

Application of Ground-Based Optical Remote Sensing to Characterize Area Source Emissions

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The Context

- Throughout the U.S., brownfield and superfund sites are under investigation for remediation and development. Major issues have existed on how to identify potential hot spots and quantify emissions. This information is needed in evaluating risk management for determining control technology requirements and land use options.
 - Increasing trend in the U.S. towards recreational use and development of landfills. Land use options including building schools, gyms, soccer fields, and parks on landfills.
 - Due to urban sprawl, it is not uncommon to have neighborhoods adjacent to landfills.
- Changes in RCRA regulations have resulted in landfill design and operational changes. Trends towards wet landfill operation with leachate recirculation and addition of other liquids and sewage sludge. This results in faster waste decomposition and gas production.
- Through funding by 21M², EPA/ORD has provided leadership in the development and application of technology for characterizing large area sources being investigated for future land use options.



Recreational Use & Nearby Structures at Superfund Landfill



On-Site Structures.....



This is a gym with an “Absolutely No Smoking” sign

Gas Migration under Highway...



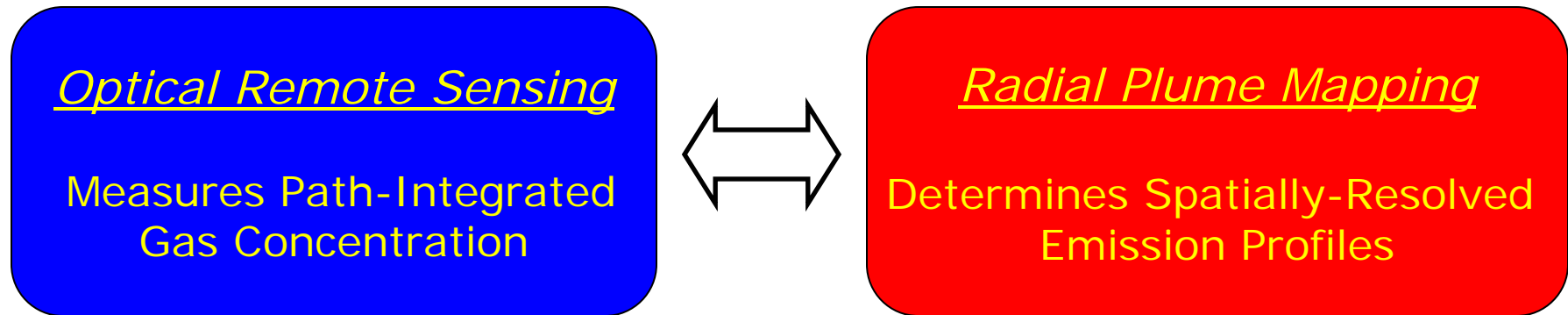
Recently Developed Neighborhood Adjacent to Colorado Landfill



Colorado Brownfield Site



Fugitive Emission Measurement Solution



Open-Path Optical Techniques:

Fourier Transform InfraRed (FTIR)

Tunable Diode Laser (TDL)

Ultraviolet Spectroscopy (UV-DOAS)

Multi-path Calculation Algorithms:

