Advanced Leak Detection and Data Analytics - Safety Benefits

Gas Infrastructure & Safety Policy Session
Illinois Commerce Commission
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N. Jonathan Peress

EDF ENVIRONMENTAL DEFENSE FUND®
Finding the ways that work

ALD+ = Sensors and data analytics

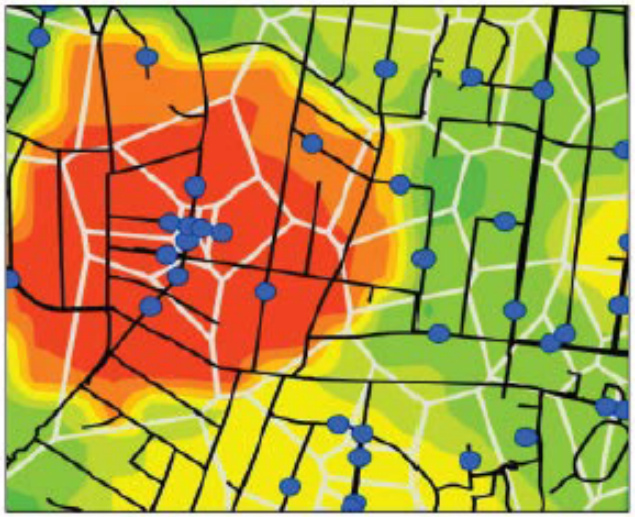
High sensitivity, mobile mounted methane detectors

e.g., Picarro, Heath/LGR

Faster, more sensitive than optical imaging or hand held flame ionization

- Integration of Current Systems
  - Assessment Tool (Picarro Technology)
  - Soil Data
  - GIS
  - Historical Leak Data
  - DIMP Data

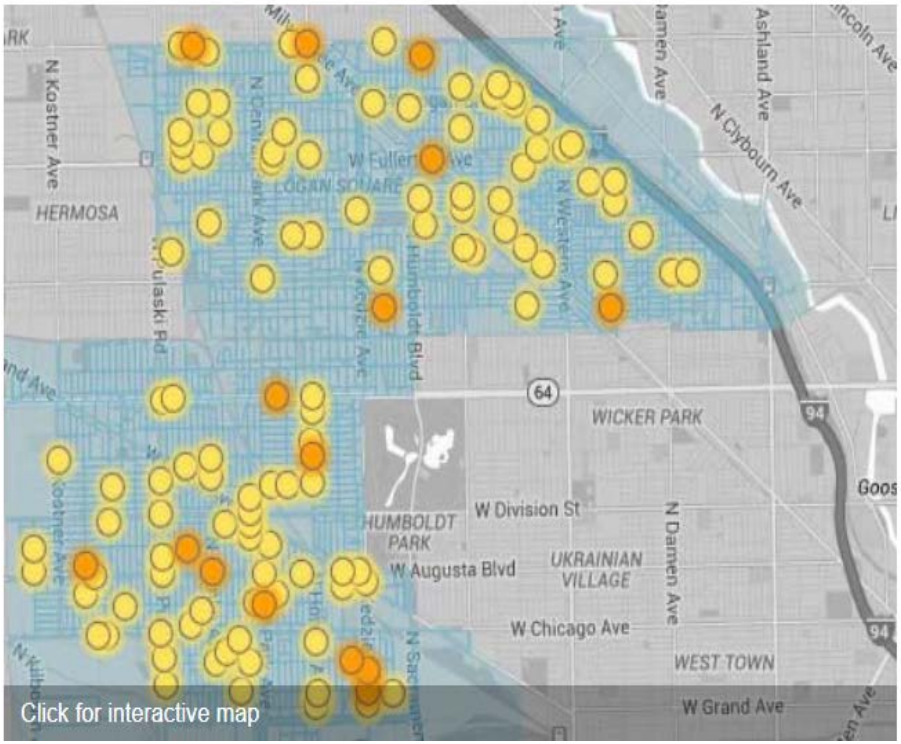
Source: PWC Consulting



Using big data analytics to model and predict risk

EDF/Google Leak Mapping Project

Explore Chicago map data



What began as an EDF science and methane public awareness campaign in 2014 is shaping gas utility business practices in 2018.

