Ambient air monitoring data summary report

KPK - Facility 8

Air Toxics and Ozone Precursor Program [ATOPs]

10.01.2025

COLORADO
Air Pollution Control Division
Department of Public Health & Environment

1. Executive Summary

1.1. Report Purpose

The purpose of this report is to summarize the air toxics and meteorology data observed by the Colorado Department of Public Health and Environment (CDPHE) in response to a complainant's concern surrounding a storage tank facility, operated by KP Kauffman Co (KPK), in Fort Lupton, Colorado.

1.2. Background Information

- Community concern was communicated regarding emissions from the KPK storage tank facility.
- An AROMA-VOC, deployed within the Examiner of Atmospheric Gases from Localized Emissions (EAGLE) trailer as a stationary air quality monitor, was positioned approximately 190 feet west of the KPK storage tank facility, accompanied by a Gill GMX501 Maximet meteorological station from May 6 through August 1, 2025.

1.3. Air Monitoring Objective

- The Air Toxics and Ozone Precursors Program (ATOPs) within the Air Pollution Control Division (APCD) of the CDPHE deployed an air monitoring trailer in response to the request of the OGHIR (Oil & Gas Health Information and Response) Program.
- Stationary monitoring was performed in order to evaluate the air concentration of compounds that may be harmful to nearby communities.

1.4. Key Findings

- Observations showed a maximum 1-hour rolling benzene average of 3.7 ppbV and a maximum 12-minute benzene measurement of 9.2 ppbV; however, neither were from the direction of KPK Facility 8.
- An average benzene concentration over the duration of the deployment was observed to be 0.21 ppbV, which is similar to typical benzene concentrations in this region.
- The highest benzene measurement from the direction of KPK Facility 8 was 2.6 ppbV.

2. Introduction

A concerned community member submitted a monitoring request to OGHIR regarding the KPK storage tank facility. In response, CDPHE-ACPD-ATOPS deployed the Examiner of Atmospheric Gases from Localized Emissions (EAGLE) from May 6 through August 1, 2025 as a continuous stationary monitoring platform (Fig. 1). This monitoring trailer was equipped with an Entanglement Technologies AROMA-VOC, which measures emissions associated with oil & gas activity, specifically benzene, and a Gill Maximet GMX501 meteorological station to measure wind speed and wind direction to assess the direction the pollutants are traveling.

