



# Evaluation of a Rapid Airborne Method for Locating Legacy Wells in Pennsylvania

**Richard Hammack, James Sams, Garret Veloski, and Rod Diehl**

# Locating Wells in Wyoming Oilfield

## Approach

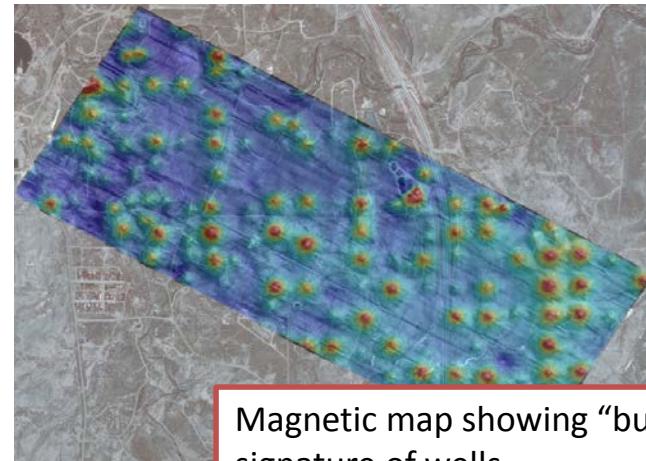
- Helicopter survey using two boom-mounted magnetometers
- Detects the unmistakable “bull's-eye” magnetic signature of vertical steel well casing

## Results from Test Area

- Method located 100% of wells drilled for primary production (1912-1926)
- Method located 82% of wells drilled for secondary recovery (water flood, 1965-1990)
- Based on success locating old wells at test area, operator used helicopter method to survey entire oilfield

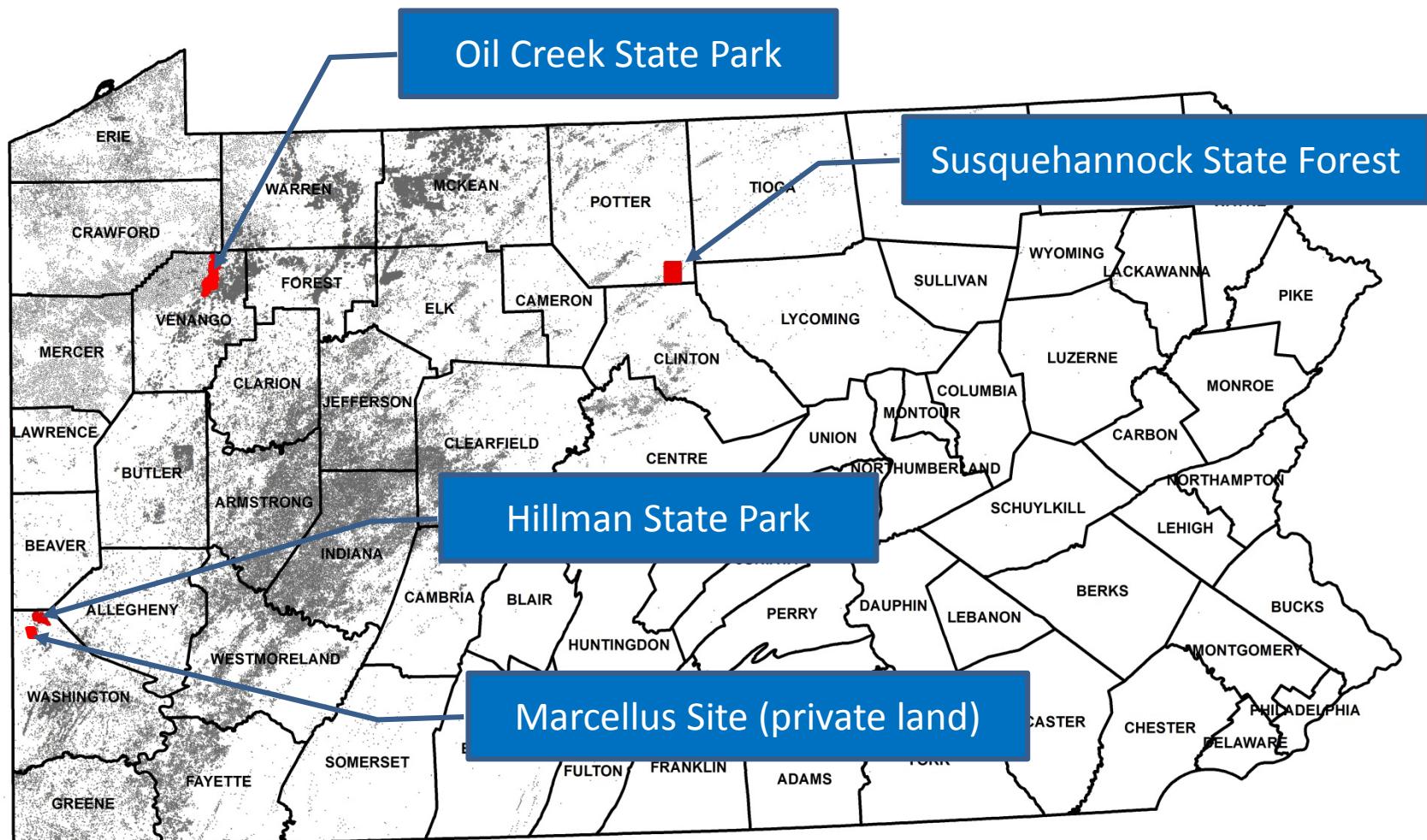


Helicopter with two boom-mounted magnetometers



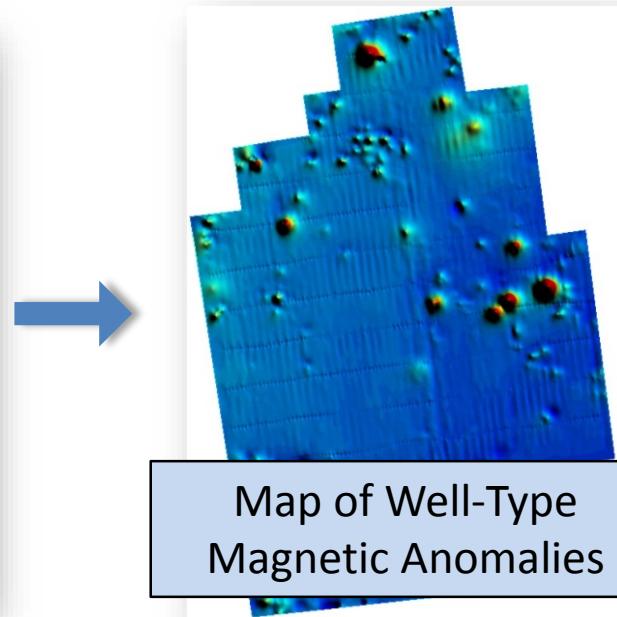
Magnetic map showing “bull's eye” signature of wells

