

Proposed Community Monitoring in the North Denver/Commerce City Industrial Area



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Air Pollution Control Division
Department of Public Health & Environment

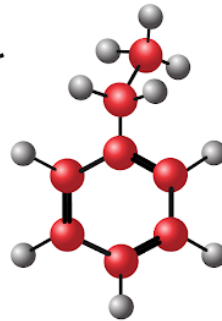
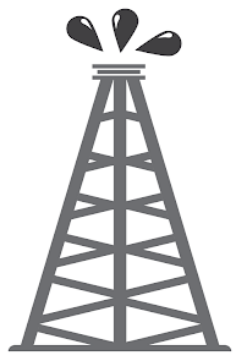


Assessing human health risk from oil and gas operations

EPIDEMIOLOGY STUDIES

SCREENING-LEVEL RISK ASSESSMENTS

Source >> Emissions >> Concentration >> Exposure >> Dose >> Health effects



Biomonitoring

ICF'S RISK ASSESSMENT



CDPHE's Oil and Gas Health Information Response (OGHIR) Program

- Collaborative Program between Toxicology and Environmental Epidemiology Office (TEEO) and Air Pollution Control Division (APCD)
- Created to respond to Oil and Gas-Related health complaints, assess short and long term health risks, and do community investigations
- Established Science-Based Health Guideline Values (HGVs) for VOCs commonly associated with Oil and Gas Development

CDPHE Health Guideline Values and Odor Thresholds for Select VOCs

Compound	CDPHE Health Guideline Values (ppbv)		Odor Threshold (ppbv)
	Short Term (1-hr)	Long Term (lifetime)	
benzene	9	4	470
isoprene	20	2	47
n-hexane	1700	198	1500
methyl cyclopentane	750	75	-
2-methyl pentane	990	90	410
3-mentyl pentane	4100	380	426
cyclohexane	1000	1743	520
toluene	2000	1327	21
ethyl benzene	5000	9	<2
o-xylene	2000	23	12

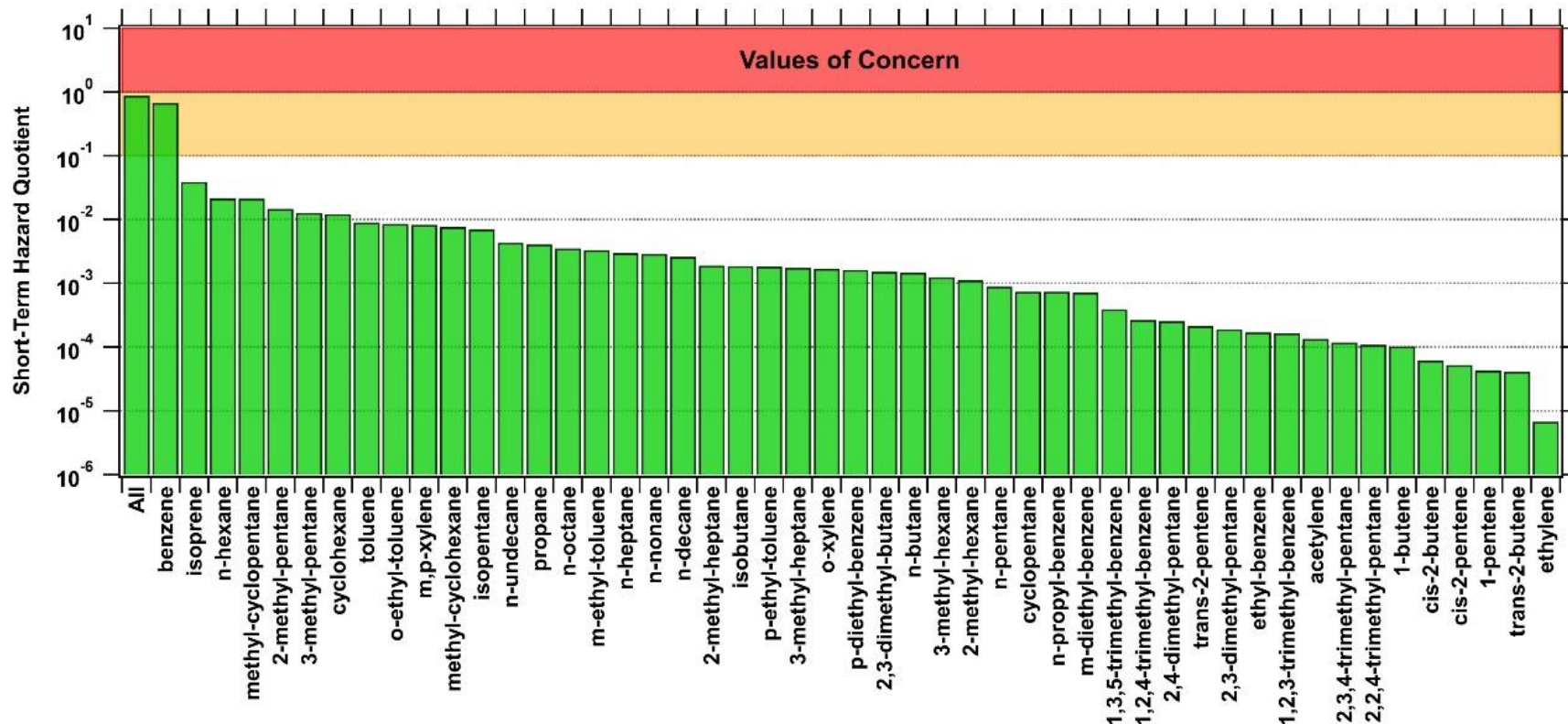
Program Website:

