

A Collaborative Approach to Infrastructure Reliability

CA-NV AWWA Fall Conference
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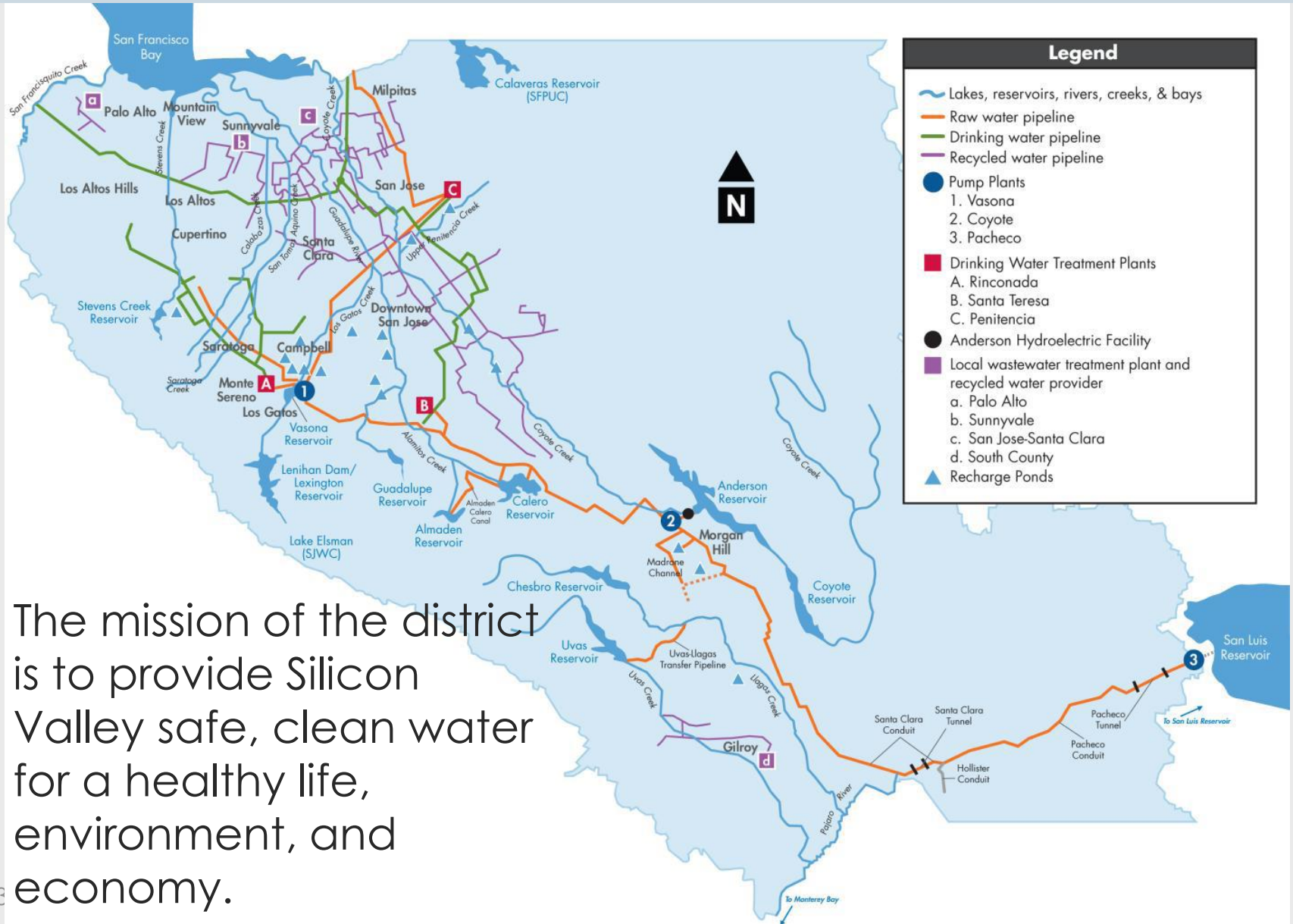
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Outline