# Helicopter Magnetic and Methane Surveys of PA State Lands with Legacy Oil and Gas Wells



Gray shading denotes legacy well density

# Locating Wells in Pennsylvania



Navigating to Magnetic  
Anomaly Location

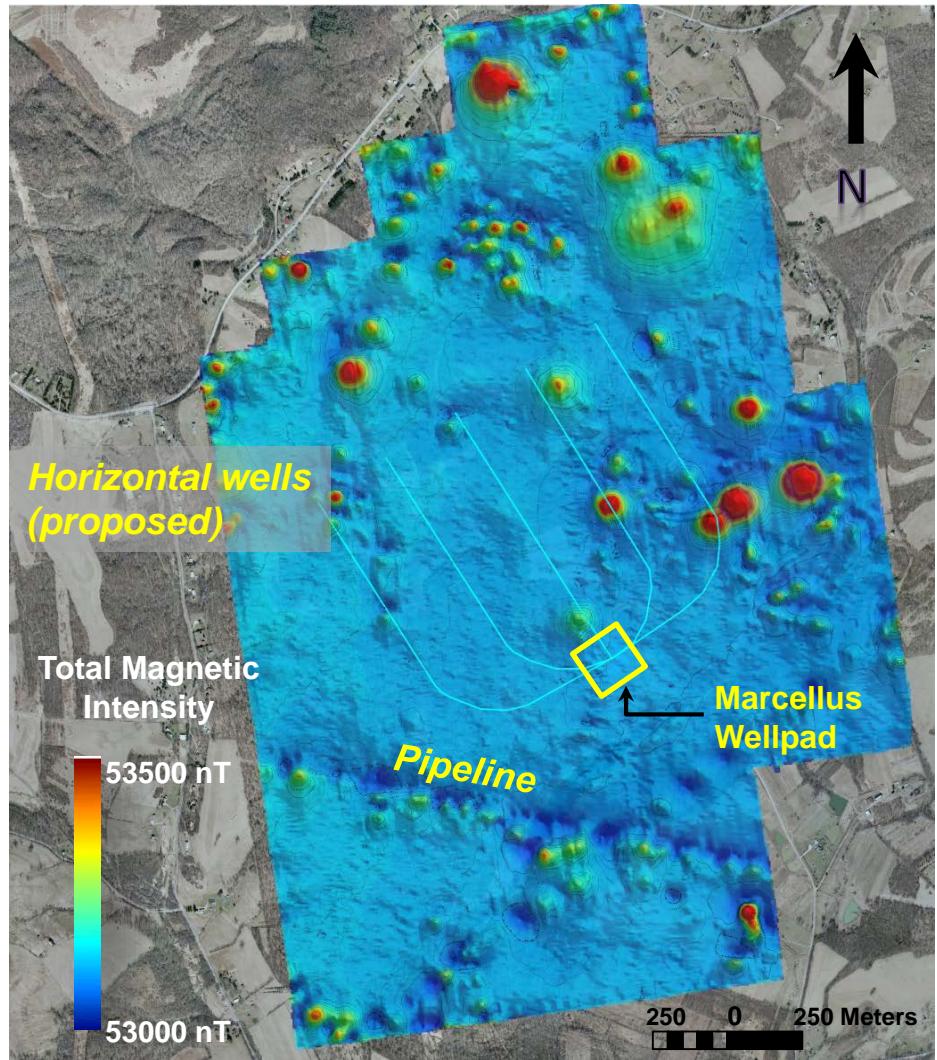


Locating Magnetic  
Anomaly on the Ground



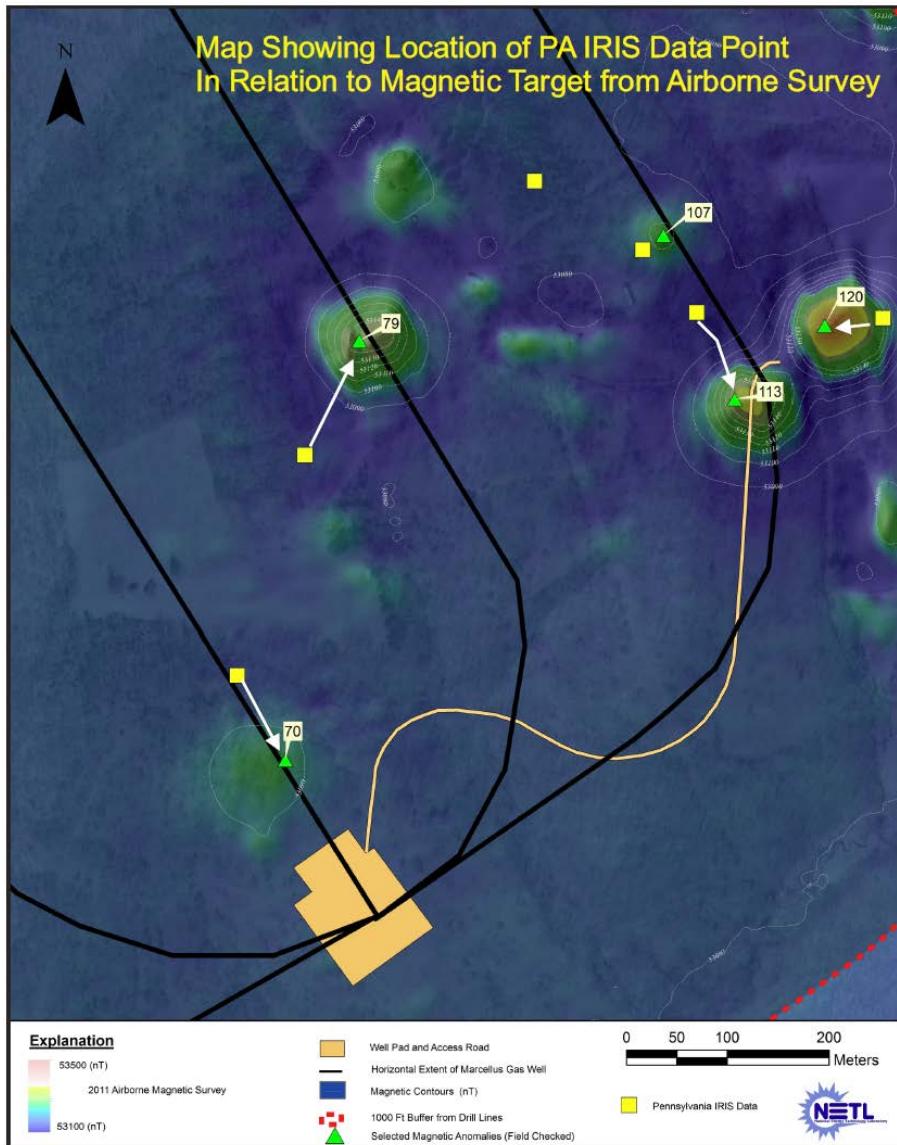
Excavation to Confirm  
Well Location

# Locating Wells in Pennsylvania



Helicopter Magnetic Map of Proposed  
