APPENDIX G:

Development and Evaluations of Alternatives

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Development and Evaluation of Alternatives

Purpose and Scope

The OID Water Resources Plan (WRP) evaluated the district's water resources, delivery system, and operations. The WRP surveyed on-farm water use and practices. The needs and perceptions of OID customers, OID Board of Directors, OID staff, local and regional elected officials, and neighboring jurisdictions were surveyed and assessed. In conjunction with this comprehensive assessment, the WRP examined land use trends to project how future land uses will impact water supply and demand over the next two decades. Lastly, the water balance efforts provided insight on projected water use in and surrounding the district.

Under all likely scenarios for future land uses and demand for water within OID, the district's water supplies are more than sufficient to accommodate future in-district needs (provided that the infrastructure and service recommendations discussed later in this report are implemented). To address the expected changes in OID future customers' needs and to reasonably and beneficially use the district's water supplies, several alternatives have been developed and evaluated based on the five WRP goals.

Summary Description of Programmatic Alternatives

Four distinct programmatic alternatives were developed based on extensive interaction with OID staff, the Board of Directors, and the public. These alternatives encompass a range of reasonable options available to the district as it looks to respond to the land use, regulatory, resources, and customer-driven issues presented in previous technical appendixes. The term *programmatic* is used to emphasize that the alternatives evaluated in the WRP are broad-based and strategic, and represent policy-level options for OID's consideration.

Alternative 1: Continue Present Practices

Over recent years, OID has initiated several important efforts to improve management, operations, facility replacement, and long-term planning. OID has been engaged in several regional efforts related to water quality and groundwater management, has been conducting a moderate level of capital improvements to address the highest risks to the water delivery system, and has entered into three water transfer agreements to put its supplies to beneficial use and create additional revenue to fund improvements.

Alternative 1 generally consists of the following:

- Maintain existing level of service to OID customers.
- Implement an infrastructure plan that addresses high-priority improvements and major service liabilities but does not include any system enhancements to improve service or better manage system surface water outflow.

- Do not expand service to growers within the district SOI (no annexation or out-of-district water sales).
- Continue current levels of water transfers.
- Participate in regional activities such as cooperative programs for groundwater management and water quality.
- Take only minimal action to improve OID system efficiency or customer on-farm water use efficiency.

Alternative 2: Maximize Service Improvements within District Boundaries

This programmatic alternative is similar to Alternative 1, but has the following significant differences:

- Improve level of service to customers (consists of operational, policy, management, and infrastructure improvements).
- Provide improved drought protection.
- Construct facilities to better manage OID surface water outflow.
- Establish new and/or revised water transfer agreements.

Alternative 3: Maximize Service Improvements within District Boundaries and Moderate Expansion of Service within OID's SOI

Similar to Alternative 2, this variation allows for the moderate expansion of service into the district's SOI. This is the most balanced of all alternatives because it provides for service expansion while allowing water transfers as necessary to fund required improvements.

Alternative 4: Maximize Service within OID's SOI

This alternative would maximize the use of available water for expanding service to growers within the district's SOI. Under this alternative, no water is available for transfer because all district water supplies are used to facilitate an expanded customer base.

Evaluation Process

The WRP programmatic alternatives were developed and comprehensively evaluated using analytic and qualitative methods illustrated in Figure G-1. From this analysis emerged the Best Apparent Alternative: the package of recommended facilities and actions for the district to advance as the basis for programmatic environmental documentation.

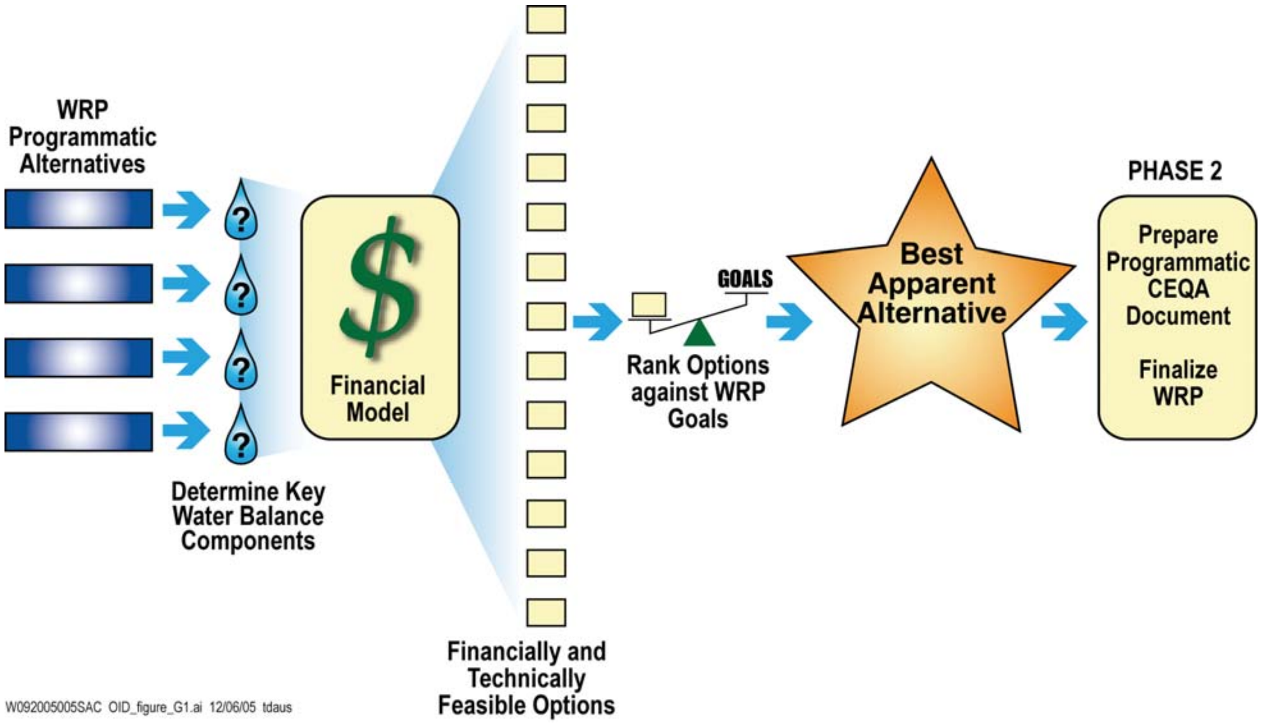

FIGURE G-1
Evaluation Process

Elements Common to Multiple Alternatives

With the exception of Alternative 1, all alternatives contain several common components and elements. For example, each alternative is predicated on the philosophy that OID must first provide dependable irrigation and domestic service to users within its service area before it considers either expanding service outside district boundaries or water transfers to other agencies. Other common features are the following:

- Revised service standard
- WRP recommendations implemented within district boundaries
- Uniform projections for land use
- Conservative projections for on-farm water use efficiency
- Improved water supply reliability

Each common feature is described in this subsection.

Revised Service Standard

The WRP recommends that OID revise its existing service standards to conform to a new framework organized by customer categories that allows customer needs to drive the appropriate standards within reasonable limits. By responding to varied customer needs, the long-term customer base would be maintained, and in some areas it would increase as a result of new land uses (primarily orchards) that need a higher level of surface water service. This is a flexible approach that would adjust to local factors (land use, crop type, irrigation methods, customer knowledge, groundwater conditions) as they change over the next 20 or more years. Service standards are described in more detail in the Infrastructure Plan Technical Appendix H.

WRP Recommendations Implemented within District Boundaries

Alternatives 2, 3, and 4 include the recommended Infrastructure Plan, which includes rehabilitation of pipelines and laterals, flow control and measurement projects, irrigation service turnouts standardization and replacement, drainwater reclamation and outflow management projects, regulating reservoirs, groundwater wells, and SCADA improvements. In addition, the WRP recommends continuation of the district's ongoing Main Canals and Tunnels Improvements Program. These alternatives include common recommendations for new policies and programs critical to successful implementation of the WRP. Together, these recommendations provide cumulative long-term improvements to OID's customer service, supply reliability, and operational efficiency.