• <https://www.colorado.gov/pacific/cdphe/categories/services-and-information/environment/oil-and-gas/oil-and-gas-and-your-health>



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CDPHE OGHIR Risk Analysis and Health Guideline Values (HGVs) (Example)



Hazard Quotient (HQ) = Air Measurement/Health Guideline Value

<https://www.ncbi.nlm.nih.gov/pubmed/30012994>

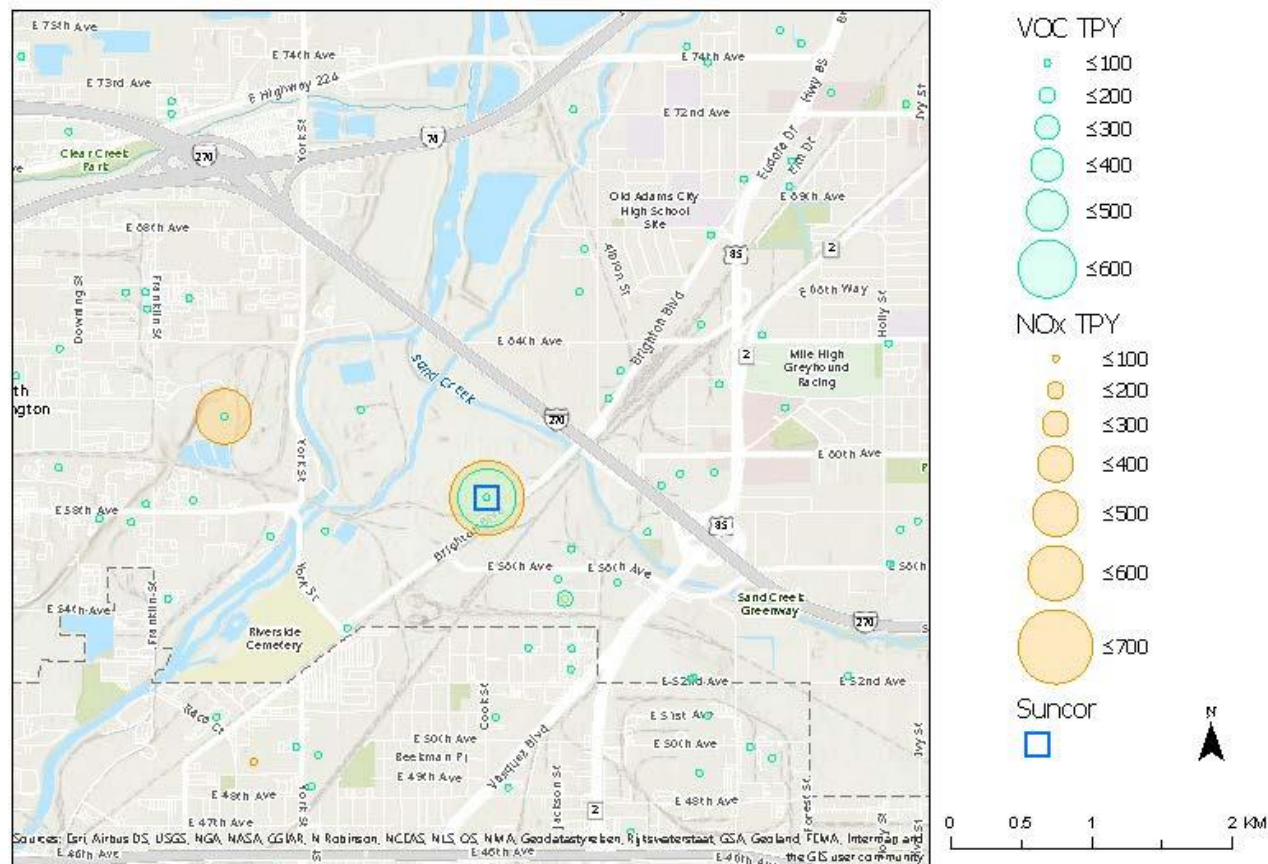
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North Denver/Commerce City Sources

