

Overview of CATALOG Field Activities

LANL-AE-2090-2115

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National Energy Technology Laboratory
Resource Sustainability Project Review Meeting
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Project Overview

- 5 Years \$30M BIL funding, FY 2023, 2024
Appropriations \$10M/yr
- July 1st, 2023 – June 30th 2024
- Objective: Organize an inter-lab group who can respond to UOW requests, develop large area drone survey capabilities, and collect data to feed other WPs

Project Overview

Work Package 9 Points of contact

- Lead: Christine Downs
- Co-Lead: Eric Gultinan

LLNL	LBNL	LANL	SNL	NETL
Jacob Trueblood	Yuxin Wu / Sebastien Biraud	Eric Gultinan	Christine Downs	Matthew Reeder / Rick Hammack

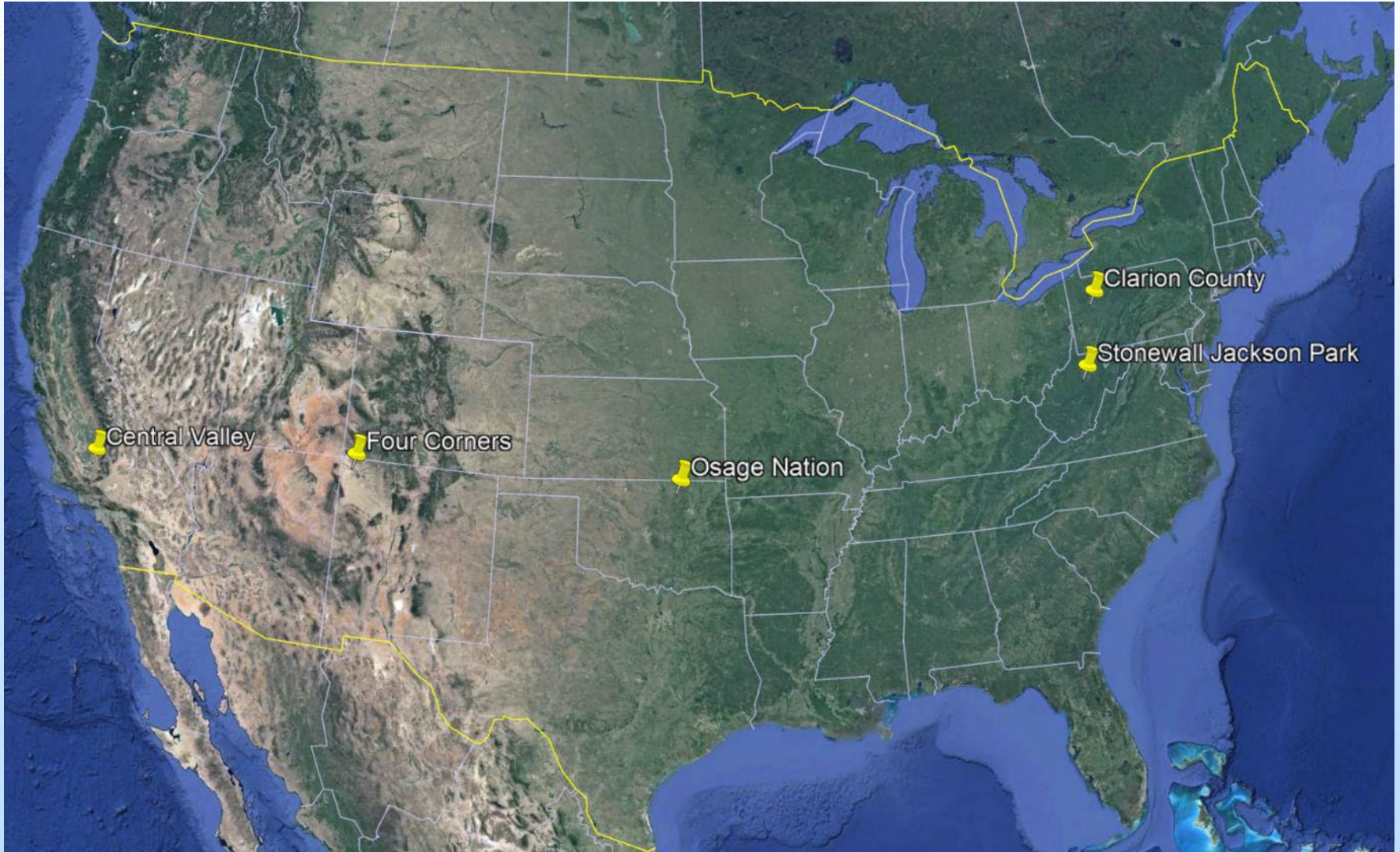
Project Overview

Research and Development Priorities

Priority 1: Identify large field areas that have high UOW potential where we can leverage drone survey techniques. Survey 4 sections in different environments across the USA.

