



Supplemental Water Supply Options

Board Retreat

October 15th, 2021



Overview

- Short Term
- Long Term
- Detailed Review of Supplemental Supply Options
- Regional Opportunities
- Next Steps

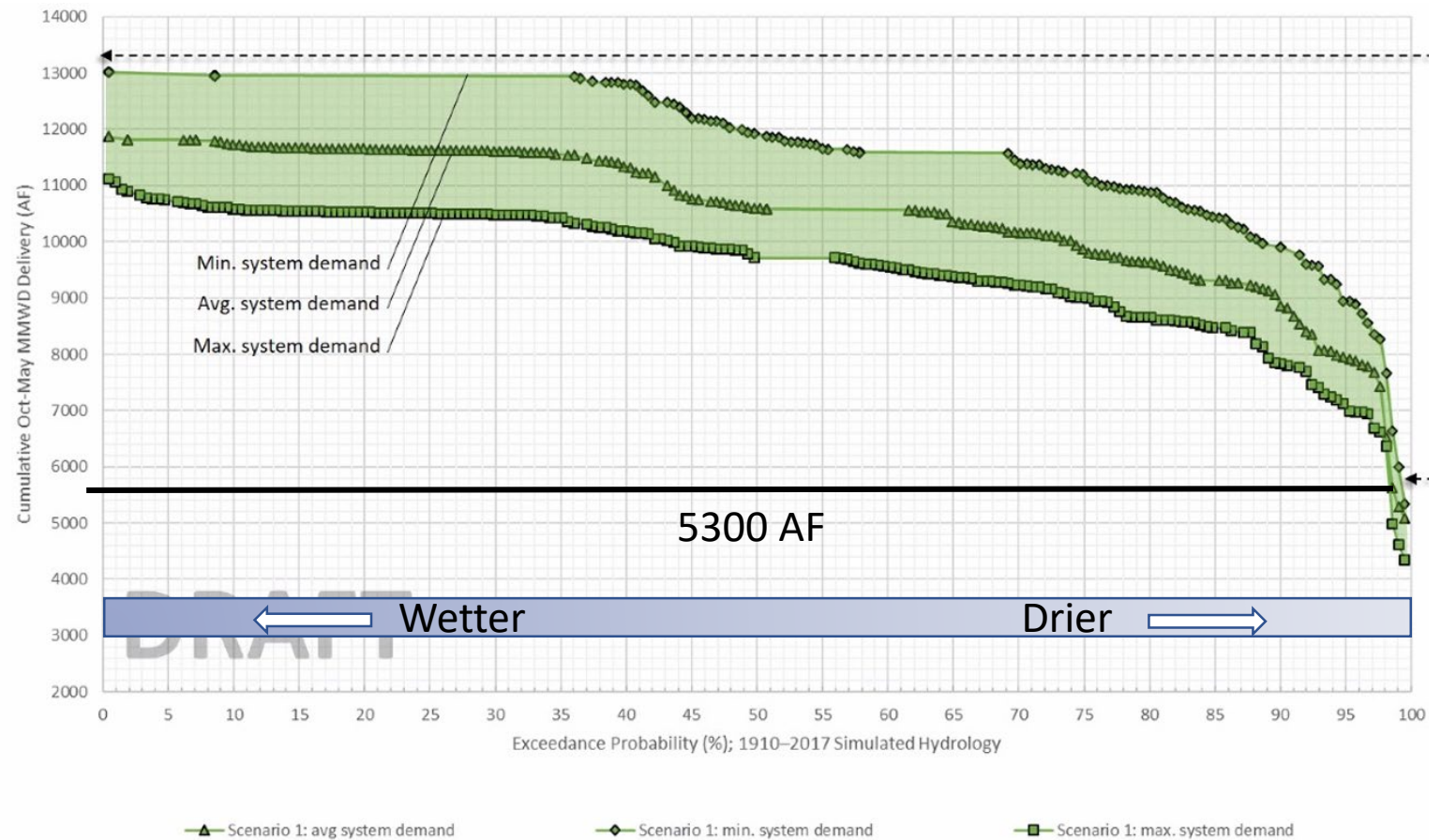
Short Term Options

✓ Conservation

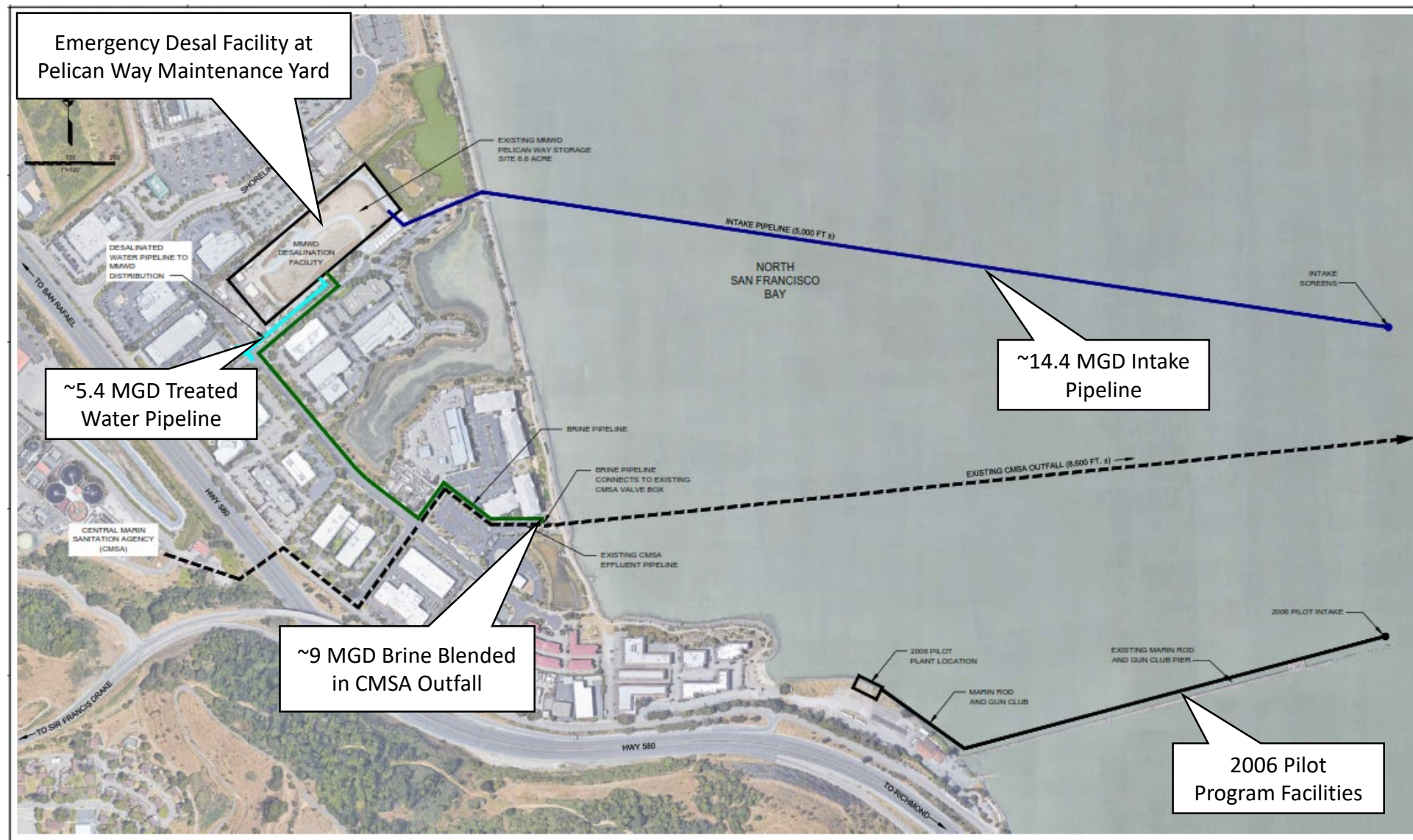
- Sonoma Winter Water & Ground Water Recharge
- Desalination
- Intertie Project

