Ambient air monitoring data summary report

MT GOAT Adams County Birch Street site

Air Toxics and Ozone Precursor Program [ATOPs]

2026 Quarter 1

COLORADO
Air Pollution Control Division
Department of Public Health & Environment

1. Executive Summary

1.1. Report Purpose

The purpose of this report is to describe ambient measurements of benzene (C_6H_6), hydrogen sulfide (H_2S), and meteorological parameters (pressure, temperature, relative humidity, solar radiation, wind speed, wind direction) collected at the Adams County Birch Street site (39.82811°N, 104.93644°W) for the Municipality-Tied Ground-based Observations of Air Toxics (MT GOAT) network during January, February, and March 2026 (2026 Q1).

1.2. Background Information

The Municipality-Tied Ground-based Observations of Air Toxics (MT GOAT) network consists of fixed stationary ambient air quality monitoring at the Air Pollution Control Division (APCD) Adams County Birch Street site (39.82811°N, 104.93644°W). The APCD Adams County Birch Street site is located across the street from, and directly west of, Adams City Middle School (4451 E 72nd Ave, Commerce City, CO 80022). Both the CDPHE APCD Adams County Birch street site and Adams City Middle School are located in a disproportionately impacted (DI) community, as designated by the State of Colorado's Office of Environmental Justice[1].

The legislative mandate for the MT GOAT network is provided by Colorado House Bill 21-1189 (HB21-1189), also known as the "Regulate Air Toxics" Act, which was signed into law in June 2021[2]. HB21-1189 mandates that the APCD perform a minimum of thirty (30) days of community-based air toxics monitoring per ninety (90) day quarter within a three-mile radius of four covered facilities: Suncor Refinery in Commerce City, Phillips 66 Pipeline Denver Terminal in Commerce City, Holly Energy Partners (Sinclair) Terminal in Henderson, and Collins Aerospace in Pueblo[2]. HB21-1189 specifies three covered air toxics for monitoring: benzene (C_6H_6), hydrogen sulfide (H_2S), and hydrogen cyanide (HCN)[2].

The MT GOAT network at the APCD Adams County Birch Street site measures two of the three air toxics (benzene and hydrogen sulfide) and is within a three-mile radius of two of the four facilities (Suncor Refinery and Phillips 66 Pipeline Denver Terminal) specified by HB21-1189. The remainder of the HB21-1189 legislative mandate is fulfilled by routine mobile laboratory deployments conducted using the Community Air Toxics (CAT) and Emissions Monitoring Utility (EMU) mobile laboratories.

On January 17, 2025, the Colorado Air Quality Control Commission adopted a new rule identifying five priority toxic air contaminants for the State of Colorado: benzene, hydrogen sulfide, formaldehyde, ethylene oxide, and hexavalent chromium compounds.[3] The MT GOAT network at the APCD Adams County Birch Street site measures two of the five priority toxic air contaminants: benzene (C_6H_6) and hydrogen sulfide (H_2S).

1.3. Key Findings

Benzene (C_6H_6) was continuously measured for approximately 55% of 2026 Q1, or fifty (50) out of ninety (90) days. Hydrogen sulfide (H_2S) was continuously measured for approximately 91% of 2026 Q1, or eighty-two (81) out of ninety (90) days.

During 2026 Q1, benzene (C_6H_6) levels remained below both short- and long-term non-cancer health guideline values, meaning that non-cancer health impacts from benzene are not expected. Cancer risk estimates show an excess risk of less than 8 cases in a million.

Hydrogen sulfide (H_2S) levels remained below short-term health guideline values, but were above long-term health guideline values. This means that health impacts over a long period of time are possible, but not certain, and more investigation is needed to assess the potential for health impacts.

The hydrogen sulfide (H_2S) concentration measured at the Adams County Birch Street site during 2026 Q1 regularly exceeded the typical odor threshold of 10 ppbv. Throughout the entirety of 2026 Q1, the measured hydrogen sulfide (H_2S) concentration at the Adams County Birch Street site exceeded the odor threshold of 10 ppbv for more than 51 hours, or approximately two days (~2% of 2026 Q1).

There was a correlation between winds originating from the south and higher concentrations of both benzene (C_6H_6) and hydrogen sulfide (H_2S), indicating that emission source(s) for both air toxics are located somewhere to the south of the Adams County Birch Street site.

The measured benzene (C_6H_6) concentration at the Adams County Birch Street site during 2026 Q1 tended to be highest in the early morning, between the hours of 6 a.m. and 9 a.m. MST, and lowest during the afternoon, between the hours of 12 p.m. and 4 p.m. MST. The measured hydrogen sulfide (H_2S) concentration at the Adams County Birch Street site tended to be highest overnight, between the hours of 8 p.m. and 9 a.m. MST, and lowest during the afternoon, between the hours of 12 p.m. and 5 p.m. MST. The average wind direction between the hours of 9 p.m. to 11 a.m. was from the south.

2. Introduction

Benzene (C_6H_6) is a volatile organic compound (VOC) emitted from oil & gas operations, wildfires, vehicle exhaust, tobacco smoke, and some solvents[4]. Short-term exposure to low levels of benzene (C_6H_6) does not usually cause severe health impacts[4]. Prolonged exposure to very high concentrations of benzene (C_6H_6) can cause lung irritation, coughing, headaches, and dizziness[4]. Chronic exposure to benzene increases cancer risk[4].

Hydrogen sulfide (H_2S) is emitted from sewage, hot springs, volcanic activity, oil & gas operations, animal feedlots, and asphalt[5]. Short-term exposure to low-levels of hydrogen sulfide (H_2S) does not usually cause severe health impacts[5]. Prolonged exposure to very high concentrations of hydrogen sulfide (H_2S) can cause loss of sense of smell, nausea, vomiting, shortness of breath, loss of sleep, respiratory tract irritation, unconsciousness, and death[5].

The MT GOAT network at the APCD Adams County Birch Street site (39.82811°N, 104.93644°W) near-continuously measured ambient concentrations of benzene (C_6H_6) and hydrogen sulfide (H_2S), as well as meteorological parameters, during January, February, and March 2026.

3. Methods

3.1. Dual-Cavity AROMA-TOX instrument

The Dual-Cavity AROMA-TOX instrument operates in two modes: LabScan Mode and RapidScan Mode. For the purposes of this report, only LabScan Mode data is used. LabScan Mode reports a benzene (C_6H_6) concentration once every 10-15 minutes.

In LabScan Mode, a sample is collected approximately every ten minutes by drawing ambient air onto one of two adsorbent traps, called “collectors”. While one collector is collecting ambient sample air, the other collector is rapidly heated to 330°C, desorbing the sample onto an additional trap called the “focuser”. The focuser ramps in temperature to separate compounds in the sample based on vapor pressure and, to a lesser extent, affinity to the focuser material. Compounds are detected by broadband cavity ringdown spectroscopy after being thermally separated. When one sample is measured, the sample from the other collector proceeds through the same process, allowing for continuous sample collection.

Broadband (BB) Cavity Ring-Down Spectroscopy (CRDS) measures the absolute optical extinction by samples that scatter and absorb light. The setup consists of a broadband laser that illuminates an optical cavity containing two highly reflective mirrors. When the laser is in resonance with a cavity mode, intensity builds up due to constructive interference. The laser is then turned off, and the light intensity lost from the cavity is measured. The highly reflective mirrors allow for an effective pathlength of several kilometers, resulting in very low limits of detection, consistent with Beer’s Law. The broadband laser cycles through different wavelengths to obtain the loss of light intensity at different wavelengths, allowing for compound identification.

The time for light to decay (ringdown time) is measured rather than absolute absorbance. The ringdown time is first measured in the absence of any analytes to establish the background loss of light intensity. When a compound is present in the cavity that absorbs at the same frequency of the laser, the ringdown time decreases, as the compound absorbs light in addition to it leaking from the cavity. By taking the ringdown times with and without an analyte present, and knowing the absorption cross-section of the analyte at a given wavelength, the concentration of the analyte can be determined. The ringdown timescale is on the order of microseconds, while switching wavelengths on the broadband laser is on the order of milliseconds. The determined concentration assumes that the analyte is well-mixed within the cavity.

The CRDS technique has a key advantage over other spectroscopy techniques for quantification of gas concentrations, in addition to the lower limits of detection afforded by the long effective pathlength. Because the measurement is of the ringdown time and not absolute absorbance, fluctuations in the light intensity do not affect the concentration measurement, as typical absorbance measurements rely on comparing the light intensity in the presence and absence of an analyte.

