Technical Memorandum 4: High-Level Evaluation and Screening of Water Management Options

Wholesale Water Management and Reliability Study

PREPARED FOR

SAN JUAN WATER DISTRICT

PREPARED BY

MWH

BUILDING A BETTER WORLD

5 May 2016

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List of Abbreviations and Acronyms

AF	acre-foot
ASR	aquifer storage and recovery
Cal Am	California American Water
CVP	Central Valley Project
District or SJWD	San Juan Water District
ID	Option identification number
option	water management option
O##	Option number
PCWA	Placer County Water Agency
Study	Wholesale Water Management and Reliability Study
TAF	thousand acre-feet
TM	technical memorandum
WCA	Wholesale Customer Agency
WSR	Water Supply & Reliability Committee

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1.0 Introduction and Background

This Technical Memorandum (TM) is the fourth of a series of memoranda that will look to improve management of surface water and groundwater resources within the San Juan Water District's (District) wholesale service area, and potentially outside the District's current service area. It contains the high-level evaluation and screening of the initial water management options (option) performed to help complete the District's Wholesale Water Management and Reliability Study (Study). This TM contains the following:

- Identification and screening of identified initial options.
- Results from the screening of the initial options using the developed evaluation criteria and metrics[1] to identify which options should be retained for further evaluation.
- Overview of the approach for prioritizing the retained options. This approach will use the results of a more detailed evaluation of each retained option and apply the same evaluation criteria and metrics, providing a consistent framework for evaluation, comparison, and prioritization of options.[2]

[1] Refer to TM 3 for details on the evaluation criteria and metrics.
[2] The application of this approach and the associated results will be included in a future TM.

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2.0 Water Management Options Identification and Screening

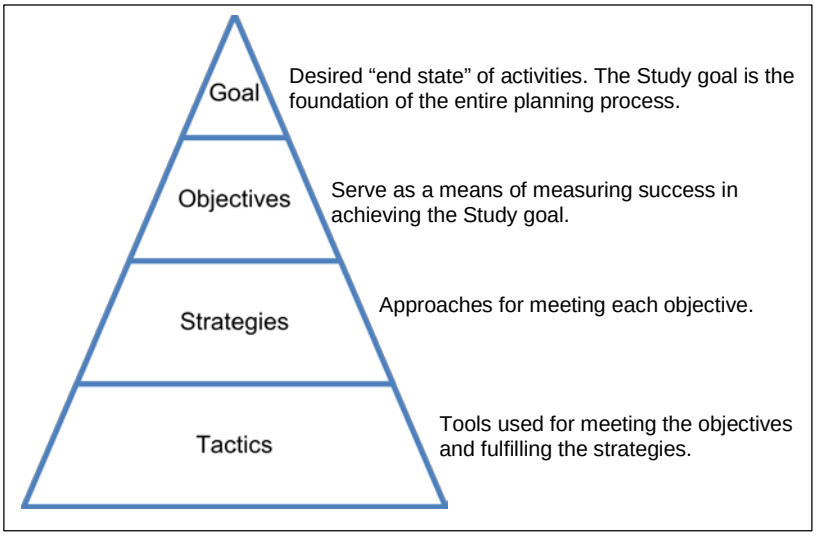
This section summarizes the Study goal, objectives, strategies, and tactics. It also lists the initial options developed for the Study, and describes how the options were identified and screened.

2.1 Study Goal, Objectives, Strategies, and Tactics

The Study goal is to improve management of surface water and groundwater resources within the District's wholesale service area, and potentially outside the District's current service area, through collaboration, consolidations, or other actions improve its water supply reliability. This goal will be achieved and measured using the following three objectives:

1. Increase water supply reliability to the District's retail customers and Wholesale Customer Agencies during dry years by integrating surface water and groundwater storage.

2. Perfect the beneficial use of the District's water rights, contractual entitlements, and facilities.



3. Provide long-term financial benefits to our ratepayers, and provide regional and statewide benefits.

In order to meet these objectives, several strategies were developed. These strategies, and associated tactics for achieving the strategies, are as follows:

A. **<u>Increase use of District's water rights and contract entitlements</u>** – Helps meet Objectives 2 and 3 of perfecting beneficial use and providing long-term financial benefits, respectively. To implement this strategy, the following tactics could be taken:

   – **Groundwater recharge** – Increases surface water supply use by recharging the groundwater basin during wet years either within or outside of the District service area. Provides both an increase in the use of water supplies and revenue received by the District from additional sales.

- **Expansion of District's service area** – Increases number of users and likely demand for District's surface water supplies. Provides both an increase in the use of water supplies and revenue received by the District from additional sales.

- **Water transfers/exchanges** – Increases use of District's surface water supplies during wet years by transferring supplies to another agency. Also, increases District revenue through implementing a new transfer.

B. **Develop alternative access to surface water** – Helps meet Objectives 1 and 2 of increasing water supply reliability and perfecting beneficial use, respectively. To implement this strategy, the following tactics could be taken:

- **Surface water storage** – Increases use of surface water supplies in wet years by storing water when available. Consequently, increases stored surface water for later use when surface water supplies are reduced or may not be available.

- **New point of diversion or intertie connection** – Decreases reliance on solely Folsom Lake. Unlikely to perfect beneficial use unless paired with another option such that in wet years, the District can increase its use of its surface water supplies.

C. **Diversify water supply portfolio** – Helps meet Objective 1 of increasing water supply reliability. To implement this strategy, the following tactics could be taken:

- **Groundwater extraction** – Provides the District with another source of water aside from surface water supplies. During extreme drought conditions, when access to surface water supplies from Folsom Lake may be unavailable, the District will have access to groundwater.

- **Recycled water use** – Provides the District with another source of water aside from surface water supplies. During extreme drought conditions, when access to surface water supplies from Folsom Lake may be unavailable, the District will have access to recycled water.

2.2 Initial Options

Figure 2-1 shows how the 28 initial options fit into the above strategies and tactics to help meet the Study's goal and objectives. Table 2-1 lists the initial options and associated identification numbering.

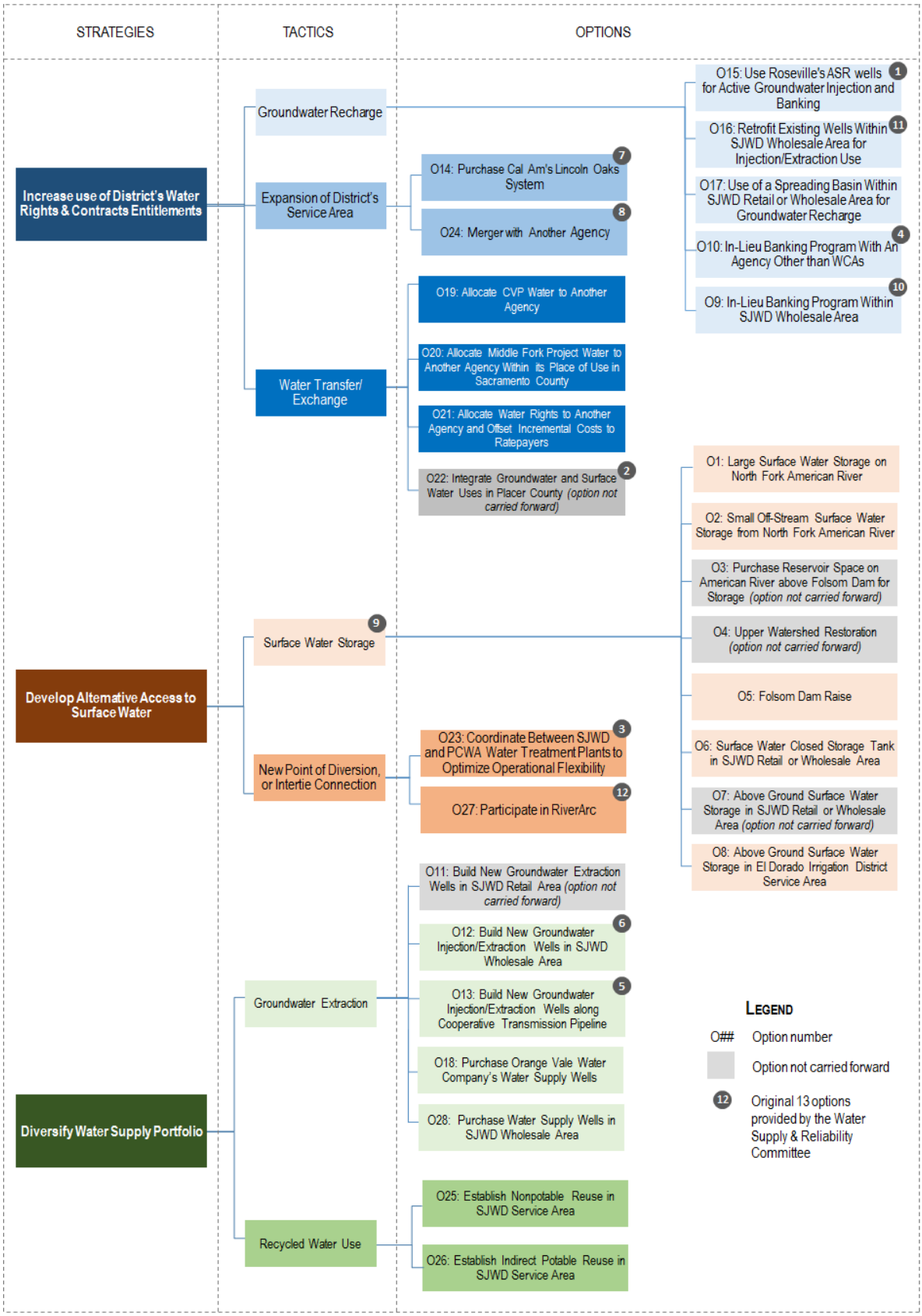


Figure 2-1. Initial Options Grouped by Strategy and Tactic

Table 2-1. List of Initial Options

ID	Name
O1	Large Surface Water Storage on North Fork American River
O2	Small Off-Surface Surface Water Storage from North Fork American River
O3	Purchase Reservoir Space on American River above Folsom Dam for Storage
O4	Upper Watershed Restoration
O5	Folsom Dam Raise
O6	Surface Water Closed Storage Tank in SJWD Retail or Wholesale Area
O7	Above Ground Surface Water Storage in SJWD Retail or Wholesale Area
O8	Above Ground Surface Water Storage Basin in El Dorado Irrigation District Service Area
O9	In-Lieu Banking Program Within SJWD Wholesale Area
O10	In-Lieu Banking Program With An Agency Other than WCAs
O11	Build New Groundwater Extraction Wells in SJWD Retail Area
O12	Build New Groundwater Injection/Extraction Wells in SJWD Wholesale Area
O13	Build New Groundwater Injection/Extraction Wells along Cooperative Transmission Pipeline
O14	Purchase Cal Am's Lincoln Oaks System
O15	Use Roseville's ASR wells for Active Groundwater Injection and Banking
O16	Retrofit Existing Wells Within SJWD Wholesale Area for Injection/Extraction Use
O17	Use of a Spreading Basin Within SJWD Retail or Wholesale Area for Groundwater Recharge
O18	Purchase Orange Vale Water Company's Water Supply Wells
O19	Allocate CVP Water to Another Agency
O20	Allocate Middle Fork Project Water to Another Agency Within its Place of Use in Sacramento County
O21	Allocate Water Rights to Another Agency and Offset Incremental Costs to Ratepayers
O22	Integrate Groundwater and Surface Water Uses in Placer County
O23	Coordinate Between SJWD and PCWA Water Treatment Plants to Optimize Operational Flexibility
O24	Merger with Another Agency
O25	Establish Nonpotable Reuse in SJWD Service Area
O26	Establish Indirect Potable Reuse in SJWD Service Area
O27	Participate in RiverArc
O28	Purchase Water Supply Wells in SJWD Wholesale Area

Key:
ASR = aquifer storage and recovery
Cal Am = California American Water Company
CVP = Central Valley Project
ID = Identification
O## = Option number
PCWA = Placer County Water Agency
SJWD = San Juan Water District
WCA = Wholesale Customer Agency

2.3 Sources Consulted to Identify Initial Options

As part of the District's Request for Proposal for this Study (dated October 7, 2015), 13 options were provided. These options were identified by the Water Supply & Reliability Committee (WSR) for better water management of groundwater and surface water for the purpose of being included in this evaluation. These are identified with grey circles in Figure 2-1. These 13 options were expanded to 28 initial options through a wide range of input including meetings and document review. During the meetings, participants brainstormed and refined the initial options. The meetings conducted were as follows:

- Project Kick-Off Meeting with WSR and District Staff (February 2, 2016)
- District Board Meeting (March 9, 2016)
- Wholesale Customer Agency (WCA) Meeting (March 14, 2016)
- WSR Meeting (April 6, 2016)

In addition to the meetings listed above, a range of documents were reviewed to assist in identifying the initial options. Documents reviewed range from Urban Water Management Plans, Wholesale Master Plans, Integrated Regional Water Management Plans, Federal Feasibility Studies for specific projects such as Auburn Dam, Folsom Dam Raise, and Sacramento River Regional Water Reliability Project, and District reports such as the Phase 1 High-Level Feasibility Analysis for Water Supply Reliability. Refer to TM 2 for a list of documents provided by the District for this Study, and to Attachment 2 for specific references used to evaluate each individual option. This document review helped provide definition to the options discussed during the meetings, in addition to identifying other options that would help cover the full range of potential actions that the District could take to improve surface water and groundwater management.

2.4 Evaluation of Initial Options

The initial options were evaluated using both qualitative and quantitative screening criteria to support evaluation, comparison, and scoring of those options. The criteria were vetted with the District's WSR during the Project Kick-Off Meeting. Details on each criterion are presented in TM 3 and lookup tables used in the option evaluation forms for each criteria are in Attachment 1. The criteria are also summarized below as follows:

1. **Cost-effectiveness –** quantitatively measures the cost-effectiveness of an option's water supply benefits (yield) relative to its costs at a conceptual or pre-appraisal level
2. **Contribution to objectives –** quantitatively and qualitatively assesses an option's contribution to each of the Study objectives
    - Increase water supply reliability to the District's retail customers and WCAs by integrating surface water and groundwater storage thus: (1) increasing reliability

during dry years and (2) mitigating extreme drought conditions (i.e., improving the District's ability to receive water supplies during an extreme drought when there is very limited access to the District's current water rights and contract entitlements).

- Perfect the beneficial use of the District's water rights, contractual entitlements, and facilities

- Provide long-term financial benefits to District ratepayers, and provide regional and statewide benefits

3. **Implementation complexity –** qualitatively assesses how likely it is an option will be implemented within a reasonable timeframe to achieve its potential benefits relative to the following seven implementation factors or metrics:

   - Environmental compliance requirements

   - Permitting requirements and approvals

   - Water rights and contracts requirements

   - Institutional arrangements and coordination

   - Land acquisitions

   - Public acceptance and support

   - Schedule

- **Uncertainty –** qualitatively assesses level of confidence in the definition of the option with respect to the costs, and yield and reliability metrics

Using the above criteria and associated metrics, each initial options was evaluated. Refer to Attachment 2 for the full evaluations of each initial option.

2.5 Evaluation Results

Table 2-2 summarizes option evaluation results. The first four columns contain information on each option – identification number, name, project type, and water source. The next four column groupings correspond to the four evaluation criteria and show the range of scores assigned to each metric. For the cost-effectiveness criteria, the associated metrics are in terms of yield and cost. The color-scale employed for overall cost-effectiveness helps to visually group which options are the least expensive (green) to the most expensive (red). For the other three criteria, the metrics are all qualitative. Scores were developed based on each option's assigned assessment value (1, 2, or 3). The higher the value, the more likely an option will score higher.

Table 2-2. High-Level Evaluation Summary of Initial Options

Option Information				Cost-Effectiveness			Contribution to Objectives				Implementation Complexity							Uncertainty		Relative Scores				
ID	Name	Type	Water Source	Yield - Long-term Average (TAF/year)	Total Cost ($)	Overall Cost-Effectiveness ($/AF)	Improve Dry Year Reliability	Perfect Beneficial Use	Provide Financial Benefit	Extreme Drought Conditions	Environmental Compliance Requirements	Permitting Requirements	Water Rights/Contracts	Institutional & Coordination	Land Acquisition	Public Acceptance & Support	Schedule	Costs	Yield & Reliability	Cost-Effectiveness Score	Objectives Score	Implementation Complexity Score	Uncertainty Score	Grouping
O1	Large Surface Water Storage on North Fork American River	SW	OTHR	200	$ 6,861,420,000	$ 1,241	♦♦♦	♦♦♦	♦	♦♦♦	♦	♦	♦	♦	♦	♦	♦	♦	♦♦	0.00	2.50	1.00	1.50	C
O2	Small Off-Stream Surface Water Storage from North Fork American River	SW	OTHR	17	$ 1,011,500,000	$ 2,139	♦♦♦	♦♦♦	♦	♦♦♦	♦	♦	♦	♦	♦	♦	♦	♦	♦♦	0.96	2.50	1.00	1.50	C
O3	Purchase Reservoir Space on American River above Folsom Dam for Storage	SW	OTHR	0	$ -	$ -	♦♦♦	♦♦♦	♦	♦♦♦	♦♦	♦♦	♦	♦	♦♦♦	♦♦	♦	♦	♦		2.50	1.71	1.00	x
O4	Upper Watershed Restoration	SW	OTHR	0	$ -	$ -	♦	♦	♦	♦♦	♦♦	♦♦	♦♦♦	♦♦	♦♦♦	♦♦	♦	♦	♦		1.25	2.14	1.00	x
O5	Folsom Dam Raise	SW	OTHR	2	$ 87,035,000	$ 1,840	♦♦	♦	♦	♦♦	♦	♦	♦♦♦	♦	♦♦♦	♦	♦	♦	♦	0.96	1.50	1.57	1.00	C
O6	Surface Water Closed Storage Tank in SJWD Retail or Wholesale Area	SW	OTHR	0	$ 17,015,000	$ 47,102	♦	♦	♦	♦	♦♦	♦♦	♦♦♦	♦♦♦	♦	♦♦	♦	♦♦	♦♦♦	0.00	1.00	2.00	2.50	C
O7	Above Ground Surface Water Storage in SJWD Retail or Wholesale Area	SW	OTHR	0	$ -	$ -	♦♦♦	♦♦	♦	♦♦	♦	♦	♦♦♦	♦	♦	♦	♦	♦	♦		2.00	1.29	1.00	x
O8	Above Ground Surface Water Storage Basin in El Dorado Irrigation District Service Area	SW	APPR	1	$ 1,300,000	$ 161	♦♦	♦♦	♦	♦♦	♦♦	♦♦	♦	♦	♦♦	♦♦♦	♦♦	♦	♦♦	1.00	1.75	1.86	1.50	C
O9	In-Lieu Banking Program Within SJWD Wholesale Area	GW	OTHR	1	$ 100,000	$ 105	♦♦	♦♦	♦♦♦	♦♦	♦♦	♦♦	♦♦♦	♦	♦♦♦	♦♦♦	♦♦♦	♦♦	♦♦	2.32	2.25	2.43	2.00	A
O10	In-Lieu Banking Program With an Agency Other than the WCAs	GW	OTHR	21	$ 5,200,000	$ 113	♦♦♦	♦♦♦	♦♦♦	♦♦	♦♦	♦♦♦	♦♦	♦	♦♦♦	♦♦♦	♦♦	♦♦	♦♦	2.27	2.75	2.29	2.00	A
O11	Build New Groundwater Extraction Wells in SJWD Retail Area	GW	OTHR	0	$ 1,000,000	$ 1,459	♦♦	♦	♦	♦♦	♦♦	♦♦	♦♦♦	♦♦♦	♦	♦♦♦	♦	♦	♦♦	0.97	1.50	2.14	1.50	x
O12	Build New Groundwater Injection/Extraction Wells in SJWD Wholesale Area	GW	OTHR	5	$ 27,000,000	$ 432	♦♦♦	♦♦	♦♦	♦♦	♦♦	♦♦	♦♦♦	♦	♦	♦♦♦	♦♦	♦♦	♦♦	0.99	2.25	2.00	2.00	B
O13	Build New Groundwater Injection/Extraction Wells along Cooperative Transmission Pipeline	GW	OTHR	5	$ 27,000,000	$ 432	♦♦♦	♦	♦♦♦	♦♦	♦	♦♦	♦♦	♦♦	♦	♦♦♦	♦♦	♦♦	♦♦	0.99	2.25	1.86	2.00	B
O14	Purchase Cal Am's Lincoln Oaks System	GW	OTHR	17	$ 50,000,000	$ 260	♦♦	♦♦♦	♦	♦♦	♦	♦♦	♦♦	♦	♦	♦	♦	♦	♦♦	1.00	2.00	1.29	1.50	C
O15	Use Roseville's ASR wells for Active Groundwater Injection and Banking	GW	OTHR	2	$ 300,000	$ 191	♦♦	♦♦♦	♦♦	♦♦♦	♦	♦	♦♦	♦	♦	♦♦	♦♦	♦	♦♦	1.00	2.50	1.43	1.50	B
O16	Retrofit Existing Wells Within SJWD Wholesale Area for Injection/Extraction Use	GW	OTHR	13	$ 1,000,000	$ 154	♦♦	♦♦♦	♦	♦♦	♦♦	♦♦	♦♦♦	♦	♦♦♦	♦♦♦	♦	♦	♦	1.00	2.00	2.14	1.00	B
O17	Use of a Spreading Basin Within SJWD Retail or Wholesale Area for Groundwater Recharge	GW	OTHR	1	$ 300,000	$ 115	♦♦	♦♦	♦	♦♦	♦♦	♦♦	♦♦♦	♦	♦	♦♦	♦	♦	♦	2.26	1.75	1.71	1.00	B

