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VALLEY WATER  
MANAGEMENT  
COMPANY



**Cawelo Water District Beneficial Reuse Program**  
Food Safety Expert Panel Meeting - January 12, 2016  
Abby Auffant, Chevron Water Regulatory Coordinator  
David Ansolabehere, Cawelo Water District General Manager

# Agenda



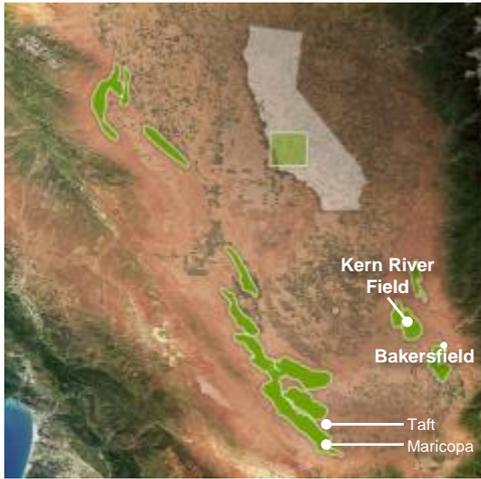
- Introductions
  
- Chevron
  - Kern River Field / Heavy Oil Overview
  - Water Handling at Kern River Field
  
- Cawelo Water District
  - Valley Water Management Company
  - Water Handling and Distribution



# Kern River Field Historical Overview



# Kern River Operations The Kern River Field



# Kern River Operations Discovery!



- Discovery well dug by hand to 75' in **May 1899**
- Thick, gooey oil was struck at a depth of 43'
- By 1903, there were **800 wells** and **400 companies** in the Kern River Field



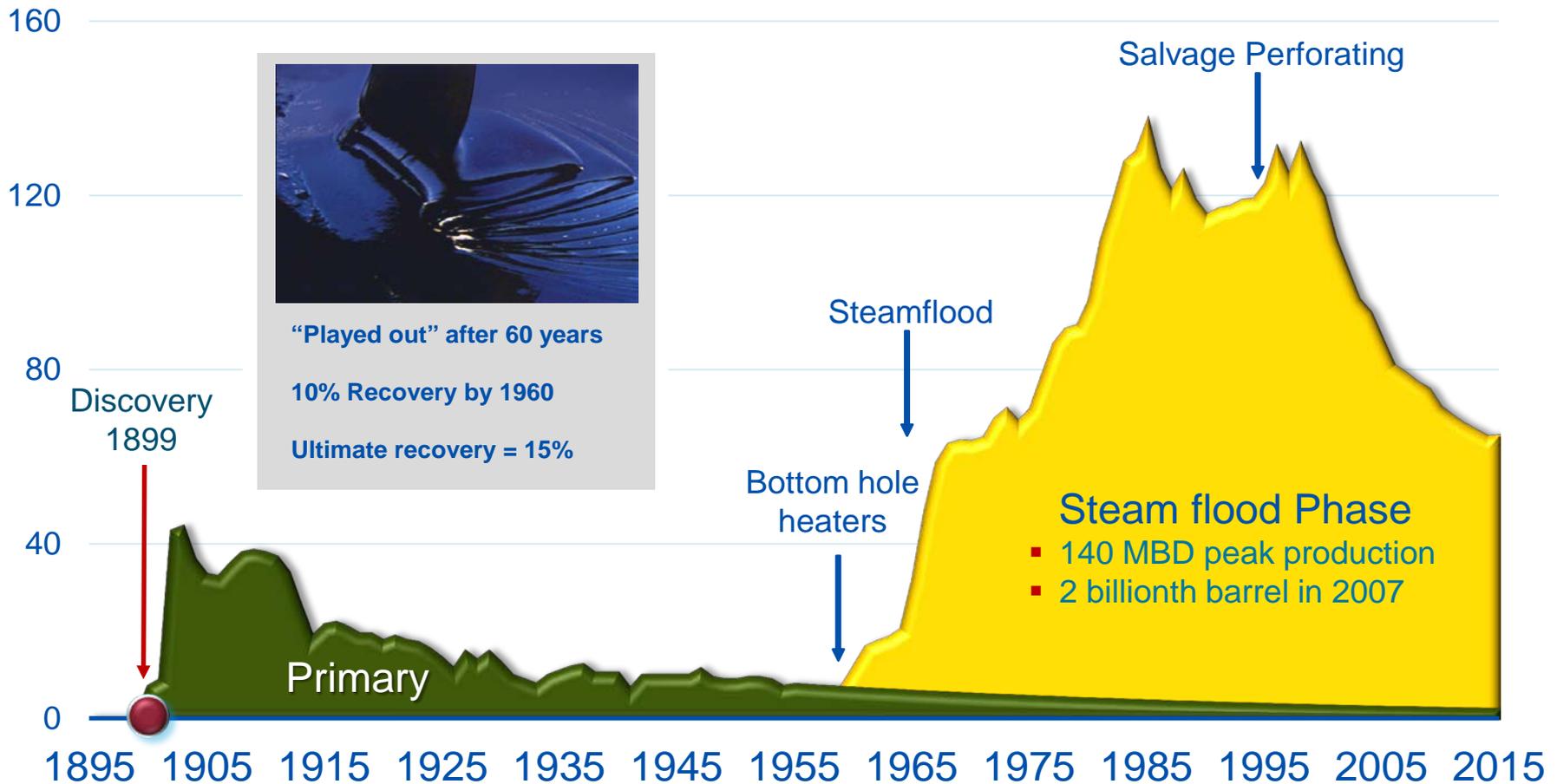
*Kern River Field  
1899.*

# Kern River Operations Production and the Impact of Steam Flooding

## Production

(thousands of barrels per day)

- Steam Flooding introduced - 1960's
- Second peak oil event
- Recovery exceeding 60% of Original Oil in Place