Uniform Projections for Land Use

All programmatic alternative are based on uniform projections for land use within the district and the SOI. Future land use was determined from historical trends, grower and industry interviews, an assessment of agricultural market conditions and local conditions. For example, it was estimated that orchard crops would increase from approximately 10,000 to 15,000 acres from 2005 to 2025. It is understood that this increase is an estimate and can vary. Therefore, water balance model runs were conducted to assess a sensitivity variation of ±20 percent from the projected value of approximately 15,000 acres. It was also assumed that the majority of projected increases in orchard ground will likely come from a conversion of pasture ground. In OID, water applied to pasture is commonly double of that applied to orchards. Therefore, it was important to understand the sensitivity of adjusted land use to employ conservative estimates of forecasted applied water in 2025. Hence, conservative land use projections (projections that likely overestimate future water demand) were used as the basis for alternative evaluation. Again, this was performed by reducing the estimated orchard acreage (approximately 15,000 acres) by 20 percent.

Conservative Projections for On-Farm Water Use Efficiency

On-farm water use efficiency projections for each programmatic alternative were conservatively estimated for forecasted trends through 2025. For example, no increase in irrigation efficiency on pasture was assumed relative to current estimates. This resulted in a likely conservative estimate for forecasted water applied to pasture in 2025.

Improved Water Supply Reliability

Alternatives 2, 3, and 4 are based on measures to improve water supply reliability to users within the district, as discussed below.

Evaluation Methodology

Applying these common assumptions uniformly, a detailed methodology was employed to determine key water balance components for projected 2025 conditions for each programmatic alternative. Next, decisions regarding the provision of service to customers outside OID but within the SOI (annexation) and water transfers were made for each alternative. Lastly, the Financial Model was used to analyze various strategies for viably supporting each alternative.

The four alternatives, combined with the viable financial strategies for implementation, results in a set of 13 distinct options, all of which are financially and technically feasible. Following the evaluation, a matrix summarizing each alternative was then compared to the WRP goals. From this comparison emerged the Best Apparent Alternative.

Determination of Water Supply Quantities Available for Future Transfers and/or Service Expansion in SOI

Based on the water balance efforts previously described, it is first necessary to estimate the future quantity of water supplies available to OID after all in-district needs have been met. This requires the multistep analysis summarized here.

Step 1: Setting Water Supply Reliability Target

The acceptable level of water supply reliability is fundamental to determining the quantity of available water supply remaining after meeting in-district needs. As discussed in the Resources Inventory Technical Appendix B, based on current water demand and absent any water transfer obligations, OID would need to augment its Stanislaus River supply with additional sources under average evapotranspiration (ET) conditions 9 percent of the time. Under maximum projected ET conditions, OID would need to augment supplies 21 percent of the time.

After considering the current minimum water transfer obligation of 30,000 ac-ft (ac-ft), OID must augment its Stanislaus River supply 19 percent of the time during average ET conditions. Under maximum ET conditions, OID currently needs to augment their Stanislaus River supplies in all years.

To augment Stanislaus River water supplies, OID increases their groundwater pumping and increases the reuse of drainwater. During extreme shortages, OID customers with backup groundwater pumping systems would need to increase levels of groundwater use, and varied levels of deficit irrigation would occur.

It should be noted that an extreme shortage, such as what was observed in 1976, has not occurred since the New Melones Reservoir was put into operation and since OID's existing transfer agreements were established. However, as shown in Figure G-2, in a *maximum* ET condition, and with the level of Stanislaus River curtailment expected in 1 out of 20 years (5 percent chance of occurrence), the sum of OID's irrigation demand and minimum water transfer obligations would exceed surface water supplies by 80,000 ac-ft.

It is recommended that over the course of implementation of the WRP, the district's water supply reliability be improved. Therefore, the WRP is based on the following ultimate water supply reliability criteria:

> *OID, via a combination of drought response policies and programs, additional groundwater wells, and minimal water transfer commitments, shall be able to meet in-district water demand under a maximum ET condition* <u>*and*</u> *an extreme Stanislaus River curtailment (the 5 percent chance of occurrence).*

Step 2: Determine 2025 Best Case Scenario Maximum Excess Water Supplies

The objective of this step is to establish the best case scenario (defined as full Stanislaus River entitlement and average ET conditions) maximum amount of water available in 2025 to support water transfers and/or expansion into the SOI. It should be noted that, in the context of this analysis, water transfers do not include what could occur based on recaptured drainwater, which is addressed separately and discussed later in this technical appendix.

The Water Balance Model was used to estimate certain components of the OID water balance for the 2025 scenario in average ET conditions. Table G-1 summarizes the results of this analysis and relevant assumptions.

TABLE G-1
Water Balance Components: 2025 Best Case Scenario
OID WRP Technical Appendixes

Water Balance Component	Projected Value
Projected demand from Stanislaus River under average ET condition	233,000 ac-ft*
Full Stanislaus River supply to OID	300,000 ac-ft
Availability of full river supply	79%

* Not representative of total in-district demand, which is met by the combination of Stanislaus River supplies and a base level of groundwater pumping and reclaimed water use.

The model indicates that in the 2025 average ET condition, OID would divert approximately 233,000 ac-ft from the Stanislaus River to meet in-system demands. As shown in Figure G-3, surface water available for diversion in most years exceeds OID surface water demand by 67,000 ac-ft (300,000 ac-ft annually is available for diversion with 79 percent certainty).

Therefore, in an average ET condition with full Stanislaus River entitlement, OID could apply a maximum of 67,000 ac-ft toward water transfers and/or expansion into the SOI.

Step 3: Determine 2025 Worst Case Maximum Excess Water Supplies

The objective of this step is to establish the amount of water available in 2025 to support water transfers and/or expansion into the SOI during the worst case condition (defined as the 5 percent chance of occurrence Stanislaus River curtailment during maximum ET conditions).

The Water Balance Model was used to estimate OID water balance components for the 2025 scenario in the maximum ET condition and during an extreme Stanislaus River curtailment (the 5 percent chance of occurrence). Table G-2 summarizes the results of this analysis and relevant assumptions.

