Water Supply Roadmap – Update

BOARD OF DIRECTORS

January 21, 2025

Overview

- Follow-up on various items raised during January 7 update
- Review and Evaluation of Projects
- Next Steps
  - At a February Board Meeting select project(s) to move to design and engineering review

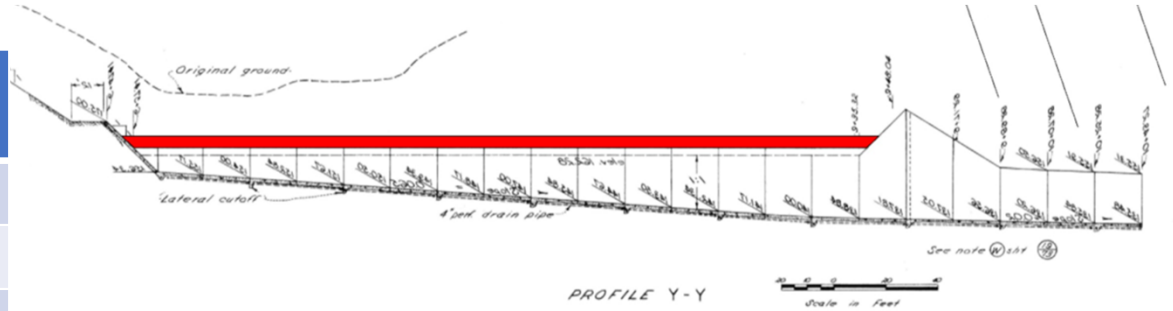
Follow-up on prior discussion items

#	Question or Comment	Response
1	Staff requested to include capital costs as well as dry-year costs per AF in project comparisons.	Done.
2	Staff to present dry-year yield in AFY for all projects including storage.	Done.
3	Staff to review why Nicasio Reservoir was selected as the top site for spillway modifications.	Slides 4-5.
4	Questions were raised as to whether capital costs of desalination projects were reasonable.	Slides 6-8.
5	Question as to potential implementation and permitting challenges for each project alternative.	Slides 9-10.
6	Question as to the range of potential water supply needs over time.	Slides 11-14.

Spillway Modifications

Spillway Modifications

Dam	Freeboard @ Design flood (ft)
Nicasio	6.6
Soulajule	2.7
Kent	3.0
Alpine	2.3



Concept for raised spillway at Nicasio

- Nicasio is unique among District spillways
  - More freeboard
  - Original design contemplated future raise
- Alpine, Kent & Soulajule spillway modifications may still provide incremental benefit and will be examined after Nicasio
- However, yields will be relatively small

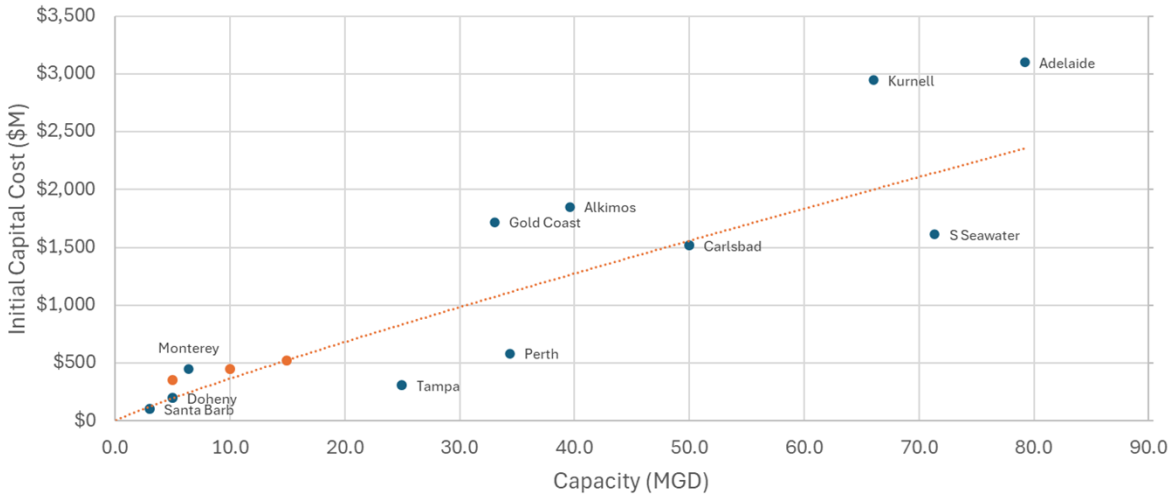
Review of Desalination Costs

Review of 2022 Cost Estimate [10 MGD option]