Prioritizing Pipe Replacement Using ALD+

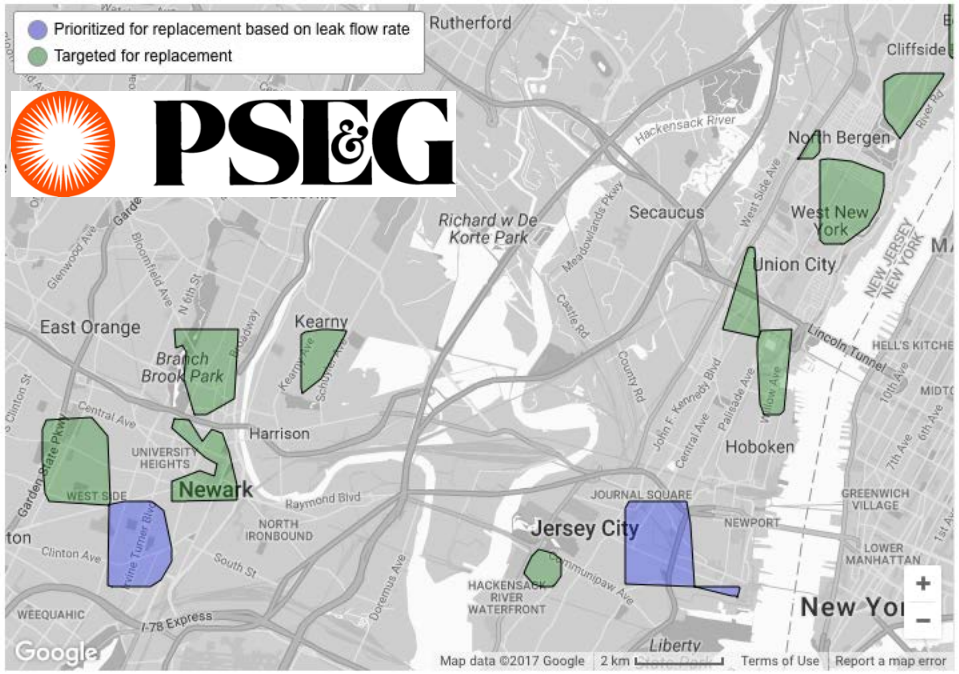
- Public Utilities Fortnightly white paper and article (May 2017) describe methodology and benefits.
- Improving decision-making by using ALD+.
- EDF collaborations with PSE&G (NJ), PGL (Chicago), Con Ed (NY), PG&E (CA) and Peoples (Pittsburgh)

