WEEKLY REPORT FOR WEEK 17
(NOVEMBER 26, 2018 – NOVEMBER 30, 2018)

Report No. 53005-81-RPT-028
Revision 0

September 2019

Prepared for:

Washington River Protection Solutions, LLC
P.O. Box 850
Richland, WA 99352

Subcontract 53005, Release 81

Prepared by:

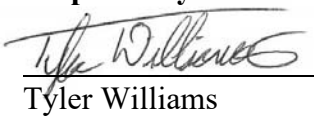
TerraGraphics Environmental Engineering, Inc.
2926 E. Ainsworth
Pasco, WA 99301

TerraGraphics

www.terragraphics.com

Approval Form

Prepared by:



Date: 09/17/2019

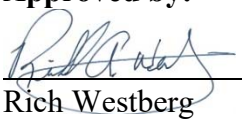
Tyler Williams

Reviewed by:

Date: 09/17/2019

Matthew Erickson, Ph.D.

Approved by:



Date: 09/17/2019

Rich Westberg

Record of Revision

Revision	Date	Pages/Sections Changed	Brief Description
0	09/2019	All	Original Issue.

Table of Contents

Appendices

Figures

Tables

Acronyms

COPC	Chemical of Potential Concern
CSO	Central Shift Office
ML	Mobile Laboratory
NDEA	N-nitrosodiethylamine
NDMA	N-nitrosodimethylamine
NEMA	N-nitrosomethylethylamine
NMOR	N-nitrosomorpholine
OEL	Occupational Exposure Limit
PST	Pacific Standard Time
PTR-MS	Proton Transfer Reaction – Mass Spectrometer
QA	Quality Assurance
QC	Quality Control

1.0 NOVEMBER 26, 2018 – MOBILE LABORATORY MAINTENANCE

All times reported in this document are recorded in Pacific Standard Time (PST).

1.1 Summary

On November 26, 2018, Mobile Laboratory (ML) staff arrived at 07:15. Staff took the ML to McCurley®[1] Integrity Dealership to undergo 5,000-mile vehicle maintenance. Upon arrival, the dealership explained that they could not perform the required maintenance on that day. The ML was then taken to Les Schwab®[2] to have winter tires installed. The ML was left at Les Schwab for two hours for tire service. At 10:50, after the van returned to TerraGraphics, a Quality Assurance (QA) Representative performed a surveillance on the cold startup procedure found in Report No. 66409-RPT-004, *Mobile Laboratory Operational Procedure*. At 13:00, the ML staff performed maintenance on Variac®[3] temperature controllers in the ML for the remainder of the day. DR18-012 was initiated to adequately document the issue discovered with Variac TC-05 not receiving power. See Appendix A for the full Deficiency Report. The instance will be discussed in detail in a subsequent monthly summary report.

[1] McCurley is a registered trademark of McCurley Integrity Dealerships, LLC, Tri-Cities, Washington.
[2] Les Schwab is a registered trademark of Les Schwab Warehouse Center, Inc., Bend, Oregon.
[3] Variac is a registered trademark of Instrument Service & Equipment, Inc., Cleveland, Ohio.

2.0 NOVEMBER 27, 2018 – MOBILE LABORATORY MAINTENANCE

2.1 Summary

On November 27, 2018, the staff verified the calibration of instruments inside the ML. Zero-air and span checks were performed on the LI-COR®[4] CO_2 monitor, Picarro ammonia analyzer, and the Proton Transfer Reaction – Mass Spectrometer (PTR-MS). With assistance from the Picarro support team, communication between the Picarro and DAQFactory®[5] software was tested and confirmed by 14:37.

[4] LI-COR is a registered trademark of LI-COR, Inc., Lincoln, Nebraska.
[5] DAQFactory is a registered trademark of AzeoTech, Inc., Ashland, Oregon.

3.0 NOVEMBER 28, 2018 – SOURCE CHARACTERIZATION

3.1 Quality Assessment

Data from November 28, 2018, 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 was adequately documented and all checks passed the acceptance limits.

3.2 Summary

On November 28, 2018, the ML Operators performed source characterization of the, 2607E12 Septic Tanks, located near the 242A Evaporator on the Hanford Site.

The ML arrived on site and checked in with the Central Shift Office (CSO) at 06:57. A QA/quality control (QC) zero-air/span check was performed on the Picarro ammonia analyzer, LI-COR CO_2 monitor and the PTR-MS at 06:03, prior to arrival. At 07:15, the ML arrived at the septic tanks and began side port sampling at 07:24, with the inlet approximately 10 feet from the septic source. At 07:48, the ML staff moved the inlet 3-4 feet closer to the source. At 07:54, the lid was removed off one of the septic tanks, and at 07:56 the ML staff moved the inlet back to 10 feet away from the septic tank. The inlet was moved 3 feet away from a septic tank at 08:01. After six minutes, the inlet was moved so that it was 1 foot away from the septic tank. At 08:28, two of the five septic tanks had their lids cracked open.

At 10:02, a tube was connected to the end of the inlet in preparation to place inside a septic tank. From 10:40 to 11:42, the tube was placed inside one of the septic tanks, while the lids of various septic tanks were opened and closed. The tube connected to the inlet was inserted into a septic tank again from 11:49 to 12:04. At 12:24, the ML staff checked out with the CSO and the ML returned to the TerraGraphics warehouse in Pasco, WA, at 13:27.

Table 3-1. Mobile Laboratory Sampling Mode throughout the Monitoring Period.

Time	Location	Sampling Mode
07:15 - 07:24	East End of Septic Tank	Mobile Monitoring
07:24 - 07:48	Inlet: 10 feet from Septic Tank	Side Port Sampling
07:48 - 07:56	Inlet: 3-4 feet from Septic Tank	Side Port Sampling
07:56 - 08:01	Inlet: 10 feet from Septic Tank	Side Port Sampling
08:01 - 08:07	Inlet: 3 feet from Septic Tank	Side Port Sampling
08:07 - 10:40	Inlet:1 foot from Septic Tank	Side Port Sampling
10:40 - 11:42	Inlet: Connector Tube Inside Septic Tank	Side Port Sampling
11:42 - 11:49	Inlet: 12 feet from Septic Tank	Side Port Sampling
11:49 - 12:04	Inlet: Connector Tube Inside Septic Tank	Side Port Sampling

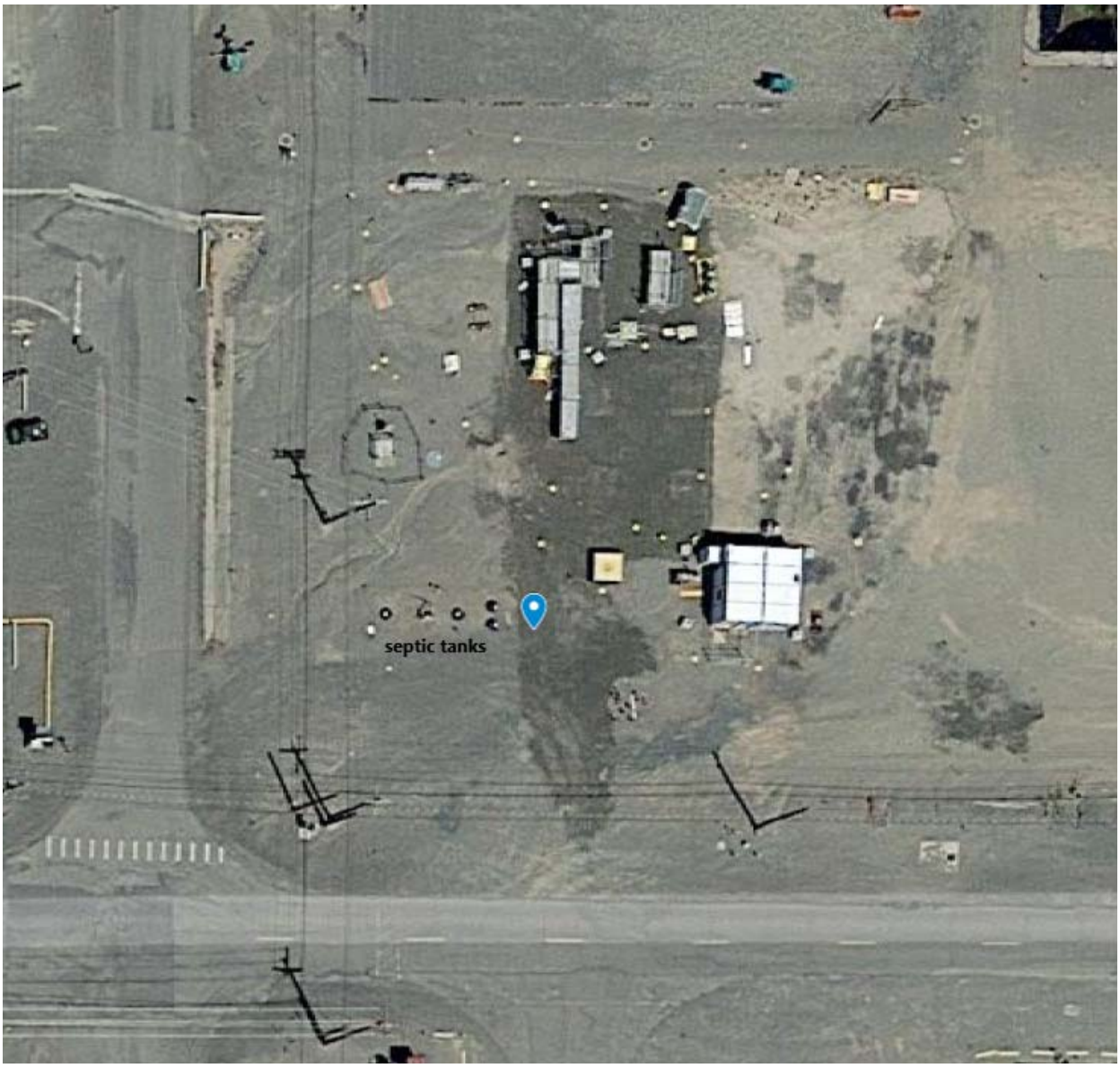


Figure 3-1. Location of the Mobile Laboratory for the Duration of the Monitoring Period.

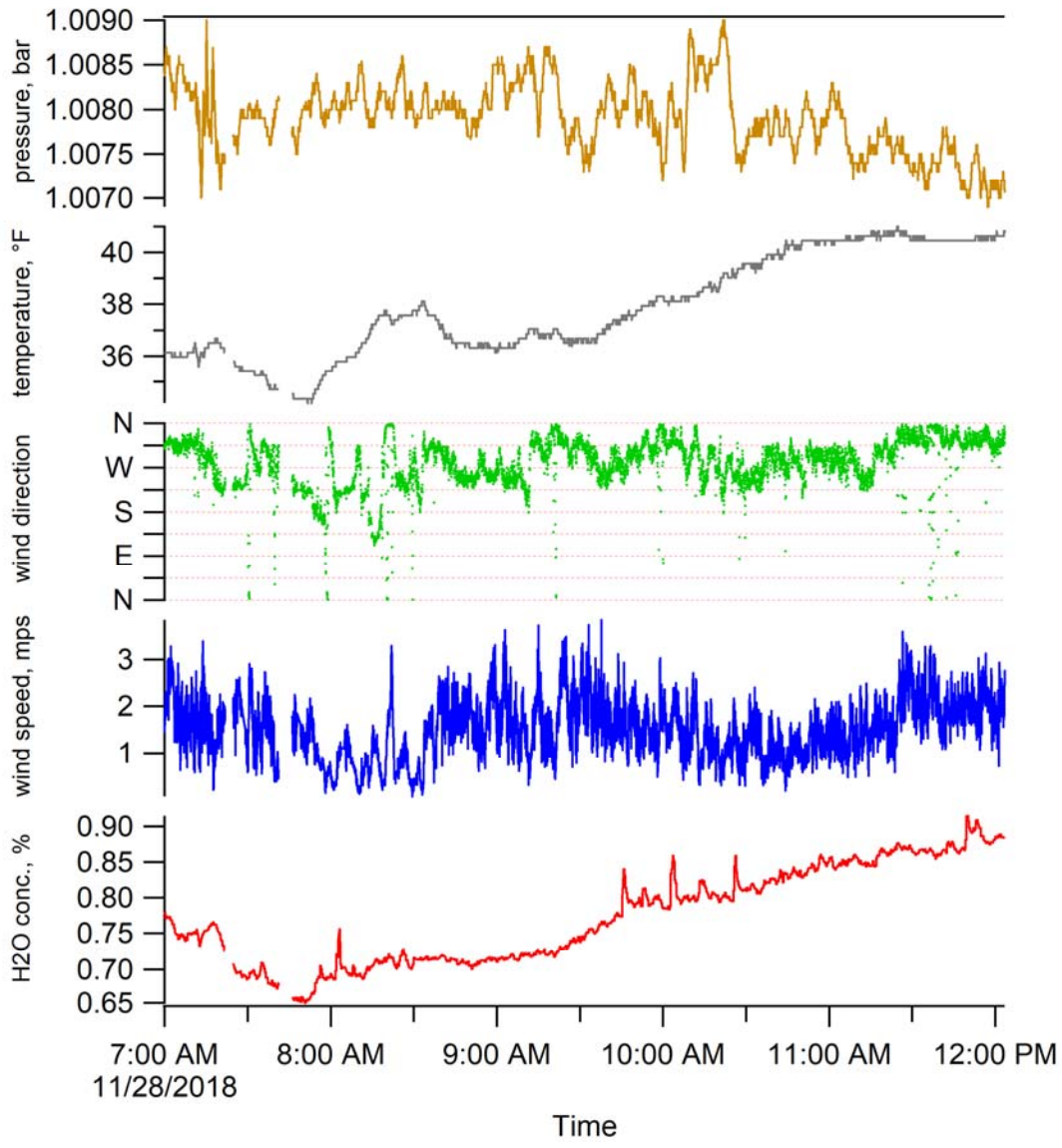


Figure 3-2. Weather Data.

3.3 Samples Collected

Continuous air monitoring was performed using the following instrumentation:

- PTR-MS,
- LI-COR CO_2 Monitor,
- Picarro Ammonia Monitor, and
- Weather Station.

Confirmatory air samples were not collected during this period.

3.4 Area Monitoring

Table 3-2. Chemical of Potential Concern Statistical Information for the Monitoring Period of November 28, 2018. (2 Sheets)

COPC #	COPC Name	OEL (ppb)	Ave. (ppb)	St. Dev. (ppb)	Rel St. Dev. (%)	Max (ppb)	Median (ppb)
1	ammonia	25000	8.128	3.580	44.051	29.381	7.603
2	formaldehyde	300	0.996	0.232	23.300	2.471	0.957
3	methanol	200000	10.793	4.298	39.826	41.163	9.817
4	acetonitrile	20000	0.126	0.026	21.001	0.279	0.123
5	acetaldehyde	25000	2.245	0.525	23.389	13.179	2.173
6	ethylamine	5000	0.013	0.007	52.457	0.058	0.013
7	1,3-butadiene	1000	0.270	0.112	41.310	1.056	0.260
8	propanenitrile	6000	0.056	0.019	33.389	0.284	0.055
9	2-propenal	100	0.202	0.057	28.176	1.279	0.196
10	1-butanol + butenes	20000	0.326	0.137	41.917	1.285	0.309
11	methyl isocyanate	20	0.047	0.014	30.475	0.136	0.046
12	methyl nitrite	100	0.162	0.080	49.753	0.790	0.146
13	furan	1	0.052	0.017	32.324	0.145	0.051
14	butanenitrile	8000	0.029	0.013	45.225	0.111	0.027
15	but-3-en-2-one + 2,3-dihydrofuran + 2,5-dihydrofuran	200, 1, 1	0.064	0.015	23.241	N/A*	N/A*
16	butanal	25000	0.140	0.052	37.524	0.426	0.120
17	NDMA**	0.3	0.032	0.023	73.003	0.144	0.030
18	benzene	500	0.304	0.142	46.614	2.728	0.273
19	2,4-pentadienenitrile + pyridine	300	0.048	0.014	28.979	0.239	0.046
20	2-methylene butanenitrile	300	0.042	0.013	29.880	0.104	0.041
21	2-methylfuran	1	0.053	0.016	30.863	0.167	0.051
22	pentanenitrile	6000	0.020	0.009	45.507	0.083	0.019
23	3-methyl-3-buten-2-one + 2-methyl-2-butenal	20	0.049	0.018	36.356	0.177	0.047
24	NEMA**	0.3	0.013	0.015	113.796	0.104	0.008
25	2,5-dimethylfuran	1	0.040	0.016	40.146	0.132	0.037
26	hexanenitrile	6000	0.008	0.005	70.798	0.041	0.006
27	2-hexanone (MBK)	5000	0.028	0.016	57.810	0.133	0.026
28	NDEA**	0.1	0.004	0.007	161.459	0.048	0.000
29	butyl nitrite + 2-nitro-2-methylpropane	100, 300	0.018	0.007	39.472	0.073	0.017

Table 3-2. Chemical of Potential Concern Statistical Information for the Monitoring Period of November 28, 2018. (2 Sheets)

COPC #	COPC Name	OEL (ppb)	Ave. (ppb)	St. Dev. (ppb)	Rel St. Dev. (%)	Max (ppb)	Median (ppb)
30	2,4-dimethylpyridine	500	0.032	0.017	53.116	0.282	0.029
31	2-propylfuran + 2-ethyl-5-methylfuran	1	0.027	0.013	49.151	0.132	0.025
32	heptanenitrile	6000	0.007	0.005	71.622	0.046	0.006
33	4-methyl-2-hexanone	500	0.020	0.013	64.781	0.119	0.018
34	NMOR**	0.6	0.009	0.011	111.851	0.084	0.006
35	butyl nitrate	2500	0.004	0.004	99.332	0.029	0.003
36	2-ethyl-2-hexenal + 4-(1-methylpropyl)-2,3-dihydrofuran + 3-(1,1-dimethylethyl)-2,3-dihydrofuran	1	0.023	0.015	62.833	0.104	0.021
37	6-methyl-2-heptanone	8000	0.020	0.013	64.202	0.088	0.019
38	2-pentylfuran	1	0.039	0.015	38.772	0.122	0.038
39	biphenyl	200	0.013	0.011	84.564	0.087	0.011
40	2-heptylfuran	1	0.030	0.012	38.569	0.115	0.028
41	1,4-butanediol dinitrate	50	0.004	0.003	75.633	0.019	0.003
42	2-octylfuran	1	0.001	0.003	193.663	0.027	0.000
43	1,2,3-propanetriol 1,3-dinitrate	50	0.000	0.001	440.112	0.015	0.000
44	PCB	1000	0.004	0.003	66.174	0.017	0.003
45	6-(2-furanyl)-6-methyl-2-heptanone	1	0.003	0.002	85.237	0.016	0.002
46	furfural acetophenone	1	0.015	0.007	48.886	0.063	0.013

*The maximum peak value for but-3-en-2-one + 2,3 dihydrofuran + 2,5 dihydrofuran was 0.310 ppb and the median value was 0.062 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 [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].

The following figures display chemical of potential concern (COPC) signals, overlaid with the same signal smoothed using a 1-minute moving average (in cases where a moving average assist with data visualization), and CO_2, for the monitoring period November 28, 2018. If within range of the plot's left axis, a green horizontal line representing 50% of the COPC's Occupational Exposure Limit (OEL) and a blue horizontal line representing the COPC's OEL are shown.

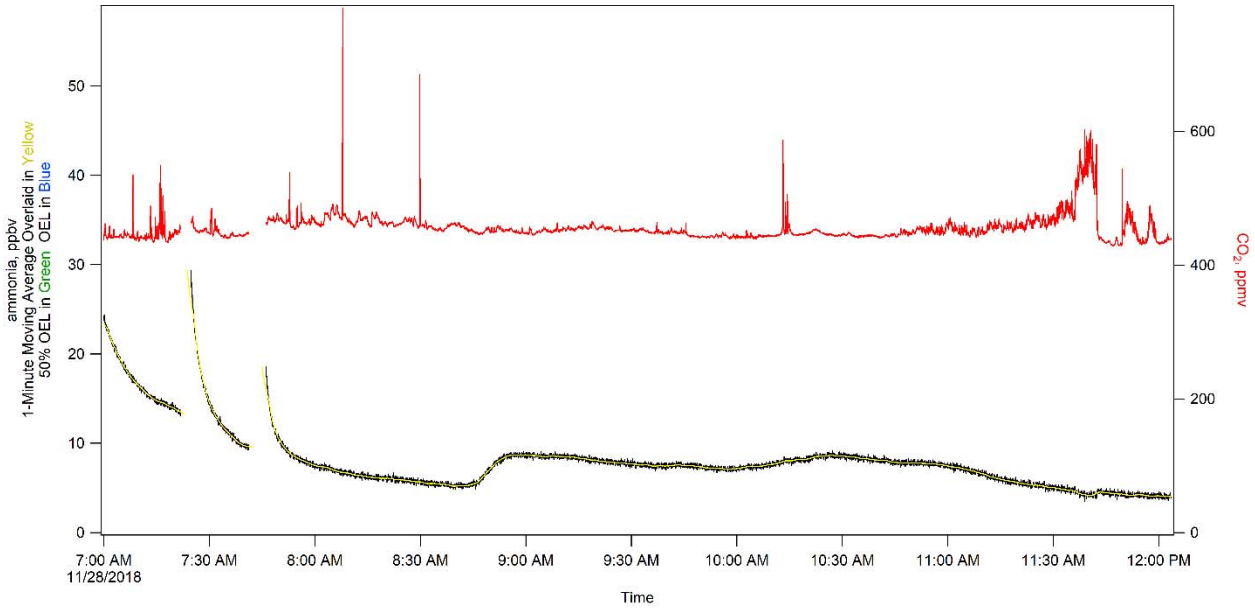


Figure 3-3. Ammonia.

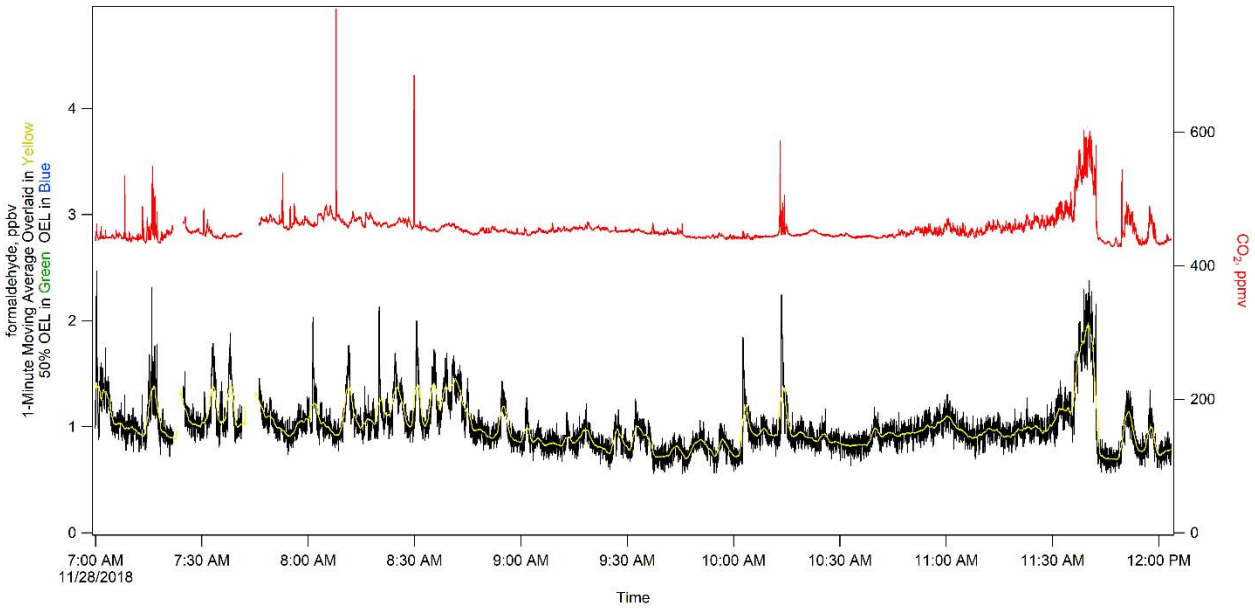


Figure 3-4. Formaldehyde.

