SNAPS
Lost Hills

Mid-Monitoring Update
Oct 28th, 2019

Study of Neighborhood Air near Petroleum Sources

- Study air quality in neighborhoods
- Select neighborhoods close to oil and gas extraction facilities
- Characterize cumulative impact from surrounding sources

Motivation

- Exposure concerns raised by communities
- Aliso Canyon underground natural gas storage leak
- California Council on Science and Technology (CCST) recommendations
- Part of broader CARB effort to understand impacts of oil and gas operations

Scope

Program Goals

Characterize air quality in communities near oil and gas operations

Identify emission sources as feasible

Analyze data for **possible health risks**

Major Pollutants

Toxic Air Contaminants (TACs)

Criteria Pollutants
Particulate Matter ($PM_{2.5}$)
Carbon Monoxide (CO), Ozone(O_3)

Volatile Organic Compounds (VOCs)

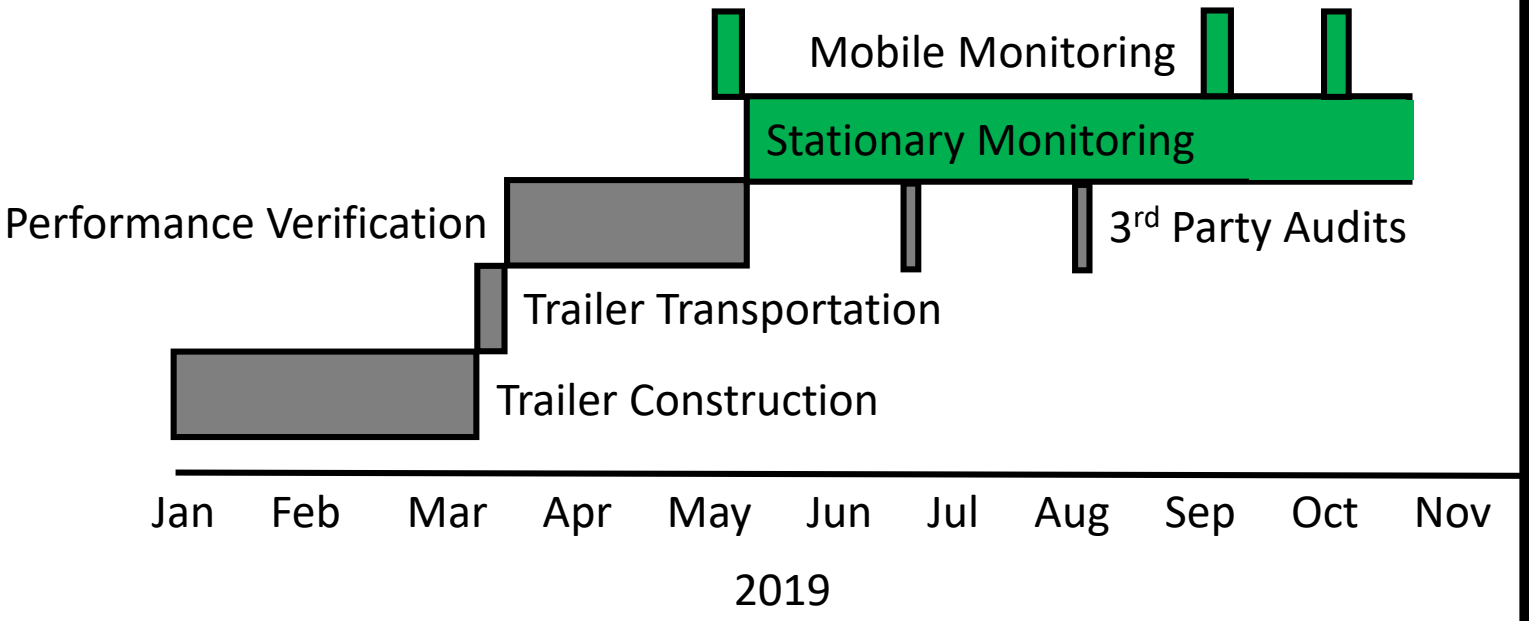
Methane (CH_4)

Hydrogen Sulfide (H_2S)

