

# This presentation premiered at WaterSmart Innovations

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# The Chino Basin Aquifer:

## Insuring For Clean Reliable Water For Today And The Future



By  
David Schroeder



# What Do We Do?

- Provide Education to the Community
- Provide Water Conservation Outreach
- Offer Landscape Evaluation Audits
- Help Fund Recycled Water Projects
- **Protect Chino Basin Groundwater**





# Promote Sustainable Landscapes



**Permeable Surfaces**



# Educate and Demonstrate



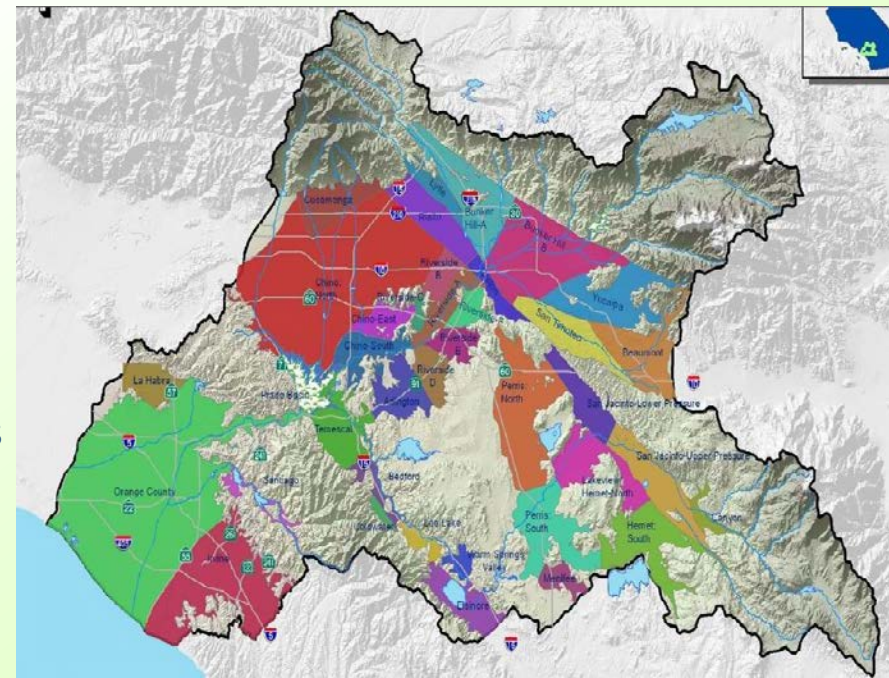
# Involve the Community





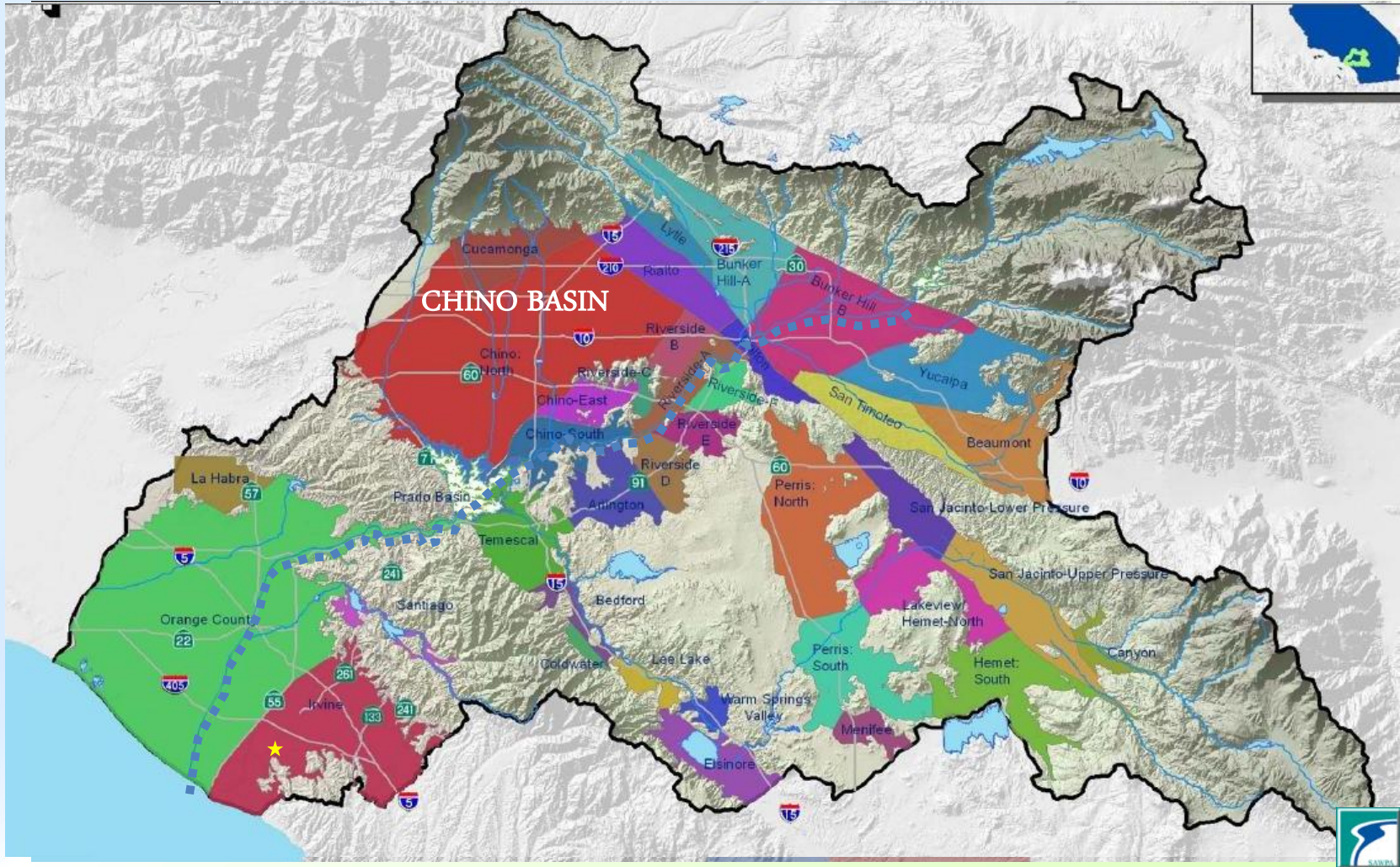
# Southern California Groundwater Basins

- Mojave Ground Water Basins at 3,406 sq. miles- Divided into six sub basins
- Imperial Valley Groundwater Basin at 1,870 sq. miles
- Antelope Valley Groundwater Basin at 1,580 sq. miles
- Ward Valley Groundwater Basin at 1,500 sq. miles
- Chuckwalla Valley Groundwater Basin at 940 sq. miles
- **Coastal Plain of Orange County Groundwater Basin at 350 sq. miles**
- Central Basin at 277 sq. miles- Los Angeles area
- San Gabriel Basin at 255 sq. miles- Includes the subbasins of Claremont and Pomona
- **Chino Basin at 235 sq. miles- One of the Largest in So. Cal**
- West Coast Basin at 140 sq. miles- Los Angeles area
- **Bunker Hill Basin at 120 sq. miles**
- **Riverside Basin at 92 sq. miles**
- **Rialto Basin at 47 sq. miles**
- Raymond Basin LA county at 41 sq. miles
- Santa Paula Basin at 36 sq. miles
- Warren Valley Basin at 27 sq. miles
- Santa Maria Valley Ground Water Basin at 19 sq. miles
- **Cucamonga Basin at 15 sq. miles**
- Malibu Valley Groundwater Basin at 1.0 sq. mile





# Santa Ana River Watershed





# Water and Challenges

- Basin storage capacity: 5 million acre-feet
- Over 800 active wells
- Safe yield: 140,000 acre-feet a year
- Located amid major growth area in Southern California

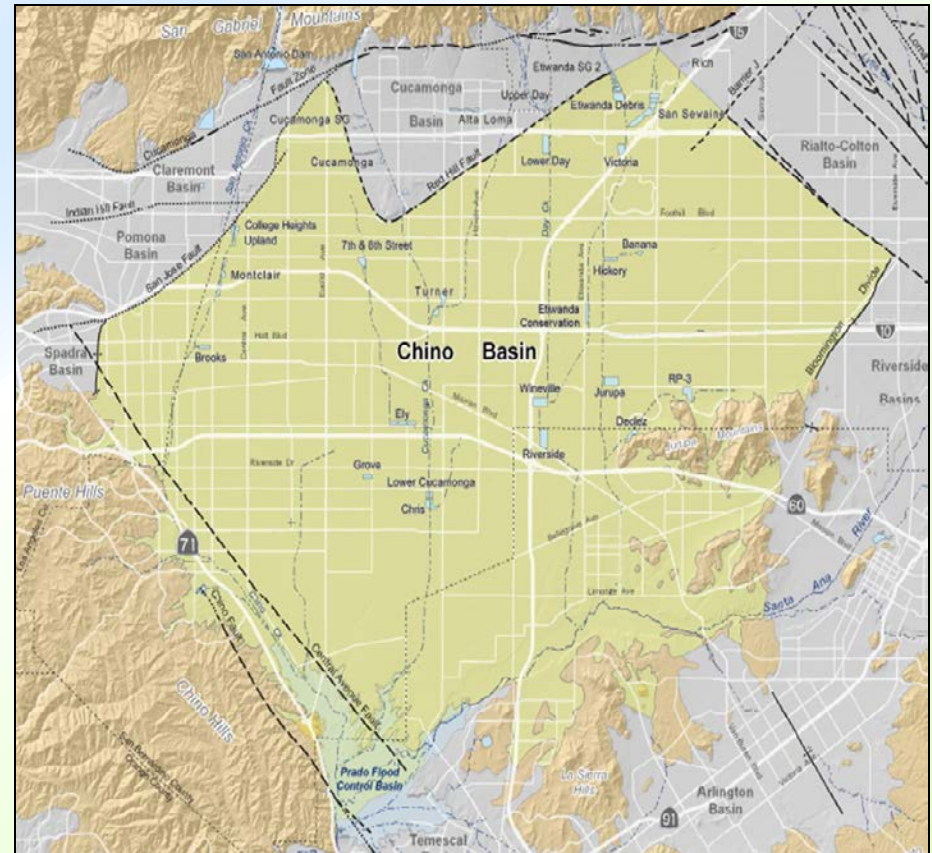


The Chino Basin provides water for approximately 900,000 residents.