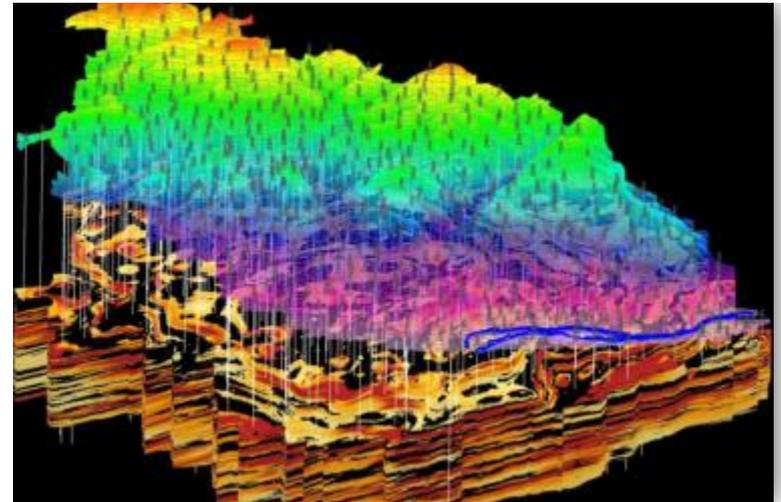


# Kern River Operations

## Kern River Field Today



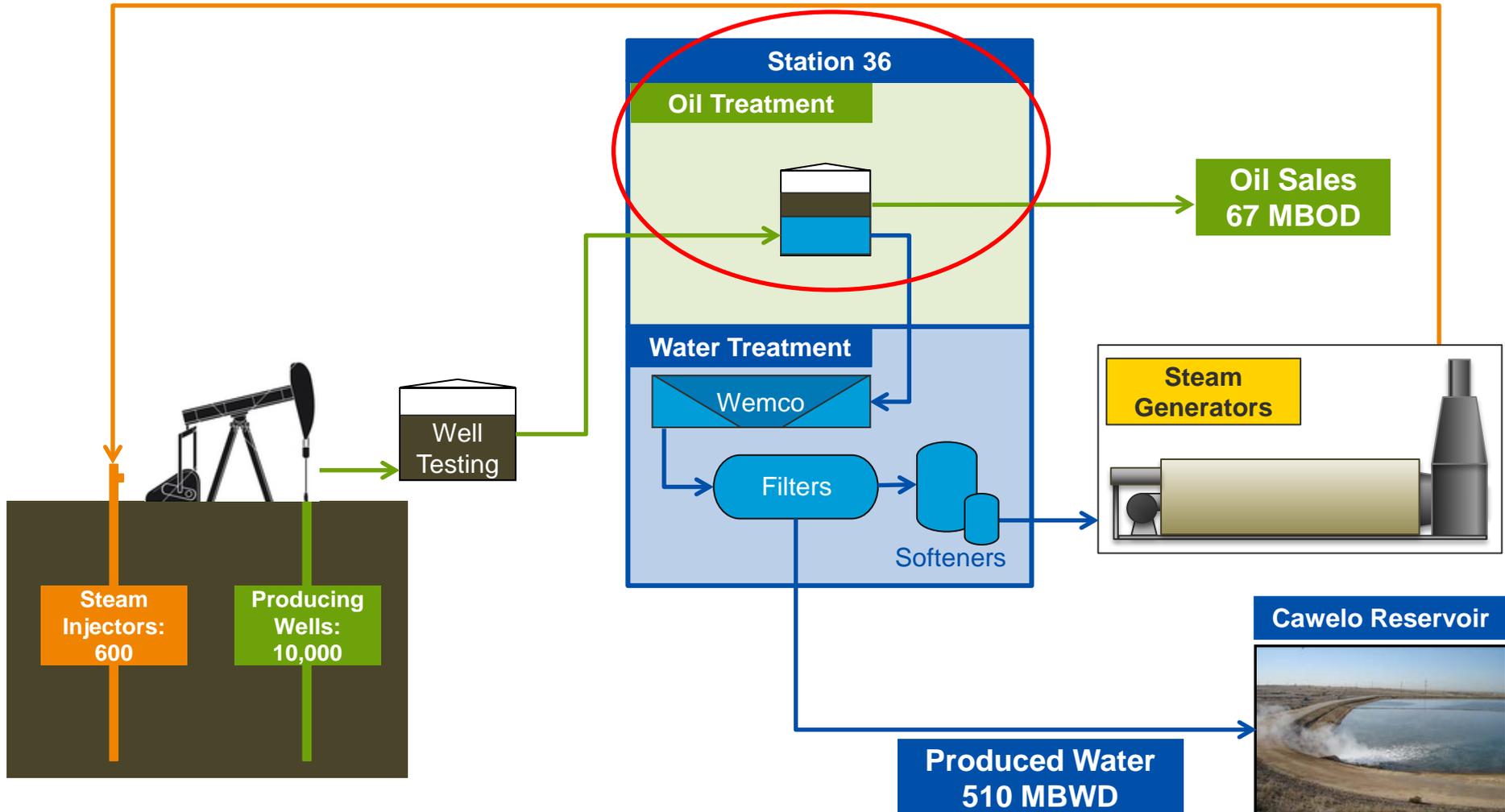
- **20** square miles
- **10,000** producing wells
- **67,000** barrels of **OIL** per day produced
- **783,000** barrels of **WATER** per day produced
- **250,000** barrels of **STEAM** per day injected
- **3rd** largest oil field in California
- **10th** largest oil field in United States