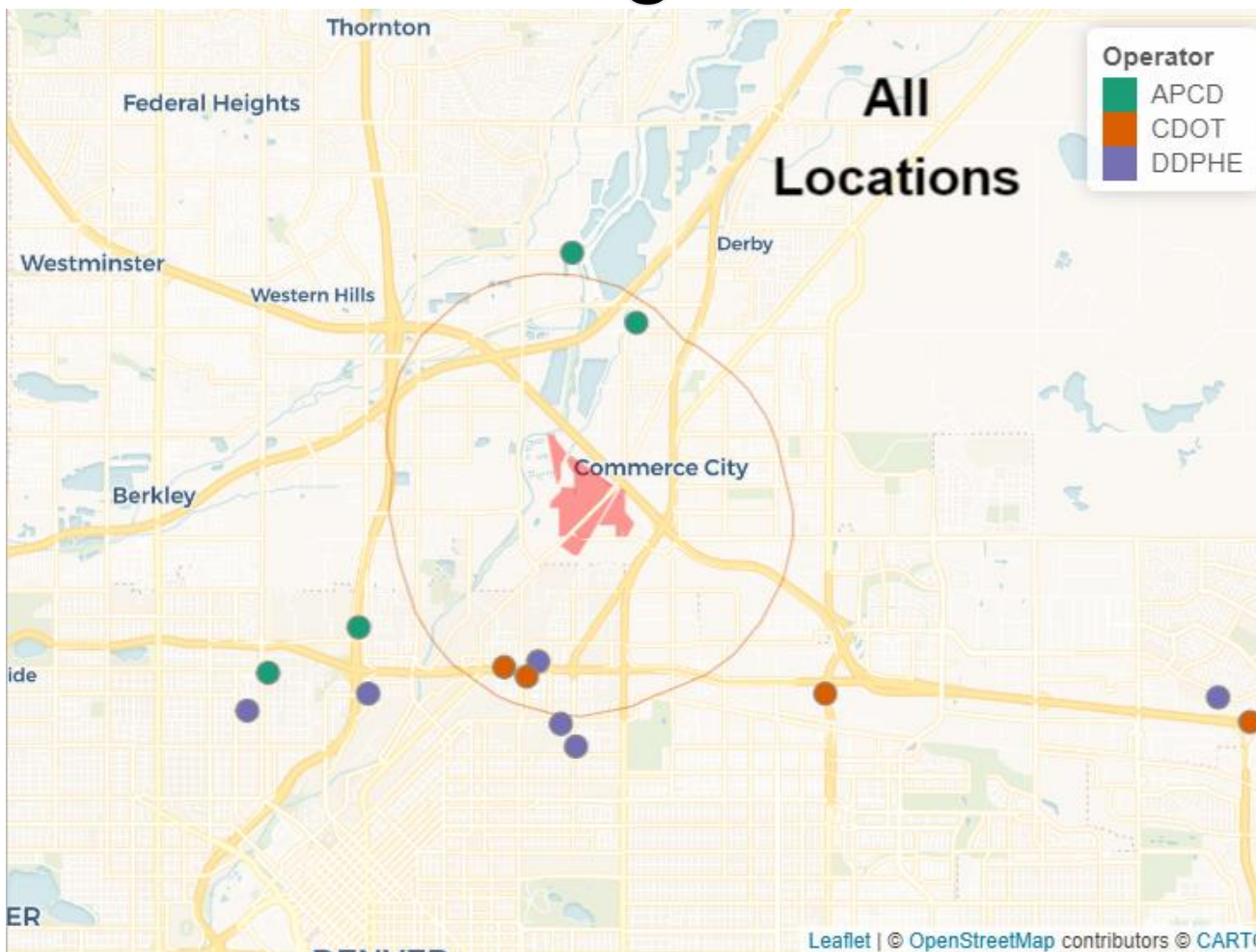
Sources of VOC and NOx in the area include:

- Suncor Refinery
- Hite Water Treatment Facility
- Cherokee Generating Station
- Major Highways/Truck Routes
 - I-70, I-270, others
- Sand Creek Landfill
- Multiple other Heavy and Light Industries

Sources of VOC and NOX near Suncor refinery (7/30/2020)



Current North Denver/Commerce City Monitoring Locations



Tools and Outcomes

Data Collection Technologies

1) Screening Level Measurements

- SPODs, PM sensors



2) Reference/Lab Grade Measurements

- CAMML (mobile lab)
 - VOCs (hourly GC-FID)
 - Criteria Pollutants
 - CAMML measurements serve as a proxy for human exposure



3) Emissions Quantification

- New Mobile Van



Outcomes

Multi-jurisdictional,
Collaborative Data

Shared Data Platform

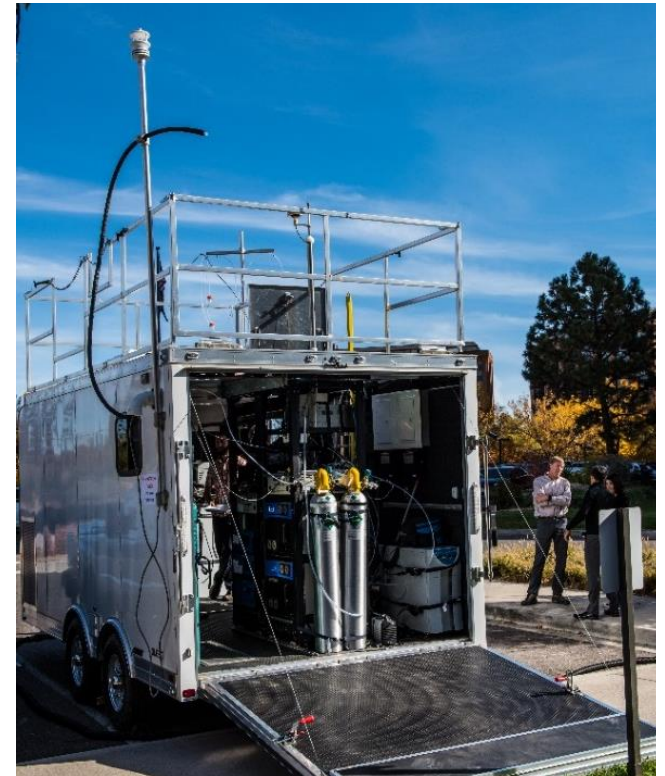
Combined Toxicological
Expertise and
Communication Efforts

