does not create a barrier to native fish migration.

Challenges/Considerations: Sites Reservoir is located far north of the Tri-Valley; supply would still need to be exported through the Delta (best when paired with Delta Conveyance).

Potential Partners: Zone 7 and other statewide partners

Estimated Yield: 10,000 AFY for Zone 7 (2,500 AFY for DSRSD)*

Capital Cost: $70M (Zone 7's share)**

Unit Cost: $1,000/AF for Zone 7**

**Yield based on Zone 7's draft 2020 UWMP sample portfolio, assuming approximately 25 percent of the yield would go to DSRSD (based on portion of Zone 7's total direct demand).*
*** Zone 7's share of cost from 2019 WSE Update adjusted proportionally based on revised capital cost of Sites Reservoir (~$3B total; decrease from ~$5B assumed in 2019 WSE) and inflated to 2021 dollars. Capital cost rounded up to the nearest $5M, unit cost rounded up to the nearest $100/AF.*

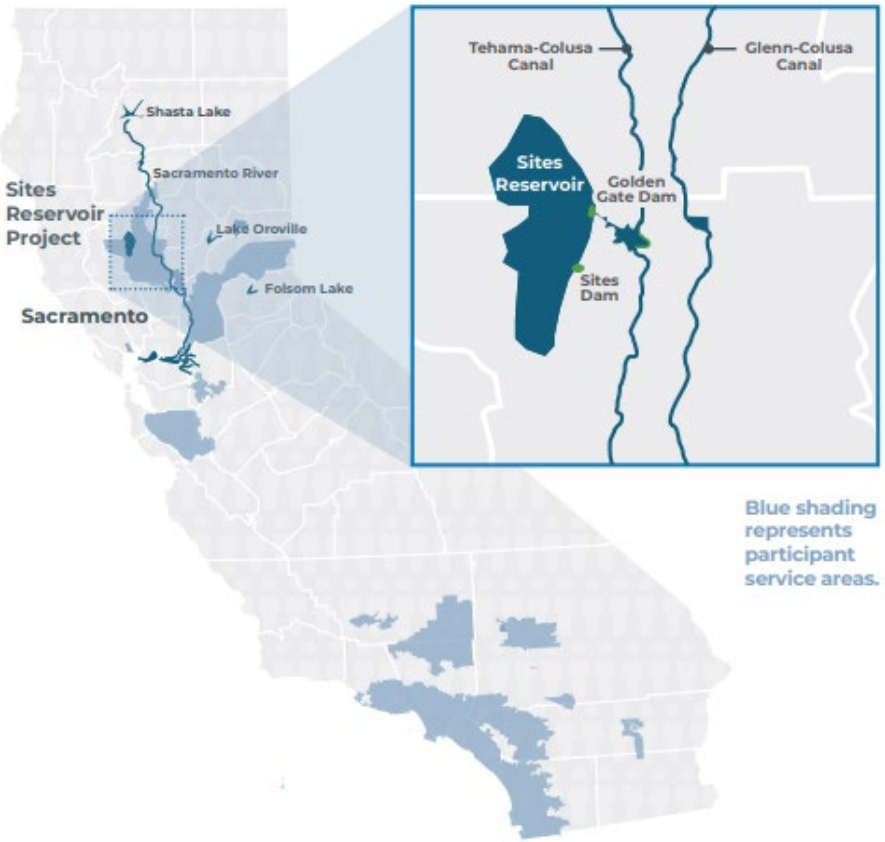


Figure 3-6. Proposed location of Sites Reservoir

Source: Sites Project Authority

P-8. Los Vaqueros Reservoir Expansion and Transfer-Bethany Pipeline

Description: Los Vaqueros Reservoir is an off-stream reservoir owned by CCWD. The reservoir was expanded to 160,000 AF in 2012 (Phase 1) and CCWD is planning a further expansion to 275,000 AF as Phase 2, along with construction of the new Transfer-Bethany Pipeline that would connect the reservoir to the SBA. The reservoir expansion would provide storage (and potentially some new supply) and enable more operational flexibility. Additionally, the Transfer-Bethany Pipeline would provide new conveyance for Zone 7, improving resilience and facilitating future transfers.

Benefits: Provides storage, conveyance, and operational flexibility. Project has already gone through environmental review and can be implemented in the next 5 to 10 years.

Challenges/Considerations: Although there is potential for some new water supply, Zone 7 is primarily evaluating the project for storage, due to increasing Delta restrictions and the uncertainty around new supply availability.

Potential Partners: Zone 7 and other regional partners

Estimated Yield: 10,000 AF of storage for Zone 7; average delivery 1,600 AFY (400 AFY for DSRSD)*

Capital Cost: Zone 7's share TBD. ***(For initial comparison purposes, assumed to be on the order of $10M)*****

Unit Cost: $1,700/AF for Zone 7***

**Average delivery based on Zone 7's 2019 WSE Update, assuming approximately 25 percent of the yield would go to DSRSD (based on portion of Zone 7's total direct demand).*
*** Total capital cost is approximately $900M, with an estimated 23 percent funded by local partners. Local partners' shares are still being determined and will depend on partner participation and usage.*
****Unit cost from Zone 7's 2019 WSE Update, inflated to 2021 dollars. Estimate is expected to change significantly as partners' participation is confirmed.*

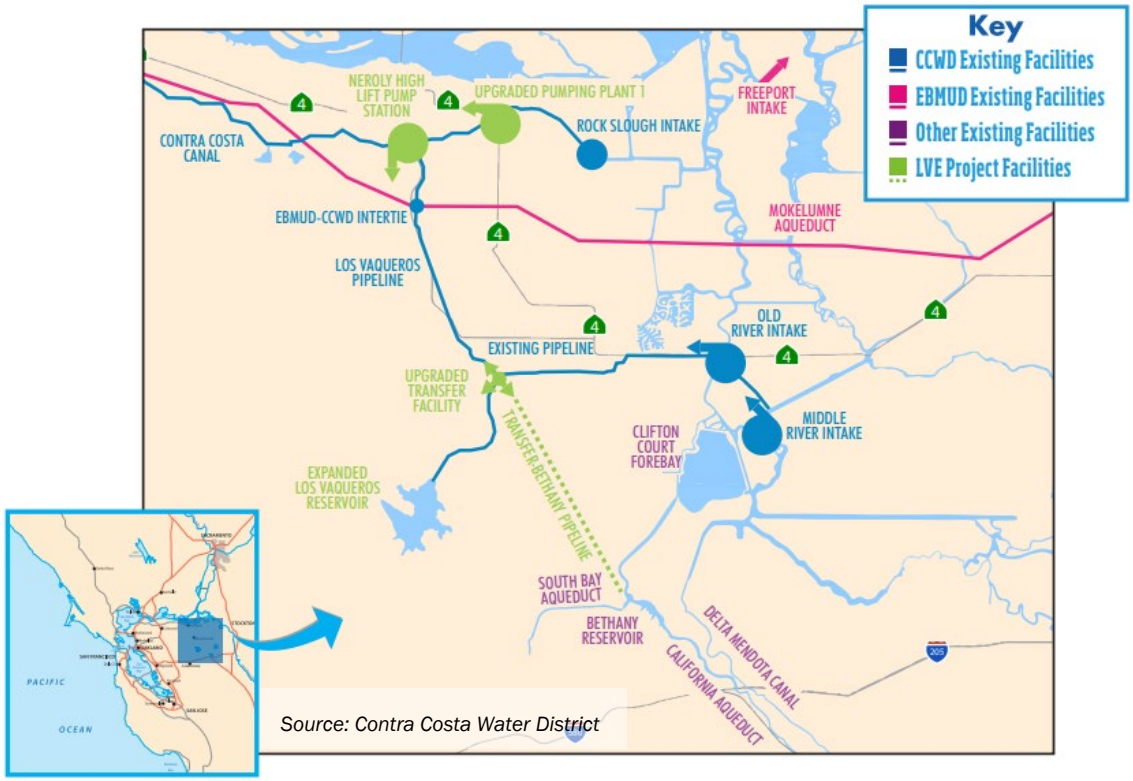


Figure 3-7. Proposed Los Vaqueros Reservoir Expansion project facilities

NP-1. Recycled Water Storage in Chain of Lakes

Description: A 2004 memorandum of understanding between DSRSD and Zone 7 includes collaborative efforts to find up to 1,200 AF of recycled water storage. Zone 7 has identified Lakes F and G as suitable for recycled water storage; however, these lakes are still being mined for gravel and Zone 7 may not acquire them until as late as 2060. While earlier acquisition may be possible, it would require negotiating with the quarry owners and operators, which is likely to be costly. This alternative includes constructing a pipeline to convey tertiary treated recycled water to/from Lake G seasonally. Water would be pumped to the lake in the winter months, for later use in the summer months.

Benefits: Helps meet future recycled water demands, reduces peak potable demands, and partially offsets the need for new supplemental potable supply. Using stored water to meet peak demands would enable expansion of the recycled water program year-round and reduce effluent discharge to the San Francisco Bay.

Challenges/Considerations: Timing is too far off to meet water supply needs and early acquisition would be costly. Additionally, there could be potential water quality challenges with surface storage (e.g., algae growth), which may require additional treatment.

Potential Partners: DSRSD, Zone 7, EBMUD, DERWA

Estimated Yield: 1,200 AF of storage; would enable up to 3,200 AFY increase in recycled water use year-round (DERWA total).

Capital Cost: $130M (minimum)*

Unit Cost: $2,700/AF (minimum)* based on additional reuse year-round

** Preliminary cost estimate includes pumps and conveyance and assumes $1M/acre to acquire the land (approximately 40 acres for Lake G). Actual cost of acquiring the land would depend on negotiations and could be significantly higher. O&M includes DERWA treatment and distribution costs, and savings from reduced wastewater discharge. Unit cost reflects annual payment (including O&M) over a 30-year period at 5 percent interest, divided by yield. Capital cost rounded up to the nearest $5M, unit cost rounded up to the nearest $100/AF. See Appendix C for more information.*

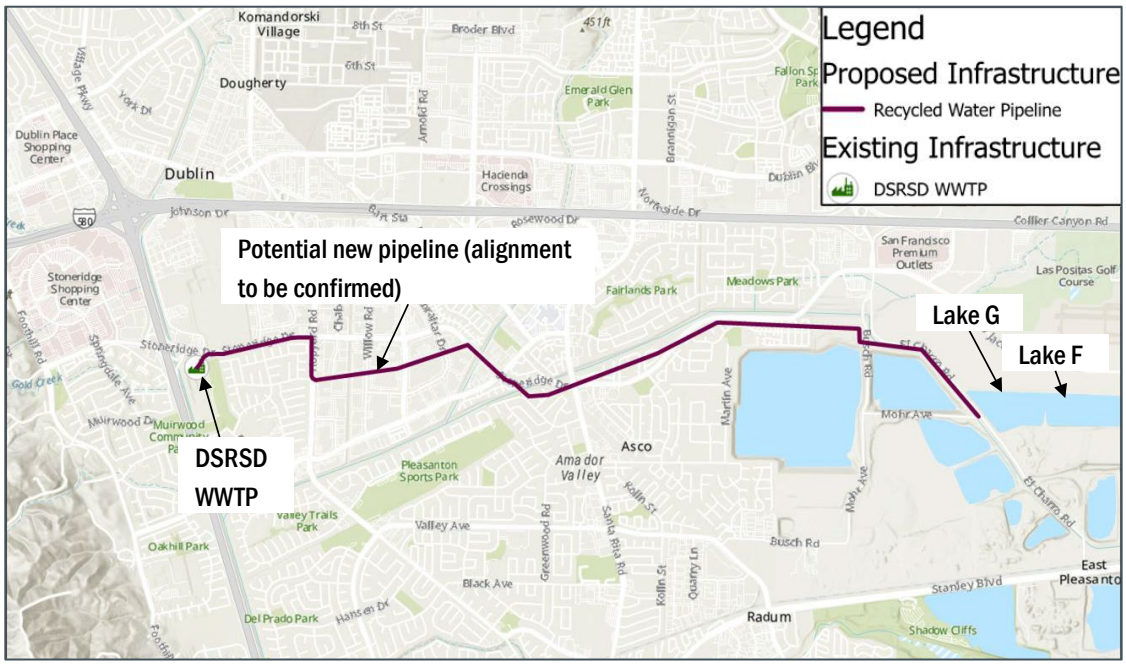


Figure 3-8. Potential future recycled water storage facilities

NP-2. Fringe Basin Groundwater

Description: Although the Fringe Basin generally has lower quality groundwater and pumping capacity than the Main Basin, it may be sufficient for non-potable uses. This concept would involve pumping groundwater from one or more Fringe Basin wells to supplement the recycled water supply in summer months, which would also enable greater recycled water use in the shoulder months. DERWA has been exploring a pilot project at the Nursery Well (in San Ramon). The 2021 AWSS also considers potential well sites near DSRSD's WWTP or the Clean Water Revival line (currently used for brine disposal from Zone 7's groundwater demineralization facility), given proximity to DSRSD's recycled water system. Zone 7's sampling of nearby wells in 2021 will provide a sense of existing water quality conditions in this area.

Benefits: Helps meet future recycled water demands, reduces peak potable demands, and partially offsets the need for new supplemental potable supply. Enables expanded recycled water use in the shoulder months and reduces wastewater discharge.

Challenges/Considerations: Pumping capacity and water quality are unknown and require further investigation (Zone 7 groundwater studies are in progress).

Potential Partners: DSRSD, Zone 7, EBMUD, DERWA

Estimated Yield: 800 AFY of groundwater; would enable up to 2,600 AFY increase in recycled water use year-round (DERWA total)*

Capital Cost: $15M*

Unit Cost: $1,000/AF* based on groundwater plus additional reuse in shoulder months

** Preliminary yield and cost estimates assume three wells operating five months/year at 400 gallons per minute (gpm) and up to 1.5 miles of new conveyance. Number, location, and capacity of wells would need to be confirmed through field investigations. O&M includes DERWA treatment and distribution costs, and savings from reduced wastewater discharge. Unit cost reflects annual payment (including O&M) over a 30-year period at 5 percent interest, divided by yield. Capital cost rounded up to the nearest $5M, unit cost rounded up to the nearest $100/AF.*

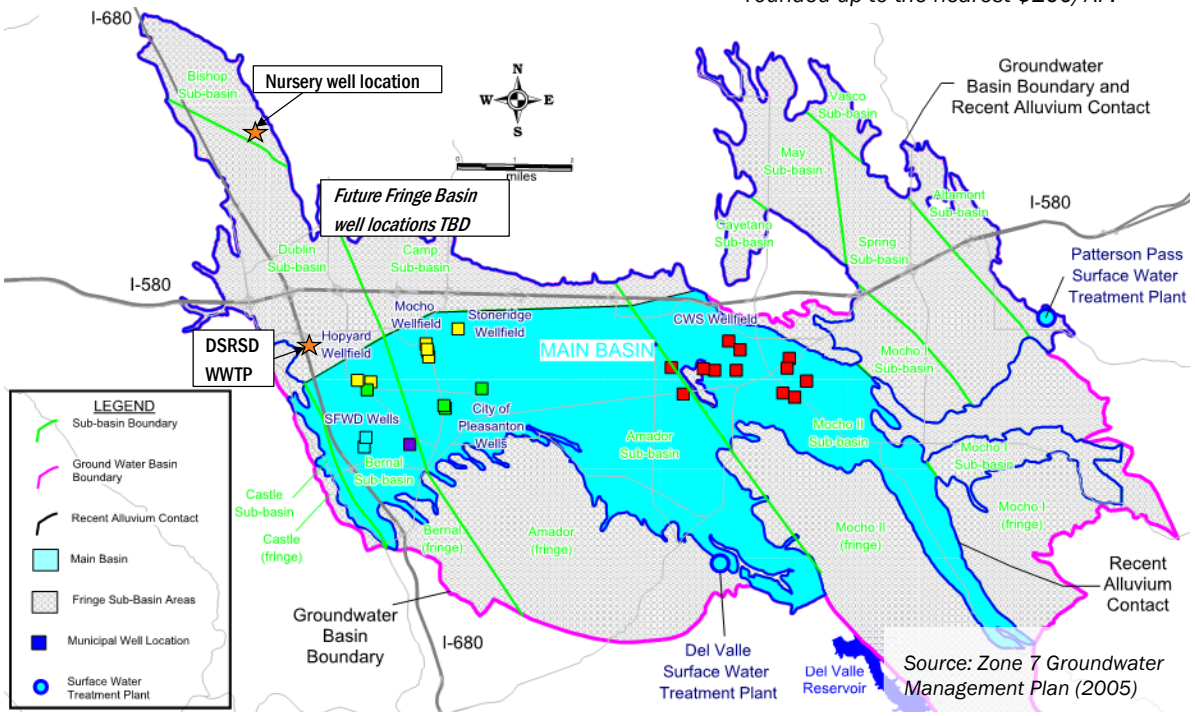


Figure 3-9. Groundwater basin overview

NP-3. Groundwater from Hopyard 7 Well

Description: Zone 7's Hopyard 7 well is located within the Pleasanton Sports Park, though is not connected to the potable distribution system due to elevated levels of arsenic, manganese, and boron. While not suitable for drinking water, this concept would make use of Hopyard 7 to supplement the recycled water supply. Groundwater from Hopyard 7 could be conveyed to DSRSD's WWTP by pumping to a nearby sewer. This approach would blend the groundwater with wastewater, diluting the concentration of contaminants to a level that may be acceptable for irrigation (to be confirmed).

Benefits: Helps meet future recycled water demands, reduces peak potable demands, and partially offsets the need for new supplemental potable supply. Enables expanded recycled water use in the shoulder months and reduces wastewater discharge. Makes use of an otherwise idle well and frees capacity for Zone 7 to recharge the groundwater basin with higher quality water.

Challenges/Considerations: Requires understanding of existing and maximum allowable contaminant levels to avoid negative impacts and ensuring that groundwater is not used outside of Zone 7's service area. Potentially requires outreach and education to overcome public perception challenges.

Potential Partners: DSRSD, Zone 7, possibly Pleasanton or LAVWMA for options to convey flow to DSRSD WWTP

Estimated Yield: 1,000 AFY of groundwater; could enable up to 1,400 AFY increase in recycled water use year-round (for DSRSD)

Capital Cost: $5M*

Unit Cost: $900/AF* based on groundwater plus additional reuse in shoulder months

**Preliminary cost estimate assumes groundwater can be pumped to a nearby sewer for conveyance to DSRSD's WWTP (route and capacity to be confirmed). If separate conveyance is required, cost would increase. O&M includes recycled water treatment and distribution costs, and savings from reduced wastewater discharge. Unit cost reflects annual payment (including O&M) over a 30-year period at 5 percent interest, divided by yield. Capital cost rounded up to the nearest $5M, unit cost rounded up to the nearest $100/AF.*

Figure 3-10. Zone 7's Hopyard 7 well

NP-4. RO Reject from Zone 7's Groundwater Demineralization Facility

Description: Zone 7's Mocho Groundwater Demineralization Plant uses RO technology to treat groundwater. The RO reject (or brine) from this process is currently conveyed through the Clean Water Revival line to the Livermore-Amador Valley Water Management Agency (LAVWMA) export pipeline and discharged to the San Francisco Bay. This concept would involve intercepting and blending (with wastewater/ groundwater) or re-treating the RO reject to reduce the salt concentration to a level appropriate for irrigation. However, timing and quantity of brine releases depend on Zone 7's operations and are not consistent or predictable.

Benefits: Helps meet future recycled water demands, reduces peak potable demands, and partially offsets the need for new supplemental potable supply.

Challenges/Considerations: On average, less than 0.5 mgd of brine is available. Given the variability and unpredictability of timing and quantity of flow, it is unlikely this alternative would enable expansion of the recycled water program.

Potential Partners: DSRSD, Zone 7, DERWA, EBMUD

Estimated Yield: 100 AFY (may not be available when needed)

Capital Cost: $10M*

Unit Cost: $7,000/AF*

** Estimated cost for a second RO facility to treat the brine, assuming 0.5 mgd of brine is available on average. Assumes the plant operates 5 months out of the year with a 50 percent recovery rate. Unit cost reflects annual payment (including O&M) over a 30-year period at 5 percent interest, divided by yield. Capital cost rounded up to the nearest $5M, unit cost rounded up to the nearest $100/AF.*

Figure 3-11. Potential RO reject treatment alternative

NP-5. Wastewater from Neighboring Agency

Description: CCCSD and Livermore currently discharge wastewater effluent year-round, though both agencies are planning future reuse projects and reserving their wastewater for these future uses. CCCSD has entered a temporary (three-year) agreement with DERWA to divert available wastewater, which may be renewed for two successive one-year terms. However, the agreement cannot extend beyond a total of five years unless separately negotiated. This concept would involve a longer-term diversion from either CCCSD or Livermore if future conditions enable a new agreement with either agency.

Benefits: Helps meet future recycled water demands, reduces peak potable demands, and partially offsets the need for new supplemental potable supply. Enables expansion of the recycled water program year-round and reduces wastewater discharge to the San Francisco Bay.

Challenges/Considerations: Long-term availability of wastewater is uncertain and depends on status of other local and regional projects (e.g., Tri-Valley Potable Reuse). Currently, both CCCSD and Livermore are reserving wastewater for future uses.

Potential Partners: DSRSD, DERWA, CCCSD, City of Livermore, EBMUD

Estimated Yield: 1,400 AFY of wastewater; would enable up to 3,400 AFY increase in recycled water use year-round (equivalent to total DERWA buildout demands).

Capital Cost: TBD*

Unit Cost: $600/AF based on additional reuse year-round**

**Potential capital expenses may include cost of acquiring wastewater and/or new diversion facilities (would depend on terms of agreement).*
***Includes cost of wastewater treatment and disposal of unused effluent (summer months); includes DERWA costs and LAVWMA discharge savings in the shoulder months; does not include cost of new diversion facilities or wastewater acquisition. See Appendix C for more information.*

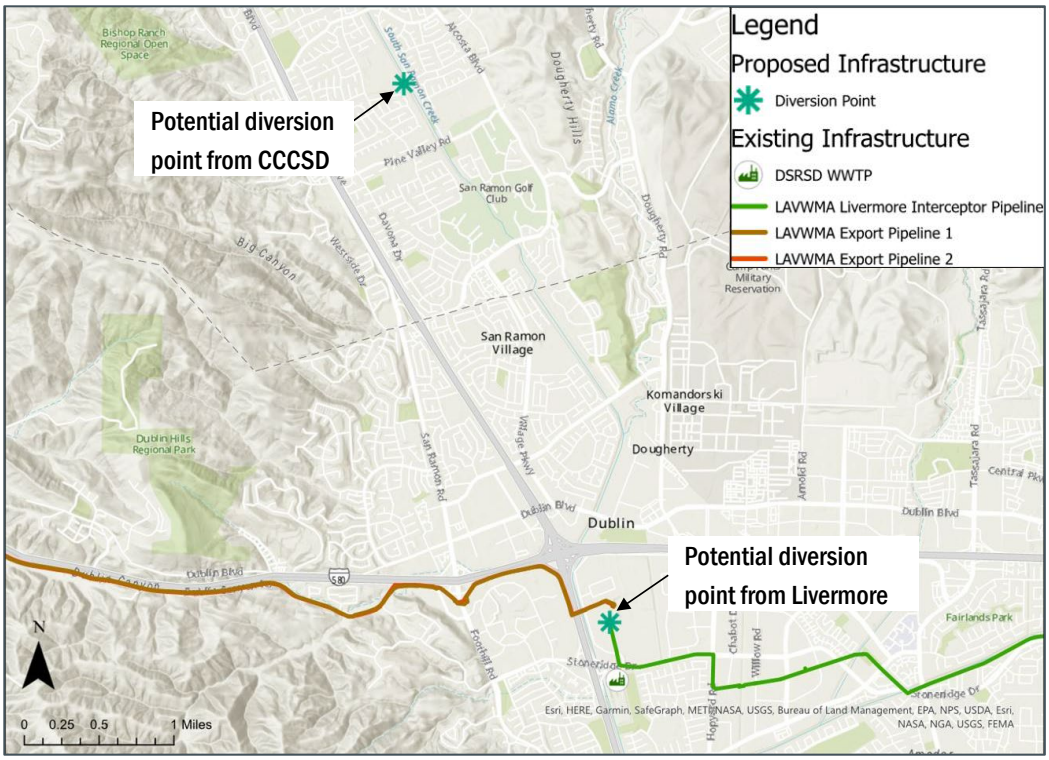


Figure 3-12. Potential wastewater diversion points from CCCSD and Livermore

Section 4

Alternatives Evaluation

The 2021 AWSS evaluation involved a multi-step process that engaged key stakeholders along the way. As a first step, individual alternatives were evaluated based on their benefits and costs. Secondly, the most preferred alternatives were combined into four portfolios, each organized around a different overall goal (e.g., most resilient, lowest cost). These portfolios were tested against different uncertainties to determine relative risks. Lastly, feasible implementation timelines for alternatives in the preferred portfolios informed near-term recommendations and the long-term strategy. Ultimately, the recommended framework is a function of four elements: benefits, cost, risk, and timing.

Outcomes of the alternatives evaluation are described in this section. More details regarding evaluation criteria, scores, and weights are provided in Appendix B.

4.1 Benefits and Costs

Through a workshop exercise, the project team identified nine evaluation criteria that are measurable, independent, and established without considering the specific alternatives (Table 4-1). These criteria are framed as benefits where a higher score is better. All criteria were evaluated qualitatively, except for dry-year supply. Details on the qualitative and quantitative scores in addition to a sensitivity analysis are provided in Appendix B. For this analysis, cost was considered separately and used to screen out alternatives with relatively high costs compared to benefits.

Table 4-1. Evaluation Criteria

Criteria	Description	Quantitative	Qualitative
1. Regulatory Feasibility	Anticipated or established regulations. Alternative can be permitted and/or similar projects have been permitted.		■
2. Technical Feasibility	Feasibility of design, construction, and operation from a technical/engineering standpoint.		■
3. Institutional Complexity	Ease of implementation and operation from an institutional standpoint (e.g., willingness of external partners)		■
4. Community Support	Public perception and support from key stakeholders, local leaders, and non-governmental organizations		■
5. Dry-year Supply	Anticipated dry-year yield (in AFY)	■	
6. Resilience to Shocks	Increased redundancy and resilience to emergency events/outages (e.g., seismic risk, levee failure)		■
7. Local Control	Local (non-imported) supply source		■
8. Water Quality	Improves delivered water quality and avoids sources contaminated with constituents of emerging concern (e.g., Perfluoroalkyl and polyfluoroalkyl substances [PFAS])		■
9. Environmental Sustainability	Potential environmental impacts during construction or operation of the alternative, including water quality and energy usage (greenhouse gas [GHG] impacts)		■

Each alternative (from Table 3-3) was scored against these nine criteria to develop an overall composite benefit score. Figure 4-1 shows an example of the overall benefit scores for the alternatives, with longer bars (i.e., projects towards the top of the list) indicating greater benefits. This initial step did not provide enough information to screen out any alternatives. Rather, it helped to highlight the different types of benefits offered by each alternative. For example, P-5 (Intertie) and P-6 (Delta Conveyance) do not provide any dry-year supply and, therefore, did not score very highly as a result. However, when paired with a supply alternative, new conveyance can help ensure access to the supply and provide greater resilience. To demonstrate this, P-6 (Delta Conveyance) and P-7 (Sites Reservoir) were evaluated separately (as individual alternatives) and as a combined alternative. Figure 4-1 demonstrates that these alternatives offer greater benefits when combined. Other alternatives would also score better if combined—such as Regional Desalination paired with a new intertie and/or Los Vaqueros Reservoir Expansion.