# Chino Groundwater Basin

- **Tilted Alluvial Basin**
  - 500 to 100 feet thick
  - 200 to 600 feet to water
- **Storage**
  - 5 Million AF total
  - 1 Million AF unused
- **Production**
  - 150,000 to 190,000 AFY
- **Safe Yield**
  - Approx. 140,000 AFY without artificial recharge





# History

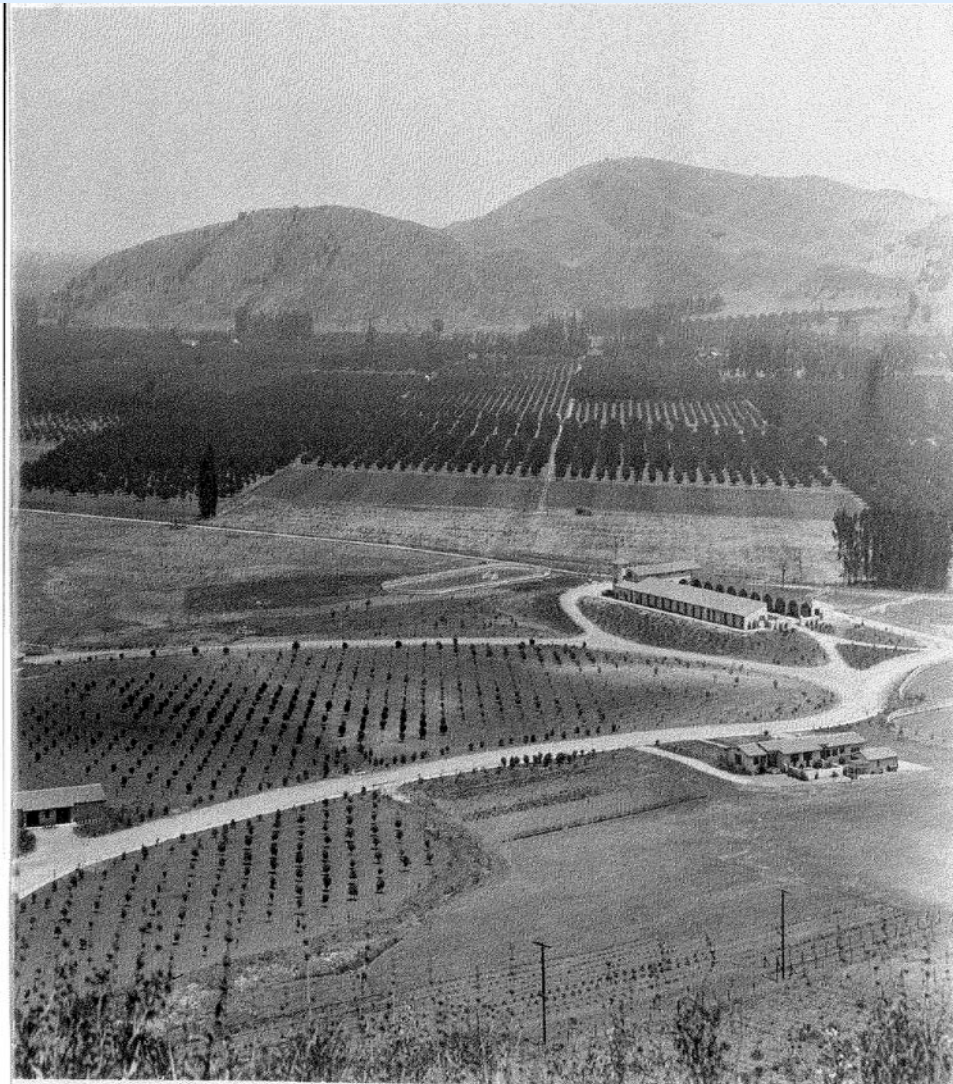
## Predominantly Agriculture

- Citrus
- Grapes
- Crops
- Feed
- Cattle
- Dairy





# Agriculture and Free Flowing Creeks











# 1938 Flood

## San Antonio Creek

March 1938 Flood



## Chino Area

When Philadelphia crossed S.A. west

March 1938 - Flood

P. B. Photo





# 1938 Flood Ontario Area



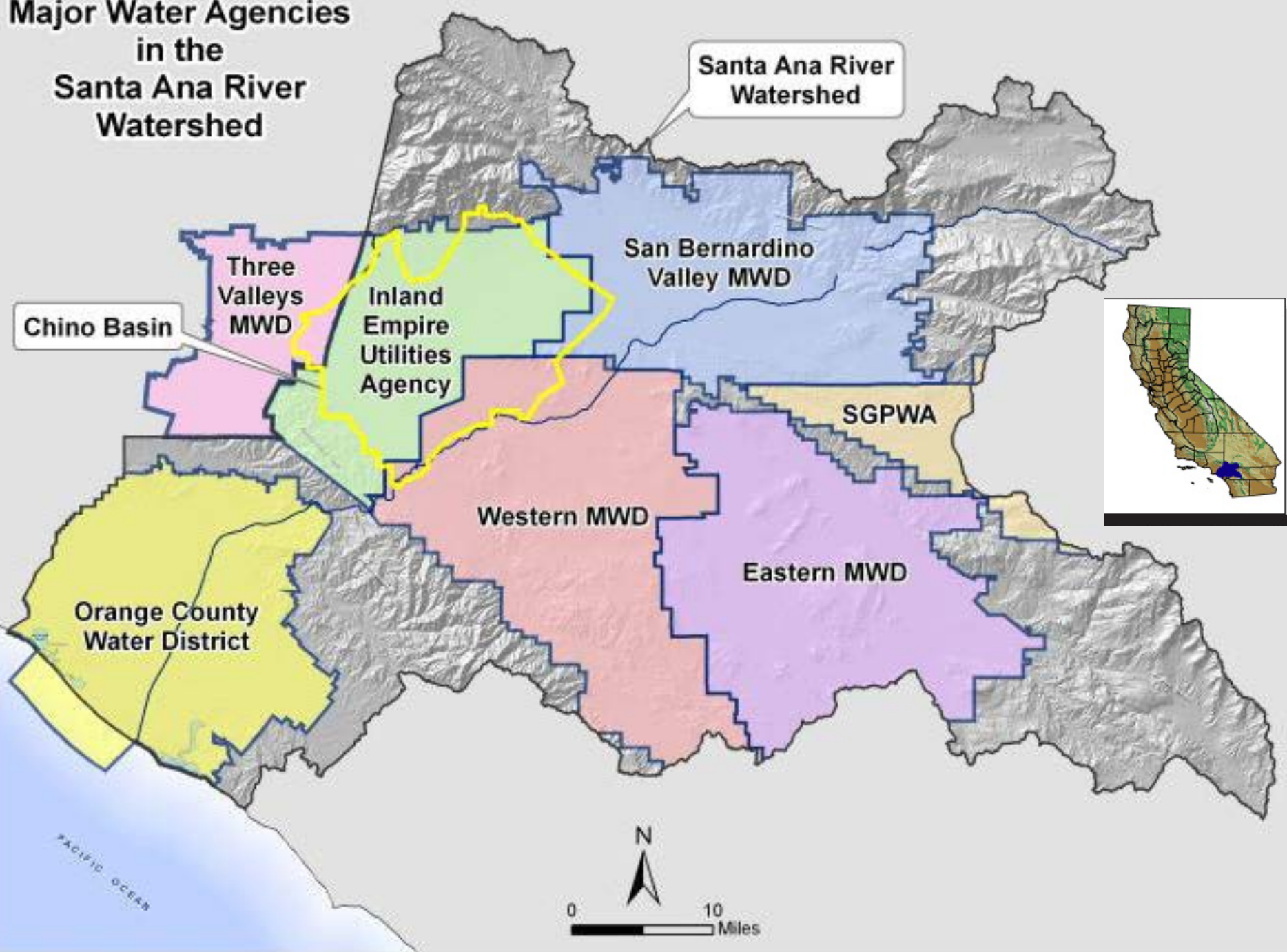
**Look at that wasted water! Damn, there's no Dam!**

# Chronology of Recharge Program

- 1978 – Chino Basin Judgment
- 1999 - Optimum Basin Management Plan
- 2002 - CBWM adopted Recharge Master Plan
- 2002 - IEUA Certified PEIR for RW Master Plan
- 2002 – CBWM approved application for 30,000 AF RW recharge
- 2003 – Four Party Agreement
- 2004 - Maximum Benefit Basin Plan Amendment for TDS
- 2004 – MOU with OCWD
- 2005 – Maintenance Agreement
- 2005 & 2007 RWQCB Recharge Permits
- 2009 – RWQCB Permit Amendment

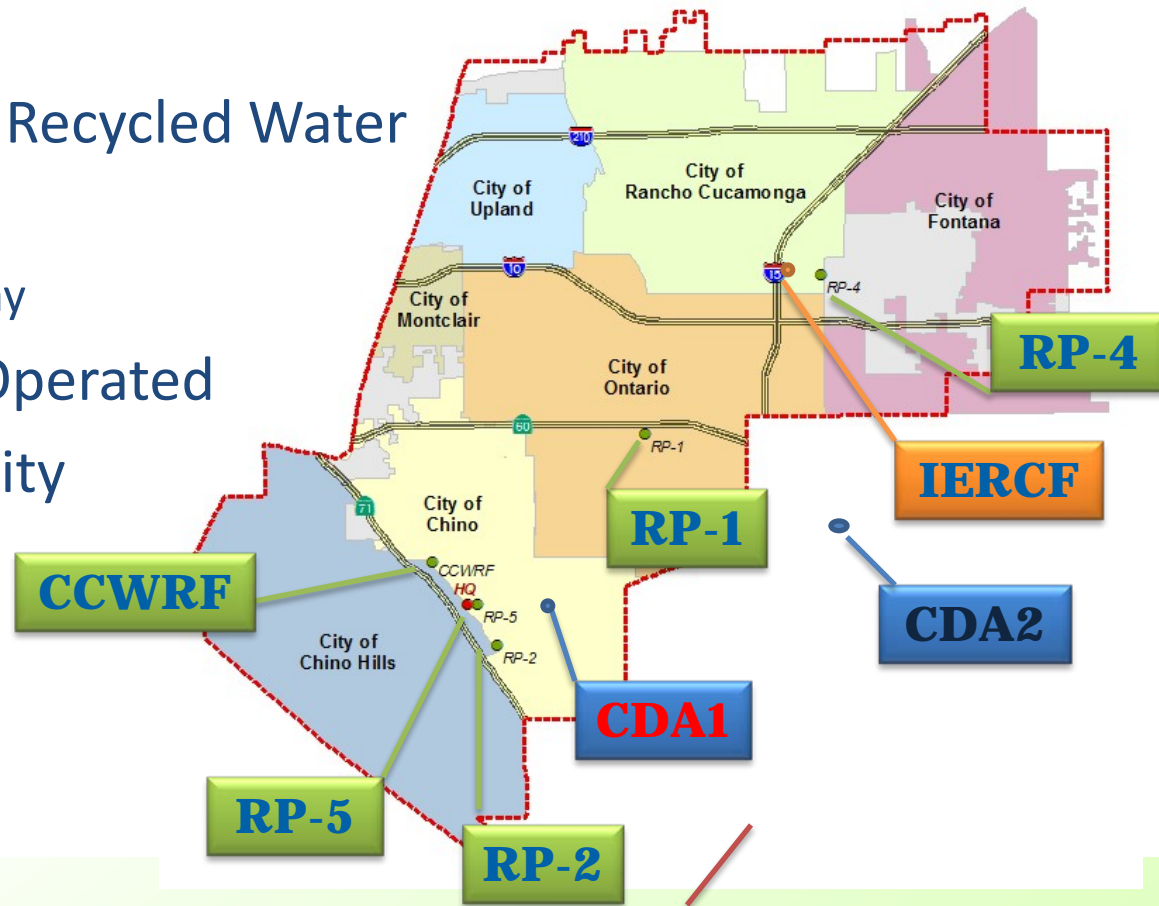


# Major Water Agencies in the Santa Ana River Watershed



# Inland Empire Utilities Agency (IEUA)

- Wholesale Imported & Recycled Water
- Wastewater Treatment
  - 53 Million Gallons per Day
- 5 Treatment Facilities Operated
- Regional Compost Facility
- Groundwater Desalter
- Groundwater Recharge
  - 19 Recharge Sites
- 260 Square Miles
- 900,000 People





# Chino Basin Water Supply Planning

- Challenges
  - Population growth
  - Increasing water demand
  - Significant imported water supply reductions and lack of reliability
- Solution
  - Increased development of local water supplies



Chino Basin is one of the largest groundwater basins in Southern California and has a growing population

