Supplemental Information

Development of Organic Gas Exhaust Speciation Profiles for Nonroad Spark Ignition and Compression Ignition Engines and Equipment

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Co-eluted and Unknown Species Details. For some species that co-elute, the chromatography peak area was split equally between the two compounds by the contractor. For other species, co-elution was noted but only one of the co-eluted compounds was reported and all mass was assigned to that species. In such cases, the mass was subsequently split equally between the co-eluted compounds and the unreported species were added to the chemical list. The following were indicated as co-eluted species:

- 2,2-dimethylpentane and methylcyclopentane
- 3-methyl-3-ethyl-pentane and 3,4-dimethylhexane
- Cis-1,4-dimethylcyclohexane and trans-1,3-dimethylcyclohexane
- Propylcyclopentane and 2,6-dimethylheptane
- 2,5-dimethylheptane and 3,5-dimethylheptane
- Decane and isobutylbenzene
- n-butylbenzene and 1-methyl-4-n-propylbenzene
- Isobutyraldehyde and methyl ethyl ketone

Unknown hydrocarbons were reported by the lab according to carbon number, as unidentified C5, C6, C7, C8, and C9-C12+. Reported designations were maintained in assigning specie identification numbers used in the SPECIATE database instead of combining unknowns into one specie identification number.

Comparisons. To compare profiles, we conducted a regression of the weight percents of a profile to the weight percents of another profile. Identical profiles would yield a 1:1 line, with a slope equal to one. We examine if the slopes from our regression are significantly different than 1 to determine if there is a difference between the profiles. Here, we define a significantly different profile by if the 95% confidence interval of the profile's slope did not include 1.

Using a regression places emphasis on the pollutants that are the highest contributors to the weight percents. As such, we use this test in a semi-qualitative method for comparing profiles, and use two-sample t-tests for more in-depth comparisons looking at each specie.

Table S.1. Regression comparing low and high sulfur diesel fuels

	R ²	Slope	95% confidence interval	
Pre-Tier 1	0.98	0.98	0.95	1.00
Tier 1	0.99	0.99	0.97	1.01
Tier 2	0.91	1.03	0.96	1.09

Emissions rates in the following three figures represent the speciated exhaust including hydrocarbons and alcohols (measured by GC-FID), and aldehydes and ketones (measured by HPLC).

Figure S.1. Comparison of absolute emission rates among 2-stroke SI engines by test and fuel ethanol level

Figure S.2. Comparison of absolute emission rates among 4-stroke SI engines by test and fuel ethanol level

Figure S.3. Comparison of absolute emission rates among CI engines by test

Figure S.4. Comparison of on-road pre-Tier 2 gasoline vehicle E0 profile to nonroad SI E0 profiles

Figure S.5. Comparison of on-road pre-Tier 2 gasoline vehicle E10 profile to nonroad SI E10 profiles

Figure S.6. Comparison of on-road pre-2007 diesel profile 8774 to nonroad CI profiles

Table S.2. Composite spark-ignition organic gas exhaust speciation profiles displayed as weight percentages of total organic gases

Specie ID	CAS Number	Compound	E0 4 stroke	E0 2 stroke	E10 4 stroke	E10 2 stroke
1	135-98-8	(1-methylpropyl)benzene	0.00	0.00	0.04	0.00
9	4259-00-1	1,1,2-TRIMETHYLCYCLOPENTANE	0.00	0.00	0.00	0.00
12	3073-66-3	1,1,3-TRIMETHYLCYCLOHEXANE	0.00	0.00	0.00	0.00
13	4516-69-2	1,1,3-TRIMETHYLCYCLOPENTANE	0.02	0.00	0.03	0.00
19	590-66-9	1,1-DIMETHYLCYCLOHEXANE	0.00	0.00	0.00	0.00
20	1638-26-2	1,1-DIMETHYLCYCLOPENTANE	0.00	0.01	0.00	0.00
21	16747-50-5	1,1-Methylethylcyclopentane	0.00	0.02	0.00	0.02
36	135-01-3	1,2 DIETHYLBENZENE	0.03	0.09	0.00	0.08
22	488-23-3	1,2,3,4-TETRAMETHYLBENZENE	0.00	0.07	0.04	0.07
23	527-53-7	1,2,3,5-TETRAMETHYLBENZENE	0.09	0.01	0.05	0.01
25	526-73-8	1,2,3-TRIMETHYLBENZENE	0.22	0.02	0.16	0.06
28	95-93-2	1,2,4,5-TETRAMETHYLBENZENE	0.01	0.13	0.01	0.14
29	877-44-1	1,2,4-TRIETHYLBENZENE	0.00	0.02	0.00	0.02
30	95-63-6	1,2,4-TRIMETHYLBENZENE	1.39	2.10	1.29	2.00
37	933-98-2	1,2-dimethyl-3-ethylbenzene	0.00	0.01	0.00	0.00
39	934-80-5	1,2-DIMETHYL-4-ETHYLBENZENE	0.12	0.04	0.09	0.03
42	463-49-0	1,2-PROPADIENE	0.00	0.00	0.00	0.00
43	102-25-0	1,3,5-TRIETHYLBENZENE	0.00	0.02	0.00	0.02
44	108-67-8	1,3,5-TRIMETHYLBENZENE	0.43	0.75	0.57	0.72
55	934-74-7	1,3,-DIMETHYL-5-ETHYLBENZENE	0.00	0.00	0.00	0.00
46	106-99-0	1,3-BUTADIENE	1.02	0.21	1.02	0.26
51	141-93-5	1,3-DIETHYLBENZENE	0.06	0.17	0.06	0.17
52	2870-04-4	1,3-DIMETHYL-2-ETHYLBENZENE	0.06	0.02	0.02	0.01
53	874-41-9	1,3-DIMETHYL-4-ETHYLBENZENE	0.03	0.08	0.09	0.01
54	4706-89-2	1,3-dimethyl-4-isopropylbenzene	0.03	0.00	0.06	0.00
59	105-05-5	1,4-DIETHYLBENZENE	0.02	0.41	0.00	0.39
60	1758-88-9	1,4-DIMETHYL-2-ETHYLBENZENE	0.06	0.25	0.06	0.24
64	106-98-9	1-BUTENE	0.36	0.12	0.43	0.13
65	107-00-6	1-butyne	0.00	0.00	0.00	0.00
357	15890-40-1	1-CIS,2-TRANS,3-TRIMETHYLCYCLOPENTANE	0.04	0.14	0.05	0.16
996	872-05-9	1-DECENE	0.00	0.02	0.08	0.01
75	637-92-3	1-ethyltertbutylether	0.00	0.00	0.00	0.00
76	592-76-7	1-HEPTENE	0.00	0.00	0.00	0.00
78	592-41-6	1-HEXENE	0.03	0.09	0.10	0.11
80	611-14-3	1-METHYL-2-ETHYLBENZENE	0.34	0.61	0.34	0.49
81	527-84-4	1-METHYL-2-ISOPROPYLBENZENE	0.18	0.07	0.27	0.05
84	1074-17-5	1-METHYL-2-N-PROPYLBENZENE	0.04	0.04	0.09	0.03
89	620-14-4	1-METHYL-3-ETHYLBENZENE	1.01	1.81	0.91	1.53
90	535-77-3	1-METHYL-3-ISOPROPYLBENZENE	0.28	0.04	0.22	0.03
92	1074-43-7	1-METHYL-3-N-PROPYLBENZENE	0.13	0.22	0.23	0.18
94	622-96-8	1-METHYL-4-ETHYLBENZENE	0.42	0.77	0.30	0.64
97	99-87-6	1-METHYL-4-ISOPROPYLBENZENE	0.00	0.00	0.00	0.00

