Toxic Ambient Air Monitoring Programs

Field»Lab»SNAPS»Data

June 6, 2019

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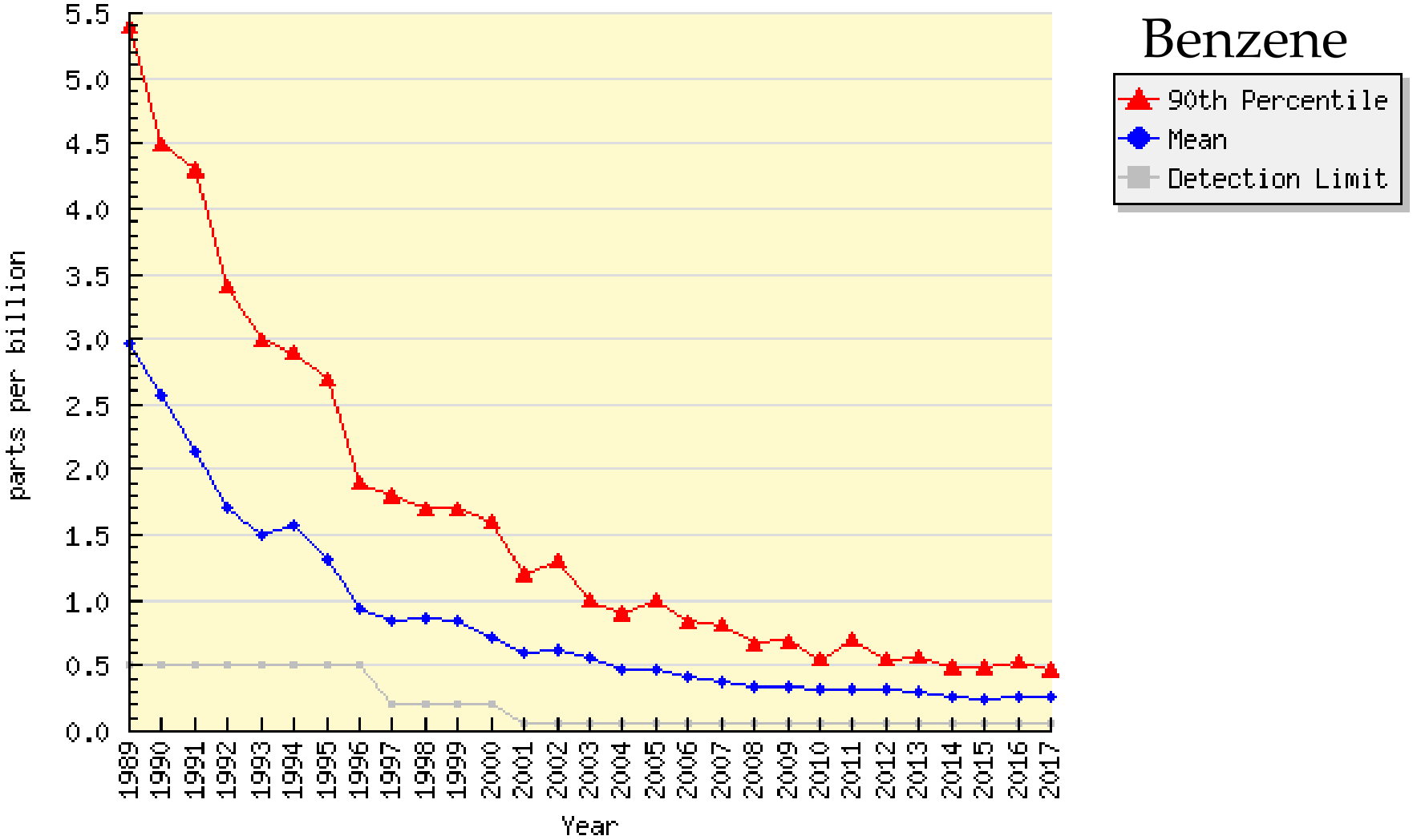
Toxics Overview

- History and Network
- Field Overview
- Laboratory Overview
- Study of Neighborhood Air near Petroleum Sources (SNAPS)

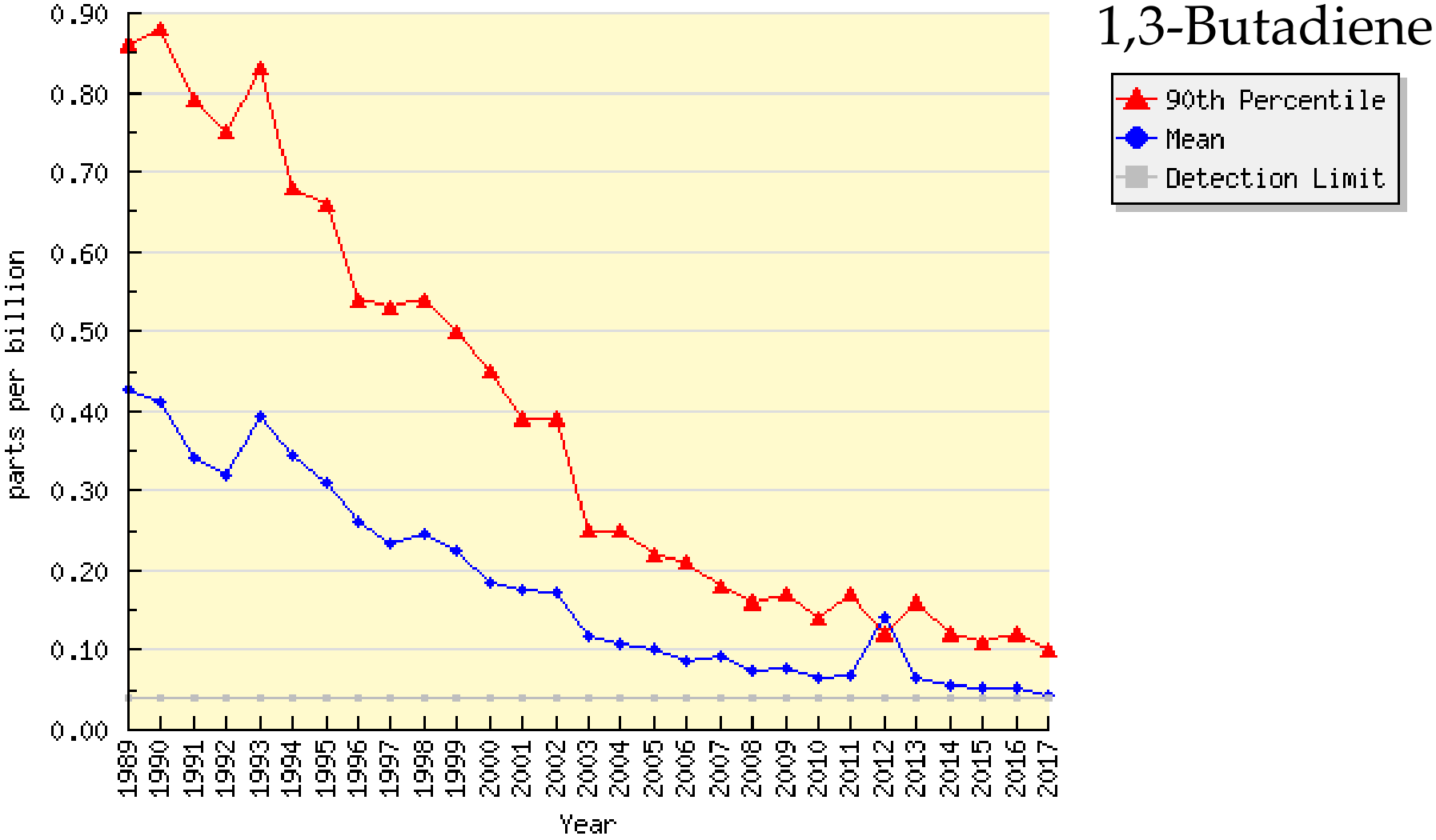
California Air Toxics Monitoring Program

- Establishes the process for the identification and control of toxic air contaminants;
  - Toxic Air Contaminant Identification and Control Act (AB 1807, 1983) created California's program to reduce exposure to air toxics.
  - In 1985, CARB established a twenty station toxic monitoring network within major urban areas.
  - Hazardous Air Pollutants List.

