



## Community Information Open Day

### Fact sheet 5

#### Glossary and explanatory notes

<b>Acetaldehyde</b>	... or <b>Ethanal</b> ( $\text{CH}_3\text{CHO}$ ) is a VOC, and is normally a gas or colourless, inflammable liquid with a boiling point of $20.8^\circ\text{C}$ , a very high vapour pressure and has a pungent odour.
<b>Acetone</b>	... or <b>Propanone</b> or <b>DimethylKetone</b> (DMK) is a colourless, flammable liquid with a boiling point of $56^\circ\text{C}$ , a high vapour pressure and has a characteristic odour (nail varnish remover).
<b>'Air toxics'</b>	A range of gaseous, aerosol or particle pollutants present in the air in low concentrations. Despite their low concentrations, air toxics can be hazardous to human, plant or animal life.
<b>Analytical suite or Analytes</b>	A set of compounds for which an air sample is specifically tested such as the USEPA TO-14 suite (some 39 compounds) or the TO-15 suite (some 97 compounds) or simply the compounds found within a sample by chemical analysis.
<b>Ambient air</b>	The surface layer of air that is likely to be breathed by humans that normally prevails over a given area or region and includes all the airborne contaminants (dust, industrial and vehicular air emissions, odours, etc).
<b>Ambient temperature</b>	Normally given in degrees Celcius ( $^\circ\text{C}$ ); it is carefully measured to ensure solar or terrestrial radiation do not affect the reading (usually achieved with a Stevenson screen or similar enclosure around the temperature sensor).
<b>Anthropogenic</b>	Generated by human activity, such as industrial effluents or air emissions.
<b>Background sample</b>	An air sample taken from an area that is considered relatively free of air contamination of a specific type, for example a sample taken on the coast in a strong sea breeze would be considered a typical clean air background sample.
<b>Blank sample</b>	A sample where the sampling device is brought to the test site but not opened, returned to the analytical laboratory and examined for any analytes present to test for contamination or cleanliness of the process.
<b>Biogenic</b>	Substances that are naturally generated by the flora and fauna in an environment such as the VOCs generated within the Jarrah forest.
<b>Carbonyls</b>	A reactive sub-set of the VOCs and are those organic compounds that have a carbon and oxygen atom coupled via a double bond (the source of the elevated reactivity); they include the aldehydes such as formaldehyde and acetaldehyde, and the ketones such as acetone

and methylethylketone (MEK).

<b>Community sample</b>	A sample taken by community members.
<b>Correlation</b>	A statistical term, defined as the apparent relationship between two variables (such as people's height and weight or the number of car accidents and the time of day).
<b>Diurnal</b>	... or <b>daily</b> , means phenomena occurring or varying over the period of one day (such as temperature, relative humidity, sunlight, etc) or denoting an event that happens every 24 hours (e.g. sunrise, sunset, etc).
<b>DNPH, DNPH tubes and DNPH sampling</b>	2,4-DiNitroPhenylHydrazine ( $\text{NH}_2\text{NHC}_6\text{H}_3(\text{NO}_2)_2$ ) is a compound used to capture air contaminants which is usually packed into a resealable glass or stainless steel tube. DNPH tubes are only opened during active sampling when a known volume of ambient air is drawn through the tube at a steady rate by means of a sampling pump, so that the concentration of analytes in air can be determined (subsequent to air sampling in the field, the captured analytes are identified and quantified by a chemical laboratory after their extraction from the DNPH cartridge).
<b>DEC</b>	Department of Environment and Conservation
<b>Formaldehyde</b>	... or <b>Methanal</b> ( $\text{HCHO}$ ) is a VOC that is a gas at ordinary temperatures with a characteristic odour.
<b>Knots</b>	One knot (kt) is one nautical mile per hour. Knots are predominantly used to express the speed of ships, aircraft, ocean currents, and winds, hence frequently appear in weather reports. <i>Note:</i> 1 kt = 1.15 mph = 1.85 kph = 0.514 m/s.
<b>mg/m<sup>3</sup></b>	Milligrams per cubic metre, is an expression of contaminant concentration in air and is dependent on air temperature. <i>Note:</i> One milligram per cubic metre is equivalent to one thousand micrograms per cubic metre; i.e. $1 \text{ mg/m}^3 = 1,000 \text{ } \mu\text{g/m}^3$ or $1 \text{ } \mu\text{g/m}^3 = 0.001 \text{ mg/m}^3$
<b>ml</b>	One millilitre, a measure of volume equal to one cubic centimetre ( $\text{cc}$ or $\text{cm}^3$ ); there are 1,000 ml in one litre, and one million ml or 1,000 litres in one cubic metre.
<b>Non-polar VOCs</b>	These are volatile organic compounds that lack any significant molecular polarity, such as methane ( $\text{CH}_4$ ) and hence don't have the propensity to attach to water molecules or droplets which alters their air chemistry behaviour to the polar compounds (such as the alcohols or carbonyls).
<b>Polar VOCs</b>	These are volatile organic compounds with some significant molecular polarity, such as methanol ( $\text{CH}_3\text{OH}$ ) and have some propensity to attach to water molecules or droplets or mucous lining of the respiratory system.