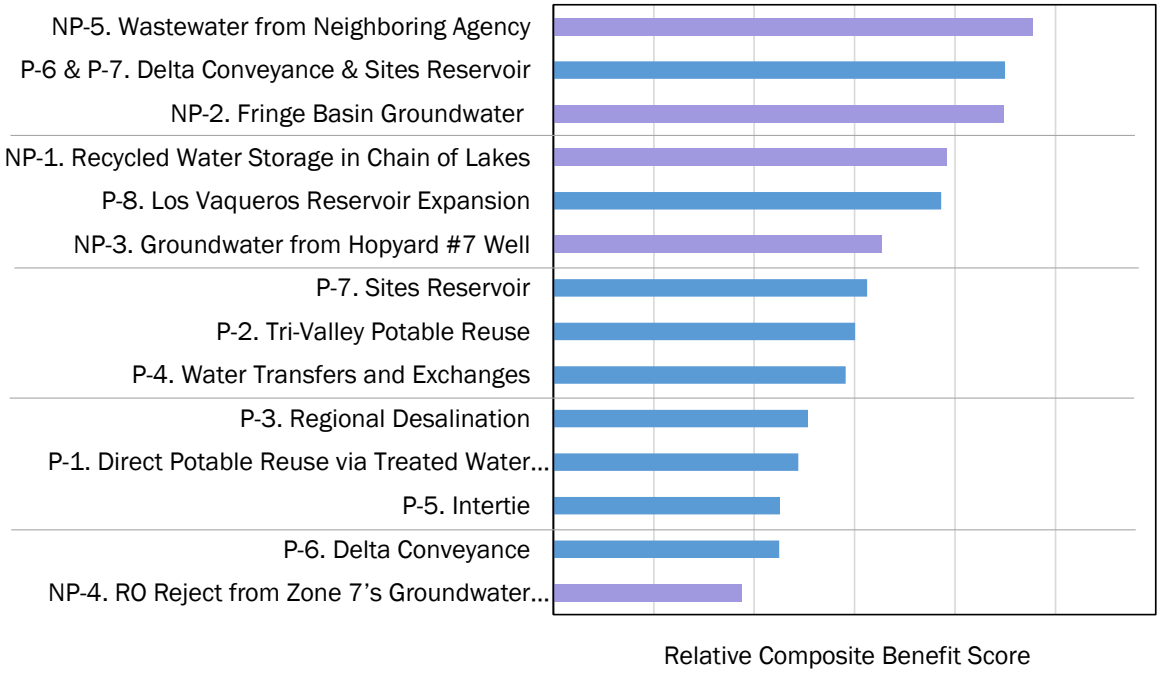


Figure 4-1. Example of relative composite benefit score for different alternatives

For a high-level comparison, preliminary capital cost estimates were prepared for DSRSD-led alternatives based on initial assumptions. For Zone 7-led alternatives, costs were pulled from previous studies and inflated to 2021 dollars (and in some cases, adjusted based on revised project cost estimates). Unit costs were calculated for DSRSD-led alternatives by dividing the annual payment (including O&M) by the expected annual yield. (Note: Unit costs reflect a 30-year payback period and 5 percent interest for consistency with the approach used in previous studies for Tri-Valley Potable Reuse and Regional Desalination; however, other assumptions may vary between studies).

Preliminary unit cost estimates are labeled and shown as dark horizontal lines in Figure 4-2. The error bars on either side of the estimate represent a level of accuracy of -50 to +100 percent. Further refinement is needed to directly compare costs across different levels of treatment, due to differing assumptions. Additionally, more detailed analysis is needed to determine rate impacts for DSRSD customers. More details on the cost estimates, including references and assumptions, are included in Appendix C.

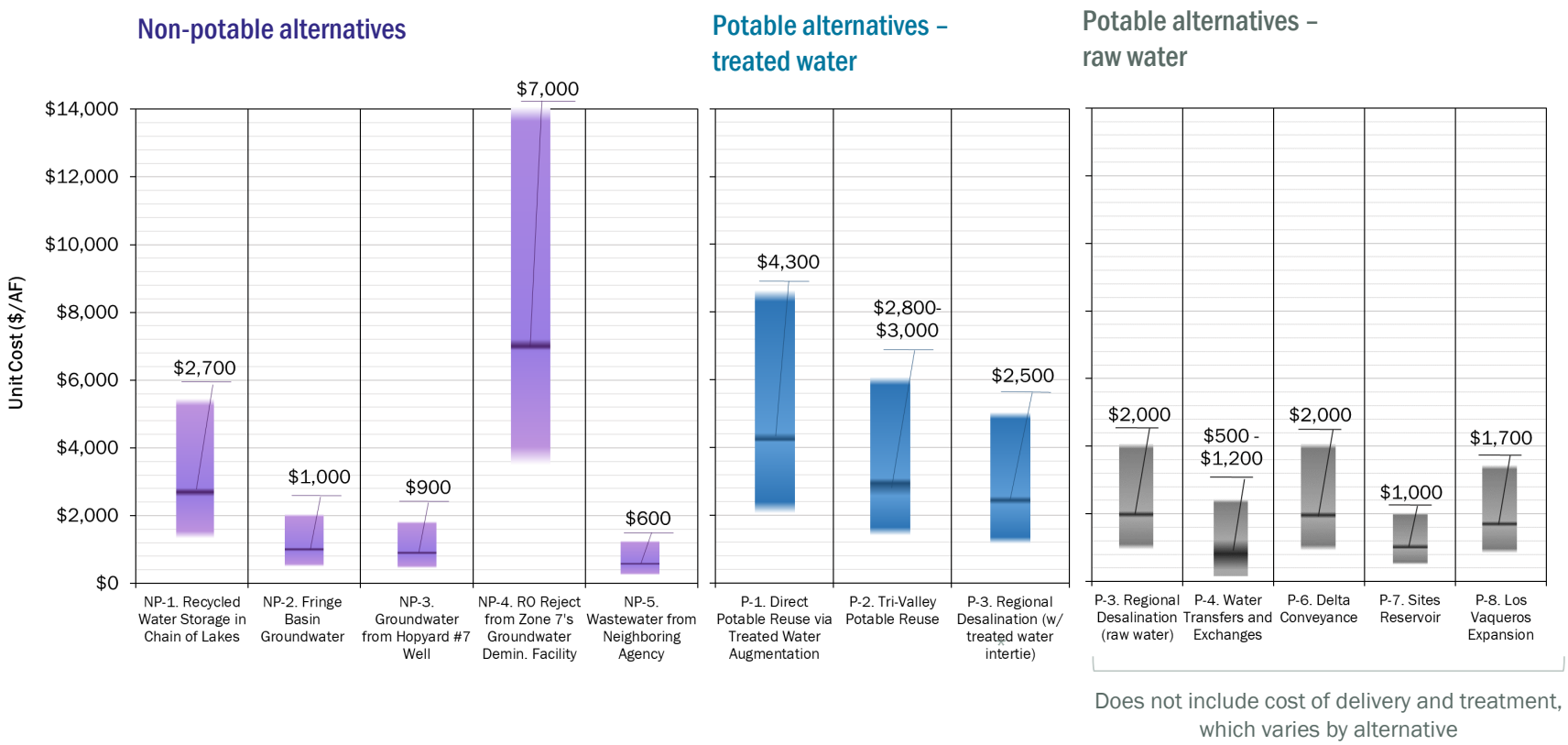


Figure 4-2. Estimated unit costs for alternatives

Costs represent initial estimates and will be refined as more information is available. Not all costs are directly comparable due to differing assumptions. See Appendix C for more information.

Plotting relative benefit scores against unit cost reveals that some alternatives have relatively high cost compared to benefit. As shown in Figure 4-3, the following two non-potable alternatives were eliminated from further evaluation at this stage:

- **NP-1 (Recycled Water Storage in Chain of Lakes)** was screened out due to the unavailability of the lakes in the foreseeable future, as the cost of negotiating with the quarry owners for early acquisition would drive the cost significantly higher. The potential need to re-treat water after storage (e.g., due to algal blooms) would also drive the cost higher than shown.
- **NP-4 (RO Reject from Zone 7's Groundwater Demineralization Facility)** was screened out due to its significant cost and minimal benefit, given the unpredictability of brine flow from Zone 7.

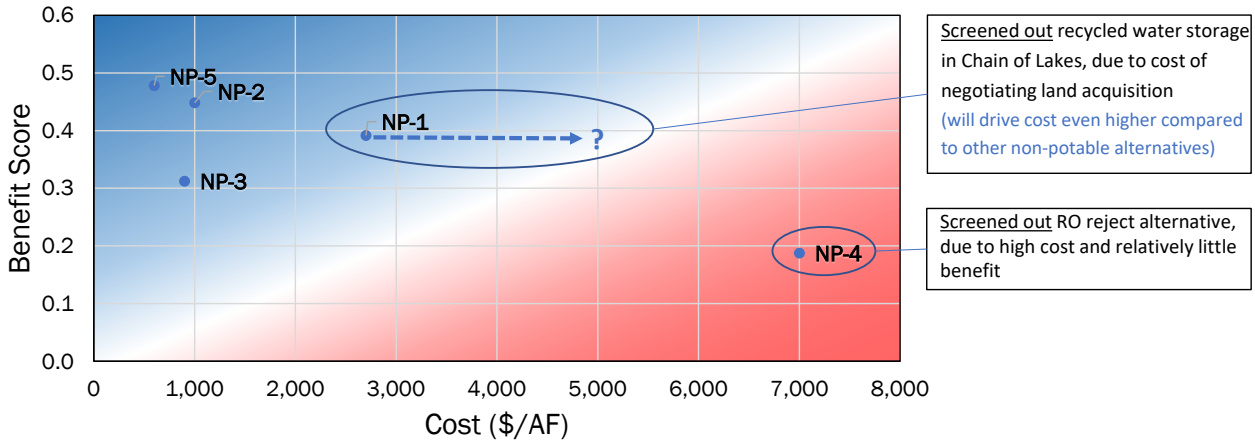


Figure 4-3. Non-potable alternatives' benefit versus cost

Although P-1 (DPR via Treated Water Augmentation) has slightly higher cost compared to benefit than the other potable alternatives, it is still within the same margin of error given the level of uncertainty in preliminary cost estimates (Figure 4-4). Therefore, all potable supply, storage, and conveyance alternatives were carried forward to the next step of the evaluation.

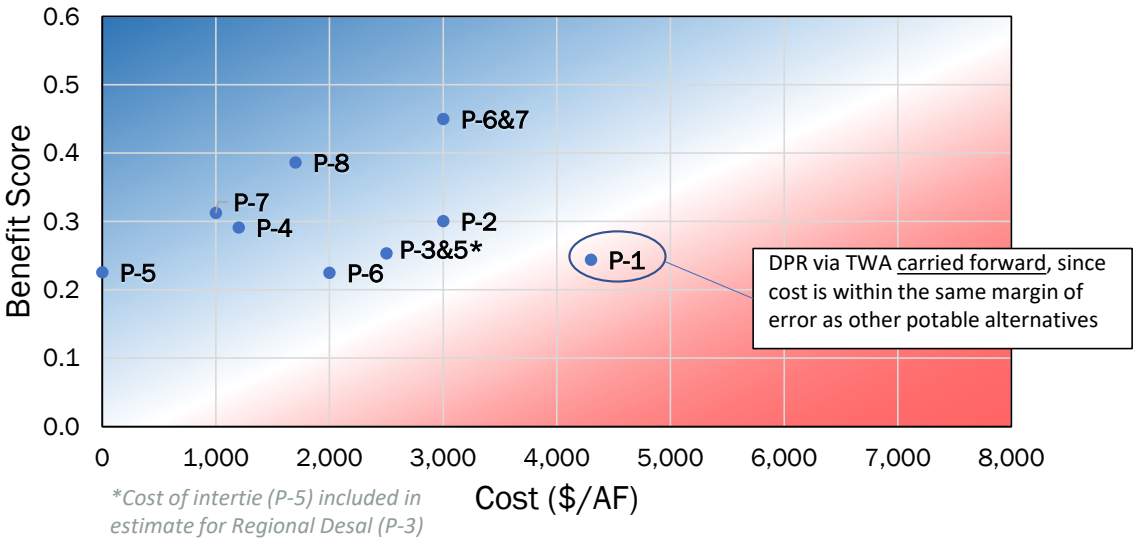


Figure 4-4. Potable alternatives' benefits versus cost

Note: For alternatives with a range of costs, higher value is shown.

4.2 Portfolio Analysis

Following the analysis of benefits and costs, the remaining alternatives were combined into four portfolios, built around different goals. Each portfolio offers different amounts of supply, storage, and conveyance, based on the portfolio's goal. Zone 7's 2020 UWMP sample portfolio was included for reference.

- Reference Portfolio: Zone 7's 2020 UWMP
- Portfolio 1: Maximize DSRSD Control
- Portfolio 2: Maximize Resilience
- Portfolio 3: Align with DSRSD's 2015 Water Policy (as possible)
- Portfolio 4: Minimize Cost

Each portfolio is described below, with portfolio elements (supply, storage, and conveyance) shown in Figure 4-5. Figure 4-6 shows how each portfolio contributes to DSRSD's overall supply diversification. Estimated supply quantities in each portfolio are based on projected long-term average yield for DSRSD. For alternatives led by Zone 7, yield for DSRSD is assumed as 25 percent of the projected long-term average yield for Zone 7, based on DSRSD's portion of Zone 7's direct demand. For non-potable alternatives, the yield reflects the assumed portion of recycled water that would be allocated to DSRSD. Expected yield from Hopyard 7 assumes there may be some curtailment of pumping from the Main Basin in dry years. Actual quantities from each supply source will vary year-to-year (e.g., depending on environmental conditions and operational strategies).

Reference Portfolio: Zone 7's 2020 UWMP. This portfolio includes projects selected in Zone 7's 2020 UWMP sample portfolio for 2040. (Note: Zone 7 also includes water transfers as an interim supply through 2030, until other projects come online).

Portfolio 1: Maximize DSRSD Control. This portfolio includes alternatives that DSRSD can pursue independently. DPR via Treated Water Augmentation is the only potable alternative DSRSD can pursue fully independently. Fringe Basin groundwater would require coordination with Zone 7 (particularly during initial investigations) and EBMUD/DERWA; however, it is included in this portfolio as it would not require a new agreement—unlike the other non-potable alternatives.

Portfolio 2: Maximize Resilience. This portfolio prioritizes new conveyance, storage, and drought-resilient supplies, optimizing for reliability and flexibility. It is very similar to Zone 7's UWMP portfolio, with the addition of recycled water. Water transfers can augment SWP supply in the near-term while other projects are being developed.

Portfolio 3: DSRSD 2015 Water Policy. This portfolio attempts to achieve DSRSD's 2015 Water Policy goals for local control, concentration risk, and conveyance by including as many projects as possible. Wastewater from a neighboring agency is included since it is the non-potable alternative with the greatest potential yield; however, this alternative is not feasible without a willing partner. Although this portfolio comes closest to meeting the policy goals, no combination of alternatives fully achieves the goals established in 2015, as demonstrated in Figure 4-6.

Portfolio 4: Minimize Cost. This portfolio aims to minimize cost—and by doing so, compromises other benefits (e.g., less diversification or local/regional supplies).

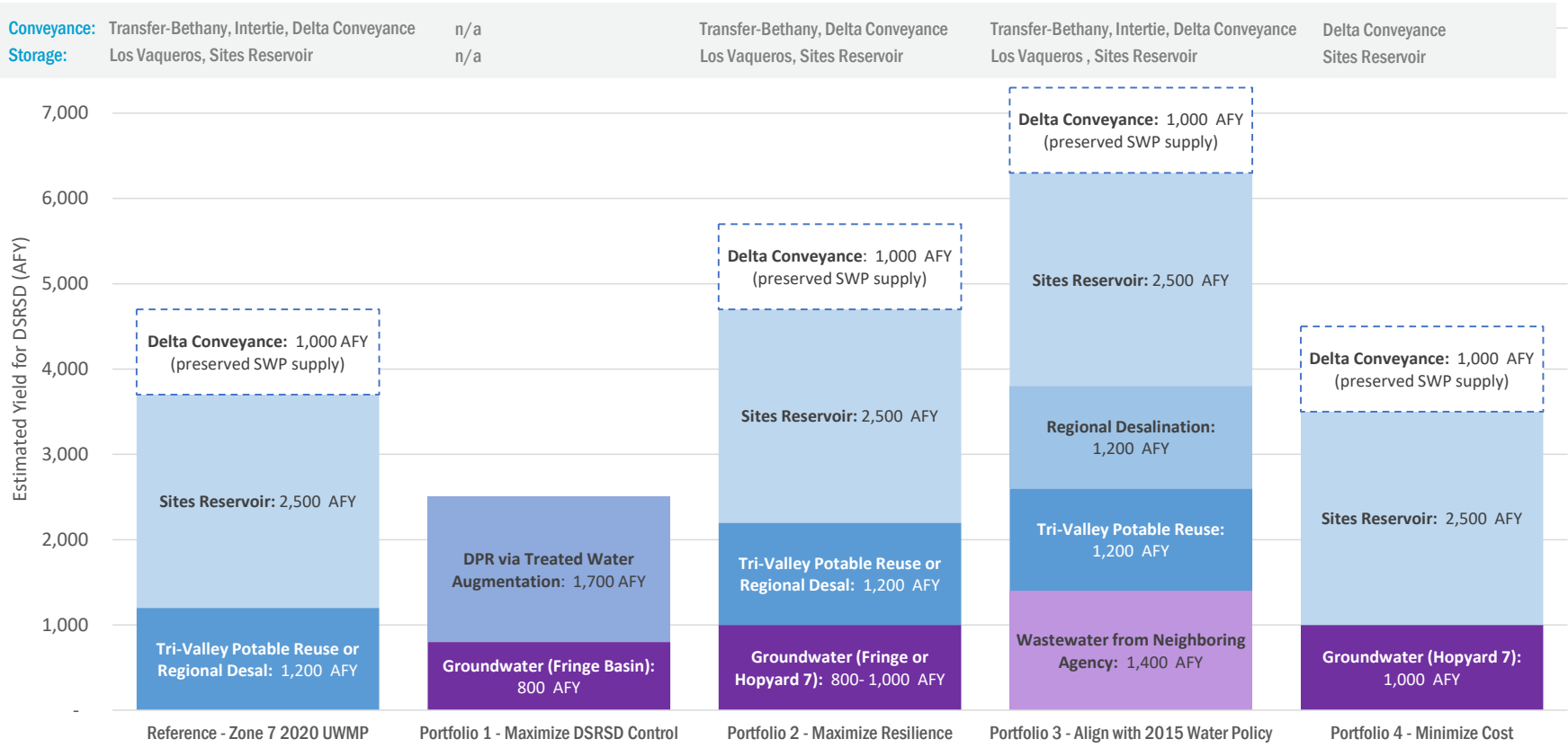


Figure 4-5. Supply, conveyance, and storage elements of portfolios

Notes:

1. *For alternatives led by Zone 7, estimated yield for DSRSD is assumed as 25 percent of the projected long-term average yield for Zone 7, since DSRSD makes up approximately one fourth of Zone 7's direct demands. Actual supply quantities will vary year-to-year depending on environmental conditions and Zone 7's operating strategies. For non-potable alternatives, estimated yield reflects the assumed portion of supply that would be allocated to DSRSD.*
2. *Actual supply benefit of Delta Conveyance is still being determined, and Zone 7's 2020 UWMP shows no supply from Delta Conveyance to be conservative. As an initial estimate, the 2021 AWSS assumes Delta Conveyance would protect against a 5 percent decrease in SWP supply (since SWP reliability is projected to decrease from 59 percent to 54 percent in the absence of action), which equates to approximately 4,000 AFY of Zone 7's Table A allocation (or about 1,000 AFY for DSRSD).*

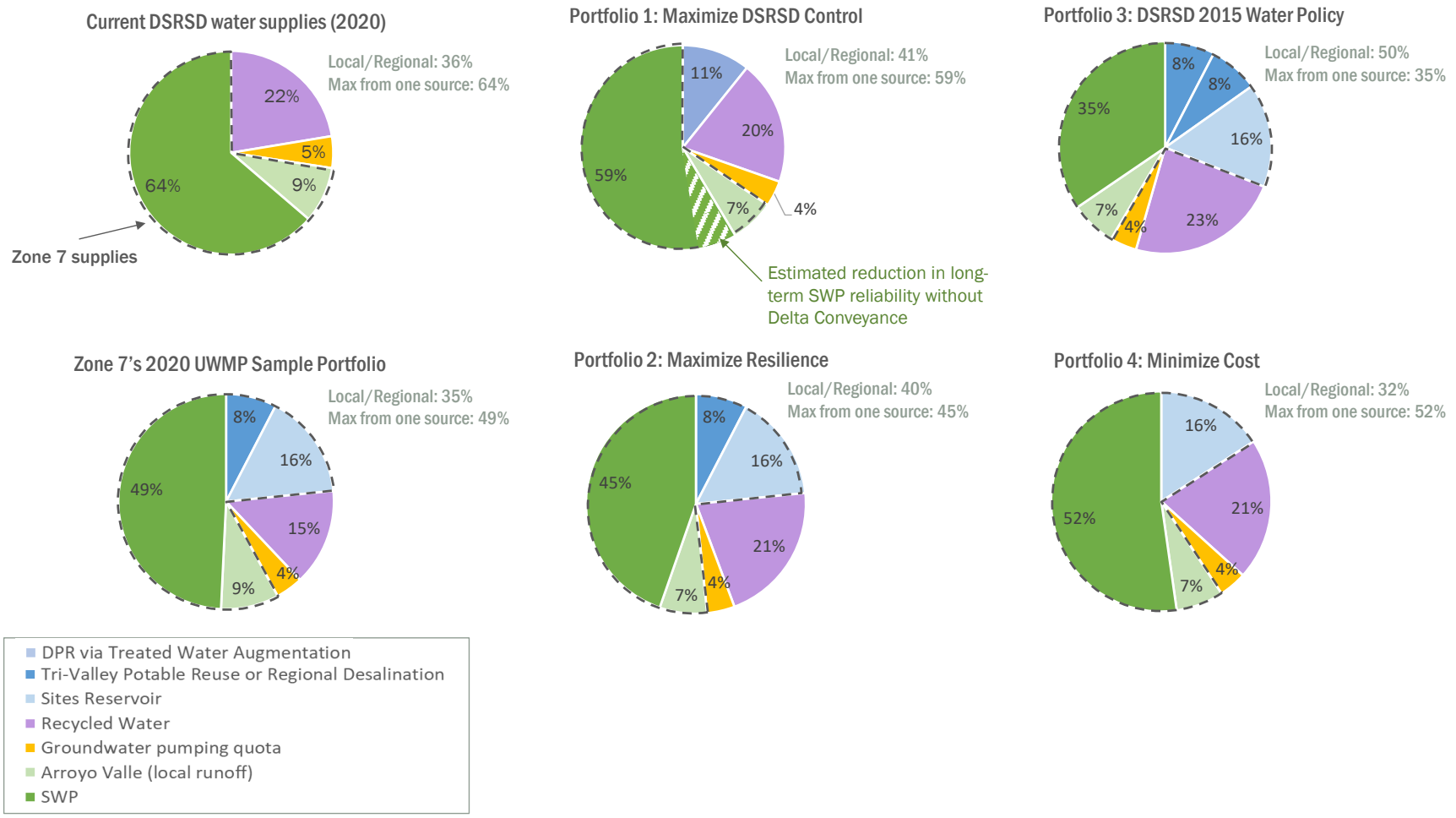


Figure 4-6. Contribution of portfolios to DSRSD's overall supply diversification

Note: Pie chart showing current DSRSD water supplies (top left) is based on 2020 demands, while the others are based on buildout demands (total volume of supply is not shown to scale).

Zone 7's 2020 UWMP sample portfolio would make substantial progress towards new and diverse supplies, storage, and conveyance compared to current conditions. Portfolios 2 and 3 contain many of the same elements as Zone 7's 2020 UWMP sample portfolio, with the addition of expanded recycled water supply. These two portfolios yield more supply than the reference portfolio and make further progress toward DSRSD's 2015 policy goals, while remaining within the same cost range (Table 4-2).

Table 4-2. Summary of Portfolio Yields and Costs

	Reference Portfolio: Zone 7's 2020 UWMP	Portfolio 1: Maximize DSRSD Control	Portfolio 2: Maximize Resilience	Portfolio 3: DSRSD 2015 Water Policy	Portfolio 4: Minimize Cost
Estimated Yield (AFY)					
New supply	3,700	2,500	4,500 to 4,700	6,300	3,500
Preserved SWP supply	1,000	0	1,000	1,000	1,000
Capital Cost ($ millions)	$435-$625	$115	$385-$585	$570-$710	$290
Unit Cost for new and preserved supply ($/AF)	$1,600-$1,700	$3,200	$1,400-$1,600	$1,600	$1,200
Local/regional supply (policy goal: ≥60%)	35%	41%	40%	50%	32%
Max. supply from single source (policy goal: ≤40%)	49%	59%	45%	35%	52%

Blue font = improved resiliency (compared to reference portfolio)
Red font = decreased resiliency (compared to reference portfolio)

4.3 Future Uncertainties

Various factors and uncertainties could compromise a project's success. For example, a key uncertainty is public perception—if the local community is opposed to a project, it may not be implemented. Therefore, the project team tested each portfolio against potential future uncertainties to determine its vulnerability under different conditions. Depending on the combination of alternatives in each portfolio, certain risks can be fully or partially mitigated.

The following four uncertainties were identified through a scenario planning workshop exercise, based on their potential to impact the success of water supply, storage, and conveyance alternatives identified in the 2021 AWSS.

- **Supply availability** – various factors (e.g., climate change, regulatory restrictions, seismic risk) can impact availability of different water supplies, including wastewater.
- **Regional collaboration** – many of the alternatives involve multi-party agreements. These could be at risk if partnerships fall through or key stakeholders are not willing to collaborate.
- **Public acceptance** – many of the alternatives involve non-traditional supplies or large construction projects, which could be at risk if local leaders, community members, or environmental stakeholders are not supportive.
- **Future water demands** – demand patterns are influenced by many factors, such as population, land use decisions, and climate. If future demands are higher than anticipated, the Tri-Valley may need new or different supply sources.

Figure 4-7 illustrates how each portfolio performs under these potential future conditions (taller bar = better performance). Portfolios that include Delta Conveyance and local/regional supplies are less at risk of supply constraints. Those that include alternatives DSRSD can pursue on its own are less affected by the lack of regional collaboration. Portfolios with more familiar supply sources may be less at risk of public perception challenges—however, public perception can also be improved through outreach and education (e.g., through pilot projects). Lastly, portfolios that yield greater amounts of supply are better equipped to meet higher than anticipated water demands. Overall, the most diverse portfolios (Portfolios 2 and 3) perform best under uncertainties.

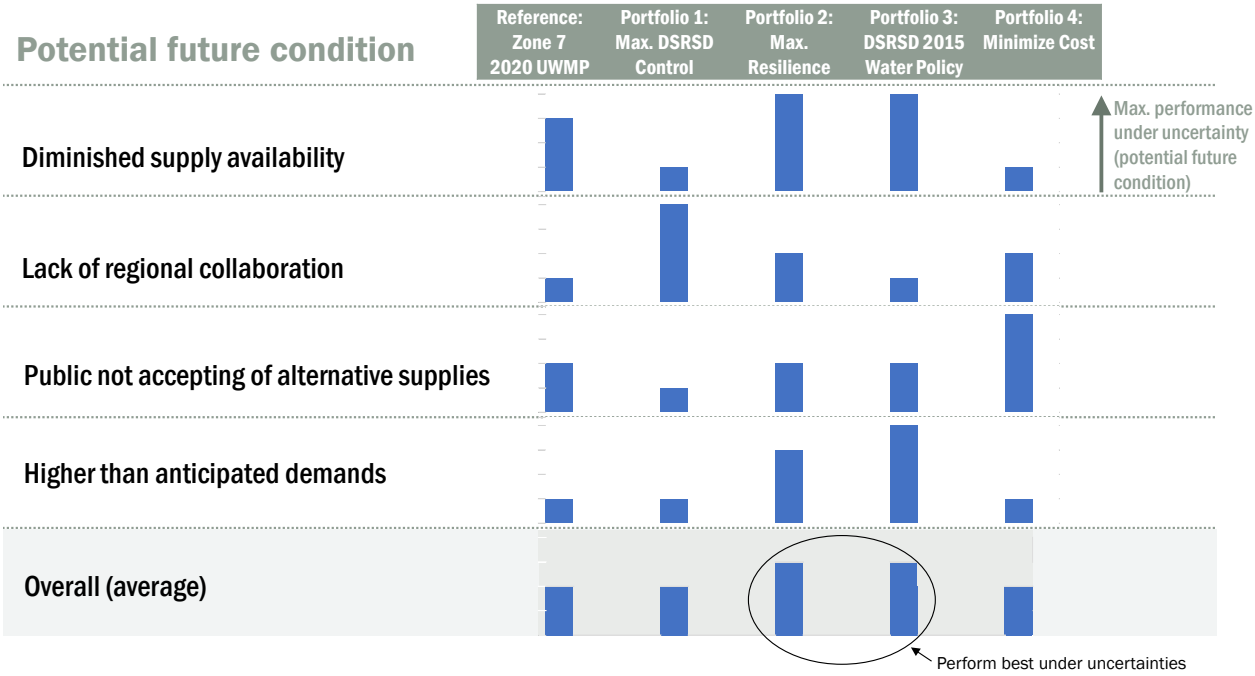


Figure 4-7. Portfolio performance under uncertainties

4.4 Key Takeaways

Based on the evaluation, the combination of alternatives in Portfolios 2 and 3 (shown to the right) offer multiple benefits and are most resilient to uncertainties. For many of these projects, additional studies are needed to further define the benefits and costs. Additionally, Zone 7 plans to update its WSE later in 2021. The update will include a more robust technical analysis of how various alternatives would complement existing water supplies and infrastructure and increase water resilience for the Tri-Valley.