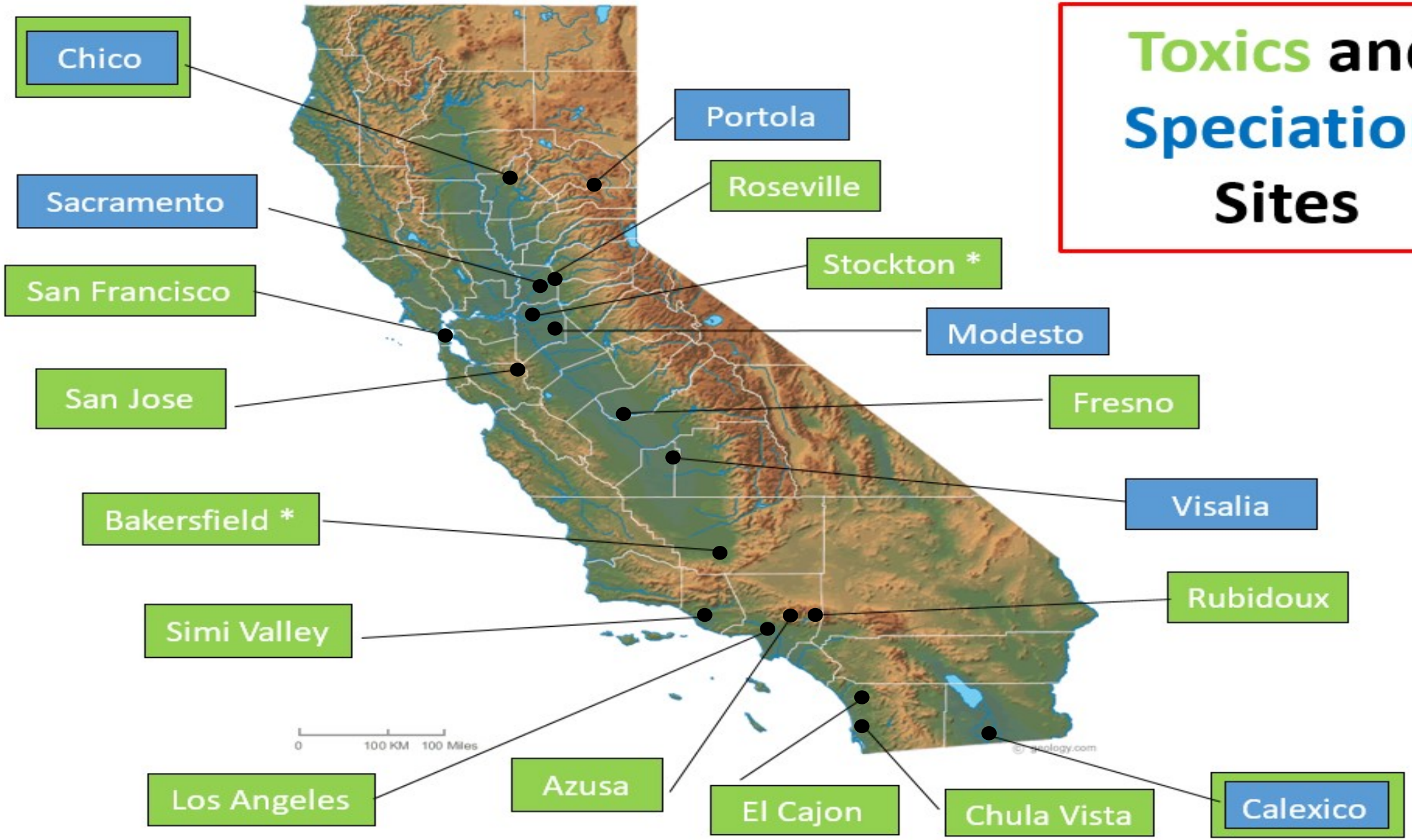
California Air Toxics Monitoring Program



California Air Toxics Monitoring Program



Toxics and Speciation Sites



TOXICS

Site	901 Canister (1 in 12 sampling)		924 Sampler (1 in 12 sampling)			SASS Sampler (1 in 6 sampling)			
	GHG	VOC	Carbonyls	Metals (ICP-MS)	Cr+6	PM 2.5 Mass	Ions	Woodsmoke	Metals (XRF)
Azusa	x	x	x	x	x				
Bakersfield	x*	x*	x*	x*	x*				
Calexico	x	x	x	x	x	x	x	x	x
Chico	x	x	x	x	x	x	x	x	x
Chula Vista	x	x	x	x	x				
El Cajon	x	x	x	x	x				
Fresno	x	x	x	x	x				
Los Angeles	x	x	x	x	x				
Modesto						x	x	x	x
Portola						x	x	x	x
Roseville	x	x	x	x	x				
Rubidoux	x	x	x	x	x				
Sac T						x	x	x	x
San Francisco	x	x	x	x	x				
San Jose	x	x	x	x	x				
Simi Valley	x	x	x	x	x				
Stockton	x	x	x*	x*	x*				
Visalia						x	x	x	x

* collocated

Metals		
Analyte	ICP-MS	XRF
Aluminum, Al		x
Antimony, Sb	x	x
Arsenic, As	x	x
Barium, Ba		x
Beryllium, Be	x	
Bromine, Br		x
Cadmium, Cd	x	
Calcium, Ca		x
Chlorine, Cl		x
Chromium, Cr	x	x
Cobalt, Co	x	x
Copper, Cu	x	x
Iron, Fe	x	x
Lead, Pb	x	x
Manganese, Mn	x	x
Mercury, Hg		x
Molybdenum, Mo	x	x
Nickel, Ni	x	x
Phosphorus, P		x
Potassium, K		x
Rubiduim, Rb		x
Selenium, Se	x	x
Silicon, Si		x
Strontium, Sr	x	x
Sulfur, S		x
Tin, Sn	x	x
Titanium, Ti	x	x
Vanadium, V	x	x
Yttrium, Y		x
Zinc, Zn	x	x
Zirconium, Zr	x	

