SCV GSA

MEMBER AGENCIES

SCV WATER

CITY OF SANTA CLARITA

LOS ANGELES COUNTY DEPARTMENT of REGIONAL PLANNING

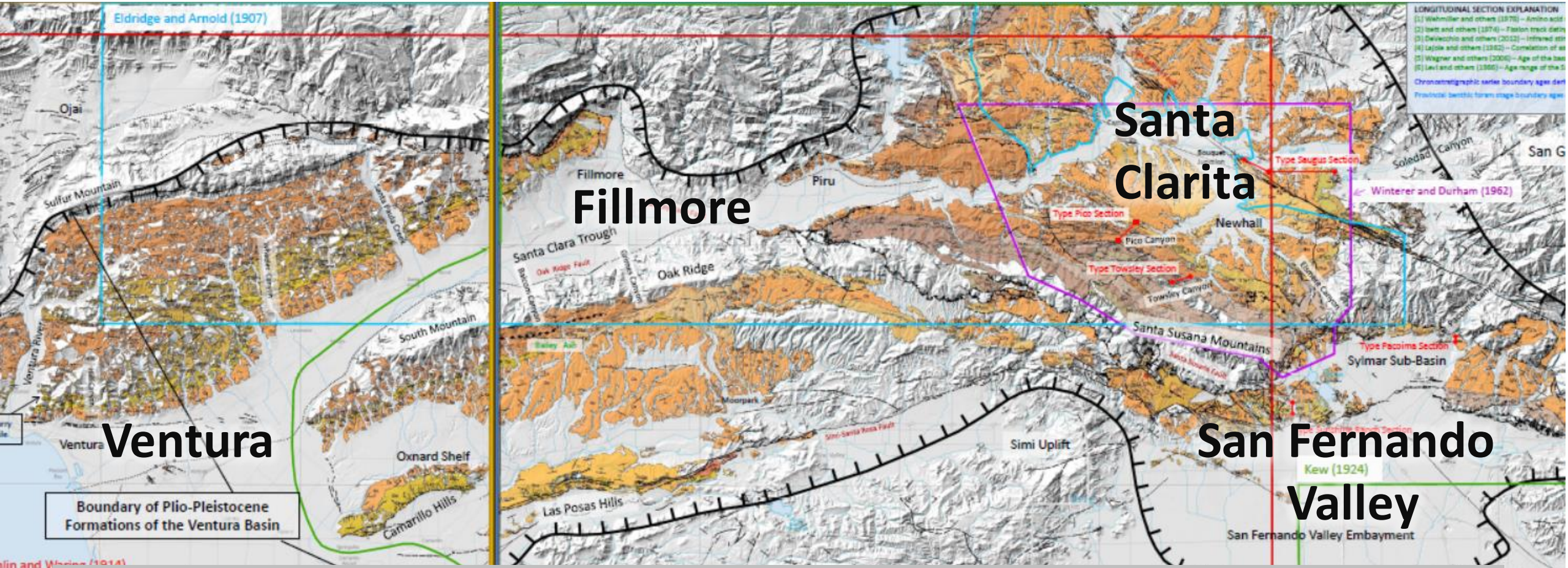
LACWD

Hydrogeologic Conceptual Model: Geologic Framework and Principal Aquifers

June 17, 2020

RCS
Anthony Hicke, Senior Groundwater Geologist
Richard C. Slade & Associates LLC

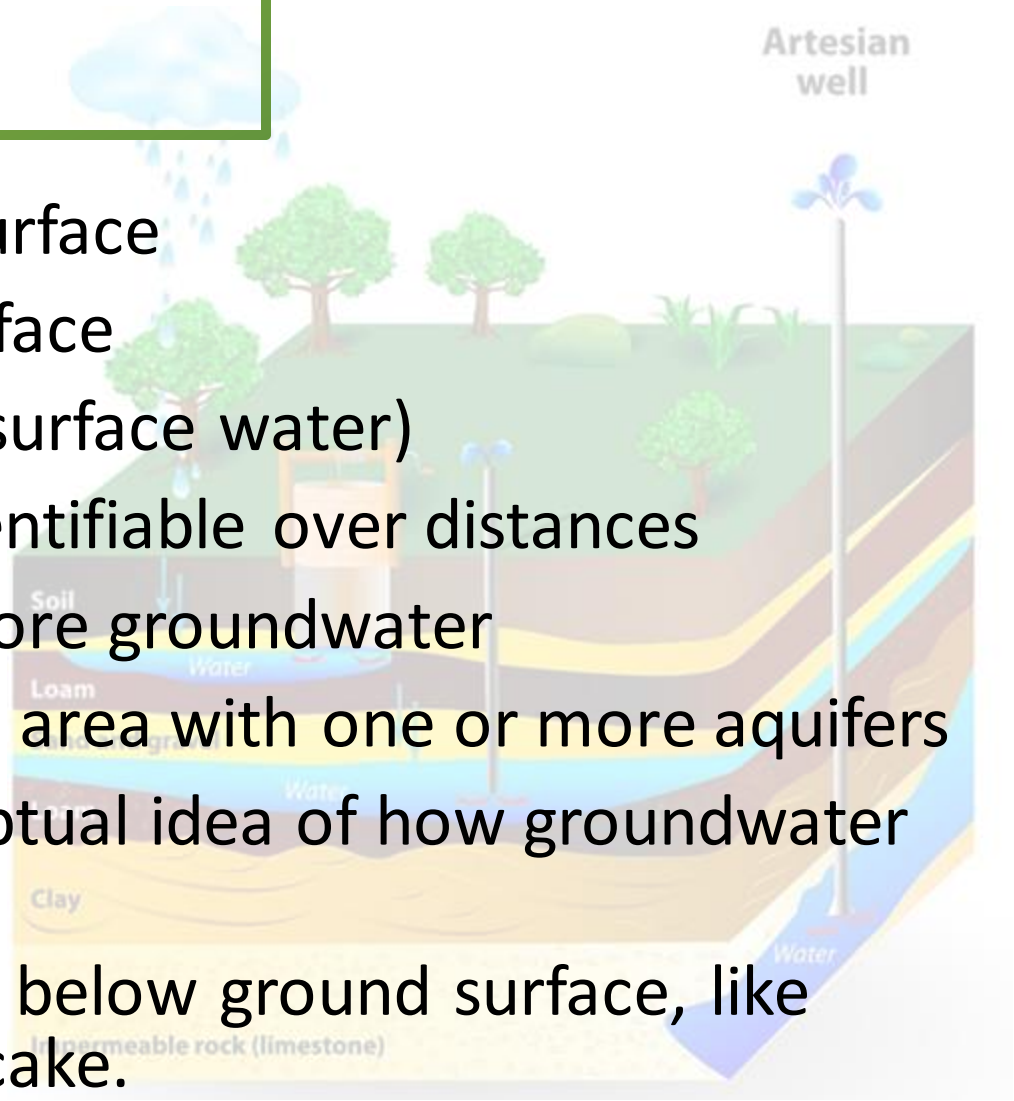
Santa Clarita Was Under Water!



SOURCE: Updated Nomenclature for Plio-Pleistocene Formations in the Onshore Ventura Basin, Los Angeles and Santa Barbara 30' × 60' Quadrangles* Brian J. Swanson1 and Pamela J. Irvine1, Search and Discovery Article #10758 (2015)**

Basic Definitions

- Groundwater – water beneath the earth's surface
- Surface water – water flowing at ground surface
- Hydrogeology – study of groundwater (and surface water)
- Formation – a group of sediments/rocks, identifiable over distances
- Aquifer – group sediments/rocks that can store groundwater
- Groundwater Basin – definable, "contained" area with one or more aquifers
- Hydrogeologic Conceptual Model – a conceptual idea of how groundwater and geology interact; not a physical model
- Cross Sections – illustrations to show what's below ground surface, like looking at the side view of a slice of a layer cake.