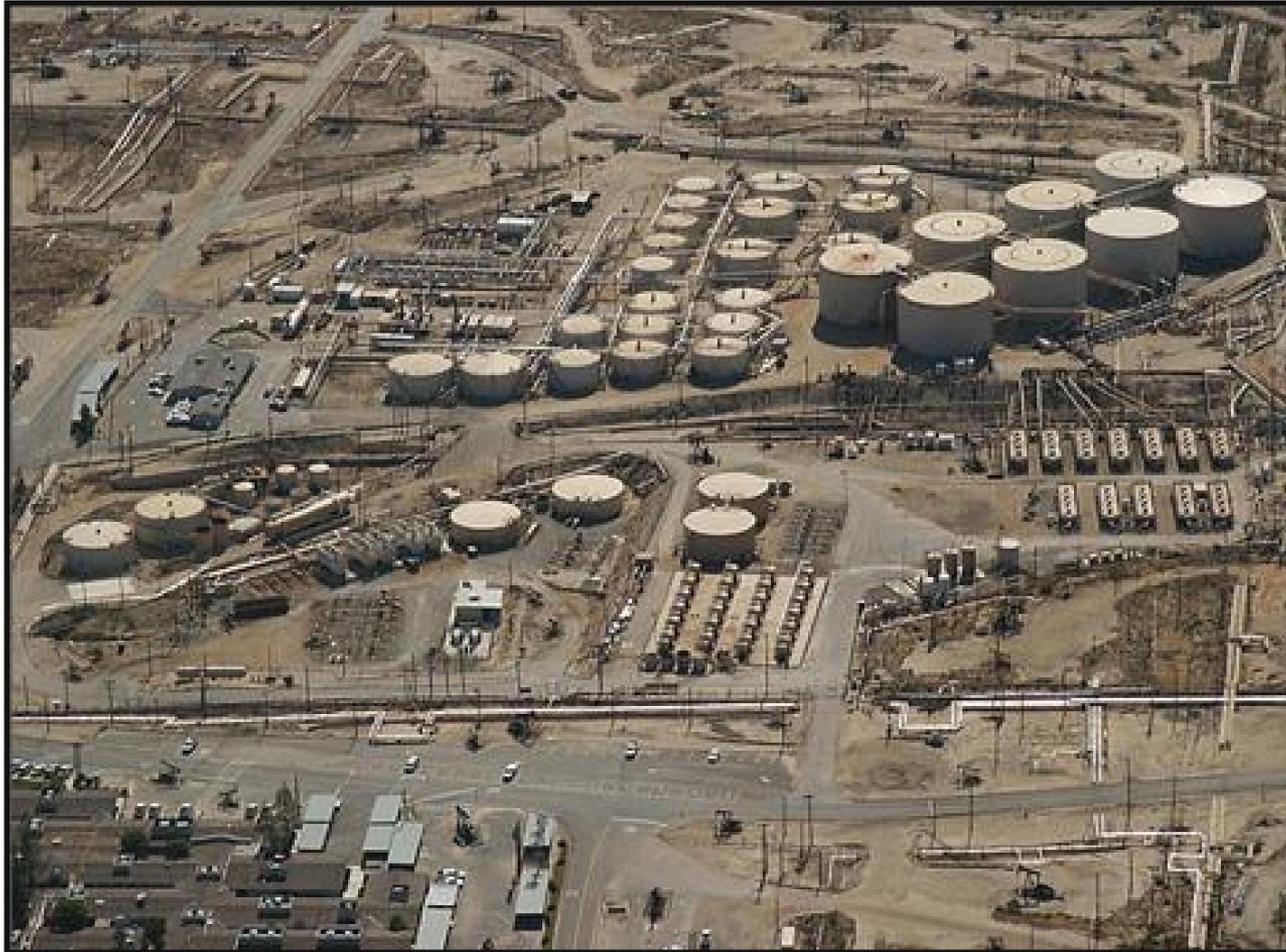
# Kern River Field Production System Overview



