



# Methane Emissions from Natural Gas Distribution Pipelines in CA

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June 2016

ESTABLISHED 1941

# Company Overview

- > Independent, not-for-profit established by the natural gas industry
- > GTI tackles tough energy challenges turning raw technology into practical solutions
- > Downhole to the burner tip including energy conversion technologies



RESEARCH &  
DEVELOPMENT



PROGRAM  
MANAGEMENT



TECHNICAL/  
ANALYTICAL



CONSULTING



TRAINING

# Disclaimer

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This presentation does not necessarily represent the views or policies of the California Air Resources Board.

# Project Overview

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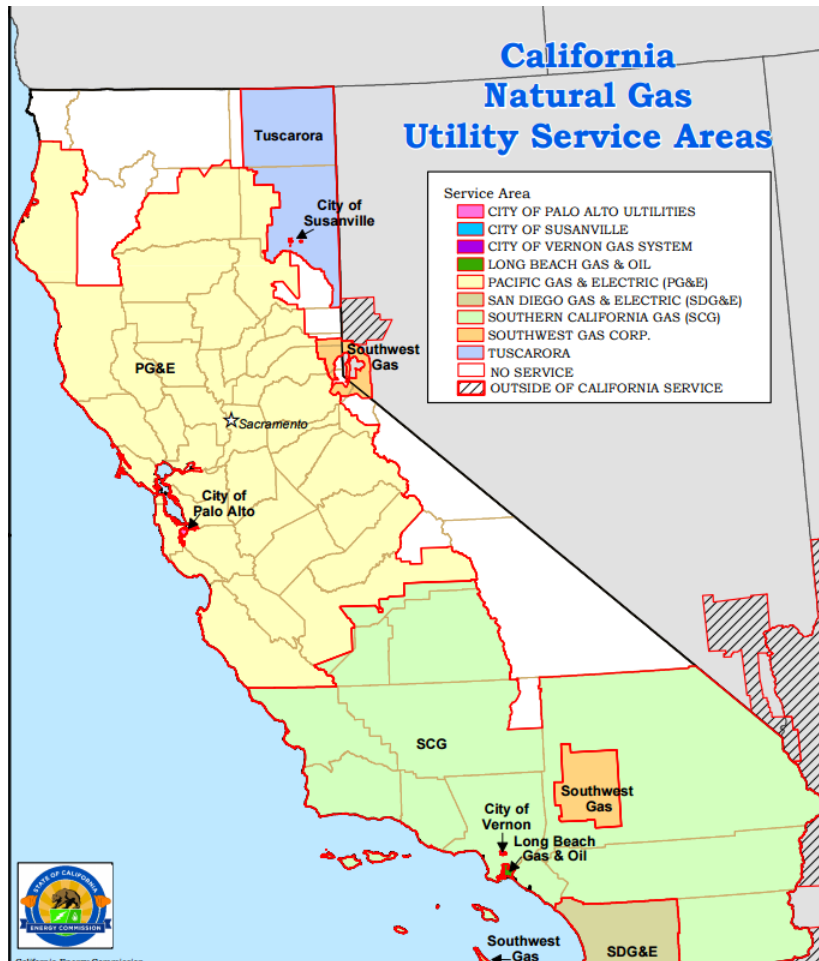
- > Sponsored by California Air Resources Board
- > Project duration of 24 months
- > Participating Utility Partners: SoCal Gas, SDG&E, PG&E
- > Objective: Quantify fugitive methane emissions from natural gas distribution pipelines in California
- > Conducted field measurements to establish the emission factors at sites with known leaks from various types of belowground pipe materials used in the gas distribution system

# Estimating Methane Emissions

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- > Total Emissions =  $\sum$  Emission Factors x Activity Data
- > Emission Factors = Leak rate in scf/leak-year
- > Activity Data = Number of annual equivalent leaks
- > Until recently current US EPA GHGI used emission factors from 1996 GRI/US EPA study
- > April 2016, US EPA revised their methane emission estimates based on the data from recent studies (EDF/WSU, GTI/OTD)

