WEEKLY REPORT FOR WEEK 34
(MARCH 25, 2019 – MARCH 29, 2019)

Report No. 53005-81-RPT-049
Revision 0
September 2019

Prepared for:

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

Subcontract 53005, Release 81

Prepared by:

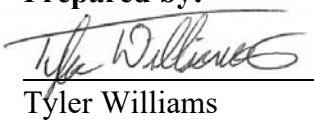
TerraGraphics Environmental Engineering, Inc.
2926 E. Ainsworth St.
Pasco, WA 99301

TerraGraphics

www.terragraphics.com

Approval Form

Prepared by:



Date: 09/27/2019

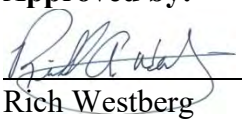
Tyler Williams

Reviewed by:

Date: 09/27/2019

Matt Erickson, Ph.D.

Approved by:



Date: 09/27/2019

Rich Westberg

Record of Revision

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

Table of Contents

Figures

Tables

Acronyms and Abbreviations

COPC	Chemical of Potential Concern
CSO	Central Shift Office
MDL	Method Detection Limit
MFC	Mass Flow Controller
ML	Mobile Laboratory
MSA	Mission Support Alliance, LLC
NDEA	N-nitrosodiethylamine
NDMA	N-nitrosodimethylamine
NEMA	N-nitrosomethylethylamine
NMOR	N-nitrosomorpholine
PTR-MS	Proton Transfer Reaction – Mass Spectrometry
PTR-TOF	Proton Transfer Reaction – Time of Flight
QA	Quality Assurance
QC	Quality Control
RL	Reporting Limit
SME	Subject Matter Expert
SOEN	Shift Office Event Notification
TVA	Toxic Vapor Analyzer

1.0 INTRODUCTION

During the week of March 25, 2019, through March 29, 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 31 through 33, and revisions for weekly reports for Weeks 24 through 27.

2.0 MARCH 25, 2019 – AREA MONITORING

2.1 Quality Assessment

Data from March 25, 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 March 25, 2019, Operators arrived at the Mobile Laboratory (ML) at 05:08. 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 05:17. The ML departed the TerraGraphics warehouse in Pasco, WA at 05:30. The ML arrived on the Hanford Site and ML personnel checked in with the Central Shift Office (CSO) at 06:23. The ML began mobile monitoring of A Farms at 06:36. The ML monitored in the area of the septic tanks located near the 242A Evaporator from 07:03 to 08:02. At 08:31, the ML was parked on the northeastern side of AP Farm until 09:46. After performing a site survey loop of A Farms, the ML was parked on the southeastern corner of the septic tanks.

After another site survey loop, the ML was parked on the northeastern corner of AP Farm downwind of a porta-potty. At 12:28, the ML was relocated to the southeastern corner of 241-AW, when a Shift Office Event Notification (SOEN) alert notified Operators that odors had been reported in 2715 AW. Mr. Eugene Morrey of WRPS was called at 12:30 for the location of 2715 AW. At 12:33, the ML was parked downwind of 2715 AW. At 13:38, the odors reported surveyed below background levels and access was restored to the structure. The ML Operators checked out with the CSO at 14:00 and departed the site. The ML arrived back at the TerraGraphics warehouse at 14:50 and Proton Transfer Reaction – Mass Spectrometer (PTR-MS) data collection was stopped.

[1] LI-COR is a registered trademark of LI-COR, Inc., Lincoln, Nebraska.

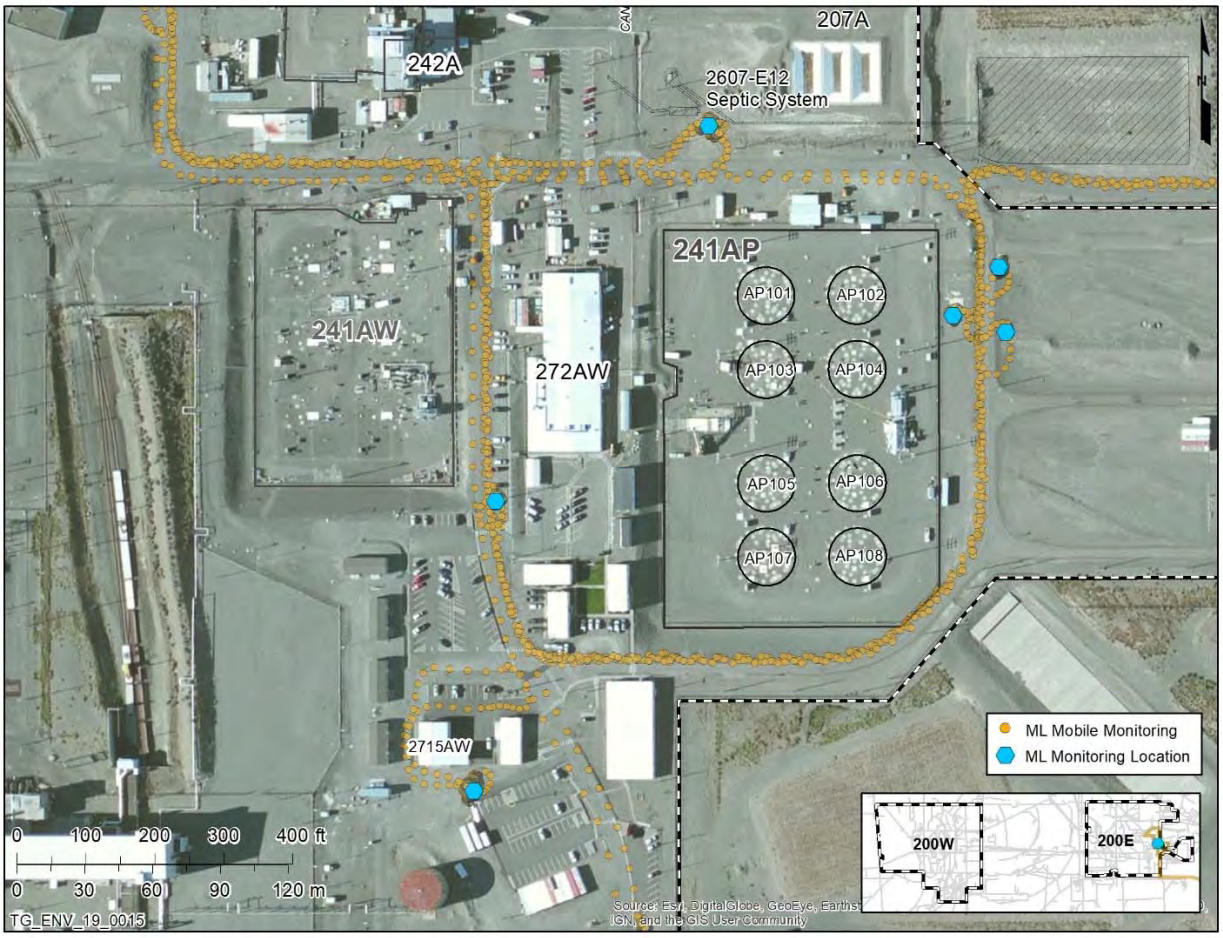


Figure 2-1. Location of the Mobile Laboratory for the Duration of the Monitoring Period.

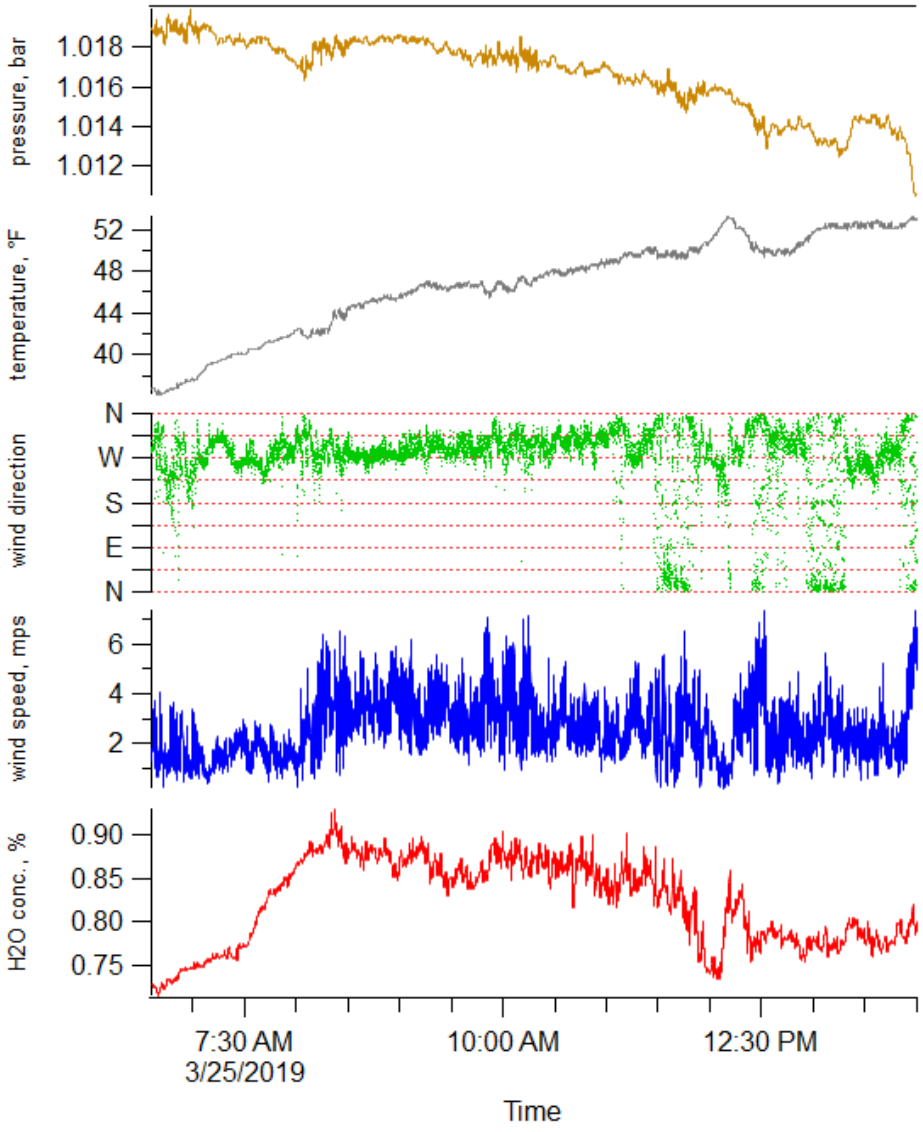


Figure 2-2. Weather Data for the Duration of the Monitoring Period.

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
- Weather Station.

Confirmatory air samples were not collected during this period.

2.4 Area Monitoring

Table 2-1. Chemical of Potential Concern Statistical Information for the Monitoring Period of March 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	0.010	11.533	1.491	12.929	15.381	11.480
2	formaldehyde	300	1.302	<1.302	0.211	35.054	8.342	<1.302
3	methanol	200000	1.839	3.813†	0.535	14.035	18.221	3.727
4	acetonitrile	20000	0.070	0.086†	0.016	18.093	0.246	0.085
5	acetaldehyde	25000	2.070	<2.070	0.294	17.475	7.572	<2.070
6	ethylamine	5000	0.055	<0.055	0.010	32.269	0.110	<0.055
7	1,3-butadiene	1000	0.122	0.271†	0.082	30.285	2.366	0.267
8	propanenitrile	6000	0.121	<0.121	0.044	79.478	1.472	<0.121
9	2-propenal	100	0.314	<0.314	0.033	32.388	0.835	<0.314
10	1-butanol + butenes	20000	0.149	<0.149	0.129	109.504	3.913	<0.149
11	methyl isocyanate	20	0.061	<0.061	0.015	34.146	0.472	<0.061
12	methyl nitrite	100	0.117	<0.117	0.022	21.081	0.479	<0.117
13	furan	1	0.053	<0.053	0.011	29.155	0.155	<0.053
14	butanenitrile	8000	0.040	<0.040	0.015	57.278	0.452	<0.040
15	but-3-en-2-one + 2,3-dihydrofuran + 2,5-dihydrofuran	200, 1, 1	0.034	0.040†	0.012	31.324	N/A*	N/A*
16	butanal	25000	0.063	0.108†	0.166	152.842	5.846	0.096
17	NDMA**	0.3	0.020	<0.020	0.013	127.004	0.085	<0.020
18	benzene	500	0.230	<0.230	0.122	58.411	6.520	<0.230
19	2,4-pentadienenitrile + pyridine	300	0.084	<0.084	0.013	26.065	0.445	<0.084
20	2-methylene butanenitrile	300	0.050	<0.050	0.009	27.007	0.139	<0.050
21	2-methylfuran	1	0.046	<0.046	0.012	28.993	0.097	<0.046
22	pentanenitrile	6000	0.029	<0.029	0.010	51.015	0.261	<0.029
23	3-methyl-3-buten-2-one + 2-methyl-2-butenal	20, 30	0.048	<0.048	0.011	32.240	0.084	<0.048
24	NEMA**	0.3	0.027	<0.027	0.012	113.240	0.073	<0.027
25	2,5-dimethylfuran	1	0.035	<0.035	0.011	37.011	0.077	<0.035
26	hexanenitrile	6000	0.029	<0.029	0.007	45.918	0.104	<0.029
27	2-hexanone (MBK)	5000	0.030	<0.030	0.008	39.526	0.062	<0.030
28	NDEA**	0.1	0.023	<0.023	0.008	105.952	0.045	0.005
29	butyl nitrite + 2-nitro-2-methylpropane	100, 300	0.106	<0.106	0.010	22.208	0.084	<0.106

Table 2-1. Chemical of Potential Concern Statistical Information for the Monitoring Period of March 25, 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	0.031	<0.031	0.017	89.152	0.674	<0.031
31	2-propylfuran + 2-ethyl-5-methylfuran	1	0.035	<0.035	0.009	50.390	0.057	<0.035
32	heptanenitrile	6000	0.029	<0.029	0.007	54.275	0.194	<0.029
33	4-methyl-2-hexanone	500	0.032	<0.032	0.007	44.339	0.044	<0.032
34	NMOR**	0.6	0.017	<0.017	0.007	161.455	0.091	<0.017
35	butyl nitrate	2500	0.019	<0.019	0.005	68.903	0.034	<0.019
36	2-ethyl-2-hexenal + 4-(1-methylpropyl)-2,3-dihydrofuran + 3-(1,1-dimethylethyl)-2,3-dihydrofuran	100, 1, 1	0.032	<0.032	0.007	40.605	0.073	<0.032
37	6-methyl-2-heptanone	8000	0.028	<0.028	0.007	37.996	0.049	<0.028
38	2-pentylfuran	1	0.029	<0.029	0.008	36.737	0.058	<0.029
39	biphenyl	200	0.031	<0.031	0.008	62.769	0.047	<0.031
40	2-heptylfuran	1	0.136	<0.136	0.011	19.261	0.099	<0.136
41	1,4-butanediol dinitrate	50	0.184	<0.184	0.007	40.283	0.053	<0.184
42	2-octylfuran	1	0.013	<0.013	0.006	238.951	0.050	<0.013
43	1,2,3-propanetriol 1,3-dinitrate	50	0.132	<0.132	0.004	361.433	0.039	<0.132
44	PCB	1000	0.139	<0.139	0.006	31.739	0.049	<0.139
45	6-(2-furanyl)-6-methyl-2-heptanone	1	0.025	<0.025	0.006	46.948	0.039	<0.025
46	furfural acetophenone	1	0.119	<0.119	0.011	20.194	0.102	<0.119
N/A*	The maximum peak value for but-3-en-2-one + 2,3 dihydrofuran + 2,5 dihydrofuran was 0.148 ppb and the median value was 0.038 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 chemical of potential concern (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 of March 25, 2019. If within range of the plot's left axis, a green horizontal line representing 50% of the COPC's occupational exposure limit (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.

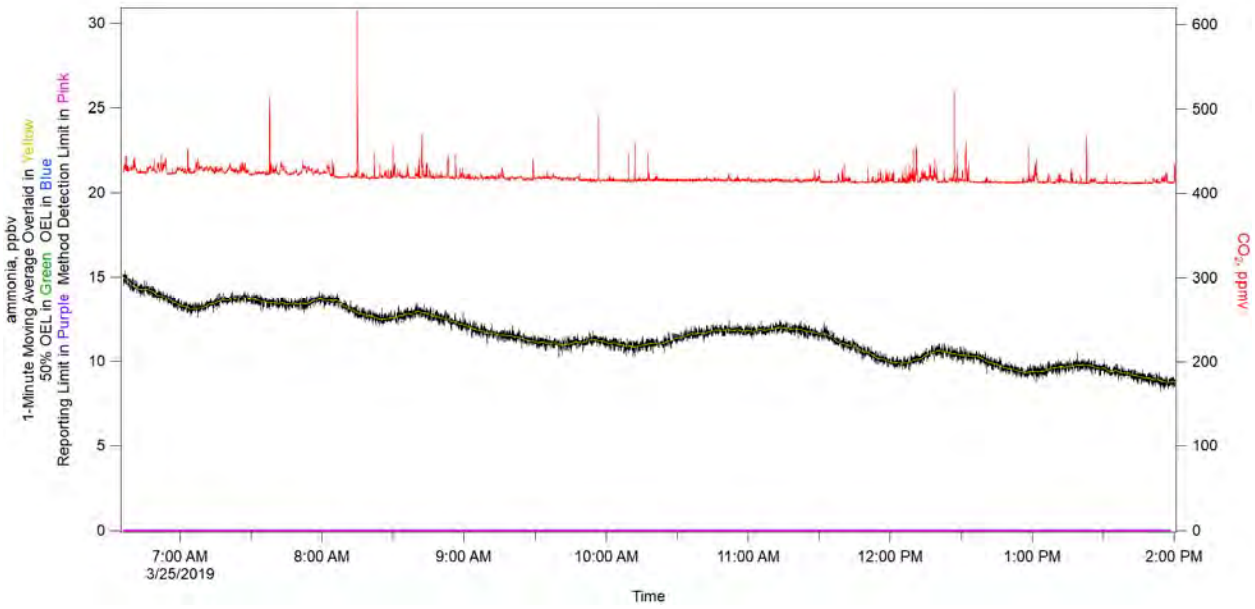


Figure 2-3. Ammonia.

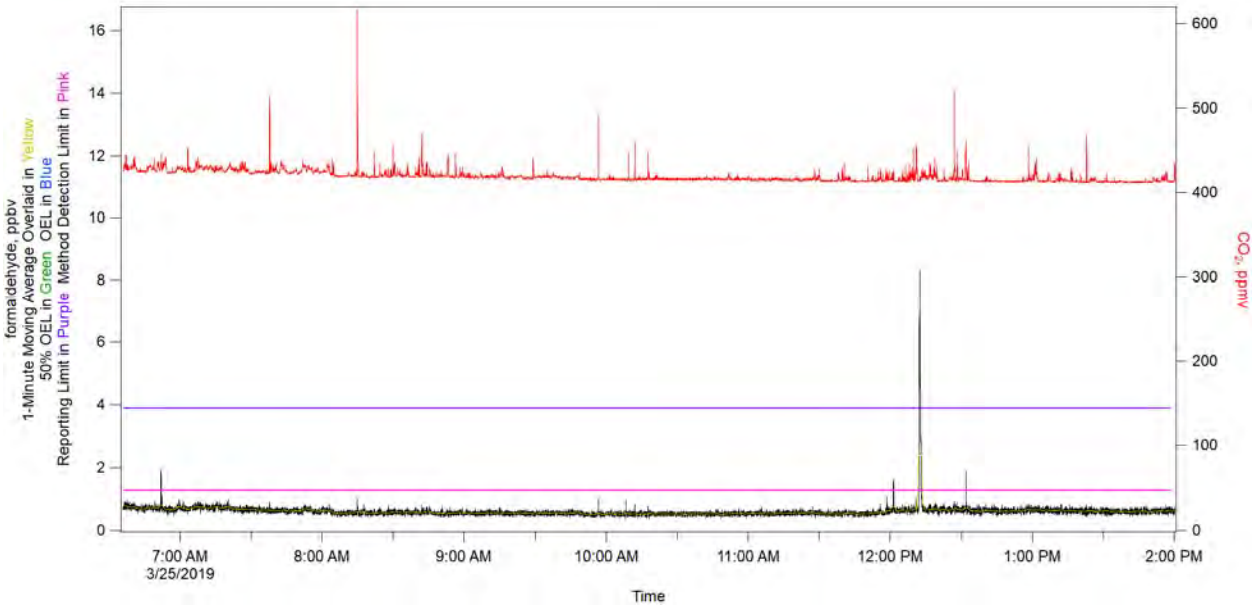


Figure 2-4. Formaldehyde.

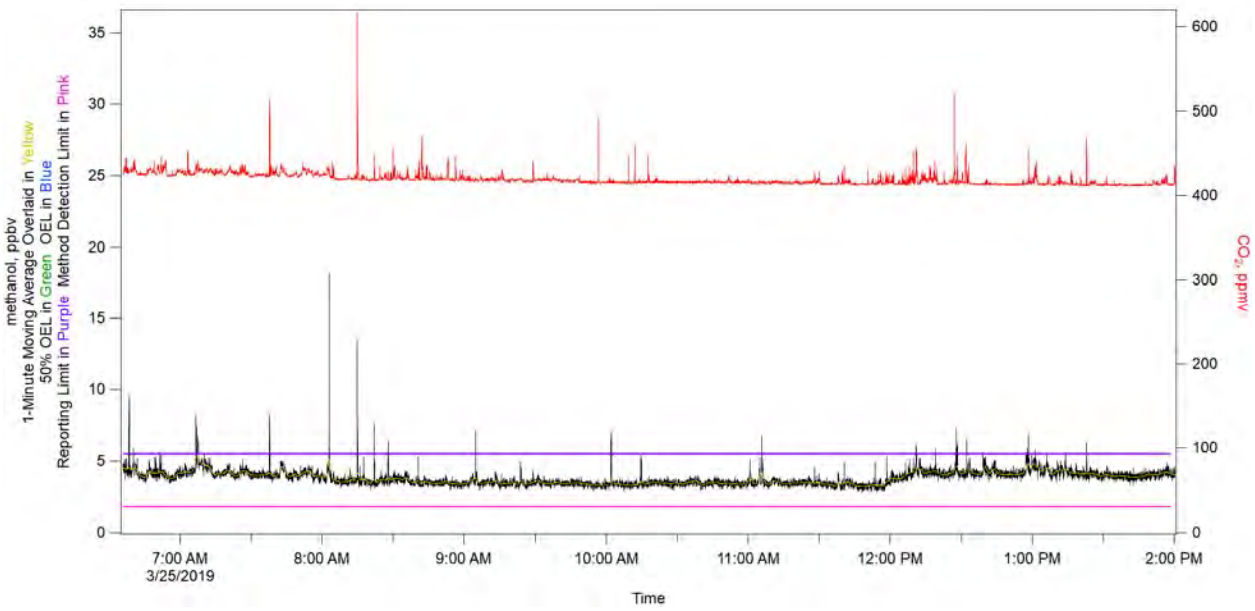


Figure 2-5. Methanol.

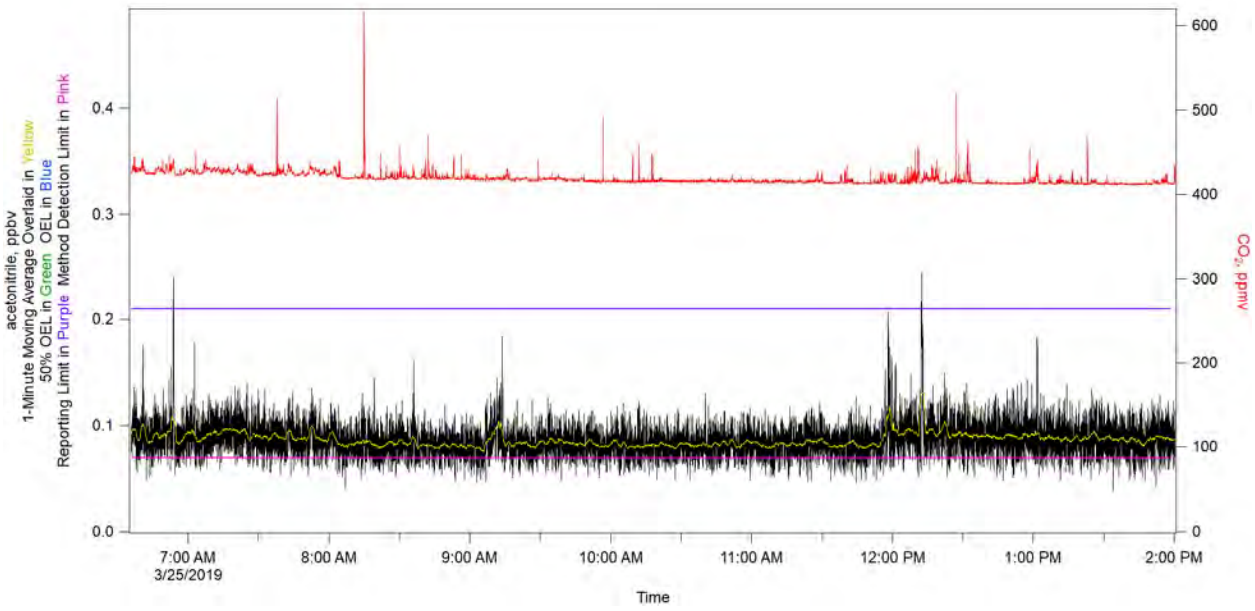


Figure 2-6. Acetonitrile.

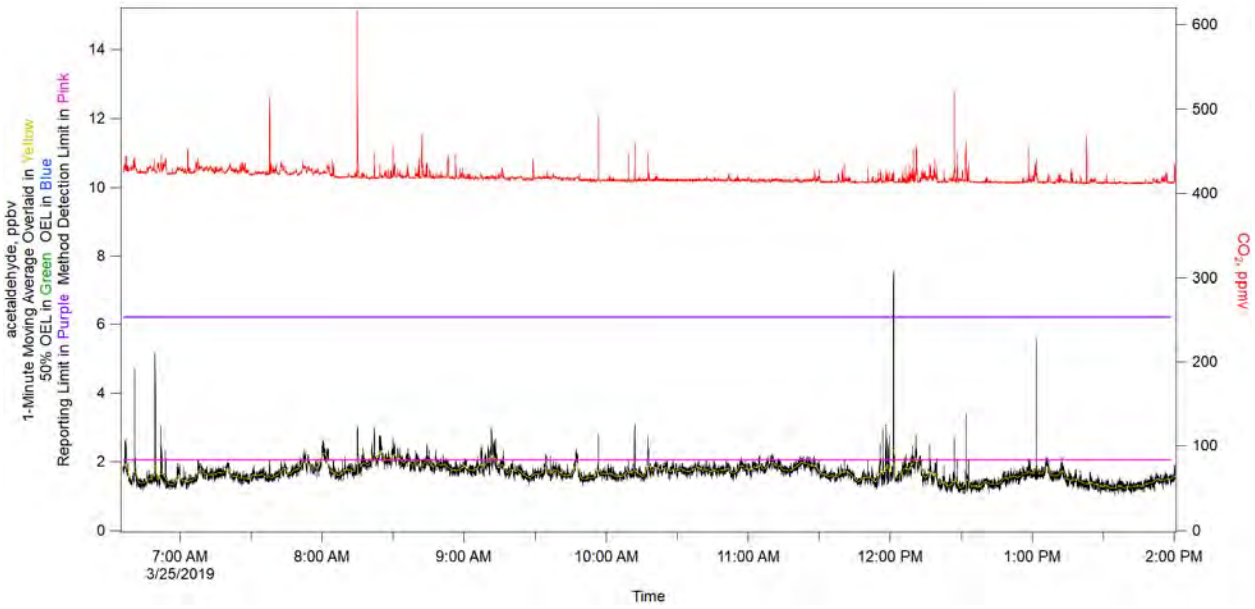


Figure 2-7. Acetaldehyde.

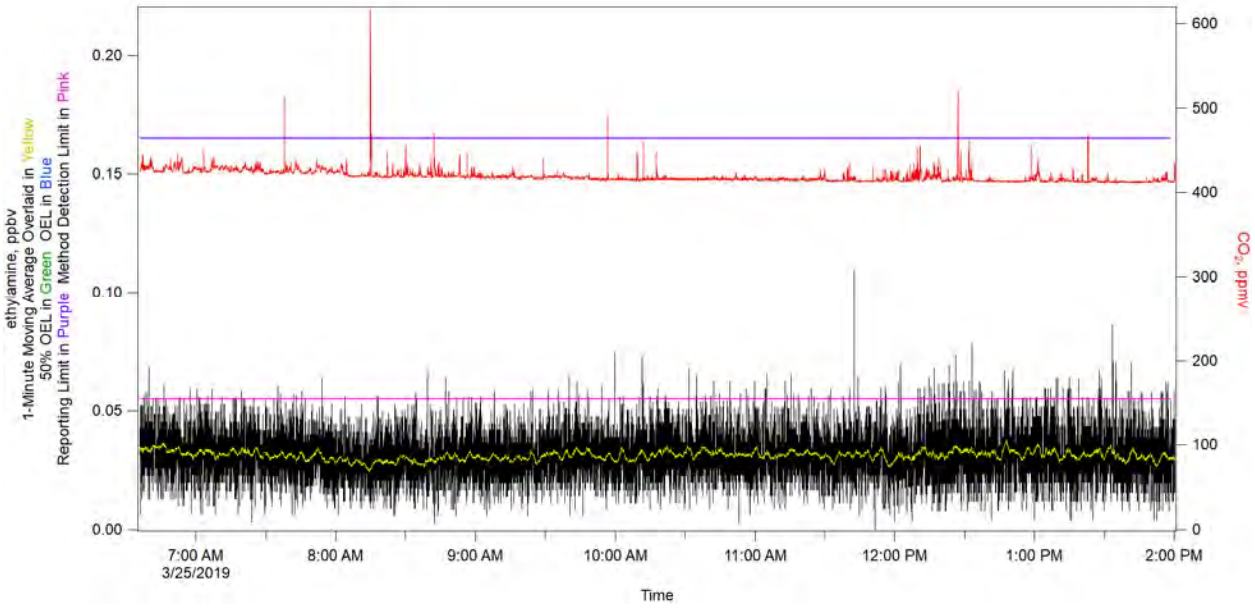


Figure 2-8. Ethylamine.

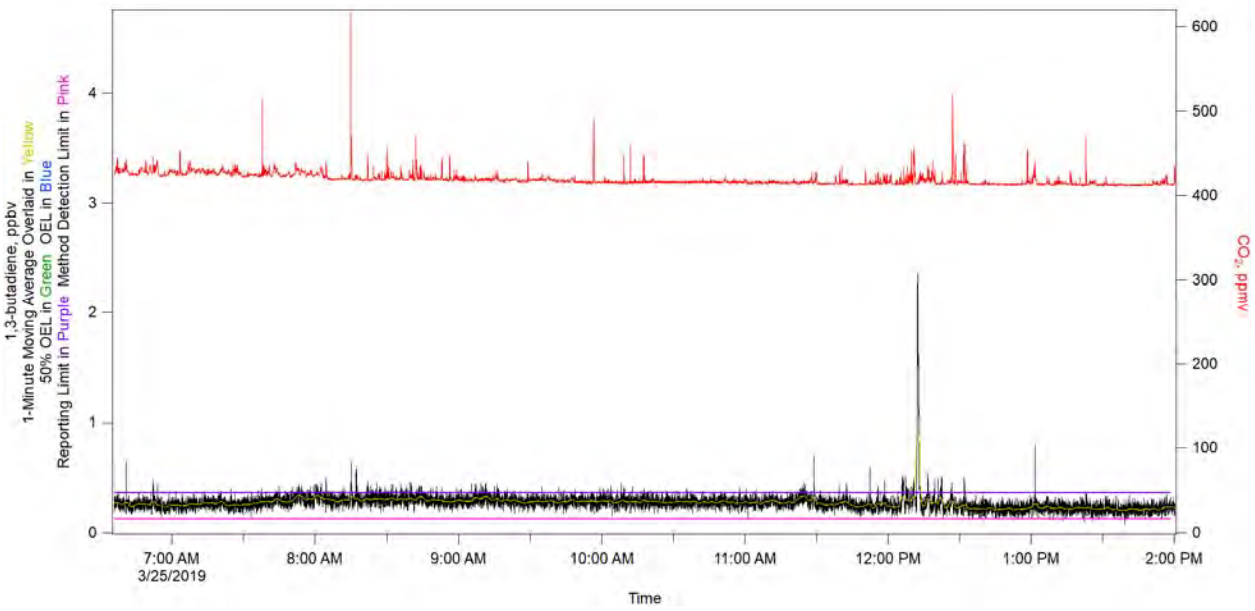


Figure 2-9. 1,3-butadiene.

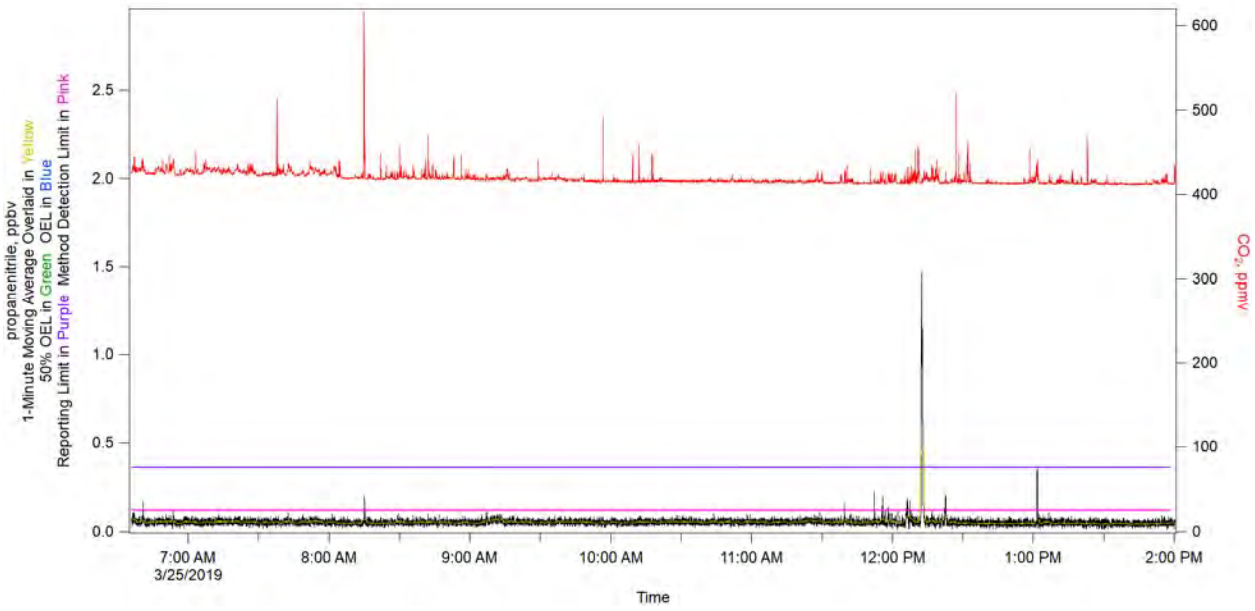


Figure 2-10. Propanenitrile.

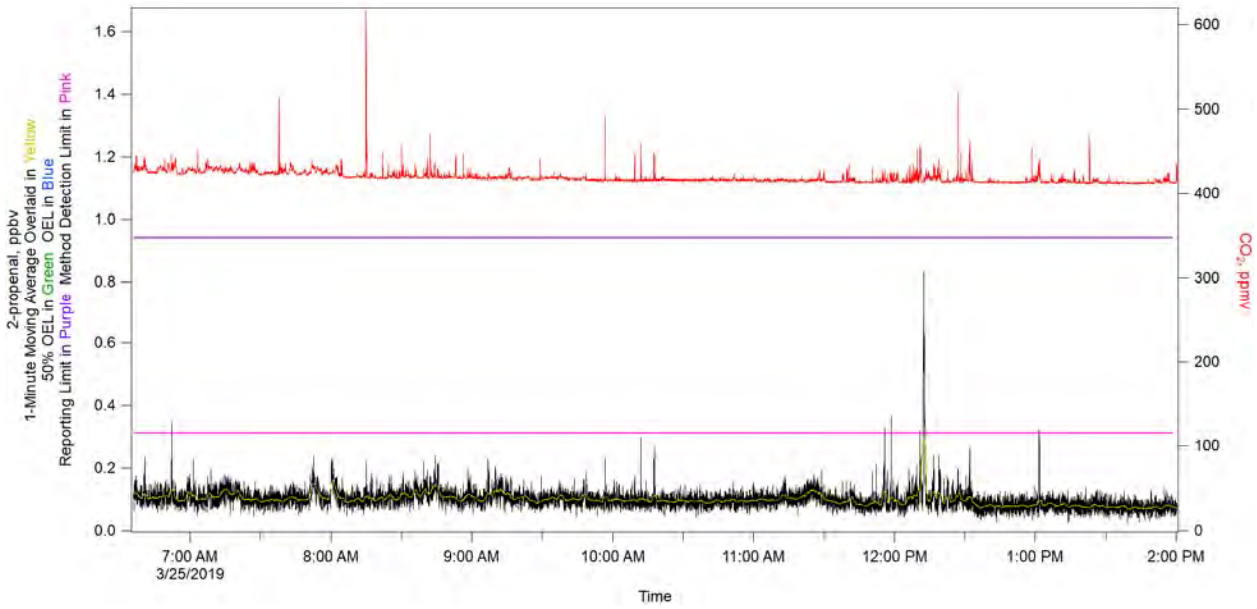


Figure 2-11. 2-propenal.

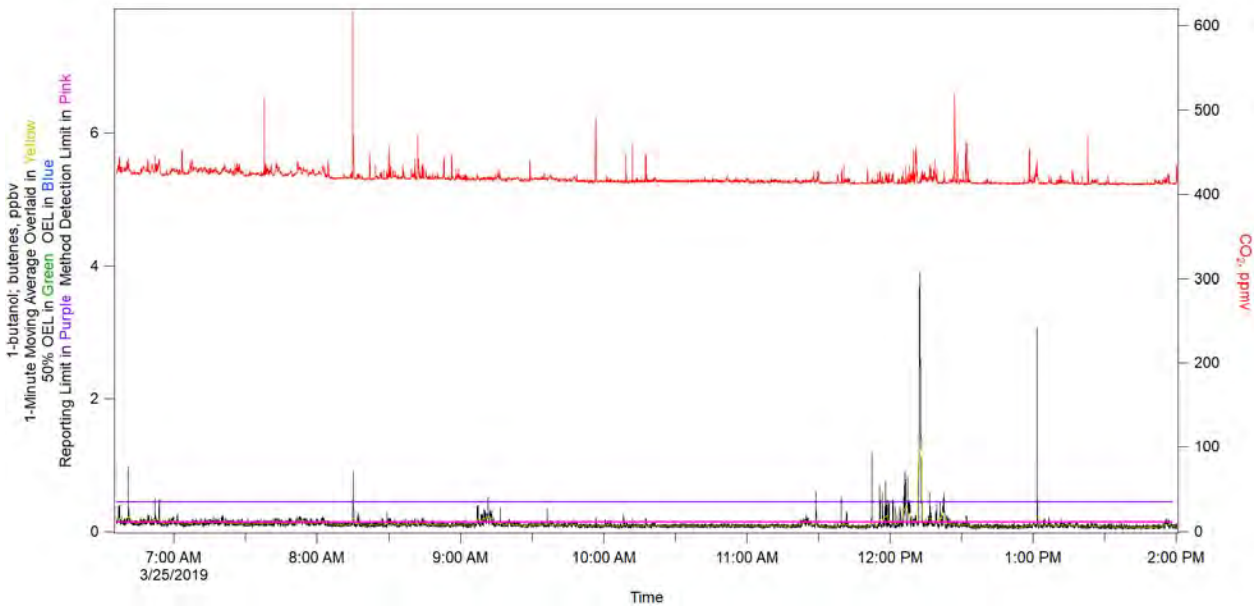


Figure 2-12. 1-butanol; Butenes.

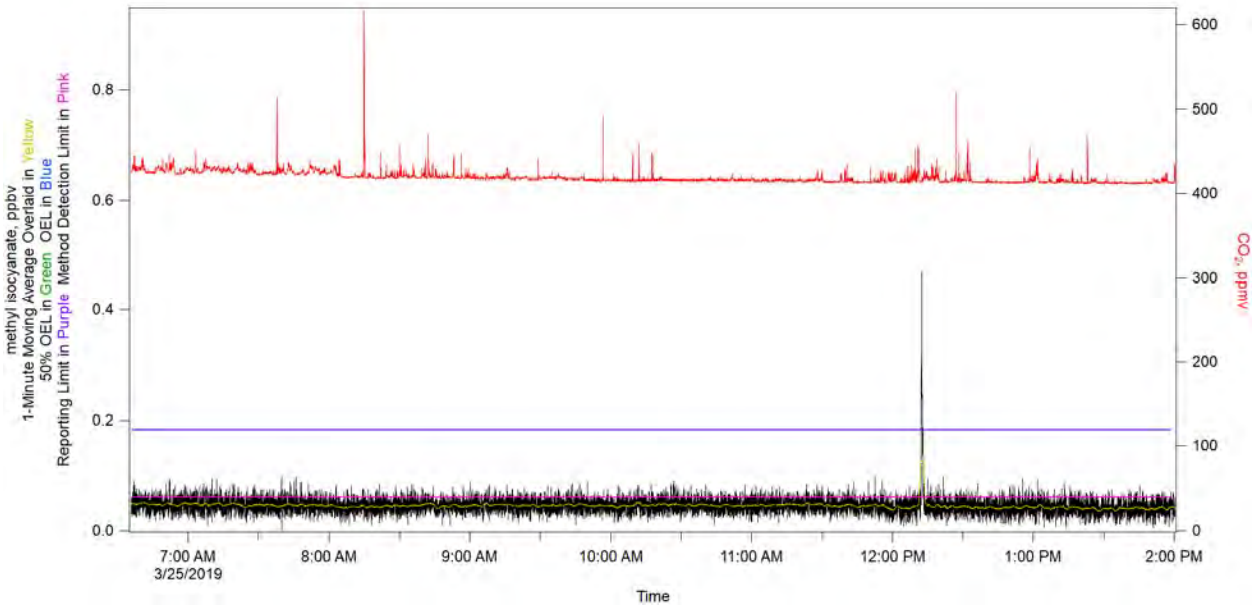


Figure 2-13. Methyl Isocyanate.

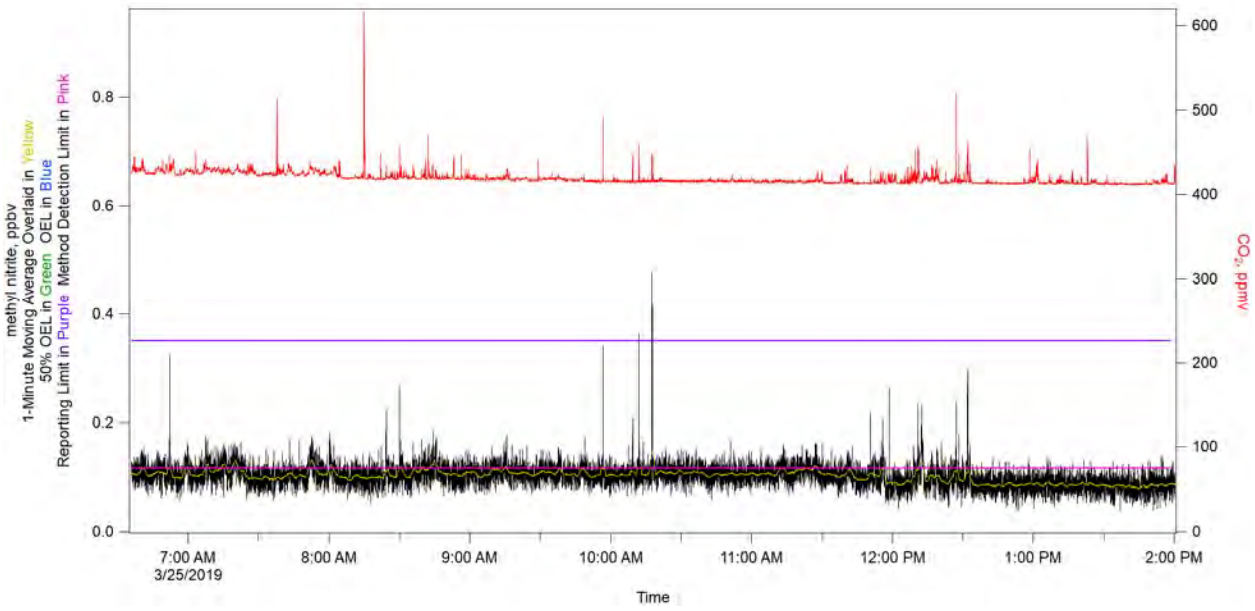


Figure 2-14. Methyl Nitrite.

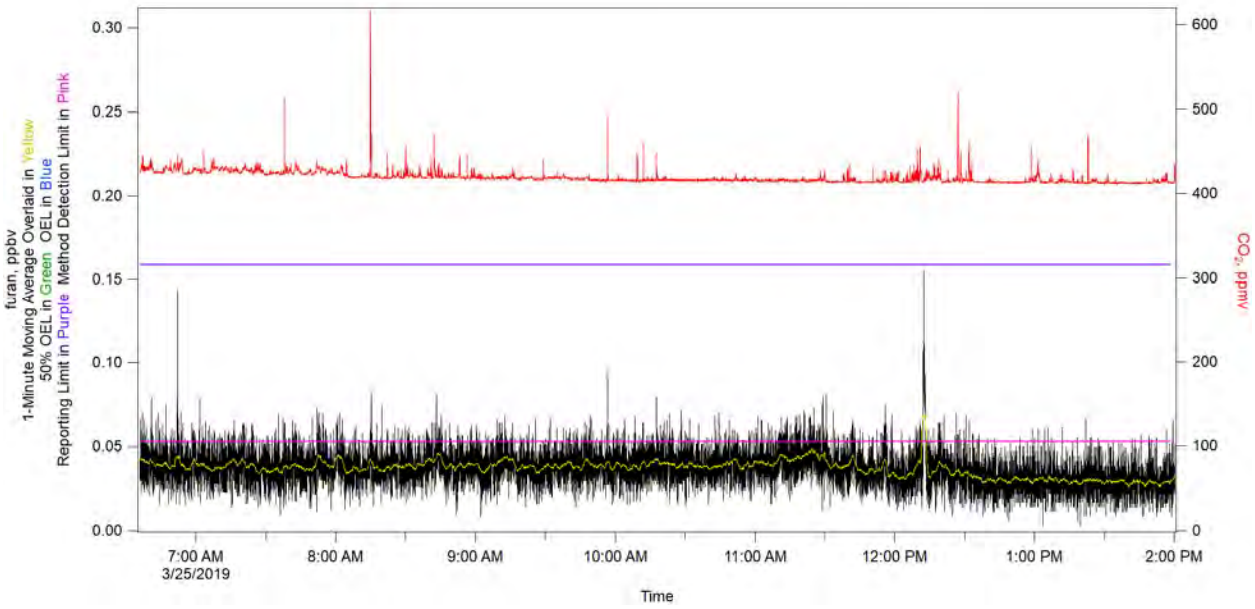


Figure 2-15. Furan.

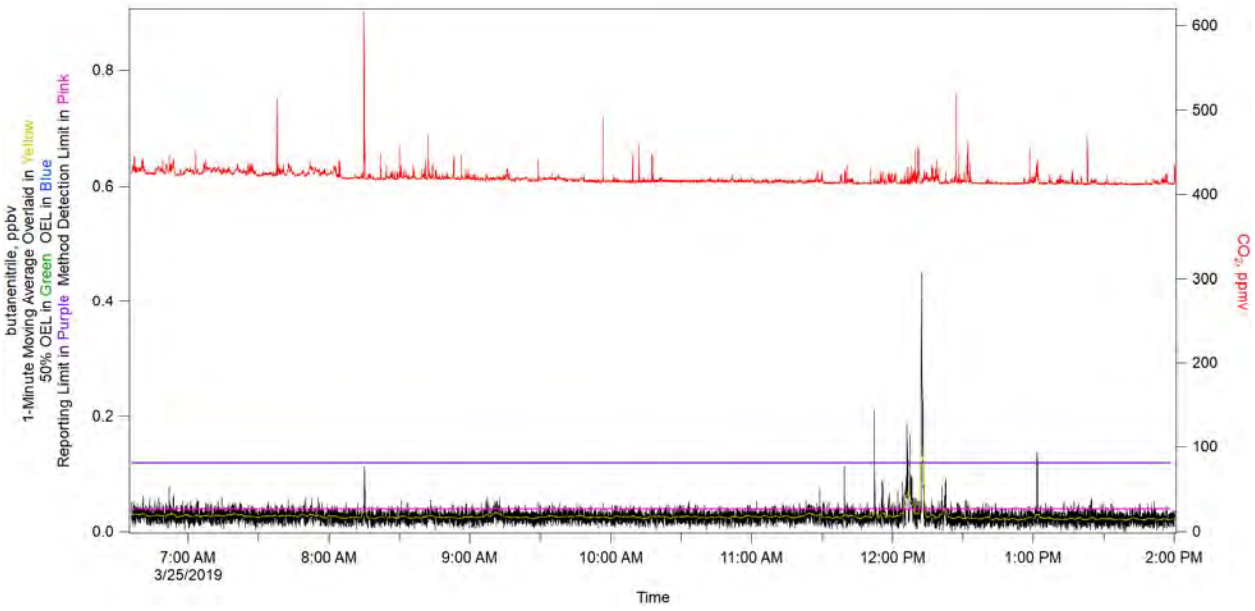


Figure 2-16. Butanenitrile.

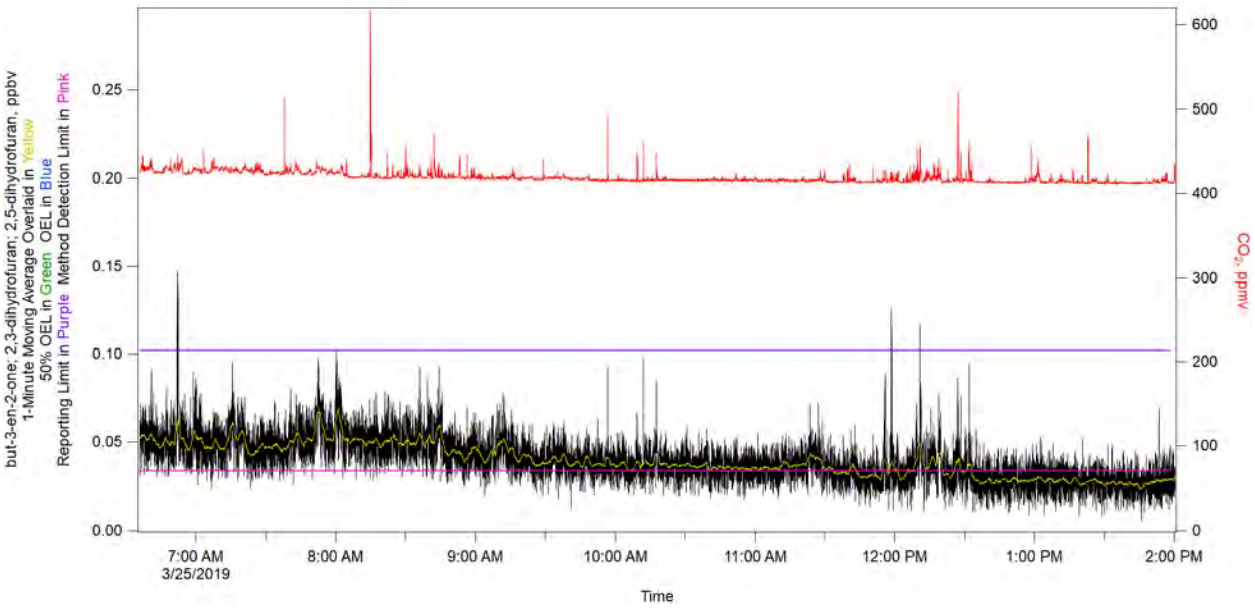


Figure 2-17. But-3-en-2-one; 2,3-dihydrofuran; 2,5-dihydrofuran.

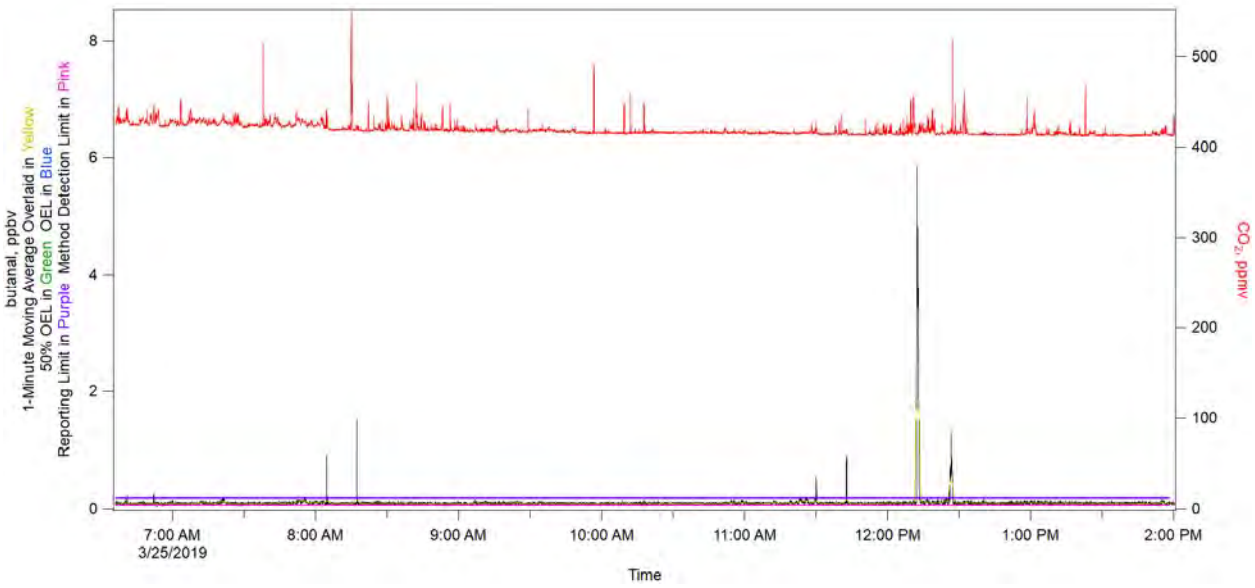


Figure 2-18. Butanal.

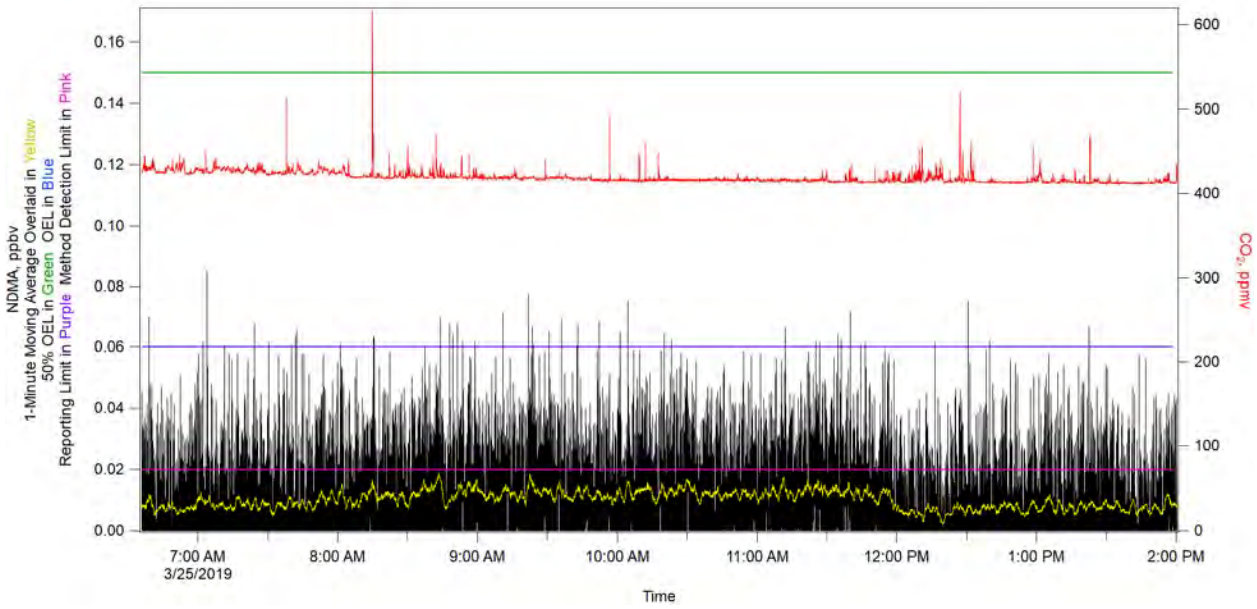


Figure 2-19. N-nitrosodimethylamine (NDMA).

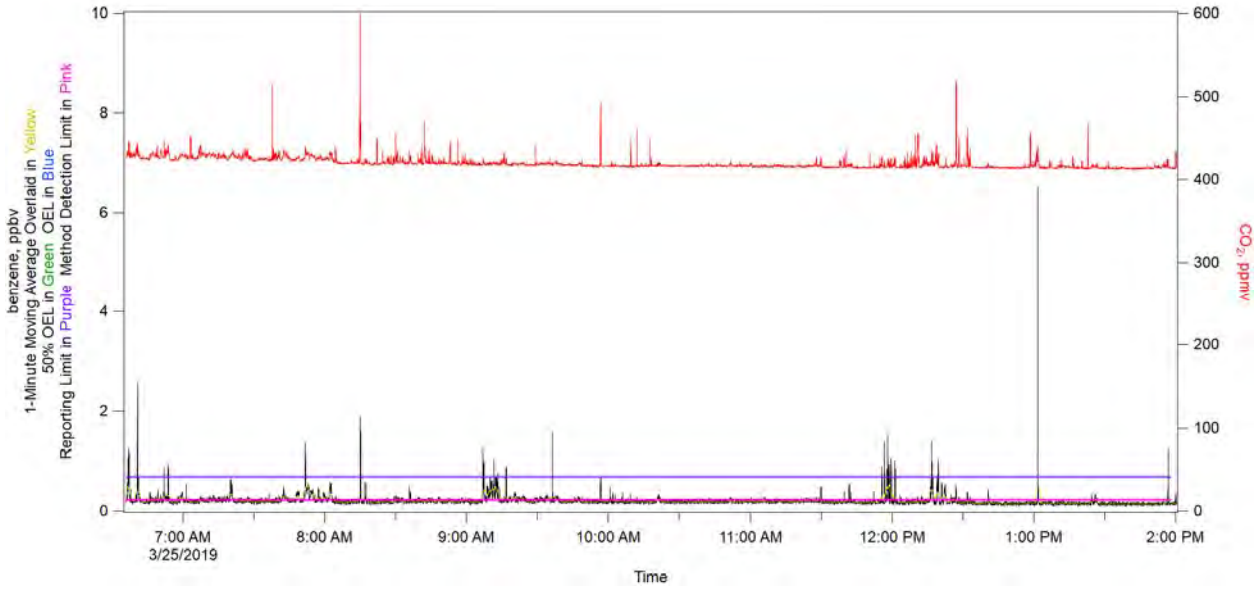


Figure 2-20. Benzene.

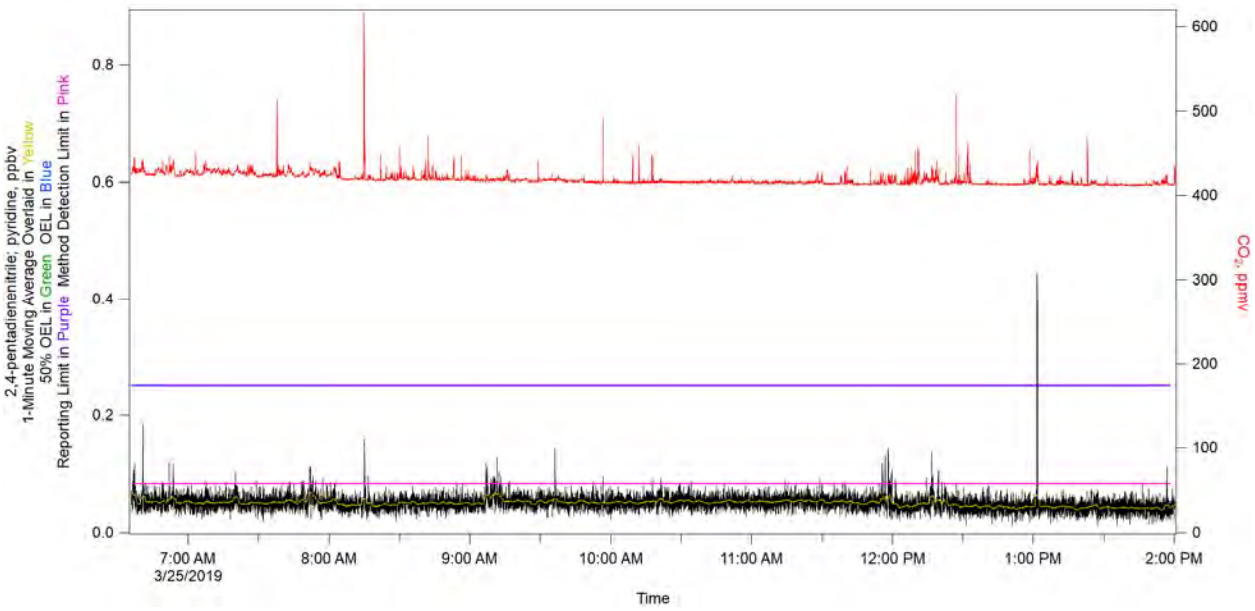


Figure 2-21. 2,4-pentadienenitrile; Pyridine.

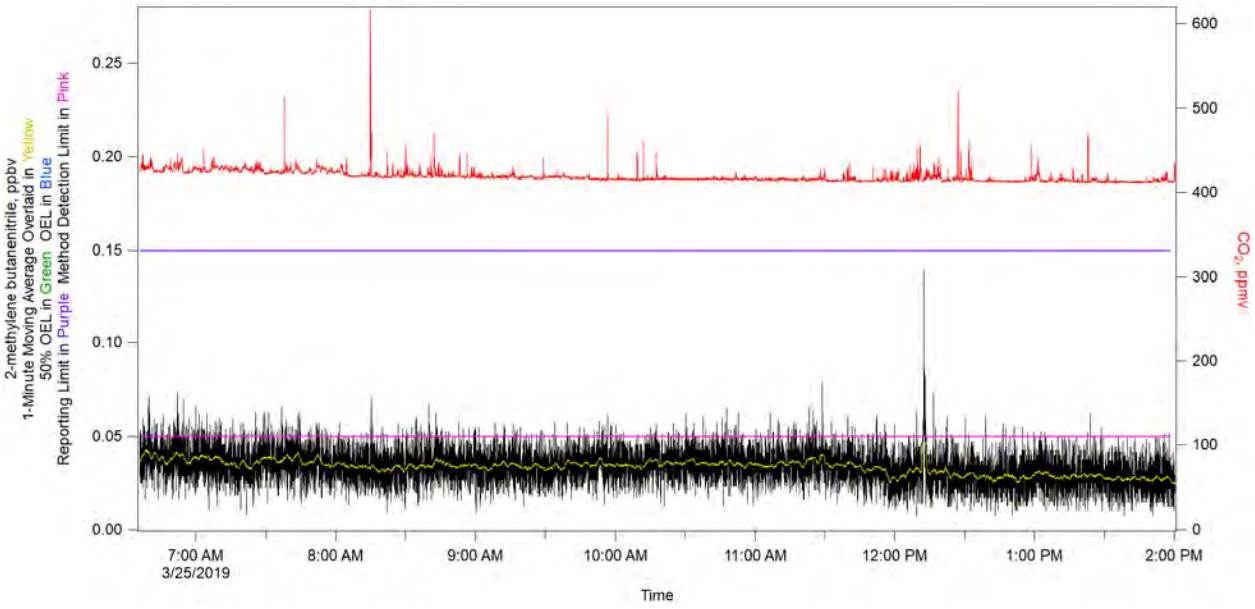


Figure 2-22. 2-methylene Butanenitrile.

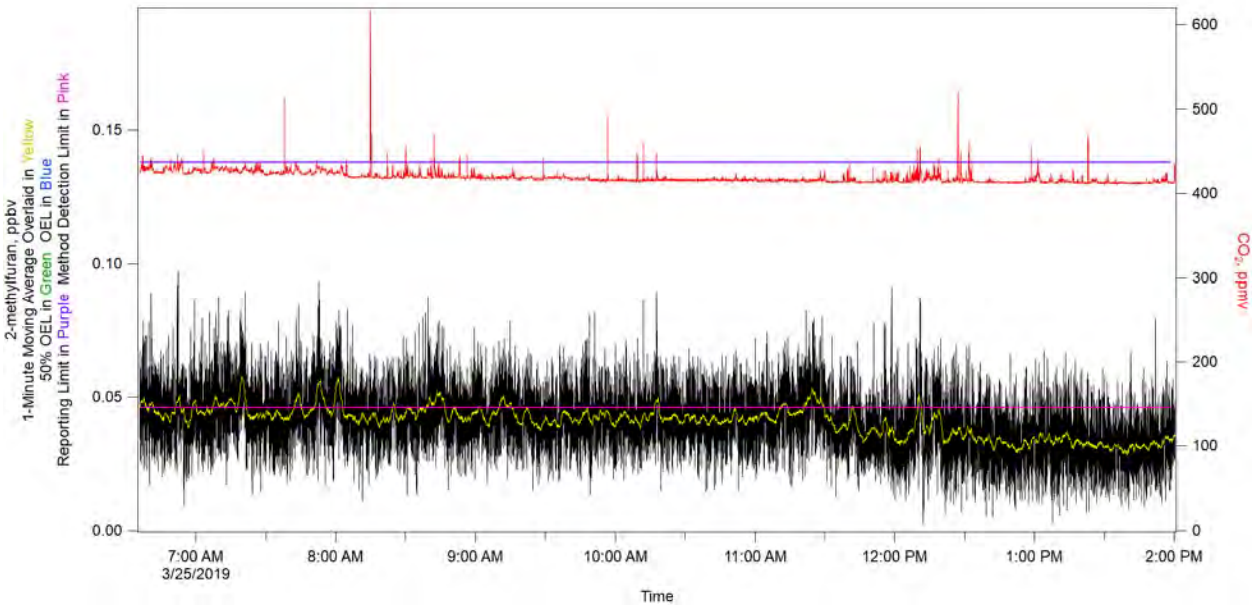


Figure 2-23. 2-methylfuran.

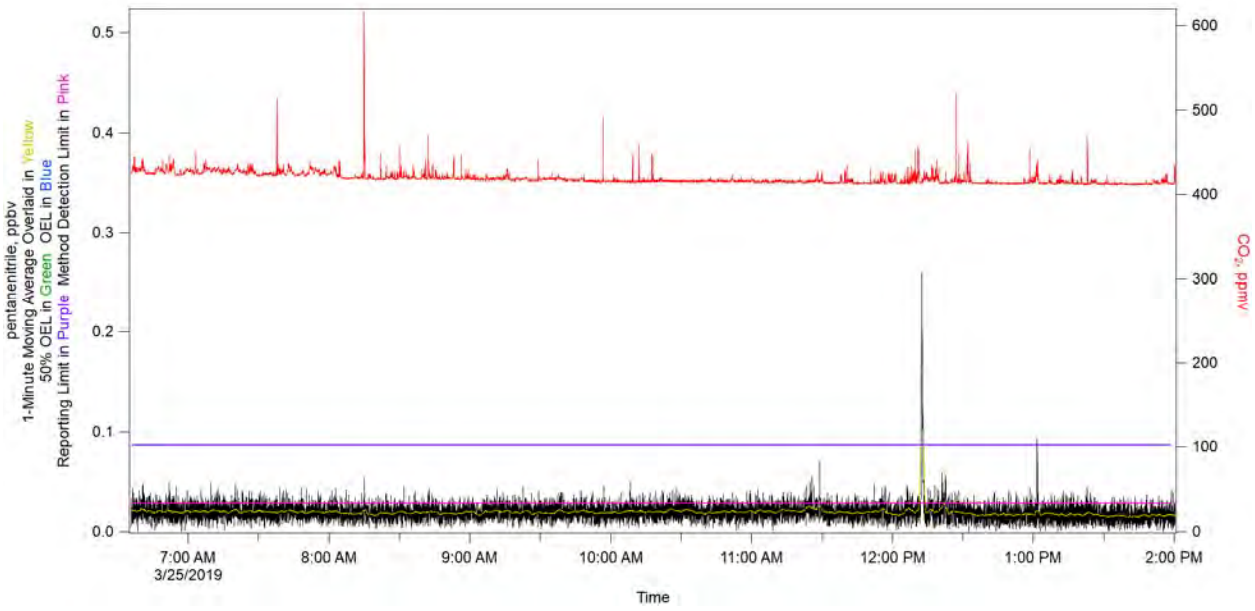


Figure 2-24. Pentanenitrile.

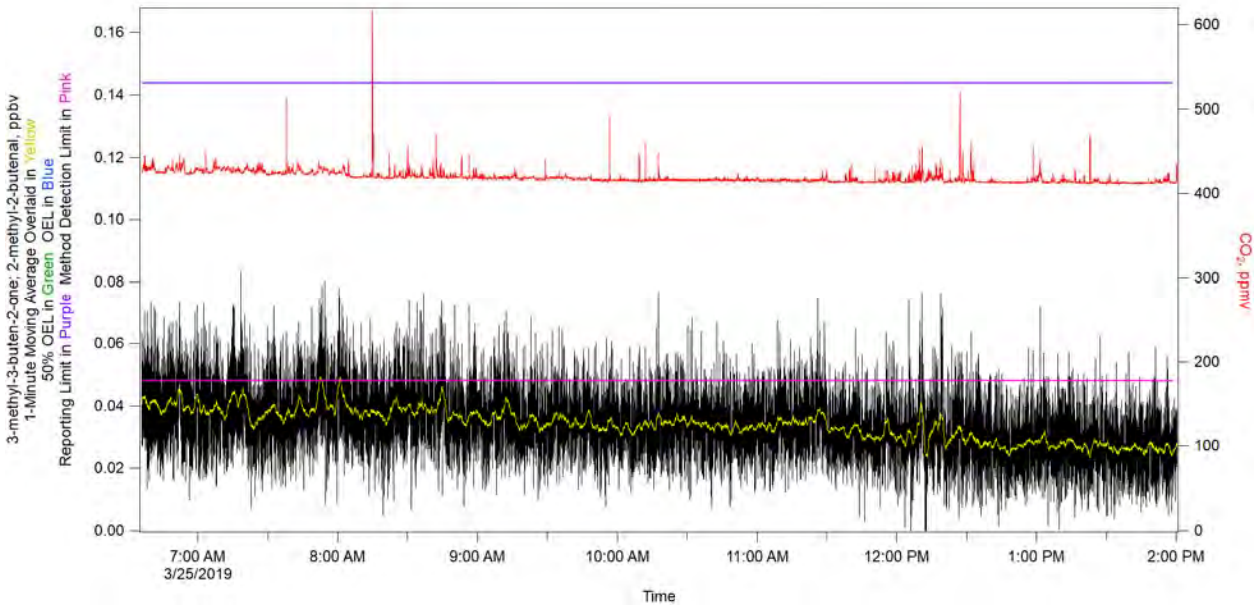


Figure 2-25. 3-methyl-3-buten-2-one; 2-methyl-2-butenal.

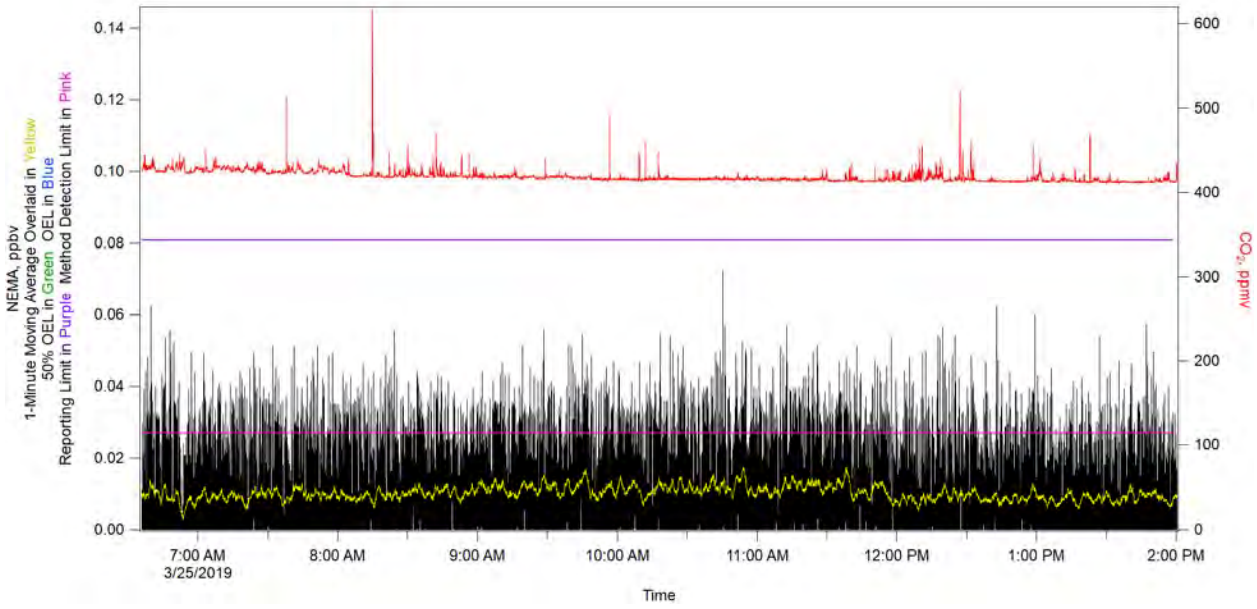


Figure 2-26. N-nitrosomethylethylamine (NEMA).