**Steam Injection  
250 MBSD**



# Kern River Field Station 36 Overview



# Kern River Field Station 36 Processing Facility



12:1 Water/Oil Ratio

Oil Production

67 MBOPD

Water Processing

Cawelo

510 MBWPD

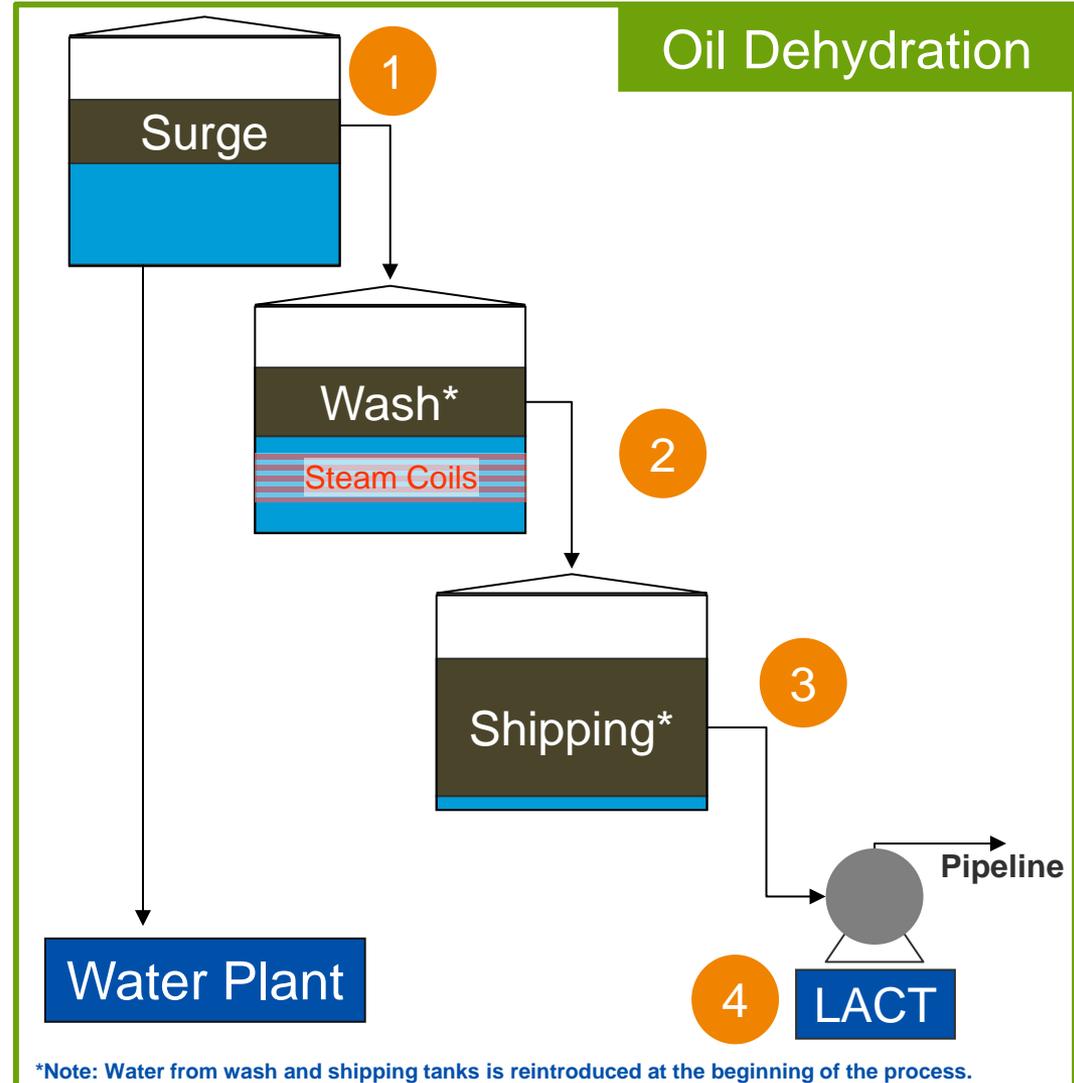
Field Use

23 MBWPD

Steam

250 MBSPD

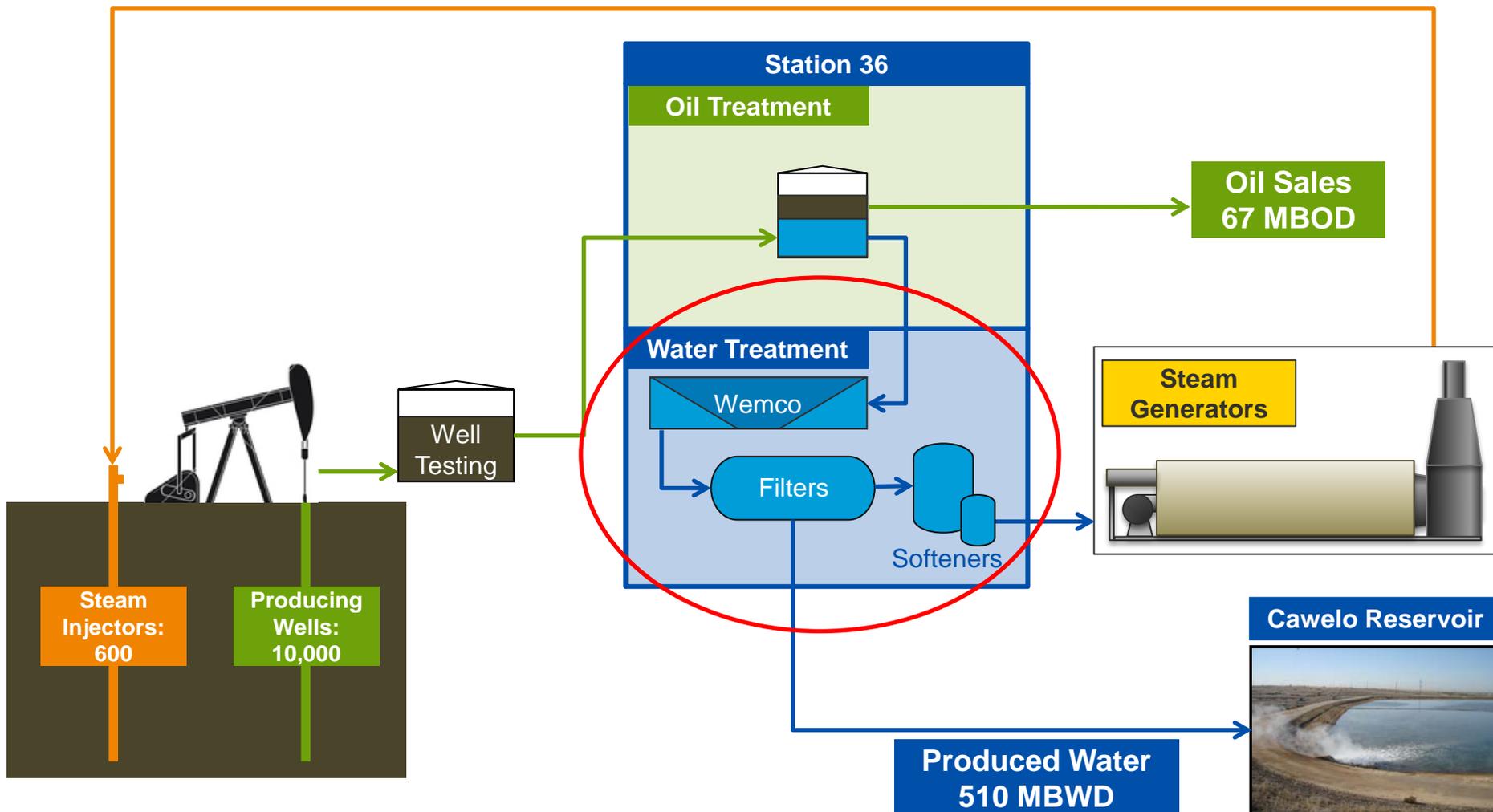
# Kern River Field Oil Treatment Process