VOC by GCMS
Analyte
1,1,1-Trichloroethane (TCEA)
1,3-Butadiene
Acetone
Acetonitrile
Acrolein
Acrylonitrile
Benzene
Bromomethane (Methyl Bromide)
Carbon Disulfide
Carbon Tetrachloride
Chloroform
Cis-1,3-dichloropropene
Dichloromethane (DCM)
Ethylbenzene
Meta + para Xylene (m/p-xylene)
MTBE
o-Dichlorobenzene
Ortho Xylene (o-xylene)
p-Dichlorobenzene
Perchloroethylene (PERC)
Styrene
Toluene
Trans-1,3-dichloropropene
Trichloroethylene (TCE)

Carbonyls
Formaldehyde
Acetaldehyde
MEK

iADAM Toxics Database

- https://www.arb.ca.gov/adam/toxics/toxics.html

EPA Sampling Schedule 2019

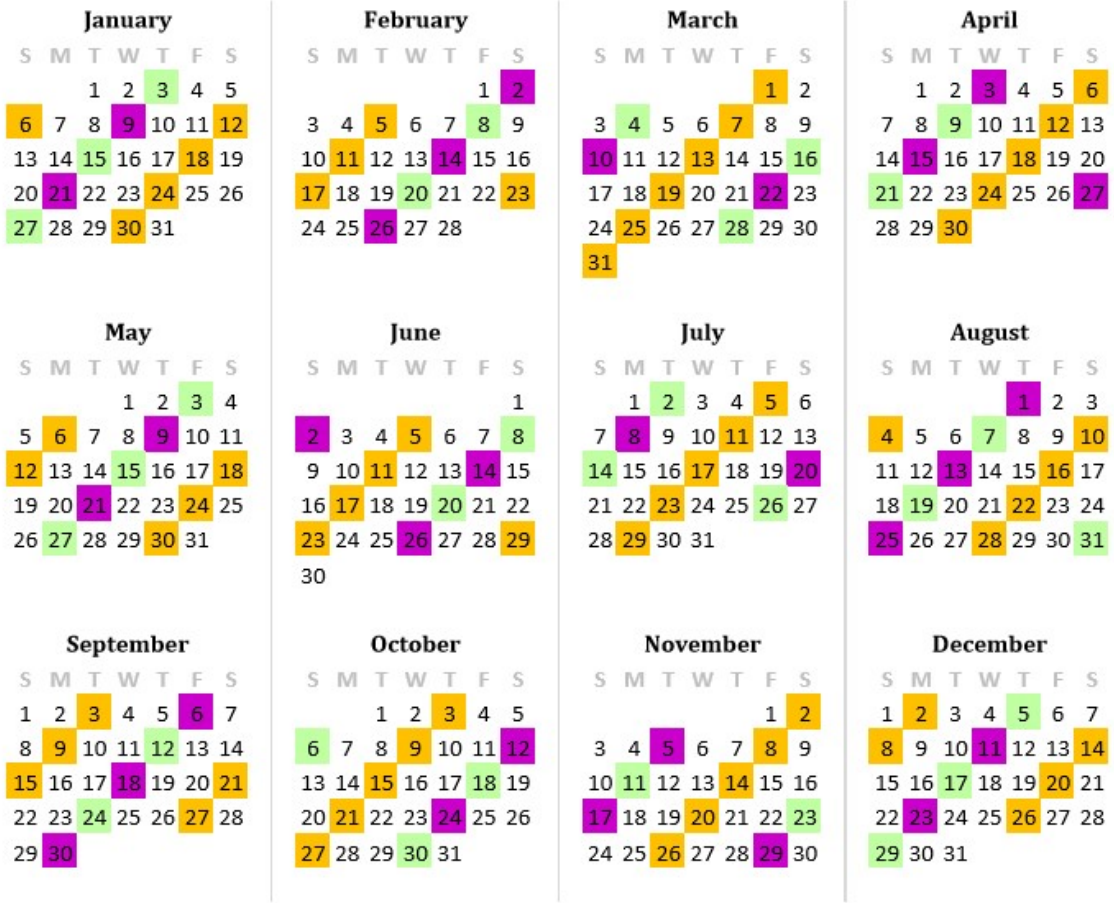
Important Dates

Notes

3-Day schedule is shown in orange, green, and purple

6-Day schedule is shown in green and purple

12-Day schedule is shown in purple



January

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

February

S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28		

March

S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

April

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

May

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

June

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30						

July

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

August

S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

September

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					

October

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

November

S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

December

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

Notes

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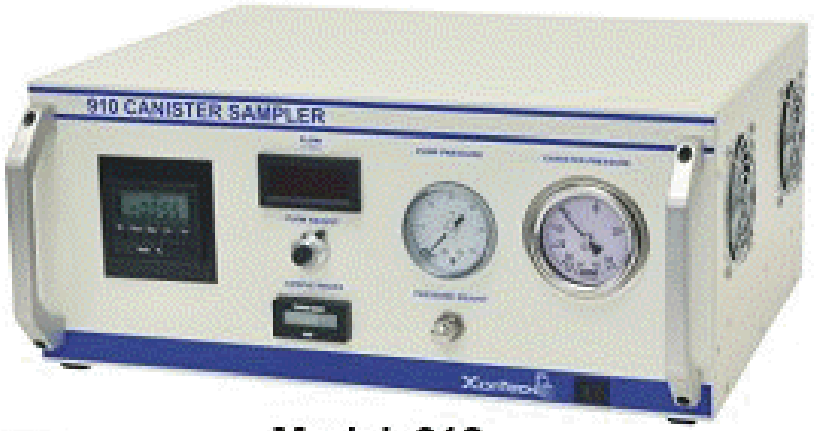
Toxics Field Overview - Samplers

