



**SEPA Odour guidance**

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# Important notes

This guidance is intended for internal SEPA use; however, it may be used externally for reference and is made available to everyone on our website. External parties should note that it could change because of changes to legislation, future Scottish Government guidance or experience in its use. It contains simplified guidance based on complex legislation which is subject to change and does not constitute legal advice. SEPA cannot be held liable for any errors and omissions in this guidance. Compliance with the law remains the responsibility of operators. If operators have concerns over compliance, they should seek professional advice or contact their regulator.

This guidance updates the 2010 version. We have endeavoured to make it accessible to all, however there are tables and diagrams, particularly in the appendices, which may be difficult to read for those with additional accessibility requirements. If you are having difficulty accessing or understanding any aspect of this guidance, please contact us at OdourRegulationSupport@sepa.org.uk to discuss how we can help.

**This guidance has been updated to meet accessibility standards and to replace certain references to legislation with references to the Environmental Authorisations (Scotland) Regulations 2018. It has not been reviewed beyond this. We are aware that sections of this guidance may need to be updated, and this work will be completed in due course.**

If you would like this document in an accessible format, such as large print, audio recording or braille, please contact SEPA by emailing equalities@sepa.org.uk

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# Introduction

The Scottish Environment Protection Agency (SEPA) is Scotland’s environmental regulator. SEPA’s purpose, as set out in the [Regulatory Reform (Scotland) Act 2014](https://www.legislation.gov.uk/asp/2014/3/contents/enacted) is to protect and improve the environment in ways that, as far as possible, also help create health and wellbeing benefits and sustainable economic growth. One of our tools to protect and improve the environment is regulation which means we are responsible for issuing environmental authorisations across a wide variety of activities. The conditions of authorisations are set to minimise the risk of harm to the environment and human health.

Protecting the environment from pollution resulting from the release of odorous substances is one of the most challenging aspects of our work. SEPA uses a framework described later in this document to assess odour and its impact. By carrying out a field assessment against a defined set of parameters SEPA officers can ensure an objective conclusion is drawn. This in turn enables SEPA to be a fair and proportionate regulator whilst at the same time ensuring that the interests of affected people are protected.

This guidance applies to both licensed and unlicensed activities (see Part 4) that fall under the relevant legislation, but there is an emphasis on ensuring compliance with environmental authorisations. It is acknowledged at the outset that certain activities are likely to produce odours from time to time.

This guidance is intended to support SEPA’s regulatory activities including licensing and enforcement actions (as specified in SEPA’s enforcement policy). Any response by SEPA to an odour complaint, or any potential odour release from a SEPA regulated activity, must be consistent with our enforcement policy and guidance found on the SEPA website.

This guidance should be taken into account when considering the grant or review of an environmental authorisation for activities that may give rise to the release of odorous substances; in particular to ensure that adequate controls are in place to ensure compliance with the conditions of an environmental authorisation.

# Aims

This guidance has been provided for SEPA officers engaged in regulating potentially odorous activities. This document aims to provide practical guidance on how and why odours occur, how they should be investigated, how they should be mitigated and the roles and responsibilities of SEPA.

The field of odour measurement and control is very wide in scope and is continually developing. This guidance has been prepared after reviewing several key information sources such as national guidance in the UK, Europe and the rest of the world. It aims to make use of best practice in the control and approach to the regulation of emissions of odorous substances from activities we regulate. It may therefore be reviewed and updated as required.

# Regulatory frameworks for addressing odour

There are several industrial, agricultural, and domestic activities that can give rise to odours. SEPA has a remit to regulate the emission of odours from industrial and agricultural activities if they are subject to controls under the Environment Authorisations (Scotland) Regulations 2018 – known as EASR. Prior to EASR odour was regulated by the now superseded Pollution Prevention and Control (Scotland) Regulations 2012 – known as “the PPC regulations” – and Part II of the Environmental Protection Act 1990, which is the waste management licensing regime and is known as “Part II of EPA90”.

## EASR and former PPC Regulations

The Pollution Prevention and Control (PPC) (Scotland) Regulations 2012 SSI 2012/360 (“PPC 2012”) implemented the European Union (EU) Directive 2010/75/EU on Industrial Emissions (IED). Chapter II of the IED, and PPC 2012 apply an integrated environmental approach to the regulation of certain industrial activities. The activities under Annex 1 of the IED (included within PPC Part A activities) include major process industries, certain waste management activities and the intensive farming of poultry and pigs. These are now listed in Part 4 of Schedule 20 of EASR and are known as ‘industrial emissions activities’. Those Part A activities that were not included in Annex 1 of the IED, as well as Part B activities for which only emissions to air were regulated under PPC 2012, are now regulated under EASR as ‘other emissions activities’, which include the activities listed in Part 3 of Schedule 26 of EASR, operating a medium combustion plant to which Schedule 27 of EASR applies and a petrol vapour recovery activity under Schedule 28 of EASR.

It is a general aim of EASR that all appropriate measures are taken to prevent or, where that is not practicable, to minimise environmental harm. Environmental harm is defined in the Regulatory Reform (Scotland) Act 2014 and includes offence to the senses of human beings. This requires that preventative measures are taken against pollution, in particular through the use of Best Available Techniques (BAT), to prevent or minimise emissions from industrial emissions activities. SEPA may when carrying out a relevant function related to other emissions activities have regard to any applicable Scottish, UK or EU guidance on the best available techniques for preventing or where that is not practicable, reducing emissions from an activity when taking into account the general aims.

EASR authorisations can specify design and control measures for odour management and authorisations are periodically reviewed to ensure they reflect current BAT.

## Part II of EPA90 (known as waste management licensing)

The aims of the Waste Management Licensing (“WML”) regime under Part II of EPA90 and the Waste Management Licensing (Scotland) Regulations 2011 (known as “WML regulations”) included ensuring that waste is recovered or disposed of without endangering human health, and without causing nuisance through odours. Waste management activities are now regulated under EASR, which makes a number of consequential amendments to the provisions of Part II of EPA90 that remain extant. Under Schedule 11 of EASR, waste management activities include landfill activities, incineration or co-incineration of solid or liquid waste at a waste incineration or co-incineration plant, recovery of waste by application to land for the purpose of soil improvement, and the management of waste motor vehicles, waste electrical and electronic equipment and batteries, each of which also has its own technical schedule. As noted above, certain waste management activities are included within Annex I of the IED and are therefore regulated as a Schedule 20 emissions activity under EASR as well as being a waste management activity under Schedule 11 of EASR, to which specific technical schedules may also apply.

The EPA90 regulation 33 (1) (c) provides it is an offence for a person to keep or manage controlled waste in a manner likely to cause pollution of the environment or harm to human health. Schedule 22 of EASR amended EPA90 regulation 33 (a) and (b) as it remains an offence to deposit controlled waste or submit controlled waste to any listed operation as well.

For the purposes of EPA90, “pollution of the environment” means pollution of the environment due to the release or escape into any environmental medium from land where controlled waste is treated, kept or deposited, or from fixed plant by means of which controlled waste is treated, kept or disposed of, of substances or articles constituting or resulting from the waste and capable (by reason of the quantity or concentration involved) of causing harm to man or any other living organisms supported by the environment (Section 29(3) EPA90).

“Harm” for this purpose means harm to the health of living organisms or other interference with ecological systems of which they are part and in the case of man includes offence to any senses or harm to property (Section 29(5) EPA90).

The EASR regulations place a duty on SEPA to take the general aims into account when carrying out a relevant function. The general aims are that all appropriate measures are taken:

 to prevent or, where that is not practicable, to minimise environmental harm;

1. to prevent and to limit the consequences of accidents which could have an impact on the environment; and
2. to use resources in a sustainable way, in the carrying on, and decommissioning, of regulated activities and following cessation of the carrying on of the regulated activity.

As set out above for industrial activities, environmental harm is defined in the Regulatory Reform (Scotland) Act 2014 and includes offence to the senses of human beings.

Notwithstanding the revocation of the WML Regulations by EASR, most of the provisions of the WML Regulations continue to have effect in relation to almost all existing waste exemptions until 1 November 2026. These set out a number of relevant objectives in relation to waste management, including –

“Ensuring that waste is recovered or disposed of without endangering human health and without using processes or methods which could harm the environment and in particular without:

1. risk to water, air, soil, plants or animals; or
2. causing nuisance through noise or odours; or
3. adversely affecting the countryside or places of special interest.”

[You can read further details on SEPA's functions and the legislation we enforce on our website.](https://www.sepa.org.uk/)

Emissions of odours from other sources such as sewage works not subject to EASR are regulated by local authorities under statutory nuisance provisions.

## Statutory nuisance

Local authorities rather than SEPA regulate statutory nuisance under Part III of EPA90. The definition of statutory nuisance in this act includes an odour arising from industrial or commercial premises which is prejudicial to health or a nuisance. The provisions require a local authority to investigate any complaints of statutory nuisance and also to inspect their area from time to time to identify any potential statutory nuisances which ought to be dealt with.

If the activity is regulated under EASR, SEPA may deal with nuisance issues arising if the nuisance relates to the regulated emissions. In circumstances where SEPA is able to take action under EASR in respect of a matter constituting a statutory nuisance, the local authority needs the consent of the Secretary of State if it wishes to institute summary proceedings for statutory nuisance under Part III of the EPA90. This is to prevent dual regulation.