- ▶ Background
- ▶ Project Analysis
 - ▶ System Outages, LOS Goal, and System Performance
- ▶ Key Project Findings
- ▶ Recommendations

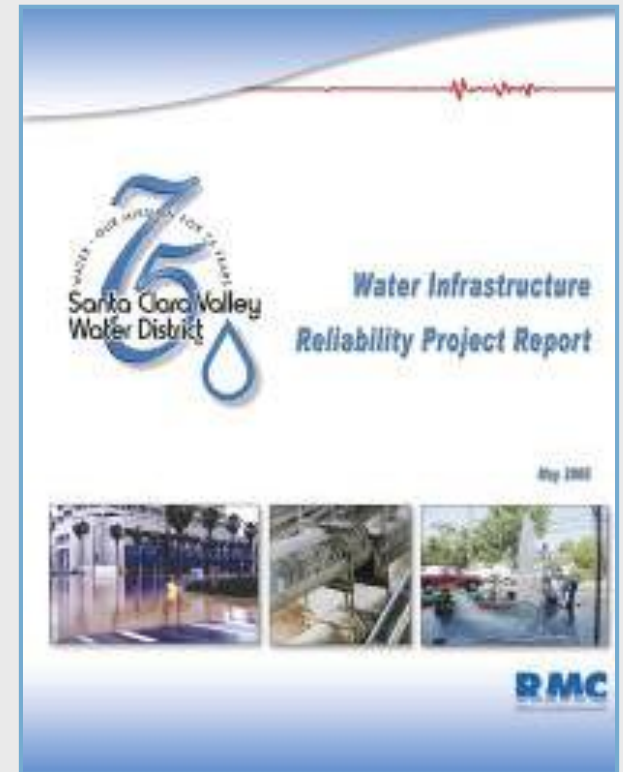
SCVWD Overview



The mission of the district is to provide Silicon Valley safe, clean water for a healthy life, environment, and economy.

2005 Infrastructure Reliability Project

- ▶ Evaluated a range of hazards, and District system performance in earthquake, power outage and flood
- ▶ Worst case scenario was a **7.9 Magnitude San Andreas earthquake**: Up to a **60 day outage**






2005 Infrastructure Reliability Project

Level of Service Goal:

Potable water service at average winter flow rates available to a minimum of one turnout per retailer within 7-14 days following a hazard event.

Recommendations:

Portfolio	Projects and Outage Time Reduction	2005 Cost
Baseline	Stockpile Spare Pipe and Emergency Response Planning: Reduces outage time from 60 to 30 days	\$8 M 
Portfolio 1	Life Safety and SCADA system improvements	\$24 M 
Portfolio 2	Construct 80MGD Distributed Local Wells for Emergency Supply: Reduces outage time from 30 to 14 days	\$110 M 
Total		\$150 M