- Xonteck 924

Model 924

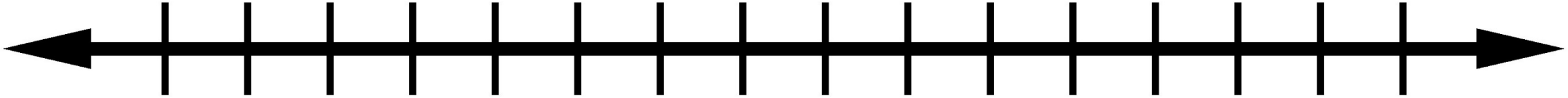
- Xonteck 901/910PC



Model 910


DaVita

Field Sample Handling



Prior to run day

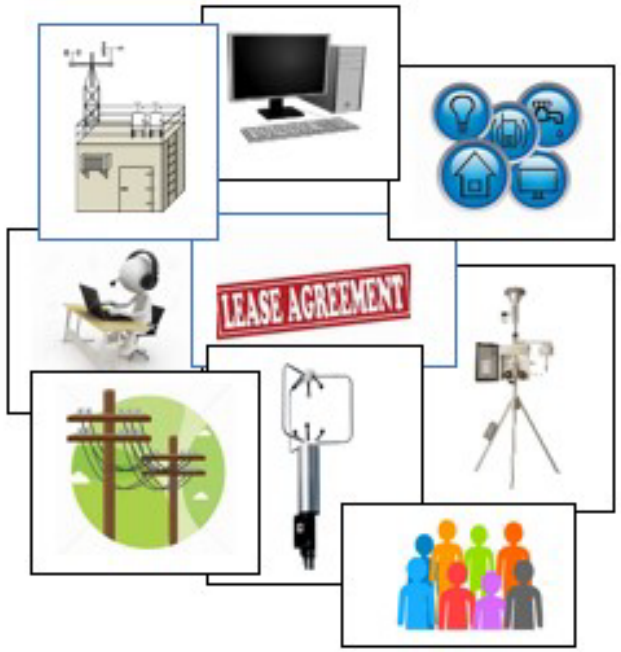
<5 days

<48 hours

<5 days

AMBIENT AIR MONITORING

MLD operates 41 sites including 6 seasonal and supports 229 district sites

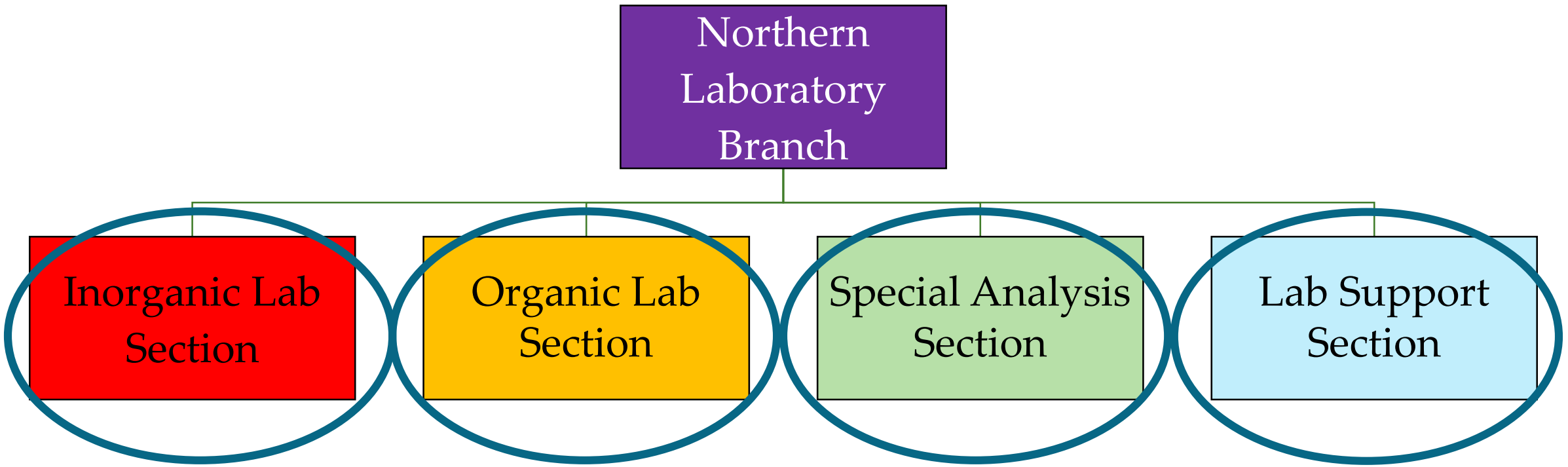


SITE NEEDS

OPERATIONS

SUPPORT

Toxics Lab Overview



Combined Laboratory Functions

- 15 Total Programs Combined, plus Special Studies
- Provide Analytical Chemistry Services to meet Federal/State Regulations and Client Expectations
- Data Quality Assurance/Quality Control
- Timely Data Reporting

TACs Ambient Air Analysis

- Total Metals by Inductively Coupled Plasma/Mass Spectrometry (ICP/MS)
  - Method 61
- Hexavalent Chromium (Cr^{6+}) by Ion Chromatography (IC)
  - Method 39
- Metals Analysis by X-Ray Fluorescence Spectroscopy (XRF)
  - Method 34

TACs Continued…

- Volatile Organic Compounds (VOCs) by Gas Chromatography-Mass Spectrometry (GC-MS)
  - Method 58, 66, and 72
- Carbonyl Compounds by High Performance Liquid Chromatography (HPLC)
  - Method 22
- Pesticides by Gas Chromatography-Triple Quadrupole Mass Spectrometry
  - Method 77

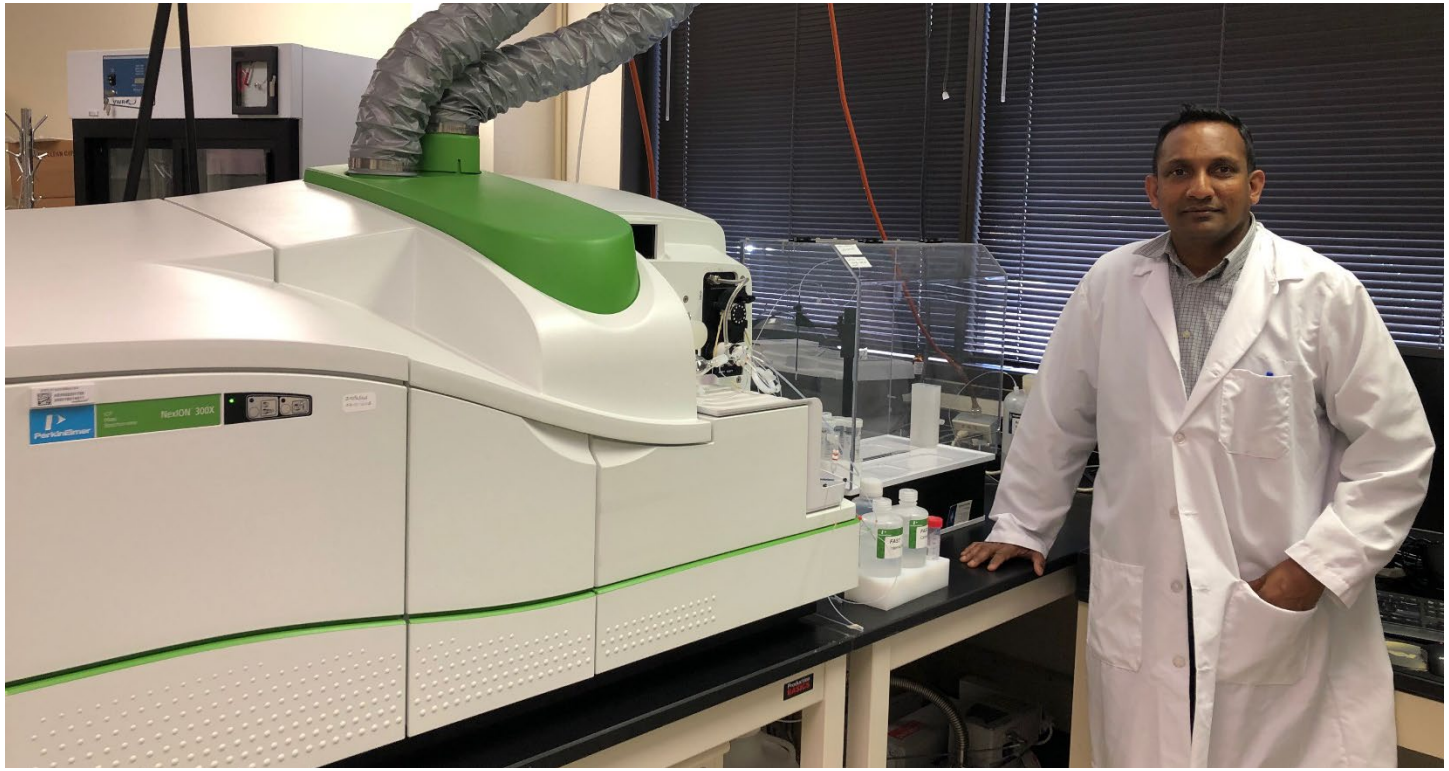
Media Preparation, Shipping and LIMS

- Filters
  - Inspect for tears, holes, imperfections
  - Acid wash, impregnation
- Canisters
  - Rigorous Cleaning Cycles
  - Prepare field spikes, if required
- Package and Ship
  - Ship out, sampled, ship back