Page 1

Table 2-2. High-Level Evaluation Summary of Initial Options (continued)

Option Information				Cost-Effectiveness			Contribution to Objectives				Implementation Complexity							Uncertainty		Relative Scores				
ID	Name	Type	Water Source	Yield - Long-term Average (TAF/year)	Total Cost ($)	Overall Cost-Effectiveness ($/AF)	Improve Dry Year Reliability	Perfect Beneficial Use	Provide Financial Benefit	Extreme Drought Conditions	Environmental Compliance Requirements	Permitting Requirements	Water Rights/Contracts	Institutional & Coordination	Land Acquisition	Public Acceptance & Support	Schedule	Costs	Yield & Reliability	Cost-Effectiveness Score	Objectives Score	Implementation Complexity Score	Uncertainty Score	Grouping
O18	Purchase Orange Vale Water Company's Water Supply Wells	GW	OTHR	0	$ 1,000,000	$ 478	2	2	1	2	2	2	3	1	2	1	2	1	2	0.99	1.75	1.86	1.50	B
O19	Allocate CVP Water to Another Agency	NS	CVP	10	$ 1,000,000	$ 40	3	3	3	2	2	3	2	1	3	2	3	1	3	2.74	2.75	2.29	2.00	A
O20	Allocate Middle Fork Project Water to Another Agency Within its Place of Use in Sacramento County	NS	MFP	7	$ 1,000,000	$ 43	1	3	3	1	3	3	3	1	3	2	3	1	3	2.72	2.00	2.57	2.00	A
O21	Allocate Water Rights to Another Agency and Offset Incremental Costs to Ratepayers	NS	APPR	17	$ 1,000,000	$ 38	2	3	3	1	2	3	3	1	3	2	3	1	3	2.75	2.25	2.43	2.00	A
O22	Integrate Groundwater and Surface Water Uses in Placer County	SW	MFP	0	$ -	$ -	2	1	1	2	2	2	1	1	1	1	1	1	1		1.50	1.29	1.00	x
O23	Coordinate Between SJWD and PCWA Water Treatment Plants to Optimize Operational Flexibility	SW	MFP	12	$ 15,000,000	$ 67	2	2	1	3	2	2	3	1	2	3	2	1	1	2.57	2.00	2.14	1.00	A
O24	Merger with Another Agency	NS	OTHR	17	$ 2,000,000	$ 106	2	3	3	2	1	1	2	1	1	2	2	1	3	2.31	2.50	1.43	2.00	A
O25	Establish Nonpotable Reuse in SJWD Service Area	RW	OTHR	3	$ 51,000,000	$ 1,989	2	1	1	3	1	2	3	1	1	3	2	1	2	0.96	1.75	1.86	1.50	C
O26	Establish Indirect Potable Reuse in SJWD Service Area	RW	OTHR	6	$ 98,600,000	$ 1,956	3	1	1	3	1	1	3	1	1	1	1	1	2	0.96	2.00	1.29	1.50	C
O27	Participate in RiverArc	SW	OTHR	1	$ 64,300,000	$ 2,376	2	2	1	3	1	1	2	1	1	2	1	2	2	0.95	2.00	1.29	2.00	C
O28	Purchase Water Supply Wells in SJWD Wholesale Area	GW	OTHR	11	$ 8,200,000	$ 141	2	3	1	2	2	2	3	1	3	1	2	1	3	2.09	2.00	2.00	2.00	B

Key: AF = acre-feet, ASR = aquifer storage and recovery, Cal Am = California American Water Company, CVP = Central Valley Project, ID = Identification, O## = Option number, PCWA = Placer County Water Agency, SJWD = San Juan Water District, TAF = thousand acre-feet, WCA = Wholesale Customer Agency
Type: SW = Surface Water, GW = Groundwater, NS = Transfer/Exchanges, RW = Recycled Water
Water Source: APPR = Pre-1914 and senior appropriative water rights, CVP = CVP Entitlement, MFP = Middle Fork Project Entitlement from Placer County Water Agency, OTHR = Other or multiple water supplies
Assessment Value score: 1 = 1, 2 = 2, 3 = 3

Notes: Grouping Designations: A = high potential, B = moderate potential, C = low potential, x = not computed because of lack of quantitative information or option not carried forward
Grey shaded options were not carried forward.
Cell shading corresponds to assessment values. Better performing metrics (e.g., lower cost-effectiveness or higher relative score) are shaded green, while lower performing metrics are shaded red. Moderate performing metrics are shaded yellow.

The last columns in Table 2-2 show the numerical scores for each option. To develop the scores for the quantitative cost-effectiveness metric, the cost per acre-foot was normalized to a standard range (1 to 3). The options with the highest cost-effectiveness (lowest cost per acre-foot) received a score of 3, while the options with the lowest cost-effectiveness (highest cost per acre-foot) received a score of 1.

All other options were assigned scores based on a linear relationship between 1 and 3. For the other qualitative criteria, the score is the average of all the assigned assessment values for that criterion.

These scores were then used to conduct a trade-off analysis to support screening of the initial options. The results from the trade-off analysis are shown in the last column in Table 2-2 (details on the initial groupings are included in Section 2.5). The trade-off analysis investigated how the options ranked across two or more criteria. It allowed for identification of options that scored well across multiple criteria and those that scored well on one metric, but not on others. The following three trade-offs were used to evaluate the options:

1. **Cost-Effectiveness and Contribution to Objectives Trade-off** – Options were ranked according to their cost-effectiveness and overall contribution to objectives scores. Options with lower cost per acre-foot and higher overall contribution to objectives scores ranked higher.

2. **Cost-Effectiveness and Implementation Complexity Trade-off** – Options were ranked according to their cost-effectiveness and implementation complexity scores. Options with lower cost per acre-foot and higher overall implementation factors (easier to implement) scores ranked higher.

3. **Contribution to Objectives and Implementation Complexity Trade-off** – Options were ranked according to their contribution to objectives and implementation complexity scores. Options with higher overall contribution to objectives and higher overall implementation factors (easier to implement) scores ranked higher.

Figures 2-2 through 2-4 present the results from these three trade-offs analyses. Each figure plots the two considered criteria on the y- and x-axes. For example, in Figure 2-2 (cost-effectiveness and contribution to objectives trade-off), the y-axis represents the cost-effectiveness and the x-axis the overall contribution to objectives score. An option plotting in the upper right corner of the figure would be more efficient and contribute better to the objectives; therefore, it would be more desirable than an option represented in the bottom left corner of the figure. Similarly for Figure 2-3 (cost-effectiveness and implementation complexity trade-off), and Figure 2-4 (contribution to objectives and implementation complexity trade-off), the upper right regions represent the more desirable ranges and the lower left regions represent the less desirable ranges.

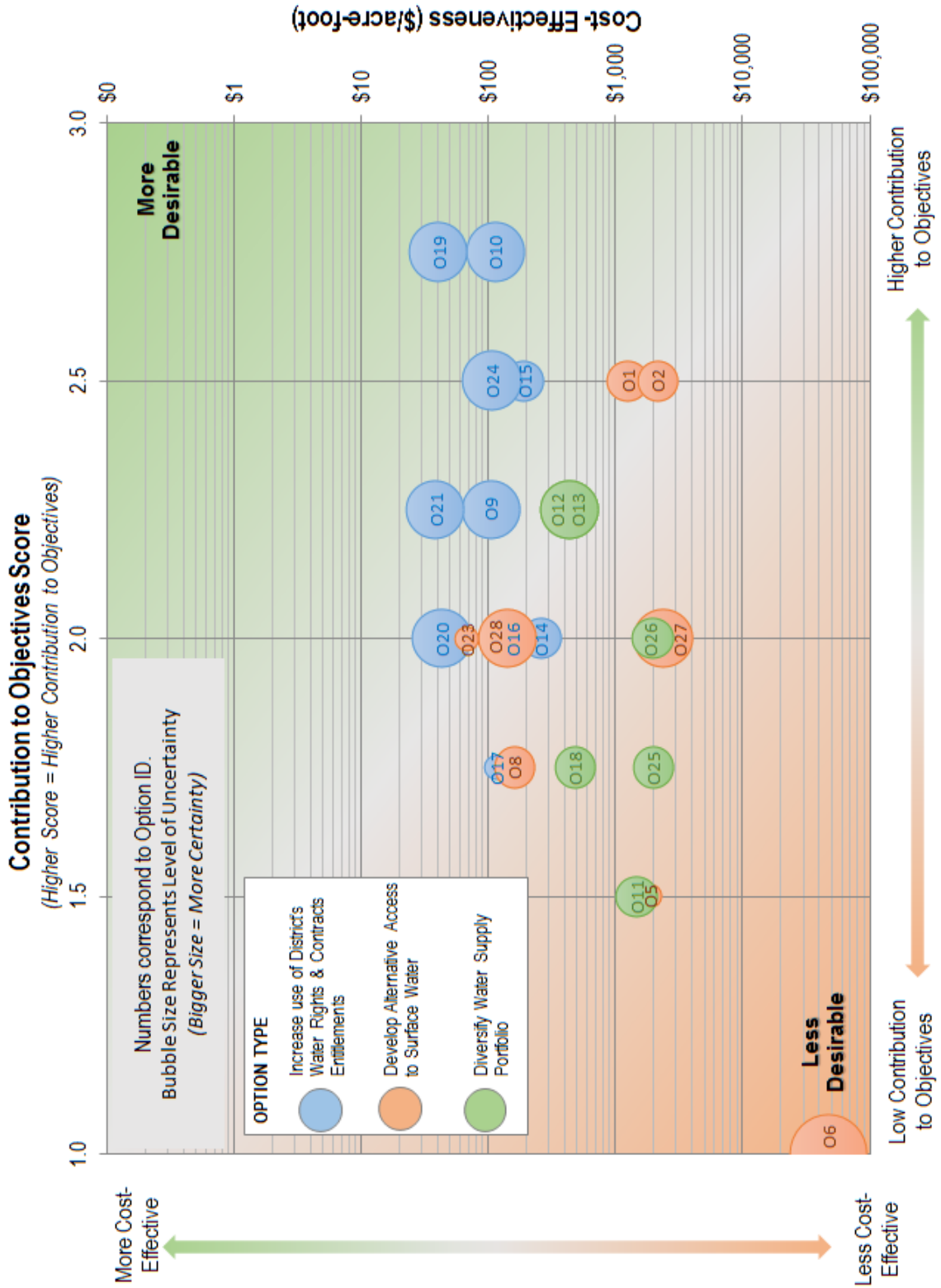


Figure 2-2. Initial Options – Cost-Effectiveness and Contribution to Objectives Trade-off Analysis

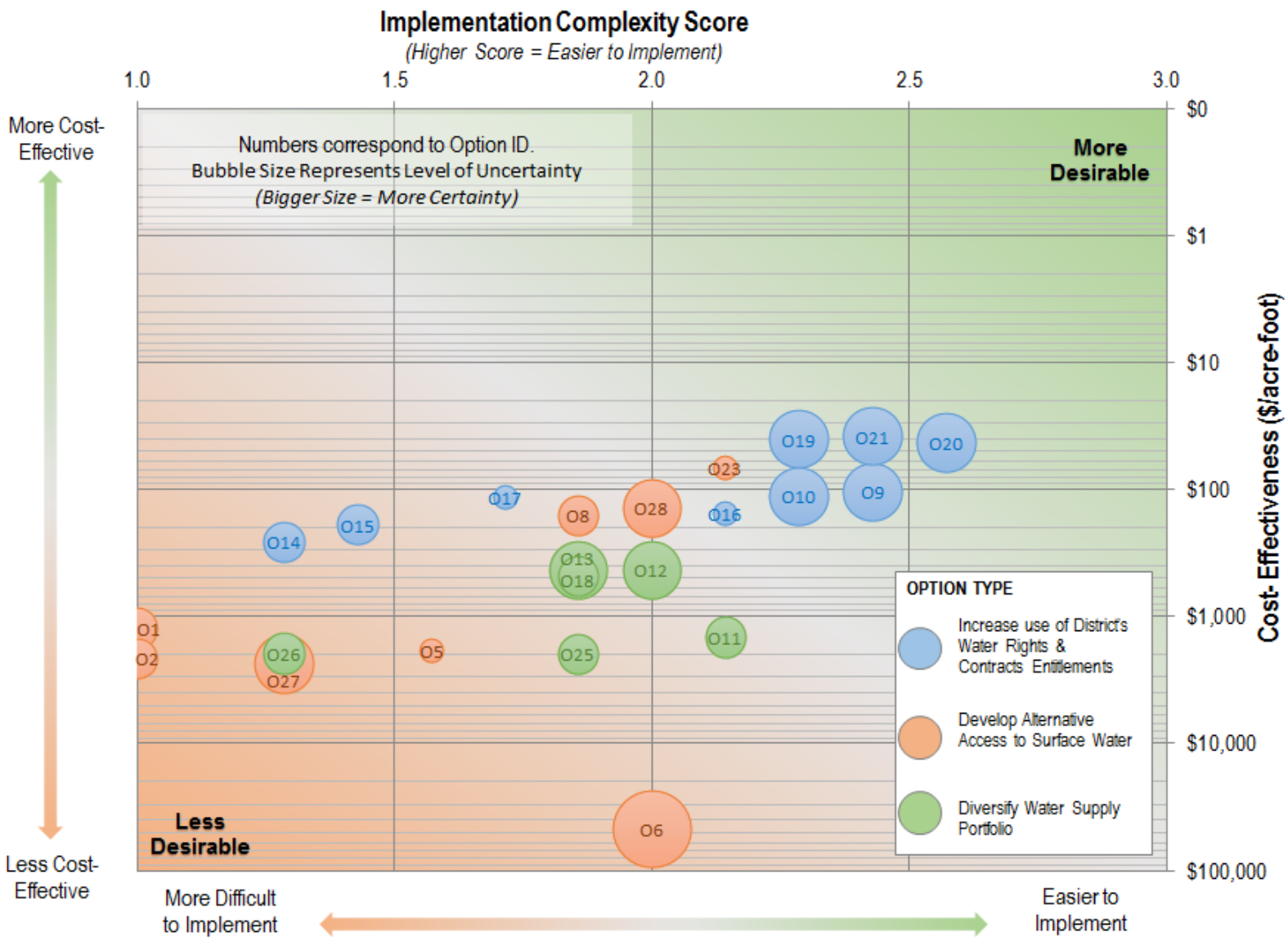


Figure 2-3. Initial Options – Cost-Effectiveness and Implementation Complexity Trade-off Analysis

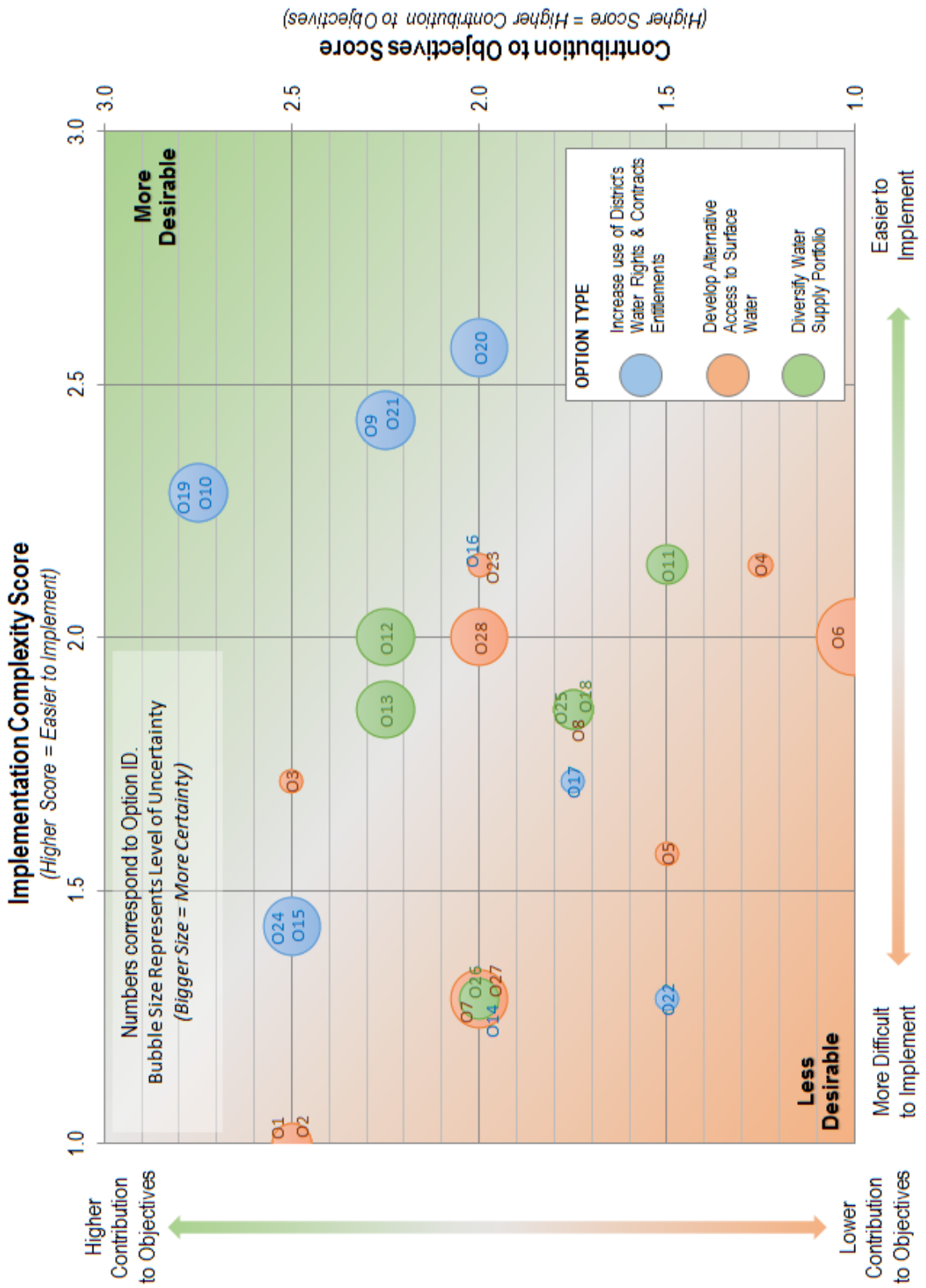


Figure 2-4. Initial Options – Contribution to Objectives and Implementation Complexity Trade-off Analysis

2.6 Grouping

The findings of the trade-off analysis were used to identify options that consistently ranked in the more desirable regions and those that consistently rank in the less desirable regions. This allowed for organizing the options into three groups:

- A – high potential
- B – moderate potential
- C – low potential

If the criteria's score was below 1.5, then it was considered low potential, whereas if the score was in the mid-2 range or above, then it was considered high potential. An option that consistently scored high across all (or most) of the trade-off scenarios was selected to be carried forward as a retained option (see Figure 2-5). This approach provided a means for identifying those options with a greater chance of achieving the District's goals and objectives for this Study in a cost-efficient manner, within a reasonable timeframe, and with higher degree of confidence.