## Planning

Before any new or altered activity is undertaken there is normally a requirement for the operator to obtain relevant planning permissions under the Town and Country Planning Scotland Act 1997 which specifies controls over new or changed developments. The planning system has an important role in preventing or minimising odour impacts from new or changed developments by regulating the location and, to a certain extent, the specification of some design and control parameters of these activities or developments. SEPA is a consultee for most planning applications and is a statutory consultee for larger developments subject to the requirement to undertake environmental impact assessments. If SEPA is the regulator of an activity under EASR, we will advise the local authority accordingly and highlight any potential issues associated with the activity including for example, its potential to give rise to odour.

More information on the planning regime in Scotland can be found at a [Guide to the Planning System in Scotland.](https://www.gov.scot/publications/guide-planning-system-scotland/)

# Part 1: The general fundamentals of odour

## 1.1 What is an odour?

Odour is perceived by our brains in response to chemicals present in the air we breathe. Odour is one of the effects that those chemicals have on us. Humans have a sensitive sense of smell and can detect odour even when chemicals are present in very low concentrations.

The subject of odour is a highly complex one and the response of an individual to odour exposure is subjective: their reaction will depend on issues such as how strong it is, what it smells like, how often and when it occurs and in what context.

The following characteristics are relevant in the assessment of odours:

* An odour can arise from a single substance or from a combination of substances.
* In combination with other substances, the characteristic odour of a single substance can be modified so as to be unrecognisable.
* Odour changes as the mixture becomes diluted. Individual components may fall below their odour threshold.
* Odours from a substance or mixture of substances can be pleasant when dilute but offensive when concentrated.
* Odours that are pleasant or acceptable to one person can be offensive and unacceptable to another and individuals can have different sensitivities to odour.

## 1.2 Effects and health impacts of odour

The main concern with odour is its ability to cause an effect that could be considered ‘objectionable’ or ‘offensive’, resulting in annoyance, nuisance, or actual harm. An objectionable or offensive effect can occur either where an odorous compound is present in very low concentrations, usually far less than the concentration that could harm physical health, or when it occurs in high concentrations.

A wide range of symptoms can be experienced by people exposed to offensive odour including vomiting, respiratory problems, nausea, drowsiness, fatigue, eye complaints, nose and throat irritation, hoarseness, headache, diarrhoea, chest tightness, nasal congestion, palpitations, and shortness of breath. Many of these may be secondary symptoms resulting from anxiety brought on by exposure to offensive odour. A 2020 risk assessment by Public Health Scotland into offsite impacts from a landfill site concluded that exposure to ‘persistent offensive odours may themselves generate anxiety and lead to health concerns.’ The report went on to say that ‘any anxiety induced could itself be considered as a form of adverse health impact’[[1]](#footnote-2)*.*

Health effects such as headache and nausea can have a significant impact on a person’s daily activities and the long-term effect of such symptoms is unknown. It is clear that these symptoms can arise at concentrations well below those associated with toxic effects or thresholds for mucus membrane irritation but are at olfactory detectable levels.

The human response to odour can be affected by pre-disposed psychological and social factors, including susceptibility. The severity of symptoms is also related to a person’s level of concern about the potential harm of the odour to their health, suggesting there is a high psychological influence on the manifestation of any physical symptoms[[2]](#footnote-3).

Variability in susceptibility to detectable odour is one of the major reasons affecting any action taken to address odour problems. Two aspects of variability are linked to conditions called “chemical odour intolerance” and “multiple chemical sensitivity”. “Chemical odour intolerance” is a condition where “chemical smells” trigger symptoms in affected individuals. Such people have a greater tendency towards anxiety than the general population, but no clear criteria exists on which a prediction of chemical odour intolerance can be based.

“Multiple chemical sensitivity” is related to a condition that affects a minority of people with chemical odour intolerance. Pregnant women are particularly susceptible to the effects of odour with exposure being associated with an increased risk of nausea and vomiting. Other susceptible sub-populations include elderly persons and people with asthma or other respiratory

illnesses. Children, as a result of their small body weight and developing respiratory system, are also classified as a susceptible sub-population.

Prolonged exposure to an odour can result in people becoming desensitised so that they can no longer detect the odour despite the odorous chemical being constantly present in the air. Conversely, individuals may become sensitised to olfactory stimulants through acute exposure events or as a result of repeated exposure to nuisance levels of odours.

Appendix 1 provides technical data on reported thresholds for both odour detection and the health effects of individual compounds. Various chemicals may combine (chemical mixture) to exacerbate the health effects or odour annoyance which would otherwise be caused by individual compounds.

SEPA staff can obtain further advice on health effects by contacting SEPA’s DE&I Advice Helpdesk. It may also be helpful to contact [Health Protection Scotland](https://www.publichealthscotland.scot/) (part of Public Health Scotland) and the relevant local health board for information.

## 1.3 Why assess odour?

The effects of odour emissions are assessed for a wide range of reasons, including investigating complaints and determining applications for an authorisation. The amount and type of information required for an assessment depends on the circumstances of the odour discharge and the reason for undertaking the assessment. Usually, the aim of the assessment is to determine the source of the odour and whether it is offensive, therefore causing adverse effects on the local community.

Odour assessments can generally be categorised as being needed for one of six reasons:

* Considering environmental impact assessments and planning applications.
* Determining environmental authorisation applications.
* Reviewing an existing environmental authorisation.
* Monitoring compliance with environmental authorisation conditions.
* Investigating odour complaints or incidents.
* Taking enforcement actions as necessary.

## 1.4 What is an offensive odour?

EASR defines pollution as the direct or indirect introduction, as a result of human activity, of substances, vibrations, heat or noise into air, water or land which may be harmful to human health, or cause offence to any human sense, or the quality of the environment, result in damage to material property, or impair or interfere with amenities and other legitimate uses of the environment[[3]](#footnote-4). In the context of EASR or EPA90, odour can be considered to cause pollution by causing offence to human senses, or harm to human health, or harm to the quality of the environment. An understanding of what is offensive is critical to effectively regulate activities which can give rise to the release of odorous substances.

The key to understanding the principle of an offensive odour is that the mere presence of an odour does not necessarily mean that it is offensive. However, all odours, even relatively pleasant ones, have the potential to be considered offensive in certain circumstances. The characteristics of an odour that are taken into account when assessing its offensiveness are Frequency, Intensity, Duration, Odour description/character (i.e. Unpleasantness), and Location; sometimes described by acronym FIDOL.

**Table 1: FIDOL Descriptions**

| **FIDOL parameters** | **Description** |
| --- | --- |
| Frequency of detection | How often the exposure occurs |
| Intensity of exposure | The perception of the strength of the odour |
| Duration of exposure | The length of any particular odour event or length of time exposed to the odour |
| Odour description/character | The character or description of an odour as it relates to its inherent properties. Hedonic tone (pleasant, neutral or unpleasant) can be used here. |
| Location | The type of receptors and distance from source e.g., housing, play areas, areas of particular sensitivity etc and also local meteorological conditions |

When assessing the levels of polluting substances necessary to avoid harm to health it is usual to determine appropriate numerical values for such limits. In the case of odour, the response of the human nose means that each individual will make his or her own assessment as to whether the odour is offensive and whether it is acceptable. As stated above, odour can be detected at very low concentrations, often at or below the sensitivity of environmental sampling and analysis techniques currently available.

Whilst it is possible to measure the odour concentration using a standardised method (dynamic olfactometry as detailed in BS EN13725), it is more difficult to quantify the offensiveness of the odour. Where numerical rankings are used to try and simulate the sensory annoyance, they still rely upon subjective analysis and hence standardisation is almost impossible. In general, odour effects are not caused by one single pollutant or chemical species: odour is often a 'cocktail' of chemical species emitted from a process.

The nose is an extremely sensitive odour receptor - it can respond to small variations in odour over periods of a few seconds and at concentrations of fractions of a part per billion. There are many factors that influence the perception of an odour, including variations due to the subjectivity of the receptor, dispersion of odour due to local meteorological conditions and variations in the generation of odour due to raw materials and cycle operations used in the process. In general, there is very little difference between the offensiveness of an odour and its potential to cause nuisance. The assessment of offensiveness of odour remains a subjective sensory olfactory response of observers. However, much of this subjectivity can be removed by applying the FIDOL framework to odour assessments.

All of the above FIDOL factors must be considered when determining whether or not an odour is offensive, and in the context of EASR or EPA this is referenced to an “offence to human senses”. It is important to realise that, given the subjectivity of offensiveness, an assessment of odour impact must be made in a systematic manner detailing observations made at the time of the assessment. This guidance provides methods to assess the nature of an odour.

A benchmark criterion of “no reasonable cause for annoyance” is suggested to establish the point at which an odour impact becomes unacceptable. That point was established in studiesundertaken in other countries as being the point where the majority of an affected population would not find the odour to be unacceptable. For modelled releases, this point was established where odour in the air was estimated to be higher than a suggested level based on a 1-hour average for 98% of the time. This provides a reasonable basis to inform the design of new installations or the required upgrading of existing facilities, but it does not address the issue of the proportion of an affected community which may be more sensitive to odour than the normal population.

There is no clear benchmark for assessing an odour for offensiveness. For some people even otherwise pleasant odours may cause offence. Similarly, no one method for assessing offensive odour has been established which would cover all eventualities. Part 2 of this guidance provides methods and assessment benchmarks that can be used to assess whether or not any proposed activity is likely to give rise to significant pollution or cause offensive odour. Part 3 of this guidance provides advice on regulating operational sites while Part 4 provides advice on responding to and taking action in the event of offensive odour being detected beyond the boundary of a site.

