

# REMEDICATION SOLUTIONS FOR REMOTE O&G LOCATIONS



*LT Environmental, Inc.*  
Advancing Opportunity

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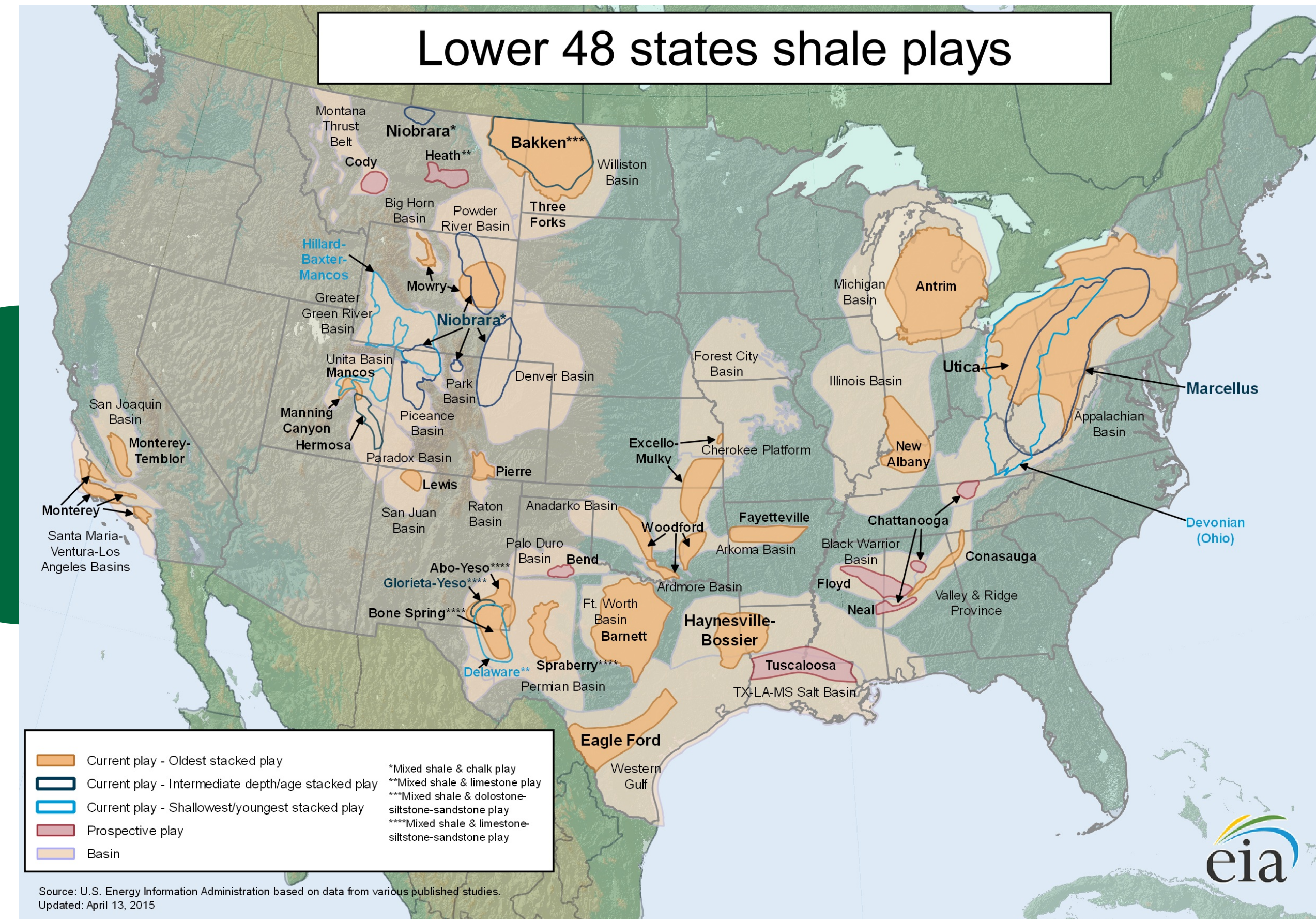


# REMOTE SITES ARE COMMON

CHALLENGES CAN BE OVERCOME WITH INNOVATION

## REMOTE SITE CHALLENGES

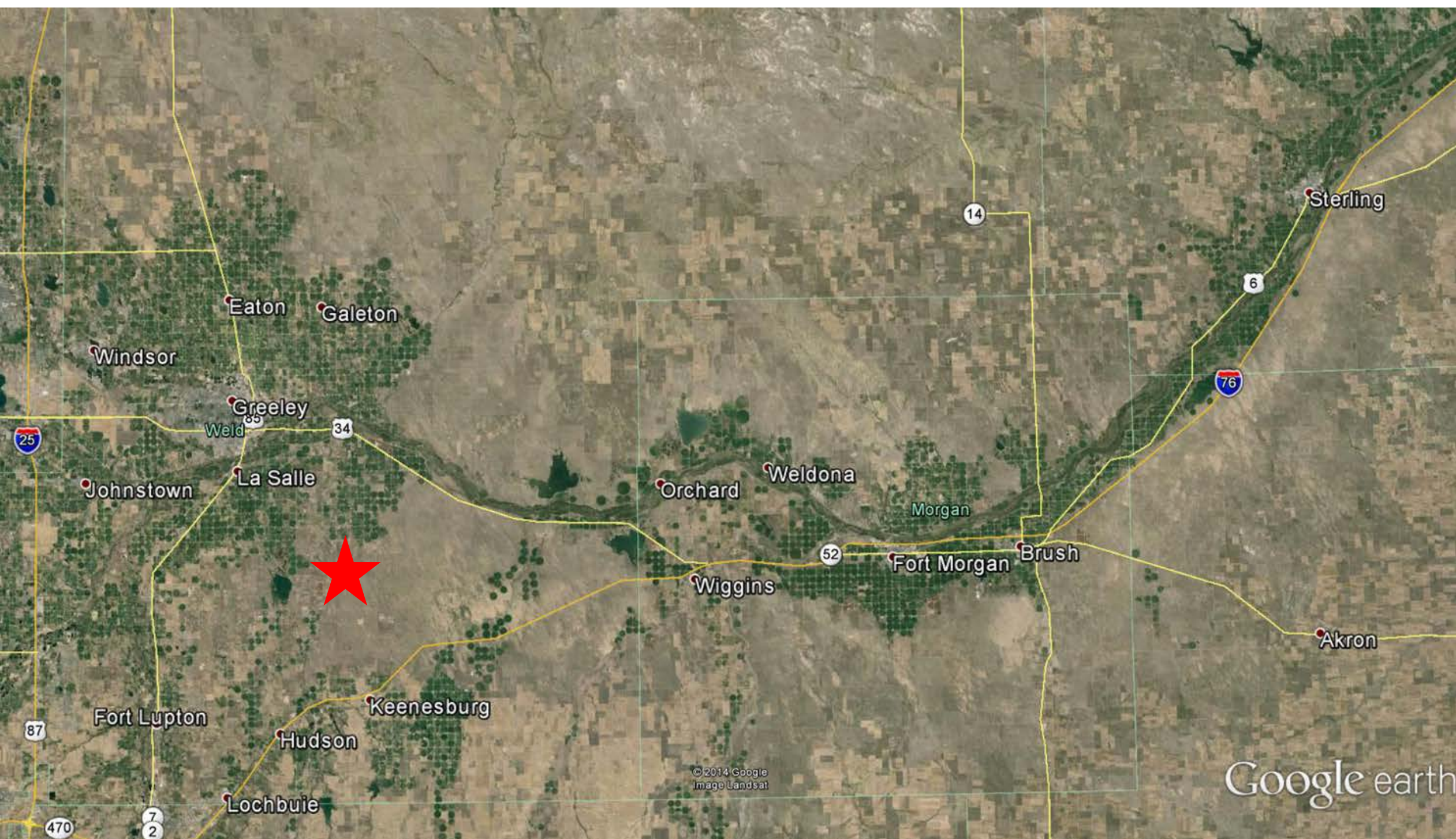
- Infrastructure Limitations (Power)
- High Personnel Mobilization Costs
- High Trucking Costs/Tipping Fees



