

# El Paso Desalination Plant



Bill Hutchison, Ph.D., P.E., P.G.

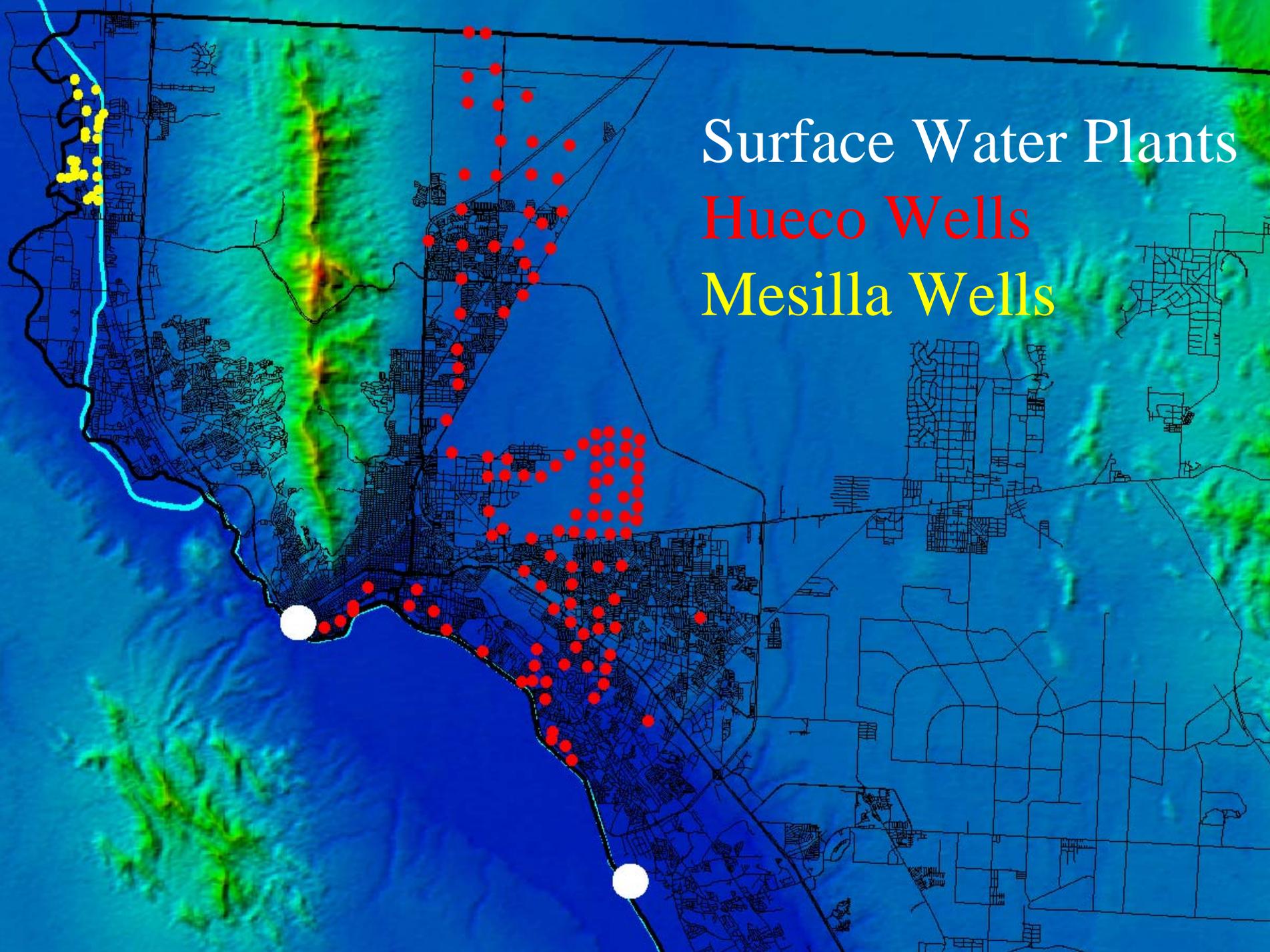
Water Resources Manager

El Paso Water Utilities

August 9, 2007

# Current El Paso Water Supply

- Hueco Bolson Groundwater
- Mesilla Bolson Groundwater
- Rio Grande Diversion

A topographic map of a city area, likely Albuquerque, New Mexico, showing elevation contours and a street grid. The map is color-coded by elevation, with blue representing lower elevations and green/yellow representing higher elevations. A river is visible on the left side. Three types of well locations are marked: yellow dots (Mesilla Wells) clustered near the river, red dots (Hueco Wells) scattered across the city and surrounding areas, and white dots (Surface Water Plants) located at the southern edge of the city. A legend in the upper right corner identifies these symbols.

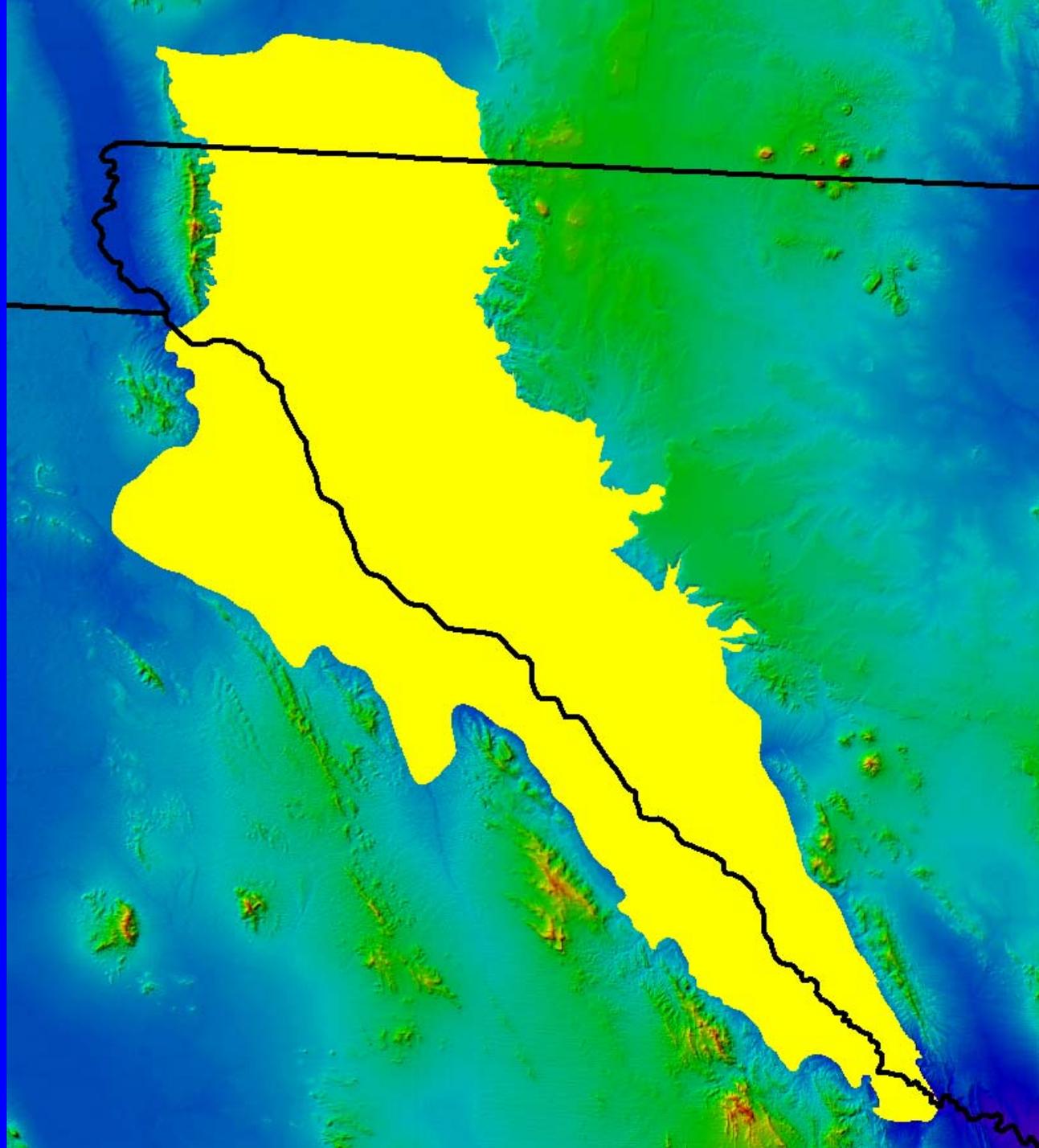
Surface Water Plants

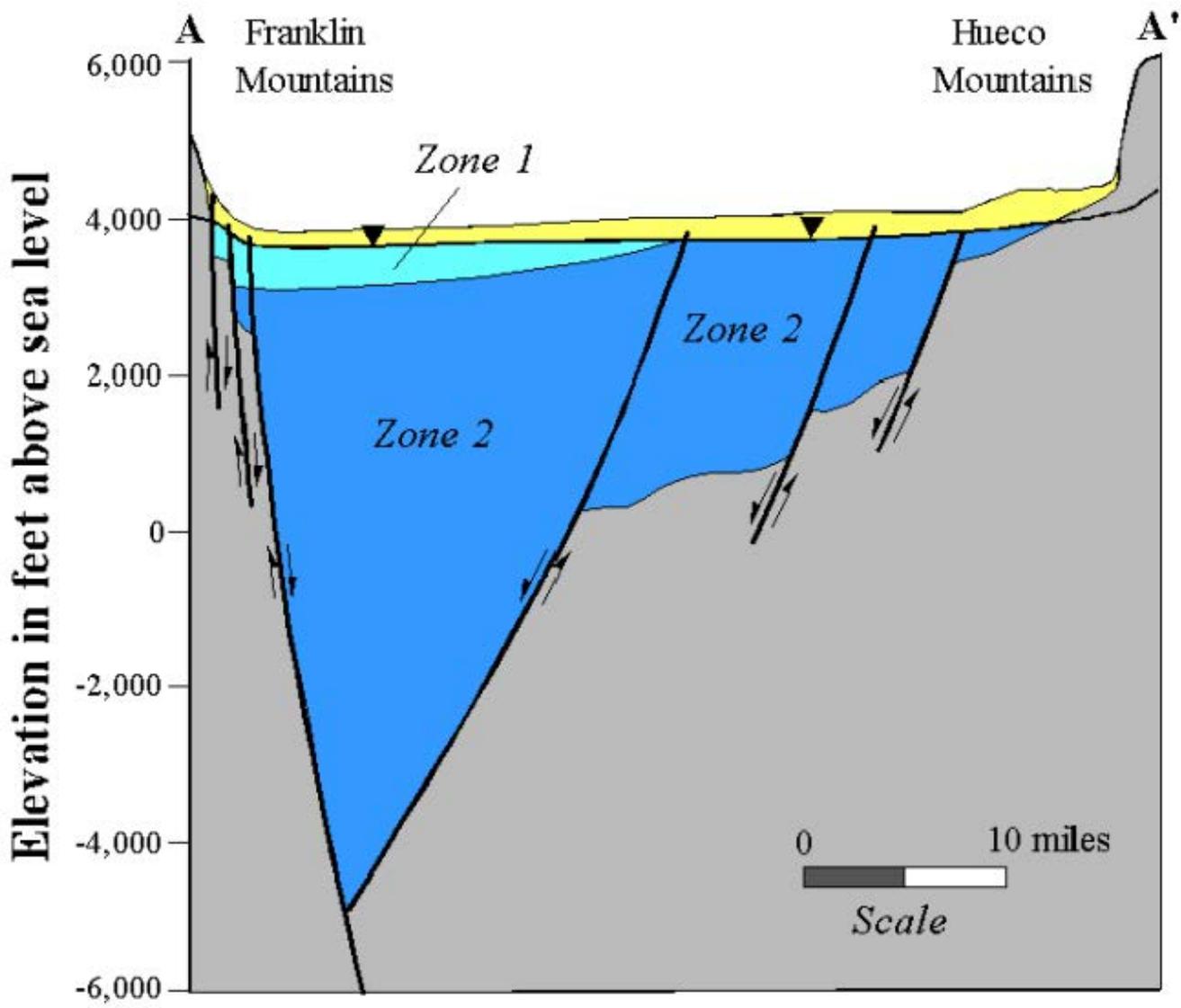
Hueco Wells

Mesilla Wells

# Hueco Bolson

~ 1.6 million acres  
~ 2,500 sq. mi.