Priority 2: Set a goal for the number of different sites in **each of 4 distinct regions** to start working and a number of wells to try and identify.

Field Sites



Four Corners near Farmington, NM

- Site Characteristics:
 - 29 Wells designated as “reclamation fund approved” by NMOCD
 - 8 wells on BLM land
 - 21 wells on Navajo Nation
 - ~ 5.8 km²
 - Scarce vegetation with moderate topography
 - **Gas leaks have been detected**
- Planned activities: Methane and magnetometer drone-based survey
- Farmington BLM access approved.
- Developing an MOU with Navajo Nation



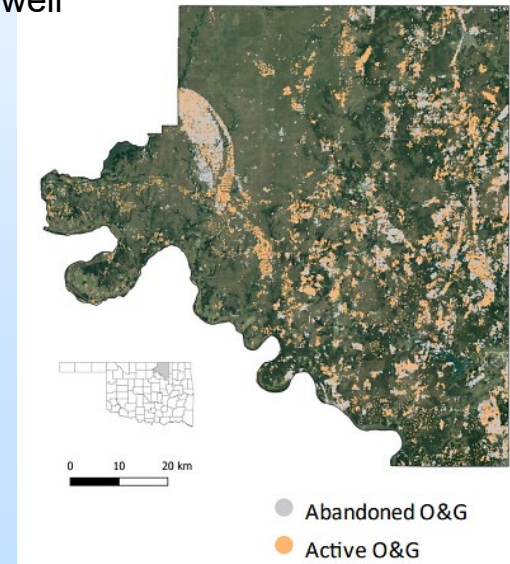
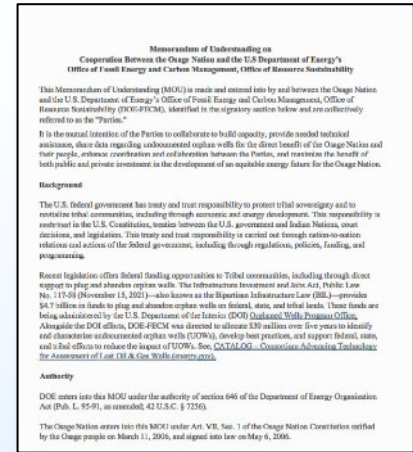
Leaky Well



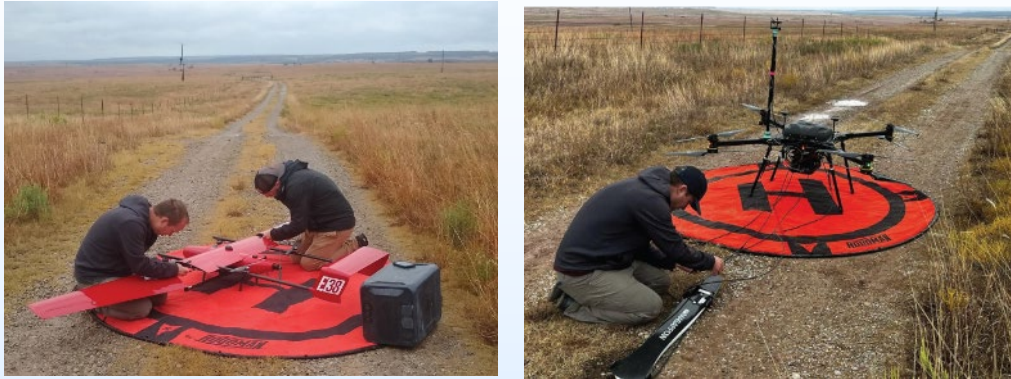
Osage Nation

FECM and the Osage Nation executed a Memorandum of Understanding (MOU) as a framework for collaboration to:

