MARIN WATER

Strategic Water Supply Assessment

PUBLIC WORKSHOP #3

July 28, 2022

Workshop Agenda: Strategic Water Supply Assessment

- Project overview
- Scenario Review
- Water Management Alternatives
- Next Steps/Schedule
- Q&A

Strategic Water Supply Assessment: Glossary

- AF – Acre foot (1 acre foot= 325,850 gallons)
- AFY – Acre feet per year
- TAF – Thousand acre feet
- AR – Atmospheric River
- GPCD – Gallons per capita per day
- GPHD – Gallons per household per day
- GW – Ground Water
- DPR – Direct Potable Re-use
- IPR – Indirect Potable Re-use
- WTP – Water Treatment Plant
- AWTP – Advanced Water Treatment Plant
- WWTP – Waste Water Treatment Plant
- PS – Pump Station
- Synthetic Drought – hypothetical drought or artificially created
- Trace – line of reservoir storage on a chart
- Paleoclimate – Climate prior to modern observations

Project and Process Overview

Project Overview

The Assessment will address the following questions:

1. What is the current risk to MMWD's water delivery reliability under recent and projected future droughts?

2. How much additional water supply is needed under different future hydrologic drought and demand scenarios?

3. What are the range of water supply alternatives that could increase resiliency of MMWD's system? And what are their strengths and weaknesses?

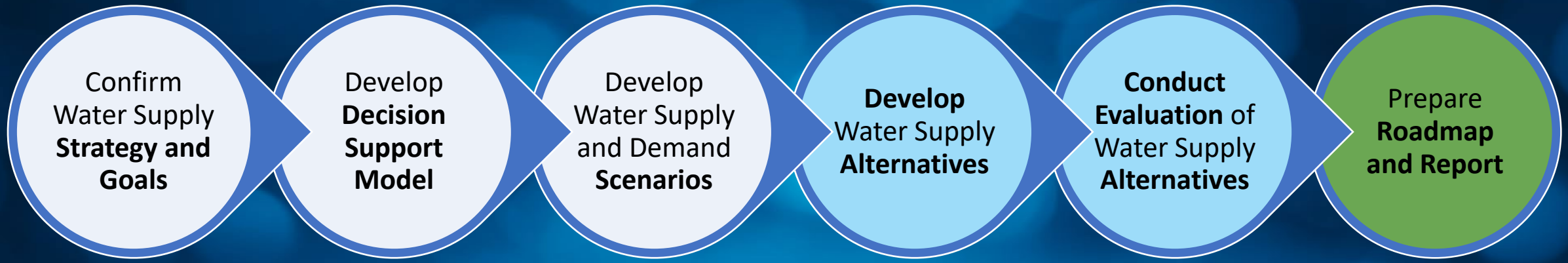
4. What recommendations can be developed to support MMWD's near-term investment in drought resiliency?