Vertical RPM for Emission Flux

Horizontal RPM for Leak Detection



RESEARCH & DEVELOPMENT

Building a scientific foundation for sound environmental decisions

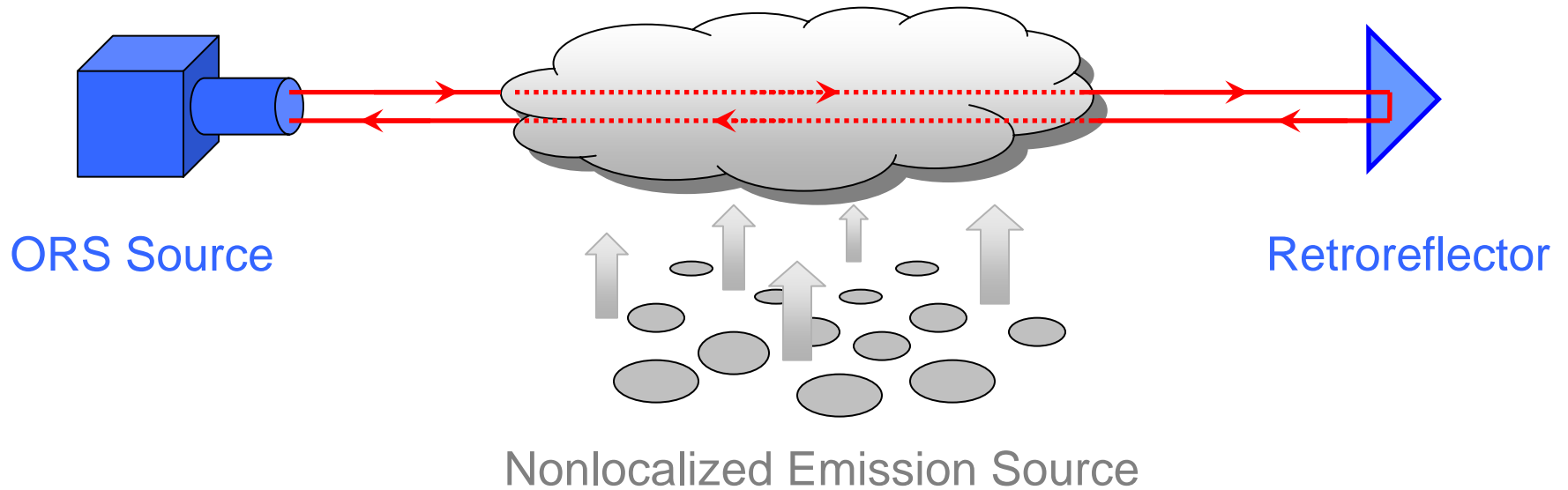
ORS Instrumentation



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Path-Integrated Optical Remote Sensing



Generates a Path Average Concentration

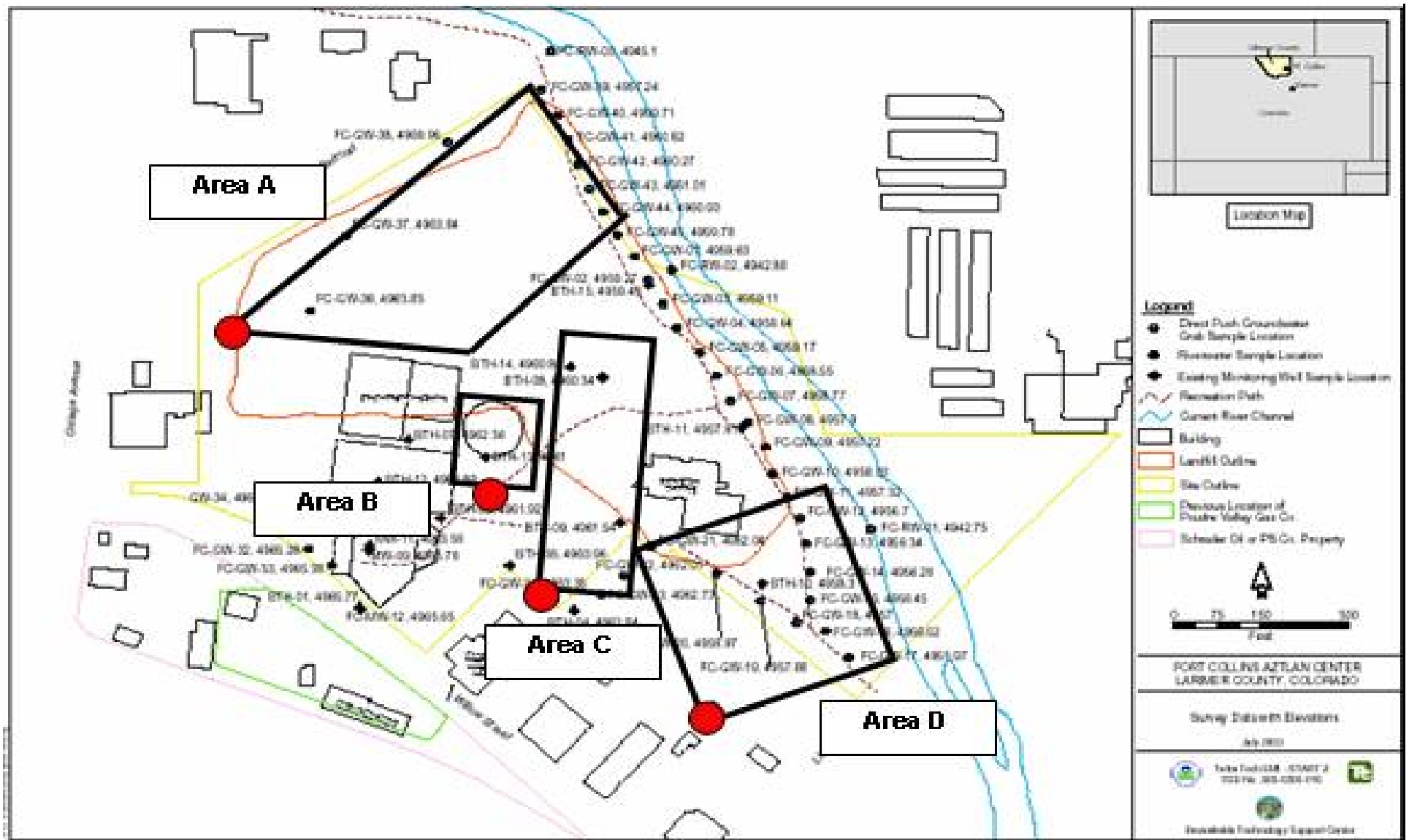
Ideal for non-homogeneous, large area sources



