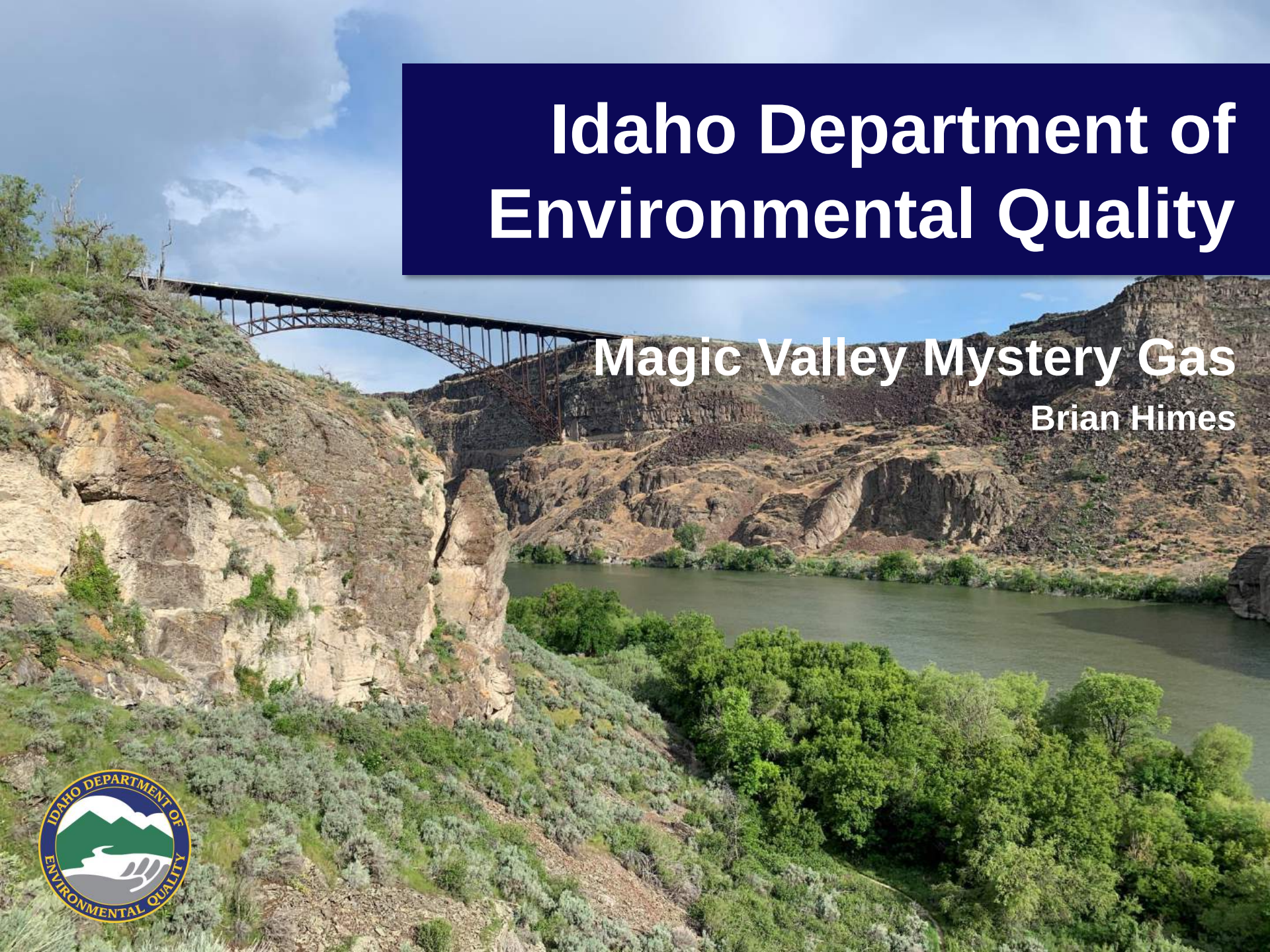


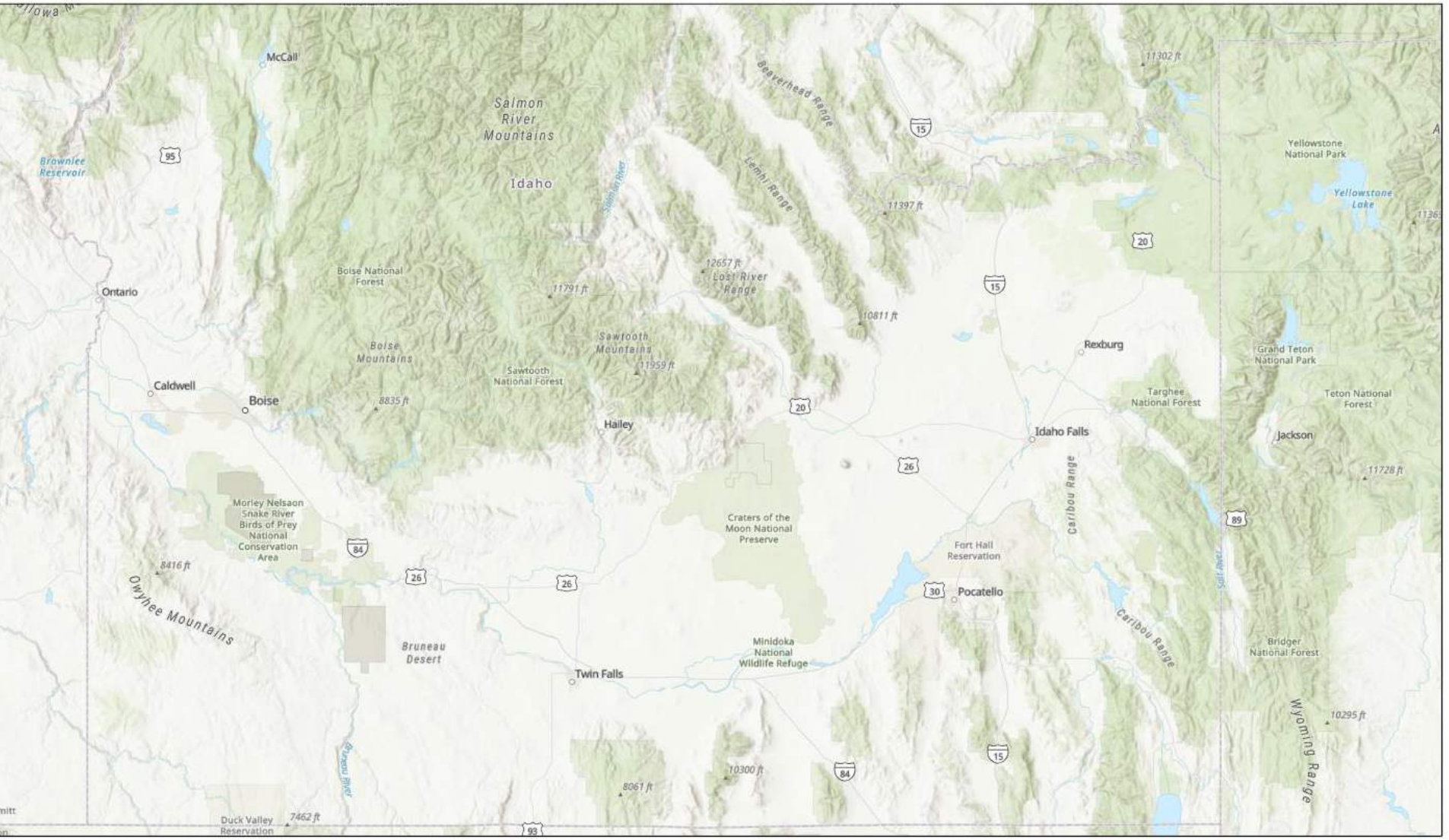
Idaho Department of Environmental Quality