Development of ongoing
monitoring

Colorado Air Monitoring Mobile Laboratory (CAMML)

Custom Aluminum trailer Mobile Lab

- Diesel Generator or Line Power
- 1 minute resolution: Ozone, NO_x, meteorology, PM_{2.5}, PM₁₀, Methane
- VOCs (by GC-MS or GC-FID) PAMS (55 compounds)
 - Integrated 45 min samples, once per hour

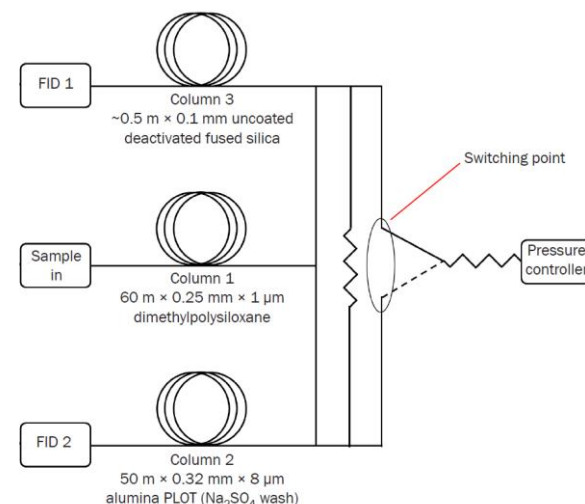


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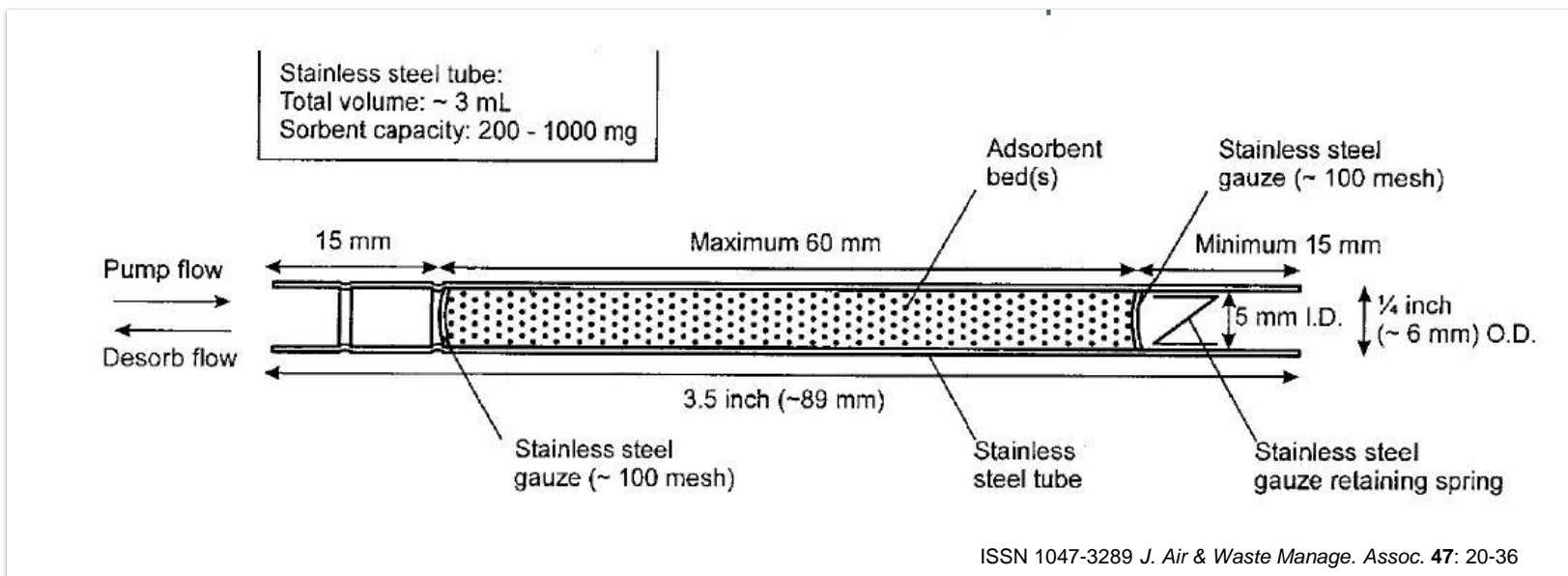
Thermal Desorption-GC-FID