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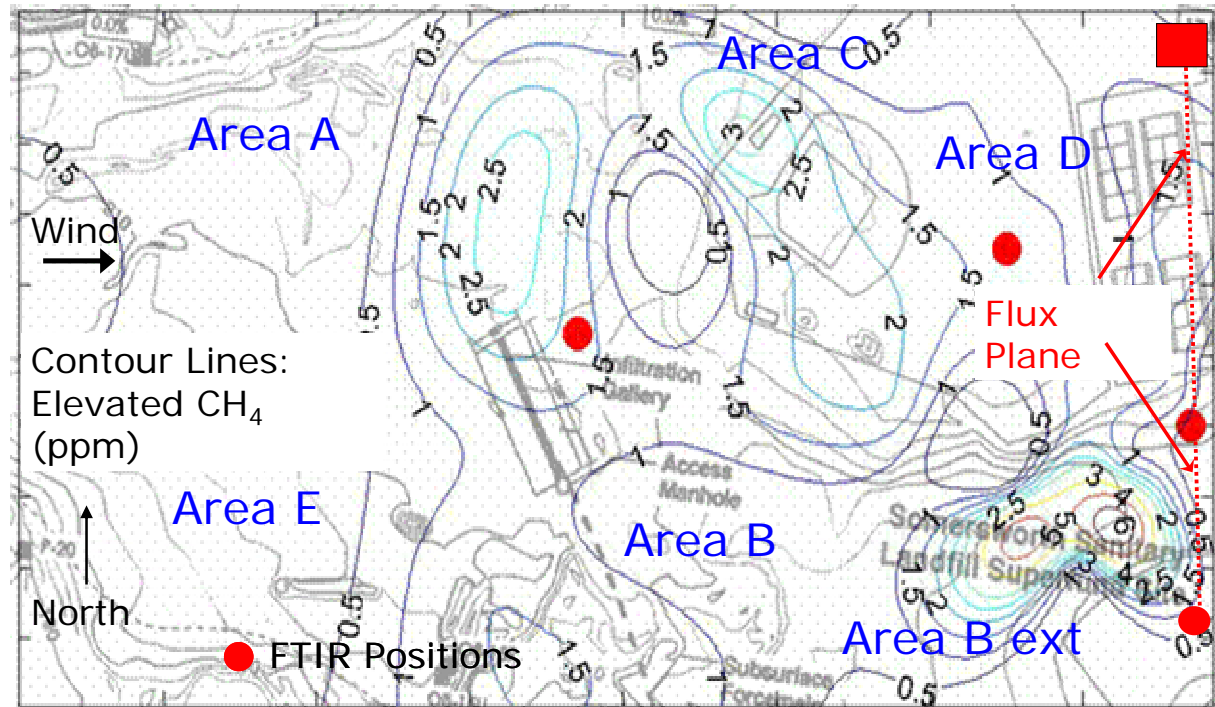
Horizontal Radial Plume Mapping Configurations