## 1.5 Parameters associated with odours

### 1.5.1 Odour units

This parameter is frequently encountered in the field of odour measurement: in simplest terms, it is the amount of dilution required to bring a specific species (or species group) of chemical in a given air sample to its detectable threshold. The greater the amount of dilution required, the more odorous the sample and the lower the odour threshold. The analysis is performed by a selected human panel and the result is presented as mg.m-3 (for pure single substance samples) or European Odour Units OUE.m-3. Many publications carry tables of odour thresholds for single substances but there is often conflict between these and often the threshold is reported as a range rather than a specific number. Comparing a chemical quantification to the odour threshold of a simple one to two species odour can be somewhat effective, but as the chemical mix of the odour becomes more complex, the odour threshold of specific components is of little use.

### 1.5.2 Hedonic tone

Hedonic tone is a somewhat arbitrary and subjective term in many ways. Essentially a panel of human assessors is exposed to a given sample and asked to rank it on a scale. There are a number of scales used but for the purposes of this guidance the +4 (pleasant) through zero (neutral) to -4 (unpleasant) scale will be referred to and is provided in Appendix 1.

### 1.5.3 Odour characterisation (by description)

Odour is often characterised using a list of standard descriptors which can vary between countries and even between different laboratories within a country. Generally speaking, a panel of assessors are exposed to an odour and asked to describe it in terms of a given list of adjectives (e.g. floral, fishy, earthy etc) and assign it an intensity on a predetermined scale such as hedonic tone. Descriptions of some common odours are provided in Appendix 1.

## 1.6 Monitoring odours

This section summarises techniques available for the “quantification” of odour in air as it relates to the investigation of offensive emissions from odorous processes. Odours will generally fall into two distinct groups: chemical and biogenic-organic. In general, the available techniques can be broken down into two different approaches: sensory and chemical techniques. The appropriate technique essentially depends on the objective of the exercise and the likely chemical cause of the odour. It is strongly advised that specialist advice is taken before undertaking monitoring for odours: SEPA staff can obtain advice from the Field Chemistry Unit within the Data, Evidence and Innovation portfolio.

The quantification of offensive odour is often inherently difficult because it seeks to relate concentrations of chemical species in air to human sensory perception. For the most part, members of the public will not complain about a specific compound but of a generally foul odour. Most such complaints will arise from biogenic sources e.g. animal rendering, AD, composting, fish processing, maggot farming and distillery dark grains plants. In cases such as these, the odour is invariably made up of a cocktail of dozens of different compounds which vary in concentration over time; it is essentially impossible to strictly quantify these on a chemical concentration basis and often, attempting to do so leaves resolution of the problem no nearer. In these cases, sensory methods are often (but not always) the best approach.

At the other end of the spectrum, some processes will be known to emit a very few simple malodorous species e.g. specific chemical synthesis installation, brickworks. In these cases, chemical quantification can be useful, especially because several of the species may come directly under the remit of specific air quality regulations.

### 1.6.1 Chemical quantification

The advantage of chemical techniques is that specific odours can be quantified and compared to known air quality limits (or, alternatively, published odour thresholds for individual species).

“Chemical” odours cover atmospheric releases of small, easily identifiable odour-causing molecules. Examples of this include sulphur dioxide release from liquid and solid fuel combustion or brickworks, toluene from print works and styrene and 1,3-butadiene from synthetic rubber production. Other discrete molecules which may be quantified include ammonia, hydrogen sulphide and formaldehyde. In these instances, it is preferable to attempt to directly quantify the identified species by conventional chemical/analytical methods because doing so allows comparison against authorisation conditions (in the case of stack/source monitoring) or legal air quality standards (ambient monitoring). Recognised monitoring techniques are readily available for use in these situations. This is by far the simplest (and rarest) scenario encountered during odour investigations.

“Biogenic-organic” odours cover a multitude of processes where organic material is being processed in some manner. The nature of these processes is such that the exact chemical composition of the odour is highly unlikely to be well characterised beforehand and is likely to consist of dozens of chemical species of different classes present at different (and temporally varying) concentration. Some very limited chemical characterisation can be attempted in such situations: in terms of stack monitoring, the CEN standard BS EN 13649 may be applied: This technique involves withdrawing a sample of gas from the stack onto absorbing tubes which are then transferred to an analysing laboratory for desorption and gas chromatography (GC-MS or GC-FID) quantification. A similar approach can be taken in ambient monitoring, using either active or passive absorbing tubes.

Both techniques have severe limitations however: the choice of absorbing material determines the class of compound which is most efficiently trapped i.e. some knowledge of the species of interest is required beforehand. In stack monitoring, hot, wet gas streams are often problematic in terms of pollutant condensation and loss.

Additionally, the analysis of the species present is almost invariably done by library-matching the GC-MS/FID results i.e. it is semi-quantitative because the absolute quantification requires extensive validation and the purchase of numerous standard materials. Finally, the results of such an exercise will likely yield a long list of many organic compounds of different classes. For example, such an exercise undertaken at a distillery dark grains plant detected over forty species including aldehydes, ketones, mercaptans, alcohols, hydrocarbons and organic acids: some of these were over the odour threshold, some under. It is highly unlikely that any one particular species could be identified as the cause of the odour because there will be a collective effect of all species to produce the odour. For these reasons, biogenic odours are best approached with sensory techniques.

Despite its limitations for odour investigation, chemical quantification data is extremely useful when choosing the most appropriate options for odour abatement. It is vital that an operator understands the constituents of their waste gases to enable suitable design and sizing of their abatement system.

Chemical quantification can also be useful when comparing inlet and outlet gases from abatement equipment to assess the efficacy of treatment.

### 1.6.2 Sensory techniques: dynamic olfactometry

The biggest advantage of sensory techniques is that they provide a direct link between the odour and human perception. The disadvantages are that it is necessarily labour intensive and not continuous. In addition, sampling from sources is generally performed by means of pumped extraction of a gas stream into a Tedlar bag and therefore the problems associated with hot, wet gas streams also apply, but they can be overcome to a certain extent using either static or dynamic pre-dilution.

The relevant standard method for olfactometry is BS EN 13725 *Air Quality – Determination of odour concentration by dynamic olfactometry*. This method is used throughout Europe, replacing many earlier national standards.

The unit used in olfactometry is the European Odour Unit, OUE.m-3. This is defined as the amount of odorous species that, when evaporated into 1 cubic metre of neutral gas at standardised conditions, elicits a response (detection threshold) from a panel equivalent to that elicited by one European Reference Odour Mass (EROM) under the same conditions. The reference substance used is n-butanol. One EROM of n-butanol is 123µg.

The test itself involves a selected panel of assessors and is conducted on a dilution rig. The testing philosophy is that of triangular forced choice i.e. each panel member is confronted with three “sniffing ports” one of which is the diluted sample, whilst the other two are neutral gas. The panel member must then make a yes/no choice as to which port is the active diluted sample port. Successive dilutions of the sample are presented to the panel members and a complex statistical calculation made to determine the final result, which attempts to take into account the natural variability of human response.

Although slightly cumbersome, costly and labour intensive, this method remains the only reliable way of actually assigning a numerical value to a complex odour. This approach has been used in a regulatory sense, as described in the two examples below.

An industrial premises boundary or receptor limit is set in terms of OUE.m-3 (generally on the 98th percentile). The precise value of this limit is determined according to the nature of that odour i.e. the greater [the potential for nuisance and loss of am](http://www.sepa.org.uk/air/process_industry_regulation/pollution_prevention__control/uk_technical_guidance/uk_horizontal_guidance/h4_2.aspx)enity from a particular odour, the lower will be the appropriate limit [(see H4 Guidance](http://www.sepa.org.uk/air/process_industry_regulation/pollution_prevention__control/uk_technical_guidance/uk_horizontal_guidance/h4_2.aspx) on Odour Management for examples of limits for various industrial processes: note these are essentially empirical in nature). A dispersion modelling exercise is then conducted using the actual emission rate in OUE./s as determined from dynamic olfactometry testing from an enclosed source e.g. a chimney stack. An atmospheric dispersion model is run to assign a limit value to the stack source (OUE.m-3) so that the boundary/receptor condition will not be breached in the worst-case dispersion conditions. It must be emphasised that this is a complex exercise, only applicable to emissions from ducted sources such as stacks and is not readily applicable without careful consideration to area and fugitive sources, due to the uncertainties in modelling such releases. Ambient dynamic olfactometry cannot be used because the value for ambient air can be up to 100 OUE.m-3. This exercise determines the additional odour contribution over and above the background level to the odour at the downwind point which can be attributed to the original source.

Olfactometry can also be used to determine the operational efficiency of odour abatement equipment. This will typically involve the olfactometric evaluation of a gas stream before and after the abatement unit(s). Minimum operational percentage efficiencies may then be applied to the equipment. This approach can be useful in determining whether or not abatement is being maintained and is effective. It should be noted that during some operational plant conditions, chemical reactions within abatement plant can actually result in the treated gas having a higher odour concentration in OUE.m-3 than the raw gas. In both given examples, it must be noted that several practical considerations may exclude the use of olfactometry, most commonly, lack of suitable sample ports and platforms and potential sample degradation due to wet, hot gas streams resulting in condensation. Another potentially confounding factor can be encountered when applying olfactometry based methods to processes which are highly variable in nature e.g. installations which process a wide variety of materials.

### 1.6.3 Sensory techniques: field testing/investigation using FIDOL factors

Often, when dealing with potential offensive odour complaints, SEPA officers will receive a communication from a member of the public which may require field deployment in order to investigate and/or verify the justification for the complaint. In such circumstances it is unlikely that instrumental techniques or procedures to initiate a dynamic olfactometry will be available within the required timescale. In such circumstances, a sensory field test (often referred to as a “sniff test” using “FIDOL factors”) is generally the most appropriate approach. The FIDOL factors along with a detailed description of the technique is set out in Part 4 and Appendix 3 to this guidance.