- Cold trap collection with thermal desorption
- GC-FID, dual column for increased sensitivity
 - DB-1 Boiling Point Column for <C5
 - PLOT Column for heavier VOCs
- Replaced NAFION Drier with Kori water system
- Heated Inlets, humidified blanks and calibrations
- Expanded calibration standard to include diesel range compounds, oxygenates, terpenes

MARKES
international



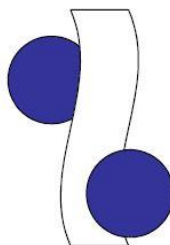
Sorbent Collection of VOCs



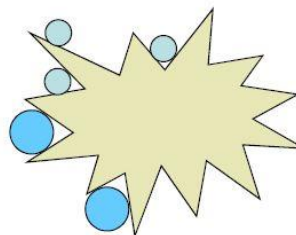
Common Sorbents:

Tenax
Carbotrap
Molecular Sieves
Activated Carbon

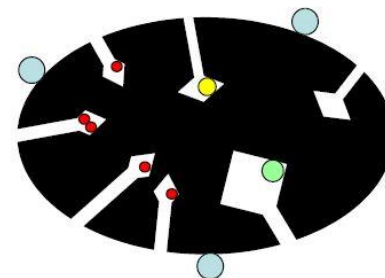
Quartz Wool



Porous Polymer



Carbon Molecular Sieve



Screening Level Sensors: SPODs



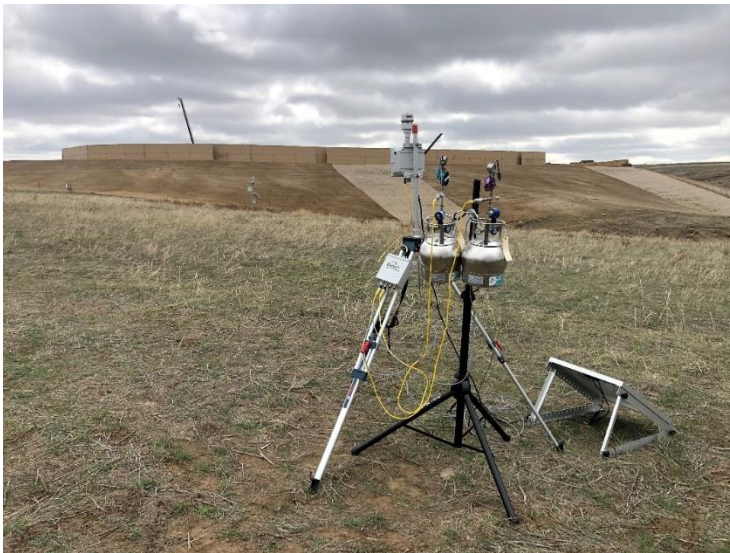
- PID (Photoionization Detector)
 - screening level for VOCs, sulfur & chlorinated compounds
- Meteorology
- Solar powered
- Capacity to trigger reference grade collections:
 - canisters and sorbent tubes



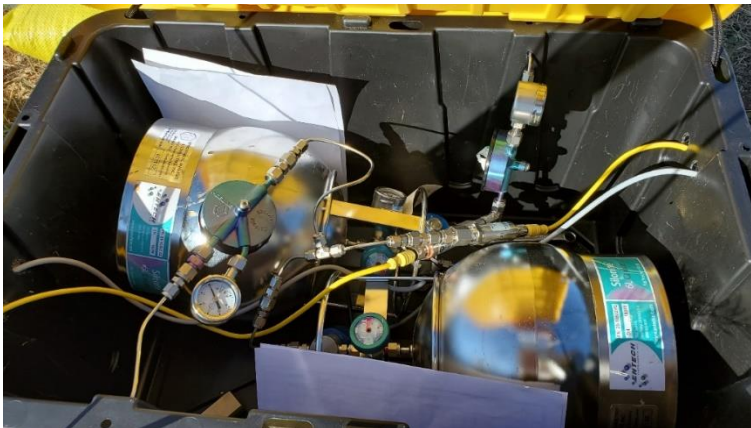
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SPOD + Canister Trigger



