EMU deployment report for Platte River Biogas on December 16, 2024

The CDPHE APCD Emissions Monitoring Utility (EMU) mobile laboratory was deployed to the area surrounding Platte River Biogas (19179 Co Rd 49, La Salle, CO 80645) on December 16, 2024. Prior to this deployment, the EMU did not receive permission to drive onto the Platte River Biogas facility property. The EMU was operated by two scientists from the CDPHE APCD Air Toxics & Ozone Precursor (ATOPs) program.

The EMU arrived in the area surrounding Platte River Biogas at approximately 11:10 a.m. MST. The EMU drove in the area surrounding Platte River Biogas until approximately 11:43 p.m. MST. From 11:43 p.m. until 12:43 p.m. MST, the EMU parked at a location approximately 4,000 feet downwind of Platte River Biogas. From 12:43 p.m. until 1:34 p.m. MST, the EMU continued to drive in the area surrounding Platte River Biogas. The complete EMU drive path around Platte River Biogas is shown in Figure 1.

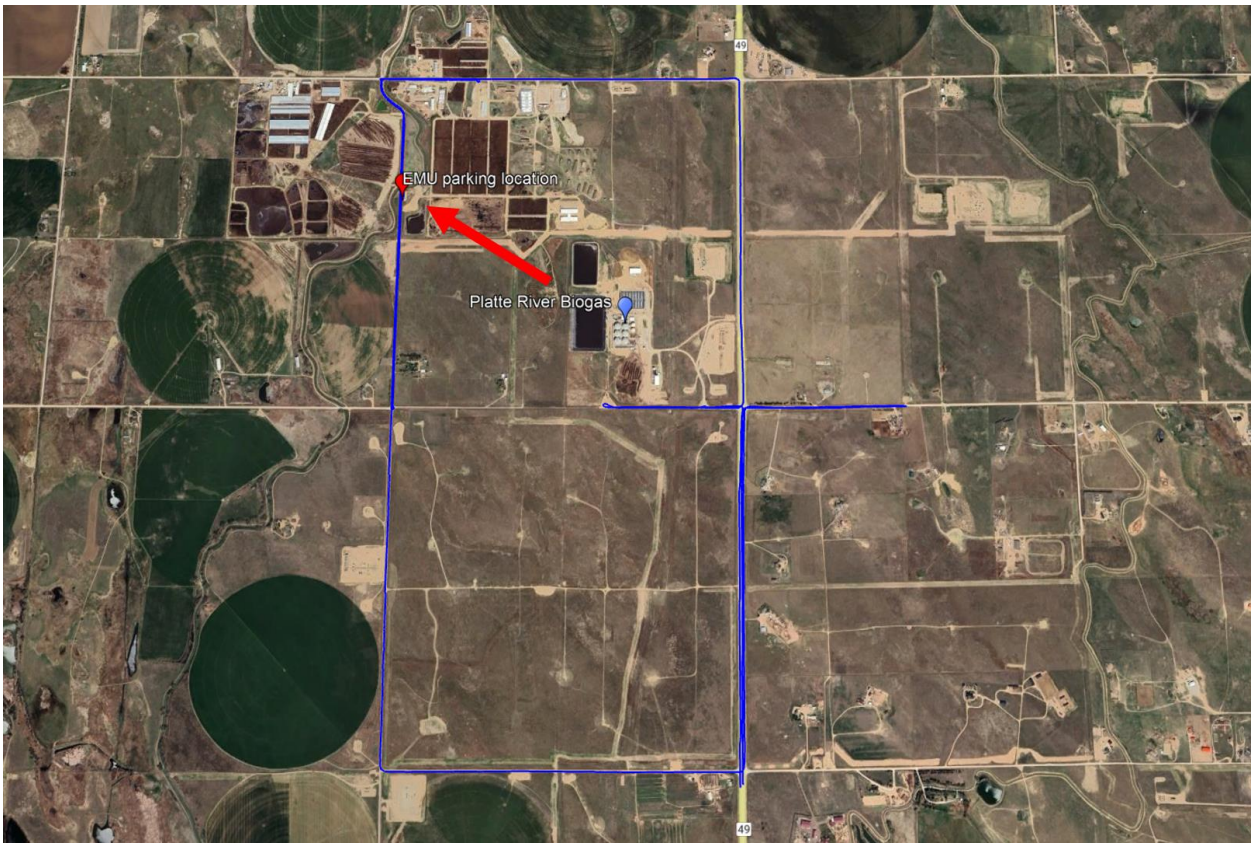

Figure 1. A map of the EMU drive path for the deployment to the area surrounding Platte River Biogas on December 16, 2024. The EMU drive path is shown as a blue line. The location of Platte River Biogas is shown as a blue marker (40.279°N, 104.608°W). The location where the EMU was parked from 11:43 a.m. to 12:43 p.m. MST is shown as a red marker (40.285°N, 104.621°W). The red arrow indicates the average wind direction.

The EMU is equipped with four instruments used for sampling ambient air toxics: a Tofwerk Vocus Eiger Proton-Transfer-Reaction Time-of-Flight Mass Spectrometer (PTR-ToF-MS), a Tofwerk Vocus B AIM Chemical Ionization Mass Spectrometer (CIMS), a Picarro Cavity Ring-Down Spectroscopy (CRDS) instrument, and a Gill Instruments MaxiMet meteorological station. All four of these instruments were fully operational for the duration of the deployment in the area surrounding Platte River Biogas. The chemical compounds and parameters measured by these four instruments are summarized in Table 1.