In the near-term, it is recommended that DSRSD continue to support Zone 7's efforts, seek supplemental non-potable supply to expand the recycled water program, and explore potential near-term pilot projects to gather information and inform longer-term decisions.

Alternatives from preferred portfolios (Portfolios 2 and 3):

P-2. Tri-Valley Potable Reuse

P-3. Regional Desalination

P-5. Intertie

P-6 and P-7. Delta Conveyance and Sites Reservoir *(best when combined)*

P-8. Los Vaqueros Reservoir Expansion and Transfer-Bethany Pipeline

NP-2/NP-3. Groundwater from Fringe Basin or Hopyard 7

NP-5. Wastewater from Neighboring Agency *(requires willing partner)*

Key near-term recommendations:

- **Support Zone 7's efforts to pursue additional supply, storage, and conveyance.**
- **Explore near-term pilots to gather information and inform longer-term decisions.**
- **Seek supplemental non-potable supplies to expand the recycled water program.**

Section 5

Recommended Framework

The recommended framework incorporates elements from the preferred portfolios, considering feasible timing (Figure 5-1) to identify near-term actions and potential longer-term solutions. Some regional projects are well underway and on track to be implemented within the next 5 to 10 years. For example, the Los Vaqueros Reservoir Expansion project (including Transfer-Bethany Pipeline) has already completed environmental review. Other projects are less certain, with start and/or end dates dependent on various factors. Most non-potable projects could be implemented in less than five years if conditions allow for the project to move forward.

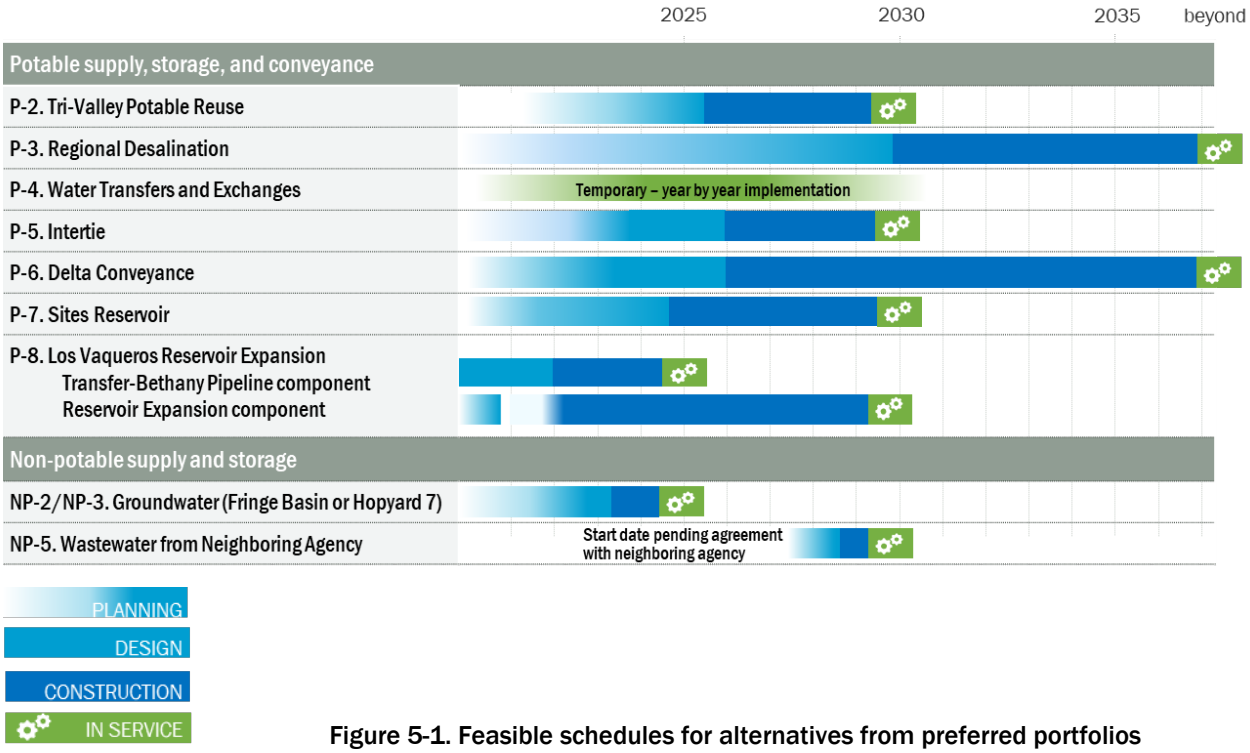


Figure 5-1. Feasible schedules for alternatives from preferred portfolios

Timing is approximate and dependent on if/when projects move forward.

Zone 7 is facing several key decision points in the next few years, including deciding whether to continue participation in the Los Vaqueros Reservoir Expansion (2021), Sites Reservoir (2021), and/or Delta Conveyance (2022) projects. Zone 7 will also be preparing its 2021 WSE Update later this year and evaluating the next phase of local water supply and water quality studies in 2022. Additionally, DSRSD's contract with Zone 7 for water supply will be up for renewal in 2024. DSRSD can take the following near-term steps to inform these decisions. Many of these efforts would complement and further support Zone 7's ongoing water supply efforts.

Near-term actions for DSRSD

Support Zone 7's efforts	
Advocate for Zone 7's continued participation in the Los Vaqueros Reservoir Expansion Project (including Transfer-Bethany Pipeline).	Given that this project has already completed environmental review and components can be online in the next 5 to 10 years, it offers near-term reliability and provides more certainty than projects that are still in the early planning stages. Additionally, the Transfer-Bethany Pipeline provides an alternate conveyance method to move water into the Tri-Valley.
Support Sites Reservoir with Delta Conveyance.	Sites Reservoir would provide storage and new supply for the Tri-Valley. Because the reservoir is located north of the Delta, bundling this project with Delta Conveyance (which would help protect against sea level rise, earthquakes, and other Delta disruptions) would enable more reliable access to the supply.
Explore possible near-term pilots	
Potable reuse pilot with Alameda County Water District (ACWD), Union Sanitary District (USD), Zone 7, and the City of Livermore.	This concept (further described on page 5-3) would include construction of an advanced water purification pilot facility at DSRSD's WWTP and deliver purified water to ACWD via Alameda Creek. This pilot would provide a regional demonstration project, collect data to inform future regional potable reuse projects, and make use of wastewater effluent currently discharged to San Francisco Bay. Longer-term, this project could also include a transfer/exchange, by which ACWD would provide one of its water sources to DSRSD or Livermore (via Zone 7) in exchange for purified water.
Pilot Transfer with Zone 7 and EBMUD.	This pilot transfer (further described on page 5-4) would utilize DSRSD's existing emergency interties with EBMUD. Although EBMUD's distribution system has limited capacity and is not designed for long-term, every year wheeling arrangements, a short-term pilot could demonstrate viability of this concept to support future dry-year or emergency transfers and inform possible future projects (e.g., a potential EBMUD-Zone 7 emergency intertie).
Seek supplemental non-potable supply	
Work with Zone 7 to collect more data on the Fringe Basin and Hopyard 7 well.	The Fringe Basin has limited potable supply potential due to high total dissolved solids but could possibly be used to supplement the recycled water supply. Similarly, Zone 7's Hopyard 7 well in the Main Basin is not used for drinking water due to elevated levels of arsenic, though may be suitable for non-potable uses. Further investigations are needed to determine the feasible quantity and quality of groundwater that could be introduced to the recycled water system.

Outcomes of these near-term efforts can inform DSRSD's longer-term strategy. For example, if a potable reuse pilot with ACWD, USD, Zone 7, and Livermore successfully demonstrates proof of concept and the local community is supportive of potable reuse, a larger scale Tri-Valley Potable Reuse Project could be implemented to reuse water in Zone 7's service area. Similarly, a pilot transfer between EBMUD and Zone 7 could test the regulatory and institutional challenges with moving water before a larger intertie is constructed.

Potential Pilot: Potable Reuse Pilot (with Possible Surface Water Exchange)

Potential Partners: DSRSD, Zone 7, City of Livermore, ACWD, USD

Description: This concept, shown in Figure 5-2, would include construction of an advanced water purification pilot facility (1 to 2 mgd) located at DSRSD's WWTP. If solely treating wastewater from DSRSD's WWTP, DSRSD would operate the facility September through May, when flows are available. If capturing and treating wastewater from Livermore that is currently discharged to San Francisco Bay through the LAVWMA pipeline, the facility could operate year-round. Purified water would be conveyed to ACWD via Alamo Canal/Arroyo de la Laguna to Alameda Creek, where ACWD could intercept the flow and divert it to Quarry Lakes for groundwater recharge. This alternative could also include a transfer, by which ACWD would provide one of its water sources to DSRSD or Livermore (via Zone 7) in exchange for the purified water.

Benefits: Conducts near-term demonstration and collects data to inform potential future regional potable reuse projects, such as Tri-Valley Potable Reuse and/or a future ACWD/USD reuse project; makes use of wastewater currently discharged to San Francisco Bay; requires minimal conveyance infrastructure; provides environmental/fish flows.

Challenges/Considerations: Project must comply with all applicable requirements for transferring purified water to ACWD; flows must be appropriate temperature for fish and timed to avoid erosion in the creek.

Estimated yield: 1,000 AF

Cost: TBD, pending confirmation of facility capacity and treatment train.

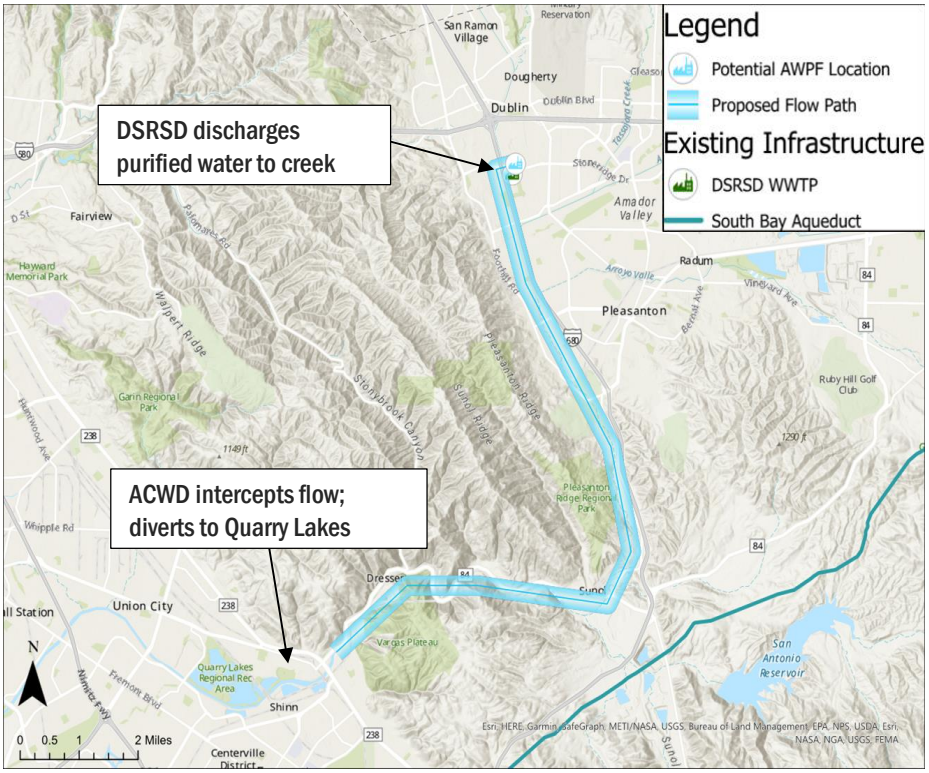


Figure 5-2. Overview of potential potable reuse pilot project

Potential Pilot: Transfer between EBMUD and Zone 7 (via Existing EBMUD-DSRSD Emergency Interties)

Potential Partners: Zone 7, EBMUD, DSRSD

Description: This pilot transfer would utilize DSRSD's existing emergency interties with EBMUD (shown in Figure 5-3), which consist of three small diameter pipeline stub-outs (separated by about 10 feet) that can be connected for temporary water transfers. Each intertie may be able to transfer 500 to 1,000 gpm from EBMUD to DSRSD.

Although EBMUD's distribution system has limited capacity and is not designed for long-term, every year wheeling arrangements, a short-term pilot could demonstrate viability of this concept to support future dry-year or emergency transfers and inform possible future projects (*e.g.*, a potential EBMUD-Zone 7 emergency intertie).

Benefits: Makes use of existing infrastructure, builds on lessons learned from DSRSD's 2016 water transfer effort with EBMUD, and potentially demonstrates proof of concept to inform future transfers to Zone 7 and/or DSRSD during emergencies.

Challenges/Considerations: Requires confirming capacity for wheeling pilot transfer water through EBMUD's conveyance and potable water system and identifying potential sellers. (EBMUD is embarking on several capital improvement projects over the next 25 years that will limit capacity for wheeling in the near-term).

Estimated yield: Up to 1,000 AF (one-time)

Unit Cost: $2,200 to $2,300/AF, including cost of wheeling (assumed as $1,500 to $1,600/AF based on initial estimate from EBMUD staff) and supply (assumed as $700/AF, though could vary).

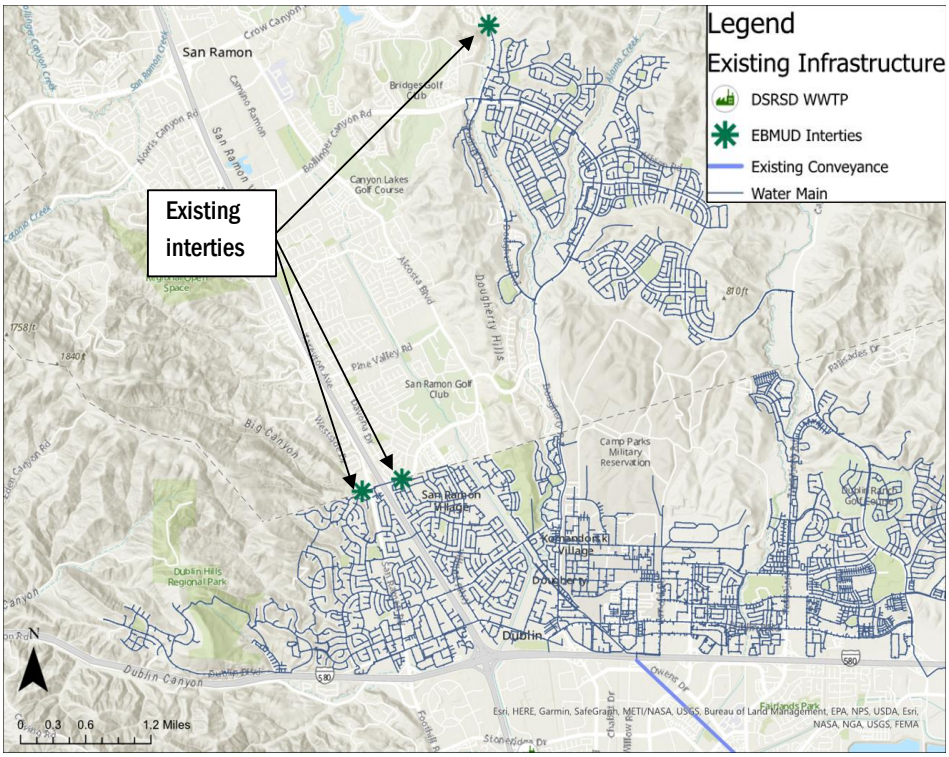


Figure 5-3. Existing EBMUD-DSRSD interties

The recommended framework (Figure 5-4) identifies potential long-term pathways, which will depend on outcomes of near-term actions and other external triggers. It is recommended that DSRSD review the framework in 2023 to incorporate new information (e.g., from Zone 7's upcoming 2021 WSE Update) and lessons learned from near-term efforts.

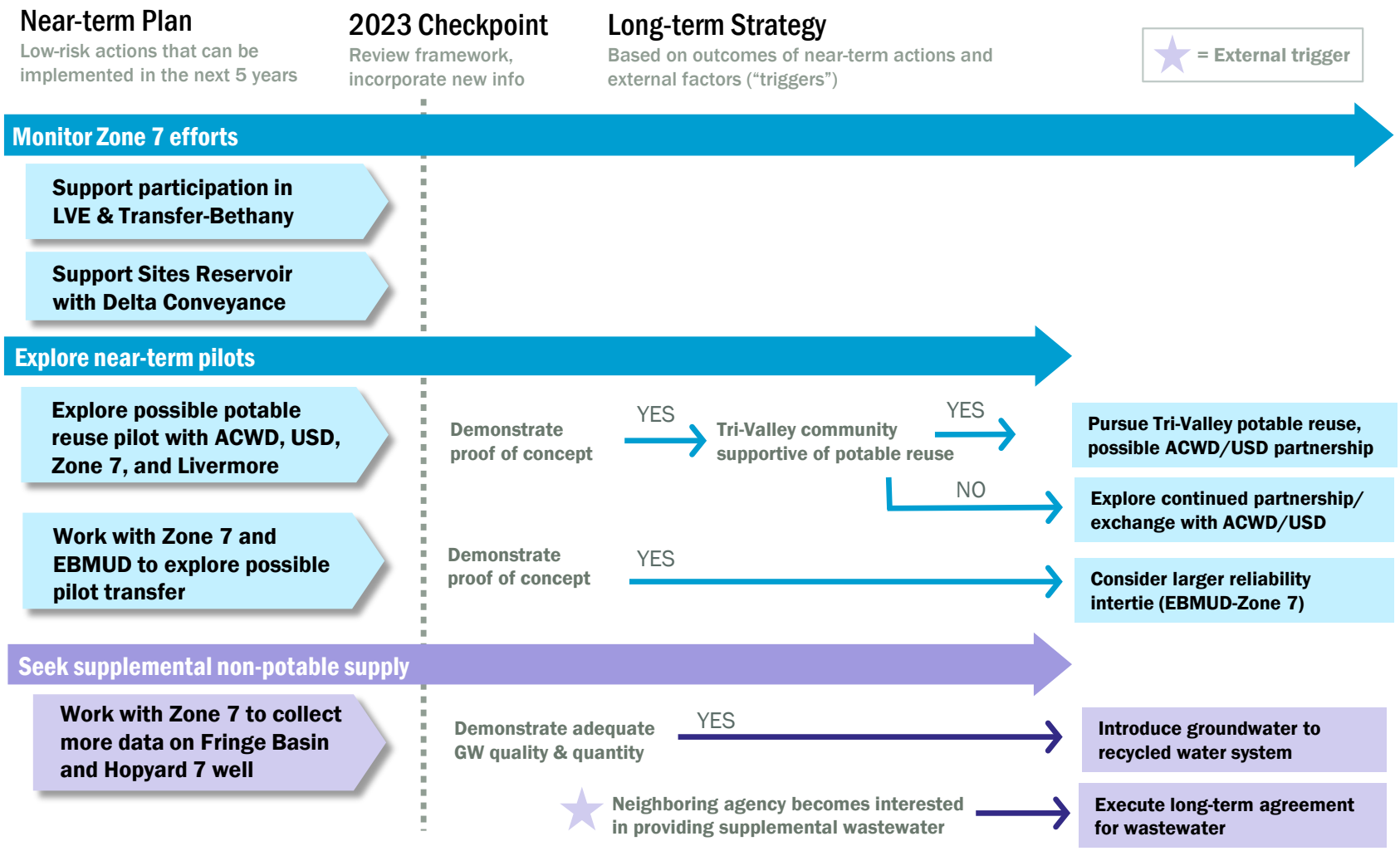


Figure 5-4. Recommended framework

Section 6

Conclusions

Conditions have changed substantially since 2015. With conservation as a way of life in California, water demand projections are lower, and less wastewater is available for reuse. However, there is still potential for DSRSD to expand its recycled water program if additional supply can be added to the recycled water system. An integrated approach is needed to manage potable and recycled water supplies and make best use of available effluent.

Additionally, diverse portfolios improve resilience, enable flexibility, and reduce risk. A combination of new supply, storage, and conveyance is needed to ensure reliability, and it is recommended that DSRSD continue to pursue an "all of the above" approach towards developing potential water projects. Near-term efforts (e.g., pilot projects, groundwater studies, and Los Vaqueros Reservoir Expansion) can enable progress while longer term projects are being developed. Partnerships are key to success, as collaborative projects offer new opportunities, multiple benefits, and improved regional reliability.

The recommended framework outlines near-term and long-term strategies for a resilient and sustainable water future, accounting for key uncertainties and decision points. It is recommended that DSRSD review and update the framework in 2023 to incorporate new information.

The results of the 2021 AWSS and recommended framework were presented to DSRSD's Board of Directors on April 6, 2021 and informed DSRSD's updated Water Resiliency Policy (Appendix A). The new policy was adopted by DSRSD's Board of Directors on April 20, 2021, replacing the 2015 Water Policy. Key principles in the adopted Water Resiliency Policy include:

- Emphasizing the need for collaborative partnerships for building water resiliency.
- Advocating for an "all of the above approach" to pursuing a diverse portfolio of water supply, storage, and conveyance projects.
- Prioritizing local and sustainable water sources and projects that contribute to regional self-reliance, while moving away from the more prescriptive goals in the 2015 Water Policy that were based on information that has evolved or substantially changed.
- Ensuring Zone 7 water shortage allocations recognize retailer water use efficiency and investments in new water supplies.
- Advancing the development of near-term projects that could be eligible for grant funding.

The 2021 AWSS and Water Resiliency Policy will guide DSRSD efforts to work collaboratively with other partner agencies on developing water projects to address DSRSD's current and future water needs. DSRSD plans to review the 2021 AWSS and Water Resiliency Policy in 2023. As part of that review, DSRSD will evaluate progress made towards building a resilient and sustainable water future for its customers and update the framework to incorporate new information.

This page intentionally left blank.

Section 7

References

BARR. *Bay Area Regional Reliability Drought Contingency Plan*. Prepared by Brown and Caldwell, 2017.

DERWA and CCCSD. *Agreement for the Temporary Diversion of Wastewater Between DERWA and CCCSD.* February 2019.

DERWA and City of Pleasanton. *Agreement to Provide Recycled Water Treatment and Delivery Services.* January 2014.

DSRSD. *2015 Urban Water Management Plan*. Prepared by West Yost Associates, 2015.

DSRSD. *Long-Term Alternative Water Supply Study*. Prepared by RMC Water and Environment, 2015.

DSRSD. *Provision of Recycled Water Service Policy* (P300-20-2). Approved July 2020.

DSRSD. *Wastewater Treatment and Biosolids Facilities Master Plan*. Prepared by West Yost Associates in association with HDR, 2017.

DSRSD. *Water Resiliency Policy* (P300-21-1). Approved April 2021.

DSRSD. *Water Supply, Storage, Conveyance, Quality and Conservation Policy* (P300-15-1). Approved October 2015.

DSRSD. *Water System Master Plan*. Prepared by West Yost Associates, 2016.

DSRSD and Zone 7. *Contract Between Zone 7 and DSRSD for a Municipal & Industrial Water Supply*. August 1994.

DSRSD and Zone 7. *Memorandum of Understanding Between DSRSD and Zone 7 for Cooperative Effort Regarding Groundwater Demineralization and Storage within the Livermore-Amador Valley*. April 2004.

Luhdorff & Scalmanni Consulting Engineers. *Field Reconnaissance and Well Site Screening Ground Water as a Supplementary DERWA Supply Source*. Memorandum to DSRSD, 2004.

Luhdorff & Scalmanni Consulting Engineers. *Summary of Work to Date on Groundwater Reconnaissance Evaluation*. Draft Technical Memorandum to DERWA, 2001.

Tri-Valley Agencies. *Joint Tri-Valley Potable Reuse Technical Feasibility Study*. Prepared by Carollo Engineers, 2018.

Zone 7. *2019 Water Supply Evaluation Update*. 2019.

Zone 7. *2020 Urban Water Management Plan: Approach and Preview*. Water Resources Committee Meeting Presentation, February 23, 2021.

Zone 7. *2020 Urban Water Management Plan: Preliminary Draft*. Special Board Meeting Presentation, April 1, 2021.

Zone 7. *2020 Urban Water Management Plan: Public Draft Version*. May 3, 2021.

Zone 7. *Annual Report for the Sustainable Groundwater Management Program 2019 Water Year: Livermore Valley Groundwater Basin*, 2020.

Zone 7. *Delta Conveyance Project: Status and Potential Next Steps*. Water Resources Committee Meeting Presentation, September 28, 2020.

Zone 7. *Fiscal Year 2018/2019 Ten-Year Water System Capital Improvement Plan.* October 2017.

Zone 7. *Groundwater Management Plan for Livermore-Amador Valley Groundwater Basin.* Prepared by Jones & Stokes, 2005.

Zone 7. *Preliminary Lake Use Evaluation for the Chain of Lakes, Addendum 1 – 2020 Update*, 2020.

This page intentionally left blank.

Appendix A: DSRSD Water Resiliency Policy, Adopted April 20, 2021

This page intentionally left blank.

Dublin San Ramon Services District
Water, wastewater, recycled water

Policy

Policy No.: P300-21-1	**Type of Policy:** Operations
Policy Title: Water Resiliency	
Policy Description: Provides guidance for building a resilient and sustainable water supply future for District customers	
Approval Date: 4/20/2021	**Last Review Date:** 2021
Approval Resolution No.: 22-21	**Next Review Date:** 2023
Rescinded Resolution No.: 89-15	**Rescinded Resolution Date:** 10/20/2015

It is the policy of the Board of Directors of Dublin San Ramon Services District to:

1. Reliably meet existing and projected water demands within the District's water service area by supplying water to meet 100% of customer water demands 90% of the time and at least 85% of customer water demands 99% of the time.

2. Collaborate with local and regional partners to build a resilient and sustainable water supply through implementation of a diverse portfolio of water supply, conveyance, and storage projects that provides flexibility to manage our water system against future uncertainties.

3. Advocate for the continued exploration and development of a broad array of projects that have the potential to improve water resiliency for the Tri-Valley, such as Bay Area Regional Desalination, Delta Conveyance, Interties, Los Vaqueros Reservoir and Transfer Bethany Pipeline, Potable Reuse, Sites Reservoir, Water Transfers, and Expanded Recycled Water Programs.

4. Prioritize the use of locally available and sustainable water supply sources and projects that contribute to regional self-reliance.

5. Advance the development of near-term water resiliency projects through local partnerships and seek grant funding to facilitate project implementation and reduce costs to District customers.

6. Support efforts by other agencies to pursue grant funding for statewide and regional projects that improve water resiliency for District customers.

7. Ensure that during droughts and other water supply shortage conditions, Zone 7 Water Agency allocates water between the treated water retailers in an equitable manner that recognizes water use efficiency and investments in new water supplies that reduce potable water demands.

8. Meet the State's long-term water use and water loss efficiency standards by promoting reasonable and efficient use of water supplies through conservation programs and water optimization tools and technologies.

9. Maximize treated wastewater effluent as a valuable water resource and minimize environmental pollution to the San Francisco Bay by recycling 100% of the flows that enter the Regional Wastewater Treatment Plant, apart from treatment residual (brine).

10. Advocate for programs to protect and enhance the quality of drinking water delivered to District customers.

Appendix B: Evaluation of Benefits and Costs

This page intentionally left blank.

The 2021 AWSS evaluation involved a multi-step process, as summarized in Figure B-1. This appendix describes the methodology and assumptions behind Step 1 (benefits and costs), including evaluation criteria, scoring, weighting, and sensitivity.