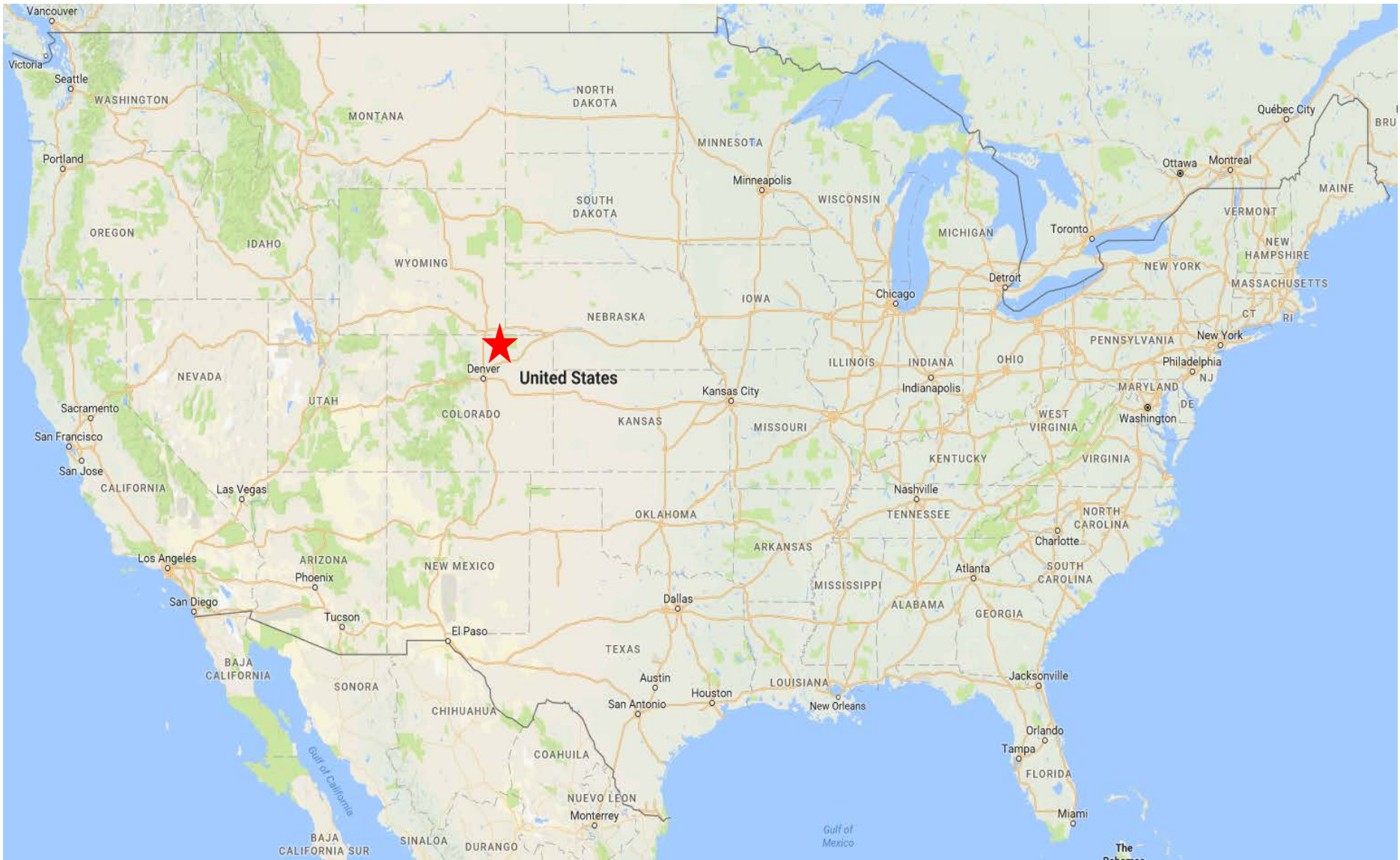


# CASE STUDY #1

DENVER-JULESBURG BASIN - COLORADO



## CONDENSATE RELEASE IN THE DENVER-JULESBURG BASIN



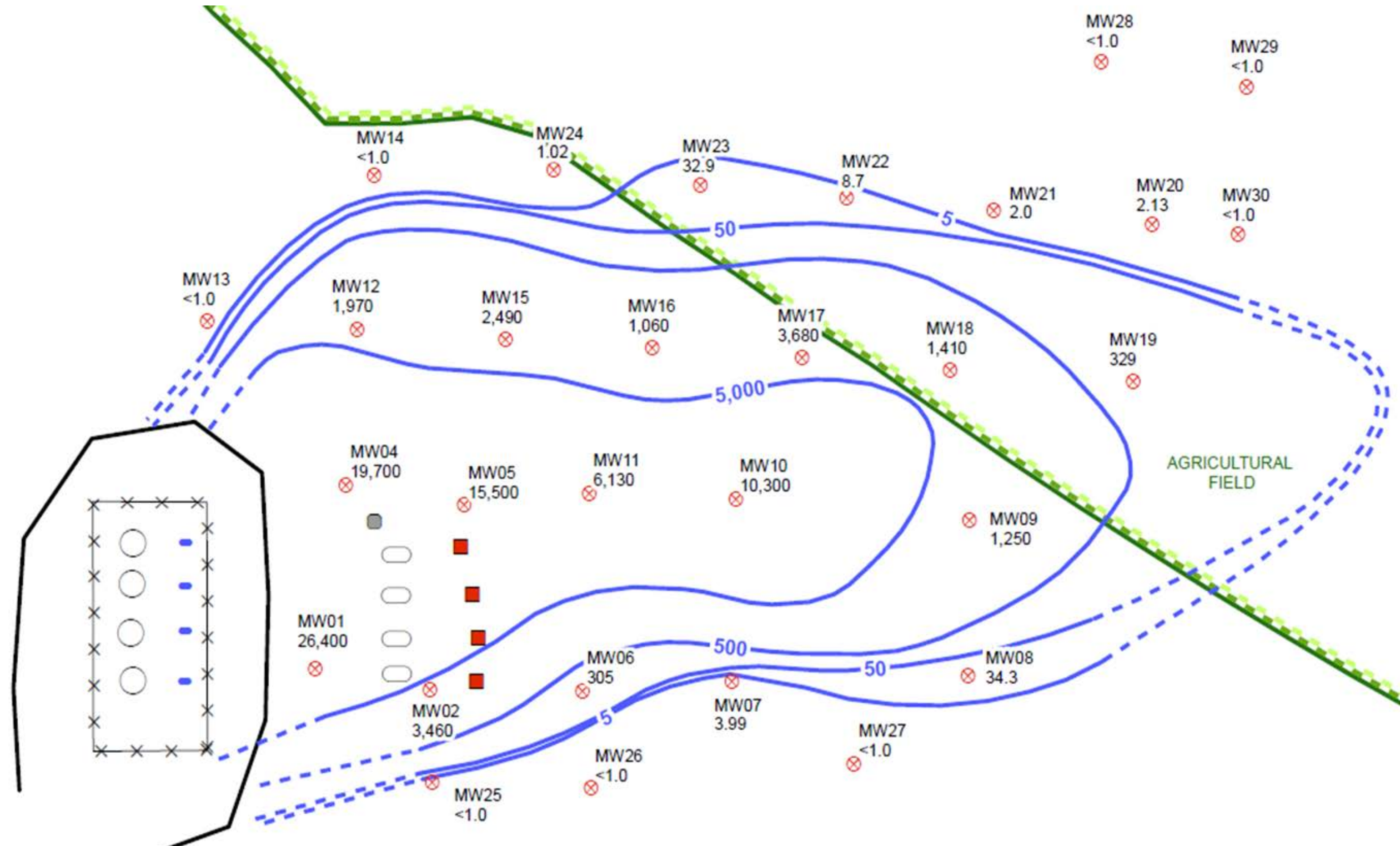


# CASE STUDY #1

DENVER-JULESBURG BASIN - COLORADO

## BENZENE GROUNDWATER PLUME

- Excavation of release area
- Benzene impact 500 feet long by 100 feet wide
- High of 26.4 mg/L –with some detectable LNAPL
- Mix of sand, clays, underlain by weathered claystone