Metals

Glycols

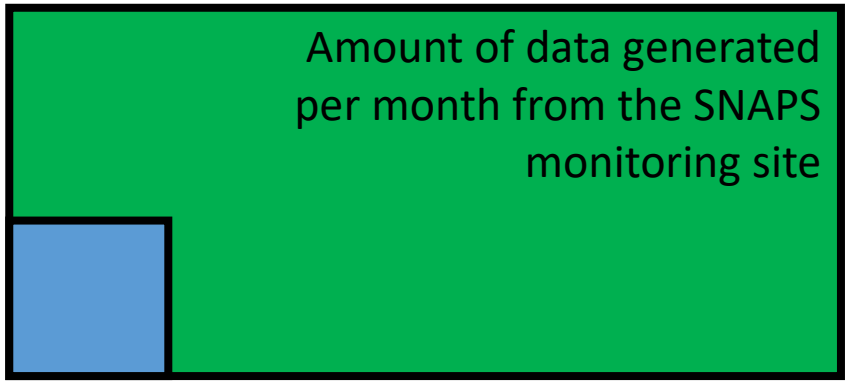
Timeline of Deployment



Measuring over 200 compounds from June 2019 onwards

Data Availability

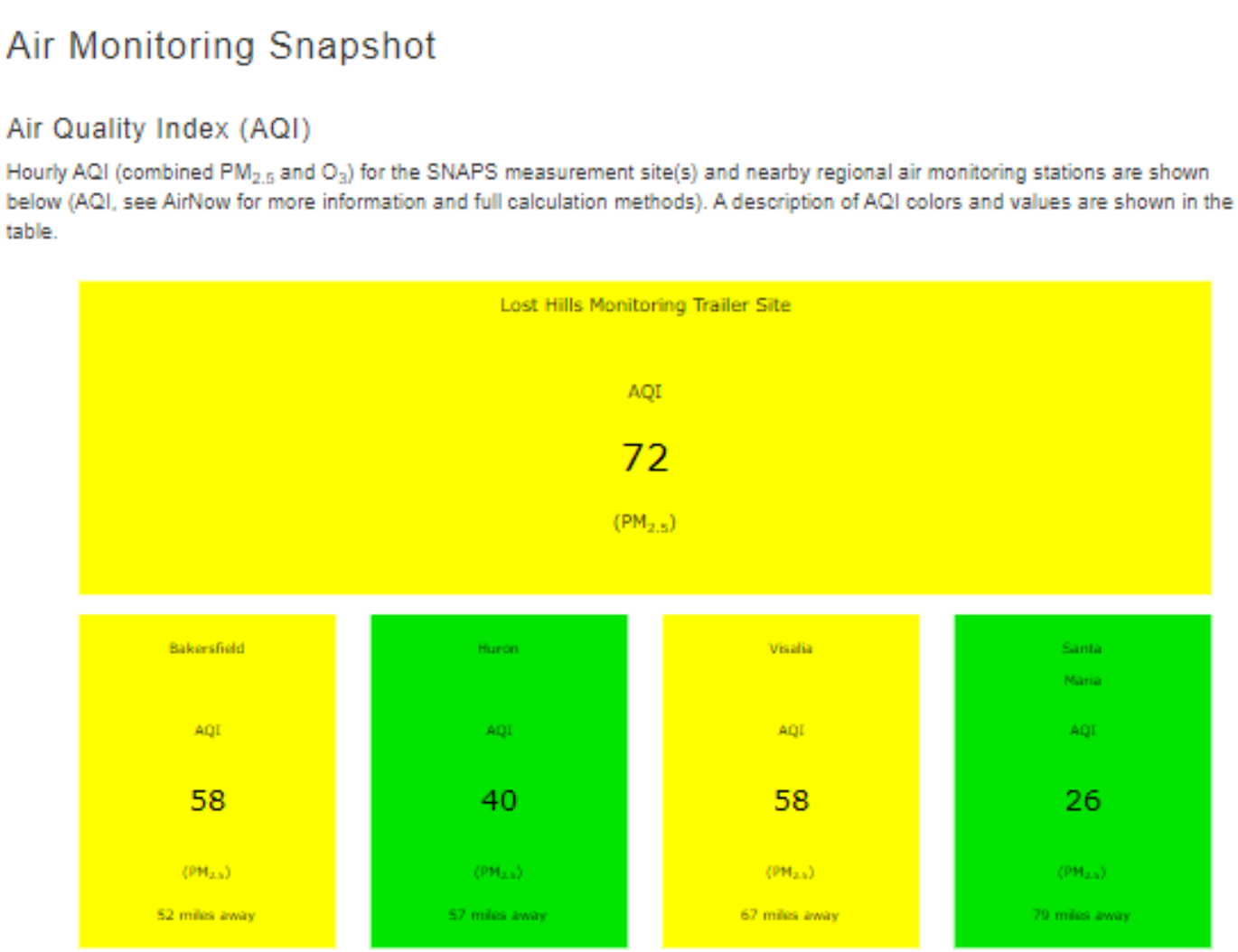
Measurement	Pollutants	Time to Public Posting of Data
On-site Instrumentation	CH_4, H_2S, O_3, CO, $PM_{2.5}$, black carbon (BC)	Hourly
Discrete Samples	Toxic air contaminants (TACs), non-TAC VOCs and metals	With published report



Amount of data generated per month from a typical regulatory monitoring site

- Results streamed hourly on project website
- Report published following the completion of monitoring

Website Real-time Data Display



https://ww2.arb.ca.gov/our-work/programs/study-neighborhood-air-near-petroleum-sources/snaps-data-display

Google search: “SNAPS data display Lost Hills”

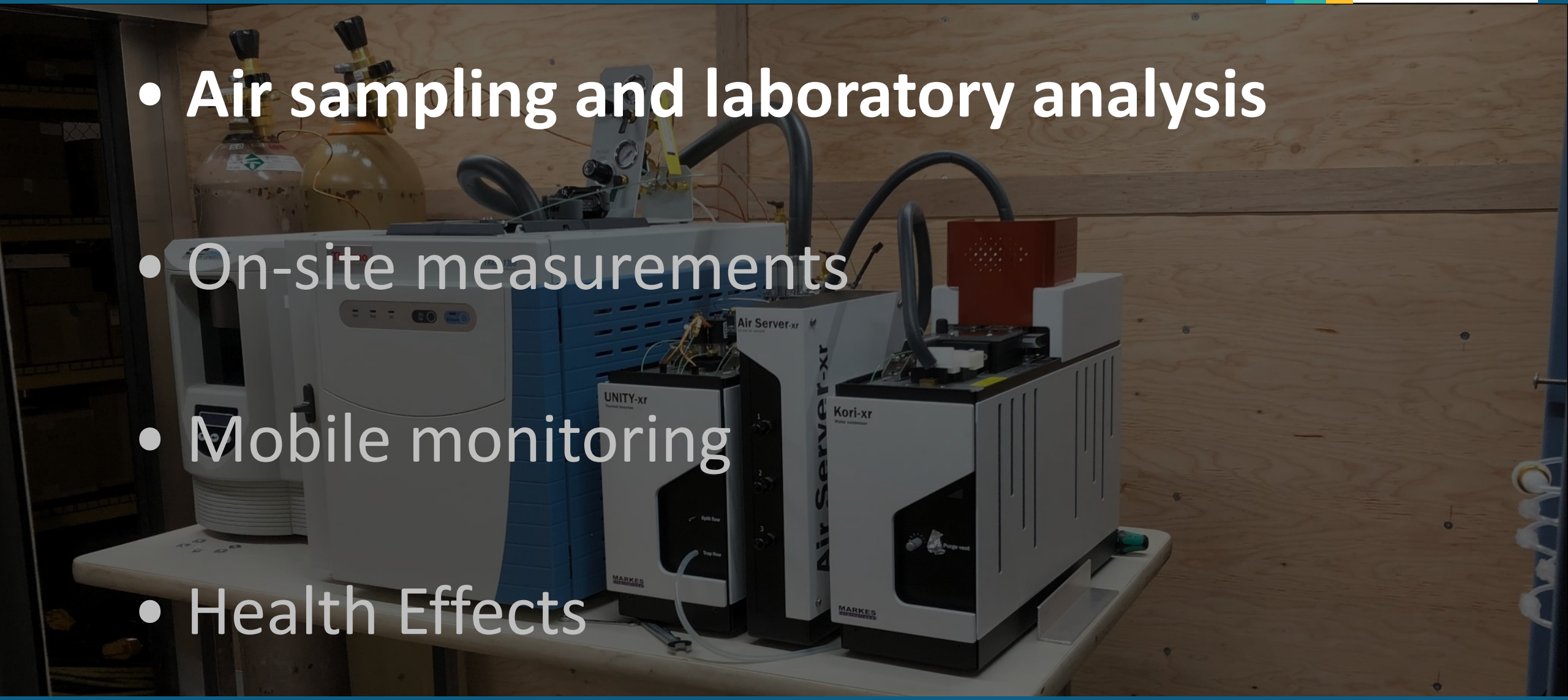
Standards & Reference Exposure Levels

- **Ambient Air Quality Standard**

  Regulatory air pollutant level set to provide public health protection, including the health of “sensitive” populations

