

## PID Response Factors for VOCs

Application Note TSI-148

TSI Volatile Organic Compound (VOC) probes are calibrated using isobutylene, but the sensor's Photo Ionization Detectors (PID) are broadband VOC detectors with a sensitivity that differs for each VOC compound. If you know what VOC you are measuring, then the table below will allow you to calculate the concentration for your specific VOC. These are approximate values, so for best accuracy, you should calibrate with the relevant VOC.

The table includes eight columns:

1. **Gas/ VOC** The most common name for the VOC.
2. **CAS No.** You can find the VOC using the CAS No.: ask your supplier.
3. **Formula** To assist in identifying the VOC and to determine the VOC's molecular weight.
4. **Response Factor (RF).** Multiply the displayed concentration by the Relative Response to calculate the actual concentration of the VOC.
5. **Relative response (%)** This is the inverse of the correction factor, specifying the percent response of the VOC, relative to isobutylene. If less than 100%, then the VOC is less responsive than isobutylene; if the relative sensitivity is greater than 100%, then the VOC is more responsive than isobutylene. Relative sensitivity (%) is specified the same way as cross-sensitivity for toxic gas sensors.
6. **Minimum Detection Level (MDL) PPM** Also called **Minimum Detectable Quantity (MDQ)**. Typical lowest concentration that can be detected. The MDL in this column is for use with the PPB sensor. Since the PPB sensor has greater sensitivity than the PPM sensor, the MDL for the PPB sensor will be much less than the MDL for the PPM sensor.
7. **Minimum Detection Level (MDL) PPB** Also called **Minimum Detectable Quantity (MDQ)**. Typical lowest concentration that can be detected. The MDL in this column is for use with the PPM sensor. Since the PPM sensor has less sensitivity than the PPM sensor, the MDL for the PPM sensor will be much more than the MDL for the PPB sensor.
8. **Molecular Weight.** The molecular weight of the VOC is used to convert its number concentration (PPM or PPB) to mass concentration ( $\text{mg}/\text{m}^3$ ).

The Relative Response/ CF/ RF is measured in dry air; high humidity will reduce this factor by 30% to 50%, so the CF/ RF should be increased in high humidity conditions.



## VOC Response

PID sensors cannot measure all VOCs or gases. Two types of VOCs are not measured:

- ZR** No response. The 10.6 eV lamp does not ionize the VOC and the VOC cannot be measured.
- NV** The vapor pressure of the VOC at 20°C is less than a few ppm. This Semi-Volatile Organic Compound (SVOC) cannot be measured.

Occasionally you will be measuring a mixture of VOCs. If the total concentration is within the linear range of your PID, then it is reasonable to assume that the concentrations are additive without interference between the different VOCs. If you are measuring a combination of VOCs, then accurate measurement of one of these VOCs will be difficult. Without careful data analysis, you will get only a CF averaged measurement. Be cautious when reporting actual VOC concentration if you know that there may be several VOC's present.

## Balance Gas

The relative response is measured in laboratory air, with 20.9% oxygen, balance nitrogen. Some gases absorb UV light without causing any PID response (*e.g.*, methane, ethane). In ambient atmospheres where these gases are present, the measured concentration of target gas will be less than is actually present. Methane absorbs UV strongly, so for accurate measurements in methane containing atmospheres, calibrate with a calibration gas containing the expected methane concentration. 50% LEL methane reduces the reading by up to 50%. Gases such as nitrogen and helium do not absorb UV and do not affect the relative response.

The correction factor for a gas mix containing PID detectable gases A, B, C... with response factors RF (A), RF (B), RF(C), in relative proportions a: b: c... is given by:

$$RF_{\text{Mix}} = \frac{1}{\frac{a}{RF_a} + \frac{b}{RF_b} + \frac{c}{RF_c} + \dots}$$

## Conversion to Mass Concentration

TSI's Model 9565 VELOCICALC<sup>®</sup> meter and Model 7575 Q-TRAK<sup>™</sup> monitor can convert their ppm or ppb readings to mass concentration units of mg/m<sup>3</sup>. Refer to the user instructions on how to change units of measurement and to calculate mass concentration.

## Accuracy of the Table

This table is for indication only. Table accuracy is 1 to 2 digits only, so when calculating concentration for a specific VOC, specify to 1 or 2 digits only. For best accuracy, calibrate using the specific VOC.

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| Gas/VOC                     | CAS No.   | Formula                                       | Response Factor | Relative Response | MDL (ppb) | MDL (ppm) | Molecular Weight (g/mol) |
|-----------------------------|-----------|---|-----------------|-------------------|-----------|-----------|--------------------------|
| Acetaldehyde                | 75-07-0   | C <sub>2</sub> H <sub>4</sub> O               | 4.9             | 21                | 25        | 480       | 44.05                    |
| Acetic Acid                 | 64-17-7   | C <sub>2</sub> H <sub>4</sub> O <sub>2</sub>  | 36.2            | 3                 | 180       | 3615      | 60.05                    |
| Acetic Anhydride            | 108-24-7  | C <sub>4</sub> H <sub>6</sub> O <sub>3</sub>  | 4.0             | 25                | 20        | 400       | 102.1                    |
| Acetone                     | 67-64-1   | C <sub>3</sub> H <sub>6</sub> O               | 0.7             | 140               | 5         | 70        | 58.08                    |
| Acetonitrile                | 75-05-8   | CH <sub>3</sub> CN                            | ZR              | ZR                | ZR        | ZR        | 41.05                    |
| Acetylene                   | 74-86-2   | C <sub>2</sub> H <sub>2</sub>                 | ZR              | ZR                | ZR        | ZR        | 26.04                    |
| Acrolein                    | 107-02-8  | C <sub>3</sub> H <sub>4</sub> O               | 4.0             | 25                | 20        | 400       | 56.06                    |
| Acrylic Acid                | 79-10-7   | C <sub>3</sub> H <sub>4</sub> O <sub>2</sub>  | 2.7             | 36                | 15        | 275       | 72.06                    |
| Acrylonitrile               | 107-13-1  | C <sub>3</sub> H <sub>3</sub> N               | ZR              | ZR                | ZR        | ZR        | 53.06                    |
| Allyl alcohol               | 107-18-6  | C <sub>3</sub> H <sub>6</sub> O               | 2.1             | 48                | 10        | 200       | 58.08                    |
| Allyl chloride              | 107-05-1  | C <sub>3</sub> H <sub>5</sub> Cl              | 4.5             | 22                | 20        | 450       | 76.53                    |
| Ammonia                     | 7664-41-7 | H <sub>3</sub> N                              | 8.5             | 12                | 40        | 850       | 17.03                    |
| Amyl acetate, n-            | 628-63-7  | C <sub>7</sub> H <sub>14</sub> O <sub>2</sub> | 1.8             | 56                | 10        | 180       | 130.2                    |
| Amyl alcohol                | 71-41-0   | C <sub>5</sub> H <sub>12</sub> O              | 3.2             | 31                | 15        | 320       | 88.15                    |
| Aniline                     | 62-53-3   | C <sub>6</sub> H <sub>7</sub> N               | 0.5             | 200               | 3         | 50        | 93.13                    |
| Anisole                     | 100-66-3  | C <sub>7</sub> H <sub>8</sub> O               | 0.5             | 211               | 2         | 50        | 108.1                    |
| Arsine                      | 7784-42-1 | AsH <sub>3</sub>                              | 2.5             | 40                | 15        | 250       | 77.95                    |
| Asphalt, petroleum fumes    | 8052-42-4 |   | 1.0             | 100               | 5         | 100       |                          |
| Benzaldehyde                | 100-52-7  | C <sub>7</sub> H <sub>6</sub> O               | 0.9             | 117               | 5         | 85        | 106.1                    |
| Benzene                     | 71-43-2   | C <sub>6</sub> H <sub>6</sub>                 | 0.5             | 200               | 3         | 50        | 78.11                    |
| Benzenethiol                | 108-98-5  | C <sub>6</sub> H <sub>5</sub> SH              | 0.7             | 143               | 4         | 70        | 110.2                    |
| Benzonitrile                | 100-47-0  | C <sub>7</sub> H <sub>5</sub> N               | 0.7             | 141               | 4         | 70        | 103.1                    |
| Benzyl alcohol              | 100-51-6  | C <sub>7</sub> H <sub>8</sub> O               | 1.3             | 80                | 6         | 125       | 108.1                    |
| Benzyl chloride             | 100-44-7  | C <sub>7</sub> H <sub>7</sub> Cl              | 0.6             | 182               | 3         | 55        | 126.6                    |
| Benzyl formate              | 104-57-4  | C <sub>8</sub> H <sub>8</sub> O <sub>2</sub>  | 0.8             | 130               | 5         | 77        | 136.1                    |
| Biphenyl                    | 92-52-4   | C <sub>12</sub> H <sub>10</sub>               | 0.4             | 250               | 2         | 40        | 154.2                    |
| Bis(2,3-epoxypropyl) ether  | 2238-07-5 | C <sub>6</sub> H <sub>10</sub> O <sub>3</sub> | 3.0             | 33                | 15        | 300       | 130.1                    |
| Boron trifluoride           | 7637-07-2 | BF <sub>3</sub>                               | ZR              | ZR                | ZR        | ZR        | 67.81                    |
| Bromine                     | 7726-95-6 | Br <sub>2</sub>                               | 20.0            | 5                 | 100       | 2000      | 159.8                    |
| Bromine pentafluoride       | 7789-30-2 | BrF <sub>5</sub>                              | ZR              | ZR                | ZR        | ZR        | 174.9                    |
| Bromobenzene                | 108-86-1  | C <sub>6</sub> H <sub>5</sub> Br              | 0.7             | 143               | 4         | 70        | 157.0                    |
| Bromochloromethane          | 74-97-5   | CH <sub>2</sub> ClBr                          | ZR              | ZR                | ZR        | ZR        | 129.4                    |
| Bromoethane                 | 74-96-4   | C <sub>2</sub> H <sub>5</sub> Br              | 5.0             | 20                | 25        | 500       | 109.0                    |
| Bromoethyl methyl ether, 2- | 6482-24-2 | C <sub>3</sub> H <sub>7</sub> OBr             | 2.5             | 40                | 15        | 250       | 139.0                    |
| Bromoform                   | 75-25-2   | CHBr <sub>3</sub>                             | 2.8             | 36                | 15        | 280       | 252.7                    |
| Bromopropane, 1-            | 106-94-5  | C <sub>3</sub> H <sub>7</sub> Br              | 1.3             | 77                | 7         | 130       | 123.0                    |
| Bromotrifluoromethane       | 75-63-8   | CF <sub>3</sub> Br                            | ZR              | ZR                | ZR        | ZR        | 148.9                    |
| Butadiene                   | 106-99-0  | C <sub>4</sub> H <sub>6</sub>                 | 0.8             | 120               | 4         | 80        | 54.09                    |
| Butadiene diepoxide, 1,3-   | 1464-53-5 | C <sub>4</sub> H <sub>6</sub> O <sub>2</sub>  | 4.0             | 25                | 20        | 400       | 86.09                    |
| Butane, n-                  | 106-97-8  | C <sub>4</sub> H <sub>10</sub>                | 46.3            | 2                 | 230       | 4600      | 58.12                    |
| Butanol, 1-                 | 71-36-3   | C <sub>4</sub> H <sub>10</sub> O              | 4.0             | 25                | 20        | 400       | 74.12                    |
| Buten-3-ol, 1-              | 598-32-3  | C <sub>4</sub> H <sub>8</sub> O               | 1.2             | 87                | 6         | 115       | 72.11                    |