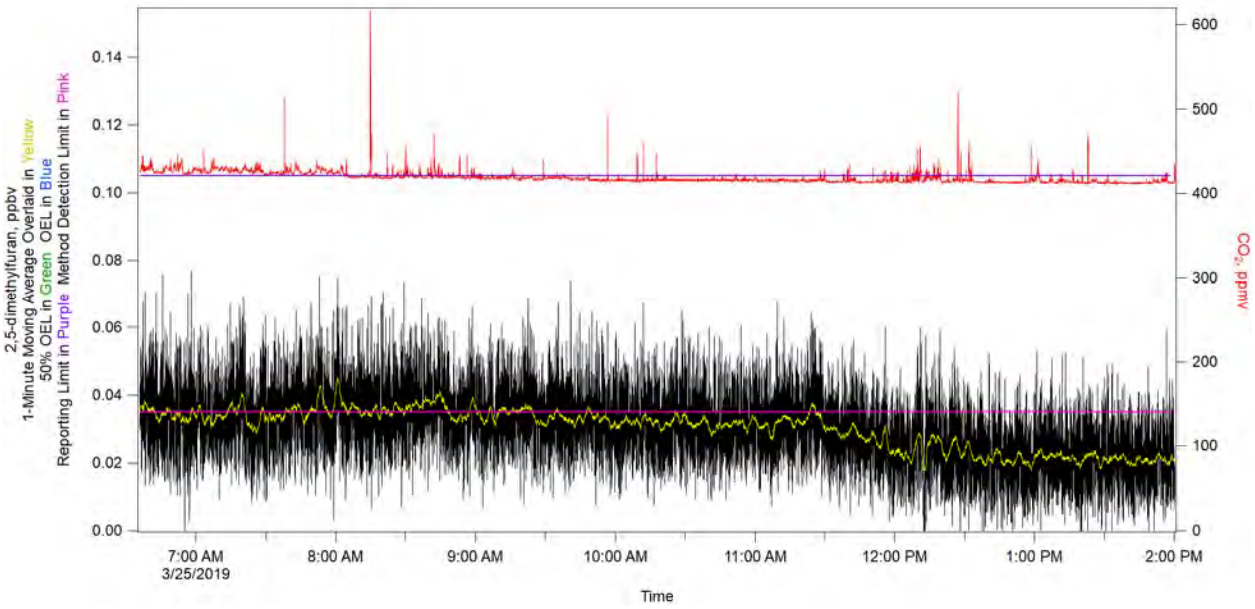


Figure 2-27. 2,5-dimethylfuran.

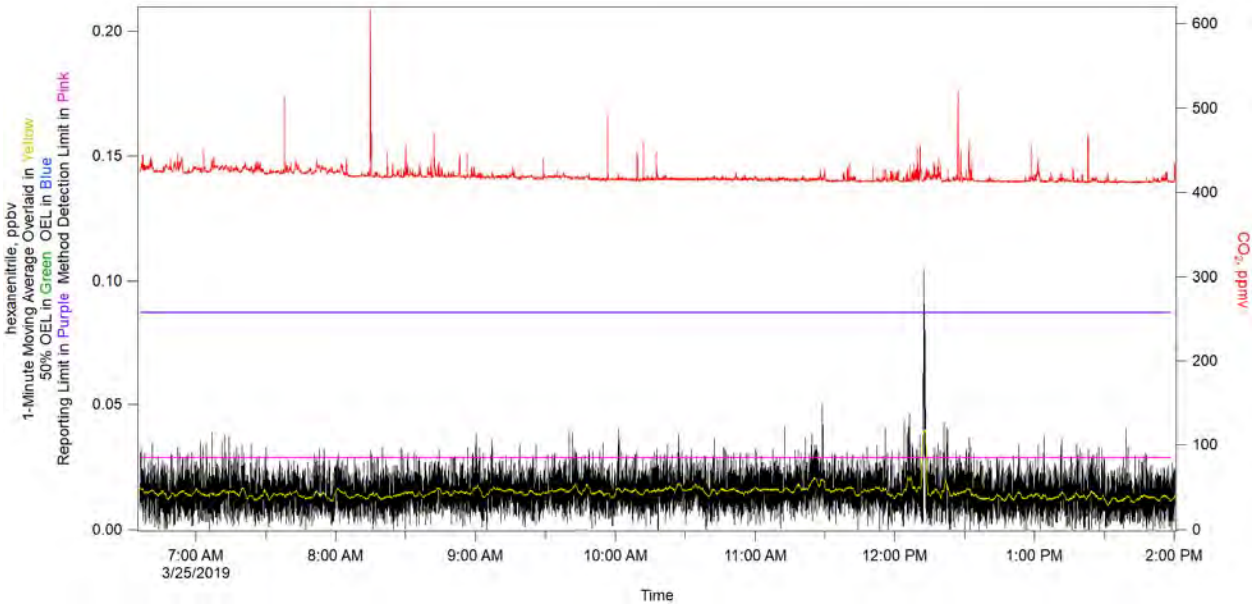


Figure 2-28. Hexanenitrile.

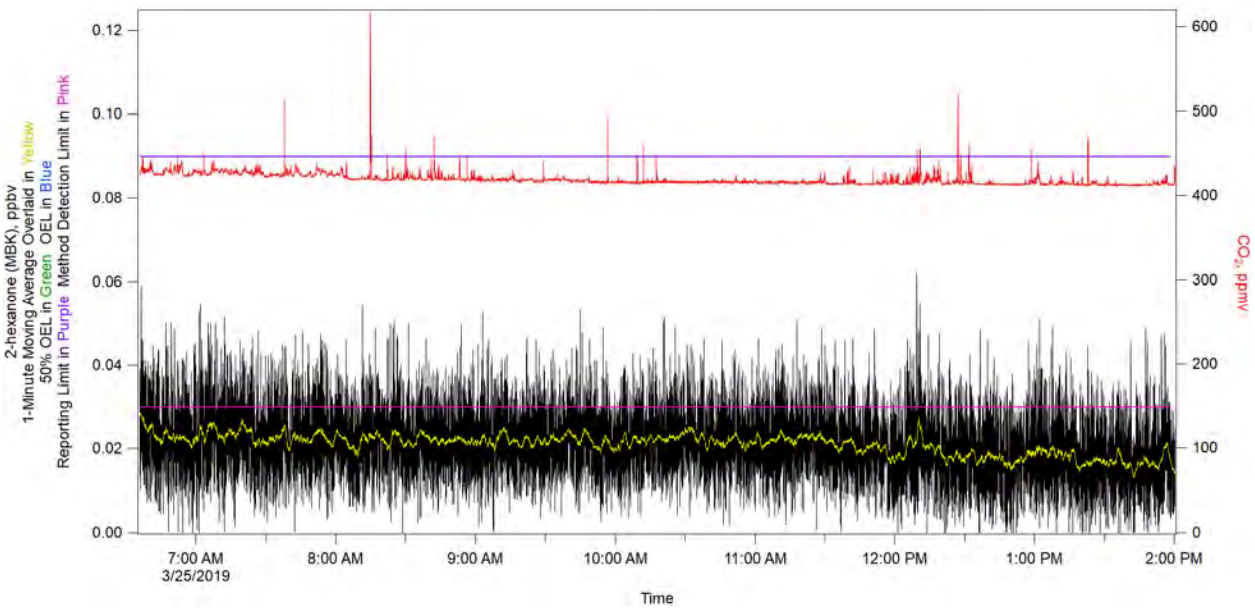


Figure 2-29. 2-hexanone (MBK).

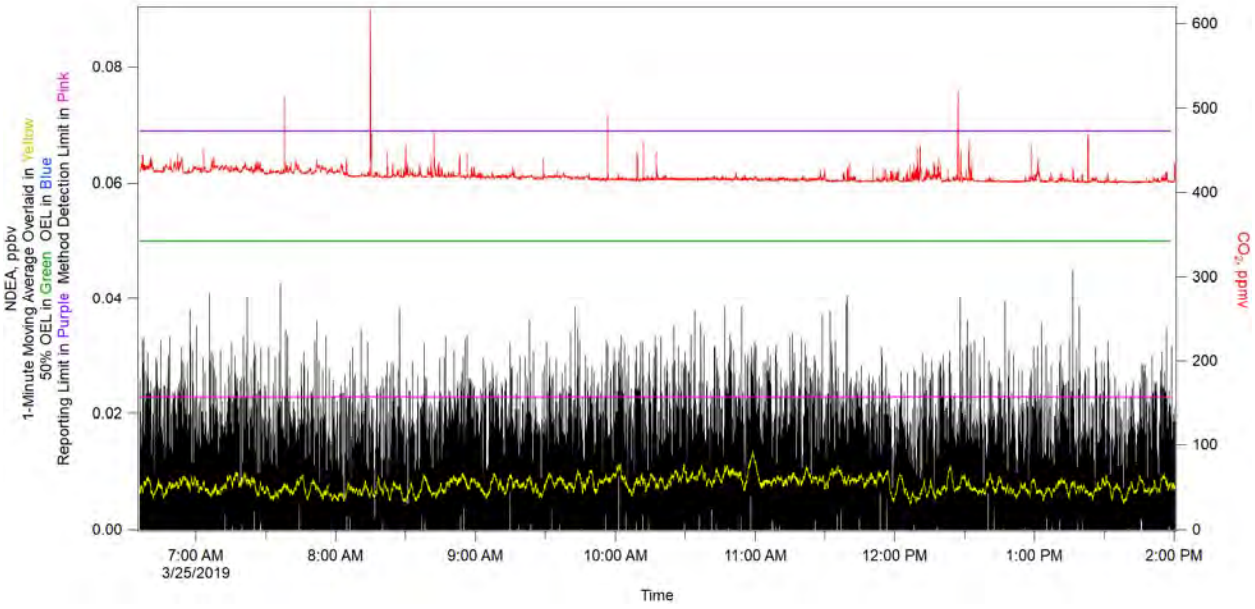


Figure 2-30. N-nitrosodiethylamine (NDEA).

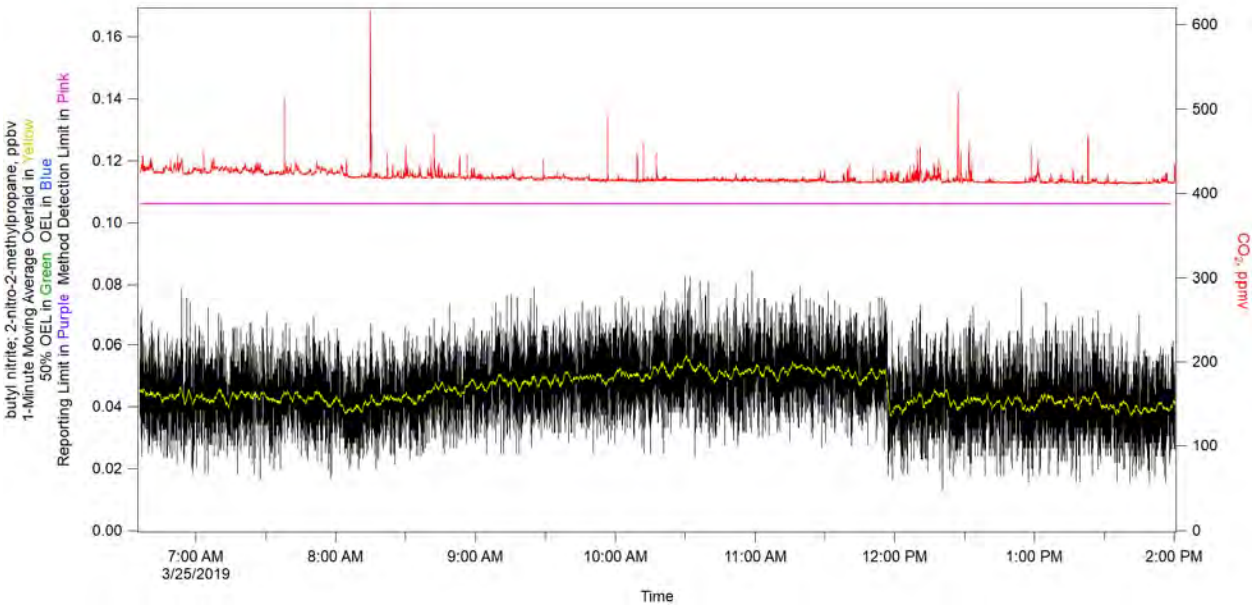


Figure 2-31. Butyl Nitrite; 2-nitro-2-methylpropane.

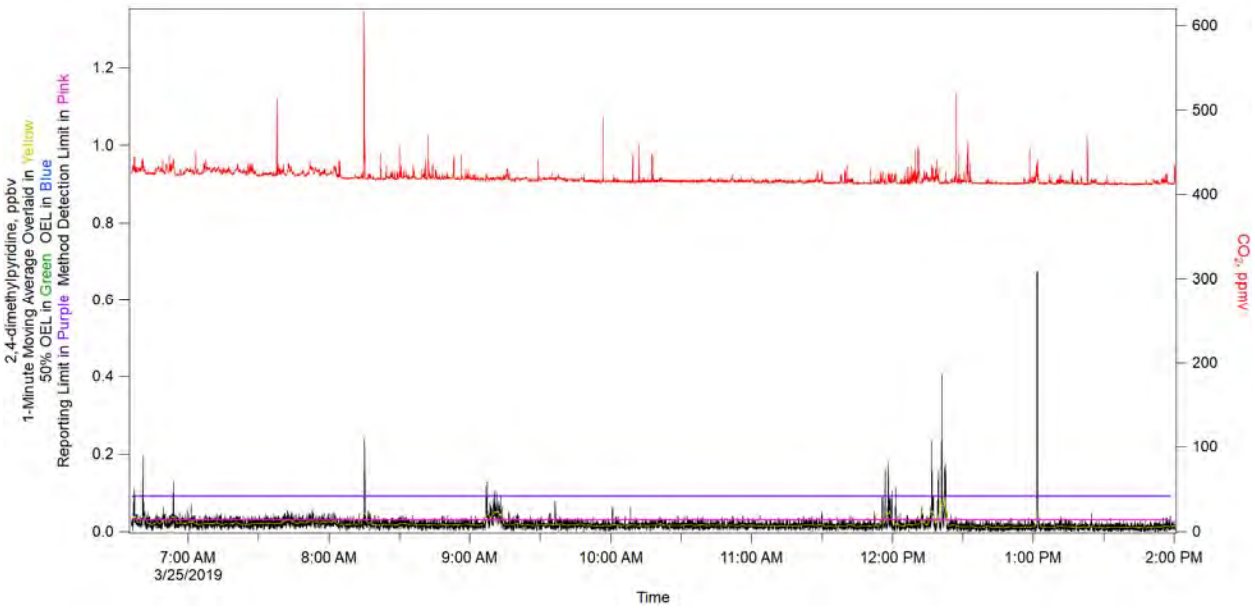


Figure 2-32. 2,4-dimethylpyridine.

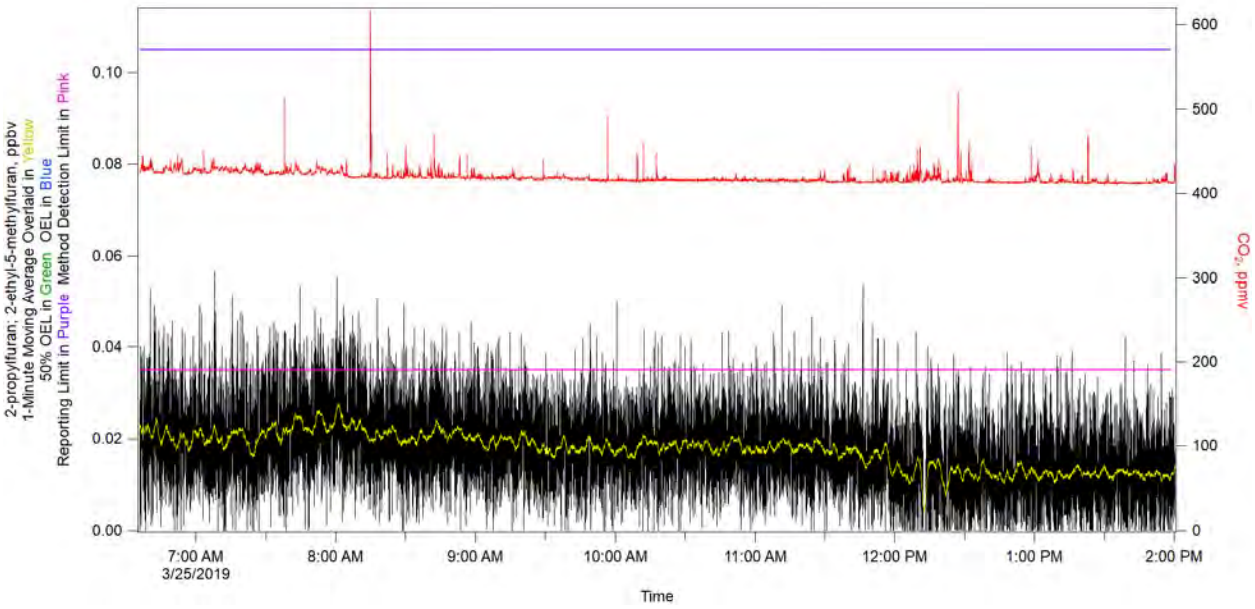


Figure 2-33. 2-propylfuran; 2-ethyl-5-methylfuran.

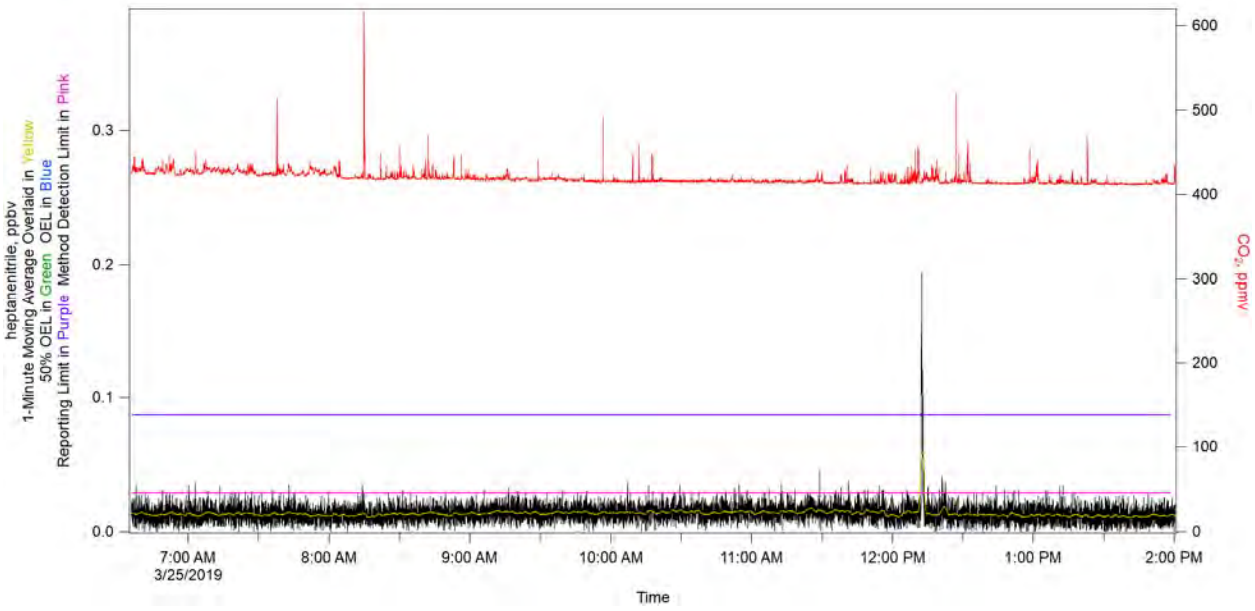


Figure 2-34. Heptanenitrile.

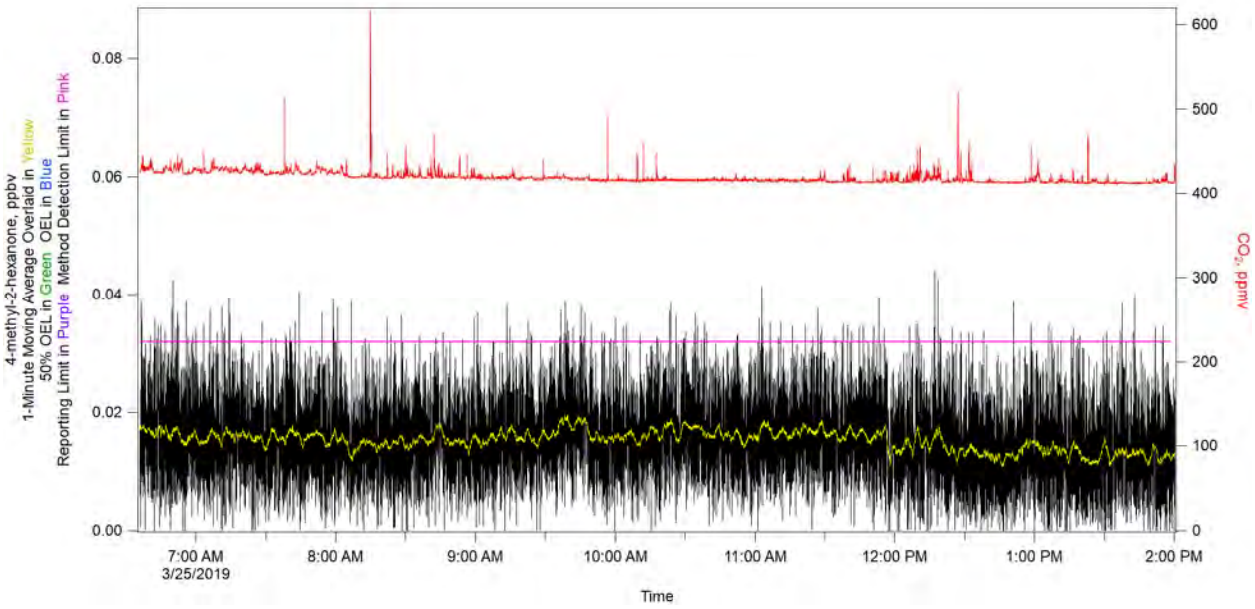


Figure 2-35. 4-methyl-2-hexanone.

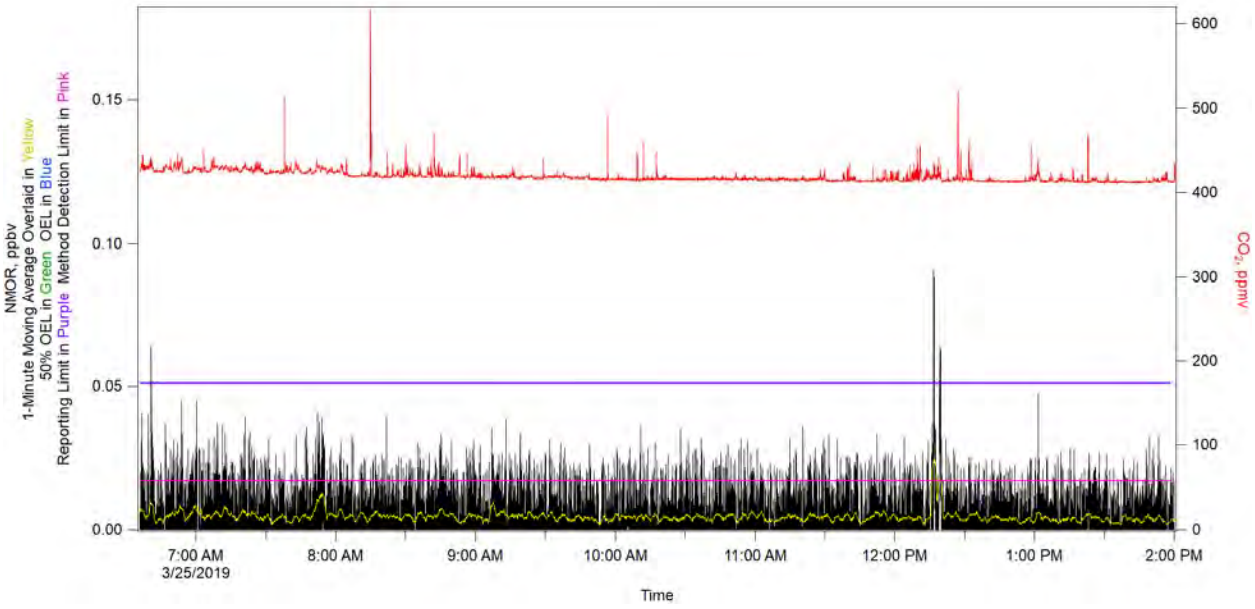


Figure 2-36. N-nitrosomorpholine (NMOR).

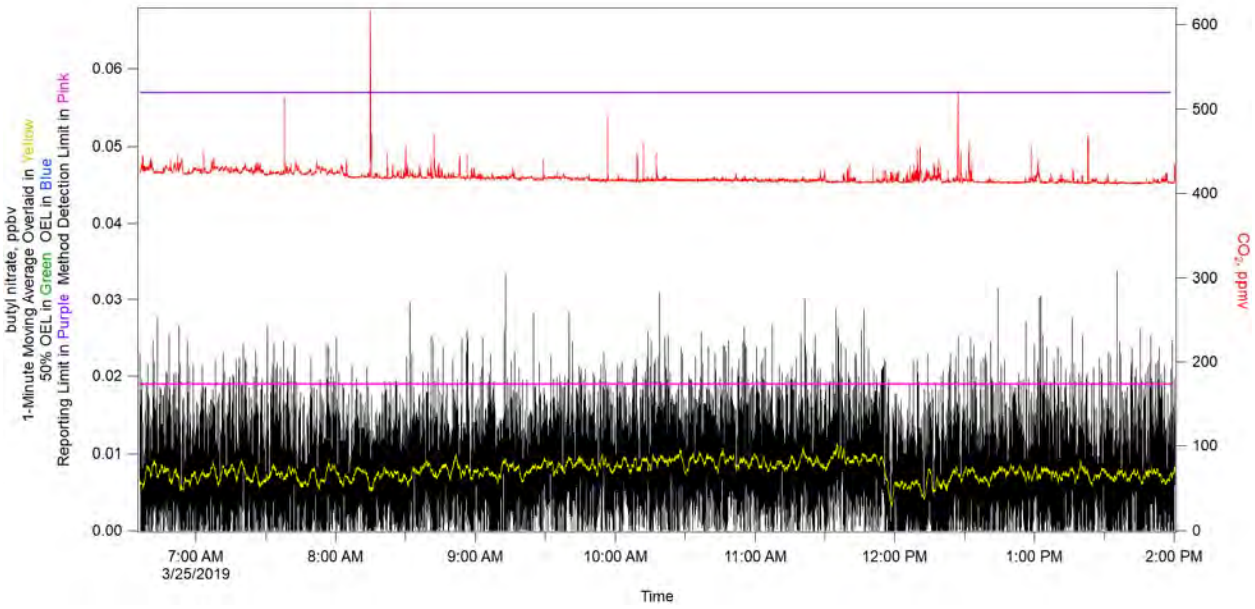


Figure 2-37. Butyl Nitrate.

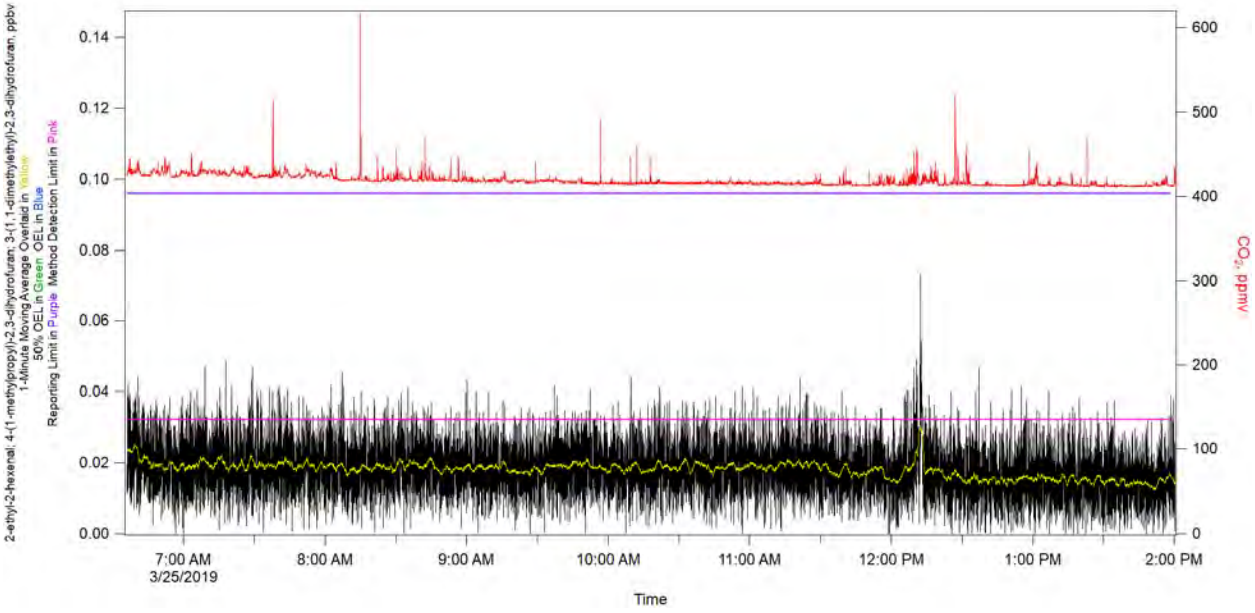


Figure 2-38. 2-ethyl-2-hexenal; 4-(1-methylpropyl)-2,3-dihydrofuran 3-(1,1-dimethylethyl)-2,3-dihydrofuran.

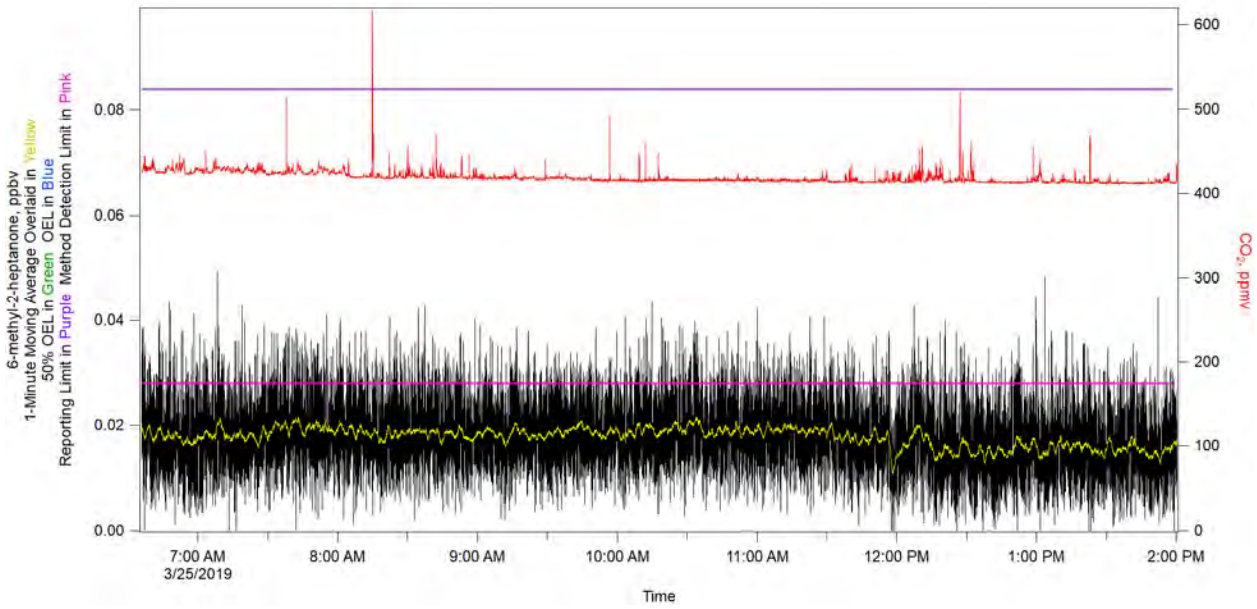


Figure 2-39. 6-methyl-2-heptanone.

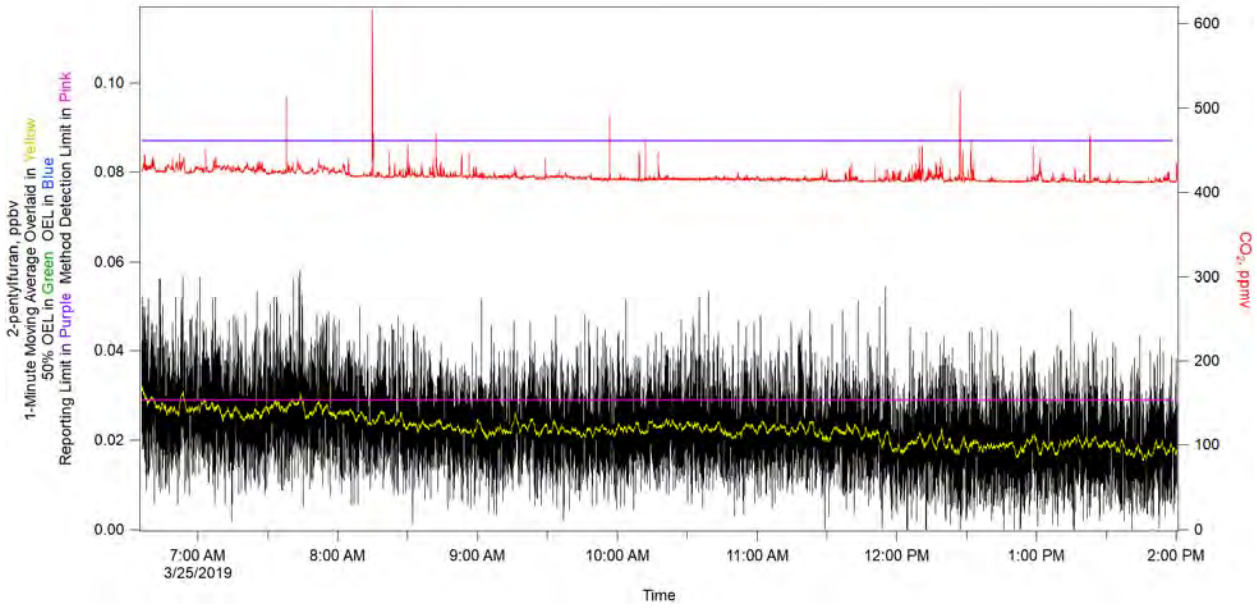


Figure 2-40. 2-pentylfuran.

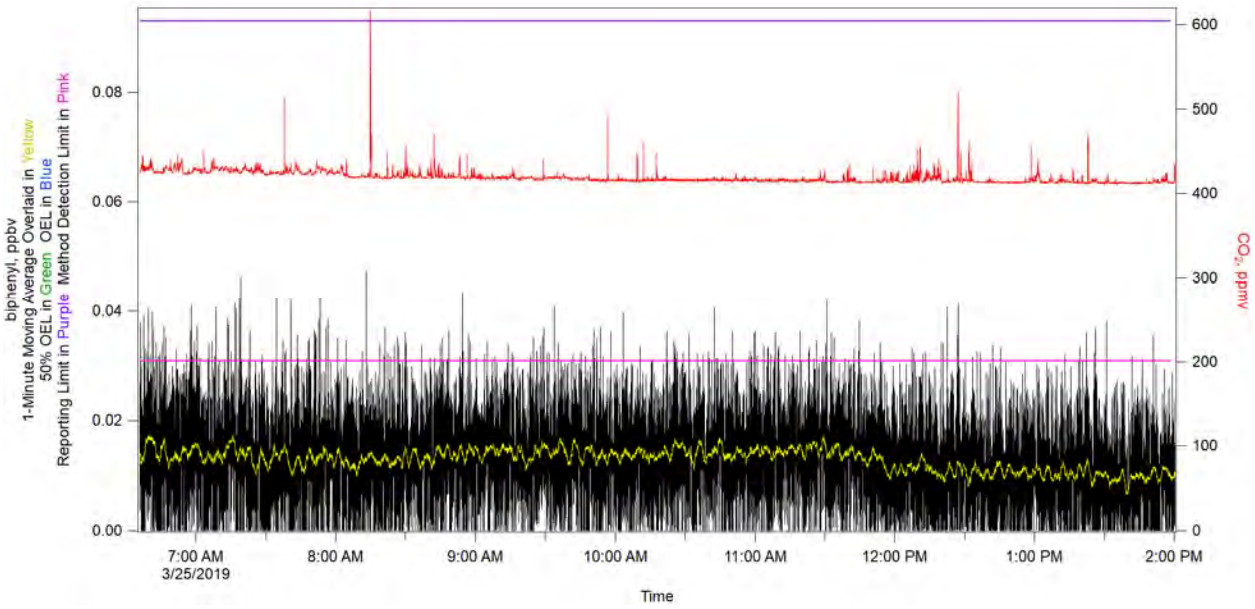


Figure 2-41. Biphenyl.

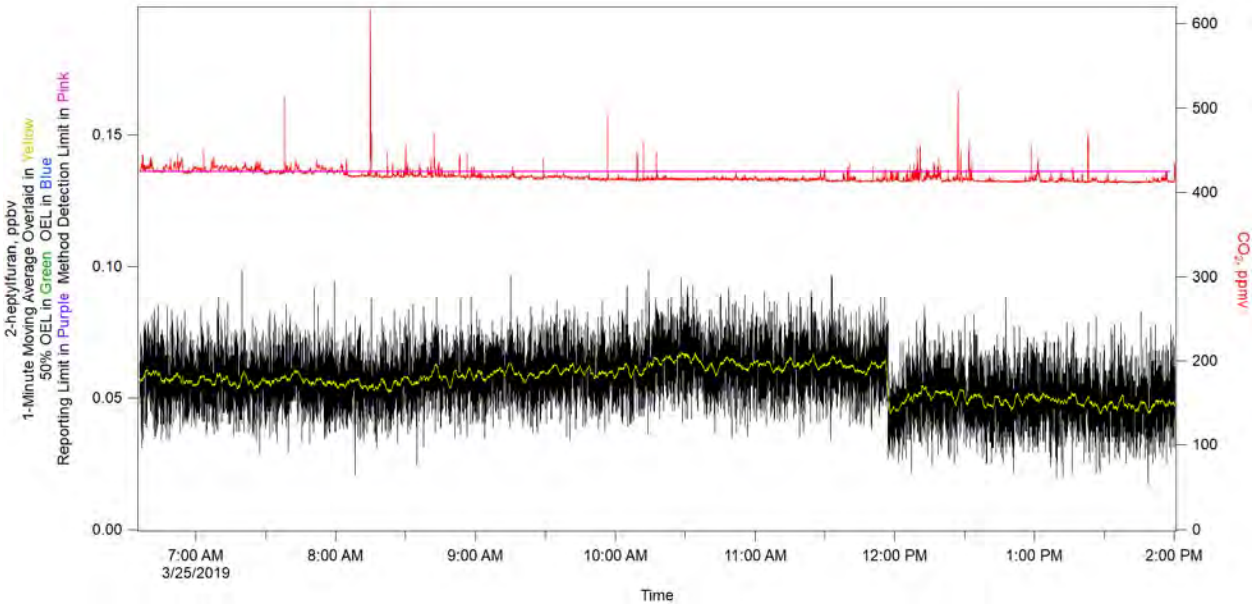


Figure 2-42. 2-heptylfuran.

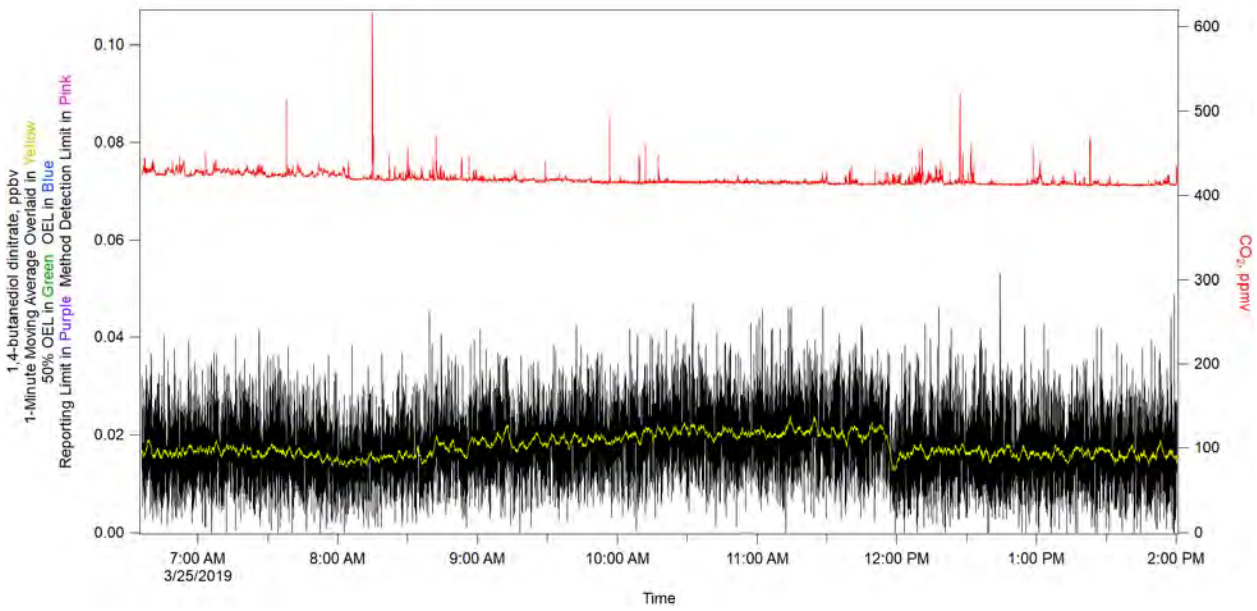


Figure 2-43. 1,4-butanediol Dinitrate.

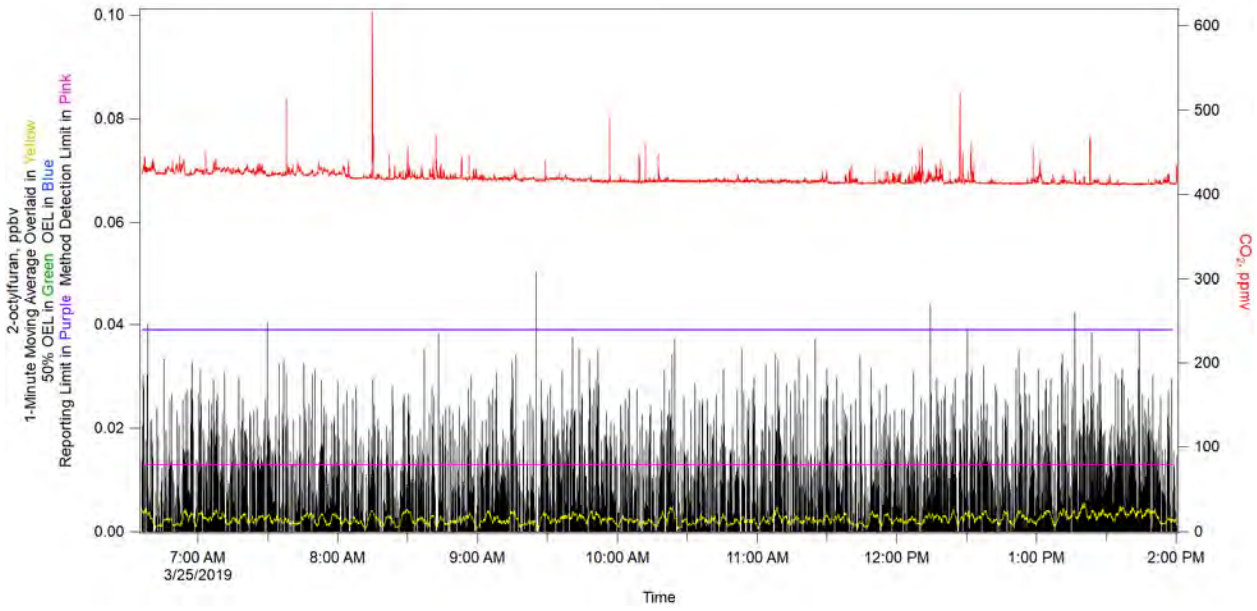


Figure 2-44. 2-octylfuran.

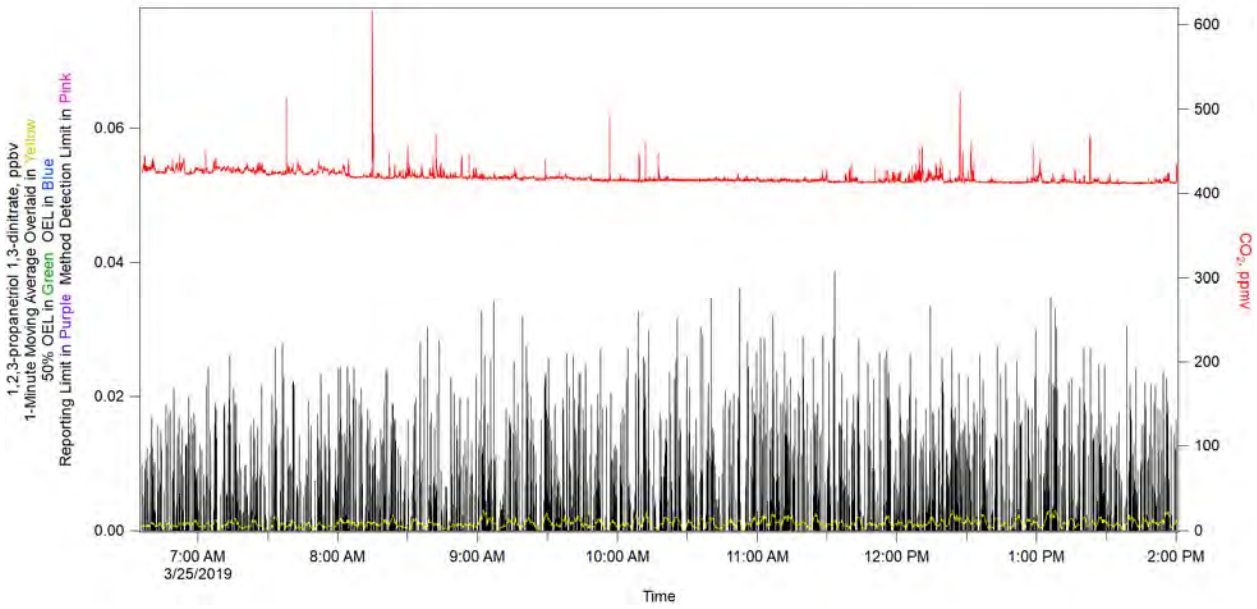


Figure 2-45. 1,2,3-propanetriol 1,3-dinitrate.

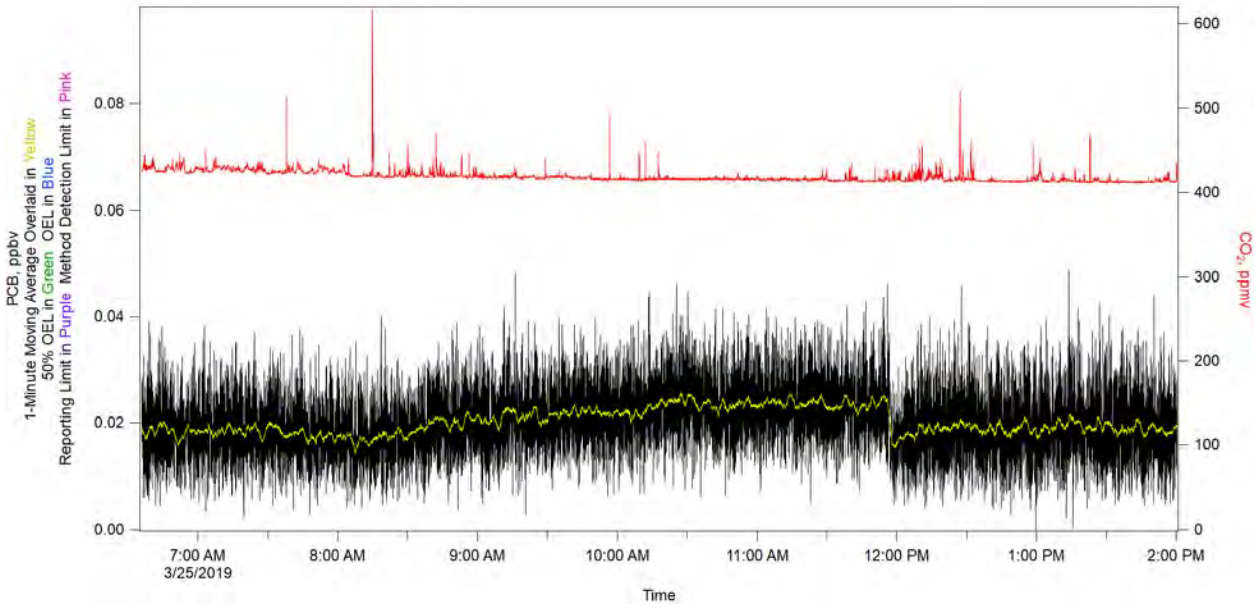


Figure 2-46. PCB.

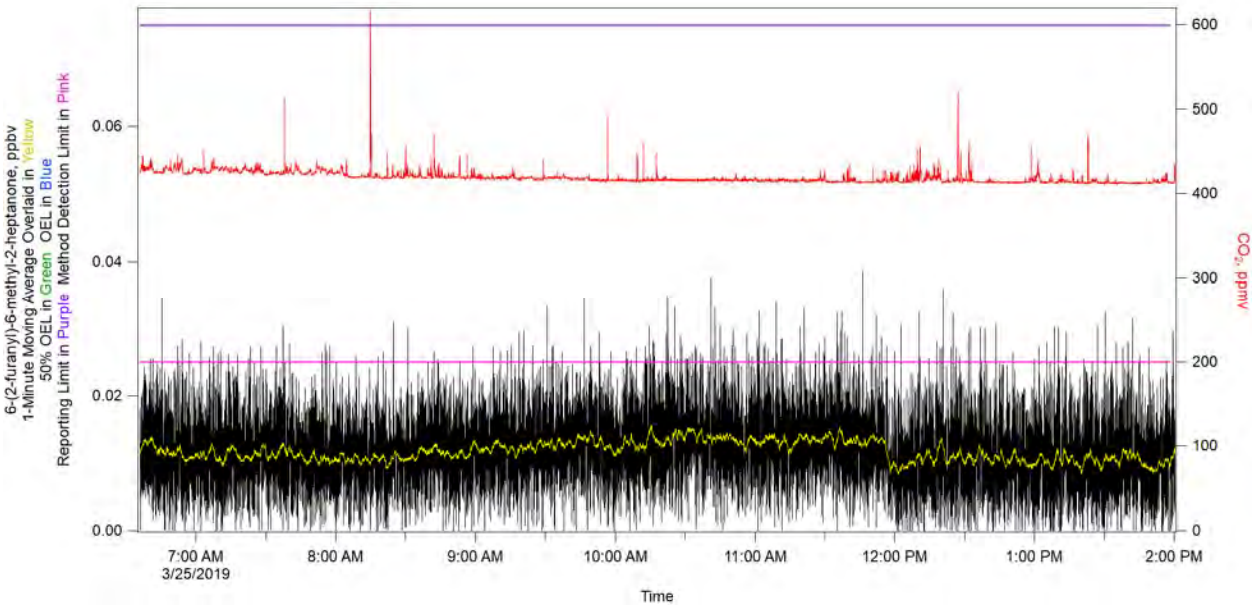


Figure 2-47. 6-(2-furanyl)-6-methyl-2-heptanone.

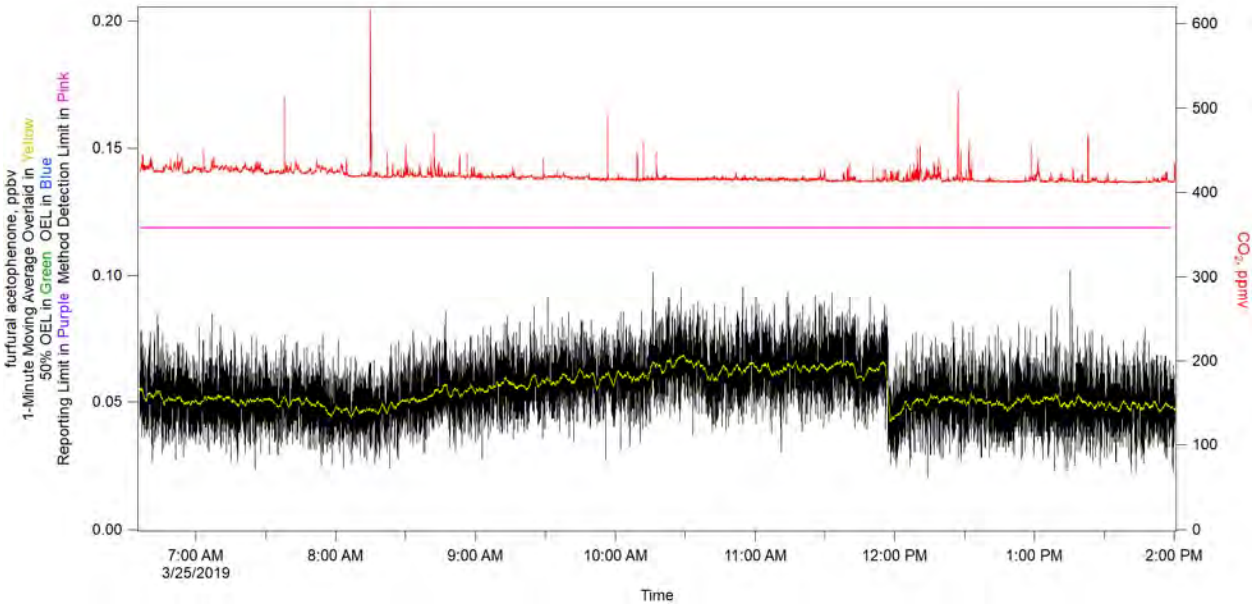


Figure 2-48. Furfural Acetophenone.

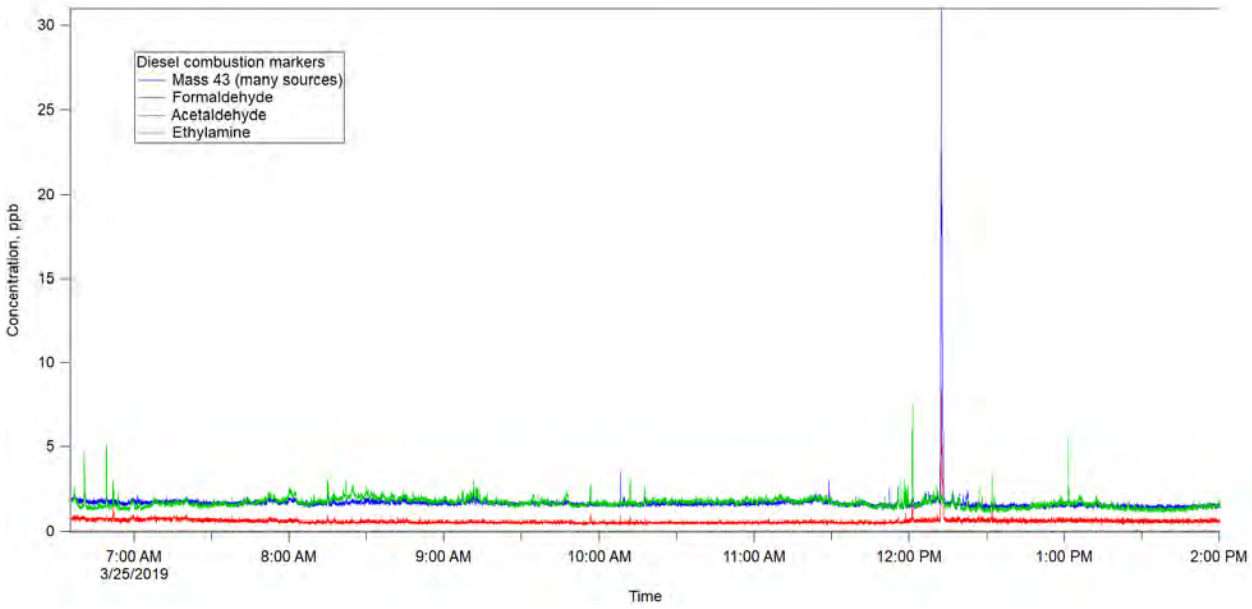


Figure 2-49. Diesel Combustion Markers.

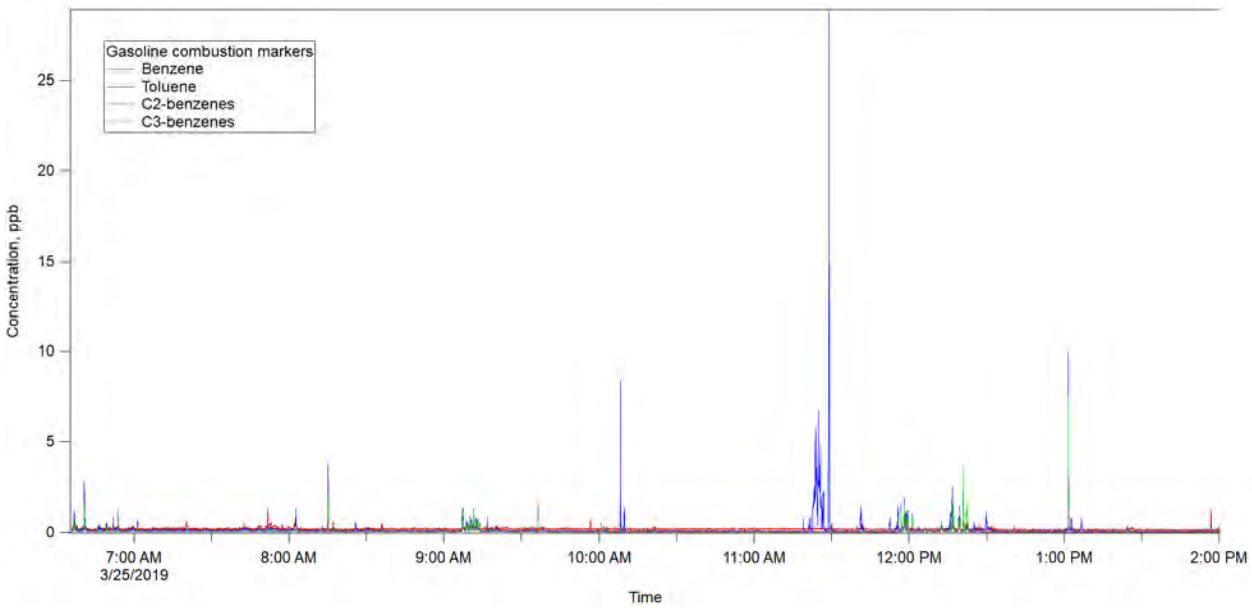


Figure 2-50. Gasoline Combustion Markers.

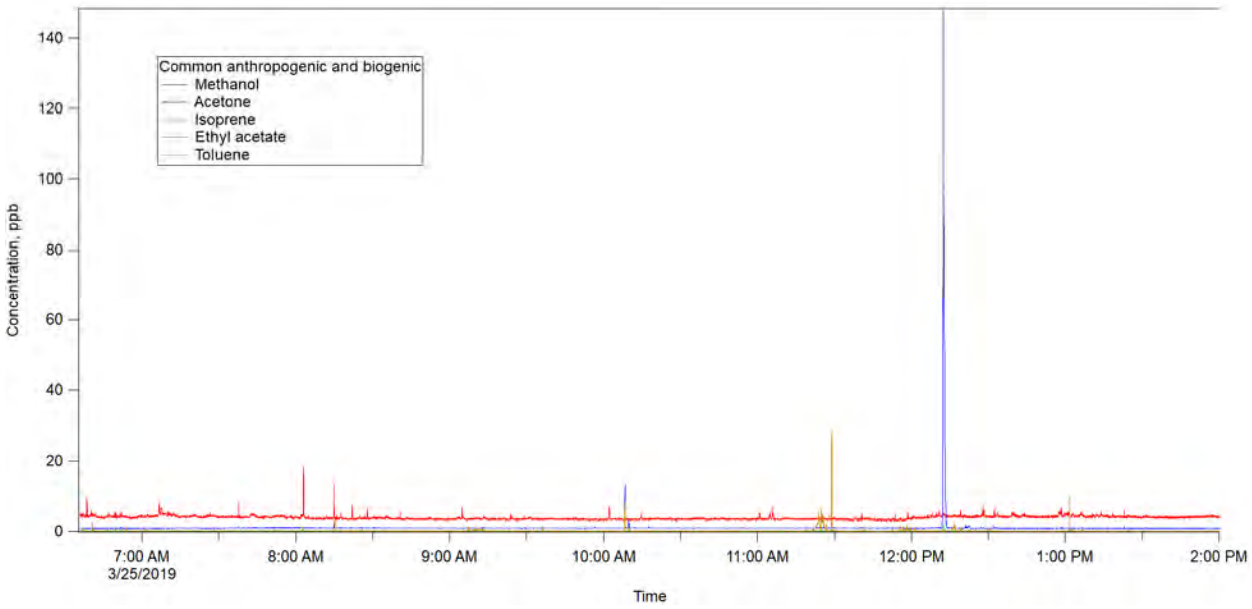


Figure 2-51. Plant and Human Markers.

3.0 MARCH 26, 2019 – AREA MONITORING

3.1 Quality Assessment

Data from March 26, 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 March 26, 2019, the Operators arrived at the ML at 04:55. 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 05:10. The ML arrived on the Hanford Site and personnel checked in with the CSO at 06:05. The ML began mobile monitoring at 06:15. After a site survey loop, the ML was parked on the southeastern corner, downwind, of the septic tanks located near the 242A Evaporator. At 07:09, Mr. Greg Hanson (TerraGraphics) and Ms. Angie Perez (WRPS) arrived for a tour of the ML. After another site survey loop, the ML was parked downwind from work occurring inside of AP Farm at 08:26. At 10:50, a site survey loop was completed before the ML was parked near the northeastern region of AP Farm. The ML moved west, close to the fence line between A Farm and AY Farm at 11:07.

After an hour, the ML was moved from the previous location and began another A Farm survey. At 12:33, the ML was parked east of AP Farm for approximately 15 minutes before relocating to the parking lot for the 242A Evaporator. At 14:15, ML Operators checked out with the CSO and departed the site. The ML arrived back at the TerraGraphics warehouse at 15:07.

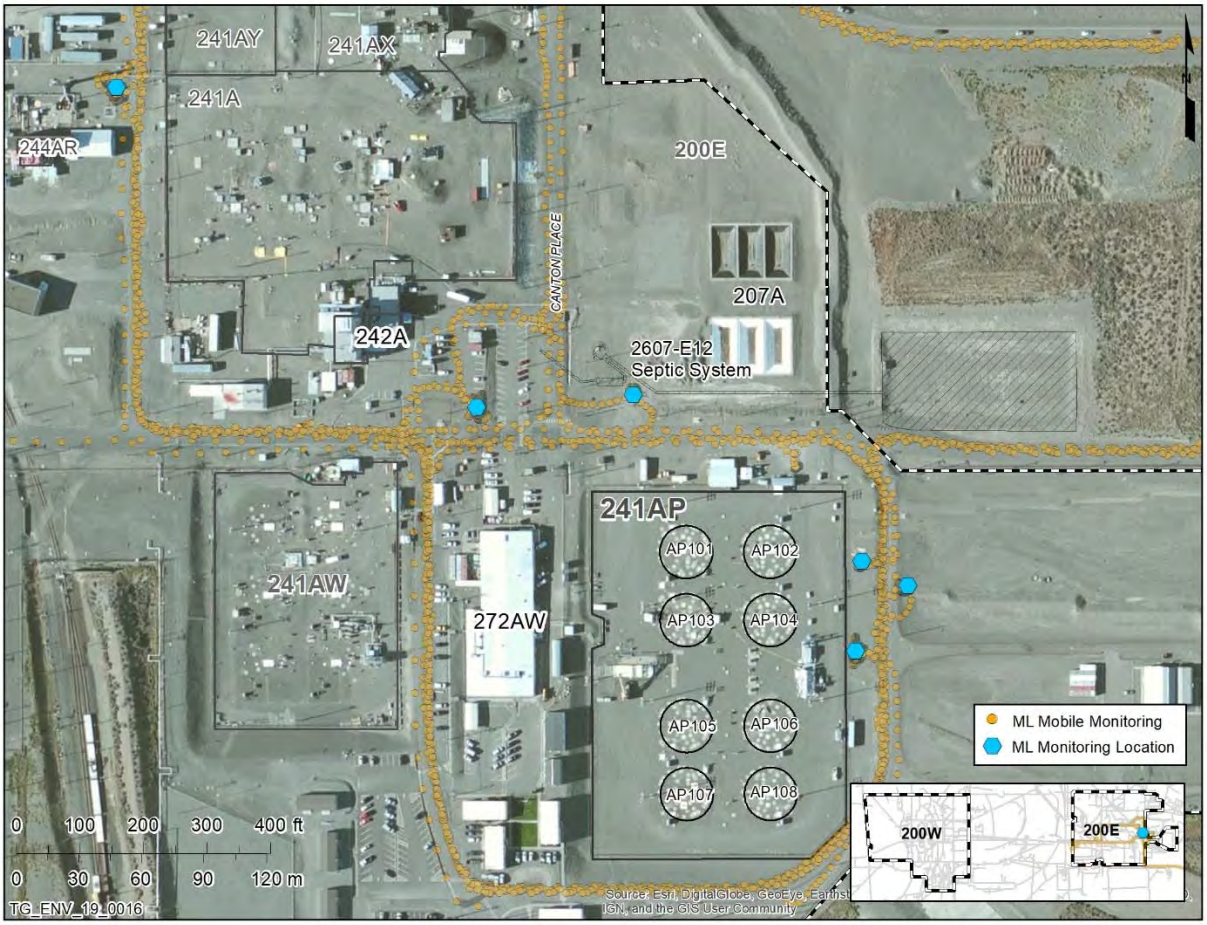


Figure 3-1. Location of the Mobile Laboratory for the Duration of the Monitoring Period.

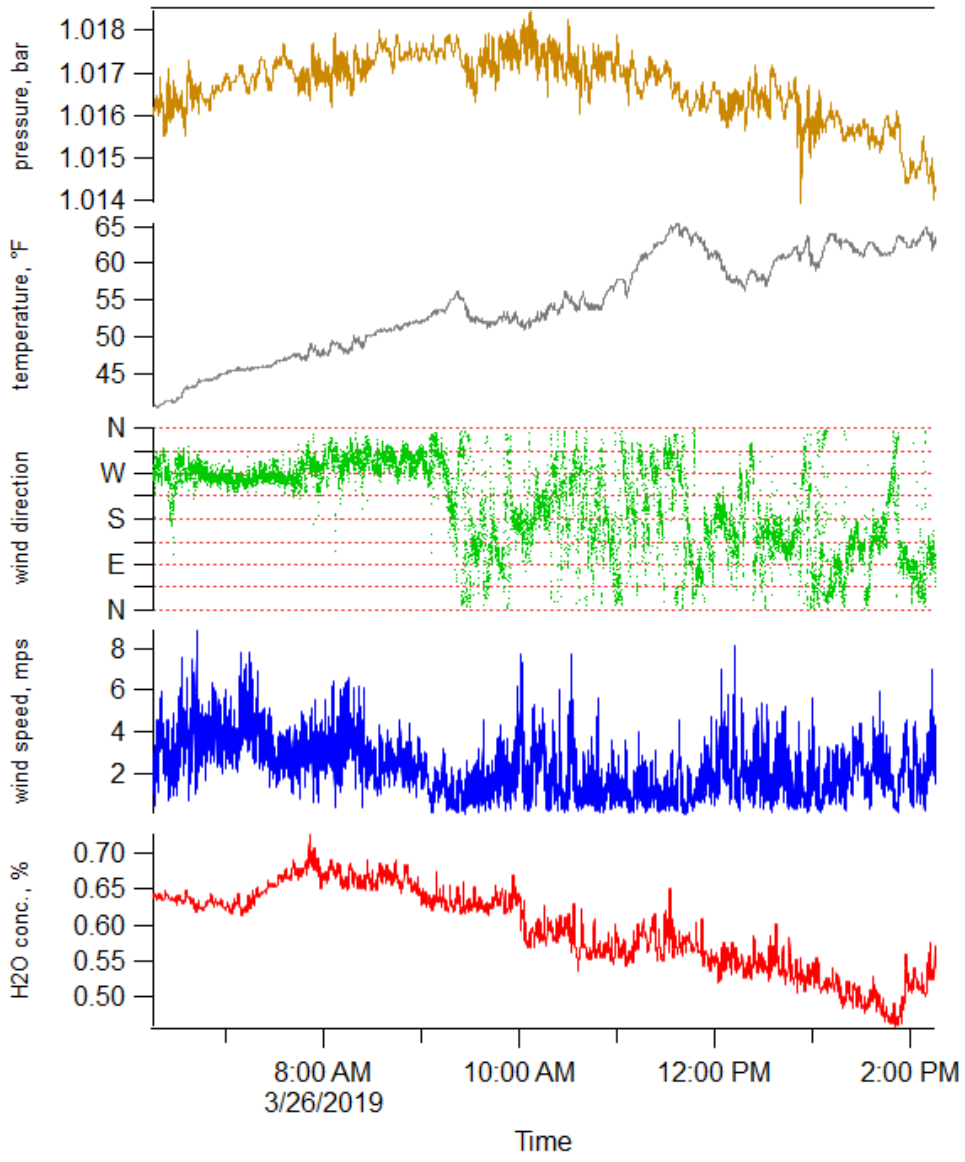


Figure 3-2. Weather Data for the Duration of the Monitoring Period.

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
- 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 March 26, 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	0.010	6.727	1.314	19.534	12.201	6.342
2	formaldehyde	300	1.302	<1.302	0.330	55.747	29.503	<1.302
3	methanol	200000	1.839	2.999†	0.945	31.514	37.768	2.834
4	acetonitrile	20000	0.070	0.079†	0.016	20.241	0.563	0.078
5	acetaldehyde	25000	2.070	<2.070	1.686	138.206	156.542	<2.070
6	ethylamine	5000	0.055	<0.055	0.010	34.584	0.094	<0.055
7	1,3-butadiene	1000	0.122	0.190†	0.145	76.442	3.498	0.167
8	propanenitrile	6000	0.121	<0.121	0.017	35.164	0.470	<0.121
9	2-propenal	100	0.314	<0.314	0.049	62.884	0.772	<0.314
10	1-butanol + butenes	20000	0.149	<0.149	0.079	95.947	2.717	<0.149
11	methyl isocyanate	20	0.061	<0.061	0.013	31.894	0.134	<0.061
12	methyl nitrite	100	0.117	<0.117	0.033	38.175	0.648	<0.117
13	furan	1	0.053	<0.053	0.010	35.073	0.132	<0.053
14	butanenitrile	8000	0.040	<0.040	0.009	41.249	0.129	<0.040
15	but-3-en-2-one + 2,3-dihydrofuran + 2,5-dihydrofuran	200, 1, 1	0.034	<0.034	0.014	58.060	N/A*	N/A*
16	butanal	25000	0.063	0.204	0.905	442.456	25.045	0.079
17	NDMA**	0.3	0.020	<0.020	0.012	120.173	0.089	<0.020
18	benzene	500	0.230	<0.230	0.173	77.787	3.253	<0.230
19	2,4-pentadienenitrile + pyridine	300	0.084	0.203†	0.441	216.794	2.002	<0.084
20	2-methylene butanenitrile	300	0.050	<0.050	0.010	34.880	0.083	<0.050
21	2-methylfuran	1	0.046	<0.046	0.012	42.630	0.158	<0.046
22	pentanenitrile	6000	0.029	<0.029	0.007	43.807	0.061	<0.029
23	3-methyl-3-buten-2-one + 2-methyl-2-butenal	20, 30	0.048	<0.048	0.010	44.921	0.119	<0.048
24	NEMA**	0.3	0.027	<0.027	0.010	100.641	0.059	<0.027
25	2,5-dimethylfuran	1	0.035	<0.035	0.009	49.459	0.084	<0.035
26	hexanenitrile	6000	0.029	<0.029	0.007	48.223	0.055	<0.029
27	2-hexanone (MBK)	5000	0.030	<0.030	0.008	45.425	0.061	<0.030
28	NDEA**	0.1	0.023	<0.023	0.008	102.333	0.048	<0.023
29	butyl nitrite + 2-nitro-2-methylpropane	100, 300	0.106	<0.106	0.013	29.632	0.107	<0.106

Table 3-1. Chemical of Potential Concern Statistical Information for the Monitoring Period of March 26, 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	0.031	<0.031	0.012	88.063	0.290	<0.031
31	2-propylfuran + 2-ethyl-5-methylfuran	1	0.035	<0.035	0.007	61.731	0.053	<0.035
32	heptanenitrile	6000	0.029	<0.029	0.006	48.320	0.049	<0.029
33	4-methyl-2-hexanone	500	0.032	<0.032	0.007	48.621	0.053	<0.032
34	NMOR**	0.6	0.017	<0.017	0.006	163.212	0.111	<0.017
35	butyl nitrate	2500	0.019	<0.019	0.006	73.066	0.039	<0.019
36	2-ethyl-2-hexenal + 4-(1-methylpropyl)-2,3-dihydrofuran + 3-(1,1-dimethylethyl)-2,3-dihydrofuran	100, 1, 1	0.032	<0.032	0.007	48.055	0.049	<0.032
37	6-methyl-2-heptanone	8000	0.028	<0.028	0.007	43.385	0.054	<0.028
38	2-pentylfuran	1	0.029	<0.029	0.007	48.529	0.060	<0.029
39	biphenyl	200	0.031	<0.031	0.007	68.785	0.050	<0.031
40	2-heptylfuran	1	0.136	<0.136	0.016	29.991	0.133	<0.136
41	1,4-butanediol dinitrate	50	0.184	<0.184	0.008	45.671	0.067	<0.184
42	2-octylfuran	1	0.013	<0.013	0.006	238.802	0.057	<0.013
43	1,2,3-propanetriol 1,3-dinitrate	50	0.000	<0.132	0.004	342.258	0.046	<0.132
44	PCB	1000	0.139	<0.139	0.008	37.722	0.063	<0.139
45	6-(2-furanyl)-6-methyl-2-heptanone	1	0.025	<0.025	0.006	53.652	0.049	<0.025
46	furfural acetophenone	1	0.119	<0.119	0.015	28.325	0.136	<0.119
N/A*	The maximum peak value for but-3-en-2-one + 2,3 dihydrofuran + 2,5 dihydrofuran was 0.221 ppb and the median value was <0.034 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 March 26, 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.

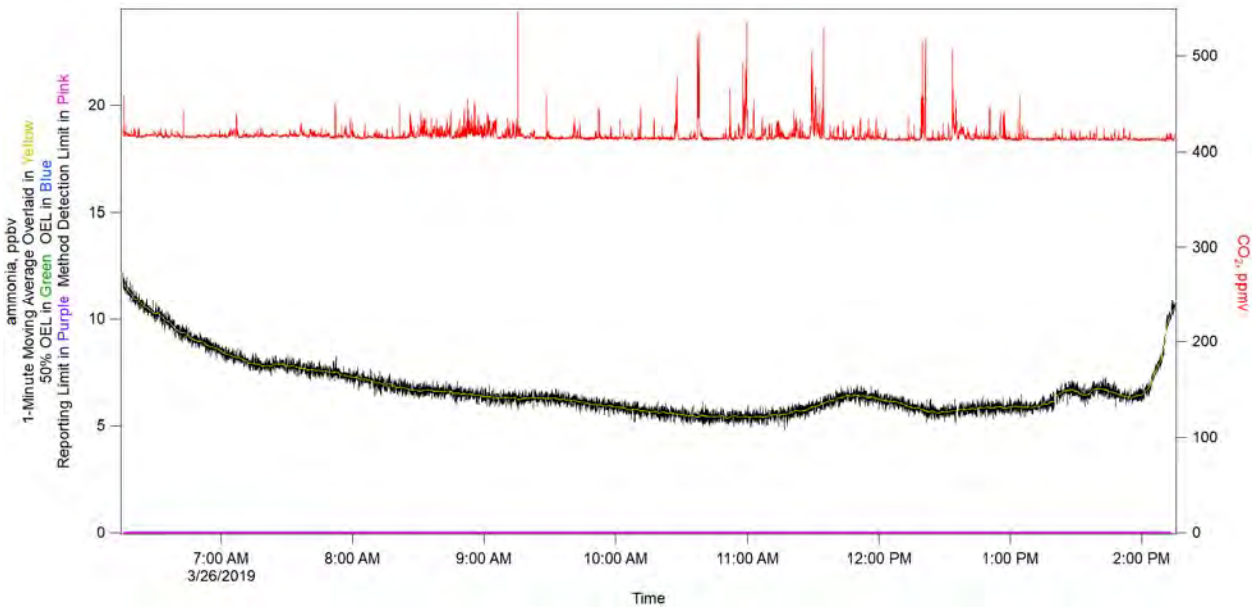


Figure 3-3. Ammonia.