Leak Detection/ Measurement Saves Money

Market Based Solutions

BY VIRGINIA PALACIOS

PSE&G: ALD+ methods helped prioritize $900M in pipeline replacement



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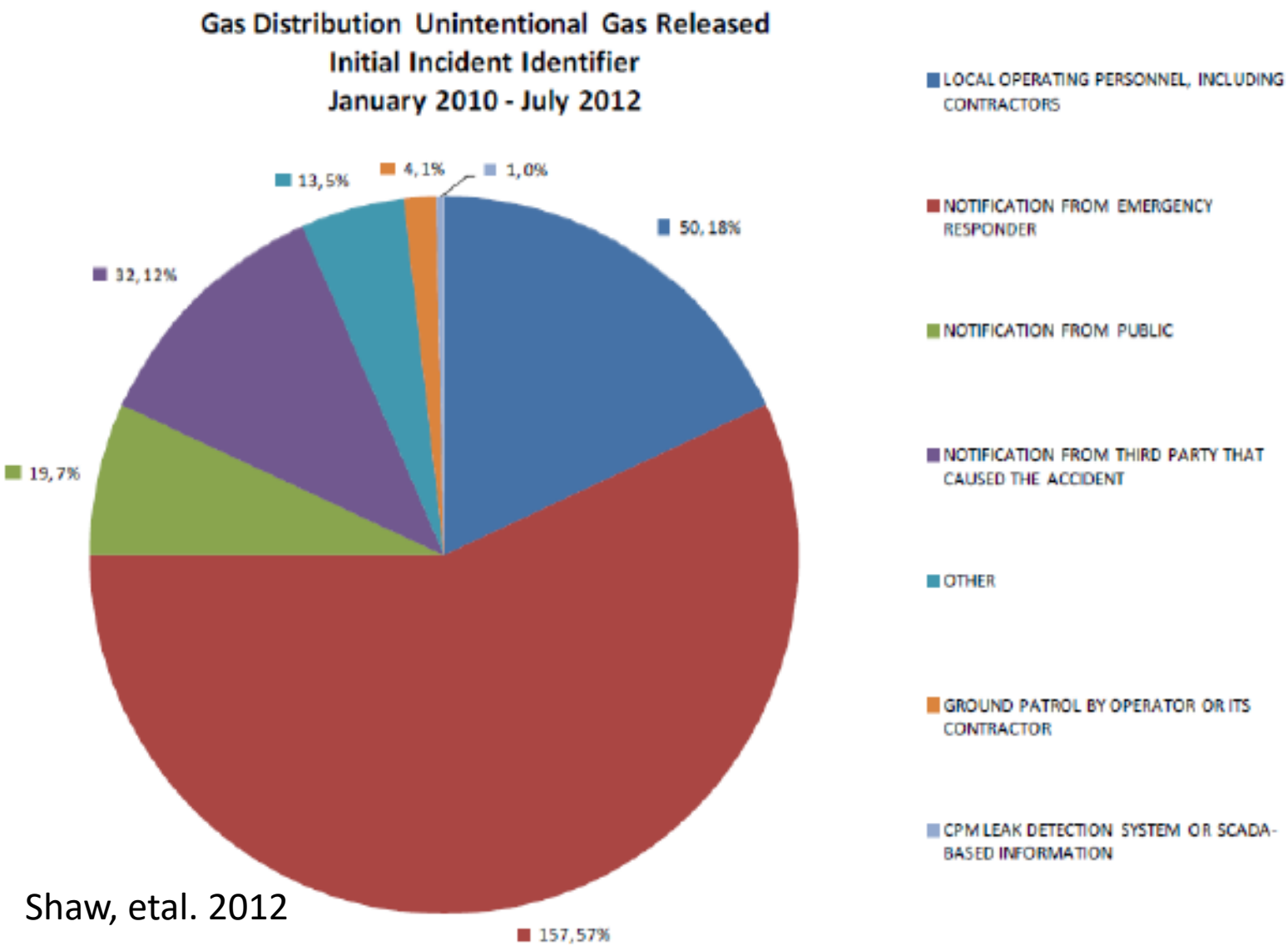
2012: First Responders Find Most Leaks



Shaw, etal. 2012

EDF/CSU Study: What did the utilities find?

Size	Utility A % **not** found	Utility B % **not** found
Low	88%	85%
Medium	77%	50%
High	0%	50%
Total	**86%**	**80%**

Source: Prof. Joseph Von Fischer, Colorado State University

Where utilities reported no leak, we found:

	Utility A			Utility B		
NG, new actionable	18	56%	23 (**72%**)	13	42%	21 (**68%**)
NG, recent repair	5	16%		2	6%	
NG, non-actionable	0	0%		6	19%	
Biological	5	16%		9	29%	
Nothing	3	9%		1	3%	
Other source	1	3%		0	0%	
Totals	32	100%		31	100%	

Source: Prof. Joseph Von Fischer, Colorado State University

Validation of false positives & leak size estimation

Weller *et al.*
EnvSci&Tech 2018

Environmental Science & Technology

Vehicle-Based Methane Surveys for Finding Natural Gas Leaks and Estimating Their Size: Validation and Uncertainty

