Kern County Oil and Gas Permitting Streamlining and Environmental Protection

Local Government Presentation

State Water Resources Control Board

Public Workshop

Development of Model Groundwater Monitoring Criteria in Areas of Oil and Gas Production

Lorelei H. Oviatt, AICP Director

Kern County Planning

and Community Development Department

661-862-8866 Loreleio@co.kern.ca.us

August 7,2014

Land Use Permits

- Local County or City zoning
- State Permit from DOGGR
  (Division of Oil, Gas, Geothermal Resources)

Both subject to review by CEQA
(California Environmental Quality Act)

Local Regulatory Approaches

- No Local Permit – DOGGR CEQA Lead/ Permit
  Kern, Kings, Sutter, Sacramento, San Benito

- Conditional Use Permit /Site Plan Review
  County/City CEQA Lead
  Public Hearings – Discretionary Decisions

California Environmental Quality Act Environmental Impact Report

- Applies to Discretionary Projects
- Disclosure Document – not Decision Document
- Cumulative Impact issues
- Site Specific and Geographically based
- Shows the good, the bad and the ugly or not legally sufficient

Current Processing
Kern County

- No permit from local government for most activities

- Oil – Since 1957
  19 requirements in Zoning
  Chapter 19.98- Oil and Gas Production

- 80% of oil production in California

Streamlined Permitting + Environmental Protection

- WSPA, CIPA and IOPA
  Industry Trade Associations as applicants
- Project level Environmental Impact Report
- 2.8 million acres – Kern County Valley
- Amendment of Zoning Ordinance to address all activities
- Kern County Board of Supervisors – Decision
- Streamlined permitting –No additional CEQA

Permit Process

- Kern County Site Plan Conformity Review
- DOGGR Permit
- Concurrent Permitting
- Both covered by Kern County EIR
- Checklist of submittal requirements and mitigation

Streamlined Features

- CEQA coverage for other agencies
  San Joaquin Valley Air District, Water Board,
  California Department of Fish and Wildlife
- Mitigation already established
- Certain processing – Kern timelines
  First review – 7 days
  Second Review – 3 days
  Third Review – training offered

Schedule

- Notice of Preparation circulated and complete
- Scoping workshops completed
- Completing studies and Draft EIR
- Circulation of Draft EIR – End 2014
- Planning Commission – Fall 2015
- Board of Supervisors – August 2015
- Permitting – October 2015

http://pcd.kerndsa.com/planning/oil-gas-zoning-amendment

Public Works Agency

Watershed Protection District

Ventura County Oil, Gas, and Groundwater

(August 7, 2014 SWRCB Workshop)

Rick Viergutz, CEG

Groundwater Manager

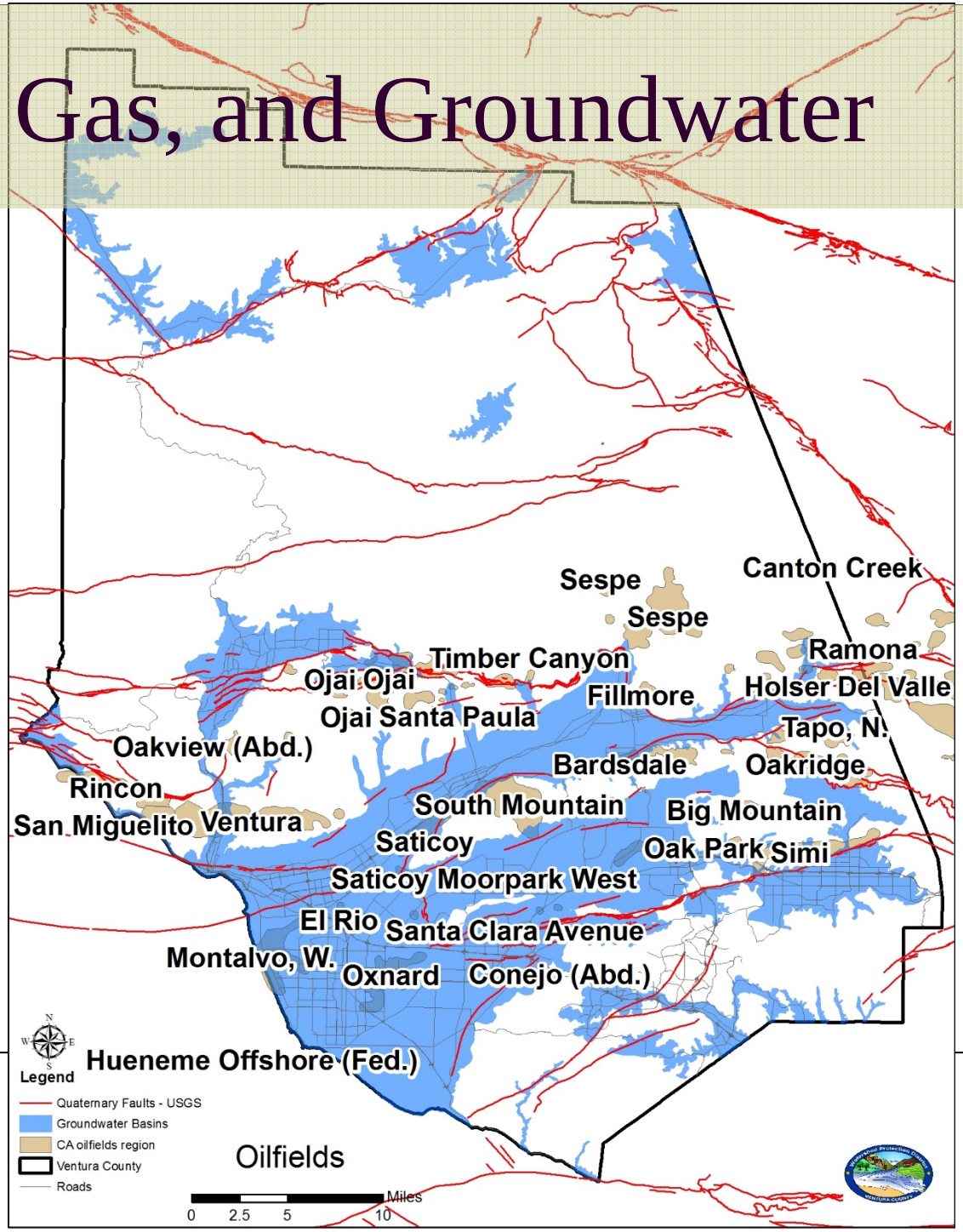
Monday, August 11, 2014

Public Works Agency

Oil and Gas history

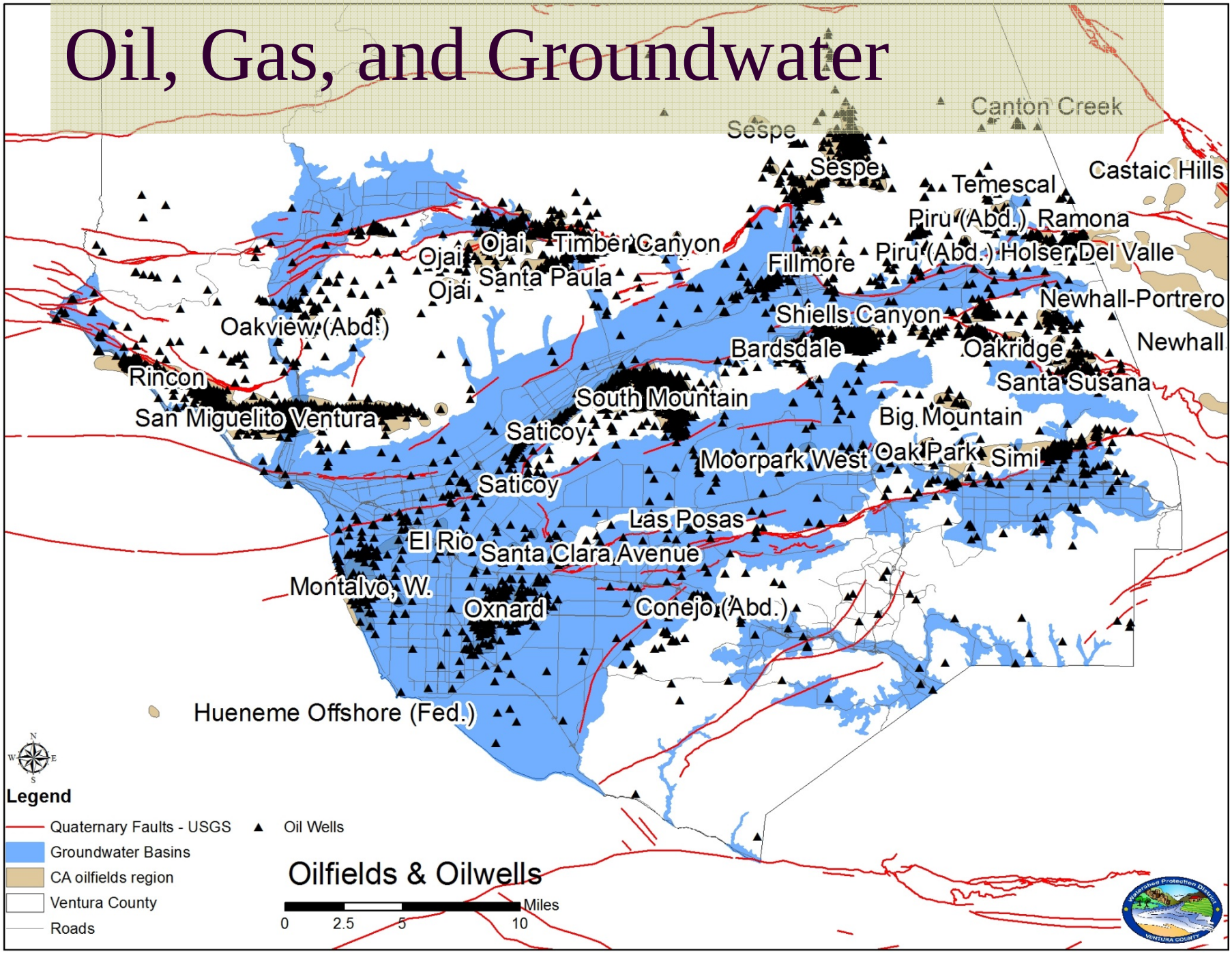
- First commercial well in CA was drilled in Ojai in 1866.
- Number of Oil Fields:
  - 34 onshore
  - 2 offshore
- Earliest record of fracking:
  - 1950's

Oil, Gas, and Groundwater



Public Works Agency

Oil, Gas, and Groundwater



Public Works Agency

Oil and Gas wells

- ~4,000 Plugged wells
- ~3,000 Active oil and gas wells
- ~ 645 Active water flood wells
- ~94 Active water disposal wells
- ~18 Active steam injection wells

- ~450 wells that have been hydraulically fractured.

Public Works Agency

Oil and Gas production

- 2013 production:
  - Oil: 8,797,926 barrels
  - Gas: 8,275,223 Mcf
  - Water: 66,705,153 barrels

- Trends:
  - 1983: 17 million bbls oil produced
  - 2005: 7 million bbls oil produced
  - 2014: Increasing above 2005 level

Public Works Agency

Water, Steam, Fracking fluid

- Data from 2013, District 2.
- Water flood injection 67,706,211 barrels
- Water disposal injection 5,521,592 barrels
- Cyclic steam 389,806 barrels

- Fracking fluid volume per well (typical):
  - Generally an acre foot of water or less
  - An acre foot is ~7,750 barrels

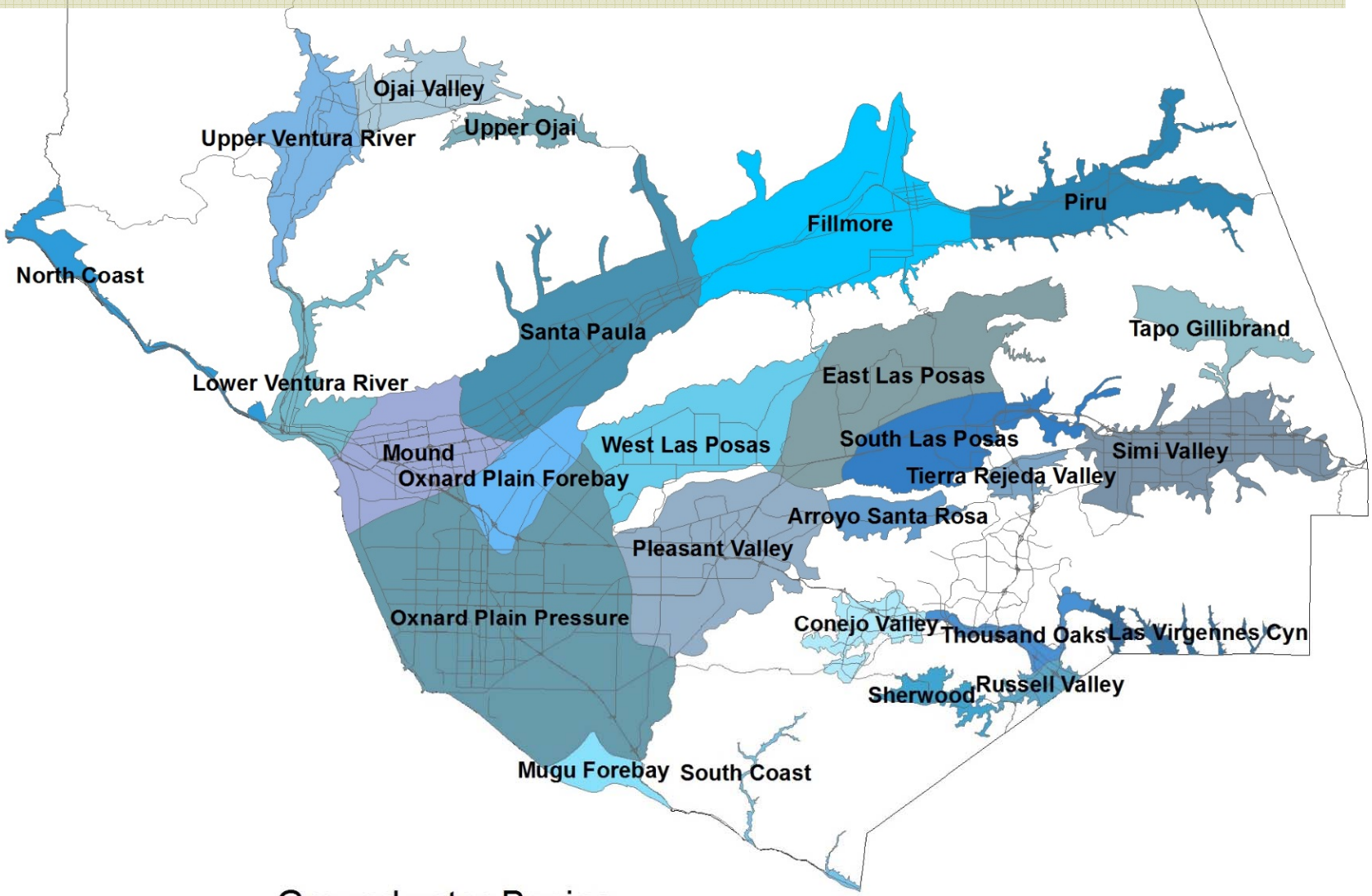
Public Works Agency

Groundwater Basins and Resource

- Ventura County has ~30 Groundwater basins
- Groundwater accounts for 60+ Percent of Water Use
- Local to State control of groundwater extraction volumes varies.
  - Significant groundwater pumping.
  - Groundwater below sea level in some areas.

