2023 Q3 SENSOR REPORT
COMMERCE CITY NORTH DENVER COMMUNITY AIR MONITORING NETWORK
COMMERCE CITY, COLORADO

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Executive Summary

In response to feedback received by Suncor Energy (U.S.A.) Inc. (Suncor) through community engagement conducted in the fall of 2020, Suncor voluntarily committed to developing a continuous, near real-time air monitoring program to gain insight into air quality for neighborhoods in the vicinity of the Suncor refinery in Commerce City, Colorado. Montrose Environmental Group - Air Quality Services, LLC (Montrose) was contracted by Suncor to deploy, operate, and maintain the network in the Commerce City and North Denver (CCND) neighborhoods. Air monitoring was accomplished through three separate technical approaches: (1) continuous, near real-time monitoring for the following analytes[1]: carbon monoxide (CO), sulfur dioxide (SO_2), hydrogen sulfide (H_2S), nitrogen oxide or nitric oxide (NO), nitrogen dioxide (NO_2), particulate matter ($PM_{2.5}$), and total volatile organic compounds (VOCs); (2) periodic collection and laboratory analysis for the presence of specific VOCs from 6-liter evacuated stainless steel ("Summa") canisters; and (3) periodic real-time air monitoring throughout neighborhoods using a mobile monitoring van to detect the presence of specific VOCs. This report details approach number one, continuous near real-time air monitoring and a screening health risk analysis. Periodic collection and analysis of Summa canister air samples and mobile monitoring van data are presented in separate reports.

Continuous air monitoring sensors were operating at 10 locations across the CCND neighborhoods. The second quarter of 2023 air monitoring preliminary data was made available in near real-time at ccnd-air.com from July 1 – September 30, 2023, and final data is presented in this report. The sensors used in this program integrate different technologies including a photoionization detector for VOCs; an electrochemical sensor for CO, NO, NO_2, H_2S, and SO_2; laser scattering for $PM_{2.5}$; and a sonic anemometer for wind speed and direction. Program updates were made during August 2023. Refer to Section 5.0 "Program Changes" for an updated list of electrochemical sensors. Table 1-6 indicates the sensor swap timeline and removal of NO as an analyte. All sensor monitoring was conducted in accordance with the Quality Assurance Project Plan (QAPP) available at ccnd-air.com/documents.

Health scientists from CTEH, LLC (CTEH®) (a subsidiary company of Montrose Environmental Group) evaluated the air monitoring data and compared them to air quality standards, health-based reference values, and previously published regional data to determine if the measured air quality may have the potential for adverse effects on community health.

The results of this assessment indicate the following:

- The monitored analyte levels at all locations were below their respective acute health-based reference levels, if available, or within the range of previously published regional data provided by the Colorado Department of Public Health and Environment (CDPHE) Air Pollution Control Division (APCD).

[1] An "analyte" is a material that a measuring device is designed to detect and measure. It may be a chemical gas, an airborne particle, or other type of material.

- SO_2 was the only analyte found to be above its NAAQS 1-hour reference level at a single location. This may be due to sensor exposure from duct exhaust on the roof at location CM9.

- It should be noted that the National Ambient Air Quality Standards (NAAQS) comparisons are used in the CCND Air Monitoring program for reference use only and may not be used to determine air quality compliance. This is because NAAQS compliance must be determined through the use of regulatory-certified instrumentation and required calculation methodology further discussed in section 2.

1.0 INTRODUCTION

In response to feedback received by Suncor Energy (U.S.A.) Inc. (Suncor) through community engagement conducted in the fall of 2020, Suncor voluntarily committed to developing a continuous, near real-time air monitoring program to gain insight into air quality for neighborhoods in the vicinity of the Suncor refinery in Commerce City, Colorado. Montrose Environmental Group-Air Quality Services, LLC (Montrose) was contracted by Suncor to deploy, operate, and maintain the network in the Commerce City and North Denver (CCND) neighborhoods. Air monitoring was accomplished through three separate technical approaches: (1) continuous, near real-time monitoring for the following analytes: carbon monoxide (CO), sulfur dioxide (SO_2), hydrogen sulfide (H_2S), nitric oxide (NO), nitrogen dioxide (NO_2), particulate matter ($PM_{2.5}$), and total volatile organic compounds (VOCs); (2) periodic collection and laboratory analysis for the presence of specific During the month of August, changes were made to remove NO from the program. For more information, please reference Section 5.0 “Program Changes”. Table 1-6 indicates the sensor swap timeline and removal of NO as an analyte. VOCs from Summa canisters; and (3) periodic real-time air monitoring throughout neighborhoods using a mobile monitoring van to detect presence of specific VOCs. An “analyte” is a material that a measuring device is designed to detect and measure. It may be a chemical gas, an airborne particle, or other type of material. This report details approach number one, the continuous, near real-time monitoring for the analytes listed. The Summa canister sampling and mobile monitoring van data are presented in separate reports. Air monitoring, sampling, and analysis from approaches (1) and (2) were conducted in accordance with the Quality Assurance Project Plan (QAPP) that can be found online at https://www.ccnd-air.com/Documents/.

1.1 Air Monitoring Site Description

Continuous air monitoring sensors were installed at ten locations across CCND neighborhoods within a three-mile radius of refinery operations in July 2021 (CM1-CM8). Two additional monitoring sensors were installed in December 2021 (CM9) and March 2022 (CM10). The monitor locations are shown in Figure 1-1 and described in Table 1-1; and were selected based on the following criteria:

- Historical wind pattern data
- Proximity to the refinery and non-refinery sources
- Existing infrastructure, as well as site access and safety
- Community feedback

FIGURE 1-1
MAP OF CCND MONITOR LOCATIONS

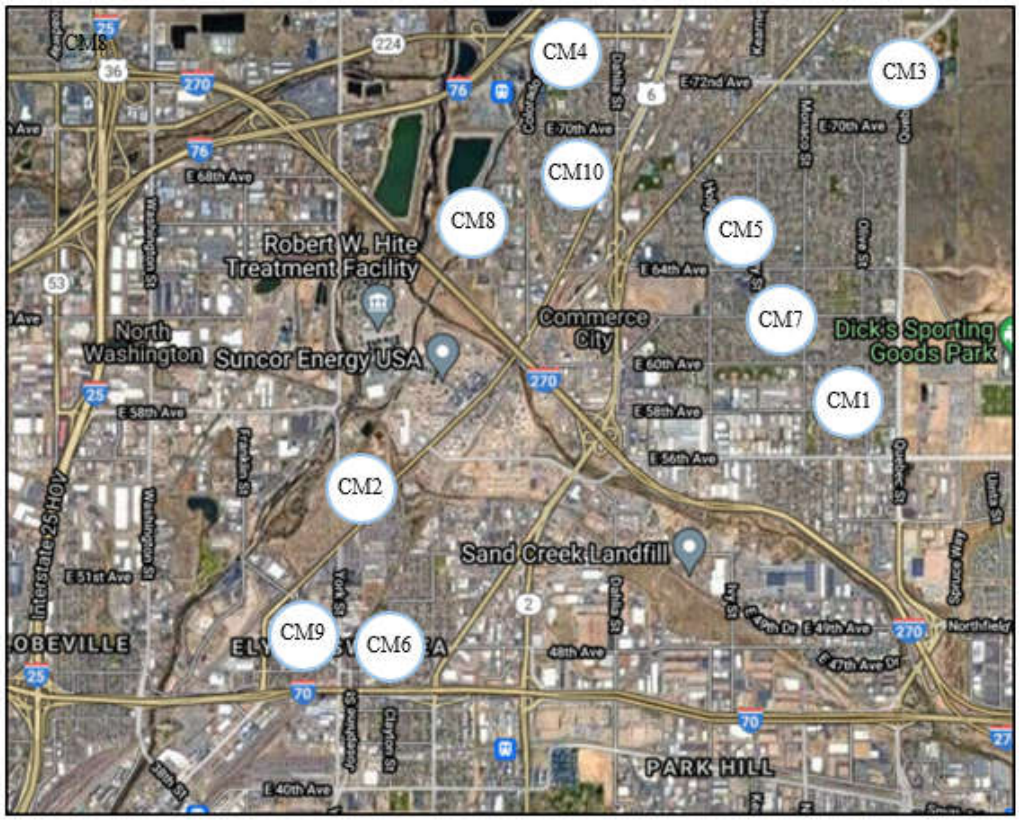


TABLE 1-1
CCND MONITORS AND SUMMA CANISTER SAMPLING LOCATIONS

Location ID	Secondary ID	GPS Coordinates	Distance from Refinery Center (miles)	Cross Streets
CM1	Rose Hill Elementary School	39.80164, -104.90882	2.0	E. 58th Ave. & Oneida St., Commerce City
CM2	Suncor Refinery Business Center	39.79630, -104.95727	0.70	Brighton Blvd. & York St., Commerce City
CM3	Adams City High School	39.82736, -104.90193	2.9	E. 72nd Ave. & Quebec Pkwy, Commerce City
CM4	Adams City Middle School	39.82893, -104.93499	1.9	Birch St. & E. 72nd Ave., Commerce City
CM5	Central Elementary School	39.81457, -104.91928	1.7	Holly St. & E. 64th Ave., Commerce City
CM6	Focus Points Family Resource Center	39.78436, -104.95663	1.4	Columbine St. & 48th Ave., Denver
CM7	Kearney Middle School	39.80888, -104.91545	1.7	E 62nd Ave. & Kearney St., Commerce City
CM8	Monroe	39.81560, -104.94503	0.85	Monroe St. & E 64th Ave., Denver
CM9	48th and Race	39.78455, -104.96264	1.7	East 48th Ave. & Race St., Denver
CM10	Alsup Elementary School	39.820268, -104.936616	1.2	East 68th Ave. & Birch St., Commerce City

2.0 METHODS

2.1 Continuous Monitoring

The sensors used in the CCND network were manufactured by Lunar Outpost (Canary-S sensor), a Colorado-based company, and AQMesh (Pod), a United Kingdom-based company and SensIT (RAMP), an Indiana-based company. The near-Federal Equivalency Method (FEM) AQM65 monitors used for quality assurance of the network were manufactured by Aeroqual, a New Zealand-based company. Each sensor is solar powered and transmits data to the data platform via Long Term Evolution (LTE) cell technology. The monitoring in the community is being performed using a variety of technology, as described in Table 1-2 and Table 1-3.

