



GROUNDWATER RECHARGE IN CALIFORNIA

Jeanine Jones, California Department of Water Resources

Groundwater Recharge (aka MAR) Definitions

- Not ASR (aquifer storage & recovery)
- Includes banking/groundwater banks
- Alluvial groundwater basins (not fractured bedrock)
- FloodMAR -- putting flood flows on ag lands, working lands, or managed natural areas (e.g. wildlife refuges)



Necessary Elements of a Recharge Project

- A surface water source
- Conveyance is commonly needed. California's highly interconnected conveyance infrastructure enables many projects. (CA law requires conveyance owners to wheel water for others, subject to capacity availability & reimbursement)
- Empty storage space in a groundwater basin
- A recharge mechanism (almost all are recharge basins or a managed section of river channel)
- Monitoring wells & a groundwater model

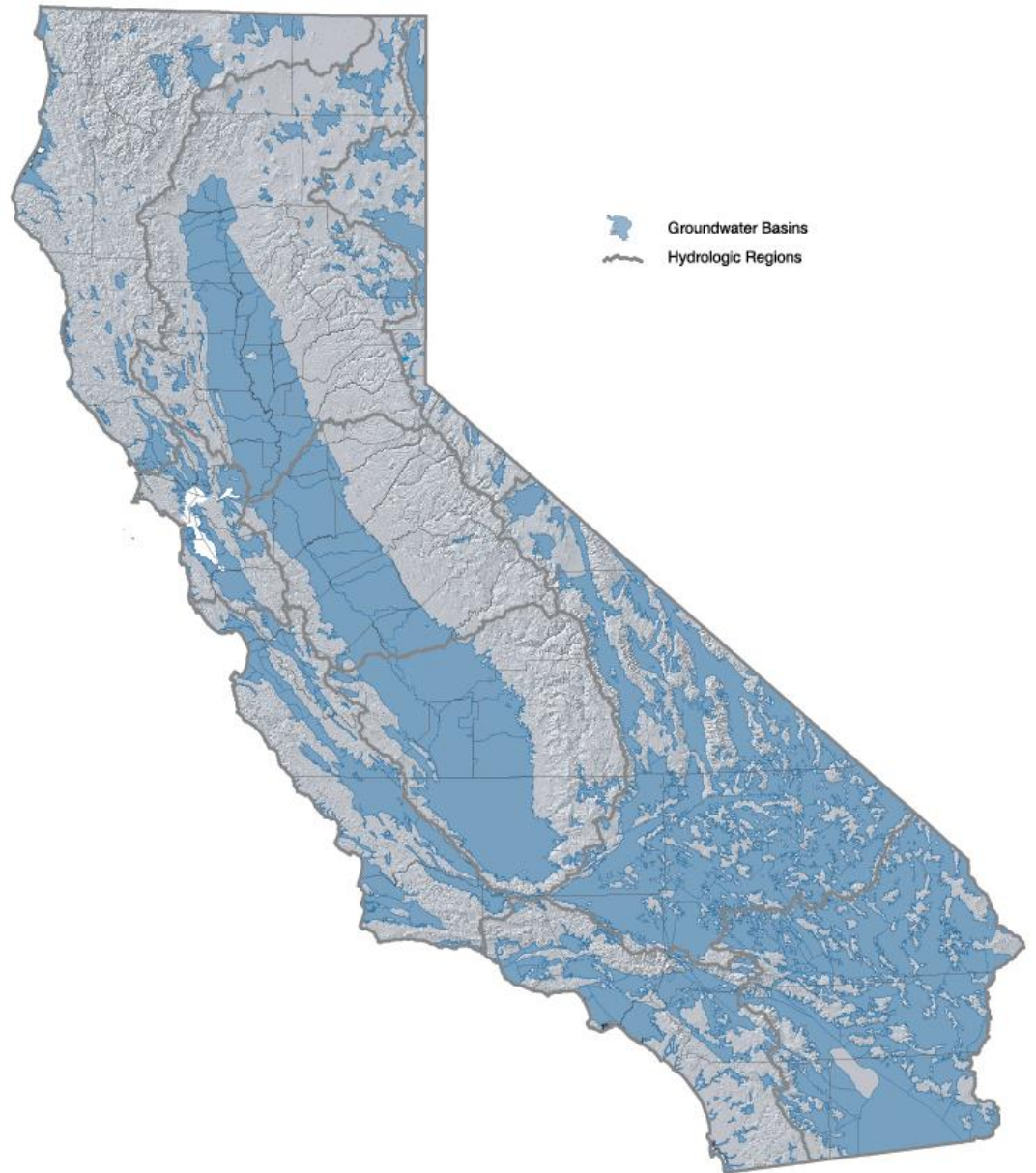
Legal Background

- Surface water sources acquired via water rights or contracts with wholesalers or wastewater agencies for recycled water
- No specific state statutes regulating recharge, legal framework has emerged through case law.
- Some special-act local agencies have specific statutory authorities that facilitate recharge projects (e.g. ability to impose pump taxes)
- Some projects are created through local agency JPAs, many projects are multi-agency partnerships