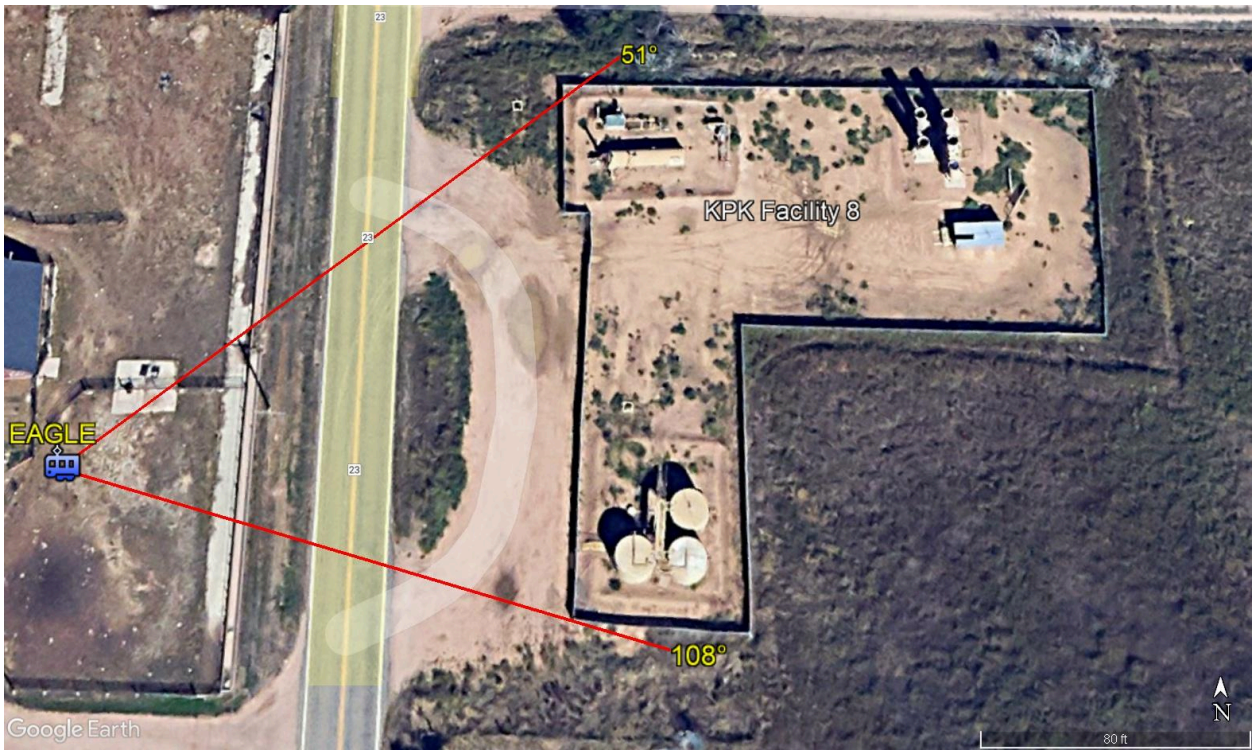

Figure 1. Satellite image of KPK Facility 8 to the east of the Examiner of Atmospheric Gases from Localized Emissions trailer. Cone of influence shows wind direction range from KPK Facility 8 (51° - 108°).

3. Methods

3.1. Stationary Measurements

The EAGLE was deployed on May 6 through August 1, 2025 for continuous monitoring of KPK Facility 8 emissions.

3.1.1. EAGLE

The EAGLE is a customized trailer with cutting-edge scientific instrumentation to measure near real-time air pollution events. The EAGLE is insulated, and temperature-controlled, allowing the scientific instrumentation to run in all weather conditions. It contains a custom calibration system that allows for multi-point and single point calibrations of the scientific instrumentation. All instrumentation and the calibration system can be monitored remotely, allowing the operator to monitor data and respond to outages or issues rapidly. For this deployment, it was configured to accept shore power for instrumentation and temperature control.

The EAGLE is equipped with an Entanglement AROMA-VOC (AROMA) and a Gill Maximet GMX501 meteorological station to meet the monitoring objectives for this deployment as follows:

1. Continuously measure and report on benzene concentrations.
2. Identify source direction of emissions.

3.1.1.1. Entanglement AROMA-VOC

The AROMA consists of three main components: traps to collect volatile organic compounds (VOCs) from the air, a thermal separator to separate the sample into individual compounds, and a cavity ringdown spectrometer detector to identify and quantify the concentrations of each compound in air approximately every 10-15 minutes per sample. The cavity ringdown spectrometer measures the absorbance of near infrared (IR) light from each compound, and identifies them based on the time they emerge from the thermal separator and their near IR spectrum (similar to a “fingerprint”). The AROMA-VOC is calibrated for and measures the following VOCs: 1,3-butadiene, 1,2-cisdichloroethylene, isoprene, trichloroethylene, benzene, toluene, ethyl benzene, the sum of xylenes, and styrene. All compound measurements other than benzene are not reported here, as oil and gas facilities are not expected to emit significant quantities of 1,3-butadiene, 1,2-cisdichloroethylene, isoprene, trichloroethylene, and styrene. Oil and gas facilities do emit toluene, ethyl benzene, and xylenes, however, the concentrations emitted fall well below established health guideline values.

3.1.1.2. Meteorology

The Gill Maximet GMX501 is a sensor that measures meteorological parameters on a continuous 1-second time resolution. It measures wind speed, wind direction, barometric pressure, temperature, relative humidity, and solar radiation. This weather station operates by continuously emitting a series of electronic outputs. Two sets of receiving sensors are arranged orthogonally around a central mast to measure the wind

speed and direction based upon the time of flight difference between when the ultrasonic pulses are received. A glass window at the top of the meteorological station measures the light intensity from solar radiation. Barometric pressure, temperature, and relative humidity are obtained through other sensors on the station. This instrument is fixed to a vertical mast approximately 12 feet above ground level to avoid any ground or structural interferences.

3.2. Data Processing

Data collected includes speciated VOC concentrations at a 10-15 minute time resolution along with meteorological parameters, including temperature, humidity, wind speed, and wind direction, at a 1-second time resolution. The meteorological data was averaged to match the VOC measurement sample times. Invalidated data were removed from the dataset. This was identified as samples that were missing necessary absorbance information from the cavity ringdown spectrometer detector to quantify benzene accurately.

3.3. Data Evaluation

All data from measurements performed by the AROMA are managed by the following method for statistical analyses. Any measurements below 0.001 ppb are replaced with zeroes as non-detects. Any measurements greater than 0.001 ppbV, but less than the detection limit, the lowest value the instrument can reliably detect, are replaced with half of the detection limit value. These values are filtered in this way to account for variability within an instrument response and to limit bias from being overly high or low. The detection limit for benzene measured by the AROMA-VOC is 0.053 ppbV. There were 30 samples that did not detect benzene (0.4% of total samples) and 128 samples that detected benzene, but fell below the method detection limit (1.6% of total samples) for a total of 2.0% of samples that did not detect benzene with a high degree of certainty (see Figure A1 for the benzene measurement histogram).

