Westlands Water District

Groundwater Sustainability Plan Workshop

December 21, 2016
23050 W. Mt Whitney Five Points, CA 93624

Workshop Outline

- **GSP Development Timeline**
- Hydrogeology Overview
- Cross Section Aquifer Characteristics
- Management Areas
- Geologic Characteristics
- SGMA's Undesirable Results by Area
- Optimization Options
- Public Input

WWD

GSP Development Timeline

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Hydrogeology- Westside Subbasin

- Located in the Western Area of the San Joaquin Groundwater Basin
- Adjacent Subbasin's include the Delta-Mendota, Kings, Tulare Lake and Pleasant Valley (Starting North Clockwise)

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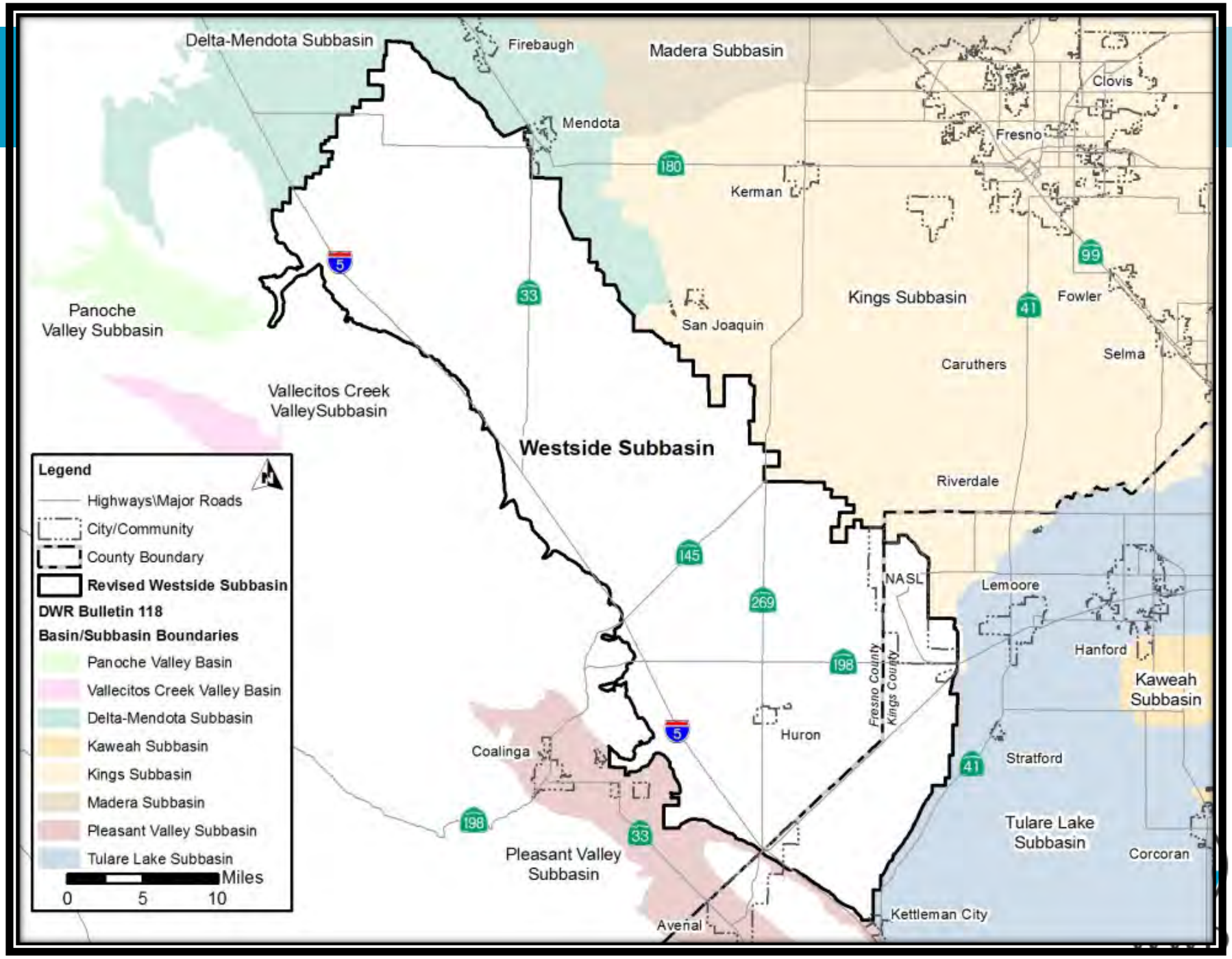
Delta-Mendota Subbasin
Firebaugh
Madera Subbasin
Clovis
Mendota
Fresno
180
Kerman
99
5
33
Kings Subbasin
41
Fowler
Panoche
Valley Subbasin
San Joaquin
Selma
Caruthers
Vallecitos Creek
ValleySubbasin
Westside Subbasin
Riverdale
145
NASL
Lemoore
269
Hanford
198
Kaweah
Subbasin
Fresno County
Kings County
Huron
5
Coalinga
Stratford
41
198
33
Tulare Lake
Subbasin
Pleasant Valley
Subbasin
Corcoran
Kettleman City
Avenal
Legend
Highways\Major Roads
City/Community
County Boundary
Revised Westside Subbasin
DWR Bulletin 118
Basin/Subbasin Boundaries
Panoche Valley Basin
Vallecitos Creek Valley Basin
Delta-Mendota Subbasin
Kaweah Subbasin
Kings Subbasin
Madera Subbasin
Pleasant Valley Subbasin
Tulare Lake Subbasin
Miles
0
5
10

Hydrogeology- Westside Subbasin

- Located in the Western Area of the San Joaquin Groundwater Basin
- Adjacent Subbasin's include the Delta-Mendota, Kings, Tulare Lake and Pleasant Valley (Starting North Clockwise)
- Topography varies by 800 feet west to east and 50 feet north to south (ground surface)
- Base of Fresh Water ranges from 800 feet to 3,500 feet (below ground surface)

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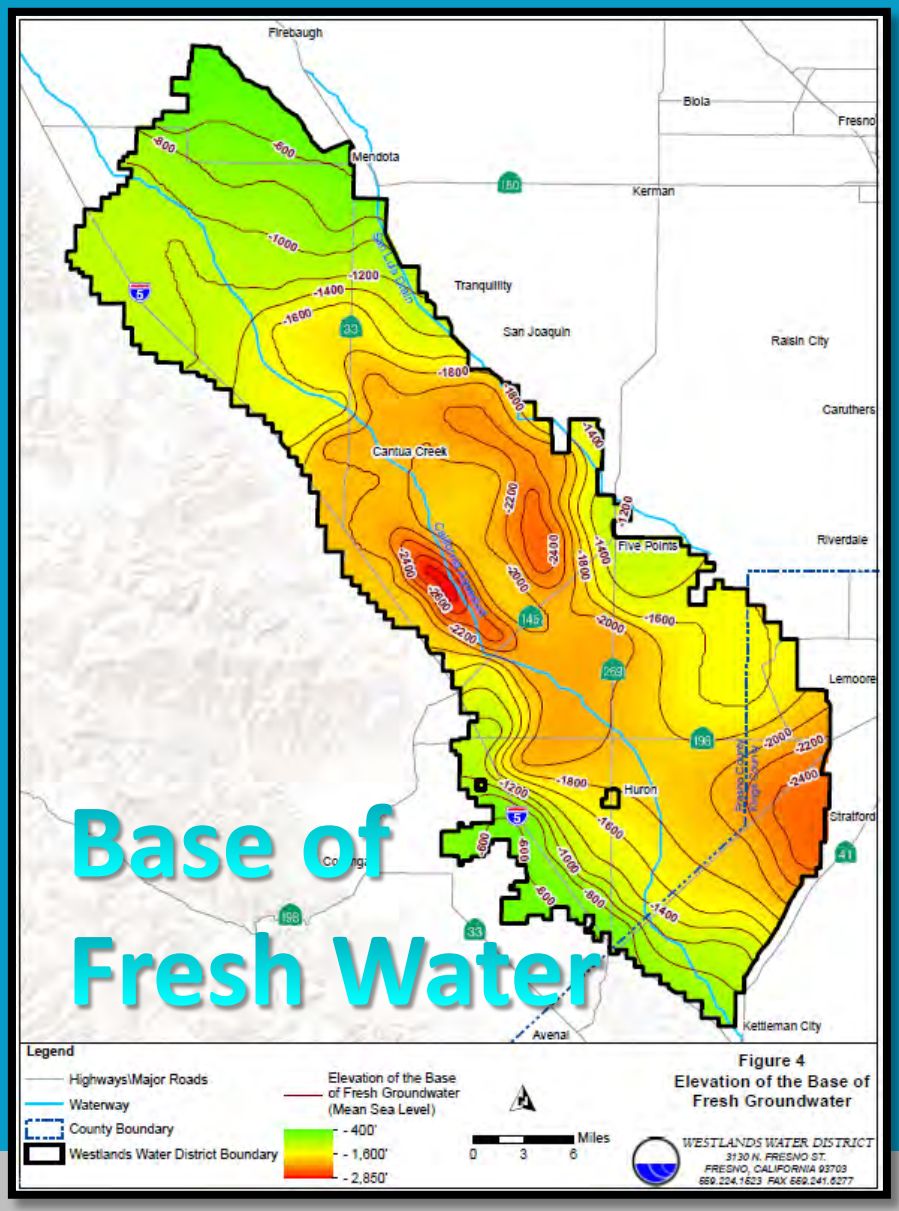
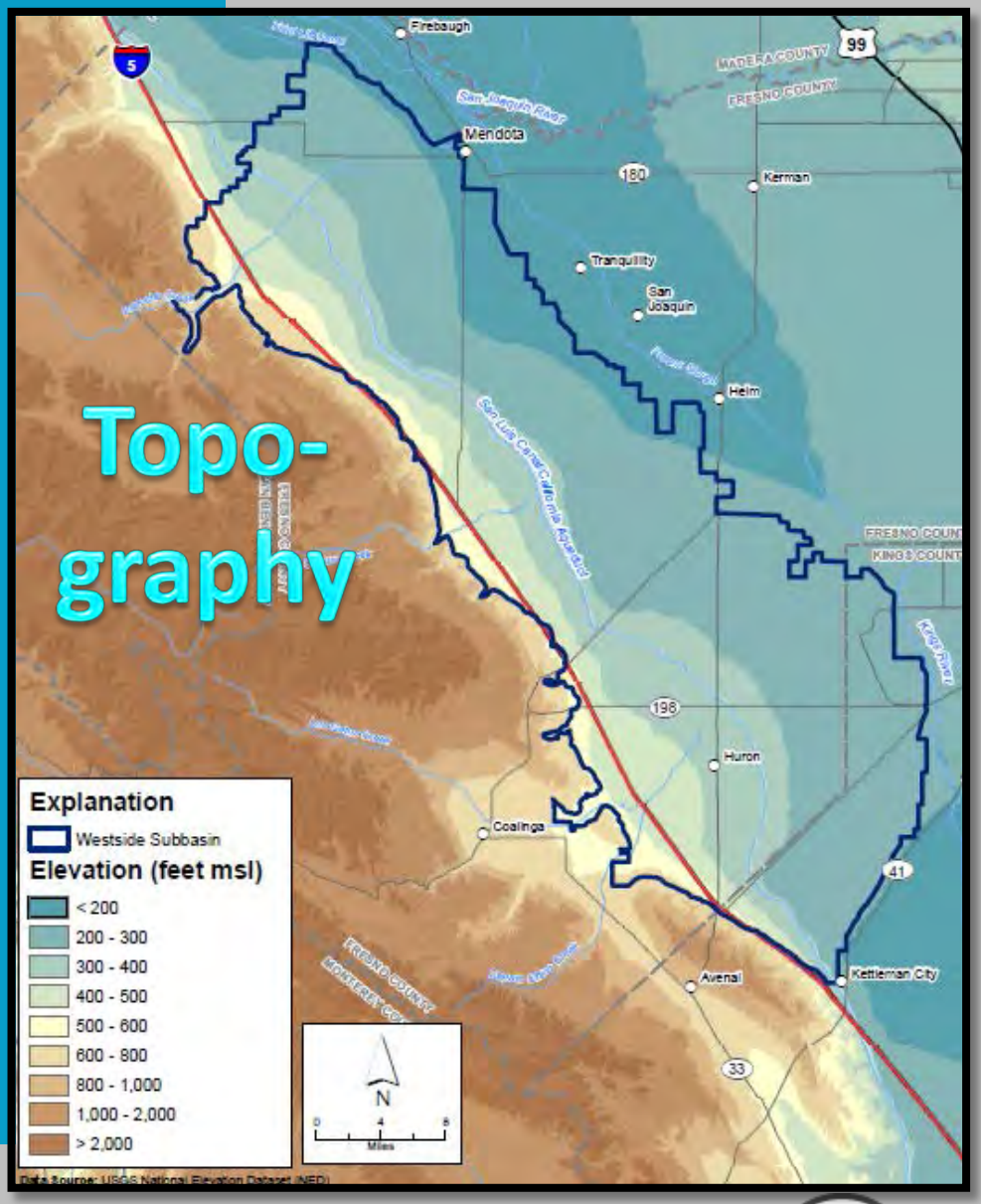