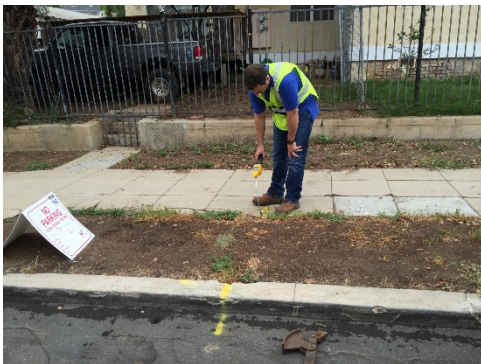
# Selection of Sites



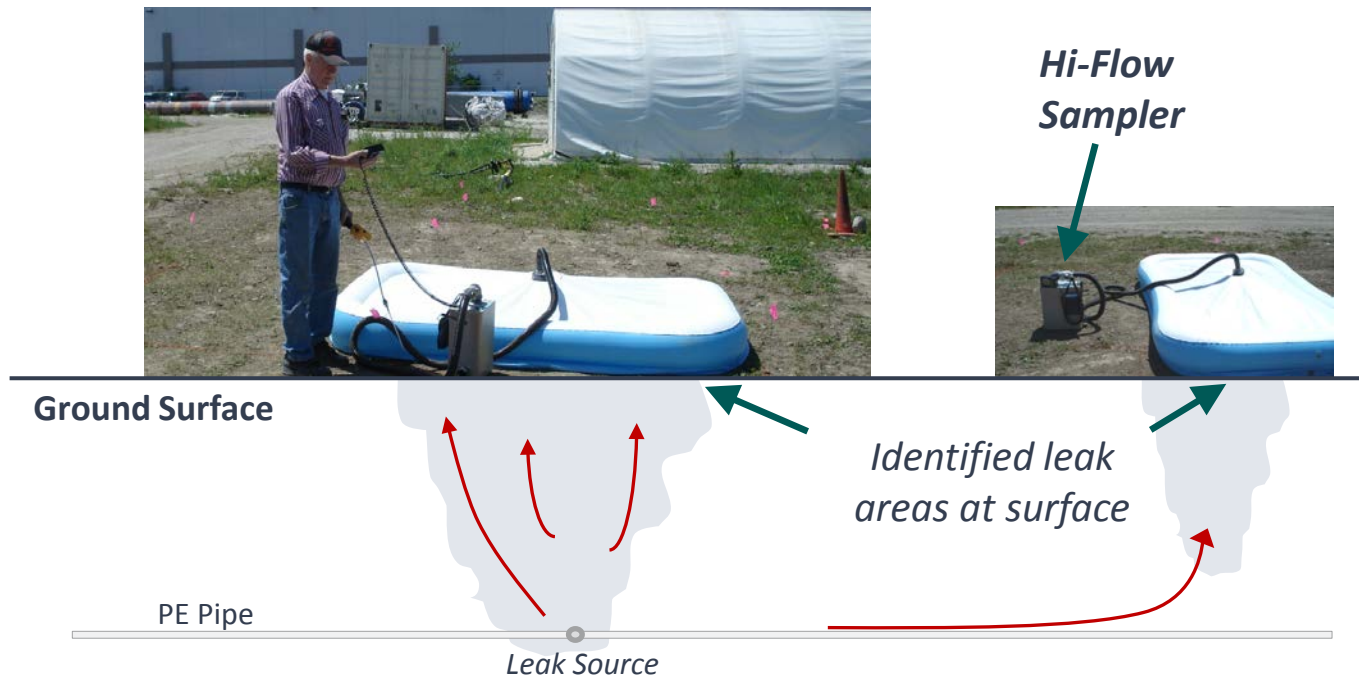
- > Plastic mains and services (57% of samples)
- > Unprotected steel mains and services (43% of samples)
- > Measured non-hazardous leaks (Grades 2 & 3)
- > Randomly selected sites based on leak records provided by each utility