3.2. Teledyne Model T101 H_2S analyzer

The Teledyne Model T101 H_2S analyzer utilizes ultraviolet fluorescence to indirectly measure the hydrogen sulfide (H_2S) concentration present in ambient air, once per second. The

analyzer continuously draws in ambient air at a flow rate of approximately 0.5 slpm. Sample air is pulled through a scrubber which removes all hydrocarbons present in the sample, which is necessary because hydrocarbons such as xylenes also undergo ultraviolet fluorescence which can interfere with the hydrogen sulfide (H_2S) measurement. Next, the sample air flows through a second scrubber which removes all sulfur dioxide (SO_2) present in the sample. Then, the sample air flows through a reaction chamber which converts all of the hydrogen sulfide (H_2S) present in the sample into sulfur dioxide (SO_2). Finally, an ultraviolet lamp is used to excite the sulfur dioxide (SO_2) molecules, which emit light (fluoresce) as they decay back to the ground state. The light emitted via sulfur dioxide (SO_2) ultraviolet fluorescence is proportional to the amount of hydrogen sulfide (H_2S) in the sample air.

3.3. MaxiMet GMX501 weather station

The MaxiMet GMX501 weather station consists of a sensor package which measures pressure, temperature, relative humidity, solar radiation, wind speed, and wind direction. The MaxiMet GMX501 weather station reports these parameters once per second.

3.4. Data Processing

All data analysis was performed using IGOR Pro 9.05 and Google Earth Pro. Instrument background data and calibration data were excluded from the analysis. Statistics were calculated by substituting zero for values below the negative method detection limit (MDL) and substituting 1/2 the MDL for measurements from the negative MDL to the positive MDL. All data presented here is publicly available, formatted according to version 3 of the Air Quality Data Exchange (AQDx) format.

3.5. 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 under the same parameters 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.

A custom-built automated calibration system is connected to both the Dual-Cavity AROMA-TOX instrument and the Teledyne Model T101 H_2S analyzer. This automated calibration system is used to perform all instrument zero measurements, bump checks, and multipoint calibrations.

For the Dual-Cavity AROMA-TOX instrument, an automated instrument bump check at ~24 ppbv benzene (C_6H_6) is performed for approximately 20 minutes every twenty-four hours. At least once per month, a full five-point calibration is performed on the Dual-Cavity AROMA-TOX instrument. An internal audit performed on March 4, 2026 indicated that the method detection limit for the Dual-Cavity AROMA-TOX instrument is 0.327 ppbv for benzene (C_6H_6), with a

percent recovery ranging from 91.1% to 110.3% when challenged with 6 ppbv of benzene (C_6H_6).

For the Teledyne Model T101 H_2S analyzer, an automated instrument zero is performed for ten minutes every six hours using ultra-high purity zero air from an on-site compressed gas cylinder. Also for the Teledyne Model T101 H_2S analyzer, an automated instrument bump check at ~600 ppbv hydrogen sulfide (H_2S) is performed for five minutes every twenty-four hours. At least once per month, a manual zero and span adjustment, followed by a full five-point calibration, is performed on the Teledyne Model T101 H_2S analyzer. An internal audit performed on March 4, 2026 indicated that the method detection limit for the Teledyne Model T101 H_2S analyzer is 0.244 ppbv for hydrogen sulfide (H_2S). The audit percent recovery for hydrogen sulfide (H_2S) ranged from 75% to 78.5% when challenged with 12.5 ppbv of hydrogen sulfide (H_2S), ranged from 98.5% to 102% when challenged with 50 ppbv of hydrogen sulfide (H_2S), and ranged from 104% to 107% when challenged with 100 ppbv of hydrogen sulfide (H_2S).

4. Deployment Summary

4.1. Overview & Summary Statistics

The Municipality-Tied Ground-based Observations of Air Toxics (MT GOAT) network measured ambient concentrations of hydrogen sulfide (H_2S) and benzene (C_6H_6), as well as meteorological parameters (pressure, temperature, relative humidity, solar radiation, wind speed, wind direction), at the Adams County Birch Street site (39.82811°N, 104.93644°W) in Commerce City, CO during 2026 Q1. The Adams County Birch Street site is located across the street from, and directly west of, Adams City Middle School (4451 E 72nd Ave, Commerce City, CO 80022). A map showing the location of the Adams County Birch Street site, as well as a photo of the site, is provided in Figure 1.

The Adams County Birch Street site is located approximately 1.5 miles northeast of the Suncor Refinery facility boundary and approximately 2 miles north of the Phillips 66 Denver Pipeline Terminal facility boundary. The Adams County Birch Street site is also located approximately 1.5 miles northeast of the Robert W. Hite Treatment Facility, which is a large wastewater treatment facility directly west of the Suncor Refinery.

During 2026 Q1, the Dual-Cavity AROMA-TOX instrument intermittently measured benzene (C_6H_6) at the Adams County Birch Street site from January 1, 2026 to March 25, 2026. Due to recurring instrument software issues, instrument temperature control issues, measurement site power outages, and failed calibration / bump checks, much of the benzene (C_6H_6) concentration data collected by the Dual-Cavity AROMA-TOX instrument was invalidated. In summary, the Dual-Cavity AROMA-TOX instrument measured benzene (C_6H_6) for approximately 55% of 2026 Q1, or fifty (50) out of ninety (90) days.

During 2026 Q1, the Teledyne Model T101 H_2S analyzer continuously measured hydrogen sulfide (H_2S) at the Adams County Birch Street site from January 1, 2026 to March 31, 2026, with the exception of one time period when the instrument was non-functional. The instrument was non-functional for approximately two days starting on March 13, 2026 due to issues with the data acquisition software. Excluding instrument calibration and zero data, the

Teledyne Model T101 H2S analyzer measured hydrogen sulfide (H_2S) for approximately 91% of 2026 Q1, or eighty-two (82) out of ninety (90) days.

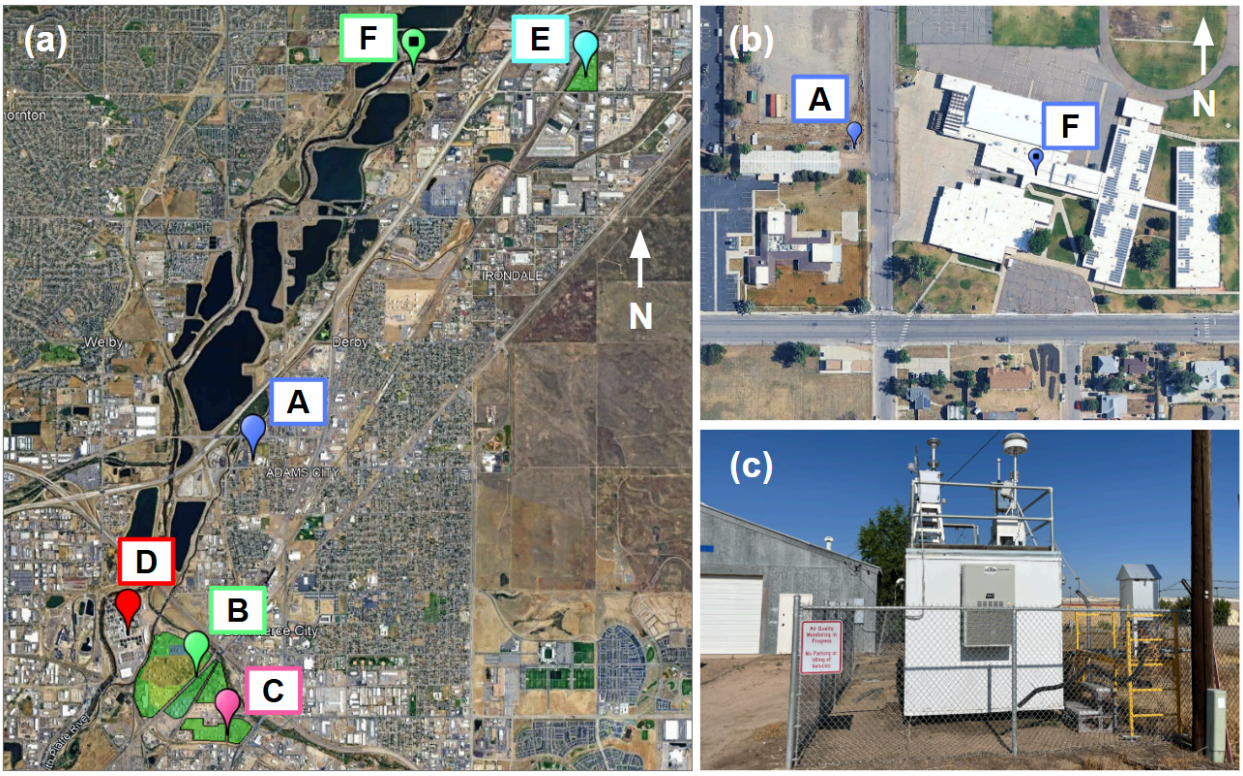

Figure 1. Map of the MT GOAT network location in Commerce City, CO. Panel (a) is a map showing the relative locations of: (A) the Adams County Birch Street site; (B) Suncor Refinery; (C) Phillips 66 Denver Pipeline Terminal; (D) the Robert W. Hite Treatment Facility; (E) the Holly Energy Partners (Sinclair) Terminal; and (F) the South Adams County Water & Sanitary District Wastewater Treatment Plant. Panel (b) is a map showing the relative locations of: (A) the Adams County Birch Street site and (F) Adams City Middle School. Panel (c) is a photo of the Adams County Birch Street site.