# Recharge Program Goals

- Conduct groundwater replenishment for water supply reliability



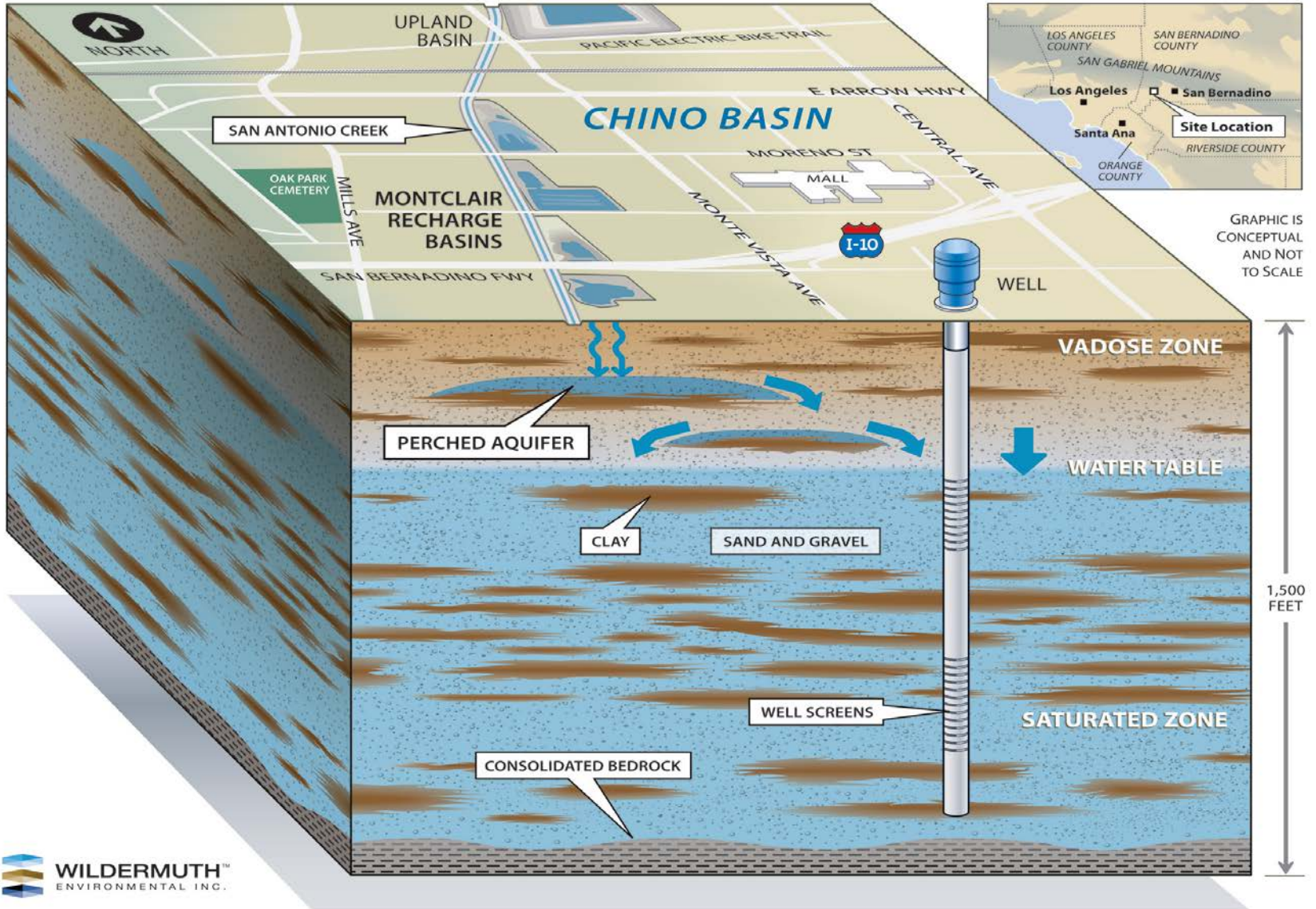
- With Water Sources

- ✓ Maximizing the capture of stormwater
- ✓ Maximizing recycled water within program and permit limits
- ✓ Utilizing imported water as available