Specie ID	CAS Number	Compound	E0 4 stroke	E0 2 stroke	E10 4 stroke	E10 2 stroke
100	1074-55-1	1-METHYL-4-N-PROPYLBENZENE	0.12	0.04	0.06	0.02
103	693-89-0	1-METHYLCYCLOPENTENE	0.01	0.11	0.06	0.17
106	124-11-8	1-NONENE	0.11	0.17	0.02	0.07
107	111-66-0	1-OCTENE	0.00	0.00	0.00	0.00
108	109-67-1	1-pentene	0.00	0.17	0.00	0.22
607	71-23-8	1-Propanol	0.10	0.00	0.06	0.00
730	15890-40-1	1-TRANS-2-CIS-3-TRIMETHYLCYCLOPENTANE	0.01	0.06	0.02	0.08
1540	2815-58-9	1-TRANS-2-CIS-4-TRIMETHYLCYCLOPENTANE	0.00	0.07	0.00	0.07
112	464-06-2	2,2,3-TRIMETHYLBUTANE	0.02	0.06	0.05	0.07
113	564-02-3	2,2,3-TRIMETHYLPENTANE	0.42	0.94	0.30	1.05
117	16747-26-5	2,2,4-trimethylhexane	0.00	0.03	0.00	0.02
118	540-84-1	2,2,4-TRIMETHYLPENTANE	3.76	7.94	4.70	12.72
121	3522-94-9	2,2,5-TRIMETHYLHEXANE	0.31	0.58	0.05	0.04
122	75-83-2	2,2-DIMETHYLBUTANE	0.03	0.09	0.04	0.07
123	1071-26-7	2,2-DIMETHYLHEPTANE	0.00	0.00	0.00	0.00
124	590-73-8	2,2-DIMETHYLHEXANE	0.00	0.10	0.01	0.09
125	15869-87-1	2,2-DIMETHYLOCTANE	0.06	0.09	0.03	0.06
126	590-35-2	2,2-DIMETHYLPENTANE	0.06	0.42	0.22	0.61
127	463-82-1	2,2-DIMETHYLPROPANE (NEOPENTANE)	0.00	0.09	0.00	0.07
128	560-21-4	2,3,3-TRIMETHYLPENTANE	0.60	1.45	0.11	0.21
129	921-47-1	2,3,4-TRIMETHYLHEXANE	0.00	0.02	0.00	0.02
130	565-75-3	2,3,4-TRIMETHYLPENTANE	0.93	2.40	0.22	0.67
132	1069-53-0	2,3,5-TRIMETHYLHEXANE	0.05	0.09	0.01	0.04
135	10574-37-5	2,3-DIMETHYL-2-PENTENE	0.00	0.00	0.00	0.00
136	79-29-8	2,3-DIMETHYLBUTANE	0.39	0.73	0.19	0.54
137	3074-71-3	2,3-DIMETHYLHEPTANE	0.00	0.02	0.00	0.02
138	584-94-1	2,3-DIMETHYLHEXANE	0.14	0.00	0.01	0.13
140	565-59-3	2,3-DIMETHYLPENTANE	1.87	0.62	1.42	0.00
141	107-39-1	2,4,4-TRIMETHYL-1-PENTENE	0.01	0.09	0.07	0.11
142	107-40-4	2,4,4-TRIMETHYL-2-PENTENE	0.00	0.01	0.05	0.02
143	16747-30-1	2,4,4-TRIMETHYLHEXANE	0.00	0.00	0.00	0.00
148	2213-23-2	2,4-DIMETHYLHEPTANE	0.04	0.08	0.02	0.06
149	589-43-5	2,4-DIMETHYLHEXANE	0.48	1.29	0.35	1.14
151	4032-94-4	2,4-DIMETHYLOCTANE	0.01	0.06	0.03	0.07
152	108-08-7	2,4-DIMETHYLPENTANE	1.09	1.41	0.33	0.95
155	2216-30-0	2,5-DIMETHYLHEPTANE	0.05	0.09	0.03	0.07
156	592-13-2	2,5-dimethylhexane	0.00	0.00	0.00	0.00
160	1072-05-5	2,6-DIMETHYLHEPTANE	0.00	0.00	0.00	0.01
170	503-17-3	2-butyne	0.00	0.00	0.00	0.00
511	78-79-5	2-METHYL-1,3-BUTADIENE	0.19	0.11	0.26	0.14
181	563-46-2	2-methyl-1-butene	0.00	0.29	0.00	0.44
2185	6094-02-6	2-METHYL-1-HEXENE	0.00	0.03	0.00	0.03
184	763-29-1	2-METHYL-1-PENTENE	0.03	0.10	0.10	0.13