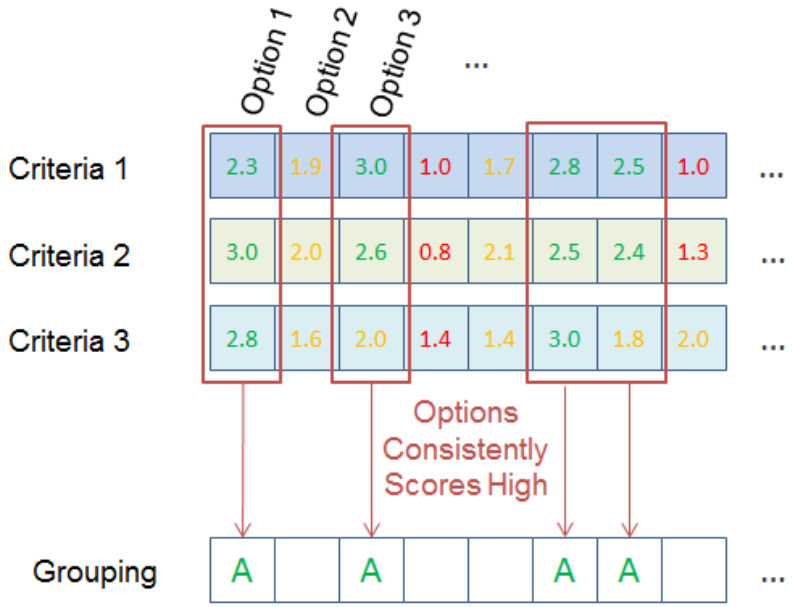


Figure 2-5. Process for Grouping Initial Options

Using this methodology, the 28 initial options were categorized into A, B, or C groupings. Table 2-2 shows the results from this initial grouping. From the initial options, 6 were in the A grouping and are being recommended to be carried forward as retained options. Of the remaining options, 7 were in the B grouping and 10 in the C grouping. Note that 5 initial options were carried forward for evaluation, which are deemed unviable, and are labeled group X.

2.7 Considerations of Yield Potential

Potential yield of these initial options were considered qualitatively as part of the contribution to the objectives score. However, to ensure that options with high yield potential, and moderate potential (group), are not prematurely eliminated from further analysis, additional analysis is conducted. Figure 2-6 shows the trade-off between yield and implementation complexity score. In this figure, the options are color coded to reflect group A, B, and C designation.

The figure shows 4 additional group B options with relatively high yields (5 to 10 TAF per year) that are clustered around an implementation complexity score of 2 (i.e., moderate complexity overall). These 4 options are, therefore, recommended also for further evaluation.

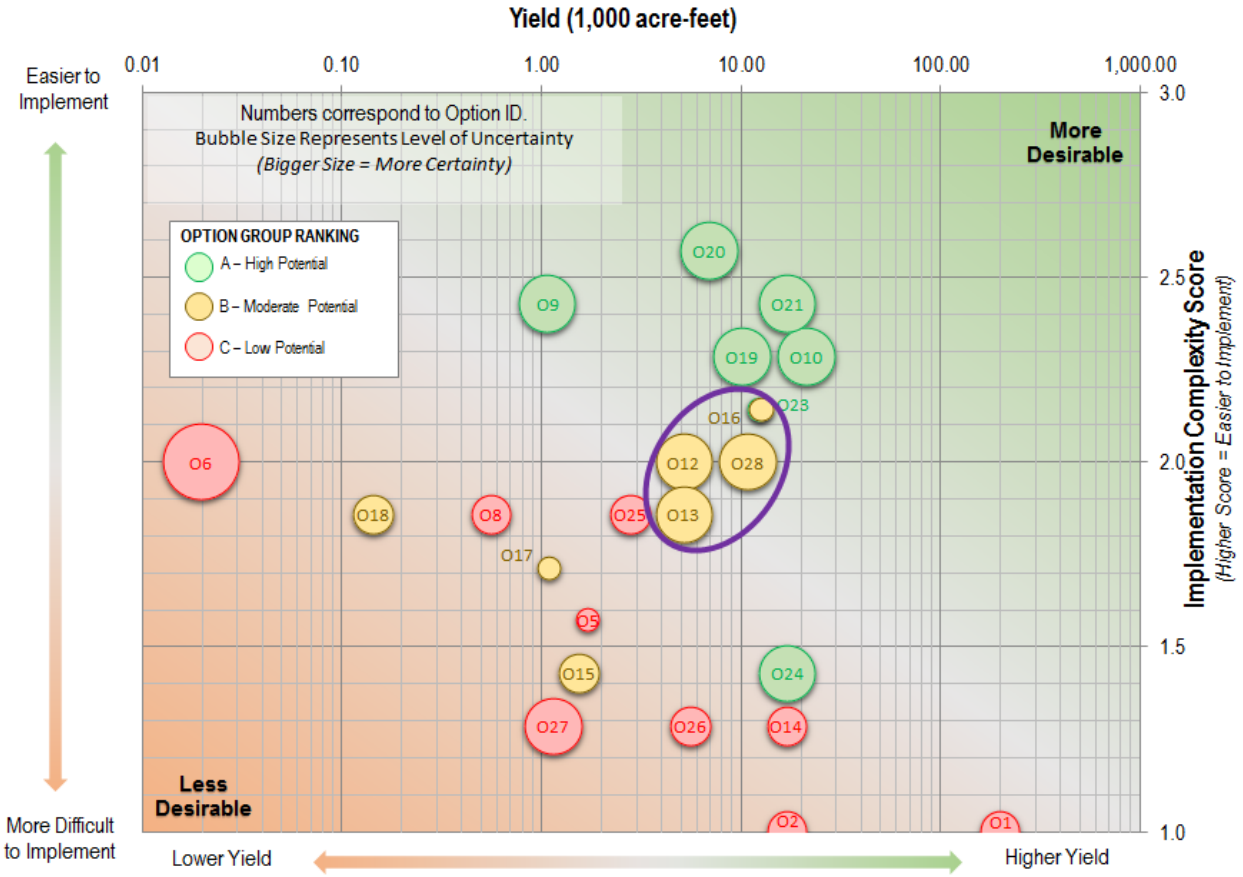


Figure 2-6. Initial Options – Yield and Implementation Complexity Trade-off Analysis

2.8 List of Retained Water Management Options

As discussed above, of the 28 initial options, 7 ranked in the high potential grouping (group A). In addition, 4 more options that are ranked in the moderate potential grouping (group B) are also retained because of their relatively high yield potential and moderate implementation complexity. These ten options (Table 2-3) are recommended for further evaluation as retained options.

The results of this initial screening analysis will be discussed with the District's WSR and Board to solicit feedback and direction. Input received will provide guidance to finalize the screening of initial options.

Table 2-3. Draft Recommendations for Retained Options

Retained Options for Further Evaluation
O9: In-Lieu Banking Program Within SJWD Wholesale Area
O10: In-Lieu Banking Program With An Agency Other than WCAs
O12: Build New Groundwater Injection/Extraction Wells in SJWD Wholesale Area
O13: Build New Groundwater Injection/Extraction Wells along Cooperative Transmission Pipeline
O16: Retrofit Existing Wells Within SJWD Wholesale Area for Injection/Extraction Use
O19: Allocate CVP Water to Another Agency
O20: Allocate Middle Fork Project Water to Another Agency Within its Place of Use in Sacramento County
O21: Allocate Water Rights to Another Agency and Offset Incremental Costs to Ratepayers
O23: Coordinate Between SJWD and PCWA Water Treatment Plants to Optimize Operational Flexibility
O24: Merger with Another Agency
O28: Purchase Water Supply Wells in SJWD Wholesale Area

Key: CVP = Central Valley Project, O## = Option number, PCWA = Placer County Water Agency, SJWD = San Juan Water District, WCA = Wholesale Customer Agency

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3.0 Next Steps

Based on the initial screening described in Section 2, the retained options (i.e., options falling into group A, subject to District Board and WSR approval) will be evaluated in more detail as refined options. TM 5 will document the evaluation and prioritization of the refined options to be conducted under Study Task 5.

3.1 Evaluation of Refined Options

Evaluation of the refined options will include the following activities:

- Additional analysis to verify options and develop more detailed descriptions regarding operations, availability of water supplies, and infrastructure needs to allow for a more refined operations analysis to better estimate option yield and potential benefits
- Assessment of the potential to enhance performance of options through integration with other options
- Refinement of information on option location and site-specific information to allow for a more thorough assessment of implementation requirements (e.g., environmental and permitting requirements)
- Conceptual engineering and cost estimates for structural features

3.2 Scoring of Refined Options

The scoring of the refined options will use a similar approach to the screening of initial options. The four evaluation criteria and associated metrics described in Section 3 will remain applicable to provide a consistent framework for evaluation, comparison, and prioritization of the options.

3.3 Priortization of Refined Options

In addition to the trade-offs described in Section 2, a composite weighted score of all four of the evaluation criteria will also be used to aid in the prioritization of the refined options relative to one another. The weights for each of the criteria and metrics will be determined using input from the District's WSR and Board on the relative importance of the four criteria.

In addition, a sensitivity analysis of the assigned weights will be performed to identify any potential effects that varying weights may have on the prioritized list of refined options.

This analysis will result in a prioritized list of refined options available to the District to implement to improve its water supply reliability and management as funds become available. A detailed scope of work for the subsequent feasibility study will be developed for these prioritized options under Study Task 6 and documented in TM 6.

Technical Memorandum 4

Attachment A – Water Management Options Evaluation Summaries

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List of Abbreviations and Acronyms

AF	acre-feet
ASR	aquifer storage and recovery
Cal Am	California American Water
CHWD	Citrus Heights Water District
CM	construction management
CPI	U.S. Department of Labor, Bureau of Statistics, Consumer Price Index
CVP	Central Valley Project
CWD	Carmichael Water District
District or SJWD	San Juan Water District
EID	El Dorado Irrigation District
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
ESA	Endangered Species Act
FERC	Federal Energy Regulatory Commission
FOWD	Fair Oaks Water District
gpm	gallons per minute
GSWC	Golden State Water Company
HP	horsepower
IPR	indirect potable reuse
IS	Initial Study
MFP	Middle Fork Project
MGD	million gallons per day
MND	Mitigated Negative Declaration
N/A	not applicable
ND	Negative Declaration
NEPA	National Environmental Policy Act
O##	Option number
O&M	operations and maintenance

OTHR	other/multiple sources
OVWC	Orange Vale Water Company
PCE	tetrachloroethylene
PCWA	Placer County Water Agency
PG&E	Pacific Gas and Electric Company
POU	place of use
Reclamation	U.S. Department of the Interior, Bureau of Reclamation
RLECWD	Rio Linda/Elverta Community Water District
ROW	right of way
RUSD	Rescue Union School District
RWQCB	Regional Water Quality Control Board
SCWA	Sacramento County Water Agency
SGA	Sacramento Groundwater Authority
SMUD	Sacramento Municipal Utility District
SSWD	Sacramento Suburban Water District
SW	surface water
SWRCB	State Water Resources Control Board
TAF	thousand acre-feet
WCA	wholesale customer agency
WTP	water treatment plant
WWTP	wastewater treatment plant

SAN JUAN WATER DISTRICT WATER SUPPLY & RELIABILITY STUDY

Project Evaluation Summary

ID: **O1**

Project Name: **Large Surface Water Storage on North Fork American River** Type: **SW**

Project Description:

Auburn Dam has been extensively studied by the federal government since the authorization of the Auburn-Folsom South Unit in 1965. Through these studies, the federal government has decided that it will not build an instream reservoir at this location. As a result, this option would need to be led through local initiatives. Since this option would be beyond what the District would move forward alone, the District would partner with other agencies to build this 2.5 million acre-foot reservoir on the American River near Auburn.

-Wet year storage: Would capture flows in the reservoir during wet years to maximize use of existing supplies if the District's successfully changed the point of diversion and acquired additional water rights for storage, and there would be potential changes in point of delivery for contract water. Otherwise, there would be no benefit in using existing supplies.

-Dry year augmentation: Would release stored water during dry years to supplement currently available supplies.

NOTE: A similar project evaluation could be developed for Alder Reservoir on a tributary of the South Fork American River. This project has received federal authorization for a feasibility study.

Related Options: None

METRICS	ASSESSMENT/ VALUE	SCORE	NOTES
Cost-Effectiveness			
Yield - Long-term Average (TAF/year)	200	N/A	*Only a portion of the yield would be attributed to the District. The District's exact amount was not determined. Source: Reclamation 2013*
Water Supply Source	Other/Multiple Sources	OTHR	*In addition to either a new water right or modifying the District's appropriative rights, the reservoir would store and release water for other partners. Partners' water sources are unknown.*
Total Cost ($)	$ 6,861,420,000	N/A	*Estimate of $6 - 10 Billion was in 2007 dollars for the entire project, excluding O&M (Reclamation, 2013). Increased to 2016 dollars using the Bureau of Labor Statistics' CPI Index. The District's portion of the total cost was not determined.*
Overall Cost-effectiveness ($/AF) (Total Cost / Yield)	$ 1,241	N/A	*Annualized, 3.5% discount rate over 100-year project life.*
Contribution to Objectives			
Improve Dry Year Reliability	High Potential	💧💧💧	*Would increase ability to store water when available for later use in dry conditions*
Perfect Beneficial Use of Existing Supplies	High Potential	💧💧💧	*Assuming the District could modify the point of diversion of its appropriative rights or point of delivery for contract water, this would increase average annual use of the District's existing water supplies.*
Provide Financial Benefit	High upfront costs and/or unlikely to include new water transfers	💧	*Extremely high upfront costs for ratepayers. Some improved ability for District to engage water transfers.*
Extreme Drought Conditions	High Potential to Improve Conditions During an Extreme Drought	💧💧💧	*Would increase storage to provide supply during extreme drought conditions.*
Implementation Complexity			
Environmental Compliance Requirements	Complex: EIR	💧	*EIR for potential construction and/or operational impacts associated with building a new in-stream reservoir.*
Permitting Requirements	Complex: Multiple Federal, State and Local Permits	💧	*Complex, as it would require building a new in-stream reservoir.*
Water Rights / Contracts	High: New Water Right	💧	*Would require a new water right for storage and new rights for diversions if District could not justify the change in existing water rights. For contract deliveries, it would require the original water right holders to obtain additional water rights to divert and/or store, and consequently a change in point of delivery for the District.*
Institutional & Coordination	High: Partnerships Needed, Likely New Agreement	💧	*Partnerships would be imperative to build new in-stream reservoir both for construction and operation of the reservoir.*

Land Acquisition	High: No Willing Seller Identified	💧	*Large area of land would need to be purchased or leased from the federal government; much of the site is owned by Reclamation.*
Public Acceptance & Support	Low: Low Public Acceptance and Support	💧	*Low support for building a large reservoir. Auburn Dam has encountered significant technical and political challenges since its authorization and has not been constructed.*
Schedule	Greater than 3 years to implement	💧	*Would take 20+ years to design and construct.*
Uncertainty			
Costs	Low: No Planning Documents, Best Engineering Judgment Applied	💧	*Based on Reclamation estimates; however these are outdated, and there is high uncertainty for dam costs.*
Yield & Reliability	Moderate: Confirmed Yield, Moderate Reliability, and/or Agreement is Long-Term	💧💧	*Based on Auburn Dam estimates (Reclamation 2013).*

Key: AF = acre-feet, CVP = Central Valley Project, EIR = Environmental Impact Report, IS = Initial Study, MND = Mitigated Negative Declaration, N/A = not applicable, ND = Negative Declaration, PCWA = Placer County Water Agency, ROW = Right-of-Way, TAF = thousand acre-feet

Relative Ranking

References:

Reclamation. 2013 (edited). Auburn Dam, Auburn Folsom Unit American River Division Central Valley Project.

SAN JUAN WATER DISTRICT WATER SUPPLY & RELIABILITY STUDY

Project Evaluation Summary

ID: **O2**

Project Name: **Small Off-Stream Surface Water Storage from North Fork American River**

Type: **SW**

Project Description:

Option would include constructing an approximately 400,000 AF reservoir off of the North Fork American River for wet year storage. No specific location has been evaluated at this stage. Various reservoir sizes are possible, but were not evaluated. It is anticipated that the overall cost-effectiveness and other metrics would be scalable and therefore not significantly change despite different reservoir size variations.

-Wet year storage: Would capture flows in the reservoir during wet years to maximize use of existing supplies if the District's successfully changed the point of diversion and acquired additional water rights for storage, and there would be potential changes in point of delivery for contract water. Otherwise, there would be no benefit in using existing supplies.

-Dry year augmentation: Would release stored water during dry years to supplement currently available supplies.

NOTE: A similar project evaluation could be developed for Clay Station Reservoir or storage off Knickerbocker Creek.

Related Options: None

METRICS	ASSESSMENT/ VALUE	SCORE	NOTES
Cost-Effectiveness			
Yield - Long-term Average (TAF/year)	17.1	N/A	*Based on 2030 demands, the District has 21,377 AF/year of currently unused surface water rights/contract entitlements during Water Forum wet/average years, which constitute 80 percent of the years from 1921 through 2015 (November-March unimpaired flows to Folsom Lake exceeding 950,000 AF).*
Water Supply Source	Other/Multiple Sources	OTHR	*New water right or modified District's appropriative rights.*
Total Cost ($)	$ 1,011,500,000	N/A	*Based on an off-stream reservoir project, excludes O&M (Los Vaqueros Reservoir Expansion, Alternative 3 (Reclamation 2008)). Unit costs escalated to 2016 value using the Bureau of Labor Statistics' CPI Index.*
Overall Cost-effectiveness ($/AF) (Total Cost / Yield)	$ 2,139	N/A	*Annualized, 3.5% discount rate over 100-year project life*
Contribution to Objectives			
Improve Dry Year Reliability	High Potential	♦♦♦	*Large annual acre-foot increase would occur in dry year supply.*
Perfect Beneficial Use of Existing Supplies	High Potential	♦♦♦	*Assuming the District could modify its appropriative rights, this would increase average annual use of the District's water supply and treatment capacity (as compared to usage).*
Provide Financial Benefit	High upfront costs and/or unlikely to include new water transfers	♦	*Extremely high upfront costs for ratepayer. Some improved ability for District to engage in water transfers.*
Extreme Drought Conditions	High Potential to Improve Conditions During an Extreme Drought	♦♦♦	*Would increase storage to provide supply during extreme drought conditions.*
Implementation Complexity			
Environmental Compliance Requirements	Complex: EIR	♦	*EIR for potential construction and/or operational impacts associated with building a new in-stream reservoir.*
Permitting Requirements	Complex: Multiple Federal, State and Local Permits	♦	*Complex, as it would require building a new in-stream reservoir.*
Water Rights / Contracts	High: New Water Right	♦	*Would require a new water right for storage and new rights for diversions if District could not justify the change in existing water rights. For contract deliveries, it would require the original water right holders to obtain additional water rights to divert and/or store, and consequently a change in point of delivery for District.*

Institutional & Coordination	High: Partnerships Needed, Likely New Agreement		*Partnerships would be imperative to build new in-stream reservoir both for construction and operation of the reservoir.*
Land Acquisition	High: No Willing Seller Identified		*Large area of land would need to be purchased; much of the site is owned by PCWA.*
Public Acceptance & Support	Low: Low Public Acceptance and Support		*Low support for building a large reservoir.*
Schedule	Greater than 3 years to implement		*Would take multiple years to design and construct.*
Uncertainty			
Costs	Low: No Planning Documents, Best Engineering Judgment Applied		*While costs were based on a similar off-stream reservoir project (Los Vaqueros Reservoir Expansion (Reclamation 2008)), no specific site was chosen and evaluated.*
Yield & Reliability	Moderate: Confirmed Yield, Moderate Reliability, and/or Agreement is Long-Term		*Based on 2030 demands provided in the Urban Water Management Plan (2010).*

Key: AF = acre-feet, CVP = Central Valley Project, EIR = Environmental Impact Report, IS = Initial Study, MND = Mitigated Negative Declaration, N/A = not applicable, ND = Negative Declaration, PCWA = Placer County Water Agency, ROW = Right-of-Way, TAF = thousand acre-feet

Relative Ranking

References:

Reclamation. 2008. Draft Appendix C, Engineering Designs and Costs, Los Vaqueros Reservoir Expansion Investigation, California Draft Feasibility Report.
2010 Urban Water Management Plan for SJWD, CHWD, OVWC, City of Folsom, and FOWD

SAN JUAN WATER DISTRICT WATER SUPPLY & RELIABILITY STUDY

Project Evaluation Summary

ID: **O3**

Project Name: **Purchase Reservoir Space on American River above Folsom Dam for Storage**

Type: **SW**

OPTION NOT CARRIED FORWARD

Project Description:

Option would include either purchasing capacity in an existing upstream hydropower reservoir, or entering into an agreement with the current owners for use of capacity in the reservoir. The purchase or or use of storage space would provide reservoir capacity for District use.

-Wet year storage: Would capture flows in reservoir during wet years to maximize use of existing supplies and/or additional contract amount.

-Dry year augmentation: Would release stored water during dry years to supplement currently available supplies.

Note: During this initial evaluation, it was determined that this option would not be carried forward. There are currently no hydropower reservoirs on the upper American River in the process of FERC license renewal. Reservoirs considered included those owned/operated by PCWA; Rock Creek Hydro, LLC; El Dorado Irrigation District; SMUD; and PG&E. The next hydropower reservoir to update its FERC license is not until approximately 2030. Additional exploration of such a storage opportunity may affect established FERC license conditions, resulting in the District possibly needing to compensate for the potential power generation revenue loss which would likely be a very challenging mitigation action.