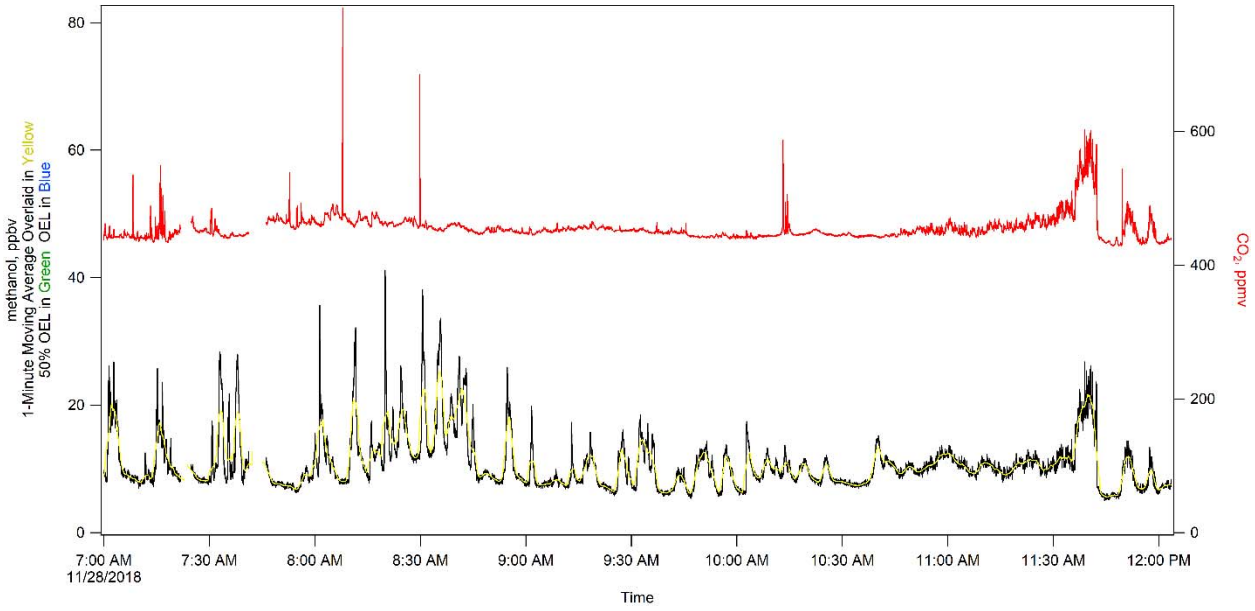


Figure 3-5. Methanol.

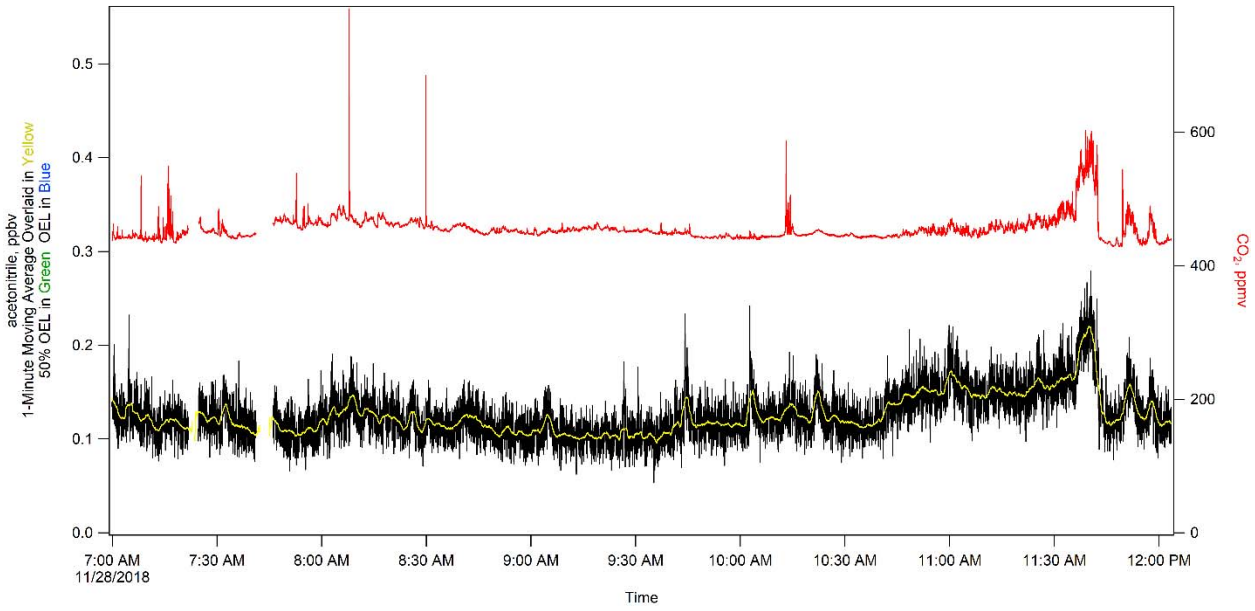


Figure 3-6. Acetonitrile.

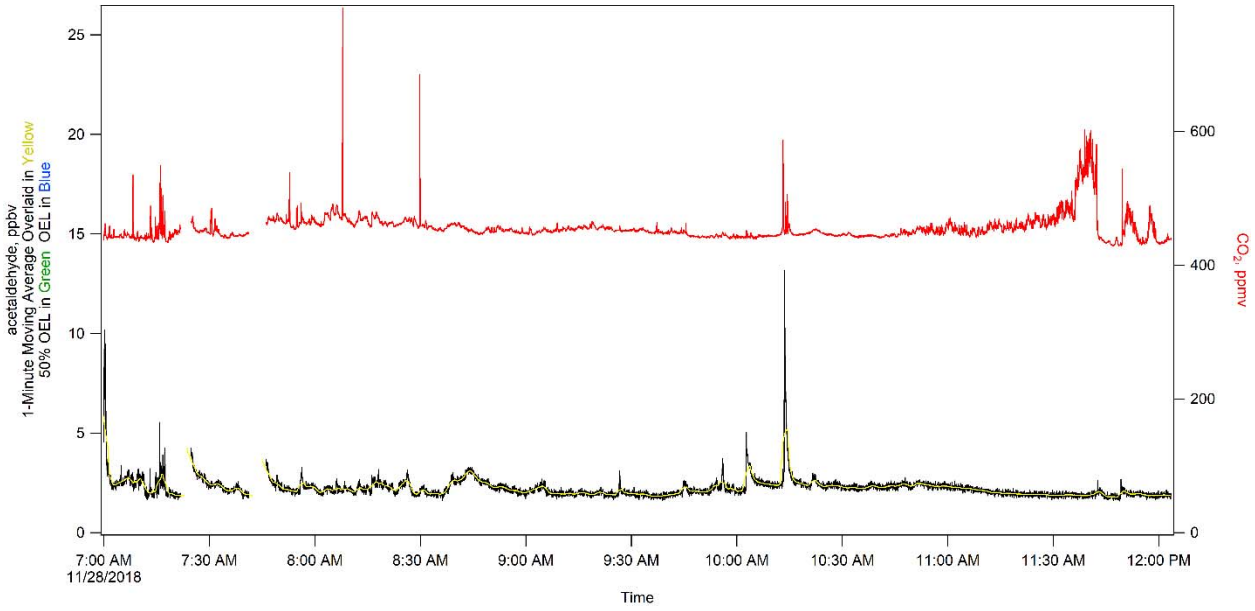


Figure 3-7. Acetaldehyde.

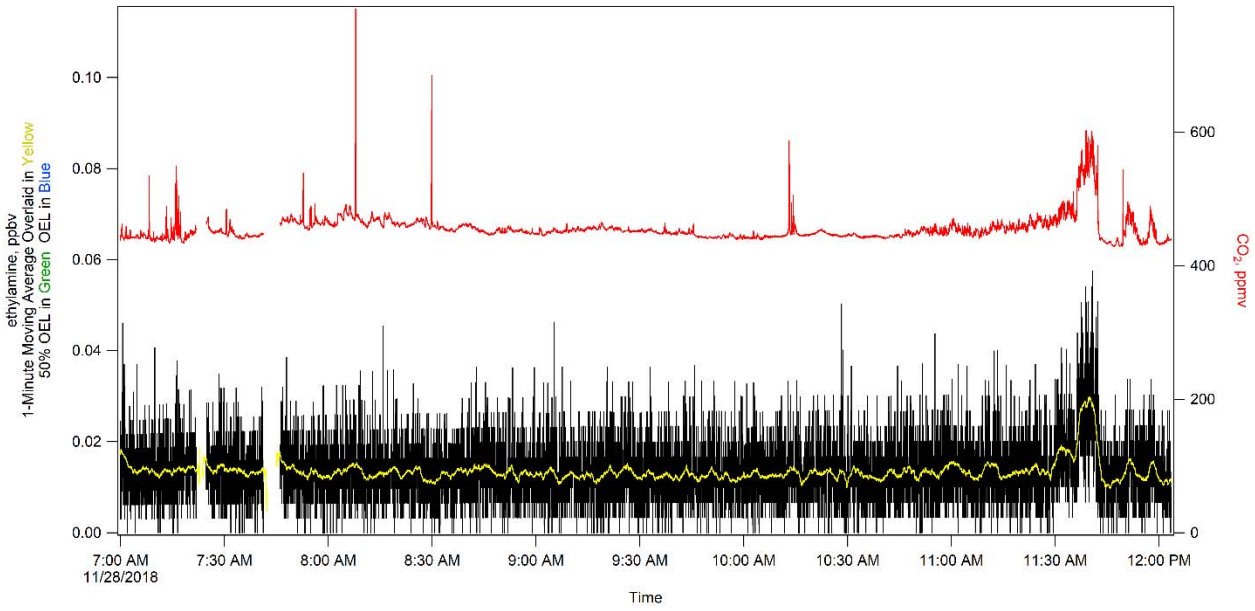


Figure 3-8. Ethylamine.

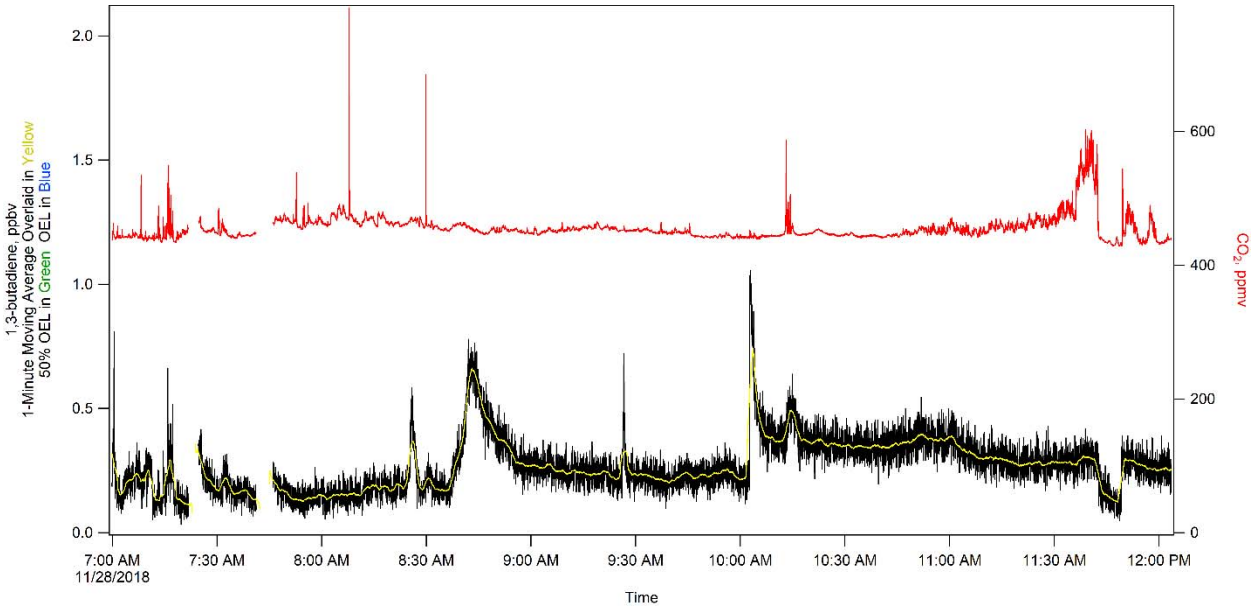


Figure 3-9. 1,3-butadiene.

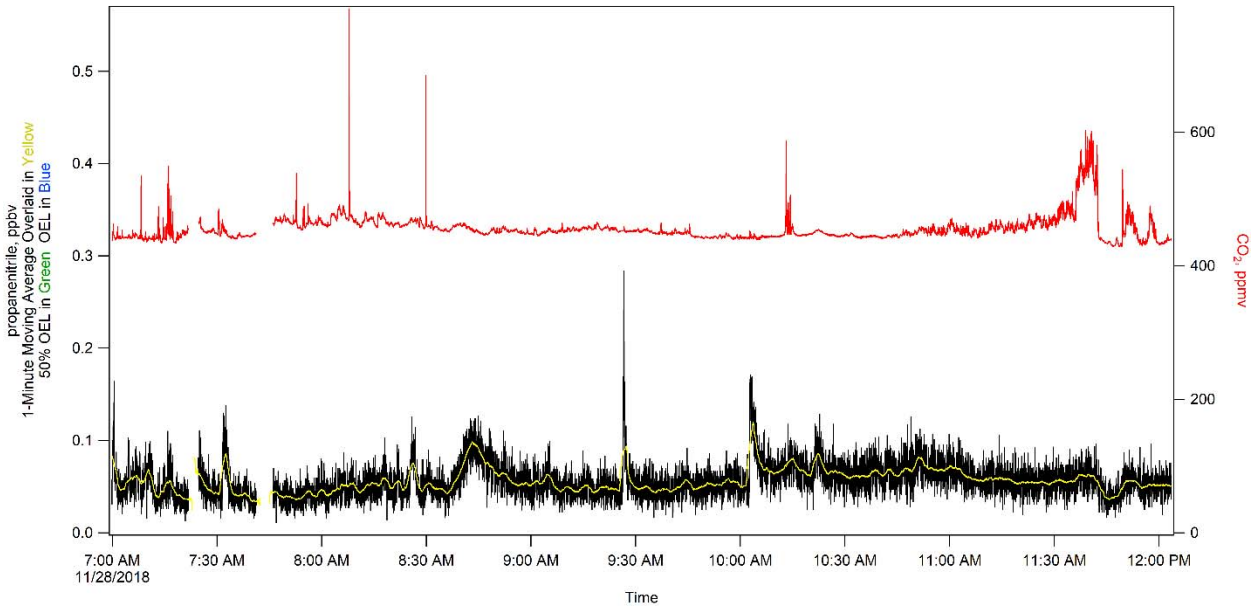


Figure 3-10. Propanenitrile.

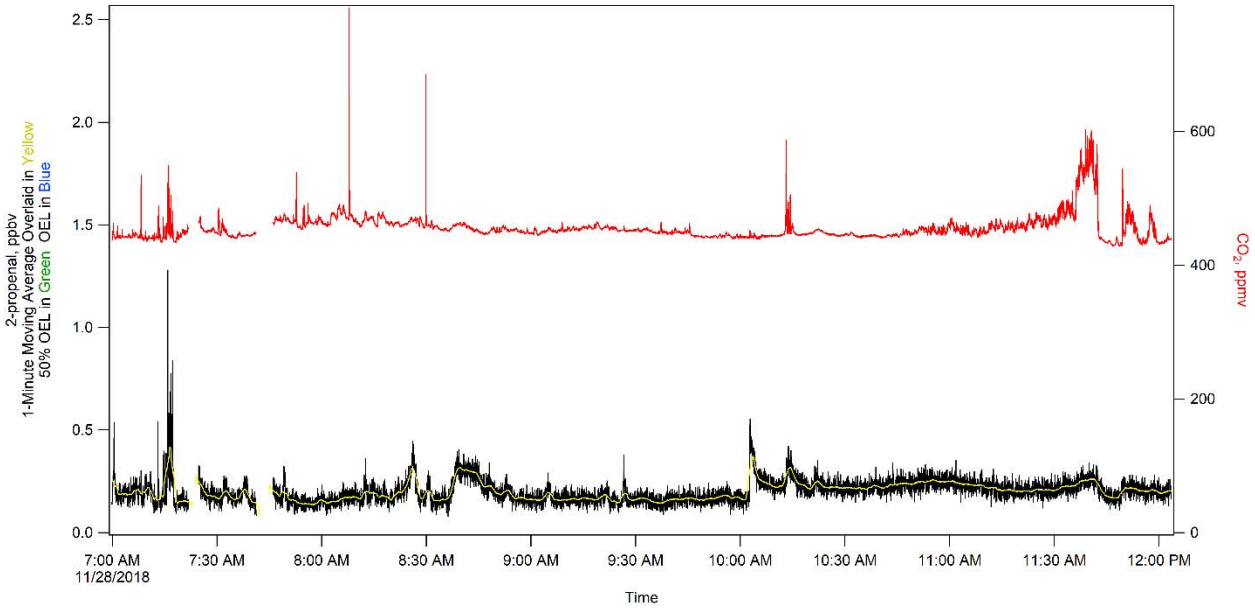


Figure 3-11. 2-propenal.

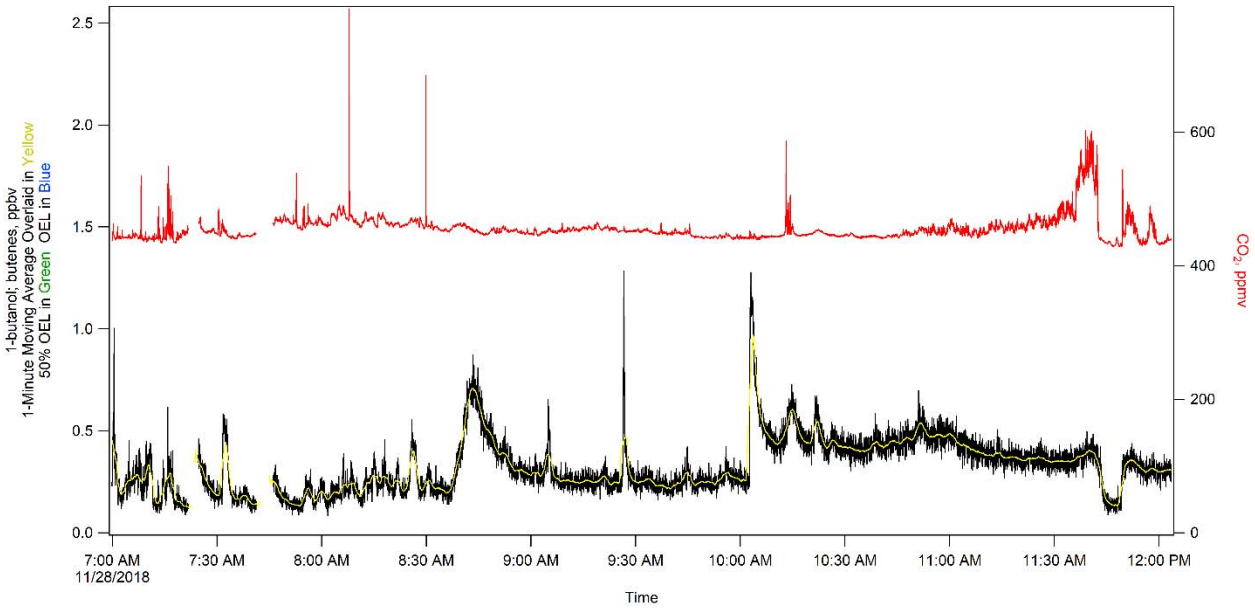


Figure 3-12. 1-butanol; Butenes.

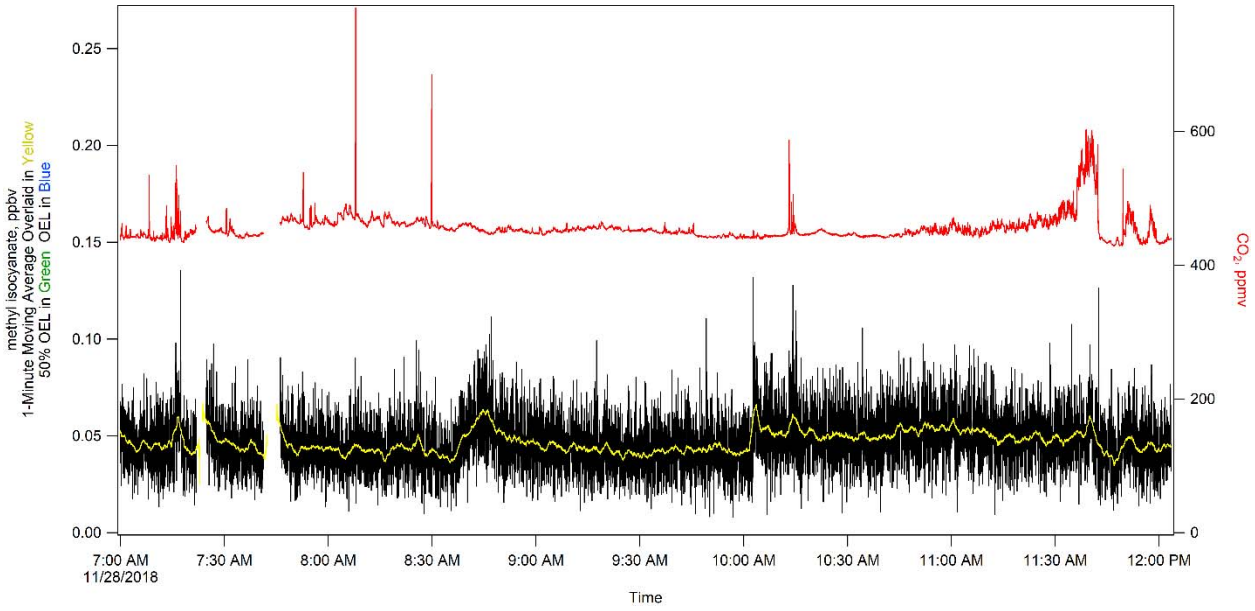


Figure 3-13. Methyl Isocyanate.

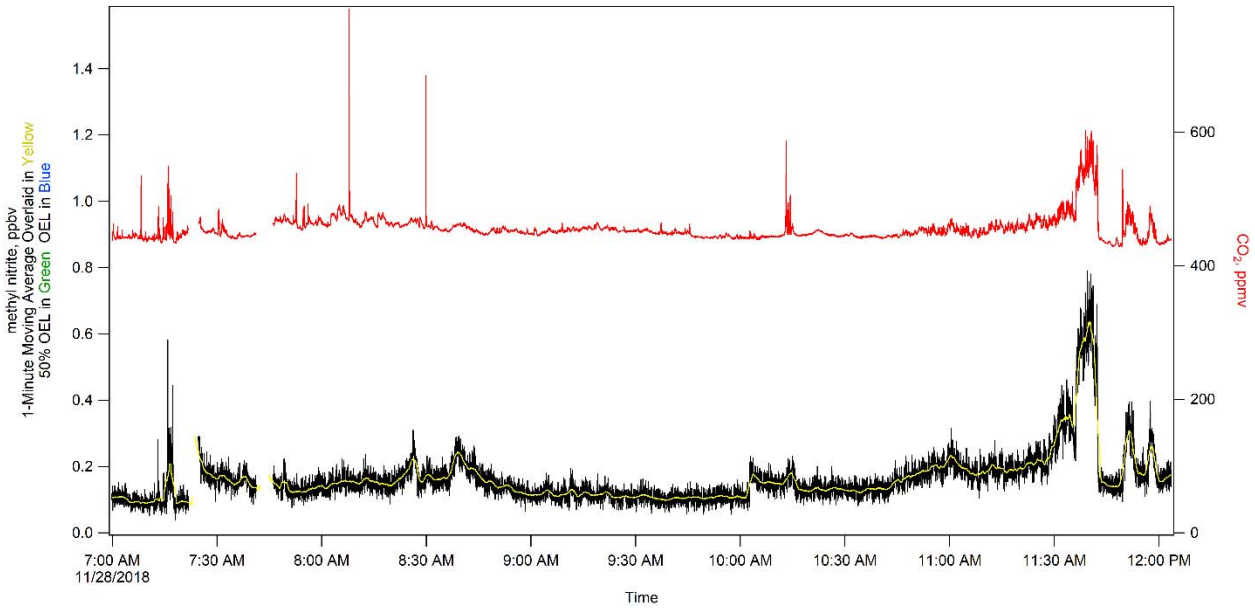


Figure 3-14. Methyl Nitrite.