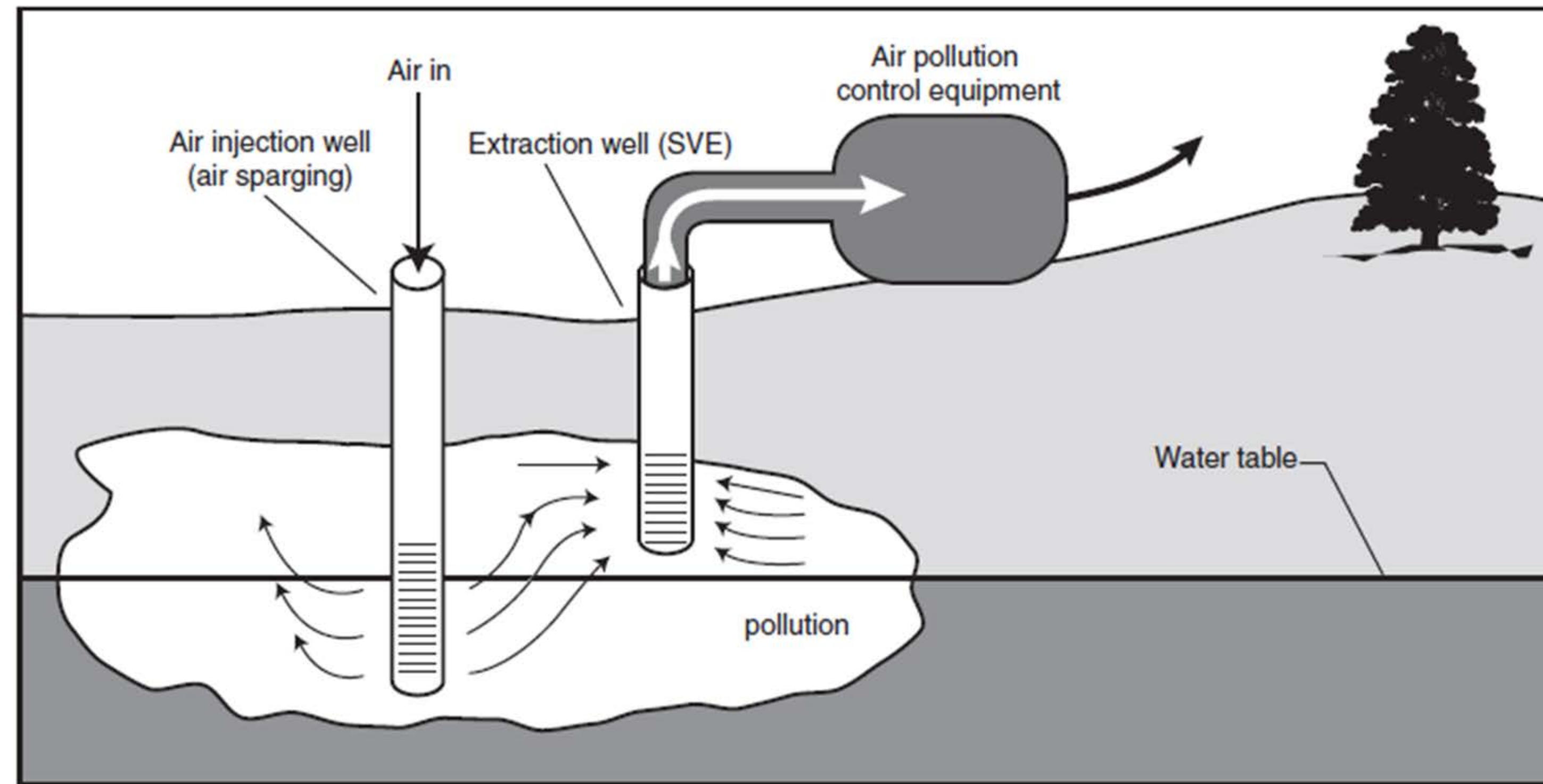


# CASE STUDY #1

DENVER-JULESBURG BASIN - COLORADO

## AIR SPARGE/SOIL VAPOR EXTRACTION (AS/SVE)

- Good fit due to relative large extent and high benzene concentration
- Pilot tested technology due to geology. Recommended if geology is competent or fine-grained
- Good site assessment key to success





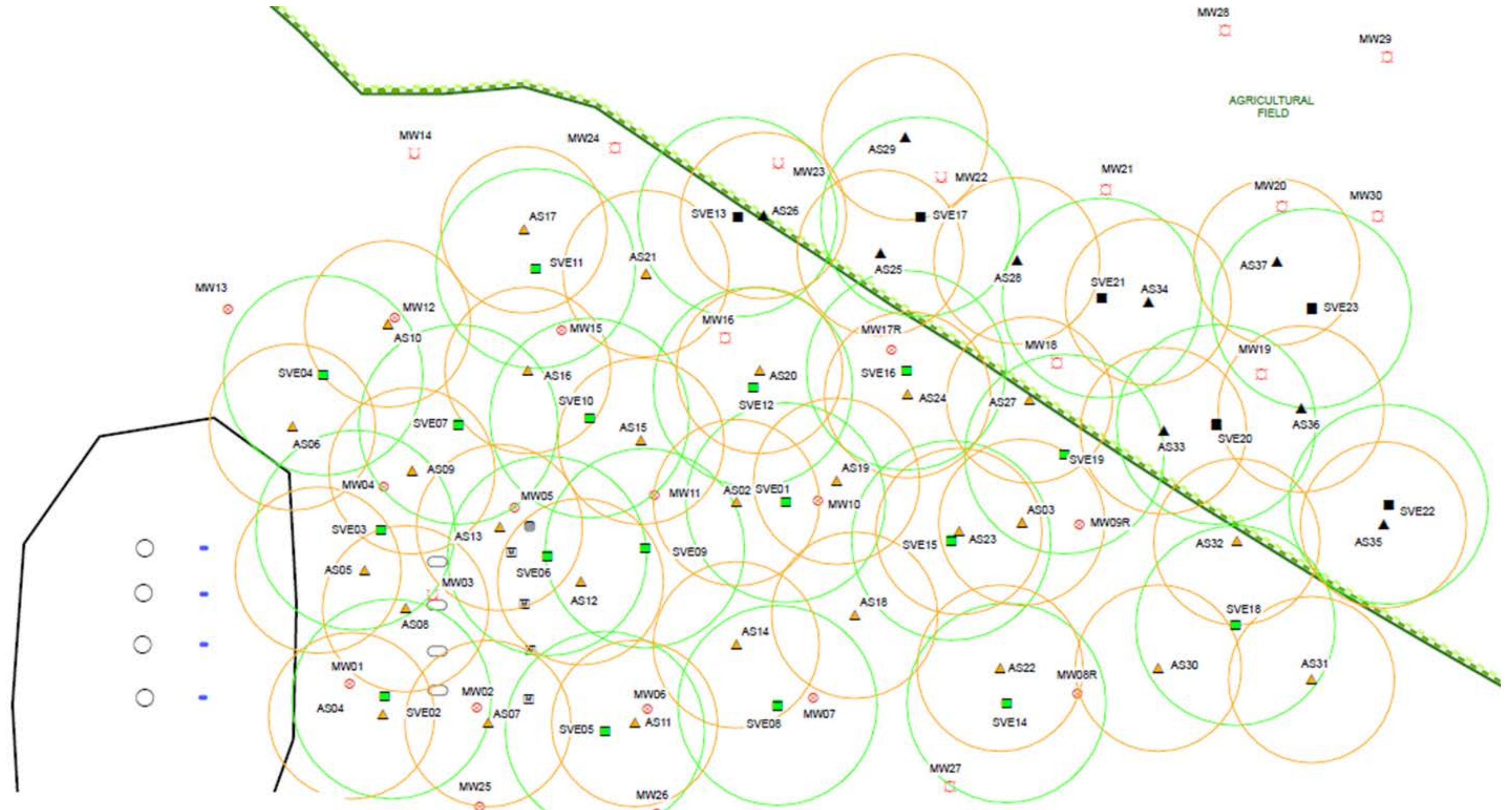
# CASE STUDY #1

## DENVER-JULESBURG BASIN - COLORADO

DENVER-JULESBURG BASIN - COLORADO

## AS/SVE WELL LAYOUT

- 37 AS wells with 20' radius of influence (ROI)
- 23 SVE wells with 30' ROI





# CASE STUDY #1

DENVER-JULESBURG BASIN - COLORADO

## AS/SVE NATURAL GAS TRAILER

- Hook directly to onsite separator
- 14 trailers in use by DJ Basin producers
- Telemetry capabilities
- 1st trailer on 9th site since 2006 (with engine rebuild)