TABLE 1-2
CCND MONITORING TECHNOLOGY PRIOR TO SENSOR CHANGE

Air Pollutant/Parameter Category	Principle of Operation	Sensor Manufacturer
Total VOC	Photoionization Detector	Lunar Outpost
SO_2	Electrochemical Sensor	AQMesh
CO	Electrochemical Sensor	AQMesh
NO_2	Electrochemical Sensor	AQMesh
NO	Electrochemical Sensor	AQMesh
H_2S	Electrochemical Sensor	AQMesh
$PM_{2.5}$	Laser Scattering	Lunar Outpost
Wind Speed, Wind Direction	Sonic Anemometer	Lunar Outpost
Temperature, Relative Humidity, Barometric Pressure	Solid State	Lunar Outpost

TABLE 1-3
CCND MONITORING TECHNOLOGY POST SENSOR CHANGE

Air Pollutant/Parameter Category	Principle of Operation	Sensor Manufacturer
Total VOC	Photoionization Detector	SensIT
SO_2	Electrochemical Sensor	SensIT
CO	Electrochemical Sensor	SensIT
NO_2	Electrochemical Sensor	SensIT
H_2S	Electrochemical Sensor	SensIT
$PM_{2.5}$	Laser Scattering	SensIT
Wind Speed, Wind Direction	Sonic Anemometer	SensIT
Temperature, Relative Humidity, Barometric Pressure	Solid State	SensIT

The sensors monitor the ambient air by allowing it to passively enter each sensor's exterior housing via small holes and pass over the surface of the sensor. The AQM65 monitors the ambient air via a pump that pulls the sample into the individual analyte specific gas modules for analysis. Each device used in this project is solar-powered and transmits data via cellular communication.

The Photoionization Detector (PID) sensors used to measure VOCs contain a lamp that produces photons that carry enough energy to break molecules into ions. The PID responds to molecules that have an ionization energy at or below the energy of the lamp; the PID used on this project employs a 10.6 electron-volt lamp. The produced ions then generate an electrical current that is measured as the output of the detector. PIDs are known to drift with ambient temperature and humidity variation. The PIDs used in this program mitigate the humidity issue by having a hydrophobic filter installed between the lamp and the ambient air. This deters water molecules from entering the ion-producing chamber and absorbing radiation. The PIDs are also heated slightly above ambient temperature to improve the stability of the detector.

Electrochemical sensors measure the concentration of a specific gas (SO_2, CO, NO, NO_2, and H_2S) within an external circuit via oxidation or reduction reactions. These reactions generate the positive or negative current flow through the external circuit. An electrochemical sensor is made up of a working, counter, and reference electrode. All these components sit inside of a sensor housing along with a liquid electrolyte that is specific to the compound of interest. Temperature and relative humidity are known to affect the electrochemical sensors being used and could influence data quality. The AQMesh Pods devices collect sensor temperature and ambient relative humidity data to mitigate the impact of these interferences via algorithms that were developed during extensive global comparisons with reference data. SensIT RAMP devices similarly collect temperature and ambient relative humidity data along with an active sampling and heating mechanism to mitigate the impact of these interferences. AQMesh Pod and SensIT RAMP non-zero readings that are below the instrument's detection limit may be artifacts of the manufacturer's algorithm. Extreme temperature and humidity conditions can cause the liquid electrolyte to dry up and cause erratic readings on the monitors. The AQMesh Pod monitors conditions that can cause these erratic readings and automatically invalidates this data to improve the overall quality of the data the sensors are reporting.

Additionally, electrochemical sensors have known cross-sensitivity to other compounds. For example, ozone causes a response in the NO_2 sensor. This issue is mitigated by using an ozone filter on the face of the NO_2 sensor. Similarly, the SO_2 sensor can have a response caused by the presence of H_2S. Again, the SO_2 sensor has a built-in filter to mitigate the H_2S interference. The SO_2 sensor has additional interference from NO_2. The AQMesh data processing algorithms incorporate any data correction for these interferences.

The sensor data are intended to be used for informational purposes only and cannot be used for official compliance determinations. The accuracy of sensors used in the program are not as high as certified ambient air monitoring equipment used by federal and local officials for NAAQS compliance monitoring. The sensors' detection limits and accuracy can be found in the QAPP online at https://www.ccnd-air.com/Documents/. State regulatory compliance data can be found on the CDPHE air quality website at https://www.colorado.gov/airquality .

The sampled particles are measured by the physical principle of light scattering. Each single particle is illuminated by a defined laser light and each scattering signal is detected at an angle of 90° by a photo diode. In accordance with the Mie theory, each measured pulse height is directly

proportional to the particle size whereas each pulse is classified in an electronic register of 32 different size channels.

Sensors like the Lunar Outpost Canary-S, AQMesh Pod and SensIT RAMP are also known to produce data that is noisier (lower signal-to-noise ratio) than traditional regulatory reference method quality ambient air monitoring equipment. To mitigate this issue, the data were averaged at one or 24-hours to improve the signal-to-noise of the instrument readings.

All sampling and quality assurance procedures were performed by Montrose.

2.2 Assessment of Community Health Implications

Health scientists from CTEH, LLC (CTEH®) (a subsidiary company of Montrose) evaluated the air monitoring data collected by Montrose from July 1, 2023, through September 30, 2023. Results were compared to various standards, health-based reference levels, and previously published regional data to determine if the measured air quality may have the potential for adverse health effects within the surrounding communities.

The analytes CO, NO_2, SO_2, and $PM_{2.5}$ are all listed by the United States Environmental Protection Agency (USEPA) as "criteria air pollutants". These analytes were identified in the U.S. federal Clean Air Act as airborne pollutants that, at certain levels, may adversely impact public health and welfare and for which NAAQS would be established and updated based on the periodically reviewed scientific data associating criteria pollutant levels and public health impacts. Unlike chemical-specific health reference values, the NAAQS provide air quality standards designed to protect public health at the regional level.

The determination that a criteria pollutant is at a level legally required to be mitigated comes from evaluation of one year (CO) to three years (NO_2, SO_2, and $PM_{2.5}$) of air monitoring data[2] collected by regulatory-grade instrumentation. If the maximum or average analyte levels in this report are higher than their respective NAAQS, it does not indicate a violation of the NAAQS or that adverse health effects are likely. Any measurement of a criteria air pollutant over its respective NAAQS reference concentration must be evaluated in the context of one to three years of data previously collected. For example, a 1-hour average value above the NO_2 standard concentration would not constitute an exceedance of the NO_2 NAAQS. To be a NAAQS exceedance, a measurement must be made by a regulatory grade instrument and compared to one-hour daily maximum concentration measurements, averaged over three years, to determine whether it is part of the 98^{th} percentile or higher. However, the data reported herein may be used to determine trends in criteria pollutant levels in the CCND communities.

H_2S and NO are not criteria air pollutants but were selected to be monitored because of the potential to produce reactive nitrogen compounds in the air (NO), or because of presence in some grades of crude oil and its refined products (H_2S). Although NO does not have a health-based reference value, average and maximum NO levels for the Front Range region have been previously measured and reported by the CDPHE Air Pollution Control Division (APCD)[3]. The maximum and average NO levels measured by Montrose from July 1 to August 11, 2023 were compared to the regional values reported by APCD. During the month of August, changes were

[2] USEPA NAAQS Table, available online at https://www.epa.gov/criteria-air-pollutants/naaqs-table
[3] CO APCD 2020 Air Quality Data Report, available online at https://www.colorado.gov/airquality/tech_doc_repository.aspx?action=open&file=2020AnnualDataReport.pdf

made to remove NO from the program. The health reference values for H_2S were developed by the Agency for Toxic Substances and Disease Registry (ATSDR)[4]. The ATSDR acute health-based reference levels (one day to two weeks of continuous exposure) is a health reference value below which continuous exposure is likely to be without risk of developing adverse health effects, even in sensitive sub-populations. Maximum one-hour rolling average H_2S levels recorded in each CCND neighborhood were compared to an ATSDR acute-health-based reference level.

Finally, the USEPA has established values for use in emergency situations, termed Acute Exposure Guideline Levels (AEGLs). Unlike health-based reference levels that can be thousands of times below exposure levels where adverse effects are observed, AEGL values are levels at which different acute adverse health effects may be anticipated to occur. According to USEPA, "AEGL-1 represent exposure levels that could produce mild and progressively increasing but transient and non-disabling odor, taste, and sensory irritation or certain asymptomatic, non-sensory effects. With increasing airborne concentration above each AEGL, there is a progressive increase in the likelihood of occurrence and the severity of effects described for each corresponding AEGL [i.e., AEGL-2 or AEGL-3]." The AEGL-1 60-minute value, if available for the applicable compound, was also used for comparison purposes because it is more precautionary (than AEGL-2 or AEGL-3) as the AEGL-1 level reflects potential health impacts that are reversible upon cessation of exposure. The AEGL-1 60-minute values for H_2S (510 ppb), NO_2 (500 ppb), and SO_2 (200 ppb) were also listed for comparison purposes. The USEPA did not derive an AEGL-1 value for CO, therefore an AEGL-2 (83 ppm) was selected.

2.3 Summary of Downtime or Equipment Malfunction

Data recovery is a percentage of the number of data points collected divided by the expected number of data points. For example, if a data point is expected every five minutes, 12 data points would be expected over a one-hour period. If only 11 data points were received, the data recovery for that hour would be 92%. The data recovery during the reporting period meets the QAPP targets and are presented in Table 1-4.

[4] ATSDR MRL List available online at https://wwwn.cdc.gov/TSP/MRLS/mrlsListing.aspx

TABLE 1-4
CCND MONITORING DATA RECOVERY

Location ID	AQMesh/SensIT (excludes periods of adverse atmospheric conditions)	AQMesh/SensIT (includes periods of adverse atmospheric conditions)	Lunar Outpost
CM1	100.0%	92.4%	99.7%
CM2	100.0%	89.8%	99.2%
CM3	100.0%	93.0%	96.7%
CM4	100.0%	93.0%	99.3%
CM5	100.0%	92.7%	99.7%
CM6	100.0%	92.0%	93.1%
CM7	100.0%	93.7%	99.8%
CM8	100.0%	89.0%	99.8%
CM9	100.0%	92.1%	99.7%
CM10	100.0%	88.4%	92.6%

Data recovery may be below 100% for several reasons, including instrument malfunction, instrument communication issues, monitor downtime when performing quality assurance procedures, etc. In alignment with the QAPP, data recovery does not include downtime when adverse atmospheric conditions such as extreme humidity, extreme temperature, and other conditions can affect a monitor's ability to provide reliable data.