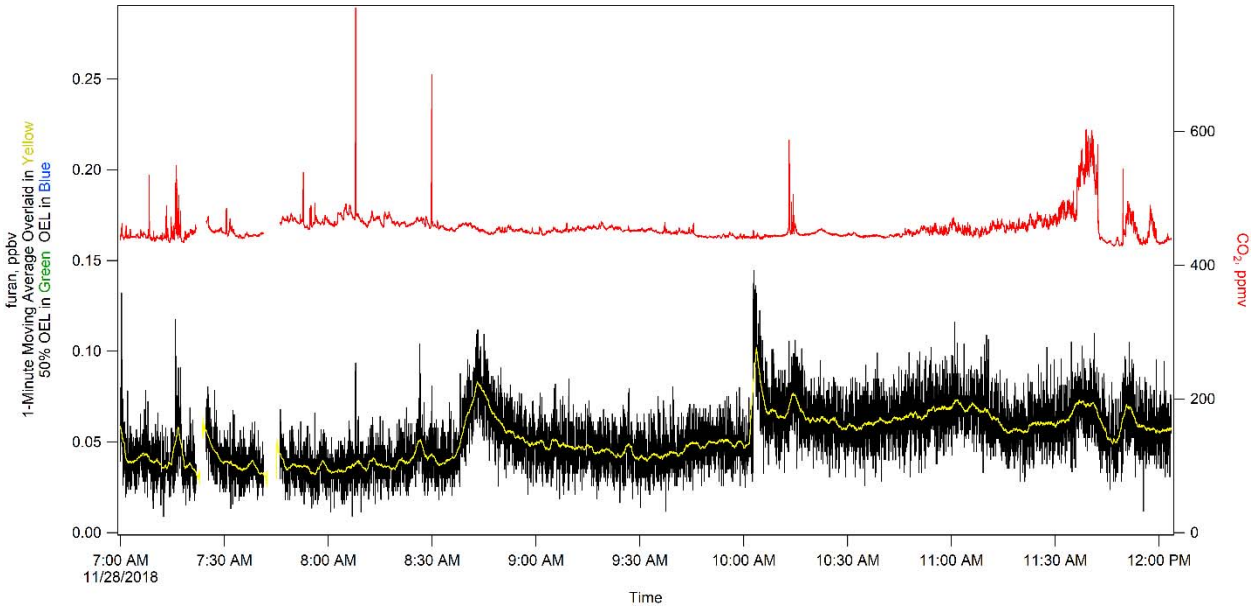


Figure 3-15. Furan.

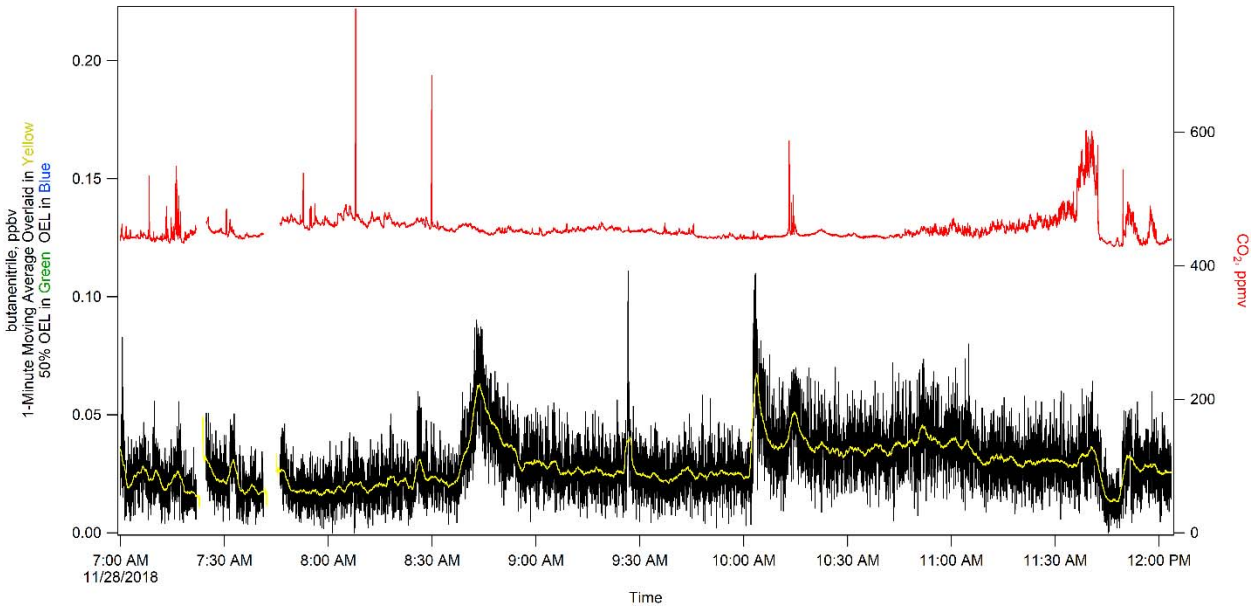


Figure 3-16. Butanenitrile.

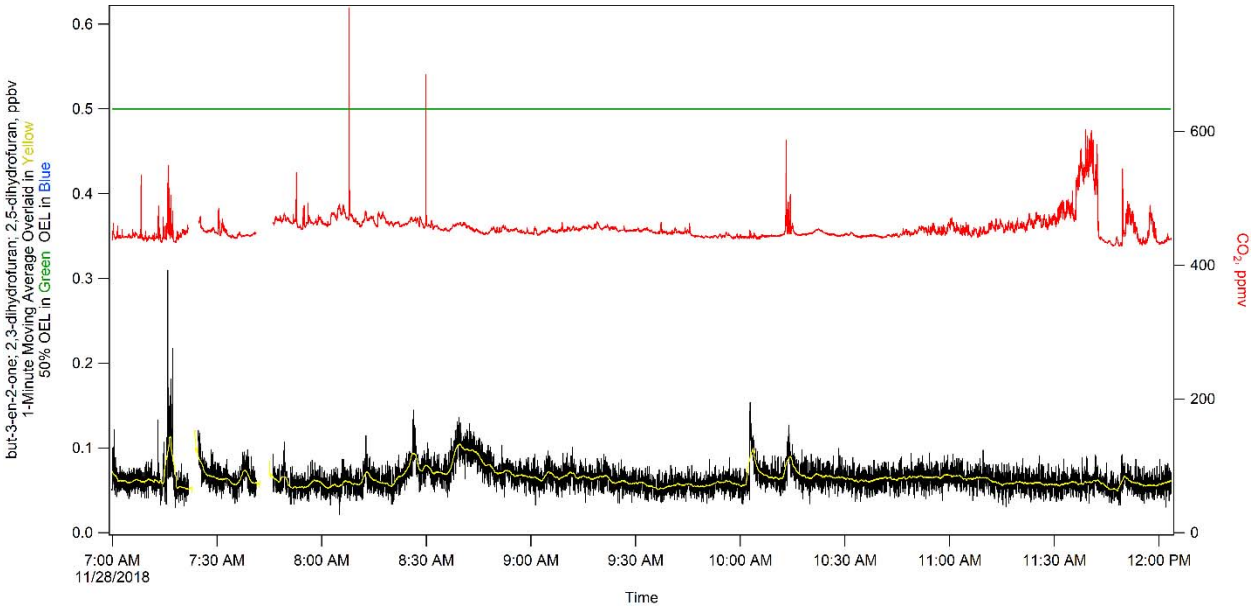


Figure 3-17. But-3-en-2-one; 2,3-dihydrofuran; 2,5-dihydrofuran.

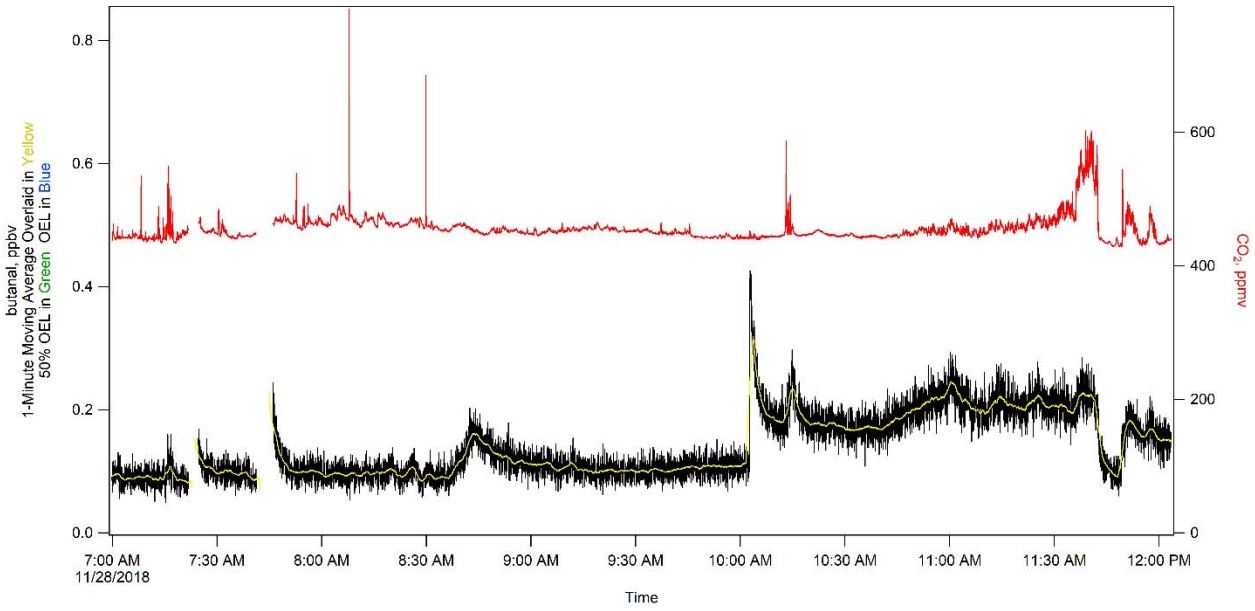


Figure 3-18. Butanal.

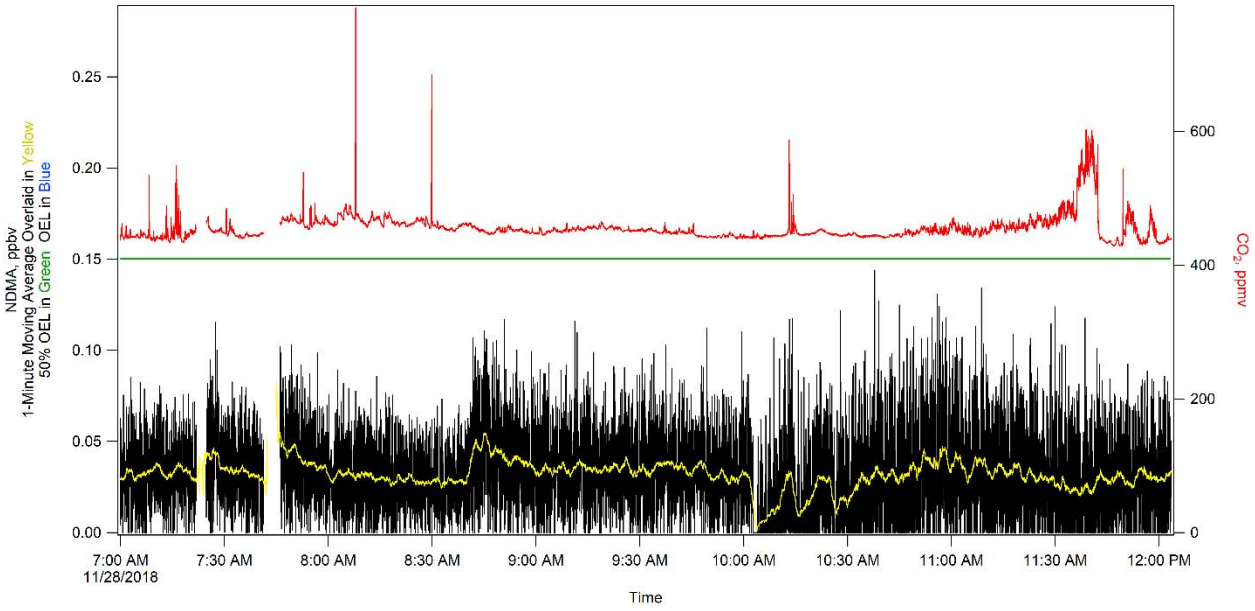


Figure 3-19. N-nitrosodimethylamine (NDMA).

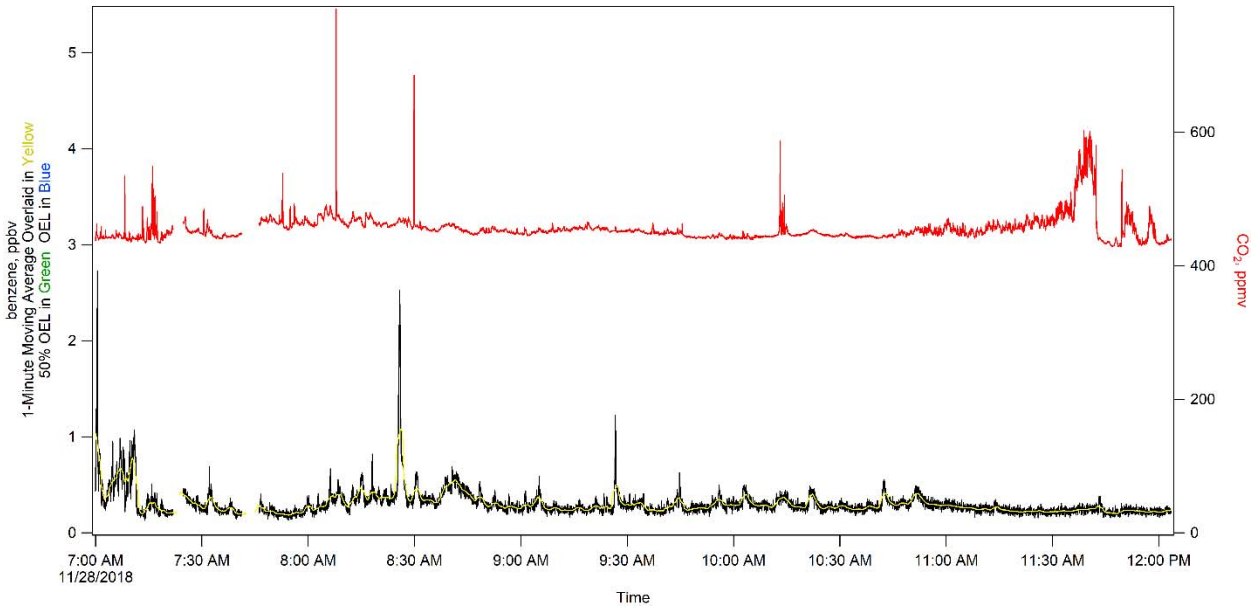


Figure 3-20. Benzene.

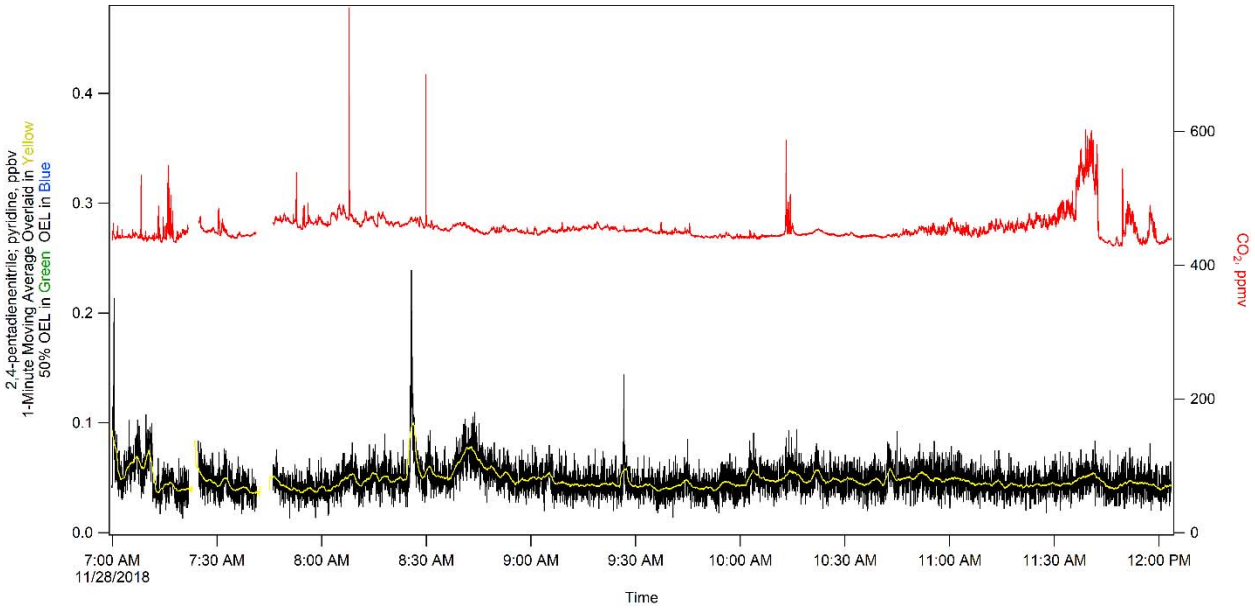


Figure 3-21. 2,4-pentadienenitrile; Pyridine.

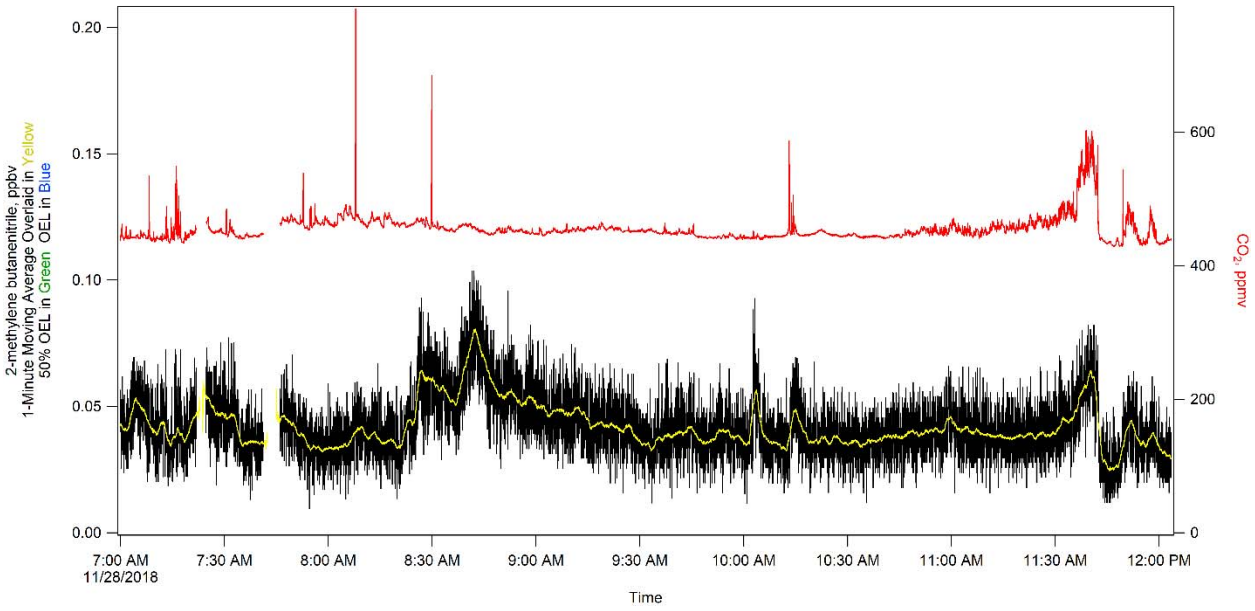


Figure 3-22. 2-methylene Butanenitrile.

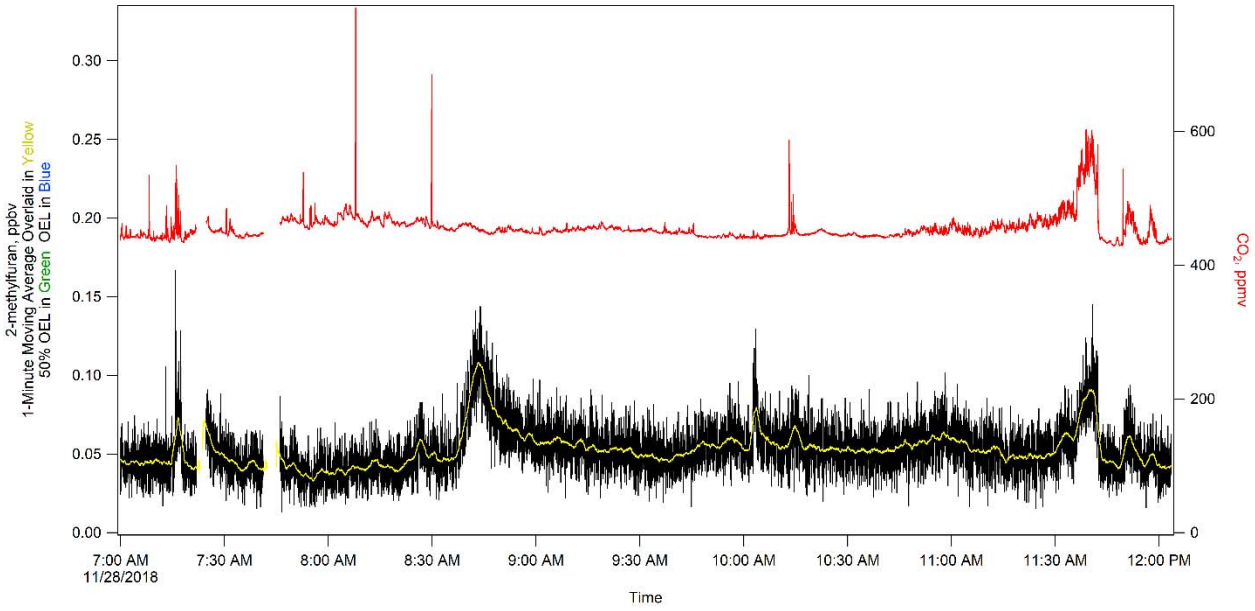


Figure 3-23. 2-methylfuran.

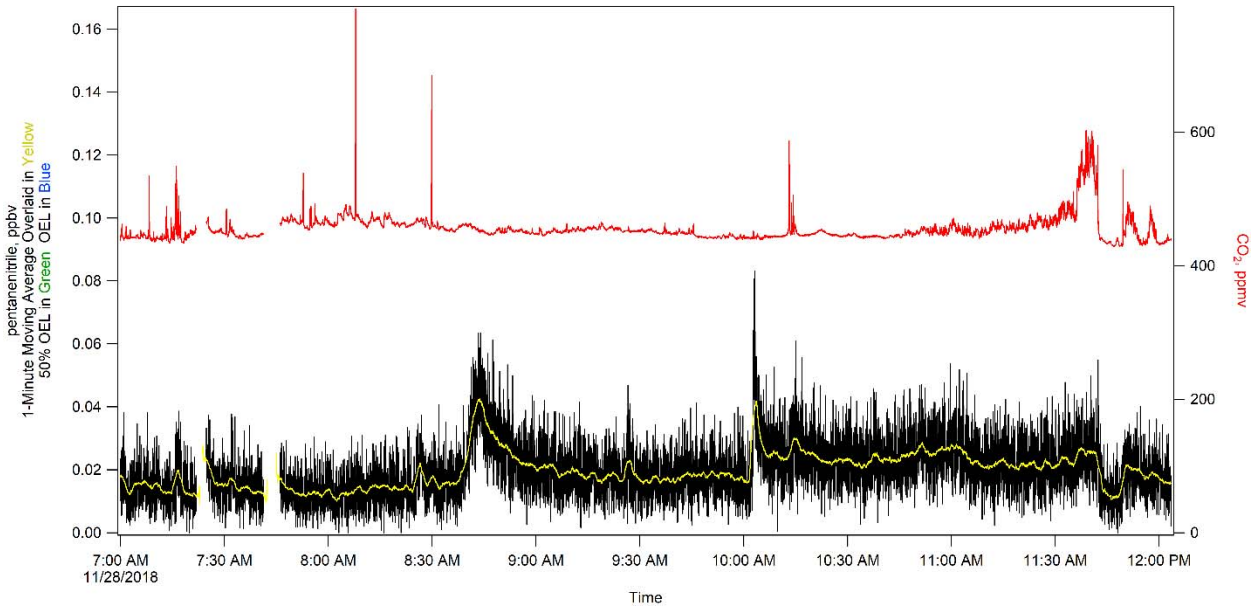


Figure 3-24. Pentanenitrile.