HRPM at Region 1 Facility

Methane Surface Scan

Area	Methane Conc. (ppm)
A	2.7
B	1.8
Bext	6.4
C	3.1
D	1.9
E	1.9

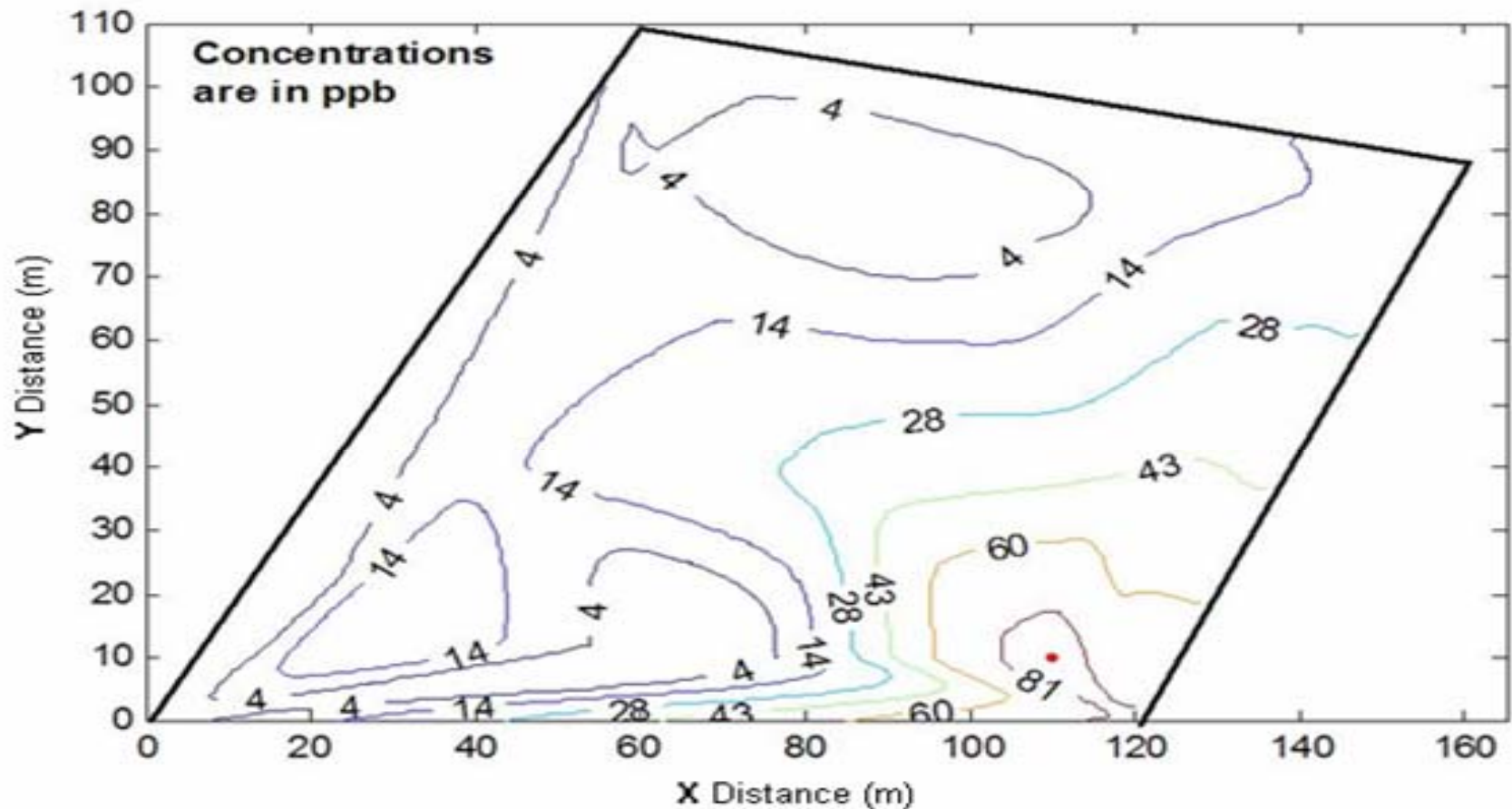


Methane Concentration Contour Map



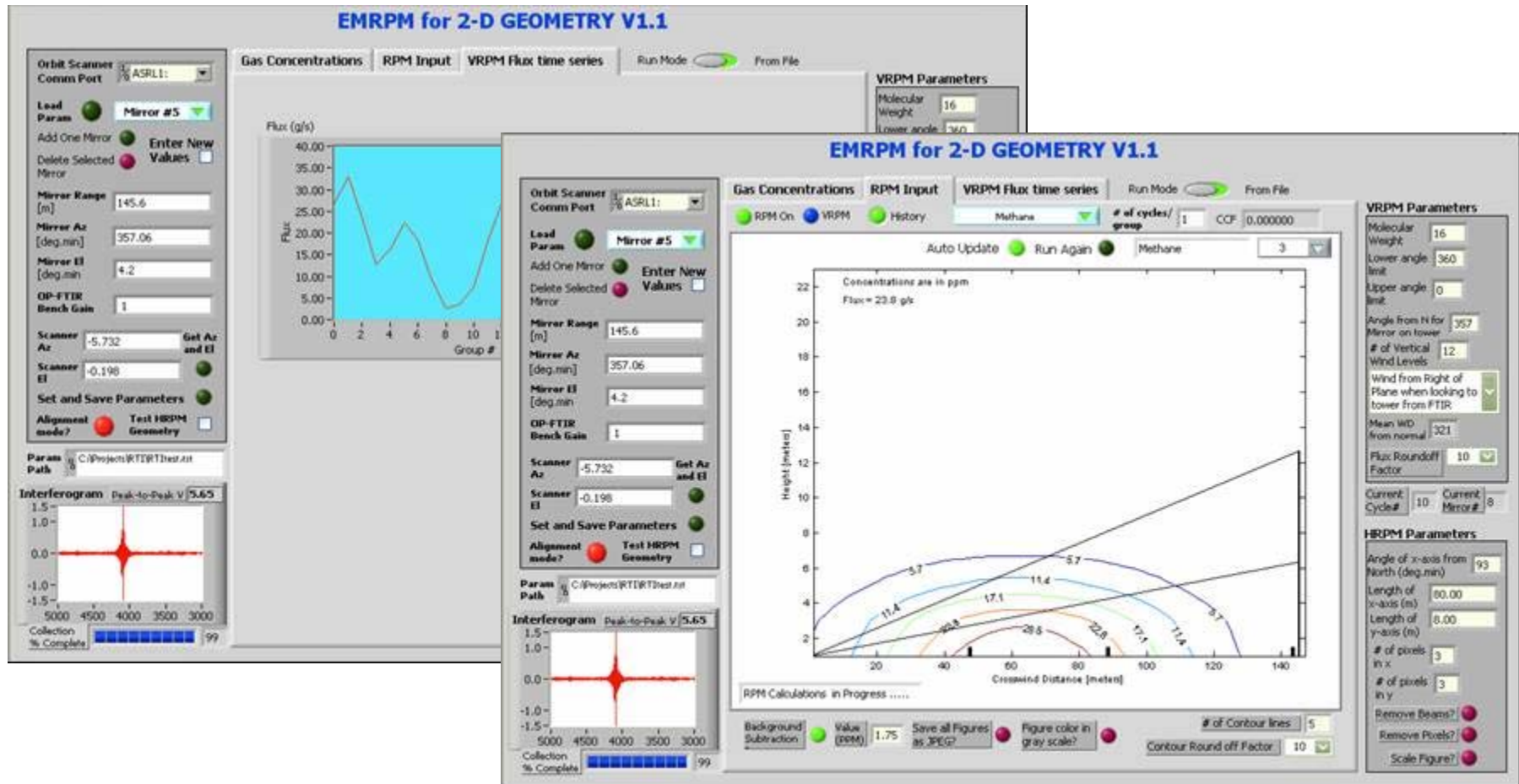
Surface Concentration Map of Gasoline Vapor from a Suspected Underground Source

Ft. Collins Area-A. Gasoline Source Location



Automated RPM Software

- Commercially available (ARCADIS/IMACC)



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Plume Capture Study

- In the near future, EPA and ARCADIS will be conducting a plume capture study using the RPM method
- The study will use controlled gas releases to evaluate the effectiveness of the method in capturing plumes originating from sources located a great distance upwind of the configuration



ORS Cost Estimates for Conducting Field Tests

- Pricing includes
 - Preparation of Quality Assurance Project Plan
 - 5 days of data collection,
 - Equipment lease, and
 - Final report
- Pricing may vary depending on site location and project needs
- Costing for
 - TDL studies (single compound), \$15K - \$25K
 - OP-FTIR studies (multiple compounds) - \$25K to \$35K



EPA Publications

- Measurements of Fugitive Emissions at Region I Landfill (EPA-600/R-04-001, Jan 2004)