3.4. Quality Control & Assurance

To ensure reliability and validity of field measurements, proper quality control (QC) and quality assurance (QA) must be carried out before, during, and after data collection. QC processes ensure instruments are operating properly throughout a measurement period to maintain consistency. QA processes implement checks and validation of the collected data to ensure completeness and accuracy. By carrying out proper QC and QA, confidence in the data is established. QA processes were performed in the form of multipoint calibrations and regular calibration checks. The deployment was initiated with

a 5-point calibration and then followed by calibration checks several times per week to assess instrument response reliability to ensure that it remained within 30% of the expected value for each measured compound. If the calibration check revealed instrument response was outside of 30% of the expected value, a new multipoint calibration was performed. A multipoint calibration was also performed following any instrument maintenance that required changing components.

4. Deployment Summary

4.1. AROMA-VOC

The average benzene concentration observed during the deployment from May 6 through August 1, 2025, was 0.21 ppb, which is similar to typical benzene concentrations for this region. The maximum 1-hour rolling benzene average was 3.7 ppb, observed on May 20, 2025 from 2:39 - 3:39 AM, with a maximum 10-15 minute measurement of 8.9 ppb during this event. The wind was from south-southeast of the EAGLE, and not the direction of KPK Facility 8 during these measurements, indicating that another source was likely the cause of the increased observations. The deployment maximum benzene concentration of 9.2 ppb was observed on July 1, 2025 at 11:23 PM and was from the southeast, also not from the direction of KPK Facility 8.

Many of the benzene concentrations that were observed above typical values were not from the direction of KPK Facility 8 (Fig. 2 and Fig. 3). Because the stationary location of the EAGLE was surrounded by various oil and gas activity, it is likely that these increased emissions resulted from these additional sources. The highest observed concentrations also coincided with low wind speeds (Figure 3). This allows for pollution to accumulate at a given location, as high winds transport and dilute pollution from a nearby source more rapidly.

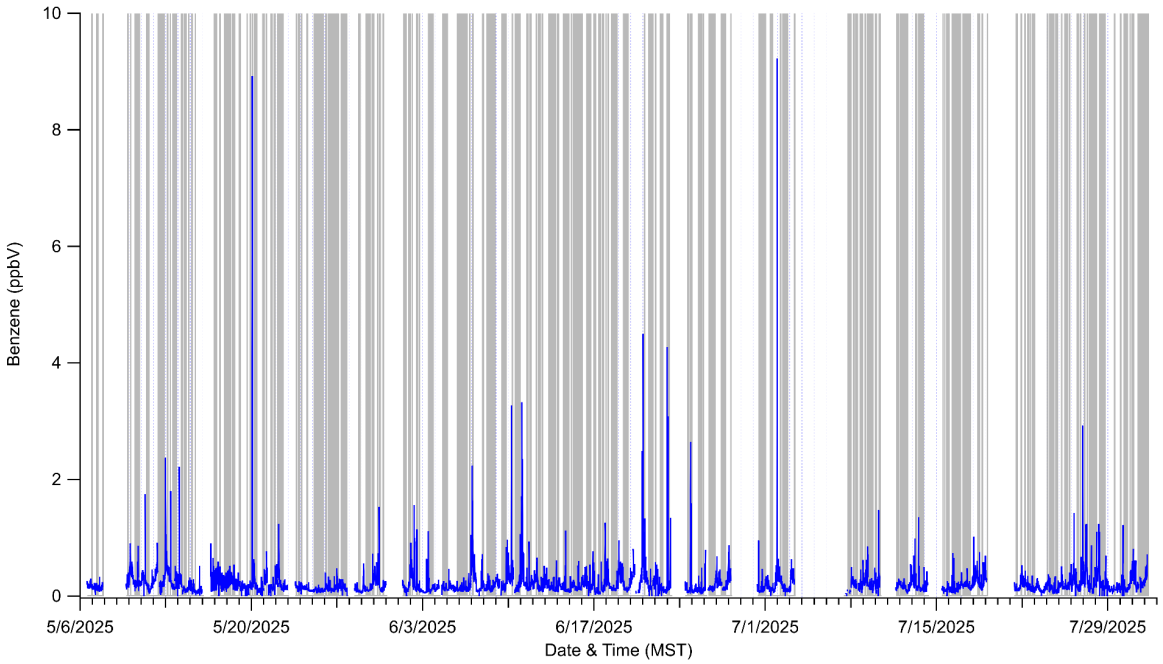

Figure 2. Figure showing the time series of benzene concentrations as measured by the EAGLE during the deployment. Grey vertical bars are periods when the wind was observed to be coming from the direction of KPK Facility 8 (51° - 108°).