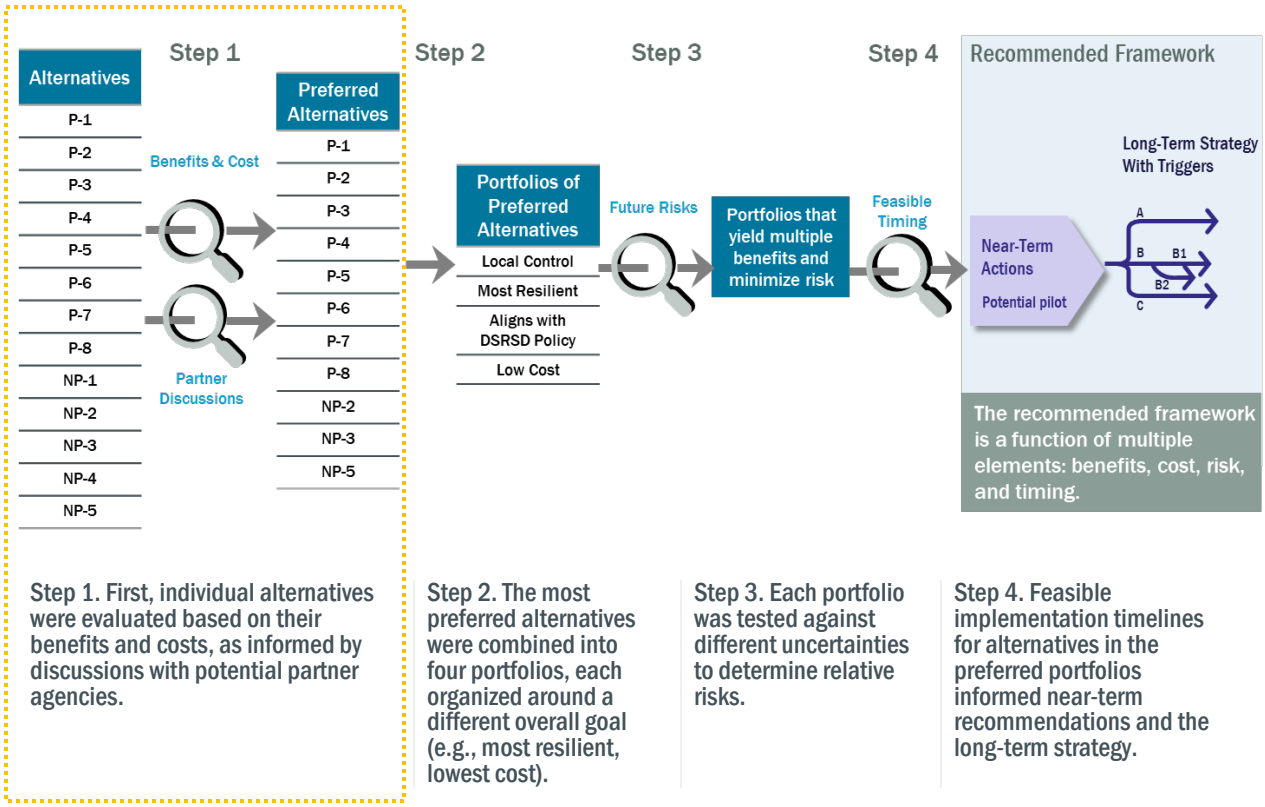


Figure B-1. 2021 AWSS evaluation process

The intent of Step 1 is to highlight the types of benefits offered by different alternatives and screen out alternatives with relatively high costs compared to potential benefit. Though many of the alternatives are still conceptual and need to be further developed to fully understand the benefits and costs, this exercise aided in informing next steps. The recommended framework in the 2021 AWSS includes near-term actions that DSRSD can take to further explore alternatives and inform longer-term decisions.

B.1 Evaluation Criteria

Through a workshop exercise, the project team identified nine evaluation criteria that are measurable, independent, and established without considering the specific alternatives (Table B-1). These criteria are framed as benefits, where a higher score is better. All criteria were evaluated qualitatively, except for dry-year supply. Cost was considered separately, as discussed further below.

Table B-1. Evaluation Criteria

Criteria	Description	Quantitative	Qualitative
1. Regulatory Feasibility	Anticipated or established regulations. Alternative can be permitted and/or similar projects have been permitted.		■
2. Technical Feasibility	Feasibility of design, construction, and operation from a technical/engineering standpoint.		■
3. Institutional Complexity	Ease of implementation and operation from an institutional standpoint (e.g., willingness of external partners)		■
4. Community Support	Public perception and support from key stakeholders, local leaders, and non-governmental organizations		■
5. Dry-year Supply	Anticipated dry-year yield (in AFY)	■	
6. Resilience to Shocks	Increased redundancy and resilience to emergency events/outages (e.g., seismic risk, levee failure)		■
7. Local Control	Local (non-imported) supply source		■
8. Water Quality	Improves delivered water quality and avoids sources contaminated with constituents of emerging concern (e.g., PFAS)		■
9. Environmental Sustainability	Potential environmental impacts during construction or operation of the alternative, including water quality and energy usage (GHG impacts)		■

B.2 Scoring Alternatives

Table B-2 presents the scoring guide for evaluating benefits. The quantitative criterion (dry-year supply) was scored using anticipated dry-year yield, in AFY. For qualitative characteristics, each alternative was evaluated relative to others using an increasing positive scale (higher score = more benefit), ranging from 1 to 3, 4, or 5 depending on the criteria.

Table B-2. Scoring Guide for Evaluation

Quantitative Criteria	Description	Score				
Dry-year Supply	Anticipated dry-year yield	Anticipated dry-year yield for DSRSD (ranges from 0 to 2,500 AFY)				
Qualitative Criteria	**Description**	**1**	**2**	**3**	**4**	**5**
Regulatory Feasibility	Anticipated or established regulations. Alternative can be permitted and/or similar projects have been permitted.	Regulatory process and outcome uncertain	Regulatory requirements known/anticipated and complex	Regulations known and straightforward (e.g., proven compliance)	-	-
Technical Feasibility	Feasibility of design, construction, and operation from a technical/engineering standpoint.	Uncertainty around land availability, operational requirements, or supply consistency	Requirements known but challenging/complex (e.g., requires new facilities or substantial changes in operations)	Requirements known and straightforward (e.g., can be achieved with existing facilities; minimal operational changes needed)	-	-
Institutional Complexity	Ease of implementation and operation from an institutional standpoint (e.g., willingness of external partners)	Requires multiple agencies; does not currently have willing partner(s)	Requires multiple agencies; has willing partner(s) but no existing agreement	Requires multiple agencies; has willing partner(s) and existing agreement	No partners needed (DSRSD can pursue independently)	-
Community Support	Public perception and support from key stakeholders, local leaders, and non-governmental organizations	Known opposition	Likely opposition	Unknown	Likely support	Known support
Resilience to Shocks	Increased redundancy and resilience to emergency events/outages (e.g., seismic risk, levee failure)	Neither seismic resilience nor system/conveyance flexibility	Either seismic resilience or system/conveyance flexibility	Both seismic resilience and system/conveyance flexibility	-	-
Local Control	Local (non-imported) supply source	Imported supply	Conveyance or storage projects (if supply could come from local or regional sources)	Regional or local supply (not imported)	-	-
Water Quality	Improves delivered water quality and avoids sources contaminated with constituents of emerging concern (e.g., PFAS)	Lowers water quality	Unknown	Neutral/low risk of water quality impacts	Improves water quality	-
Environmental Sustainability	Potential environmental impacts during construction or operation of the alternative, including water quality and energy usage (GHG impacts)	Anticipated ecosystem impacts and high energy demand	Possible ecosystem impacts or high energy demand	Minimal anticipated ecosystem impacts and low energy demand	-	-

Project team members independently scored each alternative using Table B-2 as a guide. After compiling and comparing independent scoring results, the project team discussed differences across the results and reached consensus on the scores in Table B-3. Explanations for scores that required further discussion are noted below the table.

Table B-3. Scores

Alternatives	Regulatory Feasibility	Technical Feasibility	Institutional Complexity	Community Support	Dry-Year Supply (AFY)	Resilience to Shocks	Local Control	Water Quality	Environmental Sustainability
Maximum score	**3**	**3**	**4**	**5**	**2,500**	**3**	**3**	**4**	**3**
P-1. Direct Potable Reuse via Treated Water Augmentation	1	1	4	2	0	2	3	3	2
P-2. Tri-Valley Potable Reuse	2	2	2	1	1,200 [a]	2	3	3	2
P-3. Regional Desalination	2	2	2	2	1,200 [a]	2	2	3	1
P-4. Water Transfers and Exchanges	2	3	1	3	1,200 [a]	1	1	3	2
P-5. Intertie	3	2	1	3	0	2	2	2	2
P-6. Delta Conveyance	2	2	2	2	0	3	1	3	1
P-7. Sites Reservoir	2	2	2	2	2,500 [a]	1 [d]	1	3	1
P-8. Los Vaqueros Reservoir Expansion and Transfer-Bethany Pipeline	2	2	2	4	400 [a]	3	2	3	1
NP-1. Recycled Water Storage in Chain of Lakes	3	1 [b]	2	3	1,200 [c]	2	3	2 [e]	3
NP-2. Fringe Basin Groundwater	3	2	3	3	800 [c]	2	3	2	3
NP-3. Groundwater from Hopyard 7 Well	3	1	2	3	1,000 [c]	2	3	1	2
NP-4. RO Reject from Zone 7's Groundwater Demineralization Facility	2	1	2	3	0 [c]	2	3	1	2
NP-5. Wastewater from Neighboring Agency	3	3	1	3	1,400 [c]	2	3	3	3

a. Supply for DSRSD is calculated as 25 percent of the assumed yield for Zone 7, rounded down to the nearest 100 AFY. Yields based on Zone 7's 2020 UWMP, except for Los Vaqueros Reservoir Expansion (which is based on average delivery from Zone 7's 2019 WSE Update). For Sites Reservoir, the average yield is assumed, though Zone 7 may rely more heavily on Sites Reservoir in a dry year.

b. Due to questions around land availability and water quality (i.e., potential need for additional treatment).

c. Yield reflects the assumed portion of recycled water that would be allocated to DSRSD. Expected yield from Hopyard 7 assumes there may be some curtailment of pumping from the Main Basin in dry years. Dry-year yield assumed to be zero for NP-4, given that Zone 7 paused operations of their demineralization facility during the last drought to preserve supply.

d. Provides more resilience when paired with Delta Conveyance. Without Delta Conveyance, Zone 7 may not be able to access the water stored in Sites Reservoir in the event of a Delta outage.

e. Due to possible algal blooms in lake (may require additional treatment).

The scores in Table B-3 were normalized (i.e., converted to a scale of 0 to 1 for each criterion to create a comparable basis) and used to develop an overall relative benefit score for each alternative. Evaluation criteria can be equally weighted (such that each equally contributes to the overall benefit score) or assigned different weights to reflect relative importance of each, so long as the sum of all weights equals 1 (i.e., 100 percent). Figure B-2 presents the relative benefit scores when all criteria are weighted equally. Each colored bar represents the benefit score for an individual criterion (shown in legend); alternatives with longer bars (i.e., towards the top of the figure) generally offer greater benefits. As discussed further below, different weighting schemes were applied to test the sensitivity of results.

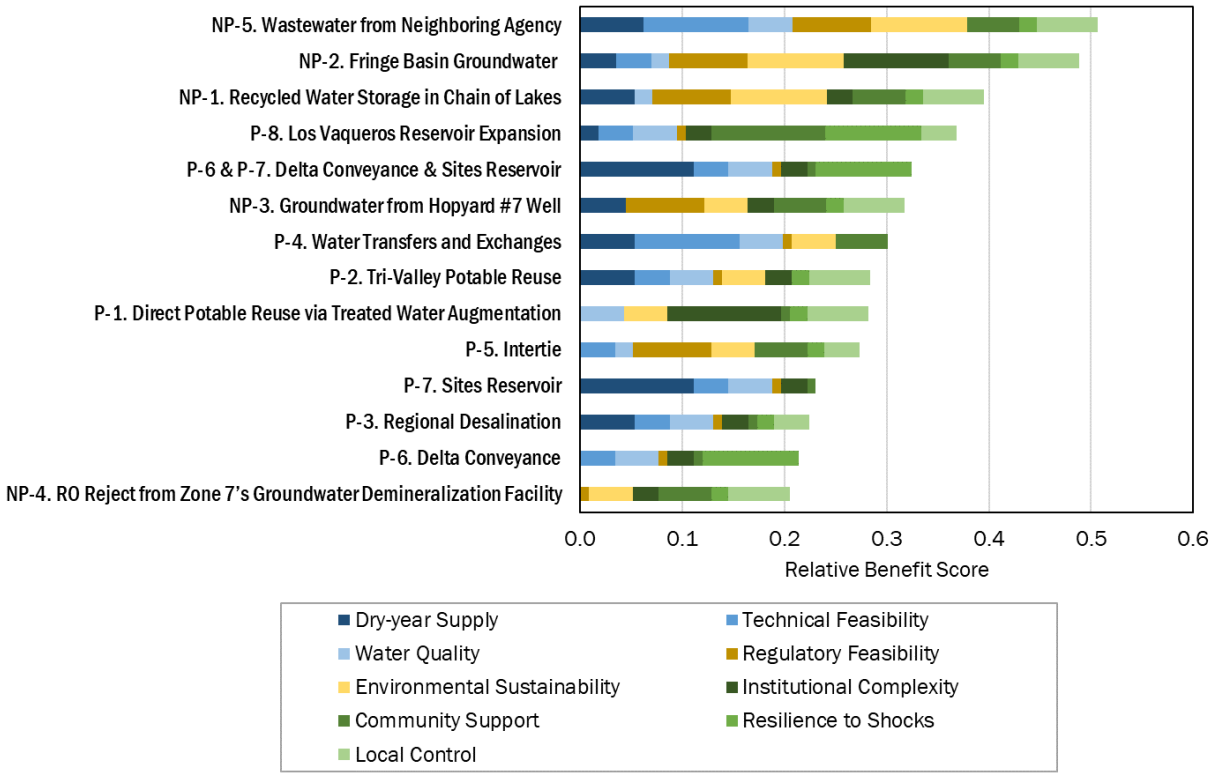


Figure B-2. Relative benefit scores of alternatives with all criteria weighted equally

This initial step did not provide enough information to screen out any alternatives. Rather, it helped to highlight the different types of benefits offered by each alternative. For example, P-5 (Intertie) and P-6 (Delta Conveyance) do not provide any dry-year supply and, therefore, did not score very highly as a result. However, when paired with a supply alternative, new conveyance can help ensure access to the supply and provide greater resilience. To demonstrate this, P-6 (Delta Conveyance) and P-7 (Sites Reservoir) were evaluated separately (as individual alternatives) and as combined alternative. Figure B-2 demonstrates that these alternatives offer greater benefits when combined. Other alternatives would also score better if combined—such as Regional Desalination paired with a new intertie and/or Los Vaqueros Reservoir Expansion.

B.3 Weighting and Sensitivity

Assigning weights to evaluation criteria allows decision makers to emphasize the relative importance of some criteria over others (higher weight indicates greater relative importance). To develop a set of weights that reflects DSRSD's priorities, four DSRSD staff independently assigned weights to each criterion, and the average of the four weighting schemes was applied. The average weighting scheme emphasizes dry-year supply and resilience to shocks greater than the other criteria, indicating DSRSD's desire to develop a diversified and resilient water portfolio (as reflected in both the 2015 Water Policy and updated Water Resiliency Policy).

To test sensitivity of the overall benefit scores, the project team also evaluated the alternatives with all nine criteria weighted equally. Table B-4 presents the average weights and equal weights.

Table B-4. Weighting Schemes

Criteria	DSRSD Average Weights [a]	Equal Weights
Regulatory Feasibility	8%	11%
Technical Feasibility	8%	11%
Institutional Complexity	10%	11%
Community Support	10%	11%
Dry-Year Supply	23%	11%
Resilience to Shocks	16%	11%
Local Control	11%	11%
Water Quality	7%	11%
Environmental Sustainability	8%	11%
Total [b]	100%	100%

a. Average of weights independently assigned by four DSRSD staff.
b. Difference due to rounding.

Figures shown in the 2021 AWSS use the average of the four weighting schemes. However, as illustrated in Figure B-3, overall benefit scores remain relatively consistent when compared to the equally weighted criteria.

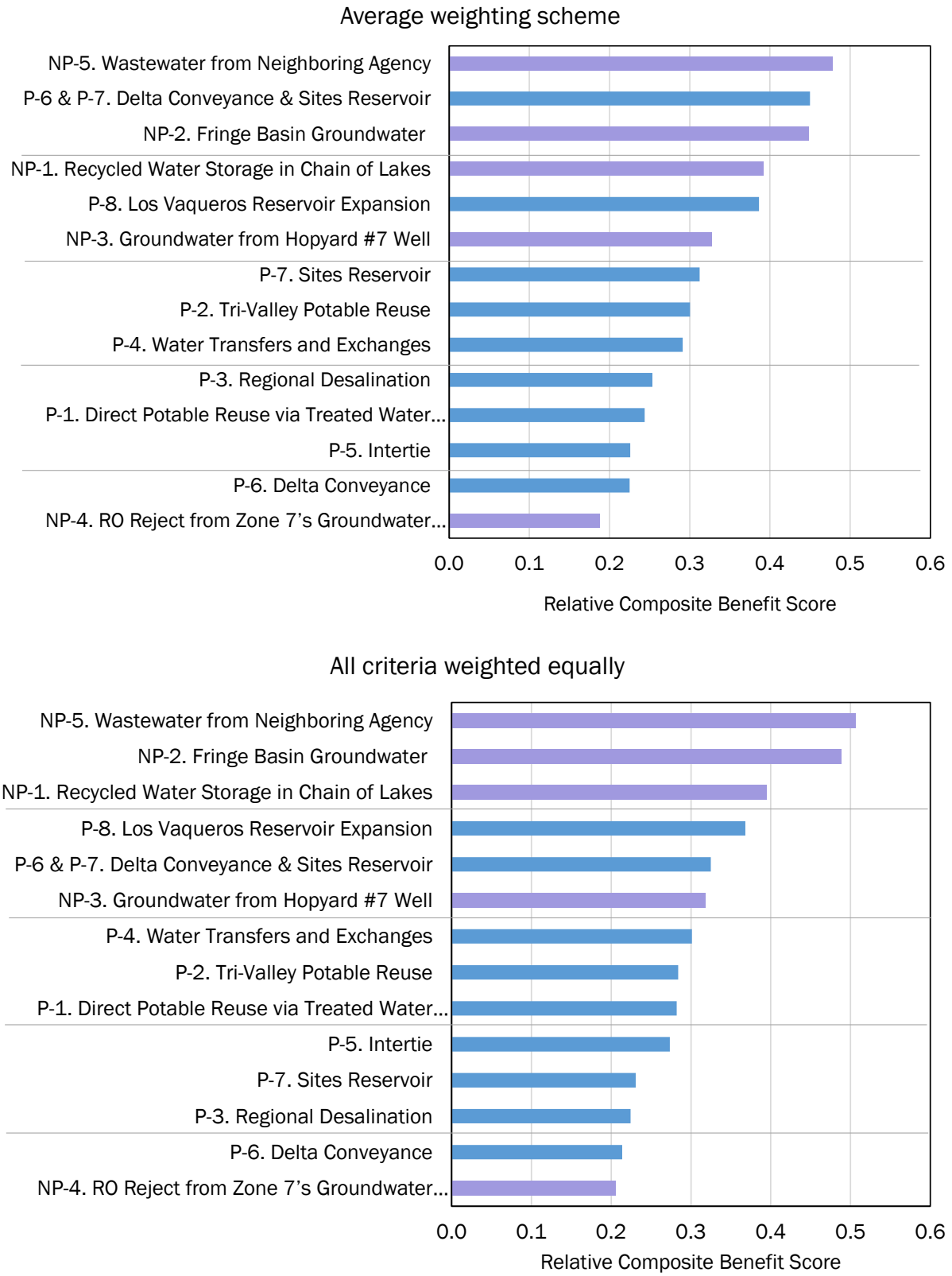


Figure B-3. Relative benefit scores using DSRSD average weights and equal weights

B.4 Benefits versus Costs

Considering costs in addition to benefits adds another dimension to the evaluation and helps to distinguish certain alternatives. For a high-level comparison, preliminary unit cost estimates were prepared for DSRSD-led alternatives based on initial assumptions, as detailed in Appendix C. For Zone 7-led alternatives, unit costs were pulled from previous studies and inflated to 2021 dollars (and in some cases, adjusted based on revised project cost estimates).

Plotting relative benefit scores against unit cost reveals that some alternatives have relatively high cost compared to benefit. As shown in Figure B-4, two non-potable alternatives were eliminated from further evaluation at this stage. NP-1 (Recycled Water Storage in Chain of Lakes) was screened out due to the unavailability of the lakes in the foreseeable future, as the cost of negotiating with the quarry owners for early acquisition would drive the cost significantly higher. NP-4 (RO Reject from Zone 7's Groundwater Demineralization Facility) was also eliminated, due to the variability in timing and quantity of brine discharges from Zone 7, which results in high treatment cost and minimal supply potential. The other three non-potable alternatives offer greater potential benefit relative to cost.

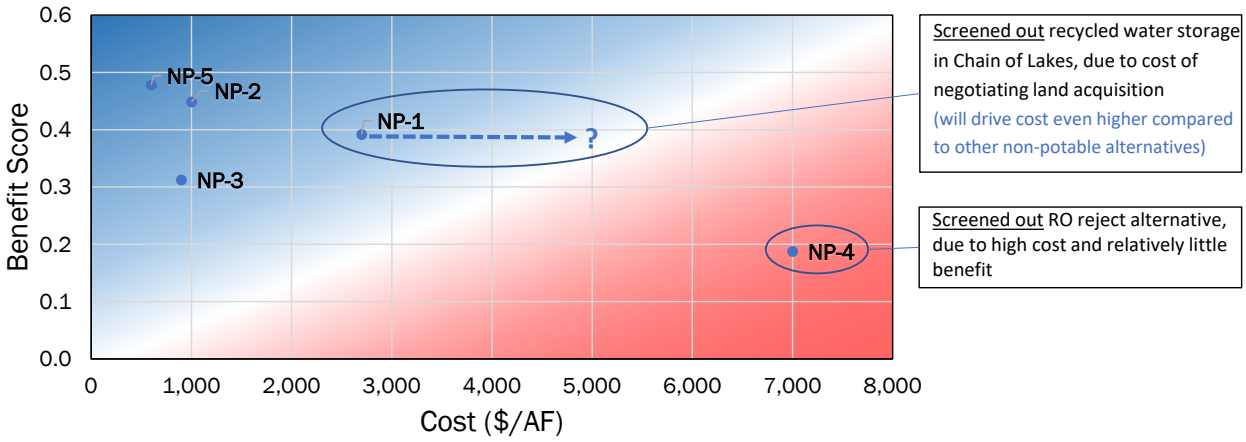


Figure B-4. Non-potable alternatives' benefit versus cost

Although P-1 (DPR via Treated Water Augmentation) has slightly higher cost compared to benefit than the other potable alternatives, it is still within the same range as others given the level of uncertainty in preliminary cost estimates and differing assumptions between studies (Figure B-5). Therefore, all potable supply, storage, and conveyance alternatives were carried forward to the next step of the evaluation.

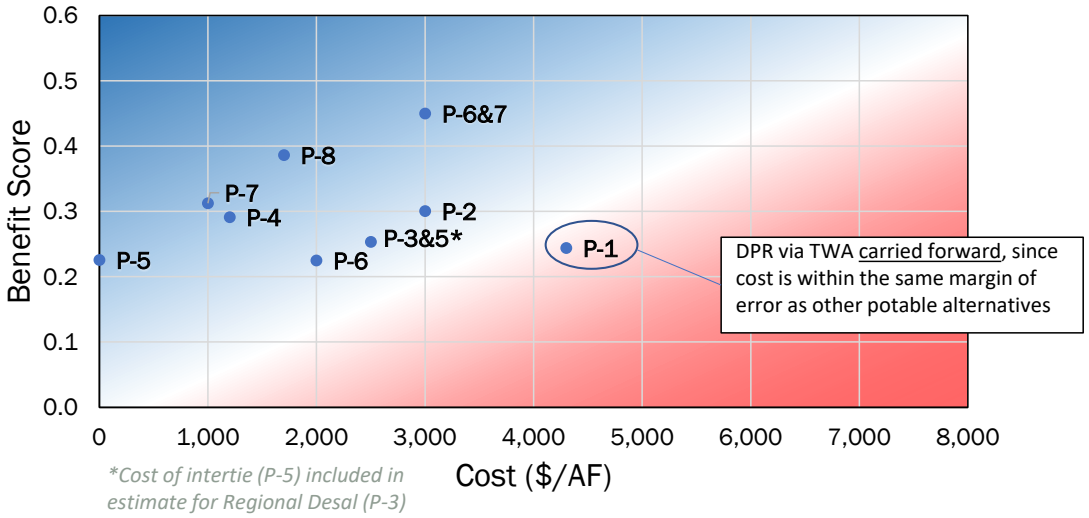


Figure B-5. Potable alternatives' benefit versus cost

Note: For alternatives with a range of costs, higher value is shown.

B.5 Summary

Ultimately, Step 1 of the evaluation was used to screen out two alternatives from further evaluation: NP-1 (Recycled Water Storage in Chain of Lakes) and NP-4 (RO Reject from Zone 7's Groundwater Demineralization Facility). The remaining alternatives were incorporated into different portfolios, as described in Section 4.2 of the 2021 AWSS. Each portfolio was developed around a different goal, and selection of alternatives for each portfolio was informed by the benefits and costs highlighted in the evaluation described above.

For many alternatives, additional studies are needed to further define the benefits and costs, including impacts to ratepayers. Additionally, Zone 7 plans to update its WSE later in 2021. The WSE Update will include a more robust technical and financial analysis of how various alternatives would complement existing water supplies and infrastructure and increase water resilience for the Tri-Valley.

This page intentionally left blank.

Appendix C: Cost Estimates

This page intentionally left blank.

This appendix presents the approach and assumptions for developing the high-level cost estimates presented in the 2021 AWSS. All cost estimates are preliminary and for comparative purposes only; any alternatives that move forward should undergo more detailed cost analysis as plans progress.

C.1 Basis of Cost

High-level estimates of capital and O&M costs were prepared for each DSRSD-led alternative (i.e., direct potable reuse via treated water augmentation and all non-potable alternatives). Capital costs were developed as Class 5 estimates with an accuracy range of -50 to +100 percent, in accordance with AACE International (Association for the Advancement of Cost Engineering). Section C.5 presents these estimates, including key assumptions for each alternative.

Major construction items—such as pipelines, pump stations, and wells—are included as line items in each capital cost sheet. Other associated construction costs are estimated as a percentage of raw construction costs. Associated construction costs include demolition; site civil; shoring and dewatering; yard piping; heating, ventilation, and air-conditioning (HVAC); and/or electrical and instrumentation. Table C-1 presents contingencies and assumptions, including a bid market allowance of 10 percent to account for uncertainty in future material or labor costs and a contingency of 30 percent applied to the total project cost.

Table C-1. Contingencies and Assumptions

Item	Description
A: Total Direct Cost	
General Conditions	10% of A
General Contractor Overhead and Profit, Bonds and Insurance	15% of A
Sales Tax	9.5% of A/2
B: Subtotal	
Bid Market Allowance	10% of B
C: Total Construction Cost	
Project Cost Factor	30% of C
D: Total Project Cost	
Estimating Contingency	30% of D
E: Total Project Cost (with Contingency)	

Annual operating costs include line items for electricity, pipeline and equipment maintenance, and aggregated treatment costs for RO and treated water augmentation facilities. For non-potable alternatives, costs include treatment and distribution of new supply (including additional recycled water produced in the shoulder months, as described in Section C.2) and cost savings from reduced effluent discharge via LAVWMA.

For Zone 7-led alternatives, capital costs were extracted from previous studies and inflated to 2021 dollars (and in some cases, adjusted based on revised assumptions). References and assumptions for Zone 7 costs are included in Section C.4.

C.2 Recycled Water Yield Assumptions

Costs for non-potable alternatives that supplement the recycled water supply during peak summer irrigation months also reflect the added benefits and costs associated with expanded recycled water production in the shoulder (i.e., non-peak) months. Except for NP-4 (RO Reject from Zone 7's Groundwater Demineralization Facility), which is not anticipated to provide a reliable or consistent source of supply, the 2021 AWSS assumes that by procuring new supply in the summer months (from storage, groundwater, or wastewater from a neighboring agency), DSRSD would also be able to produce additional recycled water in the shoulder months, using wastewater effluent that is currently discharged to the San Francisco Bay. Figure C-1 demonstrates how adding supply during the summer months to meet peak demand enables greater recycled water use year-round.