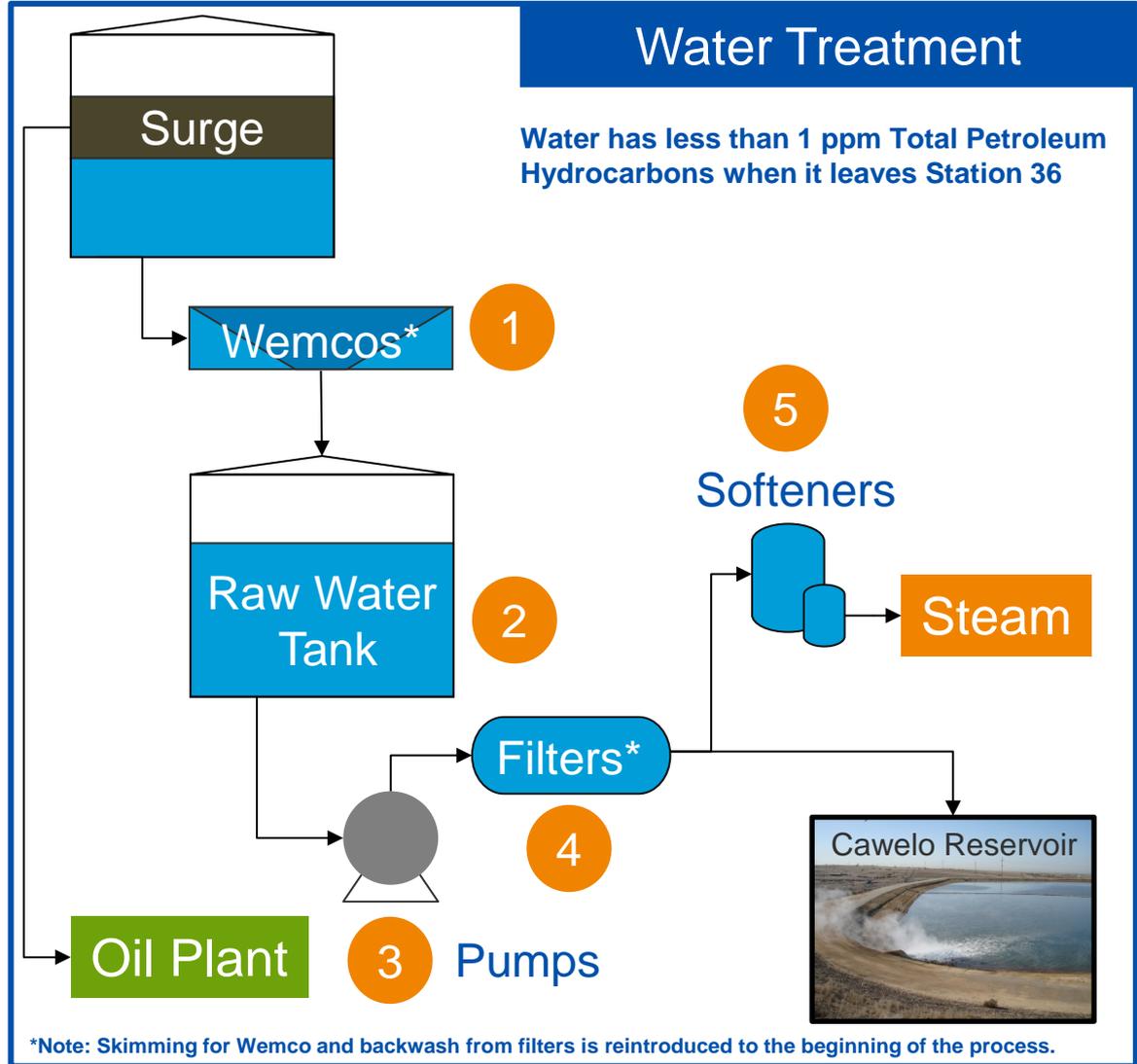
# Kern River Field Production System Overview



