# Measurement of Hydrocarbon and Greenhouse Gas Emissions from Uncharacterized Area Sources

## PROJECT FACT SHEET

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2012 Unconventional Resources

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12122-15

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**Cost Share**
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**Prime Contractor**
Utah State University

**Participants**
Utah Science Technology and Research Initiative; Bureau of Land Management; Utah Department of Environmental Quality; GSI, Inc.

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**Reports and Publications**
www.rpsea.org/projects/12122-15

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## Research Objectives

The project objective is to quantify emissions from uncharacterized area sources, including produced water evaporation ponds, land farms, areas with natural (and human-enhanced) geological seepage, and soils near wells in Utah's Uintah Basin. These sources have never been quantified but likely contribute significantly to overall ozone-forming hydrocarbon and greenhouse gas emissions. Quantification will improve the accuracy and efficacy of air quality decisions made by operators while expanding the pool of characterized emission sources that can be used in emissions reductions schemes required by air quality regulators in the Uintah Basin and other areas. Emissions from facilities that employ different solid and liquid waste management strategies will be tested to determine the air emissions impact of each strategy.

## Approach

An enhanced version of an EPA emission isolation flux chamber will be used to characterize carbon dioxide, methane, and nonmethane hydrocarbon emissions from area sources related to oil and gas development. The chamber will be compared against plume characterization/inverse modeling and eddy covariance flux measurements. The collected data will be used to develop computational models that use hydrocarbon concentrations, meteorological conditions, and other parameters to predict emissions from oil and gas waste facilities, including facilities in the Uintah Basin.

The same measurement techniques will also be used to determine emissions from soils in the Uintah Basin. Soils on well pads will be measured to determine if well bore or other subsurface leakage is a significant air emissions source. Soils at locations distant from wells that may experience natural or enhanced (due to reservoir pressurization) hydrocarbon seepage will also be measured.

## Accomplishments

Researchers have constructed and fully tested the flux chamber system and have completed characterization of one produced water disposal facility and one land farm. The team has contacted EPA, Utah Department of Environmental Quality (DEQ), and GSI to allow for method comparisons of emission measurements at produced water ponds. Investigations continue into the applicability of using a Weather Research and Forecasting (WRF) Model to calculate meteorological input parameters for an Atmospheric Dispersion Model (AERMOD). Utah State completed a summer sampling campaign at two produced water disposal facilities in Wyoming in collaboration with GSI, Inc. and Wyoming DEQ. The flux chamber measurements at these facilities were made simultaneously with emissions measurements made by GSI with an open-path Fourier Transform Infrared Spectroscopy (FTIR) instrument. Researchers measured emissions of formaldehyde and other carbonyls from produced water ponds for the first time in order to add to their knowledge about emissions of hydrocarbons and alcohols.

## Significant Findings

This project will allow industry and regulators to develop quantitative, measurement-based emissions estimates for oil and gas area sources for the first time. This will improve environmental management of oil and gas operations. The team evaluated the accuracy of WRF outputs by comparing its estimations with measured meteorological parameter at the study site and found that the model well reproduced the measured values.

## Future Plans

Researchers will conduct a number of quality control experiments to compare flux chamber-derived emission rates with those derived from inverse modeling, and to determine the effects of different chamber operating conditions on measured emission rates.