



Strategic Water Supply Assessment

BOARD WORKSHOP

February 28, 2023



Workshop Agenda: Strategic Water Supply Assessment

- Project Update
- Development of Focused Strategies
- Towards a Recommended Integrated Strategy
- Next Steps

Strategic Water Supply Assessment: Schedule

- December 13 – Draft Strategies and Portfolios
- January 24 – Analysis of Portfolios
- **February 28 – Focused and Integrated Strategies**

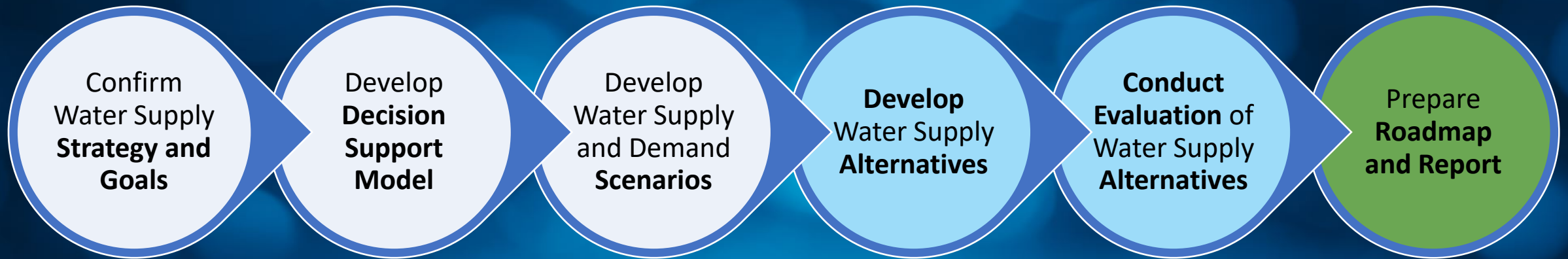
Process for Assessment

Key Project Scope Elements

Understanding Current Risks & Establishing Goals

Identifying & Evaluating Alternatives

Recommendations
& Path Forward



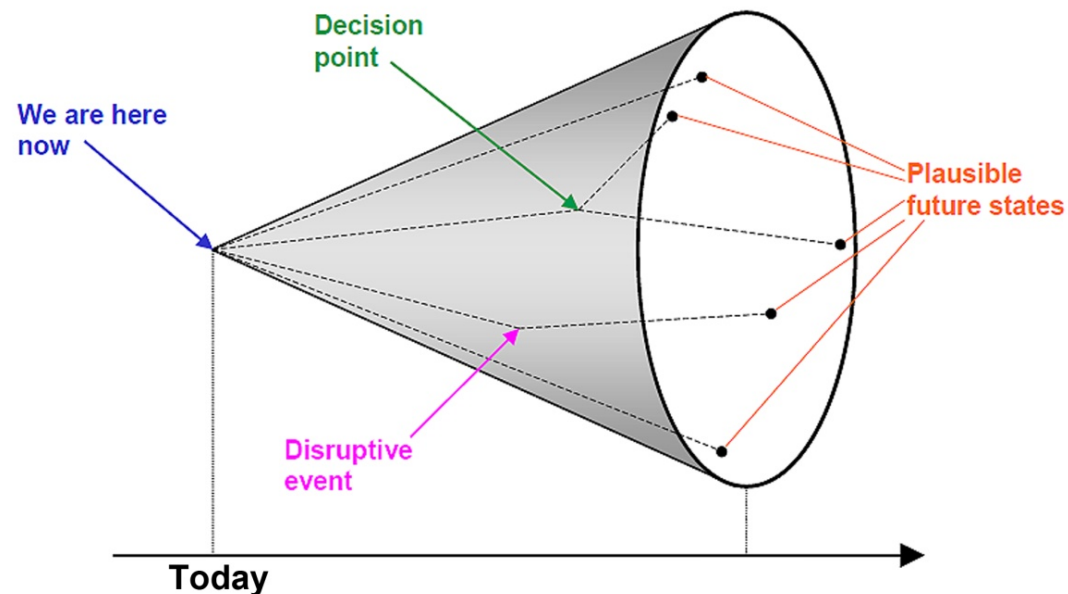

We are here

Strategic Water Supply Assessment: Scenarios

- Scenarios are intended to capture uncertainty that is NOT in management control for this decision
- Water Supply - Hydroclimate
 - Historical
 - Climate projections
 - Paleoclimate reconstructions
 - Synthetic droughts
- Water Demand
 - Recent trends
 - Population growth and land use
 - Passive levels increasing water use efficiency

