

Magellan Dupont Monthly Report

January 15 – February 7, 2025

Introduction

As part of CDPHE's commitment to measuring air quality in disproportionately impacted communities, the Magellan Dupont gasoline storage facility terminal was selected for air monitoring beginning November 19. To monitor potential air toxics emitted from the Magellan Dupont terminal, an Entanglement Technologies AROMA-TOX-EtO was deployed within a Mobile Air Remote Monitoring Trailer (MARMOT) for near real-time detection of benzene, toluene, ethyl benzene and xylenes (BTEX), which are air toxics present in gasoline. Data from this deployment can be found in the [ATOPs data repository](#). These measurements were taken to determine whether the Magellan Dupont gasoline terminal is the dominant contributor of BTEX air toxics within this community. This report describes data collected for the third month of the deployment.

Methods

These measurements were performed using an Entanglement Technologies AROMA-TOX-EtO (hereafter referred to as AROMA). The AROMA consists of three main components: traps to collect BTEX and other volatile organic compounds (VOCs) from the air, a thermal separator to separate the sample into individual compounds (like benzene, toluene, ethyl benzene, and xylenes), and a detector to identify and quantify the concentrations of each compound in air approximately every 12 minutes per sample.

To perform these measurements, the AROMA was deployed in a MARMOT trailer with a Gill Maximet GMX501 meteorological station on the west side of the South Adams County Water & Sanitation District in Commerce City ([39.842073, -104.917620](#)) located just North from Dupont Elementary School on 11/19/2024. The Maximet meteorological station measures wind speed, wind direction, temperature, solar radiation, and relative humidity. These meteorological measurements are used to determine the direction in which air toxics measured by the AROMA are coming from. A Sensit Technologies Sensor Pod (SPOD) was co-located with the MARMOT to provide 1 minute measurements of total volatile organic compounds (tVOCs). While the SPOD does not measure specific air toxics, its high time resolution and ability to provide alerts of elevated tVOC concentrations via cellular network to AROMA operators was determined to be valuable to quickly respond to any health guideline value exceedances of air toxics.

The South Adams County Water & Sanitation District provided shore power for the instruments, computer, and temperature control of the MARMOT shelter. This sampling location is approximately 1500 feet from the center of the Magellan Dupont gasoline storage facility

(39.845498, -104.914442) and 1200 feet from the Mesa Oil petroleum product recycler (39.842850, -104.913498), see Figure 1. The range of wind directions likely to incorporate emissions from Magellan Dupont or Mesa Oil (i.e., source winds) are greater than 13° and less than 64° (see map and photo in Figure 1).



Figure 1. Aerial view of the Magellan Dupont gasoline storage facility (red pin), including the location of the Marvin MARMOT monitoring station (blue tram), Dupont Elementary School (yellow pin), Mesa Oil petroleum product recycler (red pin), surrounding communities, and the range of wind directions coming from Magellan and Mesa Oil.

Results

Over the third month of deployment, the AROMA had a data coverage of 93.2%. This resulted in a total of 2,791 samples of BTEX. As benzene is the air toxic of primary concern, the results will be described in detail below. Statistics of the deployment are found in Table 1.

For the third month of sampling, the average benzene concentration was observed to be 0.54 ppb. This is greater than the median value of 0.32 ppb, demonstrating a higher frequency of concentrations measured below the average. The maximum benzene mixing ratio was 7.0 ppb,

observed on 01/27/2025 at 7:09 am (Figure 2). This measurement was associated with a wind direction of 211°, which is not from the direction of the Magellan Dupont gasoline storage facility. The maximum 1-hour rolling benzene concentration during this reporting period was 4.7 ppb, and occurred on 01/27/2025 from 6:51-7:51 am, which is below the one-hour health guideline value for benzene (9 ppbV). Of this hour, 20% of the wind was from the direction of the Magellan Dupont gasoline storage facility.

There were periods of elevated benzene concentrations (Figure 2), but these were not clearly associated with winds coming from the Magellan Dupont terminal, or the Mesa Oil petroleum product recycler. Of the 2,791 benzene measurements, 14% were greater than 1 ppb, and 3.4% were greater than 2 ppb. Benzene was well correlated with toluene, ethyl benzene, and xylenes (the other components of BTEX), suggesting a common source of these air toxics.