Specie ID	CAS Number	Compound	E0 4 stroke	E0 2 stroke	E10 4 stroke	E10 2 stroke
185	513-35-9	2-METHYL-2-BUTENE	0.20	0.59	0.24	0.76
186	2738-19-4	2-methyl-2-hexene	0.00	0.11	0.01	0.13
187	625-27-4	2-METHYL-2-PENTENE	0.04	0.13	0.07	0.18
508	78-78-4	2-METHYLBUTANE (ISOPENTANE)	2.22	10.25	1.46	6.14
2568	03968-85-2	2-METHYLBUTYLBENZENE (sec AMYLBENZENE)	0.01	0.16	0.00	0.15
193	592-27-8	2-METHYLHEPTANE	0.22	0.77	0.21	0.55
194	591-76-4	2-METHYLHEXANE	0.00	2.60	0.00	5.02
198	3221-61-2	2-METHYLOCTANE	0.18	0.62	0.16	0.47
199	107-83-5	2-METHYLPENTANE	0.33	1.73	0.78	2.32
491	75-28-5	2-METHYLPROPANE (ISOBUTANE)	0.14	0.22	0.03	0.02
497	115-11-7	2-METHYLPROPENE (ISOBUTYLENE)	2.66	0.75	3.07	1.02
513	67-63-0	2-Propanol	0.01	0.02	0.00	0.00
203	558-37-2	3,3-DIMETHYL-1-BUTENE	0.02	0.01	0.04	0.01
205	4032-86-4	3,3-DIMETHYLHEPTANE	0.00	0.03	0.00	0.04
206	563-16-6	3,3-DIMETHYLHEXANE	0.03	0.09	0.04	0.08
208	562-49-2	3,3-DIMETHYLPENTANE	0.03	0.10	0.01	0.04
209	7385-78-6	3,4-DIMETHYL-1-PENTENE	0.01	0.02	0.01	0.02
211	922-28-1	3,4-DIMETHYLHEPTANE	0.00	0.04	0.00	0.03
212	583-48-2	3,4-DIMETHYLHEXANE	0.04	0.09	0.01	0.07
215	926-82-9	3,5-DIMETHYLHEPTANE	0.05	0.09	0.03	0.07
221	816-79-5	3-ethyl-2-pentene	0.00	0.01	0.00	0.01
226	619-99-8	3-ETHYLHEXANE	0.00	0.00	0.00	0.00
229	617-78-7	3-ETHYLPENTANE	0.03	0.21	0.10	0.33
230	563-45-1	3-METHYL-1-BUTENE	0.04	0.20	0.08	0.13
231	3404-61-3	3-methyl-1-hexene	0.00	0.02	0.00	0.02
232	760-20-3	3-METHYL-1-PENTENE	0.03	0.08	0.04	0.09
233	1067-08-9	3-Methyl-3-ethyl-pentane	0.04	0.09	0.01	0.07
236	922-62-3	3-METHYL-CIS-2-PENTENE	0.03	0.16	0.07	0.24
242	1120-62-3	3-METHYLCYCLOPENTENE	0.00	0.00	0.02	0.00
244	589-81-1	3-METHYLHEPTANE	0.27	1.20	0.23	0.72
245	589-34-4	3-METHYLHEXANE	0.19	1.57	0.41	1.35
247	2216-33-3	3-METHYLOCTANE	0.11	0.44	0.09	0.31
248	96-14-0	3-METHYLPENTANE	0.20	1.07	0.54	1.55
239	616-12-6	3-METHYL-TRANS-2-PENTENE	0.04	0.20	0.09	0.27
240	3899-36-3	3-methyl-trans-3-hexene	0.00	0.00	0.00	0.00
253	1068-19-5	4,4-DIMETHYLHEPTANE	0.00	0.10	0.01	0.07
1471	2216-32-2	4-ETHYLHEPTANE	0.00	0.00	0.00	0.00
258	691-37-2	4-METHYL-1-PENTENE	0.00	0.00	0.00	0.02
260	691-38-3	4-METHYL-CIS-2-PENTENE	0.00	0.00	0.00	0.00
264	589-53-7	4-METHYLHEPTANE	0.06	0.73	0.03	0.18
267	2216-34-4	4-methyloctane	0.00	0.00	0.00	0.00
262	674-76-0	4-METHYL-TRANS-2-PENTENE	0.01	0.07	0.00	0.08
279	75-07-0	Acetaldehyde	0.35	0.10	0.74	0.33
281	67-64-1	Acetone	0.25	0.04	0.20	0.05
282	74-86-2	ACETYLENE	13.48	3.10	13.01	2.69