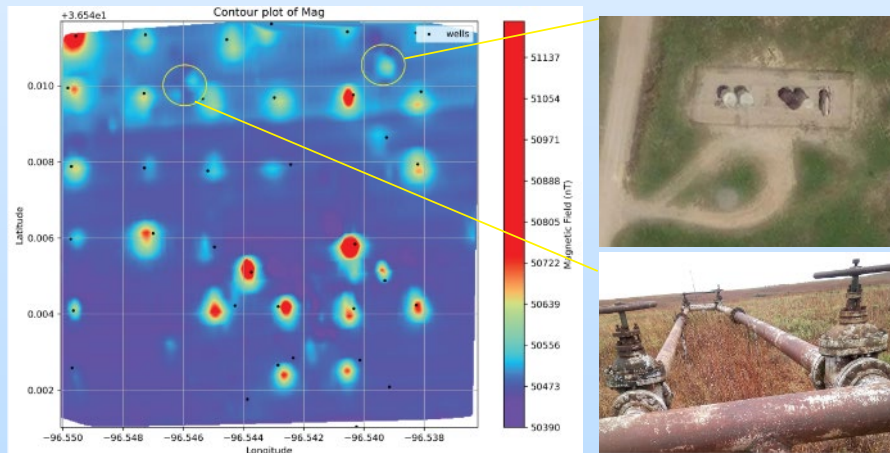
- Build capacity, provide needed technical assistance, share data the direct benefit of the Osage Nation and its people.
- Maximize the benefit of both public and private investment in the development of an equitable energy future for the Osage Nation.
- Employ historical record searches, aerial drone surveys, and on-ground measurements.
- Support the development of the Osage Nation's own undocumented orphan well identification capabilities.



Osage Nation: Fixed Wings and Aerial Methane (LANL)

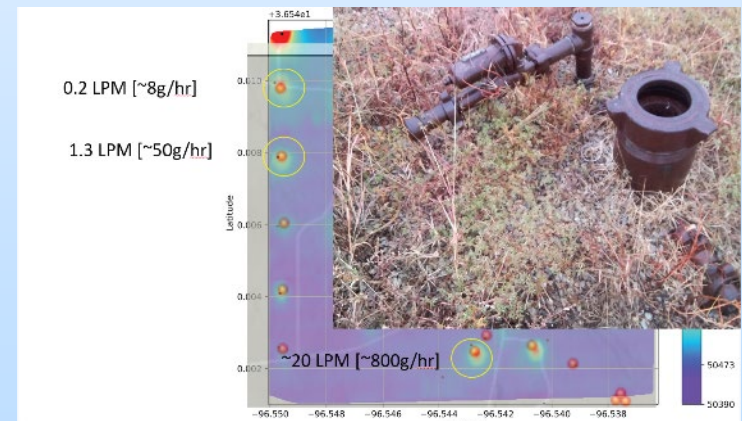
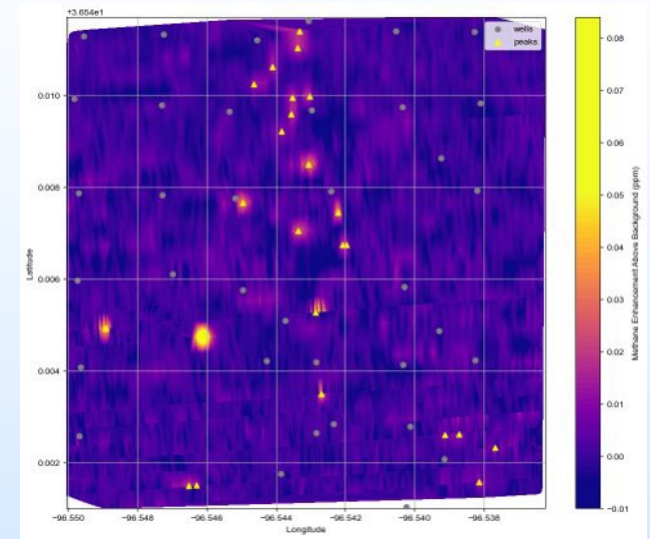