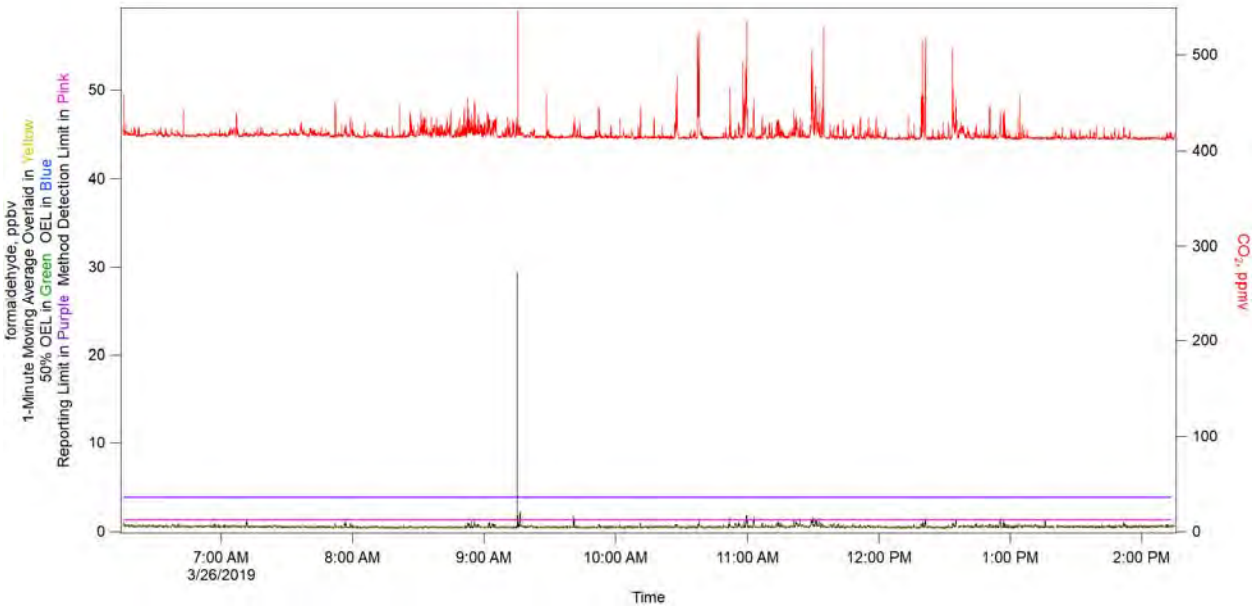


Figure 3-4. Formaldehyde.

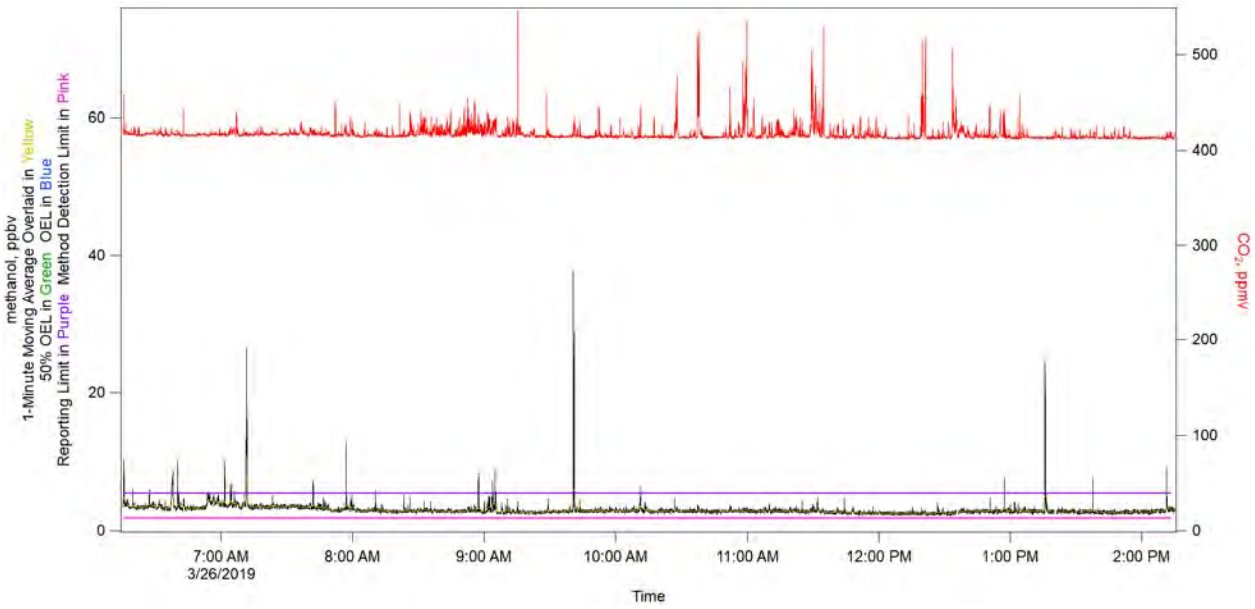


Figure 3-5. Methanol.

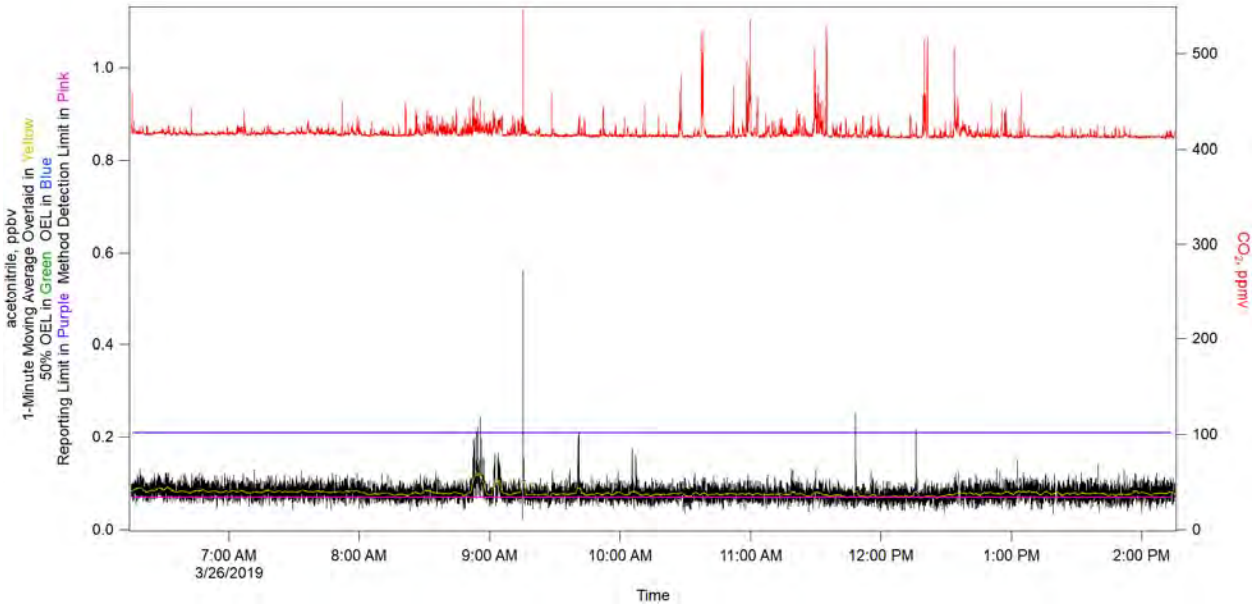


Figure 3-6. Acetonitrile.

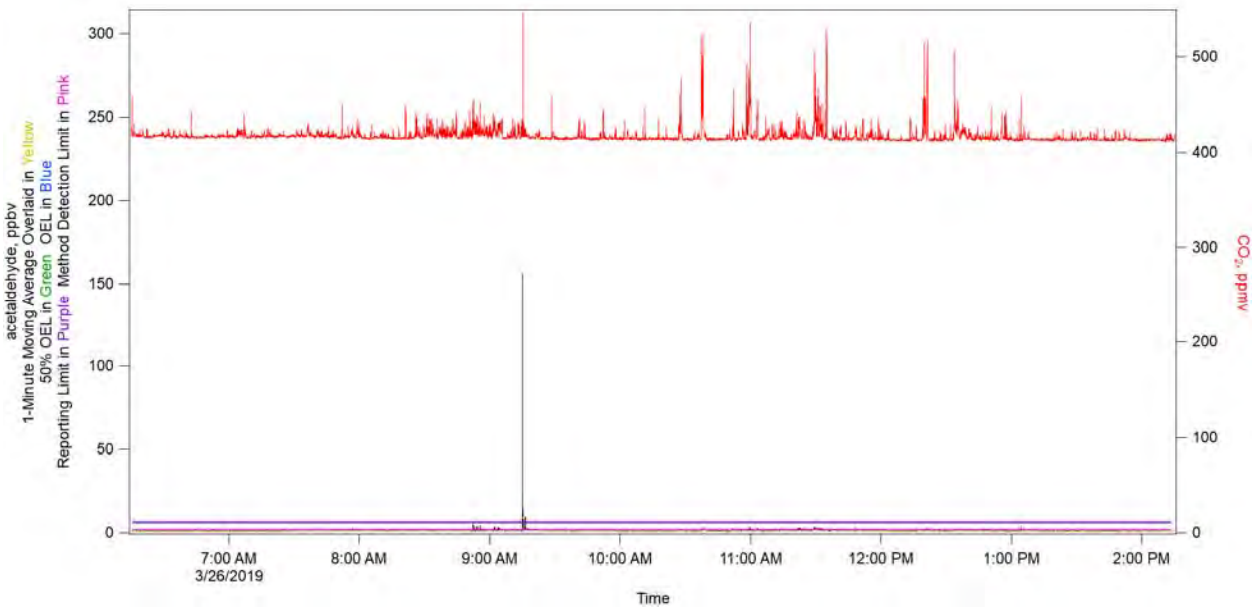


Figure 3-7. Acetaldehyde.

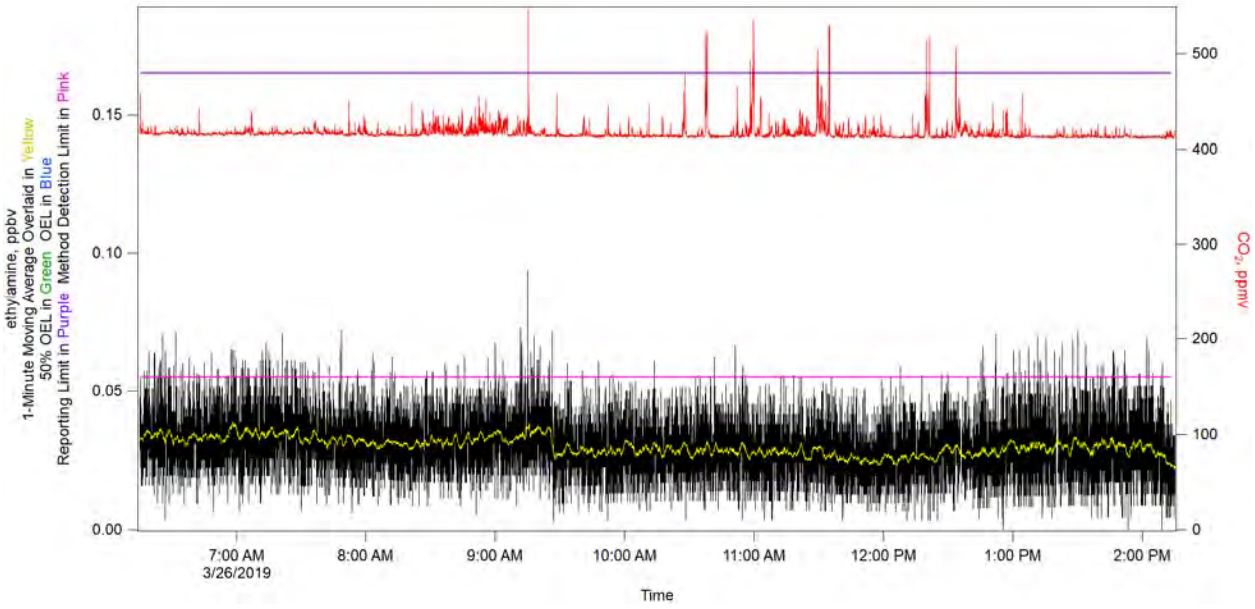


Figure 3-8. Ethylamine.

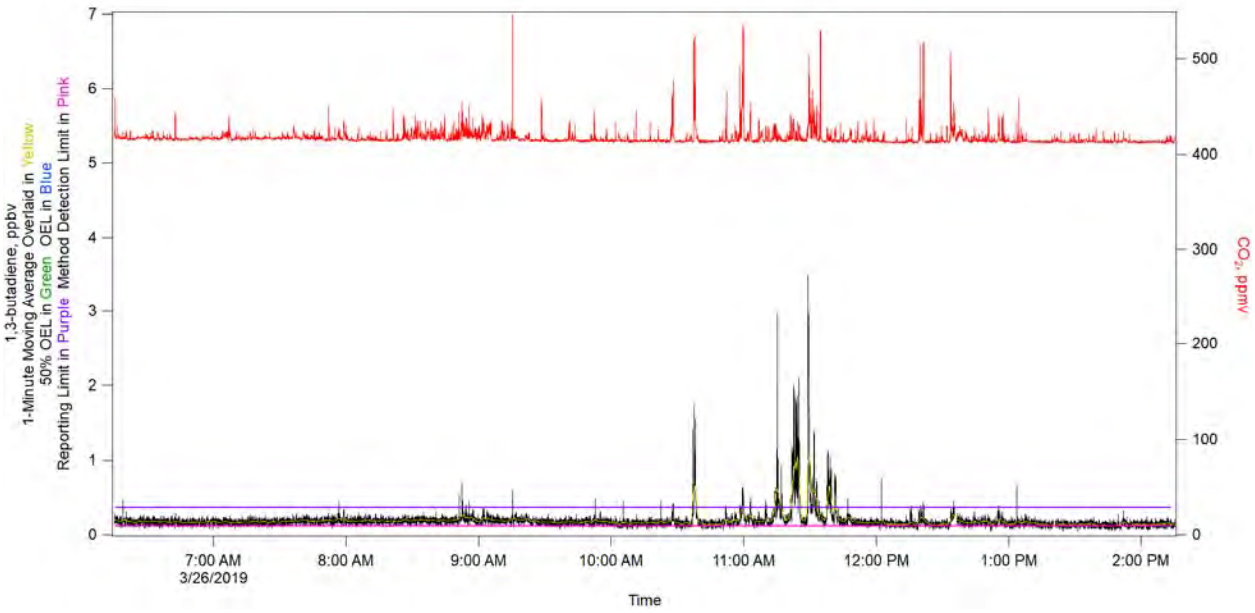


Figure 3-9. 1,3-butadiene.

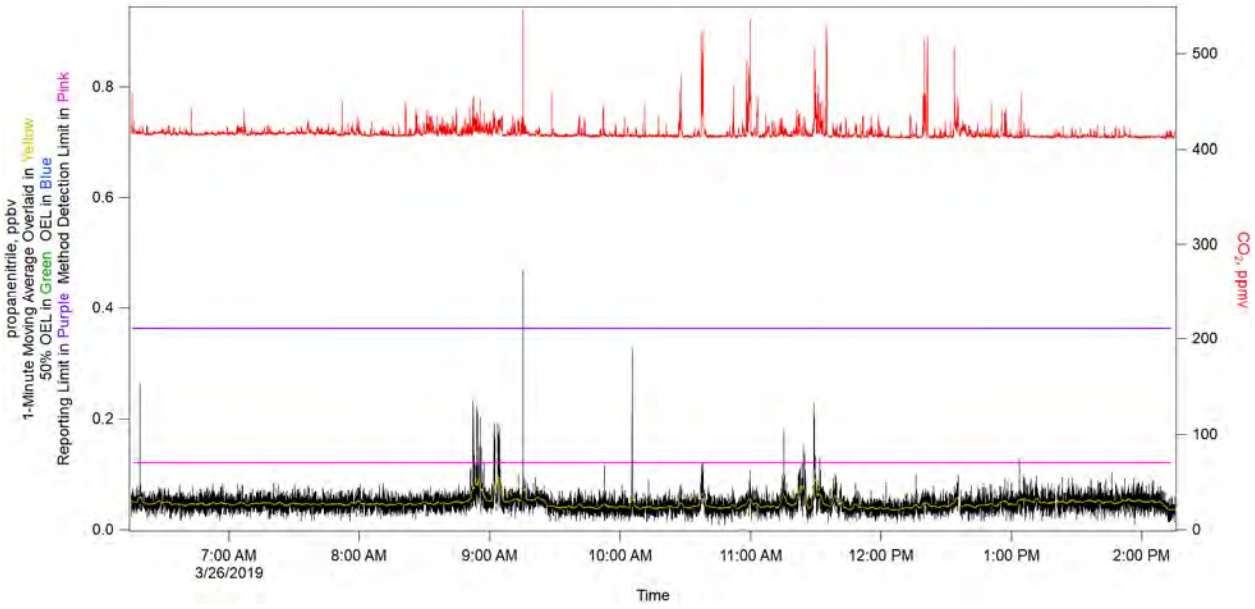


Figure 3-10. Propanenitrile.

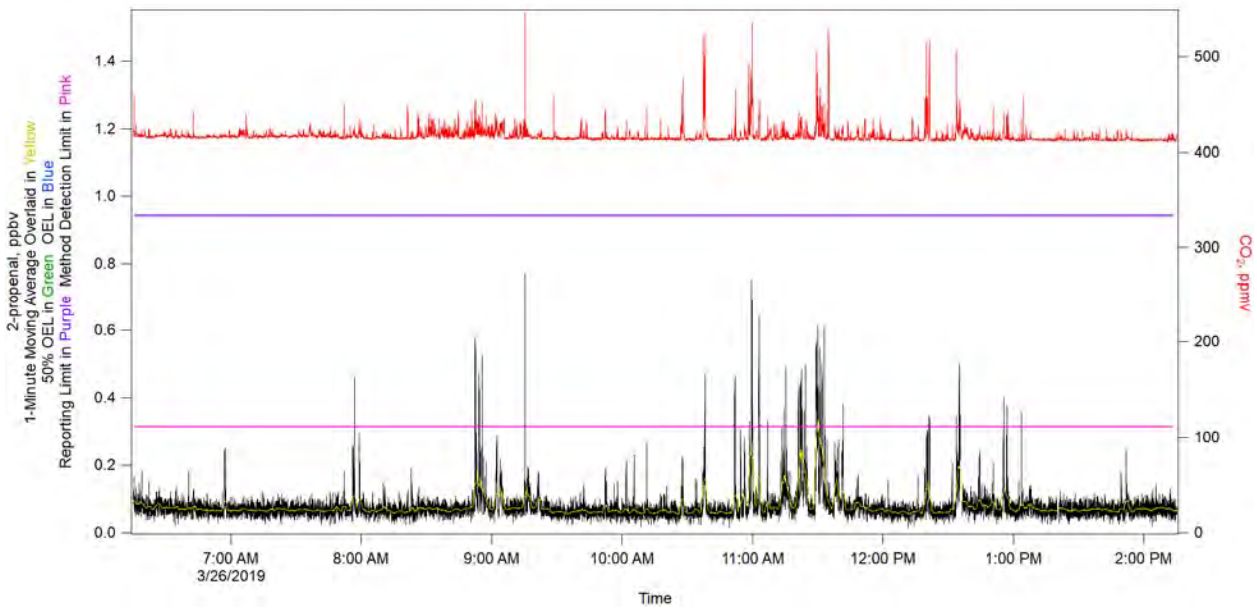


Figure 3-11. 2-propenal.

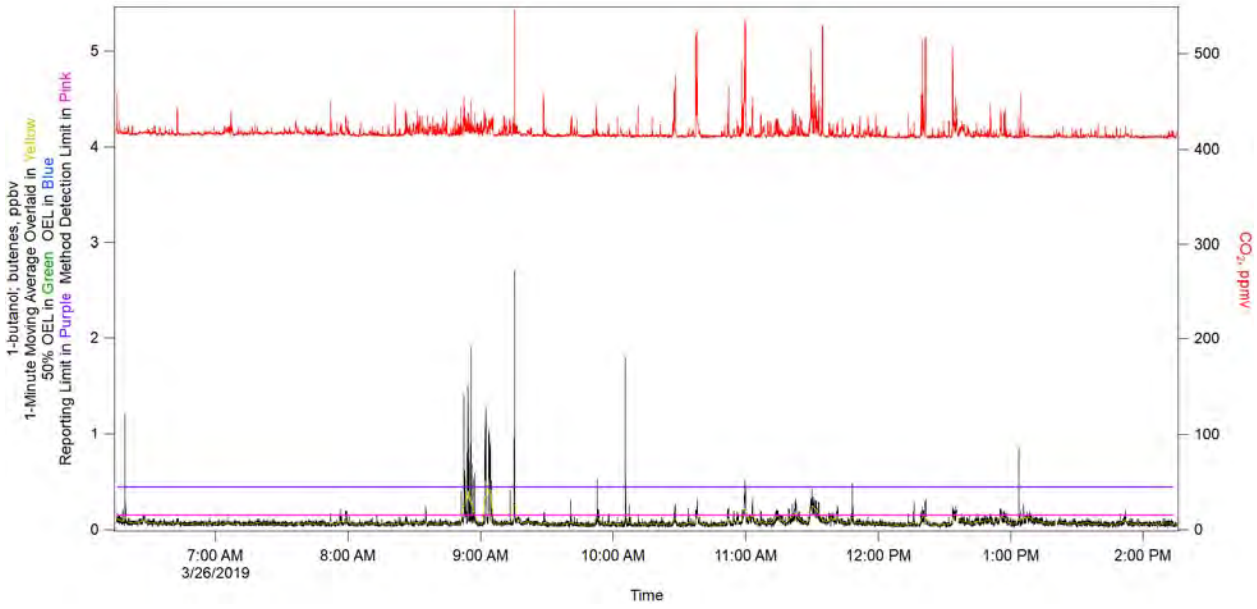


Figure 3-12. 1-butanol; Butenes.

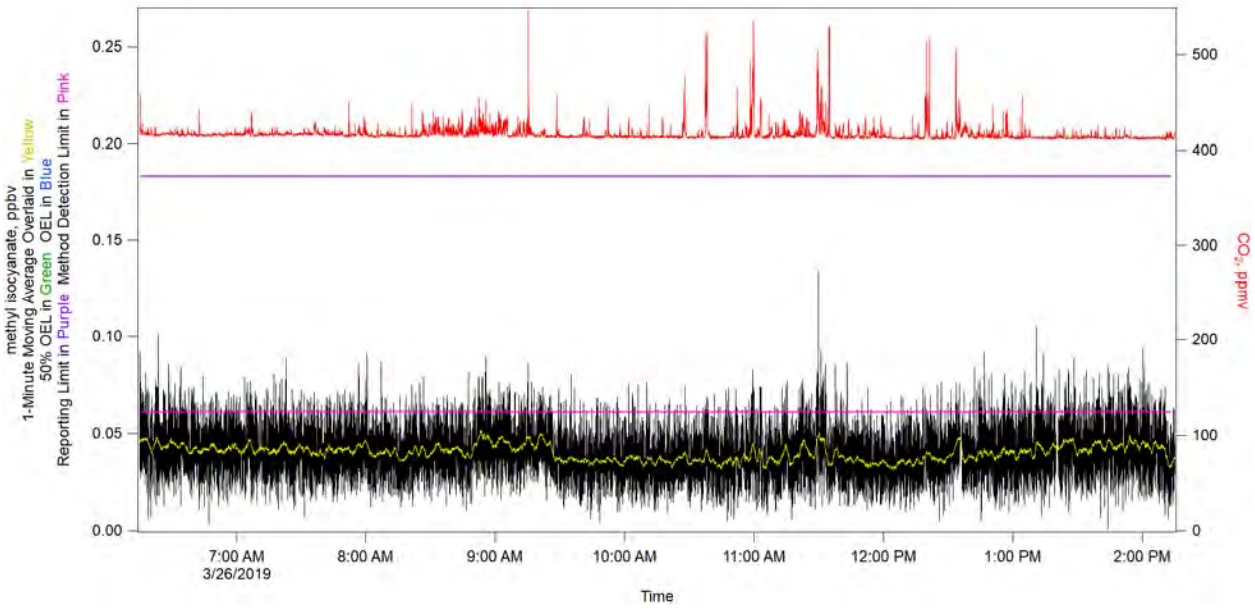


Figure 3-13. Methyl Isocyanate.

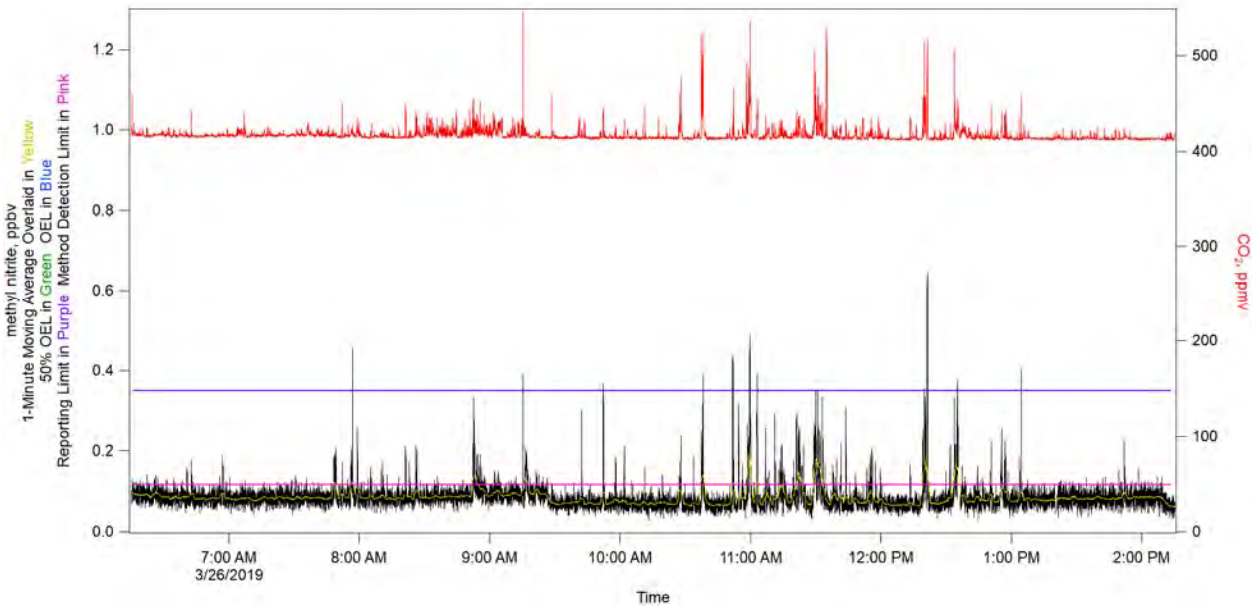


Figure 3-14. Methyl Nitrite.

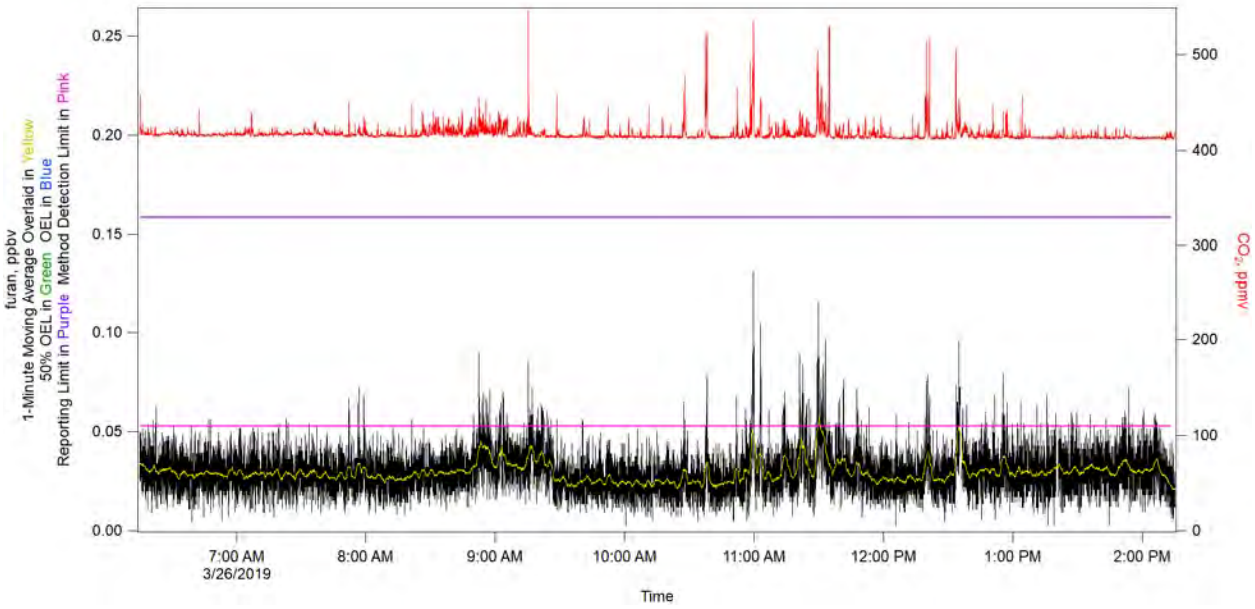


Figure 3-15. Furan.

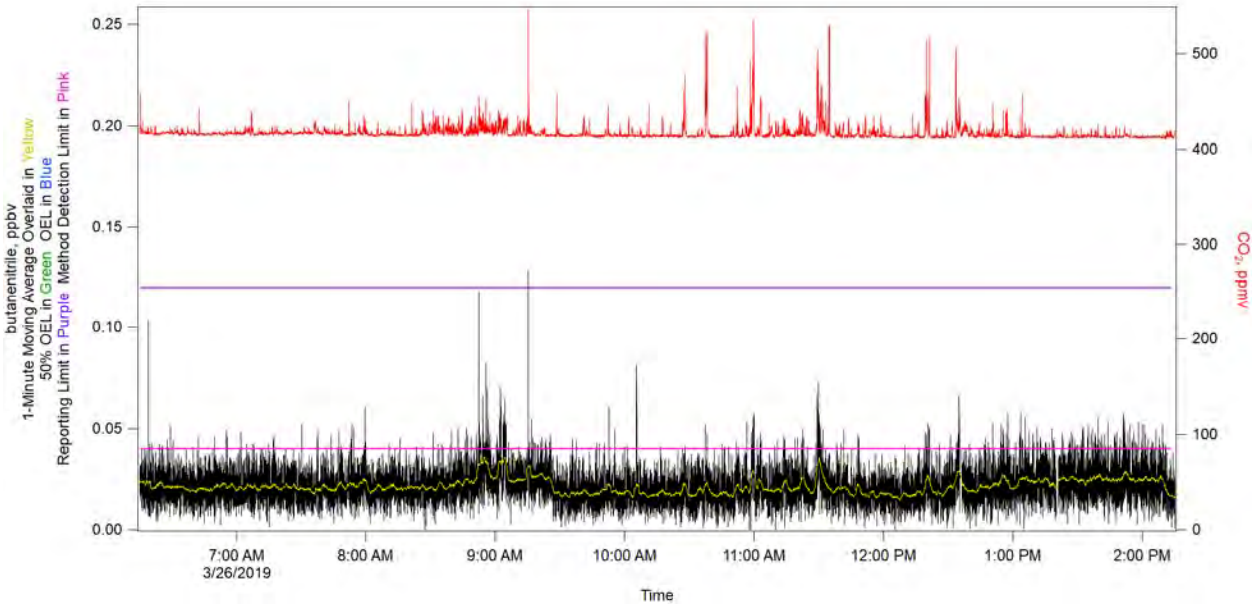


Figure 3-16. Butanenitrile.

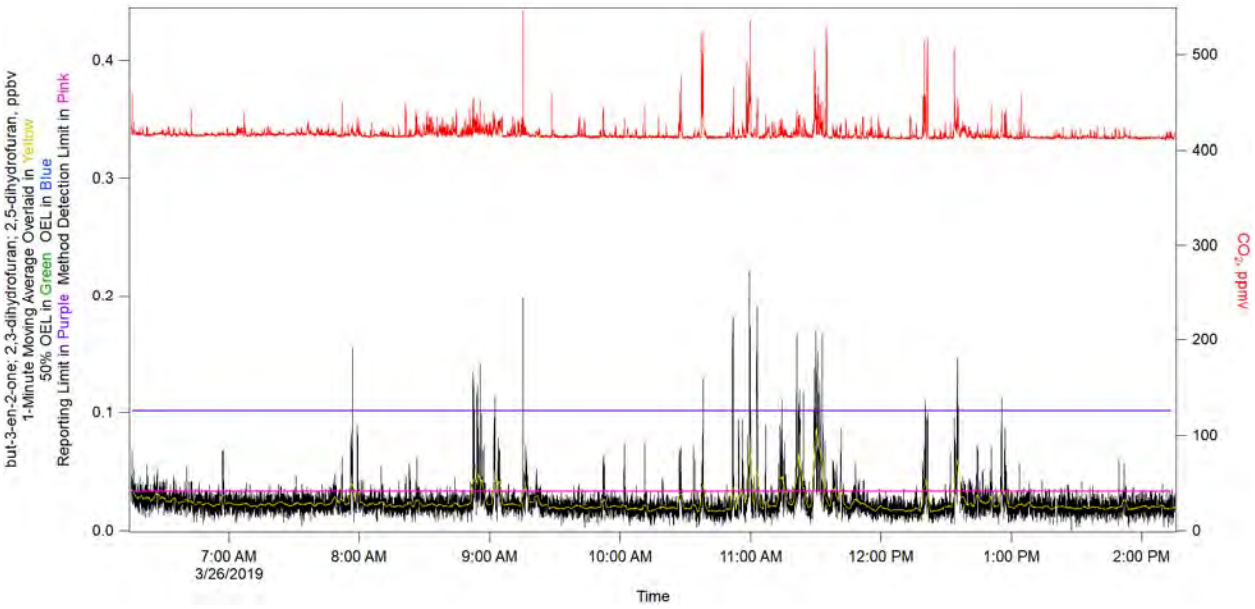


Figure 3-17. But-3-en-2-one; 2,3-dihydrofuran; 2,5-dihydrofuran.

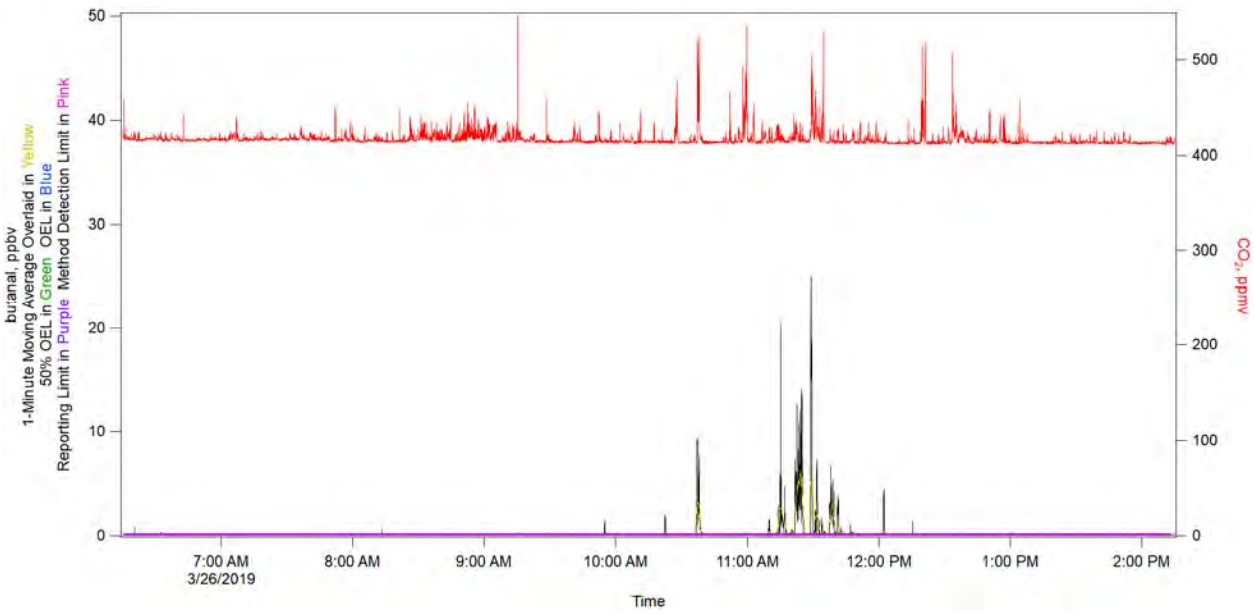


Figure 3-18. Butanal.

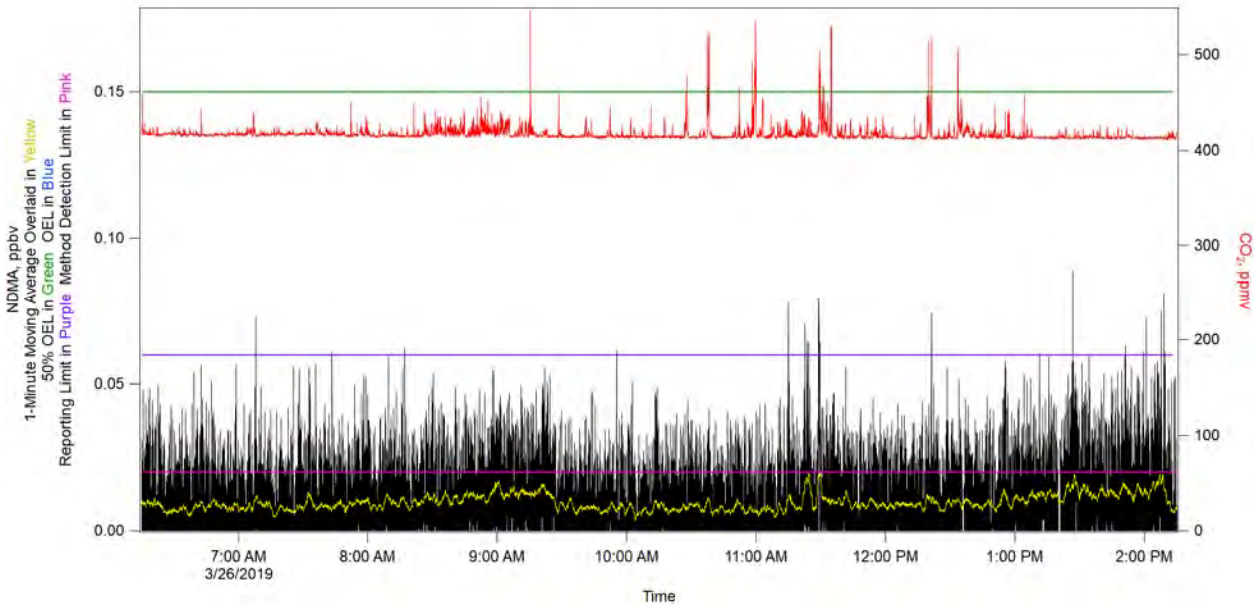


Figure 3-19. N-nitrosodimethylamine (NDMA).

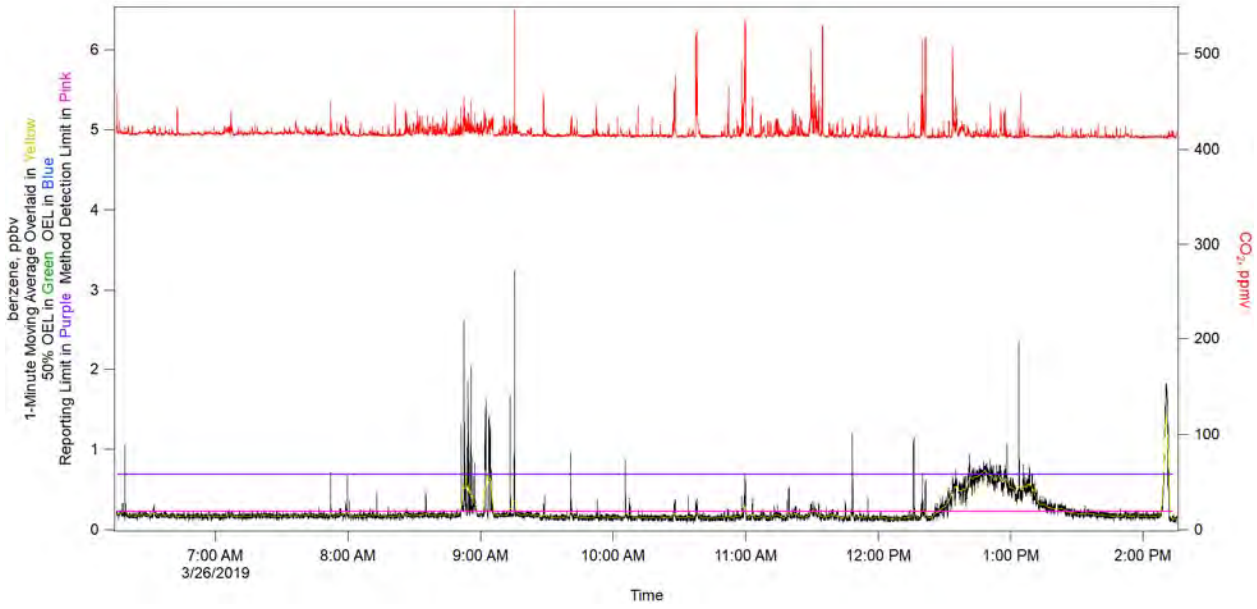


Figure 3-20. Benzene.

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

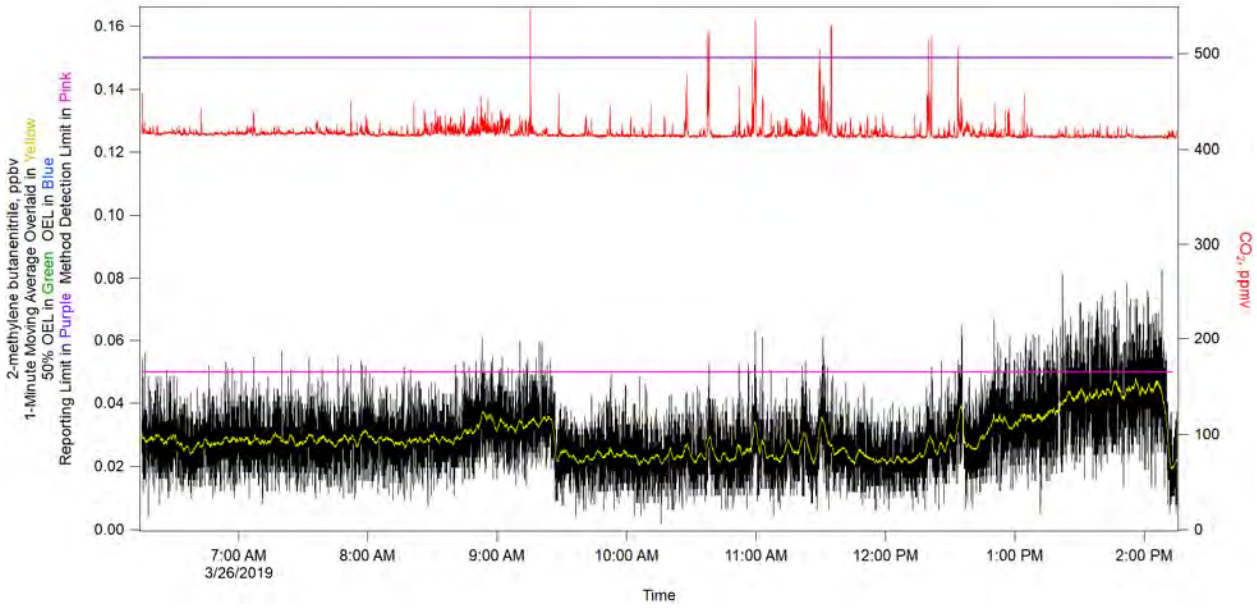


Figure 3-22. 2-methylene Butanenitrile.

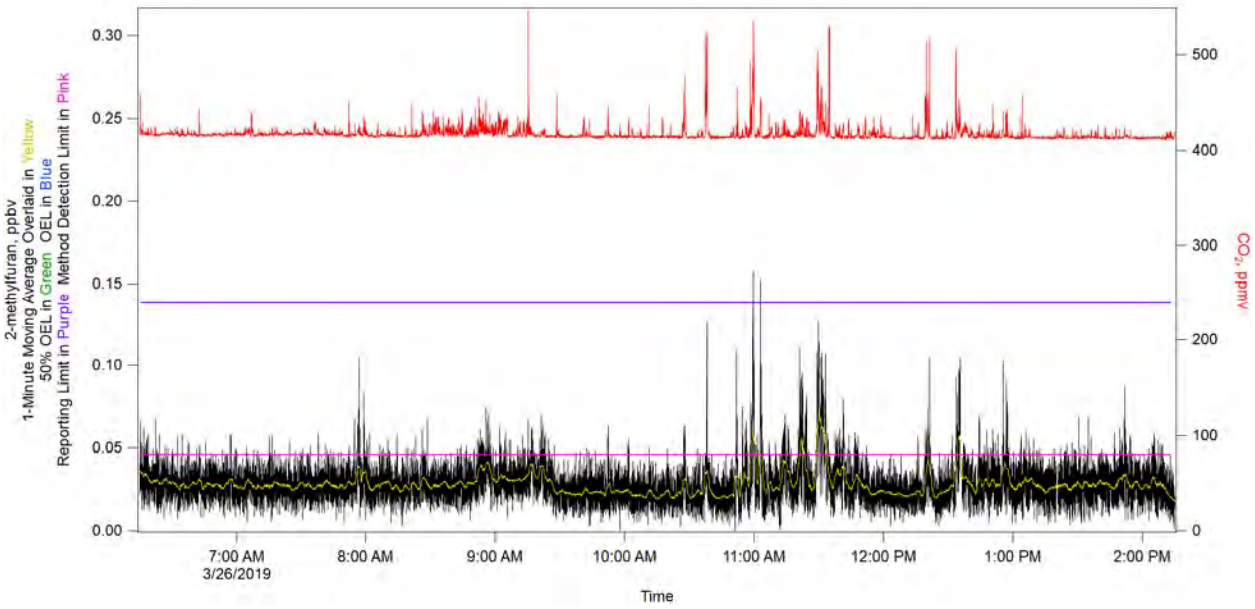


Figure 3-23. 2-methylfuran.

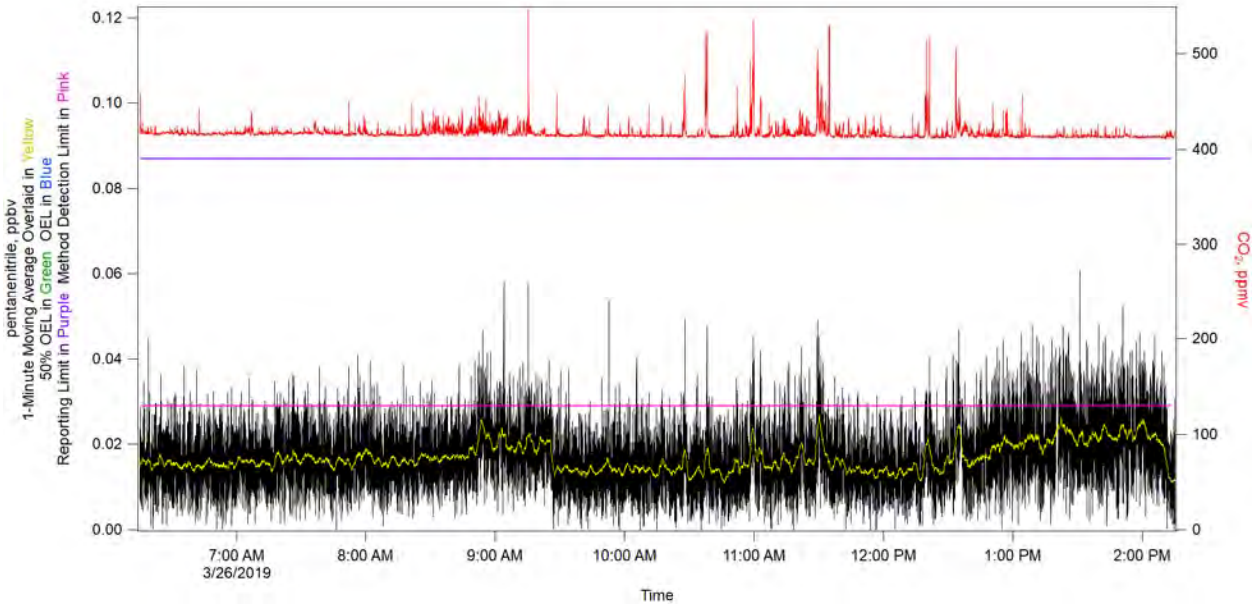


Figure 3-24. Pentanenitrile.

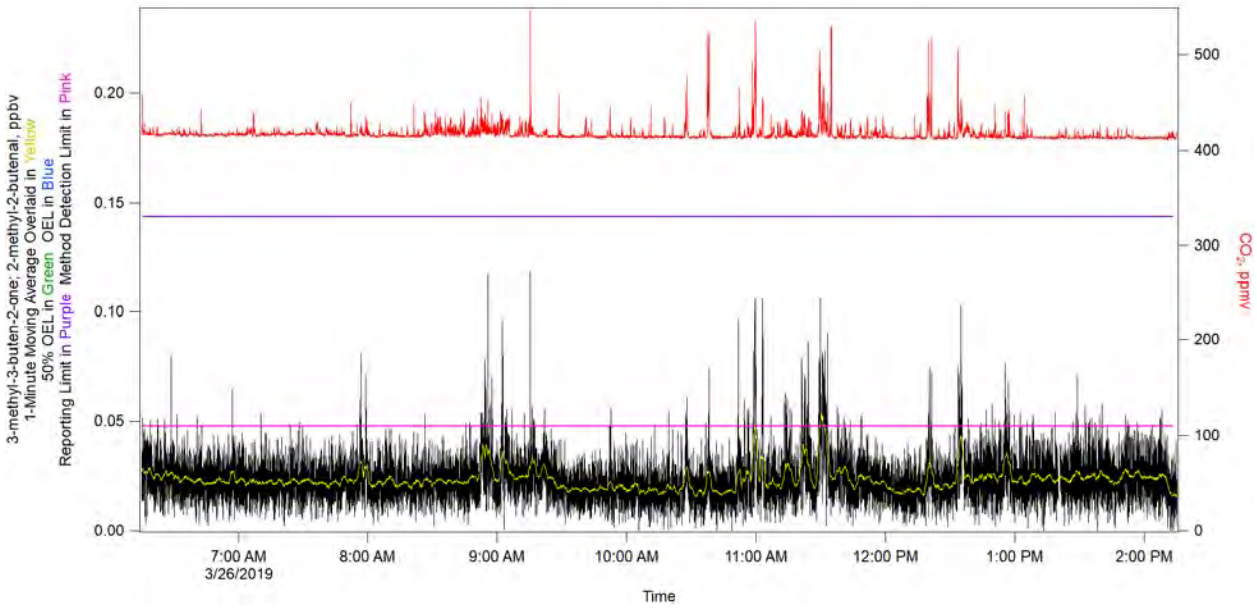


Figure 3-25. 3-methyl-3-buten-2-one; 2-methyl-2-butenal.

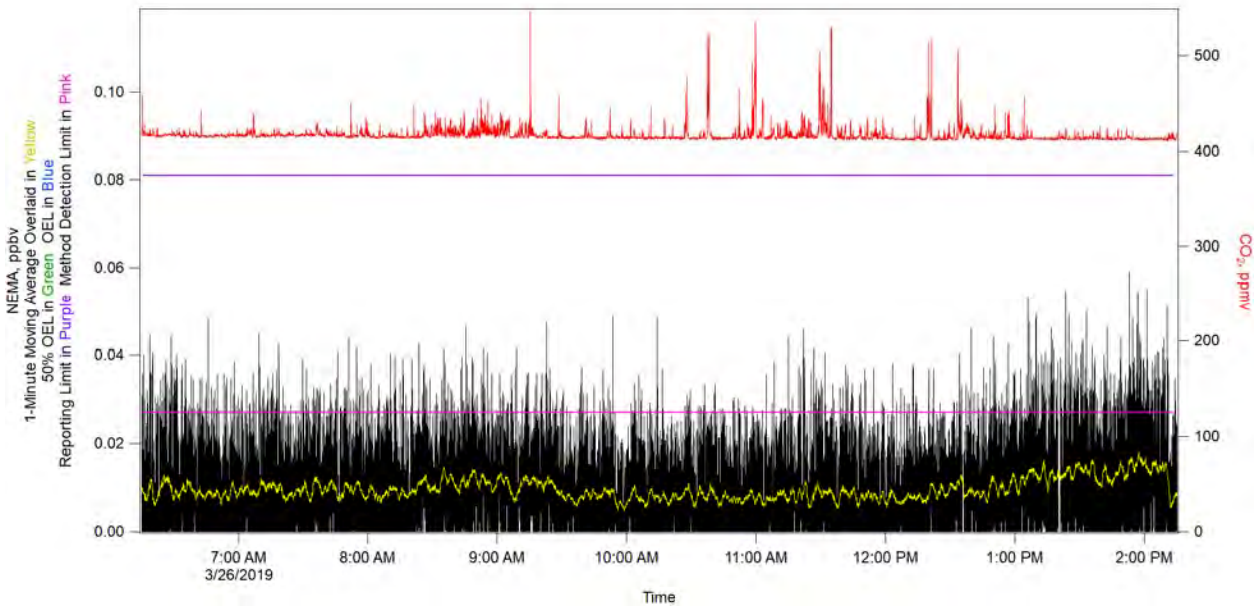


Figure 3-26. N-nitrosomethylethylamine (NEMA).

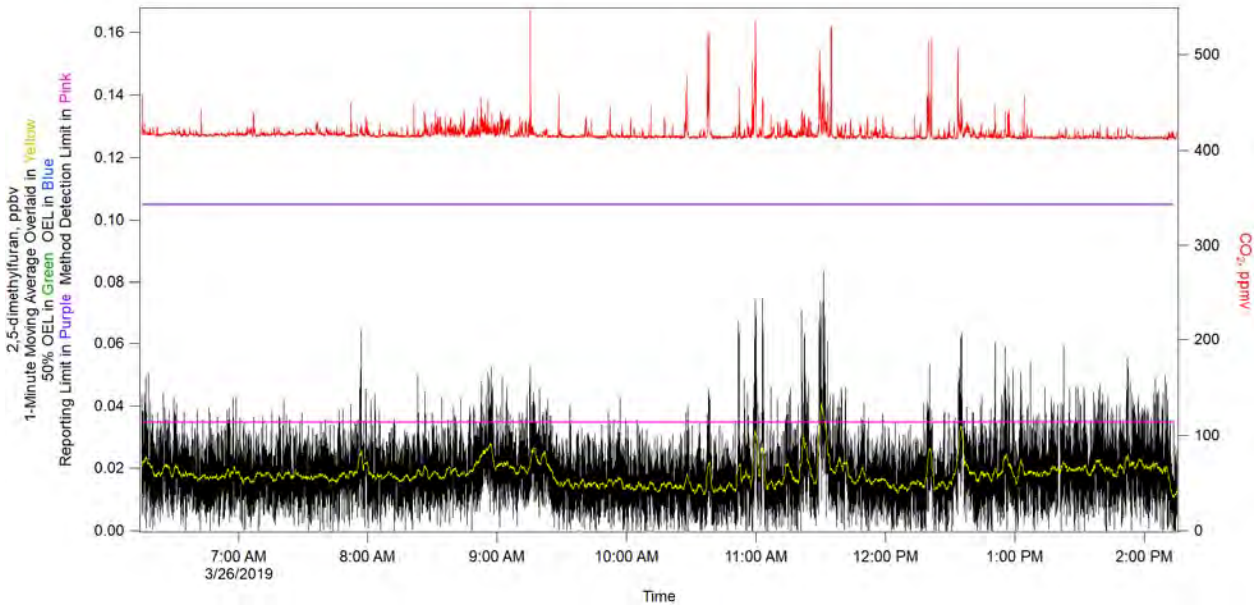


Figure 3-27. 2,5-dimethylfuran.

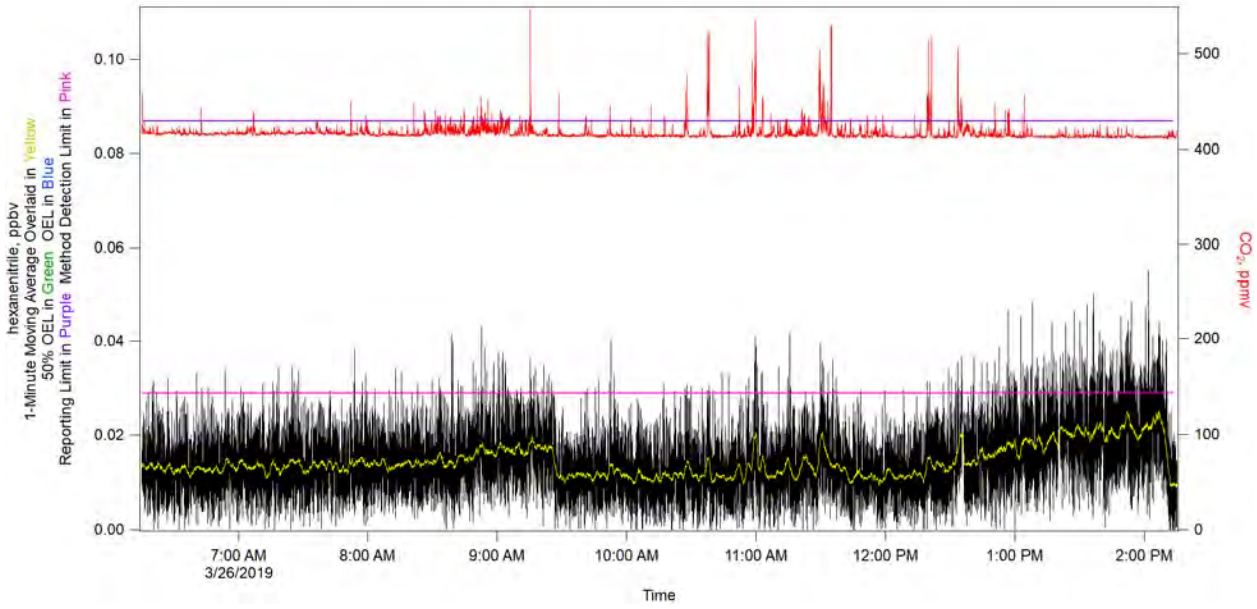


Figure 3-28. Hexanenitrile.

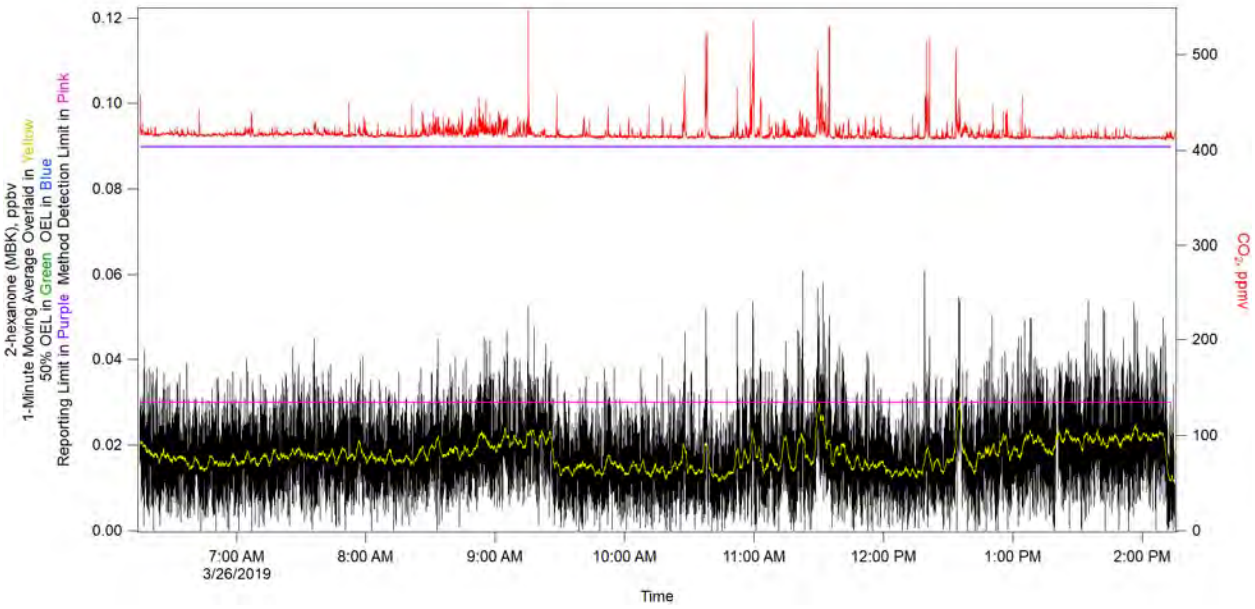


Figure 3-29. 2-hexanone (MBK).

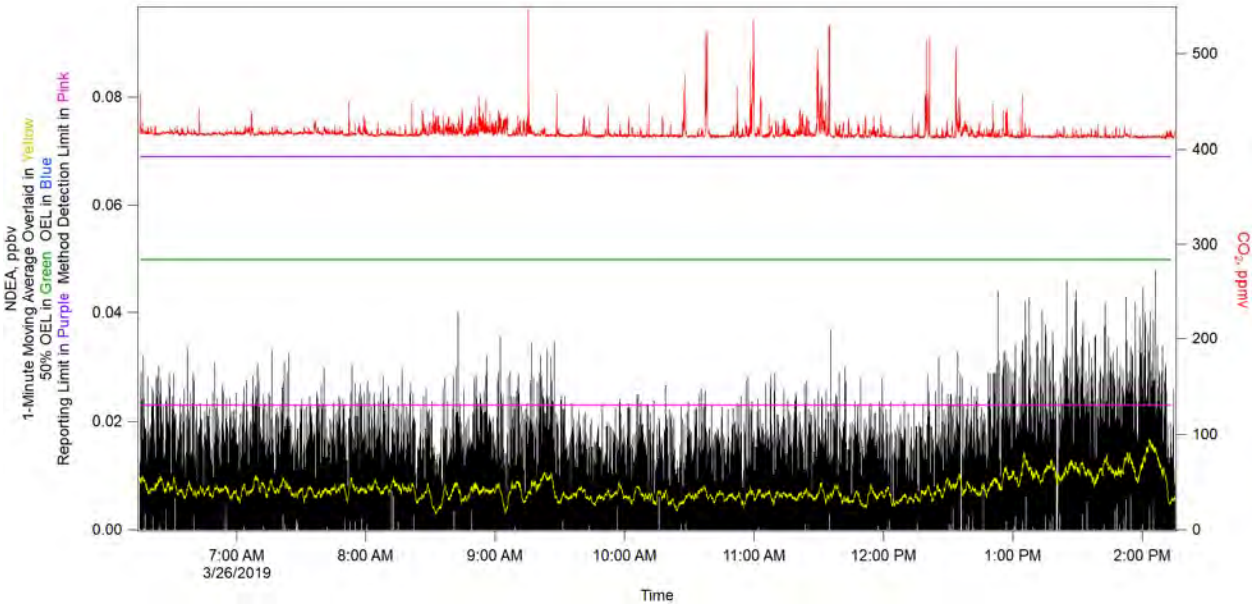


Figure 3-30. N-nitrosodiethylamine (NDEA).

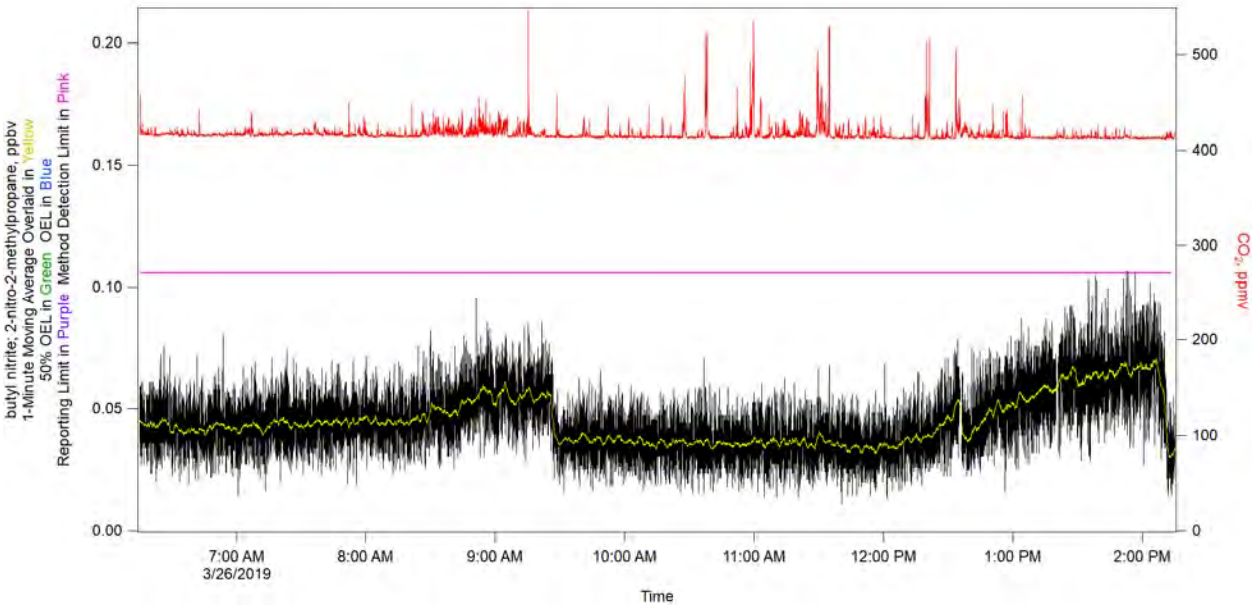


Figure 3-31. Butyl Nitrite; 2-nitro-2-methylpropane.

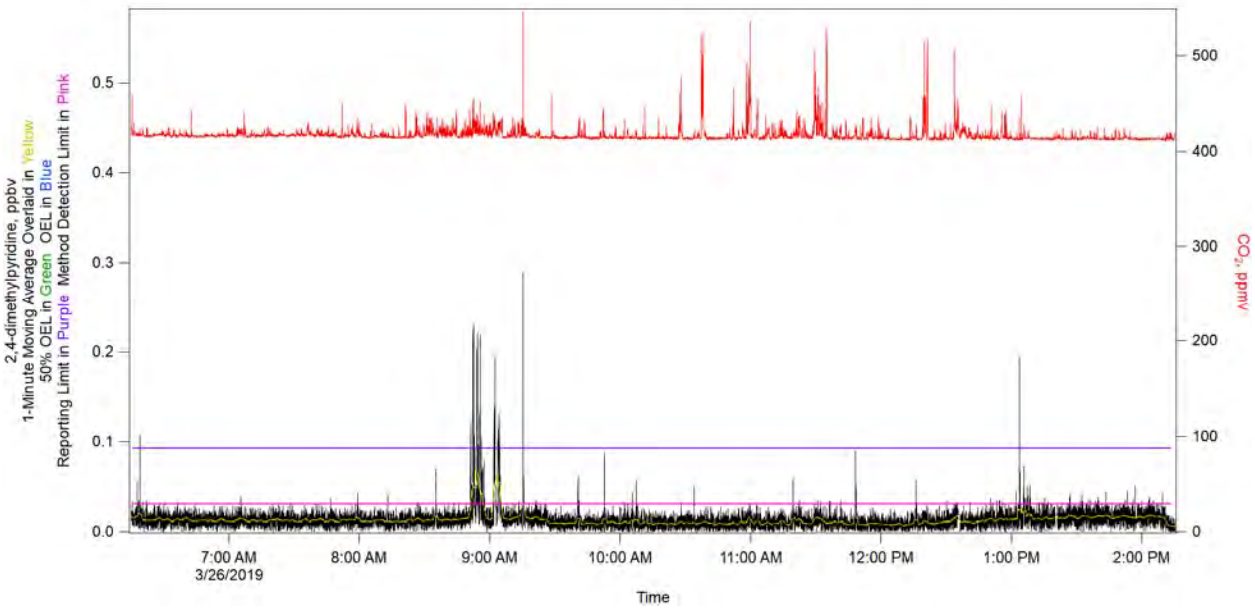


Figure 3-32. 2,4-dimethylpyridine.

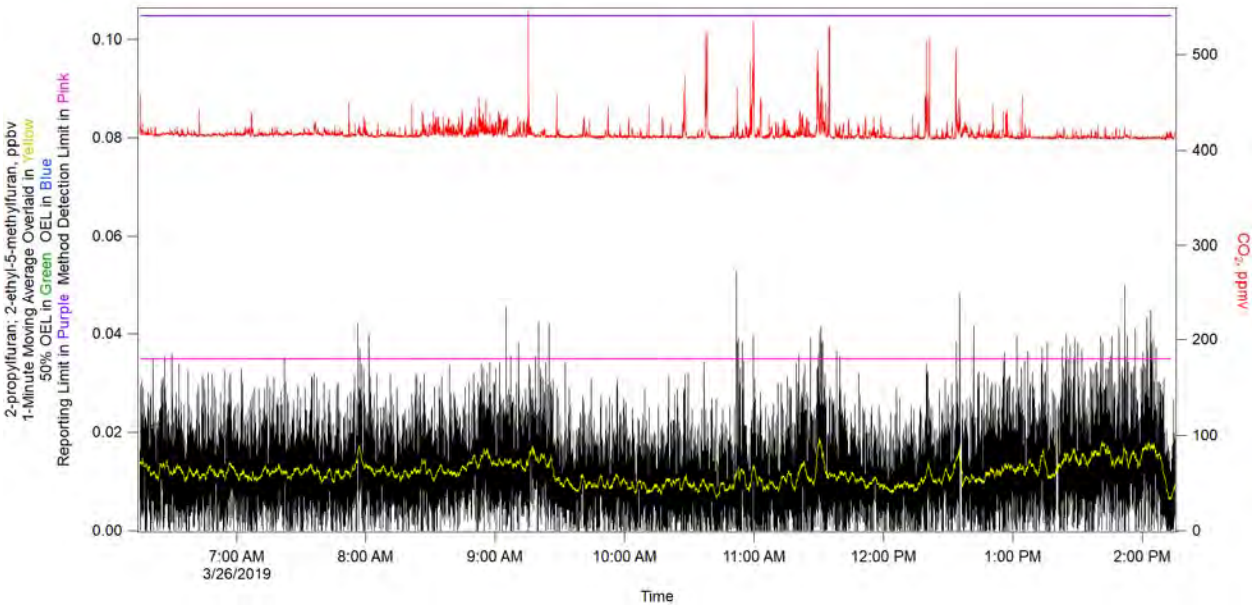


Figure 3-33. 2-propylfuran; 2-ethyl-5-methylfuran.

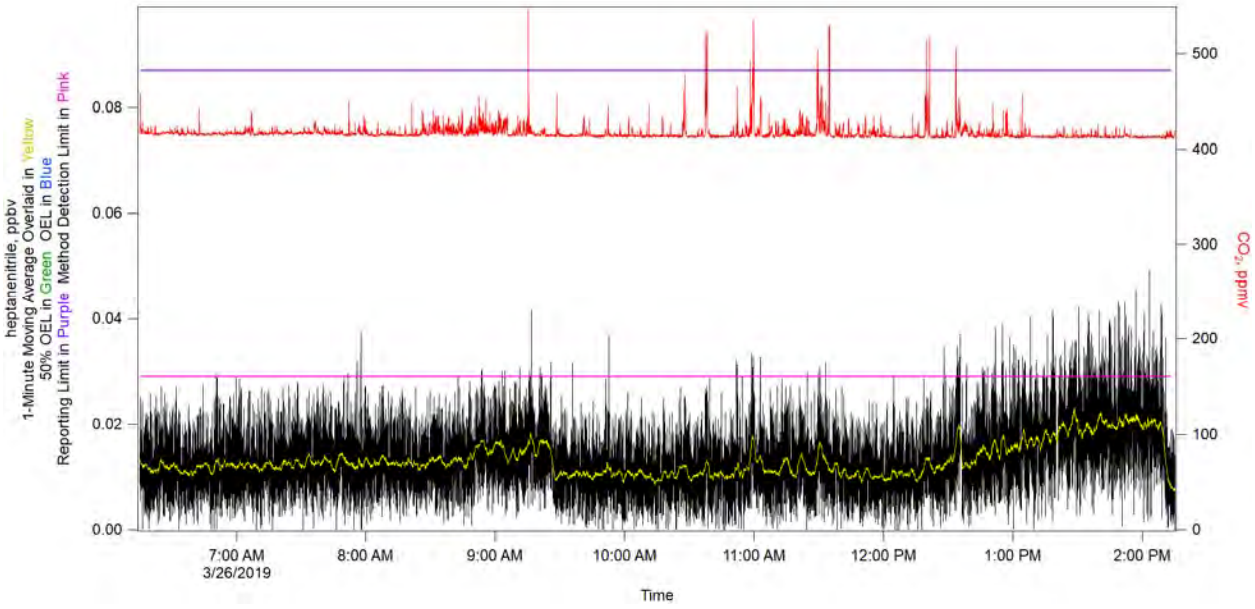


Figure 3-34. Heptanenitrile.

