# WEEKLY REPORT FOR WEEK 38
# (APRIL 21, 2019 – APRIL 27, 2019)

**Report No. 53005-81-RPT-055**

**September 2019**

**Prepared for:**

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**Subcontract 53005, Release 81**

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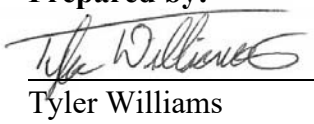
# Approval Form

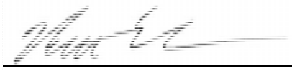
**Prepared by:**



Date: 09/19/2019

Tyler Williams

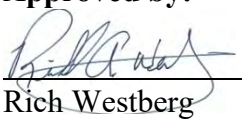
**Reviewed by:**



Date: 09/19/2019

Matthew Erickson, Ph.D.

**Approved by:**



Date: 09/19/2019

Rich Westberg

# Record of Revision

| Revision | Date | Pages/Sections Changed | Brief Description |
|---|---|---|---|
| 0 | 09/2019 | All | Original Issue. |
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| | | | |
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## Acronyms and Abbreviations

| | |
|---|---|
| AOP | Abnormal Operating Procedure |
| COC | Chain of Custody |
| COPC | Chemical of Potential Concern |
| CSM | Central Shift Manager |
| CSO | Central Shift Office |
| IH | Industrial Hygiene |
| MDL | Method Detection Limit |
| ML | Mobile Laboratory |
| NDEA | N-nitrosodiethylamine |
| NDMA | N-nitrosodimethylamine |
| NEMA | N-nitrosomethylethylamine |
| NMOR | N-nitrosomorpholine |
| PTR-TOF | Proton Transfer Reaction – Time-of-Flight |
| PTR-MS | Proton Transfer Reaction – Mass Spectrometer |
| QA | Quality Assurance |
| QC | Quality Control |
| R&D | Research and Development |
| RL | Reporting Limit |
| SME | Subject Matter Expert |
| VOC | Volatile Organic Compound |
| WRPS | Washington River Protection Solutions, LLC |

## 1.0 INTRODUCTION

During the week of April 22, 2019, through April 28, 2019, the Mobile Laboratory (ML) performed area monitoring around the 200 East Area of the Hanford Site, as well as source characterization in support of the Washington River Protection Solutions, LLC (WRPS) Fugitive Emissions Team. The data team continued processing data collected from the previous week. The reporting team worked towards the completion of weekly reports for Weeks 33 through 37 and monthly reports.

## 2.0 APRIL 22, 2019 – AREA MONITORING AND AOP-015 EVENT

### 2.1 Quality Assessment

Data from April 22, 2019, were assessed using Procedure 17124-DOE-HS-102, "Mobile Laboratory Data Processing – Analysis." A Data Exchange Checklist was completed. The data were accepted by TerraGraphics with the following comments. Report No. 66409-RPT-004, *Mobile Laboratory Operational Procedure*, was adequately documented and all checks passed the acceptance limits.

### 2.2 Summary

On April 22, 2019, ML personnel arrived at the TerraGraphics warehouse in Pasco, WA at 04:50. The Quality Assurance/Quality Control (QA/QC) zero-air/span checks were performed on the LI-COR®[1] $CO_2$ monitor, the Picarro $NH_3$ analyzer, and the Proton Transfer Reaction – Mass Spectrometer (PTR-MS) beginning at 05:08. The ML arrived on the Hanford Site and checked in with the Central Shift Manager (CSM) at 06:01. The ML began a site survey loop of A Farms at 06:12. The ML was parked at the southeast corner of A Farm prior to starting a site survey loop at 07:30. The ML Operators proceeded to park near the northwest side of A Farm and remained there until 09:18, when an Abnormal Operating Procedure (AOP)-015 occurred. The Operators reported to the Central Shift Office (CSO) for a pre-job briefing and headed to U Farm, the location of the AOP-015, at 09:37. The ML arrived at U Farm and completed set-up of the 208-foot heated line at 09:54. At 10:17, the Industrial Hygiene (IH) Technicians moved the 208-foot line as close to the change trailer as possible. At 14:02, the AOP-015 was exited and Operators began the process to disconnect the 208-foot line. At 14:40, operators checked out with the CSM and the ML departed the site. After stopping to pick up a Swagelok®[2] order, the ML arrived back at the TerraGraphics warehouse at 15:50.

[1] LI-COR is a registered trademark of LI-COR, Inc., Lincoln, Nebraska.
[2] Swagelok is a registered trademark of Swagelok Company, Solon, Ohio.


**Figure 2-1. Location of the Mobile Laboratory for the Duration of the Monitoring Period.**

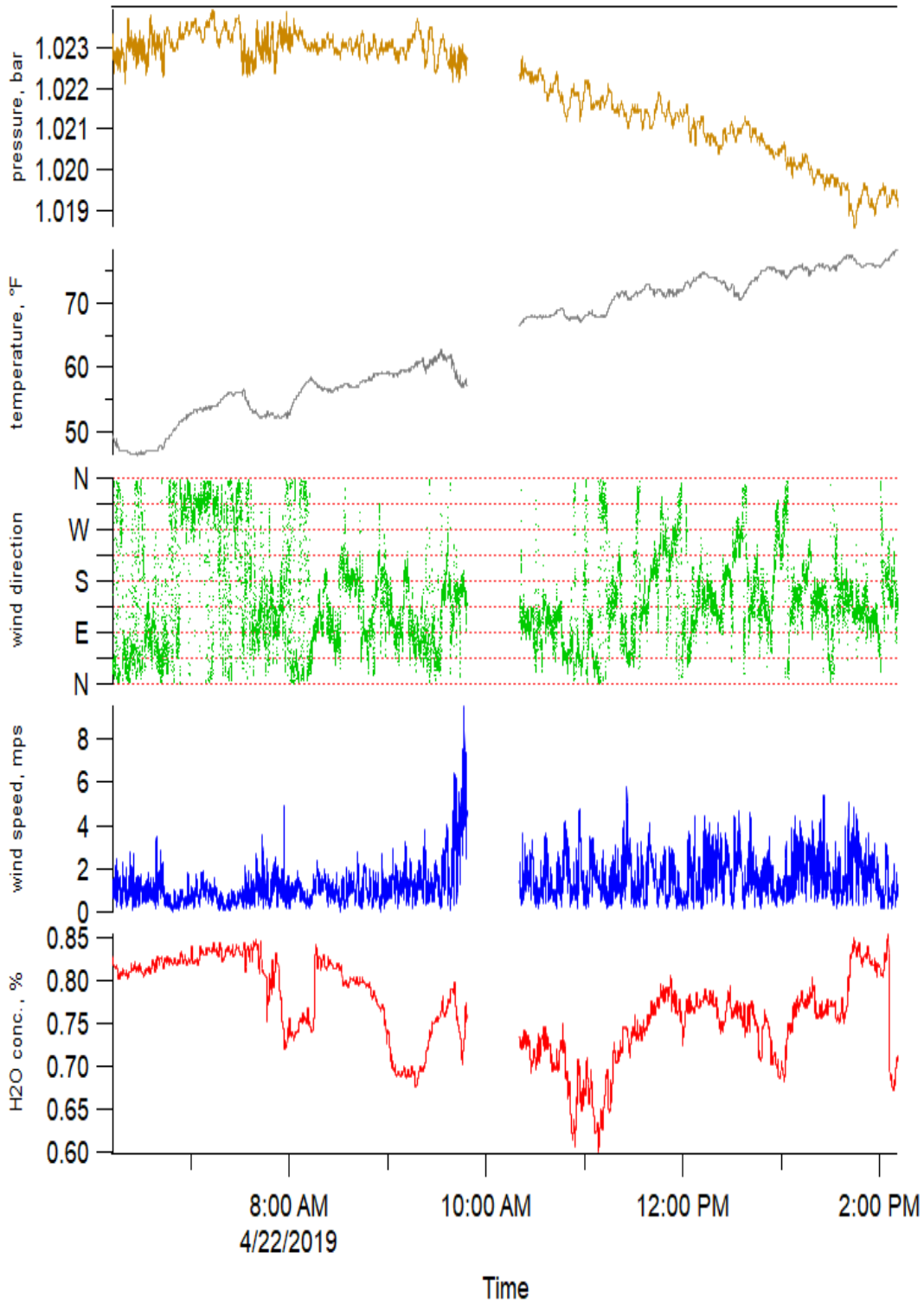


**Figure 2-2. Weather Data for the Duration of the Monitoring Period.**

## 2.3 Samples Collected

Continuous air monitoring was performed using the following instrumentation:

- Proton Transfer Reaction – Time-of-Flight (PTR-TOF) 6000 X2,
- LI-COR $CO_2$ Monitor,
- Picarro Ammonia Monitor, and
- Airmar®[3] Weather Station.

Confirmatory air samples were not collected during this period.

## 2.4 Area Monitoring

The ML performed area monitoring from approximately 06:12 to 09:18. The section below displays the chemical of potential concern (COPC) statistical results during that monitoring period.

[3] Airmar is a registered trademark of Airmar Technology Corporation, Milford, New Hampshire.

**Table 2-1. Chemical of Potential Concern Statistical Information for the Area Monitoring on April 22, 2019. (2 Sheets)**

| COPC # | COPC Name | OEL (ppb) | MDL (ppb) | Ave. (ppb) | St. Dev. (ppb) | Rel St. Dev. (%) | Max. (ppb) | Median (ppb) |
|---|---|---|---|---|---|---|---|---|
| 1 | ammonia | 25000 | 6.225 | 15.117† | 2.501 | 16.546 | 19.967 | 14.926† |
| 2 | formaldehyde | 300 | 1.721 | <1.721 | 0.160 | 16.728 | 2.069 | <1.721 |
| 3 | methanol | 200000 | 5.758 | 9.093† | 1.309 | 14.401 | 31.024 | 8.944† |
| 4 | acetonitrile | 20000 | 0.085 | 0.115† | 0.035 | 30.372 | 0.690 | 0.113† |
| 5 | acetaldehyde | 25000 | 1.027 | 1.868† | 0.286 | 15.290 | 4.132 | 1.848† |
| 6 | ethylamine | 5000 | 0.069 | <0.069 | 0.022 | 60.293 | 0.149 | <0.069 |
| 7 | 1,3-butadiene | 1000 | 0.183 | 0.243† | 0.076 | 31.323 | 0.764 | 0.237† |
| 8 | propanenitrile | 6000 | 0.107 | <0.107 | 0.029 | 41.530 | 0.226 | <0.107 |
| 9 | 2-propenal | 100 | 0.340 | <0.340 | 0.059 | 44.631 | 0.800 | <0.340 |
| 10 | 1-butanol + butenes | 20000 | 0.214 | <0.214 | 0.051 | 38.302 | 0.684 | <0.214 |
| 11 | methyl isocyanate | 20 | 0.069 | <0.069 | 0.029 | 51.972 | 0.190 | <0.069 |
| 12 | methyl nitrite | 100 | 0.098 | 0.122† | 0.046 | 37.793 | 1.081 | 0.120† |
| 13 | furan | 1 | 0.062 | <0.062 | 0.020 | 51.288 | 0.142 | <0.062 |
| 14 | butanenitrile | 8000 | 0.039 | <0.039 | 0.020 | 59.178 | 0.133 | <0.039 |
| 15 | but-3-en-2-one + 2,3-dihydrofuran + 2,5-dihydrofuran | 200, 1, 1 | 0.041 | 0.059† | 0.024 | 41.597 | N/A* | N/A* |
| 16 | butanal | 25000 | 0.061 | 0.181† | 0.044 | 24.374 | 0.507 | 0.179† |
| 17 | NDMA** | 0.3 | 0.082 | <0.082 | 0.024 | 170.407 | 0.181 | <0.082 |
| 18 | benzene | 500 | 0.236 | <0.236 | 0.062 | 35.619 | 1.087 | <0.236 |
| 19 | 2,4-pentadienenitrile + pyridine | 300, 1000 | 0.085 | <0.085 | 0.021 | 41.818 | 0.145 | <0.085 |
| 20 | 2-methylene butanenitrile | 300 | 0.036 | <0.036 | 0.013 | 66.048 | 0.086 | <0.036 |
| 21 | 2-methylfuran | 1 | 0.043 | 0.047† | 0.025 | 53.309 | 0.199 | 0.044† |
| 22 | pentanenitrile | 6000 | 0.036 | <0.036 | 0.015 | 71.669 | 0.102 | <0.036 |
| 23 | 3-methyl-3-buten-2-one + 2-methyl-2-butenal | 20, 30 | 0.043 | 0.051† | 0.027 | 52.213 | 0.207 | 0.048† |
| 24 | NEMA** | 0.3 | 0.058 | <0.058 | 0.023 | 147.645 | 0.181 | <0.058 |
| 25 | 2,5-dimethylfuran | 1 | 0.032 | <0.032 | 0.020 | 68.511 | 0.156 | <0.032 |
| 26 | hexanenitrile | 6000 | 0.031 | <0.031 | 0.012 | 84.308 | 0.080 | <0.031 |
| 27 | 2-hexanone (MBK) | 5000 | 0.036 | <0.036 | 0.018 | 75.365 | 0.115 | <0.036 |
| 28 | NDEA** | 0.1 | 0.034 | <0.034 | 0.014 | 144.283 | 0.096 | <0.034 |
| 29 | butyl nitrite + 2-nitro-2-methylpropane | 100, 300 | 0.058 | <0.058 | 0.016 | 47.429 | 0.111 | <0.058 |

**Table 2-1. Chemical of Potential Concern Statistical Information for the Area Monitoring on April 22, 2019. (2 Sheets)**

| COPC # | COPC Name | OEL (ppb) | MDL (ppb) | Ave. (ppb) | St. Dev. (ppb) | Rel St. Dev. (%) | Max. (ppb) | Median (ppb) |
|---|---|---|---|---|---|---|---|---|
| 30 | 2,4-dimethylpyridine | 500 | 0.036 | <0.036 | 0.014 | 89.652 | 0.186 | <0.036 |
| 31 | 2-propylfuran + 2-ethyl-5-methylfuran | 1 | 0.027 | <0.027 | 0.015 | 90.089 | 0.108 | <0.027 |
| 32 | heptanenitrile | 6000 | 0.027 | <0.027 | 0.010 | 88.437 | 0.071 | <0.027 |
| 33 | 4-methyl-2-hexanone | 500 | 0.033 | <0.033 | 0.014 | 81.695 | 0.097 | <0.033 |
| 34 | NMOR** | 0.6 | 0.021 | <0.021 | 0.010 | 171.498 | 0.073 | <0.021 |
| 35 | butyl nitrate | 2500 | 0.022 | <0.022 | 0.009 | 117.865 | 0.060 | <0.022 |
| 36 | 2-ethyl-2-hexenal + 4-(1-methylpropyl)-2,3-dihydrofuran + 3-(1,1-dimethylethyl)-2,3-dihydrofuran | 100, 1, 1 | 0.028 | <0.028 | 0.013 | 82.677 | 0.087 | <0.028 |
| 37 | 6-methyl-2-heptanone | 8000 | 0.028 | <0.028 | 0.012 | 78.887 | 0.094 | <0.028 |
| 38 | 2-pentylfuran | 1 | 0.026 | <0.026 | 0.013 | 78.273 | 0.081 | <0.026 |
| 39 | biphenyl | 200 | 0.022 | <0.022 | 0.010 | 122.375 | 0.070 | <0.022 |
| 40 | 2-heptylfuran | 1 | 0.067 | <0.067 | 0.017 | 38.417 | 0.127 | <0.067 |
| 41 | 1,4-butanediol dinitrate | 50 | 0.036 | <0.036 | 0.012 | 81.392 | 0.075 | <0.036 |
| 42 | 2-octylfuran | 1 | 0.020 | <0.02 | 0.010 | 199.378 | 0.069 | <0.02 |
| 43 | 1,2,3-propanetriol 1,3-dinitrate | 50 | 0.011 | <0.011 | 0.005 | 354.338 | 0.062 | <0.011 |
| 44 | PCB | 1000 | 0.034 | <0.034 | 0.011 | 65.590 | 0.090 | <0.034 |
| 45 | 6-(2-furanyl)-6-methyl-2-heptanone | 1 | 0.025 | <0.025 | 0.009 | 92.834 | 0.059 | <0.025 |
| 46 | furfural acetophenone | 1 | 0.064 | <0.064 | 0.017 | 39.118 | 0.117 | <0.064 |
| N/A* | The maximum peak value for but-3-en-2-one + 2,3 dihydrofuran + 2,5 dihydrofuran was 0.263 ppb and the median value was 0.056† ppb. The PTR-MS results for but-3-en-2-one + 2,3 dihydrofuran + 2,5 dihydrofuran are not compared to OEL concentrations because: 1) the result is suspect due to a known biogenic interferant (methacrolein) that is expected to be in concentrations that occasionally exceed the dihydrofuran OEL, and 2) this combination of COPCs have OEL concentrations that differ by a factor of 200, which provide widely variant bases for these numbers. | | | | | | | |
| ** | Nitrosamine results are suspect due to isobaric interferants causing positive bias that have been encountered during previous background [53005-81-RPT-007, *PTR-MS Mobile Laboratory Vapor Monitoring Background Study, (3/18/2018 – 4/20/2018)*, and *Fiscal Year 2017 Mobile Laboratory Vapor Monitoring at the Hanford Site: Monitoring During Waste Disturbing Activities and Background Study*, RJ Lee Group, Inc.]. | | | | | | | |
| < | COPC Averages below the MDL. | | | | | | | |
| † | COPC Averages between the RL and the MDL. | | | | | | | |
| | COPC Averages >100% of the OEL. | | | | | | | |
| | COPC Averages 50-100% of the OEL. | | | | | | | |
| | COPC Averages 10-50% of the OEL. | | | | | | | |

Figure 2-3 through Figure 2-51 display 46 COPC signals, overlaid with the same signal smoothed using a 1-minute moving average (in cases where a moving average assists with data visualization), and $CO_2$, for the monitoring period April 22, 2019. If within range of the plot's left axis, a green horizontal line representing 50% of the COPC's OEL, a blue horizontal line representing the COPC's OEL, a horizontal purple line representing the Reporting Limit (RL), and a pink horizontal line representing the Method Detection Limit (MDL) are shown.

