

# PICARRO

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## The World's Leading Instruments for Carbon and Water Cycle Measurements

WORLD ECONOMIC FORUM



Technology  
Pioneer  
**2012**



CERA

Energy Innovation  
Pioneer 2012





**Inventories**  
**Emission Factors**  
**Measurements**

**“AS soon as emissions become worth a lot of money, I start losing faith in self-reported numbers regardless of who signs off on them.”**

**....Pieter Tans, Senior Scientist  
NOAA Earth Systems Research Lab**

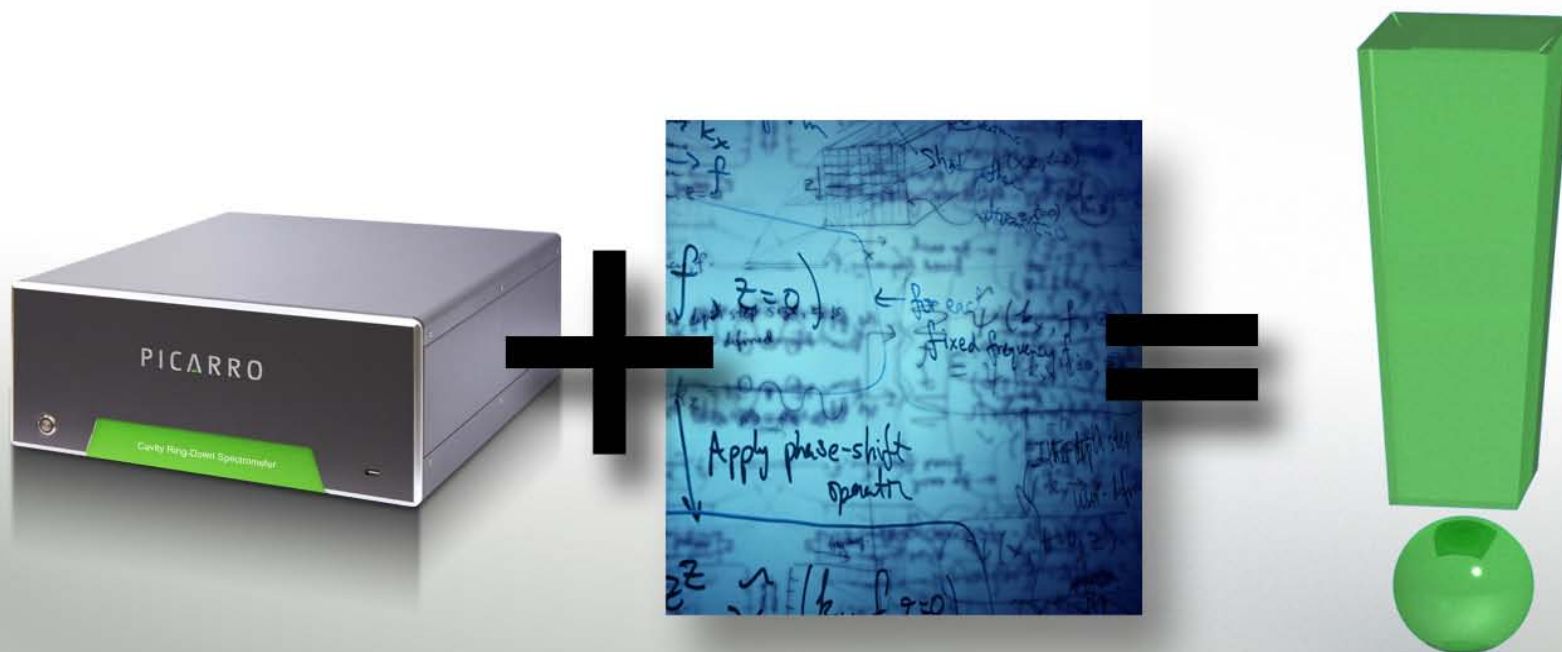
**“It’s like going on a diet without weighing yourself. We’re counting the calories, believing the bottom-up calculations are right and not making any effort to test by getting on the scale.”**

**....Ray Weiss, Professor, Scripps**

**Bloomberg Markets, January 11, 2011**





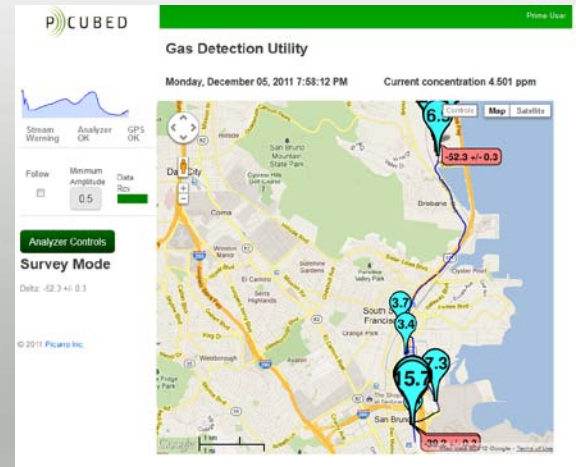
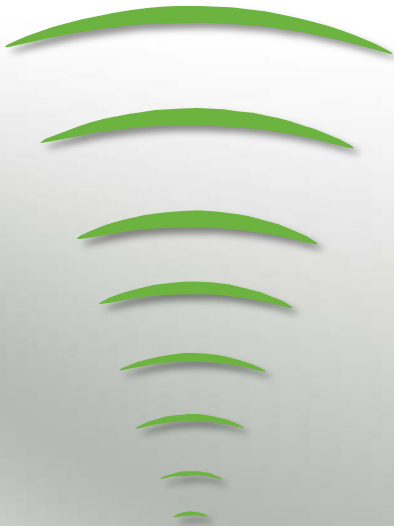


