Public Quarterly Report

Date of Report: 8th Quarterly Report – September 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

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For quarterly period ending: September 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		**$140,101**	
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*		
		7th Payable Milestone		**$61,187**	**$66,754**
		8th Quarterly Status Report			
		Total		**$201,288**	**$66,754**

2: Items Not Completed During this Quarterly Period: None**.**

3: Project Technical Status:

The team completed edits to the Report on Understanding of Probability of Detection under Diverse Operating Conditions (Deliverable 6). The final report is attached as Appendix A (*redacted in public report*).

Real-World Field Trials and POD Analysis (Tasks 5.2, 5.3, and 5.4):

To test the applicability of the developed protocol, the second phase of real-world field experiments for Task 5.2 took place from September 3-6, 2024. A team of three members from CSU and SMU participated in the experiments to test the protocol. The real-world experiments were conducted in the Permian Basin region of Western Texas, with the operator's permission, focusing on underground gathering lines. To detect a leak, the team covered approximately 25 miles of gathering pipelines and ultimately discovered a pipeline leak about 5 miles northeast of Denver City, Texas. This leak was detected over an underground pipeline with a diameter of 1½ inches and a pressure of 80 lbs. Initial measurements at the source showed 100% gas using the DP-IR+. CH4 concentrations extended roughly 10m from the source. Immediately after detecting the leak, the team reported it to the operator. 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. Given that the peak concentration exceeded the lower explosive limit (LEL), the team proceeded with extreme caution, using four-gas monitors. In accordance with the protocol, the team conducted leak detection surveys at three distinct times each day of the experiment: 1) 12:30 pm - 01:30 pm, and 2) 01:30 pm - 02:30 pm on Day 1, and 3) 8:00 am - 9:30 am on Day 2. A total of six passes were conducted to collect elevated CH4 data for each survey method. The data were collected at 0, 5, and 10 m downwind distance of pipeline right-of-way (ROW) from the leak source during the walking survey, downwind of the emission point and perpendicular to the wind direction.

Team completed the data analysis for both real-world field trials conducted in Uinta-Piceance Basin of Western Colorado and Eastern Utah from June 17-21 and in the Permian Basin of Western Texas from September 3– 6.

- Deliverable 7 - 8 Analysis of field data from real-world sites; Understanding how probability of detection varies in adverse field conditions, is attached as Appendix B (*redacted in public report*).
- Deliverable 9 - Recommended advancements to remote methane leak detection technologies is attached as Appendix C (*redacted in public report*).

The team is planning to complete these tasks/deliverables in the next quarter:

- Finalize preparations for submitting the Soil Moisture paper to a peer-reviewed journal.

- Complete the draft of the Urban Canyon paper and diverse operating conditions paper, utilizing complete data sets to analyze the impacts of sloped and urban conditions.

Presentations and Conferences:

Presentations:

- Smits, K.M., D. Zimmerle, N. Jayarathne, G.V. Rao and R.S. Kolodziej, "Improving leak detection for natural gas pipeline leaks," presented at the National Association of Pipeline Safety Representative National Meeting, Niagara Falls, New York, September 24, 2024. Invited Presentation.

Academic Publications/Journal Articles (Task 4.7):

- **Atmospheric Stability and Gas Plume Behavior:** Titled "Improving the efficacy of mobile leak survey methods for belowground natural gas leaks by incorporating knowledge of atmospheric stability and gas plume behavior". Submitted for peer review to *Process Safety & Env. Protection*.
- **Gas Composition Impact Paper:** Titled "Impacts of mixed hydrocarbon compositions on the probability of detection from belowground pipeline leaks using mobile survey methods". Submitted for peer review *to Elementa: Science of the Anthropocene*. (Journal Paper).
- **Soil Moisture Paper:** Titled "Performance of Mobile Survey Solutions for Natural Gas Pipeline Leaks under Different Soil Texture, Moisture, and Surface Conditions." Reviewed by the group and PI, to be submitted by the end of October 2024.
- **Urban Canyon Paper**: Titled "Performance of mobile survey solutions for belowground natural gas pipeline leaks in urban environments." In preparation.
- **Diverse operating conditions**: Titled "Understanding the probability of detection of multiple mobile survey platforms under diverse operating conditions." In Preparation.

Meetings:

- September 30, 2024, Meeting with the operators to discuss the results of real-world field trials at the Permian Basin of Western Texas.
- The next Technical Advisory Meeting is scheduled for November 6, 2024, at 9 am MT.

5. Project Schedule

The project is progressing as scheduled with some delay in analysis due to the addition of the Texas field campaign in September. Team expects to have the draft Final Report ready for initial review by November 2024.

Appendix:

A. Deliverable 6 - Report on understanding of the probability of detection under diverse conditions (*redacted in public report*).
B. Deliverable 7-8, Analysis of field data from real-world sites; Understanding how probability of detection varies in adverse field conditions (*redacted in public report*).
C. Deliverable 9 – Recommended advancements to remote methane leak detection technologies (*redacted in public report*).