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

Conservation scenario is now a Water Management Alternative

Draft Scenario Assumptions

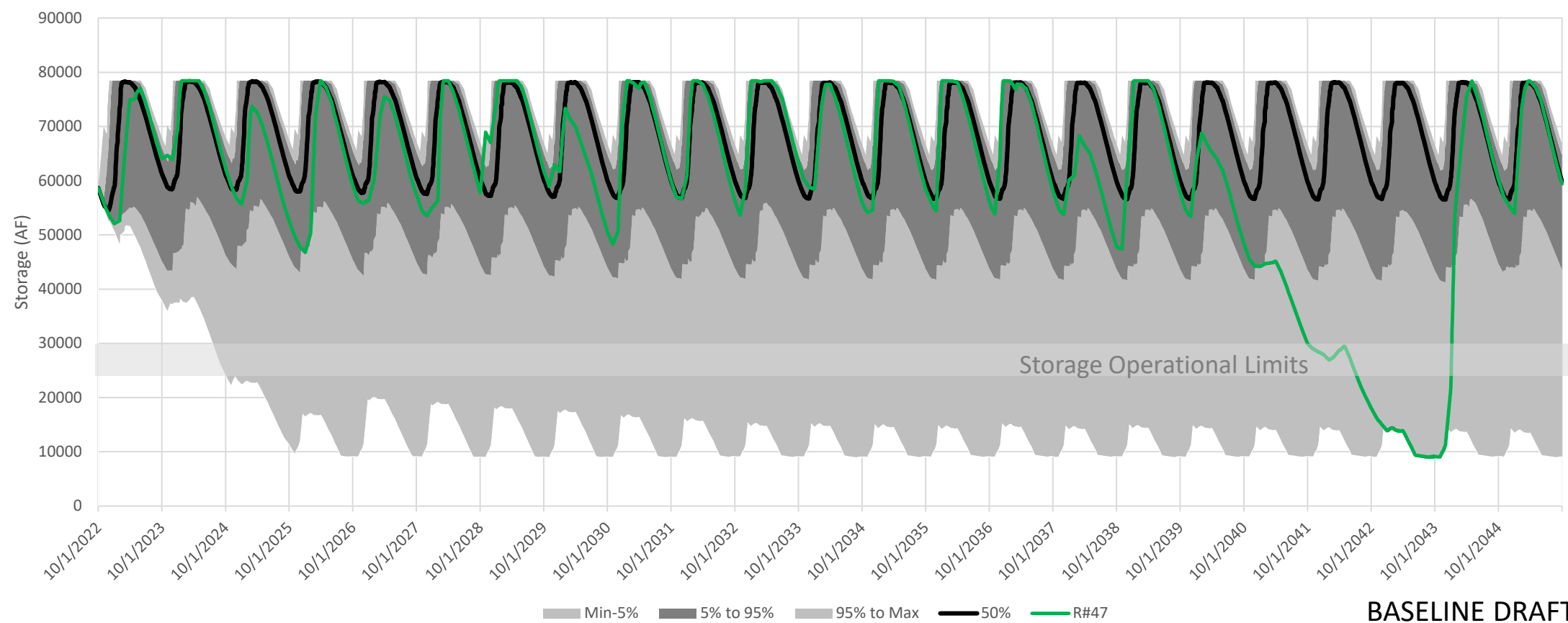
Scenario	Hydroclimate Assumptions	Demand Assumptions	Operational Assumptions
Scenario 1 – Current Trends	Historical observed	Passive-level savings; drought conservation per WSCP	Current operations; local supply preference; supplemental water with Kastania Pump Station rehabilitation
Scenario 2 – Short and Severe Drought	Severe 4-Yr drought (2020, 2021, 1976, 1977)	Passive-level savings; drought conservation per WSCP	Current operations; local supply preference; supplemental water with Kastania Pump Station rehabilitation
Scenario 3 – Beyond Drought of Record	Long-range, extended 6- or 7-Yr drought (based on climate change projections)	Passive-level savings; drought conservation per WSCP	Current operations; local supply preference; supplemental water with Kastania Pump Station rehabilitation
Scenario 4 – Abrupt Disruptions	Severe 2-Yr (2020, 2021) or 4-Yr drought (2020, 2021, 1976, 1977); high wildfire likelihood	Passive-level savings; drought conservation per WSCP	Operational disruptions due to post-wildfire sediment loads; Treatment plants at reduced capacity (Bon Tempe offline & San Geronimo @ 50% operating capacity for 6 months)

Conservation scenario is now a Water Management Alternative

Scenarios Provide Planning Level Estimates of Deficit

Scenario	Max. Deficit Duration	Annual Deficit (AFY)
Scenario 2 – Short and Severe Drought	4 years	7,500 – 8,500 AFY (4 yrs)

Simulated MMWD Total Reservoir Storage, WY 2023-2045, Scenario 2



BASELINE DRAFT RESULTS

Roadmaps

Water Management Alternatives Categories

- Water Management Alternatives considered in 6 main categories
 - Water Conservation
 - Sonoma-Marin Partnerships
 - Local Surface Storage
 - Water Purchases with Conveyance through Bay Interties
 - Desalination
 - Water Reuse

Pursuing Demand Reduction through Water Efficiency



- Incentivized, voluntary program
- Quantifiable programs with calculated water savings
- Participation levels limited to be achievable based on historic data

- Short, medium, long term demand reduction goals maximizing the potential water savings
- Leading edge initiatives
- Incentivized, voluntary program
- May include adaptation of ordinances
- Includes non-quantifiable programs

- Short term, low frequency
- Initially voluntary, progress to mandatory
- Defined short term savings objectives per adopted Shortage Level (WSCP)
- Provides some long-term benefit

SWSA Conservation Element Program Details & Cost

Activity Name (program offer)	Annual Participation	Unit Cost (\$/AF)	Cumulative Water Savings in 2045 (AF)
<i>Actual Drought Response Program Savings</i>			
High Efficiency Toilets	30	\$2,435	6
High Efficiency Clothes Washers	390	\$732	116
Flume Home Water Monitor	2,000	\$442	904
Drought Program Turf Conversion	380,000	\$2,024	780
Drought Program Mulch Madness	47,600	\$3,116	97
Hot Water Recirculating System	150	\$1,677	17
<i>Forecasted Ongoing SWSA Water Conservation Element</i>			
AMI Leak Notifications	1,250	\$287	9,990
Non-Functional Turf Conversion	70,000	\$2,132	4,505
Turf Conversion – Post Drought Programs	100,000	\$1,985	4,282
Pool Cover Rebates	90	\$877	642
Residential Irrigation Controller	100	\$1,035	586
Residential CAP's	500	\$13,763	378
Laundry-to-Landscape System	40	\$4,988	154
Rain Barrel Rebate Program	15,000	\$8,820	58
Program Overhead		\$414	
Total		\$1,792	22,515

Additional Water Efficiency Programs & Activities

- Incentive programs target savings for both indoor & outdoor
- Landscape Plan Review
- Education Program
 - Youth Education in Schools
 - Contractors (builders, landscapers, plumbers)
 - Homeowners
- Outreach Events
 - Local community events
- Local, State, and National Partnerships
 - ie: Master Gardeners, Alliance for Water Efficiency
- Water Waste Prohibitions
 - Follow-up on reported water waste
- Customer Resources
 - ie: Weekly watering schedule

Current Incentive Offers

- High Efficiency Clothes Washers
- High Efficiency Toilets
- Flume devices (*Grant funded*)
- Hot water recirculating systems
- Showerheads, faucet aerators
- Dye tablets for toilet leak detection
- Lawn replacement
- Rain barrels
- WaterSense irrigation controllers
- Laundry-to-landscape graywater kits
- Pool and spa covers
- Hose nozzles

Evaluation Criteria

Criteria	Description	Measurement
Yield	Estimate of new supply or reduced demand option can provide during dry years	AFY 5-pt qualitative scale
Cost	Cost per acre-foot of supply or demand reduction	\$/AFY 5-pt qualitative scale
Timing	Estimate of time required before project could be implemented considering planning, design, permitting, and implementation	Years before alternative could begin operation
Reliability	Reliability of supply during periods of dry year need	5-pt qualitative scale
Flexibility	Degree to which the option could be operated (or implemented) across a wide range of hydrologic conditions by having ability to adjust the magnitude of operation each year to meet required conditions	5-pt qualitative scale
Environmental	Anticipated positive or negative impacts on the natural environment	5-pt qualitative scale
Feasibility	Maturity of the concept and technical ability to implement	5-pt qualitative scale
Energy	Estimated change in energy required to implement and operate	KWH/AF 5-pt qualitative scale
Permitting/Legal	List of permits required and status if option has begun permitting process	5-pt qualitative scale
Social	Description of positive or negative socioeconomic effects	5-pt qualitative scale
Jurisdiction	Primary jurisdiction for implementation	5-pt qualitative scale
Public Acceptance	Anticipated public acceptance	5-pt qualitative scale