Benzene concentrations did not correlate with other meteorological parameters such as temperature and relative humidity (Figure 3). In order to evaluate the source winds of benzene pollution, polar plots were generated (Figure 4). These plots show the wind direction (described by angle) and wind speed (shown as distance from the plot center) measured for each benzene sample. By color coding the plot by benzene concentration, the source direction of benzene pollution can be identified. Higher benzene concentrations typically correlate with lower wind speeds (wind speed < 3 mph), as shown in Figure 4. However, there were two events with benzene concentrations greater than 4 ppbV with wind speeds greater than 3 mph. The two highest measured concentrations for this period (4.3 and 4.5 ppb) were measured from a direction of 34° and 28°, with an average wind speed of 3.8 mph. These measurements were a part of a plume with a series of elevated benzene concentrations, and the benzene concentrations, wind speeds and wind directions of this event are listed in Table 2. This event occurred with source winds from the Magellan Dupont gasoline storage facility, and correlated with the other compounds present in BTEX (Figure 2). The above evidence suggests that the elevated benzene concentrations observed during this plume may have been due to the Magellan Dupont gasoline storage facility. At no point did the observed benzene concentrations exceed the acute health guideline value of 9 ppbV.

The third highest measured benzene concentration (4.2 ppb) occurred from a wind direction of 286°, with an average wind speed of 4.3 mph. This elevated benzene measurement did not occur from the direction of the Magellan Dupont gasoline storage facility.

There is no specific direction at low wind speeds that correlate with elevated benzene concentrations. This suggests that the Magellan Dupont gasoline storage facility is not the only contributor of BTEX air toxics pollution in the neighborhood where the AROMA is sampling. These results cannot exclude the possibility that the Magellan Dupont terminal is a contributor to BTEX air toxics pollution in the surrounding neighborhood, but it demonstrates that it is not the sole source.