Related Options: None

METRICS	ASSESSMENT/ VALUE	SCORE	NOTES
Cost-Effectiveness			
Yield - Long-term Average (TAF/year)		N/A	*Not quantified, as there are currently no hydropower reservoirs in which the District could purchase capacity or utilize capacity (via an agreement), and none will be undergoing FERC relicensing during the next decade.*
Water Supply Source	Other/Multiple Sources	OTHR	*Unknown, as a specific reservoir was not evaluated.*
Total Cost ($)		N/A	*Not quantified, as there are currently no hydropower reservoirs in which the District could purchase capacity or utilize capacity (via an agreement), and none will be undergoing FERC relicensing during the next decade.*
Overall Cost-effectiveness ($/AF) (Total Cost / Yield)		N/A	
Contribution to Objectives			
Improve Dry Year Reliability	High Potential	💧💧💧	*Would increase ability to store water when available for use when surface water supplies are low.*
Perfect Beneficial Use of Existing Supplies	High Potential	💧💧💧	*Assuming the District could modify the point of diversion of its appropriative rights and acquire a new water right for storage, this would increase average annual use of the District's existing water supplies.*
Provide Financial Benefit	High upfront costs and/or unlikely to include new water transfers	💧	*Would increase the ability to facilitate a water transfer; however, the high cost is not likely to be compatible with currently available transfer markets.*
Extreme Drought Conditions	High Potential to Improve Conditions During an Extreme Drought	💧💧💧	*Would increase storage to provide supply during extreme drought conditions.*
Implementation Complexity			
Environmental Compliance Requirements	Moderate: IS/ND/MND	💧💧	*Purchasing a portion of a reservoir (with no new construction) may require IS/MND.*
Permitting Requirements	Moderate: Some State and/or Local Permits	💧💧	*Moderate, as it would require purchasing a portion of a reservoir (with no new construction).*
Water Rights / Contracts	High: New Water Right	💧	*Current point of diversion for District's water rights is Folsom Dam. This option would require the District to either modify its water rights to allow for upstream diversion and storage, or enter into exchange and operation agreements with the owner to operate its facility for the District's benefit.*
Institutional & Coordination	High: Partnerships Needed, Likely New Agreement	💧	*Would need a new partnership with the reservoir owner.*
Land Acquisition	Low: Existing ROW / Not Applicable	💧💧💧	*N/A*

Public Acceptance & Support	Moderate: Some Public Acceptance and Moderate Support		*Moderate support, as option would likely be costly and yield is uncertain.*
Schedule	Greater than 3 years to implement		*Would be over a decade until another hydropower reservoir needs to renew its FERC license.*
Uncertainty			
Costs	Low: No Planning Documents, Best Engineering Judgment Applied		*None available.*
Yield & Reliability	Low: Unconfirmed Yield, Low Reliability, and/or Agreement is Short-Term		*None available.*

Key: AF = acre-feet, CVP = Central Valley Project, EIR = Environmental Impact Report, IS = Initial Study, MND = Mitigated Negative Declaration, N/A = not applicable, ND = Negative Declaration, PCWA = Placer County Water Agency, ROW = Right-of-Way, TAF = thousand acre-feet

Relative Ranking

References:

SAN JUAN WATER DISTRICT WATER SUPPLY & RELIABILITY STUDY

Project Evaluation Summary

ID: **O4**

Project Name: **Upper Watershed Restoration** Type: **SW**

OPTION NOT CARRIED FORWARD

Project Description:

Option would include forest management activities in the Sierra Nevada such as removal of excess brush and trees. This could lead to an increase in the snowpack by creating the right-sized gaps in the canopy so that snow can fall to the ground but still receive enough shade to be protected from direct exposure to sunlight and higher winds that would otherwise cause the snowpack to melt earlier. A larger snowpack along with later snowmelt could increase the available water supplies for the District in addition to providing wider environmental and public benefits. Another benefit would be lower potential for high-intensity wildfires which could otherwise dramatically increase runoff and sediment that degrades water quality and reduces reservoir storage capacity.

-Wet year storage: None.

-Dry year augmentation: Would have potential for larger snowpack and therefore more water supplies in the watershed to which the District could have access.

Note: While this option could provide widespread public and environmental benefits, it is unlikely that any increase in snowpack, and thereby potentially water supply reliability, could be quantified or directly attributed to the District.

Related Options: None

METRICS	ASSESSMENT/ VALUE	SCORE	NOTES
Cost-Effectiveness			
Yield - Long-term Average (TAF/year)		N/A	*Research did not provide any conclusive results for estimating yield for the proposed forest management activities.*
Water Supply Source	Other/Multiple Sources	OTHR	*Would be indirect, through natural hydrologic processes.*
Total Cost ($)		N/A	*No specific amount was been determined.*
Overall Cost-effectiveness ($/AF) (Total Cost / Yield)		N/A	
Contribution to Objectives			
Improve Dry Year Reliability	Low Potential	💧	*Given the large uncertainty associated with this alternative, this alternative would be unlikely to improve dry year reliability.*
Perfect Beneficial Use of Existing Supplies	Low Potential	💧	*Would not increase use of existing supplies.*
Provide Financial Benefit	High upfront costs and/or unlikely to include new water transfers	💧	*Would be unlikely to include new water transfers.*
Extreme Drought Conditions	Moderate Potential to Improve Conditions During an Extreme Drought	💧💧	*The extent of improved conditions during extreme drought would depend on the effectiveness of this proposed strategy.*
Implementation Complexity			
Environmental Compliance Requirements	Moderate: IS/ND/MND	💧💧	*Removing excess brush and tress may require IS/MND.*
Permitting Requirements	Moderate: Some State and/or Local Permits	💧💧	*Removing excess brush and trees may require State and/or local permits.*
Water Rights / Contracts	Low: No Change	💧💧💧	*Would not change water rights.*
Institutional & Coordination	Moderate: Partnerships Needed, Likely Similar to Existing Arrangement	💧💧	*Would require coordination with the management authority and implementation agencies because the District would likely not be the implementation agency.*
Land Acquisition	Low: Existing ROW / Not Applicable	💧💧💧	*No land acquisition would be required.*
Public Acceptance & Support	Moderate: Some Public Acceptance and Moderate Support	💧💧	*Would provide greater public benefits, but District-specific benefits cannot be quantified.*
Schedule	Greater than 3 years to implement	💧	*Implementation of this option would require long-term efforts currently being led by the State and conservative groups.*
Uncertainty			
Costs	Low: No Planning Documents, Best Engineering Judgment Applied	💧	*Not calculated.*
Yield & Reliability	Low: Unconfirmed Yield, Low Reliability, and/or Agreement is Short-Term	💧	*Not calculated.*

Key: AF = acre-feet, CVP = Central Valley Project, EIR = Environmental Impact Report, IS = Initial Study, MND = Mitigated Negative Declaration, N/A = not applicable, ND = Negative Declaration, PCWA = Placer County Water Agency, ROW = Right-of-Way, TAF = thousand acre-feet

Relative Ranking

References:

Reclamation. 2013 (edited). Measurement of snow interception and canopy effects on snow accumulation and melt in a mountainous maritime climate, Oregon, United States

SAN JUAN WATER DISTRICT WATER SUPPLY & RELIABILITY STUDY

Project Evaluation Summary

ID: **O5**

Project Name: **Folsom Dam Raise** Type: **SW**

Project Description:

Option would include the District partnering in the Folsom Dam raise. As this is a federal facility, Reclamation would be the implementation agency under Congressional authorization. If the authority is for increasing water supply, it would be for the CVP, which would include the District's contract delivery. It would not increase the current commitment from Reclamation to honor the District's water rights.

-Wet year storage: None, as the increased storage would belong to Reclamation.

-Dry year augmentation: Could improve the District's dry year reliability because the increased storage may delay the State's curtailment actions and improve contract delivery.

Note: The Folsom Dam Raise Project was authorized by the Energy and Water Development and Appropriations Act of 2004 (Public Law 108-137) to improve flood protection by increasing the reservoir storage capacity at the Folsom Facility. However, the 3.5-foot raise is not authorized for water supply. This raise is expected to be completed by 2021. This option would be in addition to the existing authorization.

Related Options: None

METRICS	ASSESSMENT/ VALUE	SCORE	NOTES
Cost-Effectiveness			
Yield - Long-term Average (TAF/year)	1.7	N/A	*Based on 2030 demands, the District has 21,377 AF/year of currently unused surface water rights/contract entitlements during Water Forum wet/average years, which constitute 80 percent of the years from 1921 through 2015 (November-March unimpaired flows to Folsom Lake exceeding 950,000 AF). When water supply authorization is secured, a 3.5-foot raise would increase storage by approximately 46,200 AF, which would benefit the entire CVP and reduce the potential for low storage to affect water right deliveries. However, the potential yield would be uncertain, and the realized benefit for the District would likely be limited. Assume the District would only receive 10%.*
Water Supply Source	Other/Multiple Sources	OTHR	*District's water rights and contract entitlements.*
Total Cost ($)	$ 87,035,000	N/A	*First cost of $74 Million (Oct 2006 price level) for a 3.5 foot raise from its existing elevation (USACE 2007). Converted to 2016 dollars using the Bureau of Labor Statistics' CPI Index. As the District would need an additional raise (in addition to the Folsom Dam Raise Project's 3.5 foot raise), the cost would be more expensive due to impacts on property and the need to modify the dam, dikes, tainter gate, berms, etc. This additional cost was not calculated. With authorization, Reclamation may pay for the project and recover the costs using the CVP repayment process.*
Overall Cost-effectiveness ($/AF) (Total Cost / Yield)	$ 1,840	N/A	*Annualized, 3.5% discount rate over 100-year project life*
Contribution to Objectives			
Improve Dry Year Reliability	Moderate Potential	💧💧	*Would increase the ability for Reclamation to provide CVP deliveries to all contractors.*
Perfect Beneficial Use of Existing Supplies	Low Potential	💧	*Would not increase demands to drive additional diversions.*
Provide Financial Benefit	High upfront costs and/or unlikely to include new water transfers	💧	*Extremely high upfront costs for users. Some improved ability for District to engaged in water transfers.*

Extreme Drought Conditions	Moderate Potential to Improve Conditions During an Extreme Drought		*Would provide additional storage capacity in Folsom Lake which could reduce the occurrence of extreme drought conditions (i.e., the District being unable to take water from the lake).*
Implementation Complexity			
Environmental Compliance Requirements	Complex: EIR		*EIR for potential construction and/or operational impacts associated with modifying a dam.*
Permitting Requirements	Complex: Multiple Federal, State and Local Permits		*Complex permitting for modifying a dam.*
Water Rights / Contracts	Low: No Change		*Reclamation has existing water rights for the raise, which is unlikely to result in additional contracts or changes in contract amount.*
Institutional & Coordination	High: Partnerships Needed, Likely New Agreement		*Would need to partner with Reclamation as this would be a federally-led project.*
Land Acquisition	Low: Existing ROW / Not Applicable		*No additional land would be required.*
Public Acceptance & Support	Low: Low Public Acceptance and Support		*A 3.5-foot dam raise is already being explored. An additional raise or further change to the existing authorization may have limited support.*
Schedule	Greater than 3 years to implement		*10+ year timeframe expected.*
Uncertainty			
Costs	Low: No Planning Documents, Best Engineering Judgment Applied		*Based on American River Common Features project estimates for the authorized 3.5-foot dam raise.*
Yield & Reliability	Low: Unconfirmed Yield, Low Reliability, and/or Agreement is Short-Term		*Potential District yield not quantified.*

Key: AF = acre-feet, CVP = Central Valley Project, EIR = Environmental Impact Report, IS = Initial Study, MND = Mitigated Negative Declaration, N/A = not applicable, ND = Negative Declaration, PCWA = Placer County Water Agency, ROW = Right-of-Way, TAF = thousand acre-feet

Relative Ranking

References:

USACE. 2007. Engineering Documentation Report. Folsom Dam Raise Project. American River Watershed Project, California. March.

SAN JUAN WATER DISTRICT WATER SUPPLY & RELIABILITY STUDY

Project Evaluation Summary

ID: **O6**

Project Name: **Surface Water Closed Storage Tank in SJWD Retail or Wholesale Area** Type: **SW**

Project Description: Option would build multiple 8 million gallon storage tanks in the SJWD Retail or Wholesale Area to capture wet year flows. For this analysis, a single 8 million gallon storage tank was used. Tanks were assumed to be in-ground, lined, covered basins storing untreated surface water. Pipeline would also be required to connect tanks to the water treatment facility. Multiple tanks would be needed to contribute substantial volumes of water. The proposed tank would need to store raw water prior to treatment because treated water cannot be stored for long periods of time (e.g., several years) without risk of formation of disinfection byproducts and loss of chlorine residual.

Related Options: None

METRICS	ASSESSMENT/ VALUE	SCORE	NOTES
Cost-Effectiveness			
Yield - Long-term Average (TAF/year)	0.0196	N/A	*Assumed one tank. Assumed tank would fill every Water Forum wet/average year. Assumed Water Forum wet/average years were 80 percent of the years from 1921 through 2015 (November-March unimpaired flows to Folsom Lake exceeding 950,000 AF).*
Water Supply Source	Other/Multiple Sources	OTHR	*District's water rights and contract entitlements*
Total Cost ($)	$ 17,015,000	N/A	*Cost estimate assumptions for a rectangular, in-ground lined basin with floating cover: - 8 million gallon storage basin: $5.2 Million - 3 MGD, 150 HP pump station: $0.825 Million - 10,000 feet of 18" transmission pipeline: $2.13 Million - 2.2 acre land purchase for basin: $1.54 Million - Plus 30% contingency, 30% engineering, CM & Admin, 3% environmental documentation, 2% legal*
Overall Cost-effectiveness ($/AF) (Total Cost / Yield)	$ 47,102	N/A	*Annualized, 3.5% discount rate over 30-year project life.*
Contribution to Objectives			
Improve Dry Year Reliability	Low Potential	1	*Limited yield given small tank size. Would require many tanks.*
Perfect Beneficial Use of Existing Supplies	Low Potential	1	*Would not increase wet year beneficial use, but would allow redirected beneficial use in dry years.*
Provide Financial Benefit	High upfront costs and/or unlikely to include new water transfers	1	*Would minimally reduce or avoid the need for dry year purchases from another agency (e.g., groundwater from SSWD).*
Extreme Drought Conditions	Limited Potential to Improve Conditions During an Extreme Drought	1	*Would slightly improve, but would require a large number of tanks and land purchases.*
Implementation Complexity			
Environmental Compliance Requirements	Moderate: IS/ND/MND	2	*While tank installation typically would not pose major environmental compliance issues, the site(s) are unknown and environmental compliance requirements would be uncertain.*
Permitting Requirements	Moderate: Some State and/or Local Permits	2	*Tank installation may require some local permits.*
Water Rights / Contracts	Low: No Change	3	*Would use existing water rights.*
Institutional & Coordination	Low: No Partnerships Needed	3	*No external coordination would be needed.*
Land Acquisition	High: No Willing Seller Identified	1	*Each tank would require purchase of 2+ acres within the service area.*
Public Acceptance & Support	Moderate: Some Public Acceptance and Moderate Support	2	*Potential issues regarding construction in multiple locations within the service area.*
Schedule	Greater than 3 years to implement	1	*Land acquisition plus multiple sites/tanks could increase project duration.*
Uncertainty			
Costs	Moderate: Cost Information, No Engineering Details	2	*Based on similar costs for tanks in same area.*
Yield & Reliability	High: Confirmed Yield, High Reliability, and/or Agreement is Long-Term	3	

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Relative Ranking

References:

SAN JUAN WATER DISTRICT WATER SUPPLY & RELIABILITY STUDY

Project Evaluation Summary

ID: **O7**

Project Name: **Above Ground Surface Water Storage in SJWD Retail or Wholesale Area** Type: **SW**

OPTION NOT CARRIED FORWARD

Project Description: Option would build a 20,000 AF above ground open basin to capture wet year flows in the SJWD Retail or Wholesale Area for use during dry years.

-Wet year storage: Would capture flows in reservoir during wet years to maximize use of contract supplies.

-Dry year augmentation: Would release stored water during dry years to supplement available supplies.

Note: The SJWD service area was evaluated using a parcel-based geospatial analysis for suitable sites for the proposed 20,000 AF reservoir. The only parcel identified that would be large enough for this facility would be in the American River Parkway, which was not considered a feasible location. Combining parcels was also evaluated, however, first estimates show land acquisition costs upwards of $140 Million. This estimate was based on a sum of 2013 county assessor total values of a representative selection of parcels sufficient to accommodate construction.

Related Options: None

METRICS	ASSESSMENT/ VALUE	SCORE	NOTES
Cost-Effectiveness			
Yield - Long-term Average (TAF/year)		N/A	*Unable to find land parcel(s) for reservoir. No yield calculated.*
Water Supply Source	Other/Multiple Sources	OTHR	*District's water rights and contract entitlements.*
Total Cost ($)		N/A	*First estimates indicated land acquisition costs upwards of $140 Million based on a sum of 2013 county assessor total values of a representative selection of parcels sufficient to accommodate construction.*
Overall Cost-effectiveness ($/AF) (Total Cost / Yield)		N/A	
Contribution to Objectives			
Improve Dry Year Reliability	High Potential	♦♦♦	*Would use stored water during dry years when adequate surface water is unavailable to meet demands.*
Perfect Beneficial Use of Existing Supplies	Moderate Potential	♦♦	*Could increase wet year use by storing supplies during wet years.*
Provide Financial Benefit	High upfront costs and/or unlikely to include new water transfers	♦	*Would avoid or reduce dry year cost to purchase water when it would have otherwise been required. Likely high upfront costs to purchase land if it was available.*
Extreme Drought Conditions	Moderate Potential to Improve Conditions During an Extreme Drought	♦♦	*Would provide an additional location for the District to get water when access to Folsom Lake supplies are limited.*
Implementation Complexity			
Environmental Compliance Requirements	Complex: EIR	♦	*EIR for potential construction impacts associated with building above ground storage.*
Permitting Requirements	Complex: Multiple Federal, State and Local Permits	♦	*Complex permitting for building above ground storage.*
Water Rights / Contracts	Low: No Change	♦♦♦	*No change.*
Institutional & Coordination	High: Partnerships Needed, Likely New Agreement	♦	*Unknown as a site could not be identified.*
Land Acquisition	High: No Willing Seller Identified	♦	*No seller(s) identified, and unlikely to find any within the District as the land is mostly residential and commercial parcels of high value.*
Public Acceptance & Support	Low: Low Public Acceptance and Support	♦	*Would require large purchase of land.*
Schedule	Greater than 3 years to implement	♦	*Long timeframe, as the land not not been acquired or identified.*
Uncertainty			
Costs	Low: No Planning Documents, Best Engineering Judgment Applied	♦	*Not calculated.*
Yield & Reliability	Low: Unconfirmed Yield, Low Reliability, and/or Agreement is Short-Term	♦	*Not calculated.*

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Relative Ranking

References:

SAN JUAN WATER DISTRICT WATER SUPPLY & RELIABILITY STUDY

Project Evaluation Summary

ID: **O8**

Project Name: **Above Ground Surface Water Storage Basin in El Dorado Irrigation District Service Area** Type: **SW**

Project Description:

Option would purchase the 700 AF Bass Lake for an above ground basin to store wet year flows for use during dry years. This would require a water exchange agreement with EID.

Bass Lake, along with 58 acres of surrounding land, was purchased by Rescue Union School District (RUSD) in 2015 from El Dorado Irrigation District (EID) to develop a 20-acre environmental science and technology site. The remaining land is planned to be parkland that would be shared with the El Dorado Hills Community Services District. Since purchasing the property from EID, the RUSD has decided to build elsewhere. The property is located off of Bass Lake Road, south of Green Valley Road in El Dorado Hills.

EID sold the lake as it was deemed surplus property. The lake originally consisted of potable water, direct precipitation, and runoff from a local drainage basin. It was last used by EID as an emergency source to supplement recycled water demands when there were insufficient recycled water supplies. The lake has not received supplemental potable water for over five years.

-Wet year storage: Would capture flows in reservoir during wet years to maximize use of surface water supplies.

-Dry year augmentation: Would release stored water during dry years to supplement available supplies.