**PICARRO + SCIENCE = INFORMATION**

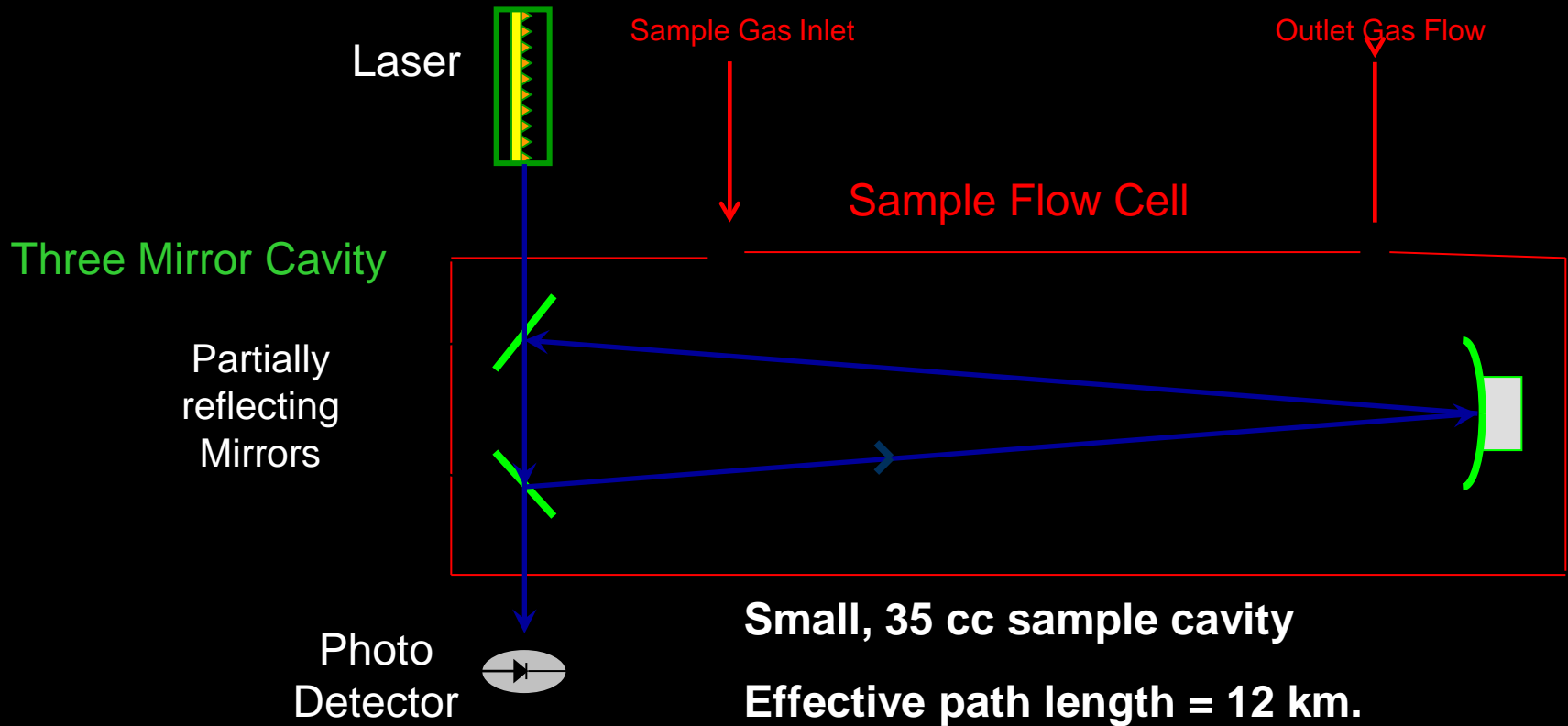


# PICUBED

Picarro Processing Platform



# Cavity Ring Down Spectroscopy



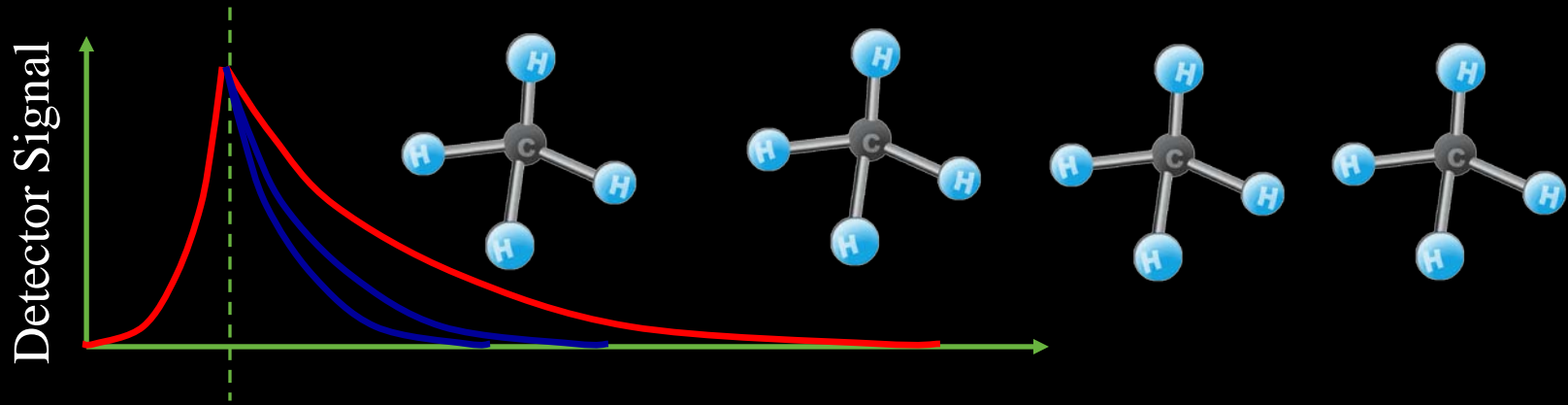


# Cavity Ring Down Spectroscopy

Shut off Laser

Fill Cavity

Make Ringdown Measurement



- Passive measurement.
- Laser is off during measurement.
- Small, 35 cc sample cavity
- Effective path length = 12 km.