**Groundwater
supplies about
40% of California
water use in
average years,
60% in drought
years**

**DWR has
delineated 515
basins**

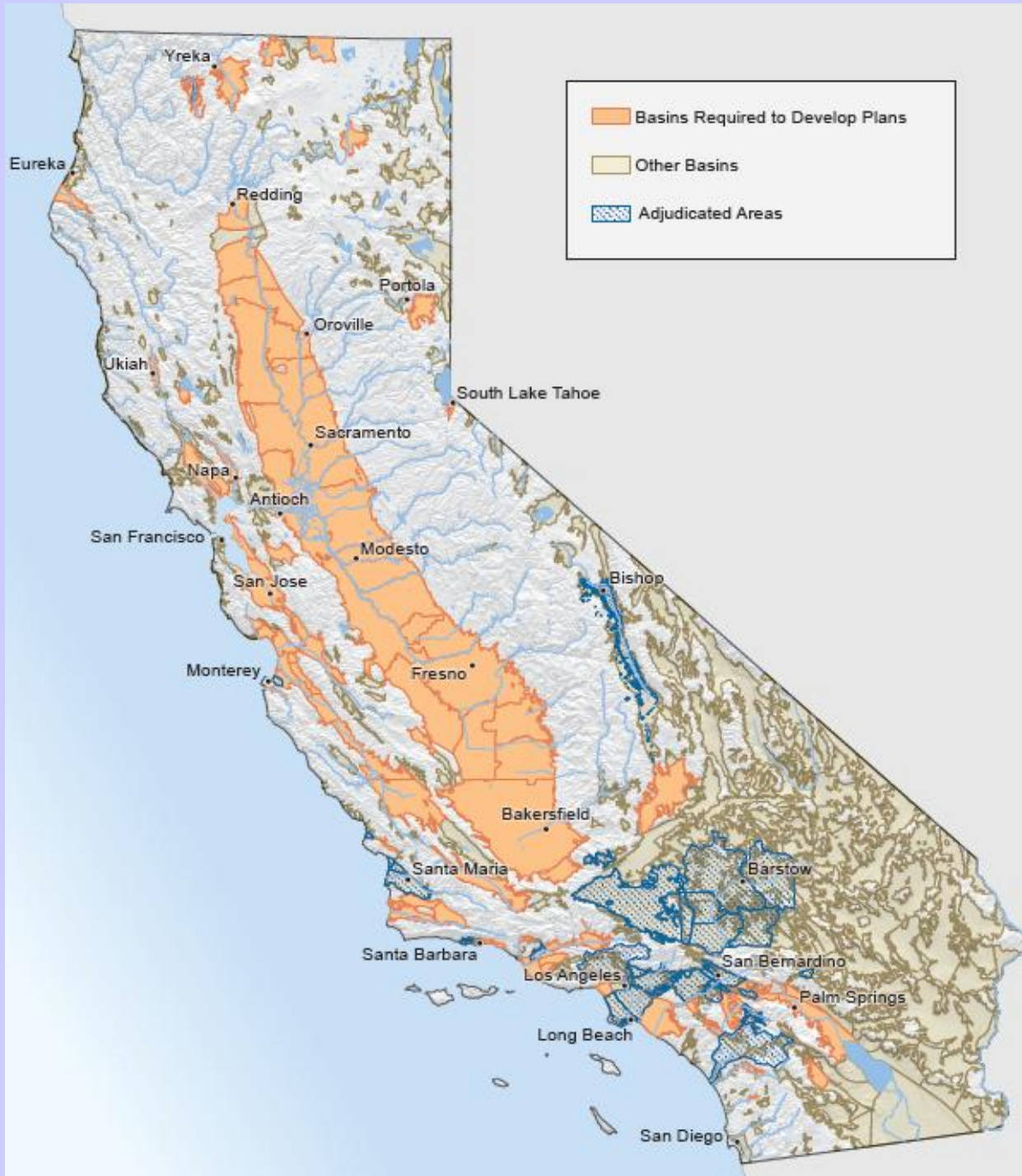


General Regulatory Background

- 1914: present system of state surface water regulation enacted
- Subsequently: small number of groundwater basins with mandatory local management created through locally-driven court adjudications or special act local districts
- Late 20th century: minor state legislation authorizing generic local groundwater management enacted
- 2014: Sustainable Groundwater Management Act (SGMA) enacted, requiring mandatory local groundwater management in designated basins