- **Reference Exposure Level**

  Pollutant concentration level at or below which no adverse health effects are anticipated for a specified exposure duration



- **Air sampling and laboratory analysis**
- On-site measurements
- Mobile monitoring
- Health Effects

Air Quality Measurements

Filter Cassette

Sorbent Cartridge

Gas Canister

Organic Chemical Measurements

135 chemicals measured each week

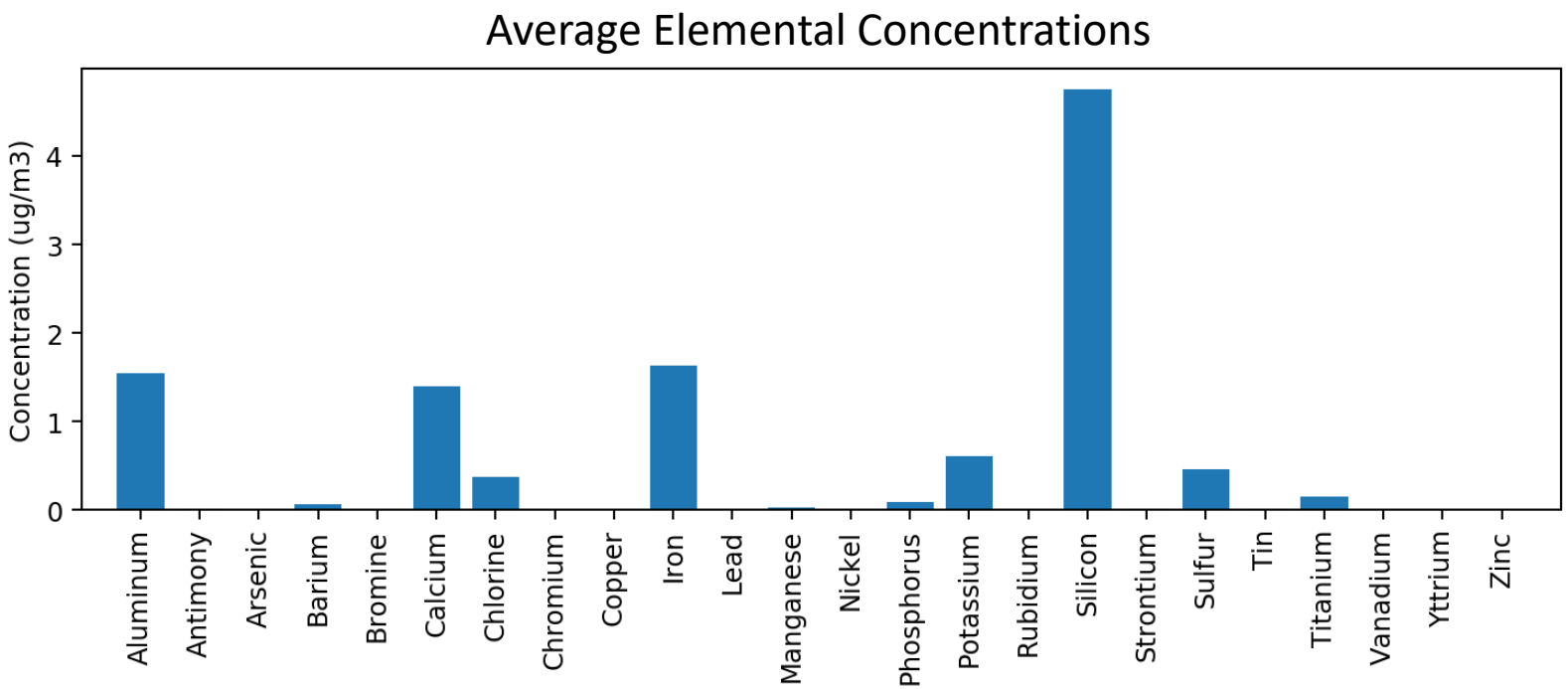
10 chemicals detected

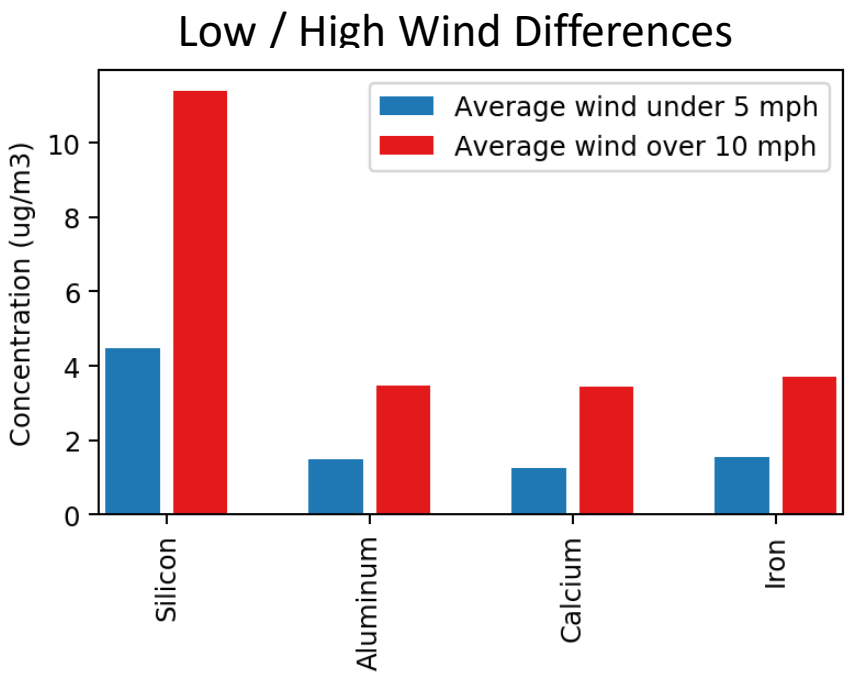
0 above acute health thresholds

Chemicals Detected
Benzene
Benzoic Acid
Carbon Tetrachloride (R-10)
Trichlorofluoromethane (R-11)
Dichlorodifluoromethane (R-12)
Trichlorotrifluoroethane (R-113)
Hexachloroethane (R-110)
Hydrogen Sulfide
Naphthalene
Methylnaphthalene

Data are preliminary. Final results will be published in the final report.