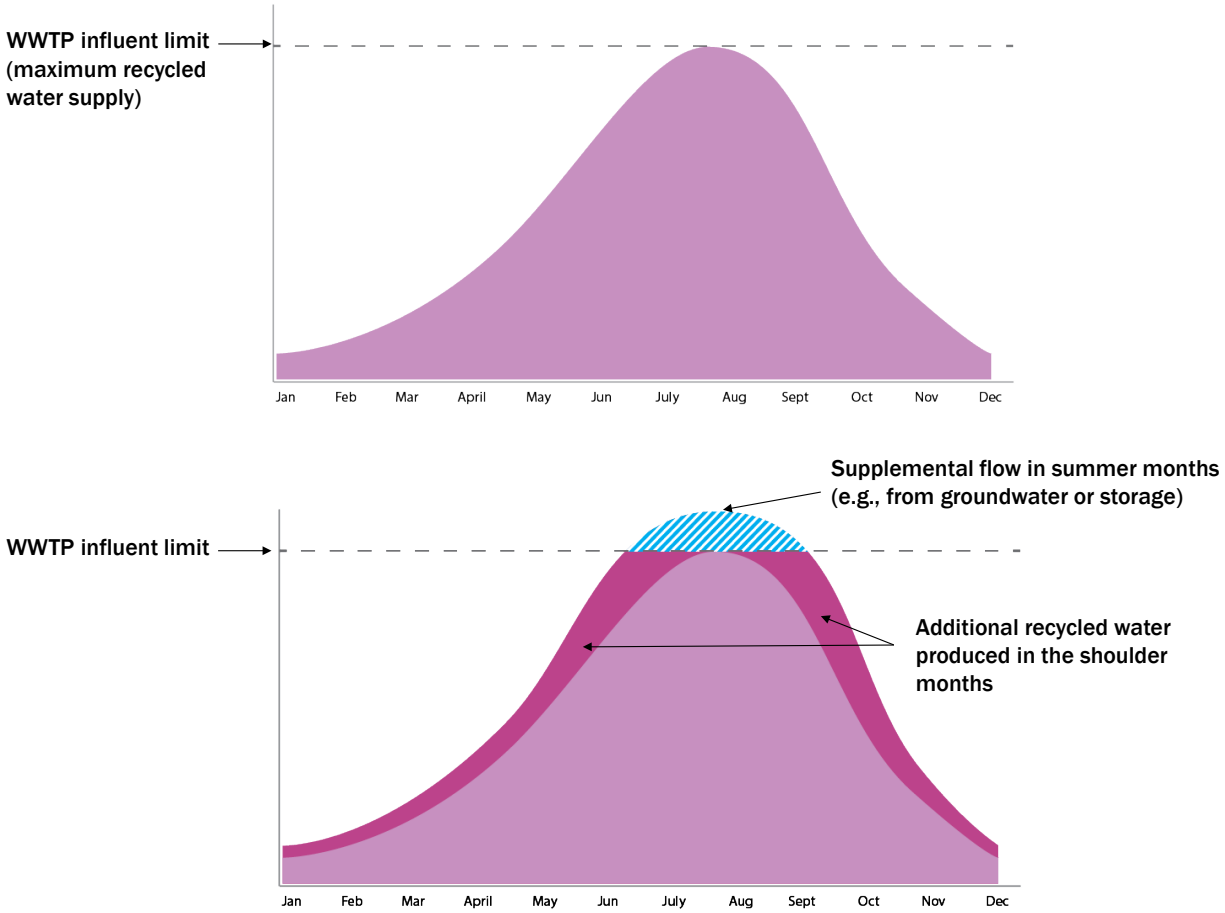


Figure C-1. Recycled water demand curve without (top) and with (bottom) supplemental non-potable supply

Table C-2 summarizes estimated annual yields from each non-potable alternative, including the new peak month supply and additional recycled water produced in the shoulder months. These yields are estimated based on a modeled demand curve (using 2020 recycled water demand data) and may vary based on shifts in demand patterns or supply availability.

Table C-2. Assumed Yield from Non-Potable Alternatives			
Alternative	New peak month supply (AFY)	Additional recycled water in shoulder months (AFY)	Total increase in non-potable supply (AFY)
NP-1. Recycled Water Storage in Chain of Lakes	1,200	2,000	3,200
NP-2. Fringe Basin Groundwater	800	1,800	2,600
NP-3. Groundwater from Hopyard #7 Well	1,000	400	1,400[a]
NP-4. RO Reject from Zone 7's Groundwater Demineralization Facility	100	n/a[b]	100
NP-5. Wastewater from Neighboring Agency	1,400	2,000	3,400[c]

a. Total supply capped based on DSRSD's buildout demand (accounting for Pleasanton's growth)
b. Assumes timing and quantity of RO reject is too variable to provide reliable, year-round benefit.
c. Total supply capped based on DERWA's buildout demand.

Where applicable, operating costs for non-potable alternatives include the following costs applied to the quantities in Table C-2, as indicated below.

- Secondary treatment – applied to new peak month supply (if added to the head of the WWTP)
- Tertiary treatment and distribution – applied to total increase in non-potable supply
- LAVWMA discharge savings – applied to shoulder month supply (i.e., wastewater that would have been discharged to the San Francisco Bay but can now be recycled). For NP-1 (Recycled Water Storage in Chain of Lakes), discharge savings were applied to the entire volume (peak months plus shoulder months) since all the flow originates as wastewater from DSRSD's WWTP.

C.3 Unit Cost Assumptions

Two sets of lifecycle costs were calculated for each DSRSD-led alternative, for comparison: a 60-year period with a 3 percent real discount rate (reflective of assumptions described below) and a 30-year period with a 5 percent discount rate (for consistency with costs from previous studies). For both scenarios, capital costs for construction were applied starting at year 2023 and spread across the estimated duration of construction. Estimated construction durations range from one to three years, depending on the alternative. Salvage values were not included in estimates, and annual operating costs were applied beginning in the last year of construction and at a constant annual rate throughout the analysis period.

60-year period with 3 percent real discount rate. Lifecycle costs were calculated for each DSRSD-led alternative over a 60-year period, which is representative for a reasonable pipeline service life and allows two successive 30-year periods for the treatment and pumping facilities. Equipment replacement costs were estimated at 60 percent of the initial capital cost and applied 30 years after year 2023 for treatment facilities and pump stations. A real discount rate of 3 percent was used to calculate the net present value (NPV) in 2021 dollars for each alternative. A Stifel Municipal Market Outlook report for the week of April 26, 2021 showed values ranging from 2.62 to 2.82 percent for revenue bonds maturing in 30 years. Given current market conditions are historically low, a 3 percent real discount rate was selected.

30-year period with 5 percent real discount rate. Lifecycle costs were also calculated over a 30-year period to more closely match analysis periods used in previous studies for the unit cost of Zone 7-led alternatives. As described in Zone 7's 2019 WSE Update, costs for the Tri-Valley Potable Reuse and Regional Desalination projects were calculated over a 30-year period at 5 percent interest.

Therefore, a 5 percent real discount rate was used to match the rate assumed in previous analyses, though this is higher than current interest rates.

The NPV calculation used in both scenarios is presented below.

$$NPV = \sum_{t=1}^{n} \frac{R_t}{(1+i)^{([2023+t]-2021)}}$$

where,

R_t *= cost or benefit at time t*
i *= real discount rate (3 percent per year)*
t *= time after start of analysis period*
n *= analysis period (30 or 60 years)*

The unit cost of alternatives (i.e., dollars per acre-foot) was calculated by dividing the annual payment by the estimated annual yield for each alternative. Annual yields for non-potable alternatives include the estimated production of additional recycled water in the shoulder months. Annual payments were calculated using the NPV amount, the real discount rate of either 3 or 5 percent, and assuming a payment period of once per year, using the equation below.

$$A = \frac{(i \times NPV)}{(1-(1+i)^{-n})}$$

where,

A *= annual payment*
i *= real discount rate (3 percent per year)*
NPV *= net present value*
n *= analysis period (30 or 60 years)*

Unit costs calculated for each DSRSD-led alternative are presented in Figure C-2 and Figure C-3 (reflecting a 60-year period at 3 percent interest and 30-year period at 5 percent interest, respectively). Cost estimates are labeled and shown as dark horizontal lines, with error bars demonstrating a level of accuracy of -50 to +100 percent. The 2021 AWSS presents 30-year lifecycle costs (as shown in Figure C-3) for a more consistent basis between DSRSD-led and Zone 7-led alternatives; however, other assumptions differ between studies. Additionally, given these projects are still conceptual, these preliminary cost estimates are intended to only serve the purpose of initial comparison and require refinement as projects are further defined.

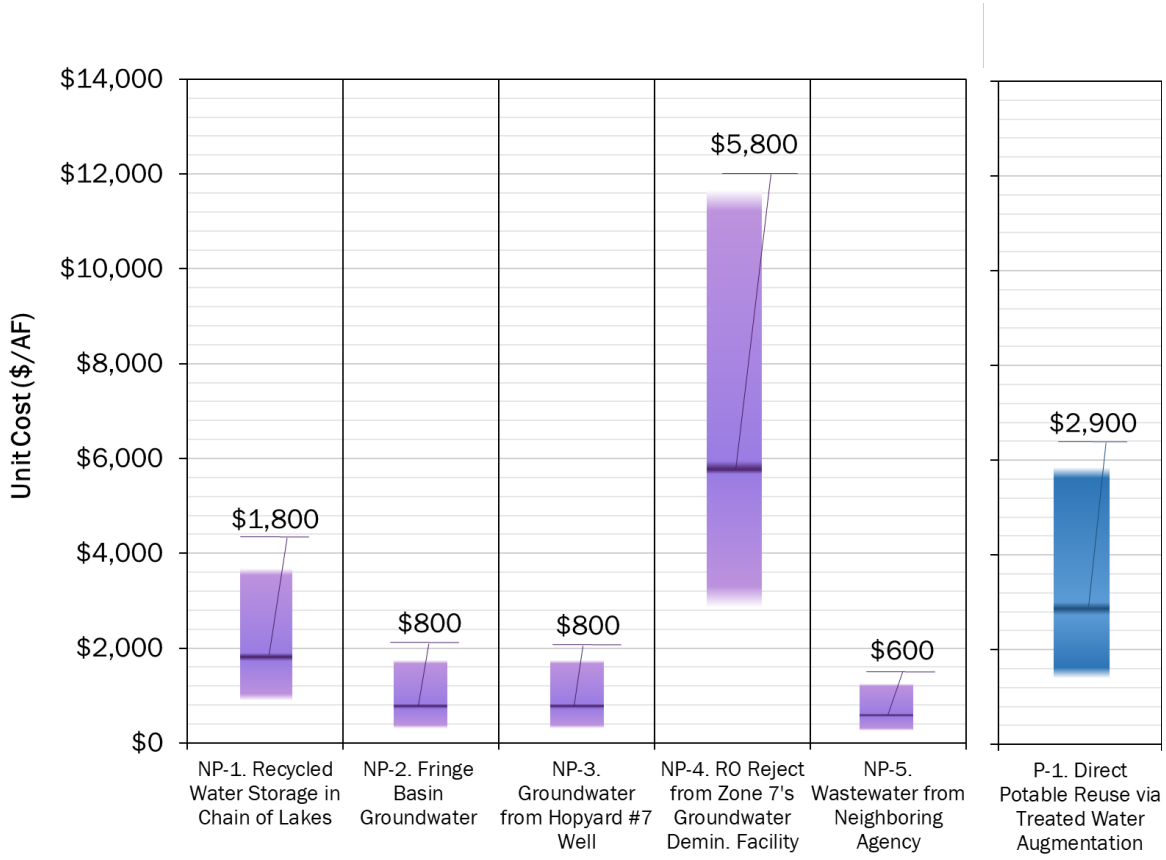


Figure C-2. Unit cost estimates for DSRSD-led alternatives (based on 60-year period and 3 percent interest)

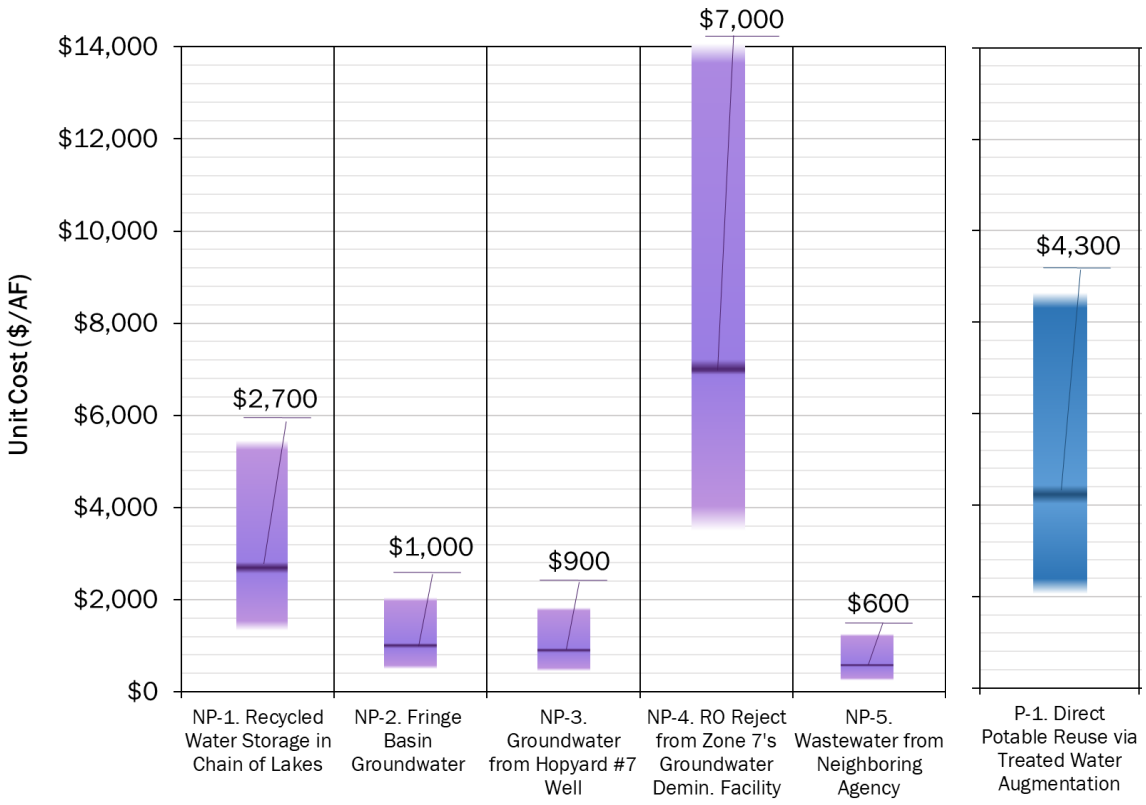


Figure C-3. Unit cost estimates for DSRSD-led alternatives (based on 30-year period and 5 percent interest)

C.4 Costs for Zone 7-Led Alternatives

Costs for Zone 7 alternatives were carried forward from previous studies and adjusted to account for inflation and, in some cases, revised project assumptions. Zone 7's share of capital cost (rounded up to the nearest $5M) and unit costs (rounded up to the nearest $100/AF) are presented in Table C-3, along with references and assumptions. These costs represent the cost to Zone 7; further analysis is needed to determine rate impacts for DSRSD.

Table C-3. Summary of Costs for Zone 7 Alternatives

Alternative	Reference(s)	Capital Cost, Zone 7's Share ($M) [a]	Unit Cost ($/AF) [a]	Notes/Assumptions
P-2. Tri-Valley Potable Reuse	2018 Joint Tri-Valley Potable Reuse Technical Feasibility Study and Zone 7's 2019 WSE Update	$135-$275	$2,800-$3,000	Cost based on Zone 7 2019 WSE, which carried forward costs from the *Joint Tri-Valley Potable Reuse Technical Feasibility Study* (inflated to 2018 dollars, plus $6M in additional studies). Costs inflated to 2021.
P-3. Regional Desalination	Zone 7's 2019 WSE Update	$90	$2,000-$2,500	Assumes 10-MGD facility with Zone 7's share at 5 MGD. Higher end of unit cost includes delivery through EBMUD intertie. Costs inflated to 2021.
P-4. Water Transfers and Exchanges	Zone 7's 2019 WSE Update	$0.5-$115	$500-$1,200	Based on Zone 7's 2019 WSE Update; costs inflated to 2021. Cost varies by types of transfer (e.g., short-term vs. long-term, SWP vs. non-SWP).
P-5. Intertie	Zone 7's Fiscal Year 18/19 Water System CIP and 2019 WSE Update	$55	n/a	Costs based on a 6.8-mile, 30-inch diameter pipeline connecting the west side of Zone 7's system with EBMUD's system. Cost converted to 2021 dollars based on estimated timing of project in Zone 7's Fiscal Year 18/19 CIP.
P-6. Delta Conveyance	Zone 7's 2019 WSE Update and Water Resources Committee Meeting Presentation (September 28, 2020)	$220	$2,000 [b]	Zone 7's share of cost (as presented in 2019 WSE Update for CA WaterFix) was adjusted proportionally, accounting for inflation and revised project cost for Delta Conveyance. Unit cost was adjusted proportionally considering revised project cost and yield assumptions.[b]
P-7. Sites Reservoir	Zone 7's 2019 WSE Update and September 2020 Retailer Report	$70	$1,000	Zone 7's share of capital cost (as presented in 2019 WSE Update) was adjusted based on revised total capital cost of $3-3.3B (from Sept 2020 retailer report). Unit cost based on Sept 2020 retailer report.
P-8. Los Vaqueros Expansion and Transfer-Bethany Pipeline	Zone 7's 2019 WSE Update	TBD [c]	$1,700	Costs will be allocated among partners based on proportional use of the facilities. Unit cost is preliminary estimated cost of water delivered to Zone 7 (based on 10,000 AF of storage and average annual delivery at 1,600 AFY).

a. All costs shown in 2021 dollars.

b. Assumes Delta Conveyance will preserve 5 percent of Zone 7's Table A allocation (~4,000 AFY), instead of 13 percent (~11,000 AFY) as assumed in Zone 7's 2019 WSE Update for CA WaterFix. Actual water supply benefit of Delta Conveyance is still being determined.

c. Total capital cost is approximately $900M, with an estimated 23 percent funded by local partners. Local partners' shares are still being determined and will depend on partner participation and usage. For the 2021 AWSS, Zone 7's share was assumed to be on the order of $10M.

Given costs for Zone 7 alternatives were pulled from different sources, they cannot be directly compared to the costs developed for DSRSD-led alternatives, as the basis of cost and assumptions may differ. For the 2021 AWSS, these estimates are intended to illustrate the order-of-magnitude costs of different types of projects. Further analysis is needed to better define the costs of alternatives and compare using a consistent basis.

C.5 Costs for DSRSD-Led Alternatives

Capital, O&M, and unit cost estimates prepared for DSRSD-led alternatives are summarized in Table C-4, with details on capital and O&M costs for each alternative presented on subsequent pages.

Table C-4. Summary of Costs for DSRSD-Led Alternatives

Alternative	Capital Cost ($M) [a]	O&M ($/year) [b]	Estimated Yield (AFY) [c]	Unit Cost, 60-year lifecycle ($/AF) [d]	Unit Cost, 30-year lifecycle ($/AF) [d]	Notes/Assumptions
P-1. DPR via Treated Water Augmentation	$100	$1,000,000	1,700	$2,900	$4,300	Estimated based on capital and O&M cost curves created for unit processes in advanced water purification facilities. Includes added cost for pump station and pipeline to connect to potable water system. Easement cost not included.
NP-1. Recycled Water Storage in Chain of Lakes	$130	$1,600,000	3,200	$1,800	$2,700	Assumes recycled water is pumped to Lake G five months/year and returned five months/year and no additional treatment is required (if required, cost would increase). Does not include cost of negotiating early acquisition of lakes from the quarry owners, which could significantly increase cost.
NP-2. Fringe Basin Groundwater	$15	$1,500,000	2,600	$800	$1,000	Assumes 3 wells (capacity 400 gpm) operating 5 months/year, and up to 1.5 miles of new conveyance.
NP-3. Groundwater from Hopyard #7 Well	$5	$1,100,000	1,400	$800	$900	Assumes Hopyard 7 is pumped to an existing sewer for conveyance to DSRSD's WWTP influent; sewer capacity and alignment were not verified. Additional analysis is needed to determine existing sewer capacity. Assumes Hopyard 7 well is pumped 5 months/year and produces 2 mgd.
NP-4. RO Reject from Zone 7's Groundwater Demineralization Facility	$10	$300,000	100	$5,800	$7,000	Estimated cost for a second RO facility to treat the brine, assuming 0.5 mgd of brine is available on average. Assumes the plant operates 5 months out of the year with a 50 percent recovery rate. Does not include cost of RO concentrate management.
NP-5. Wastewater from Neighboring Agency	TBD	$2,100,000	3,400	$600	$600	No capital cost assumed at this time; may include cost of purchasing water or installing new diversion facilities. Cost to treat additional wastewater or send to LAVWMA is included in annual O&M.

a. *Capital costs rounded up to the nearest $5M.*
b. *O&M costs include recycled water treatment and distribution costs (for non-potable alternatives) and are rounded up to the nearest $100,000/year.*
c. *Yield estimates are preliminary. For non-potable alternatives, yield reflects total expected increase in non-potable supply (based on new supplemental supply in the peak months plus additional recycled water production in the shoulder months, where applicable).*
d. *Unit costs rounded up to the nearest $100/AF and shown for two different lifecycles: 60-year period with 3 percent real discount rate (lower value) and 30-year period with 5 percent real discount rate (higher value). The 2021 AWSS presents the higher values, which are more consistent with the approach used to calculate unit costs for Zone 7-led alternatives.*

P-1. Direct Potable Reuse via Treated Water Augmentation

CAPITAL COST ESTIMATE

Line Item		Cost ($USD)	Notes
TWA facility	2 mgd capacity	$ 28,800,000	Estimate from Plumlee et al., 2014, including: ozone, BAC, BAC, UV-AOP, MF/UF, and NF/RO unit processes.
Building cost (rework/expansion of existing building)		$ 2,600,000	Assumes $200 per ft^2
Conveyance pipeline	5,000 LF; 10-in dia	$ 1,538,000	connects to potable system
Pump to potable water supply	(1) 50 HP pump	$ 105,000	
HDD crossing	1 assumed	$ 339,000	
Raw Construction Costs		**$ 33,382,000**	
Demolition (if applicable) - 5 to 10%	0%	$ -	
Site Civil (if applicable) - 5%	5%	$ 1,669,000	
Sheeting/Shoring/Dewatering (if applicable) - 10%	0%	$ -	
Specialty Foundation (if applicable) - 12%	0%	$ -	
Yard Piping (if applicable) - 10%	10%	$ 3,338,000	
HVAC (if applicable) - 5%	5%	$ 1,570,000	TWA facility and building
Electrical and Instrumentation (if applicable) - 25%	25%	$ 26,000	For pumps (TWA facility estimates include electrical and instrumentation)
Total Direct Cost		**$ 39,985,000**	
General Conditions - 10%	10%	$ 3,998,000	
General Contractor Overhead and Profit, Bonds and Insurance - 15%	15%	$ 5,998,000	
Sales Tax - 9.5% applied to 1/2 of Total Direct Costs	9.5%	$ 1,899,000	
Subtotal		**$ 51,880,000**	
Bid Market Allowance - up to 10%	10%	$ 5,188,000	Allowance for uncertainty in market conditions
Total Construction Cost		**$ 57,068,000**	
Project Cost Factor - 30%	30%	$ 17,120,000	
Total Project Cost		**$ 74,188,000**	
Estimating Contingency - 30%	30%	$ 22,256,000	
Total Project Cost (with Contingency)		**$ 96,445,000**	

P-1. Direct Potable Reuse via Treated Water Augmentation

OPERATING COST ESTIMATES

Line Item	Cost ($USD)	Notes
Ozone (incl. elec, chem, labor, & replacements)	$ 12,700	based on 2014 paper includes: energy, replacement parts, chemical use, and labor (if significant)
BAC (incl. elec, chem, labor, & replacements)	$ 125,000	based on 2014 paper includes: energy, replacement parts, chemical use, and labor (if significant)
BAC (incl. elec, chem, labor, & replacements)	$ 147,000	based on 2014 paper includes: energy, replacement parts, chemical use, and labor (if significant)
UV-AOP (incl. elec, chem, labor, & replacements)	$ 70,900	based on 2014 paper includes: energy, replacement parts, chemical use, and labor (if significant)
MF or UF (incl. elec, chem, labor, & replacements)	$ 498,000	based on 2014 paper includes: energy, replacement parts, chemical use, and labor (if significant)
NF or RO (incl. elec, chem, labor, & replacements)	$ 498,000	based on 2014 paper includes: energy, replacement parts, chemical use, and labor (if significant)
Electrical cost	$ 21,100	for pump operation
Pipeline Maintenance	$ 18,800	1% of pipeline install
LAVWMA/EBDA discharge savings	$ (435,000)	$795/MG based on proposed FY21/22 costs (per email correspondence with Chuck Weir)
Annual Costs	**$ 957,000**	

Class 5 Capital Cost Estimate Range	
-50%	$ 48,300,000
Estimate	$ 96,500,000
+100%	$ 193,000,000

Parameters	Value	Notes
Daily Yield, mgd	2.0	Average yield when operating
Operation, months	9	Operated September-May when flow is available
Annual Yield, AFY	1,700	

General Project Assumptions

- Capital and operating costs developed from *Megan H. Plumlee, Benjamin D. Stanford Jean-Francois Debroux, D. Cory Hopkins & Shane A. Snyder (2014) Costs of Advanced Treatment in Water Reclamation, Ozone: Science & Engineering, 36:5, 485-495 (Plumlee et al., 2014)*
- Assumes facility operates Sept-May with maintenance during summer

NP-1. Recycled Water Storage in Chain of Lakes
CAPITAL COST ESTIMATE

Line Item		Cost ($USD)	Notes
Conveyance pipeline	28,000 LF; 12-in dia.	$ 10,338,000	
Conveyance pump station	(3) 70 HP pumps	$ 452,000	from DSRSD WWTP to Lake G @ 2.6 mgd for 5 mo/yr
Return pump station	(2) 80 HP pumps	$ 381,000	from Lake G to DSRSD WWTP @ 2.6 mgd for 5 mo/yr
HDD Crossing	4 assumed	$ 1,354,000	
Land acquisition	40 acres	$ 40,000,000	Assume $1M/acre per discussion with Zone 7. Lake G surface area is 40 acres (per Preliminary COL Evaluation Update)
Negotation costs (based on lost revenue from aggregate)	TBD		Cost to be determined; Not included in preliminary estimate
Raw Construction Costs		**$ 52,526,000**	
Demolition (if applicable) - 5 to 10%	0%	$ -	
Site Civil (if applicable) - 5%	5%	$ 42,000	Apply only to pump stations
Sheeting/Shoring/Dewatering (if applicable) - 10%	10%	$ 83,000	Apply only to pump stations
Specialty Foundation (if applicable) - 12%	0%	$ -	
Yard Piping (if applicable) - 10%	10%	$ 83,000	Apply only to pump stations
HVAC (if applicable) - 5%	5%	$ 42,000	Apply only to pump stations
Electrical and Instrumentation (if applicable) - 25%	25%	$ 208,000	Apply only to pump stations
Total Direct Cost		**$ 52,984,000**	
General Conditions - 10%	10%	$ 5,298,000	
General Contractor Overhead and Profit, Bonds and Insurance - 15%	15%	$ 7,948,000	
Sales Tax - 9.5% applied to 1/2 of Total Direct Costs	9.5%	$ 2,517,000	
Subtotal		**$ 68,747,000**	
Bid Market Allowance - up to 10%	10%	$ 6,875,000	Allowance for uncertainty in market conditions
Total Construction Cost		**$ 75,621,000**	
Project Cost Factor - 30%	30%	$ 22,686,000	
Total Project Cost		**$ 98,308,000**	
Estimating Contingency - 30%	30%	$ 29,492,000	
Total Project Cost (with Contingency)		**$ 127,800,000**	