| Gas/VOC                          | CAS No.    | Formula  | Response Factor | Relative Response | MDL (ppb) | MDL (ppm) | Molecular Weight (g/mol) |
|----------------------------------|------------|--|-----------------|-------------------|-----------|-----------|--------------------------|
| Butene, 1-                       | 106-98-9   | C <sub>4</sub> H <sub>8</sub>                  | 1.3             | 77                | 7         | 130       | 56.11                    |
| Butoxyethanol, 2-                | 111-76-2   | C <sub>6</sub> H <sub>14</sub> O <sub>2</sub>  | 1.1             | 91                | 6         | 110       | 118.2                    |
| Butyl acetate, n-                | 123-86-4   | C <sub>6</sub> H <sub>12</sub> O <sub>2</sub>  | 2.4             | 41                | 10        | 240       | 116.2                    |
| Butyl acrylate, n-               | 141-32-2   | C <sub>7</sub> H <sub>12</sub> O <sub>2</sub>  | 1.5             | 67                | 8         | 150       | 128.2                    |
| Butyl lactate                    | 138-22-7   | C <sub>7</sub> H <sub>14</sub> O <sub>3</sub>  | 2.5             | 40                | 15        | 250       | 146.2                    |
| Butyl mercaptan                  | 109-79-5   | C <sub>4</sub> H <sub>10</sub> S               | 0.5             | 185               | 3         | 50        | 90.19                    |
| Butylamine, 2-                   | 513-49-5   | C <sub>4</sub> H <sub>11</sub> N               | 0.9             | 111               | 5         | 90        | 73.14                    |
| Butylamine, n-                   | 109-73-9   | C <sub>4</sub> H <sub>11</sub> N               | 1.0             | 100               | 5         | 100       | 73.14                    |
| Camphene                         | 565-00-4   | C <sub>10</sub> H <sub>16</sub>                | 0.5             | 222               | 2         | 45        | 136.2                    |
| Carbon disulfide                 | 75-15-0    | CS <sub>2</sub>                                | 1.4             | 71                | 7         | 140       | 76.14                    |
| Carbon monoxide                  | 630-08-0   | CO   | ZR              | ZR                | ZR        | ZR        | 28.01                    |
| Carbon tetrabromide              | 558-13-4   | CB <sub>4</sub>                                | 3.0             | 33                | 15        | 300       | 331.6                    |
| Carbon tetrachloride             | 56-23-5    | CCl <sub>4</sub>                               | ZR              | ZR                | ZR        | ZR        | 153.8                    |
| Carbonyl sulphide                | 463-58-1   | COS  | ZR              | ZR                | ZR        | ZR        | 60.08                    |
| Carvone, R-                      | 6485-40-1  | C <sub>10</sub> H <sub>14</sub> O              | 1.0             | 100               | 5         | 100       | 150.2                    |
| Chlorine                         | 7782-50-5  | Cl <sub>2</sub>                                | ZR              | ZR                | ZR        | ZR        | 70.91                    |
| Chlorine dioxide                 | 10049-04-4 | ClO <sub>2</sub>                               | 1.0             | 100               | 5         | 100       | 67.45                    |
| Chlorine trifluoride             | 7790-91-2  | ClF <sub>3</sub>                               | ZR              | ZR                | ZR        | ZR        | 92.45                    |
| Chloro-1,1,1,2-tetrafluoroethane | 2837-89-0  | C <sub>2</sub> HClF <sub>4</sub>               | ZR              | ZR                | ZR        | ZR        | 136.5                    |
| Chloro-1,1,1-trifluoroethane, 2- | 75-88-7    | C <sub>2</sub> H <sub>2</sub> ClF <sub>3</sub> | ZR              | ZR                | ZR        | ZR        | 118.5                    |
| Chloro-1,1,2,2-tetrafluoroethane | 354-25-6   | C <sub>2</sub> HClF <sub>4</sub>               | ZR              | ZR                | ZR        | ZR        | 136.5                    |
| Chloro-1,1,2-trifluoroethane, 1- | 421-04-5   | C <sub>2</sub> H <sub>2</sub> ClF <sub>3</sub> | ZR              | ZR                | ZR        | ZR        | 118.5                    |
| Chloro-1,1-difluoroethane, 1-    | 75-68-3    | C <sub>2</sub> H <sub>3</sub> ClF <sub>2</sub> | ZR              | ZR                | ZR        | ZR        | 100.5                    |
| Chloro-1,1-difluoroethane, 1-    | 75-68-3    | C <sub>2</sub> H <sub>3</sub> ClF <sub>2</sub> | ZR              | ZR                | ZR        | ZR        | 100.5                    |
| Chloro-1,1-difluoroethane, 2-    | 338-65-8   | C <sub>2</sub> H <sub>3</sub> ClF <sub>2</sub> | ZR              | ZR                | ZR        | ZR        | 100.5                    |
| Chloro-1,2,2-trifluoroethane     | 431-07-2   | C <sub>2</sub> H <sub>2</sub> ClF <sub>3</sub> | ZR              | ZR                | ZR        | ZR        | 118.5                    |
| Chloro-1,3-butadiene, 2-         | 126-99-8   | C <sub>4</sub> H <sub>5</sub> Cl               | 3.2             | 30                | 16        | 320       | 88.54                    |
| Chloro-1-fluoroethane, 1-        | 1615-75-4  | C <sub>2</sub> H <sub>4</sub> ClF              | ZR              | ZR                | ZR        | ZR        | 82.50                    |
| Chloro-2-fluoroethane, 1-        | 762-50-5   | C <sub>2</sub> H <sub>4</sub> ClF              | ZR              | ZR                | ZR        | ZR        | 82.50                    |
| Chloroacetaldehyde               | 107-20-0   | C <sub>2</sub> H <sub>3</sub> OCl              | ZR              | ZR                | ZR        | ZR        | 78.50                    |
| Chlorobenzene                    | 108-90-7   | C <sub>6</sub> H <sub>5</sub> Cl               | 0.5             | 220               | 2         | 50        | 112.6                    |
| Chlorodifluoromethane            | 75-45-6    | CHClF <sub>2</sub>                             | ZR              | ZR                | ZR        | ZR        | 86.47                    |
| Chloroethane                     | 75-00-3    | C <sub>2</sub> H <sub>5</sub> Cl               | ZR              | ZR                | ZR        | ZR        | 64.51                    |
| Chloroethanol, 2-                | 107-07-3   | C <sub>2</sub> H <sub>5</sub> ClO              | 10.0            | 10                | 50        | 1000      | 80.51                    |
| Chloroethyl methyl ether, 2-     | 627-42-9   | C <sub>3</sub> H <sub>7</sub> ClO              | 2.6             | 40                | 13        | 250       | 94.54                    |
| Chlorofluoromethane              | 593-70-4   | CH <sub>2</sub> ClF                            | ZR              | ZR                | ZR        | ZR        | 68.48                    |
| Chloroform                       | 67-66-3    | CHCl <sub>3</sub>                              | ZR              | ZR                | ZR        | ZR        | 119.4                    |

| Gas/VOC                              | CAS No.    | Formula  | Response Factor | Relative Response | MDL (ppb) | MDL (ppm) | Molecular Weight (g/mol) |
|--------------------------------------|------------|--|-----------------|-------------------|-----------|-----------|--------------------------|
| Chloromethane                        | 74-87-3    | CH <sub>3</sub> Cl   | ZR              | ZR                | ZR        | ZR        | 50.49                    |
| Chloropentafluoroethane              | 76-15-3    | C <sub>2</sub> ClF <sub>5</sub>                              | ZR              | ZR                | ZR        | ZR        | 154.5                    |
| Chlorotoluene, o-                    | 95-49-8    | C <sub>7</sub> H <sub>7</sub> Cl                             | 0.5             | 220               | 2         | 50        | 126.6                    |
| Chlorotoluene, p-                    | 108-41-8   | C <sub>7</sub> H <sub>7</sub> Cl                             | 0.5             | 200               | 3         | 50        | 126.6                    |
| Chlorotrifluoroethylene              | 79-38-9    | C <sub>2</sub> ClF <sub>3</sub>                              | 1.0             | 100               | 5         | 100       | 116.5                    |
| Chlorotrifluoromethane               | 75-72-9    | CClF <sub>3</sub>  | ZR              | ZR                | ZR        | ZR        | 104.5                    |
| Citral                               | 5392-40-5  | C <sub>10</sub> H <sub>16</sub> O                            | 1.0             | 100               | 5         | 100       | 152.2                    |
| Citronellol                          | 26489-01-0 | C <sub>10</sub> H <sub>20</sub> O                            | 1.0             | 100               | 5         | 100       | 156.3                    |
| Cresol, m-                           | 108-39-4   | C <sub>7</sub> H <sub>8</sub> O                              | 1.1             | 95                | 5         | 105       | 108.1                    |
| Cresol, o-                           | 95-48-7    | C <sub>7</sub> H <sub>8</sub> O                              | 1.1             | 95                | 5         | 105       | 108.1                    |
| Cresol, p-                           | 106-44-5   | C <sub>7</sub> H <sub>8</sub> O                              | 1.1             | 95                | 5         | 105       | 108.1                    |
| Crotonaldehyde                       | 4170-30-3  | C <sub>4</sub> H <sub>6</sub> O                              | 1.0             | 100               | 5         | 100       | 70.09                    |
| Cumene                               | 98-82-8    | C <sub>9</sub> H <sub>12</sub>                               | 0.6             | 170               | 3         | 60        | 120.2                    |
| Cyanamide                            | 420-04-2   | CH <sub>2</sub> N <sub>2</sub>                               | ZR              | ZR                | ZR        | ZR        | 42.04                    |
| Cyanogen bromide                     | 506-68-3   | CNBr   | ZR              | ZR                | ZR        | ZR        | 105.9                    |
| Cyanogen chloride                    | 506-77-4   | CNCl   | ZR              | ZR                | ZR        | ZR        | 61.47                    |
| Cyclohexane                          | 110-82-7   | C <sub>6</sub> H <sub>12</sub>                               | 1.3             | 77                | 7         | 130       | 84.16                    |
| Cyclohexanol                         | 108-93-0   | C <sub>6</sub> H <sub>12</sub> O                             | 2.9             | 34                | 15        | 300       | 100.2                    |
| Cyclohexanone                        | 108-94-1   | C <sub>6</sub> H <sub>10</sub> O                             | 1.1             | 91                | 6         | 110       | 98.14                    |
| Cyclohexene                          | 110-83-8   | C <sub>6</sub> H <sub>10</sub>                               | 0.8             | 133               | 5         | 75        | 82.15                    |
| Cyclohexylamine                      | 108-91-8   | C <sub>6</sub> H <sub>13</sub> N                             | 1.0             | 102               | 5         | 100       | 99.18                    |
| Cyclopentane                         | 287-92-3   | C <sub>5</sub> H <sub>10</sub>                               | 4.0             | 25                | 20        | 400       | 70.13                    |
| Decane, n-                           | 124-18-5   | C <sub>10</sub> H <sub>22</sub>                              | 1.0             | 96                | 5         | 100       | 142.3                    |
| Diacetone alcohol                    | 123-42-2   | C <sub>6</sub> H <sub>12</sub> O <sub>2</sub>                | 0.8             | 125               | 5         | 80        | 116.2                    |
| Dibenzoyl peroxide                   | 94-36-0    | C <sub>14</sub> H <sub>10</sub> O <sub>4</sub>               | 0.8             | 125               | 5         | 80        | 242.2                    |
| Diborane                             | 19287-45-7 | B <sub>2</sub> H <sub>6</sub>                                | ZR              | ZR                | ZR        | ZR        | 27.67                    |
| Dibromochloromethane                 | 124-48-1   | CHBr <sub>2</sub> Cl   | 10.0            | 10                | 50        | 1000      | 208.3                    |
| Dibromodifluoromethane               | 75-61-6    | CF <sub>2</sub> Br <sub>2</sub>                              | ZR              | ZR                | ZR        | ZR        | 209.8                    |
| Dibromoethane 1,2-                   | 106-93-4   | C <sub>2</sub> H <sub>4</sub> Br <sub>2</sub>                | 2.0             | 50                | 10        | 200       | 187.9                    |
| Dibromotetrafluoroethane, 1,2-       | 124-73-2   | C <sub>2</sub> F <sub>4</sub> Br <sub>2</sub>                | ZR              | ZR                | ZR        | ZR        | 259.8                    |
| Dibutyl hydrogen phosphate           | 107-66-4   | HC <sub>8</sub> H <sub>18</sub> PO <sub>4</sub>              | 4.0             | 25                | 20        | 400       | 210.2                    |
| Dichloro-1,1,1-trifluoroethane, 2,2- | 306-83-2   | C <sub>2</sub> HCl <sub>2</sub> F <sub>3</sub>               | ZR              | ZR                | ZR        | ZR        | 152.9                    |
| Dichloro-1,1-difluoroethane, 1,2-    | 1649-08-7  | C <sub>2</sub> H <sub>2</sub> Cl <sub>2</sub> F <sub>2</sub> | ZR              | ZR                | ZR        | ZR        | 134.9                    |
| Dichloro-1,2,2-trifluoroethane, 1,2- | 354-23-4   | C <sub>2</sub> HCl <sub>2</sub> F <sub>3</sub>               | ZR              | ZR                | ZR        | ZR        | 152.9                    |
| Dichloro-1,2-difluoroethane, 1,2-    | 631-06-1   | C <sub>2</sub> H <sub>2</sub> Cl <sub>2</sub> F <sub>2</sub> | ZR              | ZR                | ZR        | ZR        | 134.9                    |
| Dichloro-1-fluoroethane, 1,1-        | 1717-00-6  | C <sub>2</sub> H <sub>3</sub> Cl <sub>2</sub> F              | ZR              | ZR                | ZR        | ZR        | 116.9                    |
| Dichloro-1-fluoroethane, 1,1-        | 1717-00-6  | C <sub>2</sub> H <sub>3</sub> Cl <sub>2</sub> F              | ZR              | ZR                | ZR        | ZR        | 116.9                    |