Groundwater Basins and Resource

Public Works Agency



Groundwater Basins

0 2.5 5 10 Miles

Watershed Protection District

Public Works Agency

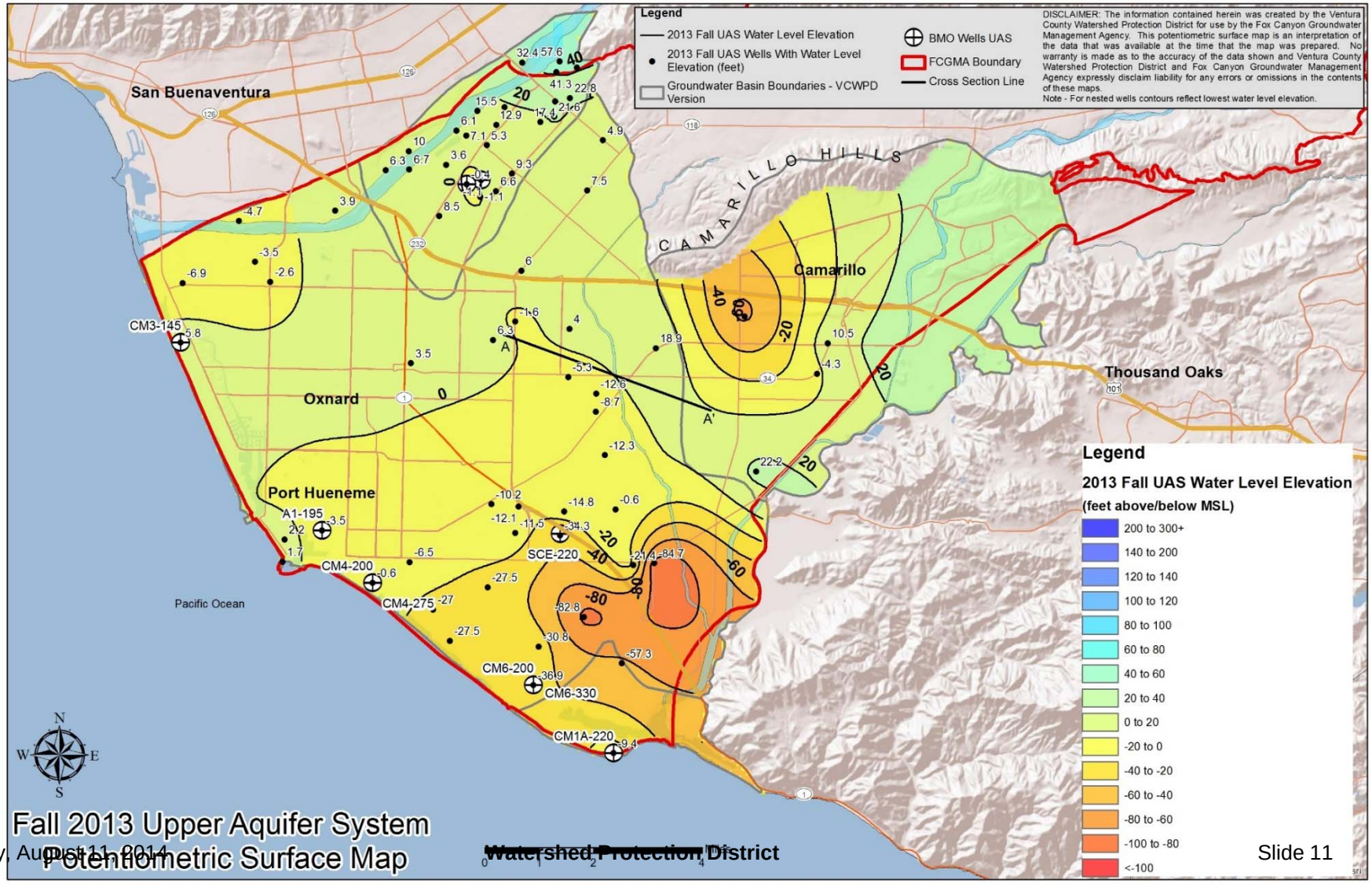
Groundwater Basins and Resource

- County Groundwater Monitoring Program-
- Gauge ~200 wells two to four times per year.
- Water quality sampling of~150 water wells once per year.
  - Typically for general minerals
  - Less frequently for radiologics and organics.
- Produce annual groundwater conditions report

Groundwater Basins and Resource

(Fall 2013 Upper Aquifer System)

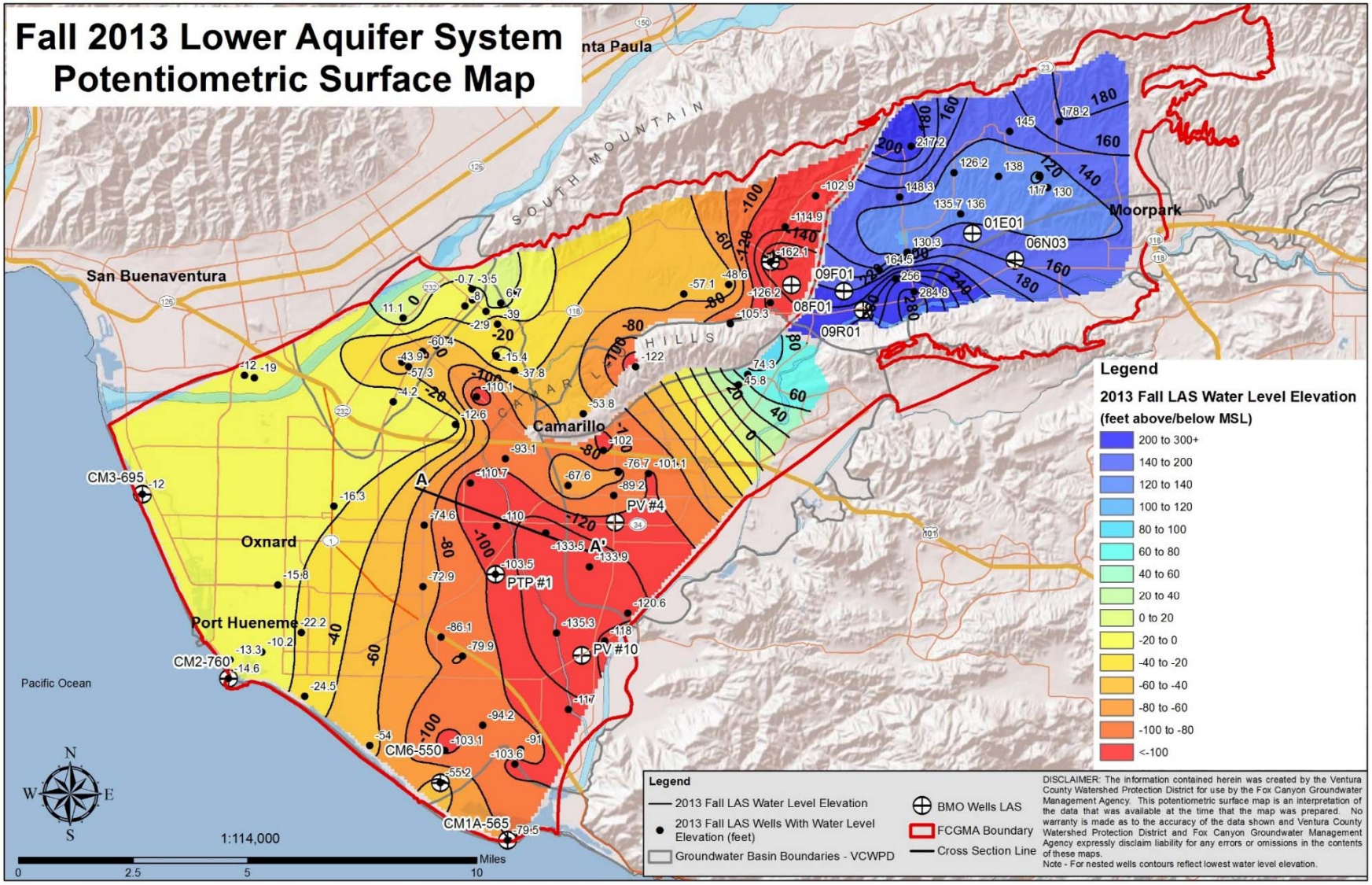
Public Works Agency



Groundwater Basins and Resource

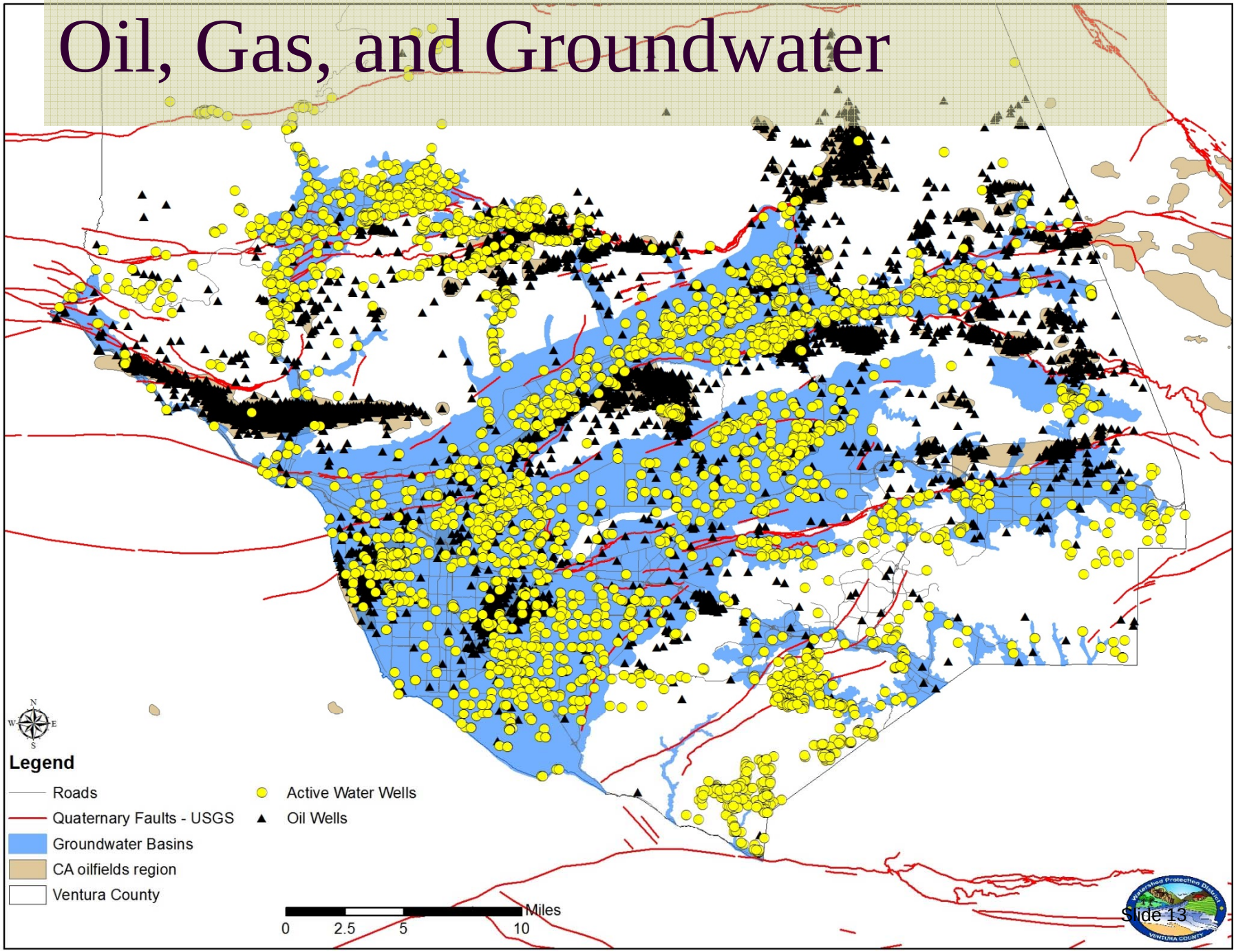
(Fall 2013 Lower Aquifer System)

Public Works Agency



Oil, Gas, and Groundwater

Public Works Agency



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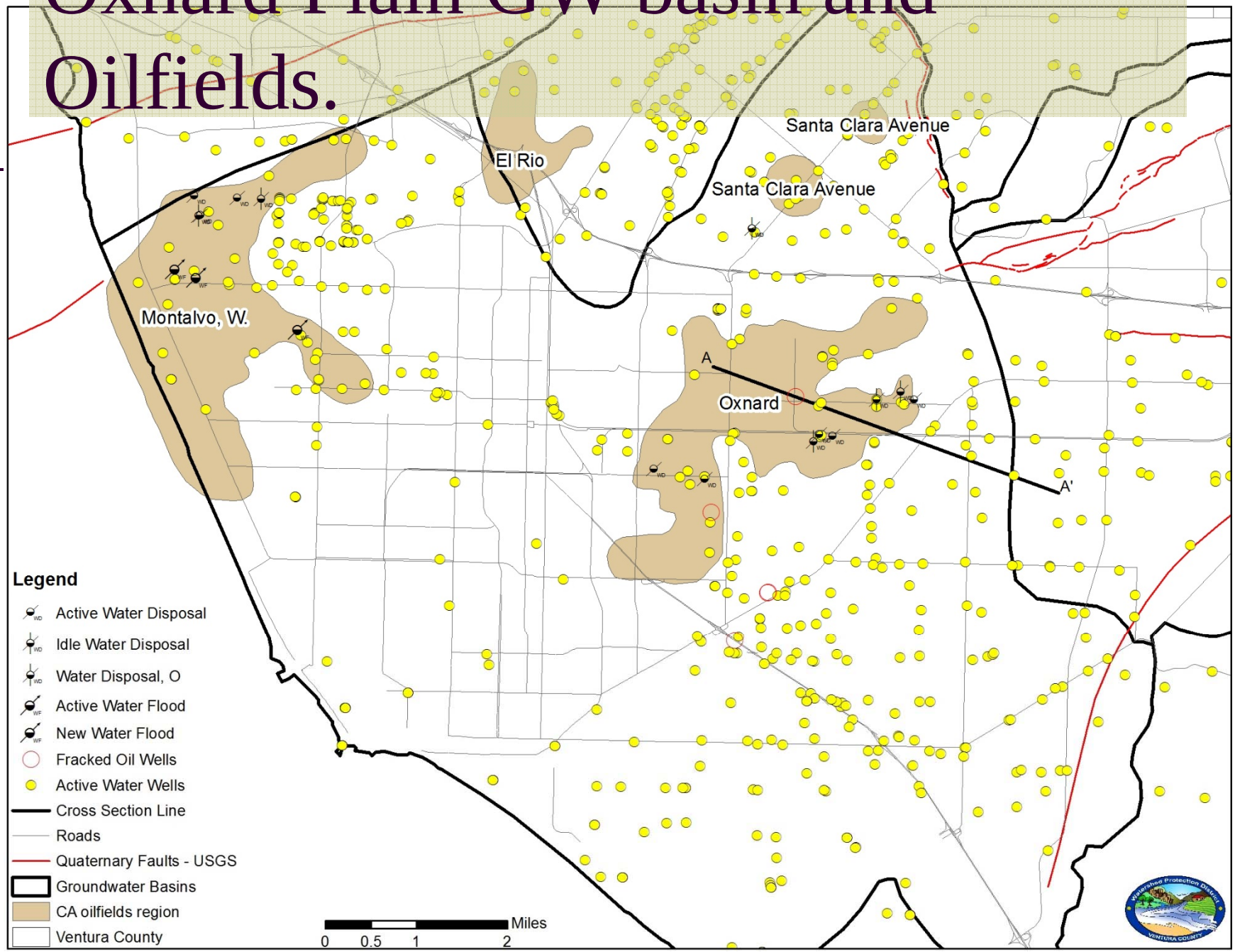
Oil, Gas, and Groundwater

- Draw on the Groundwater Resource is Significant.
- Known water quality concerns related to
  - Sea water intrusion in coastal areas
  - Recharge from upgradient sources may be of poor quality
- Number and types of oil wells is significant.