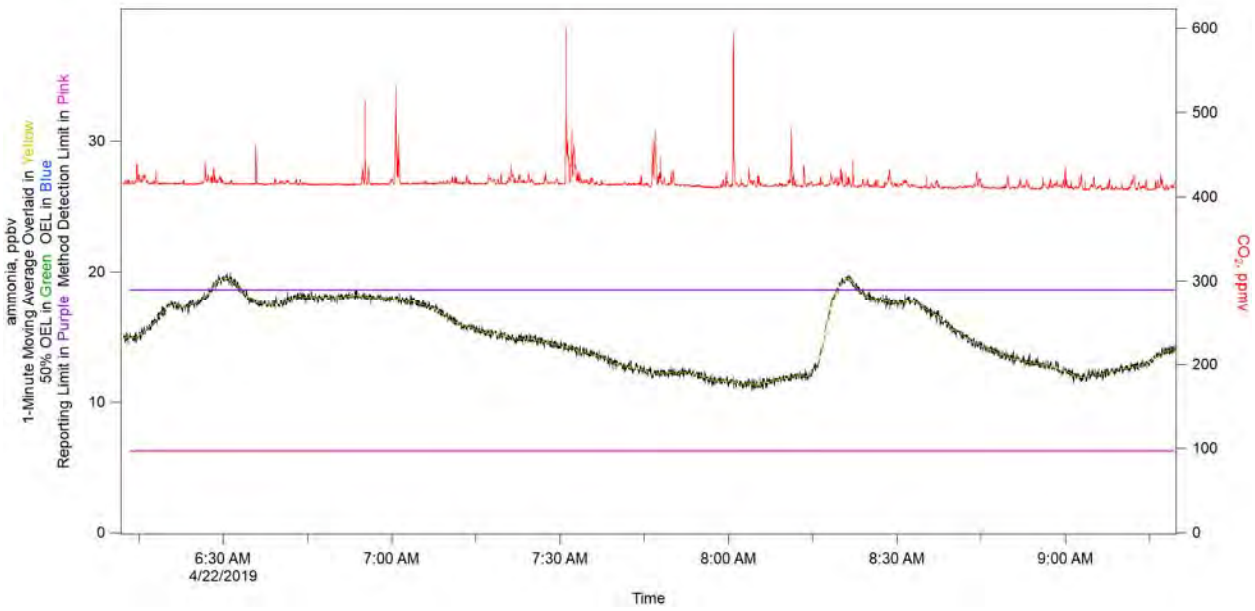


**Figure 2-3. Ammonia.**

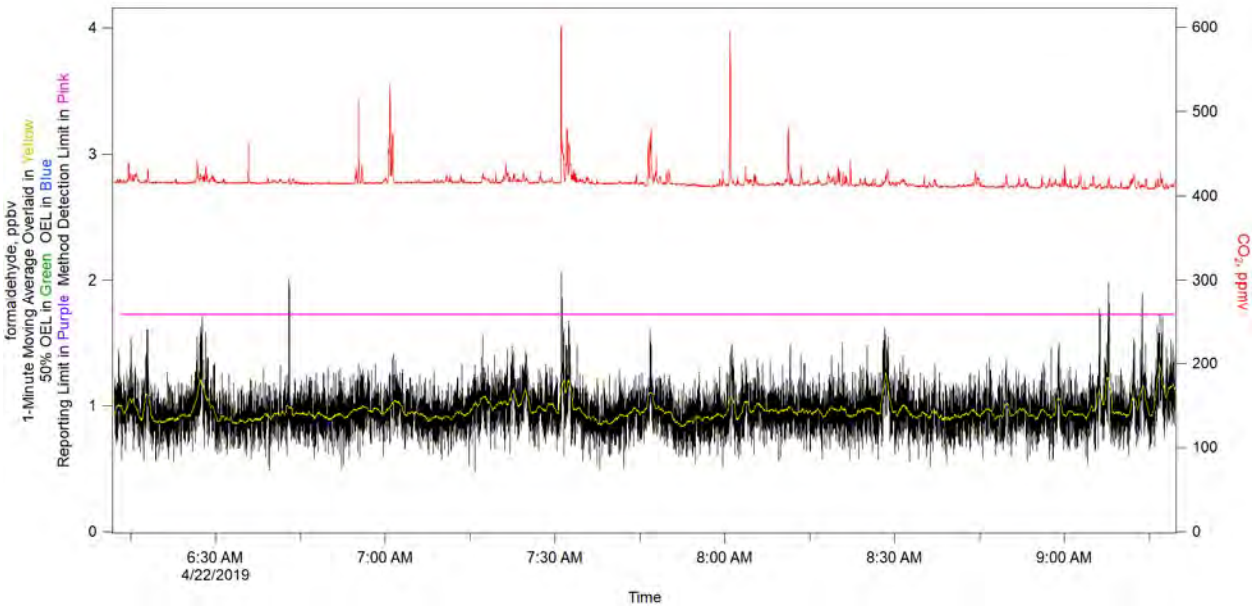


**Figure 2-4. Formaldehyde.**

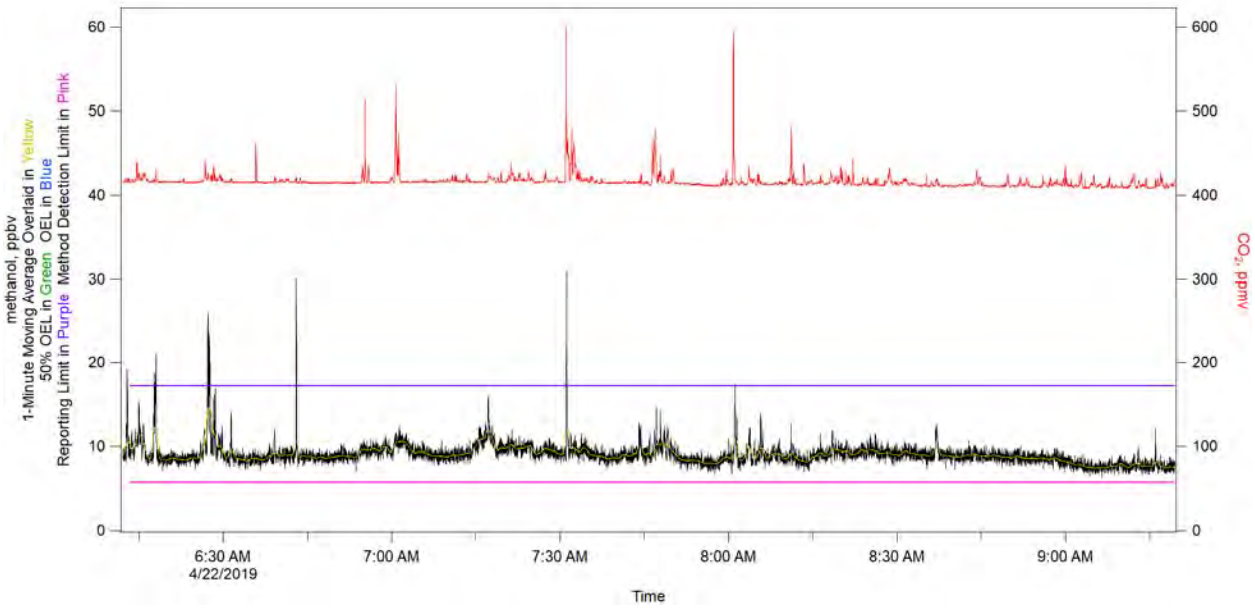


**Figure 2-5. Methanol.**

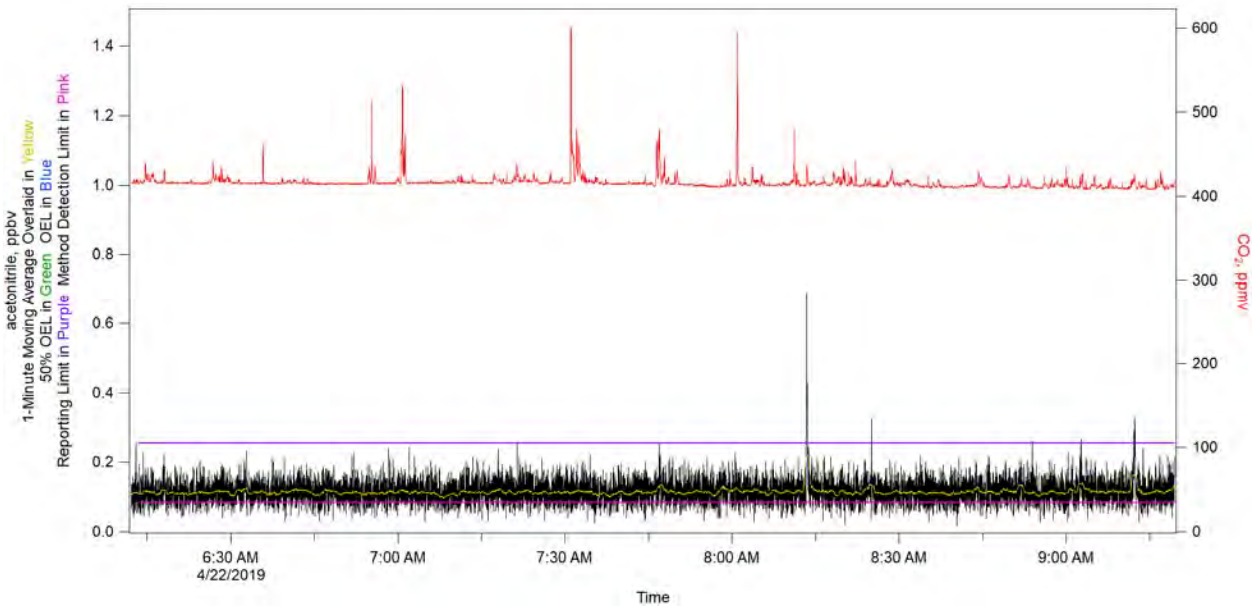


**Figure 2-6. Acetonitrile.**

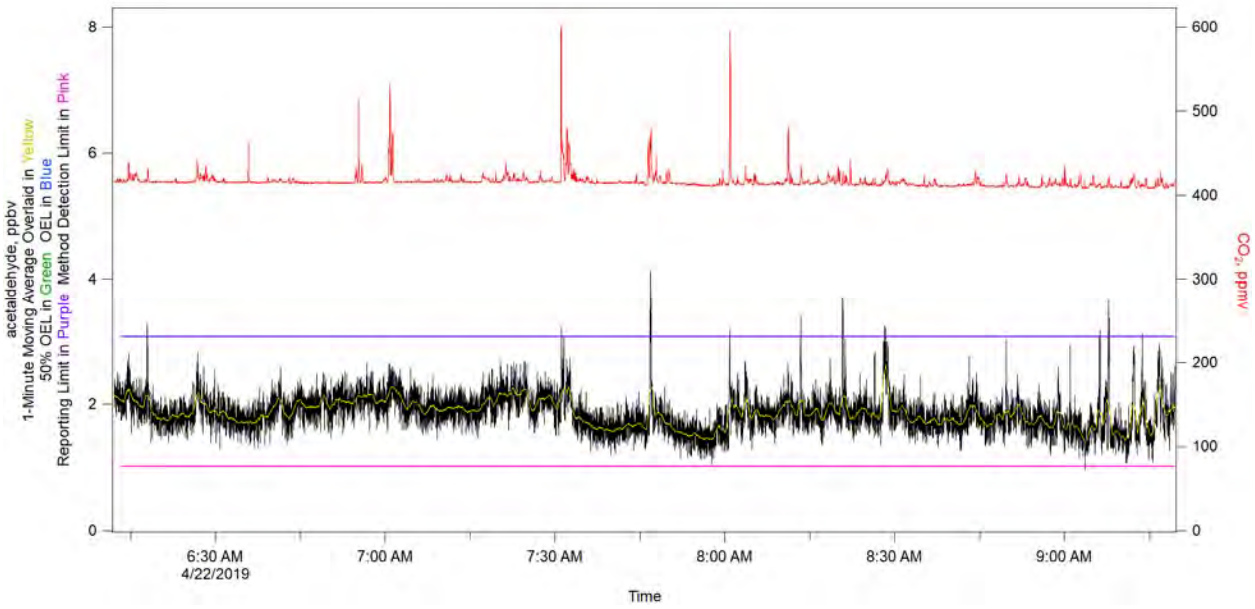


**Figure 2-7. Acetaldehyde.**

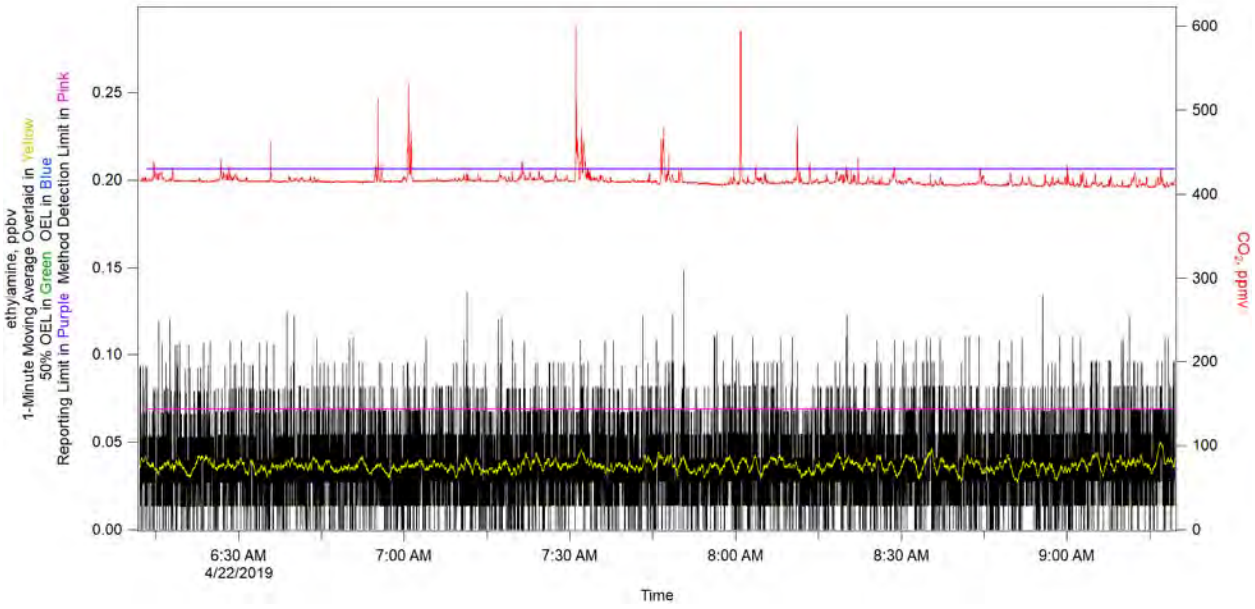


**Figure 2-8. Ethylamine.**

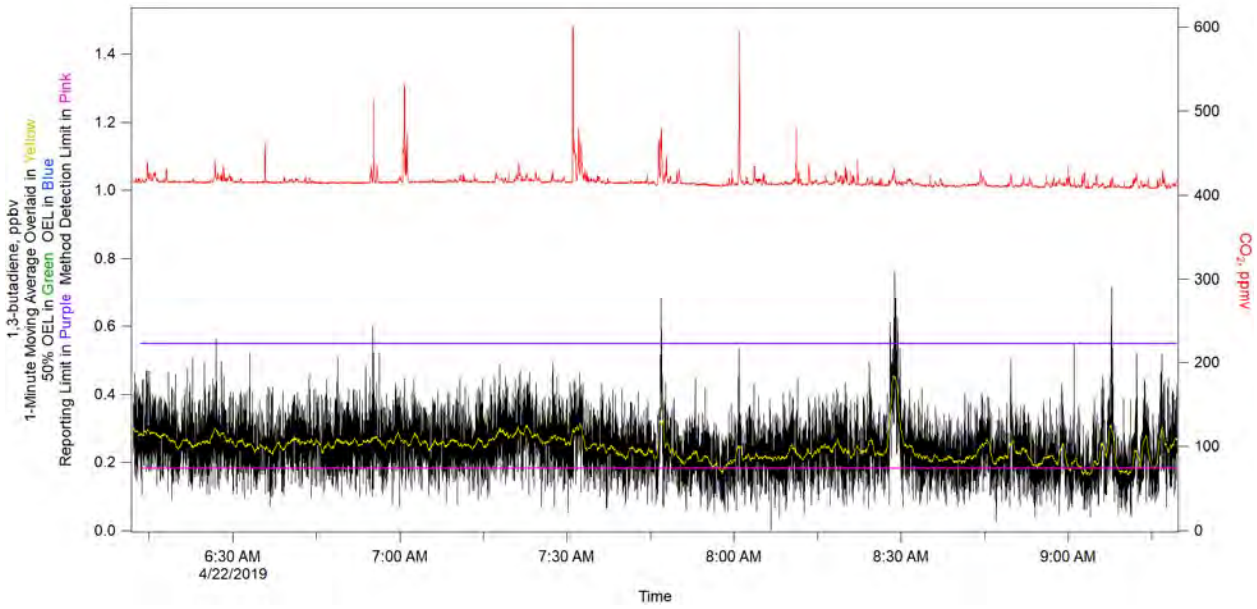


**Figure 2-9. 1,3-butadiene.**

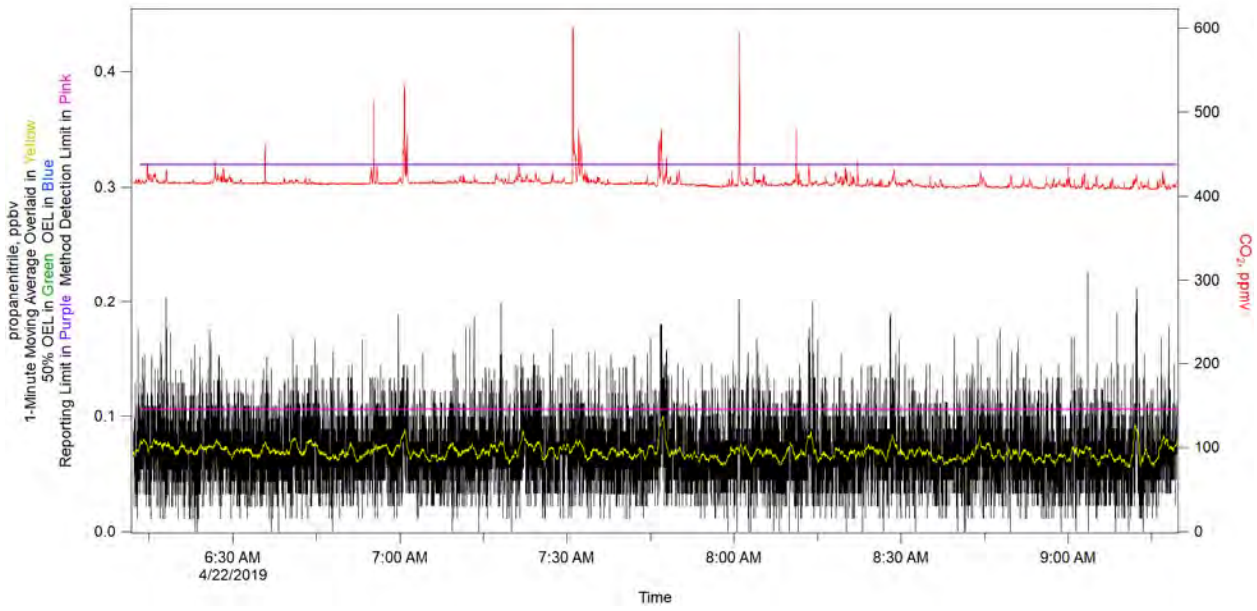


**Figure 2-10. Propanenitrile.**

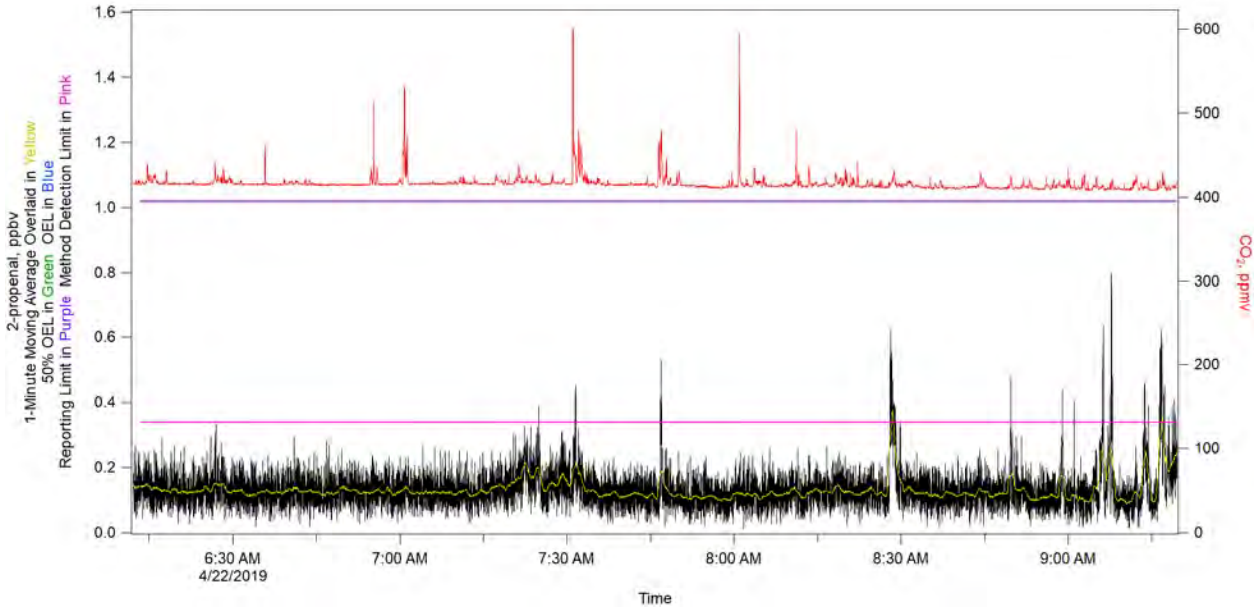


**Figure 2-11. 2-propenal.**

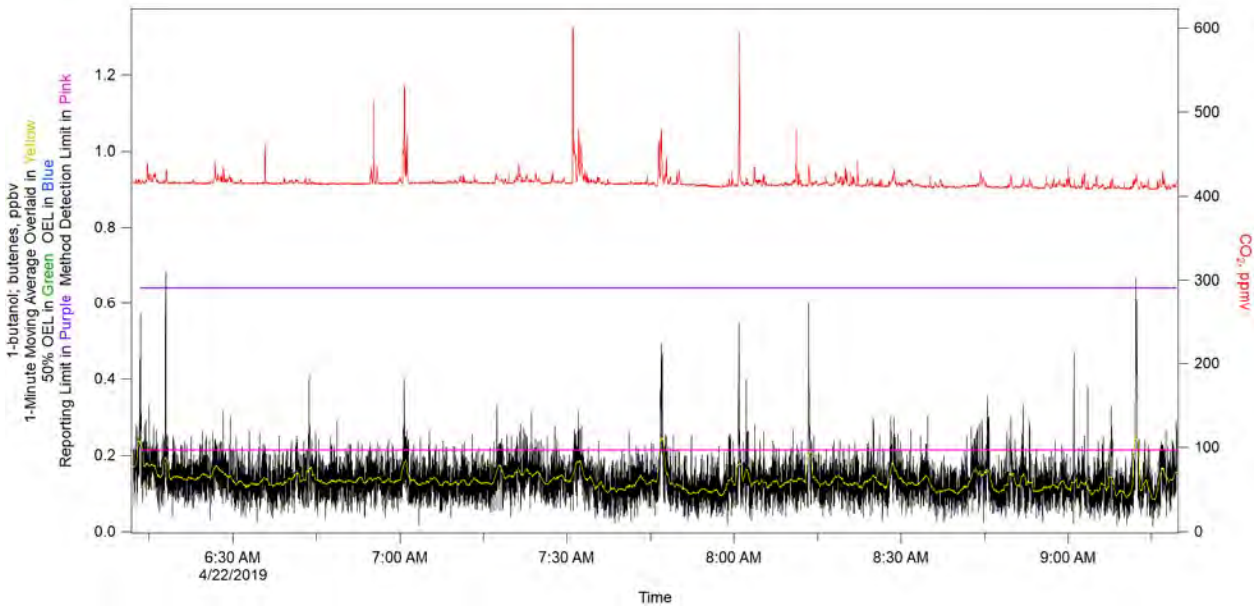


**Figure 2-12. 1-butanol; Butenes.**

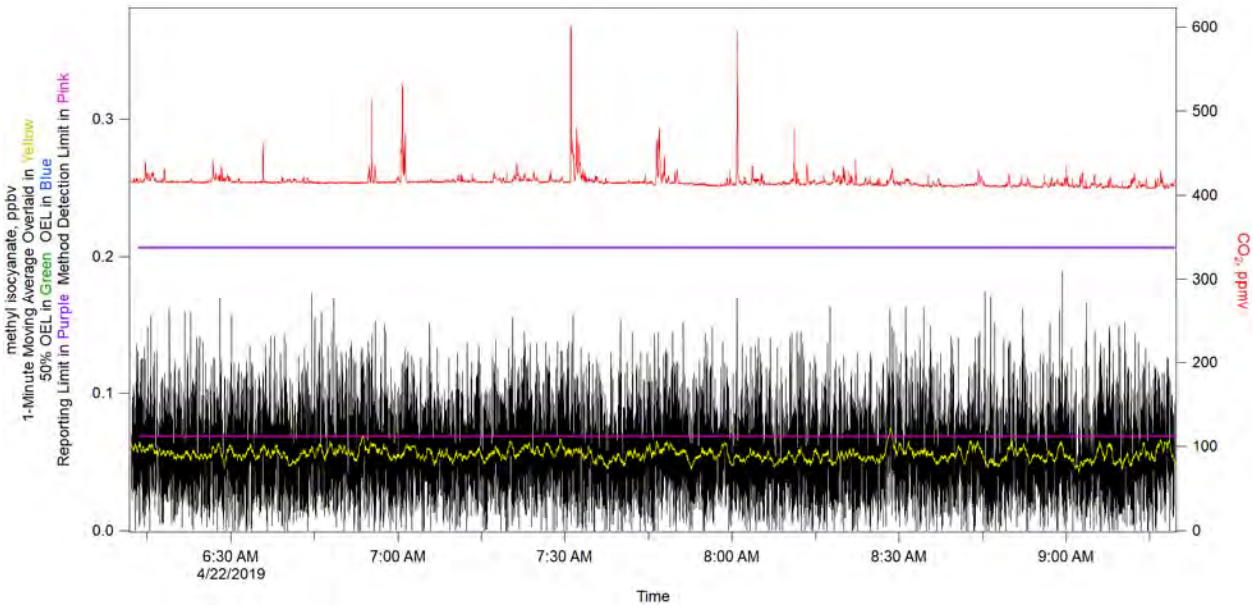


**Figure 2-13. Methyl Isocyanate.**

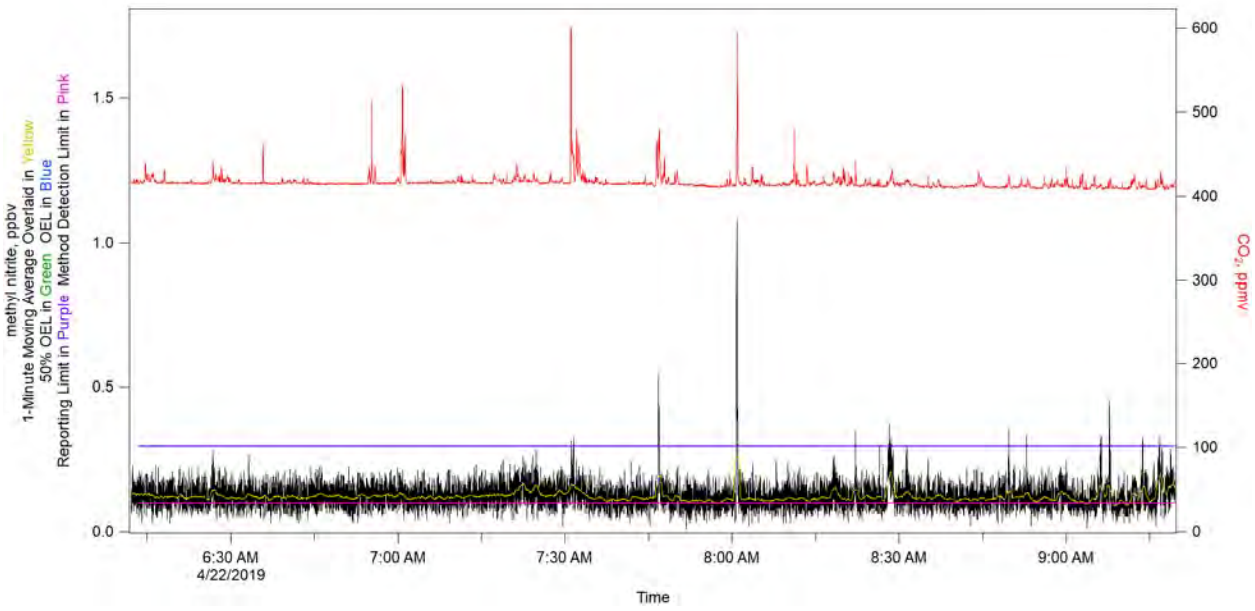


**Figure 2-14. Methyl Nitrite.**

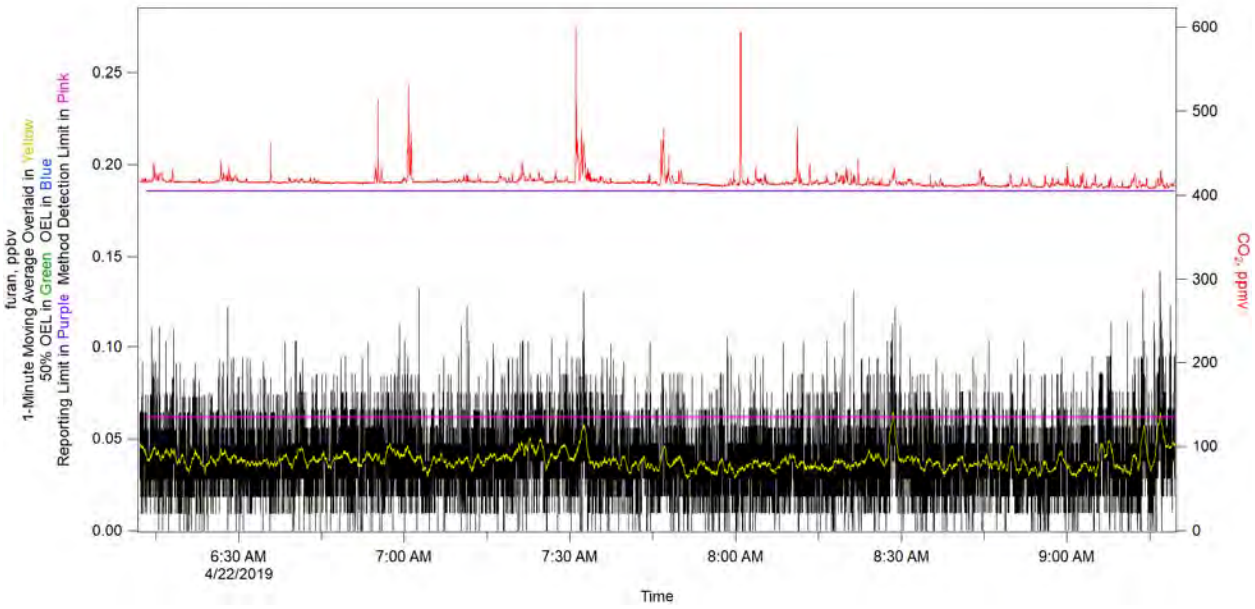


**Figure 2-15. Furan.**

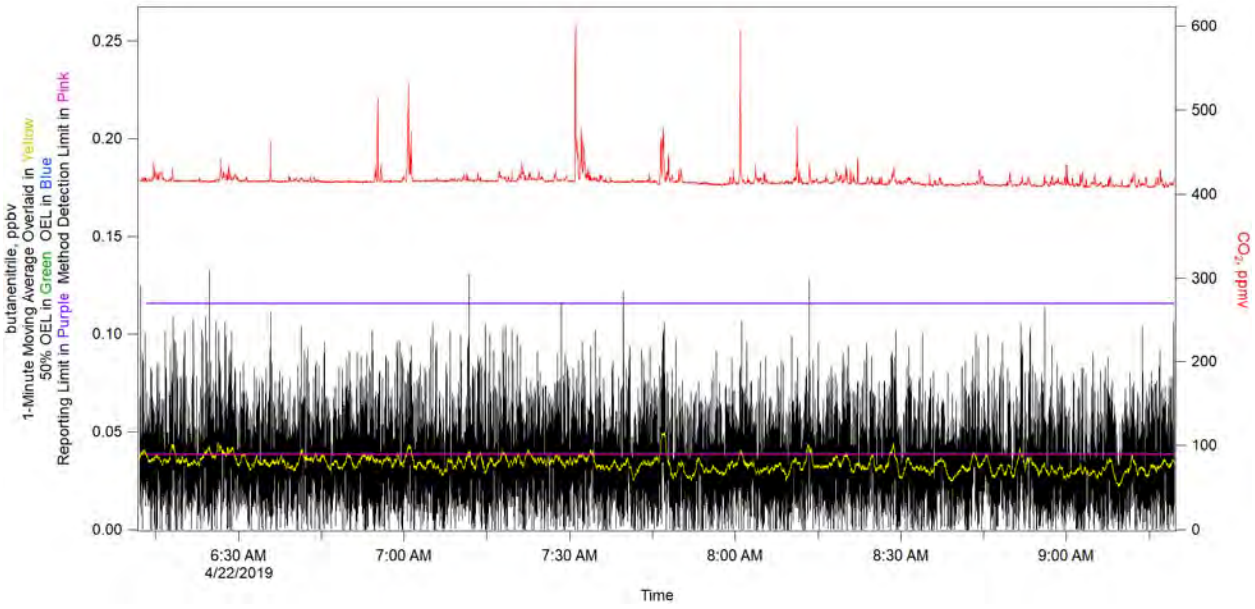


**Figure 2-16. Butanenitrile.**

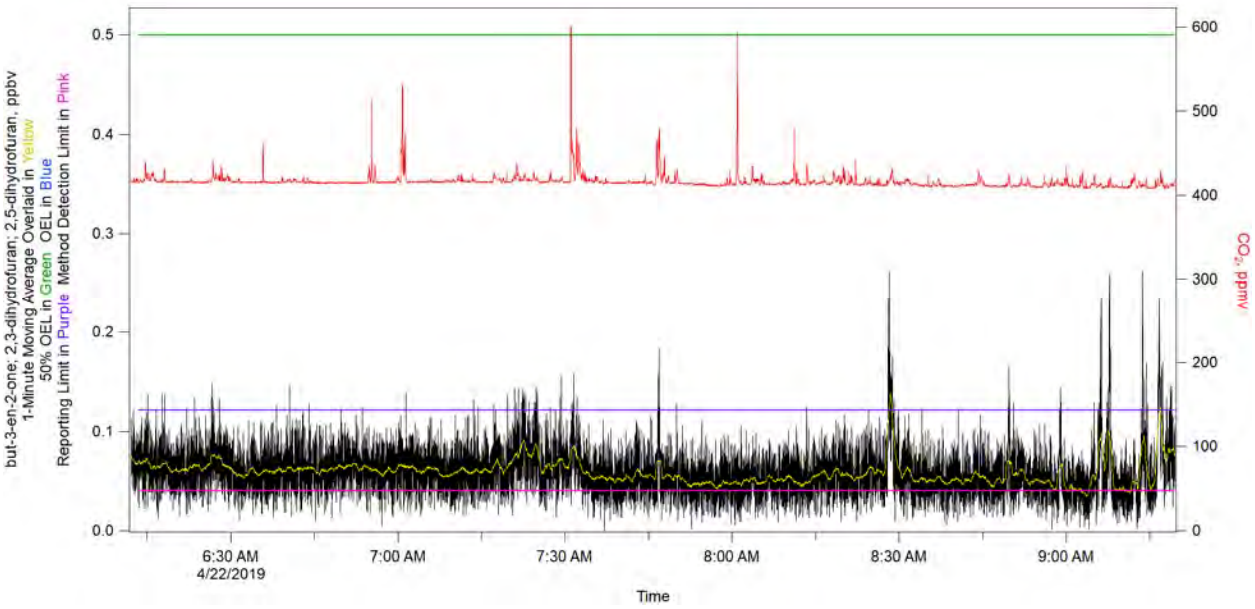


**Figure 2-17. But-3-en-2-one; 2,3-dihydrofuran; 2,5-dihydrofuran.**

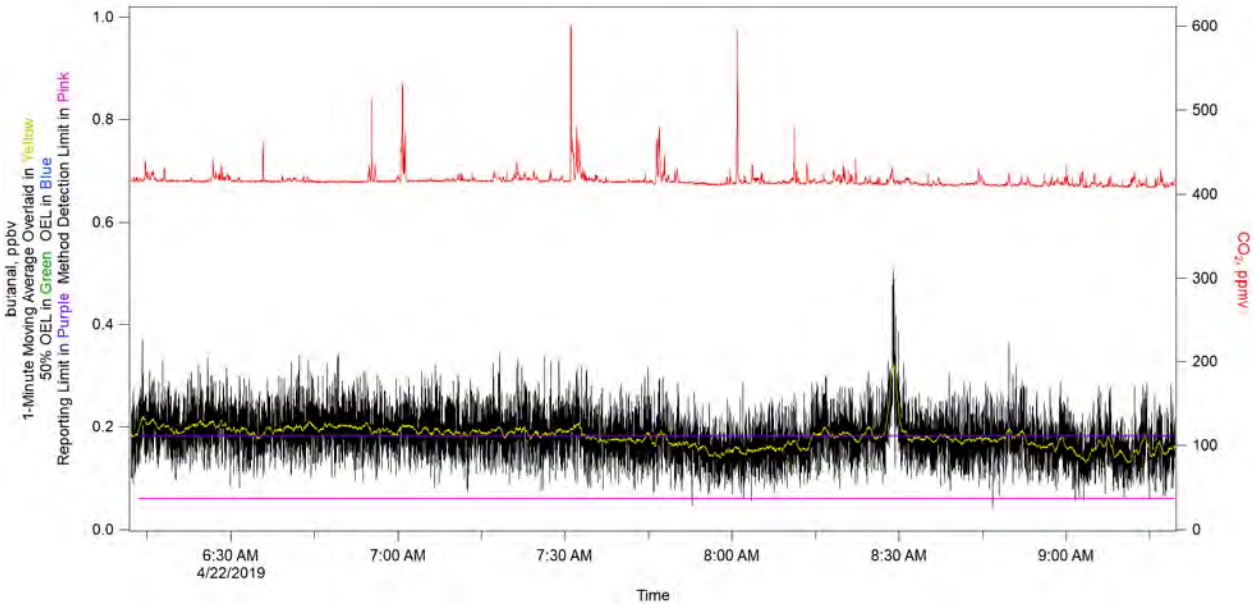


**Figure 2-18. Butanal.**

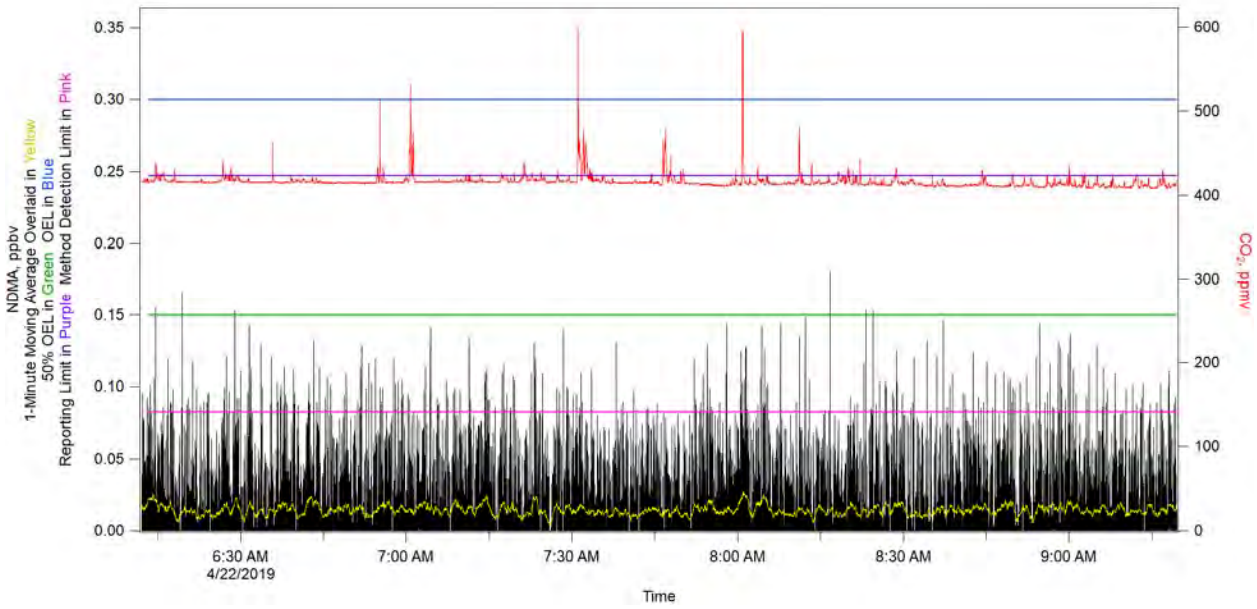


**Figure 2-19. N-nitrosodimethylamine (NDMA).**

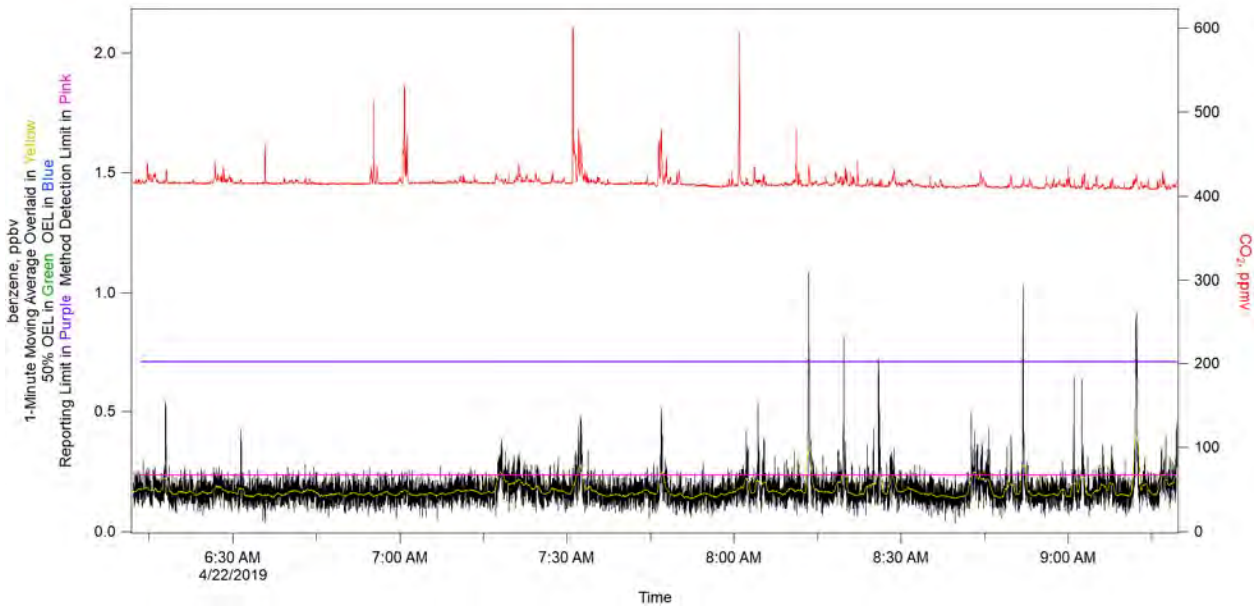


**Figure 2-20. Benzene.**

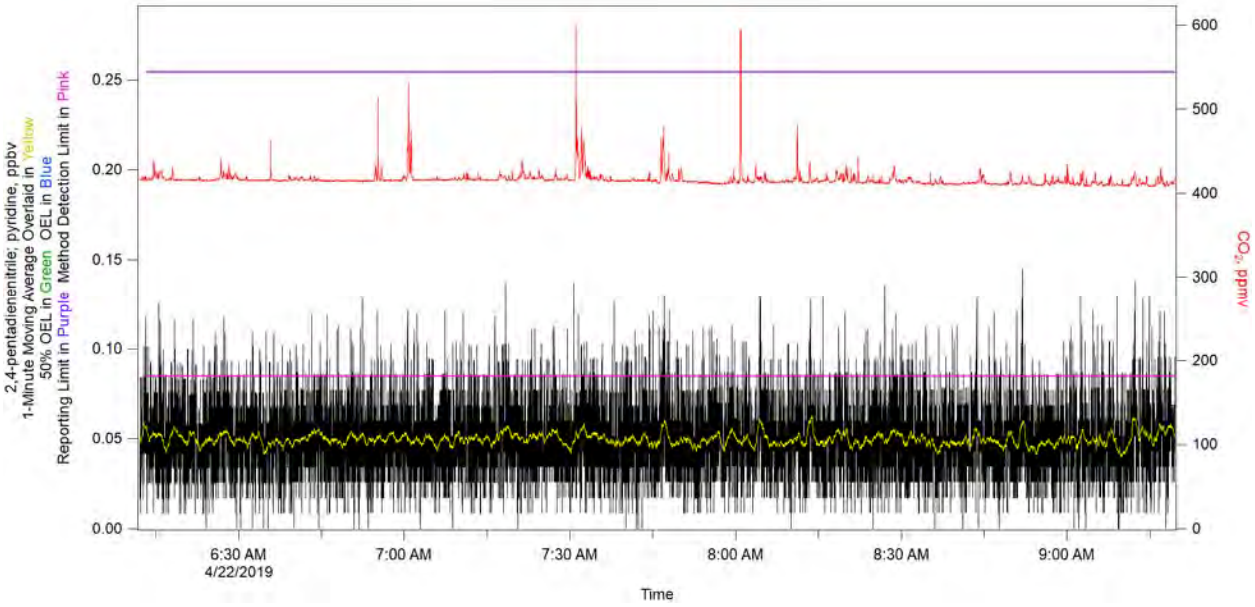


**Figure 2-21. 2,4-pentadienenitrile; Pyridine.**

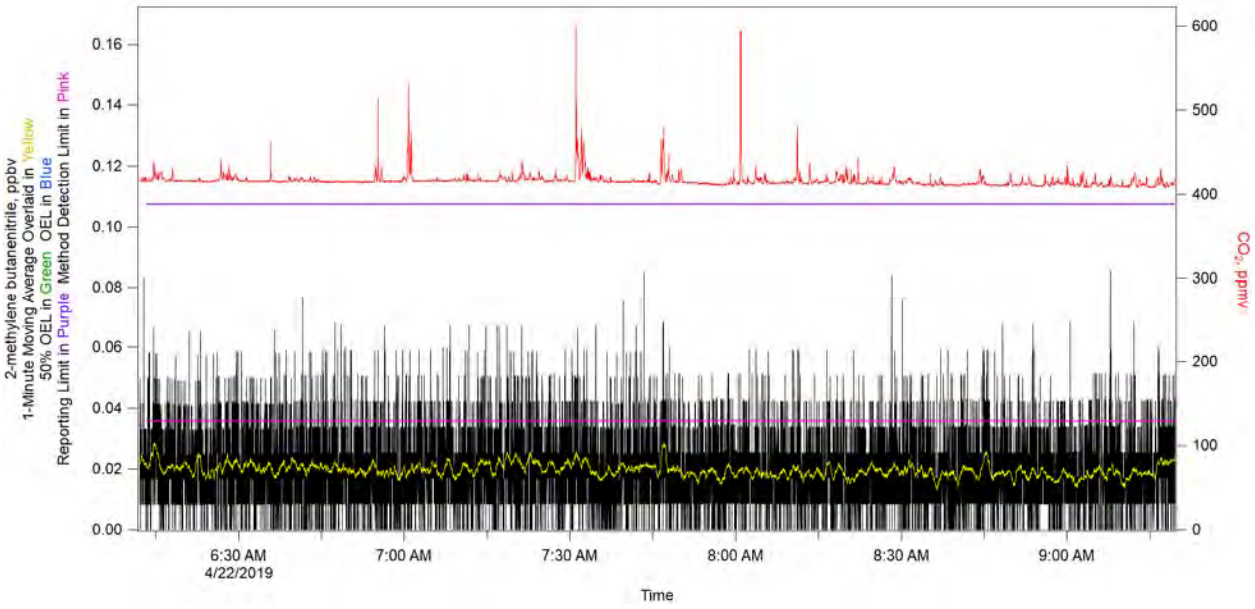


**Figure 2-22. 2-methylene Butanenitrile.**

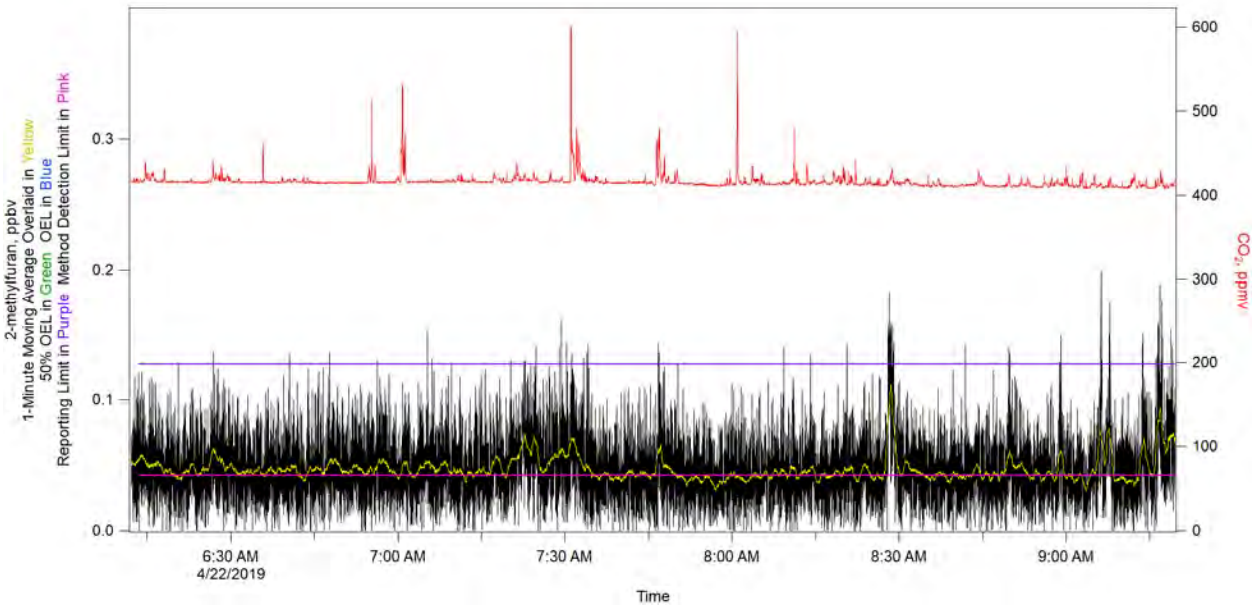


**Figure 2-23. 2-methylfuran.**

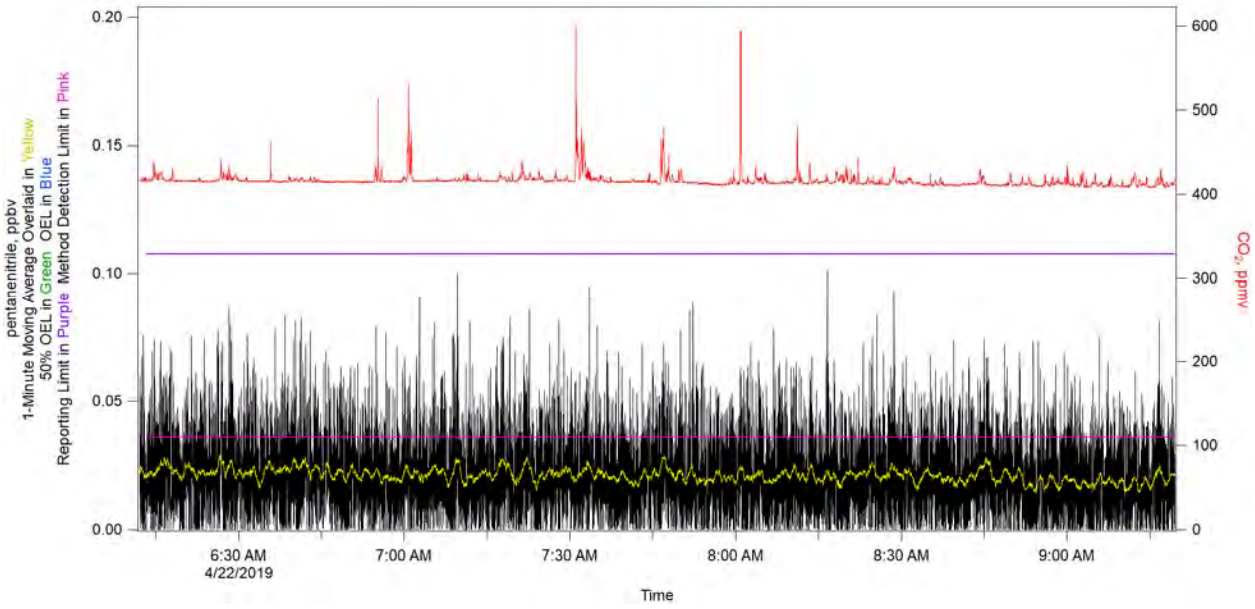


**Figure 2-24. Pentanenitrile.**

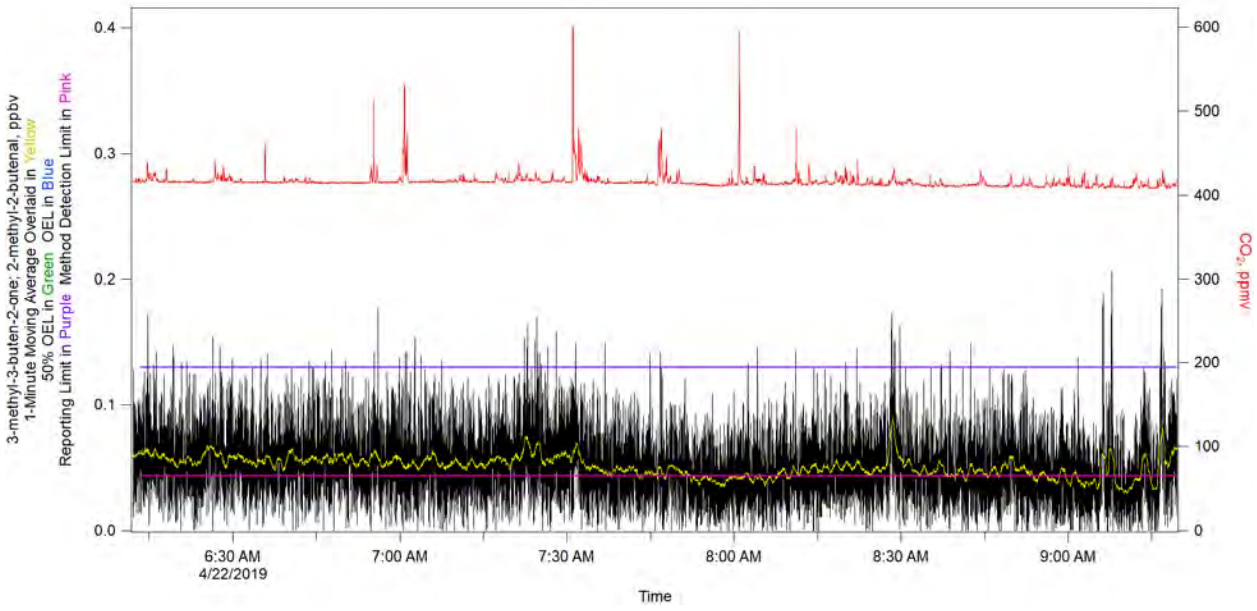


**Figure 2-25. 3-methyl-3-buten-2-one; 2-methyl-2-butenal.**

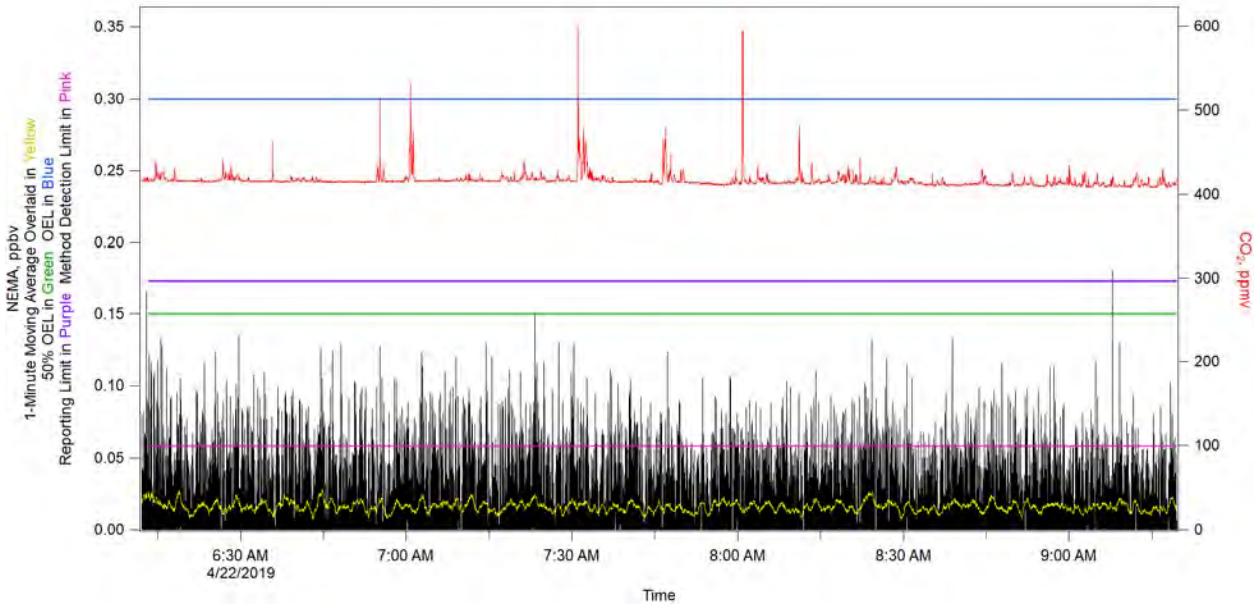


**Figure 2-26. N-nitrosomethylethylamine (NEMA).**

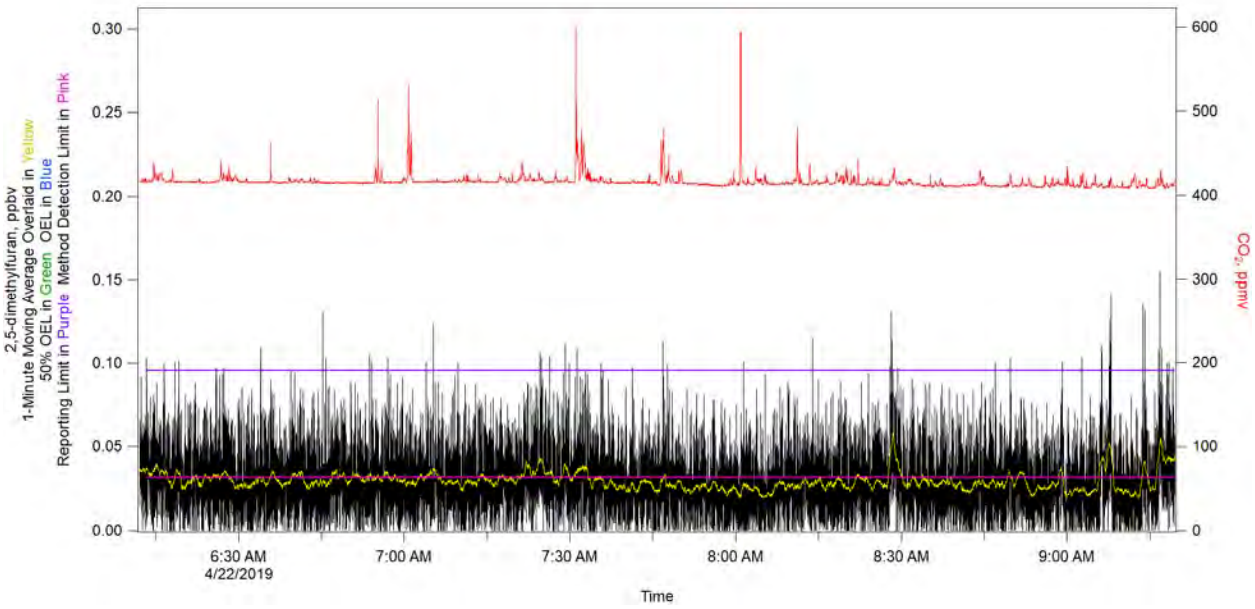


**Figure 2-27. 2,5-dimethylfuran.**

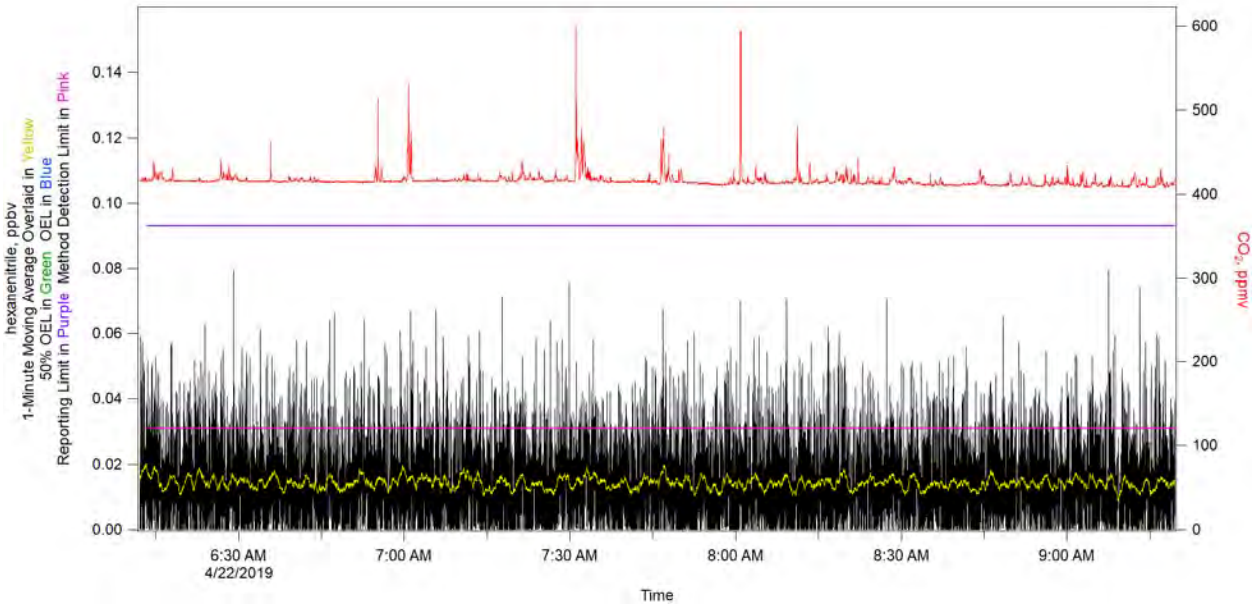


**Figure 2-28. Hexanenitrile.**

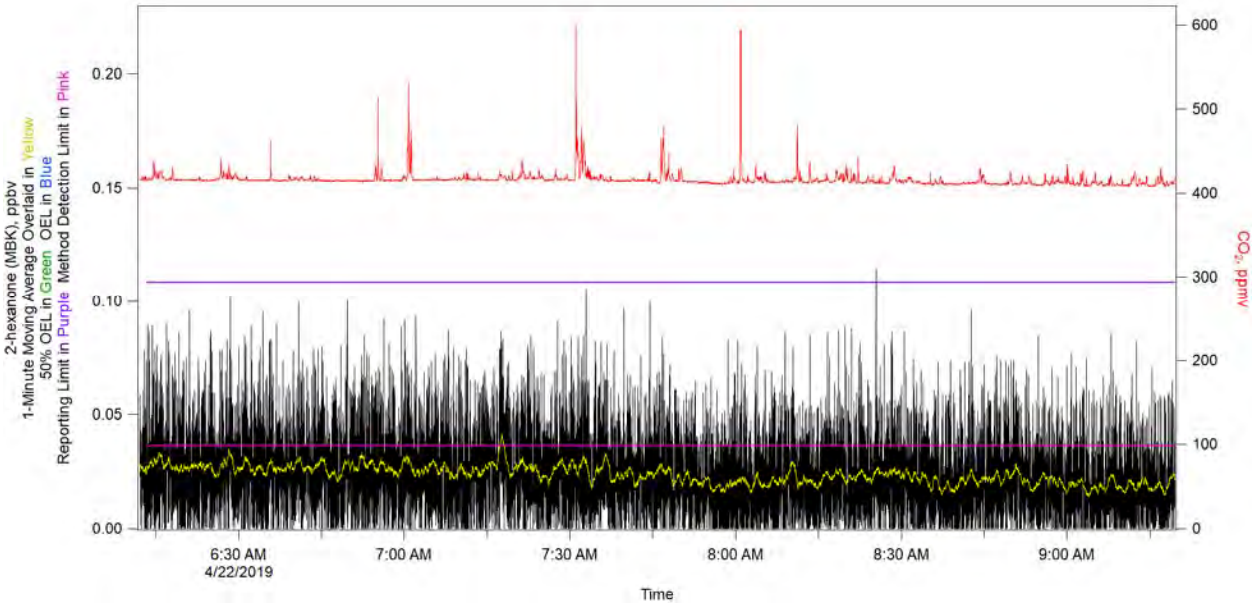


**Figure 2-29. 2-hexanone (MBK).**

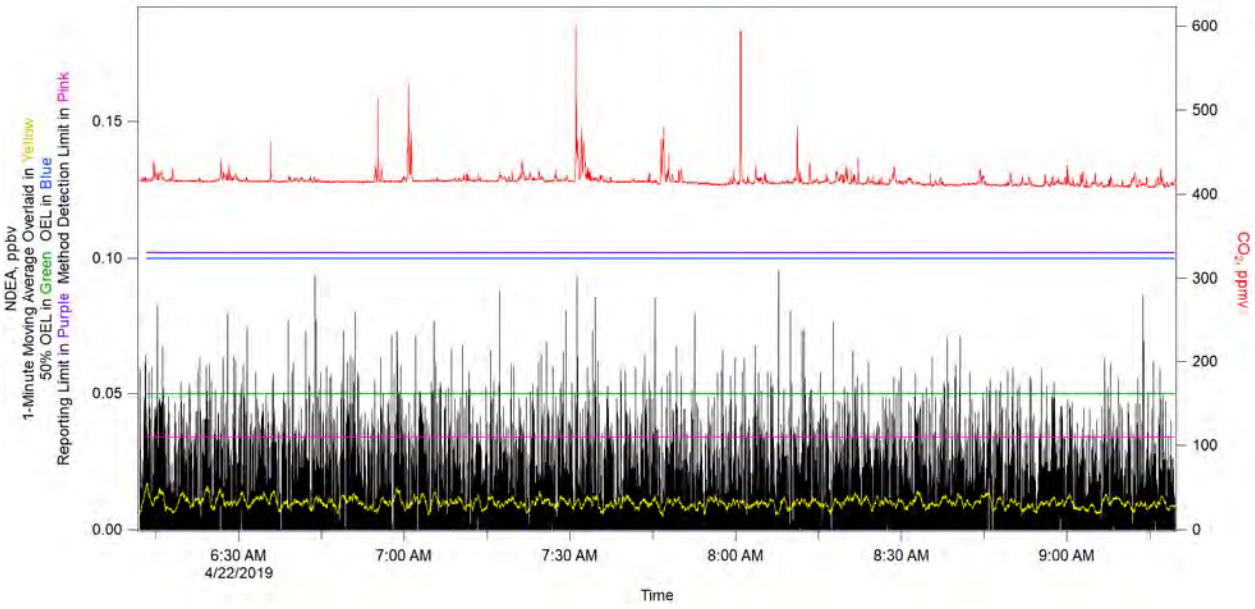


**Figure 2-30. N-nitrosodiethylamine (NDEA).**

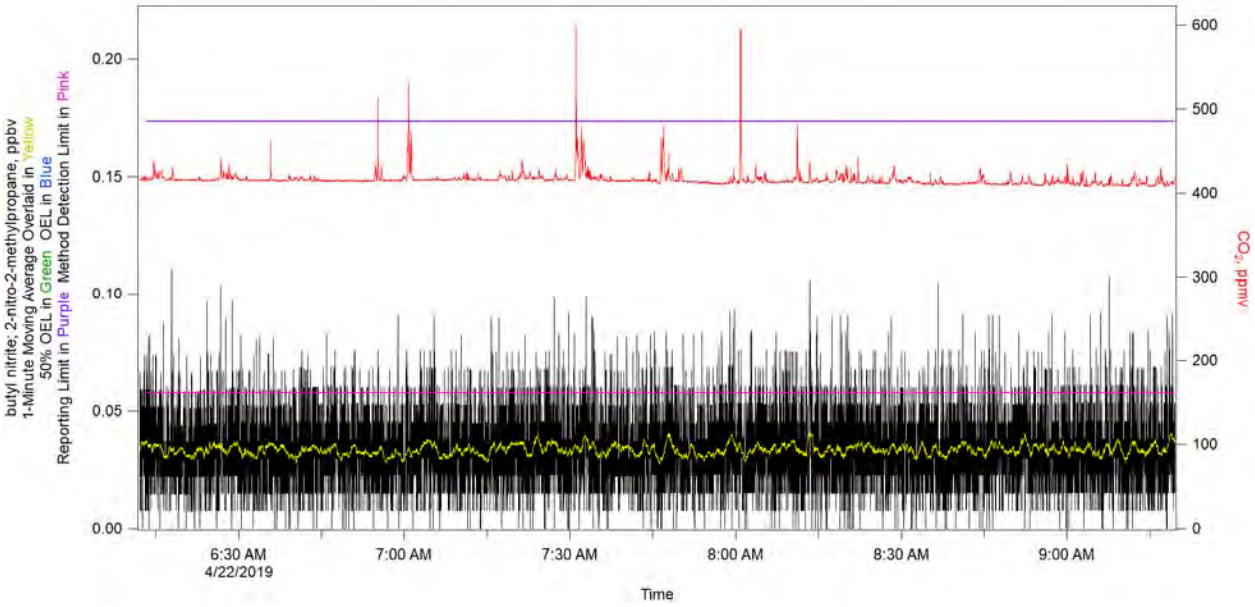


**Figure 2-31. Butyl Nitrite; 2-nitro-2-methylpropane.**

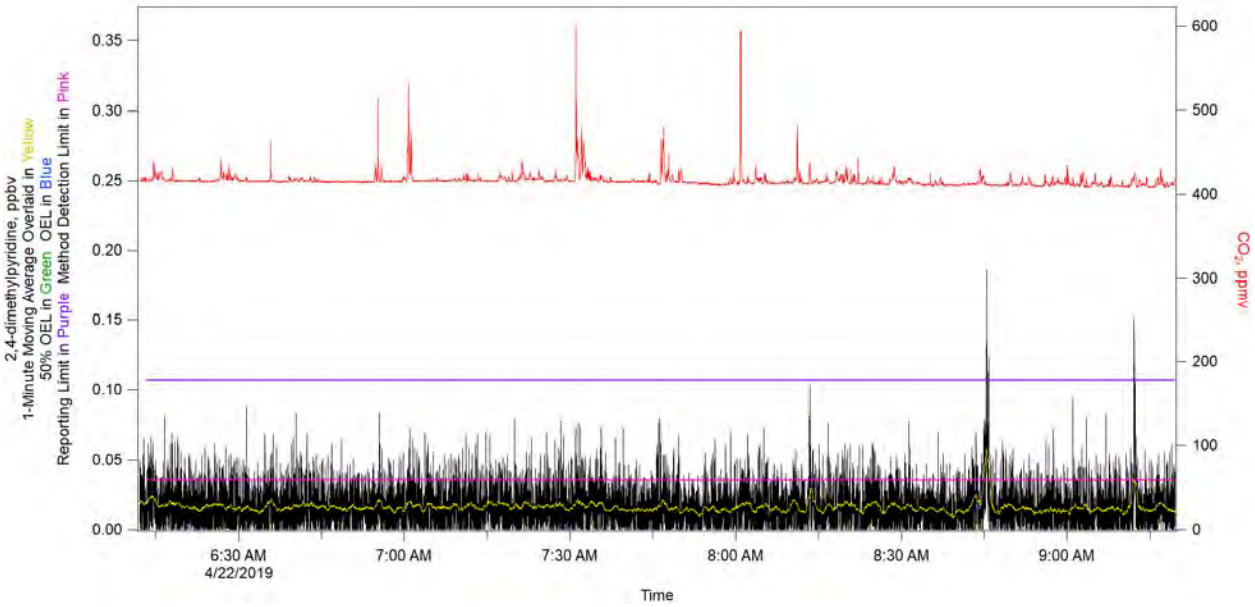


**Figure 2-32. 2,4-dimethylpyridine.**

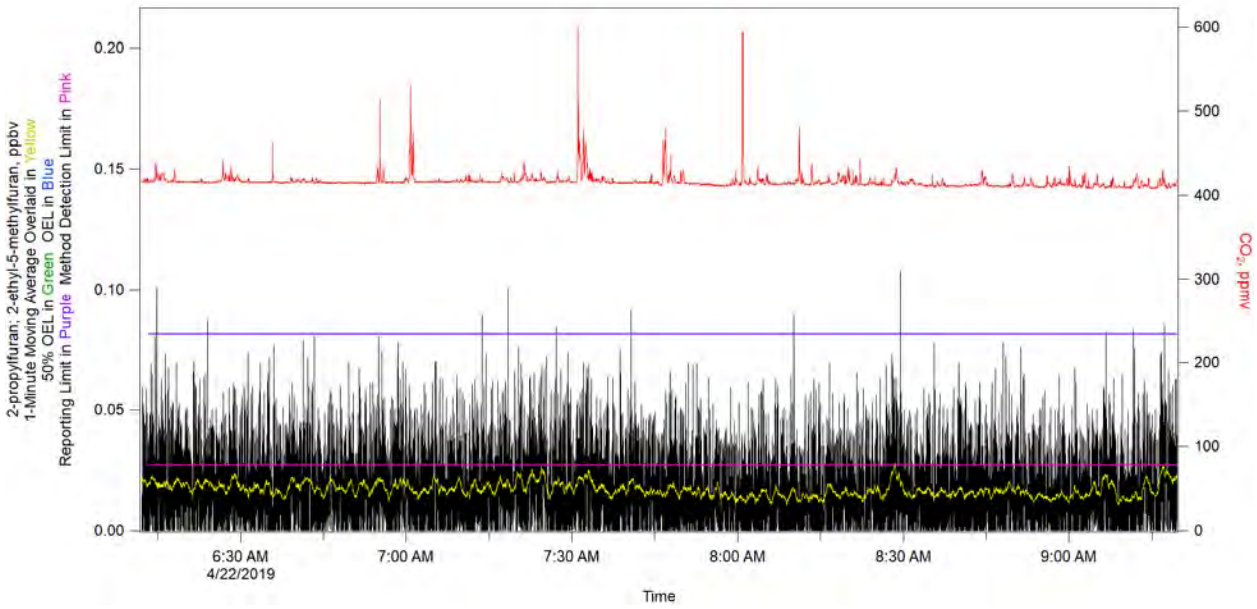


**Figure 2-33. 2-propylfuran; 2-ethyl-5-methylfuran.**

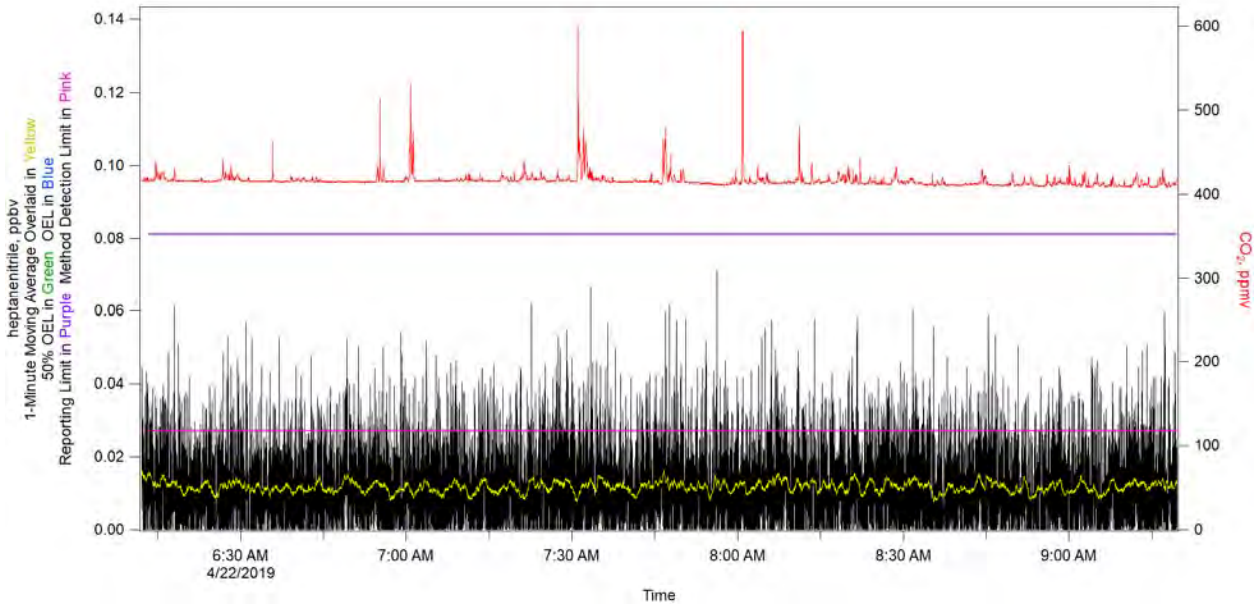


**Figure 2-34. Heptanenitrile.**

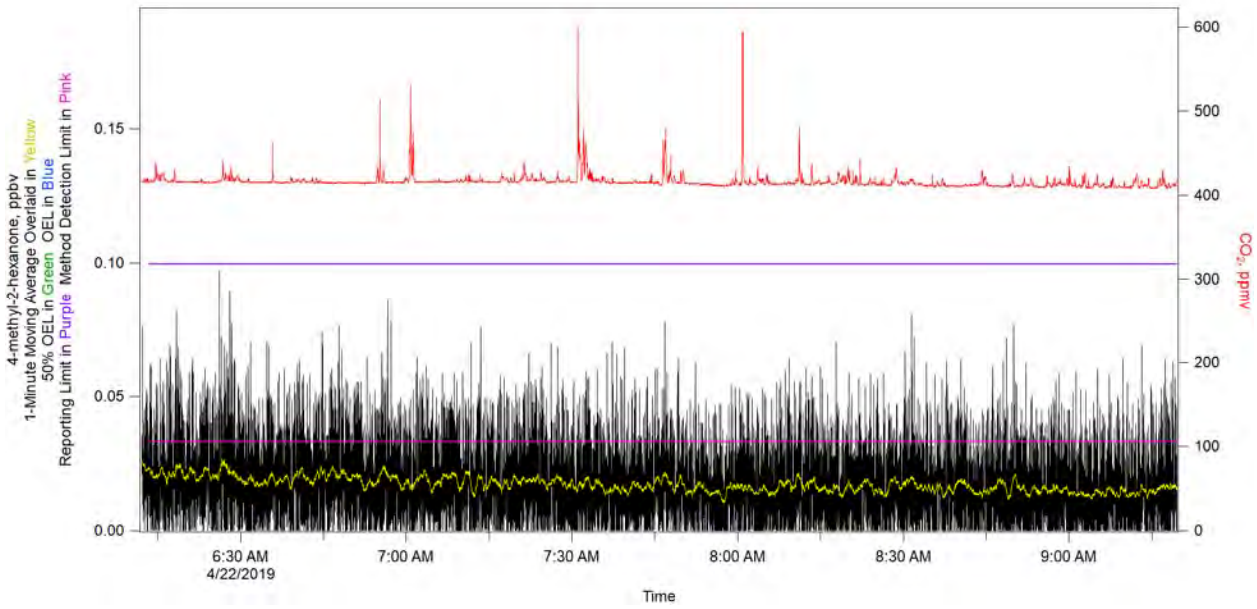


**Figure 2-35. 4-methyl-2-hexanone.**

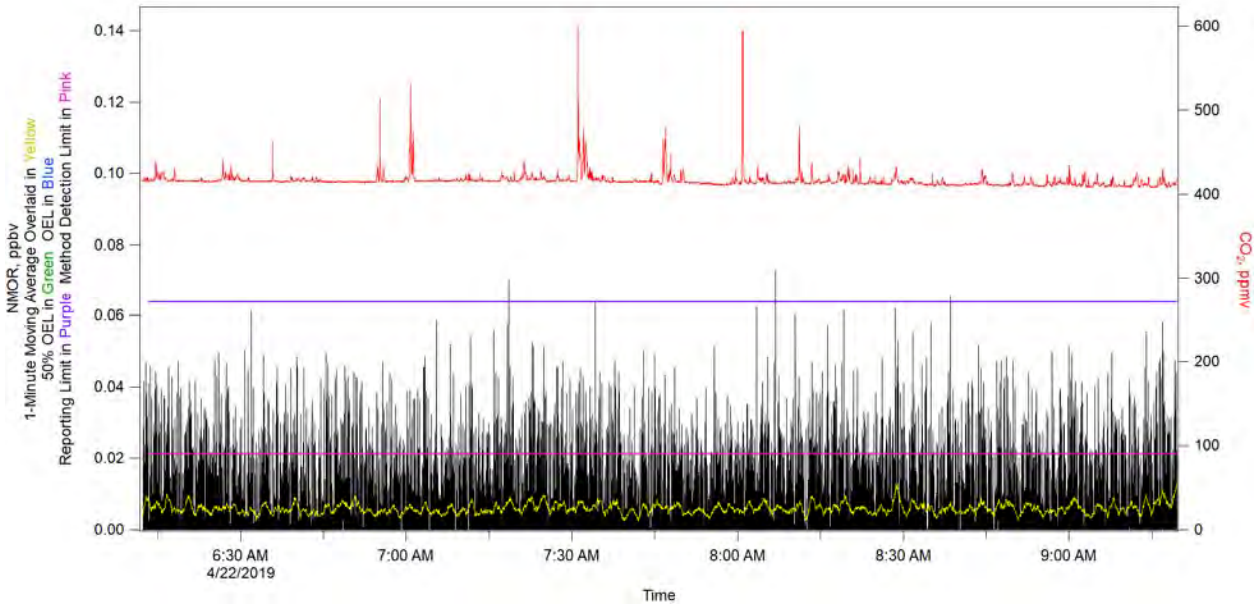


**Figure 2-36. N-nitrosomorpholine (NMOR).**

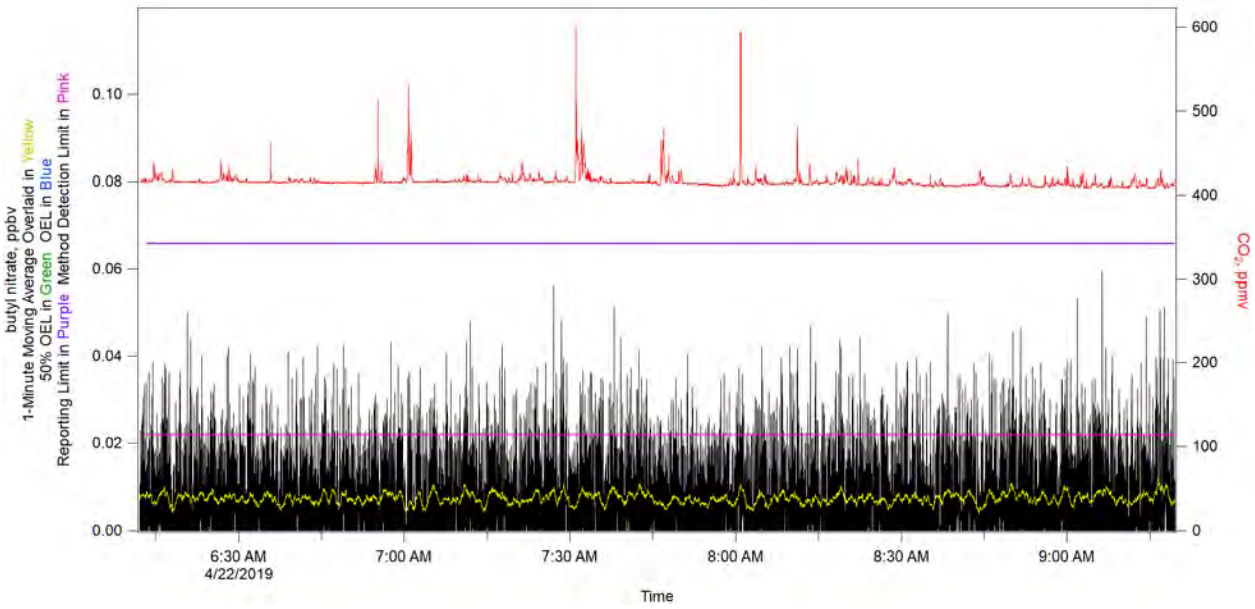


**Figure 2-37. Butyl Nitrate.**

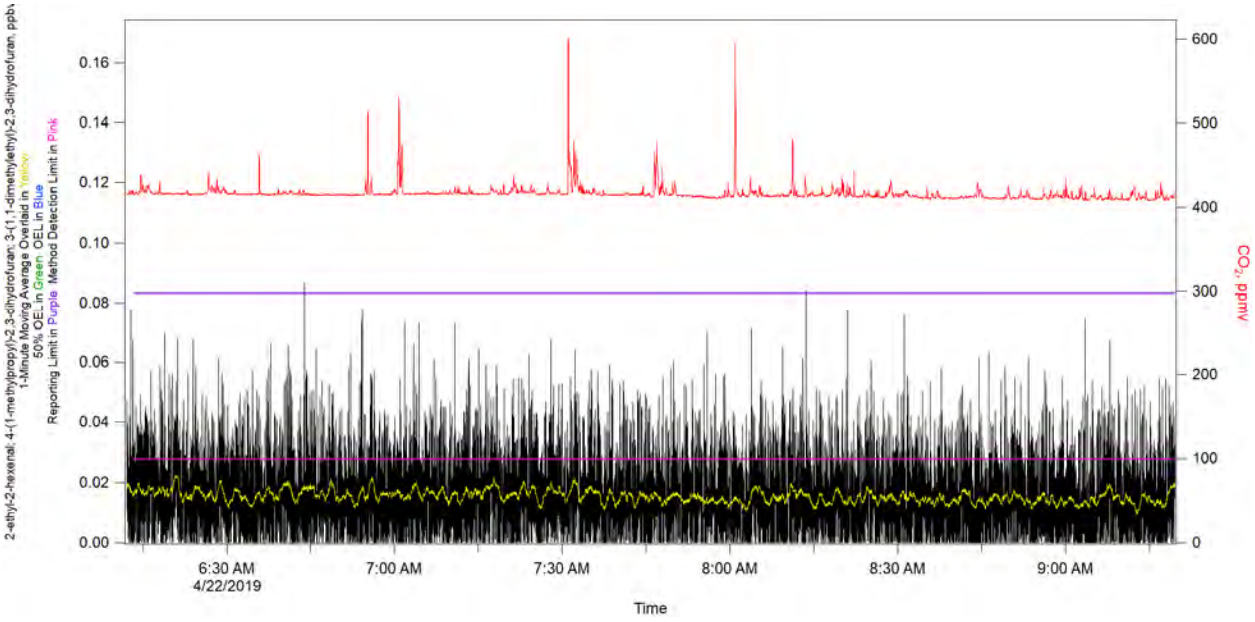


**Figure 2-38. 2-ethyl-2-hexenal; 4-(1-methylpropyl)-2,3-dihydrofuran 3-(1,1-dimethylethyl)-2,3-dihydrofuran.**

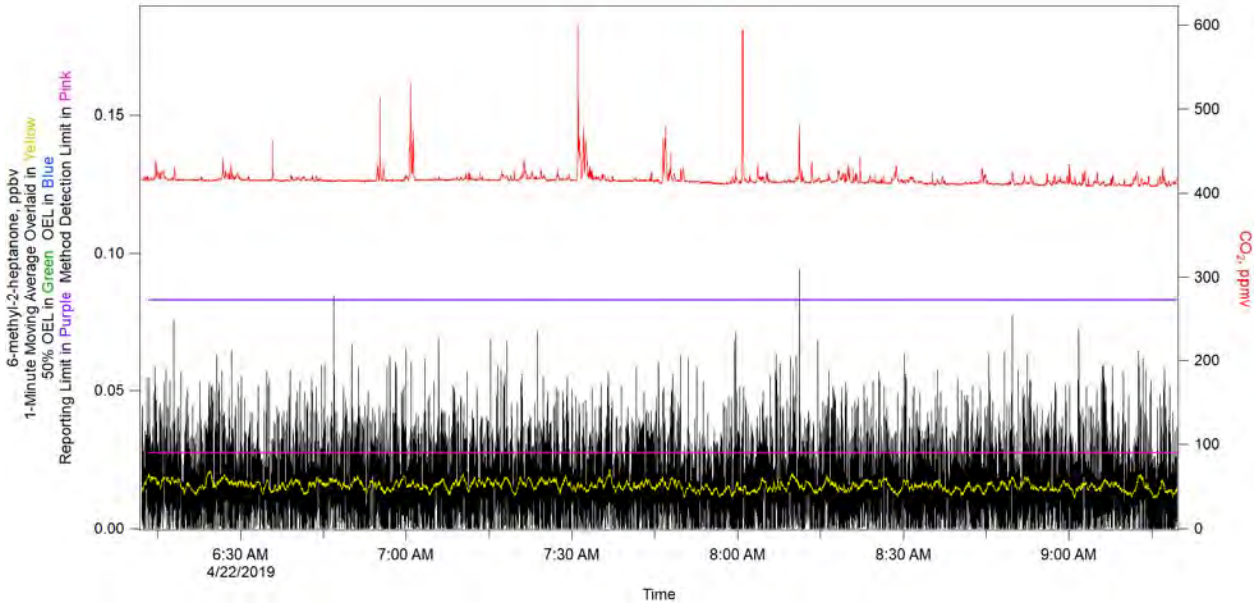


**Figure 2-39. 6-methyl-2-heptanone.**

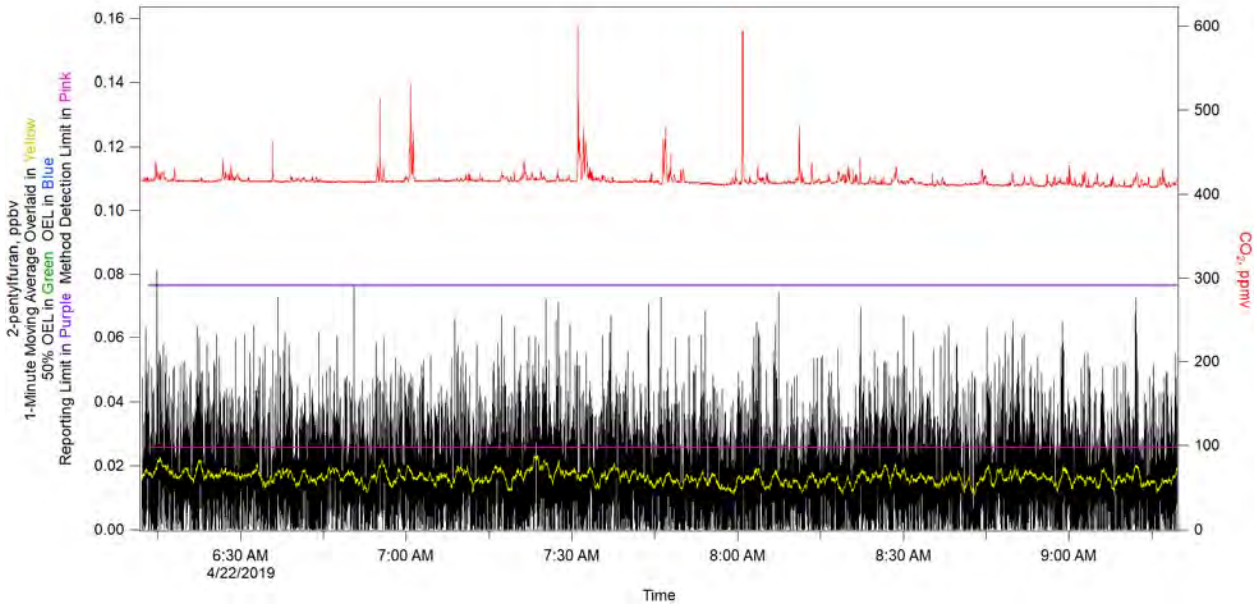


**Figure 2-40. 2-pentylfuran.**

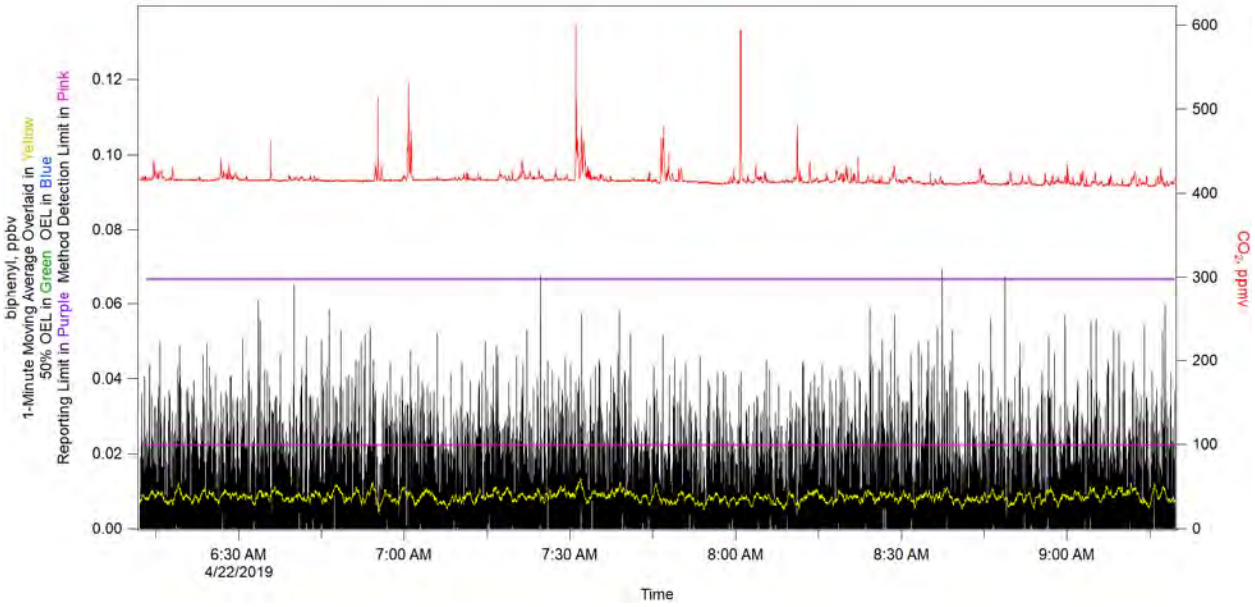


**Figure 2-41. Biphenyl.**

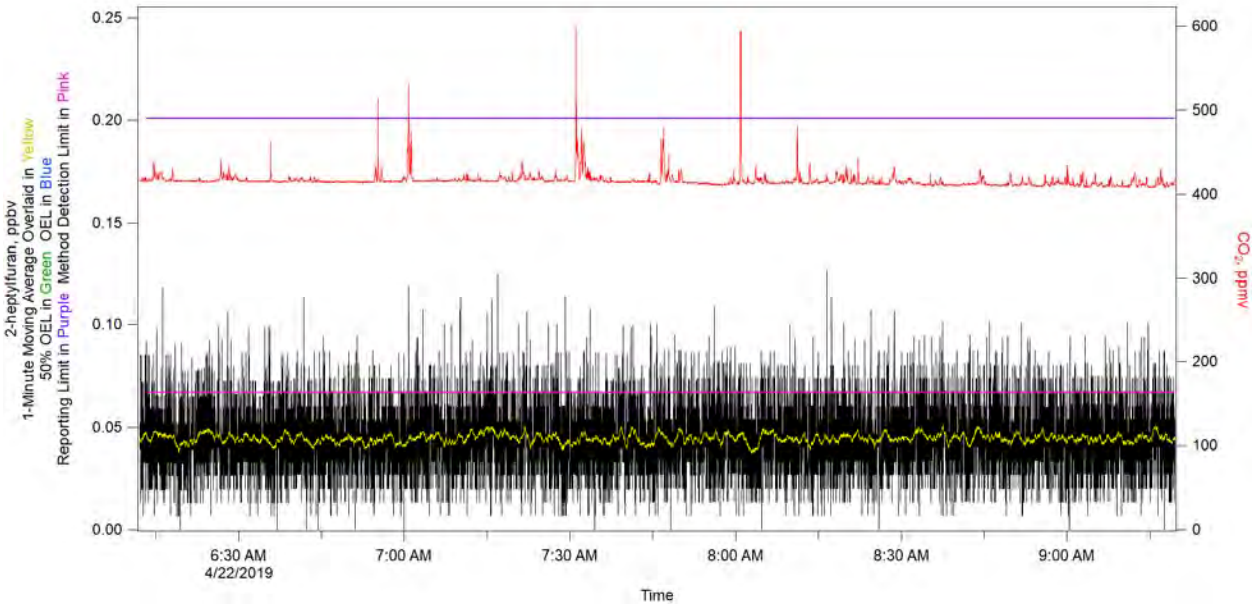


**Figure 2-42. 2-heptylfuran.**

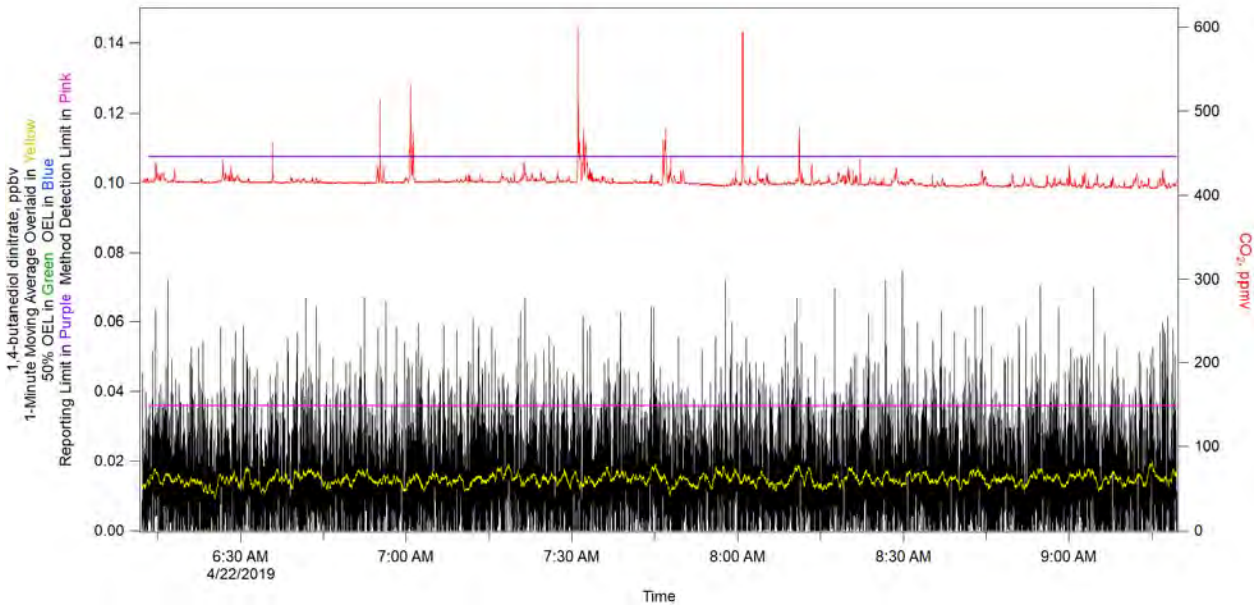


**Figure 2-43. 1,4-butanediol Dinitrate.**

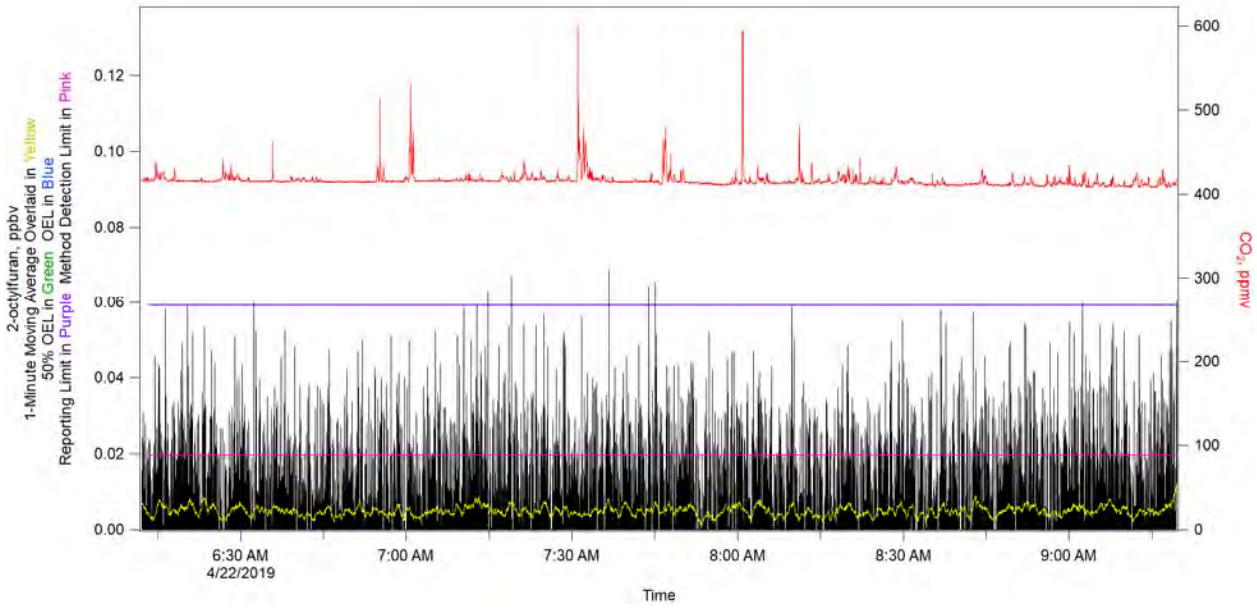


**Figure 2-44. 2-octylfuran.**

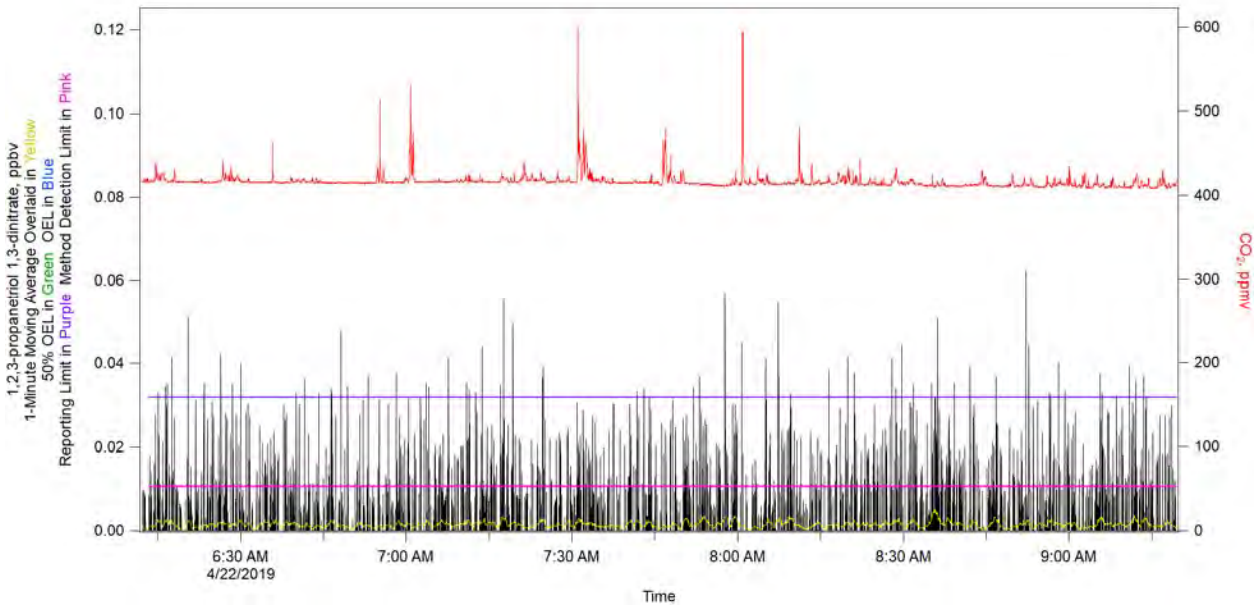


**Figure 2-45. 1,2,3-propanetriol 1,3-dinitrate.**

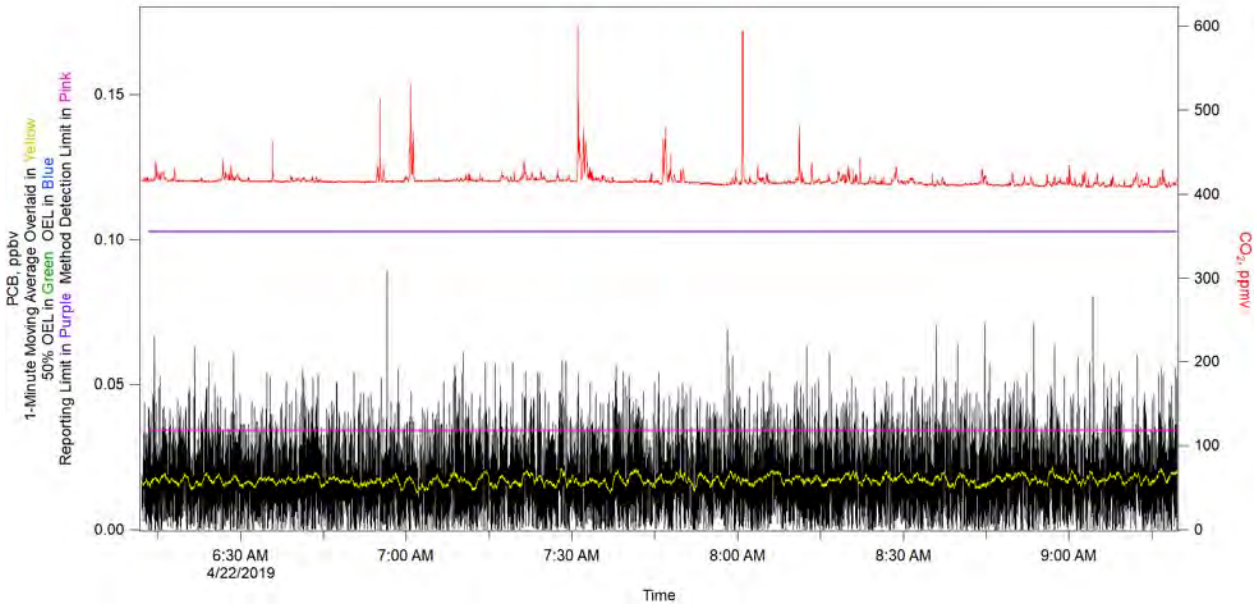


**Figure 2-46. PCB.**

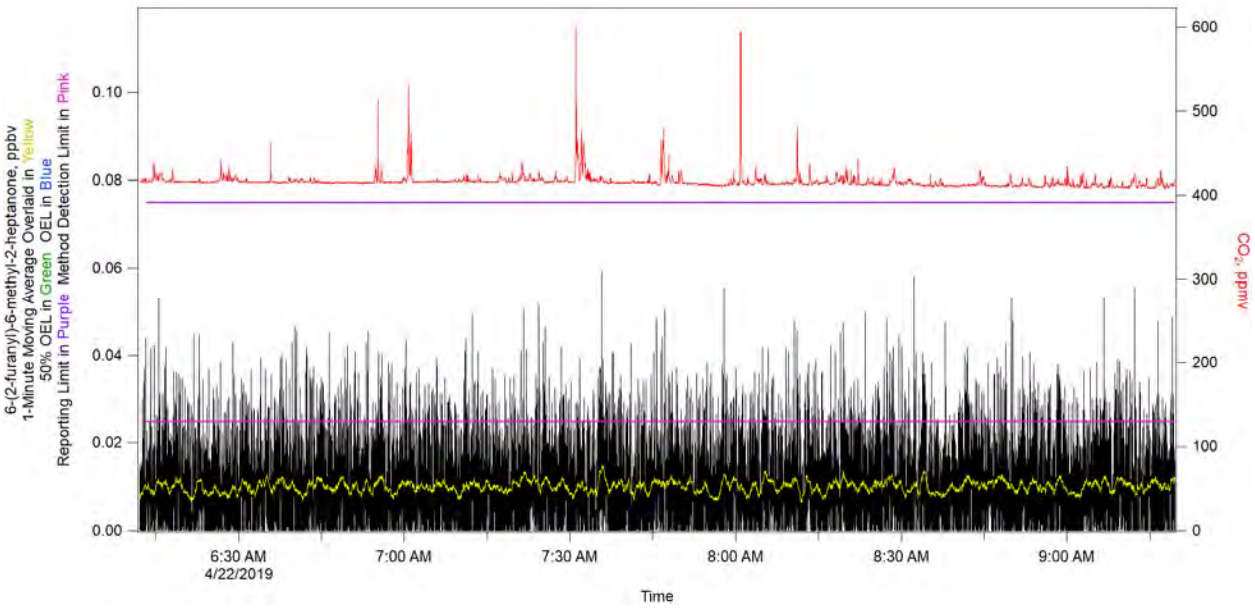


**Figure 2-47. 6-(2-furanyl)-6-methyl-2-heptanone.**

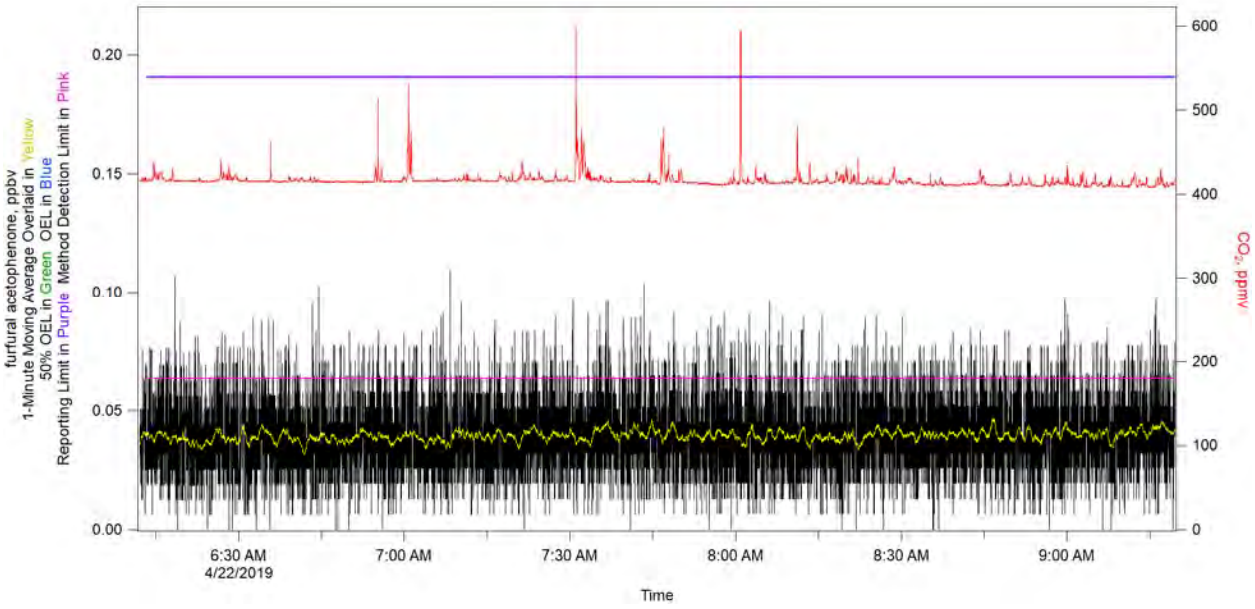


**Figure 2-48. Furfural Acetophenone.**

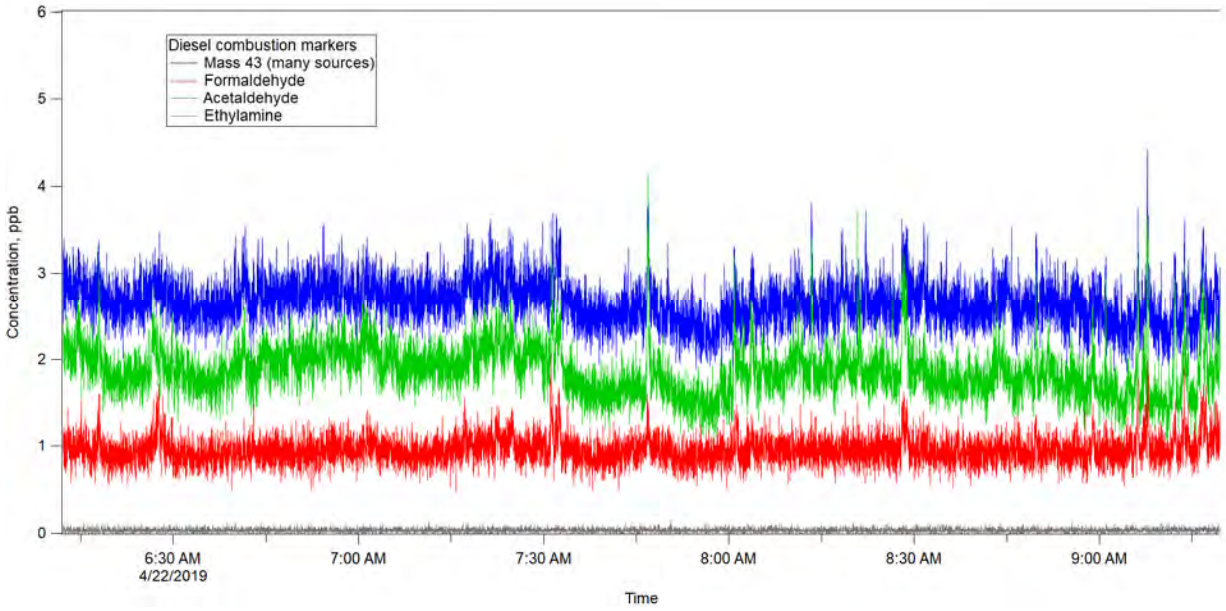


**Figure 2-49. Diesel Combustion Markers.**

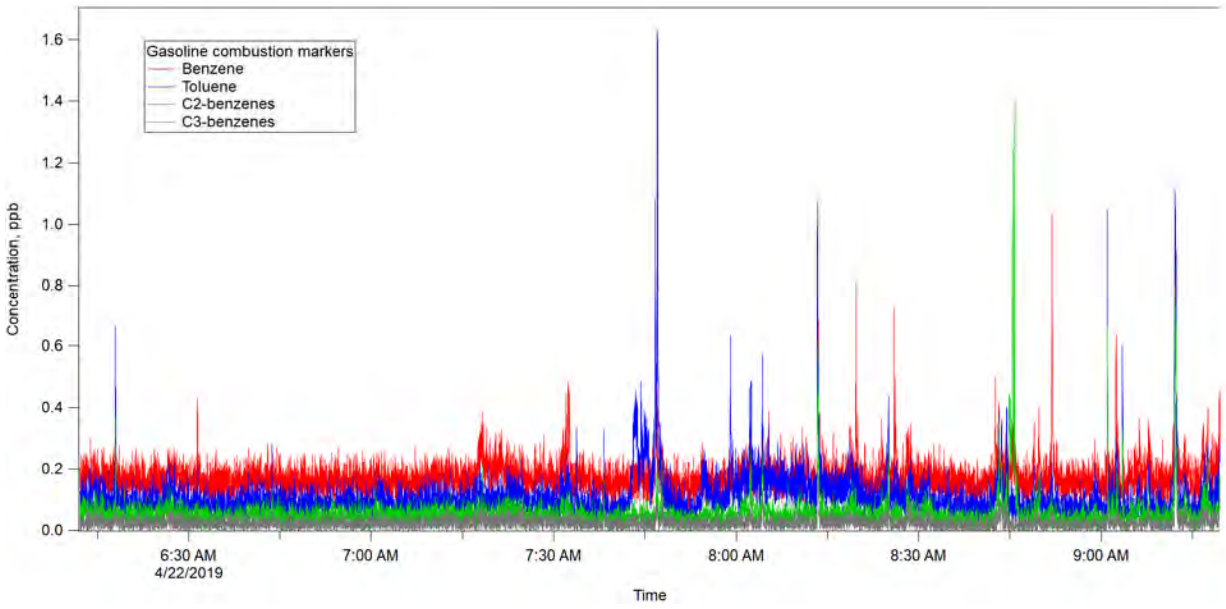


**Figure 2-50. Gasoline Combustion Markers.**

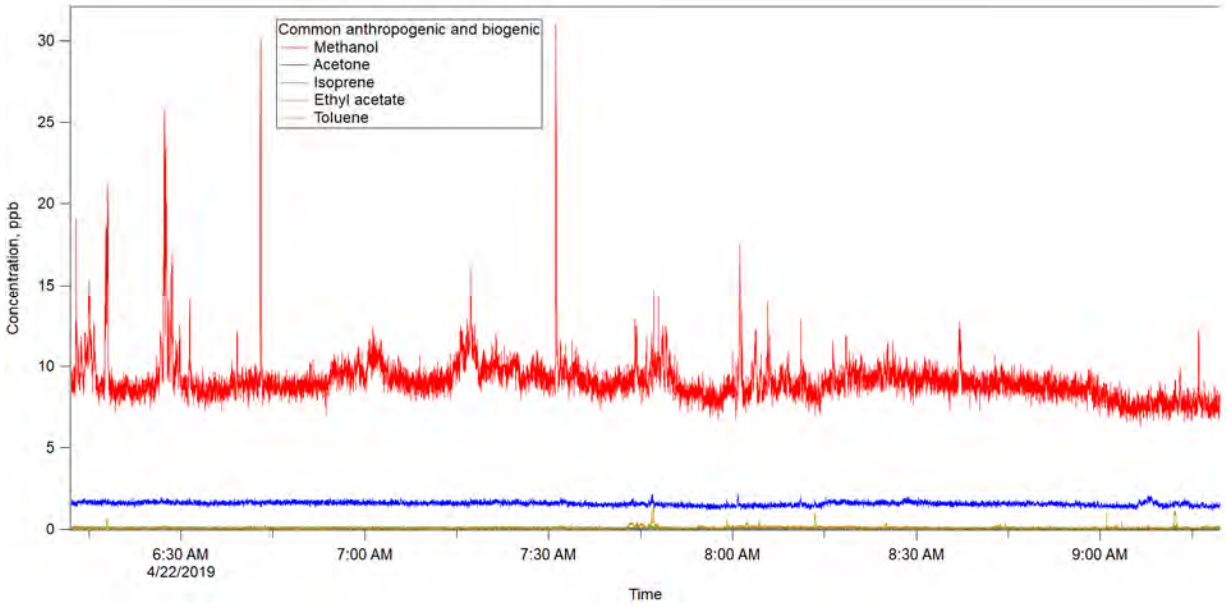


**Figure 2-51. Plant and Human Markers.**

## 2.5 AOP-015 Event

The ML Operators monitored the AOP-015 event near the U Farm Change Trailer from approximately 10:17 to 14:19. The section below provides the COPC statistical results from that monitoring period. 53005-81-COM-0519-005, *Subcontract 53005, Release 81 – Transmittal of Revision 1 of Special Communication Report for (AOP)-015 Event on April 22, 2019*, can be found in Appendix A.

**Table 2-2. Chemical of Potential Concern Statistical Information for the AOP-015 Monitoring on April 22, 2019. (2 Sheets)**

| COPC # | COPC Name | OEL (ppb) | MDL (ppb) | Ave. (ppb) | St. Dev. (ppb) | Rel St. Dev. (%) | Max. (ppb) | Median (ppb) |
|---|---|---|---|---|---|---|---|---|
| 1 | ammonia | 25000 | 6.225 | 8.602† | 0.401 | 4.658 | 10.190 | 8.579† |
| 2 | formaldehyde | 300 | 1.721 | 2.225† | 0.291 | 13.097 | 3.324 | 2.220† |
| 3 | methanol | 200000 | 5.758 | 20.292 | 2.157 | 10.629 | 26.112 | 20.378 |
| 4 | acetonitrile | 20000 | 0.085 | 0.121† | 0.033 | 27.005 | 0.260 | 0.119† |
| 5 | acetaldehyde | 25000 | 1.027 | 2.438† | 0.302 | 12.387 | 3.625 | 2.425† |
| 6 | ethylamine | 5000 | 0.069 | <0.069 | 0.024 | 58.427 | 0.166 | <0.069 |
| 7 | 1,3-butadiene | 1000 | 0.183 | 0.285† | 0.078 | 27.319 | 0.714 | 0.282† |
| 8 | propanenitrile | 6000 | 0.107 | <0.107 | 0.030 | 38.903 | 0.226 | <0.107 |
| 9 | 2-propenal | 100 | 0.340 | <0.34 | 0.049 | 30.420 | 0.398 | <0.34 |
| 10 | 1-butanol + butenes | 20000 | 0.214 | <0.214 | 0.050 | 31.860 | 0.410 | <0.214 |
| 11 | methyl isocyanate | 20 | 0.069 | 0.083† | 0.035 | 42.416 | 0.266 | 0.080† |
| 12 | methyl nitrite | 100 | 0.098 | 0.217† | 0.050 | 22.983 | 0.433 | 0.217† |
| 13 | furan | 1 | 0.062 | <0.062 | 0.022 | 44.090 | 0.155 | <0.062 |
| 14 | butanenitrile | 8000 | 0.039 | <0.039 | 0.021 | 58.294 | 0.147 | <0.039 |
| 15 | but-3-en-2-one; 2,3-dihydrofuran + 2,5-dihydrofuran | 200, 1, 1 | 0.041 | 0.051† | 0.019 | 38.469 | N/A* | N/A* |
| 16 | butanal | 25000 | 0.061 | 0.264 | 0.054 | 20.465 | 0.518 | 0.262 |
| 17 | NDMA** | 0.3 | 0.082 | <0.082 | 0.030 | 198.986 | 0.269 | <0.082 |
| 18 | benzene | 500 | 0.236 | 0.413† | 0.075 | 18.184 | 0.699 | 0.412† |
| 19 | 2,4-pentadienenitrile + pyridine | 300, 1000 | 0.085 | <0.085 | 0.024 | 36.674 | 0.192 | <0.085 |
| 20 | 2-methylene butanenitrile | 300 | 0.036 | <0.036 | 0.014 | 59.873 | 0.103 | <0.036 |
| 21 | 2-methylfuran | 1 | 0.043 | 0.046† | 0.024 | 52.210 | 0.178 | 0.044† |
| 22 | Pentanenitrile | 6000 | 0.036 | <0.036 | 0.016 | 67.023 | 0.119 | <0.036 |
| 23 | 3-methyl-3-buten-2-one + 2-methyl-2-butenal | 20, 30 | 0.043 | <0.043 | 0.024 | 58.595 | 0.161 | <0.043 |
| 24 | NEMA** | 0.3 | 0.058 | <0.058 | 0.029 | 154.500 | 0.181 | <0.058 |
| 25 | 2,5-dimethylfuran | 1 | 0.032 | <0.032 | 0.020 | 72.220 | 0.125 | <0.032 |
| 26 | hexanenitrile | 6000 | 0.031 | <0.031 | 0.014 | 77.287 | 0.098 | <0.031 |
| 27 | 2-hexanone (MBK) | 5000 | 0.036 | <0.036 | 0.021 | 66.718 | 0.149 | <0.036 |
| 28 | NDEA** | 0.1 | 0.034 | <0.034 | 0.016 | 134.378 | 0.107 | <0.034 |
| 29 | butyl nitrite + 2-nitro-2-methylpropane | 100, 300 | 0.058 | <0.058 | 0.020 | 39.035 | 0.132 | <0.058 |
| 30 | 2,4-dimethylpyridine | 500 | 0.036 | <0.036 | 0.016 | 76.457 | 0.118 | <0.036 |

**Table 2-2. Chemical of Potential Concern Statistical Information for the AOP-015 Monitoring on April 22, 2019. (2 Sheets)**

| COPC # | COPC Name | OEL (ppb) | MDL (ppb) | Ave. (ppb) | St. Dev. (ppb) | Rel St. Dev. (%) | Max. (ppb) | Median (ppb) |
|---|---|---|---|---|---|---|---|---|
| 31 | 2-propylfuran + 2-ethyl-5-methylfuran | 1 | 0.027 | <0.027 | 0.014 | 113.359 | 0.102 | <0.027 |
| 32 | heptanenitrile | 6000 | 0.027 | <0.027 | 0.012 | 81.009 | 0.084 | <0.027 |
| 33 | 4-methyl-2-hexanone | 500 | 0.033 | <0.033 | 0.015 | 81.918 | 0.092 | <0.033 |
| 34 | NMOR** | 0.6 | 0.021 | <0.021 | 0.012 | 200.988 | 0.093 | <0.021 |
| 35 | butyl nitrate | 2500 | 0.022 | <0.022 | 0.010 | 110.338 | 0.067 | <0.022 |
| 36 | 2-ethyl-2-hexenal + 4-(1-methylpropyl)-2,3-dihydrofuran + 3-(1,1-dimethylethyl)-2,3-dihydrofuran | 100, 1, 1 | 0.028 | <0.028 | 0.014 | 80.121 | 0.100 | <0.028 |
| 37 | 6-methyl-2-heptanone | 8000 | 0.028 | <0.028 | 0.013 | 81.765 | 0.089 | <0.028 |
| 38 | 2-pentylfuran | 1 | 0.026 | <0.026 | 0.013 | 81.122 | 0.078 | <0.026 |
| 39 | biphenyl | 200 | 0.022 | <0.022 | 0.014 | 106.903 | 0.079 | <0.022 |
| 40 | 2-heptylfuran | 1 | 0.067 | <0.067 | 0.020 | 33.915 | 0.150 | <0.067 |
| 41 | 1,4-butanediol dinitrate | 50 | 0.036 | <0.036 | 0.016 | 64.364 | 0.101 | <0.036 |
| 42 | 2-octylfuran | 1 | 0.020 | <0.02 | 0.010 | 204.239 | 0.093 | <0.02 |
| 43 | 1,2,3-propanetriol 1,3-dinitrate | 50 | 0.011 | <0.011 | 0.010 | 264.422 | 0.080 | <0.011 |
| 44 | PCB | 1000 | 0.034 | <0.034 | 0.016 | 53.239 | 0.109 | <0.034 |
| 45 | 6-(2-furanyl)-6-methyl-2-heptanone | 1 | 0.025 | <0.025 | 0.010 | 93.233 | 0.080 | <0.025 |
| 46 | furfural acetophenone | 1 | 0.064 | <0.064 | 0.019 | 36.634 | 0.135 | <0.064 |
| N/A* | The maximum peak value for but-3-en-2-one + 2,3 dihydrofuran + 2,5 dihydrofuran was 0.143 ppb and the median value was 0.049† ppb. The PTR-MS results for but-3-en-2-one + 2,3 dihydrofuran + 2,5 dihydrofuran are not compared to OEL concentrations because: 1) the result is suspect due to a known biogenic interferant (methacrolein) that is expected to be in concentrations that occasionally exceed the dihydrofuran OEL, and 2) this combination of COPCs have OEL concentrations that differ by a factor of 200, which provide widely variant bases for these numbers. | | | | | | | |
| ** | Nitrosamine results are suspect due to isobaric interferants causing positive bias that have been encountered during previous background [53005-81-RPT-007, *PTR-MS Mobile Laboratory Vapor Monitoring Background Study, (3/18/2018 – 4/20/2018)*, and *Fiscal Year 2017 Mobile Laboratory Vapor Monitoring at the Hanford Site: Monitoring During Waste Disturbing Activities and Background Study*, RJ Lee Group, Inc.]. | | | | | | | |
| < | COPC Averages below the MDL. | | | | | | | |
| † | COPC Averages between the RL and the MDL. | | | | | | | |
| | COPC Averages >100% of the OEL. | | | | | | | |
| | COPC Averages 50-100% of the OEL. | | | | | | | |
| | COPC Averages 10-50% of the OEL. | | | | | | | |

Figure 2-52 through Figure 2-100 display 46 COPC signals, overlaid with the same signal smoothed using a 1-minute moving average (in cases where a moving average assists with data visualization), and $CO_2$, for the monitoring period April 22, 2019. If within range of the plot's left axis, a green horizontal line representing 50% of the COPC's OEL, a blue horizontal line representing the COPC's OEL, a horizontal purple line representing the RL, and a pink horizontal line representing the MDL are shown.