**1 Part per Billion**  
← - - - +/- 12 INCHES - - - →  
**in**  
**1 Second**



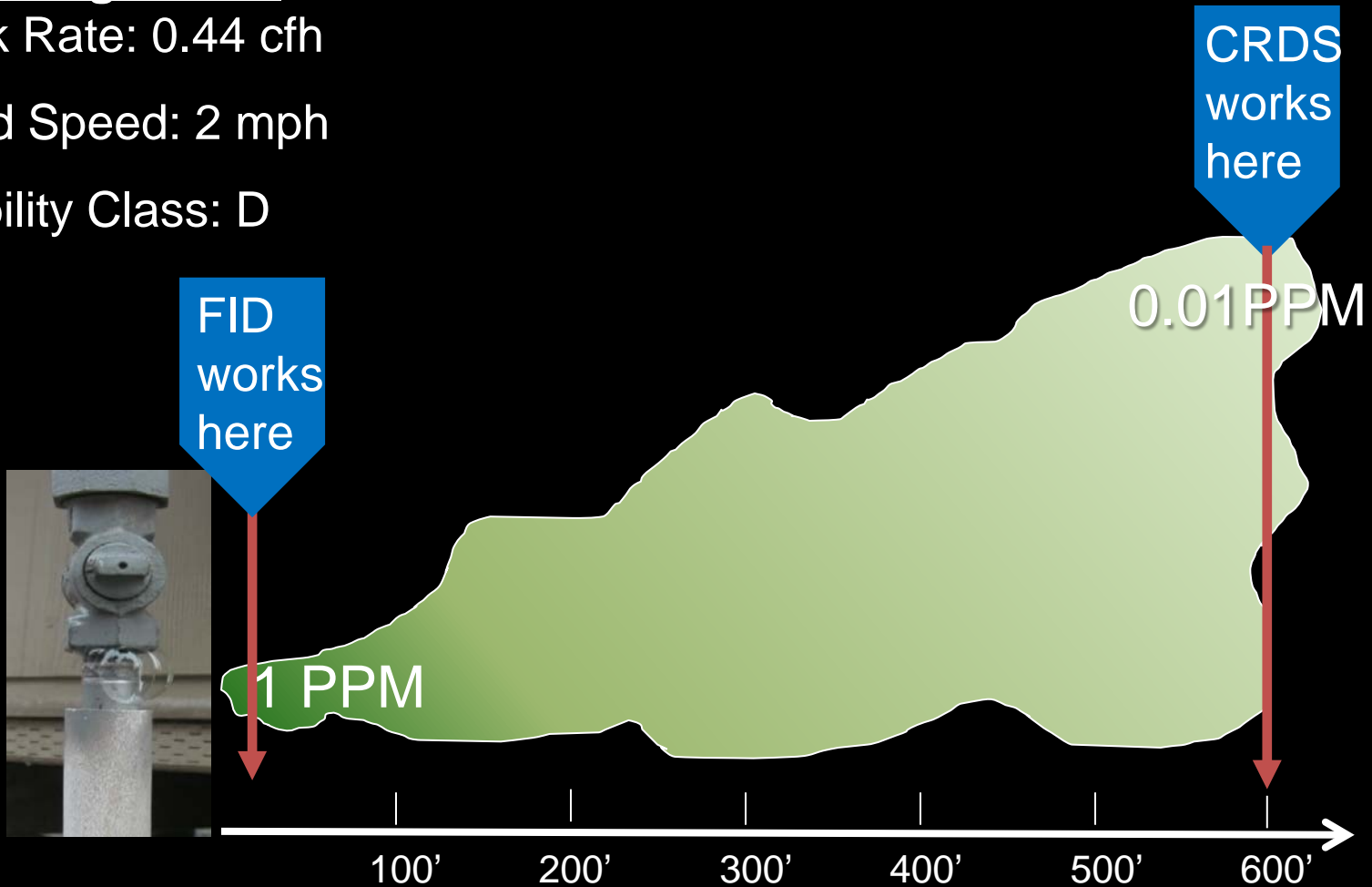
# How far away can one measure?