Unsaturated  
Zone

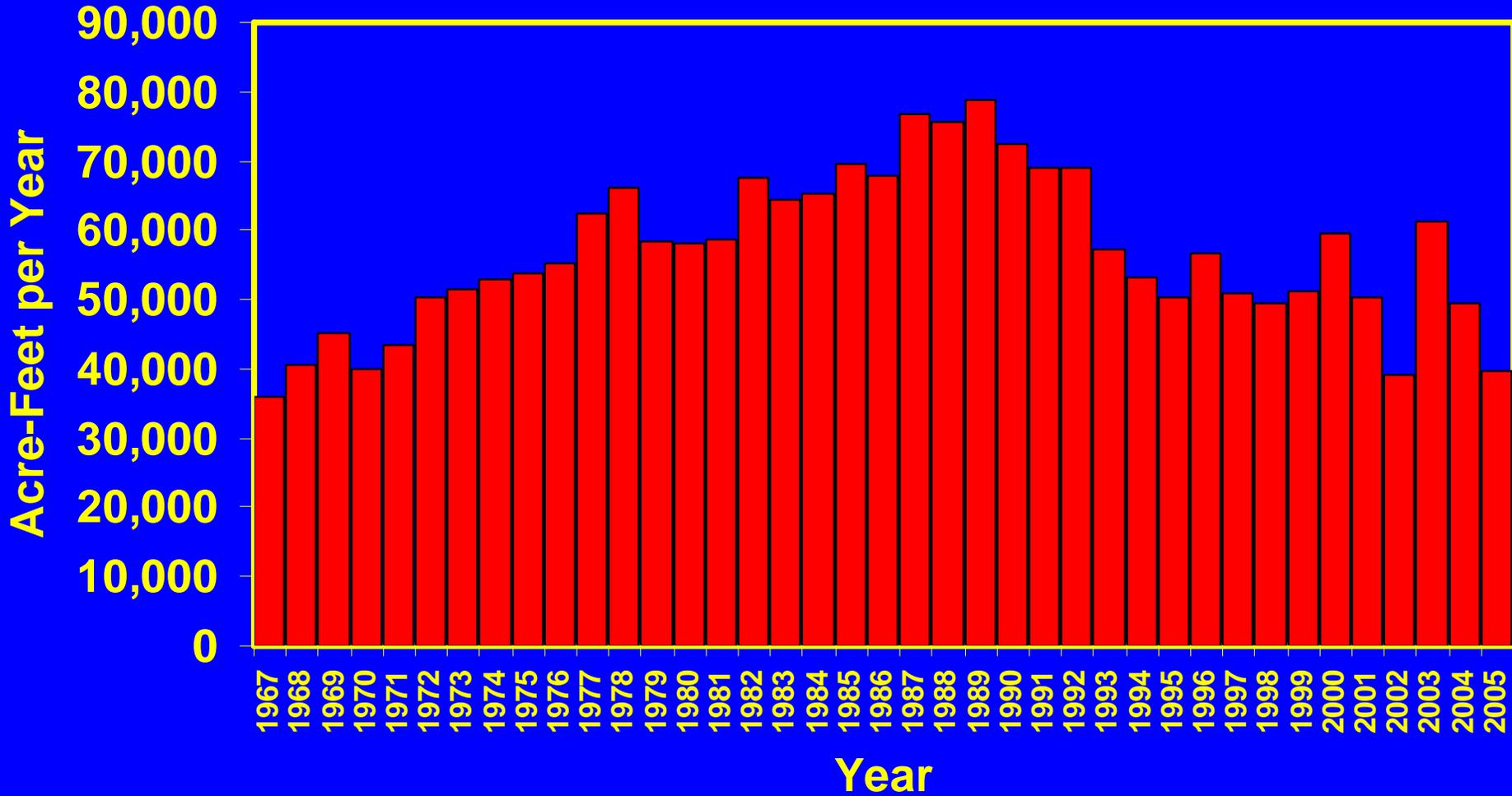


TDS Zone 1  
300 - 1000 mg/L

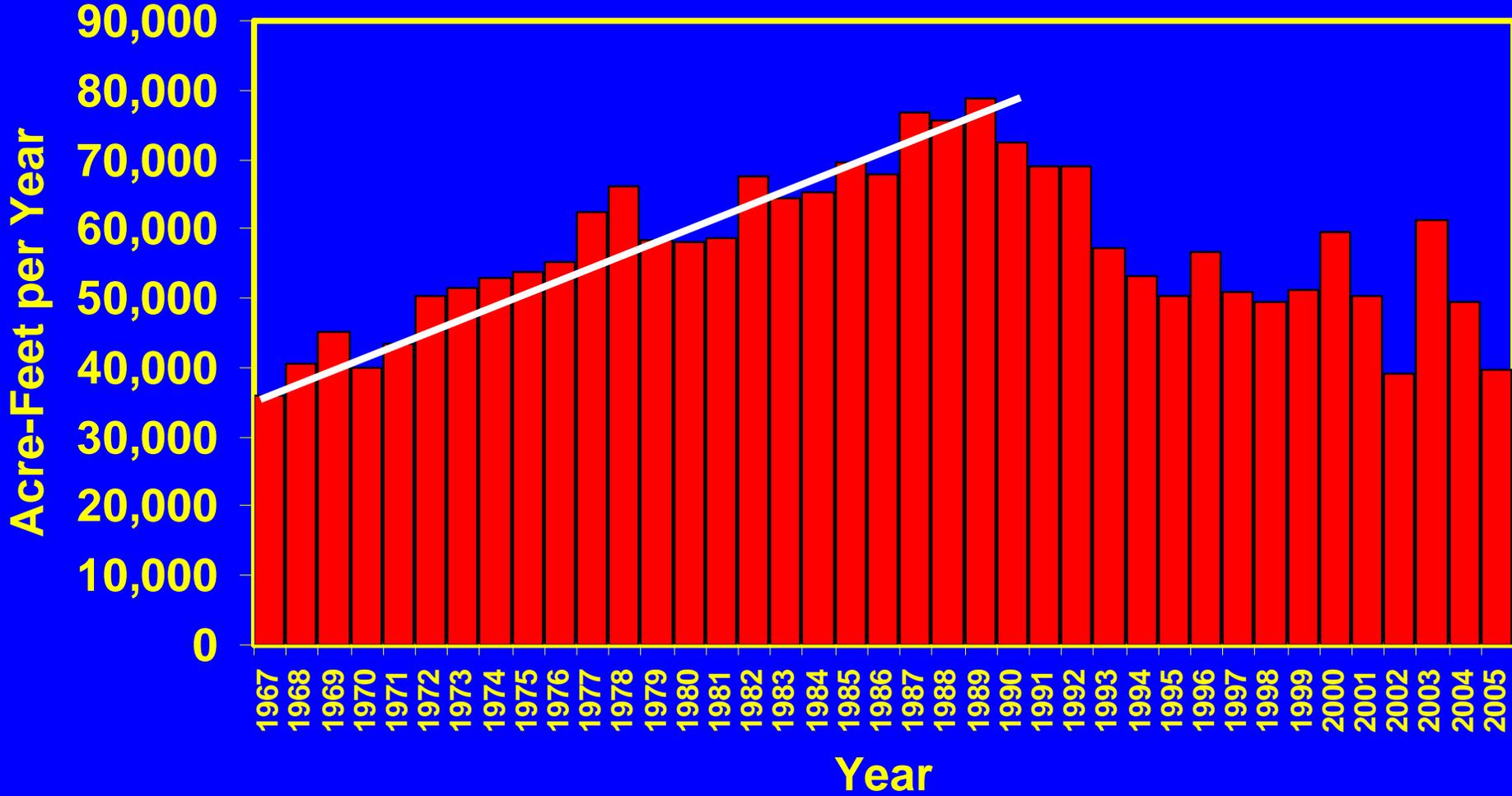


TDS Zone 2  
> 1,000 mg/L

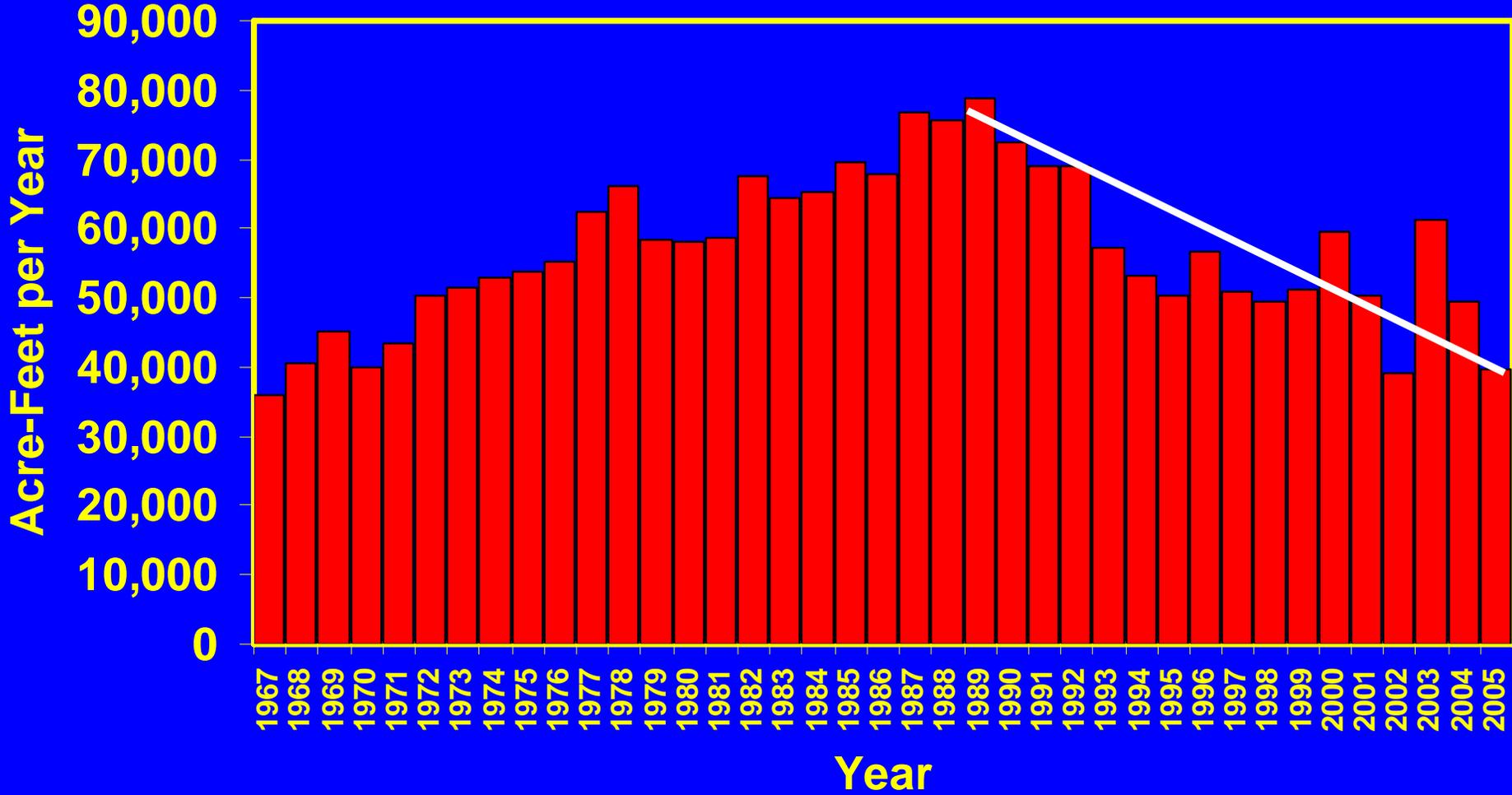
# EPWU Hueco Bolson Pumping



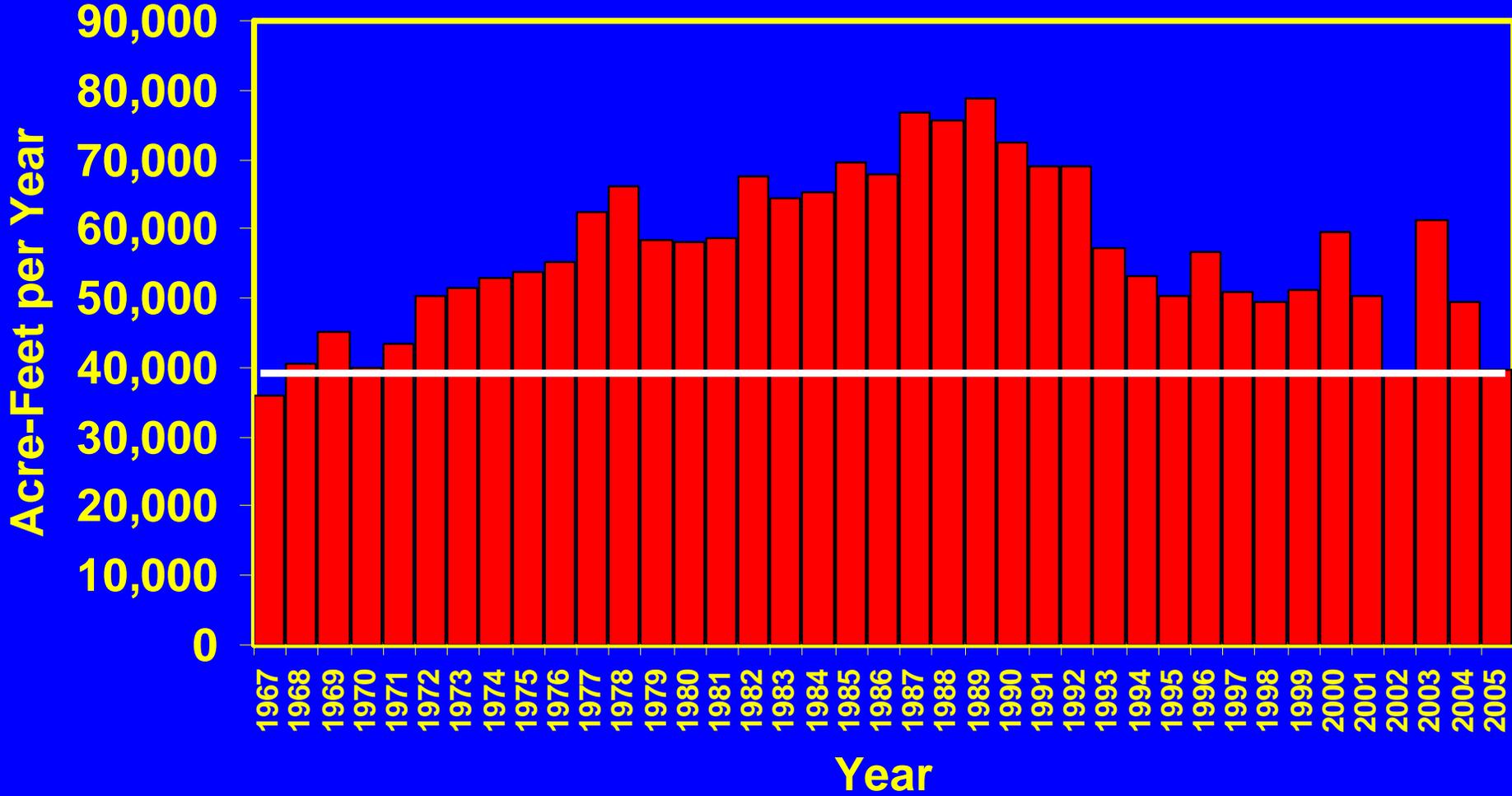
# EPWU Hueco Bolson Pumping



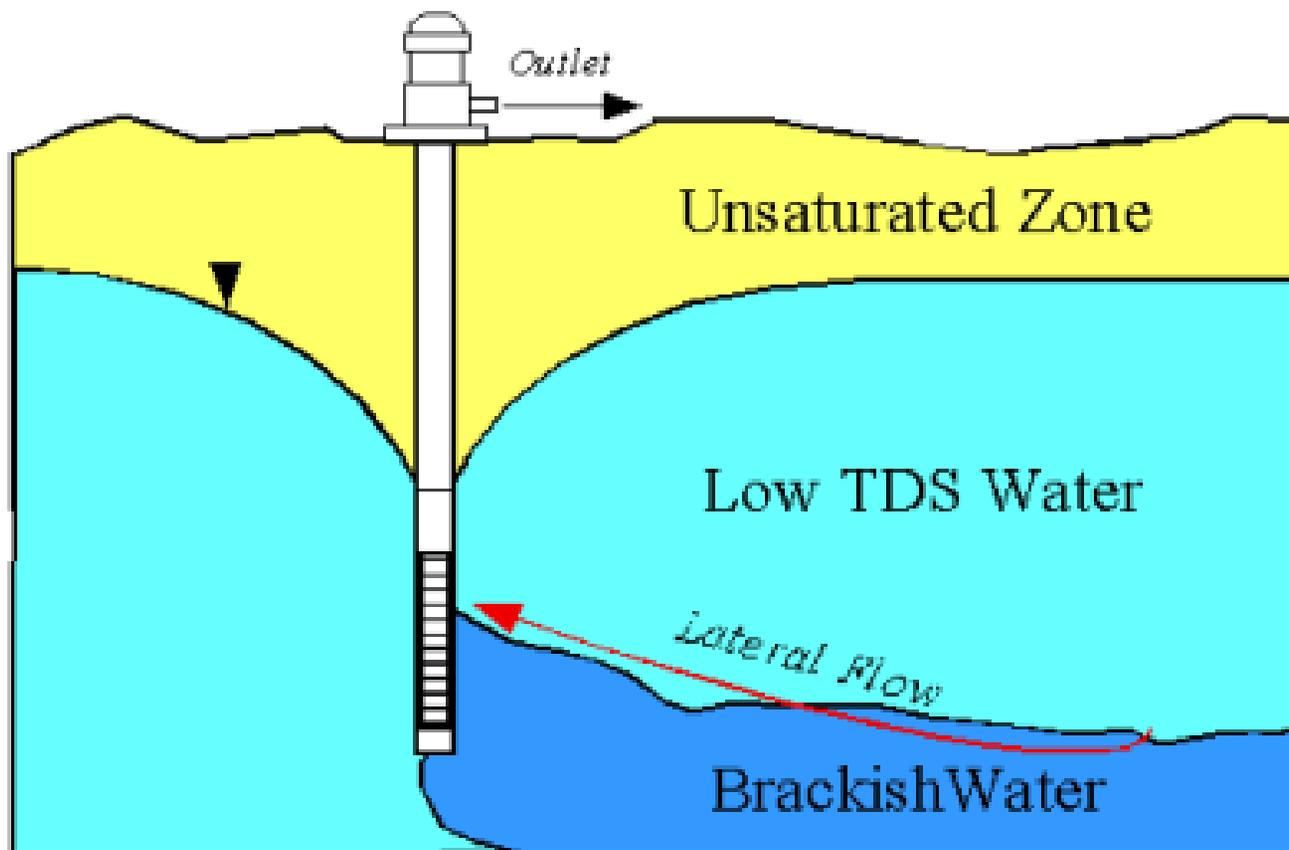
# EPWU Hueco Bolson Pumping



# EPWU Hueco Bolson Pumping

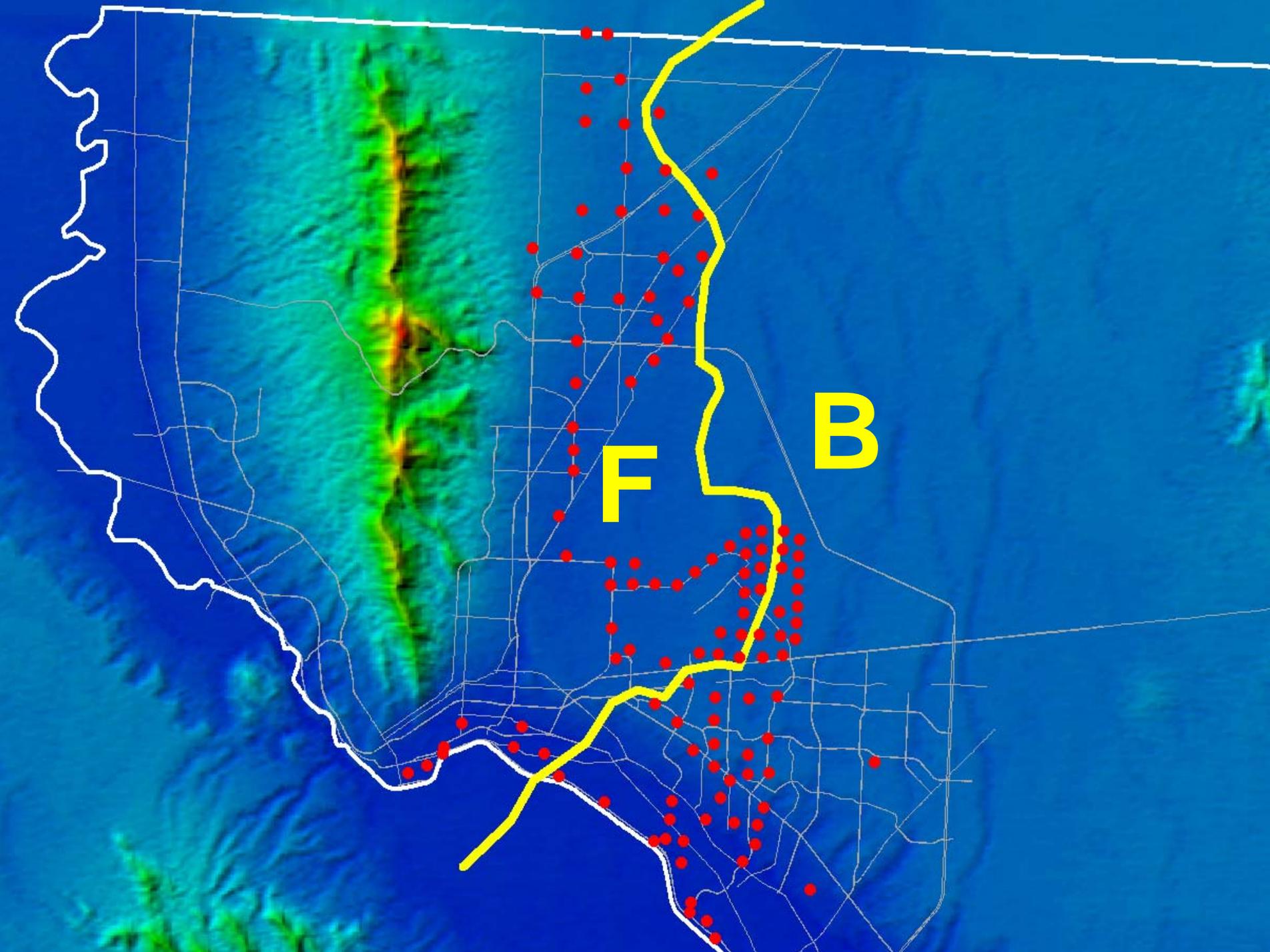


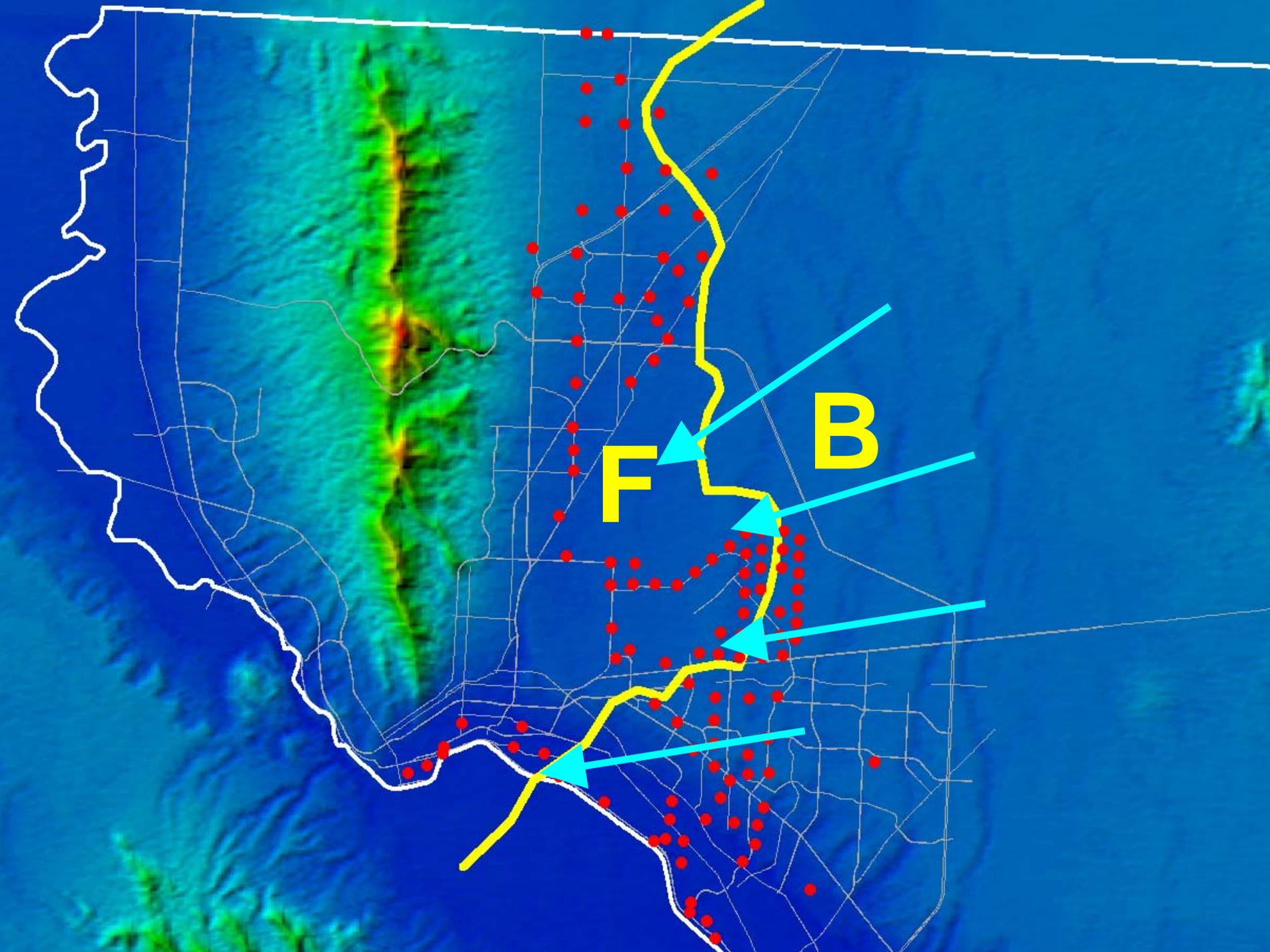
# Brackish Groundwater Intrusion

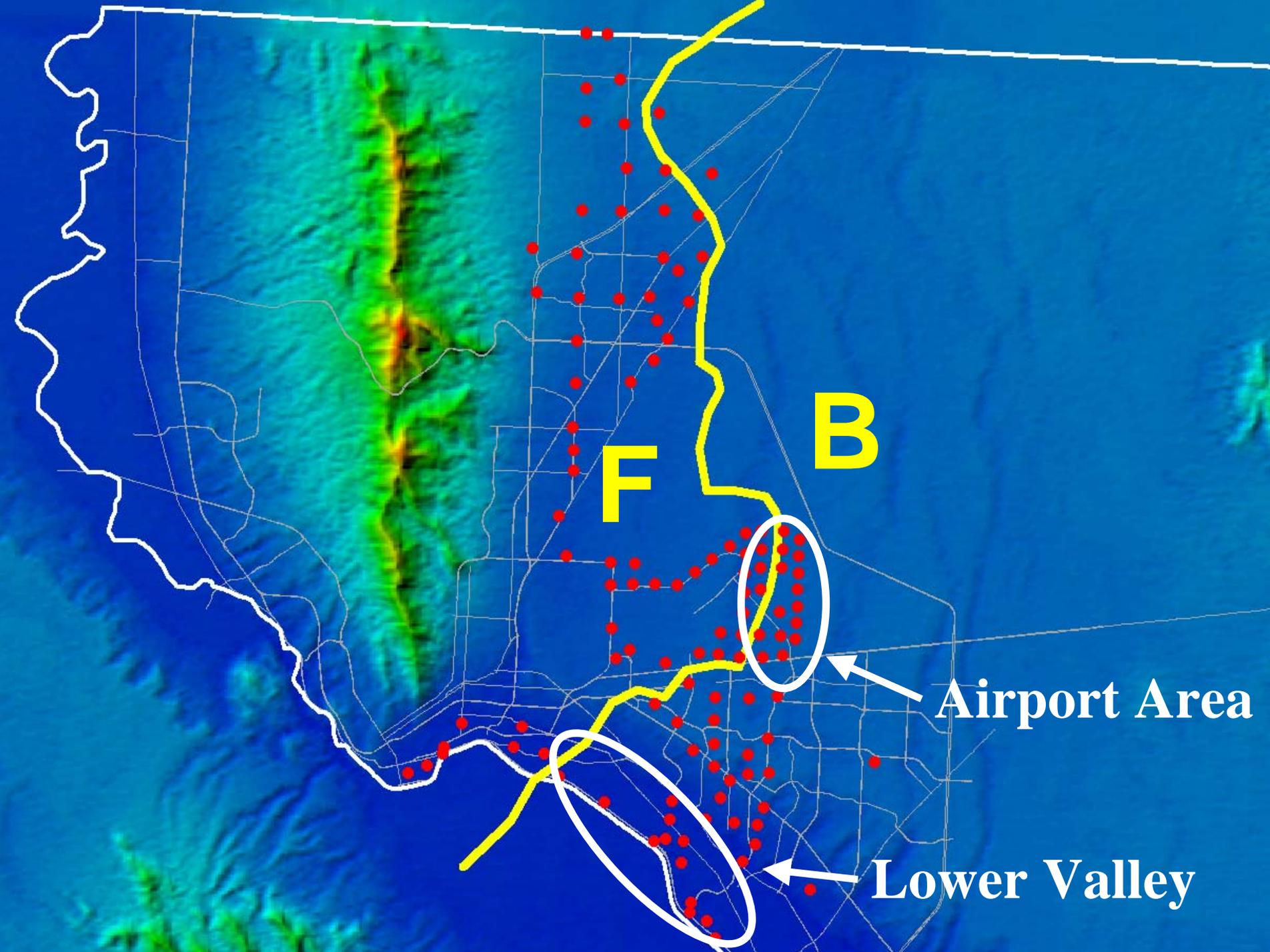