Items	Cost	Comments
Intake	$10M	Baseline costs are comprehensive, may be low in some areas, but gaps are likely covered by allowances and contingency.
Pretreatment	$36M	
Membrane Filtration	$48M	
Chemical Feed and Storage	$7M	
Residuals Treatment	$17M	
Post Treatment	$15M	
Pipeline to distribution system	$20M	
subtotal	$153M	
Allowances for Sitework, yard piping, electrical (total 41.25 %)	$63.2M	
Contractor Markup (26%)	$57M	
Contingency (30%)	$82M	Estimate is -30% to +50%
Engineering, Construction Management, Engineering Services During Construction, commissioning (28%)	$99M	Fairly standard multipliers.
June 2022 total cost	$454.2	
De-escalation 2022 to 2024	$7.0M	
Grand total in Dec 2024 dollars	$447.2M	This estimate appears reasonable at this stage.

Review of Desal Costs

- Comparison of Projects in USA and AUS
- Current capital cost estimates appear to be consistent with actual or estimated costs of comparative projects



Implementation Challenges

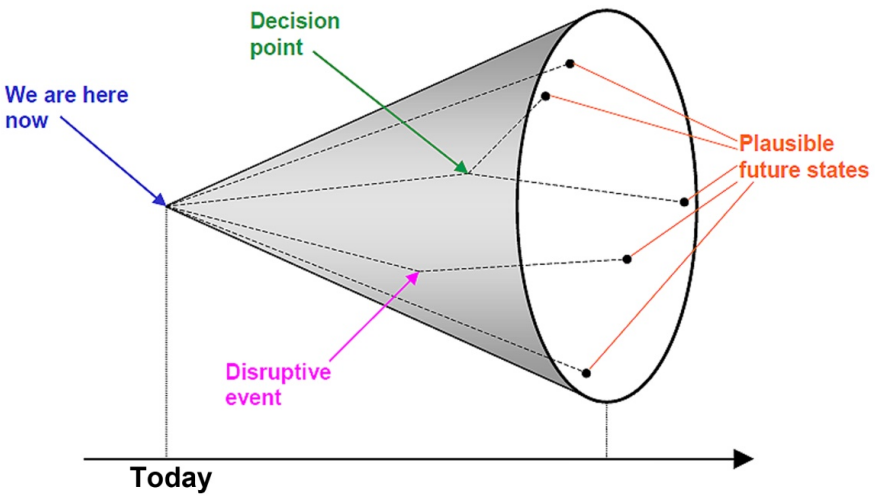
Project Implementation Challenges: External Permitting Agencies

Agency	Water Efficiency	Desal	Recycled Water Pipe	IPR/DPR	Storage	Conveyance
Army Corps of Engineers		✓		?	✓	✓
BCDC		✓		?		
CA-Dept of Fish & Wildlife		✓		?	✓	✓
CA Dept of Drinking Water		✓		✓	✓	✓
CA Dept of Water Resources		✓	✓	✓	✓	
CA State Historic Preservation Office					✓	✓
CA SWRCB				✓	✓	
NOAA		✓				
NMFS		✓			✓	
SF RWQCB					✓	✓
US Coast Guard		✓				
US Fish and Wildlife		✓		✓	✓	✓