Related Options: None

METRICS	ASSESSMENT/ VALUE	SCORE	NOTES
Cost-Effectiveness			
Yield - Long-term Average (TAF/year)	0.56	N/A	*Based on 2030 demands, the District has 21,377 AF/year of currently unused surface water rights/contract entitlements during Water Forum wet/average years, which constitute 80 percent of the years from 1921 through 2015 (November-March unimpaired flows to Folsom Lake exceeding 950,000 AF). Assumed 700 AF of this water, when available, would go to Bass Lake for storage.*
Water Supply Source	Pre-1914 and Senior Appropriative Water Right	APPR	
Total Cost ($)	$ 1,300,000	N/A	*Assumed:* *Property: $300,000 (price paid by RUSD in 2015)* *Legal and Other Administrative Fees: $1,000,000* *Infrastructure: None*
Overall Cost-effectiveness ($/AF) (Total Cost / Yield)	$ 161	N/A	*Annualized, 3.5% discount rate over 30-year project life. Additional CVP annual cost of $35/AF (SJWD and SSWD 2014) to use CVP water to replace the water supply currently going to the WCAs. Would likely require an additional $/AF charge to use EID infrastructure.*
Contribution to Objectives			
Improve Dry Year Reliability	Moderate Potential	💧💧	*Would use stored water during dry years when adequate surface water is unavailable to meet demands.*
Perfect Beneficial Use of Existing Supplies	Moderate Potential	💧💧	*Assumed the District could modify its appropriative rights, and could increase wet year use by storing water during wet years.*
Provide Financial Benefit	High upfront costs and/or unlikely to include new water transfers	💧	*Would avoid or reduce the dry year cost to purchase water when it would have otherwise been required. Likely high upfront costs to develop the storage basin and enter into an agreement with EID.*
Extreme Drought Conditions	Moderate Potential to Improve Conditions During an Extreme Drought	💧💧	*Would provide an additional location for the District to get water when access to Folsom Lake supplies are limited.*
Implementation Complexity			
Environmental Compliance Requirements	Moderate: IS/ND/MND	💧💧	*Purchasing a reservoir (with no new construction) may require IS/MND.*
Permitting Requirements	Moderate: Some State and/or Local Permits	💧💧	*Moderate, as it would require purchasing a reservoir (with no construction).*

Water Rights / Contracts	High: New Water Right	💧	*Would require a new water right to divert water for storage. Resulting water supply impacts could be alleviated by establishing the Area of Origin of the District's appropriative water right.*
Institutional & Coordination	High: Partnerships Needed, Likely New Agreement	💧	*Would need agreement with EID.*
Land Acquisition	Moderate: Willing Seller Identified	💧💧	*The land would be purchased from RUSD.*
Public Acceptance & Support	High: Public Acceptance and Wide Support	💧💧💧	
Schedule	1-2 years to implement	💧💧	*Moderate timeframe to purchase and enter into agreements.*
Uncertainty			
Costs	Low: No Planning Documents, Best Engineering Judgment Applied	💧	*General estimate.*
Yield & Reliability	Moderate: Confirmed Yield, Moderate Reliability, and/or Agreement is Long-Term	💧💧	*Based on 2030 demands provided in the Urban Water Management Plan (2010).*

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Relative Ranking

References:

Sacramento Bee. 2014. EID's Bass Lake Property Sought for School Focusing on Environment, Technology. June 3.
Village Life. 2015. School District to Purchase Second School Site Property. September 14.
El Dorado Irrigation District. 2011. Water Resources and Service Reliability Report.
El Dorado Irrigation District. 2010 Urban Water Management Plan.

SAN JUAN WATER DISTRICT WATER SUPPLY & RELIABILITY STUDY

Project Evaluation Summary

ID: **O9**

Project Name: **In-Lieu Banking Program Within SJWD Wholesale Area** Type: **GW**

Project Description: Option would construct new and/or expand existing infrastructure to (1) supply existing groundwater users in the SJWD Wholesale Area with surface water in wetter years for use in-lieu of those users pumping groundwater, such that (2) in dry years, those users would expand their use of stored groundwater, thus leaving surface water for the District to use or make available for purchase by others. Currently, groundwater is pumped during wetter years for well maintenance purposes and those groundwater users have access to surface water supplies. This option would analyze the minimum amount of groundwater pumping needed for well maintenance purposes, such that surface water supplies would be used in-lieu of the current amount being pumped. Note that while stored groundwater is affected by the basin's cone of depression, this option would both improve overall basin conditions and the ability of the District to extract groundwater from the WCAs when needed.

-Wet year storage: Would maximize use of contract surface water to preserve groundwater supply in wet years when surface water is abundant.

-Dry year augmentation: Additional surface water would be available, as groundwater users would use stored groundwater instead of surface water.

Related Options: None

METRICS	ASSESSMENT/ VALUE	SCORE	NOTES
Cost-Effectiveness			
Yield - Long-term Average (TAF/year)	1.1	N/A	*Wet/average year groundwater production for well maintenance purposes on average (AF/year): CHWD: 390, FOWD: 840, OVWC: 0. Assumed that CHWD and FOWD would lower maintenance-required pumping to several hours per month, equalling 80 AF/year per agency. Groundwater production would be 1,070 AF/year.*
Water Supply Source	Other/Multiple Sources	OTHR	*District's water rights and contract entitlements.*
Total Cost ($)	$ 100,000	N/A	*Assumed: - Cost to enter into contracts/agreements: $100,000 - Infrastructure: None, existing access to surface water supplies*
Overall Cost-effectiveness ($/AF) (Total Cost / Yield)	$ 105	N/A	*Annualized, 3.5% discount rate over 30-year project life. Assumed $100/AF (for pumping, energy, and O&M costs) to produce groundwater which is the price wholesalers would then pay the District to take surface water. (Note that the $/AF cost for using wells would increase as usage decreases. This is not reflected in the $/AF cost at this stage.)*
Contribution to Objectives			
Improve Dry Year Reliability	Moderate Potential	💧💧	*A small volume of additional surface water would be available since groundwater users would use stored groundwater instead of surface water in dry years.*
Perfect Beneficial Use of Existing Supplies	Moderate Potential	💧💧	*Increased use of contract surface water to preserve groundwater supply in wet years (when surface water is abundant) would occur but be limited, so dry year allocations could be slightly increased.*
Provide Financial Benefit	Low upfront costs and/or able to implement new water transfers	💧💧💧	*Reduced groundwater extraction during wet years would increase groundwater recharge and provide opportunities for SJWD water transfers of similar amount.*
Extreme Drought Conditions	Moderate Potential to Improve Conditions During an Extreme Drought	💧💧	*Would improve groundwater conditions by allowing basin to recharge during wet years.*
Implementation Complexity			
Environmental Compliance Requirements	Moderate: IS/ND/MND	💧💧	
Permitting Requirements	Moderate: Some State and/or Local Permits	💧💧	
Water Rights / Contracts	Low: No Change	💧💧💧	*No change.*
Institutional & Coordination	High: Partnerships Needed, Likely New Agreement	🔴	*Agreements would be needed with WCAs*
Land Acquisition	Low: Existing ROW / Not Applicable	💧💧💧	*Assumed minor infrastructure changes within ROW.*
Public Acceptance & Support	High: Public Acceptance and Wide Support	💧💧💧	

Schedule	Less than 1 year to implement	💧💧💧	
Uncertainty			
Costs	Moderate: Cost Information, No Engineering Details	💧💧	
Yield & Reliability	Moderate: Confirmed Yield, Moderate Reliability, and/or Agreement is Long-Term	💧💧	

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Relative Ranking

References:

SAN JUAN WATER DISTRICT WATER SUPPLY & RELIABILITY STUDY

Project Evaluation Summary

ID: **O10**

Project Name: **In-Lieu Banking Program With an Agency Other than the WCAs** Type: **GW**

Project Description:

Option would construct new and/or expand existing infrastructure to supply surface water to existing groundwater users outside the SJWD Wholesale Area (but within the Sacramento Groundwater Authority (SGA) area that do not currently have surface water sources) in wetter years for use in-lieu of groundwater use.

-Wet year storage: Would maximize use of contract surface water to preserve groundwater supply in wet years when surface water is abundant.

-Dry year augmentation: Would make additional surface water available as groundwater users would use stored groundwater instead of surface water.

Related Options: None

METRICS	ASSESSMENT/ VALUE	SCORE	NOTES
Cost-Effectiveness			
Yield - Long-term Average (TAF/year)	21.4	N/A	*Wet/average years (2006, 2011) groundwater production average of 53.9 TAF/yr (SSWD = 24.2, RLECWD = 3.0, SCWA = 5.0, GSWC = 1.2, Cal Am = 16.5, CWD = 2.45) Based on 2030 demands, the District has 21,377 AF/year of currently unused surface water rights/contract entitlements during Water Forum wet/average years, which constitute 80 percent of the years from 1921 through 2015 (November-March unimpaired flows to Folsom Lake exceeding 950,000 AF).*
Water Supply Source	Other/Multiple Sources	OTHR	*District's water rights and contract entitlements.*
Total Cost ($)	$ 5,200,000	N/A	*Assumed:* *- Cost to enter into contracts/agreements: $200,000* *- Infrastructure: $5 Million (conservative representative estimate which would vary by agency)*
Overall Cost-effectiveness ($/AF) (Total Cost / Yield)	$113.23	N/A	*Annualized, 3.5% discount rate over 30-year project life. Assumed $100/AF (for pumping, energy, and O&M costs) to produce groundwater which is the price wholesalers would then pay the District to take surface water.*
Contribution to Objectives			
Improve Dry Year Reliability	High Potential	💧💧💧	*Additional surface water would be available since groundwater users will use stored groundwater instead of surface water in dry years.*
Perfect Beneficial Use of Existing Supplies	High Potential	💧💧💧	*Would maximize use of contract surface water to preserve groundwater supply in wet years when surface water is abundant, thus increasing dry year allocations.*
Provide Financial Benefit	Low upfront costs and/or able to implement new water transfers	💧💧💧	*Reduced groundwater extraction during wet years would increase groundwater recharge and provide opportunities for SJWD water transfers of similar amount.*
Extreme Drought Conditions	Moderate Potential to Improve Conditions During an Extreme Drought	💧💧	*Would improve groundwater conditions by allowing basin to recharge during wet years.*
Implementation Complexity			
Environmental Compliance Requirements	Moderate: IS/ND/MND	💧💧	
Permitting Requirements	Low: No Permits	💧💧💧	
Water Rights / Contracts	Moderate: Change to Point of Diversion/Delivery, and/or Place of Use	💧💧	*A change in Place of Use could be needed, depending on the participating agencies.*
Institutional & Coordination	High: Partnerships Needed, Likely New Agreement	💧	*Would require new agreements for the District.*
Land Acquisition	Low: Existing ROW / Not Applicable	💧💧💧	*Assumed some infrastructure changes within ROW (either owned by the District or participating agency).*
Public Acceptance & Support	High: Public Acceptance and Wide Support	💧💧💧	
Schedule	1-2 years to implement	💧💧	
Uncertainty			

Costs	Moderate: Cost Information, No Engineering Details	💧💧	
Yield & Reliability	Moderate: Confirmed Yield, Moderate Reliability, and/or Agreement is Long-Term	💧💧	

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Relative Ranking

References:

SAN JUAN WATER DISTRICT WATER SUPPLY & RELIABILITY STUDY

Project Evaluation Summary

ID: **O11**

Project Name: **Build New Groundwater Extraction Wells in SJWD Retail Area** Type: **GW**

OPTION NOT CARRIED FORWARD

Project Description: Option would install new groundwater extraction wells within the SJWD Retail Area to supplement existing supplies during dry years.

-Wet year storage: None.

-Dry year augmentation: Would provide limited ability to extract groundwater in dry years to supplement existing supplies.

Note: This option was not carried forward because previous evaluations determined that there was no potential to extract groundwater in the SJWD Retail Area.

Related Options: None

METRICS	ASSESSMENT/ VALUE	SCORE	NOTES
Cost-Effectiveness			
Yield - Long-term Average (TAF/year)	0.04	N/A	*Assumed 1 well pumping at 300 gpm, pumping 1/2 day, 365 days during dry years only (1 in 5 years)*
Water Supply Source	Other/Multiple Sources	OTHR	*Groundwater*
Total Cost ($)	$ 1,000,000	N/A	*Assumed: - Construction cost for 1 well and facility - Land cost of $0.5 Million*
Overall Cost-effectiveness ($/AF) (Total Cost / Yield)	$ 1,459	N/A	*Annualized, 3.5% discount rate over 30-year project life. Assumed costs of $100/AF (including pumping, energy, and O&M costs) to produce groundwater.*
Contribution to Objectives			
Improve Dry Year Reliability	Moderate Potential	💧💧	*Would provide limited ability to pump groundwater in dry years to supplement existing supplies.*
Perfect Beneficial Use of Existing Supplies	Low Potential	💧	*None, as this would be a new source of water.*
Provide Financial Benefit	High upfront costs and/or unlikely to include new water transfers	💧	*Limited potential for groundwater production.*
Extreme Drought Conditions	Moderate Potential to Improve Conditions During an Extreme Drought	💧💧	*Would provide another source of water should surface water supplies from Folsom Lake become unavailable.*
Implementation Complexity			
Environmental Compliance Requirements	Moderate: IS/ND/MND	💧💧	
Permitting Requirements	Moderate: Some State and/or Local Permits	💧💧	
Water Rights / Contracts	Low: No Change	💧💧💧	*N/A*
Institutional & Coordination	Low: No Partnerships Needed	💧💧💧	*No outside coordination would be needed.*
Land Acquisition	High: No Willing Seller Identified	💧	*Location of well(s) to be identified.*
Public Acceptance & Support	High: Public Acceptance and Wide Support	💧💧💧	*Could have localized complaints, but overall high public support.*
Schedule	Greater than 3 years to implement	💧	*Long time-frame as land to be acquired has not be identified.*
Uncertainty			
Costs	Low: No Planning Documents, Best Engineering Judgment Applied	💧	*No specific site(s) have been identified.*
Yield & Reliability	Moderate: Confirmed Yield, Moderate Reliability, and/or Agreement is Long-Term	💧💧	*Estimated from typical extraction wells in this region.*

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Relative Ranking

References:

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SAN JUAN WATER DISTRICT WATER SUPPLY & RELIABILITY STUDY

Project Evaluation Summary

ID: **O12**

Project Name: **Build New Groundwater Injection/Extraction Wells in SJWD Wholesale Area** Type: **GW**

Project Description:

Option would facilitate groundwater banking by installing new groundwater extraction wells within the SJWD Wholesale Area to enable either the sale of groundwater to another agency, or groundwater extraction and conveyance to the SJWD Retail Area via the Cooperative Transmission Pipeline.

-Wet year storage: None

-Dry year augmentation: Would provide ability to utilize groundwater in dry years to supplement existing supplies. With the SJWD Retail Area using groundwater, more surface water could be made available to other agencies.

Related Options: None

METRICS	ASSESSMENT/ VALUE	SCORE	NOTES
Cost-Effectiveness			
Yield - Long-term Average (TAF/year)	5.2	N/A	*Assumed 9 new wells (3 in OVWD, 3 in CHWD, 3 in FOWD). Extraction would occur in dry years only, with each well extracting at 1,000 gpm, pumping 1/2 day, 360 days (5 maintenance days). Injection would occur in wet/average years only, assuming 24 hours at 360 days (5 maintenance days) at 500 gpm. Water Forum wet/average years constituted 80 percent of the years from 1921 through 2015 (November-March unimpaired flows to Folsom Lake exceeding 950,000 AF). Assumed a 10 percent loss in aquifer.*
Water Supply Source	Other/Multiple Sources	OTHR	*Groundwater*
Total Cost ($)	$ 27,000,000	N/A	*Assumed: - Cost for water right/contract for water supplies for injection - Average well and facility cost - Land cost of $3 Million*
Overall Cost-effectiveness ($/AF) (Total Cost / Yield)	$ 432	N/A	*Annualized, 3.5% discount rate over 30-year project life. Assumed O&M of $150/AF to produce groundwater and inject groundwater.*
Contribution to Objectives			
Improve Dry Year Reliability	High Potential	💧💧💧	*Would provide ability to extract groundwater in dry years to supplement existing supplies. The SJWD Retail Area would be able to use groundwater, leaving more surface water supplies available for others to use.*
Perfect Beneficial Use of Existing Supplies	Moderate Potential	💧💧	*Some potential if this option is operated as groundwater bank.*
Provide Financial Benefit	Moderate upfront costs and/or limited ability to perform new water transfers	💧💧	*Would increase use of surface water supplies. Also, during dry years, these users would use groundwater, making surface water supplies available for SJWD to transfer (generate revenue).*
Extreme Drought Conditions	Moderate Potential to Improve Conditions During an Extreme Drought	💧💧	*Would improve groundwater conditions by allowing basin to recharge during wet years.*
Implementation Complexity			
Environmental Compliance Requirements	Moderate: IS/ND/MND	💧💧	*Potential for well interference impacts. Potentially higher costs to ratepayers.*
Permitting Requirements	Moderate: Some State and/or Local Permits	💧💧	*Would require application for General Order for ASR in addition to general permits for construction and management.*
Water Rights / Contracts	Low: No Change	💧💧💧	
Institutional & Coordination	High: Partnerships Needed, Likely New Agreement	💧	*New agreements would be needed.*
Land Acquisition	High: No Willing Seller Identified	💧	*Location(s) to be identified.*
Public Acceptance & Support	High: Public Acceptance and Wide Support	💧💧💧	*Could have localized complaints, but overall high public support.*
Schedule	1-2 years to implement	💧💧	

Uncertainty			
Costs	Moderate: Cost Information, No Engineering Details	💧💧	*Based on similar costs in region. Specific sites unknown.*
Yield & Reliability	Moderate: Confirmed Yield, Moderate Reliability, and/or Agreement is Long-Term	💧💧	*Number of wells estimated and unknown at this point.*

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Relative Ranking

References:

New well costs from construction of Sky Crest well by CHWD, 2015

SAN JUAN WATER DISTRICT WATER SUPPLY & RELIABILITY STUDY

Project Evaluation Summary

ID: **O13**

Project Name: **Build New Groundwater Injection/Extraction Wells along Cooperative Transmission Pipeline** Type: **GW**

Project Description:

Option would facilitate groundwater banking by installing new groundwater extraction wells along the Cooperative Transmission Pipeline to enable either the selling of groundwater to another agency, or groundwater extraction and conveyance to the SJWD Retail Area via the Cooperative Transmission Pipeline.

-Wet year storage: Would store surface water supplies in groundwater banks to maximize use of existing supplies.

-Dry year augmentation: Would provide ability to utilize groundwater in dry years to supplement existing supplies. With the SJWD Retail Area using groundwater, more surface water could be made available to other agencies.

Related Options: None

METRICS	ASSESSMENT/ VALUE	SCORE	NOTES
Cost-Effectiveness			
Yield - Long-term Average (TAF/year)	5.2	N/A	*Assumed 9 wells, each extracting in dry years only at 1,000 gpm, pumping 1/2 day, 360 days (5 maintenance days). Injection would occur in wet/average years only, assuming 24 hours at 360 days (5 maintenance days) at 500 gpm. Water Forum wet/average years constituted 80 percent of the years from 1921 through 2015 (November-March unimpaired flows to Folsom Lake exceeding 950,000 AF). Assumed a 10 percent loss in aquifer.*
Water Supply Source	Other/Multiple Sources	OTHR	*Groundwater*
Total Cost ($)	$ 27,000,000	N/A	*Assumed: - Cost for average injection well and facility - Land cost of $3 Million*
Overall Cost-effectiveness ($/AF) (Total Cost / Yield)	$ 432	N/A	*Annualized, 3.5% discount rate over 30-year project life. Assumed O&M of $150/AF to produce groundwater and inject groundwater.*
Contribution to Objectives			
Improve Dry Year Reliability	High Potential	💧💧💧	*Would provide ability to extract groundwater in dry years to supplement existing supplies. The SJWD Retail Area would be able to use groundwater, leaving more surface water supplies available for others to use.*
Perfect Beneficial Use of Existing Supplies	Low Potential	💧	*None*
Provide Financial Benefit	Low upfront costs and/or able to implement new water transfers	💧💧💧	*Reduced groundwater extraction during wet years would increase groundwater recharge and provide opportunities for SJWD water transfers of similar amount.*
Extreme Drought Conditions	Moderate Potential to Improve Conditions During an Extreme Drought	💧💧	*Would provide another source of water.*
Implementation Complexity			
Environmental Compliance Requirements	Complex: EIR	💧	*Potential for well interference impacts. Potentially higher costs to ratepayers.*
Permitting Requirements	Moderate: Some State and/or Local Permits	💧💧	*Would require application for General Order for ASR in addition to general permits for construction and management.*
Water Rights / Contracts	Moderate: Change to Point of Diversion/Delivery, and/or Place of Use	💧💧	
Institutional & Coordination	Moderate: Partnerships Needed, Likely Similar to Existing Arrangement	💧💧	*New agreements would be needed.*
Land Acquisition	High: No Willing Seller Identified	💧	*Location(s) to be identified.*
Public Acceptance & Support	High: Public Acceptance and Wide Support	💧💧💧	*Could have localized complaints, but overall high public support.*
Schedule	1-2 years to implement	💧💧	

Uncertainty			
Costs	Moderate: Cost Information, No Engineering Details	💧💧	*Based on similar costs in region. Specific sites unknown.*
Yield & Reliability	Moderate: Confirmed Yield, Moderate Reliability, and/or Agreement is Long-Term	💧💧	*Number of wells estimated and unknown at this point.*

Key: AF = acre-feet, CVP = Central Valley Project, EIR = Environmental Impact Report, IS = Initial Study, MND = Mitigated Negative Declaration, N/A = not applicable, ND = Negative Declaration, PCWA = Placer County Water Agency, ROW = Right-of-Way, TAF = thousand acre-feet

Relative Ranking

References:

New well costs from construction of Sky Crest well by CHWD, 2015

SAN JUAN WATER DISTRICT WATER SUPPLY & RELIABILITY STUDY

Project Evaluation Summary

ID: **O14**

Project Name: **Purchase Cal Am's Lincoln Oaks System** Type: **GW**

Project Description: Option would purchase California American Water's (Cal Am) Lincoln Oaks System which serves the western portion of the City of Citrus Heights and the unincorporated area west of I-80 and east of the UPRR. This would enable construction or expansion of infrastructure to provide surface water for use in-lieu of pumping groundwater. Then in dry years, those users would only use groundwater. Also, higher allocations would be available.