Base of Fresh Water
Firebaugh
Mendota
Biola
Fresno
Kerman
Tranquility
San Joaquin
Raisin City
Caruthers
Cantua Creek
Five Points
Riverdale
Lemoore
Huron
Stratford
Coalinga
Avenal
Kettleman City
Legend
Highways\Major Roads
Waterway
County Boundary
Westlands Water District Boundary
Elevation of the Base of Fresh Groundwater (Mean Sea Level)
- 400'
- 1,600'
- 2,850'
Miles
0 3 6
Figure 4
Elevation of the Base of Fresh Groundwater
WESTLANDS WATER DISTRICT
3130 N. FRESNO ST.
FRESNO, CALIFORNIA 93703
559.224.1523 FAX 559.241.6277


Topo-graphy
Firebaugh
Mendota
Kerman
Tranquility
San Joaquin
Helm
Huron
Coalinga
Avenal
Kettleman City
MADERA COUNTY
FRESNO COUNTY
KINGS COUNTY
Explanation
Westside Subbasin
Elevation (feet msl)
< 200
200 - 300
300 - 400
400 - 500
500 - 600
600 - 800
800 - 1,000
1,000 - 2,000
> 2,000
N
Miles
Data Source: USGS National Elevation Dataset (NED)

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Hydrogeology- Westside Subbasin

- Sierra Nevada Mountain Range (East) is the source of the younger sedimentary deposits in the Subbasin.
- Diablo Range (West) is source of marine sedimentary rocks in the Subbasin.
- Tulare Lake Bed is the source of the Corcoran Clay.

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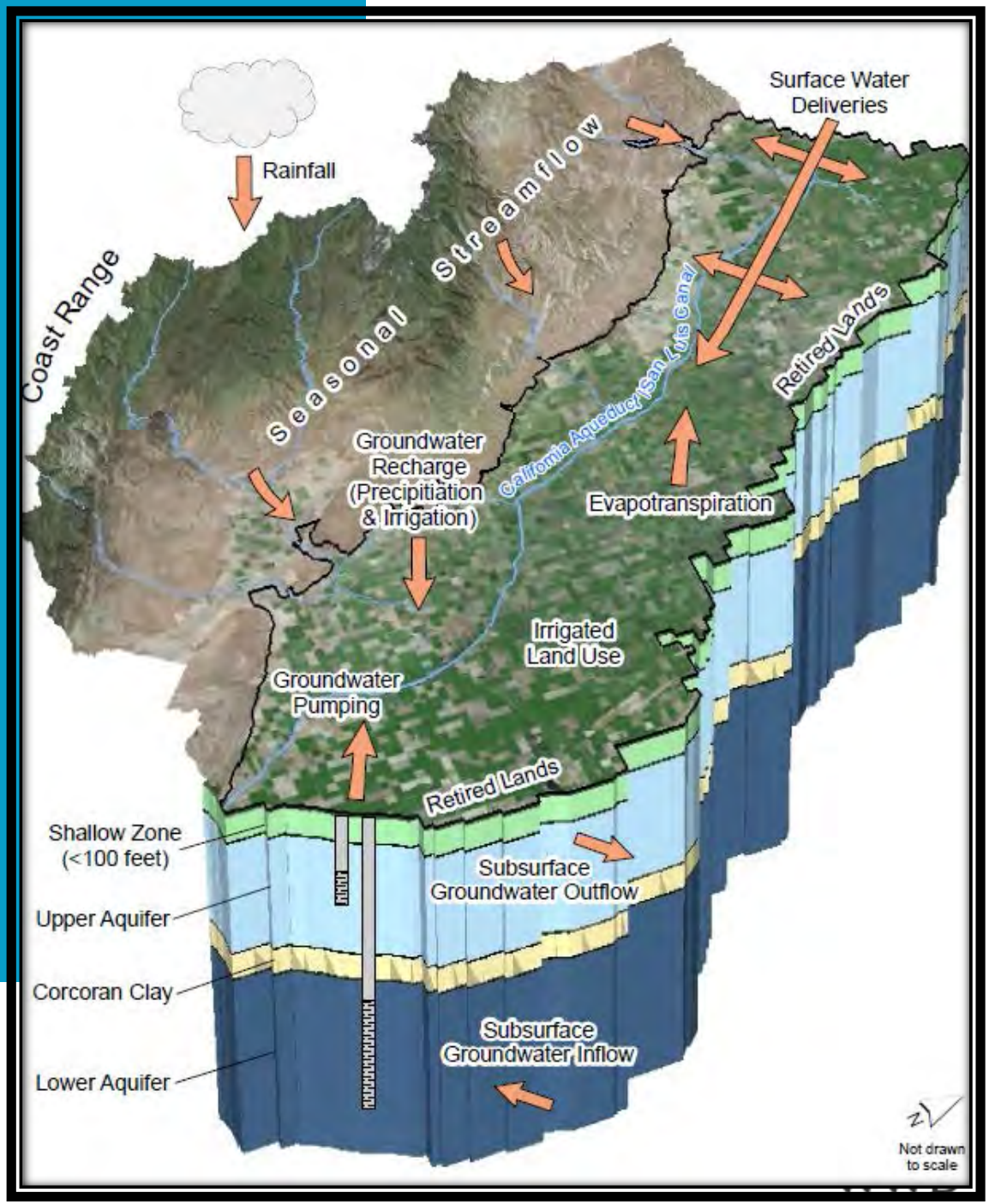
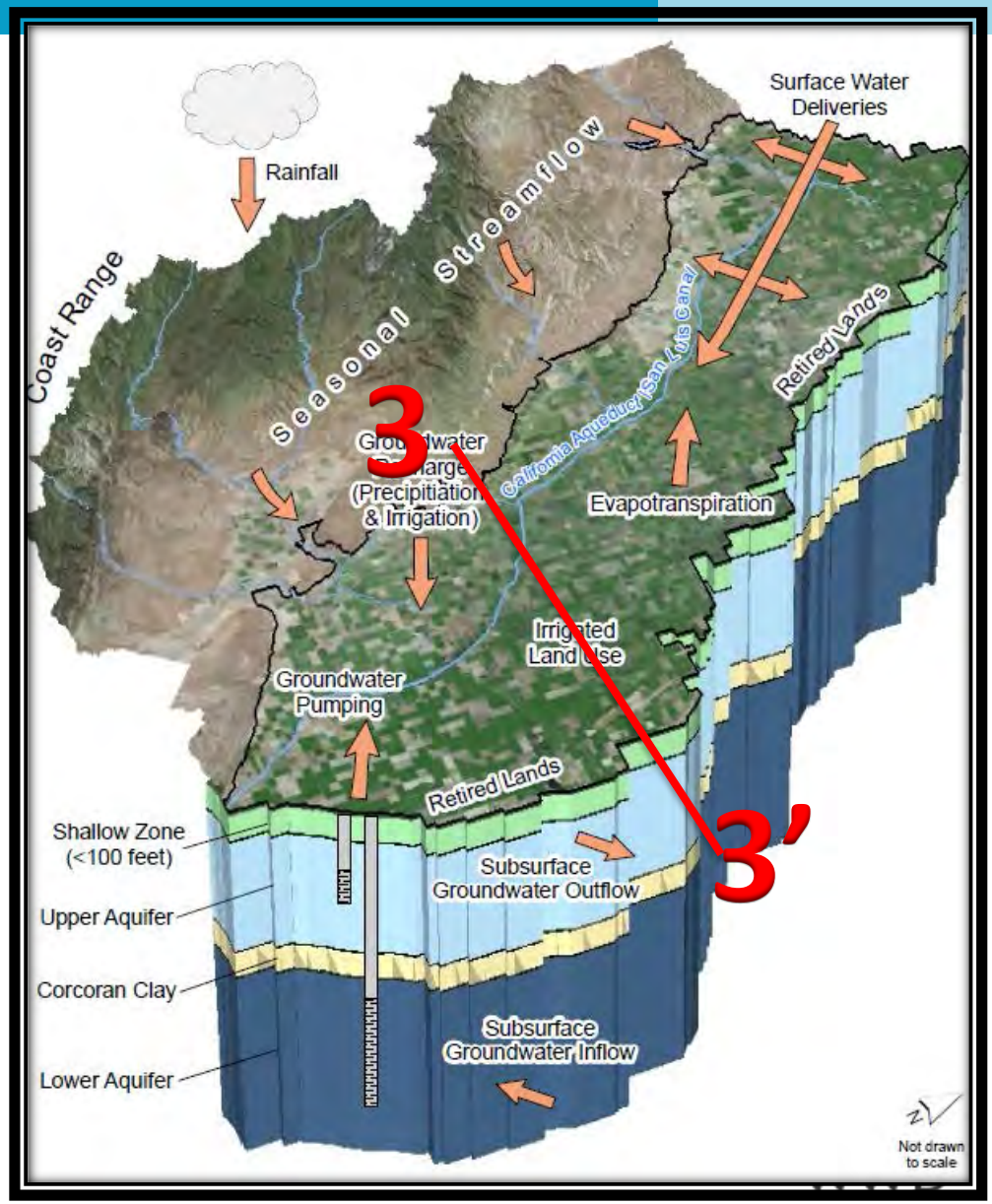
Hydrogeology-Westside Subbasin