# CASE STUDY #1

DENVER-JULESBURG BASIN - COLORADO

## AFTER 1.5 YEARS OF OPERATION

- 95% reduction
- Polished remaining groundwater with carbon injection





# CASE STUDY #2

ROCK SPRINGS, WYOMING



## HISTORICAL SKIM PIT ROCK SPRINGS, WYOMING



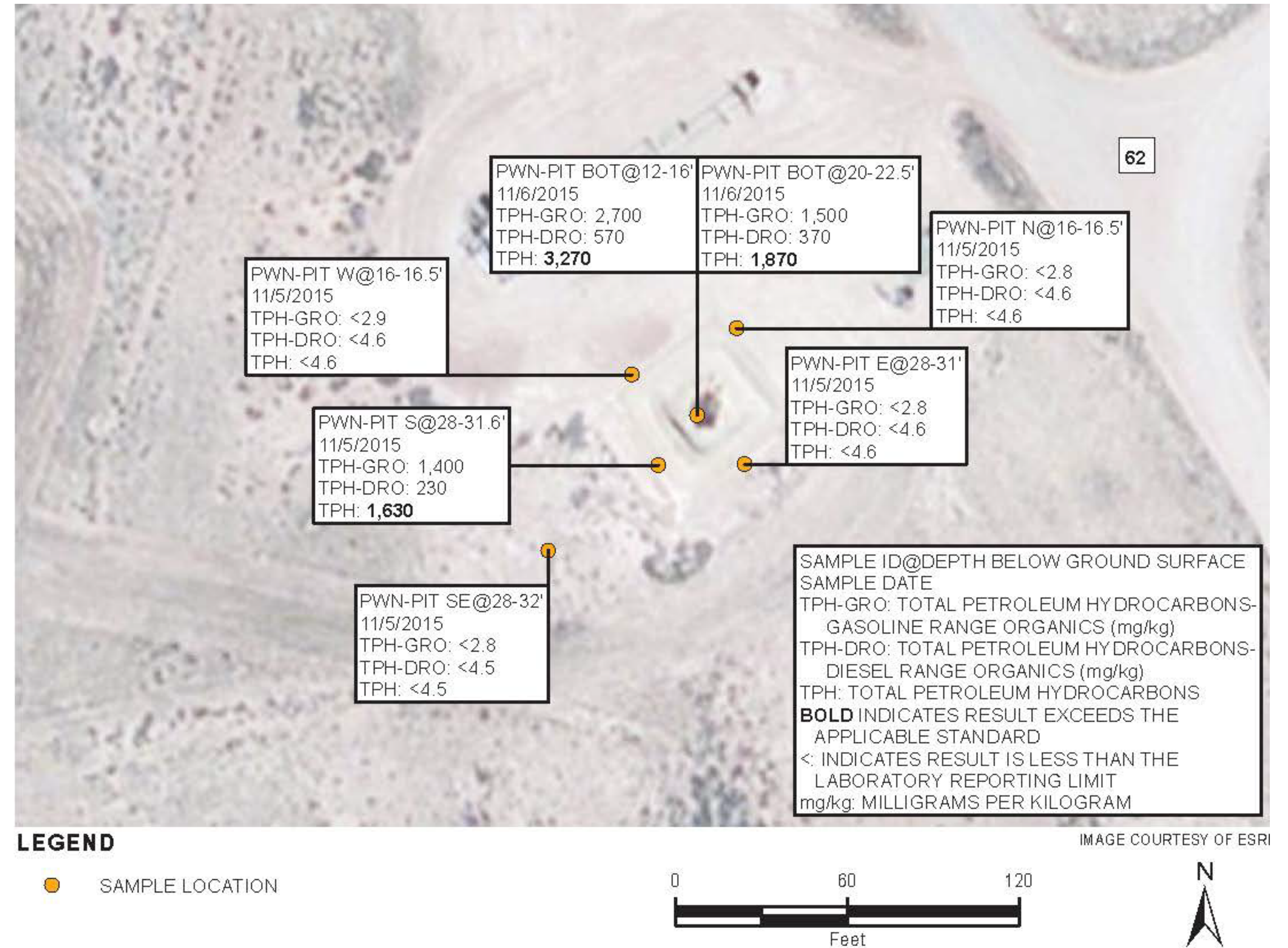


# CASE STUDY #2

ROCK SPRINGS, WYOMING

## HISTORICAL SKIM PIT

- 2,500 cubic yards impacted soil
- Total petroleum hydrocarbons (TPH) gasoline and diesel range organics
- 60 feet by 40 feet and up to 30 feet deep
- No power onsite but SVE best fit technology