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Supporting Information

ABSTRACT: Managing leaks in urban natural gas (NG) distribution systems is important for reducing methane emissions and costly waste. Mobile surveying technologies have emerged as a new tool for monitoring system integrity, but this new technology has not yet been widely adopted. Here, we establish the efficacy of mobile methane surveys for managing local NG distribution systems by evaluating their ability to detect and locate NG leaks and quantify their emissions. In two cities, three quarters of leak indications from mobile surveys corresponded to NG leaks, but local distribution companies' field crews did not find most of these leaks, indicating that the national CH_4 survey factor for leaks to local NG distribution pipelines is underestimated by a factor of 2.4. We found the median distance between mobile-estimated leak locations and actual leak locations was 19 m. A comparison of emission quantification methods (mobile-based, surface enclosure, and tracer ratio) found that the mobile method concentrated leak magnitude for the smallest leaks but accurately estimated size for the largest leaks that are responsible for the majority of total emissions. Across leak sizes, mobile methods adequately rank relative emission rates for repair prioritization, and they are easily deployed and offer efficient spatial coverage.

1. INTRODUCTION

Reporting natural gas (NG) leaks in urban distribution systems has significant environmental, economic, and public safety benefits. Methane (CH_4) is the primary component of NG and is the second most important anthropogenic greenhouse gas in large part because it has a global warming potential 80 times greater than CO_2 over a 20-year period.[1] The economic [illegible]

ALD finds leaks that other methods miss: PG&E, Centerpoint Energy, CSU analysis finds 3 to 5 times more leaks than standard utility survey methods