The AQMesh Pod internal quality assurance and procedures automatically invalidates this data to improve the overall quality of the data the sensors are reporting.

3.0 RESULTS

3.1 Results Summary

The one-hour rolling average results for CO, NO, NO_2, $PM_{2.5}$, H_2S, SO_2, and VOCs during this reporting period can be found in Table 1-5 and Figures 1-3 through 1-9. The gaseous (CO, NO, NO_2, H_2S, SO_2, and VOC) data is reported on a one-hour rolling average updated every 5 minutes. The $PM_{2.5}$ data presented on the website is a one-hour block average to align with the other $PM_{2.5}$ sensor-based monitoring programs around the local community. The 24-hour block average for $PM_{2.5}$ and rolling average for H_2S are also reported. Values reported as zero do not necessarily mean that the analyte is not present, but instead indicates that the analytes' concentration, if present, is below the detectable level of the instrument.

This evaluation includes screening values from the USEPA NAAQS, EPA AEGL, and ATSDR Minimal Risk Level (MRL). The Clean Air Act requires USEPA to set NAAQS for criteria air pollutants. AEGLs are used by emergency planners and responders worldwide as guidance for emergency response situations. Health reference levels, such as MRLs provided by the ATSDR, are intended to serve as a screening tool to help public health professionals determine where further evaluation may be needed. As explained above in Section 2.2, if the maximum or average analyte levels in this report are higher than their respective NAAQS reference level, it does not indicate an exceedance of the NAAQS or that adverse health effects are likely. Table 1-5 and Figures 1-3 to 1-9 indicate readings for the monitoring period relative to the NAAQS and MRLs (if applicable).

TABLE 1-5
CCND MONITORS RESULTS SUMMARY

Analyte	Range Across Network[5]	NAAQS Reference Values	Health-based Reference Value (Source)
CO	<0.1 – 9.3 ppm (1-hour average)	**35 ppm** (1-hour average not to be exceeded more than one per year)	**83 ppm** (1-hour USEPA AEGL-2)
NO	<10 - 72 ppb (1-hour average)	NA	NA
NO_2	<10 - 68 ppb (1-hour average)	**100 ppb** (98^{th} percentile of 1-hour daily maximum, averaged over 3 years)	**500 ppb** (1-hour USEPA AEGL-1)
SO_2	<30-86 ppb (1-hour average)	**75 ppb** (99^{th} percentile of 1-hour daily maximum concentrations, averaged over 3 years)	**200 ppb** (1-hour USEPA AEGL-1)
H_2S	<30 ppb (24-hour average)	NA	**70 ppb** (acute[6] ATSDR MRL)
H_2S	<30-52 ppb (1-hour average)	NA	**510 ppb** (1-hour USEPA AEGL-1)
$PM_{2.5}$	<3 - 44 µg/m^3 (24-hour average)	**35 µg/m^3** (98^{th} percentile of 24-hour daily average concentrations, averaged over 3 years)	NA
Total VOC	<0.3 – 2.24 ppm (1-hour average)	NA	NA

[5] The "<" symbol indicates that the recorded concentration was less than the instrument's detection limit
[6] An acute exposure is defined by ATSDR as 1-14 days

3.2 Carbon Monoxide (CO)

Figure 1-2 shows the one-hour rolling averages of CO from July 1, 2023, through September 30, 2023. The USEPA NAAQS for CO is 35 ppm as a one-hour average not to be exceeded more than once per year. Figure 1-3 shows that all the measured one-hour average CO values in all CCND neighborhoods were more than 3-times lower (maximum 1-hour average: 9.3 ppm) than the CO NAAQS reference level. Further, the maximum one-hour measured CO values in the CCND neighborhoods were more than 8-times lower than the one-hour USEPA AEGL-2 of 83 ppm.

3.3 Nitric Oxide (NO)

Figure 1-3 shows the one-hour rolling averages of NO from July 1, 2023, through August 11, 2023. There are no established USEPA NAAQS, health-based reference level, or USEPA AEGL-1 value for NO since NO demonstrates low toxicity and is naturally occurring in the human body[7]. Thus, measured NO levels were compared to NO levels published by APCD in 2021[8]. The annual average NO levels reported by APCD for Denver (four locations), Jefferson County, and Weld County ranged from 0.7 to 30 ppb, (maximum levels ranged from 32 to 386 ppb), while the maximum one-hour rolling average NO values by site measured by Montrose in the CCND neighborhoods concentration ranged from 22 - 72 ppb. NO was removed from the monitoring plan in the month of August.

3.4 Nitrogen Dioxide (NO_2)

Figure 1-4 shows the one-hour rolling averages of NO_2 from July 1, 2023, through September 30, 2023. The USEPA NAAQS for NO_2 is 100 ppb as the 98th percentile of one-hour daily maximum concentrations, averaged over three years. Figure 1-5 shows that all measured 1-hour average NO_2 values in all CCND neighborhoods (maximum 1-hour average: 68 ppb) were at least 32% lower than the NO_2 NAAQS concentration. Thus, NO_2 levels such as those measured in the CCND neighborhoods would not contribute to an annual exceedance of the NAAQS. Further, the maximum measured one-hour average NO_2 concentration across all the CCND neighborhoods was at least seven times lower than the one-hour USEPA AEGL-1 for NO_2 of 500 ppb.

3.5 Sulfur Dioxide (SO_2)

Figure 1-5 shows the one-hour rolling averages of SO_2 from July 1, 2023, through September 30, 2023. The USEPA NAAQS for SO_2 is 75 ppb as 99th percentile of one-hour daily maximum concentrations, averaged over three years. Figure 1-6 shows a maximum one-hour average SO_2 value of 86 ppb from the CM9 location, which occurred September 7, from 9:55-11:55. There were no readings greater than 75 ppb at other monitoring locations. This concentration may have been due to the sensor being exposed to a building exhaust duct, located on the roof near CM9. A technician noted the smell of fumes in the air near the exhaust duct, while on a site visit the following day to collect a triggered sample and noted that the building was occupied by a construction company and a business operating a paint spray booth. During this same time period, CO concentrations were also elevated, possibly due to fumes from the vent. However, this exceedance does not necessarily indicate a NAAQS violation.

[7] https://www.epa.gov/sites/default/files/2014-11/documents/nitrogen_oxides_volume_11.pdf
[8]Colorado Air Pollution Control Division. 2021 Air Quality Data Report, dated November 4, 2022. Available online at: https://www.colorado.gov/airquality/tech_doc_repository.aspx?action=open&file=2021AnnualDataReport.pdf

Further, the maximum measured one-hour average SO_2 concentrations measured across all the CCND neighborhoods are more than 2.3-times lower than the one-hour USEPA AEGL-1 for SO_2 of 200 ppb.

3.6 Hydrogen Sulfide (H_2S)

Figures 1-6A and 1-6B show the one-hour and 24-hour rolling averages of H_2S, respectively, from July 1, 2023, through September 30, 2023. The maximum 24-hour average was less than the instrument detection limit of 30 ppb from all CCND neighborhoods and is below the ATSDR acute-duration MRL of 70 ppb, thus, it is unlikely that H_2S levels measured in the CCND neighborhoods would result in an increased risk of adverse acute health effects. Further, the maximum measured one-hour average H_2S values (maximum 1-hour average: 52 ppb) in the CCND neighborhoods are more than 9-times lower than the one-hour USEPA AEGL-1 for H_2S of 510 ppb.

3.7 Particulate Matter ($PM_{2.5}$)

Figures 1-7A and 1-7B show the one-hour and 24-hour block averages of $PM_{2.5}$, respectively, from July 1, 2023, through September 30, 2023. The USEPA NAAQS for $PM_{2.5}$ is 35 µg/m^3 as 98th percentile of 24-hour daily (block) average concentrations, averaged over 3 years. The measured 24-hour averages were below the NAAQS concentration at all CCND sensor locations.

3.8 Total Volatile Organic Compounds (VOC)

Figure 1-8 shows the one-hour rolling averages of total VOCs from July 1, 2023, through September 30, 2023. The measured maximum one-hour average across this reporting period was 2.24 ppm. There are no NAAQS or health-based reference values for total VOCs because this measurement may be made of one to thousands of different chemical compounds having various thresholds of toxic effects.

VOC sensor-triggered samples were collected automatically when instantaneous total VOCs were detected at an airborne concentration of 1 part per million (ppm) or higher for one minute or longer. During the third quarter of 2023, total VOC levels went above 1 ppm four times, which triggered the capture of four air samples. The results of the sensor-triggered events and health risk evaluations are presented in separate reports found at ccnd-air.com/Documents.

4.0 CONCLUSIONS

Continuous air monitoring sensors were operating at ten locations across the CCND neighborhoods during the monitoring period. The air monitoring data from July-September 2023 was compared to air quality standards, health-based reference values, and previously published regional data to determine if the measured air quality may have the potential for adverse effects on community health.

The results of this assessment indicate the following:

- The monitored analyte levels at all locations were below their respective acute health-based reference levels, if available, or within the range of previously published regional