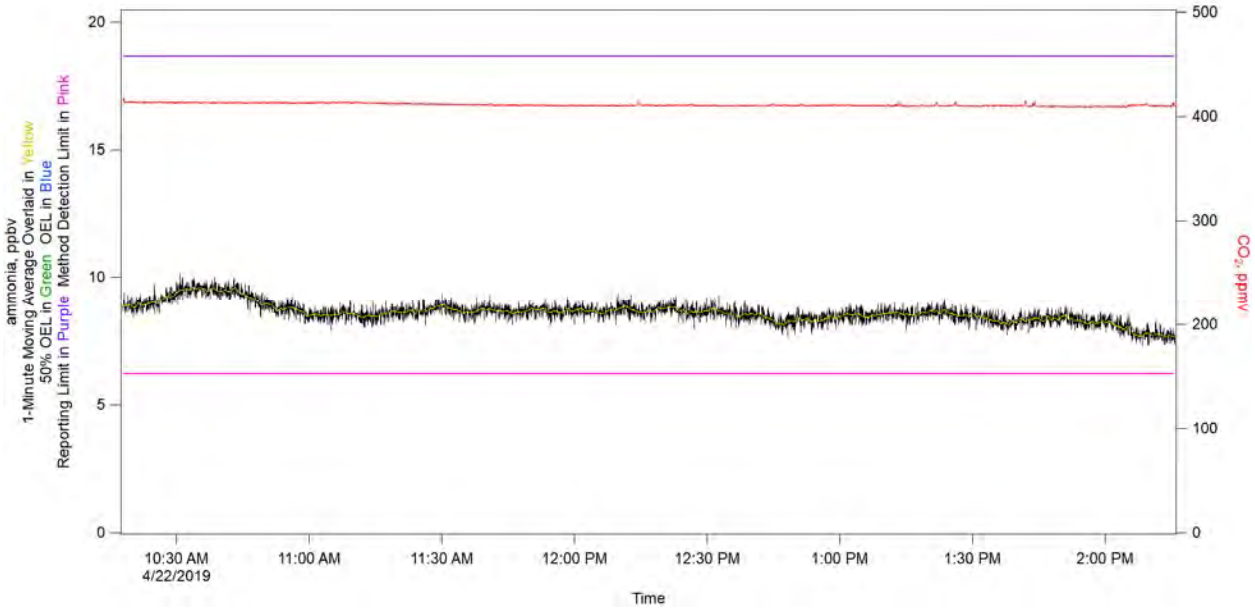


**Figure 2-52. Ammonia.**

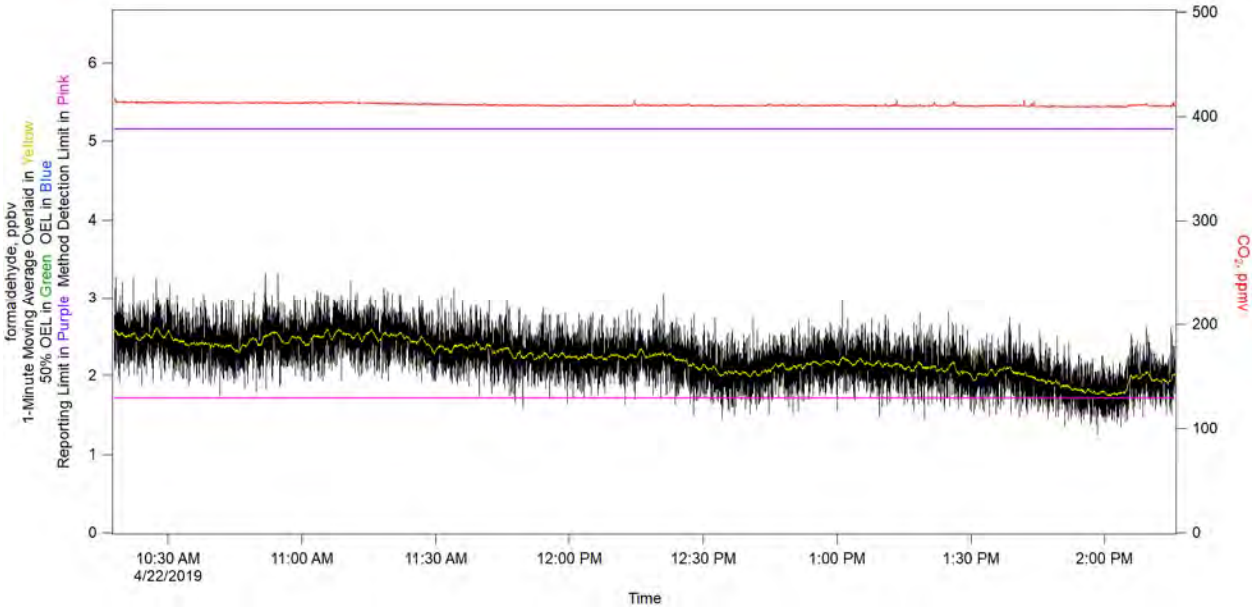


**Figure 2-53. Formaldehyde.**

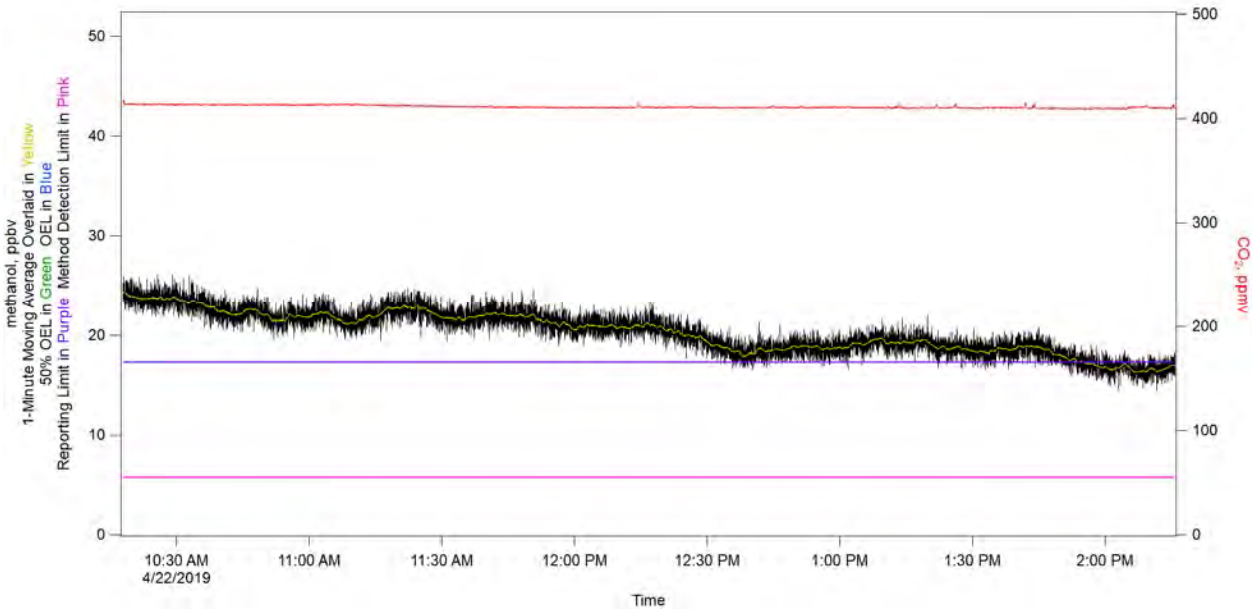


**Figure 2-54. Methanol.**

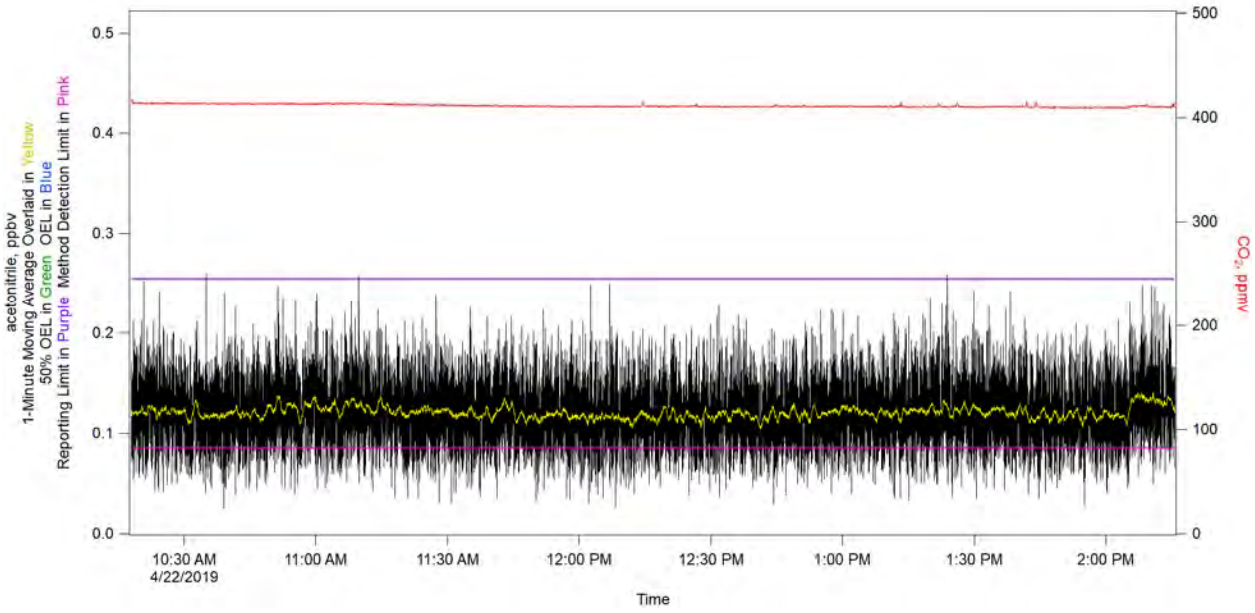


**Figure 2-55. Acetonitrile.**

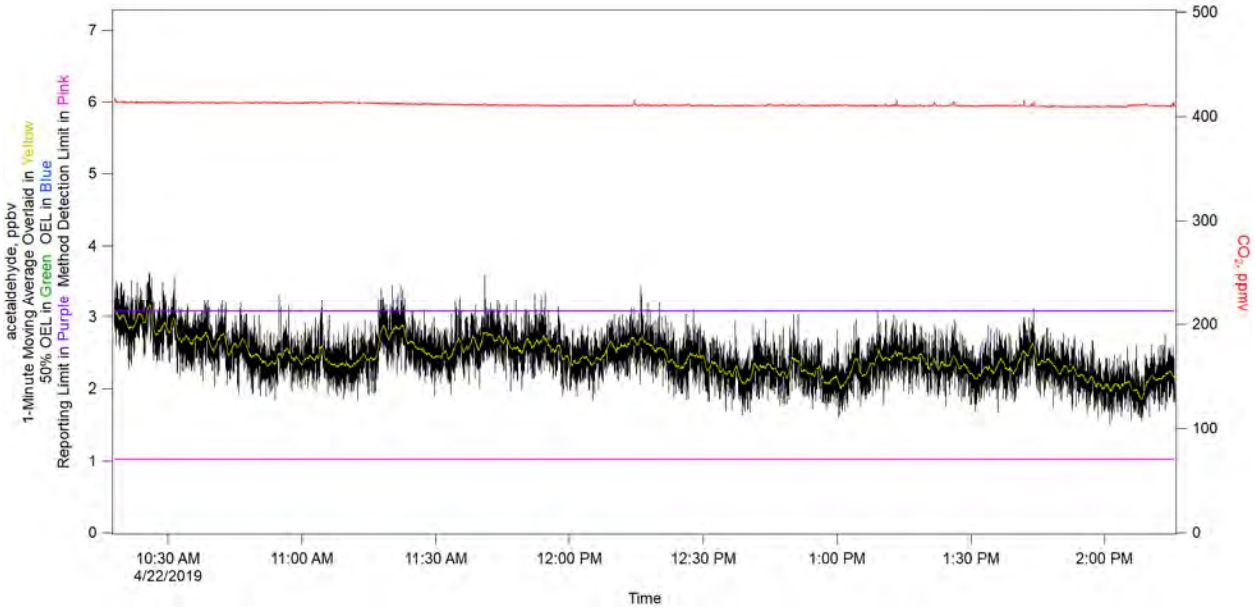


**Figure 2-56. Acetaldehyde.**

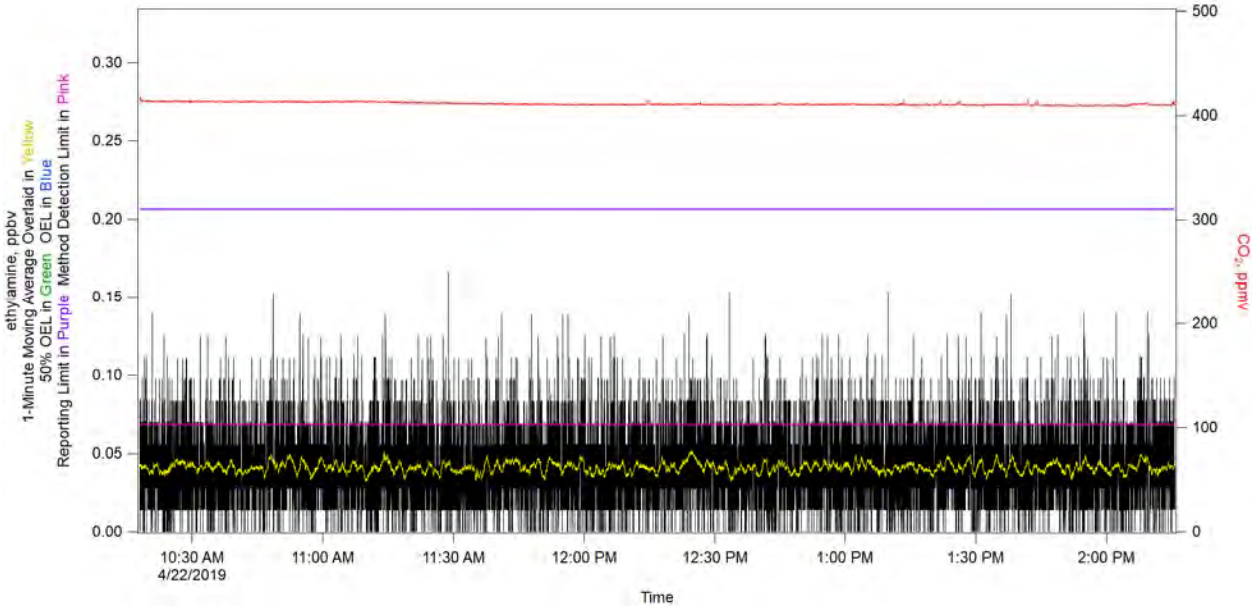


**Figure 2-57. Ethylamine.**

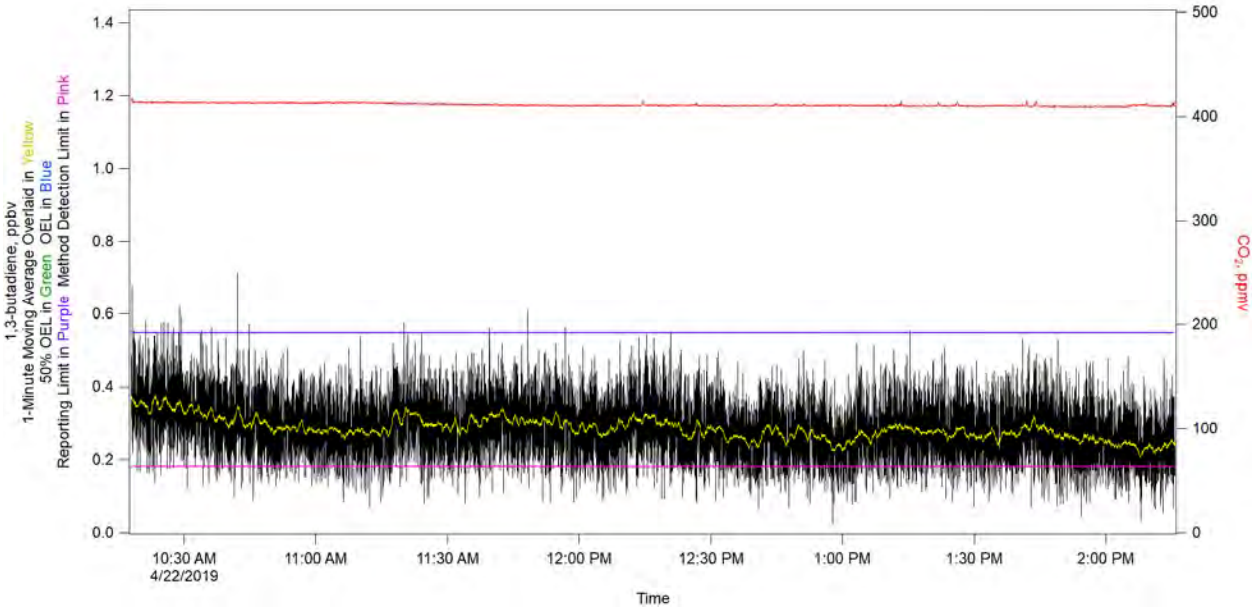


**Figure 2-58. 1,3-butadiene.**

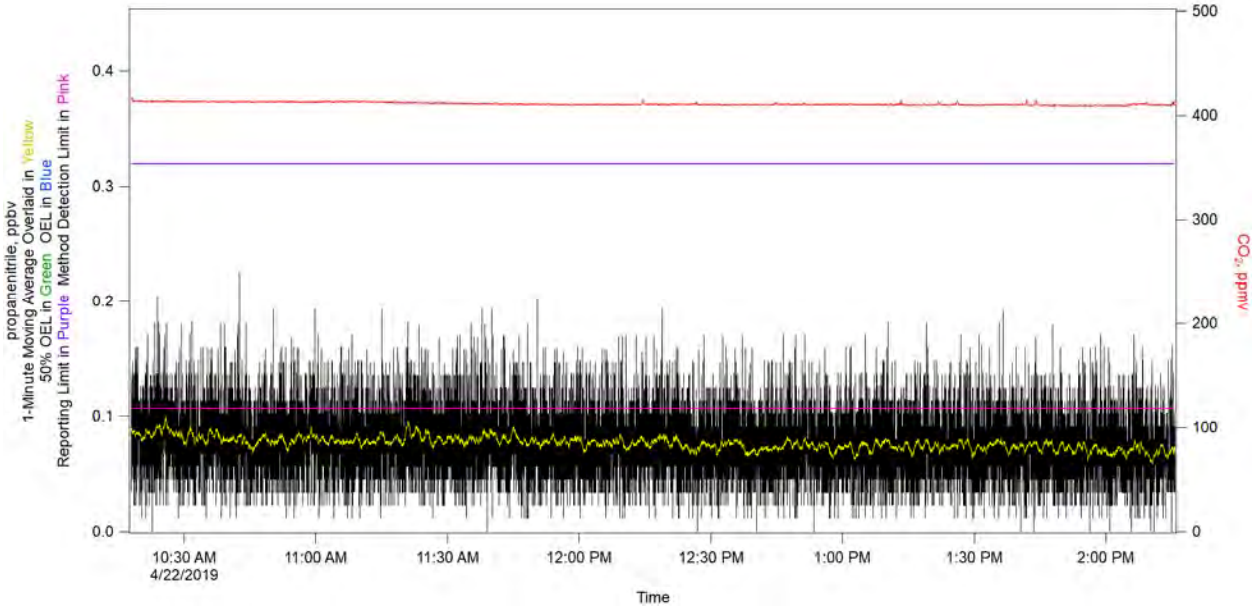


**Figure 2-59. Propanenitrile.**

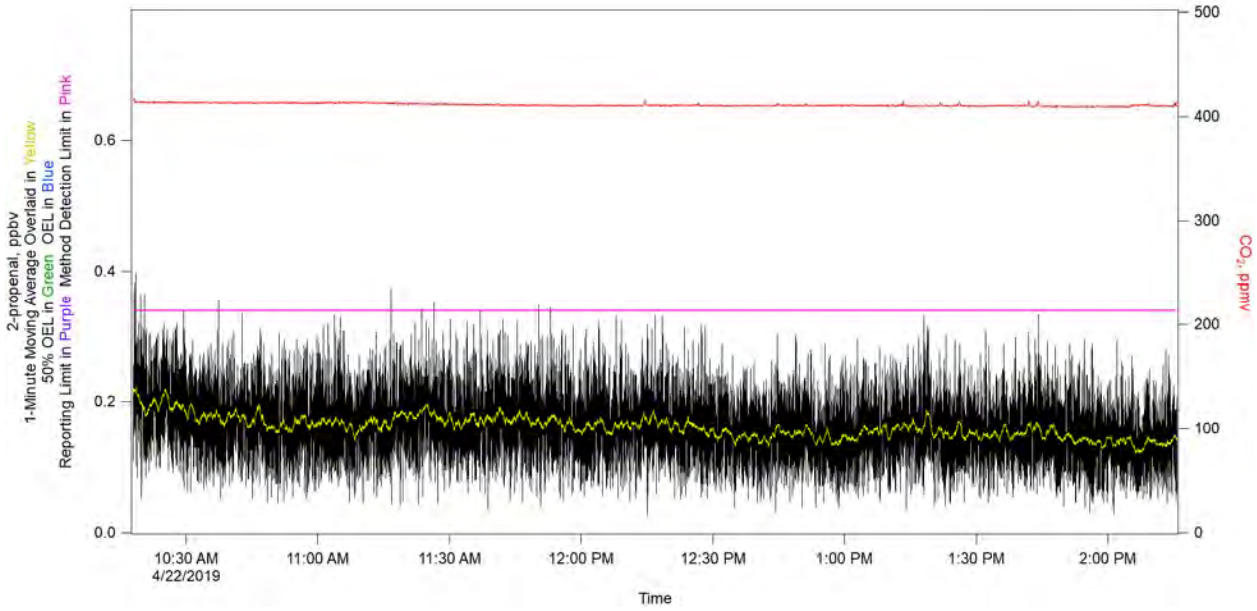


**Figure 2-60. 2-propenal.**

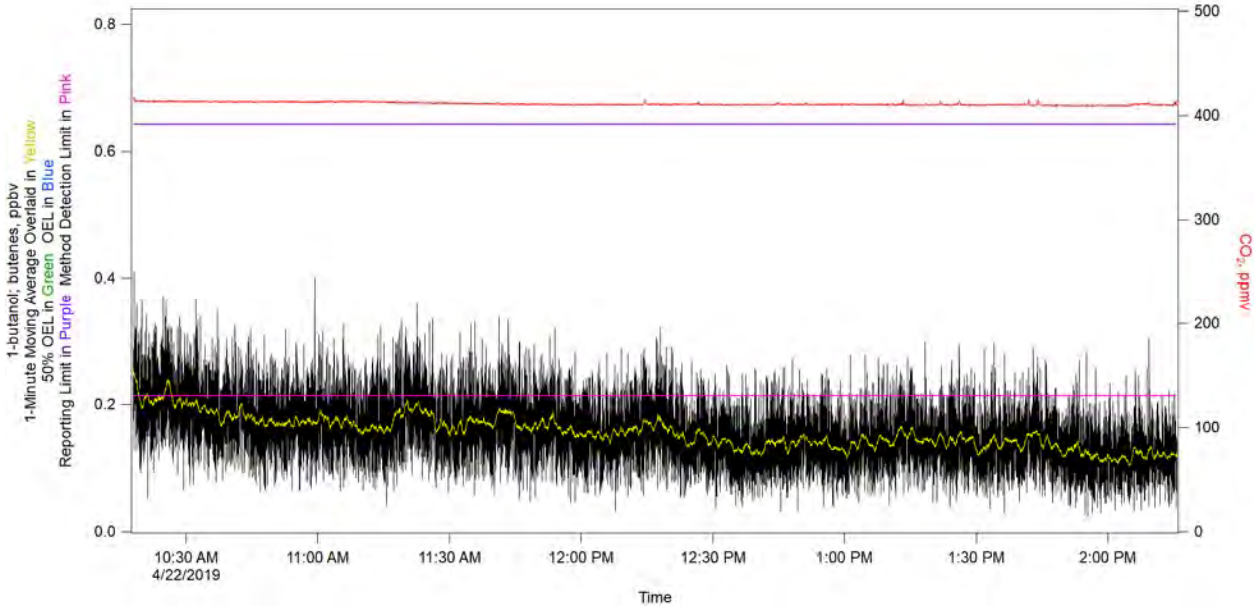


**Figure 2-61. 1-butanol; Butenes.**

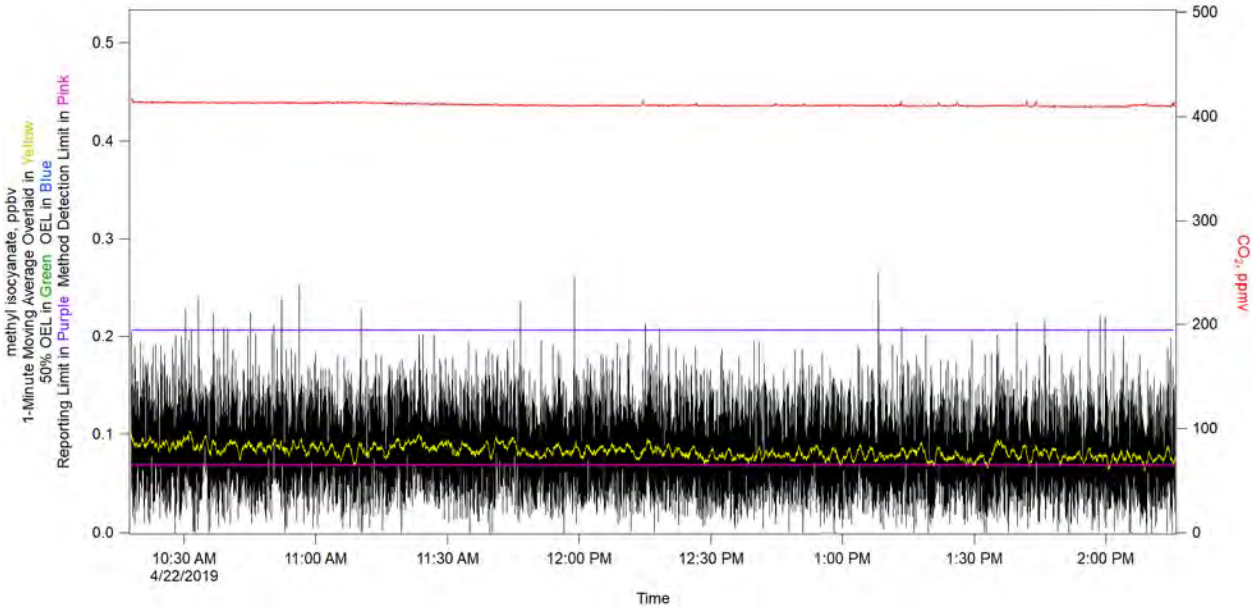


**Figure 2-62. Methyl Isocyanate.**

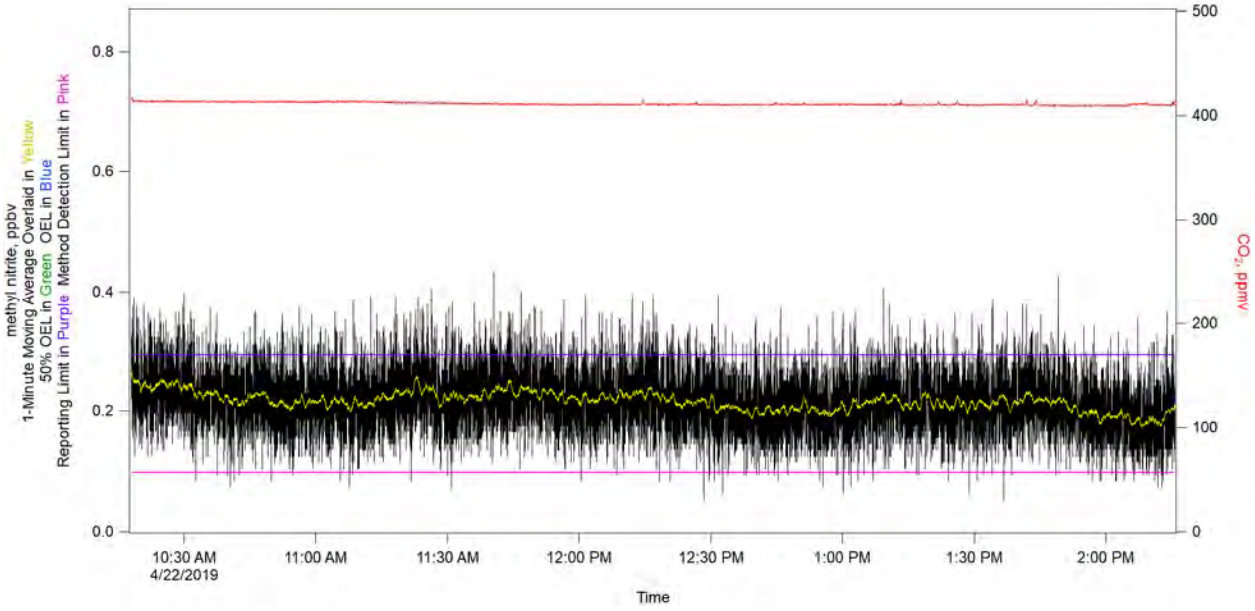


**Figure 2-63. Methyl Nitrite.**

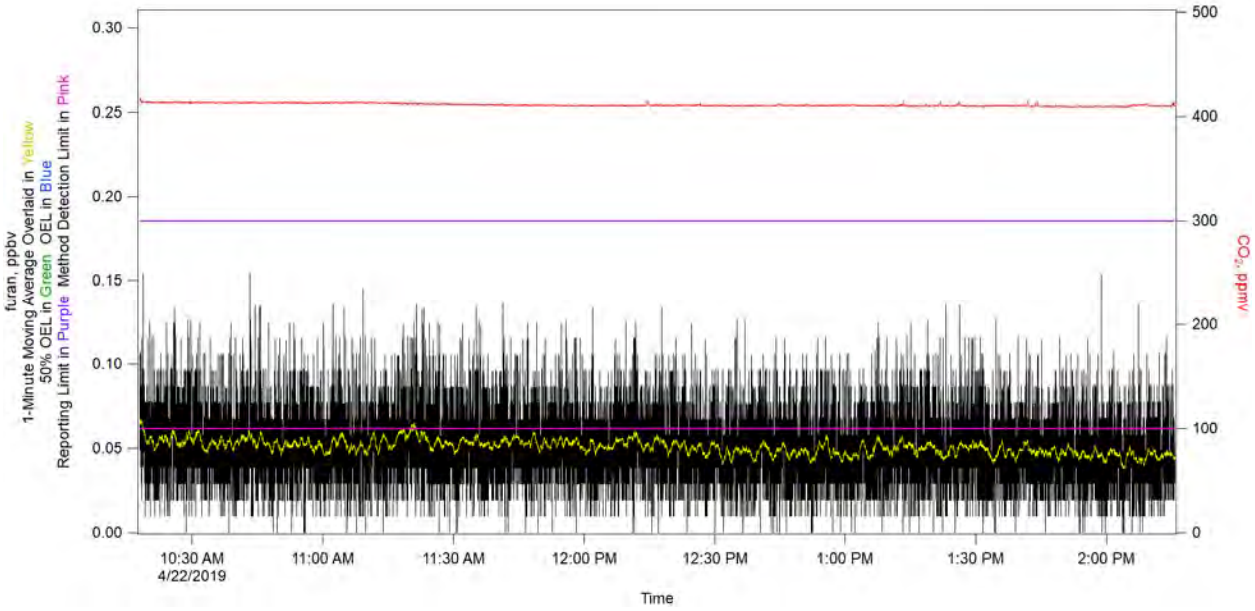


**Figure 2-64. Furan.**

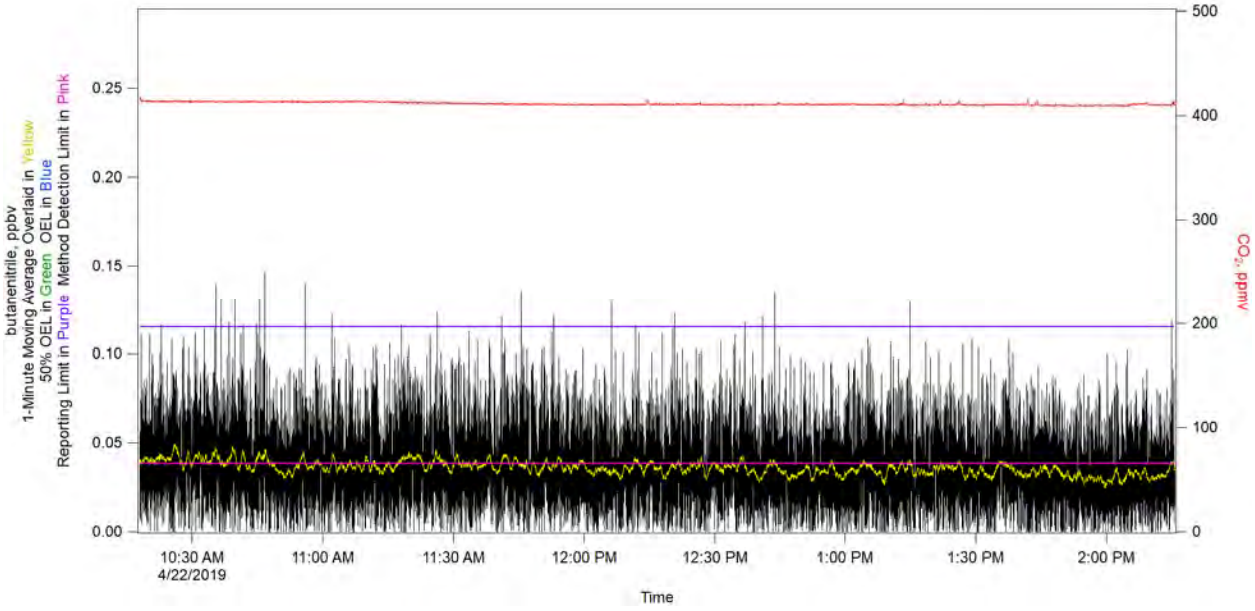


**Figure 2-65. Butanenitrile.**

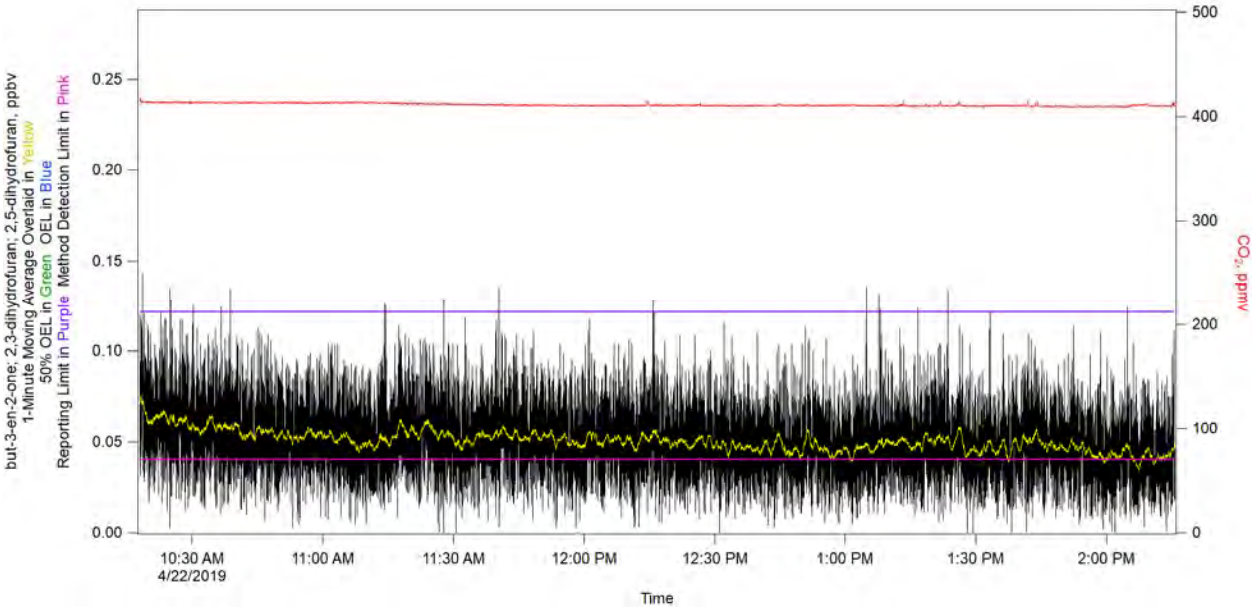


**Figure 2-66. But-3-en-2-one; 2,3-dihydrofuran; 2,5-dihydrofuran.**

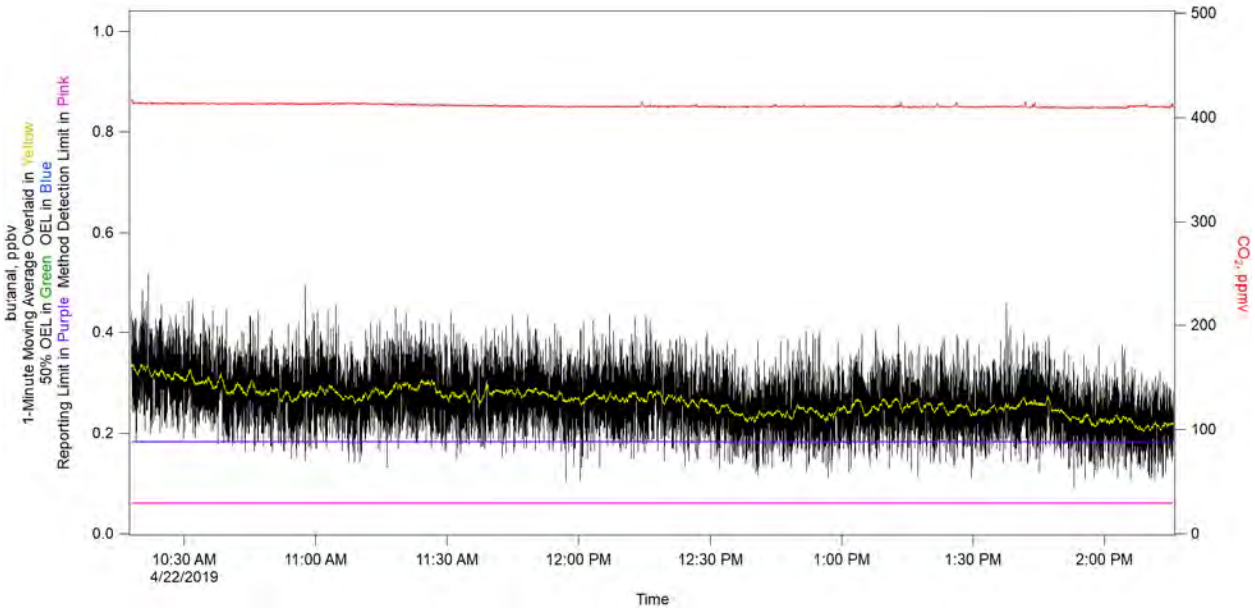


**Figure 2-67. Butanal.**

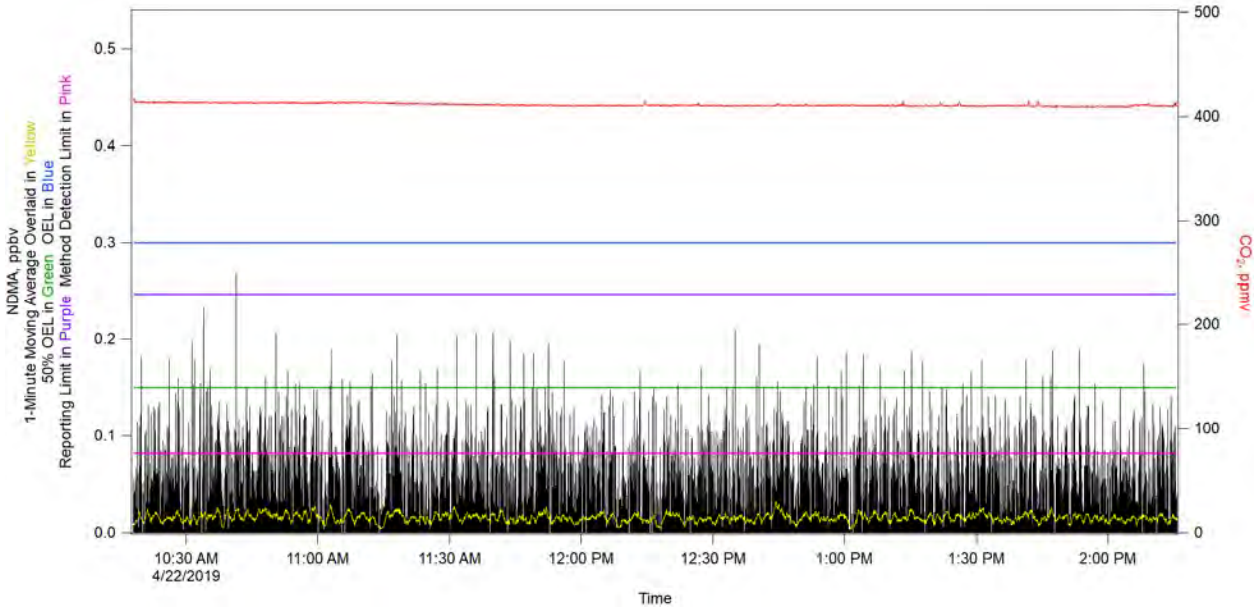


**Figure 2-68. N-nitrosodimethylamine (NDMA).**

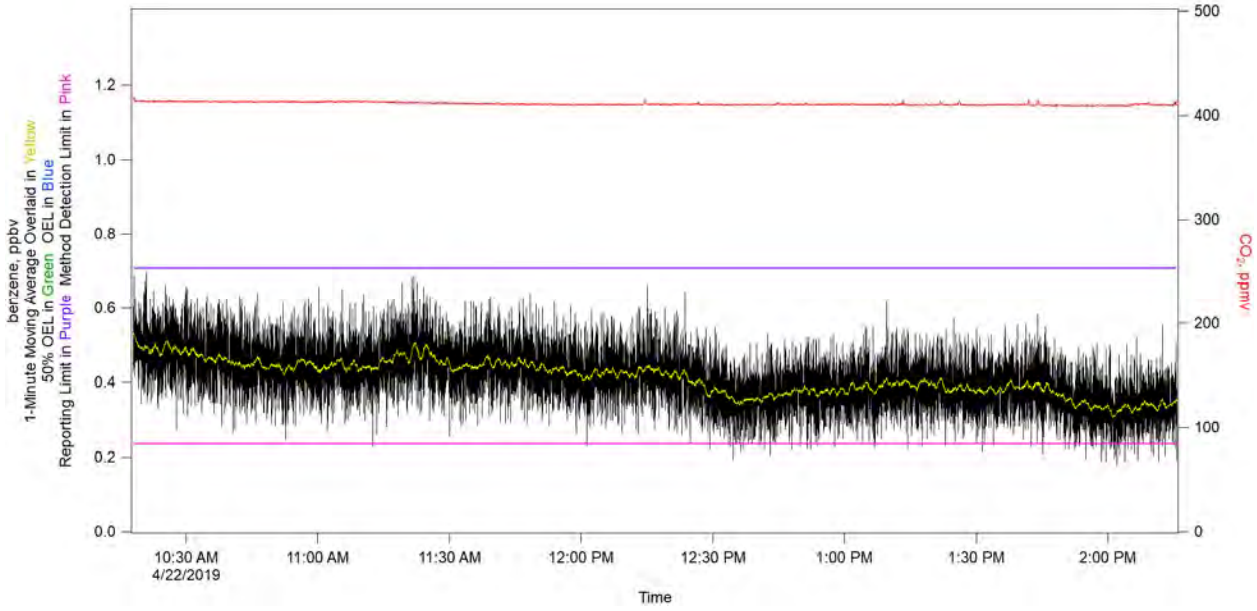


**Figure 2-69. Benzene.**

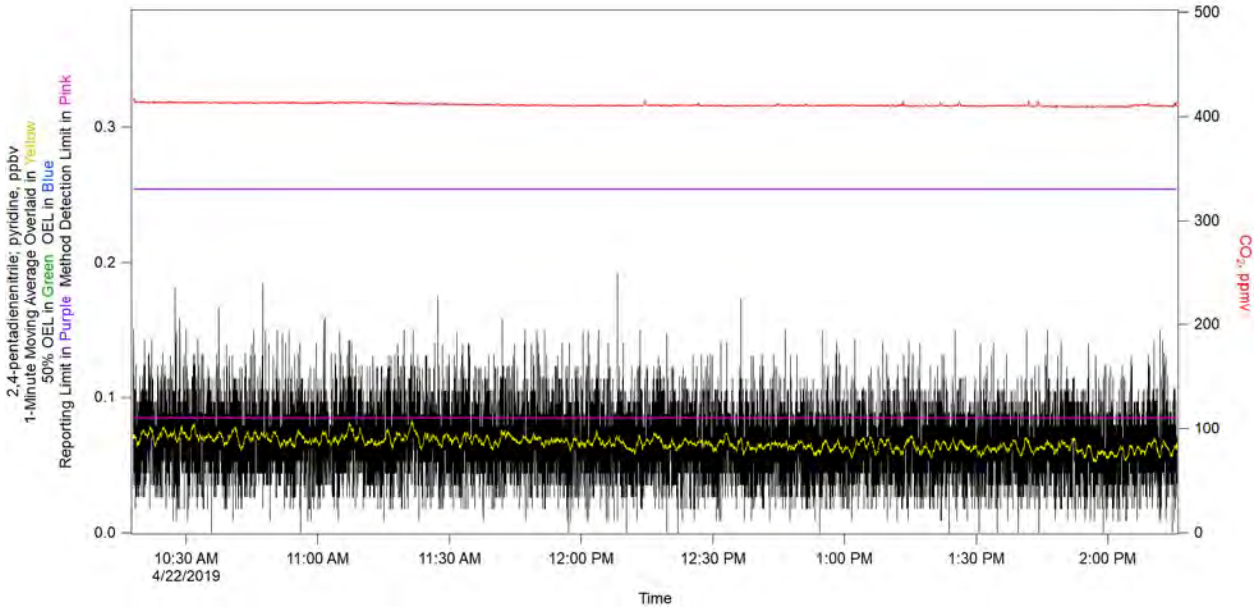


**Figure 2-70. 2,4-pentadienenitrile; Pyridine.**

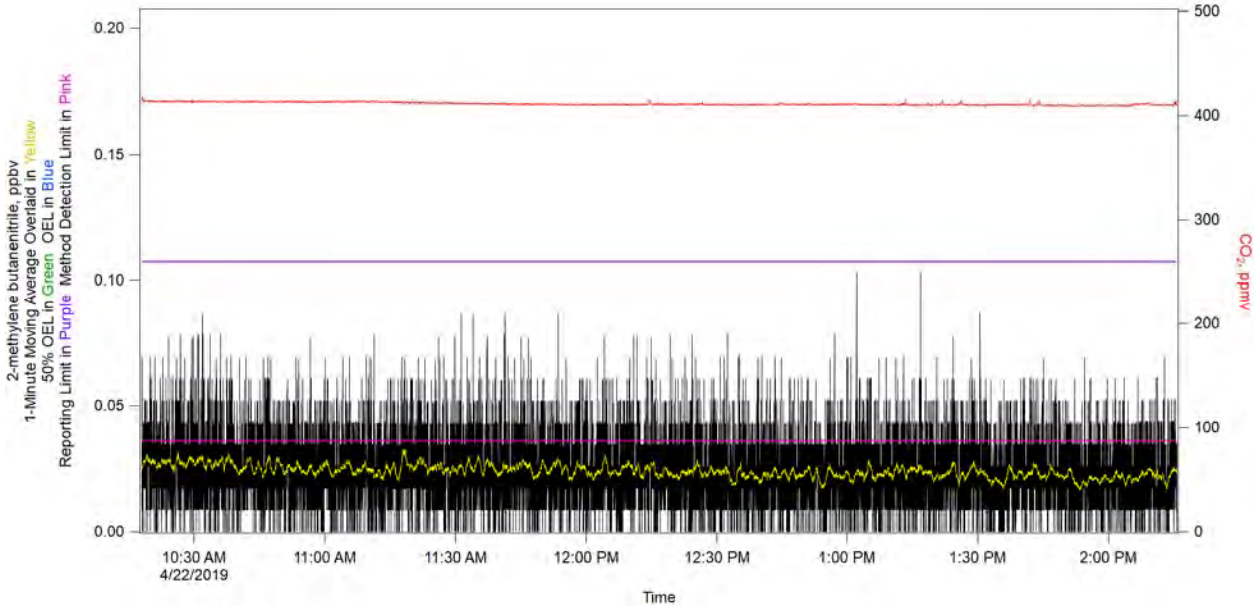


**Figure 2-71. 2-methylene Butanenitrile.**

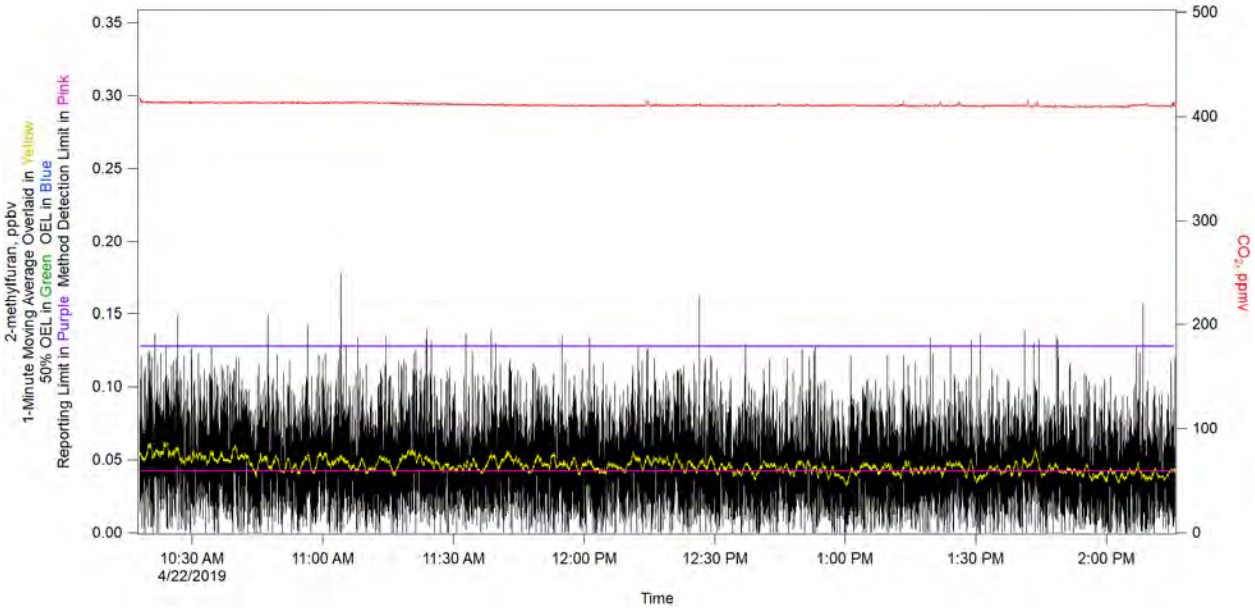


**Figure 2-72. 2-methylfuran.**

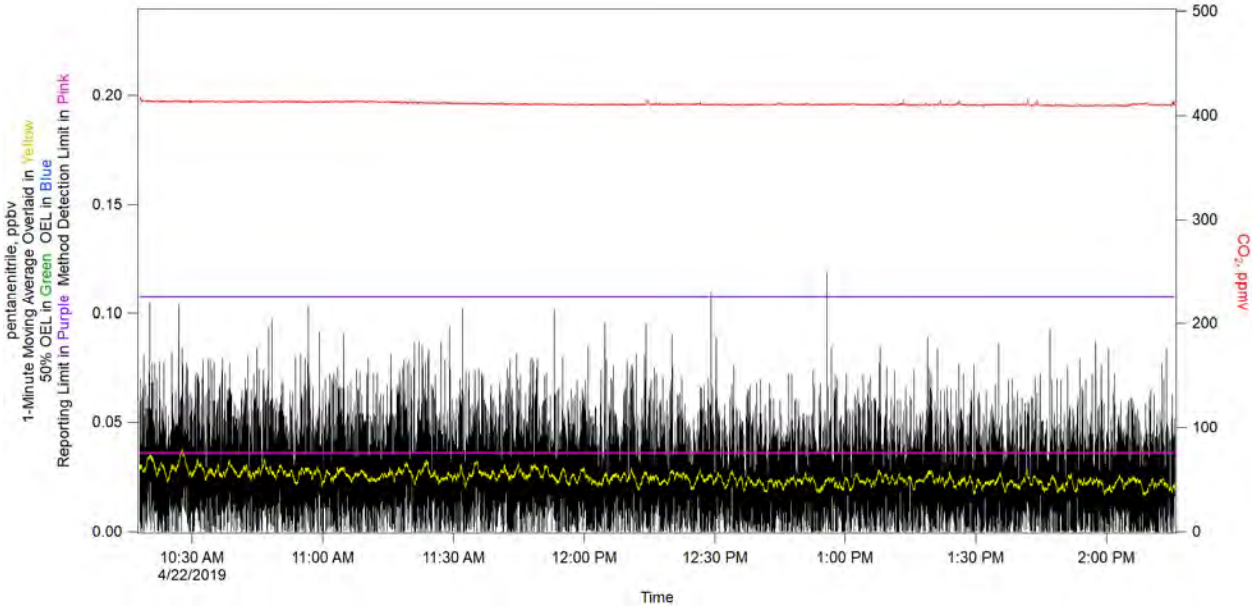


**Figure 2-73. Pentanenitrile.**

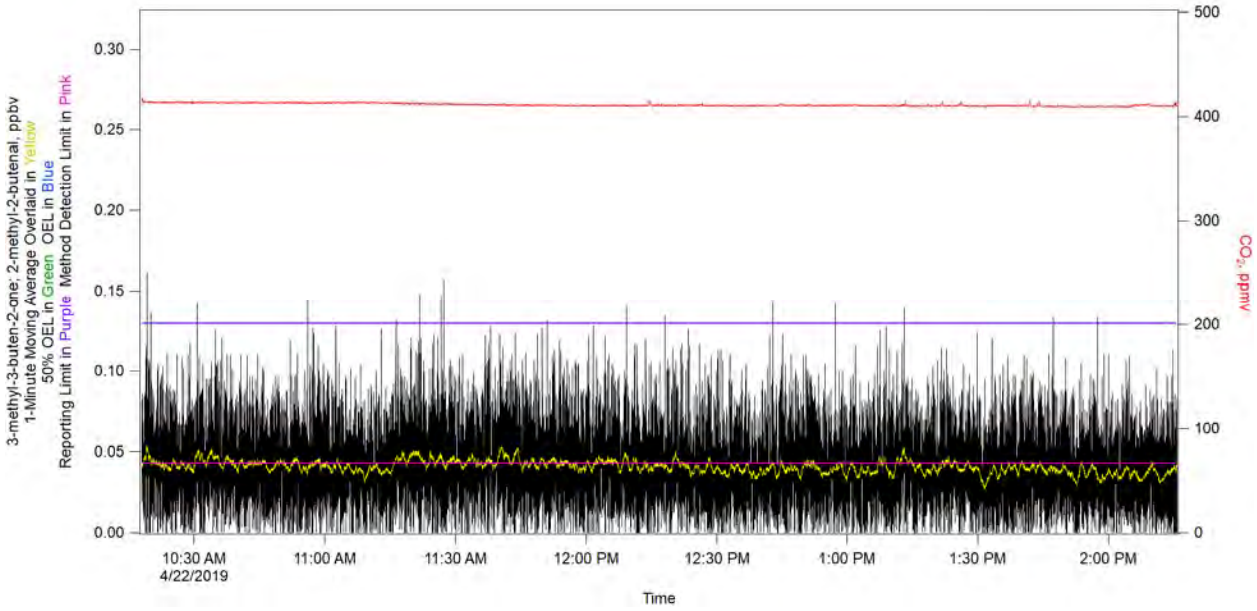


**Figure 2-74. 3-methyl-3-buten-2-one; 2-methyl-2-butenal.**

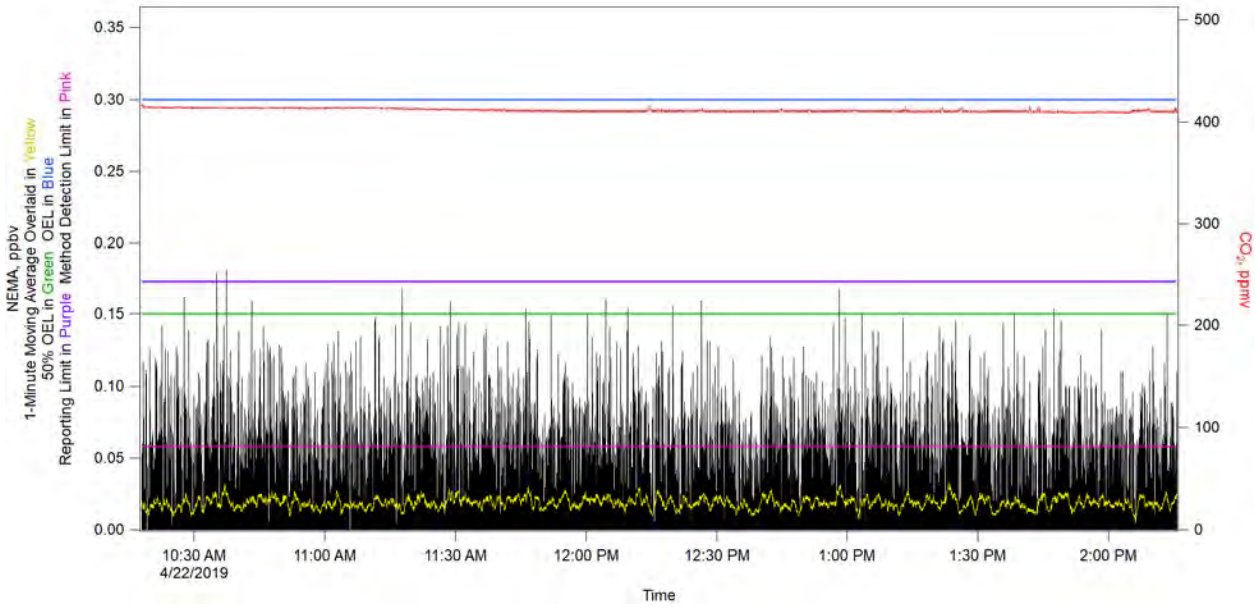


**Figure 2-75. N-nitrosomethylethylamine (NEMA).**

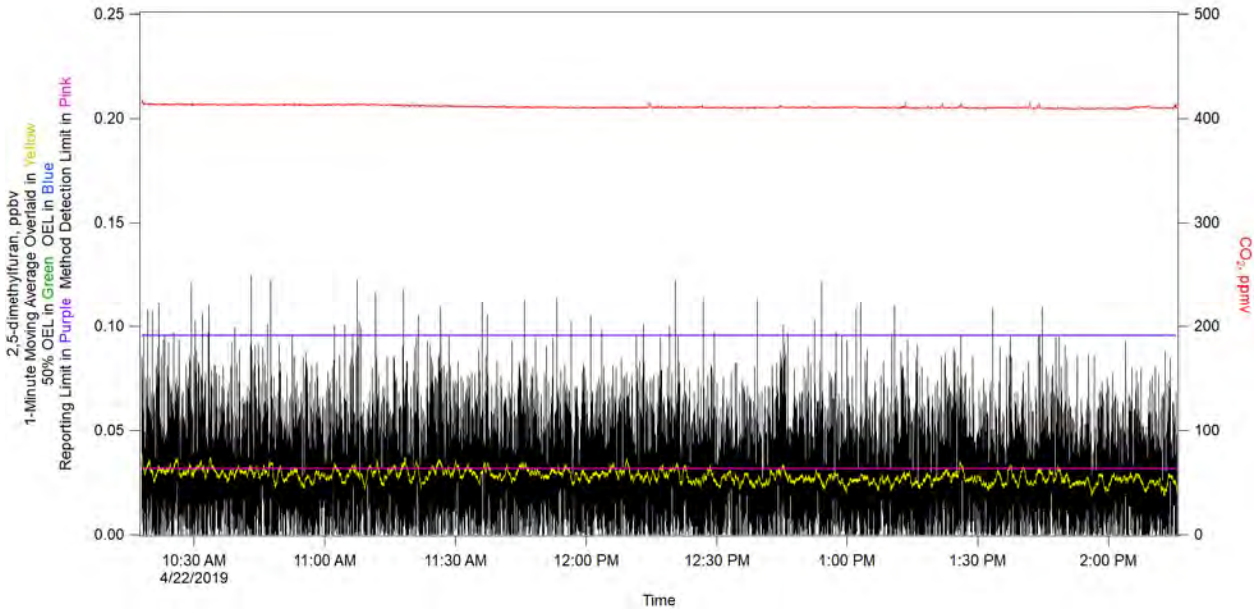


**Figure 2-76. 2,5-dimethylfuran.**

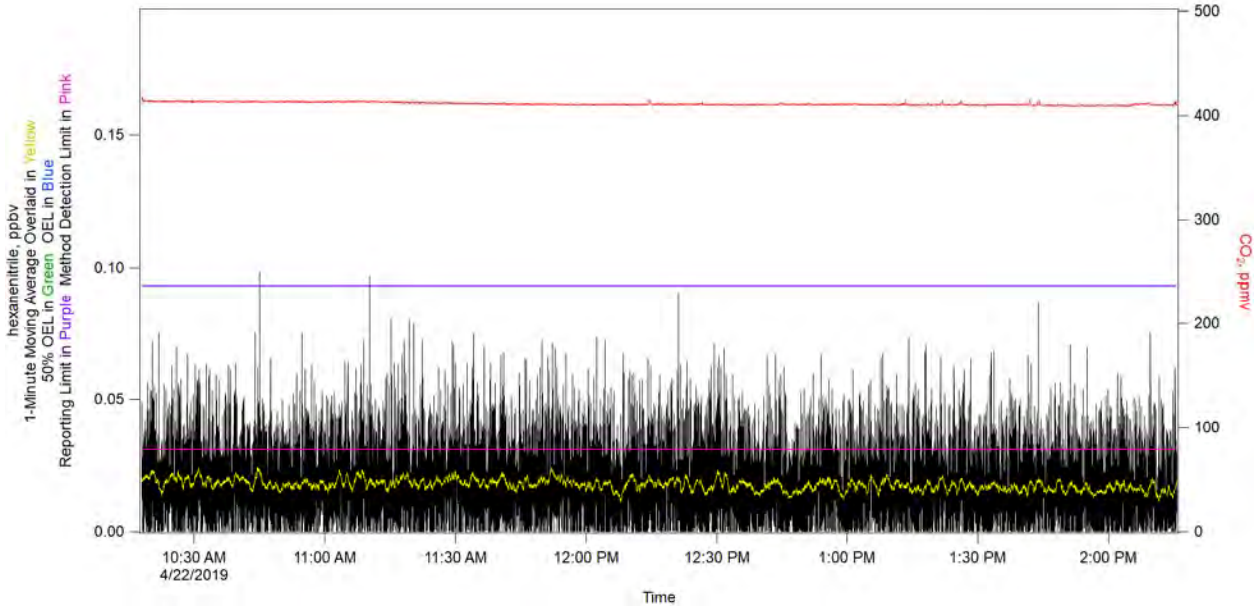


**Figure 2-77. Hexanenitrile.**

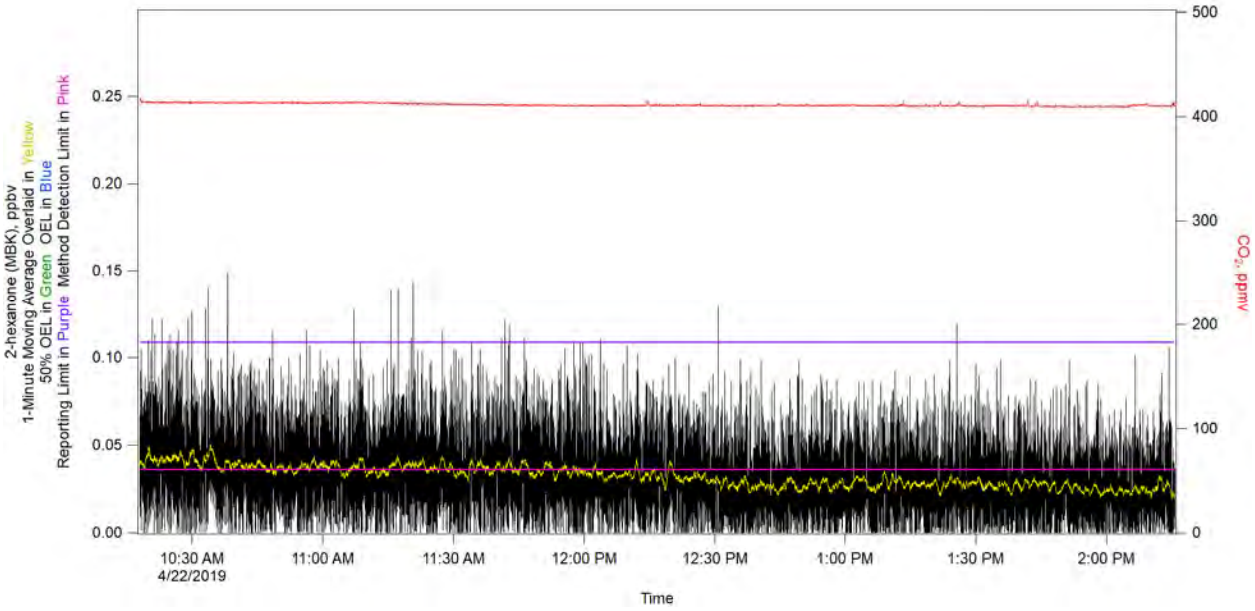


**Figure 2-78. 2-hexanone (MBK).**

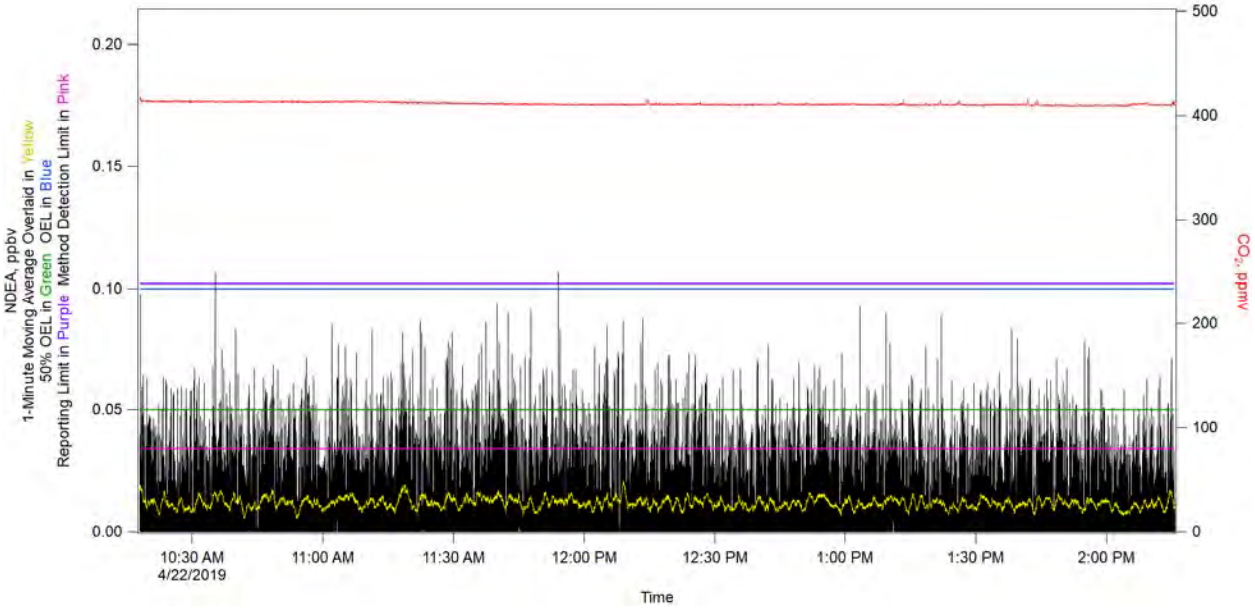


**Figure 2-79. N-nitrosodiethylamine (NDEA).**

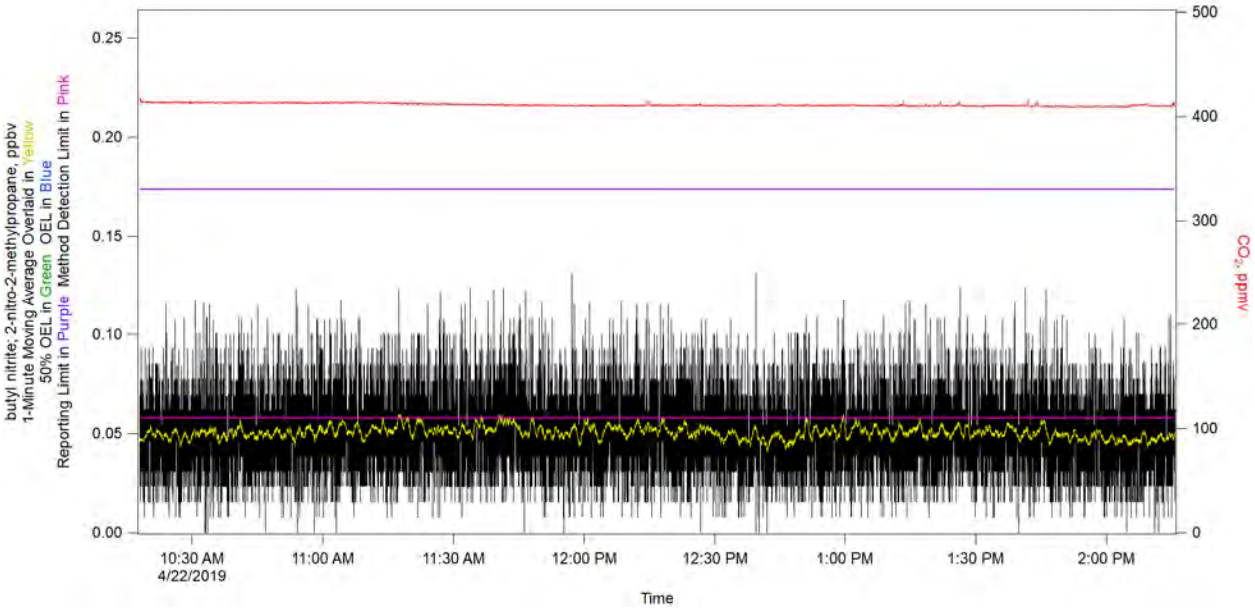


**Figure 2-80. Butyl Nitrite; 2-nitro-2-methylpropane.**

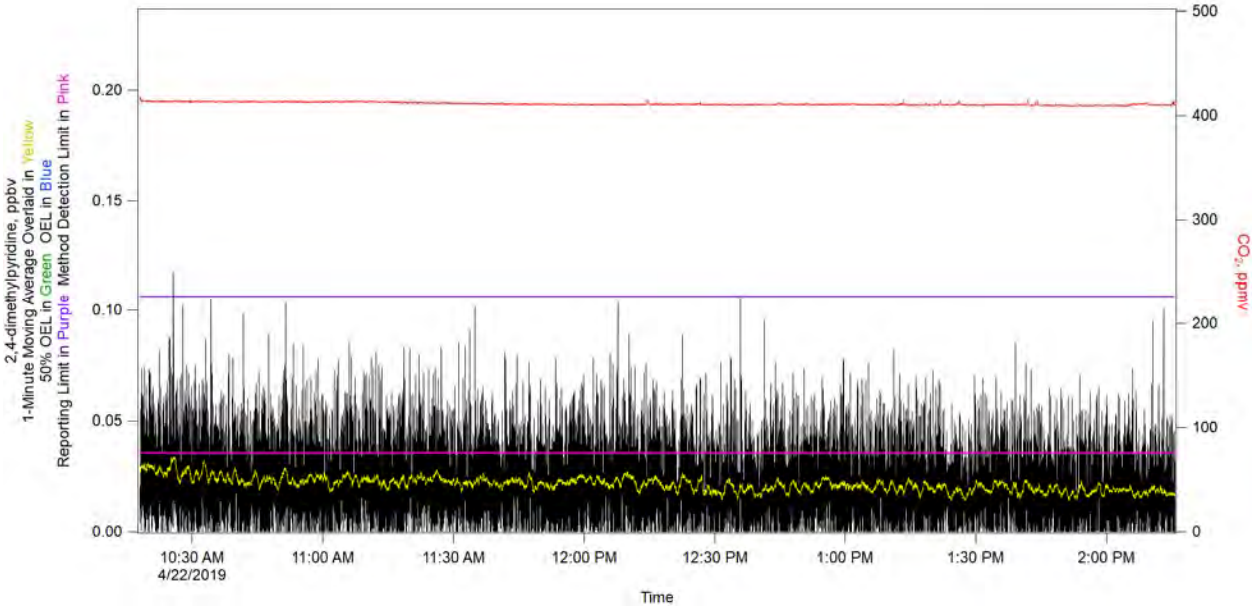


**Figure 2-81. 2,4-dimethylpyridine.**

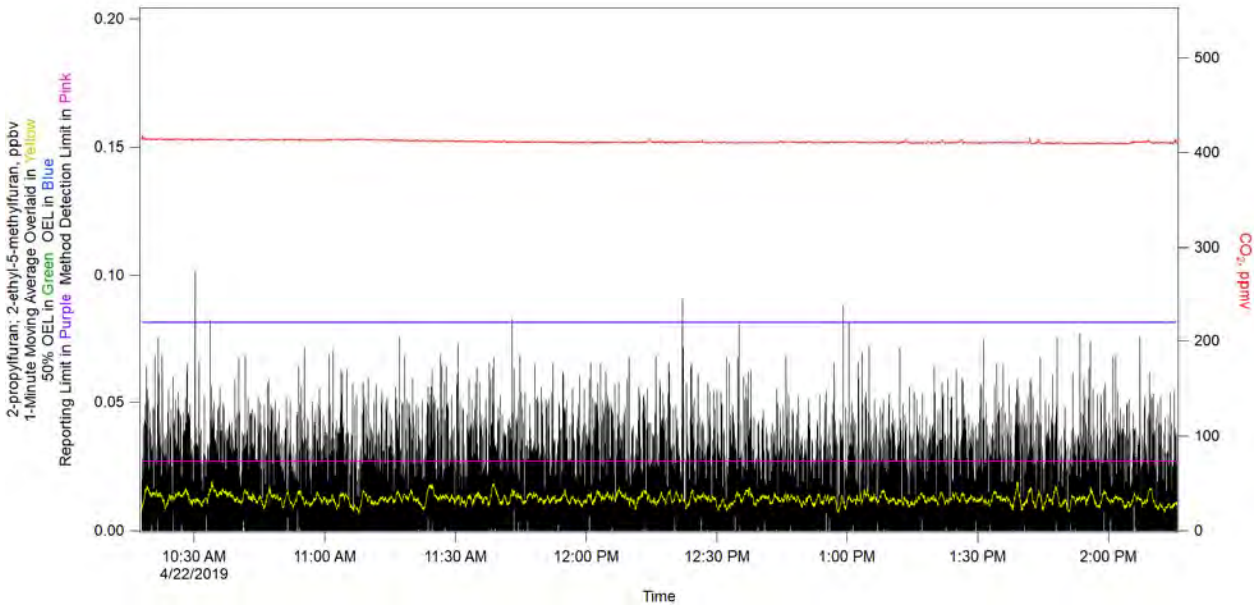


**Figure 2-82. 2-propylfuran; 2-ethyl-5-methylfuran.**

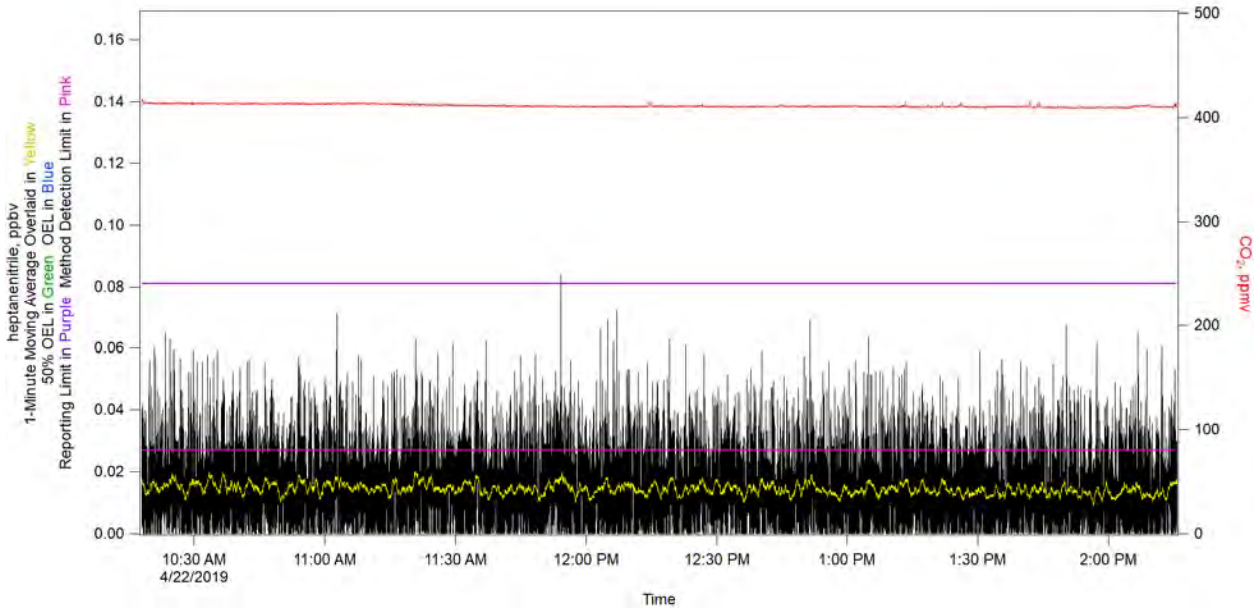


**Figure 2-83. Heptanenitrile.**

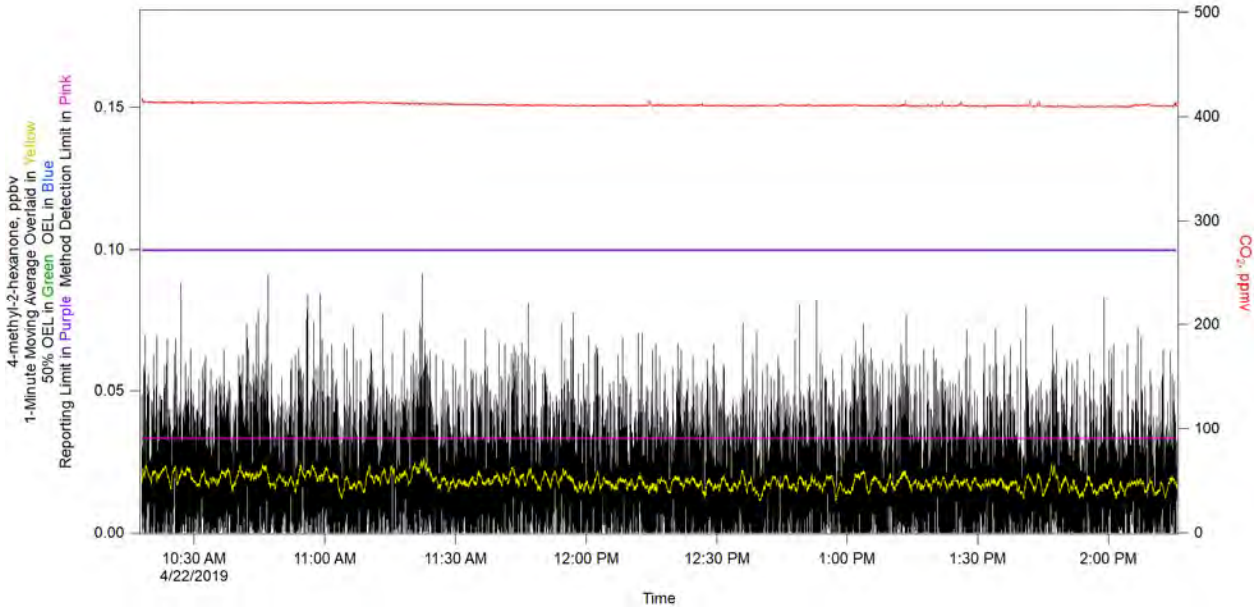


**Figure 2-84. 4-methyl-2-hexanone.**

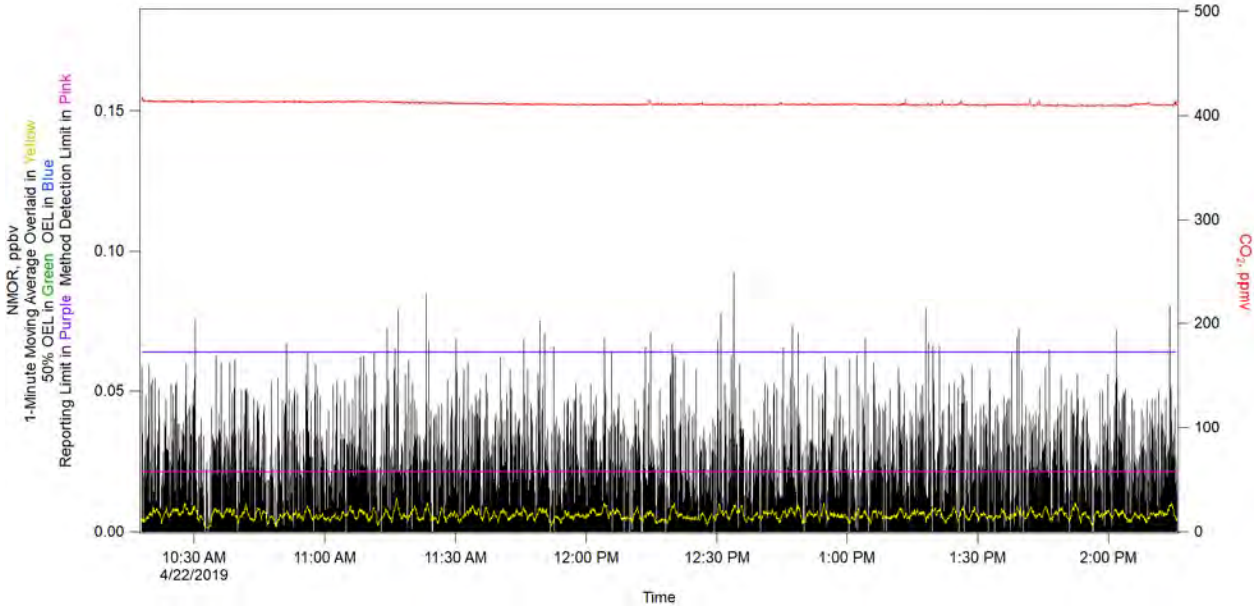


**Figure 2-85. N-nitrosomorpholine (NMOR).**

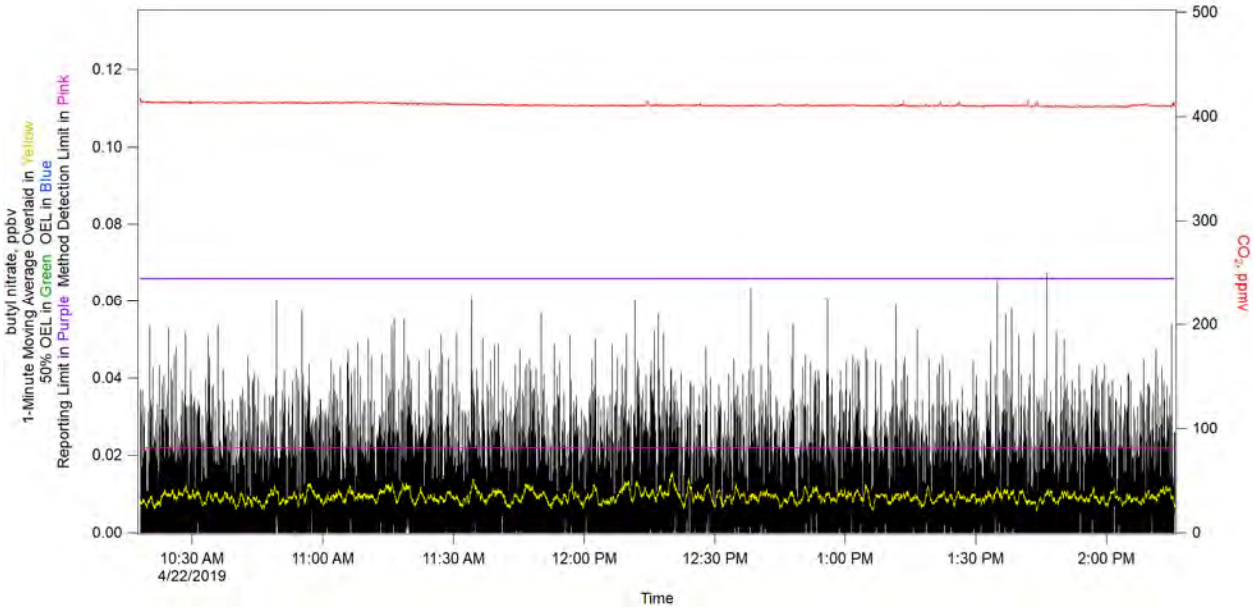


**Figure 2-86. Butyl Nitrate.**

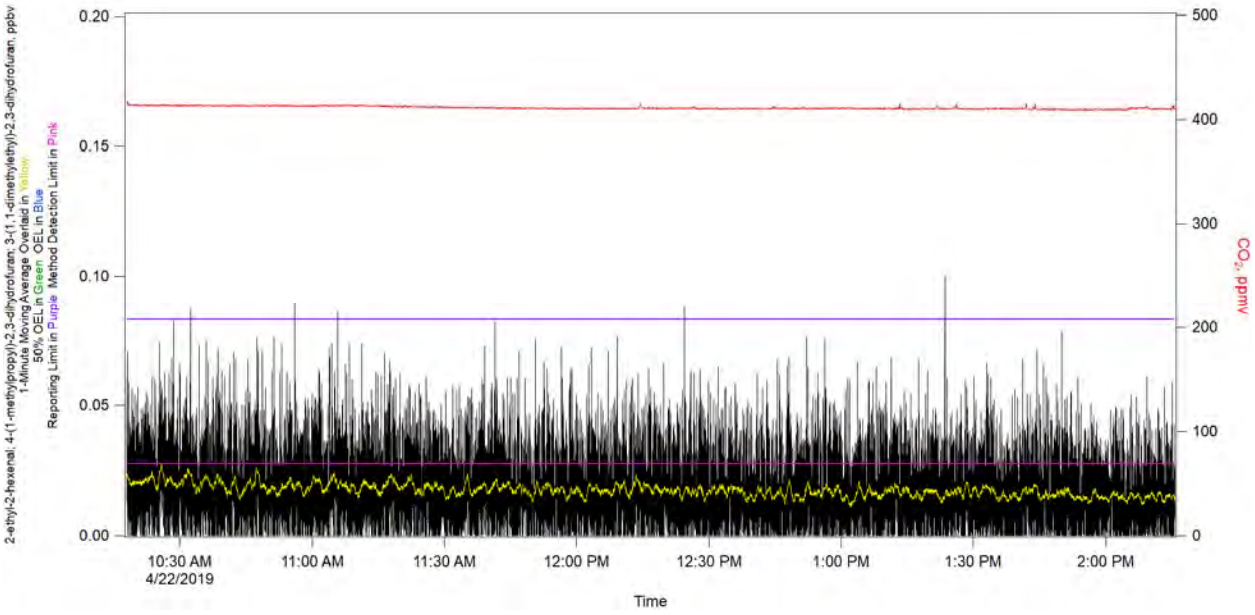


**Figure 2-87. 2-ethyl-2-hexenal; 4-(1-methylpropyl)-2,3-dihydrofuran 3-(1,1-dimethylethyl)-2,3-dihydrofuran.**

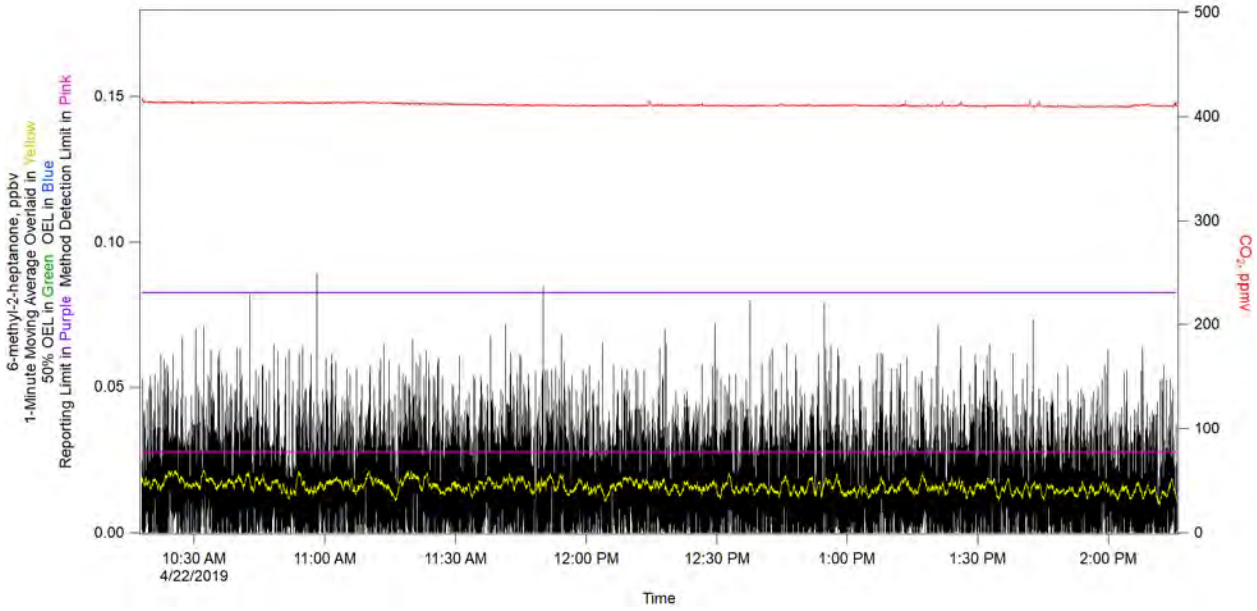


**Figure 2-88. 6-methyl-2-heptanone.**

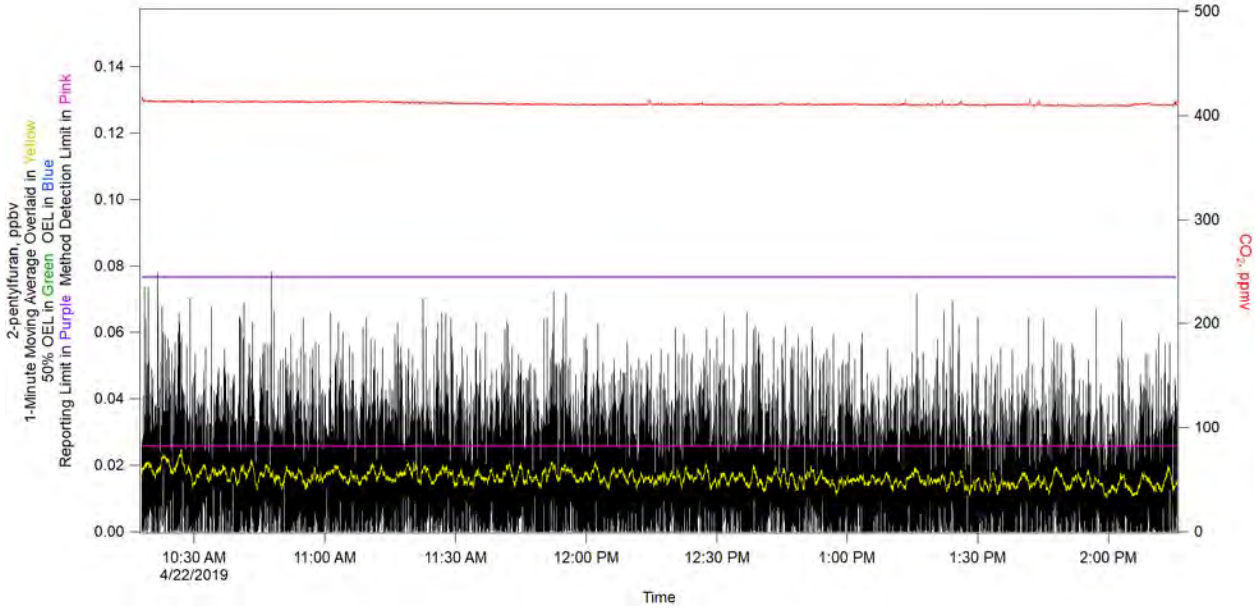


**Figure 2-89. 2-pentylfuran.**

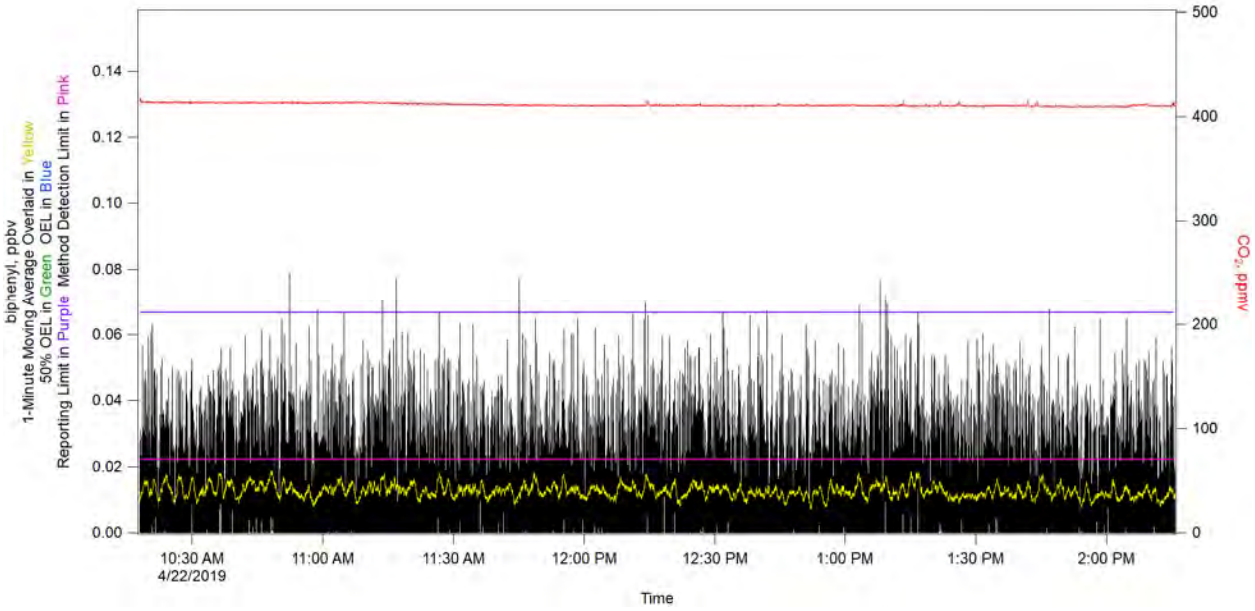


**Figure 2-90. Biphenyl.**

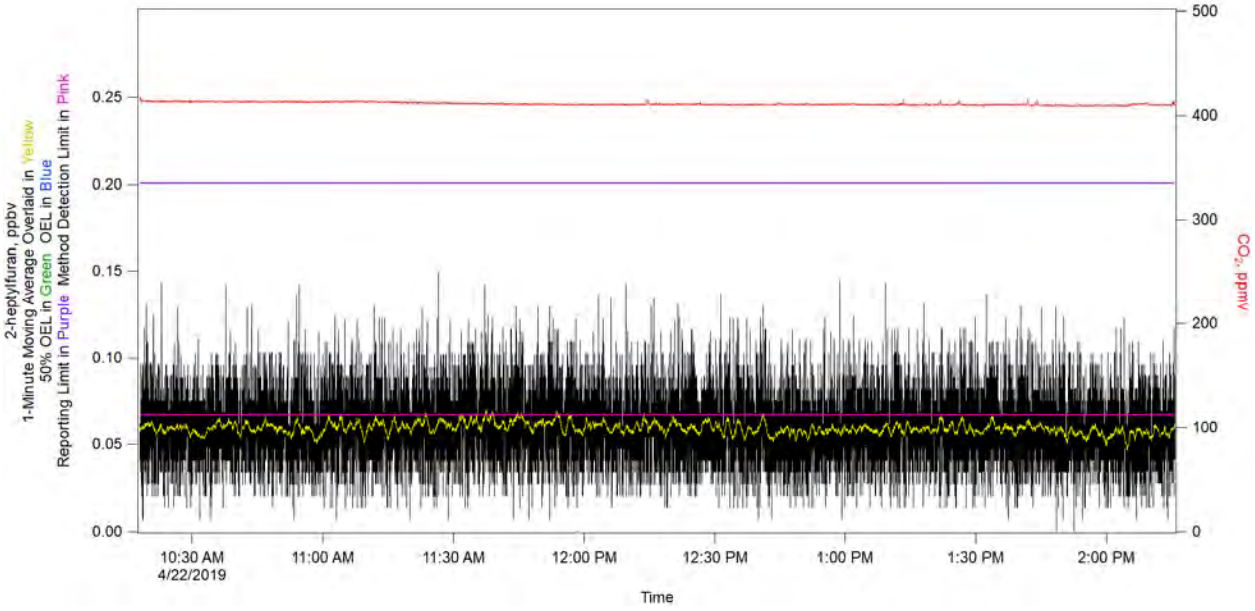


**Figure 2-91. 2-heptylfuran.**

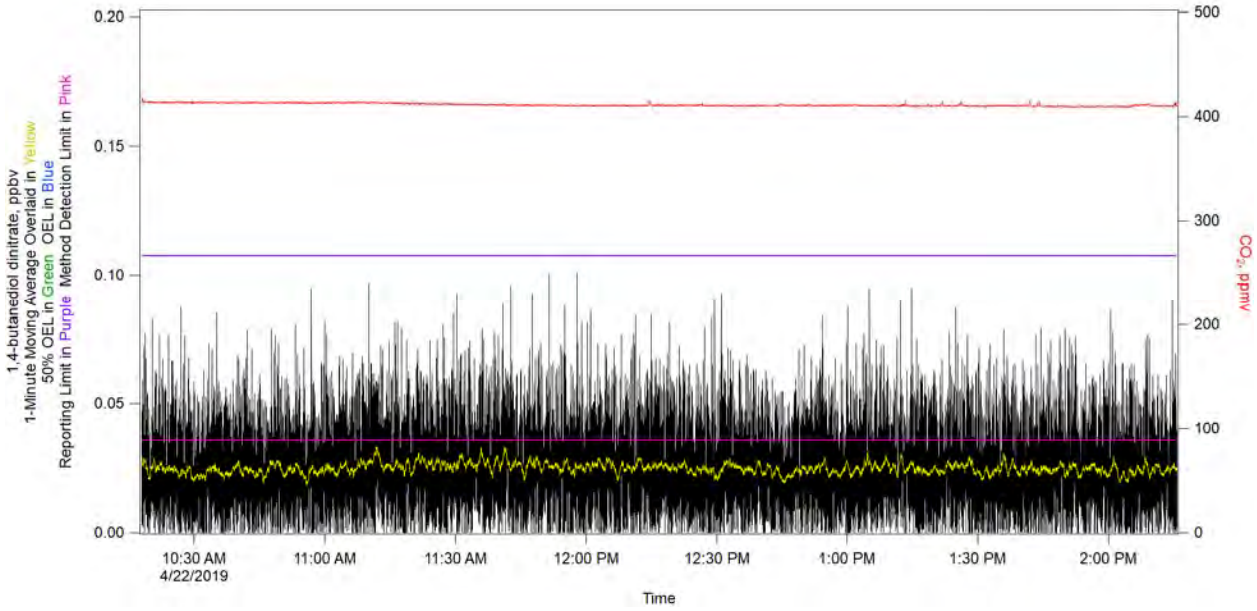


**Figure 2-92. 1,4-butanediol Dinitrate.**

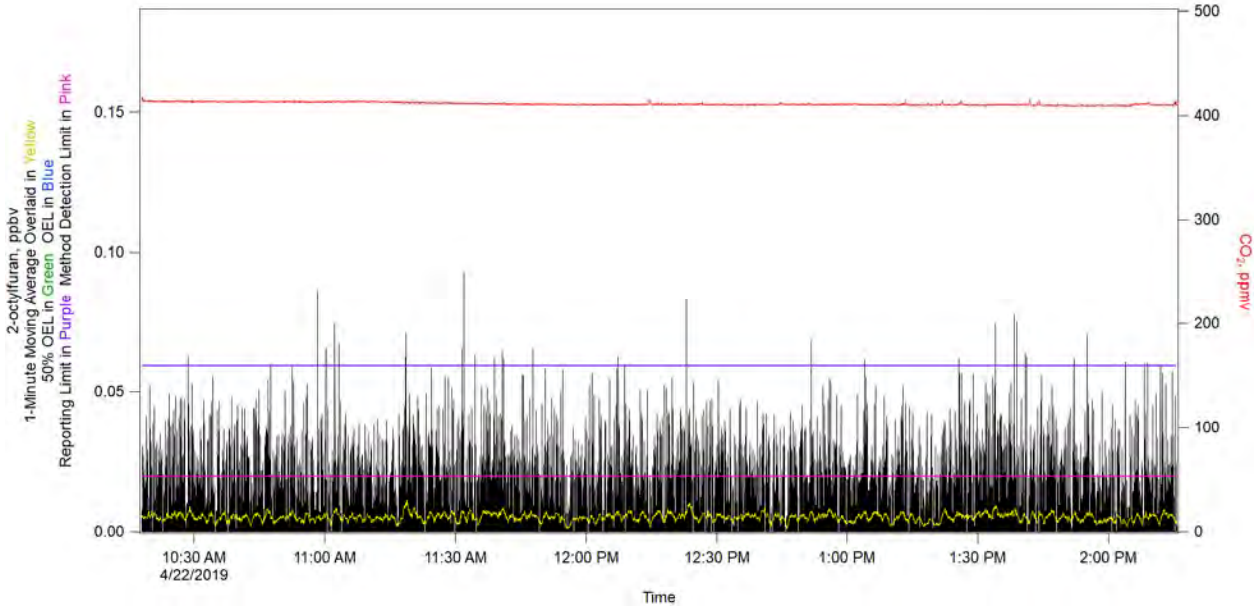


**Figure 2-93. 2-octylfuran.**

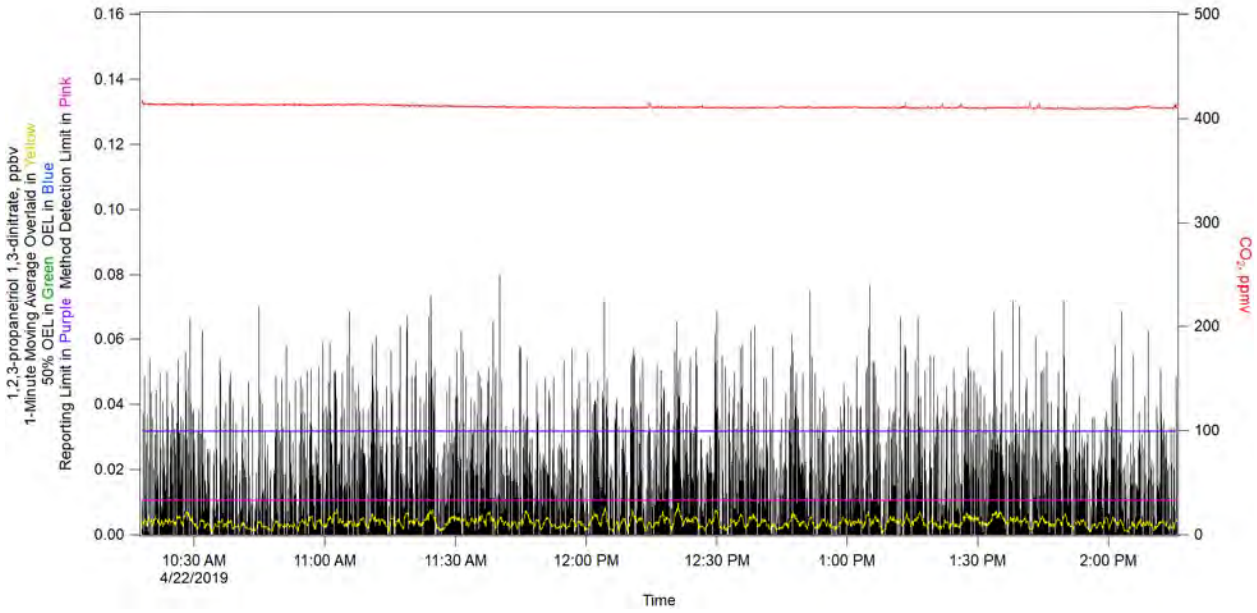


**Figure 2-94. 1,2,3-propanetriol 1,3-dinitrate.**

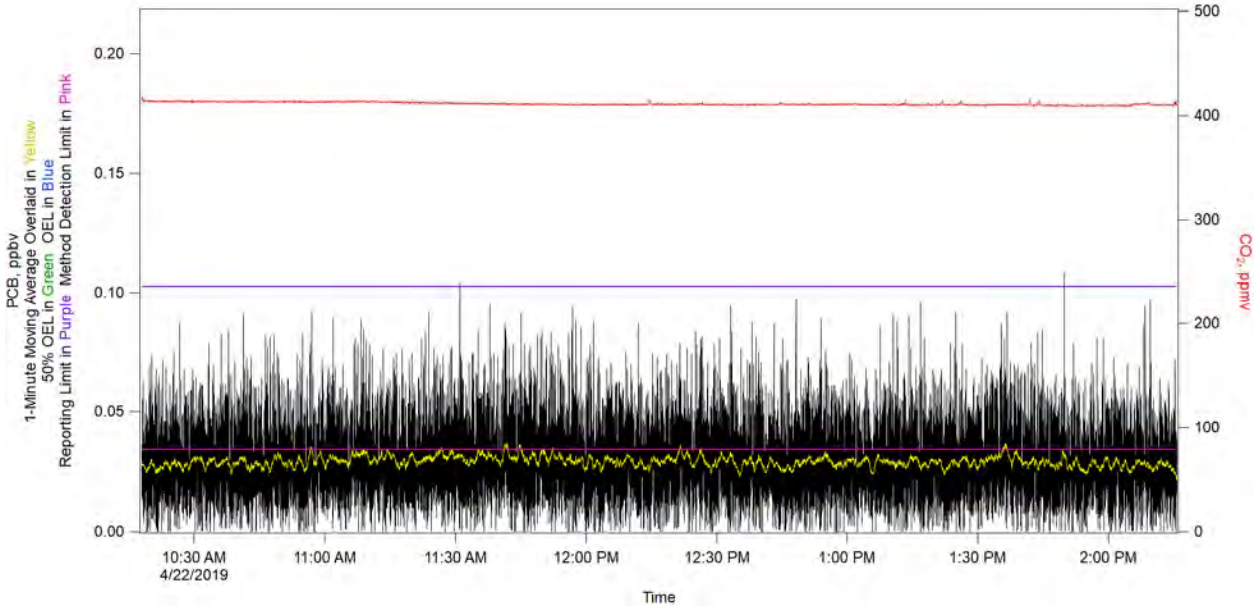


**Figure 2-95. PCB.**

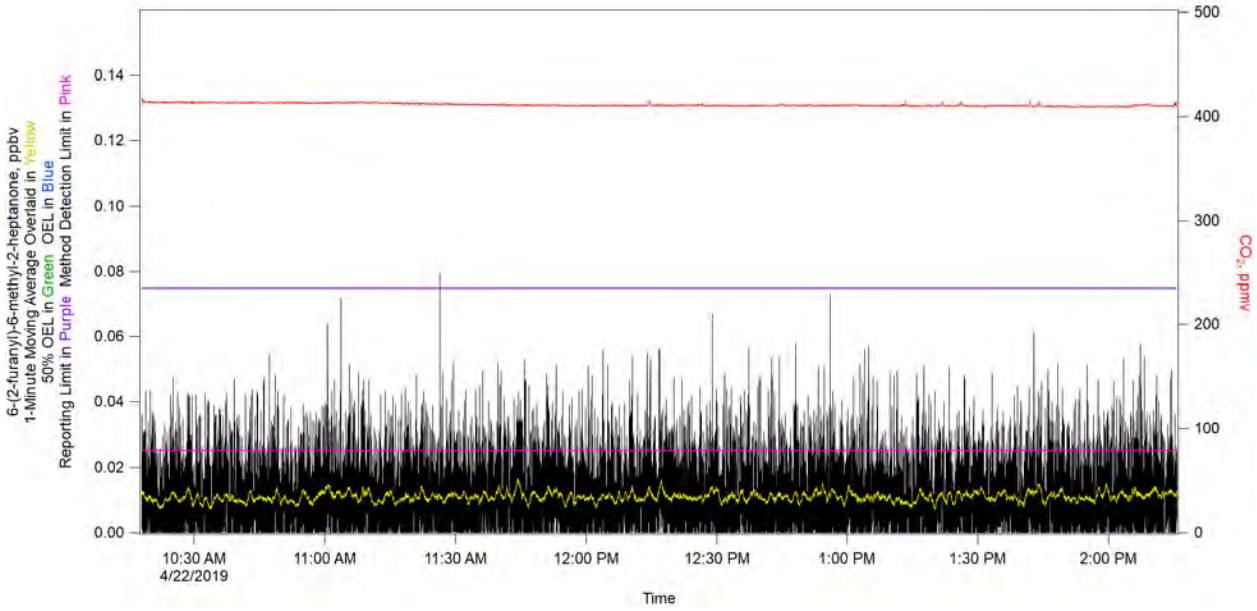


**Figure 2-96. 6-(2-furanyl)-6-methyl-2-heptanone.**

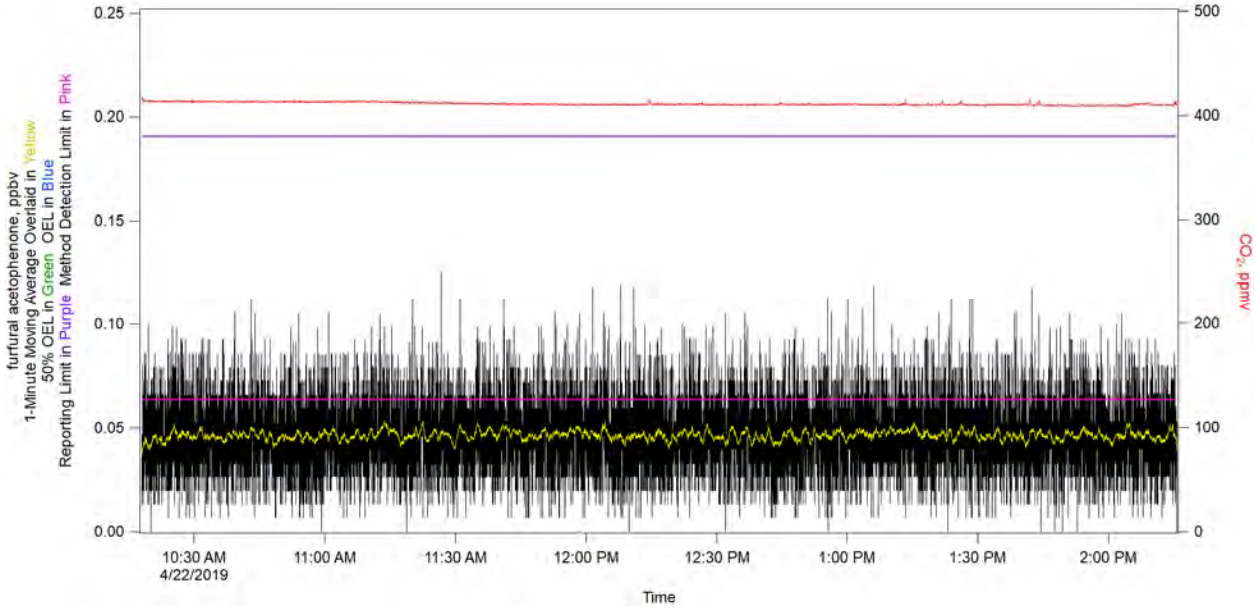


**Figure 2-97. Furfural Acetophenone.**

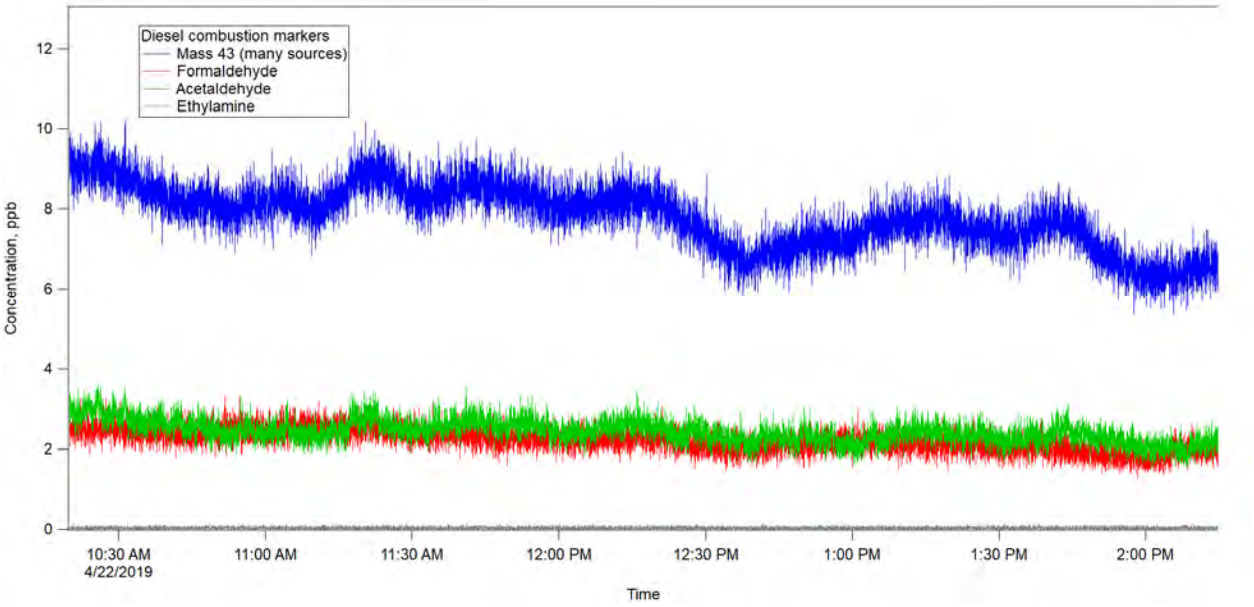


**Figure 2-98. Diesel Combustion Markers.**

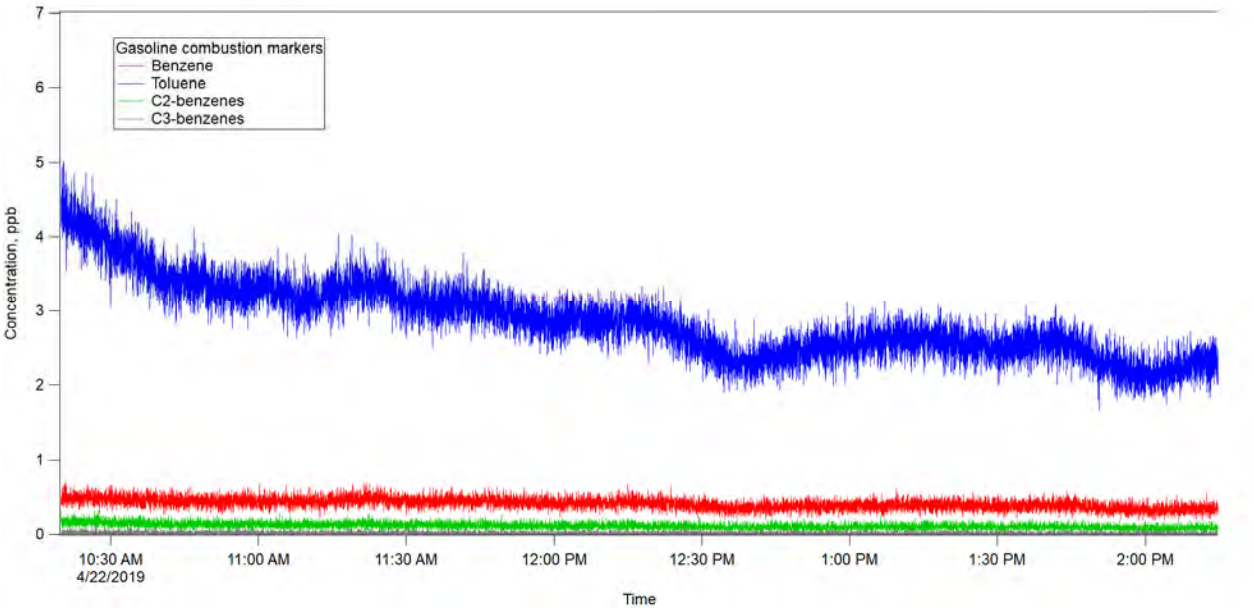


**Figure 2-99. Gasoline Combustion Markers.**

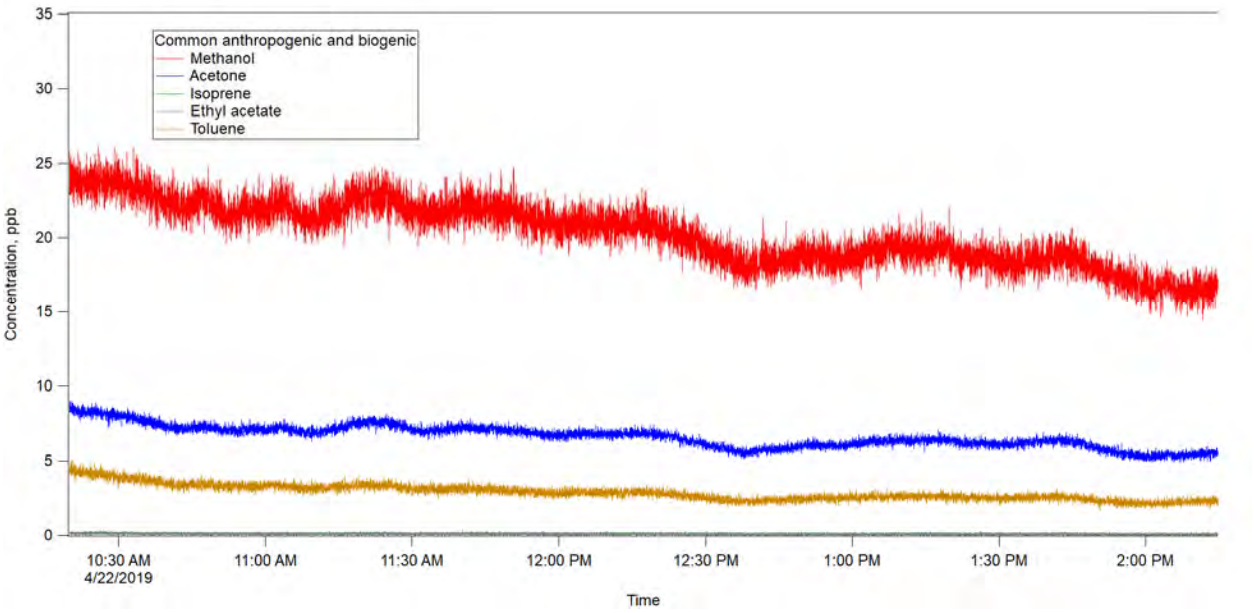


**Figure 2-100. Plant and Human Markers.**

## 2.6 Odor Compounds

The ML monitored the AOP-015 event near the U Farm Change Trailer from approximately 10:17 to 14:19. This section provides the odor compound statistical results from that monitoring period.

**Table 2-3. Odor Statistical Information for AOP-015 Monitoring on April 22, 2019.**

| Odor # | Odor Compound Name | MDL (ppb) | Ave. (ppb) | St. Dev. (ppb) | Rel St. Dev. (%) | Max. (ppb) | Median (ppb) |
|---|---|---|---|---|---|---|---|
| 1 | methyl mercaptan | 0.147 | <0.147 | 0.044 | 30.407 | 0.366 | <0.147 |
| 2 | Dimethylsulfide + ethanethiol | 0.088 | 0.193† | 0.045 | 23.122 | 0.402 | 0.193† |
| 3 | allyl mercaptan | 0.033 | <0.033 | 0.013 | 201.445 | 0.126 | <0.033 |
| 4 | 1-propanethiol + isopropyl mercaptan | 0.041 | <0.041 | 0.023 | 139.480 | 0.182 | <0.041 |
| 5 | 2-butene-1-thiol | 0.062 | <0.062 | 0.012 | 263.193 | 0.147 | <0.062 |
| 6 | diethyl sulfide + 2-methylpropane-2-thiol | 0.281 | 0.373† | 0.089 | 23.980 | 0.824 | 0.365† |
| 7 | thiopropanal sulfuroxide | 0.024 | 0.126 | 0.051 | 40.564 | 0.353 | 0.123 |
| 8 | dimethyl disulfide | 0.027 | 0.053† | 0.030 | 57.077 | 0.203 | 0.051† |
| 9 | 1-pentanethiol + 2,2-dimethylpropane-1-thiol | 0.046 | <0.046 | 0.019 | 121.401 | 0.121 | <0.046 |
| 10 | benzenethiol | 0.028 | 0.107 | 0.057 | 52.758 | 0.320 | 0.105 |
| 11 | diallyl sulfide | 0.022 | <0.022 | 0.013 | 193.852 | 0.130 | <0.022 |
| 12 | methyl propyl disulfide | 0.016 | 0.026† | 0.032 | 124.046 | 0.187 | 0.011† |
| 13 | methylbenzenethiol | 0.027 | <0.027 | 0.017 | 114.929 | 0.111 | <0.027 |
| 14 | dimethyl trisulfide | 0.020 | <0.020 | 0.010 | 157.053 | 0.069 | <0.020 |
| 15 | (1-oxoethyl) thiophene | 0.040 | <0.040 | 0.024 | 170.062 | 0.164 | <0.040 |
| 16 | (1-oxopropyl) thiophene | 0.029 | 0.031† | 0.024 | 75.714 | 0.138 | 0.028† |
| 17 | dipropyl disulfide | 0.024 | <0.024 | 0.013 | 102.344 | 0.087 | <0.024 |
| 18 | methyl propyl trisulfide | 0.019 | <0.019 | 0.013 | 160.881 | 0.089 | <0.019 |
| 19 | dimethyl tetrasulfide | 0.021 | <0.021 | 0.009 | 92.339 | 0.057 | <0.021 |
| 20 | dipropyl trisulfide | 0.022 | <0.022 | 0.013 | 177.118 | 0.096 | <0.022 |
| 21 | diphenyl sulfide | 0.026 | <0.026 | 0.014 | 137.747 | 0.099 | <0.026 |
| < | COPC Average/Median Below the MDL. | | | | | | |
| † | Average/Median Between the RL and the MDL. | | | | | | |

Figure 2-101 through Figure 2-121 display potential odor-causing compounds, overlaid with the same signal smoothed using a one-minute moving average, and $CO_2$, for the monitoring period of April 22, 2019. If within range of the plot's left axis, a horizontal purple line representing the RL, and a pink horizontal line representing the MDL are shown.