Marcellus Well Pad Location

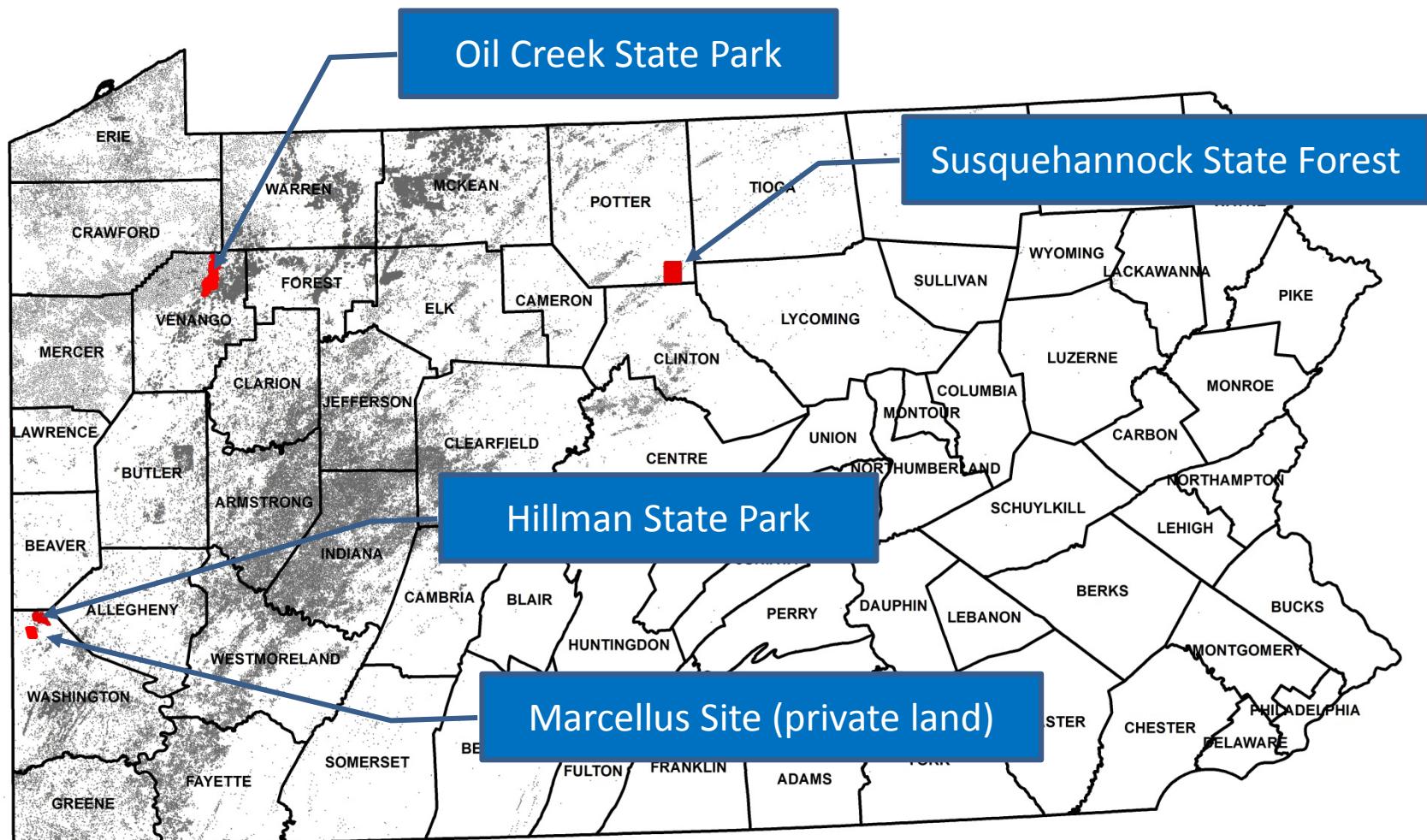
# Locating Wells in Pennsylvania



## How Accurate are Well Databases?

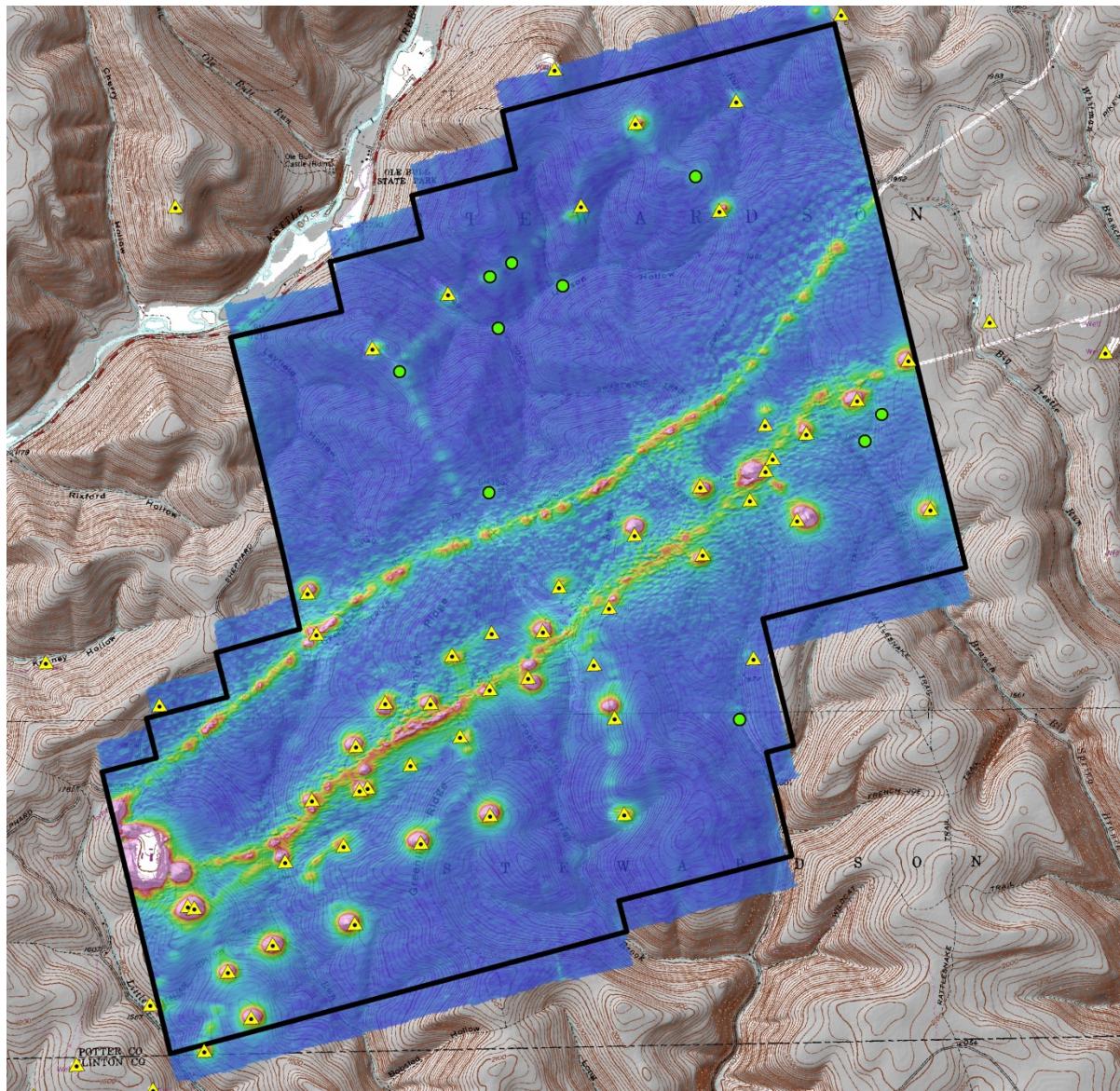
- PA IRIS database well positions often > 100 m from actual well locations
- 17 wells located in study area; six were in PA IRIS well database
- Some locations in PA IRIS well database were not close to any confirmed well