# Groundwater Management Issues

- Declining groundwater levels
- Brackish water intrusion







**F**

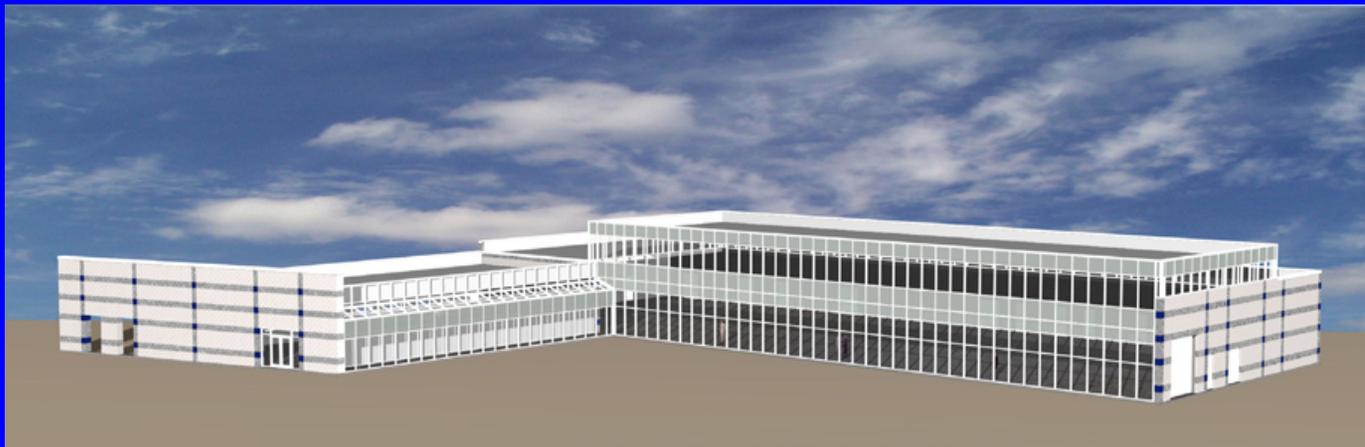
**B**

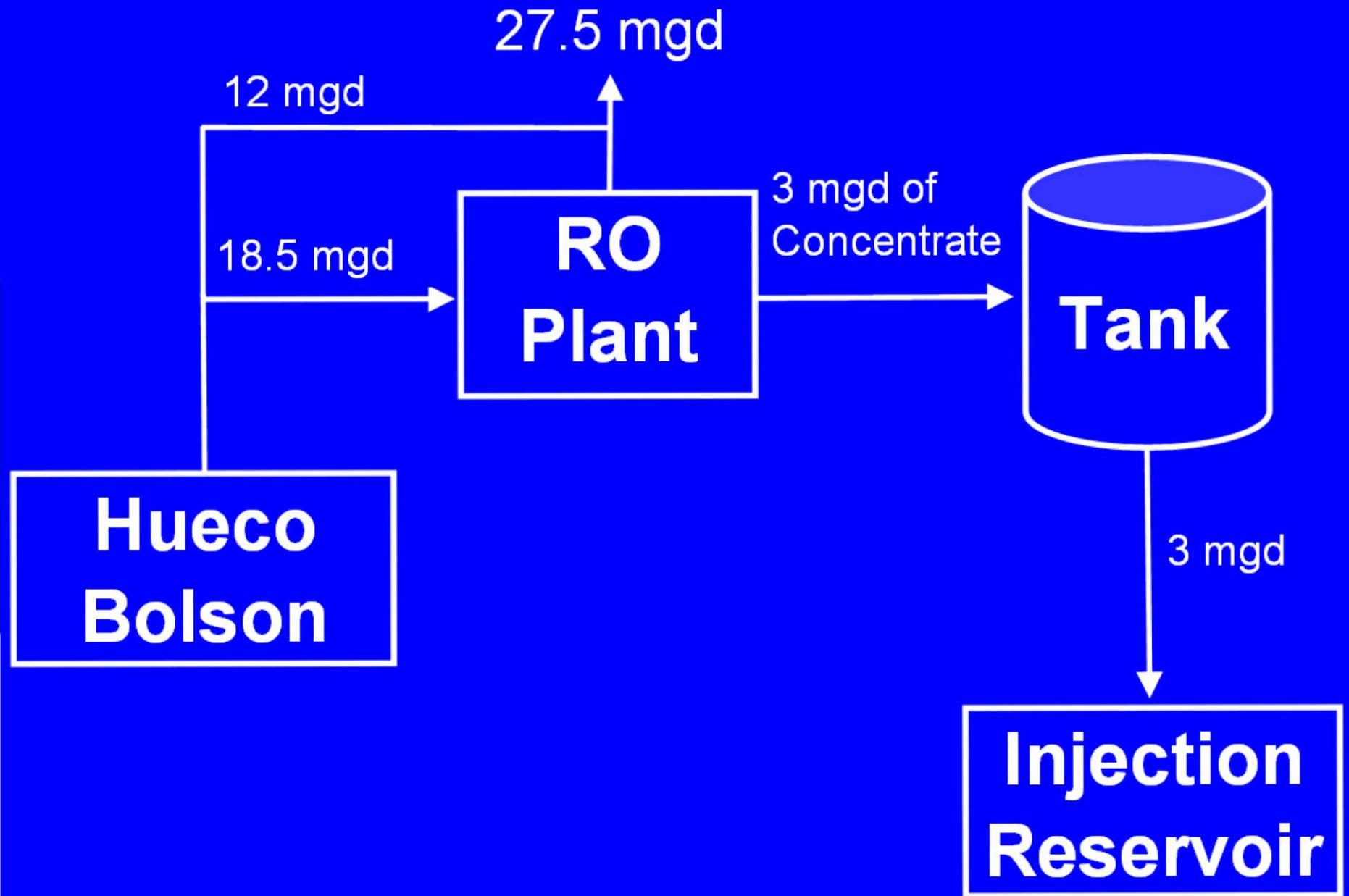
**Airport Area**

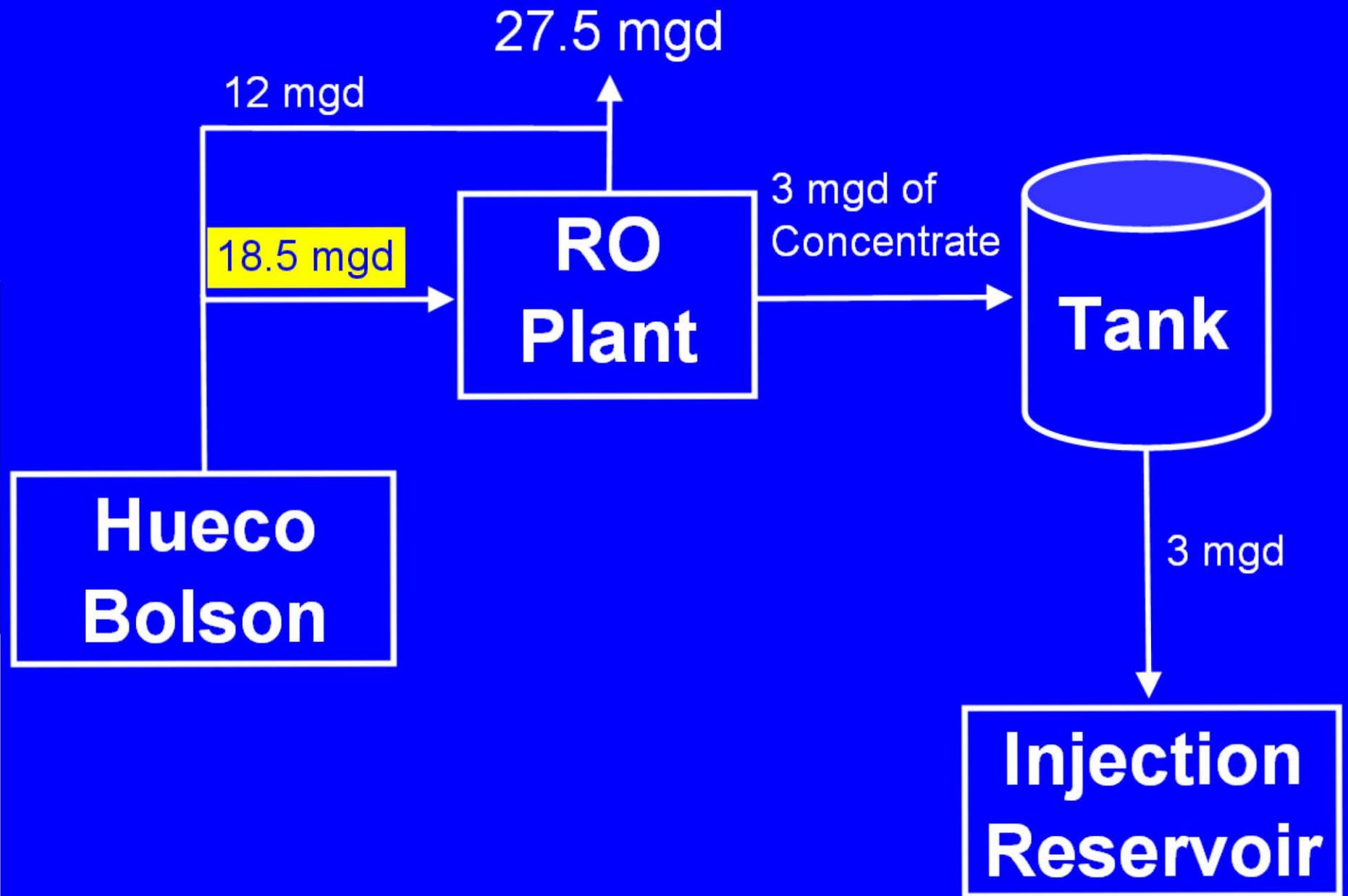
**Lower Valley**

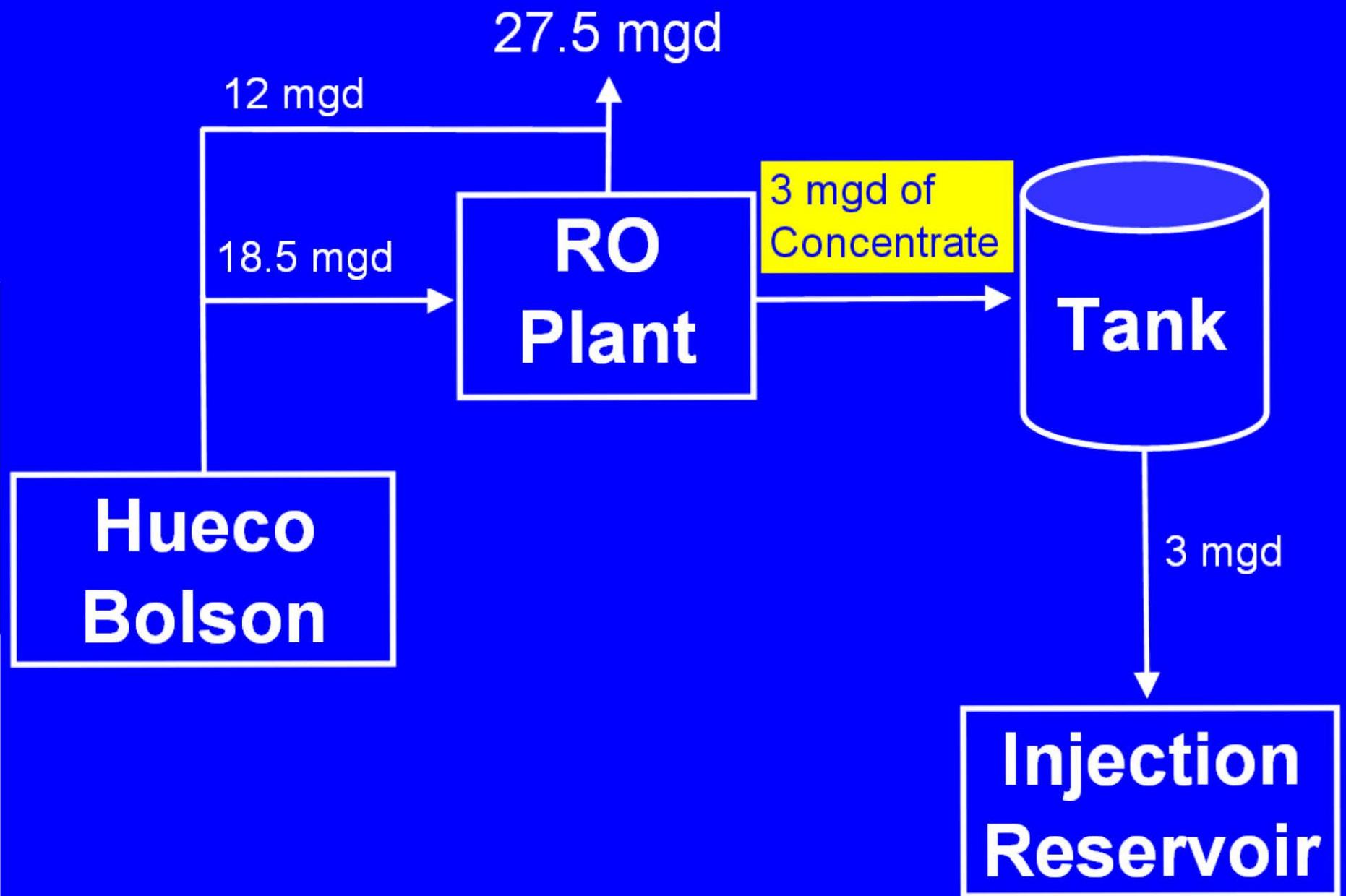
# Kay Bailey Hutchison Desalination Plant

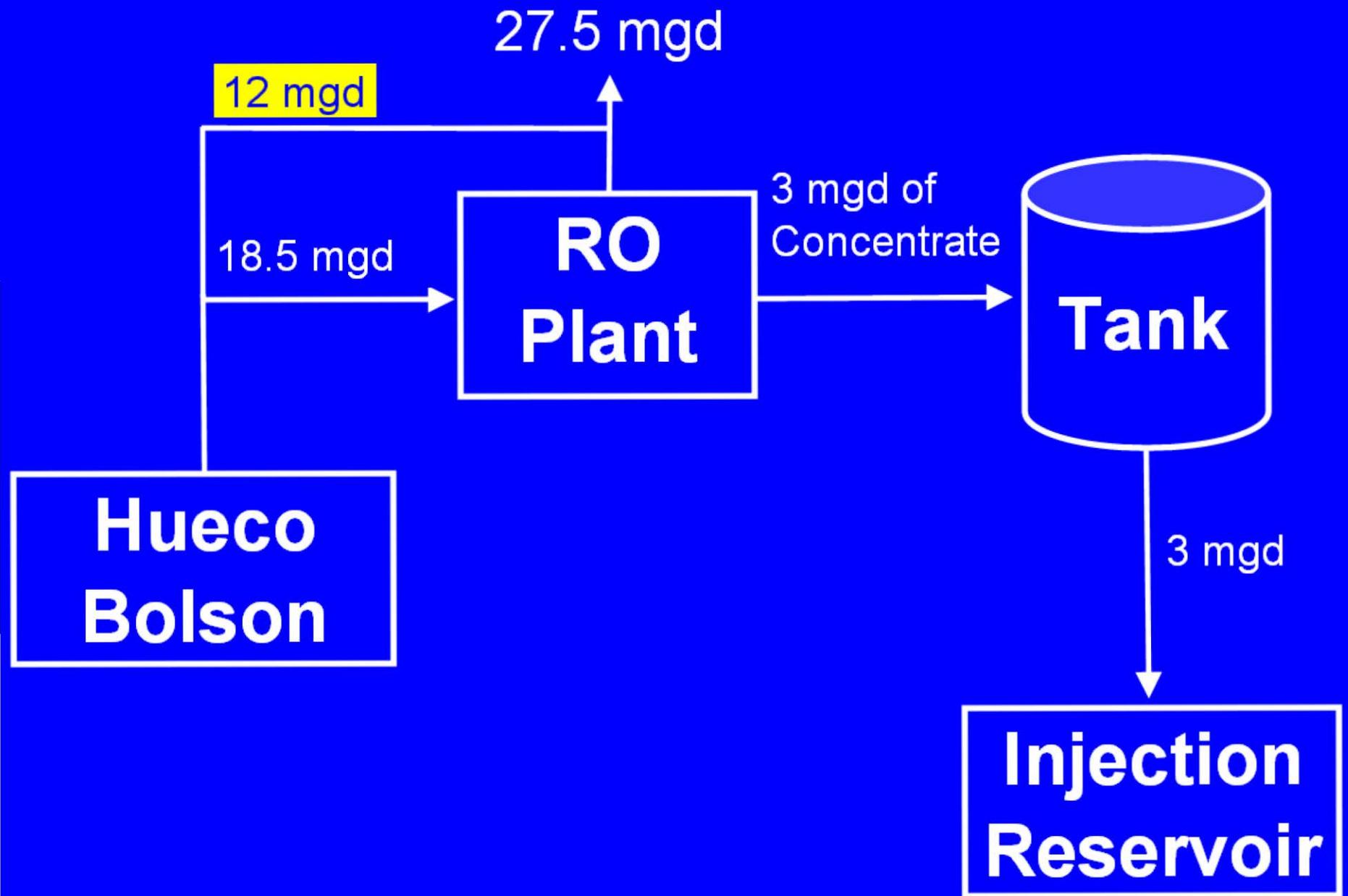
- EPWU and Ft Bliss
- Desalination Plant and some wells located on Ft Bliss
- Concentrate disposal by injection well