SPOD
+
Sorbent
Tube
Trigger



SPOD Dashboard

SENSIT



SPOD 1001

SPOD 1002

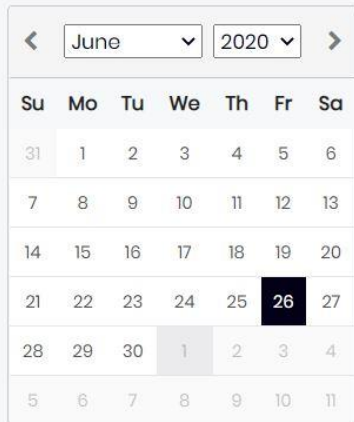


SPOD 1032

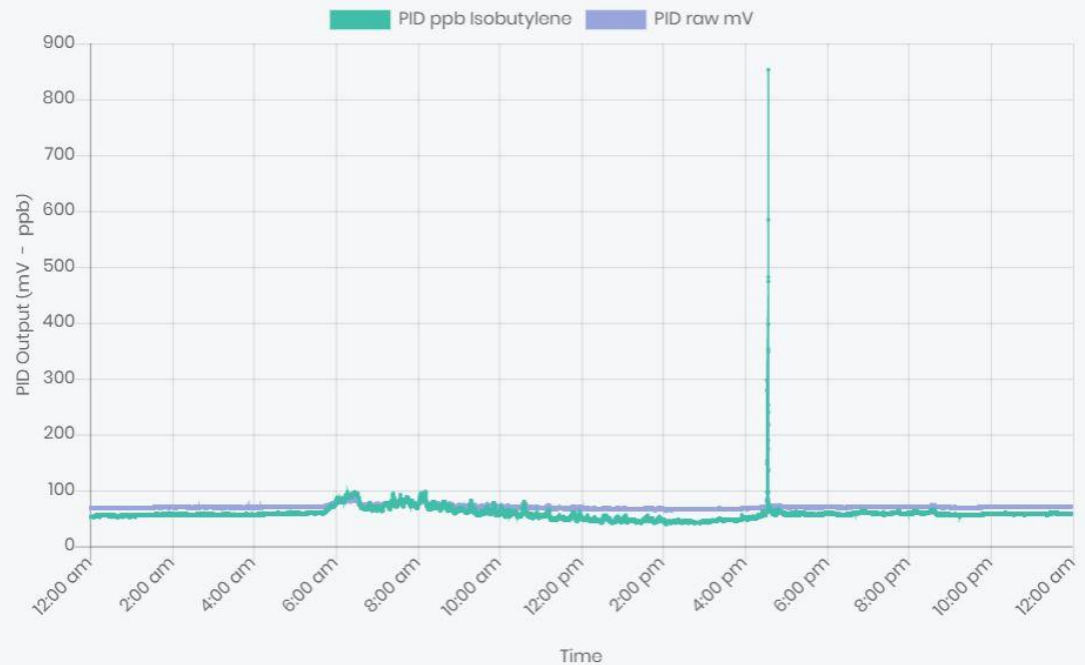
SPOD 1033

SPOD 1034

SPOD 1035



SPOD 1002

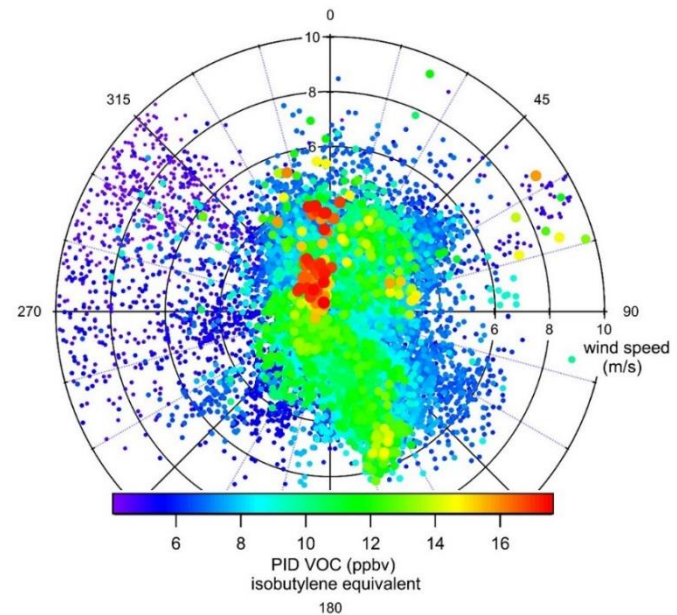
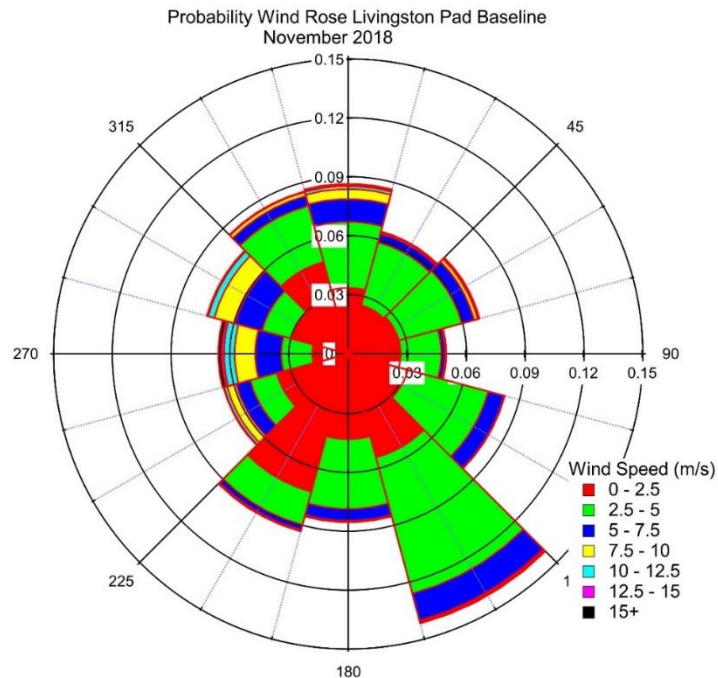