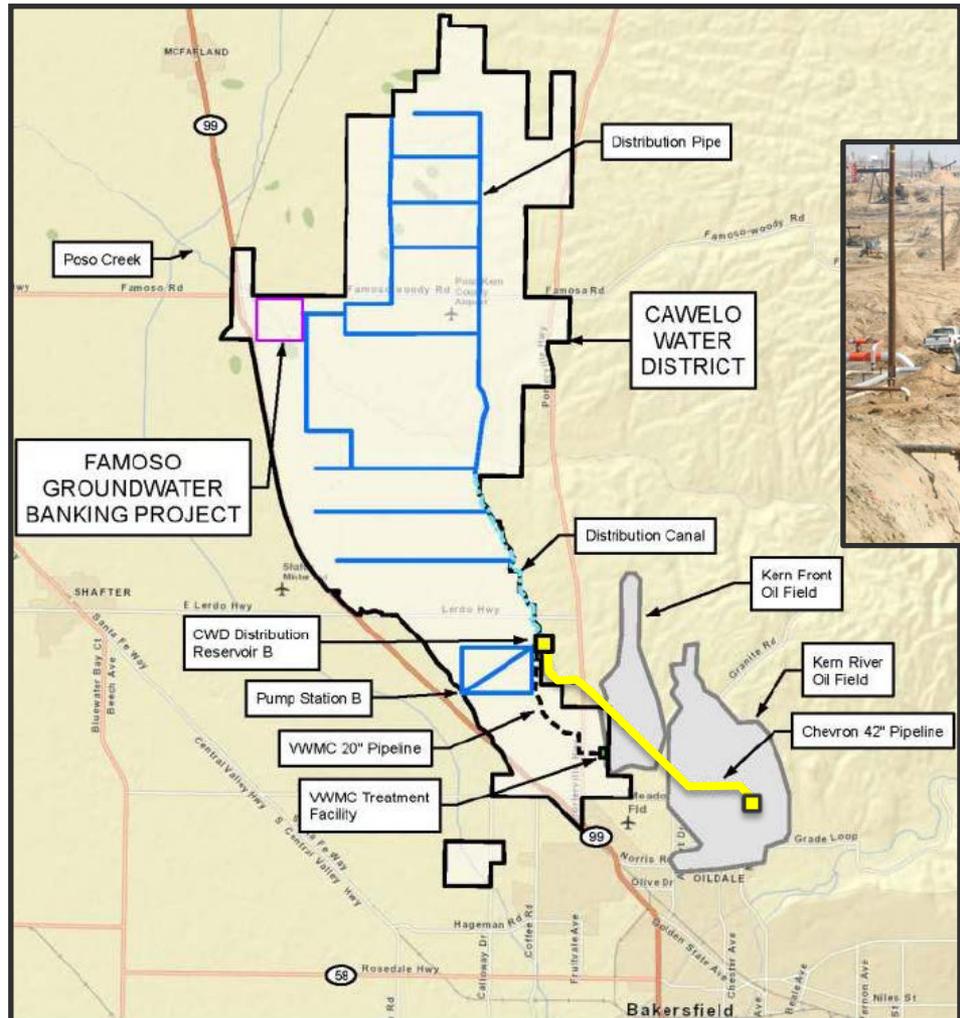
Steam Injection  
250 MBSD



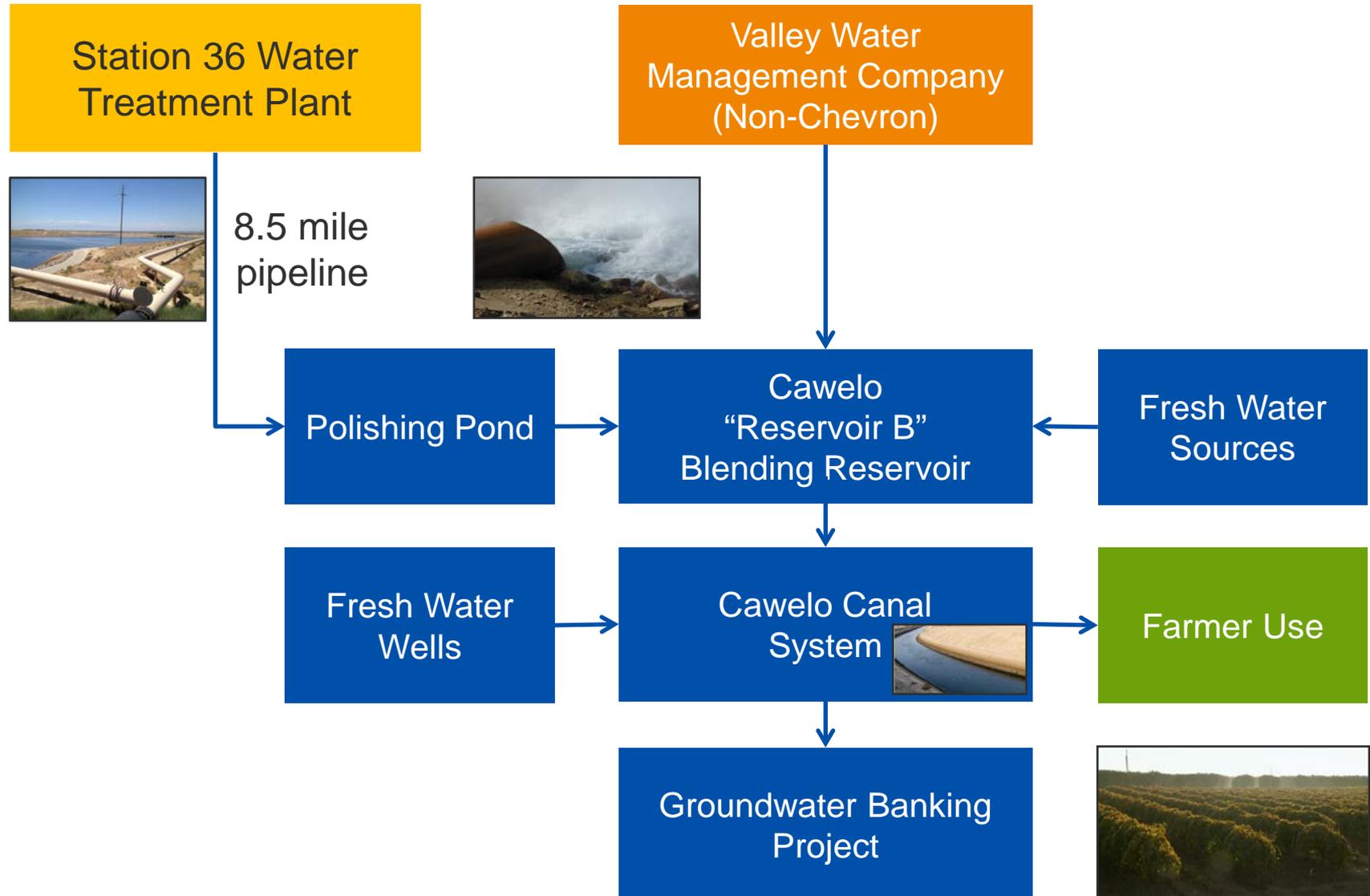
# Kern River Field Water Treatment Process



# Providing Produced Formation Water for Beneficial Use in Cawelo Water District



# Providing Produced Formation Water for Beneficial Use in Cawelo Water District



# Cawelo Water District



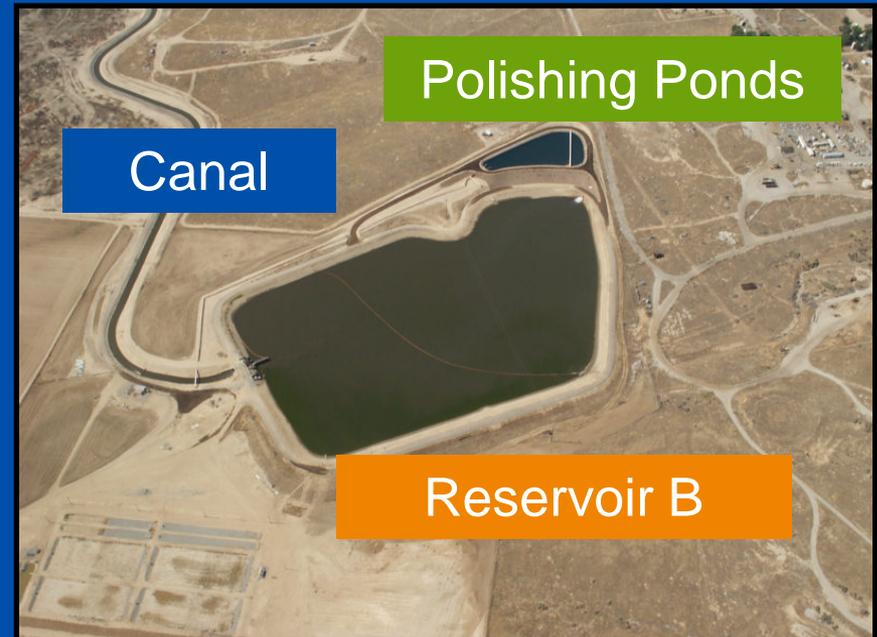
- Beneficial reuse of produced water for local water district for over 20 years
- 500,000+ barrels of water per day pumped
- Solely for agricultural use
  - Benefits 90 farmers
  - Primarily “permanent” crops such as citrus, nuts, and grapes