The maximum one-hour average benzene (C_6H_6) concentration measured at the Adams County Birch Street site during 2026 Q1 was 2.2 ppbv. The maximum one-hour average hydrogen sulfide (H_2S) concentration measured at the Adams County Birch Street site during 2026 Q1 was 50.0 ppbv.

The hydrogen sulfide (H_2S) concentration measured at the Adams County Birch Street site during 2026 Q1 regularly exceeded the typical odor threshold of 10 ppbv. Throughout the entirety of 2026 Q1, the measured hydrogen sulfide (H_2S) concentration at the Adams County Birch Street site exceeded the odor threshold of 10 ppbv for more than 51 hours, or approximately two days (~2% of 2026 Q1).

Summary statistics for the measured benzene (C_6H_6), hydrogen sulfide (H_2S), and meteorological parameters are provided at native instrument time resolution in Table 1. Summary statistics for the measured benzene (C_6H_6), hydrogen sulfide (H_2S), and

meteorological parameters are provided for one-hour running averages in Table 2. A time series plot of the measured benzene (C_6H_6) and hydrogen sulfide (H_2S) concentrations is provided in Figure 2. A time series plot of the measured meteorological parameters is provided in Figure 3.

Table 1. Summary statistics for the MT GOAT network at the Adams County Birch Street site during 2026 Q1, calculated at native instrument time resolution. Statistics were calculated by substituting zero for values below the negative method detection limit (MDL) and substituting 1/2 the MDL for measurements from the negative MDL to the positive MDL. Statistics below the MDL are given as <MDL.

Parameter	Minimum	Median	Average	Standard deviation	Maximum
Benzene (C_6H_6)	<0.3 ppbv	<0.3 ppbv	<0.3 ppbv	<0.3 ppbv	2.3 ppbv
Hydrogen sulfide (H_2S)	<0.2 ppbv	0.9 ppbv	2.0 ppbv	3.4 ppbv	111.9 ppbv
Pressure	821.1 mbar	841.7 mbar	841.3 mbar	6.1 mbar	858.1 mbar
Temperature	3.0 °F	45.3 °F	45.8 °F	15.6 °F	89.4 °F
Relative humidity	0.0%	37.0%	41.0%	20.7%	96.0%
Solar radiation	0.0 W/m^2	2.0 W/m^2	158.3 W/m^2	244.2 W/m^2	1225.0 W/m^2
Wind speed	0.0 mph	3.6 mph	4.7 mph	3.7 mph	49.7 mph

Table 2. Summary statistics for the MT GOAT network at the Adams County Birch Street site during 2026 Q1, calculated for one-hour running averages. Statistics were calculated by substituting zero for values below the negative method detection limit (MDL) and substituting 1/2 the MDL for measurements from the negative MDL to the positive MDL. Statistics below the MDL are given as <MDL.

Parameter	Minimum	Median	Average	Standard deviation	Maximum
Benzene (C_6H_6)	<0.3 ppbv	<0.3 ppbv	<0.3 ppbv	<0.3 ppbv	2.2 ppbv
Hydrogen sulfide (H_2S)	<0.2 ppbv	0.9 ppbv	2.0 ppbv	2.7 ppbv	50.0 ppbv

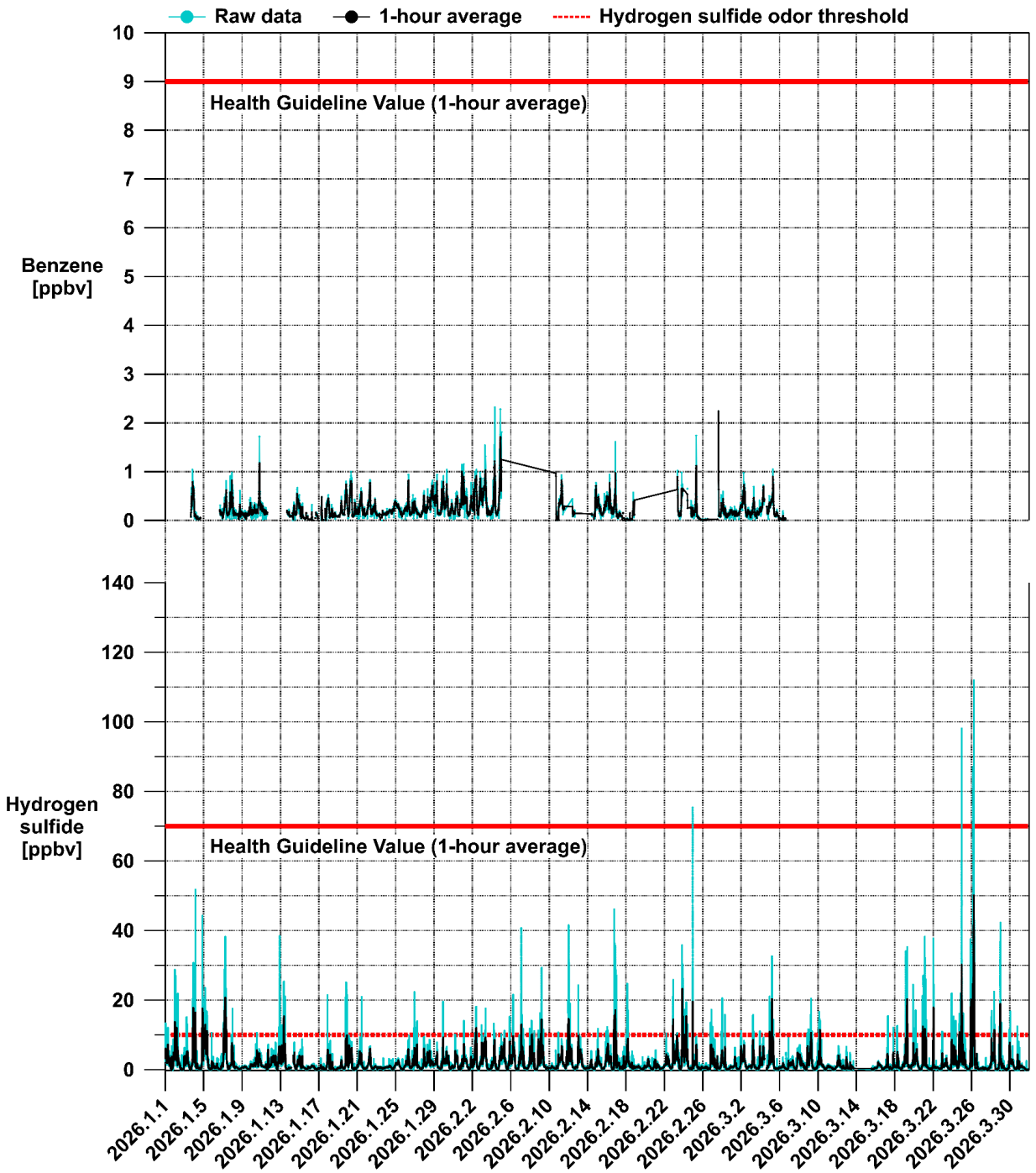

Figure 2. Time series of benzene (C_6H_6) and hydrogen sulfide (H_2S) concentrations measured by the MT GOAT network at the Adams County Birch Street site during 2026 Q1. The measured benzene (C_6H_6) concentration is compared to the Health Guideline Value (HGV) of 9 ppbv for a one-hour average. The measured hydrogen sulfide (H_2S) concentration is compared to the Health Guideline Value (HGV) of 70 ppbv for a one-hour average. The hydrogen sulfide (H_2S) typical odor threshold of 10 ppbv is also shown.