Metals Measured





- 24 elements detected
- Concentrations higher on windy days
- Days with higher Si, Al, Ca, Fe suggest wind-blown soil/dust

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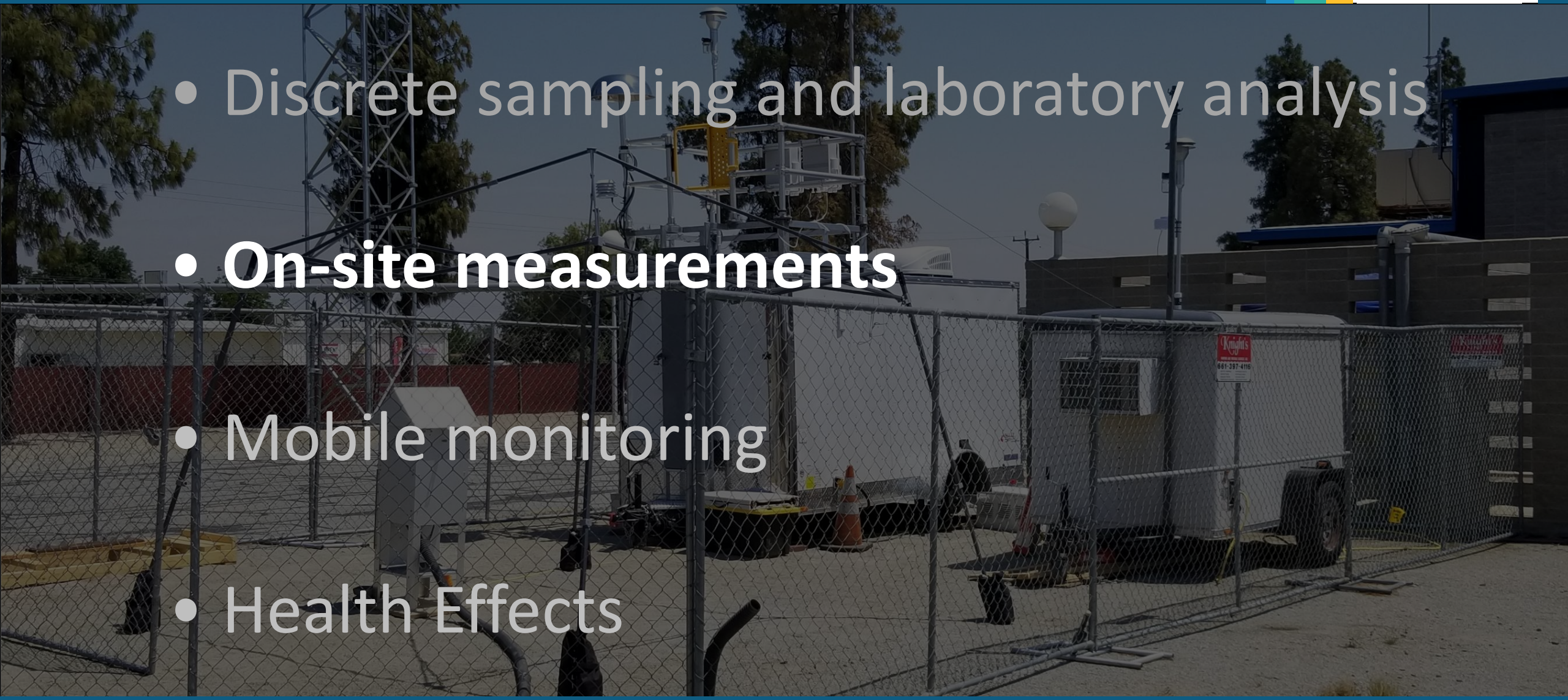

- Discrete sampling and laboratory analysis
- **On-site measurements**
- Mobile monitoring
- Health Effects

On-site Measurements

$PM_{2.5}$ and Ozone Measurements

Nowcast Air Quality Index

53.8% considered 'good'

46.0% moderate

0.2% unhealthy for sensitive groups

0.0% unhealthy

Air Quality Index Levels of Health Concern	Numerical Value
Good	0 to 50
Moderate	51 to 100
Unhealthy for Sensitive Groups	101 to 150
Unhealthy	151 to 200
Very Unhealthy	201 to 300
Hazardous	301 to 500

Air Quality Index in Lost Hills considered 'good' most of the time

Data are preliminary. Final results will be published in the final report.

Concentrations Relative to Standards

	$PM_{2.5}$ (ug/m^3)	O_3 (ppb)	CO (ppm)	H_2S (ppb)
Standard or Acute REL	**35.0**	**70.0**	**9.0**	**30.0**
Maximum Concentration	**23.5**	**57.6**	**0.16**	**8.13**
Average Concentration	**12.5**	**33.9**	**0.12**	**0.29**

All measurements are below established acute standards

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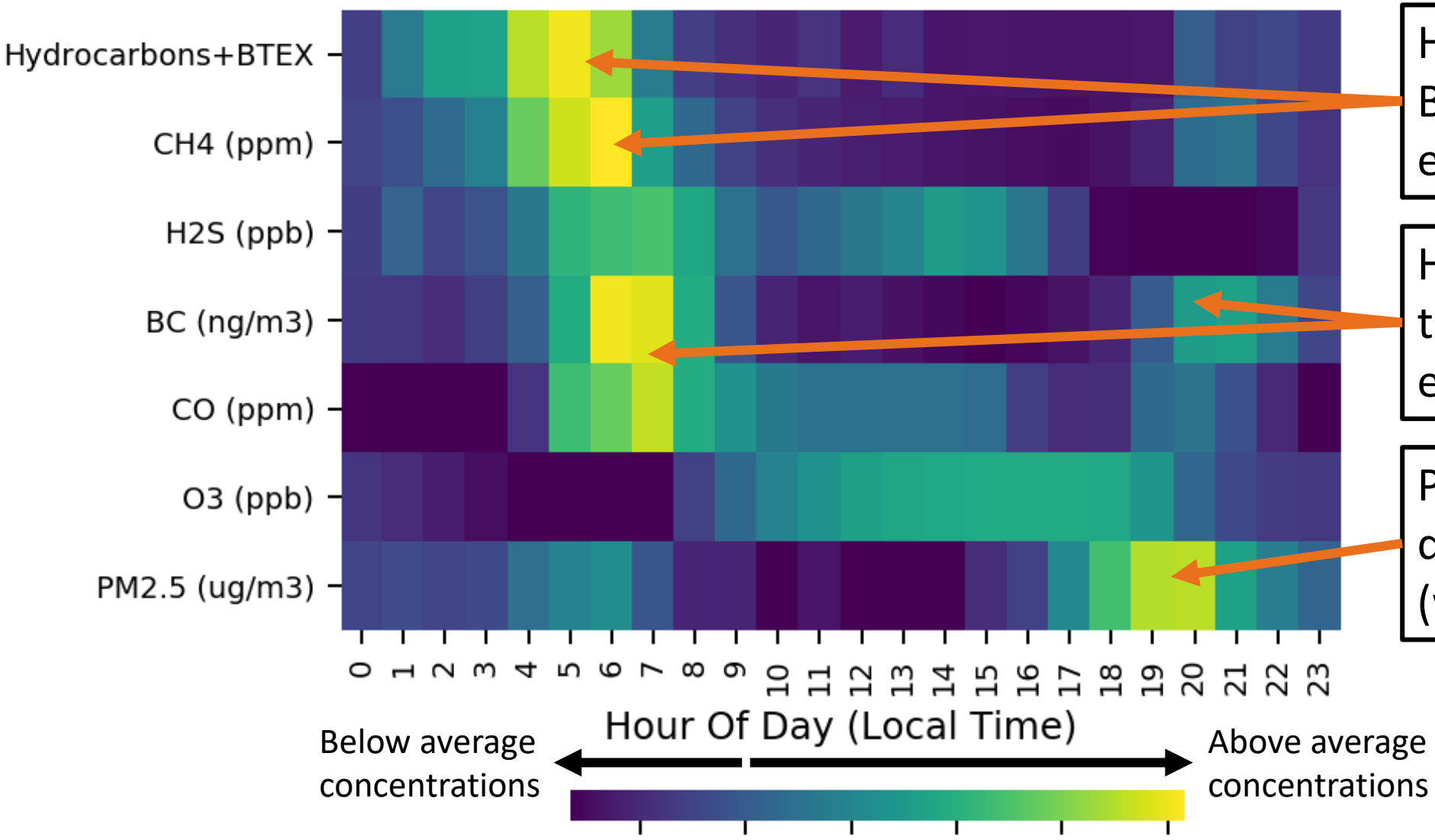
Hourly Pollutant Measurements