## Modeling a Leak

Leak Rate: 0.44 cfh

Wind Speed: 2 mph

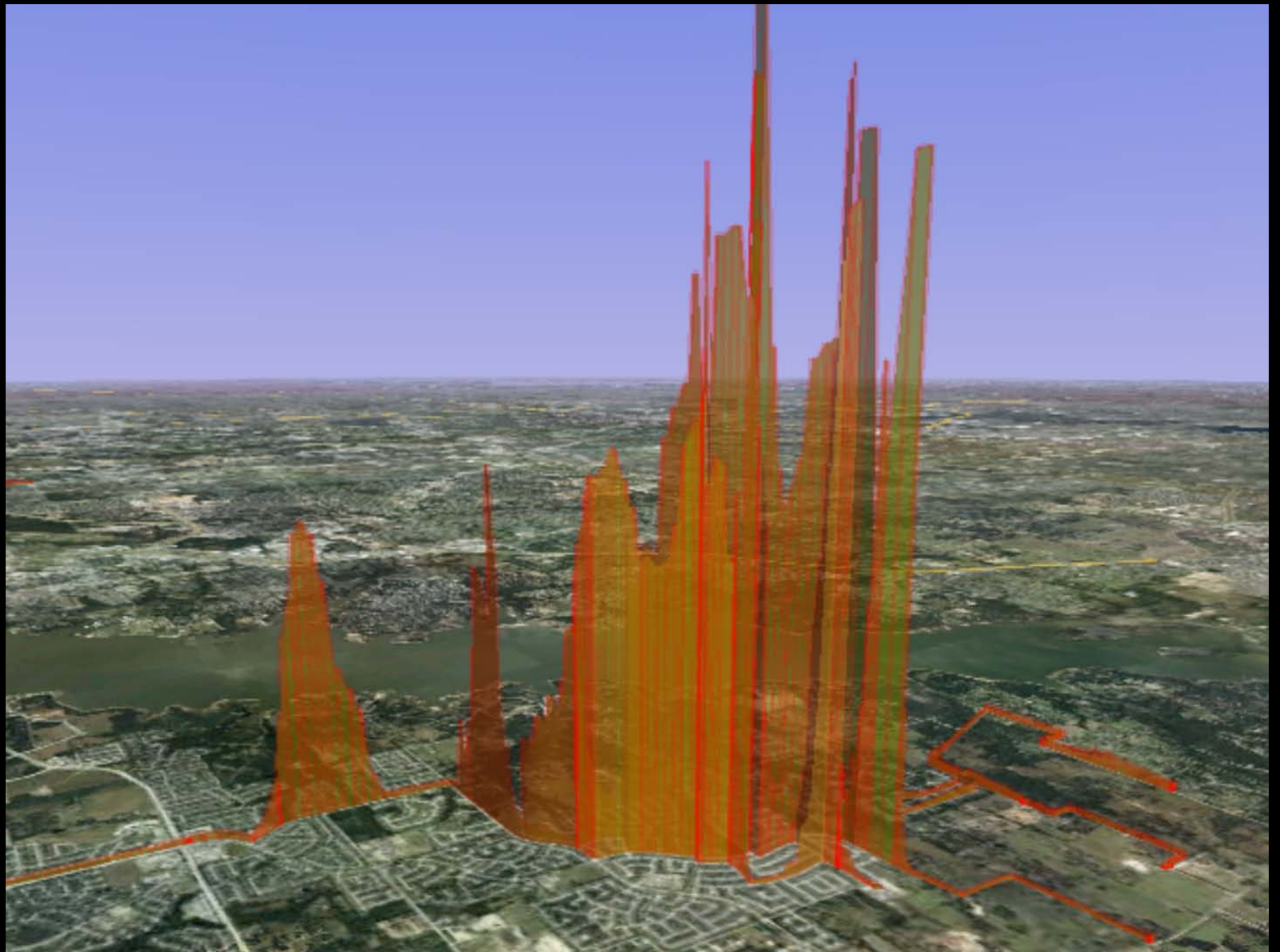
Stability Class: D



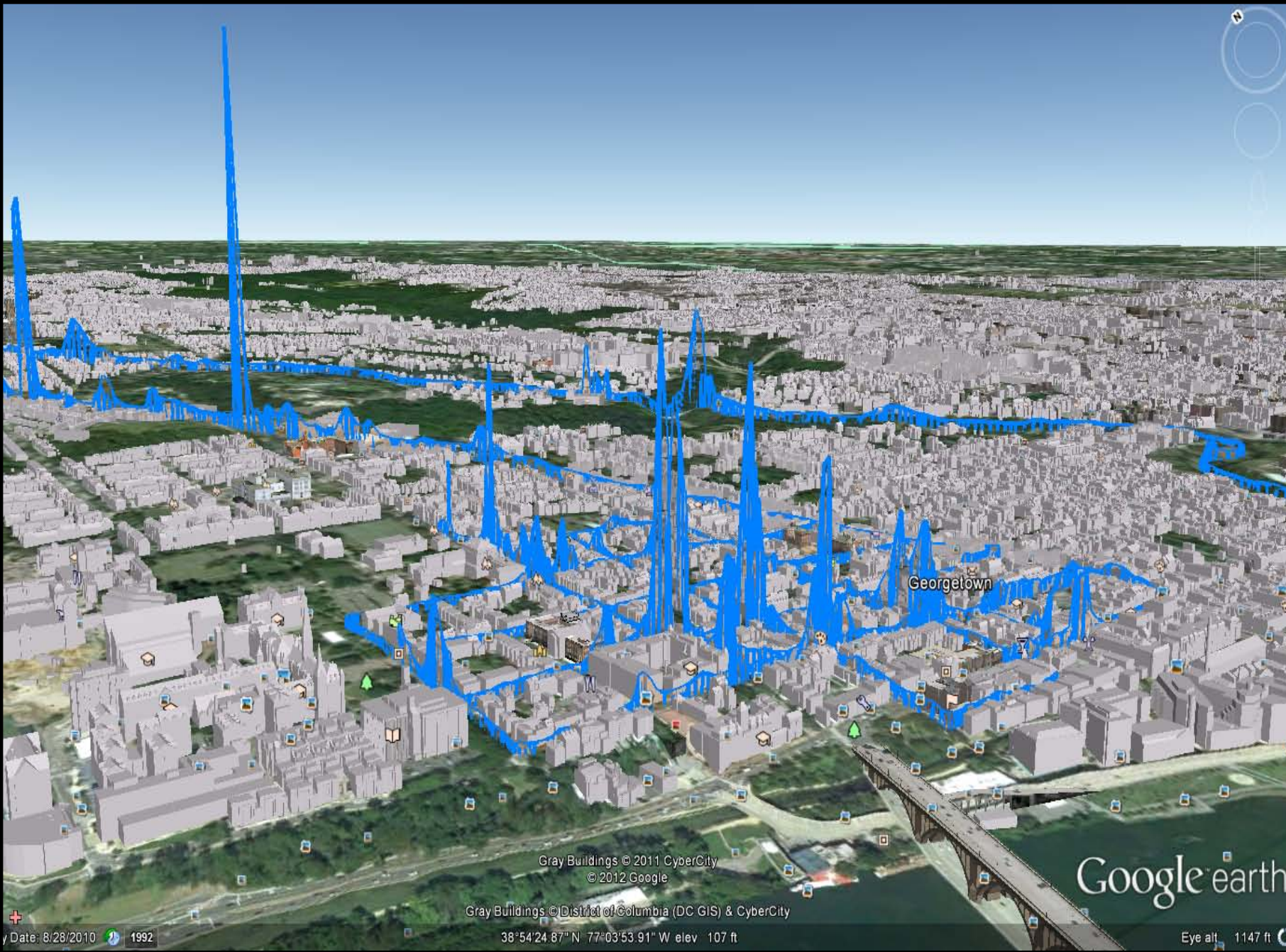
A close-up, high-contrast photograph of a person's face, partially obscured by their hands. The person's eyes are closed, and their hands are pressed against their face, covering their eyes. The lighting is dramatic, highlighting the texture of the skin and the fingers. The overall mood is one of concealment or seeking.