Magic Valley Mystery Gas

Brian Himes

Outline

- Initial Complaint and Response
- Event Analysis
- Sampling Plan
- Work to be Completed
- Larger Context



1:2,311,162

0 20 40 80 mi

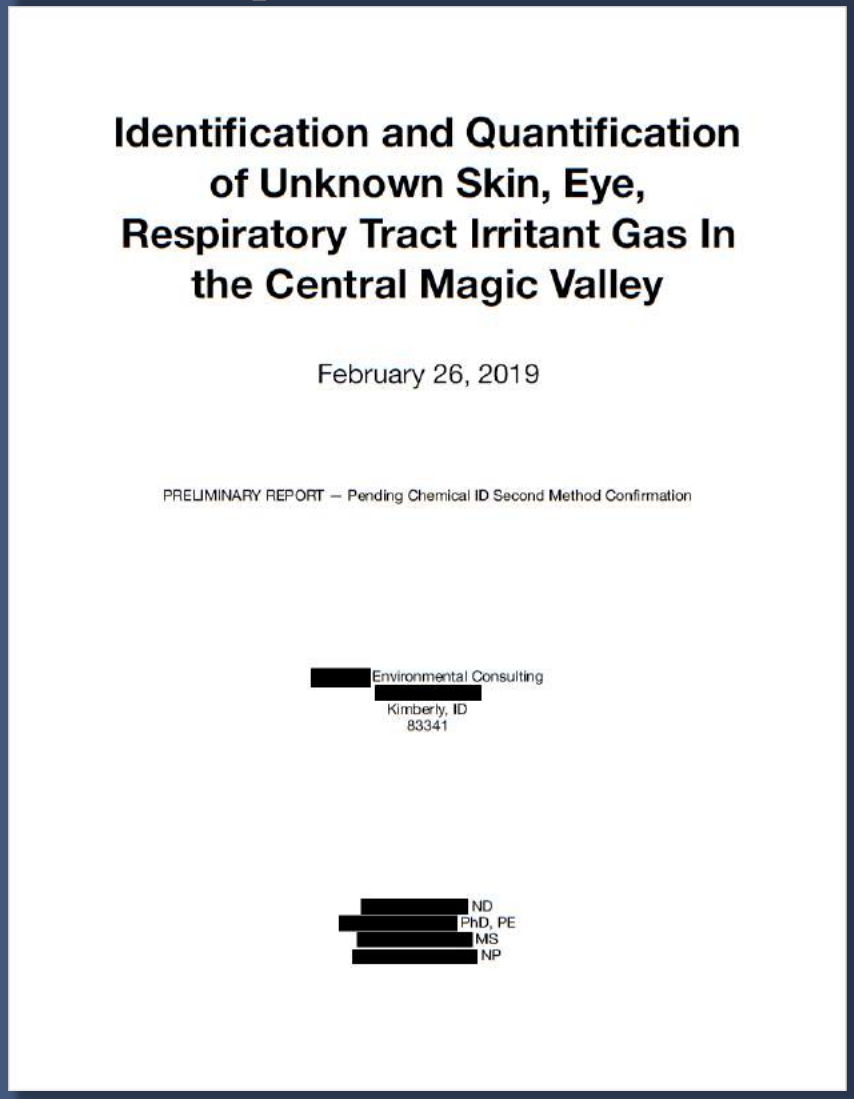
0 30 60 120 km

Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community

Jim Sapara

Initial Complaint and Response

- DEQ Twin Falls Regional Office received numerous calls in late January
- Initially considered an odor complaint
- Initial response was inconclusive
- 18 page preliminary report received on February 26.



Identification and Quantification of Unknown Skin, Eye, Respiratory Tract Irritant Gas In the Central Magic Valley

February 26, 2019

PRELIMINARY REPORT – Pending Chemical ID Second Method Confirmation

[redacted] Environmental Consulting
[redacted]
Kimberly, ID
83341

[redacted] ND
[redacted] PhD, PE
[redacted] MS
[redacted] NP

Initial Complaint and Response

- Authors describe a series of interactions with the mystery gas over several days in late January and early February
- Reported Odors
  - Acrid chemical odor
  - Smell of freshly cut hay
  - Smell of formaldehyde
- Reported Symptoms
  - Eye and throat irritation
  - Skin burns on contact with falling snow
  - Sense of suffocation
  - Increased heart rate
- All symptoms improved out of town

Initial Complaint and Response

- Initially used a handheld sensor to take readings of formaldehyde and TVOC
  - River-like flow
  - Higher in the nearby canyon
  - More intense at night
  - Odors present at seemingly low concentrations
  - Gathers near the ground
  - Present throughout the Magic Valley
  - Concentrations decrease during rain and breaking of inversion conditions

Initial Complaint and Response

- Authors described an “analytic approach” to identifying the “lung irritant gases.”
  - Cross-referenced pollutants created by meth labs (their initial hypothesis)
  - Reviewed area air permits and known types of land use to develop a list of “non-ubiquitous pollutants likely to be present”
  - Narrowed the list to “those that could plausibly be encountered as a gas outdoors in winter weather conditions”
  - Narrowed further to those that cause the observed symptoms
  - Gas density and ability to cause symptoms below odor threshold
- “From this quick analysis, the best fit was found with Phosgene”
- Rented a Thermo Scientific Miran SapphIRe
  - $26,000 IR spectrophotometer
  - Measured high concentrations of Phosgene and Formaldehyde

Initial Complaint and Response

- What is phosgene?
  - $COCl_2$
  - Chemical warfare agent responsible for the most deaths in WWI – Schedule 3 of the Chemical Weapons Convention
    - Choking agent with no anti-dote
  - Used in the production dyes, plastics and pesticides
    - Mostly created and used at the same site
  - Numerous production methods (no natural sources)
    - Chlorine and CO in the presence of UV light
    - Thermal decomposition of chloromethanes (refrigerants) and chlorinated solvents
  - Slightly soluble in water and decomposes to HCl
  - Persistent in the atmosphere and subject to long-range transport