Specie ID	CAS Number	Compound	E0 4 stroke	E0 2 stroke	E10 4 stroke	E10 2 stroke
283	107-02-8	Acrolein	0.03	0.03	0.04	0.04
301	100-52-7	Benzaldehyde	0.43	0.11	0.21	0.07
302	71-43-2	BENZENE	5.64	1.36	3.77	1.23
592	106-97-8	BUTANE	0.62	1.69	0.50	1.17
351	2207-01-4	CIS-1,2-DIMETHYLCYCLOHEXANE	0.04	0.11	0.04	0.10
360	1192-18-3	CIS-1,2-DIMETHYLCYCLOPENTANE	0.00	0.00	0.00	0.00
352	638-04-0	Cis-1,3-dimethylcyclohexane	0.00	0.00	0.00	0.00
353	2532-58-3	CIS-1,3-DIMETHYLCYCLOPENTANE	0.02	0.07	0.09	0.02
354	624-29-3	Cis-1,4-Dimethylcyclohexane	0.00	0.03	0.01	0.03
362	930-89-2	Cis-1-ethyl-2-methylcyclopentane	0.01	0.08	0.02	0.07
364	2613-66-3	CIS-1-METHYL-3-ETHYLCYCLOPENTANE	0.02	0.05	0.04	0.06
367	590-18-1	CIS-2-BUTENE	0.18	0.08	0.19	0.10
368	6443-92-1	CIS-2-HEPTENE	0.02	0.05	0.02	0.06
369	7688-21-3	CIS-2-HEXENE	0.02	0.08	0.02	0.10
370	7642-04-8	CIS-2-OCTENE	0.00	0.08	0.00	0.01
371	627-20-3	CIS-2-PENTENE	0.10	0.22	0.14	0.28
2616	7642-10-6	CIS-3-HEPTENE	0.00	0.00	0.00	0.00
372	7642-09-3	CIS-3-HEXENE	0.01	0.09	0.03	0.12
373	20237-46-1	CIS-3-NONENE	0.00	0.01	0.00	0.01
382	4170-30-3	Crotonaldehyde	0.03	0.02	0.02	0.02
385	110-82-7	CYCLOHEXANE	0.05	0.05	0.53	0.08
388	110-83-8	CYCLOHEXENE	0.12	0.03	0.05	0.04
48	542-92-7	CYCLOPENTADIENE	0.35	0.12	0.39	0.12
390	287-92-3	CYCLOPENTANE	0.04	0.07	0.06	0.10
391	142-29-0	CYCLOPENTENE	0.03	0.09	0.07	0.13
598	124-18-5	DECANE	0.05	0.08	0.04	0.06
2735	108-20-3	DI-ISOPROPYL ETHER	0.00	0.00	0.00	0.00
1712	5779-94-2	Dimethylbenzaldehyde	0.09	0.02	0.04	0.02
599	112-40-3	DODECANE	0.02	0.08	0.01	0.05
438	74-84-0	ETHANE	0.93	0.25	0.86	0.29
442	64-17-5	Ethanol	0.14	0.06	2.49	7.63
449	100-41-4	ETHYLBENZENE	1.79	3.37	1.37	2.18
450	1678-91-7	ETHYLCYCLOHEXANE	0.02	0.17	0.02	0.11
451	1640-89-7	ETHYLCYCLOPENTANE	0.00	0.00	0.01	0.00
452	74-85-1	ETHYLENE	8.94	1.79	10.11	1.94
465	50-00-0	Formaldehyde	1.61	0.36	1.45	0.49
600	142-82-5	HEPTANE	0.26	1.15	0.22	0.62
840	66-25-1	Hexanaldehyde	0.00	0.00	0.00	0.00
601	110-54-3	HEXANE	0.19	0.76	0.43	0.70
602	1077-16-3	HEXYLBENZENE	0.00	0.02	0.00	0.03
485	496-11-7	INDAN	0.00	0.00	0.00	0.00
3	538-93-2	ISOBUTYLBENZENE	0.05	0.07	0.04	0.06
2119	78-84-2	ISOBUTYRALDEHYDE	0.01	0.01	0.02	0.01
514	98-82-8	ISOPROPYLBENZENE (CUMENE)	0.10	0.11	0.04	0.06
2560	3875-51-2	ISOPROPYLCYCLOPENTANE	0.00	0.01	0.01	0.03

Specie ID	CAS Number	Compound	E0 4 stroke	E0 2 stroke	E10 4 stroke	E10 2 stroke
517	590-86-3	Isovaleraldehyde	0.05	0.01	0.04	0.02
522	1330-20-7	m-& p-XYLENE	3.58	6.30	4.49	5.27
2164	1334-78-7	m/p-Tolualdehyde	0.27	0.05	0.19	0.08
536	78-93-3	MEK	0.01	0.01	0.02	0.01
529	74-82-8	METHANE	15.89	1.70	15.40	1.74
531	67-56-1	Methanol	0.17	0.08	0.17	0.13
548	1634-04-4	Methyl t-butyl ether (MTBE)	0.00	0.00	0.00	0.00
550	108-87-2	METHYLCYCLOHEXANE	0.08	0.43	0.23	0.63
551	96-37-7	METHYLCYCLOPENTANE	0.06	0.41	0.21	0.60
611	91-20-3	NAPHTHALENE	0.03	0.06	0.07	0.05
595	71-36-3	N-butyl alcohol	0.06	0.00	0.03	0.00
596	104-51-8	n-Butylbenzene	0.12	0.03	0.06	0.02
603	111-84-2	NONANE	0.17	0.34	0.06	0.16
606	538-68-1	N-PENT-BENZENE	0.03	0.08	0.03	0.09
608	103-65-1	n-PROPYLBENZENE	0.28	0.67	0.24	0.47
604	00111-65-9	OCTANE	0.22	0.45	0.14	0.30
1467	529-20-4	o-Tolualdehyde	0.07	0.04	0.03	0.02
620	95-47-6	o-XYLENE	1.20	2.27	1.26	1.82
605	109-66-0	PENTANE	0.33	0.84	0.32	0.87
671	74-98-6	PROPANE	0.27	0.05	0.07	0.03
673	123-38-6	Propionaldehyde	0.04	0.05	0.03	0.05
677	2040-96-2	Propylcyclopentane	0.00	0.00	0.00	0.01
678	115-07-1	PROPYLENE	5.29	1.14	5.29	1.26
109	74-99-7	PROPYNE	0.00	0.02	0.00	0.02
698	100-42-5	STYRENE	0.79	0.22	0.59	0.17
701	994-05-8	T-amylmethylether	0.00	0.00	0.00	0.00
86	1074-92-6	TERT-1-BUT-2-METHYLBENZENE	0.00	0.13	0.03	0.16
63	98-19-1	TERT-1-BUT-3,5-DIMETHYLBENZENE	0.00	0.12	0.00	0.14
2329	7364-19-4	TERT-1-BUTYL-4-ETHYLBENZENE	0.00	0.06	0.02	0.06
703	98-06-6	TERT-BUTYLBENZENE	0.00	0.03	0.00	0.03
717	108-88-3	TOLUENE	8.64	8.64	7.77	7.77
724	6876-23-9	TRANS-1,2-DIMETHYLCYCLOHEXANE	0.01	0.38	0.02	0.17
725	822-50-4	TRANS-1,2-DIMETHYLCYCLOPENTANE	0.03	0.10	0.03	0.10
726	2207-03-6	TRANS-1,3-DIMETHYLCYCLOHEXANE	0.00	0.03	0.01	0.03
727	1759-58-6	TRANS-1,3-DIMETHYLCYCLOPENTANE	0.00	0.23	0.00	0.35
729	2207-04-7	TRANS-1,4-DIMETHYLCYCLOHEXANE	0.00	0.01	0.01	0.02
1586	930-90-5	Trans-1-ethyl-2-methyl-cyclopentane	0.00	0.09	0.03	0.11
736	2613-65-2	TRANS-1-METHYL-3-ETHYLCYCLOPENTANE	0.00	0.11	0.03	0.14
737	624-64-6	TRANS-2-BUTENE	0.32	0.20	0.25	0.23