SGMA Statistics

- 94 of California's 515 groundwater basins subject to SGMA management requirements, accounting for more than 95 percent of state groundwater use.
- 20 of the 94 basins are designated as critically overdrafted.
- More than 250 GSAs formed



SGMA's "Six Sins"

- Significant/unreasonable:
 - Declines in groundwater levels
 - Reductions in groundwater storage
 - Saltwater intrusion
 - Water quality degradation
 - Land subsidence
 - Surface water depletion

Recharge Background

- California's earliest recharge projects began in the 1910s in Los Angeles area. Large-scale banking (1 MAF projects) began in the 1970s-80s in the San Joaquin Valley
- Recharge projects are very common. DWR has provided \$100sM grant funding for them.
- Post-SGMA, big push for FloodMAR and temporary recharge permits/projects

Recharge Isn't Rocket Science

- Many of the SoCal projects were constructed before computers (image is 1960s) and groundwater models (MODFLOW was 1980s) existed

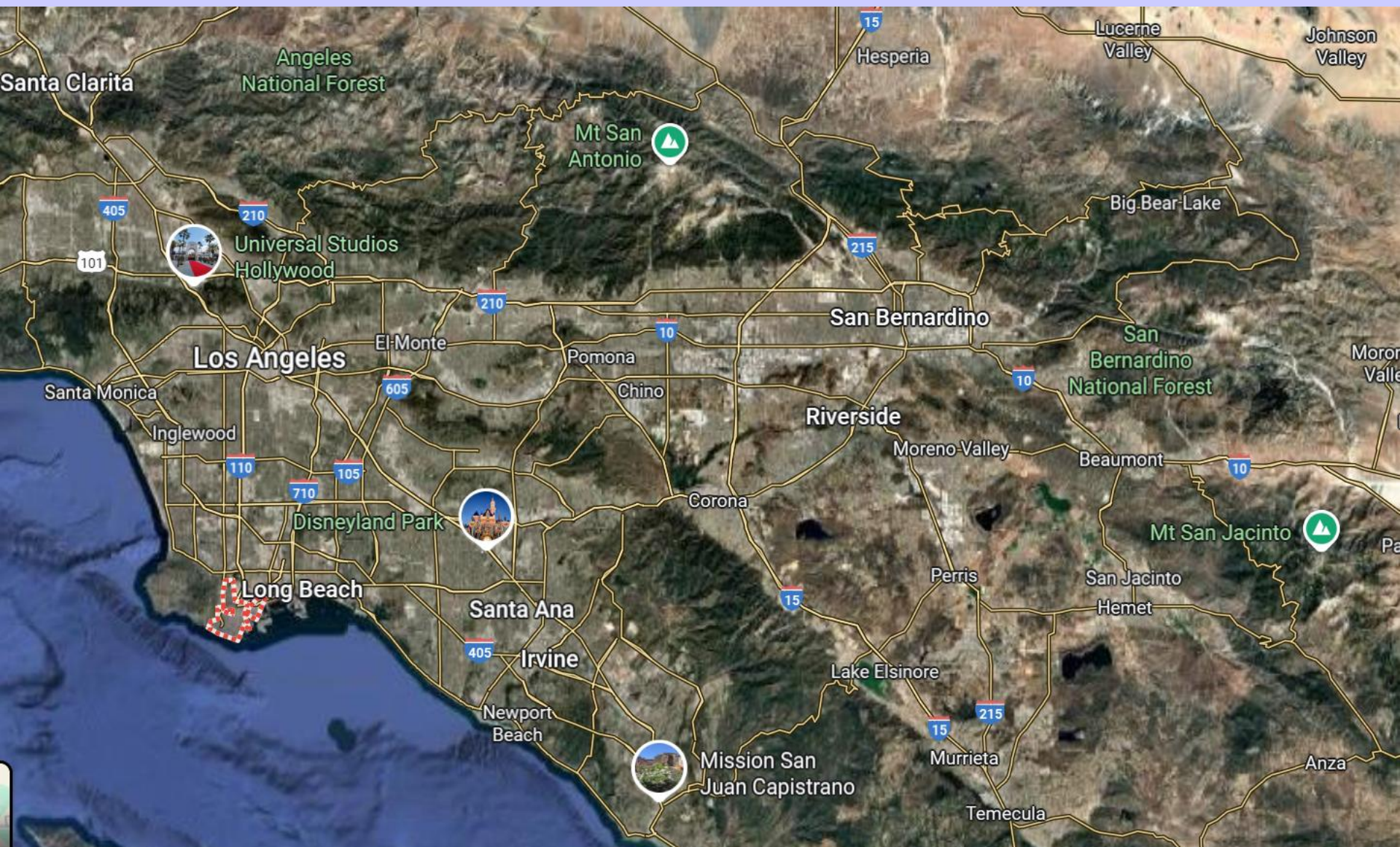