Changed Circumstances before Implementation

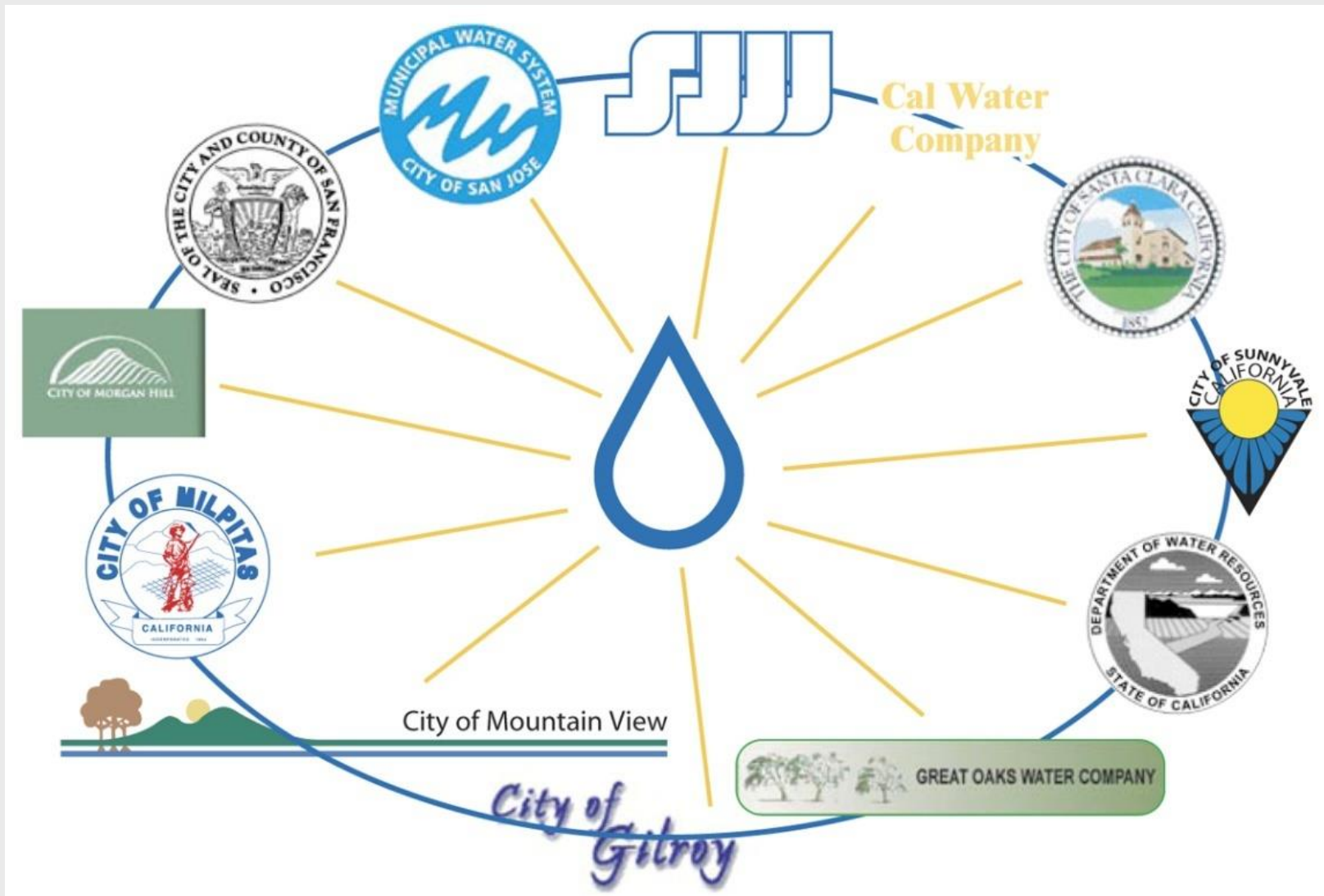
- ▶ Successful retailer operations without District treated water for up to **8 weeks**
- ▶ Investments in reliability that were not known/planned at time of 2005 report:
 - ▶ District Dam Seismic Retrofits and Water Treatment Plant upgrades (More than \$0.5 Billion)
 - ▶ Retailer system improvements (tank seismic upgrades, interties, increased storage)
 - ▶ San Francisco Public Utilities Commission (SFPUC) Water System Improvement Program (WSIP)

2016 Infrastructure Reliability Project

Project Goal: Update 2005 IRP and identify new reliability improvements since well fields would not be implemented

- ▶ **Review hazards (outage scenarios)**
- ▶ **Update the level of service goal**
- ▶ Evaluate more **regional, less capital intensive alternatives** to the well fields