Reset Zoom



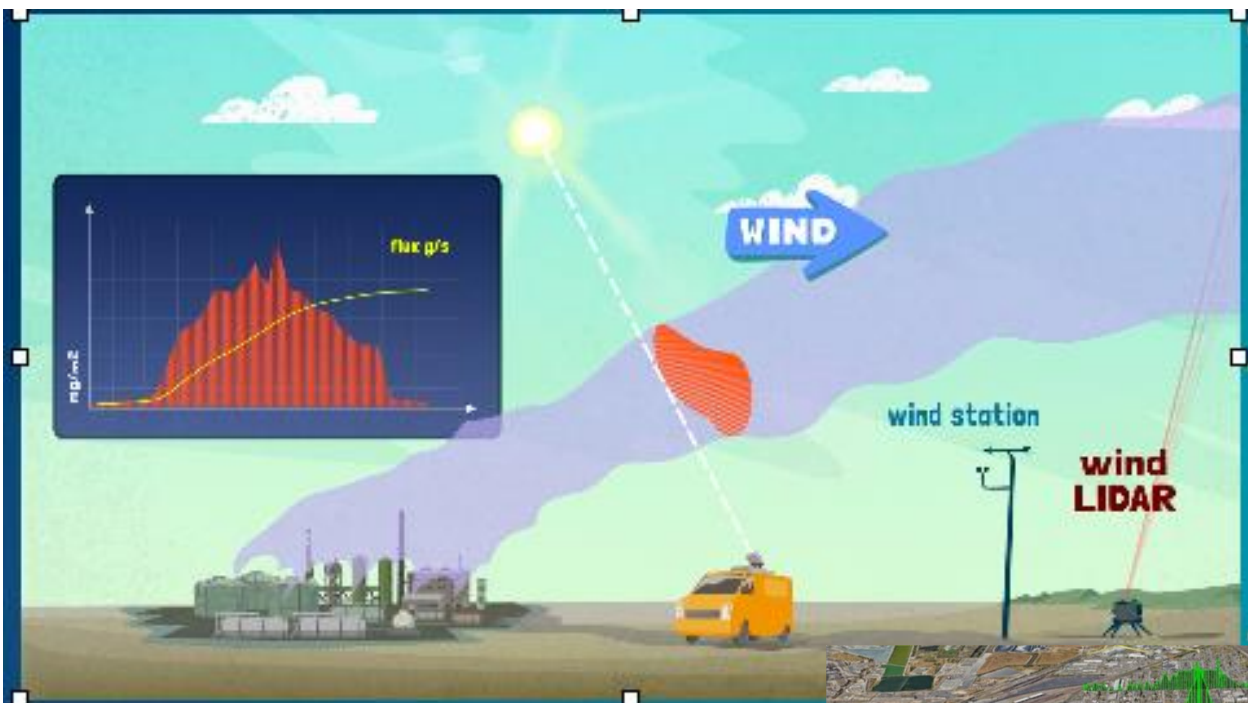
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PID as screening tool, Broomfield Deployment (Example)



New Van Monitoring Technology

SOF Flux Measurement



- The number of molecules for the key species above the SOF vehicle are estimated from spectroscopic analysis of direct solar IR light
- Measurements are conducted while driving to measure the total mass of molecules along the road traveled.
- The total mass is multiplied by the wind speed which yields the flux in kg/s (compare OTM 10)

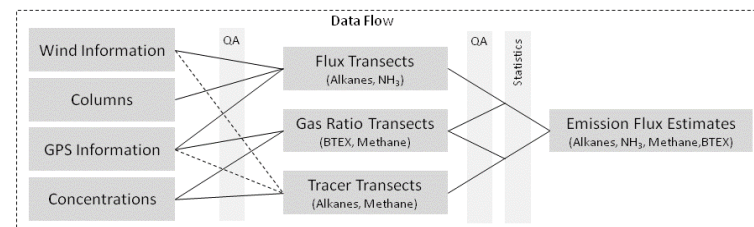
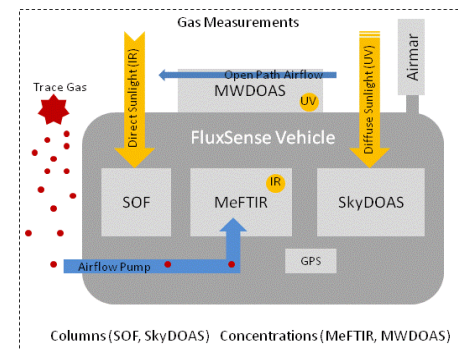
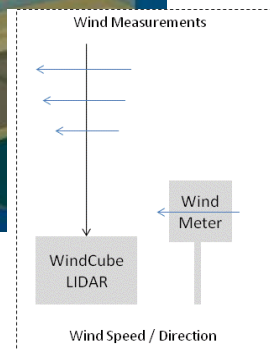