# Helicopter Magnetic and Methane Surveys of PA State Lands with Legacy Oil and Gas Wells

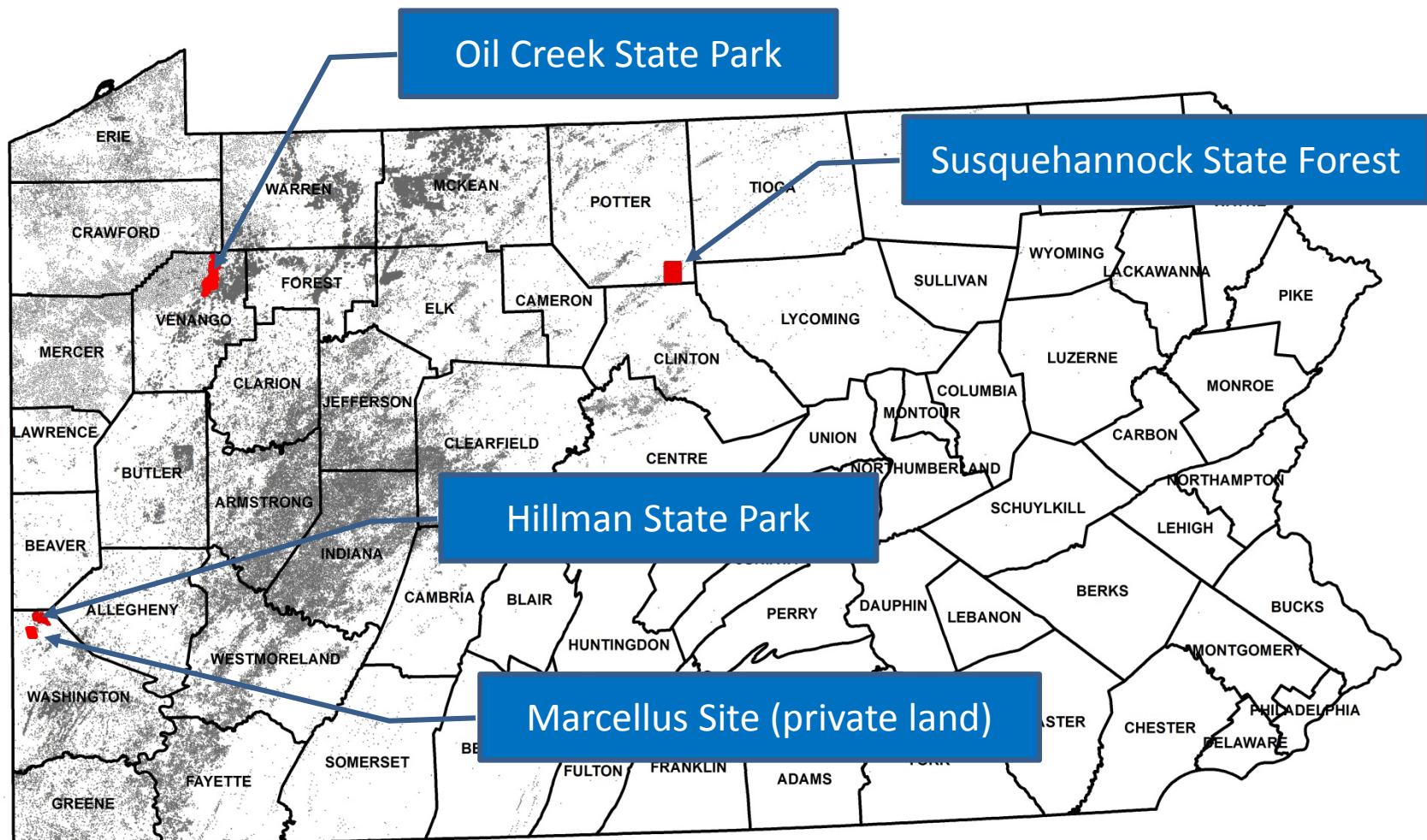


Gray shading denotes legacy well density

# Susquehannock SF

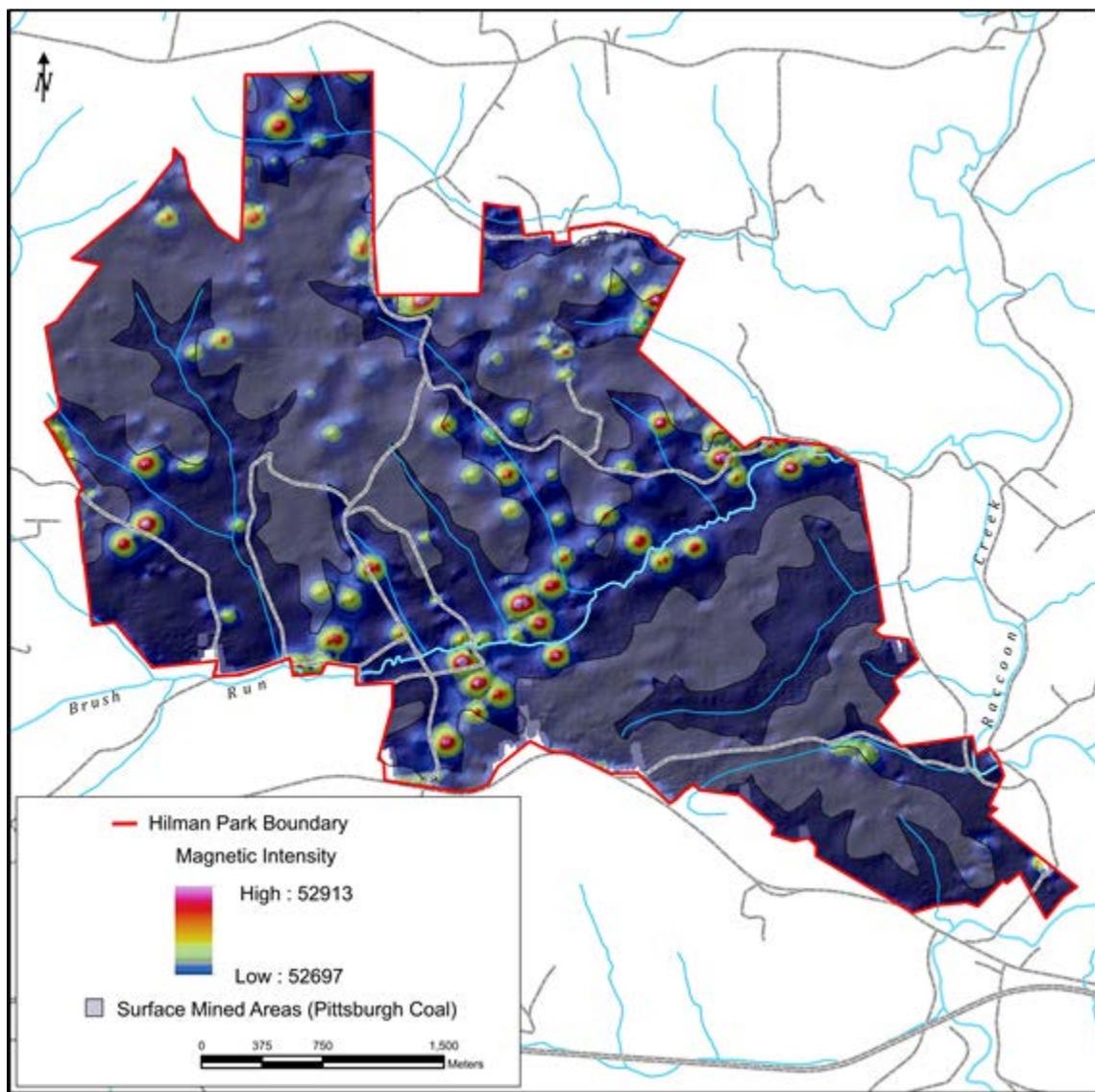


# Helicopter Magnetic and Methane Surveys of PA State Lands with Legacy Oil and Gas Wells



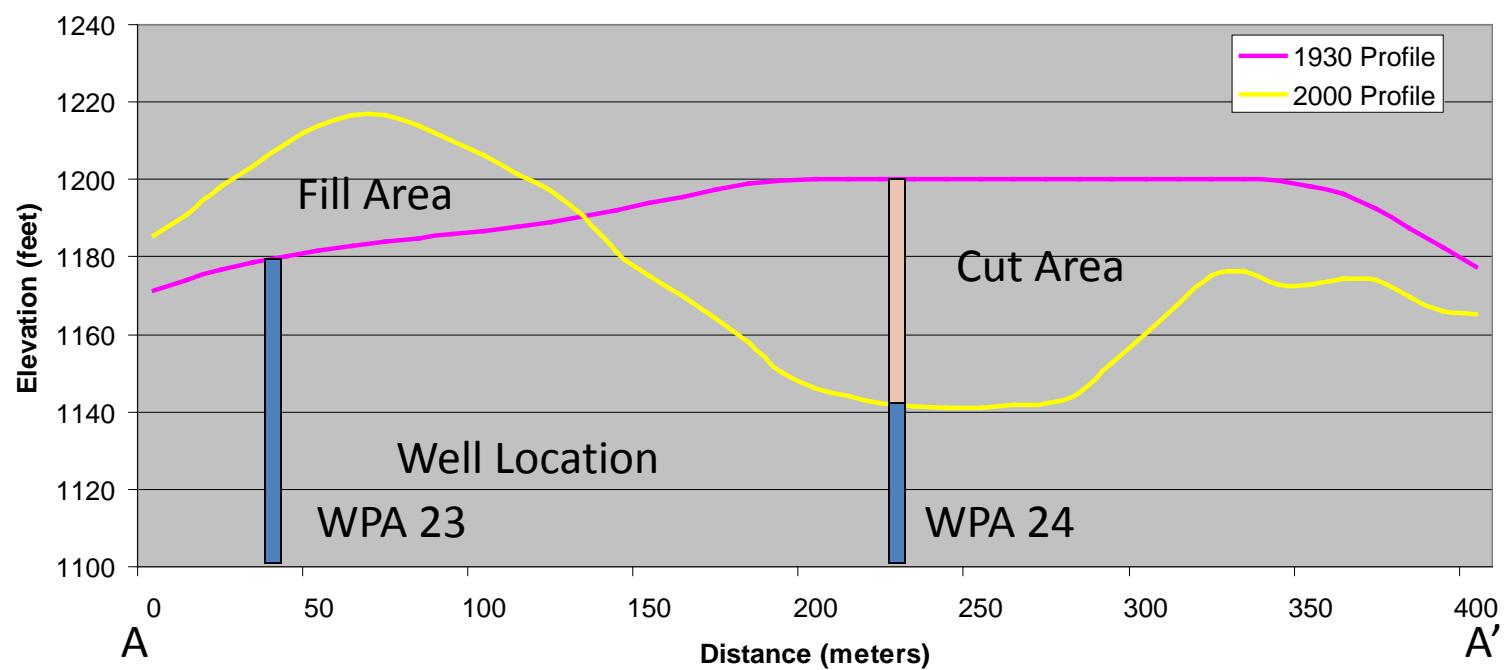
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# Hillman State Park