Sonoma Winter Water

- Intriguing new concept developed by Sonoma Water – excess stream flow Oct - May
- Analysis by Sonoma found opportunities ranging from ~6TAF to 2TAF depending on rainfall
- Next Steps:
 - Regulatory approval
 - Contractor discussions over allocation of water
 - Plan to pursue



Emergency Desalination Project



Emergency Desalination

- Intake – 30-inch HDPE pipe laying on bay floor to 2 intake screens with 1-mm openings mounted to concrete blocks.
 - National Marine Fisheries, US Fish and Wildlife, California Dept of Fish & Wildlife, Coast Guard, Bay Conservation and Development Commission, Army Corps of Engineers, State Lands Commission
- Brine Discharge – 1/2 mile of 30-inch HDPE buried pipe
 - Regional Water Quality Control Board, Fishery agencies, City of San Rafael and collaboration with Central Marin Sanitation Agency
- Treatment – Skid mounted or containerized systems mounted to concrete pads, piping, electrical and controls to ensure operation
 - State Water Resources Control Board Division of Drinking Water approval of source and final water quality
- Distribution Pump station- Use the same tanks and mobile pump station as for intertie project
- Power – PG&E line power is preferred but generator could be a back up until PG&E installation is complete
 - Bay Air Quality Management District permit to operate generators

Emergency Desalination Project



Emergency Intertie Project Alignment

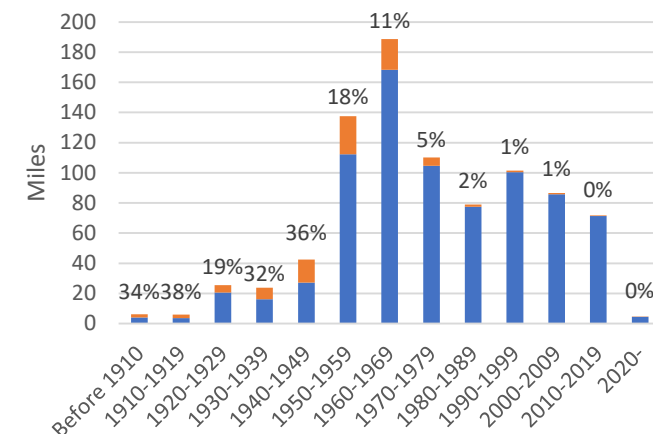
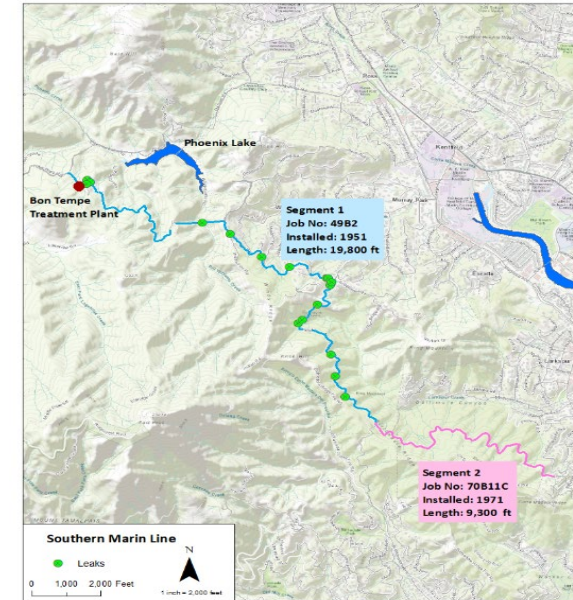


Emergency Intertie Project Update

- ✓ MOU with EBMUD to allow us to conduct engineering studies to finalize approach before developing the wheeling agreement – ***(Board Authorization October 5)***
- ✓ Project Engineering – Technical feasibility established and we are pursuing contract amendment for final design of pipe segment on the bridge – ***(Board Authorization Oct 5).***
- California Environmental Quality Act Notice of Exemption – ***(Board Authorization October 19)***
- Agreement with Contra Costa Water District to allow conveyance, storage and exchange of transfer water – ***(Board Authorization October 19)***
- Pre-purchase agreements for certain long lead items – ***(Board Authorization October 19)***
- Authorization for Purchase of Water – ***(Board Authorization November 2/17)***
- Agreement with East Bay Municipal Utility District – ***(Board Authorization December 14)***