Strategic Water Supply Assessment: Key Project Scope Elements

Understanding Current Risks & Establishing Goals

Identifying & Evaluating Alternatives

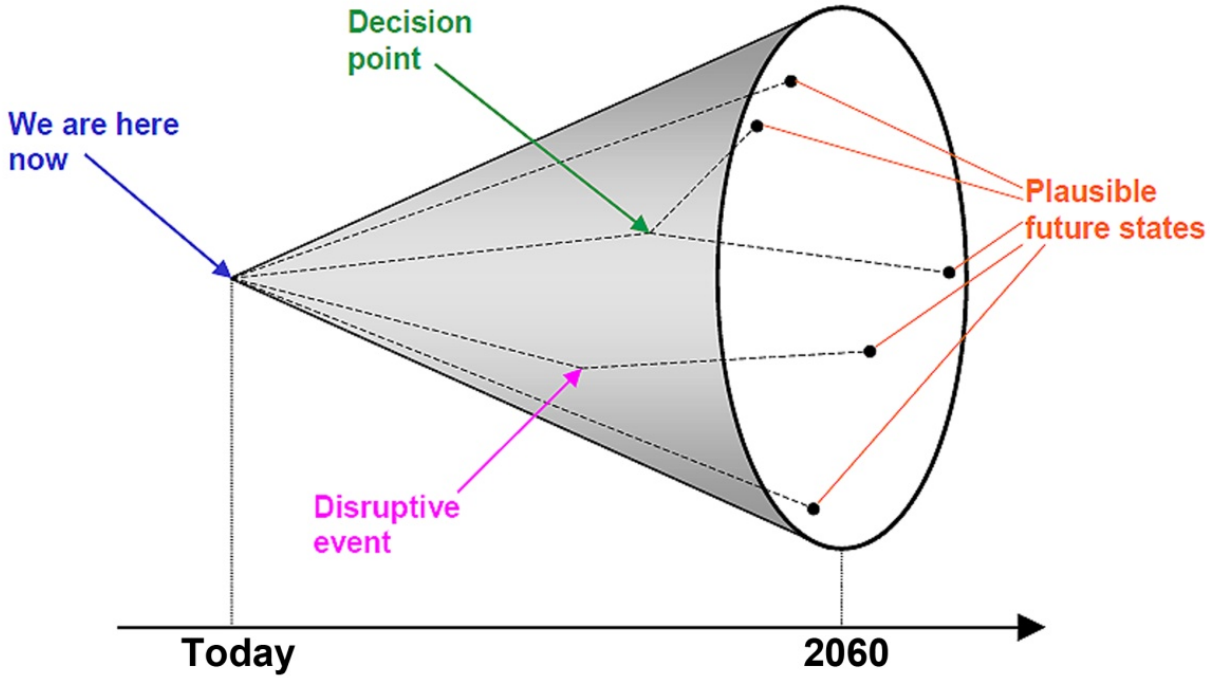
Recommendations & Path Forward



Supply and Demand Scenarios

Water Supply and Demand Scenarios

- Recognizing that future is uncertain
  - Climate change
  - Drought variability
  - Demands
  - Policies and regulations
- Seeking robust solutions
- Scenarios allow us to explore plausible future conditions and identify promising solutions
  - Historical droughts
  - Climate projections
  - Paleo reconstructions
  - Stress tests



Scenarios are alternative views of how the future might unfold. Scenarios are not predictions or forecasts of the future

Strategic Water Supply Assessment: Scenarios

- Draft Scenarios:
  - Represent plausible range of future conditions
  - Utilize demand, existing supply and hydrologic conditions to determine how the water system responds