Hydrogeology- Westside Subbasin

- Shallow Aquifer-<100 feet



Cross Section

Westside Subbasin Boundary

Westside Subbasin Boundary

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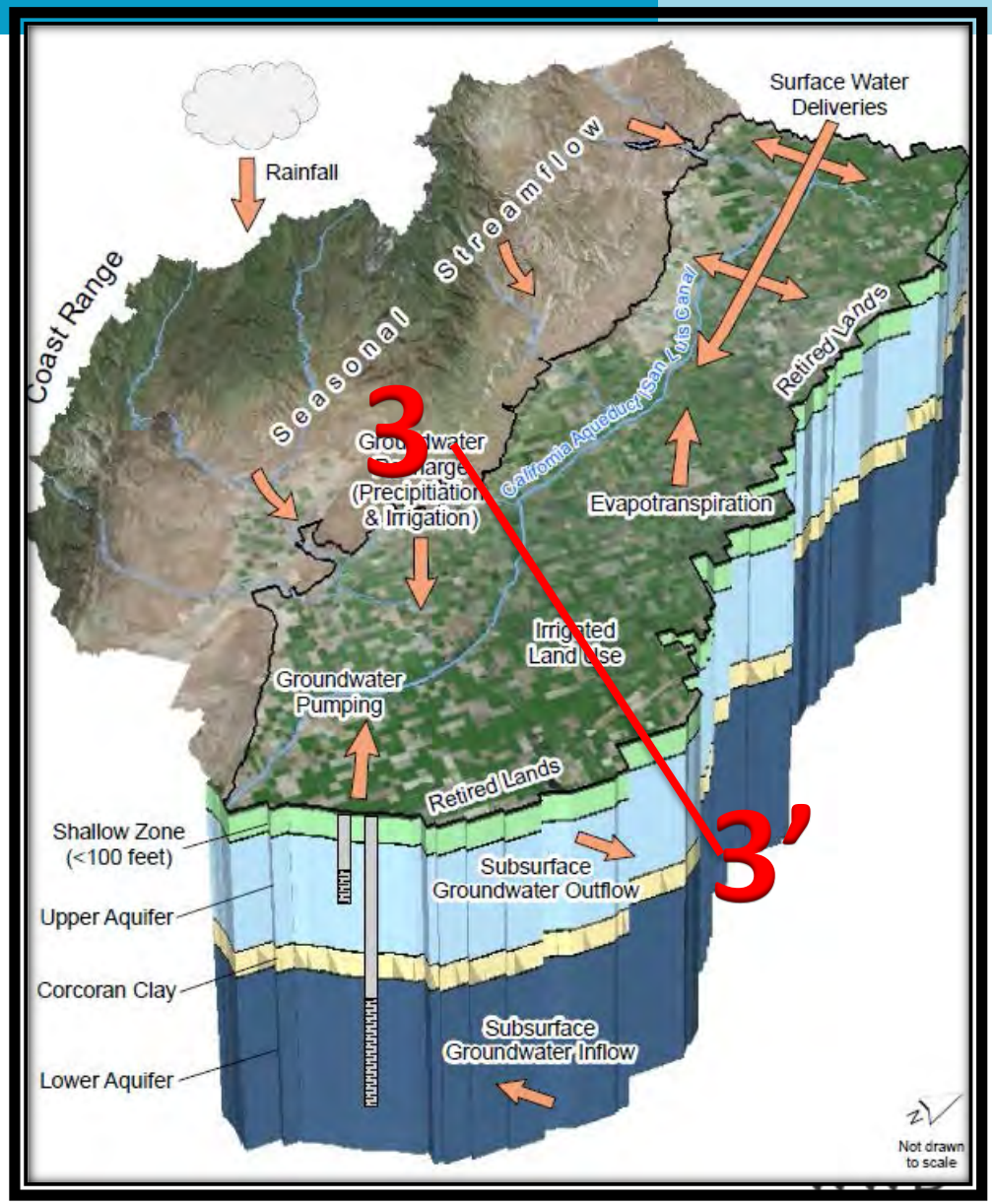
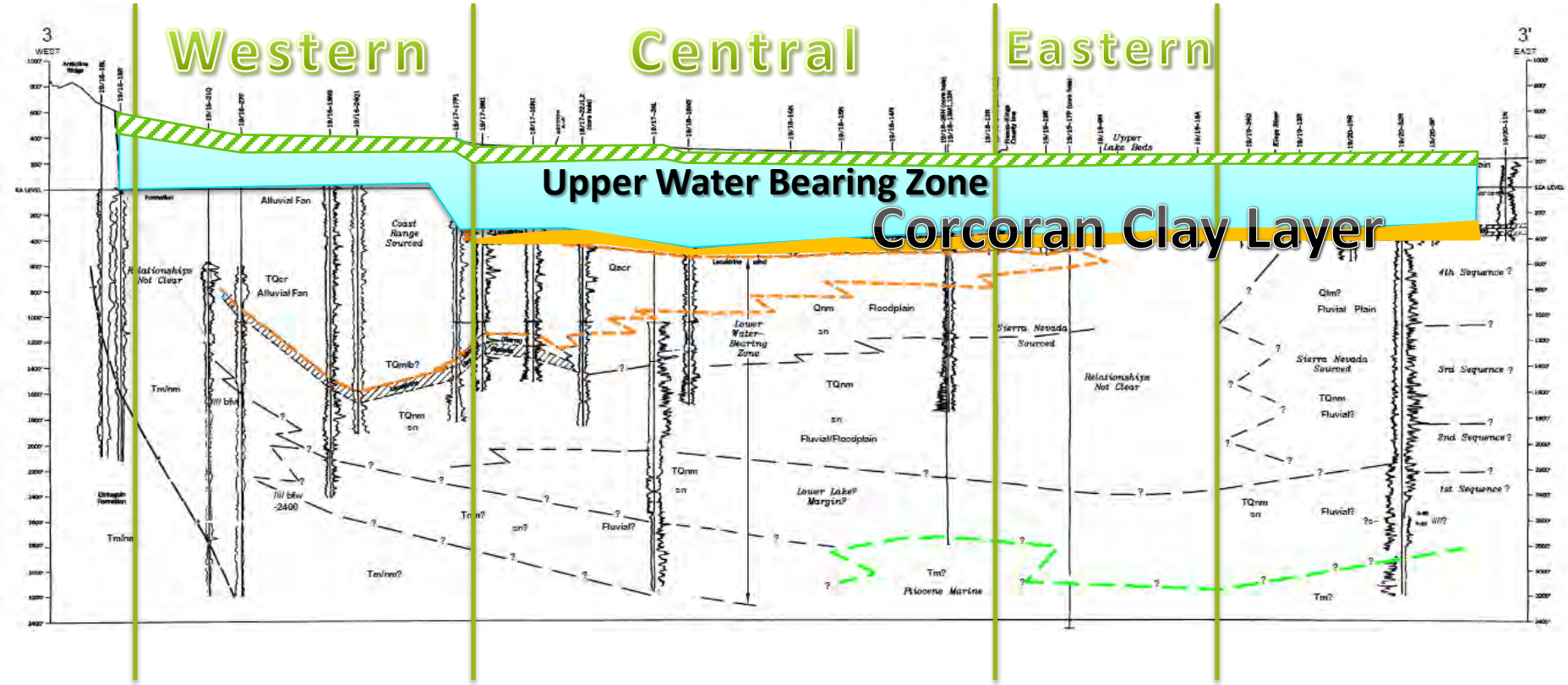
Hydrogeology- Westside Subbasin

- Shallow Aquifer-<100 feet
- Upper Water Bearing Zone - Above the Corcoran Clay
  - 100 feet to 800 feet