Pre-purchase of Materials - October 19

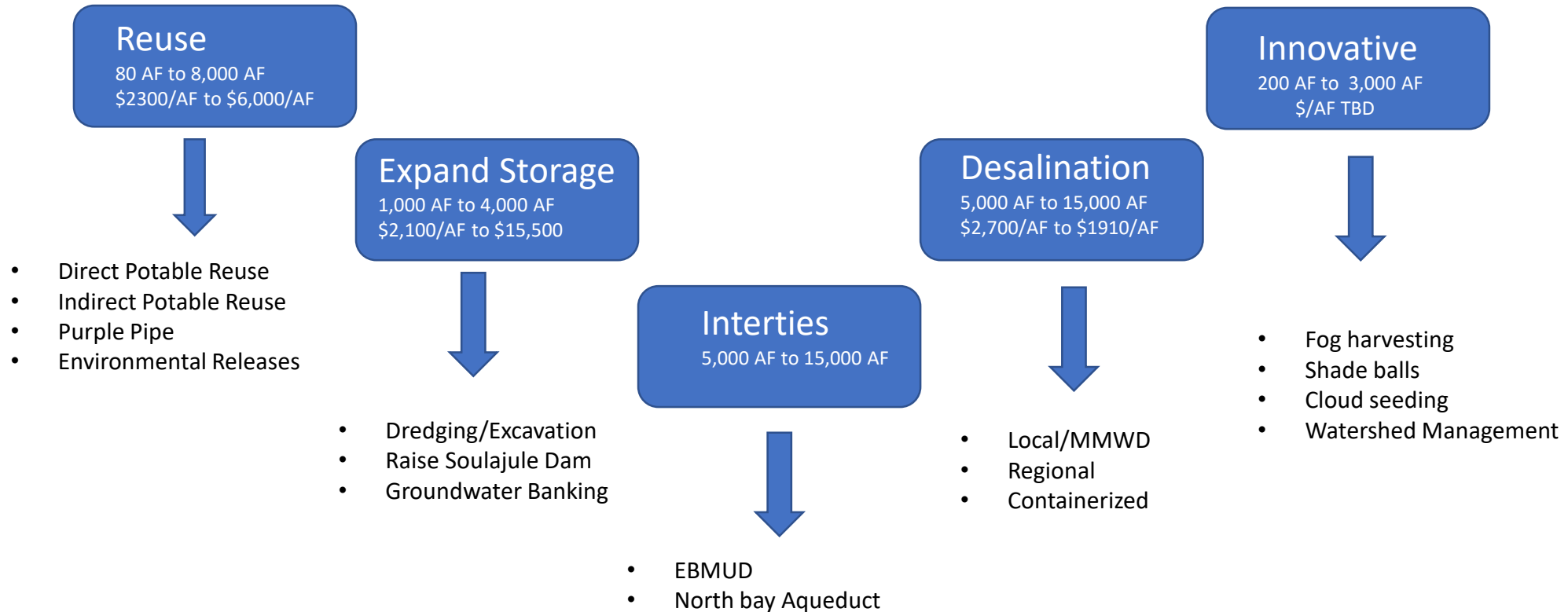
- Estimated cost range \$18M to \$25M
 - 55,000 ft of pipe - \$12M-\$15M
 - Pump stations - \$4M - \$6M
 - Tanks - \$2M – \$4M
- Risk Mitigation
 - Analysis indicates 50% of the pipe can be re-purposed for pipe replacement projects:
 - Schedule of manufacturing indicates raw materials ordered 10/21/21, however pipe fab begins Feb 1, 2022
 - Purchase spec includes language for manufacturer to assist District in reselling pipe or using materials
 - Pump stations can be used for emergency response at a number of locations
 - Tanks can be deployed as replacements or retained for emergency response