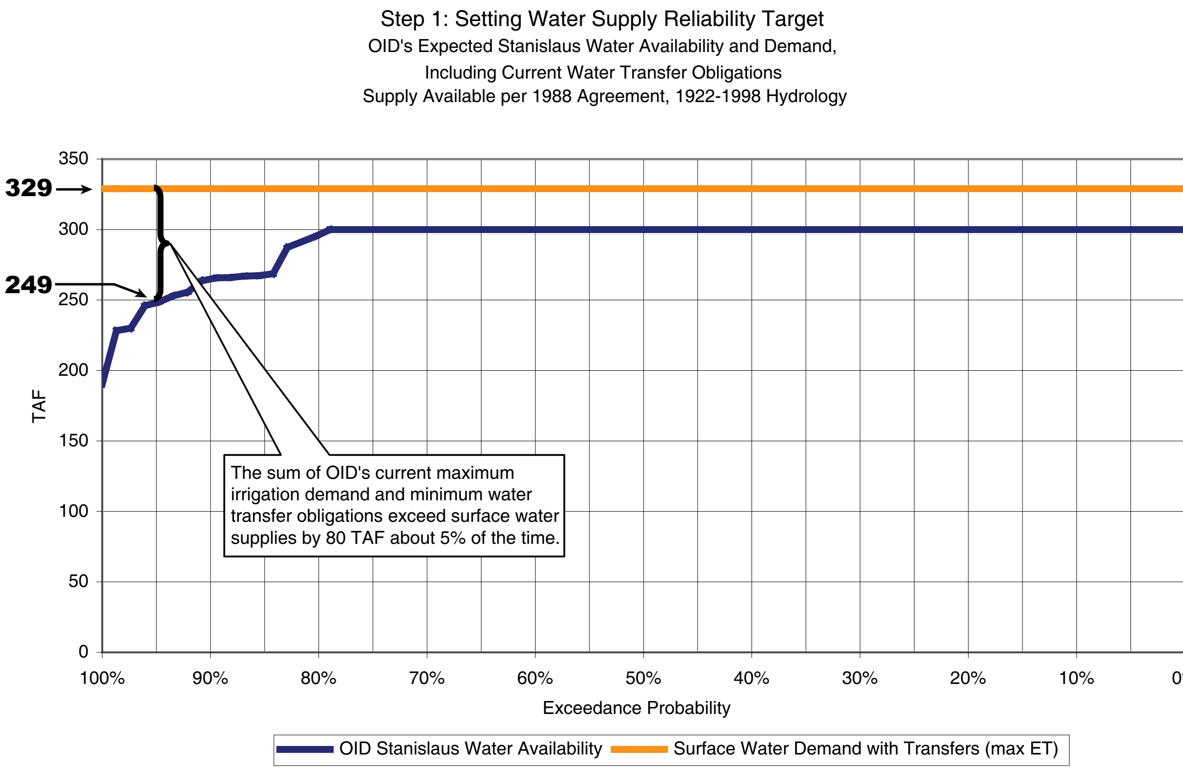

FIGURE G-2
Setting Water Reliability Target
OID WRP Technical Appendixes

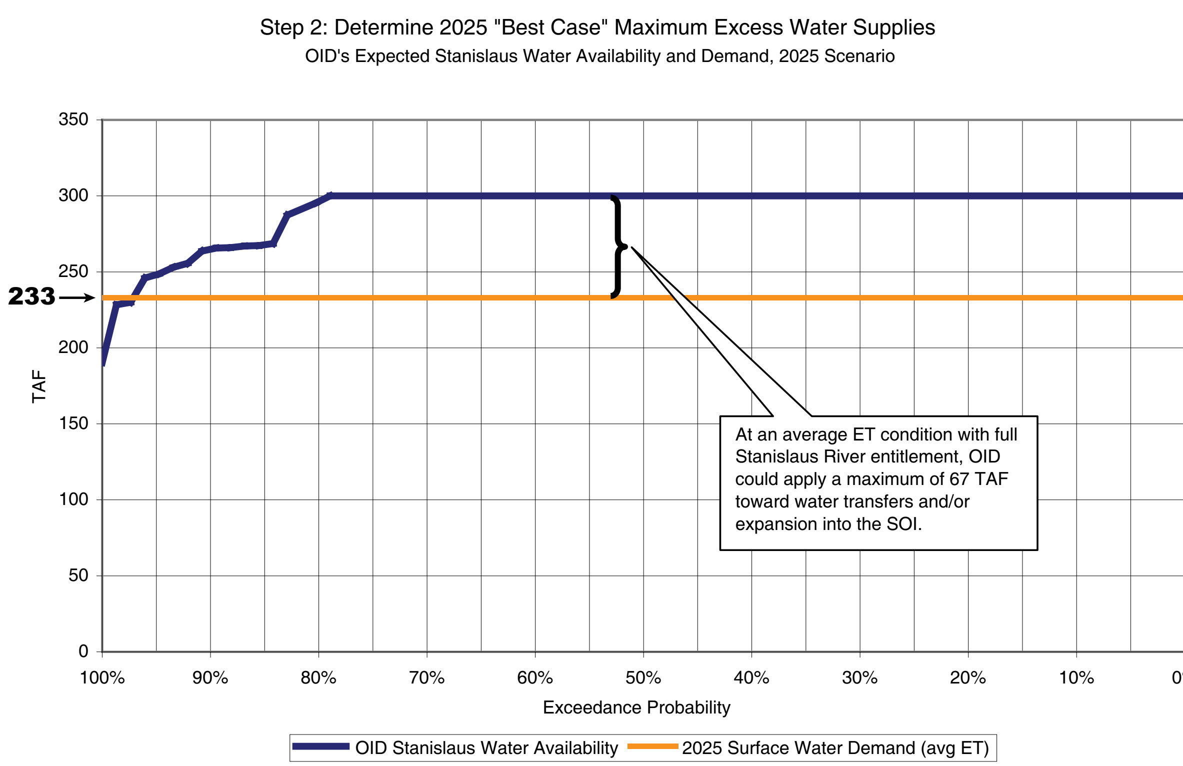

FIGURE G-3
Determining 2025 Best-Case Scenario
OID WRP Technical Appendixes

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TABLE G-2
Water Balance Components: 2025 Worst Case Scenario
OID WRP Technical Appendixes

Water Balance Component	Projected Value
Projected demand from Stanislaus River in maximum ET condition	265,000 ac-ft*
Stanislaus River supply during extreme curtailment	249,000 ac-ft
Frequency of Occurrence of extreme curtailment	5%

* Not representative of total in-district demand, which is met by the combination of Stanislaus River Supplies and a base level of groundwater pumping and reclaimed water use.

Under this scenario, it would be necessary to implement the drought response measures described in the Infrastructure Plan Technical Appendix H. Collectively, these measures are capable of reducing OID's 2025 surface water demand (or effectively increasing supplies) by up to 66,000 ac-ft. Additionally, it is assumed that OID would require that any lands annexed by the district (or contracted with via an out-of-district service agreement) would be required to participate in a Cooperative Use Program for private wells and therefore have the capability to pump groundwater to meet demand during Stanislaus River curtailments or periods of maximum ET demand.

Practical application of this assumption would effectively limit potential annexations/out-of-district service agreements to those landowners having access to groundwater of sufficient yield to fully supply their operations. By establishing this requirement as a condition of service, OID would support regional agriculture while simultaneously facilitating in-lieu recharge of the aquifer by providing surface water supplies (when available) to lands that would otherwise pump groundwater. Therefore, limiting potential annexations/out-of-district service agreements to areas with access to groundwater contributes to the overall health of regional groundwater resources while maximizing the beneficial use of OID's available supplies.

Should OID elect to serve lands outside the district without access to groundwater, then other measures would be necessary to generate additional drought supplies, such as land fallowing or other drought-management methods.

As shown, analysis indicates that in the 2025 maximum ET condition, the combination of OID drought response measures and surface water diversion would result in an effective supply of 315,000 ac-ft (249,000 ac-ft Stanislaus River supply plus 66,000 ac-ft in drought response). As shown in Figure G-4, OID surface water demand would be 50,000 ac-ft less than is available for diversion in the 5 percent availability condition (315,000 ac-ft minus 265,000 ac-ft equals 50,000 ac-ft).

Therefore, in a maximum ET condition with extreme Stanislaus River curtailment (5 percent chance of occurrence), OID could apply a maximum of 50,000 ac-ft toward water transfers while meeting all remaining in-district water demand.

Step 4: Determine Remaining Quantity of Surface Water to Support Additional Water Transfers or Service Expansion into SOI

As was previously shown in Step 2, in the best case condition OID could apply a maximum of 67,000 ac-ft toward water transfers and/or expansion into the SOI. Step 3 determined that in the worst case condition, OID could apply a maximum of 50,000 ac-ft toward water transfers and/or expansion into the SOI. Therefore, as shown in Table G-3, should OID elect to dedicate that 50,000 ac-ft for transfer, then in the best case condition 17,000 ac-ft remain to support either expanded service into the SOI or additional water transfers (of lesser reliability and therefore less value to the receiving agency). At an assumed "diversion" water duty of 4 ac-ft per acre,[1] 17,000 ac-ft could supply 4,250 acres.