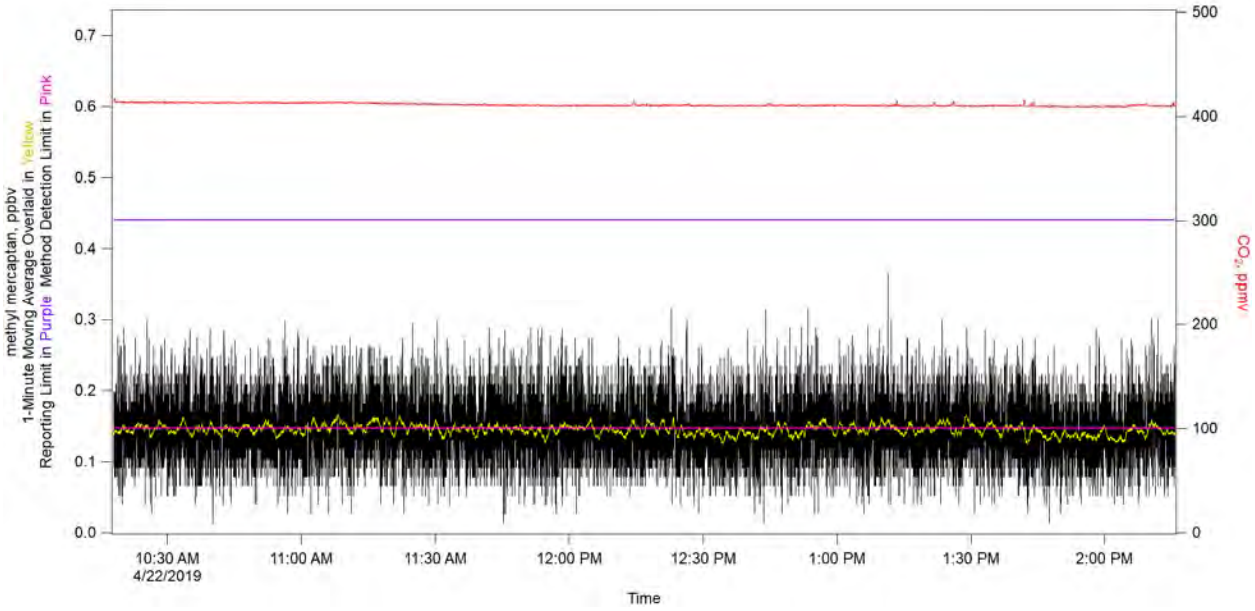


**Figure 2-101. Methyl Mercaptan.**

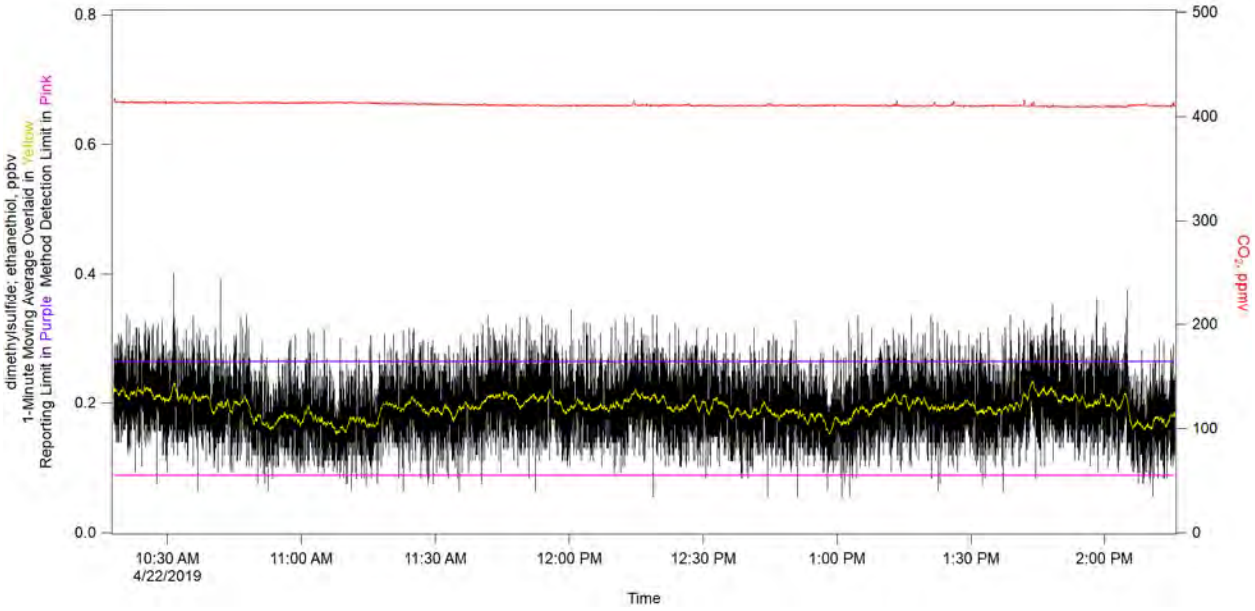


**Figure 2-102. Dimethyl Sulfide; Ethanethiol.**

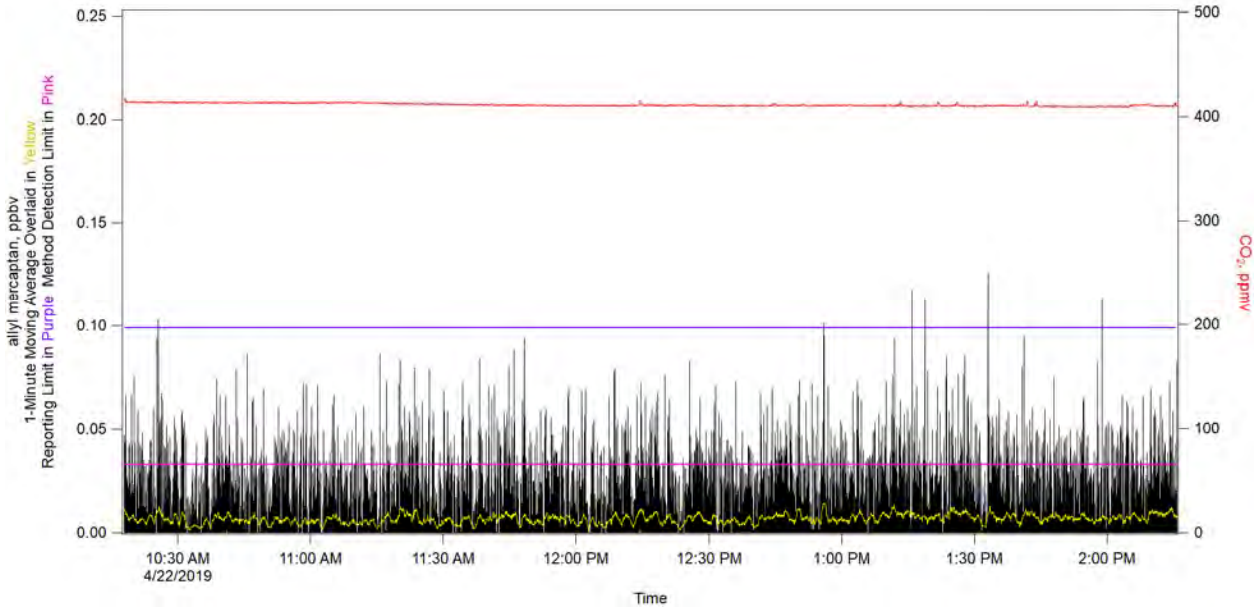


**Figure 2-103. Allyl Mercaptan.**

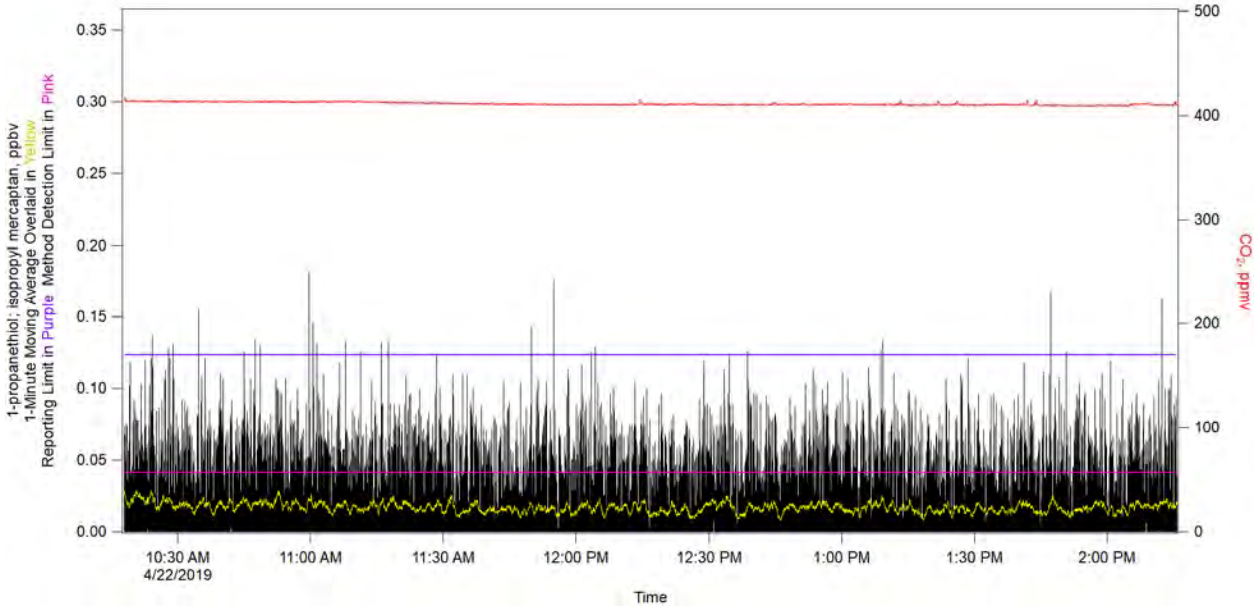


**Figure 2-104. 1-propanethiol; Isopropyl Mercaptan.**

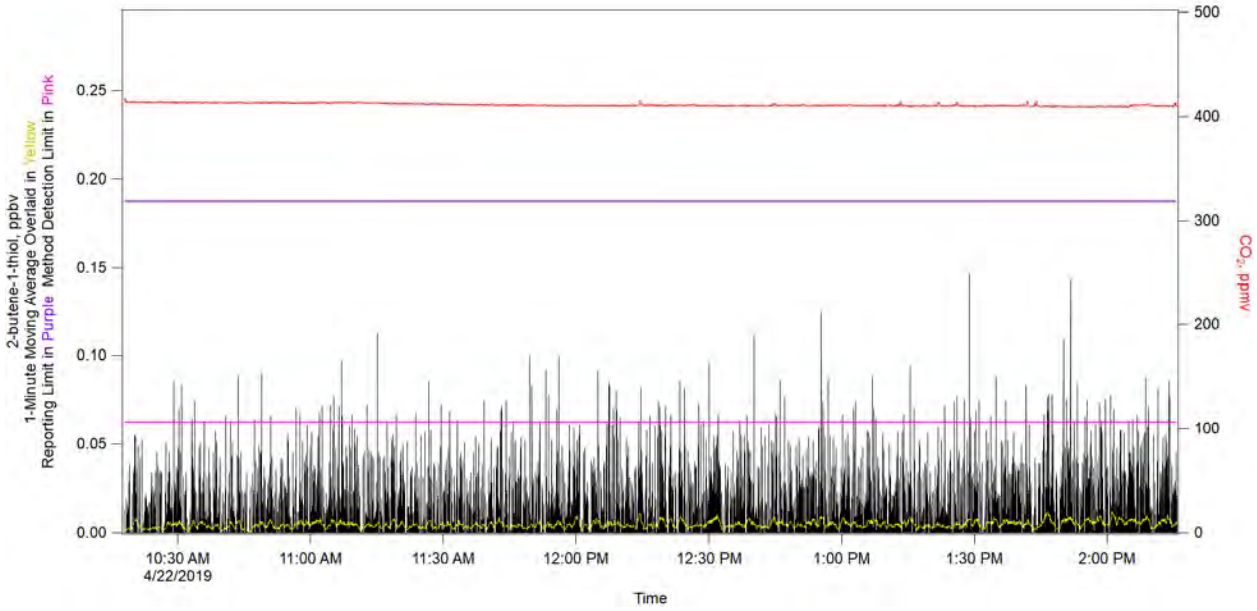


**Figure 2-105. 2-butene-1-thiol.**

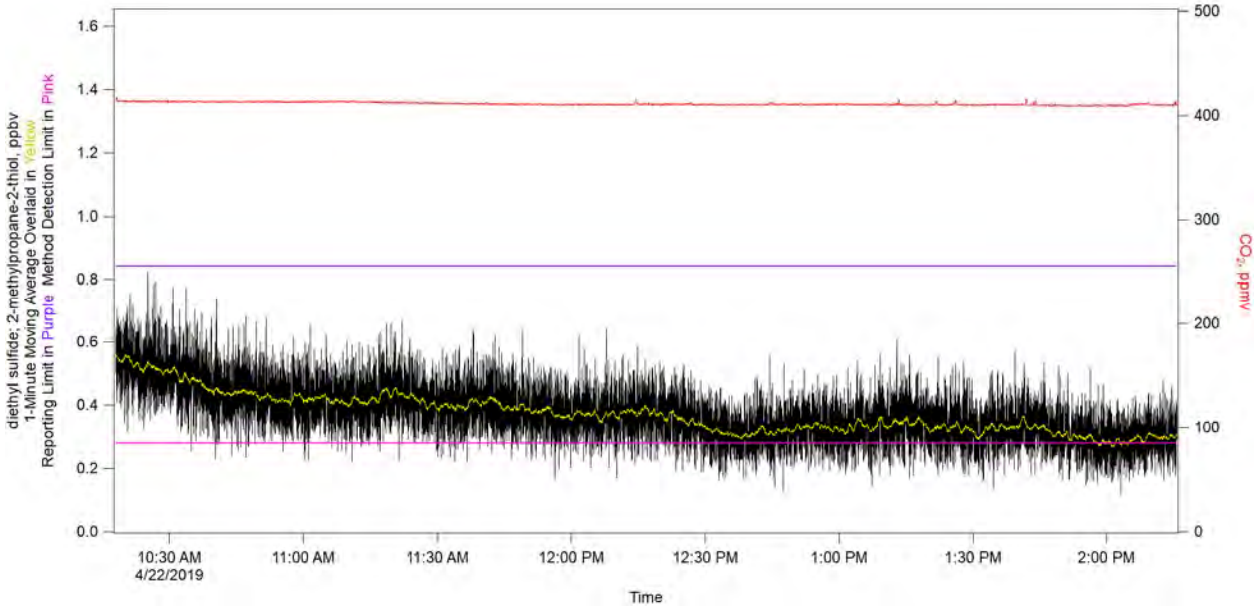


**Figure 2-106. Diethyl Sulfide; 2-methylpropane-2-thiol.**

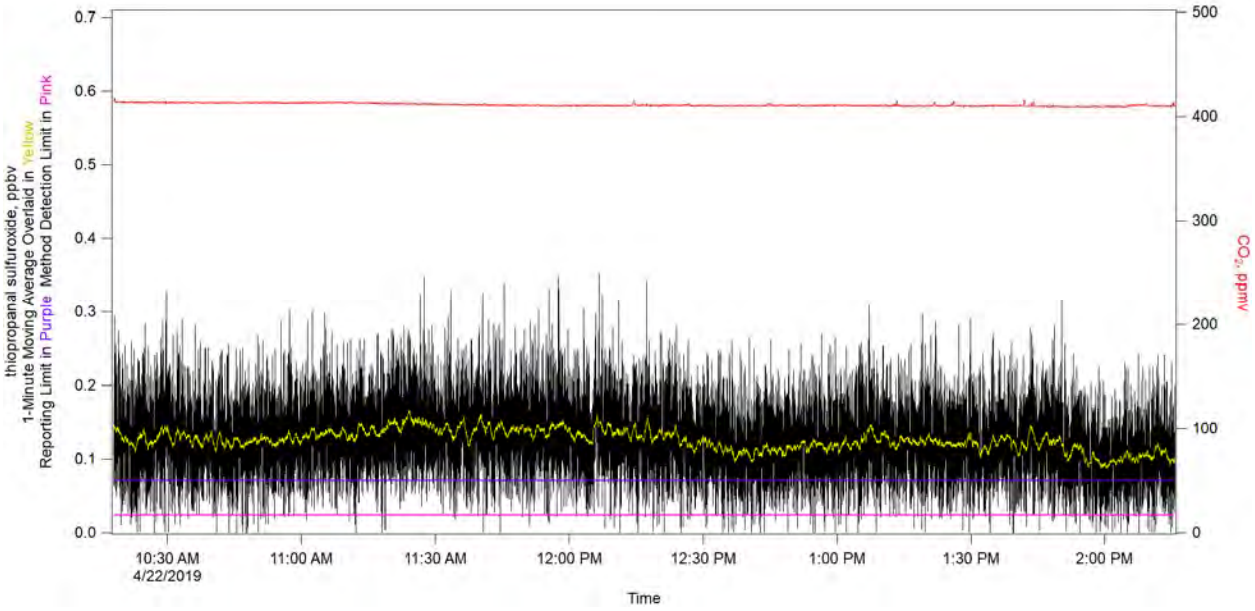


**Figure 2-107. Thiopropanal Sulfuroxide.**

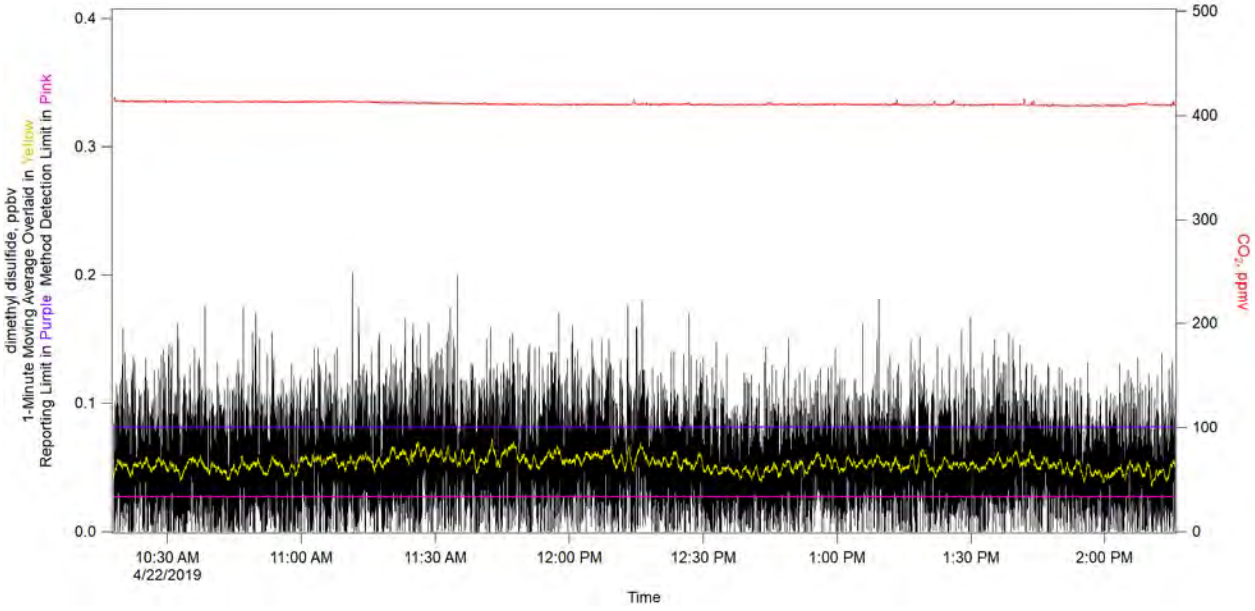


**Figure 2-108. Dimethyl Disulfide.**

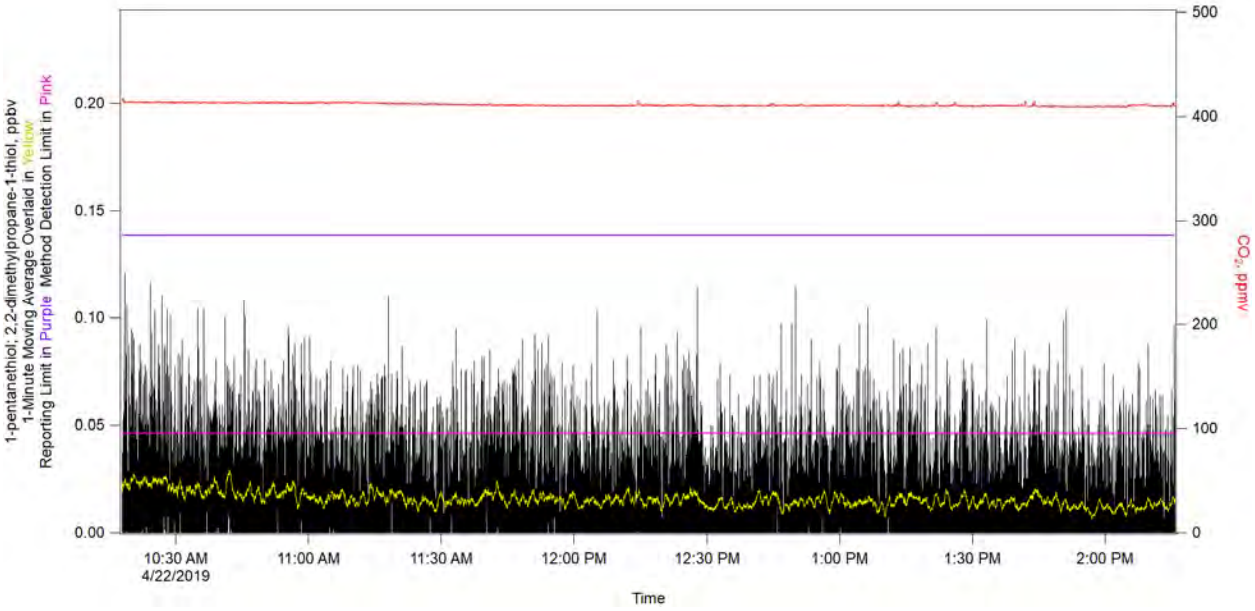


**Figure 2-109. 1-pentanethiol; 2,2-dimethylpropane-1-thiol.**

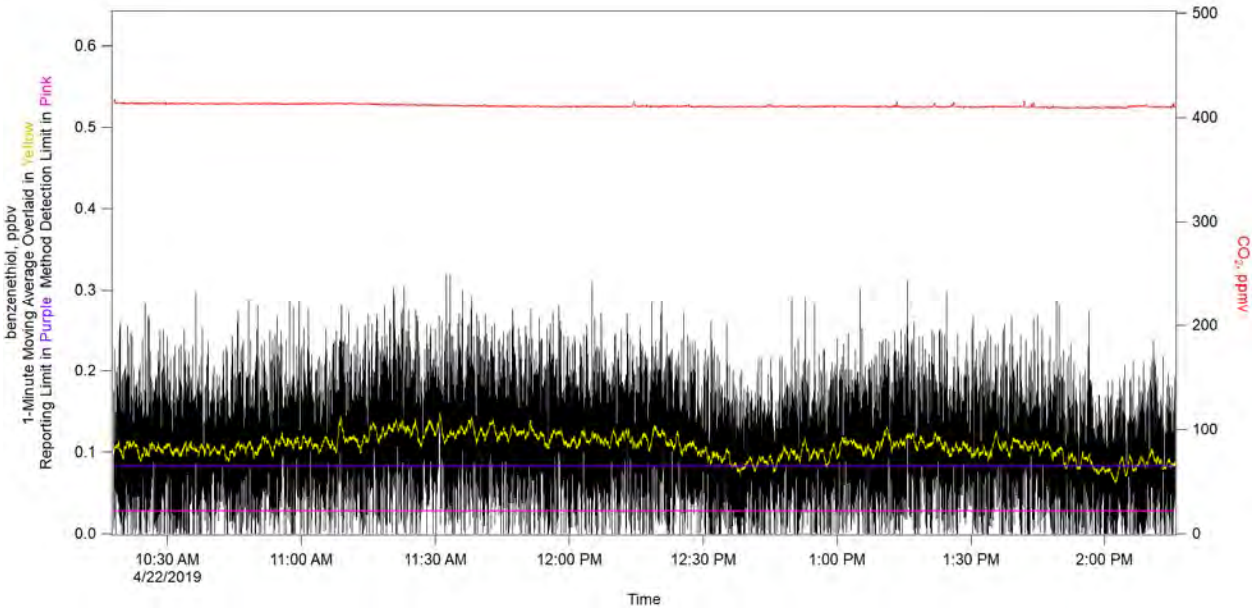


**Figure 2-110. Benzenethiol.**

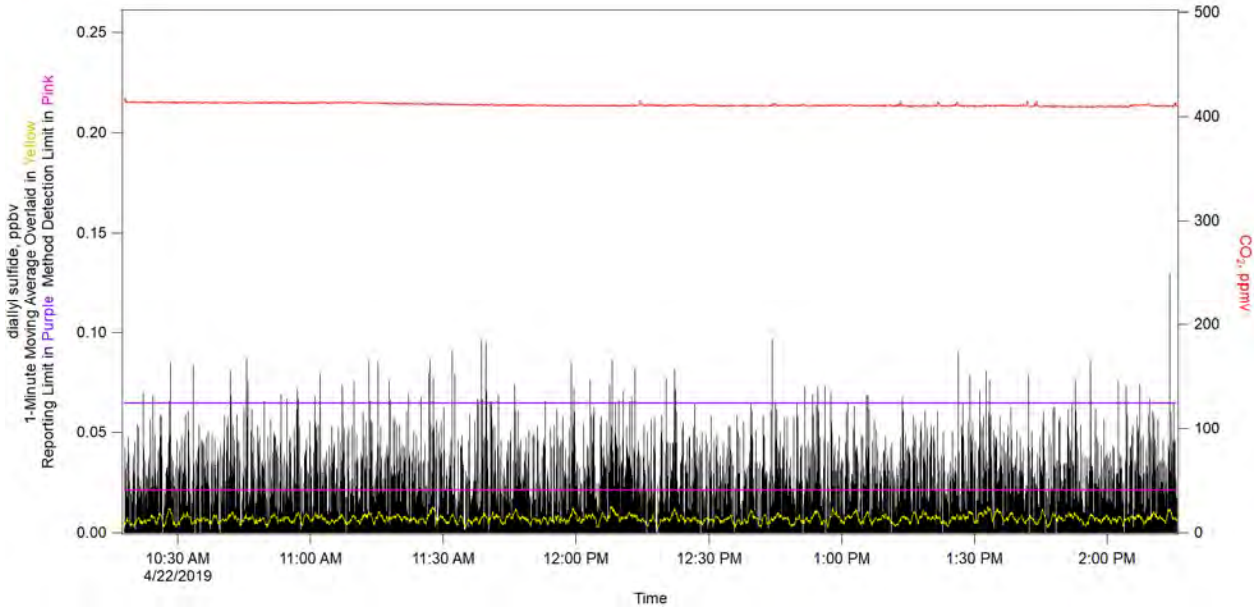


**Figure 2-111. Diallyl Sulfide.**

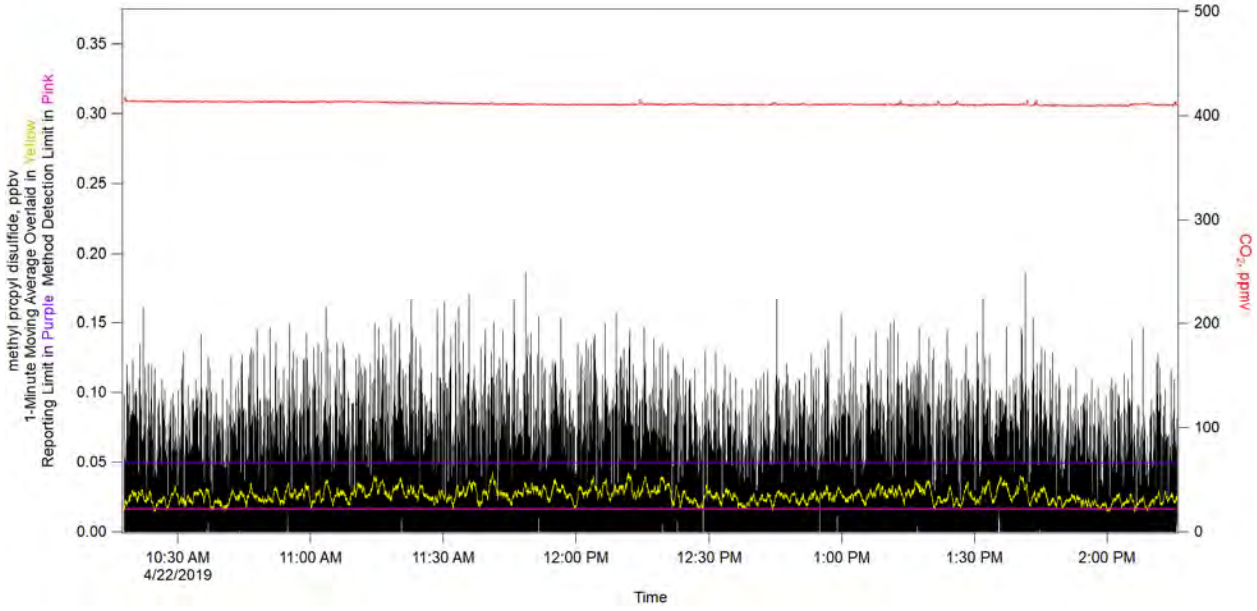


**Figure 2-112. Methyl Propyl Disulfide.**

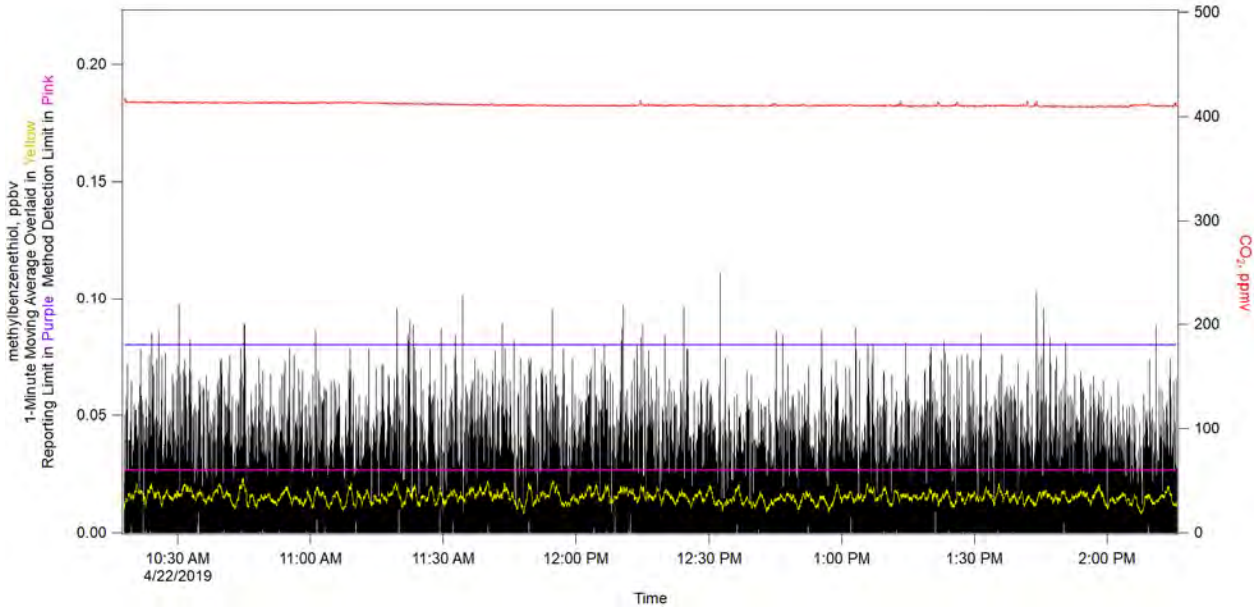


**Figure 2-113. Methylbenzenethiol.**

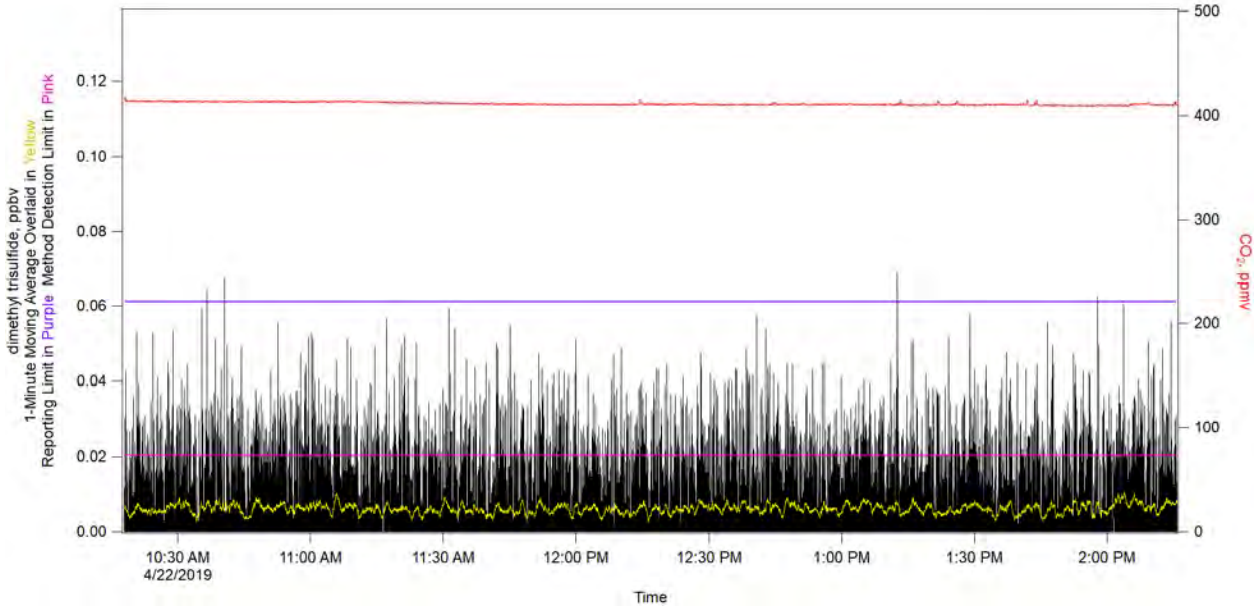


**Figure 2-114. Dimethyl Trisulfide.**

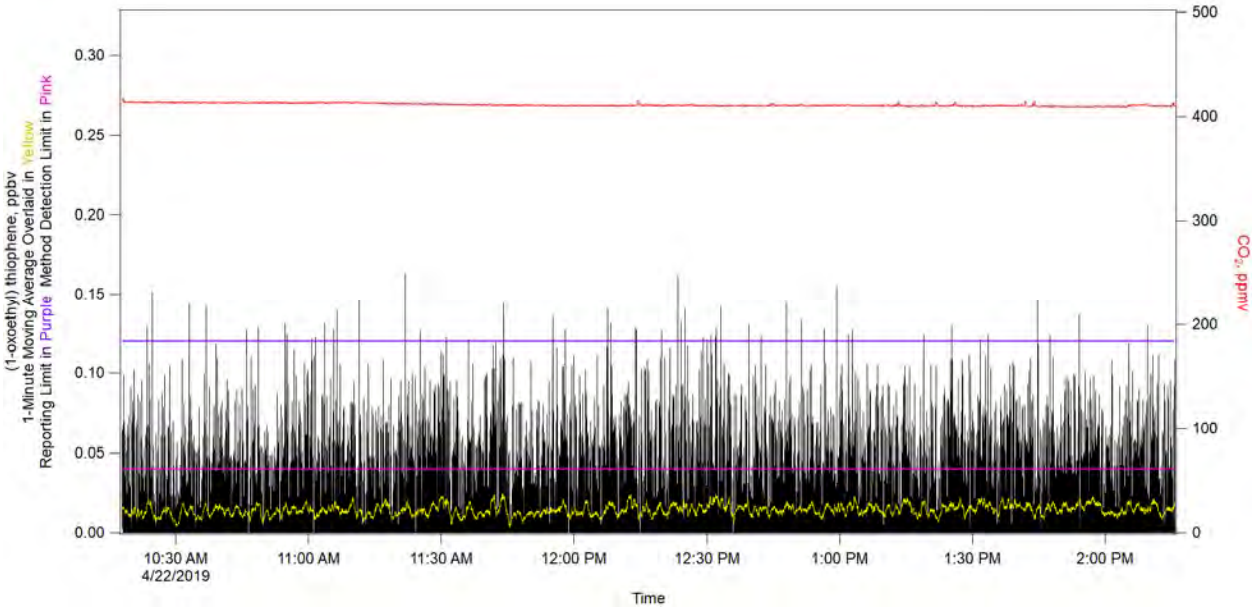


**Figure 2-115. (1-oxoethyl) Thiophene.**

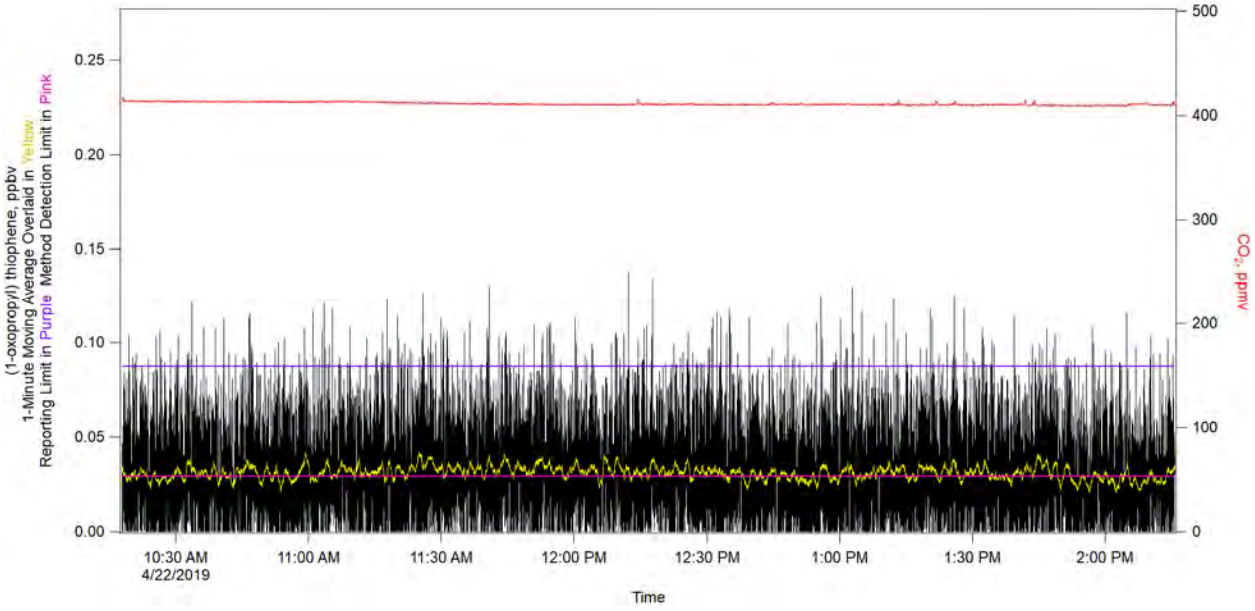


**Figure 2-116. (1-oxopropyl) Thiophene.**

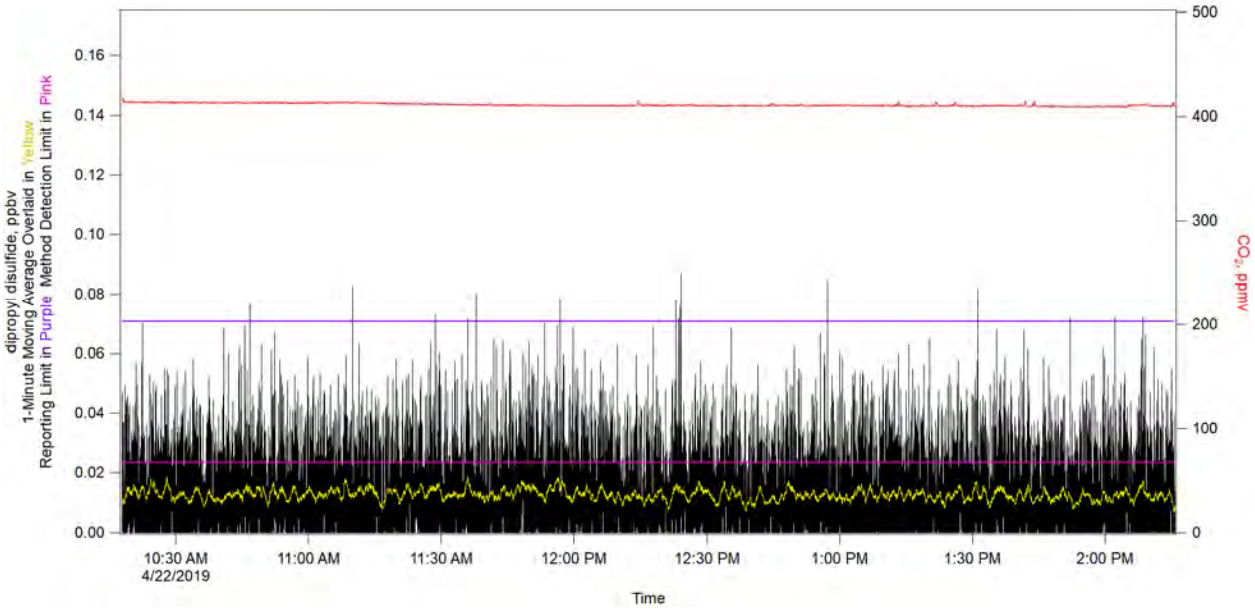


**Figure 2-117. Dipropyl Disulfide.**

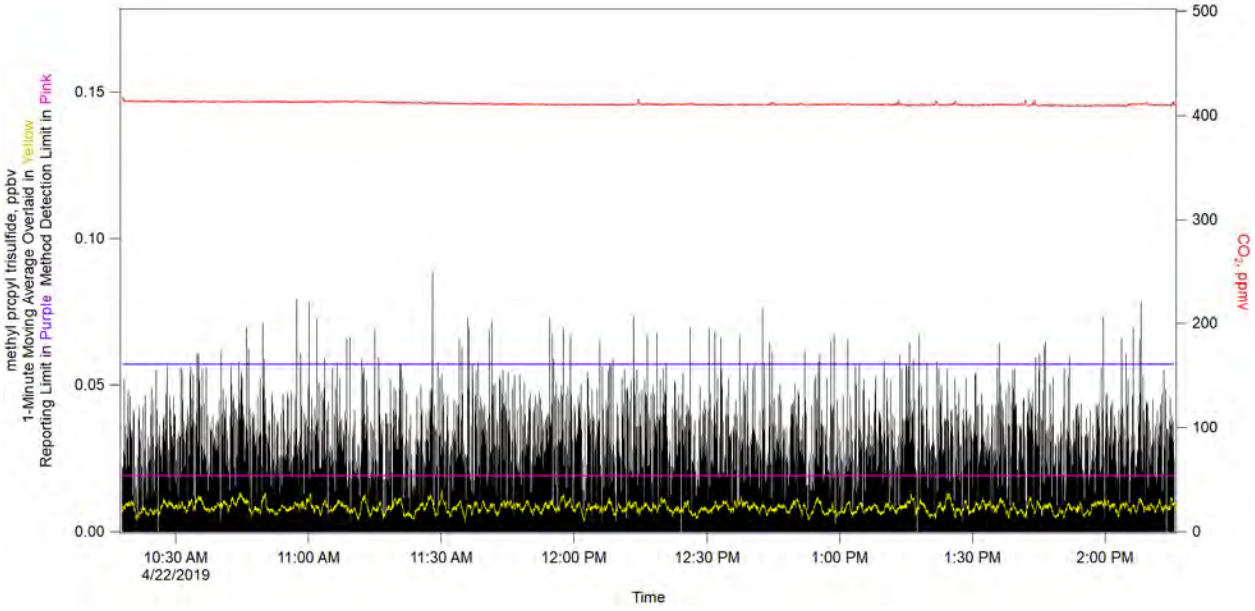


**Figure 2-118. Methyl Propyl Trisulfide.**

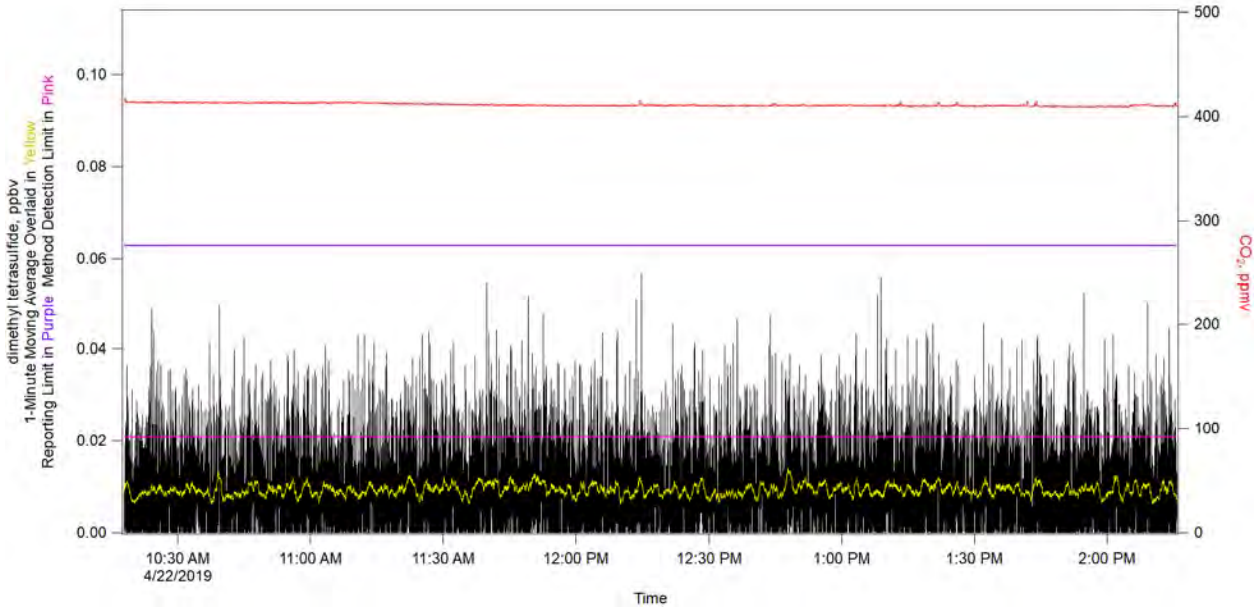


**Figure 2-119. Dimethyl Tetrasulfide.**

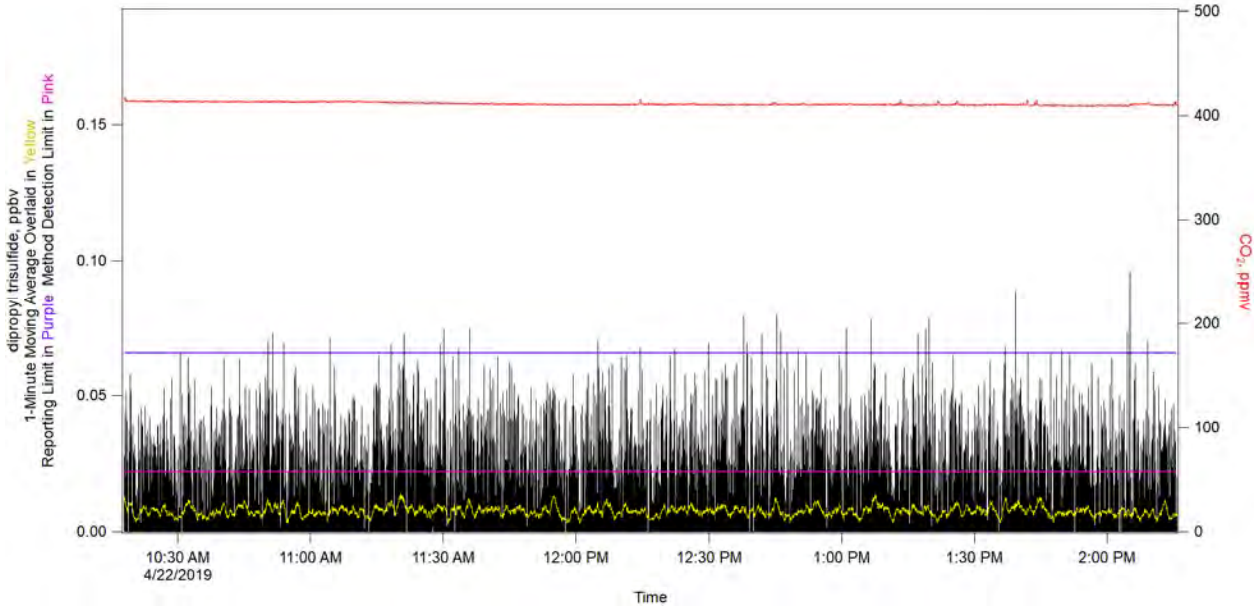


**Figure 2-120. Dipropyl Trisulfide.**

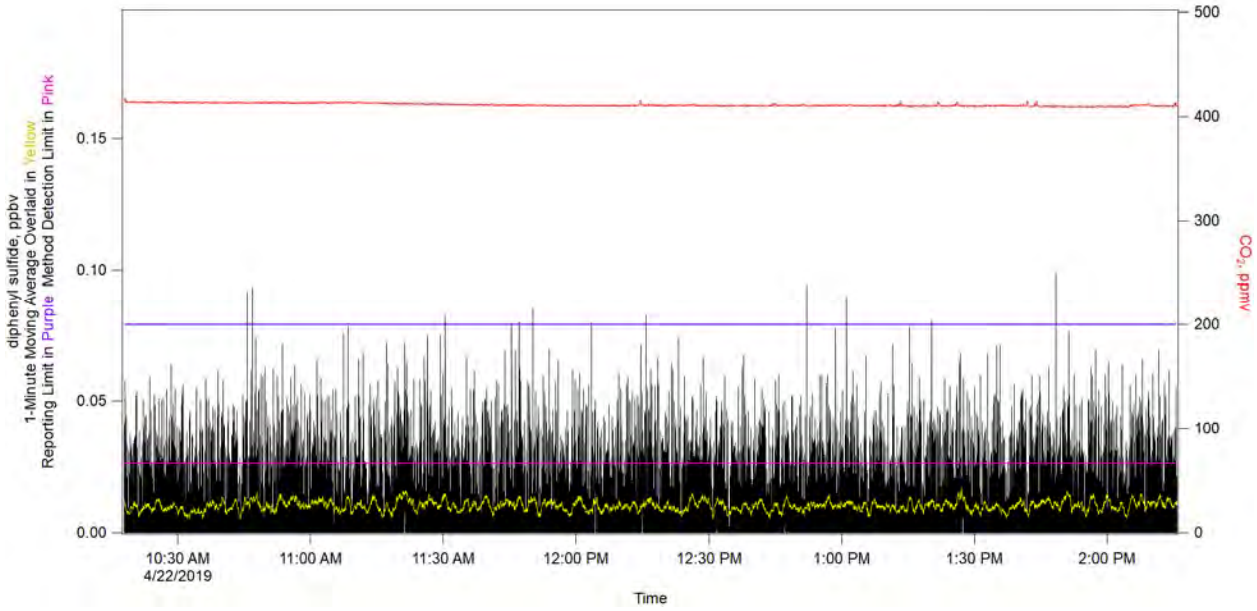


**Figure 2-121. Diphenyl Sulfide.**

# 3.0 APRIL 23, 2019 – AREA MONITORING

## 3.1 Quality Assessment

Data from April 23, 2019, were assessed using Procedure 17124-DOE-HS-102. A Data Exchange Checklist was completed. The data were accepted by TerraGraphics with the following comments. Report No. 66409-RPT-004 was adequately documented and all checks passed the acceptance limits.

## 3.2 Summary

On April 23, 2019, the ML personnel arrived at the TerraGraphics warehouse at 04:50. The QA/QC zero-air/span checks were performed on the LI-COR $CO_2$ monitor, the Picarro $NH_3$ analyzer, and the PTR-MS beginning at 05:01. The ML arrived on the Hanford Site and checked in with the CSM at 06:20. The ML began a site survey loop of A Farms at 06:26. The ML relocated to the parking lot of AZ Farm, downwind of AZ Farm, at 06:58. Due to varying wind direction, the ML was moved to the northeast side of A Farm. The SME remotely logged in to the PTR-MS to tune the ion source at 08:03. The ML began a site survey loop at 08:40 until parking on the north side of 244-CR Waste Disposal Vault. The ML Operators performed another site survey loop at 10:28. The ML then proceeded to park east of AP Farm, downwind of a portable restroom, and remained there for approximately two hours. The ML Operators performed a site survey loop at 13:30. The Operators checked out with the CSM at 14:00, started a multipoint calibration using the Research and Development (R&D) gas standard, and the ML departed the site. The multipoint calibration was performed at request of the SME to confirm the transmission efficiency. The ML arrived back at the TerraGraphics warehouse at 14:50.


**Figure 3-1. Location of the Mobile Laboratory for the Duration of the Monitoring Period.**

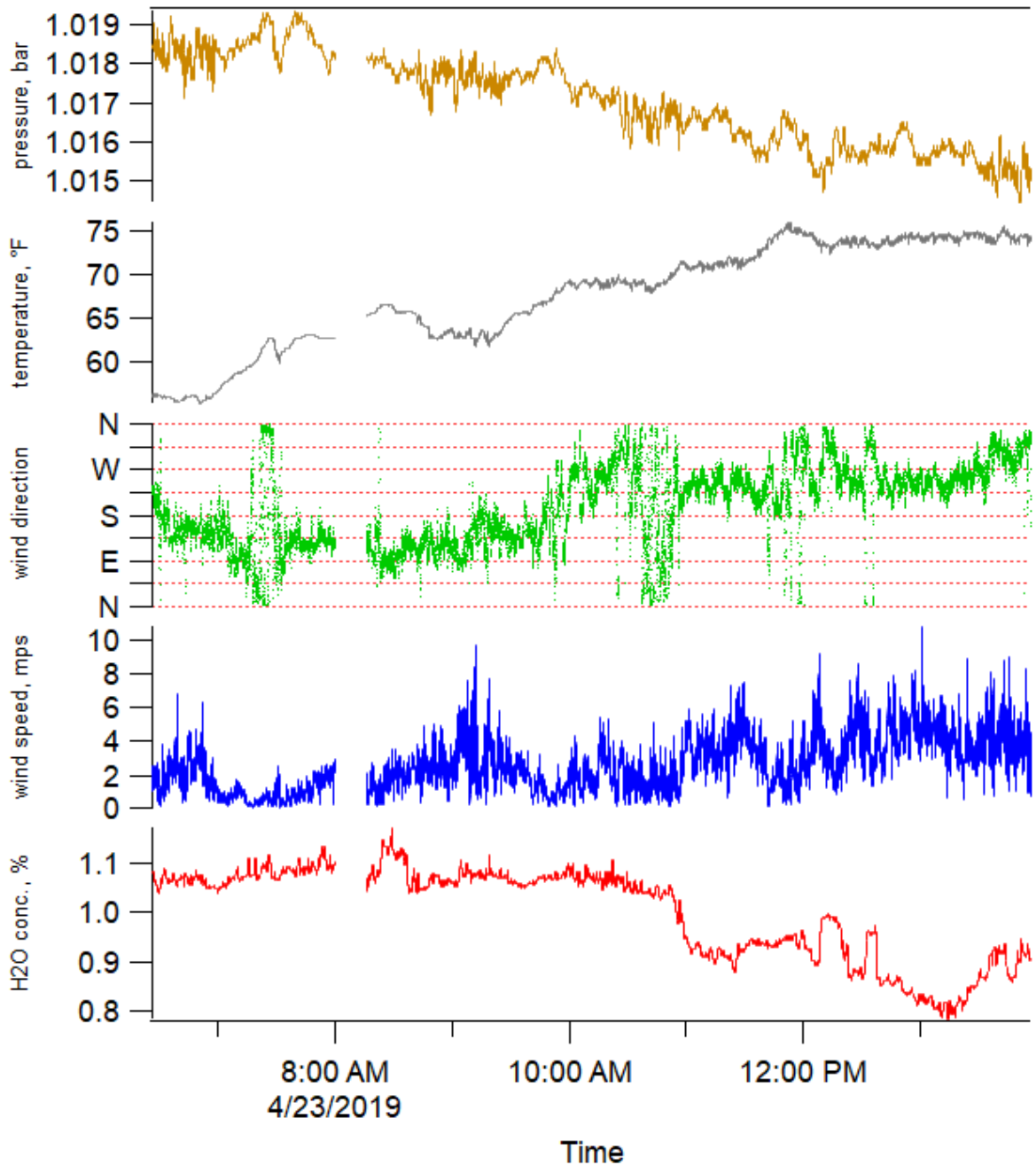


**Figure 3-2. Weather Data for the Duration of the Monitoring Period.**

### 3.3 Samples Collected

Continuous air monitoring was performed using the following instrumentation:

- PTR-TOF 6000 X2,
- LI-COR $CO_2$ Monitor,
- Picarro Ammonia Monitor, and
- Airmar Weather Station.

Confirmatory air samples were not collected during this period.

## 3.4 Area Monitoring

**Table 3-1. Chemical of Potential Concern Statistical Information for the Monitoring Period of April 23, 2019. (2 Sheets)**

| COPC # | COPC Name | OEL (ppb) | MDL (ppb) | Ave. (ppb) | St. Dev. (ppb) | Rel St. Dev. (%) | Max. (ppb) | Median (ppb) |
|---|---|---|---|---|---|---|---|---|
| 1 | ammonia | 25000 | 6.225 | 11.483† | 3.526 | 30.710 | 22.783 | 10.694† |
| 2 | formaldehyde | 300 | 1.721 | <1.721 | 0.177 | 28.311 | 13.358 | <1.721 |
| 3 | methanol | 200000 | 5.758 | 6.482† | 1.008 | 15.553 | 28.017 | 6.286† |
| 4 | acetonitrile | 20000 | 0.085 | 0.141† | 0.036 | 25.717 | 0.469 | 0.141† |
| 5 | acetaldehyde | 25000 | 1.027 | 1.367† | 0.428 | 31.303 | 17.290 | 1.289† |
| 6 | ethylamine | 5000 | 0.069 | <0.069 | 0.020 | 70.042 | 0.148 | <0.069 |
| 7 | 1,3-butadiene | 1000 | 0.183 | 0.242† | 0.098 | 40.591 | 2.969 | 0.235† |
| 8 | propanenitrile | 6000 | 0.107 | <0.107 | 0.040 | 72.910 | 3.053 | <0.107 |
| 9 | 2-propenal | 100 | 0.340 | <0.340 | 0.052 | 58.819 | 1.113 | <0.340 |
| 10 | 1-butanol + butenes | 20000 | 0.214 | <0.214 | 0.048 | 52.175 | 1.677 | <0.214 |
| 11 | methyl isocyanate | 20 | 0.069 | <0.069 | 0.028 | 61.255 | 1.126 | <0.069 |
| 12 | methyl nitrite | 100 | 0.098 | <0.098 | 0.040 | 42.378 | 0.552 | <0.098 |
| 13 | furan | 1 | 0.062 | <0.062 | 0.018 | 59.305 | 0.161 | <0.062 |
| 14 | butanenitrile | 8000 | 0.039 | <0.039 | 0.018 | 73.796 | 0.550 | <0.039 |
| 15 | but-3-en-2-one + 2,3-dihydrofuran + 2,5-dihydrofuran | 200, 1, 1 | 0.041 | <0.041 | 0.022 | 57.346 | N/A* | N/A* |
| 16 | butanal | 25000 | 0.061 | 0.107† | 0.036 | 33.830 | 1.273 | 0.106† |
| 17 | NDMA** | 0.3 | 0.082 | <0.082 | 0.022 | 169.944 | 0.166 | <0.082 |
| 18 | benzene | 500 | 0.236 | <0.236 | 0.045 | 37.209 | 1.064 | <0.236 |
| 19 | 2,4-pentadienenitrile + pyridine | 300, 1000 | 0.085 | <0.085 | 0.019 | 46.390 | 0.129 | <0.085 |
| 20 | 2-methylene butanenitrile | 300 | 0.036 | <0.036 | 0.012 | 75.842 | 0.078 | <0.036 |
| 21 | 2-methylfuran | 1 | 0.043 | <0.043 | 0.023 | 65.586 | 0.235 | <0.043 |
| 22 | pentanenitrile | 6000 | 0.036 | <0.036 | 0.020 | 125.650 | 1.596 | <0.036 |
| 23 | 3-methyl-3-buten-2-one + 2-methyl-2-butenal | 20, 30 | 0.043 | <0.043 | 0.022 | 67.202 | 0.196 | <0.043 |
| 24 | NEMA** | 0.3 | 0.058 | <0.058 | 0.018 | 143.833 | 0.135 | <0.058 |
| 25 | 2,5-dimethylfuran | 1 | 0.032 | <0.032 | 0.018 | 78.526 | 0.143 | <0.032 |
| 26 | hexanenitrile | 6000 | 0.031 | <0.031 | 0.011 | 93.948 | 0.078 | <0.031 |
| 27 | 2-hexanone (MBK) | 5000 | 0.036 | <0.036 | 0.014 | 95.360 | 0.132 | <0.036 |
| 28 | NDEA** | 0.1 | 0.034 | <0.034 | 0.012 | 147.938 | 0.088 | <0.034 |

**Table 3-1. Chemical of Potential Concern Statistical Information for the Monitoring Period of April 23, 2019. (2 Sheets)**

| COPC # | COPC Name | OEL (ppb) | MDL (ppb) | Ave. (ppb) | St. Dev. (ppb) | Rel St. Dev. (%) | Max. (ppb) | Median (ppb) |
|---|---|---|---|---|---|---|---|---|
| 29 | butyl nitrite + 2-nitro-2-methylpropane | 100, 300 | 0.058 | <0.058 | 0.015 | 51.200 | 0.101 | <0.058 |
| 30 | 2,4-dimethylpyridine | 500 | 0.036 | <0.036 | 0.011 | 104.254 | 0.106 | <0.036 |
| 31 | 2-propylfuran + 2-ethyl-5-methylfuran | 1 | 0.027 | <0.027 | 0.013 | 99.993 | 0.124 | <0.027 |
| 32 | heptanenitrile | 6000 | 0.027 | <0.027 | 0.009 | 96.807 | 0.069 | <0.027 |
| 33 | 4-methyl-2-hexanone | 500 | 0.033 | <0.033 | 0.012 | 94.084 | 0.087 | <0.033 |
| 34 | NMOR** | 0.6 | 0.021 | <0.021 | 0.009 | 177.343 | 0.090 | <0.021 |
| 35 | butyl nitrate | 2500 | 0.022 | <0.022 | 0.008 | 124.356 | 0.056 | <0.022 |
| 36 | 2-ethyl-2-hexenal + 4-(1-methylpropyl)-2,3-dihydrofuran + 3-(1,1-dimethylethyl)-2,3-dihydrofuran | 100, 1, 1 | 0.028 | <0.028 | 0.012 | 90.495 | 0.087 | <0.028 |
| 37 | 6-methyl-2-heptanone | 8000 | 0.028 | <0.028 | 0.010 | 89.781 | 0.086 | <0.028 |
| 38 | 2-pentylfuran | 1 | 0.026 | <0.026 | 0.012 | 84.944 | 0.086 | <0.026 |
| 39 | biphenyl | 200 | 0.022 | <0.022 | 0.010 | 125.006 | 0.072 | <0.022 |
| 40 | 2-heptylfuran | 1 | 0.067 | <0.067 | 0.016 | 42.649 | 0.113 | <0.067 |
| 41 | 1,4-butanediol dinitrate | 50 | 0.036 | <0.036 | 0.011 | 86.983 | 0.071 | <0.036 |
| 42 | 2-octylfuran | 1 | 0.020 | <0.02 | 0.009 | 203.821 | 0.075 | <0.02 |
| 43 | 1,2,3-propanetriol 1,3-dinitrate | 50 | 0.011 | <0.011 | 0.004 | 378.421 | 0.071 | <0.011 |
| 44 | PCB | 1000 | 0.034 | <0.034 | 0.010 | 71.473 | 0.075 | <0.034 |
| 45 | 6-(2-furanyl)-6-methyl-2-heptanone | 1 | 0.025 | <0.025 | 0.009 | 100.951 | 0.075 | <0.025 |
| 46 | furfural acetophenone | 1 | 0.064 | <0.064 | 0.015 | 42.996 | 0.112 | <0.064 |
| N/A* | The maximum peak value for but-3-en-2-one + 2,3 dihydrofuran + 2,5 dihydrofuran was 0.365 ppb and the median value was <0.041 ppb. The PTR-MS results for but-3-en-2-one + 2,3 dihydrofuran + 2,5 dihydrofuran are not compared to OEL concentrations because: 1) the result is suspect due to a known biogenic interferant (methacrolein) that is expected to be in concentrations that occasionally exceed the dihydrofuran OEL, and 2) this combination of COPCs have OEL concentrations that differ by a factor of 200, which provide widely variant bases for these numbers. | | | | | | | |
| ** | Nitrosamine results are suspect due to isobaric interferants causing positive bias that have been encountered during previous background [53005-81-RPT-007, *PTR-MS Mobile Laboratory Vapor Monitoring Background Study, (3/18/2018 – 4/20/2018)*, and *Fiscal Year 2017 Mobile Laboratory Vapor Monitoring at the Hanford Site: Monitoring During Waste Disturbing Activities and Background Study*, RJ Lee Group, Inc.]. | | | | | | | |
| < | COPC Averages below the MDL. | | | | | | | |
| † | COPC Averages between the RL and the MDL. | | | | | | | |
| | COPC Averages >100% of the OEL. | | | | | | | |
| | COPC Averages 50-100% of the OEL. | | | | | | | |
| | COPC Averages 10-50% of the OEL. | | | | | | | |

Figure 3-3 through Figure 3-51 display 46 COPC signals, overlaid with the same signal smoothed using a 1-minute moving average (in cases where a moving average assists with data visualization), and $CO_2$, for the monitoring period April 23, 2019. If within range of the plot's left axis, a green horizontal line representing 50% of the COPC's OEL, a blue horizontal line representing the COPC's OEL, a horizontal purple line representing the RL, and a pink horizontal line representing the MDL are shown. The tuning of the PTR-MS ion source from 08:03 to 08:16 performed by Dr. Matthew Erickson, the subject matter expert (SME), was removed from the following plots.