The principle of a field test is relatively simple: first, the officer will visit the area of the complaint. Assuming they can identify the likely source of the odour (from local knowledge, information gleaned from the complainant etc), the officer should then identify several testing locations, some upstream and some downstream of the suspected source. The exact number and location of the testing locations depends on the topographical area and the likely odour sources and receptors. At each location, the officer should use their olfactory sense to assign a scaled numerical attribute to the intensity, duration and location of any odour encountered, along with a description of the odour. Basic meteorological conditions should also be noted (e.g. air temperature, wind speed and direction, precipitation etc). Finally, any other relevant supporting information should also be recorded: typically, this will include any confounding factors, unusual operating conditions at the suspected installation and sensitivity of the testing location. A site visit may also be conducted after the field assessment to help pinpoint the source. This is not always appropriate though and it is the operator’s responsibility to identify and understand all odour emissions and ensure these are prevented or minimised as far as possible.

Field testing can be used in conjunction with other techniques on a long term, scheduled basis in order to build up a profile of the location. Again, further guidance on the details and suggested procedural approaches is provided in Part 4 of this guidance and in Appendix 3.

Operators of activities with a risk of generating offensive odours are also expected to carry out some form of field assessment for potential impacts to receptors. Whilst this does not need to follow the FIDOL framework it must be carried out using a recognised method or standard and have a clear purpose with defined actions should odour pollution be found.

It however important to note that operators and members of their staff may experience both short and long-term olfactory adaptation. This normal phenomenon causes individuals who work on site and are exposed to higher levels of odorous emissions, often for extended periods of time, to have reduced sensitivity to those odours. This may not be apparent to them because their sensitivity to other odours will be unaffected. Operators and staff may sometimes detect other odours in the community which they are not adapted to and conclude, often incorrectly, that odours from those sources are causing problems instead. Olfactory adaptation must be accounted for in field assessment methods.

# Part 2: New or changed facilities

## 2.1 Planning consents

Planning authorities play the key role in land use decisions such as the suitability of locations for industrial facilities which could result in the release of odour. The application for planning consent is often the first opportunity SEPA has to make our views formally known to the applicant and to the wider community regarding a proposal to build and operate a facility that may give rise to offensive odour. Some industrial trades are inherently odorous by virtue of the materials they process, generate, use or store. Any response to a planning consultation should acknowledge that, even with the use of best industrial practice, from time to time such facilities may give rise to offensive odour. In some circumstances the ability to adequately disperse the release of offensive odour may be limited due to inadequate set back distances between the site and receptors so that a local community may be affected to a greater degree. Responses to planning consultations should be comprehensive and clear to ensure that the planning authority is made fully aware of potential problems with particular activities that by their nature or proposed location may give rise to offence arising from the release of odorous substances. Such interventions may serve to influence planning authority decisions and help to ensure that planning permission should not be granted for facilities in inappropriate locations.

An application for planning consent is often made before any application for an environmental authorisation to operate. This can result in a lack of information in a planning consultation, making it necessary for SEPA to come to a considered view on the likelihood of a release of odour. Applicants/operators should provide sufficient information and should consider submitting applications for planning consent and any required environmental authorisation at the same time. It is recognised that in some circumstances the information available at the planning stage may not be sufficient to satisfy the requirements of the environmental authorisation application, for example detailed design is incomplete. At a minimum, the planning application must provide the necessary information to inform SEPA about key environmental matters – including the potential for odour impact.

In recent years SEPA have seen an increase in developers seeking planning permission for housing and other developments which encroach on the set-back distance between odorous sites and existing receptors. This can present significant problems. For example, the operator of an odorous process, when they applied for an authorisation, may have demonstrated no odour impact at existing receptors however this may not hold up if new, closer receptors are introduced. In this case, the risk of offensive odour impacting the new receptors will be high and significant investment and time may be required to resolve the situation. Careful consideration should therefore be made when responding to such a planning consultation and advice should be sought from SEPA’s Planning department.

Further guidance on SEPA’s planning role can be found on the SEPA website.

Data from The Environment Agency’s complaints database over several years has provided us with an indication of how far from an authorised place odour complaint can occur (corresponding to the 75th percentile of odour complaints by sector); these distances are provided below. We therefore recommend that planning authorities consult with their Environmental Health Department for any new development proposals within these distances to determine whether a detailed assessment is necessary and whether the development is compatible with the existing authorised place.

* Landfill – 2km.
* Biowaste (e.g. SEPA authorised composting, anaerobic digestion, sewage sludge treatment)- 1.5km.
* Farming (e.g. SEPA authorised intensive agriculture processes) – 1km.
* Food & Drink (SEPA authorised processes) – 1km.
* Waste treatment – 0.5km.

## 2.2 Environmental authorisation

The general aim of any environmental authorisationis to ensure an activity is operated in such a manner that environmental harm is prevented or, if that can’t be done, minimised as far as possible.

The initial design and construction of any industrial plant offers the best opportunity to ensure that appropriate techniques or methods are included to prevent or minimise pollution including the release of odorous substances which might be offensive or cause nuisance.

This could result in, for example, selection of different raw materials with a lower odour threshold or the identification that odour abatement equipment is required. Engaging with operators at an early stage of process design can lead to significant improvements to protect the environment and can result in more cost-effective environmental protection devices which are an integral part of the design.

A critical element of assessing the suitability of proposed techniques or methods to prevent or minimise the release of odorous substances is the provision of robust and comprehensive proposals to effectively manage the operation of the industrial activity. The best designed and constructed equipment can fail if operated by poorly trained or inadequately supervised staff. Examples of techniques, including the management of odour, are provided in Appendix 4.

During the determination of an application for an environmental authorisation, regard must be given (subject to the requirements of the appropriate Schedule) to the release of odorous substances and the potential offence to any human senses or impairment or interference with amenities and other legitimate use of the environment that could occur, i.e. could it cause pollution or offence. It is for the applicant to provide the necessary information to allow SEPA to make a determination.

All sites with the potential to generate offensive odours must have an odour management plan (OMP). The scope and level of detail in an OMP will depend on the nature of the activities being undertaken and must be proportionate to the risk to receptors. See Appendix 5 for information.

## 2.3 Assessing odour release for the purposes of determining an application for an environmental authorisation

EASR places a duty on SEPA to take the general aims into account when carrying out a relevant function. These general aims are that all appropriate measures are taken –

(a) to prevent or, where that is not practicable, to minimise environmental harm;

(b) to prevent and to limit the consequences of accidents which could have an impact on the environment; and

(c) to use resources in a sustainable way,

in the carrying on, and decommissioning, of regulated activities and following cessation of the carrying on of the regulated activity.

Environmental harm is defined in the Regulatory Reform (Scotland) Act 2014 and includes offence to the senses of human beings.

For schedule 20 emissions activities, SEPA must where applicable set permit conditions in accordance with a number of principles relevant to BAT, including that best available techniques are applied as appropriate. In determining best available techniques, SEPA is required to consider a number of criteria, including the nature, effects and volume of the emissions concerned and the need to prevent or reduce to a minimum the overall impact of the emissions on the environment and the risks to it. Similarly when determining or revising standard conditions in relation to schedule 20 emissions activities, SEPA must ensure an integrated approach and a high level of environmental protection equivalent to that achievable with individual permit conditions and that the conditions are based on the best available techniques for preventing, or where that is not practicable reducing, emissions from an activity.

For other emissions activities (EASR Schedules 26, 27 and 28), SEPA may when carrying out a relevant function have regard to any applicable Scottish, UK or EU guidance on the best available techniques for preventing, or where that is not practicable, reducing emissions from an activity when taking into account the general aims set out above.

In addition, EASR requires SEPA to take the waste hierarchy aim into account when specifying permit conditions and determining or revising standard conditions for waste management activities and schedule 20 emissions activities. The waste hierarchy is to be applied in a way which delivers the best overall environmental outcome and takes account of the overall environmental, human health and social impacts amongst other considerations.

There also remains a duty on SEPA to discharge waste regulation functions under Part II EPA 1990in accordance with “relevant objectives” (Schedule 4, paragraphs 4 & 5 and table 23). These include:

“…ensuring that waste is managed without endangering human health and without using processes or methods which could harm the environment and in particular without-

(i) risk to water, air, soil, plants or animals; or

1. causing nuisance through noise or odours; or
2. adversely affecting the countryside or places of special interest”

[Schedule 4, paragraph 6(1)]

As described in Part 1 above, the release of odorous substances can lead to offence, annoyance, nuisance and health impacts from physiological response to unpleasant odours. The following guidance is provided to assist officers in determining applications and deciding on what conditions, if any, should be included within an environmental authorisation (if such an authorisation is to be issued) to ensure that the requirements of EASR can be achieved, to prevent or, where that is not practicable, to minimise environmental harm.

This guidance provides benchmark standards and guidance for all waste management, industrial emissions and other emissions activities that may be regulated by SEPA. The scale and extent of techniques to be adopted to prevent environmental harm will vary according to the specific circumstances of any activity, e.g., the nature and amount of odorous substances kept or used on site.

The fundamental aim of odour control is to ensure that, where odorous substances are used or generated (i.e., where they cannot be avoided), they are controlled using a high level of containment, and if required, leading to well designed, maintained, and operated abatement systems. Any exhaust gases must also be discharged to the air via appropriately designed chimneys etc (see [air emissions risk assessment for your environmental permit](https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit)[[4]](#footnote-5)).

