Public Quarterly Report

Date of Report: **7**th Quarterly Report – June 30, 2024

Contract Number: 693JK32210006POTA

Prepared for: The U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration (DOT-PHMSA)

Project Title: Accelerating Pipeline Leak Detection Quantification Solutions Through Transparent and Rigorous Scientific Validation

Prepared by: Colorado State University / Southern Methodist University

Contact Information: Kathleen M Smits / **ksmits@smu.edu/** 719-200-7648; Richard Kolodziej/ **richiek@smu.edu/** 224-688-5161; Daniel Zimmerle/dan.zimmerle@colostate.edu / Wendy Hartzell/ **Wendy.Hartzell@colostate.edu,** (970-491-8058)

For quarterly period ending: June 30, 2024

1: Items Completed During this Quarterly Period:

Item #	***Task #***	***Activity/Deliverable***	***Title***	***Federal Cost***	***Cost Share***
12	5	Comprehensive experimental data sets from real world field sites.	*Data collected from real world field sites*		
13	5	Understanding how probability of detection varies in adverse field conditions	*Analysis of field data*		
14	xx	6th Quarterly Status Report	*Submit 6th quarterly report*		
		6th Payable Milestone			
15	6	Draft of recommendations for incorporation into the relevant consensus guides, standards, and recommended practices manuals.	*Recommended advancements to remote methane leak detection technologies.*		
16	6	Initial report on understanding how recommended advancements can improve leak detection in adverse conditions	*Initial report*		
17	N/A	Prepare and present findings at public research meeting or conference**	*Prepare & present findings at public event*		
18	xx	7th Quarterly Status Report	*Submit 7th quarterly report*		**$1,184**
		Total			**$1,184**

2: Items Not Completed During this Quarterly Period: Activity 12, Task 5, Comprehensive experimental data sets from real world field sites are being compiled and analyzed after the June 17-21 field testing, along with Task 6, Draft Recommendations and Initial Report which are in progress and will be billed when completed.

3: Project Technical Status:

A draft version of ***Deliverable 6 Report on understanding of the probability of detection under diverse conditions*** is provided in **Appendix A** and is undergoing review by the group PI's.

Papers for academic submission are going through final review by coauthors in support of **Activity 15, Task 4.7**.

Activity 16 Task 5.1, and Activity 17 Task 5.2 Real-world field trials

To test the applicability of the developed protocol (Task 2), the first phase of real-world field experiments for Task 5.2 took place from June 17-21, 2024. A team of three members from CSU and SMU were involved in the experiments to test the protocol. The real-world experiments were conducted in the region of Vernal field office (Fig. 1), Utah, with the Bureau of Land Management's (BLM) permission, focusing on transmission and gathering lines. To detect a leak, the team covered approximately 40 miles of transmission pipelines and 15 miles of gathering pipelines, ultimately discovering a pipeline leak about 15 miles southwest of Jensen, Utah. This leak was located at a point where the aboveground pipeline transitioned underground beneath a roadway. The highest methane concentration was found approximately 9 meters from this transition point, indicating the source of the leak. Initial measurements at the source showed 40,000 ppm using the DP-IR+. Methane concentrations extended roughly 20 meters from the source. As per the protocol, three survey platforms were deployed, including walking, driving, and simulated unmanned aerial vehicle (SUAV), to collect elevated CH4 concentration data at the leak location for two days, as no other leaks were detected. Given that the peak concentration exceeded the lower explosive limit (LEL), the team proceeded with extreme caution, using four-gas monitors. As per the protocol, the team conducted leak detection surveys at three distinct times for each day of the experiment with sessions:

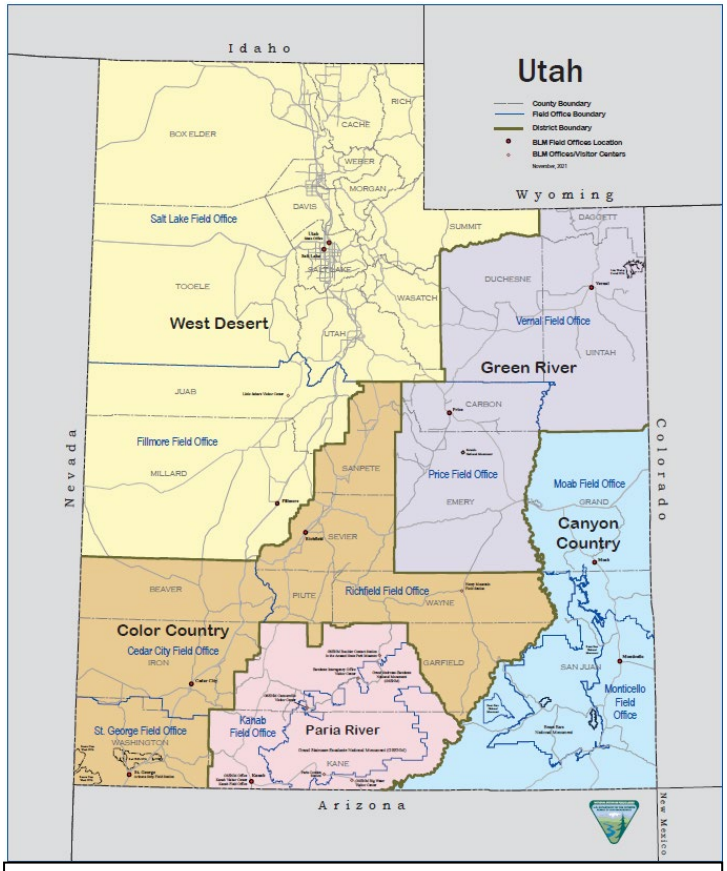

Figure 1. BLM -Utah District Map.

1. 8:00 am - 9:30 am,
2. 10:00 am - 11:30 am, and
3. 12:00 pm – 1:30 pm.

A total of six passes were conducted to collect elevated CH4 data for each survey method. The data were collected at 0, 2, 5, and 10 meters right-of-way (ROW) from the emission source in the walking survey, downwind of the emission point and perpendicular to the direction of the wind. In the driving and SUAV surveys, the data were collected at 0, 5, and 10 meters ROW from the emission point. After completing the surveys, the team reported the leak to BLM and the local emergency gas team. Data analysis is progressing from the June test, and the team is also planning for additional field testing in the next month, utilizing pipeline facilities in Texas.

Presentations and Conferences:

Citations:

- Kolodziej, R. S., Venkata Rao, G., Tian, S., Zimmerle, D.J., Smits, K.M. "*Impacts of mixed hydrocarbon blends on probability of detection from belowground pipeline leaks.*" In Review, 2024.
- Venkata Rao, G., Kolodziej, R. S., Uribe, J R., Zimmerle, D.J., Smits, K.M. "*Impact of Soil Water Saturation and Soil Heterogeneity on Methane Migration for Leak Detection and Quantification.*" In Review, 2024.

Project PI's gave a presentation to **Colorado Public Utilities Commission (PUC) on May 7th 2024** and the **Energy & Carbon Management Commission (ECMC) on May 8th 2024**.

Citations:

- Zimmerle, D., & Smits, K., *Martinez Irwin Presentation on Flowline Safety Research Results, May 7, 2024,* Presented at the meeting of Colorado Public Utilities Commission (PUC), Denver, CO.
- Zimmerle, D., & Smits, K., *Martinez Irwin Presentation on Flowline Safety Research Results, May 8, 2024,* Presented at the meeting of Energy & Carbon Management Commission (ECMC), Denver, CO.

Project PI's will give a presentation to the Texas Railroad Commission Meeting on August 31st, 2024.

- Citation: Smits, Zimmerle, Kolodziej and Rao, Accelerating Natural Gas Leak Detection Solutions for Underground Pipeline Leaks Through Transparent and Rigorous Scientific Validation, August 31, 2024, Austin TX Presentation at the annual Texas Railroad Commission Meeting, invited presentation.

4. Project Schedule

The project is progressing as scheduled. A no-cost extension was approved, extending final reporting deadlines to March 31, 2025.

Appendix A: Draft Version of *Deliverable 6 Report on understanding of the probability of detection under diverse conditions. (**redacted in Public Report**.)*