- Laboratory Information Management System (LIMS)

Total Metals by ICP/MS

- 16 sites with 1-in-12 Collection Frequency
- 37 mm Teflon Filters
- Extracted in Dilute Acid
- Extract Analyzed by
  Inductively Coupled Plasma – Mass Spectrometry
- 19 Elements Analyzed



Hexavalent Chromium (Cr^{6+}) by IC

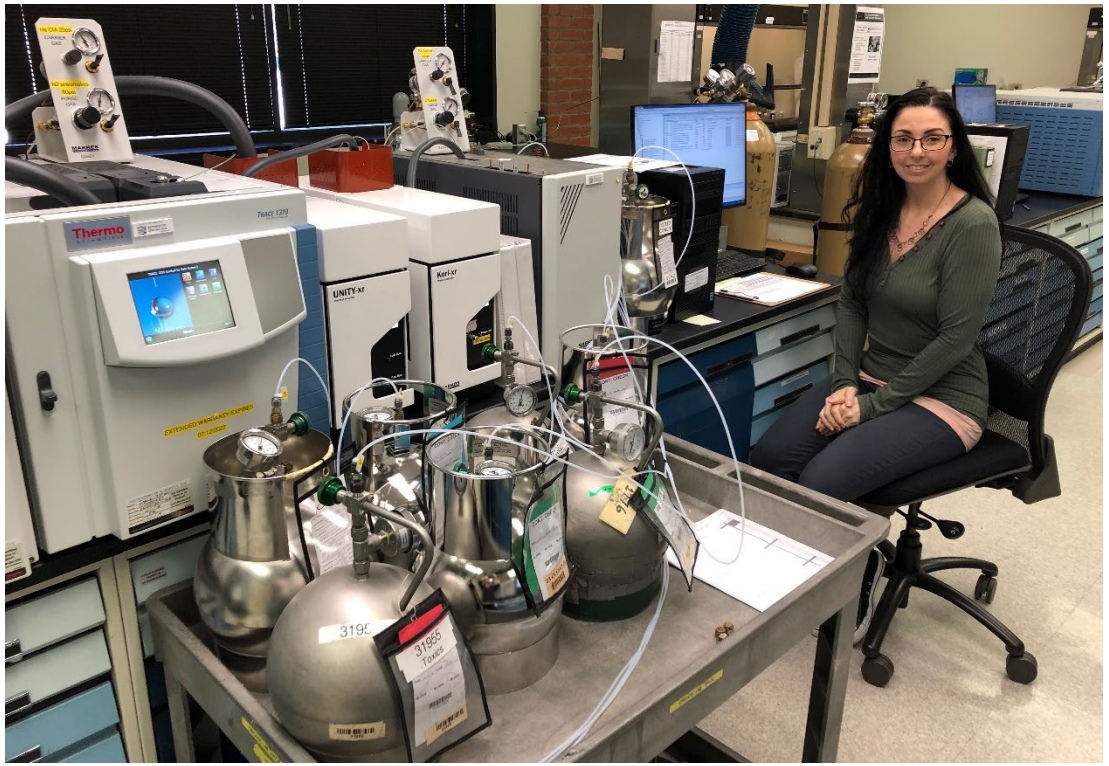
- 16 sites with 1-in-12 Collection Frequency
- 37 mm Cellulose Filters
- Extracted in Deionized Water
- Extract analyzed by Ion Chromatography

Metals Analysis by XRF

- 6 sites with 1-in-6 Collection Frequency
- 47 mm Teflon Filters
- Non-Destructive of the Sample
- Analyzed by X-Ray Fluorescence Spectroscopy
- 28 Elements Analyzed

Volatile Organic Compounds (VOCs) by GC-MS

- 16 sites with 1-in-12 Collection Frequency
- Canisters for Whole Air Sampling
- Canister Cleaning Process for Re-use
- Analyzed by Gas Chromatography-Mass Spectrometry
- 24+ Compounds Analyzed




ARGON


TOXICS
TOXICS
TOXICS
#25050

Carbonyl Compounds by HPLC

- 16 sites with 1-in-12 Collection Frequency
- DNPH Coated Silica Cartridge
- Extracted with Acetonitrile
- Analyzed by High Performance Liquid Chromatography
- 3 Compounds Analyzed
  - (Formaldehyde, Acetaldehyde, MEK)

Pesticides by GC-MS/MS

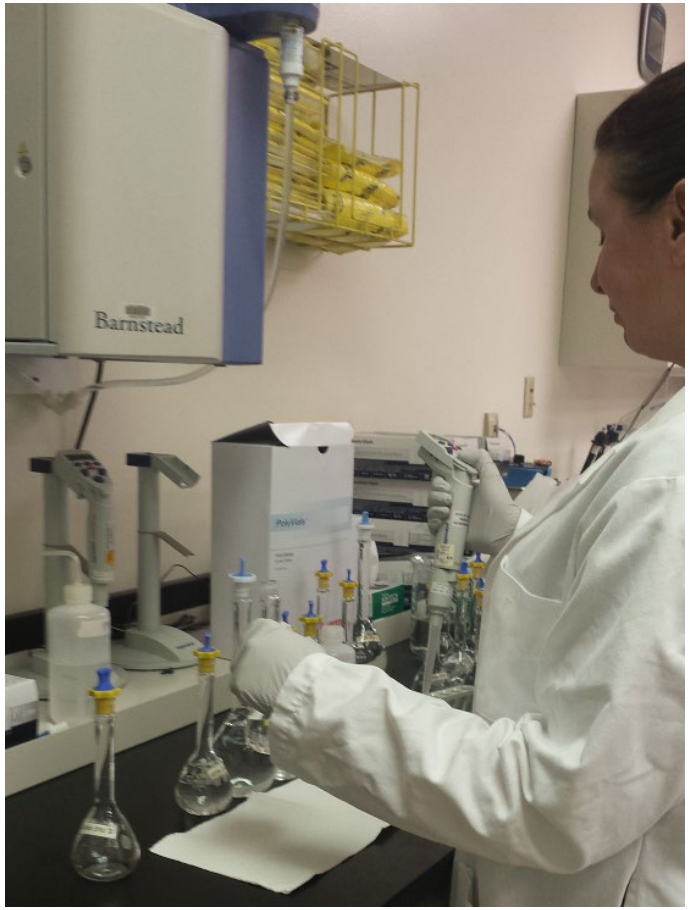
- 10-12 Week Studies at Public Sites per DPR
- 8 Network Sites on a 1-in-6 Frequency
- Canisters and Resin/Carbon Tubes
- Extracted with Ethyl Acetate
- Analyzed by Gas