Water Supply Deficit

Strategic Water Supply Assessment: Scenarios

- Draft Scenarios – *Explore Uncertainties We Don't Control*



Scenario 1 – Current Trends

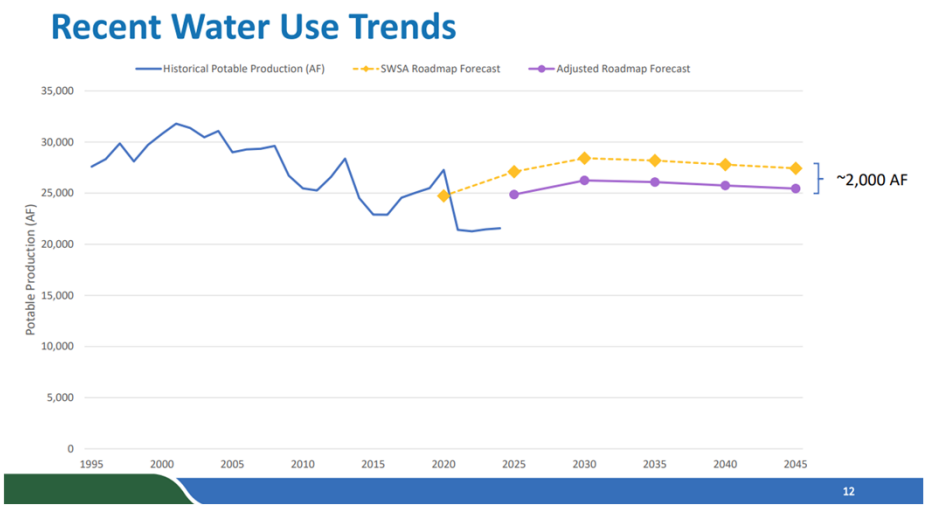
Scenario 2 – Short and Severe Drought

Scenario 3 – Beyond Drought of Record

Scenario 4 – Abrupt Disruptions

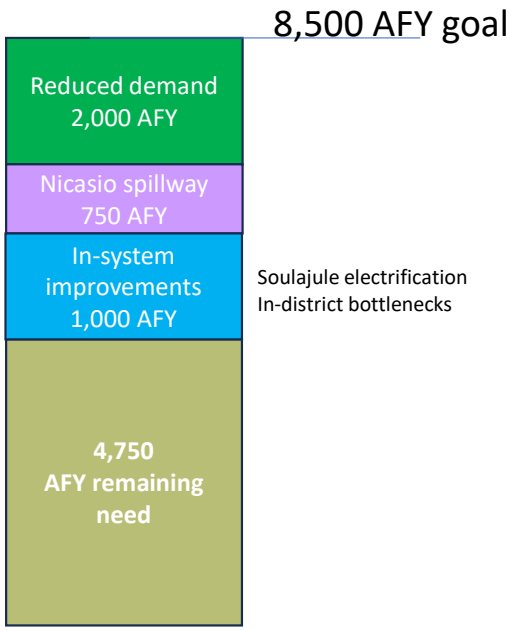
Adjusted Deficit - Demand Review

- Baseline deficit estimated at 8,500 AFY in SWSA
- Current demands are 4 TAFY less than prior forecasts due to sustained water efficiency
- Reflecting uncertain nature of demand forecasting, half of that savings appears to be appropriate
- That approach would reduce total water supply deficit from 8,500 to 6,500 AFY