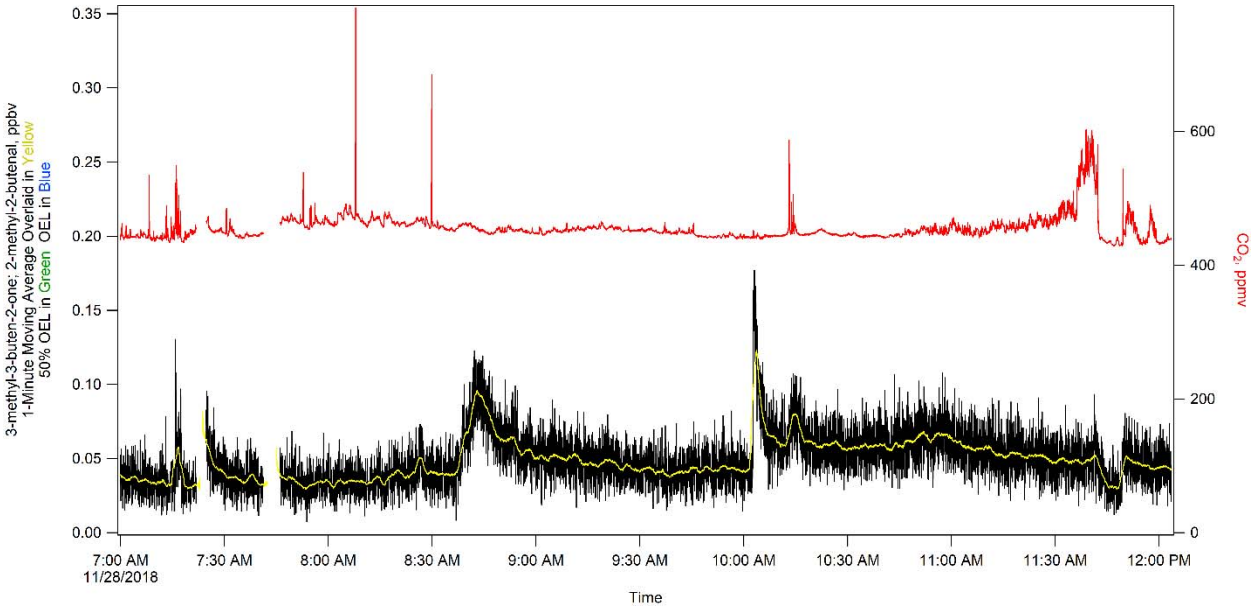


Figure 3-25. 3-methyl-3-buten-2-one; 2-methyl-2-butenal.

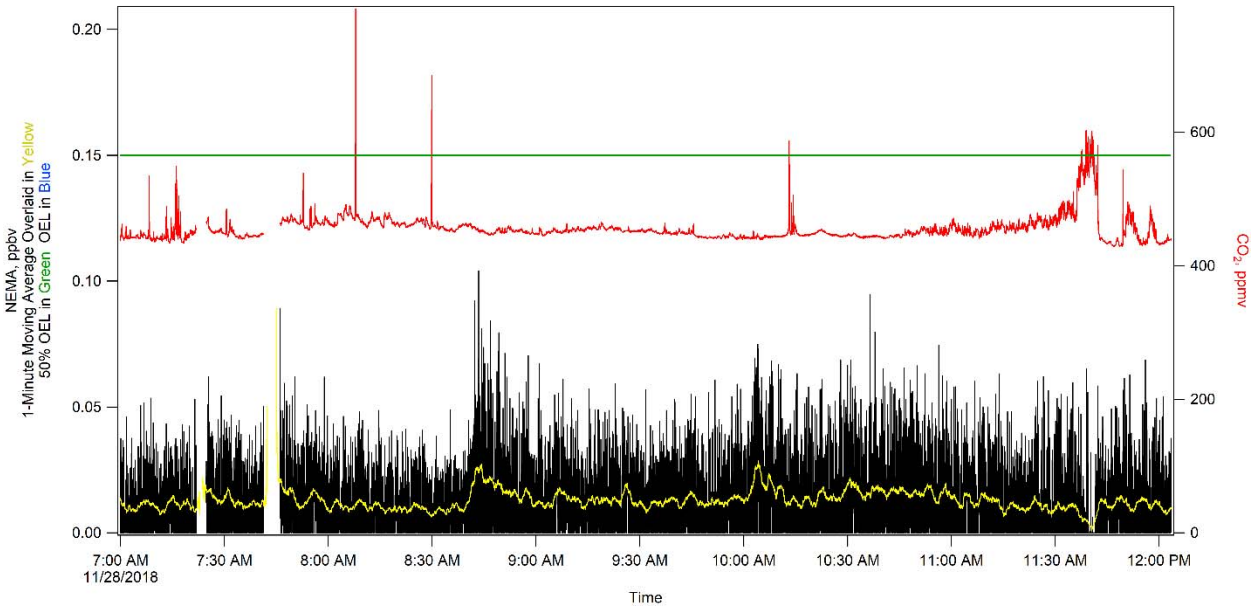


Figure 3-26. N-nitrosomethylethylamine (NEMA).

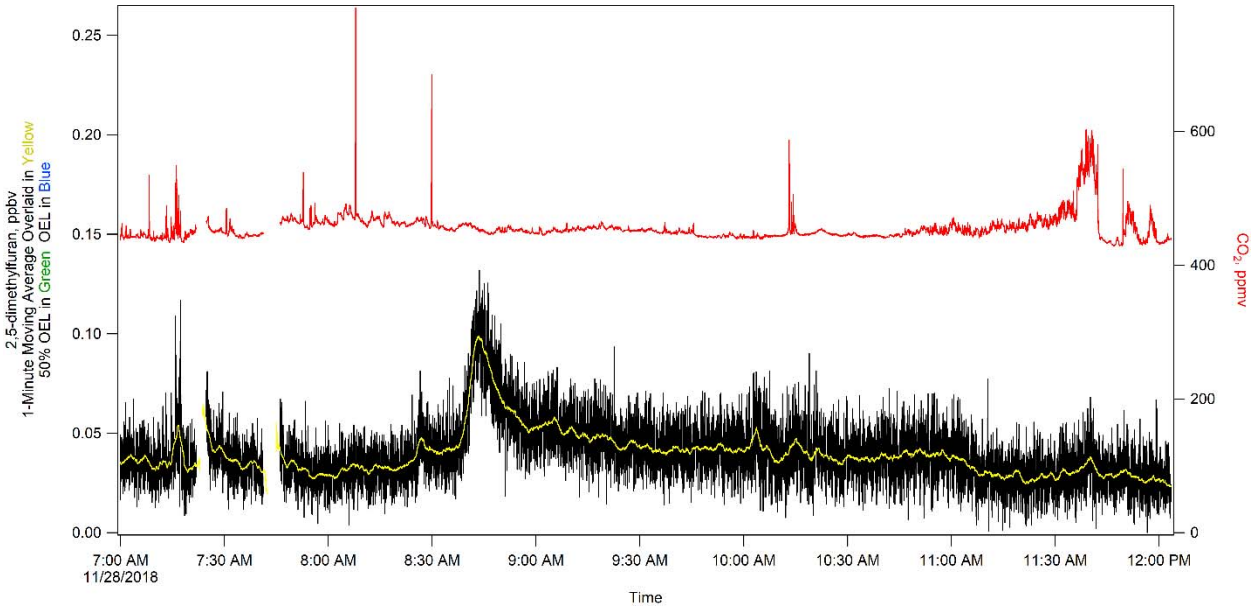


Figure 3-27. 2,5-dimethylfuran.

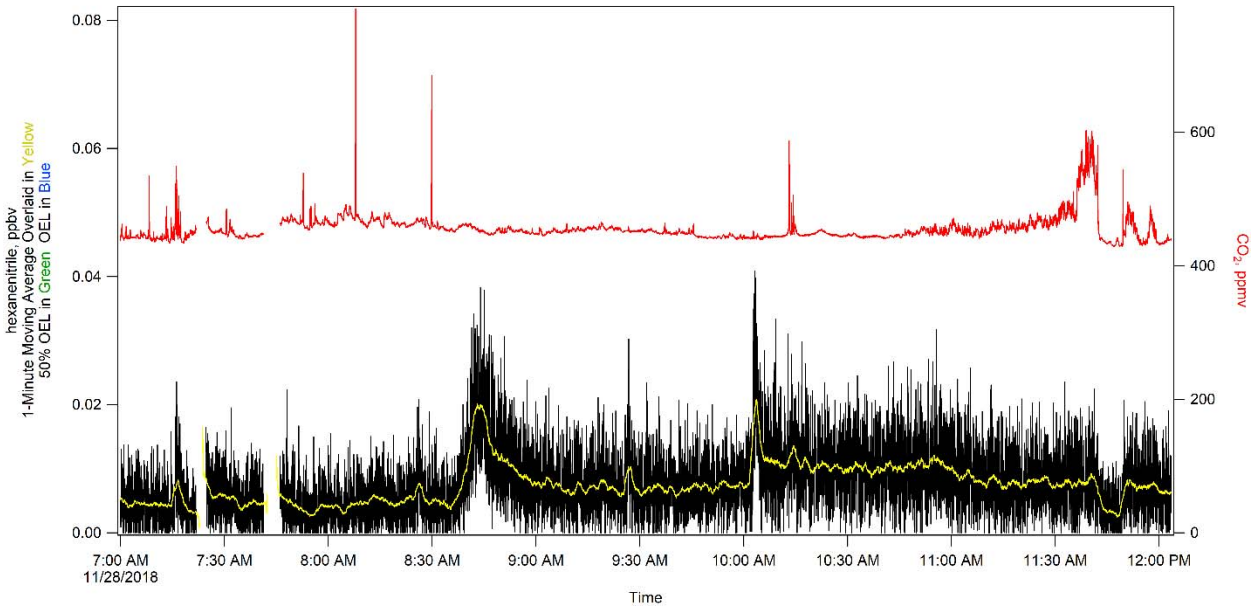


Figure 3-28. Hexanenitrile.

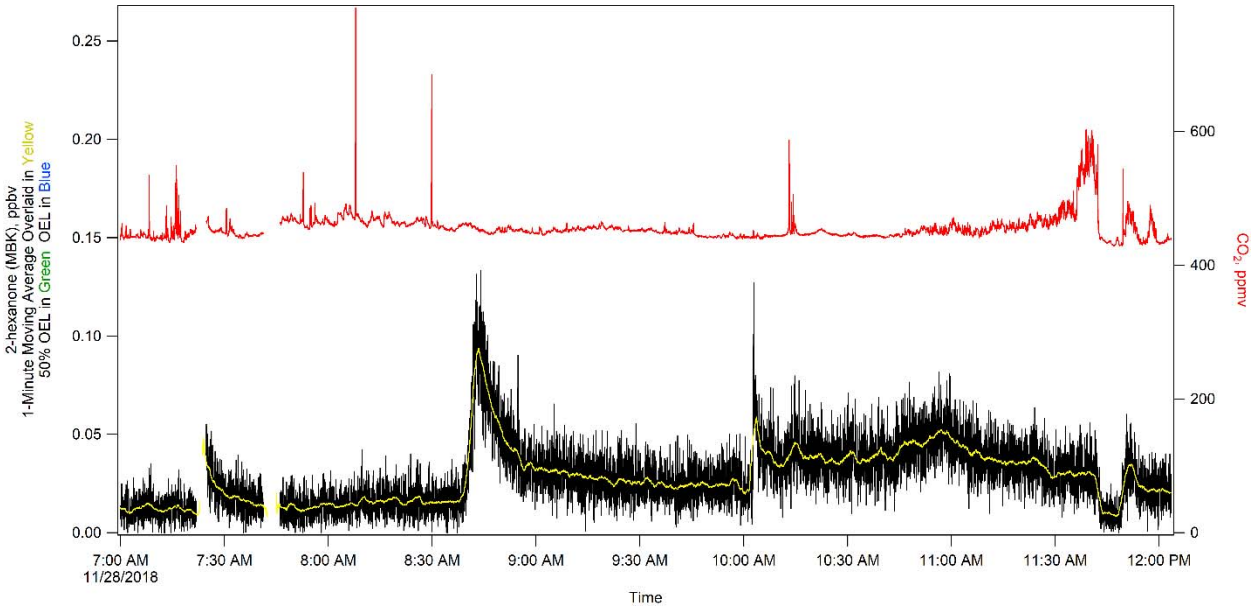


Figure 3-29. 2-hexanone (MBK).

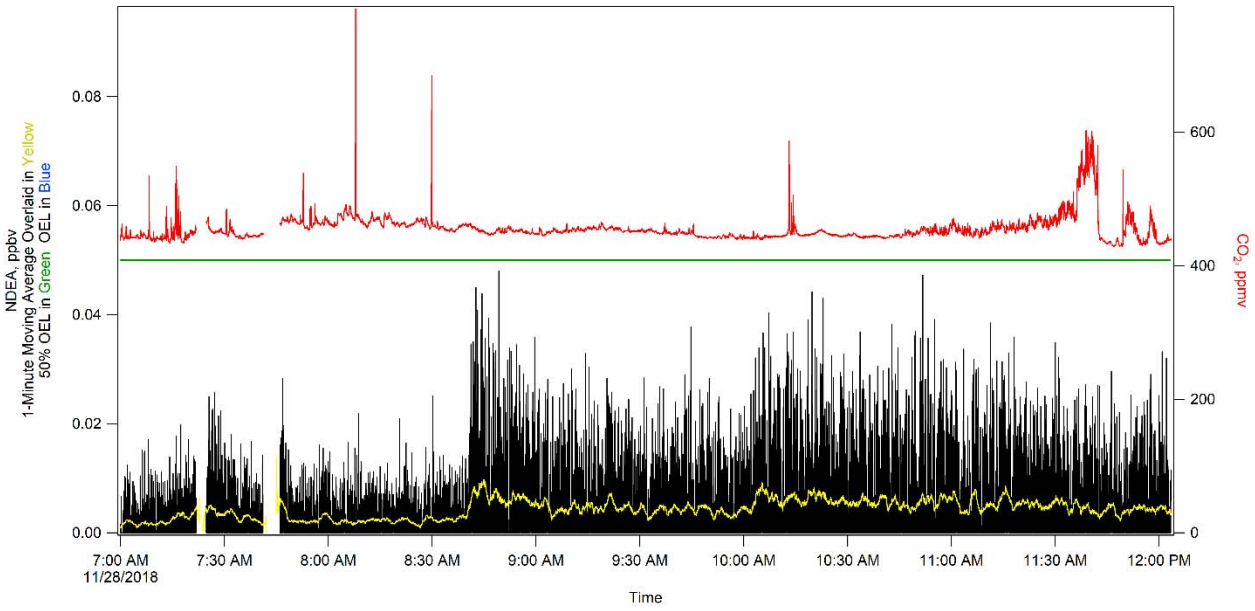


Figure 3-30. N-nitrosodiethylamine (NDEA).

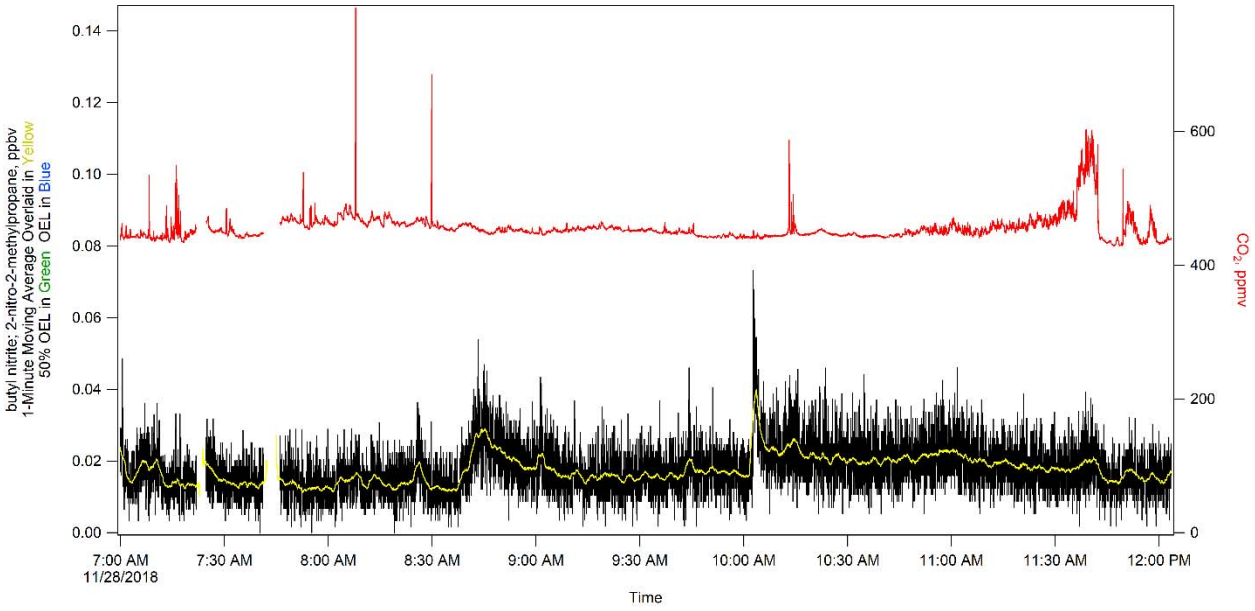


Figure 3-31. Butyl Nitrite; 2-nitro-2-methylpropane.

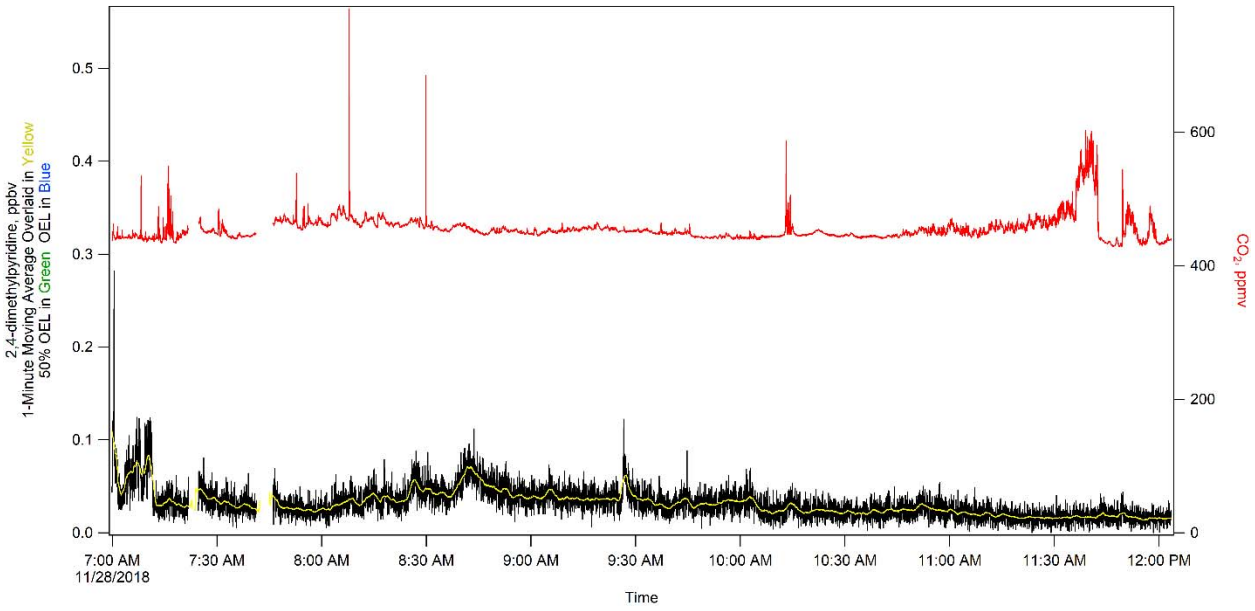


Figure 3-32. 2,4-dimethylpyridine.

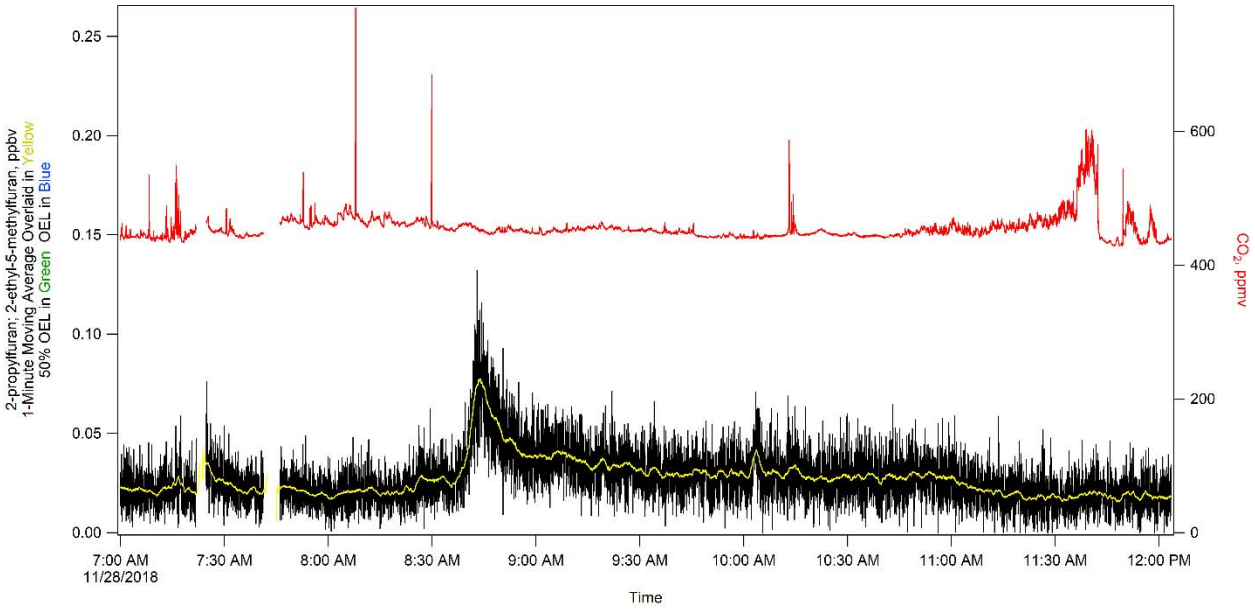


Figure 3-33. 2-propylfuran; 2-ethyl-5-methylfuran.

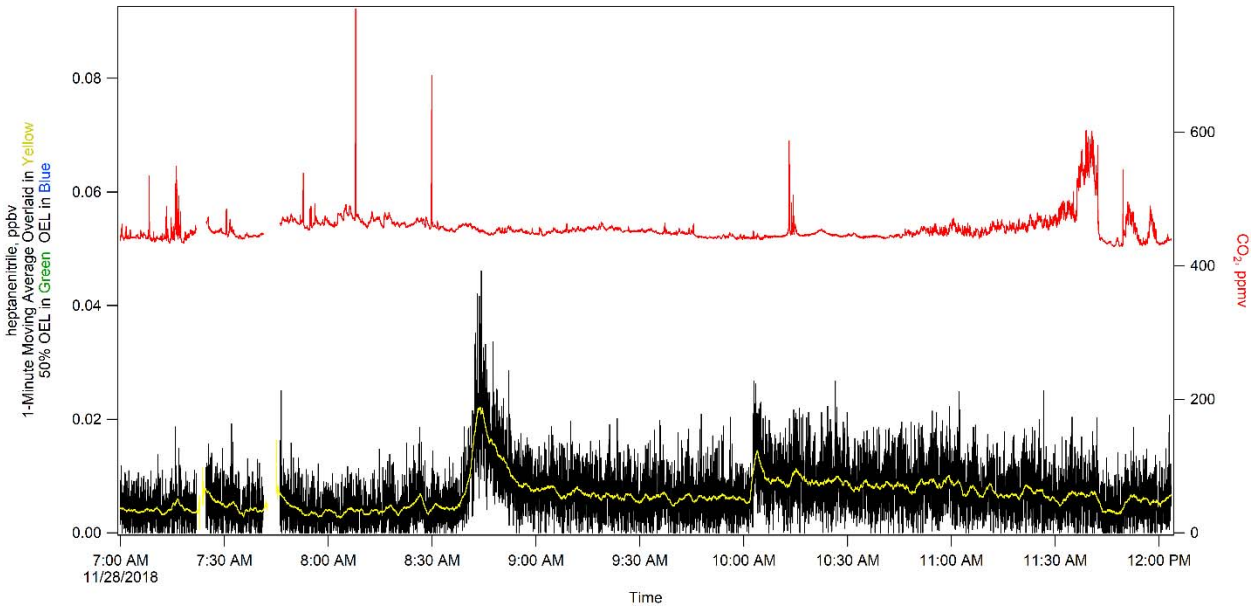


Figure 3-34. Heptanenitrile.