TABLE G-3
Water Balance Components: 2025 Availability of Supply for Water Transfer and/or Expansion into SOI
OID WRP Technical Appendixes

Water Balance Component	Projected Value
Maximum supply available for water transfer and/or expansion into the SOI	67,000 ac-ft
Firm component of available supply	50,000 ac-ft
Variable component of available supply	17,000 ac-ft

As shown in Figure G-5, in a maximum ET condition and with full Stanislaus River entitlement, assuming a water transfer commitment of 50,000 ac-ft and a commitment to provide service to an additional 4,250 acres of land within the SOI, OID would have to partially implement the recommended drought response measures (to provide 32,000 ac-ft in augmented supplies).[2]

Step 5: Determine Maximum Ability to Expand Service into SOI

As a final step, it is necessary to estimate the maximum ability to expand service into the SOI. As previously shown, in the 2025 best case condition, OID surface water available for diversion exceeds OID surface water demand by 67,000 ac-ft.

Therefore, at an assumed diversion water duty of 4 ac-ft per acre, OID could support expanded service into the SOI to a maximum of 16,750 acres. Based on this commitment, in years when deliveries from the Stanislaus River are curtailed or in maximum ET conditions, OID would be required to initiate the recommended drought response measures.

The results of this multistep analysis relative to the programmatic alternatives are summarized in Table G-4.

1 For the purpose of this study, it was assumed that lands within the SOI provided service by OID would consist primarily of orchards. A conservative estimate of approximately 4 feet of applied water per acre of deciduous trees was assumed based on a documented average (3.3 feet) and high (3.7 feet) applied water for deciduous orchards grown in the east side of the San Joaquin Valley. This also includes system conveyance losses to deliver the water to the field. Adapted from: California Department of Water Resources. 1975. Vegetative Water Use in California, 1974. Bulletin 113-3. and California Department of Water Resources. 1986. Crop Water Use in California. Bulletin 113-4.

2 This 32,000 ac-ft augmented supply would likely consist of 17,000 ac-ft associated with the annexed lands and a 15,000 ac-ft increase in OID groundwater pumping.

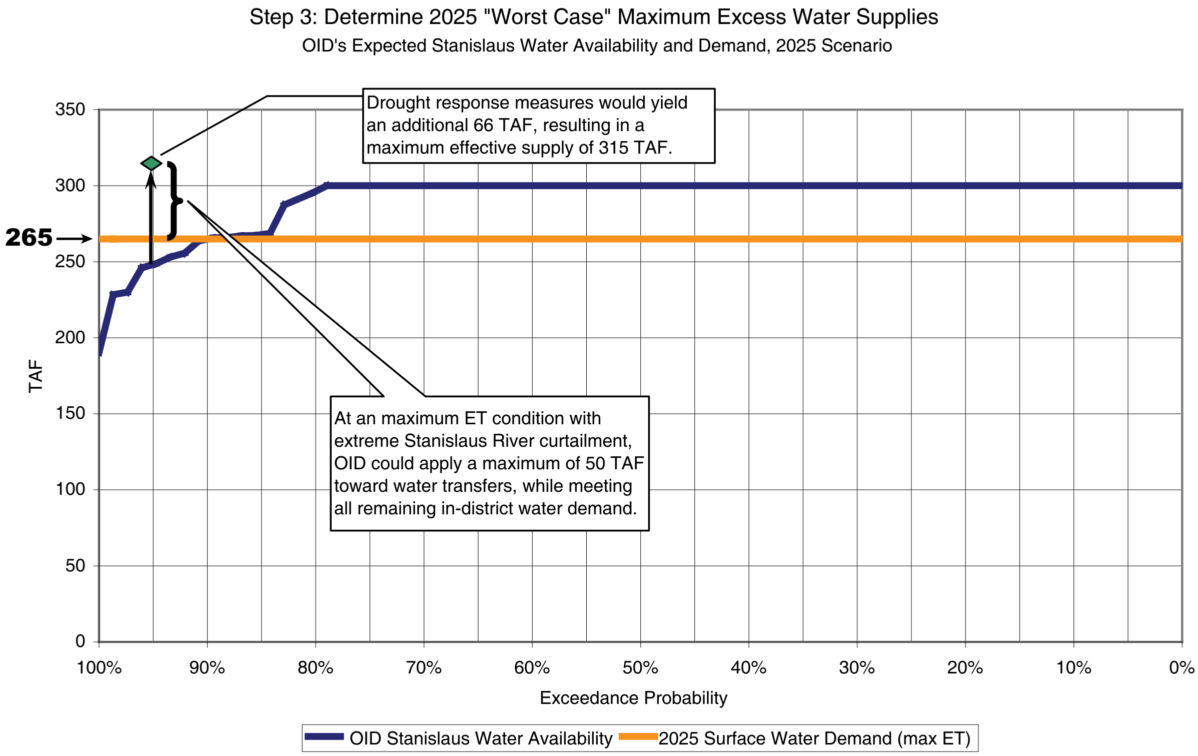


FIGURE G-4
Determining 2025 Worst-Case Scenario
OID WRP Technical Appendixes

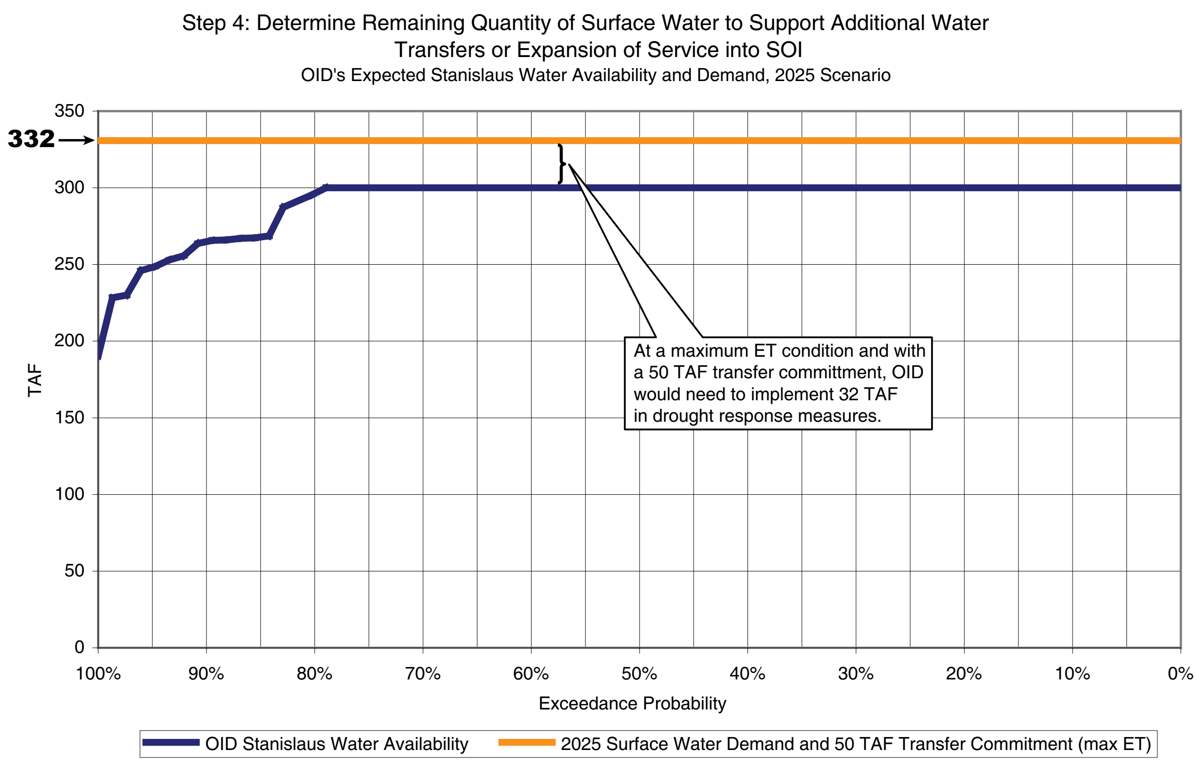


FIGURE G-5
Determining Remaining Surface Water
OID WRP Technical Appendixes

TABLE G-4
Water Balance/Reliability Analysis: Summary of 2025 Transfer and/or Annexation Opportunities by Programmatic Alternative
OID WRP Technical Appendixes