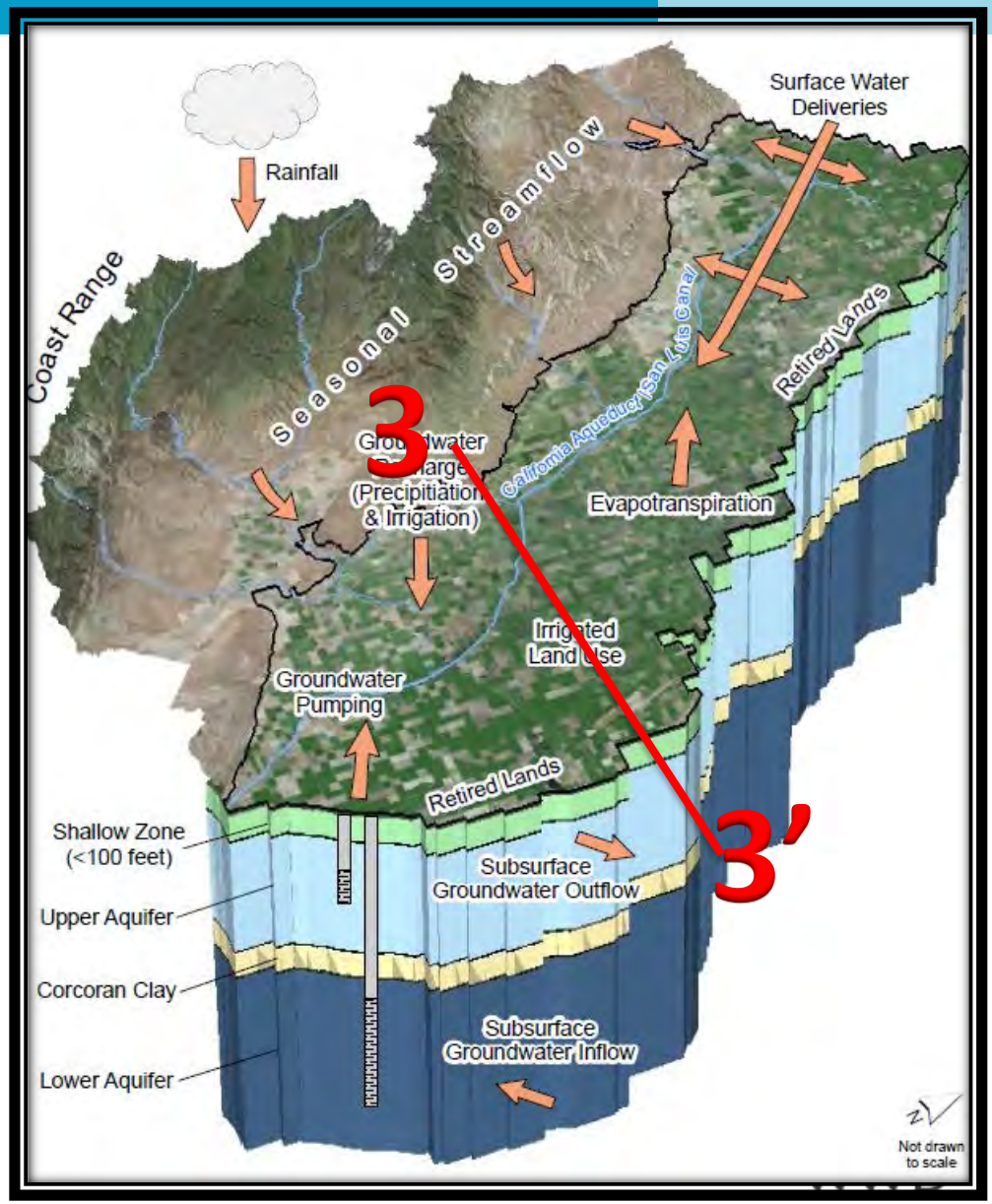


Cross Section



Hydrogeology- Westside Subbasin

- Shallow Aquifer-<100 feet
- Upper Water Bearing Zone - Above the Corcoran Clay
  - 100 feet to 800 feet
- Lower Water Bearing Zone - Below the Corcoran Clay
  - 700 feet to 3,500 feet



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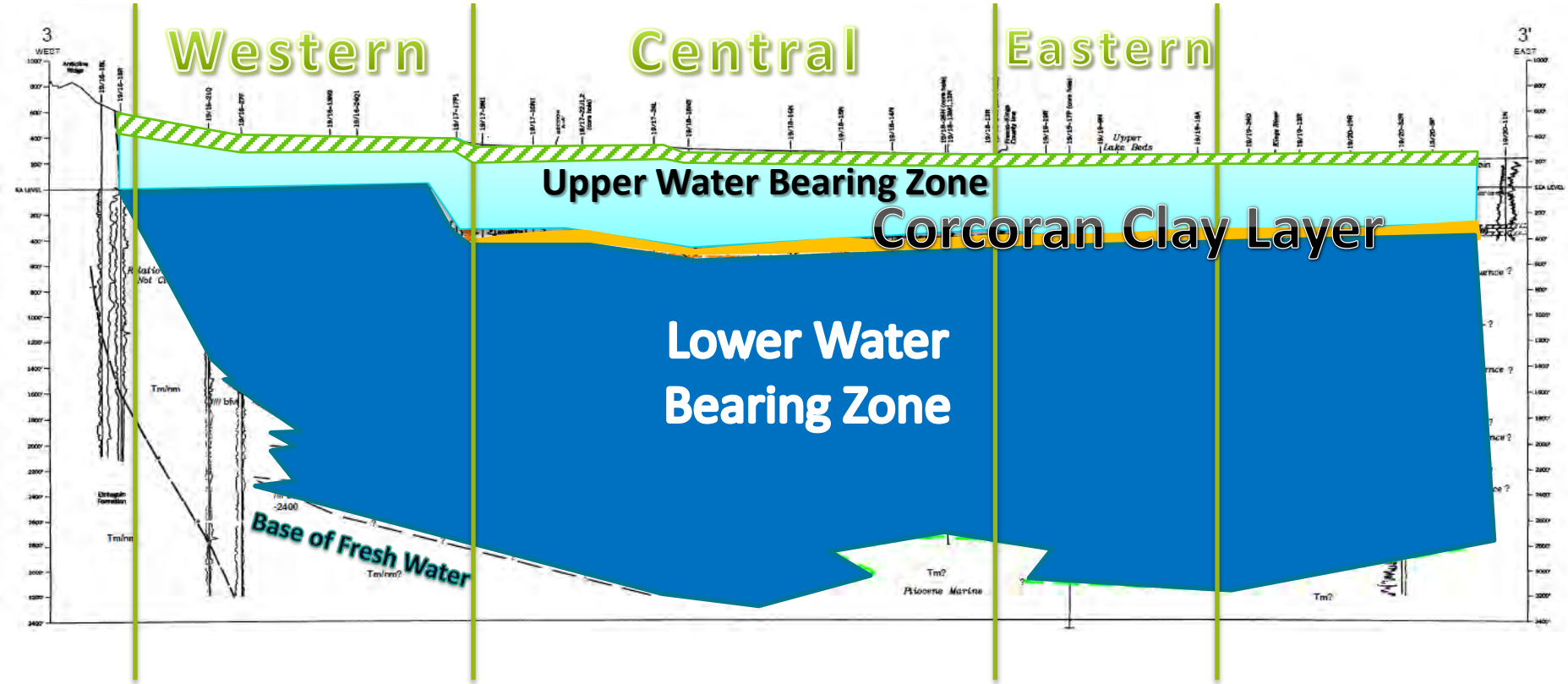

Westside Subbasin Boundary

Westside Subbasin Boundary

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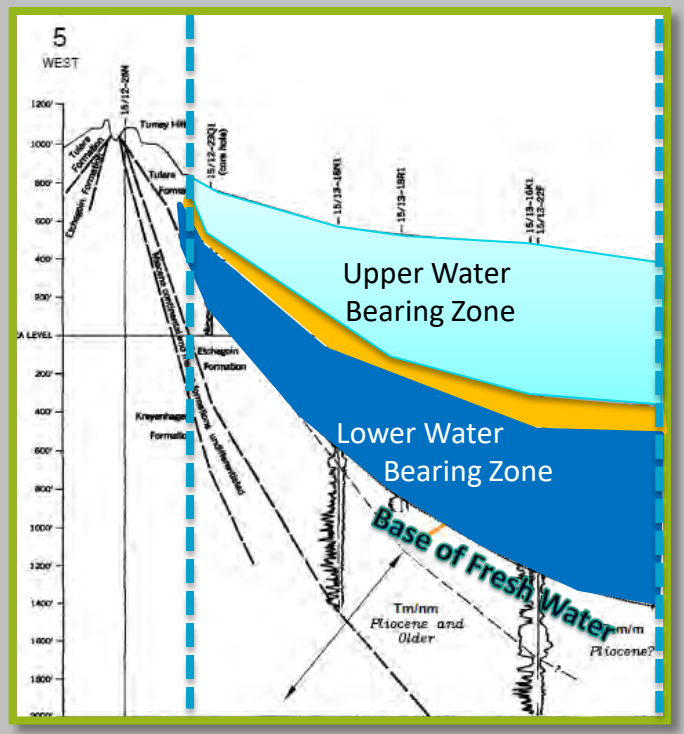
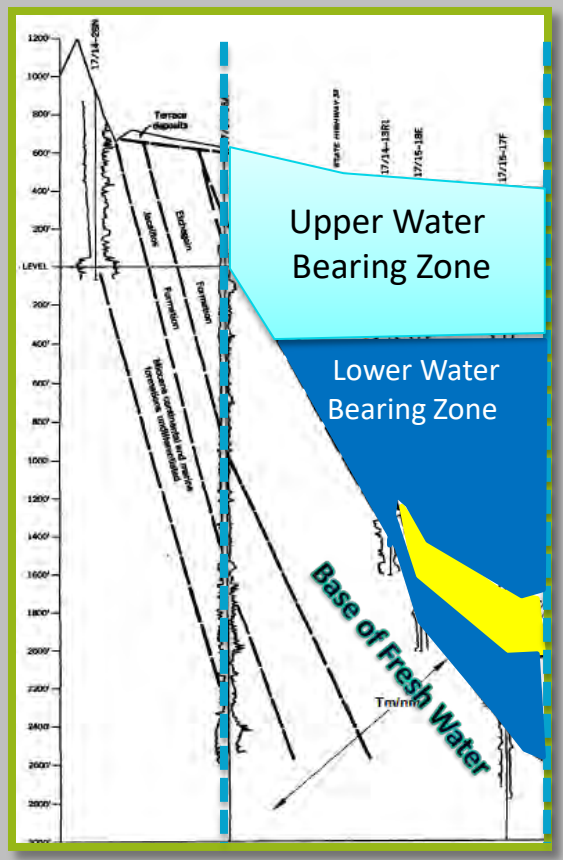
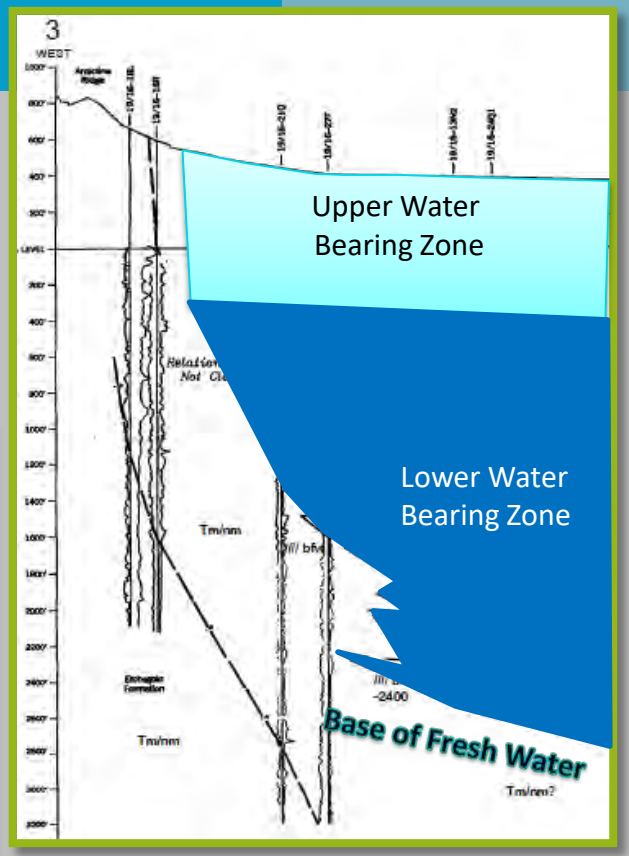
Cross Section- Western