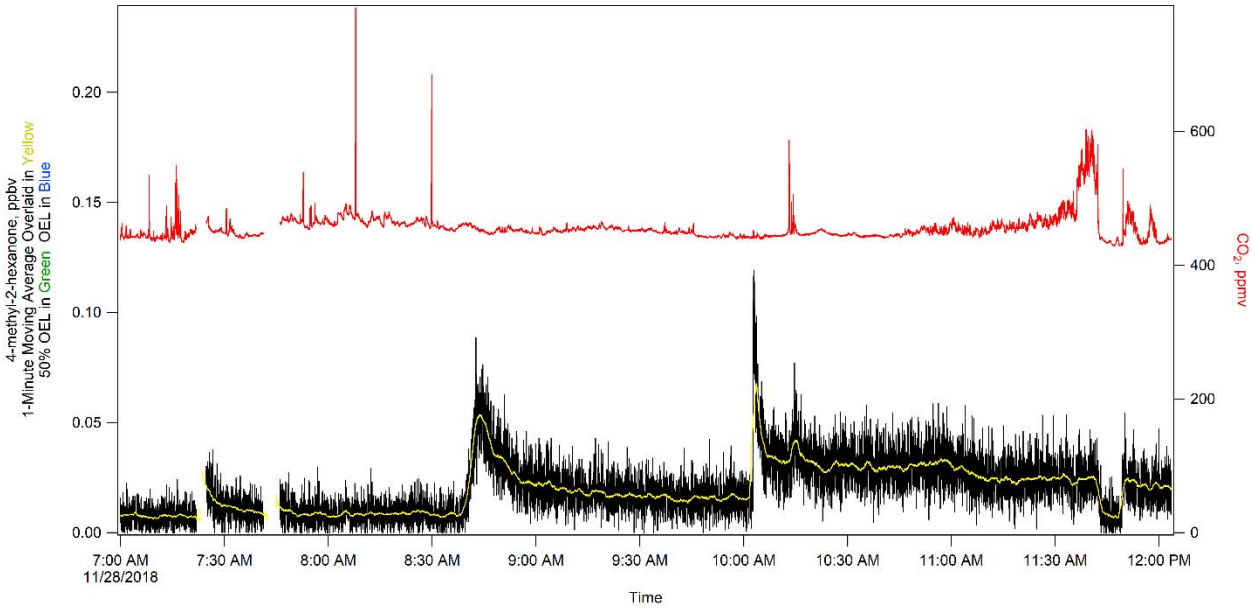


Figure 3-35. 4-methyl-2-hexanone.

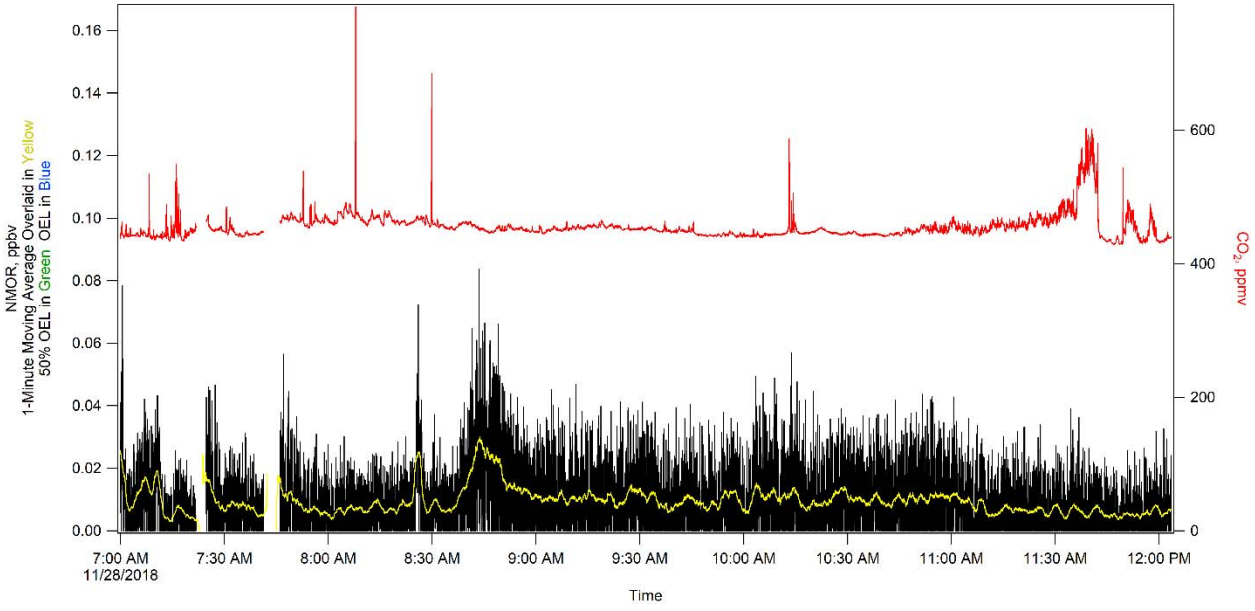


Figure 3-36. N-nitrosomorpholine (NMOR).

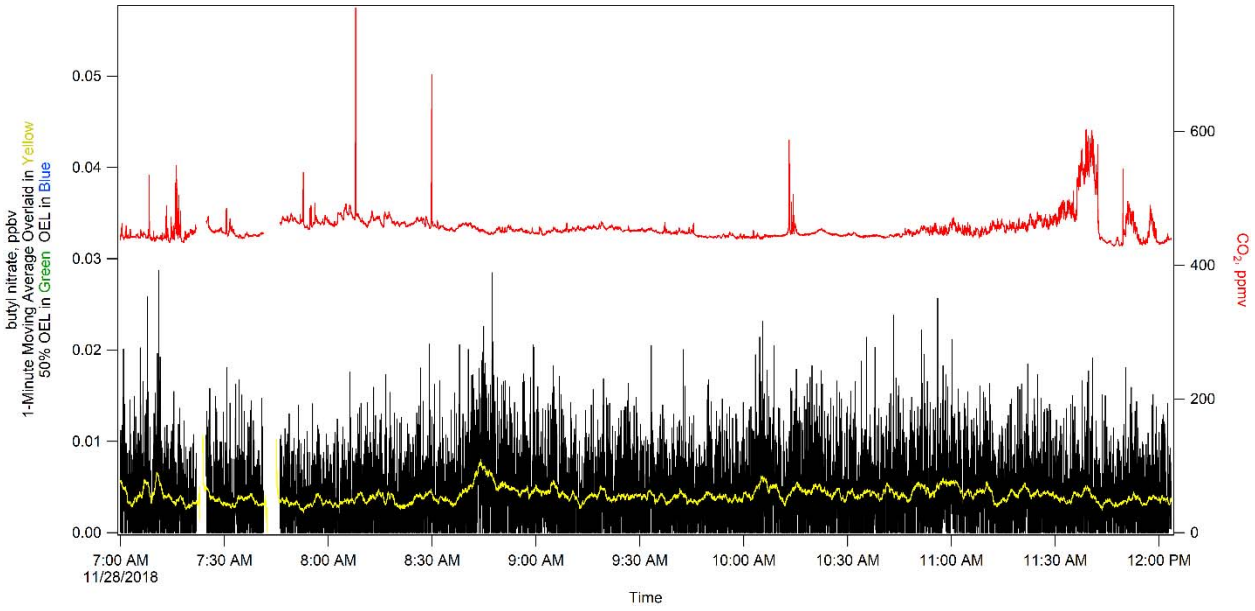


Figure 3-37. Butyl Nitrate.

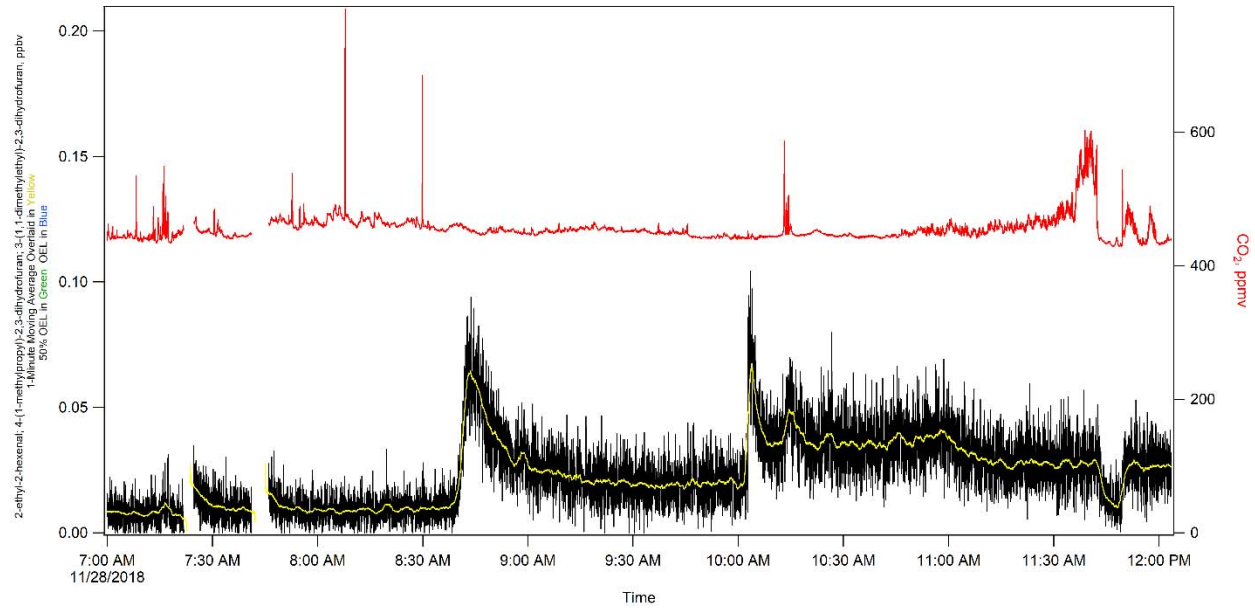


Figure 3-38. 2-ethyl-2-hexenal; 4-(1-methylpropyl)-2,3-dihydrofuran; 3-(1,1-dimethylethyl)-2,3-dihydrofuran.

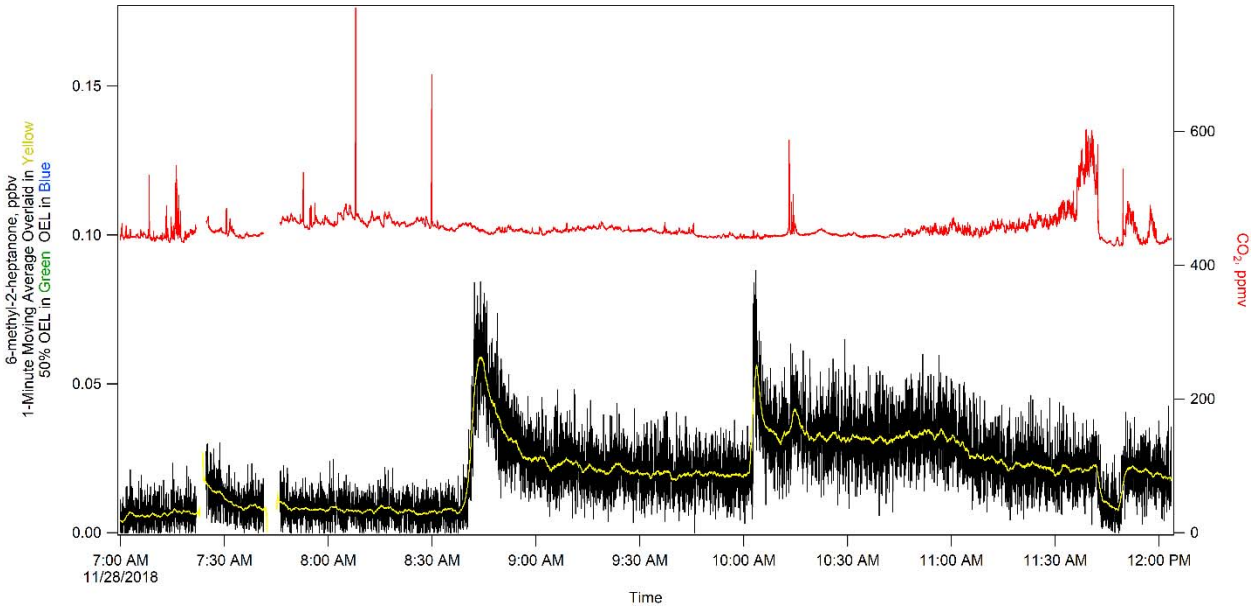


Figure 3-39. 6-methyl-2-heptanone.

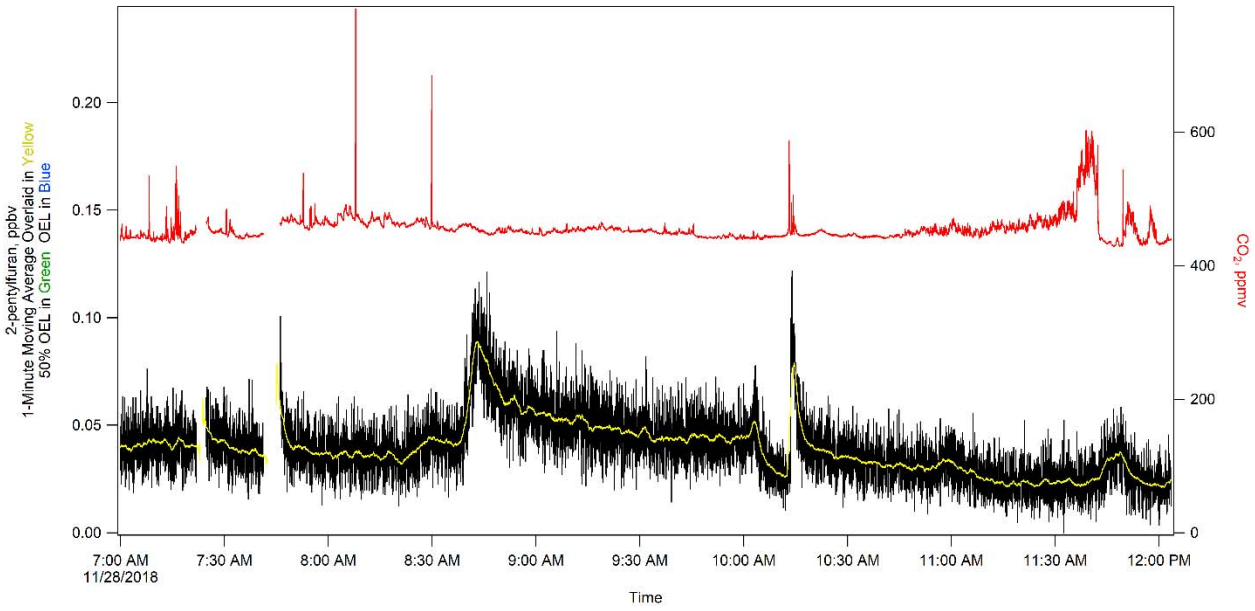


Figure 3-40. 2-pentylfuran.

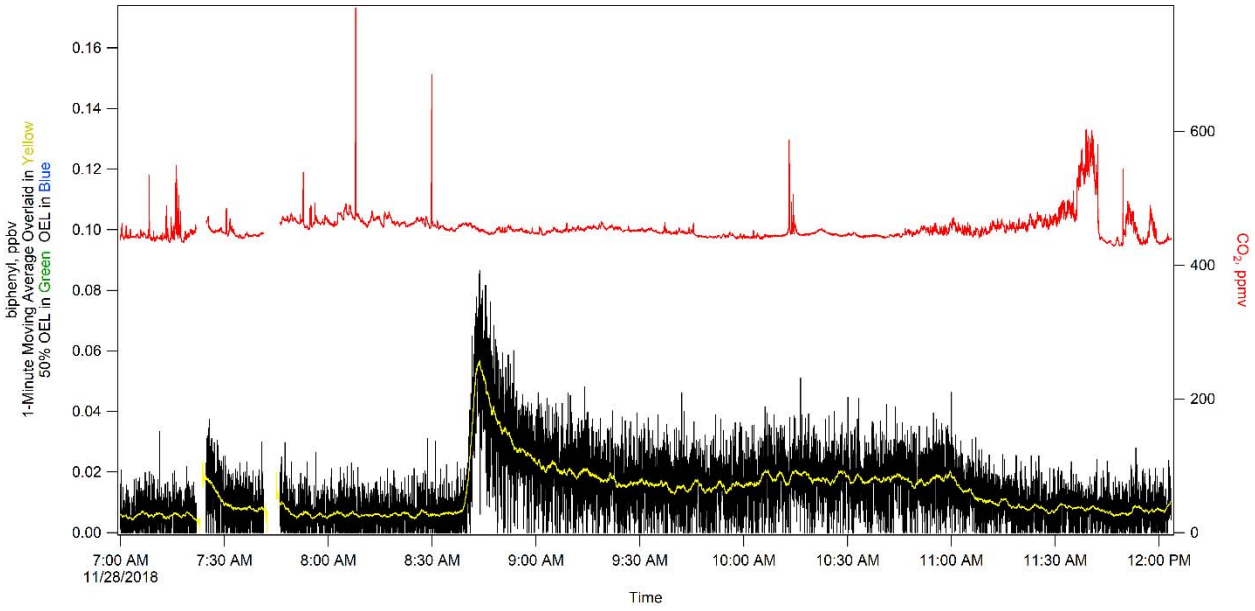


Figure 3-41. Biphenyl.

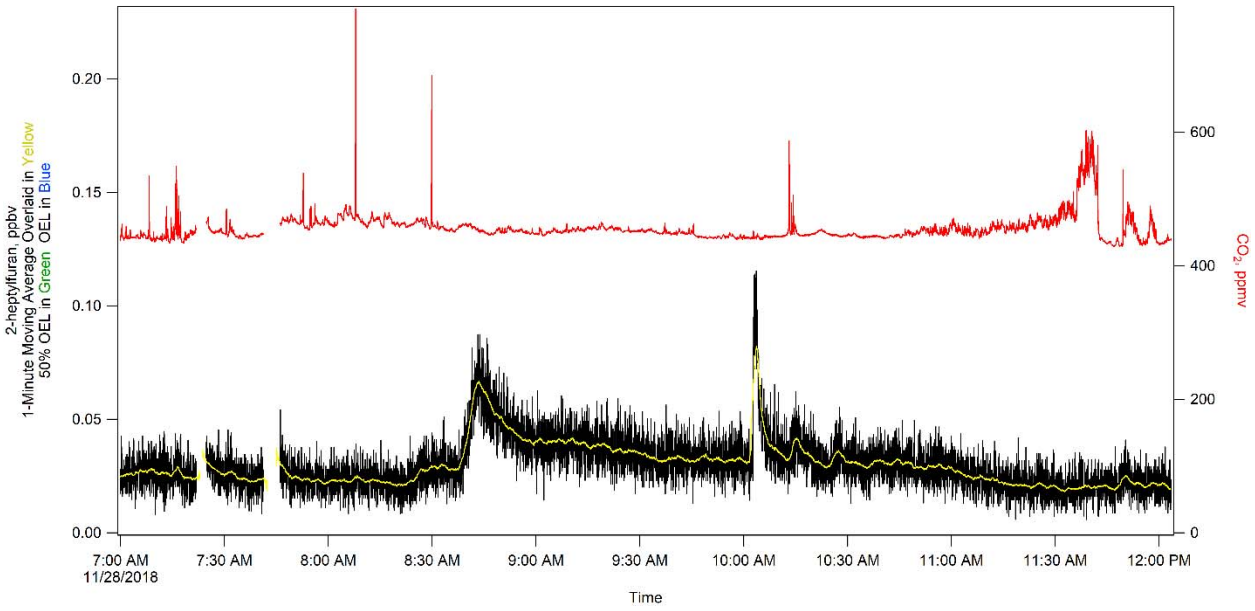


Figure 3-42. 2-heptylfuran.

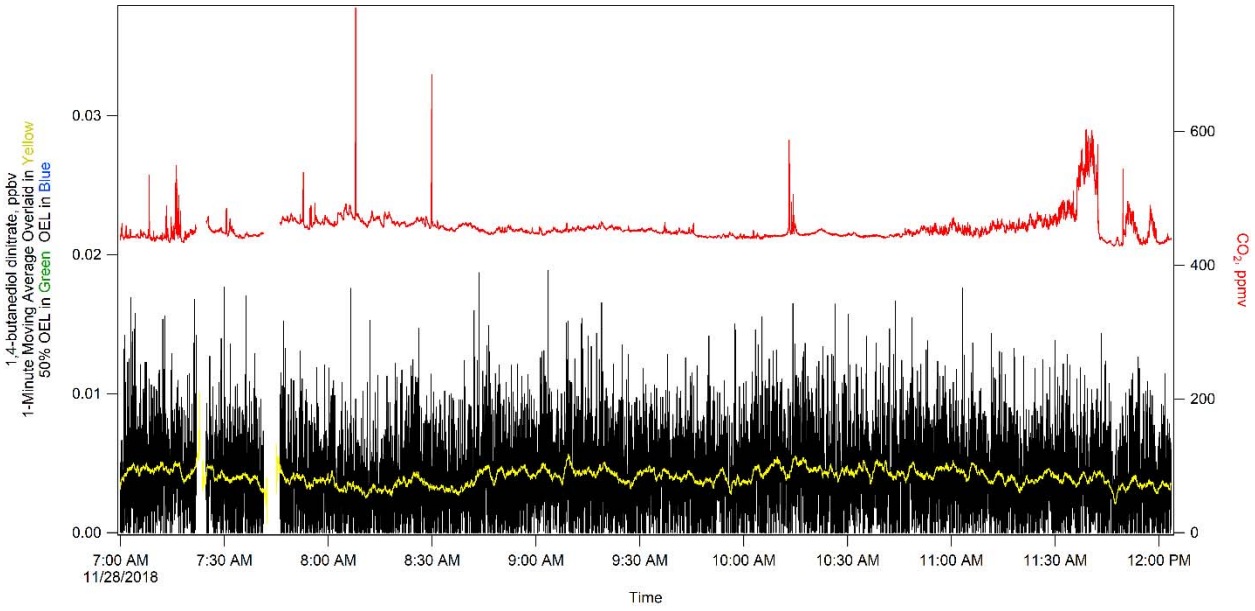


Figure 3-43. 1,4-butanediol Dinitrate.

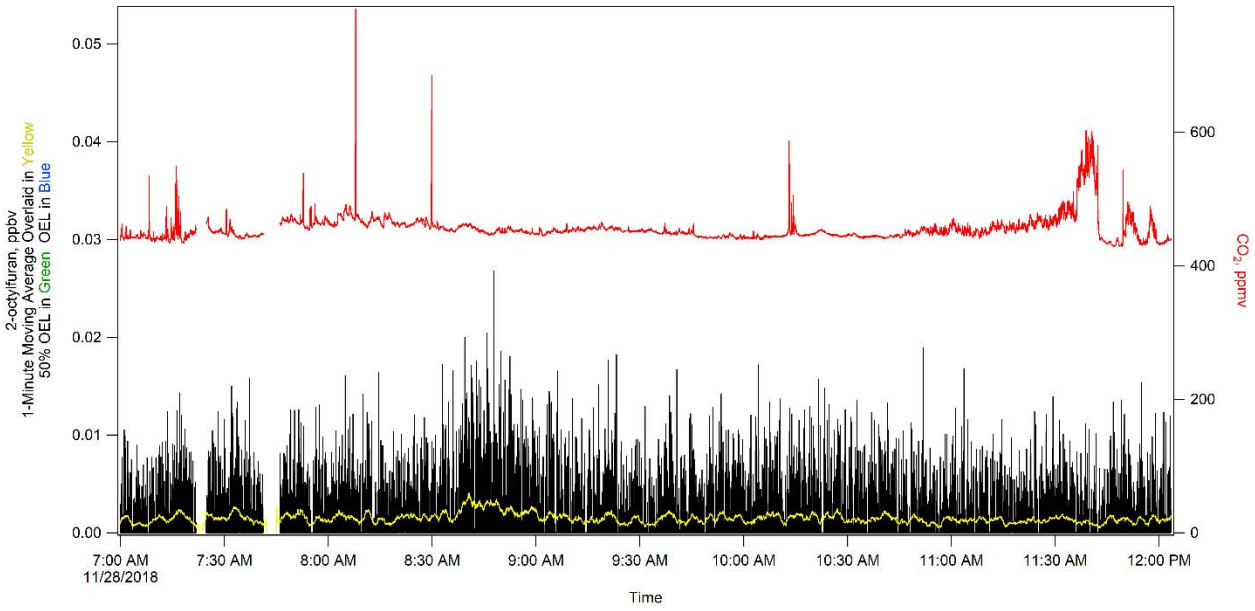


Figure 3-44. 2-octylfuran.