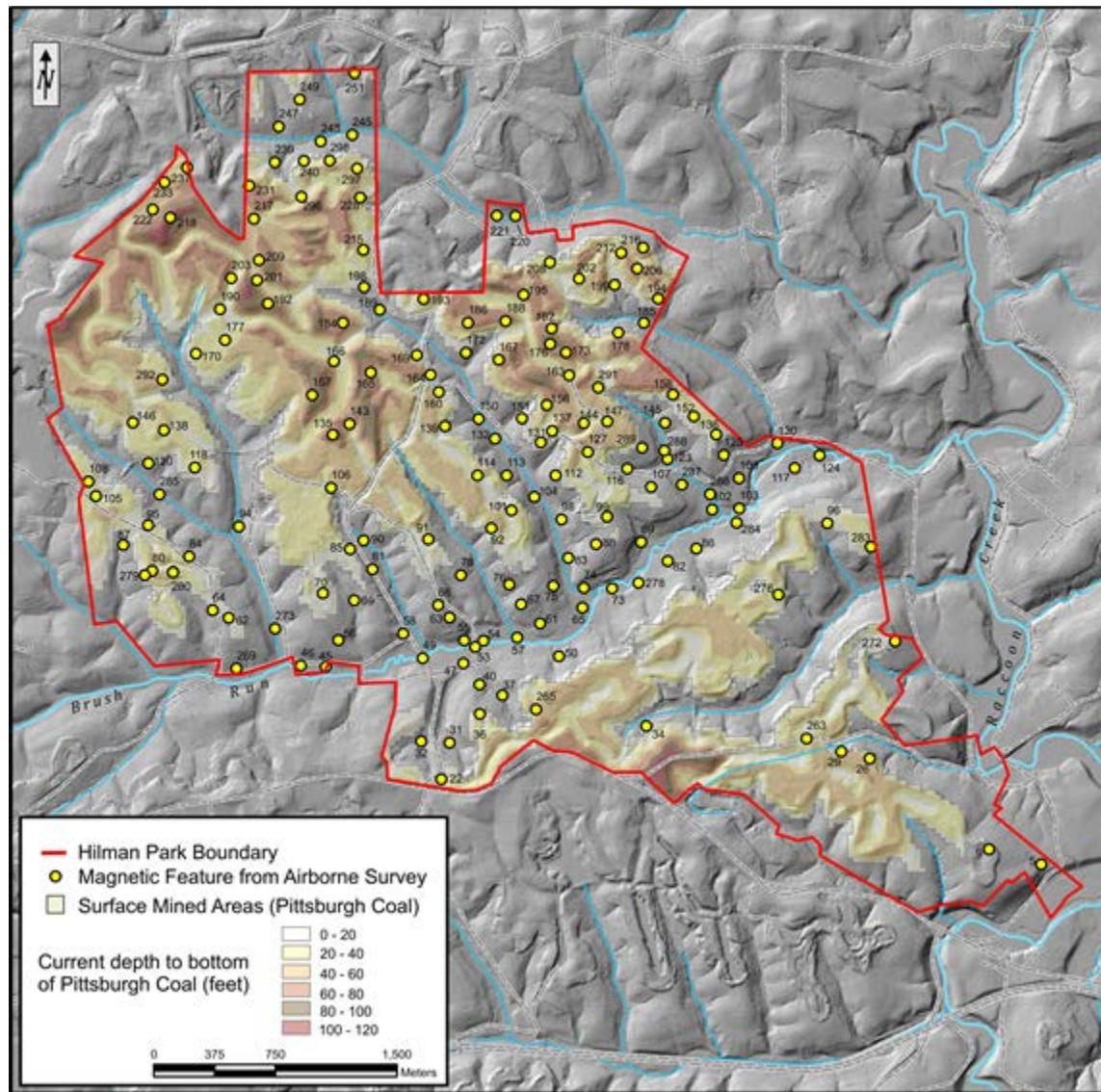




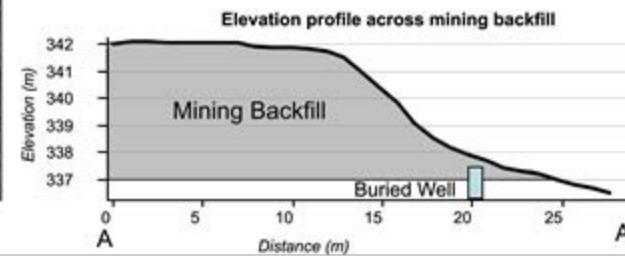
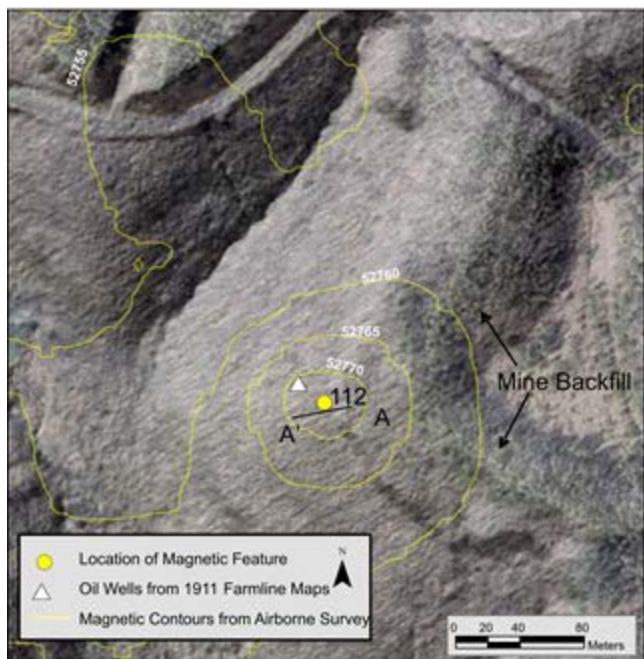
### Hilman State Park Well Profile A -- A'



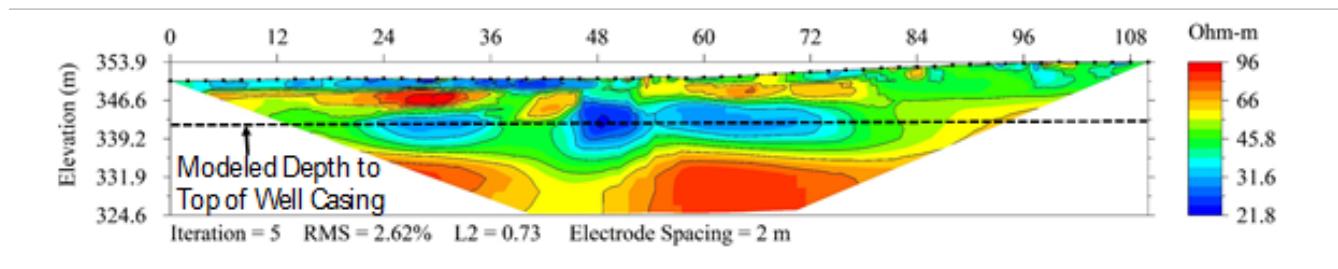
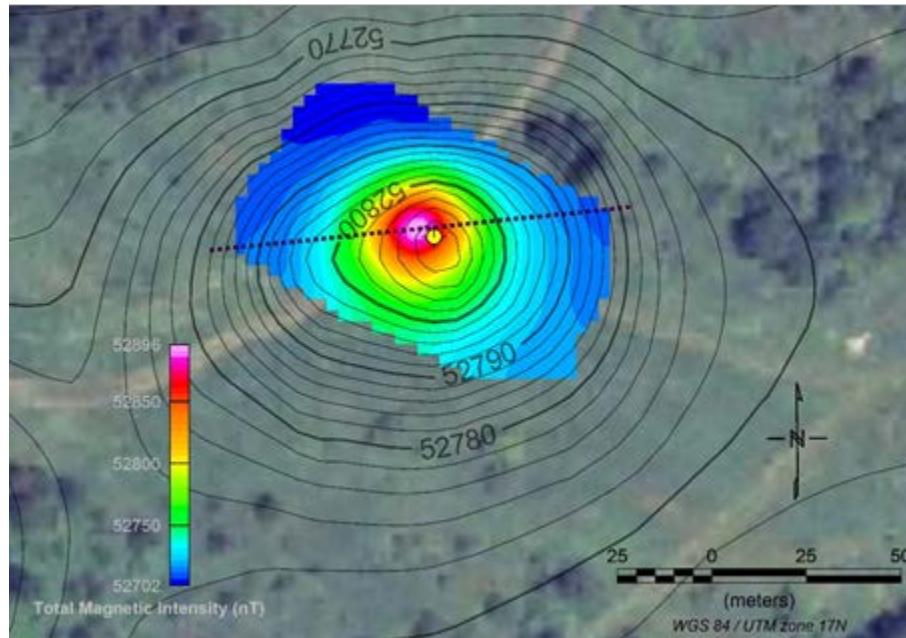
# Hillman State Park