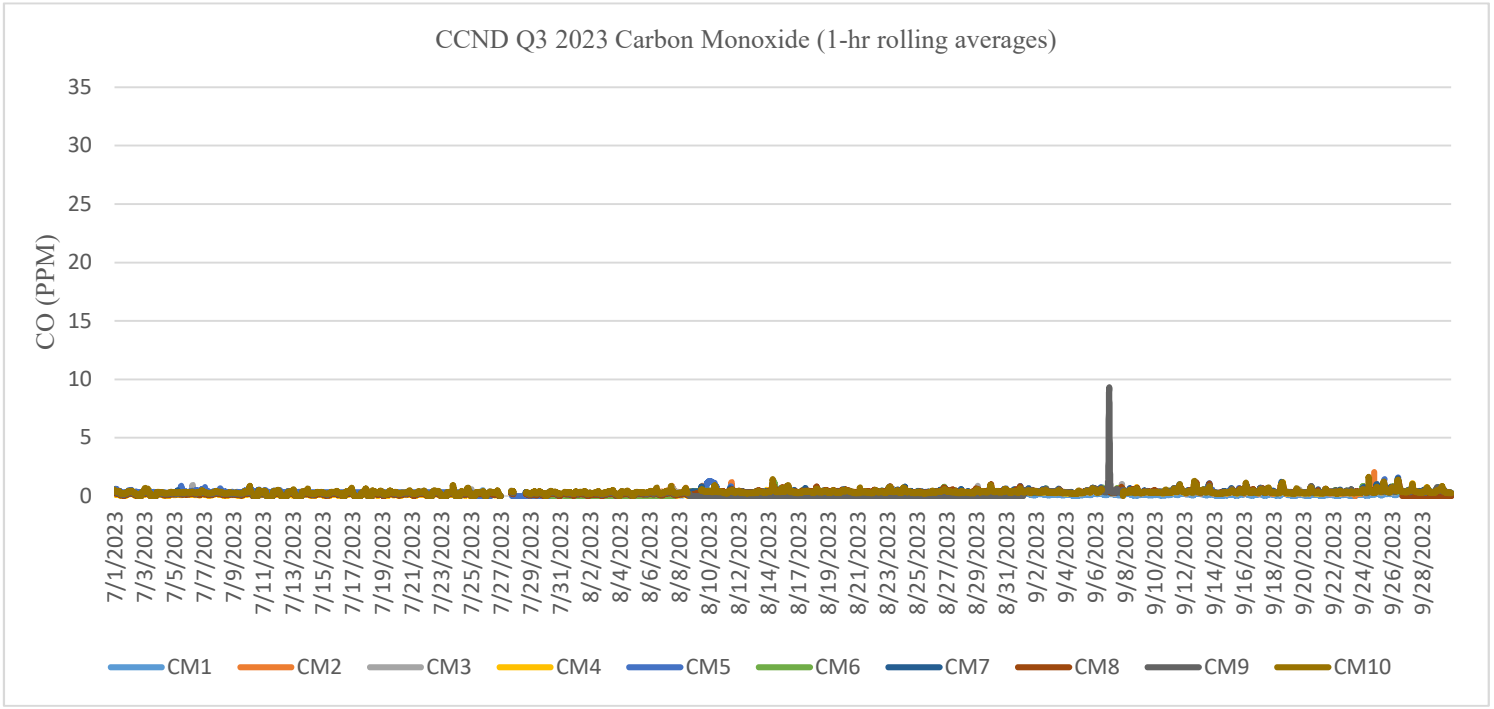
data provided by the Colorado Department of Public Health and Environment (CDPHE) Air Pollution Control Division (APCD).

- SO_2 was the only analyte found to be above its NAAQS 1-hour reference level at a single location. This may be due to sensor exposure from duct exhaust on the roof at location CM9.

- It should be noted that the NAAQS comparisons are used in the CCND Air Monitoring program for reference use only and may not be used to determine air quality compliance. This is because NAAQS compliance must be determined through the use of regulatory certified instrumentation and required calculation methodology further discussed in section 2 of this report.

FIGURE 1-2
CCND COMMUNITY MONITORING CARBON MONOXIDE (CO) DATA[9]

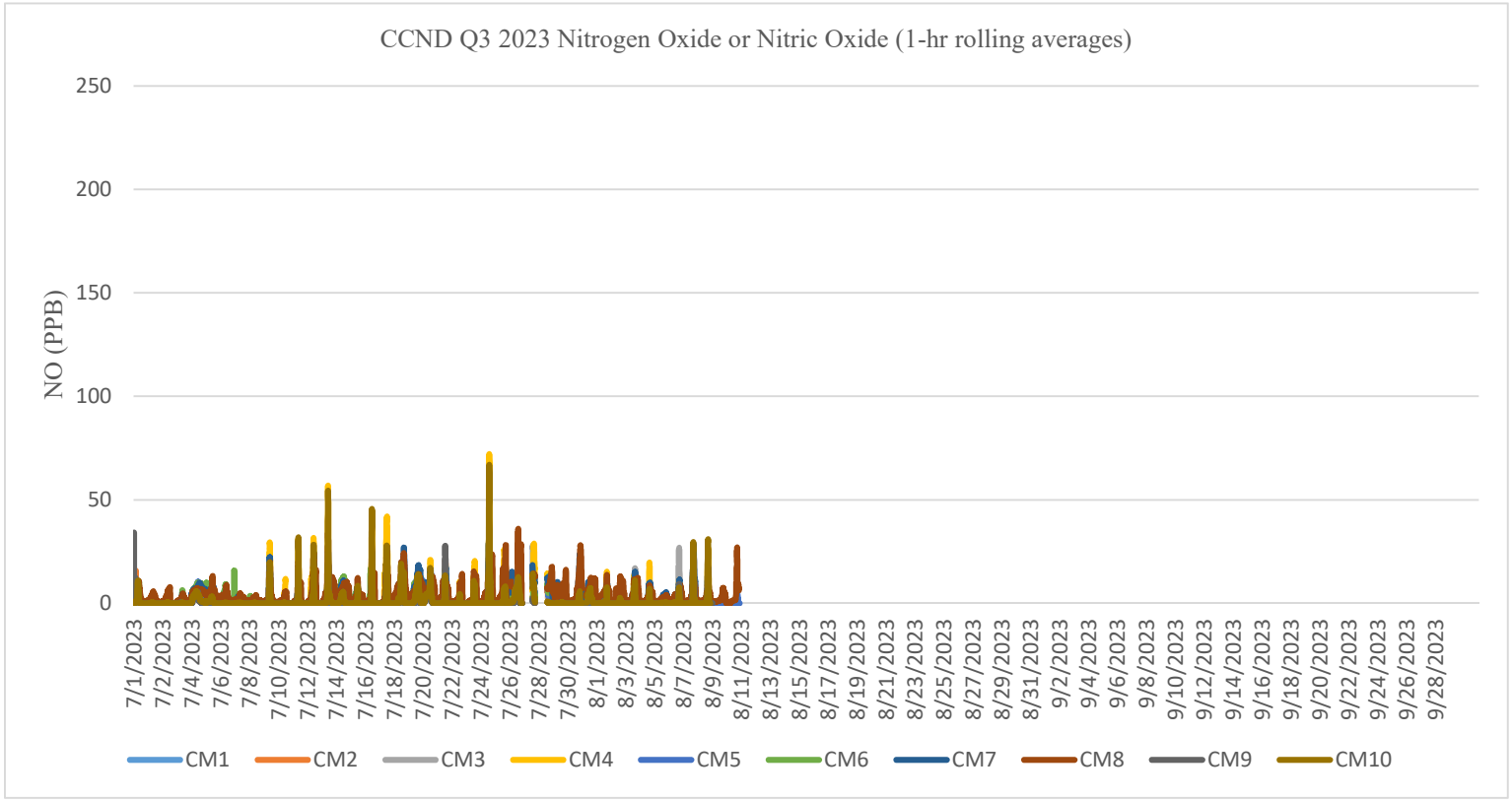
(ONE-HOUR ROLLING AVERAGES)



[9] The AQMesh Pod and SensIT RAMP's detection limit for carbon monoxide is 0.1 ppm.

FIGURE 1-3
CCND COMMUNITY MONITORING NITRIC OXIDE (NO) DATA[10]

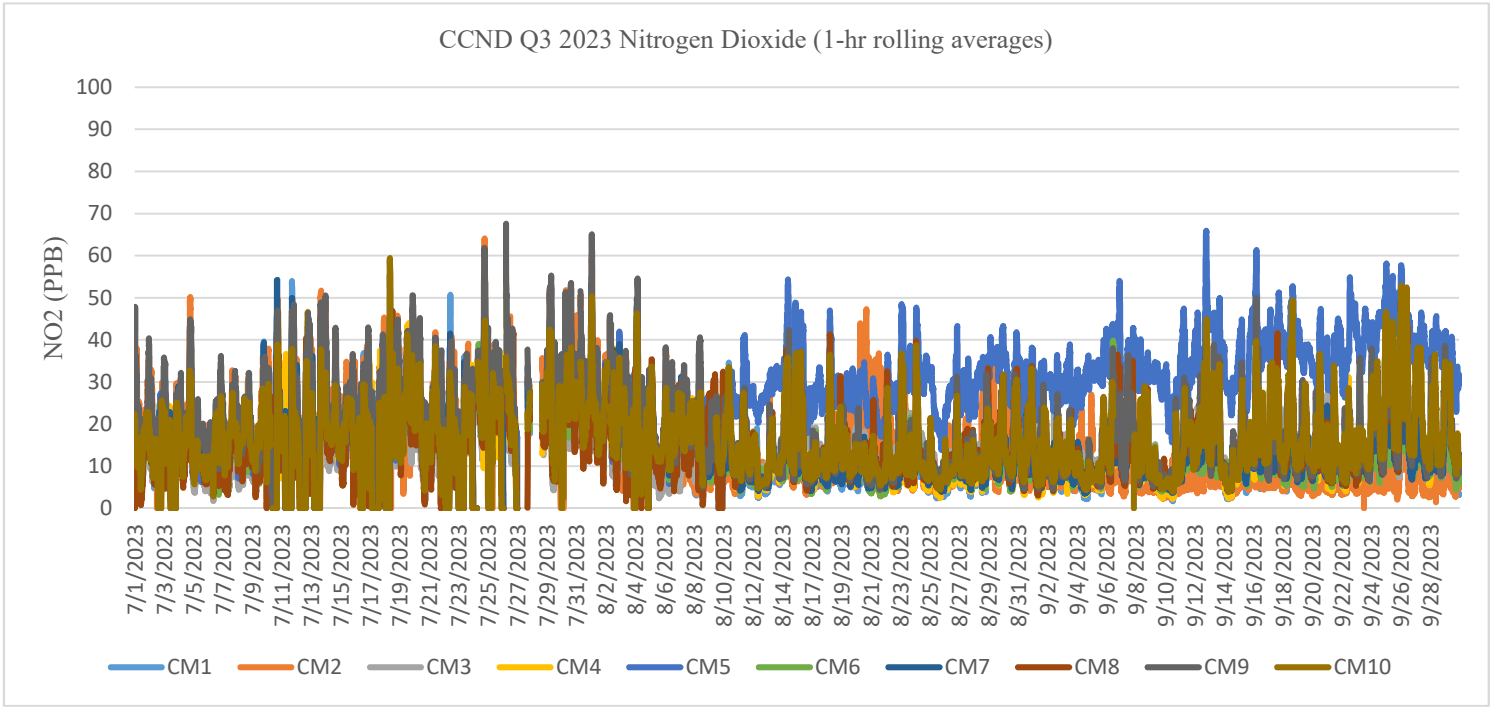
(ONE-HOUR ROLLING AVERAGES)



[10] The AQMesh Pod's detection limit for nitrogen oxide or nitric oxide is 10 ppb.