-Wet year storage: Maximize use of contract water to preserve groundwater supply in wet years when surface water is abundant, and increase average contract use.

-Dry year augmentation: Potentially higher contract water allocation because the allocation is based on usage from previous years. As stated above, the District will increase its use of contract water in non-dry years by supplying this water to the Lincoln Oaks System. In addition, instead of purchasing surface water from SSWD and Citrus Height WD, this area would rely on groundwater, leaving more surface water available for the District.

Related Options: None

METRICS	ASSESSMENT/ VALUE	SCORE	NOTES
Cost-Effectiveness			
Yield - Long-term Average (TAF/year)	17.0	N/A	*Wet/average year groundwater production averages.*
Water Supply Source	Other/Multiple Sources	OTHR	*District's water rights and contract entitlements.*
Total Cost ($)	$ 50,000,000	N/A	*Rough estimate to purchase a private system.*
Overall Cost-effectiveness ($/AF) (Total Cost / Yield)	$ 260	N/A	*Annualized, 3.5% discount rate over 30-year project life. Assumed costs of $100/AF (including pumping, energy, and O&M costs) to produce groundwater.*
Contribution to Objectives			
Improve Dry Year Reliability	Moderate Potential	💧💧	*Instead of purchasing surface water from SSWD and CHWD, this area would rely on groundwater, leaving more surface water available for the District. Also, potential for higher contract allocations from increased surface water use during wet years.*
Perfect Beneficial Use of Existing Supplies	High Potential	💧💧💧	*Would provide a new demand for District's supplies. Would improve use of contract surface water in wet years to preserve groundwater supply when surface water is abundant.*
Provide Financial Benefit	High upfront costs and/or unlikely to include new water transfers	💧	*High upfront cost. Could have potential to facilitate transfers.*
Extreme Drought Conditions	Moderate Potential to Improve Conditions During an Extreme Drought	💧💧	*Would improve groundwater conditions by allowing basin to recharge during wet years.*
Implementation Complexity			
Environmental Compliance Requirements	Complex: EIR	💧	*Would have to be approved by California Public Utilities Commission. Tetrachloroethylene (PCE) contamination present in groundwater.*
Permitting Requirements	Moderate: Some State and/or Local Permits	💧💧	
Water Rights / Contracts	Moderate: Change to Point of Diversion/Delivery, and/or Place of Use	💧💧	*Depending on which water source the District used, a change in place of use, modification of Exhibit A, or other action could be needed.*
Institutional & Coordination	High: Partnerships Needed, Likely New Agreement	💧	*Would need to enter into an agreement with Cal Am to purchase system.*
Land Acquisition	High: No Willing Seller Identified	💧	
Public Acceptance & Support	Low: Low Public Acceptance and Support	💧	*Unknown at this time.*
Schedule	Greater than 3 years to implement	💧	*Long timeframe to purchase system and construct infrastructure.*
Uncertainty			
Costs	Low: No Planning Documents, Best Engineering Judgment Applied	💧	*Unknown purchase price from Cal Am. Cal Am has indicated that it would not want to sell.*
Yield & Reliability	Moderate: Confirmed Yield, Moderate Reliability, and/or Agreement is Long-Term	💧💧	*Estimated from number of wells.*

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Relative Ranking

References:

References: Personal Communication. 2016. Regarding Cal Am not wanting to sell the Lincoln Oaks system.

SAN JUAN WATER DISTRICT WATER SUPPLY & RELIABILITY STUDY

Project Evaluation Summary

ID: **O15**

Project Name: **Use Roseville's ASR wells for Active Groundwater Injection and Banking** Type: **GW**

Project Description: Option would deliver the District's surface water for storage into Roseville's ASR wells in wet/above years. In dry years, the District would take one of the following actions:
(a) Sell banked water to Roseville and Roseville would forgo some of its surface water.
(b) Enter into an agreement with Roseville to extract groundwater and convey it to SJWD (which would require the construction of infrastructure by potentially modifying the pipeline to be able to reverse the direction of flow).
(c) Extract an equivalent amount of groundwater from existing wells in the Wholesale Area.
This option assumed that method (c) could be used for dry year augmentation.

-Wet year storage: Would maximize use of contract water by injecting currently unused surface water into the groundwater basin.

-Dry year augmentation: See (a), (b), and (c) above.

Related Options: None

METRICS	ASSESSMENT/ VALUE	SCORE	NOTES
Cost-Effectiveness			
Yield - Long-term Average (TAF/year)	1.5	N/A	*Assumed total groundwater extraction of 8,100 gpm, pumping 1/2 day, 360 days (5 maintenance days). For injection wells, assumed 24 hours at 360 days (5 maintenance days) with total injection of 5,400 gpm. Recharge frequency would be during Water Forum wet/average years (which constitute 80 percent of the years from 1921 through 2015 (November-March unimpaired flows to Folsom Lake exceeding 950,000 AF)) and with a 10 percent loss in aquifer.*
Water Supply Source	Other/Multiple Sources	OTHR	*District's water rights and contract entitlements.*
Total Cost ($)	$ 300,000	N/A	*Assumed:* *- Contractual cost: $100k* *- Minor infrastructure: $200k* *- Roseville fee for capital recovery (assumed): $30/AF* *Costs were based on the assumption that this would occur only during non-peak season, thus extensive infrastructure improvements would not be needed.*
Overall Cost-effectiveness ($/AF) (Total Cost / Yield)	$ 191	N/A	*Annualized, 3.5% discount rate over 30 year project life. Assumed operations and maintenance costs of $150/AF to produce groundwater and inject groundwater.*
Contribution to Objectives			
Improve Dry Year Reliability	Moderate Potential	💧💧	*Assuming Roseville has capacity to bank the District's surface water, this would provide opportunity to receive a small volume of stored water in dry years.*
Perfect Beneficial Use of Existing Supplies	High Potential	💧💧💧	*Would maximize use of contract water by using extra surface water for groundwater injection.*
Provide Financial Benefit	Moderate upfront costs and/or limited ability to perform new water transfers	💧💧	*Would have some improved ability for District to make transfers*
Extreme Drought Conditions	High Potential to Improve Conditions During an Extreme Drought	💧💧💧	*Would include building infrastructure to receive groundwater when supplies at Folsom Lake are limited.*
Implementation Complexity			
Environmental Compliance Requirements	Complex: EIR	💧	
Permitting Requirements	Complex: Multiple Federal, State and Local Permits	💧	
Water Rights / Contracts	Moderate: Change to Point of Diversion/Delivery, and/or Place of Use	💧💧	*Depending on which water source the District would use, a change in POU, modification of Exhibit A, or other action could be needed..*
Institutional & Coordination	High: Partnerships Needed, Likely New Agreement	💧	*Would need new agreement with Roseville.*
Land Acquisition	High: No Willing Seller Identified	💧	*Infrastructure requirements and location unknown.*

Public Acceptance & Support	Moderate: Some Public Acceptance and Moderate Support	💧💧	*Public is already aware of ASR system.*
Schedule	1-2 years to implement	💧💧	*Roseville assumed to be a willing partner.*
Uncertainty			
Costs	Low: No Planning Documents, Best Engineering Judgment Applied	💧	
Yield & Reliability	Moderate: Confirmed Yield, Moderate Reliability, and/or Agreement is Long-Term	💧💧	*Roseville willingness to take District water has not been confirmed. With future build out, there would be an additional 5 wells with an additional capacity of about 6,500 AF/year.*

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Relative Ranking

References:

SAN JUAN WATER DISTRICT WATER SUPPLY & RELIABILITY STUDY

Project Evaluation Summary

ID: **O16**

Project Name: **Retrofit Existing Wells Within SJWD Wholesale Area for Injection/Extraction Use** Type: **GW**

Project Description: Option would retrofit existing wells for injection in the District's Wholesale Area. The District's water rights and contract entitlements would be use for injection during wet years. In dry years, the District would extract the banked water using existing extraction wells.

-Wet year storage: Would maximize use of contract water by injecting currently unused surface water into the groundwater basin.

-Dry year augmentation: Would be able to use stored groundwater to supplement dry year supplies.

Related Options: None

METRICS	ASSESSMENT/ VALUE	SCORE	NOTES
Cost-Effectiveness			
Yield - Long-term Average (TAF/year)	12.7	N/A	*Total groundwater extraction capacity in Wholesale area of 29,000 gpm (23.4 TAF/year). Assumed 50 percent of all wells could be retrofitted for injection and 6 months of injection during Water Forum wet/average years, the capacity would be 5.8 TAF/year. Recharge frequency would be during Water Forum wet/average years (which constitute 80 percent of the years from 1921 through 2015 (November-March unimpaired flows to Folsom Lake exceeding 950,000 AF)) and with a 10 percent loss in aquifer.*
Water Supply Source	Other/Multiple Sources	OTHR	*District's water rights and contract entitlements.*
Total Cost ($)	$ 1,000,000	N/A	*21 wells in Wholesale Area. Retrofit of 50 percent or 10 wells at average cost of $100,000 each. RWQCB permitting or O&M costs not included.*
Overall Cost-effectiveness ($/AF) (Total Cost / Yield)	$ 154	N/A	*Annualized, 3.5% discount rate over 30 year project life. Assumed operations and maintenance costs of $150/AF to produce groundwater and inject groundwater.*
Contribution to Objectives			
Improve Dry Year Reliability	Moderate Potential	💧💧	*Would not improve WCAs ability to pump groundwater, as it is already existing. Could result in contract allocations from increased use during wet years.*
Perfect Beneficial Use of Existing Supplies	High Potential	💧💧💧	*Would increase surface water use during wet years.*
Provide Financial Benefit	High upfront costs and/or unlikely to include new water transfers	💧	*No new transfers unless paired with another option. Low upfront costs as infrastructure is already in place with only some minor improvements needed.*
Extreme Drought Conditions	Moderate Potential to Improve Conditions During an Extreme Drought	💧💧	*Would improve groundwater conditions by allowing basin to recharge during wet years.*
Implementation Complexity			
Environmental Compliance Requirements	Moderate: IS/ND/MND	💧💧	
Permitting Requirements	Moderate: Some State and/or Local Permits	💧💧	*Would require application for General Order for ASR in addition to general permits for construction and management.*
Water Rights / Contracts	Low: No Change	💧💧💧	
Institutional & Coordination	High: Partnerships Needed, Likely New Agreement	💧	*Would require agreements with WCAs.*
Land Acquisition	Low: Existing ROW / Not Applicable	💧💧💧	*No new land anticipated.*
Public Acceptance & Support	High: Public Acceptance and Wide Support	💧💧💧	
Schedule	Greater than 3 years to implement	💧	*Would likely take several years as there would be 20 wells to investigate and retrofit. Some wells would be on-line earlier than others.*

Uncertainty			
Costs	Low: No Planning Documents, Best Engineering Judgment Applied		
Yield & Reliability	Low: Unconfirmed Yield, Low Reliability, and/or Agreement is Short-Term		*Unknown if all wells are constructed to allow use as ASR wells.*

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Relative Ranking

References:

SAN JUAN WATER DISTRICT WATER SUPPLY & RELIABILITY STUDY

Project Evaluation Summary

ID: **O17**

Project Name: **Use of a Spreading Basin Within SJWD Retail or Wholesale Area for Groundwater Recharge** Type: **GW**

Project Description: Option would use existing defined recharge areas (e.g., golf courses, conservation areas, parks) to develop spreading basins to capture wet year flows. In dry years, the District would extract groundwater using existing wells.

-Wet year storage: Would maximize use of contract water by using surface water for groundwater injection during wet years.

-Dry year augmentation: Would be able to use stored groundwater to supplement dry year supplies.

Related Options: None

METRICS	ASSESSMENT/ VALUE	SCORE	NOTES
Cost-Effectiveness			
Yield - Long-term Average (TAF/year)	1.1	N/A	*Potential Miners Ravine, Baldwin Creek. Assumed: - 600'x600' surface recharge basin - Infiltration rate of 1 foot/day - Would be used 6 month/year during Water Forum wet/average years - Recharge frequency would be during Water Forum wet/average years (which constitute 80 percent of the years from 1921 through 2015 (November-March unimpaired flows to Folsom Lake exceeding 950,000 AF)) and with a 10 percent loss in aquifer.*
Water Supply Source	Other/Multiple Sources	OTHR	*District's water rights and contract entitlements.*
Total Cost ($)	$ 300,000	N/A	*Assumed existing conservation district or land owner favorable, minor grading improvements or pipeline needed, no land purchase.*
Overall Cost-effectiveness ($/AF) (Total Cost / Yield)	$ 115	N/A	*Annualized, 3.5% discount rate over 30-year project life. Assumed O&M and cost of water of $100/AF.*
Contribution to Objectives			
Improve Dry Year Reliability	Moderate Potential	💧💧	*Would allow a small volume of stored groundwater to supplement dry year supplies.*
Perfect Beneficial Use of Existing Supplies	Moderate Potential	💧💧	*Would help maximize use of surface water supplies by using them for groundwater injection during wet years.*
Provide Financial Benefit	High upfront costs and/or unlikely to include new water transfers	💧	*No new transfers. Could avoid or reduce potential need to purchase additional water in dry years.*
Extreme Drought Conditions	Moderate Potential to Improve Conditions During an Extreme Drought	💧💧	*Would allow a small volume of stored groundwater to be extracted to supplement Folsom Lake supplies.*
Implementation Complexity			
Environmental Compliance Requirements	Moderate: IS/ND/MND	💧💧	
Permitting Requirements	Moderate: Some State and/or Local Permits	💧💧	
Water Rights / Contracts	Low: No Change	💧💧💧	
Institutional & Coordination	High: Partnerships Needed, Likely New Agreement	💧	
Land Acquisition	High: No Willing Seller Identified	💧	*No location identified yet.*
Public Acceptance & Support	Moderate: Some Public Acceptance and Moderate Support	💧💧	*Would improve habitat by providing additional water surface.*
Schedule	Greater than 3 years to implement	💧	*Long timeframe, as land has not yet been identified.*
Uncertainty			
Costs	Low: No Planning Documents, Best Engineering Judgment Applied	💧	*No specific site(s) have been identified.*
Yield & Reliability	Low: Unconfirmed Yield, Low Reliability, and/or Agreement is Short-Term	💧	

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Relative Ranking

References:

SAN JUAN WATER DISTRICT WATER SUPPLY & RELIABILITY STUDY

Project Evaluation Summary

ID: **O18**

Project Name: **Purchase Orange Vale Water Company's Water Supply Wells** Type: **GW**

Project Description: Option would include purchase of existing OVWC groundwater wells by SJWD. Wells would be retrofitted to allow both injection and extraction.

-Wet year storage: Would maximize use of contract water by utilizing currently unused surface water for groundwater injection.

-Dry year augmentation: Would be able to use stored groundwater to supplement dry year supplies.

Related Options: None

METRICS	ASSESSMENT/ VALUE	SCORE	NOTES
Cost-Effectiveness			
Yield - Long-term Average (TAF/year)	0.1	N/A	*For groundwater extraction, assumed 2 wells with total extraction at 1,000 gpm, pumping 1/2 day, 360 days (5 maintenance days). For groundwater injection, assumed 24 hours at 360 days (5 maintenance days) with a total injection of 500 gpm. Recharge frequency would be 0.2 occurrence and with a 10% loss in aquifer.*
Water Supply Source	Other/Multiple Sources	OTHR	*District's water rights and contract entitlements.*
Total Cost ($)	$ 1,000,000	N/A	*Assumed OVWC has two existing supply wells that it would sell to SJWD to own and operate. One well has perchlorate detections above MCL. One produces sand.*
Overall Cost-effectiveness ($/AF) (Total Cost / Yield)	$ 478	N/A	*Annualized, 3.5% discount rate over 30-year project life. Assumed O&M of $100/AF to produce groundwater.*
Contribution to Objectives			
Improve Dry Year Reliability	Moderate Potential	💧💧	*Would allow a small volume of stored groundwater to supplement dry year supplies.*
Perfect Beneficial Use of Existing Supplies	Moderate Potential	💧💧	*Would help maximize use of contract water by utilizing currently unused surface water for groundwater injection.*
Provide Financial Benefit	High upfront costs and/or unlikely to include new water transfers	💧	*No new transfers.*
Extreme Drought Conditions	Moderate Potential to Improve Conditions During an Extreme Drought	💧💧	*Would allow a small volume of stored groundwater to be extracted to supplement Folsom Lake supplies.*
Implementation Complexity			
Environmental Compliance Requirements	Moderate: IS/ND/MND	💧💧	
Permitting Requirements	Moderate: Some State and/or Local Permits	💧💧	*Use of contaminated wells may have more complex permitting requirements.*
Water Rights / Contracts	Low: No Change	💧💧💧	
Institutional & Coordination	High: Partnerships Needed, Likely New Agreement	💧	*Would need to enter into an agreement with OVWC for purchase of wells.*
Land Acquisition	Moderate: Willing Seller Identified	💧💧	*Land would need to be purchased from private land owner at one site.*
Public Acceptance & Support	Low: Low Public Acceptance and Support	💧	*Unknown at this time due to contamination issues.*
Schedule	1-2 years to implement	💧💧	
Uncertainty			
Costs	Low: No Planning Documents, Best Engineering Judgment Applied	💧	*Unknown rehabilitation feasibility and costs.*
Yield & Reliability	Moderate: Confirmed Yield, Moderate Reliability, and/or Agreement is Long-Term	💧💧	*Number of wells and capacity assumed. Land not owned by District at one well.*

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Relative Ranking

References:

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SAN JUAN WATER DISTRICT WATER SUPPLY & RELIABILITY STUDY

Project Evaluation Summary

ID: **O19**

Project Name: **Allocate CVP Water to Another Agency** Type: **NS**

Project Description: Option would include delivering a portion of the District's CVP water to another agency in wetter years. Potential agencies include SSWD, RLECWD, and other groundwater users in the North American River Basin. As a condition of this option, the potential agency(ies) would become a new WCA, at a minimum. This analysis looked specifically at SSWD, because other agencies would require additional infrastructure. As SSWD is not a CVP user, this option would require an update to the District's Exhibit A Service Map to include SSWD as a WCA which would allow them use of CVP supplies, likely without a contract modification.

-Wet year storage: Would maximize use of contract water by allocation surface water to SSWD in wet years.

-Dry year augmentation: The District would have a higher allocation of and access to supplies due to higher usage in wet/average years.