# Measuring Methane Emissions

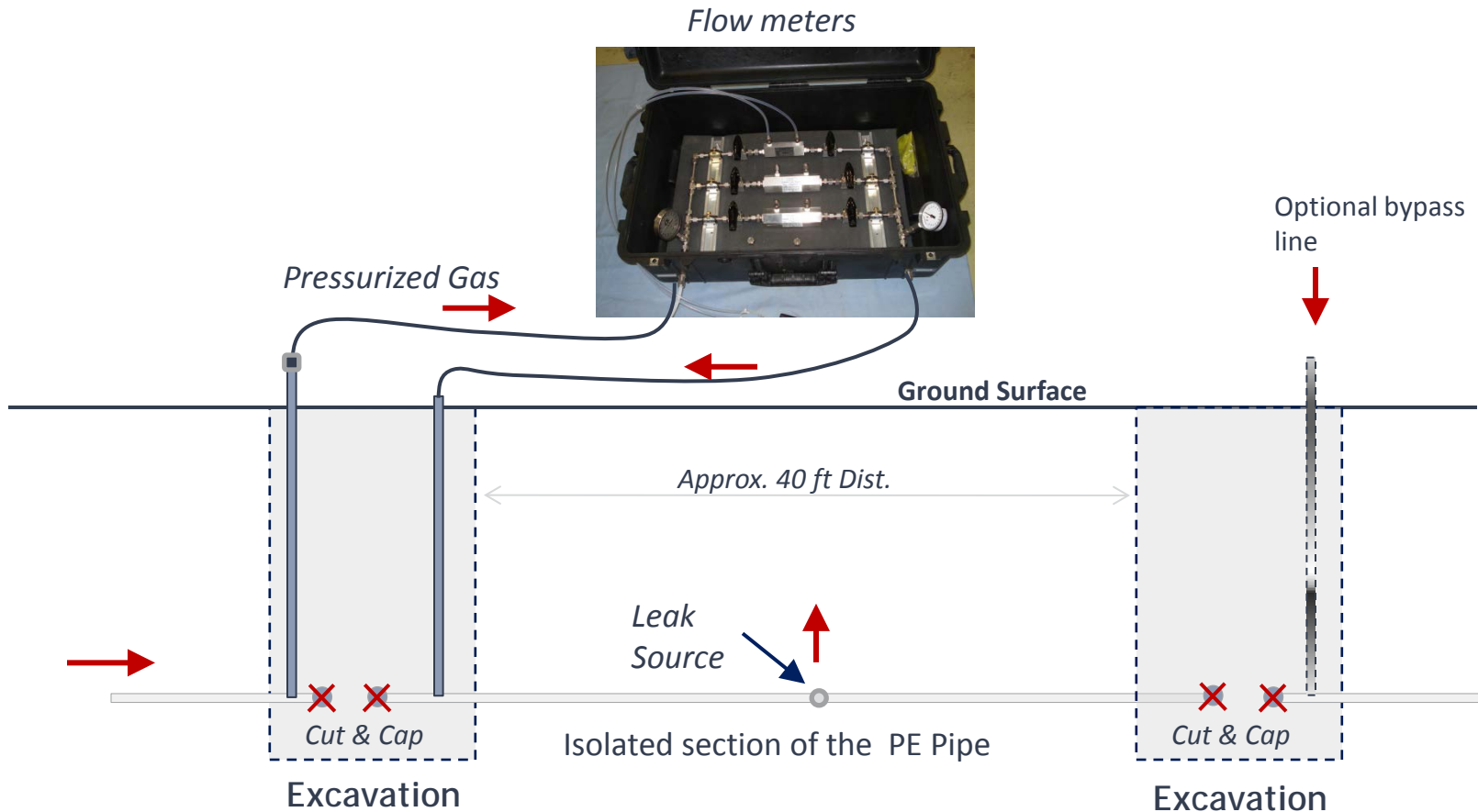
- > Survey and map leak area using a CGI
- > Enclose leak area and use the Hi-Flow Sampler to measure emissions
- > Correlate subset of surface measurements using the Hi-Flow Sampler with below ground measurements using a Laminar Flow Element