Scenario 1 – Current Trends

Scenario 2 – Conservation

Scenario 3 – Short and Severe Drought

Scenario 4 – Beyond Drought of Record

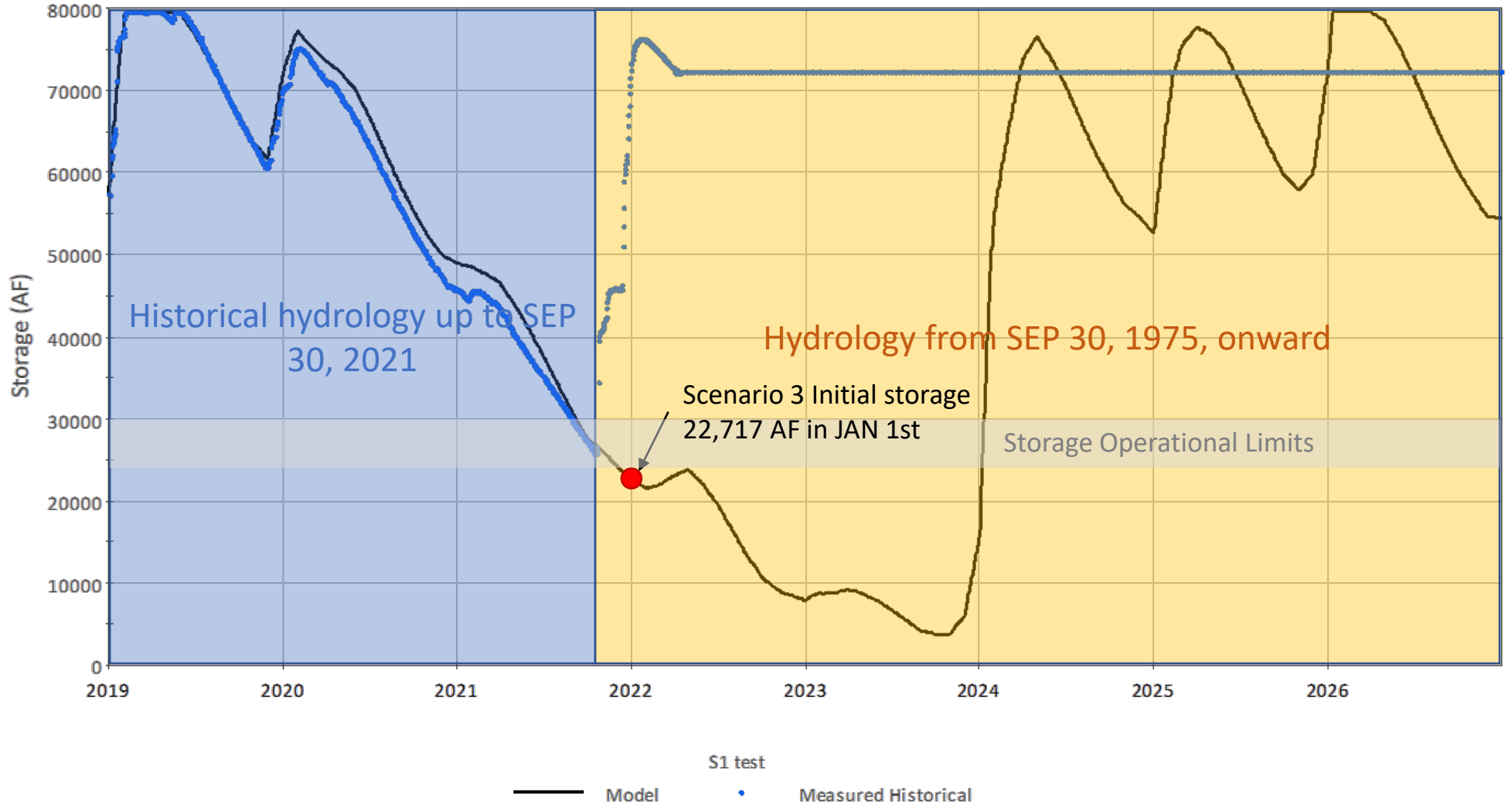
Scenario 5 – Abrupt Disruptions

Draft Scenario Assumptions

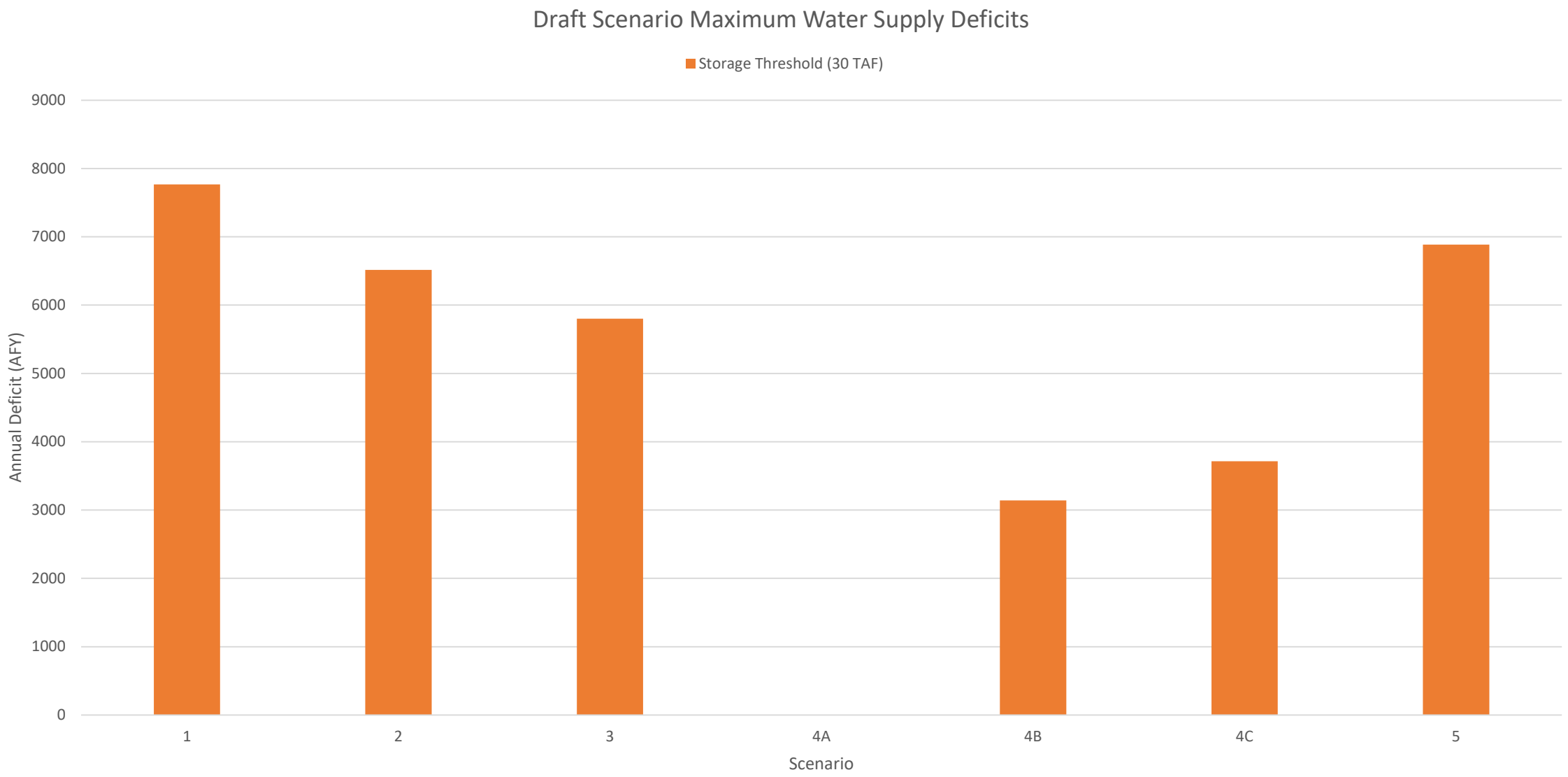
Scenario	Hydroclimate Assumptions	Demand Assumptions	Operational Assumptions
Scenario 1 – Current Trends	Historical observed	Passive-level savings	Current operations; local supply preference; supplemental water with Kastania Pump Station rehabilitation
Scenario 2 – Conservation	Historical observed	Passive plus programmatic savings	Current operations; local supply preference; supplemental water with Kastania Pump Station rehabilitation
Scenario 3 – Short and Severe Drought	Severe 4-Yr drought (2020, 2021, 1976, 1977)	Passive plus programmatic savings	Current operations; local supply preference; supplemental water with Kastania Pump Station rehabilitation
Scenario 4 – Beyond Drought of Record (A, B & C different Global Climate Models used)	Long-range, extended 6- or 7-Yr drought (based on climate change projections)	Passive plus programmatic savings	Current operations; local supply preference; supplemental water with Kastania Pump Station rehabilitation
Scenario 5 – Abrupt Disruptions	Severe 4-Yr drought (2020, 2021, 1976, 1977); high wildfire likelihood	Passive plus programmatic savings	Operational disruptions due to post-wildfire sediment loads; Treatments plants at reduced capacity (Bon Tempe offline & San Geronimo @ 50% operating capacity for 6 months)

Scenario 3 Assumptions

Total MMWD Reservoir Storage – Scenario 3



Draft Potential Supply Deficit



Summary of DRAFT Scenarios

- Scenario findings
  - Scenario 1 drought results in the highest short-term deficit
  - Scenario 2 conservation savings reduces the deficit
  - Scenario 3 with four-year drought results in the highest overall deficit
  - Scenario 4 with extended droughts creates a challenge of *persistence*
  - Scenario 5 with reduced treatment capacity results in *diversification* challenge
- Scenarios and modeling to be refined