Summary of Short Term Options

- No ideal options exist
 - Continued demand management
 - Winter water - requires adequate precipitation, regulatory approval, collaboration with other contractors and regardless we plan to pursue this option
 - Desalination –Temporary facility, complex operation, requires near term commitment to reserve equipment, begin design and pre-purchases to continue as a viable back up option
 - Intertie project – infrastructure component is progressing very well and a lot of work to be done on water transfers and wheeling
- Discussion - tradeoffs in keeping back up projects as viable options

Long Term Water Supply Options



Long Term Water Supply Options

- Innovative Concepts
 - Fog Harvesting – 1 gal/day/sq meter of mesh – pilot study to define yield and cost
 - Shade balls – reduces evaporation potential yield ~3600AF, environmental impacts to reservoir ecosystem, visual potential water quality
 - Watershed Management – 200 AFY yield, done in conjunction with BFFIP, cost depends on area and rate of thinning.
 - Cloud Seeding – 500 AF in dry years

Long Term Water Supply Options

- Water Reuse
 - Purple Pipe – expansion of existing system
 - Indirect Potable Reuse (IPR) – highly treated water through reservoir
 - Direct Potable reuse (DPR) – highly treated water directly to customers
 - Environmental releases – highly treated water to watershed

	IPR			DPR			Purple Pipe			Environmental		
	Yield [AF]	Cost [M]	Cost/AF	Yield [AF]	Cost [M]	Cost/AF	Yield [AF]	Cost [M]	Cost/AF	Yield [AF]	Cost [M]	Cost/AF
SASM	1,600	\$80	\$3,600	1,600	\$63	\$3,100	80	\$5	\$3,000			
CMSA	2,300	\$87	\$3,000	2,300	\$70	\$2,600	200	\$8.60	\$,2800	2,300	\$87	\$3,000
LGVS	900	\$59	\$5,500	900	\$65	\$5,800	300	\$15	\$4,500			

AF = acre-feet, 1 acre-foot = 325,851 gallons

Costs 2016

Source - Water Resources Plan 2040

Direct Potable Reuse – 2,200 AF

- Full Advanced Water treatment facility at CMSA
 - UF/RO/UV
 - Engineered buffer – 3 x 1-MGD tanks
 - Pump station – 170 hp / 1400 gpm
- Pipeline conveyance - 5500 ft
- Max production 2-MGD (72% recovery)
- Capital \$45M
- Operating \$3M
- \$2,400/AF

Regional Indirect Potable Re-use – 6,000 AF

- Full Advanced Water Treatment:
 - Ultra Filtration / Reverse Osmosis / UV
 - Pipe – 147,780 ft to Kent
 - 4 Pumps – 2@ 100 hp / 1@ 830hp / 1 @ 4,280hp
- Production – 8.8 MGD
- Capital - \$359M
- Operating - \$7.9M
- \$3,300/AF

Purple Pipe

Project	Total Offset [AF/Yr.]	Project Cost [M]	Cost/AF/Yr.
Lucas Valley Ext	21	\$2.7	\$8,095
Peacock Gap G.C. (Ph 8)	166	\$25.3	\$9,385
Mt. Tamalpais Cemetery	18	\$2.4	\$8,383
Circle Rd	8.3	\$1.8	\$13,144
MMWD/SASM	81	\$3.5	\$3,436
San Quentin	150	\$9.2	\$4,442

Environmental Reuse

- Full Advanced Water Treatment:
 - Ultra Filtration / Reverse Osmosis / UV
 - Pipe – 147,780 ft to Kent
 - 4 Pumps – 2@ 100 hp / 1@ 830hp / 1 @ 4,280hp
- Production – 8.8 MGD
- Capital - \$359M
- Operating - \$7.9M
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Water Reuse Summary