Fugitive and other non-contained emissions should be avoided. A hierarchy of control is listed in Table 2 below.

**Table 2: Hierarchy of control options for odorous substances**

| **Order of hierarchy** | **Control Technique** |
| --- | --- |
| 1 | Avoid using odorous substances altogether. |
| 2 | Where odorous substances are present, they should be used and stored in contained systems\*. |
| 3 | Where odorous substances cannot be fully contained, they should be captured using local ventilations systems (e.g., fume hoods) and the exhaust gases suitably treated to reduce the amount of odorous substances present. |
| 4 | Where odorous substances cannot be contained or collected locally then a building or structure should be constructed, maintained and operated to offer a high level of room containment such as having sealed (air locked) working areas, room extraction with at least three-room air changes per hour as a minimum and the exhaust gases suitably treated to reduce the amount of odorous substances present to a minimum. The number of air changes must be justified as being sufficient to prevent fugitive emissions. |
| 5 | Any treated gases are discharged to the air via appropriately designed chimneys. |

\* In this instance ‘contained systems’ is taken to mean that the odorous substances are enclosed such that they cannot escape to the immediate environment. Process buildings are generally not considered to be fully ‘contained systems’ without an extraction and abatement system because they are likely to have gaps and openings. It is accepted that for certain activities it is not always possible to contain odorous substances due to the nature of the activity being undertaken. Such activities may include landfill, composting (open windrows), land spreading and coating of large vessels/objects etc. In such circumstances deviation from the hierarchy is accepted, but alternative control methods must be described, and their use justified. Control methods for odour from such activities are discussed in Appendix 4.

An applicant should clearly demonstrate that the proposed odour management system to be used complies with the above hierarchy. Where exhaust gases are released, or could be released, the applicant should consider whether or not that release could result in pollution (as defined in EASR). This assessment should consider routine and reasonably foreseeable non-routine operational scenarios such as start-up and shut down, or failure of the abatement technology e.g. a relief valve operating bypassing the abatement equipment.

Officers determining an application should ensure that the applicant addresses these points.

Assessments should be proportionate to the likely probability of any release. All applications will require some assessment if only to discount them from further detailed assessment. The assessment should be escalating in terms of scope, detail and complexity based on the identified or suspected risks of the release of odorous substances.

For an application for an installation or a waste operation which does not handle or generate odorous substances, pollution impact from odour should be able to be screened out and need not be assessed in detail. An application for an installation handling small amounts of known odorous materials (for example a solvent) s[houl](http://www.environment-agency.gov.uk/business/topics/pollution/37231.aspx)d be assessed using tools aimed at screening out insignificant impacts such as those contained in the EA guidance on ‘Air Emission Risk Assessment for your Environmental Permit’.

For an installation handling material with a high potential for release of odorous substances, a detailed assessment of the impact any release may have to be undertaken. This should, where applicable, include the use of predictive impact models such as ADMS or AERMOD. For further information on odour modelling please contact SEPA’s Airmod department within our Data, Evidence and Innovation portfolio.

The impact of the release of a mixture of odorous substances should be assessed against the criteria [listed in Ta](http://www.sepa.org.uk/air/process_industry_regulation/pollution_prevention__control/uk_technical_guidance/uk_horizontal_guidance/h4_2.aspx)ble [3. These odour expo](http://www.sepa.org.uk/air/process_industry_regulation/pollution_prevention__control/uk_technical_guidance/uk_horizontal_guidance/h4_2.aspx)sure criteria are derived from published dose effect studies[.](http://www.sepa.org.uk/air/process_industry_regulation/pollution_prevention__control/uk_technical_guidance/uk_horizontal_guidance/h4_2.aspx) The criteria describe ground level concentrations of different odour types which have been reported as being acceptable in the long term. If the odour is caused by the release of a single substance, then substance specific odour threshold information should be used.

The use of such criteria can also help the design of a facility and highlight areas of concern. For example, they can be used as part of the method to calculate the minimum chimney stack height required as set out in the EA guidance on ‘Air Emission Risk Assessment for your Environmental Permit’.

These criteria can also be incorporated into an applicant’s justification for choosing a certain odour abatement system over another. Other key pieces of information required to demonstrate the correct technology is being used include:

* The flow rate of the air requiring treatment (what is the volume? is it continuous flow or intermittent?).
* The contaminants present (individual contaminants, concentration, and variability) in the waste gas along with information on the advantages and disadvantages of a certain technologies to treat these.
* The temperature of the waste gas (average and maximum).

**Table 3: Schedule 20 emissions activities and indicative criteria of significant pollution** note1

| **Relative offensiveness of odour** | **Indicative criterion of significant pollution note 2** |
| --- | --- |
| **More offensive odours:**Activities involving putrescible wastesProcesses involving animal or fish remainsBrickworksCreameryFat & Grease ProcessingWaste water treatmentOil refiningLivestock feed Factory | 1.5 OUE/m3 | (1.0 OUE /m3)note 3 |
| **Odours which do not obviously fall within a high or low category:**Intensive Livestock rearingFat Frying (food processing)Sugar Beet Processing | 3 OUE/m3 | (1.0 OUE /m3)note 3 |
| **Less offensive odours (but not inoffensive):**Chocolate ManufactureBreweryConfectionaryFragrance and FlavouringsCoffee RoastingBakery | 6 OUE/m3 | (5.5 OUE /m3)note 3 |
| Note 1: Reference: EA H4 Guidance Appendix 3.Note 2: Odour Units (OUE) as 98th percentile of hourly averages.Note 3: Local adjustment for hypersensitive populations (odour generated a high level of complaint) - Reference: EA H4 Guidance Appendix 3. |

The indicative criteria as described in Table 3 are the recommended minimum criteria to be used in assessment.

Where an assessment indicates that the criteria could be exceeded for any release scenario then an applicant should be required to undertake further investigation and make proposals for preventing or minimising that release should it occur, so that the impact is likely not to exceed the criteria.

In situations where, despite the conditions of an authorisation, the general principles are likely not to be achieved, the refusal of an application (including variation applications) should be considered. For example, where it is evident that the assessment criteria above could not be met even after further prevention and minimisation work (i.e., circumstances are such that the applicant cannot provide reassurance on operating without causing environmental harm from routine reasonably foreseeable emissions) then refusing the application for an environmental authorisation should be considered.

The assessment method provided above examines average releases (hourly) and therefore does not address the potential for very short-term peak releases of odour. Such releases are likely to arise from abnormal operation and therefore, even if the assessment criteria are met, this would not guarantee that no offensive odour would be caused in any specific set of circumstances.

## 2.4 Controlling the release of odorous substances in environmental authorisations

Where an assessment indicates that the impact from releases would be acceptable any authorisation granted may still be required to contain appropriate conditions designed to ensure that the general principles of EASR are achieved.

### Industrial Emissions and Other Emissions Activities in EASR (Schedules 19 – 28)

For schedule 20 emissions activities, Schedule 20, paragraph 10(1) requires emission limit values to be set for polluting substances listed in Schedule 20, paragraph 2 of EASR, and other polluting substances likely to be emitted in significant quantities from an installation, having regard to the nature of the pollutant, and the potential for emissions to transfer pollution from one environmental medium to another. SEPA may supplement or replace an emission limit value by an equivalent parameter or technical measure ensuring an equivalent level of protection for the environment (Schedule 20, paragraph 10(2)).

For most industrial emissions and other emissions activities regulated under EASR, including landfills, it may be appropriate that as a minimum, a generic condition is included. Until recently this was as follows: “All emissions to air from the permitted installation shall be free from offensive odour, as perceived by an authorised person, outside the site boundary”.

Whilst this condition will appear in authorisations issued prior to 2022 there is a new standard condition as follows: “Offensive odours from the authorised activities as perceived by a SEPA officer must not be emitted beyond the boundary of the authorised place”. This is known as the odour condition. Prior to using this condition, it is advisable to check you are using the most up to date version.

Where the likelihood of the release of odorous substances is remote (i.e. odorous substances are not handled or generated) then the use of a generic odour condition may not be required.

For activities that could release odorous materials, the generic condition should be used as a minimum with additional conditions included as necessary to control specific aspects of the operation.

For Schedule 20 emissions activities, SEPA must where applicable set permit conditions in accordance with a number of principles relevant to BAT including that “BAT conclusions are the reference point for setting permit conditions”. This means that SEPA must consider the relevant [BATc documents](https://eippcb.jrc.ec.europa.eu/reference) when setting conditions in permits for schedule 20 emissions activities. For other emissions activities (EASR Schedules 26, 27 and 28), SEPA may when carrying out a relevant function have regard to any applicable Scottish, UK or EU guidance on the best available techniques for preventing, or where that is not practicable, reducing emissions from an activity when taking into account the general aims set out above. In both cases, this may include setting emission limit values for odour.

### Waste Management Activities in EASR (Schedules 11 – 18)

For most EASR waste management activities it may be appropriate that as a minimum, a generic odour condition is included. Until recently this was as follows: “Waste Operations shall be carried out so that offensive odours, in the opinion of an authorised SEPA officer, do not become detectable beyond the boundaries of the site”

Whilst this condition will appear in authorisations issued prior to 2022 there is a new standard condition as follows: Offensive odours from the authorised activities as perceived by a SEPA officer must not be emitted beyond the boundary of the authorised place. This is known as the odour condition and is the same as that used in authorisations for industrial emissions and other emissions activities. Prior to using this condition, it is advisable to check you are using the most up to date version.

Conditions imposed in any authorisation must always comply with ordinary principles of administrative law – that is they must be related to the underlying purpose of the legislation.