Slide from September 20, 2024 Operations Committee Meeting

How to Achieve Water Supply Needs with Integrated Approach



Remaining need is approximately 4,750 AFY

Review of Alternatives

Recap of Projects That Have Been Evaluated

Alternative	Dry-year yield (AFY)	Avg Annual cost ($M)	Average $/dry-year AF
Water Efficiency Full Costs incl. AMI	1,700	3.1	**$5,750**
Sewage Agency of Southern Marin	80	0.3	$13,200
San Quentin Prison	120	2.1	$55,750
Peacock Gap	300	0.7	**$7,200**
Direct Potable Reuse (TWA)	3,800	18.4	$15,200
Direct Potable Reuse (RWA)	7,500	34.3	$14,400
Indirect Potable Reuse	7,500	39.8	$16,700
Desalination - 5 MGD	5,300	27.7	$16,300
Desalination - 10 MGD	10,600	40.3	**$11,800**
Desalination - 15 MGD	16,000	51.4	$10,100
Nicasio Spillway Modification	750	0.3	$1,100
Soulajule Dam Raise	5,000	11.8	**$7,400**
Kent Dam Raise	5,000	11.8	**$7,400**
Upper Nicasio Dam Raise	5,000	15.7	$9,800
Peta-3	3,800	7.1	**$5,900**
Peta-4	4,600	9.6	$6,500
Cotati-3	8,100	16.3	$6,250

Screening of Alternatives

Evaluation Criteria

- Water Reliability and Sustainability
- Flexibility and Resiliency
- Schedule and Implementation
- Water Quality
- Environmental Stewardship
- Social Stewardship
- Economic and Financial

Applying the Criteria

Criterion	Information Responsive to the Criterion
Water Reliability and Sustainability	Relative Dry-year yield. Technical risks if any that could impact the project's performance.
Flexibility and Resiliency	Ability to integrate well with Marin Water operations. Flexibility to work well over a range of future scenarios including climate change. Resilience to other future uncertainties including regulatory requirements.
Schedule and Implementation	Timeline to implement the project. Ability to phase implementation. Construction risk, e.g., risk of operational impacts during construction.
Water Quality	Differences, if any, in treated water quality relative to existing conditions. Construction issues that could poses challenges to maintaining WQ of environmental releases.
Environmental Stewardship	Environmental effects in resource areas including aesthetics, agriculture, air quality, biological, cultural, geology, GHG's, hazards, hydrology, land use, minerals, noise, population, and public services.
Social Stewardship	Social impacts including conflicts with established land uses.
Economic and Financial	Capital and operating costs to implement the alternative, and the timing of those costs. Cost-effectiveness of the alternative, e.g., cost per dry-year acre-foot.

Summary of Evaluation so Far

	Reliability & Sustainability	Flexibility & Resiliency	Schedule & Implementation	Water Quality	Environment	Social Steward ship	Economic & Financial
Recycled Water Purple Pipe	• Low volume of water relative to need • 77 AFY – 285 AFY	Low volume of water, no regional benefit	• Readily constructible • Minimal regulatory complexity • Short timeframe for implementation < 5 yr	Water quality suitable for intended uses.	Meets District environmental stewardship objectives	Meets District social stewardship objectives	High cost relative to yield Capital $4.6M - $28.3M
Recycled Water IPR/DPR	Provides up to 4.,000 AFY (IPR), and up to 7,800 AFY (DPR)	• System resilience improved • Reduced flexibility • Increased operational complexity	• Project timeframe > 10 years • Complex and new regulations • Would eliminate desalination as an option • Litigation likely	Source water may create public concerns over water quality.	• Brine discharge • High energy use (although no GHG impact)	Inequity in consumption of water	Fairly high costs relative to yield Capital $155M - $484M
Desalination	Availability of source water is excellent Provides 5,300 AFY – 16,000 AFY based on plant capacity	• Operational flexibility reduced by need to run at all times • System resilience improved • Complexity of operation increased	• Regulatory complexity • Implementation timeframe 5 to 7 years min • Litigation likely	Source water may create public concerns over water quality.	• Brine discharge • High energy use (although no GHG impact) • Concerns for impingement and entrainment of aquatic species	Inequity in consumption of water	• High capital costs • High O&M costs • All new infrastructure that needs frequent and costly cyclic replacement • Capital $350 M - $520M
Local Storage	Up to 5 ,000 AFY in scenario drought	• Low complexity • Increases resilience Increases operational flexibility	Project implementation > 10 years Potential constructability for Kent Litigation Likely	Provides same water quality as existing reservoirs	Environmental mitigation is possible to offset increased size of reservoir	For Soulajule & Upper Nicasio, loss of structures, inundation of farmland used for grazing.	• Capital $485M - $690M • Long lifecycle of project would result in low cost of water in long run • Kent-Soulajule are more viable than Upper Nicasio
Conveyance	3,800- to 8,100 AFY increase in dry year water supply	• Highly flexible and used only when needed • Could have synergies with future storage projects • Regional benefits	• Could be online in as few as 4 years • Phaseable	Provides same water quality as existing SCWA supply	Minimal or no long-term impacts	Pipeline must traverse conservation easement but use appears compatible.	• Costs may be phased • Capital $168M - $405M • PETA-3 is $168M for initial phase