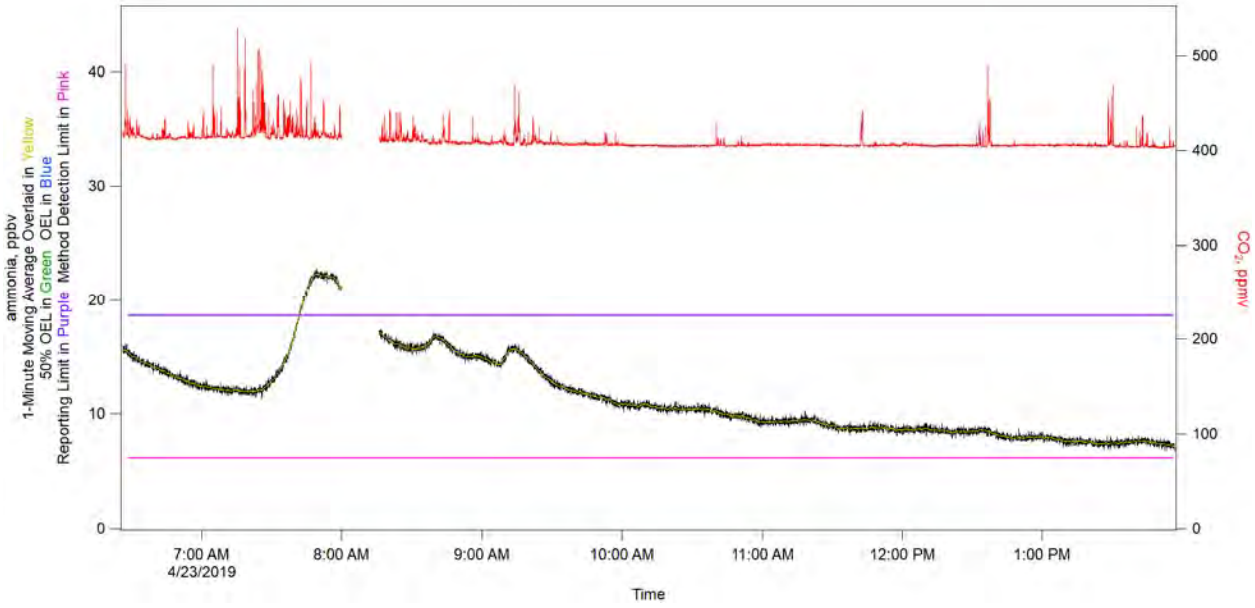


**Figure 3-3. Ammonia**

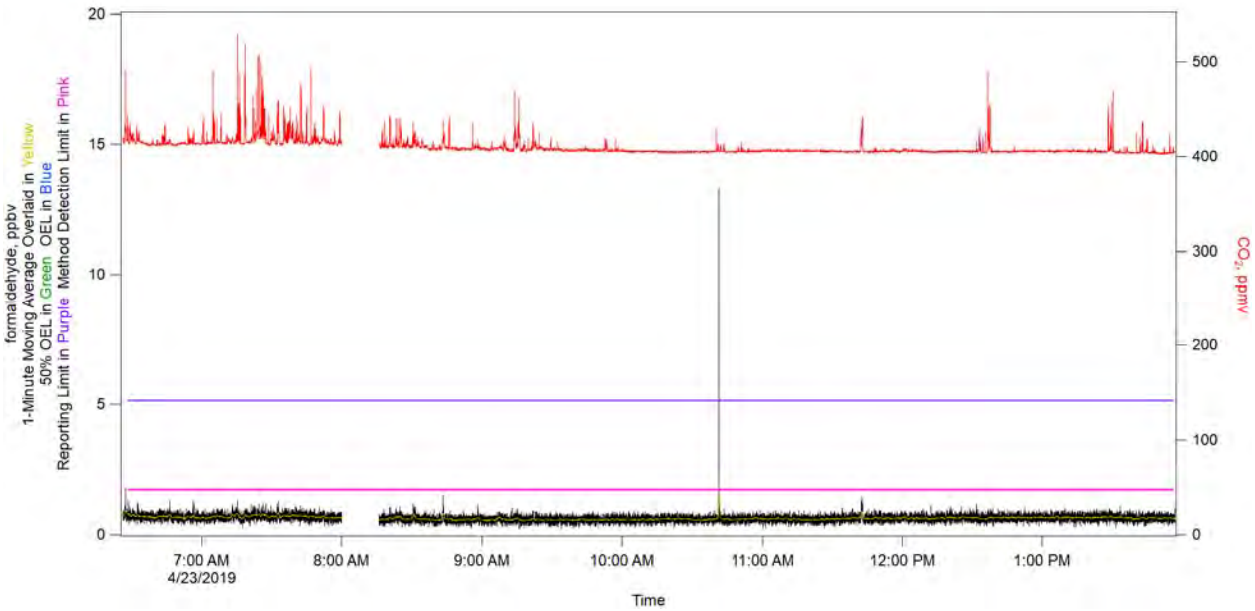


**Figure 3-4. Formaldehyde.**

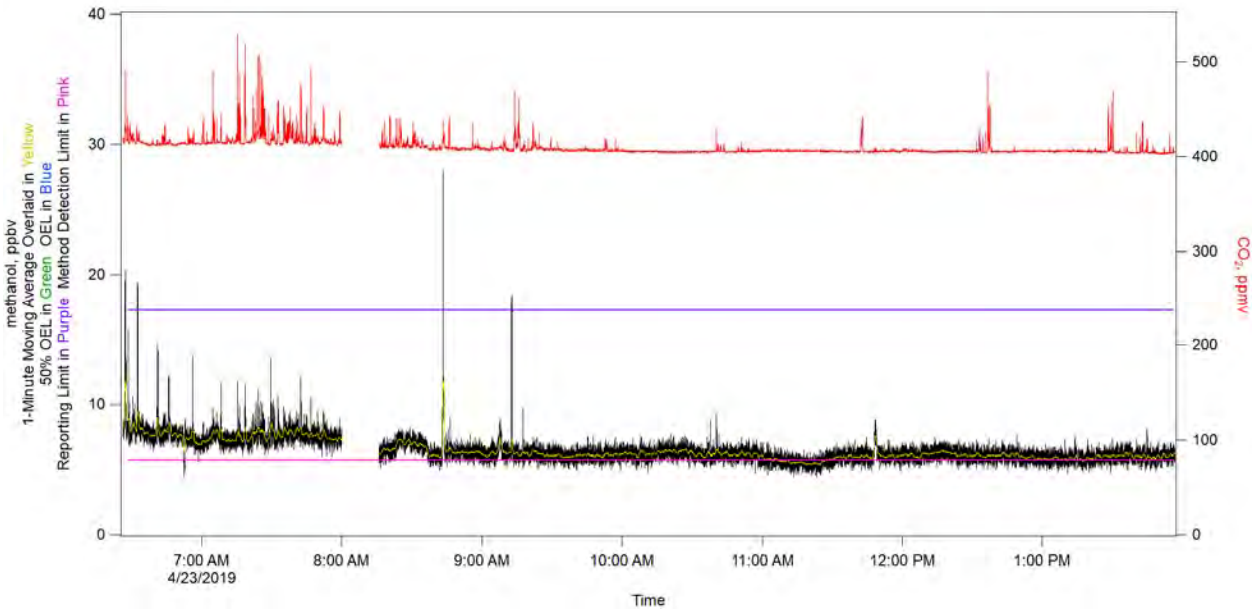


**Figure 3-5. Methanol.**

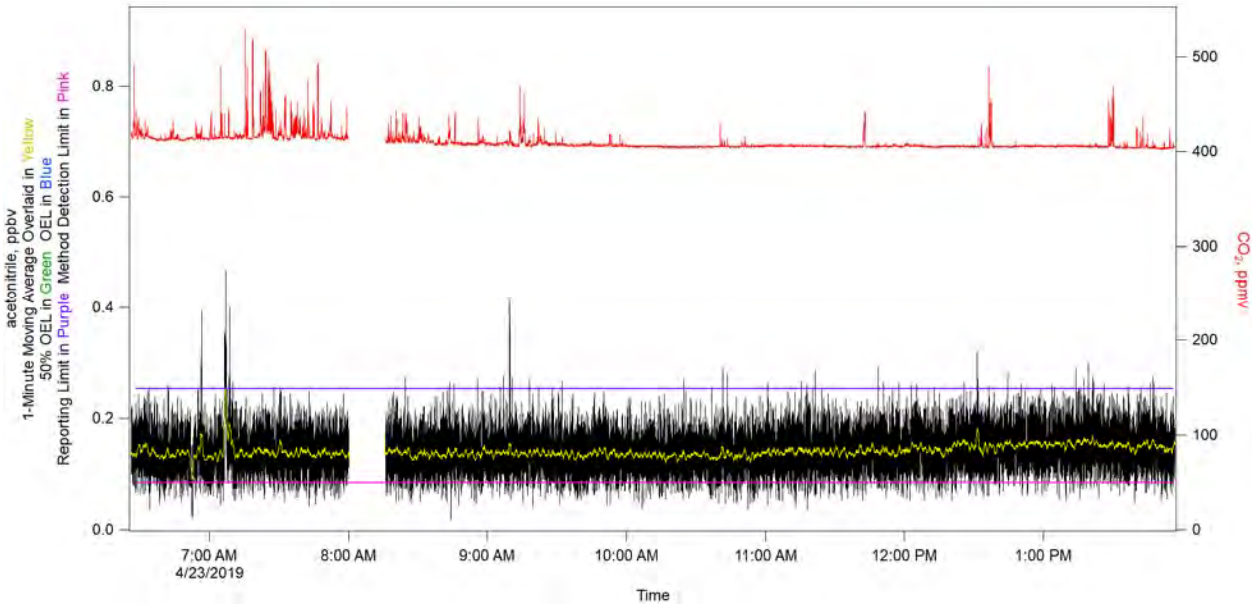


**Figure 3-6. Acetonitrile.**

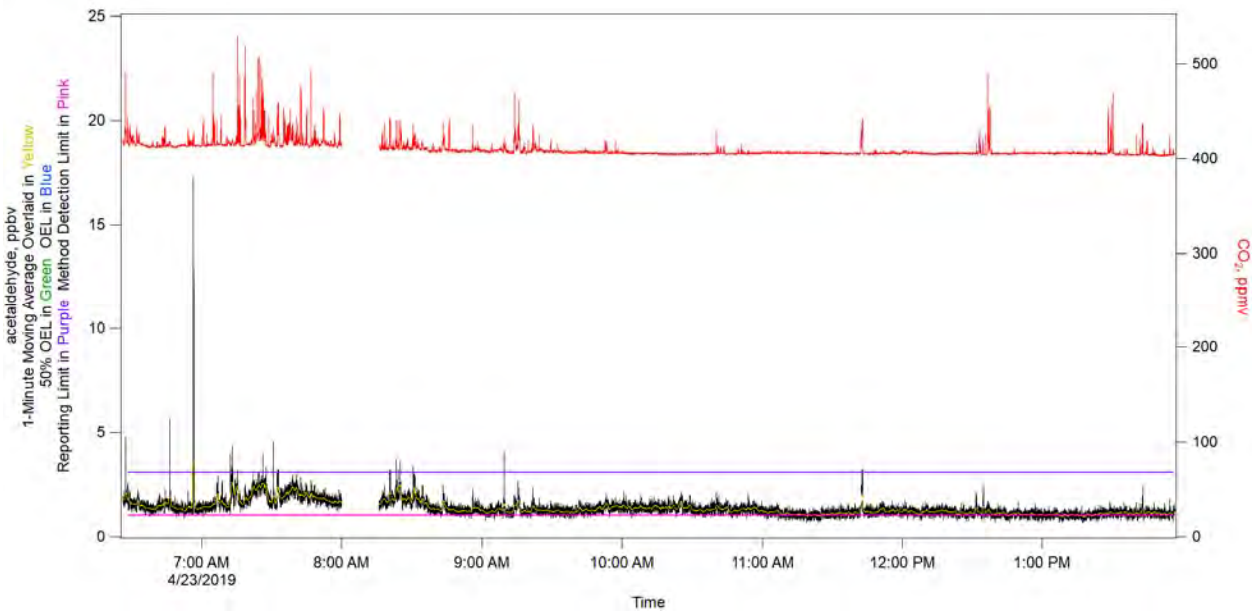


**Figure 3-7. Acetaldehyde.**

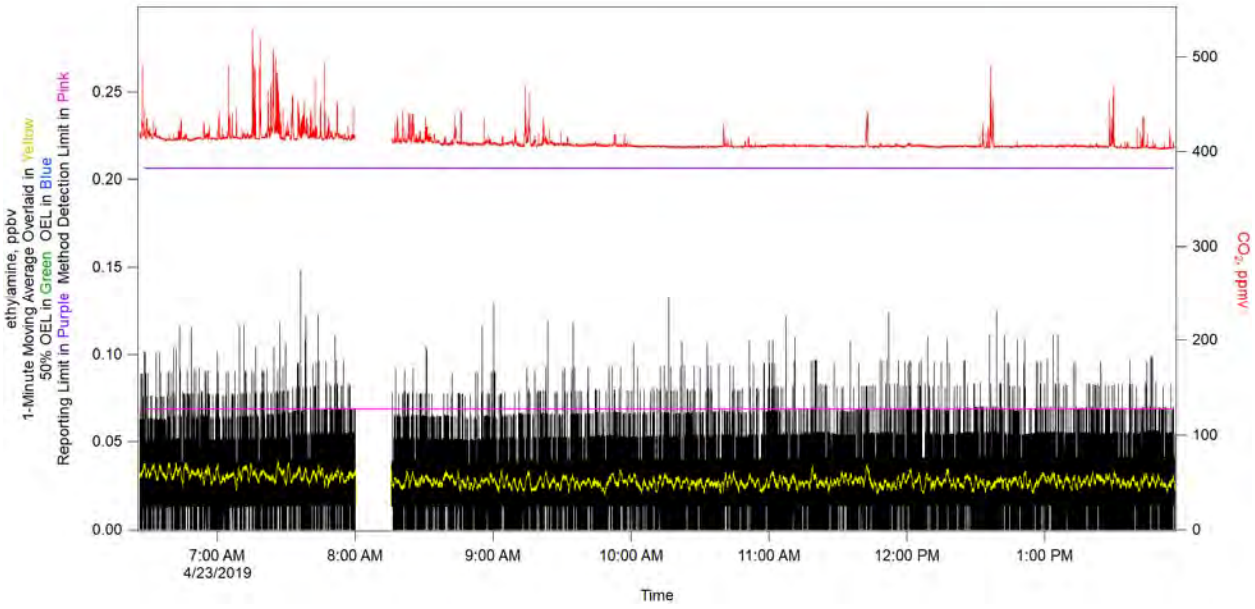


**Figure 3-8. Ethylamine.**

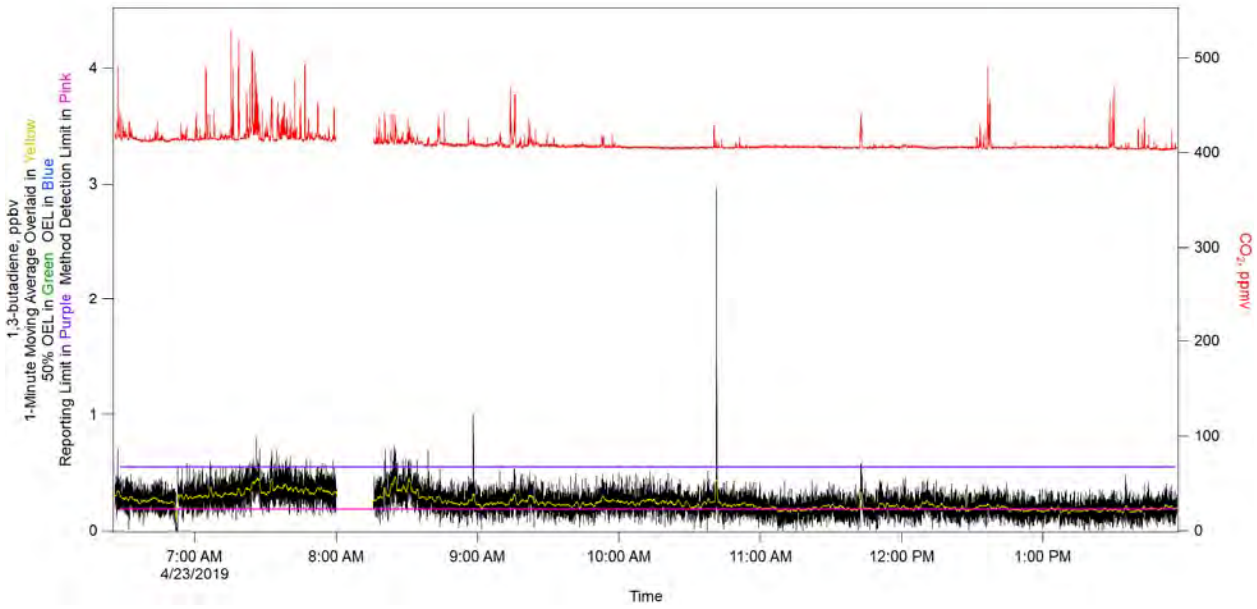


**Figure 3-9. 1,3-butadiene.**

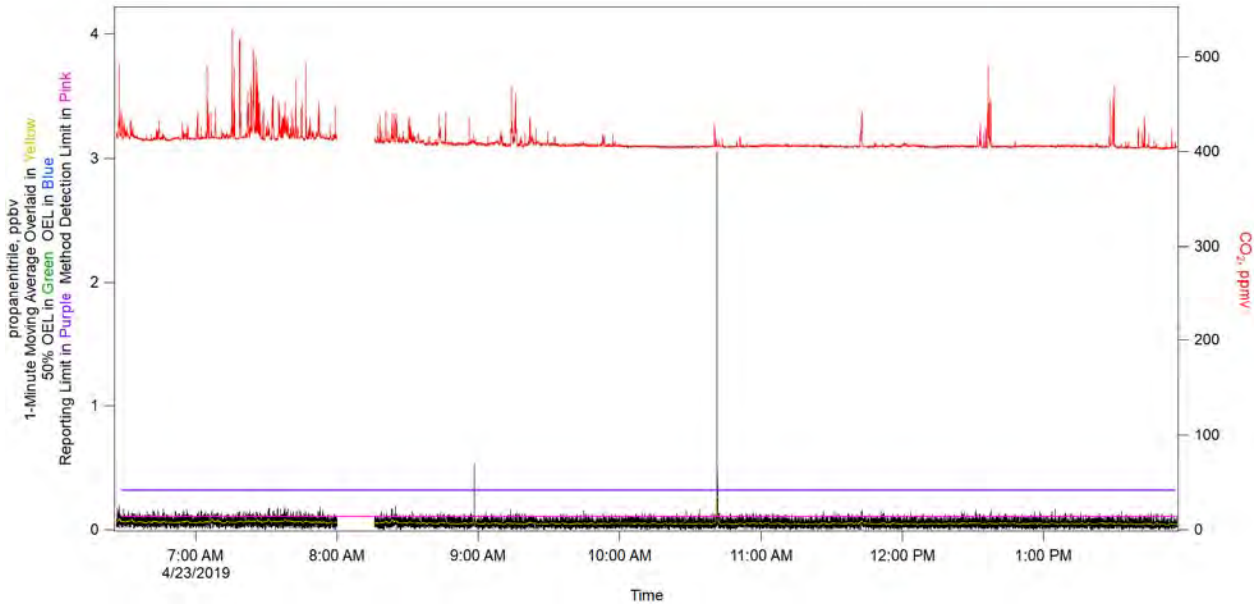


**Figure 3-10. Propanenitrile.**

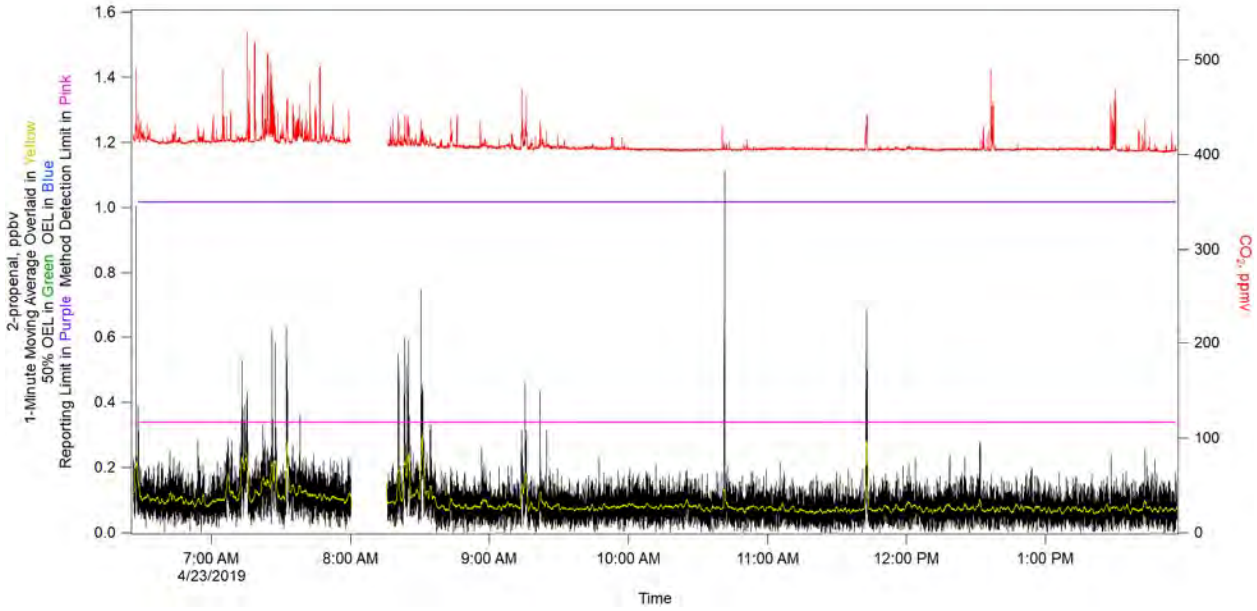


**Figure 3-11. 2-propenal.**

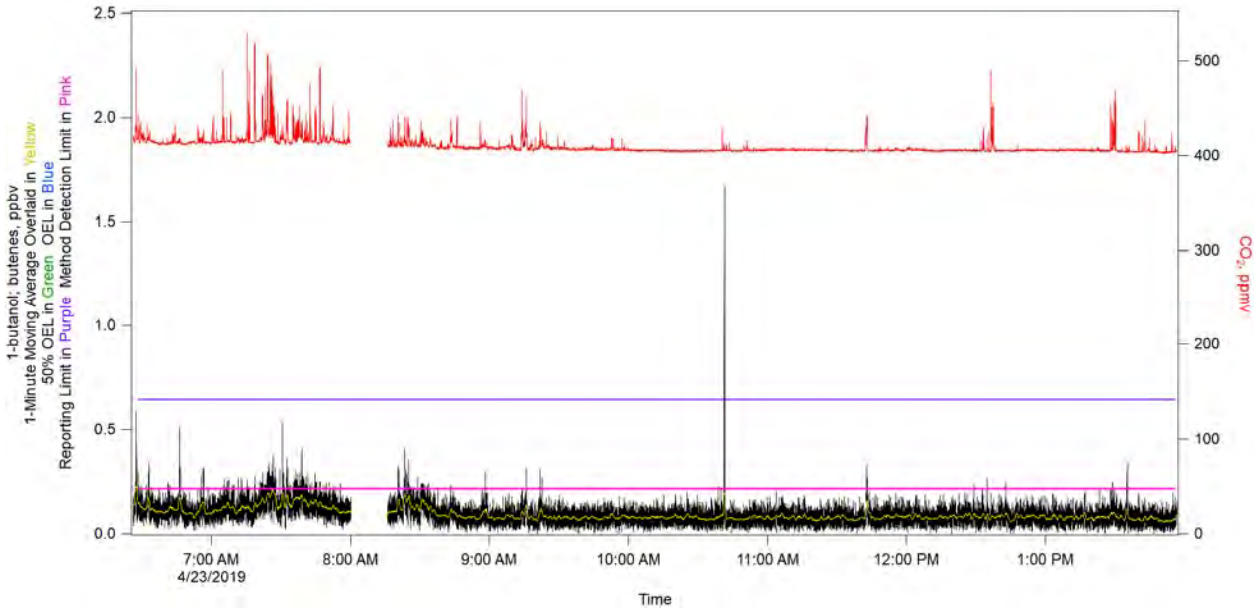


**Figure 3-12. 1-butanol; Butenes.**

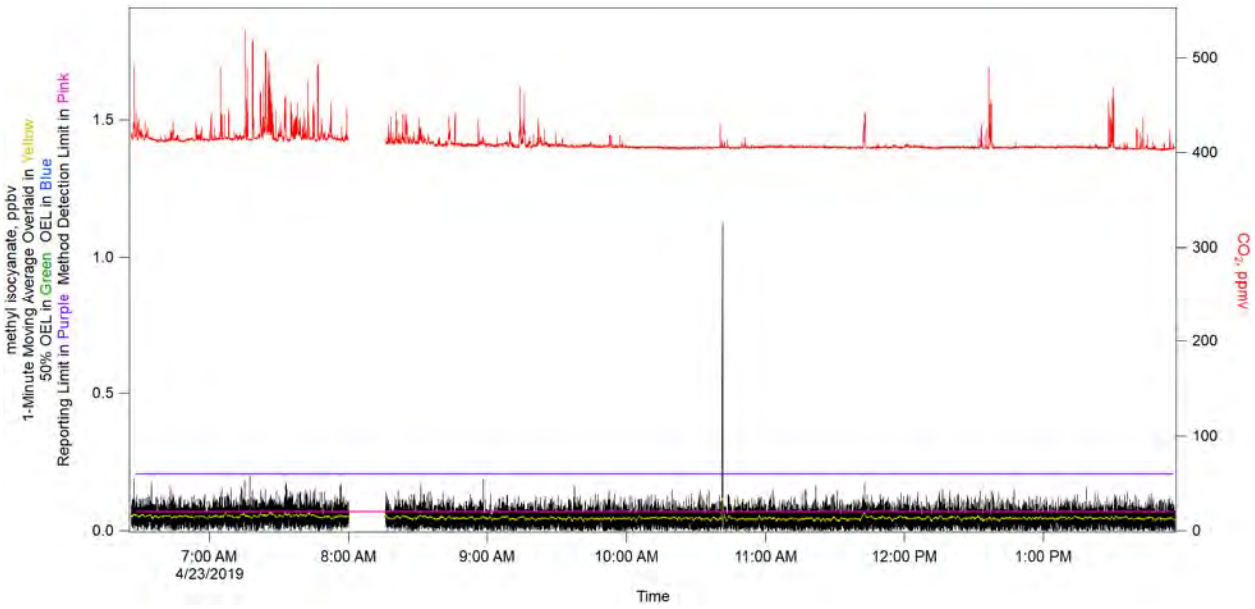


**Figure 3-13. Methyl Isocyanate.**

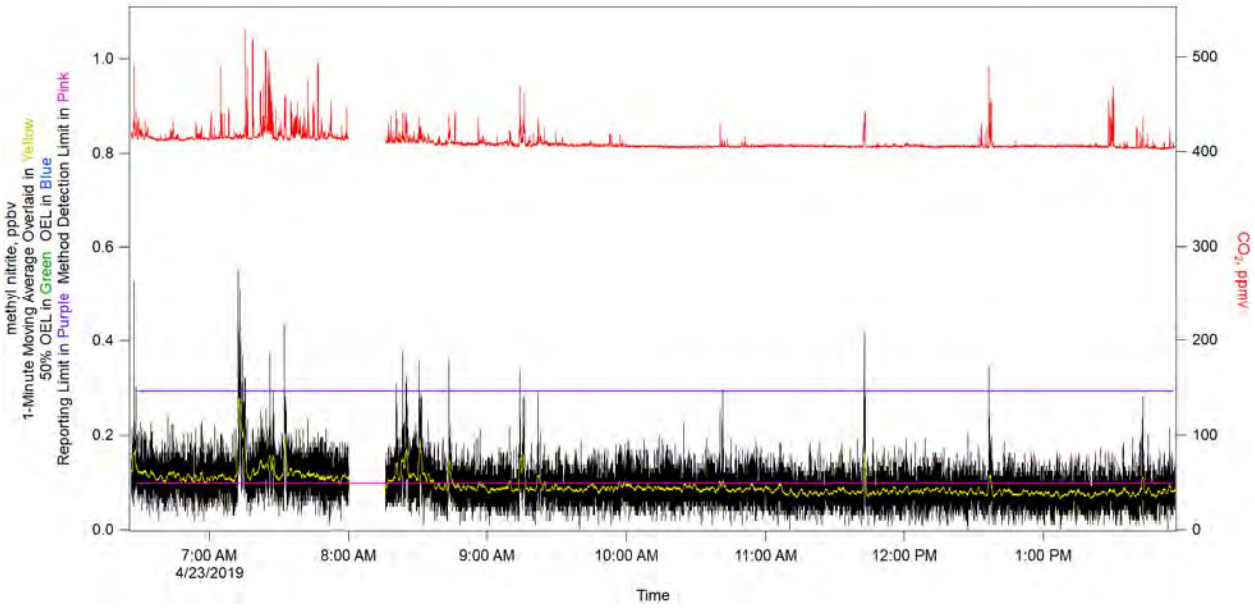


**Figure 3-14. Methyl Nitrite.**

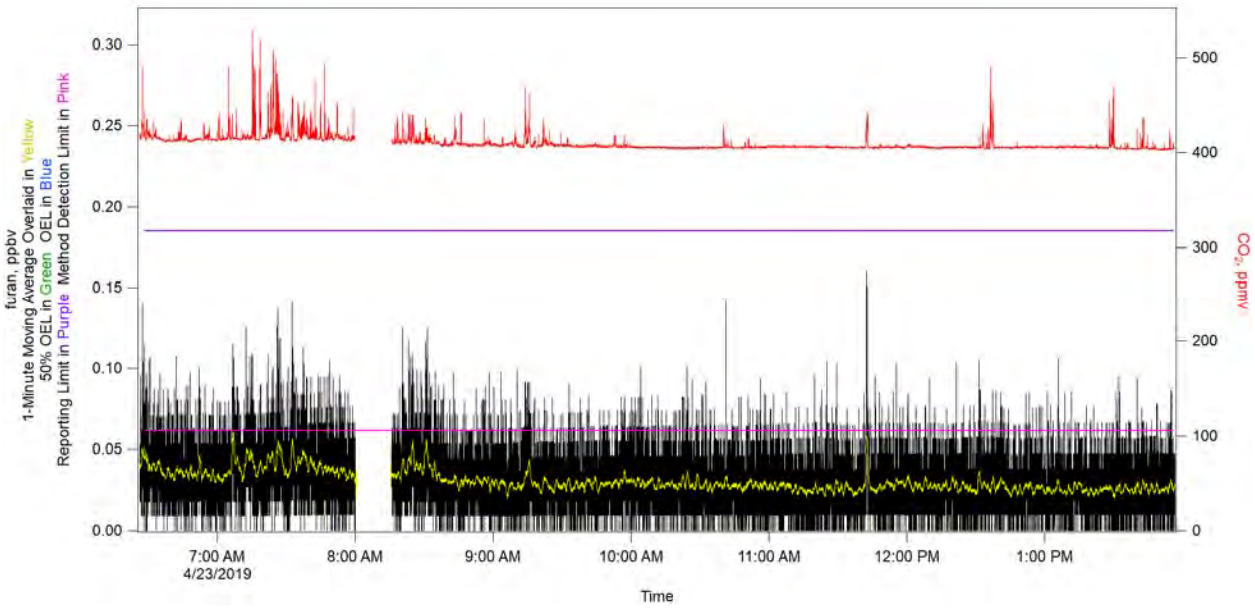


**Figure 3-15. Furan.**

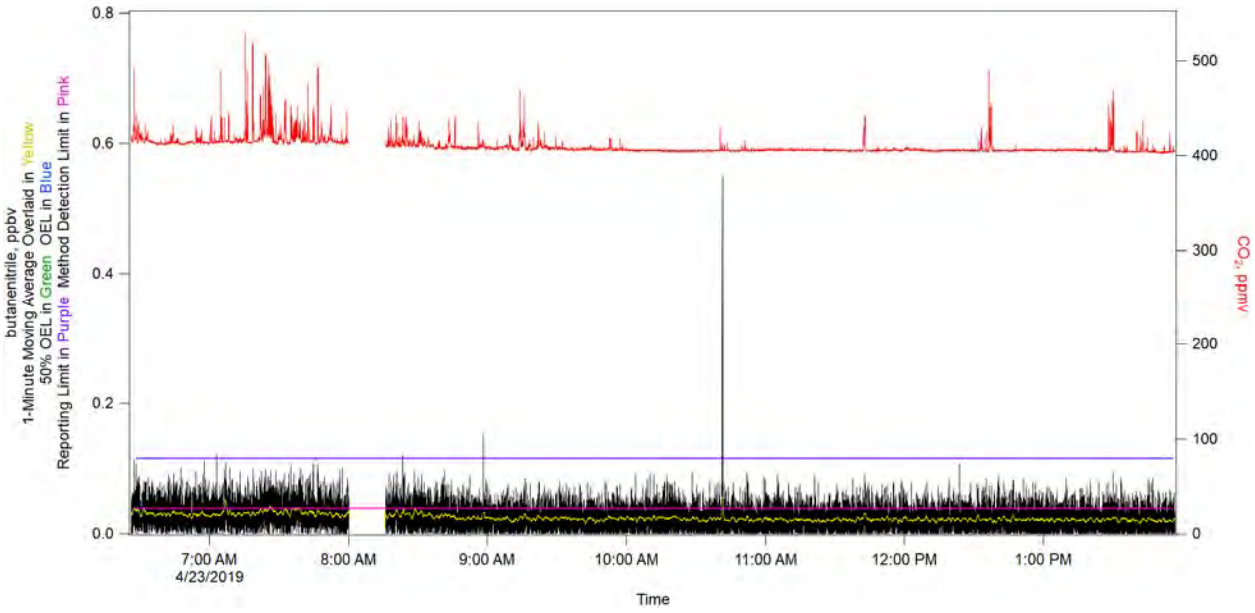


**Figure 3-16. Butanenitrile.**

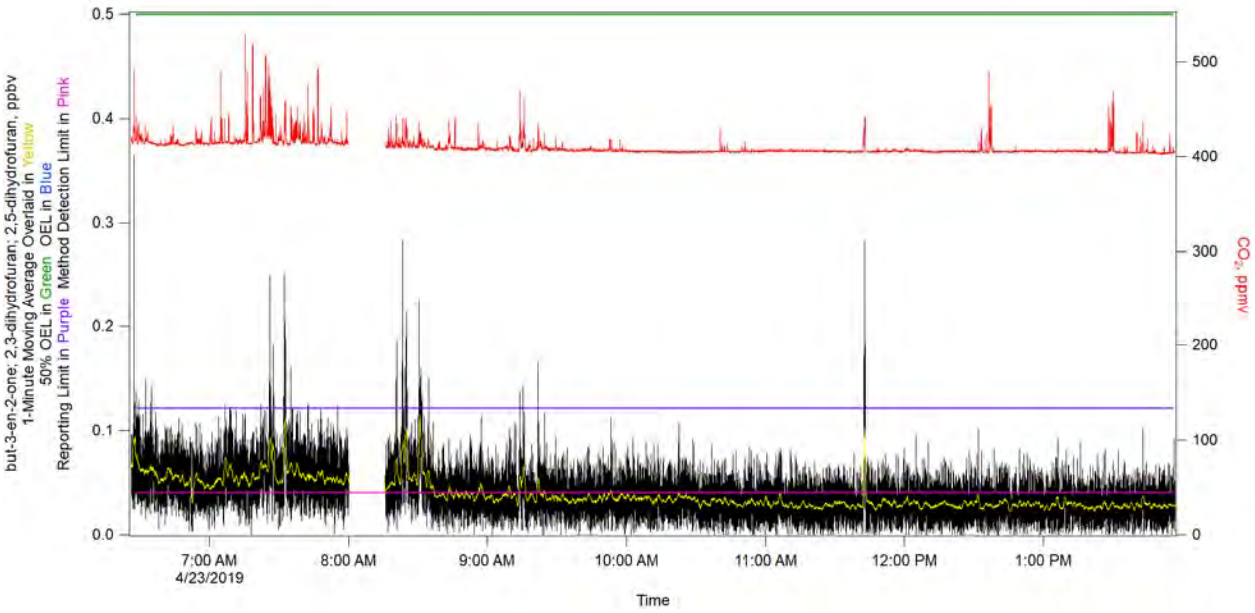


**Figure 3-17. But-3-en-2-one; 2,3-dihydrofuran; 2,5-dihydrofuran.**

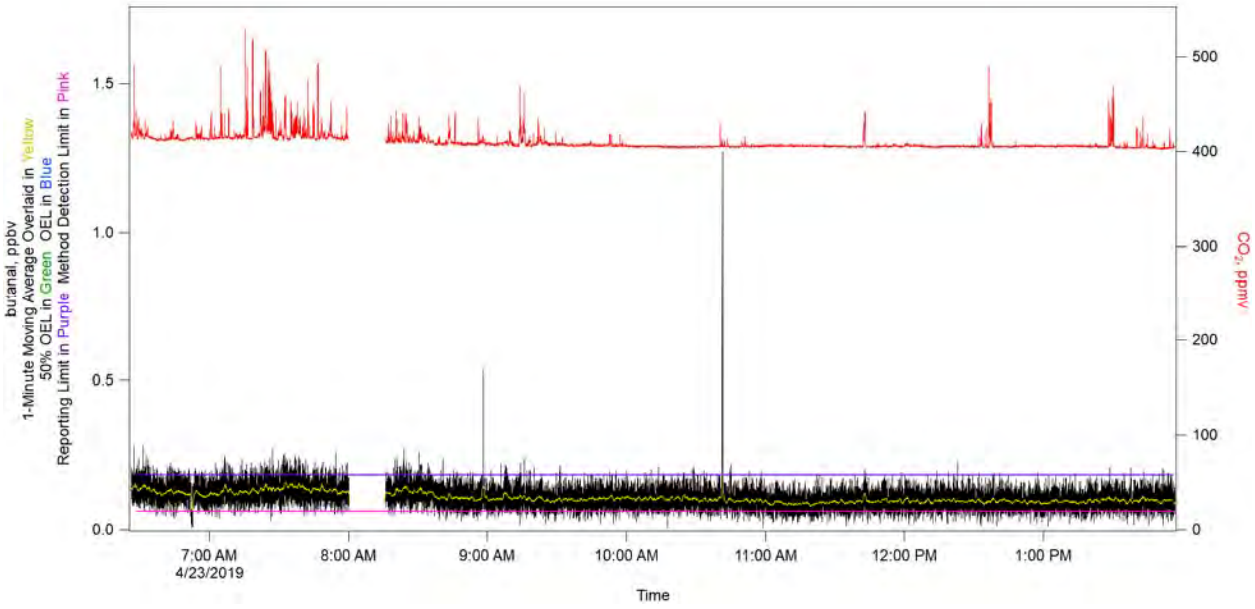


**Figure 3-18. Butanal.**

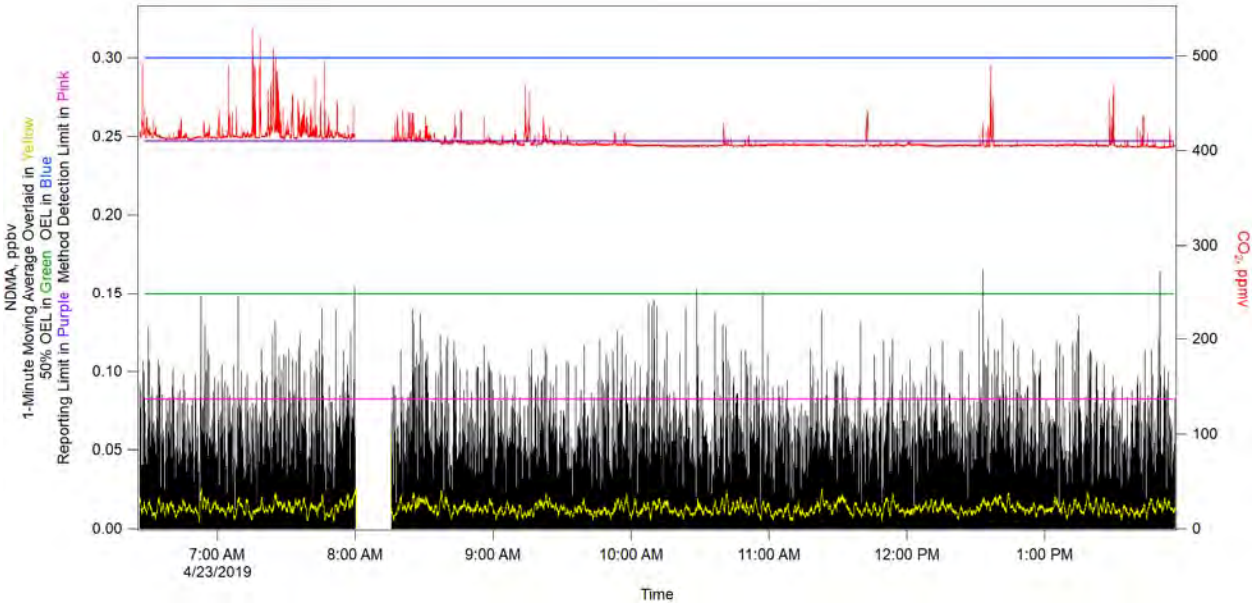


**Figure 3-19. N-nitrosodimethylamine (NDMA).**

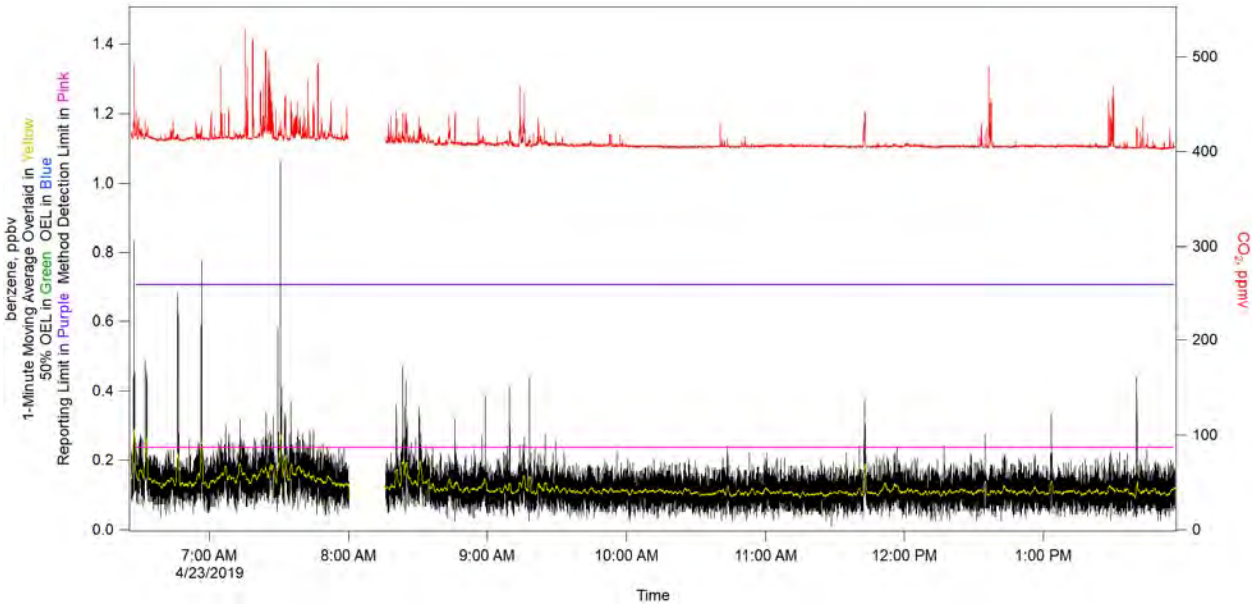


**Figure 3-20. Benzene.**

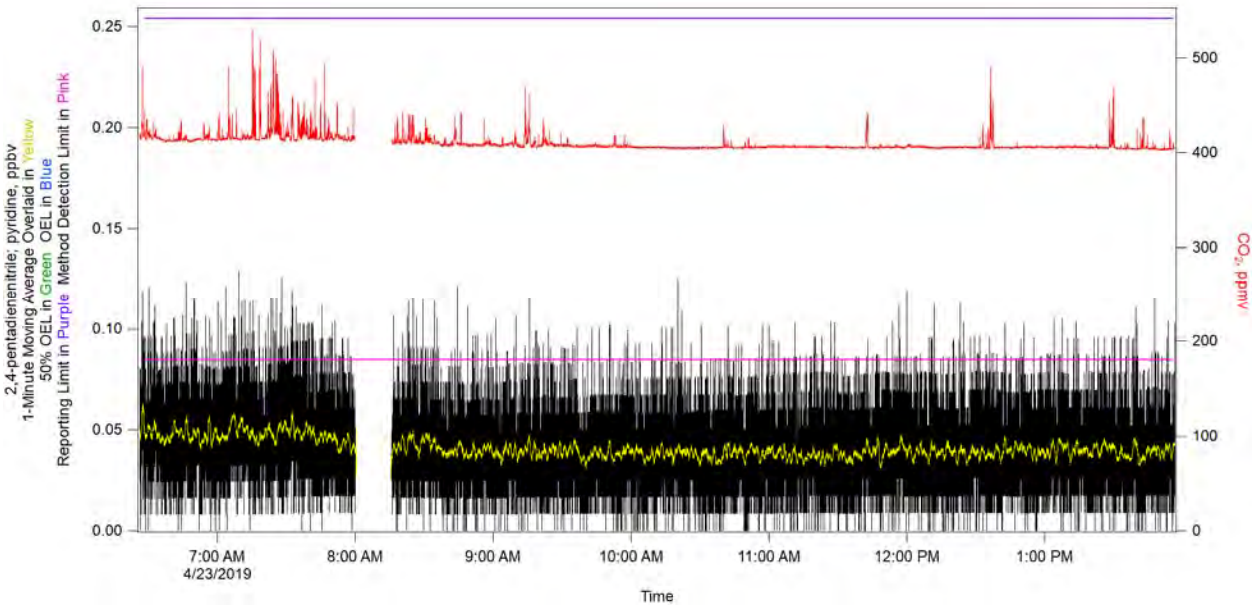


**Figure 3-21. 2,4-pentadienenitrile; Pyridine.**

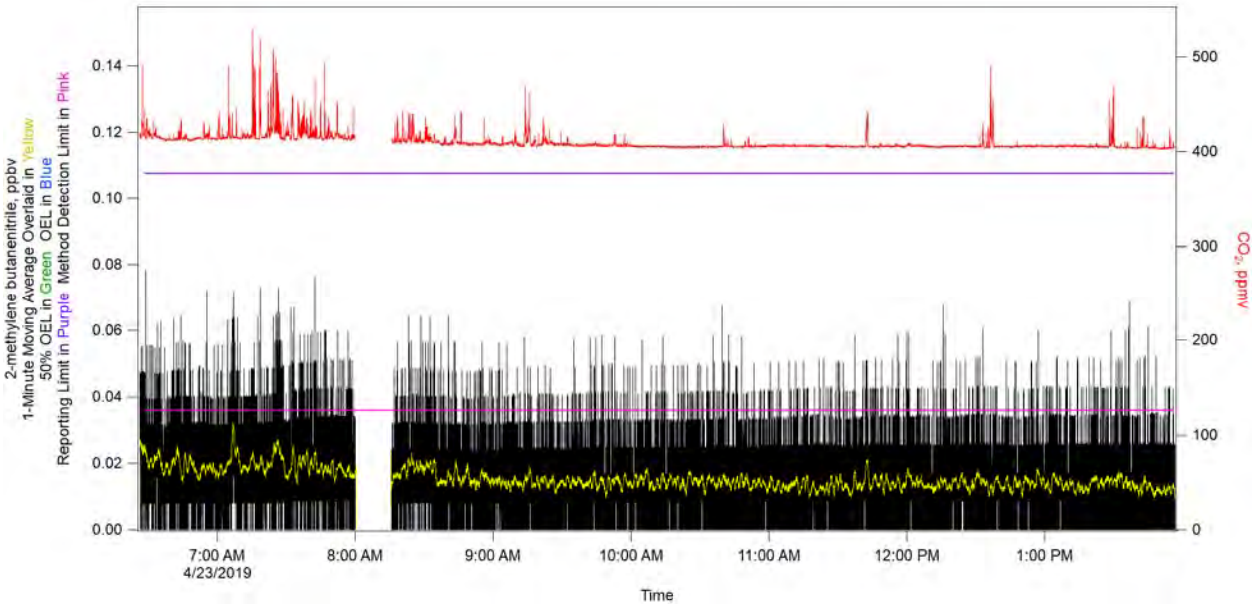


**Figure 3-22. 2-methylene Butanenitrile.**

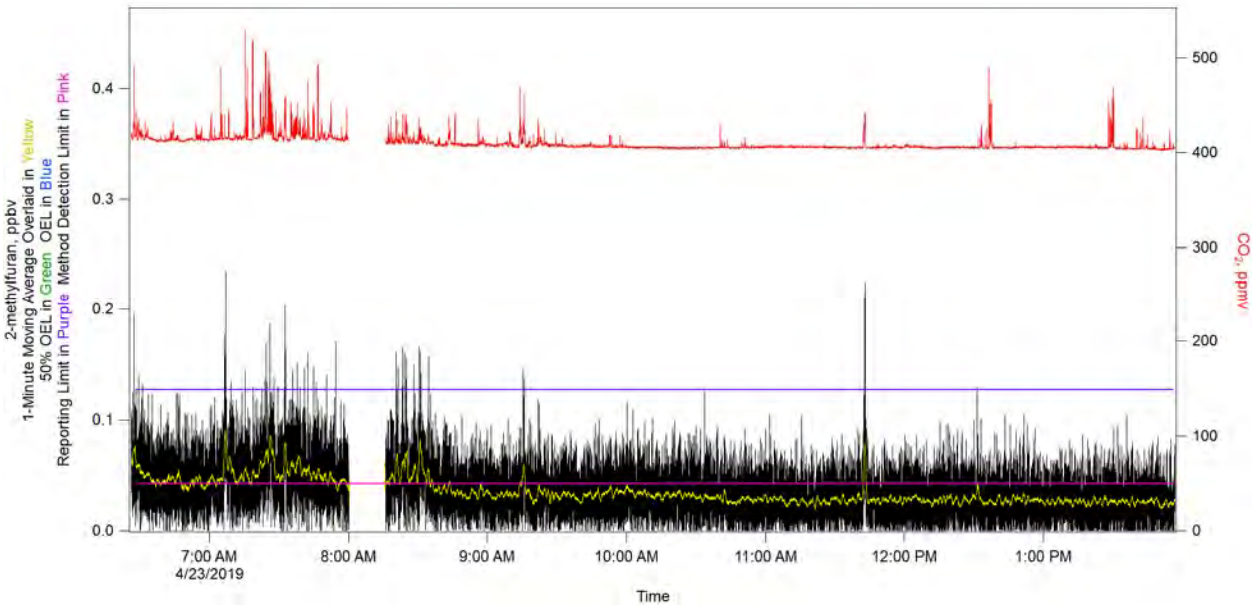


**Figure 3-23. 2-methylfuran.**

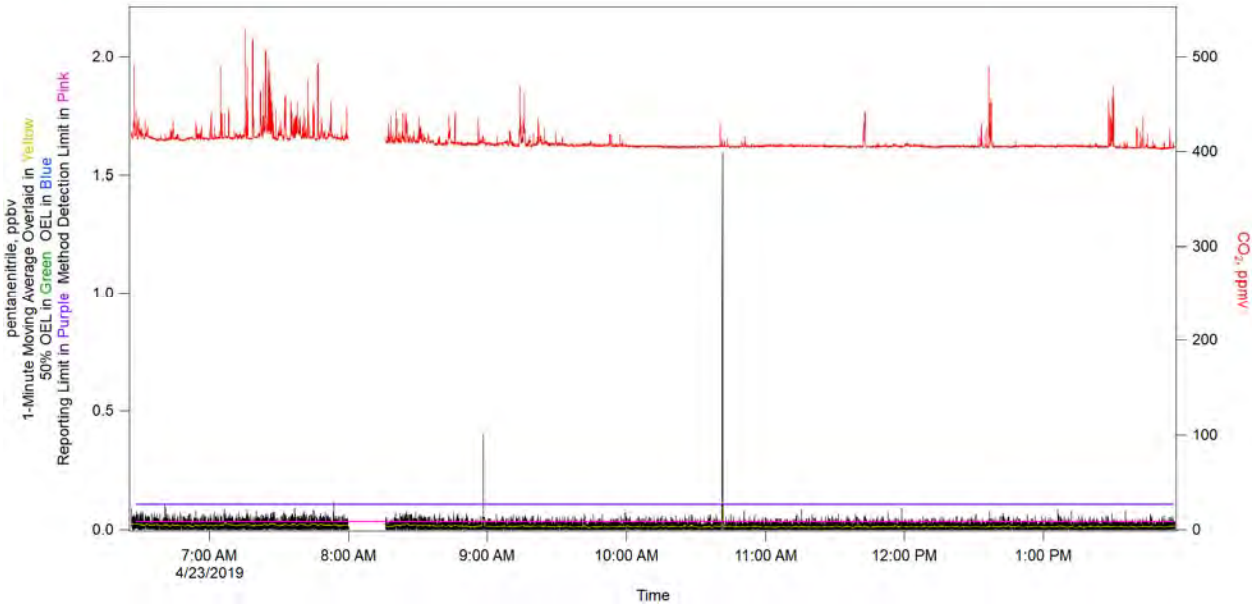


**Figure 3-24. Pentanenitrile.**

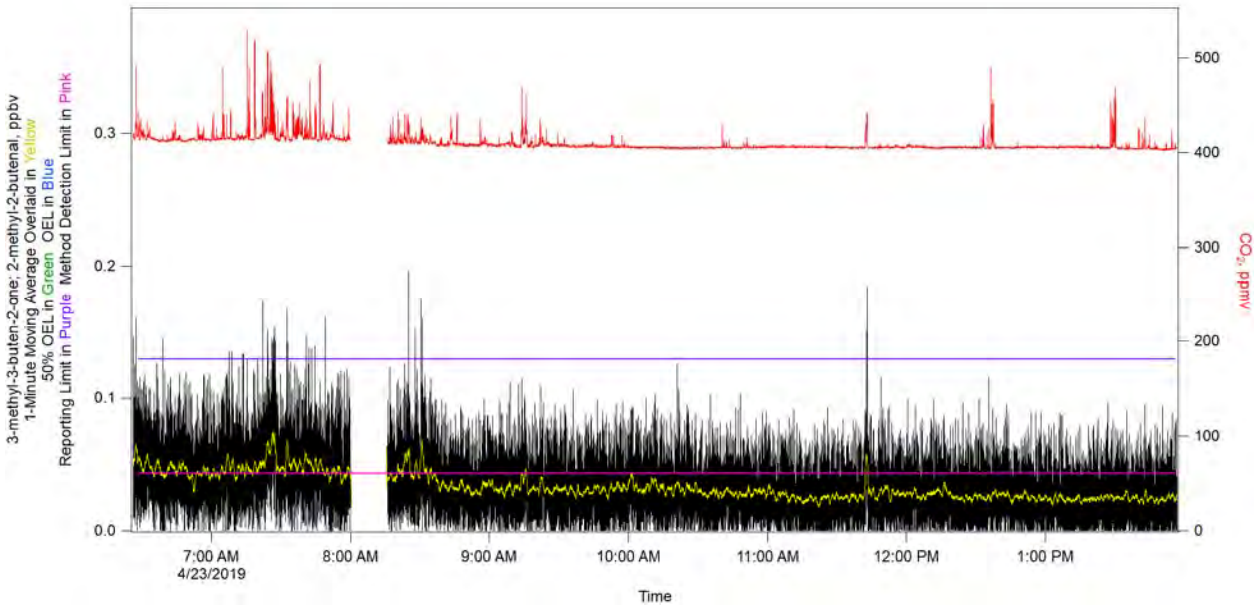


**Figure 3-25. 3-methyl-3-buten-2-one; 2-methyl-2-butenal.**

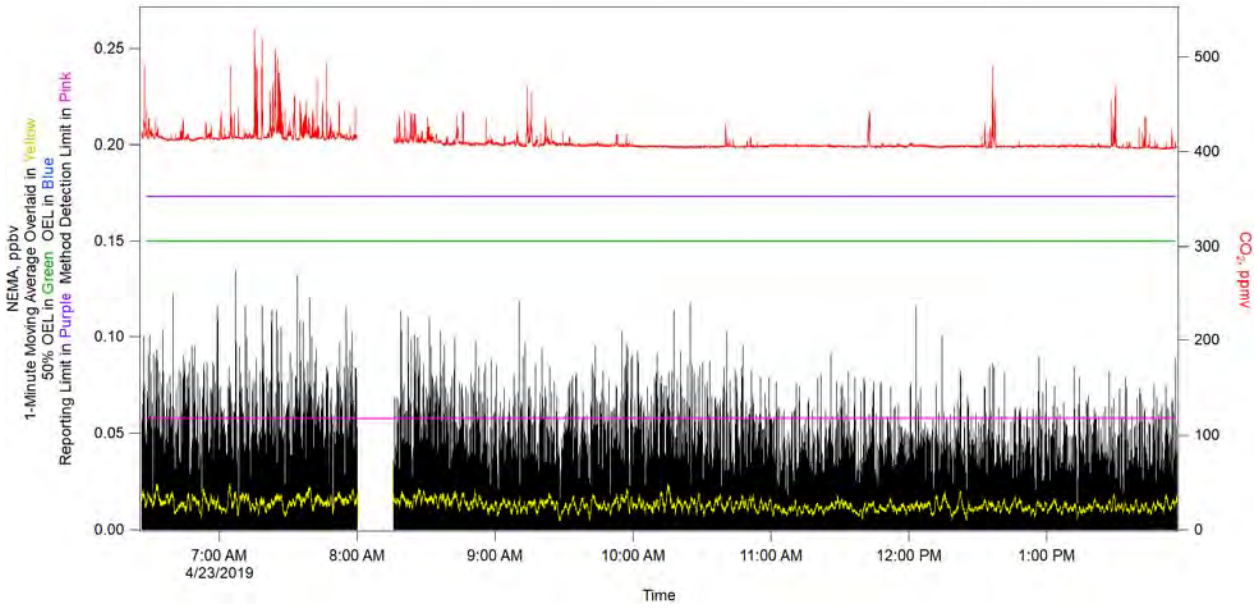


**Figure 3-26. N-nitrosomethylethylamine (NEMA).**

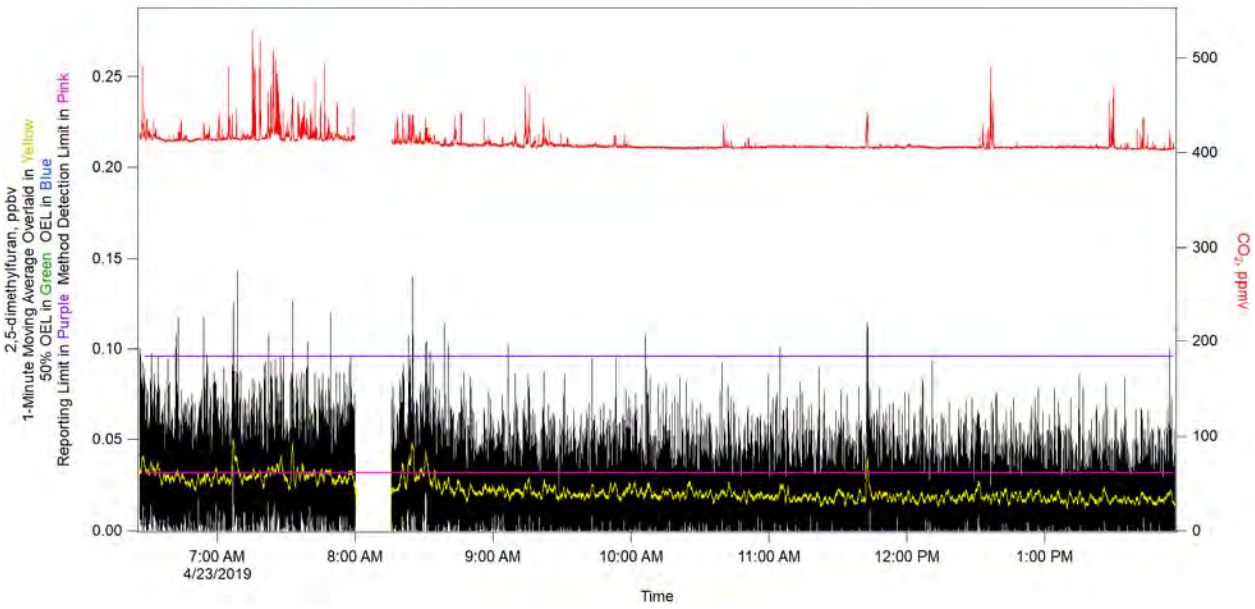


**Figure 3-27. 2,5-dimethylfuran.**

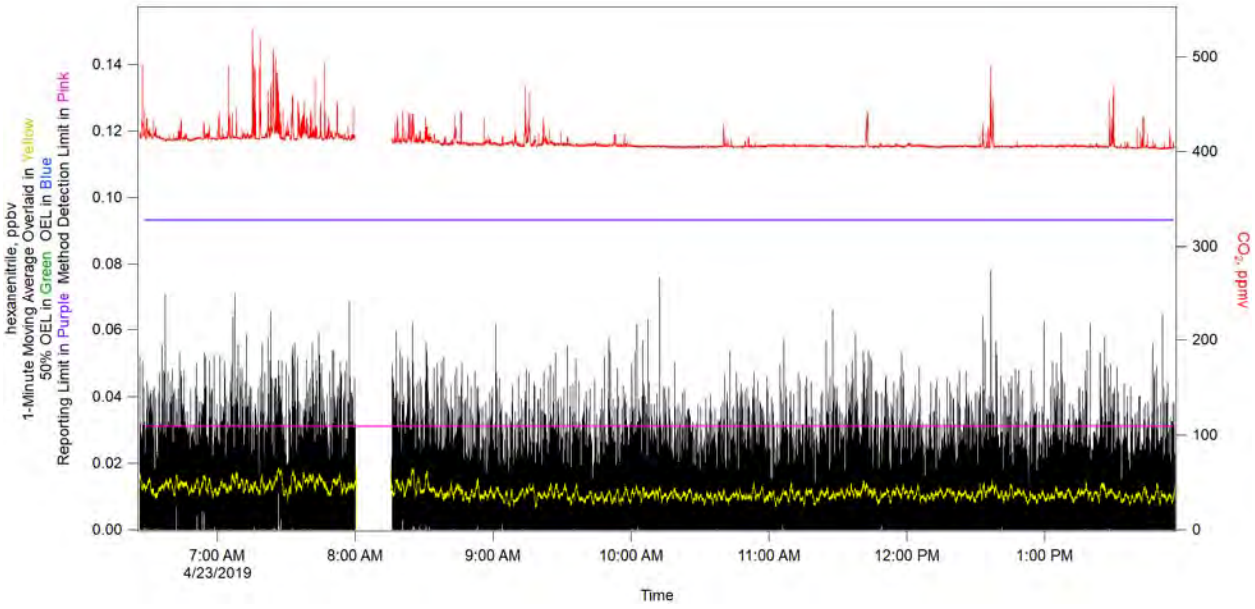


**Figure 3-28. Hexanenitrile.**

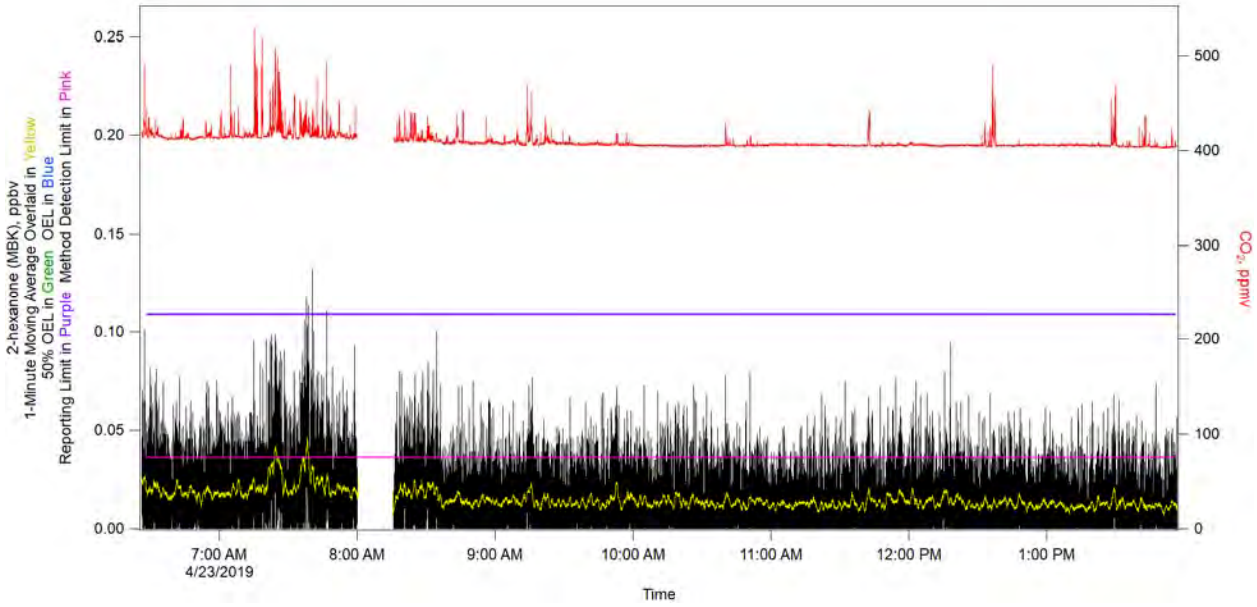


**Figure 3-29. 2-hexanone (MBK).**

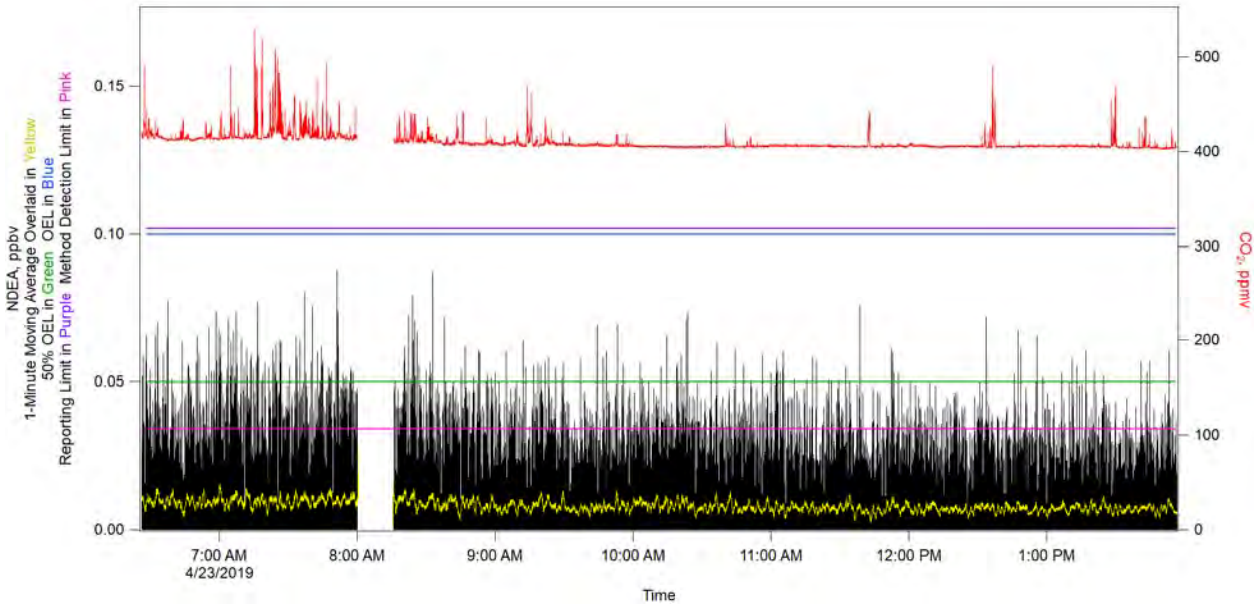


**Figure 3-30. N-nitrosodiethylamine (NDEA).**

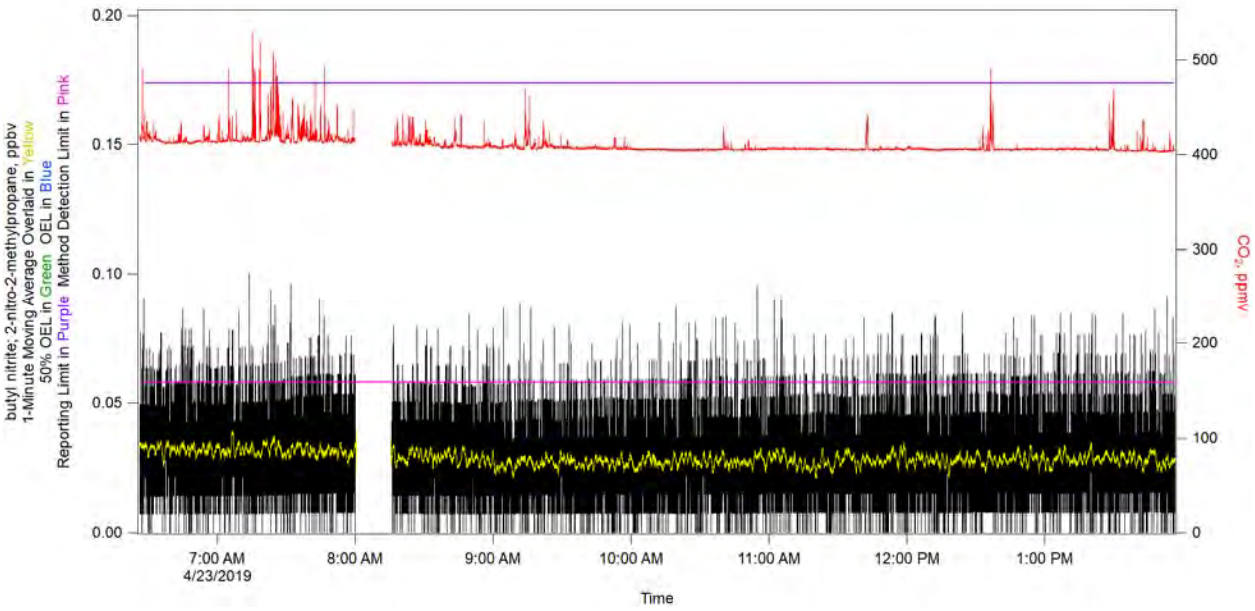


**Figure 3-31. Butyl Nitrite; 2-nitro-2-methylpropane.**

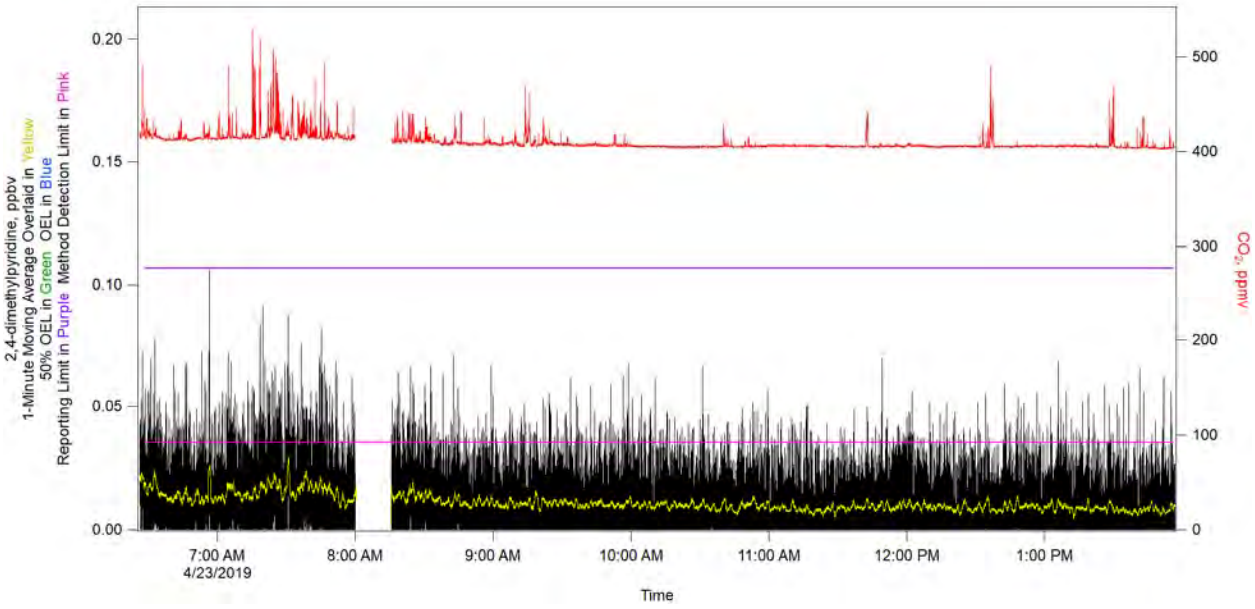


**Figure 3-32. 2,4-dimethylpyridine.**

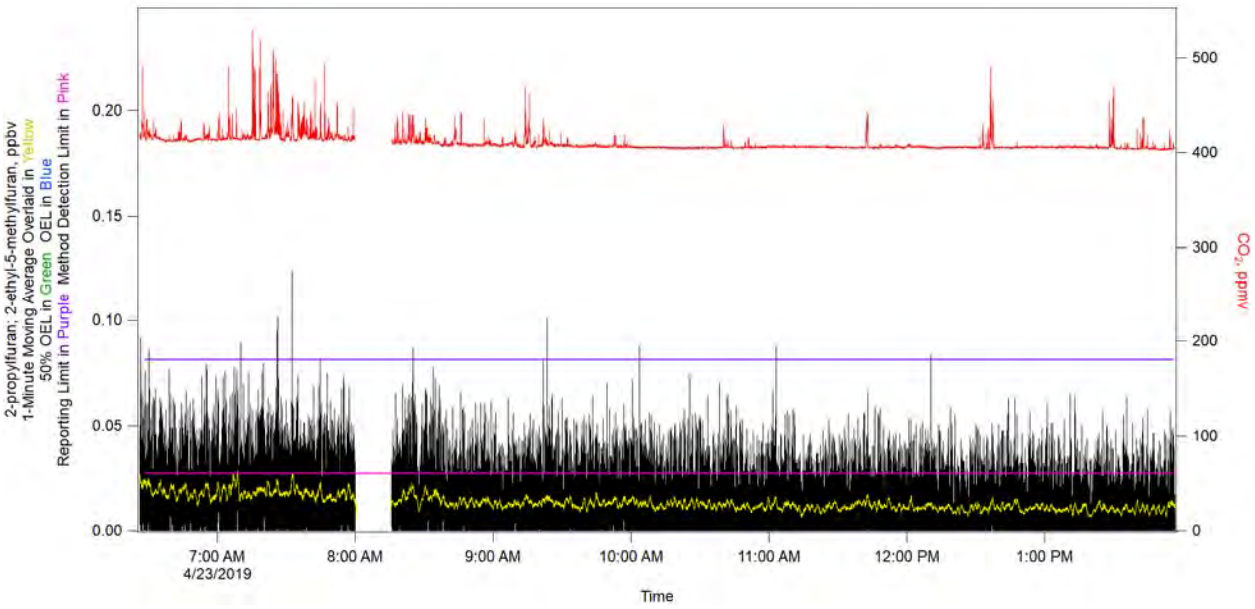


**Figure 3-33. 2-propylfuran; 2-ethyl-5-methylfuran.**

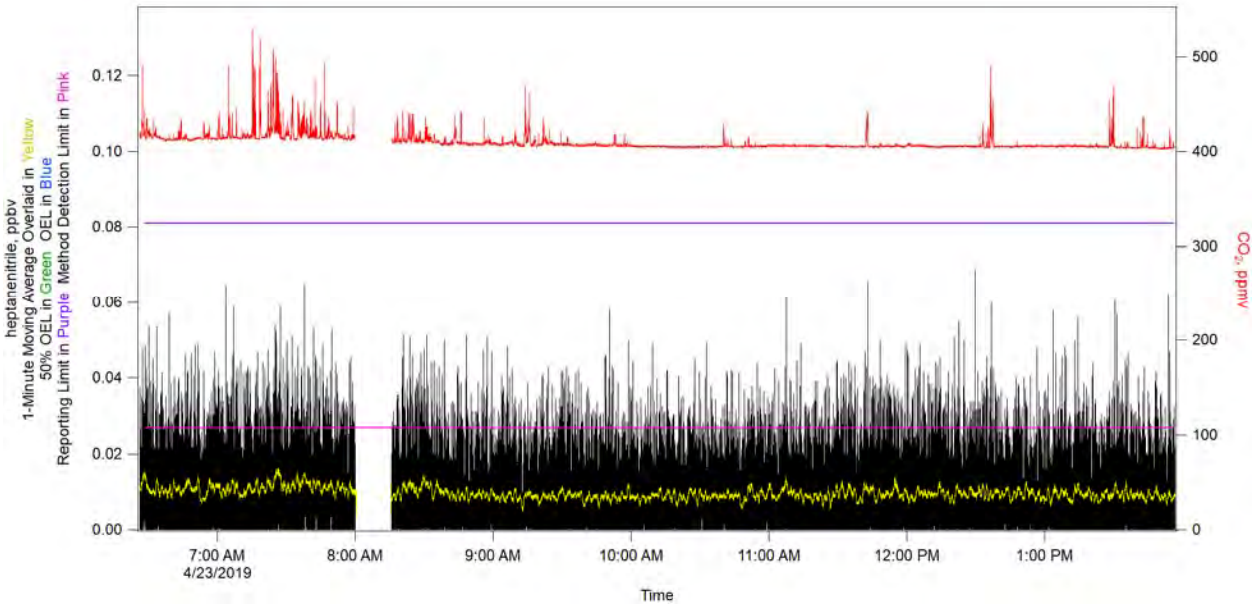


**Figure 3-34. Heptanenitrile.**

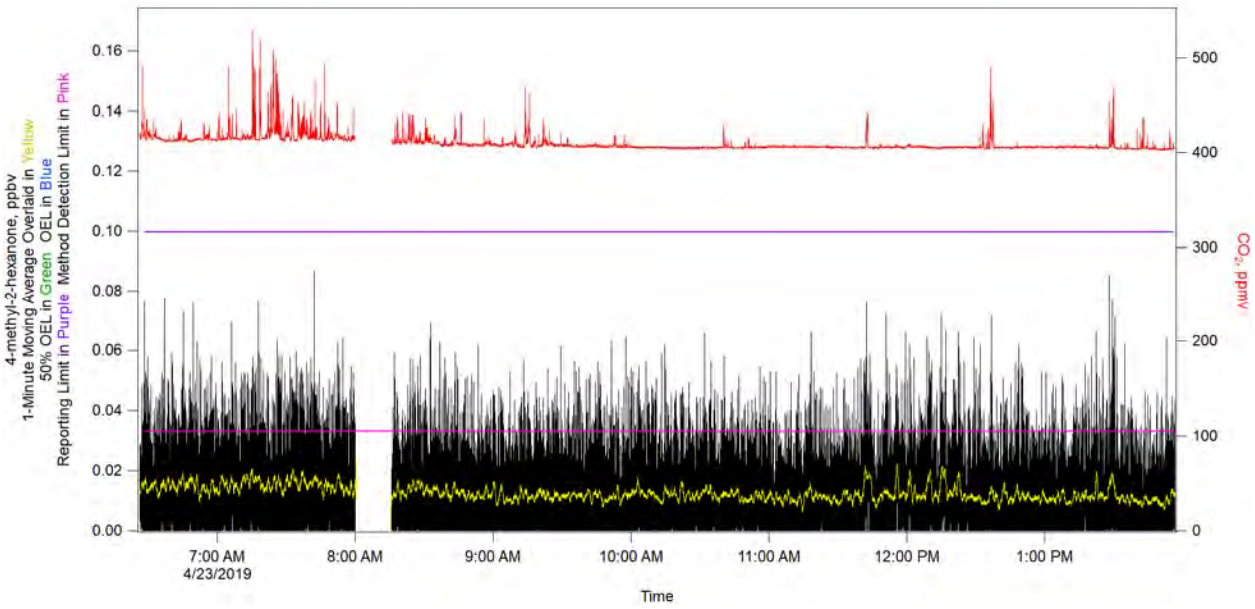


**Figure 3-35. 4-methyl-2-hexanone.**

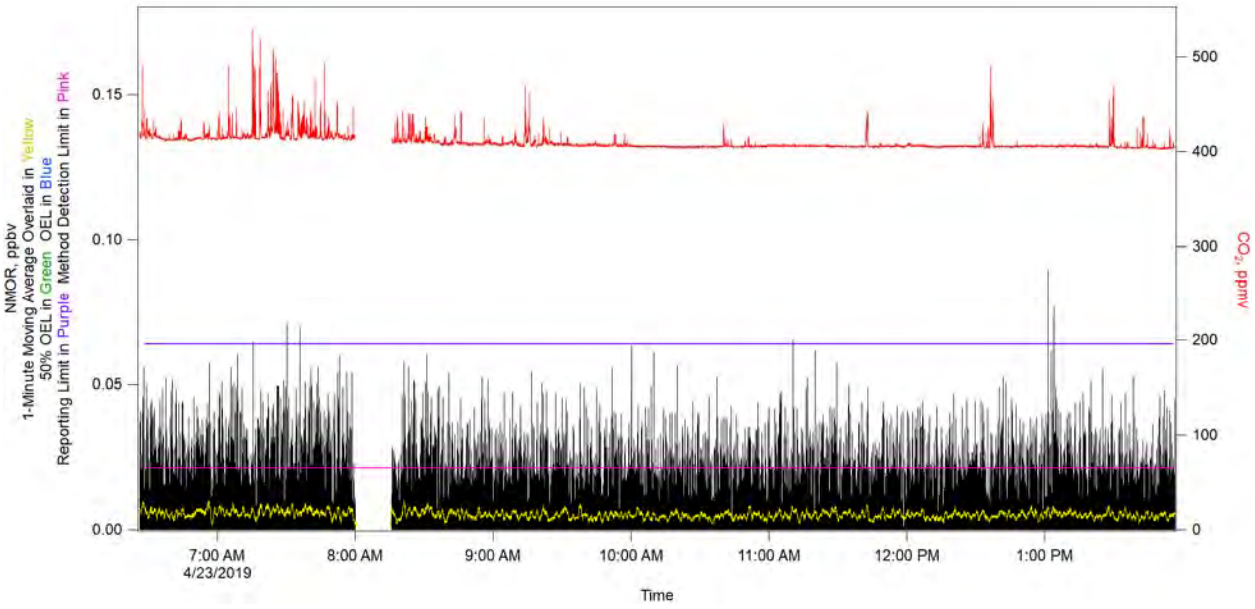


**Figure 3-36. N-nitrosomorpholine (NMOR).**

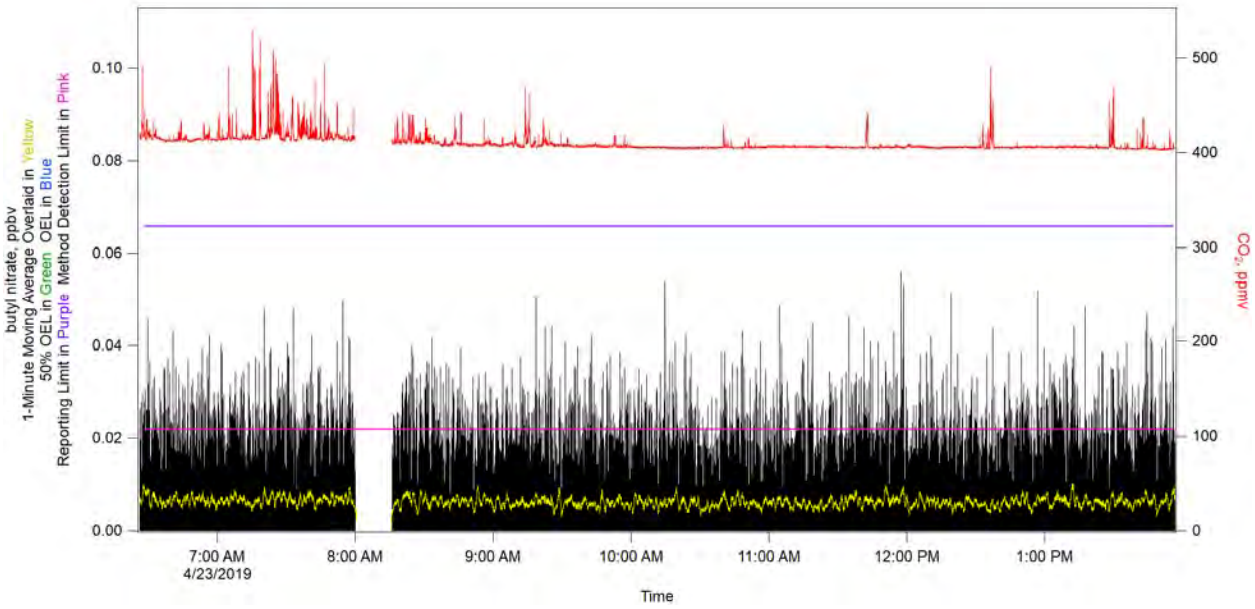


**Figure 3-37. Butyl Nitrate.**

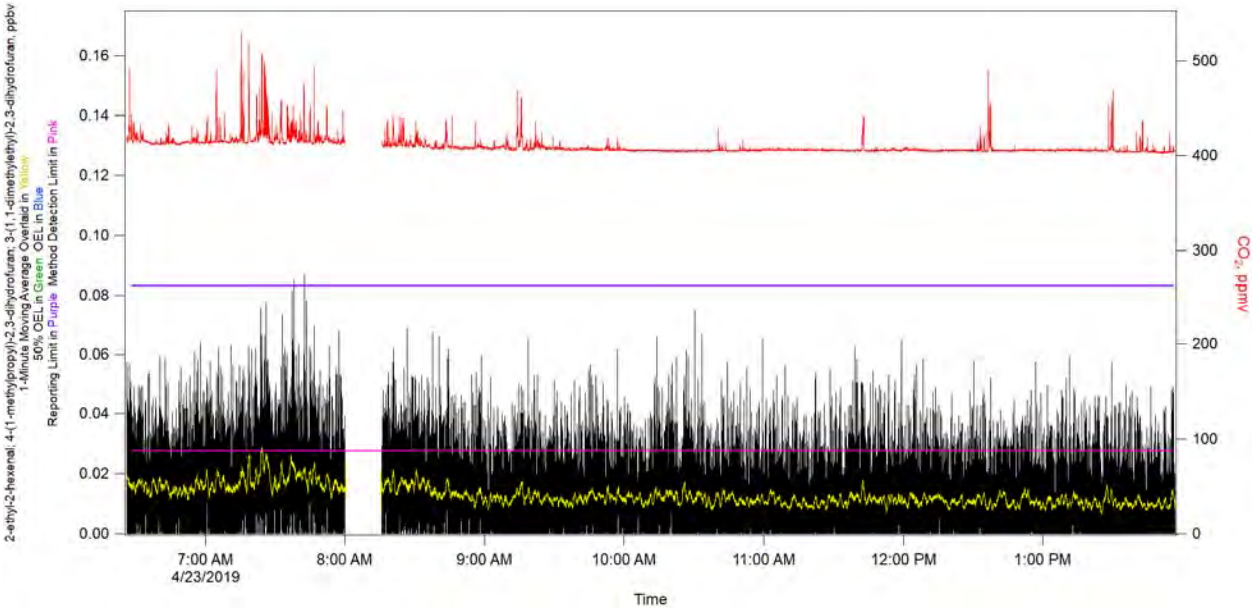


**Figure 3-38. 2-ethyl-2-hexenal; 4-(1-methylpropyl)-2,3-dihydrofuran 3-(1,1-dimethylethyl)-2,3-dihydrofuran.**

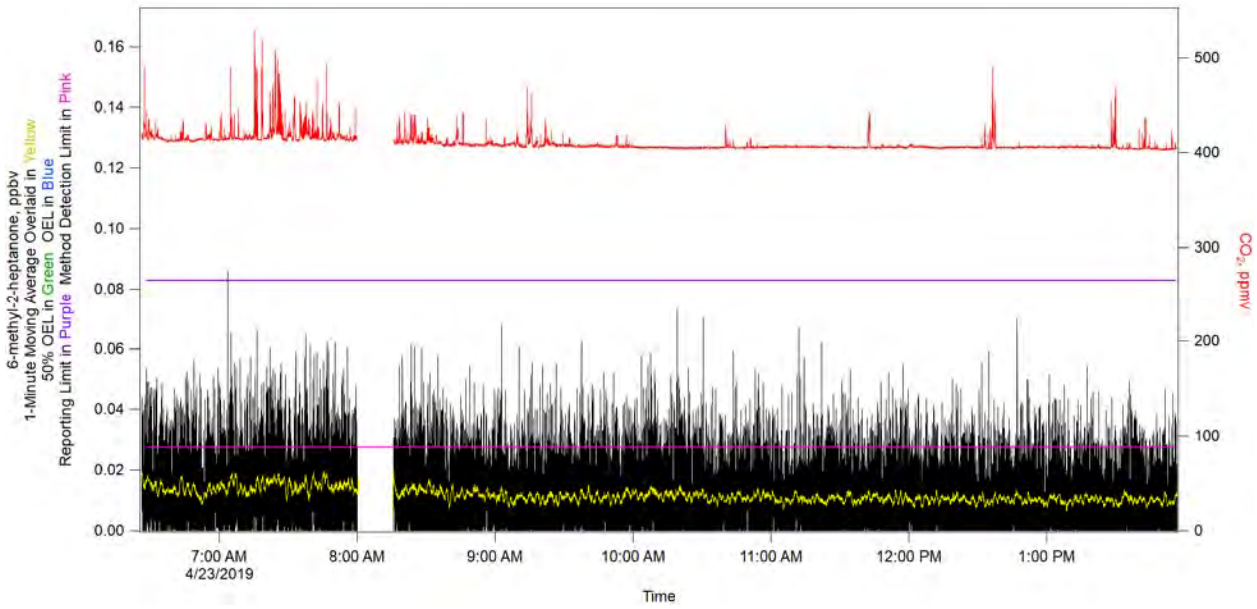


**Figure 3-39. 6-methyl-2-heptanone.**

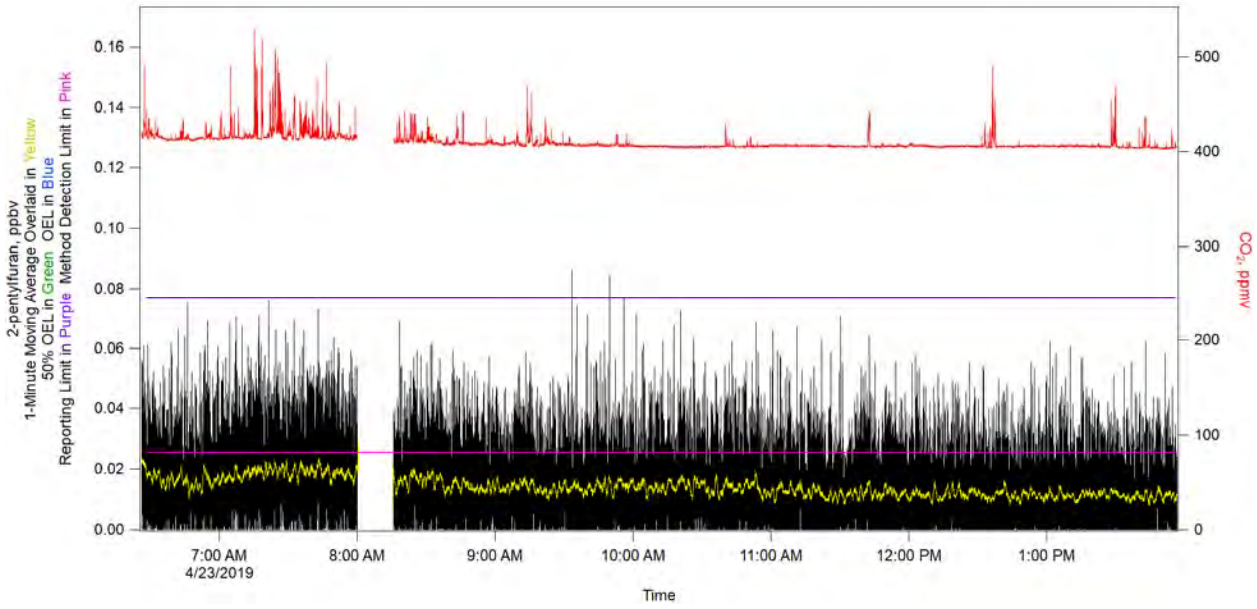


**Figure 3-40. 2-pentylfuran.**

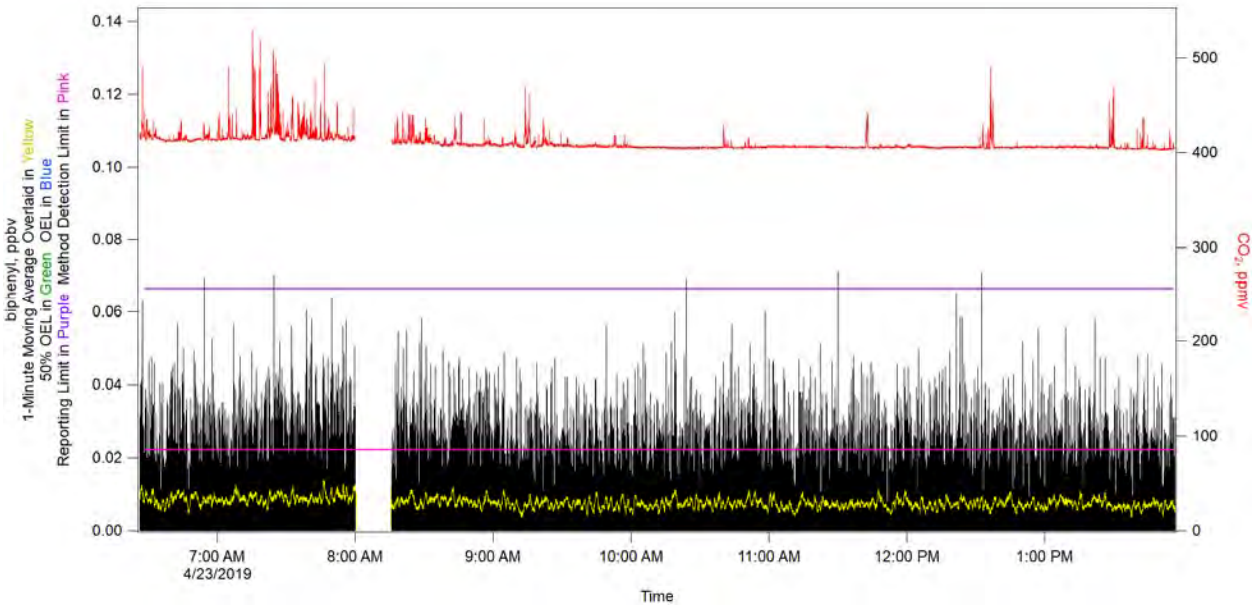


**Figure 3-41. Biphenyl.**

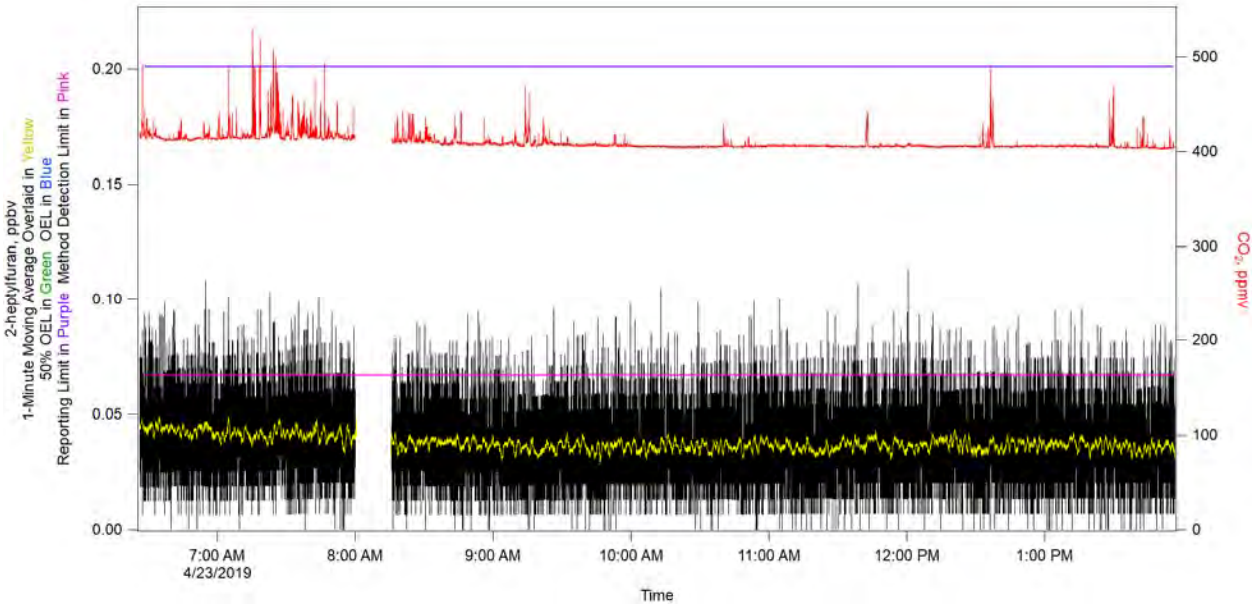


**Figure 3-42. 2-heptylfuran.**

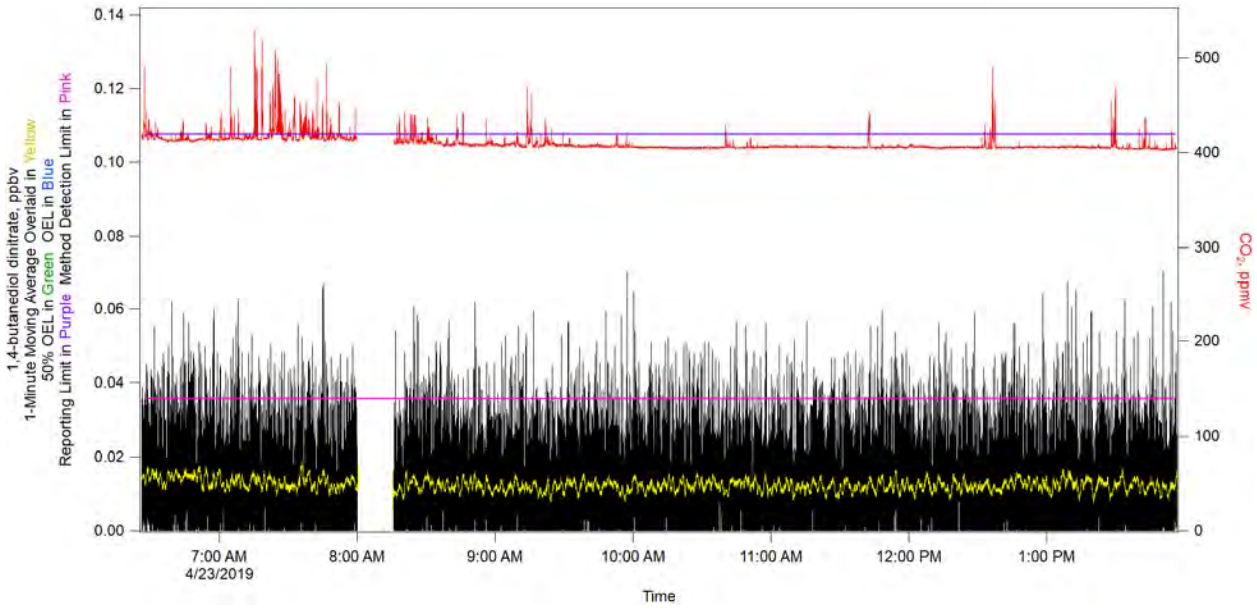


**Figure 3-43. 1,4-butanediol Dinitrate.**

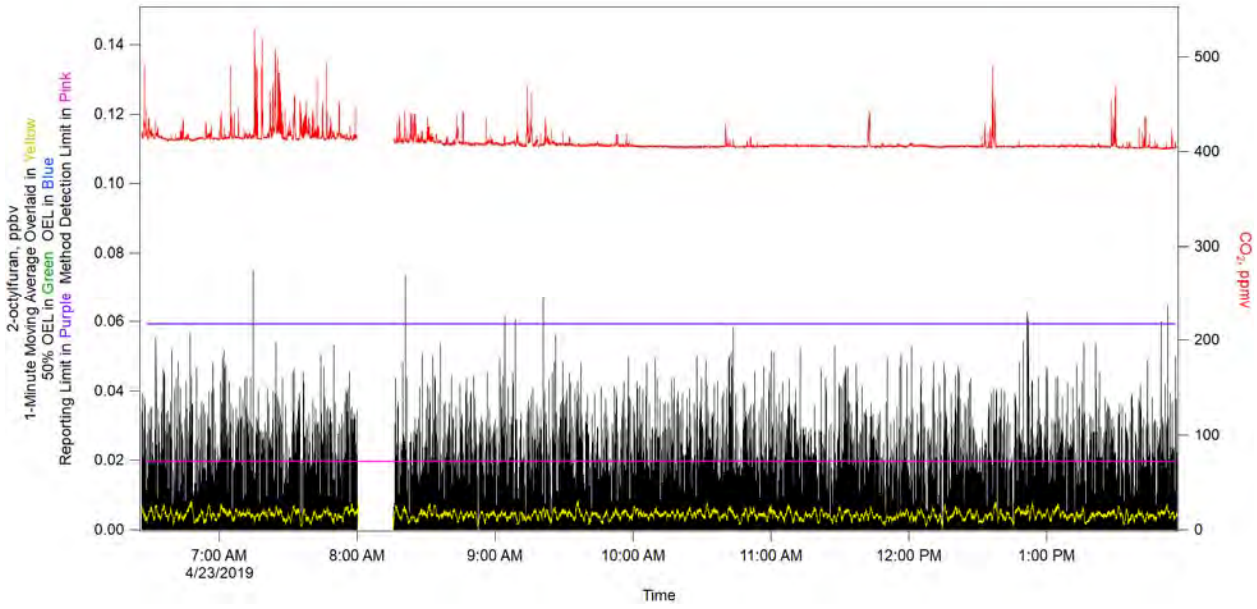


**Figure 3-44. 2-octylfuran.**

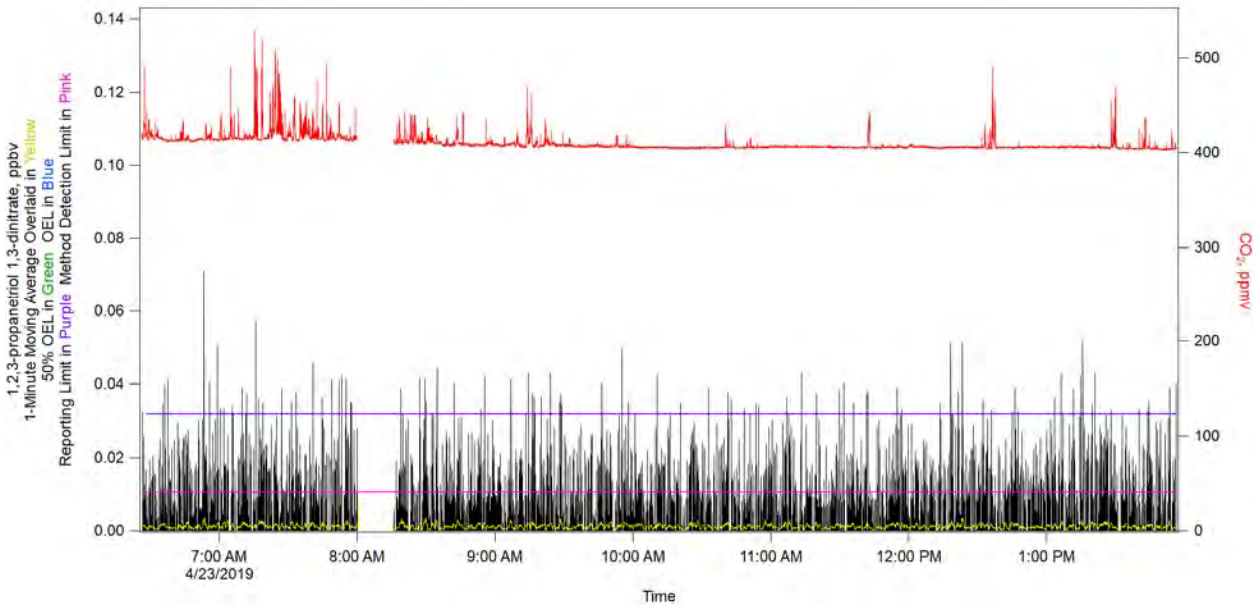


**Figure 3-45. 1,2,3-propanetriol 1,3-dinitrate.**

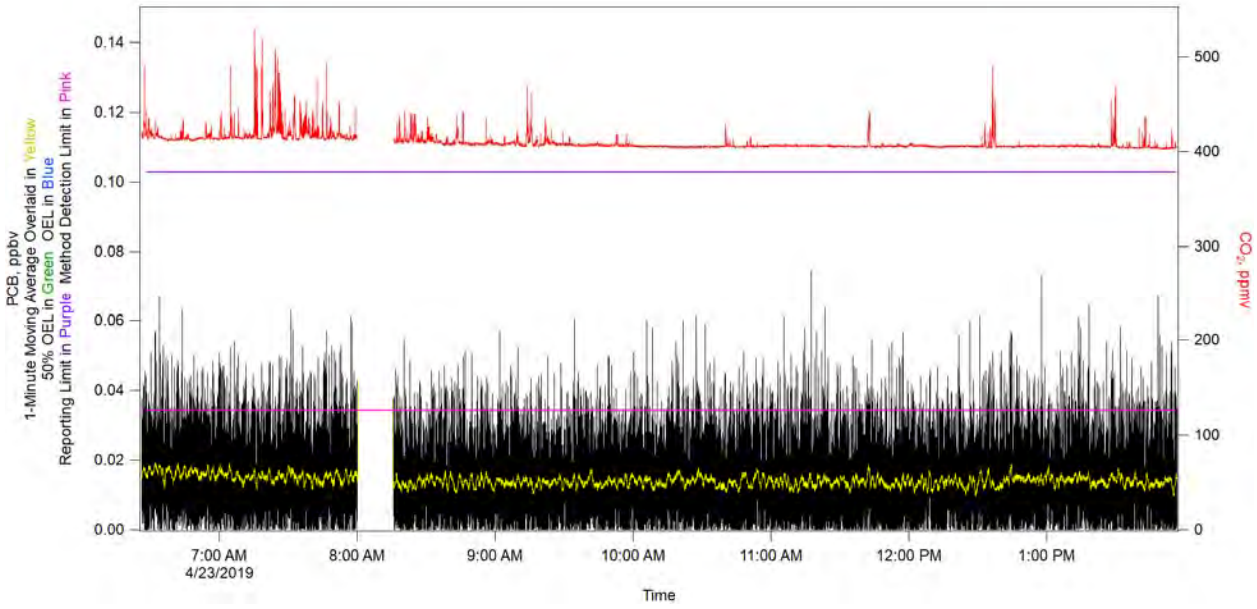


**Figure 3-46. PCB.**

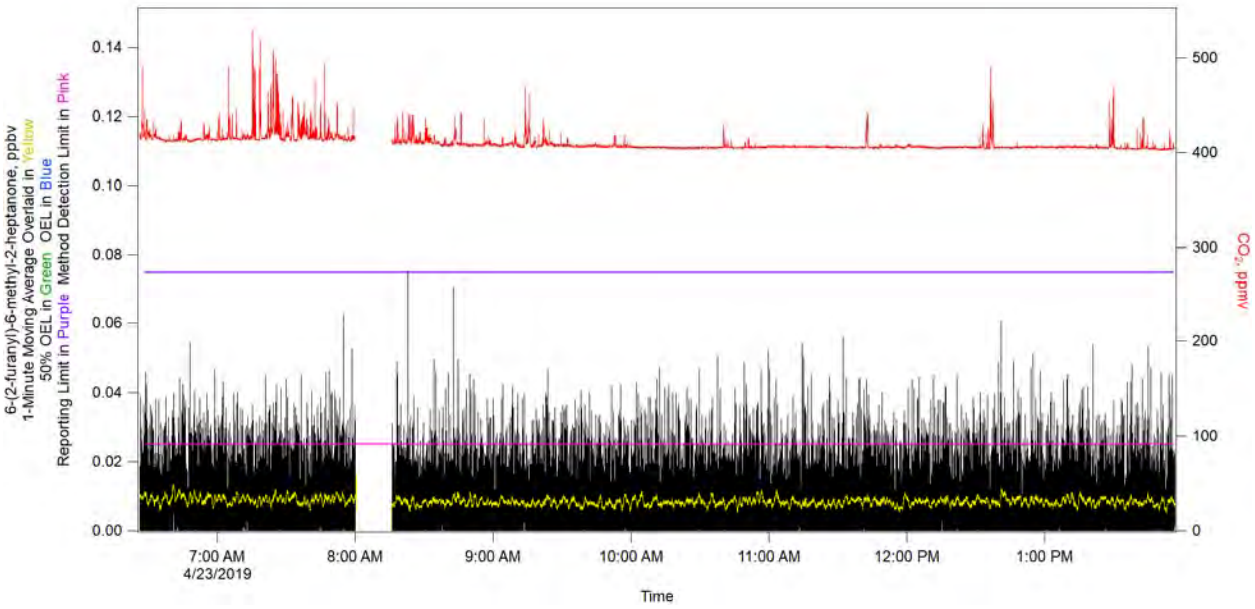


**Figure 3-47. 6-(2-furanyl)-6-methyl-2-heptanone.**

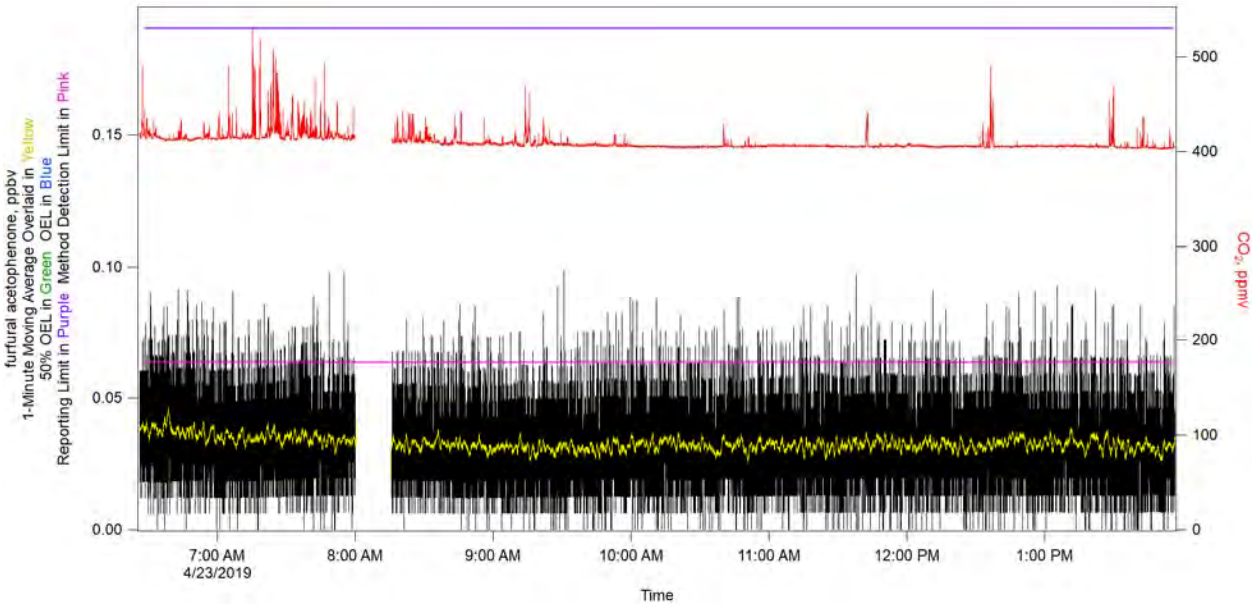


**Figure 3-48. Furfural Acetophenone.**

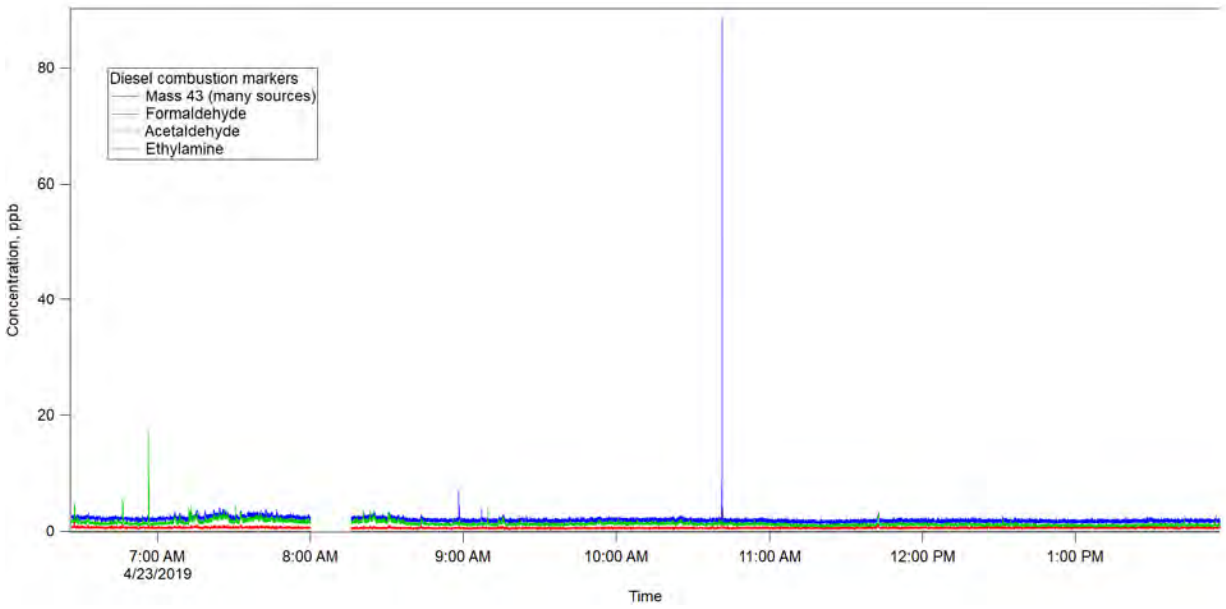


**Figure 3-49. Diesel Combustion Markers.**

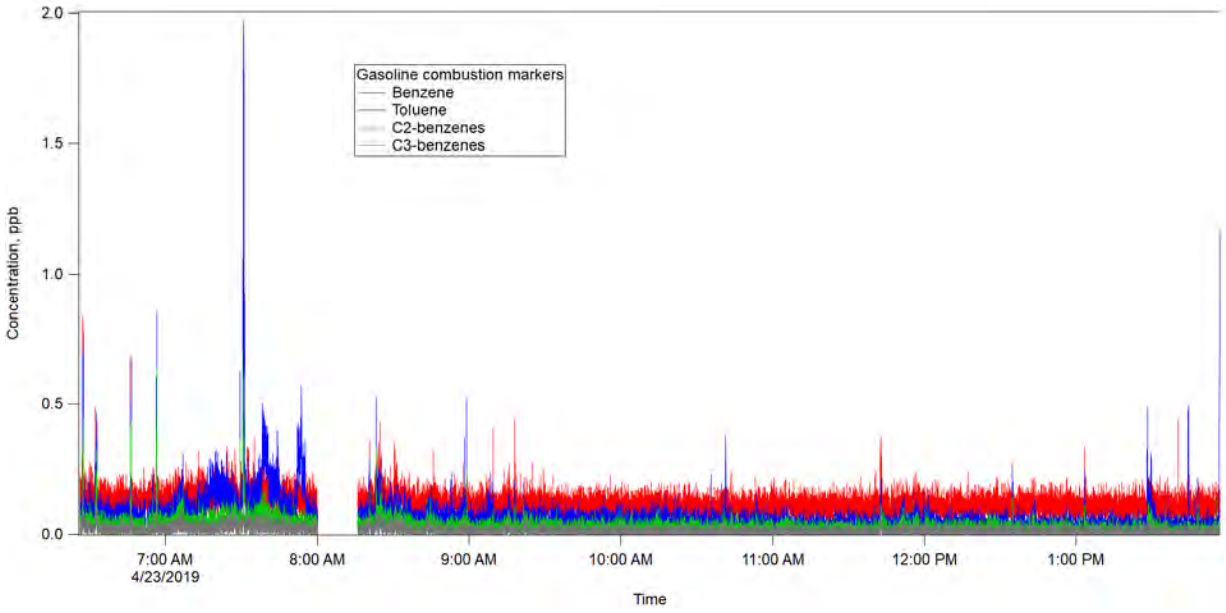


**Figure 3-50. Gasoline Combustion Markers.**

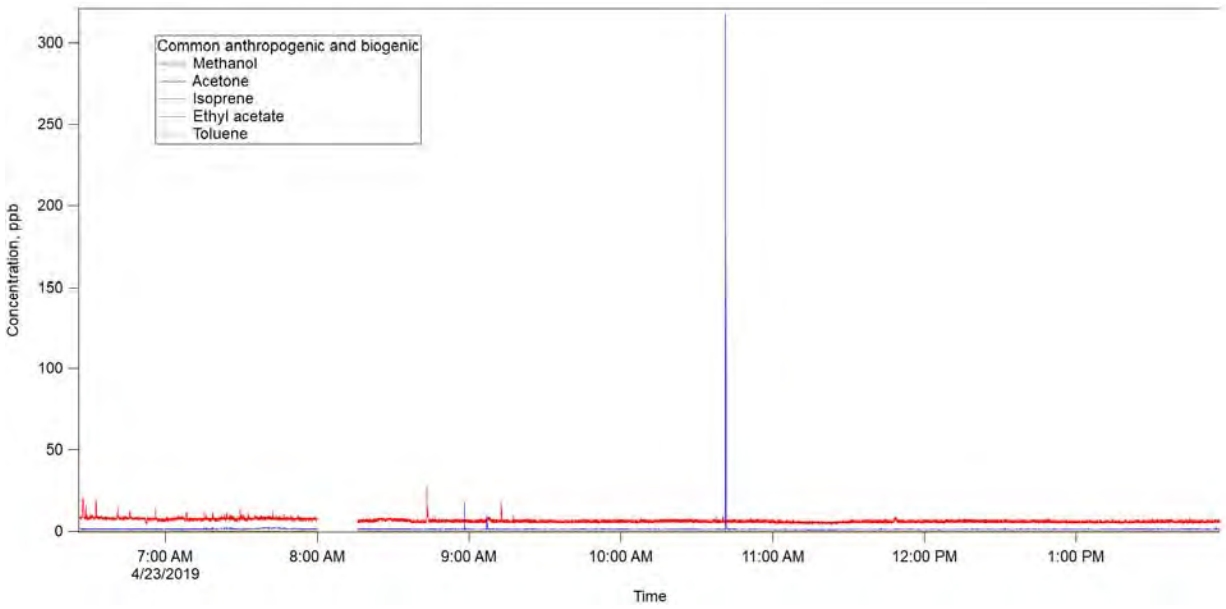


**Figure 3-51. Plant and Human Markers**

# 4.0 APRIL 24, 2019 – AREA MONITORING

## 4.1 Quality Assessment

Data from April 24, 2019, were assessed using Procedure 17124-DOE-HS-102. A Data Exchange Checklist was completed. The data were accepted by TerraGraphics with the following comments. Report No. 66409-RPT-004 was adequately documented and all checks passed the acceptance limits.

## 4.2 Summary

On April 24, 2019, ML personnel arrived at the TerraGraphics warehouse at 04:58. The QA/QC zero-air/span checks were performed on the LI-COR $CO_2$ monitor, the Picarro $NH_3$ analyzer, and the PTR-MS beginning at 05:14. The ML arrived on the Hanford Site and checked in with the CSM at 06:20. The ML began a site survey loop of A Farms at 06:30. The ML parked on the east side of A Farms from 07:02 to 09:30. The ML initiated a site survey loop at 09:30 until parking on the southeast corner of A Farm. The ML was relocated to the southeast side of C Farm at 11:08, due to varying wind directions. At 12:09, the ML Operators started a site survey loop until stopping on the northeast side of AP Farm, downwind of workers working on a pump within the farm. The Operators checked out with the CSM at 13:55 and the ML departed the site. The ML arrived back at the TerraGraphics warehouse at 14:54.


**Figure 4-1. Location of the Mobile Laboratory for the Duration of the Monitoring Period.**

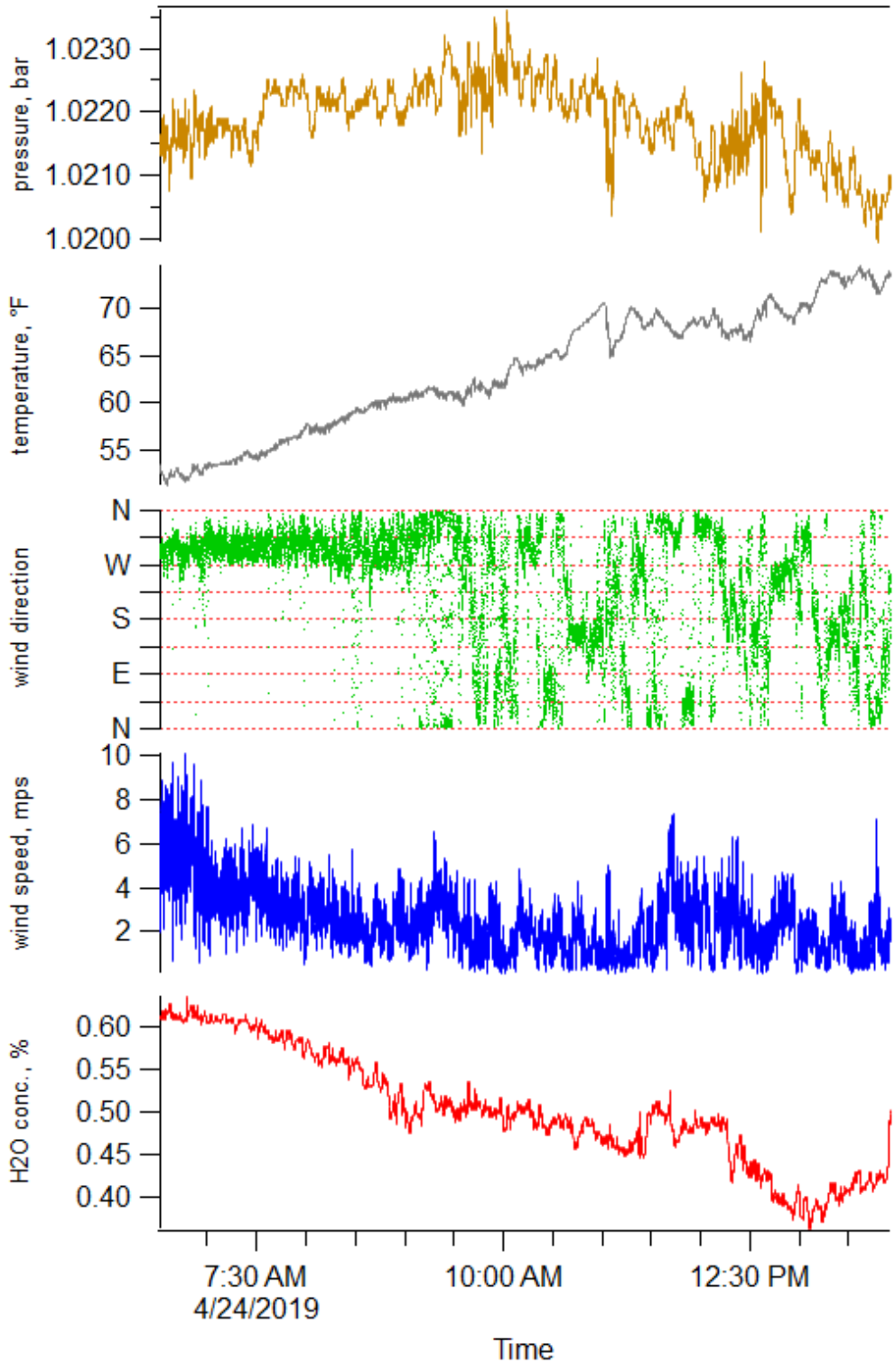


**Figure 4-2. Weather Data for the Duration of the Monitoring Period.**

### 4.3 Samples Collected

Continuous air monitoring was performed using the following instrumentation:

- PTR-TOF 6000 X2,
- LI-COR $CO_2$ Monitor,
- Picarro Ammonia Monitor, and
- Airmar Weather Station.

Confirmatory air samples were not collected during this period.

## 4.4 Area Monitoring

**Table 4-1. Chemical of Potential Concern Statistical Information for the Monitoring Period of April 24, 2019. (2 Sheets)**

| COPC # | COPC Name | OEL (ppb) | MDL (ppb) | Ave. (ppb) | St. Dev. (ppb) | Rel St. Dev. (%) | Max. (ppb) | Median (ppb) |
|---|---|---|---|---|---|---|---|---|
| 1 | ammonia | 25000 | 6.225 | 6.433† | 1.619 | 25.173 | 12.918 | 5.807† |
| 2 | formaldehyde | 300 | 1.721 | <1.721 | 0.192 | 24.970 | 3.004 | <1.721 |
| 3 | methanol | 200000 | 5.758 | <5.758 | 0.537 | 9.661 | 11.743 | <5.758 |
| 4 | acetonitrile | 20000 | 0.085 | 0.106† | 0.034 | 32.614 | 0.749 | 0.103† |
| 5 | acetaldehyde | 25000 | 1.027 | 1.089† | 0.400 | 36.712 | 12.713 | 1.019† |
| 6 | ethylamine | 5000 | 0.069 | <0.069 | 0.021 | 63.894 | 0.149 | <0.069 |
| 7 | 1,3-butadiene | 1000 | 0.183 | <0.183 | 0.070 | 53.208 | 0.860 | <0.183 |
| 8 | propanenitrile | 6000 | 0.107 | <0.107 | 0.029 | 59.594 | 0.648 | <0.107 |
| 9 | 2-propenal | 100 | 0.340 | <0.340 | 0.056 | 71.789 | 0.830 | <0.340 |
| 10 | 1-butanol + butenes | 20000 | 0.214 | <0.214 | 0.099 | 101.016 | 2.552 | <0.214 |
| 11 | methyl isocyanate | 20 | 0.069 | <0.069 | 0.024 | 59.737 | 0.172 | <0.069 |
| 12 | methyl nitrite | 100 | 0.098 | <0.098 | 0.040 | 54.107 | 0.689 | <0.098 |
| 13 | furan | 1 | 0.062 | <0.062 | 0.017 | 64.582 | 0.177 | <0.062 |
| 14 | Butanenitrile | 8000 | 0.039 | <0.039 | 0.017 | 79.130 | 0.278 | <0.039 |
| 15 | but-3-en-2-one + 2,3-dihydrofuran + 2,5-dihydrofuran | 200, 1, 1 | 0.041 | <0.041 | 0.020 | 72.524 | N/A* | N/A* |
| 16 | butanal | 25000 | 0.061 | 0.083† | 0.028 | 33.325 | 0.257 | 0.081† |
| 17 | NDMA** | 0.3 | 0.082 | <0.082 | 0.020 | 162.759 | 0.174 | <0.082 |
| 18 | benzene | 500 | 0.236 | <0.236 | 0.245 | 156.516 | 10.653 | <0.236 |
| 19 | 2,4-pentadienenitrile + pyridine | 300, 1000 | 0.085 | <0.085 | 0.024 | 58.787 | 0.816 | <0.085 |
| 20 | 2-methylene butanenitrile | 300 | 0.036 | <0.036 | 0.011 | 80.193 | 0.096 | <0.036 |
| 21 | 2-methylfuran | 1 | 0.043 | <0.043 | 0.020 | 75.306 | 0.282 | <0.043 |
| 22 | pentanenitrile | 6000 | 0.036 | <0.036 | 0.012 | 89.225 | 0.131 | <0.036 |
| 23 | 3-methyl-3-buten-2-one + 2-methyl-2-butenal | 20, 30 | 0.043 | <0.043 | 0.018 | 76.310 | 0.199 | <0.043 |
| 24 | NEMA** | 0.3 | 0.058 | <0.058 | 0.015 | 139.362 | 0.108 | <0.058 |
| 25 | 2,5-dimethylfuran | 1 | 0.032 | <0.032 | 0.015 | 89.864 | 0.133 | <0.032 |
| 26 | hexanenitrile | 6000 | 0.031 | <0.031 | 0.011 | 96.632 | 0.116 | <0.031 |
| 27 | 2-hexanone (MBK) | 5000 | 0.036 | <0.036 | 0.012 | 95.091 | 0.097 | <0.036 |
| 28 | NDEA** | 0.1 | 0.034 | <0.034 | 0.010 | 148.635 | 0.097 | <0.034 |

**Table 4-1. Chemical of Potential Concern Statistical Information for the Monitoring Period of April 24, 2019. (2 Sheets)**

| COPC # | COPC Name | OEL (ppb) | MDL (ppb) | Ave. (ppb) | St. Dev. (ppb) | Rel St. Dev. (%) | Max. (ppb) | Median (ppb) |
|---|---|---|---|---|---|---|---|---|
| 29 | butyl nitrite + 2-nitro-2-methylpropane | 100, 300 | 0.058 | <0.058 | 0.014 | 53.135 | 0.146 | <0.058 |
| 30 | 2,4-dimethylpyridine | 500 | 0.036 | <0.036 | 0.018 | 151.138 | 0.513 | <0.036 |
| 31 | 2-propylfuran + 2-ethyl-5-methylfuran | 1 | 0.027 | <0.027 | 0.011 | 110.342 | 0.111 | <0.027 |
| 32 | heptanenitrile | 6000 | 0.027 | <0.027 | 0.009 | 99.241 | 0.071 | <0.027 |
| 33 | 4-methyl-2-hexanone | 500 | 0.033 | <0.033 | 0.010 | 96.276 | 0.070 | <0.033 |
| 34 | NMOR** | 0.6 | 0.021 | <0.021 | 0.009 | 176.297 | 0.098 | <0.021 |
| 35 | butyl nitrate | 2500 | 0.022 | <0.022 | 0.007 | 130.281 | 0.061 | <0.022 |
| 36 | 2-ethyl-2-hexenal + 4-(1-methylpropyl)-2,3-dihydrofuran + 3-(1,1-dimethylethyl)-2,3-dihydrofuran | 100, 1, 1 | 0.028 | <0.028 | 0.010 | 95.048 | 0.079 | <0.028 |
| 37 | 6-methyl-2-heptanone | 8000 | 0.028 | <0.028 | 0.009 | 94.952 | 0.069 | <0.028 |
| 38 | 2-pentylfuran | 1 | 0.026 | <0.026 | 0.010 | 97.657 | 0.066 | <0.026 |
| 39 | biphenyl | 200 | 0.022 | <0.022 | 0.009 | 130.082 | 0.065 | <0.022 |
| 40 | 2-heptylfuran | 1 | 0.067 | <0.067 | 0.015 | 43.444 | 0.121 | <0.067 |
| 41 | 1,4-butanediol dinitrate | 50 | 0.036 | <0.036 | 0.010 | 89.723 | 0.073 | <0.036 |
| 42 | 2-octylfuran | 1 | 0.020 | <0.02 | 0.008 | 209.628 | 0.068 | <0.02 |
| 43 | 1,2,3-propanetriol 1,3-dinitrate | 50 | 0.011 | <0.011 | 0.004 | 373.112 | 0.053 | <0.011 |
| 44 | PCB | 1000 | 0.034 | <0.034 | 0.010 | 73.982 | 0.075 | <0.034 |
| 45 | 6-(2-furanyl)-6-methyl-2-heptanone | 1 | 0.025 | <0.025 | 0.008 | 103.426 | 0.067 | <0.025 |
| 46 | furfural acetophenone | 1 | 0.064 | <0.064 | 0.015 | 44.099 | 0.104 | <0.064 |
| N/A* | The maximum peak value for but-3-en-2-one + 2,3 dihydrofuran + 2,5 dihydrofuran was 0.274 ppb and the median value was <0.041 ppb. The PTR-MS results for but-3-en-2-one + 2,3 dihydrofuran + 2,5 dihydrofuran are not compared to OEL concentrations because: 1) the result is suspect due to a known biogenic interferant (methacrolein) that is expected to be in concentrations that occasionally exceed the dihydrofuran OEL, and 2) this combination of COPCs have OEL concentrations that differ by a factor of 200, which provide widely variant bases for these numbers. | | | | | | | |
| ** | Nitrosamine results are suspect due to isobaric interferants causing positive bias that have been encountered during previous background [53005-81-RPT-007, *PTR-MS Mobile Laboratory Vapor Monitoring Background Study, (3/18/2018 – 4/20/2018)*, and *Fiscal Year 2017 Mobile Laboratory Vapor Monitoring at the Hanford Site: Monitoring During Waste Disturbing Activities and Background Study*, RJ Lee Group, Inc.]. | | | | | | | |
| < | COPC Averages below the MDL. | | | | | | | |
| † | COPC Averages between the RL and the MDL. | | | | | | | |
| | COPC Averages >100% of the OEL. | | | | | | | |
| | COPC Averages 50-100% of the OEL. | | | | | | | |
| | COPC Averages 10-50% of the OEL. | | | | | | | |

Figure 4-3 through Figure 4-51 display 46 COPC signals, overlaid with the same signal smoothed using a 1-minute moving average (in cases where a moving average assists with data visualization), and $CO_2$, for the monitoring period April 24, 2019. If within range of the plot's left axis, a green horizontal line representing 50% of the COPC's OEL, a blue horizontal line representing the COPC's OEL, a horizontal purple line representing the RL, and a pink horizontal line representing the MDL are shown.