NP-1. Recycled Water Storage in Chain of Lakes
OPERATING COST ESTIMATES

Line Item	Cost ($USD)	Notes
Electrical cost	$ 96,400	Pumping cost to and from Lake G
Pump Maintenance	$ 16,700	2% of pump install
Pipeline Maintenance	$ 117,000	1% of pipeline install
Tertiary treatment cost for increased RW production	$ 1,820,000	$318/MG based on FY 2022-23 proposed DERWA operation & maintenance budget
Transmission cost for increased RW production	$ 331,000	$1,745/MG based on FY 2022-23 proposed DERWA operation & maintenance budget
LAVWMA/EBDA discharge savings from increased RW production	$ (829,000)	$795/MG based on proposed FY21/22 costs (per email correspondence with Chuck Weir)
Annual Costs	**$ 1,552,000**	

Class 5 Capital Cost Estimate Range	
-50%	$ 63,900,000
Estimate	$ 127,800,000
+100%	$ 255,600,000

Parameters	Value	Notes
Average Daily Flow, mgd	2.6	Average flow during summer months for use
Summer Operation, months	5	Months water is pumped from lakes for use
Annual Yield from Storage, AFY	1,200	

General Project Assumptions

- Two pump stations required to send flow to and from Chain of Lakes
- Cost to cover lost revenue from aggregate sales not included in estimate

NP-2. Fringe Basin Groundwater
CAPITAL COST ESTIMATE

Line Item		Cost ($USD)	Notes
(3) wells & pump stations installed	500 gpm capacity, ea; 400 gpm operation, ea	$ 2,969,000	
Conveyance pipeline	7,700 LF; 8 in dia.	$ 2,843,000	
Raw Construction Costs		**$ 5,812,000**	
Demolition (if applicable) - 5 to 10%	0%	$ -	
Site Civil (if applicable) - 5%	5%	$ 291,000	
Sheeting/Shoring/Dewatering (if applicable) - 10%	0%	$ -	
Specialty Foundation (if applicable) - 12%	0%	$ -	
Yard Piping (if applicable) - 10%	0%	$ -	
HVAC (if applicable) - 5%	0%	$ -	
Electrical and Instrumentation (if applicable) - 25%	0%	$ -	
Total Direct Cost		**$ 6,103,000**	
General Conditions - 10%	10%	$ 610,000	
General Contractor Overhead and Profit, Bonds and Insurance - 15%	15%	$ 915,000	
Sales Tax - 9.5% applied to 1/2 of Total Direct Costs	9.5%	$ 290,000	
Subtotal		**$ 7,918,000**	
Bid Market Allowance - up to 10%	10%	$ 792,000	Allowance for uncertainty in market conditions
Total Construction Cost		**$ 8,710,000**	
Project Cost Factor - 30%	30%	$ 2,613,000	
Total Project Cost		**$ 11,323,000**	
Estimating Contingency - 30%	30%	$ 3,397,000	
Total Project Cost (with Contingency)		**$ 14,720,000**	

NP-2. Fringe Basin Groundwater
OPERATING COST ESTIMATES

Line Item	Cost ($USD)	Notes
Electrical cost	$ 40,700	for pump operation
Pump Maintenance	$ 9,450	2% of pump capital cost
Pipeline Maintenance	$ 28,400	1% of pipeline install
Secondary Treatment for Fringe Groundwater	$ 135,000	$518/MG based on FY 2022-23 proposed DERWA operation & maintenance budget
Tertiary treatment cost for increased RW production	$ 1,480,000	$318/MG based on FY 2022-23 proposed DERWA operation & maintenance budget
Transmission cost for increased RW production	$ 269,000	$1,745/MG based on FY 2022-23 proposed DERWA operation & maintenance budget
LAVWMA/EBDA discharge savings from increased RW production (shoulder months)	$ (466,000)	$795/MG based on proposed FY21/22 costs (per email correspondence with Chuck Weir)
Annual Costs	**$ 1,497,000**	

Class 5 Capital Cost Estimate Range	
-50%	$ 7,400,000
Estimate	$ 14,800,000
+100%	$ 29,600,000

Parameters	Value	Notes
Average Daily Flow, mgd	1.7	Average yield during summer
Summer Operation, months	5	Months groundwater is pumped for use
Annual Groundwater Yield, AFY	800	

General Project Assumptions

- Number and location of wells to be confirmed through field verification
- Assumes no pumping quota for the fringe basin (assumes no adverse impacts to the Main Basin)
- Assumes fringe basin groundwater is introduced at the front of the WWTP (depending on location and water quality, groundwater may be added directly to the DERWA system to reduce costs)

NP-3. Groundwater from Hopyard #7 Well
CAPITAL COST ESTIMATE

Line Item		Cost ($USD)	Notes
Conveyance pipeline	2,200 LF; 10 in dia.	$ 812,000	Pipeline to sewer (connection point to be confirmed)
HDD crossing	1 assumed	$ 339,000	
Raw Construction Costs		**$ 1,151,000**	
Demolition (if applicable) - 5 to 10%	0%	$ -	
Site Civil (if applicable) - 5%	5%	$ 58,000	
Sheeting/Shoring/Dewatering (if applicable) - 10%	0%	$ -	
Specialty Foundation (if applicable) - 12%	0%	$ -	
Yard Piping (if applicable) - 10%	0%	$ -	
HVAC (if applicable) - 5%	0%	$ -	
Electrical and Instrumentation (if applicable) - 25%	25%	$ 288,000	
Total Direct Cost		**$ 1,496,000**	
General Conditions - 10%	10%	$ 150,000	
General Contractor Overhead and Profit, Bonds and Insurance - 15%	15%	$ 224,000	
Sales Tax - 9.5% applied to 1/2 of Total Direct Costs	9.5%	$ 71,000	
Subtotal		**$ 1,941,000**	
Bid Market Allowance - up to 10%	10%	$ 194,000	Allowance for uncertainty in market conditions
Total Construction Cost		**$ 2,135,000**	
Project Cost Factor - 30%	30%	$ 641,000	
Total Project Cost		**$ 2,776,000**	
Estimating Contingency - 30%	30%	$ 833,000	
Total Project Cost (with Contingency)		**$ 3,609,000**	

NP-3. Groundwater from Hopyard #7 Well
OPERATING COST ESTIMATES

Line Item	Cost ($USD)	Notes
Electrical cost	$ 36,800	for pump operation
Pump Maintenance	$ 7,350	2% of assumed capital for exisitng pump
Pipeline Maintenance	$ 11,500	1% of pipeline install
Secondary Treatment for Hopyard 7	$ 169,000	$518/MG based on FY 2022-23 proposed DERWA operation & maintenance budget
Tertiary treatment cost for increased RW production	$ 796,000	$318/MG based on FY 2022-23 proposed DERWA operation & maintenance budget
Transmission cost for increased RW production	$ 145,000	$1,745/MG based on FY 2022-23 proposed DERWA operation & maintenance budget
LAVWMA/EBDA discharge savings from increased RW production (shoulder months)	$ (104,000)	$795/MG based on proposed FY21/22 costs (per email correspondence with Chuck Weir)
Annual Costs	**$ 1,062,000**	

Class 5 Capital Cost Estimate Range	
-50%	$ 1,850,000
Estimate	$ 3,700,000
+100%	$ 7,400,000

Parameters	Value	Notes
Average Daily Flow, mgd	2.1	Average yield during summer
Summer Operation, months	5	Months groundwater is pumped for use
Annual Groundwater Yield, AFY	1,000	

General Project Assumptions

- Assumes WWTP can handle quality/quantity of Hop 7 water with no impact
- Cost to connect to sewer not included
- Sewer capacity and route to be verified
- Manganese in Hop 7 well water not considered in evaluation
- Arsenic and boron concentrations to be verified and monitored over time

NP-4. RO Reject from Zone 7's Groundwater Demin. Facility

CAPITAL COST ESTIMATE

Line Item		Cost ($USD)	Notes
Concrete retrofit for existing facility		$ 20,000	
RO		$ 1,695,000	Assumes $1.2/gpd, not including feed pumps
RO feed pumps	(3) 100 HP pumps	$ 630,000	Assumes 1 psi per 100 mg/L for pump sizing (1 per 0.5 mgd); 3400 mg/L TDS in RO Reject brine
Raw Construction Costs		**$ 2,345,000**	
Demolition (if applicable) - 5 to 10%	0%	$ -	
Site Civil (if applicable) - 5%	5%	$ 117,000	
Sheeting/Shoring/Dewatering (if applicable) - 10%	0%	$ -	
Specialty Foundation (if applicable) - 12%	0%	$ -	
Yard Piping (if applicable) - 10%	0%	$ -	
HVAC (if applicable) - 5%	0%	$ -	
Electrical and Instrumentation (if applicable) - 25%	25%	$ 586,000	
Total Direct Cost		**$ 3,049,000**	
General Conditions - 10%	10%	$ 305,000	
General Contractor Overhead and Profit, Bonds and Insurance - 15%	15%	$ 457,000	
Sales Tax - 9.5% applied to 1/2 of Total Direct Costs	9.5%	$ 145,000	
Subtotal		**$ 3,956,000**	
Bid Market Allowance - up to 10%	10%	$ 396,000	Allowance for uncertainty in market conditions
Total Construction Cost		**$ 4,352,000**	
Project Cost Factor - 30%	30%	$ 1,306,000	
Total Project Cost		**$ 5,657,000**	
Estimating Contingency - 30%	30%	$ 1,697,000	
Total Project Cost (with Contingency)		**$ 7,354,000**	

NP-4. RO Reject from Zone 7's Groundwater Demin. Facility

OPERATING COST ESTIMATES

Line Item	Cost ($USD)	Notes
RO	$ 225,000	Estimate from Plumlee et al., 2014
RO Maintenance	$ 46,500	2% of RO install
Annual Costs	**$ 272,000**	

Class 5 Capital Cost Estimate Range	
-50%	$ 3,700,000
Estimate	$ 7,400,000
+100%	$ 14,800,000

Parameters	Value	Notes
Average Daily Flow, mgd	0.25	Average yield during summer (may not be consistently available)
Summer Operation, months	5	Months RO reject is diverted and treated
Annual Yield, AFY	100	

General Project Assumptions
- Assumes existing building footprint can be used
- Given limitations on timing and availability of RO reject, alternative would not enable connection of new recycled water customers

NP-5. Wastewater from Neighboring Agency
CAPITAL COST ESTIMATE

Line Item		Cost ($USD)	Notes
		TBD	No capital costs assumed at this time; may include cost of purchasing water or installing new diversion facilities.
Raw Construction Costs		**$ -**	
Demolition (if applicable) - 5 to 10%	0%	$ -	
Site Civil (if applicable) - 5%	0%	$ -	
Sheeting/Shoring/Dewatering (if applicable) - 10%	0%	$ -	
Specialty Foundation (if applicable) - 12%	0%	$ -	
Yard Piping (if applicable) - 10%	0%	$ -	
HVAC (if applicable) - 5%	0%	$ -	
Electrical and Instrumentation (if applicable) - 25%	0%	$ -	
Total Direct Cost		**$ -**	
General Conditions - 10%	10%	$ -	
General Contractor Overhead and Profit, Bonds and Insurance - 15%	15%	$ -	
Sales Tax - 9.5% applied to 1/2 of Total Direct Costs	9.5%	$ -	
Subtotal		**$ -**	
Bid Market Allowance - up to 10%	10%	$ -	Allowance for uncertainty in market conditions
Total Construction Cost		**$ -**	
Project Cost Factor - 30%	30%	$ -	
Total Project Cost		**$ -**	
Estimating Contingency - 30%	30%	$ -	
Total Project Cost (with Contingency)		**$ -**	

NP-5. Wastewater from Neighboring Agency
OPERATING COST ESTIMATES

Line Item	Cost ($USD)	Notes
Secondary Treatment for CCCSD Supply	$ 236,000	$518/MG based on temporary agreement with CCCSD
Cost to waste CCCSD Supply (assume 10% wasted through LAVWMA)	$ 36,300	$795/MG based on temporary agreement with CCCSD
Tertiary treatment cost for increased RW production	$ 1,930,000	$318/MG based on FY 2022-23 proposed DERWA operation & maintenance budget
Transmission cost for increased RW production	$ 352,000	$1,745/MG based on FY 2022-23 proposed DERWA operation & maintenance budget
LAVWMA/EBDA discharge savings from increased RW production (shoulder months)	$ (518,000)	$795/MG based on proposed FY21/22 costs (per email correspondence with Chuck Weir)
Annual Costs	**$ 2,036,000**	

Class 5 Capital Cost Estimate Range	
-50%	
Estimate	
+100%	

Parameters	Value	Notes
Average Daily Flow, mgd	3.0	Average yield during summer
Summer Operation, months	5	Months wastewater is diverted
Annual Yield from Neighboring Agency, AFY	1,400	

General Project Assumptions

- Assumes connection to wastewater supply exists (no capital cost)
- Long-term arrangement may require new or upgraded diversion facilities
- Does not include cost of wastewater acquisition

Appendix D: April 6, 2021 Board Meeting Materials

This page intentionally left blank.

Dublin San Ramon Services District
Water, wastewater, recycled water

2021 Alternative Water Supply Study:
A Framework for a Resilient and Sustainable Water Future

Preview of Preliminary Results

April 6, 2021

Brown AND Caldwell

1

Agenda

- Introduction
- Future Water Needs
- Alternatives
- Evaluation
- Recommended Framework
- Next Steps

Speakers:

Jan Lee
DSRSD
AGM

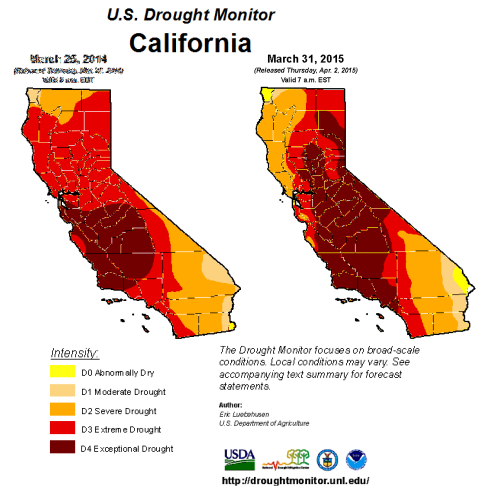
Katie Ruby, PE
Brown and Caldwell
Senior Associate/
1Water Engineer

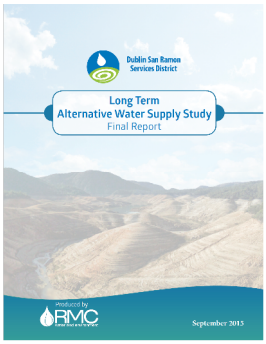
Jenny Gain, PE
Brown and Caldwell
Regional NorCal
1Water Lead

2

2

Background





- **Sept. 2015:** Long Term Alternative Water Supply Study *(2015 Study)*
- **Oct. 2015:** Water Supply, Storage, Conveyance, Quality and Conservation Policy

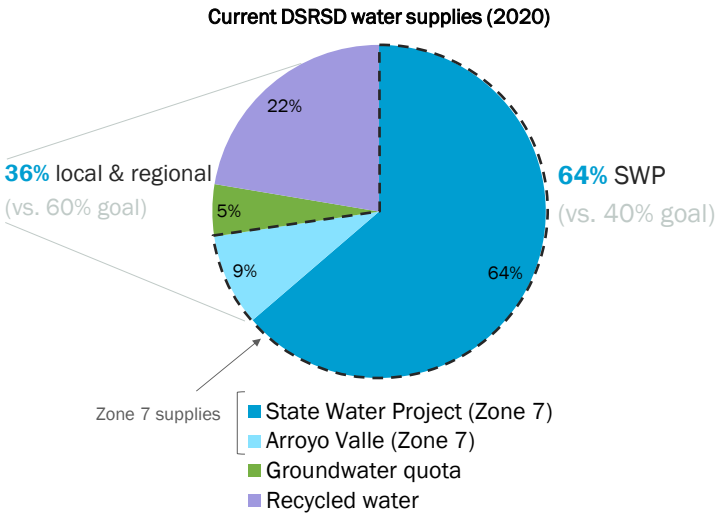
3

Current DSRSD Water Supplies Compared to 2015 Policy

DSRSD Policy Goals:

- At least **60%** of demand satisfied by local and regional supplies
- No more than **40%** originates from one source
- Except for brine, **0%** of wastewater discharged to Bay
- Independent conveyance system to serve DSRSD's customers

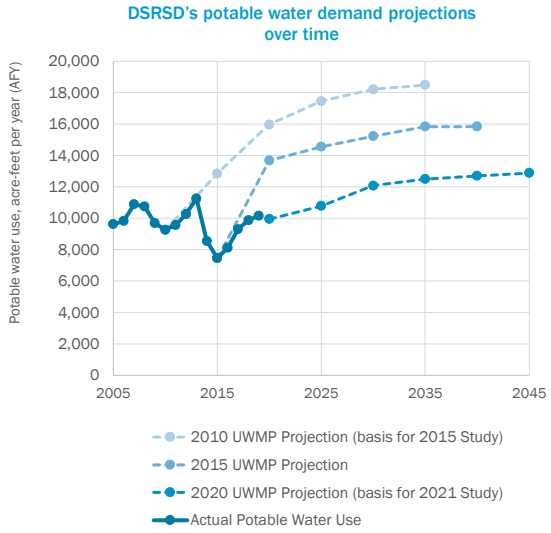
+ more



4

Much has changed since 2015

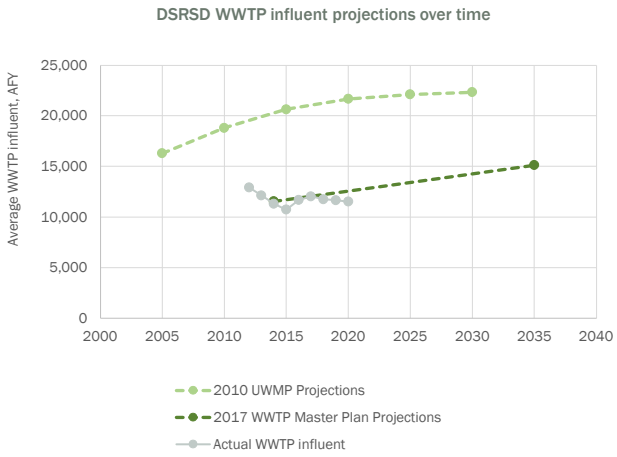
- Lower demand projections due to conservation



5

Much has changed since 2015

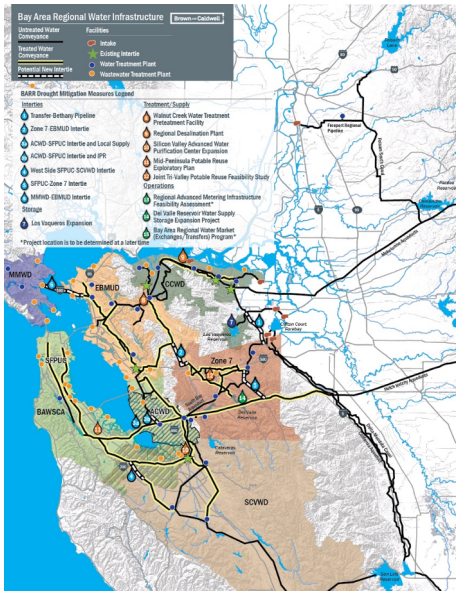
- Lower demand projections due to conservation
- Lower wastewater projections



6

Much has changed since 2015

- Lower demand projections due to conservation
- Lower wastewater projections
- Regional and local efforts

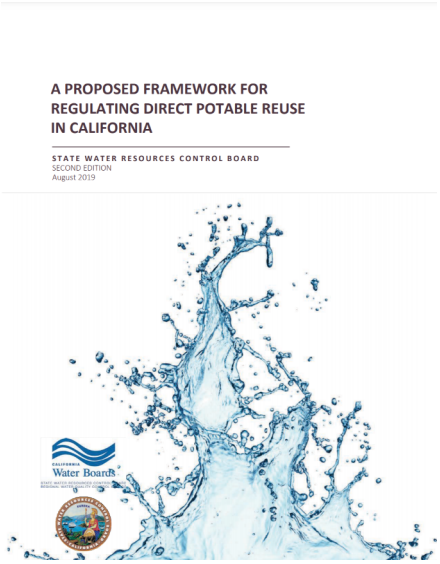


Source: BARR Drought Contingency Plan (2017).

7

Much has changed since 2015

- Lower demand projections due to conservation
- Lower wastewater projections
- Regional and local efforts
- Regulations

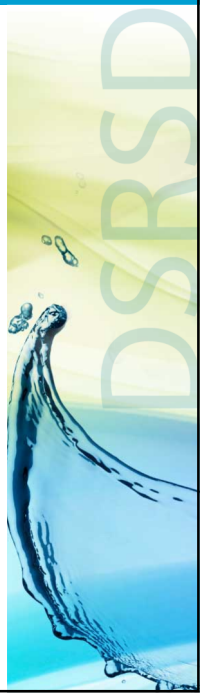


Source: State Water Resources Control Board

8

2021 AWSS Project Objectives

1. **Update** the 2015 Study with new and refined information
2. Support DSRSD's strategic plan goal to develop and implement an **integrated recycled and potable water program**
3. Inform potential updates to DSRSD's **Water Supply, Storage, Conveyance, Quality**, and **Conservation Policy**
4. Inform DSRSD's **2020 Urban Water Management Plan (UWMP) update**
5. Prepare a **framework for a resilient and sustainable water future**:
   - Outlines near- and long-term **strategies**
   - Informs and guides DSRSD's **advocacy and collaborative efforts**



9

Approach

2015 AWSS

1) Screen and confirm alternatives

RESULT: Updated list of alternatives

2) Develop future planning scenarios

RESULT: Evaluation criteria

3) Evaluate alternatives against futures

RESULT: Prioritization of near-term and long-term supply alternatives

4) Develop an adaptable framework

RESULT: Updated Water Supply Policy

10

Future Water Needs

11

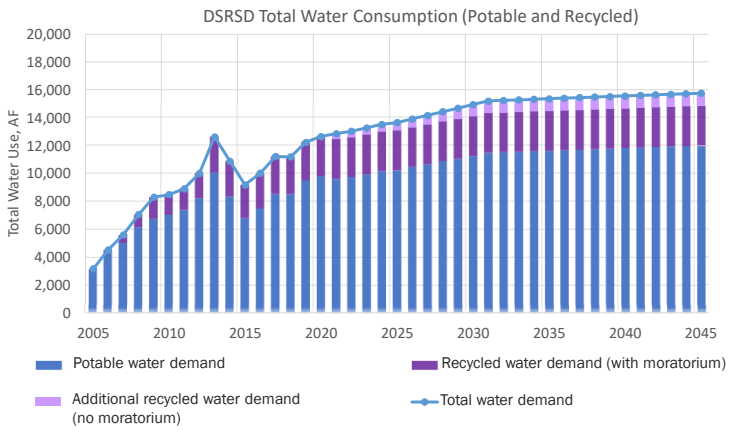
DSRSD Future Demand for Recycled and Potable Water

Projected water demand in 2045

- Total: ~16,000 AFY
- Increase: ~2,900 AFY

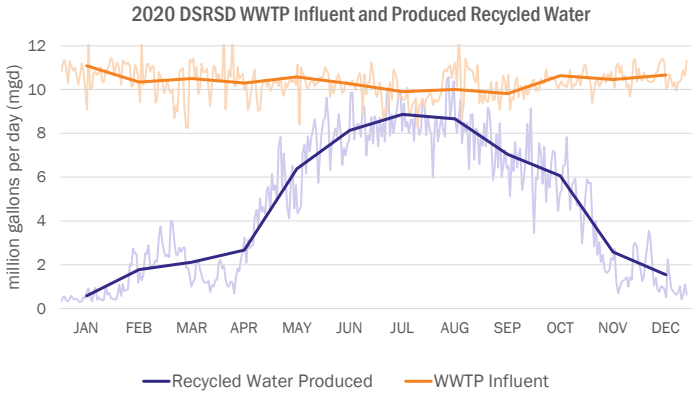
Recycled water

- Potential to offset ~30% of demand increase (900 AFY)
- Contingent on wastewater availability



12

Recycled water is limited by wastewater availability

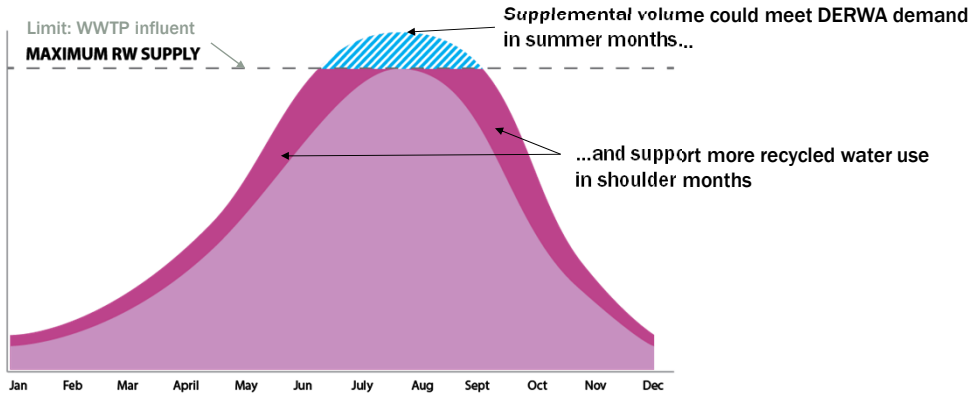


Seasonal storage:

Storing recycled water in winter months for later use in summer months

13

Expanding recycled water increases potable supply reliability



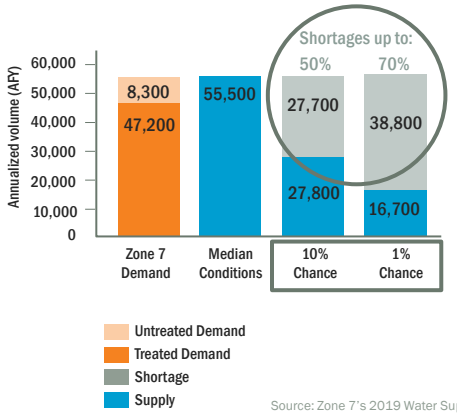
Benefits

Maximizes recycled water supply
Leverages existing infrastructure
Reduces peak potable demands
Offsets the need for new supplemental potable supply

14

Additional potable supplies are needed for Tri-Valley communities' long-term reliability

2040: Zone 7's projected demands and available supply
(assuming no new water supply projects)



Zone 7's Water Supply Reliability Policy Goals

Meet treated water customers' water needs as follows:

- **100%** of M&I water demands **90%** of the time
- At least **85%** of M&I water demands **99%** of the time

Source: Zone 7's 2019 Water Supply Evaluation Update

15

Exploring Conveyance and Storage Options

Conveyance to move supply into the Tri-Valley

- Improves reliability and resilience
  (e.g., Delta and/or South Bay Aqueduct outages)

Additional regional storage

- Improves operational flexibility and reliability
- Complements Zone 7's existing surface reservoirs and groundwater storage


Delta levee break at Jones Tract in 2004


SWP's Lake Del Valle

Photo credits: CA Department of Water Resources (DWR)

Levee failures can result in extended periods of unusable Delta supply.