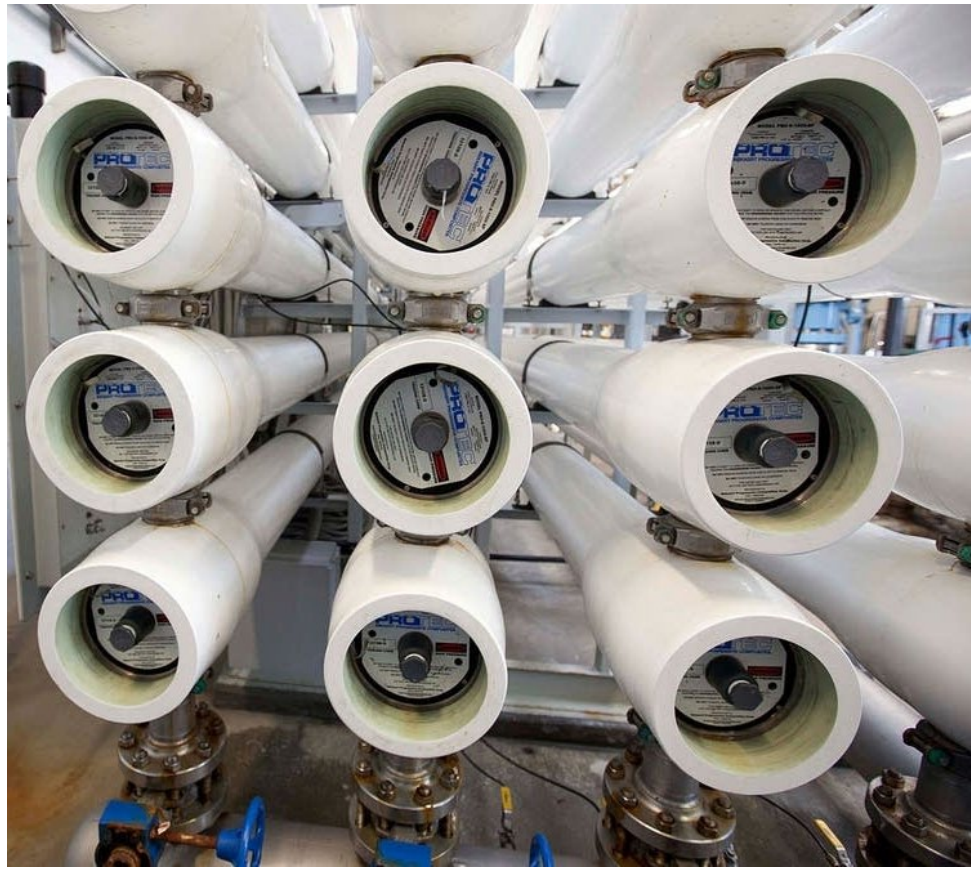
Water Management Alternatives

Water Management Alternatives Considered

- Baseline – Existing water supply system
- Desalination
- Recycled Water
- Local Surface Storage
- Sonoma-Marin Partnerships
- Water Purchases with Conveyance through Bay Interties
- Conservation

Desalination

1. Marin – North Bay Desalination Facility
2. Containerized/Leased Desalination Facility
3. Bay Area Regional Desalination Facility
4. Petaluma Brackish Regional Desalination



Desalination – Considerations

- Ballot Measure – District must seek approval of the voters to finance and construct
- Permitting – Update of CEQA and Environmental Impact Report
- Timeline to complete project
- Operations and Maintenance strategy
- Energy
- Cost

Desalination Options – Refined Draft Cost Estimate Summary

Alternative	Option 1A: Marin Regional Desal Facility-5 mgd	Option 1B: Marin Regional Desal Facility-10 mgd	Option 1C: Marin Regional Desal Facility-15 mgd	Option 2: Containerized Desal Facility-5.4 mgd	Option 3: Bay Area Desal Facility-5 mgd	Option 4: Petaluma Brackish Desal
Capital Cost	$302,133,000	$375,161,000	$436,903,000	$ 113,444,000	$262,297,000	In Progress
Annual O&M Cost	$12,963,000	$21,568,000	$29,869,000	$ 9,369,000	$ 5,887,000	
Total Annualized Cost	$ 28,378,000	$ 40,708,000	$ 52,159,000	$ 34,140,000	$ 19,269,000	
Yield, AFY	5,600	11,200	16,800	6,000	5,600	
Cost per AFY	$ 5,100	$ 3,600	$ 3,100	$ 5,700	$ 3,900	
Total annualized cost based on 30 years for Options 1 and 3, and 5-years for Option 2						

Costs for desalination are being refined

Cost estimates should be considered DRAFT. Updates are likely as evaluation continues to progress.
Typical expected accuracy range for this class estimate (Class 5) is –20 to –50 percent on the low side and +30 to +100 percent on the high side.