Cantua West





Panoche West

A.P.-West

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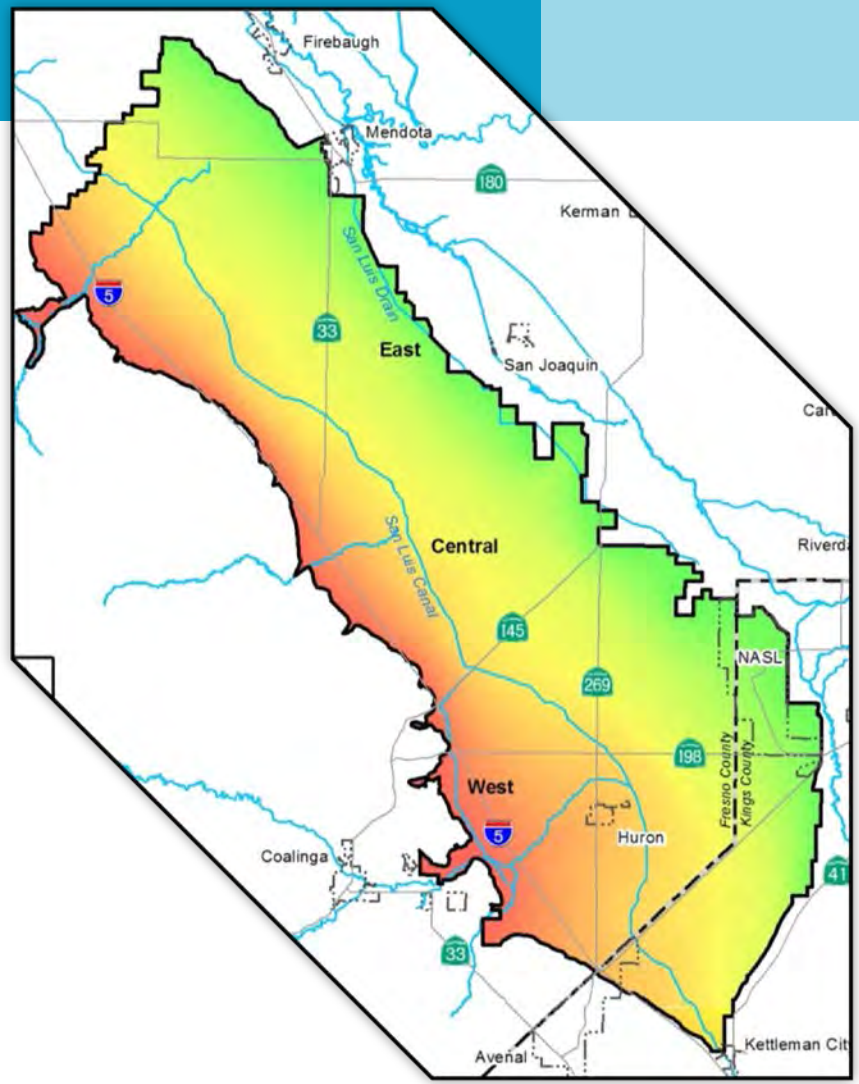
Management Areas

- Based on the variability of the three cross sections and;
- Dividing the Westside Subbasin into three management areas is supported by:
  - Corcoran Clay (Absent or Thickness)
  - Thickness of Freshwater Aquifer
  - Similar Soil Types



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Western Area Geologic Characteristics

1. Corcoran Clay
   - Panoche West Area- Extremely thick
   - Cantua West Area- Relatively thin to not existent
   - A.P. West Area- Non existent
2. Soils
   - Panoche West Area- Sandy and Clay Loams
   - Cantua West Area- Clay, Sandy and Clay Loams
   - A.P. West Area- Predominantly Sandy Loams

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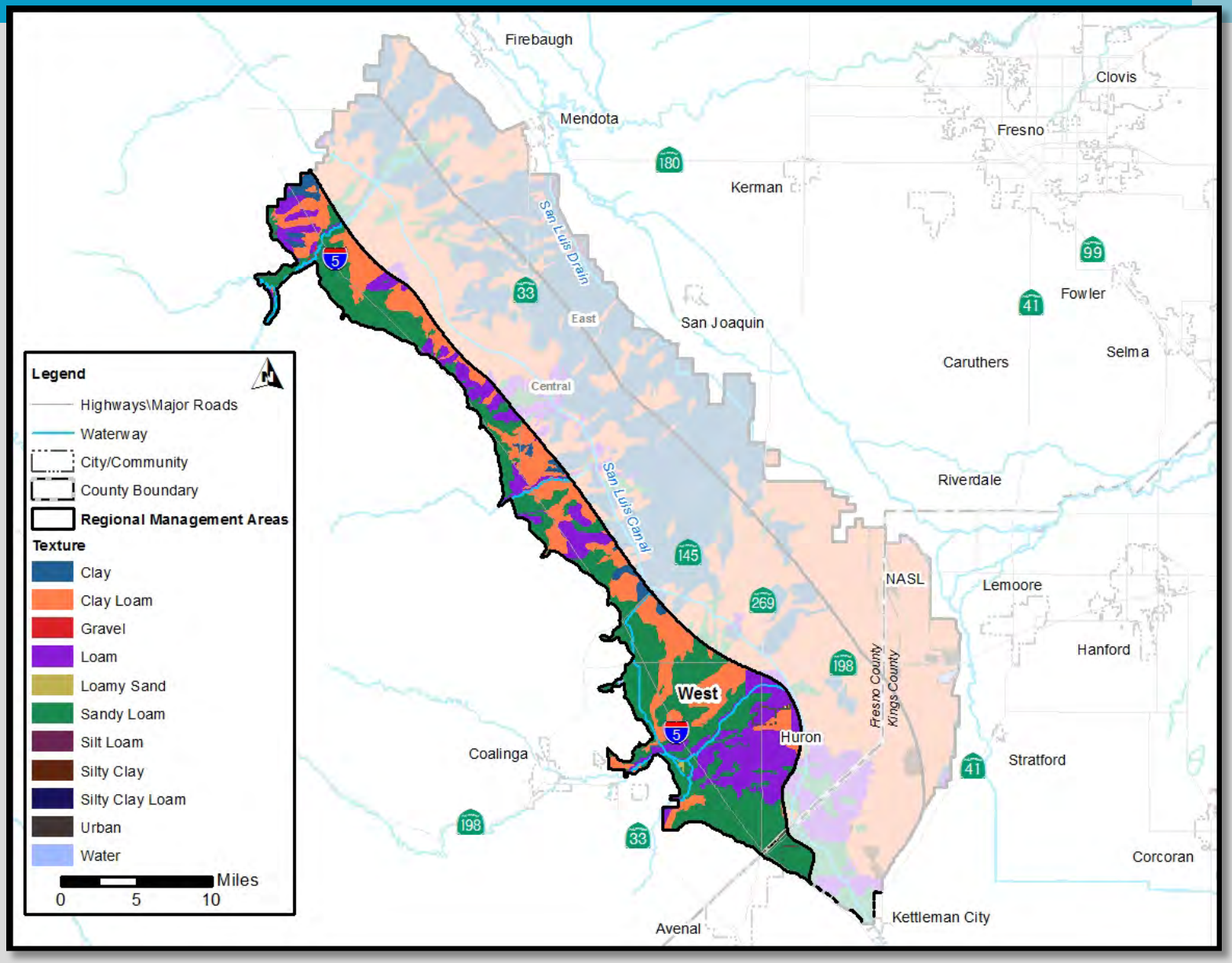
Western Area Soil Textures



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2. Soils
   - Panoche West Area- Sandy and Clay Loams
   - Cantua West Area- Clay, Sandy and Clay Loams
   - A.P. West Area- Predominantly Sandy Loams
3. Well Drained Soils