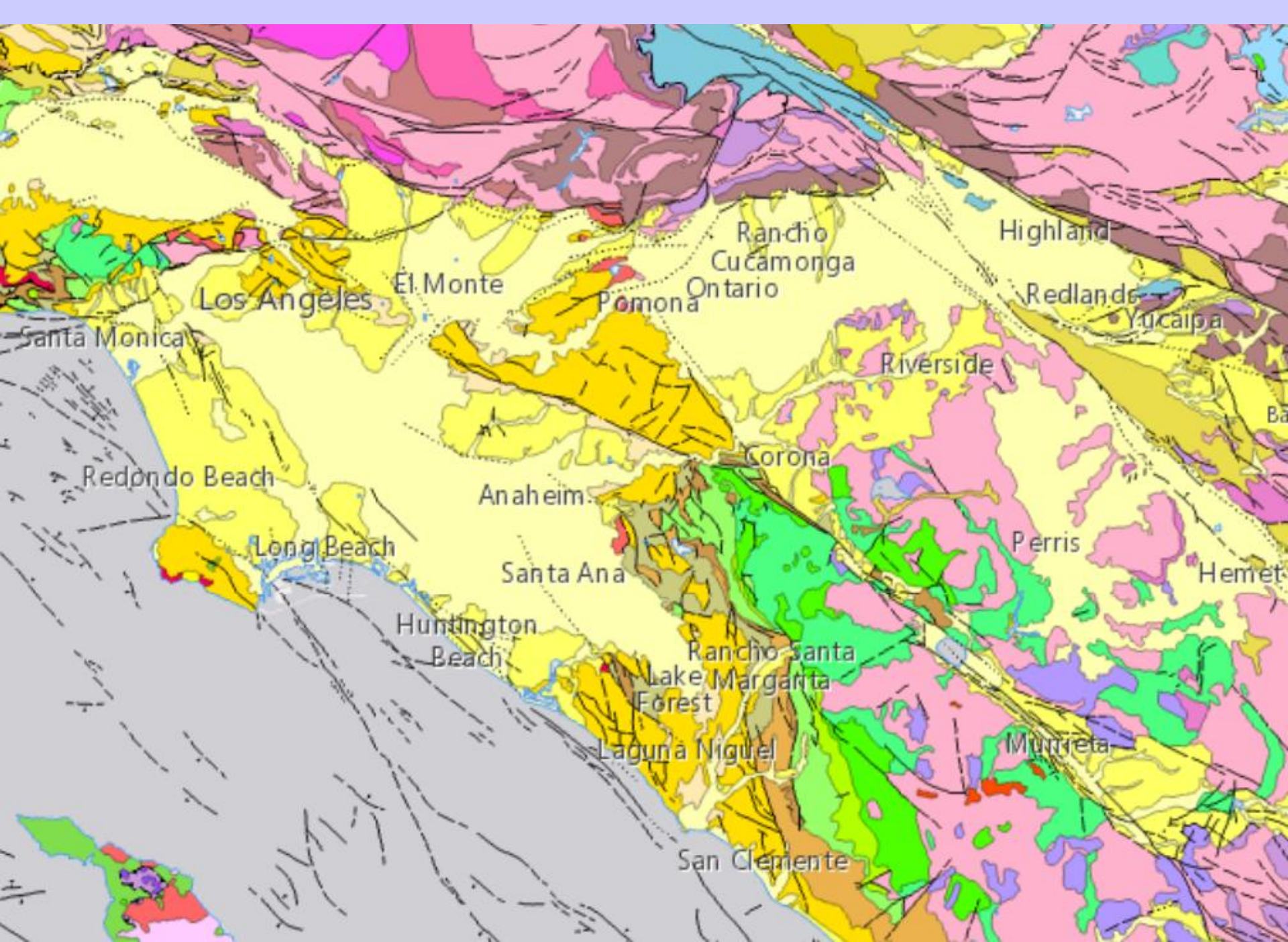
Challenges to Recharge Projects

- Groundwater contamination is an emerging challenge as drinking water MCLs become more stringent (naturally occurring arsenic, pesticides). Semitropic (AS), Arvin-Edison (TCP) banking projects in the San Joaquin Valley are dealing with this
- Some storage projects have been studied, but not constructed, because of naturally occurring AS

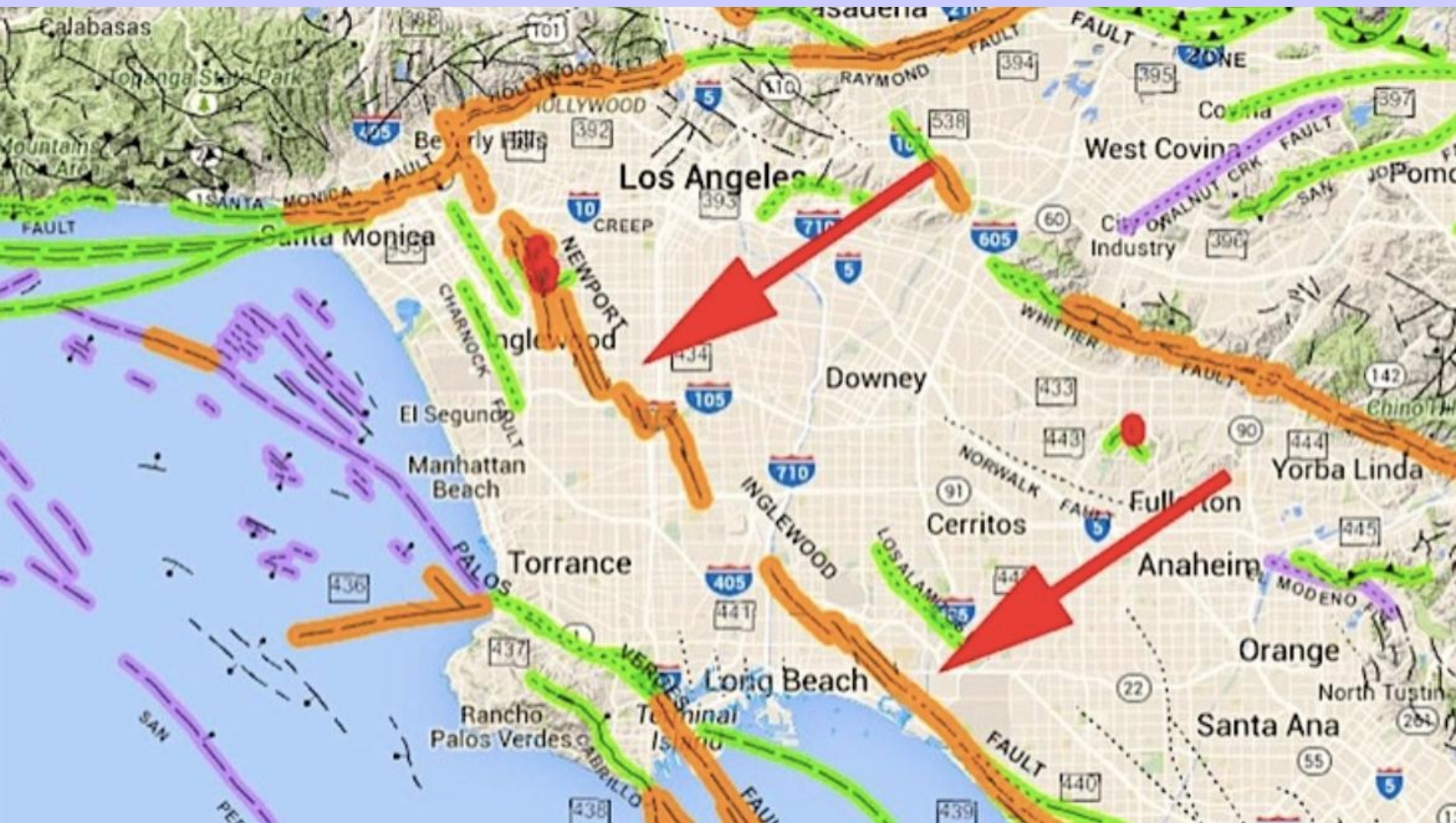
Groundwater Storage Easier to Implement Than New Surface Storage Projects