**ppb**

Parts per billion (i.e. one part in  $10^9$ ), is an expression of gaseous contaminant concentration in air and for atmospheric work generally implies a volume per volume basis (although sometimes still written as ppbv – particularly in older texts); one ppb is one cubic millimetre of contaminant gas or vapour in one cubic metre of air (or one cubic metre per cubic kilometre).

*Note:* Being on a volume per volume basis, concentrations expressed as ppb or ppm etc, remain the same at different temperatures (providing vapours do not condense with a drop in temperature).

The conversion formula to find the equivalent  $\text{mg}/\text{m}^3$  from a given ppb, is as follows:

$$\text{mg}/\text{m}^3 = \frac{\text{ppb}}{1,000} \times \frac{\text{molar weight (in grams)}}{\text{molar volume (in litres)}}$$

*Note:* One ppm is equivalent to one thousand parts per billion (ppb); i.e.

$$1 \text{ ppm} = 1,000 \text{ ppb} \quad \text{or} \quad 1 \text{ ppb} = 0.001 \text{ ppm}$$

**ppm**

Parts per million (i.e. one part in  $10^6$ ), is an expression of gaseous contaminant concentration in air and for atmospheric work generally implies a volume per volume basis. The conversion formula to find the equivalent  $\text{mg}/\text{m}^3$  from a given ppm, is as follows:

$$\text{mg}/\text{m}^3 = \frac{\text{ppm} \times \text{molar weight (in grams)}}{\text{molar volume (in litres)}}$$

For example, what is the equivalent  $\text{mg}/\text{m}^3$  for a reported emission level of 0.08 ppm chloroform (trichloromethane or  $\text{CHCl}_3$ ) at STP,

**Quality assurance**

... or **QA** is a purpose designed process to ensure that an activity is always carried out in the proper manner and aims to eliminate errors and mistakes; it is formalised under the 9000 series of Australian Standards.

**Relative Humidity (RH)**

A ratio (expressed as a percentage) of the water vapour present in the air to the maximum water vapour the air could contain at the same temperature and pressure. At this maximum  $\text{RH} = 100\%$ , the air is said to be saturated and net evaporation effectively ceases. Water will evaporate more easily the lower the RH (i.e. washing, puddles and dams will dry more quickly).

**Short-term air quality events**

Episodes of air quality degradation that usually only last for several minutes or seconds.

**Short term health guideline level**

The elevated airborne concentration for specified compounds that humans can be exposed to for a short period of time without the occurrence of any known long term harmful health effects in the average population.

**STP**

Standard Temperature and Pressure, which traditionally in science (and in Australia) is defined by a temperature of  $0^\circ\text{C}$  (or  $273.15 \text{ K}$ , where  $\text{K} = \text{degrees Kelvin}$ ) and a pressure of one atmosphere ( $1 \text{ atm} = 101.325 \text{ kPa}$  or  $760 \text{ mm Hg}$ ).

<b>Temperature</b>	See: <i>Ambient temperature</i>
<b>USEPA</b>	United States Environmental Protection Agency
<b>USEPA Method TO-15</b>	A standard method for sampling ambient air using specially prepared canisters and analysing the samples via gas chromatography followed by mass spectrometry (GC/MS)
<b>Vapour</b>	A substance in gaseous form but below its critical temperature so that it could be liquefied by pressure alone, without cooling to a lower temperature. Some critical temperatures are: 374°C for water, 289°C for benzene, 240°C for methyl alcohol, and 237°C for methylene chloride (hence we invariably refer to these as vapours in the atmosphere); and -147°C for nitrogen; -140°C for carbon monoxide; -118°C for oxygen; and -82°C for methane (which are correctly called gases as found in the earth's atmosphere).
<b>Vapour Pressure</b>	The pressure exerted by a vapour. All solids and liquids give off vapours, comprising atoms (as for mercury) or molecules (as for water or benzene) which exert this vapour pressure; when enclosed within a sealed container (which was initially pumped down to a vacuum) the vapour pressure rises to an equilibrium (maximum) pressure which depends only on the substance being studied and the temperature.
<b>VOCs</b>	... or Volatile Organic Compounds, which are defined by the USEPA as organic compounds having a vapour pressure greater than $10^{-1}$ Torr (i.e. greater than 0.1 mm Hg or 13.33 Pa) at 25 degrees Celsius and one atmosphere pressure (USEPA 1999b).
<b>Wind Direction</b>	Generally given in degrees, as a compass bearing or angle of the mean horizontal wind vector measured clockwise from North and designating the direction from which the wind blows (i.e. a north-westerly wind, given as 315°, blows from the north west).
<b>Wind Speed</b>	Due to the inherent variability of wind, its speed is normally averaged over a 10 minute period <sup>1</sup> (hence also referred to as the Mean Wind Speed) and expressed in metres per second (m/s); this unit is used in scientific research and literature, and within this report.  <i>Note:</i> 1 m/s = 1.946 knots or approximately 2 knots (kt).
<b>World Health Organisation short-term (30 minute average) Sensory Irritation Guideline</b>	The average airborne concentration of a specific compound that the average population can be exposed to over a 30-minute period without suffering sensory irritation. Sensory irritation is when a vapour or gas or contaminated air triggers a response in nerves of the eyes or nose with a sensation described as anything from tickling to stinging or burning.