Evaluation of Water Management Alternatives

Evaluation Summary of Alternatives

Code	Name	Yield Rating	Cost Rating	Timing Rating	Reliability Rating	Flexibility Rating	Feasibility Rating	Environmental ..	Energy Rating	Permitting/Lega..	Social Rating	Jurisdiction Rat..	Public Acceptan..
DS1A	Marin Regional Desalination Facility- 5 MGD Stand Alone	2	5	4	1	4	2	4	5	5	2	2	3
DS1B	Marin Regional Desalination Facility - 5 MGD Expandable	2	5	4	1	4	2	4	5	5	2	2	3
DS1C	Marin Regional Desalination Facility - 10 MGD Expandable	1	5	4	1	4	2	4	5	5	2	2	3
DS1D	Marin Regional Desalination Facility - 15 MGD	1	5	4	2	4	2	4	5	5	2	2	3
DS2	Containerized Desalination Facility	2	5	3	1	4	3	4	5	5	2	2	3
DS3	Bay Area Regional Desalination Facility	2	5	5	1	4	2	4	4	5	2	3	3
DS4	Petaluma Brackish Groundwater Desalination Facility	2	3	3	3	3	2	3	3	3	2	3	2
LS1A	Soulajule Enlargement	2	3	4	2	4	3	4	1	4	5	4	4
LS1B	Nicasio Enlargement	2	3	4	2	4	3	4	1	4	4	4	4
LS1C	Kent Enlargement	2	3	4	2	4	3	4	1	4	3	4	3
LS2A	Halleck Reservoir	3	5	5	4	5	4	5	1	5	5	5	5
LS2B	Devil's Gulch Reservoir	3	5	5	4	5	4	5	1	5	5	5	5
LS3A	Movable Spillway Gates - Soulajule	5	2	2	2	2	2	2	1	2	2	1	1
LS3B	Movable Spillway Gates - Nicasio	5	2	2	2	2	2	2	1	2	2	1	1
LS3C	Movable Spillway Gates - Kent	5	2	2	2	2	2	2	1	2	2	1	1
LS3D	Movable Spillway Gates - Alpine	5	2	2	2	2	2	2	1	2	2	1	1
LS4	Phoenix Lake - Bon Tempe Lake Connection	5	1	1	1	2	1	2	2	2	2	1	1
LS5	Soulajule Electrification	5	1	1	1	2	1	2	1	2	2	1	1
SM1	Maximize Use of Sonoma Water - Existing Facilities	4	1	1	3	1	1	2	2	1	2	2	1
SM2A	Maximize Use of Sonoma Water - Resolve Bottlenecks	3	3	2	3	1	1	2	2	1	2	2	1
SM2B	Maximize Use of Sonoma Water - Resolve Bottlenecks+South Transmission ..	3	4	3	2	3	1	3	2	2	2	2	1
SM3A	Maximize Use of Sonoma Water - Dedicated Conveyance Stafford to Nicasio	4	4	2	4	2	1	2	2	2	2	2	2
SM3B	Maximize Use of Sonoma Water - Dedicated Conveyance Kastania to Nicasio	2	4	3	2	3	1	3	3	3	3	3	2
SM3C	Maximize Use of Sonoma Water - Dedicated Conveyance Cotati to Soulajule	2	4	3	2	3	1	3	3	3	3	3	2
SM4	Regional Groundwater Bank	4	2	3	3	3	2	2	2	3	2	3	1
WC01	Temporary Urgency Change Permits (TUCPs)	4	1	1	2	1	1	3	1	3	2	4	2
WC02	Water Shortage Contingency Plan (WSCP) - Stage 1-3	1	2	1	2	1	1	1	1	1	2	1	3
WC1	Water Conservation Program	2	2	1	1	1	1	1	1	1	2	1	1
WC2	Regulatory Driven Program	2	5	2	2	1	1	1	1	1	2	1	3
WP1	EBMUD Intertie	2	4	3	4	4	1	3	3	4	3	5	2
WP2	CCWD Intertie	2	5	4	3	4	1	3	3	4	3	4	2
WP3A	NBA Intertie - MMWD	2	5	4	3	4	1	3	3	4	3	4	2
WP3B	NBA Intertie - Sonoma Aqueduct	2	5	4	3	4	1	3	3	4	3	4	2
WP5	SFPUC Intertie	4	5	4	3	4	1	4	2	4	3	4	3
WR1A	Recycled Water Expansion - Peacock Gap	5	5	3	1	3	1	2	2	2	3	1	1
WR1B	Recycled Water Expansion - San Quentin	5	5	3	1	3	1	2	2	2	3	1	1
WR2	Regional Indirect Potable Reuse (IPR)	1	5	5	1	5	4	4	5	4	3	2	4
WR3A	CMSA Direct Potable Reuse (DPR) - Raw Water Augmentation	2	5	5	2	4	5	4	5	5	4	2	5
WR3B	CMSA Direct Potable Reuse (DPR) - Treated Water Augmentation	2	5	5	2	4	5	4	4	5	4	2	5
WR4	Regional Direct Potable Reuse (DPR)	1	5	5	2	5	5	4	5	5	4	2	5

Project Team Developed 3 Potential Strategies

■ **Marin-Sonoma Focused Strategy**

- Emphasizes alternatives that maximize existing local and regional water supplies
- Sonoma-Marín partnerships, local storage optimization, interconnections