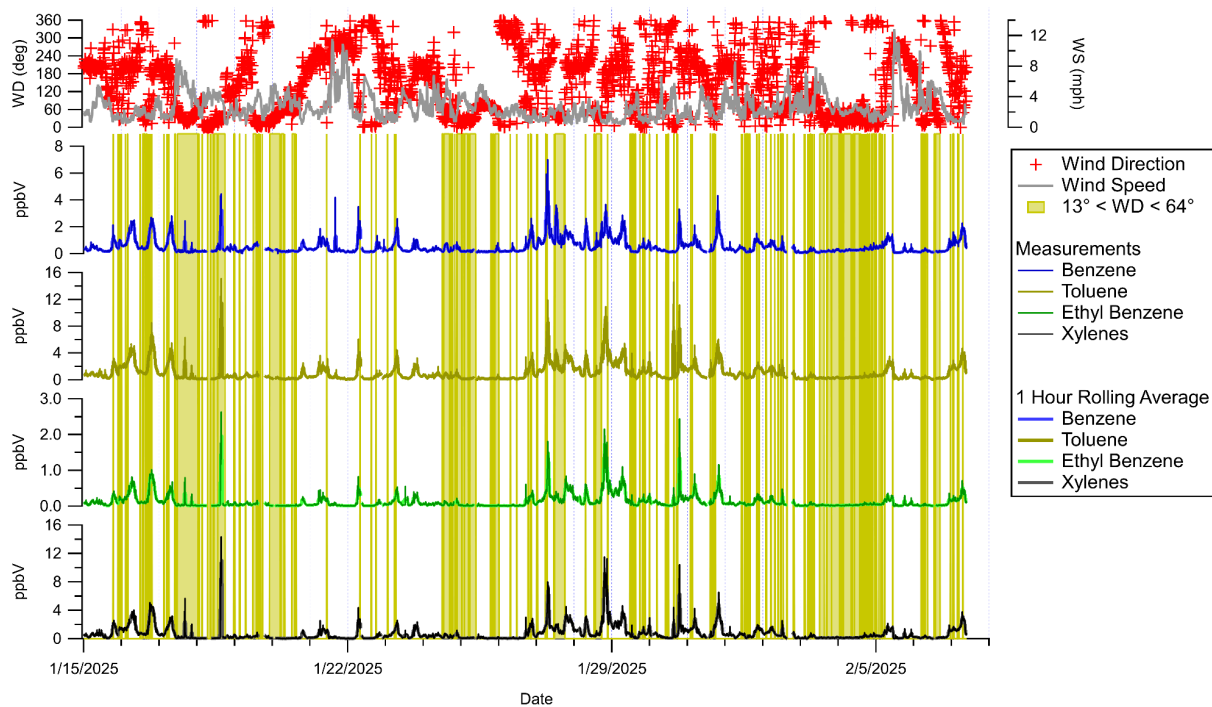


Figure 2. Five panels, from top to bottom, showing time series measurements of wind direction in degrees (left axis, red markers) and wind speed in mph (right axis, gray line), benzene in ppbV (blue lines), toluene in ppbV (yellow lines), ethyl benzene in ppbV (green lines), and xylenes in ppbV (grey and black lines). The 1-hour rolling averages are averages of the measurements preceding and proceeding 30 minutes of that time point. The yellow shaded areas of the plot indicate times when the wind was likely coming from the direction of the Magellan Dupont gasoline storage facility (wind direction above 13° and below 64°).