Specie ID	CAS Number	Compound	E0 4 stroke	E0 2 stroke	E10 4 stroke	E10 2 stroke
739	14686-13-6	TRANS-2-HEPTENE	0.01	0.06	0.02	0.07
740	4050-45-7	TRANS-2-HEXENE	0.01	0.14	0.04	0.18
2244	6434-78-2	TRANS-2-NONENE	0.00	0.01	0.00	0.01
741	13389-42-9	TRANS-2-OCTENE	0.01	0.08	0.04	0.11
742	646-04-8	TRANS-2-PENTENE	0.03	0.38	0.09	0.49
743	14686-14-7	TRANS-3-HEPTENE	0.00	0.09	0.03	0.11
744	13269-52-8	TRANS-3-HEXENE	0.00	0.00	0.00	0.00
745	20063-92-7	TRANS-3-NONENE	0.00	0.04	0.01	0.05
746	14850-23-8	Trans-4-octene	0.00	0.05	0.00	0.05
610	1120-21-4	UNDECANE	0.03	0.11	0.03	0.11
1989	#N/A	UNIDENTIFIED C5 OLEFINS	0.00	0.01	0.00	0.01
1999	#N/A	UNIDENTIFIED C6	0.13	0.07	0.16	0.07
2005	#N/A	UNIDENTIFIED C7	0.10	0.75	0.10	0.27
2011	#N/A	UNIDENTIFIED C8	0.00	0.16	0.01	0.12
327	#N/A	UNIDENTIFIED C9-C12+	1.06	3.86	1.55	3.56
845	110-62-3	Valeraldehyde	0.01	0.00	0.00	0.00

Table S.3. Composite transient cycle compression-ignition organic gas exhaust speciation profiles displayed as weight percentages of total organic gases

CAS Number	COMPOUND	Pre-Tier 1	Tier 1	Tier 2
135-98-8	(1-methylpropyl)benzene	0.00	0.00	0.00
4259-00-1	1,1,2-TRIMETHYLCYCLOPENTANE	0.00	0.00	0.00
3073-66-3	1,1,3-TRIMETHYLCYCLOHEXANE	0.00	0.00	0.00
4516-69-2	1,1,3-TRIMETHYLCYCLOPENTANE	0.00	0.00	0.00
590-66-9	1,1-DIMETHYLCYCLOHEXANE	0.00	0.00	0.00
1638-26-2	1,1-DIMETHYLCYCLOPENTANE	0.00	0.00	0.00
16747-50-5	1,1-Methylethylcyclopentane	0.00	0.00	0.00
135-01-3	1,2 DIETHYLBENZENE	0.00	0.00	0.00
488-23-3	1,2,3,4-TETRAMETHYLBENZENE	0.00	0.00	0.00
527-53-7	1,2,3,5-TETRAMETHYLBENZENE	0.11	0.03	0.00
526-73-8	1,2,3-TRIMETHYLBENZENE	0.00	0.00	0.00
95-93-2	1,2,4,5-TETRAMETHYLBENZENE	0.00	0.00	0.00
877-44-1	1,2,4-TRIETHYLBENZENE	0.00	0.00	0.00
95-63-6	1,2,4-TRIMETHYLBENZENE	0.38	0.02	0.00
933-98-2	1,2-DIMETHYL-3-ETHYLBENZENE	0.00	0.02	0.00
934-80-5	1,2-DIMETHYL-4-ETHYLBENZENE	0.04	0.07	0.00
463-49-0	1,2-PROPADIENE	0.00	0.00	0.00
102-25-0	1,3,5-TRIETHYLBENZENE	0.00	0.00	0.00
108-67-8	1,3,5-TRIMETHYLBENZENE	0.44	0.00	0.00
934-74-7	1,3,-DIMETHYL-5-ETHYLBENZENE	0.00	0.00	0.00
106-99-0	1,3-BUTADIENE	0.19	0.19	0.19
141-93-5	1,3-DIETHYLBENZENE	0.00	0.00	0.00
2870-04-4	1,3-DIMETHYL-2-ETHYLBENZENE	0.00	0.00	0.00
874-41-9	1,3-DIMETHYL-4-ETHYLBENZENE	0.00	0.00	0.00
4706-89-2	1,3-dimethyl-4-isopropylbenzene	0.00	0.00	0.00
105-05-5	1,4-DIETHYLBENZENE	0.49	0.02	0.00
1758-88-9	1,4-DIMETHYL-2-ETHYLBENZENE	0.09	0.00	0.00
106-98-9	1-BUTENE	0.00	0.30	0.00
107-00-6	1-BUTYNE	0.00	0.00	0.00
15890-40-1	1-CIS,2-TRANS,3-TRIMETHYLCYCLOPENTANE	0.00	0.00	0.00
872-05-9	1-DECENE	0.00	0.00	0.00
637-92-3	1-ethyltertbutylether	0.00	0.00	0.00
592-76-7	1-HEPTENE	0.00	0.00	0.00
592-41-6	1-HEXENE	0.64	0.41	0.15
611-14-3	1-METHYL-2-ETHYLBENZENE	0.28	0.00	0.00
527-84-4	1-METHYL-2-ISOPROPYLBENZENE	0.39	0.10	0.00
1074-17-5	1-METHYL-2-N-PROPYLBENZENE	0.00	0.00	0.00