Fixed-wing capable of 5-10x larger surveys than conventional rotary drones



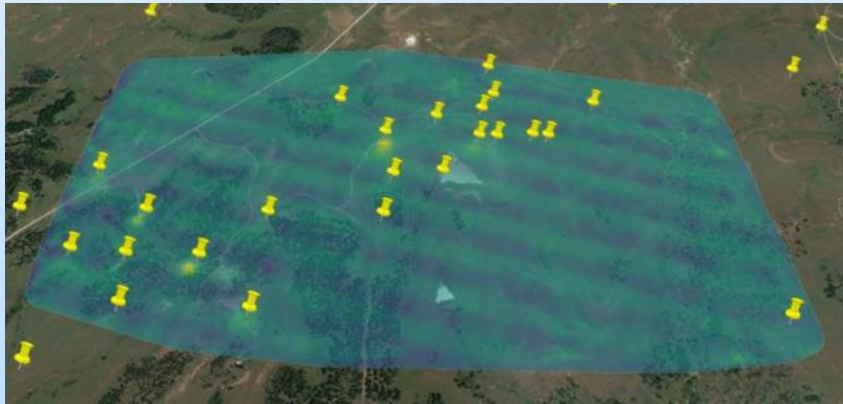
Mag signature for every well plus some false positives

Methane Survey



Ground team detected significant leak from open well (~800g/hr)

Osage Nation: Fixed Wings and Aerial Methane (LANL)

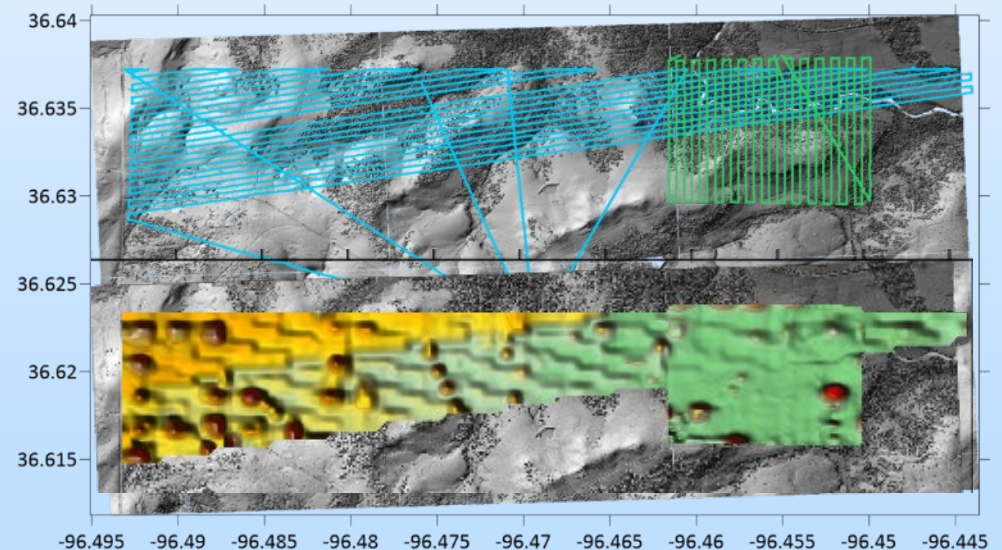


1.3 miles², 85 minutes



Osage Nation: Long Duration Drone Survey (LBNL)