# Safeguards to Ensure Water Quality



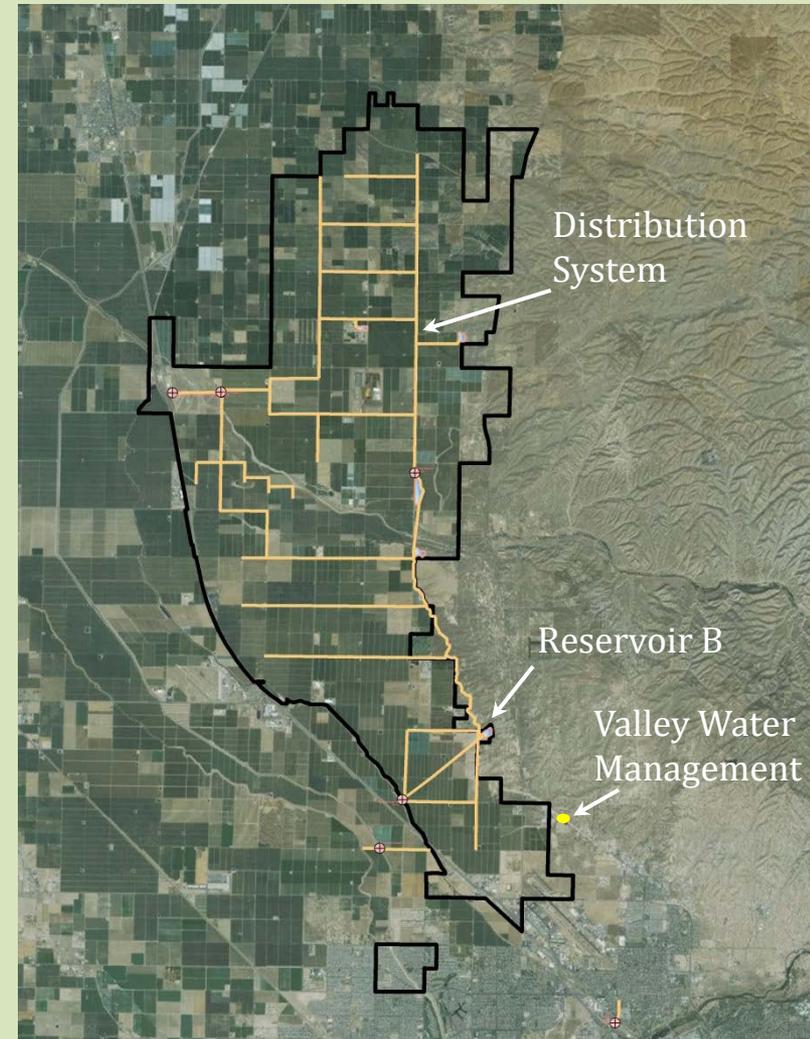
- Continuous monitoring and alarm management of water in the Chevron facility
- Operator Routine Duties:
  - Test water quality entering the plant
  - Inspect water leaving the plant
  - Daily inspection at Cawelo facility
- Cawelo Facility:
  - Booms and skimmers
  - Weekly cleaning at polishing pond
- Monthly sampling (reported quarterly to Water Board)



# Cawelo Water District Beneficial Reuse Program



- Program has been permitted irrigating crops for over 20 years
- All Produced Waters discharged to Cawelo are sampled and tested monthly by a third party laboratory
- Cawelo's Program has long history of compliance with standards set by CVRWQCB
- Providing irrigation to 34,000 acres of crops
- World Class crops include Citrus, Almonds, Pistachios, and Grapes



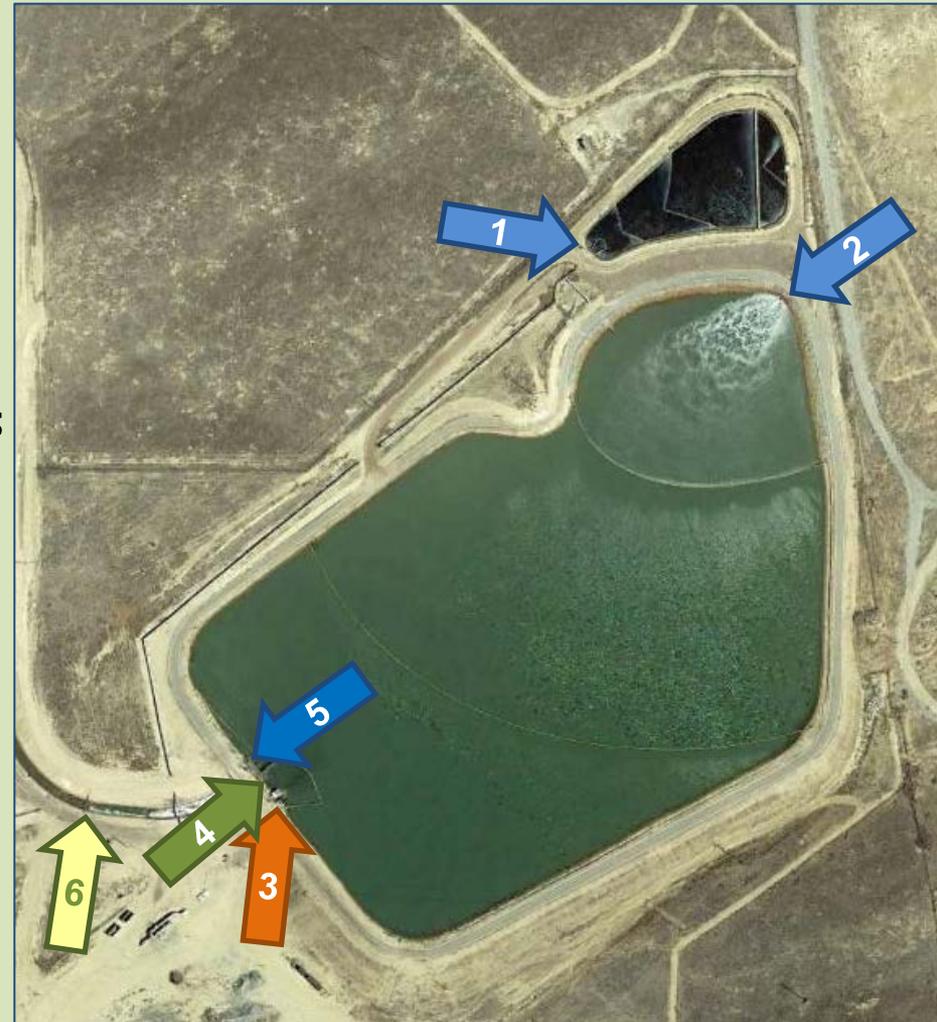
## **Cawelo Water District Valley Water Management Operations**