- CA Proposition in 2014 -- \$7.12B water bond measure, provided \$2.7B for public benefit share of new storage projects
- In 2018, DWR's CWC approved 8 projects for funding: one recycled water/gw storage project, 3 gw storage projects, & 4 surface reservoir projects
- Project sponsors have now dropped 3 of the 4 reservoir projects as economically infeasible



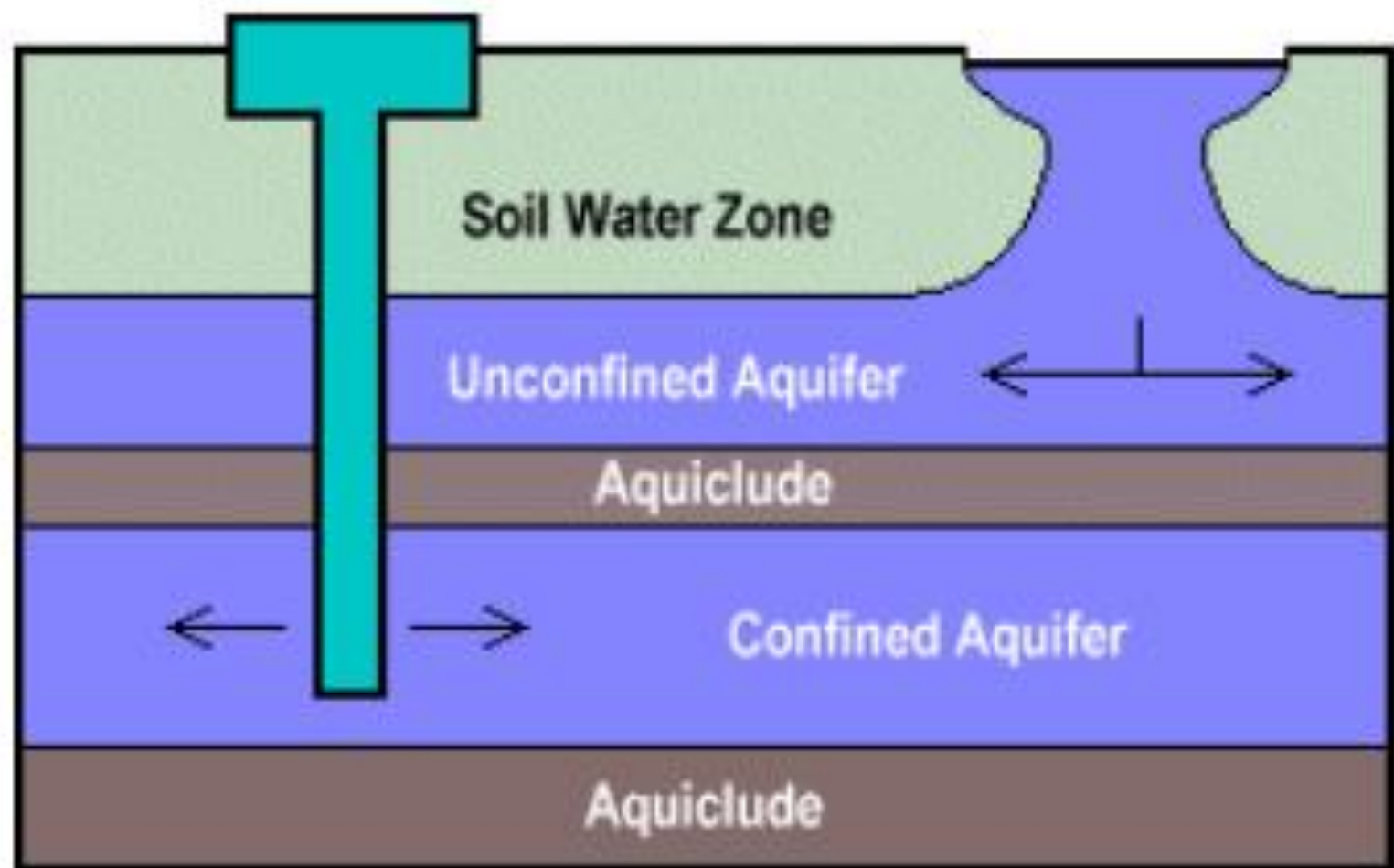