# Field Measurements – Hi Flow Sampler



# Field Measurements – Laminar Flow Element



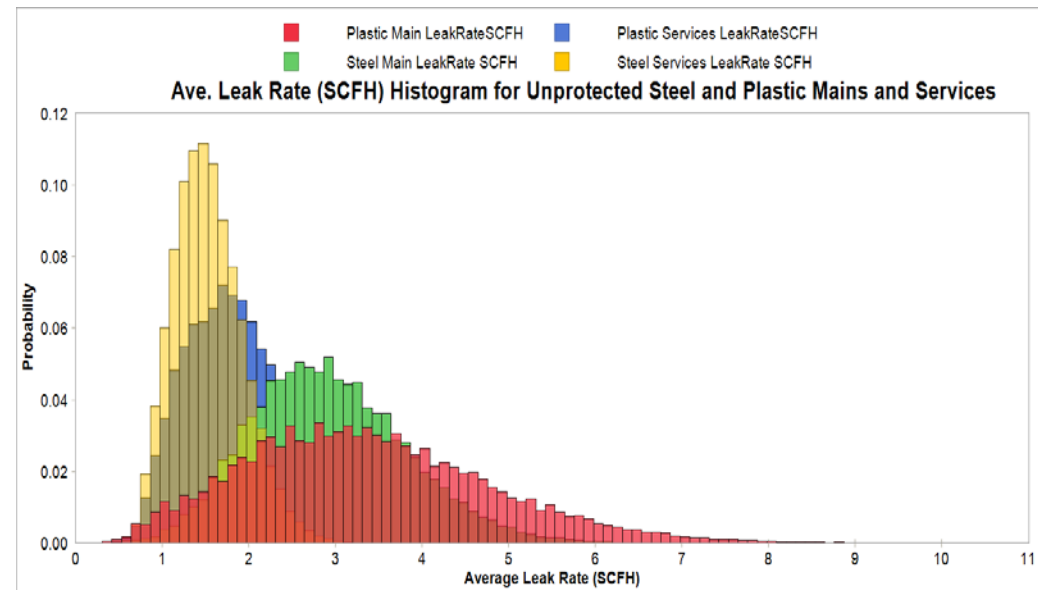
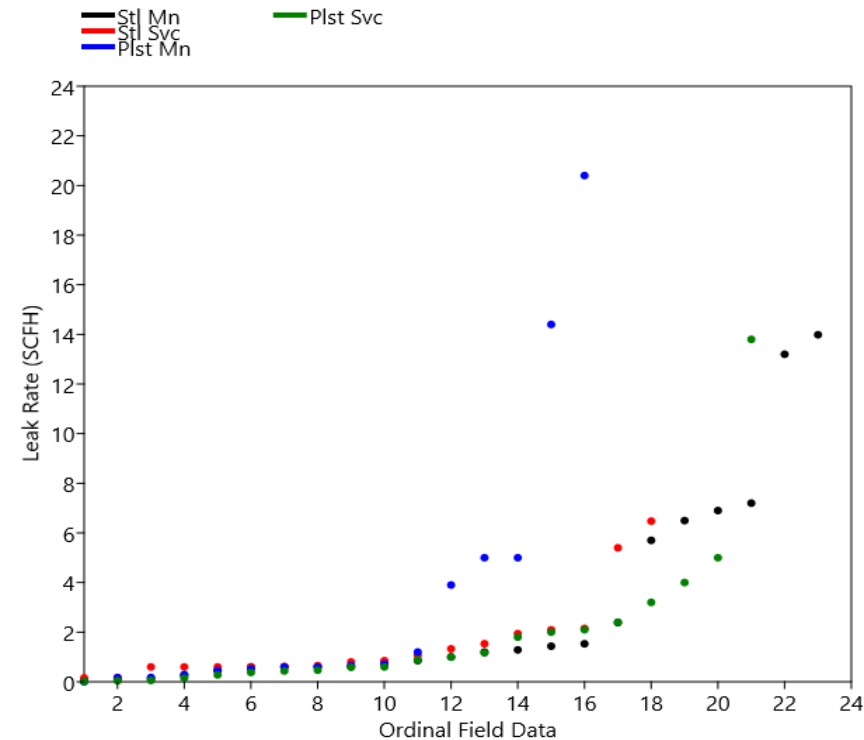
# Average Leak Rates