- Valley Water Management's facility has been in operation since 1980
- Produced fluids enter gravity separation ponds
- Produced Water treated through Depurators (Wemcos) to remove any residual oil
- Produced Water pumped through 3.5 mile pipeline to Reservoir B



## Cawelo Water District Blending Facility

- Chevron Produced Water enters Polishing Pond (1)
- Chevron Produced Water enters Reservoir B (2)
- Valley Water Produced Water enters Reservoir B (3)
- Cawelo's Imported Surface Water enters Reservoir B (4)
- Outflow to Distribution Canal (5)
- Pumped Groundwater enters Distribution Canal (6)



# Cawelo Water District Program Volumes



## Average Volumes (Last ten years)

Source	bbls/day	Acre-feet/ day	Annual Acre-feet
Chevron	500,000	63	23,500
Valley Water	100,000	13	4,800
Groundwater	168,000	22	7,900
Imported Surface Water	1,200,000	153	56,000

### Average Ratio

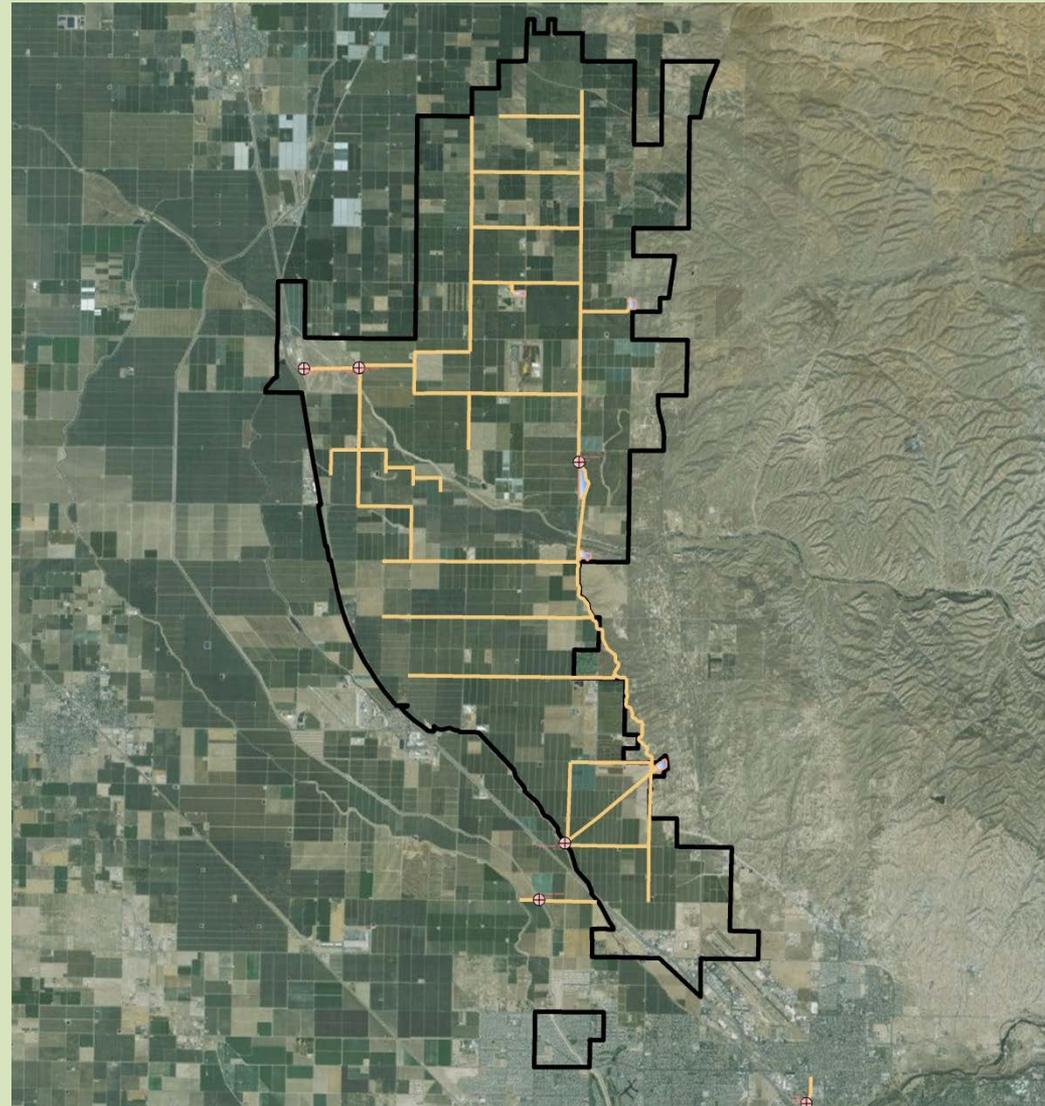
Imported/Groundwater to Produced Water

2.2 : 1

# Cawelo Water District Program Benefits



- Produced Water reduces Farmer's reliance on groundwater and supports the sustainability of our groundwater basin
- Produced Water is a critical water resource for Farmers to continue operations due to issues in the Sacramento Delta
- The provision of Produced Water to Cawelo for irrigation purposes has been run appropriately for the benefit of California agriculture and in accordance with all regulatory requirements





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