Table 1. EMU instrumentation summary

Manufacturer	Instrument	Measured parameters
Tofwerk	Vocus Eiger Proton-Transfer-Reaction Time-of-Flight Mass Spectrometer (PTR-ToF-MS)	Benzene, toluene, xylene, methanethiol, acetone, acetonitrile, acetaldehyde, butadiene, methyl ethyl ketone, hexene, tetrachloroethylene, trimethylbenzene
Tofwerk	Vocus B AIM Chemical Ionization Mass Spectrometer (CIMS)	Hydrogen cyanide, toluene
Picarro	Cavity Ring-Down Spectroscopy (CRDS) instrument	Hydrogen sulfide, methane, water vapor
Gill Instruments	Maximet GMX500	Pressure, temperature, relative humidity, wind speed & direction, GPS location, speed, heading

While parked 4,000 feet downwind of Platte River Biogas, the EMU intermittently but consistently measured elevated concentrations of hydrogen sulfide (H_2S) and methane (CH_4). While parked, the measured concentrations of methanethiol (CH_3SH) and benzene (C_6H_6) were almost entirely below the instrument detection limits of 0.2 ppbv and 0.3 ppbv for methanethiol and benzene, respectively. A time series of the concentrations of these four compounds, along with the air temperature, wind direction, and wind speed, is provided in Figure 2. A map of the EMU drive path, color-coded by H_2S concentration, is provided in Figure 3. Detailed measurement statistics for the time period when the EMU was parked are provided in Table 2.

It should be noted that the day of deployment was relatively cold, with air temperatures ranging from 3.3 to 7.7°C or 37.9 to 45.9°F (Figure 2). Also, as noted in the previous report, the Platte River Biogas facility may have ramped down operations for winter. Therefore, the conditions during the EMU deployment may not necessarily reflect standard operating conditions, especially during the summer months.