Alternative	Description	Key Components
1	Continue Present Practices	Present practices consist of a minimum transfer obligation of 30,000 ac-ft up to a maximum of 41,000 ac-ft.
2	Maximize Service Improvements within District Boundaries	2025 firm transfer of 50,000 ac-ft Additional variable transfer of 17,000 ac-ft
3	Maximize Service Improvements within District Boundaries and Moderate Expansion of Service within OID's SOI	2025 firm transfer of 50,000 ac-ft 4,250 acres of expanded service in SOI to utilize 17,000 ac-ft
4	Maximize Expansion of Service within OID's SOI	16,750 acres of expanded service in SOI to utilize 67,000 ac-ft of available supplies

Recaptured Drainwater

Based on the existing reclamation facilities and operations and on the water balance, significant opportunities exist for increasing beneficial use of surface water runoff for OID and the neighboring areas. While it is not cost-effective to "pump-back" recaptured drainwater to support expansion of service in the district's SOI, the Infrastructure Plan recommends significant improvements and new facilities to facilitate increased use of surface water outflow. The existing conditions water balance indicates that about 60,000 to 70,000 ac-ft of surface water runoff (about 70 percent field tailwater and 30 percent operational spills from OID laterals) leave the OID service area per season. Over the next 20 years, changes in land use and system improvements are projected to reduce this amount to 40,000 ac-ft. Based on proximity and timing of outflow, it was estimated that 30,000 ac-ft is a reasonable amount of surface water outflow available to capture and transfer to downstream recipients (outflow available but not utilized within OID). The district should secure agreements for the use of this water by downstream agencies prior to initiating construction. The Infrastructure Plan Technical Appendix H describes the facilities necessary to implement this transfer and provides recommendations for facilities to increase the use of reclaimed water within the district.

Drainwater Facility

Water Balance Components of Programmatic Alternatives

Relevant water balance components of the programmatic alternatives were shown in Table G-4. For the subsequent financial evaluation, it is necessary to identify a starting and ending point for analysis. It was assumed that the starting year of detailed financial study is 2010, a year when existing transfer commitments terminate, and revenue from any new agreements would begin to be realized. The end point of the analysis is assumed to be 2030. Differences between this planning period and the land use analyses (describing current conditions and forecasting 2025 conditions) are not materially significant.

In multiple programmatic alternatives, an initial and final level of firm and variable water transfers are identified. A firm water transfer is defined as the quantity of water provided in every year, including droughts. Variable transfers are reduced during dry years as Stanislaus River supplies to OID are curtailed. OID current transfer agreements with Stockton East Water District (SEWD) and Reclamation total 41,000 ac-ft. Of that volume, 30,000 ac-ft are firm and 11,000 ac-ft are variable. Over the course of WRP implementation, the quantities of firm and variable supplies available for transfer increase to 50,000 ac-ft and 17,000 ac-ft, respectively (and the overall district water supply reliability is increased as previously described). In Alternative 2, these supplies are assumed to be transferred. Alternative 4 assumes that these supplies support expansion of service into the SOI. Alternative 3 assumes that the firm quantity is transferred, and the variable quantity supports expansion of service into the SOI. Available water supplies that support transfers and/or expansion into the SOI are shown for each alternative in Figure G-6.

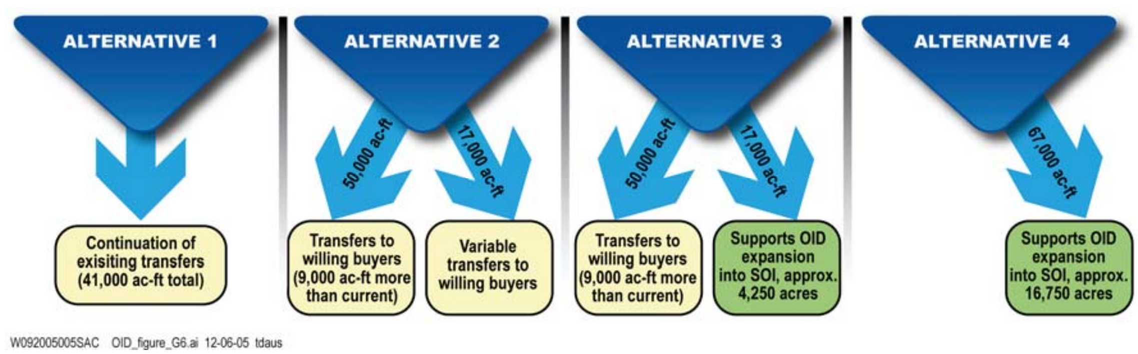


FIGURE G-6
How the Alternatives Allocate Available Water Supply

Financial Evaluation

The Financial Model was used to analyze various strategies for viably supporting each programmatic alternative. To demonstrate the tradeoff between financial strategies, several sub-alternatives were developed and compared. In these sub-alternatives, key financial parameters were tested to make the sub-alternative financially feasible. In some cases, the financial parameter varied was the water charge to all OID customers as necessary to finance the plan; in others, it was the price of transferred water. These sub-alternatives are described here.

In this comparison, the capital cost of the Main Canals and Tunnels Improvements Program was not included in the analysis. These improvements are the same for each alternative, so they do not influence the evaluation of alternatives. These improvements will be considered in the Financial Plan described for the recommended alternative. The 20-year program costs are summarized in Table G-5.

TABLE G-5
20-Year Program Costs Exclusive of Main Canals and Tunnels Improvements Program ($ millions)
OID WRP Technical Appendixes

Project Type	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Rehabilitation projects	$94	$94	$94	$94
Improved service projects	$0	$30	$30	$30
Total CIP Costs	**$94**	**$124**	**$124**	**$124**

Note: See Infrastructure Recommendations in Section 9, and Infrastructure Plan Technical Appendix H for more information on infrastructure costs.

IMPROVED SERVICE PROJECTS

For $30 million, these improvements are possible:

- Additional flow-control and measurement structures
- Additional groundwater wells
- North Side regulating reservoir
- Accelerated irrigation service turnout replacement
- Drainwater reclamation projects

Alternative 1: Continue Present Practices

Sub-alternative 1A: Finance present practices with existing water transfer revenue and increased water charge. This sub-alternative viably finances $94 million in the WRP with revenue generated from a continuation of OID's current water transfer agreements with Reclamation and SEWD. Any differential between expected revenues and costs would be met by an increase in the water charge.

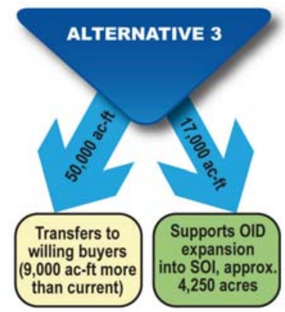
Alternative 2: Maximize Service Improvements within District Boundaries

Sub-alternative 2A: Finance service improvements within district boundaries with water transfer revenue. This sub-alternative viably finances $124 million in the WRP by using firm supply water transfers of 30,000 ac-ft increasing to 50,000 ac-ft over the 20-year period of analysis, and by using variable supply water transfers of 11,000 ac-ft increasing to 17,000 ac-ft. Additionally, facilities would be constructed to recapture drainwater, so this sub-alternative includes revenue assumed to be generated from the transfer of drainwater. The water charge would only increase 3 percent a year (to keep pace with inflation) from current levels.