CAS Number	COMPOUND	Pre-Tier 1	Tier 1	Tier 2
620-14-4	1-METHYL-3-ETHYLBENZENE	0.42	0.01	0.00
535-77-3	1-METHYL-3-ISOPROPYLBENZENE	0.00	0.08	0.00
1074-43-7	1-METHYL-3-N-PROPYLBENZENE	0.00	0.00	0.00
622-96-8	1-METHYL-4-ETHYLBENZENE	0.24	0.00	0.00
99-87-6	1-METHYL-4-ISOPROPYLBENZENE	0.00	0.00	0.00
1074-55-1	1-METHYL-4-N-PROPYLBENZENE	0.25	0.01	0.00
693-89-0	1-METHYLCYCLOPENTENE	0.35	0.00	0.00
124-11-8	1-NONENE	0.77	0.09	0.00
111-66-0	1-OCTENE	0.00	0.00	0.00
109-67-1	1-PENTENE	1.27	0.55	0.22
15890-40-1	1-TRANS-2-CIS-3-TRIMETHYLCYCLOPENTANE	0.00	0.00	0.00
2815-58-9	1-TRANS-2-CIS-4-TRIMETHYLCYCLOPENTANE	0.00	0.00	0.00
464-06-2	2,2,3-TRIMETHYLBUTANE	0.66	0.00	0.00
564-02-3	2,2,3-TRIMETHYLPENTANE	0.00	0.26	0.00
16747-26-5	2,2,4-TRIMETHYLHEXANE	0.00	0.00	0.00
540-84-1	2,2,4-TRIMETHYLPENTANE	0.78	0.65	0.73
3522-94-9	2,2,5-TRIMETHYLHEXANE	0.00	0.04	0.00
75-83-2	2,2-DIMETHYLBUTANE	0.04	0.17	0.00
1071-26-7	2,2-DIMETHYLHEPTANE	0.00	0.00	0.00
590-73-8	2,2-DIMETHYLHEXANE	0.00	0.00	0.00
15869-87-1	2,2-DIMETHYLOCTANE	0.45	0.02	0.00
590-35-2	2,2-DIMETHYLPENTANE	0.02	0.06	0.05
463-82-1	2,2-DIMETHYLPROPANE (NEOPENTANE)	0.00	0.08	0.00
560-21-4	2,3,3-TRIMETHYLPENTANE	0.08	0.41	0.38
921-47-1	2,3,4-TRIMETHYLHEXANE	0.00	0.00	0.00
565-75-3	2,3,4-TRIMETHYLPENTANE	0.25	0.06	0.46
1069-53-0	2,3,5-TRIMETHYLHEXANE	0.00	0.00	0.00
10574-37-5	2,3-DIMETHYL-2-PENTENE	0.00	0.00	0.00
79-29-8	2,3-DIMETHYLBUTANE	0.00	0.16	0.00
3074-71-3	2,3-DIMETHYLHEPTANE	0.00	0.00	0.00
584-94-1	2,3-DIMETHYLHEXANE	0.00	0.31	0.00
565-59-3	2,3-DIMETHYLPENTANE	0.09	0.14	0.29
107-39-1	2,4,4-TRIMETHYL-1-PENTENE	0.00	0.00	0.00
107-40-4	2,4,4-TRIMETHYL-2-PENTENE	0.00	0.00	0.00
16747-30-1	2,4,4-TRIMETHYLHEXANE	0.00	0.00	0.00
2213-23-2	2,4-DIMETHYLHEPTANE	0.00	0.00	0.00
589-43-5	2,4-DIMETHYLHEXANE	0.49	0.11	0.00
4032-94-4	2,4-DIMETHYLOCTANE	0.53	0.05	0.00
108-08-7	2,4-DIMETHYLPENTANE	0.19	0.43	0.36
2216-30-0	2,5-DIMETHYLHEPTANE	0.22	0.04	0.00