Low	Medium	High
Poor	Good	Best

Reliability and Sustainability

Recycled Water Purple Pipe	Sewage Agency of Southern Marin	80 AFY	Yield of all projects is low.
	San Quentin	120 AFY	
	Peacock Gap	300 AFY	
Recycled Water IPR/DPR	DPR TWA	Up to 4,000 AFY	Availability of source water is good.
	DPR RWA	Up to 7,800 AFY	Availability of source water good but capacity requires verification
	IPR	Up to 7,800 AFY	Relies on existing storage.
Desalination	5 MGD	5,300-16,000 AFY	Availability of source water is excellent
	10 MGD	10,600-16,000 AFY	
	15 MGD	16,000 AFY	
Local Storage	Kent	5,000 AFY	• Availability of source water is good (precipitation dependent) • No dependence on regional infrastructure
	Soulajule	5,000 AFY	
	Upper Nicasio	5,000 AFY	
Conveyance	PETA-3	3,800-8,100 AFY	Availability of source water is good (precipitation dependent)
	PETA-4	4,600-8,100 AFY	
	COTATI-3	8,100 AFY	

Low | Medium | High

- Contribute to dry year supply;
- Improve reliability of the system
- Improve system response to disasters

Remaining need is approximately 4,750 AFY

Flexibility and Resilience

- Increases flexibility for operations
- Improves resilience of system
- Integrates and maximizes regional systems
- Minimizes operational complexity

Recycled Water Purple Pipe	Sewage Agency of Southern Marin	Low volume of water from any of the projects provides minimal benefit to flexibility and resiliency .
	San Quentin	
	Peacock Gap	
Recycled Water IPR/DPR	DPR TWA	• Reduced flexibility since plants would need to be run even when not needed. • Increased operational complexity
	DPR RWA	
	IPR	
Desalination	5 MGD	• Reduced flexibility since plants would need to be run even when not needed. • Resilience is improved. • Increased operational complexity
	10 MGD	
	15 MGD	
Local Storage	Kent	• Operational flexibility is increased. • No increase in operational complexity.
	Soulajule	
	Upper Nicasio	
Conveyance	PETA-3	• Operational flexibility is increased. • Minor increase in operational complexity. • Regional benefits. • Could have synergy with future storage project.
	PETA-4	
	COTATI-3	

Low | Medium | High

Schedule and Implementation

- Timeframe for project implementation
- Regulatory complexity
- Does not preclude future projects
- Constructability

Recycled Water Purple Pipe	Sewage Agency of Southern Marin	Highly constructable, relatively simple regulations and short time frame to implement
	San Quentin	
	Peacock Gap	
Recycled Water IPR/DPR	DPR TWA	• Project timeframe > 10 years • Complex and new regulations • Would eliminate desalination as an option • Litigation likely
	DPR RWA	
	IPR	Project timeframe > 10 years
Desalination	5 MGD	• Regulatory complexity • Implementation timeframe 5 to 7 years min (Doheny in planning since 2002) • Ballot Measure • Litigation likely
	10 MGD	
	15 MGD	
Local Storage	Kent	• Significant constructability challenges • Project implementation > 10 years
	Soulajule	• Litigation likely • Project implementation > 10 years
	Upper Nicasio	Project implementation > 10 years but relatively modest risk of litigation or permitting difficulty
Conveyance	PETA-3	Highly constructable, relatively simple regulations and short time frame to implement
	PETA-4	
	COTATI-3	