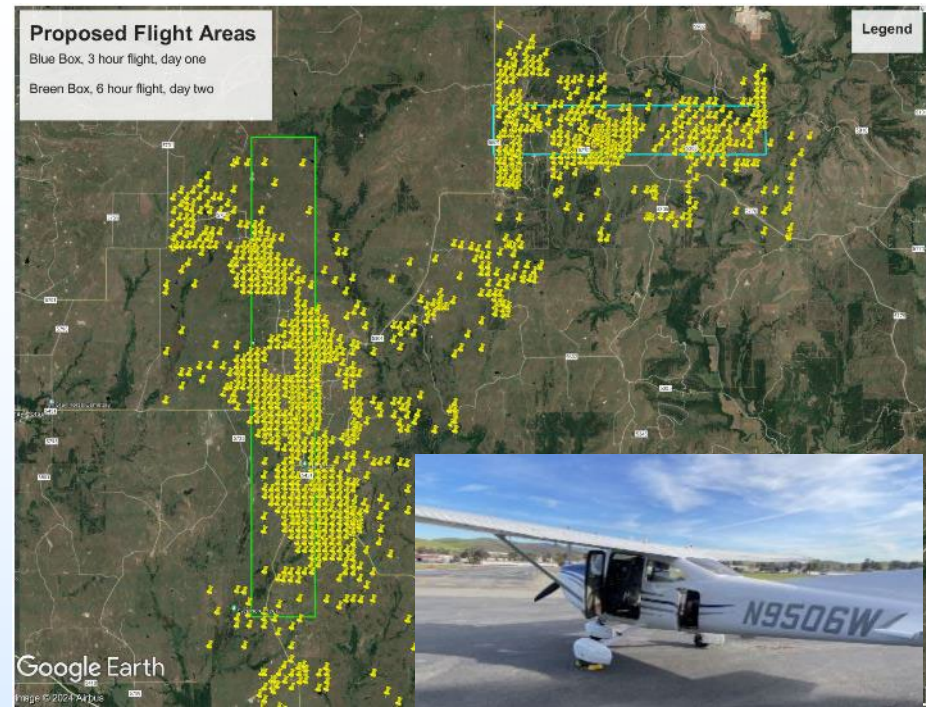
- Long duration drone (2+ hour flight time) capable of surveys at large scales
- Ability to host multiple payloads (currently in process)
- Improvement needs identified and will be tested at OSAGE and PA when ready



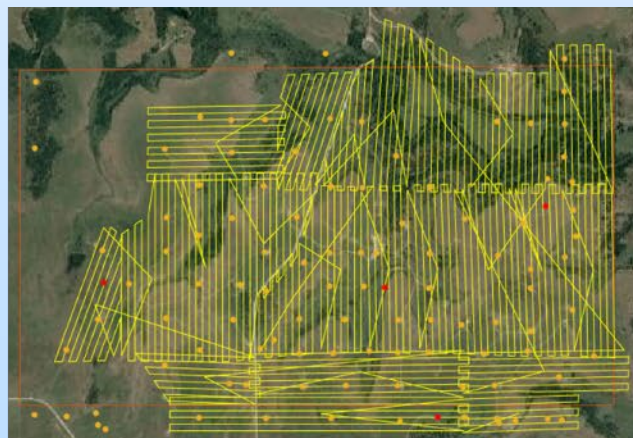
Osage Nation: Multisensor Deployment (LLNL)

Manned aircraft with hyperspectral camera to test scaling detection of “super-emitters”

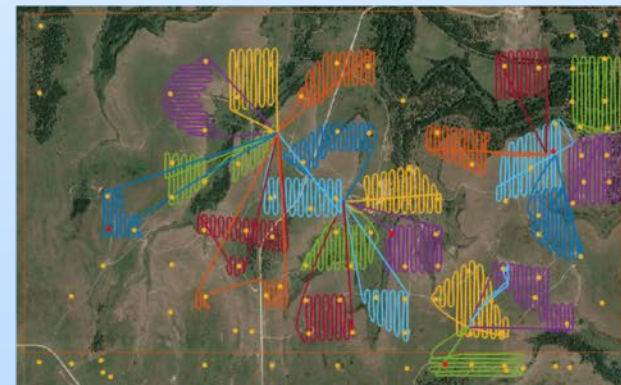
- Lidar/RGB
- Magnetometer
- UAV hyperspectral



Mag Flight Tracks



Lidar/RGB camera Flight Tracks



HSI Flight Tracks

Osage Nation: PoISAR (Sandia)

Fully polarimetric Synthetic Aperture Radar (PoISAR, in X-band)