CAS Number	COMPOUND	Pre-Tier 1	Tier 1	Tier 2
592-13-2	2,5-DIMETHYLHEXANE	0.00	0.00	0.00
1072-05-5	2,6-DIMETHYLHEPTANE	0.54	0.17	0.10
503-17-3	2-BUTYNE	0.00	0.00	0.00
78-79-5	2-METHYL-1,3-BUTADIENE	0.09	0.32	0.00
563-46-2	2-METHYL-1-BUTENE	0.26	0.18	0.57
6094-02-6	2-METHYL-1-HEXENE	0.00	0.00	0.00
763-29-1	2-METHYL-1-PENTENE	0.64	0.41	0.15
513-35-9	2-METHYL-2-BUTENE	0.00	0.10	0.30
2738-19-4	2-METHYL-2-HEXENE	0.00	0.00	0.00
625-27-4	2-METHYL-2-PENTENE	0.00	0.00	0.00
78-78-4	2-METHYLBUTANE (ISOPENTANE)	0.00	0.49	0.00
03968-85-2	2-METHYLBUTYLBENZENE (sec AMYLBENZENE)	0.00	0.00	0.00
592-27-8	2-METHYLHEPTANE	0.00	0.00	0.00
591-76-4	2-METHYLHEXANE	0.00	0.00	0.00
3221-61-2	2-METHYLOCTANE	1.12	0.19	0.00
107-83-5	2-METHYLPENTANE	0.15	0.27	0.22
75-28-5	2-METHYLPROPANE (ISOBUTANE)	0.00	0.45	0.66
115-11-7	2-METHYLPROPENE (ISOBUTYLENE)	0.34	0.74	0.00
558-37-2	3,3-DIMETHYL-1-BUTENE	0.00	0.00	0.00
4032-86-4	3,3-DIMETHYLHEPTANE	0.00	0.00	0.00
563-16-6	3,3-DIMETHYLHEXANE	0.00	0.00	0.00
562-49-2	3,3-DIMETHYLPENTANE	0.00	0.00	0.00
7385-78-6	3,4-DIMETHYL-1-PENTENE	0.00	0.01	0.00
922-28-1	3,4-DIMETHYLHEPTANE	0.00	0.00	0.00
583-48-2	3,4-DIMETHYLHEXANE	0.00	0.00	0.00
926-82-9	3,5-DIMETHYLHEPTANE	0.22	0.04	0.00
816-79-5	3-ETHYL-2-PENTENE	0.00	0.00	0.00
619-99-8	3-ETHYLHEXANE	0.11	0.02	0.00
617-78-7	3-ETHYLPENTANE	0.00	0.00	0.00
563-45-1	3-METHYL-1-BUTENE	0.00	0.00	0.00
3404-61-3	3-METHYL-1-HEXENE	0.00	0.00	0.00
760-20-3	3-METHYL-1-PENTENE	0.00	0.00	0.00
1067-08-9	3-Methyl-3-ethyl-pentane	0.00	0.00	0.00
922-62-3	3-METHYL-CIS-2-PENTENE	0.00	0.02	0.00
1120-62-3	3-METHYLCYCLOPENTENE	0.00	0.00	0.00
589-81-1	3-METHYLHEPTANE	0.00	0.02	0.19
589-34-4	3-METHYLHEXANE	0.10	0.09	0.00
2216-33-3	3-METHYLOCTANE	0.60	0.07	0.20
96-14-0	3-METHYLPENTANE	0.55	0.69	0.04
616-12-6	3-METHYL-TRANS-2-PENTENE	0.00	0.00	0.00

CAS Number	COMPOUND	Pre-Tier 1	Tier 1	Tier 2
3899-36-3	3-METHYL-TRANS-3-HEXENE	0.00	0.00	0.00
1068-19-5	4,4-DIMETHYLHEPTANE	0.00	0.00	0.00
2216-32-2	4-ETHYLHEPTANE	0.00	0.00	0.00
691-37-2	4-METHYL-1-PENTENE	0.26	0.05	0.38
691-38-3	4-METHYL-CIS-2-PENTENE	0.00	0.00	0.00
589-53-7	4-METHYLHEPTANE	0.31	0.02	0.00
2216-34-4	4-METHYLOCTANE	0.00	0.00	0.00
674-76-0	4-METHYL-TRANS-2-PENTENE	0.00	0.00	0.00
75-07-0	ACETALDEHYDE	7.18	7.14	9.51
67-64-1	ACETONE	1.89	1.04	0.00
74-86-2	ACETYLENE	2.91	3.41	1.12
107-02-8	ACROLEIN	2.92	1.47	1.70
100-52-7	BENZALDEHYDE	0.35	0.89	0.70
71-43-2	BENZENE	1.88	1.97	5.07
106-97-8	BUTANE	0.34	0.97	0.55
2207-01-4	CIS-1,2-DIMETHYLCYCLOHEXANE	0.00	0.00	0.00
1192-18-3	CIS-1,2-DIMETHYLCYCLOPENTANE	0.00	0.00	0.00
638-04-0	CIS-1,3-DIMETHYLCYCLOHEXANE	0.00	0.00	0.00
2532-58-3	CIS-1,3-DIMETHYLCYCLOPENTANE	0.23	0.03	0.00
624-29-3	Cis-1,4-Dimethylcyclohexane	0.00	0.00	0.00
930-89-2	Cis-1-ethyl-2-methylcyclopentane	0.04	0.00	0.00
2613-66-3	CIS-1-METHYL-3-ETHYLCYCLOPENTANE	0.62	0.25	0.00
590-18-1	CIS-2-BUTENE	0.00	0.00	0.00
6443-92-1	CIS-2-HEPTENE	0.00	0.18	0.00
7688-21-3	CIS-2-HEXENE	0.00	0.00	0.00
7642-04-8	CIS-2-OCTENE	0.00	0.00	0.00
627-20-3	CIS-2-PENTENE	0.00	0.02	0.00
7642-10-6	CIS-3-HEPTENE	0.00	0.00	0.00
7642-09-3	CIS-3-HEXENE	0.00	0.02	0.00
20237-46-1	CIS-3-NONENE	0.00	0.00	0.00
4170-30-3	CROTONALDEHYDE	1.94	3.85	3.16
110-82-7	CYCLOHEXANE	0.09	0.00	0.00
110-83-8	CYCLOHEXENE	0.39	0.11	0.00
542-92-7	CYCLOPENTADIENE	0.00	0.01	0.00
287-92-3	CYCLOPENTANE	0.20	0.04	0.00
142-29-0	CYCLOPENTENE	0.04	0.04	0.00
124-18-5	DECANE	0.18	0.03	0.00
108-20-3	DI-ISOPROPYL ETHER	0.00	0.00	0.00
5779-94-2	DIMETHYLBENZALDEHYDE	0.14	0.28	0.39
112-40-3	DODECANE	0.44	0.11	0.00