Hide & Seek  
is Over









Georgetown

Gray Buildings © 2011 CyberCity  
© 2012 Google

Gray Buildings © District of Columbia (DC GIS) & CyberCity

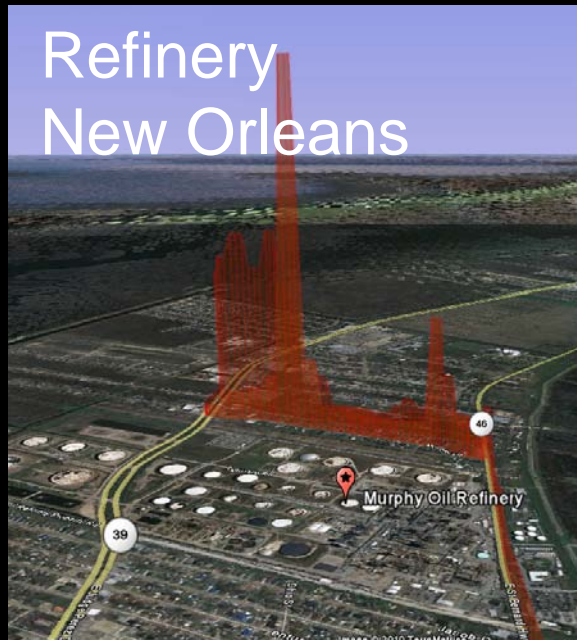
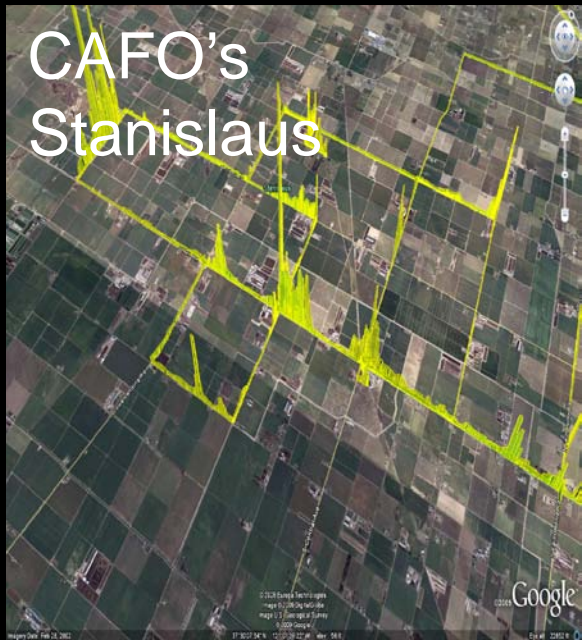
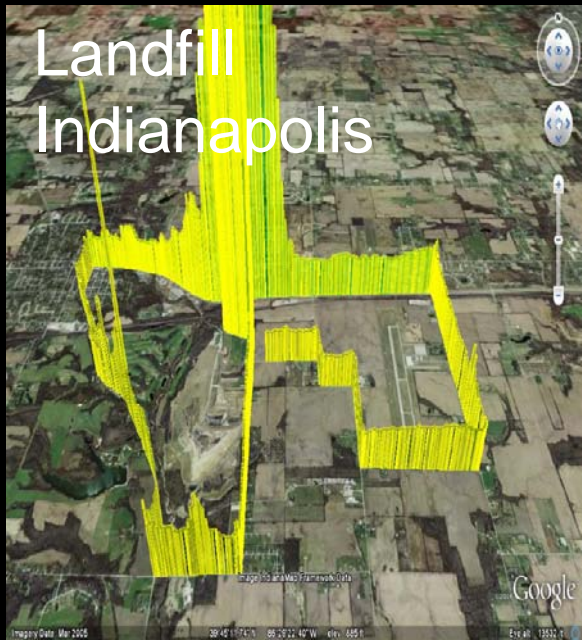
38°54'24.87" N 77°03'53.91" W elev 107 ft