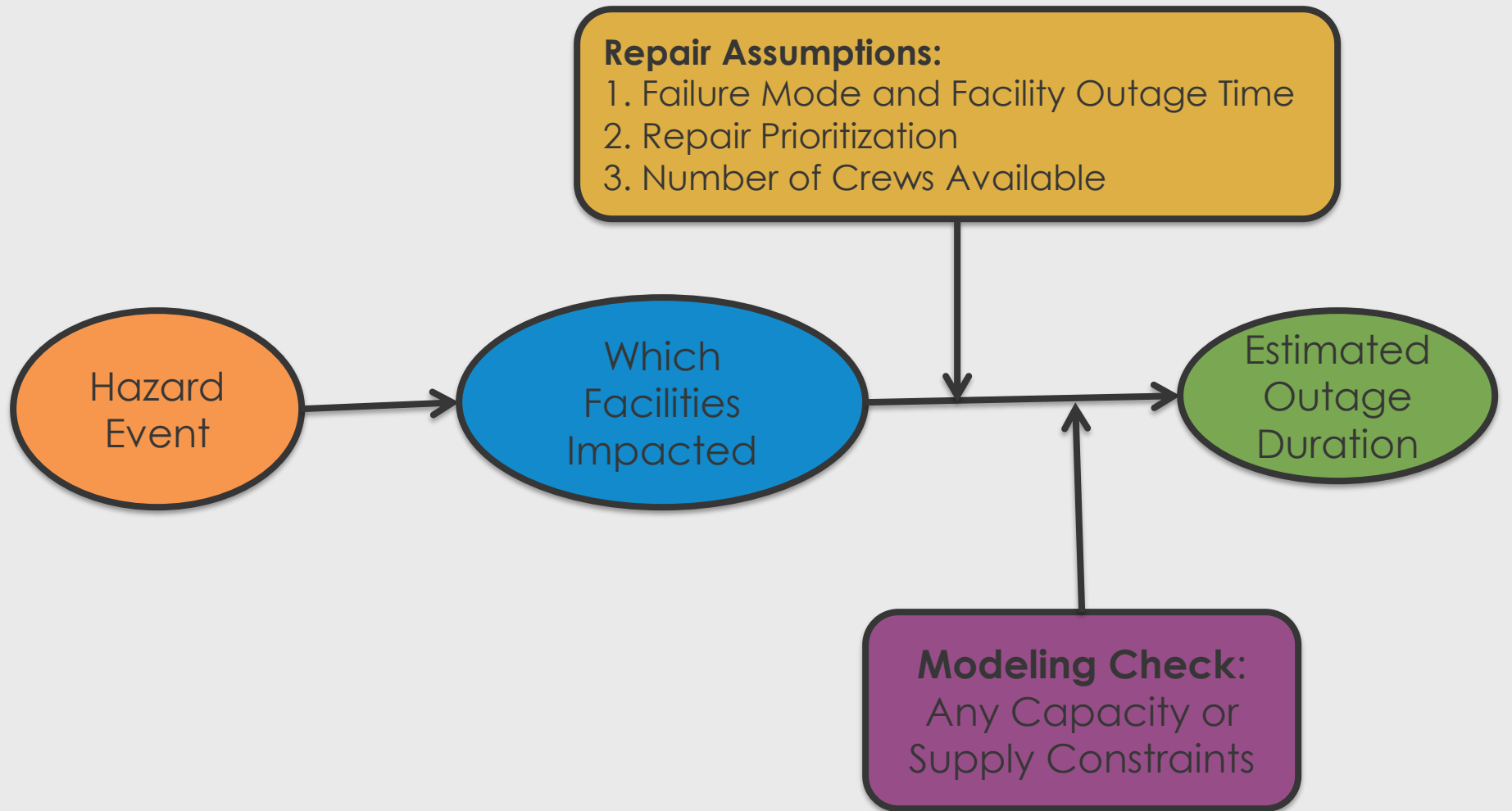
Collaboration with Retailer Partners



Outage Scenarios

- ▶ 3 Earthquake
 - ▶ Two (2) San Andreas M7.9 Scenarios
 - ▶ Central Calaveras M6.2
- ▶ 2 Delta Outage
 - ▶ 6 Month
 - ▶ 24 Month
- ▶ Extreme Storm
- ▶ Power Outage