Highest hydrocarbons, BTEX, and CH_4 in the early morning

Higher BC and CO in the morning and evening

$PM_{2.5}$ typically highest during the evening (when most windy)

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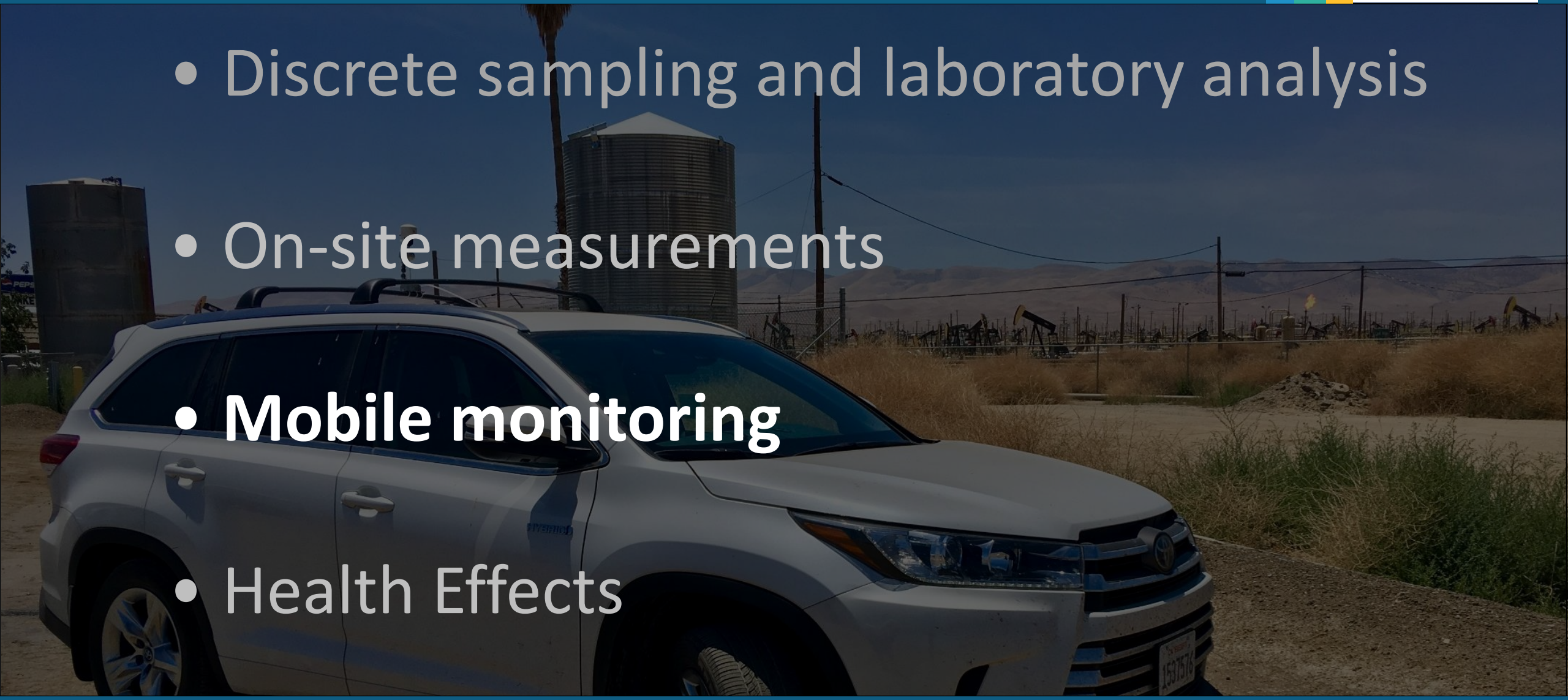
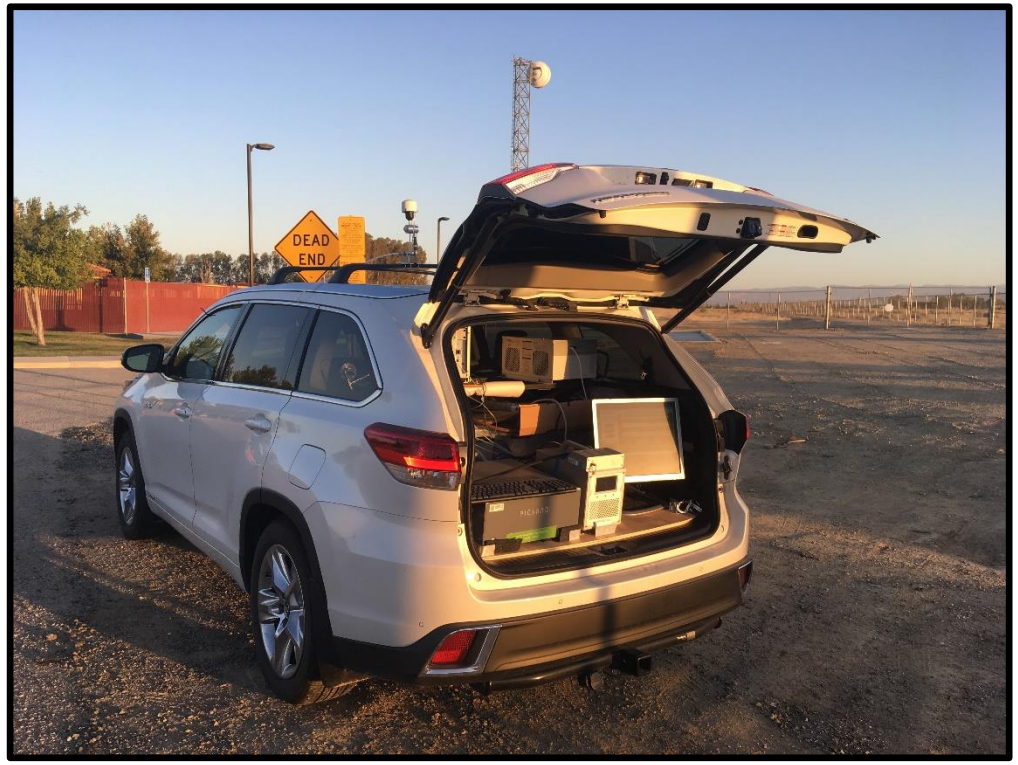