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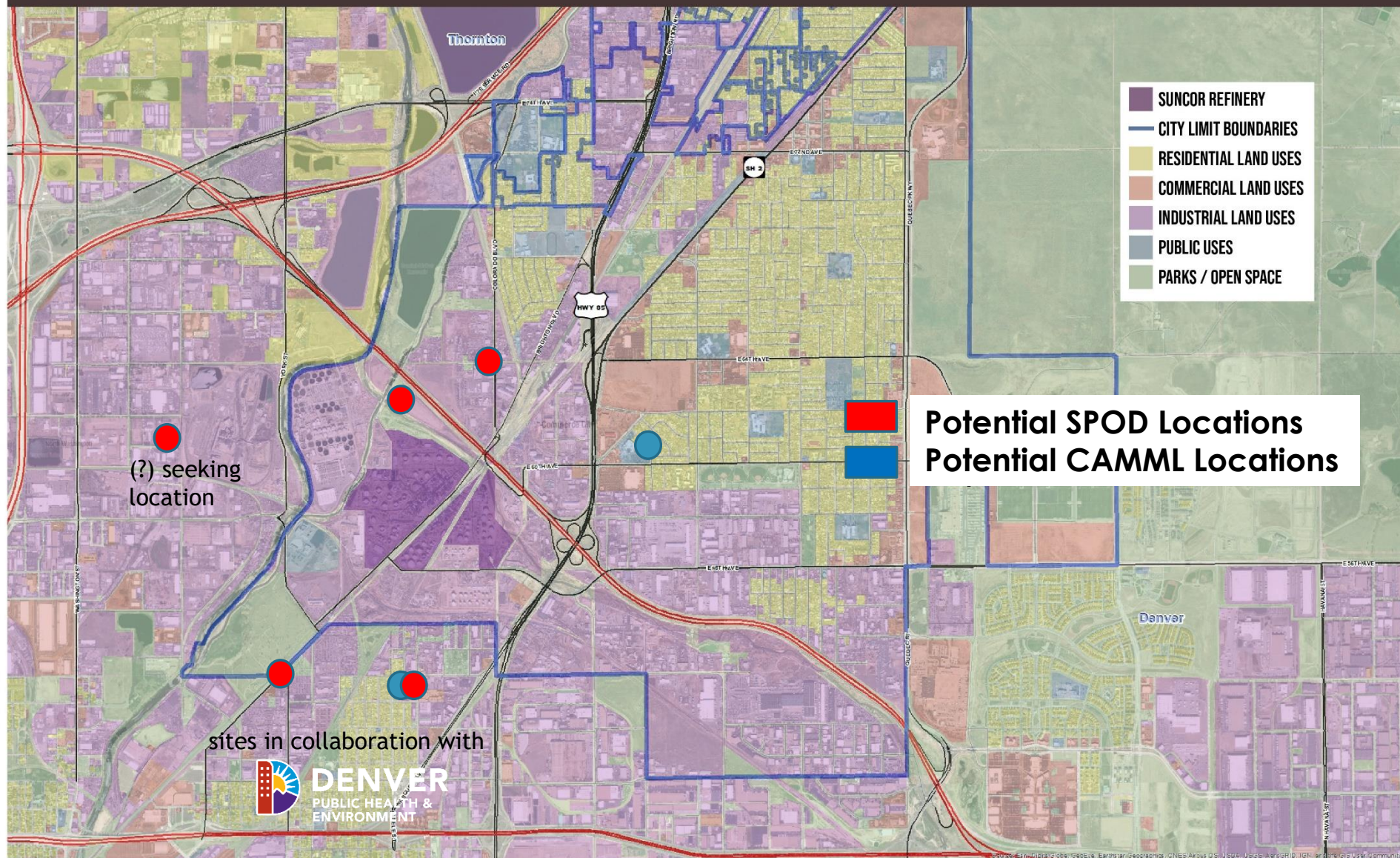


New Van Monitoring Technology

SOF Flux Measurement



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Proposed Monitoring Timeline*

2020-2022

- | | |
|--|---|
| <ul style="list-style-type: none">• SPODs → scout and identify<ul style="list-style-type: none">• attempt specialized collections as needed<ul style="list-style-type: none">• PAHs, Sulfur compounds, diesel range organics, halogenated compounds, etc. | <p>ASAP→Dec. 2021</p> <p>2+ month periods</p> |
| <ul style="list-style-type: none">• CAMML → onsite<ul style="list-style-type: none">• VOCs & Criteria Pollutants• specialized analysis (examples)<ul style="list-style-type: none">• HiVol PM filters• Speciated filters• PAHs, aldehydes, etc. | <p>January 2021→ Dec. 2022</p> <p>(as schedule permits)</p> <p>3-4 week periods</p> |
| <ul style="list-style-type: none">• New Van circumnavigation of sources | <p>July 2021→ Dec. 2022</p> <p>(as schedule permits) 1 week periods</p> |

*these timelines are estimates and subject to change based on availability of monitoring resources as well as timing of installation of electricity and finalization of necessary agreements/contracts, etc.



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