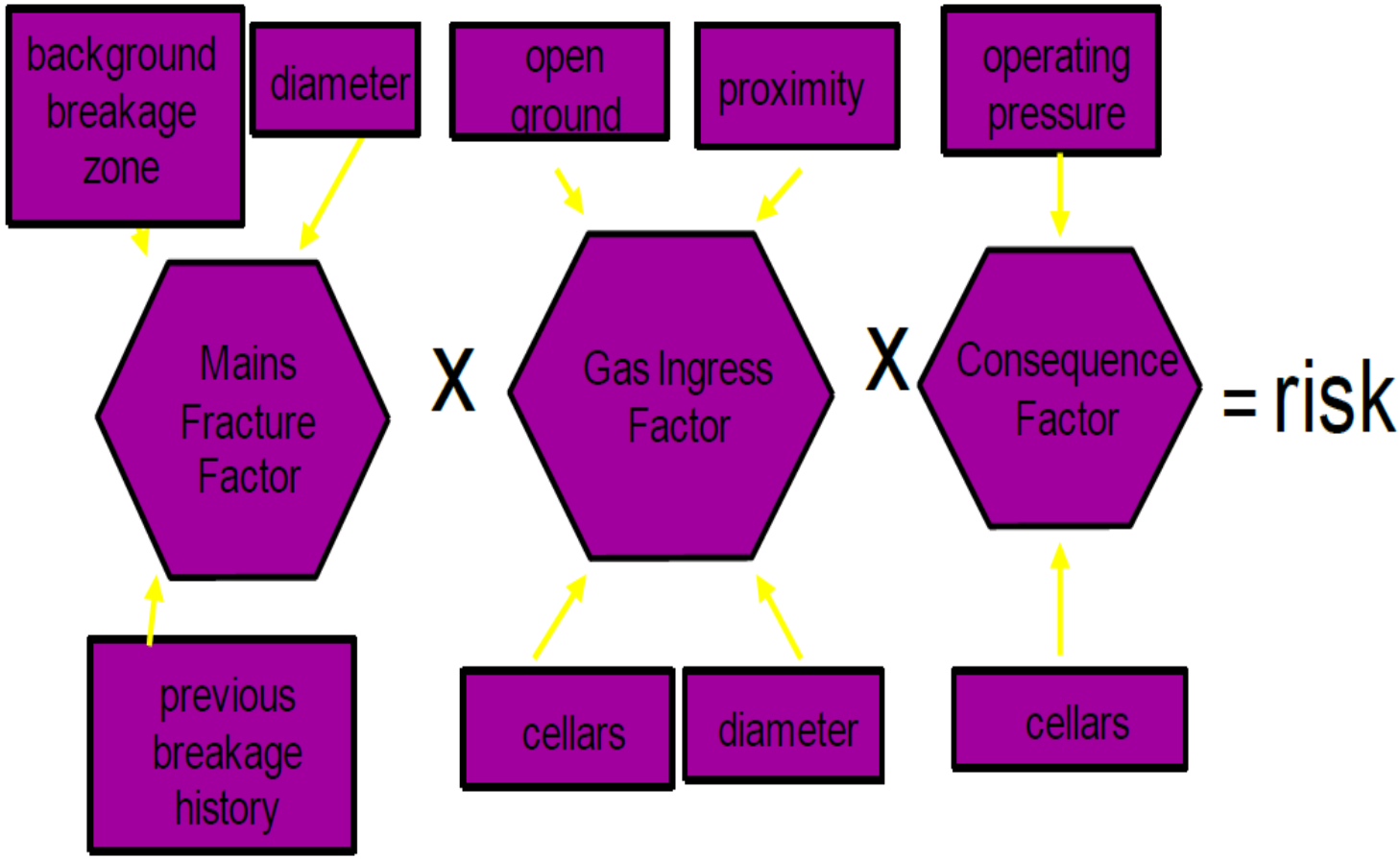
Many of these leaks present safety risk

Utilities have an obligation to use and advance state of the art safety practices

NAPSR – 2015 Summer Meeting

811 Know what's below. Call before you dig.

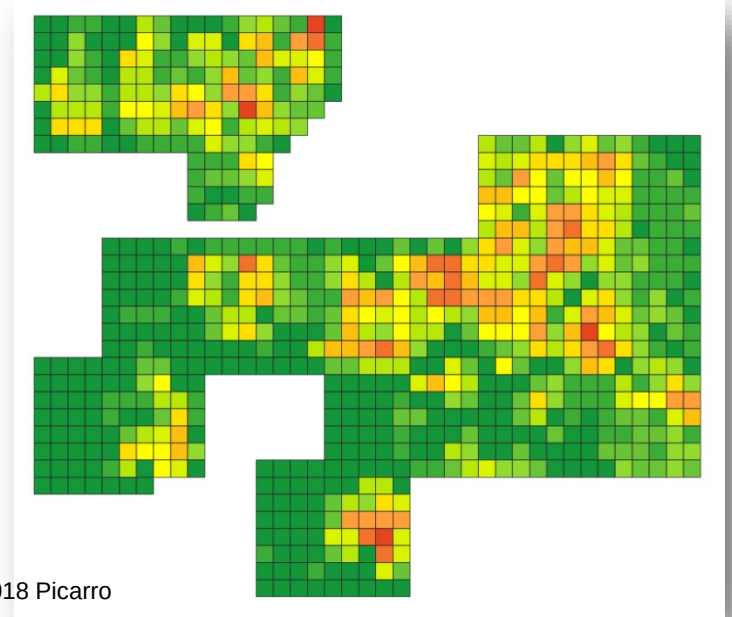
Hazard assessment algorithms – were developed at a time when odor detection was the primary basis for finding leaks. Best practice today?