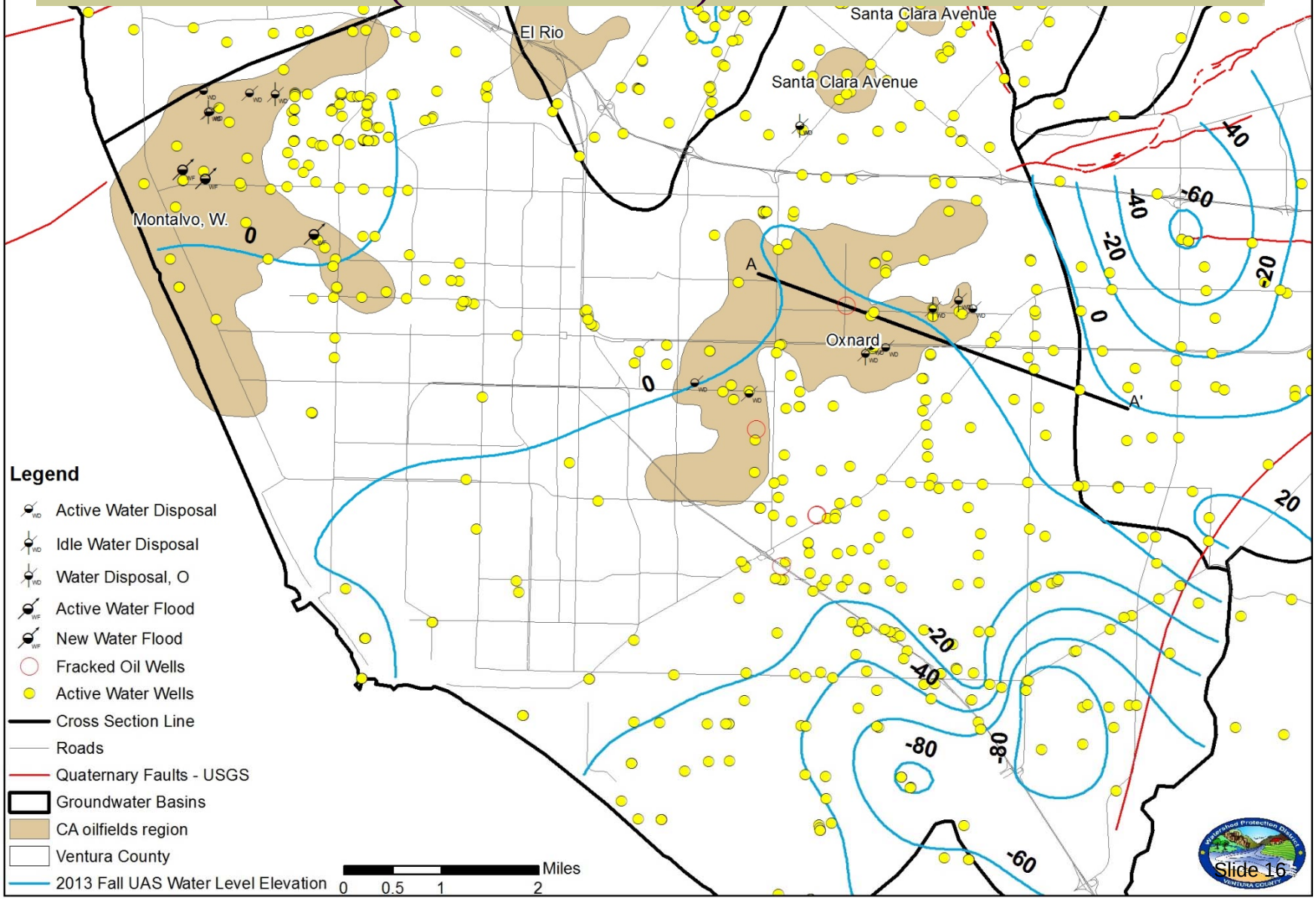
Oxnard Plain GW basin and Oilfields.

Public Works Agency



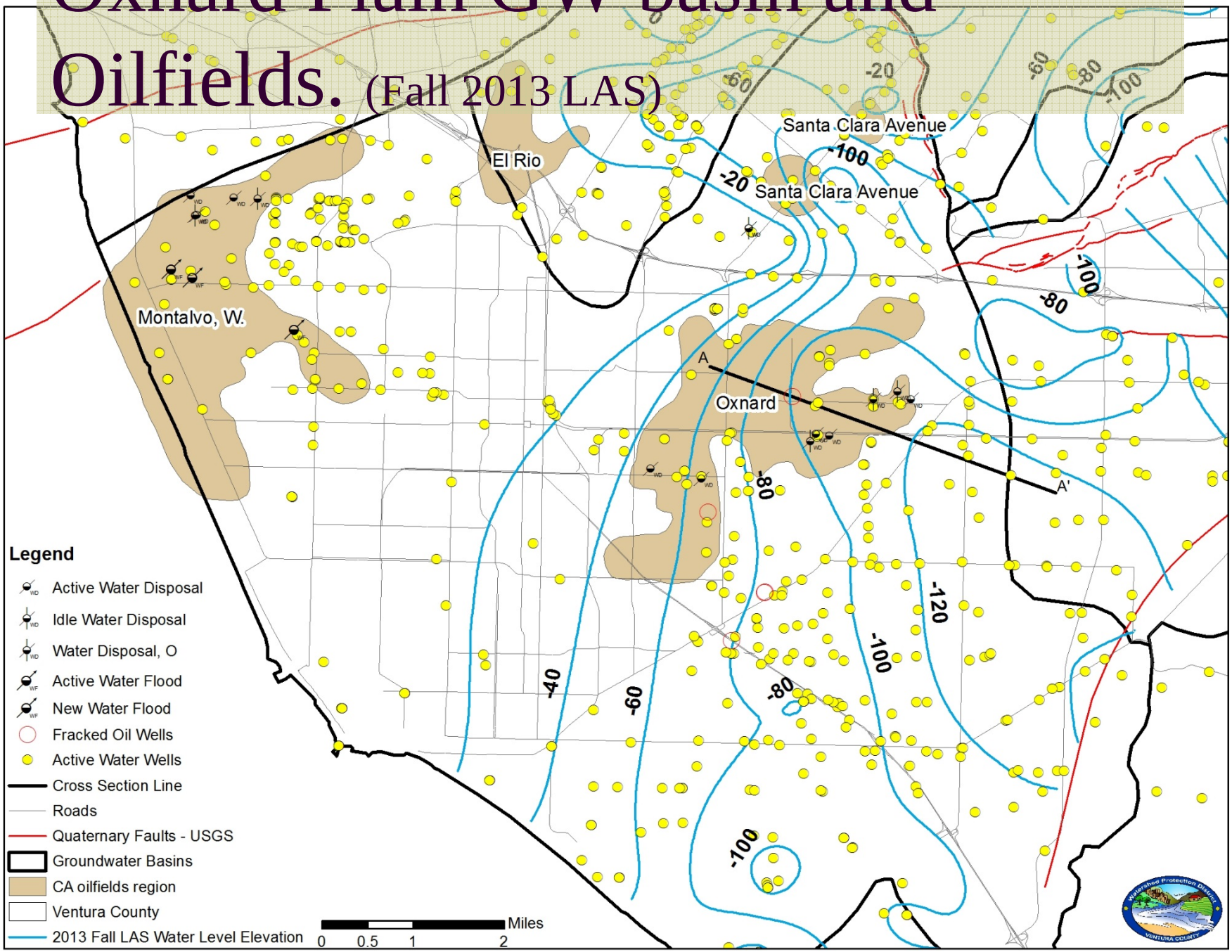
Oxnard Plain GW basin and Oilfields. (Fall 2013 UAS)

Public Works Agency



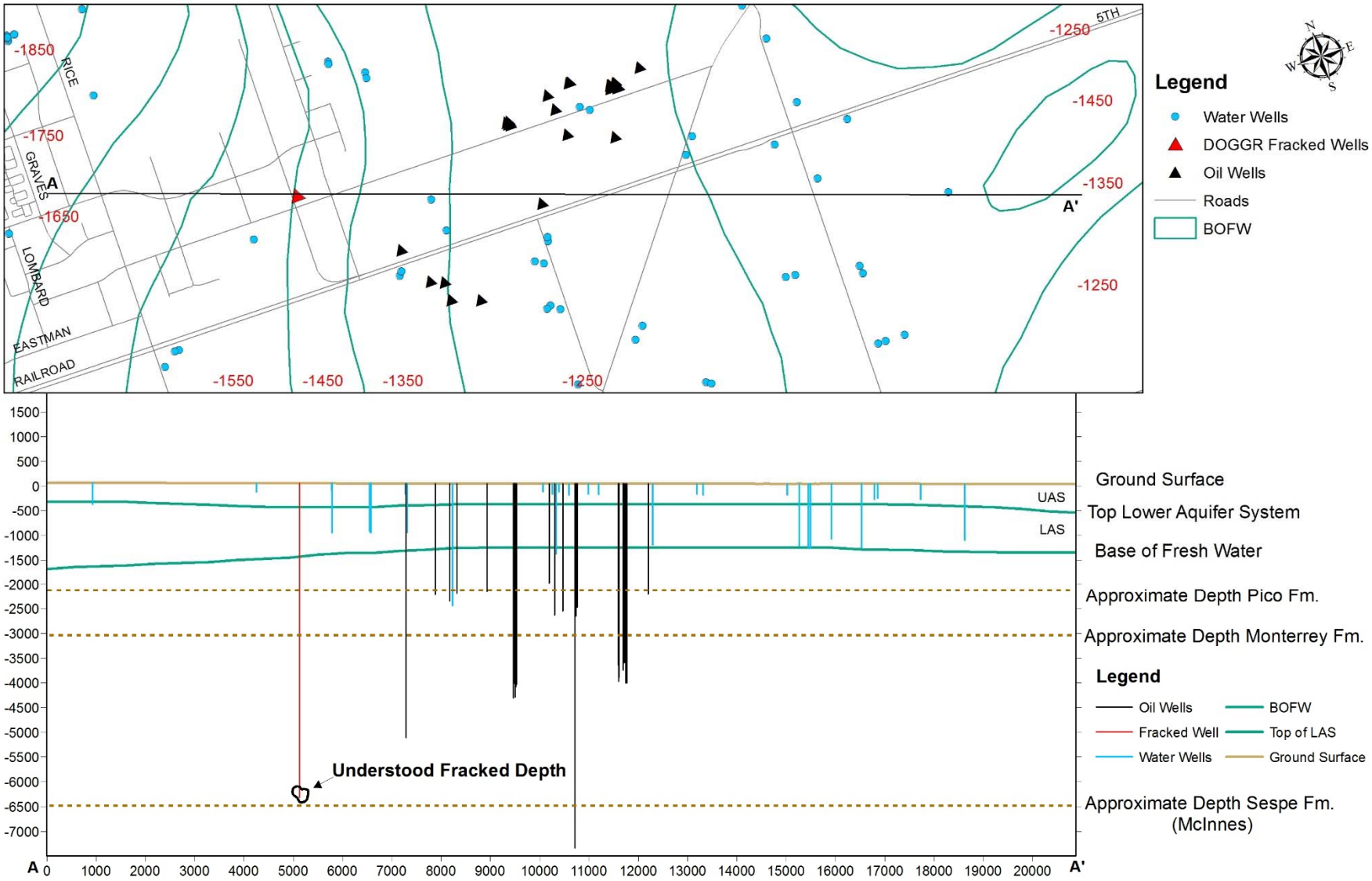
Oxnard Plain GW basin and Oilfields. (Fall 2013 LAS)

Public Works Agency



Oxnard Plain GW basin and Oilfields.

Public Works Agency



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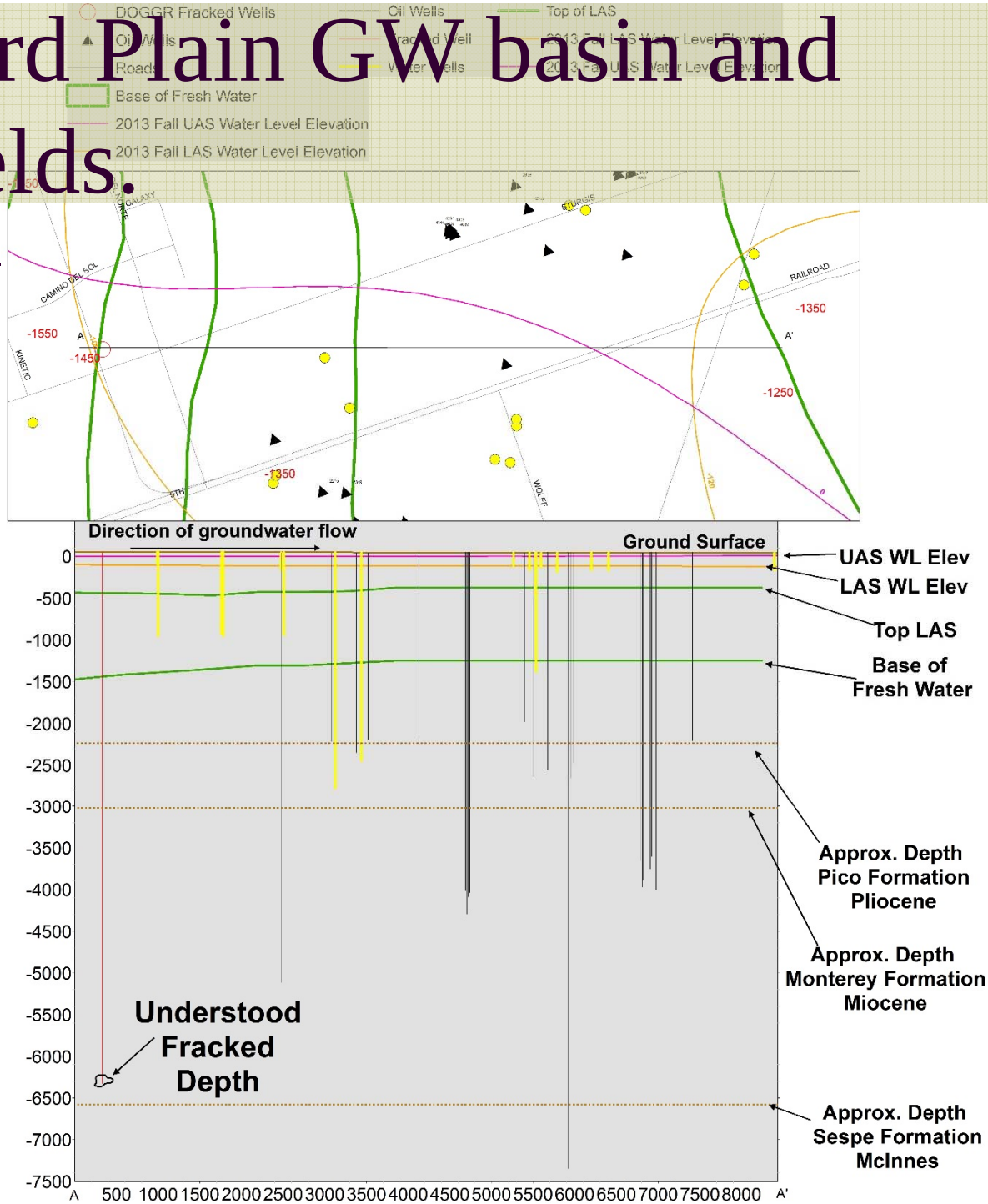