Newport-Inglewood Fault Zone



Injection Well

Spreading Basin



Injection Well vs. Spreading Basins

Rio Hondo, LA County



Recharge by injection – the LA & Orange County seawater intrusion barriers



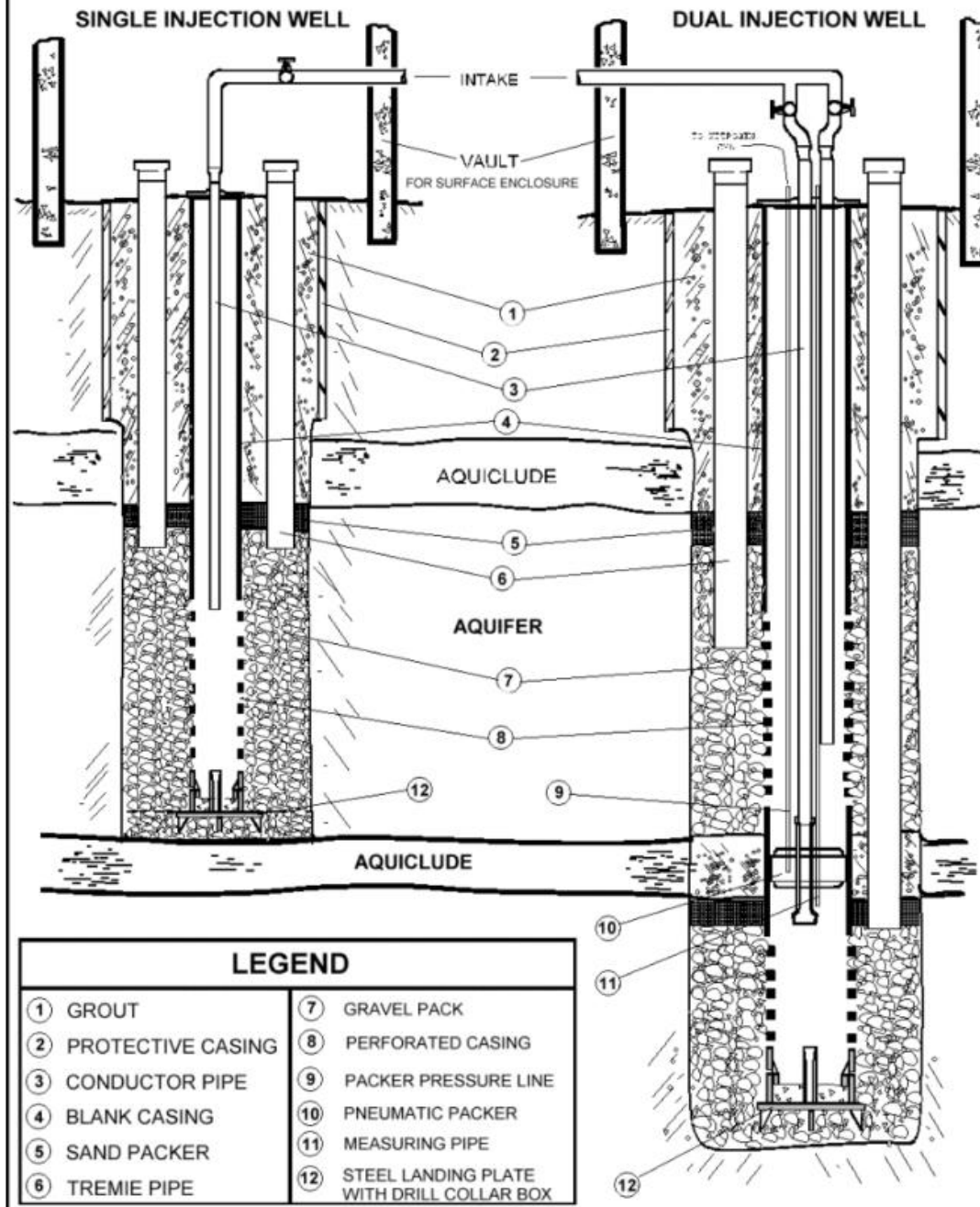
Data as of 2007. The barriers have been in operation for decades, with new injections wells and many new monitoring wells being added over time.