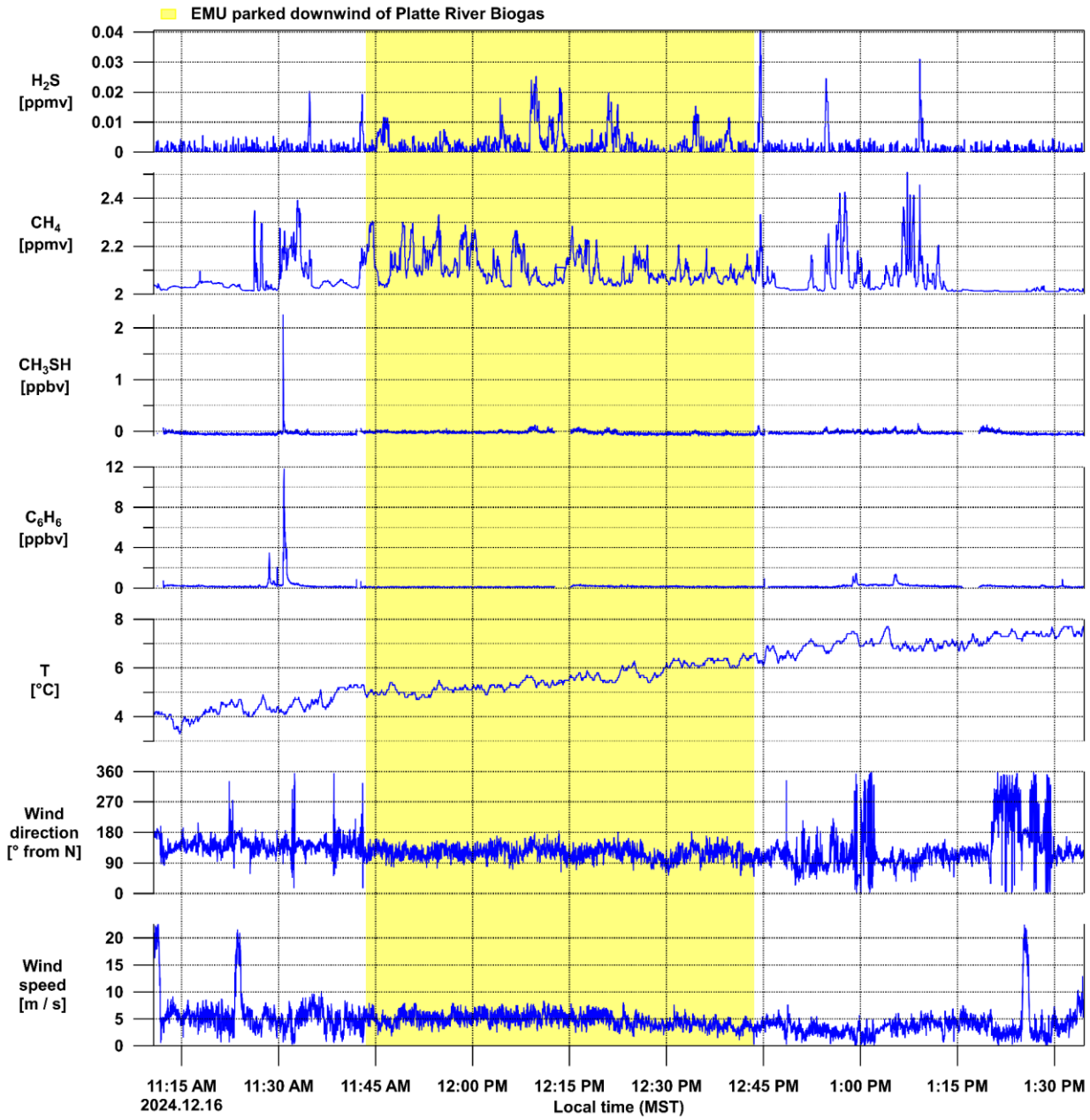

Figure 2. Time series of hydrogen sulfide, methanethiol, methane, benzene, temperature, wind direction, and wind speed as measured by the EMU in the area surrounding Platte River Biogas on December 16, 2024. The wind direction is shown as degrees clockwise from north (0° = from north; 90° = from east; 180° = from south). The yellow shading indicates the time period when the EMU was parked 0.75 miles downwind of Platte River Biogas.