Chromatography – Triple Quad

Mass Spectrometry

Sample Analysis

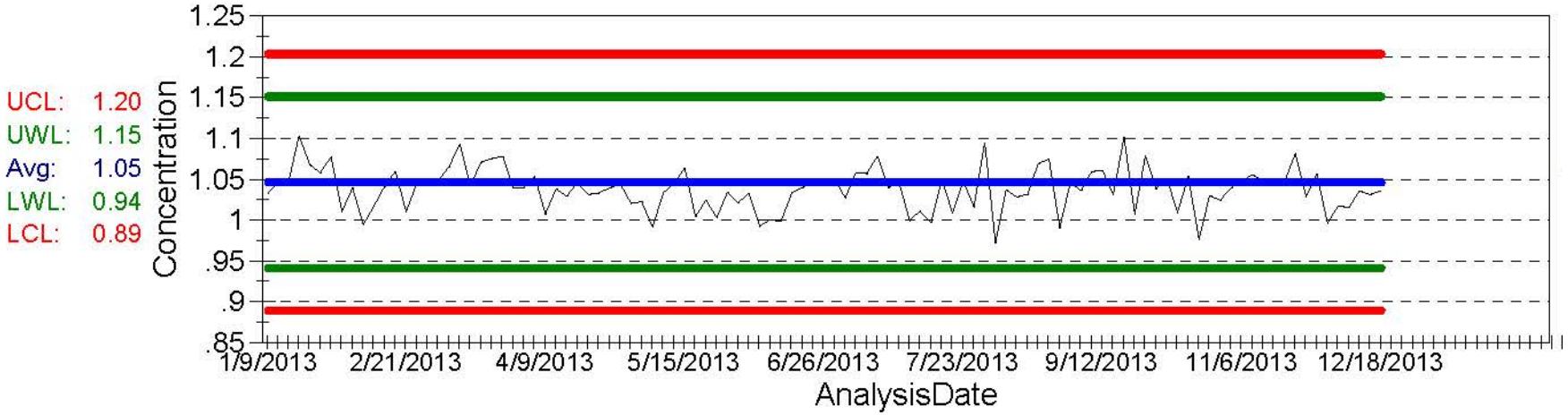
- Prepare Standards
- Method Detection Limits and
  Linearity Studies
- Blanks and Laboratory Spikes
- Analyses (Specific Analytical Sequence)



Quality Control (QC)

- Holding times
- Blanks (Field Blanks, Water Blanks, Filter Blanks)
- Check standards within ± 20% of initial calibration standard
- Beginning and closing control standards within established limits
- Replicate analyses
- Field (Matrix) spikes

- Data review
  - Analyst
  - Peer
  - Manager
  - Branch Chief



Summary

Sample Media Preparation

Shipping to Field Sites

Field Sampling

Sampled Media back to Lab

Sample Receipt and Tracking

Lab Analysis

Data to LIMS

Monthly Data Packages Prepared

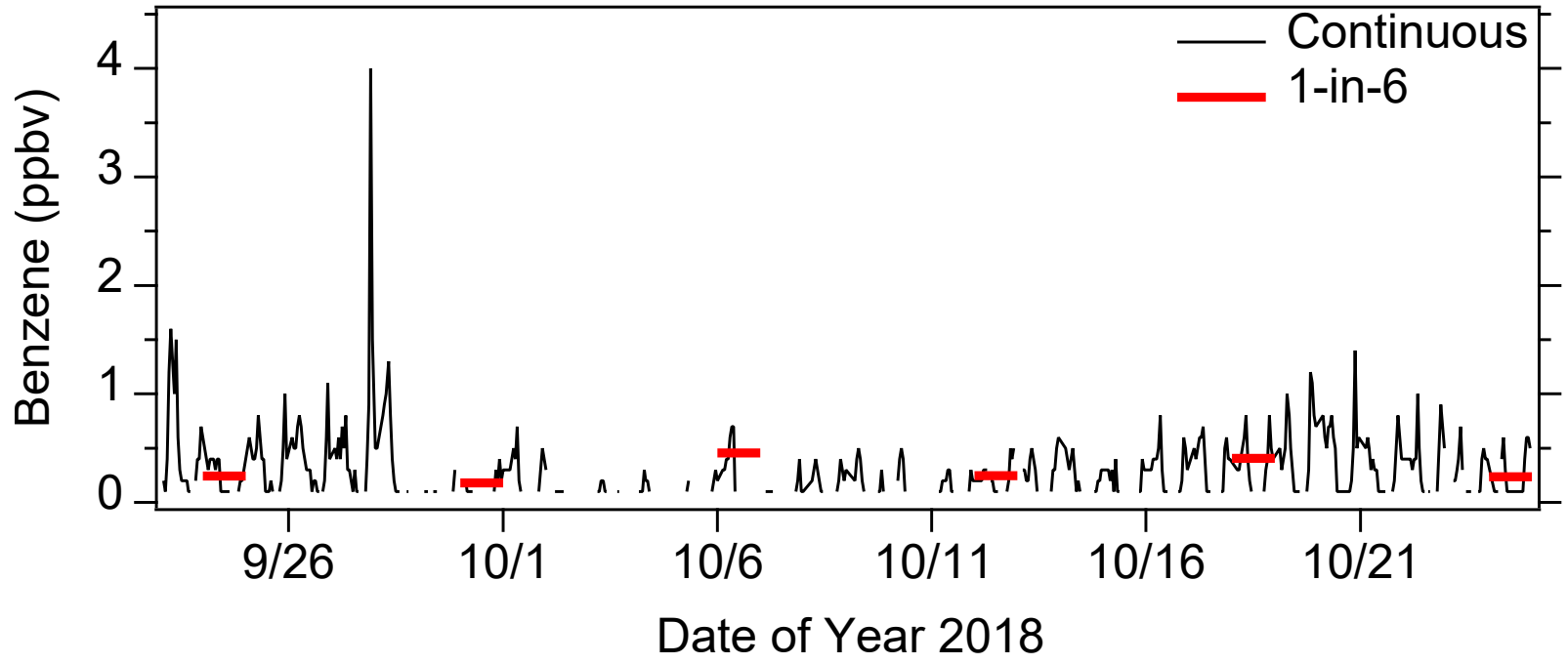
Data Packages Review (4 Level)

Data Submitted to Clients

Advanced Monitoring Techniques - Chemical Composition

VOCs — **SVOCs** — **Particles**

BTEX, Pesticides | **PAHs, Pesticides** | **Organic** | Water soluble inorganics | **Metal**