Outage Duration Estimation Methodology



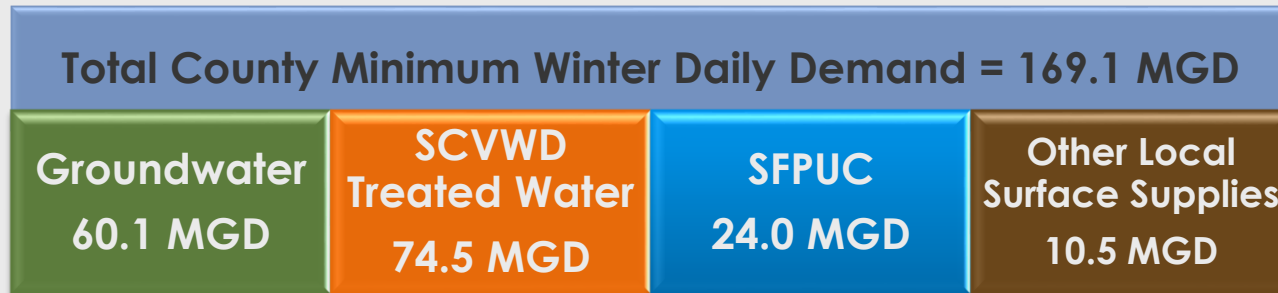
System Performance

Outage Scenario	Estimated Outage Duration ¹
Extreme Storm	East – 4 days West – 18 days Recharge – 60+ days
San Andreas M7.9 Earthquake 1	East – 4 days West – 32 days Recharge – 50 days
San Andreas M7.9 Earthquake 2	East – 18 days West – 32 days Recharge – 45 days
Calaveras M6.9 Earthquake	East – 4 days West – 4 days Recharge – 25 days
Short-term Delta Outage (6 months)	N/A – 20% Service Reduction
Long-term Delta Outage (24 Months)	N/A – 20% Service Reduction
Power Outage	Sufficient Fuel Storage to Operate on Back-up Power for 3-10 days

¹ Estimated time to restore **minimum winter** service levels

Level of Service

- ▶ Demand Target = Minimum Winter Daily Demands



- ▶ Tolerable SCVWD System Outage Durations

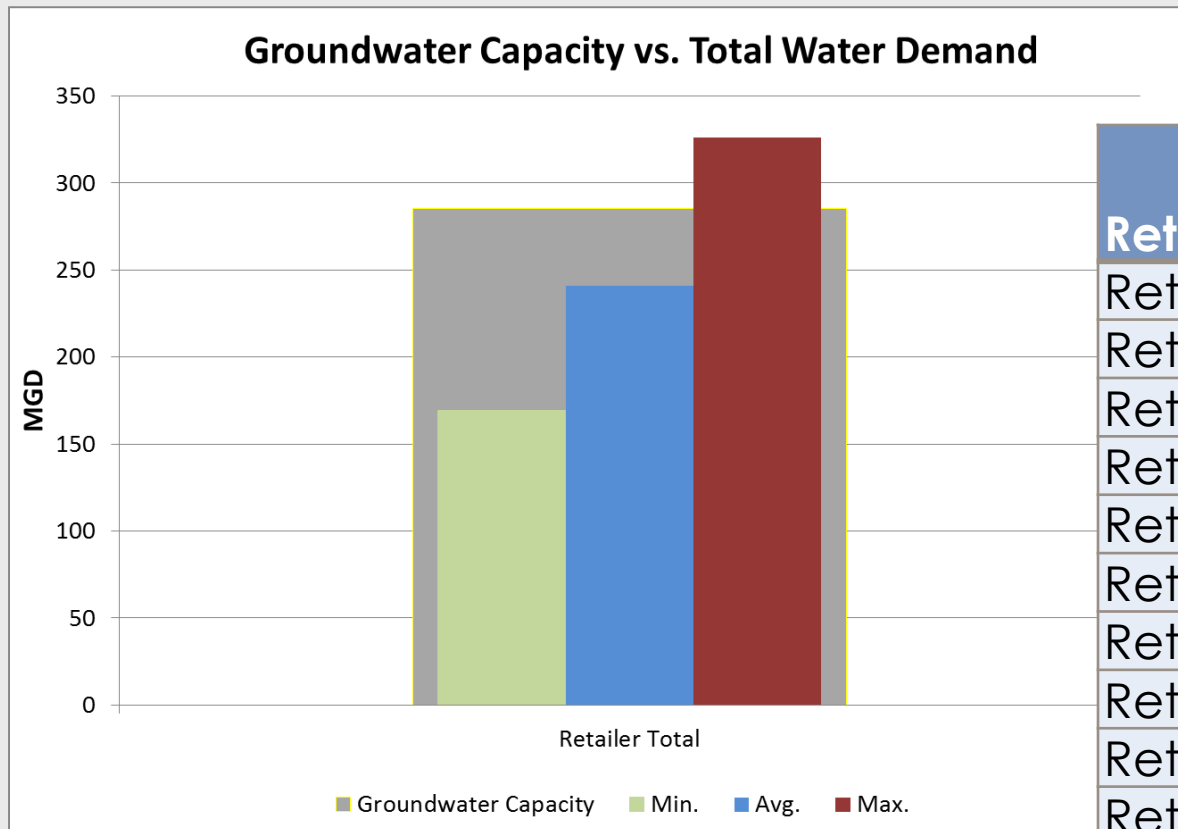
System/Retailers	Winter	Summer
East Treated Water System Retailers	Indefinite for most, one retailer (3 turnouts) is 5 days	Hours to Indefinite
West Treated Water System Retailers	Indefinite for most, one turnout is 14 days	Hours to Indefinite
Managed Recharge	60 days to Indefinite	