Public Works Agency

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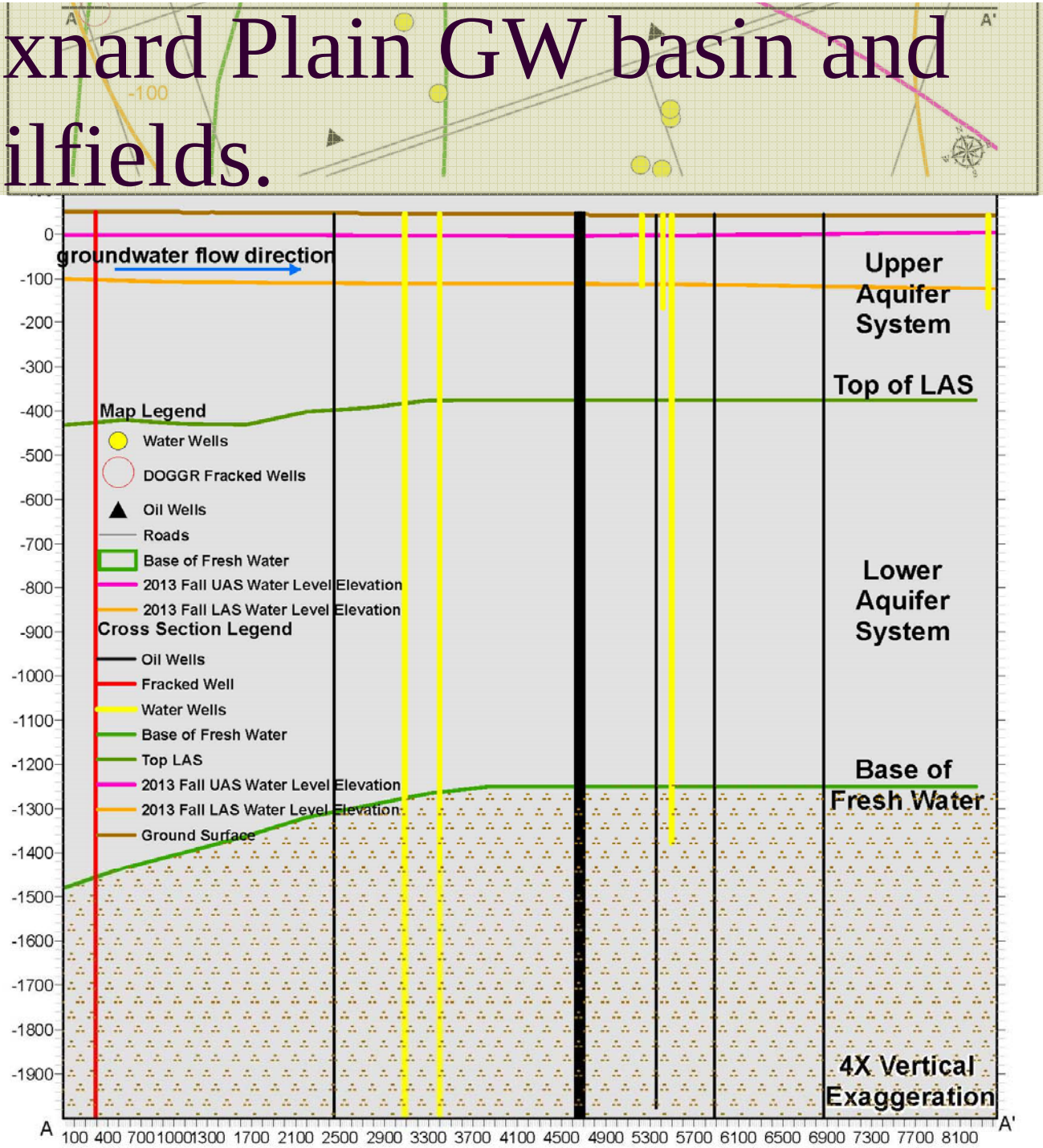


Public Works Agency

County Groundwater Monitoring Program

Public Works Agency

- Not designed to detect fracking fluids
- Limitations
  - Groundwater moderate to elevated TDS.
  - Organic analyses are infrequently done.
  - Not notified of any failures in well casings.
    - Local DOGGER office data indicates failures are extremely rare.
  - Labs that analyze for Guar are not common- we haven't evaluated its mobility.

County Groundwater Monitoring Program

Public Works Agency

- Not designed to detect fracking fluids
- Opportunities
  - Large number of water wells.
  - Many wells are very deep.
  - Much is known about groundwater flow direction.
  - Cooperative approach with other groups.

Public Works Agency

Other Considerations

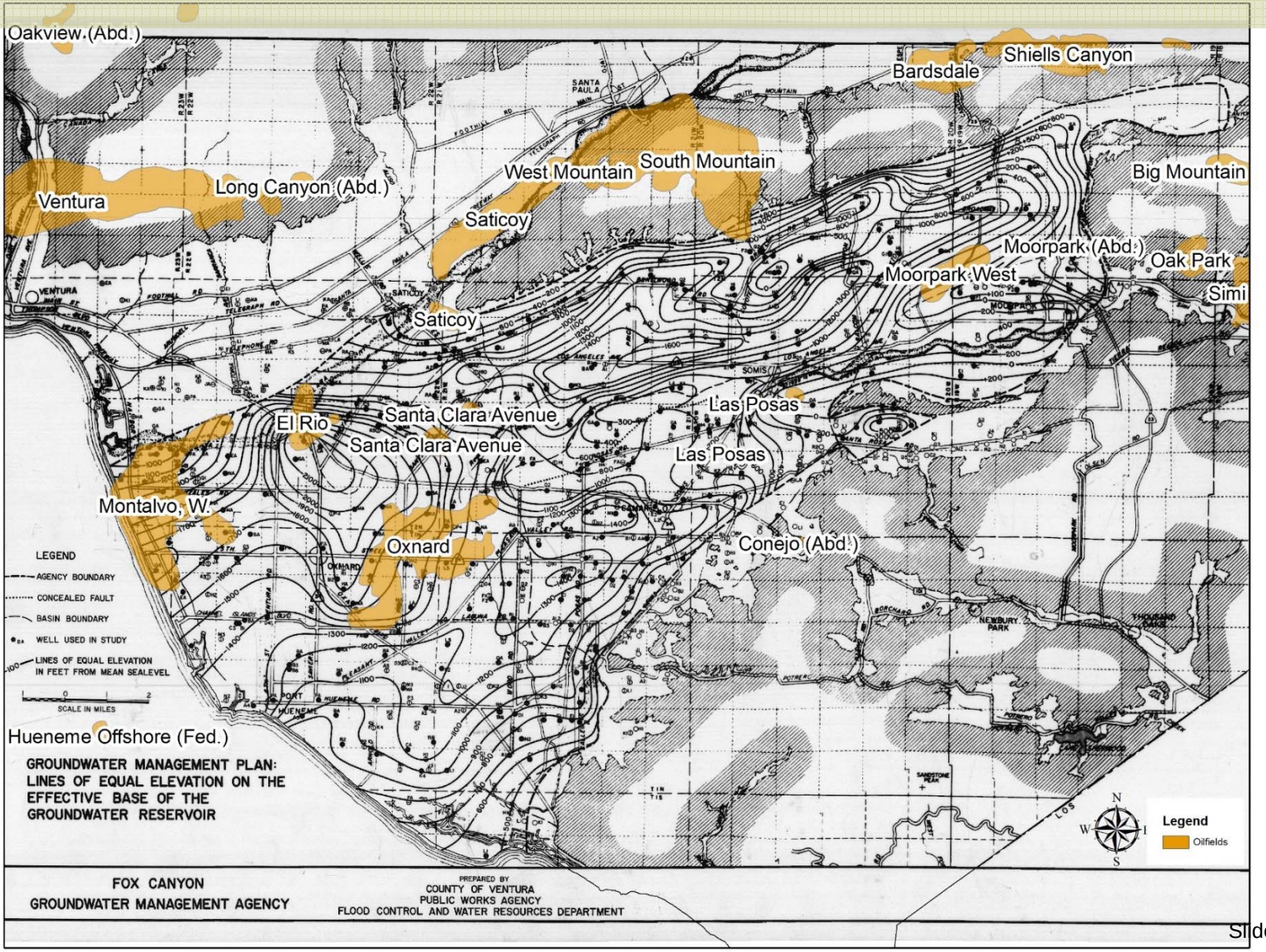
- Cooperation with others can be helpful.
- Correct monitoring program is important.
- Dilution, fate and transport of fluids.
- Be realistic about likelihood of detects and understand what next steps are.
- Fracking fluid volumes appear small relative to other fluid injection.

Public Works Agency

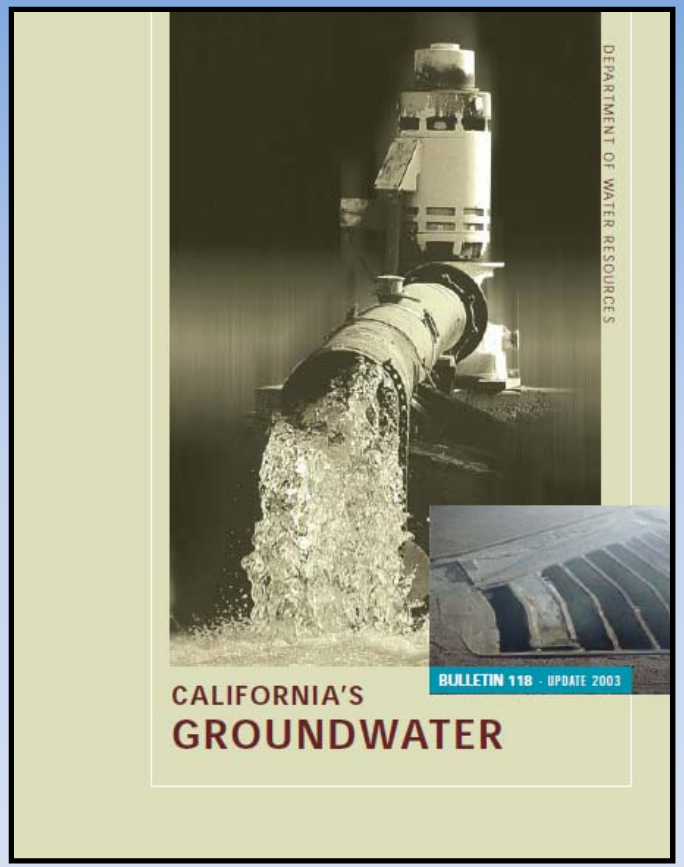
- Thank you

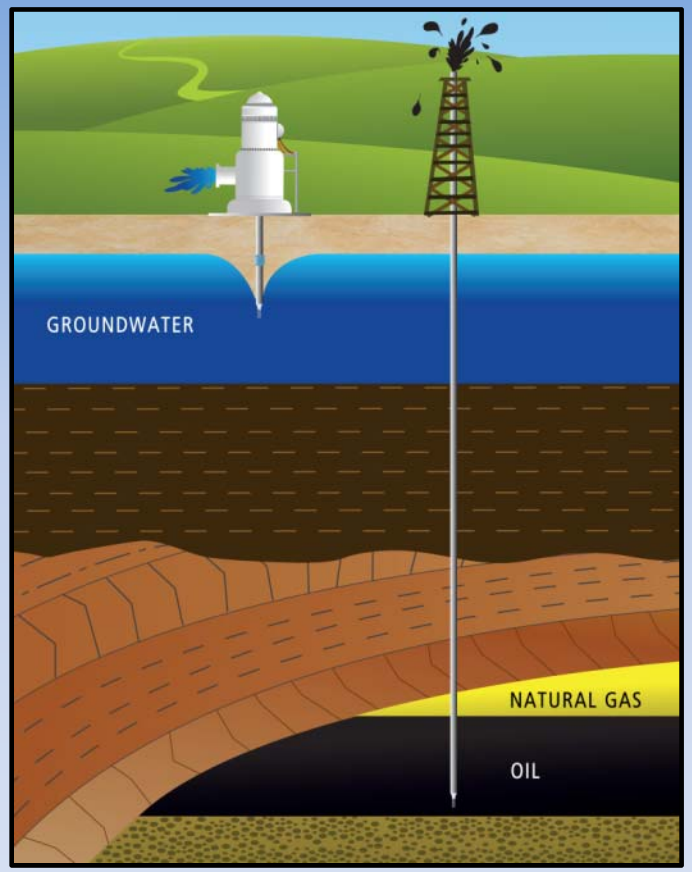
Effective Depth of Fresh Water

Public Works Agency



Oil, Gas, and Groundwater Production in the LA Coastal Plain

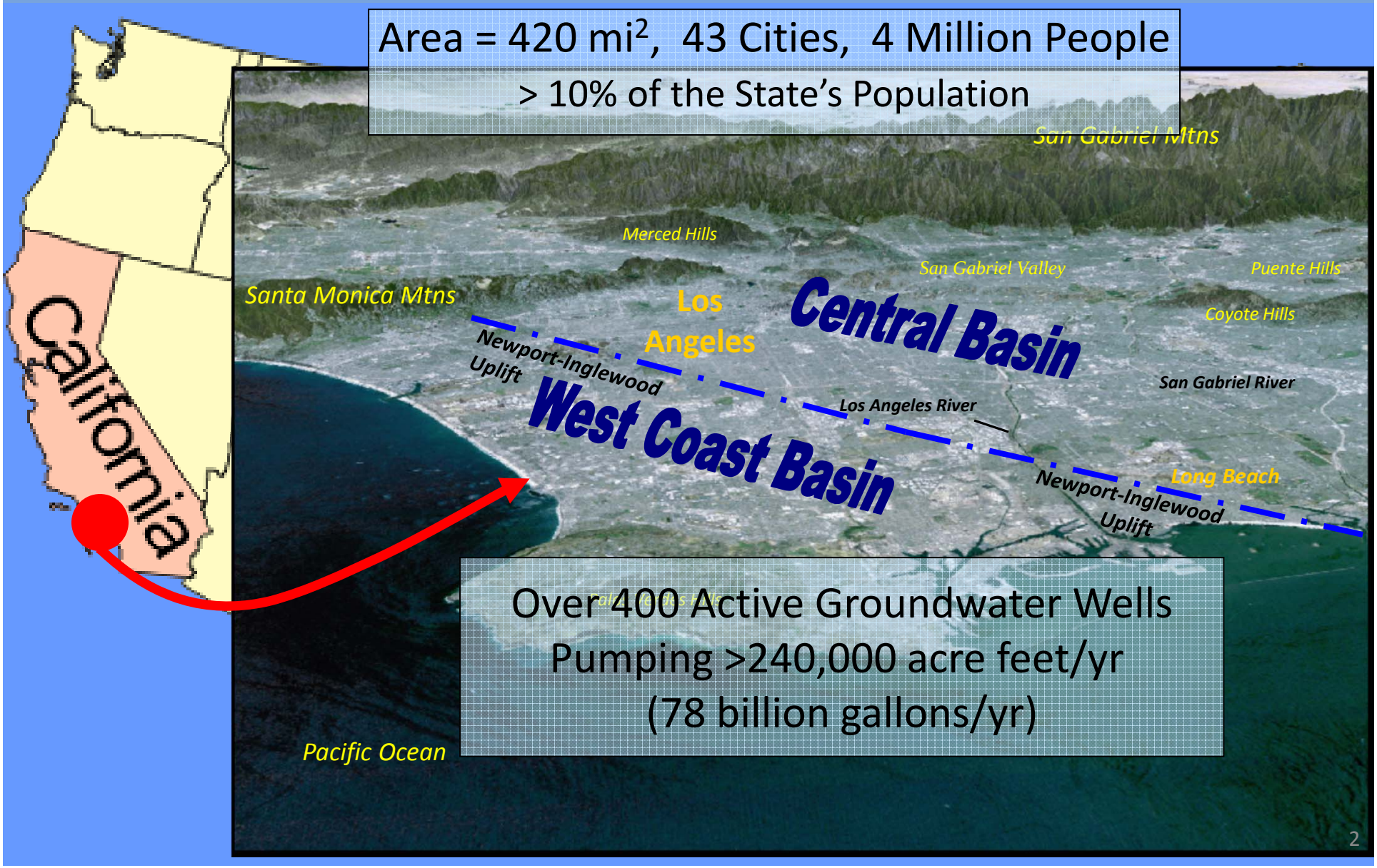




By: Ted Johnson, Chief Hydrogeologist
Water Replenishment District of Southern California
August 7, 2014

WRD
WATER REPLENISHMENT DISTRICT OF SOUTHERN CALIFORNIA

Central Basin and West Coast Basin (CBWCB)