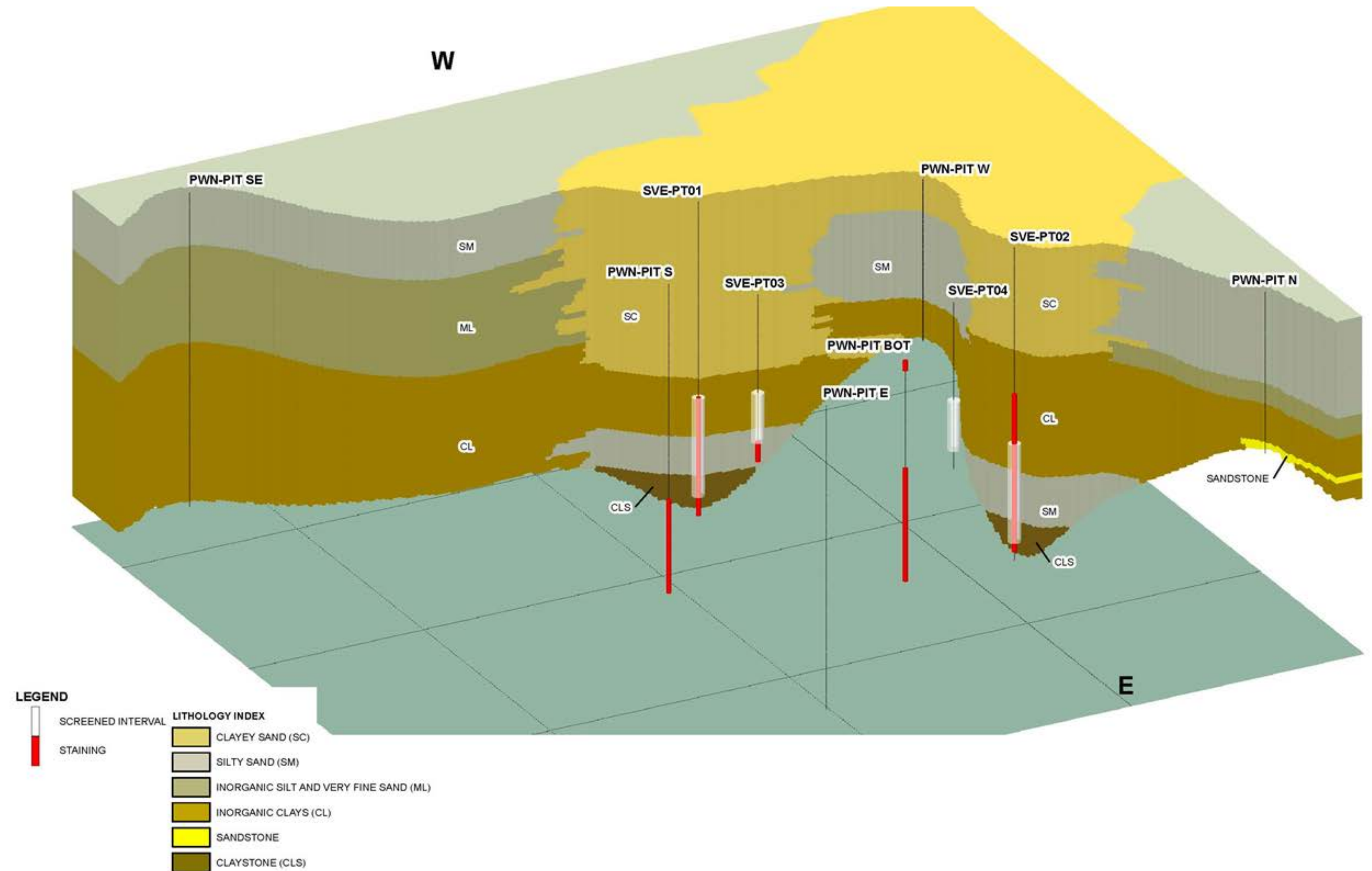


# CASE STUDY #2

ROCK SPRINGS, WYOMING

## GEOLOGY AND WELL DESIGN

- 4 SVE wells installed and pilot tested to confirm influence
- Pilot test conducted due to soil heterogeneity. Clay versus sand influence



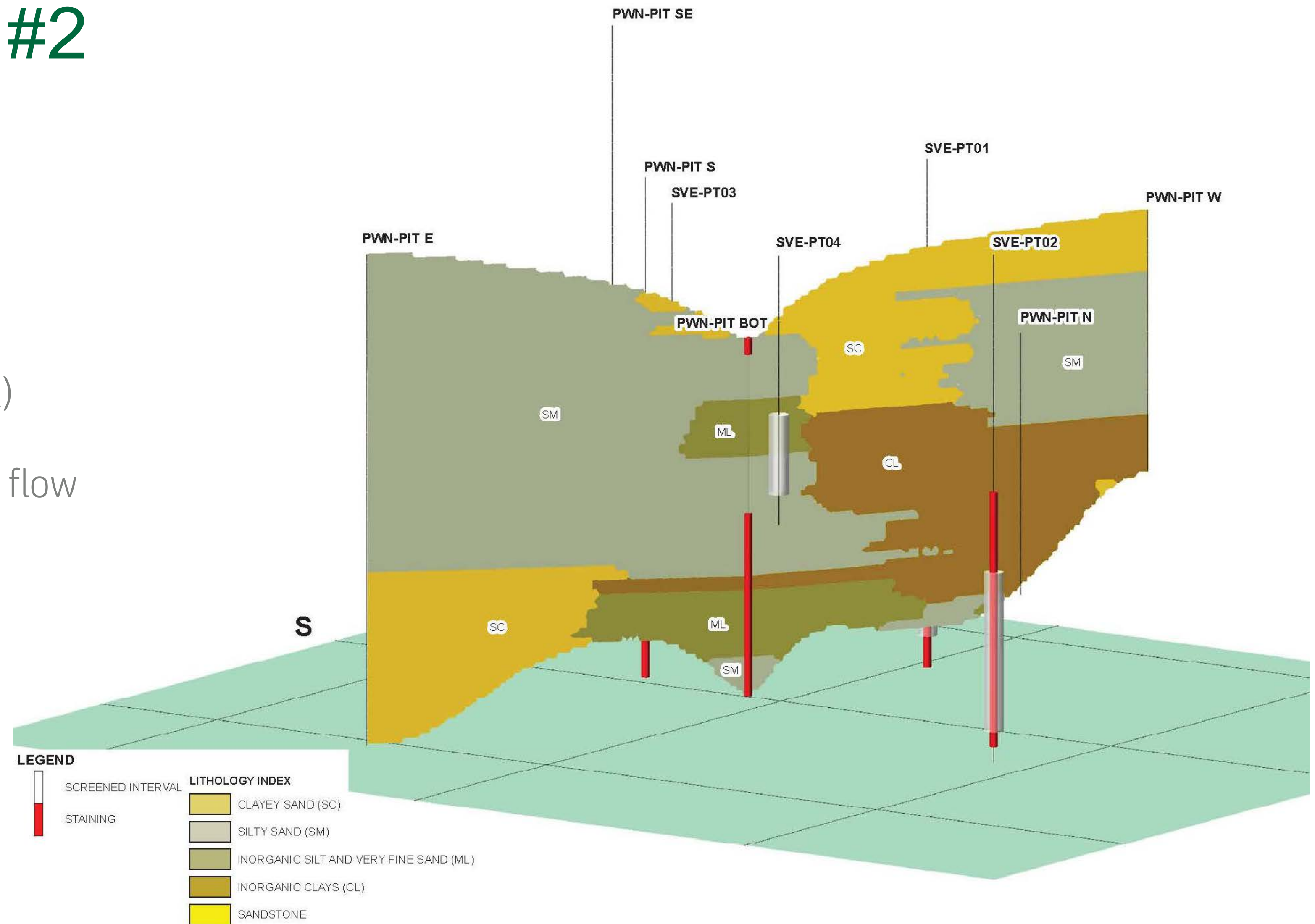


# CASE STUDY #2

ROCK SPRINGS, WYOMING

## GEOLOGY AND WELL DESIGN

- 2 additional wells required (6 total)
- Shallow impact and clay to ensure flow throughout impacted material