- Evaluation of Former Landfill Site in Fort Collins, Colorado Using Ground-Based Optical Remote Sensing Technology (EPA-600/R-05/-42, April 2005)
- Evaluation of Former Landfill Site in Colorado Springs, Colorado Using Ground-Based Optical Remote Sensing Technology (EPA-600/R-05/-41, April 2005)
- Guidance for Evaluating Landfill Gas Emissions from Closed or Abandoned Facilities (EPA-600/R-05/123, October 2005)
- A Case Study Demonstrating U.S. EPA Guidance for Evaluating Landfill Gas Emissions from Closed or Abandoned Facilities – Somersworth Sanitary Landfill; Somersworth, New Hampshire (EPA-600/R-05/142, October 2005)



Reports In Review

- Evaluation of Fugitive Emissions Using Ground-Based Optical Remote Sensing Technology
 - Summarizes data from sites conducted to date and provides comparison of commercially-available technology



Conclusions

- Through 21M² funding, EPA has developed and demonstrated technology that will lead to more reliable -
 - Estimates for emission inventories and air permits
 - Data for use in risk assessments
 - Land use policy decisions
- Next steps
 - Conducting fetch study to answer remaining issues related to use on landfills and other large area sources
 - Completing reporting summarizing field testing to data and comparing commercially available technologies