Area = 420 mi^2, 43 Cities, 4 Million People

> 10% of the State's Population

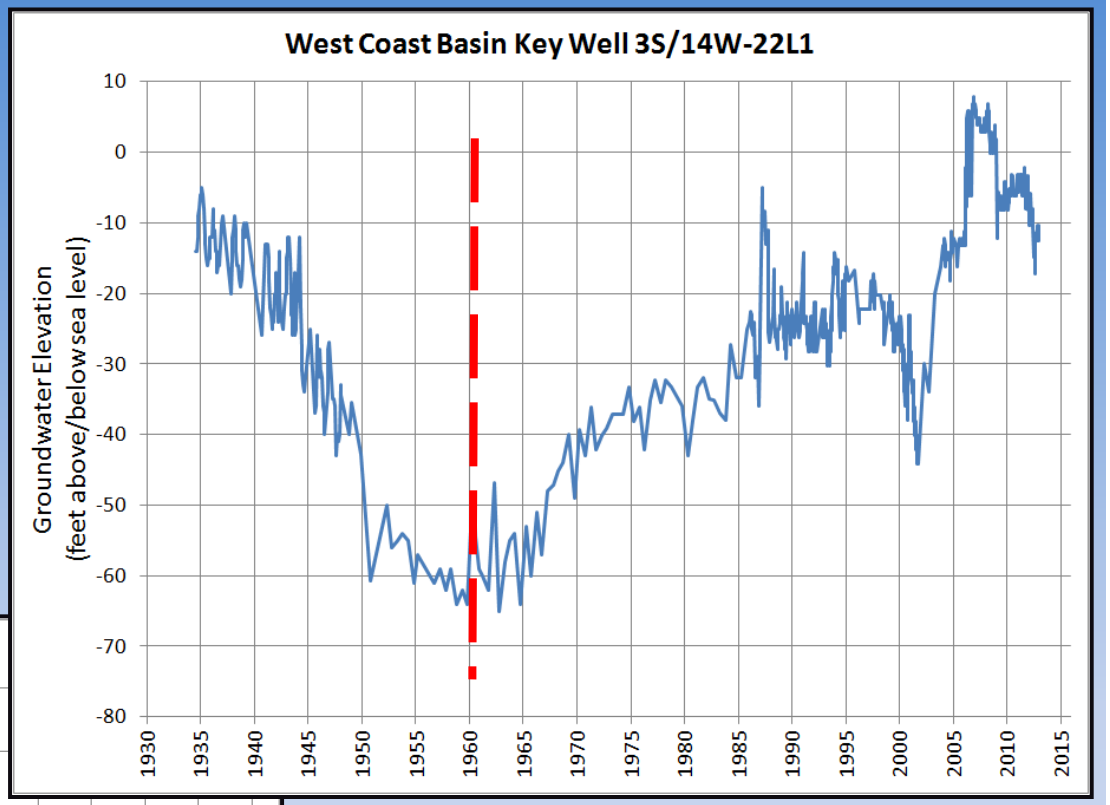
Over 400 Active Groundwater Wells

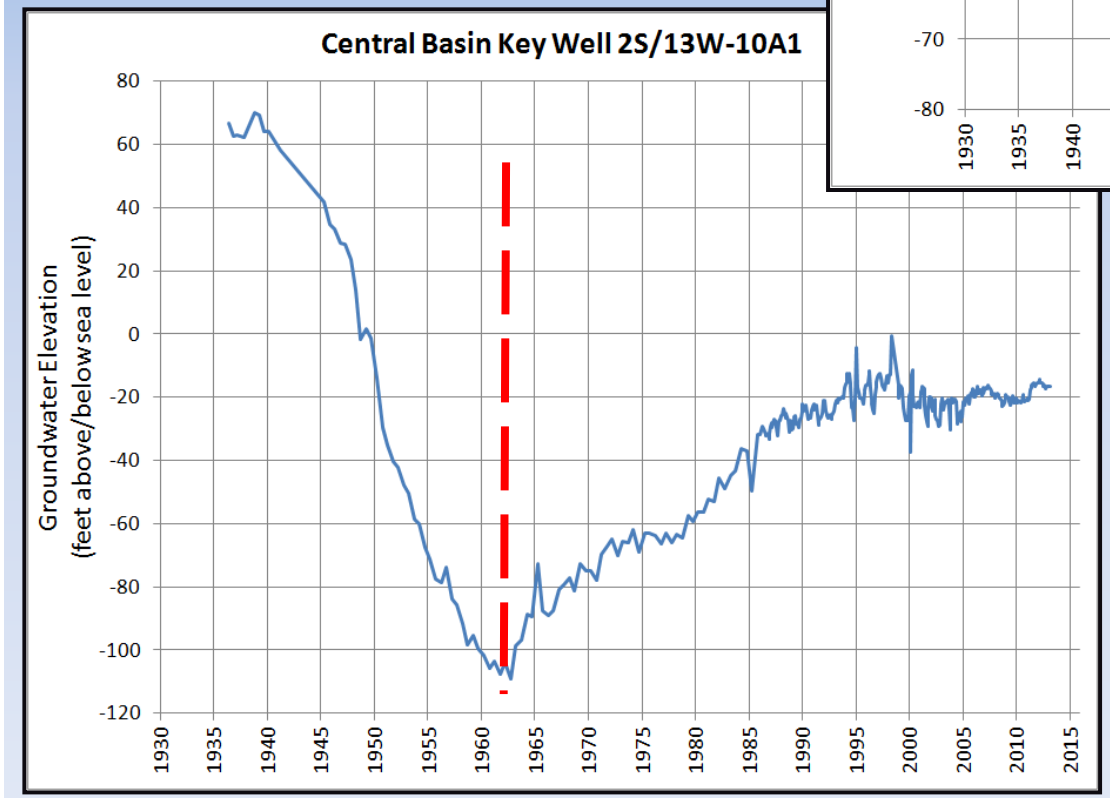
Pumping >240,000 acre feet/yr

(78 billion gallons/yr)

Severe Overdraft before 1960

- Plunging Water Levels
- Seawater Intrusion
- Wells Went Dry
- Resource being Depleted

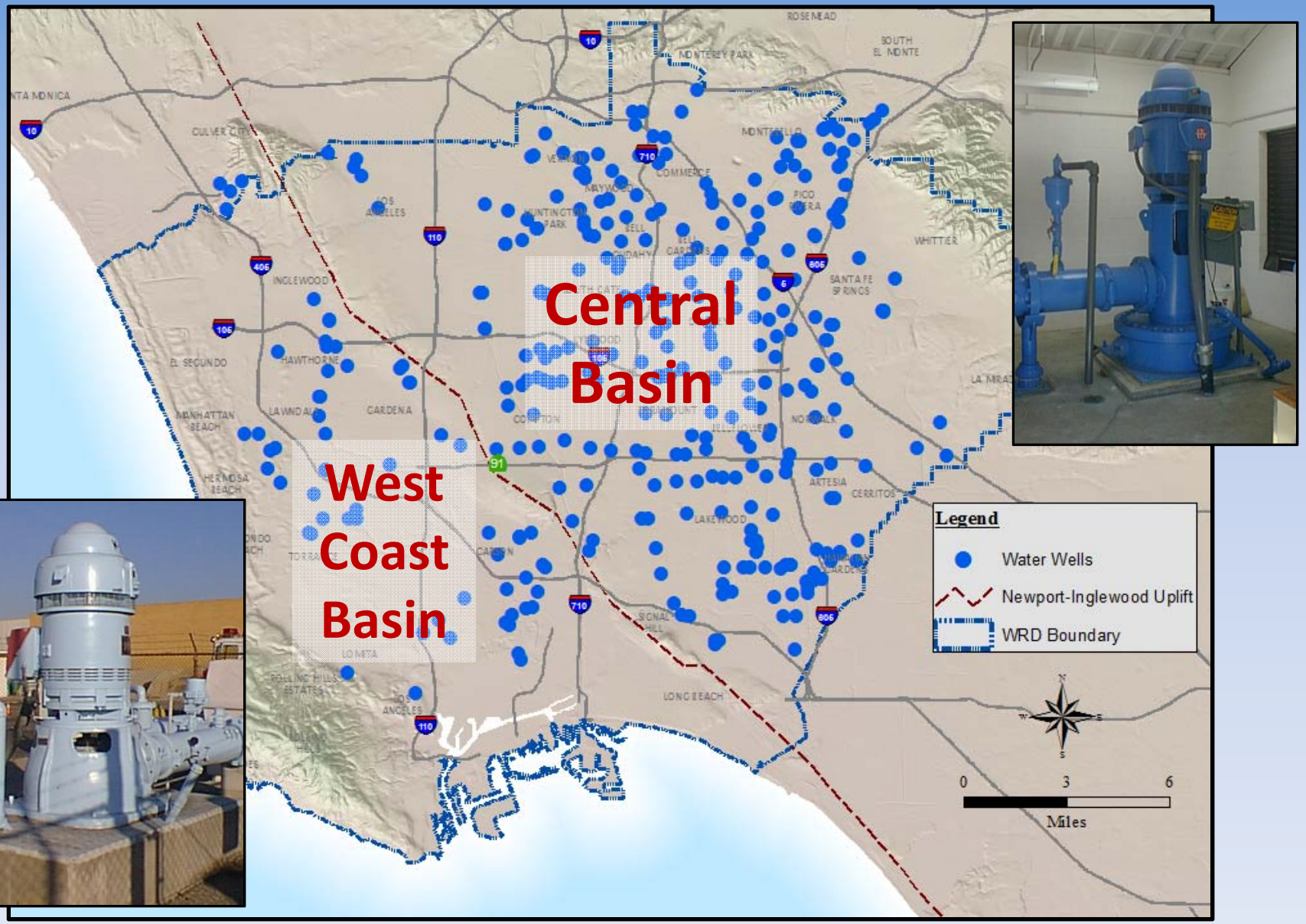




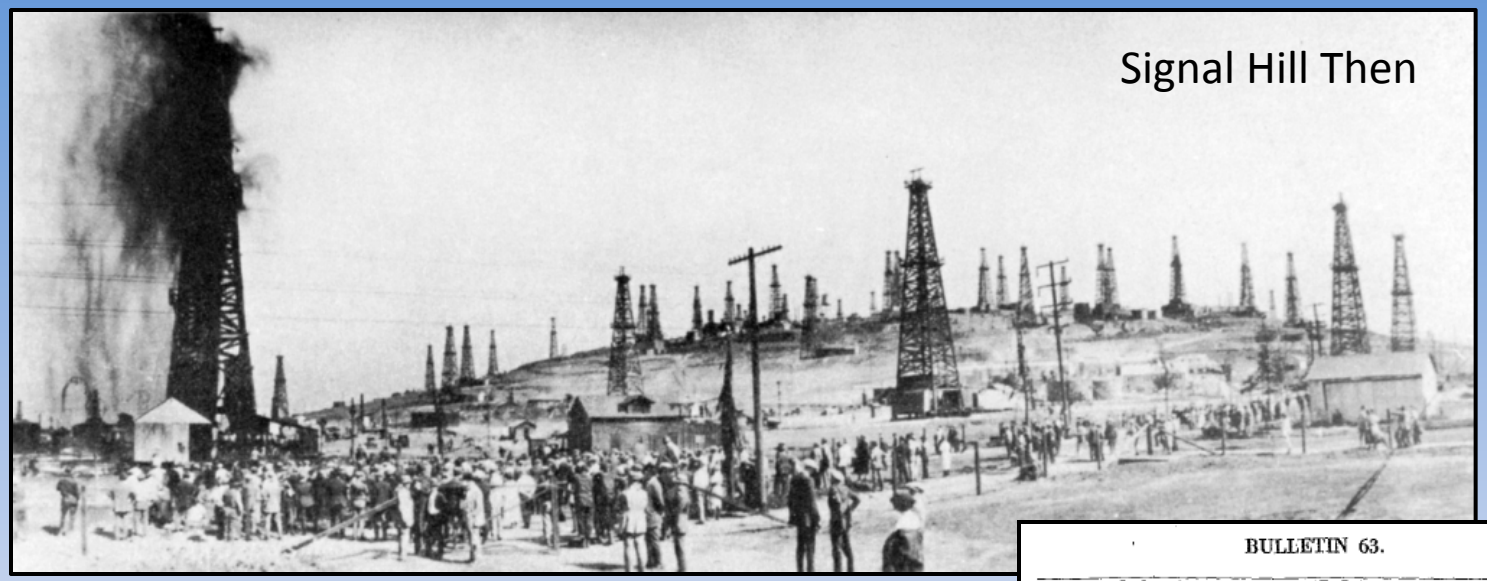
Recovery Due to…

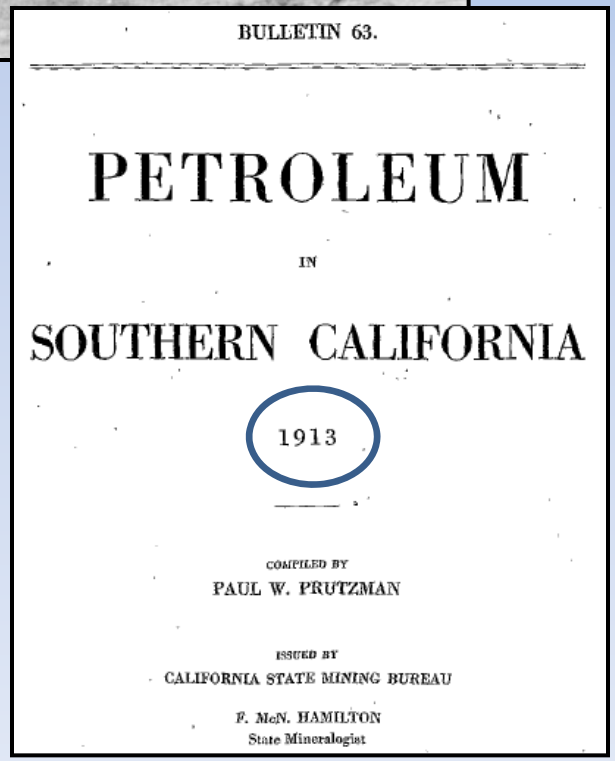
- Adjudication of Basins.
- Seawater Barrier Wells.
- Formation of WRD to provide Managed Aquifer Recharge using Imported and Recycled Water. "W.I.N." program to replace imported water.

Groundwater Production Wells



But There's Oil & Gas in the Basins too





BULLETIN 63.