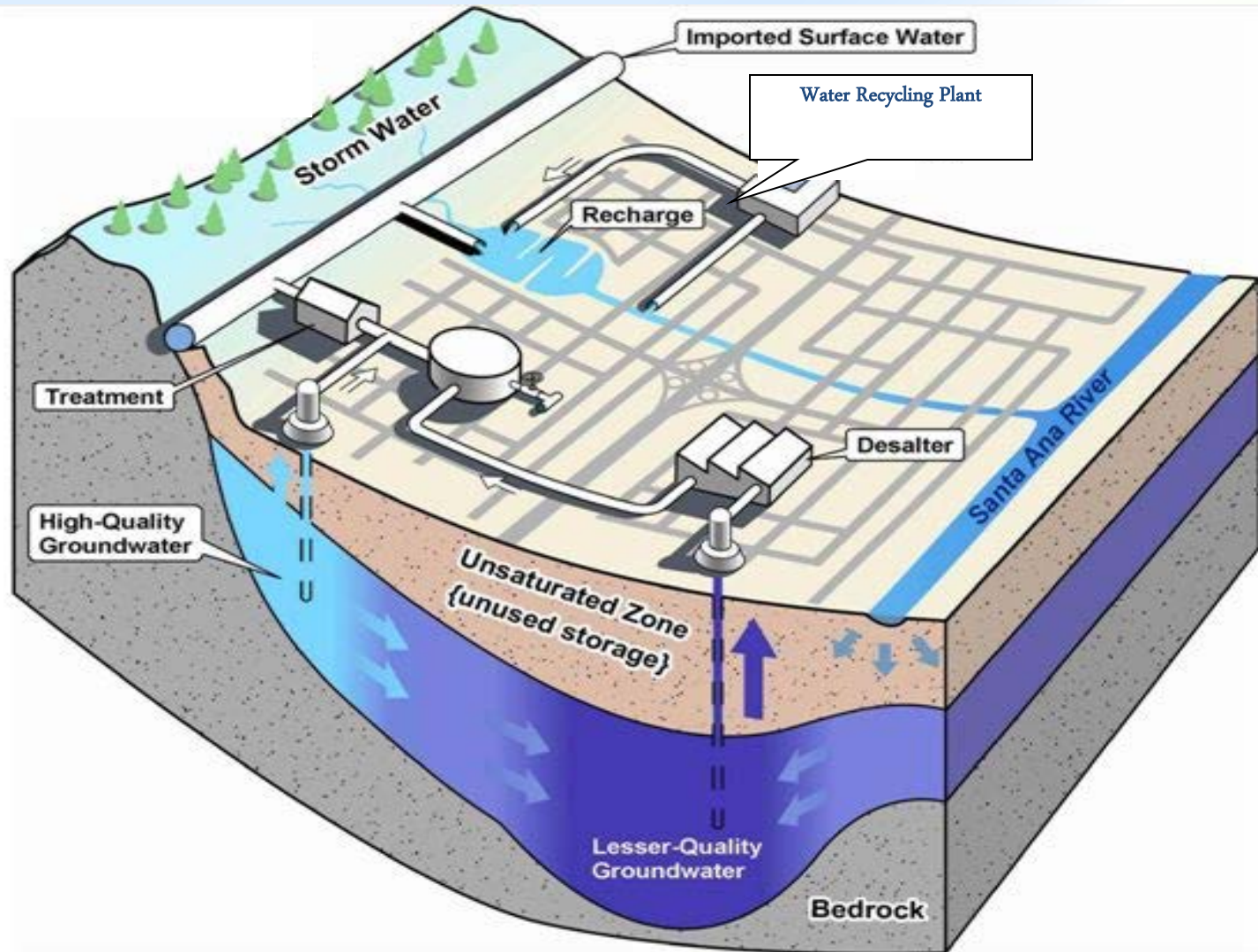




# Aquifer-System Underlying the Western Portion of the Chino Basin



# Conceptual Storage and Recovery of Water in the Chino Basin



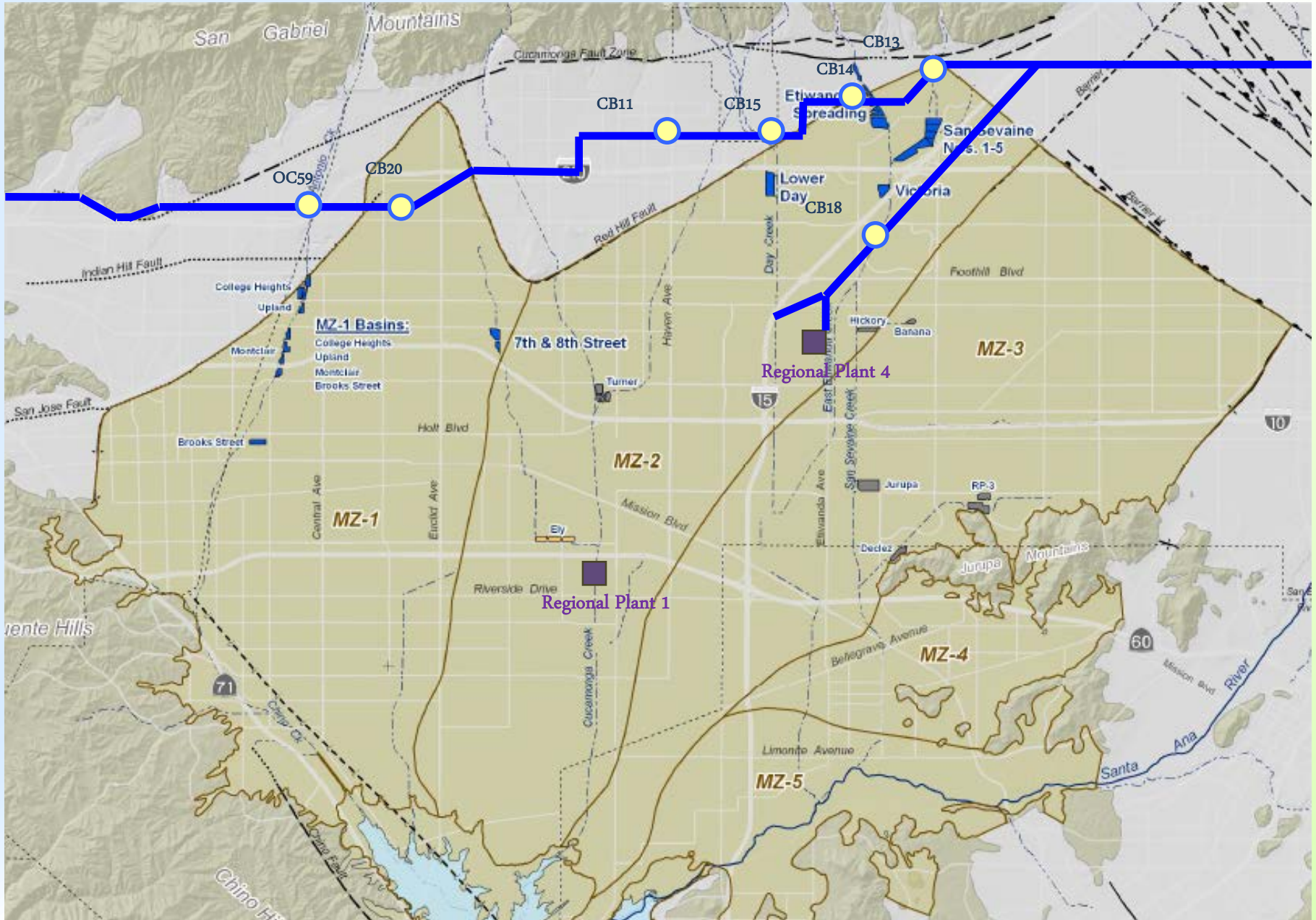


# Recharge Water Sources

Storm Water/Local Runoff

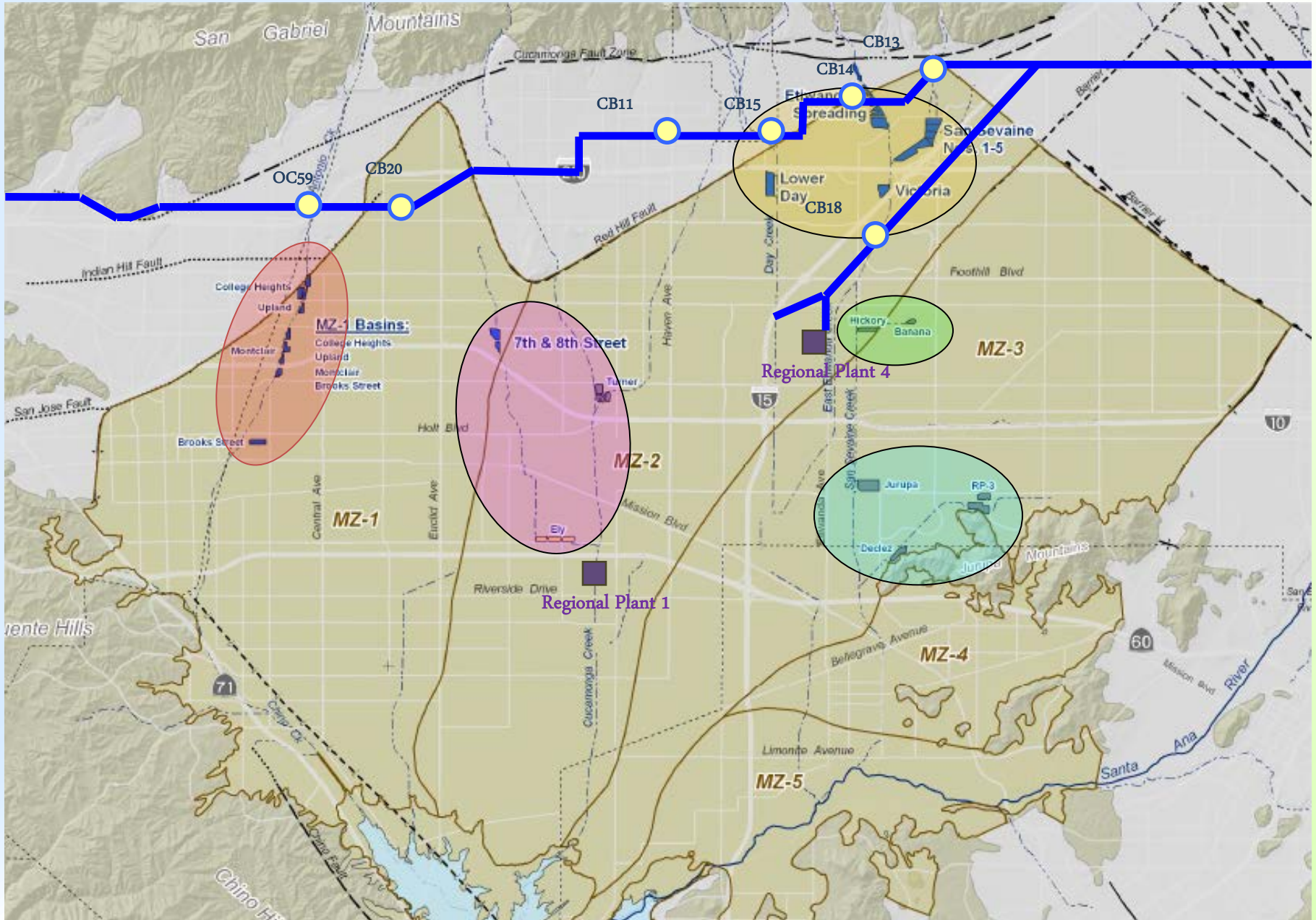


# Program Facilities





# Program Facilities





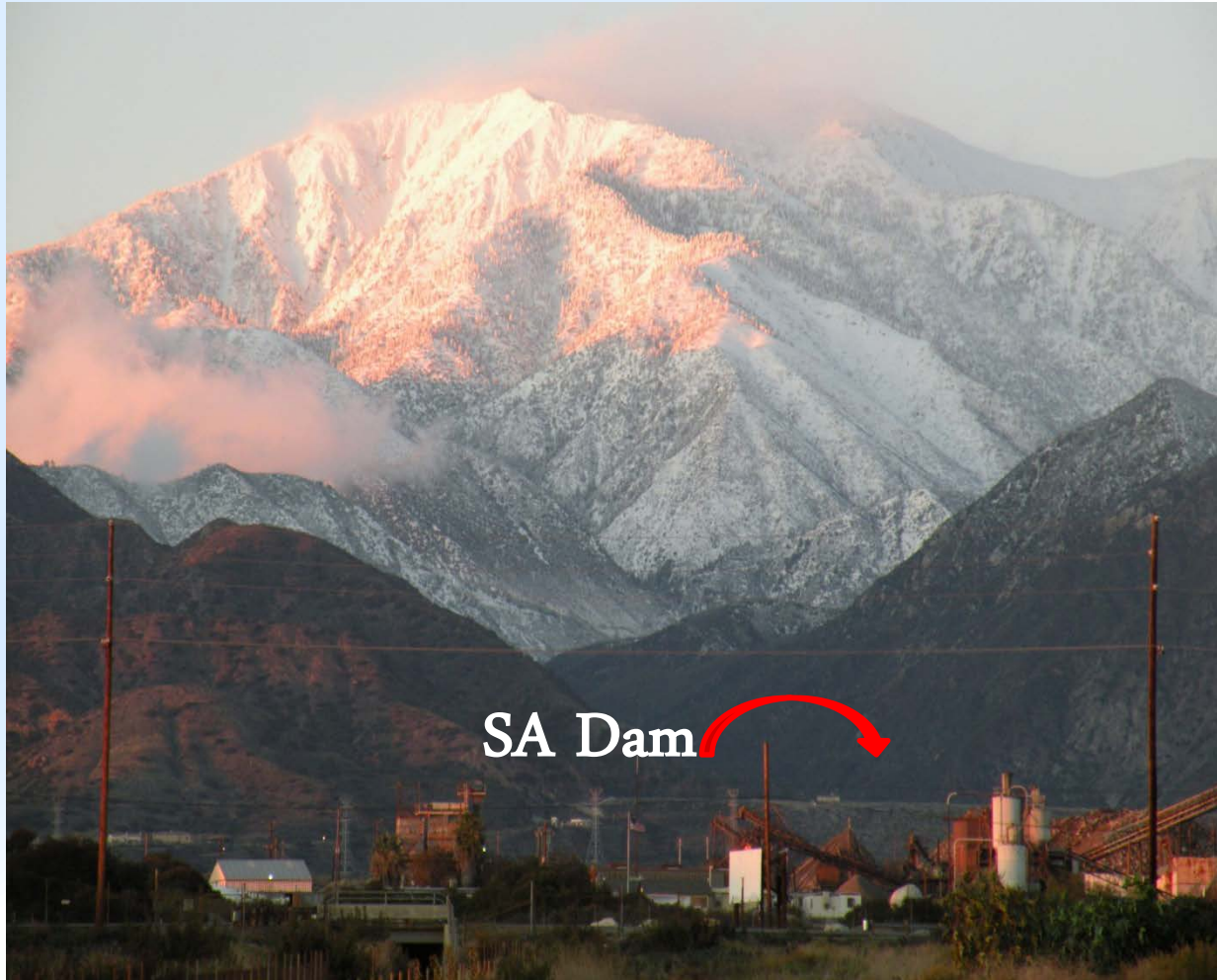


# Water Recharge





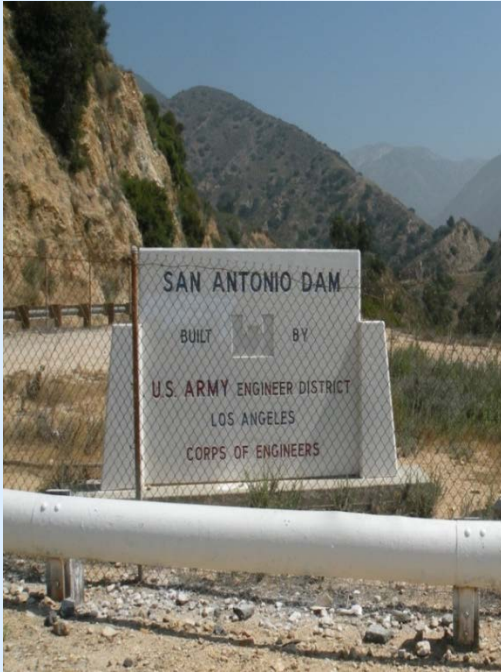
# Snow Event ☺ Future Recharge



**Mt Baldy (10,064 ft.)**



# San Antonio Dam

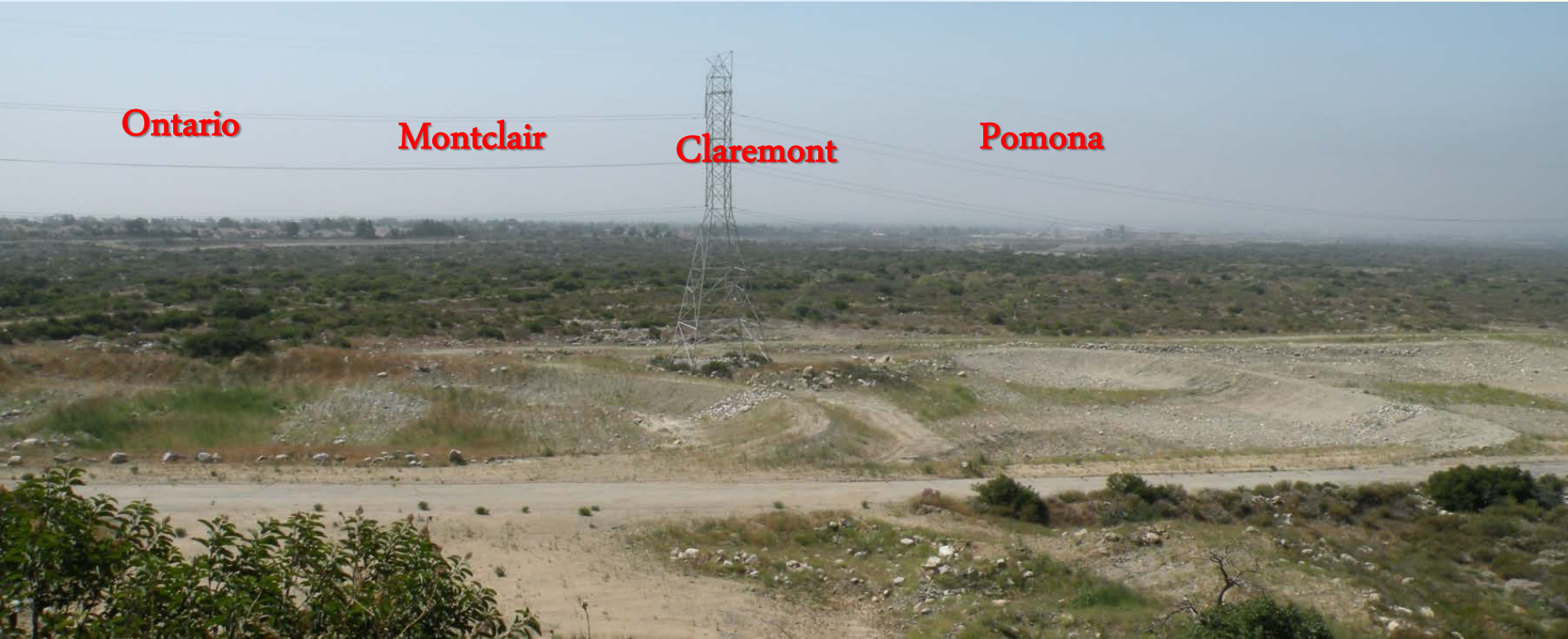


- Flood control & water conservation
- Capacity 9,285 acre feet
- Completed in 1956





# San Antonio Dam



Spreading grounds - Pomona Valley Protective Association



# Seven Oaks Dam



- Capacity 145, 000 acre feet
- Completed in 2000
- Construction Cost \$534 million

The Orange County Flood Control District, The San Bernardino County Flood Control District and Riverside County Flood Control and Water Conservation District.