Sub-alternative 2B: Finance Service Improvements within district boundaries with an increased water charge. This sub-alternative viably finances $124 million in the WRP by increasing the water charge. Additionally, facilities would be constructed to recapture drainwater, so this sub-alternative includes revenue assumed to be generated from the transfer of drainwater.

Alternative 3: Maximize Service Improvements within District Boundaries and Moderate Expansion of Service within OID's SOI

Sub-alternative 3A: Finance service improvements within district boundaries and expanded service within the SOI with water transfer revenue and annexation buy-in charges. This sub-alternative viably finances $124 million in the WRP by using firm supply water transfers of 30,000 ac-ft increasing to 50,000 ac-ft over the 20-year period of analysis. The variable supply of 17,000 ac-ft is assumed to support annexation. This quantity of supply would support about 4,250 acres, which would be assessed a buy-in charge of $350, unchanged from the current level. It is assumed that all annexed lands would pay any infrastructure capital cost associated with connecting to the OID system. Additionally, facilities would be constructed to recapture drainwater, so this sub-alternative includes revenue assumed to be generated from the transfer of drainwater. The water charge would only increase 3 percent a year (to keep pace with inflation) from current levels.



Sub-alternative 3B: Finance service improvements within district boundaries and expanded service within the SOI with water transfer revenue and annexation buy-in charges. Otherwise identical to the previous sub-alternative, this option assumes that the 4,250 acres annexed would be assessed a buy-in charge of $2,600. This buy-in charge approximately reflects the costs of the WRP spread over 55,000 acres.

Sub-alternative 3C: Finance service improvements within district boundaries and expanded service within the SOI with water transfer revenue and annexation buy-in charges. Otherwise identical to the two previous sub-alternatives, this variation includes an annexation buy-in charge of $1,600. This buy-in charge approximately reflects the avoided cost of installing an agricultural well plus the present value of the savings of pumping costs.

Sub-alternative 3D: Finance service improvements within district boundaries and expanded service within the SOI with water transfer revenue and annexation buy-in charges. This sub-alternative viably finances $124 million in the WRP plus the capital cost of annexing new lands (subsidizing an assumed $17 million in capital costs for annexation-related infrastructure) by using firm supply water transfers of 30,000 ac-ft increasing to 50,000 ac-ft over the 20-year period of analysis. The variable supply of 17,000 ac-ft is assumed to support annexation. This quantity of supply would support about 4,250 acres, which would be assessed a buy-in charge of $350, unchanged from the current level. Additionally, facilities would be constructed to recapture drainwater, so this sub-alternative includes revenue assumed to be generated from the transfer of drainwater. The water charge would only increase 3 percent a year (to keep pace with inflation) from current levels.

Sub-alternative 3E: Finance service improvements within district boundaries and expanded service within the SOI with water transfer revenue and out-of-district water sales. This sub-alternative viably finances $124 million in the WRP by using firm supply water transfers of 30,000 ac-ft increasing to 50,000 ac-ft over the 20-year period of analysis. The variable supply of 17,000 ac-ft is assumed to support expansion of service into OID's SOI. Instead of annexing land, this sub-alternative delivers 17,000 ac-ft of water as out-of-district sales at $40 per acre-foot. It is assumed that these new customers would pay any infrastructure capital cost associated with connecting to the OID system. Additionally, facilities would be constructed to recapture drainwater, so this sub-alternative includes revenue assumed to be generated from the transfer of drainwater. The water charge would only increase 3 percent a year (to keep pace with inflation) from current levels.

Alternative 4: Maximize Expansion of Service within OID's SOI

Sub-alternative 4A: Finance service improvements within the SOI with an increase in the water charge and annexation buy-in charges. This sub-alternative aims to finance $124 million in the WRP by increasing the water charge as all available excess supplies (67,000 ac-ft) are used to support annexation. This quantity of supply would support approximately 16,750 acres, which would be assessed a buy-in charge of $350, unchanged from the current level. It is assumed that all annexed lands would pay any infrastructure capital cost associated with connecting to the OID system. Additionally, facilities would be constructed to recapture drainwater, so this sub-alternative includes revenue assumed to be generated from the transfer of drainwater. The water charge would only increase 3 percent a year (to keep pace with inflation) from current levels.

Sub-alternative 4B: Finance service improvements within the SOI with an increase in the water charge and annexation buy-in charges. Otherwise identical to the previous sub-alternative, this option assumes that the 16,750 acres annexed would be assessed a buy-in charge of $2,600. This buy-in charge approximately reflects the costs of the WRP spread over 55,000 acres.

Sub-alternative 4C: Finance service Improvements within the SOI with an increase in the water charge and annexation buy-in charges. Otherwise identical to the two previous sub-alternatives, this variation includes an annexation buy-in charge of $1,600. This buy-in charge approximately reflects the avoided cost of installing an agricultural well plus the present value of the savings of pumping costs

Sub-alternative 4D: Finance service improvements within the SOI with an increase in the water charge and annexation buy-in charges. This sub-alternative viably finances $124 million in the WRP plus the capital cost of annexing new lands (subsidizing an assumed $66 million in capital costs for annexation-related infrastructure) by increasing the water charge. All available excess supplies (67,000 ac-ft) are used to support annexation. This quantity of supply would support approximately 16,750 acres, which would be assessed a buy-in charge of $350, unchanged from the current level. Additionally, facilities would be constructed to recapture drainwater, so this sub-alternative includes revenue assumed to be generated from the transfer of drainwater. The water charge would only increase 3 percent a year (to keep pace with inflation) from current levels.

Sub-alternative 4E: Finance service improvements within the SOI with an increase in the water charge and out of district water sales. This sub-alternative viably finances $124 million in the WRP by increasing the water charge. All available excess supplies (67,000 ac-ft) are used to support expansion of service into OID's SOI. Instead of annexing land, this sub-alternative delivers 67,000 ac-ft of water as out-of-district sales at $40 per acre-foot. It is assumed that these new customers would pay any infrastructure capital cost associated with connecting to the OID system. Additionally, facilities would be constructed to recapture drainwater, so this sub-alternative includes revenue assumed to be generated from the transfer of drainwater. The water charge would only increase 3 percent a year (to keep pace with inflation) from current levels.

Financial Evaluation of Alternative Results

Table G-6 shows the results of the financial evaluation. Key findings of the financial evaluation are the following:

- Water transfers will play a key role in paying for the WRP and keeping water charges low.
- Limiting water transfers would cause water charges to increase 4 to 5 times the current level.
- The WRP (not including the capital costs of the Main Canals and Tunnels Improvements Program) can be financed pay-as-you-go with water transfers if a water transfer agreement can be reached that contributes $130 to $140 per acre-foot.
- While the annexation buy-in charge in itself doesn't make a significant impact on the resulting water charge or required transfer selling fee, the district should consider increasing its annexation fee.
- It is not in the district's best interest to pay for the improvements needed for lands to annex. Those costs should be borne by the lands being annexed.
- Figure G-7 graphically illustrates the tradeoffs associated with the various sub-alternatives. In general, sub-alternatives that include significant annexation and little water transfers result in higher rates to OID's users.
- In terms of accomplishing many of its goals, the district should balance the amount of annexed lands (or out-of-district sales) and water transfers. These goals can best be met with either Sub-alternative 3C or 3E.