16

Potential Alternatives

17

Identifying Potential Alternatives

- Revisited and screened 2015 Study alternatives
- Incorporated Zone 7 and regional efforts
- Explored projects not previously considered (added non-potable options)
- Engaged potential regional partners for input

Potential Regional Partners	
Alameda County Water District (ACWD)	City of Livermore
Central Contra Costa Sanitary District (CCCSD)	City of Pleasanton
Contra Costa Water District (CCWD)	Zone 7 Water Agency
East Bay Municipal Utility District (EBMUD)	

18

Revisiting Alternatives from 2015 - Demand Management

2015 AWSS Alternatives		2021 AWSS Approach
Enhanced conservation Residential turf replacement Greywater capture/reuse	Long-term water use efficiency legislation →	**Incorporated as baseline assumption**
Rainwater capture/reuse	→	**Not further evaluated**, due to seasonality and lack of year-to-year availability
Recycled water for residential irrigation	DERWA moratorium, lower than projected WW flows →	**Not further evaluated**, since lack of wastewater prevents connection of new recycled water customers

19

Revisiting Alternatives from 2015 - Potable Reuse and Desalination

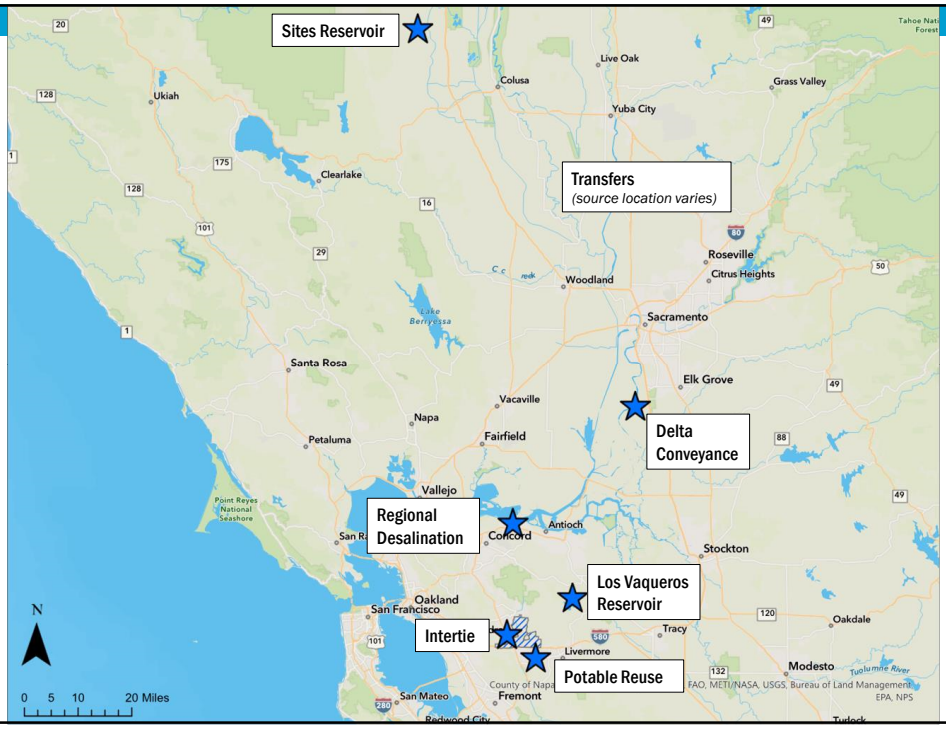
2015 AWSS Alternatives		2021 AWSS Approach
IPR via groundwater recharge IPR via reservoir augmentation	Joint Tri-Valley Potable Reuse Study →	Included as **Tri-Valley Potable Reuse** under Zone 7's supply alternatives
Direct potable reuse	DPR regulations anticipated in 2023 →	Included as **treated water augmentation (TWA)** (direct to DSRSD's distribution system)
Bay desalination (facility in Hayward)	Bay Area Regional Desalination studies →	Replaced with **Bay Area Regional Desalination** (at Mallard Slough) under Zone 7 options

20

Revisiting Alternatives from 2015 - Other Alternatives

2015 AWSS Alternatives		2021 AWSS Approach
North of Delta Transfers, wheeled through EBMUD's system	Lessons learned from past transfer attempts & BARR partnership; discussions with EBMUD →	Included as broader **transfer/ exchange opportunities** in partnership with Zone 7
Fringe Basin groundwater *(previously screened out due to limited potable supply potential)*	→	Added back as a **non-potable alternative**

Incorporating Zone 7 and Regional Efforts



Zone 7 Water Supply Reliability Options

	Potential Projects	Supply	Storage	Conveyance
	Delta Conveyance	✓		✓
*	Sites Reservoir	✓	✓	
*	Los Vaqueros Reservoir Expansion and Transfer-Bethany Pipeline		✓	✓
	Bay Area Desalination	✓		
	Potable Reuse	✓		
	Water Transfers and Exchanges	✓		
*	Interties			✓

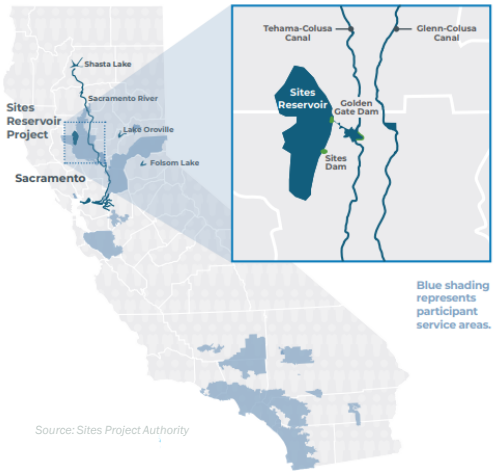
* New addition (since 2015 Study)

Zone 7 Options

Delta Conveyance

Source: Delta Conveyance Design and Construction Authority

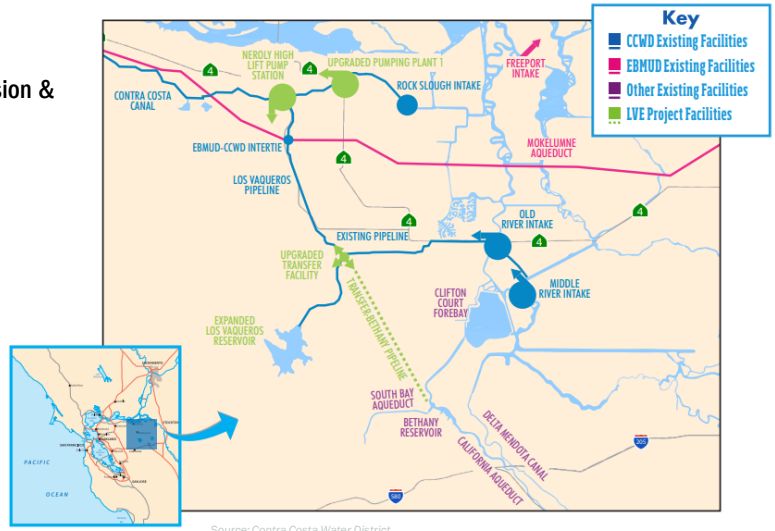
Sites Reservoir



Source: Sites Project Authority

Zone 7 Options

Los Vaqueros Reservoir Expansion & Transfer-Bethany Pipeline

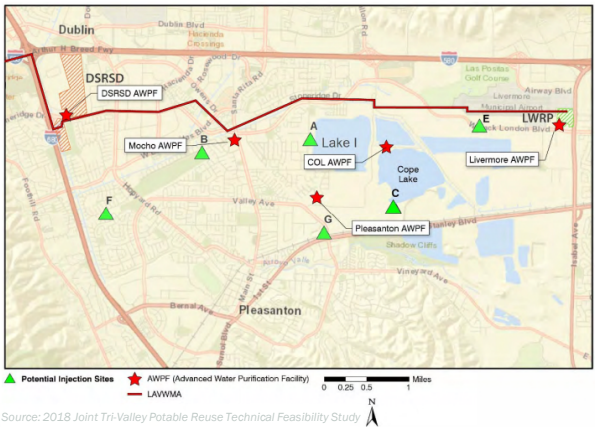


Source: Contra Costa Water District

25

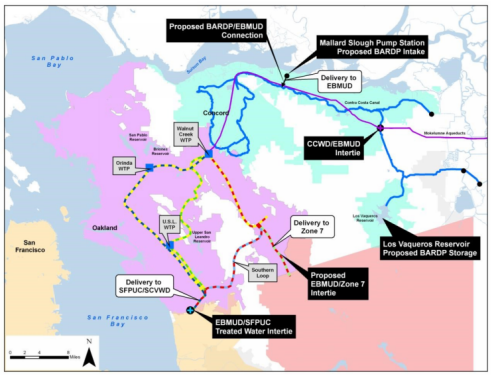
Zone 7 Options

Tri-Valley Potable Reuse



Source: 2018 Joint Tri-Valley Potable Reuse Technical Feasibility Study

Bay Area Regional Desalination

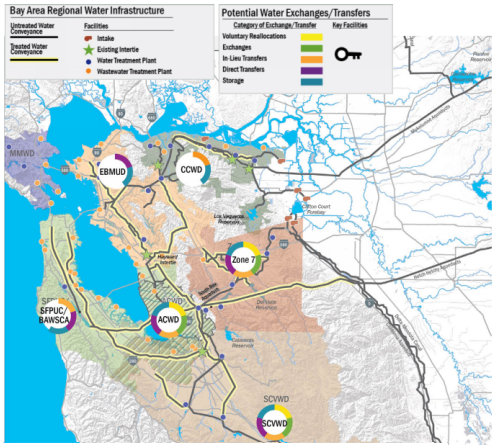


Source: Zone 7 2019 Water Supply Evaluation Update.

26

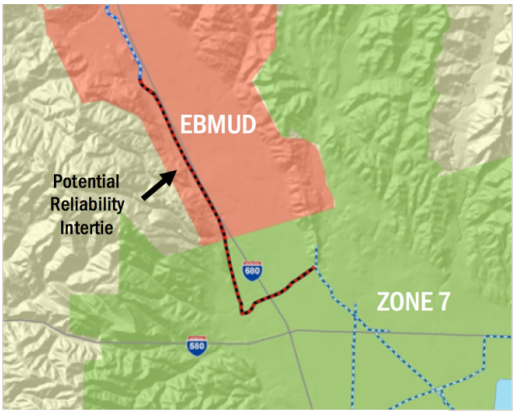
Zone 7 Options

Water Transfers and Exchanges



Source: BARR Drought Contingency Plan (2017)

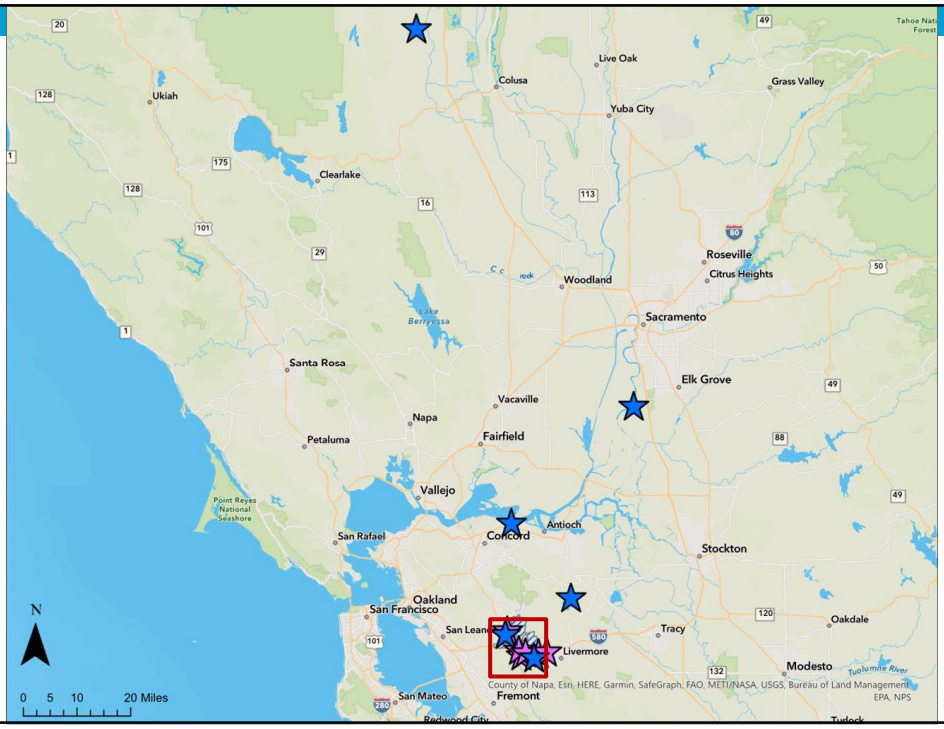
Intertie



Source: BARR Drought Contingency Plan (2017)

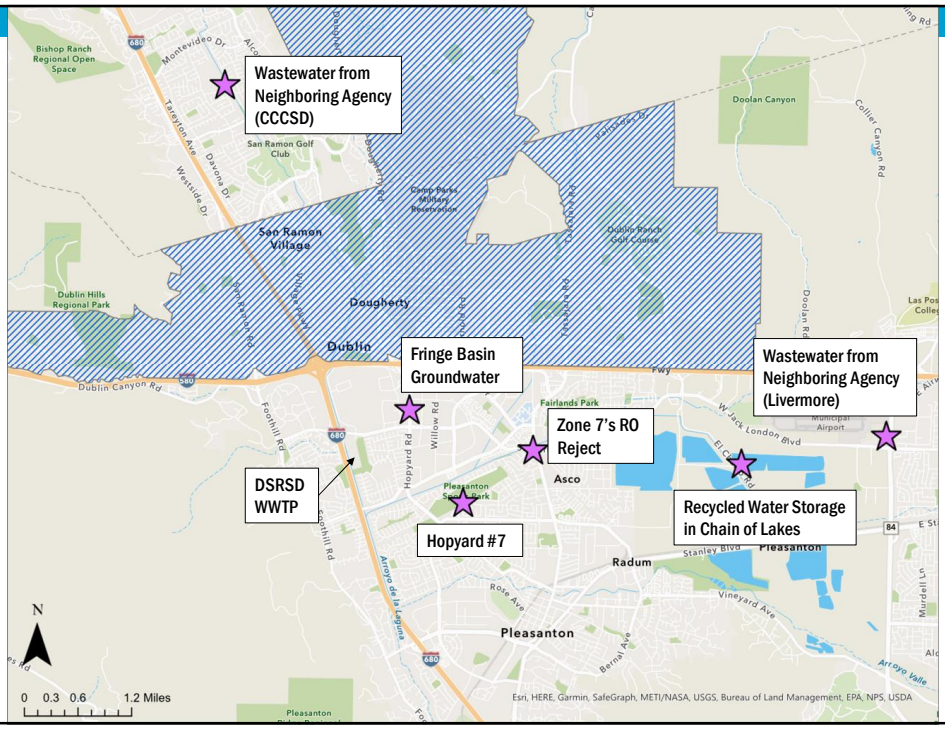
27

Exploring Non-Potable Options



28

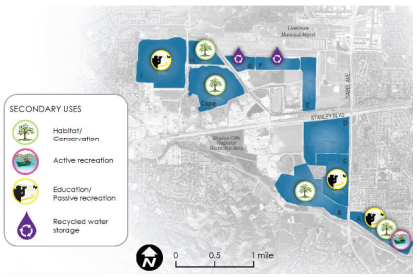
Exploring Non-Potable Options



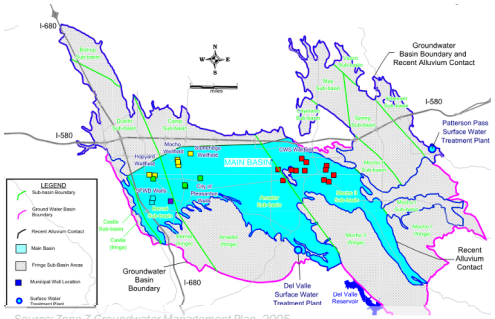
29

Non-Potable Supply and Storage Alternatives

- **Storage** of tertiary treated recycled water in Chain of Lakes
- **Groundwater (non-potable)** from the Fringe Basin or Zone 7's Hopyard #7 well
- **Reverse osmosis (RO) reject** from Zone 7's groundwater demineralization facility
- **Supplemental wastewater** from neighboring agency (CCCSD or Livermore)



Source: Zone 7 Preliminary Chain of Lakes Evaluation Update, 2020

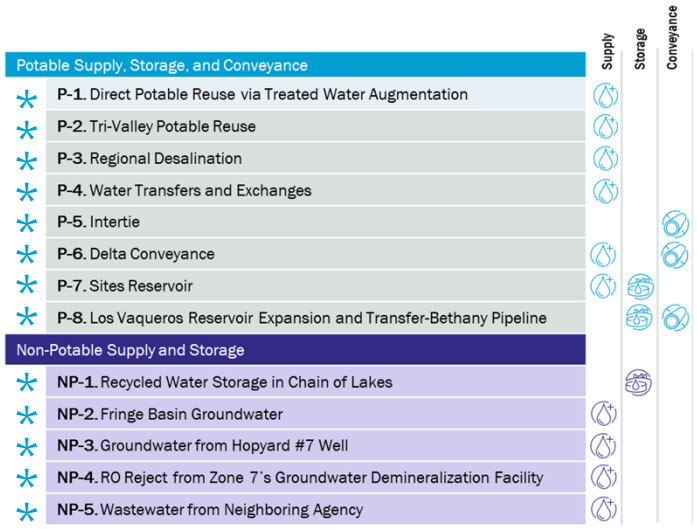


Source: Zone 7 Groundwater Management Plan, 2005

Mocho Demin Plant

30

Summary of 2021 AWSS Alternatives



* mentioned in Governor Newsom's CA Water Resilience Portfolio

Gray = currently being explored by Zone 7

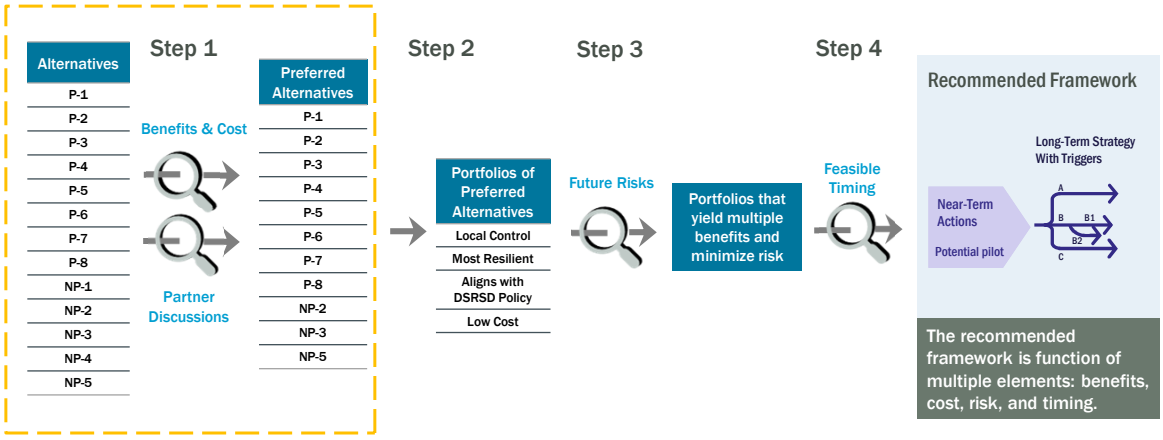
31

Preliminary Evaluation

Brown AND Caldwell

32

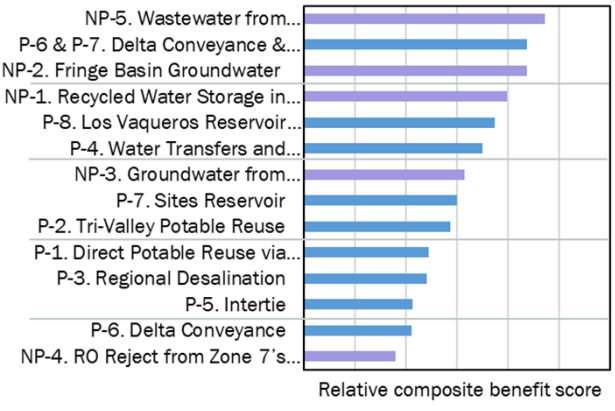
Evaluation Process Overview



Assessing Relative Benefits

Alternatives were scored using 9 evaluation criteria in four general categories:

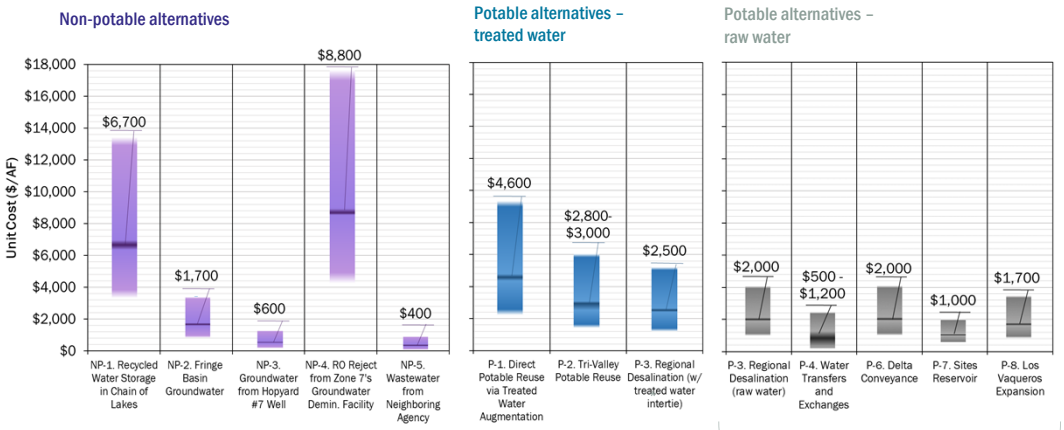
- **Technical** – technical and regulatory feasibility
- **Institutional** – institutional complexity and community support
- **Resilience** – dry-year supply, resilience to shocks, and local control
- **Sustainability** – water quality and environmental sustainability



Estimated Unit Costs

Note: costs will be refined as more information is available

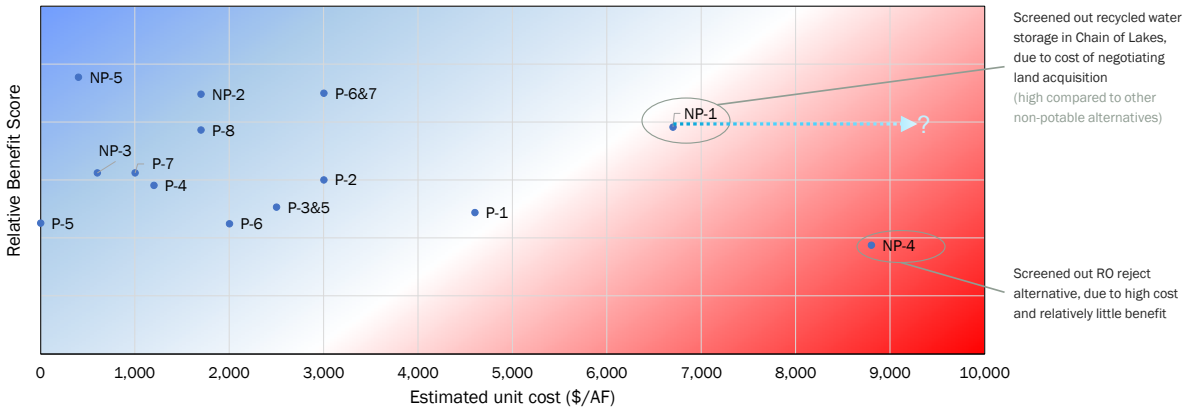
Error bars represent level of accuracy for order-of-magnitude estimates: -50% to +100%



Does not include cost of delivery and treatment, which varies by alternative

35

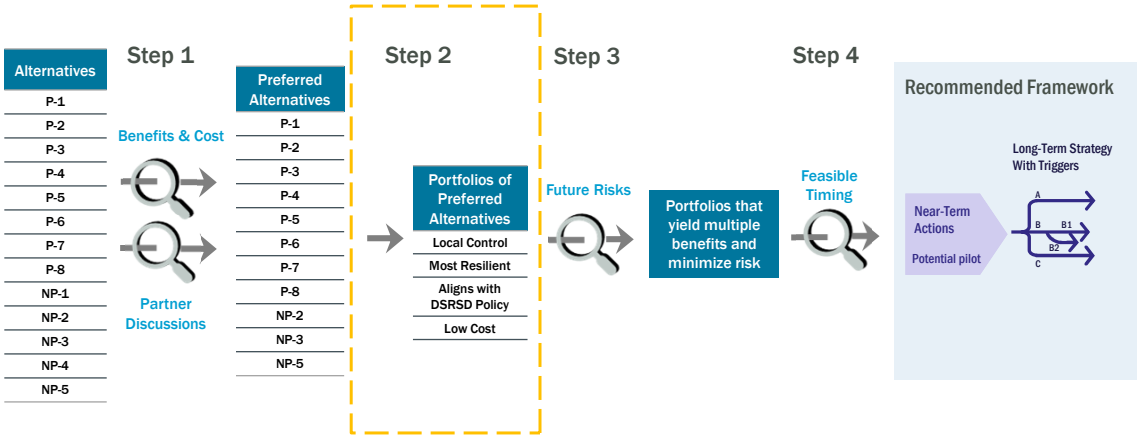
Screening Alternatives: Benefits vs. Costs



Screened out cost-prohibitive options, and incorporated remaining alternatives into different portfolios (Step 2 of evaluation)

36

Developing Portfolios



37

Identifying Portfolio Themes

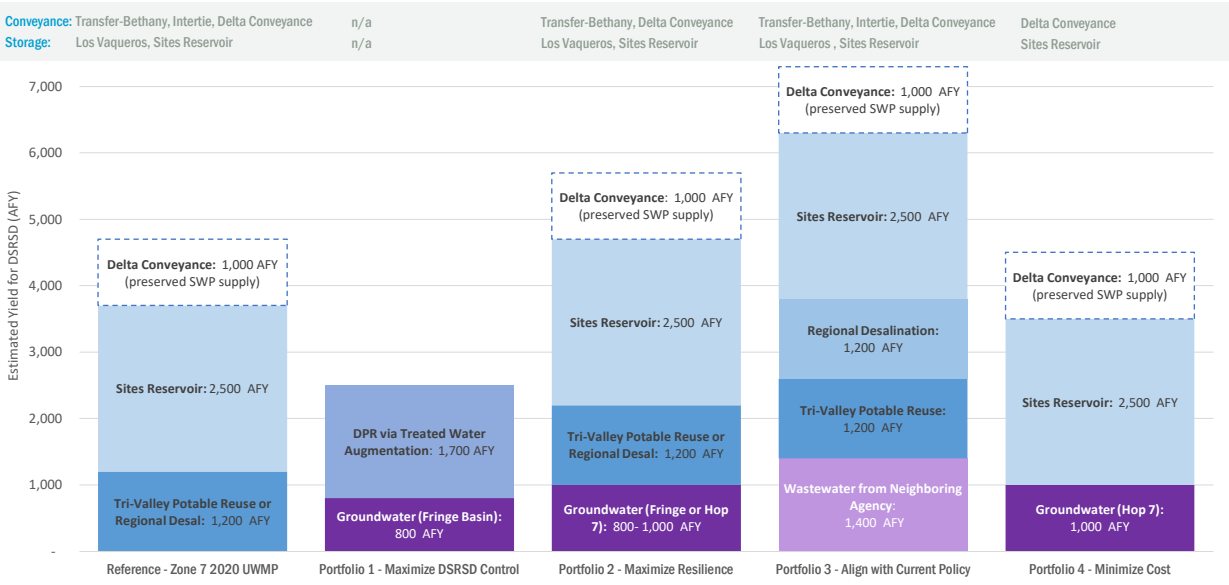
Informed by the benefit-cost analysis, combined preferred alternatives into thematic portfolios, each reflecting a different goal

- **Reference Portfolio:** Zone 7's 2020 UWMP
- **Portfolio 1:** Maximize DSRSD Control
- **Portfolio 2:** Maximize Resilience
- **Portfolio 3:** Align with DSRSD's Current Water Supply Policy (as possible)
- **Portfolio 4:** Minimize Cost

Each portfolio offers different amounts of supply, storage, and conveyance based on the portfolio's goal.