Water Reuse

1. Recycled Water – expansion of non-potable reuse system (LGVSD-Peacock Gap; CMSA-San Quentin)
2. Indirect Potable Reuse (IPR) – Advanced treatment, discharge to Kent Lake
3. Environmental releases – Advanced treatment, discharge to Kent Lake release (IPR)
4. Direct Potable reuse (DPR) – Advanced treatment for DPR, CMSA to distribution system, or discharge to Bon Tempe Lake for Bon Tempe WTP intake

Water Reuse – Considerations

- There are no operational surface water augmentation Indirect Potable Reuse or Direct Potable Reuse plants in California
- Trace contaminants present in wastewater are detectable in treated water
- Permitting - discharge of RO brine for IPR/DPR options
- Public Acceptance – education of public will be key to ensuring acceptance
- Energy
- Cost

Water Reuse Options Cost Estimate Summary

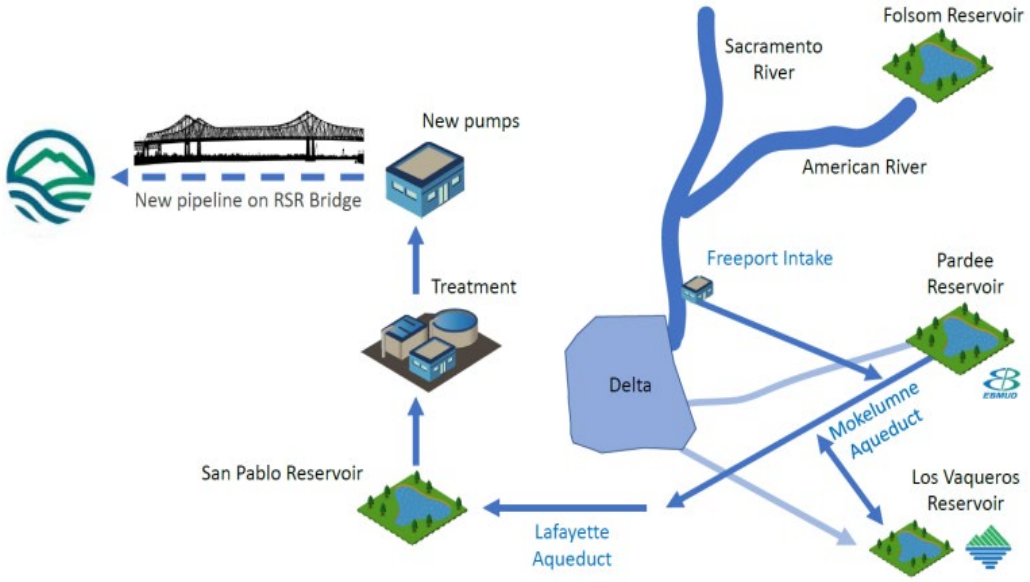
Alternative	Option 1A: Non-Potable CMSA – 0.14 mgd	Option 1B: Non-Potable Peacock Gap 0.15 mgd	Option 2: Regional IPR (In lieu Streamflow 7 mgd)	Option 4A: CMSA DPR (Treated Water Augmentation 4 mgd)	Option 4B: Regional DPR (Raw Water Augmentation 7 mgd)
Capital Cost	$ 10,026,000	$ 14,000,000	$ 451,965,000	$ 124,395,000	$ 433,864,000
Annual O&M Cost	$ 136,000	$ 166,000	$ 9,964,000	$ 8,981,000	$ 16,009,000
Total Annualized Cost	$ 648,000	$ 880,000	$ 33,023,000	$ 15,328,000	$ 38,144,000
Yield, AFY	154	166	7840	4480	7840
Cost per AF	**$-**	**$-**	**$-**	**$-**	**$-**