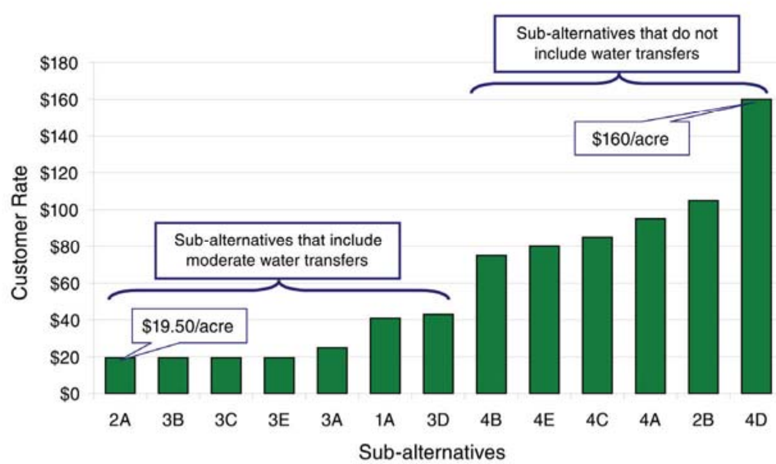


FIGURE G-7
Customer Water Charge by Sub-alternative

TABLE G-6
Financial Evaluation Results and Effect on Customer Water Charge
OID WRP Technical Appendixes

	Expansion into SOI: Annex SOI Lands		Expansion into SOI: Provide Water to SOI Lands via Contract			Firm Water Transfers			Variable Water Transfers			Recaptured Drainwater Transfers			OID Capital Outlays		Customer Water Charge
Alternatives	**Annexation Acreage**	**Buy-in Charge**	**2010 (ac-ft)**	**2030 (ac-ft)**	**Price per ac-ft**	**2010 (ac-ft)**	**2030 (ac-ft)**	**Price per ac-ft**	**2010 (ac-ft)**	**2030 (ac-ft)**	**Price per ac-ft**	**2010 (ac-ft)**	**2030 (ac-ft)**	**Price per ac-ft**	**Recom-mended CIP* (millions)**	**Subsidized Cost of Conveyance Infrastructure to Annexed Lands (millions)**	**Water Charge per Acre (+ 3% per year)**
Alternative 1: Continue Present Practices Finance $94M with an increased irrigation rate																	
Sub-alternative 1A	0	—	0	0	—	30,000	30,000	Existing contracts	11,000	11,000	Existing contracts	0	0	—	$94	—	**$41**
Alternative 2: Maximize Service Improvements within District Boundaries Finance $124M Recapture facilities developed																	
Sub-alternative 2A Finance $124M with water transfer revenue	0	—	0	0	—	30,000	50,000	$140	11,000	17,000	$20	0	30,000	$20	$124	—	**$19.50**
Sub-alternative 2B Finance $124M with an increased irrigation rate	0	—	0	0	—	0	0	—	0	0	—	0	30,000	$20	$124	—	**$105**
Alternative 3: Maximize Service Improvements within District Boundaries and Moderate Expansion of Service within OID's SOI Finance $124M with water transfer revenue Recapture facilities developed																	
Sub-alternative 3A Annexed lands pay for connection costs Annexation buy-in charge is $350/ac	4,250	$350	0	0	—	30,000	50,000	$130	0	0	—	0	30,000	$20	$124	0	**$25**
Sub-alternative 3B Annexed lands pay for connection costs Annexation buy-in charge is $2,600/ac	4,250	$2,600	0	0	—	30,000	50,000	$125	0	0	—	0	30,000	$20	$124	0	**$19.50**
Sub-alternative 3C Annexed lands pay for connection costs Annexation buy-in charge is $1,600/ac	4,250	$1,600	0	0	—	30,000	50,000	$130	0	0	—	0	30,000	$20	$124	0	**$19.50**
Sub-alternative 3D Finance $17M for annexed lands connection costs Annexation buy-in charge is $350/ac	4,250	$350	0	0	—	30,000	50,000	$130	0	0	—	0	30,000	$20	$124	$17	**$43**
Sub-alternative 3E Out-of-district lands in SOI pay for connection costs Out-of-district water sales in SOI at $40/ac-ft	0	—	0	17,000	$40	30,000	50,000	$130	0	0	—	0	30,000	$20	$124	0	**$19.50**
Alternative 4: Maximize Expansion of Service within OID's SOI Finance $124M by increasing irrigation rate Recapture facilities developed																	
Sub-alternative 4A Annexed lands pay for connection costs Annexation buy-in charge is $350/ac	16,750	$350	0	0	—	0	0	—	0	0	—	0	30,000	$20	$124	0	**$95**
Sub-alternative 4B Annexed lands pay for connection costs Annexation buy-in charge is $2,600/ac	16,750	$2,600	0	0	—	0	0	—	0	0	—	0	30,000	$20	$124	0	**$75**
Sub-alternative 4C Annexed lands pay for connection costs Annexation buy-in charge is $1,600/ac	16,750	$1,600	0	0	—	0	0	—	0	0	—	0	30,000	$20	$124	0	**$85**
Sub-alternative 4D Finance $17M for annexed lands connection costs Annexation buy-in charge is $350/ac	16,750	$350	0	0	—	0	0	—	0	0	—	0	30,000	$20	$124	$66	**$160**
Sub-alternative 4E Out-of-district lands in SOI pay for connection costs Out-of-district water sales in SOI at $40/ac-ft	0	—	0	67,000	$40	0	0	—	0	0	—	0	30,000	$20	$124	0	**$80**

* Recommended CIP does not include the Main Canals and Tunnels Improvements Program capital improvement cost.

Evaluation Results

As discussed, key water balance components were determined for each programmatic alternative, and the Financial Model was used to analyze various sub-alternatives for viably supporting each programmatic alternative. Figure G-8 summarizes each programmatic alternative's overall compliance with the WRP goals. Table G-7 provides a more detailed comparison by financial sub-alternative and assigns relative rankings to each.

PROGRAMMATIC ALTERNATIVES	GOALS 1: Provide long-term protection to OID's water rights	2: Address federal, state, and local water challenges	3: Rebuild/modernize outdated system to meet changing customer needs	4: Develop affordable ways to finance improvements	5: Involve the public in the planning process
Alternative 1: Continue Present Practices					
Alternative 2: Maximize Service Improvements within District Boundaries	✔	✔	✔	✔	
Alternative 3: Maximize Service Improvements within District Boundaries, Moderate Expansion of Service within SOI	✔	✔	✔	✔	✔
Alternative 4: Maximize Expansion of Service within OID's SOI	✔	✔	✔		

FIGURE G-8
How Alternatives Comply with the WRP Goals

Alternatives Evaluation Against WRP Goals

Goal 1: Provide Long-Term Protection to OID's Water Rights

Sub-alternative 2B is the least effective alternative in terms of protecting OID's water rights because without transferring excess supplies or expanding service into OID's SOI, 67,000 ac-ft would not be put to beneficial use in most years. This amount of water could be subject to a water rights challenge. Sub-alternative 1A does not include any infrastructure improvements that would reduce surface water outflow from the district. Although existing water transfers (41,000 ac-ft) remain in place under Sub-alternative 1A, full available supplies are not put to beneficial use.

Sub-alternatives 3A through 3E and 4A through 4E are equivalent in terms of protection of water rights because all involve maximum use of the district's available water supplies in all years by either transferring excess water, expanding service, or a combination of both.

Goal 2: Address Federal, State, and Local Water Challenges

This goal will be addressed more completely during the CEQA phase in the Programmatic Environmental Impact Report (PEIR). District outflow management (operations spills and tailwater) are related to discharge water quality issues and vary between WRP alternatives. Sub-alternative 1A is ranked lower than every other sub-alternative because present practices continue. Under present practices, no infrastructure improvements would be implemented to reduce operations spills or improve overall efficiency. Until the PEIR analysis is complete, Alternatives 2, 3, and 4 are rated equivalent because they all share the same characteristics of revised operations, improved distribution system, and development of drainwater recapture facilities, all of which improve district outflow management.