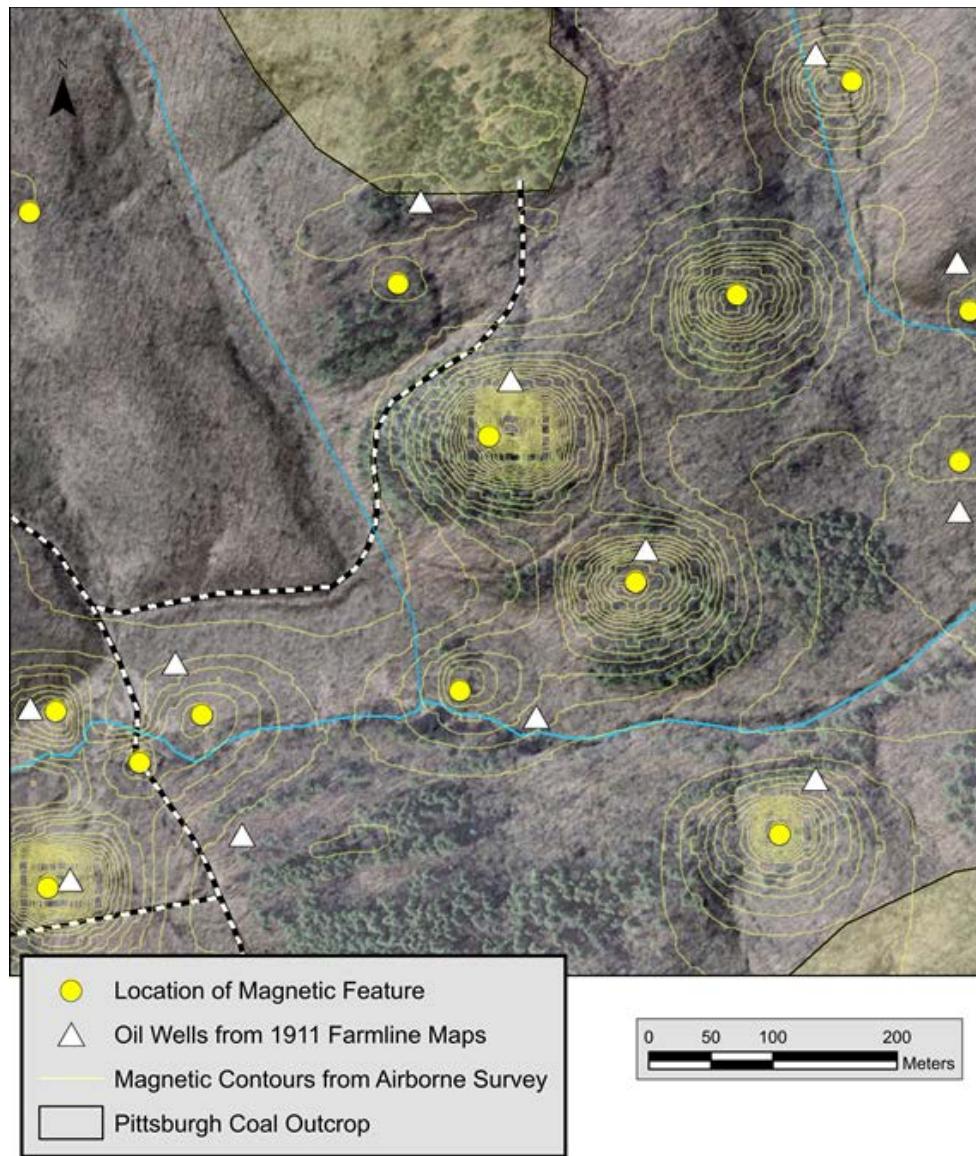
# Hillman State Park



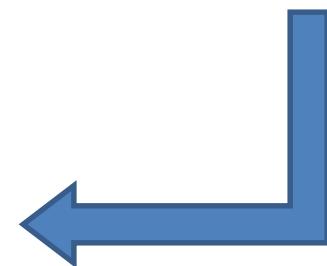
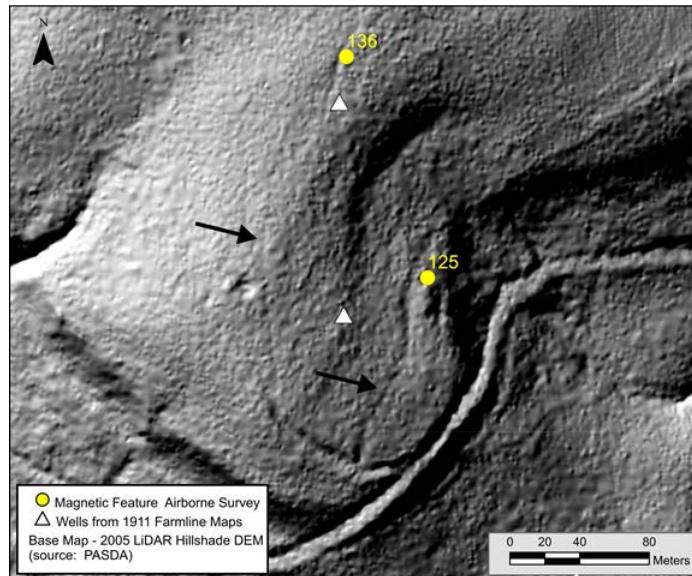
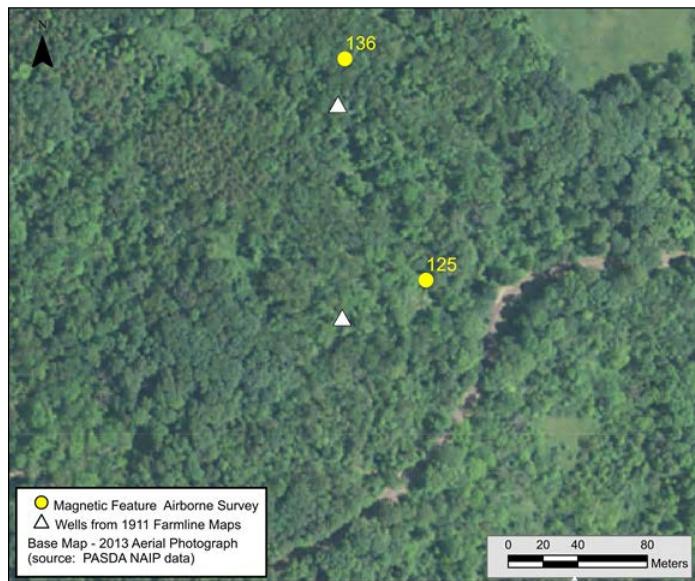
# Hillman State Park