It may be appropriate to include bespoke conditions within a waste management activity authorisation particularly for activities with a high risk of generating offensive odours. These must be approved through SEPA’s bespoke condition approval route. Examples of these could include the following:

* A requirement to undertake routine odour monitoring (on and/or off-site) and record and act upon findings. This may include scientifically sampling and analysing emissions. Please note that it is unlikely that an appropriate method of self-monitoring is for a site operator to simply carry out brief boundary checks. Operators at odorous sites are likely to be adapted to the odours and less able to detect them. Self-monitoring will require careful consideration, and a detailed methodology should be agreed with SEPA. Using the FIDOL method set out in Part 4 and Appendix 3 may be appropriate, providing operator adaptation to the odours is factored in.
* A requirement to have a formal and recorded odour management plan (see Appendix 5 for additional guidance).
* The inclusion of specific operational, maintenance and management requirements e.g. site infrastructure requirements, odour capture and containment etc (often needed to control potential fugitive or diffuse releases).
* The inclusion of specific emission limit values either limiting specific substances or mixtures of odours (See Section 2.5).
* The inclusion of a specific odour destruction/abatement efficiency condition may be appropriate to ensure that key odour prevention and minimisation equipment is operating satisfactorily (in addition to the use of operational surrogates such as thermal oxidation temperature).

Examples of suitable conditions can be found in approved authorisation templates and conditions.

### Animal Rendering

Authorisations issued for animal rendering processes prior to January 2023 may include the following condition, which differs from SEPA’s standard odour condition referred to above.

“All emissions to air from the Permitted Installation [Authorised Place] shall be free from offensive odour, as perceived by an Authorised Person, outside the Site/Permitted Installation Boundary. It shall not be a breach of this Condition in a particular case if the Operator can show that all reasonable steps have been taken and due diligence exercised to prevent the release of offensive odour.”

The 2nd limb of this condition was drafted to take account of the [Secretary of State’s Guidance Note SG8 for the rendering sector](https://www.gov.uk/government/publications/rendering-sector-guidance-note-ippc-sg-8). This is statutory guidance in England and Wales however in the interests of national consistency SEPA also refer to this guidance when regulating animal rendering processes.

The definition of “Due diligence” in this context was inserted into the interpretation of terms section of authorisations and means the application of BAT.

Since January 2023, SEPA no longer use this condition in new animal rendering authorisations. Our standard odour condition set out in section 2.4 above is now used.

The Secretary of State’s guidance directs the regulator when setting a boundary condition, to take account of the fact that animal rendering processes give rise to particularly offensive odours and there may be circumstances where offense odorous are released for reasons which are beyond the direct control of the operator i.e., breakdown of abatement plant.

The same is true of other inherently odorous activities SEPA regulate which can give rise to particularly offensive biogenic odours i.e., anaerobic digestion, in-vessel composting. If offensive odours are found outside a site SEPA will consider mitigating factors such as abatement breakdown when deciding the most appropriate regulatory action. This does not require to be set out in a condition. It therefore provides greater clarity and consistency to operators and SEPA staff if our standard odour condition is aligned over all the sectors we regulate. SEPA do not intend varying existing authorisations at present however this may be done at a future permit review.

For officers regulating animal rendering activities, it is important to note the Secretary of State’s guidance states that, at a properly managed site, there should be “very few” escapes of offensive odour beyond the boundary of the site. It goes on to say there should be no more than two such occurrences in any 12-month period and they should not exceed two hours. In the event of this frequency being exceeded the regulator would be expected to undertake investigations into whether due diligence was being achieved.

Whether it’s the existing condition or SEPA’s standard condition being used, if offensive odour is verified outside a site the operator is expected to carry out an investigation into the likely cause. If it cannot be demonstrated that the emission is linked with a problem at the site such as abatement breakdown then it is likely that due diligence and therefore BAT is not being applied, and action will be required from the operator.

## 2.5 Setting Emission Limit Value type conditions within authorisations

In some circumstances it will be appropriate to include specific quantitative emission limit values within an environmental authorisation to prevent and minimise emissions of pollutants and to ensure that pollution including offensive odours cannot occur.

In no circumstance should the indicative criteria specified in Table 3 be used as specific conditions of an authorisation. These criteria cannot be used directly in conditions, because the measurement of odour in the environment is very difficult at such dilute concentrations as may be present in ambient air samples outside the site boundary. The criteria used are based on hourly averages over a year. It is possible however to use the odour indicative criteria to set enforceable conditions within the authorisation and monitoring can then be undertaken to show compliance.

**Case example**

The assessment of an application identifies that a release concentration, of a mildly offensive odour in the exhaust gases of 20,000 OUE/m3, could result in the 3 OUE/m3 on the 98th percentile in the environment being exceeded at a housing estate located near the installation. The operator can operate abatement equipment to reduce the emission concentration to 6,000 OUE/m3 which would ensure that the indicative criteria would not be exceeded. It would therefore be appropriate to impose this 6,000 OUE/m3 as an emission limit value within the permit to ensure that BAT is used. In this case the ELV would be set as though the odour were a distinct substance. It is not appropriate, as discussed above, to impose any boundary limit such as 3 OUE/m3. The boundary limit is used to derive an emission limit value at the release point.

Alternatively, it may be appropriate to set monitoring standards for odour removal/abatement within equipment. This would be undertaken by sampling both the inlet and outlet gases and comparing them to derive a removal efficiency. This would give an indication of how well equipment is operating and may help identify problems. Different types of abatement equipment have different odour removal efficiencies. Some examples are provided in Table 4.

**Table 4: Abatement equipment odour removal efficiencies** Note 1,2

| **Equipment type** | **Typical odour removal efficiency** |
| --- | --- |
| Adsorption e.g. activated carbon systems | Depending on chemical species involved, efficiency can be >99% |
| Peat and heather type bio filters | Up to 95% |
| Soil type bio filters | >99% |
| Bio-scrubbers | >99% |
| Absorption (wet scrubbers) | >90% (2 stage water scrubber)>99% (chemical/catalyst type) |
| Thermal oxidation/Incineration | >99% |
| Note 1: Each system has advantages and disadvantages depending on specific circumstances. More information on abatement systems is provided in Appendix 4Note 2: Assumes the equipment/technology is fit for purpose and is well designed, maintained and operated. In some circumstances a multi stage system may be required to ensure offensive odours are not detectable at receptors.  |

# Part 3: Regulating operational facilities

## 3.1 Obligations

The grant of an environmental authorisation places obligations on an operator to comply with the conditions of the authorisation. SEPA also has obligations to ensure that the conditions are complied with.

The nature and frequency of inspections of authorised facilities should be determined by assessing the likely risks associated with an activity.

## 3.2 Routine inspections and compliance assessment

For activities with the potential to release odorous substances, particular attention should be given during inspections to the techniques used to prevent or minimise the release of odorous substances, such as abatement equipment.

Appendix 4 provides useful information on the techniques that can be applied at these sites as well as providing notes on issues requiring particular attention during inspection.

Local management practices will be a general theme for inspection, because experience indicates that poor management practices in areas such as supervision, maintenance and training tend to lead to repeated and extended releases of odour. This aspect of controlling odorous substances should be one of the main focuses for inspection.

There are clear expectations that sites which may give rise to offensive odour are operated to a consistently high and robust standard such that the likelihood of a release is minimised, and where a release does occur, it is effectively managed to mitigate any potential impact. The objective of any inspection programme should be to ensure that operators have practicable, robust and tested systems in place to achieve this. As discussed above more inherently odorous sites may have several odour related conditions inserted into their environmental authorisation. Compliance assessment against these conditions should be undertaken on a regular basis and even sites with a lower potential for odour release should be checked for compliance with any generic or simplified odour related conditions.

## 3.3 Investigations

Further guidance on incident and complaint responses including investigations into poor performance can be found in Part 4, alongside Appendix 3 (covering the requirements in recording odour event assessments).

# Part 4: Incident and complaint response including investigation and enforcement

When responding to a complaint or when notified of an incident involving odour, the SEPA officer should take account of general guidance on responding to complaints and incidents.

When assessing an odour event, it is not always necessary for two officers to be present. A breach of the odour condition in an authorisation can be recorded where only one officer has verified the contravention using the FIDOL factors set out in Appendix 3. However, where formal enforcement is being considered it is strongly advised that two officers carry out the assessment. In particular, corroboration is a requirement for gathering evidence for criminal enforcement i.e., a report to the PF, and it is not always possible to conclude at the odour assessment stage whether enforcement action will follow and whether any enforcement will be criminal or civil. Whilst corroboration is not a requirement for gathering evidence where a civil enforcement penalty/tool may be used, it is a more sufficient standard of evidence.

As stated above in Part 1, the assessment that any odour is offensive must be undertaken with care. It is therefore essential that a systematic approach is taken to assessing whether or not any detected odour is offensive. Officers should carry out a field investigation (including a survey of the potentially affected area) and undertake the assessments specified in Appendix 3. This includes visiting any complainant as appropriate. Investigating officers should not go to the site suspected of giving rise to an odour until they have established the extent of any odour in the local area. This is to ensure that they have not become de-sensitised to the odour by being exposed to potentially high levels of the odour within the site, meaning that they can no longer detect levels of that odour which may be present in the wider environment. This is termed ‘adaptation’.