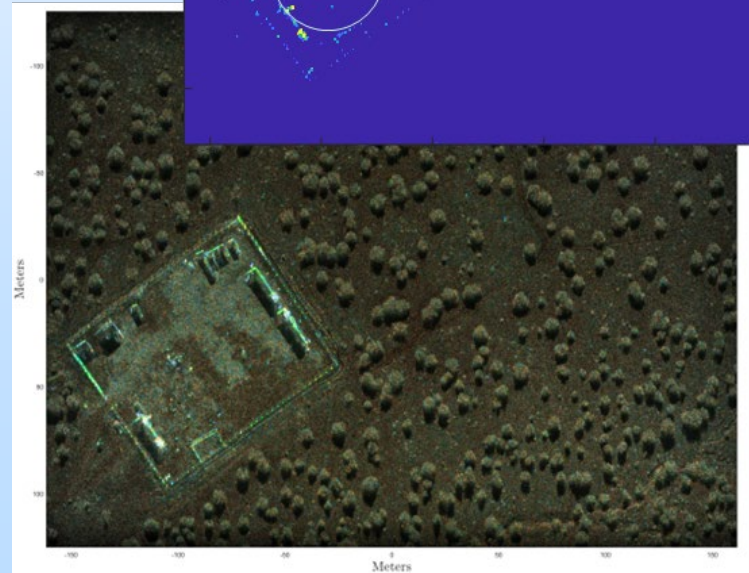
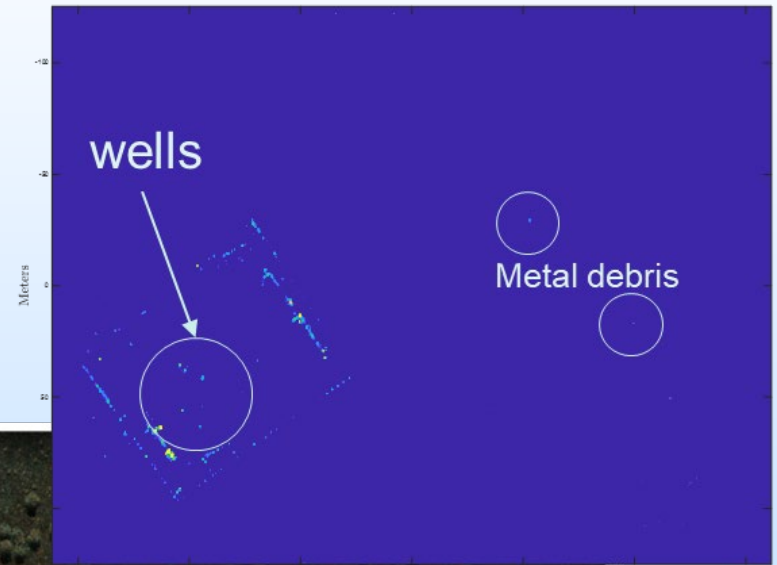
PoISAR antenna sends and receives EM waves with well defined polarization providing information about the polarimetric properties of the reflecting object.

Fully polarimetric: Measurements from each polarization channel, HH, HV, VH, VV.

For example, HV denotes measurements made from a horizontal receiving polarization port and vertical transmitting polarization port.

System: FARAD PhoeniX X-band radar system, developed by Sandia National Laboratories, and flown on a de Havilland Twin Otter aircraft.

Notional Detections from 12" Resolution Polarimetric SAR Image (SAND2024-01001 O)