Costs for Reuse options are being refined

** Cost estimates should be considered DRAFT. Updates are likely as evaluation continues to progress. Typical expected accuracy range for this class estimate (Class 5) is –20 to –50 percent on the low side and +30 to +100 percent on the high side. (Updated)

Water Purchases with Conveyance through Bay Interties

- EBMUD Intertie (Sac Valley purchases)
- CCWD Intertie (Sac Valley purchases)
- North Bay Aqueduct Intertie (Sac Valley purchases)
- SFPUC Intertie (Golden Gate Bridge)



Water Purchases - Considerations

- EBMUD wheeling principles limited to emergency operation, and other constraints
- Develop conveyance through multiple jurisdictions
- Alternative to connect to CCWD, rather than EBMUD increases cost
- Significant permitting requirements
- Yield uncertainty in drought
- Cost

Water Purchases through Bay Intertie Options Cost Estimate Summary

Alternative	EBMUD Intertie	CCWD Intertie	North Bay Aqueduct Intertie Option 1*	North Bay Aqueduct Intertie Option 2*	SFPUC Intertie (In progress)
Capital Cost	$111,350,000	$280,434,266	$225,443,094	$289,416,219	
Annual O&M Cost	$14,202,000	$11,457,000	$6,365,000	$6,365,000	
Total Annualized Cost	$19,883,000	$25,765,000	$17,867,000	$21,131,000	
Yield, AFY	TBD	TBD	TBD	TBD	
Cost per AFY	**$-**	**$-**	**$-**	**$-**	

Yield for intertie options are being developed
*Treatment cost not included

** Cost estimates should be considered DRAFT. Updates are likely as evaluation continues to progress. Typical expected accuracy range for this class estimate (Class 5) is –20 to –50 percent on the low side and +30 to +100 percent on the high side.

Local Storage Augmentation

1. Raising Soulajule Dam
2. Dredging Nicasio Lake
3. Adjustable Spillways

Source: Salix "Expert desilting or dredging of ponds, lakes, a
(http://www.salixrw.com/techniques/lake-desilting/)

Figure 10-2
Stafford Lake Main Spillway Movable Notch Gate

Local Storage Augmentation - Considerations

- Dam adequacy and structural integrity –
- New inundated areas – land ownership and impacts to land use
- Permitting:
  - Division of Safety of Dams
  - Water rights
- Environmental

Local Storage Options Cost Estimate Summary

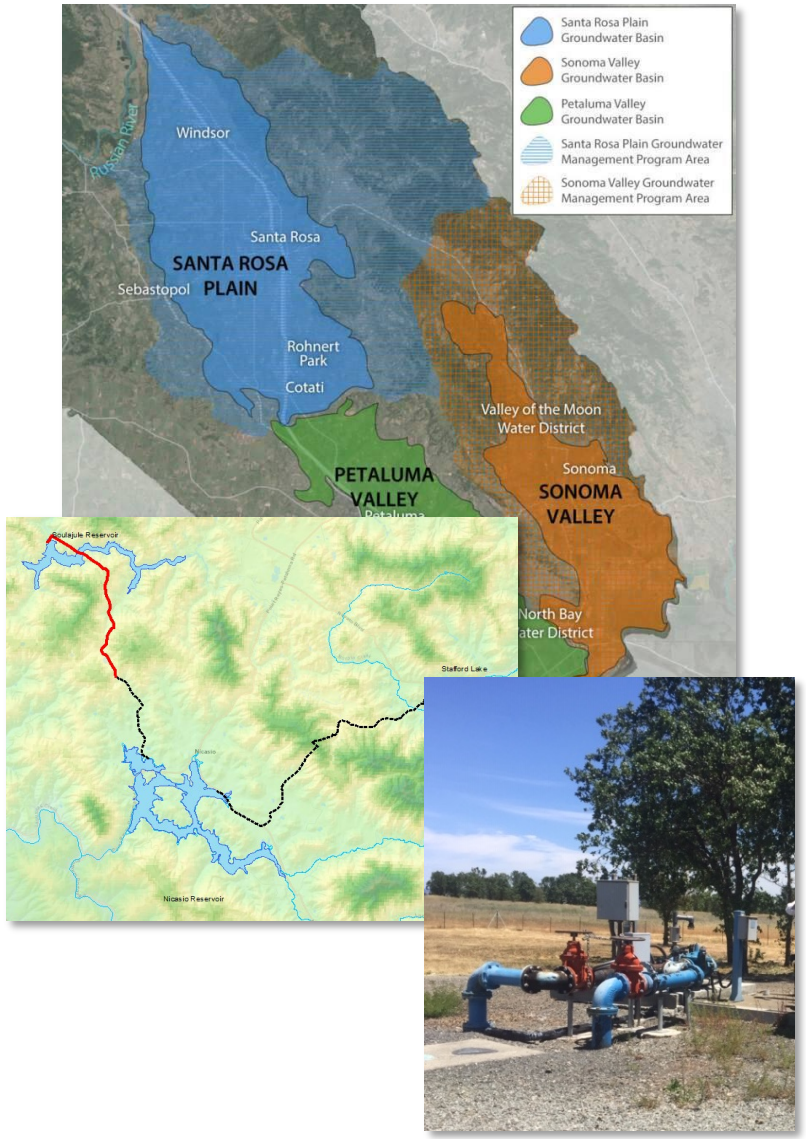
Alternative	Option 1: Raising Soulajule	Option 2: Dredging Nicasio	Option 3: Movable Spillway Gates
Capital Cost	$98,400,000	$132,000,000	$80,000,000
Annual O&M Cost	$3,320,000	$0	$1,000,000
Total Annualized Cost	$13,350,000	$19,468,000	$6,393,000
Yield, AFY	TBD	TBD	TBD
Cost per AFY	**$2,300**	**$64,900**	**$-**