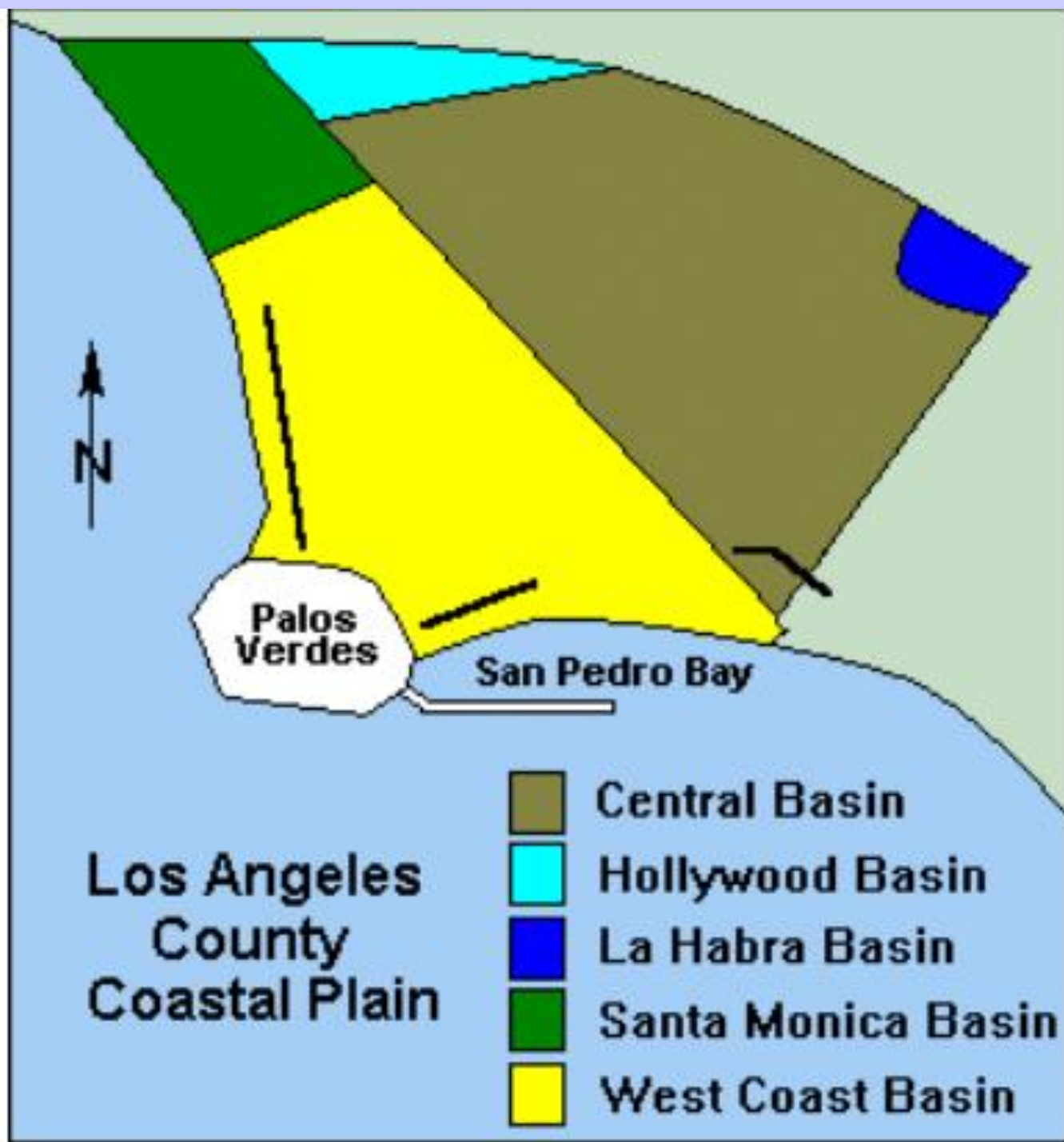
Barrier Project	West Coast	Dominguez Gap	Alamitos Gap
Date Started	1953	1969	1964
Overall Length (miles)	9	6	2.2
Number of Injection Wells	153	94	43
Number of Observation Wells	302	232	239
2008 Injection Amounts (estimated acre feet)	13,600	11,000	6,000





TYPICAL INJECTION WELL FEATURES





Water Replenishment District of SoCal

- Formed in 1959 to provide replenishment water for 2 adjudicated gw basins in LA County, the West & Central Basins
- Recharges at Montebello Forebay spreading basins & seawater injection barriers, operates two recycling plants and a brackish gw desalter
- 92 TAF of replenishment in 2023.

Recharge by Surface Spreading Orange County WD