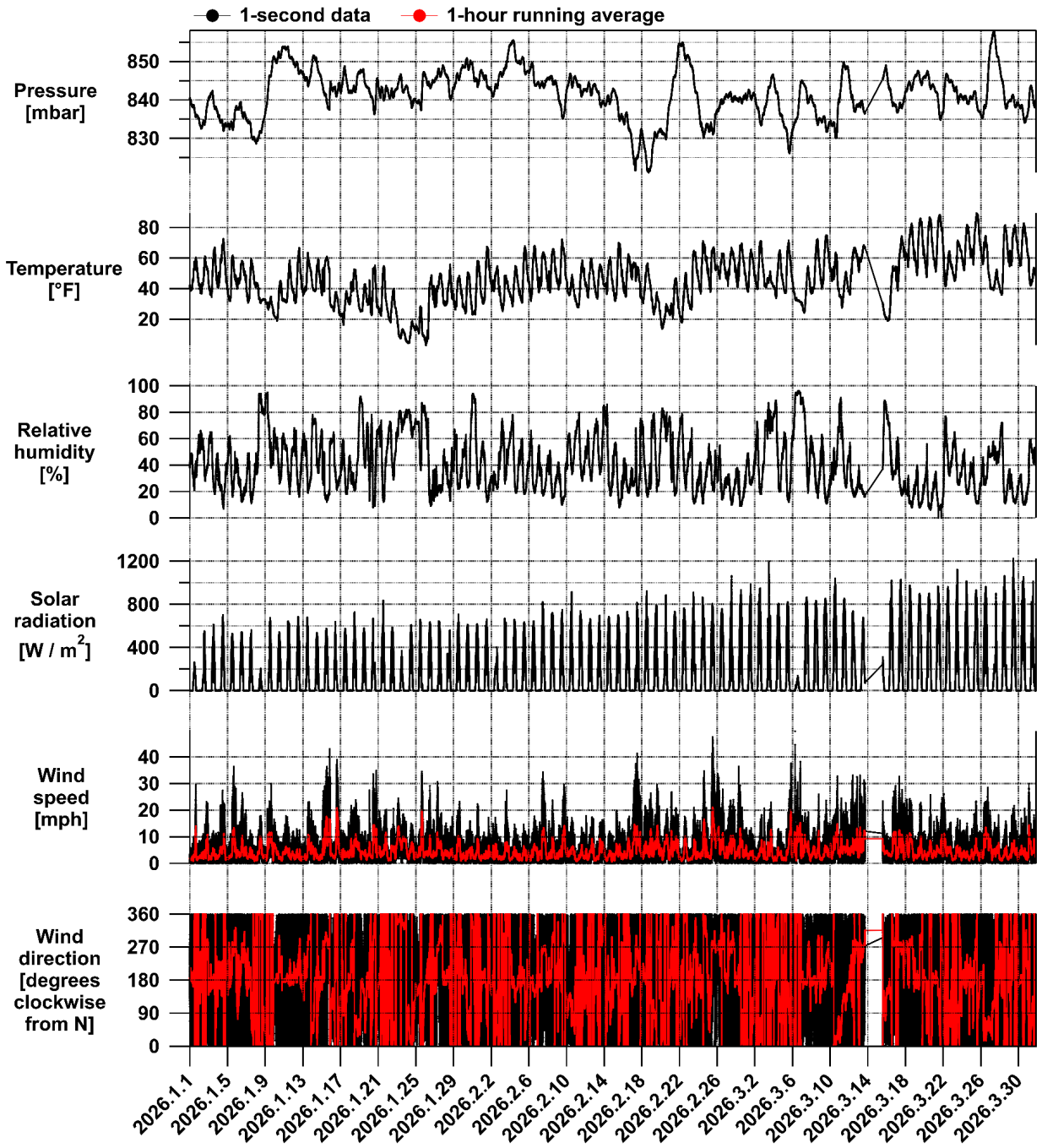

Figure 3. Time series of meteorological parameters (pressure, temperature, relative humidity, solar radiation, wind direction, wind speed) measured by the MT GOAT network at the Adams County Birch Street site during 2026 Q1.

4.2. Screening-Level Health Risk Assessment

A screening-level health risk assessment was performed to determine whether the measured levels of compounds in the air may pose a potential health risk. It is important to note that there are many compounds that were not measured and assessed in this report. Health risk assessments are a screening tool and cannot predict actual health outcomes. This approach was adapted from EPA and ATSDR screening methods. Please contact ToxCall at cdphe_toxcall@state.co.us or 303-692-2606 if you have any questions.

4.2.1. Short-term health risk

The short-term health risk was evaluated using a two-step process:

1. Calculate a hazard quotient (HQ) for each compound by dividing the maximum one-hour average level by the short-term health guideline value.
2. Calculate preliminary hazard indices (HI) by adding up the HQs ≥ 0.1 for all compounds for each hour.

When an HQ or HI is less than or equal to 1, short-term health impacts are not expected. When an HQ or HI is greater than 1, more information is needed to understand the potential health impacts. This helps to identify areas and compounds that require further investigation.

Table 3. Short-term hazard quotients for the compounds measured.

Compound	**Maximum one-hour average level [ppbv]**	**Short-term health guideline value [ppbv]**	**Hazard quotient (HQ)**
Benzene (C_6H_6)	2.2	9	0.24
Hydrogen sulfide (H_2S)	50.0	70	0.71

Table 4. Short-term preliminary hazard index. The maximum preliminary hazard index occurred on March 26, 2026 at 05:41 MST.

Compound	**One-hour average level [ppbv]**	**Short-term health guideline value [ppbv]**	**Hazard quotient (HQ)**
Benzene (C_6H_6)	No data	9	No data
Hydrogen sulfide (H_2S)	50.0	70	0.71
Preliminary hazard index (sum of HQs ≥ 0.1)			0.71

All short-term hazard quotients and hazard indices were less than 1 (Table 3 and Table 4). This means that levels of the compounds measured are not an immediate concern and are not likely to cause short-term health impacts.

4.2.2. Long-term health risk

To assess long-term health risk, we assumed that the average level of each compound measured during this deployment would be similar over many years and could represent a long-term exposure. This evaluation, like most health risk assessments, is divided into two parts: non-cancer risk and cancer risk.

4.2.2.1. Non-cancer risk

Long-term non-cancer health risk was evaluated using a two-step process:

1. Calculate a hazard quotient (HQ) for each compound by dividing the average level monitored by the long-term non-cancer health guideline value.
2. Calculate a preliminary hazard index (HI) by adding up the HQs ≥ 0.1 for all compounds.

When an HQ or HI is less than or equal to 1, long-term non-cancer health impacts are not expected. When an HQ or HI is greater than 1, further assessment is needed to understand the potential for health impacts. This helps to identify areas and compounds that require further investigation.

Table 5. Long-term hazard quotients and preliminary hazard index for the compounds measured.

Compound	**Average level [ppbv]**	**Long-term health guideline value [ppbv]**	**Hazard quotient (HQ)**
Benzene (C_6H_6)	<0.3	0.94	<0.32
Hydrogen sulfide (H_2S)	2.0	1.4	1.43
Preliminary hazard index (sum of HQs ≥ 0.1)			1.43 < HI < 1.75

The long-term hazard quotient for hydrogen sulfide (H_2S) was above 1, meaning that if someone breathes this level for a long period of time, health impacts are possible, but not certain (Table 5). More investigation is needed to assess potential health impacts. The MT GOAT network will continue monitoring at this location, as required by HB21-1189. Additionally, both hydrogen sulfide (H_2S) and benzene (C_6H_6) are priority toxic air contaminants, and the state is taking action to reduce levels of these pollutants and protect public health.

4.2.2.2. Cancer risk

Benzene (C_6H_6) can cause cancer and was evaluated for estimated excess cancer risk. This is a theoretical estimate that describes how many people, out of one million, would be expected to develop cancer if they were exposed to average levels measured during this study for a lifetime. We multiplied the average level by the upper bound inhalation unit risk to estimate excess cancer risk.

Table 6. Excess cancer risk estimates for benzene (C_6H_6).

Compound	Average level [ppbv]	Inhalation unit risk [per ppbv]	Excess cancer risk in one million
Benzene (C_6H_6)	<0.3	0.000025	<8

The estimated cancer risk from benzene was less than 8 excess cases in one million (Table 6). In other words, if one million people were exposed to the average levels measured during this study over a lifetime, an excess of less than 8 cancer cases would be expected. Note that this is a theoretical estimate of cancer risk that is used as a tool for deciding whether public health actions are needed to protect health – it is not an actual estimate of cancer cases in a community.

4.2.3. Comparison to levels across the state

In order to provide more context around these levels, the average level of benzene (C_6H_6) is compared to the average level measured at all Colorado Air Toxics Trends Station (COATTS) sites statewide during 2025. Hydrogen sulfide (H_2S) is not measured at the COATTS sites. Because the average benzene level measured at the MT GOAT Adams County Birch Street site during 2026 Q1 was below the method detection limit of 0.3 ppbv, it was not possible to calculate a percentile metric for benzene.

Table 7. Comparison of the levels of compounds measured at this site to levels measured across the state.

Compound	Average level at this site [ppbv]	Average level statewide during 2025 [ppbv]	Percentile
Benzene (C_6H_6)	<0.3	0.16	Indeterminate

4.3. Wind Analysis and Possible Emission Sources

During 2026 Q1, the measured wind direction at the Adams County Birch Street site was most often from the south to southeast, with less frequent wind from the west and the north. There was a correlation between winds originating from the south and higher concentrations of both benzene (C_6H_6) and hydrogen sulfide (H_2S), indicating that emission source(s) for both air toxics are located somewhere to the south of the Adams County Birch Street site.

Possible emissions sources for hydrogen sulfide (H_2S) located to the south of the Adams County Birch Street site include the Robert W. Hite Treatment facility and the Suncor Refinery. Possible emission sources for benzene (C_6H_6) located to the south of the Adams County Birch Street site include the Suncor Refinery and the Phillips 66 Pipeline Denver Terminal.

A wind rose for the Adams County Birch Street site during 2026 Q1 is provided in Figure 4. Pollution roses for benzene (C_6H_6) and hydrogen sulfide (H_2S) at the Adams County Birch Street site during 2026 Q1 are provided in Figures 5 and 6.