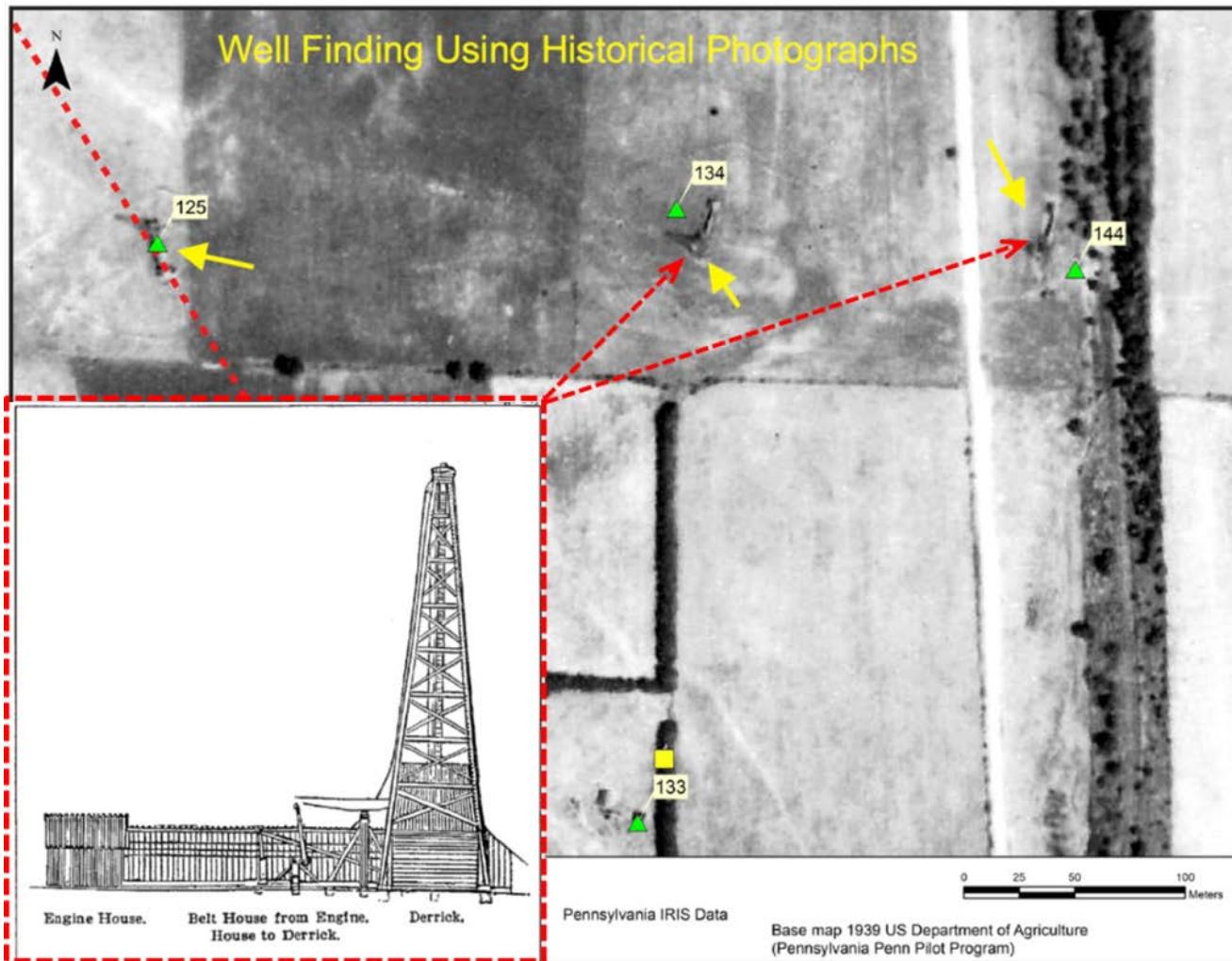
# Hillman State Park



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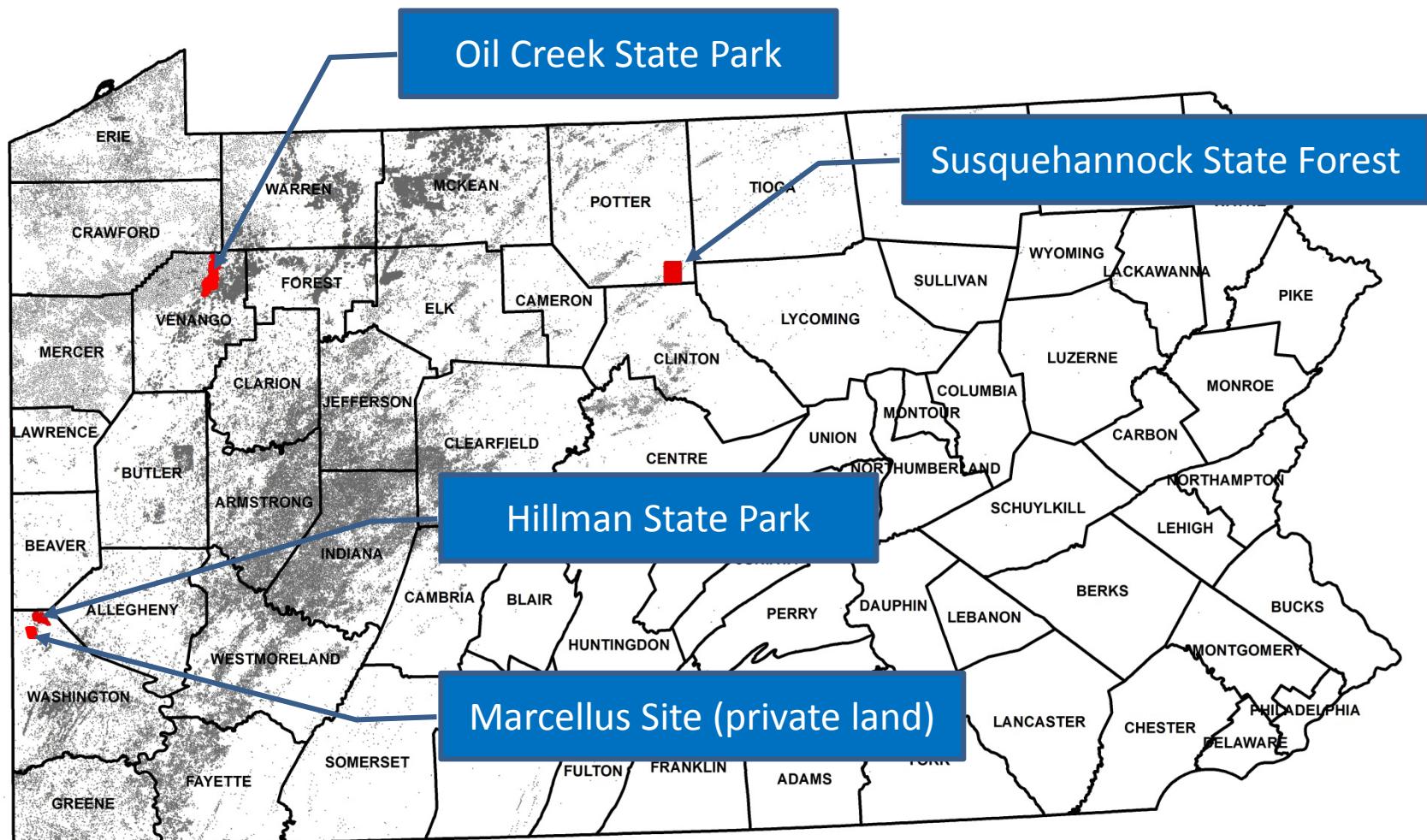


# Locating Wells in Pennsylvania



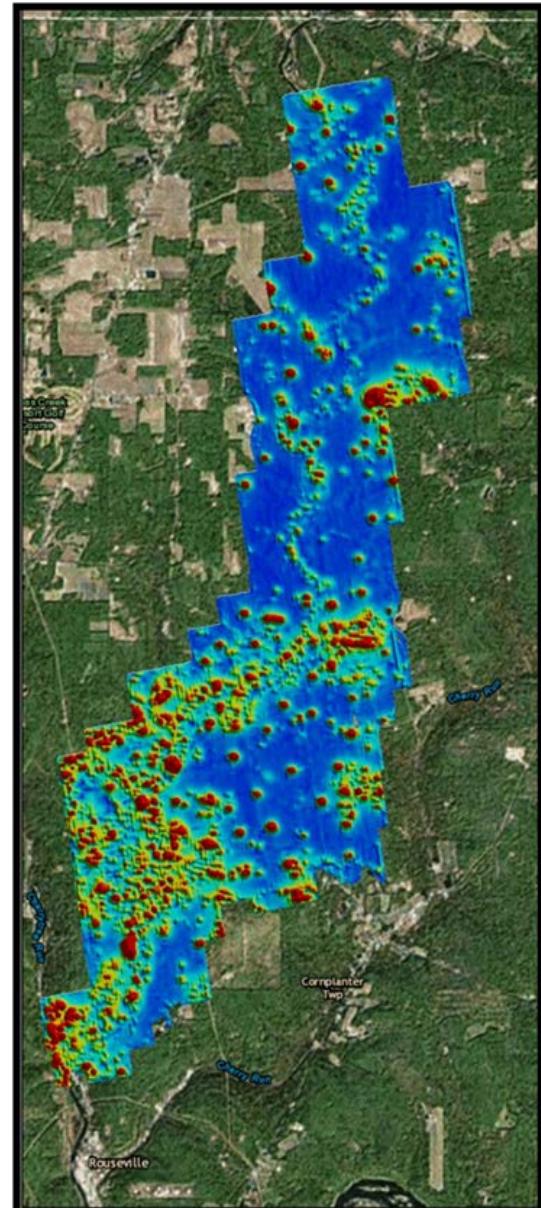
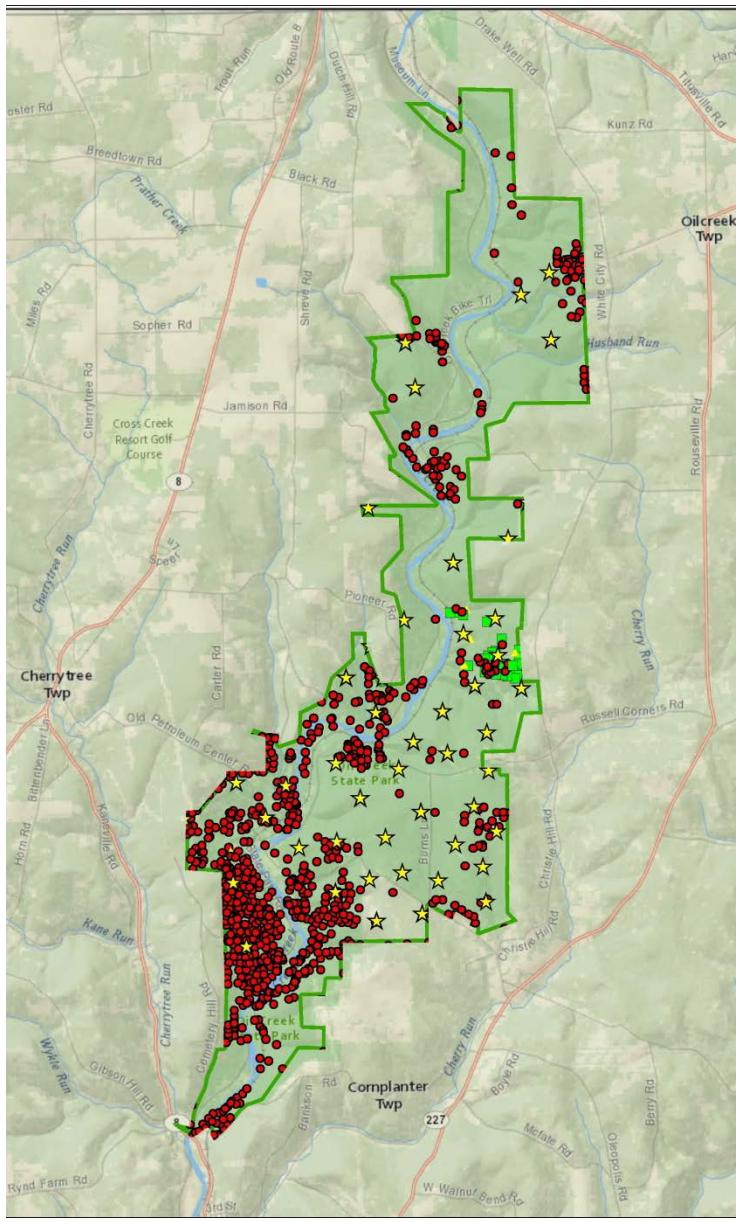
Historical air photos can be used to locate old wells in some areas