# Imported Water

(State Water Project)



**NO Colorado River Water!!!**



# Imported Water

(State Water Project)

## Calif. Aqueduct-East Branch



## Lake Silverwood



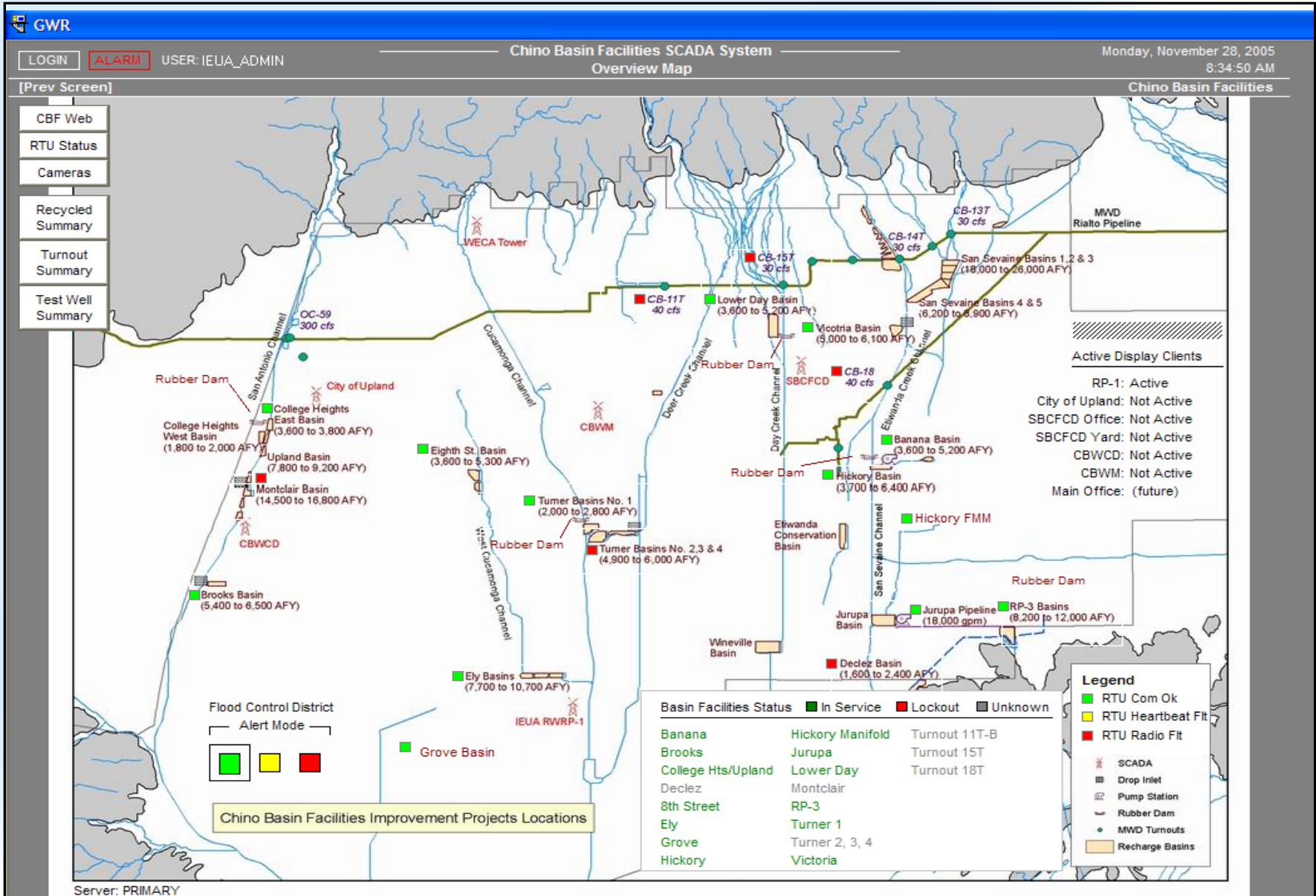
**DWR, Completed 1971**

**73,000 Acre feet**

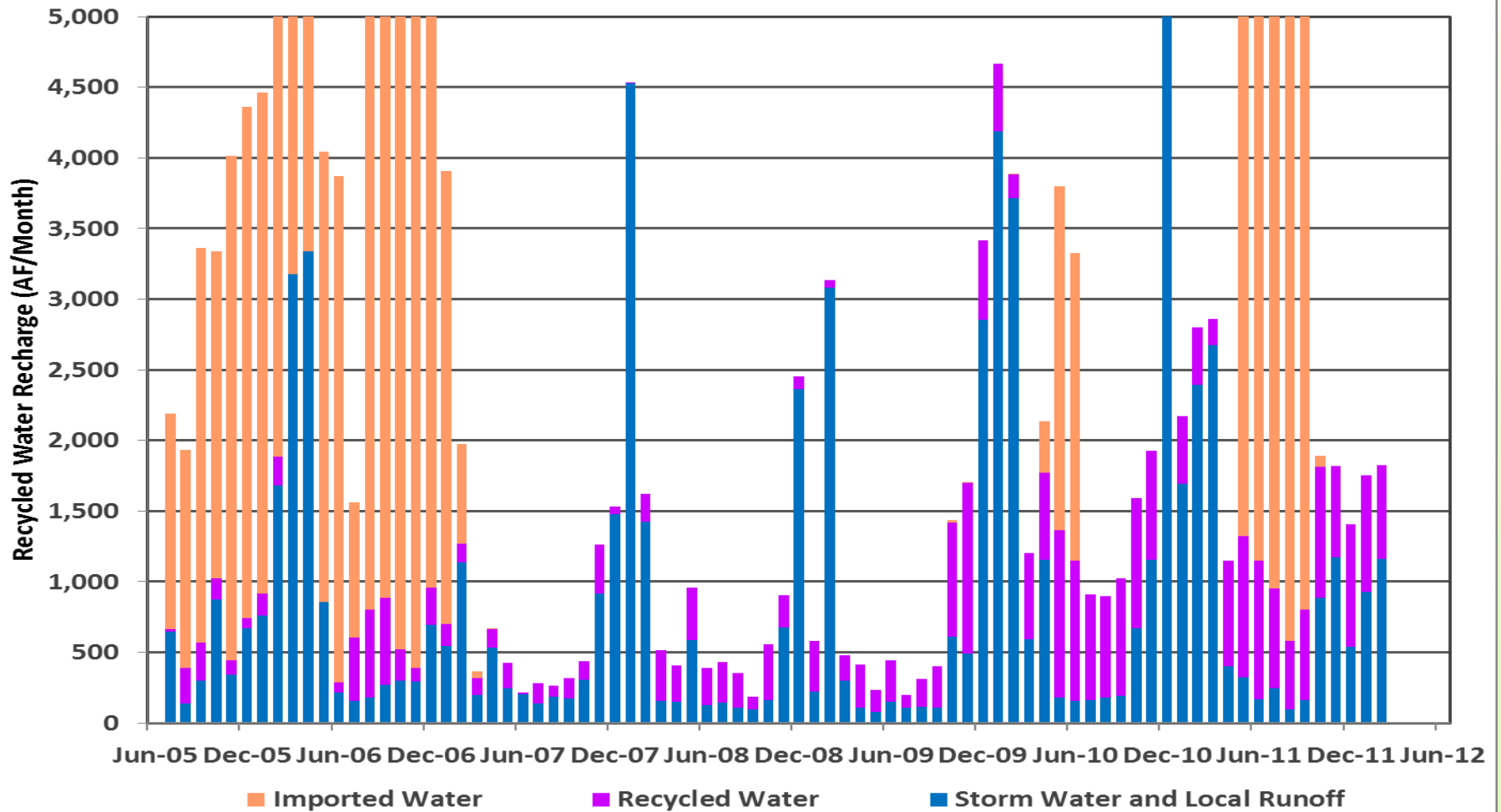


# GWR SCADA SYSTEM

## Up-to-the-minute Site Status



# All Recharge Water Sources





# Recycled Water

IEUA has Four Treatment Facilities

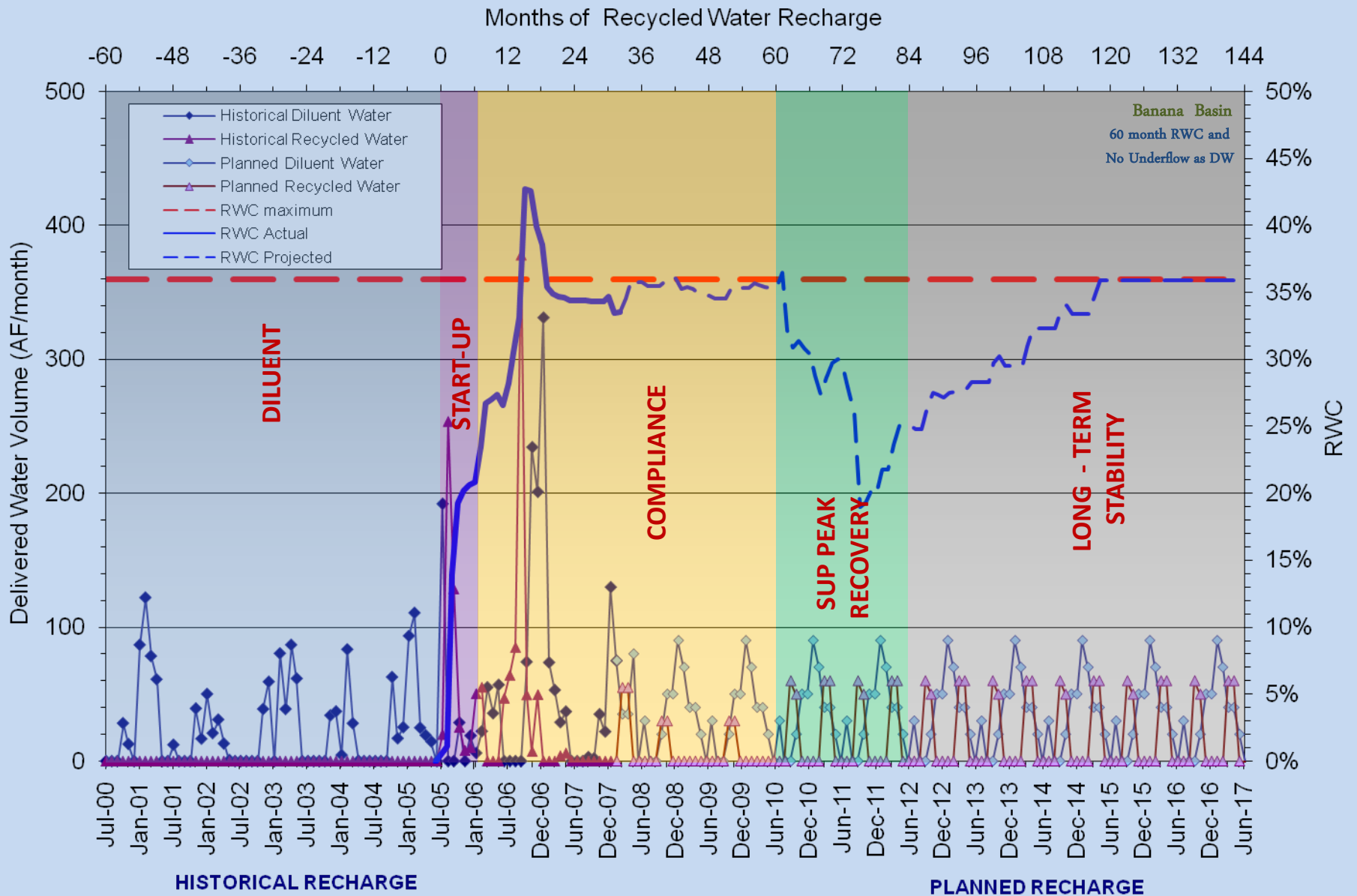
Treats 53 mgd



Annual discharges into Prado  
Basin-Santa Ana River 42,000  
acre feet-OCWD

# Managing Recycled Water Recharge Volumes

## RWC MANAGEMENT PLAN





# Beneficial Economics of Recharge

- Imported Water
  - MWD Replenishment Water
    - \$366 (2010), \$409 (2011), \$442 (2012)
  - MWD Tier 1 Full Service Untreated
    - \$424 (2010), \$527 (2011), \$560 (2012)
- Storm Water
  - \$0/AF Runoff+\$30 to \$50/AF Maintenance
- Recycled Water IEUA
  - GWR
    - \$115/AF (2011), \$155/AF (2012)
    - \$215/AF (2013), \$255/AF (2014)
  - For Direct Use (Landscape, Ag, Industrial)
    - \$195/AF (2012), \$255/AF (2013)
    - \$336/AF (2014)

# Recharge Basin Usage

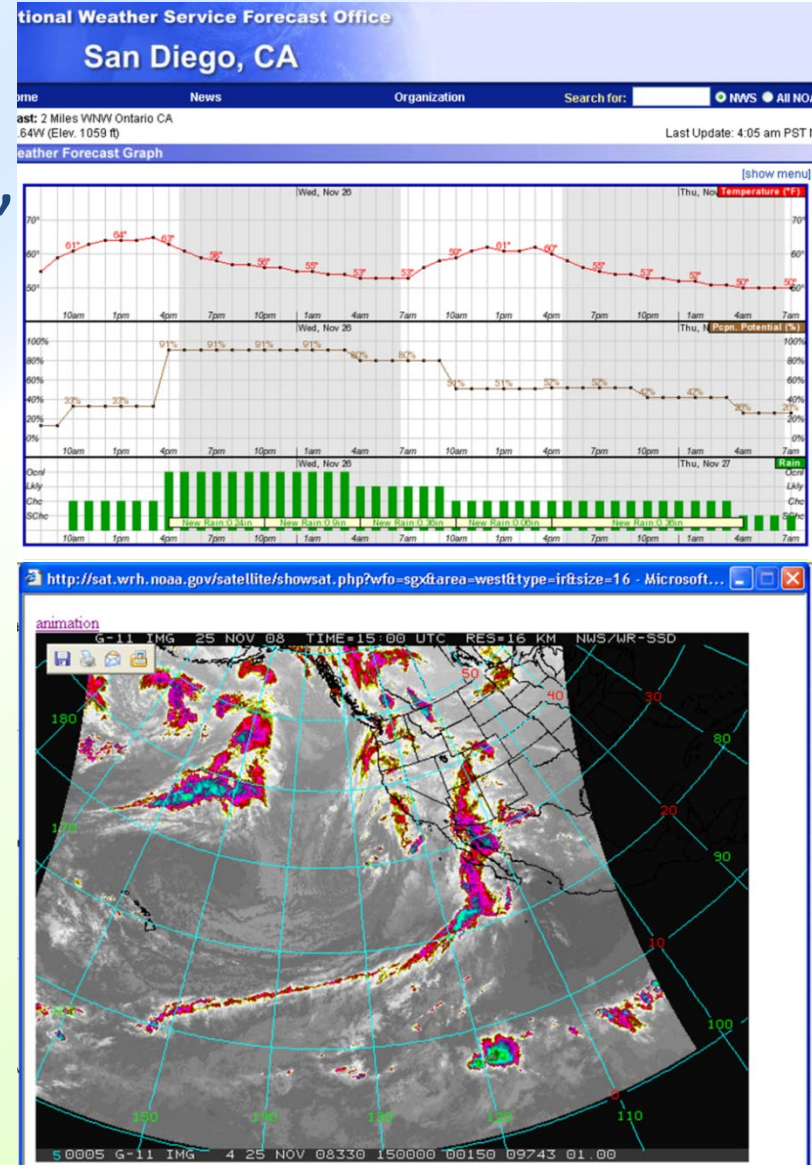
- IEUA coordinates introduction of recharge waters and the Operation & Maintenance (O&M) of basins
- CBWM funds O&M
- IEUA's funds pro rata share for recycled water
- The basins should be ready to receive all recharge waters at any time
  - Recycled water is controllable
  - Replenishment (Imported) Water when available is controllable (2007 and 2011)
  - Storm water availability is not predictable

	WATER SOURCES	IMPORTED	RECYCLED	RECYCLED	