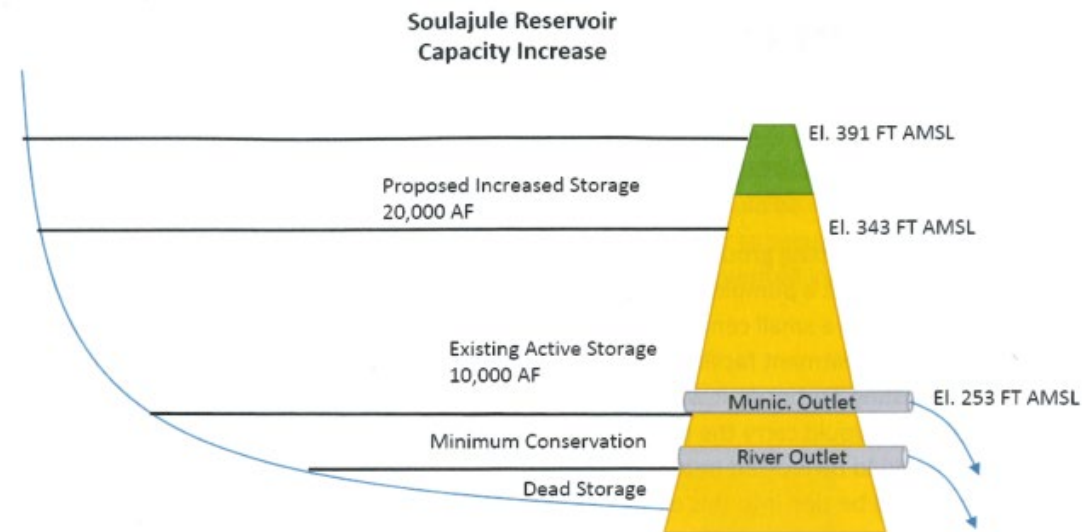
- Yield is not as much as expected – Max IPR is ~8,000 AF (\$350M)
- Costs are significant
- CMSA options preclude local desalination
- IPR would require studies
- DPR not permitted in CA, regulations in development (2023)

Expanding Storage

- Excavation or Dredging
 - 1,000 AF capacity = 1.6 million cubic yards → ~40,000 truck trips
 - Recent costs for excavation \$45/cubic yard
 - Estimate cost per 1,000 AF of capacity = \$72M
 - Regulatory/environmental approvals for the dredging or excavation work itself
 - Requires new water rights