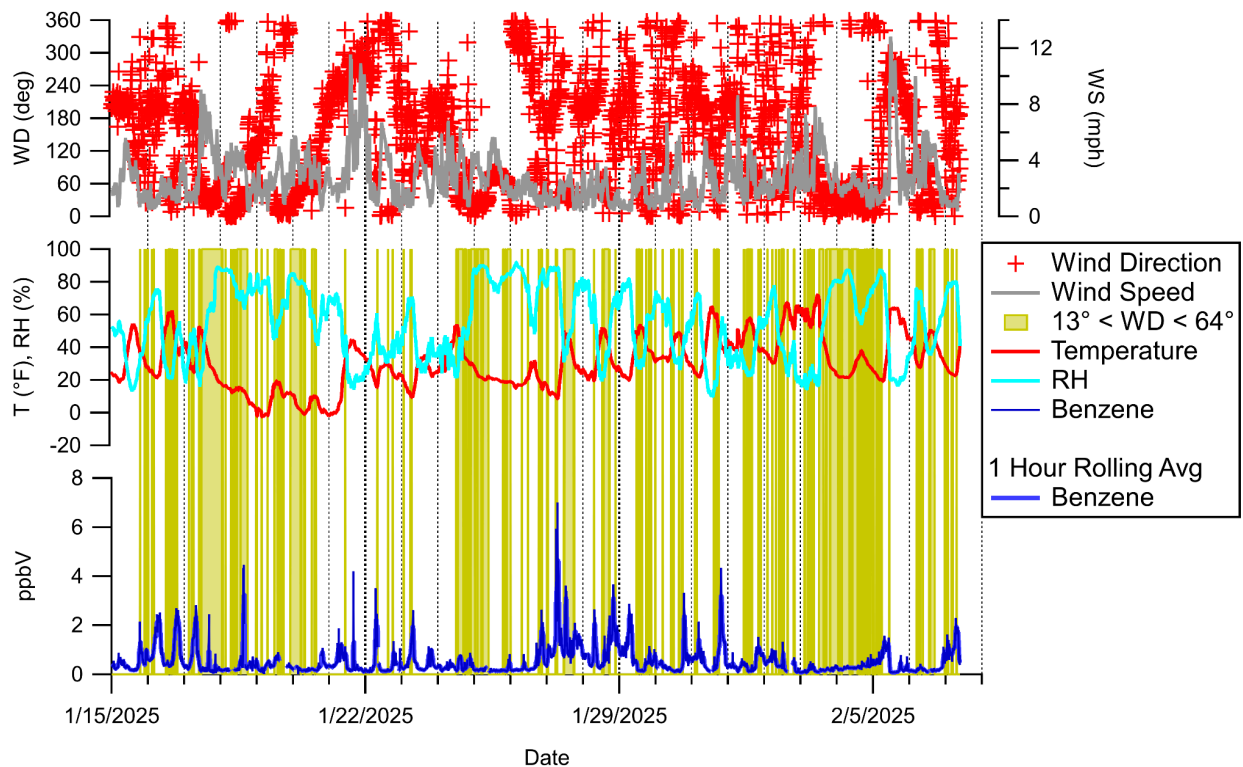


Figure 3. Three panels showing measurements, from top to bottom, of wind direction in degrees (left axis, red markers), wind speed in mph (right axis, gray line), temperature (°F, red line), relative humidity (RH, %, cyan line), and benzene in ppbV (blue lines). Benzene, wind direction and wind speed plotted with AROMA time resolution (~12 minutes), temperature and relative humidity plotted with 1 minute time resolution. The 1-hour rolling averages are averages of the measurements preceding and proceeding 30 minutes of that time point. The yellow shaded areas of the plot indicate times when the wind was likely coming from the source (wind direction above 13° and below 64°).

