Quarterly Report

Date of Report: January 1st, 2021
Contract Number: PHMSA-RA-DTPH56-17-RA-00002
Prepared for: Pipeline and Hazardous Materials Safety Administration (PHMSA)
Project Title: Tools for Predicting Gas Migration and Mitigating its Occurrence/Consequence
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For quarterly period ending: December 31st, 2020

Results and Conclusions:

In this quarter, we have continued to make progress. We have worked on the following tasks to achieve the proposed work in this project (The task number follows the numbering in the project timeline):

Task 4: Validation of analytic tool

As a follow on to this work, we performed a series of experiments at METEC in 2020 that we are currently analyzing, and we are working on the draft for publication. The manuscript focuses on estimating leakage rates from underground pipeline leaks using atmospheric methane concentrations measured various environmental conditions. In addition, the findings/ manuscript focus on describing the environmental conditions that effect the gas readings. These experiments captured diurnal variations during the methane release experiments from underground pipeline. The results of this studies have important implications for understanding atmospheric conditions on fugitive methane emissions from underground pipeline leaks. In addition to emission estimates from atmospheric methane concentrations, we used a network of low-cost sensors to measure near surface methane concentrations. Data analysis is currently in progress.

Tasks 3&4: Develop & deploy leak detection survey tool

We analyzed survey data and performed statistical analysis to understand the parameters affecting gas migration in soil. We met with industry partners to discuss the findings and their implications. We are working on the draft for publication.

Presentations:

- November 2, 2020 Virtual meeting with project industry partners to provide an update on the analytic tool and atmospheric methane measurements. Specifically, we presented methods to estimate natural gas emissions using both surface and atmospheric concentration measurements.

- Tian, S., K.M. Smits, Y. Cho, S.N. Riddick, D. Zimmerle, A. Duggan, C. Bell, Characterization, evolution and physics-based quantification of methane emissions from leaking underground NG pipelines, American Geophysical Union Fall Meeting, Virtual, Dec 2020 (poster)

- Cho, Y., K.M. Smits, S. N. Riddick, Estimating NG emissions from underground pipelines using surface concentration measurements, American Geophysical Union Fall Meeting, Virtual, Dec 2020 (poster)

- Riddick, S.N., C. Bell, A. Duggan, T. Vaughn, K.M. Smits, Y. Cho, K. Bennett, D. Zimmerle, Modelling temporal variability in the surface expression above a methane leakage: The ESCAPE model, American Geophysical Union Fall Meeting, Virtual, Dec 2020 (poster)

Plans for Future Activity:

Future work is focused on the refinement of our analytic tool, numerical modeling of the parameters affecting the predicted extent of the gas migration. Future modeling work will be extended to different obstruction conditions, vegetation, soil layering, and other environmental parameters.