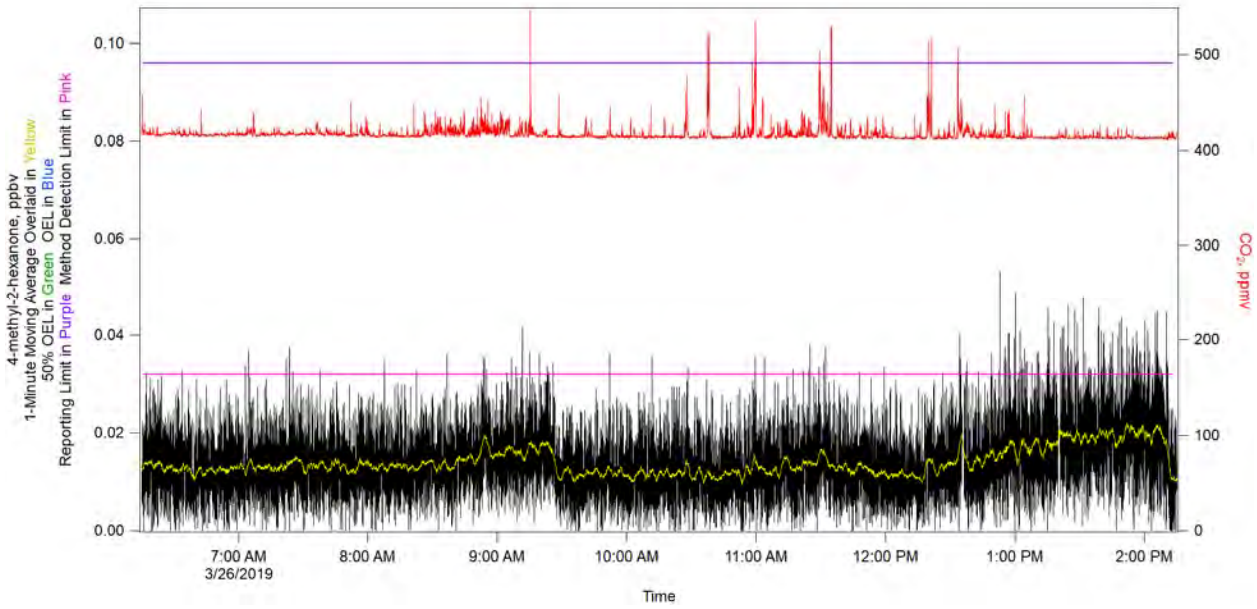


Figure 3-35. 4-methyl-2-hexanone.

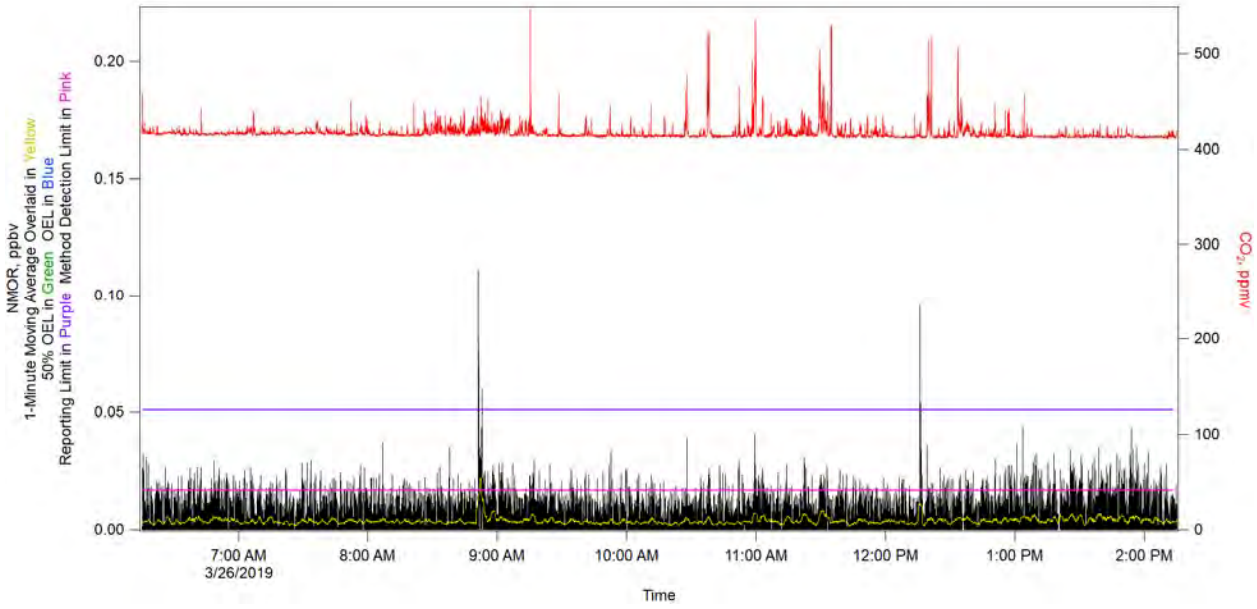


Figure 3-36. N-nitrosomorpholine (NMOR).

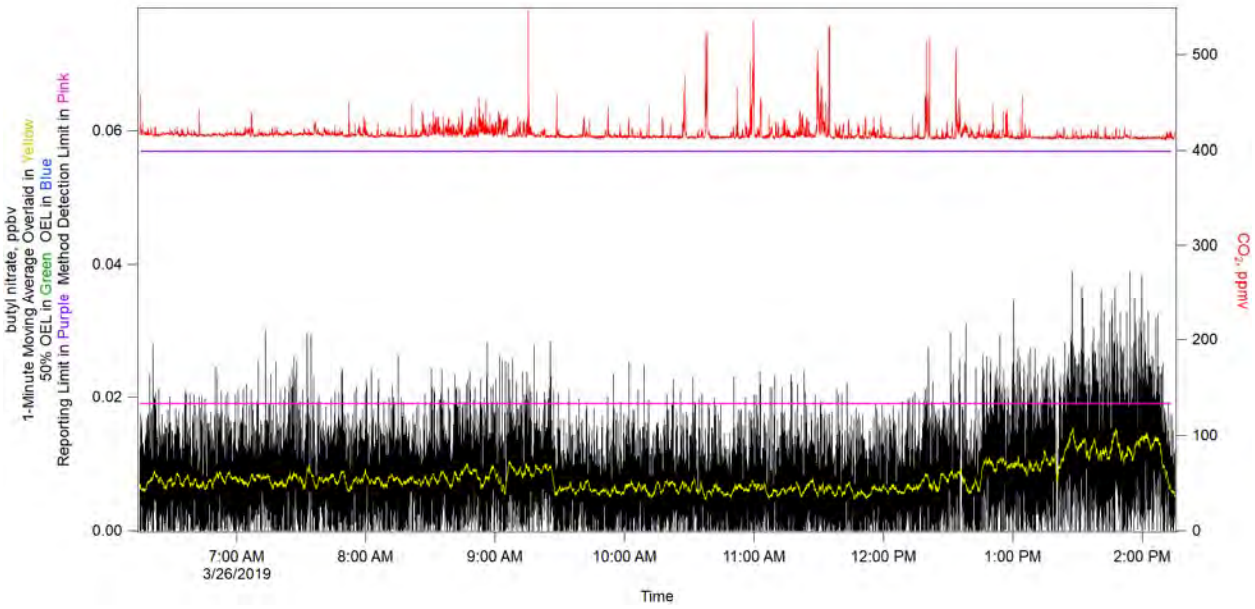


Figure 3-37. Butyl Nitrate.

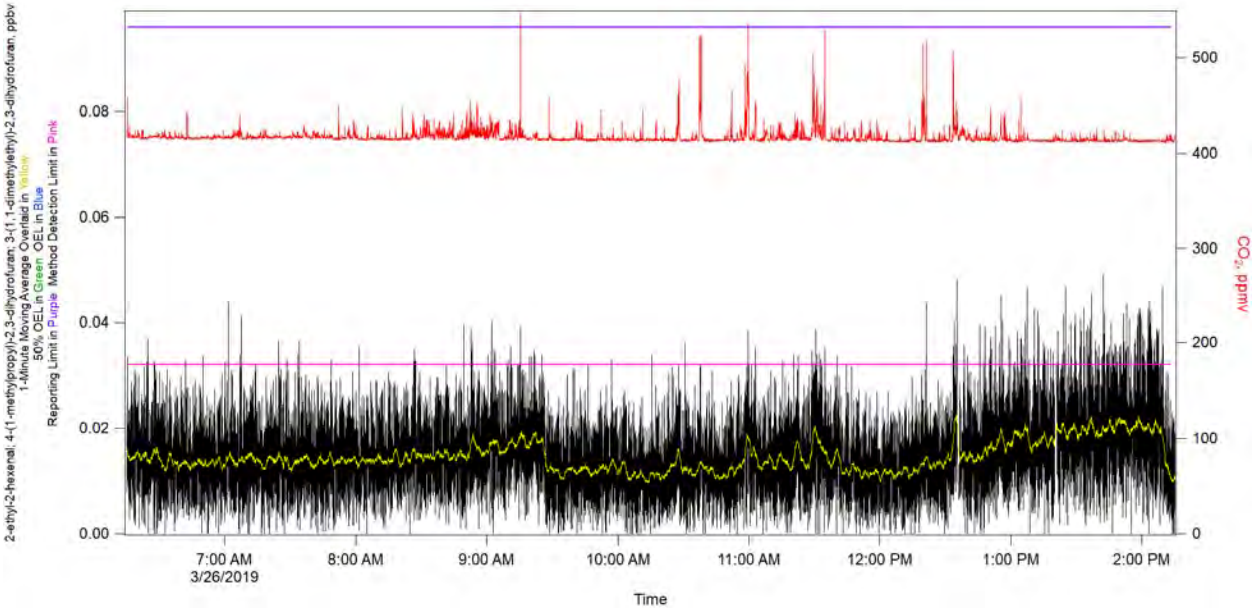


Figure 3-38. 2-ethyl-2-hexenal; 4-(1-methylpropyl)-2,3-dihydrofuran 3-(1,1-dimethylethyl)-2,3-dihydrofuran.

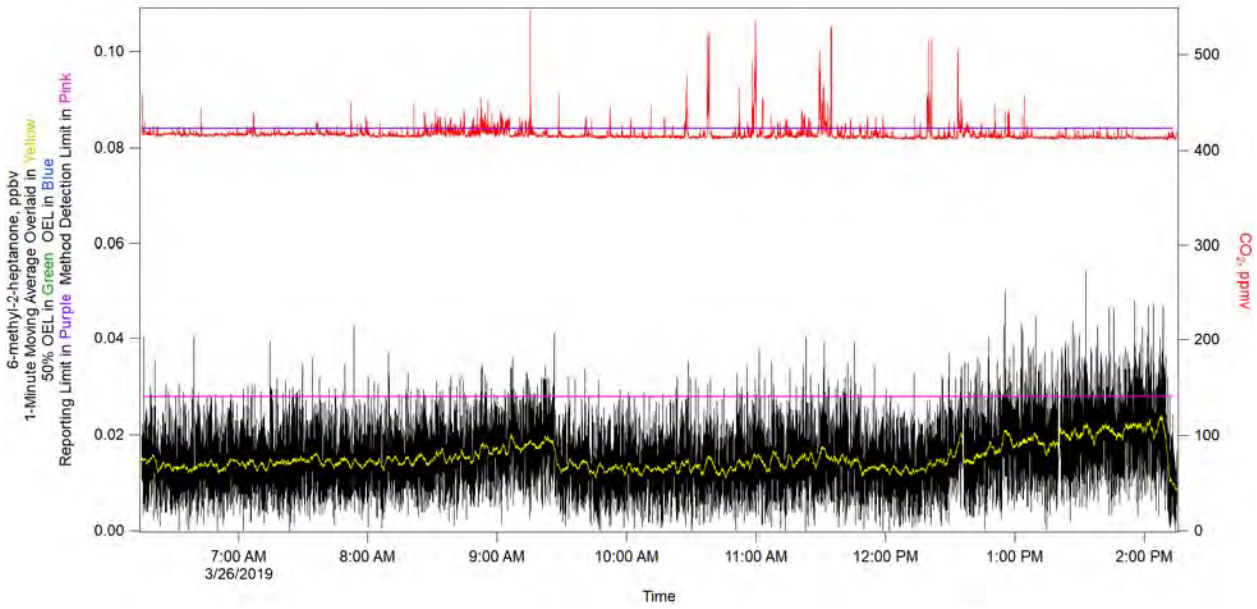


Figure 3-39. 6-methyl-2-heptanone.

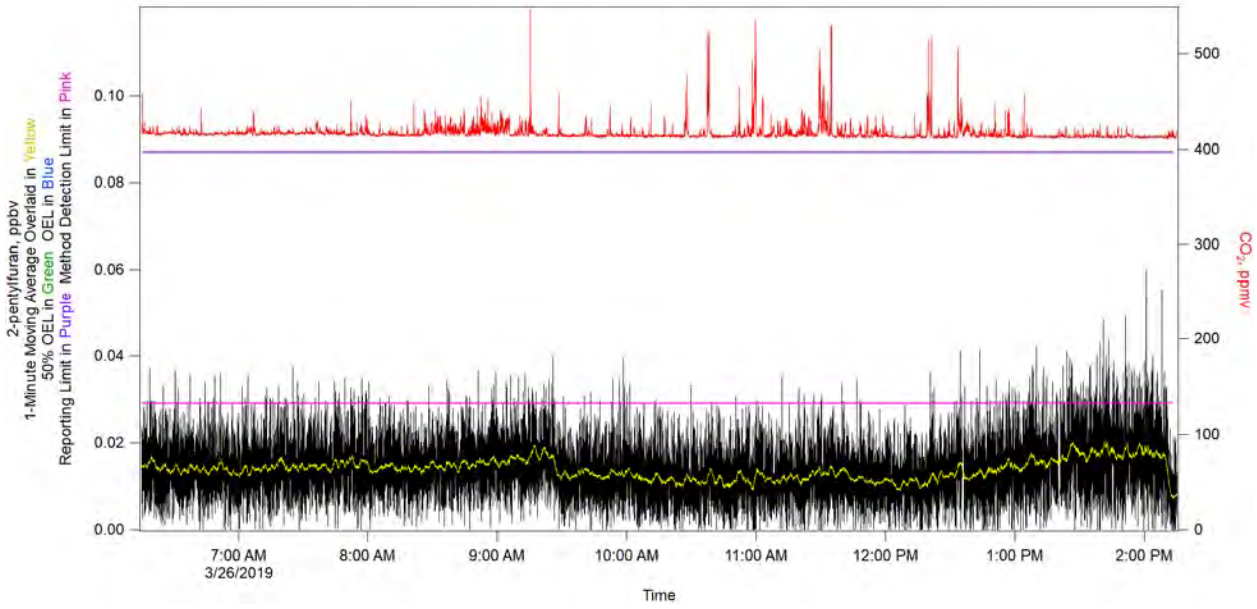


Figure 3-40. 2-pentylfuran.

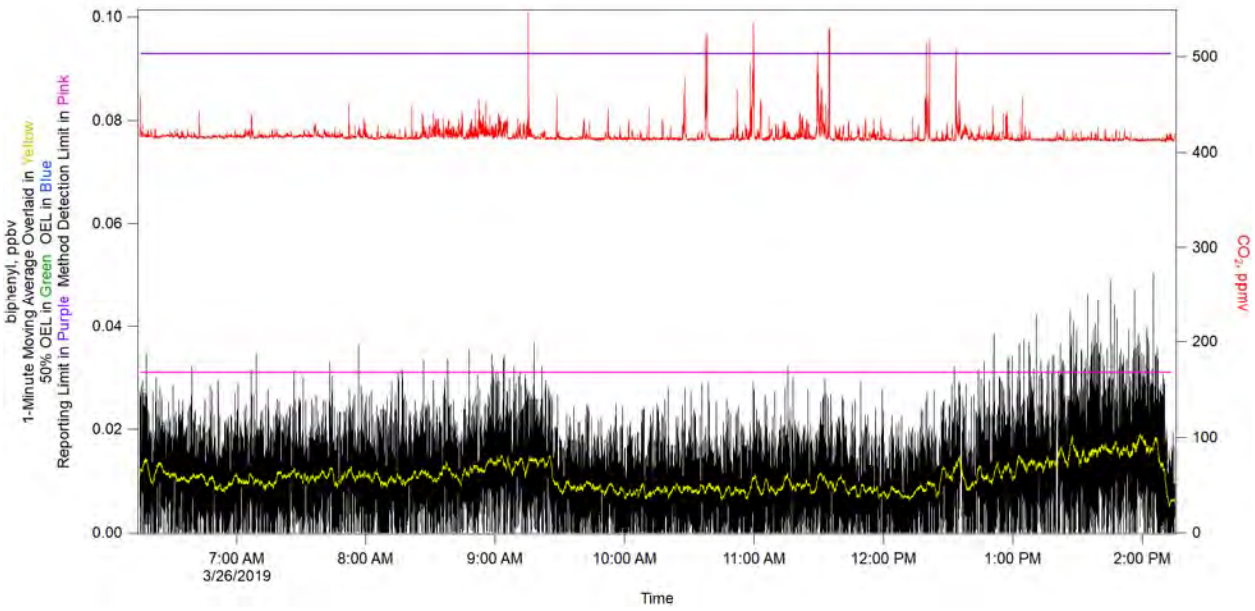


Figure 3-41. Biphenyl.

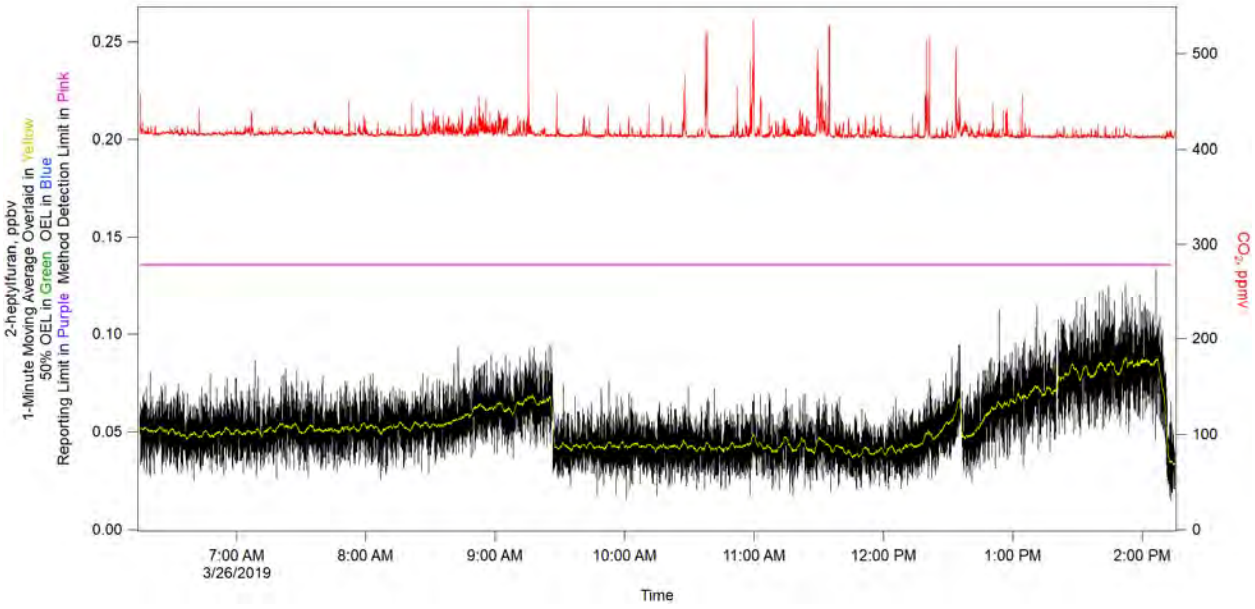


Figure 3-42. 2-heptylfuran.

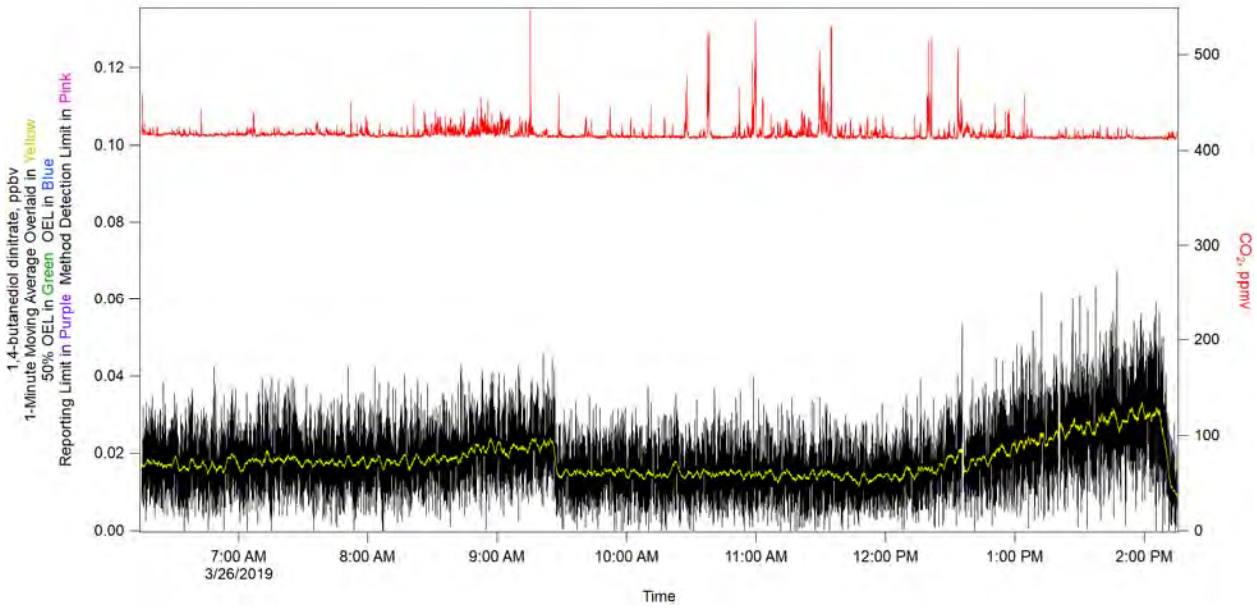


Figure 3-43. 1,4-butanediol Dinitrate.

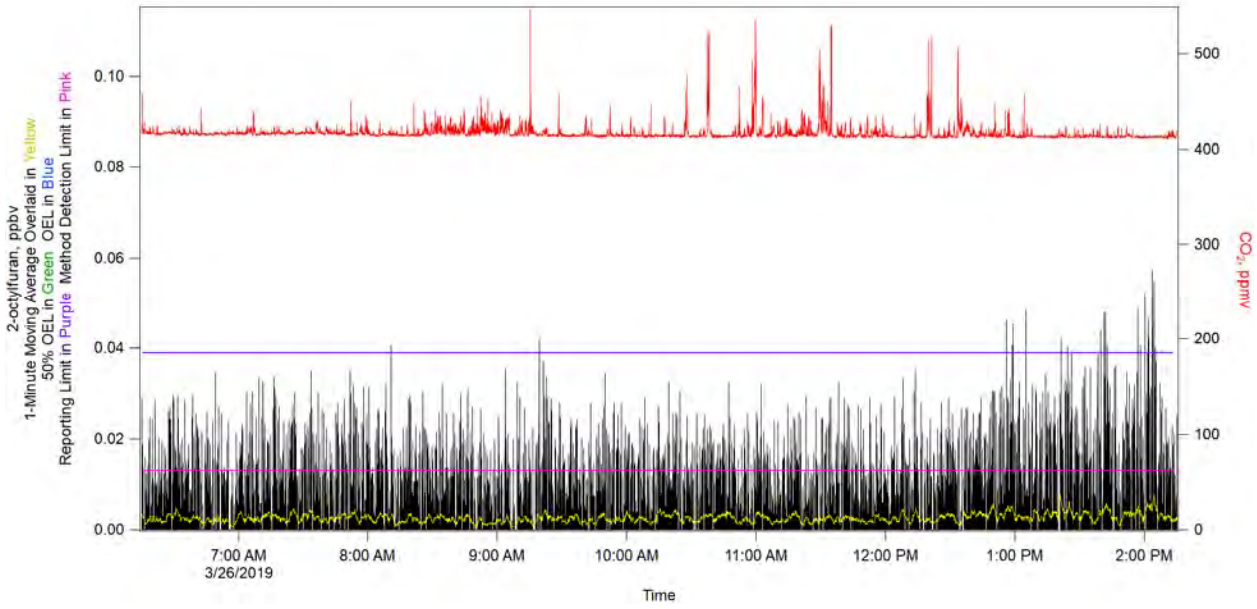


Figure 3-44. 2-octylfuran.

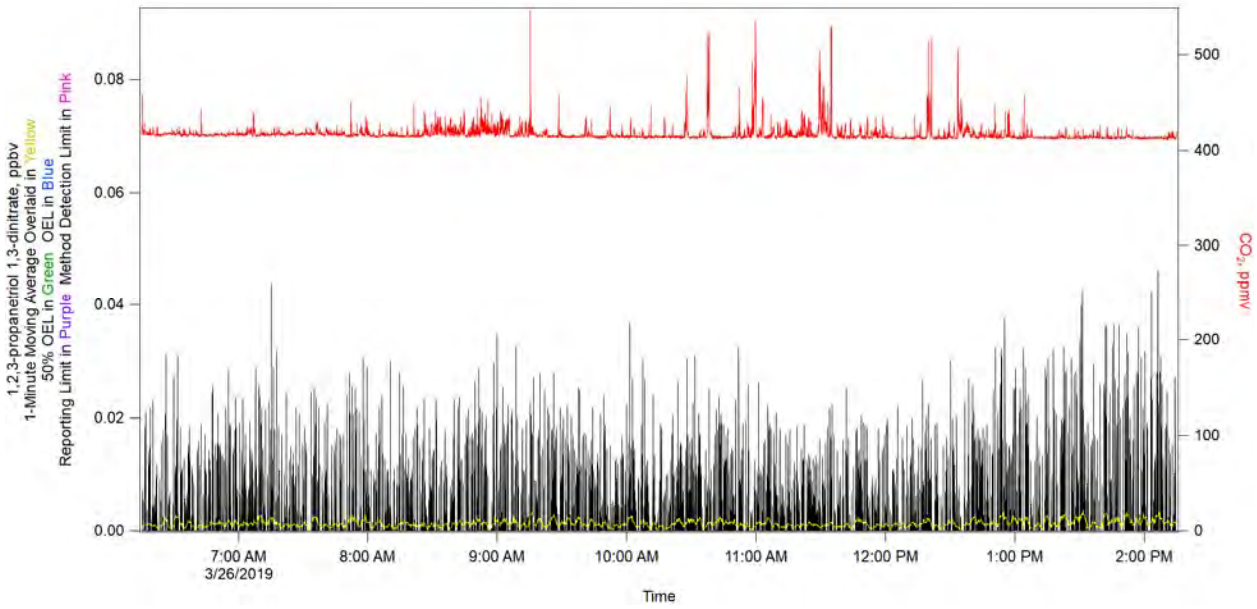


Figure 3-45. 1,2,3-propanetriol 1,3-dinitrate.

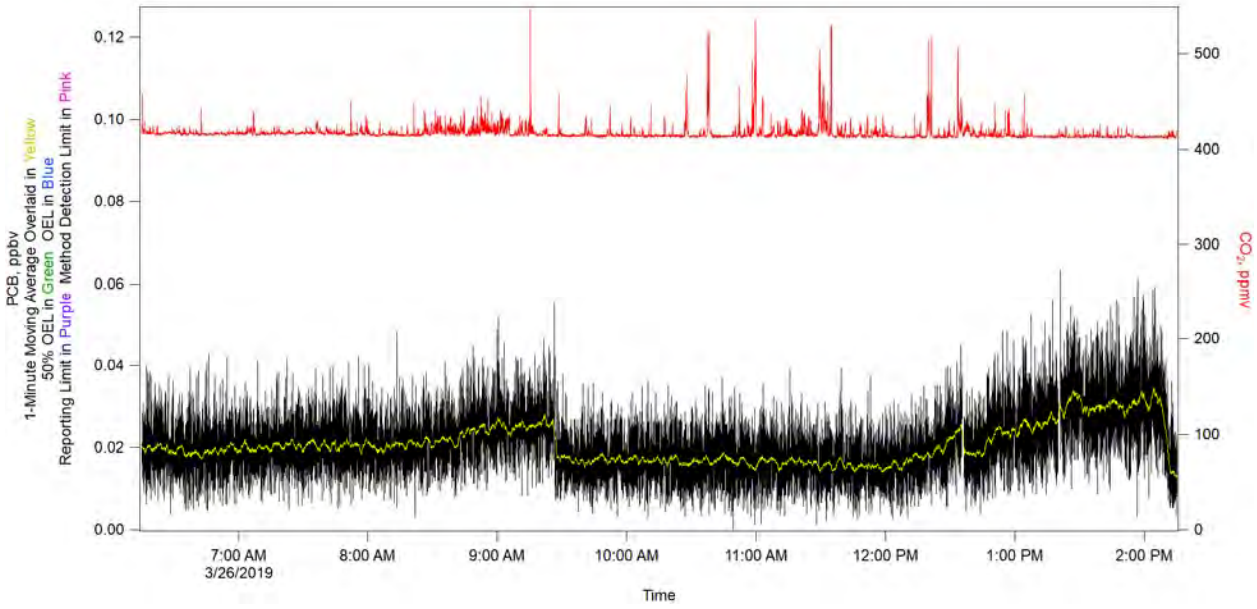


Figure 3-46. PCB.

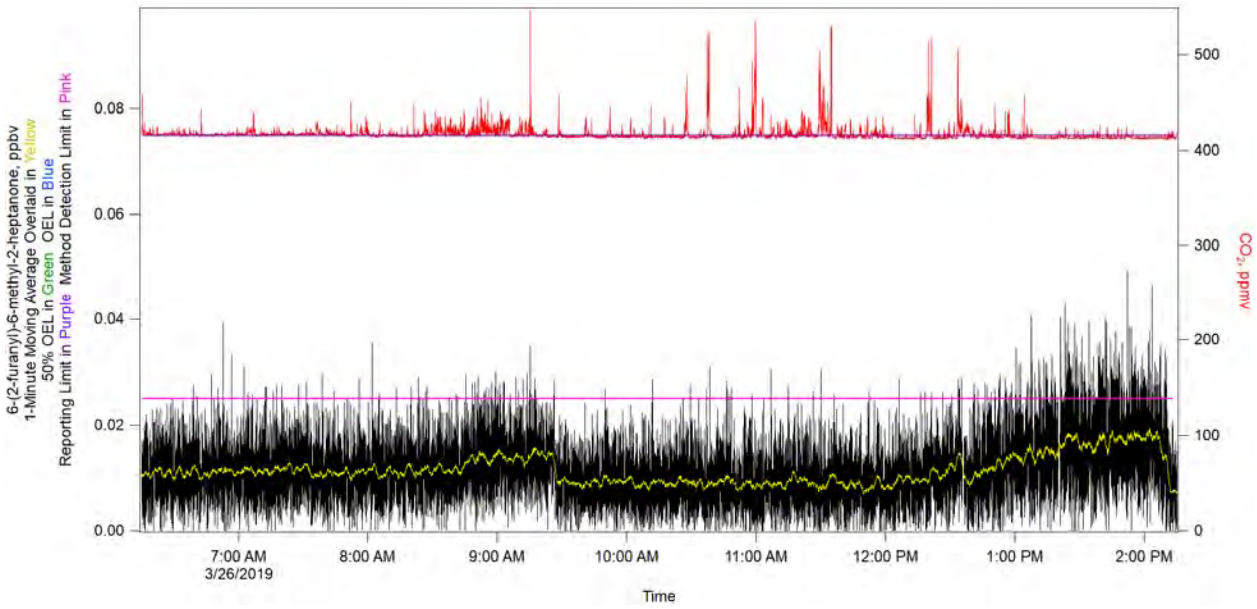


Figure 3-47. 6-(2-furanyl)-6-methyl-2-heptanone.

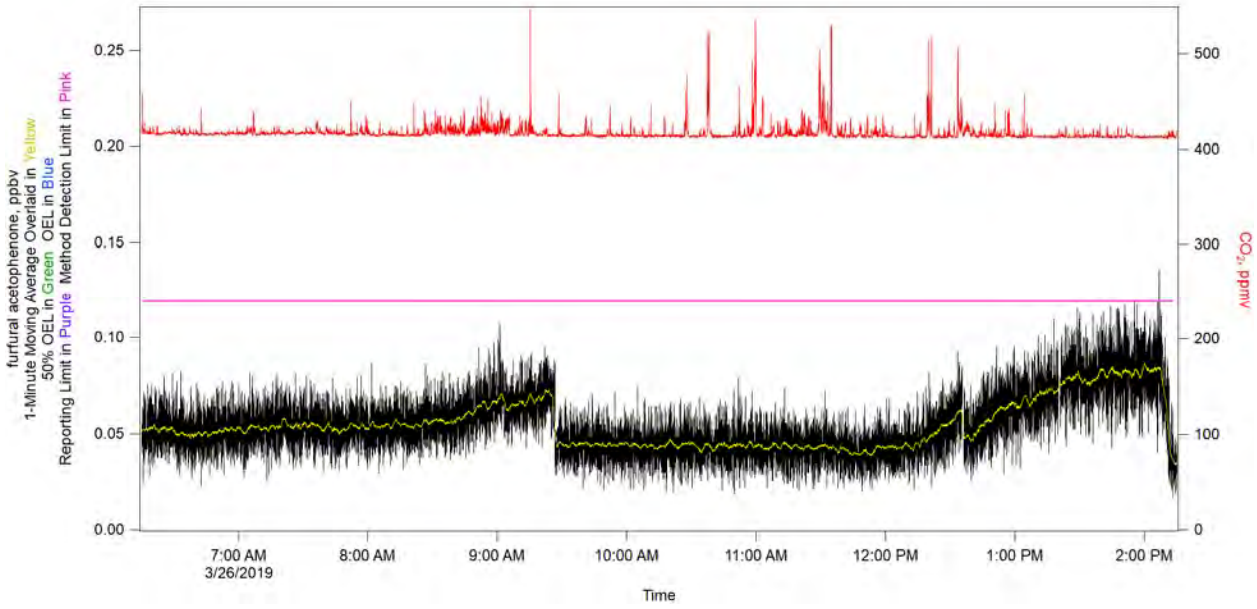


Figure 3-48. Furfural Acetophenone.

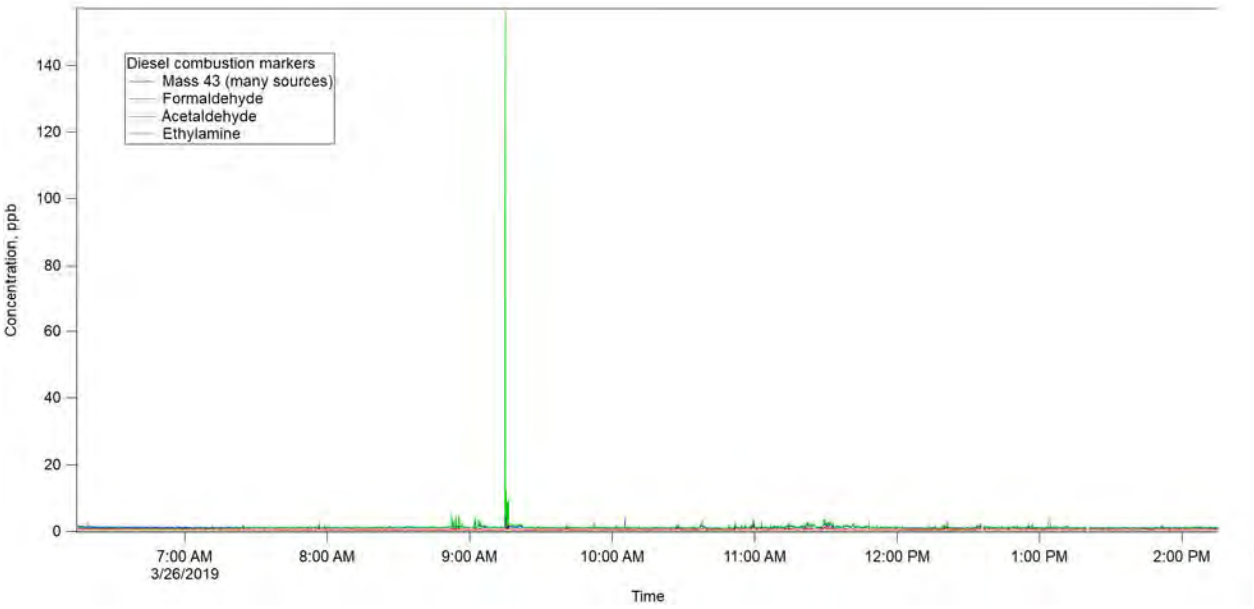


Figure 3-49. Diesel Combustion Markers.

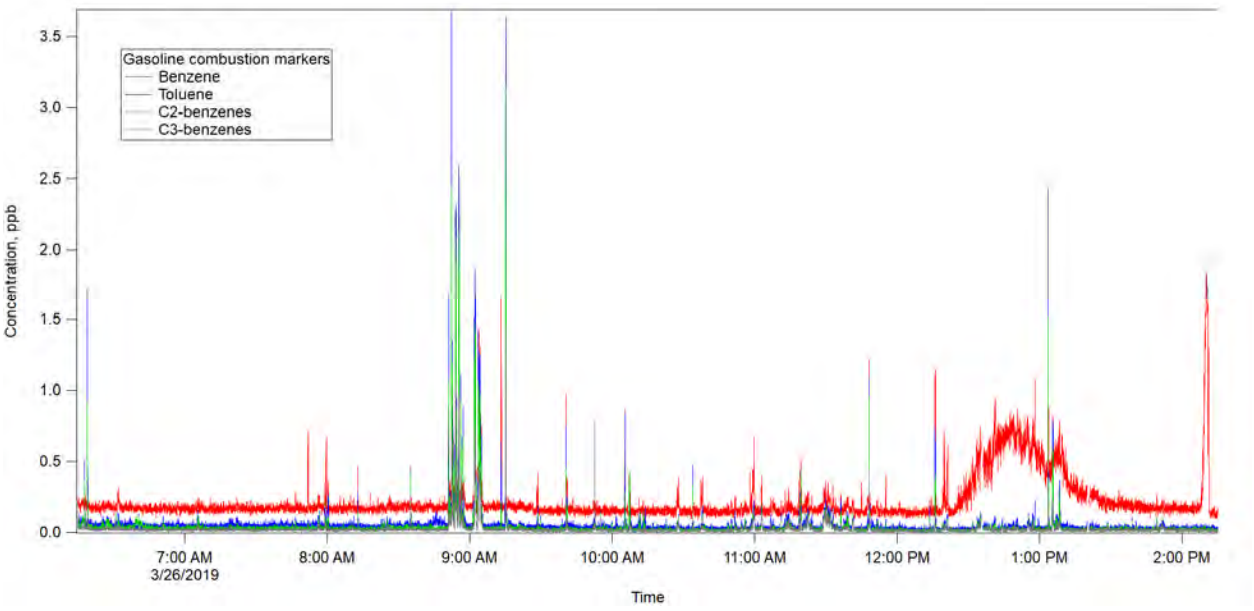


Figure 3-50. Gasoline Combustion Markers.

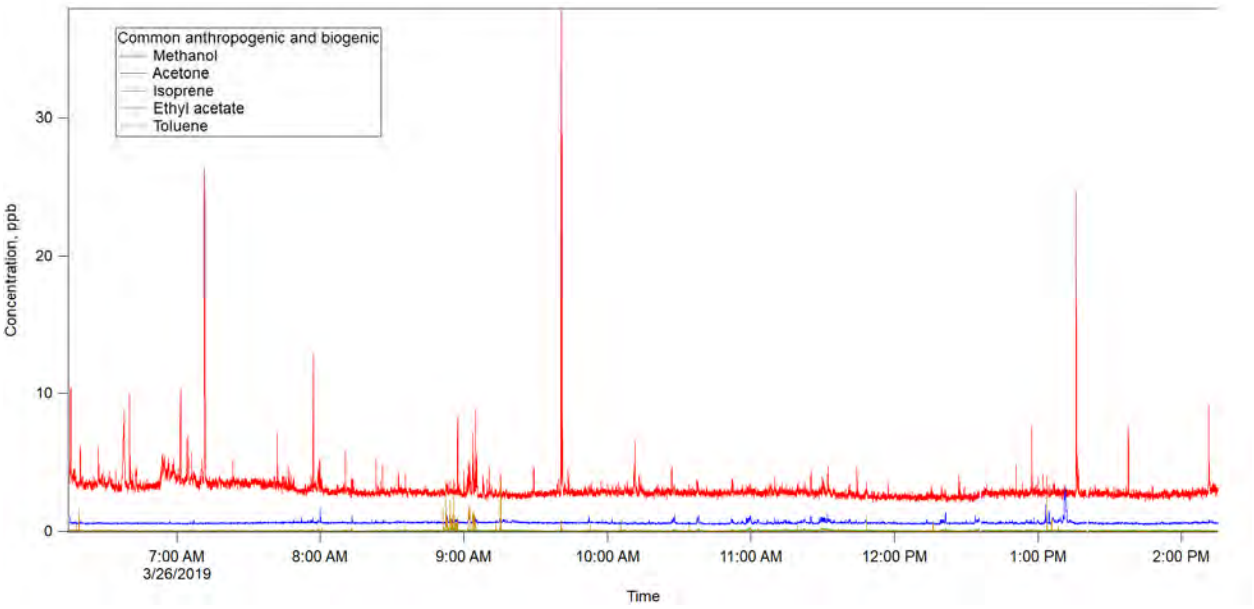


Figure 3-51. Plant and Human Markers.

4.0 MARCH 27, 2019 – AREA MONITORING

4.1 Quality Assessment

Data from March 27, 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 March 27, 2019, the Operators arrived at the ML at 04:55. 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 05:05. The ML arrived on the Hanford Site and ML personnel checked in with the CSO at 06:15. The ML began mobile monitoring at 06:27 around A Farms. At 07:13, the ML was parked downwind of a generator fuel truck until departing to perform another A Farm survey loop. At 09:10, the ML was parked downwind of a Mission Support Alliance, LLC (MSA) water truck that was unloading its contents into a holding tank, as seen in Figure 4-1. The ML performed a site survey loop at 10:35 prior to parking south of the AP Stack. At 12:35, another site survey loop was performed until the ML was parked at the northwest corner of 241A Farm at 13:20. At 14:05, ML operators checked out with the CSO and departed the site. The ML arrived back at the TerraGraphics warehouse at 15:00.

Figure 4-1. Mobile Laboratory Location Downwind of Mission Support Alliance, LLC Water Truck.

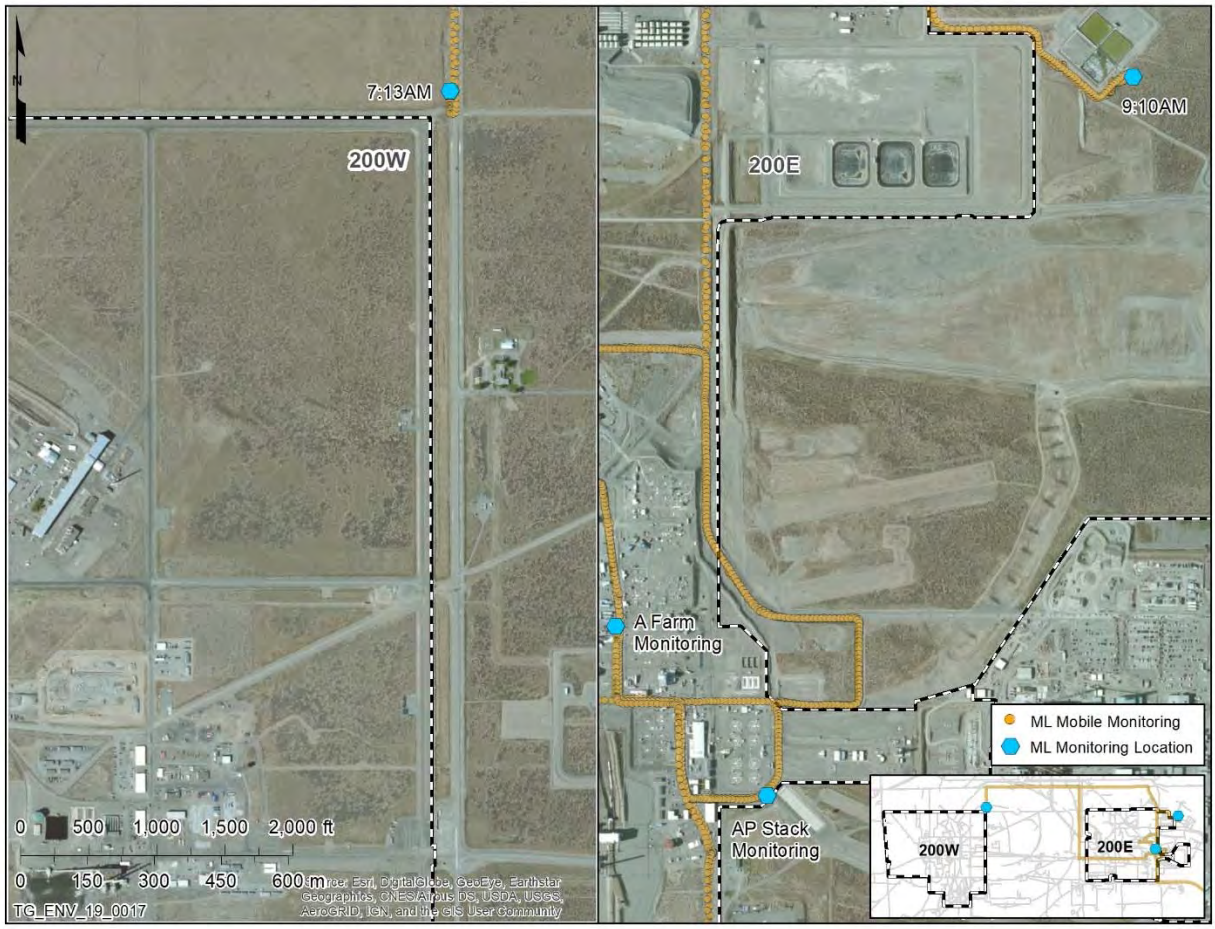


Figure 4-2. Location of the Mobile Laboratory for the Duration of the Monitoring Period.

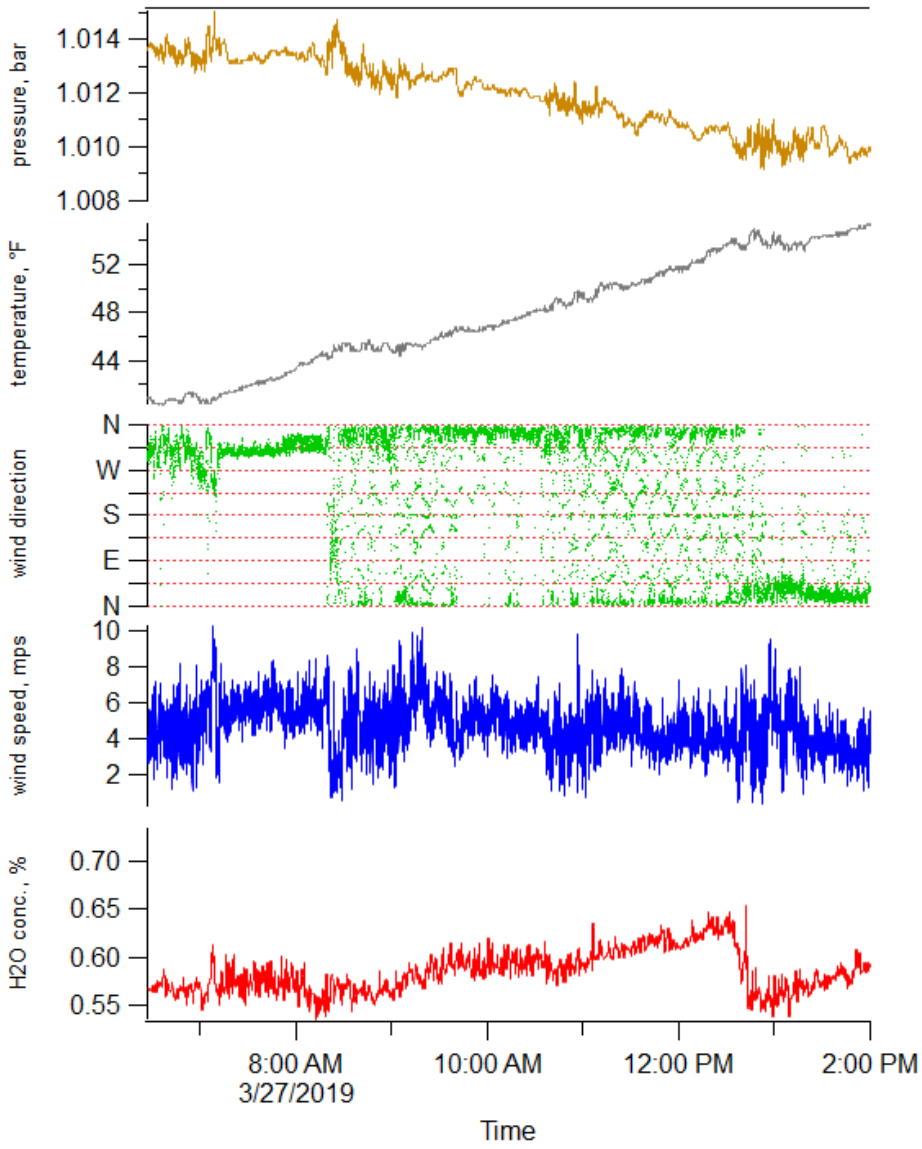


Figure 4-3. Weather Data for the Duration of the Monitoring Period.

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
- 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 March 27, 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	0.010	7.589	1.010	13.303	11.867	7.322
2	formaldehyde	300	1.302	<1.302	0.084	13.502	3.062	<1.302
3	methanol	200000	1.839	3.776†	0.300	7.938	6.103	3.768
4	acetonitrile	20000	0.070	0.079†	0.014	17.344	0.210	0.078
5	acetaldehyde	25000	2.070	<2.070	1.063	117.341	81.691	<2.070
6	ethylamine	5000	0.055	<0.055	0.011	31.578	0.093	<0.055
7	1,3-butadiene	1000	0.122	0.141†	0.034	24.363	1.024	0.139
8	propanenitrile	6000	0.121	<0.121	0.012	26.585	0.262	<0.121
9	2-propenal	100	0.314	<0.314	0.026	39.716	1.518	<0.314
10	1-butanol + butenes	20000	0.149	<0.149	0.032	53.778	1.548	<0.149
11	methyl isocyanate	20	0.061	<0.061	0.012	30.145	0.105	<0.061
12	methyl nitrite	100	0.117	<0.117	0.019	23.311	0.376	<0.117
13	furan	1	0.053	<0.053	0.008	31.569	0.084	<0.053
14	butanenitrile	8000	0.040	<0.040	0.008	38.975	0.068	<0.040
15	but-3-en-2-one + 2,3-dihydrofuran; 2,5-dihydrofuran	200, 1, 1	0.034	<0.034	0.007	33.452	N/A*	N/A*
16	butanal	25000	0.063	0.088†	0.015	17.297	0.445	0.086
17	NDMA**	0.3	0.020	<0.020	0.011	129.106	0.071	<0.020
18	benzene	500	0.230	<0.230	0.083	50.557	4.558	<0.230
19	2,4-pentadienenitrile + pyridine	300	0.084	<0.084	0.011	25.680	0.351	<0.084
20	2-methylene butanenitrile	300	0.050	<0.050	0.008	28.573	0.061	<0.050
21	2-methylfuran	1	0.046	<0.046	0.008	34.746	0.075	<0.046
22	pentanenitrile	6000	0.029	<0.029	0.006	41.512	0.050	<0.029
23	3-methyl-3-buten-2-one + 2-methyl-2-butenal	20	0.048	<0.048	0.008	38.140	0.064	<0.048
24	NEMA**	0.3	0.027	<0.027	0.010	112.398	0.058	<0.027
25	2,5-dimethylfuran	1	0.035	<0.035	0.007	46.727	0.053	<0.035
26	hexanenitrile	6000	0.029	<0.029	0.006	45.103	0.042	<0.029
27	2-hexanone (MBK)	5000	0.030	<0.030	0.007	41.392	0.047	<0.030
28	NDEA**	0.1	0.023	<0.023	0.007	96.970	0.039	<0.023
29	butyl nitrite + 2-nitro-2-methylpropane	100, 300	0.106	<0.106	0.009	22.142	0.093	<0.106
30	2,4-dimethylpyridine	500	0.031	<0.031	0.011	85.924	0.406	<0.031

Table 4-1. Chemical of Potential Concern Statistical Information for the Monitoring Period of March 27, 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	0.035	<0.035	0.006	59.676	0.041	<0.035
32	heptanenitrile	6000	0.029	<0.029	0.005	44.267	0.035	<0.029
33	4-methyl-2-hexanone	500	0.032	<0.032	0.006	46.544	0.040	<0.032
34	NMOR**	0.6	0.017	<0.017	0.007	189.431	0.185	<0.0174
35	butyl nitrate	2500	0.019	<0.019	0.005	69.925	0.033	<0.019
36	2-ethyl-2-hexenal + 4-(1-methylpropyl)-2,3-dihydrofuran + 3-(1,1-dimethylethyl)-2,3-dihydrofuran	100,1, 1	0.032	<0.032	0.006	46.700	0.037	<0.032
37	6-methyl-2-heptanone	8000	0.028	<0.028	0.006	43.224	0.039	<0.028
38	2-pentylfuran	1	0.029	<0.029	0.007	42.380	0.047	<0.029
39	biphenyl	200	0.031	<0.031	0.006	67.935	0.048	<0.031
40	2-heptylfuran	1	0.136	<0.136	0.010	19.455	0.091	<0.136
41	1,4-butanediol dinitrate	50	0.184	<0.184	0.007	40.306	0.049	<0.184
42	2-octylfuran	1	0.013	<0.013	0.006	234.499	0.048	<0.013
43	1,2,3-propanetriol 1,3-dinitrate	50	0.132	<0.132	0.004	338.122	0.039	<0.132
44	PCB	1000	0.139	<0.139	0.006	31.576	0.049	<0.139
45	6-(2-furanyl)-6-methyl-2-heptanone	1	0.025	<0.025	0.005	49.688	0.035	<0.025
46	furfural acetophenone	1	0.119	<0.119	0.010	18.962	0.092	<0.119
N/A*	The maximum peak value for but-3-en-2-one + 2,3 dihydrofuran + 2,5 dihydrofuran was 0.166 ppb and the median value was <0.034 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 March 27, 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.

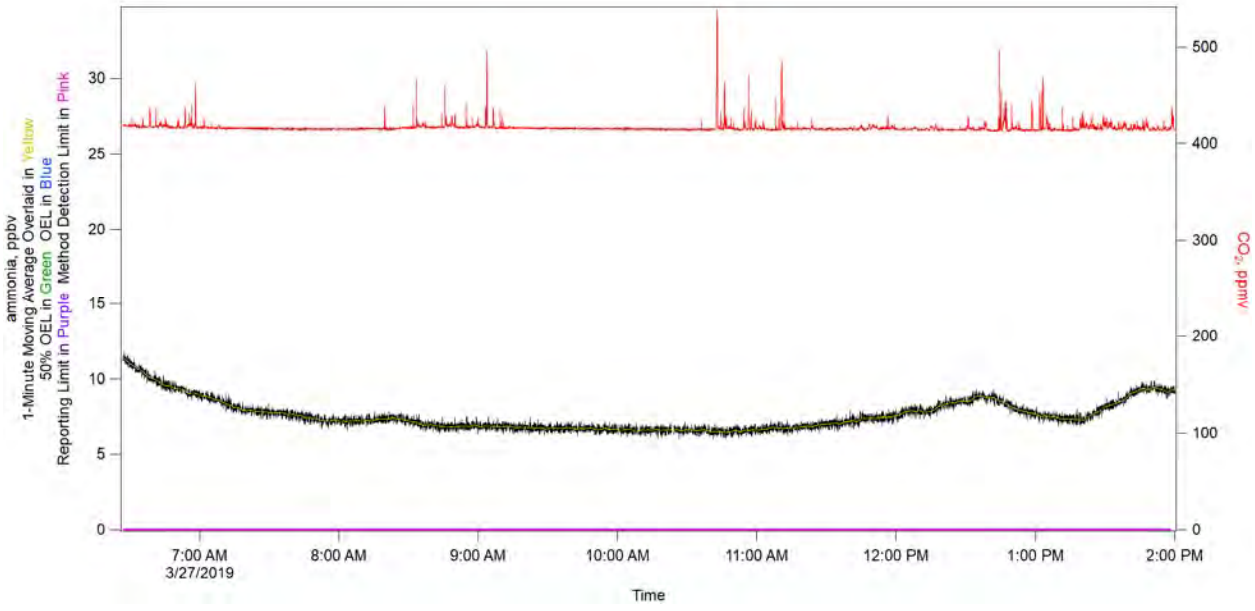


Figure 4-3. Ammonia.

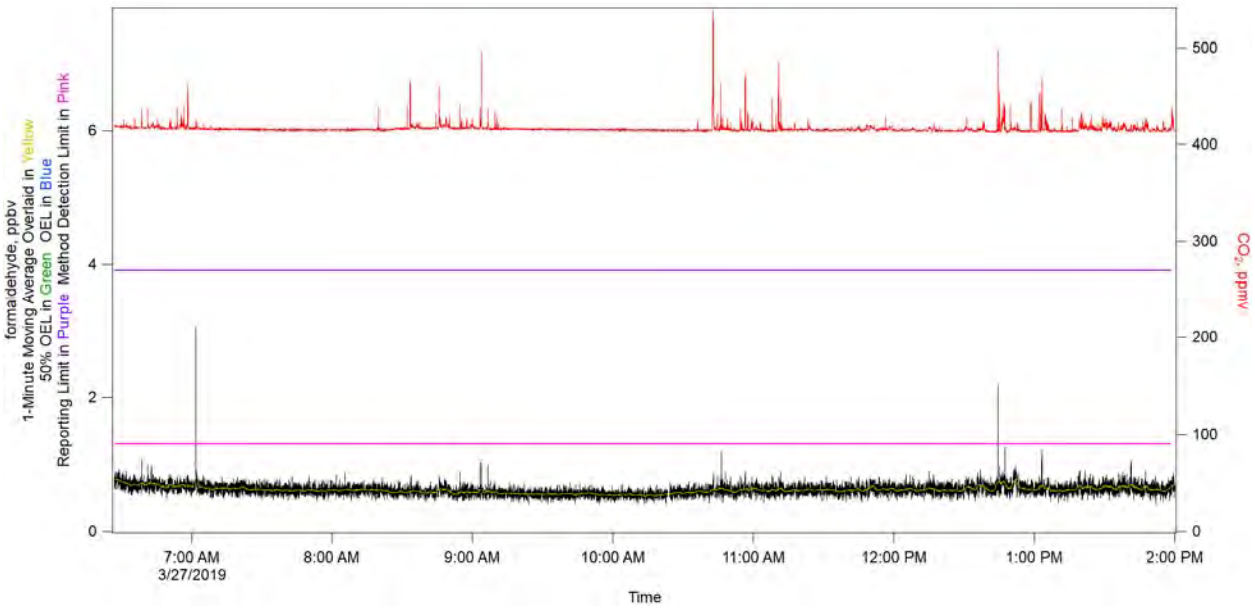


Figure 4-4. Formaldehyde.

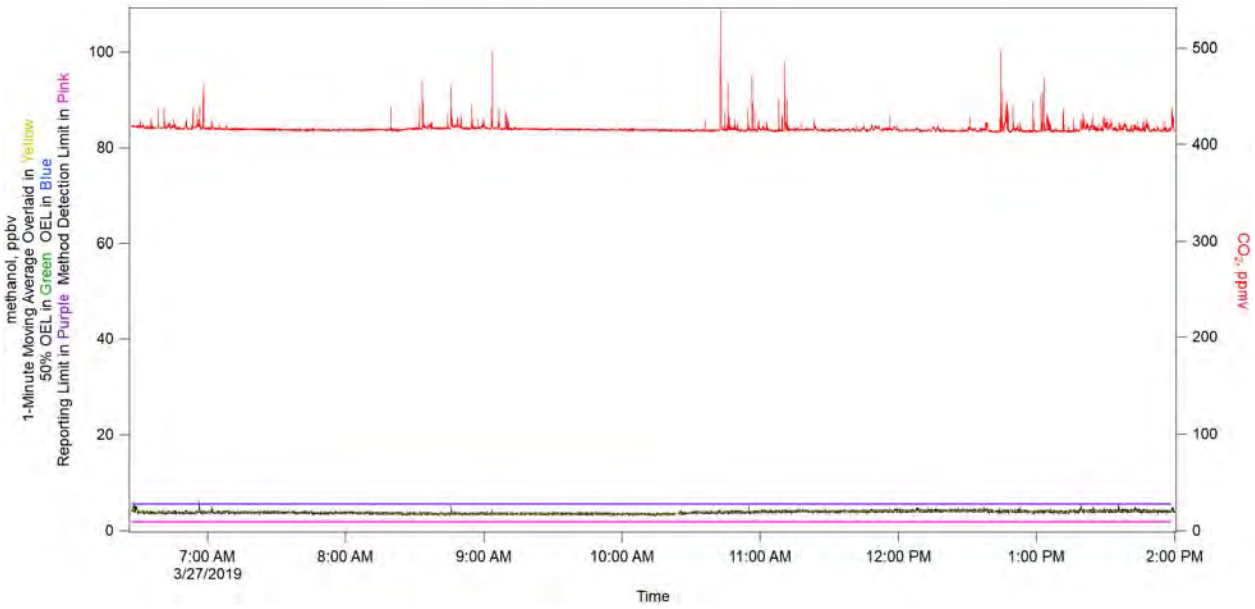


Figure 4-5. Methanol.

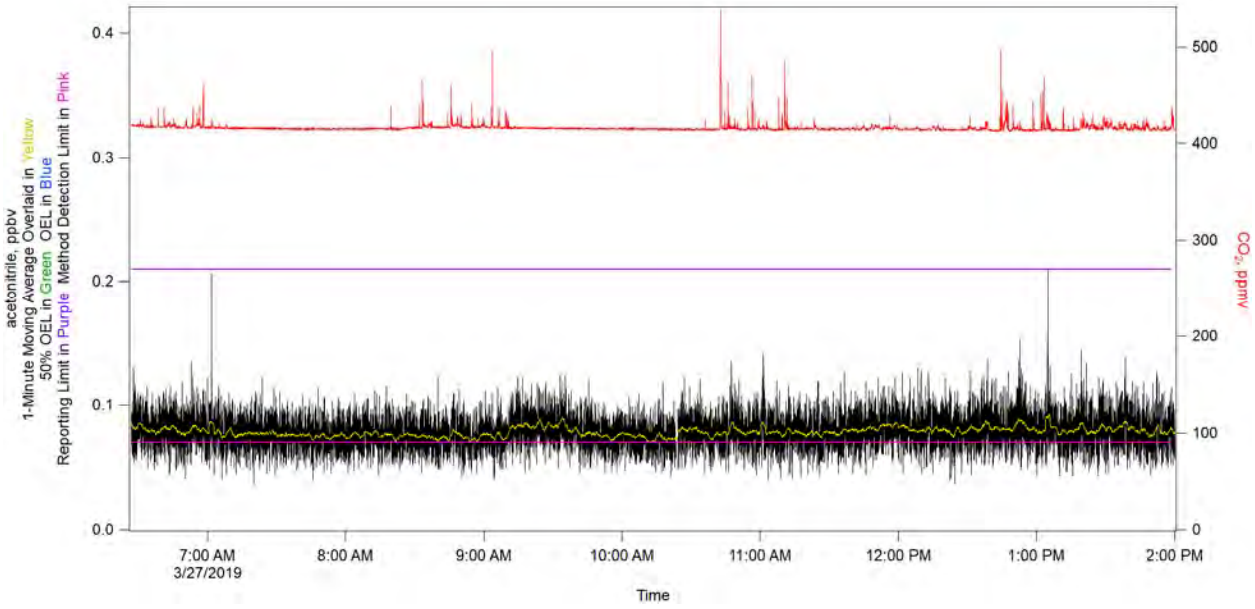


Figure 4-6. Acetonitrile.

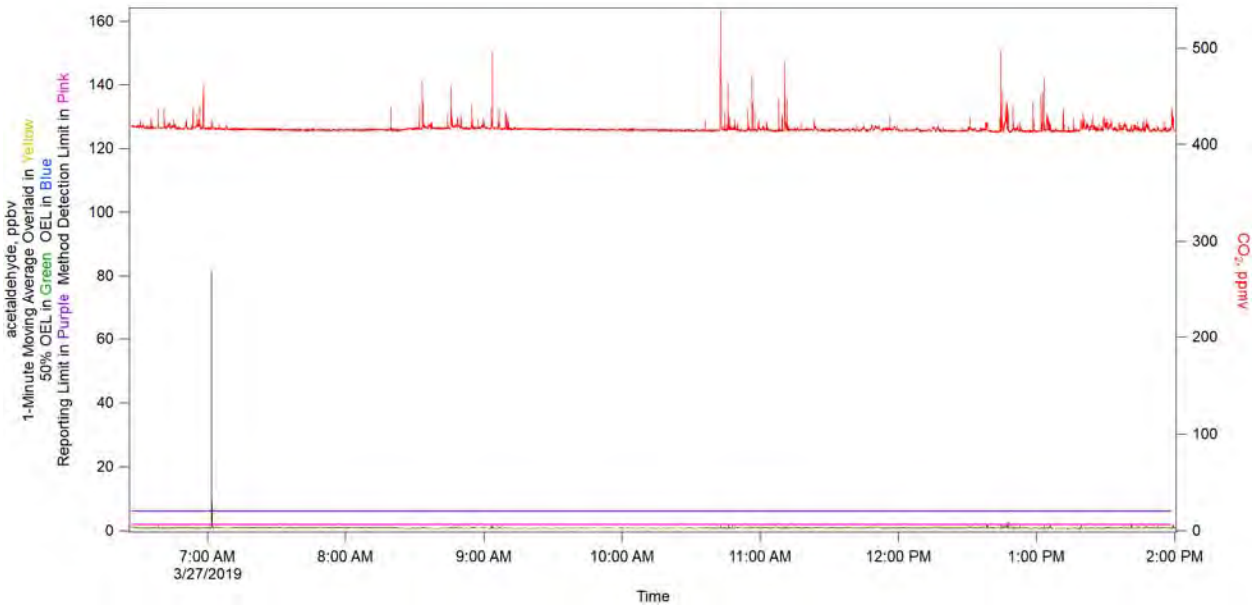


Figure 4-7. Acetaldehyde.

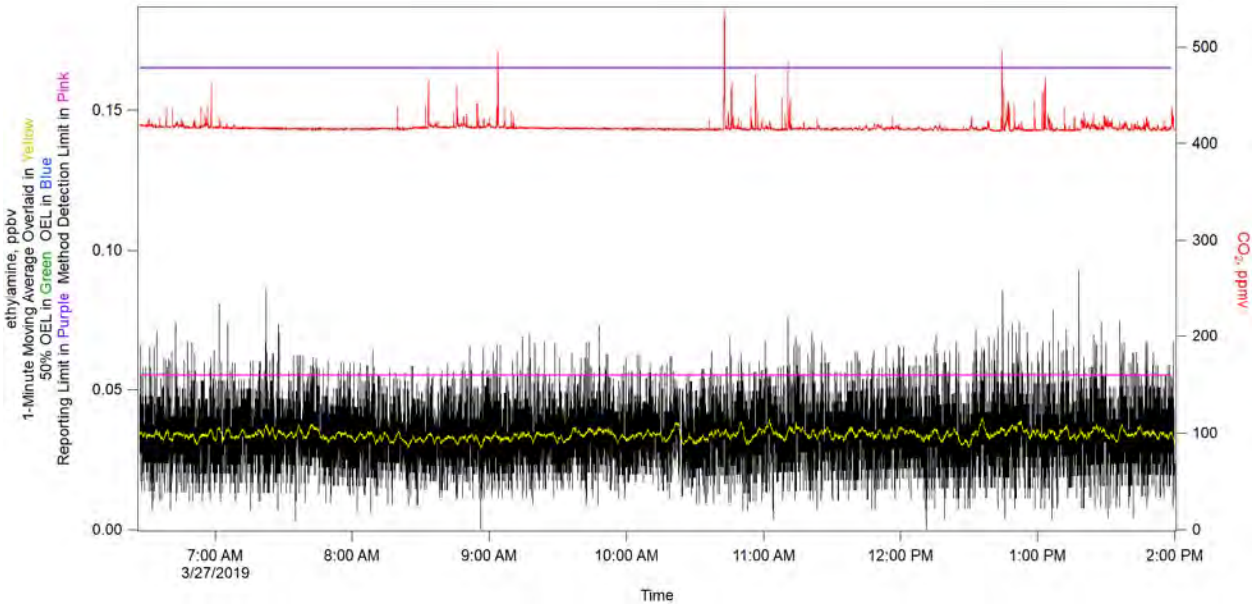


Figure 4-8. Ethylamine.

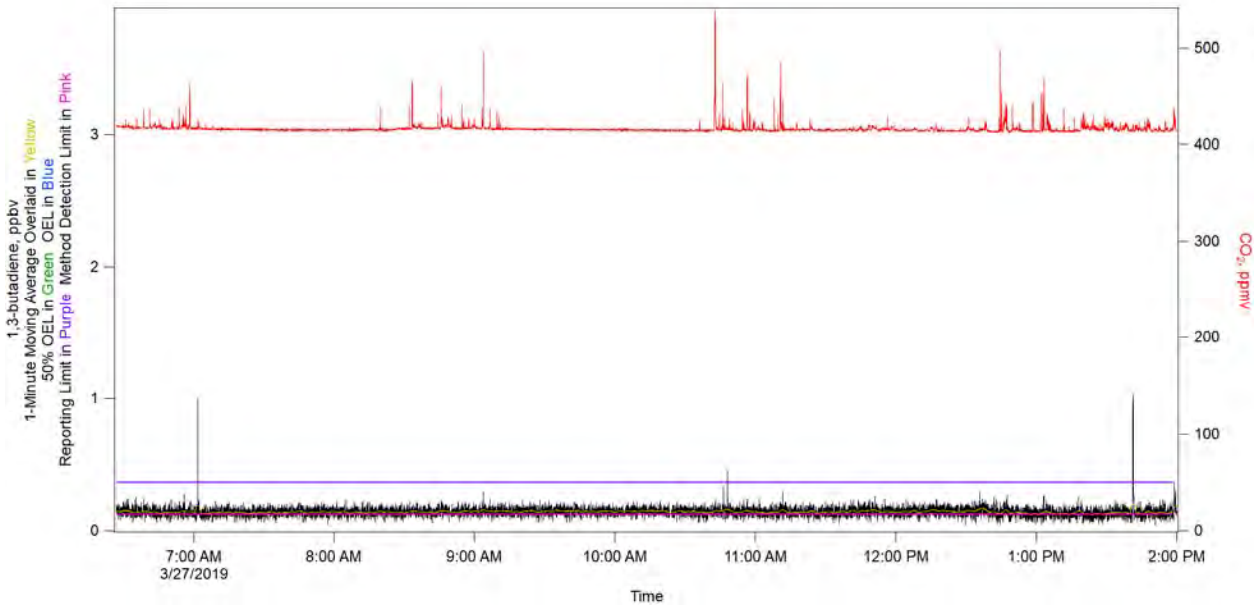


Figure 4-9. 1,3-butadiene.

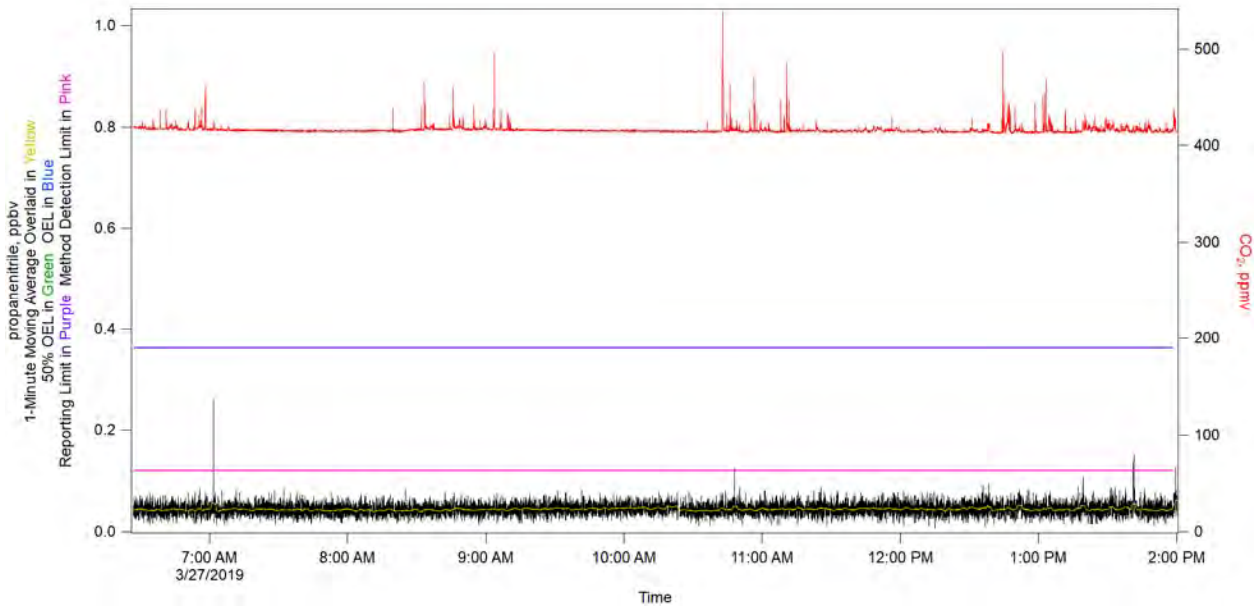


Figure 4-10. Propanenitrile.

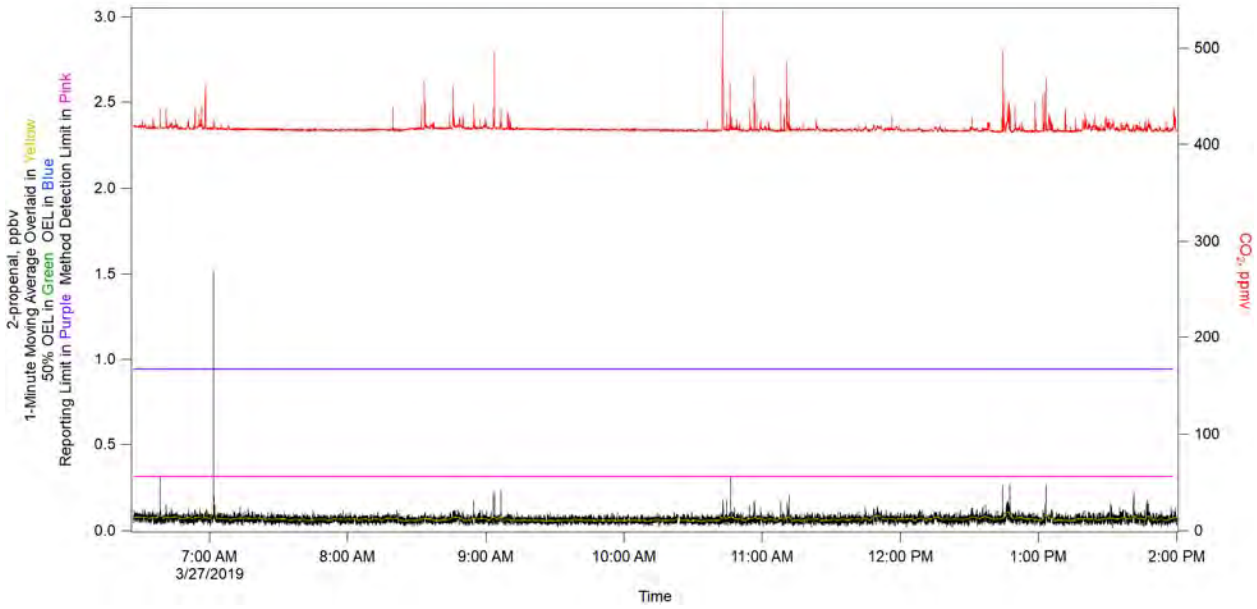


Figure 4-11. 2-propenal.