PETROLEUM

IN

SOUTHERN CALIFORNIA

1913

COMPILED BY

PAUL W. PRUTZMAN

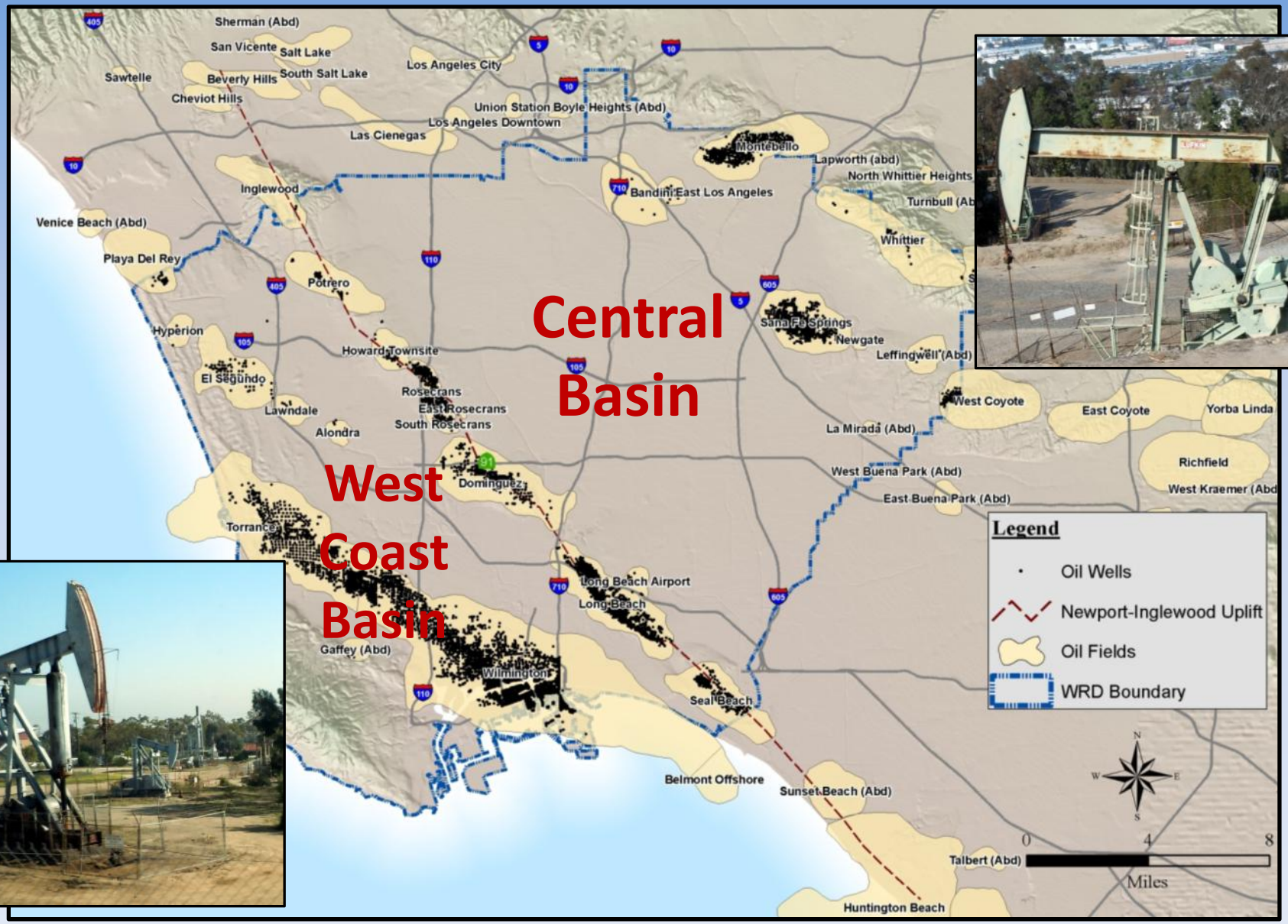
ISSUED BY

CALIFORNIA STATE MINING BUREAU

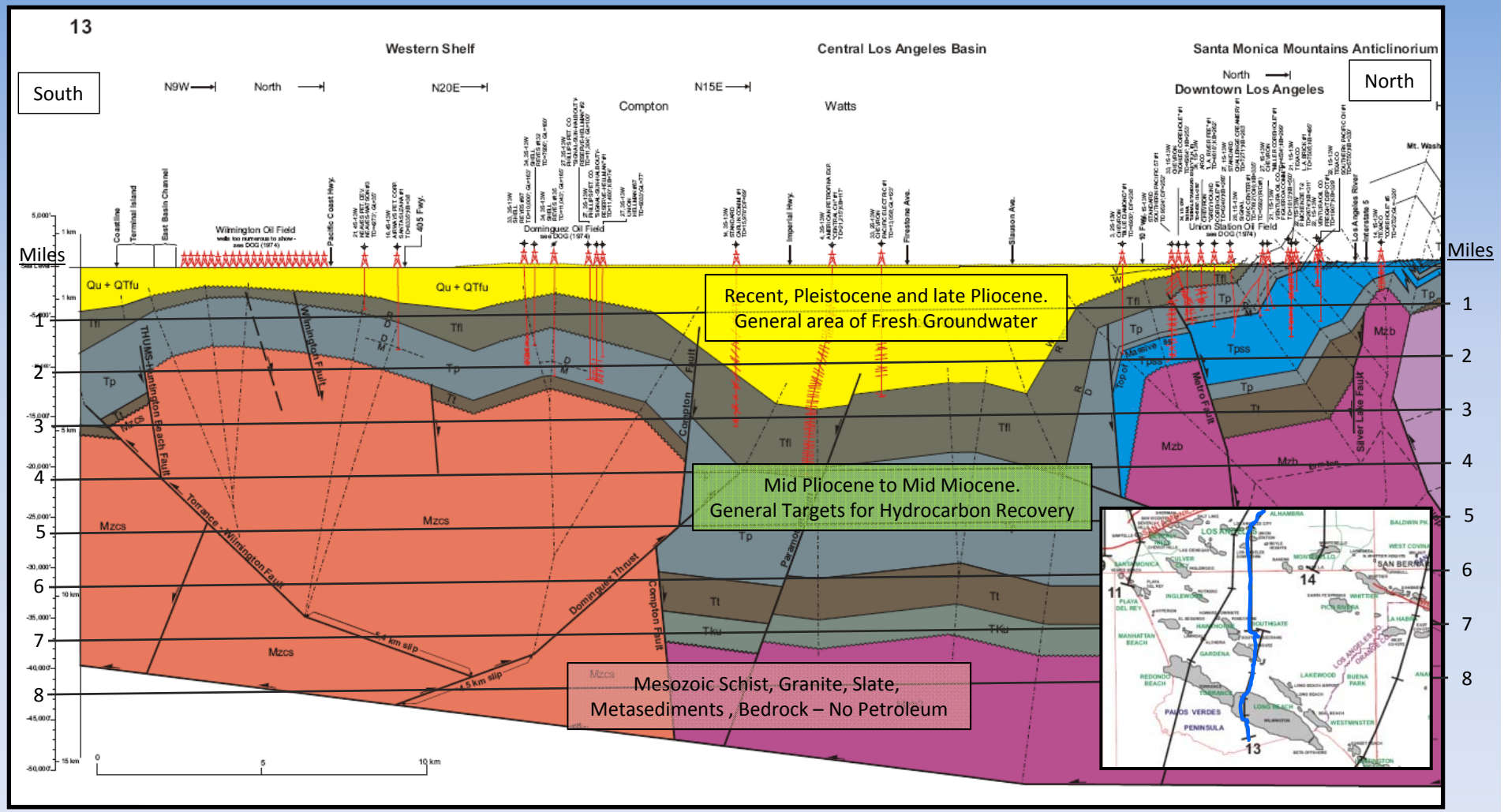
F. McN. HAMILTON

State Mineralogist

Over 30 Mapped Oil Fields and 9,700 Oil/Gas Wells Listed in WRD Service Area

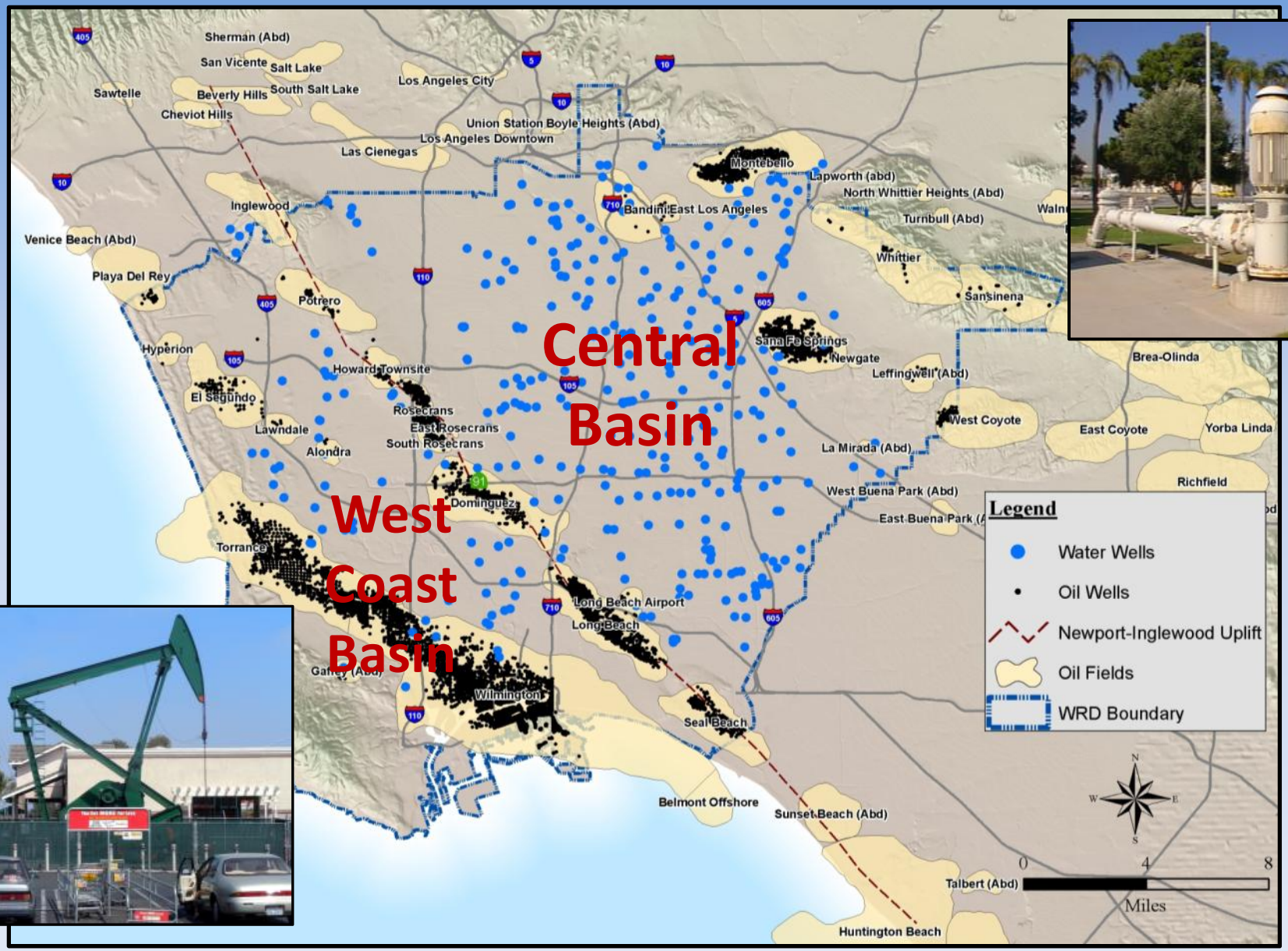


N-S Cross-Section through WRD showing Hydrocarbon and Groundwater Target Zones

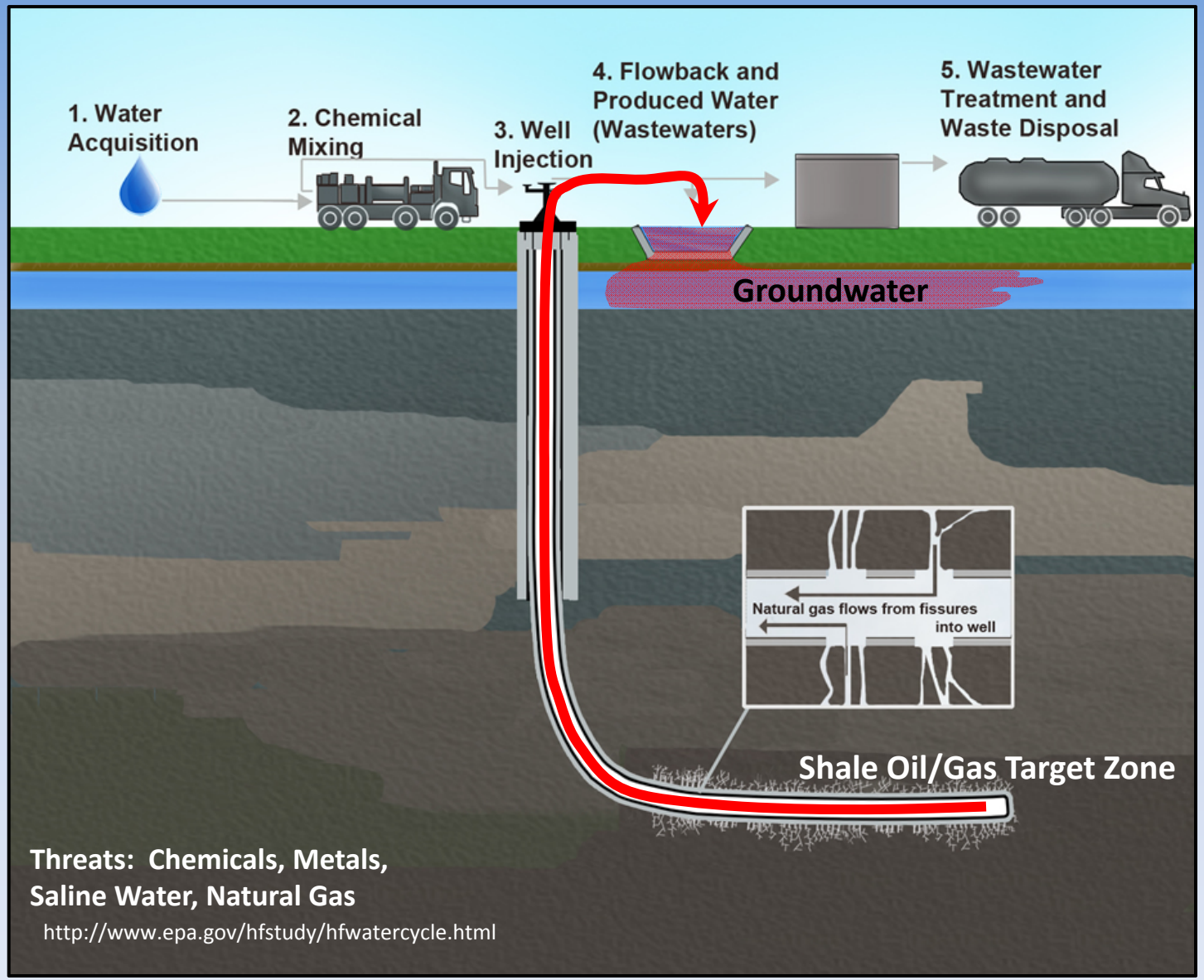


Modified from Davis – Namson, 1998
Southern California Cross Section Study

Oil Wells & Water Wells in LA Over 100 Years of Co-Existing



Potential Risks to Groundwater from Petroleum Operations and Well Stimulation



Threats: Chemicals, Metals, Saline Water, Natural Gas

http://www.epa.gov/hfstudy/hfwatercycle.html

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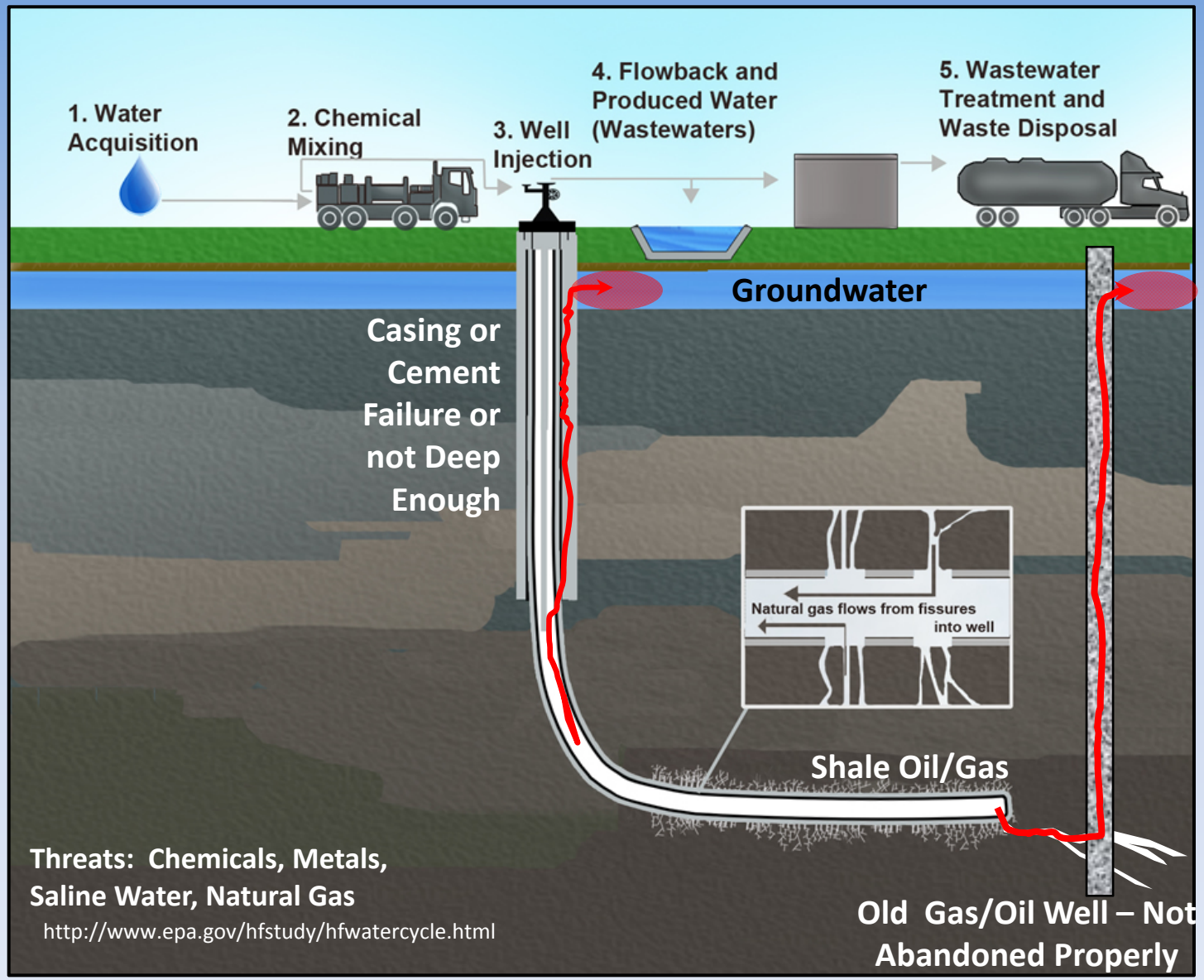