Google earth

Date: 8/28/2010 1992

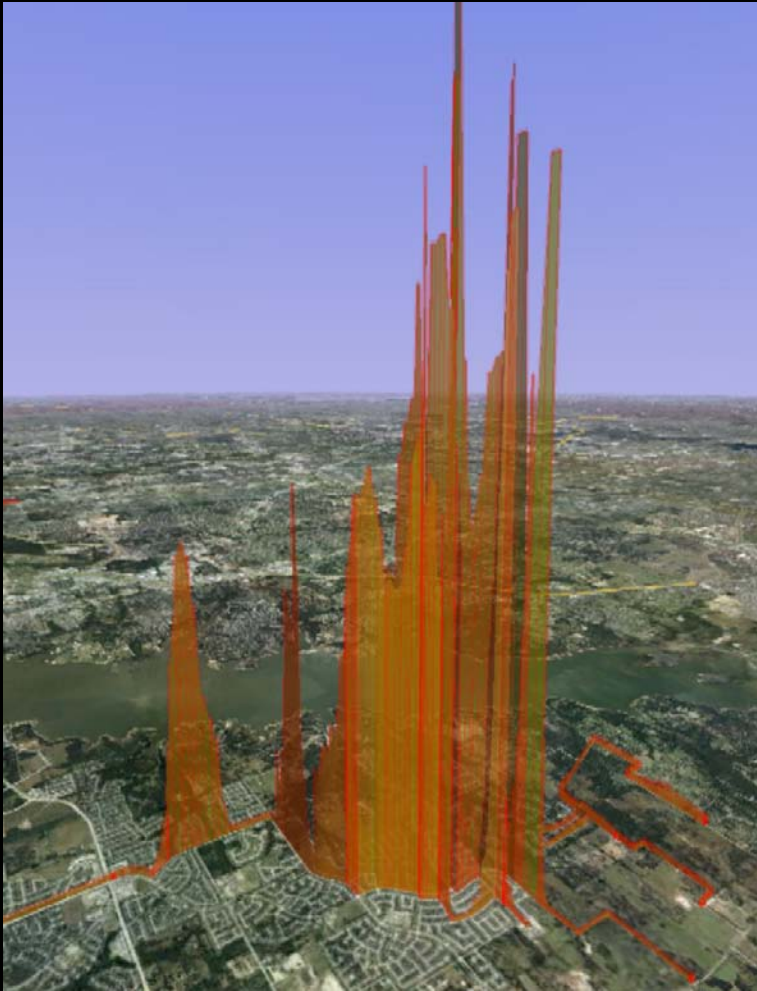
Eye alt 1147 ft



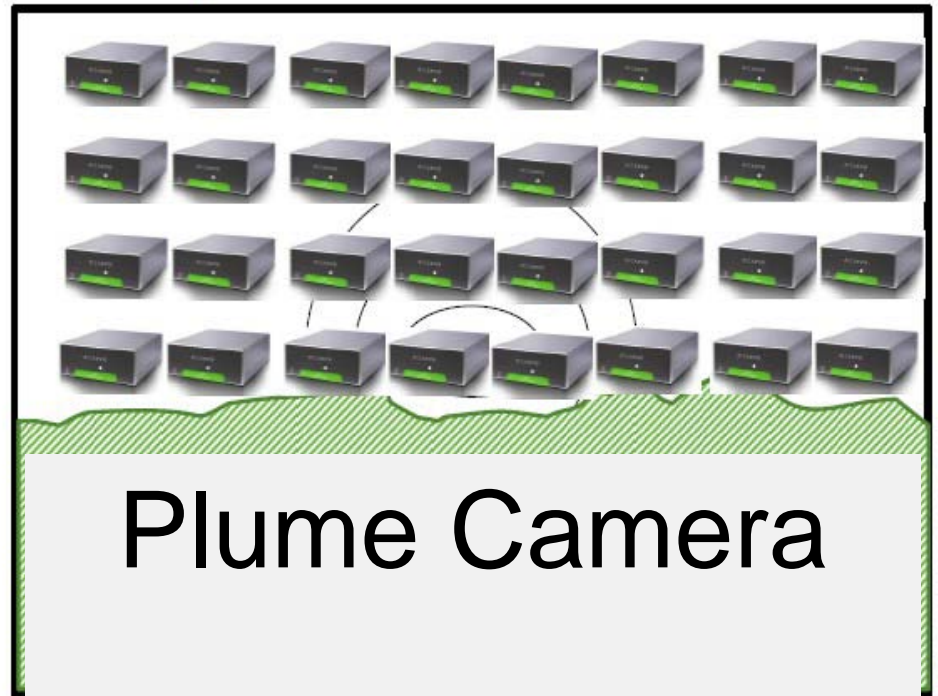




# Technology for Emissions Monitoring



32 pixels  $\rightarrow$  32 Picarros




Plume Camera



# Technology for Emissions Monitoring

**PICUBED**

Thu Apr 26 2012 14:44:49  
CH4: 1.965 ppm Wind: 3.15 m/s



GPS

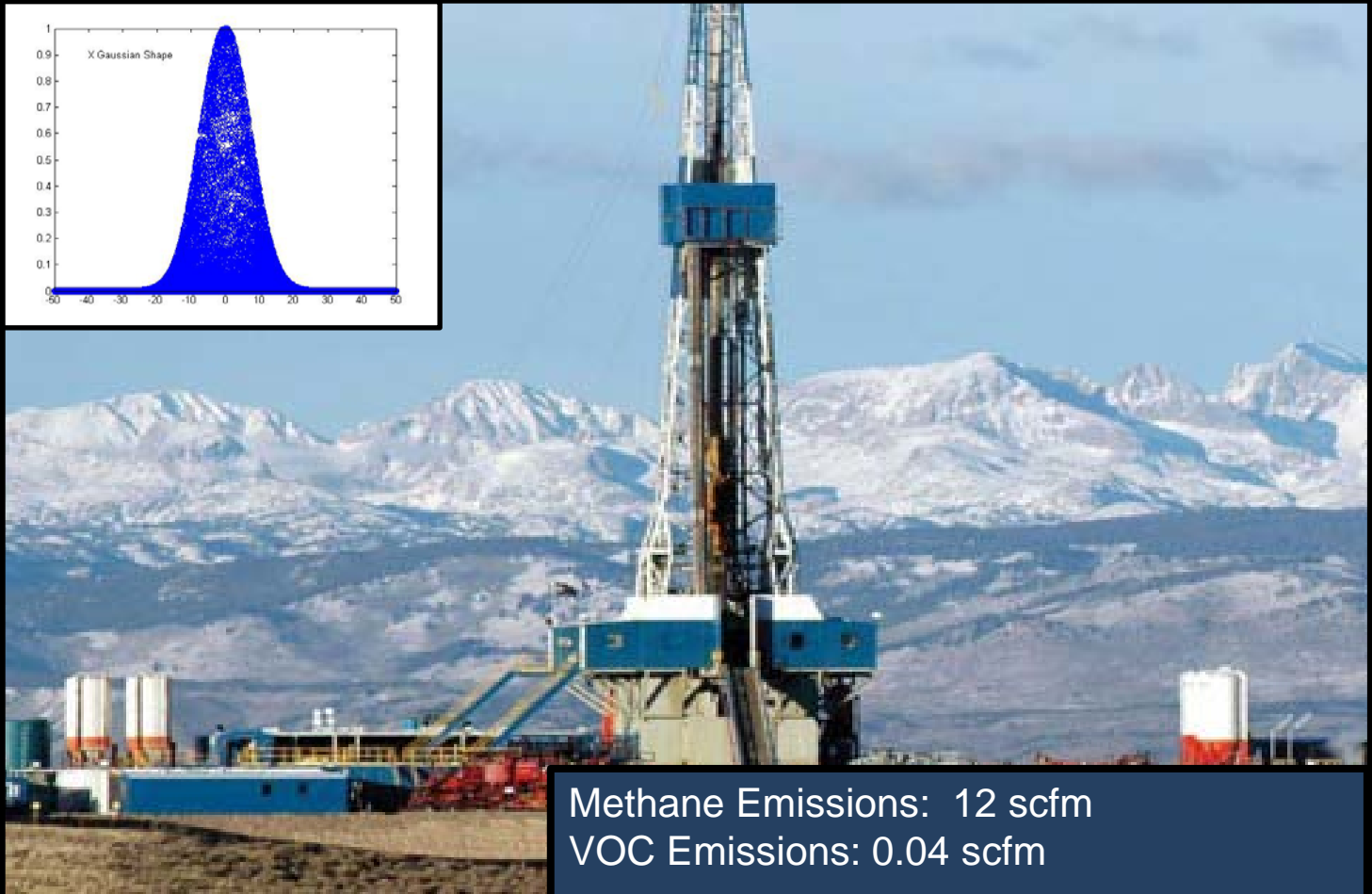
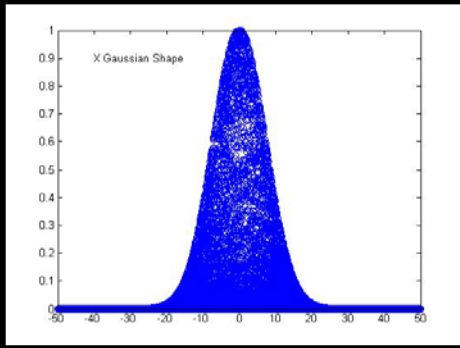
Survey Mode

Stop Survey

Start Capture

Analyzer Controls

© 2012 Picarro Inc.