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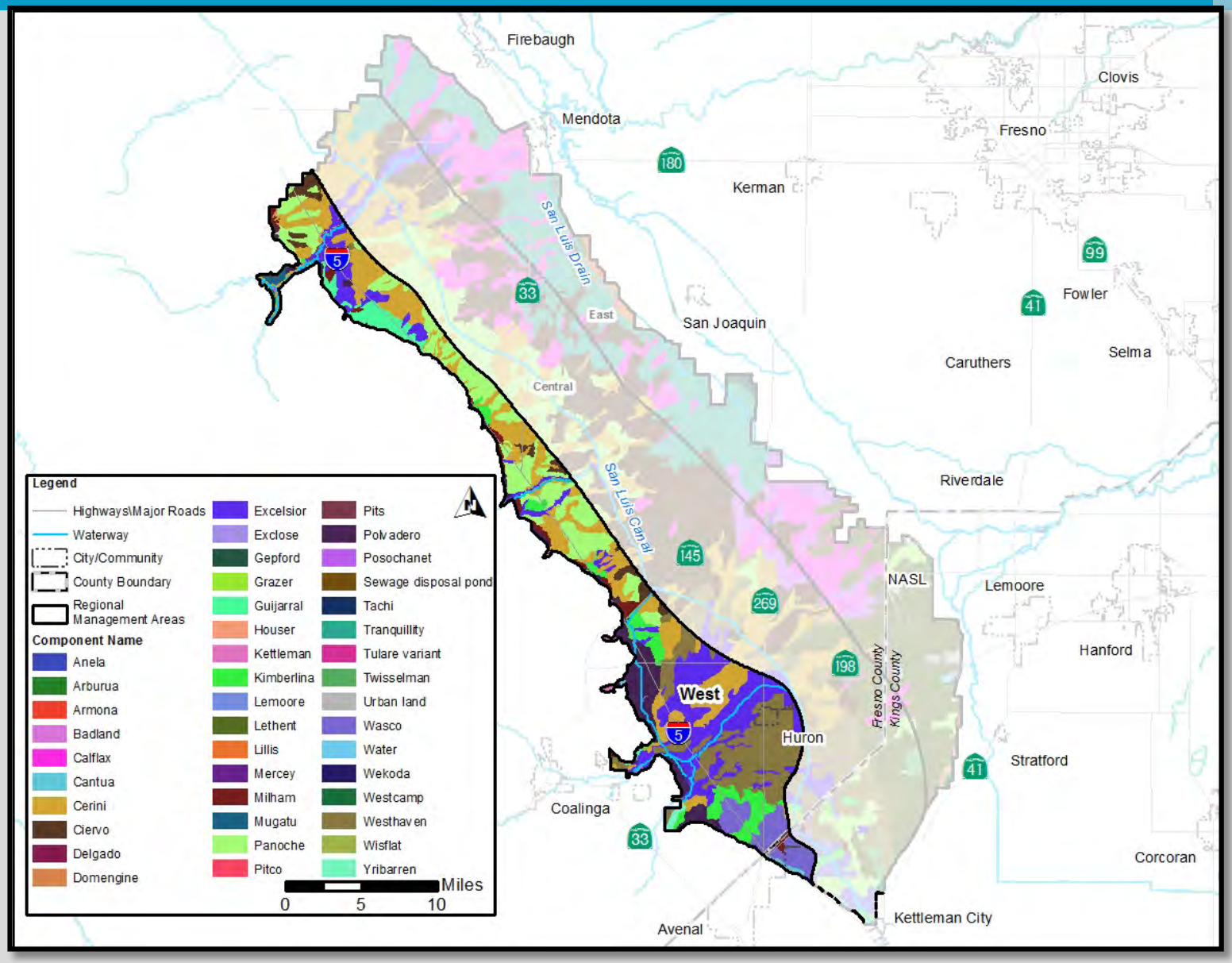
Western Area Soil Types



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Western Area Geologic Characteristics

1. Corcoran Clay
   - North Western Area- Extremely thick
   - West Central Area- Relatively thin and not existent
   - South Western Area- Not existent
2. Soils
   - North Western Area- Sandy and Clay Loams
   - West Central Area- Clay, Sandy and Clay Loams
   - South Western Area- Predominantly Sandy Loams
3. Well Drained Soils
4. Advantageous Groundwater Recharge Rates
5. The Panoche, Cantua and Arroyo Pasajero Creeks predominantly drain into the Western area of the Subbasin

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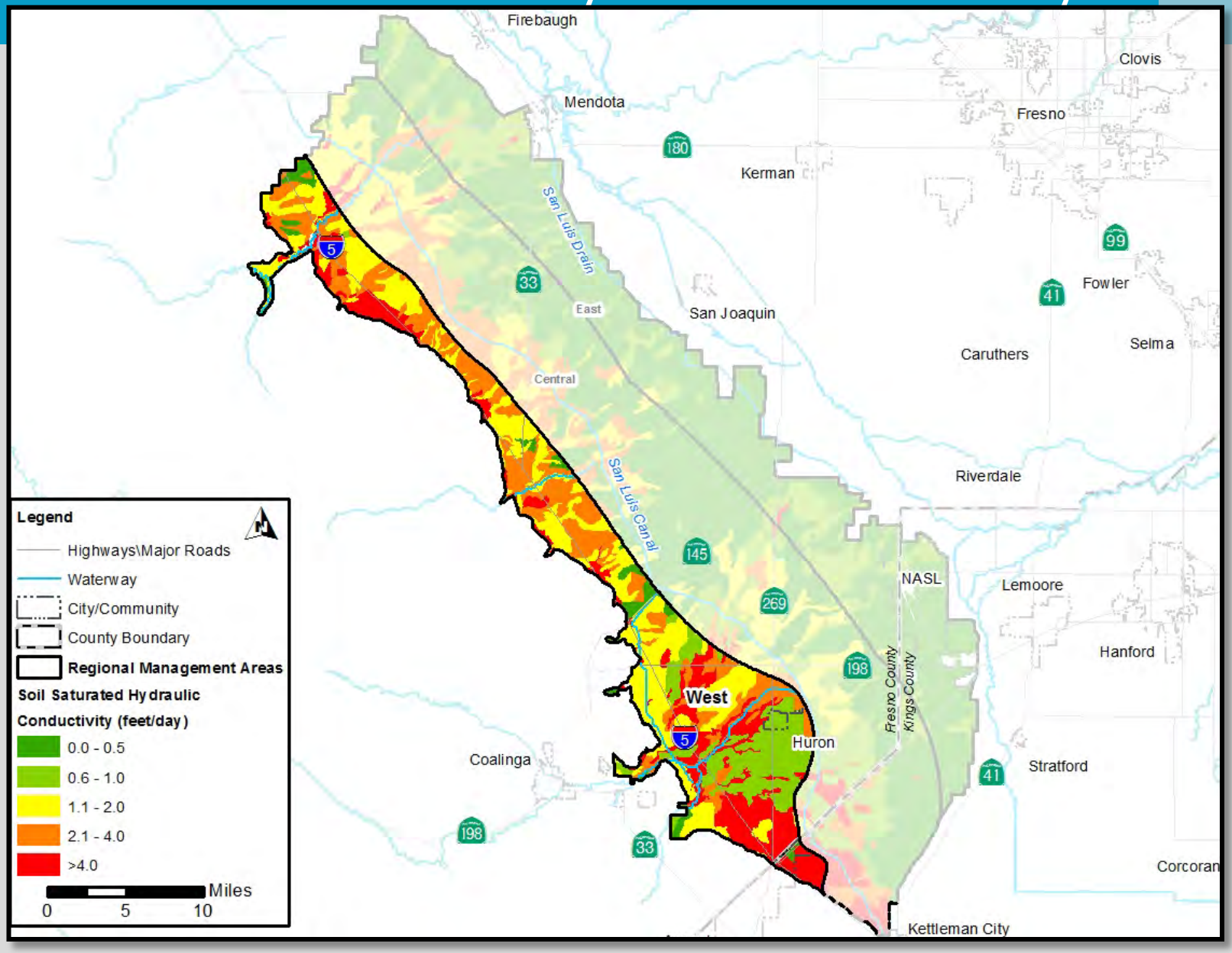
Western Areas- Soil Hydraulic Conductivity



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Sustainable Groundwater Management Act (SGMA)

- **Local Management of the Groundwater Basin**
- **Requires subbasins to be sustainably managed by 2040**
  - **"Sustainability" refers to any of the effects caused by groundwater conditions occurring throughout the basin that, when significant and unreasonable, cause undesirable results.**

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Western Area Characteristics- SGMA

- Similar Subsidence Characteristics
- Similar Trending Groundwater Level Behavior
- Areas west of the San Luis Canal have favorable recharge potential.
- Minimal or no shallow groundwater pumping.

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Western Area- Undesirable Results

Undesirable Results	Risk
Reduction in Groundwater Storage	Yes
Degradation in Water Quality	Potentially
Land Subsidence	Potentially
Chronic Lowering of Groundwater Levels	Yes

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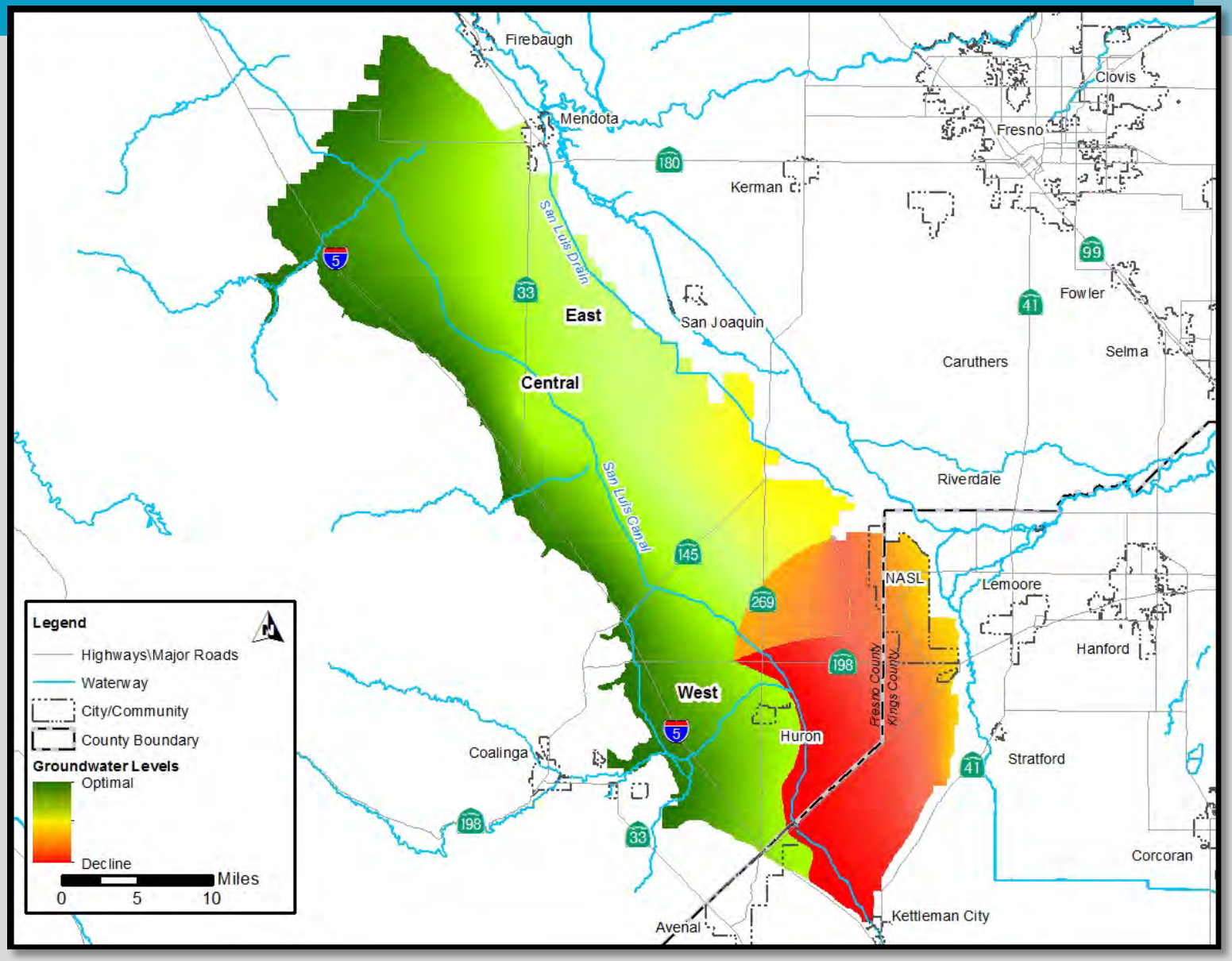
Groundwater Levels District-Wide