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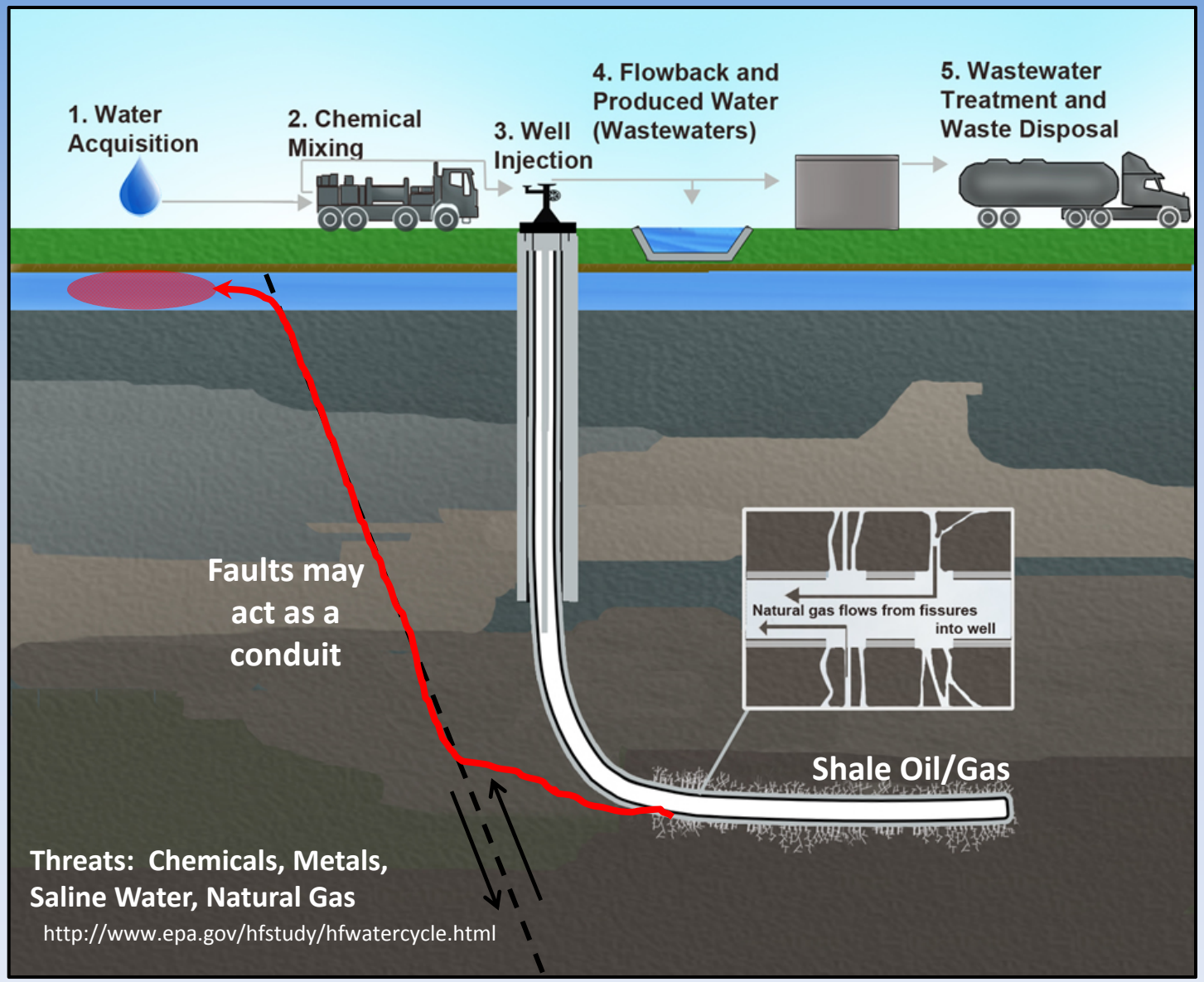

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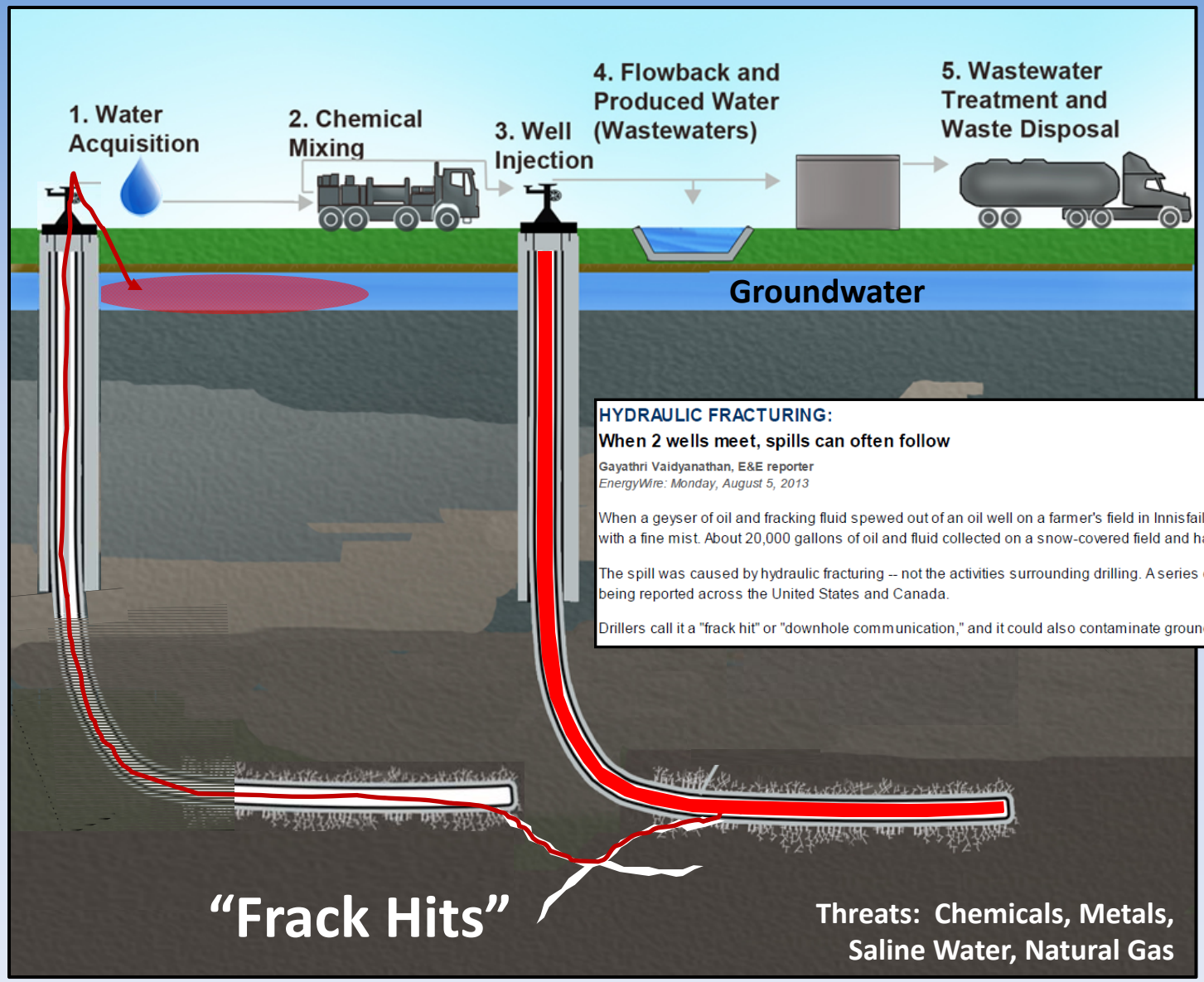


HYDRAULIC FRACTURING:

When 2 wells meet, spills can often follow

Gayathri Vaidyanathan, E&E reporter
EnergyWire: Monday, August 5, 2013

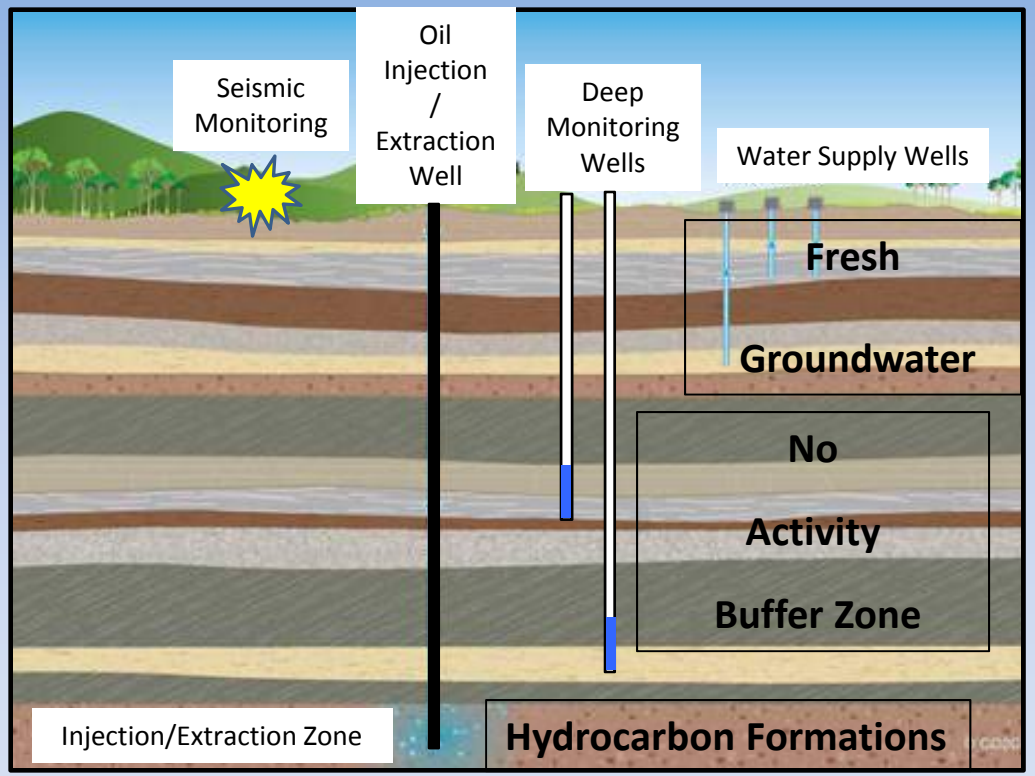
When a geyser of oil and fracking fluid spewed out of an oil well on a farmer's field in Innisfail, Alberta, it coated 100 trees with a fine mist. About 20,000 gallons of oil and fluid collected on a snow-covered field and had to be cleaned up.

The spill was caused by hydraulic fracturing -- not the activities surrounding drilling. A series of similar incidents are being reported across the United States and Canada.

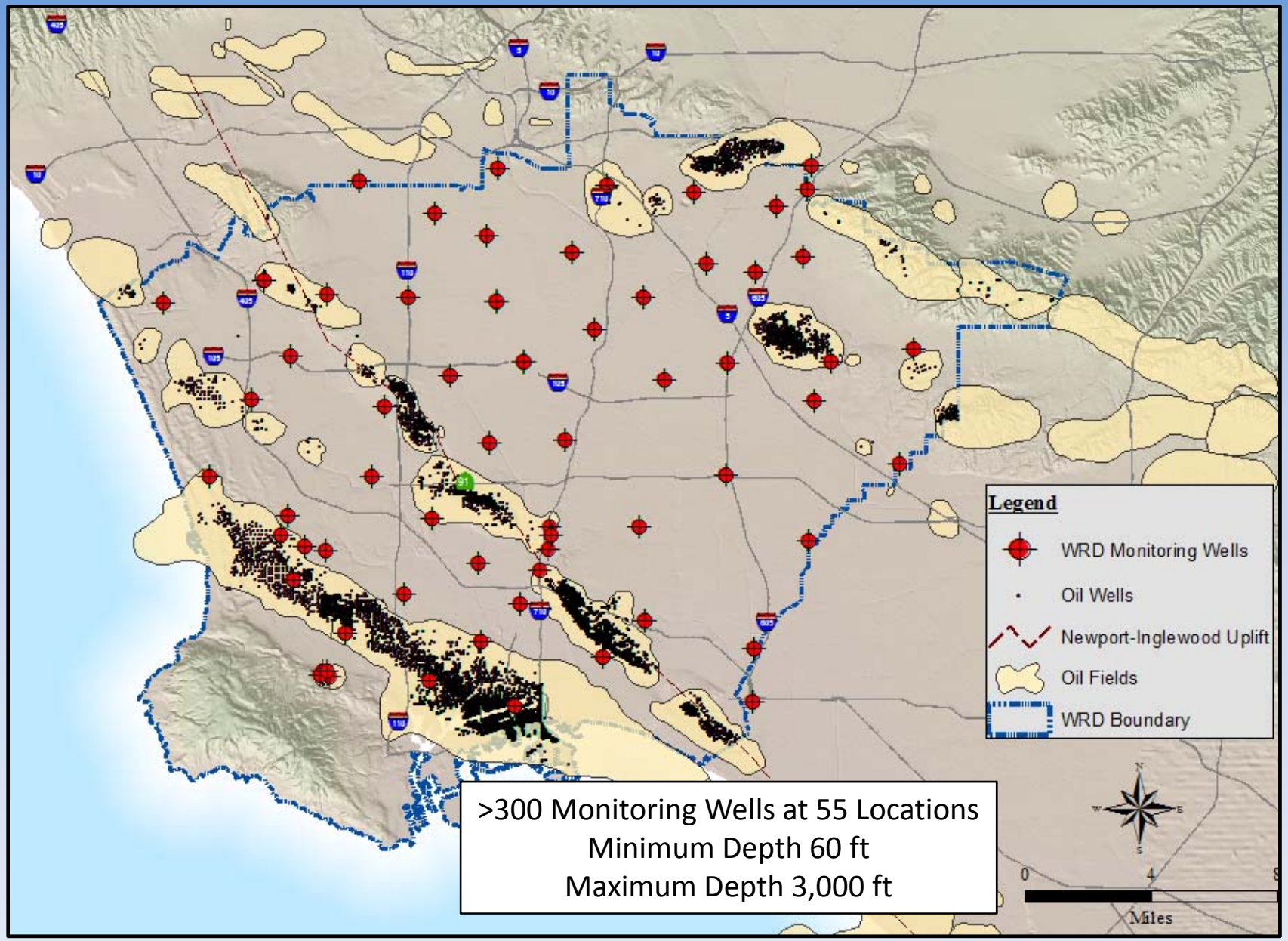
Drillers call it a "frack hit" or "downhole communication," and it could also contaminate groundwater aquifers.

Some Ways to Minimize Risk to Groundwater

- Baseline Monitoring.
- Review well design to prevent leaks or fix old wells.
- Identify artificial pathways and seal off or avoid.
- Proper collection and disposal of wastes.
- Know where fractures are and avoid "Frack Hits"
- Monitor injection pressures, buffer zones, flowback ponds, fresh groundwater, seismic monitoring, groundwater basin and reservoir characterization.