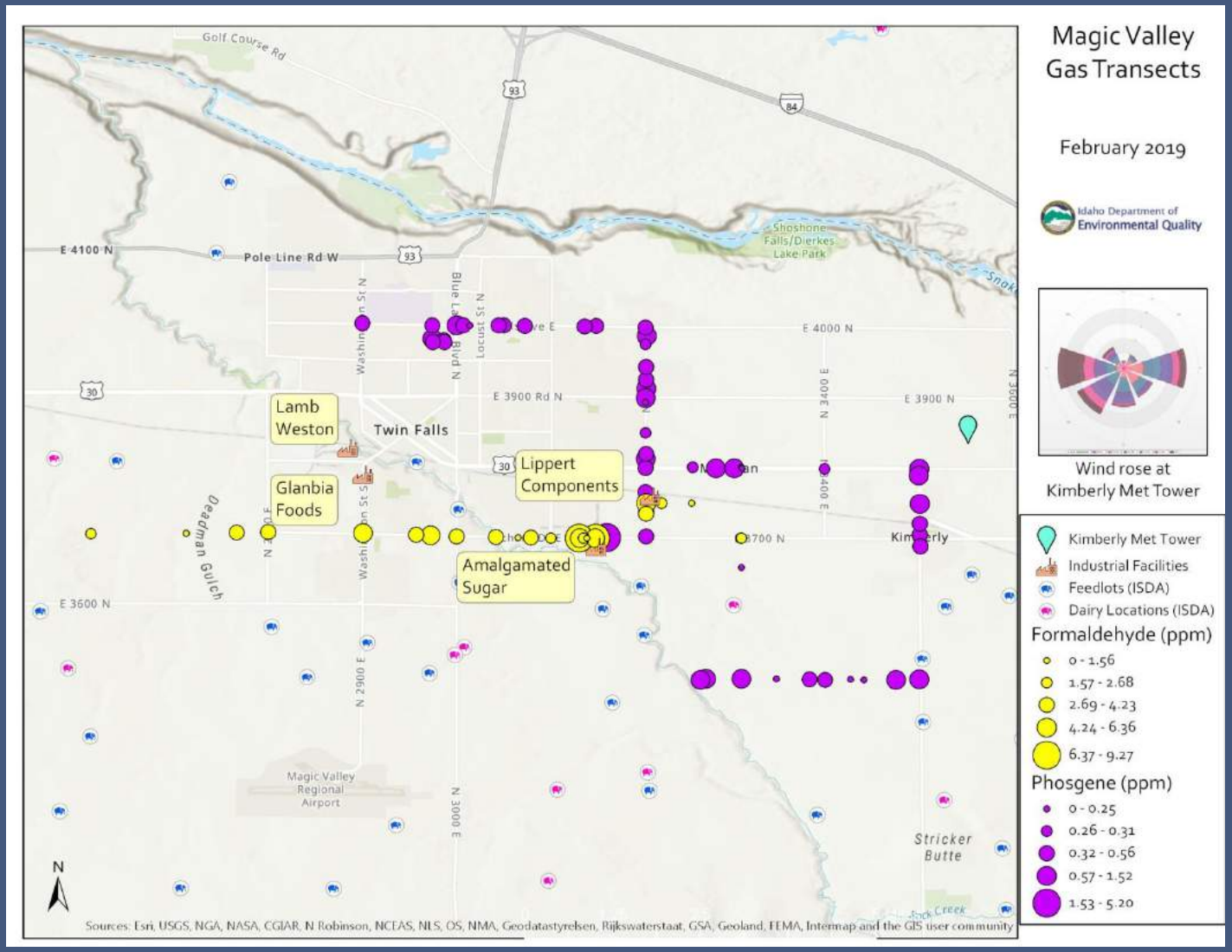
Initial Complaint and Response

- All major facilities contacted and excess emission reports reviewed
- Contacted the fire department and police department about corroborating reports
  - Police department used a drone to look for meth labs in the canyon
- Contacted the South Central Health District
  - Looked at hospitalizations and reports
- DEQ personnel drove all over the Magic Valley looking for potential sources