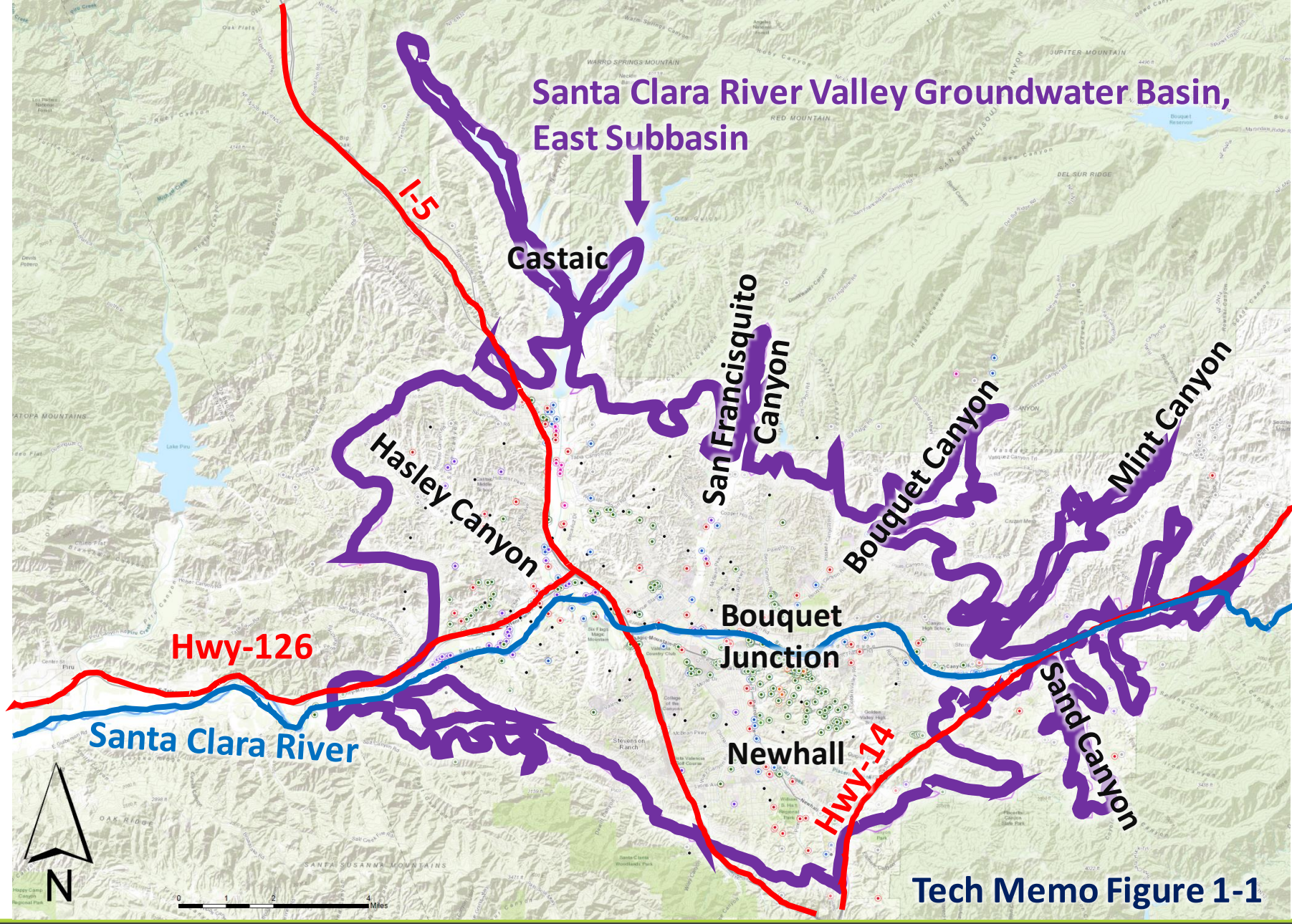


Basin Boundaries

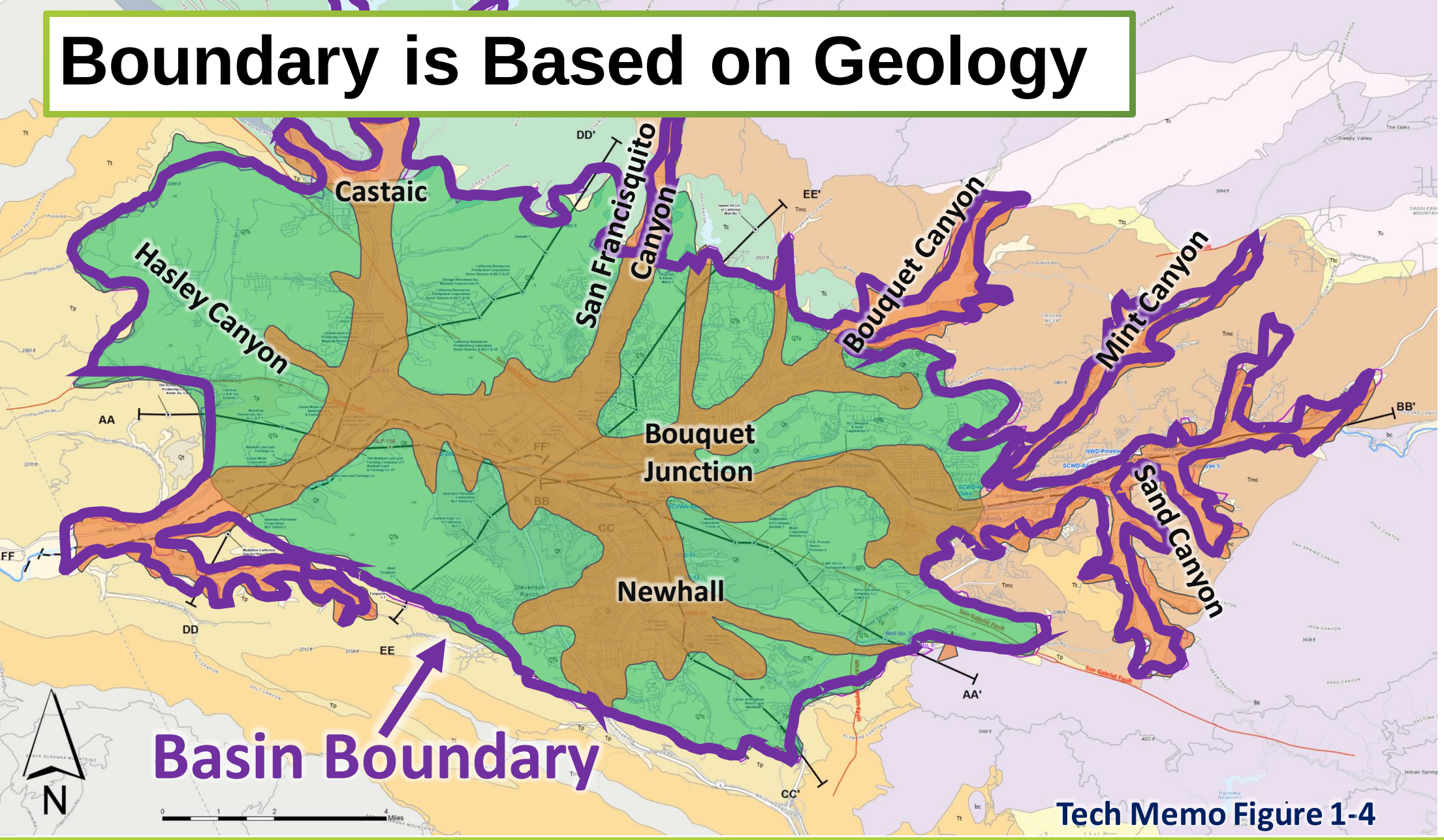
“How is the Basin Defined?”

Basin Boundaries

- DWR Bulletin 118 Basin No. 4-4.07
- DWR Basin Definition is based on Geology
- Connected to subbasin to the west



Boundary is Based on Geology



Tech Memo Figure 1-4

Boundary Alluvium +

Boundary Saugus Fmn =

Basin Boundary

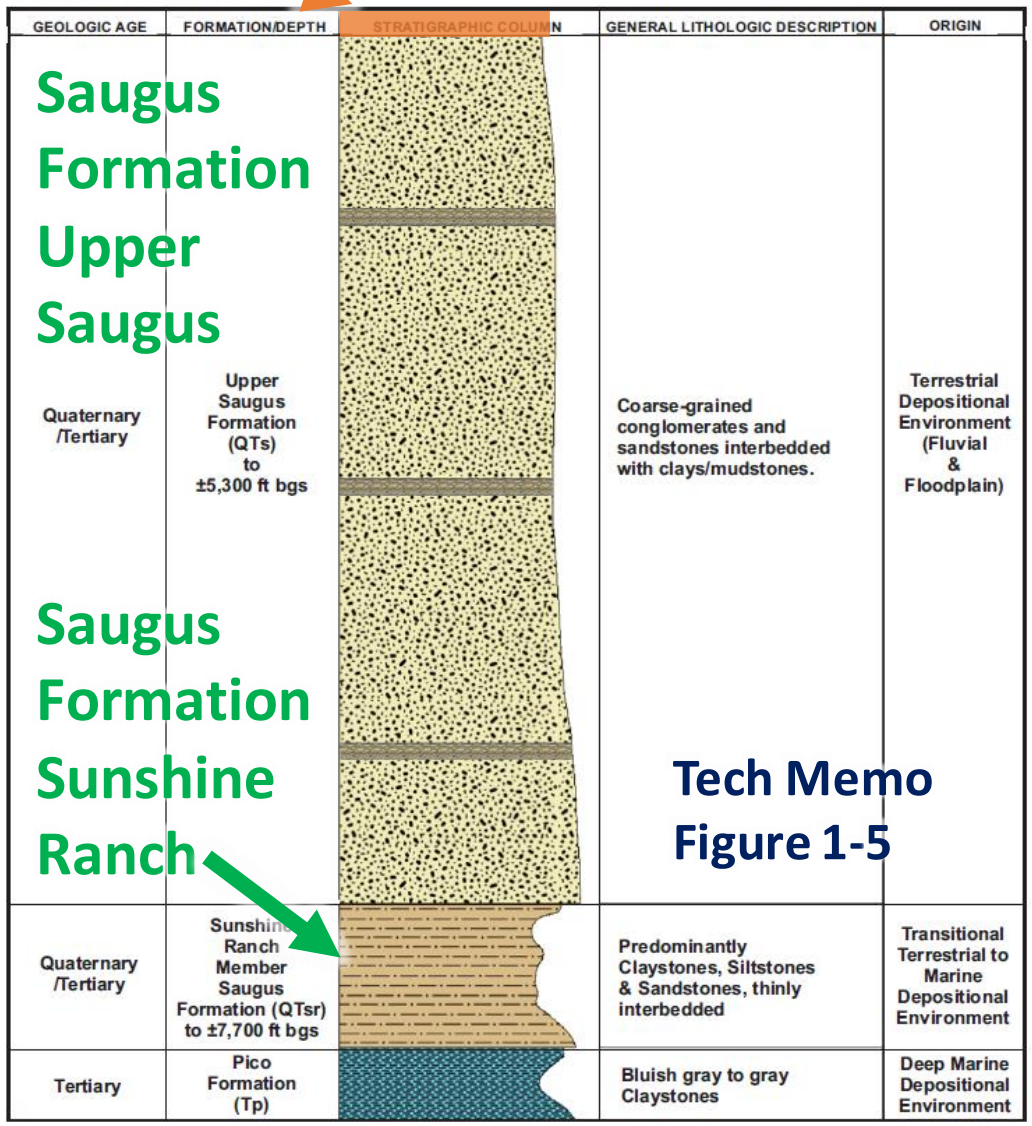
Basin Geology

“What Rocks Make up the Basin?”

Basin Geology

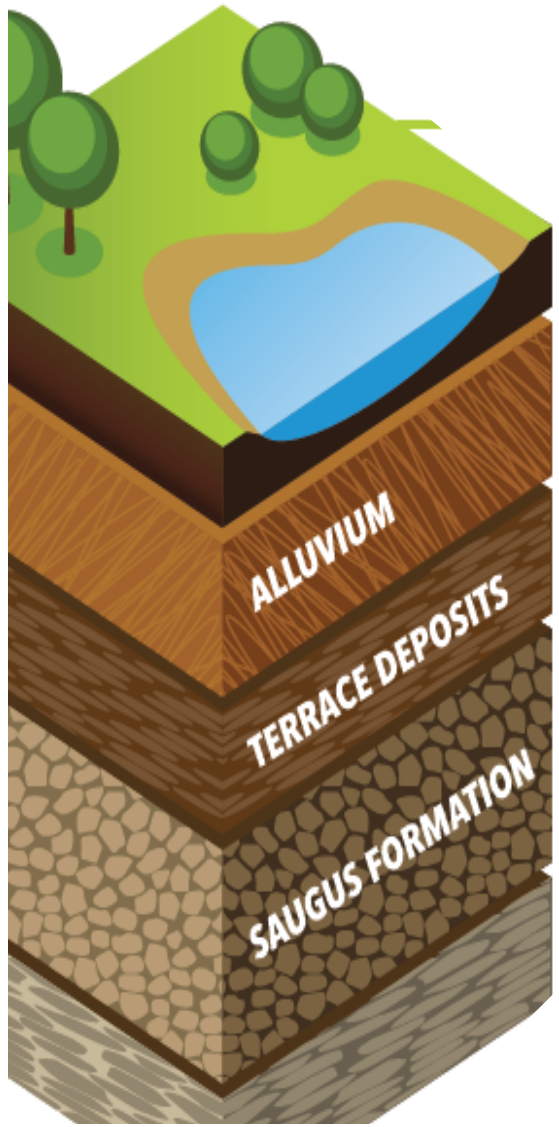
- Alluvium (10K to 0 years)
  - (not shown at right)
- Saugus Formation (3.6M to 1.8M years)
  - Upper Saugus
  - Sunshine Ranch Member
- Pico Formation (6M to 3M years old)
- Other Older Formations