Yield for local storage options is being refined

** Cost estimates should be considered DRAFT. Updates are likely as evaluation continues to progress. Typical expected accuracy range for this class estimate (Class 5) is –20 to –50 percent on the low side and +30 to +100 percent on the high side.

Sonoma-Marin Partnerships

1. Maximize Use of Sonoma Water in Winter
2. Develop Dedicated Conveyance to Soulajule or Nicasio Reservoirs
3. Groundwater Well Rehabilitation
4. Regional Groundwater Bank



Sonoma Marin Partnerships - Considerations

- Groundwater Banking –
  - Groundwater Sustainability Agencies (GSAs) developing Plans
  - Alignment with benefits for overlying pumpers
  - Exchange agreements and accounting systems
- Purchase of water and conveyance to reservoirs will likely result in reservoirs spilling some years

Sonoma-Marin Partnership Options Cost Estimate Summary

Alternative	Option 1: Maximize Use of Winter Water	Option 2: Dedicated Conveyance to MMWD Reservoirs	Option 3: Sonoma Water Well Rehabilitation	Option 4: Regional Groundwater Bank
Capital Cost		$139,000,000	$7,000,000	$20,000,000
Annual O&M Cost	$8,000,000	$-	$2,600,000	$3,900,000
Total Annualized Cost	$8,000,000	$20,400,000	$2,957,000	$4,920,000
Yield, AFY	5000	8000	TBD	TBD
Cost per AFY	**$1,600**	**$3,400**	**$-**	**$-**

Yield for Well rehabilitation and GW Bank are being developed

** Cost estimates should be considered DRAFT. Updates are likely as evaluation continues to progress. Typical expected accuracy range for this class estimate (Class 5) is –20 to –50 percent on the low side and +30 to +100 percent on the high side.

Status and Next Steps

Work in Progress

- Refinement of Water Management Alternatives yield and cost
- Additional review and consideration of Conservation as a water management alternative
- Detailed evaluation criteria

Schedule

- Proposed Upcoming Board Discussion Focus Areas
  - August 2 – Conservation as water management alternative
  - September 13 – Marin Sonoma Partnerships detailed review & Review of Water Management Alternatives
  - September 27 – TBD
  - October 18 – TBD
- Public Meetings
  - September/October TBD - Public Workshop #4

Attendee Questions & Comments

Instructions for indicating you have a question/comment

If watching from a computer or smart device:

- Use the **raise hand**  **feature** in Zoom

If listening from a phone:

- Dial ***9** to let the Zoom host know your hand is raised