Goal 3: Rebuild/Modernize an Out-of-Date System to Meet Changing Customer Needs

Under Sub-alternative 1A, the district would focus on replacement projects rather than new projects that would improve the system or enhance operations. Rebuilding would occur strictly to keep the existing system operational; therefore, Sub-alternative 1A meets Goal 3 at a minimal level.

All other sub-alternatives are given the highest rating because they all consist of an identical infrastructure plan. This infrastructure plan includes numerous projects that improve overall system efficiency and provide higher levels of customer service necessary to respond to crop changes and customer preferences.

Goal 4: Develop Affordable Ways to Finance Improvements

Every finance option for Alternative 4 (Sub-alternatives 4A though 4E) resulted in a poor rating under Goal 4 because water charges are significantly increased. Sub-alternative 4D did not receive a rating because it does not meet even the minimum affordability criteria for the district, current customers, or future customers. The water charge is increased to a level under Sub-alternative 4D that would likely result in a loss of customers since groundwater is a less expensive option. Sub-alternative 2B also rates low because water charges are significantly increased.

Sub-alternative 2A is favorable financially to both customers and OID because the improved system would be financed entirely by water transfer revenue. Under 1A, the plan remains affordable but rates are increased. Sub-alternative 3B is not favorable because the annexation buy-in fee is likely higher than growers' willingness to pay. Sub-alternative 3D is not favorable to the district because annexation costs would be subsidized by the district's current customer base.

Goal 5: Involve the Public in the Planning Process

Based on public involvement efforts during the development of the WRP, it was learned that OID customers generally want better service and want affordable water. Therefore, Sub-alternative 1A does not rate well, because no infrastructure is implemented to improve service. Although Sub-alternative 2B involves improved service, it does not rate well because water charges are increased significantly to finance the improvements.

TABLE G-7
Programmatic Alternatives and WRP Goals Ranking Matrix
OID WRP Technical Appendixes

Programmatic Alternatives	Water Resources Plan Goals					Ranking
	Provide long-term protection to OID's water rights	Address federal, state and local water challenges	Rebuild/modernize an out-of-date system to meet changing customer needs	Develop affordable ways to finance improvements	Involve the public in the planning process	
Alternative 1: Continue Present Practices Finance $94M with an increased irrigation rate						
Sub-alternative 1A	☆	☆	☆	☆☆	☆	**9**
Alternative 2: Maximize Service Improvements within District Boundaries Finance $124M Recapture facilities developed						
Sub-alternative 2A Finance $124M with water transfer revenue	☆☆☆☆	☆☆☆☆	☆☆☆☆	☆☆☆☆	☆☆	**4**
Sub-alternative 2B Finance $124M with an increased irrigation rate	☆	☆☆☆☆	☆☆☆☆	☆	☆	**8**
Alternative 3: Maximize Service Improvements within District Boundaries and Moderate Expansion of Service within OID's SOI Finance $124M with water transfer revenue Recapture facilities developed						
Sub-alternative 3A Annexed lands pay for connection costs Annexation buy-in charge is $350/ac	☆☆☆☆	☆☆☆☆	☆☆☆☆	☆☆☆	☆☆☆	**2**
Sub-alternative 3B Annexed lands pay for connection costs Annexation buy-in charge is $2,600/ac	☆☆☆☆	☆☆☆☆	☆☆☆☆	☆☆	☆☆☆	**3**
Sub-alternative 3C Annexed lands pay for connection costs Annexation buy-in charge is $1,600/ac	☆☆☆☆	☆☆☆☆	☆☆☆☆	☆☆☆☆	☆☆☆☆	**1**
Sub-alternative 3D Finance $17M for annexed lands connection costs Annexation buy-in charge is $350/ac	☆☆☆☆	☆☆☆☆	☆☆☆☆	☆	☆☆☆	**5**
Sub-alternative 3E Out-of-district lands in SOI pay for connection costs Out-of-district water sales in SOI at $40/ac-ft	☆☆☆☆	☆☆☆☆	☆☆☆☆	☆☆☆☆	☆☆☆☆	**1**
Alternative 4: Maximize Expansion of Service within OID's SOI Finance $124M by increasing irrigation rate Recapture facilities developed						
Sub-alternative 4A Annexed lands pay for connection costs Annexation buy-in charge is $350/ac	☆☆☆☆	☆☆☆☆	☆☆☆☆	☆	☆☆	**6**
Sub-alternative 4B Annexed lands pay for connection costs Annexation buy-in charge is $2,600/ac	☆☆☆☆	☆☆☆☆	☆☆☆☆	☆	☆☆	**6**
Sub-alternative 4C Annexed lands pay for connection costs Annexation buy-in charge is $1,600/ac	☆☆☆☆	☆☆☆☆	☆☆☆☆	☆	☆☆	**6**
Sub-alternative 4D Finance $17M for annexed lands connection costs Annexation buy-in charge is $350/ac	☆☆☆☆	☆☆☆☆	☆☆☆☆	—	☆☆	**7**
Sub-alternative 4E Out-of-district lands in SOI pay for connection costs Out-of-district water sales in SOI at $40/ac-ft	☆☆☆☆	☆☆☆☆	☆☆☆☆	☆	☆☆	**6**

Notes:
☆☆☆☆ = Most completely addresses goal
Sub-alternative rankings are relative

Sub-alternatives 4A through 4E do not rate high because in every case, water charges are significantly higher than other alternatives. However, these sub-alternatives did not garner the lowest rating because they keep water within the SOI (no water transfers), which satisfies a portion of the public.

It should be noted that regarding annexation options, water transfers, and affordability, public acceptance of the alternative depends on one's perspective. Current customers generally want those annexing lands to pay their fair share, while new customers would prefer some level of subsidy from the district. Many in the public want all OID water kept local, but it has been shown that doing so results in higher water charges and little protection of the district's water rights. Sub-Alternatives 3C and 3E were given the highest relative rating because they balance the amount of water transferred with moderate expansion into the SOI. In addition, water charge is not increased (beyond 3 percent annually to keep pace with inflation) under any permutation of the Alternative 3.

The Best Apparent Alternative

Programmatic Alternative 3—Maximize Service Improvements in District Boundaries and Moderate Expansion of Service in OID's SOI—most strongly supports the WRP goals. This is the most balanced of all alternatives, providing for expansion of service while allowing water transfers as necessary to fund required improvements.

The Water Balance Model was used to evaluate key water balance components for the OID system assuming implementation of Alternative 3. The analysis was also based on the projected 2025 land use and average climatic conditions. Lastly, the analysis assumed that 3,000 acres of orchards in the district that are not currently OID customers join OID because of the enhanced level of service associated with Alternative 3 as well as 4,250 acres of new lands (assumed to consist of orchards) served via expansion into the SOI. The results of the 2025 water balance are summarized in Table G-8.

TABLE G-8
Summary of 2025 Average ET Water Balance for OID Service Area

Components	Acre-Feet
Water Supply Sources for Distribution System	
Stanislaus River	
Main Canal Inflows	249,600
River Pumps	800
Groundwater Pumping	9,700
Reclamation	17,800
Total Supply	**277,900**
Conveyance and On-Farm Losses	
Conveyance Loss	
Seepage	22,700
Operational Spills	13,900
On-Farm Loss	
Deep Percolation	28,800

TABLE G-8
Summary of 2025 Average ET Water Balance for OID Service Area

Components	Acre-Feet
Tailwater	35,700
Total Losses	**101,100**
Crop ET and On-Farm Supply	
ET (net of effective precipitation)	181,200
Farm Delivery (all sources)	241,300
Drainwater	
Production (tailwater and spills)	49,600
Non-OID Drainwater	8,200
Reclamation	-17,800
Total Outflow	**40,000**