FIGURE 1-4
CCND COMMUNITY MONITORING NITROGEN DIOXIDE (NO_2) DATA[11]

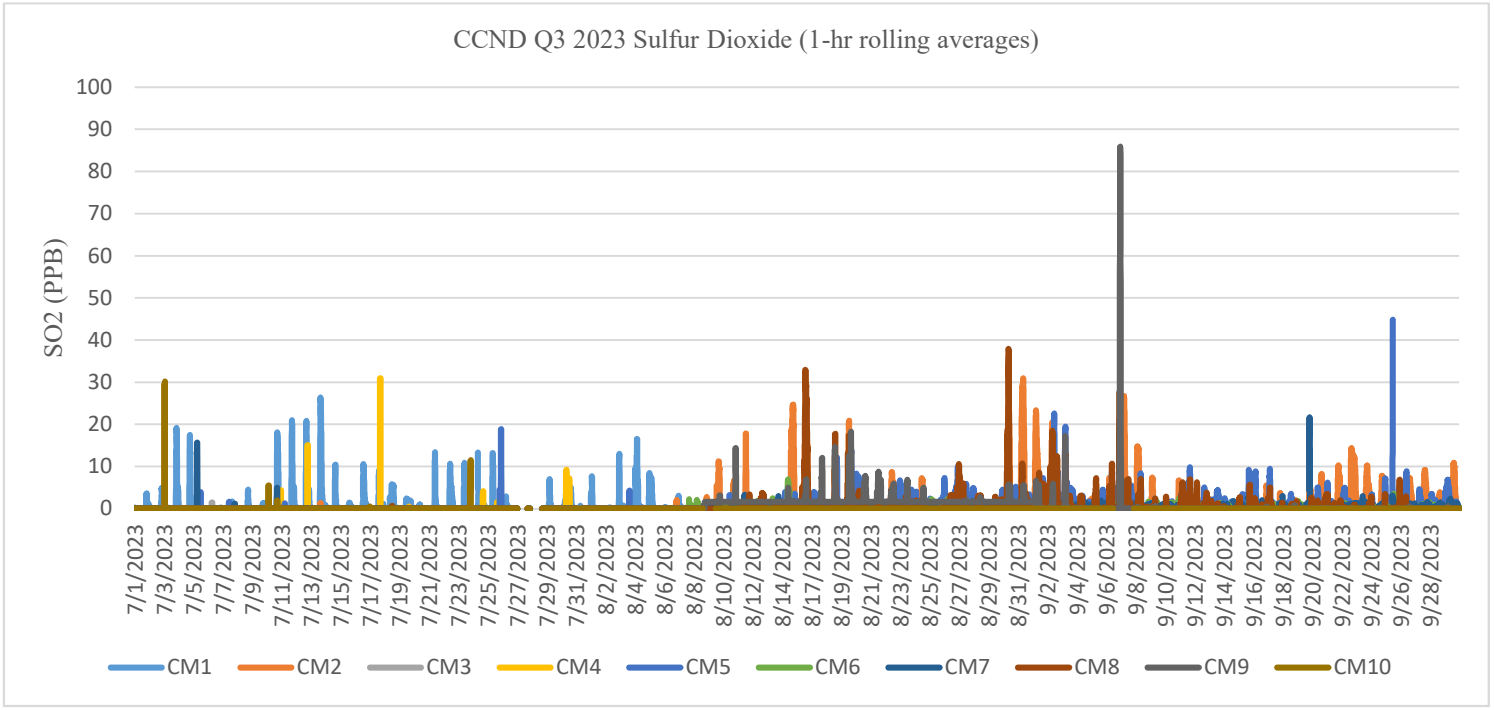
(ONE-HOUR ROLLING AVERAGES)



[11] The AQMesh Pod and SensIT RAMP's detection limit for nitrogen dioxide is 10 ppb and 20 ppb, respectively.

FIGURE 1-5
CCND COMMUNITY MONITORING SULFUR DIOXIDE (SO_2) DATA[12]

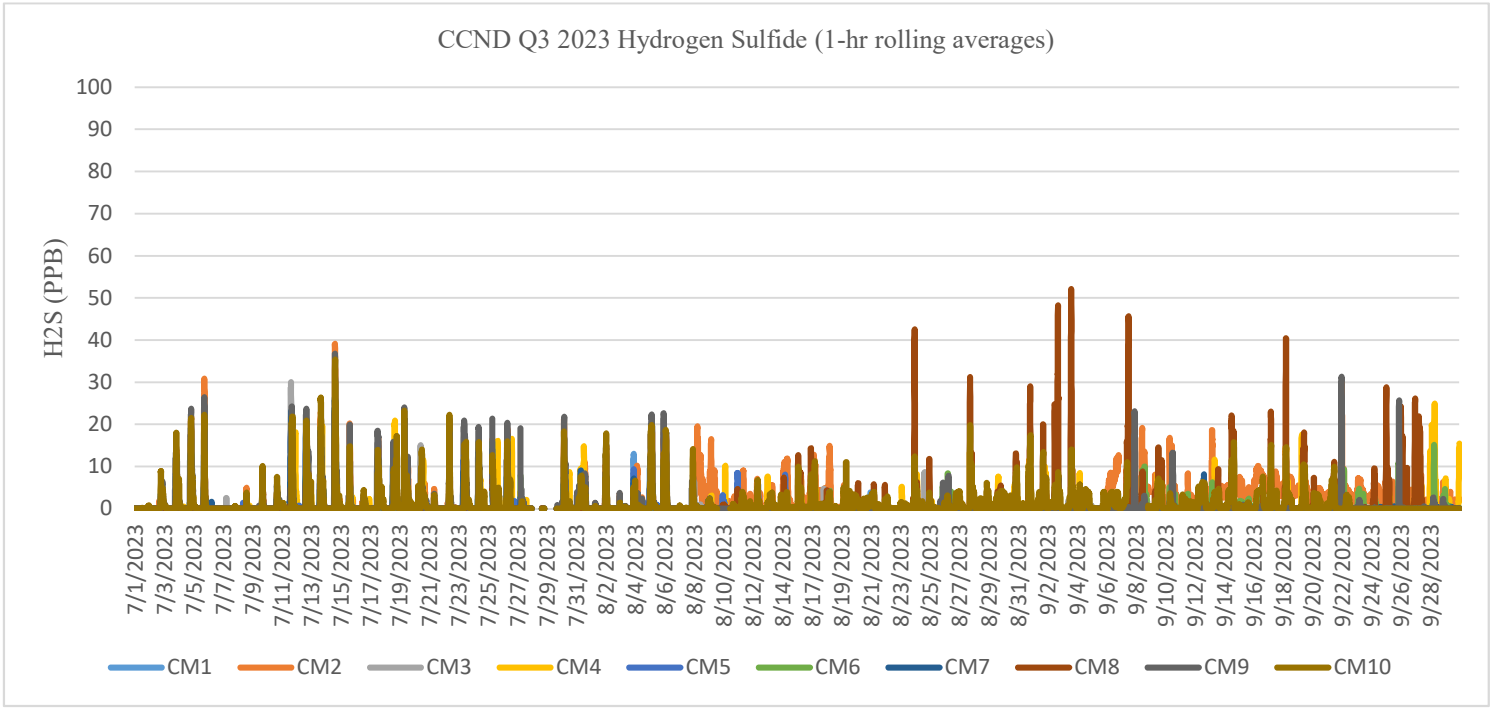
(ONE-HOUR ROLLING AVERAGES)



[12] The AQMesh Pod and SensIT RAMP's detection limit for sulfur dioxide is 30 ppb and 40 ppb, respectively.

FIGURE 1-6A
CCND COMMUNITY MONITORING HYDROGEN SULFIDE (H_2S) DATA[13]

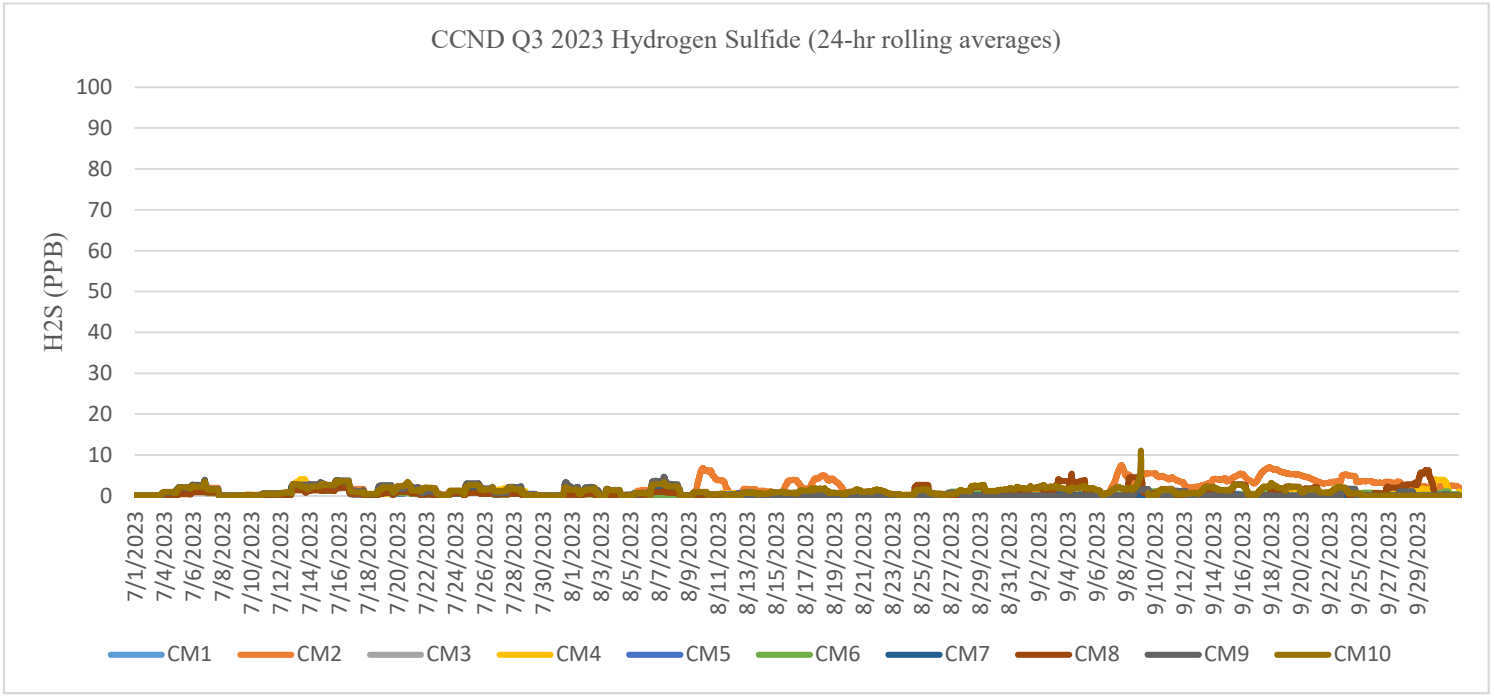
(ONE-HOUR ROLLING AVERAGES)



[13] The AQMesh Pod and SensIT RAMP's detection limit for hydrogen sulfide is 30 ppb and 10 ppb, respectively.