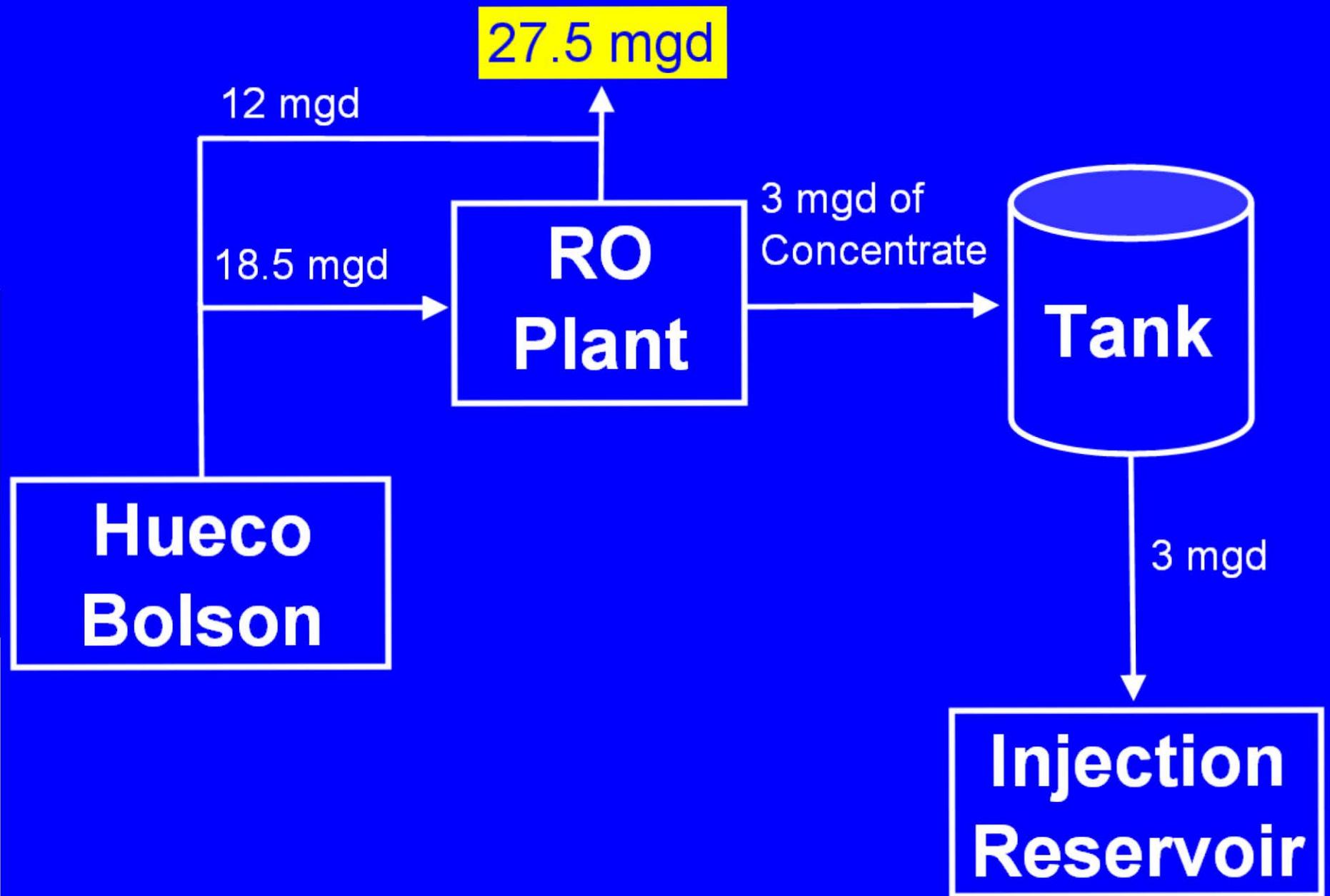






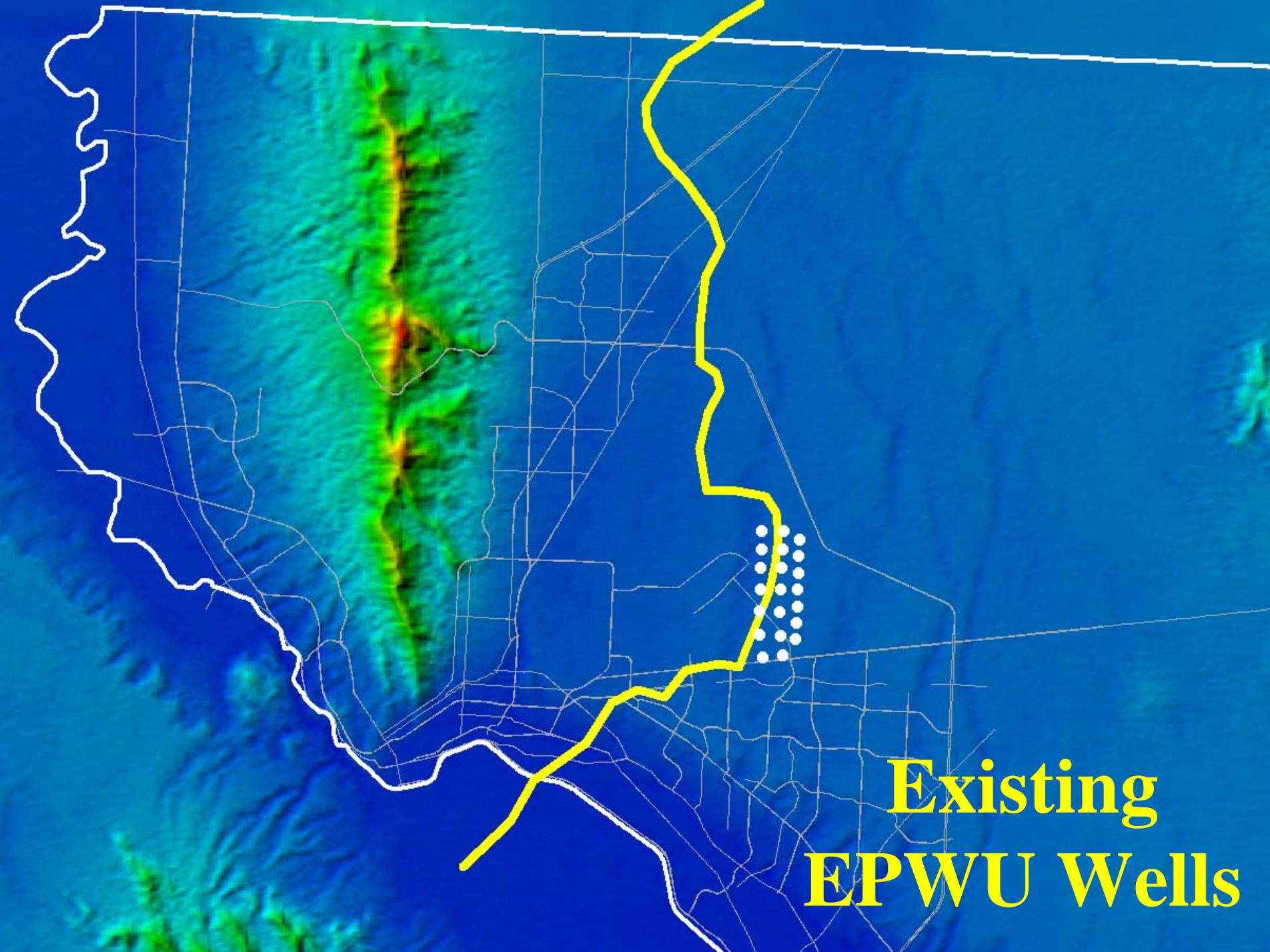




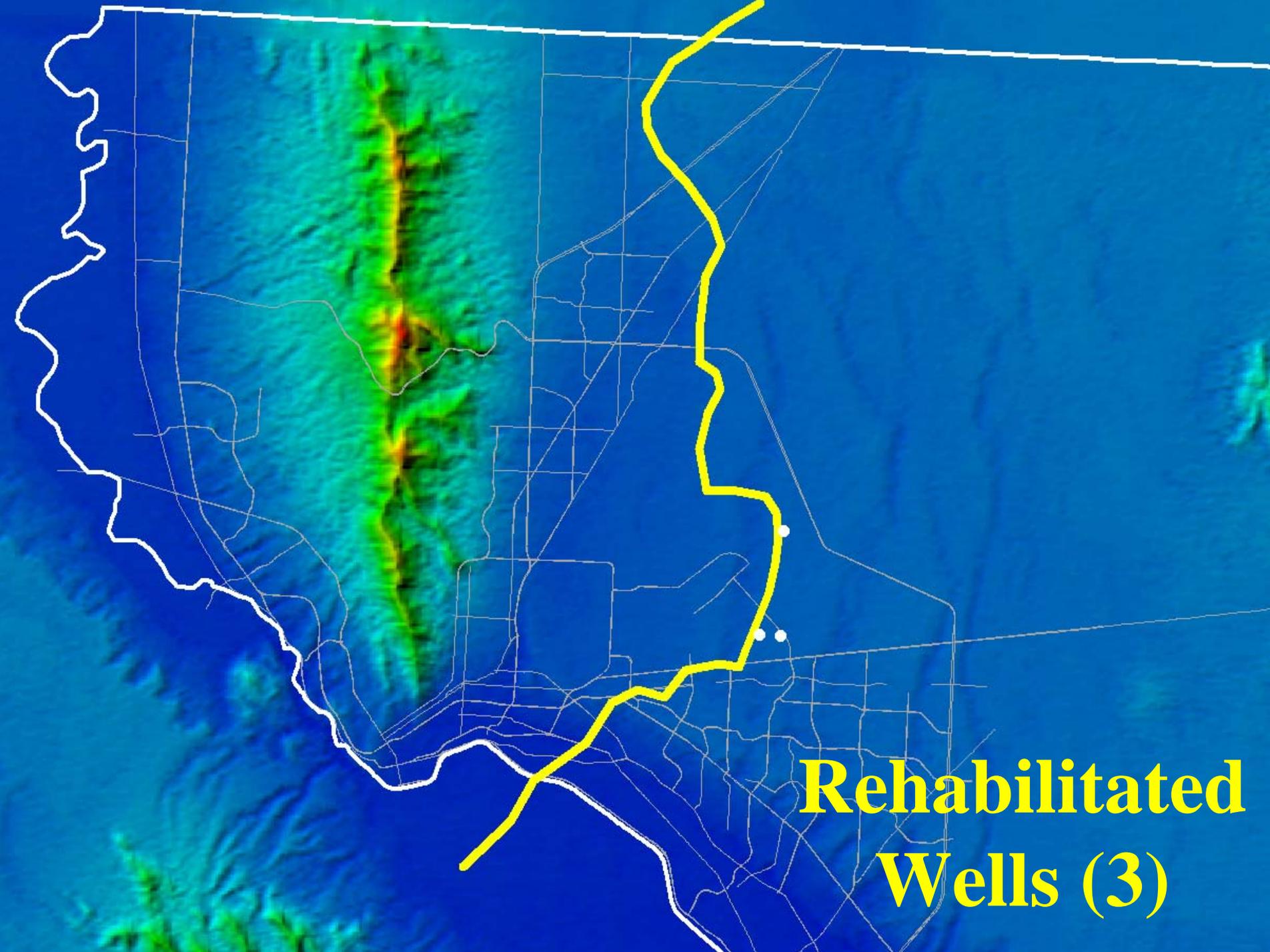


# Major Components

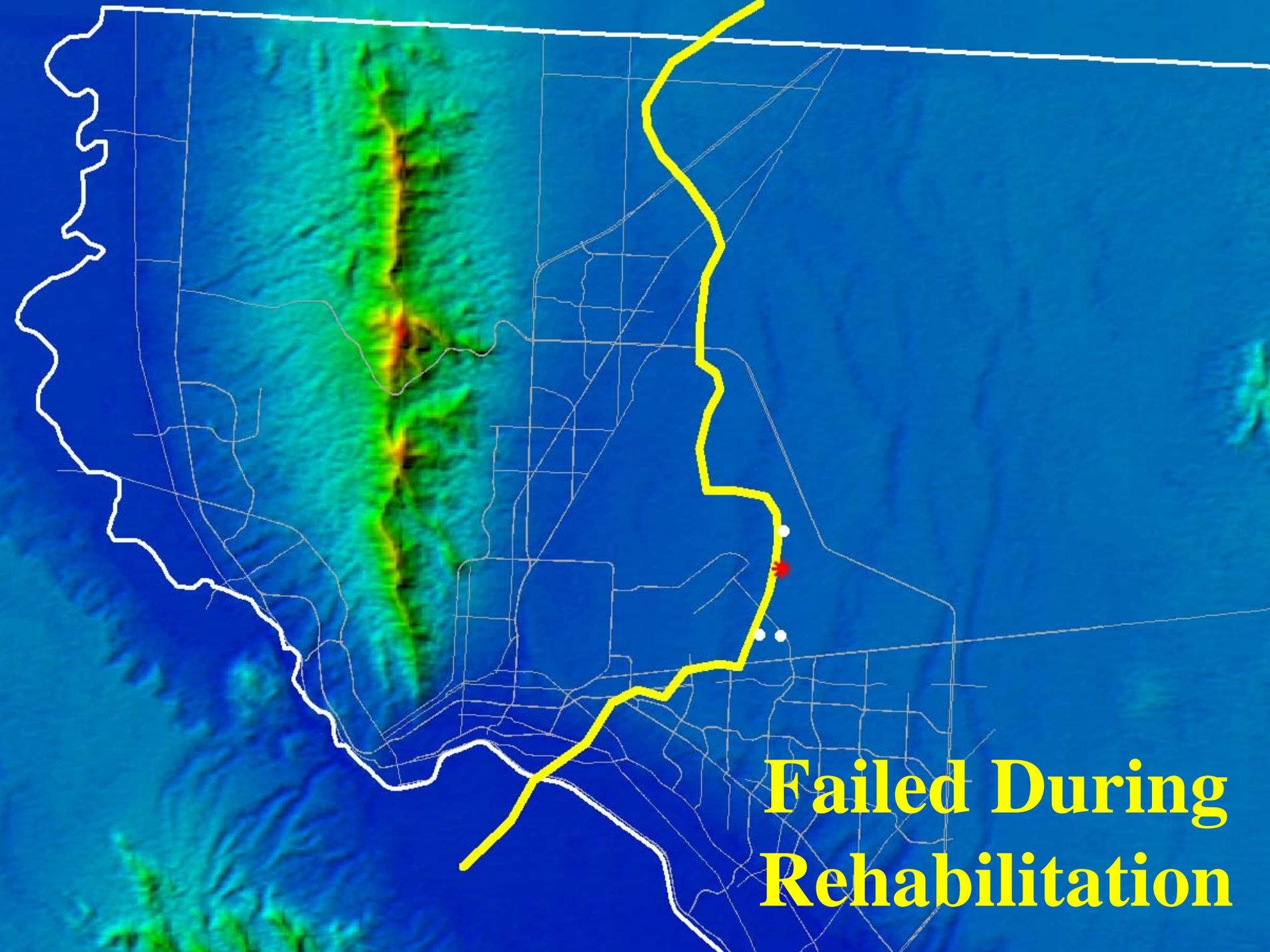
- Production Wells and Collector Lines
- Plant and Near-Plant Piping
- Concentrate Disposal Wells and Pipelines