Methane Emissions: 12 scfm  
VOC Emissions: 0.04 scfm

# Sources

- 147 Refineries
- 450 Pulp Paper Mills
- 3,100 Landfills
- 3,500 Large Waste Water Plants
- 15,500 Large CAFOS
- 3M Miles Natural Gas Pipelines
- 1,200 Natural Gas Compressor Stations
- Zillion's Fracking Locations

# Stakeholders & Customers

- Voters, Home Owners, Schools
- Real Estate, Insurance, Law Firms
- Disenfranchised Communities
- NGO's – big and small
- Elected Officials
- Federal, State & Municipal Agencies
- Service Firms
- Polluters

**Natural Gas Leaks  
Kill Trees**

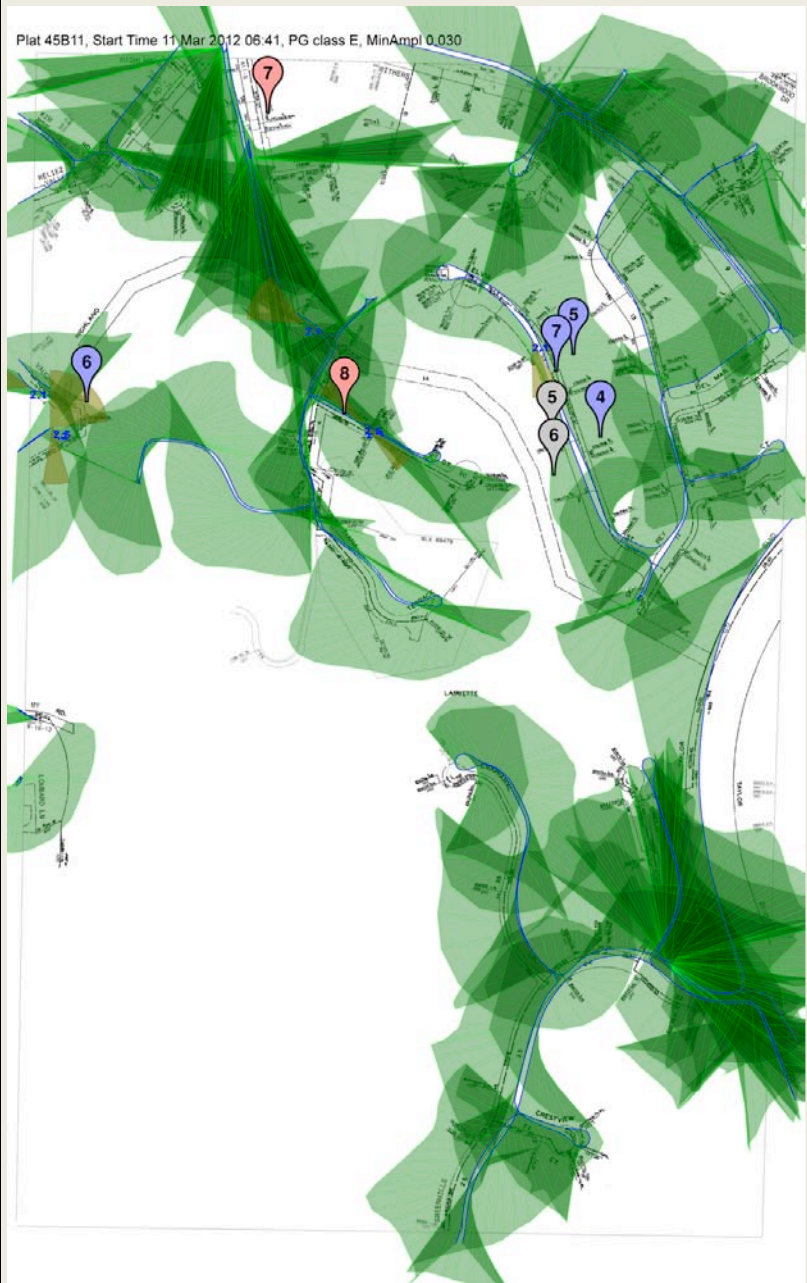


**Natural Gas Leaks Can  
Kill People**





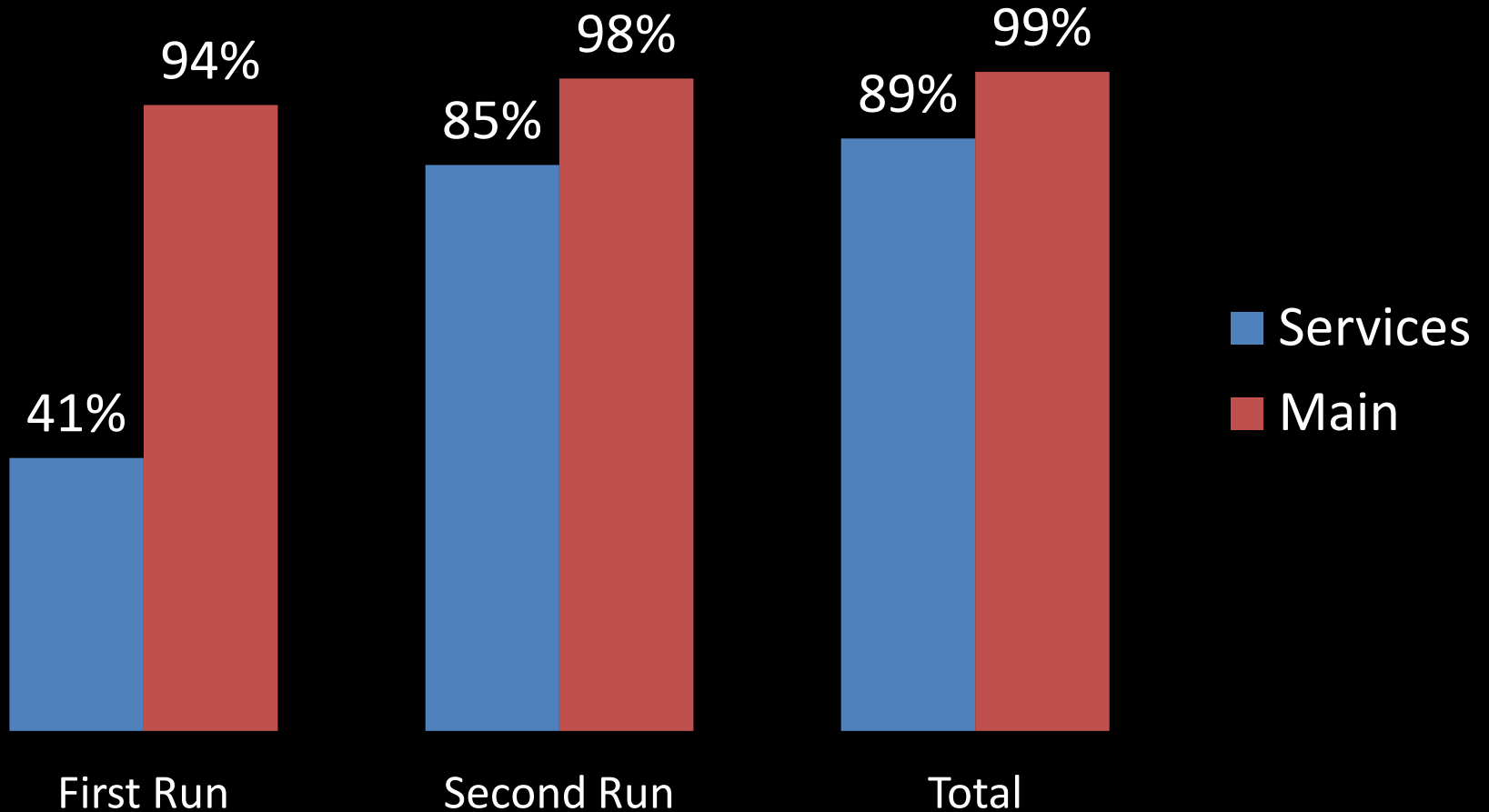
Plat 45B11, Start Time 11 Mar 2012 06:41, PG class E, MinAmpI 0.030