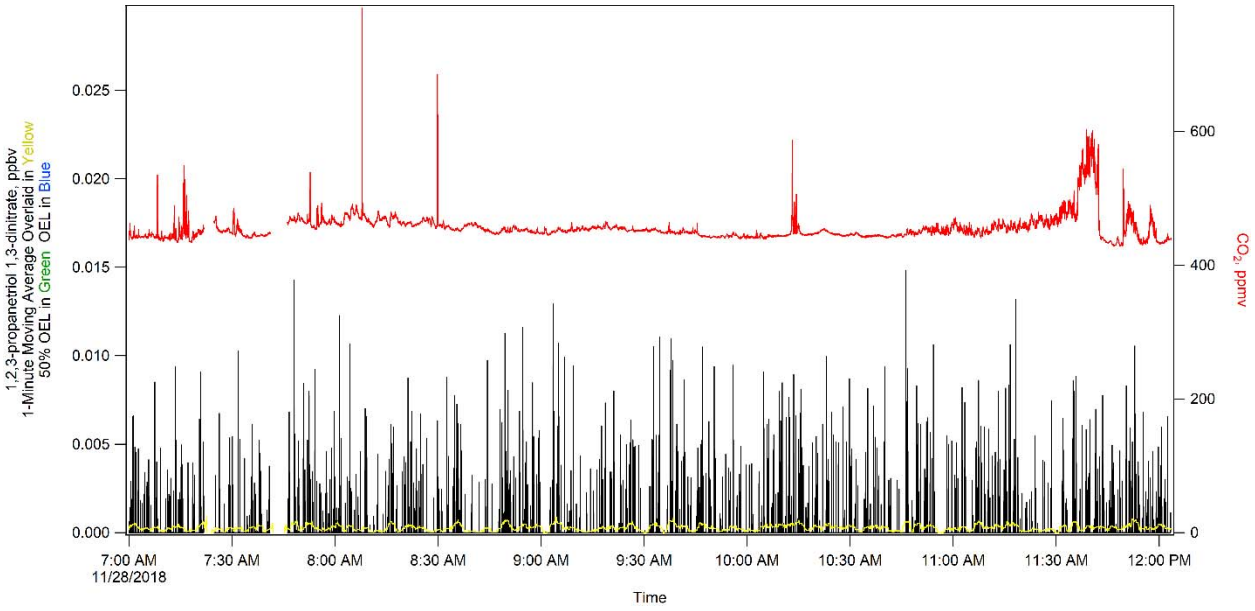


Figure 3-45. 1,2,3-propanetriol 1,3-dinitrate.

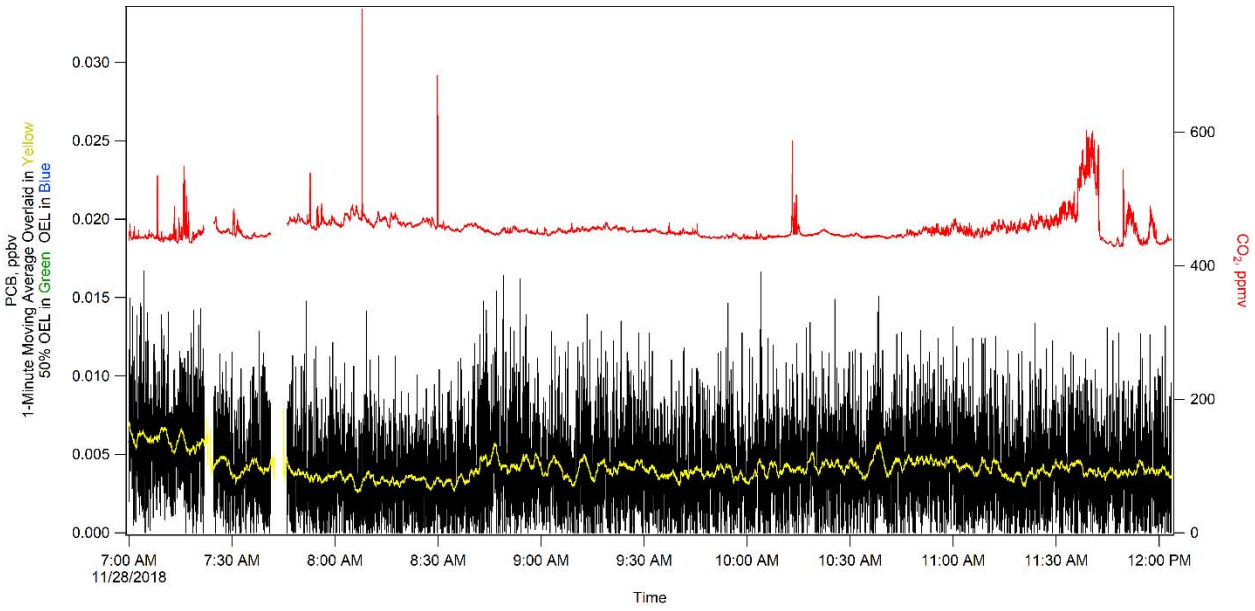


Figure 3-46. PCB.

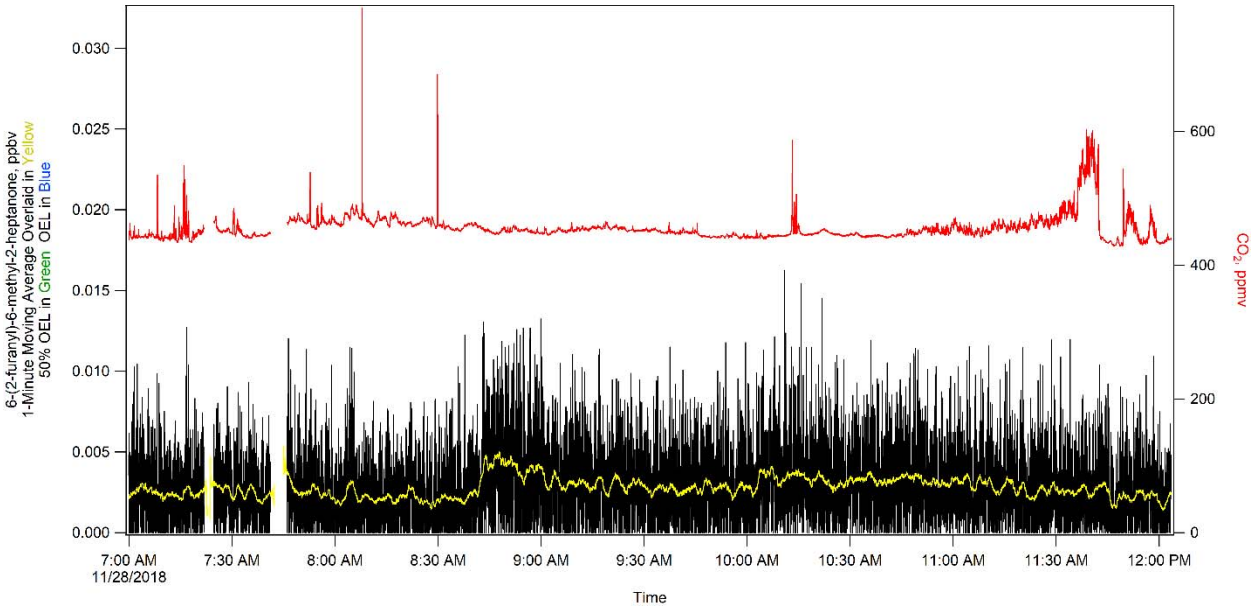


Figure 3-47. 6-(2-furanyl)-6-methyl-2-heptanone.

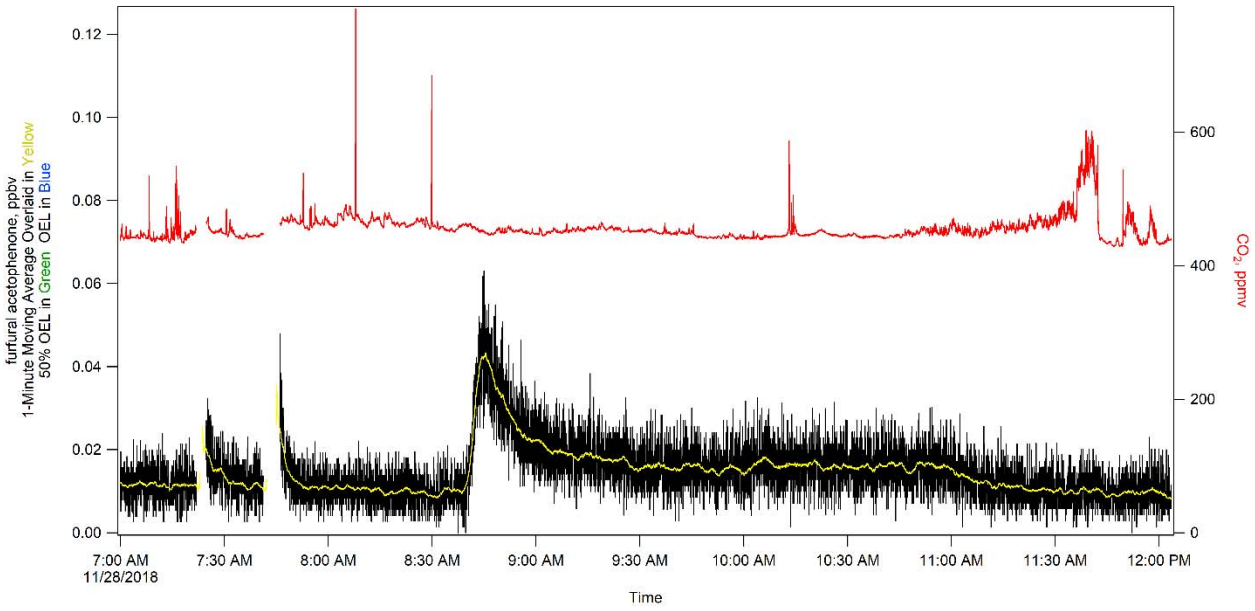


Figure 3-48. Furfural Acetophenone.

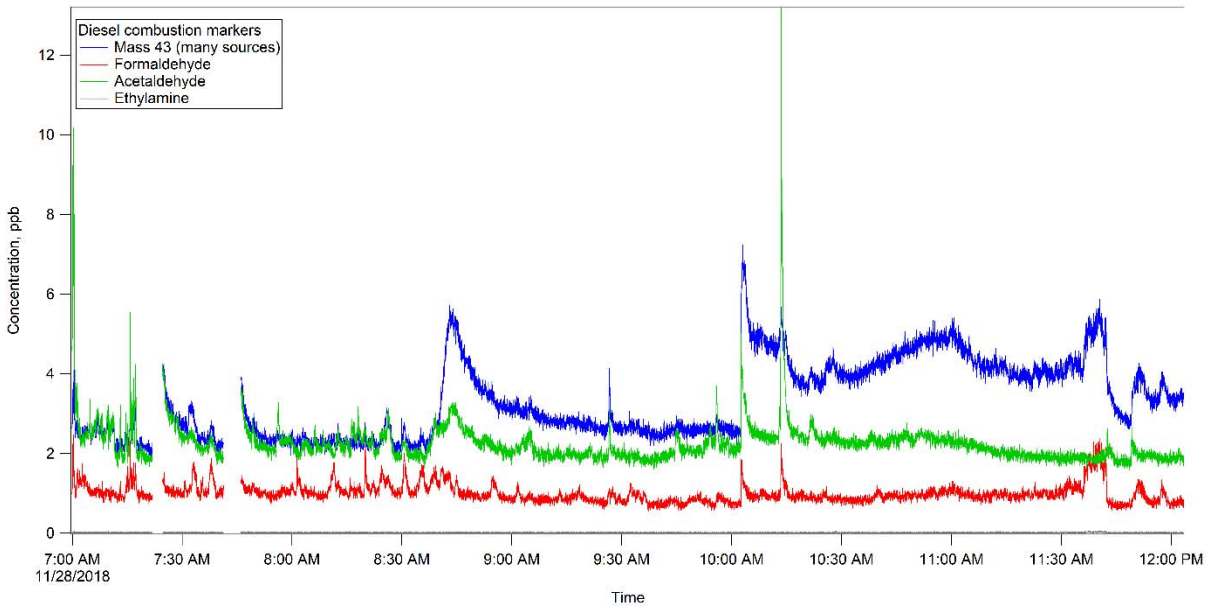


Figure 3-49. Diesel Combustion Markers.

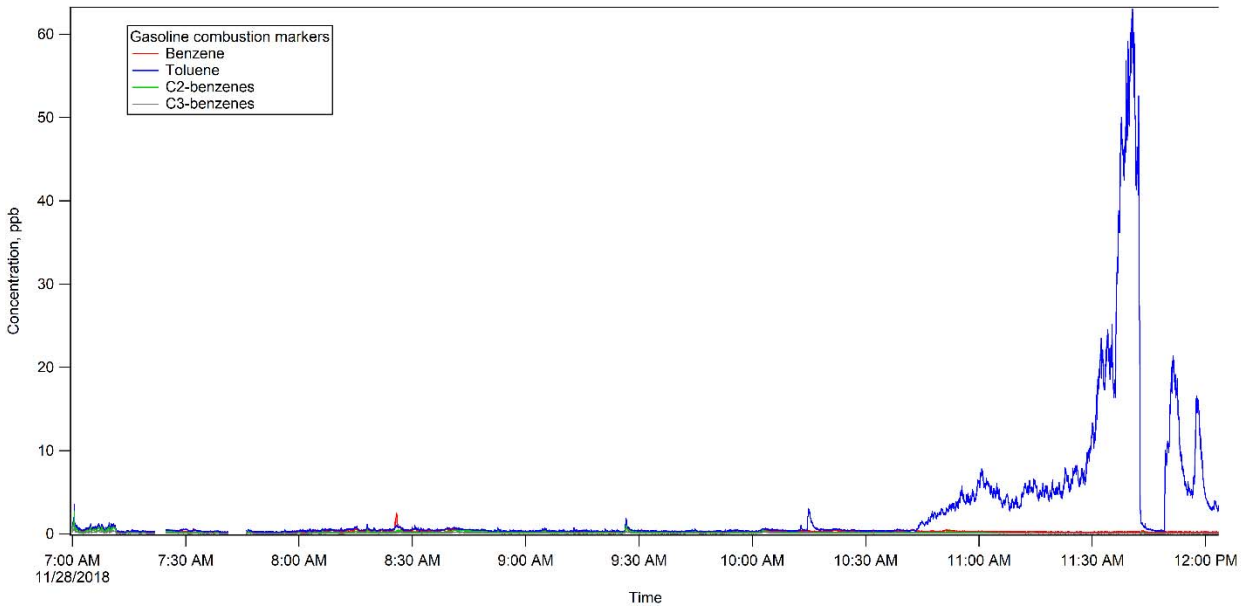


Figure 3-50. Gasoline Combustion Markers.

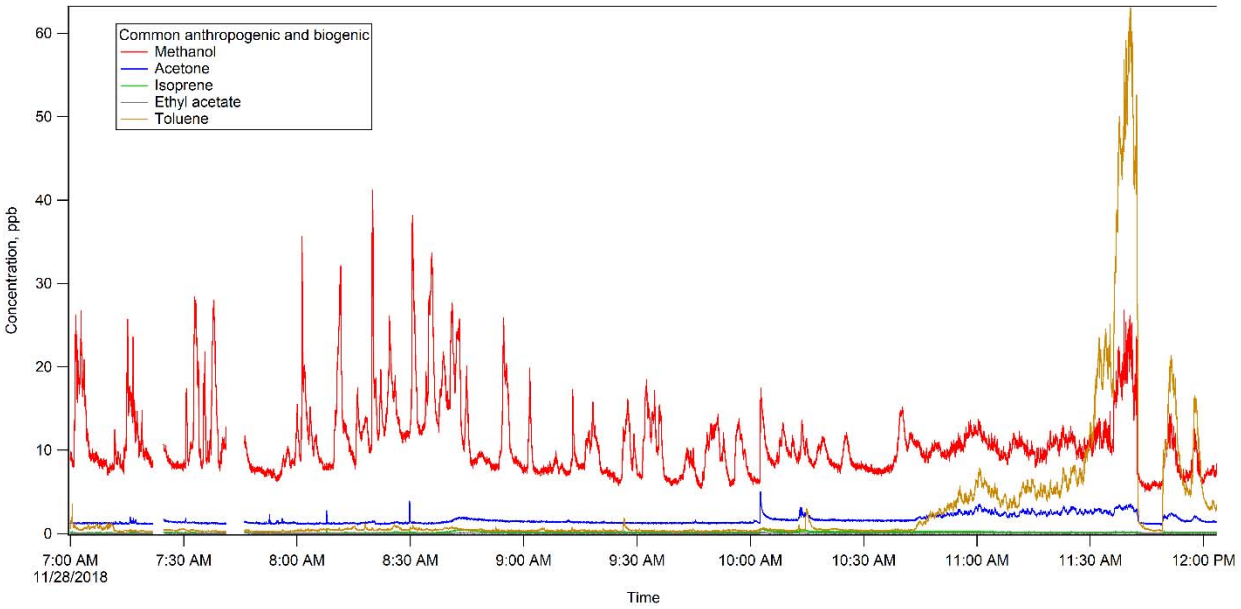


Figure 3-51. Plant and Human Markers.

3.5 Source Characterization

Table 3-3. Odor Statistical Information for the Monitoring Period of November 28, 2018.

Odor #	Odor Compound Name	Ave. (ppb)	St. Dev. (ppb)	Rel St. Dev. (%)	Max (ppb)	Median (ppb)
1	methyl mercaptan	21.349	72.249	338.418	573.009	0.459
2	Dimethylsulfide + ethanethiol	1.044	2.494	238.779	22.750	0.259
3	allyl mercaptan	0.168	0.110	65.776	1.269	0.130
4	1-propanethiol + isopropyl mercaptan	0.015	0.050	336.791	0.452	0.000
5	2-butene-1-thiol	0.023	0.021	90.586	0.204	0.019
6	diethyl sulfide + 2-methylpropane-2-thiol	0.245	0.343	139.731	2.880	0.144
7	thiopropanal sulfuroxide	0.020	0.020	101.847	0.256	0.014
8	dimethyl disulfide	0.057	0.184	320.306	1.760	0.005
9	1-pentanethiol + 2,2-dimethylpropane-1-thiol	0.023	0.033	145.277	0.291	0.000
10	benzenethiol	0.004	0.006	140.505	0.037	0.001
11	diallyl sulfide	0.007	0.009	124.166	0.063	0.004
12	methyl propyl disulfide	0.003	0.005	189.333	0.036	0.000
13	methylbenzenethiol	0.009	0.007	73.834	0.040	0.008
14	dimethyl trisulfide	0.025	0.016	63.832	0.101	0.019
15	(1-oxoethyl) thiophene	0.006	0.006	88.818	0.037	0.005
16	(1-oxopropyl) thiophene	0.007	0.005	78.240	0.039	0.006
17	dipropyl disulfide	0.005	0.005	90.494	0.039	0.004
18	methyl propyl trisulfide	0.001	0.002	168.443	0.016	0.000
19	dimethyl tetrasulfide	0.003	0.002	79.197	0.016	0.002
20	dipropyl trisulfide	0.001	0.003	210.956	0.018	0.000
21	diphenyl sulfide	0.002	0.003	127.161	0.019	0.001

The following figures 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 November 28, 2018.

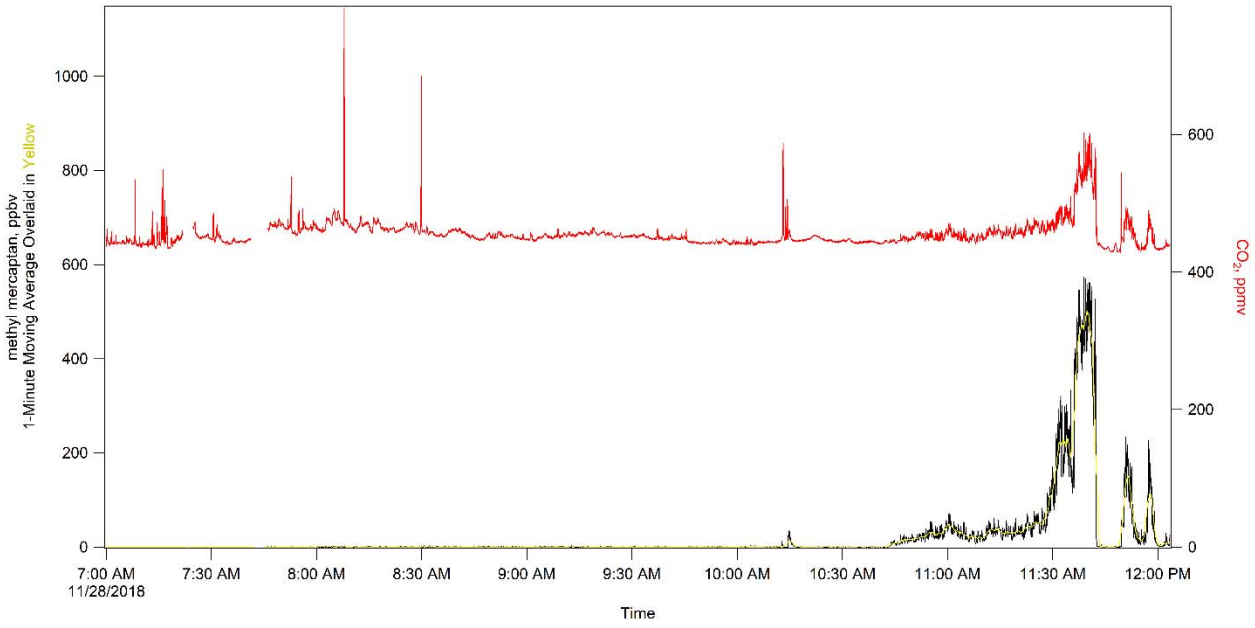


Figure 3-52. Methyl Mercaptan.

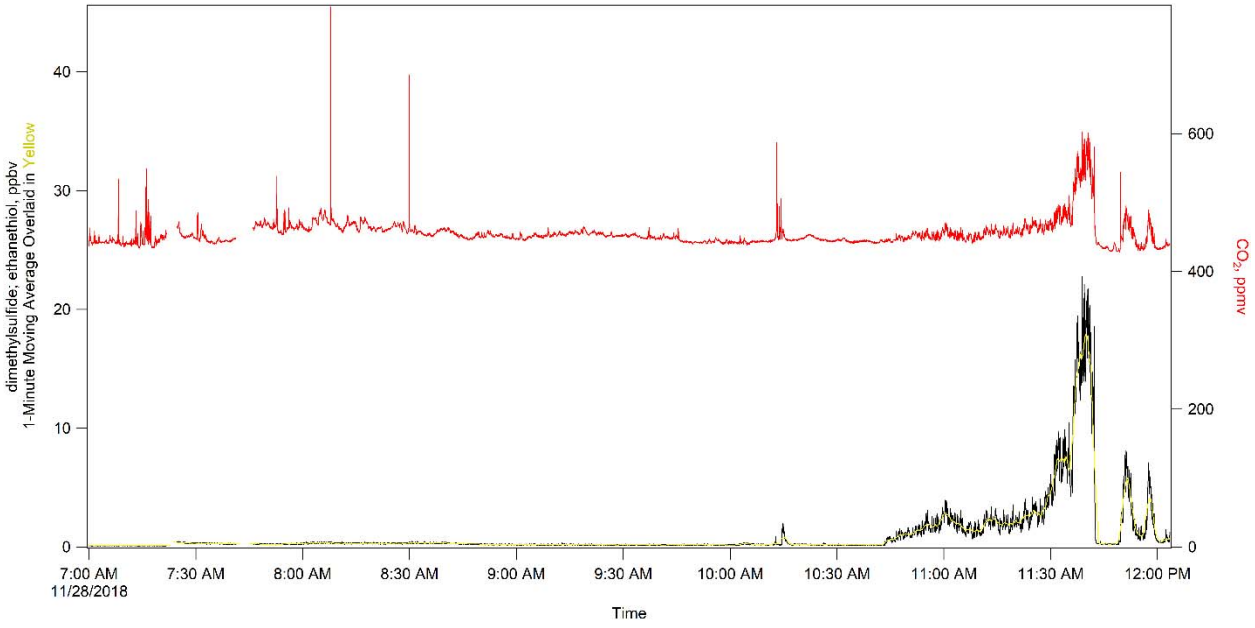


Figure 3-53. Dimethyl Sulfide; Ethanethiol.