Alluvium



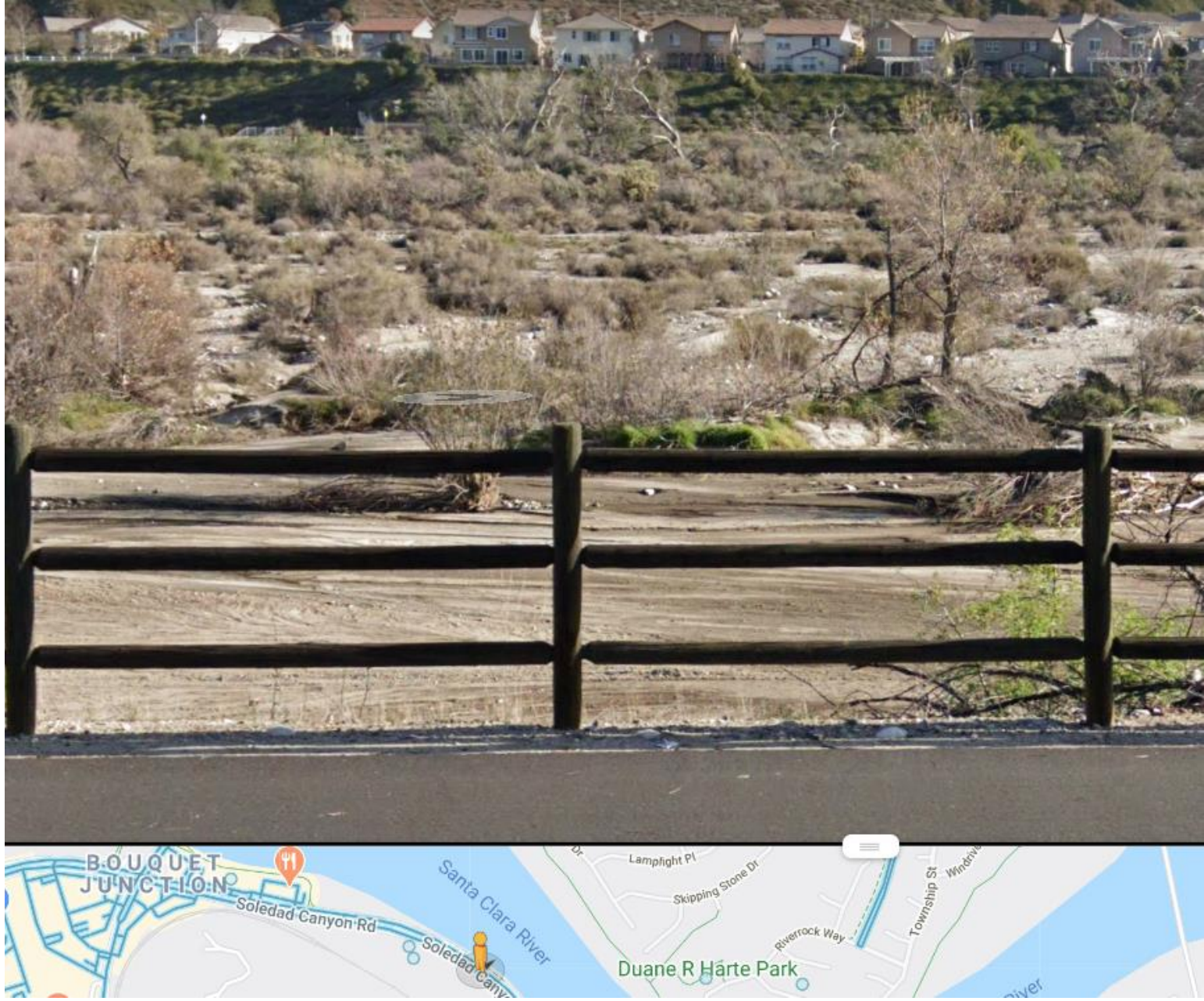
Tech Memo Figure 1-5

Pico Formation



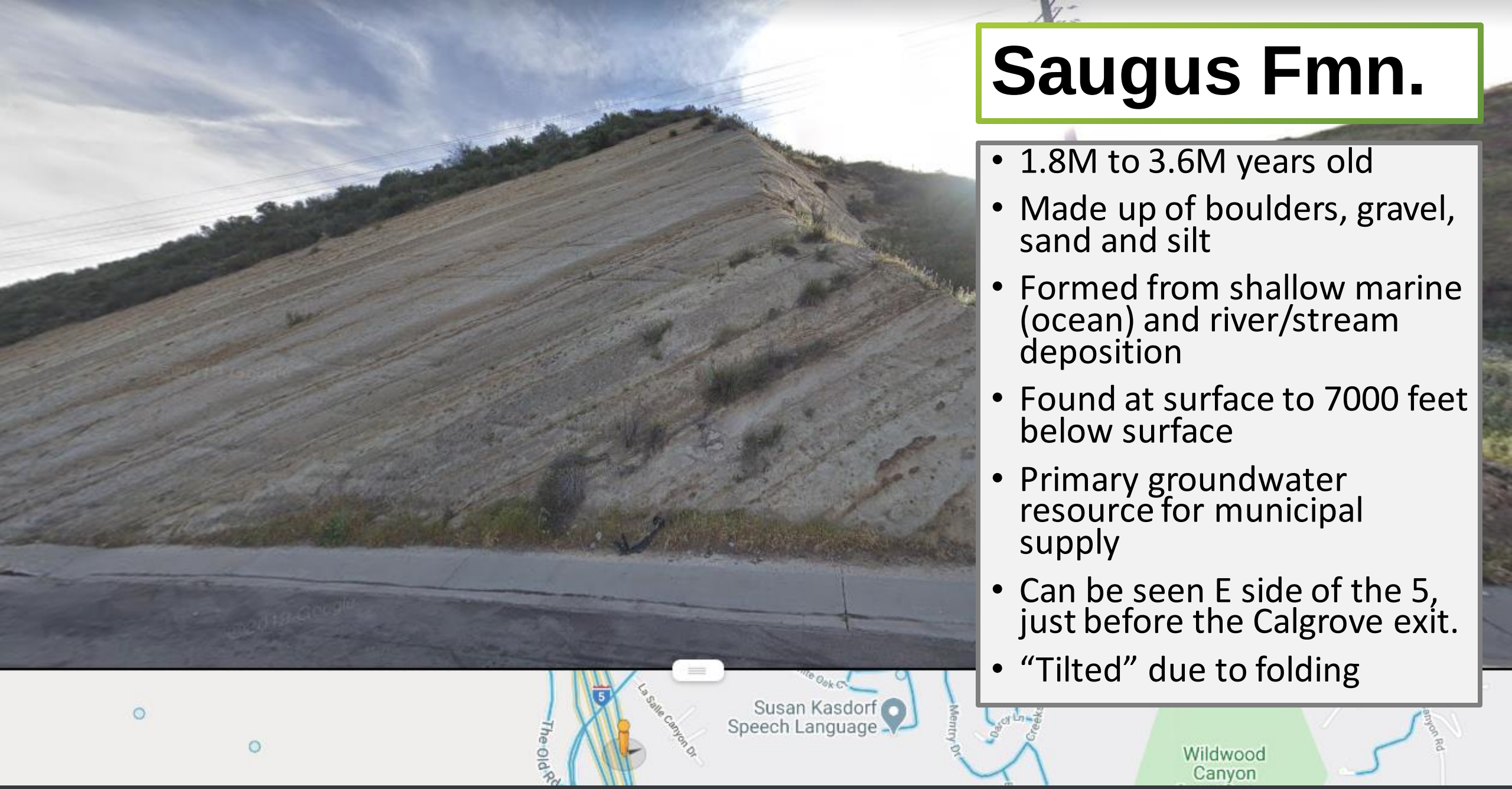
Alluvium

- 0 to 129,000 years old
- Sediments transported by water (rivers, streams, floods, etc)
- Typically found between 0 and 100 feet below the surface
- Derived from “rock” particles transported by water
- Can be seen along the bed of the Santa Clara River, Soledad Canyon Rd just east of Bouquet Junction



Saugus Fmn.

- 1.8M to 3.6M years old
- Made up of boulders, gravel, sand and silt
- Formed from shallow marine (ocean) and river/stream deposition
- Found at surface to 7000 feet below surface
- Primary groundwater resource for municipal supply
- Can be seen E side of the 5, just before the Calgrove exit.
- “Tilted” due to folding

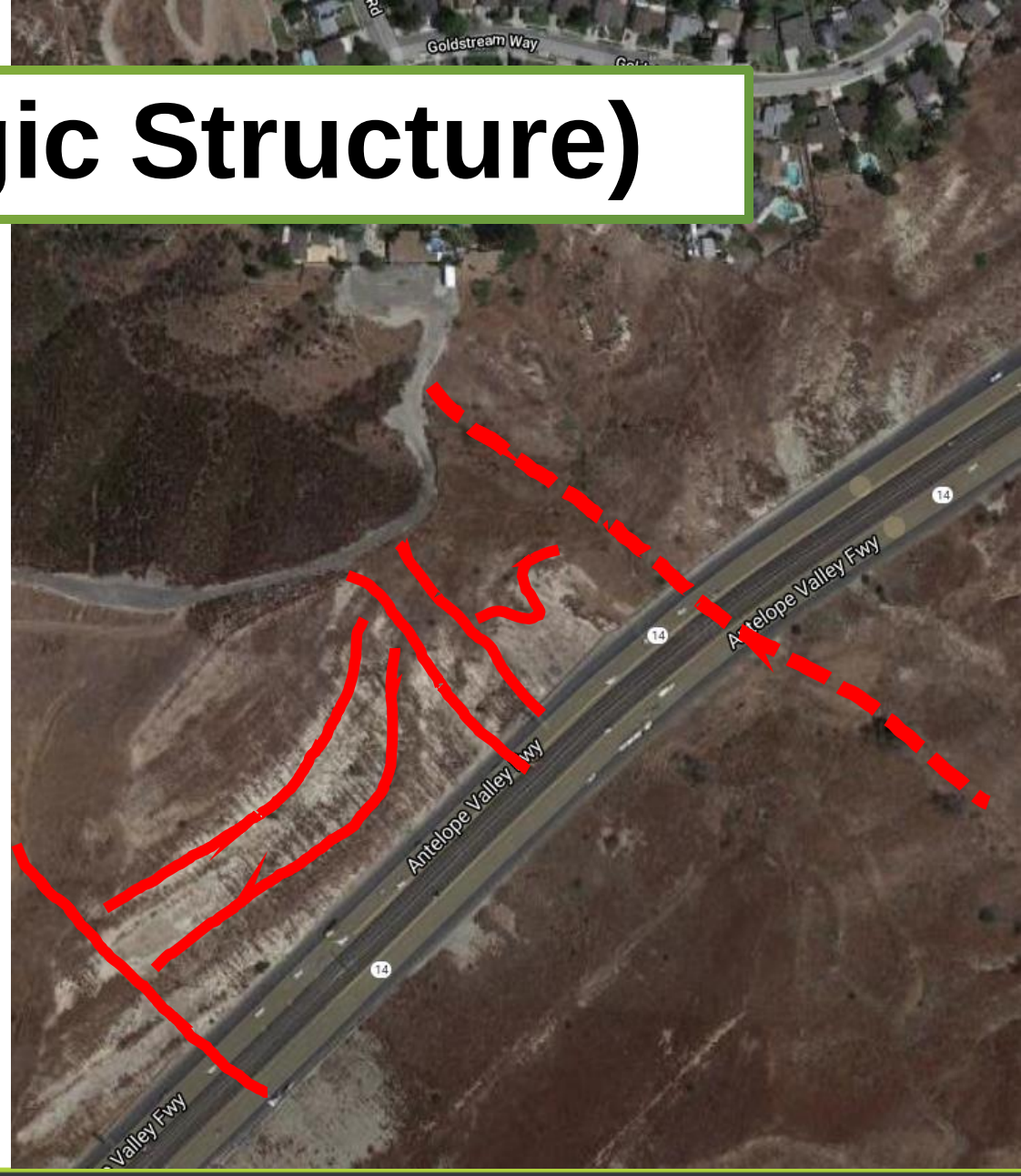


Pico Fmn.

- 1.8M to 3.6M years old
- Made up primarily of claystone
- Formed in deep marine environment
- Underlies the Saugus Formation
- Considered to be non water bearing
- N side of the 14 just E of the interchange with the
- “Tilted” due to folding

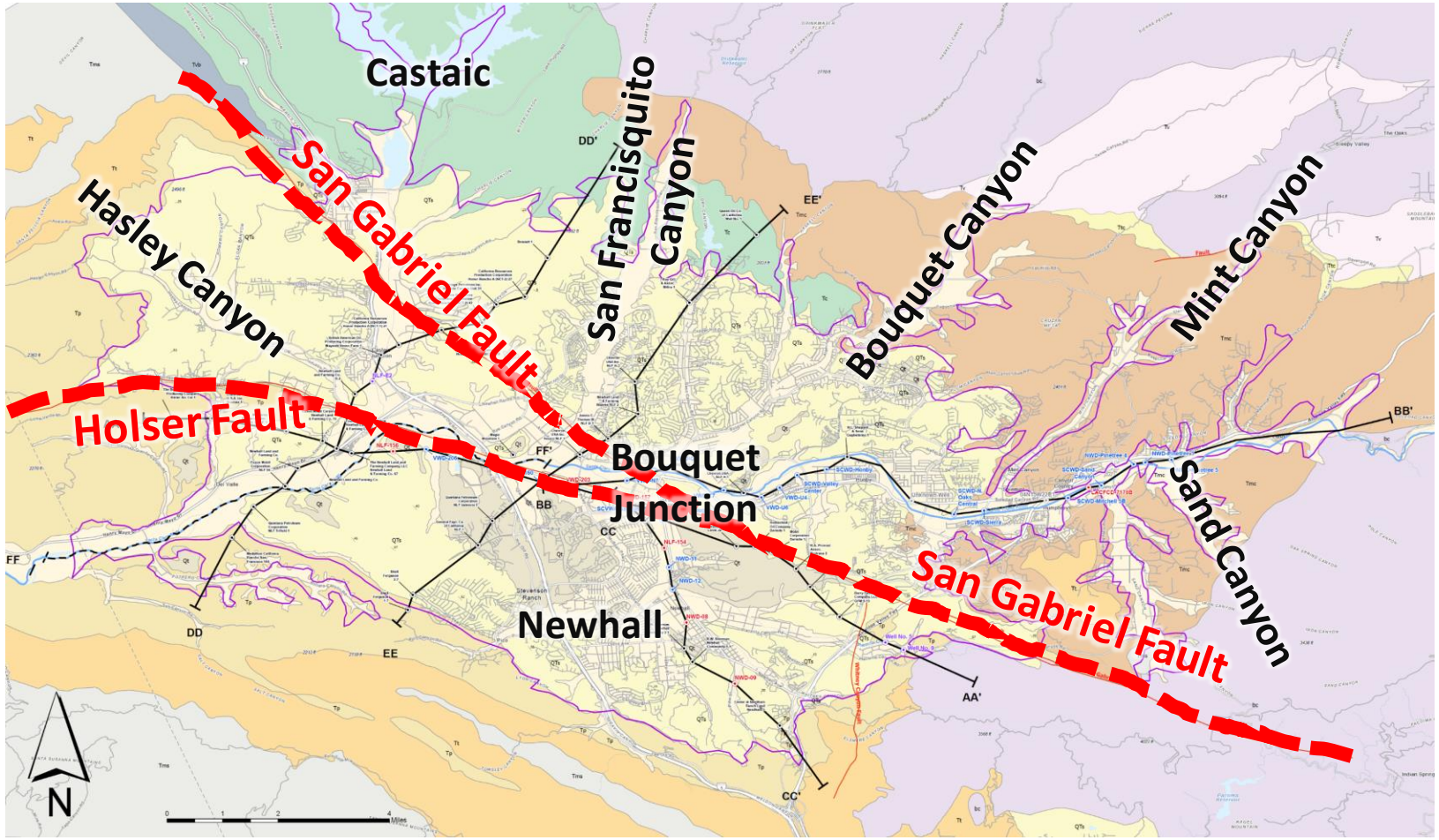
Fault and Folds (Geologic Structure)