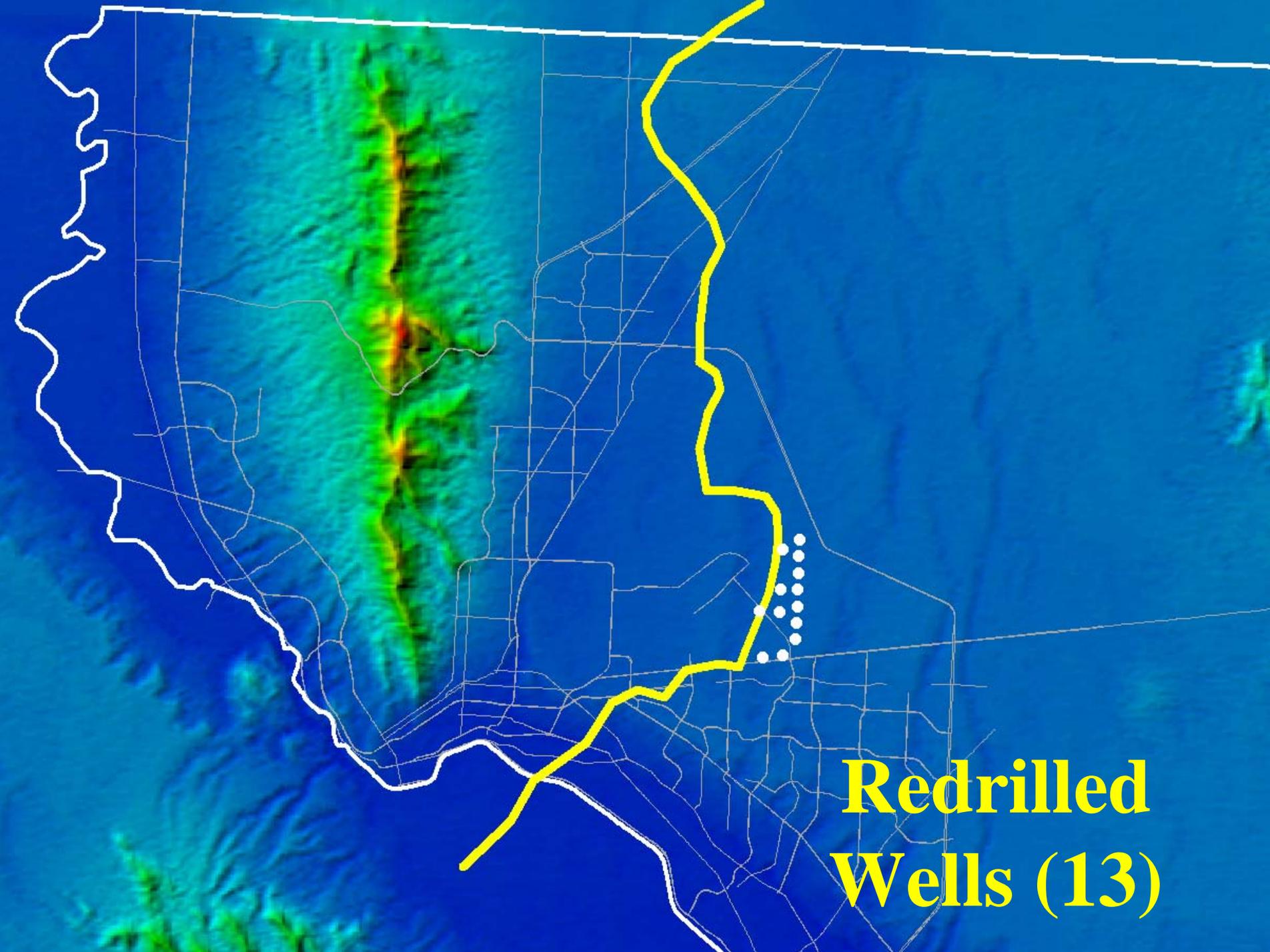
**Existing  
EPWU Wells**



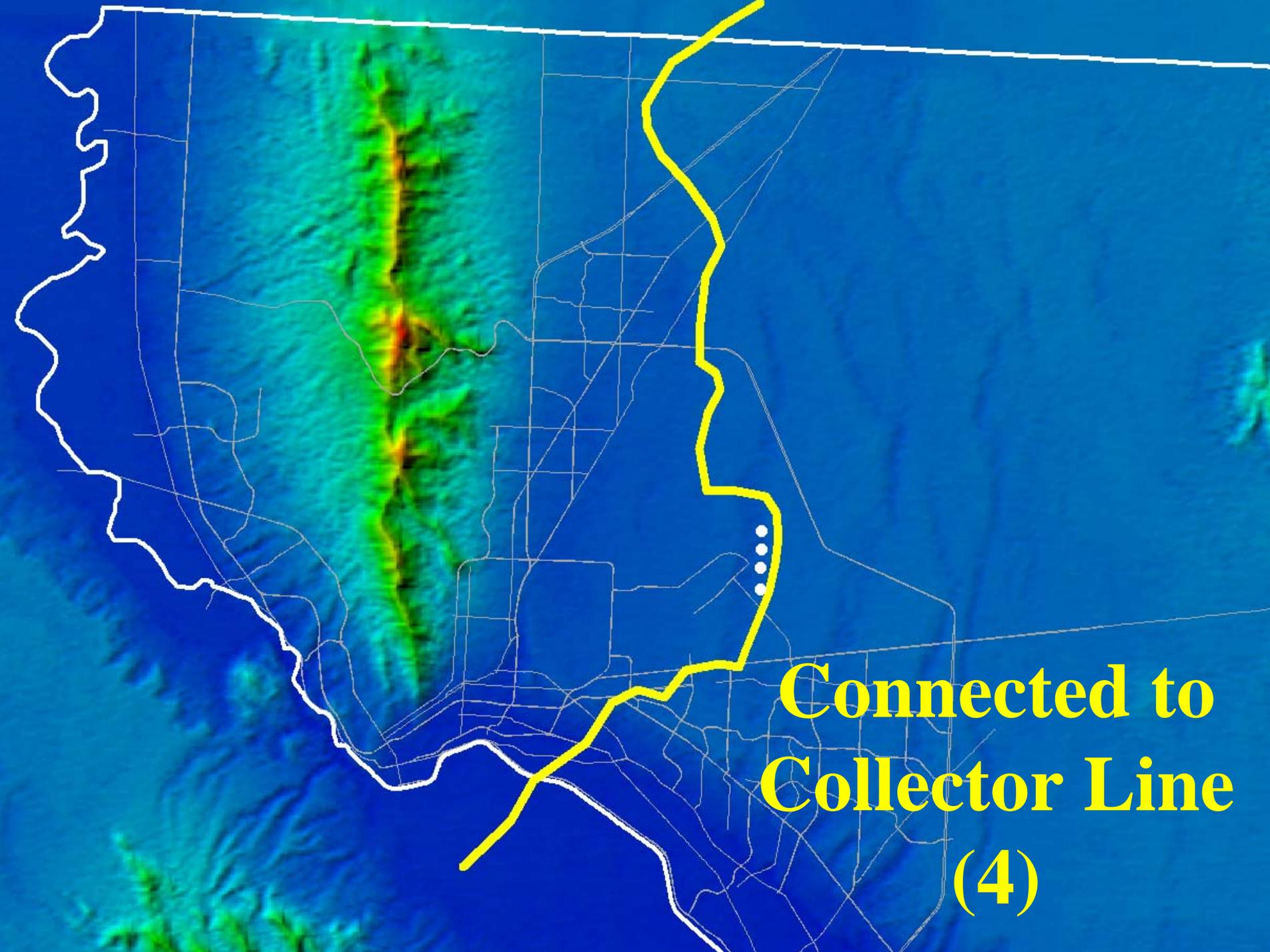
**Rehabilitated  
Wells (3)**



**Failed During  
Rehabilitation**

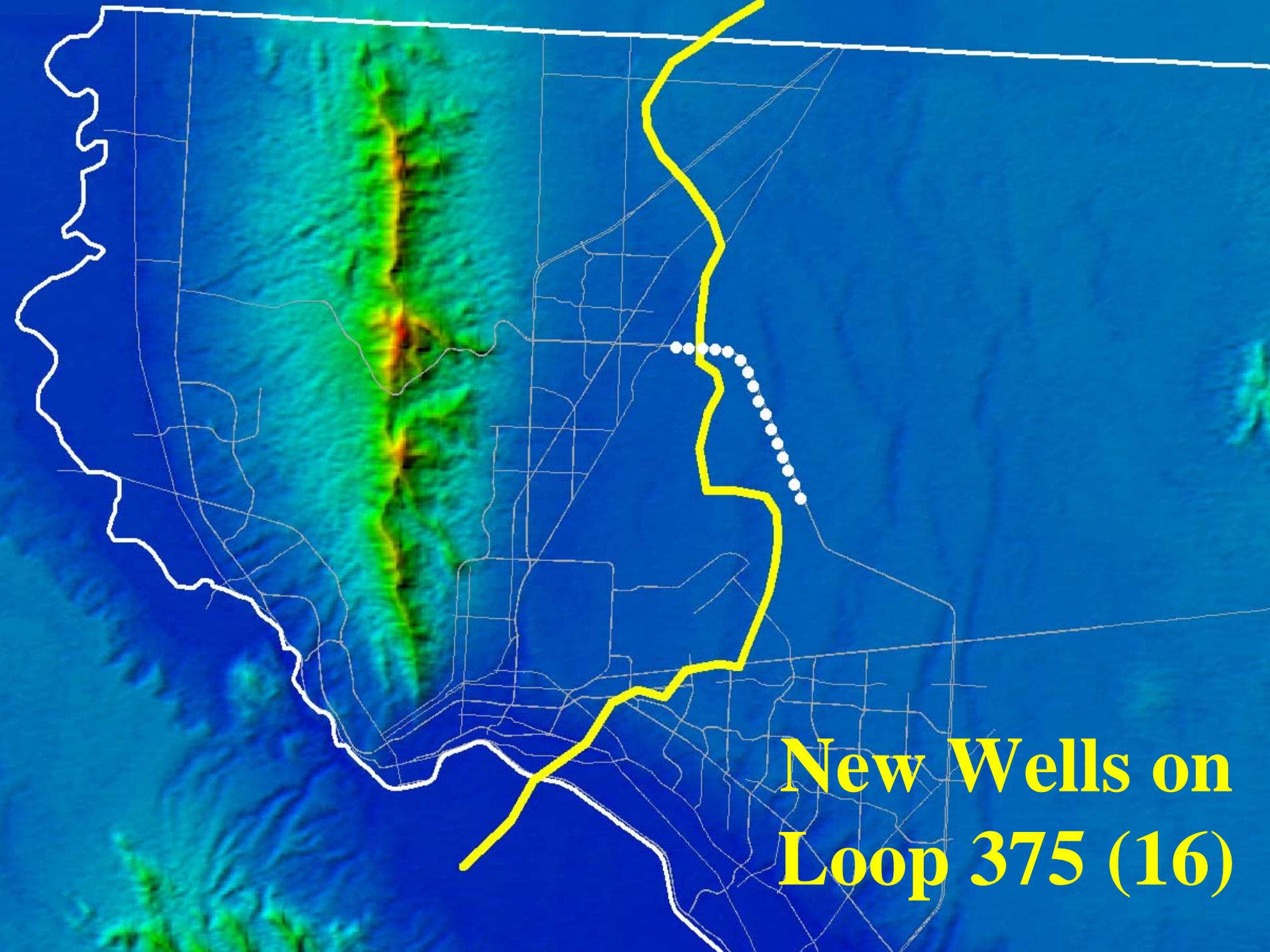


**Redrilled  
Wells (13)**

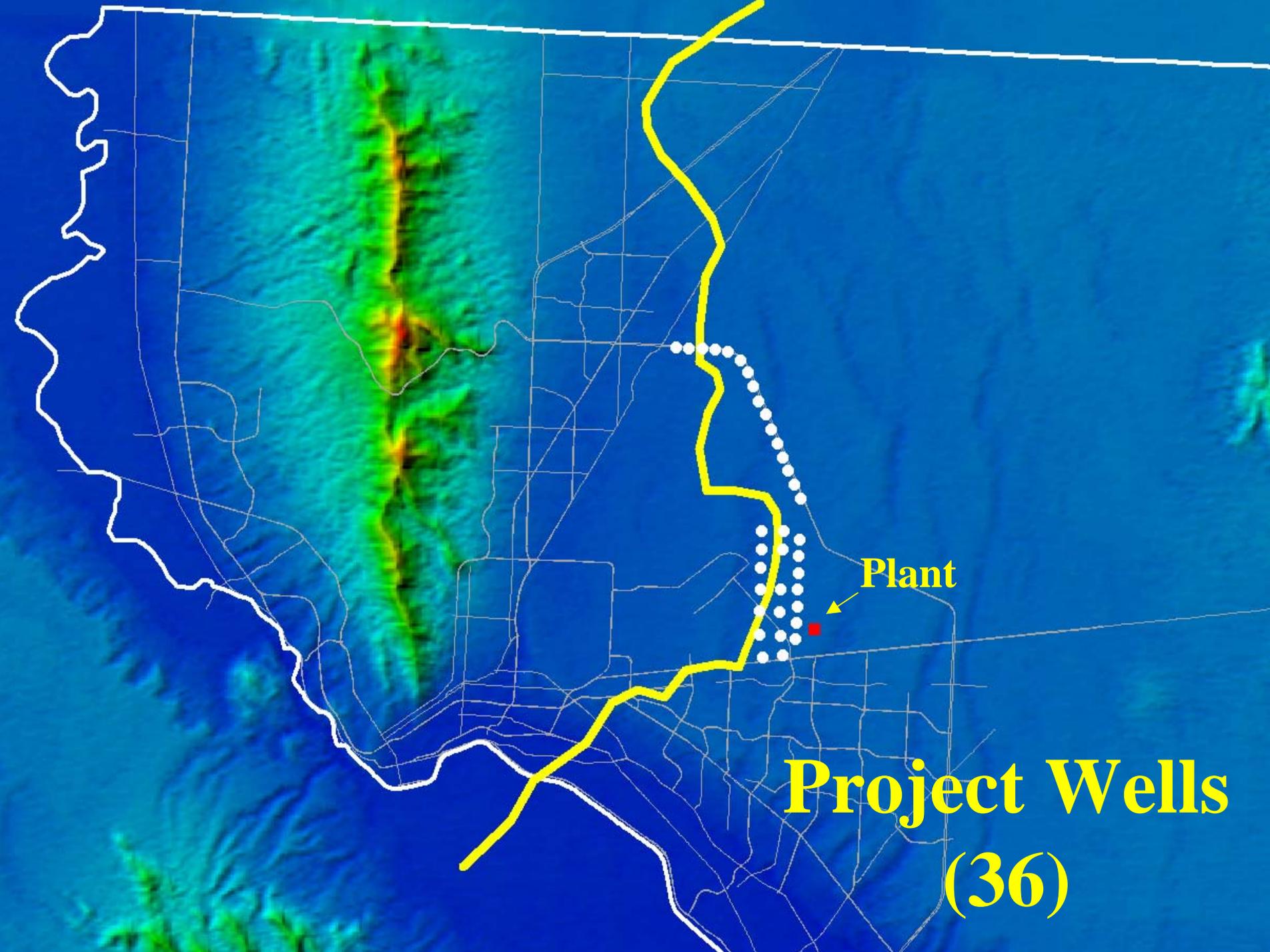


**Connected to  
Collector Line**

**(4)**



**New Wells on  
Loop 375 (16)**



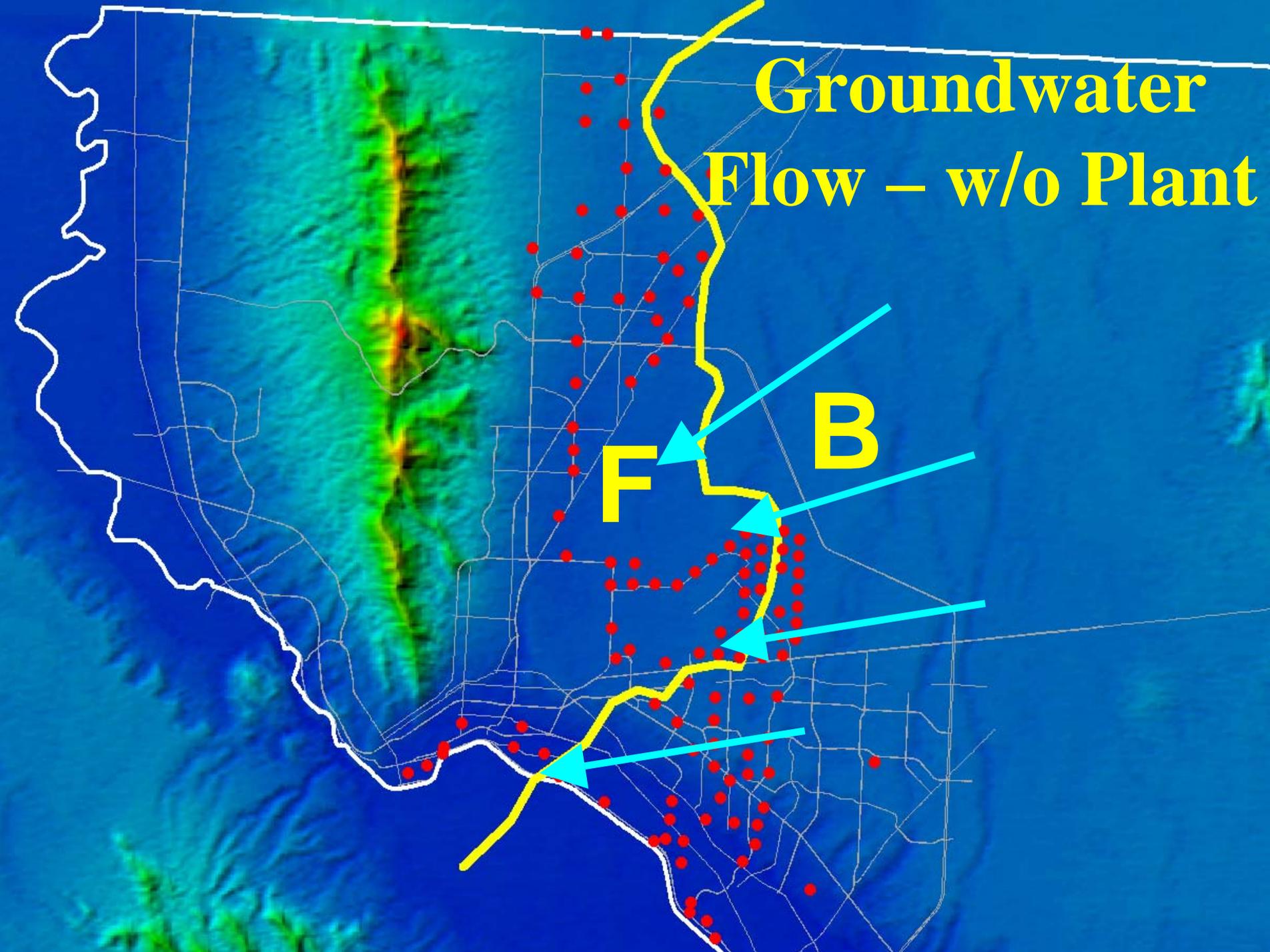