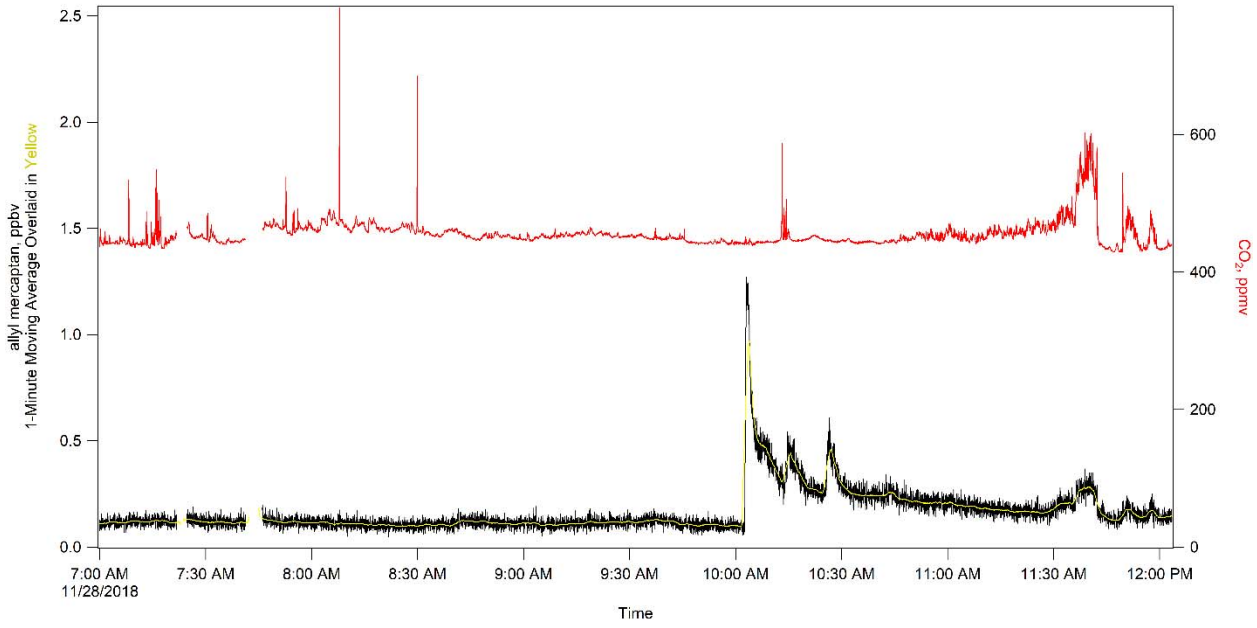


Figure 3-54. Allyl Mercaptan.

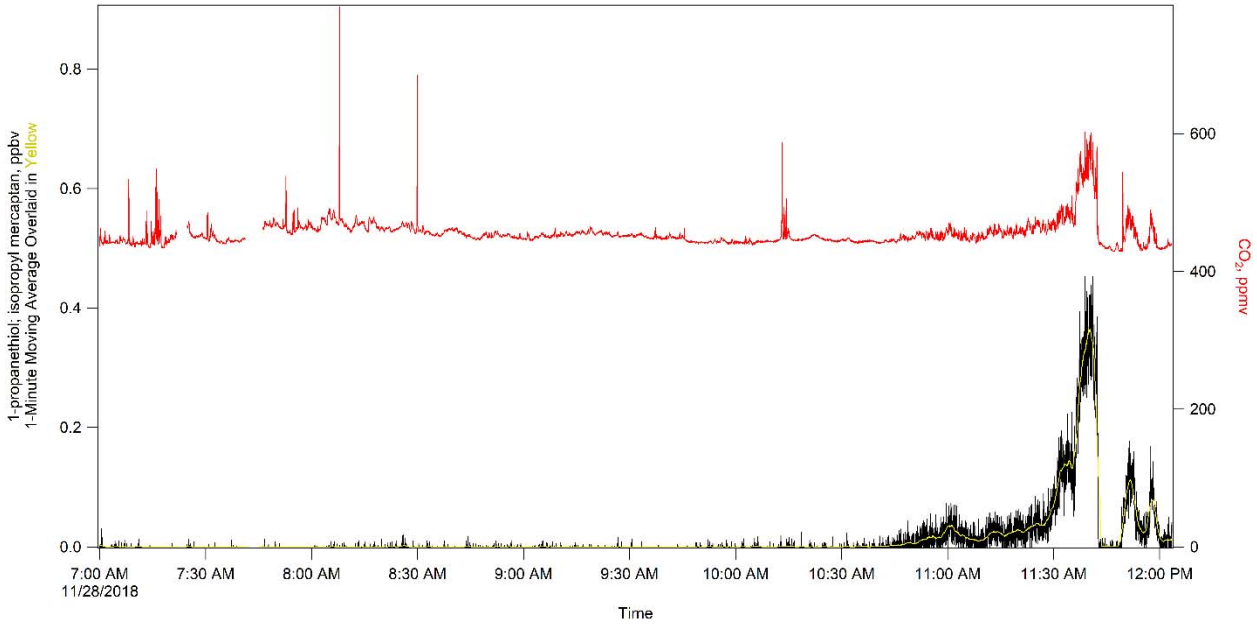


Figure 3-55. 1-propanethiol; Isopropyl Mercaptan.

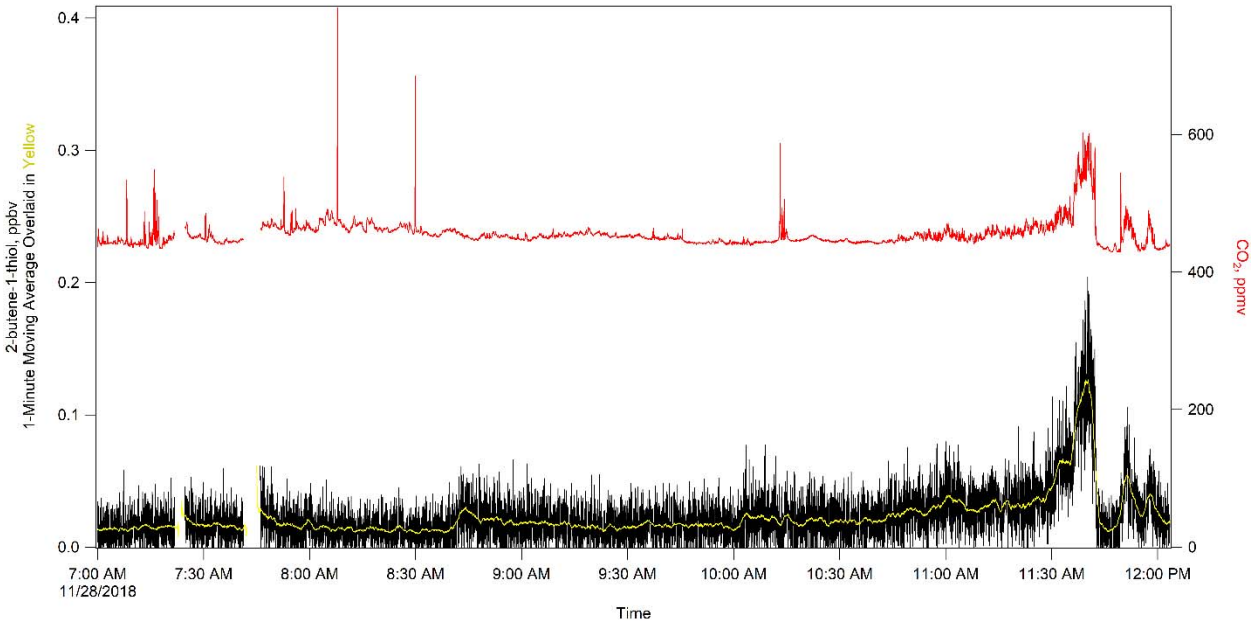


Figure 3-56. 2-butene-1-thiol.

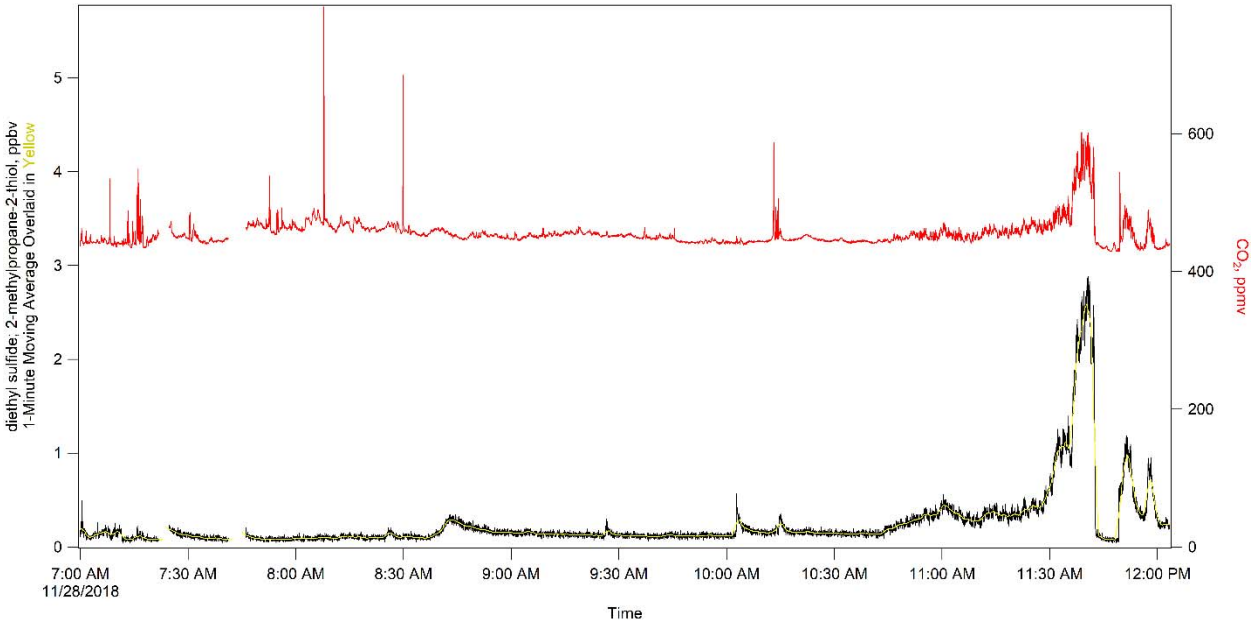


Figure 3-57. Diethyl Sulfide; 2-methylpropane-2-thiol.

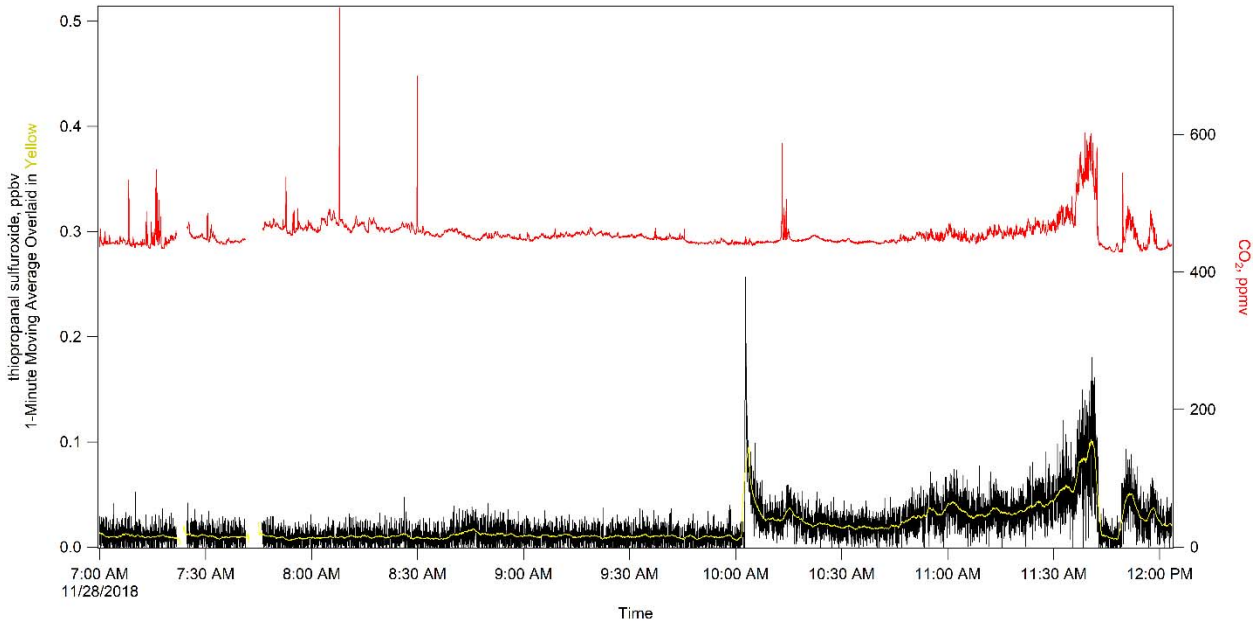


Figure 3-58. Thiopropanal Sulfuroxide.

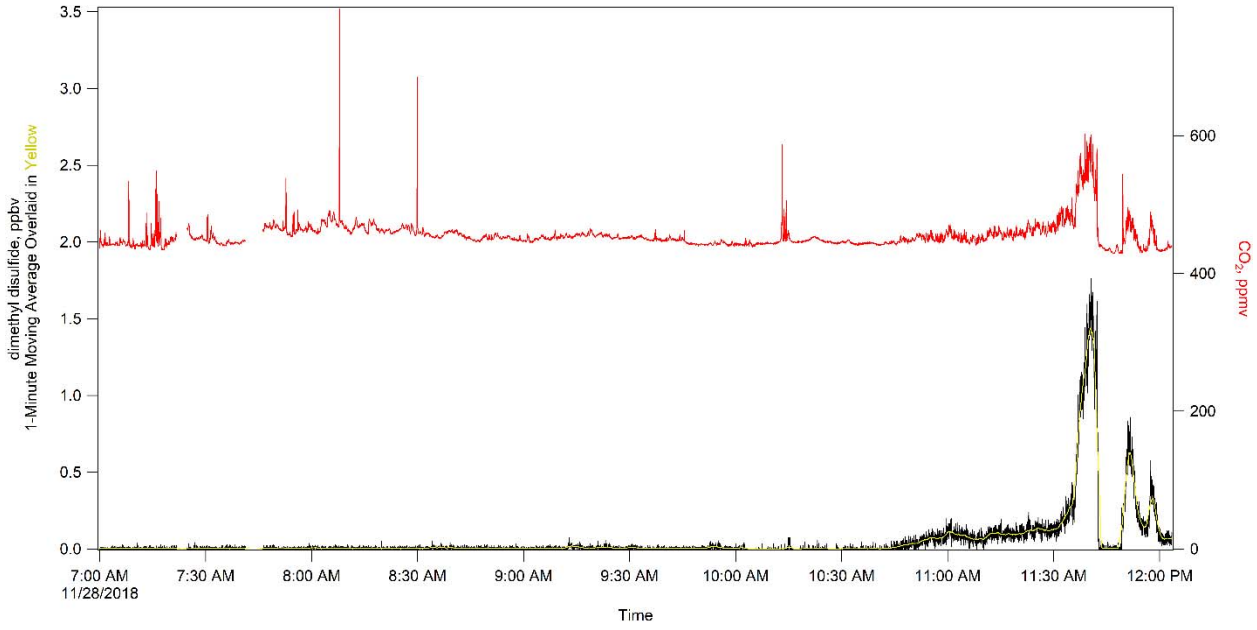


Figure 3-59. Dimethyl Disulfide.

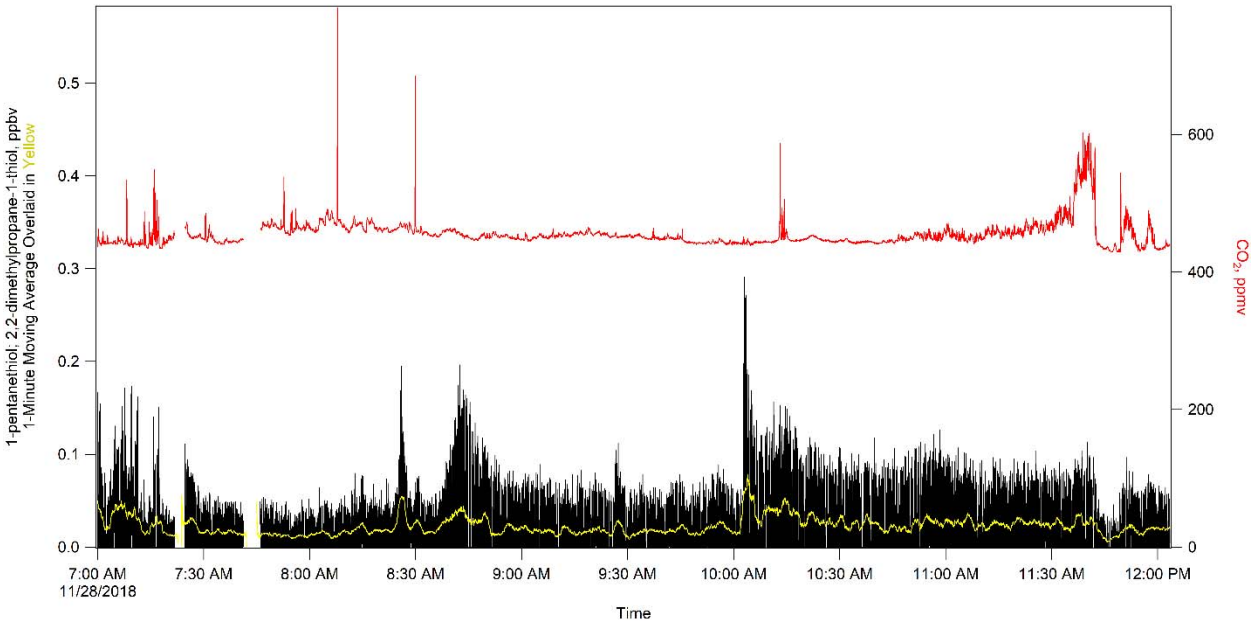


Figure 3-60. 1-pentanethiol; 2,2-dimethylpropane-1-thiol.

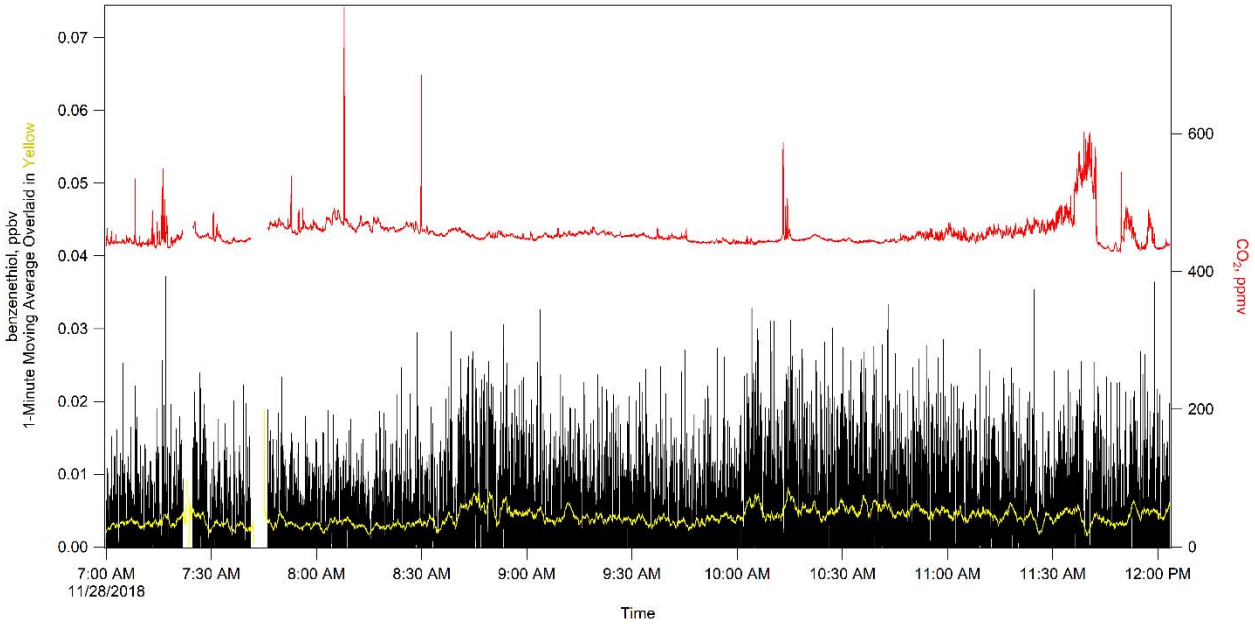


Figure 3-61. Benzenethiol.

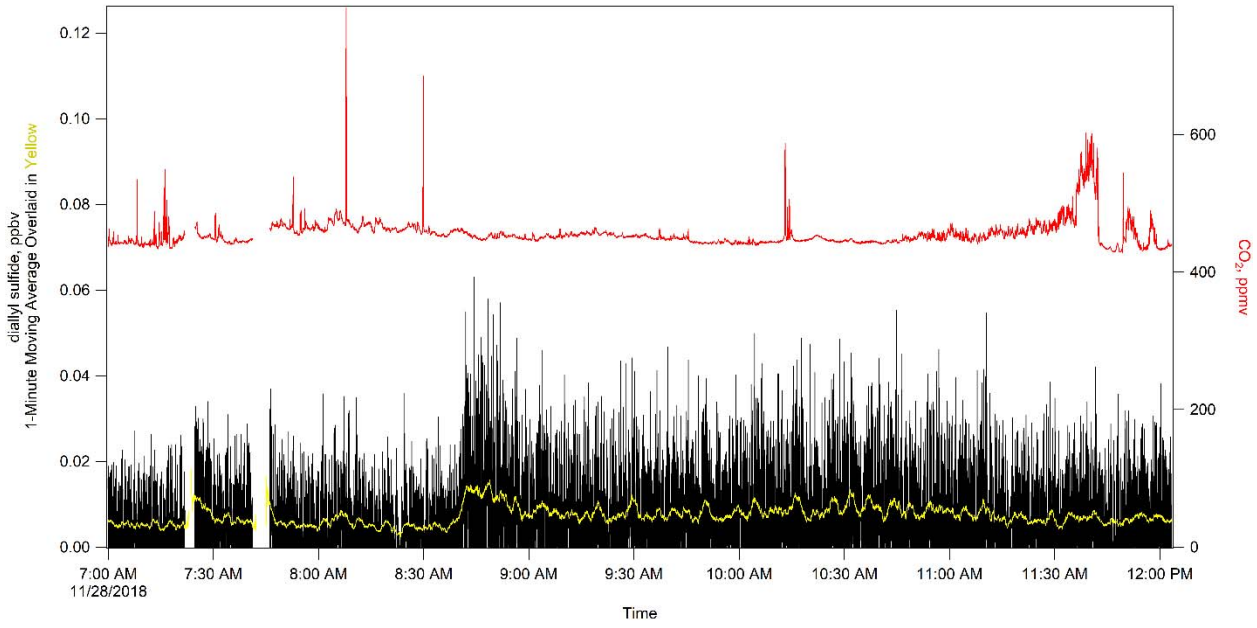


Figure 3-62. Diallyl Sulfide.

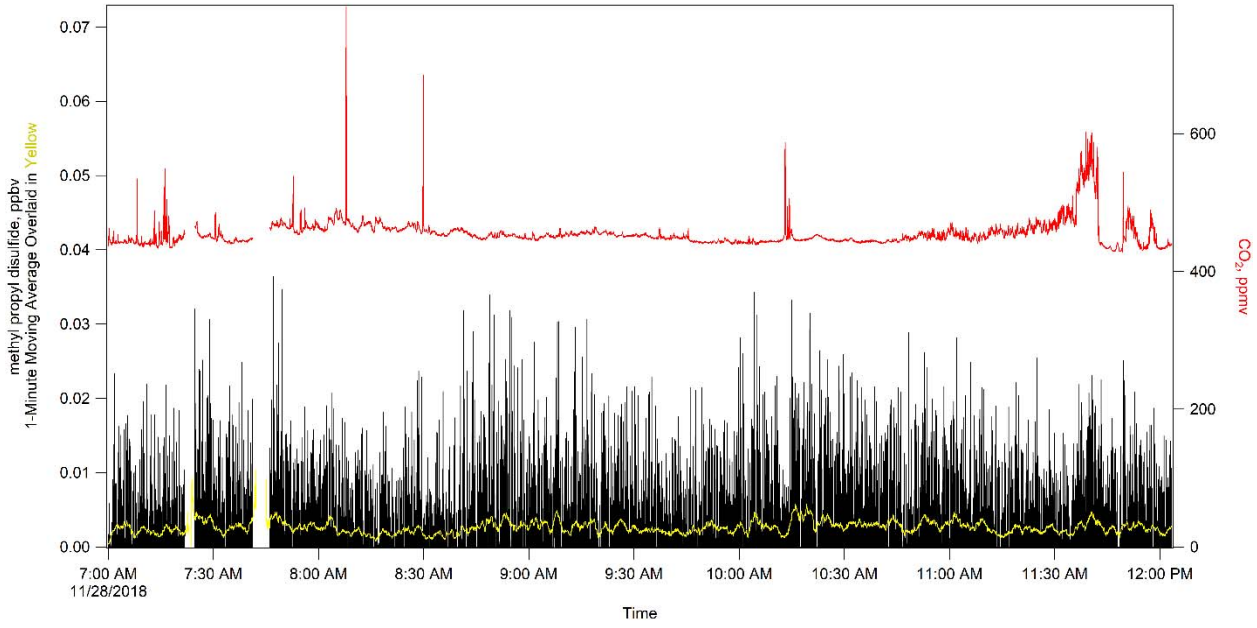


Figure 3-63. Methyl Propyl Disulfide.