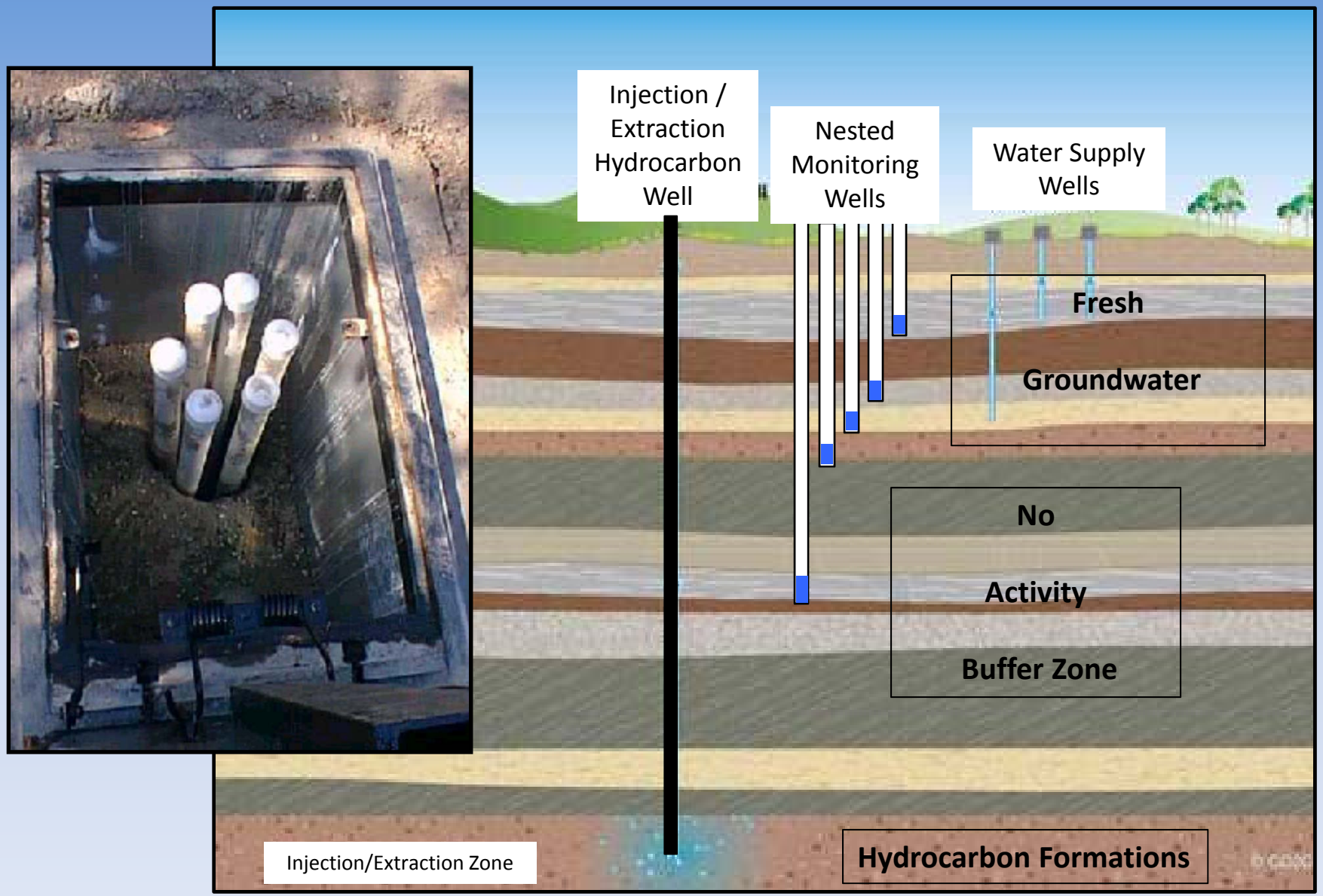


WRD Monitoring Wells & Oil Fields

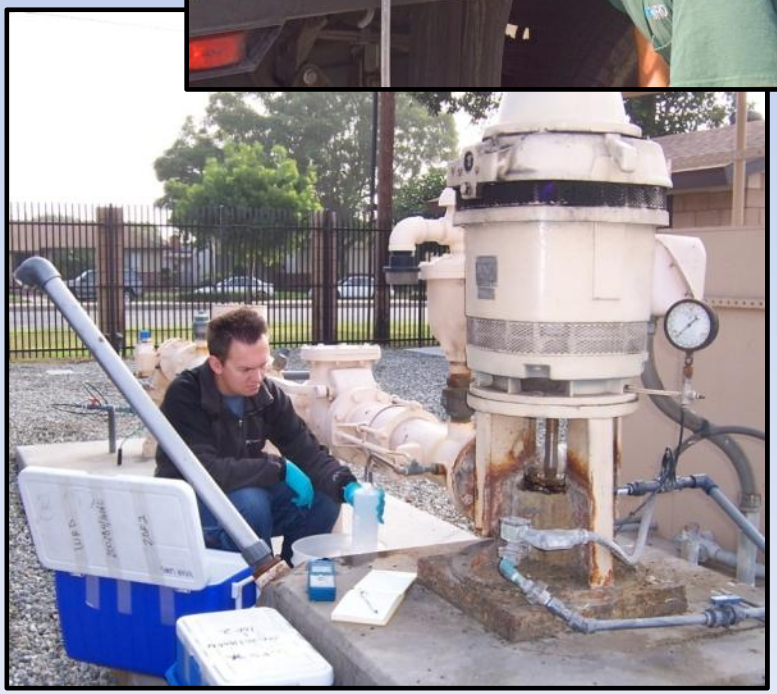


>300 Monitoring Wells at 55 Locations
Minimum Depth 60 ft
Maximum Depth 3,000 ft

WRD Nested Monitoring Wells



WRD Field Crew Samples Wells 2x/yr



Groundwater Quality Testing

Major Minerals

Total Dissolved Solid (TDS)
Cation Sum
Anion Sum
Iron, Total, ICAP
Manganese, Total, ICAP/MS
Turbidity
Alkalinity
Boron
Bicarbonate as HCO3,calculated
Calcium, Total, ICAP
Carbonate as CO3, Calculated
Hardness (Total, as CaCO3)
Chloride
Fluoride
Hydroxide as OH, Calculated
Langelier Index - 25 degree
Magnesium, Total, ICAP
Mercury
Nitrate-N by IC
Nitrite, Nitrogen by IC
Potassium, Total, ICAP
Sodium, Total, ICAP
Sulfate
Surfactants
Total Nitrate, Nitrite-N, CALC
Total Organic Carbon

General Physical Properties

Apparent Color
Lab pH
Odor
pH of CaCO3 saturation(25C)
pH of CaCO3 saturation(60C)
Radon
Specific Conductance

Metals

Aluminum, Total, ICAP/MS
Antimony, Total, ICAP/MS
Arsenic, Total, ICAP/MS
Barium, Total, ICAP/MS
Beryllium, Total, ICAP/MS
Chromium, Total, ICAP/MS
Hexavalent Chromium (Cr VI)
Cadmium, Total, ICAP/MS
Copper, Total, ICAP/MS
Lead, Total, ICAP/MS
Nickel, Total, ICAP/MS
Selenium, Total, ICAP/MS
Silver, Total, ICAP/MS
Thallium, Total, ICAP/MS
Zinc, Total, ICAP/MS

Volatile Organic Compounds

Trichloroethylene (TCE)
Tetrachloroethylene (PCE)
1,1-Dichloroethylene
cis-1,2-Dichloroethylene
trans-1,2-Dichloroethylene
Chloroform (Trichloromethane)
Carbon Tetrachloride
1,1-Dichloroethane
1,2-Dichloroethane
Fluorotrichloromethane, Freon 11
Freon 113
Isopropylbenzene
n-Propylbenzene
m,p-Xylenes
Methylene Chloride
Toluene
Dichlorodifluoromethane
Benzene
Ethyl benzene
MTBE
Perchlorate

sec-Butylbenzene
1,1,1,2-Tetrachloroethane
1,1,1-Trichloroethane
1,1,2,2-Tetrachloroethane
1,1,2-Trichloroethane
1,1-Dichloropropene
1,3-Trichlorobenzene
1,2,3-Trichloropropane
1,2,4-Trichlorobenzene
1,2,4-Trimethylbenzene
1,2-Dichloropropane
1,3,5-Trimethylbenzene
1,3-Dichlorobenzene
1,3-Dichloropropane
2,2-Dichloropropane
2-Butanone (MEK)
4-Methyl-2-Pentanone (MIBK)
Bromobenzene
Bromochloromethane
Bromodichloromethane
Bromoform

Bromomethane (Methyl Bromide)
Chlorobenzene
Chlorodibromomethane
Chloroethane
Chloromethane(Methyl Chloride)
cis-1,3-Dichloropropene
Dibromomethane
Hexachlorobutadiene
Naphthalene
n-Butylbenzene
o-Chlorotoluene
o-Dichlorobenzene (1,2-DCB)
o-Xylene
p-Chlorotoluene
p-Dichlorobenzene
p-Isopropyltoluene
Styrene
tert-Butylbenzene
trans-1,3-Dichloropropene
Vinyl chloride (VC)

Over 100 chemicals tested for from each sample. Over 60,000 results per year.

Groundwater Quality Results near Oil Fields

- Generally Good Water Quality.
- A few wells have elevated concentrations of some chemicals, such as:
  - Arsenic, Barium, Boron
  - Methane, Surfactants
  - Tert-Butyl Alcohol (TBA)
  - TDS/Chloride
  - Color/Odor

- These can be found in groundwater in non-oil production areas too.
- Either naturally occurring, or from surface releases, or from oil field operations, or from other sources. Difficult to determine.
- Additional testing / analyses may be useful to confirm results and help identify natural or human sources.

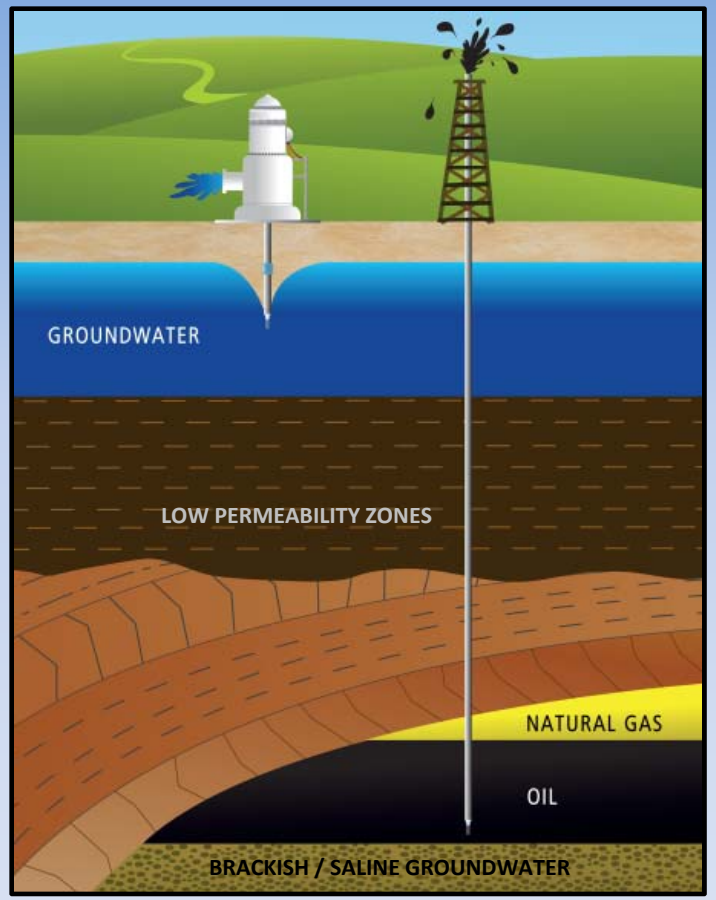
Summary

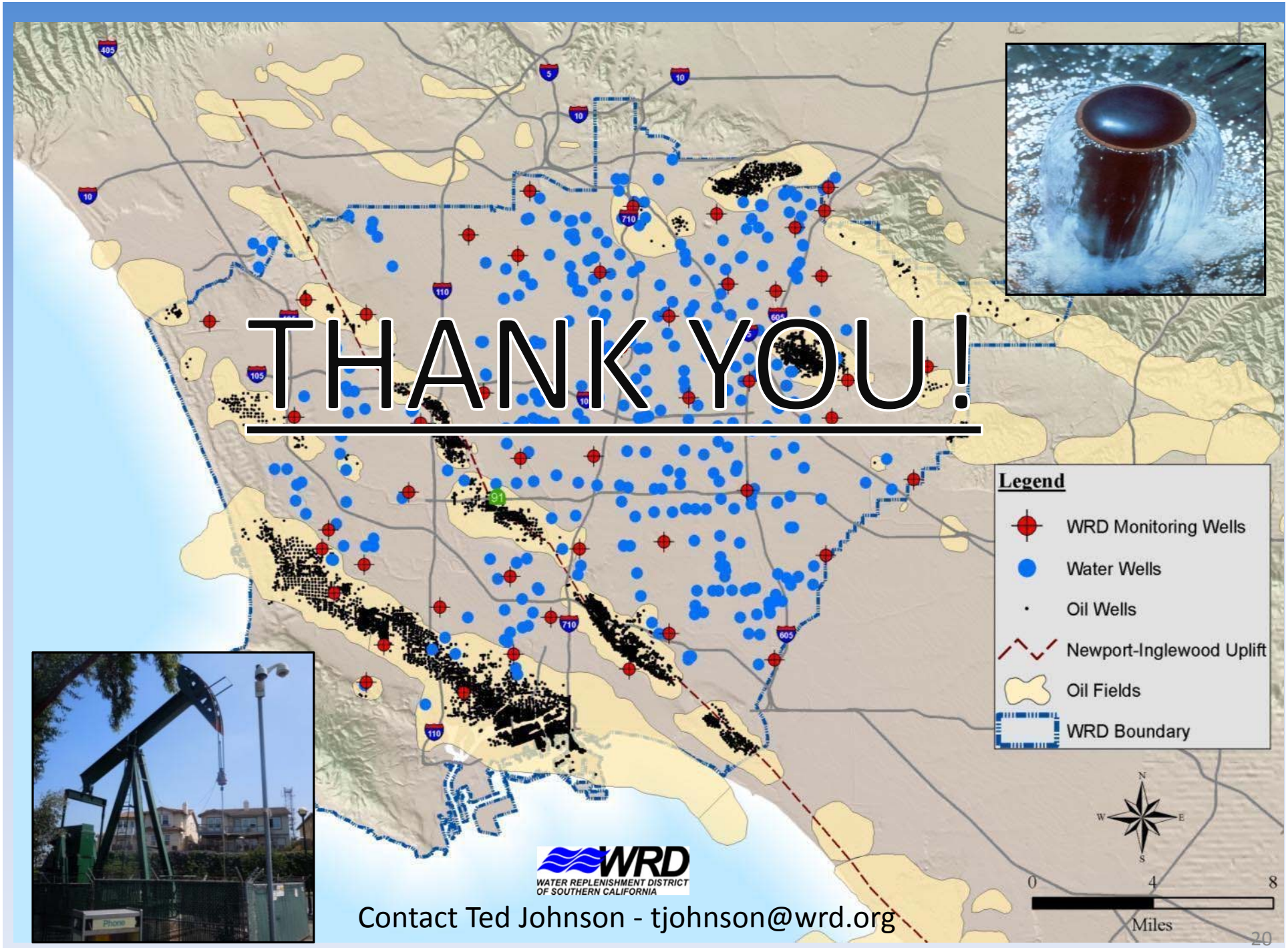
- Fresh groundwater, oil and natural gas have been successfully produced in the CBWCB for over 100 years.

- The two reservoirs are separated by thick layers of low permeability strata (buffer zone), so that with appropriate precaution, construction, regulation and monitoring, the activities in one should not affect the other.

- Responsible model groundwater monitoring criteria developed under SB4 will help ensure well stimulation practices are protective of fresh groundwater resources.

- WRD looks forward to continue participating in the process and assisting in any way possible.





THANK YOU!

WRD
WATER REPLENISHMENT DISTRICT OF SOUTHERN CALIFORNIA

Contact Ted Johnson - tjohnson@wrd.org