# CASE STUDY #2

ROCK SPRINGS, WYOMING

## SOLAR SVE SYSTEM

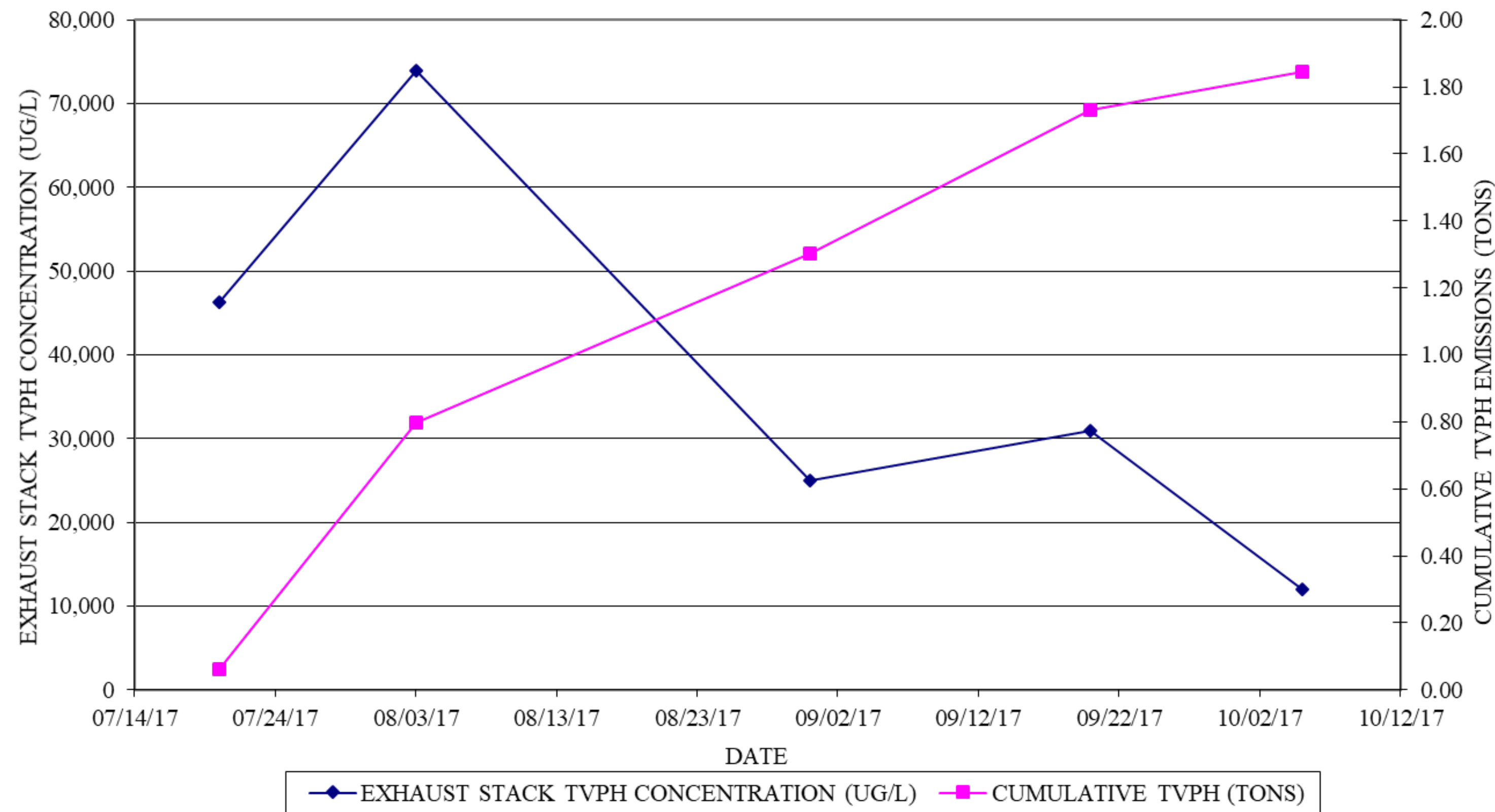
- 6 kW array (20 panels)
- 5 horsepower regenerative blower – 170 cfm @ 50" wc
- Direct drive from solar to blower via variable frequency drive (VFD)
- Telemetry capabilities