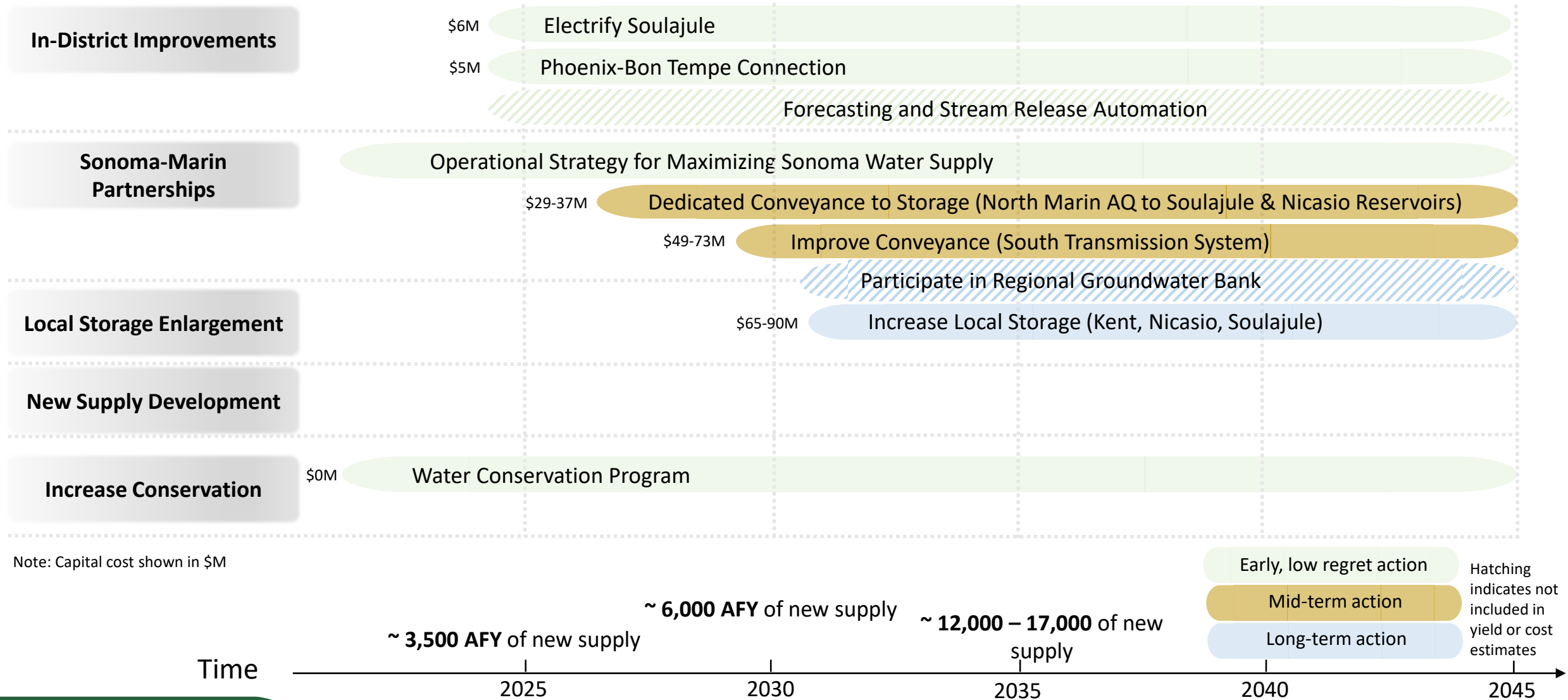
■ **Desalination Focused Strategy**

- Emphasizes alternatives which add new local drought-resilient supplies
- Brackish and Bay desalination

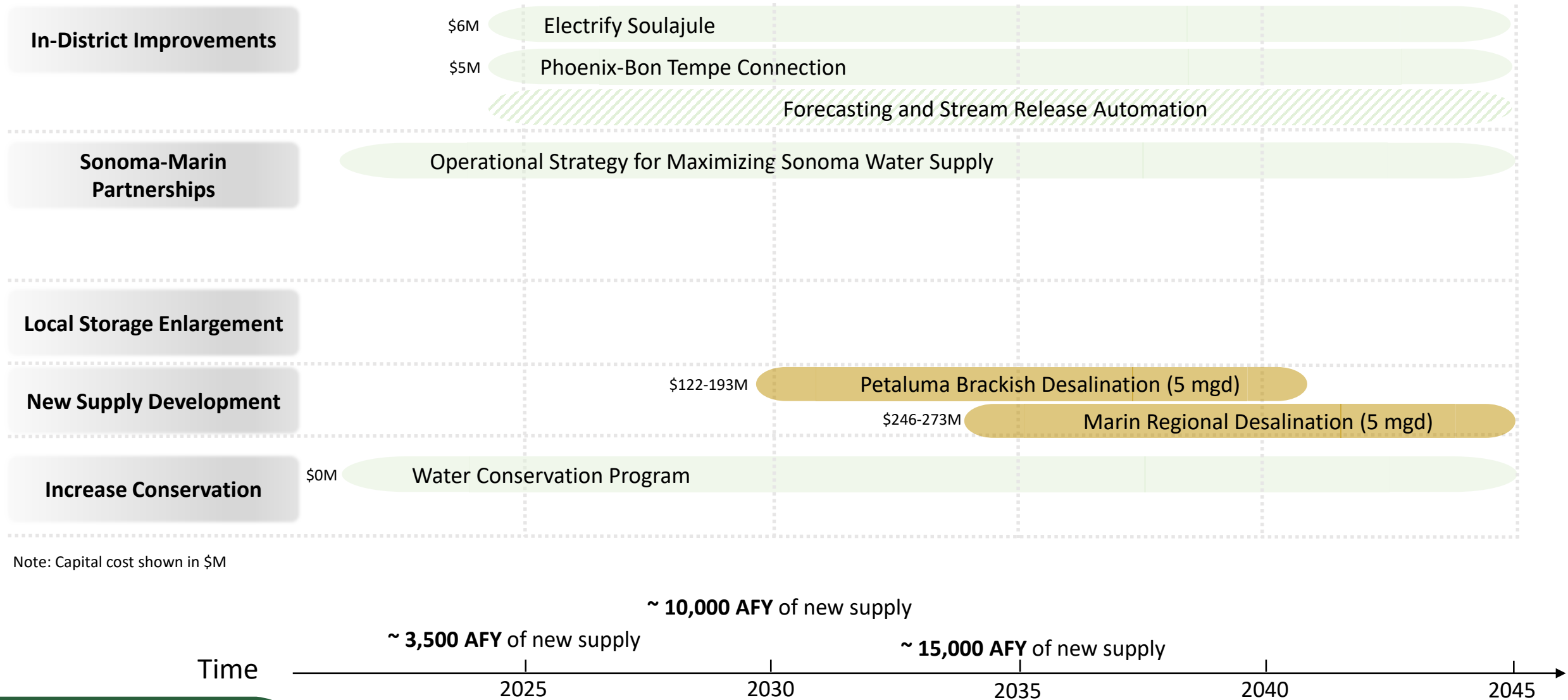
■ **Bay Intertie Focused Strategy**

- Emphasizes alternatives that diversify imported water from different source watersheds
- Water purchases with Bay interties