# Helicopter Magnetic and Methane Surveys of PA State Lands with Legacy Oil and Gas Wells

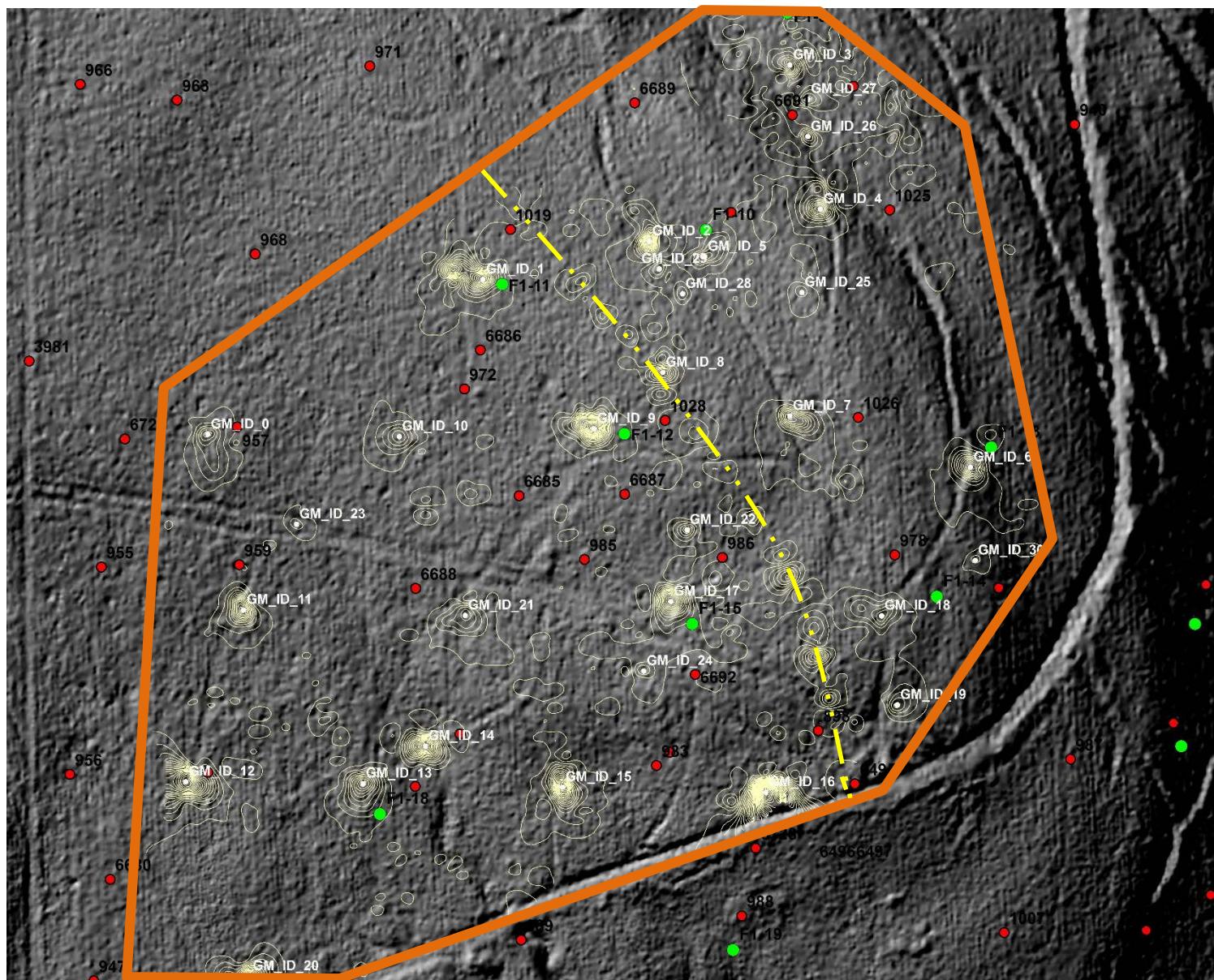


Gray shading denotes legacy well density

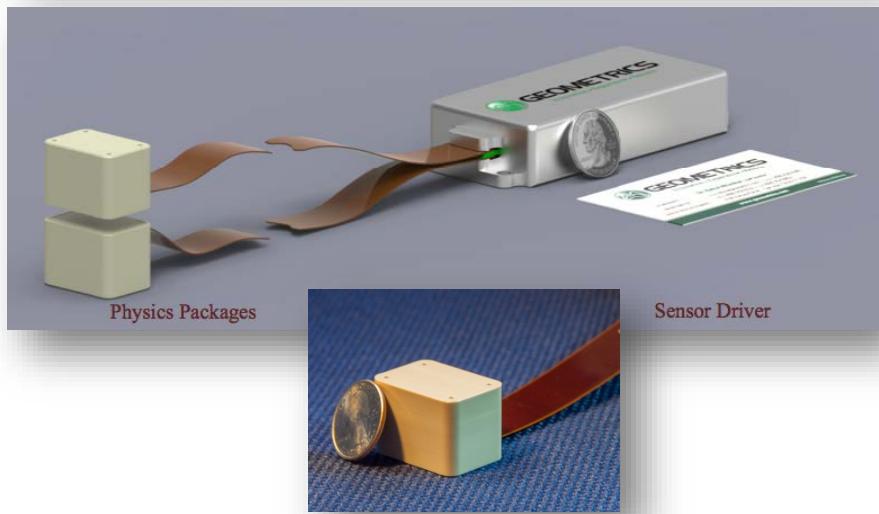
# Oil Creek State Park



# **Oil Creek State Park**



# Future



# Contact Information

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# Locating Wells in Pennsylvania



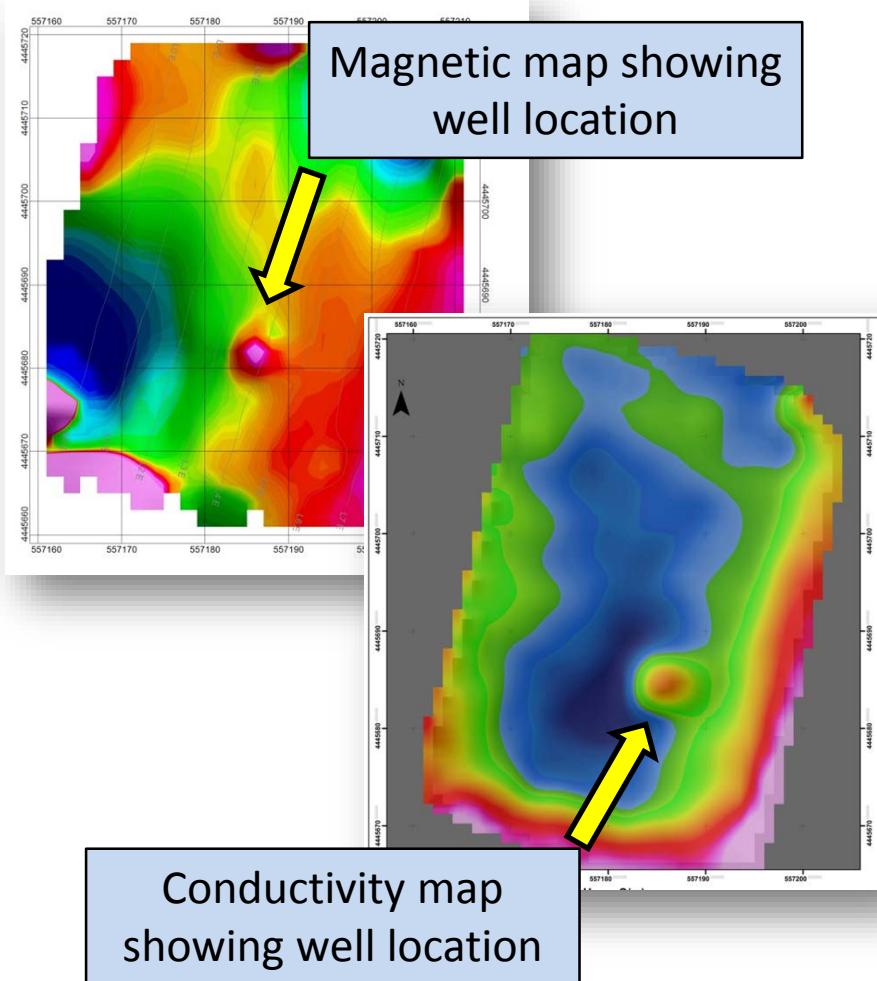
*Vertical steel well casing perturbs the earth's magnetic field and causes the distinctive "bull's eye" magnetic anomaly.*

## **What if casing is missing because:**

- Casing was pulled from sub-economic well to be reused in another well
- Metal drives during World War II recovered well casing where possible to aid war effort.

Excavation of well where steel casing had been pulled; only the wooden surface conductor remained

# Locating Wells in Pennsylvania



## What if Casing is Missing?

- This well with no casing still exhibits magnetic and conductive signatures at ground level.