- Historical land movement causes formations to move, separate, and fold
- Faults and folds can help determine how groundwater moves and collects
- Historic oil production in Newhall area is due to folded/faulted formations.
- San Gabriel Fault and small Folds can be seen in the hillside road cuts on the 14 freeway south of Golden Valley Rd



Fault and Folds (Geologic Structure)

- Faults can barriers to groundwater flow, and separate aquifers
- Main Faults in Santa Clarita include the San Gabriel Fault and the Holser Fault
  - These two faults intersect in between Newhall and Bouquet Junction.



Cross Sections

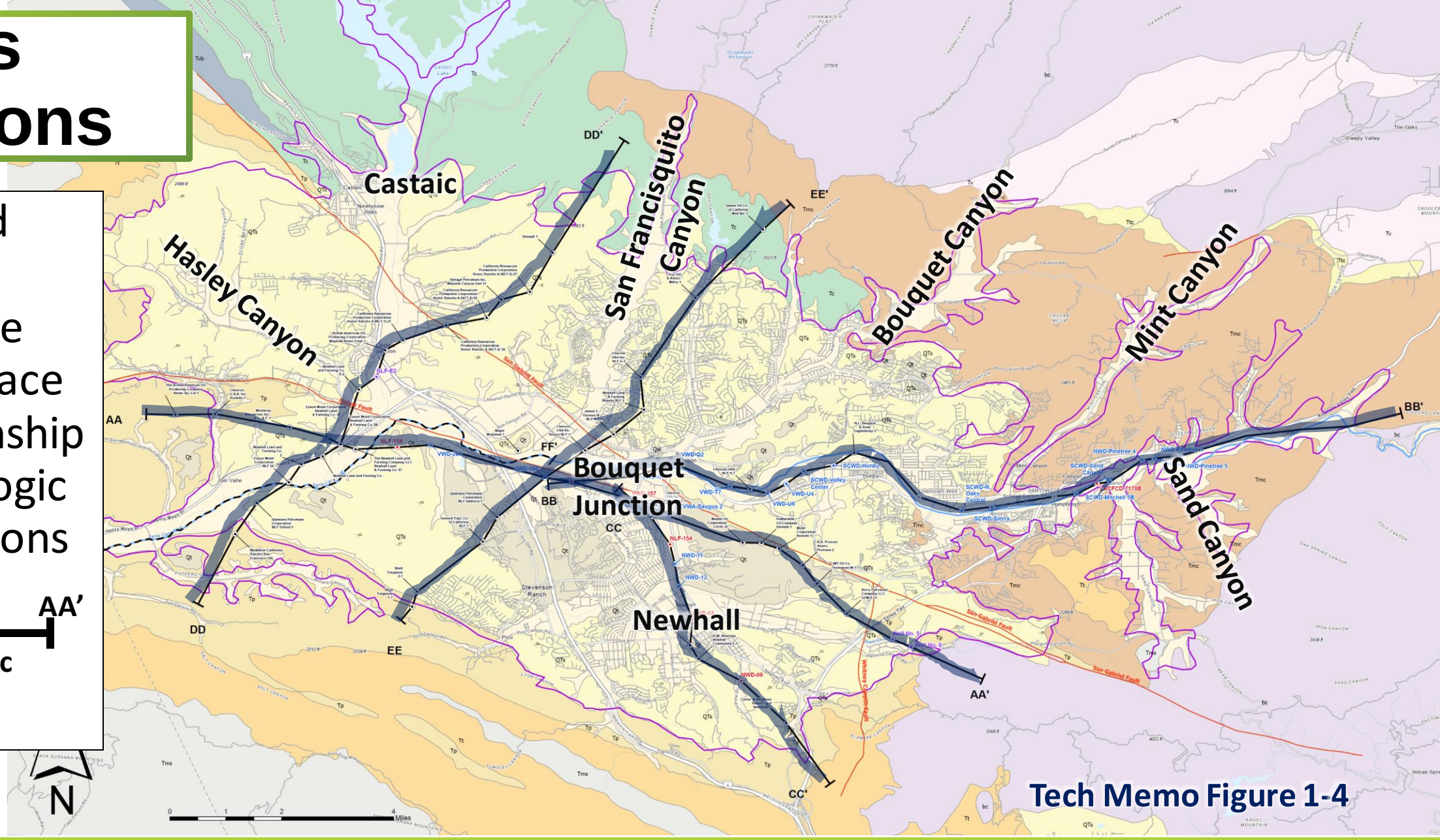
“What is the Shape of the Basin Below Ground?”

Cross Sections

- Created to help illustrate subsurface relationship of geologic formations

AA — AA’

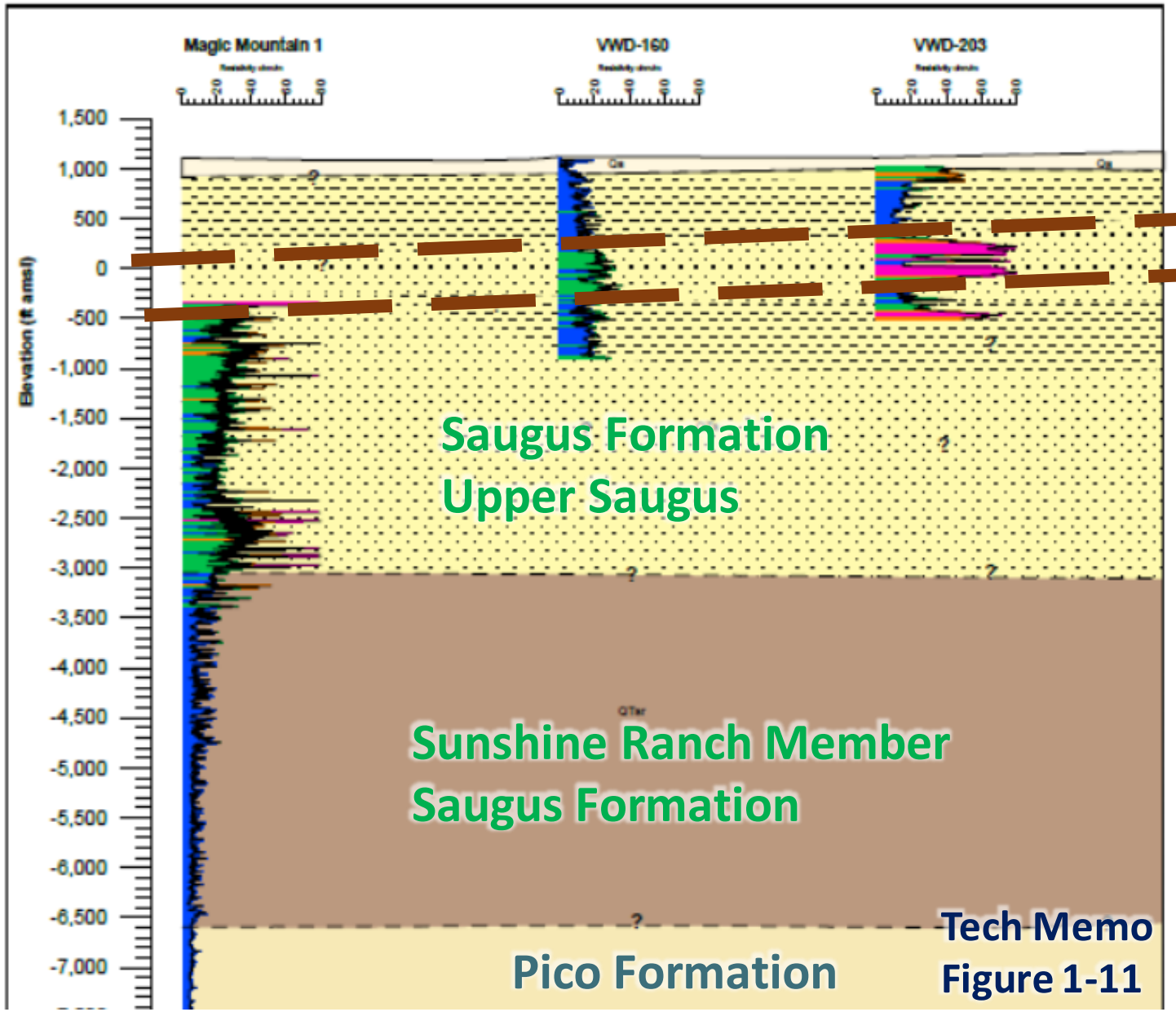
Geologic Section



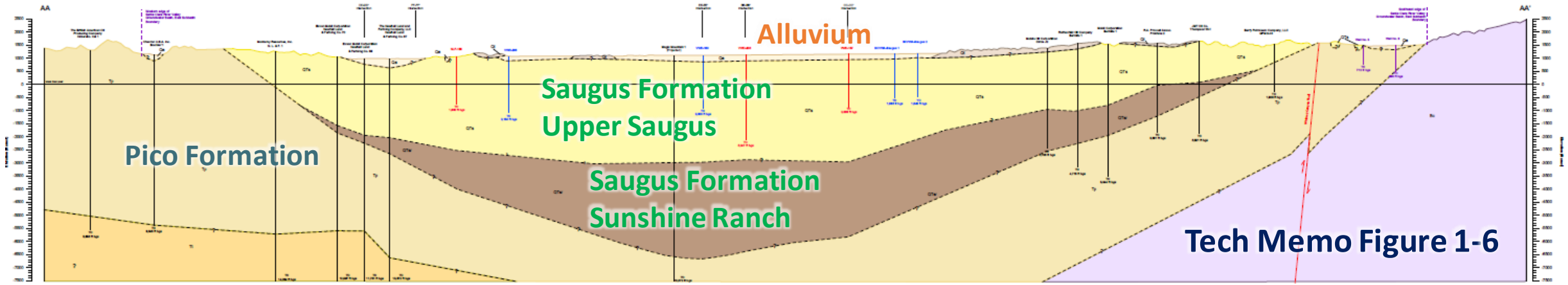
Tech Memo Figure 1-4

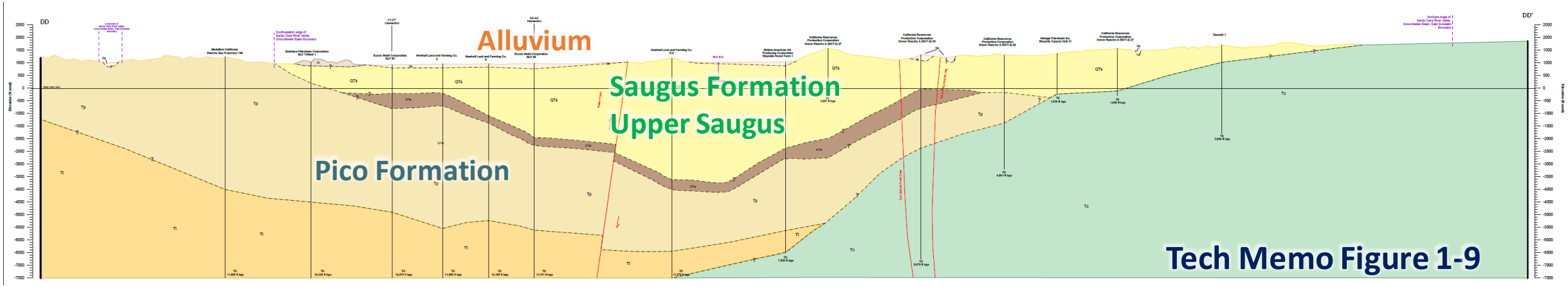
How are Cross Sections Created?