System Performance and LOS

Scenario System Impacted	# of Days to Restore Minimum Demands	Tolerable Outage Duration of Minimum Demands
Extreme Storm		
East Treated	4	Indefinite, except one retailer (3-5 days)
West Treated	18	Indefinite, except one turnout (14 days)
Critical Recharge	78	Likely more than 60 days due to wet weather
San Andreas 1 EQ		
East Treated	4	Indefinite, except one retailer (3-5 days)
West Treated	32	Indefinite, except one turnout (14 days)
Critical Recharge	53	60 Days
San Andreas 2 EQ		
East Treated	18	Indefinite, except one retailer (3-5 days)
West Treated	32	Indefinite, except one turnout (14 days)
Critical Recharge	46	60 Days
Calaveras EQ		
East Treated	4	Indefinite, except one retailer (3-5 days)
West Treated	4	Indefinite, except one turnout (14 days)
Critical Recharge	25	60 Days

Regional Redundancy

- ▶ **Backup Supplies:** Most areas have sufficient backup to SCVWD treated and groundwater
- ▶ **Excess Capacity & Interties:**



Retailer	Interties with Other Retailers
Retailer A	12
Retailer B	0
Retailer C	2
Retailer D	3
Retailer E	0
Retailer F	3
Retailer G	7
Retailer H	5
Retailer I	13
Retailer J	16

Key Project Concepts

We already have a reasonable level of regional reliability and redundancy!

We can collaborate and use existing District and retailer infrastructure as a regional system, so that only minor infrastructure improvements are needed.

Localized Solutions will work!

We can improve reliability in specific service areas that are more vulnerable to SCVWD system outages with localized, lower cost solutions rather than major infrastructure improvements.

Reliability Improvement Needs

Retailer/Area	Vulnerability
Retailer A (West System) – One of three SCVWD treated water turnouts	Limited back-up near turnout and difficult to move water there from other turnouts
Retailer B (West System) – Single SCVWD turnout	Requires valve changes and additional pumping costs
Retailer C (West System) – Single SCVWD turnout	One 2 MGD well in Zone, which has typical demands of 3-4+ MGD. Requires booster pumps.
Retailer D (East System) – Single SCVWD Turnout	Requires valve changes and is more costly to operate.
Retailer E (East System) – All three SCVWD turnouts	Back up well supply is not permitted for regular use.
Groundwater Retailer A	Groundwater supply is sensitive to reduction of groundwater recharge.