| Gas/VOC                            | CAS No.    | Formula  | Response Factor | Relative Response | MDL (ppb) | MDL (ppm) | Molecular Weight (g/mol) |
|------------------------------------|------------|--|-----------------|-------------------|-----------|-----------|--------------------------|
| Dichloro-1-fluoroethane, 1,2-      | 430-57-9   | C <sub>2</sub> H <sub>3</sub> Cl <sub>2</sub> F              | ZR              | ZR                | ZR        | ZR        | 116.9                    |
| Dichloro-1-propene, 2,3-           | 78-88-6    | C <sub>3</sub> H <sub>4</sub> Cl <sub>2</sub>                | 1.4             | 70                | 7         | 140       | 111.0                    |
| Dichloro-2,2,-difluoroethane, 1,1- | 79-35-6    | C <sub>2</sub> H <sub>2</sub> Cl <sub>2</sub> F <sub>2</sub> | ZR              | ZR                | ZR        | ZR        | 134.9                    |
| Dichloroacetylene                  | 7572-29-4  | C <sub>2</sub> Cl <sub>2</sub>                               | 5.0             | 20                | 25        | 500       | 94.93                    |
| Dichlorobenzene o-                 | 95-50-1    | C <sub>6</sub> H <sub>4</sub> Cl <sub>2</sub>                | 0.5             | 200               | 3         | 50        | 147.0                    |
| Dichlorodifluoromethane            | 75-71-8    | CCl <sub>2</sub> F <sub>2</sub>                              | ZR              | ZR                | ZR        | ZR        | 120.9                    |
| Dichloroethane 1,2-                | 107-06-2   | C <sub>2</sub> H <sub>4</sub> Cl <sub>2</sub>                | ZR              | ZR                | ZR        | ZR        | 98.96                    |
| Dichloroethane, 1,1-               | 75-34-3    | C <sub>2</sub> H <sub>4</sub> Cl <sub>2</sub>                | ZR              | ZR                | ZR        | ZR        | 98.96                    |
| Dichloroethene, 1,1-               | 75-35-4    | C <sub>2</sub> H <sub>2</sub> Cl <sub>2</sub>                | 1.0             | 105               | 5         | 100       | 96.94                    |
| Dichloroethene, cis-1,2-           | 156-59-2   | C <sub>2</sub> H <sub>2</sub> Cl <sub>2</sub>                | 0.8             | 125               | 4         | 80        | 96.94                    |
| Dichloroethene, trans-1,2-         | 540-59-0   | C <sub>2</sub> H <sub>2</sub> Cl <sub>2</sub>                | 0.7             | 143               | 4         | 70        | 96.94                    |
| Dichloroethylene 1,2-              | 540-59-0   | C <sub>2</sub> H <sub>2</sub> Cl <sub>2</sub>                | 0.8             | 133               | 4         | 75        | 96.94                    |
| Dichlorofluoromethane              | 75-43-4    | CHFCl <sub>2</sub>   | ZR              | ZR                | ZR        | ZR        | 102.9                    |
| Dichloromethane                    | 75-09-2    | CH <sub>2</sub> Cl <sub>2</sub>                              | 39.0            | 3                 | 200       | 3900      | 84.93                    |
| Dichloropropane, 1,2-              | 78-87-5    | C <sub>3</sub> H <sub>6</sub> Cl <sub>2</sub>                | ZR              | ZR                | ZR        | ZR        | 113.0                    |
| Dichlorotetrafluoroethane, 1,1-    | 374-07-2   | C <sub>2</sub> Cl <sub>2</sub> F <sub>4</sub>                | ZR              | ZR                | ZR        | ZR        | 170.9                    |
| Dichlorotetrafluoroethane, 1,2-    | 76-14-2    | C <sub>2</sub> Cl <sub>2</sub> F <sub>4</sub>                | ZR              | ZR                | ZR        | ZR        | 170.9                    |
| Dicyclopentadiene                  | 77-73-6    | C <sub>10</sub> H <sub>12</sub>                              | 0.9             | 110               | 5         | 90        | 132.2                    |
| Diesel Fuel                        | 68334-30-5 |  | 0.8             | 130               | 4         | 75        |                          |
| Diethyl ether                      | 60-29-7    | C <sub>4</sub> H <sub>10</sub> O                             | 0.9             | 110               | 4         | 90        | 74.12                    |
| Diethyl maleate                    | 141-05-9   | C <sub>8</sub> H <sub>12</sub> O <sub>4</sub>                | 2.0             | 50                | 10        | 200       | 172.2                    |
| Diethyl phthalate                  | 84-66-2    | C <sub>12</sub> H <sub>14</sub> O <sub>4</sub>               | 1.0             | 100               | 5         | 100       | 222.2                    |
| Diethyl sulphate                   | 64-67-5    | C <sub>4</sub> H <sub>10</sub> SO <sub>4</sub>               | 3.0             | 33                | 15        | 300       | 154.2                    |
| Diethyl sulphide                   | 352-93-2   | C <sub>4</sub> H <sub>10</sub> S                             | 0.6             | 180               | 3         | 50        | 90.19                    |
| Diethylamine                       | 109-89-7   | C <sub>4</sub> H <sub>11</sub> N                             | 1.0             | 100               | 5         | 100       | 73.14                    |
| Diethylaminoethanol, 2-            | 100-37-8   | C <sub>6</sub> H <sub>15</sub> ON                            | 2.7             | 40                | 15        | 270       | 117.2                    |
| Diethylaminopropylamine, 3-        | 104-78-9   | C <sub>7</sub> H <sub>18</sub> N <sub>2</sub>                | 1.0             | 100               | 5         | 100       | 130.2                    |
| Difluoroethane, 1,1-               | 75-37-6    | C <sub>2</sub> H <sub>4</sub> F <sub>2</sub>                 | ZR              | ZR                | ZR        | ZR        | 66.05                    |
| Difluoroethane, 1,2-               | 624-72-6   | C <sub>2</sub> H <sub>4</sub> F <sub>2</sub>                 | ZR              | ZR                | ZR        | ZR        | 66.05                    |
| Difluoromethane                    | 75-10-5    | CH <sub>2</sub> F <sub>2</sub>                               | ZR              | ZR                | ZR        | ZR        | 52.02                    |
| Dihydrogen selenide                | 7783-07-5  | H <sub>2</sub> Se  | 1.0             | 100               | 5         | 100       | 2.016                    |
| Dihydroxybenzene, 1,2              | 120-80-9   | C <sub>6</sub> H <sub>6</sub> O <sub>2</sub>                 | 1.0             | 100               | 5         | 100       | 110.1                    |
| Dihydroxybenzene, 1,3              | 108-46-3   | C <sub>6</sub> H <sub>6</sub> O <sub>2</sub>                 | 1.0             | 100               | 5         | 100       | 110.1                    |
| Diisobutylene                      | 107-39-1   | C <sub>8</sub> H <sub>16</sub>                               | 0.6             | 156               | 3         | 60        | 112.2                    |
| Diisopropyl ether                  | 108-20-3   | C <sub>6</sub> H <sub>14</sub> O                             | 0.7             | 150               | 3         | 70        | 102.2                    |
| Diisopropylamine                   | 108-18-9   | C <sub>6</sub> H <sub>15</sub> N                             | 0.7             | 140               | 4         | 70        | 101.2                    |
| Diketene                           | 674-82-8   | C <sub>4</sub> H <sub>4</sub> O <sub>2</sub>                 | 2.2             | 45                | 11        | 220       | 84.07                    |
| Dimethoxymethane                   | 109-87-5   | C <sub>3</sub> H <sub>8</sub> O <sub>2</sub>                 | 1.4             | 71                | 7         | 140       | 76.09                    |
| Dimethyl cyclohexane, 1,2-         | 583-57-3   | C <sub>8</sub> H <sub>16</sub>                               | 1.1             | 95                | 5         | 105       | 112.2                    |