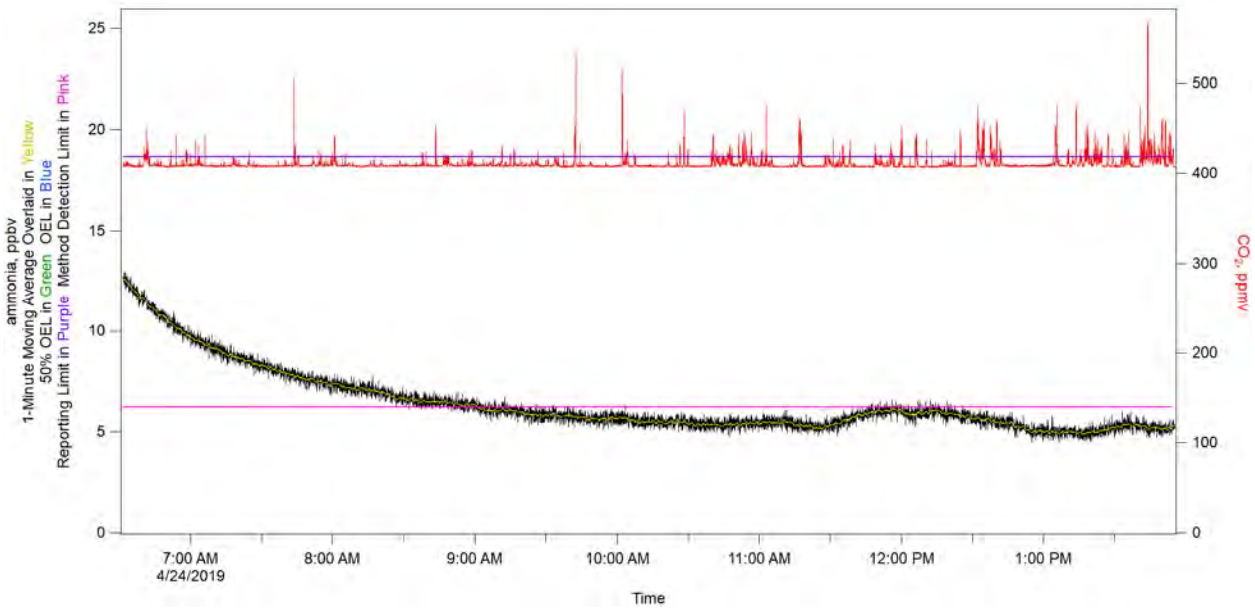


**Figure 4-3. Ammonia.**

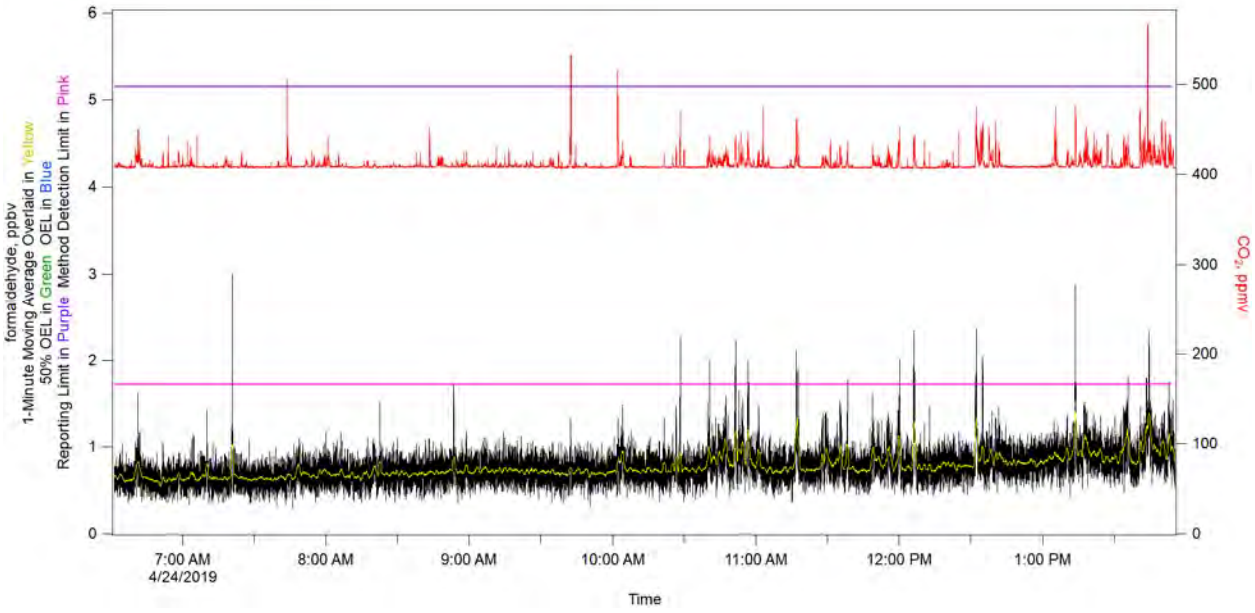


**Figure 4-4. Formaldehyde.**

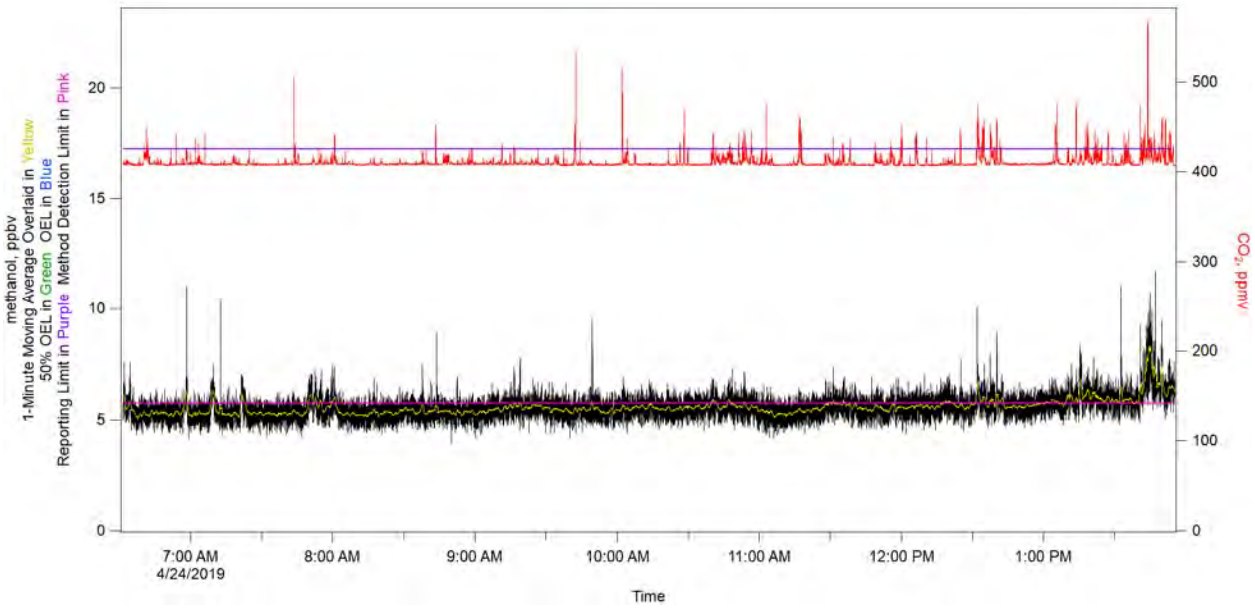


**Figure 4-5. Methanol.**

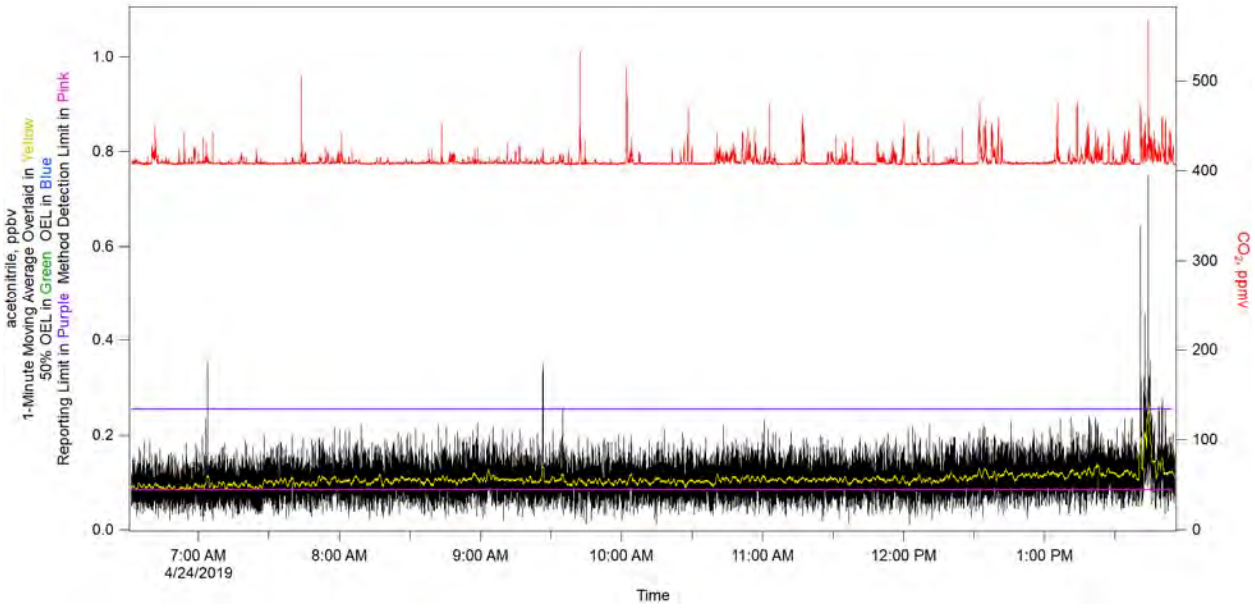


**Figure 4-6. Acetonitrile.**

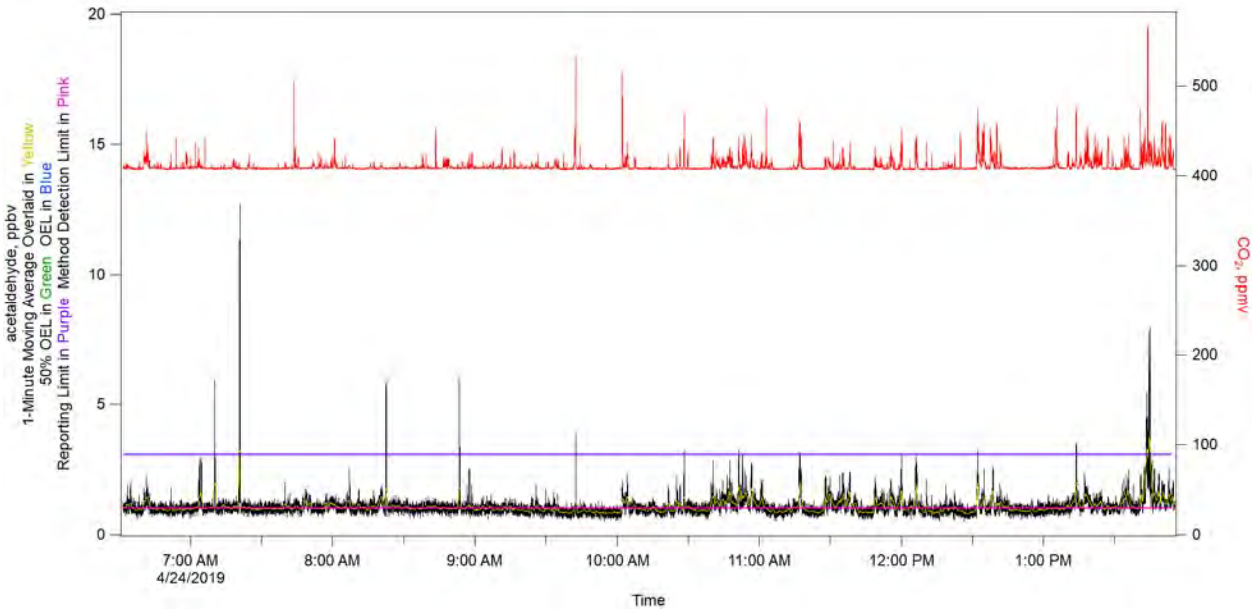


**Figure 4-7. Acetaldehyde.**

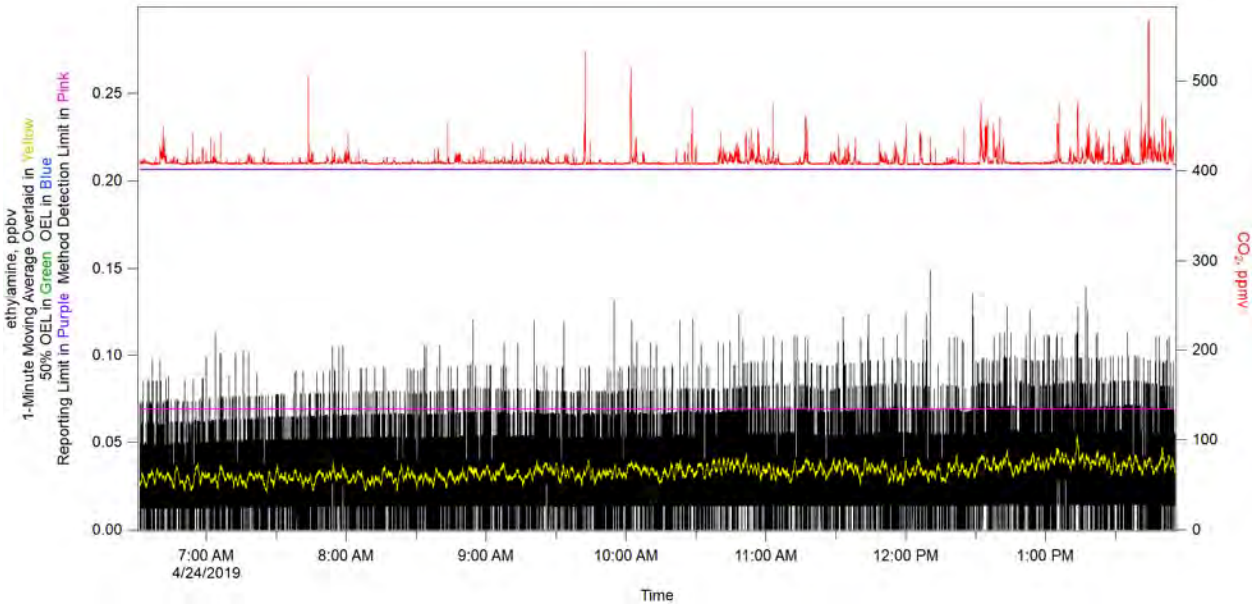


**Figure 4-8. Ethylamine.**

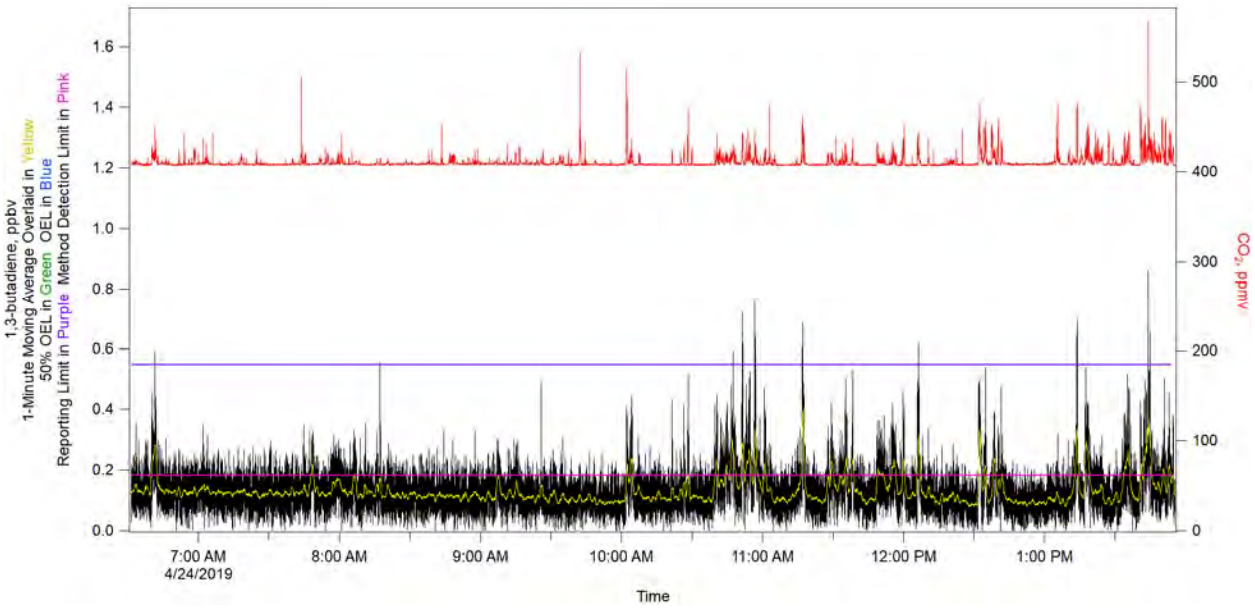


**Figure 4-9. 1,3-butadiene.**

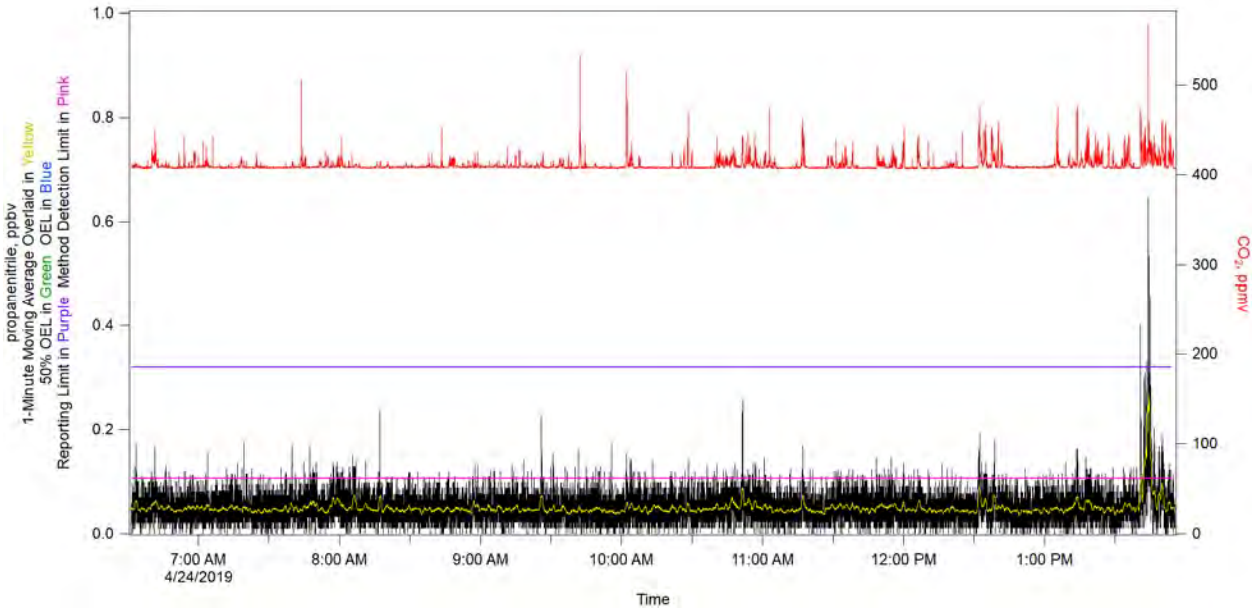


**Figure 4-10. Propanenitrile.**

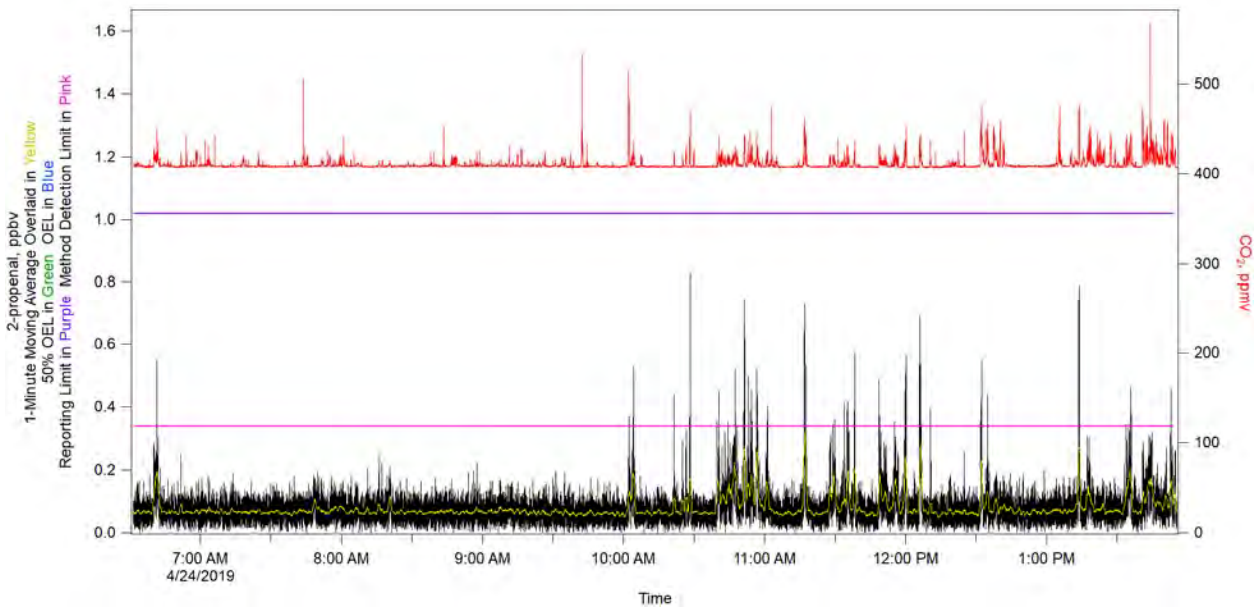


**Figure 4-11. 2-propenal.**

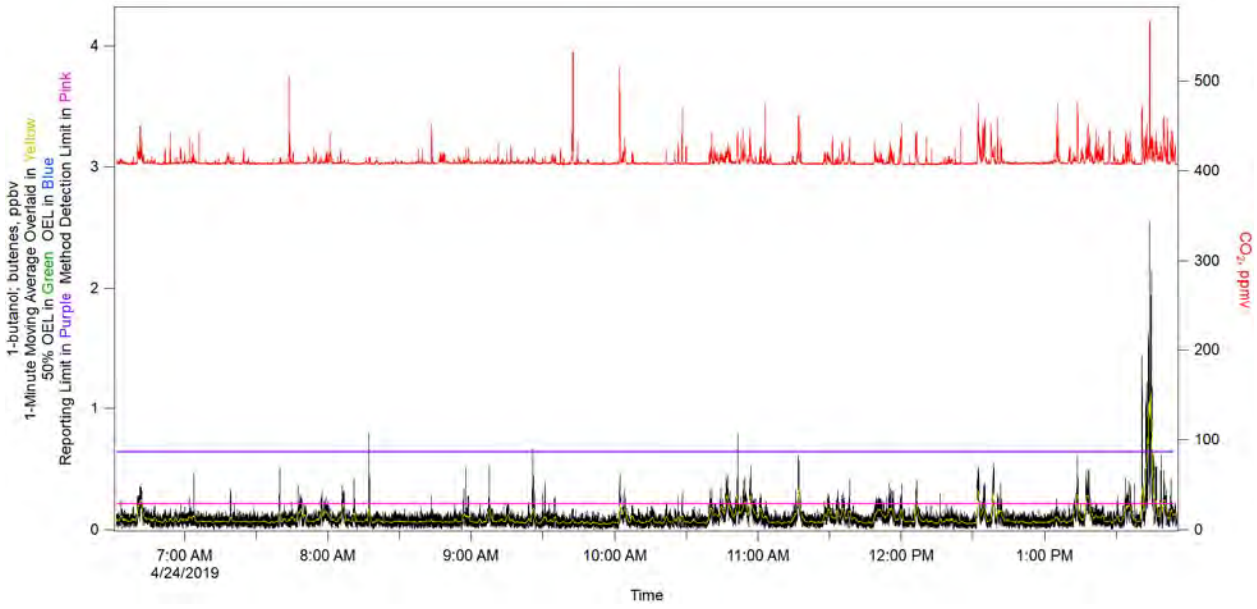


**Figure 4-12. 1-butanol; Butenes.**

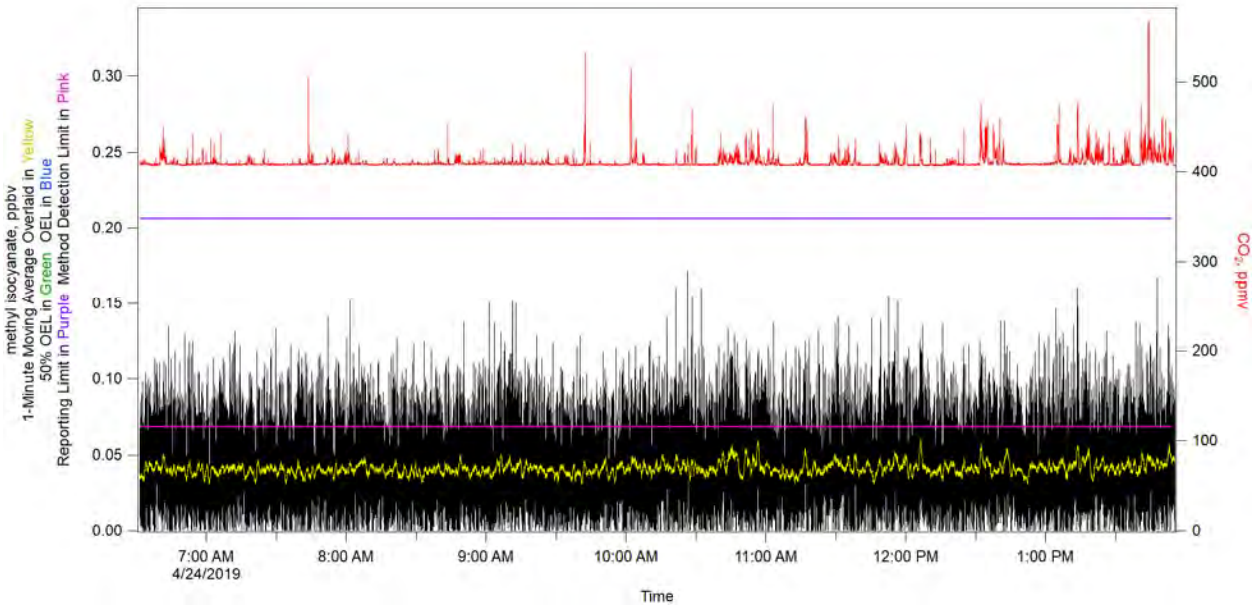


**Figure 4-13. Methyl Isocyanate.**

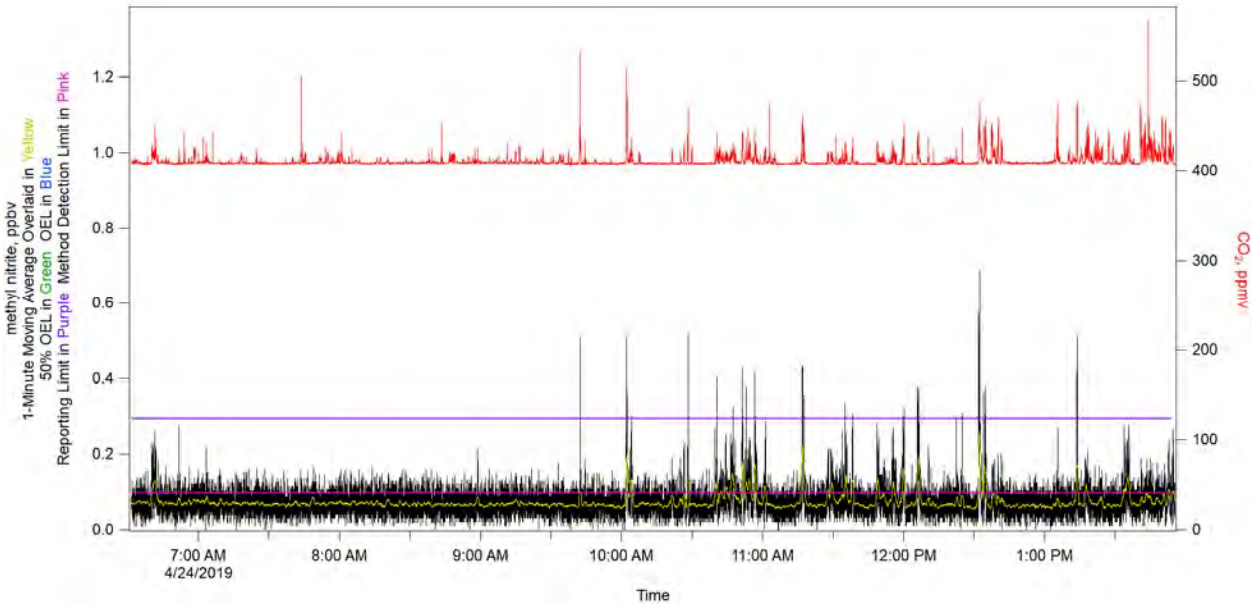


**Figure 4-14. Methyl Nitrite.**

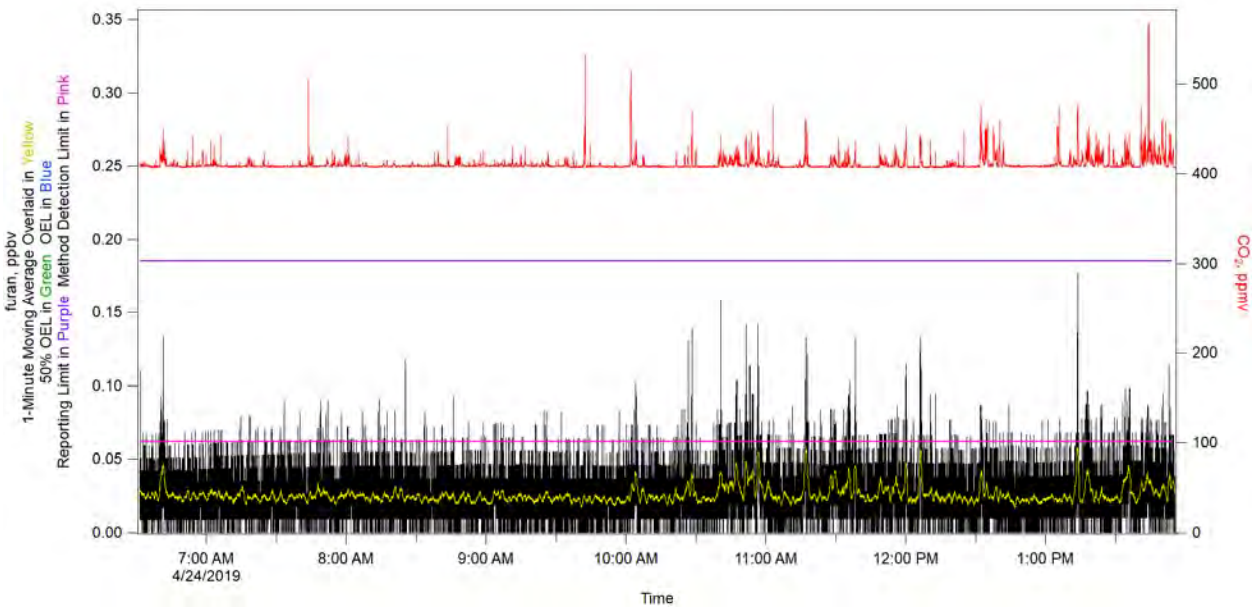


**Figure 4-15. Furan.**

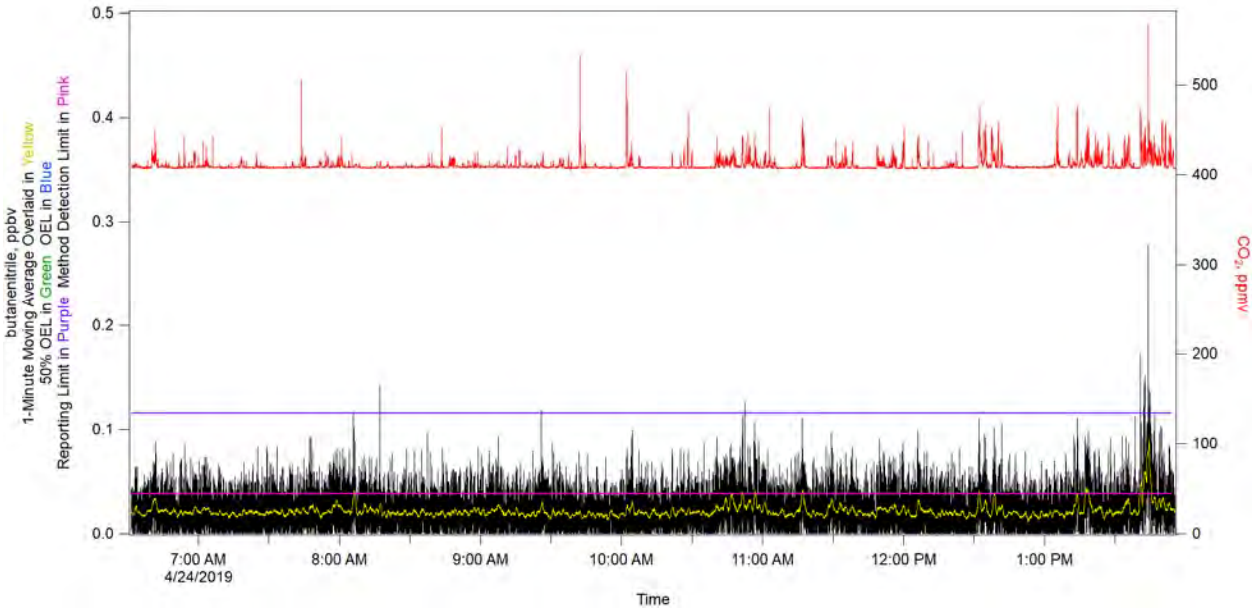


**Figure 4-16. Butanenitrile.**

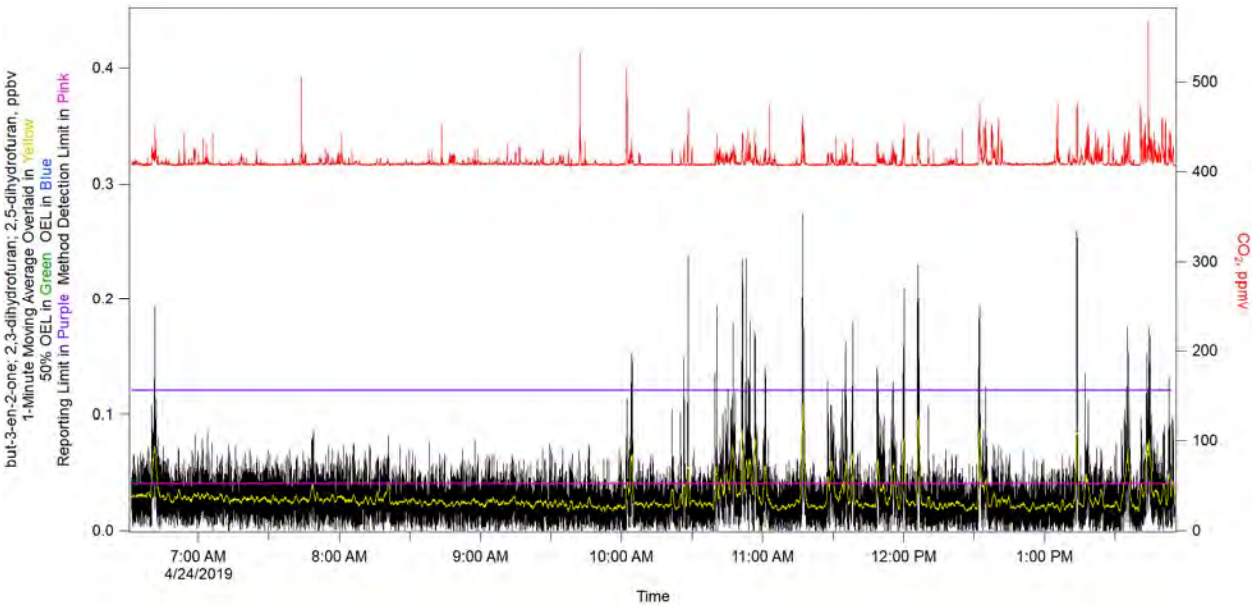


**Figure 4-17. But-3-en-2-one; 2,3-dihydrofuran; 2,5-dihydrofuran.**

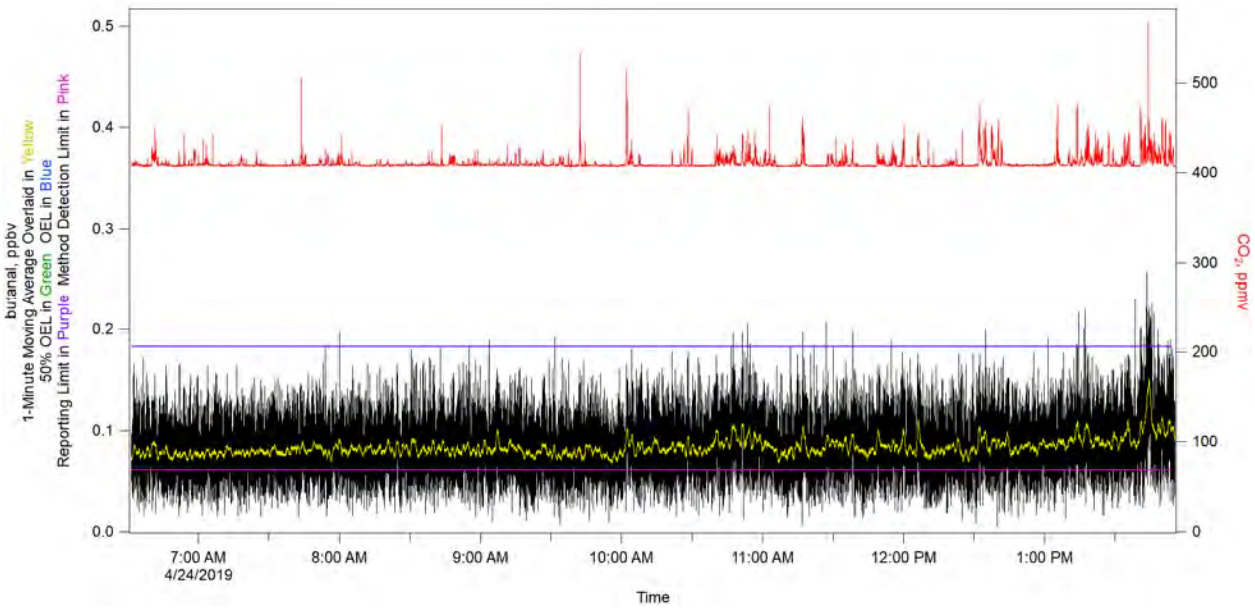


**Figure 4-18. Butanal.**

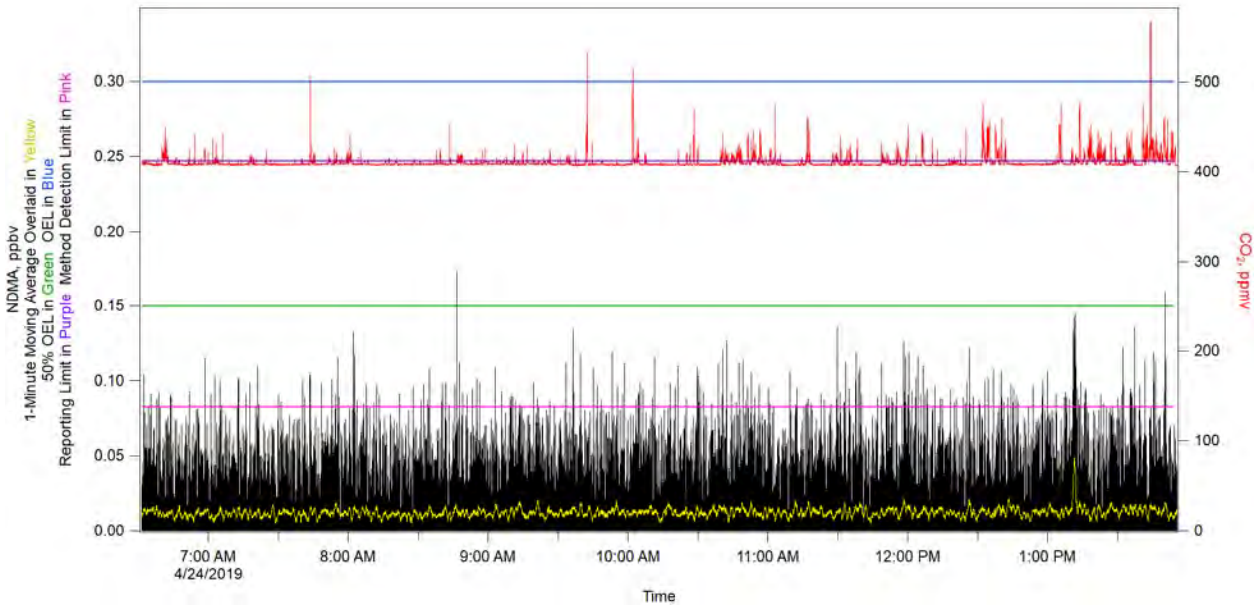


**Figure 4-19. N-nitrosodimethylamine (NDMA).**

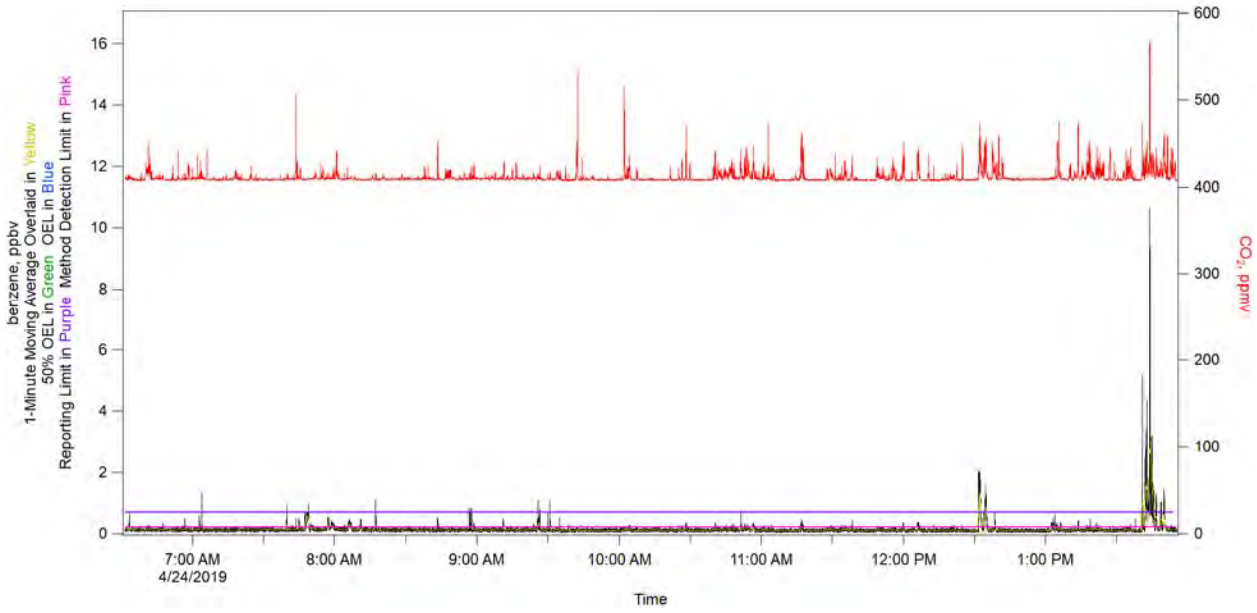


**Figure 4-20. Benzene.**

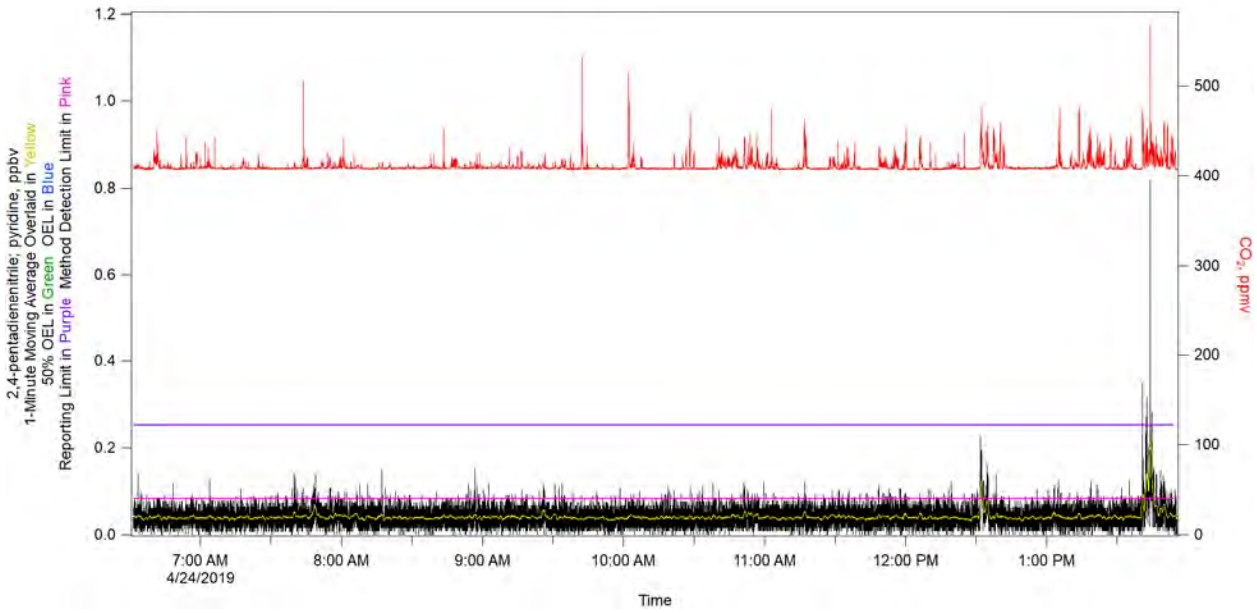


**Figure 4-21. 2,4-pentadienenitrile; Pyridine.**

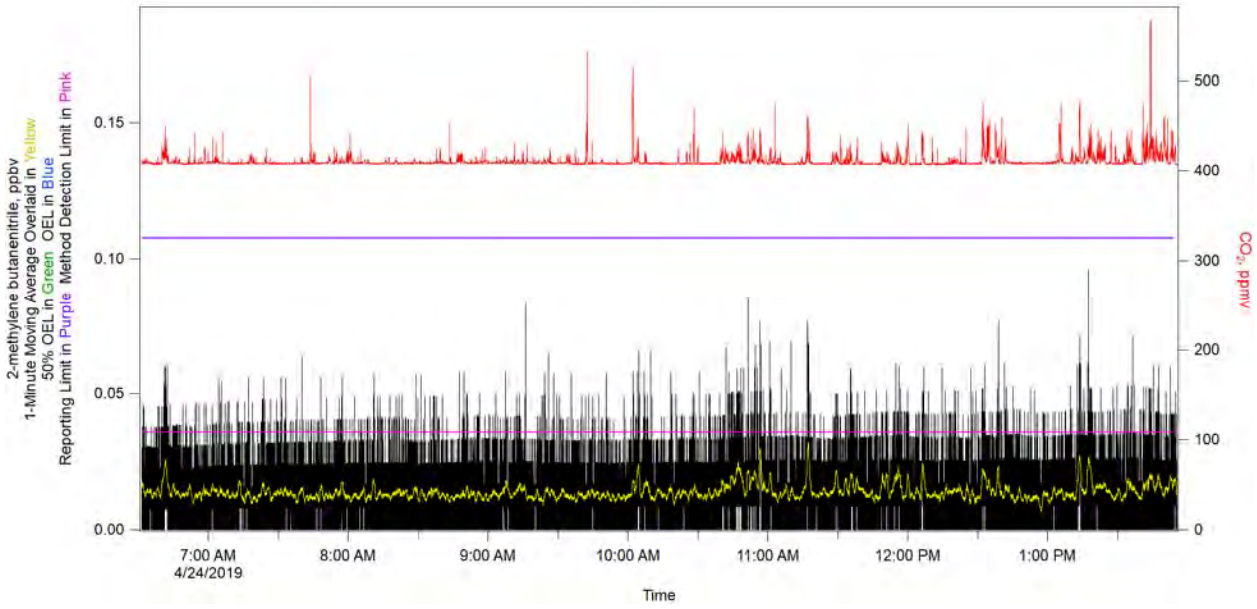


**Figure 4-22. 2-methylene Butanenitrile.**

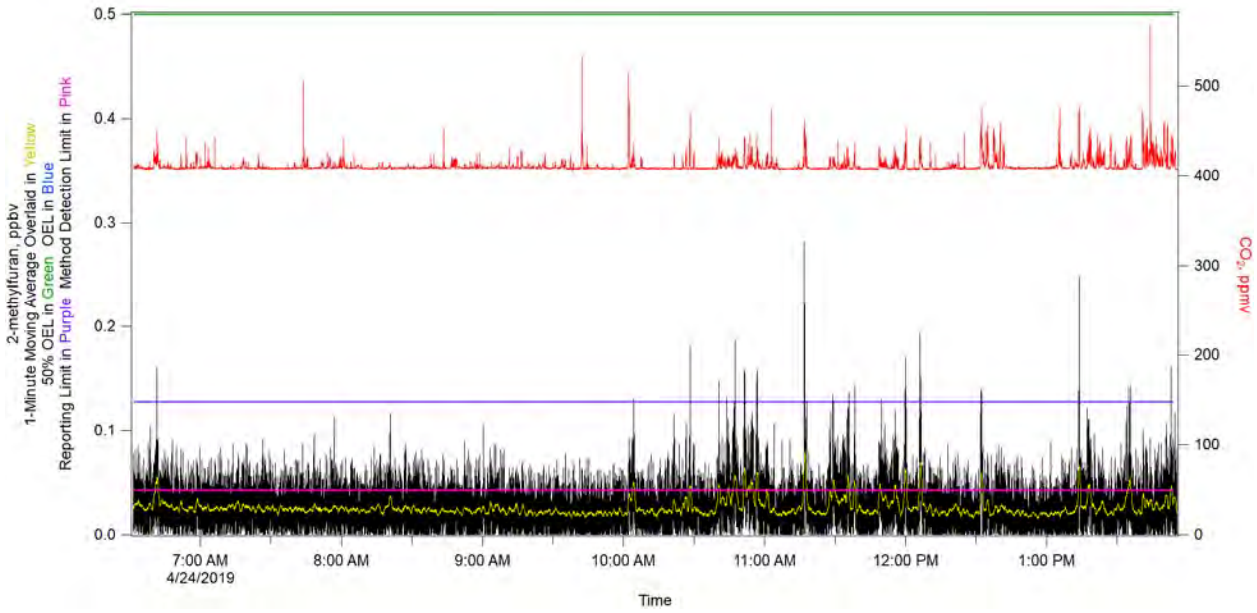


**Figure 4-23. 2-methylfuran.**

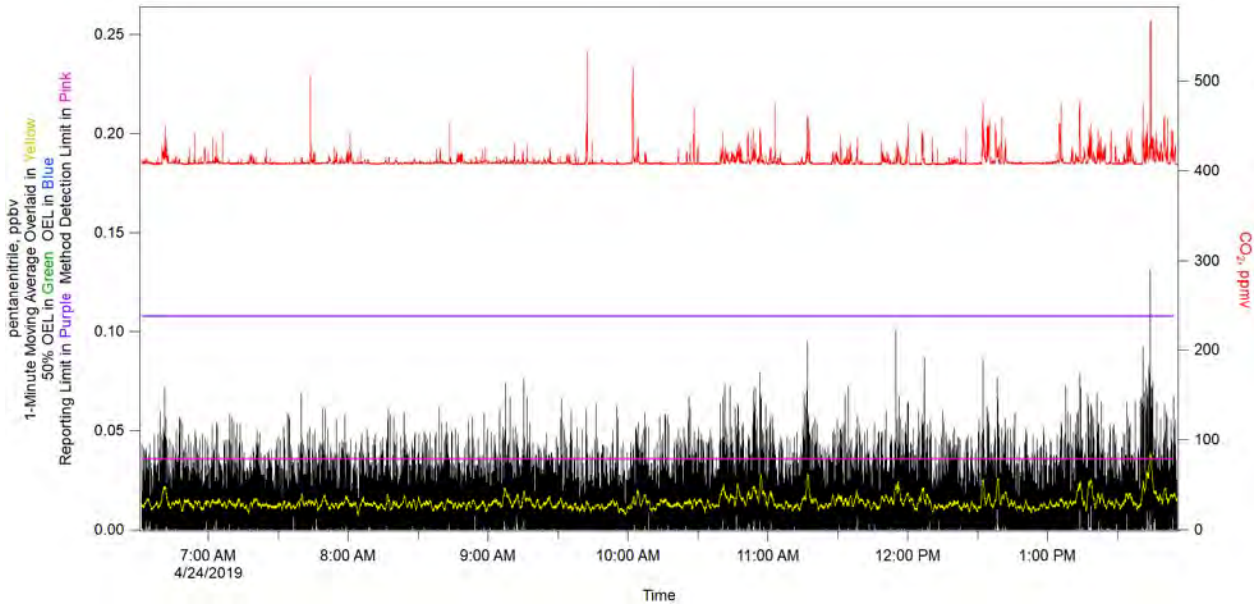


**Figure 4-24. Pentanenitrile.**

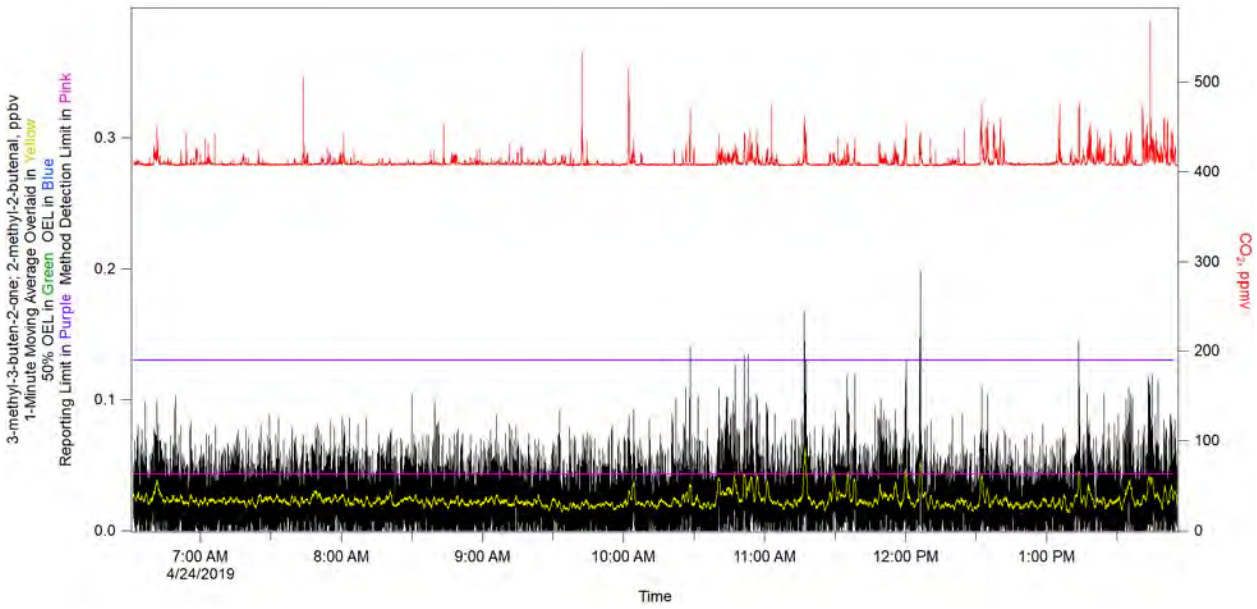


**Figure 4-25. 3-methyl-3-buten-2-one; 2-methyl-2-butenal.**

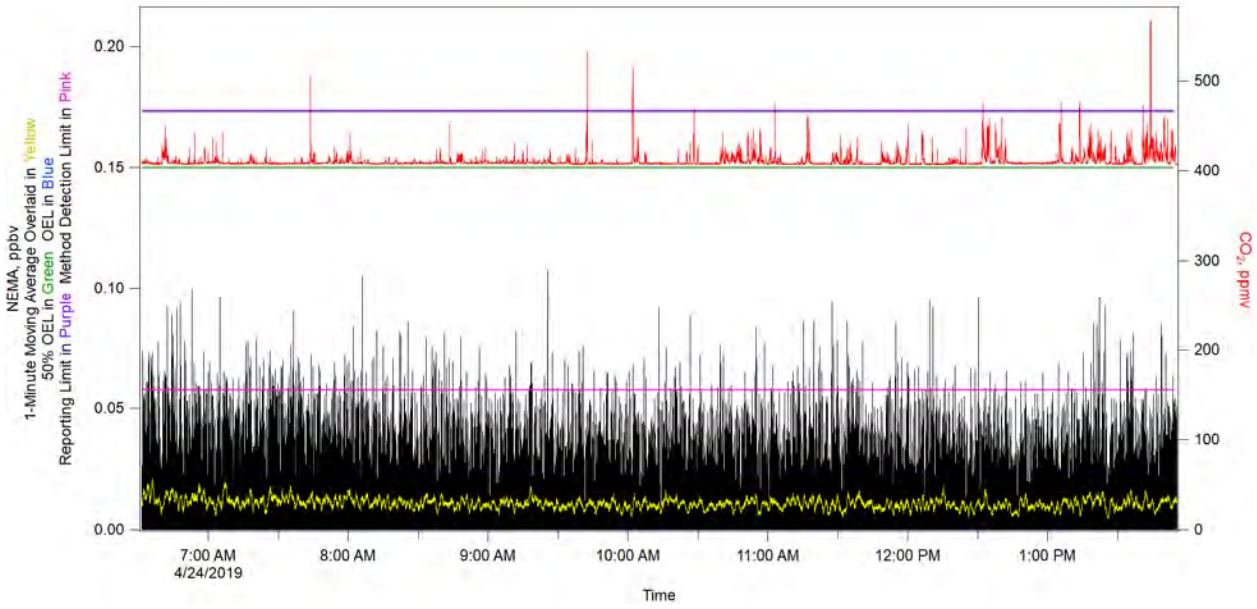


**Figure 4-26. N-nitrosomethylethylamine (NEMA).**

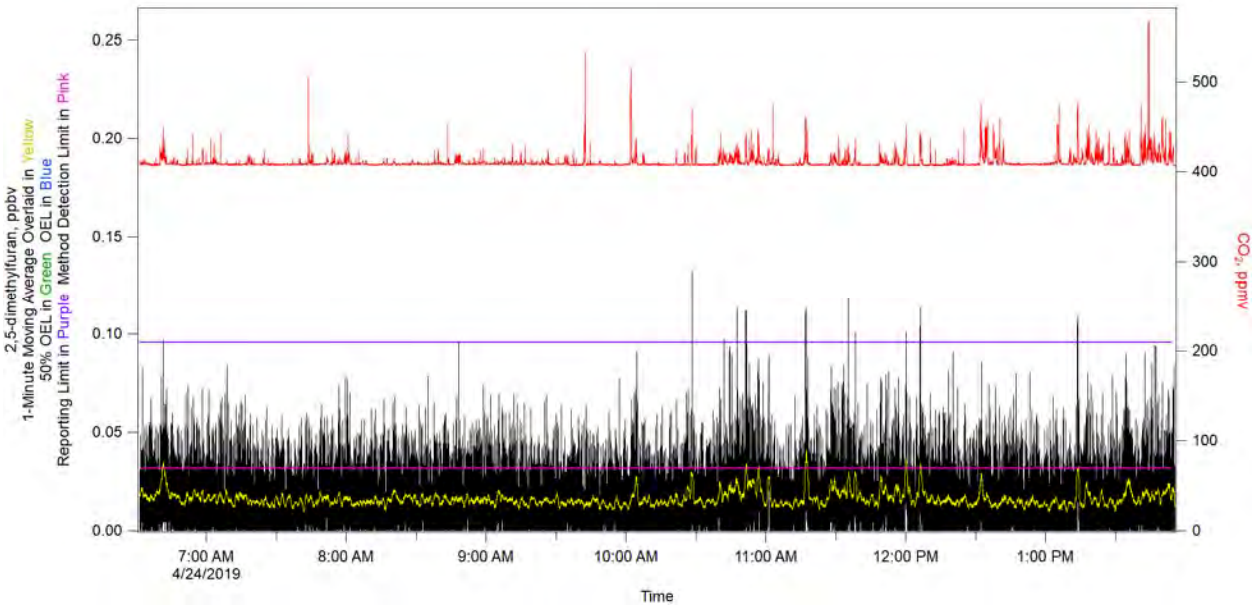


**Figure 4-27. 2,5-dimethylfuran.**

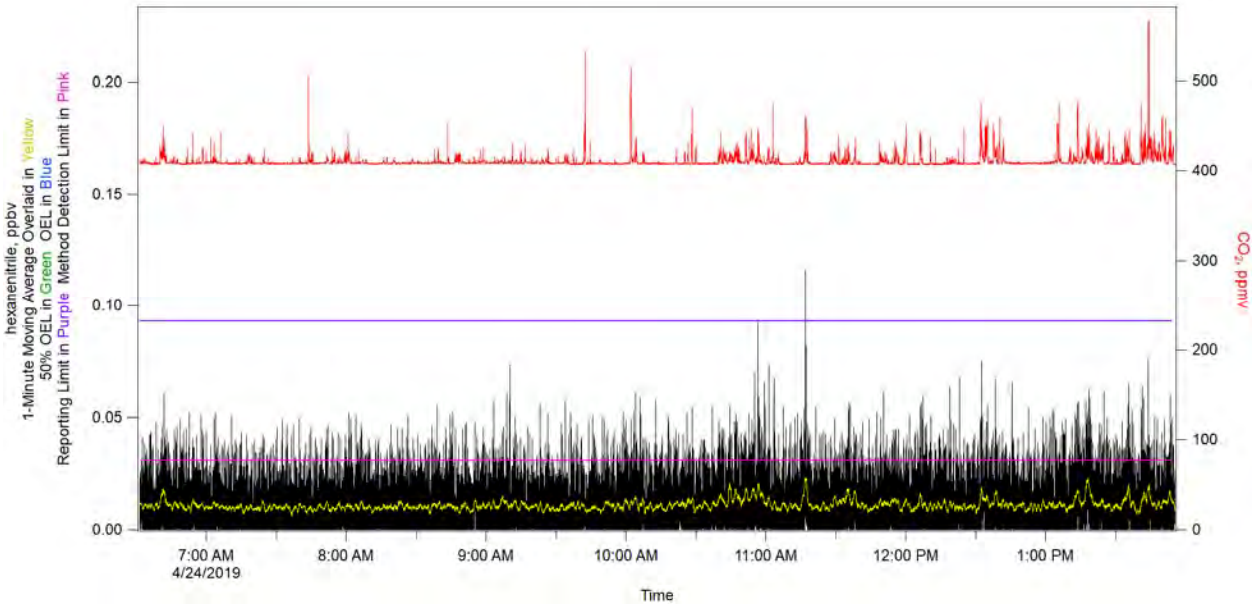


**Figure 4-28. Hexanenitrile.**

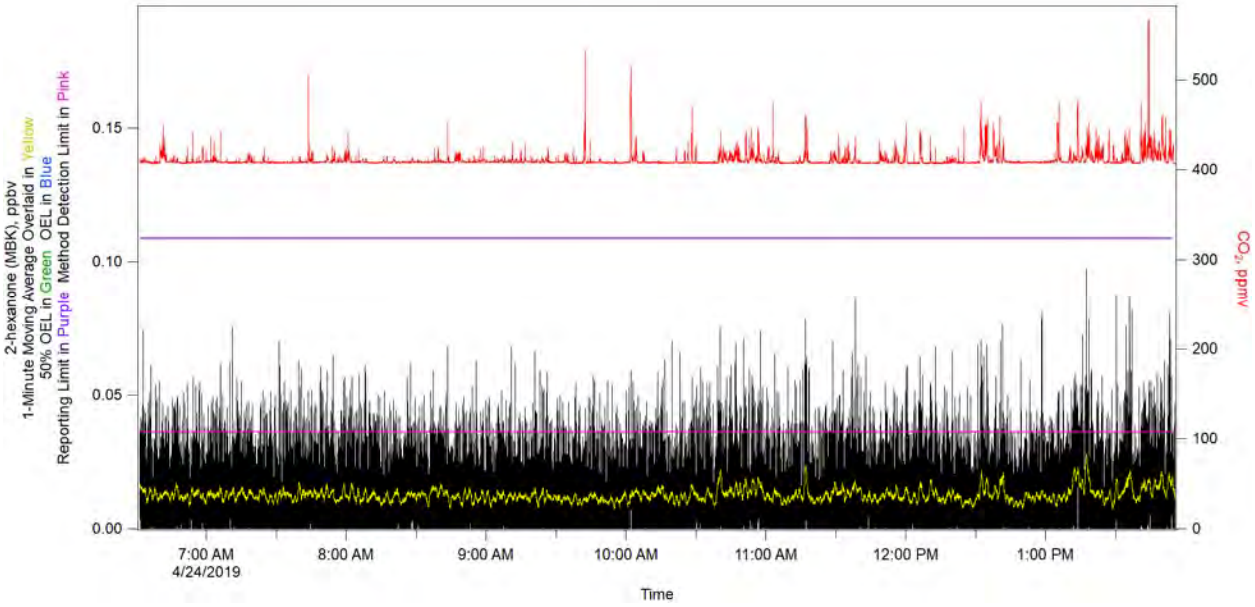


**Figure 4-29. 2-hexanone (MBK).**

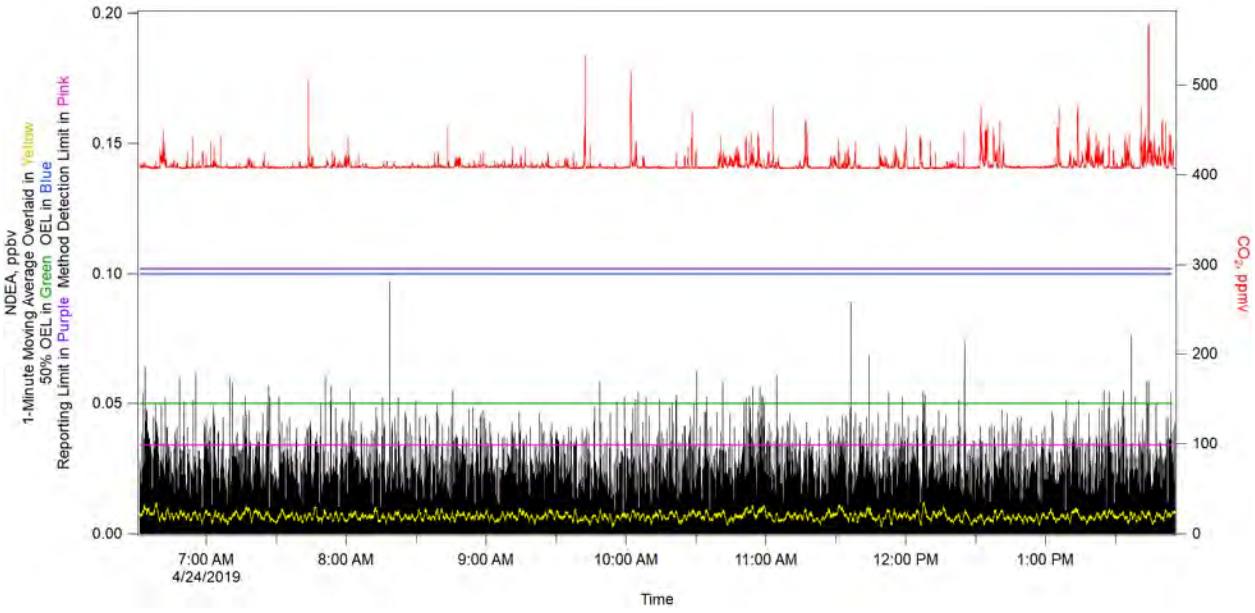


**Figure 4-30. N-nitrosodiethylamine (NDEA).**

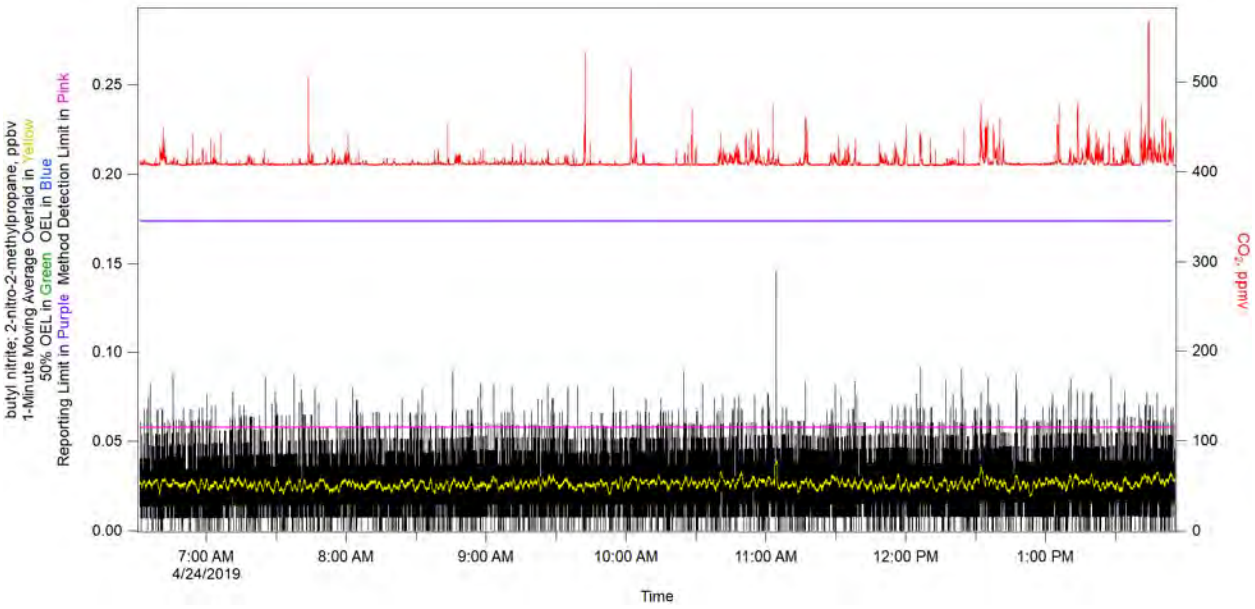


**Figure 4-31. Butyl Nitrite; 2-nitro-2-methylpropane.**

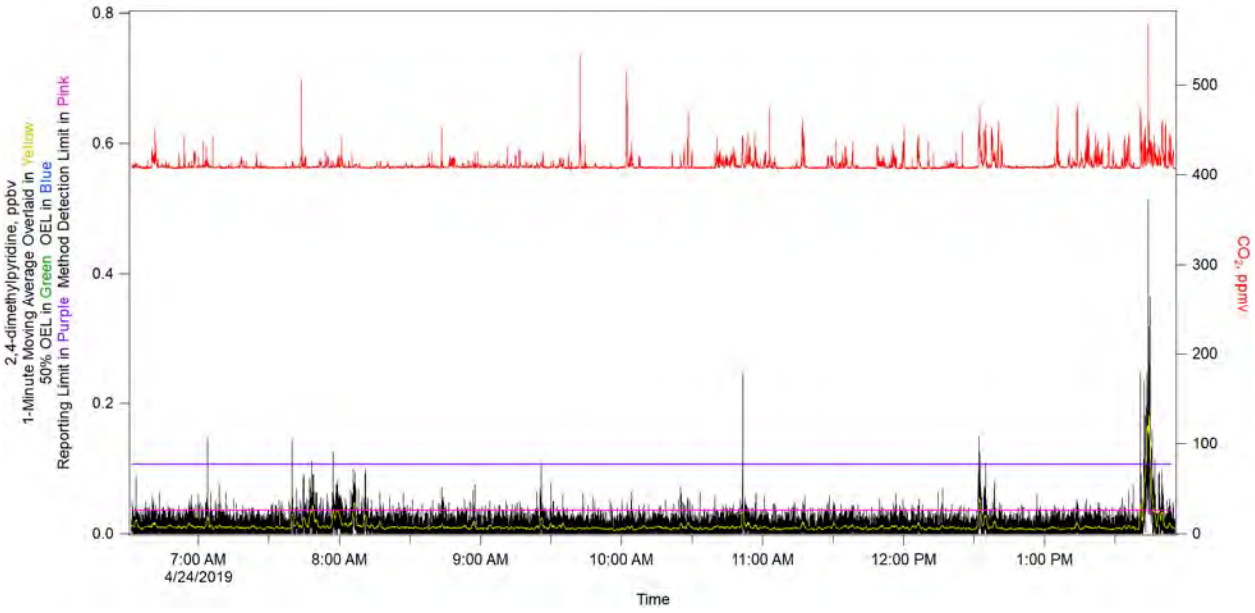


**Figure 4-32. 2,4-dimethylpyridine.**

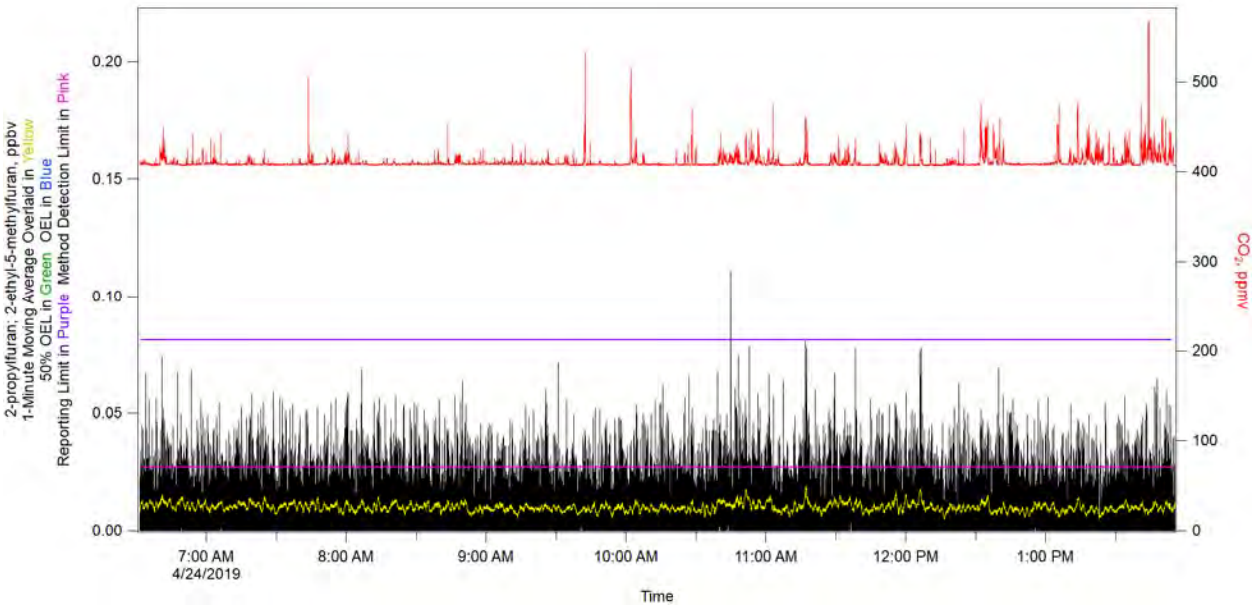


**Figure 4-33. 2-propylfuran; 2-ethyl-5-methylfuran.**

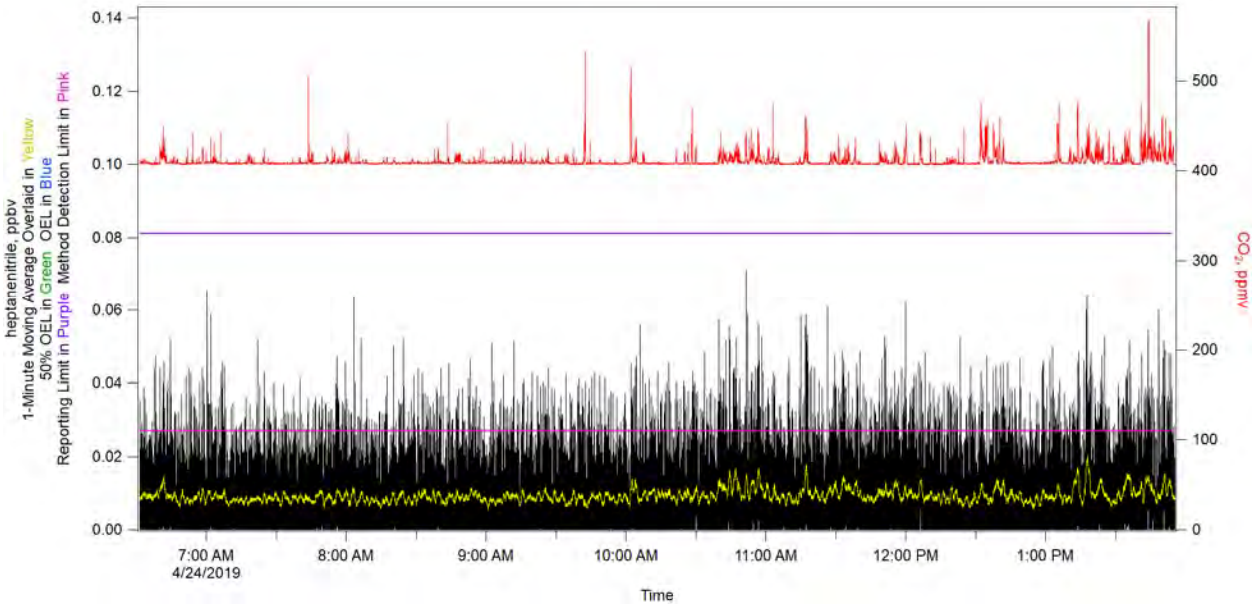


**Figure 4-34. Heptanenitrile.**

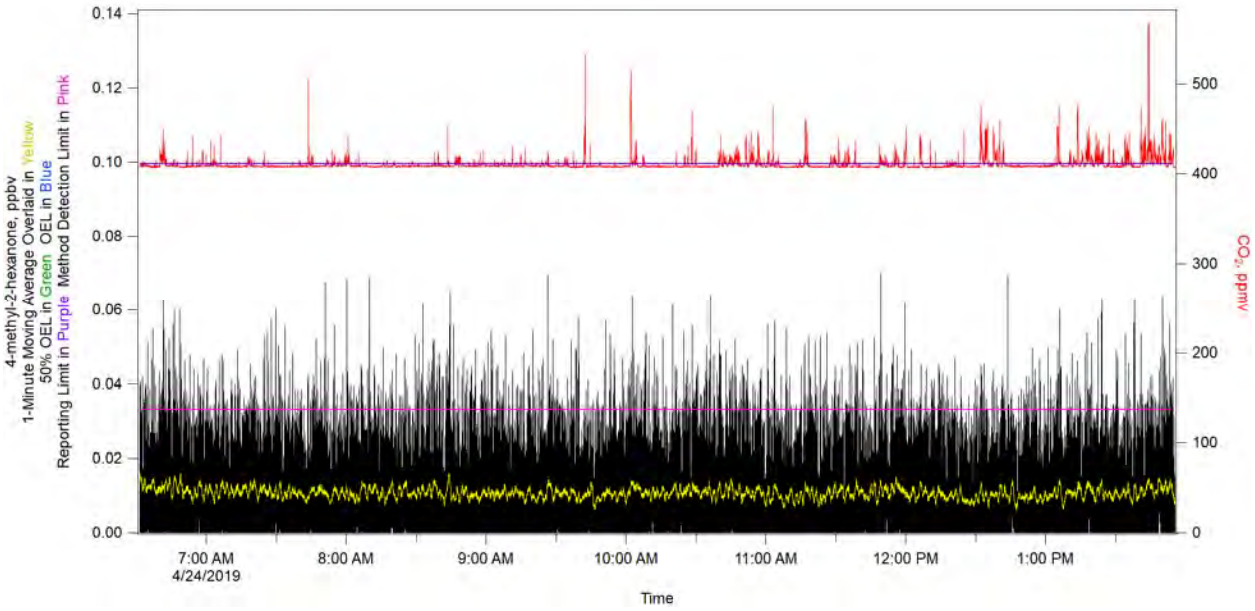


**Figure 4-35. 4-methyl-2-hexanone.**

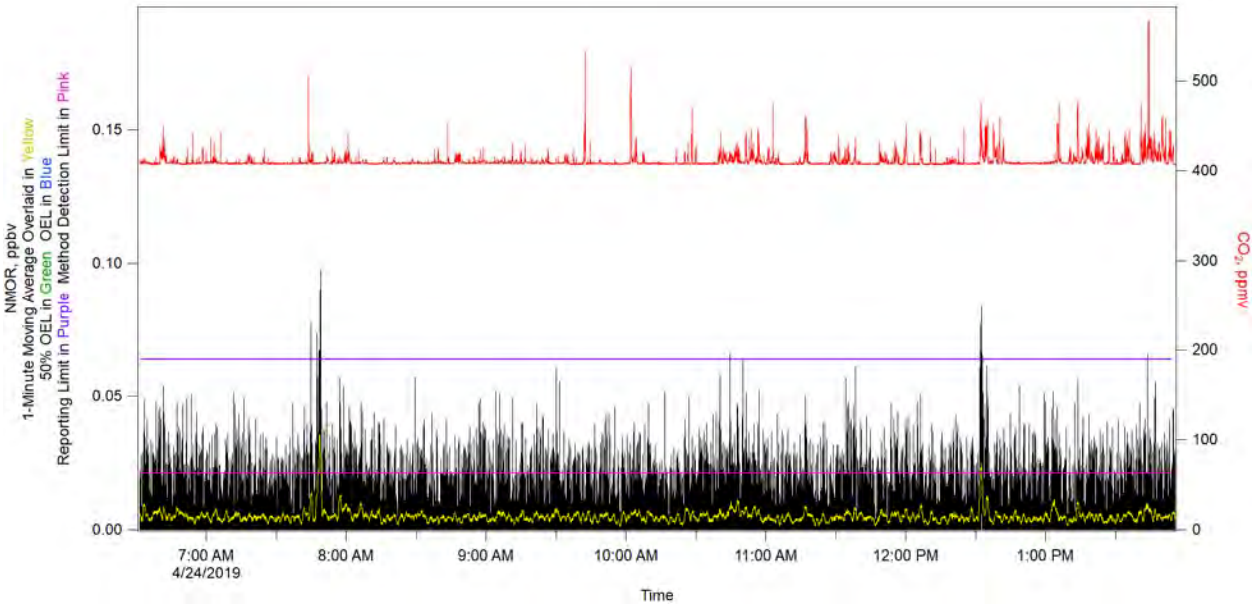


**Figure 4-36. N-nitrosomorpholine (NMOR).**

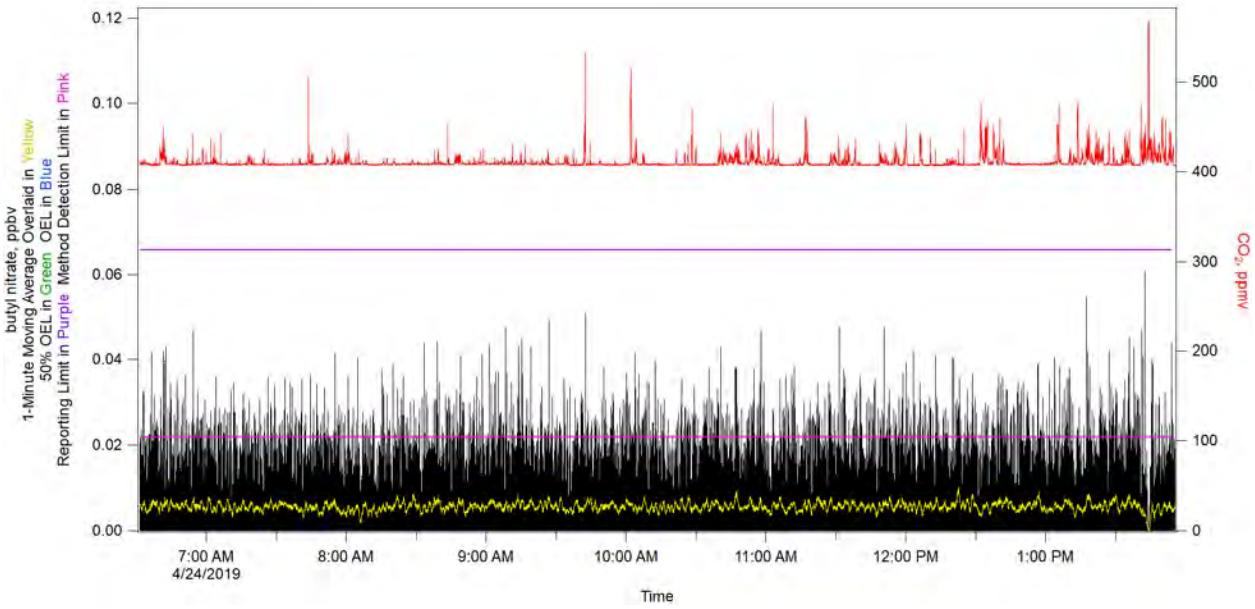


**Figure 4-37. Butyl Nitrate.**

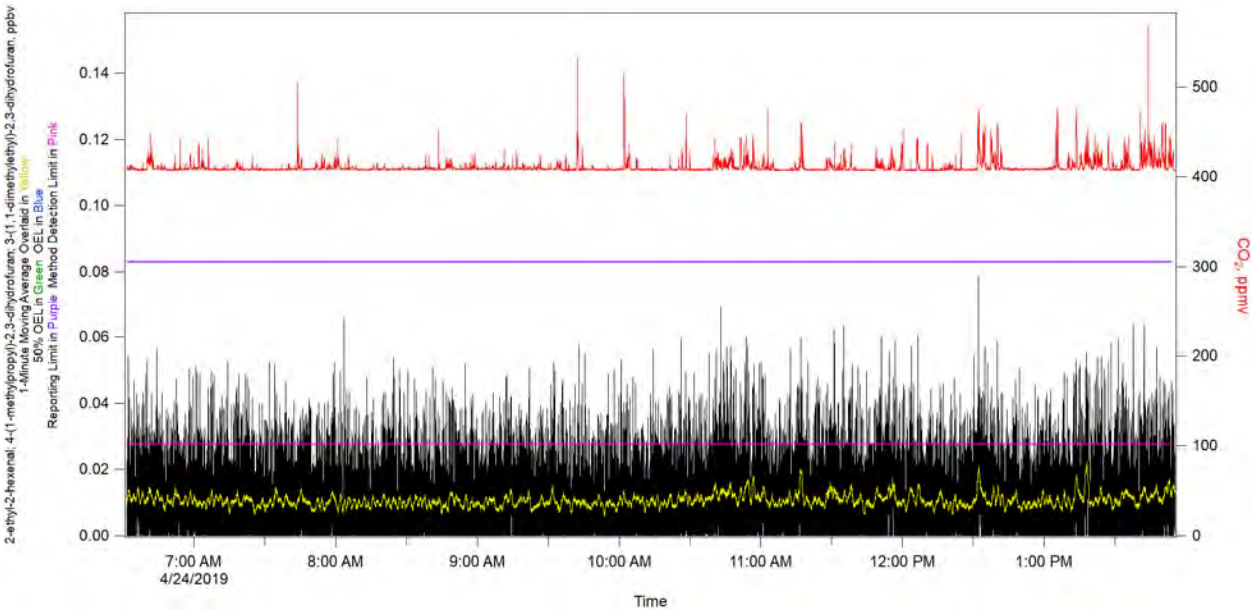


**Figure 4-38. 2-ethyl-2-hexenal; 4-(1-methylpropyl)-2,3-dihydrofuran 3-(1,1-dimethylethyl)-2,3-dihydrofuran.**

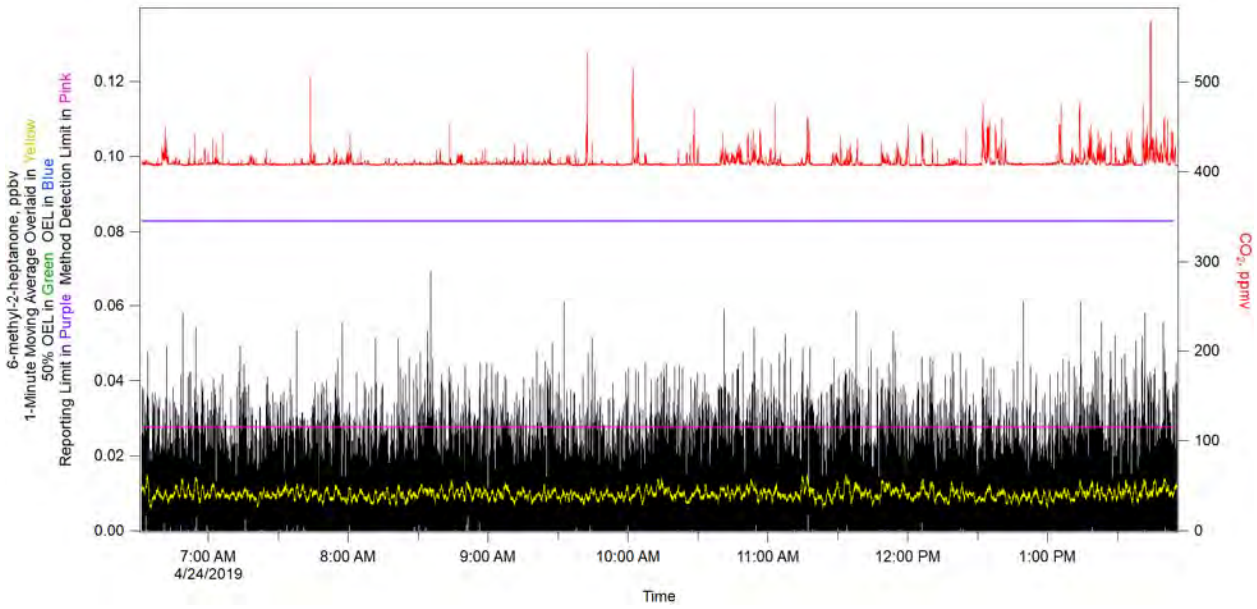


**Figure 4-39. 6-methyl-2-heptanone.**

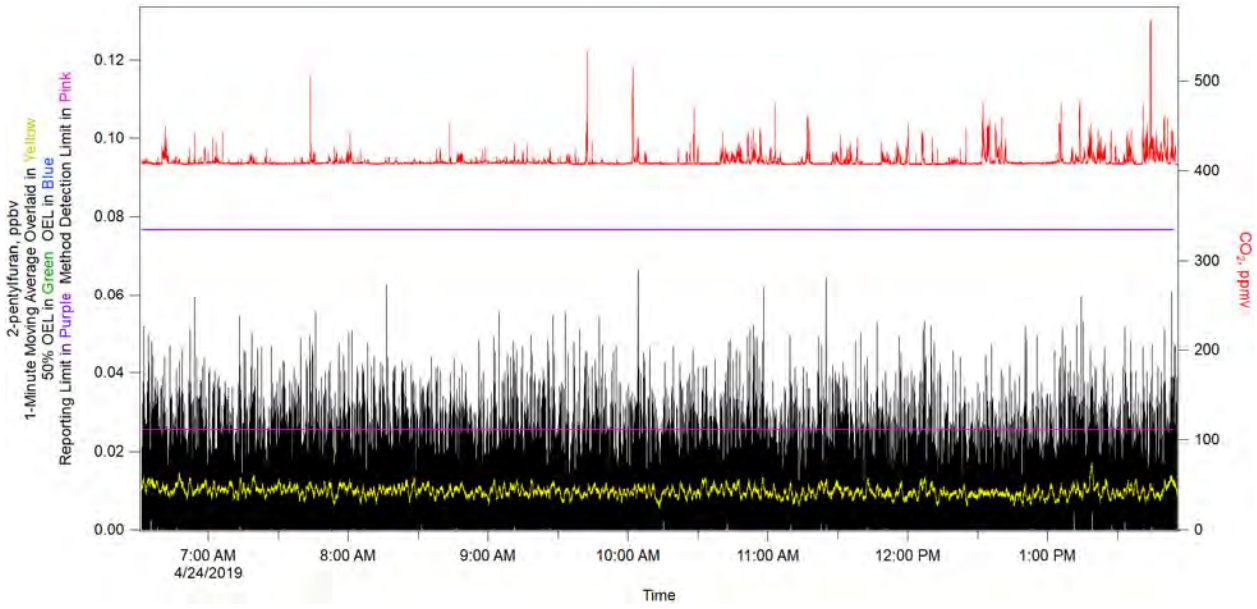


**Figure 4-40. 2-pentylfuran.**

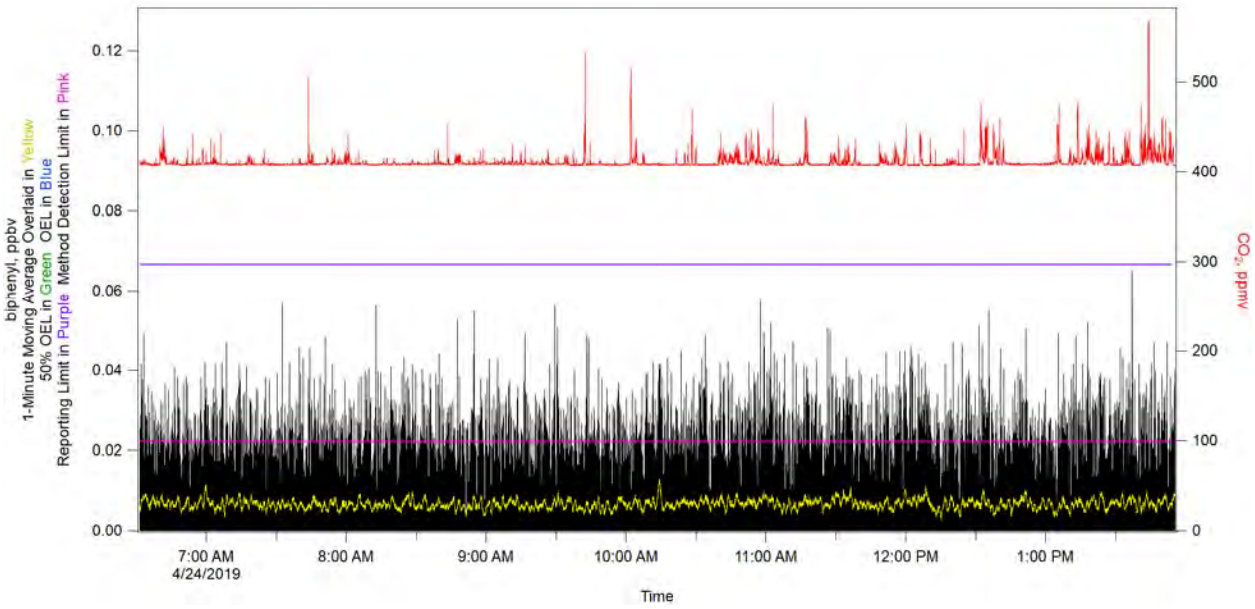


**Figure 4-41. Biphenyl.**

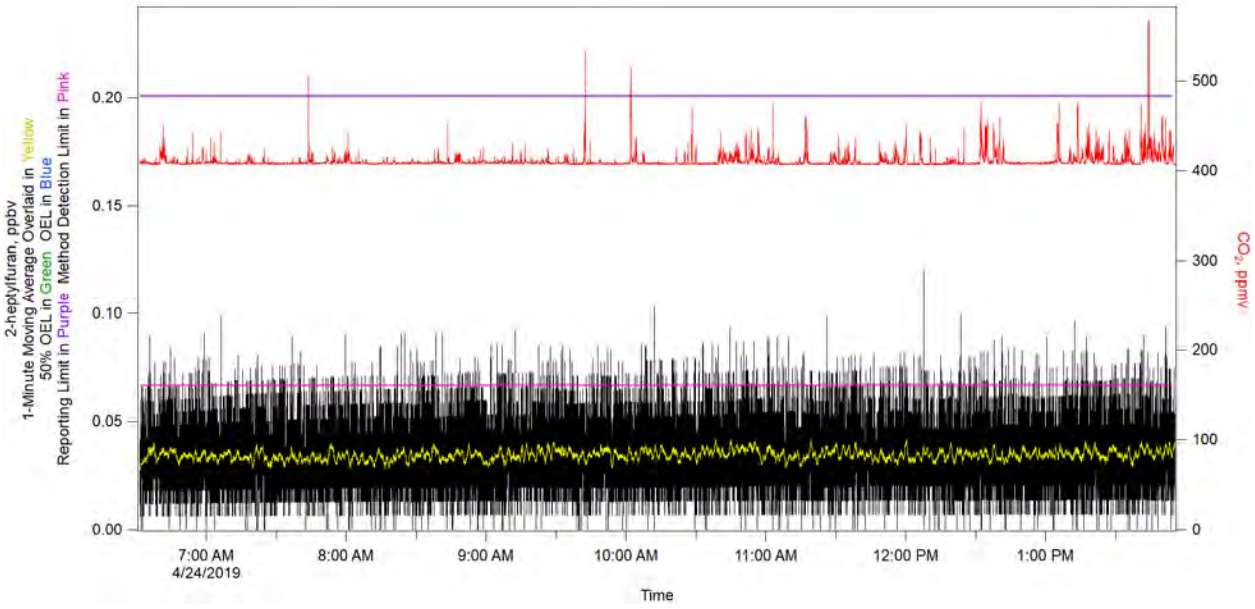


**Figure 4-42. 2-heptylfuran.**

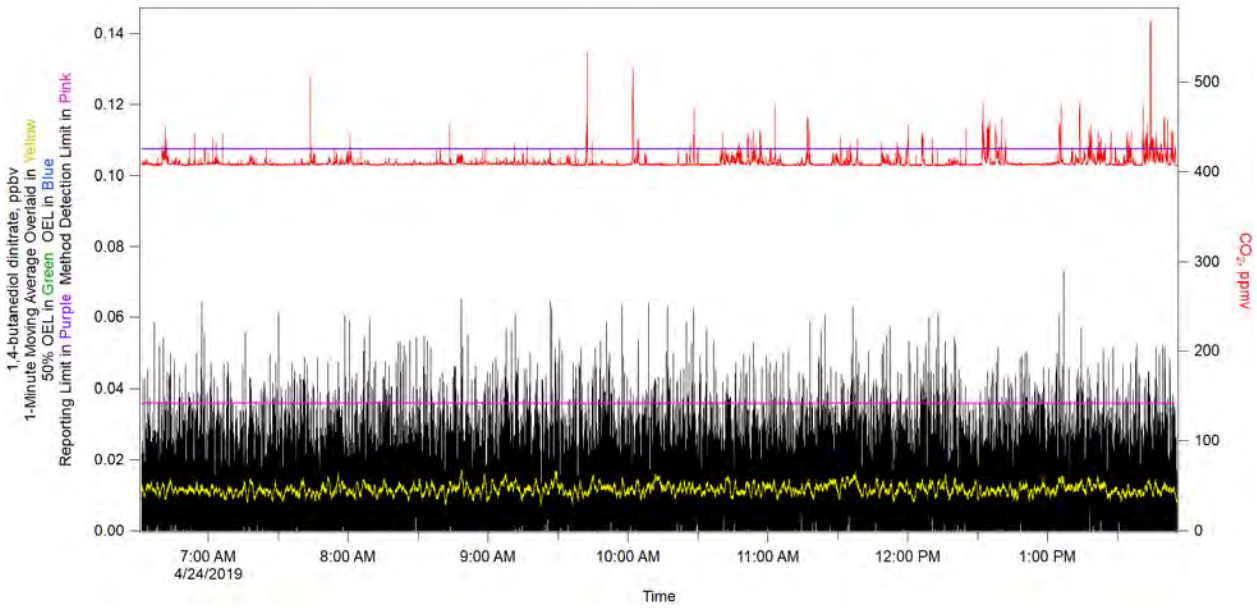


**Figure 4-43. 1,4-butanediol Dinitrate.**

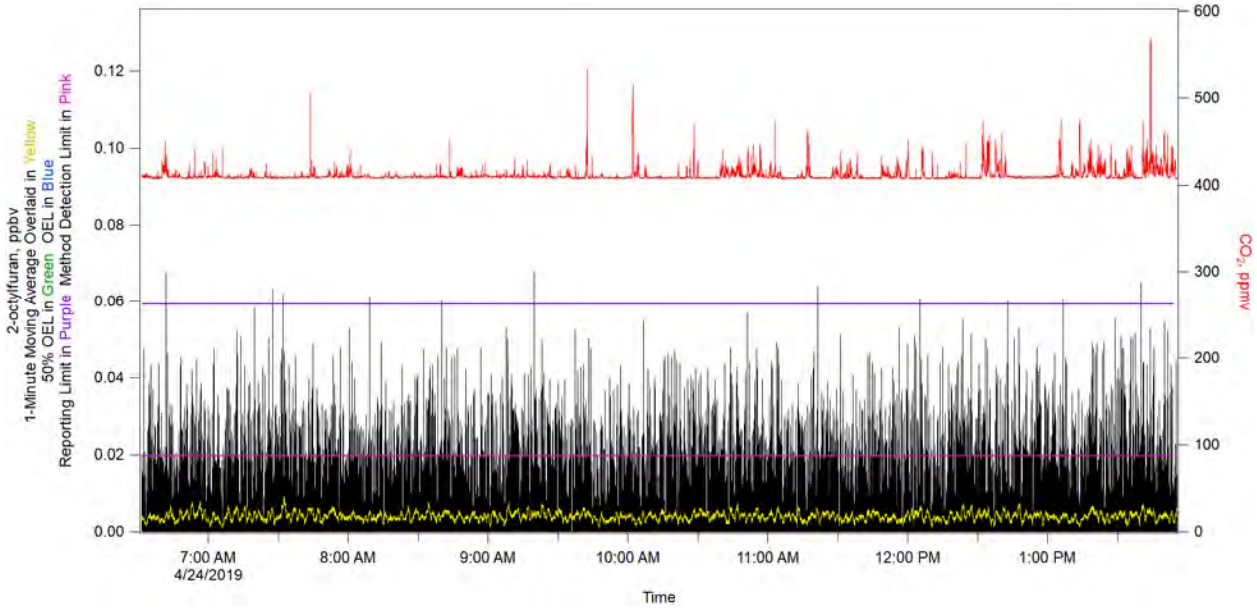


**Figure 4-44. 2-octylfuran.**

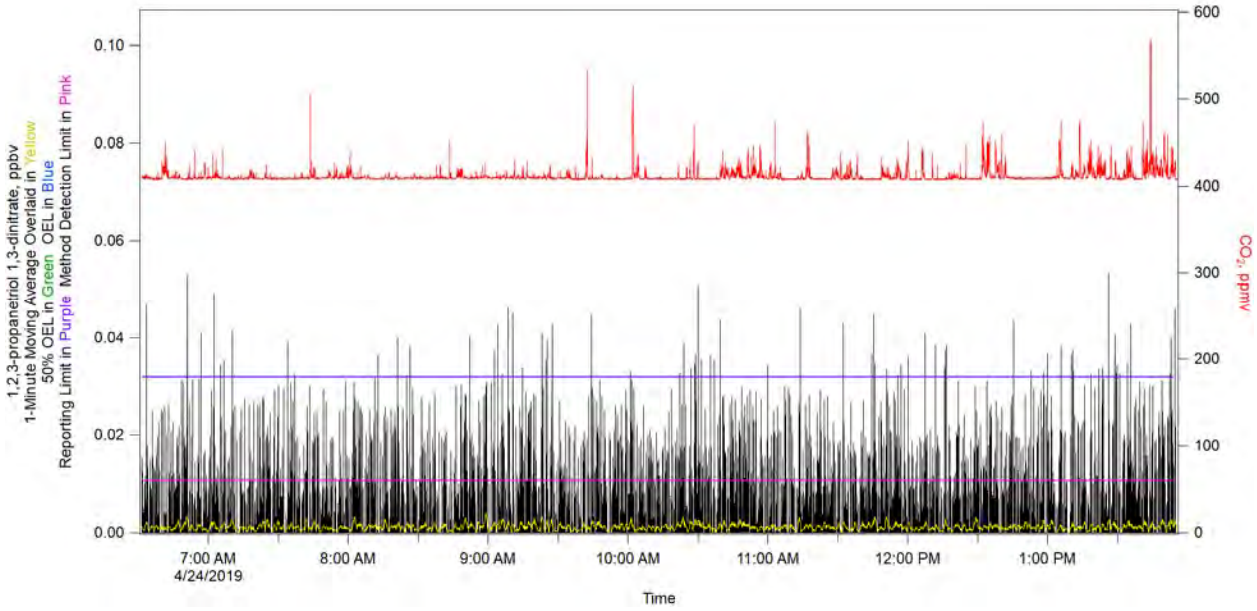


**Figure 4-45. 1,2,3-propanetriol 1,3-dinitrate.**

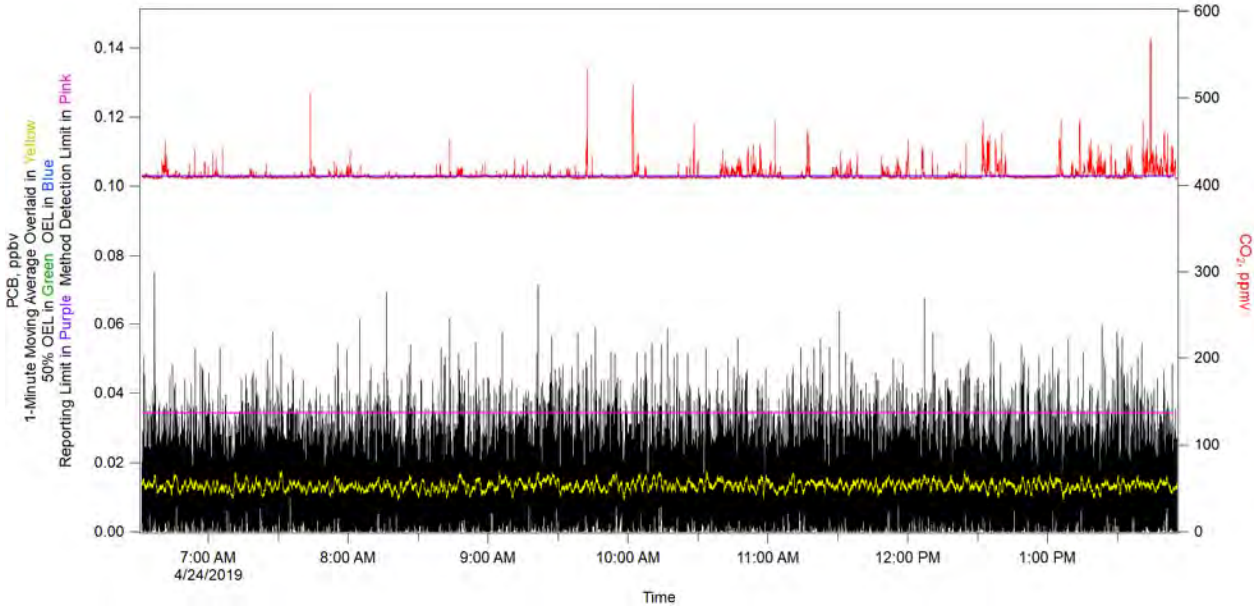


**Figure 4-46. PCB.**

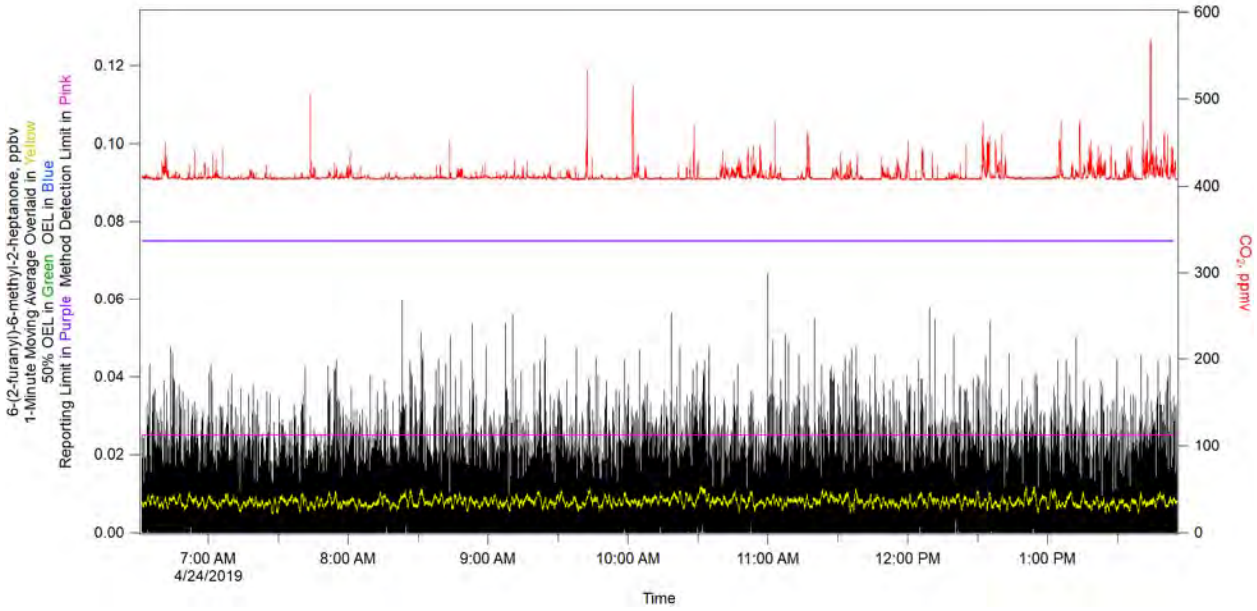


**Figure 4-47. 6-(2-furanyl)-6-methyl-2-heptanone.**

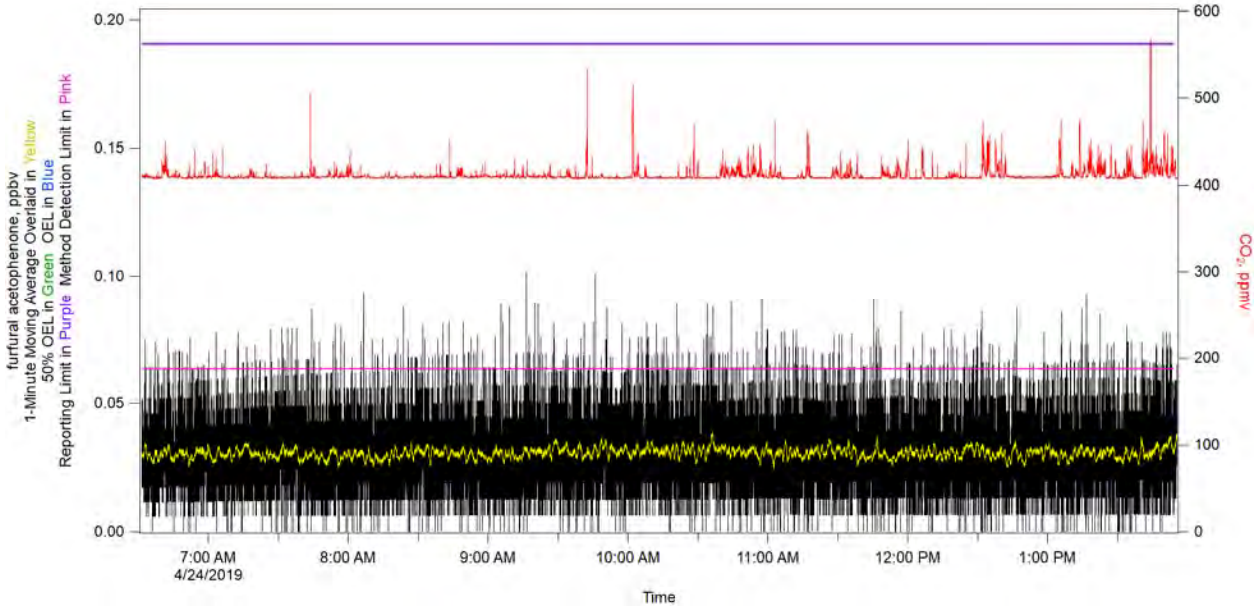


**Figure 4-48. Furfural Acetophenone.**

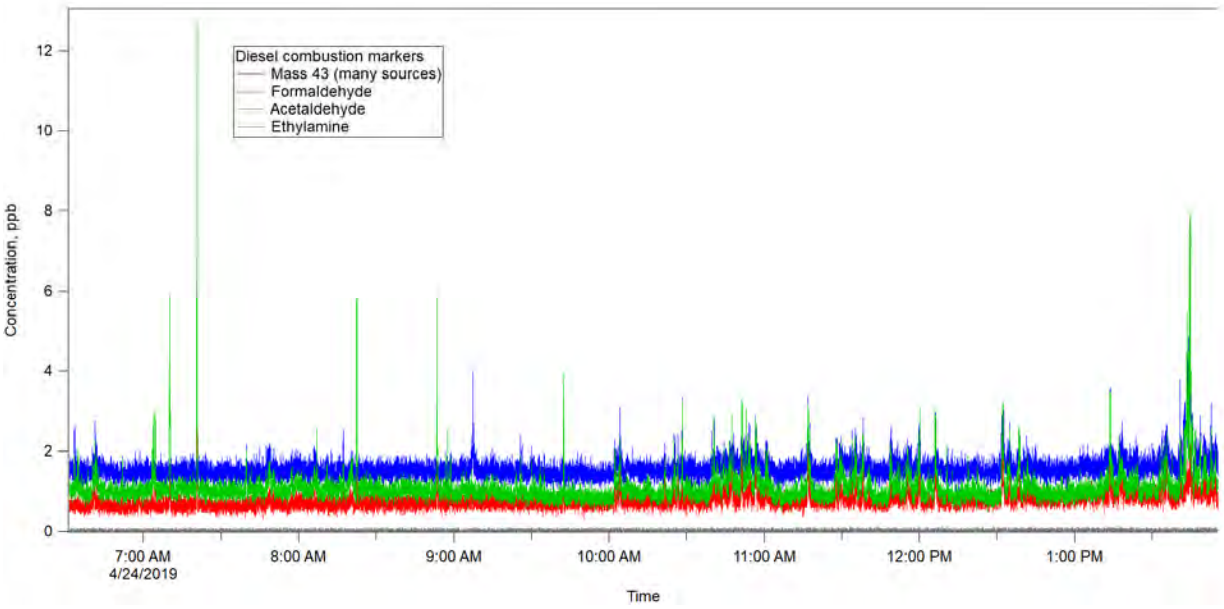


**Figure 4-49. Diesel Combustion Markers.**

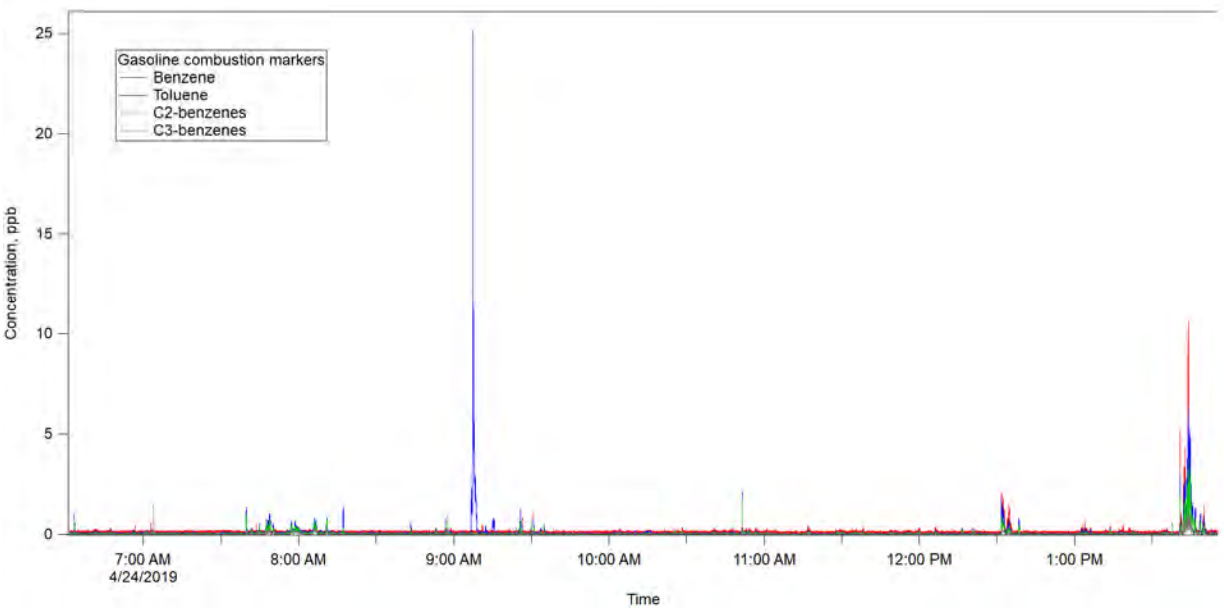


**Figure 4-50. Gasoline Combustion Markers.**

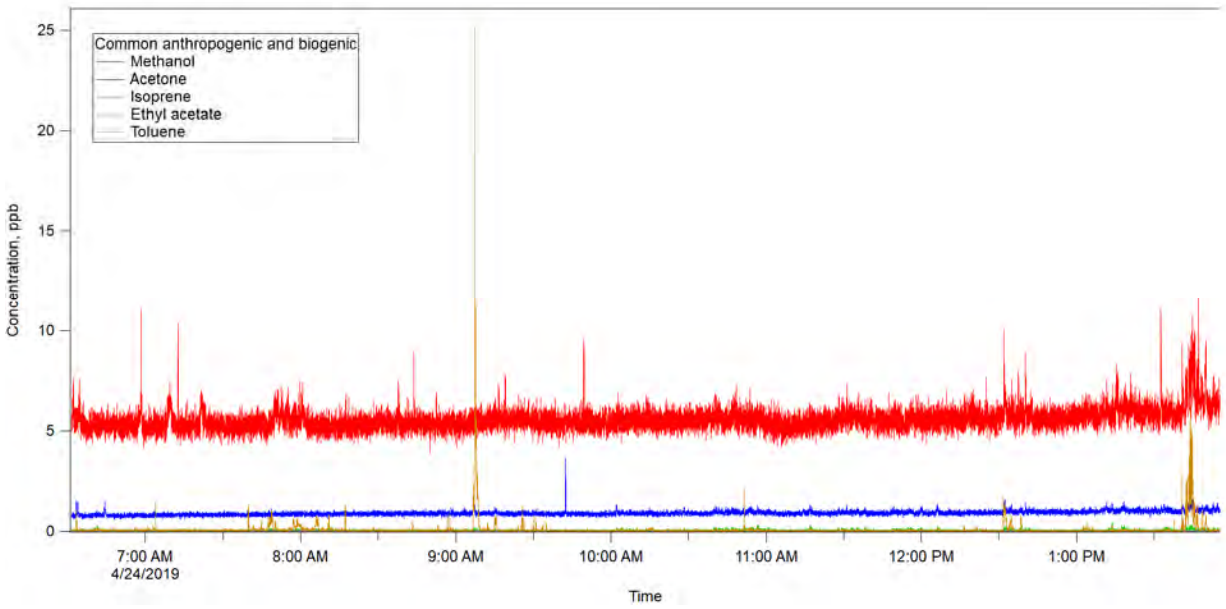


**Figure 4-51. Plant and Human Markers.**

# 5.0 APRIL 25, 2019 – AREA MONITORING

## 5.1 Quality Assessment

Data from April 25, 2019, were assessed using Procedure 17124-DOE-HS-102. A Data Exchange Checklist was completed. The data were accepted by TerraGraphics with the following comments. Report No. 66409-RPT-004 was adequately documented and all checks passed the acceptance limits.

## 5.2 Summary

On April 25, 2019, ML personnel arrived at the TerraGraphics warehouse at 05:09. The QA/QC zero-air/span checks were performed on the LI-COR $CO_2$ monitor, the Picarro $NH_3$ analyzer, and the PTR-MS beginning at 05:26. The ML arrived on the Hanford Site and checked in with the CSM at 06:25. The ML began a site survey loop of A Farms at 06:40. The ML parked east of AP Farm at 06:40, monitoring AP-102 pump manual rotation activities. At 08:03, the ML arrived at U Farm and attempted to stay downwind of the change trailer, but wind conditions were varying. The ML departed U Farm at 08:29 and performed a site survey loop. The ML parked north of C Farm and began tracking an herbicide truck. At 11:19, the ML parked at the southeast corner of the TX/TY Farm area. At 12:08, the ML left the area and began performing site survey loops. The ML personnel checked out with the CSM at 14:00 and the ML departed the site. The ML arrived back at the TerraGraphics warehouse at 14:59.

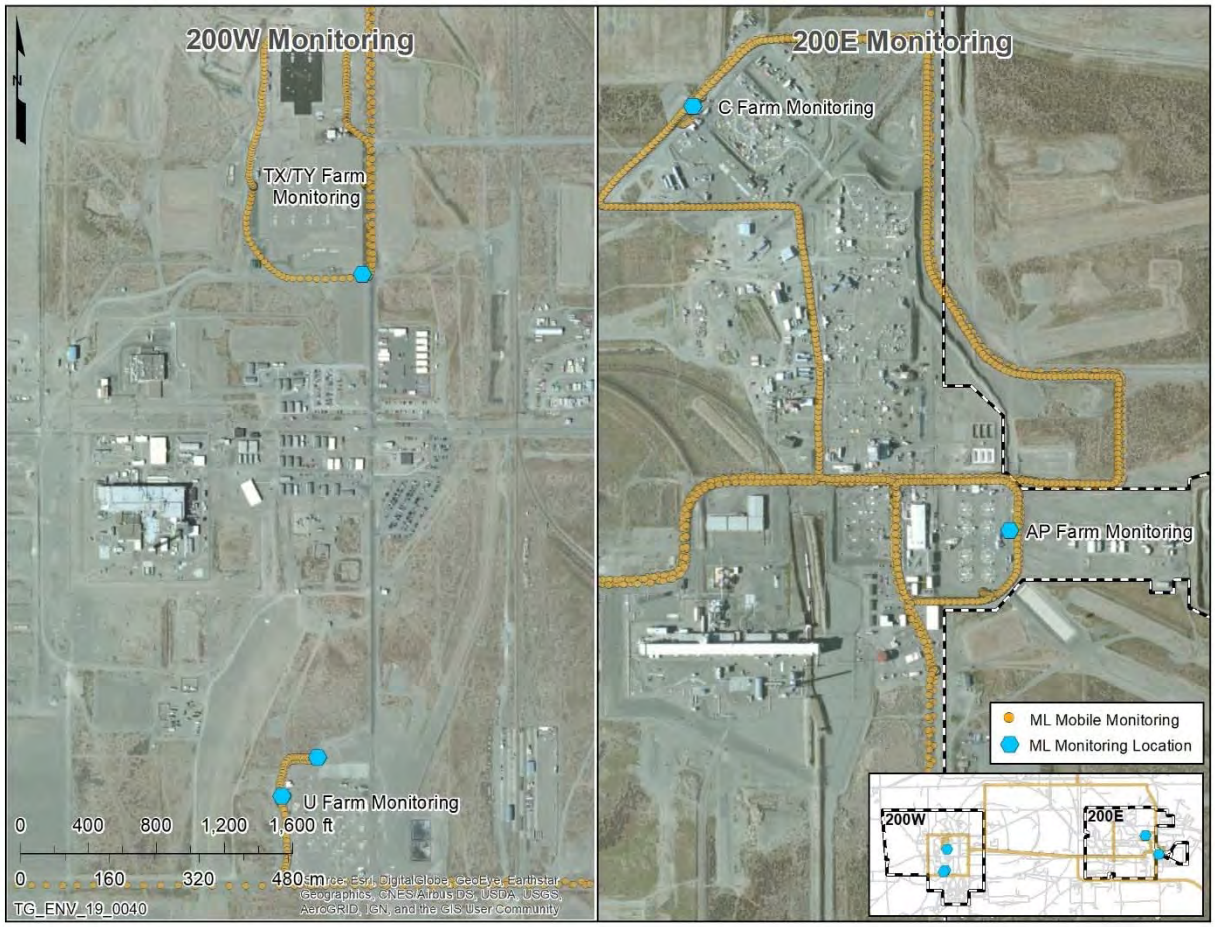


**Figure 5-1. Location of the Mobile Laboratory for the Duration of the Monitoring Period.**

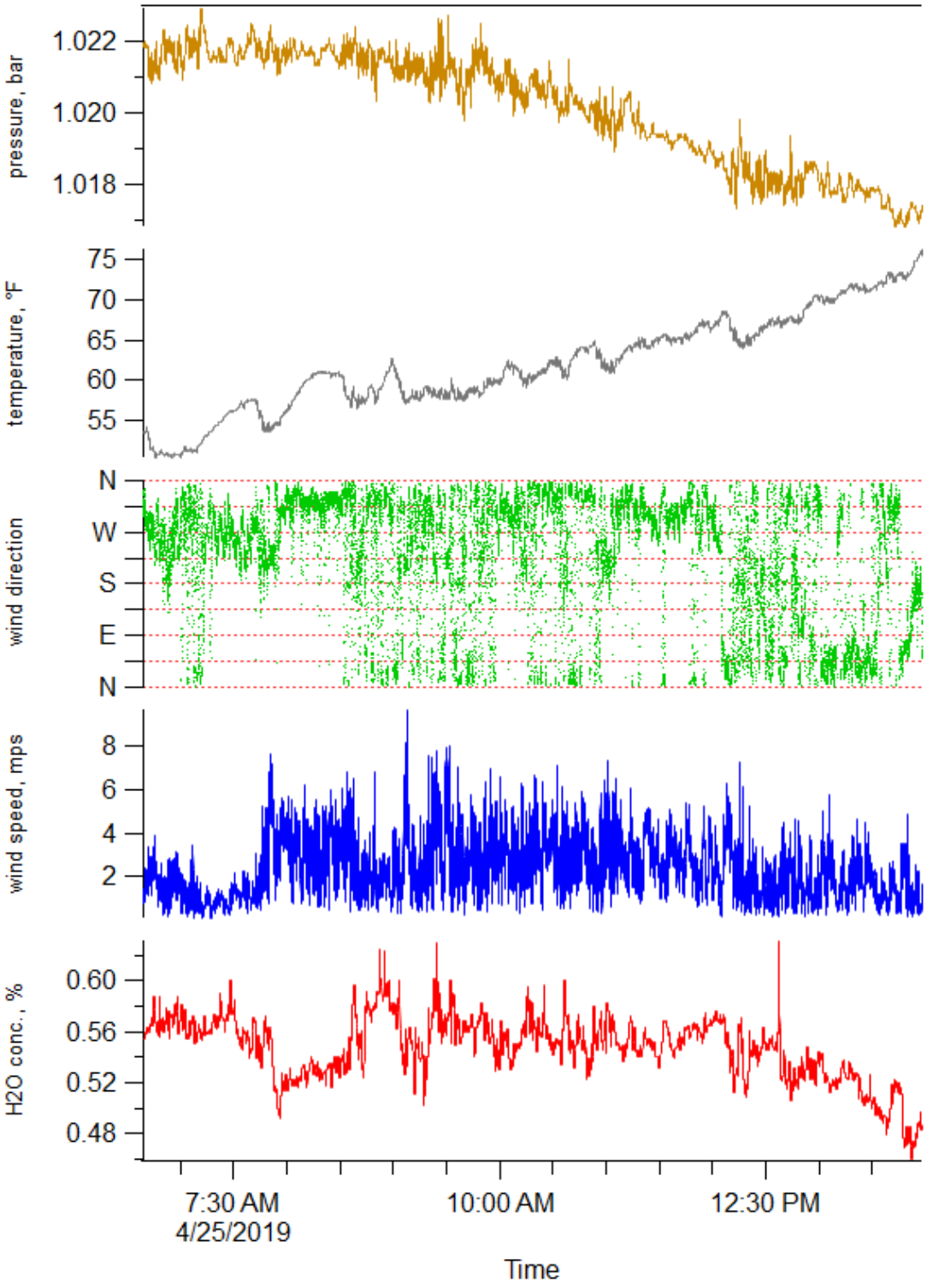


**Figure 5-2. Weather Data for the Duration of the Monitoring Period.**

### 5.3 Samples Collected

Continuous air monitoring was performed using the following instrumentation:

- PTR-TOF 6000 X2,
- LI-COR $CO_2$ Monitor,
- Picarro Ammonia Monitor, and
- Airmar Weather Station.

Confirmatory air samples were not collected during this period.

## 5.4 Area Monitoring

**Table 5-1. Chemical of Potential Concern Statistical Information for the Monitoring Period of April 25, 2019. (2 Sheets)**

| COPC # | COPC Name | OEL (ppb) | MDL (ppb) | Ave. (ppb) | St. Dev. (ppb) | Rel St. Dev. (%) | Max. (ppb) | Median (ppb) |
|---|---|---|---|---|---|---|---|---|
| 1 | ammonia | 25000 | 6.225 | 8.726† | 1.328 | 15.221 | 14.661 | 8.312† |
| 2 | formaldehyde | 300 | 1.721 | <1.721 | 0.174 | 17.168 | 6.191 | <1.721 |
| 3 | methanol | 200000 | 5.758 | 7.901† | 1.419 | 17.955 | 116.233 | 7.832† |
| 4 | acetonitrile | 20000 | 0.085 | 0.141† | 0.035 | 24.837 | 0.549 | 0.139† |
| 5 | acetaldehyde | 25000 | 1.027 | 1.447† | 0.302 | 20.906 | 11.869 | 1.406† |
| 6 | ethylamine | 5000 | 0.069 | <0.069 | 0.021 | 63.319 | 0.149 | <0.069 |
| 7 | 1,3-butadiene | 1000 | 0.183 | <0.183 | 0.055 | 49.557 | 0.714 | <0.183 |
| 8 | propanenitrile | 6000 | 0.107 | <0.107 | 0.024 | 46.163 | 0.218 | <0.107 |
| 9 | 2-propenal | 100 | 0.340 | <0.34 | 0.058 | 53.396 | 1.078 | <0.34 |
| 10 | 1-butanol + butenes | 20000 | 0.214 | <0.214 | 0.050 | 51.897 | 1.483 | <0.214 |
| 11 | methyl isocyanate | 20 | 0.069 | <0.069 | 0.025 | 57.418 | 0.174 | <0.069 |
| 12 | methyl nitrite | 100 | 0.098 | <0.098 | 0.037 | 39.216 | 0.572 | <0.098 |
| 13 | furan | 1 | 0.062 | <0.062 | 0.017 | 58.547 | 0.170 | <0.062 |
| 14 | butanenitrile | 8000 | 0.039 | <0.039 | 0.016 | 72.177 | 0.120 | <0.039 |
| 15 | but-3-en-2-one + 2,3-dihydrofuran + 2,5-dihydrofuran | 200, 1, 1 | 0.041 | <0.041 | 0.020 | 56.315 | N/A* | N/A* |
| 16 | butanal | 25000 | 0.061 | 0.143† | 0.036 | 25.154 | 0.341 | 0.142† |
| 17 | NDMA** | 0.3 | 0.082 | <0.082 | 0.024 | 171.852 | 0.187 | <0.082 |
| 18 | benzene | 500 | 0.236 | <0.236 | 0.050 | 34.311 | 1.665 | <0.236 |
| 19 | 2,4-pentadienenitrile + pyridine | 300, 1000 | 0.085 | <0.085 | 0.019 | 44.203 | 0.151 | <0.085 |
| 20 | 2-methylene butanenitrile | 300 | 0.036 | <0.036 | 0.011 | 77.220 | 0.076 | <0.036 |
| 21 | 2-methylfuran | 1 | 0.043 | <0.043 | 0.020 | 64.666 | 0.249 | <0.043 |
| 22 | pentanenitrile | 6000 | 0.036 | <0.036 | 0.012 | 81.538 | 0.094 | <0.036 |
| 23 | 3-methyl-3-buten-2-one + 2-methyl-2-butenal | 20, 30 | 0.043 | <0.043 | 0.020 | 66.140 | 0.174 | <0.043 |
| 24 | NEMA** | 0.3 | 0.058 | <0.058 | 0.021 | 154.378 | 0.155 | <0.058 |
| 25 | 2,5-dimethylfuran | 1 | 0.032 | <0.032 | 0.015 | 81.441 | 0.181 | <0.032 |
| 26 | hexanenitrile | 6000 | 0.031 | <0.031 | 0.010 | 93.082 | 0.073 | <0.031 |
| 27 | 2-hexanone (MBK) | 5000 | 0.036 | <0.036 | 0.013 | 91.578 | 0.103 | <0.036 |
| 28 | NDEA** | 0.1 | 0.034 | <0.034 | 0.011 | 146.664 | 0.091 | <0.034 |

**Table 5-1. Chemical of Potential Concern Statistical Information for the Monitoring Period of April 25, 2019. (2 Sheets)**

| COPC # | COPC Name | OEL (ppb) | MDL (ppb) | Ave. (ppb) | St. Dev. (ppb) | Rel St. Dev. (%) | Max. (ppb) | Median (ppb) |
|---|---|---|---|---|---|---|---|---|
| 29 | butyl nitrite + 2-nitro-2-methylpropane | 100, 300 | 0.058 | <0.058 | 0.015 | 49.992 | 0.103 | <0.058 |
| 30 | 2,4-dimethylpyridine | 500 | 0.036 | <0.036 | 0.010 | 105.675 | 0.162 | <0.036 |
| 31 | 2-propylfuran + 2-ethyl-5-methylfuran | 1 | 0.027 | <0.027 | 0.012 | 102.766 | 0.090 | <0.027 |
| 32 | heptanenitrile | 6000 | 0.027 | <0.027 | 0.009 | 97.437 | 0.061 | <0.027 |
| 33 | 4-methyl-2-hexanone | 500 | 0.033 | <0.033 | 0.011 | 95.943 | 0.074 | <0.033 |
| 34 | NMOR** | 0.6 | 0.021 | <0.021 | 0.009 | 172.696 | 0.070 | <0.021 |
| 35 | butyl nitrate | 2500 | 0.022 | <0.022 | 0.007 | 125.048 | 0.053 | <0.022 |
| 36 | 2-ethyl-2-hexenal + 4-(1-methylpropyl)-2,3-dihydrofuran + 3-(1,1-dimethylethyl)-2,3-dihydrofuran | 100, 1, 1 | 0.028 | <0.028 | 0.010 | 93.744 | 0.086 | <0.028 |
| 37 | 6-methyl-2-heptanone | 8000 | 0.028 | <0.028 | 0.009 | 92.542 | 0.074 | <0.028 |
| 38 | 2-pentylfuran | 1 | 0.026 | <0.026 | 0.010 | 91.077 | 0.082 | <0.026 |
| 39 | biphenyl | 200 | 0.022 | <0.022 | 0.009 | 127.802 | 0.060 | <0.022 |
| 40 | 2-heptylfuran | 1 | 0.067 | <0.067 | 0.015 | 42.904 | 0.105 | <0.067 |
| 41 | 1,4-butanediol dinitrate | 50 | 0.036 | <0.036 | 0.010 | 87.985 | 0.074 | <0.036 |
| 42 | 2-octylfuran | 1 | 0.020 | <0.02 | 0.008 | 205.792 | 0.071 | <0.02 |
| 43 | 1,2,3-propanetriol 1,3-dinitrate | 50 | 0.011 | <0.011 | 0.004 | 365.357 | 0.055 | <0.011 |
| 44 | PCB | 1000 | 0.034 | <0.034 | 0.010 | 72.343 | 0.069 | <0.034 |
| 45 | 6-(2-furanyl)-6-methyl-2-heptanone | 1 | 0.025 | <0.025 | 0.008 | 100.891 | 0.059 | <0.025 |
| 46 | furfural acetophenone | 1 | 0.064 | <0.064 | 0.015 | 43.559 | 0.116 | <0.064 |
| N/A* | The maximum peak value for but-3-en-2-one + 2,3 dihydrofuran + 2,5 dihydrofuran was 0.343 ppb and the median value was <0.041 ppb. The PTR-MS results for but-3-en-2-one + 2,3 dihydrofuran + 2,5 dihydrofuran are not compared to OEL concentrations because: 1) the result is suspect due to a known biogenic interferant (methacrolein) that is expected to be in concentrations that occasionally exceed the dihydrofuran OEL, and 2) this combination of COPCs have OEL concentrations that differ by a factor of 200, which provide widely variant bases for these numbers. | | | | | | | |
| ** | Nitrosamine results are suspect due to isobaric interferants causing positive bias that have been encountered during previous background [53005-81-RPT-007, *PTR-MS Mobile Laboratory Vapor Monitoring Background Study, (3/18/2018 – 4/20/2018)*, and *Fiscal Year 2017 Mobile Laboratory Vapor Monitoring at the Hanford Site: Monitoring During Waste Disturbing Activities and Background Study*, RJ Lee Group, Inc.]. | | | | | | | |
| < | COPC Averages below the MDL. | | | | | | | |
| † | COPC Averages between the RL and the MDL. | | | | | | | |
| | COPC Averages >100% of the OEL. | | | | | | | |
| | COPC Averages 50-100% of the OEL. | | | | | | | |
| | COPC Averages 10-50% of the OEL. | | | | | | | |

Figure 5-3 through Figure 5-51 display 46 COPC signals, overlaid with the same signal smoothed using a 1-minute moving average (in cases where a moving average assists with data visualization), and $CO_2$, for the monitoring period April 25, 2019. If within range of the plot's left axis, a green horizontal line representing 50% of the COPC's OEL, a blue horizontal line representing the COPC's OEL, a horizontal purple line representing the RL, and a pink horizontal line representing the MDL are shown.