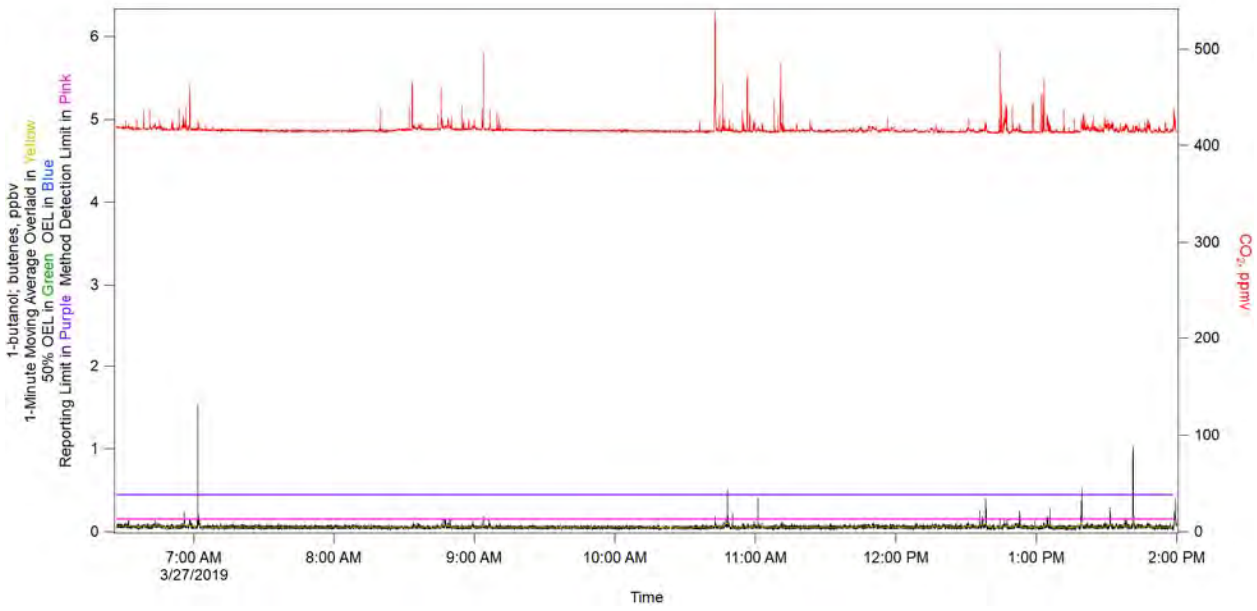


Figure 4-12. 1-butanol; Butenes.

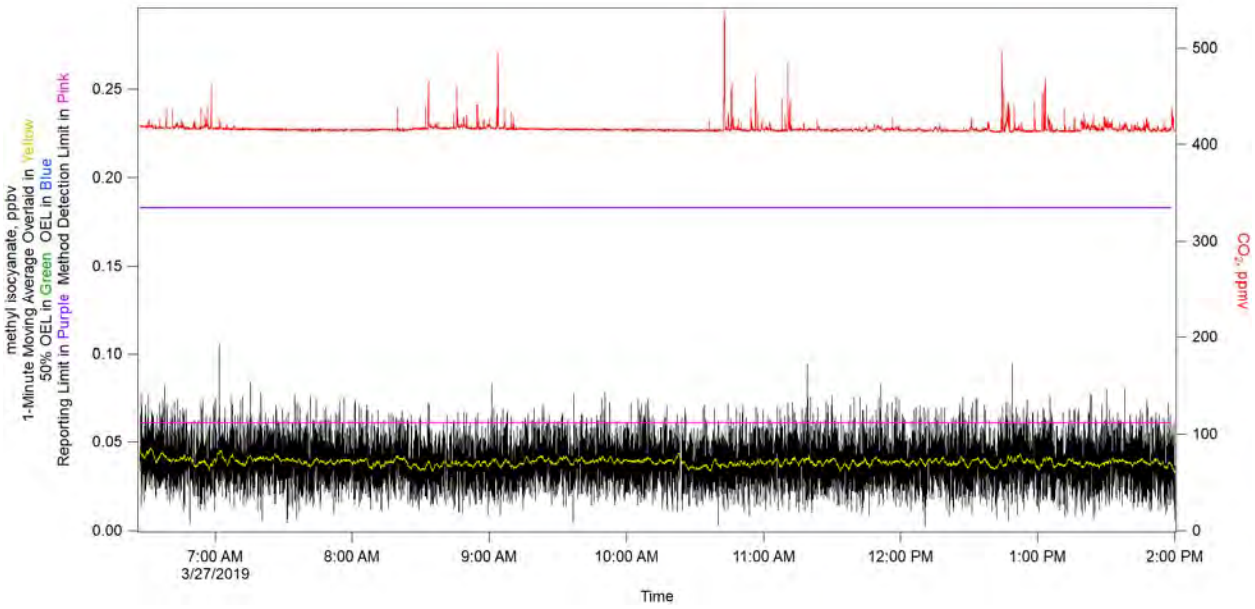


Figure 4-13. Methyl Isocyanate.

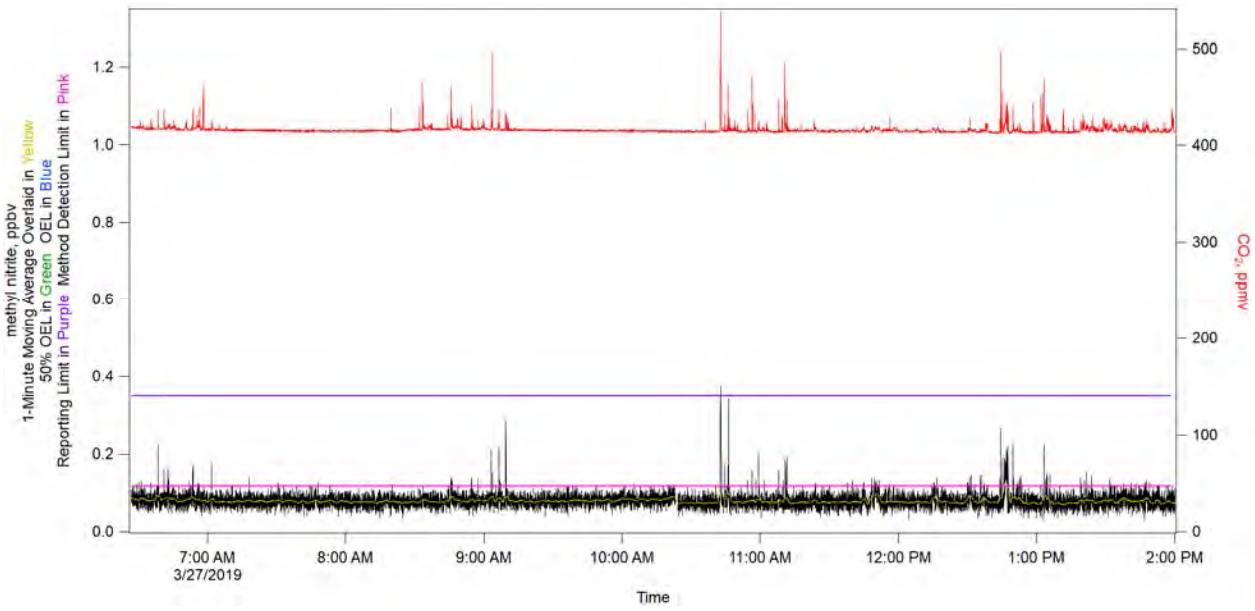


Figure 4-14. Methyl Nitrite.

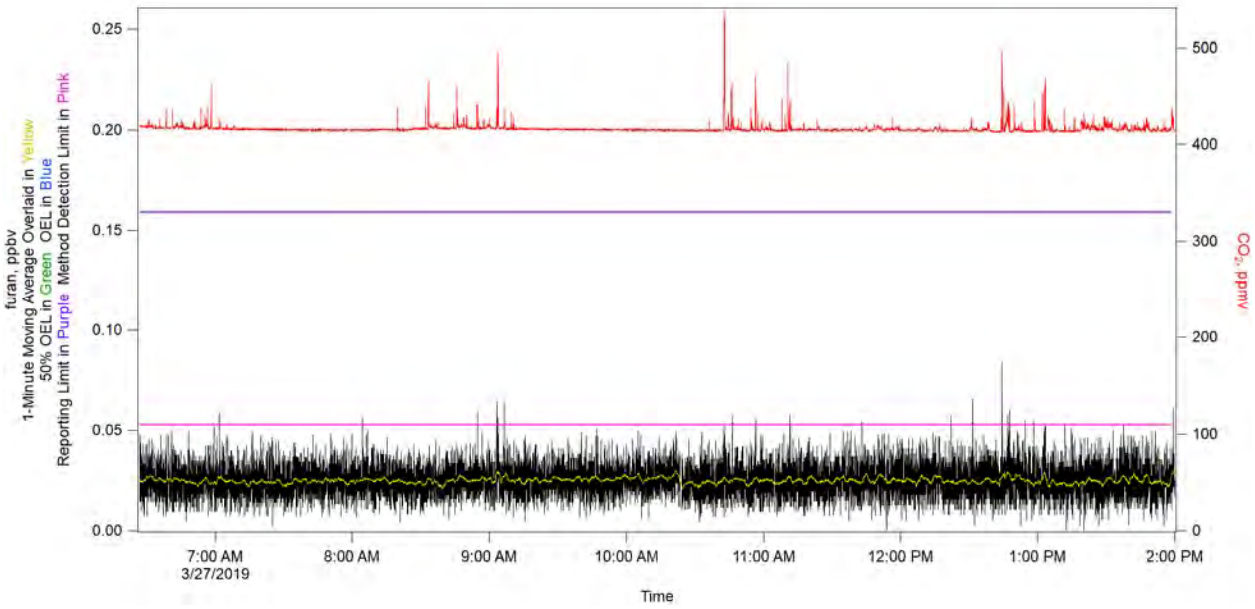


Figure 4-15. Furan.

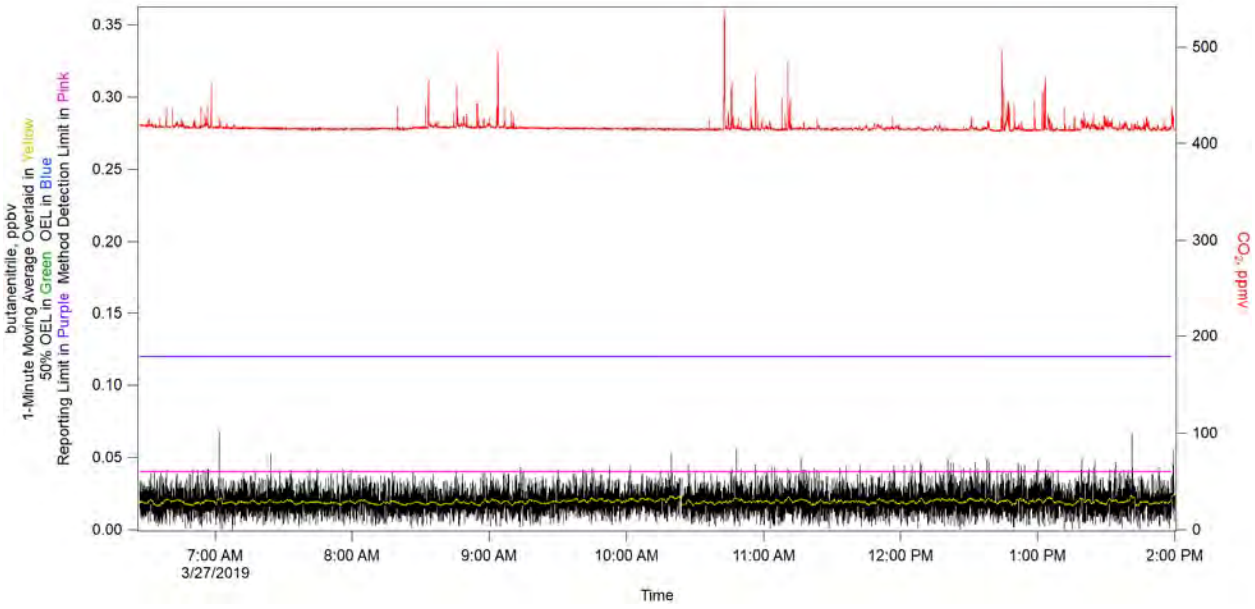


Figure 4-16. Butanenitrile.

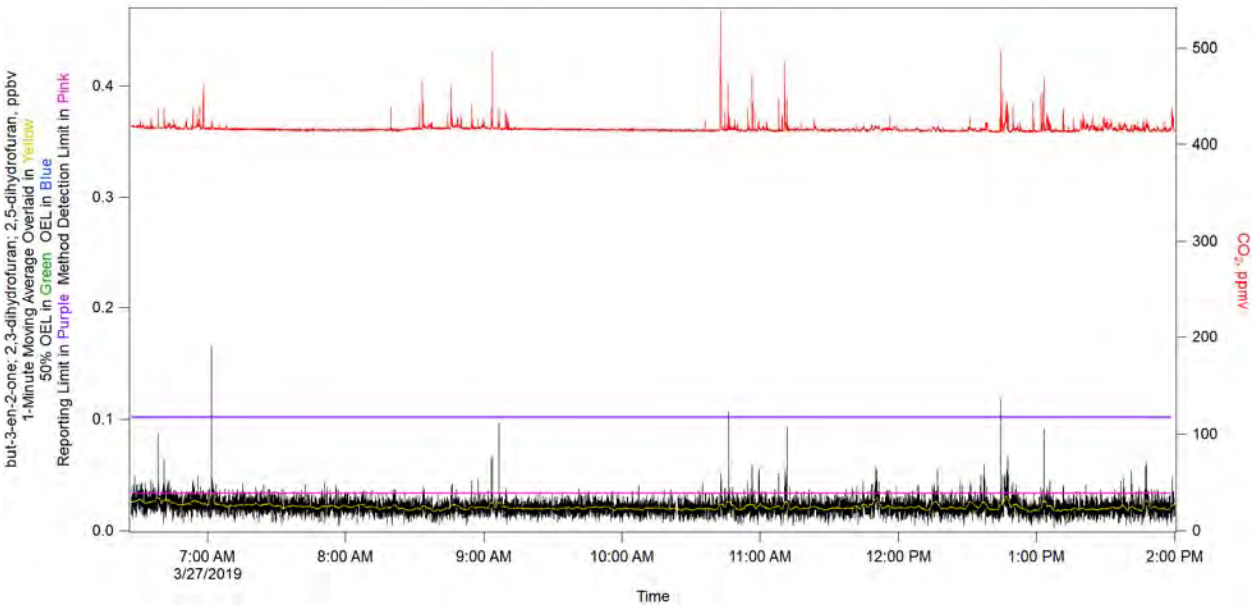


Figure 4-17. But-3-en-2-one; 2,3-dihydrofuran; 2,5-dihydrofuran.

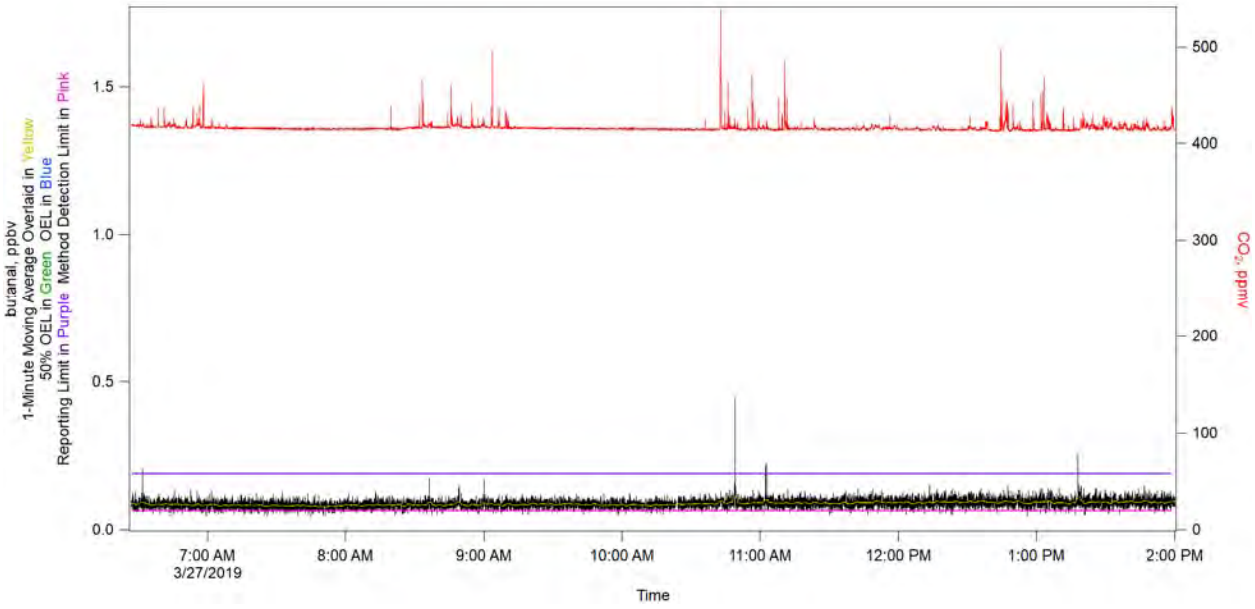


Figure 4-18. Butanal.

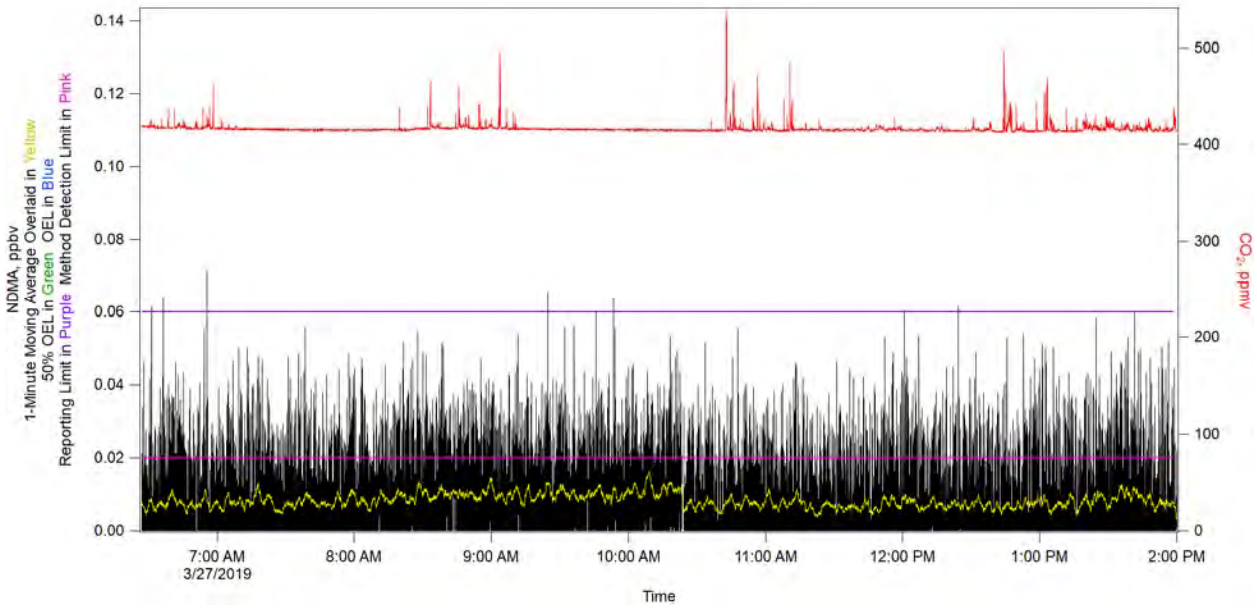


Figure 4-19. N-nitrosodimethylamine (NDMA).

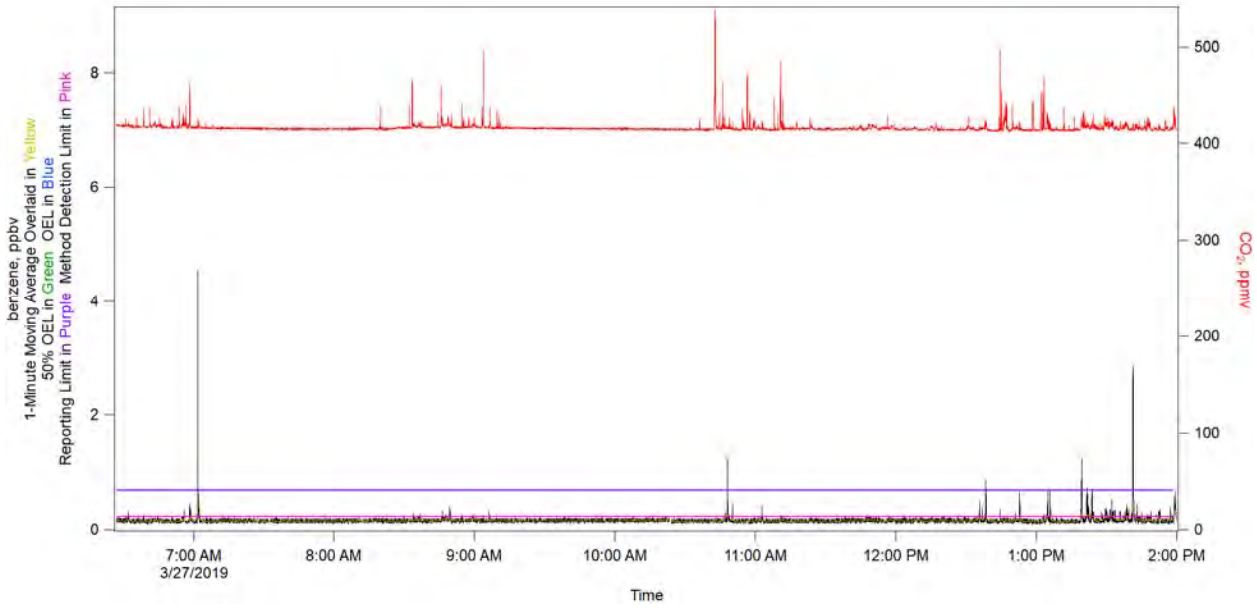


Figure 4-20. Benzene.

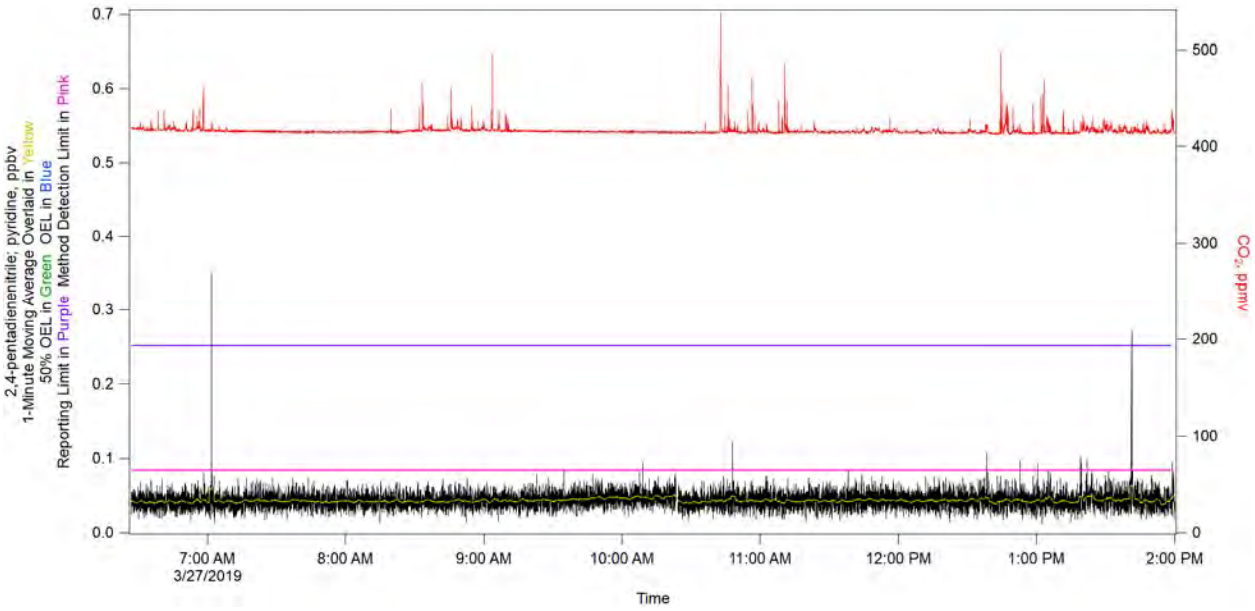


Figure 4-21. 2,4-pentadienenitrile; Pyridine.

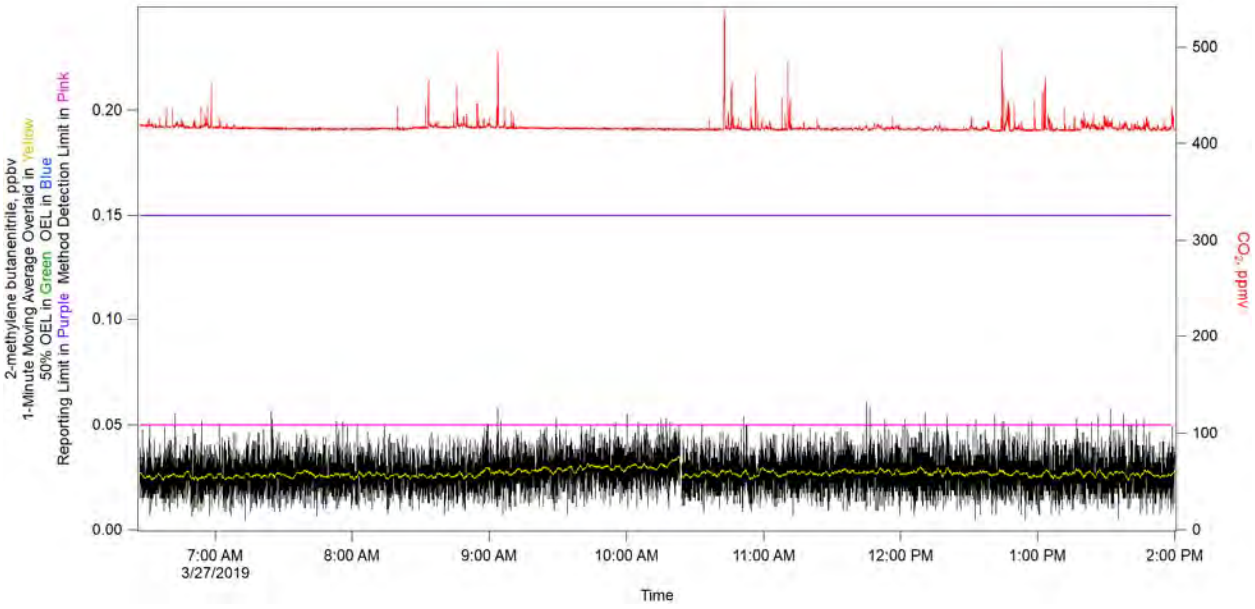


Figure 4-22. 2-methylene Butanenitrile.

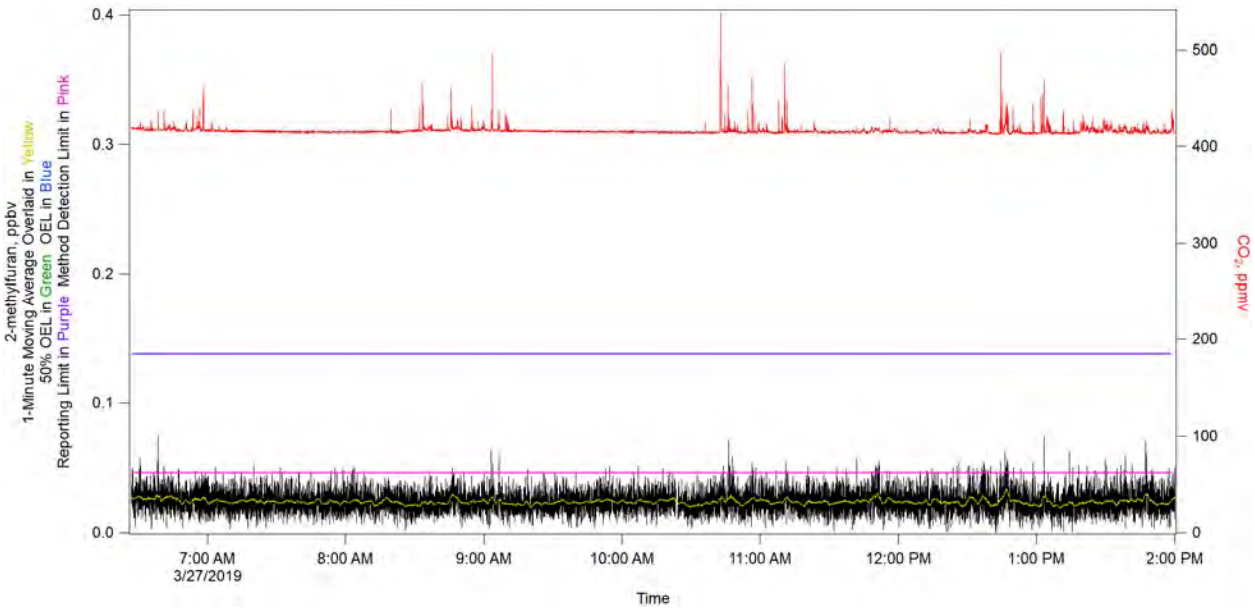


Figure 4-23. 2-methylfuran.

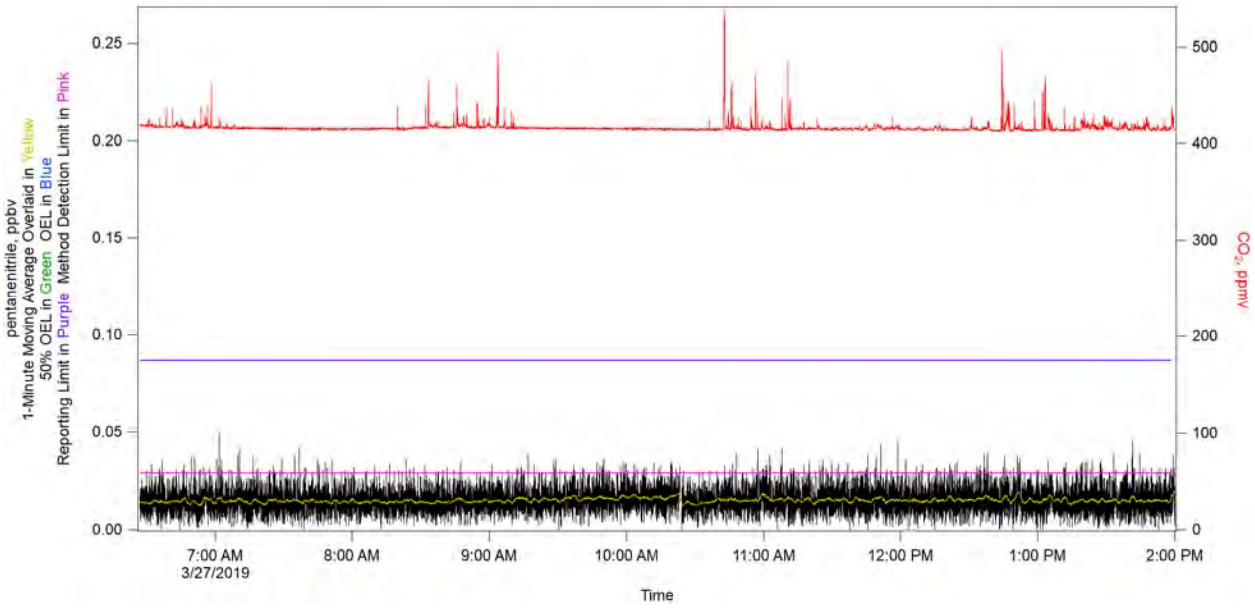


Figure 4-24. Pentanenitrile.

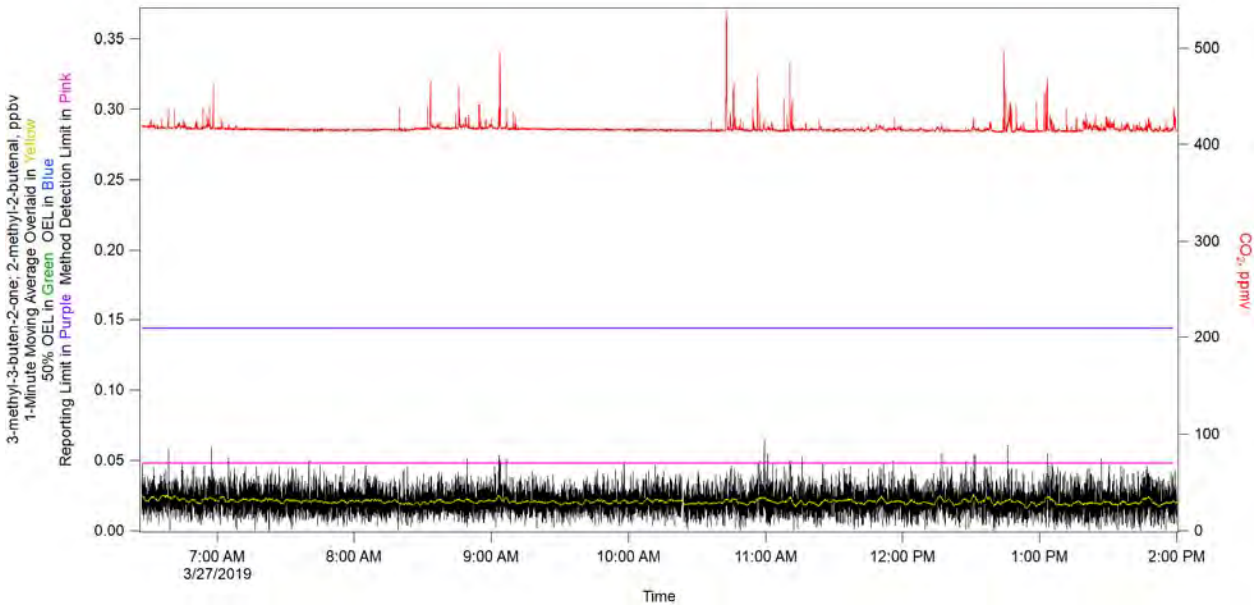


Figure 4-25. 3-methyl-3-buten-2-one; 2-methyl-2-butenal.

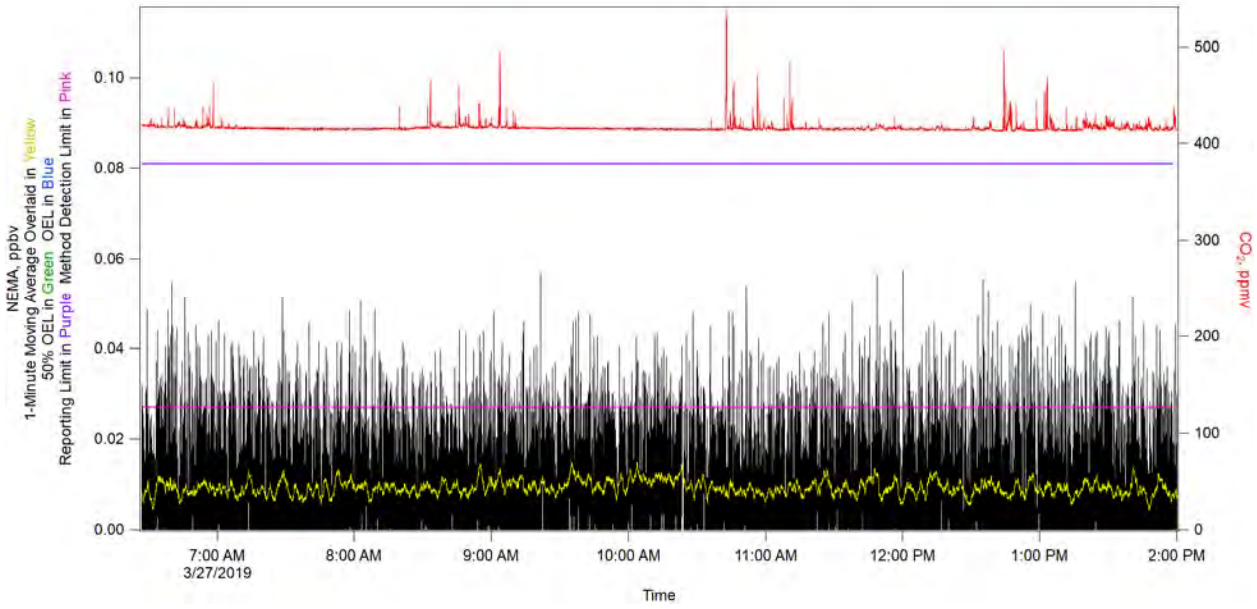


Figure 4-26. N-nitrosomethylethylamine (NEMA).

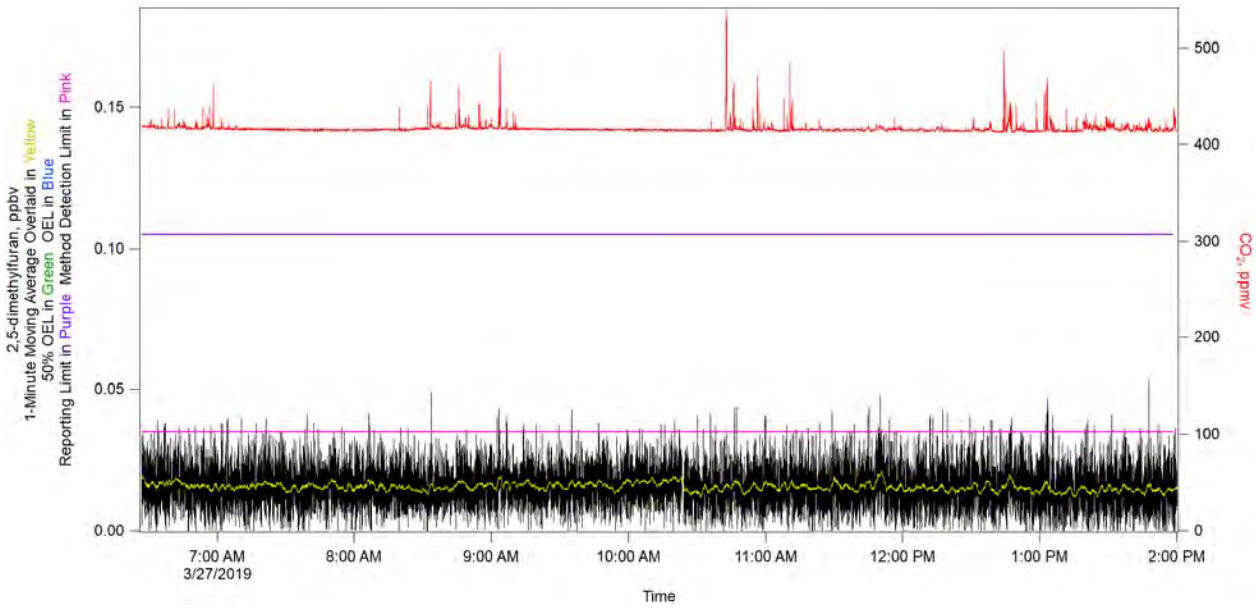


Figure 4-27. 2,5-dimethylfuran.

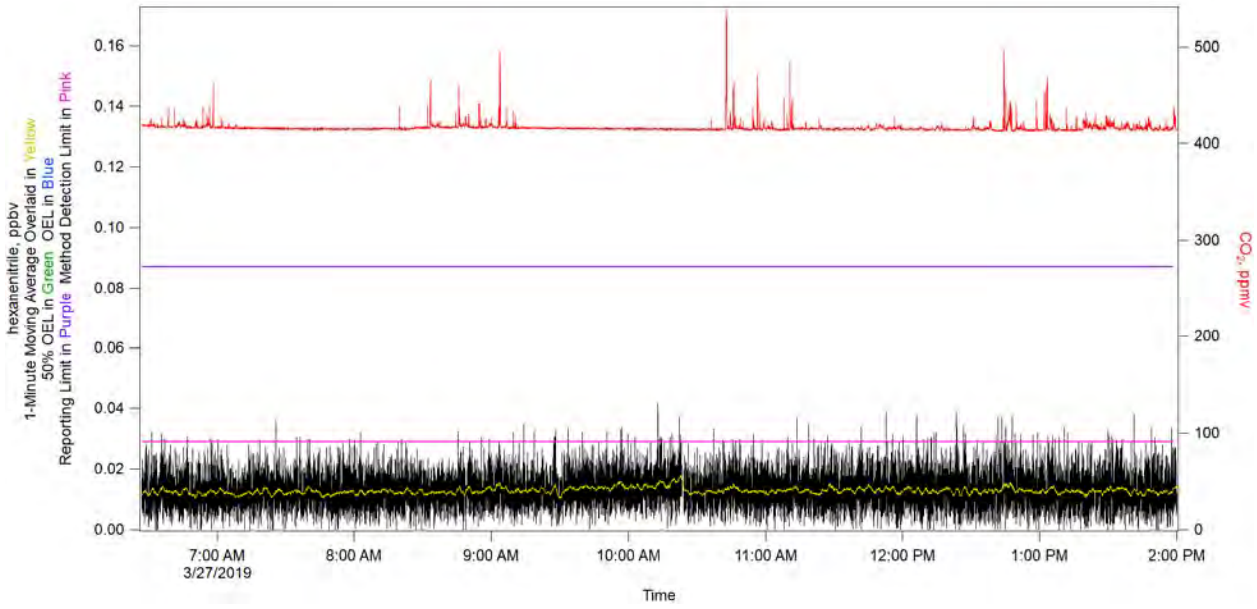


Figure 4-28. Hexanenitrile.

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

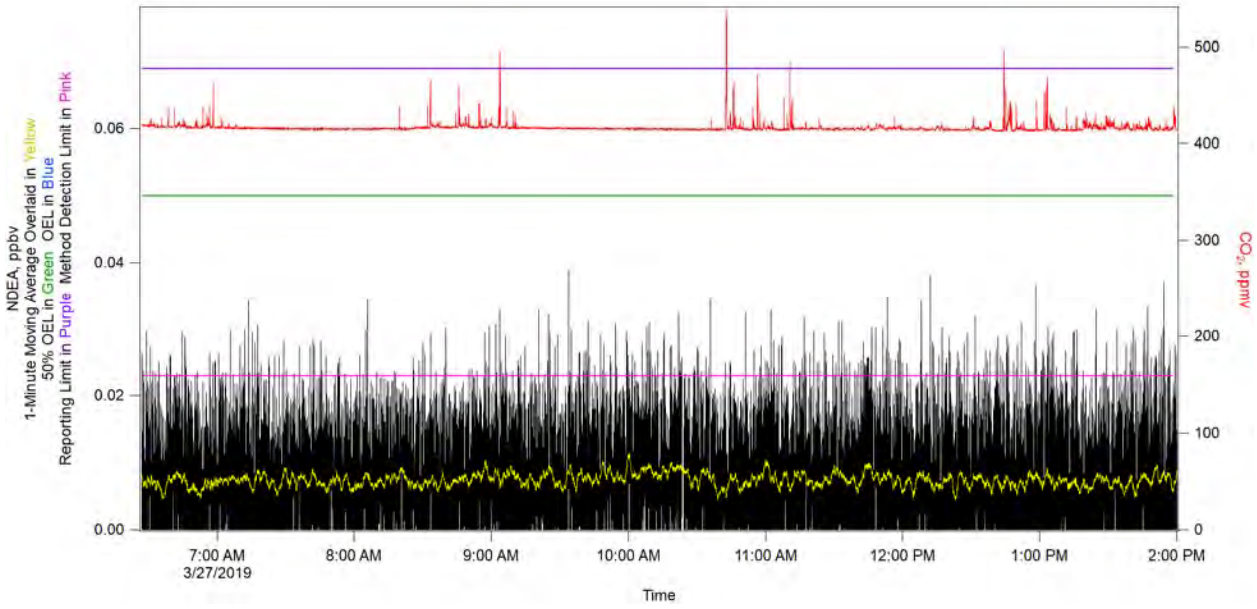


Figure 4-30. N-nitrosodiethylamine (NDEA).

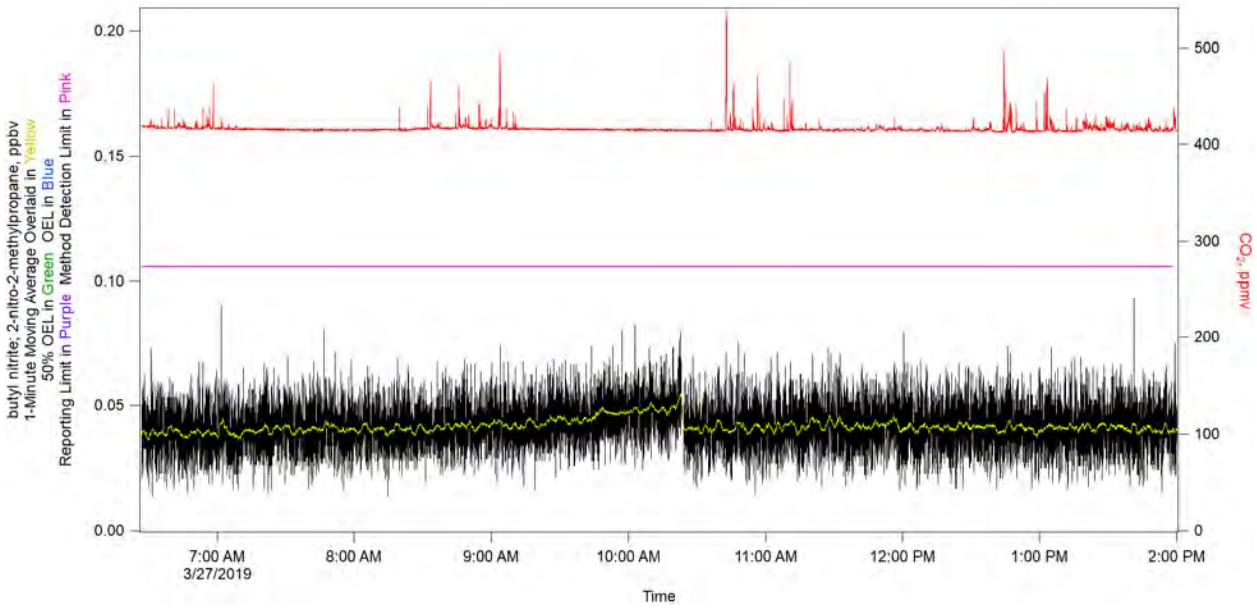


Figure 4-31. Butyl Nitrite; 2-nitro-2-methylpropane.

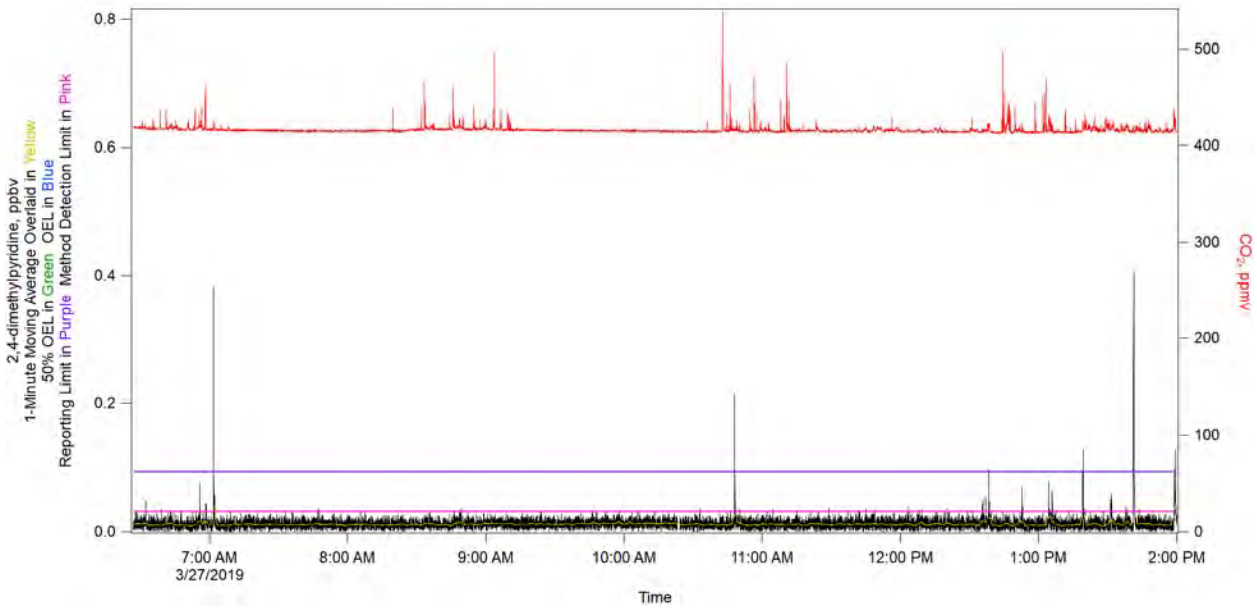


Figure 4-32. 2,4-dimethylpyridine.

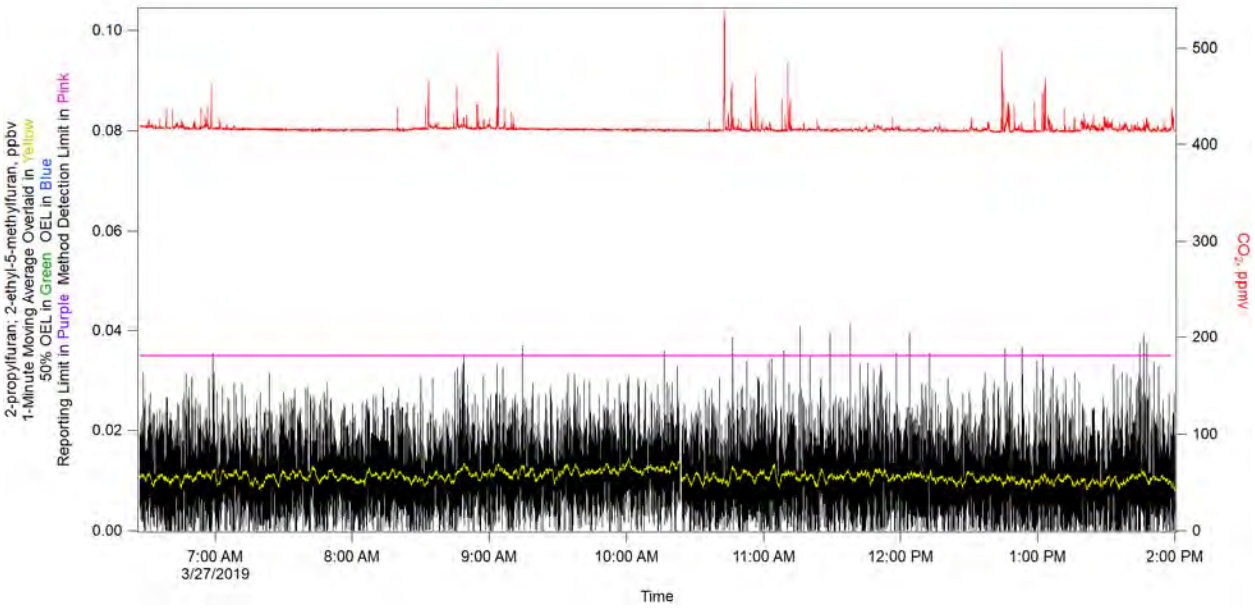


Figure 4-33. 2-propylfuran; 2-ethyl-5-methylfuran.

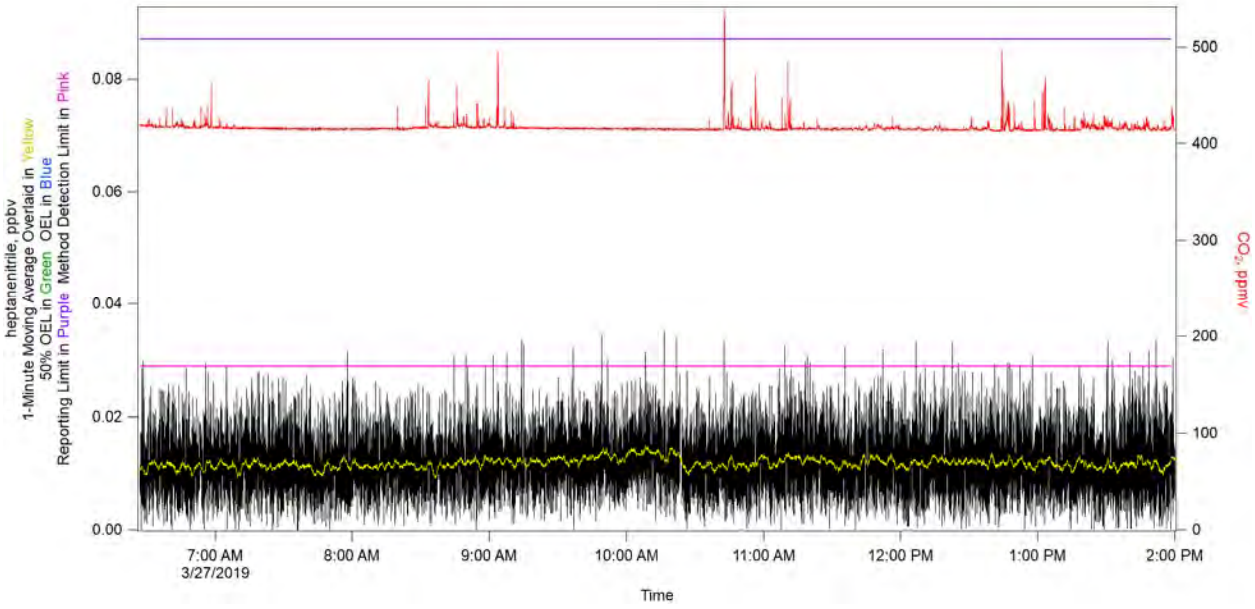


Figure 4-34. Heptanenitrile.

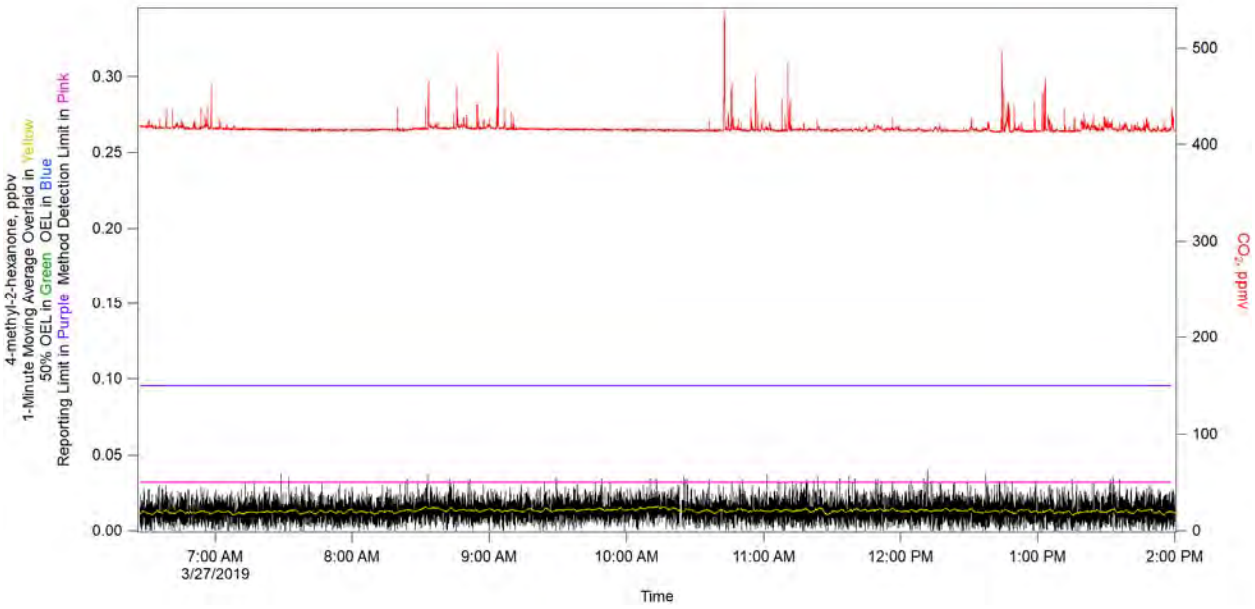


Figure 4-35. 4-methyl-2-hexanone.

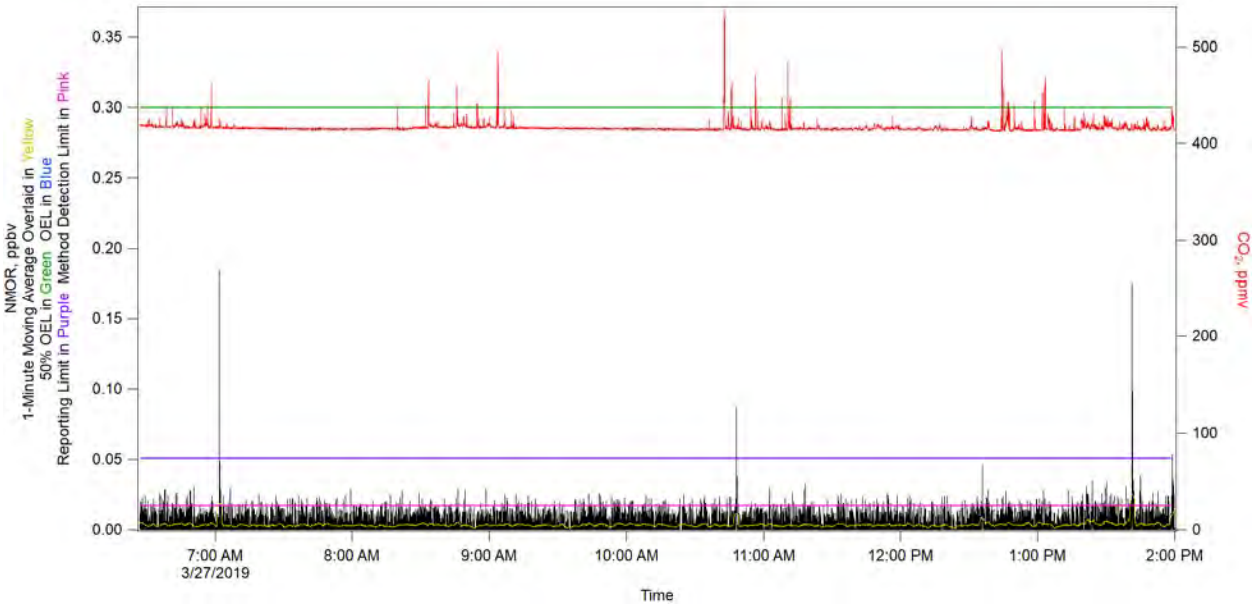


Figure 4-36. N-nitrosomorpholine (NMOR).

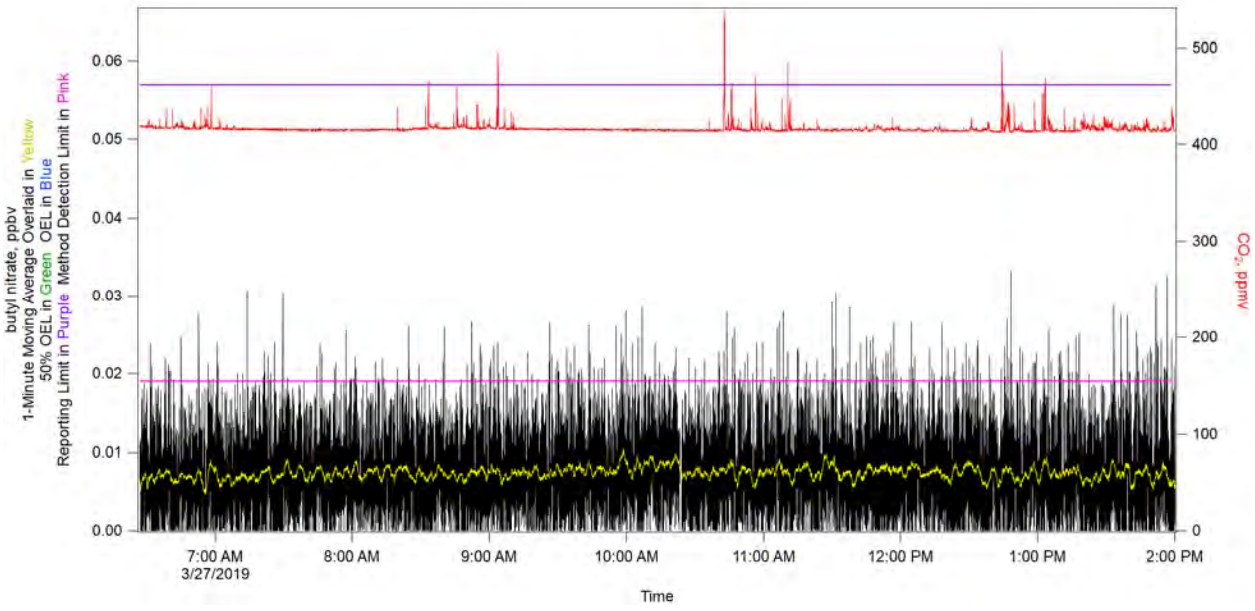


Figure 4-37. Butyl Nitrate.

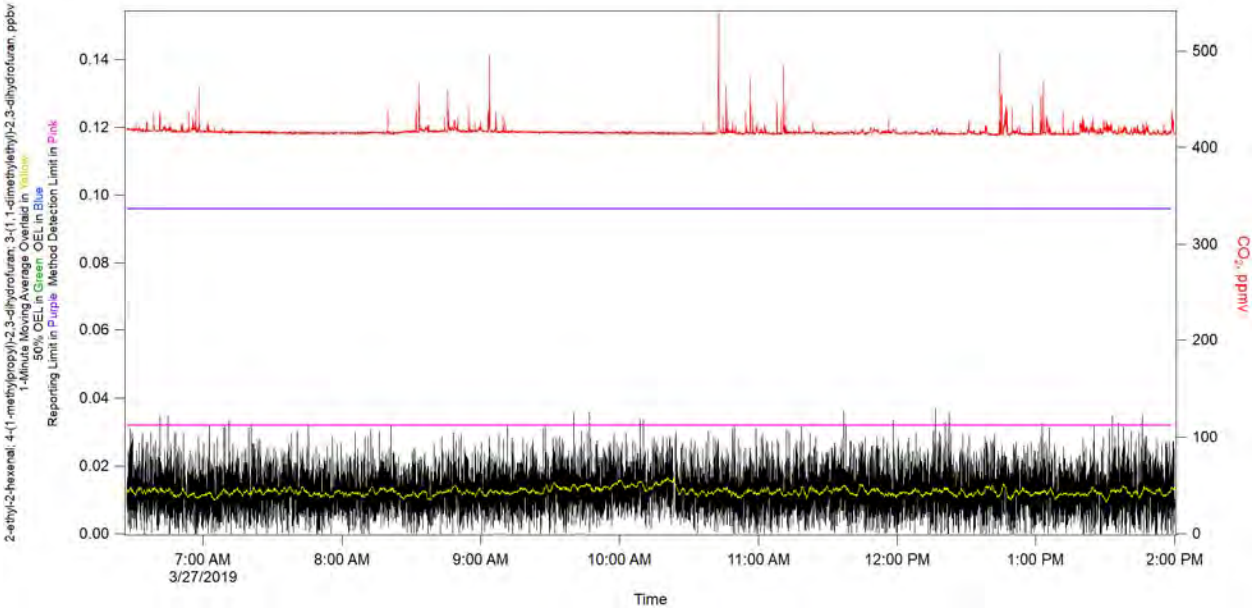


Figure 4-38. 2-ethyl-2-hexenal; 4-(1-methylpropyl)-2,3-dihydrofuran 3-(1,1-dimethylethyl)-2,3-dihydrofuran.

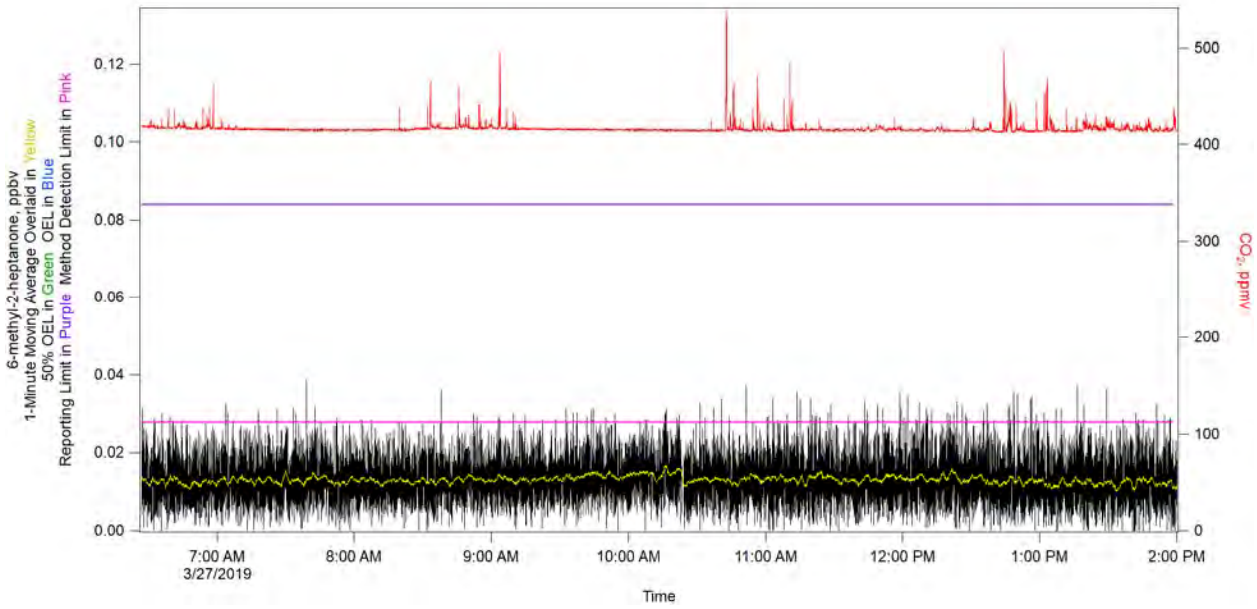


Figure 4-39. 6-methyl-2-heptanone.

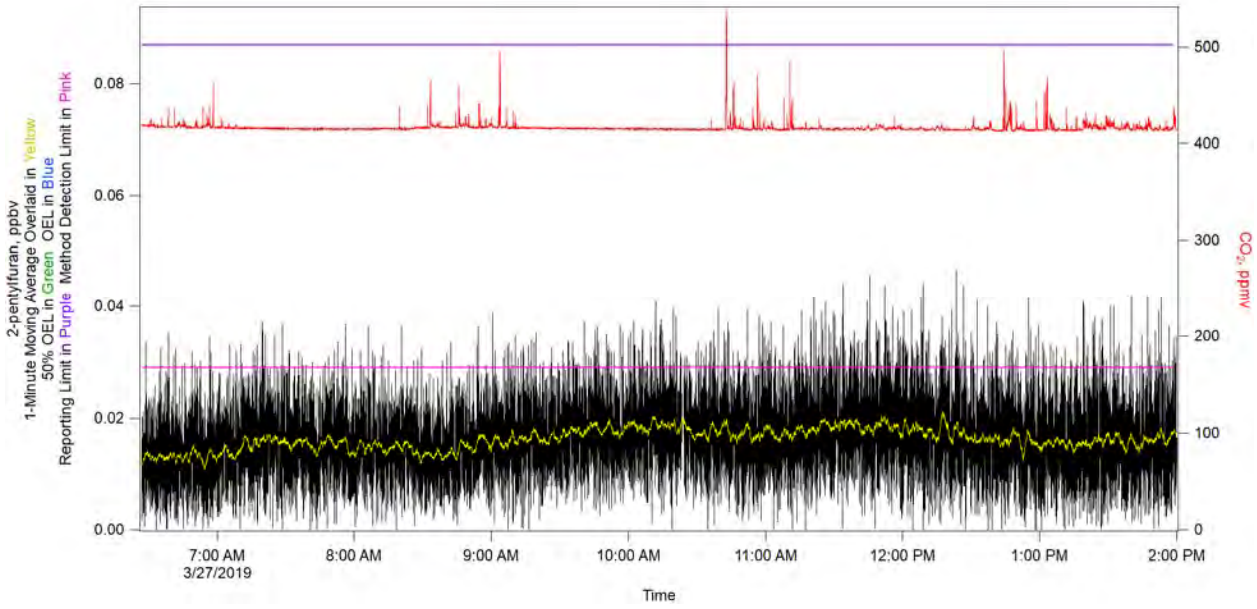


Figure 4-40. 2-pentylfuran.

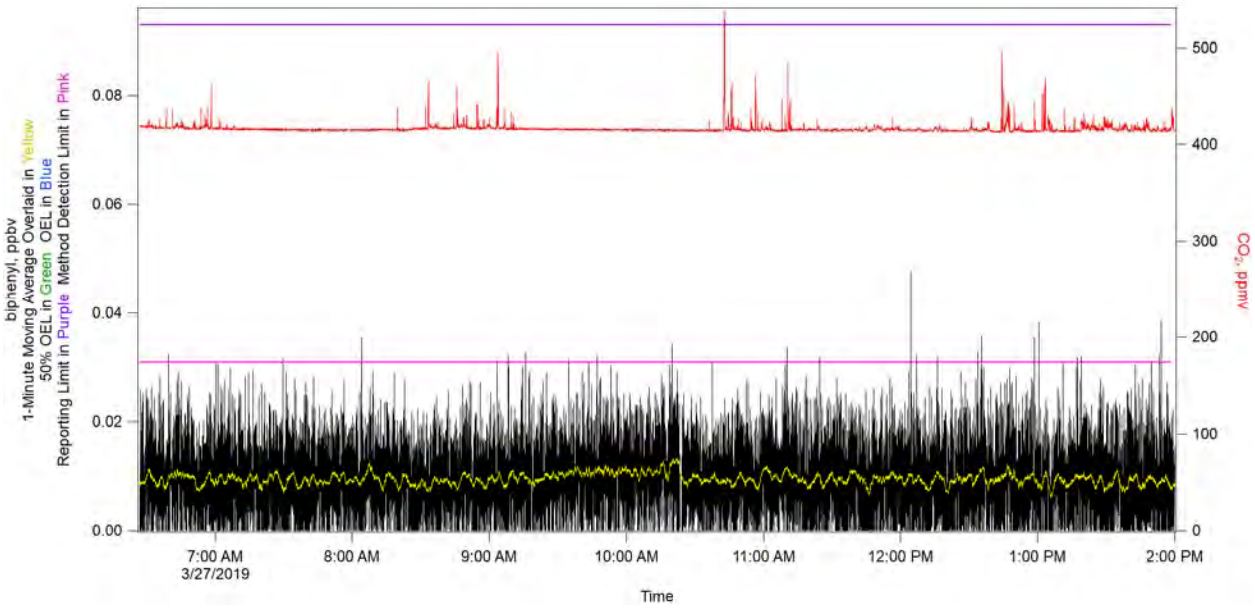


Figure 4-41. Biphenyl.

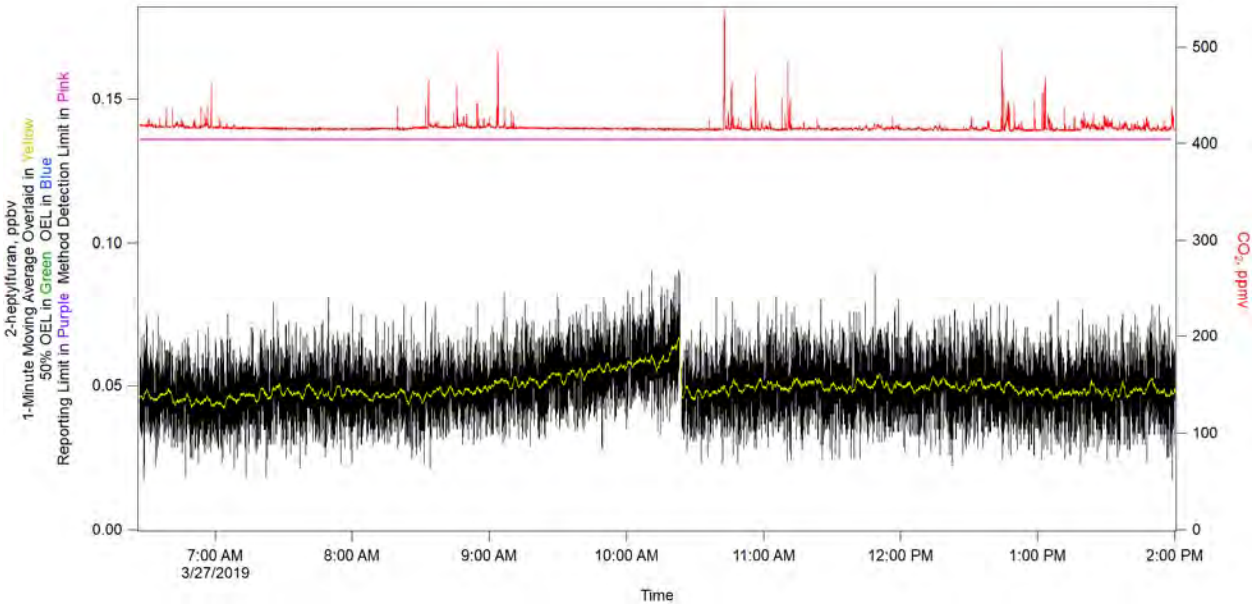


Figure 4-42. 2-heptylfuran.