		IMPORTED	IMPORTED		
		STORM	STORM	STORM	STORM
BASIN TYPE	Flow Through Basins	San Sevaine 1-3 Etiwanda Debris (p)	8Th Ely Hickory Banana	San Sevaine 5	Grove Decléz (p)
	Off Channel Basins	College Heights Upland Montclair Lower Day (p)	Brooks Turner Victoria RP3		
<b>Notes:</b>		(p) Permitted for recycled water, but transmission to this site does not exist			



# Storm Event Notifications

- 4-Party Agency's Operations, Maintenance, Planning, Management, Engineering Departments
- 3-5 day Storm Forecast
- Forecast Intensity and Precipitation Potential
- Supplemental Water Operational Changes



# Groundwater Recharge Coordinating Committee

- Four-Party Representatives
  - Recharge Operations Manager (CBWM)
  - GWR Coordinator (IEUA)
  - GWR Coordinator (SBCFCD)
  - Conservation Specialist (CBWCD)
- Agenda Topics
  - Administration
  - Operations
  - Maintenance
  - Capital Improvements
  - Planning







# Challenges and Issues

- Nitrates:
  - Crop production
  - Dairies nitrate-Less than 5 to >50mg/L
- VOCs
  - Trichloroethene (TCE) ND to > 20µg/L
  - Tetrachloroethene (PCE) ND to >20 µg/L
- Per chlorate
- TDS: less than 250 mg/L to more than 2,000 mg/L
- Hexavalent chromium chromate
- Maintenance
- Conflicts

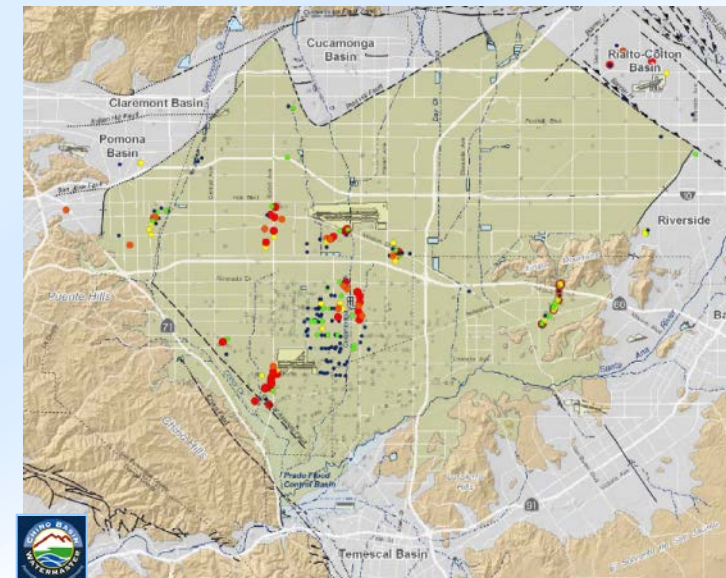
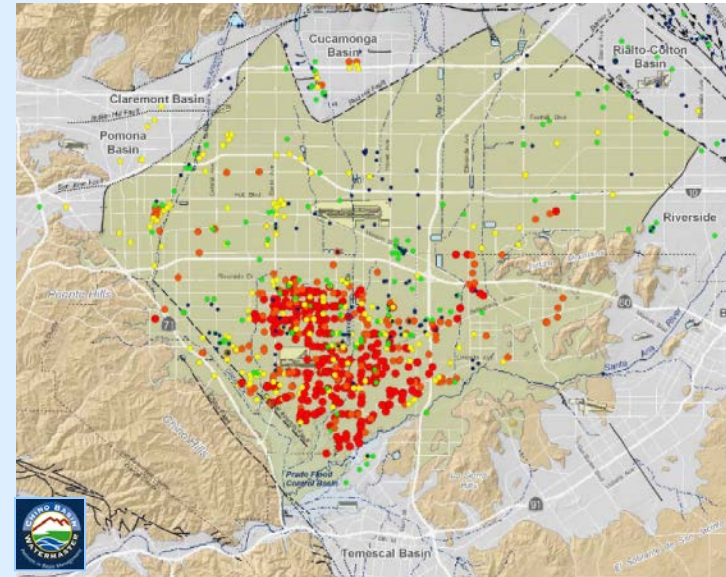
# Potential Mitigatable Impacts of CBFIP on the Santa Ana River

## Nitrate as Nitrogen > 40 mg/L

- Increase groundwater gradient and outflow from Chino Basin to Santa Ana River

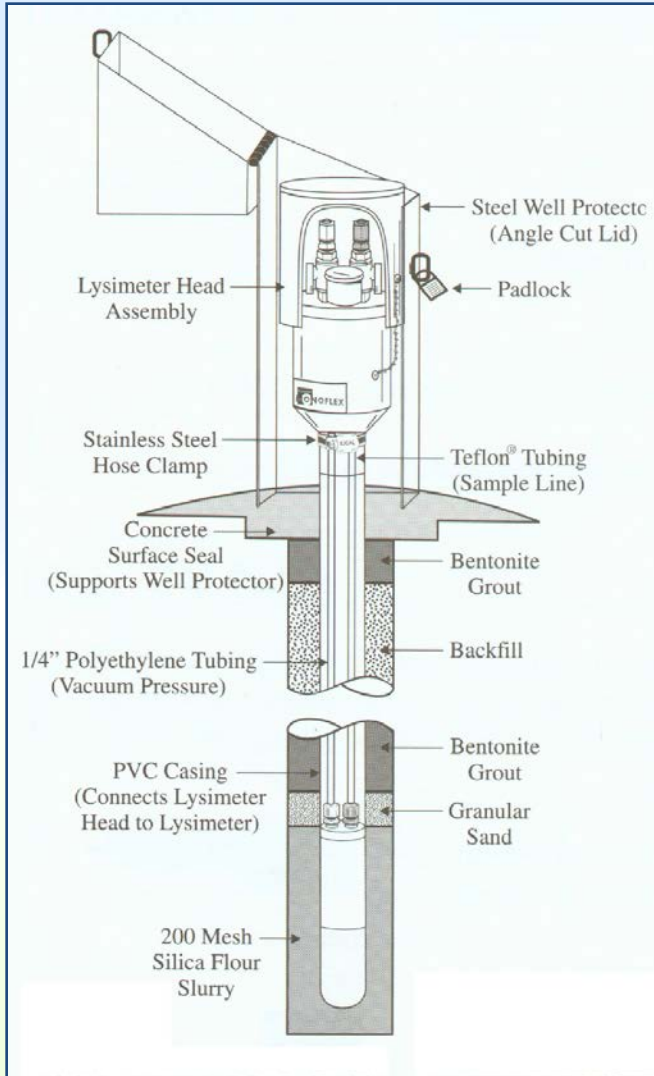
## Trichloroethene > 10 mg/L

- Migration of VOCs, high TDS water and high NO<sub>3</sub> water from the southern Chino Basin