- Interpretation of Surficial Geologic Map
- Subsurface Geologic Descriptions
- Correlation of Geophysical Electric Logs
  - “Borehole Fingerprints”
  - From Oil Wells, Municipal Water Wells, Large Ag Wells



Cross Section Examples



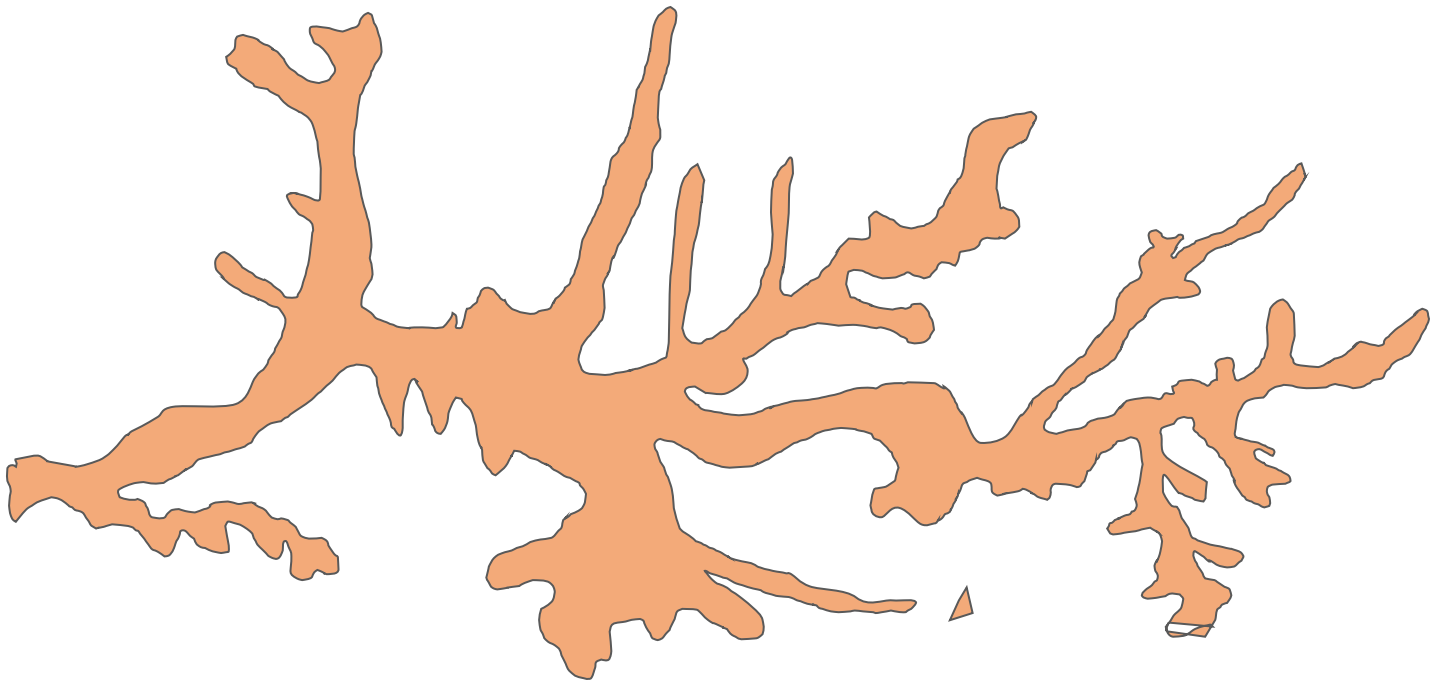


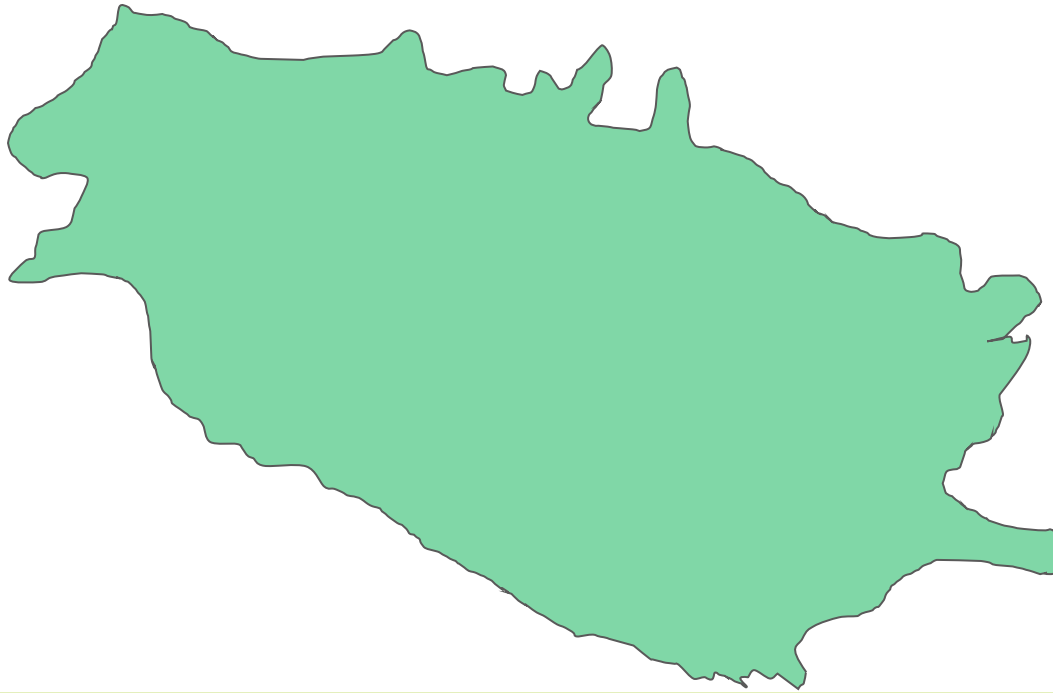
Principal Aquifers

“Where is the groundwater?”

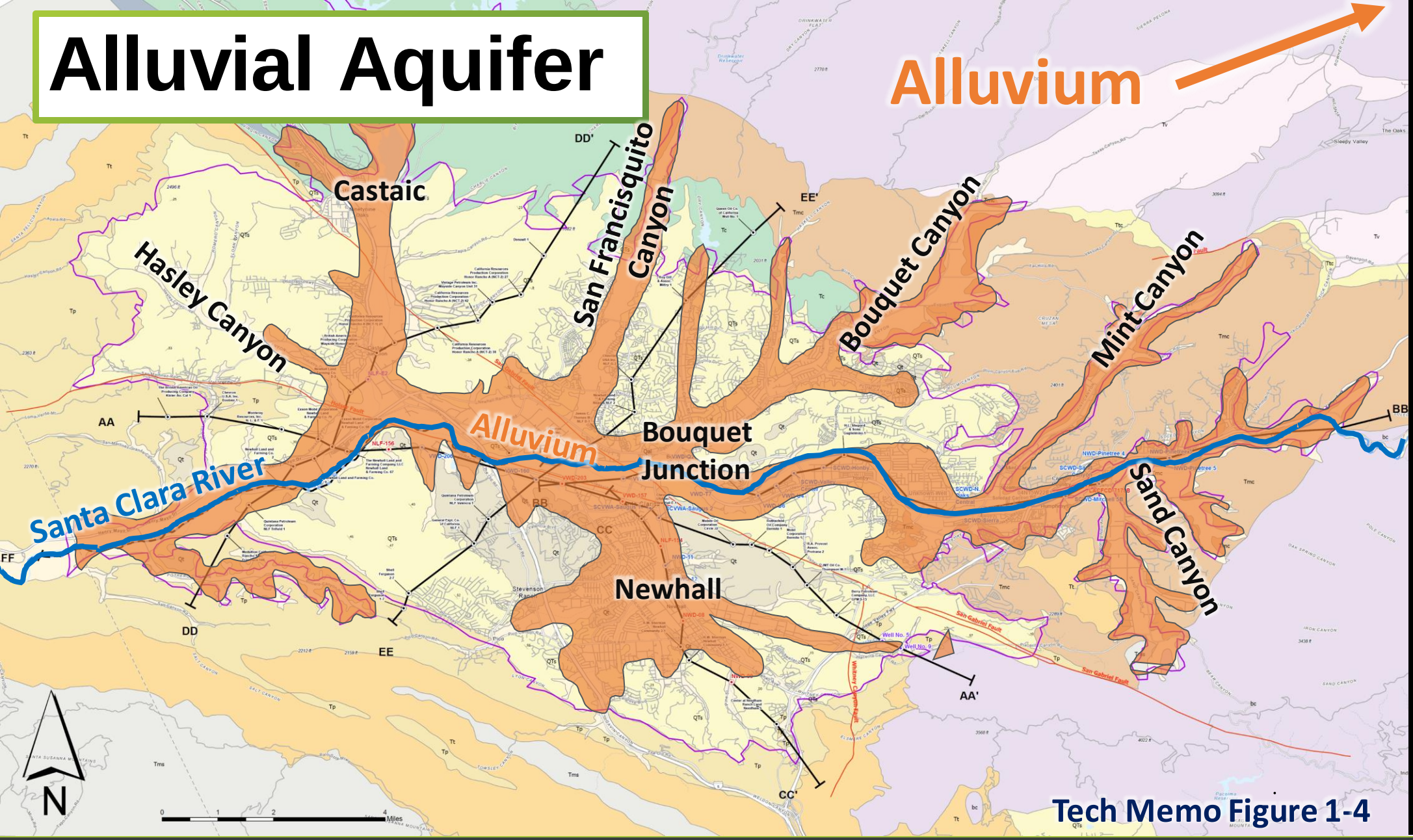
Two Aquifers Make up the Groundwater Basin