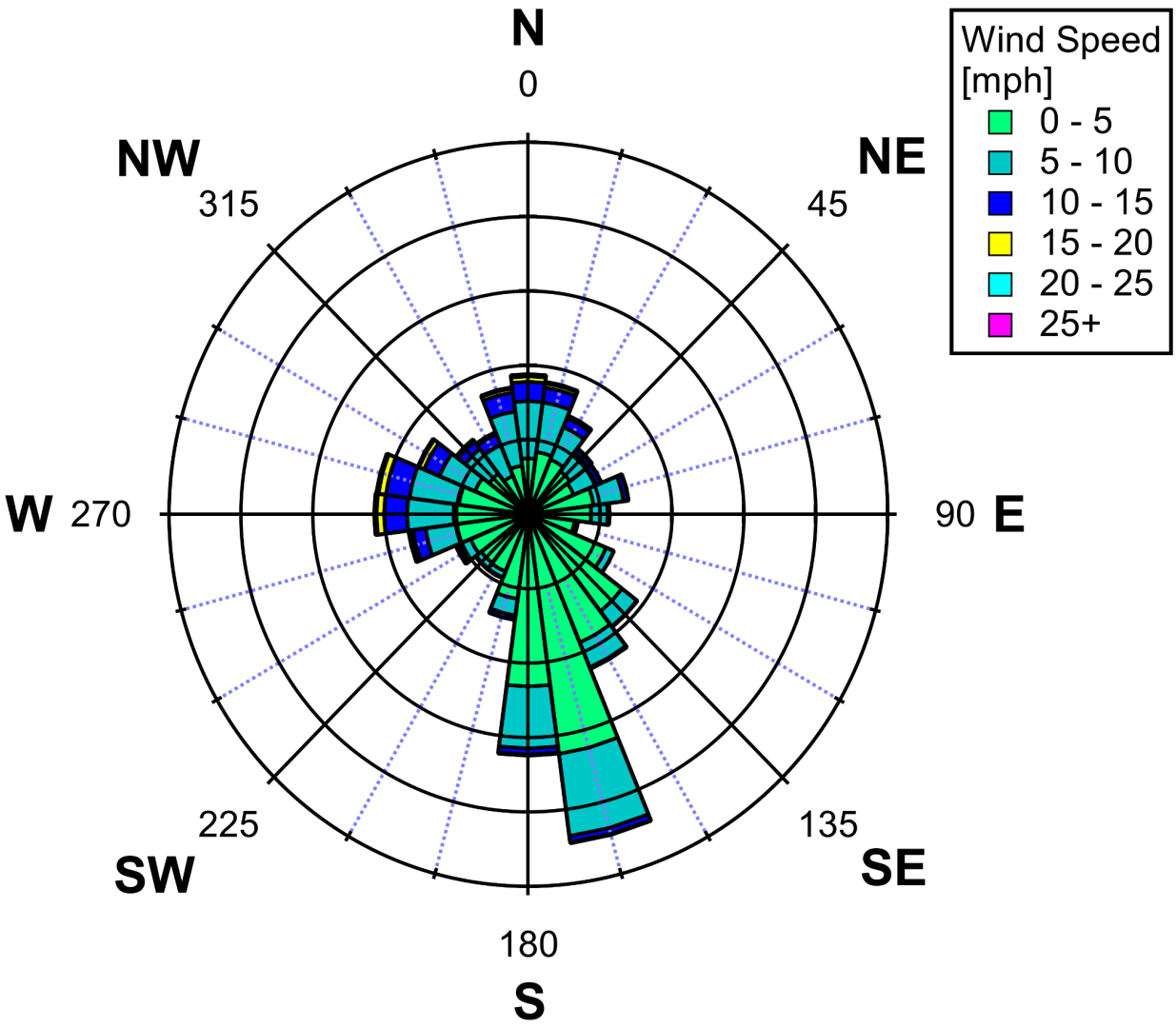

Figure 4. Wind rose measured by the MT GOAT network at the Adams County Birch Street site during 2026 Q1. The colored wedges indicate the direction that the wind is coming from.

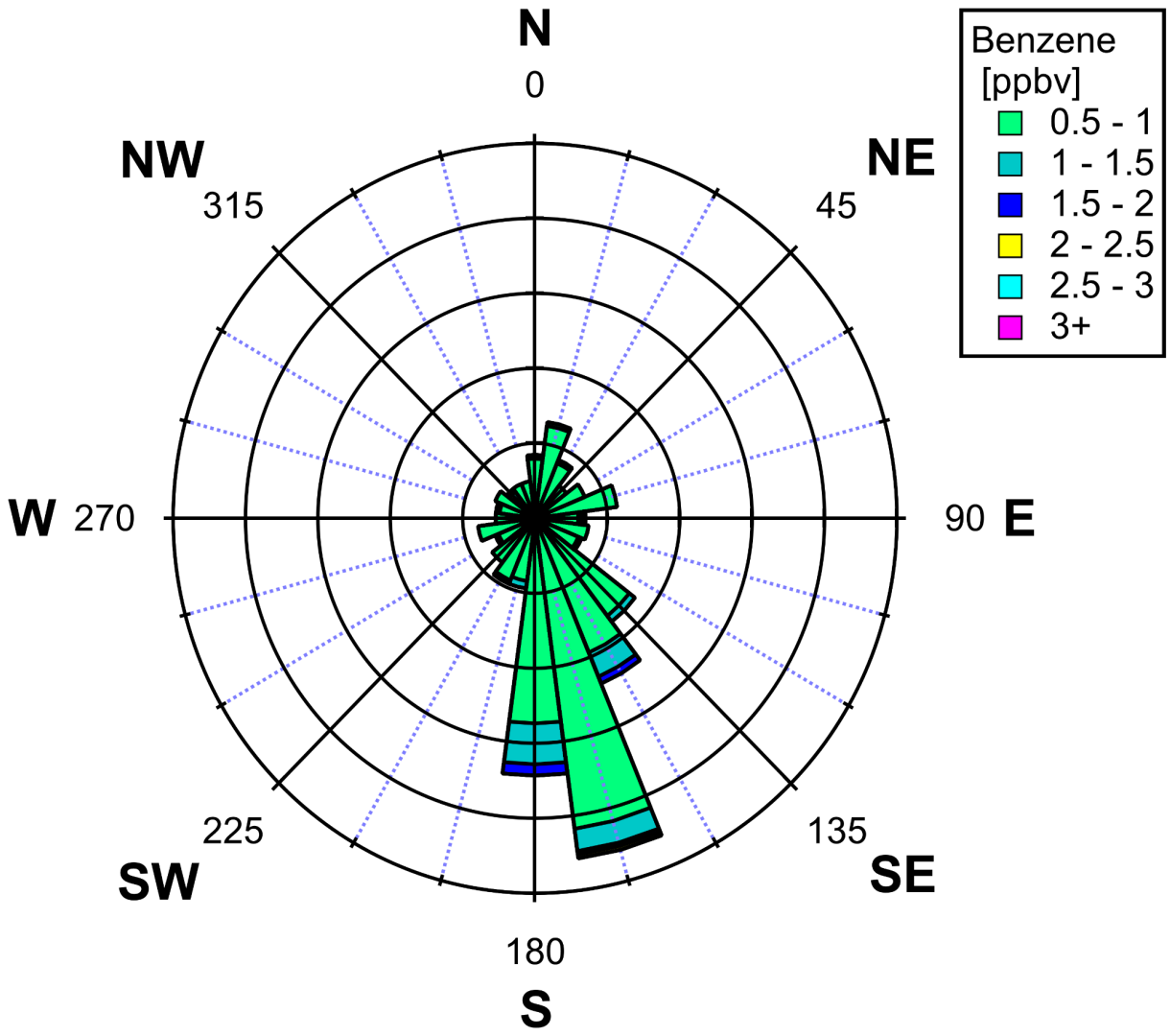

Figure 5. Pollution rose for benzene (C_6H_6) measured by the MT GOAT network at the Adams County Birch Street site during 2026 Q1. Benzene (C_6H_6) concentrations below 0.5 ppbv are excluded from the pollution rose.