FIGURE 1-6B
CCND COMMUNITY MONITORING HYDROGEN SULFIDE (H_2S) DATA[14]

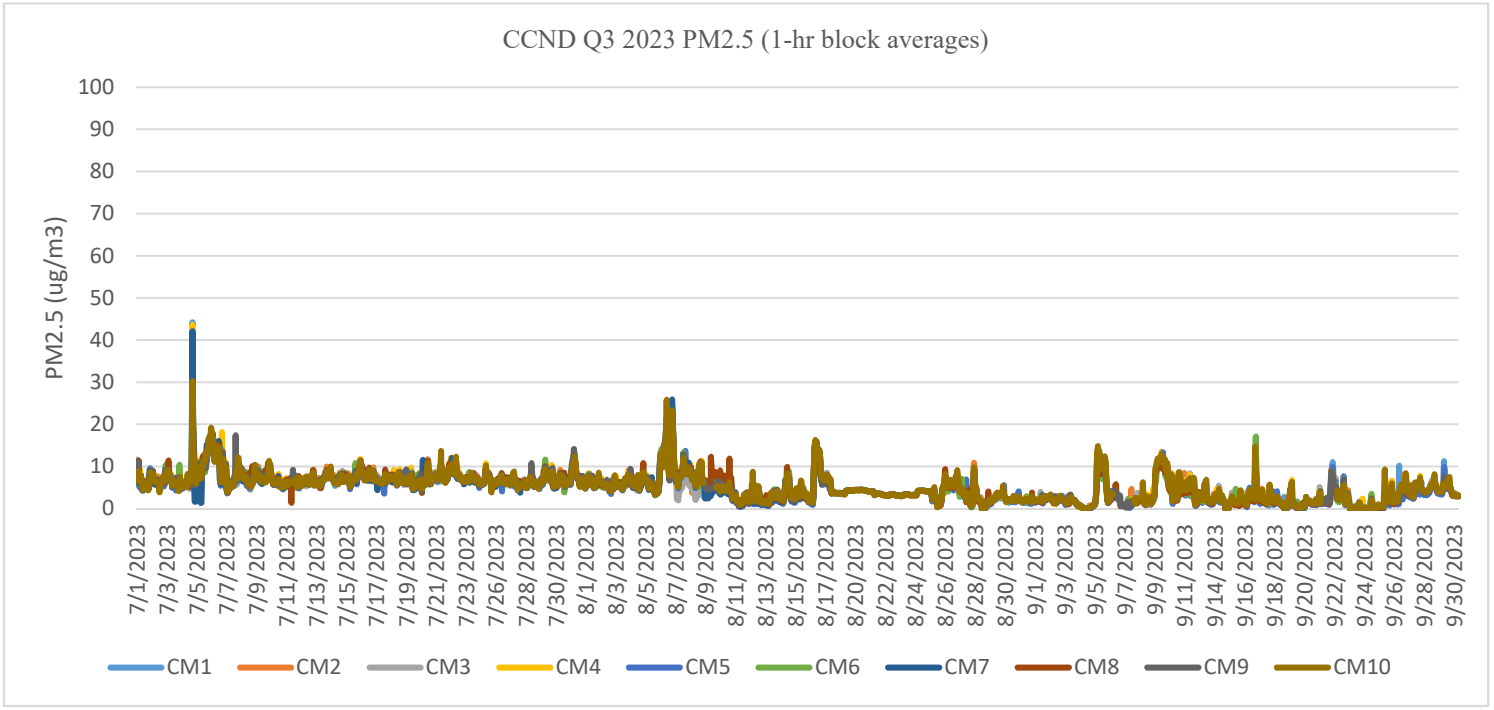
(24-HOUR ROLLING AVERAGES)



[14] The AQMesh Pod and SensIT RAMP's detection limit for hydrogen sulfide is 30 ppb and 10 ppb, respectively.

FIGURE 1-7A
CCND COMMUNITY MONITORING $PM_{2.5}$ DATA[15]

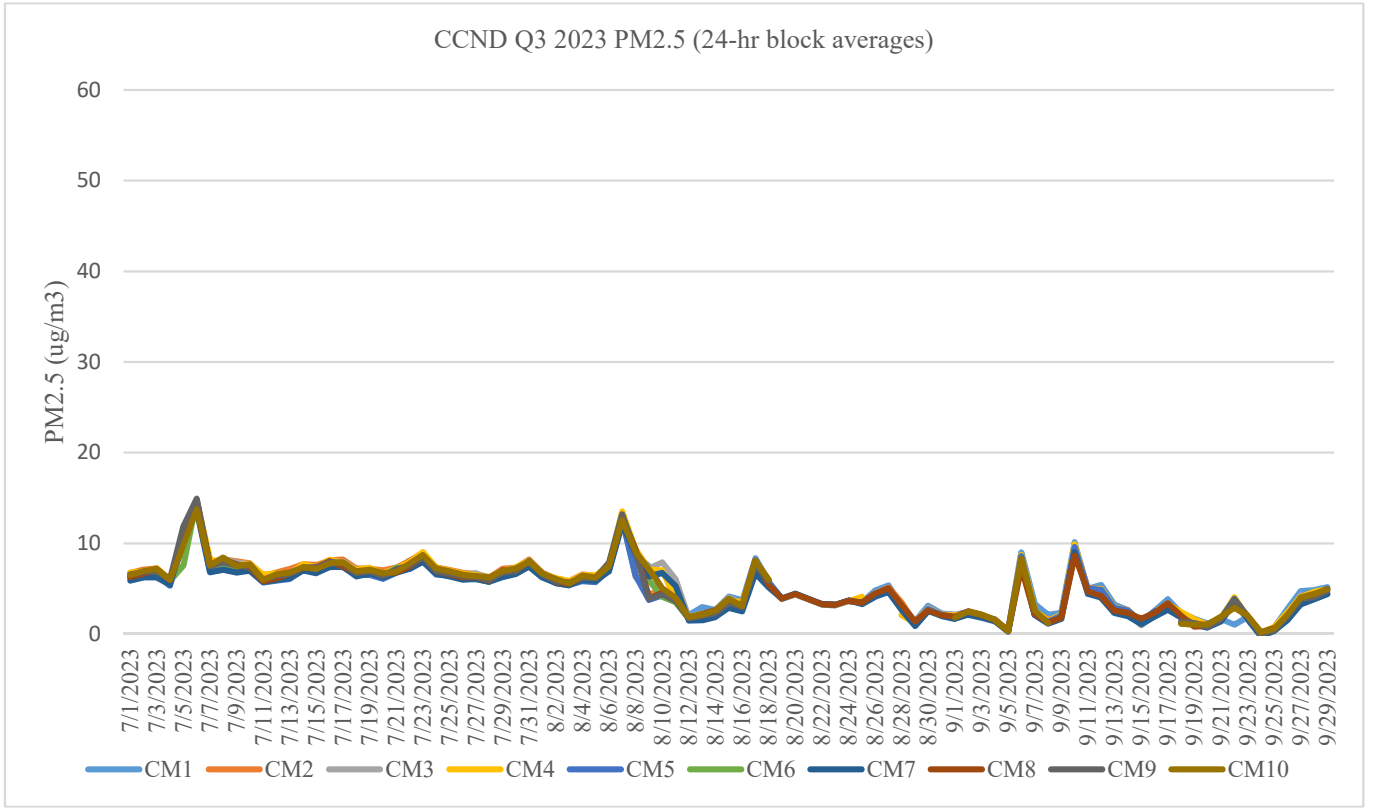
(ONE-HOUR BLOCK AVERAGES)



[15] The Lunar Outpost Canary-S and SensIT RAMP's detection limit for $PM_{2.5}$ is 3 µg/m^3.

FIGURE 1-7B
CCND COMMUNITY MONITORING $PM_{2.5}$ DATA[16]

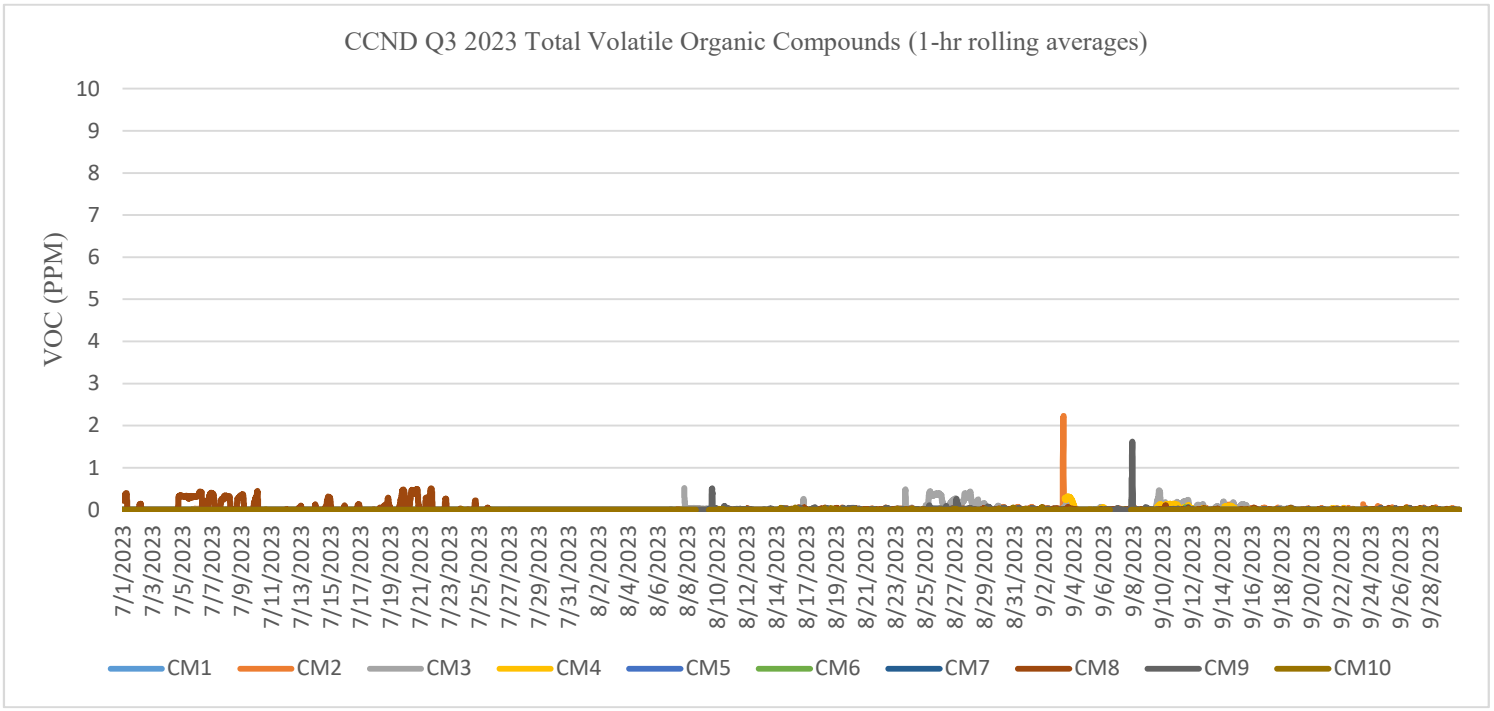
(24-HOUR BLOCK AVERAGES)



[16] The Lunar Outpost Canary-S and SensIT RAMP's detection limit for $PM_{2.5}$ is 3 µg/m^3.