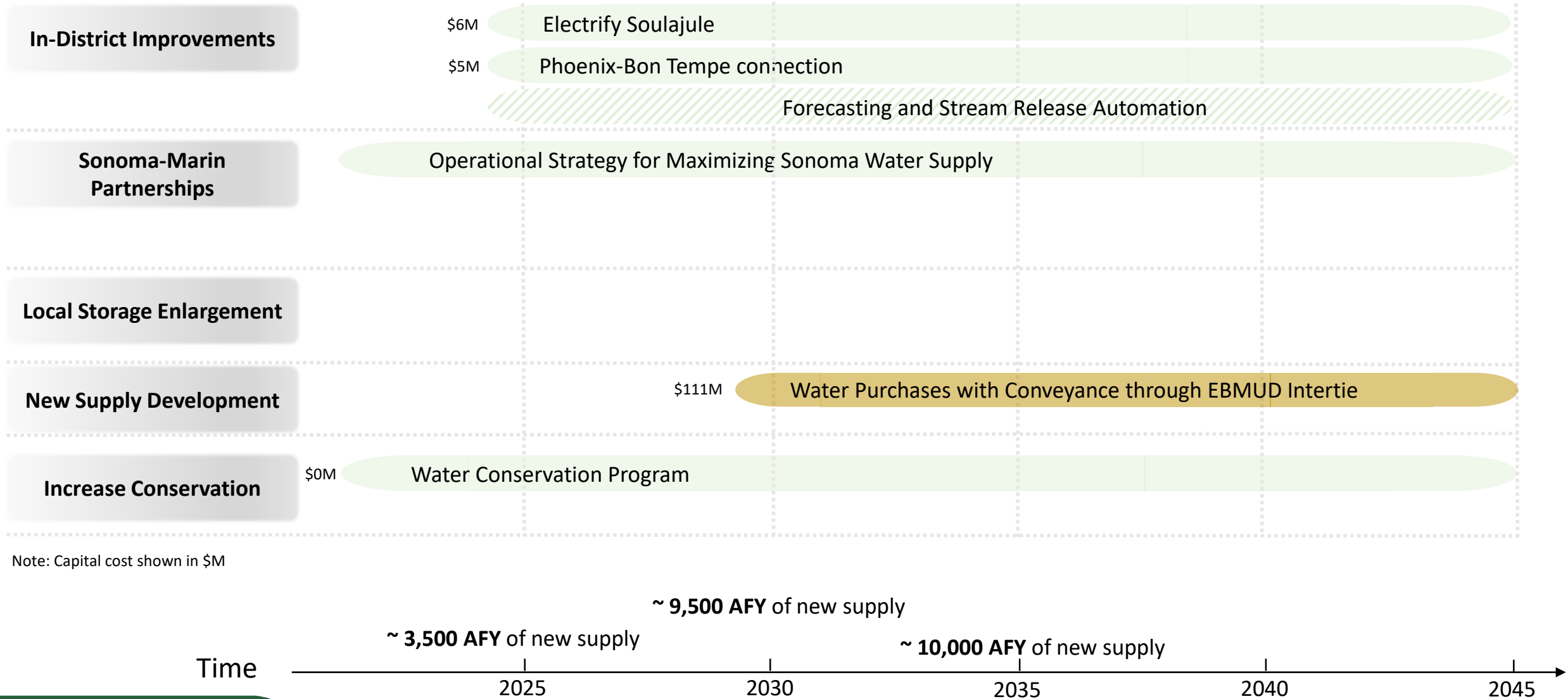
Roadmap for Marin-Sonoma Focused Strategy