| Gas/VOC                           | CAS No.    | Formula   | Response Factor | Relative Response | MDL (ppb) | MDL (ppm) | Molecular Weight (g/mol) |
|-----------------------------------|------------|---|-----------------|-------------------|-----------|-----------|--------------------------|
| Dimethyl disulphide               | 624-92-0   | C <sub>2</sub> H <sub>6</sub> S <sub>2</sub>                | 0.2             | 435               | 1         | 23        | 94.20                    |
| Dimethyl ether                    | 115-10-6   | C <sub>2</sub> H <sub>6</sub> O                             | 1.3             | 80                | 7         | 130       | 46.07                    |
| Dimethyl phthalate                | 131-11-3   | C <sub>10</sub> H <sub>10</sub> O <sub>4</sub>              | 1.0             | 100               | 5         | 100       | 194.2                    |
| Dimethyl sulphate                 | 77-78-1    | C <sub>2</sub> H <sub>6</sub> O <sub>4</sub> S              | ZR              | ZR                | ZR        | ZR        | 126.1                    |
| Dimethyl sulphide                 | 75-18-3    | C <sub>2</sub> H <sub>6</sub> S                             | 0.5             | 200               | 3         | 50        | 62.13                    |
| Dimethylacetamide N,N-            | 127-19-5   | C <sub>4</sub> H <sub>9</sub> NO                            | 1.3             | 75                | 7         | 130       | 87.12                    |
| Dimethylamine                     | 124-40-3   | C <sub>2</sub> H <sub>7</sub> N                             | 1.4             | 70                | 7         | 140       | 45.08                    |
| Dimethylaminoethanol              | 108-01-0   | C <sub>4</sub> H <sub>11</sub> NO                           | 1.5             | 70                | 8         | 150       | 89.14                    |
| Dimethylaniline, NN-              | 121-69-7   | C <sub>8</sub> H <sub>11</sub> N                            | 0.6             | 167               | 3         | 60        | 121.2                    |
| Dimethylbutyl acetate             | 108-84-9   | C <sub>8</sub> H <sub>16</sub> O <sub>2</sub>               | 1.6             | 60                | 8         | 160       | 144.2                    |
| Dimethylethylamine, NN-           | 598-56-1   | C <sub>4</sub> H <sub>11</sub> N                            | 0.8             | 125               | 4         | 80        | 73.14                    |
| Dimethylformamide                 | 68-12-2    | C <sub>3</sub> H <sub>7</sub> NO                            | 0.9             | 110               | 5         | 90        | 73.09                    |
| Dimethylheptan-4-one, 2,6-        | 108-83-8   | C <sub>9</sub> H <sub>18</sub> O                            | 0.8             | 125               | 4         | 80        | 142.2                    |
| Dimethylhydrazine, 1,1-           | 57-14-7    | C <sub>2</sub> H <sub>8</sub> N <sub>2</sub>                | 1.0             | 100               | 5         | 100       | 60.10                    |
| Dinitrobenzene, m-                | 99-65-0    | C <sub>6</sub> H <sub>4</sub> N <sub>2</sub> O <sub>4</sub> | 3.0             | 33                | 15        | 300       | 168.1                    |
| Dinitrobenzene, o-                | 528-29-0   | C <sub>6</sub> H <sub>4</sub> N <sub>2</sub> O <sub>4</sub> | ZR              | ZR                | ZR        | ZR        | 168.1                    |
| Dinitrobenzene, p-                | 100-25-4   | C <sub>6</sub> H <sub>4</sub> N <sub>2</sub> O <sub>4</sub> | 5.0             | 20                | 25        | 500       | 168.1                    |
| Dinonyl phthalate                 | 84-76-4    | C <sub>26</sub> H <sub>42</sub> O <sub>4</sub>              | 1.0             | 100               | 5         | 100       | 418.6                    |
| Dioxane 1,2-                      |            | C <sub>4</sub> H <sub>8</sub> O <sub>2</sub>                | 1.5             | 67                | 8         | 150       | 88.11                    |
| Dioxane 1,4-                      | 123-91-1   | C <sub>4</sub> H <sub>8</sub> O <sub>2</sub>                | 1.5             | 67                | 8         | 150       | 88.11                    |
| Dipentene                         | 138-86-3   | C <sub>10</sub> H <sub>16</sub>                             | 0.9             | 110               | 5         | 90        | 136.2                    |
| Diphenyl ether                    | 101-84-8   | C <sub>12</sub> H <sub>10</sub> O                           | 0.8             | 125               | 4         | 80        | 170.2                    |
| Disulphur decafluoride            | 5714-22-7  | S <sub>2</sub> F <sub>10</sub>                              | ZR              | ZR                | ZR        | ZR        | 254.1                    |
| Disulphur dichloride              | 10025-67-9 | S <sub>2</sub> Cl <sub>2</sub>                              | 3.0             | 33                | 15        | 300       | 135.0                    |
| Di-tert-butyl-p-cresol            | 2409-55-4  | C <sub>11</sub> H <sub>16</sub> O                           | 1.0             | 100               | 5         | 100       | 164.2                    |
| Divinylbenzene                    | 1321-74-0  | C <sub>10</sub> H <sub>10</sub>                             | 0.4             | 250               | 2         | 40        | 130.2                    |
| Dodecanol                         | 112-53-8   | C <sub>12</sub> H <sub>26</sub> O                           | 0.9             | 110               | 5         | 90        | 186.3                    |
| Enflurane                         | 13838-16-9 | C <sub>4</sub> H <sub>2</sub> F <sub>5</sub> Cl<br>O        | ZR              | ZR                | ZR        | ZR        | 196.5                    |
| Epichlorohydrin                   | 106-89-8   | C <sub>3</sub> H <sub>5</sub> ClO                           | 8.0             | 15                | 40        | 800       | 92.52                    |
| Epoxypropyl isopropyl ether, 2,3- | 4016-14-2  | C <sub>6</sub> H <sub>12</sub> O <sub>2</sub>               | 1.1             | 90                | 5         | 110       | 116.2                    |
| Ethane                            | 74-84-0    | C <sub>2</sub> H <sub>6</sub>                               | ZR              | ZR                | ZR        | ZR        | 30.07                    |
| Ethanol                           | 64-17-5    | C <sub>2</sub> H <sub>6</sub> O                             | 8.7             | 10                | 45        | 870       | 46.07                    |
| Ethanolamine                      | 141-43-5   | C <sub>2</sub> H <sub>7</sub> NO                            | 3.0             | 33                | 15        | 300       | 61.08                    |
| Ethoxy-2-propanol, 1-             | 1569-02-4  | C <sub>5</sub> H <sub>10</sub> O <sub>2</sub>               | 2.0             | 50                | 10        | 200       | 102.1                    |
| Ethoxyethanol, 2-                 | 110-80-5   | C <sub>4</sub> H <sub>10</sub> O <sub>2</sub>               | 29.8            | 3                 | 150       | 3000      | 90.12                    |
| Ethoxyethyl acetate, 2-           | 111-15-9   | C <sub>6</sub> H <sub>12</sub> O <sub>3</sub>               | 3.0             | 33                | 15        | 300       | 132.2                    |
| Ethyl(S)-(-)-lactate              | 97-64-3    | C <sub>5</sub> H <sub>10</sub> O <sub>3</sub>               | 3.0             | 33                | 15        | 300       | 118.1                    |
| Ethyl acetate                     | 141-78-6   | C <sub>4</sub> H <sub>8</sub> O <sub>2</sub>                | 3.6             | 28                | 20        | 360       | 88.11                    |
| Ethyl acrylate                    | 140-88-5   | C <sub>5</sub> H <sub>8</sub> O <sub>2</sub>                | 2.0             | 50                | 10        | 200       | 100.1                    |
| Ethyl amine                       | 75-04-7    | C <sub>2</sub> H <sub>7</sub> N                             | 1.0             | 100               | 5         | 100       | 45.08                    |
| Ethyl benzene                     | 100-41-4   | C <sub>8</sub> H <sub>10</sub>                              | 0.5             | 185               | 3         | 50        | 106.2                    |