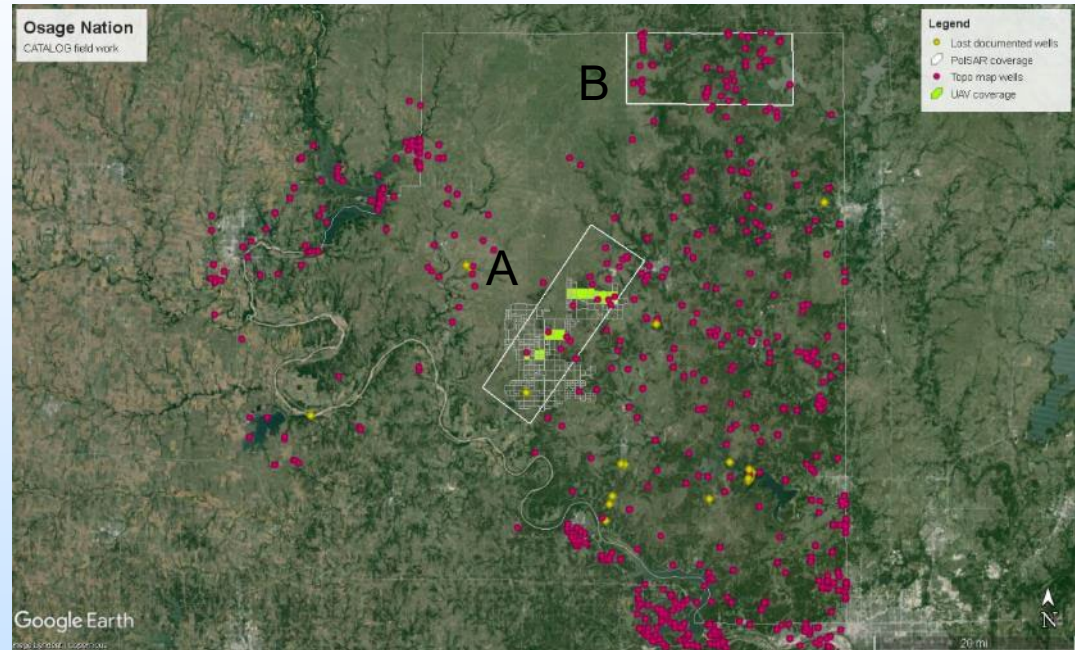


Osage Nation: PoISAR (Sandia)

PoISAR AOIs within Osage Nation

A) SNL will cover the majority of Osage Nation Ranch to 1) maximize coverage of this priority area and 2) compare and contrast detection results with other modalities (i.e., magnetics, hyperspectral, LiDAR, thermal, ground-penetrating radar). Total coverage- 300 sq km.

B) If time allows, SNL will begin another 300-sq-km area of interest to ON Department of Natural Resources to the north. There is more canopy here though acquisition will happen far ahead of significant leaf growth.



Flight plans are designed to make paths are long as possible to minimize the time spent turning the plane.

Summary Slide

We are conducting fieldwork in four to five diverse field locations to demonstrate technologies for the identification and characterization of UOWs

We are focused on developing techniques which can be economically scaled to address the national UOW problem

Appendix

- These slides will not be discussed during the presentation **but are mandatory.**

Organization Chart

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Gantt Chart (CATALOG program)

Overall Objective: Develop advanced characterization, P&A materials, and long-term monitoring solutions for permanent emissions mitigation from undocumented orphaned wells.

2023

2024

2025

2026

2027

Detection & Data Collection

Measurement and detection, historical data and field data collection, early UOW identification efforts, and outreach

Advanced Sensing Technologies

Initiate R&D for non-invasive, non-destructive borehole characterization sensors

Initiate R&D for autonomous, long-term, low power wellbore and surface monitoring systems for wellbore integrity and emissions monitoring

Evaluate and select at least one borehole characterization sensor for field validation

Evaluate and select at least one autonomous sensing platform for field validation

Field Testing

Conduct a multi-field study to test the effectiveness of materials, sensors, and processes across different producing regions

Initiate field-based validation of materials, sensors, advanced P&A processes

Remediation Technologies

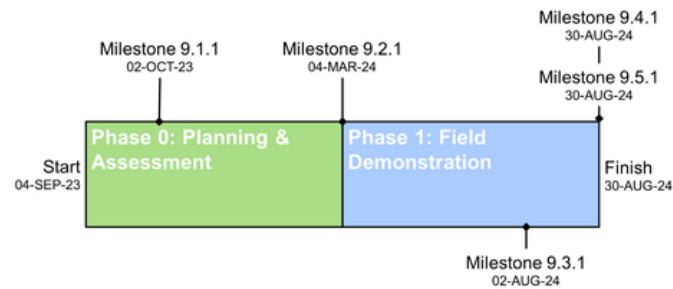
Initiate R&D for advanced materials for cost-effective, permanent P&A operations

Identify at least one advanced material for field test (laboratory validated)

Gantt Chart: WP9

Work Package Activities

Work Package 9: UOWP Field Team



Activity #	LANL	LBL	LLNL	NETL	SNL
9.1.1	Blue	Tan	Blue	Blue	Blue
9.2.1	Blue	Tan	Blue	Blue	Blue
9.3.1	Tan	Tan	Tan	Tan	Blue

Table 2: Activity Leads (Blue) and Activity Partners (Tan)

Milestones (WP1, Activity, Year)

9.1.1 Finalize list of field sites and identification target numbers

9.2.1 Field readiness for sites resulting from completion of 9.1.1

9.3.1 Field deployment for sites resulting from completion of 9.1.1 and 9.2.1