# CASE STUDY #2

ROCK SPRINGS, WYOMING



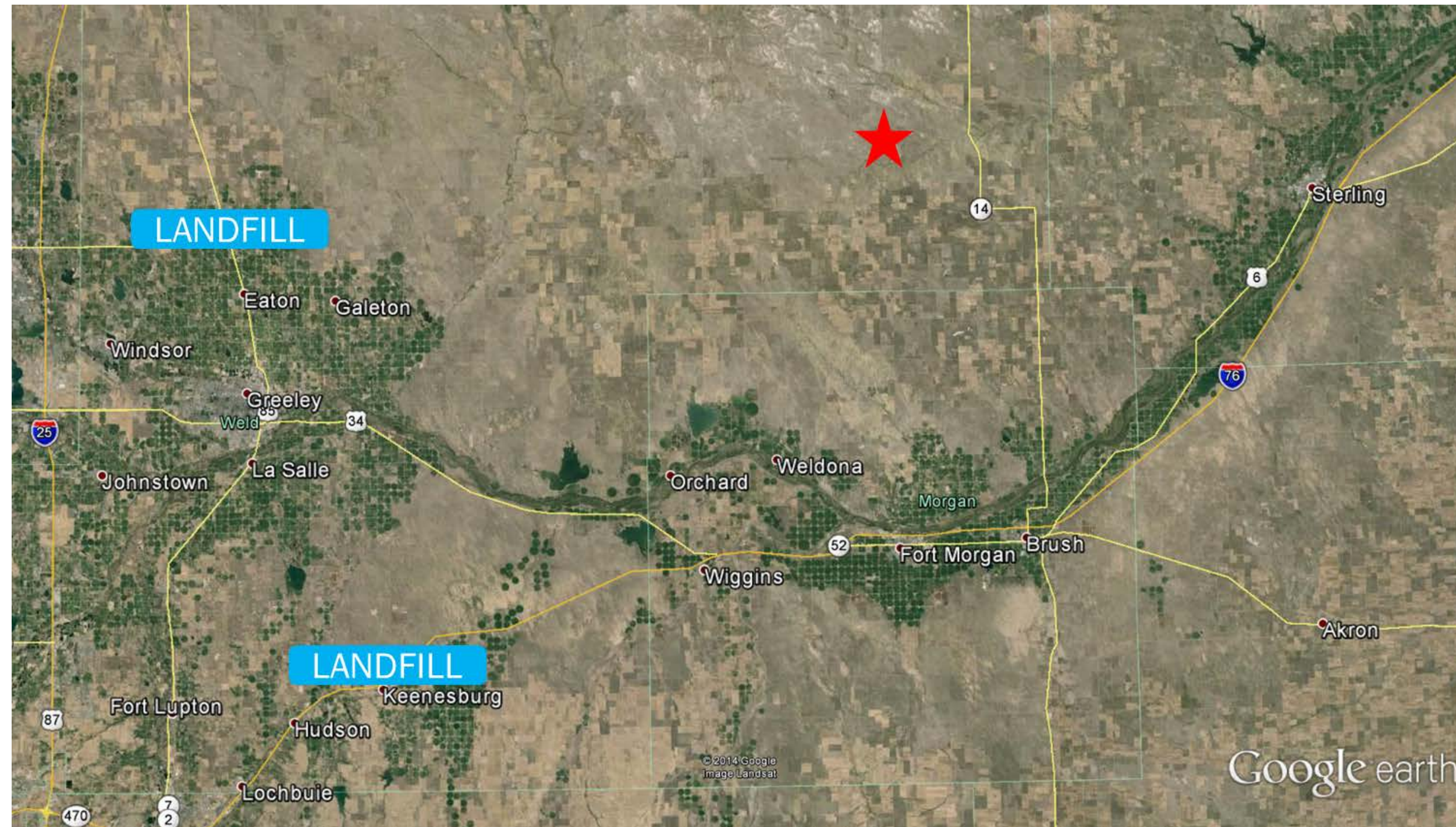
## SITE STATUS

- Startup July 2017
- 1.8 tons total volatile petroleum hydrocarbons (TVPH) removed in 3 months
- Anticipate shutdown spring 2018
- Adjustments on monthly basis
- Traditional dig and haul estimate - \$200k. Total cost including system \$125k
- 6 pits to be remediated

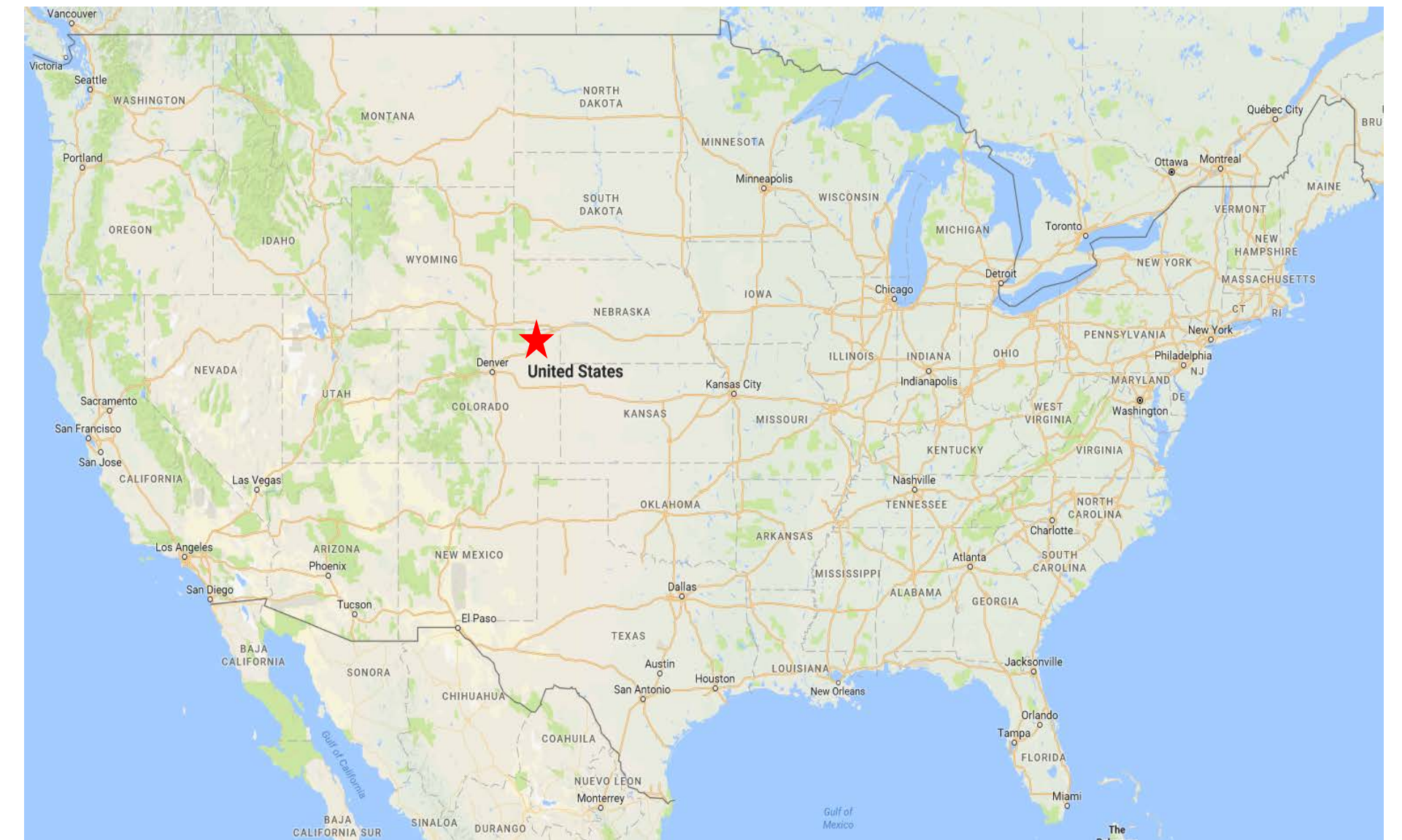


# CASE STUDY #3

MORGAN COUNTY, COLORADO



## PRODUCED WATER SKIM PITS MORGAN COUNTY, COLORADO





# CASE STUDY #3

MORGAN COUNTY, COLORADO

## 23 PRODUCED WATER SKIM PITS

- 30,000 cubic yards impacted soil
- Total petroleum hydrocarbons and benzene
- Eliminate landfill trip...Dig but no haul?





# CASE STUDY #3

MORGAN COUNTY, COLORADO

## SOIL SHREDDING



### SOIL SHREDDING

Mechanical system to increase oxidant contact. Dig and treat



# CASE STUDY #3

MORGAN COUNTY, COLORADO

## BENEFITS

- Cost – Traditional dig and haul \$1.5M, soil shredding \$1M. 33% cost savings.
- Reduce Landfill Waste
- Reduce Truck Traffic
- No Imported Fill Material





# FINAL THOUGHTS AND QUESTIONS?