FIGURE 1-8
CCND COMMUNITY MONITORING VOC DATA[17]

(ONE-HOUR ROLLING AVERAGES)



[17] The Lunar Outpost Canary-S and SensIT RAMP's detection limit for VOC is 0.3 ppm.

5.0 PROGRAM CHANGES

1. As described in the previous Sensor Reports, Montrose developed a deployment plan to switch the network over from AQMesh and Lunar Outpost to SensIT devices. During the pre-deployment quality assurance inspections, a number of the SensIT SO_2 gas sensors failed to meet the requirements of the sensor and near-FEM collocation study described in the programs QAPP due to an unknown reason. Montrose swapped the problematic SO_2 sensors with new SO_2 sensors provided by the manufacturer. The collocation study was completed during the first week of August 2023. The SensIT devices were then deployed at the ten community monitoring sites. During this process, the AQMesh and Lunar Outpost devices were removed from the program. Along with their removal was the removal of the NO analyte. The decision to remove NO was based upon two factors: The new SensIT devices do not have the capability to monitor for NO and that there are no established health-based reference levels for NO. Table 1-6 shows the timeline in which each SensIT device was installed and the corresponding AQMesh and Lunar Outpost devices that were removed.

2. The SO_2 parameter on some devices continued to exhibit issues throughout Q3 2023. SO_2 sensors were swapped in several devices exhibiting erratic SO_2 concentrations. Concurrently, multiplexer circuit boards were also swapped to combat the erratic SO_2 concentrations. By swapping the multiplexer boards, SO_2 issues appear to have been resolved. However, three devices are still exhibiting SO_2 issues.

3. The three devices continuing to exhibit SO_2 issues were installed at community monitoring locations where there was an AQM65 instrument present. The SO_2 parameter data from the AQM65 was then used in the SensIT device's place for data collection and ultimately provided to the public CCND-Air.com site. The SO_2 gas modules in these three SensIT devices are still being investigated.

TABLE 1-6
CCND SENSOR SWAP TIMELINE & NO REMOVAL

Location ID	Swap Date
CM1	8/8/23
CM2	8/7/23
CM3	8/7/23[18]
CM4	8/10/23
CM5	8/11/23
CM6	8/8/23
CM7	8/9/23
CM8	8/11/23
CM9	8/9/23
CM10	8/9/23

Prepared by:

Austin Heitmann
Operations Director – Real Time Air
Montrose Air Quality Services, LLC

Michael Lumpkin, PhD, DABT
Senior Toxicologist
CTEH®, LLC

[18] The CM3 SensIT device was first installed on 8/7/23. However, since there was an issue with the PID, it was decided to wait to provide the data to the public CCND-air website until this issue could be resolved. This issue was resolved on 8/10/23.

APPENDIX A
CALIBRATION AND QA/QC DATA

Rose Hill

				Validation Results Table																	
				CO Error			NO Error			NO2 Error			SO2 Error			H2S Error			VOC Error		
AQMesh Monitor	Lunar Outpost	Community	Validation	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span
2450728	Mon_Dutch_004	CM1	6/20/2023	0%	4%	40%	0%	98%	99%	0%	99%	100%	0%	71%	7%	0%	85%	132%	0%	37%	18%

RBC

				Validation Results Table																	
				CO Error			NO Error			NO2 Error			SO2 Error			H2S Error			VOC Error		
AQMesh Monitor	Lunar Outpost	Community	Validation	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span
2450729	Mon_Dutch_003	CM2	7/19/2023	0%	4%	39%	0%	66%	63%	0%	91%	46%	0%	26%	12%	0%	71%	475%	4%	33%	41%

Adams High

				Validation Results Table																	
				CO Error			NO Error			NO2 Error			SO2 Error			H2S Error			VOC Error		
AQMesh Monitor	Lunar Outpost	Community	Validation	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span
2450730	Mon_Dutch_005	CM3	6/26/2023	6%	58%	77%	2%	77%	84%	0%	100%	100%	7%	26%	20%	1%	79%	304%	11%	23%	30%

Adams Middle

				Validation Results Table													
				CO Error			NO Error			NO2 Error			SO2 Error			H2S Error	
AQMesh	Lunar Outpost Monitor Serial Number	Community	Validation	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision
2450732	Mon_Dutch_006	CM4	7/11/2023	2%	24%	45%	0%	33%	35%	0%	93%	92%	2%	40%	1%	0%	86%

	VOC Error		
Span	Zero	Precision	Span
855%	0%	100%	45%

Central

				Validation Results Table													
				CO Error			NO Error			NO2 Error			SO2 Error			H2S Error	
AQMesh	Lunar Outpost Monitor Serial Number	Community	Validation	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision
2450734	Mon_Dutch_007	CM5	7/18/2023	0%	100%	100%	0%	100%	100%	0%	100%	100%	0%	100%	100%	0%	100%

	VOC Error		
Span	Zero	Precision	Span
100%	4%	17%	19%

Focus Points

				Validation Results Table												
				CO Error			NO Error			NO2 Error			SO2 Error			
AQMesh Monitor Serial Number	Lunar Outpost Monitor Serial Number	Community Monitor Location	Validation Date	Zero (<10%)	Precision (<50%)	Span (<50%)	Zero (<10%)	Precision (<50%)	Span (<50%)	Zero (<10%)	Precision (<50%)	Span (<50%)	Zero (<10%)	Precision (<50%)	Span (<50%)	Zero (<10%)
2450737	Mon_Dutch_009	CM6	6/27/2023	2%	21%	39%	2%	37%	40%	0%	99%	96%	1%	25%	25%	0%

H2S Error		VOC Error		
Precision (<50%)	Span (<50%)	Zero (<10%)	Precision (<25%)	Span (<25%)
67%	500%	0%	46%	36%

Kearney

				Validation Results Table																	
				CO Error			NO Error			NO2 Error			SO2 Error			H2S Error			VOC Error		
AQMesh Monitor Serial Number	Lunar Outpost Monitor Serial Number	Community Monitor Location	Validation Date	Zero (<10%)	Precision (<50%)	Span (<50%)	Zero (<10%)	Precision (<50%)	Span (<50%)	Zero (<10%)	Precision (<50%)	Span (<50%)	Zero (<10%)	Precision (<50%)	Span (<50%)	Zero (<10%)	Precision (<50%)	Span (<50%)	Zero (<10%)	Precision (<25%)	Span (<25%)
2450735	Mon_Dutch_008	CM7	6/22/2023	3%	11%	41%	1%	40%	47%	1%	85%	96%	5%	39%	35%	0%	86%	74%	0%	38%	27%

Monroe

				Validation Results Table																	
				CO Error			NO Error			NO2 Error			SO2 Error			H2S Error			VOC Error		
AQMesh Monitor	Lunar Outpost	Community	Validation	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span
2450731	Mon_Dutch_010	CM8	6/19/2023	4%	1%	36%	3%	93%	98%	0%	17%	60%	9%	46%	30%	0%	85%	34%	0%	42%	48%

48th and Race

				Validation Results Table													
				CO Error			NO Error			NO2 Error			SO2 Error			H2S Error	
AQMesh Monitor	Lunar Outpost Monitor Serial Number	Community	Validation	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision
2450736	Mon_Dutch_001	CM9	6/28/2023	4%	1%	49%	0%	67%	47%	0%	100%	100%	0%	1%	27%	1%	88%

	VOC Error		
Span	Zero	Precision	Span
167%	0%	59%	52%

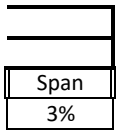
Alsup

				Validation Results Table																	
				CO Error			NO Error			NO2 Error			SO2 Error			H2S Error			VOC Error		
AQMesh Monitor	Lunar Outpost	Community	Validation	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span
2450730	Mon_Dutch_009	CM10	7/10/2023	2%	17%	28%	0%	42%	36%	0%	43%	75%	0%	40%	25%	0%	54%	344%	0%	14%	30%

		Validation Results Table														
		CO Error			NO2 Error			SO2 Error			H2S Error			VOC Error		
Community	Validation	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span
CM1	9/19/2023	4%	5%	23%	0%	57%	23%	18%	36%	12%	3%	12%	13%	1%	19%	19%

		Validation Results Table														
		CO Error			NO2 Error			SO2 Error			H2S Error			VOC Error		
Community	Validation	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span
CM2	9/25/2023	11%	92%	10%	0%	9%	63%	61%	212%	34%	0%	12%	14%	8%	16%	15%

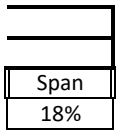
		Validation Results Table													
		CO Error			NO2 Error			SO2 Error			H2S Error			VOC Error	
Community	Validation	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision
CM3	9/18/2023	3%	20%	14%	0%	70%	14%	0%	16%	5%	2%	8%	12%	0%	3%


Span
3%

		Validation Results Table														
		CO Error			NO2 Error			SO2 Error			H2S Error			VOC Error		
Community	Validation	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span
CM4	9/26/2023	7%	36%	18%	0%	45%	29%	0%	100%	100%	3%	16%	31%	1%	2%	1%