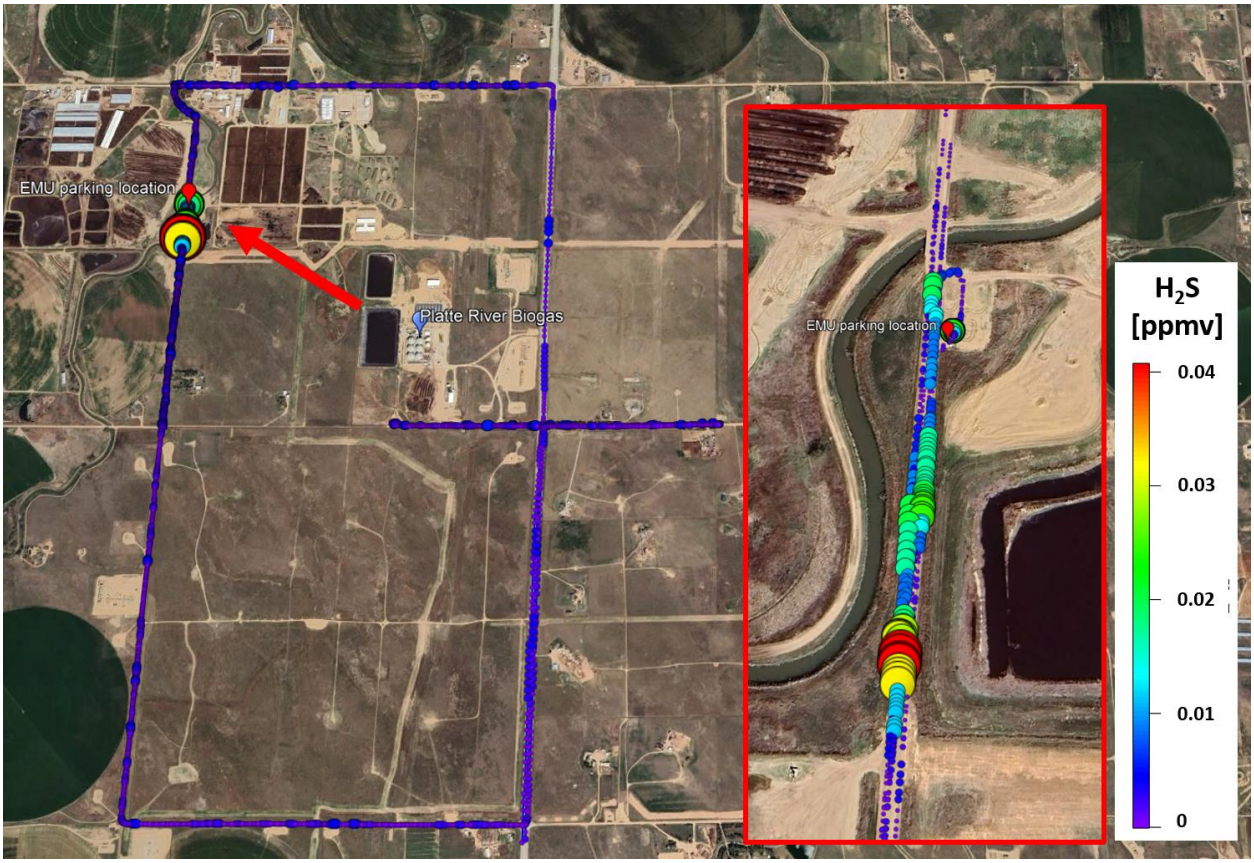

Figure 3. Map of ambient H_2S measurements in the area surrounding Platte River Biogas on December 16, 2024. The circular marker size and color indicates the ambient two-second H_2S concentration. The red arrow indicates the average wind direction. The red inset shows the area downwind of Platte River Biogas where the highest ambient H_2S concentrations were observed.

Table 2. Measurement statistics for the time period when the EMU was parked downwind of Platte River Biogas (11:43 a.m. to 12:43 p.m. MST) on December 16, 2024.

Parameter	Average	Standard deviation	Minimum	Maximum
H_2S	< 0.006 ppmv	< 0.006 ppmv	< 0.006 ppmv	0.025 ppmv
CH_4	2.107 ppmv	0.063 ppmv	2.028 ppmv	2.331 ppmv
CH_3SH	< 0.2 ppbv	< 0.2 ppbv	< 0.2 ppbv	< 0.2 ppbv
C_6H_6	< 0.3 ppbv	< 0.3 ppbv	< 0.3 ppbv	0.4 ppbv
Air temperature	5.5°C	0.5°C	4.7°C	6.6°C
Wind direction clockwise from N	120.6°	18.9°	52°	185°
Wind speed	4.9 m / s	1.2 m / s	1.0 m / s	8.4 m / s