- Alluvial Aquifer
- Saugus Aquifer

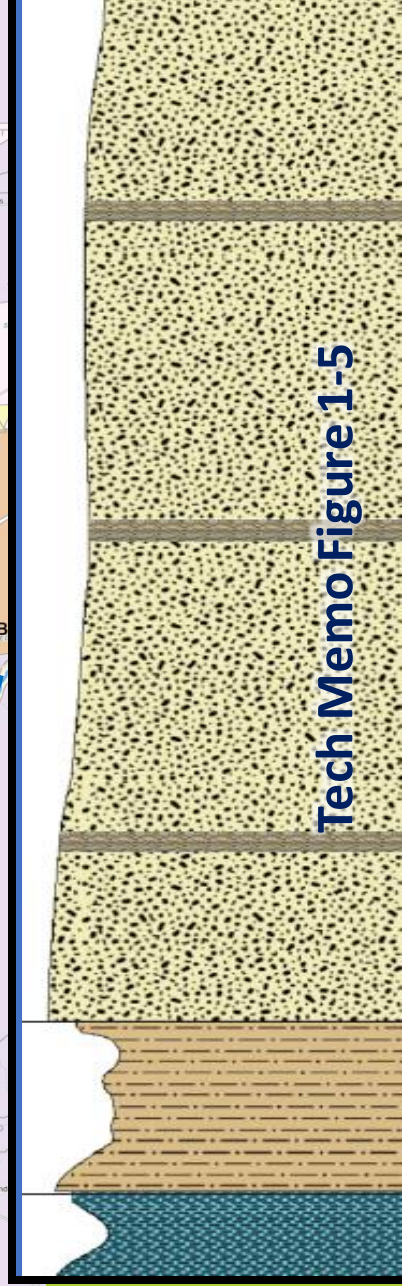




Alluvial Aquifer



Tech Memo Figure 1-4

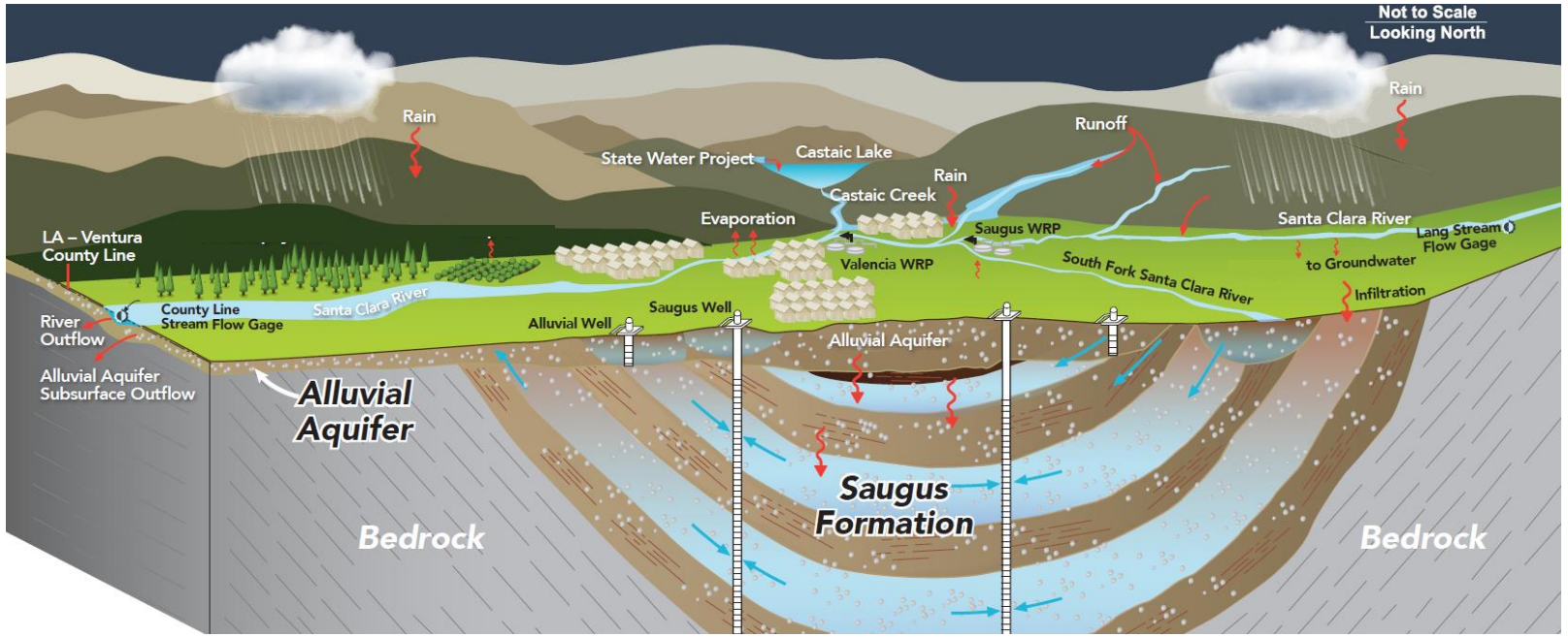


Alluvial Aquifer

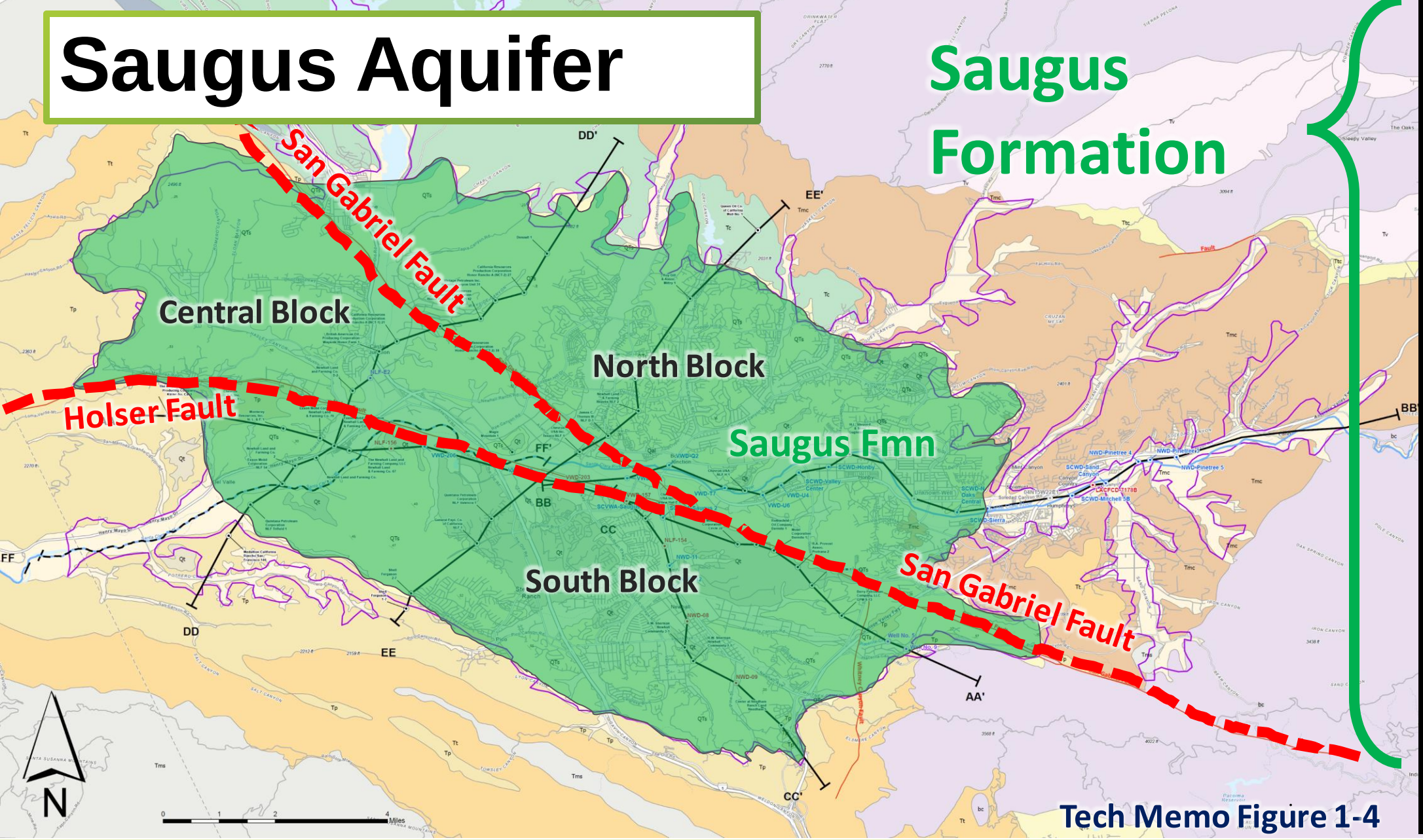
- Shallower aquifer in basin
- Maximum depth roughly 200 ft.
- Found along Santa Clara River and tributary canyons
- Relatively rapid groundwater flow
- Overlies the Saugus Formation

Groundwater Source For:

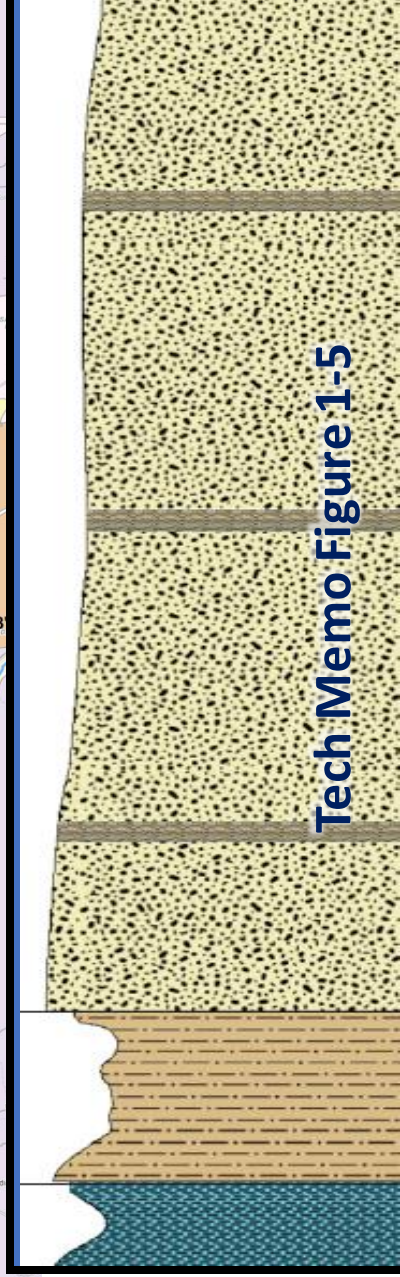
Enviro. Needs	Industrial Supply	Ag/ Irrigation	Private Domestic	Municipal Supply



Saugus Aquifer



Tech Memo Figure 1-4



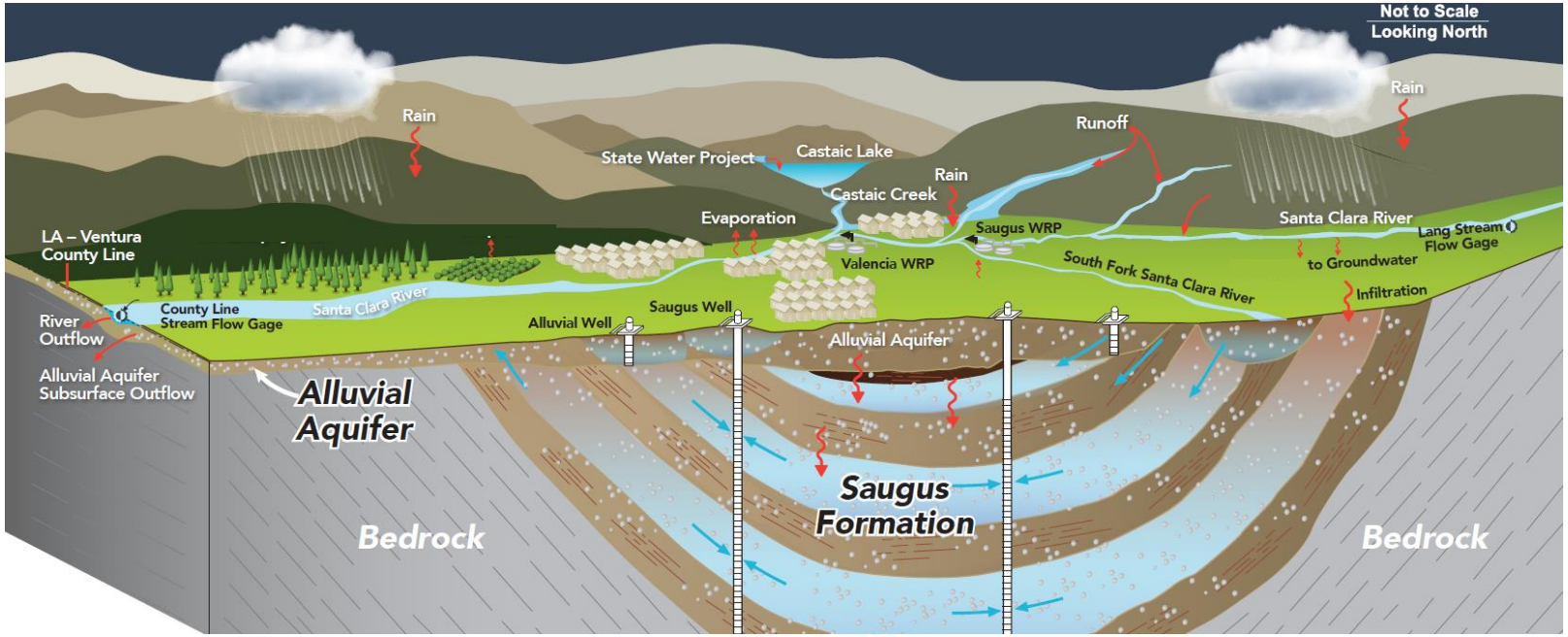
Saugus Aquifer

- Deep Aquifer – water known to be available up to ~2700 ft or more
- Exists beneath the alluvium in most areas of the basin
- Forms a “bowl” in the groundwater basin.
- Upper Saugus aquifer important for municipal use
- Lower Saugus contains less groundwater
- Relatively slower groundwater movement than Alluvial Aquifer