Roadmap for Desalination Focused Strategy

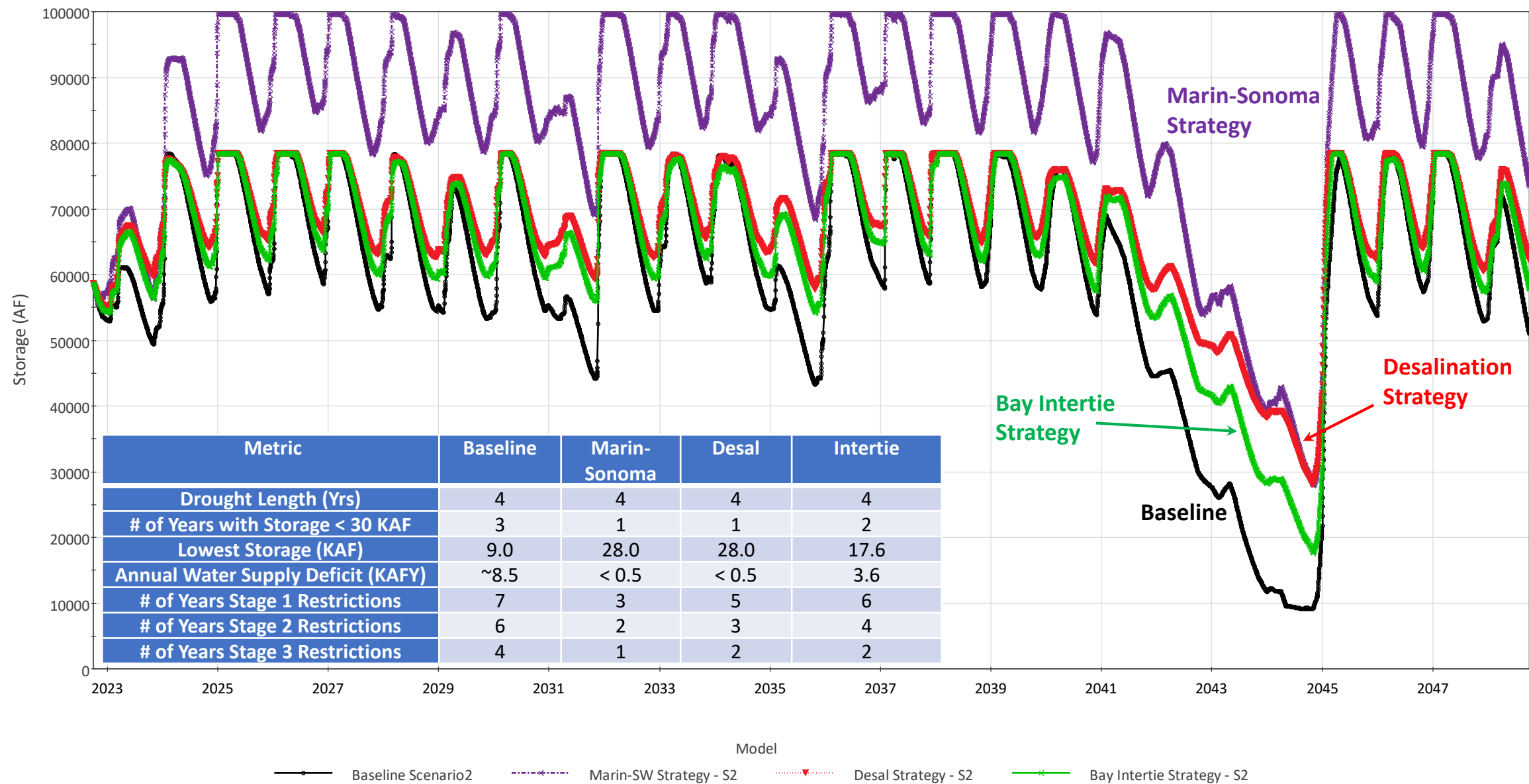


Roadmap for Bay Intertie Focused Strategy



Performance of Strategies

Total MMWD Reservoir Storage (Scenario 2)



Comparison of Strategies

	Marin-Sonoma Focused Strategy	Desalination Focused Strategy	Bay Intertie Focused Strategy
Performance in Achieving Goals	✓✓✓	✓✓✓	✓
Dry Year Yield (AFY)	12,000 - 17,000	15,000	10,000
Cost per AFY (\$)	\$1,900	\$3,000	\$2,200
Annual Cost (\$M)	\$23 - 31M	\$46M	\$22M
Capital Cost (\$M)	\$143 - 291M	\$429M	\$122M
Reliability Rating	M/H	H	L/M
Environmental Rating	M/H	L/M	M
Permitting/Legal Risk	M	L	L/M
Social Rating	M	L/M	M
Jurisdiction Rating	M/H	M/H	L

Comparison of Strategies – Benefits and Challenges

Roadmap	Benefits	Challenges / Risks
Marin-Sonoma Focused Strategy	<ul style="list-style-type: none"> • Achieves performance goals • Builds on existing infrastructure & system • Integrates supply AND storage • Building on regional partnerships • Lower cost 	<ul style="list-style-type: none"> • Limited hydrological diversification • Not fully drought resistant in multi-year extreme drought • Perceived increased competition for Winter Water
Desalination Focused Strategy	<ul style="list-style-type: none"> • Achieves performance goals • Drought-resistant supply • Jurisdiction primarily MMWD • Diversification of supply 	<ul style="list-style-type: none"> • Complex permitting & environmental considerations • High capital and operating cost relative to other options • High energy use / significant increase in carbon footprint • Poorly suited for intermittent operations • Very complex operations that results in discount to design capacity • Ballot process with uncertain outcome
Bay Intertie Focused Strategy	<ul style="list-style-type: none"> • Flexible water purchase for drought conditions • Some level of hydrological diversification • Provides connection to greater Bay Area for water supply and resiliency opportunities 	<ul style="list-style-type: none"> • Complex coordination with up to 6 agencies to obtain water • Need to pursue water transfers in highly competitive environment • Uncertainty of available water in extreme drought • Principles adopted by EBMUD board severely limit use and flexibility of intertie • Only partially achieves performance goals

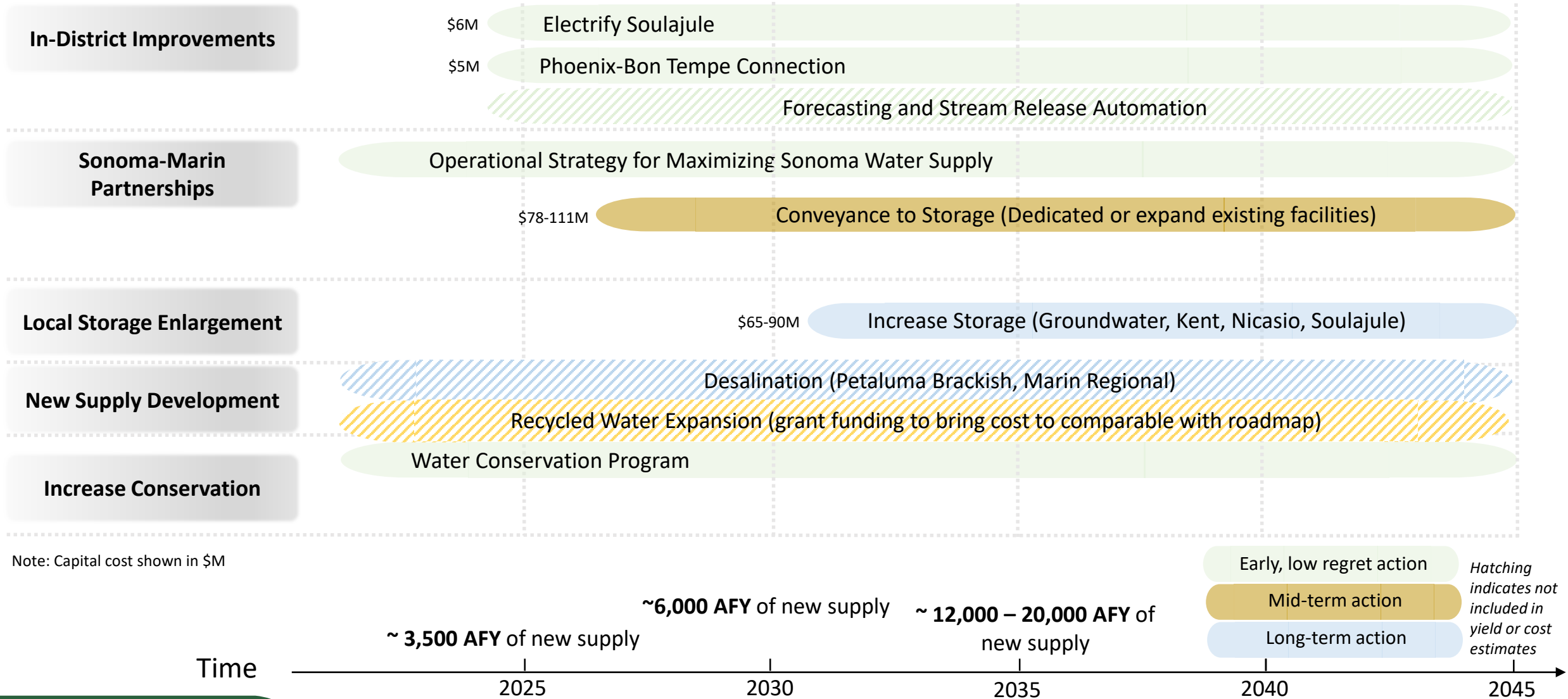
Toward a Recommended Strategy

- Learn from evaluations, analysis, and findings from the past year
- Blend promising elements from various potential strategies for integrated roadmap
- Identify common, low regret actions and flexible options