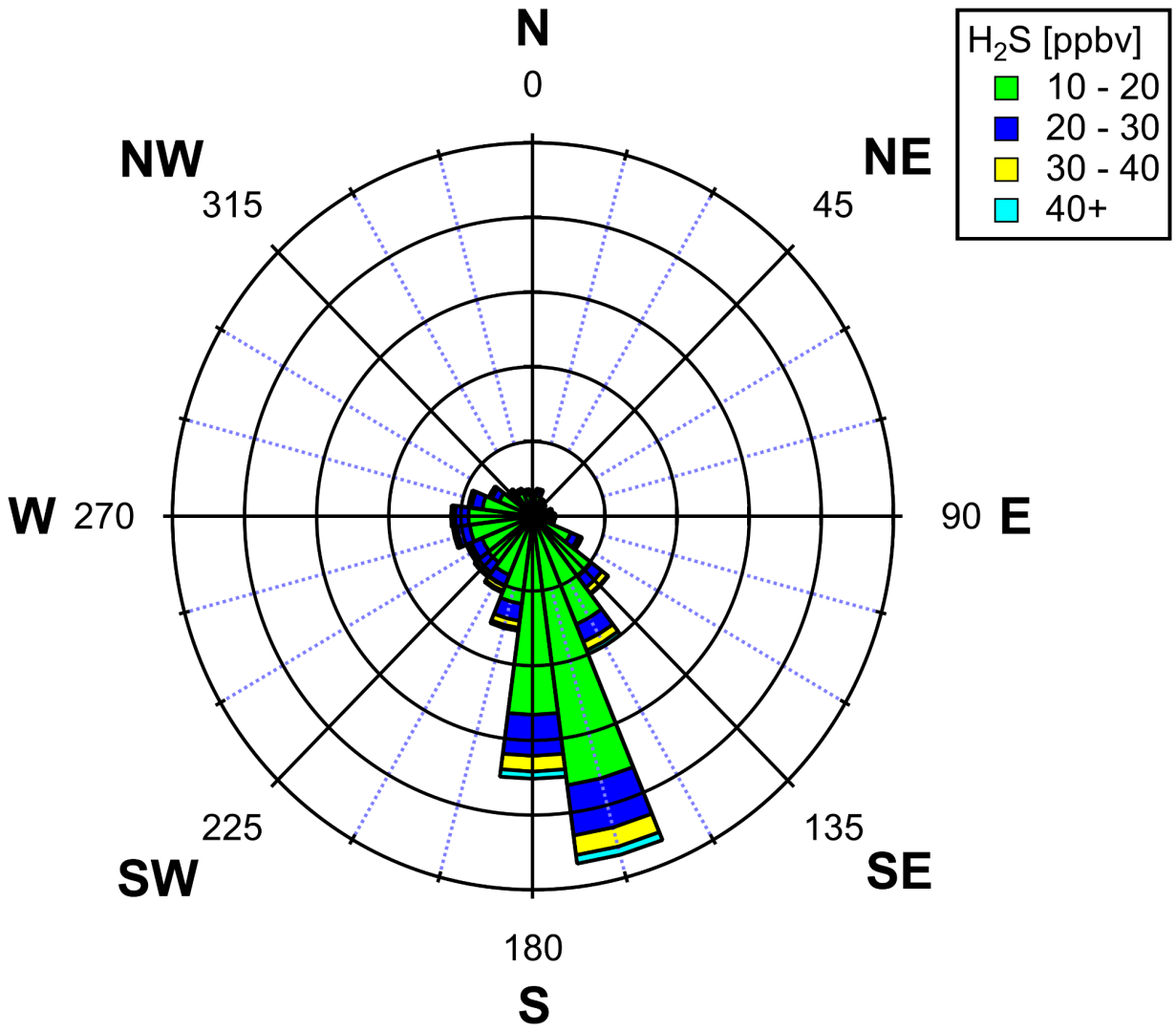

Figure 6. Pollution rose for hydrogen sulfide (H_2S) measured by the MT GOAT network at the Adams County Birch Street site during 2026 Q1. Hydrogen sulfide (H_2S) concentrations below 10 ppbv are excluded from the pollution rose.

4.4. Diurnal Analysis

The measured benzene (C_6H_6) concentration at the Adams County Birch Street site during 2026 Q1 tended to be highest in the early morning, between the hours of 6 a.m. and 9 a.m. MST, and lowest during the afternoon, between the hours of 12 p.m. and 4 p.m. MST. The measured hydrogen sulfide (H_2S) concentration at the Adams County Birch Street site tended to be highest overnight, between the hours of 8 p.m. and 9 a.m. MST, and lowest during the afternoon, between the hours of 12 p.m. and 5 p.m. MST. The average wind direction between the hours of 9 p.m. to 11 a.m. was from the south.

The diurnal patterns in both benzene (C_6H_6) and hydrogen sulfide (H_2S) concentrations are likely influenced by a combination of atmospheric vertical mixing, horizontal winds, and possible changes in emission sources. Overnight, the lack of sunlight and subsequent lower temperatures causes the layer of the atmosphere closest to the Earth's surface, referred to as the planetary boundary layer, to become shallower and more stagnant. This results in decreased vertical mixing, decreased dilution, and higher concentrations of some air pollutants. In addition to the decreased vertical mixing, the measured horizontal wind data indicates that the overnight winds are predominantly from the south, where the largest emission sources of both benzene (C_6H_6) and hydrogen sulfide (H_2S) are located. Finally, there may be diurnal changes in facility operations which result in changing emissions of both benzene (C_6H_6) and hydrogen sulfide (H_2S). Without more information, it is difficult to distinguish the effects of these three factors on the observed diurnal patterns. Diurnal plots for benzene, hydrogen sulfide, and meteorological parameters are provided in Figures 7, 8, and 9.

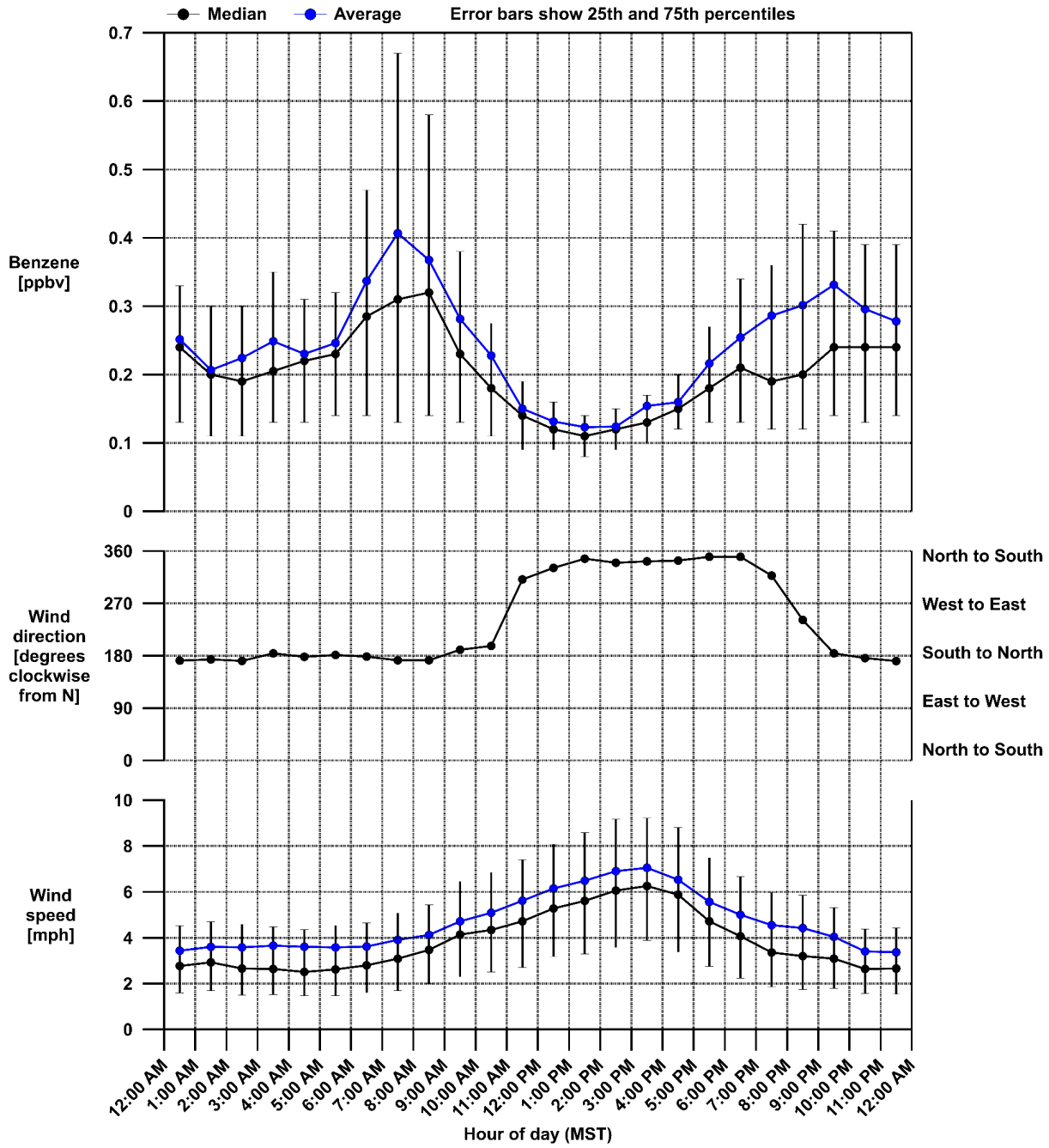

Figure 7. Diurnal plot for benzene (C_6H_6), wind speed, and wind direction measured by the MT GOAT network at the Adams County Birch Street site during 2026 Q1.