Related Options: None

METRICS	ASSESSMENT/ VALUE	SCORE	NOTES
Cost-Effectiveness			
Yield - Long-term Average (TAF/year)	10.2	N/A	*Based on 2030 demands, the District has 12,690 AF/year of currently unused CVP supplies during Water Forum wet/average years, which constitute 80 percent of the years from 1921 through 2015 (November-March unimpaired flows to Folsom Lake exceeding 950,000 AF).*
Water Supply Source	CVP Entitlement	CVP	
Total Cost ($)	$ 1,000,000	N/A	*Assumed:* *-Cost to modify Exhibit A, form new agreements, and legal and other administration fees: $1 Million* *-Capital and O&M: $0*
Overall Cost-effectiveness ($/AF) (Total Cost / Yield)	$ 40	N/A	*Annualized, 3.5% discount rate over 30-year project life. Additional CVP annual cost of $35/AF (SJWD and SSWD 2014).*
Contribution to Objectives			
Improve Dry Year Reliability	High Potential	💧💧💧	*Would have a higher allocation of and access to supplies due to higher usage in wet/average years.*
Perfect Beneficial Use of Existing Supplies	High Potential	💧💧💧	*Would maximize use of contract water by allocating currently unused surface water to SSWD.*
Provide Financial Benefit	Low upfront costs and/or able to implement new water transfers	💧💧💧	*Would implement a new water transfer with SSWD.*
Extreme Drought Conditions	Moderate Potential to Improve Conditions During an Extreme Drought	💧💧	*Would not provide an alternate way to receive water unless SJWD entered into an agreement with SSWD to receive groundwater when needed.*
Implementation Complexity			
Environmental Compliance Requirements	Moderate: IS/ND/MND	💧💧	*Would likely not need an EIS/EIR to modify Exhibit A map, but according to the Phase 1 Merger Report, NEPA and ESA may be required.*
Permitting Requirements	Low: No Permits	💧💧💧	*Likely no requirements from SWRCB.*
Water Rights / Contracts	Moderate: Change to Point of Diversion/Delivery, and/or Place of Use	💧💧	*Would require modifying Exhibit A map to include SSWD. CVP contract would remain within control of District.*
Institutional & Coordination	High: Partnerships Needed, Likely New Agreement	💧	*New inter-agency agreement with SSWD would be needed, as the existing contract between SJWD and Reclamation would need to expand their place of use to include SSWD's service area boundary (i.e., modify Exhibit A map). To be included into Exhibit A map, SSWD would need to sign as a part of the District's wholesale agencies.*
Land Acquisition	Low: Existing ROW / Not Applicable	💧💧💧	*N/A*
Public Acceptance & Support	Moderate: Some Public Acceptance and Moderate Support	💧💧	*Would not increase rates for existing WCAs. Contract would remain within control of District.*

Schedule	Less than 1 year to implement	💧💧💧	*Should take less than a year to implement, as the main tasks would be the agreement with SSWD and an administrative action by Reclamation to modify Exhibit A. SSWD is already within the place of use of Reclamation's water right, and once a part of the District's member agencies, the justification for modifying Exhibit A could be readily accepted by Reclamation.*
Uncertainty			
Costs	Low: No Planning Documents, Best Engineering Judgment Applied	💧	*General estimate for all nonstructural projects.*
Yield & Reliability	High: Confirmed Yield, High Reliability, and/or Agreement is Long-Term	💧💧💧	*Based on 2030 demands provided in the Urban Water Management Plan (2010).*

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Relative Ranking

References:

2010 Urban Water Management Plan for SJWD, CHWD, OVWD, City of Folsom, and FOWD.
2014. SJWD and SSWD. San Juan Water District & Sacramento Suburban Water District Phase I Evaluation of Water Management Alternatives. May

SAN JUAN WATER DISTRICT WATER SUPPLY & RELIABILITY STUDY

Project Evaluation Summary

ID: **O20**

Project Name: **Allocate Middle Fork Project Water to Another Agency Within its Place of Use in Sacramento County** Type: **NS**

Project Description: Option would include delivering a portion of the District's Middle Fork Project (MFP) water to another agency within the existing place of use in Sacramento County in wetter years. Currently, MFP water can be used in portions of Sacramento County including SJWD, SSWD, and RLECWD service areas, so no modifications in POU would be needed. This analysis looked specifically at SSWD, because other agencies would require additional infrastructure.

-Wet year storage: Would maximize use of contract water by allocating currently unused surface water to another agency.

-Dry year augmentation: None.

Related Options: None

METRICS	ASSESSMENT/ VALUE	SCORE	NOTES
Cost-Effectiveness			
Yield - Long-term Average (TAF/year)	6.9	N/A	*Based on 2030 demands, the District has a 8,687 AF/year of MFP water currently unused during Water Forum wet/average years, which constitute 80 percent of the years from 1921 through 2015 (November-March unimpaired flows to Folsom Lake exceeding 950,000 AF).*
Water Supply Source	PCWA Middle Fork Project Entitlement	MFP	
Total Cost ($)	$ 1,000,000	N/A	*Assumed:* *-Cost to form new agreements, and legal and other administration fees: $1 Million* *-Capital and O&M: $0*
Overall Cost-effectiveness ($/AF) (Total Cost / Yield)	$ 43	N/A	*Annualized, 3.5% discount rate over 30-year project life. Additional CVP annual cost of $35/AF (SJWD and SSWD 2014) to use CVP to replace the water supply currently being provided to the WCAs.*
Contribution to Objectives			
Improve Dry Year Reliability	Low Potential	1	*Would not increase supply.*
Perfect Beneficial Use of Existing Supplies	High Potential	3	*Would be able to maximize use of contract supplies through sales to others outside of District.*
Provide Financial Benefit	Low upfront costs and/or able to implement new water transfers	3	*Would implement a new transfer. Would maximize use of contract supplies through sales to others outside of District. Would redirect the District's MFP "take or pay" basis fees to another agency.*
Extreme Drought Conditions	Limited Potential to Improve Conditions During an Extreme Drought	1	*Would not provide an additional water source.*
Implementation Complexity			
Environmental Compliance Requirements	Low: Categorical Exemption	3	*Potential allocations are already within MFP POU.*
Permitting Requirements	Low: No Permits	3	*Potential allocations are already within MFP POU.*
Water Rights / Contracts	Low: No Change	3	*Would use existing MFP contract. Contract would remain within control of District.*
Institutional & Coordination	High: Partnerships Needed, Likely New Agreement	1	*New/modified agreement or concurrence would be needed with PCWA for use of its MFP water, as well as with the buyer(s).*
Land Acquisition	Low: Existing ROW / Not Applicable	3	*N/A*
Public Acceptance & Support	Moderate: Some Public Acceptance and Moderate Support	2	*Would not increase rates for existing WCAs. Contract would remain within control of District.*
Schedule	Less than 1 year to implement	3	*Short timeframe to implement option, as no structural improvements should be needed.*
Uncertainty			
Costs	Low: No Planning Documents, Best Engineering Judgment Applied	1	*General estimate for all nonstructural projects.*
Yield & Reliability	High: Confirmed Yield, High Reliability, and/or Agreement is Long-Term	3	*Based on 2030 demands provided in the Urban Water Management Plan (2010).*

Key: AF = acre-feet, CVP = Central Valley Project, EIR = Environmental Impact Report, IS = Initial Study, MND = Mitigated Negative Declaration, N/A = not applicable, ND = Negative Declaration, PCWA = Placer County Water Agency, ROW = Right-of-Way, TAF = thousand acre-feet

Relative Ranking

References:

2010 Urban Water Management Plan for SJWD, CHWD, OVWD, City of Folsom, and FOWD.
2014. SJWD and SSWD. San Juan Water District & Sacramento Suburban Water District Phase I Evaluation of Water Management Alternatives. May

SAN JUAN WATER DISTRICT WATER SUPPLY & RELIABILITY STUDY

Project Evaluation Summary

ID: **O21**

Project Name: **Allocate Water Rights to Another Agency and Offset Incremental Costs to Ratepayers** Type: **NS**

Project Description: Option would include the District maximizing its CVP and MFP water, and allocating its water right to another agency in wetter years. Potential agencies include SSWD, RLECWD, Cal Am, and other groundwater users in the North American River Basin. As a condition of this option, the potential agency(ies) would become a new WCA, at a minimum. This analysis looked specifically at SSWD, because other agencies would require additional infrastructure. As the water right does not have a specified POU, only environmental documentation would be needed to justify the transfer. To avoid impacting fees to the District's ratepayers, the potential agency(ies) would pay the cost differential for the District to use its CVP and MFP water versus its water right.

-Wet year storage: Would maximize use of contract water by transferring currently unused surface water to SSWD.

-Dry year augmentation: The District would have a higher allocation of and access to supplies due to higher usage in wet/average years.

Related Options: None

METRICS	ASSESSMENT/ VALUE	SCORE	NOTES
Cost-Effectiveness			
Yield - Long-term Average (TAF/year)	17.1	N/A	*Based on 2030 demands, the District has 21,377 AF/year of currently unused surface water rights/contract entitlements during Water Forum wet/average years, which constitute 80 percent of the years from 1921 through 2015 (November-March unimpaired flows to Folsom Lake exceeding 950,000 AF).* *Assumed that SJWD would use all of its CVP and MFP contracts (24,200 and 25,000 AF/year, respectively) first to meet District demands, thus only using a portion of its water rights.*
Water Supply Source	Pre-1914 and Senior Appropriative Water Right	APPR	
Total Cost ($)	$ 1,000,000	N/A	*Assumed:* *-Cost to form new agreements, and legal and other administration fees: $1 Million* *-Capital and O&M: $0*
Overall Cost-effectiveness ($/AF) (Total Cost / Yield)	$ 38	N/A	*Annualized, 3.5% discount rate over 30-year project life. Additional CVP annual cost of $35/AF (SJWD and SSWD 2014) to use CVP water to replace the water supply currently going to the WCAs.*
Contribution to Objectives			
Improve Dry Year Reliability	Moderate Potential	💧💧	*Would have a higher allocation of and access to CVP supplies due to higher usage in wet/average years.*
Perfect Beneficial Use of Existing Supplies	High Potential	💧💧💧	*Would maximize use of contract water by allocating a portion of the District's surface water to SSWD.*
Provide Financial Benefit	Low upfront costs and/or able to implement new water transfers	💧💧💧	*Would implement a new water transfer with SSWD.*
Extreme Drought Conditions	Limited Potential to Improve Conditions During an Extreme Drought	💧	*Would not provide an alternate way to receive water unless SJWD entered into an agreement with SSWD to receive groundwater when needed.*
Implementation Complexity			
Environmental Compliance Requirements	Moderate: IS/ND/MND	💧💧	*Environmental documentation would likely be needed to allocate the District's water right to another agency in wetter years.*
Permitting Requirements	Low: No Permits	💧💧💧	*No complex permitting anticipated. SWRCB approval not anticipated because the water right does not have a POU, but would need proper justification for the transfer.*
Water Rights / Contracts	Low: No Change	💧💧💧	*District's water right could be allocated to another agency without changing its POU. Water right would remain within control of District.*
Institutional & Coordination	High: Partnerships Needed, Likely New Agreement	💧	*New agreement needed with SSWD.*
Land Acquisition	Low: Existing ROW / Not Applicable	💧💧💧	*N/A*

Public Acceptance & Support	Moderate: Some Public Acceptance and Moderate Support		*Transfer would not increase rates for existing WCAs. Water right would remain within control of District.*
Schedule	Less than 1 year to implement		*Short timeframe as the main task would be entering into an agreement with SSWD.*
Uncertainty			
Costs	Low: No Planning Documents, Best Engineering Judgment Applied		*General estimate for all nonstructural projects.*
Yield & Reliability	High: Confirmed Yield, High Reliability, and/or Agreement is Long-Term		*Based on 2030 demands provided in the Urban Water Management Plan (2010).*

Key: AF = acre-feet, CVP = Central Valley Project, EIR = Environmental Impact Report, IS = Initial Study, MND = Mitigated Negative Declaration, N/A = not applicable, ND = Negative Declaration, PCWA = Placer County Water Agency, ROW = Right-of-Way, TAF = thousand acre-feet

Relative Ranking

References:

2010 Urban Water Management Plan for SJWD, CHWD, OVWD, City of Folsom, and FOWD.
SJWD. Adopted Budget. Fiscal Year 2015-2016.

SAN JUAN WATER DISTRICT WATER SUPPLY & RELIABILITY STUDY

Project Evaluation Summary

ID: **O22**

Project Name: **Integrate Groundwater and Surface Water Uses in Placer County** Type: **SW**

OPTION NOT CARRIED FORWARD

Project Description: Option would provide the District with access to surface water above Folsom Lake. In wet years, the District would provide a portion of its MFP supplies to Western Placer County as this would require fewer infrastructure modifications compared to what PCWA would need to directly deliver water to this same area. In return, PCWA would provide additional water to the District in dry years.

Note: There are limited opportunities for this option. If PCWA should want/need additional water, it would be more likely that PCWA would take water back from SSWD, SJWD, Nevada Irrigation District, etc., instead of implementing this option.

Related Options: None

METRICS	ASSESSMENT/ VALUE	SCORE	NOTES
Cost-Effectiveness			
Yield - Long-term Average (TAF/year)		N/A	*Not calculated as option not carried forward.*
Water Supply Source	PCWA Middle Fork Project Entitlement	MFP	
Total Cost ($)		N/A	*Not calculated as option not carried forward.*
Overall Cost-effectiveness ($/AF) (Total Cost / Yield)		N/A	*Not calculated as option not carried forward.*
Contribution to Objectives			
Improve Dry Year Reliability	Moderate Potential	💧💧	*Would have access to PCWA's water supply in dry years.*
Perfect Beneficial Use of Existing Supplies	Low Potential	💧	*Would require contract entitlement transfer. District would no longer own the supply.*
Provide Financial Benefit	High upfront costs and/or unlikely to include new water transfers	💧	*Supplies would not be sold; instead entitlement would be transferred to PCWA.*
Extreme Drought Conditions	Moderate Potential to Improve Conditions During an Extreme Drought	💧💧	*Would provide a method for the District to receive water from above Folsom Lake.*
Implementation Complexity			
Environmental Compliance Requirements	Moderate: IS/ND/MND	💧💧	*Moderate environmental compliance for groundwater/surface water agreements.*
Permitting Requirements	Moderate: Some State and/or Local Permits	💧💧	*Likely State permit(s) required for groundwater/surface water agreements.*
Water Rights / Contracts	High: New Water Right	💧	*Would require contract entitlement transfer. District would no longer own the supply.*
Institutional & Coordination	High: Partnerships Needed, Likely New Agreement	💧	*New agreement with PCWA would be needed.*
Land Acquisition	High: No Willing Seller Identified	💧	*N/A*
Public Acceptance & Support	Low: Low Public Acceptance and Support	💧	*Degree of public acceptance currently unknown.*
Schedule	Greater than 3 years to implement	💧	*Unlikely to get agreement on this option in near-term.*
Uncertainty			
Costs	Low: No Planning Documents, Best Engineering Judgment Applied	💧	*Not calculated as option not carried forward*
Yield & Reliability	Low: Unconfirmed Yield, Low Reliability, and/or Agreement is Short-Term	💧	*Not calculated as option not carried forward*

Key: AF = acre-feet, CVP = Central Valley Project, EIR = Environmental Impact Report, IS = Initial Study, MND = Mitigated Negative Declaration, N/A = not applicable, ND = Negative Declaration, PCWA = Placer County Water Agency, ROW = Right-of-Way, TAF = thousand acre-feet

Relative Ranking

References:

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SAN JUAN WATER DISTRICT WATER SUPPLY & RELIABILITY STUDY

Project Evaluation Summary

ID: **O23**

Project Name: **Coordinate Between SJWD and PCWA Water Treatment Plants to Optimize Operational Flexibility** Type: **SW**

Project Description:

This option would optimize the use of both the Foothill and Peterson Water Treatment Plants (WTP) and provide operational flexibility. During wet years, Peterson WTP capacity would be maximized and would serve part of PCWA's service area. This would require water to be pumped uphill and infrastructure improvements to convey water to PCWA. In return, during dry years, the District would reduce its use of Peterson WTP and instead divert some of its MFP supply above Folsom Lake to be treated at Foothill WTP. This water would be convyed south to SJWD's service area in Placer County (specifically Granite Bay). Infrastructure improvements would be needed to Foothill WTP to increase capacity, in addition to improving existing/constructing new interties.

-Wet year storage: Would maximize use of District's water supplies by using Peterson WTP to treat water for delivery to PCWA.

-Dry year augmentation: The District would have a higher allocation of and access to supplies due to higher usage in wet/average years. District would also have access to PCWA's MFP water supplies.

Related Options: None

METRICS	ASSESSMENT/ VALUE	SCORE	NOTES
Cost-Effectiveness			
Yield - Long-term Average (TAF/year)	12.3	N/A	*Assumed upper end to be equal to the average demand of SJWD Retail Area in Placer County (12,313 AF/year). Yield would need to be refined based on Foothill WTP capacity.*
Water Supply Source	PCWA Middle Fork Project Entitlement	MFP	
Total Cost ($)	$ 15,000,000	N/A	*Included increasing Foothill WTP capacity and improving/constructing infrastructure to move water from District to PCWA.*
Overall Cost-effectiveness ($/AF) (Total Cost / Yield)	$ 67	N/A	*Annualized, 3.5% discount rate over 30-year project life. Would likely require an additional $/AF charge to pump water from District to PCWA.*
Contribution to Objectives			
Improve Dry Year Reliability	Moderate Potential	💧💧	
Perfect Beneficial Use of Existing Supplies	Moderate Potential	💧💧	*Would increase use of MFP contract entitlement.*
Provide Financial Benefit	High upfront costs and/or unlikely to include new water transfers	💧	*Would only improve operational flexibility.*
Extreme Drought Conditions	High Potential to Improve Conditions During an Extreme Drought	💧💧💧	*Would provide access to supplies above Folsom Lake.*
Implementation Complexity			
Environmental Compliance Requirements	Moderate: IS/ND/MND	💧💧	*Unknown pending potential infrastructure improvement needs.*
Permitting Requirements	Moderate: Some State and/or Local Permits	💧💧	*Unknown pending potential infrastructure improvement needs.*
Water Rights / Contracts	Low: No Change	💧💧💧	
Institutional & Coordination	High: Partnerships Needed, Likely New Agreement	💧	*Would require agreement with PCWA for coordinated use of WTPs and conveyance facilities.*
Land Acquisition	Moderate: Willing Seller Identified	💧💧	*Unknown if ROW would be required.*
Public Acceptance & Support	High: Public Acceptance and Wide Support	💧💧💧	
Schedule	1-2 years to implement	💧💧	
Uncertainty			
Costs	Low: No Planning Documents, Best Engineering Judgment Applied	💧	
Yield & Reliability	Low: Unconfirmed Yield, Low Reliability, and/or Agreement is Short-Term	💧	*Need to determine ability to move water, detailed operational agreements, operations of WTPs.*

Key: AF = acre-feet, CVP = Central Valley Project, EIR = Environmental Impact Report, IS = Initial Study, MND = Mitigated Negative Declaration, N/A = not applicable, ND = Negative Declaration, PCWA = Placer County Water Agency, ROW = Right-of-Way, TAF = thousand acre-feet

Relative Ranking

References:

SAN JUAN WATER DISTRICT WATER SUPPLY & RELIABILITY STUDY

Project Evaluation Summary

ID: **O24**

Project Name: **Merger with Another Agency** Type: **NS**

Project Description: Option would include a consensus-based merger of the District with another agency. A merger would provide access to other supplies, perfect beneficial use, and provide opportunities for a conjunctive use program. A merger would provide the District with a reliable and long-term arrangement, in addition to control in operations. Potential candidates for consideration because of their proximity to the District, previous coordination/transfers with the District, existence of existing infrastructure, etc. would be as follows:
1) RLECWD: Would require buy-in to the Cooperative Transmission Pipeline and building of some new infrastructure to receive District supplies.
2) SSWD: Would allow the District to have a larger area to maximize use of its supplies and have access to groundwater. In return, SSWD would have access to District contract supplies.
3) CWD: Similar to SSWD above.
4) Others, to be determined.

-Wet year storage: Would maximize use of contract water by utilizing currently unused extra surface water in its expanded area.

-Dry year augmentation: The District would have a higher allocation of and access to supplies due to higher usage in wet/average years. Also, the District would have access to groundwater supplies as an additional source of water.