- Discrete sampling and laboratory analysis
- On-site measurements
- **Mobile monitoring**
- Health Effects

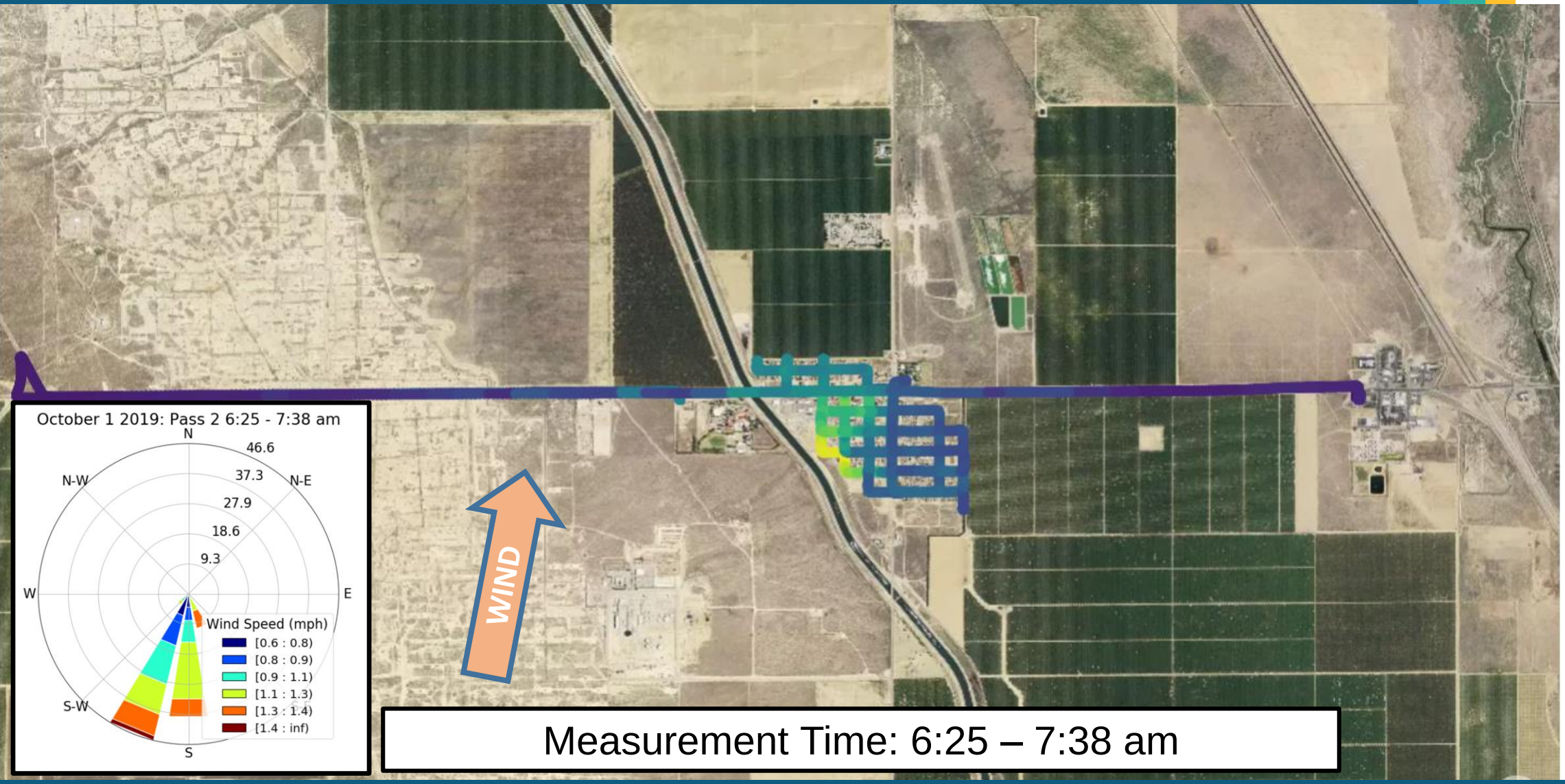
SNAPS Mobile Monitoring Platform

Mobile Monitoring

- Instruments housed within a vehicle
  - Measures CH_4 and H_2S every second
  - BTEX measurements every 15 minutes
- Monitoring along public roadways in and around Lost Hills
- Measurements are ‘snapshots’ in time
  - Multiple passes on streets of Lost Hills
  - Includes upwind measurement periods



Methane Mobile Monitoring (Oct 1st)



Methane concentrations vary around Lost Hills across space and time

Data are preliminary. Final results will be published in the final report.