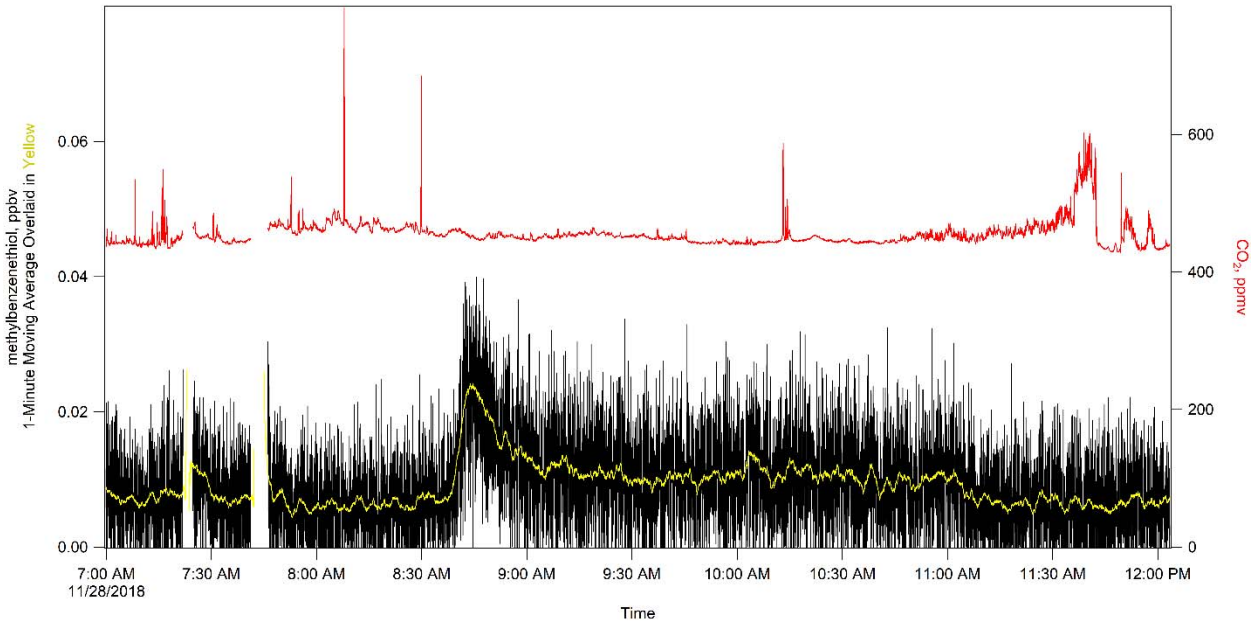


Figure 3-64. Methylbenzenethiol.

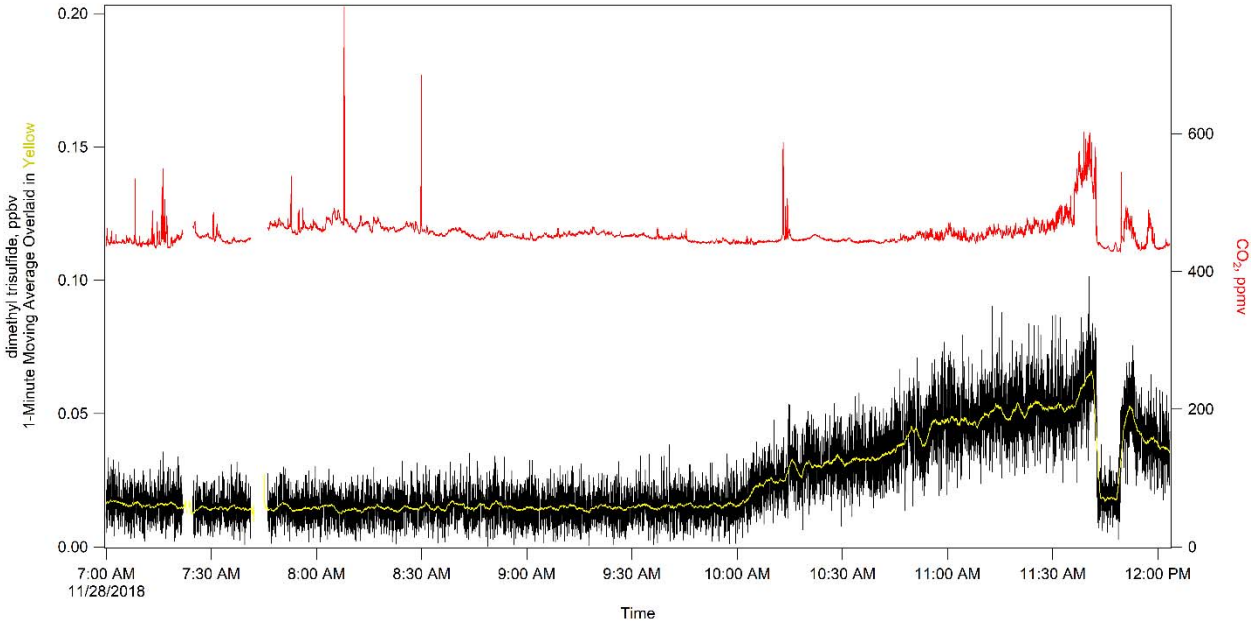


Figure 3-65. Dimethyl Trisulfide.

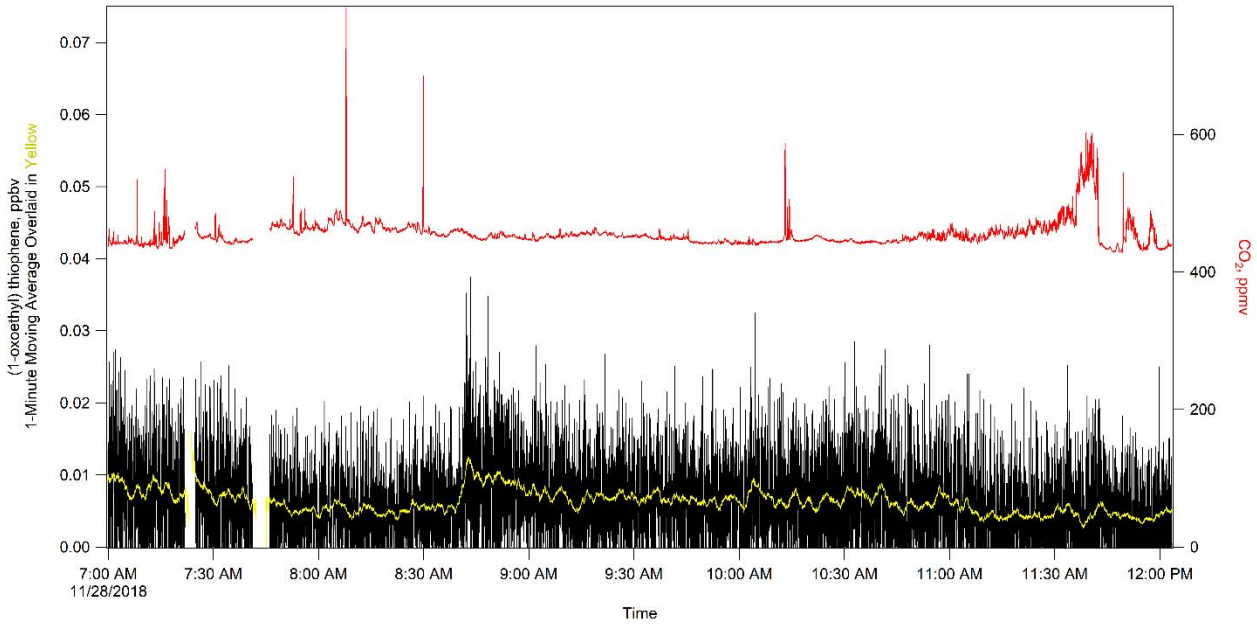


Figure 3-66. (1-oxoethyl) Thiophene.

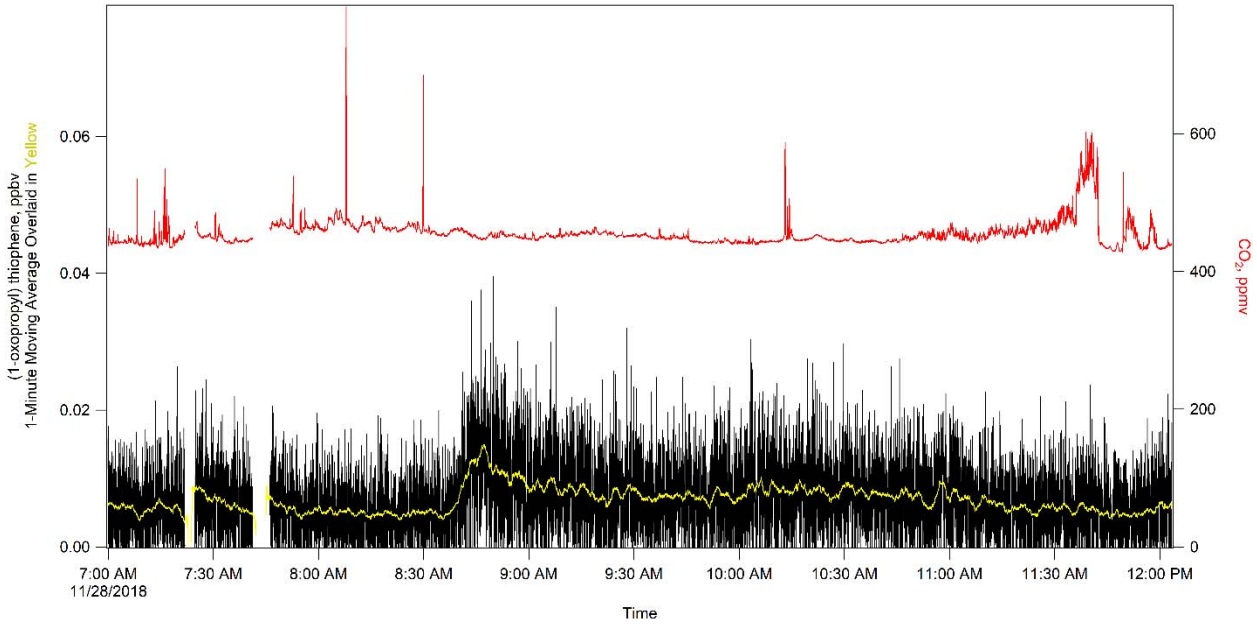


Figure 3-67. (1-oxopropyl) Thiophene.

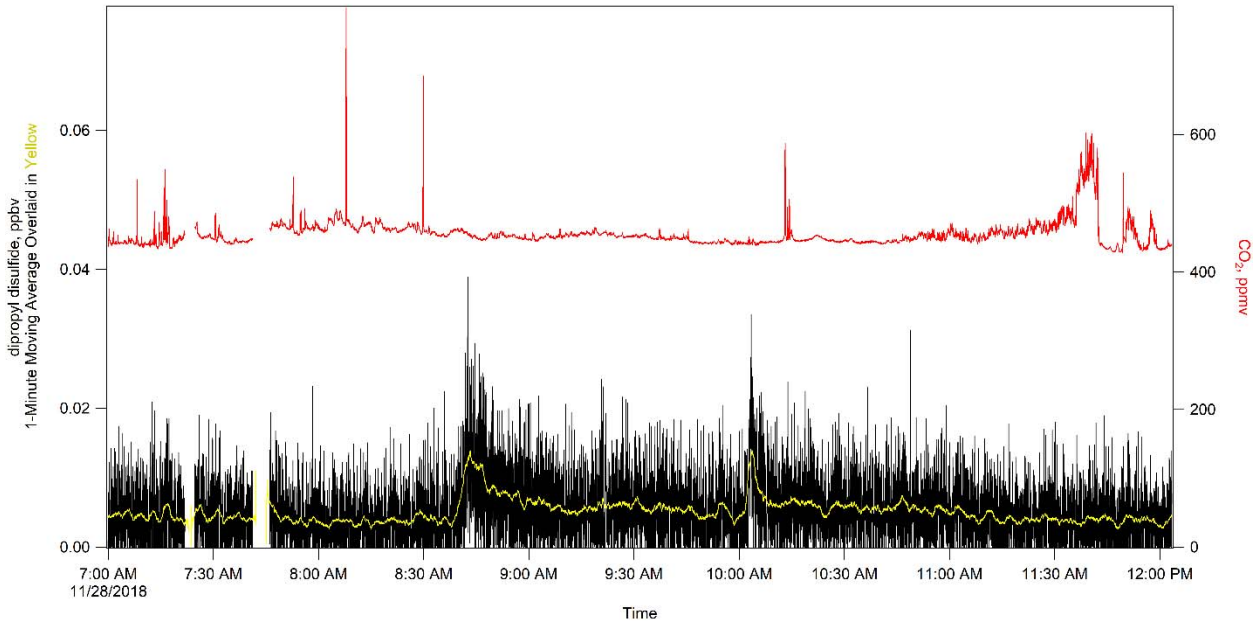


Figure 3-68. Dipropyl Disulfide.

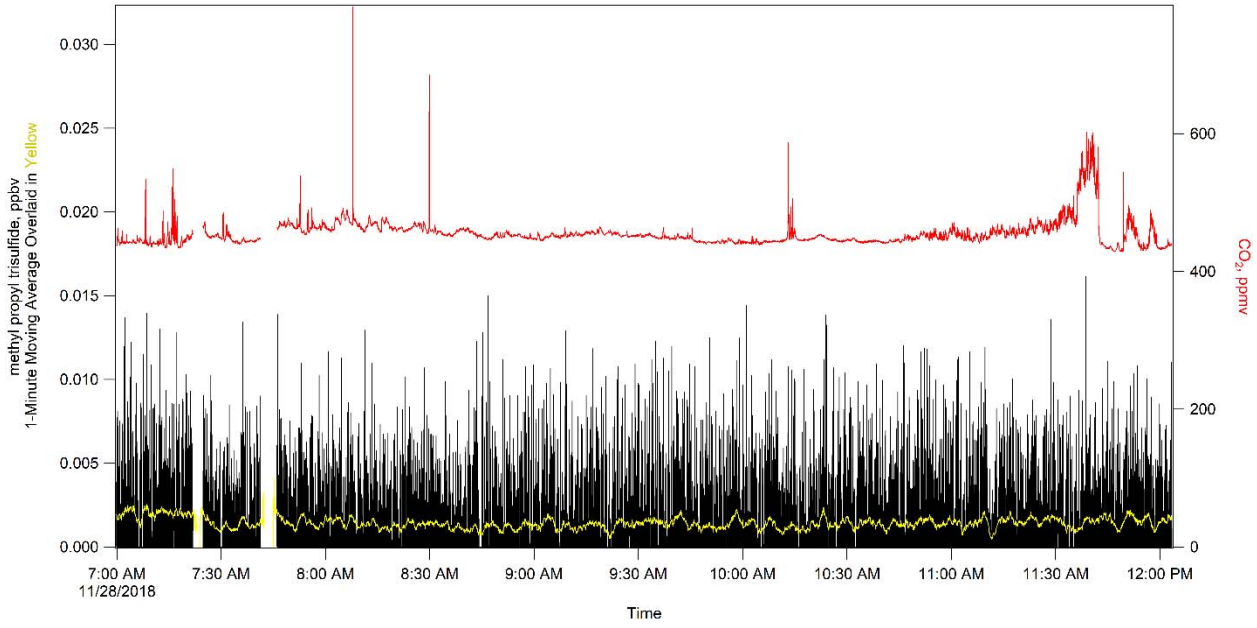


Figure 3-69. Methyl Propyl Trisulfide.

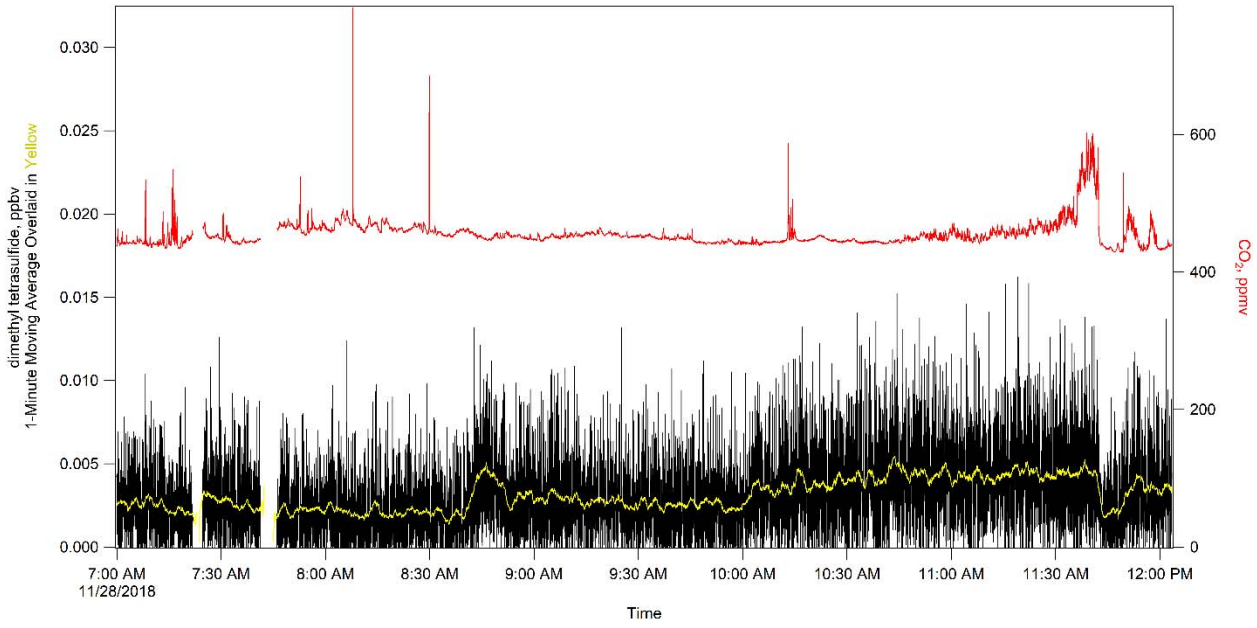


Figure 3-70. Dimethyl Tetrasulfide.

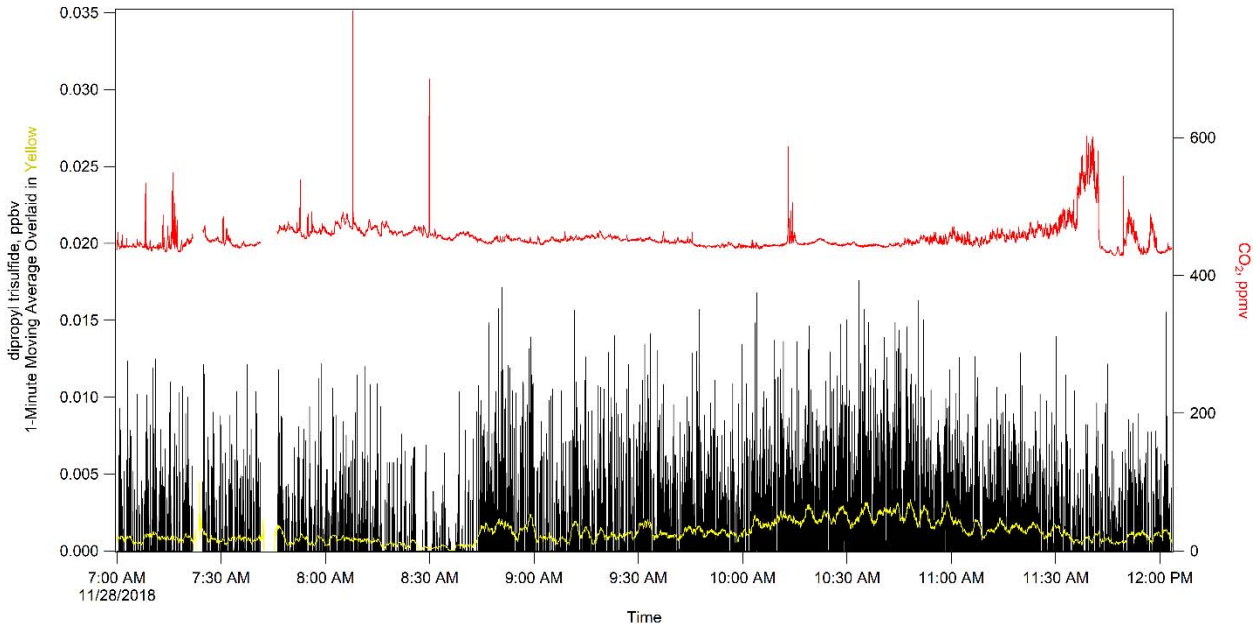


Figure 3-71. Dipropyl Trisulfide.

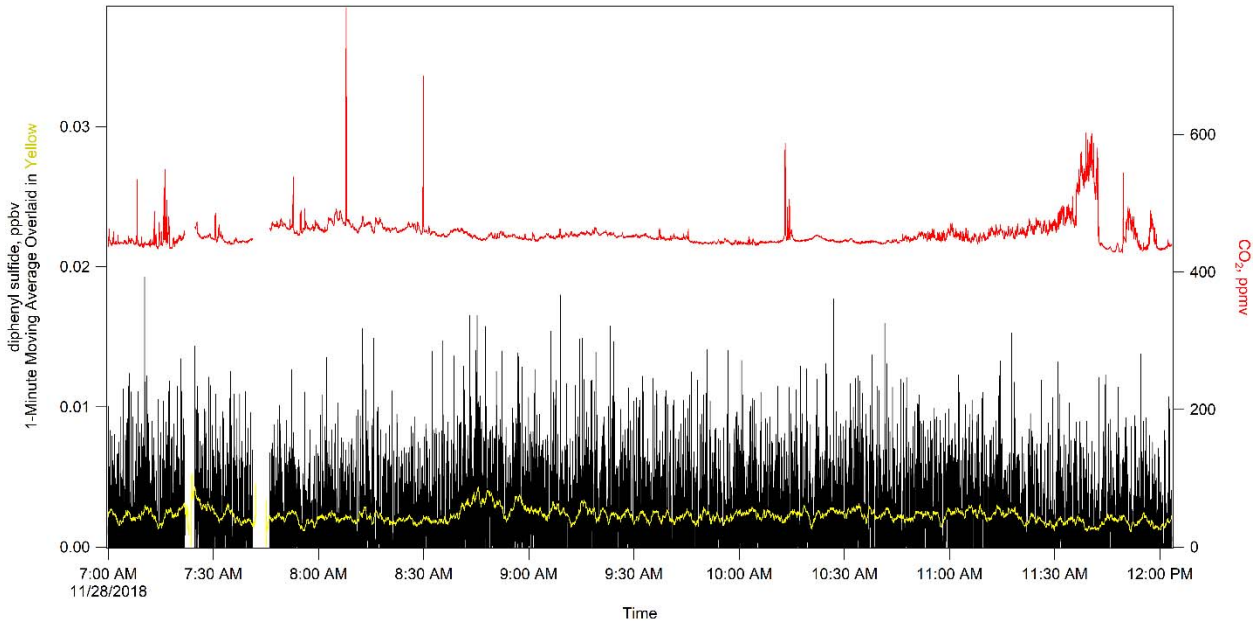


Figure 3-72. Diphenyl Sulfide.

4.0 NOVEMBER 29, 2018 – MOBILE LABORATORY TESTING

4.1 Summary

On November 29, 2018, the ML staff installed a new air conditioning fan deflector shield. The deflector shield was tested on highway conditions from 11:20 to 12:05. The new deflector shield appeared stable while driving up to 70 mph. At 14:45, the exhaust temperature was tested to ensure that the new exhaust hose that was ordered would withstand the high temperature. Minor maintenance tasks were also performed, such as working on a rear taillight that began flickering from a connection issue.

5.0 NOVEMBER 30, 2018 – MOBILE LABORATORY TESTING AND TRAINING

5.1 Summary

On November 30, 2018, ML personnel received further training on temperature controllers. At 11:30, circuit 21 was tested using a multimeter to measure resistance. The breaker was reset at 11:50. A minute after the breaker was reset, the resistance was tested and displayed an overload. Breaker 21 continued to trip and was turned off at 11:54. Further investigation will continue into the breaker failure and developing a solution.

DR18-012 was initiated to adequately document the issue with breaker 21 tripping. See Appendix A for the full Deficiency Report. The instance will be discussed in detail in a subsequent monthly summary report.

6.0 REFERENCES

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

53005-81-RPT-007, *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, *Mobile Laboratory Operational Procedure*, Revision 9, TerraGraphics Environmental Engineering, Inc., Pasco, Washington.

DR18-012, 2018, "Deficiency Report," Revision 0, 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, RJ Lee Group, Inc., 2017.

Appendix and Review Comment Record removed - Pages 58 to 61.