CAS Number	COMPOUND	Pre-Tier 1	Tier 1	Tier 2
74-84-0	ETHANE	0.13	0.47	0.00
64-17-5	ETHANOL	0.00	0.00	0.00
100-41-4	ETHYLBENZENE	0.91	0.36	0.39
1678-91-7	ETHYLCYCLOHEXANE	0.00	0.00	0.00
1640-89-7	ETHYLCYCLOPENTANE	0.00	0.00	0.00
74-85-1	ETHYLENE	16.65	18.94	18.42
50-00-0	FORMALDEHYDE	19.88	20.35	26.60
142-82-5	HEPTANE	0.26	0.09	0.00
66-25-1	HEXANALDEHYDE	0.21	0.22	0.00
110-54-3	HEXANE	0.22	0.25	0.00
1077-16-3	HEXYLBENZENE	0.00	0.00	0.00
496-11-7	INDAN	0.00	0.00	0.00
538-93-2	ISOBUTYLBENZENE	0.18	0.02	0.00
78-84-2	ISOBUTYRALDEHYDE	0.62	0.70	0.84
98-82-8	ISOPROPYLBENZENE (CUMENE)	0.37	0.07	0.00
3875-51-2	ISOPROPYLCYCLOPENTANE	0.00	0.00	0.00
590-86-3	ISOVALERALDEHYDE	0.67	0.49	0.00
1330-20-7	m-& p-XYLENE	1.48	1.09	1.07
1334-78-7	M/P-TOLUALDEHYDE	1.36	1.75	0.68
78-93-3	MEK	0.62	0.71	0.84
74-82-8	METHANE	1.74	7.09	8.28
67-56-1	METHANOL	0.00	0.00	0.00
1634-04-4	Methyl t-butyl ether	0.00	0.00	0.00
108-87-2	METHYLCYCLOHEXANE	0.35	0.26	0.00
96-37-7	METHYLCYCLOPENTANE	0.02	0.06	0.05
91-20-3	NAPHTHALENE	0.05	0.05	0.00
71-36-3	N-butyl alcohol	0.00	0.00	0.00
104-51-8	n-Butylbenzene	0.25	0.01	0.00
111-84-2	NONANE	2.23	0.42	0.00
538-68-1	N-PENT-BENZENE	0.05	0.00	0.00
103-65-1	n-PROPYLBENZENE	0.96	0.02	0.00
00111-65-9	OCTANE	0.75	0.36	0.23
529-20-4	O-TOLUALDEHYDE	0.11	0.60	0.00
95-47-6	o-XYLENE	0.70	0.41	0.00
109-66-0	PENTANE	0.12	0.68	1.56
74-98-6	PROPANE	0.06	0.57	0.15
123-38-6	PROPIONALDEHYDE	1.39	3.55	1.99
2040-96-2	Propylcyclopentane	0.54	0.17	0.10
115-07-1	PROPYLENE	0.00	3.79	0.00
74-99-7	PROPYNE	0.00	0.00	0.00

CAS Number	COMPOUND	Pre-Tier 1	Tier 1	Tier 2
100-42-5	STYRENE	0.00	0.00	0.00
994-05-8	T-AMYLMETHYLETHER	0.00	0.00	0.00
1074-92-6	TERT-1-BUT-2-METHYLBENZENE	0.35	0.04	0.00
98-19-1	TERT-1-BUT-3,5-DIMETHYLBENZENE	0.34	0.08	0.00
7364-19-4	TERT-1-BUTYL-4-ETHYLBENZENE	0.00	0.00	0.00
98-06-6	TERT-BUTYLBENZENE	0.00	0.00	0.00
108-88-3	TOLUENE	1.17	1.97	3.43
6876-23-9	TRANS-1,2-DIMETHYLCYCLOHEXANE	0.07	0.00	0.00
822-50-4	TRANS-1,2-DIMETHYLCYCLOPENTANE	0.00	0.00	0.00
2207-03-6	TRANS-1,3-DIMETHYLCYCLOHEXANE	0.00	0.00	0.00
1759-58-6	TRANS-1,3-DIMETHYLCYCLOPENTANE	0.00	0.01	0.00
2207-04-7	TRANS-1,4-DIMETHYLCYCLOHEXANE	0.00	0.00	0.00
930-90-5	Trans-1-ethyl-2-methyl-cyclopentane	0.00	0.00	0.00
2613-65-2	TRANS-1-METHYL-3-ETHYLCYCLOPENTANE	0.00	0.03	0.00
624-64-6	TRANS-2-BUTENE	1.50	0.48	0.00
14686-13-6	TRANS-2-HEPTENE	0.00	0.01	0.00
4050-45-7	TRANS-2-HEXENE	0.00	0.01	0.00
6434-78-2	TRANS-2-NONENE	0.00	0.00	0.00
13389-42-9	TRANS-2-OCTENE	0.00	0.07	0.00
646-04-8	TRANS-2-PENTENE	0.07	0.00	0.53
14686-14-7	TRANS-3-HEPTENE	0.00	0.00	0.00
13269-52-8	TRANS-3-HEXENE	0.00	0.00	0.00
20063-92-7	TRANS-3-NONENE	0.00	0.00	0.00
14850-23-8	TRANS-4-OCTENE	0.00	0.01	0.00
1120-21-4	UNDECANE	0.44	0.27	0.76
	UNIDENTIFIED C5 OLEFINS	0.00	0.11	0.00
	UNIDENTIFIED C6	0.45	0.56	0.00
	UNIDENTIFIED C7	0.05	0.06	0.00
	UNIDENTIFIED C8	0.04	0.03	0.00
	UNIDENTIFIED C9-C12+	5.00	0.70	6.08
110-62-3	VALERALDEHYDE	0.45	0.92	0.19