| Gas/VOC                               | CAS No.   | Formula   | Response Factor | Relative Response | MDL (ppb) | MDL (ppm) | Molecular Weight (g/mol) |
|---------------------------------------|-----------|---|-----------------|-------------------|-----------|-----------|--------------------------|
| Ethyl butyrate                        | 105-54-4  | C <sub>8</sub> H <sub>12</sub> O <sub>2</sub>               | 1.0             | 105               | 5         | 100       | 116.2                    |
| Ethyl chloroformate                   | 541-41-3  | C <sub>3</sub> H <sub>5</sub> O <sub>2</sub> Cl             | 80.0            | 1                 | 400       | 8300      | 108.5                    |
| Ethyl cyanoacrylate                   | 7085-85-0 | C <sub>6</sub> H <sub>7</sub> O <sub>2</sub> N              | 1.5             | 67                | 8         | 150       | 125.1                    |
| Ethyl decanoate                       | 110-38-3  | C <sub>12</sub> H <sub>24</sub> O <sub>2</sub>              | 1.8             | 56                | 10        | 180       | 200.3                    |
| Ethyl formate                         | 109-94-4  | C <sub>3</sub> H <sub>6</sub> O <sub>2</sub>                | 30.0            | 3                 | 150       | 3000      | 74.08                    |
| Ethyl hexanoate                       | 123-66-0  | C <sub>8</sub> H <sub>16</sub> O <sub>2</sub>               | 2.6             | 38                | 15        | 260       | 144.2                    |
| Ethyl hexanol, 2-                     | 105-76-7  | C <sub>8</sub> H <sub>18</sub> O                            | 1.5             | 67                | 8         | 150       | 130.2                    |
| Ethyl hexyl acrylate, 2-              | 103-11-7  | C <sub>11</sub> H <sub>20</sub> O <sub>2</sub>              | 1.0             | 100               | 5         | 100       | 184.3                    |
| Ethyl mercaptan                       | 75-08-1   | C <sub>2</sub> H <sub>6</sub> S                             | 0.7             | 145               | 3         | 70        | 62.13                    |
| Ethyl octanoate                       | 106-32-1  | C <sub>10</sub> H <sub>20</sub> O <sub>2</sub>              | 2.3             | 40                | 12        | 230       | 172.3                    |
| Ethylene                              | 74-85-1   | C <sub>2</sub> H <sub>4</sub>                               | 8.0             | 13                | 40        | 800       | 28.05                    |
| Ethylene dinitrate                    | 628-96-6  | C <sub>2</sub> H <sub>4</sub> O <sub>6</sub> N <sub>2</sub> | ZR              | ZR                | ZR        | ZR        | 152.1                    |
| Ethylene glycol                       | 107-21-1  | C <sub>2</sub> H <sub>6</sub> O <sub>2</sub>                | 20.0            | 5                 | 100       | 2000      | 62.07                    |
| Ethylene oxide                        | 75-21-8   | C <sub>2</sub> H <sub>4</sub> O                             | 15.0            | 7                 | 75        | 1500      | 44.05                    |
| Ferrocene                             | 102-54-5  | C <sub>10</sub> H <sub>10</sub> Fe                          | 0.8             | 125               | 4         | 80        | 186.0                    |
| Fluorine                              | 7782-41-4 | F <sub>2</sub>  | ZR              | ZR                | ZR        | ZR        | 38.00                    |
| Fluoroethane                          | 353-33-6  | C <sub>2</sub> H <sub>5</sub> F                             | ZR              | ZR                | ZR        | ZR        | 48.06                    |
| Fluoromethane                         | 593-53-3  | CH <sub>3</sub> F   | ZR              | ZR                | ZR        | ZR        | 34.03                    |
| Formaldehyde                          | 50-00-0   | CH <sub>2</sub> O   | ZR              | ZR                | ZR        | ZR        | 30.03                    |
| Formamide                             | 75-12-7   | CH <sub>3</sub> ON  | 2.0             | 50                | 10        | 200       | 45.04                    |
| Formic acid                           | 64-18-6   | CH <sub>2</sub> O <sub>2</sub>                              | ZR              | ZR                | ZR        | ZR        | 46.02                    |
| Furfural                              | 98-01-1   | C <sub>5</sub> H <sub>4</sub> O <sub>2</sub>                | 1.4             | 70                | 7         | 140       | 96.08                    |
| Furfuryl alcohol                      | 98-00-0   | C <sub>5</sub> H <sub>6</sub> O <sub>2</sub>                | 2.0             | 50                | 10        | 200       | 98.10                    |
| Gasoline vapors                       | 8006-61-9 |   | 1.1             | 95                | 5         | 105       |                          |
| Gasoline vapors                       | 8006-61-9 |   | 0.8             | 125               | 4         | 80        |                          |
| Gasoline vapors92 octane              | 8006-61-9 |   | 0.8             | 125               | 4         | 80        |                          |
| Germane                               | 7782-65-2 | GeH <sub>4</sub>  | 10.0            | 10                | 50        | 1000      | 76.64                    |
| Glutaraldehyde                        | 111-30-8  | C <sub>5</sub> H <sub>8</sub> O <sub>2</sub>                | 0.9             | 111               | 5         | 90        | 100.1                    |
| Halothane                             | 151-67-7  | CF <sub>3</sub> CHBr<br>Cl                                  | ZR              | ZR                | ZR        | ZR        | 197.4                    |
| Helium                                |           | He  | ZR              | ZR                | ZR        | ZR        |                          |
| Heptan-2-one                          | 110-43-0  | C <sub>7</sub> H <sub>14</sub> O                            | 0.7             | 140               | 4         | 70        | 114.2                    |
| Heptan-3-one                          | 106-35-4  | C <sub>7</sub> H <sub>14</sub> O                            | 0.8             | 133               | 4         | 75        | 114.2                    |
| Heptane n-                            | 142-82-5  | C <sub>7</sub> H <sub>16</sub>                              | 2.1             | 50                | 10        | 200       | 100.2                    |
| Hexachloroethane                      | 67-72-1   | C <sub>2</sub> Cl <sub>6</sub>                              | ZR              | ZR                | ZR        | ZR        | 236.7                    |
| Hexafluoroethane                      | 76-16-4   | C <sub>2</sub> F <sub>6</sub>                               | ZR              | ZR                | ZR        | ZR        | 138.0                    |
| Hexamethyldisilazane,<br>1,1,1,3,3,3- | 999-97-3  | C <sub>6</sub> H <sub>19</sub> NSi <sub>2</sub>             | 1.0             | 100               | 5         | 100       | 161.4                    |
| Hexamethyldisiloxane                  | 107-46-0  | C <sub>6</sub> H <sub>18</sub> OSi <sub>2</sub>             | 0.3             | 350               | 1         | 30        | 162.4                    |
| Hexan-2-one                           | 591-78-6  | C <sub>6</sub> H <sub>12</sub> O                            | 0.8             | 125               | 4         | 80        | 100.2                    |
| Hexane n-                             | 110-54-3  | C <sub>6</sub> H <sub>14</sub>                              | 4.2             | 25                | 20        | 420       | 86.18                    |
| Hexene, 1-                            | 592-41-6  | C <sub>6</sub> H <sub>12</sub>                              | 0.9             | 110               | 5         | 90        | 84.16                    |
| Hydrazine                             | 302-01-2  | H <sub>4</sub> N <sub>2</sub>                               | 3.0             | 33                | 15        | 300       | 32.05                    |
| Hydrazoic acid                        | 7782-79-8 | HN <sub>3</sub>   | ZR              | ZR                | ZR        | ZR        | 43.03                    |

| Gas/VOC                   | CAS No.    | Formula  | Response Factor | Relative Response | MDL (ppb) | MDL (ppm) | Molecular Weight (g/mol) |
|---------------------------|------------|--|-----------------|-------------------|-----------|-----------|--------------------------|
| Hydrogen                  | 1333-74-0  | H <sub>2</sub>                                   | ZR              | ZR                | ZR        | ZR        | 2.016                    |
| Hydrogen bromide          | 10035-10-6 | HBr  | ZR              | ZR                | ZR        | ZR        | 80.91                    |
| Hydrogen chloride         | 7647-01-0  | HCl  | ZR              | ZR                | ZR        | ZR        | 36.46                    |
| Hydrogen cyanide          | 74-90-8    | HCN  | ZR              | ZR                | ZR        | ZR        | 27.03                    |
| Hydrogen fluoride         | 7664-39-3  | HF   | ZR              | ZR                | ZR        | ZR        | 20.01                    |
| Hydrogen peroxide         | 7722-84-1  | H <sub>2</sub> O <sub>2</sub>                    | 4.0             | 25                | 20        | 400       | 34.01                    |
| Hydrogen sulfide          | 7783-06-4  | H <sub>2</sub> S                                 | 4.0             | 25                | 20        | 400       | 34.08                    |
| Hydroquinone              | 123-31-9   | C <sub>6</sub> H <sub>6</sub> O <sub>2</sub>     | 0.8             | 125               | 4         | 80        | 110.1                    |
| Hydroxypropyl acrylate 2- | 999-61-1   | C <sub>6</sub> H <sub>10</sub> O <sub>3</sub>    | 1.5             | 67                | 8         | 150       | 130.1                    |
| Iminodi(ethylamine) 2,2-  | 111-40-0   | C <sub>4</sub> H <sub>13</sub> N <sub>3</sub>    | 0.9             | 110               | 5         | 90        | 103.2                    |
| Iminodiethanol 2,2'-      | 111-42-2   | C <sub>4</sub> H <sub>11</sub> NO <sub>2</sub>   | 1.6             | 60                | 8         | 160       | 105.1                    |
| Indene                    | 95-13-6    | C <sub>9</sub> H <sub>8</sub>                    | 0.5             | 220               | 2         | 50        | 116.2                    |
| Iodine                    | 7553-56-2  | I <sub>2</sub>                                   | 0.2             | 667               | 1         | 15        | 253.8                    |
| Iodoform                  | 75-47-8    | CHI <sub>3</sub>                                 | 1.5             | 67                | 8         | 150       | 393.7                    |
| Iodomethane               | 74-88-4    | CH <sub>3</sub> I                                | 0.4             | 250               | 2         | 40        | 141.9                    |
| Isoamyl acetate           | 123-92-2   | C <sub>7</sub> H <sub>14</sub> O <sub>2</sub>    | 1.6             | 60                | 8         | 160       | 130.2                    |
| Isobutane                 | 75-28-5    | C <sub>4</sub> H <sub>10</sub>                   | 8.0             | 15                | 40        | 800       | 58.12                    |
| Isobutanol                | 78-83-1    | C <sub>4</sub> H <sub>10</sub> O                 | 3.5             | 30                | 20        | 350       | 74.12                    |
| Isobutyl acetate          | 110-19-0   | C <sub>6</sub> H <sub>12</sub> O <sub>2</sub>    | 2.3             | 45                | 10        | 230       | 116.2                    |
| Isobutyl acrylate         | 106-63-8   | C <sub>7</sub> H <sub>12</sub> O <sub>2</sub>    | 1.3             | 80                | 7         | 130       | 128.2                    |
| Isobutylene               | 115-11-7   | C <sub>4</sub> H <sub>8</sub>                    | 1.0             | 100               | 5         | 100       | 56.11                    |
| Isobutyraldehyde          | 78-84-2    | C <sub>4</sub> H <sub>8</sub> O                  | 1.2             | 80                | 6         | 120       | 72.11                    |
| Isocyanates, all          |            |  | NV              | NV                | NV        | NV        |                          |
| Isodecanol                | 25339-17-7 | C <sub>10</sub> H <sub>22</sub> O                | 0.9             | 110               | 5         | 90        | 158.3                    |
| Isoflurane                | 26675-46-7 | C <sub>3</sub> H <sub>2</sub> ClF <sub>5</sub> O | ZR              | ZR                | ZR        | ZR        | 184.5                    |
| Isononanol                | 2452-97-9  | C <sub>9</sub> H <sub>20</sub> O                 | 1.5             | 67                | 8         | 150       | 144.3                    |
| Isooctane                 | 565-75-3   | C <sub>8</sub> H <sub>18</sub>                   | 1.1             | 90                | 5         | 100       | 114.2                    |
| Isooctanol                | 26952-21-6 | C <sub>8</sub> H <sub>18</sub> O                 | 1.7             | 60                | 9         | 170       | 130.2                    |
| Isopentane                | 78-78-4    | C <sub>5</sub> H <sub>12</sub>                   | 6.0             | 20                | 30        | 600       | 72.15                    |
| Isophorone                | 78-59-1    | C <sub>9</sub> H <sub>14</sub> O                 | 0.8             | 133               | 4         | 75        | 138.2                    |
| Isoprene                  | 78-79-5    | C <sub>5</sub> H <sub>8</sub>                    | 0.7             | 140               | 3         | 70        | 68.12                    |
| Isopropanol               | 67-63-0    | C <sub>3</sub> H <sub>8</sub> O                  | 4.4             | 20                | 22        | 440       | 60.10                    |
| Isopropyl acetate         | 108-21-4   | C <sub>5</sub> H <sub>10</sub> O <sub>2</sub>    | 2.2             | 50                | 10        | 220       | 102.1                    |
| Isopropyl chloroformate   | 108-23-6   | C <sub>4</sub> H <sub>7</sub> O <sub>2</sub> Cl  | 1.6             | 60                | 8         | 160       | 122.6                    |
| Jet Fuel JP-4             |            |  | 0.8             | 133               | 4         | 75        |                          |
| Jet Fuel JP-5             |            |  | 0.7             | 150               | 3         | 60        |                          |
| Jet Fuel JP-8             |            |  | 0.7             | 150               | 3         | 60        |                          |
| Kerosene                  | 8008-20-6  |  |                 | 0.8               | 120       | 4 90      |                          |
| Ketene                    | 463-51-4   | C <sub>2</sub> H <sub>2</sub> O                  | 3.0             | 33                | 15        | 300       | 42.04                    |
| Liquefied petroleum gas   | 68476-85-7 |  | ZR              | ZR                | ZR        | ZR        |                          |
| Maleic anhydride          | 108-31-6   | C <sub>4</sub> H <sub>2</sub> O <sub>3</sub>     | 2.0             | 50                | 10        | 200       | 98.06                    |
| Mercaptoacetic acid       | 68-11-1    | C <sub>2</sub> H <sub>4</sub> O <sub>2</sub> S   | 1.0             | 100               | 5         | 100       | 92.12                    |