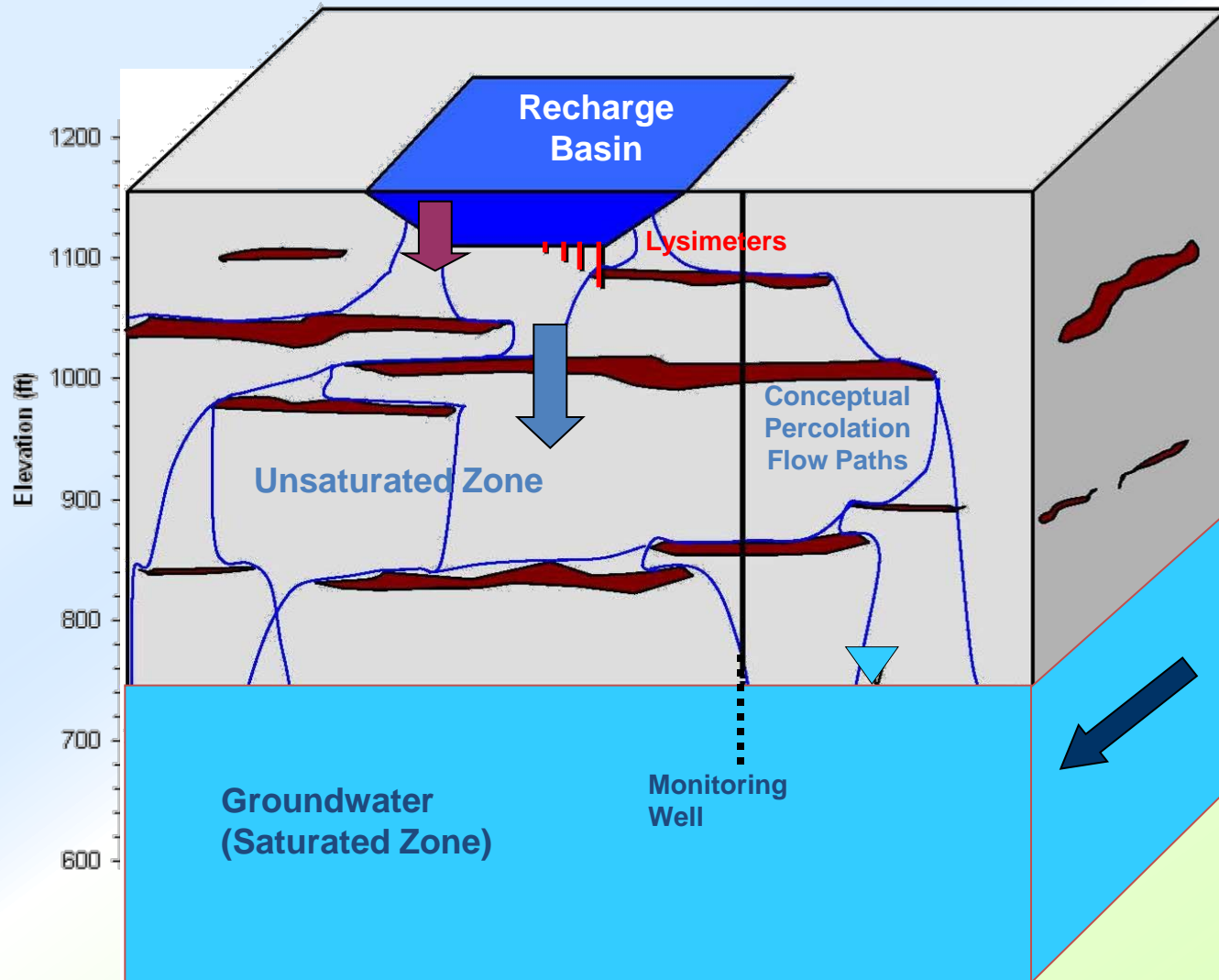




# Lysimeter Construction



# Lysimeter Monitoring





# Sampling – Calif. Mandates

- Storm Water
- Recycled Water
- Imported Water





- 24,600 acre-feet per year
- Reverse Osmosis (RO)
- Ion-Exchange (IX)
- Removal of nitrate and total dissolved solids (TDS).
- Removal of some volatile organic chemicals (VOC).
- Desalters treat contaminated groundwater in the southern portion of the Chino Basin, and to help achieve “hydraulic control” of the basin to stop the flow of contaminated groundwater into the Santa Ana River.

#### Member Agencies:

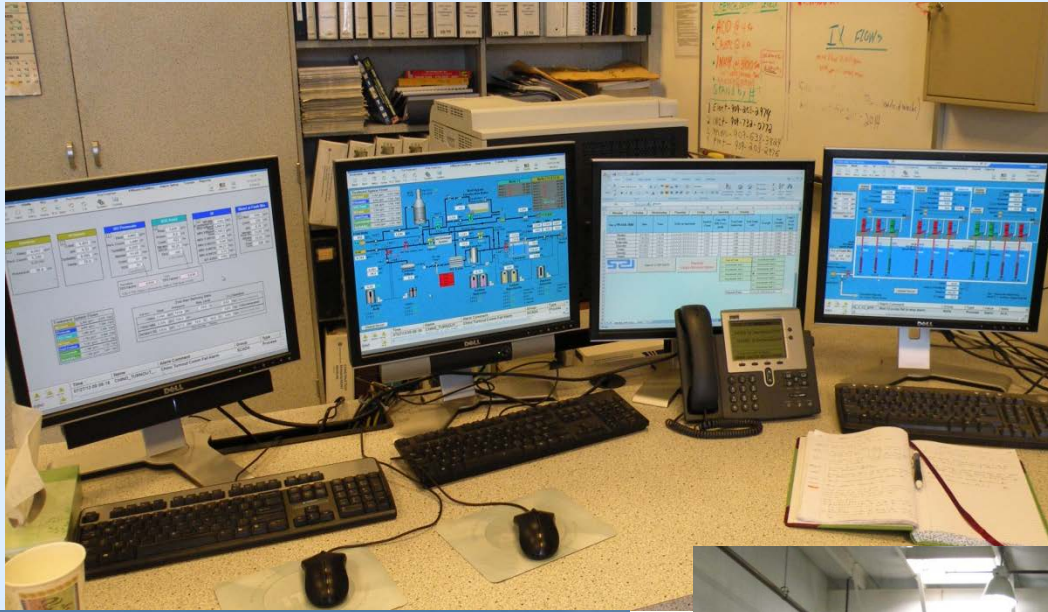
Cities of Chino, Chino Hills, Norco and Ontario;

Jurupa Community Services District; and Santa Ana River Water Company.



# Chino Basin Desalter Authority: CDA

- Desalter I
- 2001
- 11.2 MGD

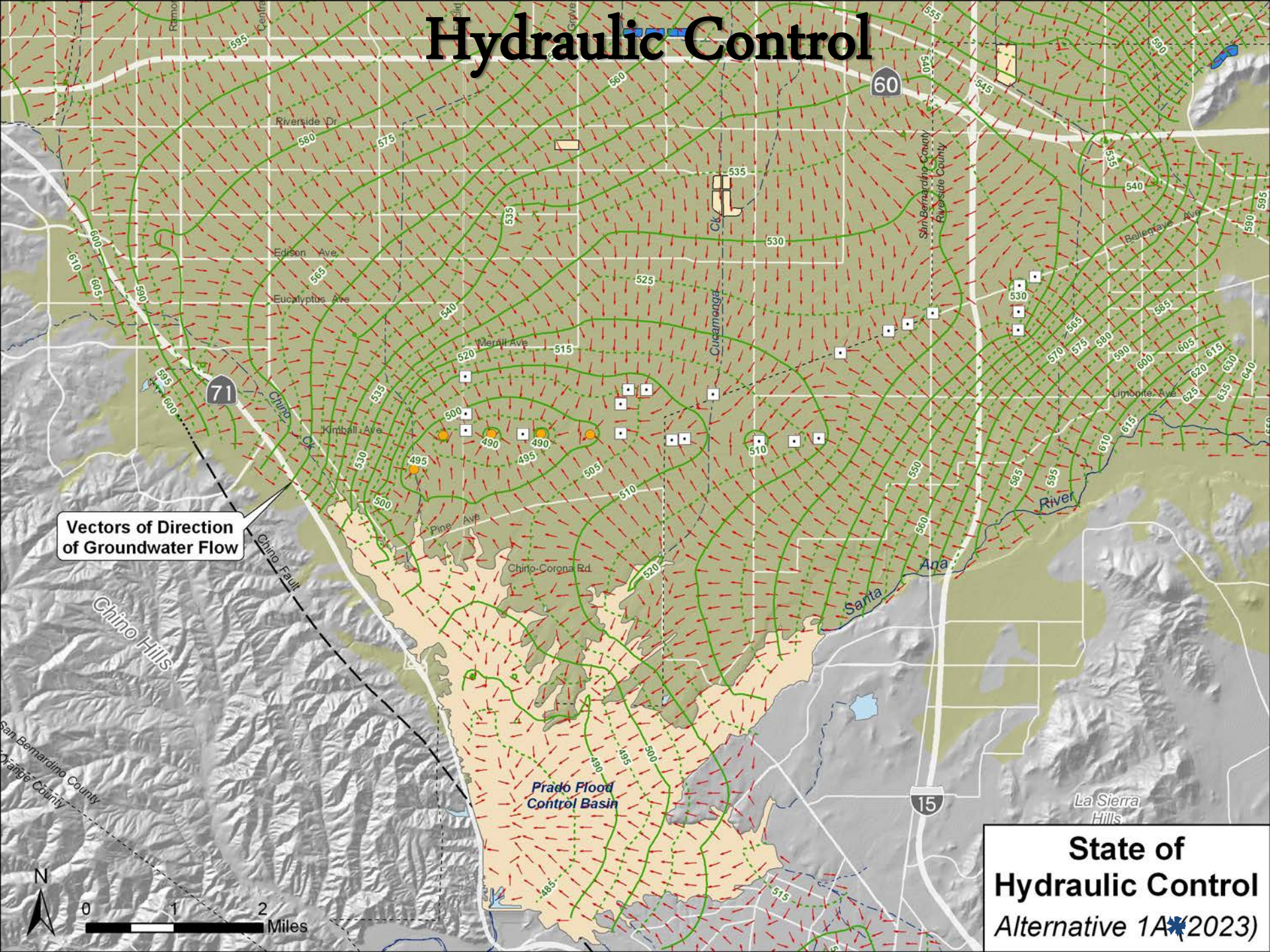


- Desalter II
- 2006
- 13.5MGD





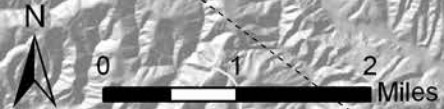
# Hydraulic Control



Vectors of Direction of Groundwater Flow

Prado Flood Control Basin

State of Hydraulic Control  
Alternative 1A (2023)