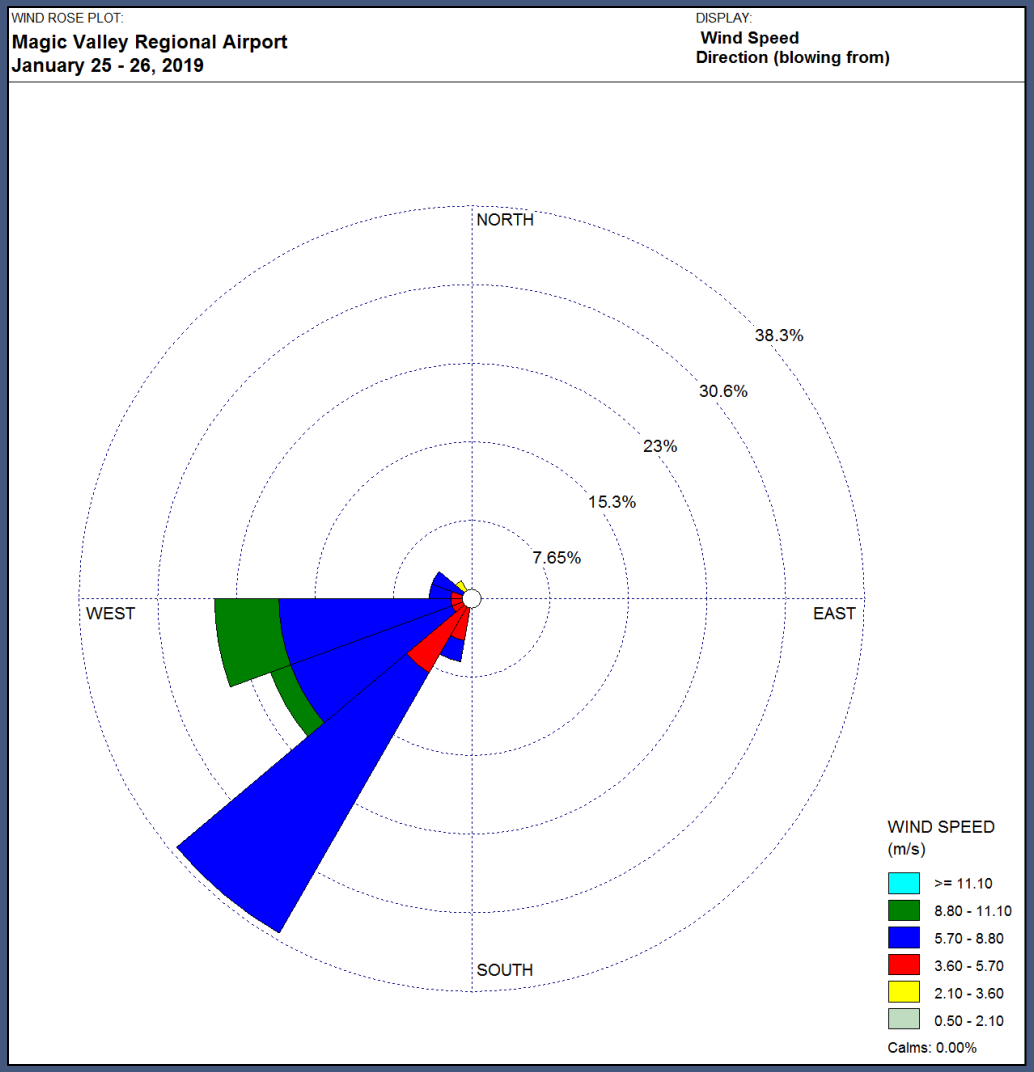
Event Analysis

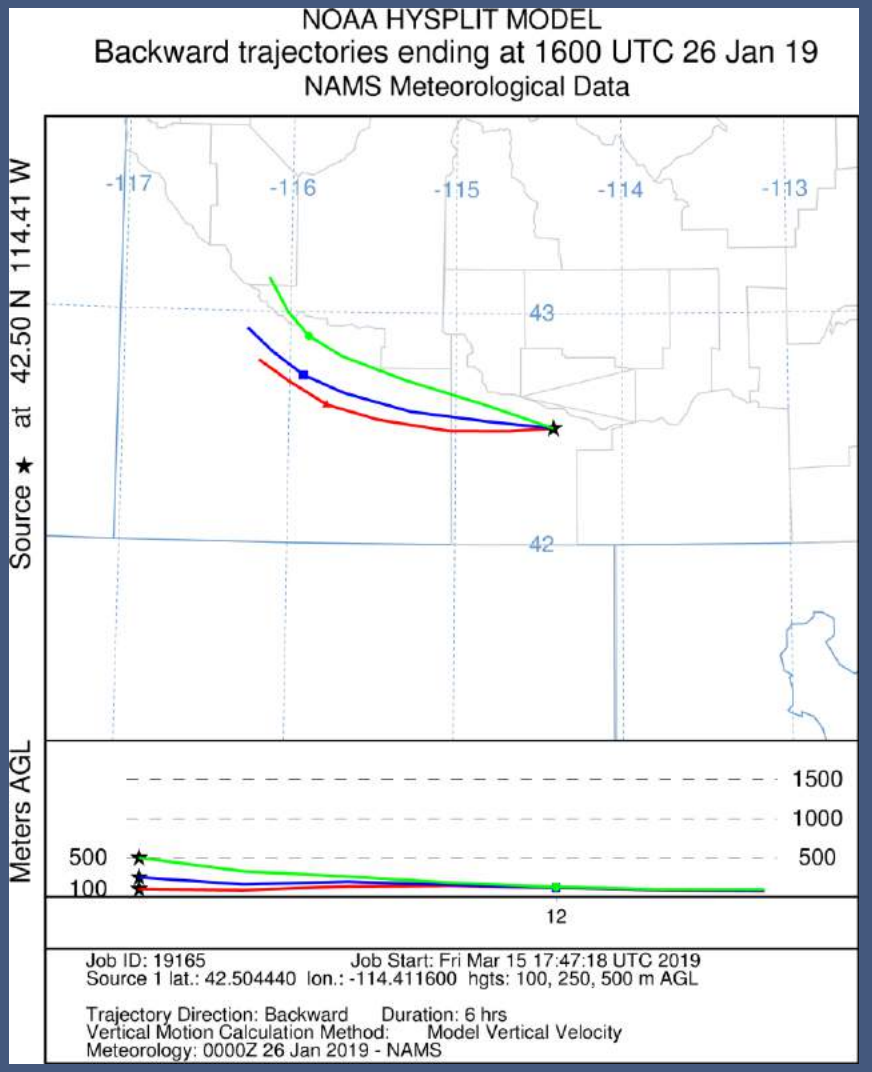
- Key Points
  - Initial detection occurred on the morning of January 26
  - Continued detection through early February
  - “Heard a whistling sound of gas escaping at high velocity from the industrial area of SE Twin Falls” on February 16th at 7:00 pm
    - Drove there with the personal air quality sensor held out the window
  - Used the Miran SapphIRe from February 20-23 across the area
    - Provided results for the evenings of February 22 and 23.
  - Phosgene Draeger tubes had no colorimetric reaction
    - Suggested this was due to high levels of Cl_2 or HCl
  - SafeAir colorimetric badges purported to indicate presence of formaldehyde and phosgene
    - Hung on the porch during the period March 8 to 10