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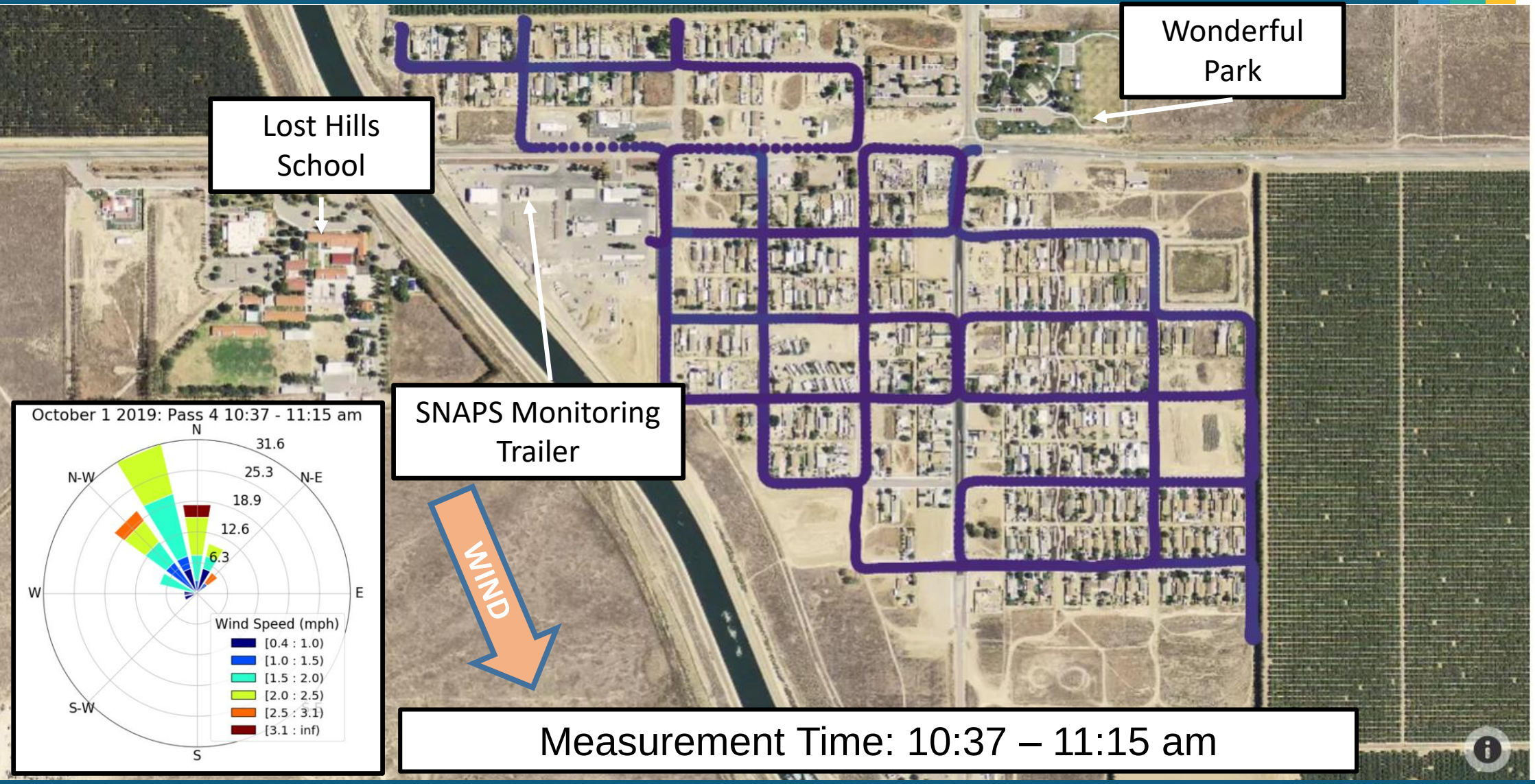
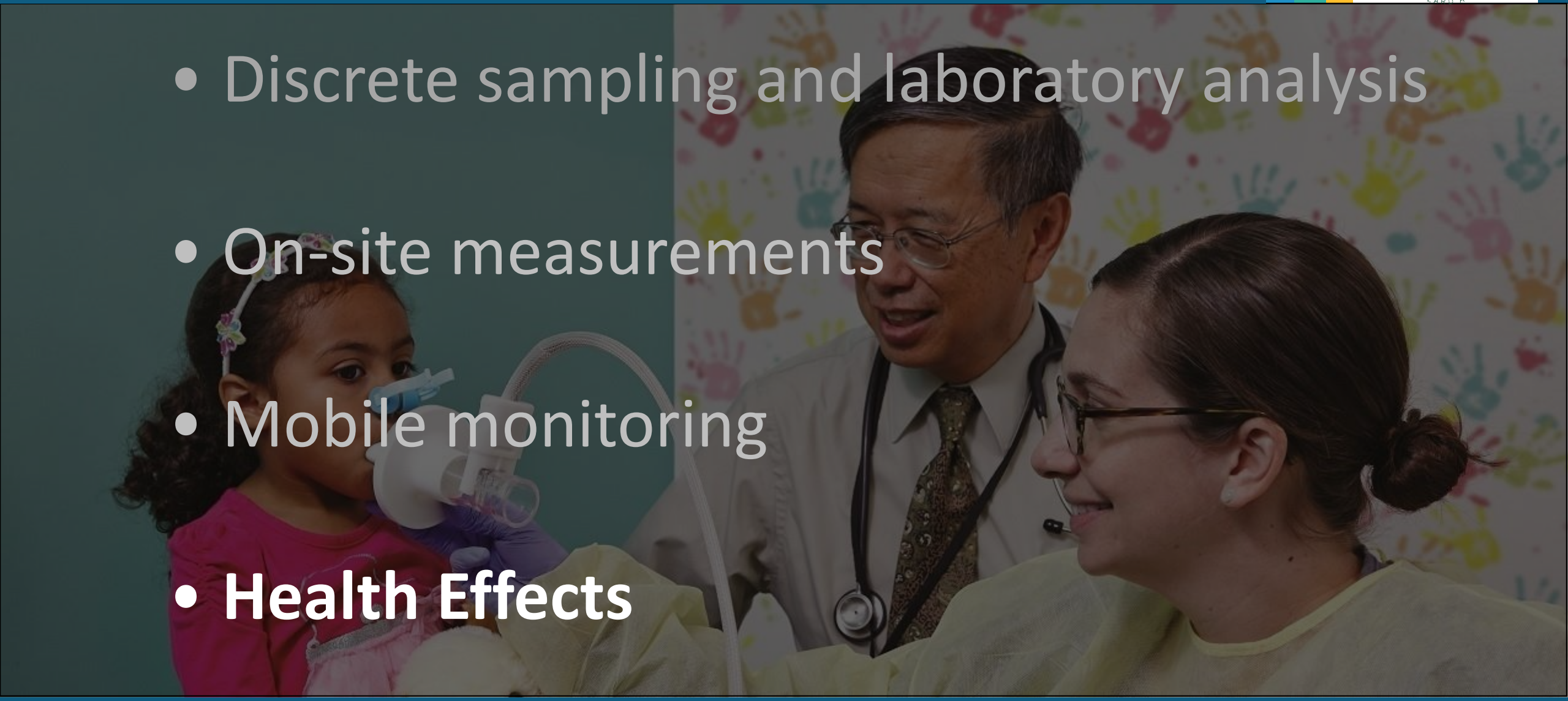


Very different map three hours later

Data are preliminary. Final results will be published in the final report.