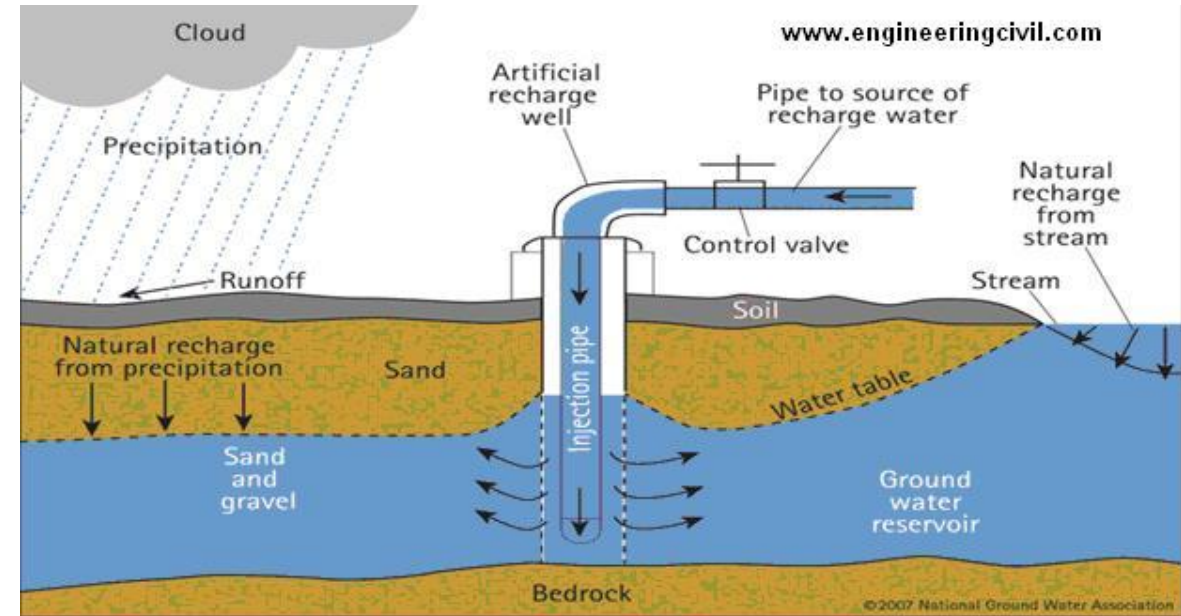
Expand Storage

- Raise Soulaajule Dam
 - Existing capacity = 10,000 AF
 - Raise dam 48 feet
 - New Capacity = 30,000 AF
- Yield affected by
 - Water rights
 - Environmental releases
- Cost \$100M - \$150M



Groundwater Storage (Banking)

- Santa Rosa Plain Conjunctive Use
- In wet years MMWD buys extra SCWA water to be used by groundwater agency in lieu of groundwater pumping
- In dry years MMWD has access to the groundwater less some losses
- Requires management of the basin to prevent over drafting
- Capacity of aquifer in wet or normal years to accept recharge is unknown
- SCWA flows may be subject to allocations