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- > Measured mains & services underground pipeline leaks:
  - Pipeline materials: unprotected steel & plastic
  - Samples size: 78 above and 9 below-ground measurements from across geographic and socio-economic areas in California
  - Bootstrap analysis of above-ground measurements to determine average leak rates and 90% UCL

	Unprotected Steel Main Leak Rate (scfh)	Unprotected Steel Services Leak Rate (scfh)	Plastic Main Leak Rate (scfh)	Plastic Services Leak Rate (scfh)
Mean	2.925	1.536	3.369	1.923
90% UCL	4.102	2.061	5.265	2.806

# Distribution of Measured Leaks

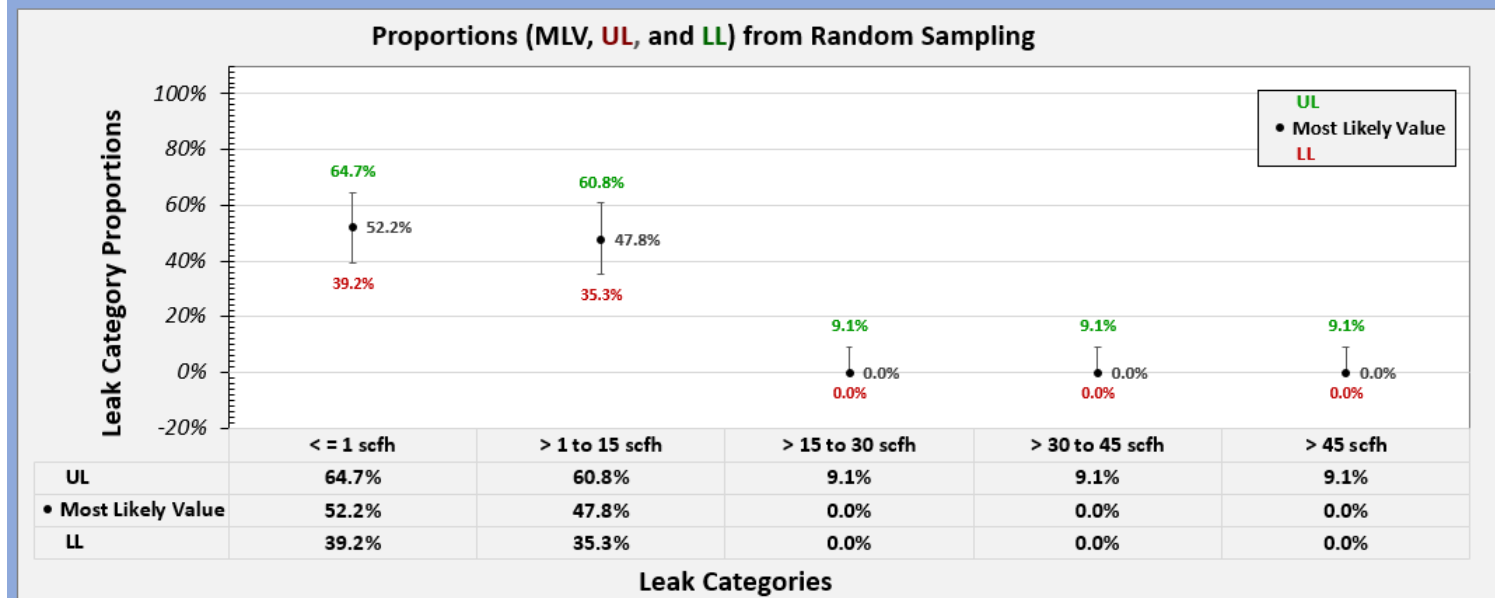