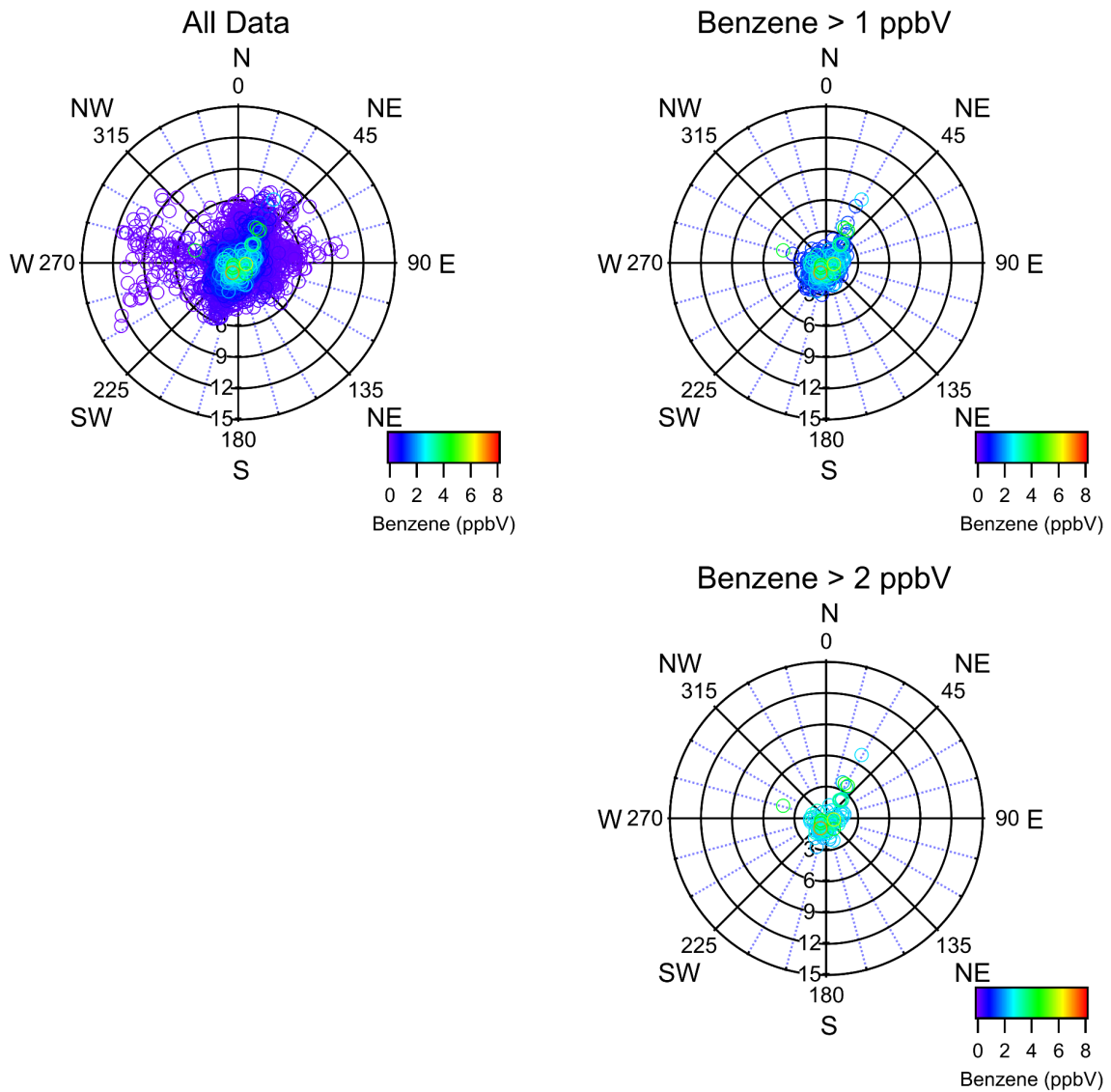


Figure 4. Three pollution polar plots for benzene. The angle data is wind direction in degrees and cardinal direction, and the radial data is wind speed in mph. The three polar plots show data for all benzene concentrations (top left), measurements where benzene concentrations are greater than 1 ppbV (top right), and measurements where benzene concentrations are greater than 2 ppbV (bottom right). Color coding is the benzene concentration determined at the same time a given wind speed and direction measurement is made to demonstrate the potential source winds of the pollution.

Table 1. Statistical data (min, max, median, average, standard deviation) for the monthly (01/15/2025 - 02/07/2025) and cumulative (11/19/2024 - 02/07/2025) sampling periods. Benzene, toluene, ethyl benzene, and xylenes statistics from AROMA sampling time resolution (~12 minutes). Meteorological statistics (wind speed, temperature, relative humidity) from 1 minute averages of 1 second data.

	Reporting Period (01/15/2024 - 02/07/2025)					Cumulative (11/19/2024 - 02/07/2025)				
	Min	Max	Median	Avg	Std. Dev.	Min	Max	Median	Avg	Std. Dev.
Benzene (ppbV)	0.04	7.0	0.32	0.54	0.58	0.04	7.0	0.33	0.53	0.53
Toluene (ppbV)	0.05	15.1	0.57	1.1	1.4	0.04	43.5	0.69	1.2	1.5
Ethyl Benzene (ppbV)	0.05	2.6	0.06	0.13	0.21	0.05	3.8	0.08	0.16	0.22
Xylenes (ppbV)	0.06	14.3	0.36	0.75	1.1	0.06	18.6	0.43	0.84	1.1
Wind Speed (mph)	0.1	16.0	2.3	2.7	1.9	0.1	16.7	2.1	2.6	1.8
Temperature (°F)	-2.9	72.3	29.1	30.7	15.7	-2.9	72.3	34.6	35.0	12.9
Relative Humidity (%)	10.0	92.0	55.0	54.2	22.1	7.0	97.0	52.0	52.5	22.1

Table 2. Elevated benzene concentrations (>2 ppbV) from samples measured with wind speeds greater than 3 mph. The table includes date and time of measurement, benzene concentration, wind speed, wind direction, and whether source winds were from the direction of Magellan Dupont gasoline storage facility.

Date & Time	Benzene (ppbV)	Wind Direction (°)	Wind Speed (mph)	Source Winds from direction of Magellan Dupont? (Y/N)
1/17/2025 4:22:36 PM	2.4	29	7.0	Y
1/18/2025 3:02:18 PM	4.3	34	3.8	Y
1/18/2025 3:13:35 PM	2.1	25	3.8	Y
1/18/2025 3:24:54 PM	4.5	28	3.8	Y
1/18/2025 3:36:22 PM	2.1	32	3.6	Y
1/21/2025 3:58:43 PM	4.2	286	4.3	N

Summary

During the measurement period of January 15, 2025 to February 7, 2025, average benzene concentrations were 0.54 ppb. A maximum measurement of 7.0 ppb occurred on 01/27/2025 at 7:09 am. The maximum rolling one-hour average benzene concentration was 4.7 ppb on 01/27/2025 from 6:51 am - 7:51 am. Elevated benzene concentrations were observed at low wind speeds from all directions, suggesting that the Magellan Dupont gasoline storage facility is not the sole source of BTEX air toxics in the neighborhood.