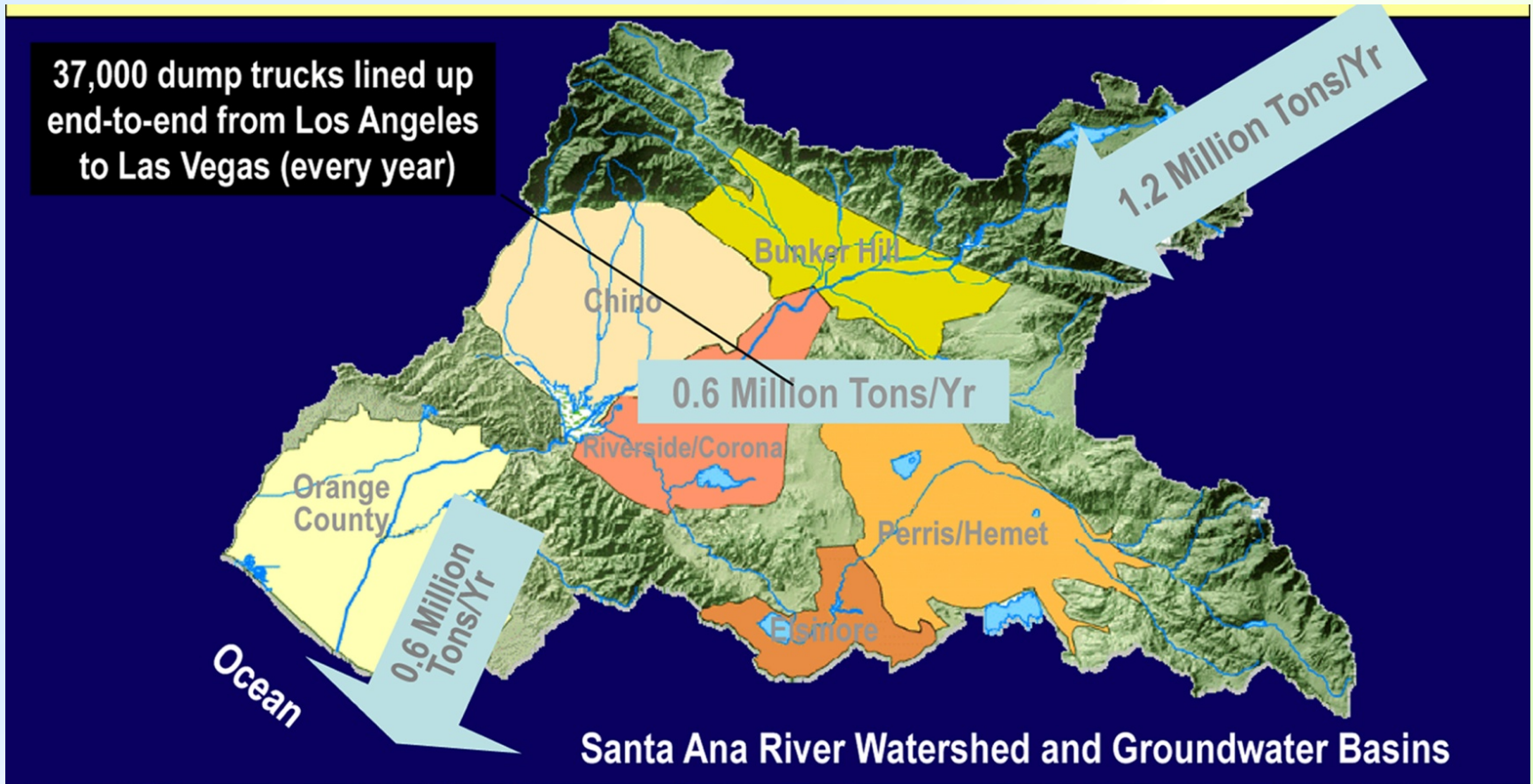




# Brine Line

90+ miles in Orange, San Bernardino, Riverside Counties

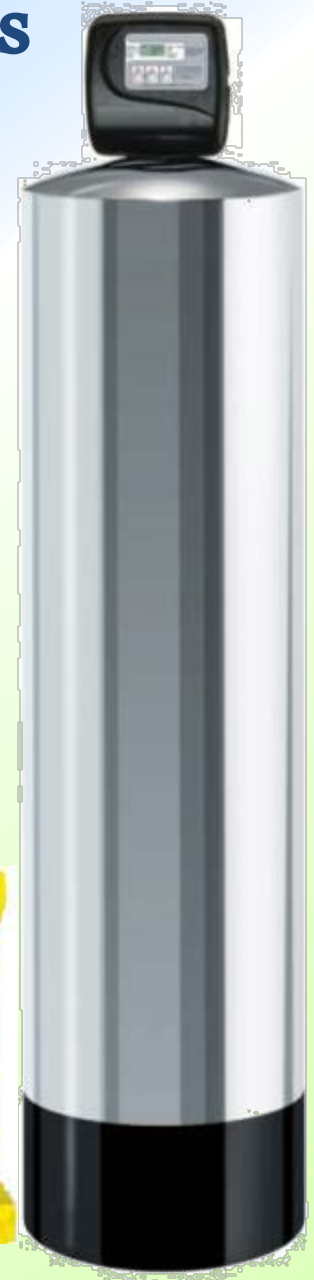
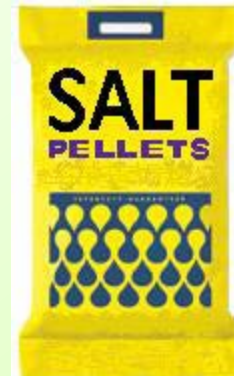
Current Flow 12 MGD, Design Capacity 30 MGD



# Problems with Water Softeners

- Excess amount of salt they discharge
- Salt is the largest constraint to groundwater and recycled water supplies
- Local agencies pushing to eliminate salt-based water softeners

One self-regenerating water Softener uses  
360 pounds of salt each year





# Answers to Water Softeners



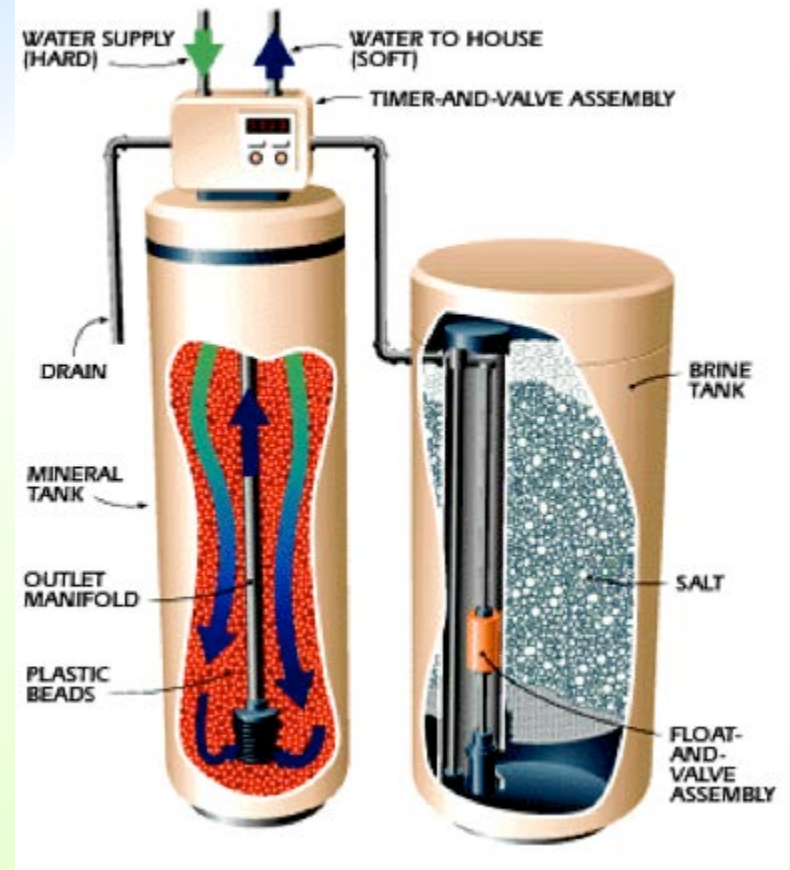
Salt Less Tank



Rebate

(IEUA pays up to \$2,000)

Exchange Tank





# The Ag Preserve

**1970's**

Almost 400 dairies  
and 400,000 cows



**Today**

Less than 40 dairies





# The Ag Preserve



Waste water ponds



Waste water discharge



Manure: Two tons per cow per year





# Inland Empire Regional Composting Facility (IERCF)

February 2002-IEUA and the County Sanitation Districts of Los Angeles County  
Located in Rancho Cucamonga



Nation's largest indoor biosolids composting facility and has been in operation since 2007.





# Maintenance & Construction







# Basin Clean Up & Configuration







# Erosion Control







# Spillway Repairs







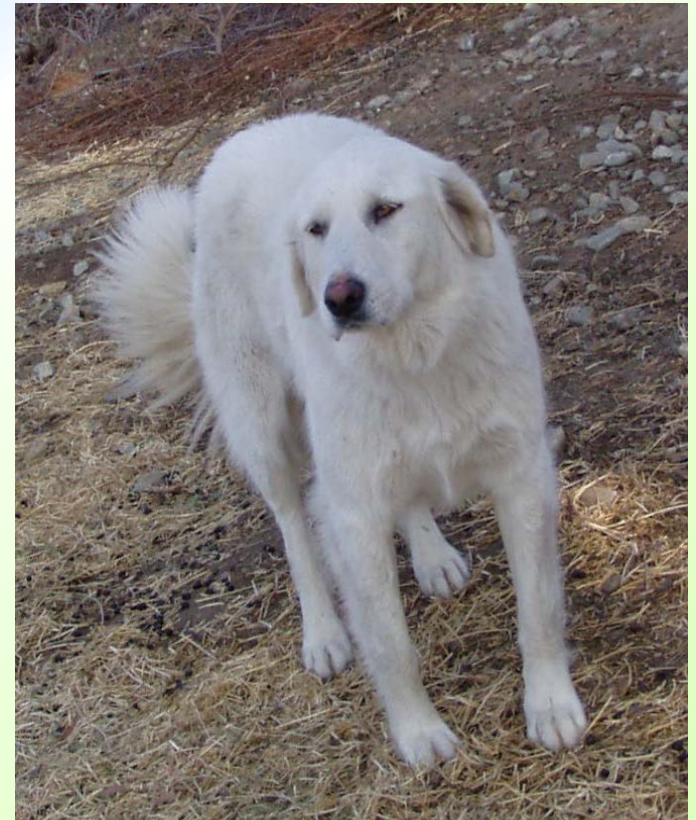


# Weed Abatement

‘The Workers’



‘The Caretaker’





# Weed Abatement

The grass is always greener.....!!!







# QUESTIONS?

Clean & Reliable Water for All!

Water makes great wildlife watching!







# Thank You!

**Contact Info:**

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909-267-3223

# Credits

- Chino Basin Desalter Authority (CDA)
- Chino Basin Water Conservation District (CBWCD)
- Chino Basin Water Master (CBWM)
- Cooper Museum
- Cucamonga Valley Water District (CVWD)
- Department of Water Resources (DWR)
- Inland Empire Regional Compost Facility (IERCF)
- Inland Empire Utilities Agency (IEUA)
- San Bernardino County Flood Control District (SBCFCD)
- Wildermuth Environmental