Low | Medium | High

Water Quality

How well does project water meet current and future drinking water quality

Recycled Water Purple Pipe	Sewage Agency of Southern Marin	Water quality suitable for intended uses.
	San Quentin	
	Peacock Gap	
Recycled Water IPR/DPR	DPR TWA	Source water may create public concerns over water quality.
	DPR RWA	
	IPR	
Desalination	5 MGD	Source water may create public concerns over water quality.
	10 MGD	
	15 MGD	
Local Storage	Kent	Water quality would be the same as existing reservoirs
	Soulajule	
	Upper Nicasio	
Conveyance	PETA-3	Water quality would be the same as currently received from Russian River
	PETA-4	
	COTATI-3	

Low | Medium | High

Environment

- How well does project meet District commitment to environmental stewardship
- Extent of environmental impacts during construction and operation

Recycled Water Purple Pipe	Sewage Agency of Southern Marin	• Beneficial re-use of water. • No permanent environmental impacts. Temporary disruption to public from construction in public roadway.
	San Quentin	
	Peacock Gap	
Recycled Water IPR/DPR	DPR TWA	DPR/IPR would require reverse osmosis which generates a concentrated brine waste stream that must be disposed of in the bay. Significant energy consumption even in normal and wet years, but no GHG impacts since District purchases deep green power.
	DPR RWA	
	IPR	
Desalination	5 MGD	• Significant energy consumption even in normal and wet years, but no GHG impacts since the District purchases deep green power. • Desalination requires open intake structure that can result in impingement and entrainment of aquatic species and loss of habitat. • Brine waste stream may result in changed conditions for aquatic species
	10 MGD	
	15 MGD	
Local Storage	Kent	• Environmental mitigation is significant due to enlargement of the reservoirs. Impacts during construction are temporary.
	Soulajule	
	Upper Nicasio	
Conveyance	PETA-3	• Construction impacts are temporary disruption to public roadways and private land • No significant long term impacts
	PETA-4	
	COTATI-3	

Low | Medium | High

Social Stewardship

- How well does project meet District commitment to social stewardship
- Extent of disruption to existing land uses

Recycled Water Purple Pipe	Sewage Agency of Southern Marin	Meets District social stewardship objectives
	San Quentin	
	Peacock Gap	
Recycled Water IPR/DPR	DPR TWA	Inequity in consumption of water
	DPR RWA	
	IPR	
Desalination	5 MGD	Inequity in consumption of water
	10 MGD	
	15 MGD	
Local Storage	Kent	Increasing the volume of Soulajule reservoir would inundate grassland currently used for grazing. Loss of this land may disrupt the viability of existing agricultural operations. Increasing the volume of Kent inundates land currently used for recreation.
	Soulajule	
	Upper Nicasio	
Conveyance	PETA-3	Pipeline must traverse conservation easement but appears to be a compatible use.
	PETA-4	
	COTATI-3	

Low | Medium | High

Economic and Financial

- Cost-effectiveness
- Ability to reduce or spread costs by phasing
- Extent to which project qualifies for grants

		Dry-year yield AFY	Initial capital $M	Avg O&M $M	$/dry-year AF	
Recycled Water Purple Pipe	Sewage Agency of Southern Marin	80	$4.6M	$0.1M	$13,200	
	San Quentin	120	$12.2M	$1.6M	$55,750	
	Peacock Gap	300	$28.5M	--	$7,200	Best of the purple-pipes for economics but requires major capital outlay relative to yield
Recycled Water IPR/DPR	DPR TWA	3,800	$155M	$11.6M	$15,200	High capital costs; high operating costs due to need to operate even in non-dry years. Cyclic replacement of equipment.
	DPR RWA	7,500	$463M	$13.8M	$14,400	
	IPR	7,500	$483M	$18.4M	$16,700	
Desalination	5 MGD	5,300	$352M	$12.2M	$16,300	High capital costs; high operating costs due to need to operate even in non-dry years. Cyclic replacement of equipment.
	10 MGD	10,600	$447M	$20.5M	$11,800	
	15 MGD	16,000	$520M	$28.5M	$10,100	
Local Storage	Kent	5,000	$519M	$0.6M	$7,400	Long asset life and low O&M cost help offset high initial cost. Could be a viable candidate for grant funding.
	Soulajule	5,000	$484M	$1.3M	$7,400	
	Upper Nicasio	5,000	$687M	$0.9M	$9,800	Very high capital outlay.
Conveyance	PETA-3	3,800 phase A 8,100 phase B	$168M $405M	$2.9M $6.5M	$5,950 $6,550	Costs may be phased.
	PETA-4	4,600 phase A 8,100 phase B	$229M $401M	$3.6M $6.9M	$6,500 $6,600	
	COTATI-3	8,100	$372M	$6.6M	$6,250	