**Plant**

**Project Wells  
(36)**

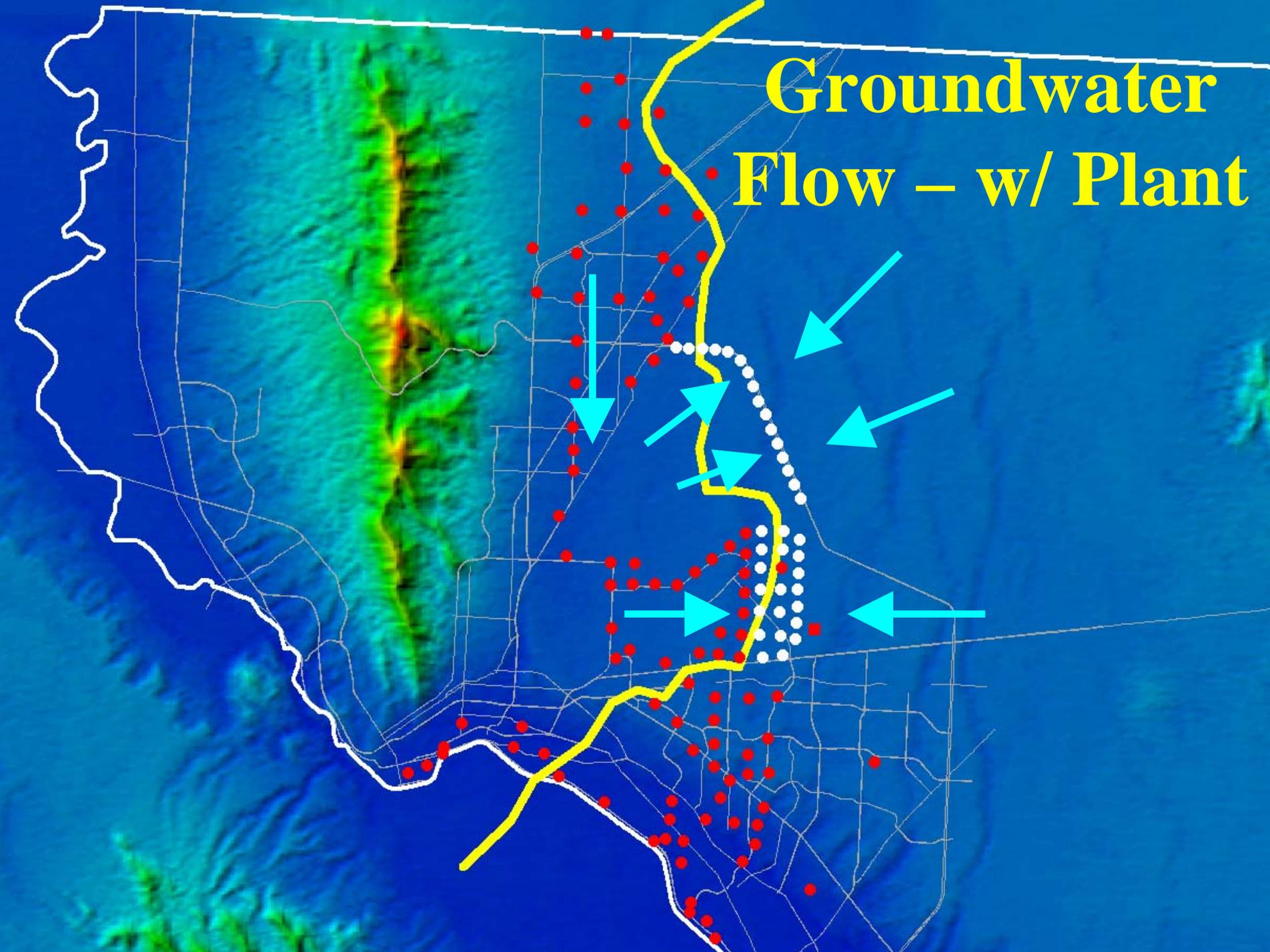
# Groundwater Flow – w/o Plant

**F**

**B**



# Groundwater Flow – w/ Plant



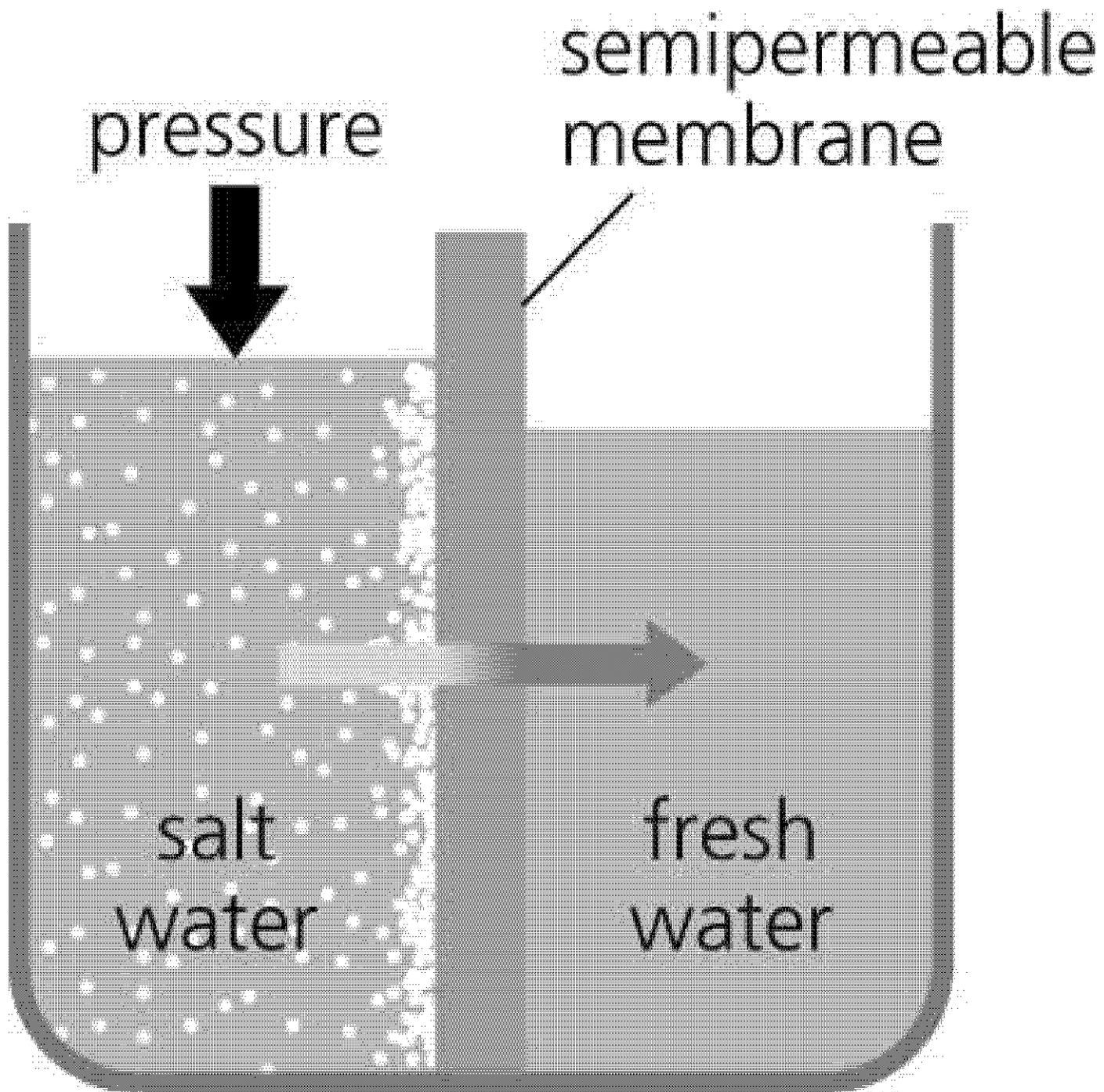
# Production Wells and Collectors

- 3 Well Drilling Contracts
- 3 Pump Furnish-and-Install Contracts
- 4 Well Equipping Contracts
- 2 Pipeline Contracts

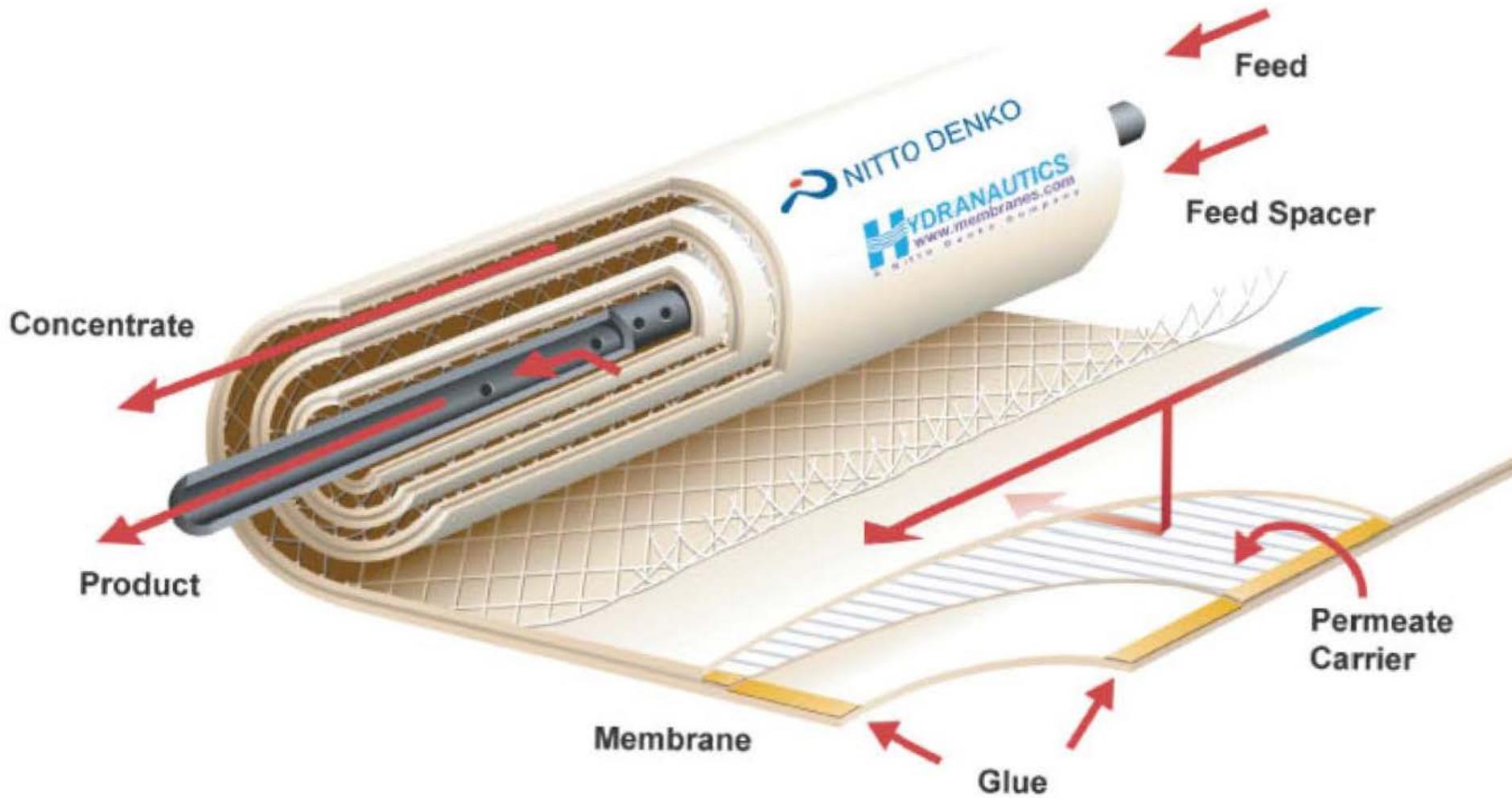
*Period of Work: March 2005 to June 2007*