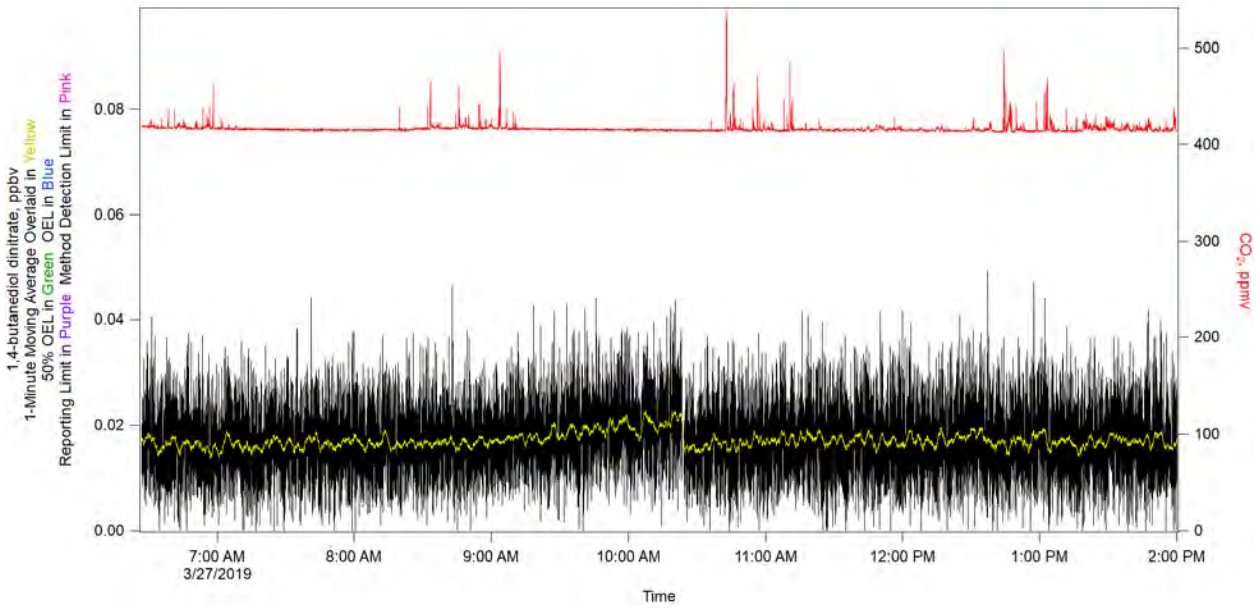


Figure 4-43. 1,4-butanediol Dinitrate.

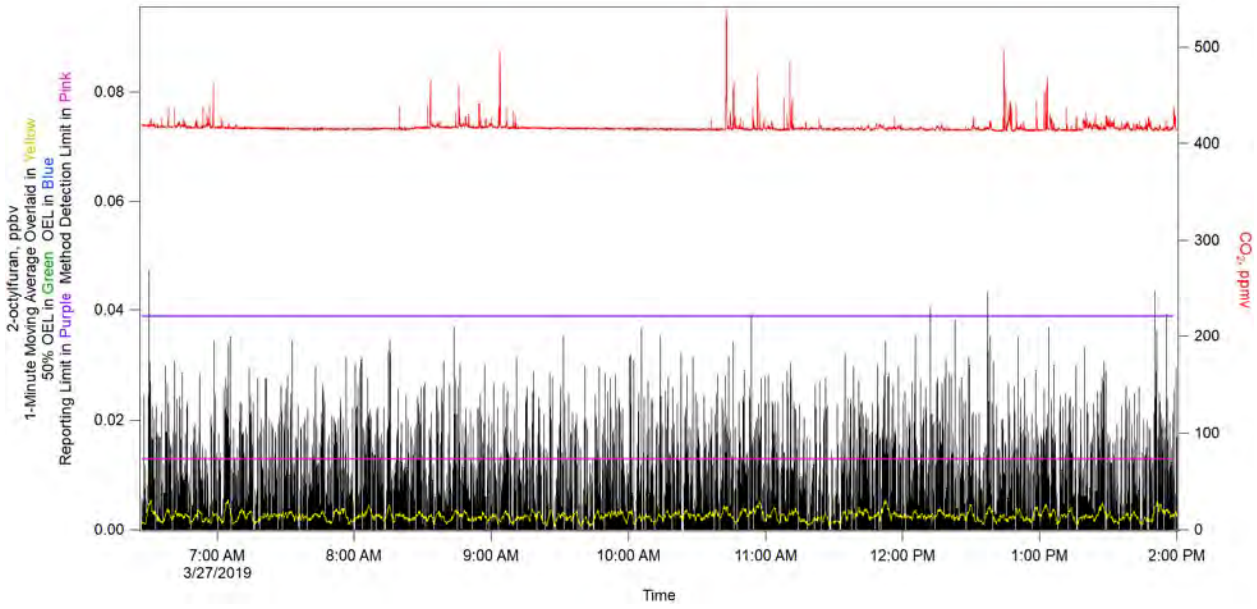


Figure 4-44. 2-octylfuran.

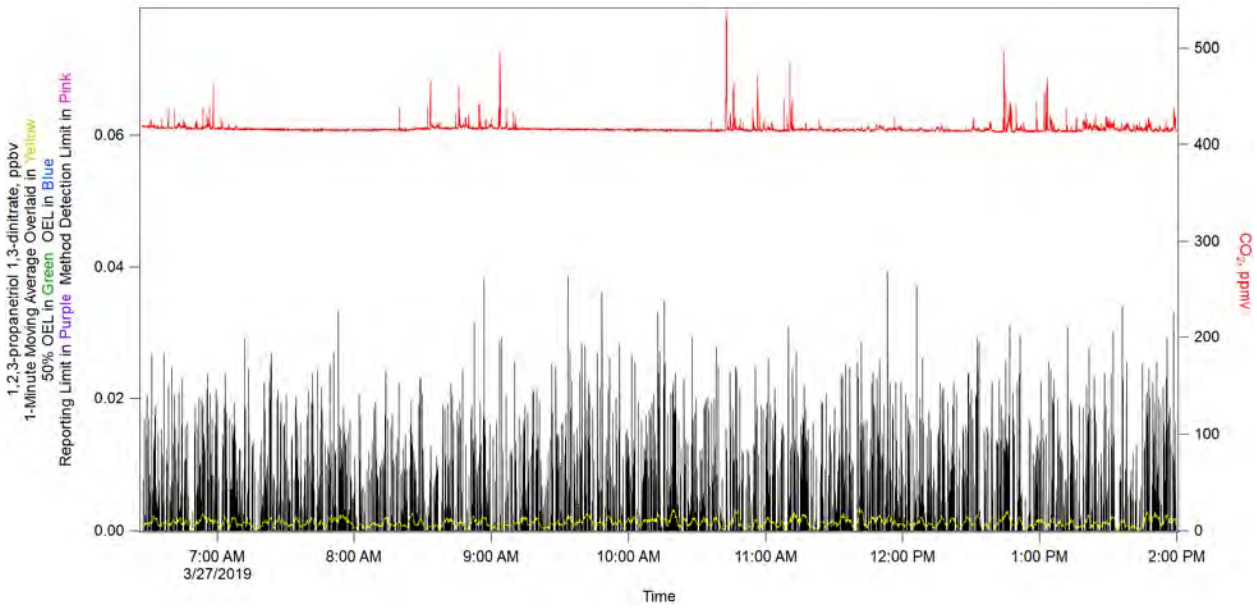


Figure 4-45. 1,2,3-propanetriol 1,3-dinitrate.

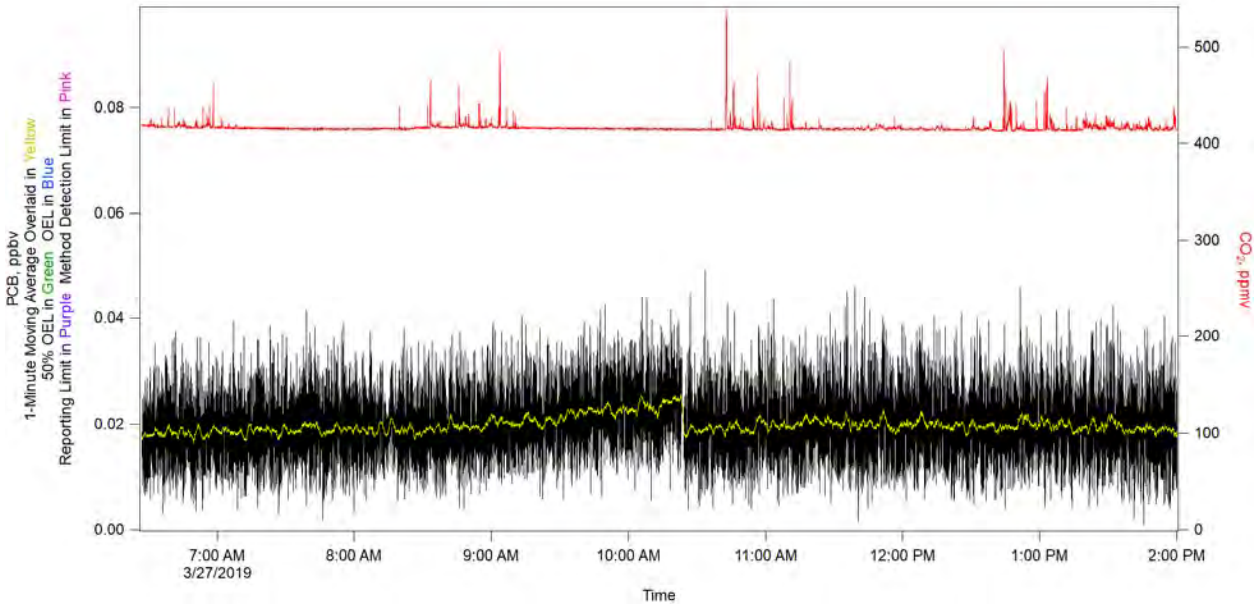


Figure 4-46. PCB.

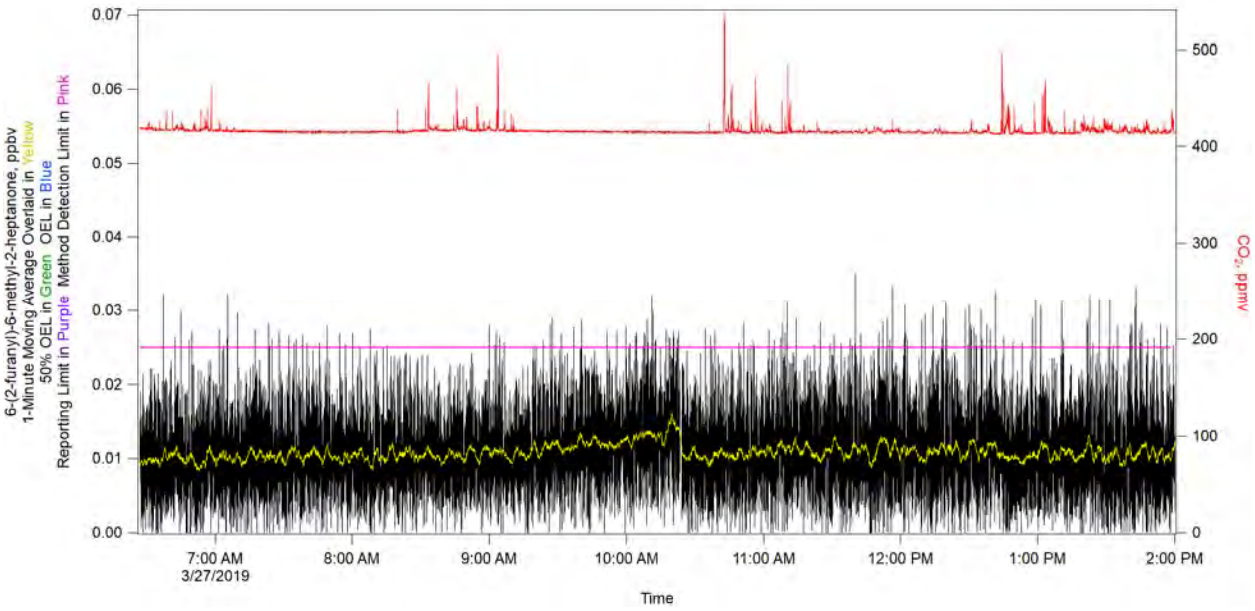


Figure 4-47. 6-(2-furanyl)-6-methyl-2-heptanone.

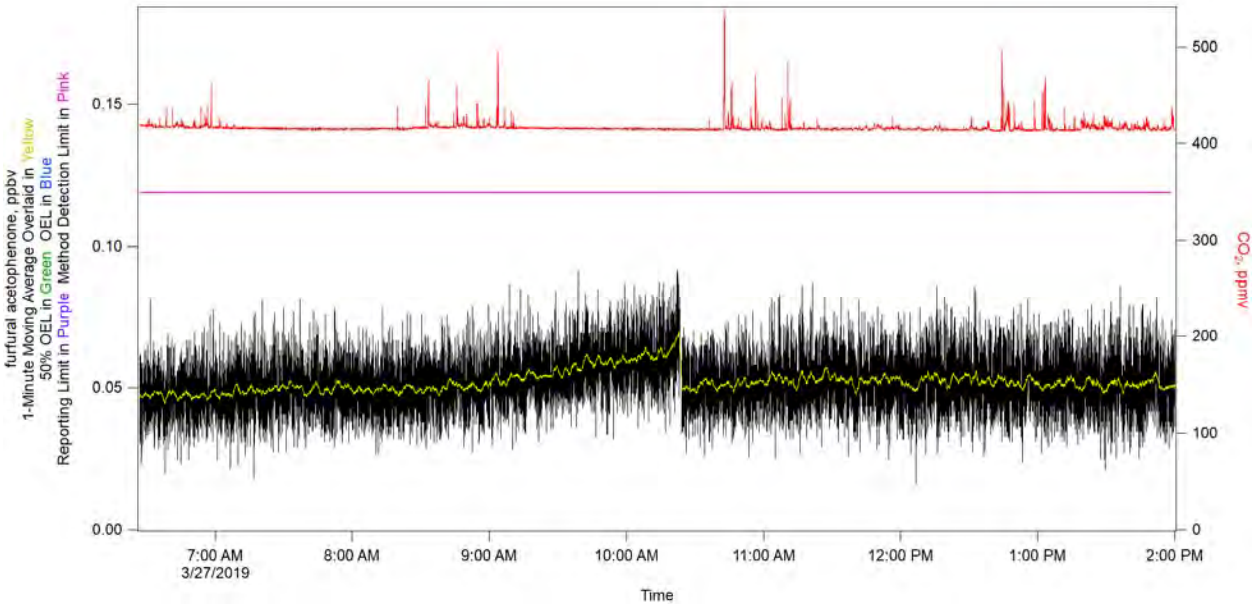


Figure 4-48. Furfural Acetophenone.

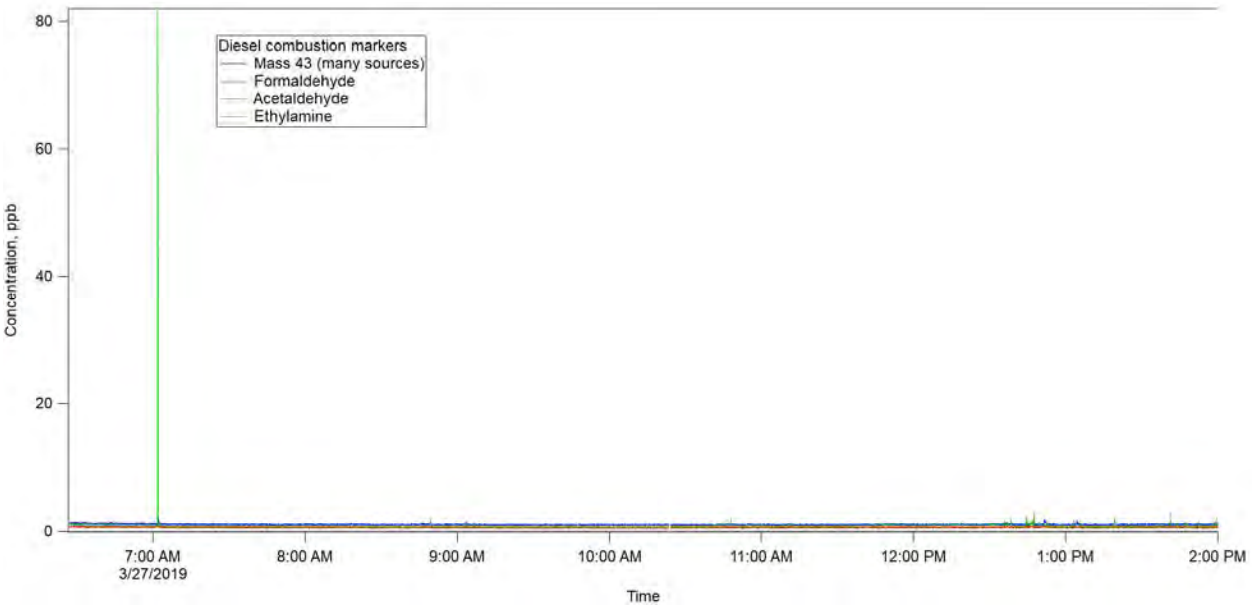


Figure 4-49. Diesel Combustion Markers.

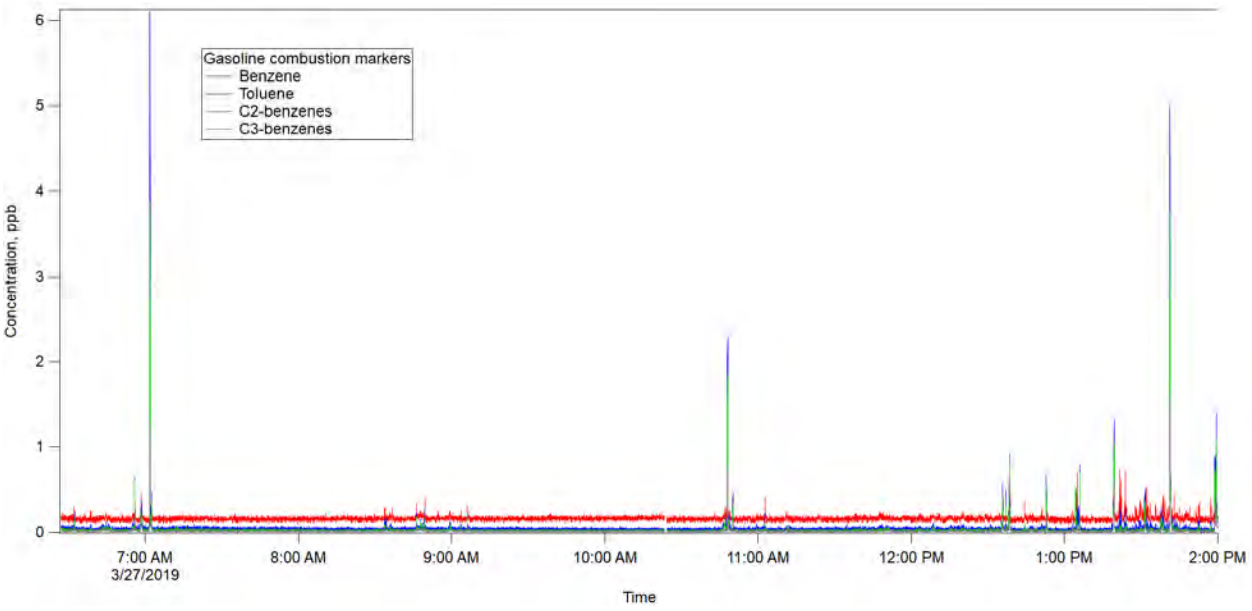


Figure 4-50. Gasoline Combustion Markers.

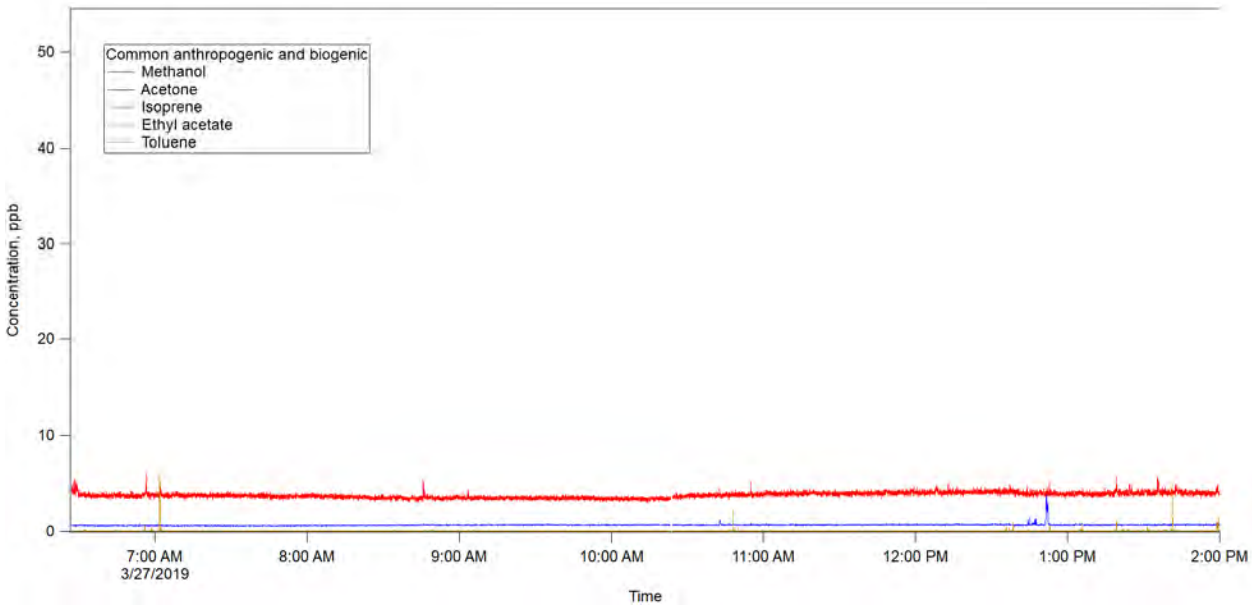


Figure 4-51. Plant and Human Markers.

5.0 MARCH 28, 2019 – AREA MONITORING AND FUGITIVE EMISSIONS

5.1 Quality Assessment

Data from March 28, 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 March 28, 2019, the Operators arrived at the ML at 05:00. 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 05:15. The ML arrived on the Hanford Site and ML personnel checked in with the CSO at 06:05. The ML performed a site survey loop of A Farms prior to parking southwest of the septic tanks located near the 242A Evaporator. At 07:55, the ML met the Subject Matter Expert (SME), Dr. Matthew Erickson, at the CSO.

At 08:48, the ML met Mr. Clark Carlson at 244AR to perform testing on diesel generators. Shortly after, the ML was parked northwest of 241-A Farm, near the farm's entrance. At 09:08, Operators connected the side port 35-ft heated line to the inlet. The Toxic Vapor Analyzer (TVA) 2020 was connected to the S2 line of the sampling system at 09:13. The configuration of the TVA 2020 in the ML is displayed in Figure 5-1.

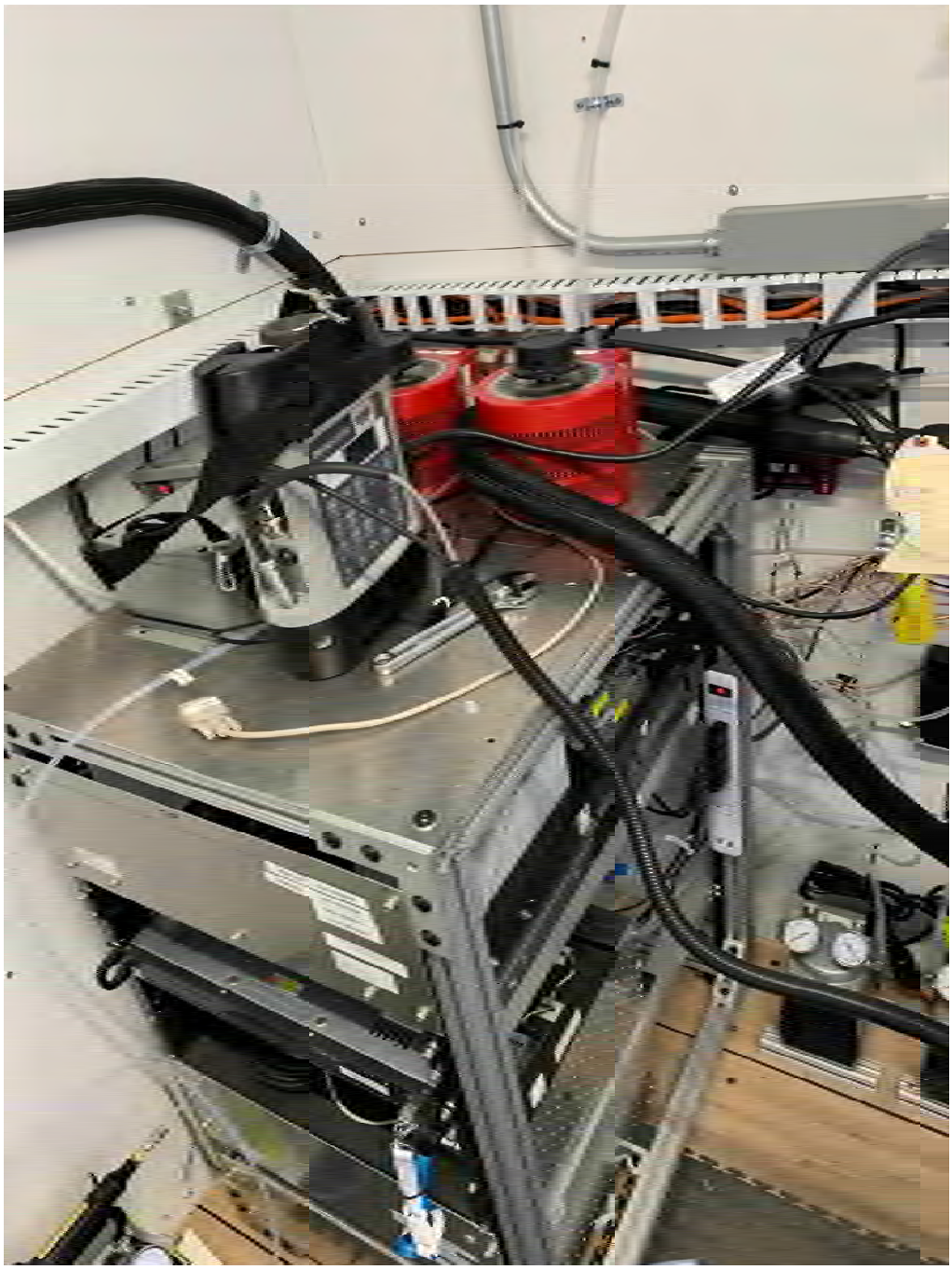


Figure 5-1. Toxic Vapor Analyzer 2020 use in the Mobile Laboratory.

The mass flow controller (MFC) connected to the dilution flow line (D1) was set to 3500sccm and the MFC connected to the supplemental flow line (D2)was set to 2000 sccm. The dilution flow for the D1 line was decreased to 3000 sccm and shortly after decreased to 2000 sccm. At 10:15, the TVA 2020 was disconnected from the sampling system. This marked the end of the first generator test.

Figure 5-2. Mobile Laboratory Monitoring of Generator #1.

The dilution line was set to sample at 3000 sccm and the supplemental flow line was set to sample at 0 sccm. The ML moved northwest of AY Farm at 10:41, connected the side port, and attached to a tripod situated above the generator exhaust. The dilution line was set to 3500 sccm and supplemental flow line was set at 2000 sccm. At 11:09, the dilution line's flow was decreased to 2500 sccm, to reduce the rate of dilution. At 11:17, the TVA 2020 was placed into the inlet line and the exhaust hose was disconnected.

Figure 5-3. Mobile Laboratory Monitoring of Generator #2.

A new PTR-MS file was started for TY Farm monitoring at 11:35. Generator (ID: HO-74-4539) was plugged into storage container (CC2EG117). The side port was disconnected at 11:37, when the ML began sampling from the mast again. At 12:20, the ML was parked on the northeast side of TY/TX Farms. After approximately 20 minutes, the ML was relocated to the southeast side of the farms in an effort to remain downwind. At 14:00, ML personnel checked out with the CSO. The ML arrived at the TerraGraphics warehouse at 15:15.

Figure 5-4. Location of the Mobile Laboratory During TY Farm Monitoring.

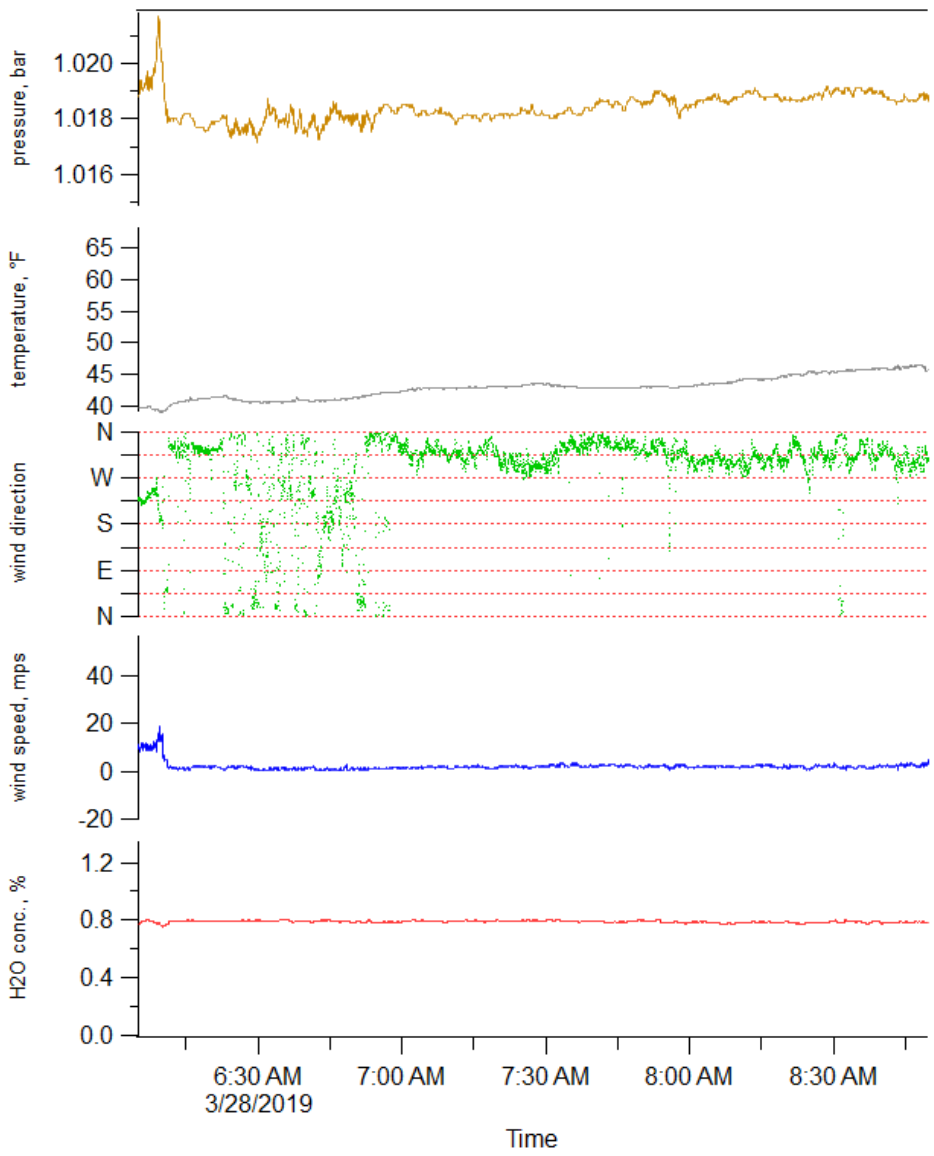


Figure 5-5. Weather Data for the Duration of the Monitoring Period.

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
- 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 March 28, 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	0.010	12.619	2.129	16.871	20.651	12.272
2	formaldehyde	300	1.302	<1.302	0.282	44.316	2.298	<1.302
3	methanol	200000	1.839	4.046†	1.585	39.179	48.457	3.702
4	acetonitrile	20000	0.070	0.091†	0.025	27.674	0.279	0.087
5	acetaldehyde	25000	2.070	<2.070	0.640	52.484	11.688	<2.070
6	ethylamine	5000	0.055	<0.055	0.010	33.254	0.081	<0.055
7	1,3-butadiene	1000	0.122	0.218†	0.046	21.036	0.730	0.216
8	propanenitrile	6000	0.121	<0.121	0.014	27.857	0.191	<0.121
9	2-propenal	100	0.314	<0.314	0.158	129.750	1.056	<0.314
10	1-butanol + butenes	20000	0.149	<0.149	0.050	55.537	0.854	<0.149
11	methyl isocyanate	20	0.061	<0.061	0.013	30.651	0.102	<0.061
12	methyl nitrite	100	0.117	<0.117	0.021	20.940	0.244	<0.117
13	furan	1	0.053	<0.053	0.009	31.986	0.088	<0.053
14	butanenitrile	8000	0.040	<0.040	0.008	38.388	0.063	<0.040
15	but-3-en-2-one + 2,3-dihydrofuran + 2,5-dihydrofuran	200, 1, 1	0.034	0.044†	0.057	128.093	N/A*	N/A*
16	butanal	25000	0.063	0.106†	0.055	52.200	0.573	0.095
17	NDMA**	0.3	0.020	<0.020	0.011	134.859	0.085	<0.020
18	benzene	500	0.230	0.839	3.344	398.800	18.869	<0.230
19	2,4-pentadienenitrile + pyridine	300	0.084	0.088†	0.212	241.343	1.357	<0.084
20	2-methylene butanenitrile	300	0.050	<0.050	0.006	36.848	0.047	<0.050
21	2-methylfuran	1	0.046	<0.046	0.011	34.068	0.085	<0.046
22	pentanenitrile	6000	0.029	<0.029	0.007	40.749	0.051	<0.029
23	3-methyl-3-buten-2-one + 2-methyl-2-butenal	20, 30	0.048	<0.048	0.010	35.485	0.080	<0.048
24	NEMA**	0.3	0.027	<0.027	0.011	123.728	0.065	<0.027
25	2,5-dimethylfuran	1	0.035	<0.035	0.009	43.096	0.060	<0.035
26	hexanenitrile	6000	0.029	<0.029	0.006	45.399	0.040	<0.029
27	2-hexanone (MBK)	5000	0.030	0.041†	0.109	268.424	0.866	<0.030
28	NDEA**	0.1	0.023	<0.023	0.008	104.905	0.046	<0.023
29	butyl nitrite + 2-nitro-2-methylpropane	100, 300	0.106	<0.106	0.008	24.568	0.071	<0.106

Table 5-1. Chemical of Potential Concern Statistical Information for the Monitoring Period of March 28, 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	0.031	0.058†	0.209	359.656	1.332	<0.031
31	2-propylfuran + 2-ethyl-5-methylfuran	1	0.035	<0.035	0.008	51.231	0.054	<0.035
32	heptanenitrile	6000	0.029	<0.029	0.005	45.404	0.038	<0.029
33	4-methyl-2-hexanone	500	0.032	<0.032	0.006	47.177	0.040	<0.032
34	NMOR**	0.6	0.017	<0.017	0.007	152.149	0.071	<0.017
35	butyl nitrate	2500	0.019	<0.019	0.005	75.594	0.031	<0.019
36	2-ethyl-2-hexenal + 4-(1-methylpropyl)-2,3-dihydrofuran + 3-(1,1-dimethylethyl)-2,3-dihydrofuran	100, 1, 1	0.032	<0.032	0.006	46.088	0.043	<0.032
37	6-methyl-2-heptanone	8000	0.028	<0.028	0.006	42.725	0.043	<0.028
38	2-pentylfuran	1	0.029	<0.029	0.007	40.927	0.047	<0.029
39	biphenyl	200	0.031	<0.031	0.007	67.520	0.040	<0.031
40	2-heptylfuran	1	0.136	<0.136	0.009	18.959	0.087	<0.136
41	1,4-butanediol dinitrate	50	0.184	<0.184	0.008	44.626	0.059	<0.184
42	2-octylfuran	1	0.013	<0.013	0.006	231.655	0.047	<0.013
43	1,2,3-propanetriol 1,3-dinitrate	50	0.132	<0.132	0.004	331.803	0.039	<0.132
44	PCB	1000	0.139	<0.139	0.007	36.100	0.066	<0.139
45	6-(2-furanyl)-6-methyl-2-heptanone	1	0.025	<0.025	0.005	50.234	0.035	<0.025
46	furfural acetophenone	1	0.119	<0.119	0.009	19.122	0.084	<0.119
N/A*	The maximum peak value for but-3-en-2-one + 2,3 dihydrofuran + 2,5 dihydrofuran was 0.476 ppb and the median value was <0.034 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 5-5 through Figure 5-53 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 March 28, 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.

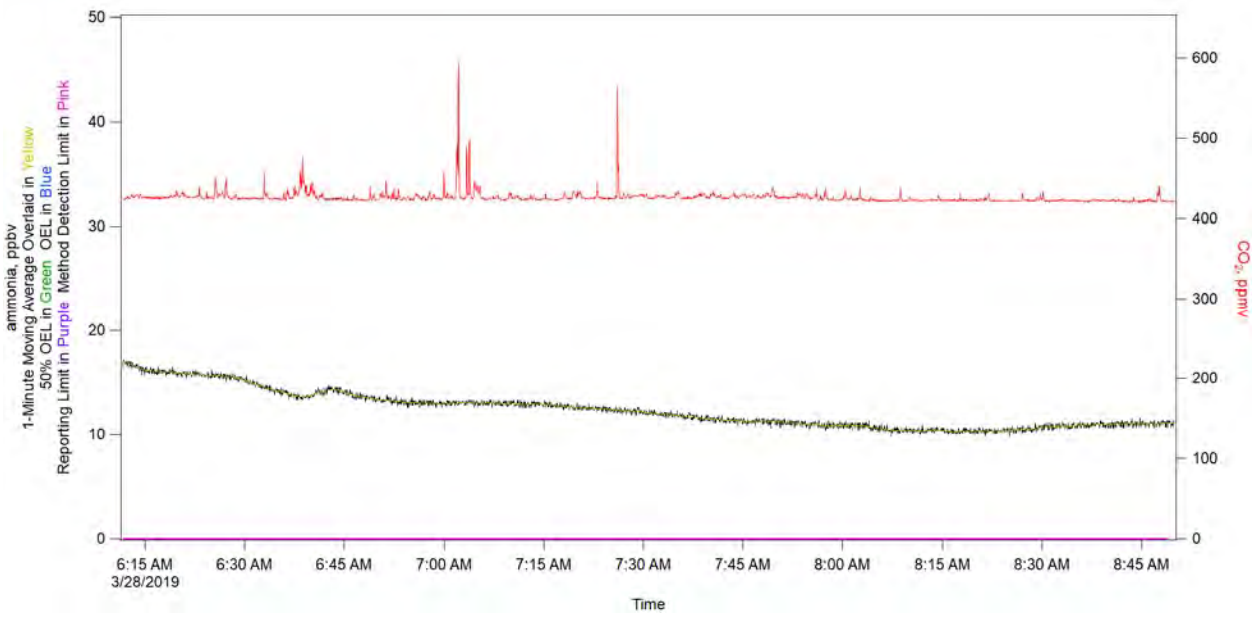


Figure 5-5. Ammonia.

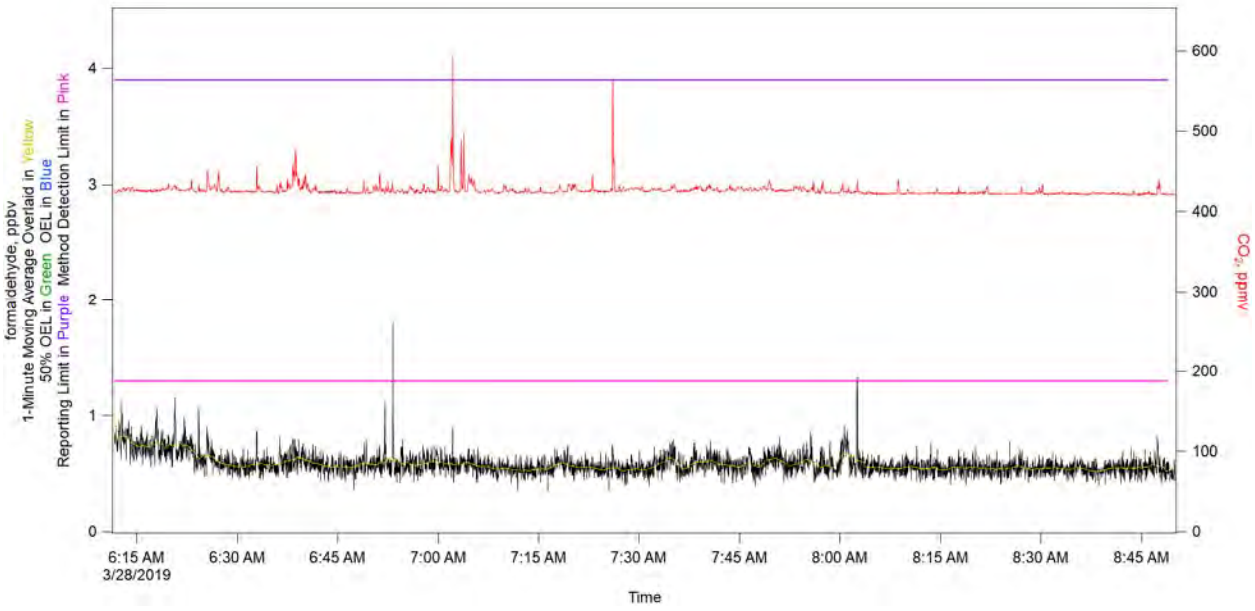


Figure 5-6. Formaldehyde.

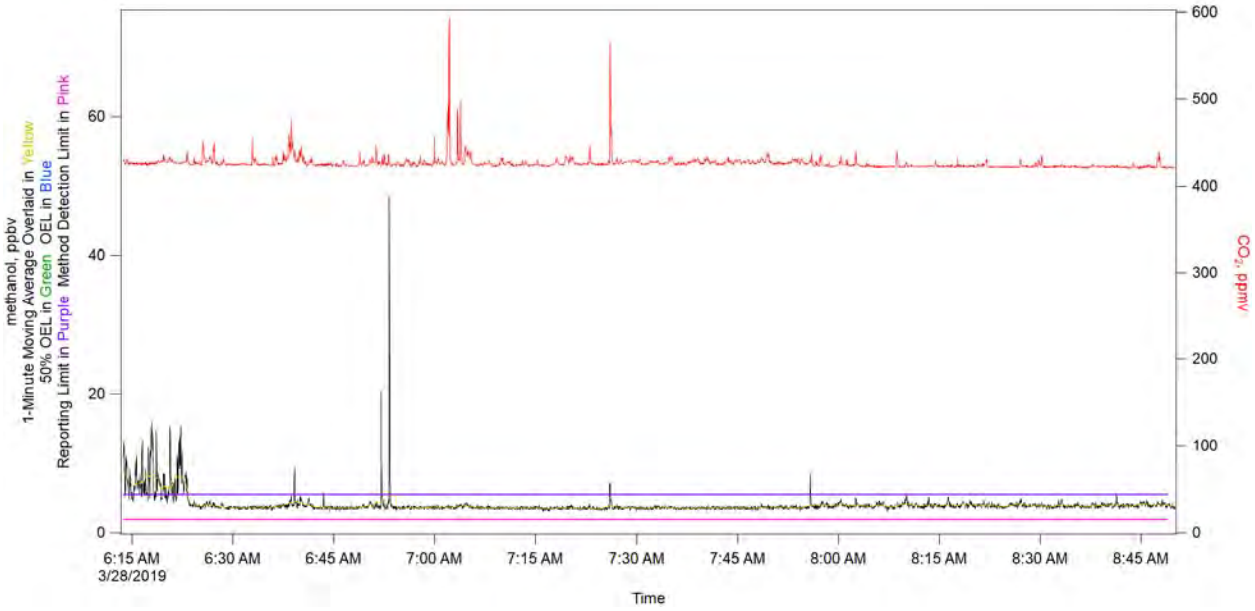


Figure 5-7. Methanol.

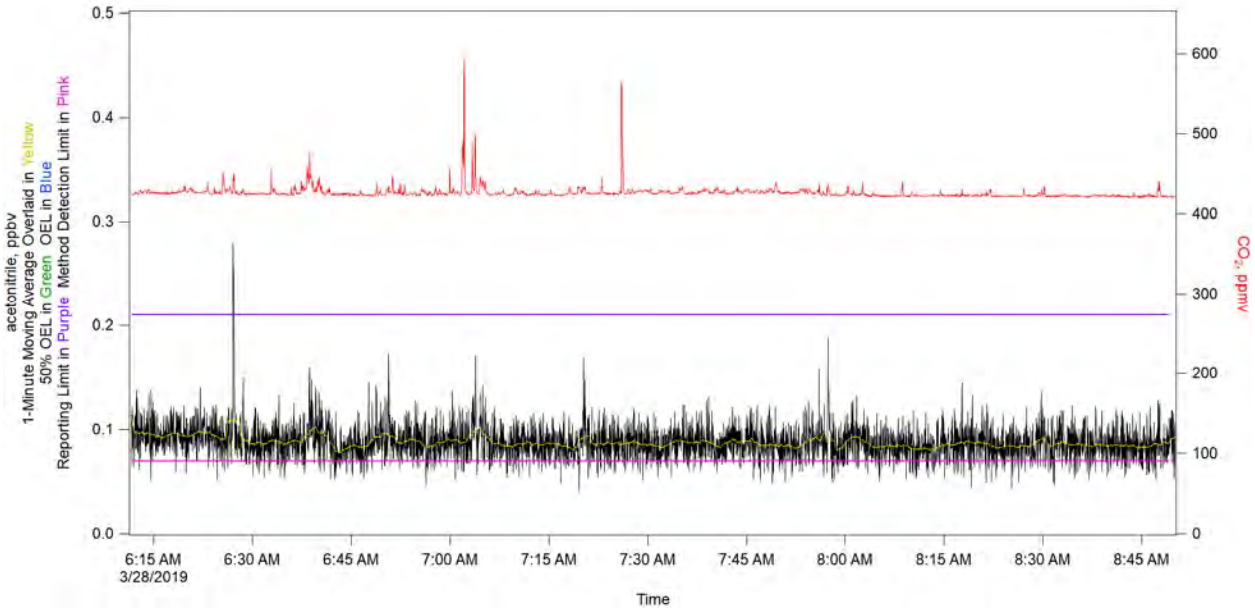


Figure 5-8. Acetonitrile.

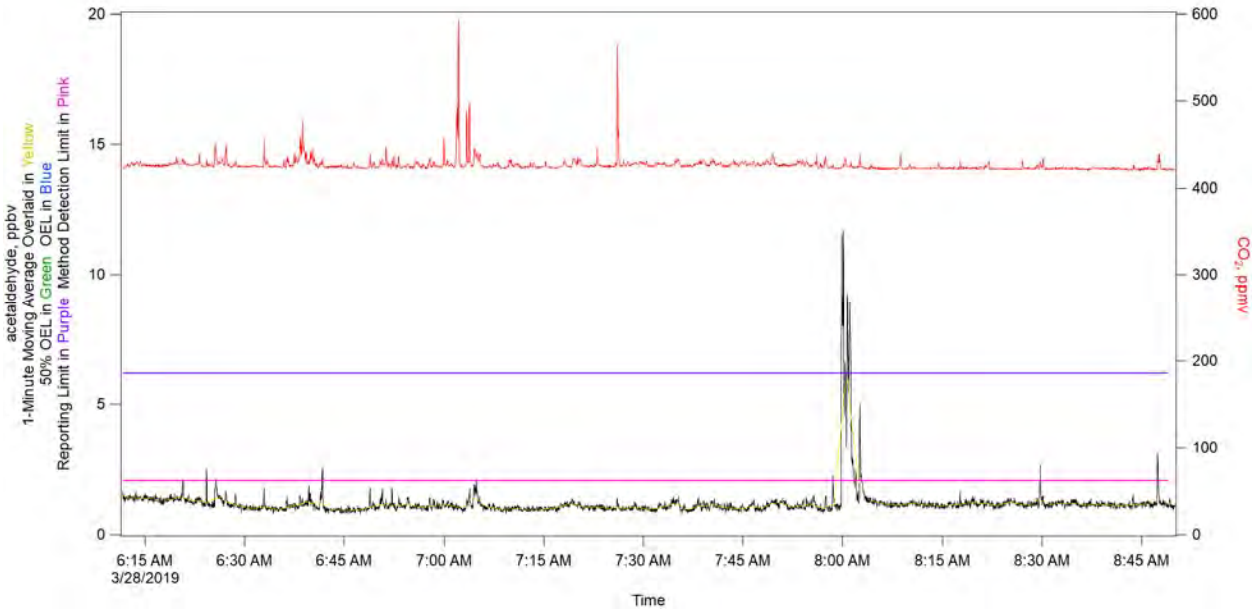


Figure 5-9. Acetaldehyde.

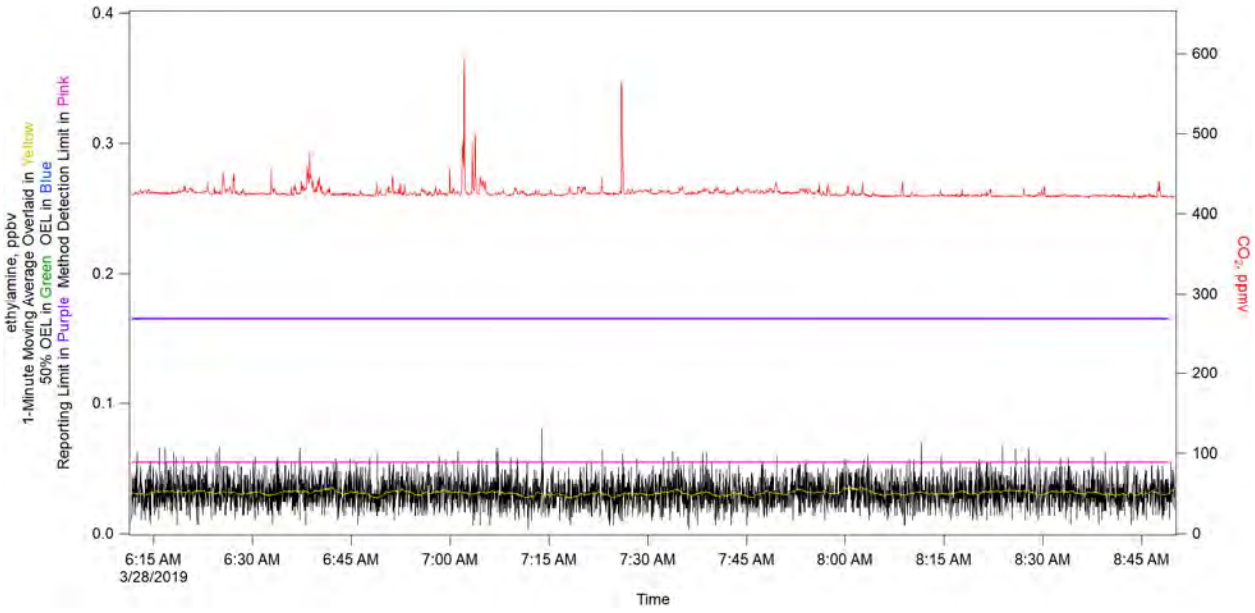


Figure 5-10. Ethylamine.

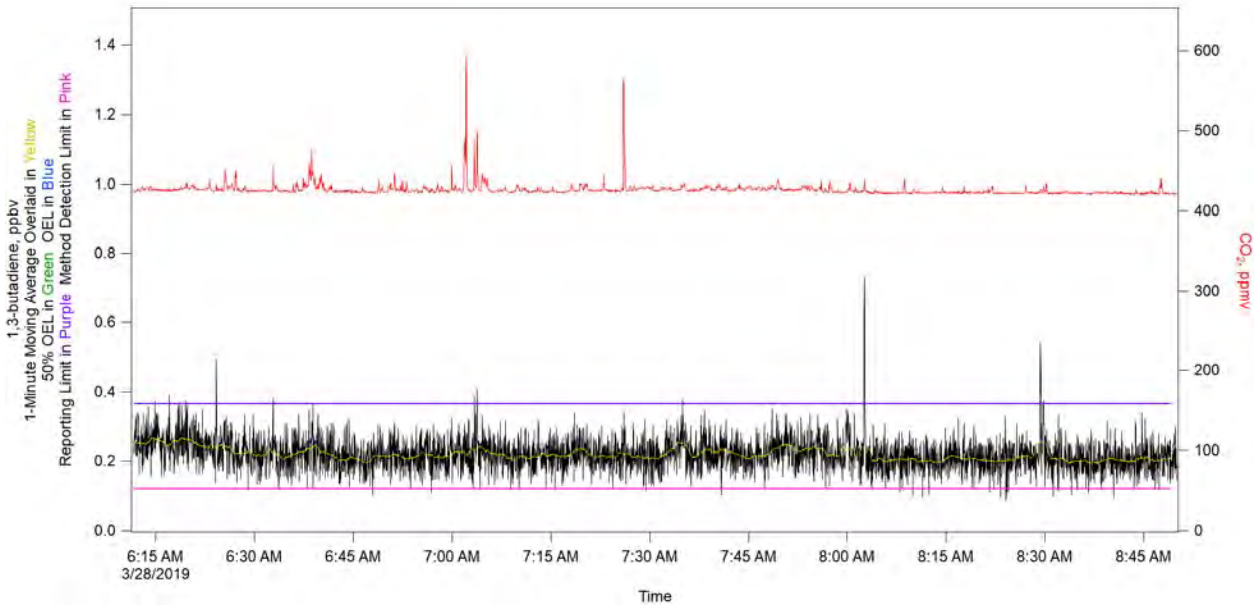


Figure 5-11. 1,3-butadiene.

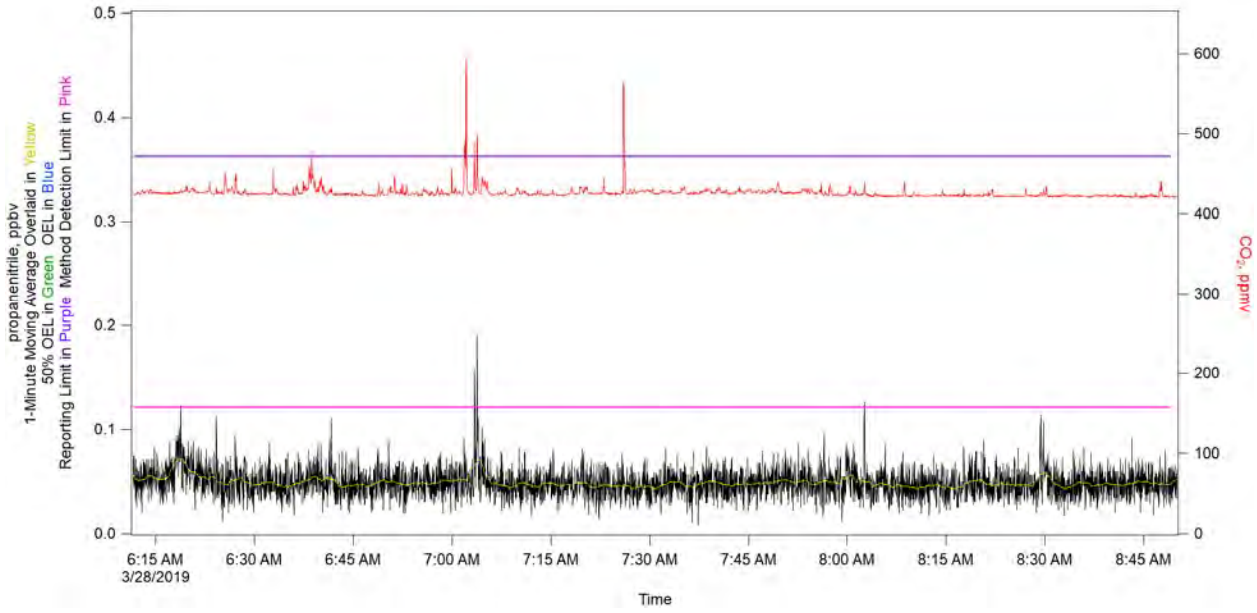


Figure 5-12. Propanenitrile.

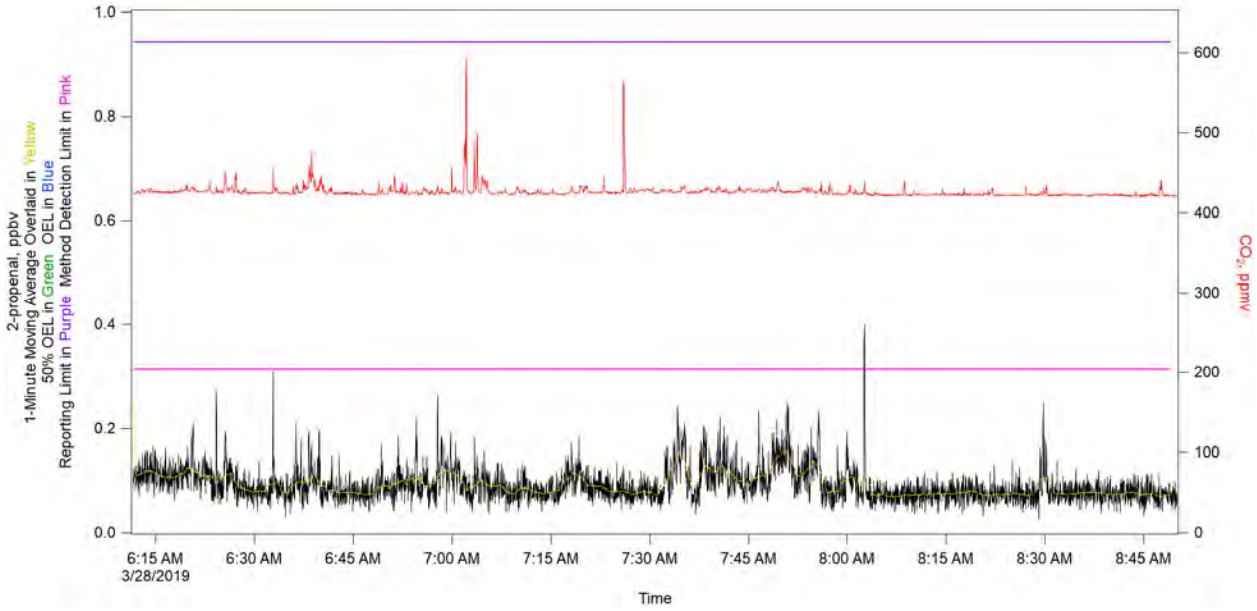


Figure 5-13. 2-propenal.

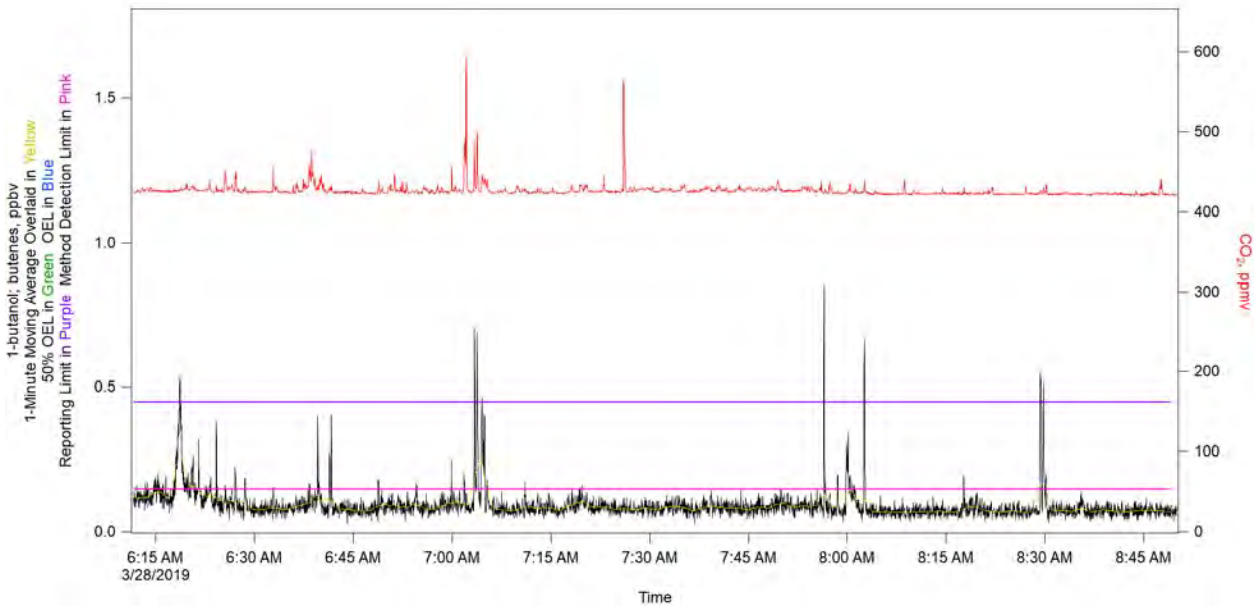


Figure 5-14. 1-butanol; Butenes.

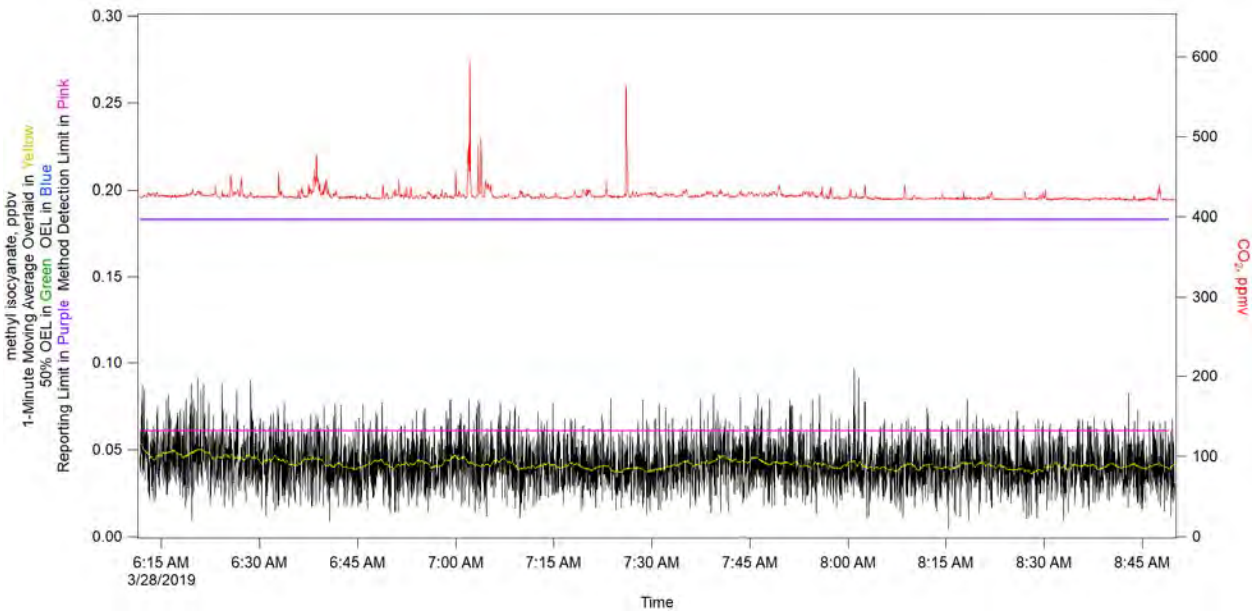


Figure 5-15. Methyl Isocyanate.

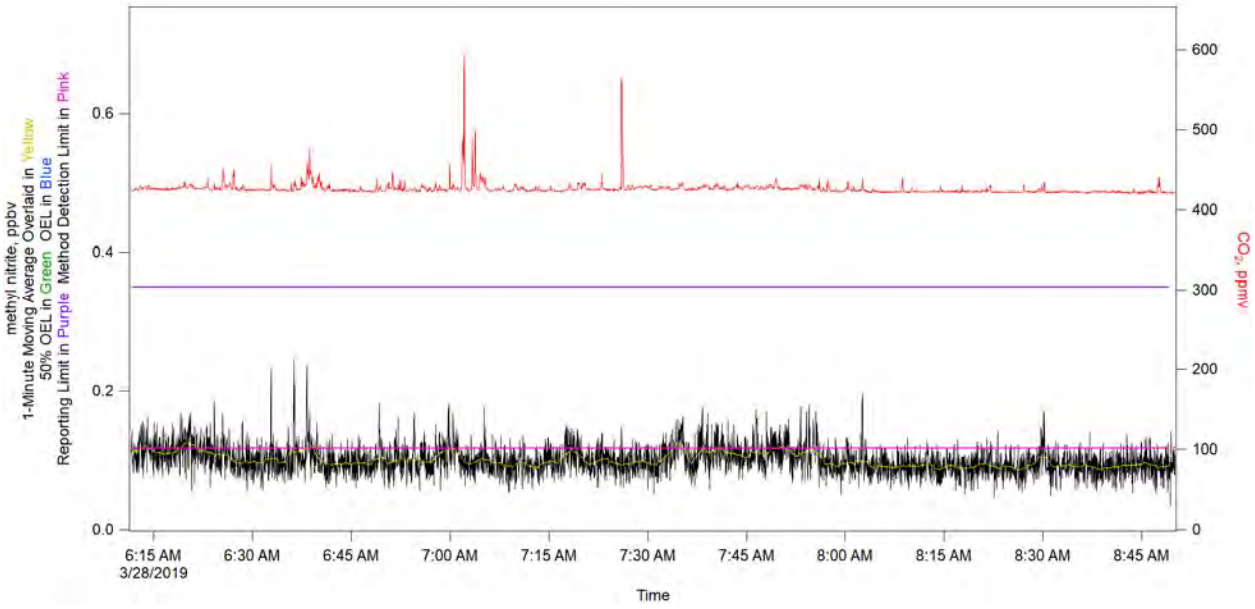


Figure 5-16. Methyl Nitrite.

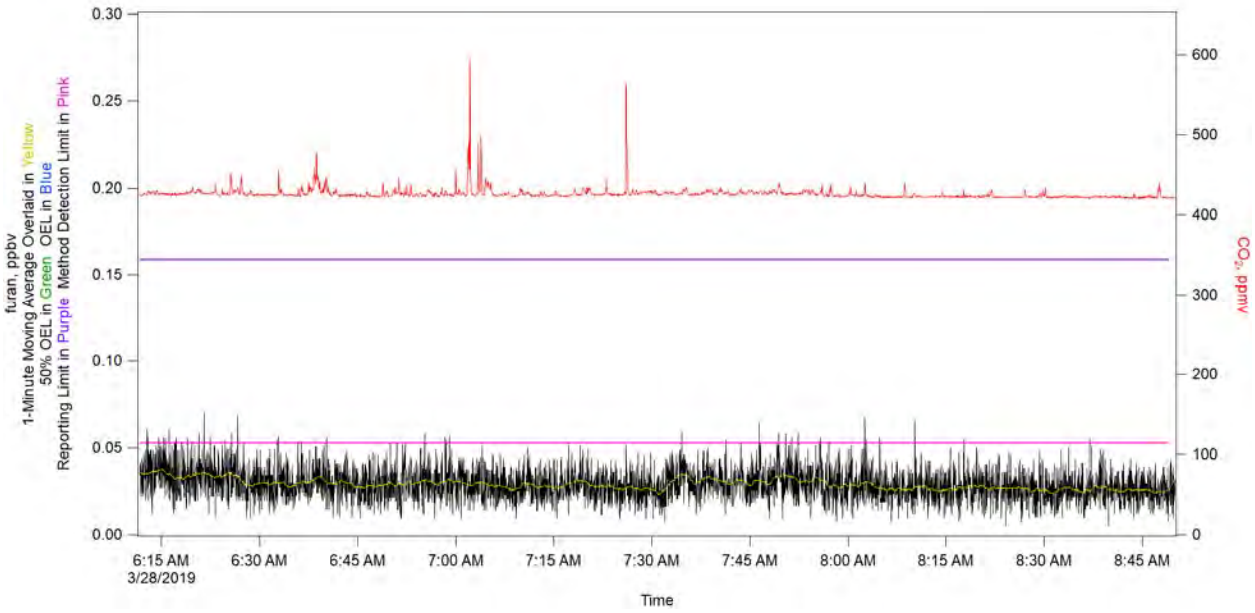


Figure 5-17. Furan.

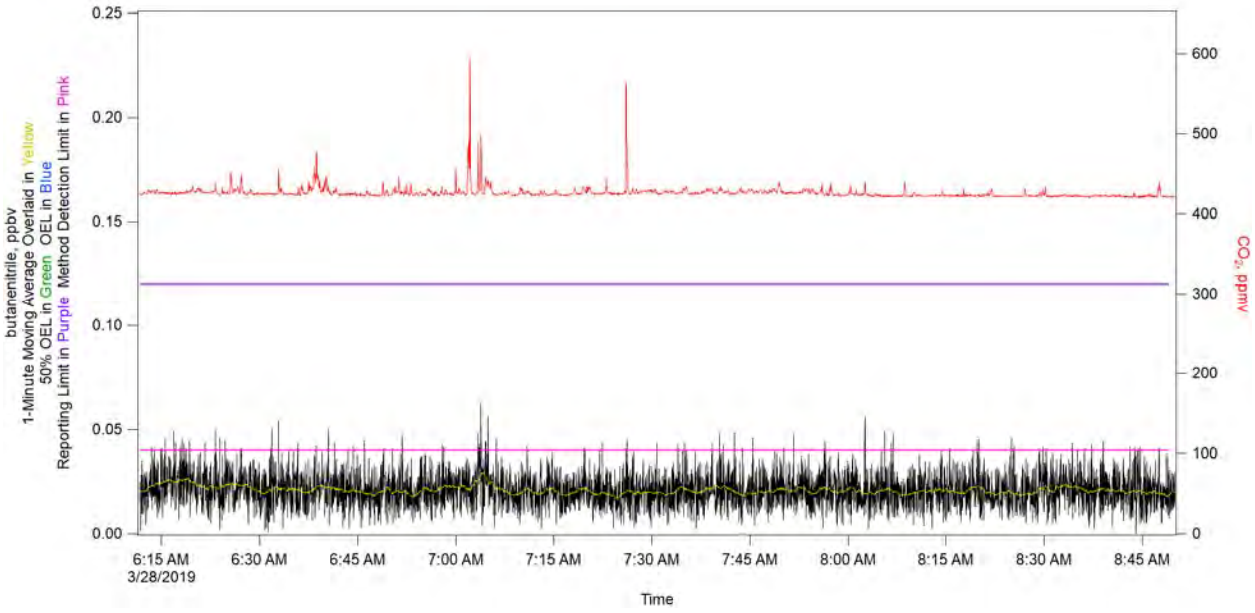


Figure 5-18. Butanenitrile.

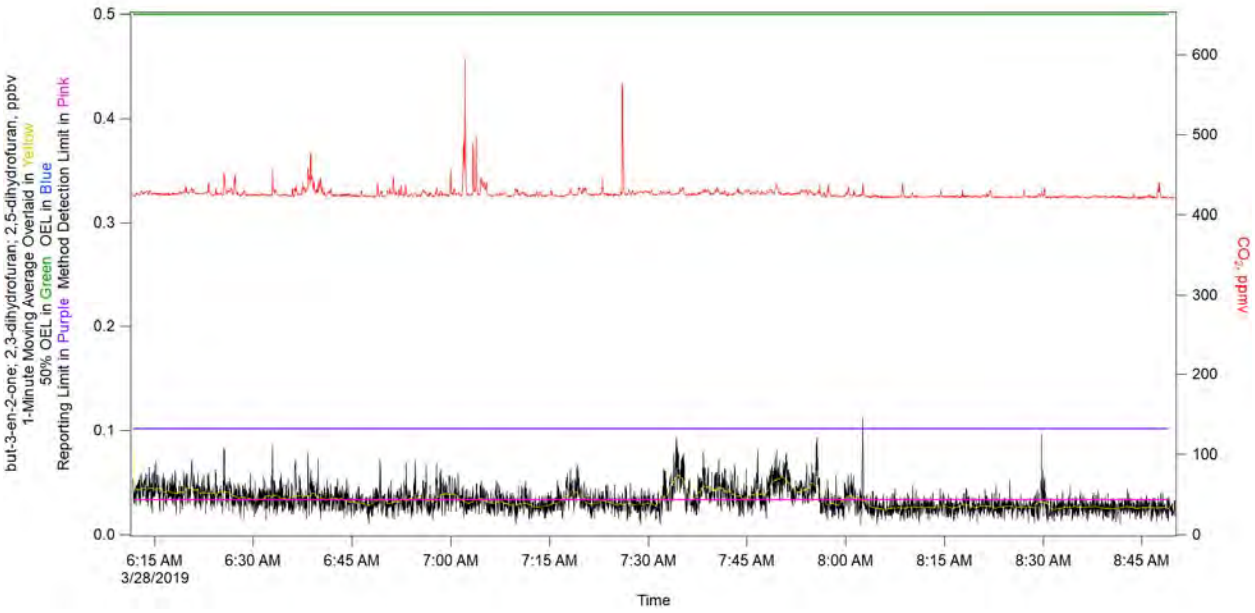


Figure 5-19. But-3-en-2-one; 2,3-dihydrofuran; 2,5-dihydrofuran.

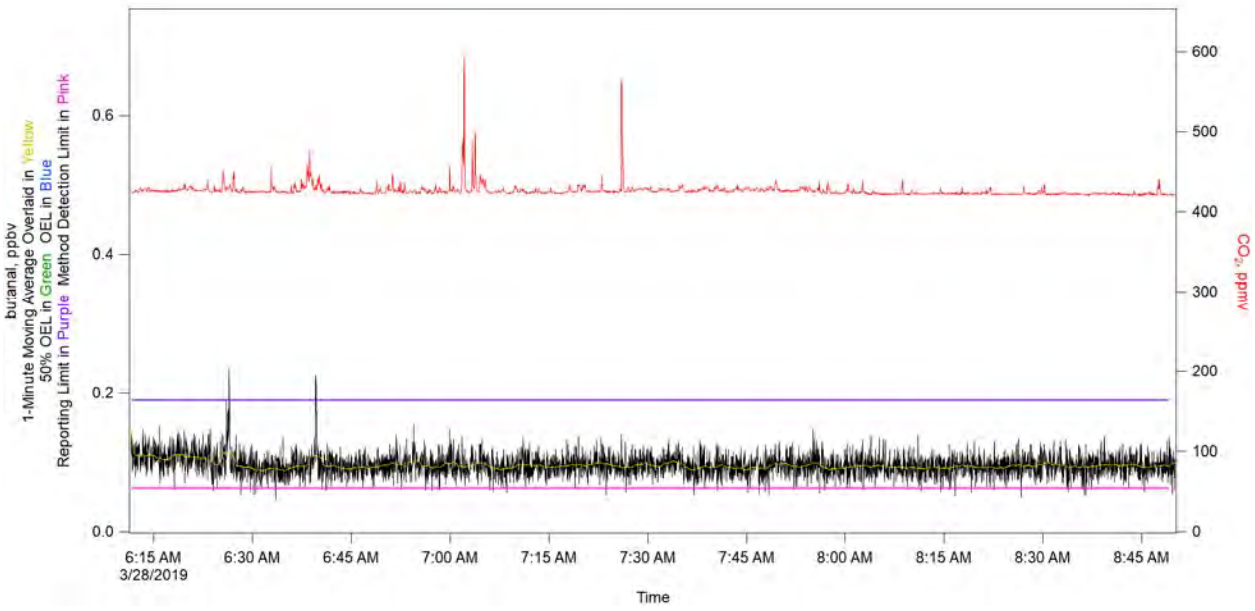


Figure 5-20. Butanal.