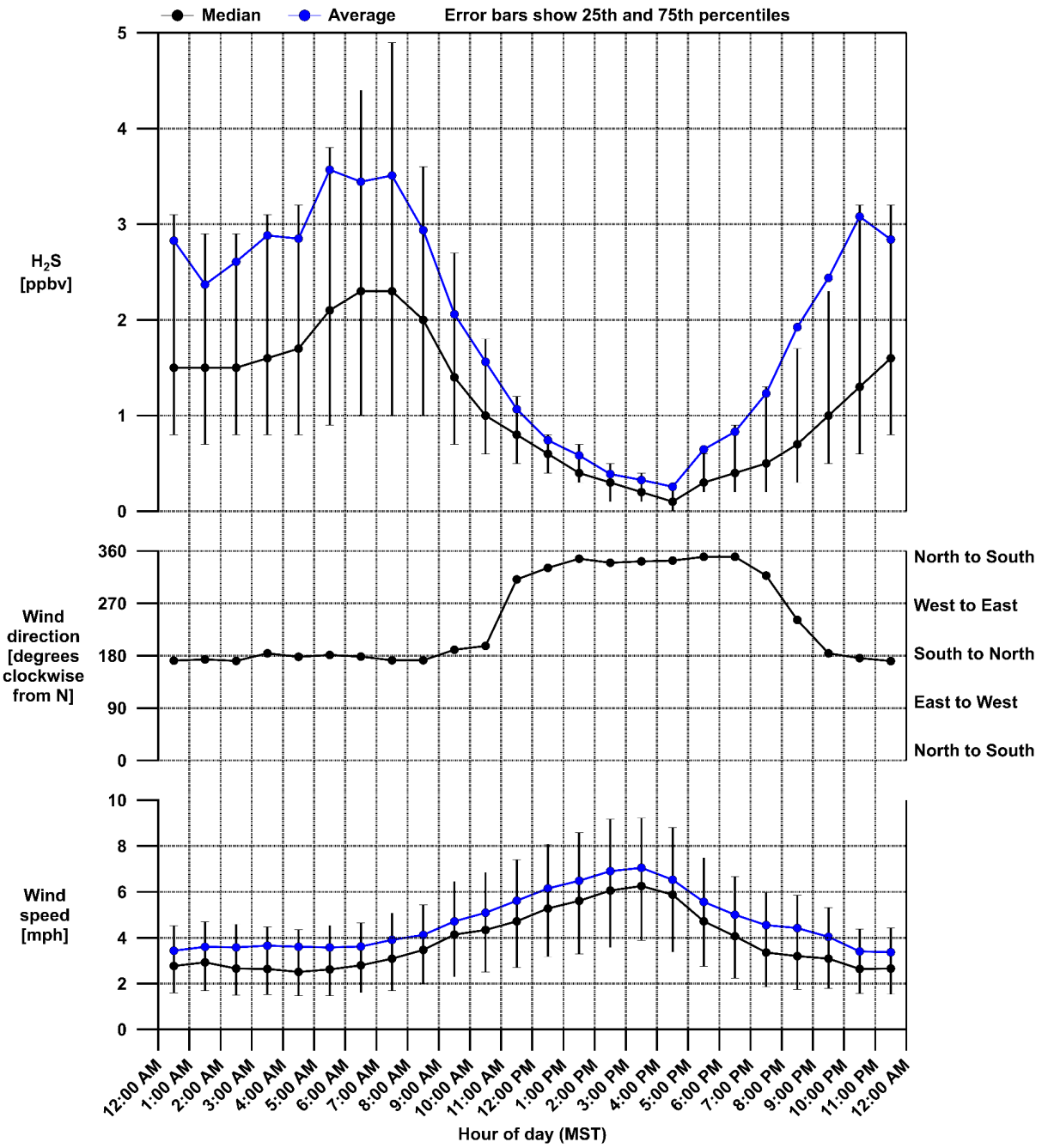

Figure 8. Diurnal plot for hydrogen sulfide (H_2S), wind speed, and wind direction measured by the MT GOAT network at the Adams County Birch Street site during 2026 Q1.

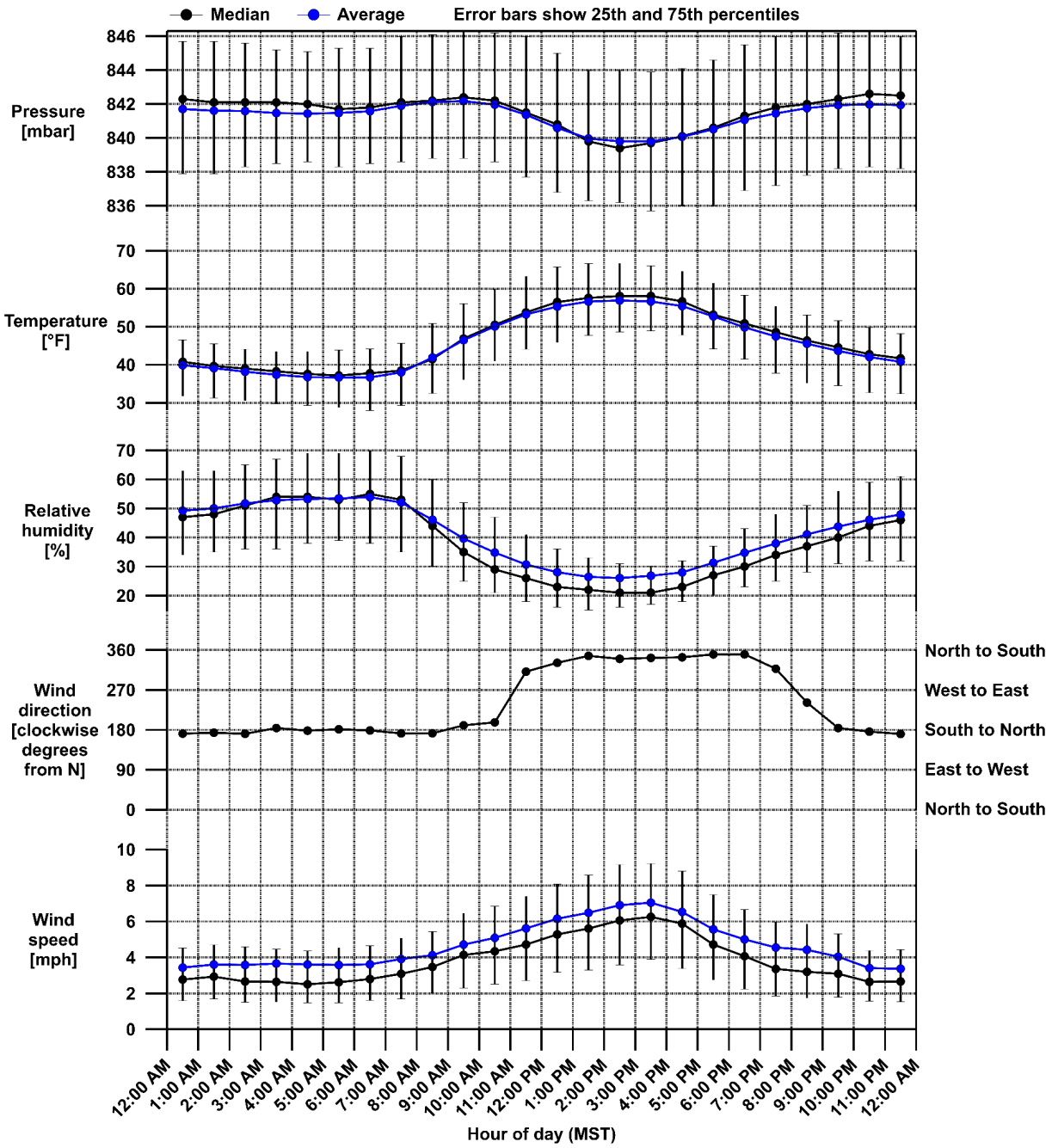

Figure 9. Diurnal plot for pressure, temperature, relative humidity, wind direction, and wind speed measured by the MT GOAT network at the Adams County Birch Street site during 2026 Q1.

4.5. Calibration checks & multipoint calibrations

There were a total of fifty (50) automated calibration checks performed for the Dual-Cavity AROMA-TOX instrument at the Adams County Birch Street site during 2026 Q1. During these automated calibration checks, an automated calibration system was used to deliver a constant flow of calibration gas containing 25.12 ppbv of benzene (C_6H_6) to the Dual-Cavity AROMA-TOX instrument. Using +/- 30 percent recovery as the pass / fail criteria, the Dual-Cavity AROMA-TOX instrument passed forty-five (45) automated calibration checks and failed five (5) automated calibration checks. All benzene (C_6H_6) concentration data adjacent to failed automated calibration checks was manually quality-flagged and not included in subsequent analysis. A time series of the automated calibration checks for the Dual-Cavity AROMA-TOX instrument is provided in Figure 10.

There were two (2) multipoint calibrations performed for the Dual-Cavity AROMA-TOX instrument at the Adams County Birch Street site during 2026 Q1. These multipoint calibrations were performed on January 28, 2026 and February 27, 2026.