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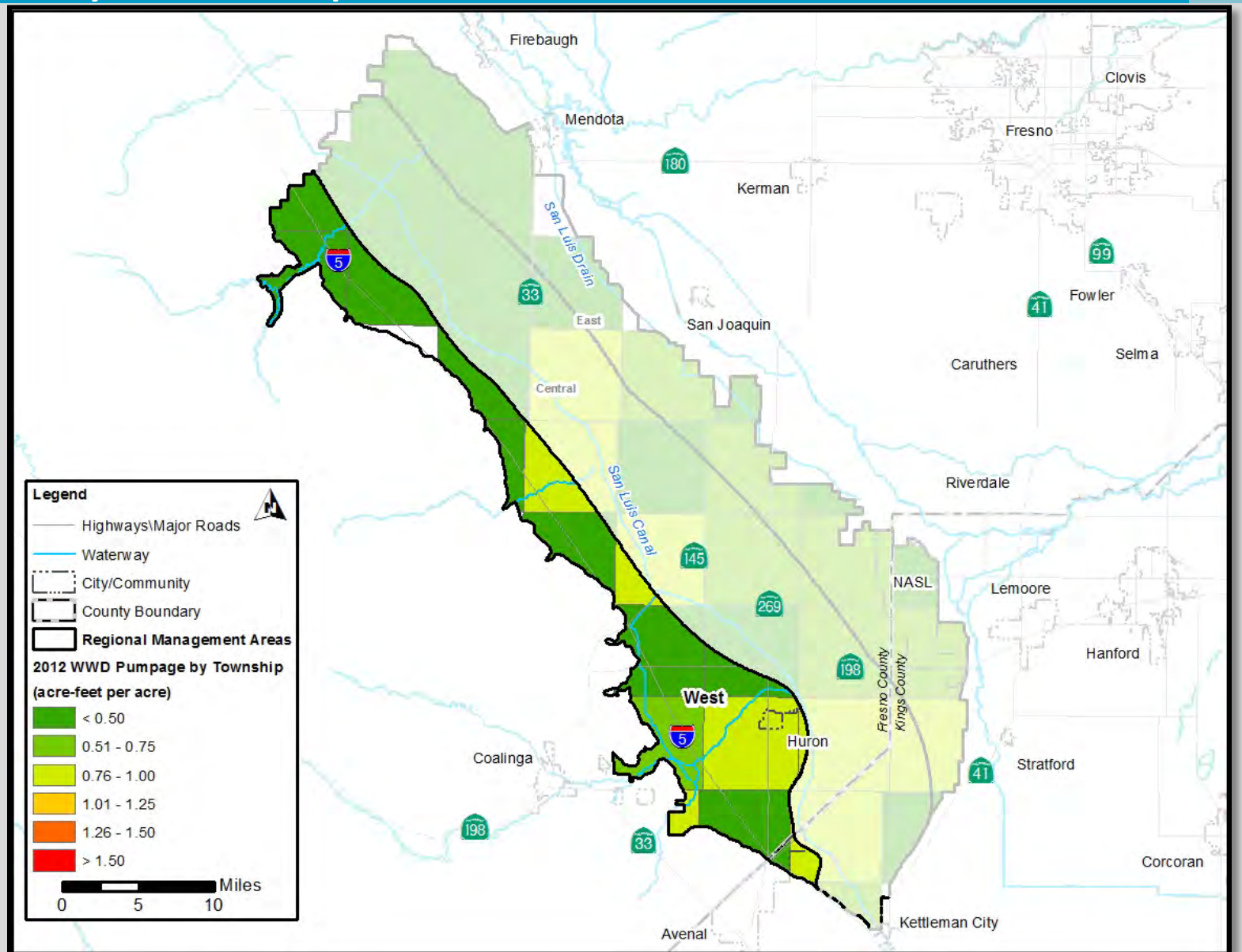
Western Area- 2012 Groundwater Pumpage by Township



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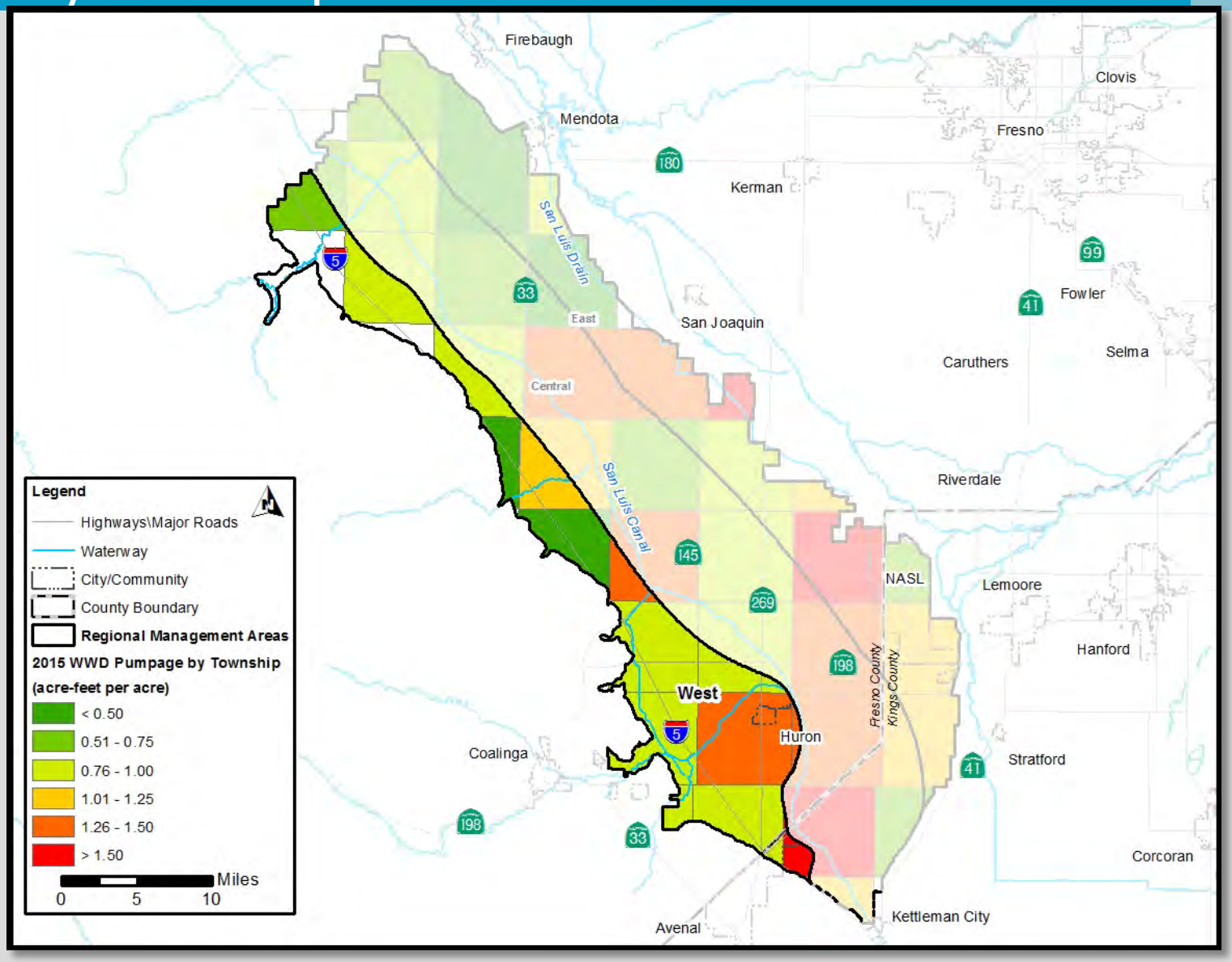
Western Area- 2015 Groundwater Pumpage by Township