Event Analysis

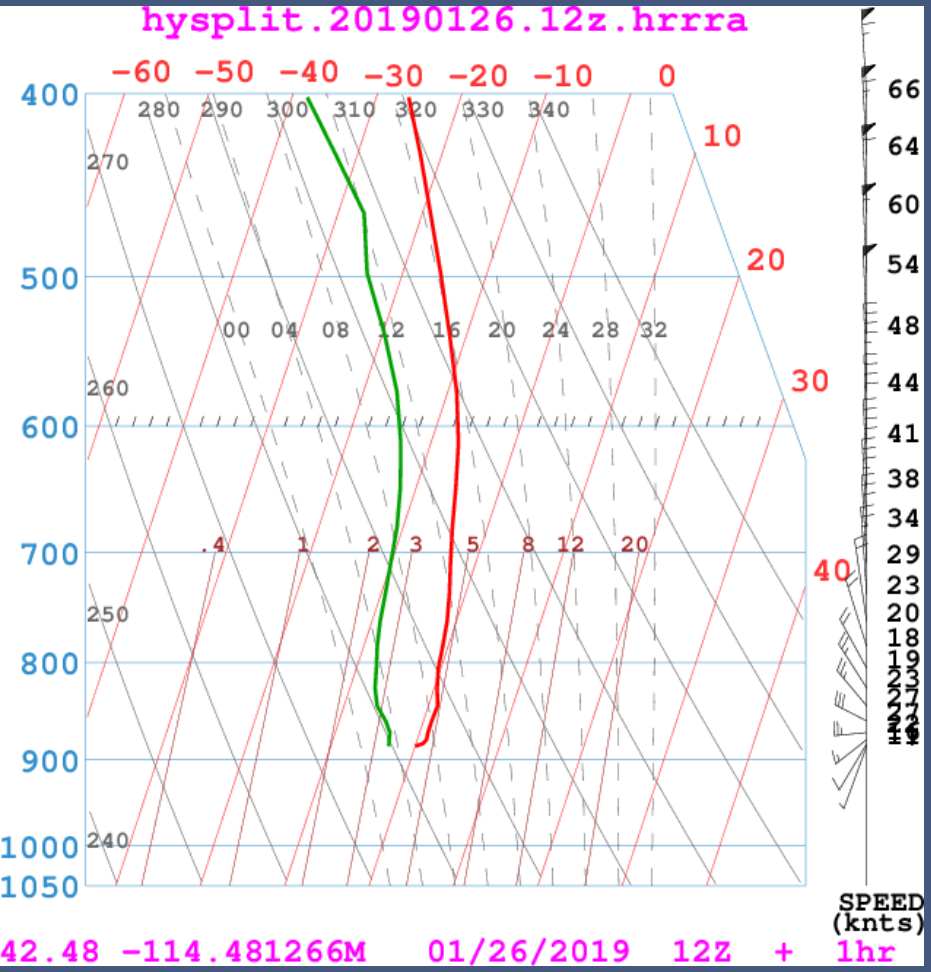


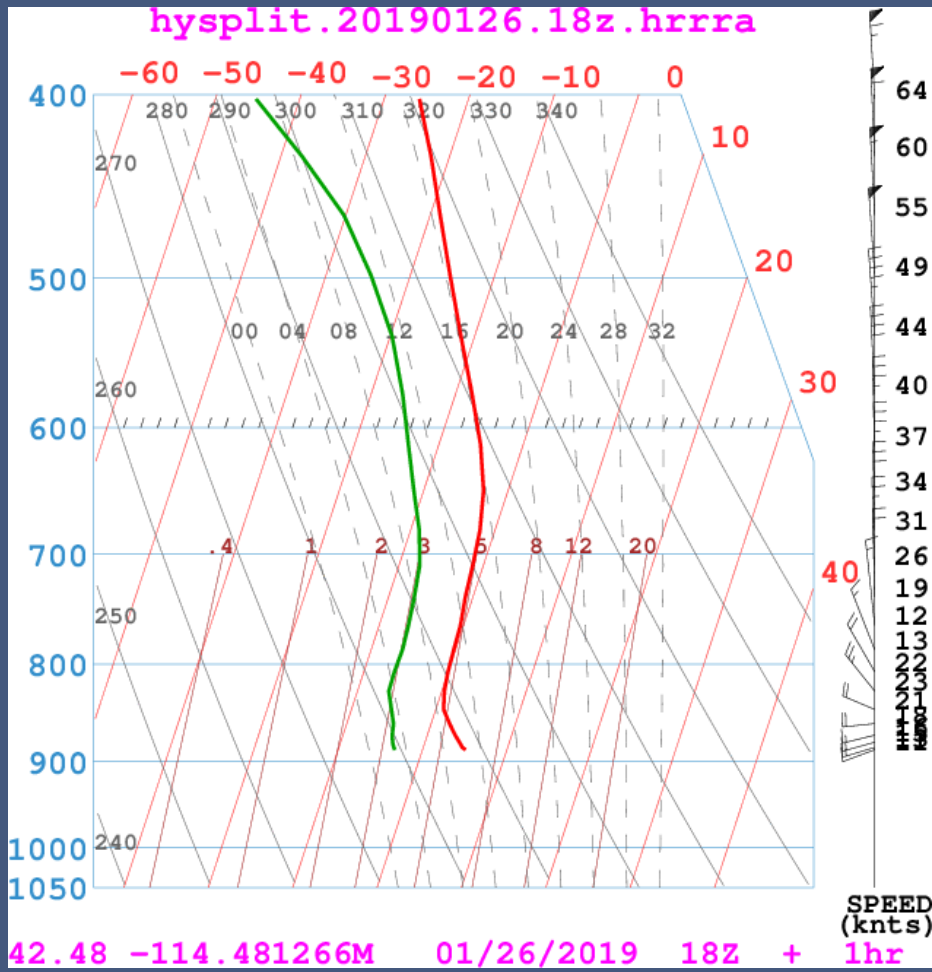
Event Analysis



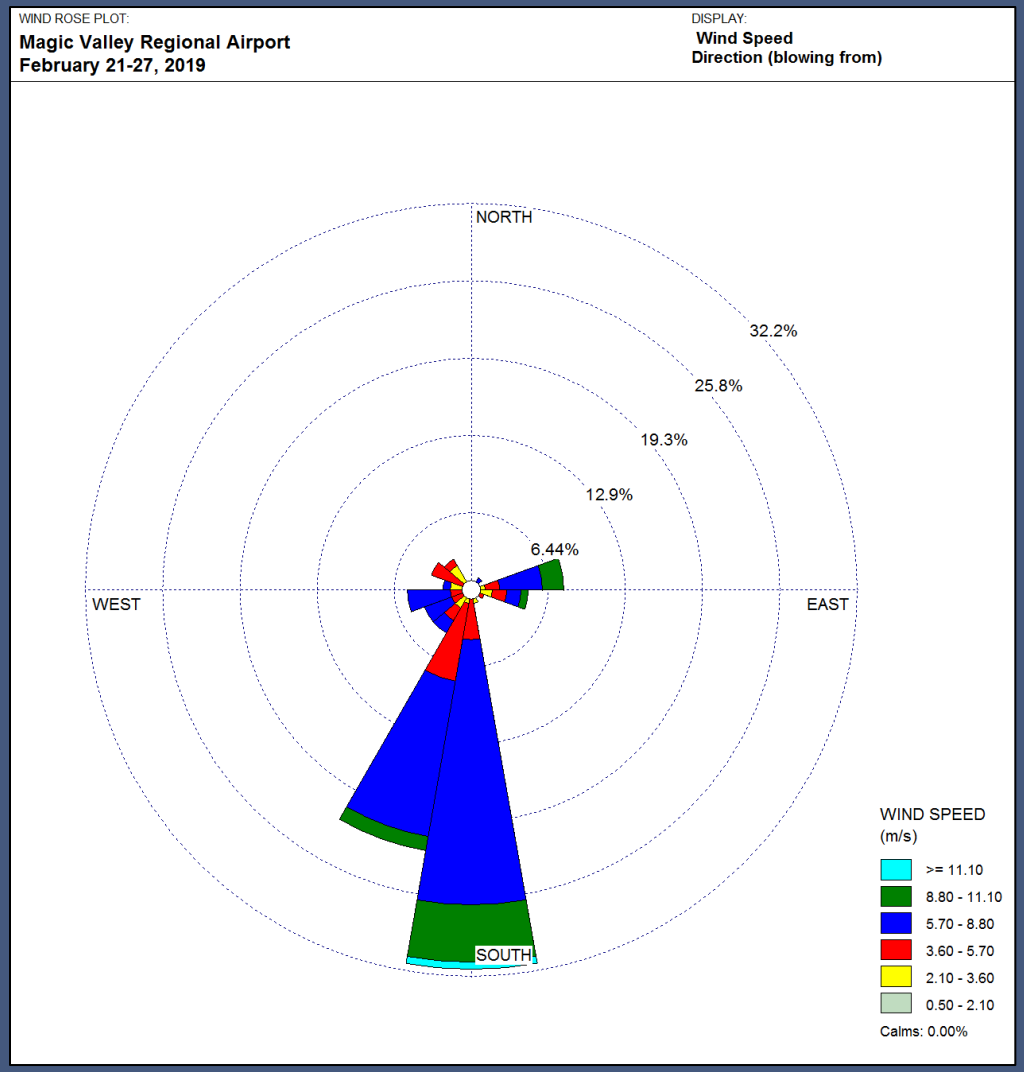


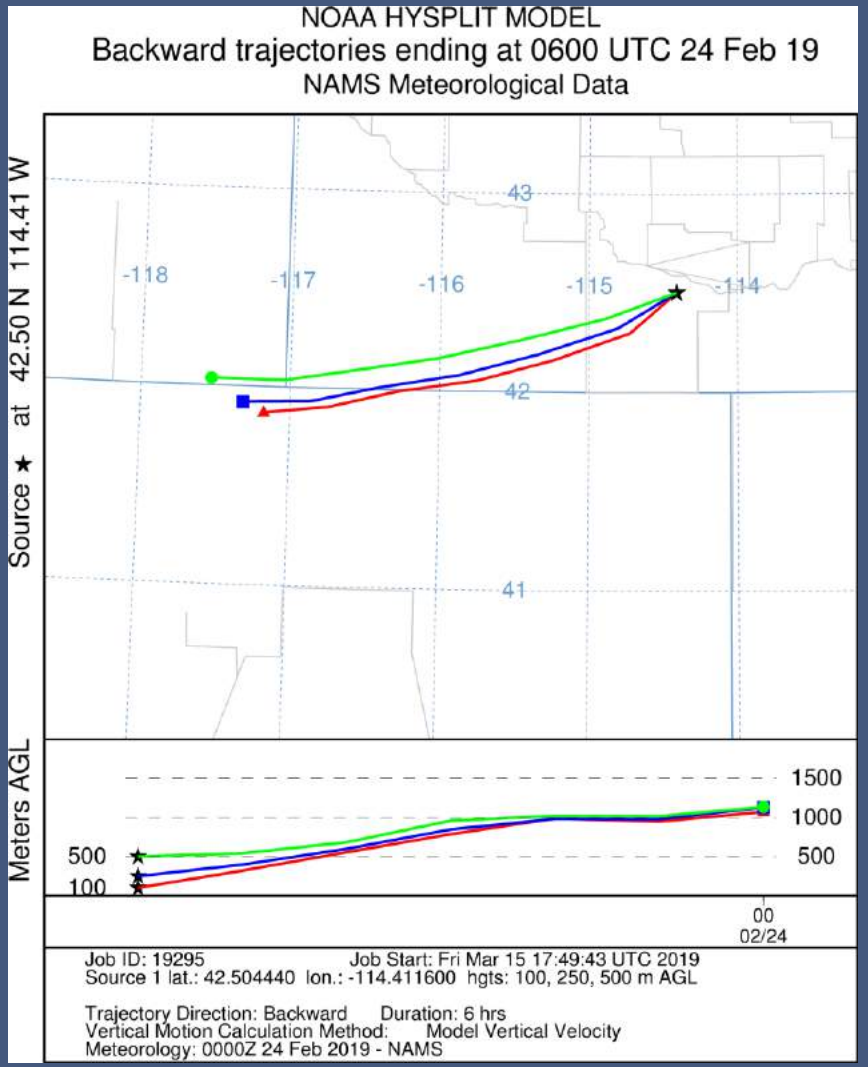
Event Analysis



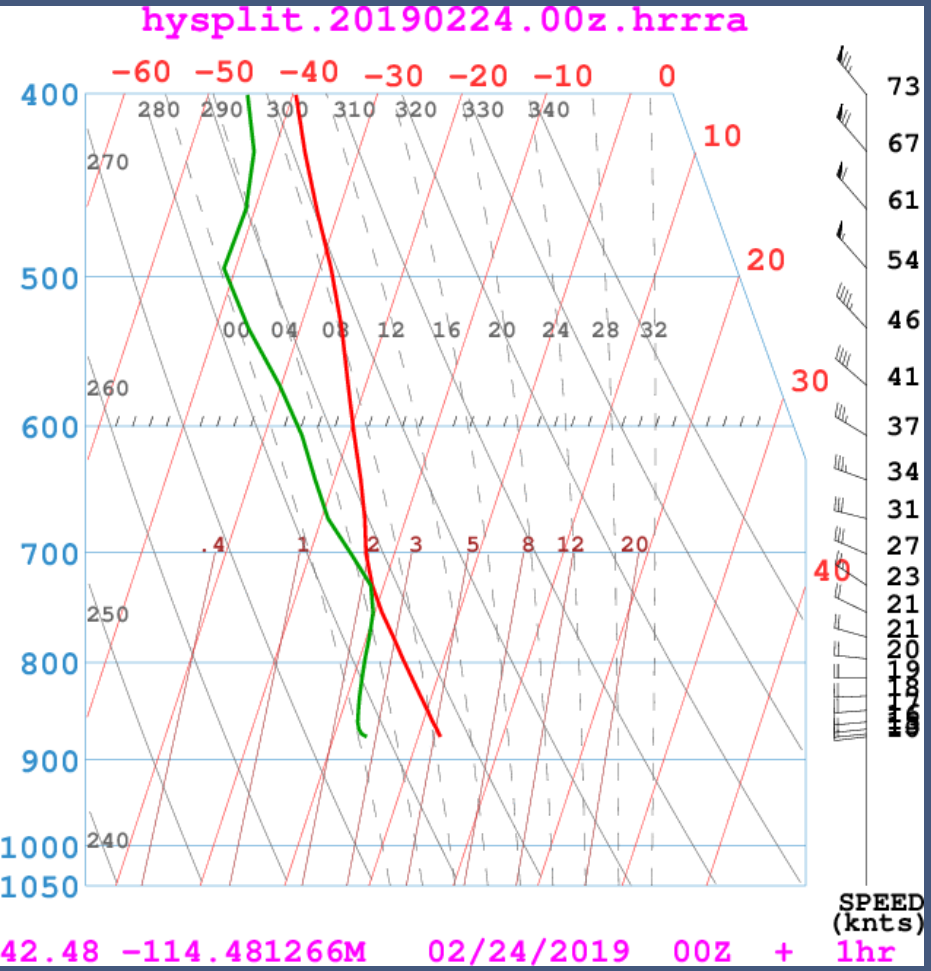


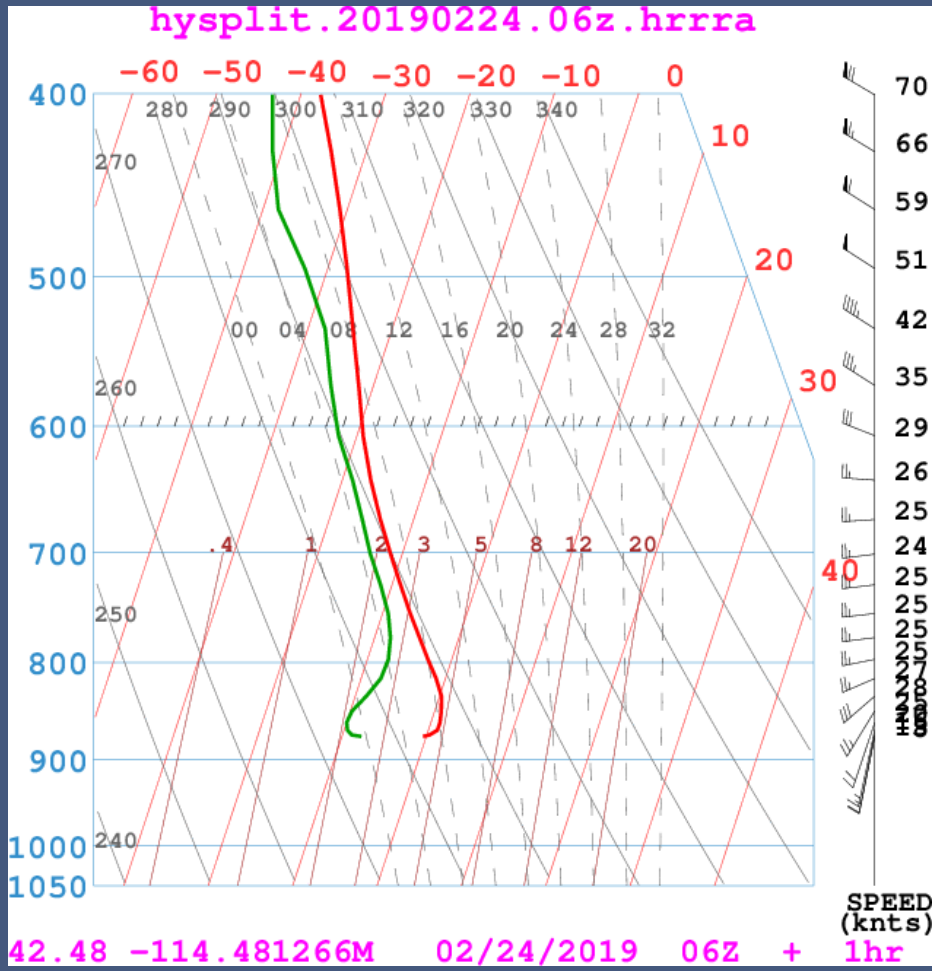
Event Analysis



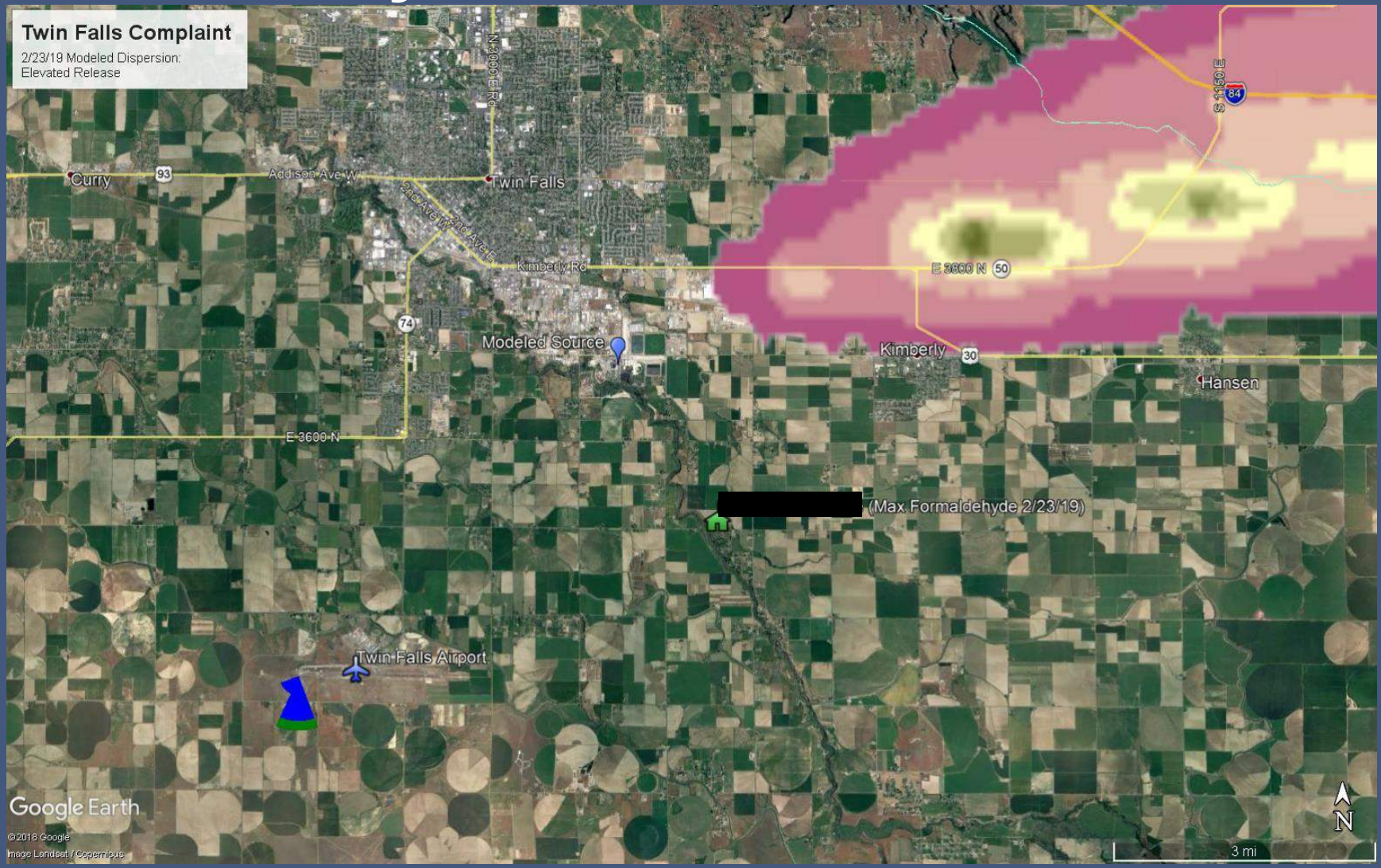


Event Analysis





Event Analysis



Event Analysis

- Initial air quality measurements made using a Temtop “laser particle multi-functional detector.”

Temtop LKC-1000S+ Professional Formaldehyde Monitor Detector with HCHO/PM2.5/PM10/TVOC Accurate Testing Air Quality Detector

by Temtop

19 customer reviews | 20 answered questions