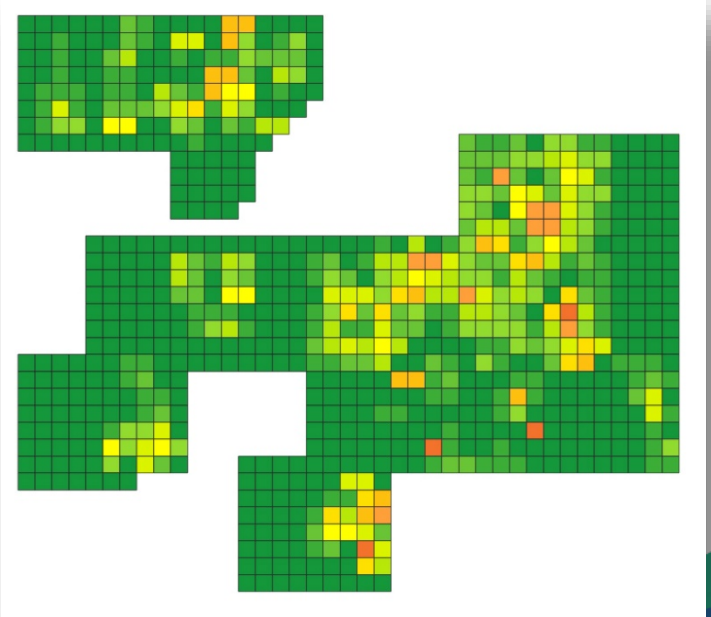
Risk Mapping (Analysis of System Risk)

- Provides high-level visualization of system risk
- Visualization of system risk support risk management, asset management, & capital prioritization decisions
- Allows identification of:
  - Highest-risk areas with highest likelihood of hazardous leaks
  - Areas most likely to have below-ground leaks that could migrate

Most potential hazardous leaks (grade 1 & 2)
(**Highest overall risk**)



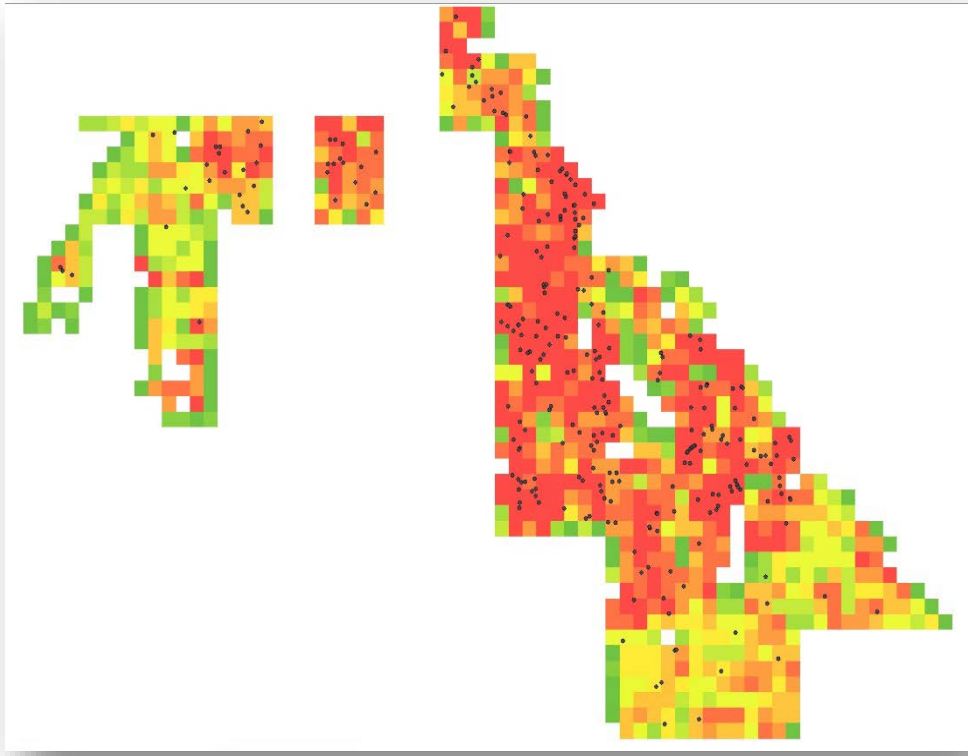
Highest-emitting potential leaks (high leak rate)
(**Highest migration risk**)



Source: 2018 Picarro

Improving DIMP Safety Model: Combined Methane Data + DIMP Model

- Allows resources to be allocated based on actual risk
- Provides cost benefits: better prioritization based on risk
- Now emerging: Big Data analytics including MI
- In sum, best safety practices are rapidly evolving



Prioritization Using DIMP + Methane Model -Heat Map

Source: Adopted from Picarro