FluxSense Measurement Study (Contract)

- Two weeks measuring in Lost Hills
  - On the oilfield
  - In the community
- Emissions and concentrations of:
  - Methane
  - BTEX
  - Volatile Organic Compounds (VOCs)
- Data analysis ongoing
- Final report will detail findings



- Discrete sampling and laboratory analysis
- On-site measurements
- Mobile monitoring
- **Health Effects**

https://www.millerchildrenshospitallb.org/pulmonary/lung-testing

Risk = Toxicity x Exposure

How dangerous is the chemical?

Health Guidance Values

Does chemical contact or enter our body?

Air monitoring data

How do we determine the toxicity?

OEHHA develops benchmarks for toxicity called Health Guidance Values

- Noncancer Reference Exposure Levels
  - Amount of chemical in air that is not likely to cause noncancer health effects
  - For short- and long-term exposures
- Cancer Health Guidance Values
  - Describe how cancer risk increases as exposure increases
  - For long-term exposure

http://clipart-library.com/clipart/163895.htm

What influences toxicity?

- Amount

- Length of exposure (time)

- Sensitivity

https://www.meadindoor.com/for-physicians/

Toxicity depends on the duration of exposure

OEHHA develops Reference Exposure Levels for specific amounts of time

- Brief exposure (*acute*): occasional 1-hour exposures
- Moderate exposure: repeated 8-hour exposures over a significant fraction of a lifetime
- Constant exposure (*chronic*): continuous exposures from 1 year to a lifetime

Acute

Chronic

https://accesspharmacy.mhmedical.com/content.aspx?bookid=2462&sectionid=194918140

How do we determine risk from a chemical in air?

Noncancer

How does the amount in air compare to the Reference Exposure Level?

Higher? May be some concern

Reference Exposure Level

Lower? Little concern

Cancer

How much does the amount in air increase cancer risk by?

Higher? Concern

Lower? Less concern

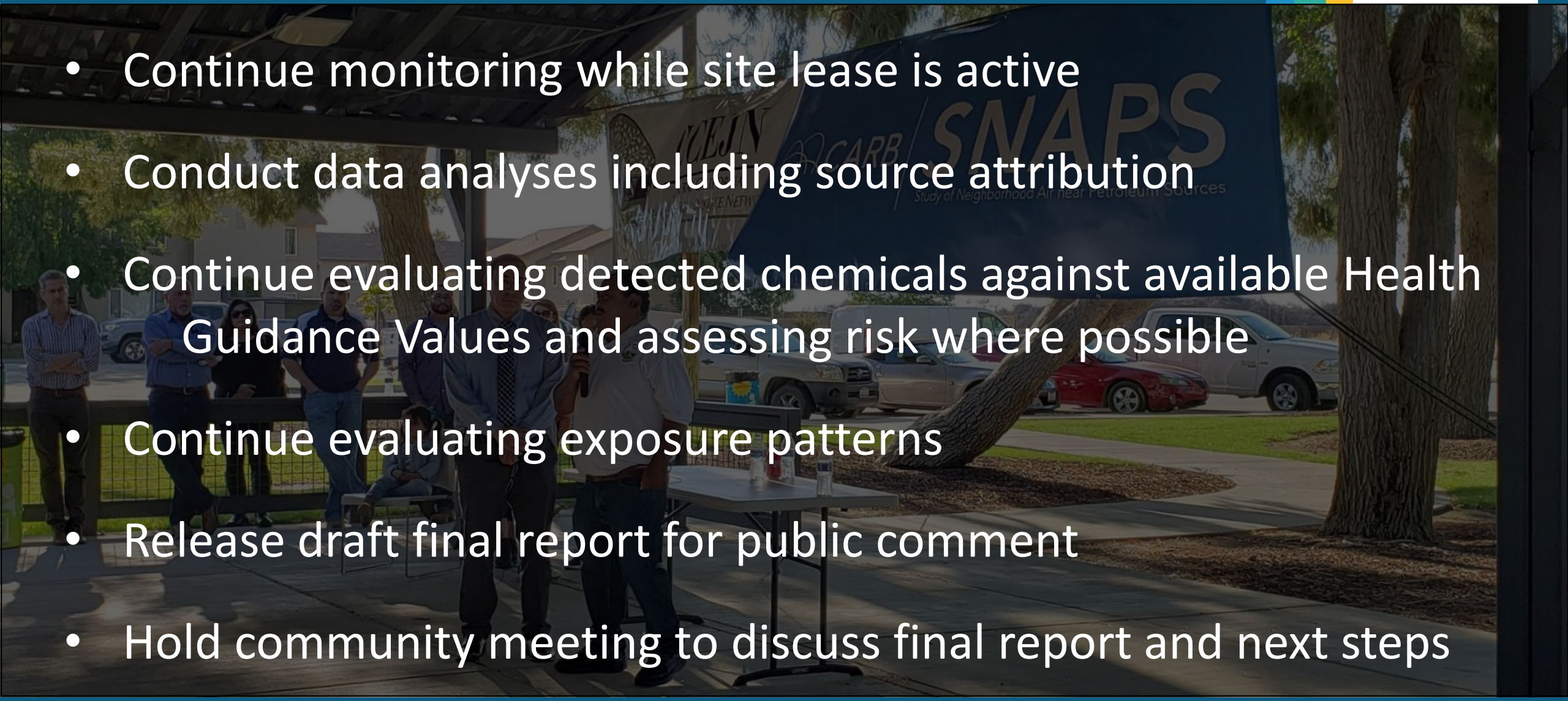
Preliminary observations on data collected to date – VOCs and metals

Short-term (acute) exposure	All detected chemicals below OEHHA acute health reference values, where applicable
Long-term (chronic) exposure	Still evaluating potential chronic health concerns
Notes	We are looking further into all chemicals detected

Ozone, H_2S, carbon monoxide, and $PM_{2.5}$

- Ozone, H_2S, and carbon monoxide were below California's health standards
- $PM_{2.5}$
  - Short-term (acute) exposure: all values below 24-hour standard
  - Long-term (chronic) exposure: average hourly concentration during June-August was 12.5 µg/m^3

Moving Forward



- Continue monitoring while site lease is active
- Conduct data analyses including source attribution
- Continue evaluating detected chemicals against available Health Guidance Values and assessing risk where possible
- Continue evaluating exposure patterns
- Release draft final report for public comment
- Hold community meeting to discuss final report and next steps