As stated in Section 1, the offensiveness of an odour can be classified by using the ‘FIDOL’ factors. Taking these factors into account, the investigating officers should determine or estimate:

* The extent or possible extent of the pollution.
* The impact that pollution is having or could have on the environment, offence to senses, loss of amenity or prevention of legitimate use of the environment; (e.g. local circumstances should be noted such as time, events taking place, areas of high amenity, the weather, etc.
* The duration, or likely duration, of the event.
* The nature of the release, in particular its description and offensive properties (e.g. reference to Appendix 1 for common descriptors, hedonic tone, etc).
* If the release has occurred in the past.
* Its frequency and its impact at that time.

The release of odorous substances, if the odour is offensive or causes a nuisance, is likely to be a breach of an environmental authorisation (or legislation, if it concerns contravention of a general binding rule). Attribution of offensive odour to its source site is therefore key to demonstrating such a breach. It is therefore important that observations and assessments undertaken during an investigation are recorded sufficiently.

As noted above, where formal enforcement action is being considered, it is strongly advised that the presence of offensive odour is corroborated, by another authorised SEPA officer, i.e., two SEPA officers will attend and investigate an odour incident.

Appendix 3 provides the FIDOL form along with guidance to record officers’ assessments.

Where possible, the field investigation should identify the potential source of the odour. It is therefore important that the nature of the odour is described (along with details of the wind direction at the assessment location(s)), and that upwind and downwind assessments are undertaken to establish the source of the odour. Once the source and the offensiveness of the odour have been established, an officer should contact the relevant operator to seek details of the operation and advise them that their operations appear to be causing offence. If they are not doing so already, they should be advised to take appropriate action to stop/minimise the release. Section 4.1 provides some actions that we can take in certain situations.

SEPA officers investigating and/or monitoring any prolonged or repeated offensive odour events may be asked by members of the public about the potential health impacts of odour or they may describe a deteriorating health concern they believe is linked to odour exposure. SEPA are not the lead authority in this area and complainants should be advised to contact their local GP or Health Protection Scotland (HPS). HPS will investigate, which may involve contacting SEPA, and appropriate action may be taken if a causal link between an emission source and public health is deemed likely. When dealing with prolonged incidences of offensive odour from a site where health is reported as a major concern by complainants, it may be prudent to liaise with HPS for support in this area. Some useful information and advice can be found in SEPA’s and HPS’s [Dealing with assertions of human health risks or effects from environmental exposures: a systematic approach](https://hpspubsrepo.blob.core.windows.net/hps-website/nss/1573/documents/1_dealing-with-assertions-of-human-health-risks.pdf).

In some circumstances, the source of the offensive odour may be obvious, and the release stopped quickly. However, in many cases the precise cause of an offensive odour may be elusive or the potential solutions difficult to achieve in a short timescale. There is no single, absolute, technical fix that can be applied to all the different causes of offensive odours. There are however many different means of preventing, controlling, or reducing offensive odours.

In line with the principles of effective regulation, we should work with the operator in achieving a speedy resolution to the release of offensive odorous substances. The operator must carry out a full investigation into the root cause(s) of any release of offensive odour and report this to SEPA. It might be possible to agree a plan of action that starts with developing the options to minimise odour impacts and ends with the resolution of the problem. This plan of action should allow all those affected by the offensive odour to see that the choice of control measures proposed for a specific site has been arrived at in a way that is both technically justifiable and takes into account the balance of benefits and costs. All stakeholders should have confidence that the chosen option is appropriate to resolve the problem in the shortest possible time.

The actions we take, in line with the Enforcement Policy and Enforcement Guidance, should be proportionate to the impact being caused and the circumstances surrounding the event itself. While agreeing a plan to remedy any particular event is desirable, it should not preclude or avoid the use of the other regulatory powers and duties set in legislation. As a consequence, and while assessing a single or multiple odour events, SEPA should consider what impact is being caused. The result of this assessment should be recorded, and the odour incident categorised as: Major Odour Incident, Significant Odour Incident, Minor Odour Incident or Unsubstantiated Odour Incident. These terms are described below. For each categorisation potential enforcement options are recommended. However, any final enforcement option decided upon should be made in light of all the facts available and in line with the Enforcement Policy and Enforcement Guidance.

## 4.1 Categorising an incident and suggested enforcement options

SEPA has an incident classification system for potential impacts on the air environment.

These are classified into four categories as shown in Table 5 overleaf.

It should be noted that amenity impact in the context of odour pollution includes offense to the senses of human beings at their place of residence.

In relation to events involving the release of odorous substances the following additional guidance is provided for each category.

**Table 5: SEPA’s environmental classification scheme – Air Pollution**

| **Category** | **Type of Impact** | **Impact description** |
| --- | --- | --- |
| Category 1: Major Incident | Environmental impact | * Widespread and long-term harm to the environment.
* Substantial harm to human health.
 |
| Amenity Impact | * Substantial impairment of amenity for a prolonged period.
 |
| Economic Impact | * Extensive damage to and/or closure of commercial activities.
 |
| Category 2:Significant incident | Environmental impact | * Long term but localised harm to the environment or widespread but short-term harm to the environment.
* Minor or no harm to human health.
 |
| Amenity Impact | * Substantial impairment of amenity for a short period or lesser impairment of amenity for a prolonged period.
 |
| Economic Impact | * Significant damage to commercial activities.
 |
| Category 3: minor incident | Environmental impact | * Short-term and localised harm to the environment.
* No harm to human health.
 |
| Amenity Impact | * Minor impairment of amenity for a short period.
 |
| Economic Impact | * Minor or no damage to commercial activities
 |
| Category 4: other incidents (e.g. unsubstantiated complaints or incidents with no impact) | Environmental impact | * Inability to locate or substantiate reported event.
 |
| Amenity Impact | * No evidence of impairment of amenity.
 |
| Economic Impact | * No damage to commercial activities.
 |

### 4.1.1 Major odour incidents (Category 1)

An incident involving the release or potential release of odorous substances which results or could result in one or more of the outcomes listed below should be considered to a be a major odour incident.

A major odour incident is one in which the release:

1. Has a significant and distracting effect on humans.

A “significant and distracting” effect on humans means odour that is persistent, widespread and at an intensity, offensiveness and extent that it leads to a change in behaviour of those exposed e.g., moving out of the affected area, experiencing nausea or sickness.

OR

1. Could have a major adverse effect on amenity value or economic impact.

An example of a major adverse effect would be an odour which prohibits the normal range of activities at an important recreation activity, event or public space.

OR

1. May result in danger to the public requiring action by the emergency services to advise the public on specific actions to be taken such as the closure of access roads, evacuation of property or a need to remain indoors.

The odorous release would normally be as a result of an incident at an installation, resulting in a release of odour which is sufficiently strong, offensive and persistent that it interferes with activities or causes disruption at sensitive receptors.

Examples include private dwellings and public events, which are impacted for a prolonged period of time e.g. premature curtailment of activities. It is likely that a number of people are affected by the odour and that the impact extends beyond daytime disturbance e.g. weekends, evenings and public holidays.

If an incident occurs that causes or could cause a major odour incident as described above then it should be considered whether to serve a regulatory notice under EASR Regulation 46 where steps are required to be taken to prevent or mitigate environmental harm caused, being caused or likely to be caused by the regulated activity, or steps are required to be taken to restore the environment affected or likely to be affected by the regulated activity, which may include the cessation of the carrying on of the activity for such period as SEPA considers necessary or appropriate (EASR Regulation 47).

In such cases SEPA must specify in the regulatory notice the reasons why SEPA is of the opinion that steps are required to be taken, and specify the steps to be taken by the person which SEPA considers to be necessary or appropriate to prevent or mitigate environmental harm caused, being caused or likely to be caused by the regulated activity, or to restore the environment affected or likely to be affected by the regulated activity. Such steps may include steps to remedy or mitigate any environmental harm, the removal of waste deposited on, in or under, land or in inland waste and/or the cessation of the carrying on of an activity for such period as SEPA considers necessary or appropriate.

It will hopefully be possible to specify such matters in the majority of relevant cases. It is possible, however, that there may be situations where we have difficulty in specifying such matters, and hence difficulty in serving a Regulatory Notice. For example, because at the relevant point we are unable to pinpoint the steps to be taken to remedy or mitigate environmental harm.

Table 6 overleaf contains examples of situations that may constitute environmental harm caused, being caused or likely to be caused by the regulated activity.

**Table 6: Examples of environmental harm “caused, being caused or likely to be caused” associated with the release of odorous substances (whether or not any authorisation condition may be breached)**

| **Example descriptions** |
| --- |
| 1 | The abatement system of a process dealing with odorous substances has failed and, while the process has stopped, the operator intends to imminently restart without the abatement system failure being rectified. |
| 2 | At a waste incinerator the plant has suffered major breakdown (involving a prolonged repair programme) but waste is still being received in the waste bunkers such that it may remain there for several days and begin to putrefy. Consideration of partial cessation of an activity to prevent further waste deliveries and requiring any waste already in the bunkers to be removed may be appropriate if the operator has not already taken those steps. |
| 3 | A landfill site is being operated in a way that waste is being tipped into liquid (leachate/water) and the tipping operation cannot be undertaken so as to ensure that any gases evolved can be contained or abated. |
| 4 | The structure of a process building has been damaged following high winds which have removed roof panels etc in such a manner that fugitive process emissions cannot be prevented, and the operator has indicated that they are going to continue or imminently restart operations. |
| 5 | An operator proposes to undertake abnormal operations, such as disturbing the waste mass in a landfill where there is high risk that a release could result in a significant or major odour incident. |
| 6 | It is found that a plant is being operated with a substantially reduced number of site staff such that any process excursion may quickly grow out of control and lead to a major or significant odour incident. |
| 7 | There is a history of odorous releases in the past and the activity is being operated in a similar manner such that there is likely to be a repeat major or significant odour incident. For example, the operator has not intervened in the process or planned contingencies in the event of a repeat of a previous failure. |

Serving a regulatory notice will not be required if the operator has already taken appropriate steps to remove the risk of a release that could lead to environmental harm, although this does not preclude us taking other enforcement action as appropriate. In all cases consideration as to the likely impact such events could have on the environment and human health must be considered.