| Gas/VOC                        | CAS No.    | Formula   | Response Factor | Relative Response | MDL (ppb) | MDL (ppm) | Molecular Weight (g/mol) |
|--------------------------------|------------|---|-----------------|-------------------|-----------|-----------|--------------------------|
| Mercury                        | 7439-97-6  | Hg  | NV              | NV                | NV        | NV        | 200.6                    |
| Mercury alkyls                 |            |   | NV              | NV                | NV        | NV        |                          |
| Mesitylene                     | 108-67-8   | C <sub>9</sub> H <sub>12</sub>                              | 0.3             | 300               | 2         | 30        | 120.2                    |
| Methacrylic acid               | 79-41-4    | C <sub>4</sub> H <sub>6</sub> O <sub>2</sub>                | 2.3             | 40                | 12        | 230       | 86.09                    |
| Methacrylonitrile              | 126-98-7   | C <sub>4</sub> H <sub>5</sub> N                             | 5.0             | 20                | 25        | 500       | 67.09                    |
| Methane                        | 74-82-8    | CH <sub>4</sub>   | ZR              | ZR                | ZR        | ZR        | 16.04                    |
| Methanol                       | 67-56-1    | CH <sub>4</sub> O   | 200.0           | 1                 | 1000      | 20000     | 32.04                    |
| Methoxyethanol, 2-             | 109-86-4   | C <sub>3</sub> H <sub>8</sub> O <sub>2</sub>                | 2.7             | 40                | 15        | 270       | 76.09                    |
| Methoxyethoxyethanol, 2-       | 111-77-3   | C <sub>5</sub> H <sub>12</sub> O <sub>3</sub>               | 1.4             | 70                | 7         | 140       | 120.1                    |
| Methoxymethylethoxy-2-propanol | 34590-94-8 | C <sub>7</sub> H <sub>16</sub> O <sub>3</sub>               | 1.3             | 80                | 7         | 130       | 148.2                    |
| Methoxypropan-2-ol             | 107-98-2   | C <sub>4</sub> H <sub>10</sub> O <sub>2</sub>               | 3.0             | 33                | 15        | 300       | 90.12                    |
| Methoxypropyl acetate          | 108-65-6   | C <sub>6</sub> H <sub>12</sub> O <sub>3</sub>               | 1.2             | 80                | 6         | 120       | 132.2                    |
| Methyl acetate                 | 79-20-9    | C <sub>3</sub> H <sub>6</sub> O <sub>2</sub>                | 5.2             | 20                | 25        | 500       | 74.08                    |
| Methyl acrylate                | 96-33-3    | C <sub>4</sub> H <sub>6</sub> O <sub>2</sub>                | 3.4             | 30                | 17        | 340       | 86.09                    |
| Methyl bromide                 | 74-83-9    | CH <sub>3</sub> Br  | 1.9             | 50                | 10        | 190       | 94.94                    |
| Methyl cyanoacrylate           | 137-05-3   | C <sub>5</sub> H <sub>5</sub> O <sub>2</sub> N              | 5.0             | 20                | 25        | 500       | 111.1                    |
| Methyl ethyl ketone            | 78-93-3    | C <sub>4</sub> H <sub>8</sub> O                             | 0.8             | 130               | 4         | 80        | 72.11                    |
| Methyl ethyl ketone peroxides  | 1338-23-4  | C <sub>8</sub> H <sub>18</sub> O <sub>2</sub>               | 0.8             | 125               | 4         | 80        | 146.2                    |
| Methyl formate                 | 107-31-3   | C <sub>2</sub> H <sub>4</sub> O <sub>2</sub>                | ZR              | ZR                | ZR        | ZR        | 60.05                    |
| Methyl isobutyl ketone         | 108-10-1   | C <sub>6</sub> H <sub>12</sub> O                            | 0.8             | 125               | 4         | 80        | 100.2                    |
| Methyl isocyanate              | 624-83-9   | C <sub>2</sub> H <sub>3</sub> NO                            | ZR              | ZR                | ZR        | ZR        | 57.05                    |
| Methyl isothiocyanate          | 556-61-6   | C <sub>2</sub> H <sub>3</sub> NS                            | 0.6             | 167               | 3         | 60        | 73.12                    |
| Methyl mercaptan               | 74-93-1    | CH <sub>4</sub> S   | 0.7             | 140               | 4         | 70        | 48.11                    |
| Methyl methacrylate            | 80-62-6    | C <sub>5</sub> H <sub>8</sub> O <sub>2</sub>                | 1.6             | 60                | 8         | 160       | 100.1                    |
| Methyl propyl ketone           | 107-87-9   | C <sub>5</sub> H <sub>10</sub> O                            | 0.8             | 130               | 4         | 80        | 86.13                    |
| Methyl salicylate              | 119-36-8   | C <sub>8</sub> H <sub>8</sub> O <sub>3</sub>                | 1.2             | 80                | 6         | 120       | 152.1                    |
| Methyl sulphide                | 75-18-3    | C <sub>2</sub> H <sub>6</sub> S                             | 0.5             | 200               | 3         | 50        | 62.13                    |
| Methyl t-butyl ether           | 1634-04-4  | C <sub>5</sub> H <sub>12</sub> O                            | 0.8             | 125               | 4         | 80        | 88.15                    |
| Methyl-2-propen-1-ol, 2-       | 51-42-8    | C <sub>4</sub> H <sub>8</sub> O                             | 1.1             | 90                | 5         | 100       | 72.11                    |
| Methyl-2-pyrrolidinone, N-     | 872-50-4   | C <sub>5</sub> H <sub>9</sub> NO                            | 0.9             | 110               | 5         | 90        | 99.13                    |
| Methyl-4,6-dinitrophenol, 2-   | 534-52-1   | C <sub>7</sub> H <sub>6</sub> N <sub>2</sub> O <sub>5</sub> | 3.0             | 33                | 15        | 300       | 198.1                    |
| Methyl-5-hepten-2-one, 6-      | 110-93-0   | C <sub>8</sub> H <sub>14</sub> O                            | 0.8             | 125               | 4         | 80        | 126.2                    |
| Methylamine                    | 74-89-5    | CH <sub>5</sub> N   | 1.4             | 70                | 7         | 140       | 31.06                    |
| Methylbutan-1-ol, 3-           | 123-51-3   | C <sub>5</sub> H <sub>12</sub> O                            | 3.4             | 30                | 17        | 340       | 88.15                    |
| Methylcyclohexane              | 108-87-2   | C <sub>7</sub> H <sub>14</sub>                              | 1.1             | 90                | 6         | 110       | 98.19                    |
| Methylcyclohexanol, 4-         | 589-91-3   | C <sub>7</sub> H <sub>14</sub> O                            | 2.4             | 40                | 12        | 240       | 114.2                    |
| Methylcyclohexanone 2-         | 583-60-8   | C <sub>7</sub> H <sub>12</sub> O                            | 1.0             | 100               | 5         | 100       | 112.2                    |
| Methylheptan-3-one, 5-         | 541-85-5   | C <sub>8</sub> H <sub>16</sub> O                            | 0.8             | 133               | 4         | 75        | 128.2                    |
| Methylhexan-2-one, 5-          | 110-12-3   | C <sub>7</sub> H <sub>14</sub> O                            | 0.8             | 133               | 4         | 75        | 114.2                    |
| Methylhydrazine                | 60-34-4    | CH <sub>6</sub> N <sub>2</sub>                              | 1.3             | 80                | 7         | 130       | 46.07                    |

| Gas/VOC                              | CAS No.    | Formula   | Response Factor | Relative Response | MDL (ppb) | MDL (ppm) | Molecular Weight (g/mol) |
|--------------------------------------|------------|---|-----------------|-------------------|-----------|-----------|--------------------------|
| Methyl-N-2,4,6-tetranitroaniline, N- | 479-45-8   | C <sub>7</sub> H <sub>5</sub> N <sub>5</sub> O <sub>8</sub> | 3.0             | 33                | 15        | 300       | 287.1                    |
| Methylpent-3-en-2-one, 4-            | 141-79-7   | C <sub>6</sub> H <sub>10</sub> O                            | 0.7             | 140               | 4         | 70        | 98.14                    |
| Methylpentan-2-ol, 4-                | 108-11-2   | C <sub>6</sub> H <sub>14</sub> O                            | 2.8             | 40                | 14        | 280       | 102.2                    |
| Methylpentane-2,4-diol, 2-           | 107-41-5   | C <sub>6</sub> H <sub>14</sub> O <sub>2</sub>               | 4.0             | 25                | 20        | 400       | 118.2                    |
| Methylpropan-2-ol, 2-                | 75-65-0    | C <sub>4</sub> H <sub>10</sub> O                            | 3.5             | 30                | 18        | 350       | 74.12                    |
| Methylstyrene                        | 25013-15-4 | C <sub>9</sub> H <sub>10</sub>                              | 0.5             | 200               | 3         | 50        | 118.2                    |
| Mineral oil                          | 8042-47-5  |   | 0.8             | 125               | 4         | 80        |                          |
| Mineral spirits                      | 64475-85-0 |   | 0.8             | 125               | 4         | 80        |                          |
| Naphthalene                          | 91-20-3    | C <sub>10</sub> H <sub>8</sub>                              | 0.4             | 230               | 2         | 45        | 128.2                    |
| Nitric oxide                         | 10102-43-9 | NO  | 8.0             | 15                | 40        | 800       | 30.01                    |
| Nitroaniline 4-                      | 100-01-6   | C <sub>6</sub> H <sub>6</sub> N <sub>2</sub> O <sub>2</sub> | 0.8             | 125               | 4         | 80        | 138.1                    |
| Nitrobenzene                         | 98-95-3    | C <sub>6</sub> H <sub>5</sub> NO <sub>2</sub>               | 1.7             | 60                | 10        | 170       | 123.1                    |
| Nitroethane                          | 79-24-3    | C <sub>2</sub> H <sub>5</sub> NO <sub>2</sub>               | ZR              | ZR                | ZR        | ZR        | 75.07                    |
| Nitrogen dioxide                     | 10102-44-0 | NO <sub>2</sub>   | 10.0            | 10                | 50        | 1000      | 46.01                    |
| Nitrogen trichloride                 | 10025-85-1 | NCl <sub>3</sub>  | 1.0             | 100               | 5         | 100       | 120.4                    |
| Nitrogen trifluoride                 | 7783-54-2  | NF <sub>3</sub>   | ZR              | ZR                | ZR        | ZR        | 71.00                    |
| Nitromethane                         | 75-52-5    | CH <sub>3</sub> NO <sub>2</sub>                             | ZR              | ZR                | ZR        | ZR        | 61.04                    |
| Nitropropane, 1-                     | 108-03-2   | C <sub>3</sub> H <sub>7</sub> NO <sub>2</sub>               | ZR              | ZR                | ZR        | ZR        | 89.09                    |
| Nitropropane, 2-                     | 79-46-9    | C <sub>3</sub> H <sub>7</sub> NO <sub>2</sub>               | ZR              | ZR                | ZR        | ZR        | 89.09                    |
| Nitrous oxide                        | 10024-97-2 | N <sub>2</sub> O  | ZR              | ZR                | ZR        | ZR        | 44.01                    |
| Nonane, n-                           | 111-84-2   | C <sub>9</sub> H <sub>20</sub>                              | 1.3             | 80                | 6         | 130       | 128.3                    |
| Norbornadiene, 2,5-                  | 121-46-0   | C <sub>7</sub> H <sub>8</sub>                               | 0.6             | 167               | 3         | 60        | 92.14                    |
| Octachloronaphthalene                | 2234-13-1  | C <sub>10</sub> Cl <sub>8</sub>                             | 1.0             | 100               | 5         | 100       | 403.7                    |
| Octane, n-                           | 111-65-9   | C <sub>8</sub> H <sub>18</sub>                              | 1.6             | 60                | 8         | 160       | 114.2                    |
| Octene, 1-                           | 111-66-0   | C <sub>8</sub> H <sub>16</sub>                              | 0.7             | 140               | 3         | 70        | 112.2                    |
| Oxalic acid                          | 144-62-7   | C <sub>2</sub> H <sub>2</sub> O <sub>4</sub>                | ZR              | ZR                | ZR        | ZR        | 90.03                    |
| Oxalonnitrile                        | 460-19-5   | C <sub>2</sub> N <sub>2</sub>                               | ZR              | ZR                | ZR        | ZR        | 52.04                    |
| Oxydiethanol 2,2-                    | 111-46-6   | C <sub>4</sub> H <sub>10</sub> O <sub>3</sub>               | 4.0             | 25                | 20        | 400       | 106.1                    |
| Oxygen                               |            | O <sub>2</sub>  | ZR              | ZR                | ZR        | ZR        | 32.00                    |
| Ozone                                | 10028-15-6 | O <sub>3</sub>  | ZR              | ZR                | ZR        | ZR        | 48.00                    |
| Paraffin wax, fume                   | 8002-74-2  |   | 1.0             | 100               | 5         | 100       |                          |
| Paraffins, normal                    | 64771-72-8 |   | 1.0             | 105               | 5         | 100       |                          |
| Pentacarbonyl iron                   | 13463-40-6 | FeC <sub>5</sub> O <sub>5</sub>                             | 1.0             | 100               | 5         | 100       | 195.9                    |
| Pentachloroethane                    | 76-01-7    | C <sub>2</sub> HCl <sub>5</sub>                             | ZR              | ZR                | ZR        | ZR        | 202.3                    |
| Pentachlorofluoroethane              | 354-56-3   | C <sub>2</sub> Cl <sub>5</sub> F                            | ZR              | ZR                | ZR        | ZR        | 220.3                    |
| Pentafluoroethane                    | 354-33-6   | C <sub>2</sub> HF <sub>5</sub>                              | ZR              | ZR                | ZR        | ZR        | 120.0                    |
| Pentan-2-one                         | 107-87-9   | C <sub>5</sub> H <sub>10</sub> O                            | 0.8             | 125               | 4         | 80        | 86.13                    |
| Pentan-3-one                         | 96-22-0    | C <sub>5</sub> H <sub>10</sub> O                            | 0.8             | 125               | 4         | 80        | 86.13                    |
| Pentandione, 2,4-                    | 123-54-6   | C <sub>5</sub> H <sub>8</sub> O <sub>2</sub>                | 0.8             | 133               | 4         | 75        | 100.1                    |
| Pentane, n-                          | 109-66-0   | C <sub>5</sub> H <sub>12</sub>                              | 7.9             | 15                | 40        | 800       | 72.15                    |
| Peracetic acid                       | 79-21-0    | C <sub>2</sub> H <sub>4</sub> O <sub>3</sub>                | 2.0             | 50                | 10        | 200       | 76.05                    |
| Perchloryl fluoride                  | 7616-94-6  | ClO <sub>3</sub> F  | ZR              | ZR                | ZR        | ZR        | 125.4                    |