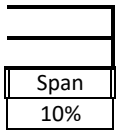
		Validation Results Table														
		CO Error			NO2 Error			SO2 Error			H2S Error			VOC Error		
Community	Validation	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span
CM5	9/26/2023	8%	10%	25%	1%	18%	44%	14%	68%	33%	0%	0%	3%	0%	5%	1%

		Validation Results Table													
		CO Error			NO2 Error			SO2 Error			H2S Error			VOC Error	
Community	Validation	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision
CM6	9/25/2023	5%	54%	1%	8%	10%	12%	0%	12%	20%	5%	0%	9%	4%	14%


Span
18%

		Validation Results Table														
		CO Error			NO2 Error			SO2 Error			H2S Error			VOC Error		
Community	Validation	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span
CM7	9/20/2023	3%	22%	7%	1%	13%	17%	0%	12%	27%	1%	16%	20%	2%	14%	13%

		Validation Results Table													
		CO Error			NO2 Error			SO2 Error			H2S Error			VOC Error	
Community	Validation	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision
CM8	9/27/2023	5%	118%	20%	9%	58%	66%	11%	188%	27%	6%	0%	19%	9%	15%


Span
10%

		Validation Results Table														
		CO Error			NO2 Error			SO2 Error			H2S Error			VOC Error		
Community	Validation	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span
CM9	9/27/2023	4%	20%	23%	4%	9%	6%	6%	4%	21%	1%	12%	16%	1%	1%	3%

		Validation Results Table														
		CO Error			NO2 Error			SO2 Error			H2S Error			VOC Error		
Community	Validation	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span	Zero	Precision	Span
CM10	9/21/2023	6%	37%	17%	30%	79%	59%	0%	15%	14%	2%	4%	11%	6%	11%	9%

APPENDIX B
FIELD DATA SHEETS

Monthly AQM65 QA/QC (RBC:829)

Date	7/14/23	8/16/23	9/25/23	10/26/23	11/27/23	12/19/23
Time	10:30	11:00	9:30	10:00	10:30	10:00
Technician	RK	RK	RK	RK	RK	RK

WEEKLY VALIDATION REVIEWED						
" "	✓	✓	✓	✓	✓	✓

Gas Validation Checks		(REPLACED)				
SO2 bottle pressure (psi)	0	450	400	350	300	250
H2S bottle pressure (psi)	100	50	20	450	425	400
			(REPLACED)			

Comments: 7/14/23 - SO2 BOTTLE REPLACED
9/25/23 - H2S BOTTLE REPLACED

Monthly AQM65 QA/QC (Kearney MS:830)

Date	7/19/23	8/15/23	9/20/23	10/20/23	11/20/23	12/18/23
Time	12:00	10:00	9:00	9:30	11:00	10:00
Technician	RK	RK	RK	RK	RK	RK

WEEKLY VALIDATION						
WEEKLY VALIDATION REVIEWED	✓	✓	✓	✓	✓	✓

Gas Validation Checks						(REPLACED)
SO2 bottle pressure (psi)	300	225	150	100	50	0
H2S bottle pressure (psi)	0 (REPLACED)	450	400	350	275	200

Comments: 7/19/23 - H2S BOTTLE REPLACED
11/20/23 - REPLACE SO2 BOTTLE SOON.

Monthly AQM65 QA/QC (Focus Points:831)

Date	7/20/23	8/14/23	9/26/23	10/17/23	11/28/23	12/20/23
Time	13:00	11:00	10:00	10:30	11:00	10:00
Technician	RK	RK	RK	RK	RK	RK

Weekly Validation						
Weekly Validation Reviewed	✓	✓	✓	✓	✓	✓

Gas Validation Checks			(Replaced)			
SO2 bottle pressure (psi)	100	25	450	400	350	300
H2S bottle pressure (psi)	100	50	20	450	400	350
			(Replaced)			

Comments: 8/14/23 - SO2 Bottle Replaced
9/26/23 - H2S Bottle Replaced

Quarterly AQM65 QA/QC (RBC:829)

Date	9/25/23	12/19/23				
Time	9:30	10:30				
Technician	RK	RK				

Particulate Monitor						
Flow Rate (2.0 LPM +/-0.5)	✓	✓				
Filter Change (2 filters total)	✓	✓				
Check for Leaks (@ 60 kpa/no < 10 kpa in 10 sec.)	✓	✓				
Check Zero (+/- 3.0 ug/m^-3)	✓	✓				
Check laser and detector	✓	✓				
Clean cyclone	✓	✓				

Gas Validation Checks						
Flow Rate	PASS	PASS				
Filter Change	✓	✓				
Gas Validation Checks	✓	✓				

Comments: _____

Quarterly AQM65 QA/QC (Kearney MS:830)

Date	9/20/23	12/18/23				
Time	9:00	10:00				
Technician	RK	RK				

Particulate Monitor						
Flow Rate (2.0 LPM +/-0.5)	✓	✓				
Filter Change (2 filters total)	✓	✓				
Check for Leaks (@ 60 kpa/no < 10 kpa in 10 sec.)	✓	✓				
Check Zero (+/- 3.0 ug/m^-3)	✓	✓				
Check laser and detector	✓	✓				
Clean cyclone	✓	✓				

Gas Validation Checks						
Flow Rate	Pass	Pass				
Filter Change	✓	✓				
Gas Validation Checks	✓	✓				

Comments: _____

Quarterly AQM65 QA/QC (Focus Points:831)

Date	9/26/23	12/20/23				
Time	10:00	10:30				
Technician	RK	RK				

Particulate Monitor						
Flow Rate (2.0 LPM +/-0.5)	✓	✓				
Filter Change (2 filters total)	✓	✓				
Check for Leaks (@ 60 kpa/no < 10 kpa in 10 sec.)	✓	✓				
Check Zero (+/- 3.0 ug/m^-3)	✓	✓				
Check laser and detector	✓	✓				
Clean cyclone	✓	✓				

Gas Validation Checks						
Flow Rate	Pass	Pass				
Filter Change	✓	✓				
Gas Validation Checks	✓	✓				

Comments:

Annual AQM65 QA/QC (RBC:829)

Date	09/23	05/23				
Time	10:00	15:00				
Technician	RK	RK				

Particulate Monitor						
Replace PM Module		✓				

Gas Sensor Modules (Replace if necessary)						
CO	✓					
NO2	✓					
VOC	✓					
SO2						
H2S						

Comments:

Annual AQM65 QA/QC (Kearney MS:830)

Date	05/23					
Time	14:00					
Technician	RK					

Particulate Monitor						
Replace PM Module	✓					

Gas Sensor Modules (Replace if necessary)						
CO						
NO2						
VOC						
SO2						
H2S						

Comments:

Annual AQM65 QA/QC (Focus Points:831)

Date	01/23	11/23				
Time	10:00	10:30				
Technician	RK	RK				

Particulate Monitor						
Replace PM Module	✓					

Gas Sensor Modules (Replace if necessary)						
CO						
NO2						
VOC						
SO2	✓					
H2S		✓				

Comments:

APPENDIX C
CALIBRATION GAS CERTIFICATION SHEETS

GASCO AFFILIATES, LLC.

320 Scarlet Blvd.
Oldsmar, FL 34677
(800) 910-0051
fax: (866) 755-8920
www.gascogas.com

CERTIFICATE OF ANALYSIS

Date: January 24, 2023
Order Number: 22070361
Lot Number: 304-402645914-1

Customer: Cal Gas Direct Inc.

Use Before: 01/24/2027

Component	Requested Concentration	Analytical Result (+/- 2%)
Carbon Monoxide	500 PPM	486 PPM
Air	Balance	Balance

Cylinder Size: 2.0 Cu. Ft.
Contents: 58 Liter

Valve: 5/8" -18UNF
Pressure: 500 psig

Product composition verified by direct comparison to calibration standards traceable to N.I.S.T. weights and/ or N.I.S.T. Gas Mixture reference materials.

Analyst:

Glenn Velez

GASCO AFFILIATES, LLC.

320 Scarlet Blvd.
Oldsmar, FL 34677
(800) 910-0051
fax: (866) 755-8920
www.gascogas.com

CERTIFICATE OF ANALYSIS

Date: January 24, 2023
Order Number: 22070361
Lot Number: 304-402645915-1

Customer: Cal Gas Direct Inc.

Use Before: 01/24/2027

Component	Requested Concentration	Analytical Result (+/- 2%)
Isobutylene	200 PPM	208 PPM
Air	Balance	Balance

Cylinder Size: 2.0 Cu. Ft.
Contents: 58 Liter

Valve: 5/8" -18UNF
Pressure: 500 psig

Product composition verified by direct comparison to calibration standards traceable to N.I.S.T. weights and/ or N.I.S.T. Gas Mixture reference materials.

Analyst:

Glenn Velez

GASCO AFFILIATES, LLC.

320 Scarlet Blvd.
Oldsmar, FL 34677
(800) 910-0051
fax: (866) 755-8920
www.gascogas.com

CERTIFICATE OF ANALYSIS

Date: January 24, 2023
Order Number: 22070361
Lot Number: 304-402645912-1

Customer: Cal Gas Direct Inc.

Use Before: 01/24/2025

Component	Requested Concentration	Analytical Result (+/- 2%)
Hydrogen Sulfide	20 PPM	21.5 PPM
Air	Balance	Balance

Cylinder Size: 2.0 Cu. Ft.
Contents: 58 Liter

Valve: 5/8" -18UNF
Pressure: 500 psig

Product composition verified by direct comparison to calibration standards traceable to N.I.S.T. weights and/ or N.I.S.T. Gas Mixture reference materials.

Analyst:

Glenn Velez

GASCO AFFILIATES, LLC.

320 Scarlet Blvd.
Oldsmar, FL 34677
(800) 910-0051
fax: (866) 755-8920
www.gascogas.com

CERTIFICATE OF ANALYSIS

Date: January 24, 2023
Order Number: 22070361
Lot Number: 304-402650509-1

Customer: Cal Gas Direct Inc.

Use Before: 01/24/2025

Component	Requested Concentration	Analytical Result (+/- 2%)
Sulfur Dioxide	20 PPM	21.5 PPM
Nitrogen	Balance	Balance

Cylinder Size: 2.0 Cu. Ft.
Contents: 58 Liter

Valve: 5/8" -18UNF
Pressure: 500 psig

Product composition verified by direct comparison to calibration standards traceable to N.I.S.T. weights and/ or N.I.S.T. Gas Mixture reference materials.

Analyst:

Glenn Velez

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