Price: $159.99 & **FREE Shipping**. Details

Color: **Black**

- The latest 9-IN-1 air quality detector measures PM2.5, PM10, particles, HCHO(formaldehyde), TVOC, AQI, temperature, humidity and histogram function.
- The new histogram function can reflect the changes on PM2.5 directly for the latest 12 hours.
- Temtop advanced third-generation laser particle sensor has a lifetime up to 20,000 hours. Combined with the unique particle swarm optimization algorithm, it makes particle measurement more accurate and stable.
- The pre-calibrated electrochemical sensors will accurately capture formaldehyde molecules accompanied by the detection function covering a wide range of organic pollutants.
- Large TFT screen and rich display make it clear and easy to read data, even with battery indicator light to help you check battery at any time

› See more product details

New (3) from $159.94 & FREE shipping. Details

Event Analysis

Health Parameter Guide							
PM2.5	PM10	AQI	CO2(ppm)	Status	HCHO(mg/m³)	TVOC (mg/m³)	Displayed Contents
0.0-12.0	0-54	0-50	0-700	Good	0-0.1	0-0.5	Safe
12.1-35.4	55-154	51-100	701-1000	Moderate			
35.5-55.4	155-254	101-150	1001-1500	Unhealthy for Sensitive Groups			
55.5-150.4	255-354	151-200	1501-2500	Unhealthy	> 0.1	> 0.5	Unsafe
150.5-250.4	355-424	201-300	2501-5000	Very Unhealthy			
≥250.5	≥425	≥301	≥5001	Hazardous			