# Likelihood of Large Leaks for Unprot. Steel Mains and Services?

Confidence Level 80.0 %  
Upper Level of 90.0 %

## GTI Unprotected Steel Mains

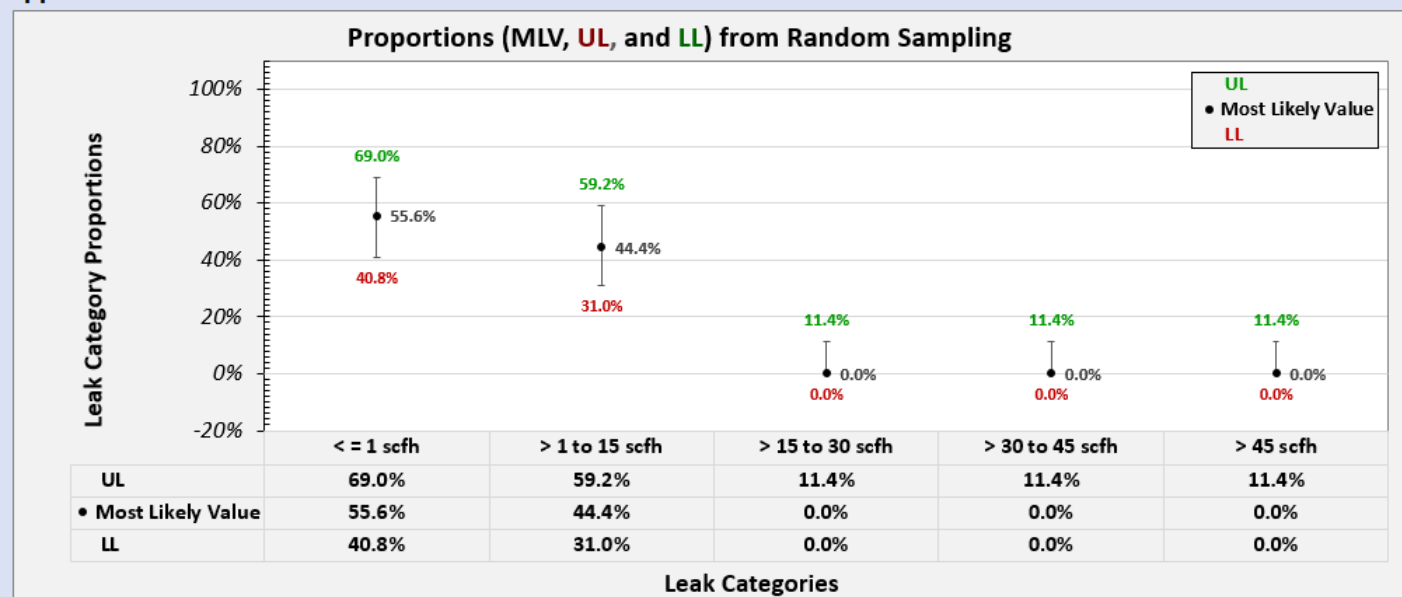
Sample Size 23



Confidence Level 80.0 %  
Upper Level of 90.0 %

## GTI Unprotected Steel Services

Sample Size 18

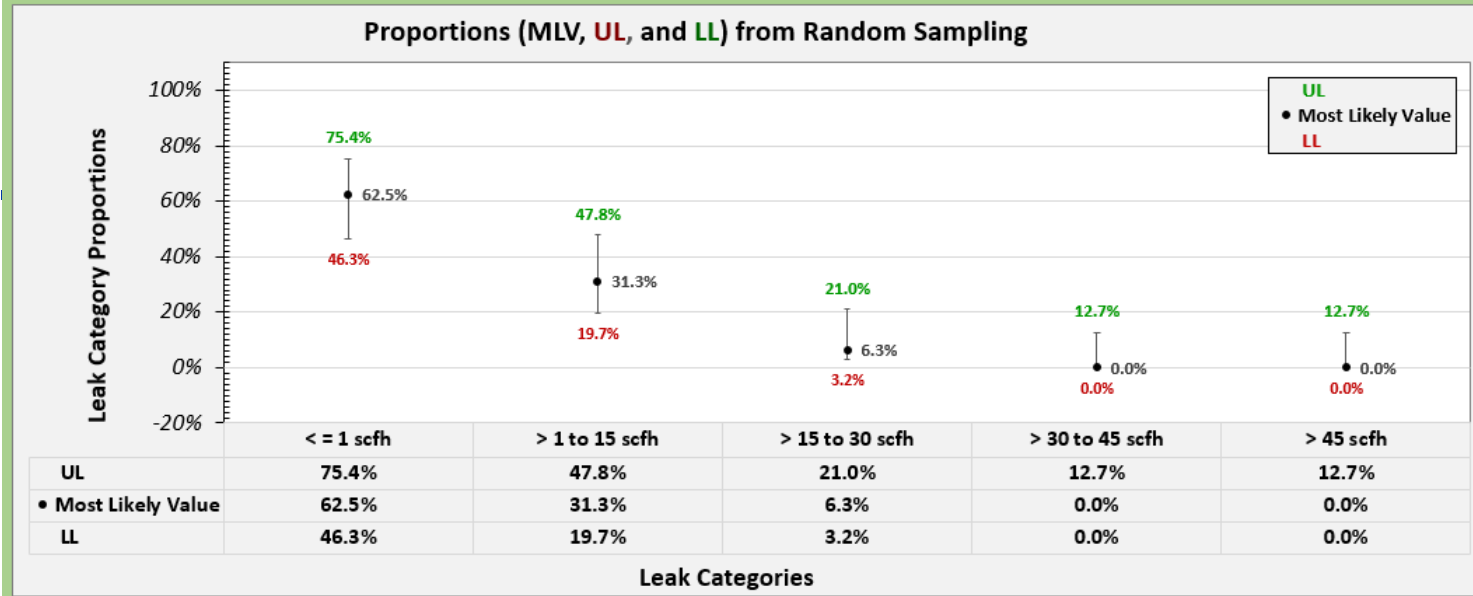


# Likelihood of Large Leaks for Plastic Mains and Services?

Confidence Level 80.0 %  
Upper Level of 90.0 %

## GTI Plastic Mains

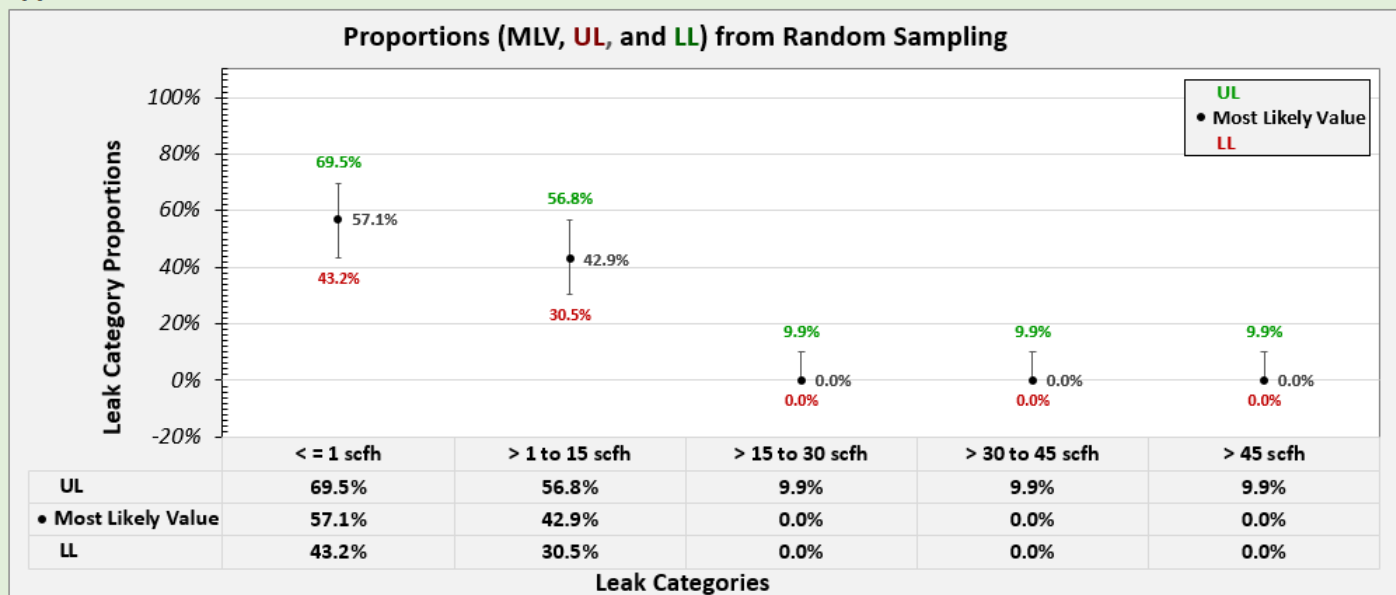
Sample Size 16



Confidence Level 80.0 %  
Upper Level of 90.0 %

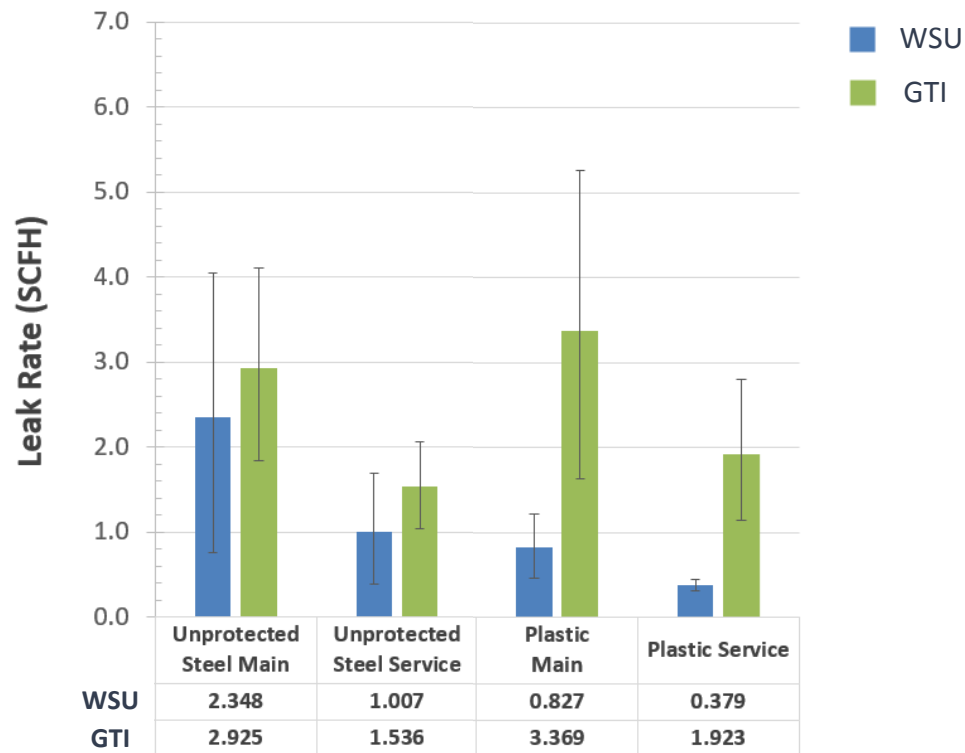
## GTI Plastic Services

Sample Size 21



# Emission Factors: CA vs National (WSU)

WSU and GTI 2015 Average Leak Rate (SCFH) with 90% Upper and 10% Lower Confidence Limits



# Summary and Potential Additional Research

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- > In General, leak rates from this study are lower than GRI/EPA 1996 study (with the exception of plastic services), but higher than the WSU national study
- > Better characterization of emissions from other distribution sources, such as residential meters in CA (\$150K proposal is in process)
- > Research programs through DOE-NETL will be addressing mitigation and quantification of methane emissions from the gas industry

# CEC Project: Quantifying Emissions from Commercial Buildings

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- > PON-14-507 Regional Climate Impacts and Adaptation Studies For the Natural Gas System and Other Environmental Related Issues
- > Develop and pilot test a method to measure fugitive emissions in commercial buildings
  - > Sources include piping and joining components downstream of meter, sewer and waste water vent stacks, commercial appliances
- > LBNL key subcontractor
- > Project initiated in Jan 2016
- > Funding \$599k

# Questions

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