# Plant and Near-Plant Pipes

- Reverse Osmosis Plant
- “4-Pipe” Project (41,800 ft)
  - Airport Well Collector (Final)
  - Loop 375 Collector (Final)
  - Concentrate Pipeline (Initial)
  - Finished Water Pipeline



# ESPA-1 Membranes





# Plant Overview

- 5 Skids
- Flow Rate: 1.70 to 3.64 mgd per skid
- Expected Recovery: 70% to 82.5%
- Expected Salt Rejection: up to 93%

# Pretreatment

- Antiscalant
- Acid
  - pH adjustment to 7.4



# Finished Water Treatment

- pH Adjustment to 7.5
  - Caustic Soda
- Corrosion Inhibitor
  - ~ 2 ppm
- Disinfection
  - Sodium Hypochlorite
  - 1 ppm Cl residual

# Concentrate Treatment

- Ability to add acid as needed



# Plant and Near-Plant Pipelines

- 2 Contracts
  - Plant
  - 4-pipe project

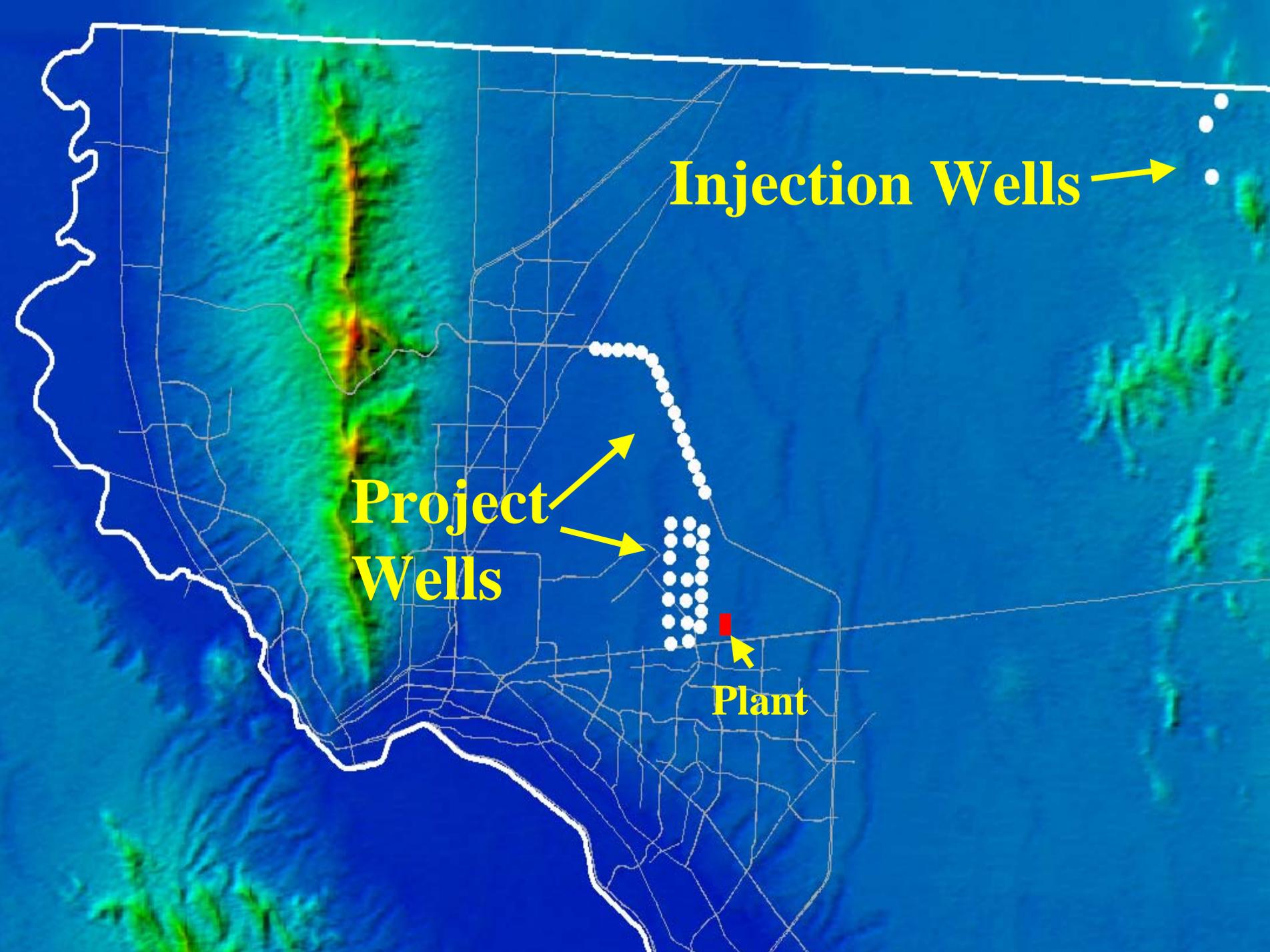
*Period of Work: July 2005 to June 2007*

# Concentrate Disposal

- 3 Injection Wells
- Surface Injection Facilities
- Concentrate Pipeline (97,800 ft)

# Cost Comparison (2002)

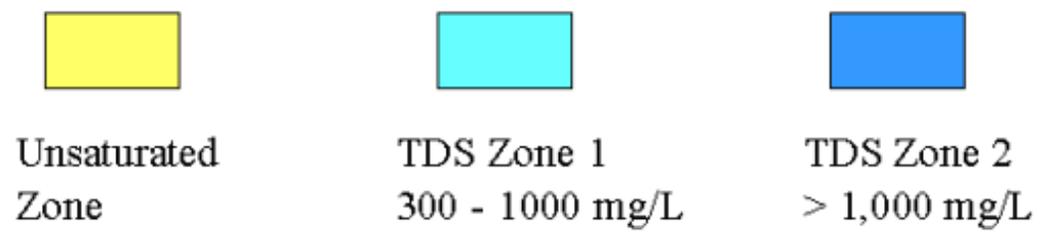
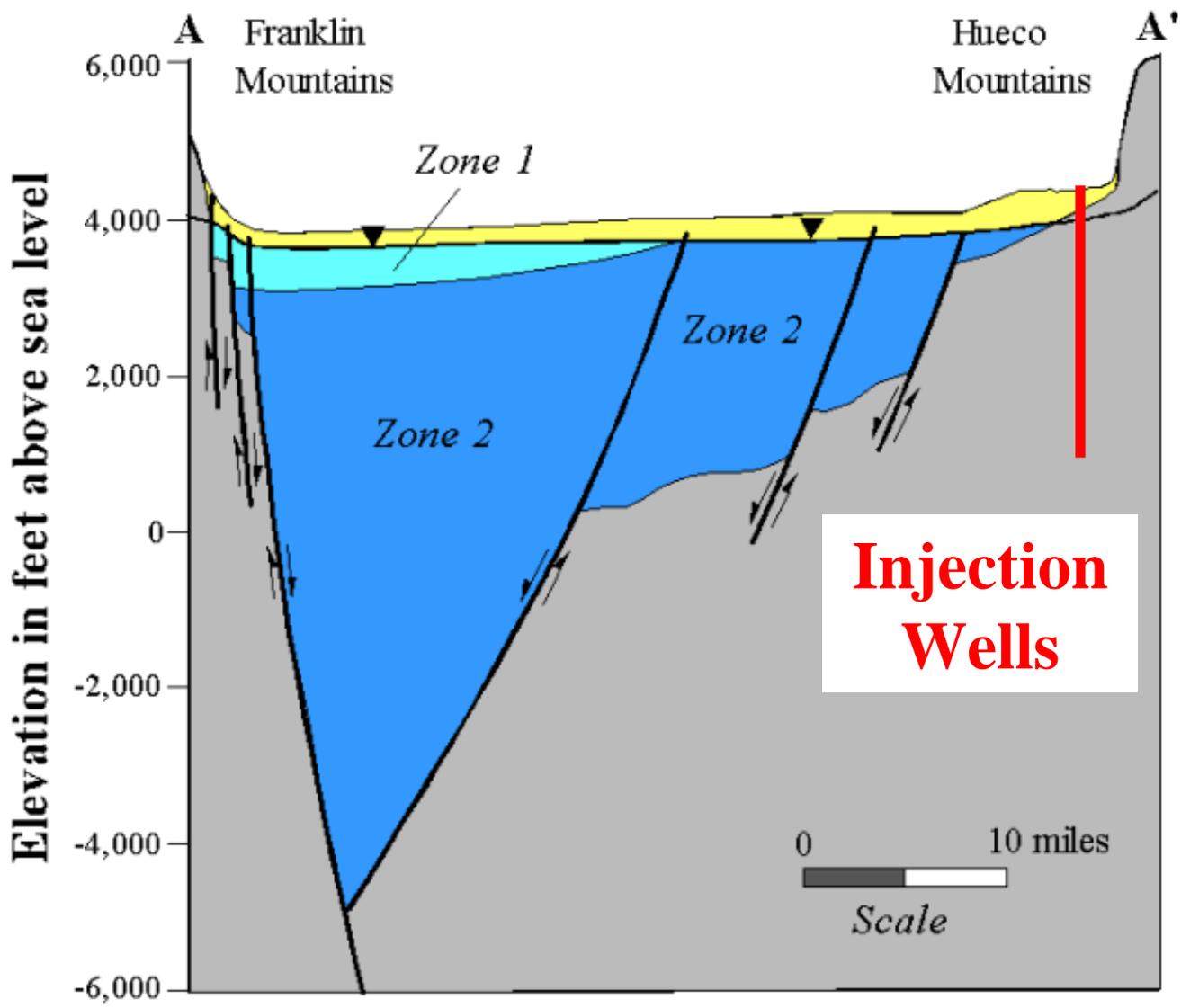
Disposal Method	Capital (million)	Annual O&M (million)	Present Value (million)
Passive Evaporation	\$41	\$1.0	\$71
Enhanced Evaporation	\$23	\$2.9	\$88
Deep Well Injection	\$7	\$0.8	\$25