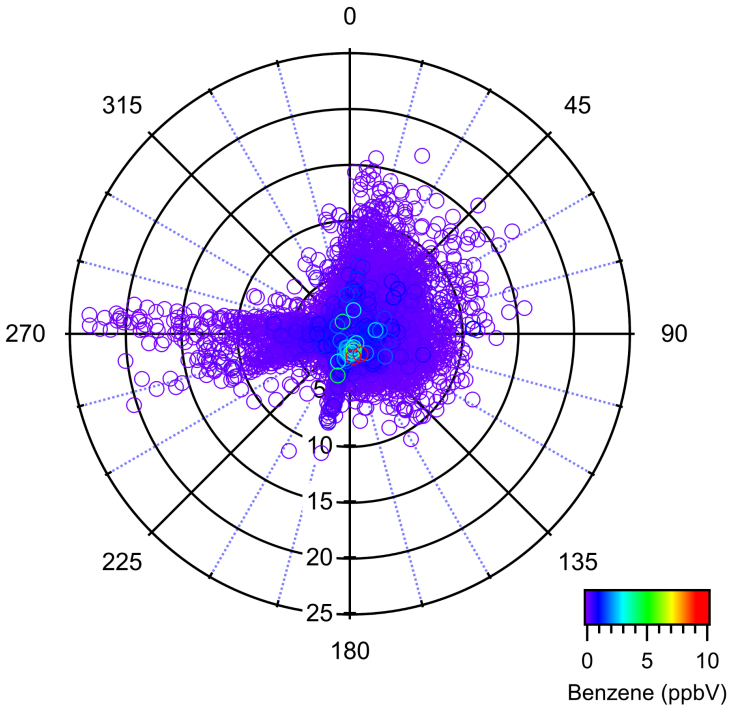

Figure 3. Polar plot showing wind speed (radial data, in mph) and wind direction (angle data, where 0 degrees indicates North) averaged to the AROMA sample time. Each

measurement is color-coded by the benzene concentration measured during the same time as the associated wind direction and wind speed to demonstrate the source direction of pollution.

Appendix A

Table A1:

KPK Facility 8	Benzene (ppbV)
Maximum	9.2
Minimum	0[a]
Average	0.21
Median	0.16
Standard Deviation	0.25
Number of Observations	7985

a) Non-detect

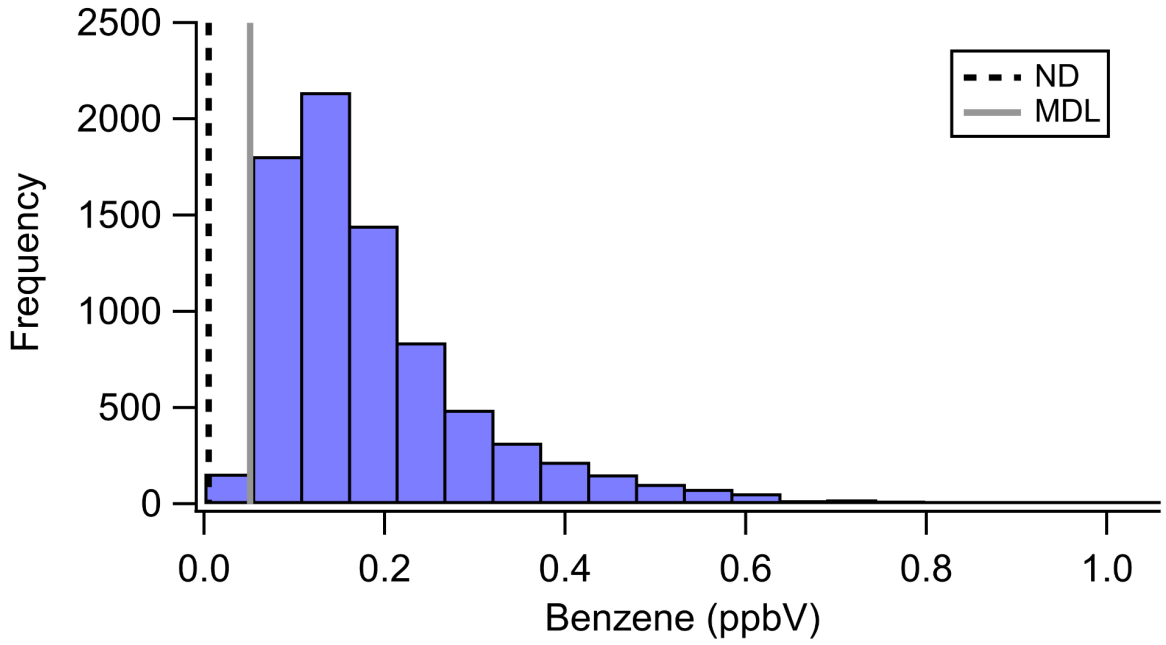

Figure A1: Histogram of benzene (ppbV) observations from the AROMA-VOC from May 6 to August 1, 2025. Data shows that 0.4% of the total observations are

non-detects (ND, vertical black dashed line) and 2.0% are below the method detection limit (MDL, grey solid line).