| Gas/VOC                                  | CAS No.    | Formula   | Response Factor | Relative Response | MDL (ppb) | MDL (ppm) | Molecular Weight (g/mol) |
|--|------------|---|-----------------|-------------------|-----------|-----------|--------------------------|
| Perfluoropropane                         | 76-19-7    | C <sub>3</sub> F <sub>8</sub>                               | ZR              | ZR                | ZR        | ZR        | 188.0                    |
| Petroleum ether                          |            |   | 0.9             | 110               | 5         | 90        |                          |
| Phenol                                   | 108-95-2   | C <sub>6</sub> H <sub>6</sub> O                             | 1.2             | 85                | 6         | 120       | 94.11                    |
| Phenyl propene, 2-                       | 98-83-9    | C <sub>9</sub> H <sub>10</sub>                              | 0.4             | 230               | 2         | 45        | 118.2                    |
| Phenyl-2,3-epoxypropyl ether             | 122-60-1   | C <sub>9</sub> H <sub>10</sub> O <sub>2</sub>               | 0.8             | 125               | 4         | 80        | 150.2                    |
| Phenylenediamine, p-                     | 106-50-3   | C <sub>6</sub> H <sub>8</sub> N <sub>2</sub>                | 0.6             | 167               | 3         | 60        | 108.1                    |
| Phosgene                                 | 75-44-5    | COCl <sub>2</sub>   | ZR              | ZR                | ZR        | ZR        | 98.92                    |
| Phosphine                                | 7803-51-2  | PH <sub>3</sub>   | 2.0             | 50                | 10        | 200       | 34.00                    |
| Picoline, 3-                             | 108-99-6   | C <sub>6</sub> H <sub>7</sub> N                             | 0.9             | 110               | 5         | 90        | 93.13                    |
| Pinene, alpha                            | 80-56-8    | C <sub>10</sub> H <sub>16</sub>                             | 0.3             | 315               | 2         | 30        | 136.2                    |
| Pinene, beta                             | 127-91-3   | C <sub>10</sub> H <sub>16</sub>                             | 0.3             | 315               | 2         | 30        | 136.2                    |
| Piperidine                               | 110-89-4   | C <sub>5</sub> H <sub>11</sub> N                            | 0.9             | 110               | 5         | 90        | 85.15                    |
| Piperylene                               | 504-60-9   | C <sub>5</sub> H <sub>8</sub>                               | 0.7             | 150               | 3         | 67        | 68.12                    |
| Prop-2-yn-1-ol                           | 107-19-7   | C <sub>3</sub> H <sub>4</sub> O                             | 1.3             | 80                | 7         | 130       | 56.06                    |
| Propan-1-ol                              | 71-23-8    | C <sub>3</sub> H <sub>8</sub> O                             | 4.8             | 20                | 25        | 480       | 60.10                    |
| Propane                                  | 74-98-6    | C <sub>3</sub> H <sub>8</sub>                               | ZR              | ZR                | ZR        | ZR        | 44.10                    |
| Propane-1,2-diol, total                  | 57-55-6    | C <sub>3</sub> H <sub>8</sub> O <sub>2</sub>                | 10.0            | 10                | 50        | 1000      | 76.09                    |
| Propene                                  | 115-07-1   | C <sub>3</sub> H <sub>6</sub>                               | 1.4             | 70                | 7         | 140       | 42.08                    |
| Propionaldehyde                          | 123-38-6   | C <sub>3</sub> H <sub>6</sub> O                             | 1.7             | 60                | 8         | 169       | 58.08                    |
| Propionic acid                           | 79-09-4    | C <sub>3</sub> H <sub>6</sub> O <sub>2</sub>                | 8.0             | 15                | 40        | 800       | 74.08                    |
| Propyl acetate, n-                       | 109-60-4   | C <sub>5</sub> H <sub>10</sub> O <sub>2</sub>               | 2.5             | 40                | 13        | 250       | 102.1                    |
| Propylene dinitrate                      | 6423-43-4  | C <sub>3</sub> H <sub>6</sub> N <sub>2</sub> O <sub>6</sub> | ZR              | ZR                | ZR        | ZR        | 166.1                    |
| Propylene oxide                          | 75-56-9    | C <sub>3</sub> H <sub>6</sub> O                             | 7.0             | 15                | 35        | 700       | 58.08                    |
| Propyleneimine                           | 75-55-8    | C <sub>3</sub> H <sub>7</sub> N                             | 1.3             | 80                | 7         | 130       | 57.10                    |
| Pyridine                                 | 110-86-1   | C <sub>5</sub> H <sub>5</sub> N                             | 0.8             | 133               | 4         | 75        | 79.10                    |
| Pyridylamine 2-                          | 504-29-0   | C <sub>5</sub> H <sub>6</sub> N <sub>2</sub>                | 0.8             | 125               | 4         | 80        | 94.12                    |
| Silane                                   | 7803-62-5  | SiH <sub>4</sub>  | ZR              | ZR                | ZR        | ZR        | 32.12                    |
| Sodium fluoroacetate                     | 62-74-8    | C <sub>2</sub> H <sub>2</sub> O <sub>2</sub> F<br>Na        | ZR              | ZR                | ZR        | ZR        | 100.0                    |
| Styrene                                  | 100-42-5   | C <sub>8</sub> H <sub>8</sub>                               | 0.4             | 230               | 2         | 50        | 104.2                    |
| Sulphur dioxide                          | 7446-09-5  | SO <sub>2</sub>   | ZR              | ZR                | ZR        | ZR        | 64.06                    |
| Sulphur hexafluoride                     | 2551-62-4  | SF <sub>6</sub>   | ZR              | ZR                | ZR        | ZR        | 146.1                    |
| Sulphur tetrafluoride                    | 7783-60-0  | SF <sub>4</sub>   | ZR              | ZR                | ZR        | ZR        | 108.1                    |
| Sulphuric acid                           | 7664-93-9  | H <sub>2</sub> SO <sub>4</sub>                              | ZR              | ZR                | ZR        | ZR        | 98.08                    |
| Sulphuryl fluoride                       | 2699-79-8  | SO <sub>2</sub> F <sub>2</sub>                              | ZR              | ZR                | ZR        | ZR        | 102.1                    |
| Terphenyls                               |            | C <sub>18</sub> H <sub>14</sub>                             | 0.6             | 167               | 3         | 60        | 230.3                    |
| Terpinolene                              | 586-62-9   | C <sub>10</sub> H <sub>16</sub>                             | 0.5             | 210               | 2         | 50        | 136.2                    |
| Tert-butanol                             | 75-65-0    | C <sub>4</sub> H <sub>10</sub> O                            | 2.6             | 40                | 15        | 260       | 74.12                    |
| Tetrabromoethane, 1,1,2,2-               | 79-27-6    | C <sub>2</sub> H <sub>2</sub> Br <sub>4</sub>               | 2.0             | 50                | 10        | 200       | 345.7                    |
| Tetracarbonylnickel                      | 13463-39-3 | NiC <sub>4</sub> O <sub>4</sub>                             | 1.0             | 100               | 5         | 100       | 170.7                    |
| Tetrachloro-1,2-difluoroethane, 1,1,2,2- | 76-12-0    | C <sub>2</sub> Cl <sub>4</sub> F <sub>2</sub>               | ZR              | ZR                | ZR        | ZR        | 203.8                    |