Project Ideas – Type and number



Isolation Valves (10)

Interties (12)



Connections/Turnouts (9)

Groundwater Wells (17)



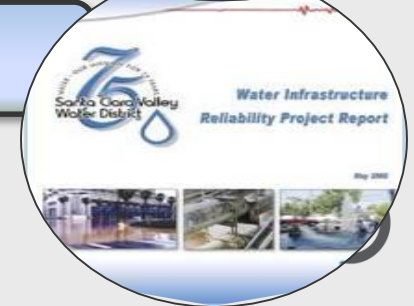
Other Equipment (4)

Backup Power/Fuel (7)



Pipeline Improvements (20)

Studies (17)



Project Analysis

- ▶ 4 Screenings:
 - ▶ Fatal Flaw Analysis (E.g. contractual hurdles, high cost with limited benefit): **Eliminated 13 projects**
 - ▶ Consolidation/Removal of Duplicates: **Eliminated 16 projects**
 - ▶ Qualitative Analysis with Criteria: **Eliminated 29 projects**
 - ▶ Quantitative Analysis with Criteria: **Eliminated 18 projects**
- ▶ Resulted in **20 Recommended Projects**

Recommended Projects

Portfolio	#	Project Description
Operations Only	1	Treated Water Wheeling Study
	2	Water Retailer Intertie Study
	3	Study to Remove One Retailer's Well Restrictions
	4	Add Disinfection to One Retailer's Wells
	5	Add Equipment to Use Existing Retailer Intertie
	6	Upgrade Existing Intertie for Bi-Directional Flow
\$10M CIP	7	Retailer Emergency Service Connection to Feed District PL
	8	Retailer Well Connected to SCVWD PL for Emergency Use (1)
	9	Retailer Well Connected to SCVWD PL for Emergency Use (2)
	10	New Retailer Well
	11	New Retailer Well (2)
	12	New Retailer Well (3)
	13	New Retailer Well (4)
	14	New Retailer Well (5)
	15	Upgrade Retailer Intertie
	16	Construct New Intertie between Two Retailers
	17	Upgrade Retailer Intertie (2)
	18	Two New Isolation Valves on Milpitas Pipeline
	19	Three New Isolation Valves on West Pipeline
\$100M CIP	20	Almaden Valley Pipeline Seismic Improvements (<i>future</i>) ²