**Injection Wells** →

**Project Wells**

**Plant**



WOODS' INC. 18710005  
SPACER 1/4 INCH  
L/4 INCH VI ENDS  
CLIPS BRCS 400000 1/4  
1974 1210000 1/4

WOOD PRESERVED  
WOOD MAINTENANCE  
RATED SHEATHING  
2x4 1/2x8 1/2x10

Test Hole  $\phi 3$   
7/16/03  
BOX # 50  
2343 - 2357

2343

2343

2346

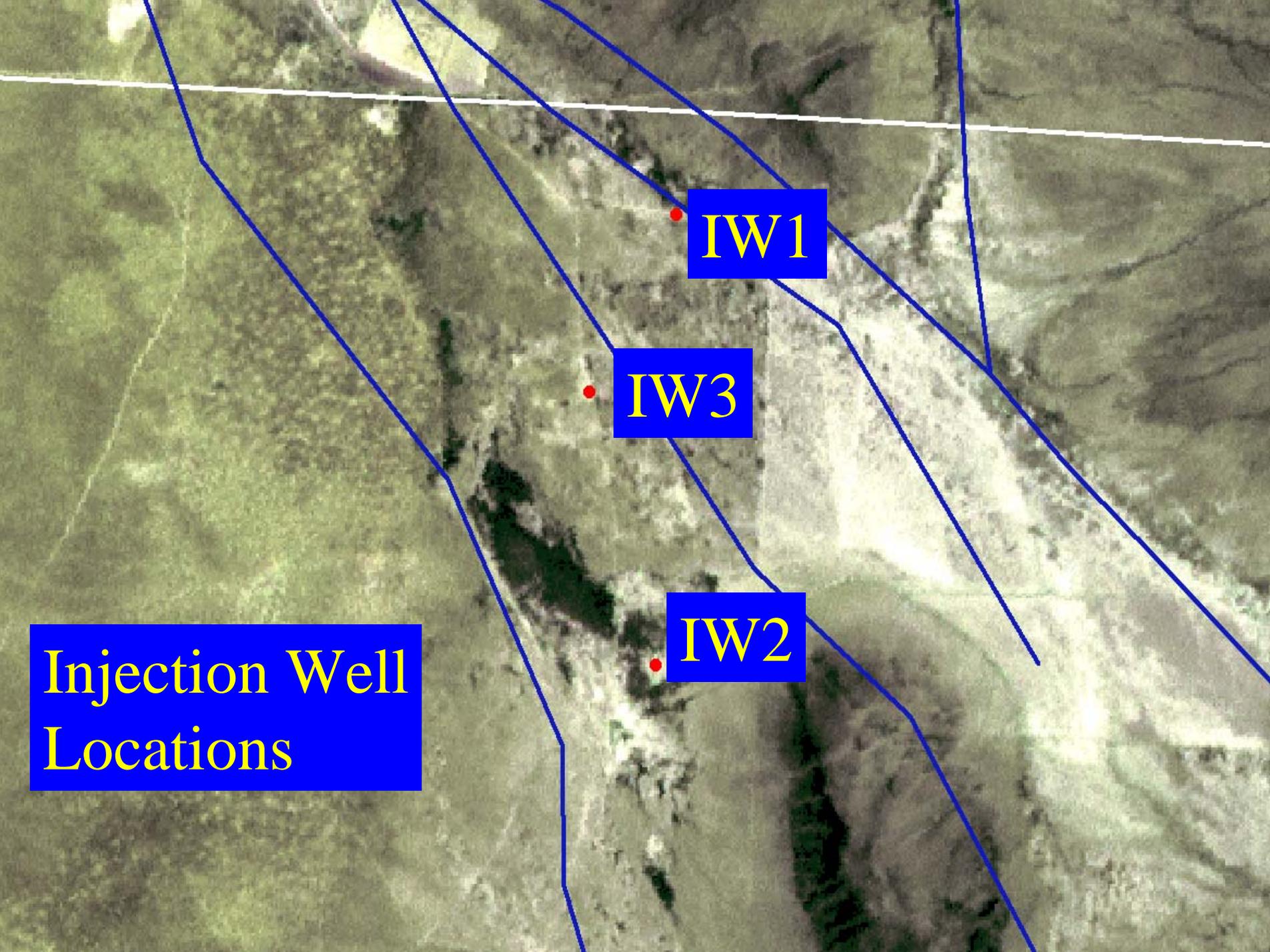
2347

2346

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35

2357

2357



IW1

IW3

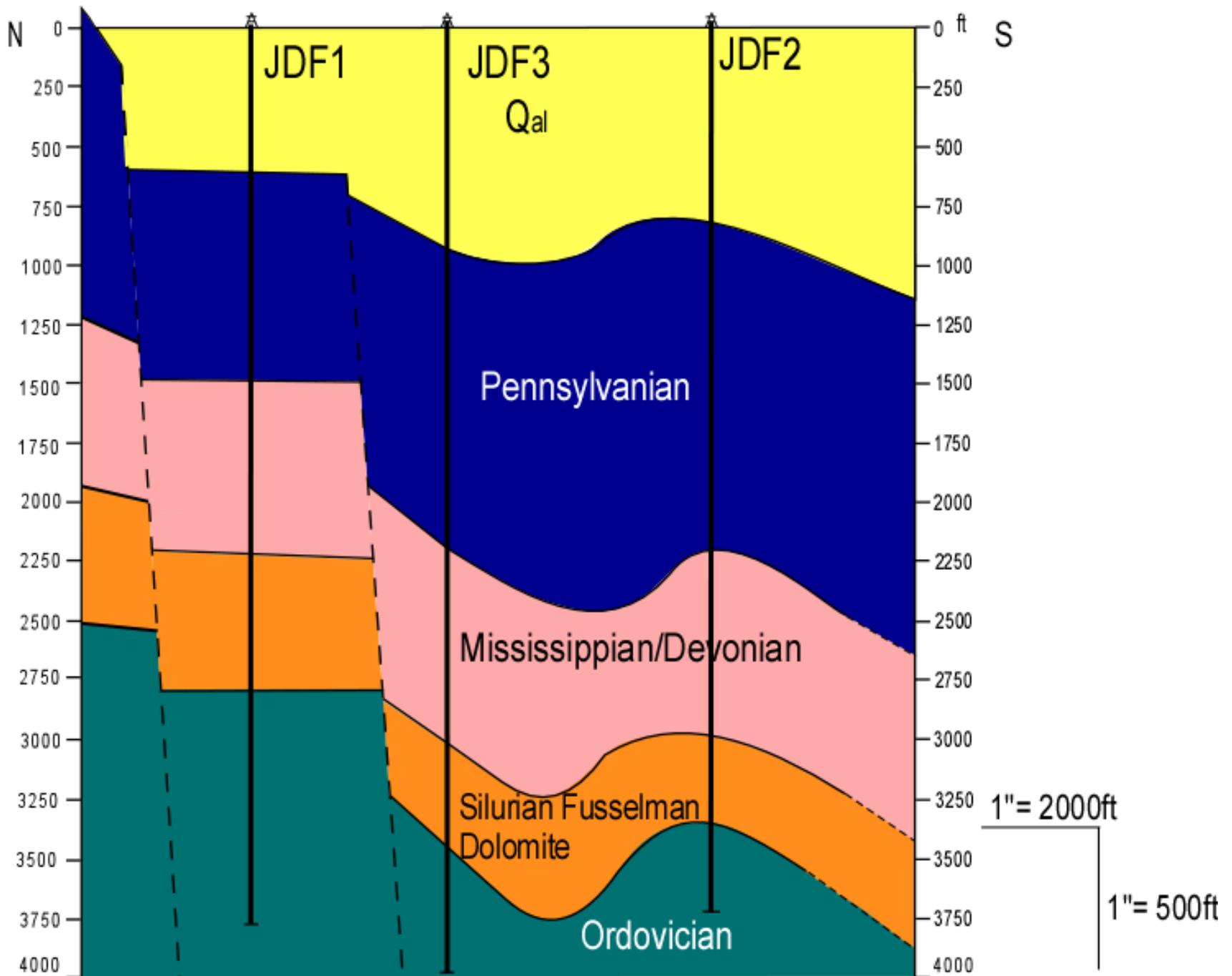
IW2

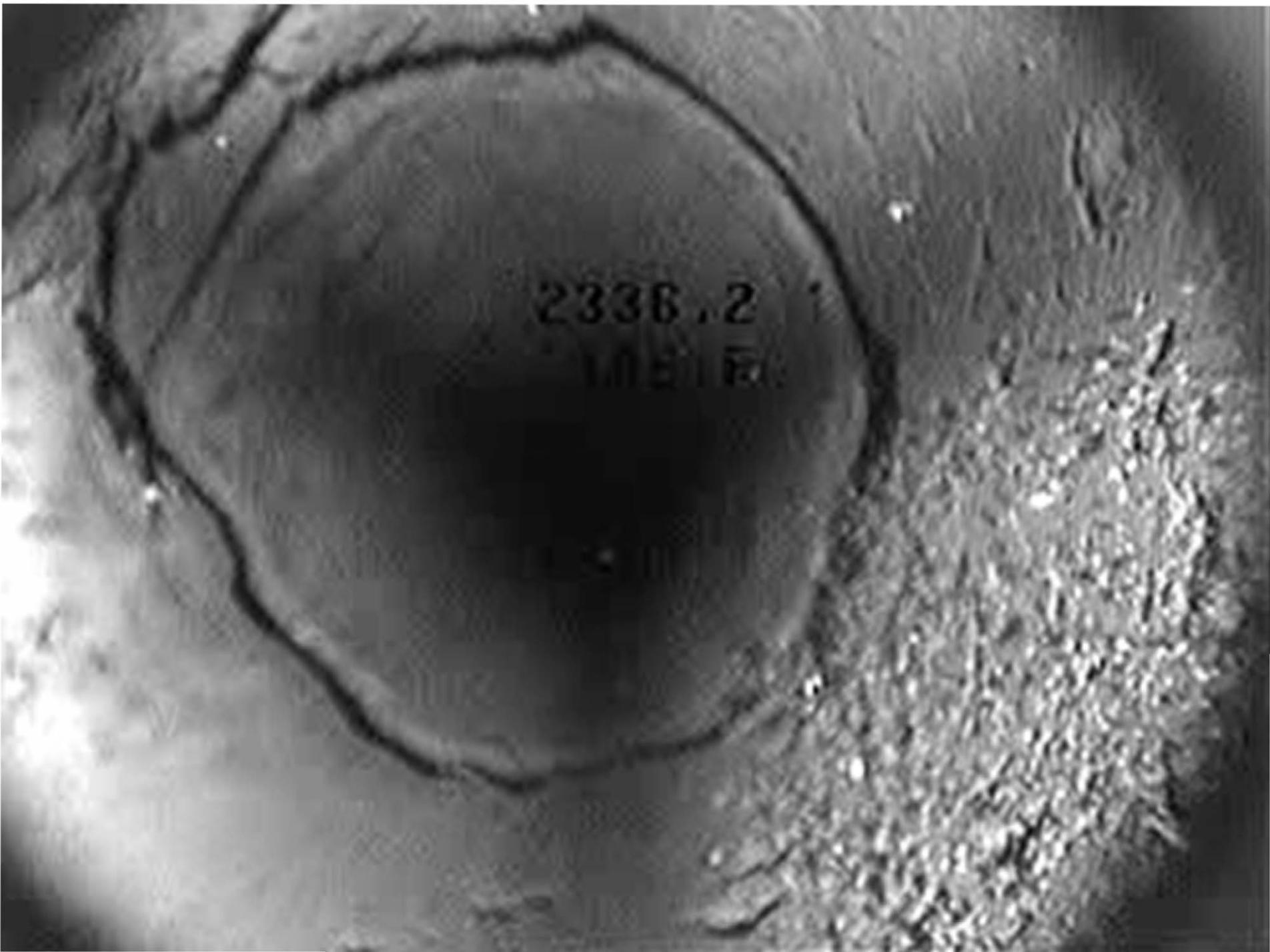
Injection Well  
Locations

# Injection Well Construction

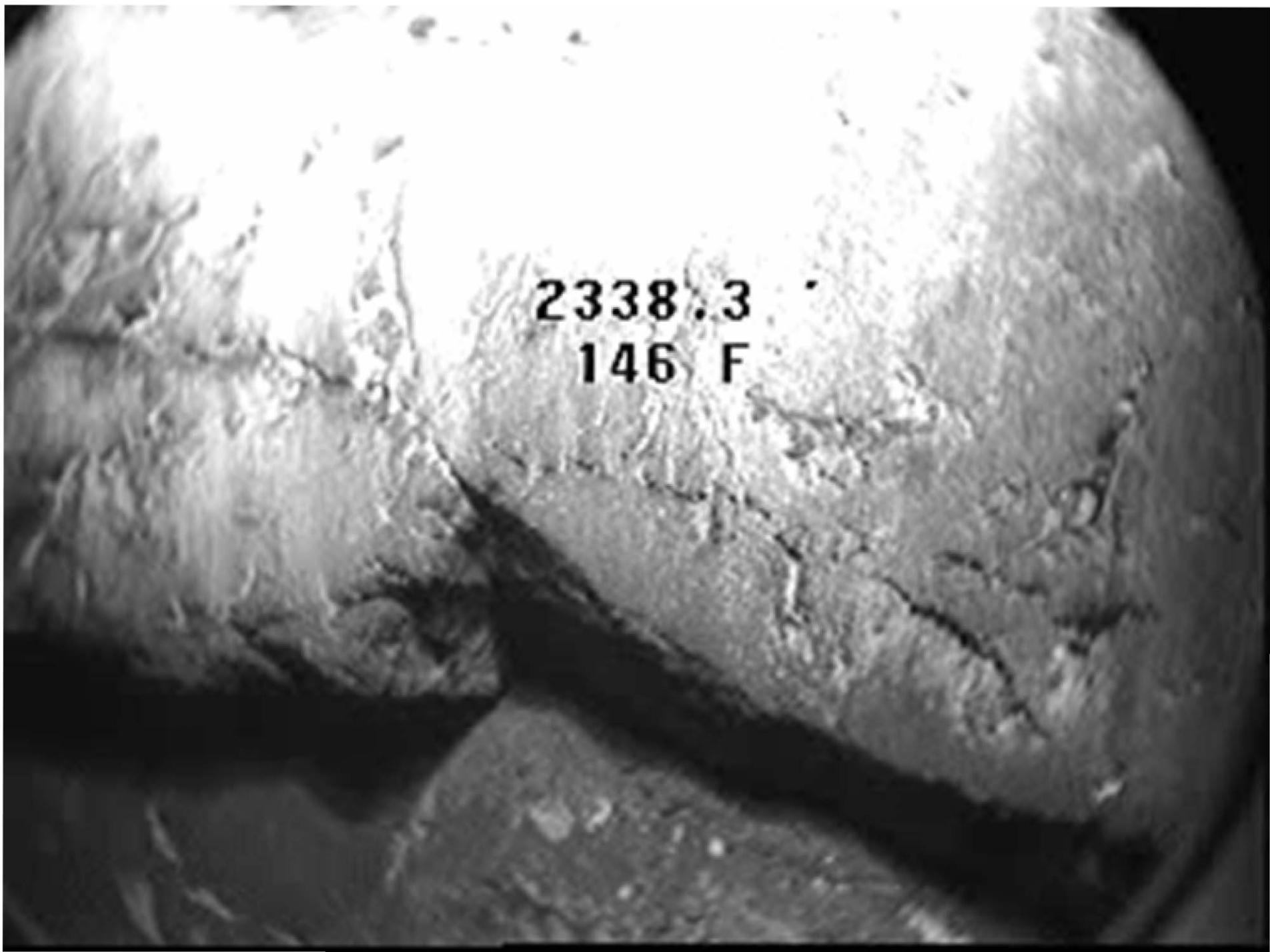
- Class I Standards
- Open Hole Injection Zone
- Well 1 (2004)
  - 3,777 ft deep
- Well 3 (2006)
  - 4,030 ft deep
- Well 2 (2007)
  - 3,720 ft deep







2336.2  
1051R



2338.3  
146 F

# Injection Well Summary

- Depth to Water (Static) ~ 500 ft
- Injection Capacity 1,400 to 2,000 gpm
- Depth to Water (Injection) > 350 ft
- Formation Water TDS ~ 8,800 mg/l
- Bottom Hole Temperature ~ 160°F

# Surface Injection Facilities

- Yard Piping
- Storage Tanks (~300,000 gal each site)
- Electrical System (solar w/ backup)
- Communications and Controls



# Injection Well Issues

- Reservoir capacity
  - Ongoing evaluation during initial operation of wells
- Potential for mineral precipitation
  - Concentrate is supersaturated with respect to:
    - Calcite
    - Barite
    - Silica

# Concentrate Disposal

- Test Hole Drilling Contract (USACE)
- 3 Injection Well Construction Contracts
- Surface Injection Facility Contract
- Downhole Equipping Contract
- Concentrate Pipeline Contract

*Period of Work: April 2003 to June 2007*

# 30-Day Commissioning Test

- Originally Scheduled for May and June 2007
- Scenarios:
  1. One Skid (low flow)
  2. Two Skids (low flow)
  3. Three Skids (low flow)
  4. Four Skids (low flow)
  5. Five Skids (low flow)
  6. Five Skids (max flow)
  7. Two Skids (high flow)



# Start-up Issues

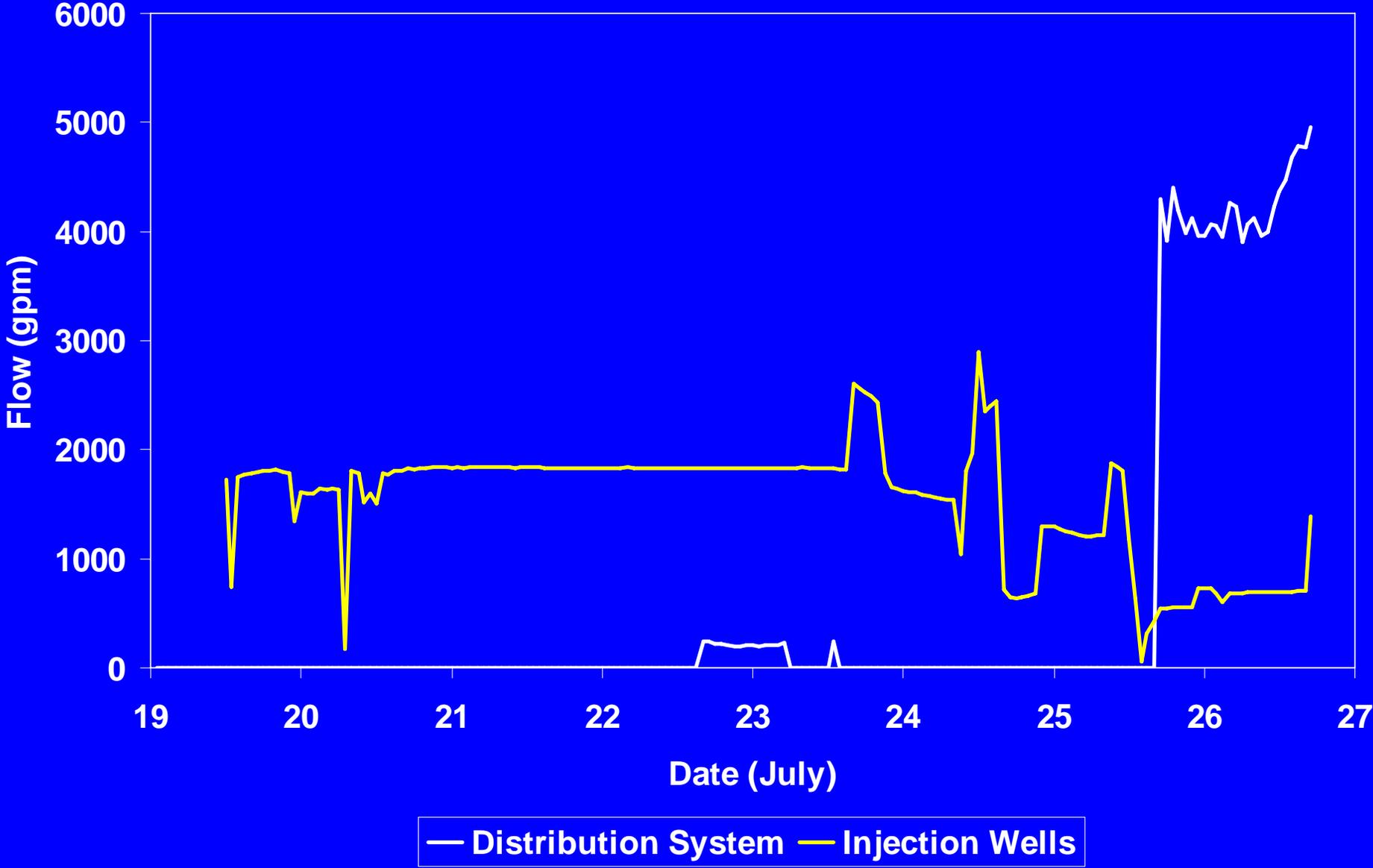
- Programming of Control System
- Communications with Wells
- Plant Equipment



# Start-up Summary

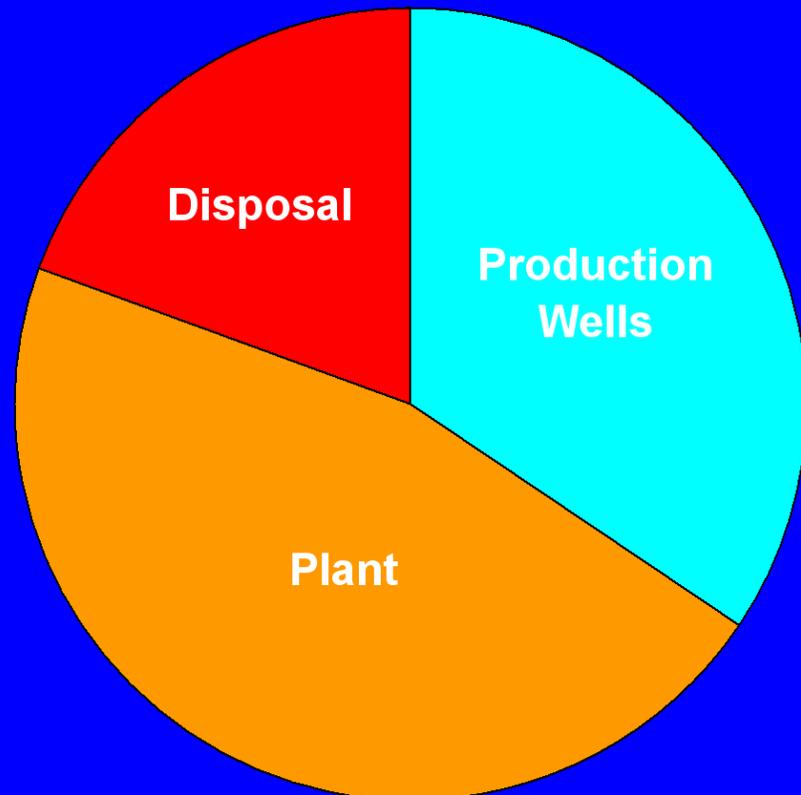
- Began July 19, 2007
- Currently running Scenario 6

# Finished Water to Distribution and Flow to Injection Wells



# Capital Costs

- Production Wells and Collectors \$ 30 Million
- Plant and Near-Plant Pipes \$ 40 Million
- Concentrate Disposal \$ 17 Million



**Total Cost:**  
**\$87 Million**  
(21 Contracts)

# Sources of Funding

# Annual Operating Costs

Assumes \$0.07/kwh and 80% Operation

• Wells, Collectors	\$ 700,000
• Ft Bliss (water and land)	\$ 1,300,000
• Desalination Plant	\$ 2,600,000
• Disposal	\$ 200,000
• Finished Water Pipeline	\$ 26,000
• <b>Total</b>	<b>\$ 4,826,000</b>

# Amortized Capital and O&M (\$/AF)

Assumes 5% Discount Rate

# Cost Comparison