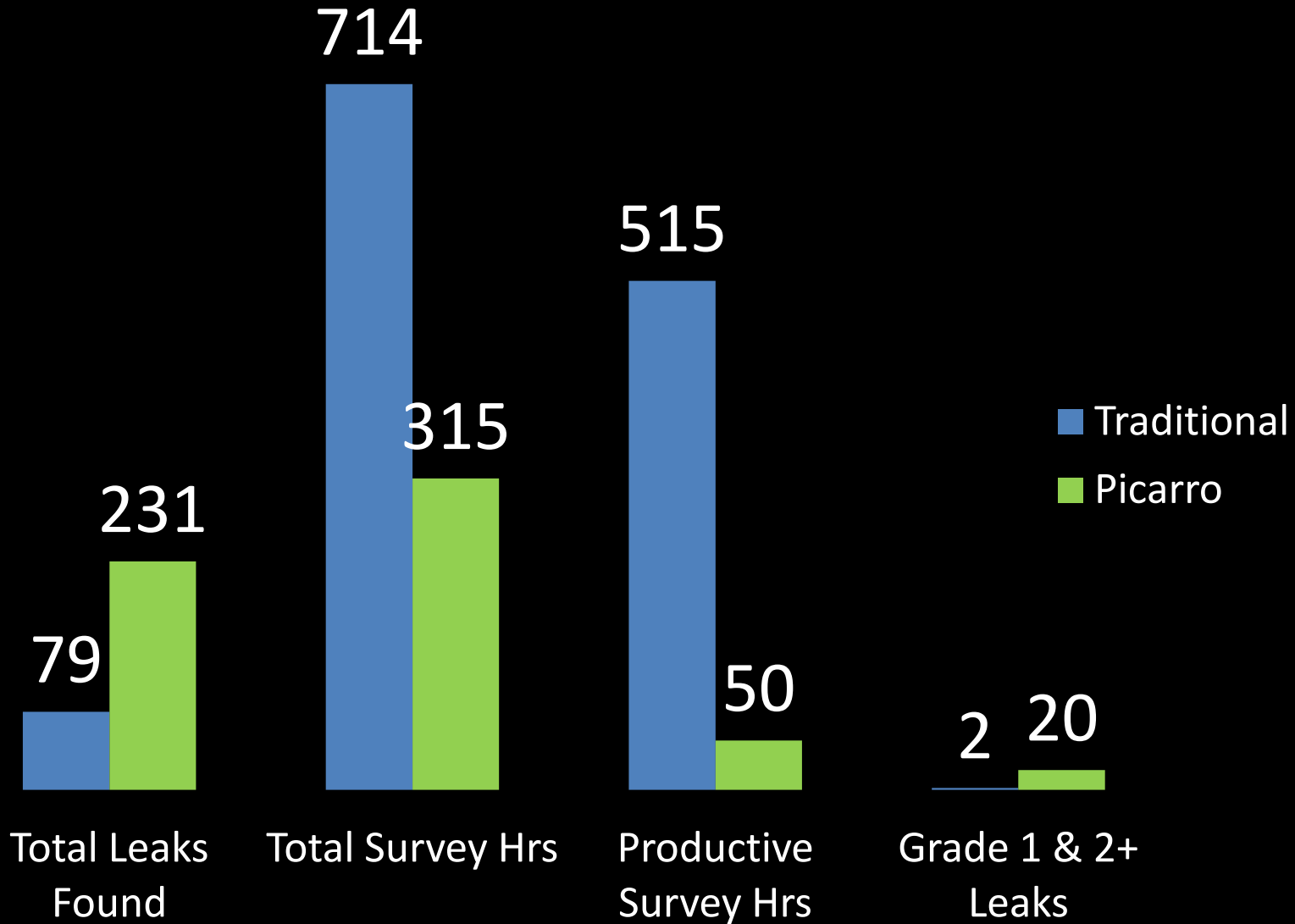
Plat 45B11, Start Time 13 Feb 2012 09:26, PG class D, MinAmpI 0.030  
Plat 45B11, Start Time 11 Mar 2012 06:41, PG class E, MinAmpI 0.030



# Survey Coverage



# Side by Side Scorecard



A close-up, black and white photograph of a person's face, partially obscured by their hands. The person's eyes are closed, and their hands are pressed against their face, with fingers spread, suggesting a state of hiding, seeking, or emotional distress. The lighting is dramatic, highlighting the texture of the skin and the tension in the hands.

Hide & Seek  
is Over



TRANSPARENCY IS  
THE NEW GAME