Advanced Monitoring Techniques - Chemical Composition

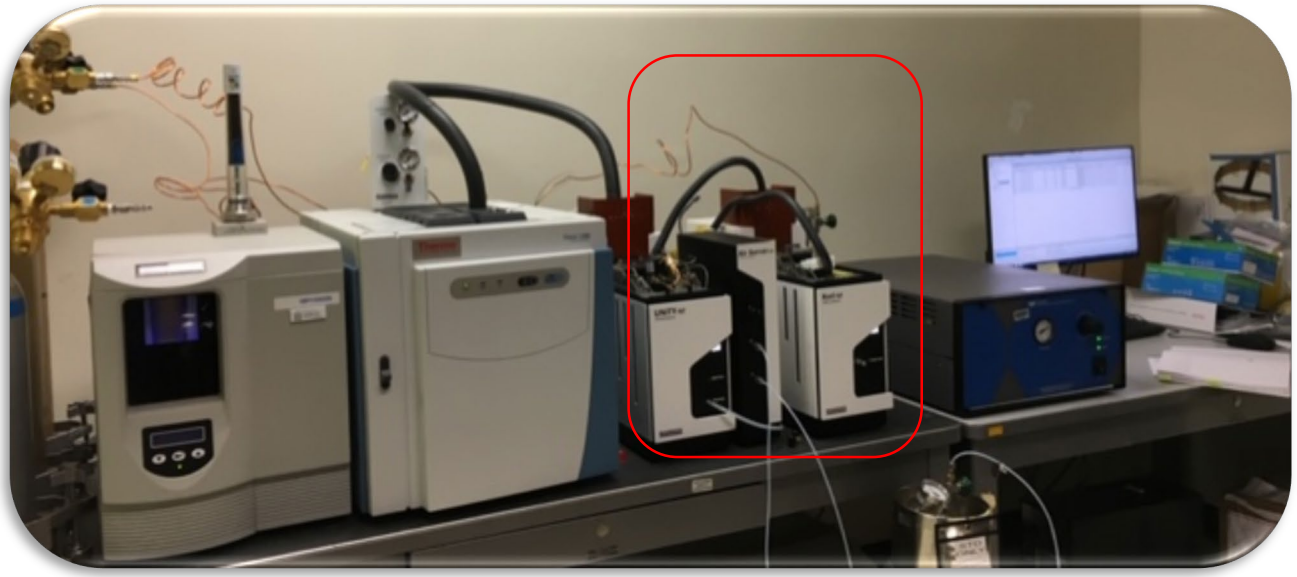
VOCs — **SVOCs** — **Particles**

BTEX, Pesticides

PAHs, Pesticides

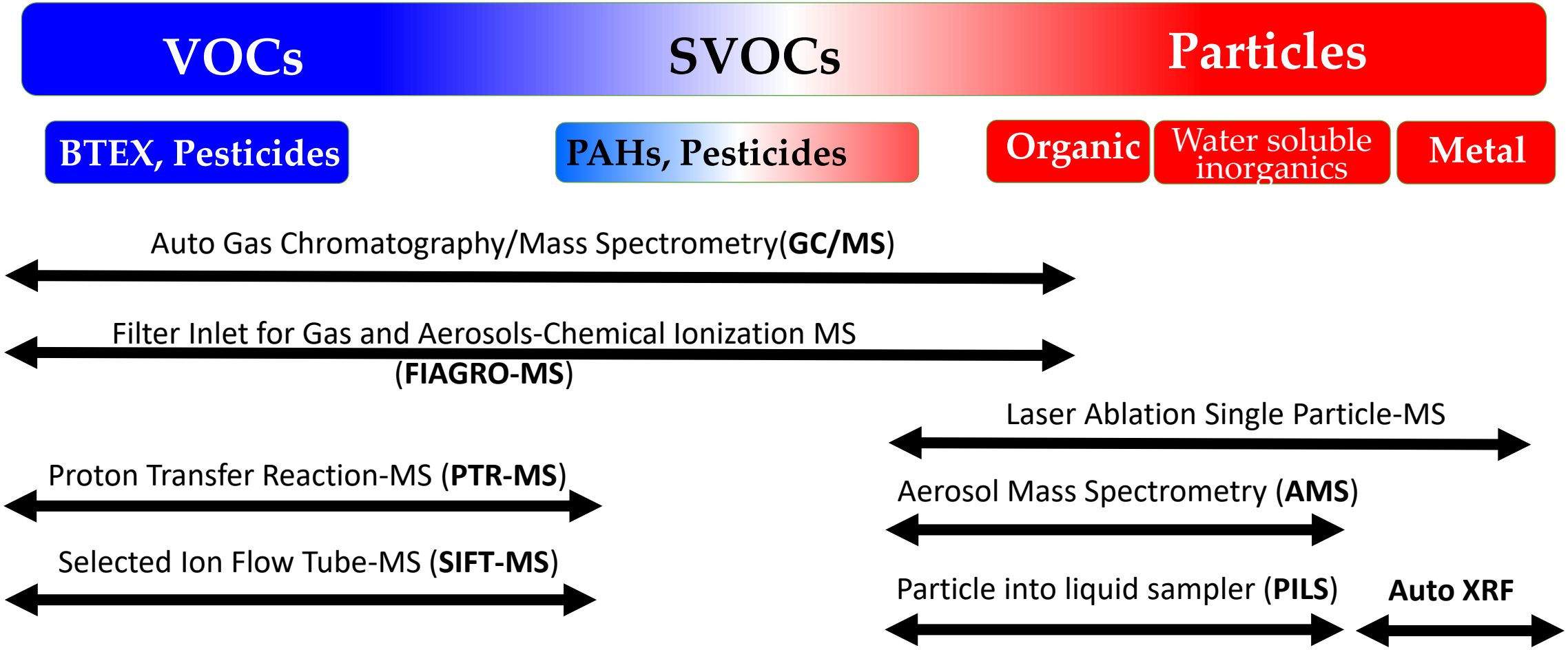
Organic | **Water soluble inorganics** | **Metal**

Lab-grade auto gas chromatograph

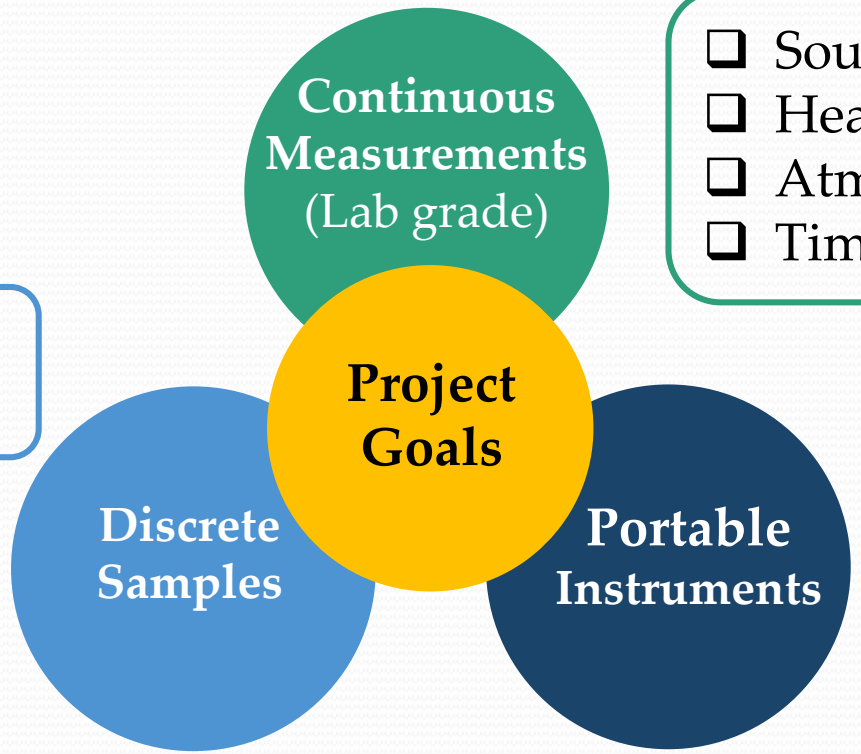


Portable auto gas chromatograph

Advanced Monitoring Techniques - Chemical Composition



CALIFORNIA AIR RESOURCES BOARD



- ❑ Source attribution
- ❑ Health analysis
- ❑ Atmospheric processing
- ❑ Time series