Event Analysis

Event Analysis

We have concerns about the quality of the reported data in the letter which limit our ability to provide quantitative health risk assessment and make public health determinations. Several of these concerns are listed below:

- Lack of appropriate quality assurance/quality controls for monitoring data (no reported instrument calibrations, no standardized sampling protocol, no weather information, etc.)
- Usage of real-time testing instruments that have limited ability to accurately identify or quantify gases
  - One reported methodology is only in “beta” testing and is not a validated method for chemical identification
  - Incomplete data sets
- Other reported test methods do not test positive for phosgene (colorimetric - Draeger tube)
- Inconsistencies in reporting units of gas concentrations. (Sometimes reported in ppm, mg/m3 or ug/m3)
  - Unclear if these data are accurately reported
- Subjective reporting and interpretation of data

Sampling Plan

- Looked for other possible chemicals that could cause the same symptoms and is more likely to be present in Twin Falls.
  - Ammonia is typically elevated in agricultural areas and can manifest similarly.
    - Number of large feedlots and dairies in close proximity to their residence.
    - Surrounded by farm fields
- Lack of corroborating complaints suggests it's a localized issue.
  - Sampling will focus on the house

Sampling Plan

Evaluation of Possible Ambient Air Toxics and Potential Sources

Central Magic Valley, Idaho

State of Idaho
Department of Environmental Quality
March 2019

www.deq.idaho.gov

Alta
Science & Engineering, Inc.

Quality Assurance Project Plan for Ambient Air Monitoring, Kimberly, ID 83341

IDEQ Contract No. K157 Task Order #59

Prepared for: Idaho Department of Environmental Quality
May 17, 2019

Alta Science & Engineering, Inc.
988 S. Longmont Avenue, Suite 200
Boise, Idaho 83706
208-336-7080
alta-se.com

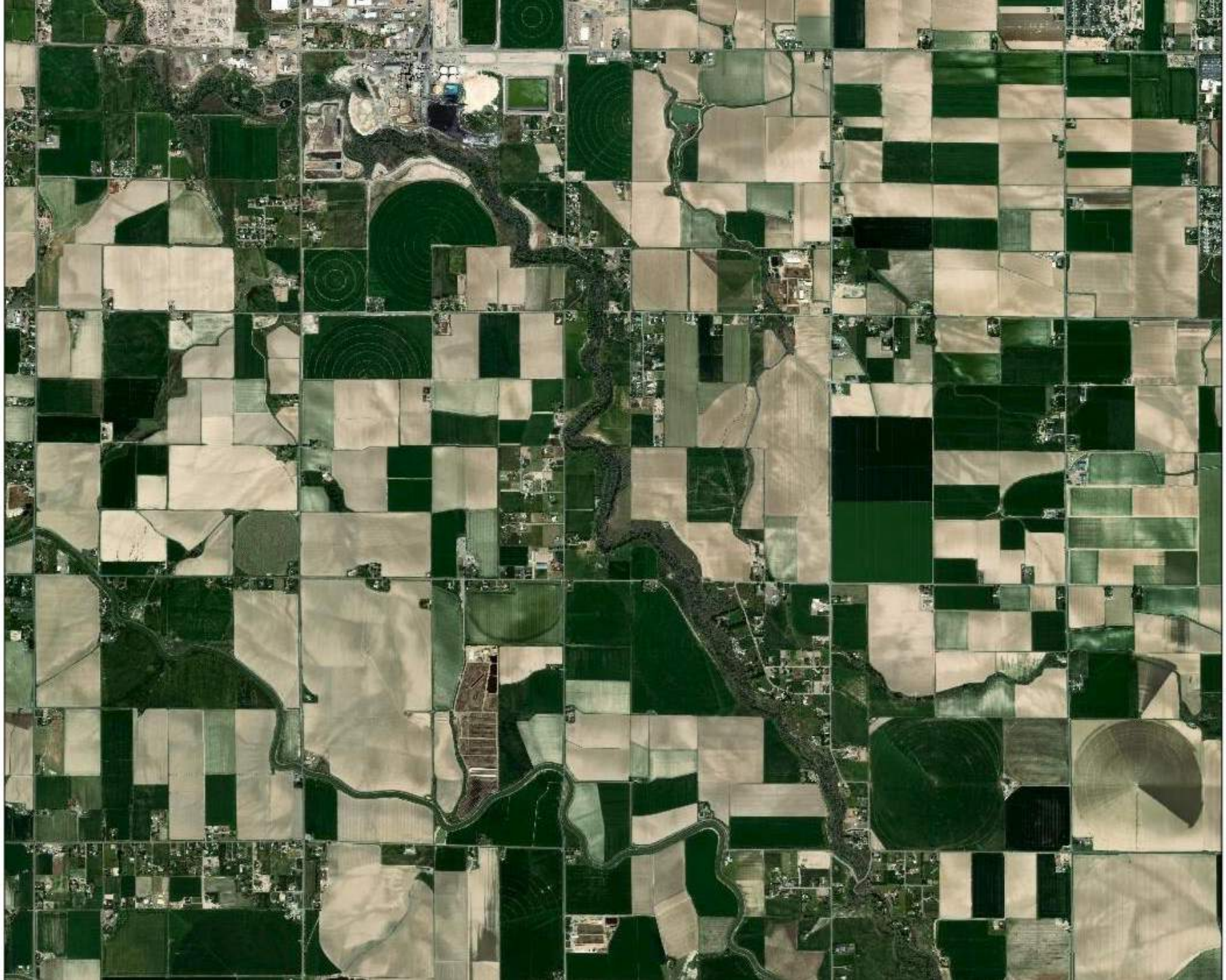
Sampling Plan

- Phosgene - OSHA 61
- Ammonia – NIOSH 6016
- Formaldehyde – NIOSH 2016

Constituent	Screening Values (ppm)	Method Reporting Limit (PPM)
Phosgene	0.1	0.0021
Formaldehyde	0.008	0.0057
Ammonia	0.1	0.0997

Sampling Plan

- Originally aiming for the end of May to sample.
  - Climatological winds are very similar from February to May
  - Clear nights in May tend to have stronger inversions
- Delayed until the first week of June
  - Rain and withdrawn permission




.5
.3
.03

Work to be Completed

- Get results and interpret
  - IDHW Health Risk Assessment
- Finish analysis of their data
  - Reasons for incorrect results?
- Sit down with family
  - What we found
  - Our analysis
  - Explain what we think could have happened
  - Suggest things they could do to follow up

Larger Context

- Essentially an odor report
  - Lots of money and effort
- Personal Air Sensors
- DEQ's role
  - Indoor/outdoor air

Thank you

Thoughts?

Ideas?

Questions?