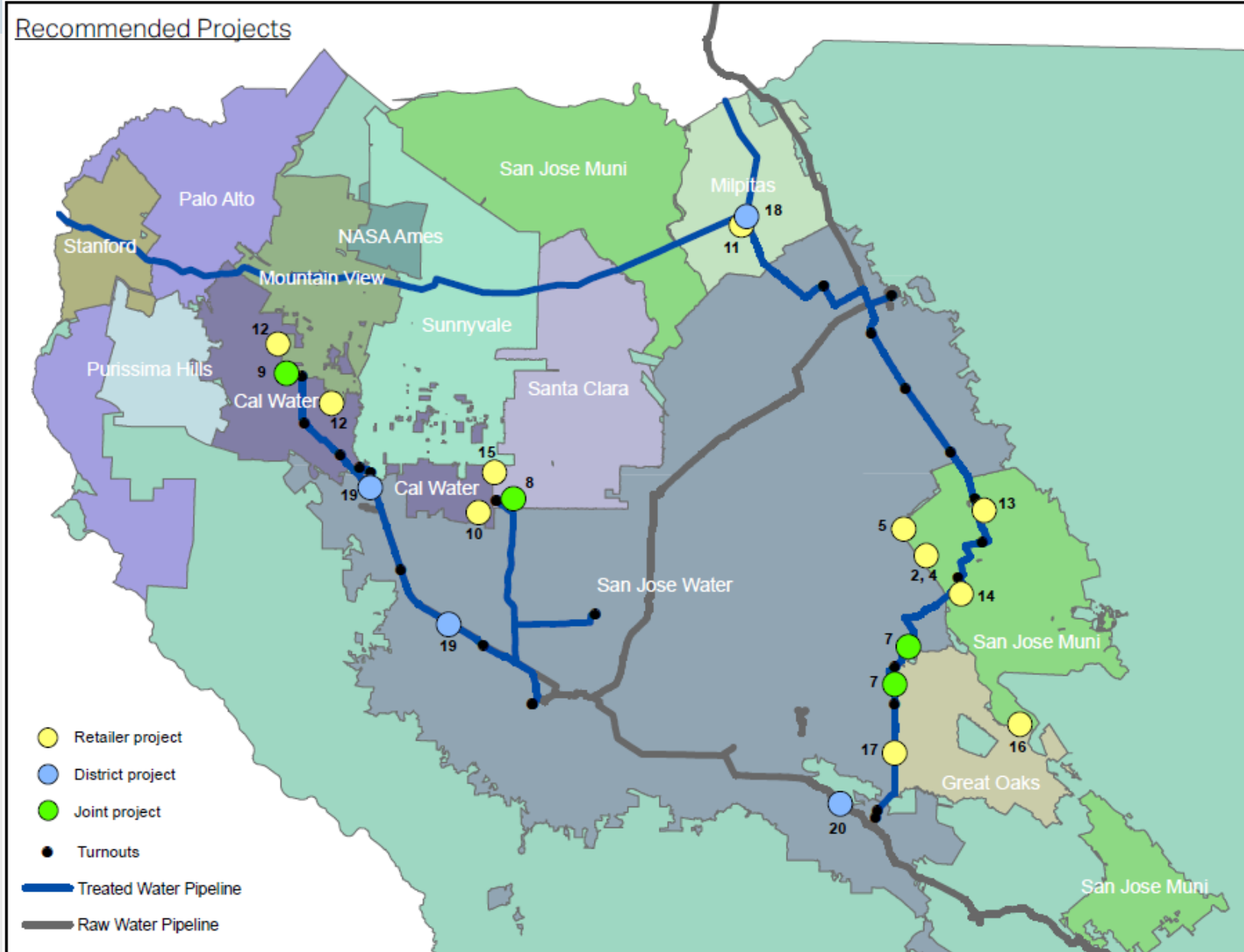
District Project Cost	Retailer Project Cost ¹
\$0.5M	---
O&M budget	\$0.5M
---	TBD
---	\$1.0M
---	\$0.5M
---	\$0.2M
\$1.4M	TBD
\$0.9M	\$2M
\$0.7M	\$2.8M
---	\$2.8M
---	\$2.8M
---	\$2.8M
---	\$2.8M
---	\$2.8M
---	\$1.2M
---	\$1.2M
---	\$1.2M
\$1.4M	---
\$2.2M	---
\$135.3M (<i>future</i>)	---
\$7.1M	TBD

	District Project
	Joint Project
	Water Retailer Project ¹

¹ Some retailer projects provide duplicate benefits. Not all projects will be implemented. Retailers will determine which provide most benefit.

² Planned for future implementation when pipeline reaches end of service life.

Recommended Projects



Additional District Recommendations

- ▶ Continue Emergency Response Planning
- ▶ Continue to plan for recharge operations in critical areas during drought or other outages
- ▶ Address seismic and climate vulnerabilities through long term asset replacements
 - ▶ Replace vulnerable pipe segments with earthquake resistant design
 - ▶ Consider future climate conditions (extreme heat, stronger storms, etc.) in routine equipment replacements

Conclusions and Summary

- ▶ Total near term investment = \$7.1 Million SCVWD and \$0.5M - \$3M per retailer (TBD)
- ▶ LOS Improvements
 - ▶ Reduces outage durations for parts of the SCVWD system in key areas, but not system-wide.
 - ▶ Improves ability of retailers to tolerate SCVWD system outages.
- ▶ Localized improvements and use of existing SCVWD and retailer infrastructure as a regional system provides an acceptable level of reliability.