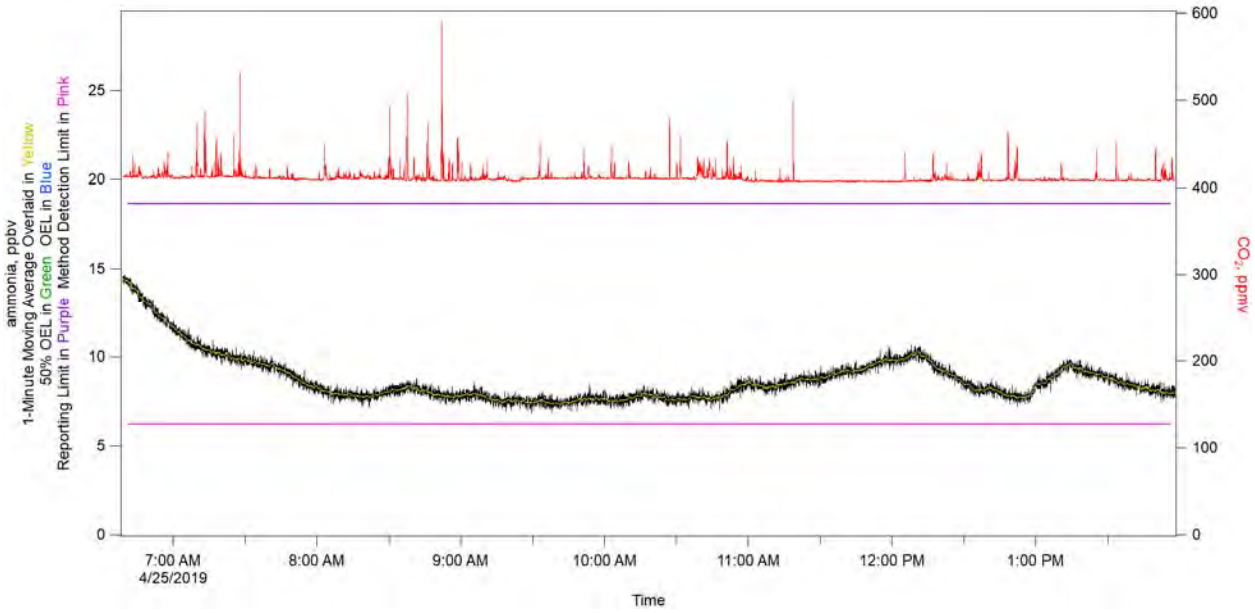


**Figure 5-3. Ammonia.**

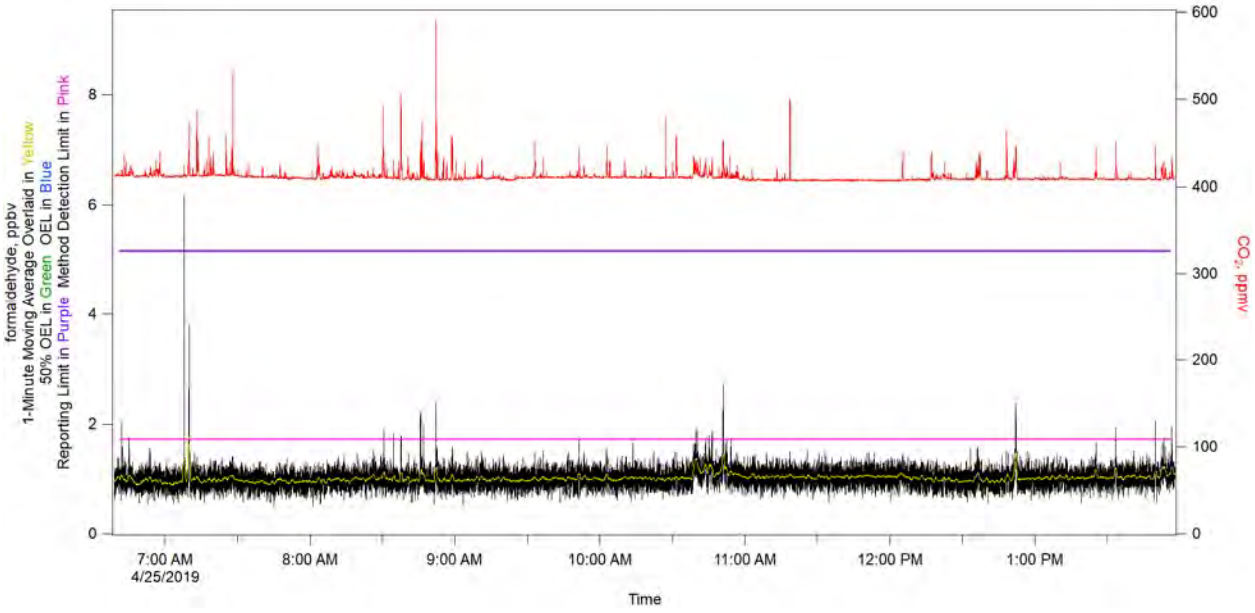


**Figure 5-4. Formaldehyde.**

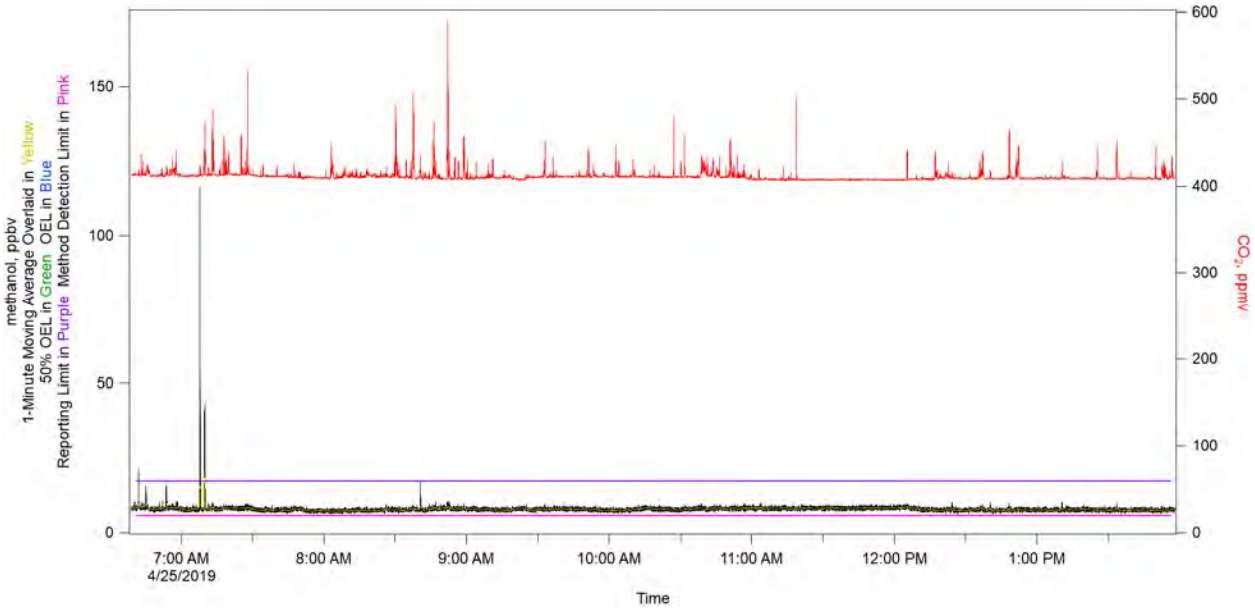


**Figure 5-5. Methanol.**

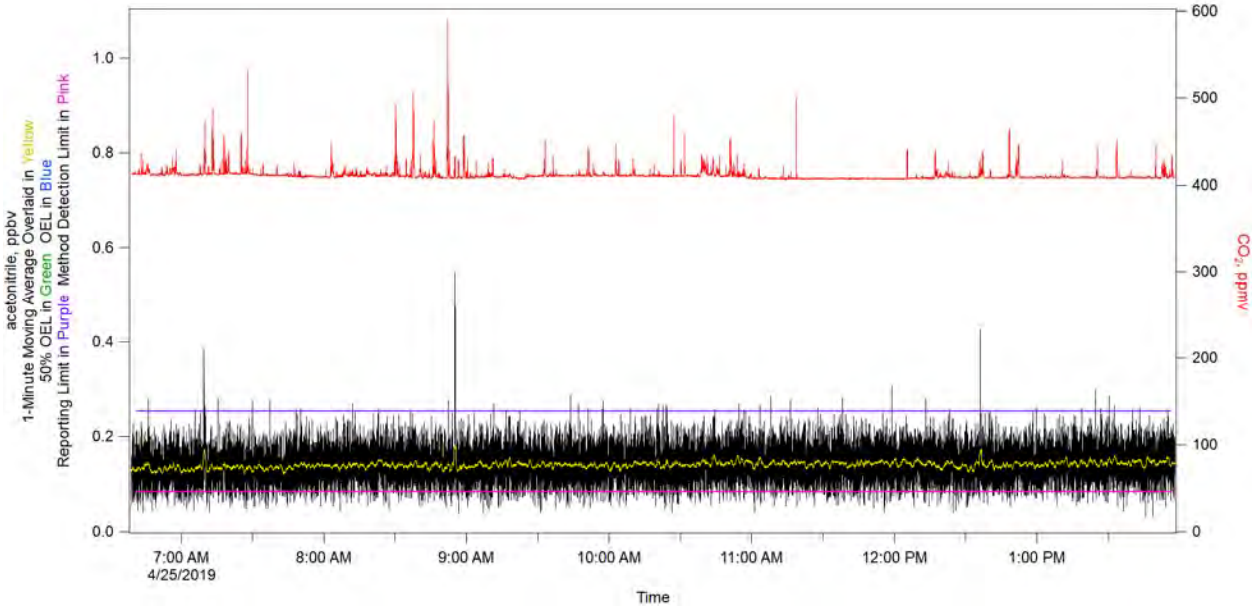


**Figure 5-6. Acetonitrile.**

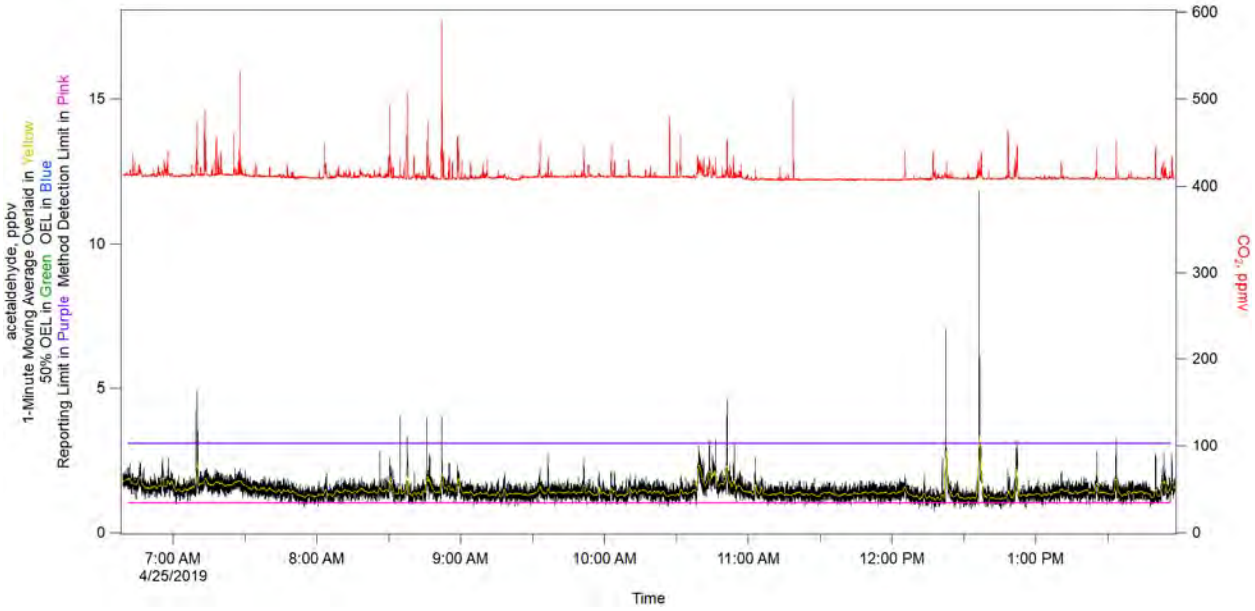


**Figure 5-7. Acetaldehyde.**

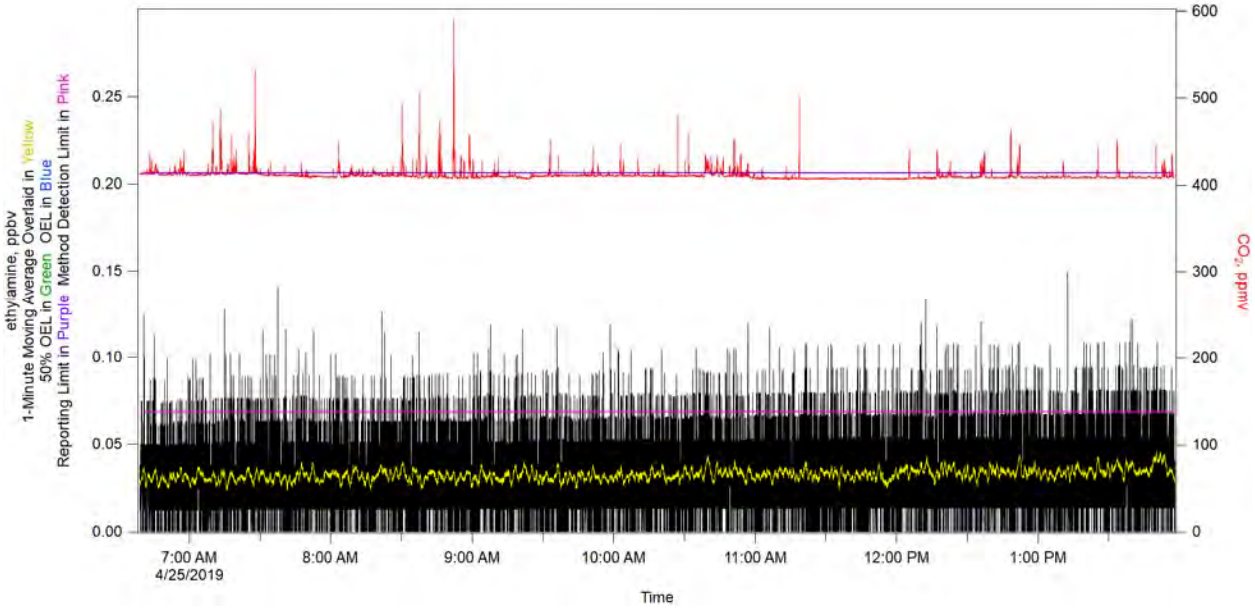


**Figure 5-8. Ethylamine.**

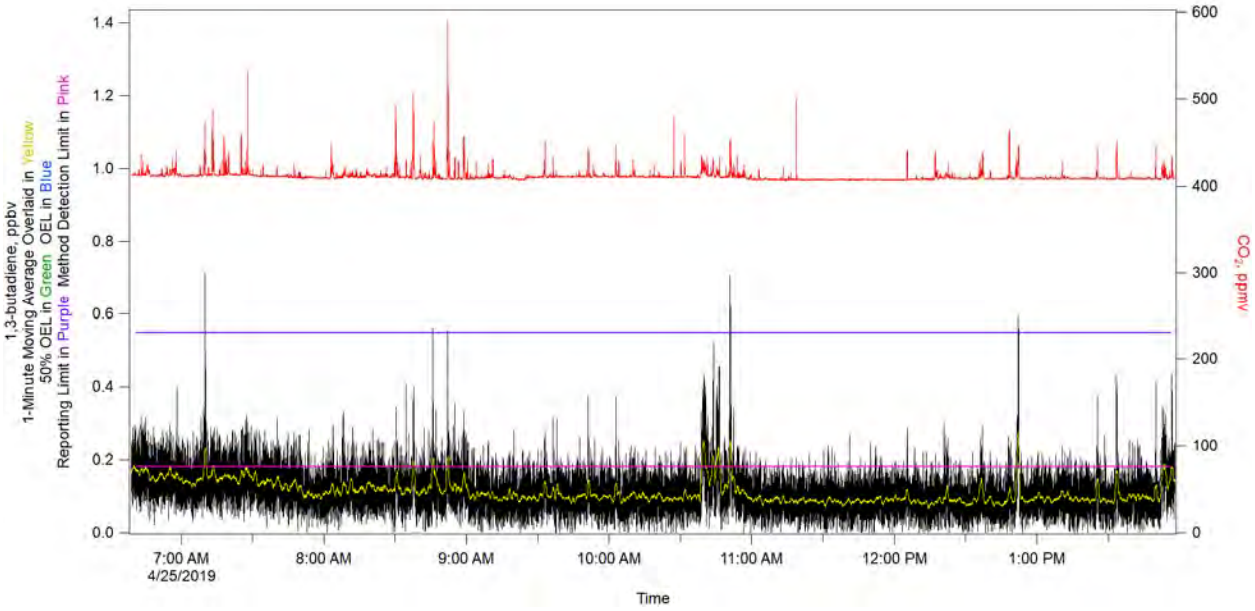


**Figure 5-9. 1,3-butadiene.**

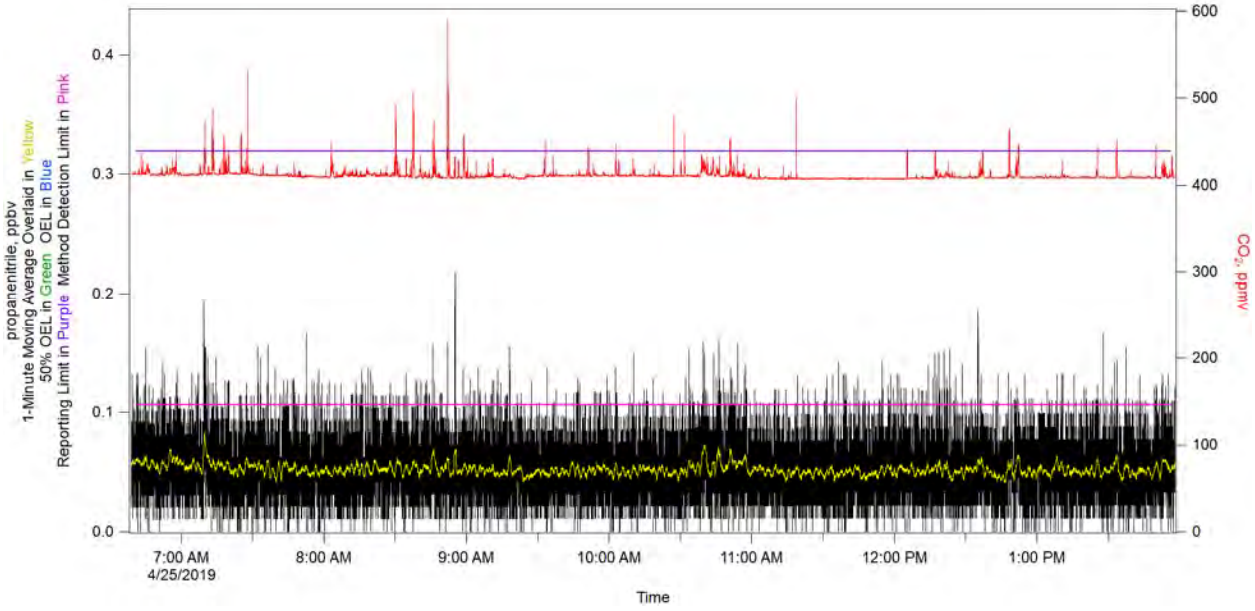


**Figure 5-10. Propanenitrile.**

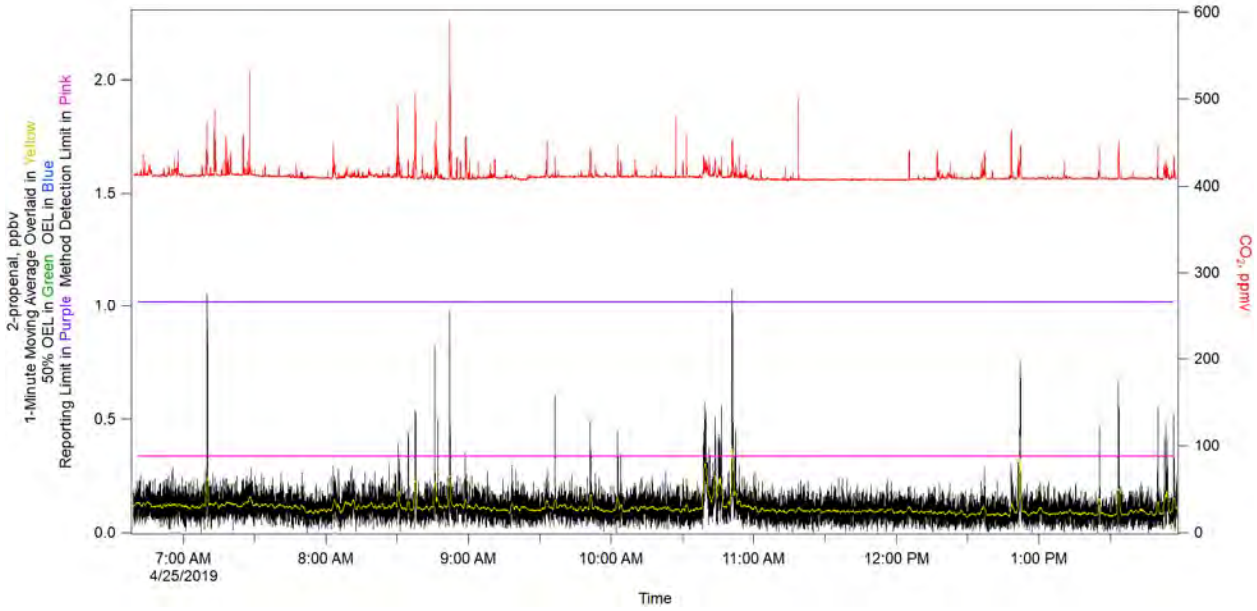


**Figure 5-11. 2-propenal.**

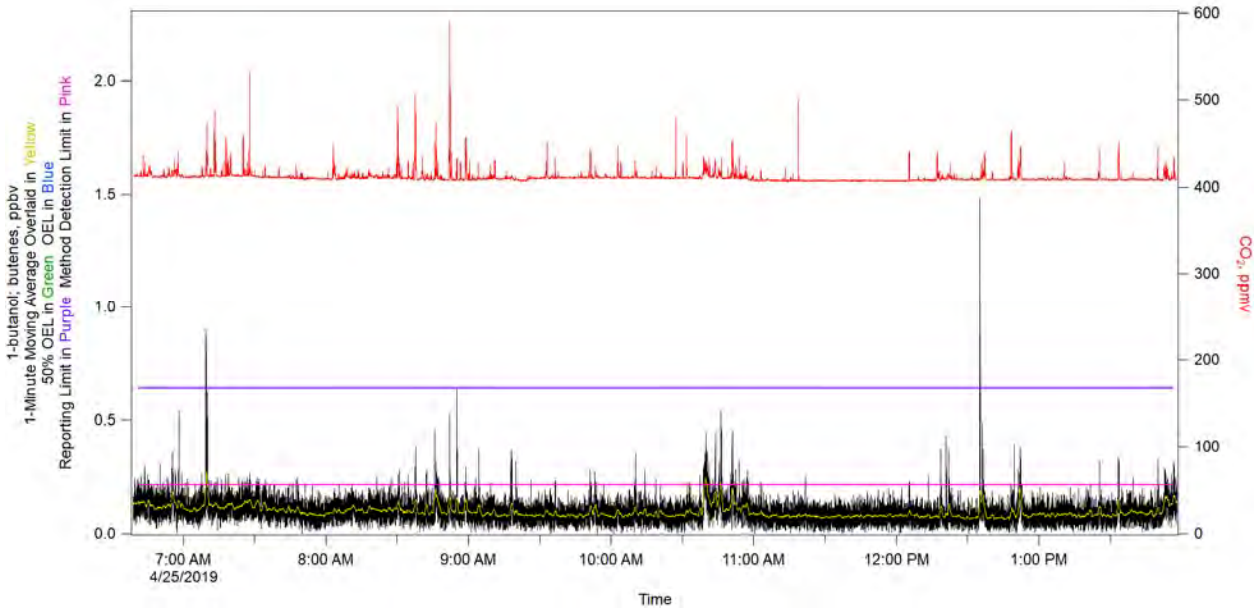


**Figure 5-12. 1-butanol; Butenes.**

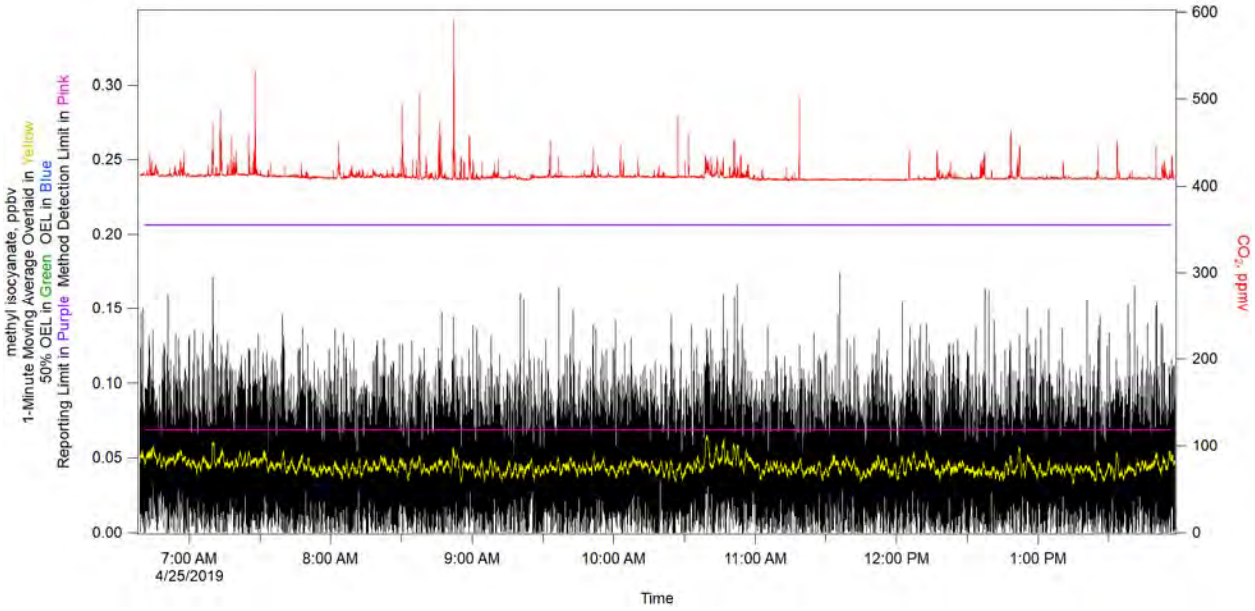


**Figure 5-13. Methyl Isocyanate.**

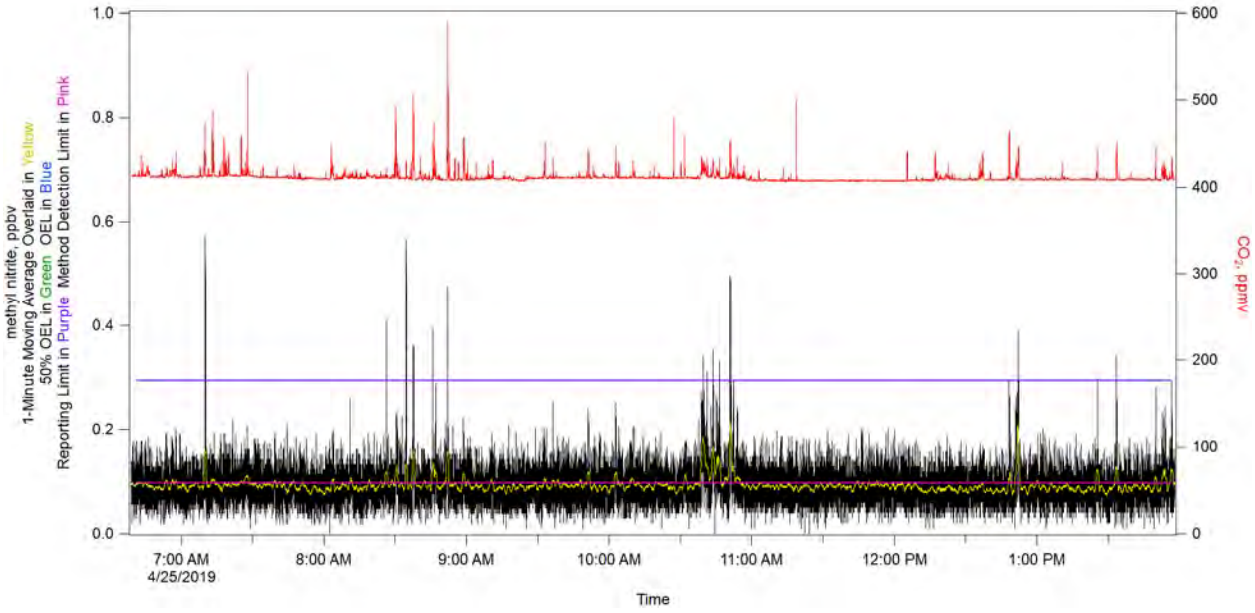


**Figure 5-14. Methyl Nitrite.**

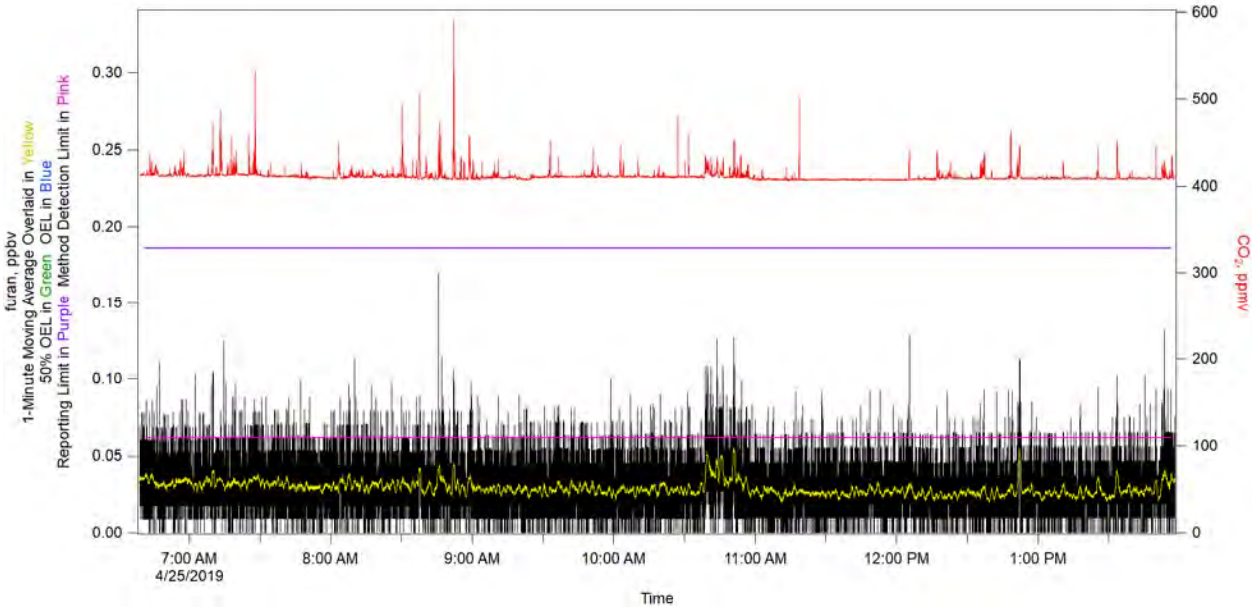


**Figure 5-15. Furan.**

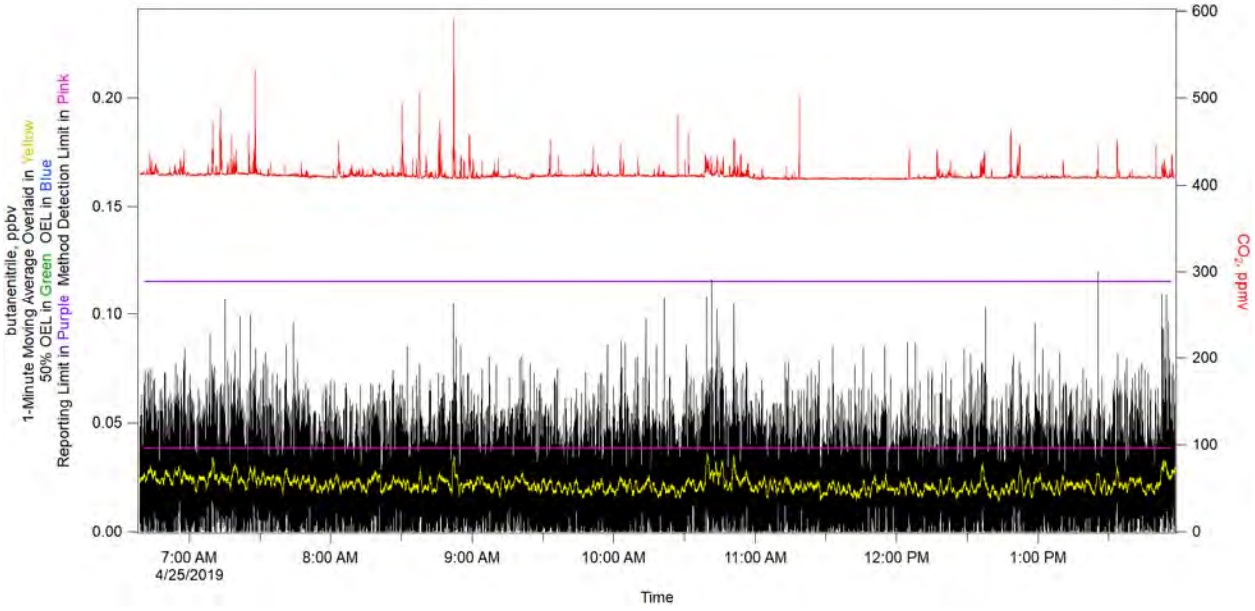


**Figure 5-16. Butanenitrile.**

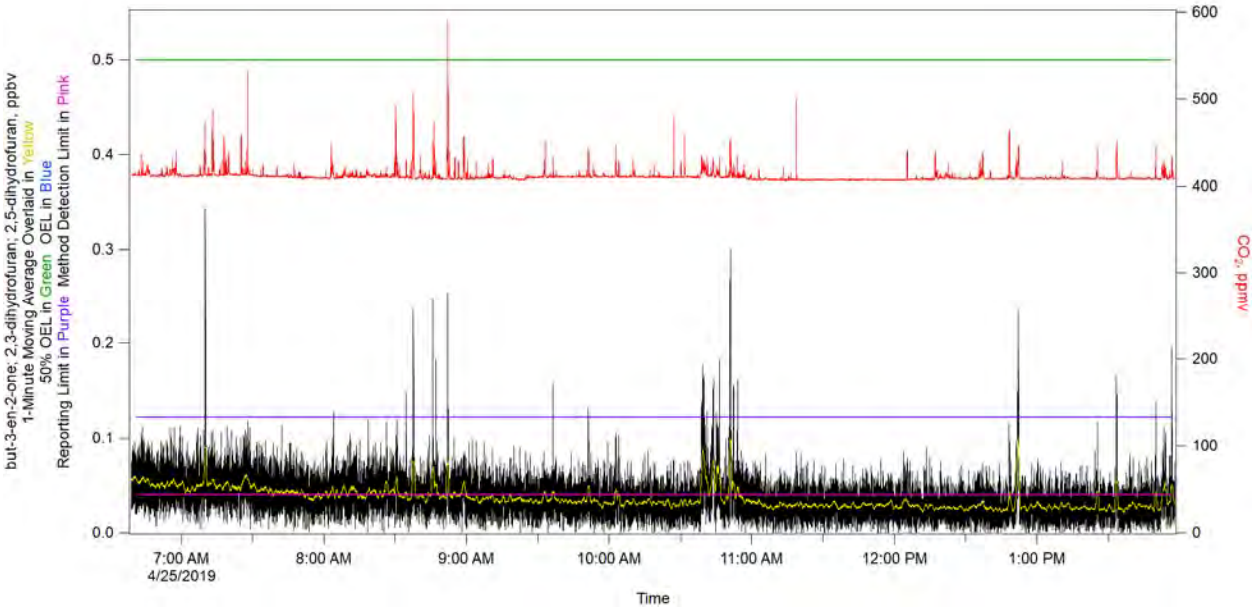


**Figure 5-17. But-3-en-2-one; 2,3-dihydrofuran; 2,5-dihydrofuran.**

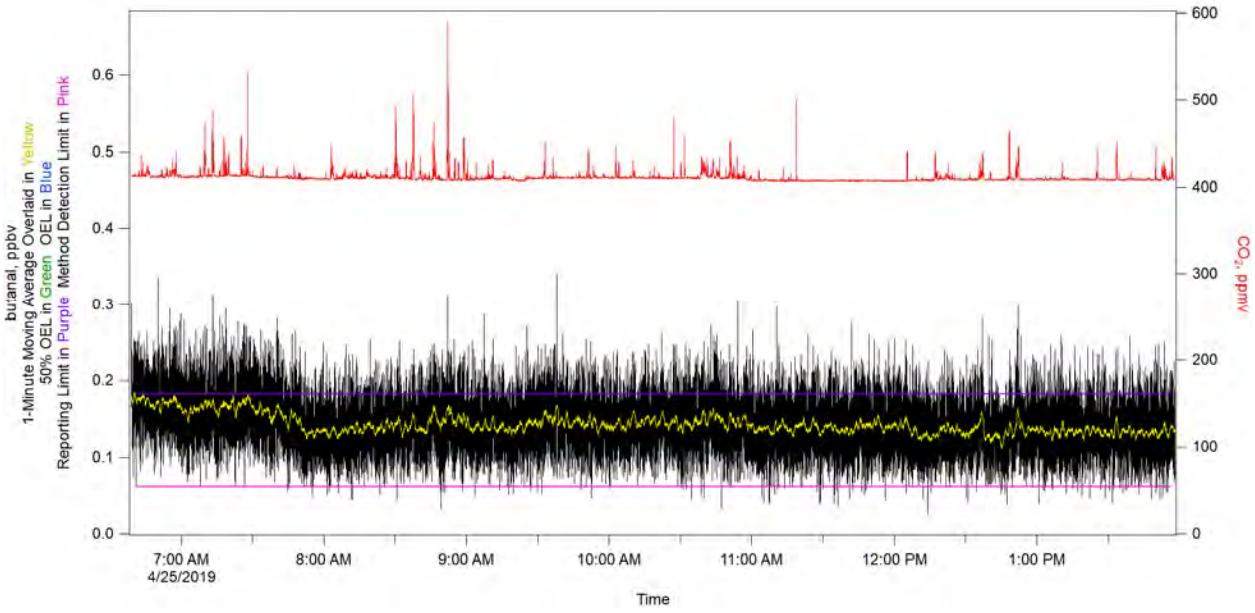


**Figure 5-18. Butanal.**

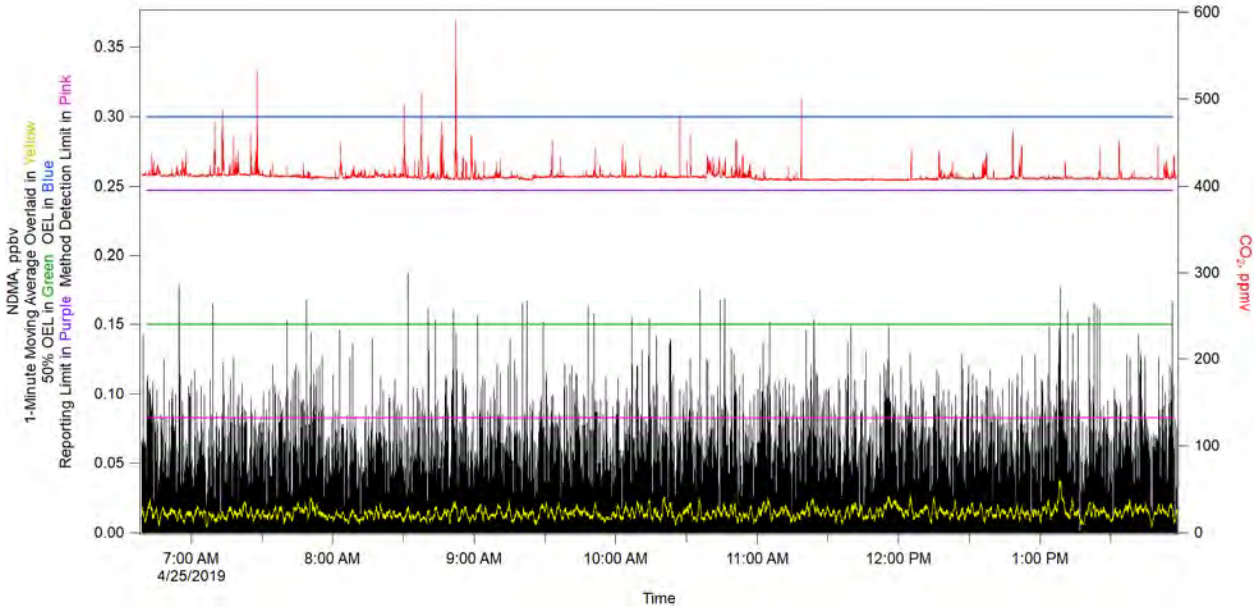


**Figure 5-19. N-nitrosodimethylamine (NDMA).**

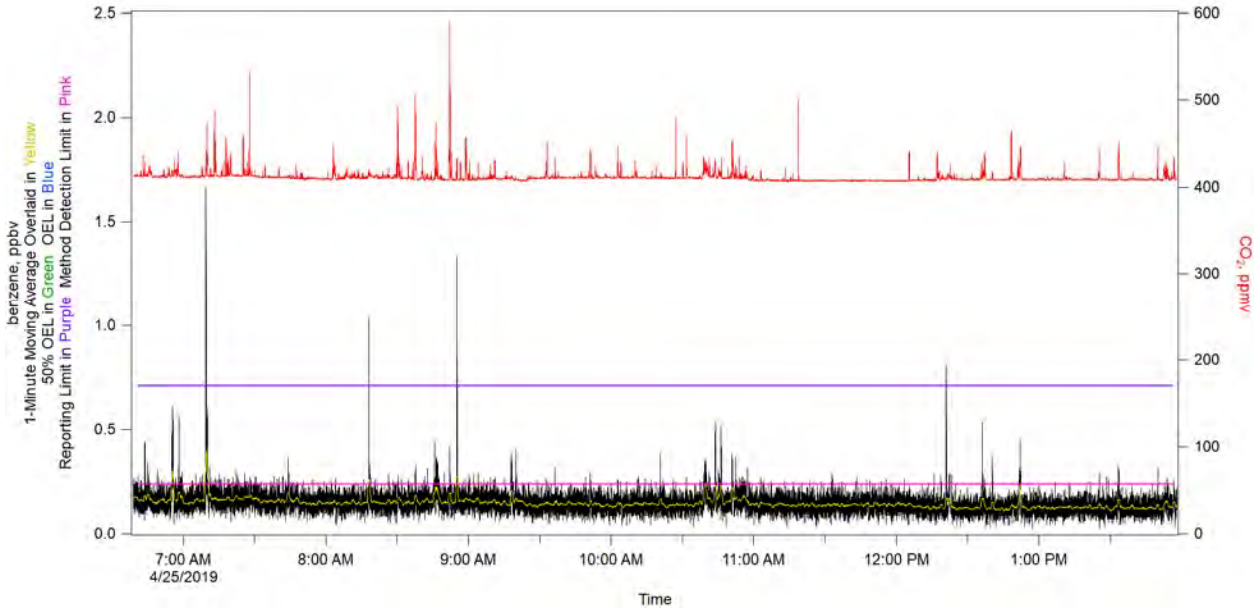


**Figure 5-20. Benzene.**

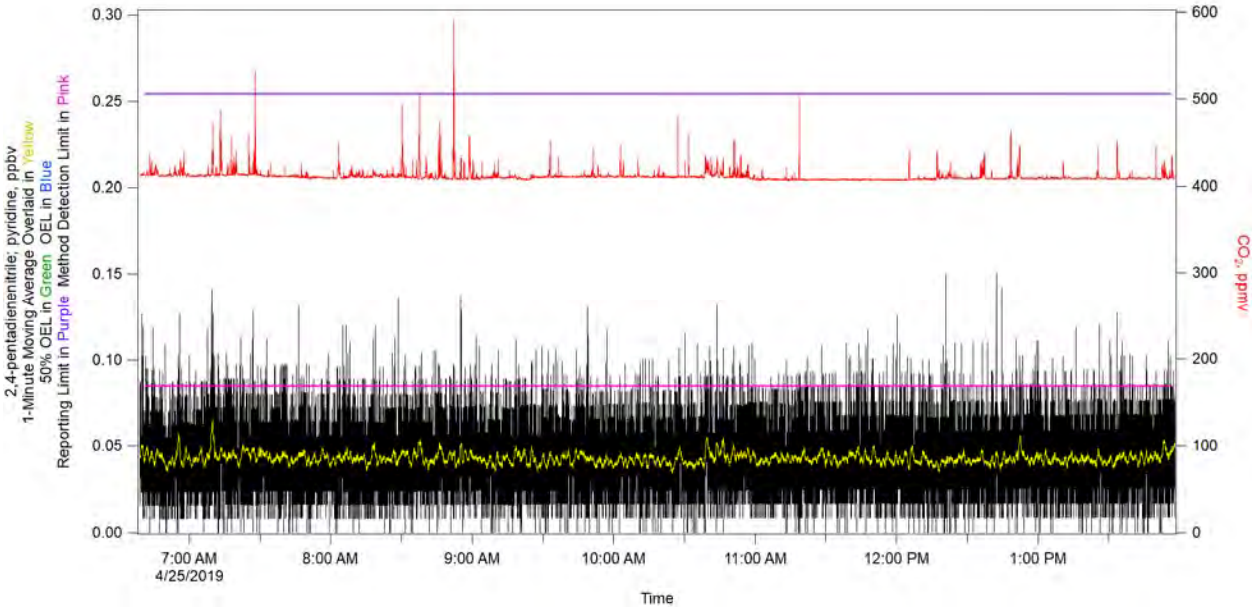


**Figure 5-21. 2,4-pentadienenitrile; Pyridine.**

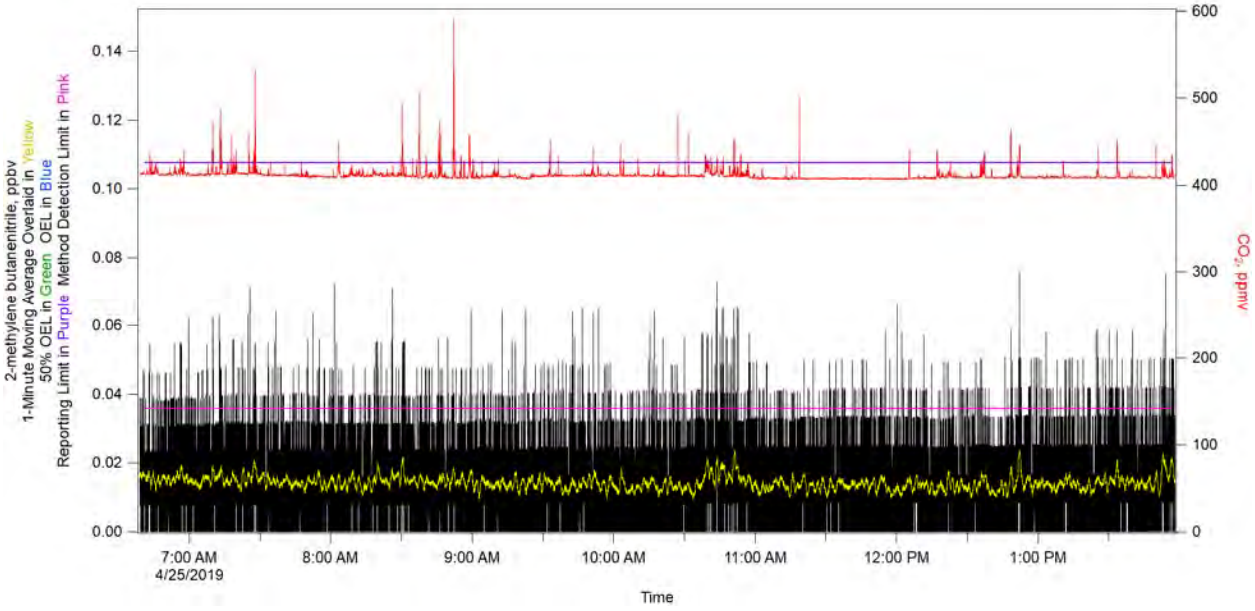


**Figure 5-22. 2-methylene Butanenitrile.**

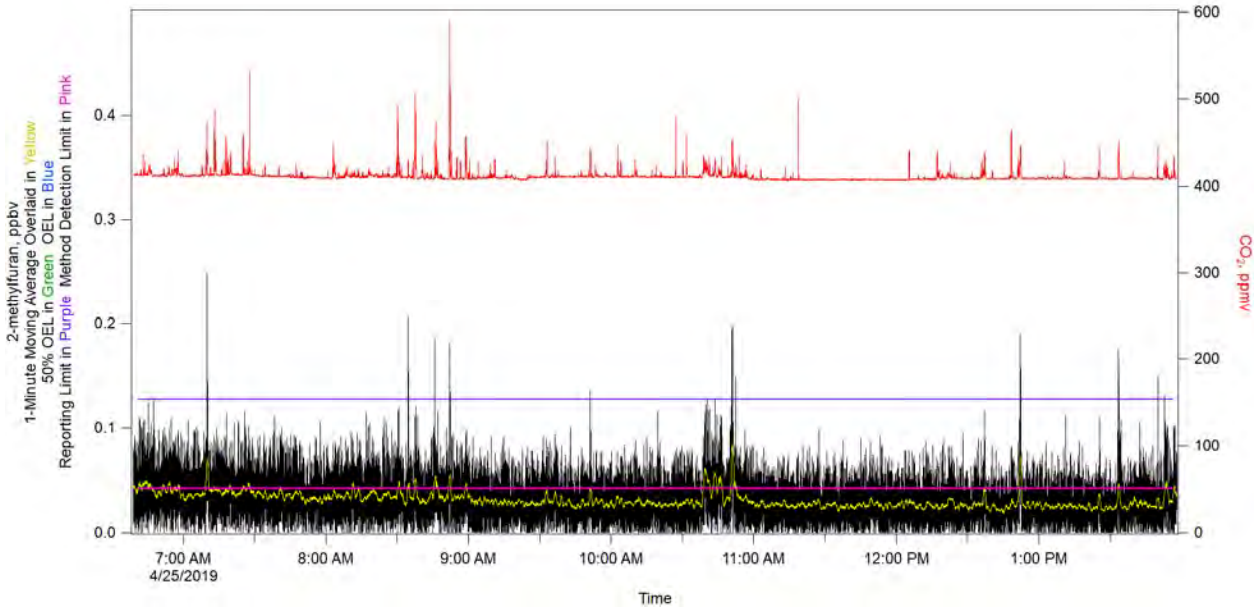


**Figure 5-23. 2-methylfuran.**

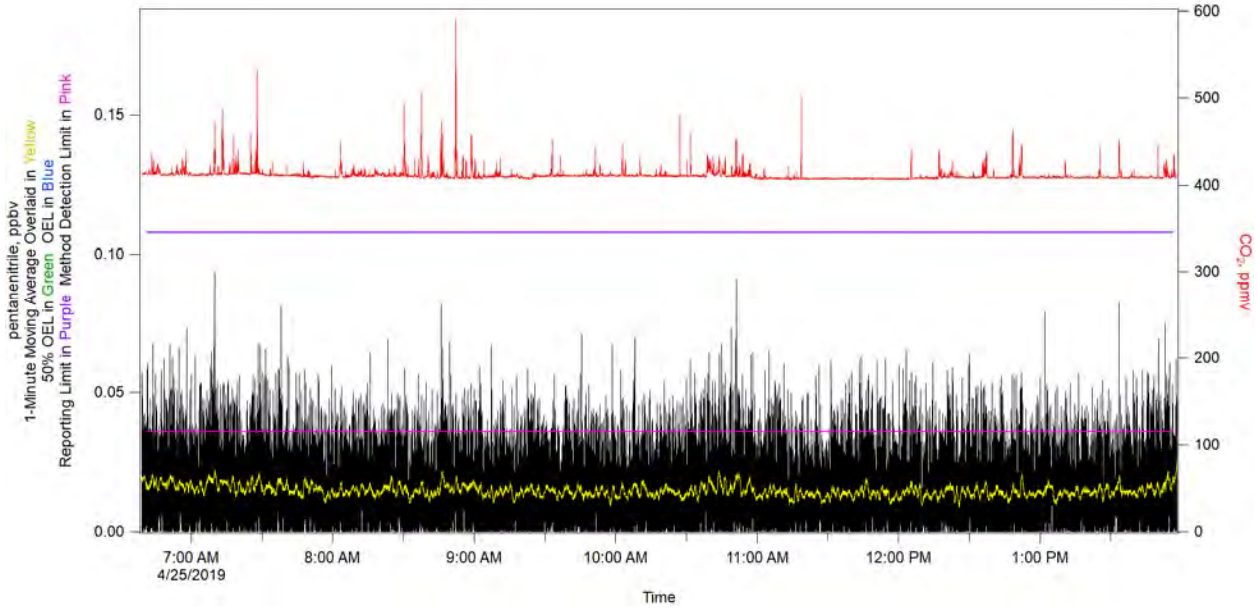


**Figure 5-24. Pentanenitrile.**

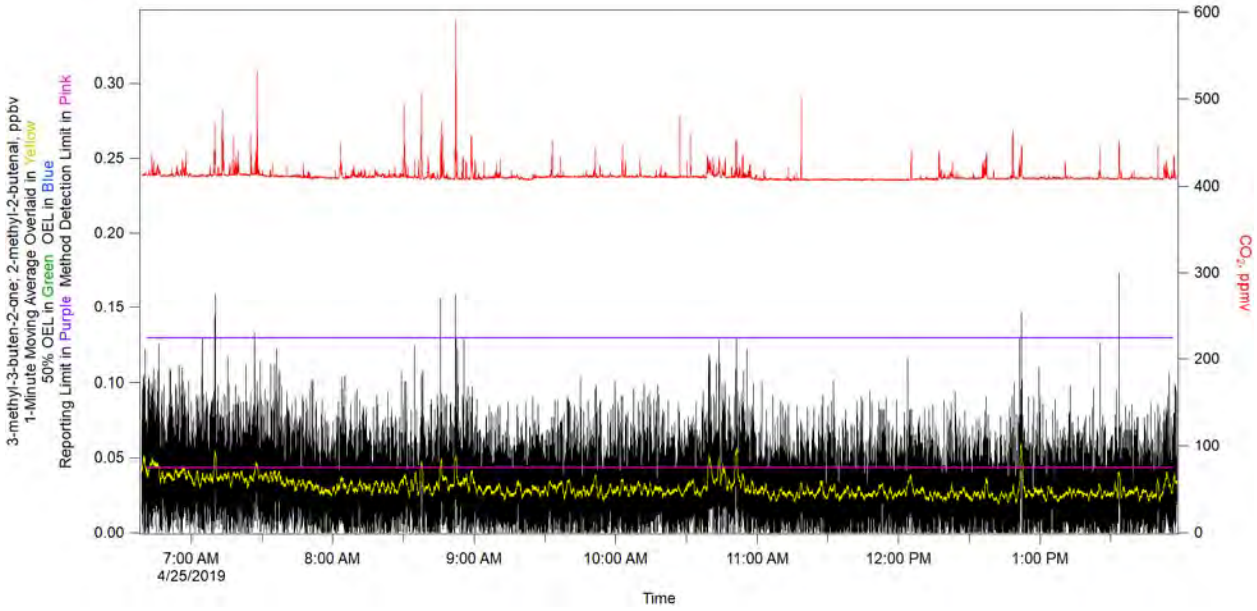


**Figure 5-25. 3-methyl-3-buten-2-one; 2-methyl-2-butenal.**

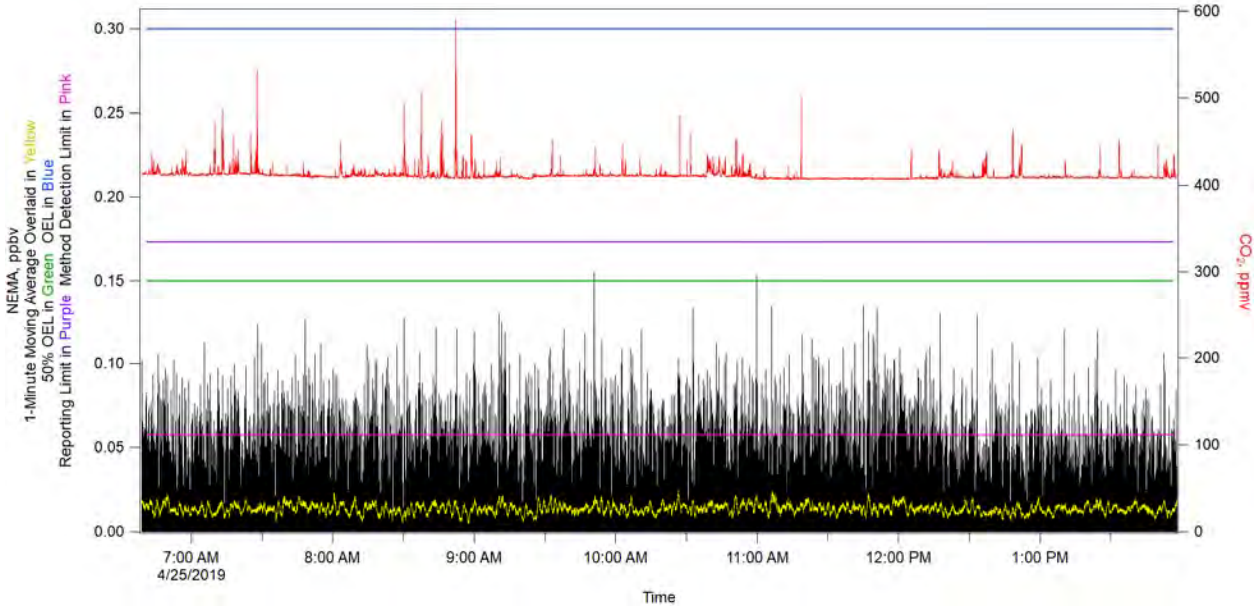


**Figure 5-26. N-nitrosomethylethylamine (NEMA).**

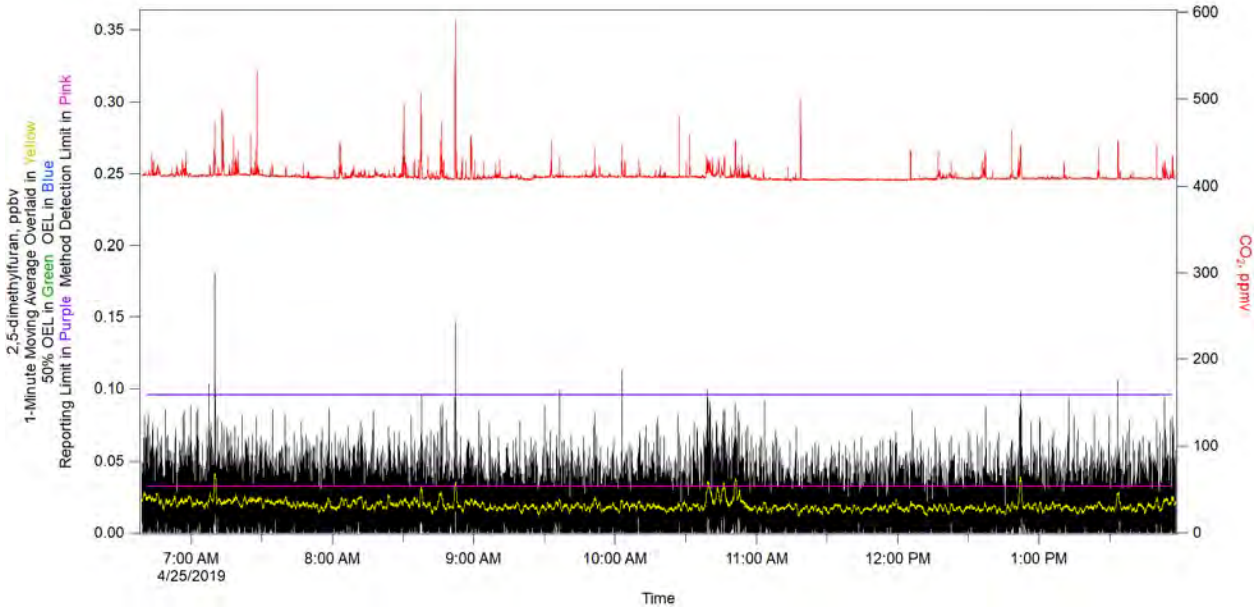


**Figure 5-27. 2,5-dimethylfuran.**

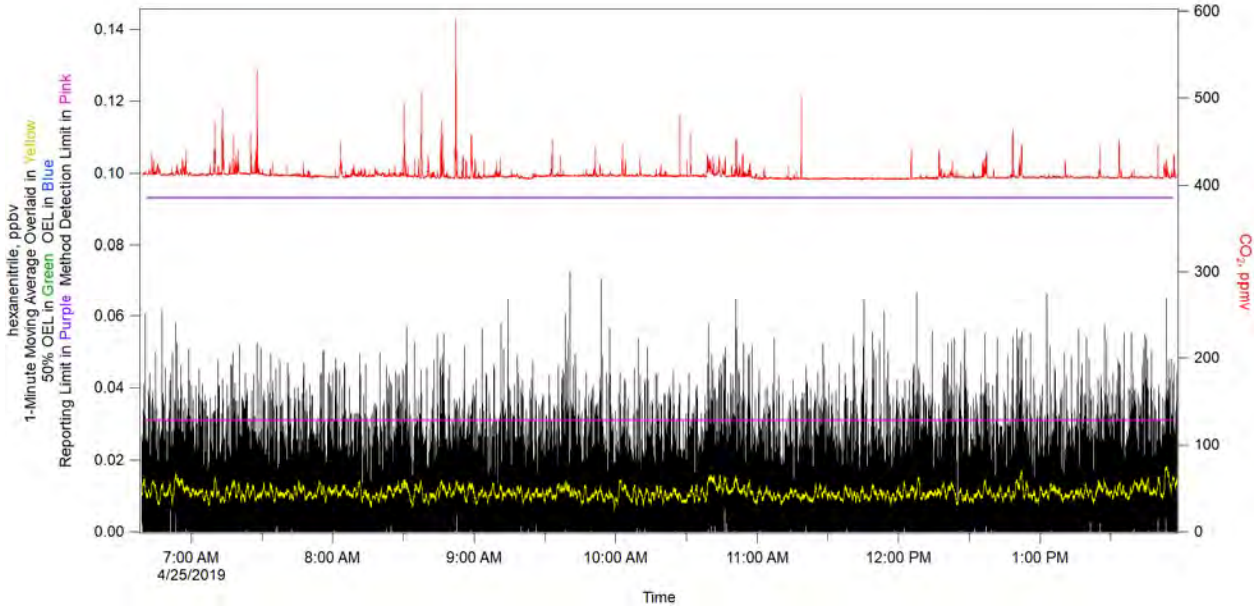


**Figure 5-28. Hexanenitrile.**

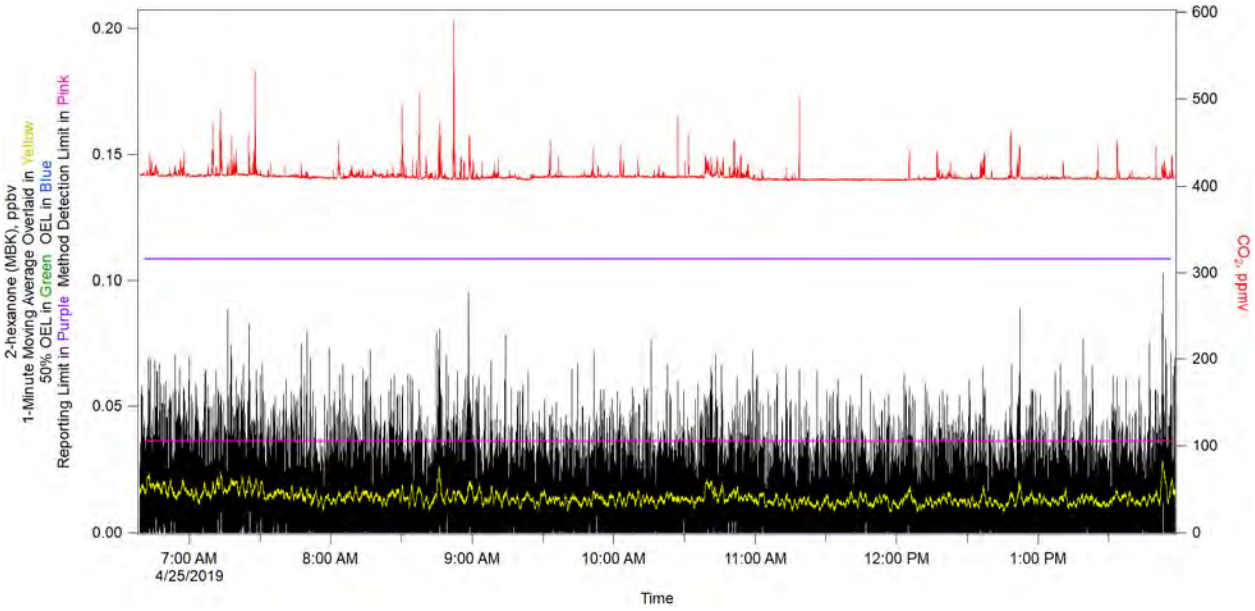


**Figure 5-29. 2-hexanone (MBK).**

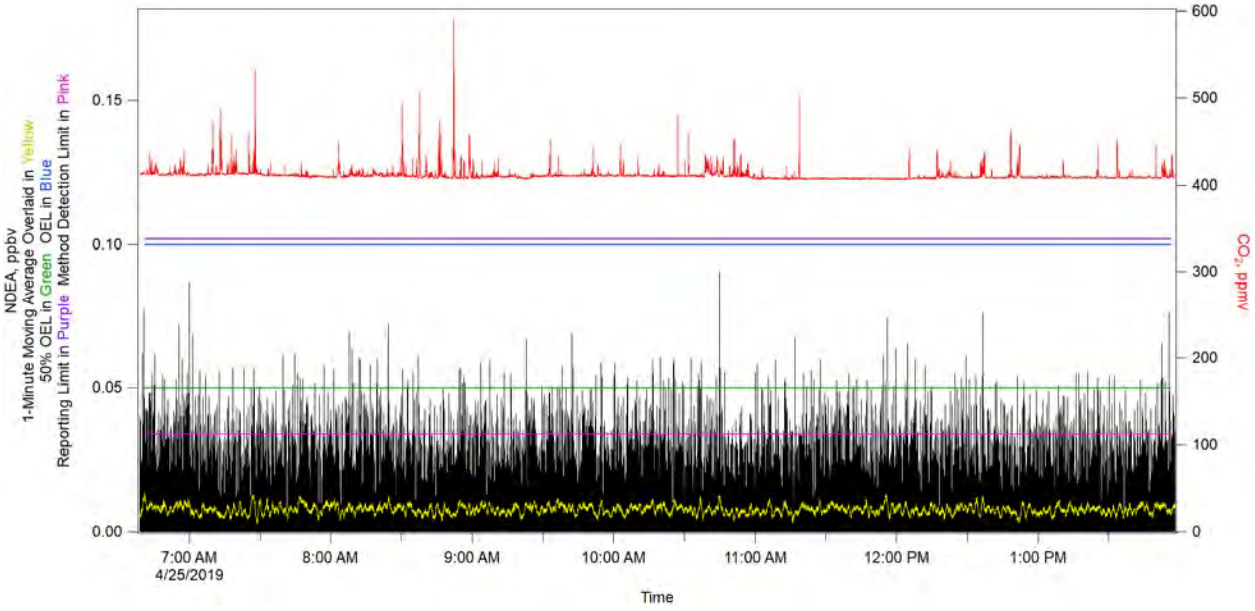


**Figure 5-30. N-nitrosodiethylamine (NDEA).**

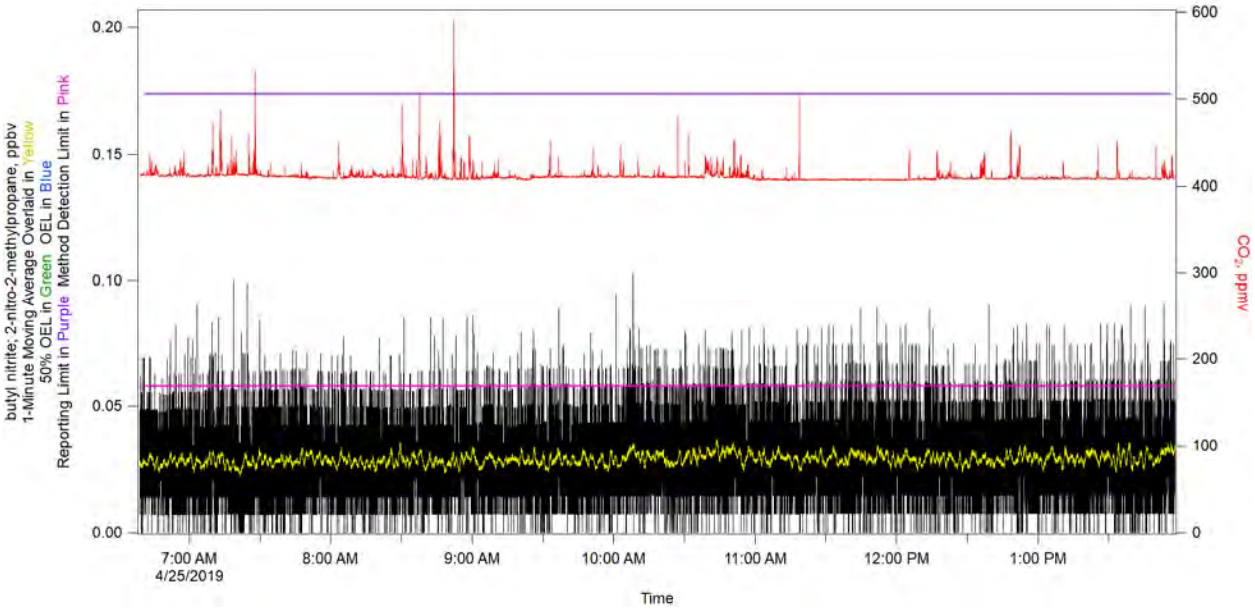


**Figure 5-31. Butyl Nitrite; 2-nitro-2-methylpropane.**

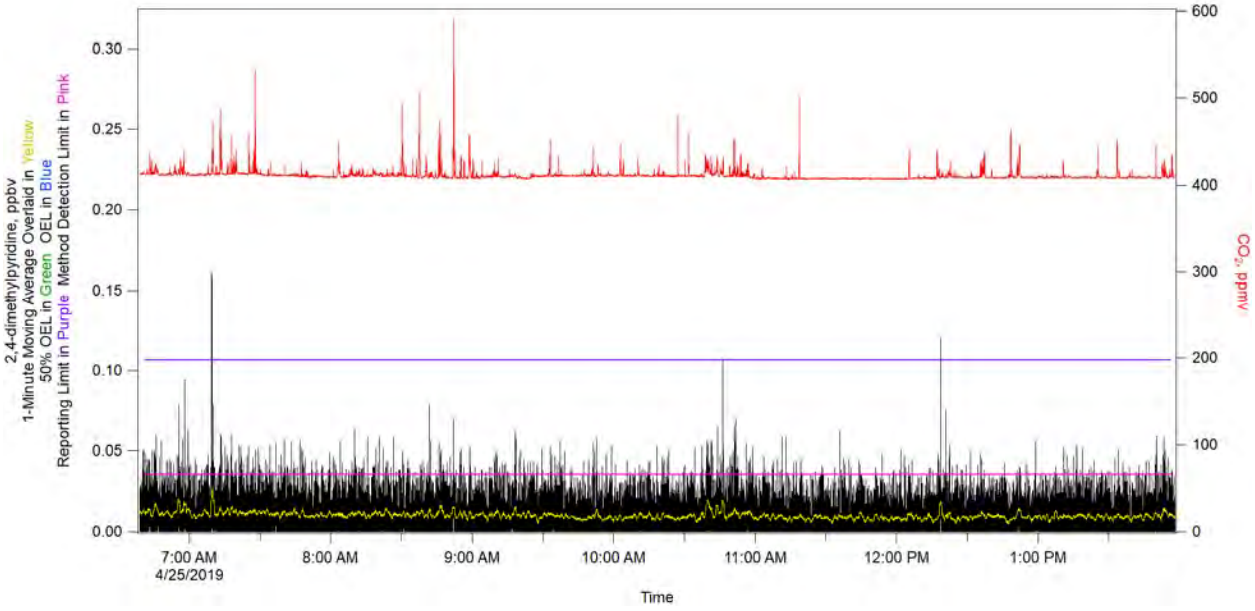


**Figure 5-32. 2,4-dimethylpyridine.**

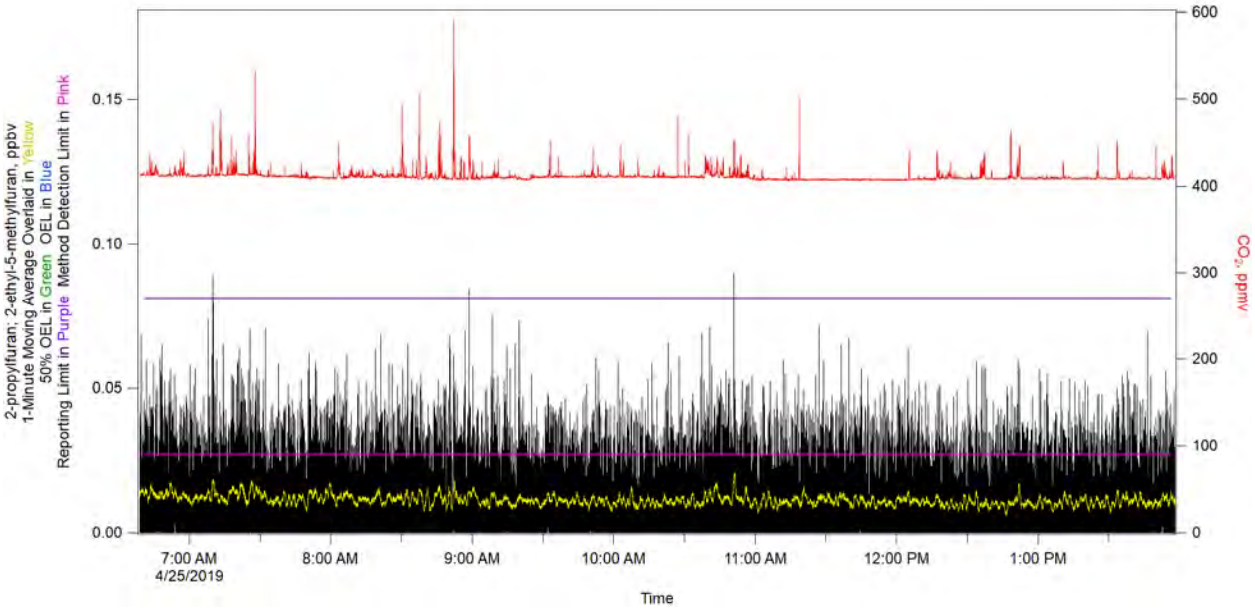


**Figure 5-33. 2-propylfuran; 2-ethyl-5-methylfuran.**

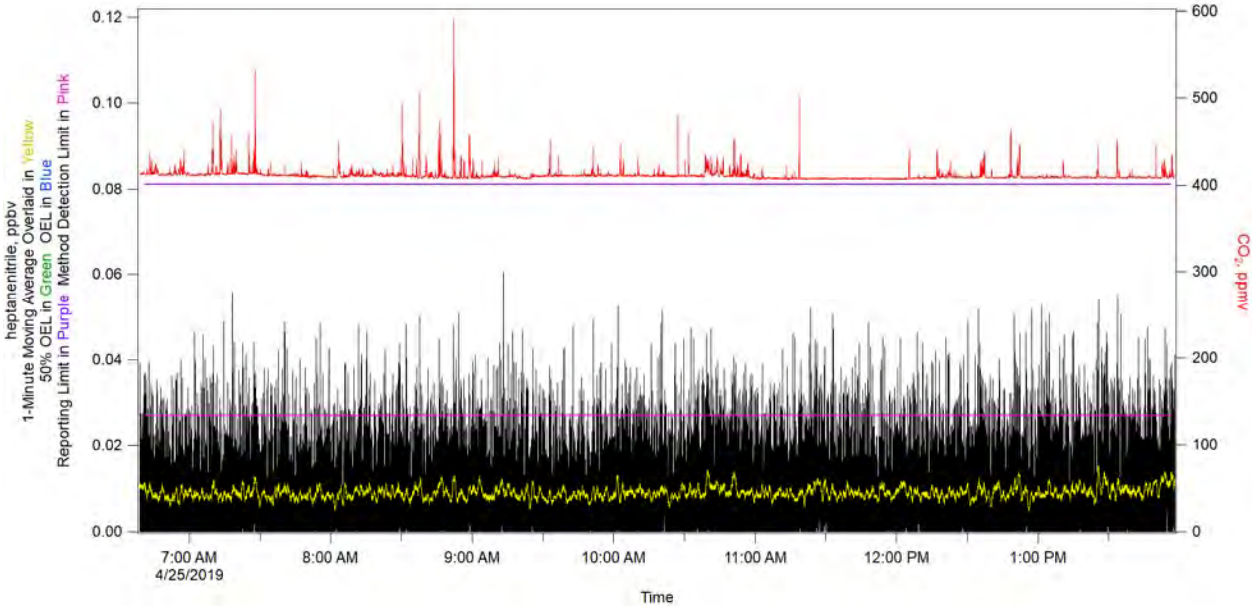


**Figure 5-34. Heptanenitrile.**

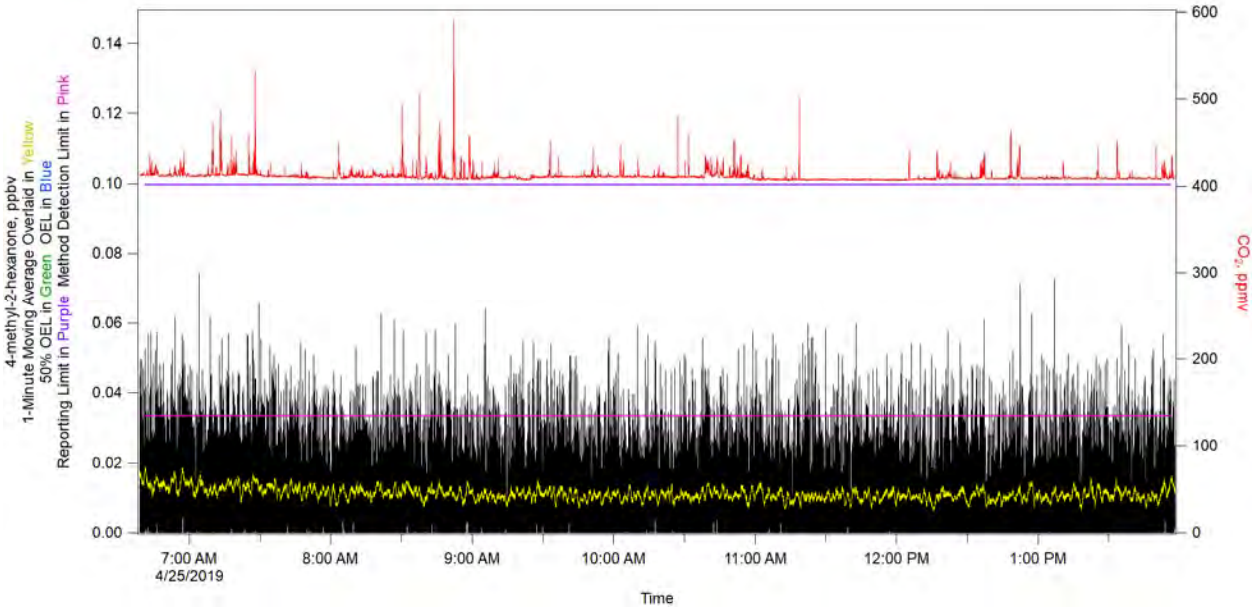


**Figure 5-35. 4-methyl-2-hexanone.**

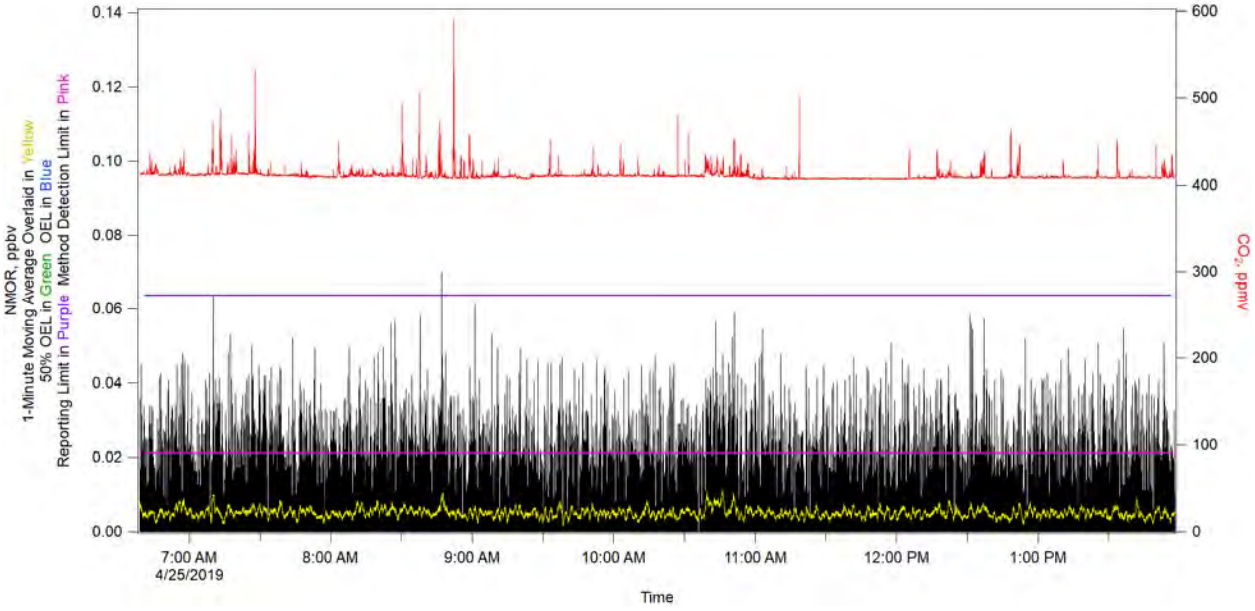


**Figure 5-36. N-nitrosomorpholine (NMOR).**

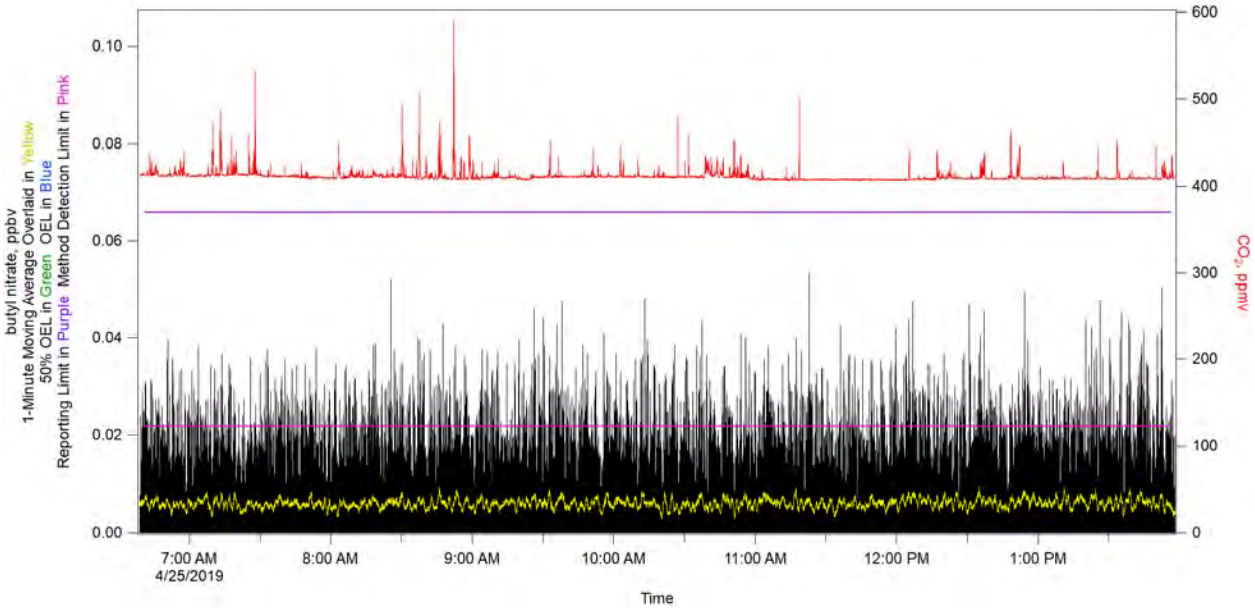


**Figure 5-37. Butyl Nitrate.**

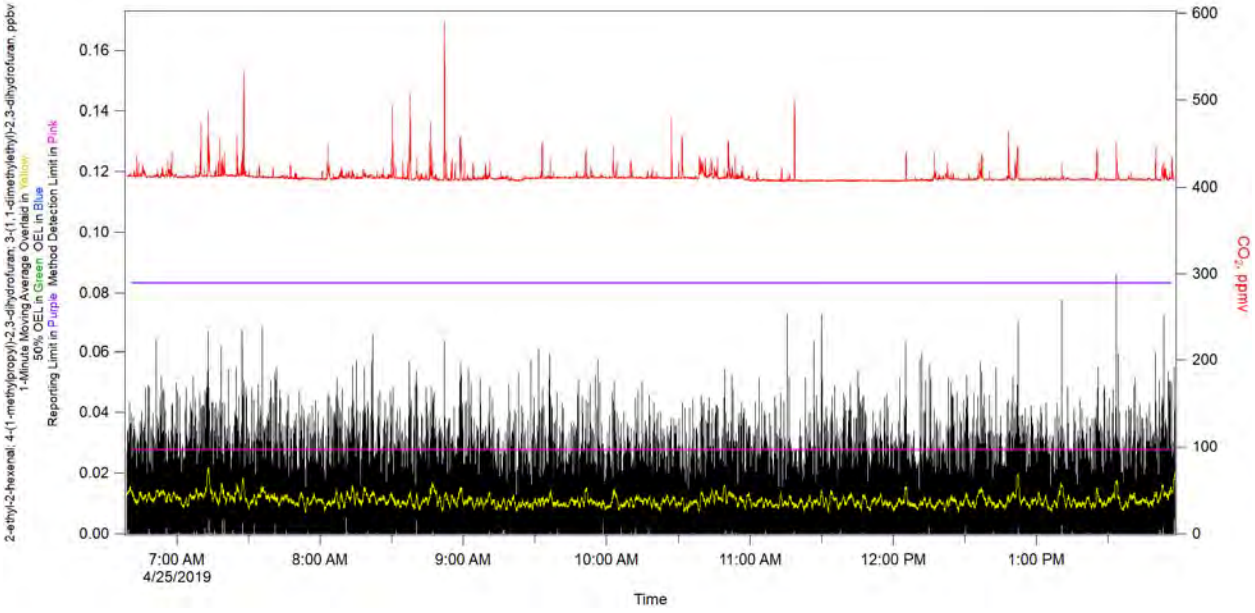


**Figure 5-38. 2-ethyl-2-hexenal; 4-(1-methylpropyl)-2,3-dihydrofuran 3-(1,1-dimethylethyl)-2,3-dihydrofuran.**

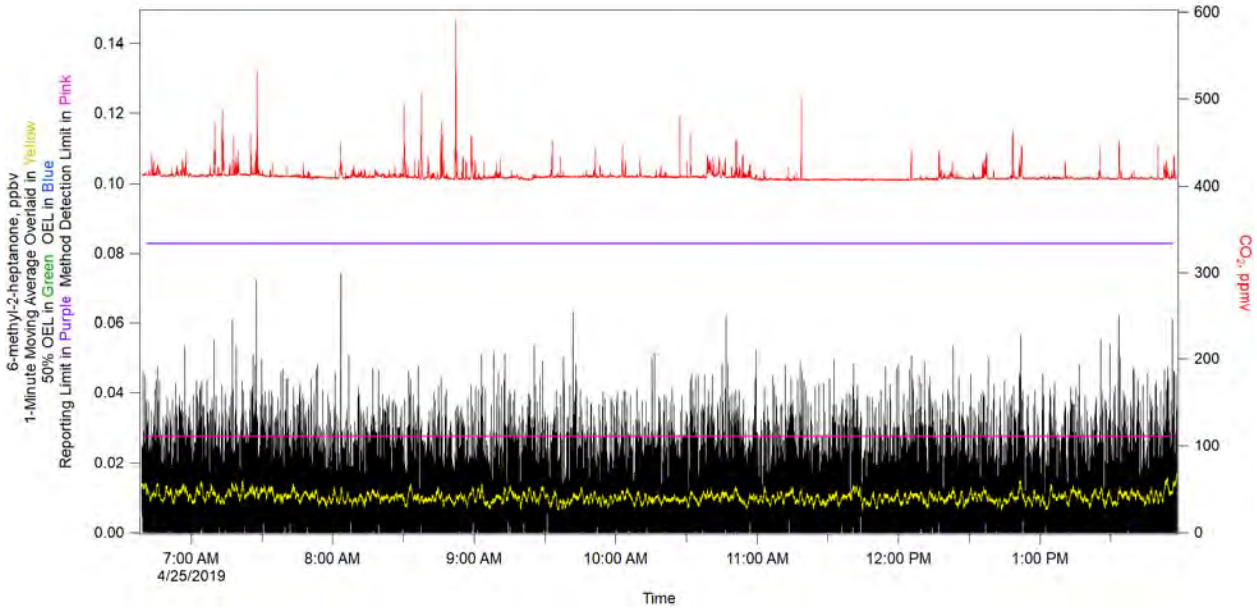


**Figure 5-39. 6-methyl-2-heptanone.**

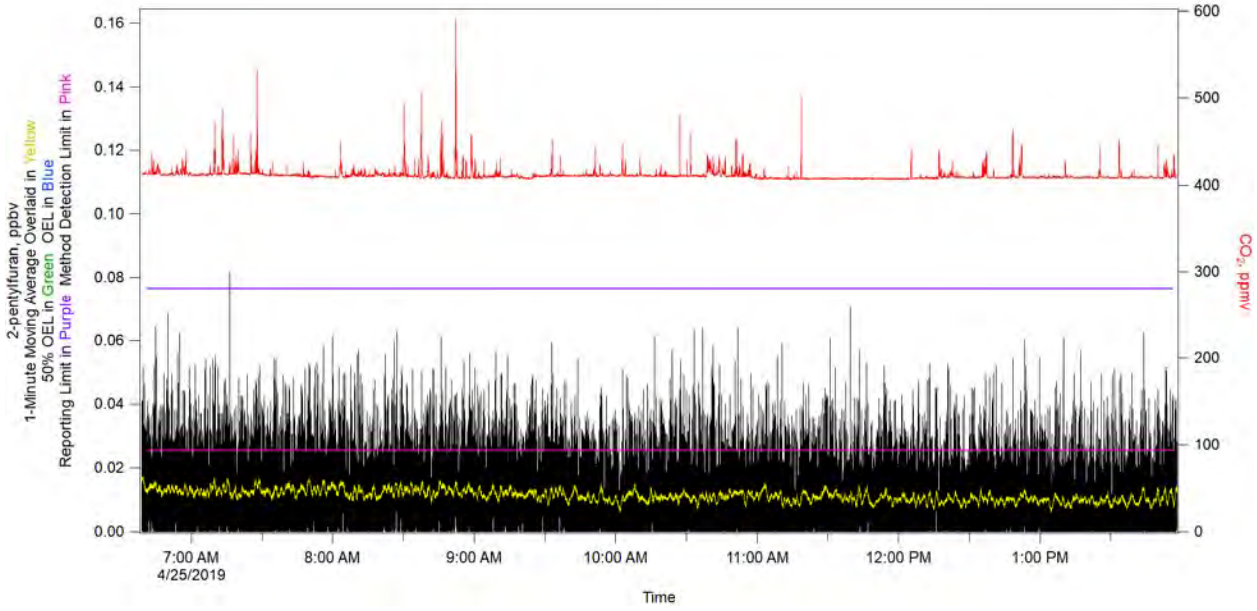


**Figure 5-40. 2-pentylfuran.**

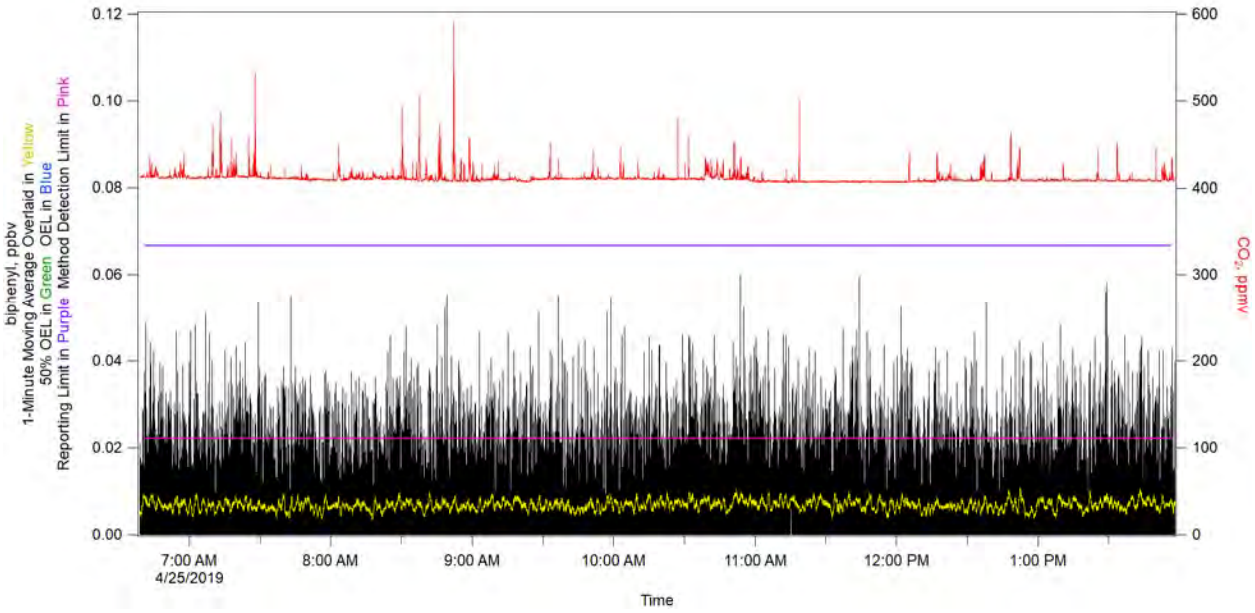


**Figure 5-41. Biphenyl.**

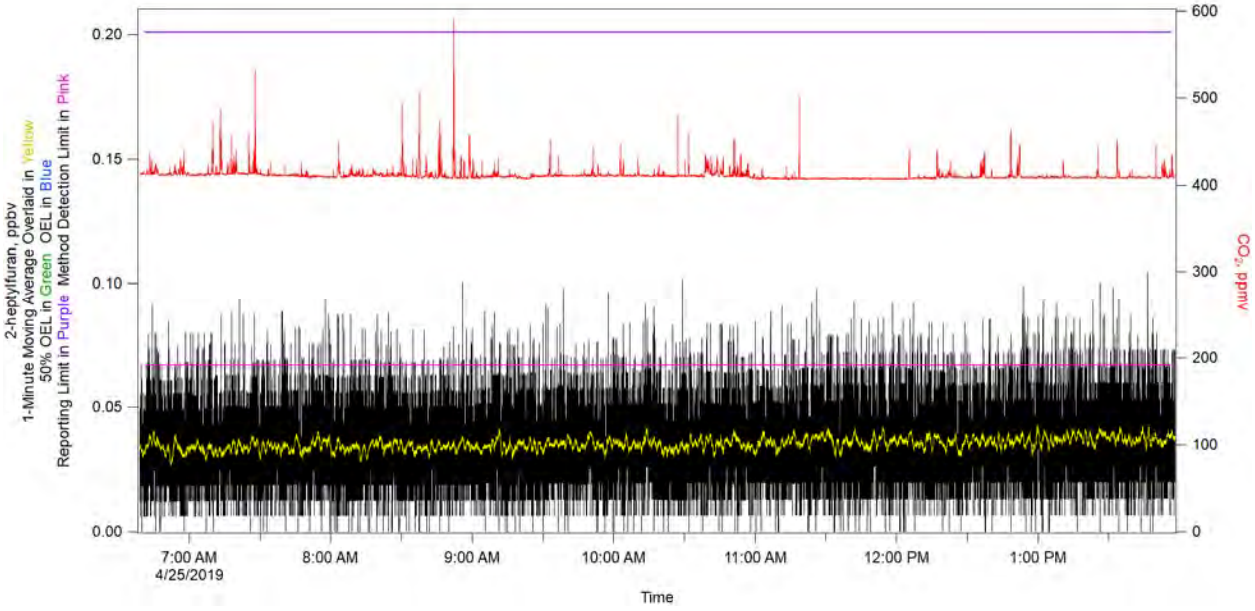


**Figure 5-42. 2-heptylfuran.**

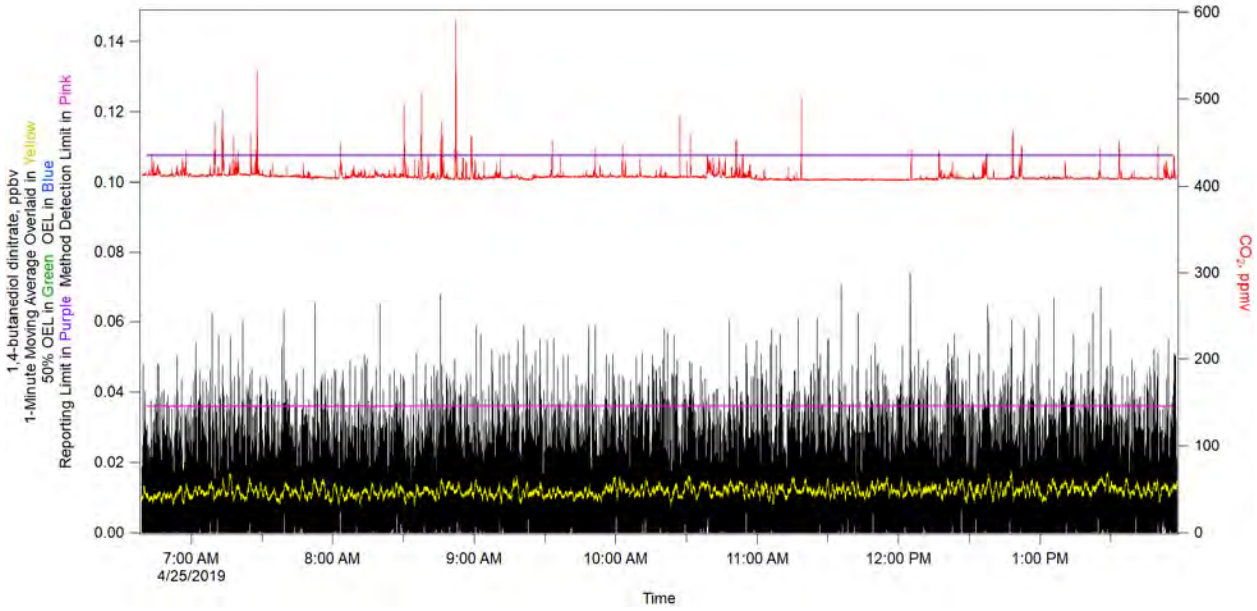


**Figure 5-43. 1,4-butanediol Dinitrate.**

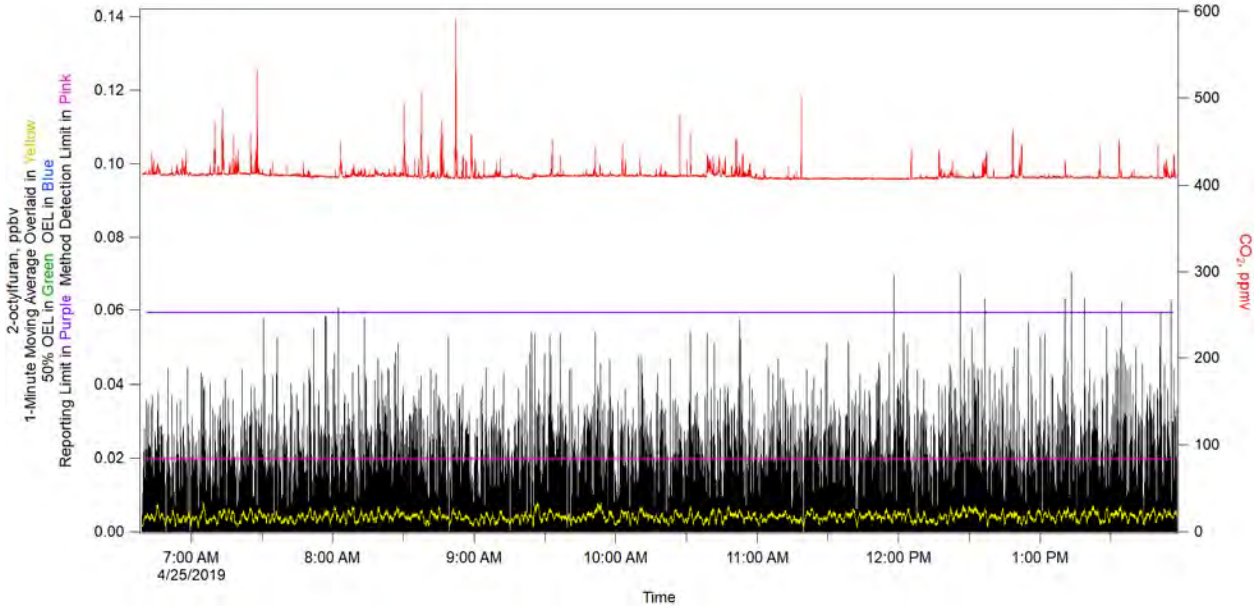


**Figure 5-44. 2-octylfuran.**

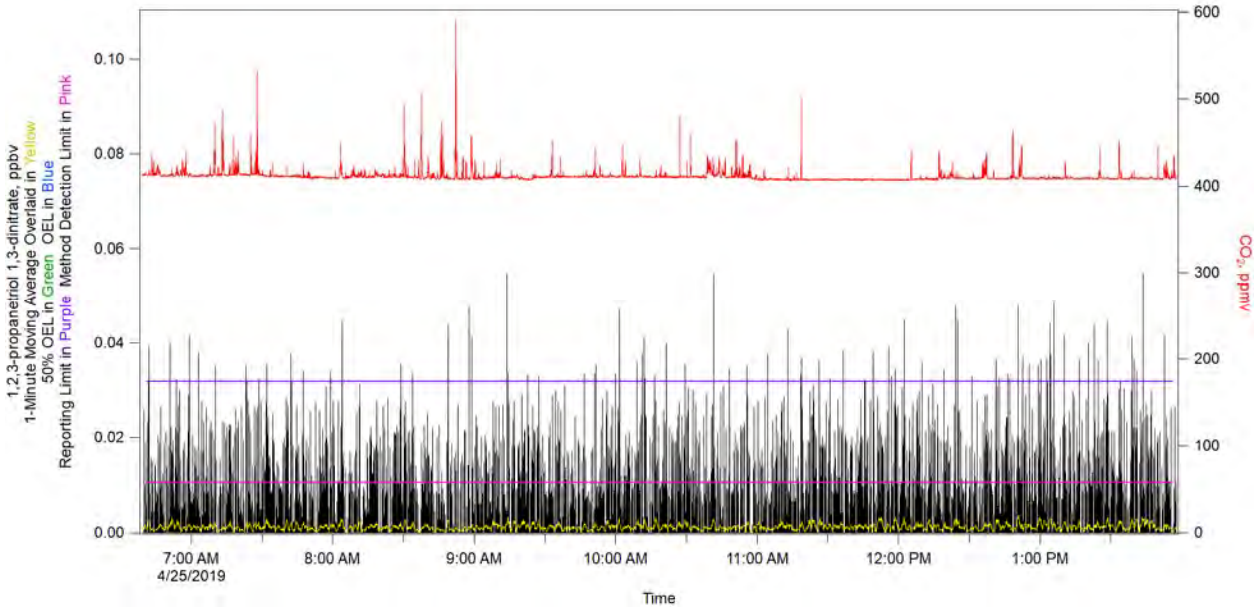


**Figure 5-45. 1,2,3-propanetriol 1,3-dinitrate.**

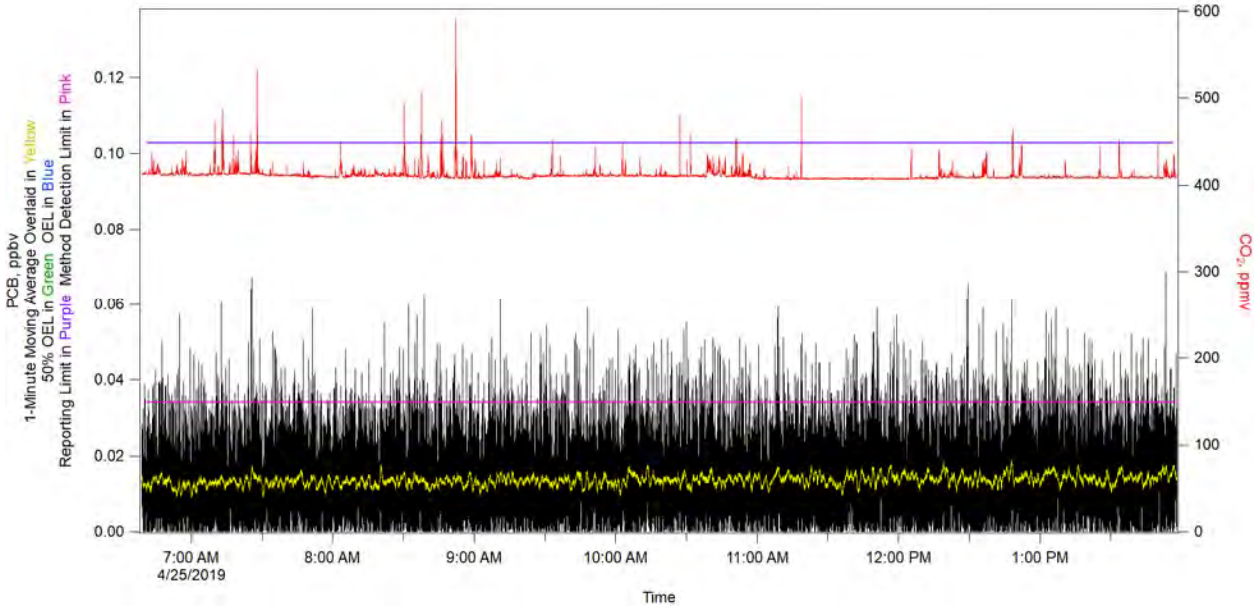


**Figure 5-46. PCB.**

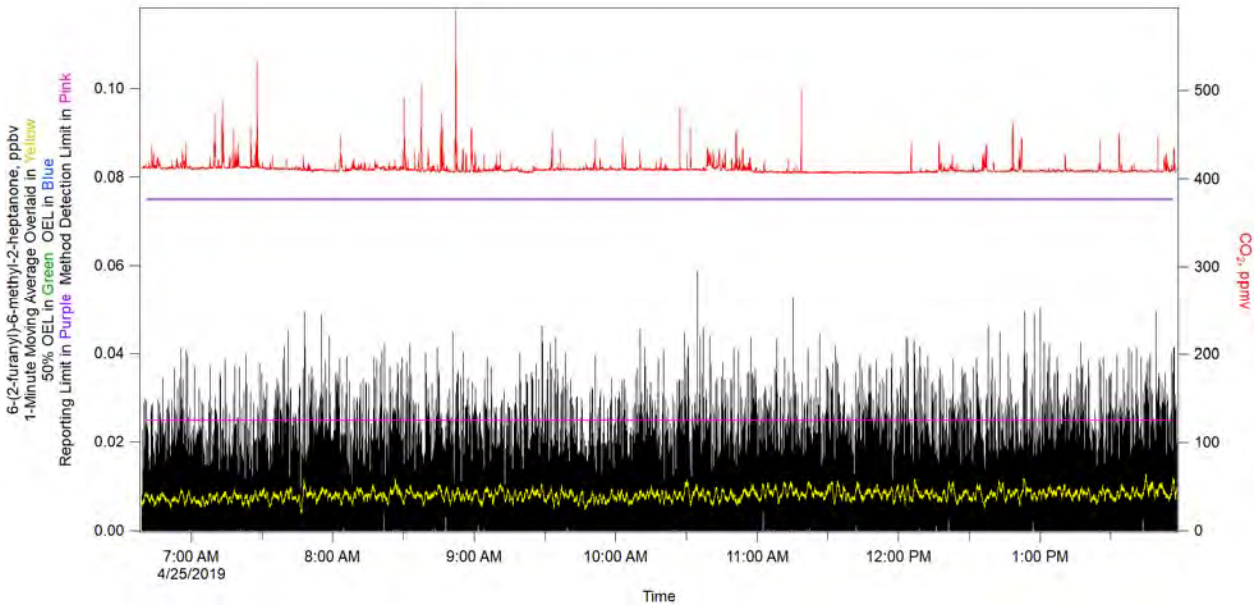


**Figure 5-47. 6-(2-furanyl)-6-methyl-2-heptanone.**

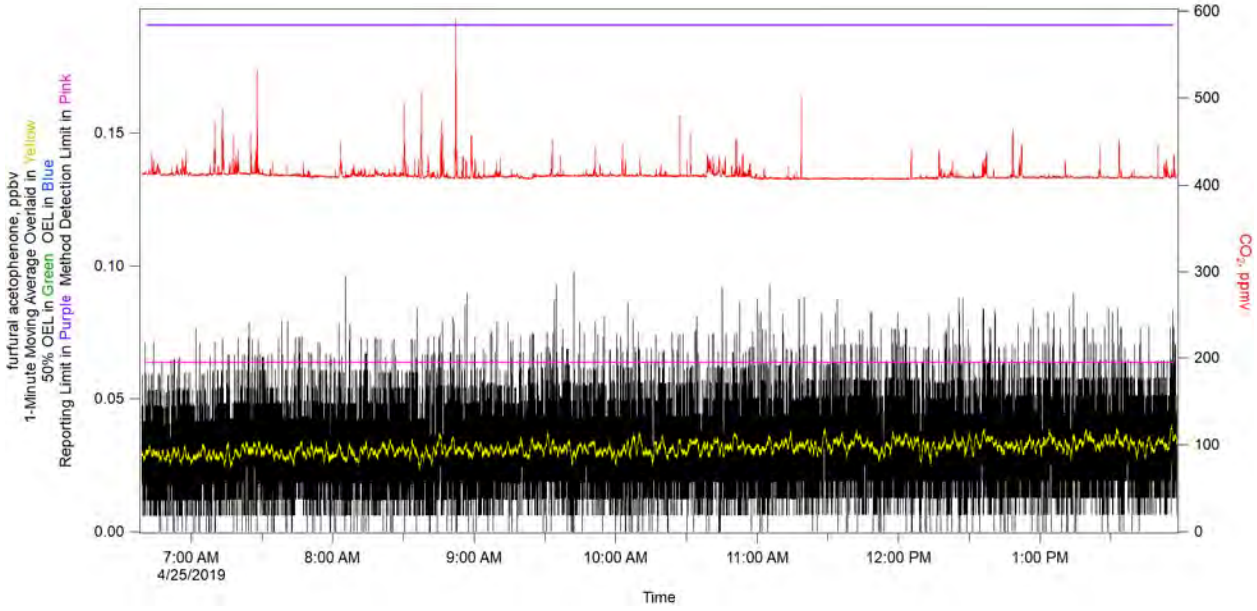


**Figure 5-48. Furfural Acetophenone.**

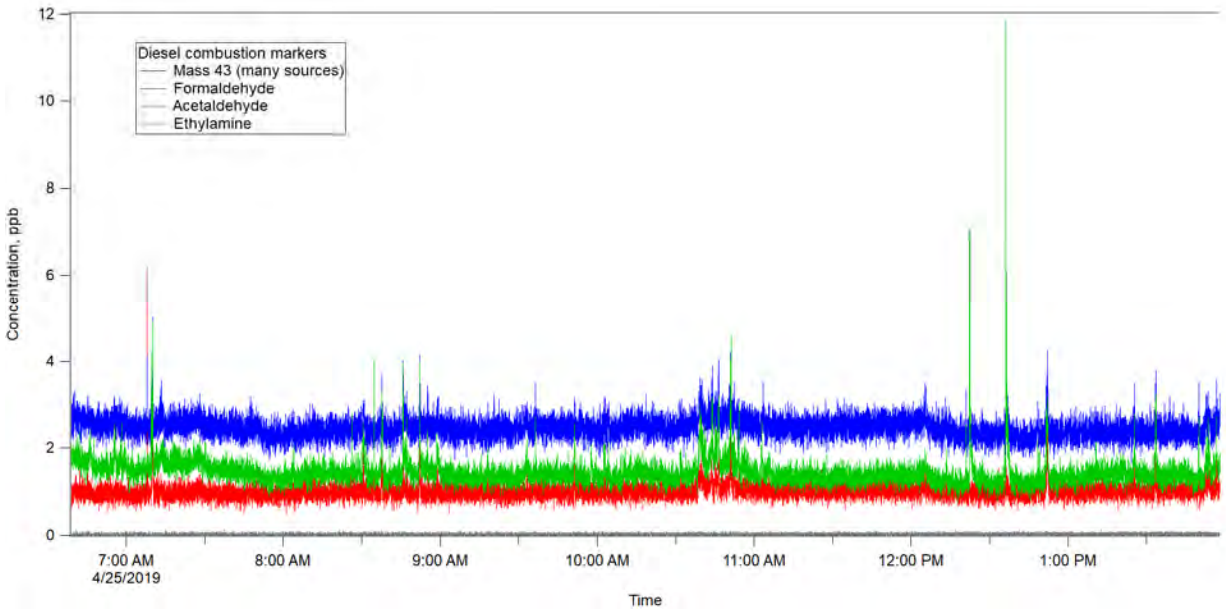


**Figure 5-49. Diesel Combustion Markers.**

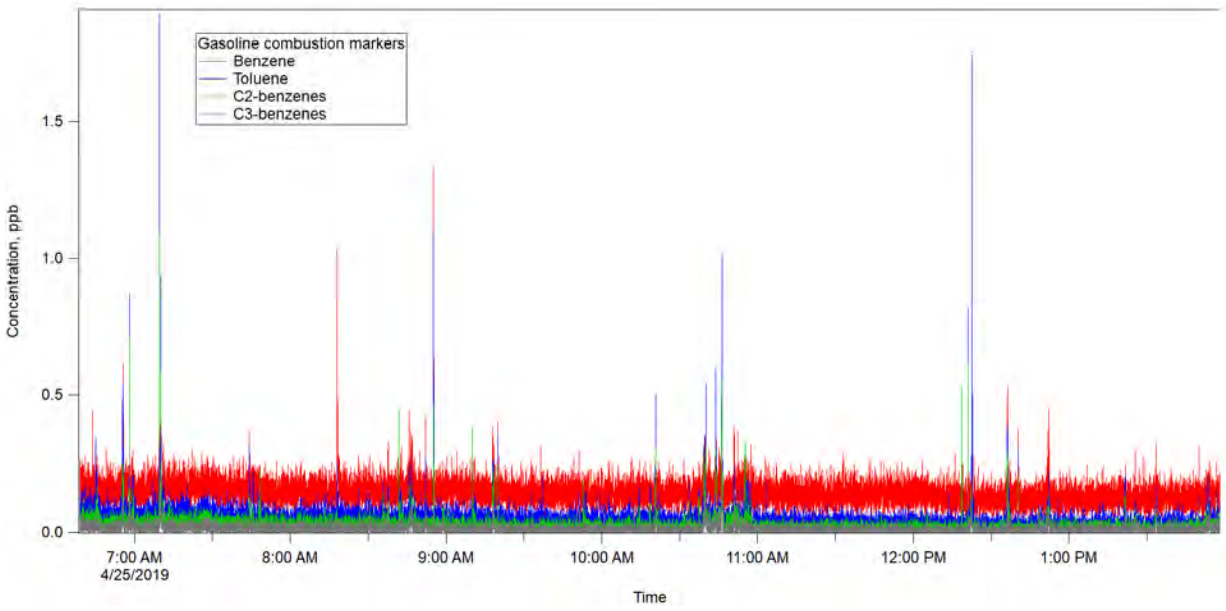


**Figure 5-50. Gasoline Combustion Markers.**

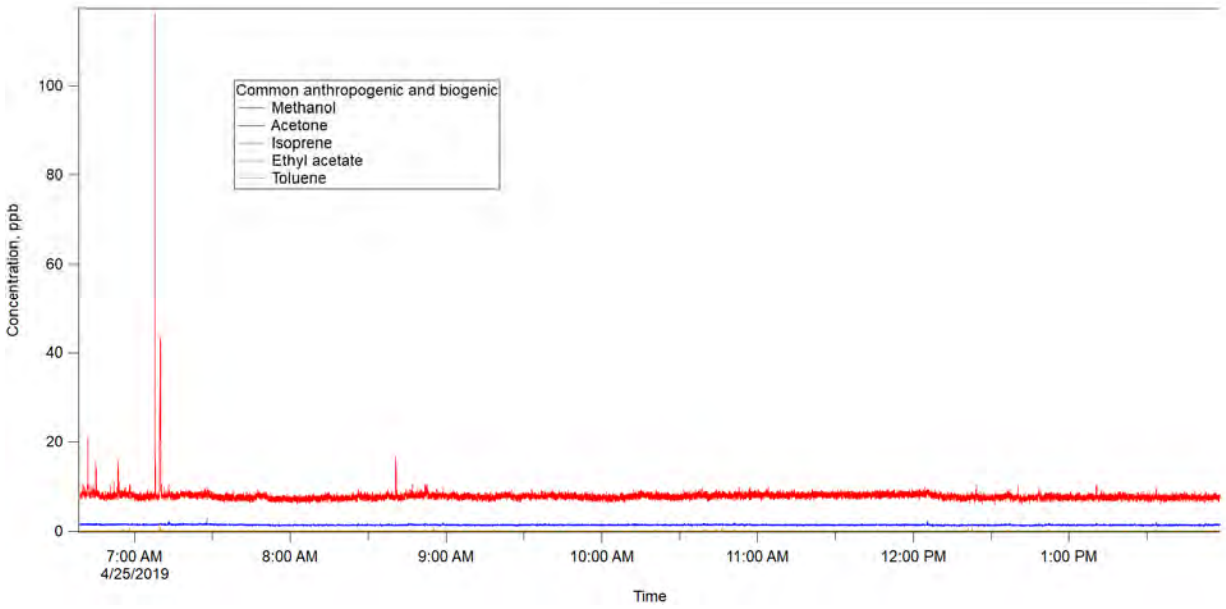


**Figure 5-51. Plant and Human Markers.**

## 6.0 APRIL 26, 2019 – TESTING

### 6.1 Summary

On April 26, 2019, the ML personnel arrived at the TerraGraphics warehouse at 05:50. An ML Operator initiated a zero-air and span check on the PTR-MS using the volatile organic compound (VOC) gas standard (ID: 160-401380144-1) at 05:59. Figure 6-1 shows the response of toluene for the duration of the days testing. Once complete, the operator switched to the R&D gas standard and began a multipoint calibration at 06:36. The Operator connected calibration box (ID: CZ-MHE-001) line to the mast and began a 2-hour, zero-air check at 07:42. The purpose of the long zero is to provide a better data set for calculation of detection limits. After this, the R&D cylinder (ID:160-401265983-1)was set to a flow of ~40 sccm and was allowed time to mix with the zero-air until all the species reached a stable concentration. The Operator connected two Carbotraps®[4] to the sampling system and initiated sampling at 10:30. After an hour of sampling, the Carbotraps were disconnected from the sampling line and a Chain of Custody (COC) was completed. The purpose of this test was to collect a known amount of mass onto the Carbotraps and the results from the ML can be compared to this known mass and the PTR-MS values that were recorded simultaneously. The Operator replaced the almost empty zero-air gas standard with a new zero-air gas standard at 11:45. The ML was prepped for the April 29, 2019, deployment prior to ML personnel departing the TerraGraphics warehouse for the day.

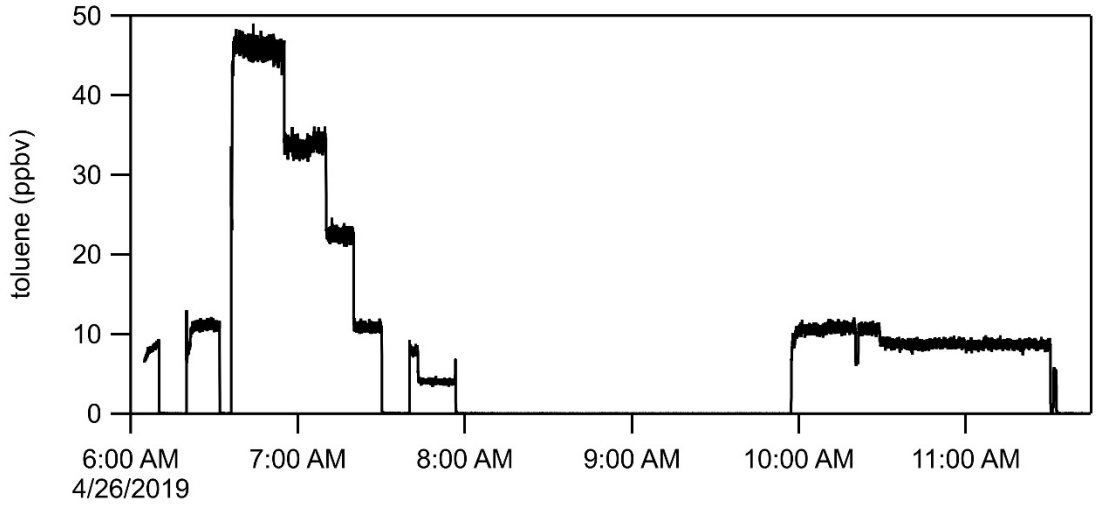


**Figure 6-1. Time-series of Toluene During the Testing Performed on April 26, 2019.**

[4] Carbotrap is a registered trademark of Sigma-Aldrich Co., LLC, St. Louis, Missouri.

## 7.0 ZERO-AIR AND SENSITIVITY VERIFICATION

Tables 7-1 through 7-6 display the zero-air and sensitivity checks.

**Table 7-1. Zero-air Checks for the LI-COR $CO_2$ Monitor.**

| Date | Time | Instrument Check | Observed Result (ppm) | Expected Result (ppm) | % Difference | Acceptance Criteria (%) | Pass/Fail |
|---|---|---|---|---|---|---|---|
| 04/22/19 | 05:43 | Zero | 0.009 | <50 | N/A | N/A | Pass |
| 04/23/19 | 05:34 | Zero | 0.041 | <50 | N/A | N/A | Pass |
| 04/24/19 | 05:46 | Zero | 0.198 | <50 | N/A | N/A | Pass |
| 04/25/19 | 05:56 | Zero | 0.282 | <50 | N/A | N/A | Pass |

**Table 7-2. Span Checks for the LI-COR $CO_2$ Monitor.**

| Date | Time | Instrument Check | Observed Result (ppm) | Expected Result (ppm) | % Difference | Acceptance Criteria (%) | Pass/Fail |
|---|---|---|---|---|---|---|---|
| 04/22/19 | 05:53 | Span | 361 | 385 | -6.2 | 20 | Pass |
| 04/23/19 | 05:36 | Span | 365 | 384 | -5.1 | 20 | Pass |
| 04/24/19 | 05:49 | Span | 365 | 383 | -4.9 | 20 | Pass |
| 04/25/19 | 05:59 | Span | 365 | 384.7 | -5.2 | 20 | Pass |

**Table 7-3. Zero-air Checks for the Proton Transfer Reaction - Time-of-Flight.**

| Date | Time | Instrument Check | Observed Result (ppb) | Expected Result (ppb) | % Difference | Acceptance Criteria (%) | Pass/Fail |
|---|---|---|---|---|---|---|---|
| 04/22/19 | 05:53 | Zero | 0.08 | <0.5 ppb | N/A | N/A | Pass |
| 04/23/19 | 05:46 | Zero | 0.075 | <0.5 ppb | N/A | N/A | Pass |
| 04/24/19 | 05:59 | Zero | 0.075 | <0.5 ppb | N/A | N/A | Pass |
| 04/25/19 | 06:09 | Zero | 0.07 | <0.5 ppb | N/A | N/A | Pass |

**Table 7-4. Span Checks for the Proton Transfer Reaction - Time-of-Flight .**

| Date | Time | Instrument Check | Observed Result (ppb) | Expected Result (ppb) | % Difference | Acceptance Criteria (%) | Pass/Fail |
|---|---|---|---|---|---|---|---|
| 04/22/19 | 06:03 | Span | 9.5 | 10.8 | 12 | 30 | Pass |
| 04/23/19 | 05:56 | Span | 9.75 | 10.8 | 9.7 | 30 | Pass |
| 04/24/19 | 06:10 | Span | 10 | 10.8 | 7.4 | 30 | Pass |
| 04/25/19 | 06:20 | Span | 9.8 | 10.8 | 9 | 30 | Pass |

**Table 7-5. Zero-air Checks for the Picarro.**

| Date | Time | Instrument Check | Observed Result (ppb) | Expected Result (ppb) | % Difference | Acceptance Criteria (%) | Pass/Fail |
|---|---|---|---|---|---|---|---|
| 04/22/19 | 05:23 | Zero | 6.6 | < 20 ppb | N/A | N/A | Pass |
| 04/23/19 | 05:17 | Zero | 6.8 | < 20 ppb | N/A | N/A | Pass |
| 04/24/19 | 05:29 | Zero | 7.1 | < 20 ppb | N/A | N/A | Pass |
| 04/25/19 | 05:37 | Zero | 7.0 | < 20 ppb | N/A | N/A | Pass |

**Table 7-6. Span Checks for the Picarro.**

| Date | Time | Instrument Check | Observed Result (ppb) | Expected Result (ppb) | % Difference | Acceptance Criteria (%) | Pass/Fail |
|---|---|---|---|---|---|---|---|
| 04/22/19 | 05:36 | Span | 3650 | 3250 | 12.3 | 20 | Pass |
| 04/23/19 | 05:17 | Span | 3680 | 3250 | 13.0 | 20 | Pass |
| 04/24/19 | 05:42 | Span | 3690 | 3250 | 13.5 | 20 | Pass |
| 04/25/19 | 05:51 | Span | 3636 | 3250 | 11.9 | 20 | Pass |

## 8.0 DATA PROCESSING AND REPORTING

During the Week of April 22, 2019 through April 26, 2019, the data processing team continued processing data from the previous week and current week. The reporting team worked towards the completion of reports for Week 34, Week 36, Week 37, Week 38, Month 5, Month 6, Month 7, and the report for the AOP-015 Event. The reporting team submitted the draft weekly summary report, 53005-81-RPT-046, *Weekly Report for Week 33 (March 18, 2019 – March 22, 2019).*

## 9.0 REFERENCES

17124-DOE-HS-102, 2018, "Mobile Laboratory Data Processing – Analysis," Revision 2, TerraGraphics Environmental Engineering, Inc., Pasco, Washington.

53005-81-COM-0519-005, *Subcontract 53005, Release 81 – Transmittal of Revision 1 of Special Communication Report for (AOP)-015 Event on April 22, 2019*, TerraGraphics Environmental Engineering, Inc., Pasco, Washington.

53005-81-RPT-007, 2018, *PTR-MS Mobile Laboratory Vapor Monitoring Background Study, (3/18/2018 – 4/20/2018)*, Revision 0, TerraGraphics Environmental Engineering, Inc., Pasco, Washington.

66409-RPT-004, 2019, *Mobile Laboratory Operational Procedure*, Revision 11, TerraGraphics Environmental Engineering, Inc., Pasco, Washington.

*Fiscal Year 2017 Mobile Laboratory Vapor Monitoring at the Hanford Site: Monitoring During Waste Disturbing Activities and Background Study*, 2017, RJ Lee Group, Inc., Pasco, Washington.

# APPENDIX A

## 53005-81-COM-0519-005, REVISION 1 OF SPECIAL COMMUNICATION REPORT FOR (AOP)-015 EVENT ON APRIL 22, 2019

TerraGraphics www.terragraphics.com

**VIA E-MAIL** – TOCVND@rl.gov / Kyle_R_Dickman@rl.gov

53005-81-COM-0519-005
Revision 1

May 9, 2019

Kyle Dickman
Buyer's Technical Representative
Washington River Protection Solutions, LLC
Post Office Box 850
Richland, Washington 99352

Dear Mr. Dickman:

SUBJECT: **SUBCONTRACT 53005, RELEASE 81 – TRANSMITTAL OF REVISION 1 OF THE SPECIAL COMMUNICATION REPORT FOR AOP-015 EVENT ON APRIL 22, 2019**

Reference: Letter, From Mr. Rich Westberg to Mr. Kyle Dickman, *Subcontract 53005, Release 81 – Transmittal of Special Communication Report for AOP-015 Event on April 22, 2019*, 53005-81-COM-0519-005, dated May 6, 2019.

TerraGraphics is pleased to transmit Revision 1 of the attached letter report for the Abnormal Operating Procedure (AOP)-015 event that took place on April 22, 2019. There was a mass calibration issue discovered in the referenced report above that has now been corrected in the attached letter report. Please accept our apologies for this oversight.

Please note that TOCVND@rl.gov is included as a recipient of this submittal for reference only. This submittal is not listed on the Master Submittal Register (MSR) for this task.

Thank you for the opportunity to support this task. If you have any questions, please feel free to contact me at (509) 547-3883.

Sincerely,

Rich Westberg
Business Unit Manager, Health, Safety, & Analytical Services
Pasco Office

/kls

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**Attachment 1**

**LETTER REPORT FOR AOP-015 EVENT ON APRIL 22, 2019**

TerraGraphics

Attachment to 53005-81-COM-0519-005, Revision 1
May 9, 2019

## 1.0 INTRODUCTION

On April 22, 2019, the TerraGraphics Mobile Laboratory (ML) was deployed to the Hanford Site for area monitoring around the 200 East location. The ML's objective was to perform vapor monitoring for a range of compounds, primarily focused on chemicals of potential concern (COPCs) and odor-causing compounds. At approximately 9:18 Pacific Standard Time (PST), an Abnormal Operating Procedure (AOP)-015 event was reported near the U-Farm change trailer. There were no significant responses of COPCs or odor compounds, with levels remaining below occupational exposure limits (OELs) or at typical background levels at the initial time of the AOP-015 event.

The ML operators were notified of the AOP-015 event by Central Shift Office (CSO) announcement at 9:18 PST, while monitoring the northwest side of 241-A Farm, and immediately headed to the CSO for briefing. By 9:50 PST, following further instruction from the CSO, the ML operators traveled to 200 West and positioned approximately 500 feet to the south of the entrance of the U-Farm change trailer. At this time, the ML operators set up the 208-foot heated inlet line for vapor monitoring. The ML was instructed by the CSO to maintain its position. After the arrival of the Industrial Hygiene Technicians (IHTs) at approximately 10:17 PST, the heated inlet line was extended north by the IHTs toward the U-Farm change trailer with the end of the line falling less than halfway between the ML position and the source of the AOP-015 event. The ML operators continued vapor monitoring in this position, sampling from the 208-foot heated inlet line, until 14:02 PST, at which time the CSO announced an exit from the AOP-015. During this monitoring period, the wind direction was primarily based from the south. Consequently, the ML inlet was positioned upwind and 300 feet away from the U-Farm change trailer for the majority of the monitoring.

## 2.0 April 22, 2019 – AOP-015 EVENT

### 2.1 Quality Assessment

Data from April 16, 2019, were assessed using Procedure 17124-DOE-HS-102, "Mobile Laboratory Data Processing-Analysis." A Data Acceptance Checklist was completed. The data were accepted by TerraGraphics with the following comments. Report No. 66409-RPT-004, *Mobile Laboratory Operational Procedure*, was adequately documented and all checks passed the acceptance limits.

### 2.2 Summary

Figure 2-1 below shows the position of the ML and its 208-foot heated line inlet for the duration of the monitoring period.

**Figure 2-1. Position of the Mobile Laboratory for the Duration of Monitoring (10:17 PST – 14:02 PST).**

Figure 2-2 below shows meteorological data from the ML mast for the duration of the monitoring period.

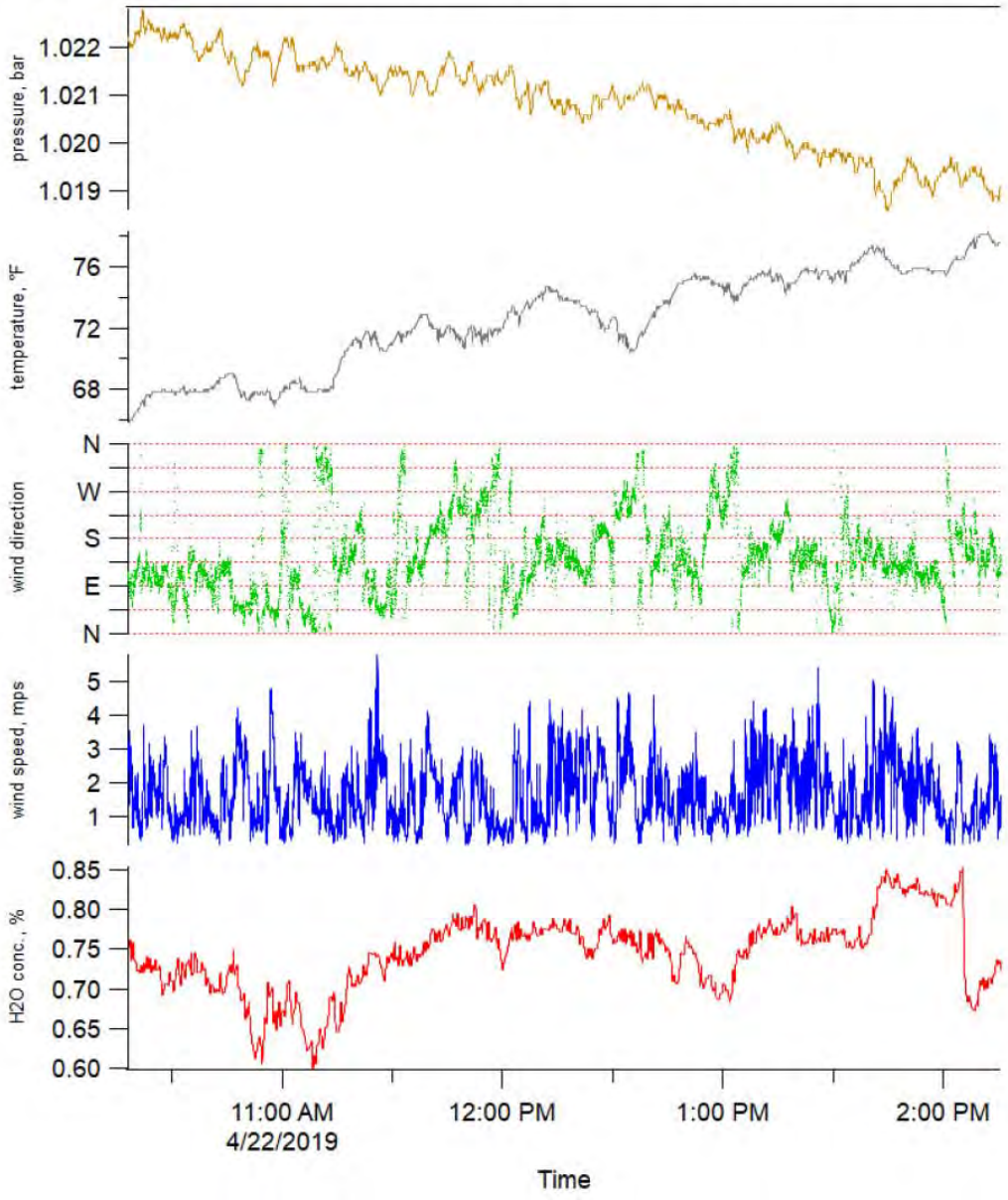


**Figure 2-2. Meteorological Data from Mobile Laboratory Mast for the Duration of Monitoring.**

## 2.3 Chemicals of Potential Concern

**Table 2-1. Chemical of Potential Concern Statistical Information for the Monitoring Period of April 22, 2019. (2 Sheets)**

| COPC # | COPC Name | OEL (ppb) | MDL (ppb) | Ave. (ppb) | St. Dev. (ppb) | Rel. St. Dev. % | Max (ppb) | Median (ppb) |
|---|---|---|---|---|---|---|---|---|
| 1 | Ammonia | 25000 | 6.225 | 8.602† | 0.401 | 4.658 | 10.190 | 8.579† |
| 2 | Formaldehyde | 300 | 1.721 | 2.225† | 0.291 | 13.097 | 3.324 | 2.22† |
| 3 | Methanol | 200000 | 5.758 | 20.292 | 2.157 | 10.629 | 26.112 | 20.378 |
| 4 | Acetonitrile | 20000 | 0.085 | 0.121† | 0.033 | 27.005 | 0.260 | 0.119† |
| 5 | Acetaldehyde | 25000 | 1.027 | 2.438† | 0.302 | 12.387 | 3.625 | 2.425† |
| 6 | Ethylamine | 5000 | 0.069 | <0.069 | 0.024 | 58.427 | 0.166 | <0.069 |
| 7 | 1,3-butadiene | 1000 | 0.183 | 0.285† | 0.078 | 27.319 | 0.714 | 0.282† |
| 8 | Propanenitrile | 6000 | 0.107 | <0.107 | 0.030 | 38.903 | 0.226 | <0.107 |
| 9 | 2-propenal | 100 | 0.340 | <0.34 | 0.049 | 30.420 | 0.398 | <0.34 |
| 10 | 1-butanol + butenes | 20000 | 0.214 | <0.214 | 0.050 | 31.860 | 0.410 | <0.214 |
| 11 | methyl isocyanate | 20 | 0.069 | 0.083† | 0.035 | 42.416 | 0.266 | 0.08† |
| 12 | methyl nitrite | 100 | 0.098 | 0.217† | 0.050 | 22.983 | 0.433 | 0.217† |
| 13 | Furan | 1 | 0.062 | <0.062 | 0.022 | 44.090 | 0.155 | <0.062 |
| 14 | Butanenitrile | 8000 | 0.039 | <0.039 | 0.021 | 58.294 | 0.147 | <0.039 |
| 15 | but-3-en-2-one + 2,3-dihydrofuran + 2,5-dihydrofuran | 100, 1, 1 | 0.041 | 0.051† | 0.019 | 38.469 | N/A* | N/A* |
| 16 | Butanal | 25000 | 0.061 | 0.264 | 0.054 | 20.465 | 0.518 | 0.262 |
| 17 | NDMA** | 0.3 | 0.082 | <0.082 | 0.030 | 198.986 | 0.269 | <0.082 |
| 18 | Benzene | 500 | 0.236 | 0.413† | 0.075 | 18.184 | 0.699 | 0.412† |
| 19 | 2,4-pentadienenitrile + pyridine | 300, 1000 | 0.085 | <0.085 | 0.024 | 36.674 | 0.192 | <0.085 |
| 20 | 2-methylene butanenitrile | 30 | 0.036 | <0.036 | 0.014 | 59.873 | 0.103 | <0.036 |
| 21 | 2-methylfuran | 1 | 0.043 | 0.046† | 0.024 | 52.210 | 0.178 | 0.044† |
| 22 | Pentanenitrile | 6000 | 0.036 | <0.036 | 0.016 | 67.023 | 0.119 | <0.036 |
| 23 | 3-methyl-3-buten-2-one + 2-methyl-2-butenal | 20, 30 | 0.043 | <0.043 | 0.024 | 58.595 | 0.161 | <0.043 |
| 24 | NEMA** | 0.3 | 0.058 | <0.058 | 0.029 | 154.500 | 0.181 | <0.058 |
| 25 | 2,5-dimethylfuran | 1 | 0.032 | <0.032 | 0.020 | 72.220 | 0.125 | <0.032 |
| 26 | Hexanenitrile | 6000 | 0.031 | <0.031 | 0.014 | 77.287 | 0.098 | <0.031 |
| 27 | 2-hexanone (MBK) | 5000 | 0.036 | <0.036 | 0.021 | 66.718 | 0.149 | <0.036 |
| 28 | NDEA** | 0.1 | 0.034 | <0.034 | 0.016 | 134.378 | 0.107 | <0.034 |

TerraGraphics

Attachment to 53005-81-COM-0519-005, Revision 1
May 9, 2019

**Table 2-1. Chemical of Potential Concern Statistical Information for the Monitoring Period of April 22, 2019. (2 Sheets)**

| COPC # | COPC Name | OEL (ppb) | MDL (ppb) | Ave. (ppb) | St. Dev. (ppb) | Rel. St. Dev. % | Max (ppb) | Median (ppb) |
|---|---|---|---|---|---|---|---|---|
| 29 | butyl nitrite + 2-nitro-2-methylpropane | 100, 30 | 0.058 | <0.058 | 0.020 | 39.035 | 0.132 | <0.058 |
| 30 | 2,4-dimethylpyridine | 500 | 0.036 | <0.036 | 0.016 | 76.457 | 0.118 | <0.036 |
| 31 | 2-propylfuran + 2-ethyl-5-methylfuran | 1 | 0.027 | <0.027 | 0.014 | 113.359 | 0.102 | <0.027 |
| 32 | Heptanenitrile | 6000 | 0.027 | <0.027 | 0.012 | 81.009 | 0.084 | <0.027 |
| 33 | 4-methyl-2-hexanone | 500 | 0.033 | <0.033 | 0.015 | 81.918 | 0.092 | <0.033 |
| 34 | NMOR** | 0.6 | 0.021 | <0.021 | 0.012 | 200.988 | 0.093 | <0.021 |
| 35 | butyl nitrate | 2500 | 0.022 | <0.022 | 0.010 | 110.338 | 0.067 | <0.022 |
| 36 | 2-ethyl-2-hexenal + 4-(1-methylpropyl)-2,3-dihydrofuran + 3-(1,1-dimethylethyl)-2,3-dihydrofuran | 100,1, 1 | 0.028 | <0.028 | 0.014 | 80.121 | 0.100 | <0.028 |
| 37 | 6-methyl-2-heptanone | 8000 | 0.028 | <0.028 | 0.013 | 81.765 | 0.089 | <0.028 |
| 38 | 2-pentylfuran | 1 | 0.026 | <0.026 | 0.013 | 81.122 | 0.078 | <0.026 |
| 39 | Biphenyl | 200 | 0.022 | <0.022 | 0.014 | 106.903 | 0.079 | <0.022 |
| 40 | 2-heptylfuran | 1 | 0.067 | <0.067 | 0.020 | 33.915 | 0.150 | <0.067 |
| 41 | 1,4-butanediol dinitrate | 50 | 0.036 | <0.036 | 0.016 | 64.364 | 0.101 | <0.036 |
| 42 | 2-octylfuran | 1 | 0.020 | <0.02 | 0.010 | 204.239 | 0.093 | <0.02 |
| 43 | 1,2,3-propanetriol 1,3-dinitrate | 50 | 0.011 | <0.011 | 0.010 | 264.422 | 0.080 | <0.011 |
| 44 | PCB | 1000 | 0.034 | <0.034 | 0.016 | 53.239 | 0.109 | <0.034 |
| 45 | 6-(2-furanyl)-6-methyl-2-heptanone | 1 | 0.025 | <0.025 | 0.010 | 93.233 | 0.080 | <0.025 |
| 46 | furfural acetophenone | 1 | 0.064 | <0.064 | 0.019 | 36.634 | 0.135 | <0.064 |
| N/A* | The maximum peak value for but-3-en-2-one + 2,3 dihydrofuran + 2,5 dihydrofuran was 0.143 ppb and the median value was 0.049† ppb. The PTR-MS results for but-3-en-2-one + 2,3 dihydrofuran + 2,5 dihydrofuran are not compared to OEL concentrations because: 1) the result is suspect due to a known biogenic interferant (methacrolein) that is expected to be in concentrations that occasionally exceed the dihydrofuran OEL, and 2) this combination of COPCs have OEL concentrations that differ by a factor of 200, which provide widely variant bases for these numbers. | | | | | | | |
| ** | Nitrosamine results are suspect due to isobaric interferants causing positive bias that have been encountered during previous background studies the Spring 2018 background study [53005-81-RPT-007, *PTR-MS Mobile Laboratory Vapor Monitoring Background Study, (3/18/2018 – 4/20/2018)*, and *Fiscal Year 2017 Mobile Laboratory Vapor Monitoring at the Hanford Site: Monitoring During Waste Disturbing Activities and Background Study*, RJ Lee Group, Inc., 2017]. | | | | | | | |
| < | COPC Average/Median Below the MDL. | | | | | | | |
| † | COPC Average/Median Between the MDL and the RL (i.e., 3*MDL). | | | | | | | |

1-6

## 2.4 Odor Compounds

**Table 2-2. Odor Statistical Information for the Monitoring Period of April 22, 2019.**

| Odor # | Odor Name | MDL (ppb) | Ave. (ppb) | St. Dev. (ppb) | Rel. St. Dev. (ppb) | Max (ppb) | Median (ppb) |
|---|---|---|---|---|---|---|---|
| 1 | hydrogen sulfide | 2.801 | <2.801 | 0.199 | 8.924 | 3.108 | <2.801 |
| 2 | methyl mercaptan | 0.147 | <0.147 | 0.044 | 30.407 | 0.366 | <0.147 |
| 3 | dimethylsulfide; ethanethiol | 0.088 | 0.193† | 0.045 | 23.122 | 0.402 | 0.193† |
| 4 | allyl mercaptan | 0.033 | <0.033 | 0.013 | 201.445 | 0.126 | <0.033 |
| 5 | 1-propanethiol; isopropyl mercaptan | 0.041 | <0.041 | 0.023 | 139.480 | 0.182 | <0.041 |
| 6 | 2-butene-1-thiol | 0.062 | <0.062 | 0.012 | 263.193 | 0.147 | <0.062 |
| 7 | diethyl sulfide; 2-methylpropane-2-thiol | 0.281 | 0.373† | 0.089 | 23.980 | 0.824 | 0.365† |
| 8 | thiopropanal sulfuroxide | 0.024 | 0.126 | 0.051 | 40.564 | 0.353 | 0.123 |
| 9 | dimethyl disulfide | 0.027 | 0.053† | 0.030 | 57.077 | 0.203 | 0.051† |
| 10 | 1-pentanethiol; 2,2-dimethylpropane-1-thiol | 0.046 | <0.046 | 0.019 | 121.401 | 0.121 | <0.046 |
| 11 | benzenethiol | 0.028 | 0.107 | 0.057 | 52.758 | 0.320 | 0.105 |
| 12 | diallyl sulfide | 0.022 | <0.022 | 0.013 | 193.852 | 0.130 | <0.022 |
| 13 | methyl propyl disulfide | 0.016 | 0.026† | 0.032 | 124.046 | 0.187 | 0.011† |
| 14 | methylbenzenethiol | 0.027 | <0.027 | 0.017 | 114.929 | 0.111 | <0.027 |
| 15 | dimethyl trisulfide | 0.020 | <0.02 | 0.010 | 157.053 | 0.069 | <0.02 |
| 16 | (1-oxoethyl) thiophene | 0.040 | <0.04 | 0.024 | 170.062 | 0.164 | <0.04 |
| 17 | (1-oxopropyl) thiophene | 0.029 | 0.031† | 0.024 | 75.714 | 0.138 | 0.028† |
| 18 | dipropyl disulfide | 0.024 | <0.024 | 0.013 | 102.344 | 0.087 | <0.024 |
| 19 | methyl propyl trisulfide | 0.019 | <0.019 | 0.013 | 160.881 | 0.089 | <0.019 |
| 20 | dimethyl tetrasulfide | 0.021 | <0.021 | 0.009 | 92.339 | 0.057 | <0.021 |
| 21 | dipropyl trisulfide | 0.022 | <0.022 | 0.013 | 177.118 | 0.096 | <0.022 |
| 22 | diphenyl sulfide | 0.026 | <0.026 | 0.014 | 137.747 | 0.099 | <0.026 |
| < | COPC Average/Median Below the MDL. | | | | | | |
| † | COPC Average/Median Between the MDL and the RL (i.e., 3*MDL). | | | | | | |

## 2.5 All Other Mass Signals Detected by Proton Transfer Reaction – Mass Spectrometer

**Table 2-3. Other Mass Signal Statistical Information for the Monitoring Period of April 22, 2019. (12 Sheets)**

| # | Species Name | MDL (ppb) | Ave. (ppb) | St. Dev. (ppb) | Rel. St. Dev. (ppb) | Max (ppb) | Median (ppb) |
|---|---|---|---|---|---|---|---|
| 1 | nominal m/z 26 | 0.189 | <0.189 | 0.056 | 41.944 | 0.423 | <0.189 |
| 2 | nominal m/z 27 | 0.435 | <0.435 | 0.092 | 24.673 | 0.792 | <0.435 |
| 3 | nominal m/z 36 | 1.631 | 1.911† | 0.184 | 9.616 | 2.648 | 1.909† |
| 4 | nominal m/z 38 | 0.678 | 4.531 | 0.383 | 8.460 | 5.972 | 4.54 |
| 5 | nominal m/z 39 | 1.530 | 6.899 | 0.434 | 6.295 | 8.448 | 6.91 |
| 6 | nominal m/z 40 | 0.272 | 0.332† | 0.073 | 22.025 | 0.629 | 0.332† |
| 7 | nominal m/z 41 | 0.551 | 0.747† | 0.129 | 17.318 | 1.270 | 0.743† |
| 8 | unknown m/z 42 | 0.298 | 0.304† | 0.081 | 26.649 | 0.667 | 0.3† |
| 9 | nominal m/z 43 | 1.411 | 7.81 | 0.803 | 10.281 | 10.266 | 7.872 |
| 10 | nominal m/z 44 | 0.708 | 0.715† | 0.104 | 14.588 | 1.126 | 0.713† |
| 11 | nominal m/z 45 | 5.841 | 6.62† | 1.204 | 18.194 | 12.005 | 6.378† |
| 12 | nominal m/z 46 | 2.018 | 3.023† | 0.429 | 14.181 | 8.074 | 2.963† |
| 13 | formamide | 0.240 | 0.264† | 0.063 | 23.961 | 0.523 | 0.264† |
| 14 | formic acid | 0.908 | 7.271 | 0.629 | 8.649 | 9.198 | 7.331 |
| 15 | ethanol | 0.050 | <0.05 | 0.021 | 164.305 | 0.170 | <0.05 |
| 16 | nominal m/z 48 | 0.267 | 0.331† | 0.067 | 20.086 | 0.639 | 0.331† |
| 17 | nominal m/z 50 | 0.473 | 0.499† | 0.081 | 16.301 | 0.850 | 0.497† |
| 18 | nominal m/z 51 | 0.536 | 0.615† | 0.104 | 16.938 | 1.125 | 0.612† |
| 19 | nominal m/z 52 | 0.588 | <0.588 | 0.060 | 20.750 | 0.541 | <0.588 |
| 20 | nominal m/z 53 | 0.280 | 0.283† | 0.064 | 22.441 | 0.623 | 0.278† |
| 21 | nominal m/z 54 | 0.308 | <0.308 | 0.043 | 27.589 | 0.357 | <0.308 |
| 22 | unknown m/z 55 | 0.091 | <0.091 | 0.040 | 57.514 | 0.255 | <0.091 |
| 23 | unknown m/z 58 | 0.270 | <0.27 | 0.026 | 49.651 | 0.191 | <0.27 |
| 24 | $C_3H_7N$ | 0.089 | 0.093† | 0.037 | 40.220 | 0.271 | 0.09† |
| 25 | acetone | 0.274 | 6.635 | 0.775 | 11.686 | 9.543 | 6.659 |
| 26 | nominal m/z 60 | 0.292 | 0.768† | 0.110 | 14.296 | 1.245 | 0.766† |
| 27 | acetic acid + acetate fragment | 0.592 | 4.247 | 0.472 | 11.102 | 5.907 | 4.287 |
| 28 | nominal m/z 64 | 0.160 | 0.241† | 0.052 | 21.707 | 0.484 | 0.242† |
| 29 | nominal m/z 65 | 0.154 | 0.291† | 0.057 | 19.611 | 0.542 | 0.29† |

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**Table 2-3. Other Mass Signal Statistical Information for the Monitoring Period of April 22, 2019. (12 Sheets)**

| # | Species Name | MDL (ppb) | Ave. (ppb) | St. Dev. (ppb) | Rel. St. Dev. (ppb) | Max (ppb) | Median (ppb) |
|---|---|---|---|---|---|---|---|
| 30 | nominal m/z 66 | 0.126 | <0.126 | 0.032 | 31.989 | 0.259 | <0.126 |
| 31 | nominal m/z 67 | 0.154 | 0.159† | 0.041 | 25.770 | 0.361 | 0.157† |
| 32 | nominal m/z 68 | 0.132 | <0.132 | 0.031 | 31.179 | 0.252 | <0.132 |
| 33 | isoprene | 0.108 | 0.115† | 0.038 | 32.727 | 0.301 | 0.115† |
| 34 | unknown m/z 70 | 0.032 | <0.032 | 0.016 | 74.956 | 0.102 | <0.032 |
| 35 | $C_5H_{10}$ | 0.074 | <0.074 | 0.030 | 52.058 | 0.198 | <0.074 |
| 36 | unknown m/z 71 | 0.037 | 0.071† | 0.031 | 44.067 | 0.223 | 0.069† |
| 37 | nominal m/z 72 | 0.211 | <0.211 | 0.035 | 26.983 | 0.290 | <0.211 |
| 38 | nominal m/z 73 | 0.113 | <0.113 | 0.016 | 57.765 | 0.111 | <0.113 |
| 39 | $C_3H_4O_2$ | 0.099 | 0.182† | 0.051 | 28.271 | 0.401 | 0.18† |
| 40 | nominal m/z 74 | 0.226 | <0.226 | 0.043 | 23.023 | 0.361 | <0.226 |
| 41 | methyl acetate | 0.056 | 0.365 | 0.081 | 22.070 | 0.679 | 0.363 |
| 42 | nominal m/z 76 | 0.245 | <0.245 | 0.035 | 26.105 | 0.280 | <0.245 |
| 43 | unknown m/z 77(a) | 0.115 | 0.222† | 0.057 | 25.738 | 0.475 | 0.22† |
| 44 | unknown m/z 77(b) | 0.023 | <0.023 | 0.014 | 116.799 | 0.089 | <0.023 |
| 45 | nominal m/z 78 | 0.236 | <0.236 | 0.040 | 22.759 | 0.363 | <0.236 |
| 46 | nominal m/z 81 | 0.164 | 0.196† | 0.045 | 22.730 | 0.409 | 0.193† |
| 47 | $C_6H_{10}$ | 0.069 | 0.104† | 0.040 | 38.336 | 0.284 | 0.101† |
| 48 | unknown m/z 84 | 0.039 | <0.039 | 0.016 | 67.372 | 0.107 | <0.039 |
| 49 | nominal m/z 85 | 0.063 | 0.091† | 0.028 | 30.539 | 0.211 | 0.092† |
| 50 | $C_4H_4O_2$ | 0.049 | 0.131† | 0.041 | 30.951 | 0.310 | 0.129† |
| 51 | $C_6H_{12}$ | 0.049 | <0.049 | 0.020 | 64.297 | 0.135 | <0.049 |
| 52 | nominal m/z 86 | 0.156 | <0.156 | 0.032 | 26.840 | 0.250 | <0.156 |
| 53 | nominal m/z 87 | 0.155 | 0.357† | 0.060 | 16.685 | 0.602 | 0.355† |
| 54 | nominal m/z 88 | 0.224 | <0.224 | 0.031 | 26.453 | 0.275 | <0.224 |
| 55 | nominal m/z 89 | 0.068 | <0.068 | 0.014 | 58.045 | 0.091 | <0.068 |
| 56 | ethyl acetate | 0.026 | 0.11 | 0.052 | 47.030 | 0.348 | 0.109 |
| 57 | unknown m/z 89 | 0.065 | 0.088† | 0.034 | 38.627 | 0.264 | 0.086† |