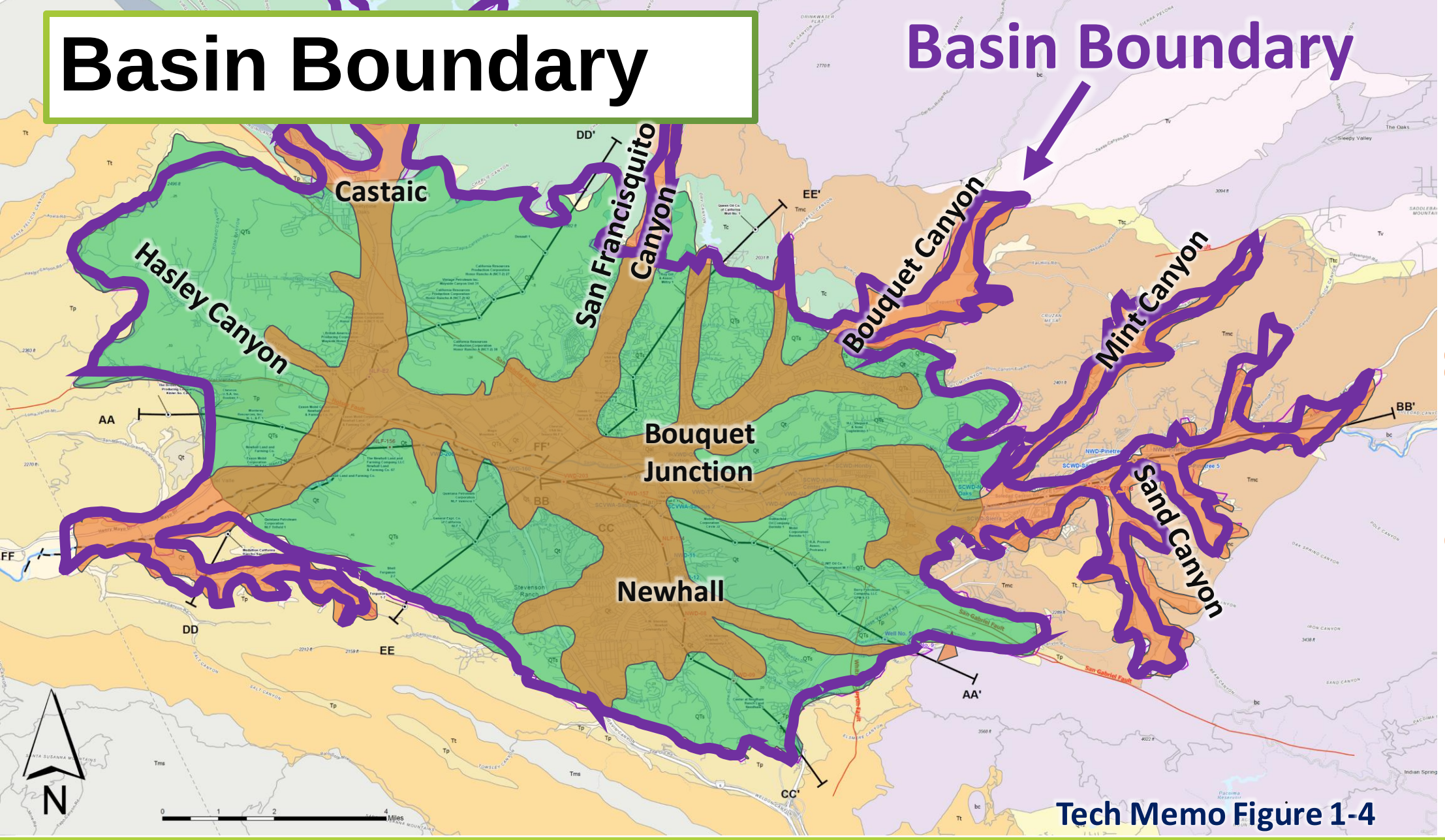
Groundwater Source For:

Municipal Supply

Ag/Irrigation



Basin Boundary

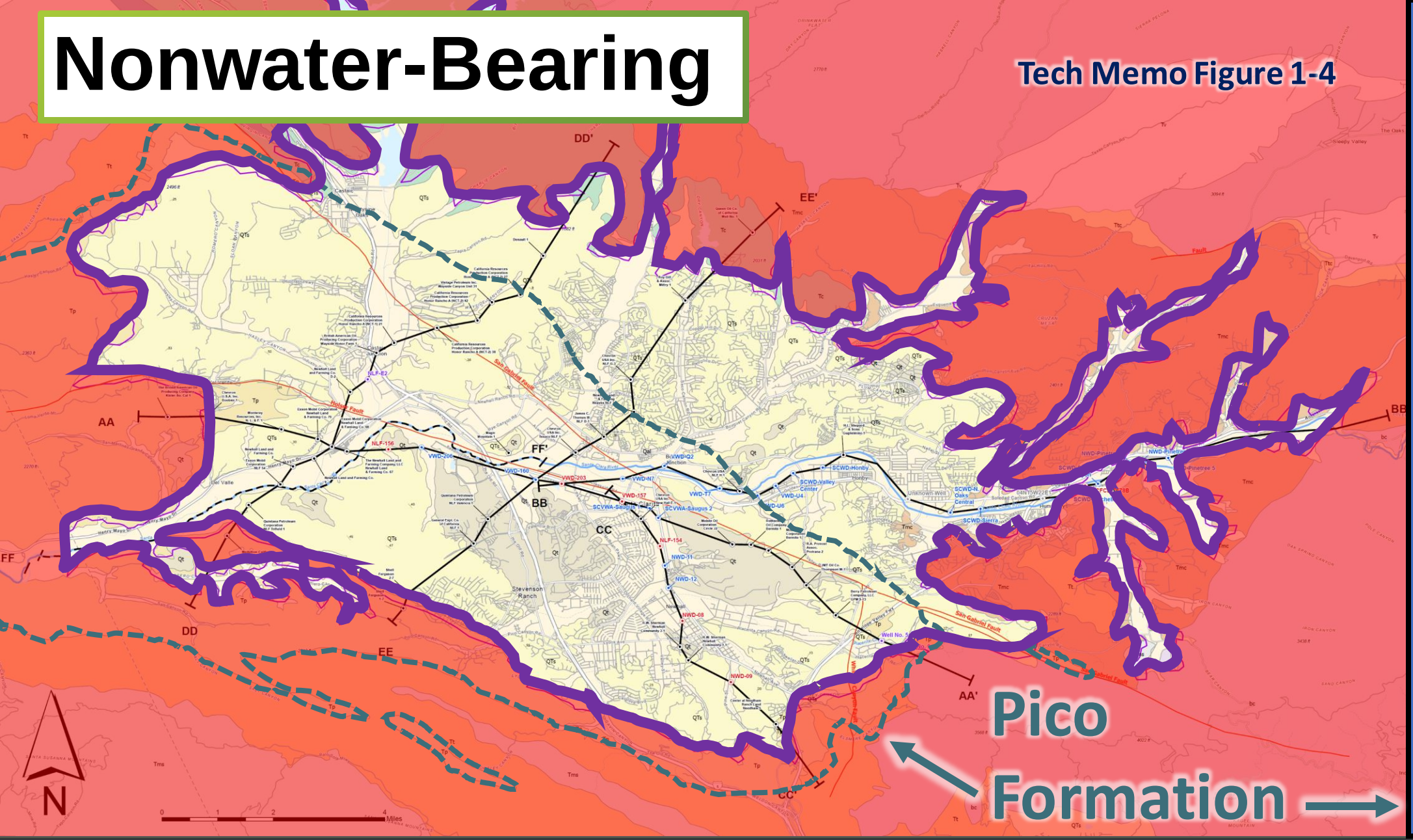


Tech Memo Figure 1-4

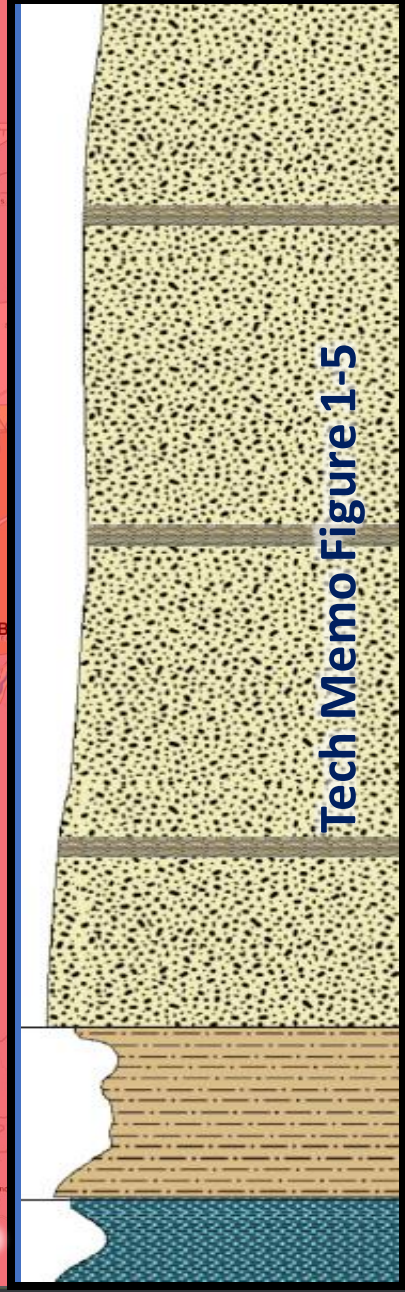
Boundary Alluvium + Boundary Saugus Fmn = Basin Boundary

Nonwater-Bearing

Tech Memo Figure 1-4



Pico Formation



Groundwater Recharge and Discharge Areas

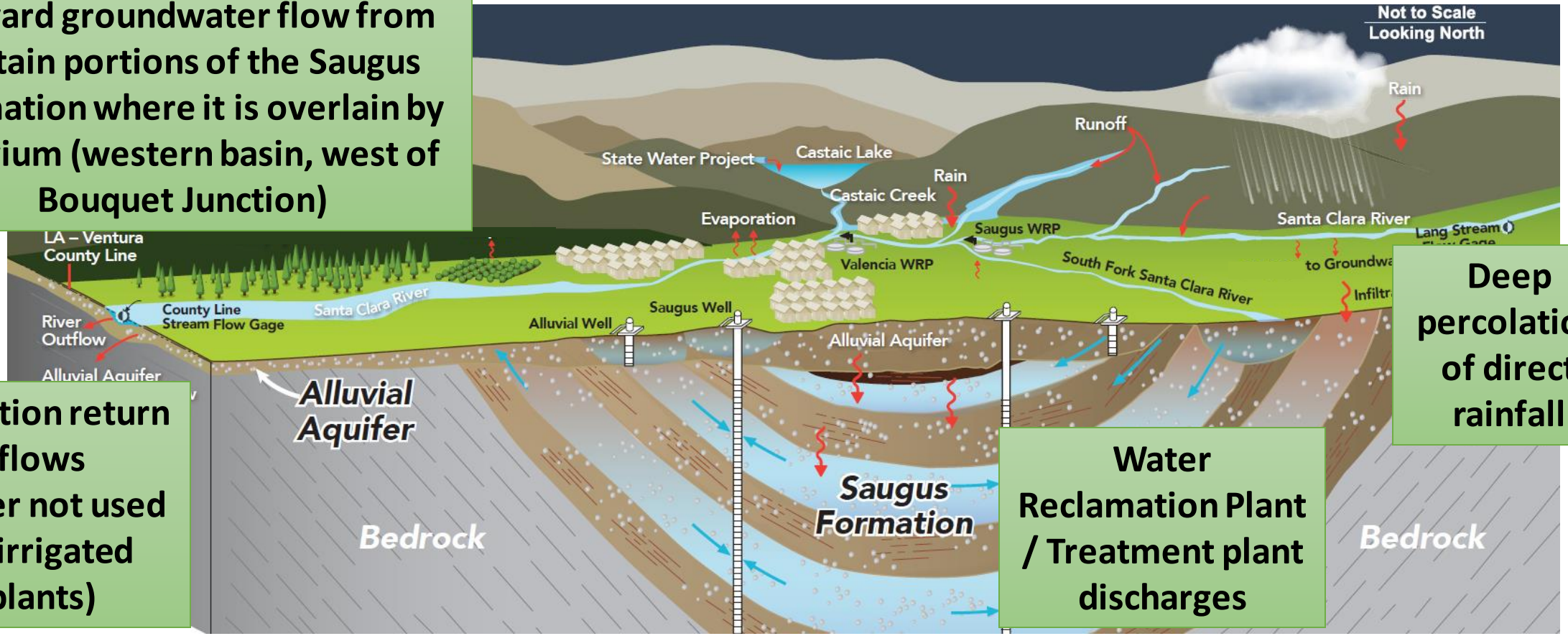
How does water “Get in” and “Get out”?