| Gas/VOC                                  | CAS No.    | Formula   | Response Factor | Relative Response | MDL (ppb) | MDL (ppm) | Molecular Weight (g/mol) |
|--|------------|---|-----------------|-------------------|-----------|-----------|--------------------------|
| Tetrachloro-1-fluoroethane, 1,1,2,2-     | 354-14-3   | C <sub>2</sub> HCl <sub>4</sub> F                           | ZR              | ZR                | ZR        | ZR        | 185.8                    |
| Tetrachloro-2,2-difluoroethane, 1,1,1,2- | 76-11-9    | C <sub>2</sub> Cl <sub>4</sub> F <sub>2</sub>               | ZR              | ZR                | ZR        | ZR        | 203.8                    |
| Tetrachloro-2-fluoroethane, 1,1,1,2-     | 354-11-0   | C <sub>2</sub> HCl <sub>4</sub> F                           | ZR              | ZR                | ZR        | ZR        | 185.8                    |
| Tetrachloroethane, 1,1,1,2-              | 630-20-6   | C <sub>2</sub> H <sub>2</sub> Cl <sub>4</sub>               | ZR              | ZR                | ZR        | ZR        | 167.8                    |
| Tetrachloroethane, 1,1,2,2-              | 79-34-5    | C <sub>2</sub> H <sub>2</sub> Cl <sub>4</sub>               | ZR              | ZR                | ZR        | ZR        | 167.8                    |
| Tetrachloroethylene                      | 127-18-4   | C <sub>2</sub> Cl <sub>4</sub>                              | 0.7             | 140               | 4         | 70        | 165.8                    |
| Tetrachloronaphthalenes, all isomers     | 20020-02-4 | C <sub>10</sub> H <sub>4</sub> Cl <sub>4</sub>              | 1.0             | 100               | 5         | 100       | 266.0                    |
| Tetraethyl orthosilicate                 | 78-10-4    | C <sub>8</sub> H <sub>20</sub> O <sub>4</sub> Si            | 2.0             | 50                | 10        | 200       | 208.3                    |
| Tetraethyllead                           | 78-00-2    | C <sub>8</sub> H <sub>20</sub> Pb                           | ZR              | ZR                | ZR        | ZR        | 323.4                    |
| Tetrafluoroethane, 1,1,1,2-              | 811-97-2   | C <sub>2</sub> H <sub>2</sub> F <sub>4</sub>                | ZR              | ZR                | ZR        | ZR        | 102.0                    |
| Tetrafluoroethane, 1,1,2,2-              | 359-35-3   | C <sub>2</sub> H <sub>2</sub> F <sub>4</sub>                | ZR              | ZR                | ZR        | ZR        | 102.0                    |
| Tetrafluoroethylene                      | 116-14-3   | C <sub>2</sub> F <sub>4</sub>                               | 1.0             | 100               | 5         | 100       | 100.0                    |
| Tetrafluoromethane                       | 75-73-0    | CF <sub>4</sub>   | ZR              | ZR                | ZR        | ZR        | 88.00                    |
| Tetrahydrofuran                          | 109-99-9   | C <sub>4</sub> H <sub>8</sub> O                             | 1.6             | 65                | 8         | 150       | 72.11                    |
| Tetramethyl orthosilicate                | 681-84-5   | C <sub>4</sub> H <sub>12</sub> O <sub>4</sub> Si            | ZR              | ZR                | ZR        | ZR        | 152.2                    |
| Tetramethyl succinonitrile               | 3333-52-6  | C <sub>8</sub> H <sub>12</sub> N <sub>2</sub>               | 1.0             | 100               | 5         | 100       | 136.2                    |
| Therminol                                |            |   | 1.0             | 100               | 5         | 100       |                          |
| Thionyl chloride                         | 7719-09-7  | SOCl <sub>2</sub>   | ZR              | ZR                | ZR        | ZR        | 119.0                    |
| Toluene                                  | 108-88-3   | C <sub>7</sub> H <sub>8</sub>                               | 0.5             | 200               | 3         | 50        | 92.14                    |
| Toluene-2,4-diisocyanate                 | 584-84-9   | C <sub>9</sub> H <sub>6</sub> N <sub>2</sub> O <sub>2</sub> | 1.6             | 60                | 8         | 160       | 174.2                    |
| Toluenesulphonylchloride, p-             | 98-59-9    | C <sub>7</sub> H <sub>7</sub> SO <sub>2</sub> Cl            | 3.0             | 33                | 15        | 300       | 190.6                    |
| Toluidine, o-                            | 95-53-4    | C <sub>7</sub> H <sub>9</sub> N                             | 0.5             | 200               | 3         | 50        | 107.2                    |
| Tributyl phosphate                       | 126-73-8   | C <sub>12</sub> H <sub>27</sub> O <sub>4</sub> P            | 5.0             | 20                | 25        | 500       | 266.3                    |
| Tributylamine                            | 102-82-9   | C <sub>12</sub> H <sub>27</sub> N                           | 1.0             | 100               | 5         | 100       | 185.4                    |
| Trichloro-1,1-difluoroethane, 1,2,2-     | 354-21-2   | C <sub>2</sub> HCl <sub>3</sub> F <sub>2</sub>              | ZR              | ZR                | ZR        | ZR        | 169.4                    |
| Trichloro-1,2-difluoroethane, 1,1,2      | 354-15-4   | C <sub>2</sub> HCl <sub>3</sub> F <sub>2</sub>              | ZR              | ZR                | ZR        | ZR        | 169.4                    |
| Trichloro-2,2-difluoroethane, 1,1,1-     | 354-12-1   | C <sub>2</sub> HCl <sub>3</sub> F <sub>2</sub>              | ZR              | ZR                | ZR        | ZR        | 169.4                    |
| Trichloro-2-fluoroethane, 1,1,2-         | 359-28-4   | C <sub>2</sub> H <sub>2</sub> Cl <sub>3</sub> F             | ZR              | ZR                | ZR        | ZR        | 151.4                    |
| Trichlorobenzene 1,2,4-                  | 120-82-1   | C <sub>6</sub> H <sub>3</sub> Cl <sub>3</sub>               | 0.6             | 180               | 3         | 50        | 181.4                    |
| Trichloroethane, 1,1,1-                  | 71-55-6    | C <sub>2</sub> H <sub>3</sub> Cl <sub>3</sub>               | ZR              | ZR                | ZR        | ZR        | 133.4                    |
| Trichloroethane, 1,1,2-                  | 79-00-5    | C <sub>2</sub> H <sub>3</sub> Cl <sub>3</sub>               | ZR              | ZR                | ZR        | ZR        | 133.4                    |
| Trichloroethylene                        | 79-01-6    | C <sub>2</sub> HCl <sub>3</sub>                             | 0.7             | 150               | 3         | 65        | 131.4                    |

| Gas/VOC                             | CAS No.   | Formula  | Response Factor | Relative Response | MDL (ppb) | MDL (ppm) | Molecular Weight (g/mol) |
|-------------------------------------|-----------|--|-----------------|-------------------|-----------|-----------|--------------------------|
| Trichlorofluoromethane              | 75-69-4   | CCl <sub>3</sub> F   | ZR              | ZR                | ZR        | ZR        | 137.4                    |
| Trichloronitromethane               | 76-06-2   | CCl <sub>3</sub> NO <sub>2</sub>                             | ZR              | ZR                | ZR        | ZR        | 164.4                    |
| Trichlorophenoxyacetic acid, 2,4,5- | 93-76-5   | C <sub>8</sub> H <sub>5</sub> O <sub>3</sub> Cl <sub>3</sub> | 1.0             | 100               | 5         | 100       | 255.5                    |
| Trichloropropane 1,2,3-             | 96-18-4   | C <sub>3</sub> H <sub>5</sub> Cl <sub>3</sub>                | ZR              | ZR                | ZR        | ZR        | 147.4                    |
| Trichlorotrifluoroethane, 1,1,1-    | 354-58-5  | C <sub>2</sub> Cl <sub>3</sub> F <sub>3</sub>                | ZR              | ZR                | ZR        | ZR        | 187.4                    |
| Trichlorotrifluoroethane, 1,1,2-    | 76-13-1   | C <sub>2</sub> Cl <sub>3</sub> F <sub>3</sub>                | ZR              | ZR                | ZR        | ZR        | 187.4                    |
| Triethylamine                       | 121-44-8  | C <sub>6</sub> H <sub>15</sub> N                             | 0.9             | 110               | 5         | 90        | 101.2                    |
| Trifluoroethane, 1,1,1-             | 420-46-2  | C <sub>2</sub> H <sub>3</sub> F <sub>3</sub>                 | ZR              | ZR                | ZR        | ZR        | 84.04                    |
| Trifluoroethane, 1,1,2-             | 430-66-0  | C <sub>2</sub> H <sub>3</sub> F <sub>3</sub>                 | ZR              | ZR                | ZR        | ZR        | 84.04                    |
| Trifluoroethanol, 2,2,2-            | 75-89-8   | C <sub>2</sub> H <sub>3</sub> F <sub>3</sub> O               | ZR              | ZR                | ZR        | ZR        | 100.0                    |
| Trifluoromethane                    | 75-46-7   | CHF <sub>3</sub>   | ZR              | ZR                | ZR        | ZR        | 70.01                    |
| Trimethylamine                      | 53-50-3   | C <sub>3</sub> H <sub>9</sub> N                              | 0.5             | 200               | 3         | 50        | 59.11                    |
| Trimethylbenzene, 1,3,5-            | 108-67-8  | C <sub>9</sub> H <sub>12</sub>                               | 0.3             | 300               | 2         | 35        | 120.2                    |
| Trinitrotoluene 2,4,6-              | 118-96-7  | C <sub>7</sub> H <sub>5</sub> N <sub>3</sub> O <sub>6</sub>  | ZR              | ZR                | ZR        | ZR        | 227.1                    |
| Turpentine                          | 8006-64-2 | C <sub>10</sub> H <sub>16</sub>                              | 0.6             | 167               | 3         | 60        | 136.2                    |
| TVOC                                |           |  | 1.0             | 100               | 5         | 100       |                          |
| Undecane, n-                        | 1120-21-4 | C <sub>11</sub> H <sub>24</sub>                              | 0.9             | 110               | 5         | 100       | 156.3                    |
| Vinyl acetate                       | 108-05-2  | C <sub>4</sub> H <sub>6</sub> O <sub>2</sub>                 | 1.1             | 90                | 6         | 110       | 86.09                    |
| Vinyl bromide                       | 593-60-2  | C <sub>2</sub> H <sub>3</sub> Br                             | 1.0             | 100               | 5         | 100       | 106.9                    |
| Vinyl chloride                      | 75-01-4   | C <sub>2</sub> H <sub>3</sub> Cl                             | 2.1             | 50                | 10        | 200       | 62.50                    |
| Vinyl-2-pyrrolidinone, 1-           | 88-12-0   | C <sub>6</sub> H <sub>9</sub> NO                             | 0.9             | 110               | 5         | 90        | 111.1                    |
| Xylene mixed isomers                | 1330-20-7 | C <sub>8</sub> H <sub>10</sub>                               | 0.4             | 230               | 2         | 40        | 106.2                    |
| Xylene, m-                          | 108-38-3  | C <sub>8</sub> H <sub>10</sub>                               | 0.4             | 230               | 2         | 50        | 106.2                    |
| Xylene, o-                          | 95-47-6   | C <sub>8</sub> H <sub>10</sub>                               | 0.6             | 167               | 3         | 60        | 106.2                    |
| Xylene, p-                          | 106-42-3  | C <sub>8</sub> H <sub>10</sub>                               | 0.6             | 180               | 3         | 50        | 106.2                    |
| Xylidine, all                       | 1300-73-8 | C <sub>8</sub> H <sub>11</sub> N                             | 0.7             | 140               | 4         | 70        | 121.2                    |

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