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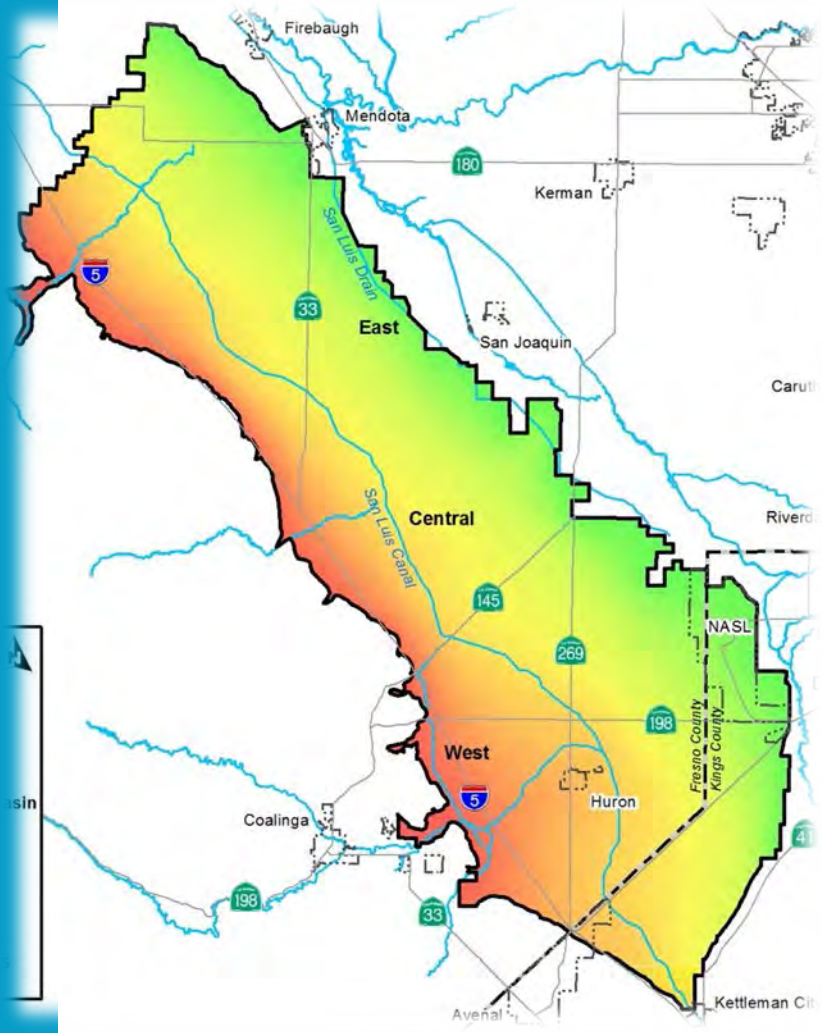
Optimization Options

Avoiding the six undesirable results identified in SGMA and optimizing pumping the Westside Subbasin



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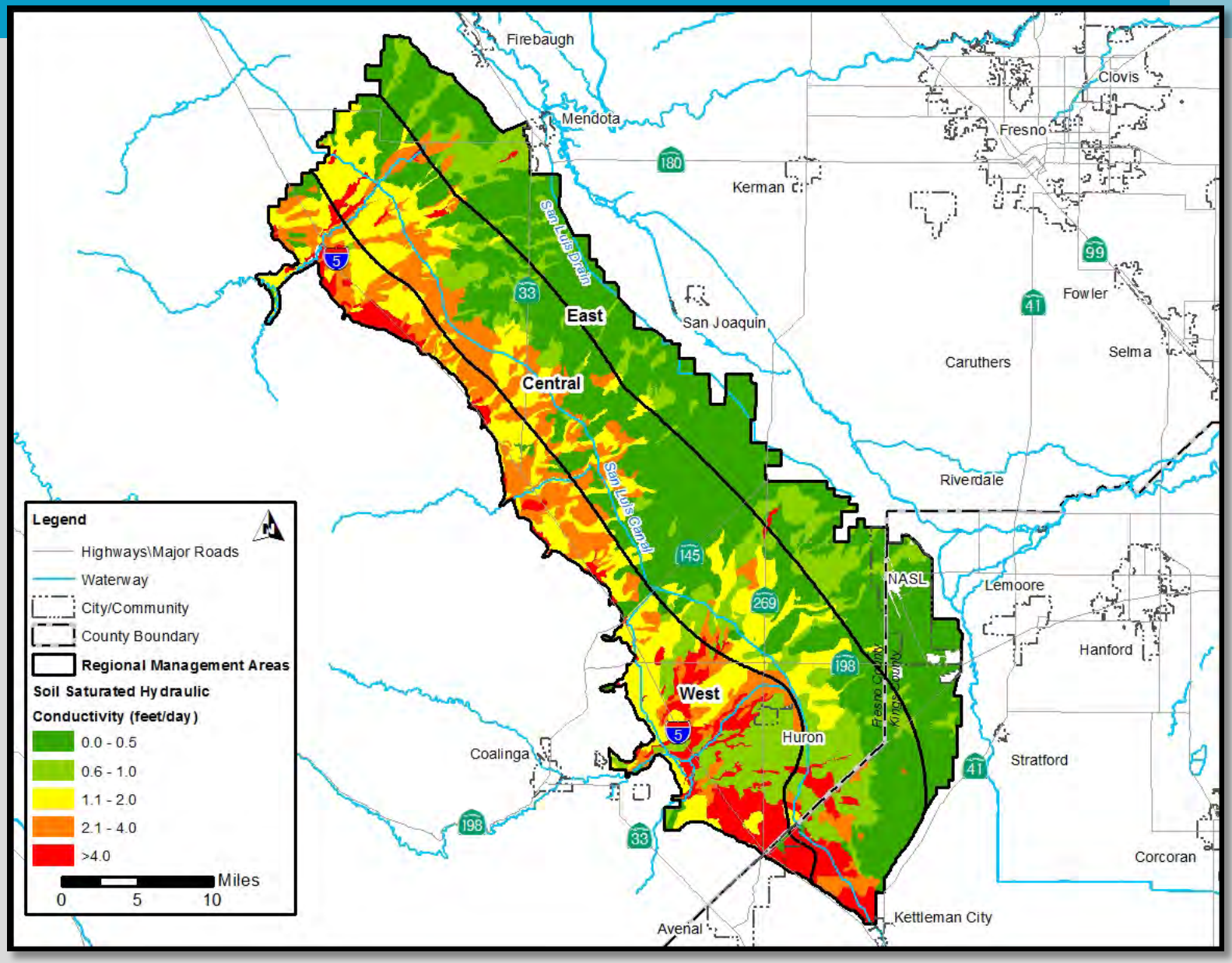
Soil Hydraulic Conductivity



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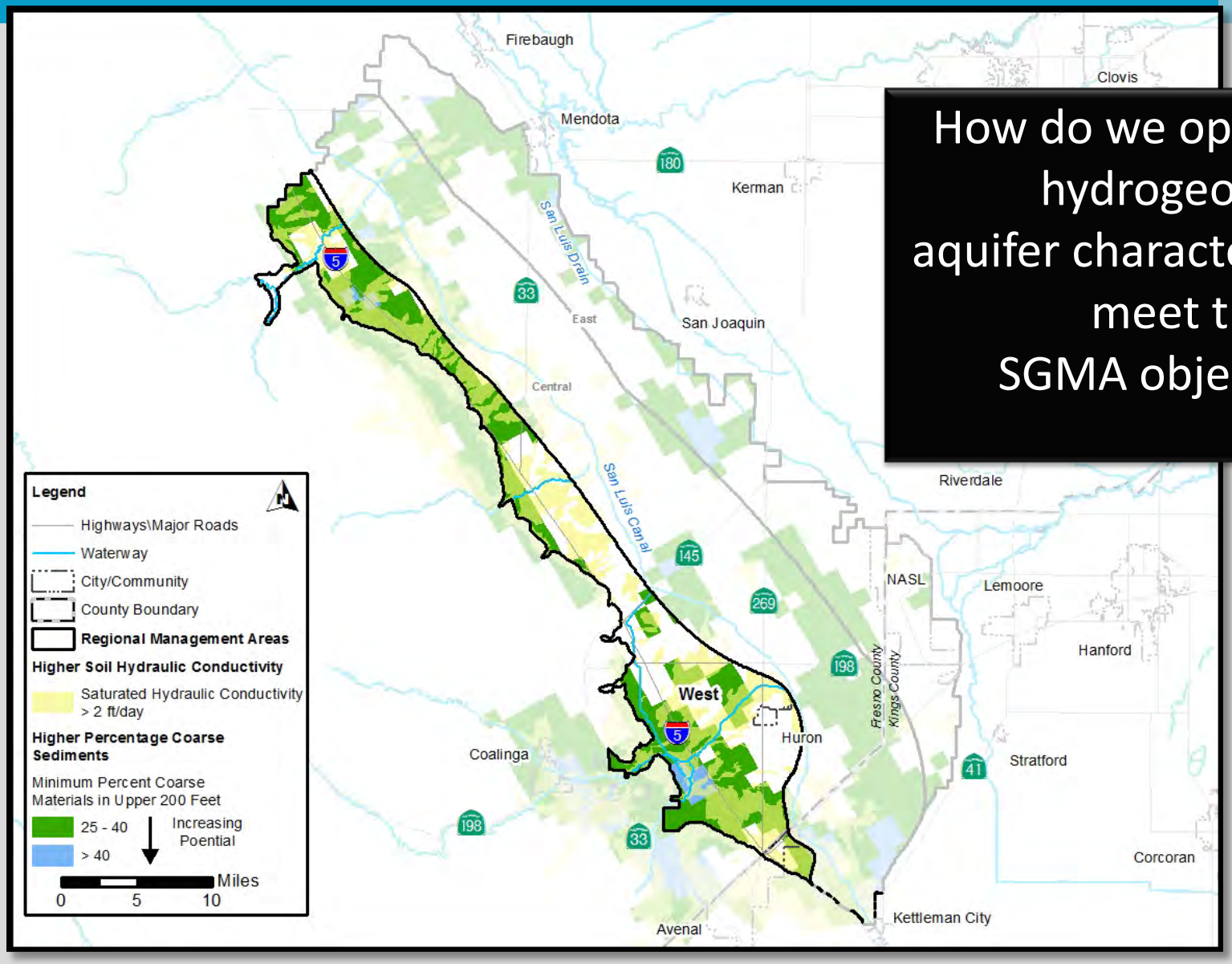
Western Area- Recharge Potential



How do we optimize the hydrogeology, aquifer characteristics and meet the SGMA objectives?

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Groundwater Credit Options

Groundwater Banking Projects developed by:

- The District

OR/AND

- Water Users

WWD

Groundwater Credit Options

Aquifer Storage and Recovery (ASR) developed by:

- The District

OR/AND

- Water Users

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Groundwater Credit Options

What type of groundwater credit works best with your farming practices?

WWD

Management Areas

Group the **Western** Area of the subbasin as:

- Three management areas

OR

- One management area

Management Areas

Based on farm practices, do you have suggestions or comments on the proposed management areas?

WWD

Management Options

What management options would you like the District to incorporate in the GSP?

1. Flexibility to transfer Sustainable Yield Allocation to water users in the same management area
2. Land Fallowing with Compensation
3. Public Input?

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SGMA Terminology

Are you understanding the terminology? What can we do differently from a terminology stand point?

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GSP IDEAS

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QUESTIONS

WWD