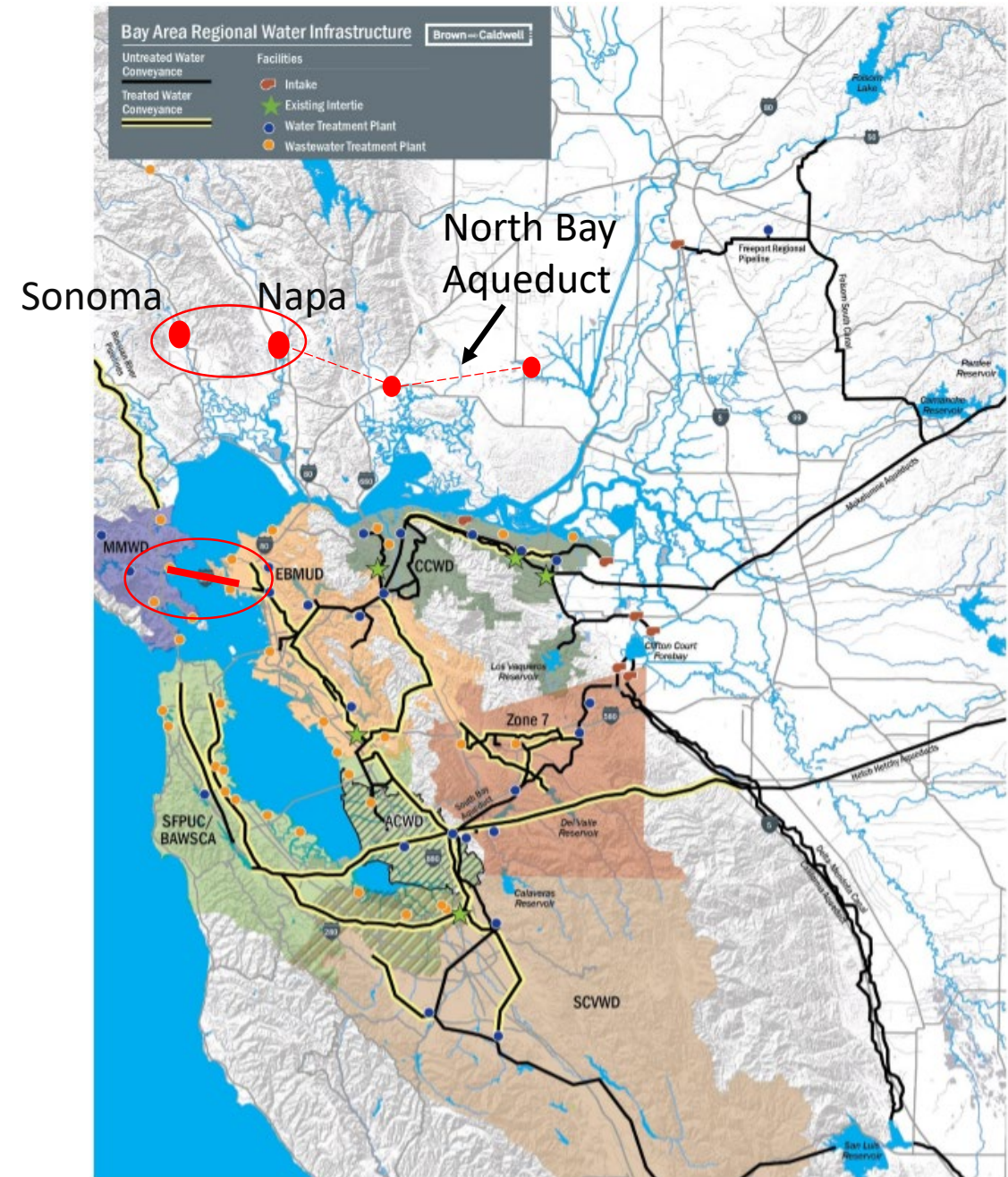


Local Desalination Plant

- Capacity 5 to 15 MGD
 - Intake – 4500 ft of 48-inch HDPE pipe to 1-mm self cleaning screens
 - Pre-treatment - Ultra-filtration membrane system
 - Desalination – Reverse osmosis system
 - Treated water – disinfection, storage, pump station and pipeline
 - Brine – holding tank, pump station and 3500 ft of 30-inch pipeline to CMSA outfall
- Capital Cost
 - 5-MGD = \$152 M / cost per AF = \$2,710
 - 10-MGD = \$192 M / cost per AF = \$2,173
 - 15-MGD = \$222 M / cost per AF = \$1,962
- Annual Operating Cost for 15-MGD Desalination plant = ~\$20M
- Schedule to produce water likely greater than 48 months

Interties

- Existing Interties:
 - MMWD - Sonoma
 - CCWD – East Bay MUD
 - Hayward – East Bay Mud
 - Hayward – ACWD
 - ACWD – Zone 7
 - SFPUC - ACWD
 - SFPUC – Valley Water
- Proposed Interties:
 - MMWD - East Bay MUD
 - CCWD – South Bay Aqueduct
- Potential Intertie
 - Sonoma – North Bay Aqueduct



Regional Opportunities

- Desalination
- Expansion of Los Vaqueros
- Groundwater Recharge

Only Possible with intertie

Water Supply Projects

What are the Right Criteria for prioritization of supply options?

- Yield – *Larger projects preferred*
- Cost – *Lower cost projects preferred*
- Cost/AF – *The right small project may be favorable but not really help supply*
- Reliability/Resilience – *Cost of not doing the project*
- Public Acceptance – *DPR or IPR*

Water Supply Project Prioritization

Project	Priority	Yield	Cost	Cost/AF	Public Acceptance
Intertie	High	9000	\$100	TBD	Yes
DPR	Med	2200	\$45	\$2,400	Unlikely
IPR	High	6000	\$359	\$3,300	Maybe
Purple Pipe	Med	150	\$9.20	\$4,400	Yes
Environmental Releases	Low	6000	\$359	\$3,300	Maybe
Dredging/Excavation	Low	1,000	\$72M	\$7,200	Yes
Raise SoulaJule Dam	Low	20,000	\$100M	\$2,100	Maybe
Groundwater Banking	High	900	\$1M	\$1,400	Yes
Regional Desalination	Low	5000	\$75M	\$1,825	Maybe
Local Desal	Low	5000	\$150M	\$2,710	Maybe
Containerized Desal	Low	2000	\$70M	\$3,510	Maybe
Watershed Mangement	High	200	N/A	N/A	Yes
Shade Balls	Med	3600	TBD	TBD	No
Fog Harvesting	Low	10	\$5M	\$25,000	Yes
Cloud Seeding	Low	500	\$0.50	\$7,400	Yes

- Discussion – Long Term Water Supply Priorities

Next Steps

- Continue developing drought projects – (EIP/Desal/Winter Water)
- Based on board input further develop action/implementation plan for long term water supply opportunities