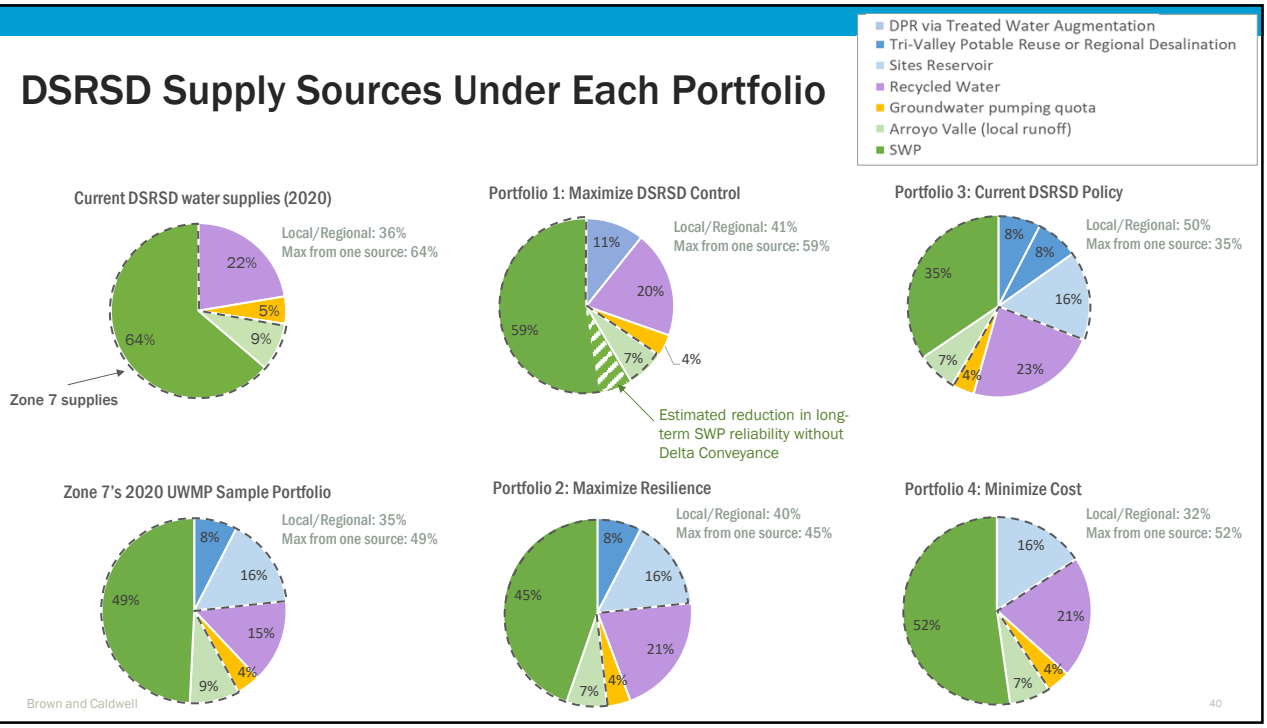
38

Augmenting Supply, Storage, and Conveyance



39

DSRSD Supply Sources Under Each Portfolio



40

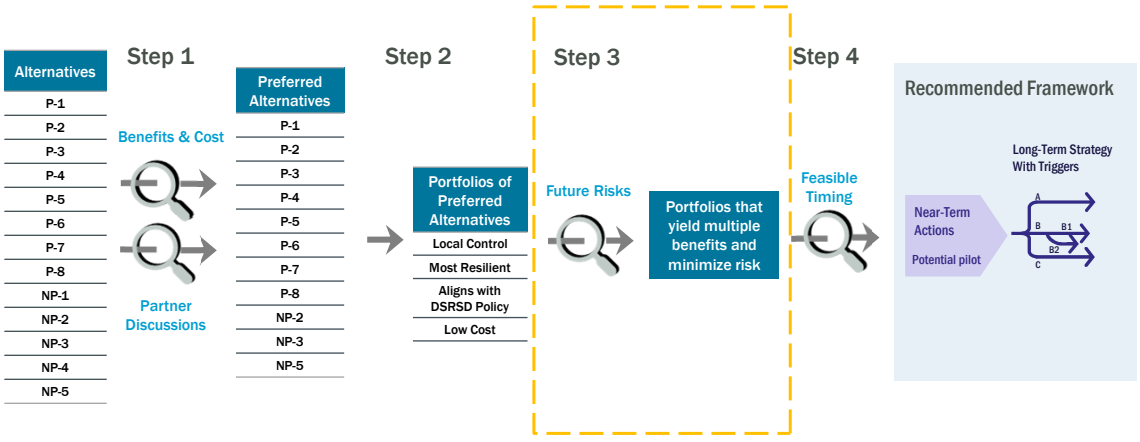
In Summary: Portfolio Yields and Costs

Compared to reference portfolio (Zone 7 2020 UWMP)
Blue font = improved resiliency
Gray font = decreased resiliency

	Reference portfolio				
	Zone 7 2020 UWMP	Portfolio 1 – Max. DSRSD Control	Portfolio 2 – Max. Resilience	Portfolio 3 – Current DSRSD Policy	Portfolio 4 – Min. Cost
Estimated yield (AFY) **New supply** **Preserved SWP supply**	3,700 1,000	2,500	**4,500 to 4,700** 1,000	**6,300** 1,000	3,500 1,000
Capital cost ($M)	$415-$600	$100	$365-$565	$545-$690	$270
Unit cost for new and preserved supply ($/AF)	$1,500-$1,700	$3,700	$1,300-$1,700	$1,600	$1,100
Local (or regional) supply (policy goal ≥60%)	35%	**41%**	**40%**	**50%**	32%
Max. supply from single source (policy goal ≤40%)	49%	59%	**45%**	**35%**	52%

41

Evaluating Relative Risk of Portfolios



42

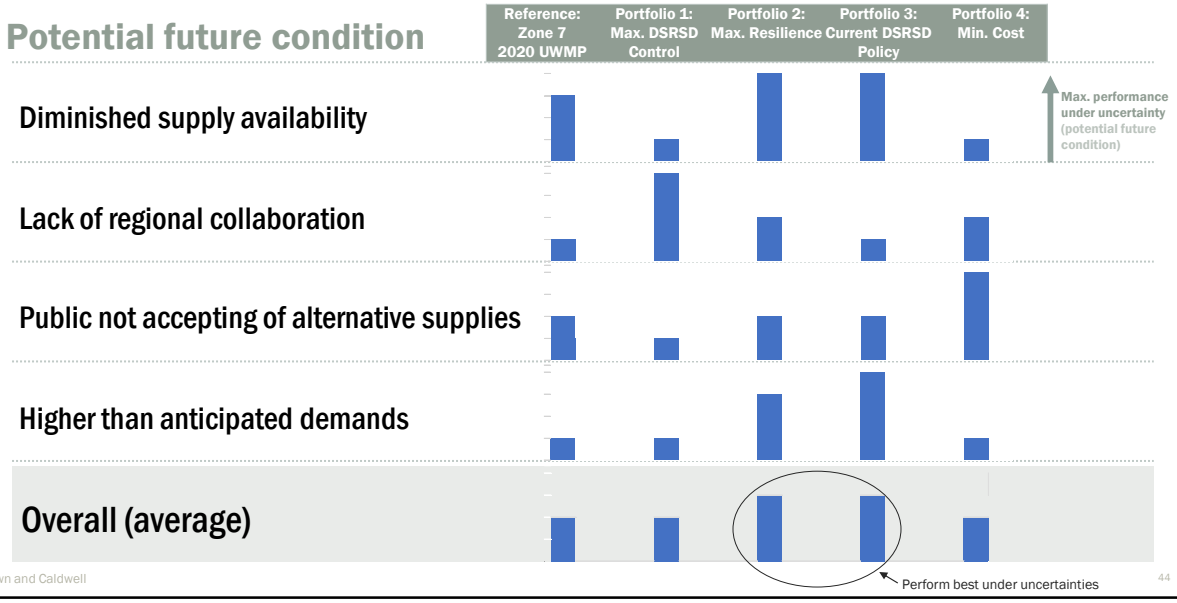
Future uncertainties can impact portfolio performance

Portfolios were evaluated four key uncertainties to determine relative risk:

- Supply availability
- Regional collaboration
- Public acceptance
- Future water demands

43

Diverse portfolios perform better under uncertainties



44

Key Takeaways

The combination of alternatives in Portfolios 2 and 3 offer multiple benefits and are most resilient to uncertainties.

Alternatives from preferred portfolios (Portfolios 2 & 3):

- **Delta Conveyance & Sites Reservoir** (best when combined)
- **Los Vaqueros Reservoir Expansion & Transfer-Bethany Pipeline**
- **Tri-Valley Potable Reuse**
- **Regional Desalination**
- **Intertie**
- **Groundwater from Fringe Basin or Hopyard 7**
- **Wastewater from Neighboring Agency *(requires willing partner)***

RECOMMENDATIONS

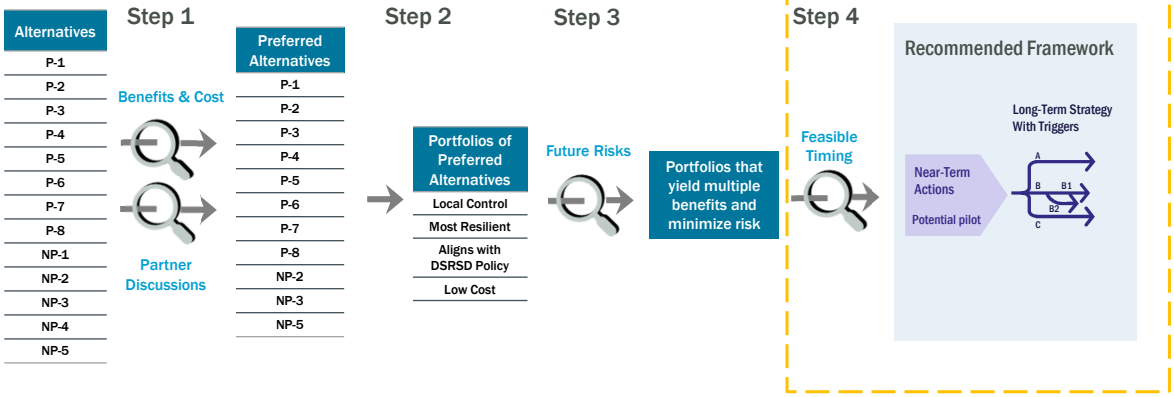
- Support Zone 7's efforts to pursue additional supply, storage, and conveyance.
- Seek supplemental non-potable supplies to expand the recycled water program.
- Explore near-term pilots to gather information and inform longer-term decisions.

45

Recommended Framework

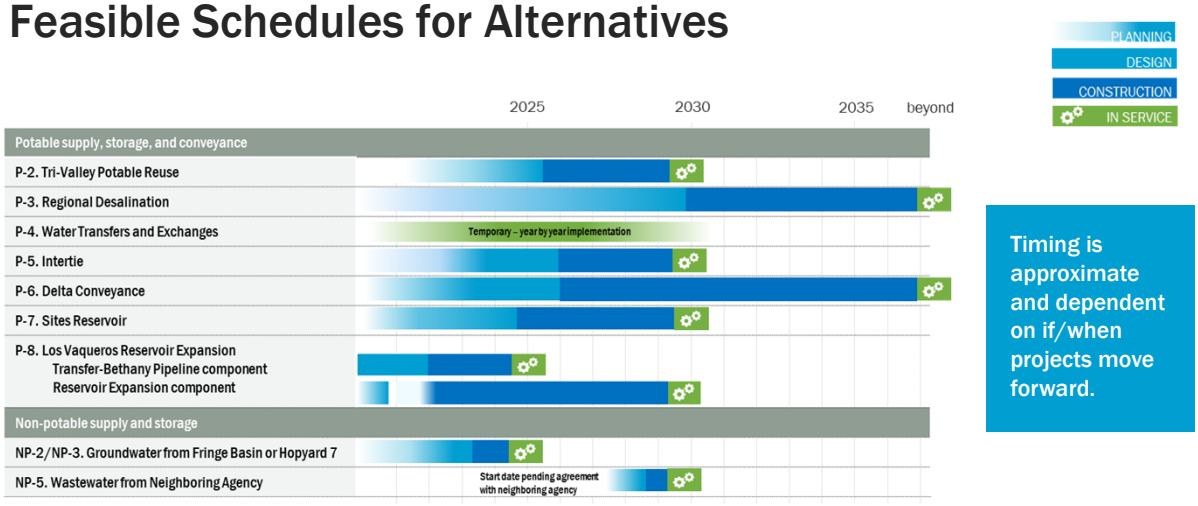
46

Developing a Framework



47

Feasible Schedules for Alternatives



Timing is approximate and dependent on if/when projects move forward.

48

Key Decision Points

2021
- Zone 7 2021 Water Supply Evaluation Update
- Los Vaqueros Reservoir Expansion JPA
- Next phase of Sites Reservoir Project

2022
- Next phase of Delta Conveyance (2023-2024)
- Continue advancing local water supply and water quality studies (including potable reuse)

2023
Regulations for direct potable reuse

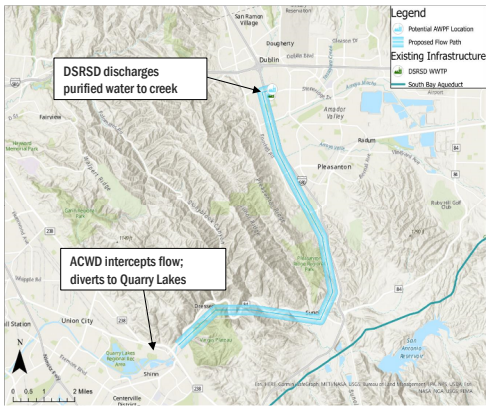
2024
DSRSD's contract renewal with Zone 7

DSRSD can take near-term steps to inform upcoming decision points:

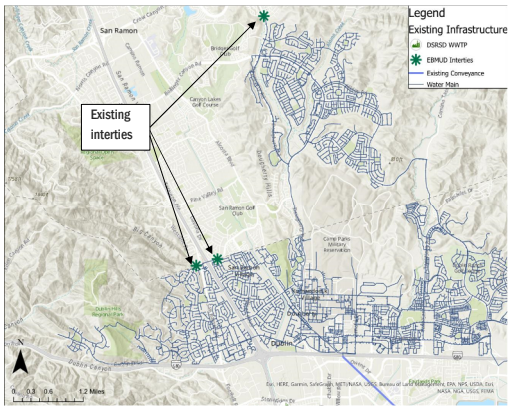
Support Zone 7's efforts:	Explore possible near-term pilots:	Seek supplemental non-potable supply:
LVE and Transfer-Bethany	Potable reuse pilot with ACWD, Zone 7, and Livermore	Work with Zone 7 to explore groundwater
Sites Reservoir and Delta Conveyance	Pilot transfer with Zone 7 and EBMUD	

Potential Near-Term Pilots

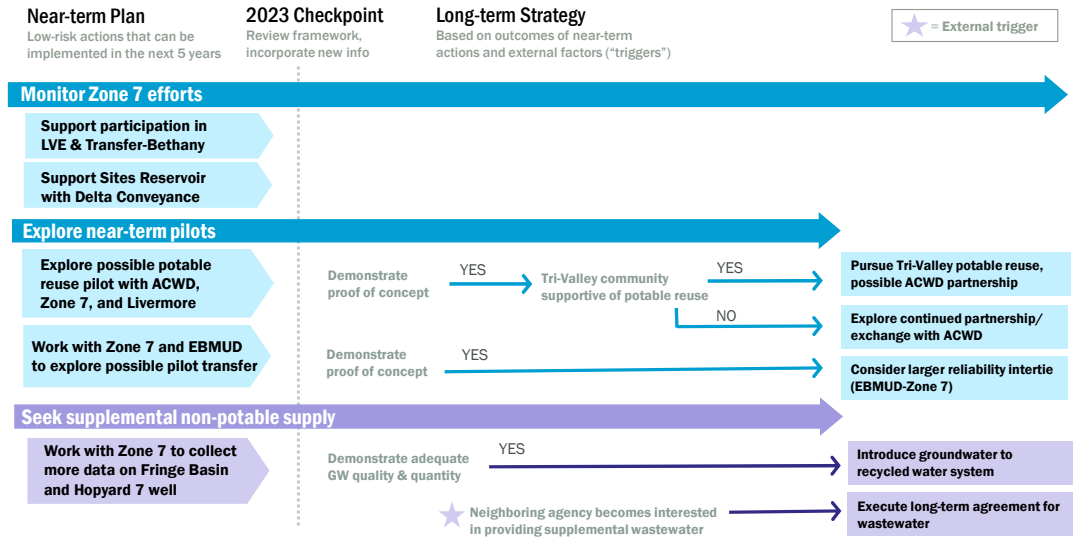
Potable reuse pilot with ACWD (with possible surface water exchange)



Pilot transfer between EBMUD and Zone 7 (via existing EBMUD-DSRSD interties)



Recommended Framework



51

Conclusions

- Conditions have changed since 2015
- Expanding recycled water benefits potable supply reliability
- Diverse portfolios improve resilience, enable flexibility, and reduce risk
- Partnerships are key to success

Recommended Next Steps

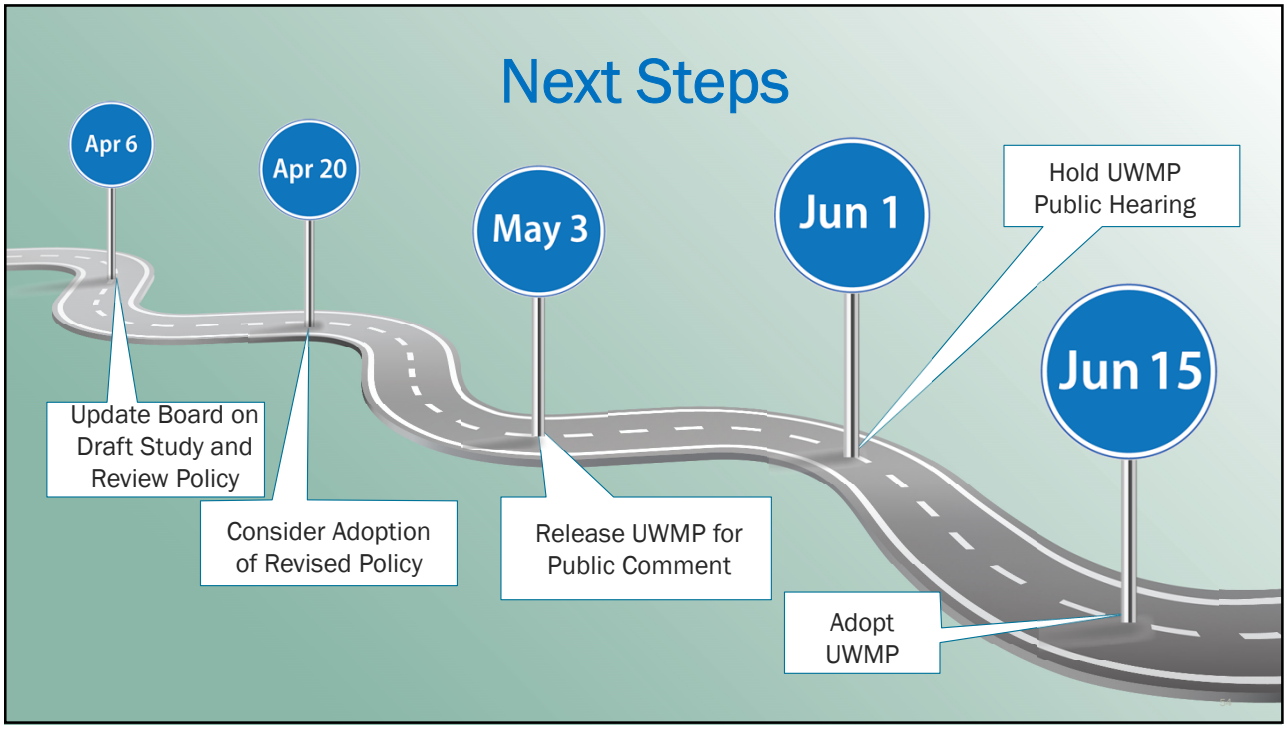
1. Amend 2015 policy to align with the recommended framework
2. Review framework in 2023 and incorporate new information

52

Proposed Revisions to 2015 Policy

- Align **conservation and water use efficiency** goals with State requirements
- Emphasize **collaborative partnerships** for building water resiliency
- Advocate for **"all of the above approach"** to pursuing a **diverse portfolio** of water supply, storage, and conveyance projects
- Prioritize **local and sustainable water sources** and projects that contribute to **regional self-reliance**
- Engage **District customers** regarding region's water supply challenges, potential solutions, and costs
- Ensure Zone 7 **water shortage allocations** recognize retailer **water use efficiency** and **investments in new water supplies**

53



54

Board Discussion and Questions

55

DUBLIN SAN RAMON SERVICES DISTRICT
MINUTES OF A REGULAR MEETING OF THE BOARD OF DIRECTORS

April 6, 2021

Pursuant to Governor Newsom's Executive Orders N-25-20, N-29-20, and N-33-20, and local county health orders issued to address the COVID-19 pandemic, this Board meeting was held via Teams teleconference. The District Boardroom is closed to the public; however, the public may observe and comment by calling in to the teleconference meeting per the instructions provided on page 4 of the agenda. As required by the Brown Act, all votes were taken by roll call vote due to the attending Directors participating via teleconference.

1. CALL TO ORDER

   A regular meeting of the Board of Directors was called to order at 6 p.m. by President Johnson.

2. PLEDGE TO THE FLAG

3. ROLL CALL

   Boardmembers present at start of meeting:
   President Ann Marie Johnson, Vice President Richard M. Halket, Director Marisol Rubio, Director Arun Goel, and Director Georgean M. Vonheeder-Leopold.

   District staff present: Dan McIntyre, General Manager; Jan Lee, Assistant General Manager; Carol Atwood, Administrative Services Manager/Treasurer; Judy Zavadil, Engineering Services Manager/District Engineer; Jeff Carson, Operations Manager; Douglas E. Coty, General Counsel; and Nicole Genzale, Executive Services Supervisor/District Secretary.

4. SPECIAL ANNOUNCEMENTS/ACTIVITIES – None

5. PUBLIC COMMENT (MEETING OPEN TO THE PUBLIC) – 6:02 p.m. No public comment was received.

6. AGENDA MANAGEMENT (CONSIDER ORDER OF ITEMS) – No changes were made.

7. CONSENT CALENDAR

   General Manager McIntyre reported that updated Attachments 1 and 2 for Item 7.C have been provided for the Board and published on DSRSD's website as supplemental materials to the agenda packet.

   Directors Goel and Vonheeder-Leopold requested an edit be made to the support letter in Item 7.J by removing the words "the concerns and" from the first sentence. The Board agreed with the suggested edit.

   Director Vonheeder-Leopold MOVED for approval of the items on the Consent Calendar including the updated attachments for Item 7.C and the removal of the words "the concerns and" from the support letter for Item 7.J. Director Goel SECONDED the MOTION, which CARRIED with FIVE AYES per roll call vote.

   7.A. Approve Regular Meeting Minutes of March 16, 2021 – Approved

   7.B. Approve Special Meeting Minutes of March 23, 2021 – Approved

7.C. Authorize Execution of Quitclaim Deed to Wildlife Management, LLC and Authorize Execution of Agreement Requiring Incidental Take Permit with the California Department of Fish and Wildlife – Approved

7.D. Award Contract to Belkorp Ag, LLC for Purchase of Tractor for Biosolids Harvesting – Approved

7.E. Approve the Salary Ranges for the New Mechanical Superintendent and Pretreatment Programs Administrator Job Classifications and Abolish Twenty-Two (22) Classifications – Approved – Resolution No. 11-21 and Resolution No. 12-21

7.F. Approve Updated Senior Manager Job Titles and Classification Descriptions – Approved – Resolution No. 13-21

7.G. Approve Amendment No. 2 to the Individual Agreements for Personal Services between Carol A. Atwood, Jeff R. Carson, and Judy A. Zavadil and Dublin San Ramon Services District – Approved – Resolution No. 14-21, Resolution No. 15-21, and Resolution No. 16-21

7.H. Adopt Pay Schedule in Accordance with California Code of Regulations, Title 2, Section 570.5, Requirement for a Publicly Available Pay Schedule and *Rescind Resolution No. 1-21* – Approved – Resolution No. 17-21

7.I. Approve the District's Five-Year Strategic Plan for Fiscal Years Ending 2022-2026 Approved – Resolution No. 18-21

7.J. Approve Letter of Support for the CEMEX Reclamation Plan Amendment Project for the Eliot Quarry Facility – Approved

8. BOARD BUSINESS

8.A. Approve Continuation of District's State of Emergency in Response to COVID-19 Pandemic by General Manager and Find that the Need for the District's State of Emergency Still Exists

Assistant General Manager Lee reviewed the item for the Board. She reported that Contra Costa County will move into the Orange Tier (Tier 3) this week under the State's four-tier system for reopening the economy. Governor Newsom also reported today that the State has set a target date of June 15, 2021 to fully re-open the economy and terminate the four-color tier system.

Director Vonheeder-Leopold MOVED to Approve Continuation of District's State of Emergency in Response to COVID-19 Pandemic by General Manager and Find that the Need for the District's State of Emergency Still Exists. Director Goel SECONDED the MOTION, which CARRIED with FIVE AYES per roll call vote.

8.B. Receive Presentation on the District's 2021 Alternative Water Supply Study and Provide Direction

Assistant General Manager Lee reviewed the item for the Board. She introduced presenters Ms. Jenny Gain and Ms. Katie Ruby, consultants from Brown and Caldwell, who provided the 2021 Alternative Water Supply Study: A Framework for a Resilient and

Sustainable Water Future. The presentation was published on DSRSD's website as supplemental materials to the agenda packet. The Study references the 2015 Study, which provided the framework for the District's Water Supply, Storage, Conveyance, Quality and Conservation policy (2015 Water Policy). The presentation covered the 2021 Study's purpose and overview, future water needs, potential supply, storage, and conveyance alternatives, preliminary evaluation of said alternatives, a supply, storage and conveyance portfolio analysis, and recommendations to update the 2015 Water Policy.

The Board and staff discussed various aspects of the 2021 Study. The presenters noted the Study covers the proposals included in Governor Newsom's Water Resilience Portfolio released last July and also considers state and regional projects. The Board highlighted some of the alternatives presented, including Zone 7 Water Agency's Hopyard Well #7 for recycled water, and the Delta and Sites Reservoir conveyance. The Board emphasized the importance of examining how catastrophes or contaminants of emerging concern may impact potable supply. The Board supported incorporating "shelf-ready" projects into the policy should federal funding become available. They also discussed agencies' different perspectives on the cost of supply – total water versus new water. The Board emphasized the need for timely DSRSD customer outreach (messaging, presentations, etc.) to garner support for recycled water and current supply strategies, and to make clear the consequences of the "do nothing" alternative. The Board directed staff to update the 2015 Water Policy to align with the Study's recommendations and the additional concepts brought forth from this evening's discussion. The Board complimented staff and the consultants on an excellent presentation.

The Board took a short recess at 7:58 p.m. and reconvened at 8:05 p.m. for Item 8.C.

8.C. Discussion and Direction on the District Fleet Program and Update on Air Quality Regulations

Operations Manager Carson reviewed the item for the Board. He introduced presenters Mechanical Maintenance Supervisor Shawn Quinlan, Operations Compliance Supervisor Diane Griffin, and Courtney Mizutani of Mizutani Consulting. They described the Fleet Management Program including the District's current vehicle and equipment inventory, maintenance, operations, funding, replacement criteria, and its gradual and ongoing transition to "green" vehicles per new and imminent air quality regulations.

The Board and staff discussed planning efforts to convert to a more energy- and cost-efficient fleet, the life expectancy of the District's existing gas and diesel vehicles, and the number of vehicles the District currently employs versus future needs. The Board directed staff to provide the Board additional information regarding how the District Fleet Program will best incorporate into the upcoming proposed budget for fiscal years ending 2022 and 2023, taking into consideration program/operational needs, air quality requirements, and this evening's discussion. President Johnson also stated she would like staff to prioritize efforts to downsize the fleet.

8.D. Receive a Briefing on the CalPERS Actuarial Report for DSRSD and an Evaluation on the Pay-down of the District's Unfunded Actuarial Liability and Provide Direction on Future Unfunded Actuarial Obligations

Administrative Services Manager Atwood reviewed the item for the Board. The Board determined, based on current uncertainties and possible negative impacts of the COVID-19 pandemic emergency on District finances, that it would be prudent to stay the course and directed staff to make only the required CalPERS contribution for the Unfunded Actuarial Liability (UAL) and not an accelerated paydown contribution amount at this time. The Board expressed it would be amenable to reconsider adjusting the contribution amount when normal business conditions emerge.

9. REPORTS

9.A. Boardmember Items

- Joint Powers Authority and Committee Reports – None
- Submittal of Written Reports for Day of Service Events Attended by Directors

  Director Rubio submitted written reports to Executive Services Supervisor/District Secretary Genzale. She reported that she attended the Zone 7 Water Agency Legislative Briefing and Water 101 on March 30 and the Association of California Water Agencies DC2021 Seminar on March 31. She summarized the activities and discussions at the meetings.

  Director Vonheeder-Leopold submitted a written report to Executive Services Supervisor/District Secretary Genzale. She reported that she attended the California Special Districts Association Leadership Module on Governance Foundations on March 24 and 25. She summarized the activities and discussions at the meetings.

- Request New Agenda Item(s) Be Placed on a Future Board or Committee Agenda – None

9.B. Staff Reports

- Event Calendar – General Manager McIntyre reported on the following:
  - The DSRSD/Pleasanton Liaison Committee meeting is scheduled for April 15 at 4 p.m.
  - The DSRSD/Zone 7/Dublin Liaison Committee meeting is scheduled for April 19 at 4 p.m.
- Correspondence to and from the Board on an Item not on the Agenda – None

10. ADJOURNMENT

President Johnson adjourned the meeting at 9:28 p.m.

Submitted by,

Nicole Genzale, CMC
Executive Services Supervisor/District Secretary