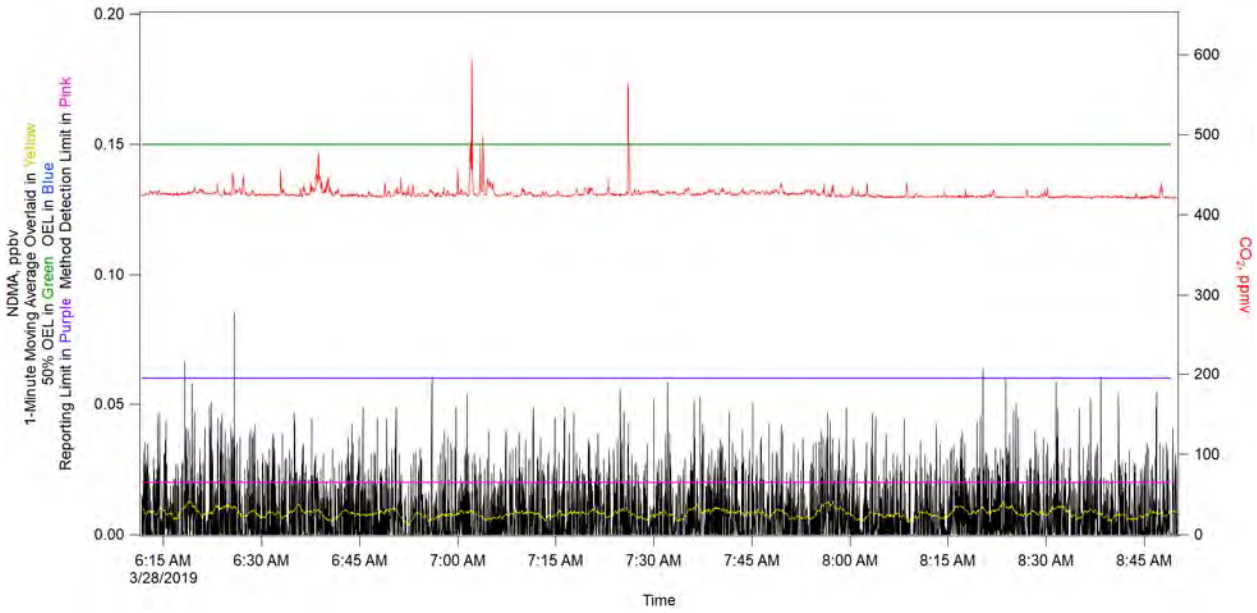


Figure 5-21. N-nitrosodimethylamine (NDMA).

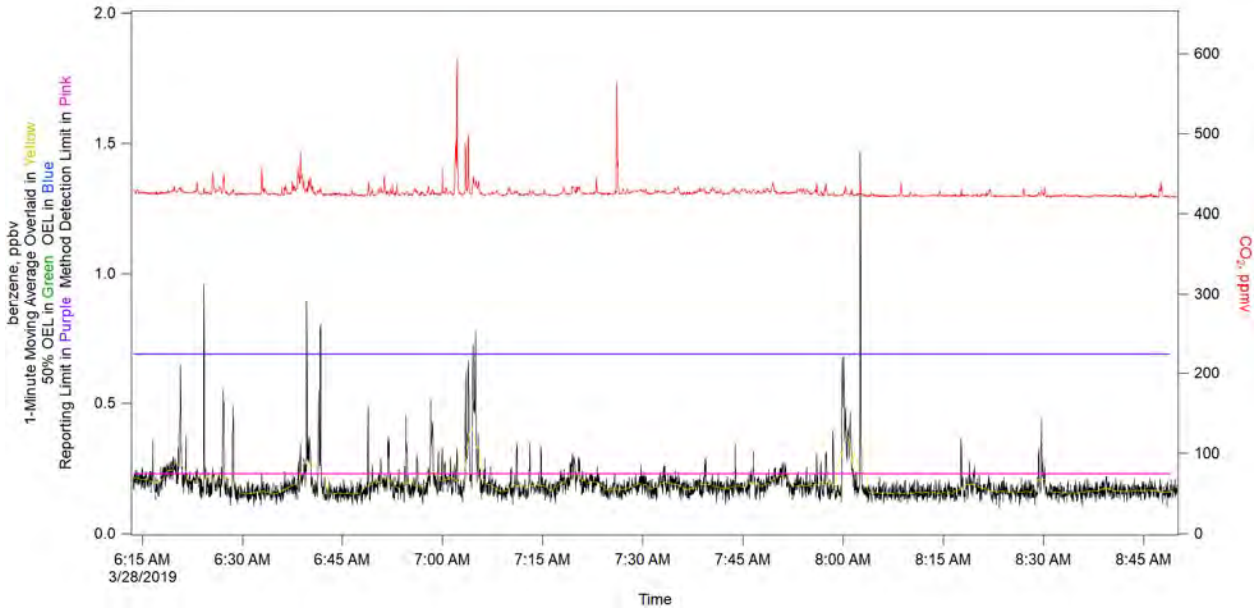


Figure 5-22. Benzene.

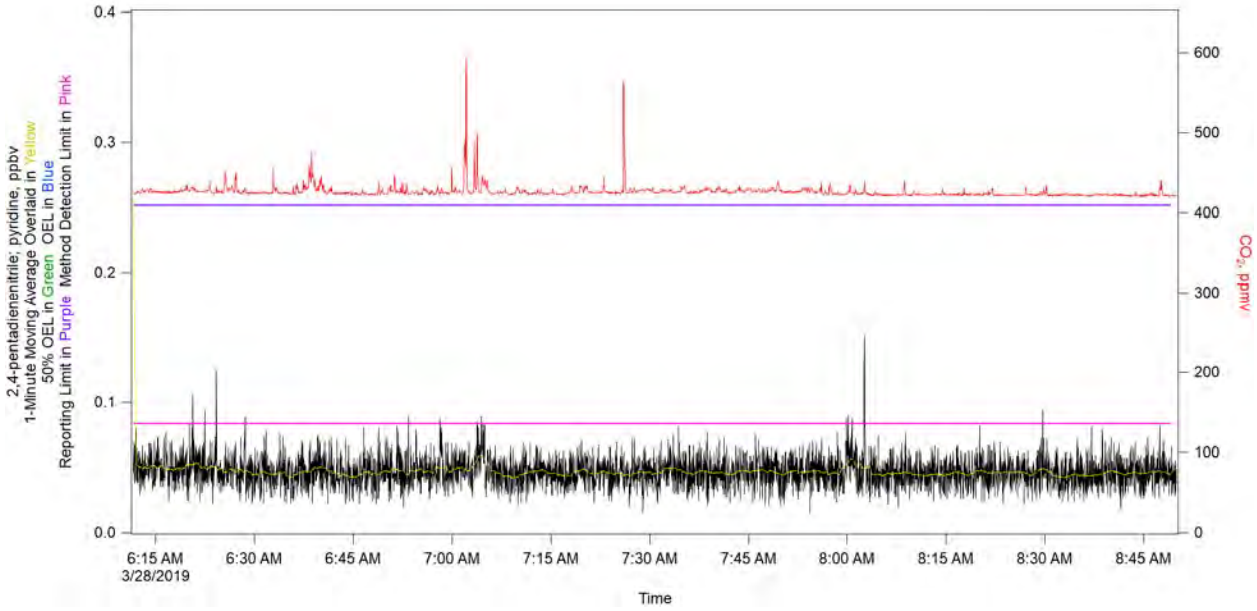


Figure 5-23. 2,4-pentadienenitrile; Pyridine.

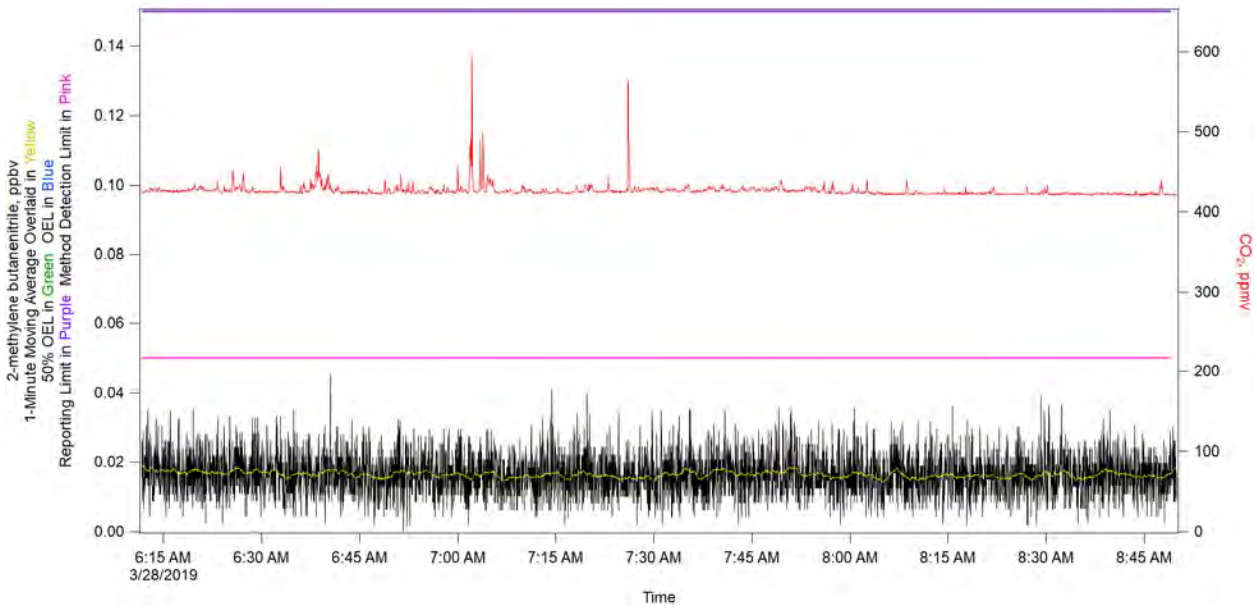


Figure 5-24. 2-methylene Butanenitrile.

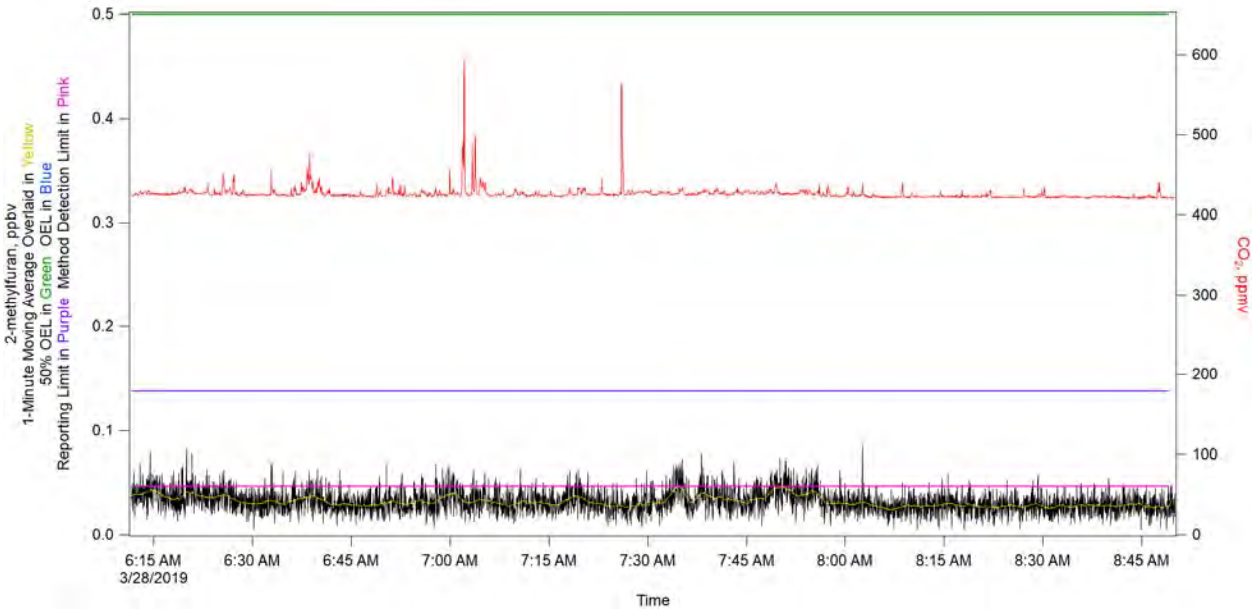


Figure 5-25. 2-methylfuran.

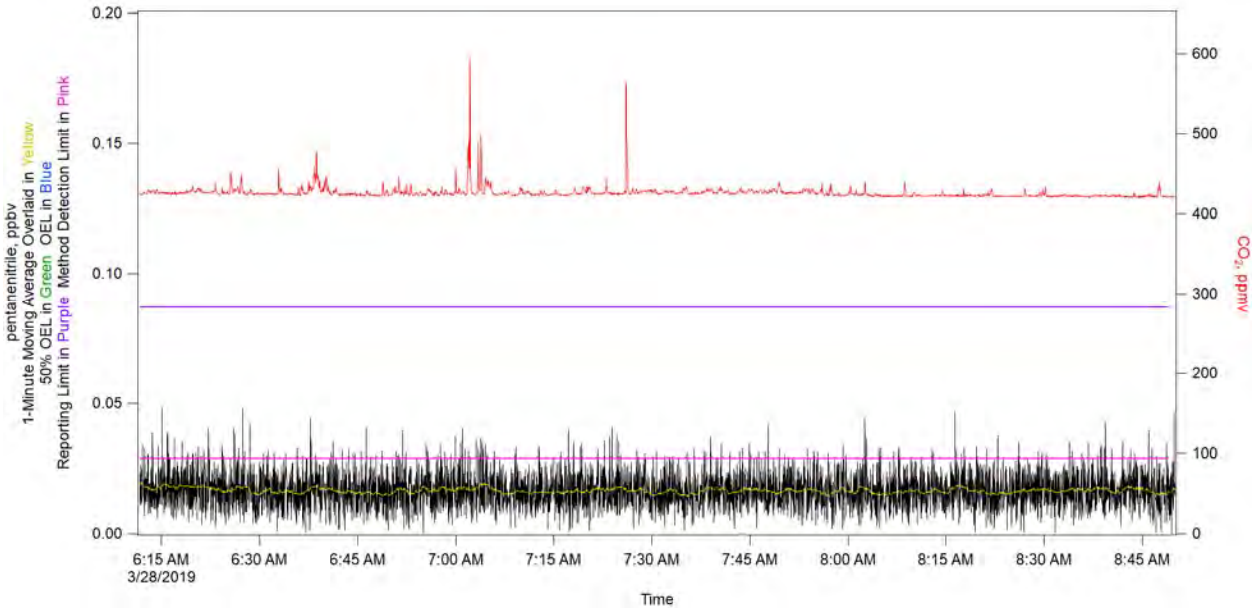


Figure 5-26. Pentanenitrile.

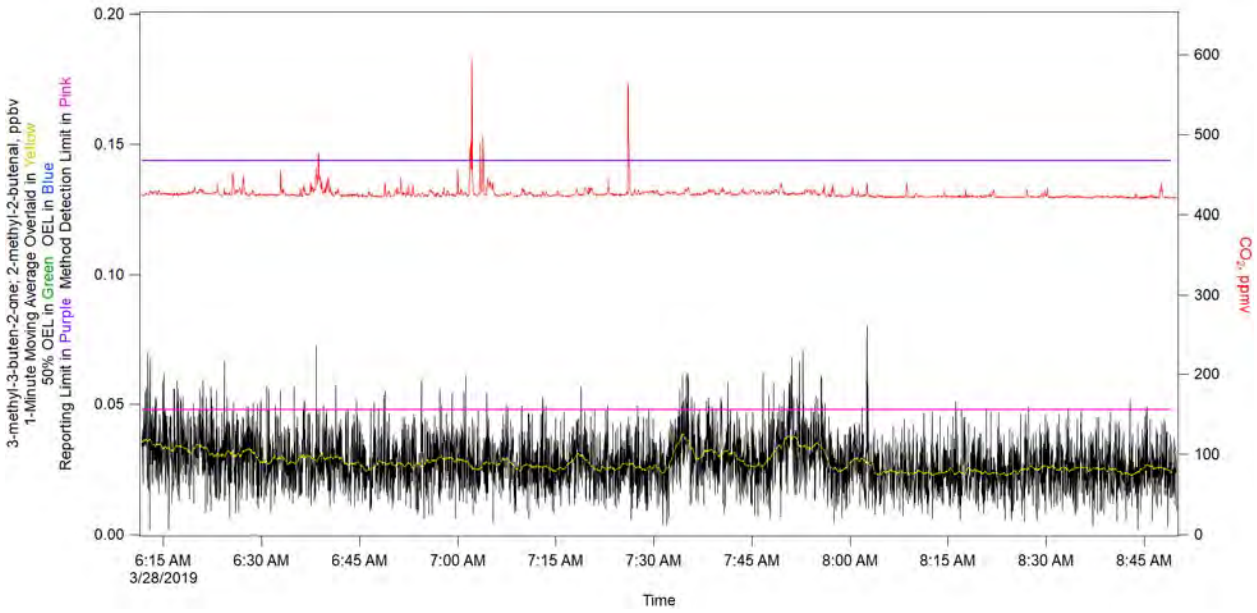


Figure 5-27. 3-methyl-3-buten-2-one; 2-methyl-2-butenal.

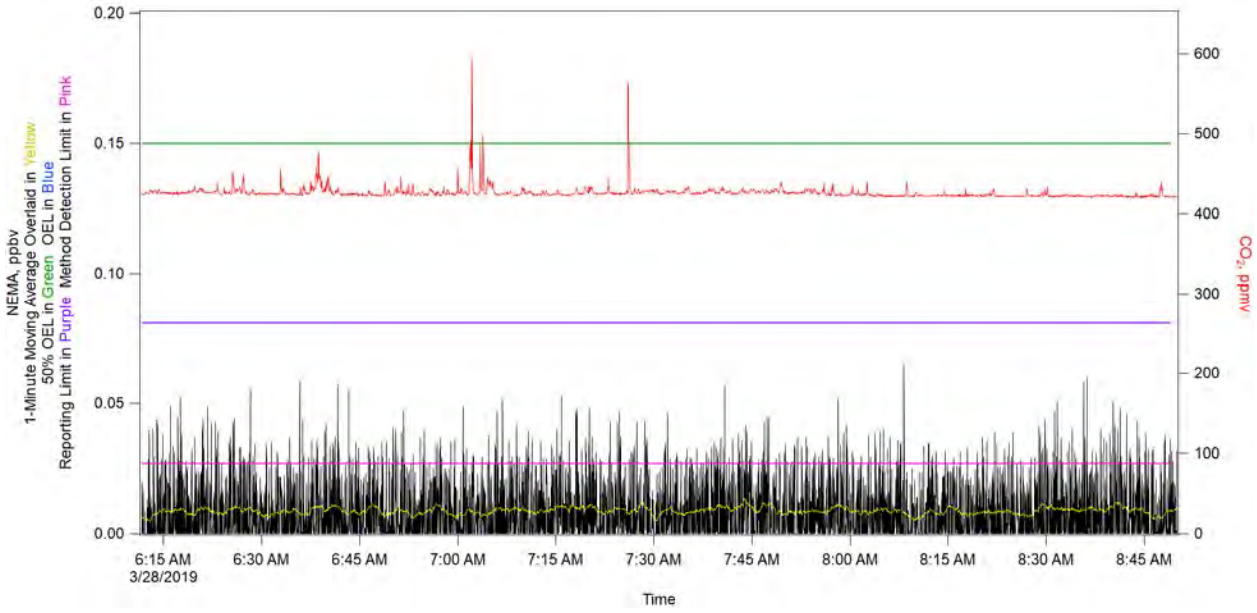


Figure 5-28. N-nitrosomethylethylamine (NEMA).

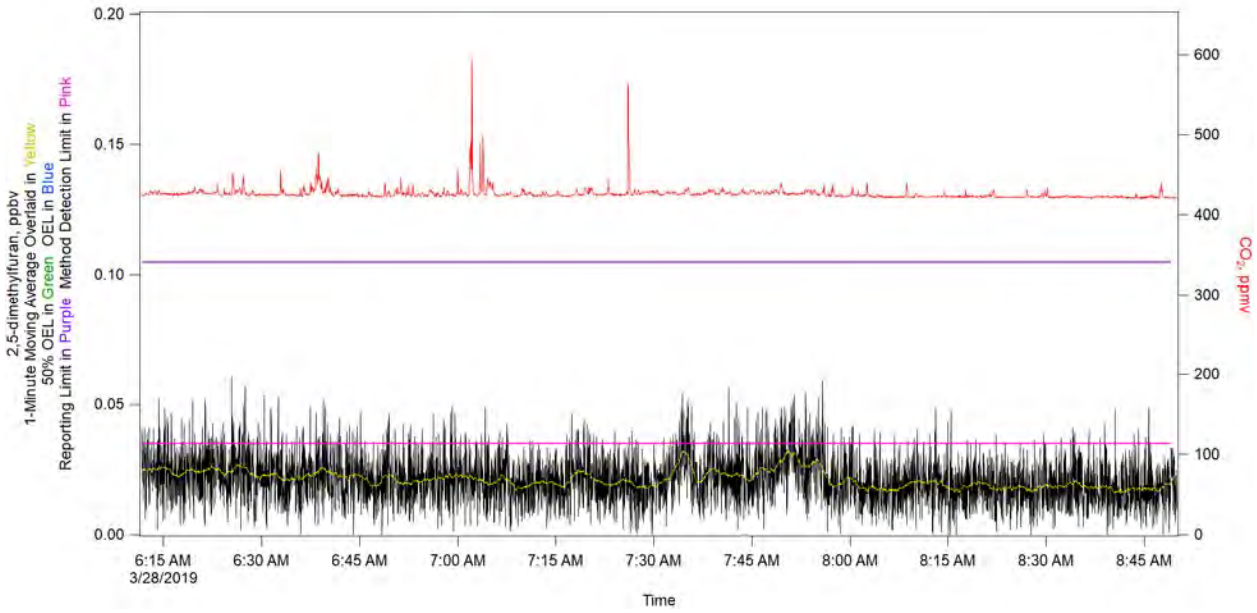


Figure 5-29. 2,5-dimethylfuran.

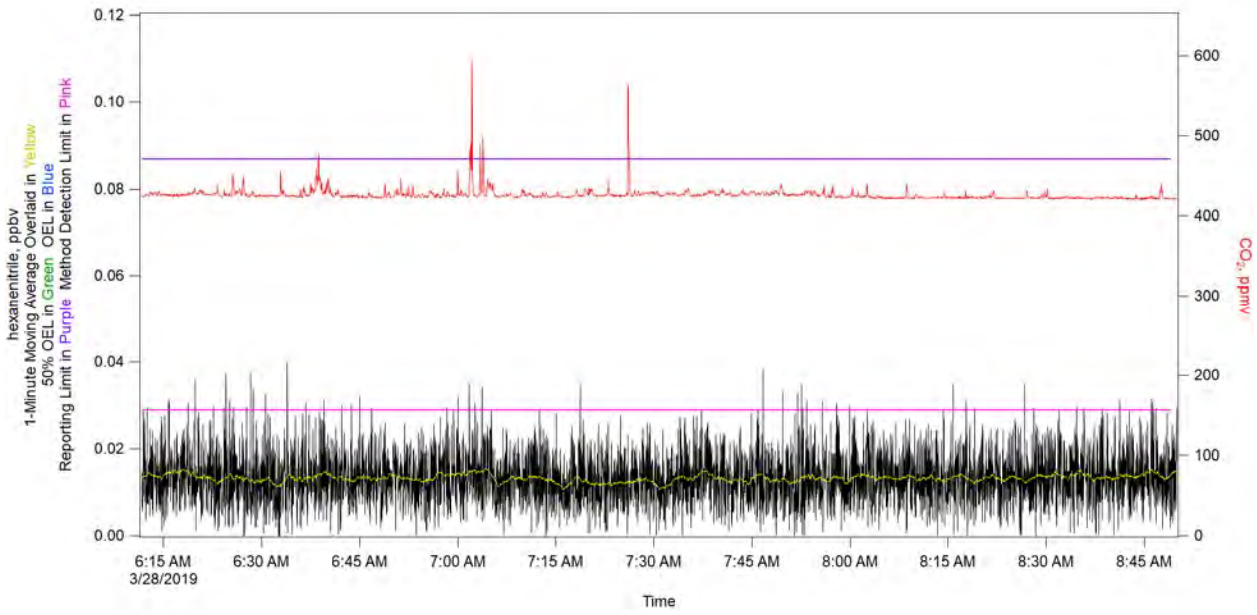


Figure 5-30. Hexanenitrile.

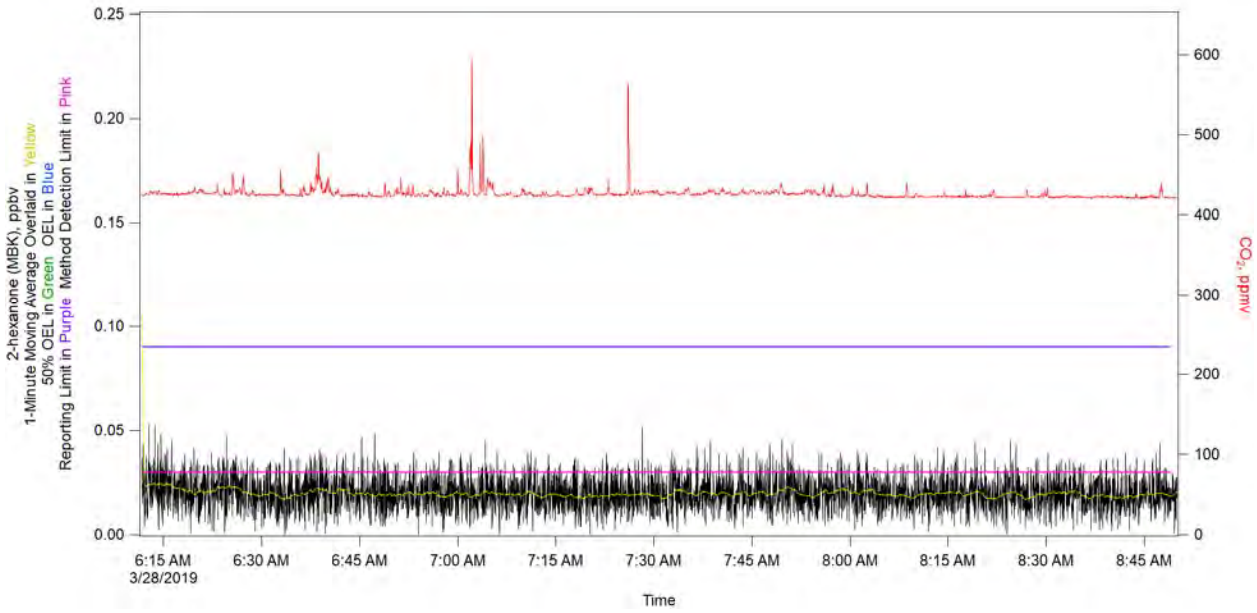


Figure 5-31. 2-hexanone (MBK).

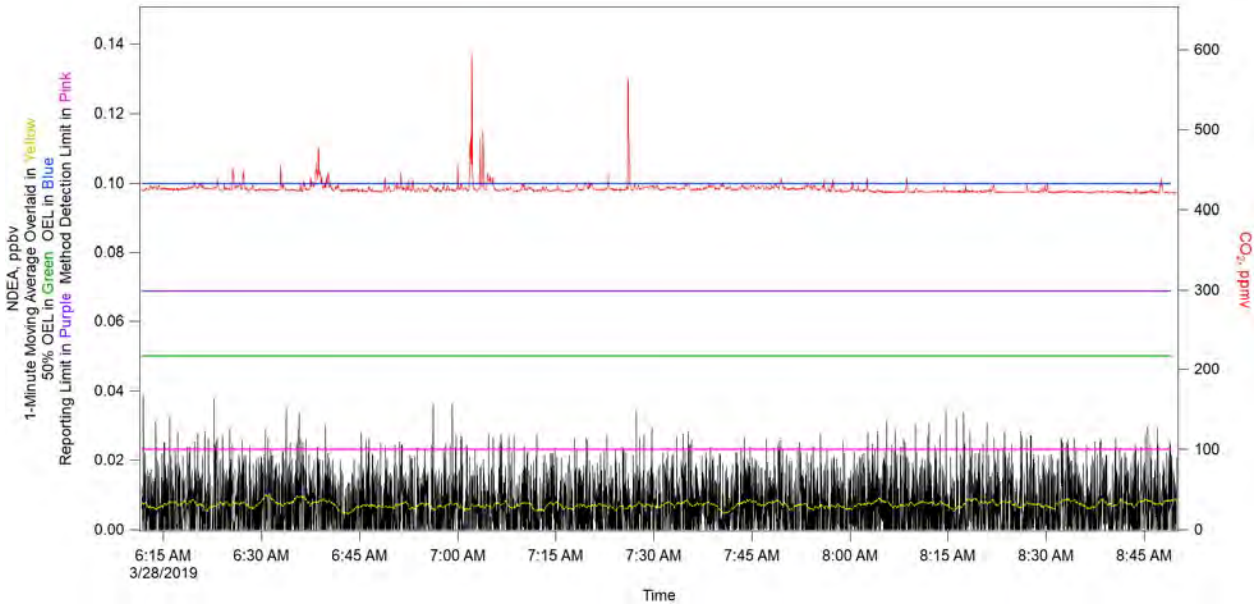


Figure 5-32. N-nitrosodiethylamine (NDEA).

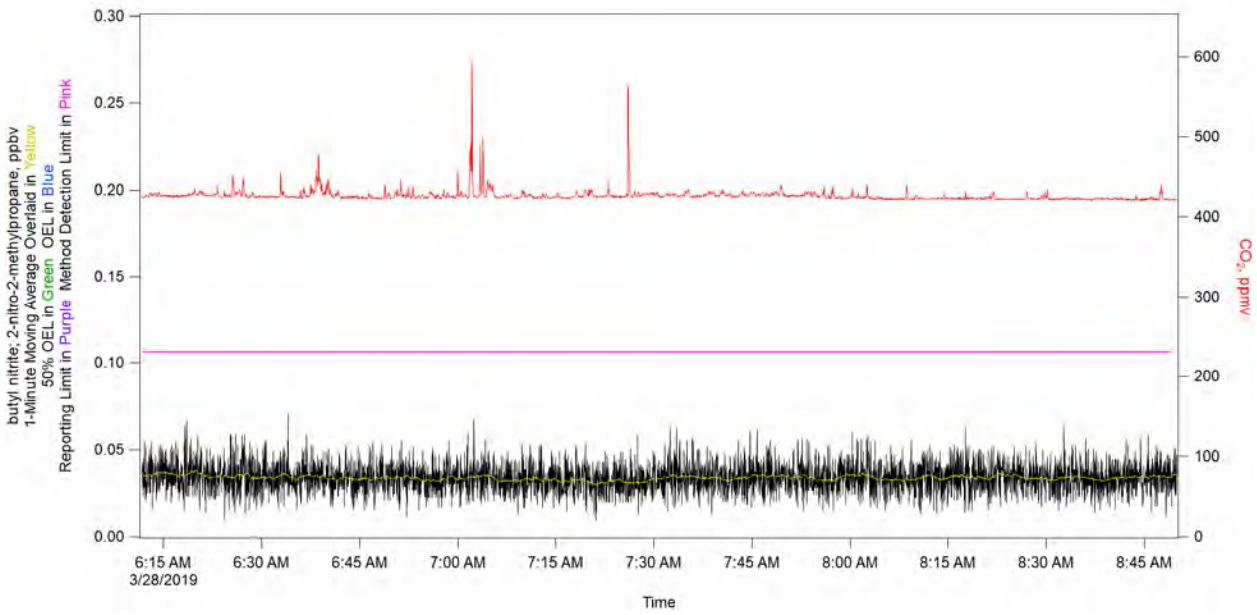


Figure 5-33. Butyl Nitrite; 2-nitro-2-methylpropane.

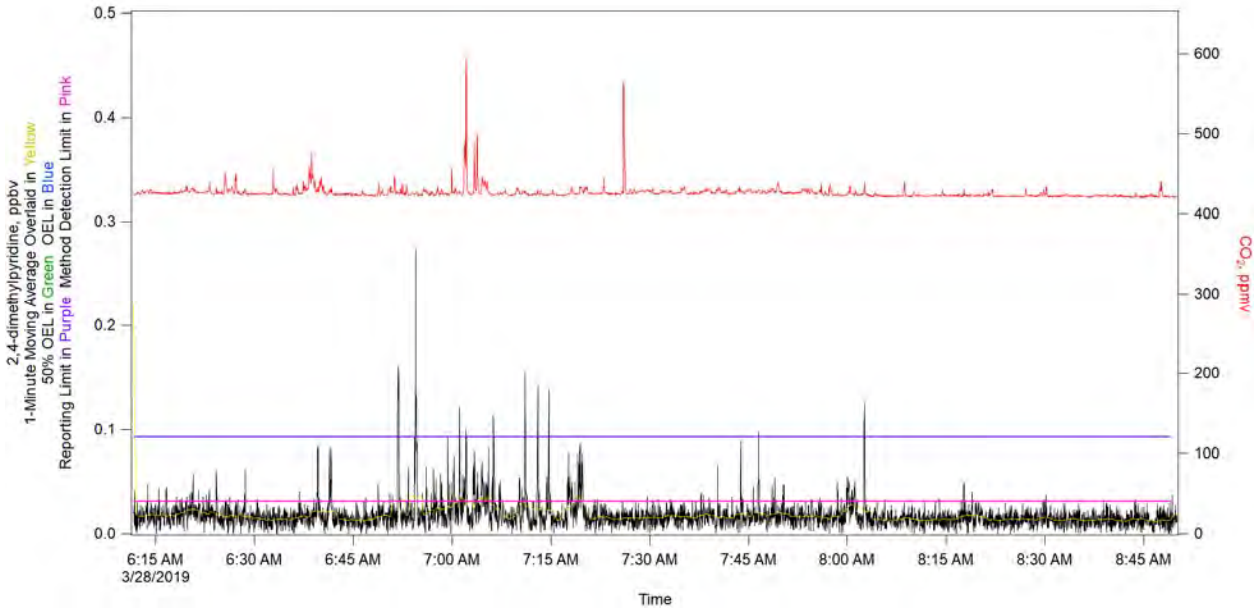


Figure 5-34. 2,4-dimethylpyridine.

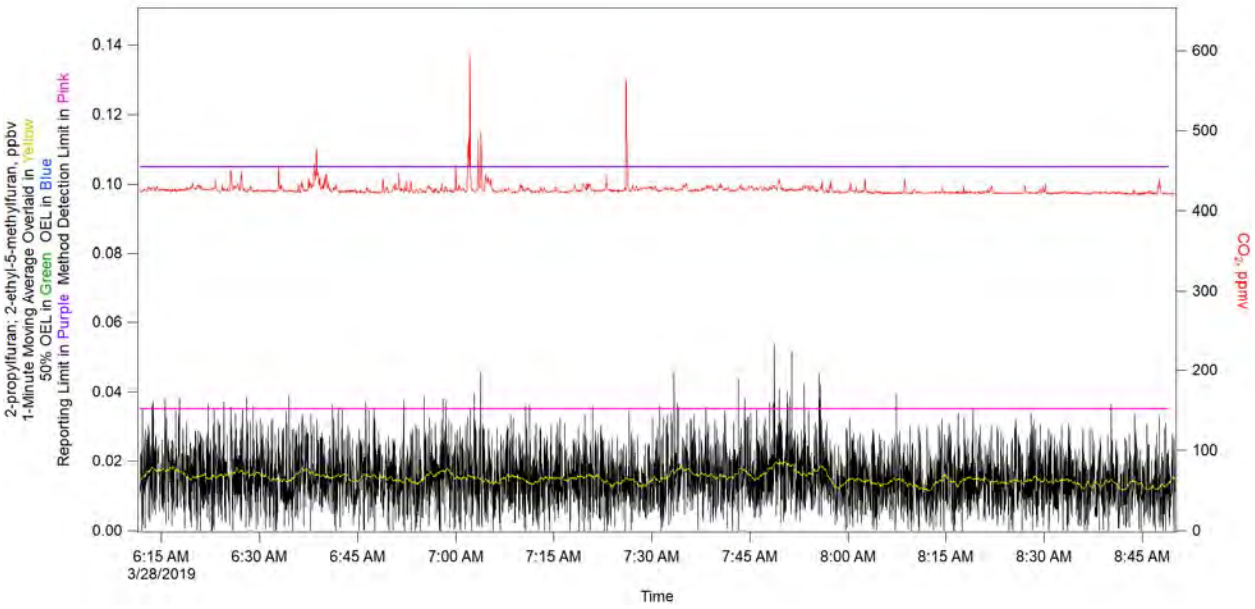


Figure 5-35. 2-propylfuran; 2-ethyl-5-methylfuran.

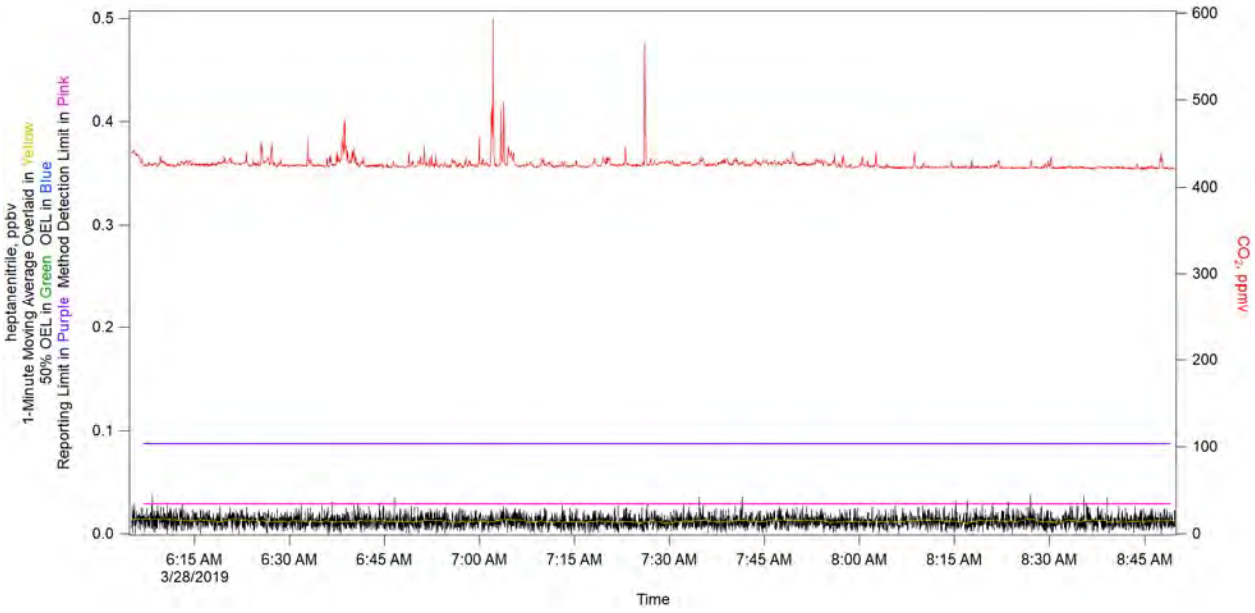


Figure 5-36. Heptanenitrile.

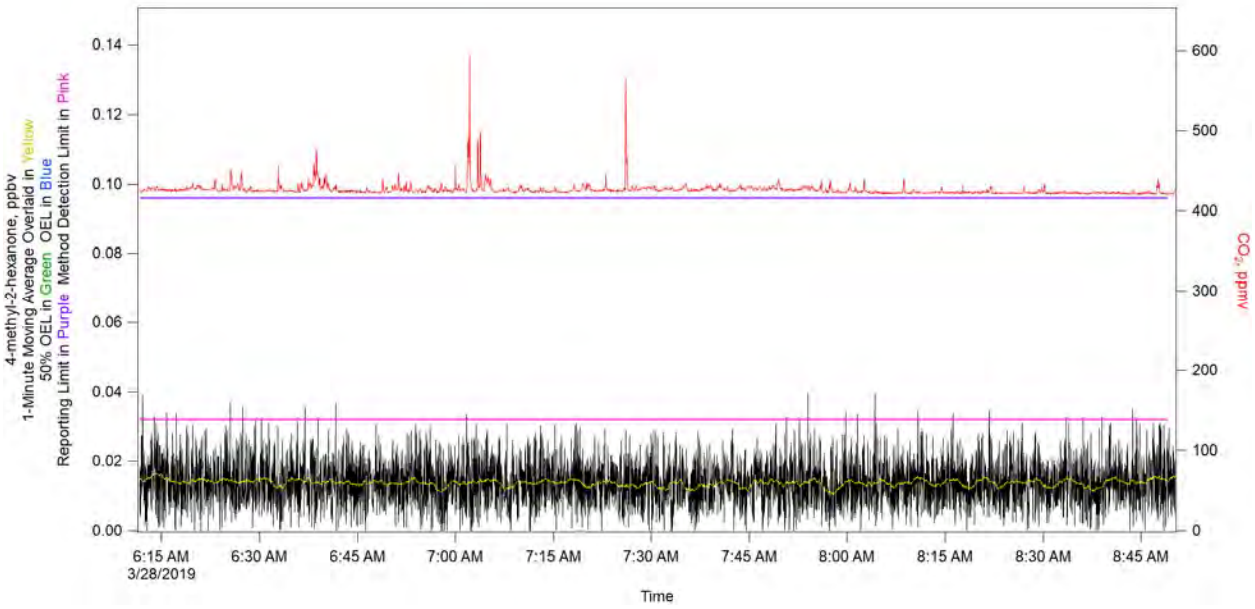


Figure 5-37. 4-methyl-2-hexanone.

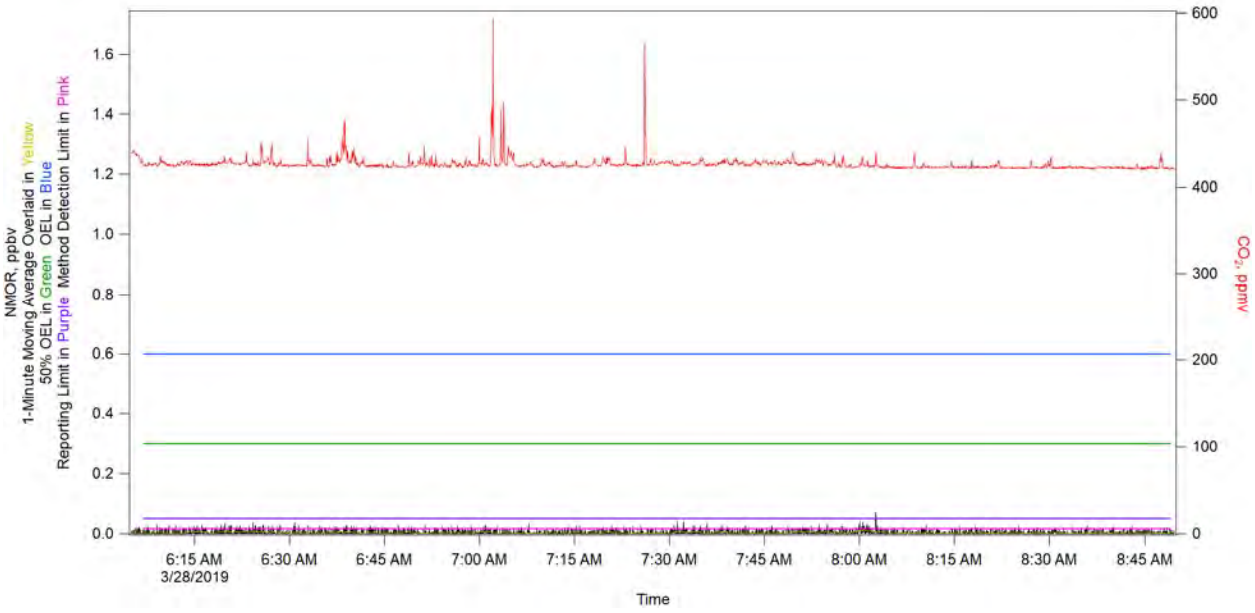


Figure 5-38. N-nitrosomorpholine (NMOR).

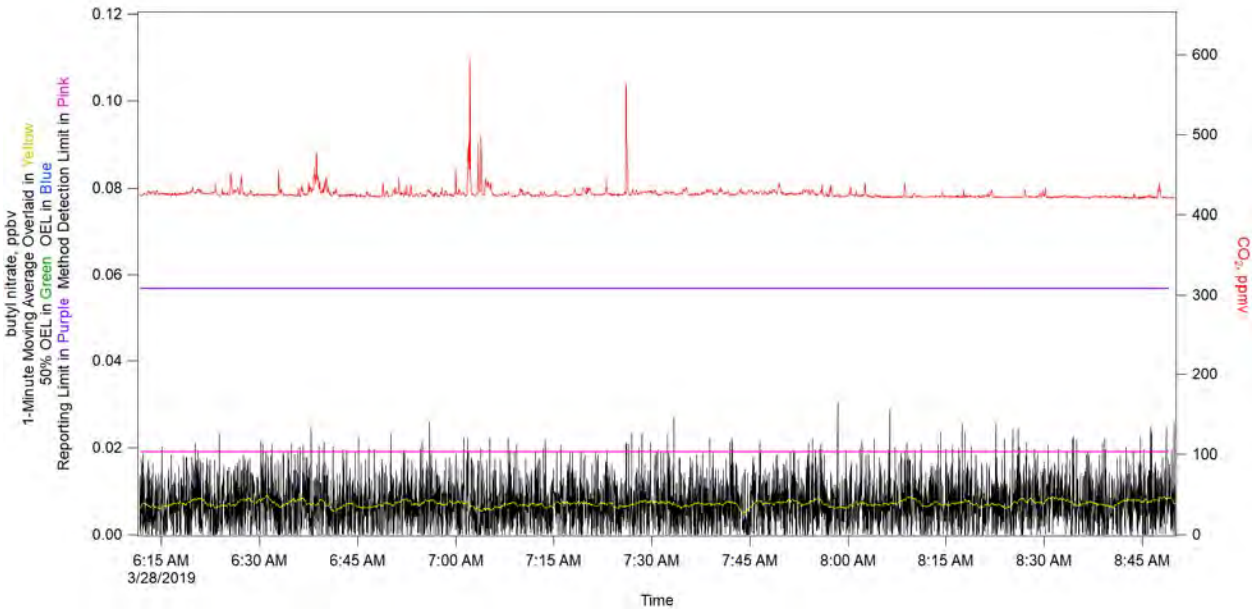


Figure 5-39. Butyl Nitrate.

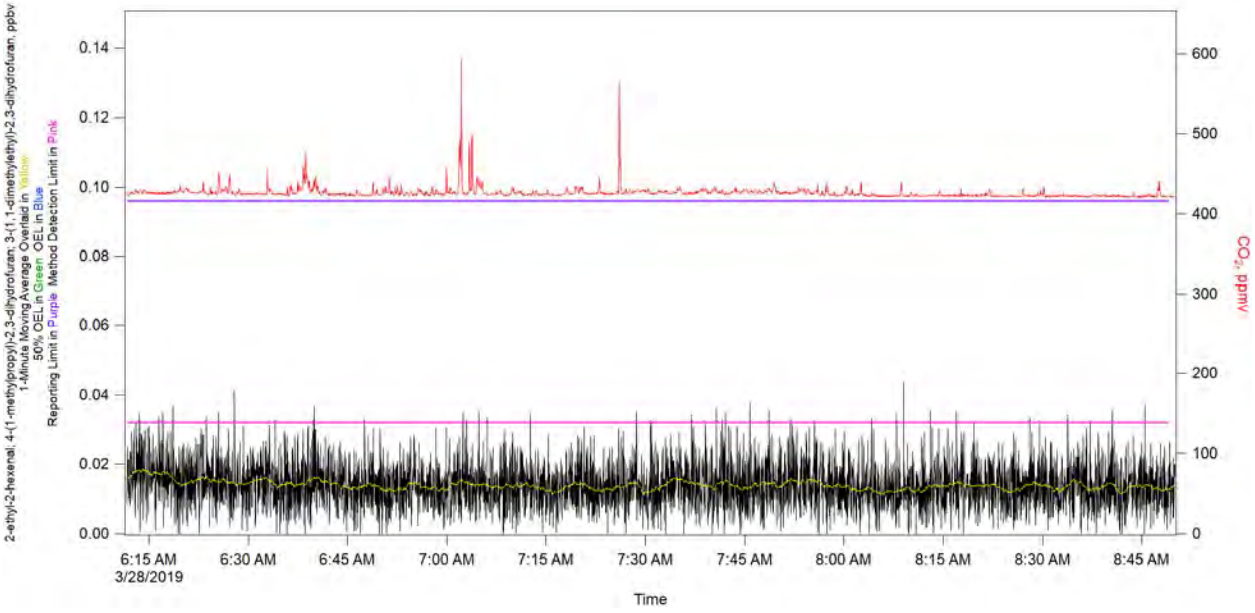


Figure 5-40. 2-ethyl-2-hexenal; 4-(1-methylpropyl)-2,3-dihydrofuran 3-(1,1-dimethylethyl)-2,3-dihydrofuran.

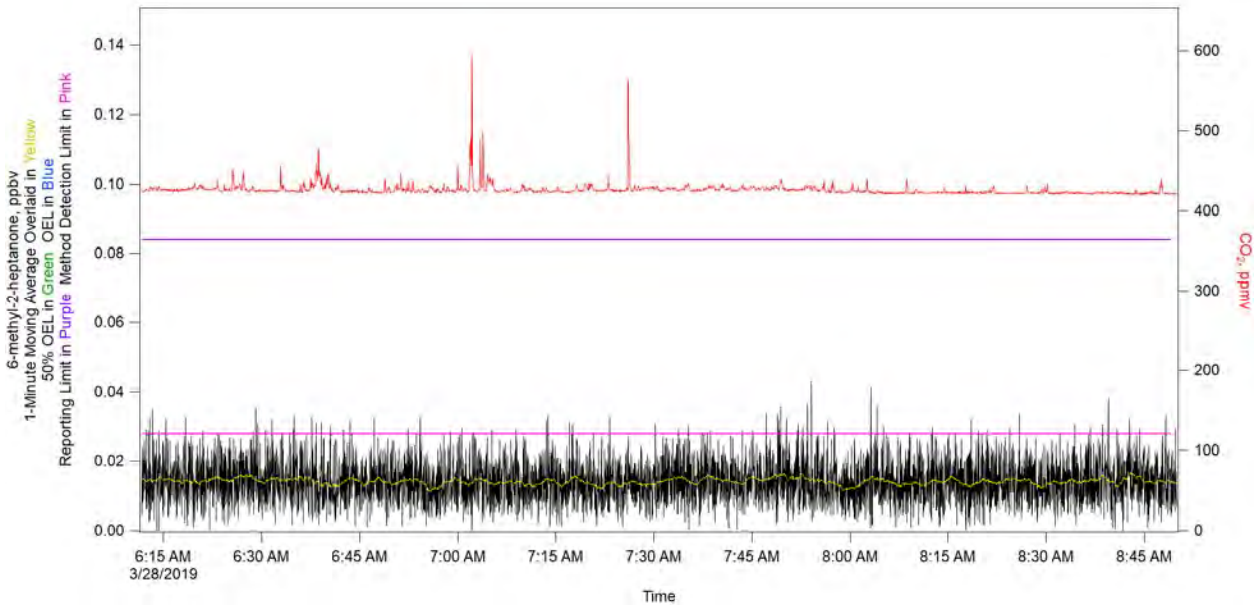


Figure 5-41. 6-methyl-2-heptanone.

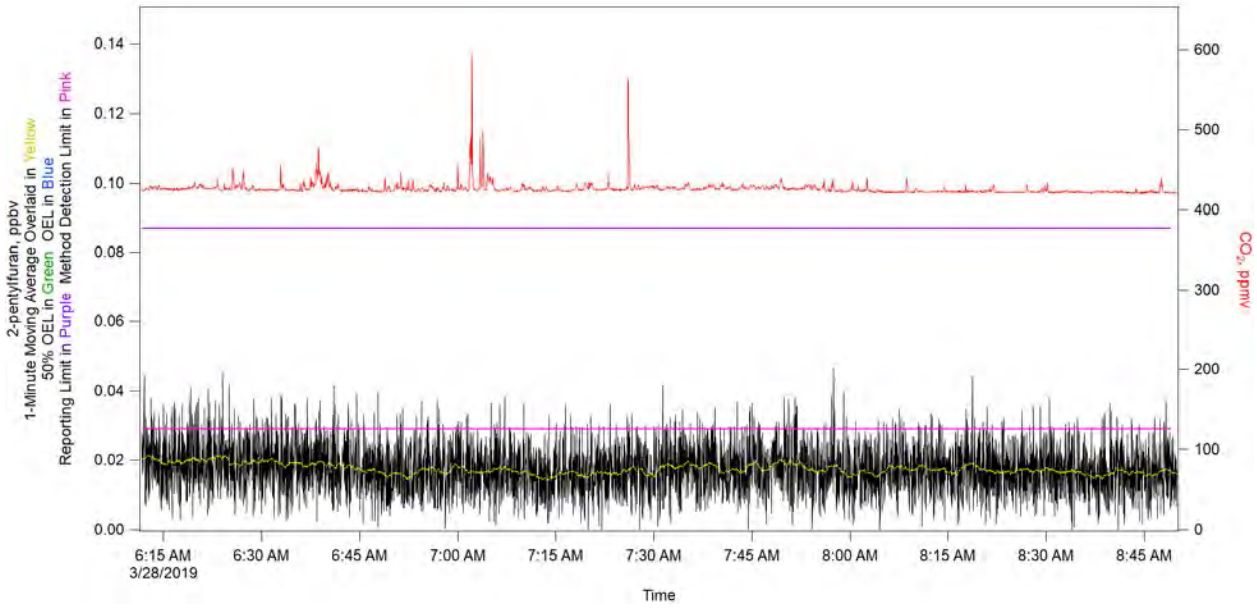


Figure 5-42. 2-pentylfuran.

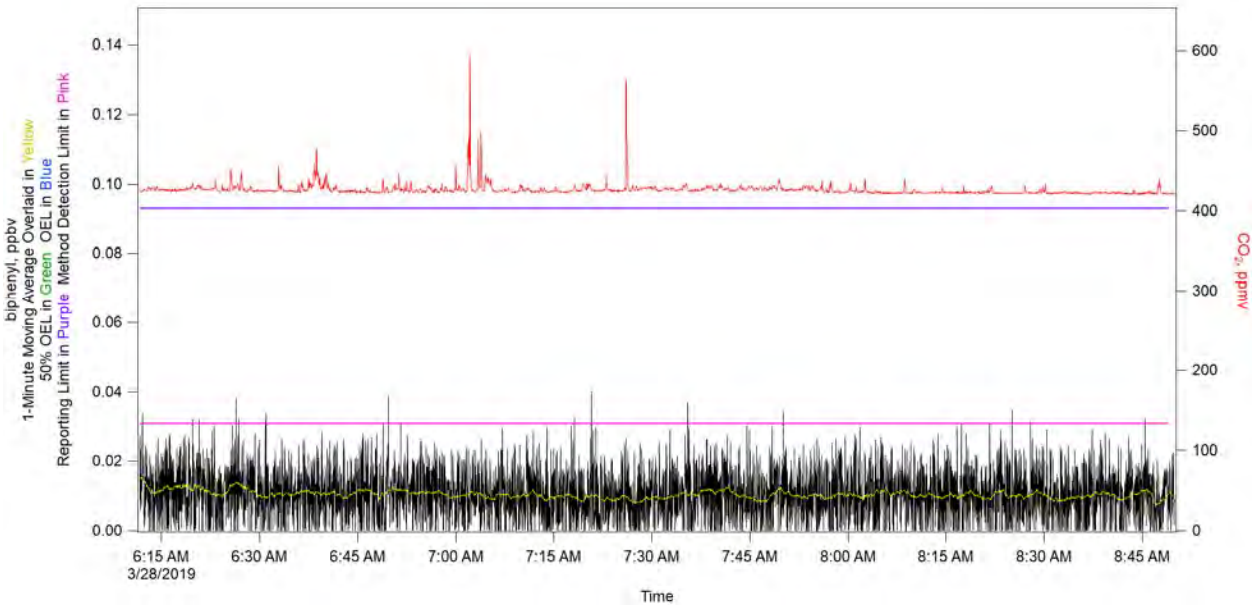


Figure 5-43. Biphenyl.

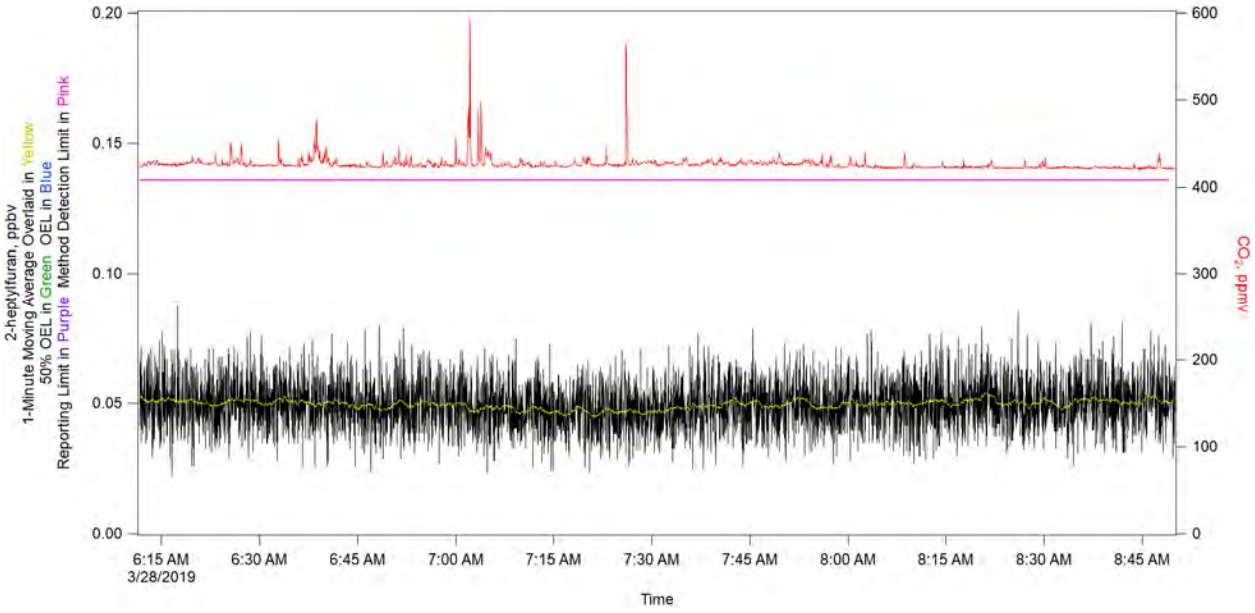


Figure 5-44. 2-heptylfuran.

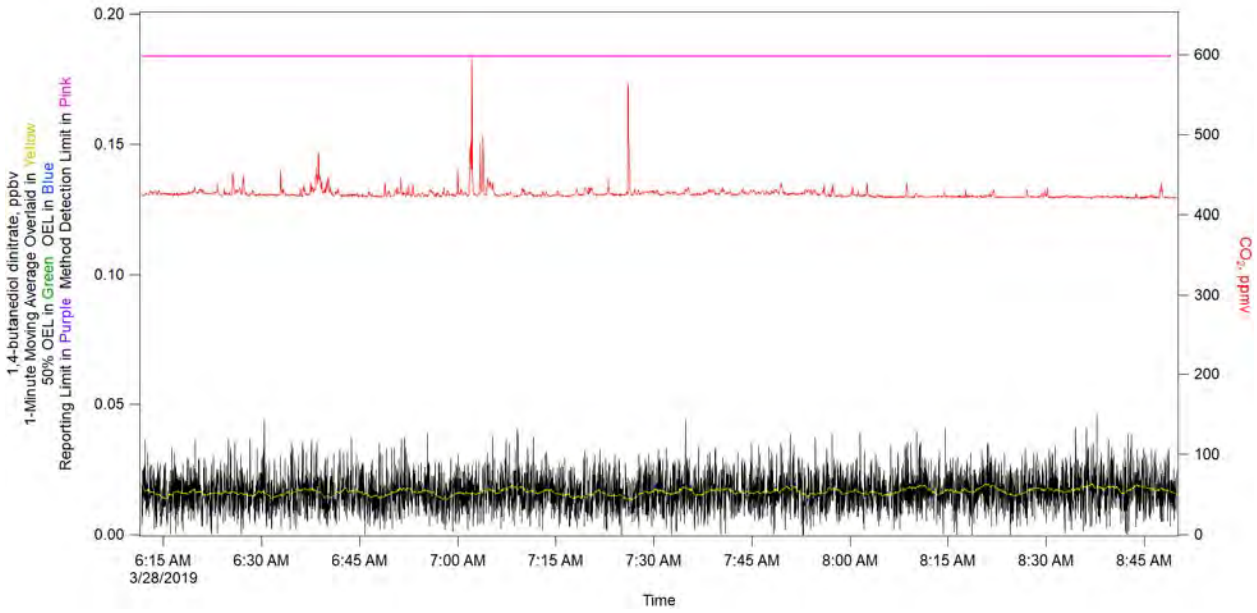


Figure 5-45. 1,4-butanediol Dinitrate.

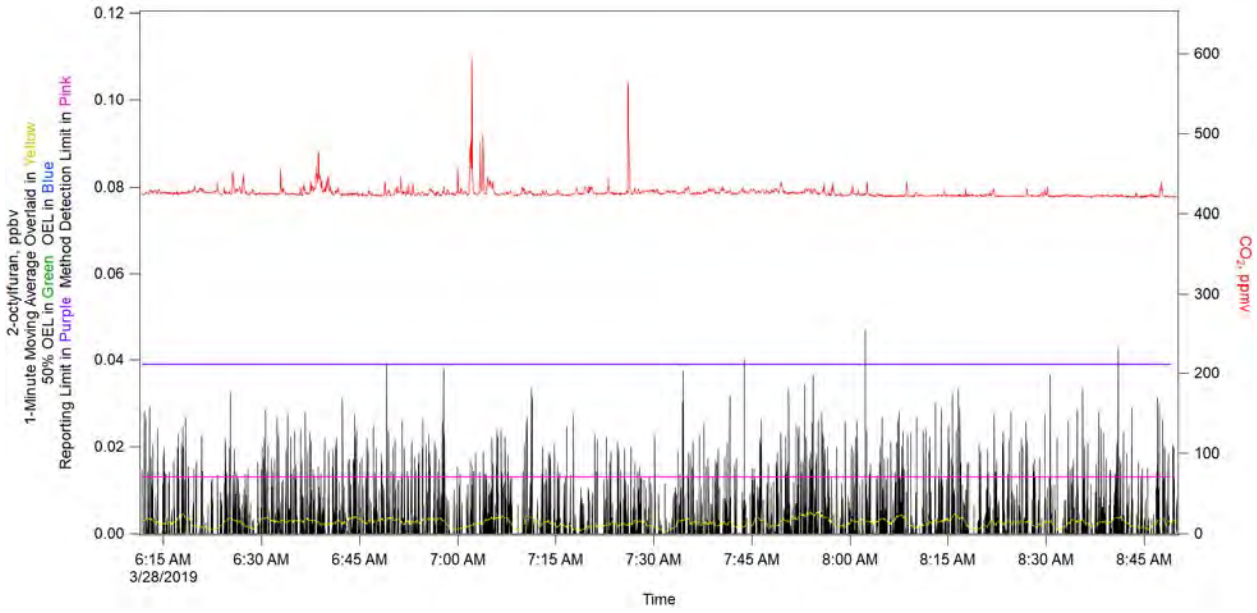


Figure 5-46. 2-octylfuran.

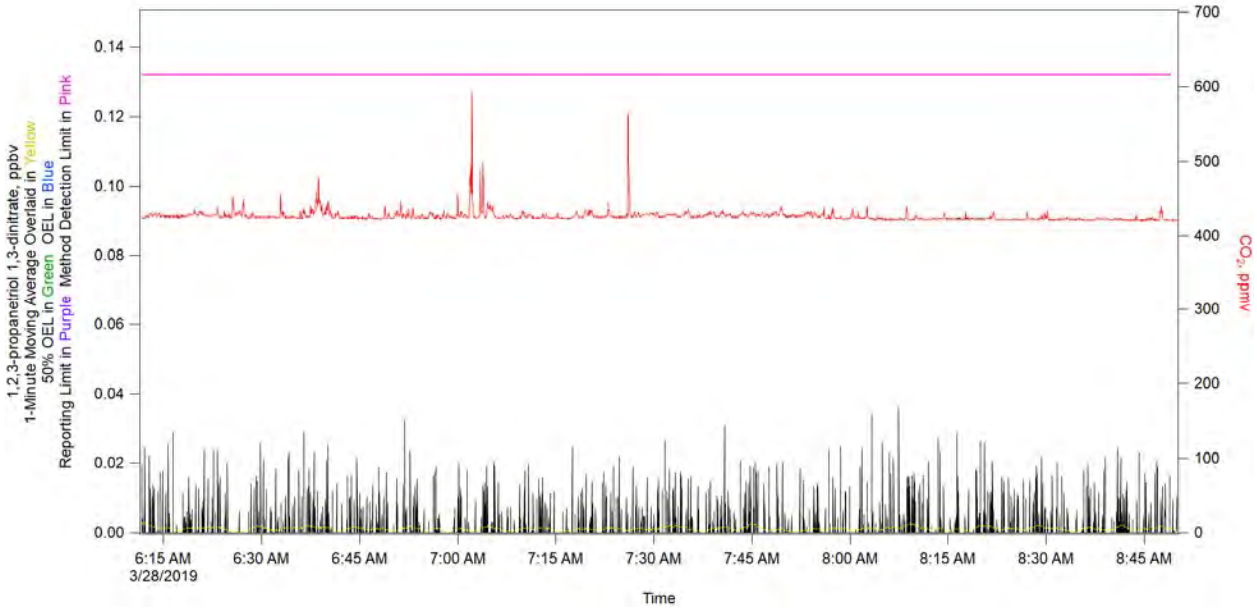


Figure 5-47. 1,2,3-propanetriol 1,3-dinitrate.

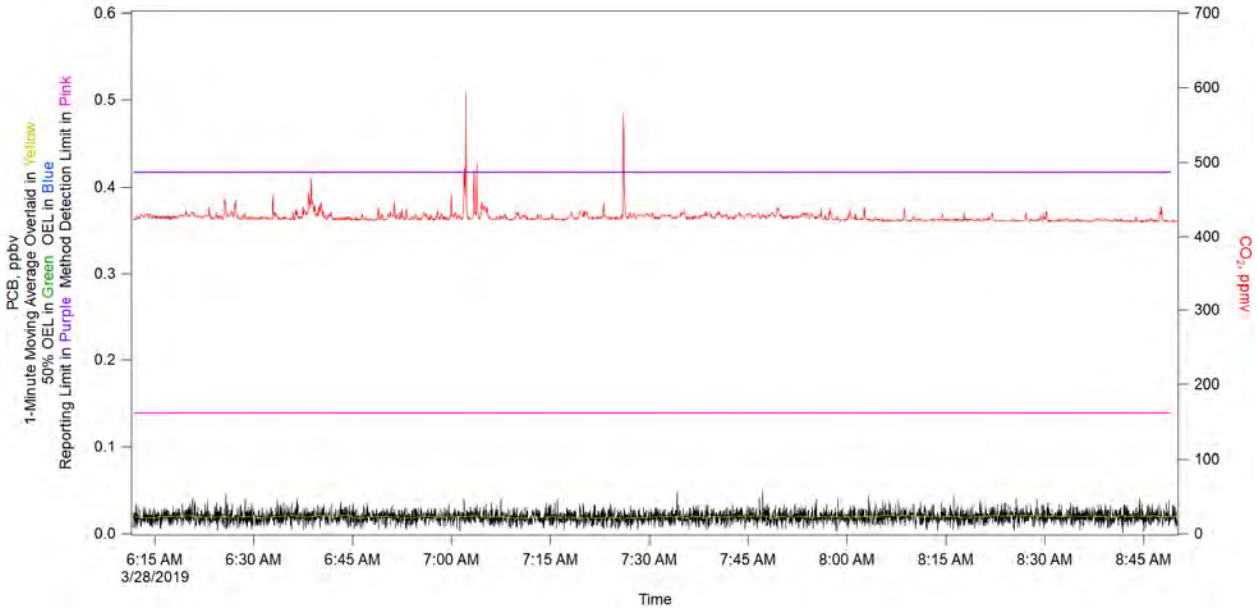


Figure 5-48. PCB.

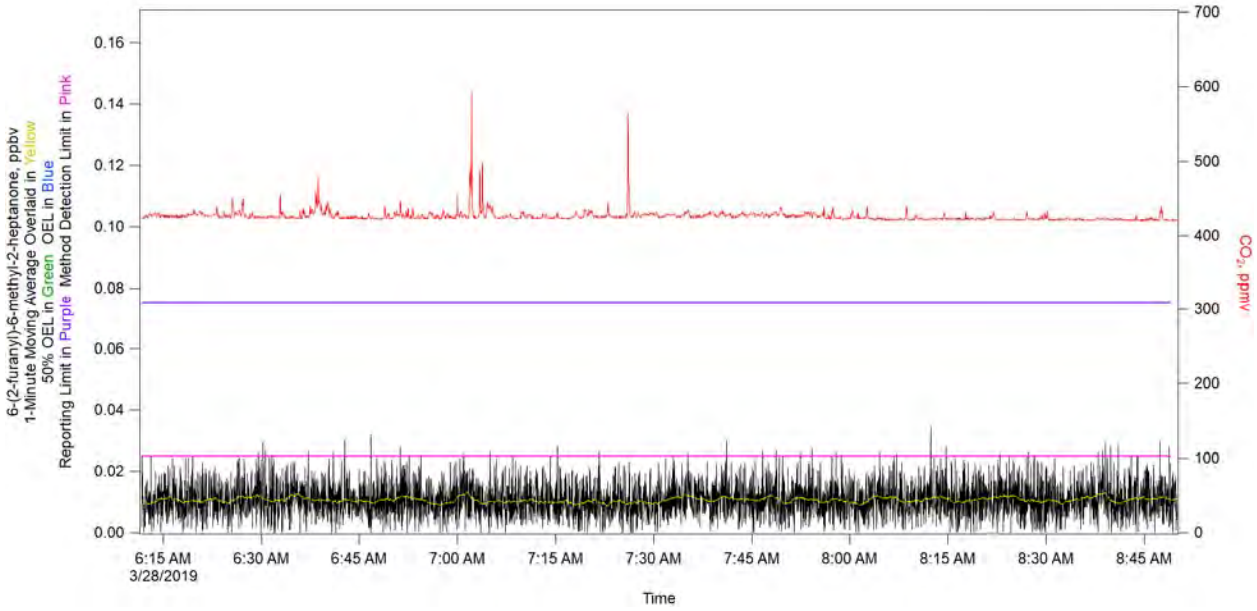


Figure 5-49. 6-(2-furanyl)-6-methyl-2-heptanone.

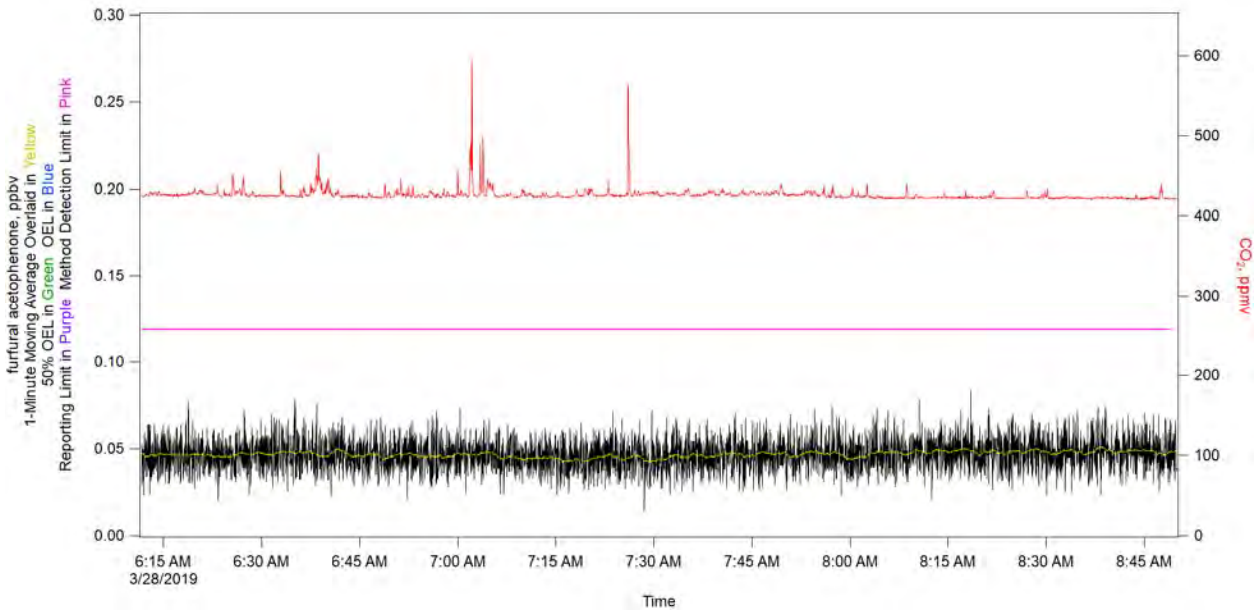


Figure 5-50. Furfural Acetophenone.