Main Elements of Integrated Strategy

- **Water Conservation and Flexible Drought Measures**
 - Expand long-term water conservation program
 - Continue implementation of Water Shortage Contingency Plan measures for drought conservation
- **Improve Operability and Flexibility of Storage Facilities**
 - Electrify pump station at Soulajule
 - Connect Phoenix Lake and Bon Tempe Reservoir
 - More strategic implementation of Temporary Urgency Change Permits
 - Forecasting and stream release automation
- **Maximize Use of Sonoma Water Supplies**
 - Operational strategy to maximize take of Sonoma Water supplies
 - Develop dedicated conveyance to storage (Phase 1 – Stafford to Soulajule/Nicasio, Phase 2 – NMAQ to Stafford)
 - Improve conveyance of water to MMWD system (South Transmission System and possible Kastania PS expansion)
- **Increase Local Storage**
 - Develop an additional 20 KAF of storage
 - Possible movable spillway gates at Soulajule and Nicasio
- **Develop New Local Supplies**
 - Petaluma brackish desalination
 - Expand recycled water distribution (with grant cost share)
- **Regional Water Bank**
 - Explore participation in regional groundwater bank

Roadmap for Integrated Strategy



Understanding the Roadmap

Electrify Soulajule

Provides PG&E line power to the pump station so that the lake can be operated more frequently. Estimated yield of 420 AFY. Capital cost estimated \$6M. Cost per AF ~\$1,800.

Phoenix-Bon Tempe Connection

Provides connection from Phoenix Lake to Bon Tempe reservoir. Estimated yield 260 AFY. Capital Cost \$5M. Cost per AF ~ \$1,611.

Forecasting and Stream Release Automation

Improve forecasting capabilities and stream release automation.

Operational Strategy for Maximizing Sonoma Water Supply

Develop operational rules to guide the timing and quantity of water purchased from Sonoma to maximize take of supplemental water in dry years while minimizing risk of reservoirs spills.

Water Conservation Element

Build upon the District's industry-leading conservation program and pursue a variety of identified activities to incentive further water use efficiency.

Understanding the Roadmap Continued

Conveyance to Storage
(Dedicated or expand existing facilities)

Increasing the capacity of existing infrastructure to take supplemental winter water from Sonoma and place in reservoir storage or constructing dedicated conveyance to reservoir storage. Estimated yield is 4,000 – 5,500 AFY. Capital cost \$111-158M. Cost per AFY is ~ \$3000 - 3,150.

Increase Local Storage
(Kent, Nicasio, Soulajule)

Increasing the capacity of local storage by raising one of the dams. Estimated yield is 5,000 AFY. Estimated capital cost is \$90M and cost per AF is ~ \$1,650.

Participate in Regional Groundwater Bank

Pumping existing groundwater from the Santa Rosa Plain aquifer for consumption could create the necessary capacity to store winter water from Sonoma.

Desalination
(Petaluma Brackish, Marin Regional)

Monitor advances in desalination technology, track installation of desalination plants in California and perform feasibility analysis for Petaluma brackish desalination which conceptually could yield 5,000 AFY.

Recycled Water Expansion (grant funding to bring cost to comparable with roadmap)

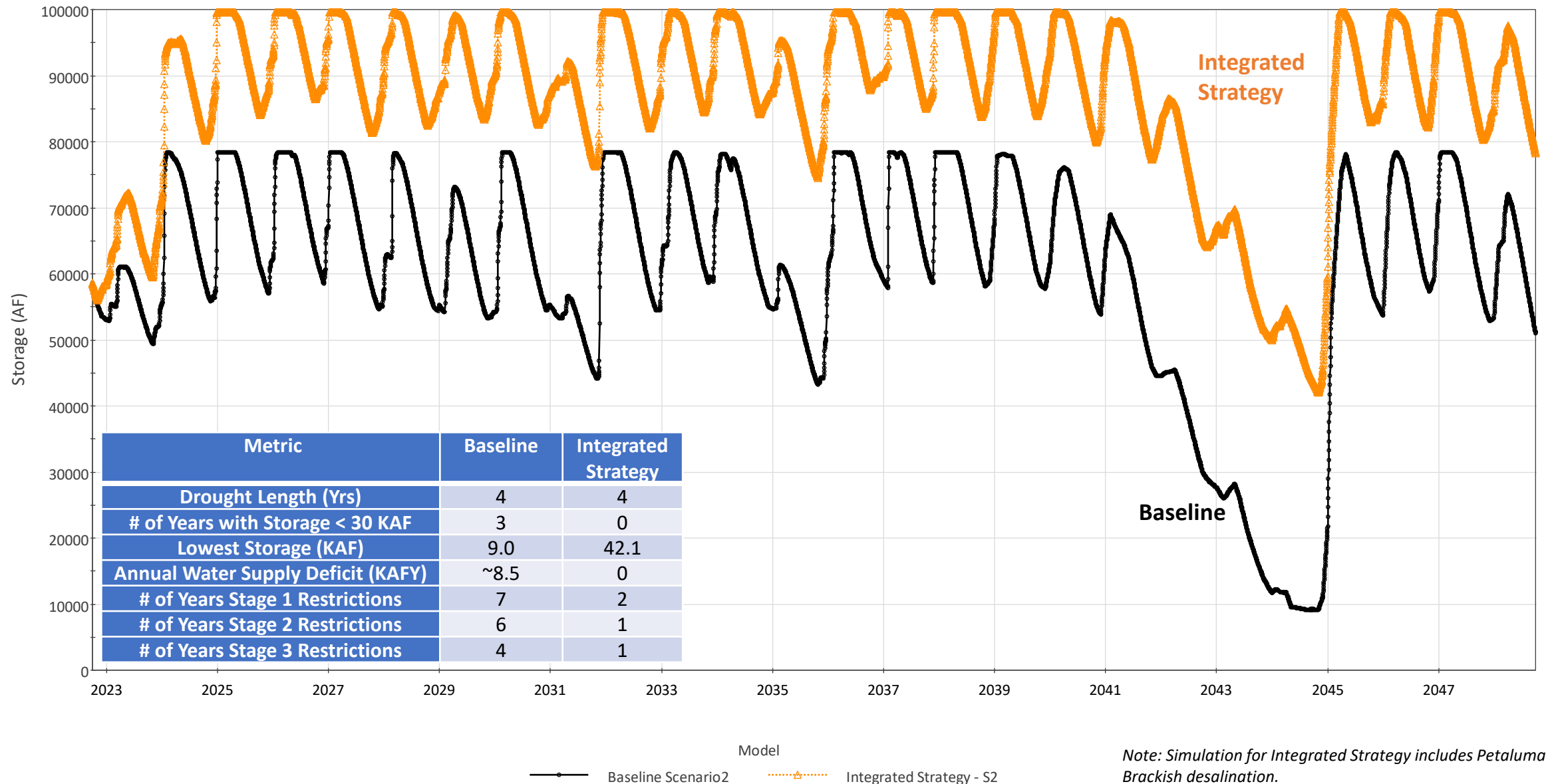
Pursue grant opportunities for recycled water projects to reduce the cost to the average cost per acre foot for the roadmap.