Related Options: None

METRICS	ASSESSMENT/ VALUE	SCORE	NOTES
Cost-Effectiveness			
Yield - Long-term Average (TAF/year)	17.1	N/A	*Based on 2030 demands, the District has 21,377 AF/year of currently unused surface water rights/contract entitlements during Water Forum wet/average years, which constitute 80 percent of the years from 1921 through 2015 (November-March unimpaired flows to Folsom Lake exceeding 950,000 AF). Assumed the merger agenci(es) would use all available surplus supplies.*
Water Supply Source	Other/Multiple Sources	OTHR	*All sources.*
Total Cost ($)	$ 2,000,000	N/A	*Assumed legal, administration, and miscellaneous fees of $2 Million.*
Overall Cost-effectiveness ($/AF) (Total Cost / Yield)	$ 106	N/A	*Annualized, 3.5% discount rate over 30-year project life. Additional CVP annual cost of $35/AF (SJWD and SSWD 2014) to use CVP water to replace the supply currently being provided to the WCAs. Also assumed capital and O&M of $100/AF, as well as likely additional $/AF charges for Cooperative Transmission Pipeline use and treatment costs.*
Contribution to Objectives			
Improve Dry Year Reliability	Moderate Potential	💧💧	*Would have a higher allocation of and access to CVP supplies due to higher demand and increased CVP use in wet/average years. May also have access to other supplies based on the merger agency.*
Perfect Beneficial Use of Existing Supplies	High Potential	💧💧💧	*Would maximize use of contract water by utilizing currently unused surplus surface water in merger.*
Provide Financial Benefit	Low upfront costs and/or able to implement new water transfers	💧💧💧	*Would increase water demands and number of ratepayers.*
Extreme Drought Conditions	Moderate Potential to Improve Conditions During an Extreme Drought	💧💧	*Could provide an alternate way to receive water pending the District's new water portfolio (e.g., access to groundwater).*
Implementation Complexity			
Environmental Compliance Requirements	Complex: EIR	💧	*NEPA and ESA may be required (SJWD and SSWD 2014).*
Permitting Requirements	Complex: Multiple Federal, State and Local Permits	💧	*Interaction with SWRCB may be needed.*
Water Rights / Contracts	Moderate: Change to Point of Diversion/Delivery, and/or Place of Use	💧💧	*Depending on the agency involved in the merger with the District, a change in POU may or may not be needed.*
Institutional & Coordination	High: Partnerships Needed, Likely New Agreement	💧	*Would require consolidation of the administrative organizations.*
Land Acquisition	High: No Willing Seller Identified	💧	*N/A*

Public Acceptance & Support	Moderate: Some Public Acceptance and Moderate Support		*Public acceptance unknown, but likely would be supported as this option would provide a financial benefit to ratepayers.*
Schedule	1-2 years to implement		*Detailed evaluation and agreements would be needed. Assumed no structural changes would be needed.*
Uncertainty			
Costs	Low: No Planning Documents, Best Engineering Judgment Applied		*General estimate for all nonstructural projects.*
Yield & Reliability	High: Confirmed Yield, High Reliability, and/or Agreement is Long-Term		*Based on 2030 demands provided in the Urban Water Management Plan (2010).* *Amount would depend on merger agency.*

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Relative Ranking

References:

2010 Urban Water Management Plan for SJWD, CHWD, OVWD, City of Folsom, and FOWD.
2014. SJWD and SSWD. San Juan Water District & Sacramento Suburban Water District Phase I Evaluation of Water Management Alternatives. May

SAN JUAN WATER DISTRICT WATER SUPPLY & RELIABILITY STUDY

Project Evaluation Summary

ID: **O25**

Project Name: **Establish Nonpotable Reuse in SJWD Service Area** Type: **RW**

Project Description:

Option would establish nonpotable reuse in the SJWD Service Area. Reclaimed water could be used for flushing toilets, watering parks or residential lawns, supplying fire hydrants, washing cars and streets, filling decorative fountains, or many other purposes. Methods to accomplish this could be as follows:
(1) Build a pipeline from City of Roseville's wastewater treatment plant to SJWD Service Area and utilizing existing tertiary treatment facilities *(note, this method was selected for this high-level evaluation as it was anticipated to have the lowest total cost).*
(2) Build a pipeline from Sacramento Regional County Sanitation District's wastewater treatment plant to the SJWD's Service Area.
(3) Build a scalping plant within SJWD's Service Area to treat liquid raw wastewater.
(4) Build a pipeline from EID's wastewater treatment plant to the SJWD's Service Area.

-Wet year storage: None.

-Dry year augmentation: Would use recycled water to meet certain nonpotable water demands, leaving more water right and contract entitlement water available for District use.

Related Options: None

METRICS	ASSESSMENT/ VALUE	SCORE	NOTES
Cost-Effectiveness			
Yield - Long-term Average (TAF/year)	2.8	N/A	*Assumed average supply of 2.5 MGD based on similar facilities.*
Water Supply Source	Other/Multiple Sources	OTHR	*recycled water*
Total Cost ($)	$ 51,000,000	N/A	*Assumed:* *- 64,000 feet of 24" transmission pipe : $21.5 Million* *- 50,000 feet of 6" distribution pipe: $4.6 Million* *- 375 HP pump station: $2 Million* *- Valves and turnouts: $1 Million* *- Plus 30% contingency, 30% engineering, CM & Admin, 3% environmental documentation, 2% legal* *-No additional recycled water storage required*
Overall Cost-effectiveness ($/AF) (Total Cost / Yield)	$ 1,989	N/A	*Annualized, 3.5% discount rate over 30-year project life and a recycled water wholesale cost of $1,000/AF.*
Contribution to Objectives			
Improve Dry Year Reliability	Moderate Potential	💧💧	*Would use recycled water to meet certain nonpotable water demands, leaving more water right and contract entitlement water available for District use. Volume of recycled water available would be subject to potential reductions in dry years (due to reduced production related to water conservation activities).*
Perfect Beneficial Use of Existing Supplies	Low Potential	💧	*Would not increase use of existing supplies.*
Provide Financial Benefit	High upfront costs and/or unlikely to include new water transfers	💧	*Would not support new transfers. High upfront costs.*
Extreme Drought Conditions	High Potential to Improve Conditions During an Extreme Drought	💧💧💧	*Would provide another source of water (recycled water) when supplies from Folsom Lake are unavailable.*
Implementation Complexity			
Environmental Compliance Requirements	Complex: EIR	💧	*EIR for potential construction and/or operational impacts associated with pipeline and plant construction.*
Permitting Requirements	Moderate: Some State and/or Local Permits	💧💧	*California Title 22 requirements, RWQCB permit, Petition for Change, Ownership of Discharge, Water Right application.*
Water Rights / Contracts	Low: No Change	💧💧💧	*No change.*
Institutional & Coordination	High: Partnerships Needed, Likely New Agreement	💧	*Would required new partnership with City of Roseville.*
Land Acquisition	High: No Willing Seller Identified	💧	*POW would be required for new pipeline.*
Public Acceptance & Support	High: Public Acceptance and Wide Support	💧💧💧	*Likely high support for use of recycled water.*
Schedule	1-2 years to implement	💧💧	

Uncertainty			
Costs	Low: No Planning Documents, Best Engineering Judgment Applied		*Users for recycled water have not yet been identified, but would likely be parks, golf courses, schools, and other nonpotable water uses.*
Yield & Reliability	Moderate: Confirmed Yield, Moderate Reliability, and/or Agreement is Long-Term		*Based on similar facilities. Long-term availability from Roseville has not yet been evaluated.*

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Relative Ranking

References:

2013. Bartle Wells Associates. City of Sunnyvale Recycled Water Pricing Recommendations

SAN JUAN WATER DISTRICT WATER SUPPLY & RELIABILITY STUDY

Project Evaluation Summary

ID: **O26**

Project Name: **Establish Indirect Potable Reuse in SJWD Service Area** Type: **RW**

Project Description: Option would establish indirect potable reuse (IPR) by conveying advanced treated wastewater treatment plant effluent from the Dry Creek WWTP to groundwater injection wells in the SJWD Wholesale Area. A groundwater study would need to be conducted to identify the movement of water and ensure that existing drinking water wells would not be affected by the injected effluent. It was also assumed that existing extraction wells within the District would be used for this option.

-Wet year storage: Would inject water or utilize a spreading basin during all year types, including wet years.

-Dry year augmentation: Stored water could be extracted in dry years, providing an additional source of water for the District to use when contract supplies are not sufficient to meet demand.

Related Options: Options 11, 12, and 13

METRICS	ASSESSMENT/ VALUE	SCORE	NOTES
Cost-Effectiveness			
Yield - Long-term Average (TAF/year)	5.6	N/A	*Assumed 5 MGD average day production from Dry Creek WWTP. Higher than O24 because IPR would allow for utilization of recycled water during off peak periods.*
Water Supply Source	Other/Multiple Sources	OTHR	*recycled water*
Total Cost ($)	$ 98,600,000	N/A	*Assumed:* *- Full advanced treatment as required to meet Title 22 Groundwater Replenishment Requirements: $32.5 Million* *- 64,000 feet of 24" transmission pipe : $21.5 Million* *- 225 HP pump station: $1.4 Million* *- (4) 250 foot deep injection wells: $.25 Million* *- Plus 30% contingency, 30% engineering, CM & Admin, 3% environmental documentation, 2% legal* *- Use of existing extraction wells.*
Overall Cost-effectiveness ($/AF) (Total Cost / Yield)	$ 1,956	N/A	*Annualized, 3.5% discount rate over 30-year project life and a recycled water wholesale cost of $1,000/AF.*
Contribution to Objectives			
Improve Dry Year Reliability	High Potential	💧💧💧	*Stored water could be extracted in dry years, providing an additional source of water for the District to use when contract supplies are not sufficient to meet demand.*
Perfect Beneficial Use of Existing Supplies	Low Potential	💧	*While effluent would be injected or spread in a basin during all year types, including wet years, use of existing surface water supplies would not be increased.*
Provide Financial Benefit	High upfront costs and/or unlikely to include new water transfers	💧	*Would not support new transfers. High upfront costs.*
Extreme Drought Conditions	High Potential to Improve Conditions During an Extreme Drought	💧💧💧	*Would provide another source of water (recycled water) when supplies from Folsom Lake are unavailable.*
Implementation Complexity			
Environmental Compliance Requirements	Complex: EIR	💧	*EIR for potential construction and/or operational impacts associated with pipeline and treatment facility construction.*
Permitting Requirements	Complex: Multiple Federal, State and Local Permits	💧	*Complex permitting required by California Title 22 regulations for groundwater replenishment projects. Modify Roseville's permits.*
Water Rights / Contracts	Low: No Change	💧💧💧	*No change.*
Institutional & Coordination	High: Partnerships Needed, Likely New Agreement	💧	*Utilizing recycled water stored in groundwater basins would require coordination with agencies with access to the groundwater basin.*
Land Acquisition	High: No Willing Seller Identified	💧	*If surface spreading ponds are utilized, land would need to be acquired in strategic locations (permeable soil, away from potable supply wells, etc.).*

Public Acceptance & Support	Low: Low Public Acceptance and Support		*There would be the potential for public opposition to IPR due to perceived health risks and discomfort with consuming recycled water.*
Schedule	Greater than 3 years to implement		*Advanced treatment facilities and permitting could take significant time to implement.*
Uncertainty			
Costs	Low: No Planning Documents, Best Engineering Judgment Applied		
Yield & Reliability	Moderate: Confirmed Yield, Moderate Reliability, and/or Agreement is Long-Term		

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Relative Ranking

References:

2013. Bartle Wells Associates. City of Sunnyvale Recycled Water Pricing Recommendations

SAN JUAN WATER DISTRICT WATER SUPPLY & RELIABILITY STUDY

Project Evaluation Summary

ID: **O27**

Project Name: **Participate in RiverArc** Type: **SW**

Project Description: Option would create a link between the Sacramento River and the Cooperative Transmission Pipeline that would enable the District to receive some of its water supplies from the Sacramento River when needed as part of the RiverArc Project. The project would divert water through existing intakes/diversions from the Sacramento River, deliver that water via raw water pipelines to a new regional WTP, and distribute the treated surface water through new and existing pipelines to local water agencies. This project would require coordination with other agencies to help fund the project in addition to the District moving some of its water rights from the American River to the Sacramento River.

-Wet year storage: None.

-Dry year augmentation: Would provide more reliability as the District would have access to surface water from another location, should very limited supplies be available at Folsom Lake (i.e., during extreme drought conditions). The volume of water supplies available/allocated would be the same, but the District would have the flexibility to take delivery of water from two different access points.

Related Options: Options 18, 19, 20, and 23

METRICS	ASSESSMENT/ VALUE	SCORE	NOTES
Cost-Effectiveness			
Yield - Long-term Average (TAF/year)	1.2	N/A	*10.3 MGD maximum day demand (5.15 MGD average daily demand) during dry years only. Assumed dry years would occur every 1 in 5 years, for the entire year.*
Water Supply Source	Other/Multiple Sources	OTHR	*MFP and CVP water*
Total Cost ($)	$ 64,300,000	N/A	*Preliminary portion of District's total project cost.*
Overall Cost-effectiveness ($/AF) (Total Cost / Yield)	$ 2,376	N/A	*Annualized, 3.5% discount rate over 50-year project life.*
Contribution to Objectives			
Improve Dry Year Reliability	Moderate Potential	◆◆	*Would diversify supply options, but the District's total volume of water allocated/received would not increase.*
Perfect Beneficial Use of Existing Supplies	Moderate Potential	◆◆	*Would not increase use of contract supplies unless paired with another option (e.g., purchasing another agency, building infrastructure to enable transfers) such that in wet years, the District could increase its use of contract entitlements.*
Provide Financial Benefit	High upfront costs and/or unlikely to include new water transfers	◆	*Could include new transfers if combined with other options. High upfront costs.*
Extreme Drought Conditions	High Potential to Improve Conditions During an Extreme Drought	◆◆◆	*Would decrease the District's reliance on Folsom Lake by providing access to its supplies from the Sacramento River.*
Implementation Complexity			
Environmental Compliance Requirements	Complex: EIR	◆	*EIR for potential construction impacts associated with building a large, new pipeline. Also, NEPA for moving CVP diversion.*
Permitting Requirements	Complex: Multiple Federal, State and Local Permits	◆	*Complex, as it would require building a new, large pipeline.*
Water Rights / Contracts	Moderate: Change to Point of Diversion/Delivery, and/or Place of Use	◆◆	*Change in point of delivery for contract entitlements.*
Institutional & Coordination	High: Partnerships Needed, Likely New Agreement	◆	*Would require partnering with other agencies to build the project.*
Land Acquisition	High: No Willing Seller Identified	◆	*To be determined.*
Public Acceptance & Support	Moderate: Some Public Acceptance and Moderate Support	◆◆	*Moderate support within District as the costs are high, even though it would improve dry year reliability.*
Schedule	Greater than 3 years to implement	◆	*Would take over 25 years to design and construct.*
Uncertainty			
Costs	Moderate: Cost Information, No Engineering Details	◆◆	*(West Yost Associates, 2015)*
Yield & Reliability	Moderate: Confirmed Yield, Moderate Reliability, and/or Agreement is Long-Term	◆◆	*(West Yost Associates, 2015)*

Key: AF = acre-feet, CVP = Central Valley Project, EIR = Environmental Impact Report, IS = Initial Study, MND = Mitigated Negative Declaration, N/A = not applicable, ND = Negative Declaration, PCWA = Placer County Water Agency, ROW = Right-of-Way, TAF = thousand acre-feet

Relative Ranking

References:

2015. West Yost Associates. Sacramento River Regional Water Reliability Project. Planning Phase 1. September.

SAN JUAN WATER DISTRICT WATER SUPPLY & RELIABILITY STUDY

Project Evaluation Summary

ID: **O28**

Project Name: **Purchase Water Supply Wells in SJWD Wholesale Area** Type: **GW**

Project Description: Option would transfer O&M responsibility and ownership of mutually agreed groundwater supply wells and associated facilities in the WCAs to the District. The District would centrally operate production wells, storage, and selected transmission pipelines. This option would implement the District's Policy F: Full Service Demand Responsibility. It would help the District achieve full integration of groundwater management and conjunctive use, and provide economies of scale. Purchasing the wells would provide the District with operational flexibility and avoid the need for numerous agreements. Wells would be retrofitted to allow for both injection and extraction, to the extent possible.

-Wet year storage: Would maximize use of contract water by utilizing currently unused surface water for groundwater injection.

-Dry year augmentation: Would be able to use stored groundwater to supplement dry year supplies.

Related Options: None

METRICS	ASSESSMENT/ VALUE	SCORE	NOTES
Cost-Effectiveness			
Yield - Long-term Average (TAF/year)	10.9	N/A	*Wholesale Area total extraction capacity of 29,000 gpm (23.4 TAF/year). Assuming 50 percent of all wells could be retrofitted for injection and 6 months of injection during Water Forum wet/average years, the capacity would be 5.8 TAF/year. Recharge frequency would be during Water Forum wet/average years (which constitute 80 percent of the years from 1921 through 2015 (November-March unimpaired flows to Folsom Lake exceeding 950,000 AF)) and with a 10 percent loss in aquifer.*
Water Supply Source	Other/Multiple Sources	OTHR	*District's water rights and contract entitlements.*
Total Cost ($)	$ 8,200,000	N/A	*Assumed purchase price would be the book value (capital assets, less depreciation) of the wells:* *- FOWD, 8 wells: $3.5 Million (FOWD, 2015)* *- CHWD, 4 wells: $3.7 Million (CHWD, 2015)* *- OVWC, 2 wells: $1 Million (estimated)*
Overall Cost-effectiveness ($/AF) (Total Cost / Yield)	$ 141	N/A	*Annualized, 3.5% discount rate over 30-year project life. O&M of $100/AF to produce groundwater.*
Contribution to Objectives			
Improve Dry Year Reliability	Moderate Potential	💧💧	*Would not improve wholesale agencies ability to pump groundwater, as it is already existing. Could result in higher contract allocations from increased use during wet years.*
Perfect Beneficial Use of Existing Supplies	High Potential	💧💧💧	*Would increase surface water use during wet years.*
Provide Financial Benefit	High upfront costs and/or unlikely to include new water transfers	💧	*High cost to purchase.*
Extreme Drought Conditions	Moderate Potential to Improve Conditions During an Extreme Drought	💧💧	*Would improve groundwater conditions by allowing basin to recharge during wet years.*
Implementation Complexity			
Environmental Compliance Requirements	Moderate: IS/ND/MND	💧💧	
Permitting Requirements	Moderate: Some State and/or Local Permits	💧💧	*ASR permitting, Division of Drinking Water source water amendments.*
Water Rights / Contracts	Low: No Change	💧💧💧	
Institutional & Coordination	High: Partnerships Needed, Likely New Agreement	💧	*Would require agreements with WCAs for purchase of wells.*
Land Acquisition	Low: Existing ROW / Not Applicable	💧💧💧	*No new land anticipated.*
Public Acceptance & Support	Low: Low Public Acceptance and Support	💧	*Public opinion of selling off water production capacity, less reliability and control of costs.*
Schedule	1-2 years to implement	💧💧	

Uncertainty			
Costs	Low: No Planning Documents, Best Engineering Judgment Applied		*Unknown if willing sellers.*
Yield & Reliability	High: Confirmed Yield, High Reliability, and/or Agreement is Long-Term		*Number of wells and capacity well established. Modifications required for ASR would need further assessment.*

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Relative Ranking

References:

2015. Fair Oaks Water District. Comprehensive Annual Financial Report for the Year Ended December 31, 2014.
2015. Citrus Heights Water District. Audited Financial Statements for December 31, 2014.

Project Evaluation Criteria - Metrics and Scoring

Objective: Financial Benefit	
Low upfront costs and/or able to implement new water transfers	♦♦♦
Moderate upfront costs and/or limited ability to perform new water transfers	♦♦
High upfront costs and/or unlikely to include new water transfers	♦

Completeness of Project Definition - Cost	
High: Planning Documents/Studies Available	♦♦♦
Moderate: Cost Information, No Engineering Details	♦♦
Low: No Planning Documents, Best Engineering Judgment Applied	♦

Implementation Factor - Environmental Compliance Requirements	
Low: Categorical Exemption	♦♦♦
Moderate: IS/ND/MND	♦♦
Complex: EIR	♦

Uncertainty - Yield/Reliability	
High: Confirmed Yield, High Reliability, and/or Agreement is Long-Term	♦♦♦
Moderate: Confirmed Yield, Moderate Reliability, and/or Agreement is Long-Term	♦♦
Low: Unconfirmed Yield, Low Reliability, and/or Agreement is Short-Term	♦

Implementation Factor - Permitting Requirements	
Low: No Permits	♦♦♦
Moderate: Some State and/or Local Permits	♦♦
Complex: Multiple Federal, State and Local Permits	♦

Implementation Factor - Public Acceptance and Support	
High: Public Acceptance and Wide Support	♦♦♦
Moderate: Some Public Acceptance and Moderate Support	♦♦
Low: Low Public Acceptance and Support	♦

Implementation Factor - Water Right/Contract	
Low: No Change	♦♦♦
Moderate: Change to Point of Diversion/Delivery, and/or Place of Use	♦♦
High: New Water Right	♦

Implementation Factor - Schedule	
Greater than 3 years to implement	♦
1-2 years to implement	♦♦
Less than 1 year to implement	♦♦♦

Implementation Factor - Institutional Requirements	
Low: No Partnerships Needed	♦♦♦
Moderate: Partnerships Needed, Likely Similar to Existing Arrangement	♦♦
High: Partnerships Needed, Likely New Agreement	♦

Implementation Factor - Land Acquisition	
Low: Existing ROW / Not Applicable	♦♦♦
Moderate: Willing Seller Identified	♦♦
High: No Willing Seller Identified	♦

Type	Code
Surface Water	SW
Groundwater	GW
Transfer/Exchanges	NS
Recycled Water	RW

Water Supply Source	Code
Pre-1914 and Senior Appropriative Water Right	APPR
CVP Entitlement	CVP
PCWA Middle Fork Project Entitlement	MFP
Other/Multiple Sources	OTHR

Extreme Drought Objective Contribution	
High Potential to Improve Conditions During an Extreme Drought	♦♦♦
Moderate Potential to Improve Conditions During an Extreme Drought	♦♦
Limited Potential to Improve Conditions During an Extreme Drought	♦

Objective Contribution	
High Potential	♦♦♦
Moderate Potential	♦♦
Low Potential	♦

Key:

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IS = Initial Study

MND = Mitigated Negative Declaration

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