Low | Medium | High

Overall Summary

	Reliability & Sustainability	Flexibility & Resiliency	Schedule & Implementation	Water Quality	Environment	Social Steward ship	Economic & Financial
Recycled Water Purple Pipe	• Low volume of water relative to need • 77 AFY – 285 AFY	Low volume of water, no regional benefit	• Readily constructible • Minimal regulatory complexity • Short timeframe for implementation < 5 yr	Water quality suitable for intended uses.	Meets District environmental stewardship objectives	Meets District social stewardship objectives	• Capital $4.6M - $28.3M • High cost relative to yield
Recycled Water IPR/DPR	Provides up to 4.,000 AFY (IPR), and up to 7,800 AFY (DPR)	• System resilience improved • Reduced flexibility • Increased operational complexity	• Project timeframe > 10 years • Complex and new regulations • Would eliminate desalination as an option • Litigation likely	Source water may create public concerns over water quality.	• Brine discharge • High energy use (although no GHG impact)	Inequity in consumption of water	Capital $155M - $484M Fairly high costs relative to yield
Desalination	Availability of source water is excellent Provides 5,300 AFY – 16,000 AFY based on plant capacity	• Operational flexibility reduced by need to run at all times • System resilience improved • Complexity of operation increased	• Regulatory complexity • Implementation timeframe 5 to 7 years min • Litigation likely	Source water may create public concerns over water quality.	• Brine discharge • High energy use (although no GHG impact) • Concerns for impingement and entrainment of aquatic species	Inequity in consumption of water	• Capital $350 M - $520M • High O&M costs • All new infrastructure that needs frequent and costly cyclic replacement
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Evaluation Leads to Narrowing of Alternatives

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Desalination 10 MGD	Availability of source water is excellent Provides 10,600 AFY	• Operational flexibility reduced by need to run at all times • System resilience improved • Complexity of operation increased	• Regulatory complexity • Implementation timeframe 5 to 7 years min • Litigation likely	Source water may create public concerns over water quality	• Brine discharge • High energy use (although no GHG impact) • Concerns for impingement and entrainment of aquatic species	Inequity in consumption of water	• High capital costs • High O&M costs • All new infrastructure that needs frequent and costly cyclic replacement • Capital $350 M - $520M
Local Storage Kent	Up to 5 ,000 AFY in scenario drought	• Low complexity • Increases resilience • Increases operational flexibility	• Project implementation > 10 years • Potential constructability concerns, extended construction duration and risk	Provides same water quality as existing reservoirs	Environmental mitigation is possible to offset increased size of reservoir	No impacts to private land	• Capital $519M • Long lifecycle of project would result in low cost of water in long run
Local Storage Soulajule	Up to 5 ,000 AFY in scenario drought	• Low complexity • Increases resilience • Increases operational flexibility	• Project implementation > 10 years • Litigation Likely	Provides same water quality as existing reservoirs.	Environmental mitigation is possible to offset increased size of reservoir	Loss of structures, inundation of farmland used for grazing	• Capital $485M • Long lifecycle of project would result in low cost of water in long run
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Next Steps

Next Steps In Decision Making Process

- Based on Board Discussion, February Update will provide Recommendation on Project(s) to advance to design and environmental review