There were a total of eighty-seven (87) automated calibration checks performed for the Teledyne Model T101 H_2S analyzer at the Adams County Birch Street site during 2026 Q1. During these automated calibration checks, an automated calibration system was used to deliver a constant flow of calibration gas containing 603.17 ppbv of hydrogen sulfide (H_2S) to the Teledyne Model T101 H_2S analyzer. Using +/- 30 percent recovery as the pass / fail criteria, the Teledyne Model T101 H_2S analyzer passed all of the eighty-seven (87) automated calibration checks. A time series of the automated calibration checks for the Teledyne Model T101 H_2S analyzer is provided in Figure 11.

There were three (3) manual instrument zero & span calibrations performed for the Teledyne Model T101 H_2S analyzer at the Adams County Birch Street site during 2026 Q1. These manual instrument zero & span calibrations were performed on January 30, 2026; February 27, 2026; and March 26, 2026. Additionally, there were three (3) multipoint calibrations performed for the Teledyne Model T101 H_2S analyzer at the Adams County Birch Street site during 2026 Q1. These multipoint calibrations were performed on January 30, 2026; February 27, 2026; and March 26, 2026.

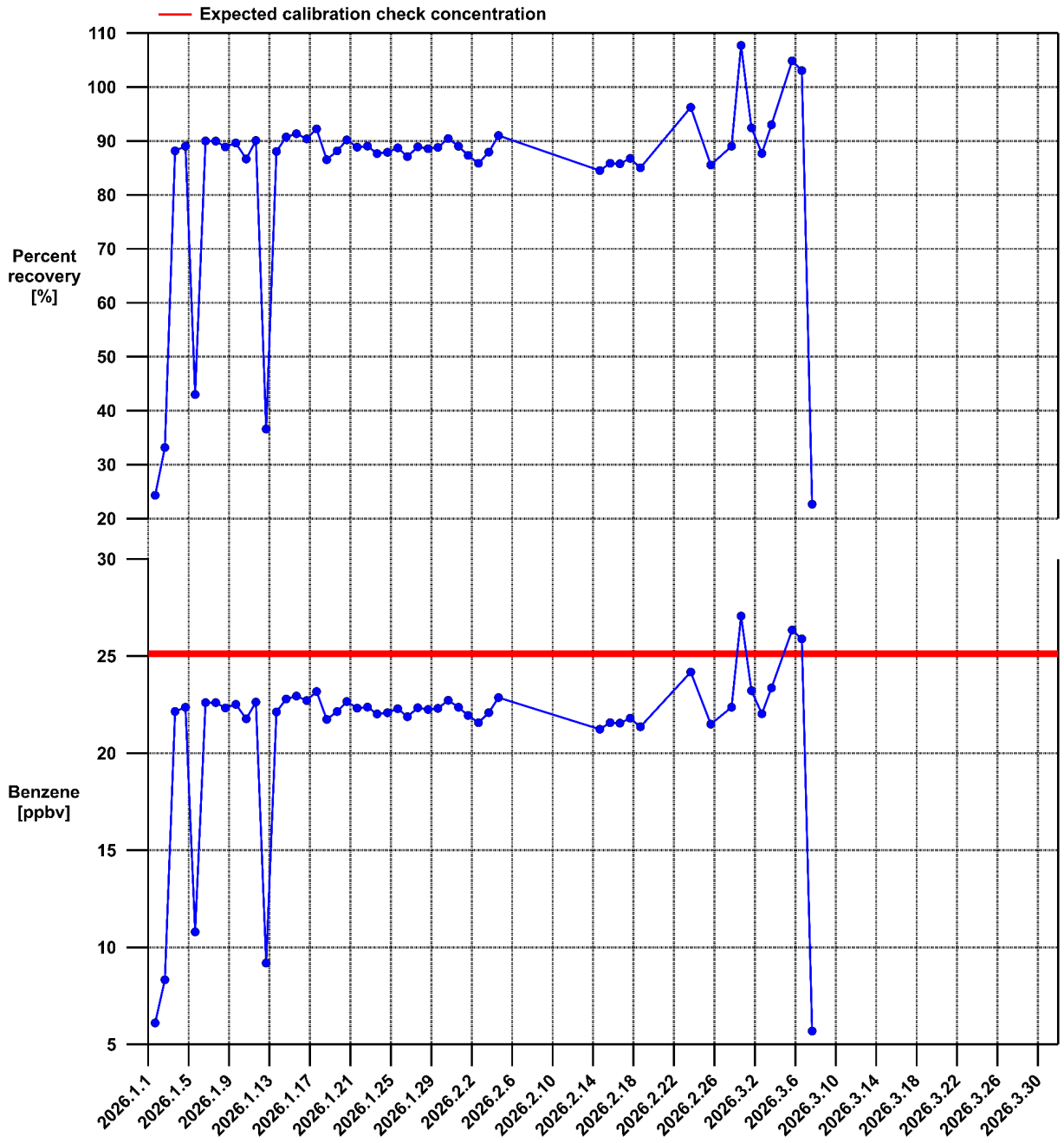

Figure 10. Time series of benzene (C_6H_6) automated calibration checks for the Dual-Cavity AROMA-TOX instrument at the Adams County Birch Street site during 2026 Q1.

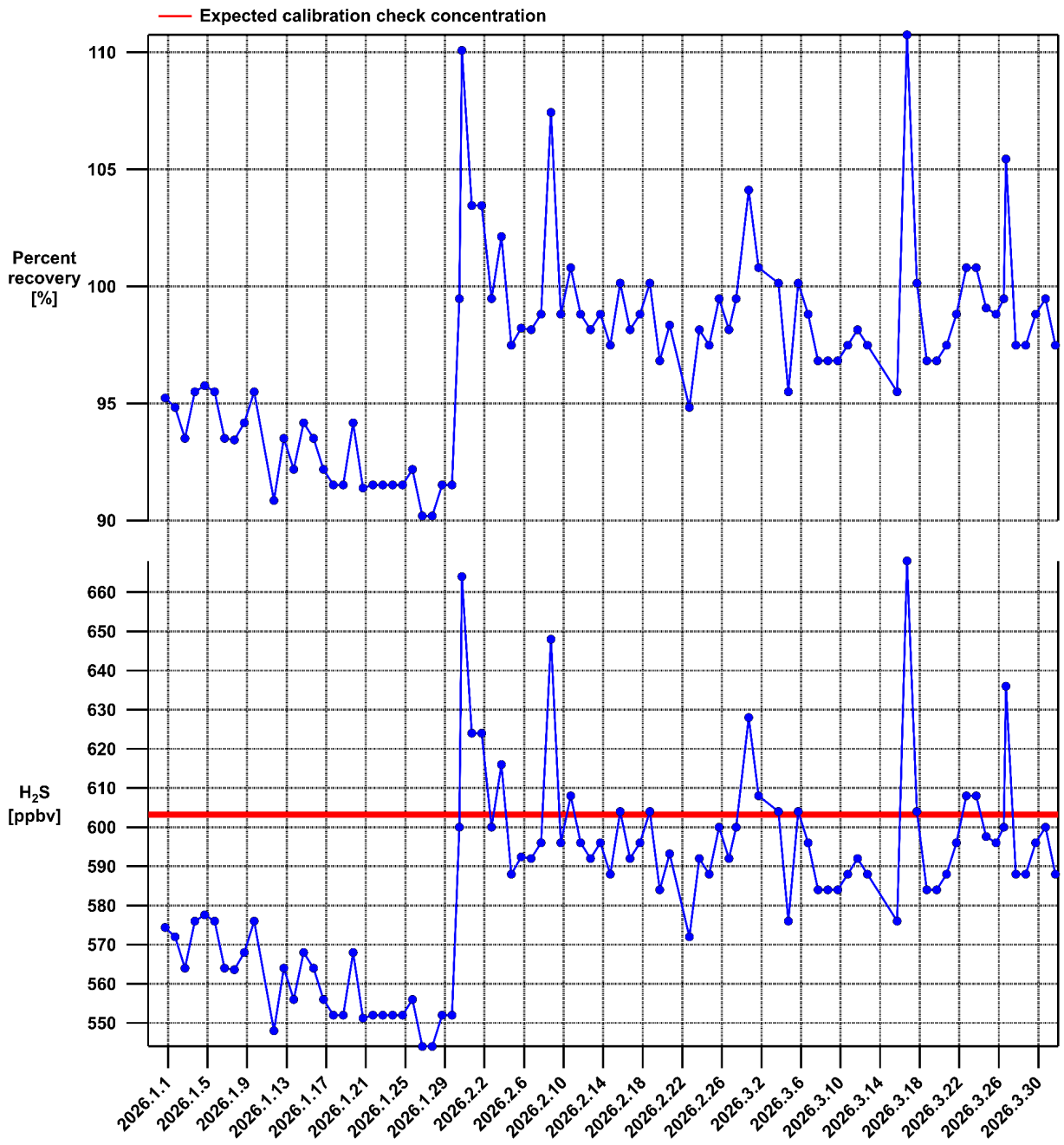

Figure 11. Time series of hydrogen sulfide (H_2S) automated calibration checks for the Teledyne Model T101 H_2S analyzer at the Adams County Birch Street site during 2026 Q1.

5. References

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