| 58 | nominal m/z 90 | 0.395 | <0.395 | 0.030 | 27.442 | 0.231 | <0.395 |
| 59 | unknown m/z 91(a) | 0.472 | <0.472 | 0.031 | 36.891 | 0.234 | <0.472 |
| 60 | unknown m/z 91(b) | 0.037 | 0.06† | 0.039 | 65.785 | 0.249 | 0.056† |

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**Table 2-3. Other Mass Signal Statistical Information for the Monitoring Period of April 22, 2019. (12 Sheets)**

| # | Species Name | MDL (ppb) | Ave. (ppb) | St. Dev. (ppb) | Rel. St. Dev. (ppb) | Max (ppb) | Median (ppb) |
|---|---|---|---|---|---|---|---|
| 61 | nominal m/z 92 | 0.143 | 0.561 | 0.109 | 19.474 | 1.029 | 0.551 |
| 62 | unknown m/z 93 | 0.047 | <0.047 | 0.040 | 132.426 | 0.272 | <0.047 |
| 63 | toluene | 0.055 | 2.88 | 0.537 | 18.635 | 5.244 | 2.796 |
| 64 | nominal m/z 94 | 0.223 | 0.399† | 0.068 | 17.015 | 0.726 | 0.396† |
| 65 | unknown m/z 95(a) | 0.079 | 0.176† | 0.054 | 30.663 | 0.433 | 0.172† |
| 66 | unknown m/z 95(b) | 0.063 | <0.063 | 0.030 | 52.435 | 0.183 | <0.063 |
| 67 | unknown m/z 95(c) | 0.083 | 0.136† | 0.055 | 40.161 | 0.381 | 0.133† |
| 68 | nominal m/z 96 | 0.149 | <0.149 | 0.034 | 24.573 | 0.273 | <0.149 |
| 69 | unknown m/z 97 | 0.036 | <0.036 | 0.020 | 58.602 | 0.133 | <0.036 |
| 70 | $C_5H_4O_2$ | 0.089 | <0.089 | 0.027 | 48.368 | 0.186 | <0.089 |
| 71 | $C_7H_{12}$ | 0.054 | <0.054 | 0.025 | 51.552 | 0.183 | <0.054 |
| 72 | unknown m/z 98(a) | 0.040 | <0.04 | 0.013 | 71.873 | 0.089 | <0.04 |
| 73 | unknown m/z 98(b) | 0.035 | <0.035 | 0.017 | 69.936 | 0.117 | <0.035 |
| 74 | unknown m/z 98(c) | 0.031 | <0.031 | 0.015 | 89.979 | 0.106 | <0.031 |
| 75 | nominal m/z 99 | 0.149 | 0.21† | 0.042 | 20.116 | 0.388 | 0.211† |
| 76 | nominal m/z 100 | 0.036 | 0.692 | 0.099 | 14.345 | 1.109 | 0.691 |
| 77 | nominal m/z 101 | 0.089 | 0.056† | 0.021 | 37.373 | 0.150 | 0.055† |
| 78 | unknown m/z 101 | 0.054 | 0.079† | 0.030 | 37.438 | 0.223 | 0.078† |
| 79 | $C_5H_8O_2$ | 0.049 | 0.081† | 0.033 | 41.112 | 0.244 | 0.078† |
| 80 | nominal m/z 102 | 0.172 | <0.172 | 0.029 | 27.092 | 0.235 | <0.172 |
| 81 | nominal m/z 103 | 0.041 | 0.042† | 0.018 | 43.283 | 0.148 | 0.039† |
| 82 | ethyl propionate | 0.025 | <0.025 | 0.022 | 94.551 | 0.125 | <0.025 |
| 83 | unknown m/z 103 | 0.037 | 0.067† | 0.027 | 40.100 | 0.188 | 0.066† |
| 84 | nominal m/z 104 | 0.142 | <0.142 | 0.022 | 35.938 | 0.184 | <0.142 |
| 85 | unknown m/z 105 | 0.063 | 0.173† | 0.046 | 26.654 | 0.390 | 0.171† |
| 86 | styrene | 0.030 | <0.03 | 0.010 | 374.427 | 0.145 | <0.03 |
| 87 | nominal m/z 106 | 1.046 | <1.046 | 0.037 | 21.034 | 0.353 | <1.046 |
| 88 | nominal m/z 107 | 0.089 | <0.089 | 0.019 | 41.078 | 0.146 | <0.089 |
| 89 | unknown m/z 107 | 0.079 | <0.079 | 0.031 | 44.605 | 0.228 | <0.079 |
| 90 | $C_2$ benzenes | 0.053 | 0.116† | 0.039 | 34.088 | 0.322 | 0.112† |
| 91 | nominal m/z 108 | 0.206 | <0.206 | 0.022 | 35.282 | 0.161 | <0.206 |

**Table 2-3. Other Mass Signal Statistical Information for the Monitoring Period of April 22, 2019. (12 Sheets)**

| # | Species Name | MDL (ppb) | Ave. (ppb) | St. Dev. (ppb) | Rel. St. Dev. (ppb) | Max (ppb) | Median (ppb) |
|---|---|---|---|---|---|---|---|
| 92 | unknown m/z 108 | 0.041 | <0.041 | 0.020 | 53.336 | 0.126 | <0.041 |
| 93 | nominal m/z 109 | 0.184 | 0.559 | 0.079 | 14.191 | 0.898 | 0.558 |
| 94 | nominal m/z 110 | 0.099 | <0.099 | 0.027 | 29.081 | 0.235 | <0.099 |
| 95 | unknown m/z 111 | 0.025 | 0.076 | 0.045 | 59.513 | 0.280 | 0.073 |
| 96 | $C_6H_6O_2$ | 0.029 | <0.029 | 0.024 | 130.718 | 0.170 | <0.029 |
| 97 | $C_8H_{14}$ | 0.043 | <0.043 | 0.020 | 63.358 | 0.135 | <0.043 |
| 98 | unknown m/z 112 | 0.032 | <0.032 | 0.014 | 72.778 | 0.093 | <0.032 |
| 99 | $C_6H_9NO$ | 0.028 | <0.028 | 0.012 | 101.557 | 0.075 | <0.028 |
| 100 | nominal m/z 113 | 0.180 | 0.319† | 0.054 | 16.946 | 0.532 | 0.317† |
| 101 | nominal m/z 114 | 0.133 | <0.133 | 0.030 | 26.907 | 0.239 | <0.133 |
| 102 | unknown m/z 115(a) | 0.095 | <0.095 | 0.018 | 66.306 | 0.117 | <0.095 |
| 103 | unknown m/z 115(b) | 0.062 | <0.062 | 0.022 | 72.684 | 0.129 | <0.062 |
| 104 | unknown m/z 115(c) | 0.027 | 0.034† | 0.023 | 66.898 | 0.156 | 0.032† |
| 105 | nominal m/z 116 | 0.078 | <0.078 | 0.021 | 35.944 | 0.163 | <0.078 |
| 106 | $C_6H_{12}O_2$ | 0.035 | 0.036† | 0.021 | 58.416 | 0.141 | 0.034† |
| 107 | unknown m/z 117 | 0.020 | <0.02 | 0.016 | 84.175 | 0.118 | <0.02 |
| 108 | nominal m/z 118 | 0.149 | <0.149 | 0.025 | 29.722 | 0.208 | <0.149 |
| 109 | nominal m/z 119 | 0.128 | 0.17† | 0.036 | 21.239 | 0.334 | 0.169† |
| 110 | nominal m/z 120 | 0.077 | <0.077 | 0.017 | 43.792 | 0.110 | <0.077 |
| 111 | unknown m/z 120 | 0.027 | <0.027 | 0.013 | 85.842 | 0.102 | <0.027 |
| 112 | unknown m/z 121(a) | 0.031 | 0.039† | 0.026 | 67.558 | 0.154 | 0.037† |
| 113 | unknown m/z 121(b) | 0.036 | 0.274 | 0.065 | 23.765 | 0.558 | 0.272 |
| 114 | $C_3$ benzenes | 0.033 | <0.033 | 0.018 | 106.124 | 0.145 | <0.033 |
| 115 | nominal m/z 122 | 0.088 | 0.153† | 0.034 | 22.366 | 0.291 | 0.153† |
| 116 | unknown m/z 123(a) | 0.054 | <0.054 | 0.031 | 68.653 | 0.189 | <0.054 |
| 117 | unknown m/z 123(b) | 0.054 | <0.054 | 0.031 | 68.653 | 0.189 | <0.054 |
| 118 | unknown m/z 123(c) | 0.033 | <0.033 | 0.016 | 62.838 | 0.117 | <0.033 |
| 119 | nominal m/z 124 | 0.202 | 0.274† | 0.045 | 16.454 | 0.446 | 0.271† |
| 120 | unknown m/z 125(a) | 0.025 | <0.025 | 0.013 | 84.950 | 0.080 | <0.025 |
| 121 | unknown m/z 125(b) | 0.025 | <0.025 | 0.013 | 84.950 | 0.080 | <0.025 |
| 122 | unknown m/z 125(c) | 0.027 | <0.027 | 0.015 | 76.451 | 0.095 | <0.027 |

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**Table 2-3. Other Mass Signal Statistical Information for the Monitoring Period of April 22, 2019. (12 Sheets)**

| # | Species Name | MDL (ppb) | Ave. (ppb) | St. Dev. (ppb) | Rel. St. Dev. (ppb) | Max (ppb) | Median (ppb) |
|---|---|---|---|---|---|---|---|
| 123 | nominal m/z 126 | 0.101 | 0.128† | 0.031 | 23.986 | 0.246 | 0.125† |
| 124 | unknown m/z 127(a) | 0.019 | 0.103 | 0.043 | 41.604 | 0.281 | 0.104 |
| 125 | unknown m/z 127(b) | 0.028 | <0.028 | 0.015 | 89.940 | 0.096 | <0.028 |
| 126 | nominal m/z 128 | 0.086 | <0.086 | 0.023 | 30.583 | 0.173 | <0.086 |
| 127 | unknown m/z 129(a) | 0.025 | <0.025 | 0.015 | 111.770 | 0.111 | <0.025 |
| 128 | unknown m/z 129(b) | 0.035 | 0.175 | 0.045 | 25.913 | 0.349 | 0.173 |
| 129 | naphthalene | 0.025 | <0.025 | 0.018 | 101.843 | 0.108 | <0.025 |
| 130 | nominal m/z 130 | 0.081 | <0.081 | 0.023 | 32.362 | 0.180 | <0.081 |
| 131 | nominal m/z 131 | 0.120 | 0.294† | 0.053 | 18.014 | 0.529 | 0.293† |
| 132 | nominal m/z 132 | 0.074 | <0.074 | 0.022 | 33.778 | 0.171 | <0.074 |
| 133 | nominal m/z 133 | 0.072 | <0.072 | 0.022 | 33.135 | 0.173 | <0.072 |
| 134 | nominal m/z 134 | 0.078 | <0.078 | 0.020 | 34.733 | 0.164 | <0.078 |
| 135 | $C_4$ benzenes | 0.052 | <0.052 | 0.019 | 39.977 | 0.135 | <0.052 |
| 136 | nominal m/z 136 | 0.096 | 0.104† | 0.036 | 34.638 | 0.256 | 0.1† |
| 137 | nominal m/z 137 | 0.079 | 0.098† | 0.027 | 27.966 | 0.205 | 0.099† |
| 138 | nominal m/z 138 | 0.068 | <0.068 | 0.020 | 34.760 | 0.157 | <0.068 |
| 139 | unknown m/z 139(a) | 0.036 | 0.059† | 0.023 | 38.876 | 0.185 | 0.058† |
| 140 | unknown m/z 139(b) | 0.024 | <0.024 | 0.011 | 94.582 | 0.072 | <0.024 |
| 141 | nominal m/z 140 | 0.071 | 0.071† | 0.022 | 31.618 | 0.162 | 0.07† |
| 142 | unknown m/z 141(a) | 0.026 | <0.026 | 0.014 | 123.920 | 0.101 | <0.026 |
| 143 | unknown m/z 141(b) | 0.026 | <0.026 | 0.014 | 123.920 | 0.101 | <0.026 |
| 144 | unknown m/z 141(c) | 0.029 | <0.029 | 0.014 | 82.368 | 0.086 | <0.029 |
| 145 | nominal m/z 142 | 0.083 | <0.083 | 0.022 | 31.427 | 0.169 | <0.083 |
| 146 | nominal m/z 143 | 0.075 | 0.092† | 0.026 | 28.169 | 0.198 | 0.091† |
| 147 | nominal m/z 144 | 0.086 | <0.086 | 0.022 | 31.494 | 0.174 | <0.086 |
| 148 | nominal m/z 145 | 0.093 | 0.094† | 0.026 | 27.283 | 0.217 | 0.091† |
| 149 | nominal m/z 146 | 0.064 | <0.064 | 0.019 | 36.453 | 0.141 | <0.064 |
| 150 | nominal m/z 147 | 0.079 | 0.126† | 0.031 | 24.353 | 0.258 | 0.126† |
| 151 | nominal m/z 148 | 0.069 | <0.069 | 0.021 | 33.503 | 0.153 | <0.069 |
| 152 | nominal m/z 149 | 0.078 | 0.089† | 0.026 | 28.919 | 0.200 | 0.09† |
| 153 | nominal m/z 150 | 0.072 | <0.072 | 0.022 | 31.604 | 0.173 | <0.072 |

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**Table 2-3. Other Mass Signal Statistical Information for the Monitoring Period of April 22, 2019. (12 Sheets)**

| # | Species Name | MDL (ppb) | Ave. (ppb) | St. Dev. (ppb) | Rel. St. Dev. (ppb) | Max (ppb) | Median (ppb) |
|---|---|---|---|---|---|---|---|
| 154 | unknown m/z 151(a) | 0.021 | <0.021 | 0.012 | 120.573 | 0.084 | <0.021 |
| 155 | unknown m/z 151(b) | 0.021 | <0.021 | 0.012 | 120.573 | 0.084 | <0.021 |
| 156 | unknown m/z 151(c) | 0.026 | <0.026 | 0.012 | 97.023 | 0.103 | <0.026 |
| 157 | nominal m/z 152 | 0.070 | <0.07 | 0.020 | 34.568 | 0.153 | <0.07 |
| 158 | nominal m/z 153 | 0.074 | 0.087† | 0.025 | 28.901 | 0.203 | 0.084† |
| 159 | nominal m/z 154 | 0.065 | <0.065 | 0.020 | 36.039 | 0.153 | <0.065 |
| 160 | unknown m/z 155(a) | 0.019 | <0.019 | 0.012 | 163.973 | 0.097 | <0.019 |
| 161 | unknown m/z 155(b) | 0.019 | <0.019 | 0.012 | 163.973 | 0.097 | <0.019 |
| 162 | unknown m/z 155(c) | 0.026 | <0.026 | 0.012 | 91.749 | 0.094 | <0.026 |
| 163 | nominal m/z 156 | 0.068 | <0.068 | 0.019 | 36.554 | 0.153 | <0.068 |
| 164 | nominal m/z 157 | 0.078 | 0.087† | 0.025 | 28.524 | 0.194 | 0.084† |
| 165 | nominal m/z 158 | 0.072 | <0.072 | 0.020 | 34.231 | 0.144 | <0.072 |
| 166 | unknown m/z 159(a) | 0.037 | <0.037 | 0.017 | 49.893 | 0.129 | <0.037 |
| 167 | unknown m/z 159(b) | 0.029 | <0.029 | 0.014 | 60.253 | 0.108 | <0.029 |
| 168 | nominal m/z 160 | 0.063 | <0.063 | 0.018 | 37.734 | 0.130 | <0.063 |
| 169 | nominal m/z 161 | 0.077 | 0.085† | 0.024 | 28.699 | 0.198 | 0.083† |
| 170 | nominal m/z 162 | 0.064 | <0.064 | 0.018 | 37.231 | 0.151 | <0.064 |
| 171 | nominal m/z 163 | 0.081 | <0.081 | 0.023 | 30.189 | 0.191 | <0.081 |
| 172 | nominal m/z 164 | 0.080 | <0.08 | 0.021 | 33.408 | 0.151 | <0.08 |
| 173 | nominal m/z 165 | 0.099 | 0.099† | 0.027 | 26.768 | 0.218 | 0.096† |
| 174 | nominal m/z 166 | 0.075 | <0.075 | 0.020 | 34.001 | 0.157 | <0.075 |
| 175 | nominal m/z 168 | 0.067 | <0.067 | 0.019 | 35.223 | 0.143 | <0.067 |
| 176 | nominal m/z 169 | 0.074 | 0.074† | 0.023 | 30.296 | 0.185 | 0.075† |
| 177 | nominal m/z 170 | 0.069 | <0.069 | 0.019 | 35.334 | 0.144 | <0.069 |
| 178 | nominal m/z 171 | 0.072 | <0.072 | 0.022 | 31.337 | 0.170 | <0.072 |
| 179 | nominal m/z 172 | 0.070 | <0.07 | 0.019 | 34.769 | 0.143 | <0.07 |
| 180 | nominal m/z 173 | 0.045 | <0.045 | 0.017 | 39.621 | 0.116 | <0.045 |
| 181 | nominal m/z 174 | 0.066 | <0.066 | 0.018 | 37.418 | 0.149 | <0.066 |
| 182 | nominal m/z 175 | 0.073 | <0.073 | 0.022 | 32.162 | 0.168 | <0.073 |
| 183 | nominal m/z 176 | 0.063 | <0.063 | 0.018 | 37.439 | 0.142 | <0.063 |
| 184 | nominal m/z 177 | 0.082 | 0.083† | 0.024 | 28.702 | 0.202 | 0.082† |

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**Table 2-3. Other Mass Signal Statistical Information for the Monitoring Period of April 22, 2019. (12 Sheets)**

| # | Species Name | MDL (ppb) | Ave. (ppb) | St. Dev. (ppb) | Rel. St. Dev. (ppb) | Max (ppb) | Median (ppb) |
|---|---|---|---|---|---|---|---|
| 185 | nominal m/z 178 | 0.072 | <0.072 | 0.020 | 34.260 | 0.150 | <0.072 |
| 186 | nominal m/z 179 | 0.082 | <0.082 | 0.023 | 29.994 | 0.177 | <0.082 |
| 187 | nominal m/z 180 | 0.086 | <0.086 | 0.022 | 31.341 | 0.156 | <0.086 |
| 188 | unknown m/z 181(a) | 0.026 | <0.026 | 0.013 | 122.401 | 0.099 | <0.026 |
| 189 | unknown m/z 181(b) | 0.026 | <0.026 | 0.013 | 122.401 | 0.099 | <0.026 |
| 190 | unknown m/z 181(c) | 0.030 | <0.03 | 0.013 | 93.774 | 0.084 | <0.03 |
| 191 | nominal m/z 182 | 0.078 | <0.078 | 0.021 | 32.580 | 0.156 | <0.078 |
| 192 | unknown m/z 183(a) | 0.028 | <0.028 | 0.013 | 97.497 | 0.088 | <0.028 |
| 193 | unknown m/z 183(b) | 0.032 | <0.032 | 0.013 | 71.171 | 0.083 | <0.032 |
| 194 | unknown m/z 183(c) | 0.025 | <0.025 | 0.016 | 105.609 | 0.097 | <0.025 |
| 195 | nominal m/z 184 | 0.091 | <0.091 | 0.022 | 30.343 | 0.175 | <0.091 |
| 196 | nominal m/z 185 | 0.089 | <0.089 | 0.023 | 29.560 | 0.180 | <0.089 |
| 197 | nominal m/z 186 | 0.084 | <0.084 | 0.021 | 32.072 | 0.155 | <0.084 |
| 198 | unknown m/z 187(a) | 0.030 | <0.03 | 0.016 | 80.055 | 0.099 | <0.03 |
| 199 | unknown m/z 187(b) | 0.034 | <0.034 | 0.013 | 70.090 | 0.093 | <0.034 |
| 200 | nominal m/z 188 | 0.095 | <0.095 | 0.023 | 29.507 | 0.189 | <0.095 |
| 201 | unknown m/z 189 | 0.034 | <0.034 | 0.013 | 63.604 | 0.089 | <0.034 |
| 202 | nominal m/z 190 | 0.081 | <0.081 | 0.021 | 32.287 | 0.155 | <0.081 |
| 203 | nominal m/z 191 | 0.086 | <0.086 | 0.024 | 27.998 | 0.190 | <0.086 |
| 204 | nominal m/z 192 | 0.081 | <0.081 | 0.021 | 32.026 | 0.169 | <0.081 |
| 205 | nominal m/z 193 | 0.087 | <0.087 | 0.022 | 30.117 | 0.180 | <0.087 |
| 206 | nominal m/z 194 | 0.082 | <0.082 | 0.021 | 32.034 | 0.160 | <0.082 |
| 207 | unknown m/z 195(a) | 0.032 | 0.034† | 0.017 | 50.589 | 0.115 | 0.033† |
| 208 | unknown m/z 195(b) | 0.026 | <0.026 | 0.010 | 88.190 | 0.068 | <0.026 |
| 209 | nominal m/z 196 | 0.075 | <0.075 | 0.020 | 33.716 | 0.174 | <0.075 |
| 210 | nominal m/z 197 | 0.079 | <0.079 | 0.021 | 32.208 | 0.168 | <0.079 |
| 211 | nominal m/z 198 | 0.082 | <0.082 | 0.021 | 32.168 | 0.159 | <0.082 |
| 212 | nominal m/z 200 | 0.081 | <0.081 | 0.021 | 31.839 | 0.159 | <0.081 |
| 213 | nominal m/z 201 | 0.071 | <0.071 | 0.020 | 34.409 | 0.167 | <0.071 |
| 214 | nominal m/z 202 | 0.064 | <0.064 | 0.018 | 37.915 | 0.127 | <0.064 |
| 215 | nominal m/z 203 | 0.045 | <0.045 | 0.015 | 45.230 | 0.100 | <0.045 |

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**Table 2-3. Other Mass Signal Statistical Information for the Monitoring Period of April 22, 2019. (12 Sheets)**

| # | Species Name | MDL (ppb) | Ave. (ppb) | St. Dev. (ppb) | Rel. St. Dev. (ppb) | Max (ppb) | Median (ppb) |
|---|---|---|---|---|---|---|---|
| 216 | nominal m/z 205 | 0.078 | <0.078 | 0.022 | 30.736 | 0.168 | <0.078 |
| 217 | nominal m/z 206 | 0.054 | <0.054 | 0.016 | 41.373 | 0.112 | <0.054 |
| 218 | nominal m/z 207 | 0.040 | <0.04 | 0.014 | 47.237 | 0.120 | <0.04 |
| 219 | nominal m/z 208 | 0.039 | <0.039 | 0.013 | 50.580 | 0.087 | <0.039 |
| 220 | nominal m/z 209 | 0.039 | <0.039 | 0.014 | 47.364 | 0.113 | <0.039 |
| 221 | nominal m/z 210 | 0.038 | <0.038 | 0.013 | 51.565 | 0.087 | <0.038 |
| 222 | nominal m/z 211 | 0.076 | <0.076 | 0.020 | 32.397 | 0.160 | <0.076 |
| 223 | nominal m/z 212 | 0.037 | <0.037 | 0.012 | 53.991 | 0.086 | <0.037 |
| 224 | nominal m/z 213 | 0.043 | <0.043 | 0.016 | 40.208 | 0.114 | <0.043 |
| 225 | nominal m/z 214 | 0.083 | <0.083 | 0.021 | 31.499 | 0.165 | <0.083 |
| 226 | nominal m/z 215 | 0.095 | <0.095 | 0.023 | 28.719 | 0.193 | <0.095 |
| 227 | nominal m/z 216 | 0.078 | <0.078 | 0.020 | 32.541 | 0.165 | <0.078 |
| 228 | nominal m/z 217 | 0.087 | <0.087 | 0.022 | 30.716 | 0.166 | <0.087 |
| 229 | nominal m/z 218 | 0.042 | <0.042 | 0.014 | 46.371 | 0.100 | <0.042 |
| 230 | nominal m/z 219 | 0.050 | <0.05 | 0.016 | 42.688 | 0.131 | <0.05 |
| 231 | nominal m/z 220 | 0.049 | <0.049 | 0.015 | 43.906 | 0.099 | <0.049 |
| 232 | nominal m/z 221 | 0.087 | <0.087 | 0.022 | 29.644 | 0.172 | <0.087 |
| 233 | nominal m/z 224 | 0.040 | <0.061 | 0.017 | 37.505 | 0.125 | <0.061 |
| 234 | nominal m/z 225 | 0.042 | <0.04 | 0.013 | 50.942 | 0.093 | <0.04 |
| 235 | nominal m/z 226 | 0.041 | <0.042 | 0.014 | 47.620 | 0.100 | <0.042 |
| 236 | nominal m/z 227 | 0.038 | <0.041 | 0.013 | 48.945 | 0.099 | <0.041 |
| 237 | nominal m/z 228 | 0.037 | <0.038 | 0.013 | 49.325 | 0.087 | <0.038 |
| 238 | nominal m/z 229 | 0.034 | <0.037 | 0.012 | 53.325 | 0.073 | <0.037 |
| 239 | nominal m/z 230 | 0.034 | <0.034 | 0.012 | 53.793 | 0.085 | <0.034 |
| 240 | nominal m/z 231 | 0.041 | <0.034 | 0.012 | 56.394 | 0.073 | <0.034 |
| 241 | nominal m/z 232 | 0.036 | <0.041 | 0.014 | 48.680 | 0.091 | <0.041 |
| 242 | nominal m/z 233 | 0.036 | <0.036 | 0.012 | 52.600 | 0.086 | <0.036 |
| 243 | nominal m/z 234 | 0.034 | <0.036 | 0.012 | 52.945 | 0.091 | <0.036 |
| 244 | nominal m/z 235 | 0.046 | <0.034 | 0.012 | 56.086 | 0.085 | <0.034 |
| 245 | nominal m/z 236 | 0.043 | <0.046 | 0.014 | 45.116 | 0.104 | <0.046 |
| 246 | nominal m/z 237 | 0.034 | <0.043 | 0.014 | 48.160 | 0.092 | <0.043 |

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**Table 2-3. Other Mass Signal Statistical Information for the Monitoring Period of April 22, 2019. (12 Sheets)**

| # | Species Name | MDL (ppb) | Ave. (ppb) | St. Dev. (ppb) | Rel. St. Dev. (ppb) | Max (ppb) | Median (ppb) |
|---|---|---|---|---|---|---|---|
| 247 | nominal m/z 238 | 0.038 | <0.034 | 0.012 | 56.296 | 0.085 | <0.034 |
| 248 | nominal m/z 239 | 0.047 | <0.038 | 0.012 | 52.234 | 0.085 | <0.038 |
| 249 | nominal m/z 240 | 0.050 | <0.047 | 0.015 | 44.415 | 0.117 | <0.047 |
| 250 | nominal m/z 241 | 0.046 | <0.05 | 0.015 | 43.688 | 0.111 | <0.05 |
| 251 | nominal m/z 242 | 0.042 | <0.046 | 0.014 | 44.218 | 0.097 | <0.046 |
| 252 | nominal m/z 243 | 0.037 | <0.042 | 0.013 | 48.475 | 0.085 | <0.042 |
| 253 | nominal m/z 244 | 0.038 | <0.037 | 0.013 | 50.302 | 0.085 | <0.037 |
| 254 | nominal m/z 245 | 0.042 | <0.038 | 0.013 | 52.361 | 0.085 | <0.038 |
| 255 | nominal m/z 246 | 0.041 | <0.042 | 0.014 | 47.974 | 0.098 | <0.042 |
| 256 | nominal m/z 247 | 0.038 | <0.041 | 0.013 | 49.239 | 0.097 | <0.041 |
| 257 | nominal m/z 248 | 0.043 | <0.038 | 0.013 | 50.431 | 0.079 | <0.038 |
| 258 | nominal m/z 249 | 0.036 | <0.043 | 0.014 | 47.795 | 0.092 | <0.043 |
| 259 | nominal m/z 250 | 0.035 | <0.036 | 0.012 | 53.962 | 0.084 | <0.036 |
| 260 | nominal m/z 251 | 0.036 | <0.035 | 0.012 | 53.941 | 0.084 | <0.035 |
| 261 | nominal m/z 252 | 0.034 | <0.036 | 0.012 | 53.114 | 0.079 | <0.036 |
| 262 | nominal m/z 253 | 0.041 | <0.034 | 0.011 | 55.941 | 0.084 | <0.034 |
| 263 | nominal m/z 254 | 0.037 | <0.041 | 0.013 | 49.604 | 0.103 | <0.041 |
| 264 | nominal m/z 255 | 0.040 | <0.037 | 0.012 | 53.559 | 0.085 | <0.037 |
| 265 | nominal m/z 256 | 0.035 | <0.04 | 0.013 | 49.329 | 0.085 | <0.04 |
| 266 | nominal m/z 257 | 0.043 | <0.035 | 0.012 | 54.848 | 0.072 | <0.035 |
| 267 | nominal m/z 258 | 0.033 | <0.043 | 0.014 | 47.417 | 0.098 | <0.043 |
| 268 | nominal m/z 259 | 0.046 | <0.033 | 0.011 | 56.427 | 0.084 | <0.033 |
| 269 | nominal m/z 260 | 0.036 | <0.046 | 0.014 | 45.401 | 0.124 | <0.046 |
| 270 | nominal m/z 261 | 0.042 | <0.036 | 0.012 | 53.321 | 0.084 | <0.036 |
| 271 | nominal m/z 262 | 0.039 | <0.042 | 0.013 | 48.120 | 0.091 | <0.042 |
| 272 | nominal m/z 263 | 0.041 | <0.039 | 0.013 | 51.042 | 0.084 | <0.039 |
| 273 | nominal m/z 264 | 0.037 | <0.041 | 0.013 | 48.022 | 0.091 | <0.041 |
| 274 | nominal m/z 265 | 0.038 | <0.037 | 0.012 | 52.020 | 0.077 | <0.037 |
| 275 | nominal m/z 266 | 0.038 | <0.038 | 0.013 | 51.789 | 0.085 | <0.038 |
| 276 | nominal m/z 267 | 0.037 | <0.038 | 0.012 | 50.955 | 0.090 | <0.038 |
| 277 | nominal m/z 268 | 0.037 | <0.037 | 0.012 | 53.095 | 0.090 | <0.037 |

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**Table 2-3. Other Mass Signal Statistical Information for the Monitoring Period of April 22, 2019. (12 Sheets)**

| # | Species Name | MDL (ppb) | Ave. (ppb) | St. Dev. (ppb) | Rel. St. Dev. (ppb) | Max (ppb) | Median (ppb) |
|---|---|---|---|---|---|---|---|
| 278 | nominal m/z 270 | 0.039 | <0.037 | 0.012 | 51.984 | 0.091 | <0.037 |
| 279 | nominal m/z 271 | 0.043 | <0.039 | 0.013 | 50.909 | 0.097 | <0.039 |
| 280 | nominal m/z 272 | 0.039 | <0.043 | 0.014 | 46.535 | 0.096 | <0.043 |
| 281 | nominal m/z 273 | 0.041 | <0.039 | 0.013 | 50.371 | 0.090 | <0.039 |
| 282 | nominal m/z 274 | 0.046 | <0.041 | 0.013 | 48.871 | 0.103 | <0.041 |
| 283 | nominal m/z 275 | 0.046 | <0.046 | 0.014 | 44.914 | 0.134 | <0.046 |
| 284 | nominal m/z 276 | 0.031 | <0.046 | 0.014 | 45.684 | 0.090 | <0.046 |
| 285 | nominal m/z 277 | 0.038 | <0.031 | 0.011 | 60.092 | 0.071 | <0.031 |
| 286 | nominal m/z 278 | 0.040 | <0.038 | 0.013 | 51.868 | 0.084 | <0.038 |
| 287 | nominal m/z 279 | 0.033 | <0.04 | 0.013 | 49.916 | 0.096 | <0.04 |
| 288 | nominal m/z 280 | 0.040 | <0.033 | 0.012 | 56.432 | 0.083 | <0.033 |
| 289 | nominal m/z 281 | 0.042 | <0.04 | 0.013 | 49.719 | 0.090 | <0.04 |
| 290 | nominal m/z 282 | 0.031 | <0.042 | 0.013 | 49.076 | 0.078 | <0.042 |
| 291 | nominal m/z 283 | 0.031 | <0.031 | 0.011 | 59.097 | 0.064 | <0.031 |
| 292 | nominal m/z 284 | 0.037 | <0.031 | 0.011 | 58.821 | 0.071 | <0.031 |
| 293 | nominal m/z 285 | 0.048 | <0.037 | 0.012 | 52.348 | 0.083 | <0.037 |
| 294 | nominal m/z 286 | 0.037 | <0.048 | 0.015 | 43.502 | 0.097 | <0.048 |
| 295 | nominal m/z 287 | 0.038 | <0.037 | 0.012 | 52.596 | 0.083 | <0.037 |
| 296 | nominal m/z 288 | 0.037 | <0.038 | 0.012 | 51.355 | 0.084 | <0.038 |
| 297 | nominal m/z 289 | 0.038 | <0.037 | 0.012 | 52.142 | 0.095 | <0.037 |
| 298 | nominal m/z 290 | 0.031 | <0.038 | 0.013 | 50.316 | 0.096 | <0.038 |
| 299 | nominal m/z 291 | 0.044 | <0.031 | 0.011 | 58.435 | 0.077 | <0.031 |
| 300 | nominal m/z 292 | 0.044 | <0.044 | 0.014 | 45.893 | 0.089 | <0.044 |
| 301 | nominal m/z 293 | 0.042 | <0.044 | 0.014 | 46.947 | 0.095 | <0.044 |
| 302 | nominal m/z 294 | 0.036 | <0.042 | 0.013 | 47.570 | 0.114 | <0.042 |
| 303 | nominal m/z 295 | 0.049 | <0.036 | 0.012 | 53.895 | 0.089 | <0.036 |
| 304 | nominal m/z 296 | 0.040 | <0.049 | 0.015 | 43.398 | 0.103 | <0.049 |
| 305 | nominal m/z 297 | 0.073 | <0.04 | 0.013 | 49.579 | 0.096 | <0.04 |
| 306 | nominal m/z 298 | 0.035 | <0.073 | 0.020 | 32.459 | 0.158 | <0.073 |
| 307 | nominal m/z 299 | 0.032 | <0.035 | 0.012 | 54.028 | 0.083 | <0.035 |
| 308 | nominal m/z 300 | 0.031 | <0.032 | 0.011 | 58.386 | 0.077 | <0.032 |

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**Table 2-3. Other Mass Signal Statistical Information for the Monitoring Period of April 22, 2019. (12 Sheets)**

| # | Species Name | MDL (ppb) | Ave. (ppb) | St. Dev. (ppb) | Rel. St. Dev. (ppb) | Max (ppb) | Median (ppb) |
|---|---|---|---|---|---|---|---|
| 309 | nominal m/z 301 | 0.045 | <0.031 | 0.011 | 58.400 | 0.076 | <0.031 |
| 310 | nominal m/z 302 | 0.035 | <0.045 | 0.014 | 45.644 | 0.096 | <0.045 |
| 311 | nominal m/z 303 | 0.044 | <0.035 | 0.012 | 54.842 | 0.083 | <0.035 |
| 312 | nominal m/z 304 | 0.039 | <0.044 | 0.014 | 46.838 | 0.090 | <0.044 |
| 313 | nominal m/z 305 | 0.039 | <0.039 | 0.013 | 50.691 | 0.090 | <0.039 |
| 314 | nominal m/z 306 | 0.039 | <0.039 | 0.013 | 50.629 | 0.095 | <0.039 |
| 315 | nominal m/z 307 | 0.037 | <0.039 | 0.013 | 50.564 | 0.090 | <0.039 |
| 316 | nominal m/z 308 | 0.037 | <0.037 | 0.012 | 51.132 | 0.083 | <0.037 |
| 317 | nominal m/z 309 | 0.044 | <0.037 | 0.012 | 51.824 | 0.083 | <0.037 |
| 318 | nominal m/z 310 | 0.041 | <0.044 | 0.014 | 46.122 | 0.090 | <0.044 |
| 319 | nominal m/z 311 | 0.057 | <0.041 | 0.013 | 49.083 | 0.090 | <0.041 |
| 320 | nominal m/z 312 | 0.048 | <0.057 | 0.016 | 39.580 | 0.121 | <0.057 |
| 321 | nominal m/z 313 | 0.068 | <0.048 | 0.015 | 44.167 | 0.102 | <0.048 |
| 322 | nominal m/z 314 | 0.048 | <0.068 | 0.018 | 35.107 | 0.140 | <0.068 |
| 323 | nominal m/z 315 | 0.050 | <0.048 | 0.015 | 43.475 | 0.096 | <0.048 |
| 324 | nominal m/z 316 | 0.047 | <0.05 | 0.015 | 42.425 | 0.107 | <0.05 |
| 325 | nominal m/z 317 | 0.047 | <0.047 | 0.014 | 44.753 | 0.096 | <0.047 |
| 326 | nominal m/z 318 | 0.048 | <0.047 | 0.014 | 45.381 | 0.109 | <0.047 |
| 327 | nominal m/z 319 | 0.041 | <0.048 | 0.015 | 44.262 | 0.103 | <0.048 |
| 328 | nominal m/z 320 | 0.047 | <0.041 | 0.013 | 48.309 | 0.090 | <0.041 |
| 329 | nominal m/z 321 | 0.035 | <0.047 | 0.014 | 44.119 | 0.096 | <0.047 |
| 330 | nominal m/z 322 | 0.038 | <0.035 | 0.012 | 54.346 | 0.083 | <0.035 |
| 331 | nominal m/z 323 | 0.034 | <0.038 | 0.012 | 51.646 | 0.084 | <0.038 |
| 332 | nominal m/z 324 | 0.038 | <0.034 | 0.012 | 55.202 | 0.076 | <0.034 |
| 333 | nominal m/z 325 | 0.032 | <0.038 | 0.012 | 52.065 | 0.089 | <0.038 |
| 334 | nominal m/z 326 | 0.032 | <0.032 | 0.011 | 57.514 | 0.083 | <0.032 |
| 335 | nominal m/z 327 | 0.032 | <0.032 | 0.011 | 57.480 | 0.070 | <0.032 |
| 336 | nominal m/z 328 | 0.032 | <0.032 | 0.011 | 56.928 | 0.077 | <0.032 |
| 337 | nominal m/z 329 | 0.033 | <0.032 | 0.011 | 57.293 | 0.076 | <0.032 |
| 338 | nominal m/z 330 | 0.039 | <0.033 | 0.011 | 57.197 | 0.096 | <0.033 |
| 339 | nominal m/z 332 | 0.055 | <0.039 | 0.014 | 44.449 | 0.108 | <0.039 |

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**Table 2-3. Other Mass Signal Statistical Information for the Monitoring Period of April 22, 2019. (12 Sheets)**

| # | Species Name | MDL (ppb) | Ave. (ppb) | St. Dev. (ppb) | Rel. St. Dev. (ppb) | Max (ppb) | Median (ppb) |
|---|---|---|---|---|---|---|---|
| 340 | nominal m/z 333 | 0.032 | <0.055 | 0.016 | 39.208 | 0.132 | <0.055 |
| 341 | nominal m/z 334 | 0.032 | <0.032 | 0.011 | 56.983 | 0.070 | <0.032 |
| 342 | nominal m/z 335 | 0.032 | <0.032 | 0.011 | 57.294 | 0.083 | <0.032 |
| 343 | nominal m/z 336 | 0.033 | <0.032 | 0.011 | 57.539 | 0.077 | <0.032 |
| 344 | nominal m/z 337 | 0.033 | <0.033 | 0.011 | 56.544 | 0.076 | <0.033 |
| 345 | nominal m/z 338 | 0.032 | <0.033 | 0.011 | 57.067 | 0.077 | <0.033 |
| 346 | nominal m/z 339 | 0.032 | <0.032 | 0.011 | 57.053 | 0.076 | <0.032 |
| 347 | nominal m/z 340 | 0.033 | <0.032 | 0.011 | 56.704 | 0.076 | <0.032 |
| 348 | nominal m/z 341 | 0.032 | <0.033 | 0.011 | 57.538 | 0.076 | <0.033 |
| 349 | nominal m/z 342 | 0.033 | <0.032 | 0.011 | 57.365 | 0.071 | <0.032 |
| 350 | nominal m/z 343 | 0.033 | <0.033 | 0.011 | 56.469 | 0.070 | <0.033 |
| 351 | nominal m/z 344 | 0.033 | <0.033 | 0.011 | 56.363 | 0.076 | <0.033 |
| 352 | nominal m/z 345 | 0.032 | <0.033 | 0.011 | 56.683 | 0.077 | <0.033 |
| 353 | nominal m/z 346 | 0.033 | <0.032 | 0.011 | 56.901 | 0.083 | <0.032 |
| 354 | nominal m/z 347 | 0.033 | <0.033 | 0.011 | 56.822 | 0.076 | <0.033 |
| 355 | nominal m/z 348 | 0.033 | <0.033 | 0.011 | 56.821 | 0.077 | <0.033 |
| 356 | nominal m/z 349 | 0.033 | <0.033 | 0.011 | 56.525 | 0.071 | <0.033 |
| 357 | nominal m/z 350 | 0.033 | <0.033 | 0.011 | 56.402 | 0.076 | <0.033 |
| < | Signal Average/Median Below the MDL. | | | | | | |
| † | Signal Average/Median Between the MDL and the RL (i.e., 3*MDL). | | | | | | |

## 3.0 PRELIMINARY ANALYSIS

The Subject Matter Expert (SME) reviewed the maximum values to identify species of interest which were then further investigated for trends and plumes. No COPCs or odor species responded during this time that warranted further investigation. The only response of interest was at nominal m/z 46. Figure 3-1 shows the response at nominal m/z 46 during the monitoring period. There were multiple short-lived spikes increasing well above the background level. Identification of the species responsible for the m/z 46 response needs more investigation, but the spikes were coupled with spikes in $CO_2$ which suggests a combustion source. The lack of response from aromatics and aldehydes typical of diesel and gasoline vehicle combustion engines suggests it is not vehicle related. Current work has observed a large response at nominal m/z 46 in generator exhaust, which is a plausible explanation for the short-lived spikes correlated with $CO_2$.

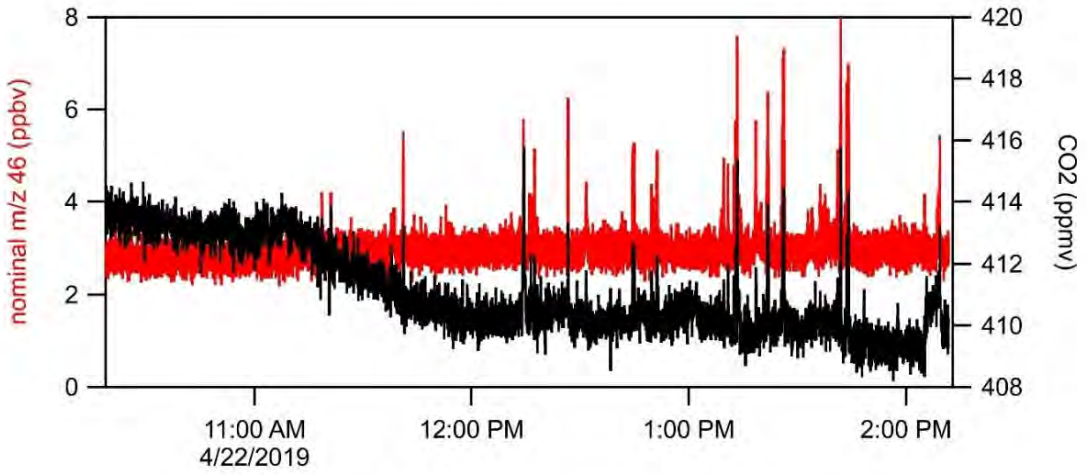


**Figure 3-1. Response of $CO_2$ and Nominal m/z 46 During Monitoring after the AOP-015 Event on 04/22/2019.**

## 4.0 REFERENCES

17124-DOE-HS-102, 2018, "Mobile Laboratory Data Processing-Analysis," Revision 0, TerraGraphics Environmental Engineering, Inc., Pasco, Washington.

66409-RPT-004, 2019, *Mobile Laboratory Operational Procedure*, Revision 11, TerraGraphics Environmental Engineering, Inc., Pasco, Washington.