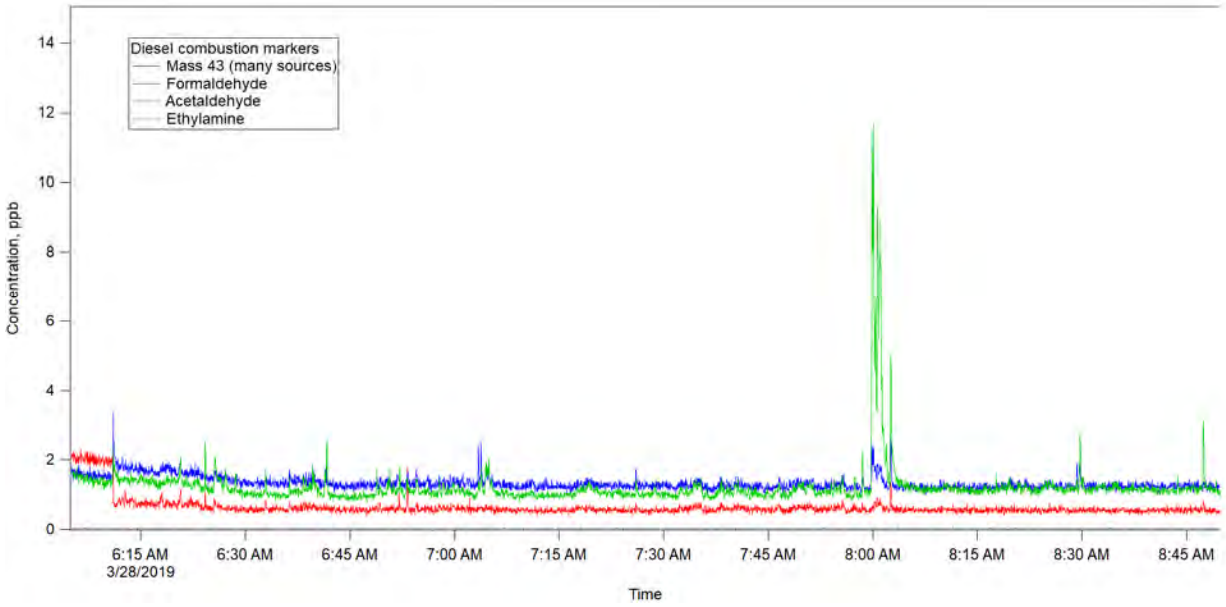


Figure 5-51. Diesel Combustion Markers.

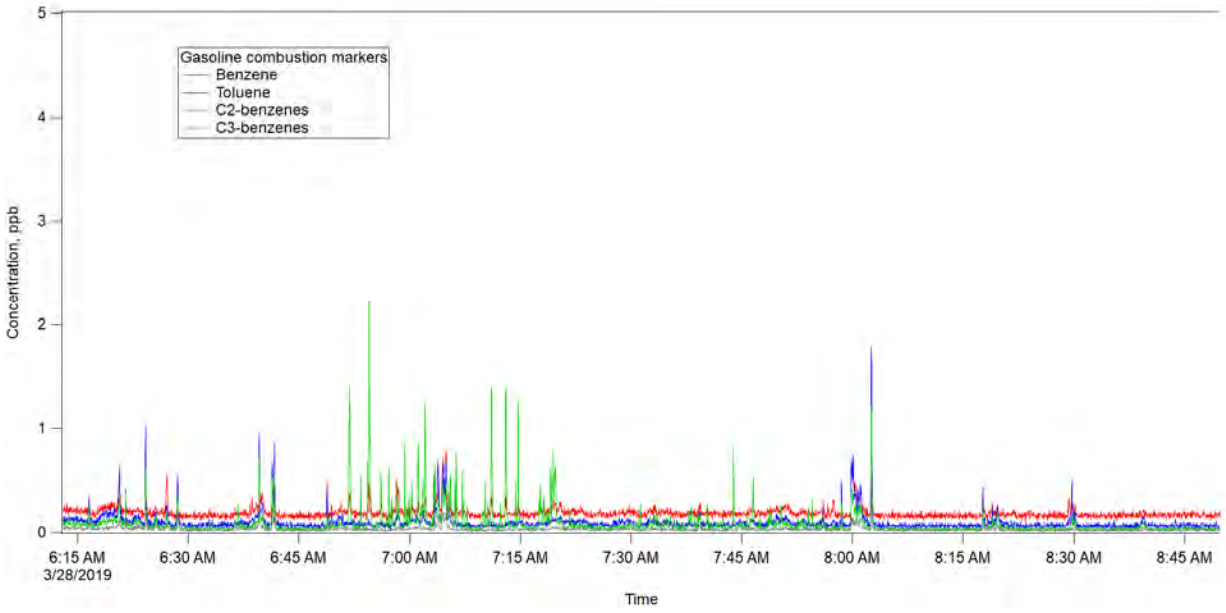


Figure 5-52. Gasoline Combustion Markers.

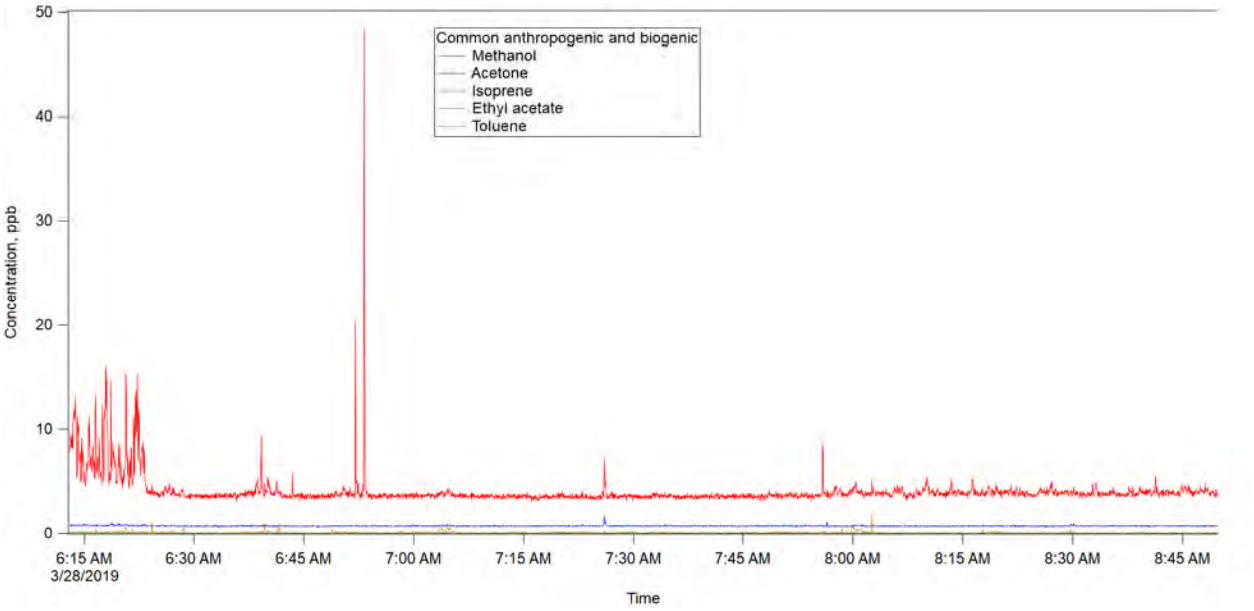


Figure 5-53. Plant and Human Markers.

5.5 Fugitive Emissions – Generator Monitoring

The following section displays the ML's monitoring of generators located in the 200 East area of the Hanford Site.

Table 5-2. Generators Monitored.

Generator ID	Location	Time	Monitoring Type
G3447	Northwest corner of A Farm	09:08 – 10:31	Side port
HO-74-4539	Northwest of AY Farm	10:42 – 11:37	Side port

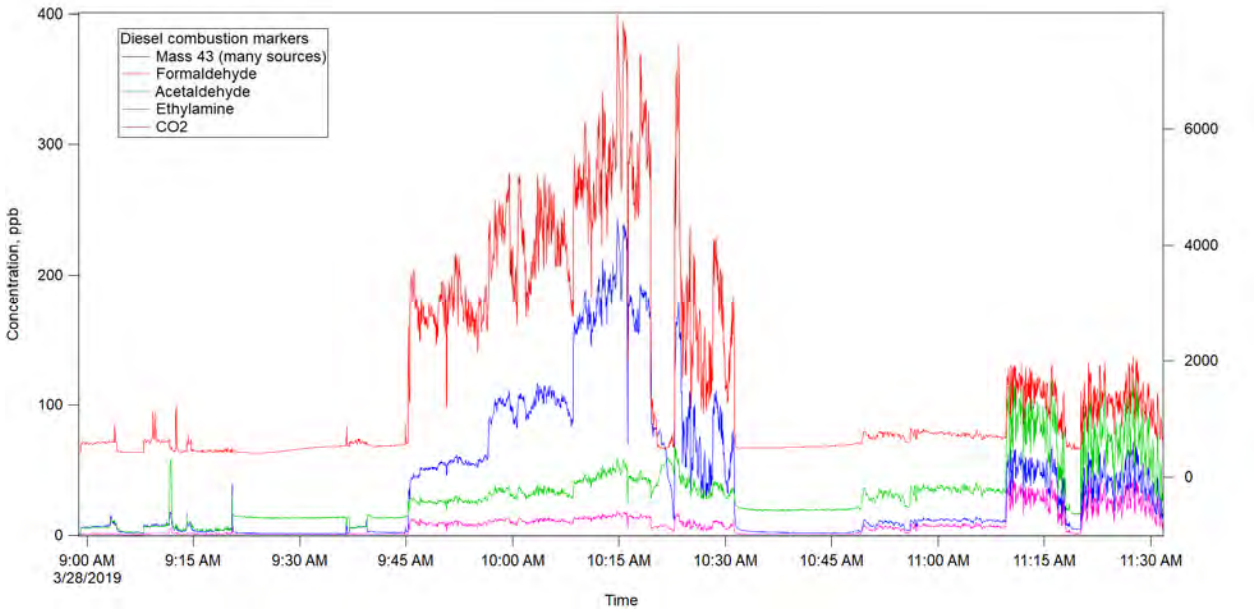


Figure 5-54. Diesel Combustion Markers and CO_2.

5.6 TY Farm Monitoring

The following section displays the ML's monitoring of TY Farm for potential odor-causing compounds.

Table 5-3. Odor Statistical Information for the Monitoring Period of March 28, 2019.

Odor #	Odor Compound Name	MDL (ppb)	Ave. (ppb)	St. Dev. (ppb)	Rel St. Dev. (%)	Max. (ppb)	Median (ppb)
1	methyl mercaptan	0.137	<0.137	0.014	20.569	0.119	<0.137
2	Dimethylsulfide + ethanethiol	0.107	<0.107	0.016	15.615	0.180	<0.107
3	allyl mercaptan	0.177	<0.177	0.010	60.539	0.053	<0.177
4	1-propanethiol + isopropyl mercaptan	0.469	<0.469	0.009	78.703	0.050	<0.469
5	2-butene-1-thiol	0.180	<0.180	0.010	103.769	0.054	<0.180
6	diethyl sulfide + 2-methylpropane-2-thiol	0.529	<0.529	0.013	27.157	0.136	<0.529
7	thiopropanal sulfuroxide	0.046	<0.046	0.003	255.309	0.023	<0.046
8	dimethyl disulfide	0.186	<0.186	0.007	56.696	0.038	<0.186
9	1-pentanethiol + 2,2-dimethylpropane-1-thiol	0.048	<0.048	0.011	101.767	0.127	<0.048
10	benzenethiol	0.019	<0.019	0.005	162.289	0.036	<0.019
11	diallyl sulfide	0.034	<0.034	0.009	135.020	0.060	<0.034
12	methyl propyl disulfide	0.022	<0.022	0.004	234.093	0.036	<0.022
13	methylbenzenethiol	0.103	<0.103	0.008	84.541	0.047	<0.103
14	dimethyl trisulfide	0.022	0.032†	0.009	27.316	0.065	0.031
15	(1-oxoethyl) thiophene	0.276	<0.276	0.008	59.196	0.040	<0.276
16	(1-oxopropyl) thiophene	0.028	<0.028	0.008	68.662	0.045	<0.028
17	dipropyl disulfide	0.018	<0.018	0.006	62.689	0.035	<0.018
18	methyl propyl trisulfide	0.047	<0.047	0.007	100.766	0.033	<0.047
19	dimethyl tetrasulfide	0.027	<0.027	0.004	46.196	0.029	<0.027
20	dipropyl trisulfide	0.132	<0.132	0.007	165.264	0.039	<0.132
21	diphenyl sulfide	0.014	<0.014	0.008	116.118	0.040	<0.014

Figure 5-54 through Figure 5-74 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 March 28, 2019.

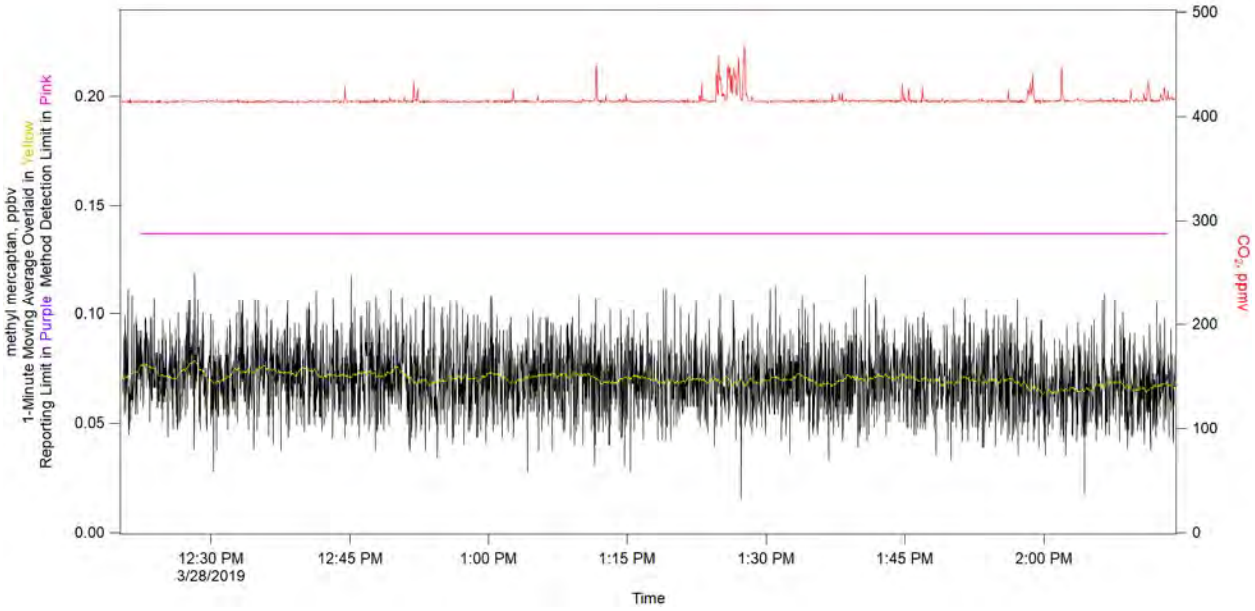


Figure 5-54. Methyl Mercaptan.

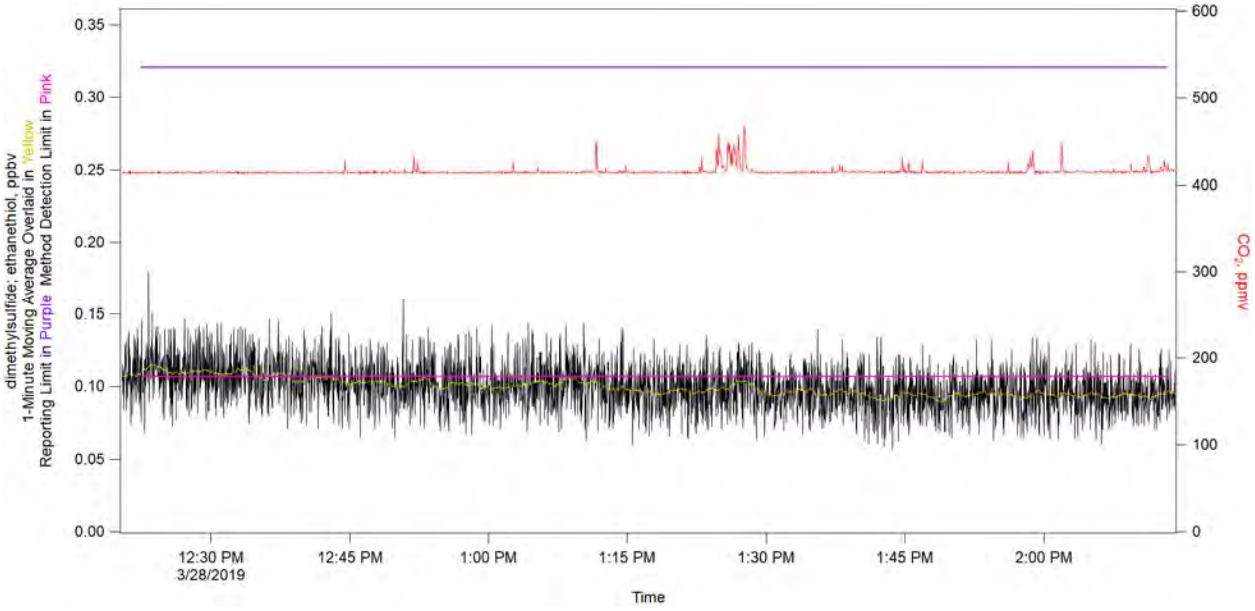


Figure 5-55. Dimethyl Sulfide; Ethanethiol.

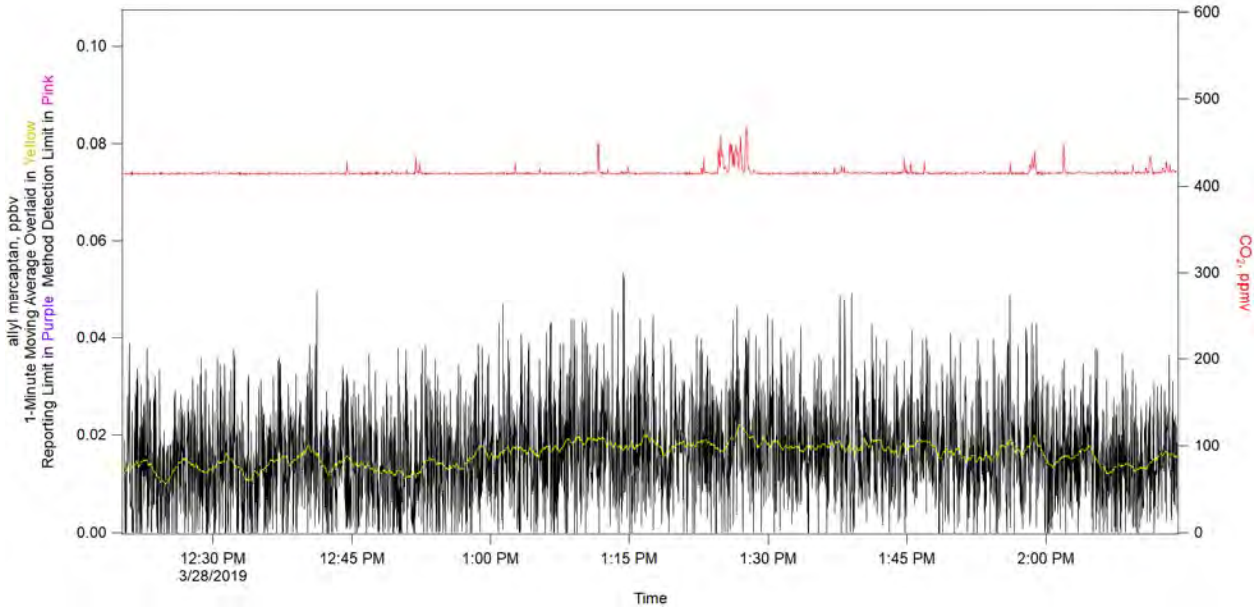


Figure 5-56. Allyl Mercaptan.

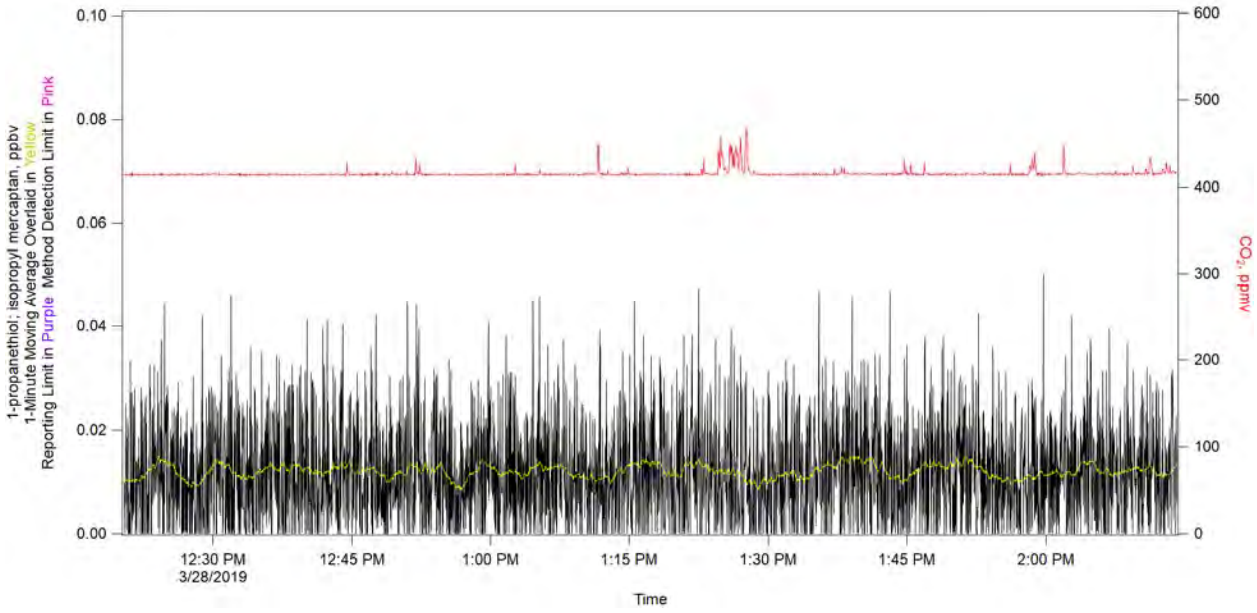


Figure 5-57. 1-propanethiol; Isopropyl Mercaptan.

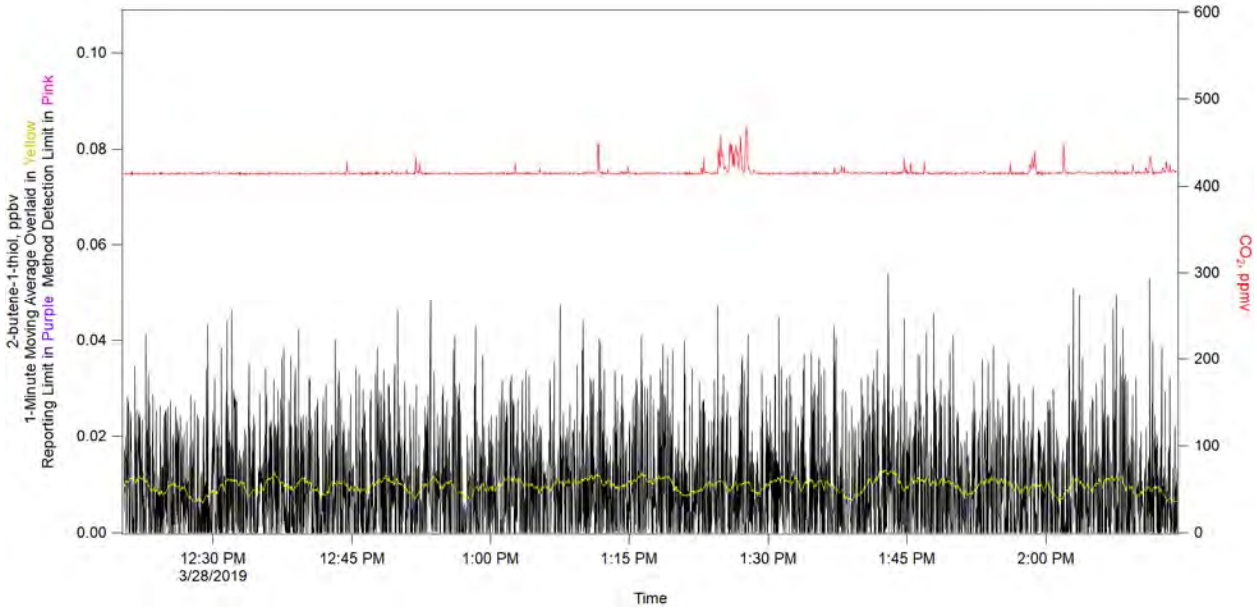


Figure 5-58. 2-butene-1-thiol.

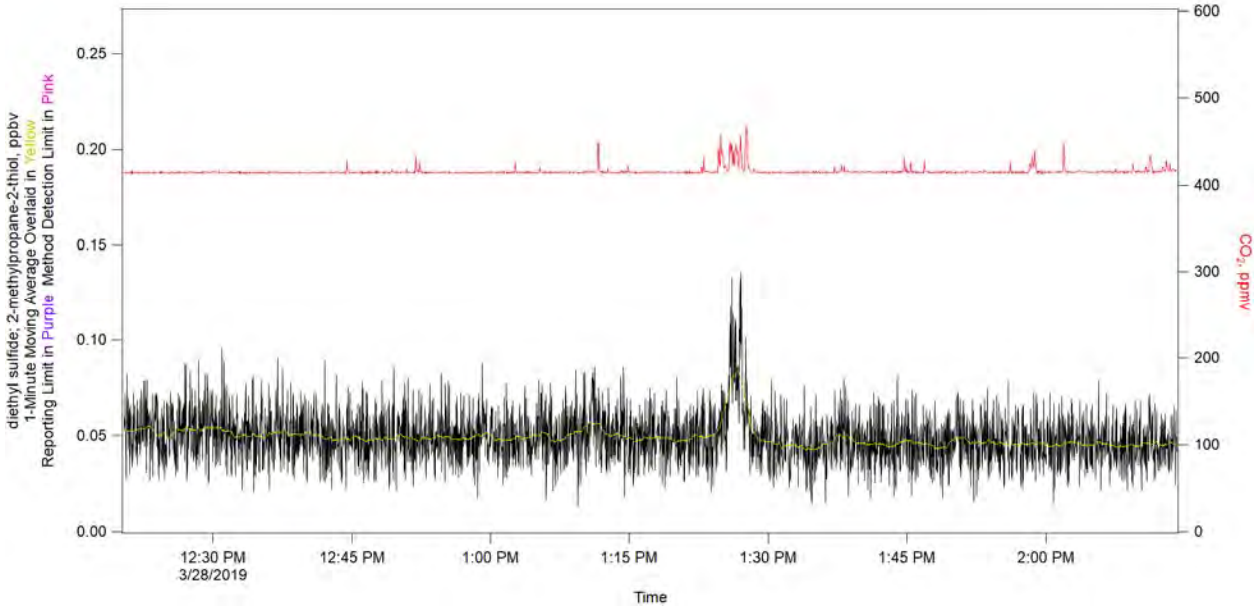


Figure 5-59. Diethyl Sulfide; 2-methylpropane-2-thiol.

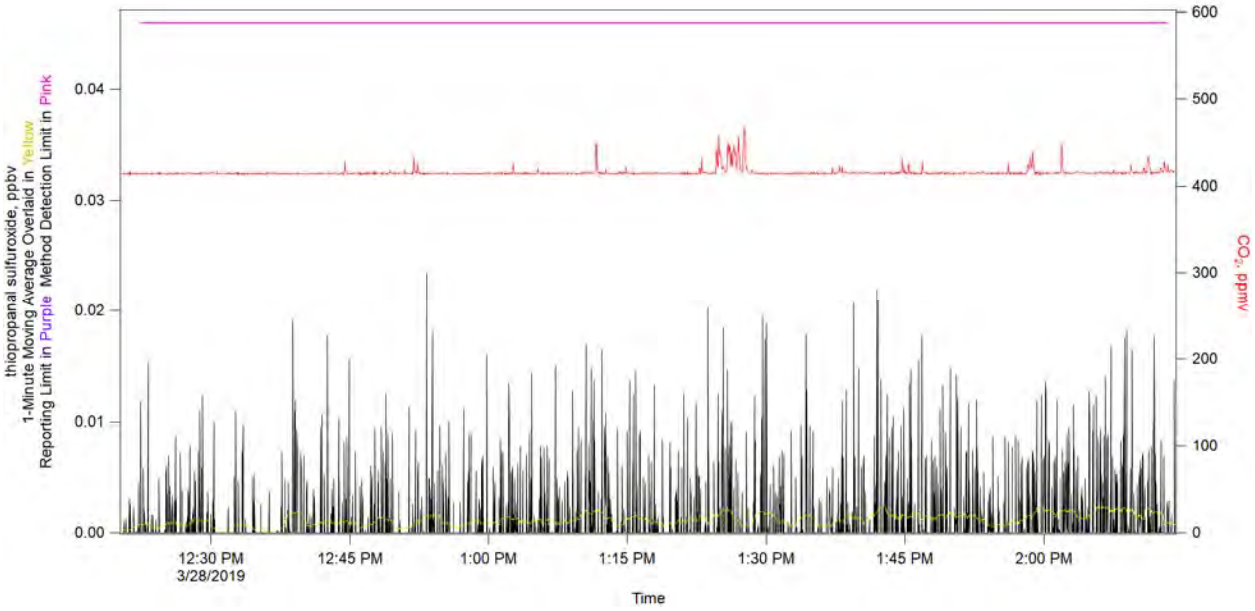


Figure 5-60. Thiopropanal Sulfuroxide.

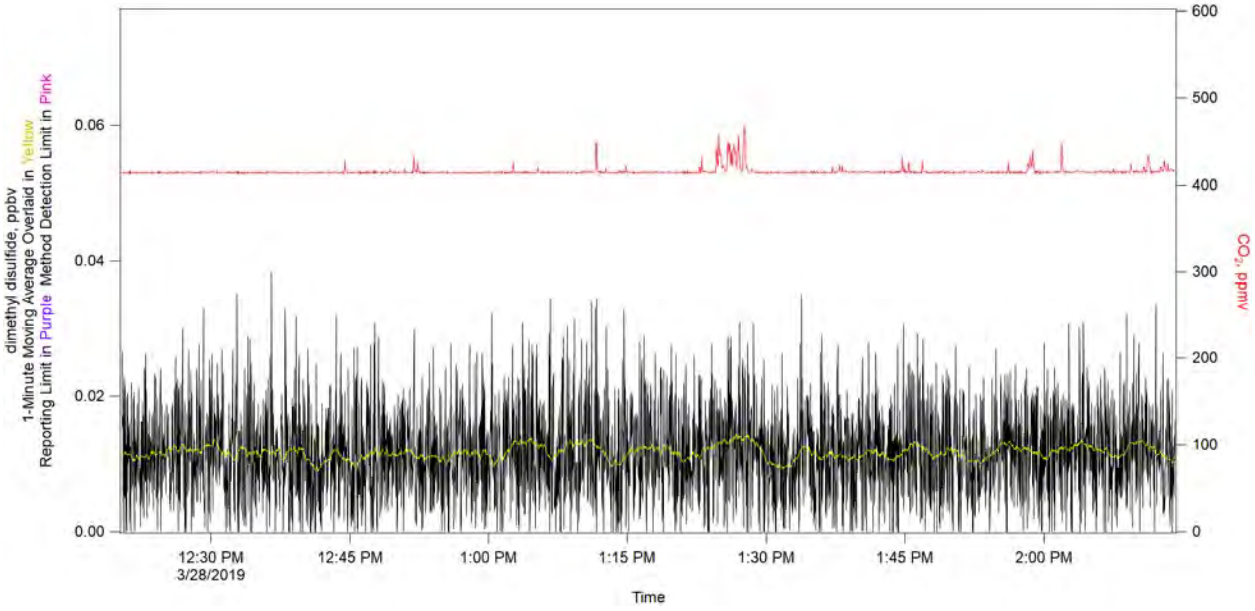


Figure 5-61. Dimethyl Disulfide.

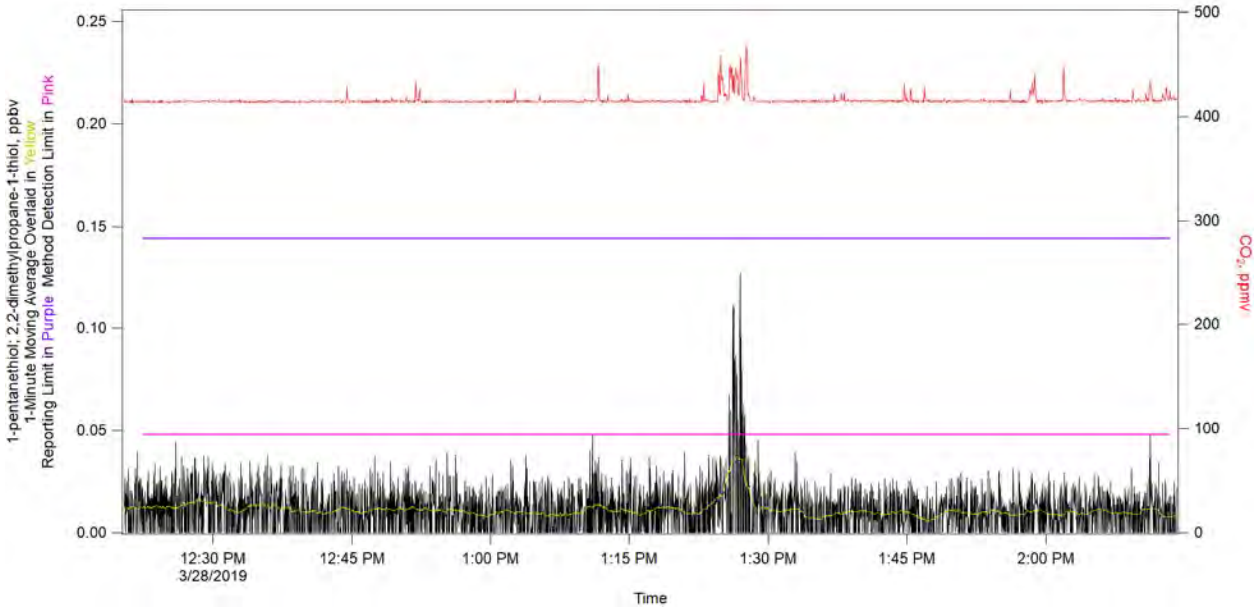


Figure 5-62. 1-pentanethiol; 2,2-dimethylpropane-1-thiol.

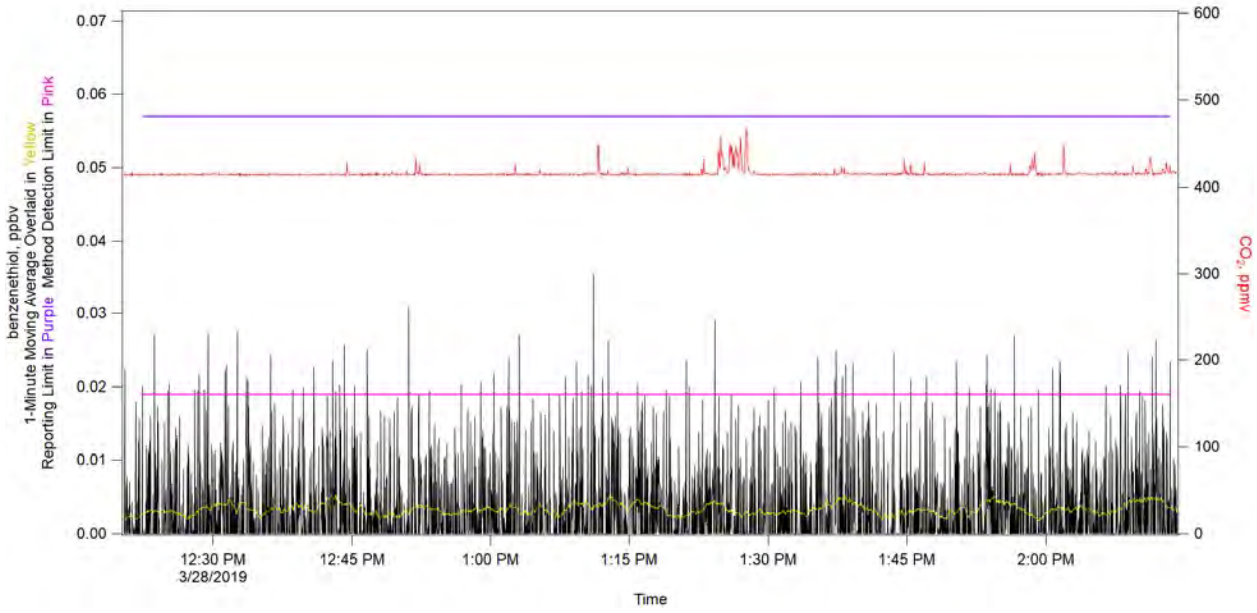


Figure 5-63. Benzenethiol.

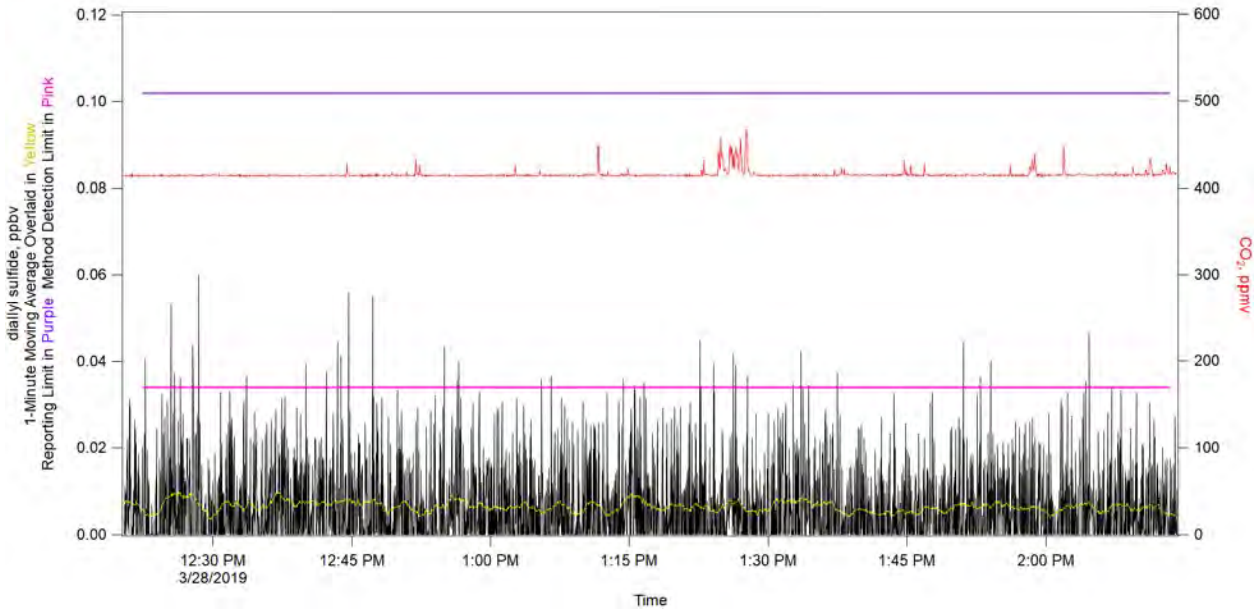


Figure 5-64. Diallyl Sulfide.

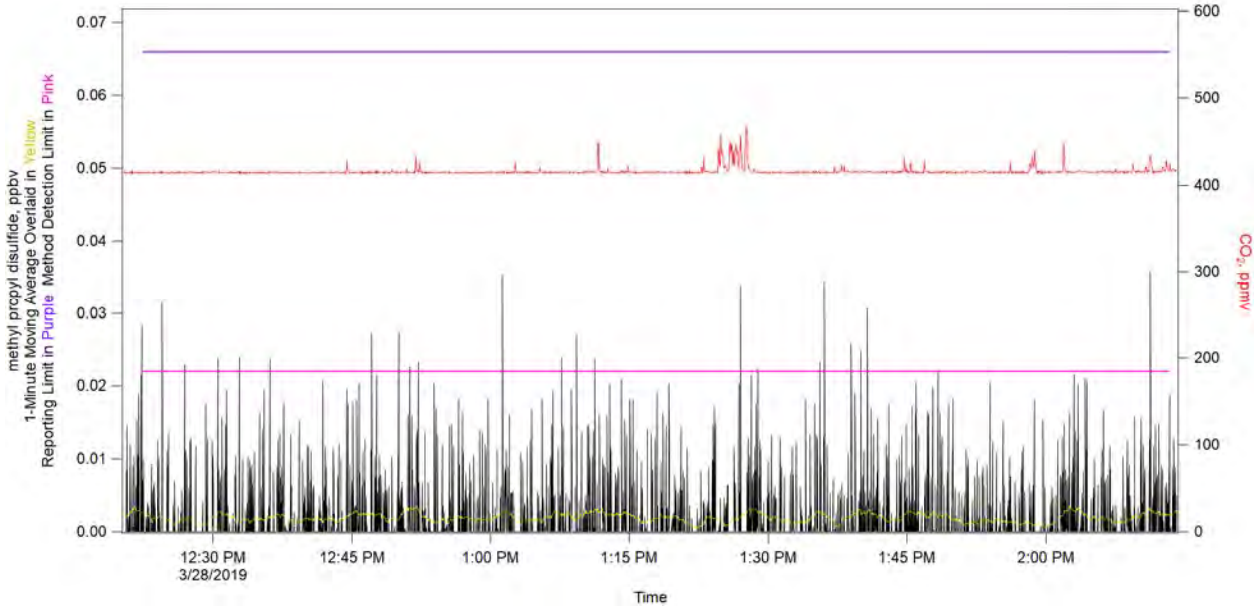


Figure 5-65. Methyl Propyl Disulfide.

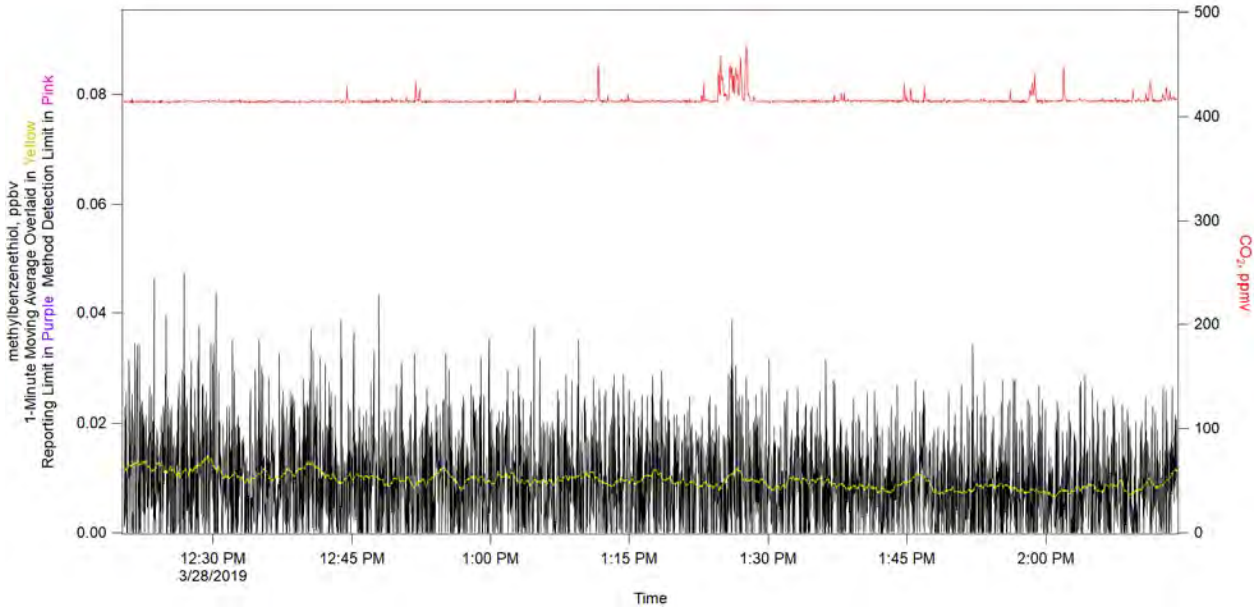


Figure 5-66. Methylbenzenethiol.

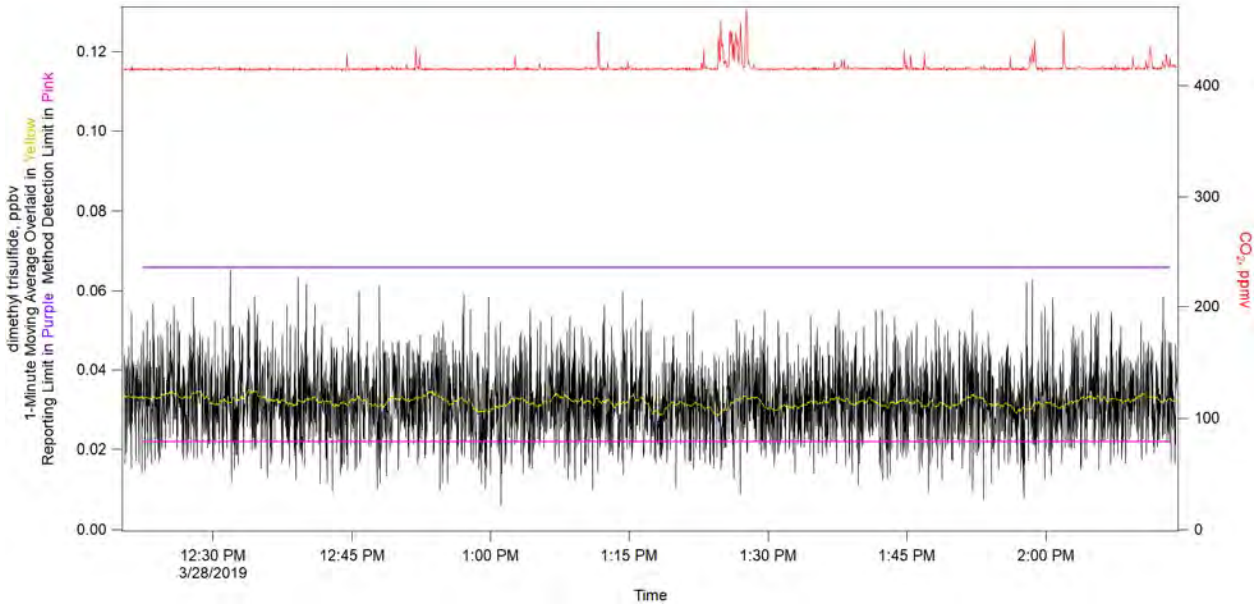


Figure 5-67. Dimethyl Trisulfide.

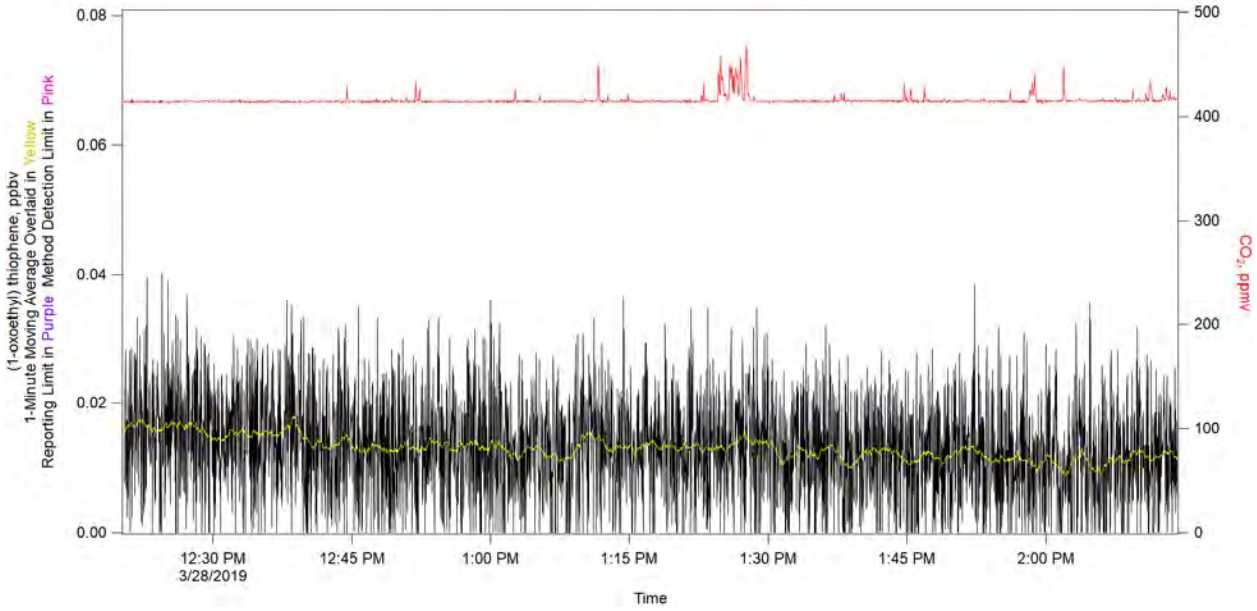


Figure 5-68. (1-oxoethyl) Thiophene.

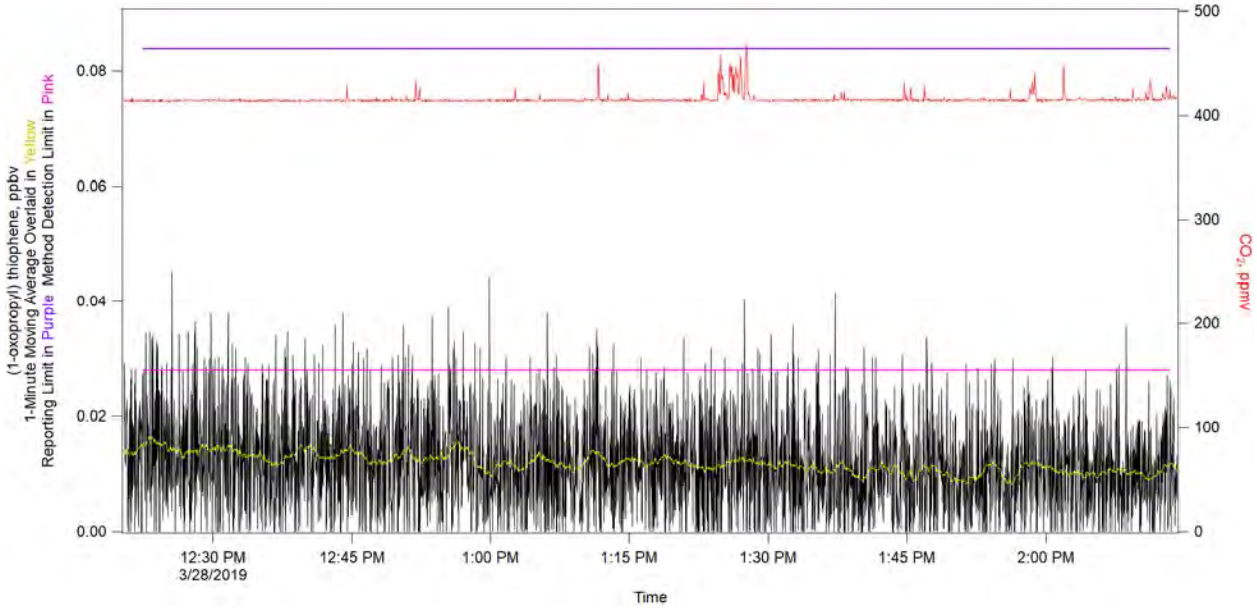


Figure 5-69. (1-oxopropyl) Thiophene.

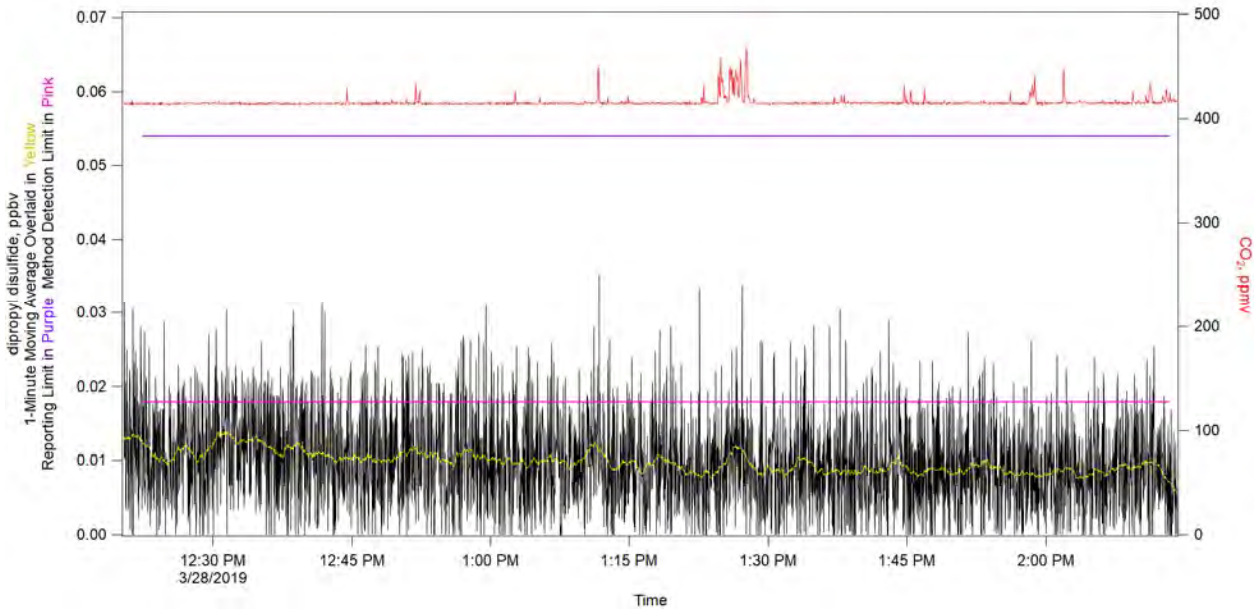


Figure 5-70. Dipropyl Disulfide.

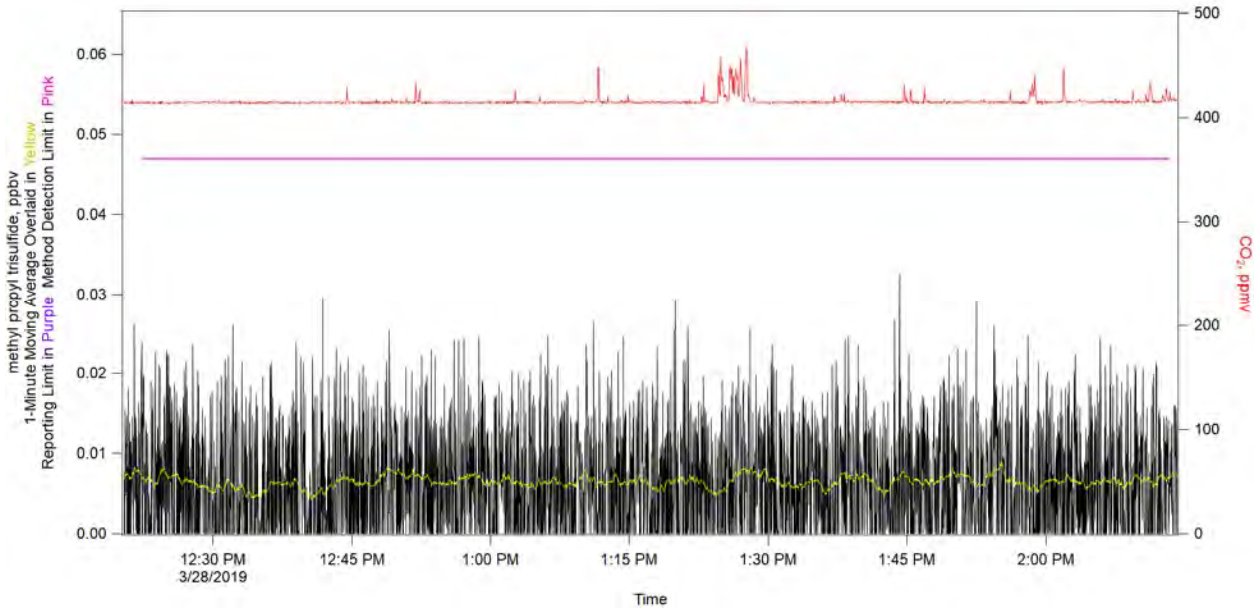


Figure 5-71. Methyl Propyl Trisulfide.

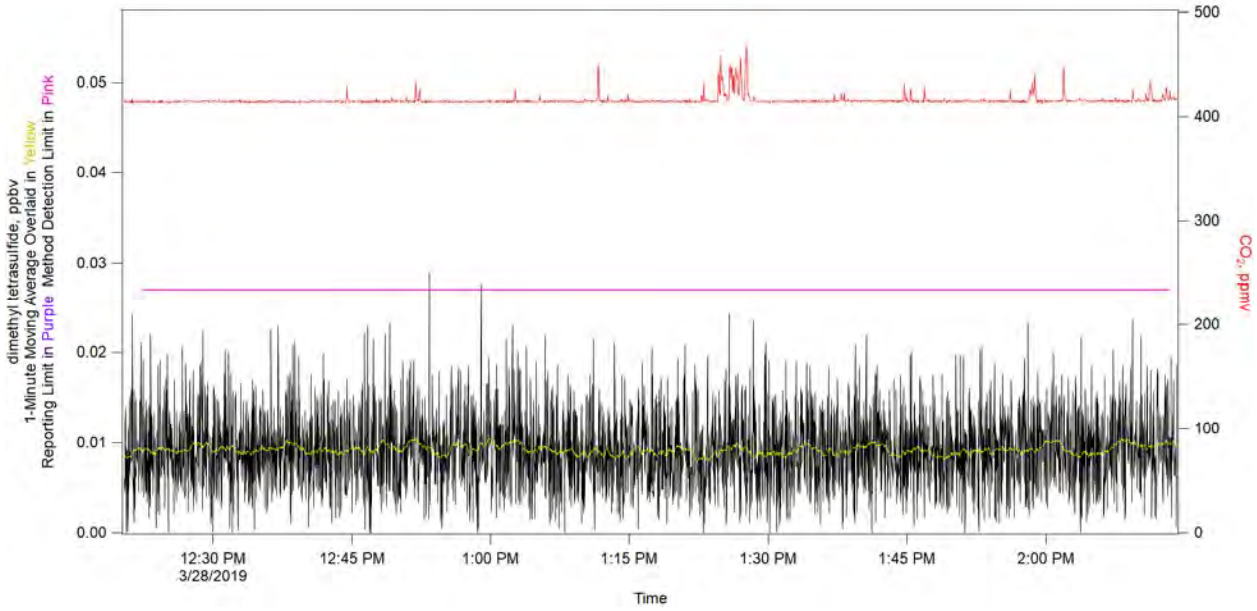


Figure 5-72. Dimethyl Tetrasulfide.

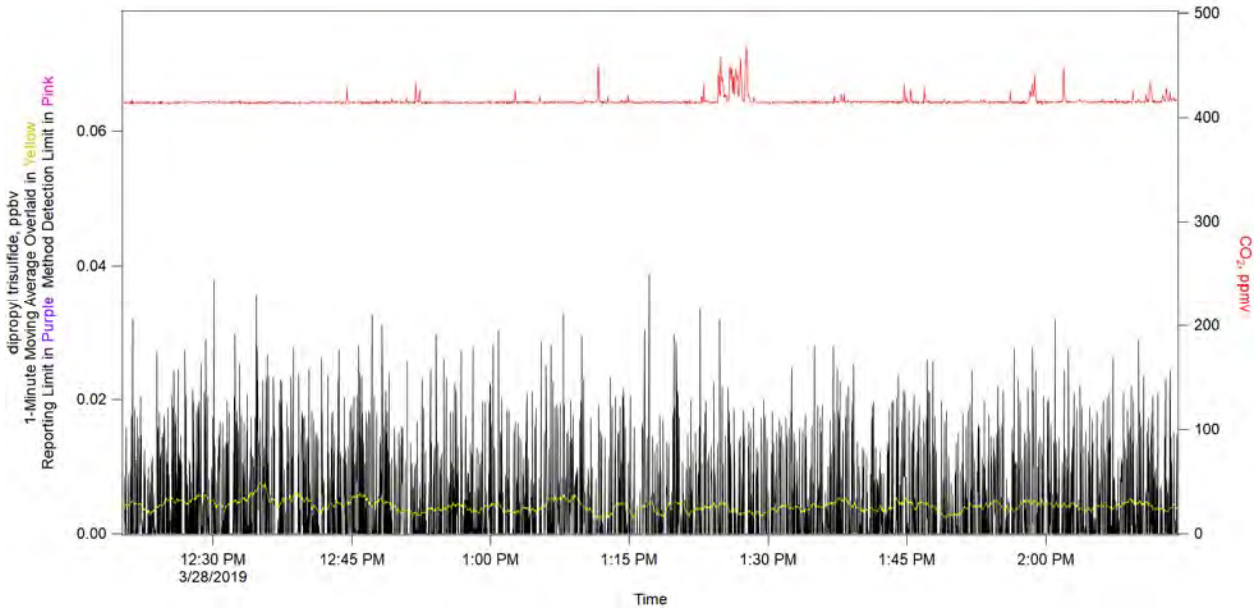


Figure 5-73. Dipropyl Trisulfide.

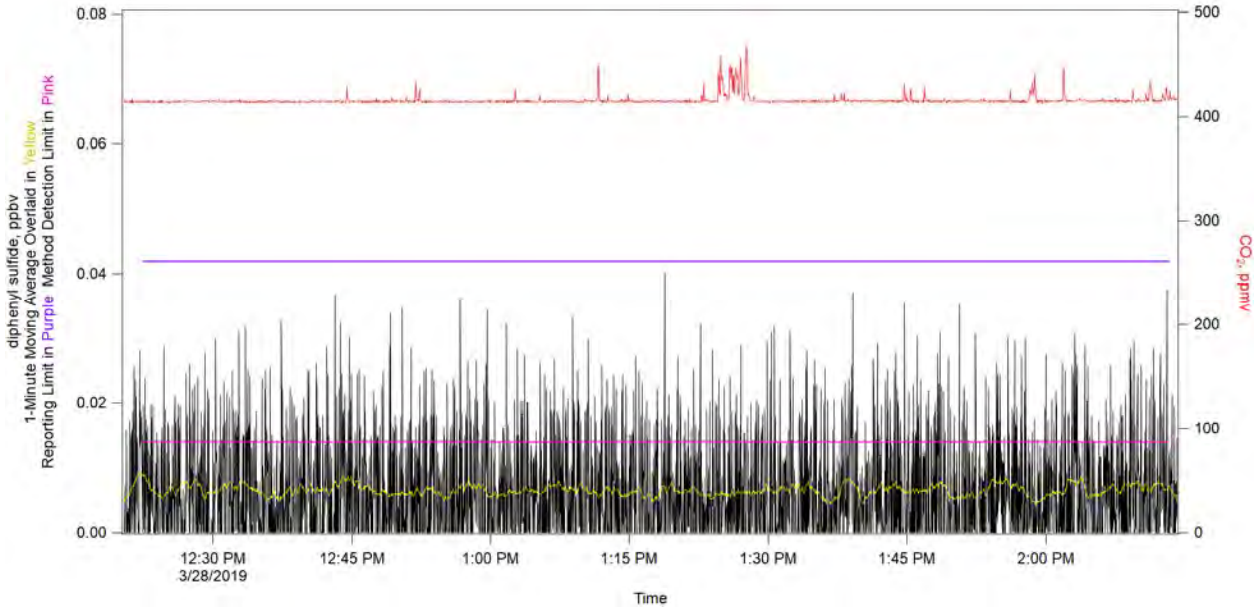


Figure 5-74. Diphenyl Sulfide.

6.0 MARCH 29, 2019 – MOBILE LABORATORY TESTING

On March 29, 2019, the ML Operators arrived at the TerraGraphics warehouse at 08:00 to perform testing on the sorbent sampling system. Operators connected the calibration gas exhaust to the mast inlet in order to sample any off-gases. The 3/8-in. tubing was then connected to the instrument exhaust and the tubing was ran outside. At 09:05, the two test Thermosorb®[2]-N cartridges were connected to the sampling system. The NDMA gas standard (cylinder ID: CC496322) was connected to the system. At 09:45 the PTR-MS was set to sample at a rate of 40 sccm of NDMA. After verifying the NDMA flow rate was stable, the Thermosorb-N sampling was initiated at 12:21. At 12:27, Operators noticed they did not account for the additional flow the sorbents required when beginning this test. This resulted in there being more sample flow than dilution air. Additionally, this meant there was no longer an overflow of the zero-air plus NDMA mixture and garage air was being added to the mix. The SME requested that the zero-air be sampled at 4500 sccm to ensure there was overflow of the zero-air plus NDMA mixture. At 13:22, the Thermosorb-N sampling was stopped. Figure 6-1 below shows the NDMA concentration throughout this testing period.

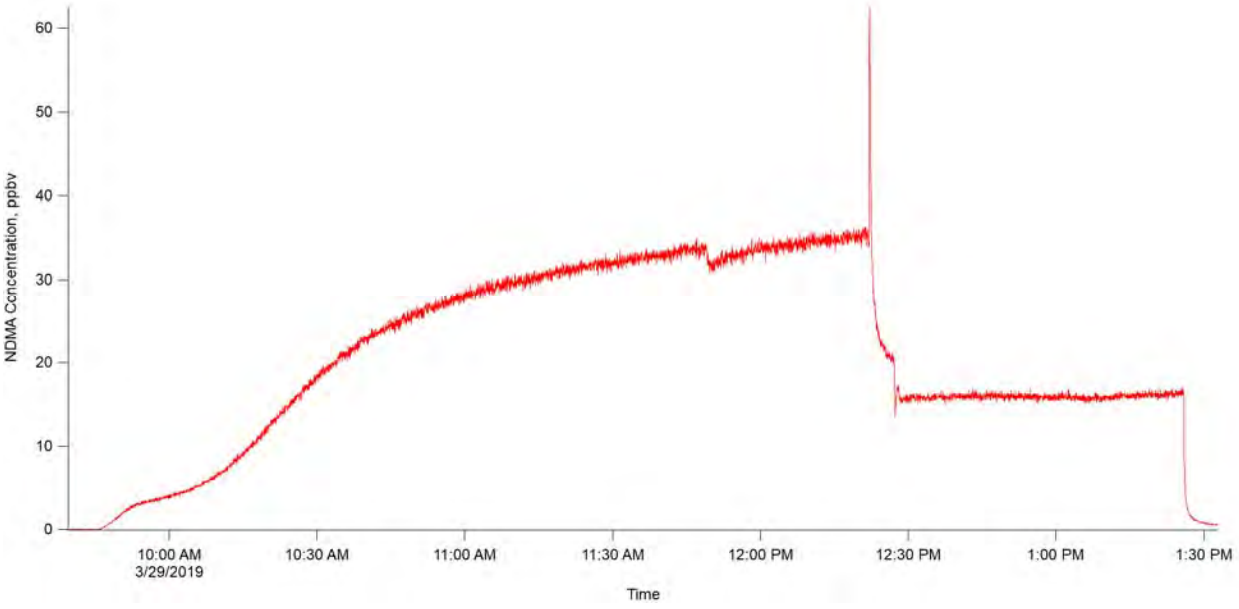


Figure 6-1. NDMA Concentration Before and During Thermosorb-N Sampling.

The flow of NDMA was stopped and disconnected, while the zero-air remained at 4500 sccm to flush out any remaining NDMA from the lines. At 13:45, a new PTR-MS file was created, and the operators began cleaning the windows of the laboratory with glass cleaner, to test the response on the PTR-MS. Performing this test is part of an ongoing effort to characterize unique sources and generate a fingerprint. Results from this test will assist data analysts to differentiate between potential sources while processing data. Figure 6-2 below shows the PTR-MS response to the window cleaner being applied.

[2] Thermosorb is a registered trademark of Ellutia Limited Company, Cambridgeshire, United Kingdom.

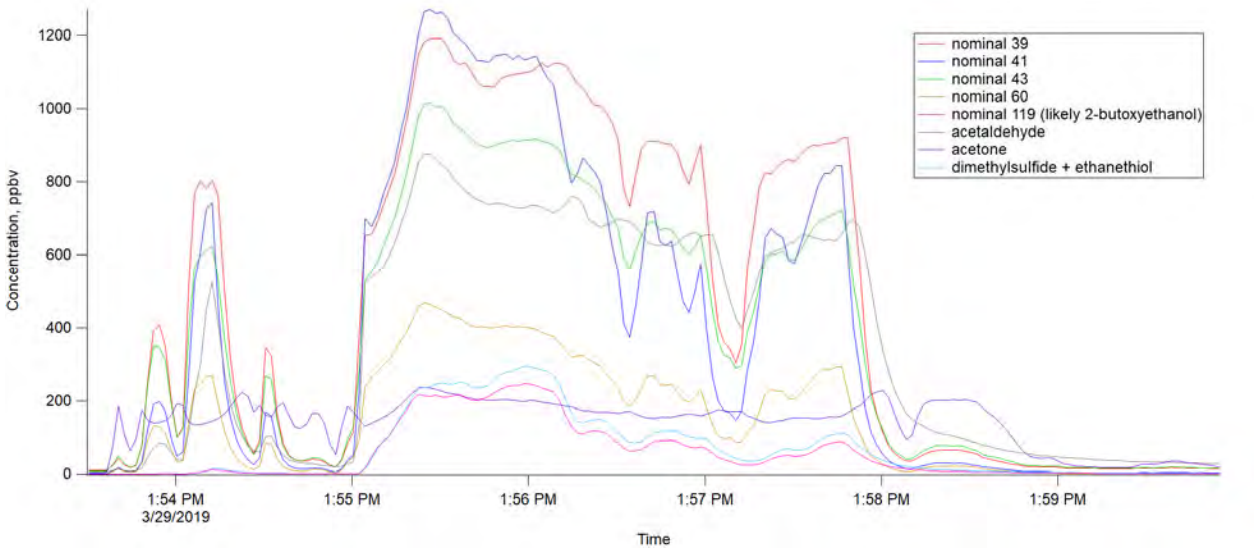


Figure 6-2. Proton Transfer Reaction – Mass Spectrometer Response to Glass Cleaner Being Applied to Mobile Laboratory Windows.

Due to the signal intensity of the window cleaner constituents that were detected by PTR-MS, many compounds saturated the mass scale at their respective m/z. This was caused by sampling relatively undiluted glass cleaner vapor off the windshield which is close to the inlet mast. The most apparent example of instrument saturation is the acetone response in the figure shown above. Acetone is a very common cleaning solvent and was likely present in high abundance in the glass cleaner solution but appears to be one of the smaller contributors to the plume captured in the plot above. It also appears that it is not trending well with other plume constituents. This is caused by instrument saturation at m/z 59, making absolute quantification of acetone during this event difficult.

While many nominal masses were identified in the signal response to the glass cleaner, only one was provided a tentative name based on common ingredients in window cleaner solutions. 2-butoxyethanol (protonated mass of 119.107205 amu) is a common glycol ether used as a surfactant in many cleaning products due to its properties both as an ether and an alcohol, and was likely responsible for the perceived instrument response at m/z 119 in the mass scale. Other nominal masses that exhibited an instrument response during this sampling could be theorized to be unidentified window cleaner ingredients or potentially fragmented compounds appearing in relatively common fragmentation patterns.

Further interrogation of this plume will be published as part of the detailed analysis of test results to be conducted as part of 53005-81-RPT-059, *PTR-MS Mobile Laboratory Vapor Monitoring Monthly Report – Month 7.*

At 14:23, the PTR-MS data collection was stopped, and data were saved to an external hard drive. The ML Operators departed the shop at 14:25 to return to the TerraGraphics Ainsworth office.

7.0 ZERO AND SPAN VERIFICATIONS

Tables 7-1 through 7-6 display the zero-air and span checks for Week 34.

Table 7-1. Zero-air Checks LI-COR CO_2 Monitor.

Date	Time	Instrument Check	Observed Result (ppm)	Expected Result (ppm)	% Difference	Acceptance Criteria (%)	Pass/Fail
03/25/19	05:52	Zero	0.8	<50	N/A	N/A	Pass
03/26/19	05:43	Zero	1.4	<50	N/A	N/A	Pass
03/27/19	05:37	Zero	1.3	<50	N/A	N/A	Pass
03/28/19	06:14	Zero	1.5	<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
03/25/19	05:52	Span	348	384.6	9.4	20	Pass
03/26/19	05:43	Span	364	385	5.5	20	Pass
03/27/19	05:37	Span	366	384	4.6	20	Pass
03/28/19	06:14	Span	367	385.1	4.7	20	Pass

Table 7-3. Zero-air Checks for the PTR-MS.

Date	Time	Instrument Check	Observed Result (ppm)	Expected Result (ppm)	% Difference	Acceptance Criteria (%)	Pass/Fail
03/25/19	06:30	Zero	0.08	<0.5	N/A	N/A	Pass
03/26/19	05:55	Zero	0.08	<0.5	N/A	N/A	Pass
03/27/19	05:50	Zero	0.08	<0.5	N/A	N/A	Pass
03/28/19	06:19	Zero	0.08	<0.5	N/A	N/A	Pass

Table 7-4. Span Checks for the PTR-MS.

Date	Time	Instrument Check	Observed Result (ppm)	Expected Result (ppm)	% Difference	Acceptance Criteria (%)	Pass/Fail
03/25/19	06:30	Span	9.3	10.8	13.9	30	Pass
03/26/19	06:05	Span	9.6	10.8	11	30	Pass
03/27/19	06:00	Span	9.5	10.8	12	30	Pass
03/28/19	06:19	Span	9.5	10.8	12	30	Pass

Table 7-5. Zero-air Checks for the Picarro Ammonia Analyzer.

Date	Time	Instrument Check	Observed Result (ppm)	Expected Result (ppm)	% Difference	Acceptance Criteria (%)	Pass/Fail
03/25/19	06:31	Zero	4.6	<20	N/A	N/A	Pass
03/26/19	05:25	Zero	5.2	<20	N/A	N/A	Pass
03/27/19	05:17	Zero	5.9	<20	N/A	N/A	Pass
03/28/19	06:18	Zero	5.8	<20	N/A	N/A	Pass

Table 7-6. Span Checks for the Picarro Ammonia Analyzer.

Date	Time	Instrument Check	Observed Result (ppm)	Expected Result (ppm)	% Difference	Acceptance Criteria (%)	Pass/Fail
03/25/19	06:31	Span	3600	3250	10.8	20	Pass
03/26/19	05:37	Span	3620	3250	10	20	Pass
03/27/19	05:31	Span	3626	3250	11.5	20	Pass
03/28/19	06:18	Span	3672	3250	13	20	Pass

8.0 DATA PROCESSING AND REPORTING SUMMARY

During the week of March 25, 2019, through March 29, 2019, the ML performed mobile monitoring of the 200 East Area on the Hanford Site. The data processing team continued processing data from the previous week's ML data. The reporting team worked towards the completion of reports for Week 31, Week 32, Week 33, Month 5, Month 6, Month 7, and the revisions for weekly reports for Weeks 24 through-27. The reporting team submitted the final Report No. 53005-81-RPT-041, *Weekly Report for Week 28 (February 10, 2019 – February 15, 2019)* and Report No. 53005-81-RPT-042, *Weekly Report for Week 29 (February 19, 2019 – February 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-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.

53005-81-RPT-059, 2019, *PTR-MS Mobile Laboratory Vapor Monitoring Monthly Report – Month 7*, Revision A, 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.

Review Comment Record (RCR) Removed – Page 159