Benefits and Challenges of Integration Strategy

Roadmap	Benefits	Challenges / Risks
Integrated Strategy	<ul style="list-style-type: none"> • High potential yield • Builds on existing infrastructure & system • Integrates supply AND storage • Building on regional partnerships • Increases hydrological diversification • Multiple options for supply (multiple options for conveyance and storage, incorporates recycling and desalination) • Lower cost 	<ul style="list-style-type: none"> • Some elements are not fully drought resistant in multi-year extreme drought • Perceived increased competition for Winter Water
Marin-Sonoma Focused Strategy	<ul style="list-style-type: none"> • Achieves performance goals • Builds on existing infrastructure & system • Integrates supply AND storage • Building on regional partnerships • Lower cost 	<ul style="list-style-type: none"> • Limited hydrological diversification • Not fully drought resistant in multi-year extreme drought • Perceived increased competition for Winter Water
Desalination Focused Strategy	<ul style="list-style-type: none"> • Achieves performance goals • Drought-resistant supply • Jurisdiction primarily MMWD • Diversification of supply 	<ul style="list-style-type: none"> • Complex permitting & environmental considerations • High capital and operating cost relative to other options • High energy use / significant increase in carbon footprint • Poorly suited for intermittent operations • Very complex operations that results in discount to design capacity • Ballot process with uncertain outcome
Bay Intertie Focused Strategy	<ul style="list-style-type: none"> • Flexible water purchase for drought conditions • Some level of hydrological diversification • Provides connection to greater Bay Area for water supply and resiliency opportunities 	<ul style="list-style-type: none"> • Complex coordination with up to 6 agencies to obtain water • Need to pursue water transfers in highly competitive environment • Uncertainty of available water in extreme drought • Principles adopted by EBMUD board severely limit use and flexibility of intertie • Only partially achieves performance goals

Performance of Integrated Strategy

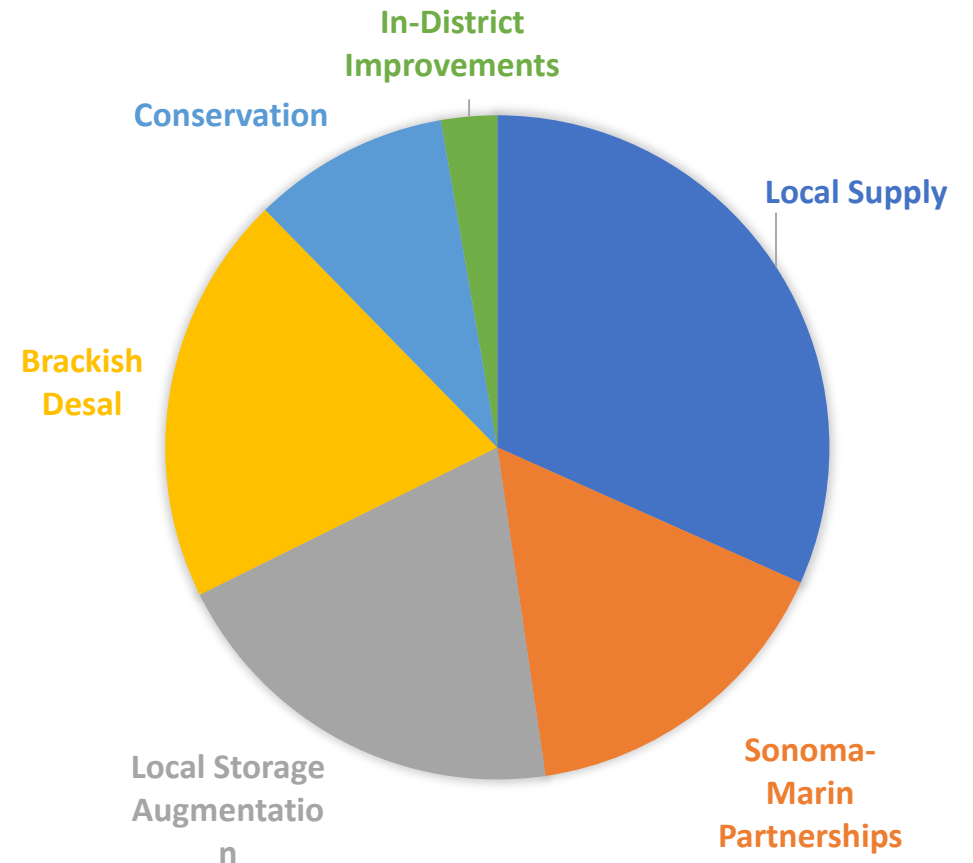
Total MMWD Reservoir Storage (Scenario 2)



Integrated Strategy Leads to Improved Resilience

- District is faced with ample supply in most years, but stressed during extended period of drought
- Future drought frequency and severity are uncertain, but scenarios support assessment of uncertainty by looking at history, using future projections, and using stress tests
- Water management actions available to District provide sufficient capability to address historical and projected future droughts (including stress test droughts)
- A robust portfolio of actions in the Integrated Strategy diversifies drought supplies and significantly increases the District's resilience
- Benefits will occur in non-extended drought years with more durable supply and increased storage
- Implementation will require timely and sustained investments, flexible management of some options, increased collaboration with regional partners, and leveraging of state and federal grant funding

ENHANCING MMWD'S DROUGHT WATER SUPPLY PORTFOLIO



Next Steps

- Final decision-making on roadmap
- Develop implementation plan