Groundwater Recharge Alluvial Aquifer

Subsurface groundwater inflow from upstream areas along the Santa Clara River and its tributaries.

Runoff from higher elevations (river and tributaries).

Upward groundwater flow from certain portions of the Saugus Formation where it is overlain by alluvium (western basin, west of Bouquet Junction)



Deep percolation of direct rainfall

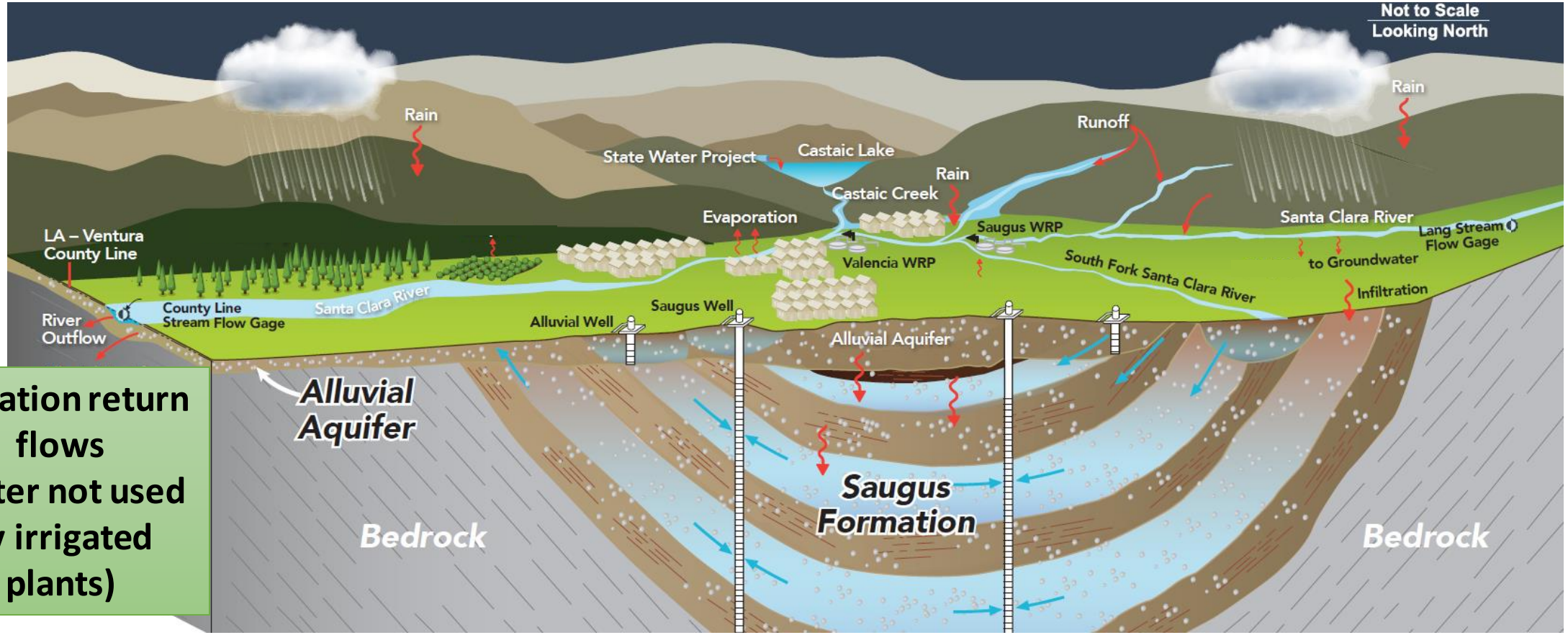
Irrigation return flows (water not used by irrigated plants)

Water Reclamation Plant / Treatment plant discharges

Groundwater Recharge Saugus Aquifer

Infiltration from alluvium (eastern basin, east of Bouquet Canyon)

Deep percolation of direct rainfall



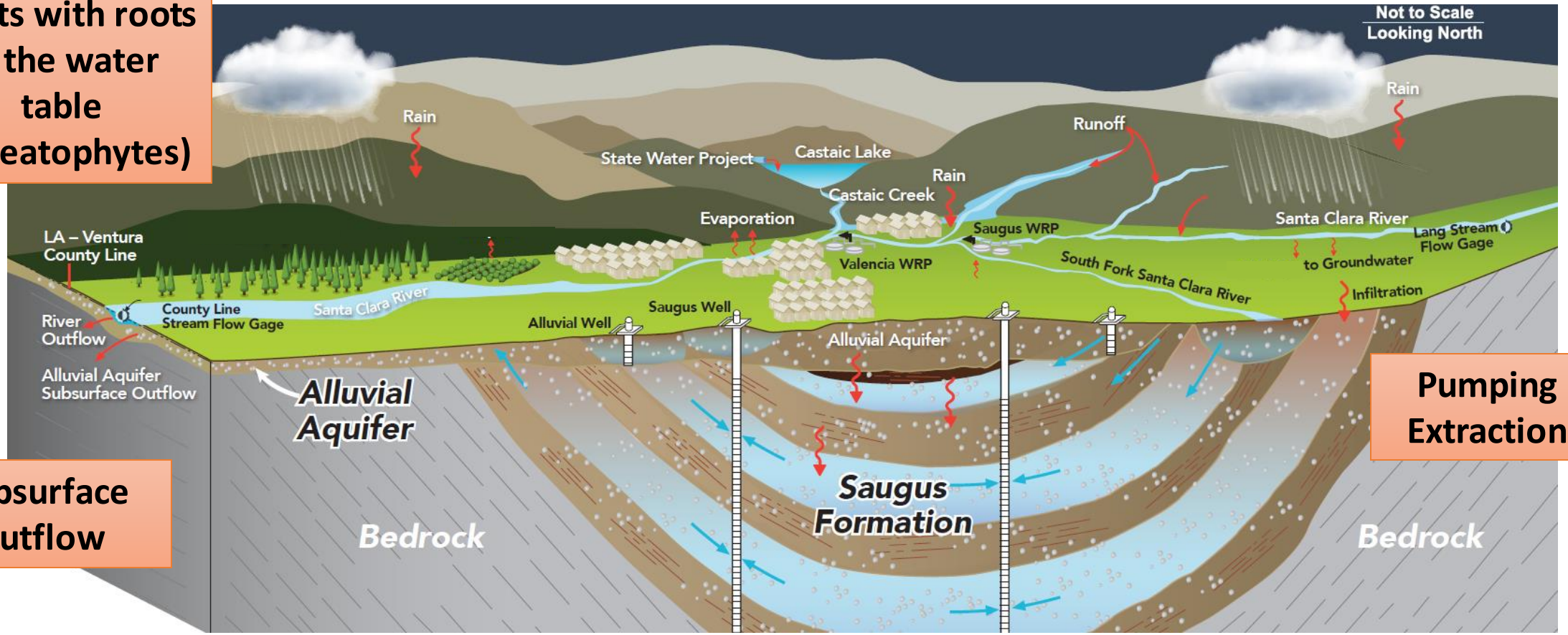
Irrigation return flows (water not used by irrigated plants)

Groundwater Discharge Alluvial Aquifer

Inflow into Saugus Aquifer (eastern basin, east of Bouquet Canyon)

Discharge to surface flow (called base flow)

Plants with roots in the water table (phreatophytes)

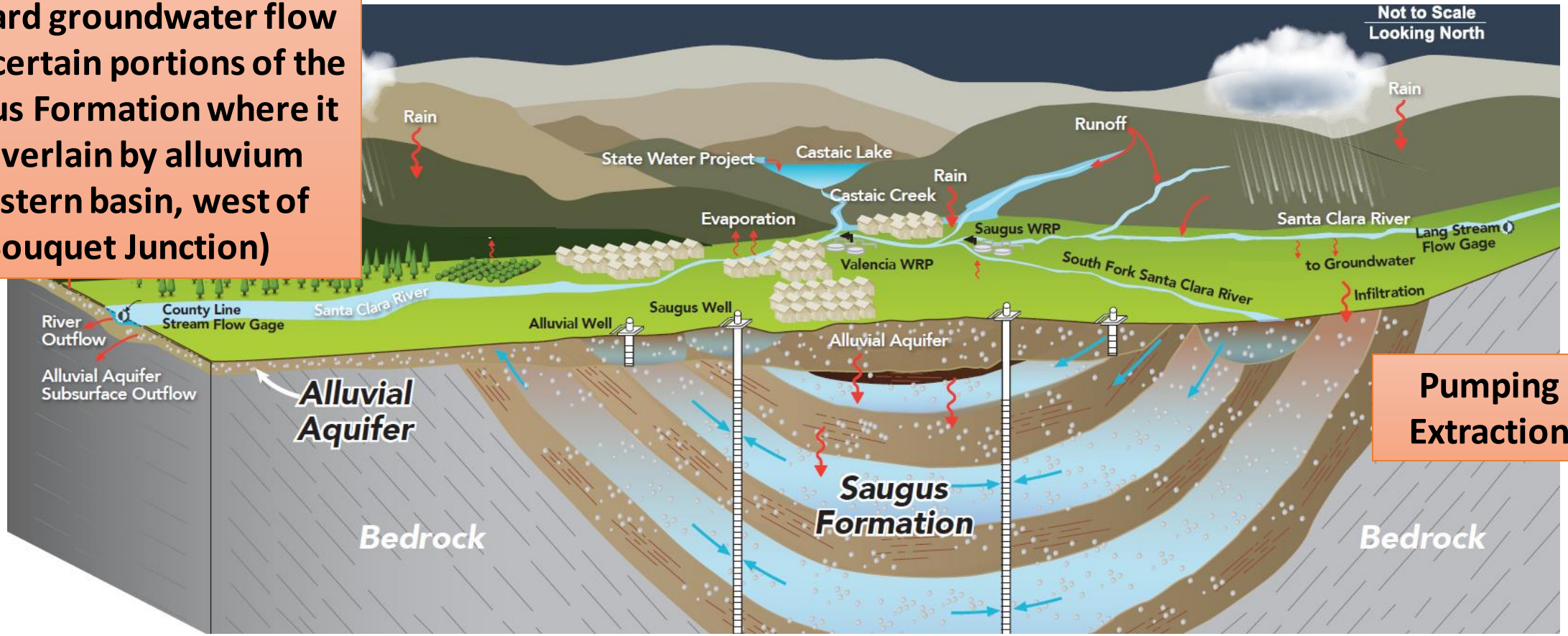


Pumping Extraction

Subsurface outflow

Groundwater Discharge Saugus Aquifer

Upward groundwater flow from certain portions of the Saugus Formation where it is overlain by alluvium (western basin, west of Bouquet Junction)



Pumping Extraction

- Pumping Extraction

SCV GSA

QUESTIONS?

Hydrogeologic Conceptual Model: Geologic Framework and Principal Aquifers

MEMBER AGENCIES

SCV WATER

CITY OF SANTA CLARITA

LOS ANGELES COUNTY DEPARTMENT of REGIONAL PLANNING

LACWD

June 17, 2020

RCS Anthony Hicke, Senior Groundwater Geologist
Richard C. Slade & Associates LLC