- ❑ Health analysis
- ❑ Long-term trend

- ❑ Spatial distribution
- ❑ Quick response

CALIFORNIA AIR RESOURCES BOARD

Study of Neighborhood Air Near Petroleum Sources (SNAPS)

Motivations

Aliso Canyon underground natural gas storage leak

Exposure concerns raised by communities

Part of broader CARB effort to understand impacts of oil and gas operations

Program Goals

Characterize air quality at the community level

Analyze data for **possible health risks**

Identify emission sources as feasible

Target Analytes and Monitoring Techniques

Major Pollutants

Criteria Pollutants
(PM2.5 , Ozone, Carbon Monoxide)

Volatile Organic Compounds (VOCs)
(e.g. BTEX, Aldehydes, Glycols)

Polycyclic Aromatic Hydrocarbons (PAHs)

Methane

Hydrogen Sulfide

Metals

Black Carbon

Target Analytes and Monitoring Techniques

Discrete Samples

VOCs
(e.g. BTEX, Aldehydes, Glycols)

PAHs

Metals

Continuous Measurements

VOCs
(BTEX & other hydrocarbons)

Metals

Black Carbon

Hydrogen Sulfide

Criteria Pollutants
(PM2.5 , Ozone, Carbon Monoxide)

Methane

Portable Instruments

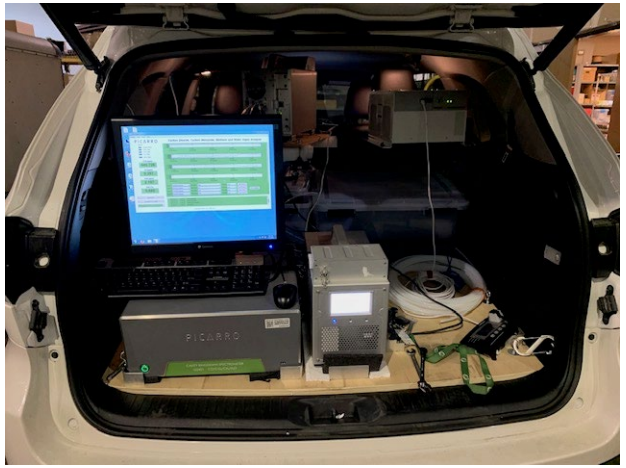
VOCs
(BTEX)

Carbon Monoxide

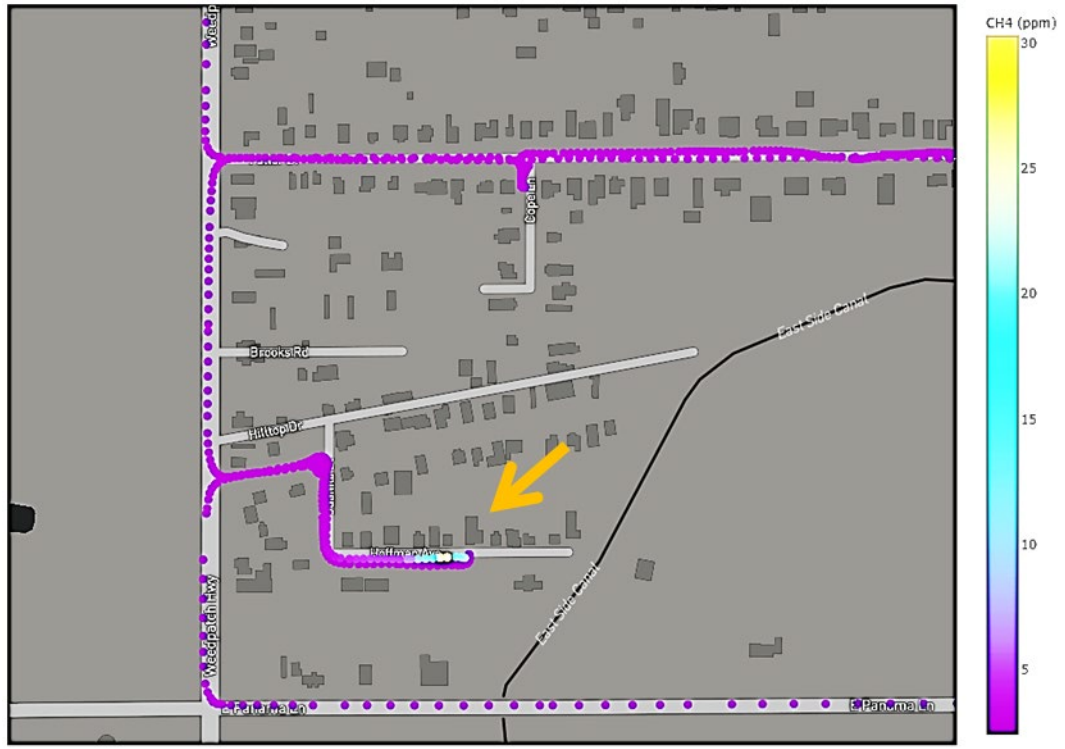
Methane

	Discrete Samples	Continuous Measurements
Sampling	1-in-6	Hourly or less
Application	Health risk assessment	Health risk assessment & Source attribution

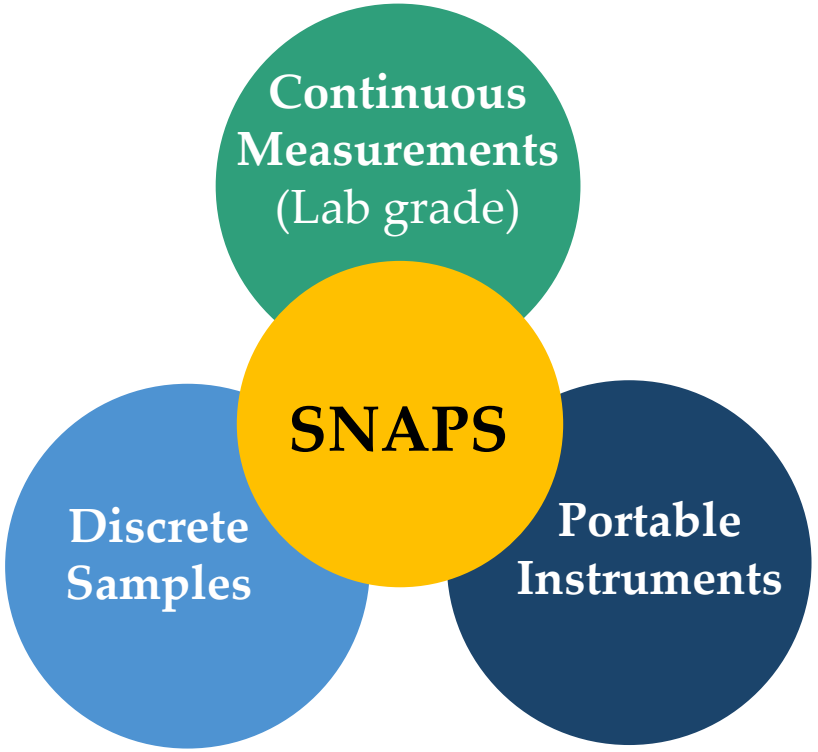
Monitoring Techniques – Mobile Monitoring



- **VOCs (BTEX)**
- **Carbon Monoxide**
- **Methane**



Study of Neighborhood Air Near Petroleum Sources (SNAPS)



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