The circumstances surrounding the issue of a regulatory notice will often be unique and, given the severity of such an action, officers should ensure that information obtained during an incident investigation/response is carefully recorded and that the issue of a regulatory notice requiring the cessation of an activity is approved in accordance with SEPA’s policies and procedures.

In the event of a major odour incident, consideration should be given to reporting the matter to the Procurator Fiscal. In certain circumstances however an enforcement measure may be appropriate. See Appendix 2 for guidance on the criteria to consider when making this decision.

### 4.1.2 Significant odour incidents (Category 2)

An incident involving the release or potential release of odorous substances which results or could result in one or more of the criteria listed below should be considered to be a significant odour incident if:

1. it would result in an abnormal and prolonged disturbance due to odour. This would typically lead to disruption rather than to evacuation of dwellings etc.

Or

1. the release could result in a reduction in amenity value. This would typically mean that the odour is sufficiently offensive and persistent that it prevents or significantly restricts the local population’s use of an amenity, including at their home, or recreation area such as a park for a period of time.

Any occurrence that causes or could cause a significant odour incident as described here should be assessed as to whether or not to serve a regulatory notice under EASR Regulation 46 where steps are required to be taken to prevent or mitigate environmental harm caused, being caused or likely to be caused by the regulated activity, or steps are required to be taken to restore the environment affected or likely to be affected by the regulated activity, which may include the cessation of the carrying on of the activity for such period as SEPA considers necessary or appropriate (EASR Regulation 47).

Following a significant odour incident, formal action seeking prevention of future events is recommended, including serving appropriate statutory notices, which may include regulatory notices.

Consideration should also be given to reporting the event to the Procurator Fiscal, especially if this is a repeat event and where alleged offending has caused or was likely to have caused significant environmental harm, or to the use of other enforcement tools, such as enforcement measures, e.g. a Variable Monetary Penalty (VMP) (under the Environmental Regulation (Enforcement Measures) (Scotland) Order 2015) may be considered, or in certain circumstances consideration could also be given to accepting an Enforcement Undertaking or use of the lower monetary penalty, a Fixed Monetary Penalty (FMP), but this may not be appropriate in light of the severity of the incident and any resultant harm.

Use of these enforcement measures is subject to the requirement in Lord Advocate’s Guidelines for SEPA to report alleged offending to the Crown in certain circumstances where significant environmental harm has been caused or was likely to arise as a result of, the alleged offending.

 In assessing the extent and significance of any environmental harm caused or likely to have been caused by any significant odour incident, as required by [Lord Advocate’s Guidelines](https://www.sepa.org.uk/media/219604/lord_advocates_guidelines.pdf), SEPA will consider several key factors. This will enable SEPA to make a balanced decision on whether significant environmental harm has been or is likely to be caused by any significant odour incident. A template for this decision-making framework including the key factors to be considered can be found in Appendix 2.

### 4.1.3 Minor odour incidents (Category 3)

An incident involving the release or potential release of odorous substances which results or could result in one or more of the criteria listed below should be considered to be a minor odour incident and be taken as likely to be minor pollution if:

1. it would involve a minimal effect on humans e.g., a change in odour emissions, which is short-term and/or intermittent and affects a small, localised population.

Or

1. it could result in a minimal effect on amenity value which, in relation to odour, means a localised, minor or transitory effect on amenities and uses of the local environment. Normally a small proportion of the amenity area, as opposed to the whole amenity area, would be affected and people would still be using the area, despite complaints being received.

Note – Where SEPA has verified repeated category 3 ‘minor’ odour incidents from the same source site over a period of time, consideration should be given to recording further incidents as category 2 ‘significant’ odour incidents. This is because it is likely that the incident will have resulted in the amenity impact criteria for category 2 incidents from table 4 above being met i.e., there has been ‘lesser [than substantial] impairment of amenity for a prolonged period’.

The point at which the criteria for a category 2 incident is met may not be the same for every site. The outcome of SEPA’s FIDOL investigations along with information from complainants about how they are being impacted by the odour incidents should inform this decision.

Following a minor odour incident, SEPA would expect an operator to provide a report outlining their investigation into the root causes of the incident and proposing measures to prevent a repetition.

Consideration should also be given to use of enforcement tools, such as a final warning letter (FWL) or a Fixed Monitory Penalty (FMP). Use of enforcement measures is subject to the requirements in Lord Advocate’s Guidelines.

### 4.1.4 Other Incidents such as unsubstantiated complaints etc. (Category 4)

Many complaints from members of the public are unsubstantiated by authorised officers. This may be due to the transient nature of odorous releases which can have an impact over a very short period of time. These complaints should be responded to in accordance with SEPA’s policies in relation to complaint response. In all cases, the complaint should be logged in our environmental events system, even if unsubstantiated, so that a history of complaints can be established. Such information may be useful in tracking potential releases and allowing us to develop an appropriate intervention plan, if required.

Similarly, where a complaint is substantiated but there may be more than one probable source, this too should be logged in order to build up information on the possible source(s) and thus inform consequential actions.

Remember that SEPA’s classification system is based upon impact (or potential impact) from an incident. If odour is detected outside a site but is not deemed to be offensive then it is unlikely to be having an impact and should be recorded as a category 4 incident.

Where an operator reports a release (in accordance with their authorisation) as an incident this should be logged and depending on the nature of the event, investigated. This may simply be by awaiting the operator’s investigation report. The incident should be recorded whether or not the release has provoked complaint or identification of offensive odour beyond the boundary of the authorised place as perceived by a SEPA officer. Information of this nature can be used to detect patterns of operation and perhaps aid in the prediction of more significant incidents (and thus allow for intervention to prevent them). This is similar to the health and safety ‘near miss’ recording schemes for industrial accidents.

## 4.2 Activities operating without an environmental authorisation

In the case of unauthorised activities (i.e., those regulated activities which require an authorisation under EASR but have none) which may result in, or are resulting in, pollution from the release of odorous substances resulting in offensive odour the following must be considered:

* The activity is operating without a relevant environmental authorisationand should be advised to stop operating or risk compounding the severity of the offence by continuing to operate. A regulatory notice can be served specifying the steps to stop the commission of the offence, which may include a requirement on the operator to apply for the relevant environmental authorisation as soon as possible and/or requiring the cessation of the carrying on of the activity. Where the operator chooses to continue operating without making a relevant application and that operation gives rise to pollution, then consideration should be given to whether an interdict (and interim interdict) can be sought to prevent continued operation until the environmental authorisation application can be determined and/or the potential risk of the release of odorous substances has been removed or has been significantly reduced.
* It is an offence to fail to comply with the requirements of a regulatory notice.
* In all cases above, and in accordance with the Enforcement Policy, consideration should be given to referring the matter to the Procurator Fiscal.

## 4.3 Other considerations

### Use of EASR Regulation 62 or EPA 90 Section 59(7) Powers

Consideration of the use of SEPA’s powers to take direct action to remove or reduce the risk of significant environmental harm or pollution should not be taken lightly. Senior management permission following legal advice must be obtained before using these powers.

### Use of the court to seek remedy

Under EASR Regulation 50, SEPA may also take court proceedings for the purpose of securing compliance with the Regulations, a general binding rule, an authorisation or the requirements within certain notices including a regulatory notice.

Consideration may also be given to seeking an (interim) interdict from the courts if an operator fails to cease the activities following the service of a regulatory notice or in the case of an unauthorised activity (which should be authorised) where we have no powers to issue a formal notice. Senior management permission following legal advice must be obtained before seeking any court remedy such as interdict.

# Part 5: Working with communities

Statutory guidance to SEPA made under Section 31 of the Environment Act 1995 directs us to use our statutory powers to support the aims of environmental justice, in particular to prevent environmental burdens falling disproportionately on particular (vulnerable) communities or sectors of society. We are directed to encourage and inform public participation in decisions affecting their environment and sustainable development and to encourage engagement between industry (and other institutions) and their local communities on environmental and sustainable development issues. The guidance also directs us to assess and understand the impacts of emissions on health and take action to minimise such impacts within the framework established by legislation. Such action should encompass issues that have a significant effect on well-being such as odour and noise, where these are subject to regulation.

For the purposes of Section 6 of the Human Rights Act 1998 we, as a public body, must act in a way which is compatible with the Convention on Human Rights (the European Convention on Human Rights [ECHR] is incorporated into Scots law through the Human Rights Act 1998). We must therefore find a fair balance between the protection of individual rights and the interests of the environment and the general public when interfering with a convention right.

Clear and effective communication and the provision of useful information by both SEPA and the operator are essential when working with a local community which may be or is being affected by offensive odours.

Operators should be encouraged to have a proactive system of informing us and the local community, especially if they are planning to undertake any non-routine activity which could give rise to odour, for example cleaning of equipment. This will allow us to engage with an operator about the best way in which to undertake the work, and it also means we are informed in advance should a complaint be made during that work. Similarly, operators should ensure that they report incidents or possible incidents relating to the release of odorous substances promptly to us so that we can provide advice and support.

The length of time from identification of a problem to its resolution can be a common reason for community concerns regarding odour impact, even though we may have taken appropriate action to prevent further incidents. Local communities may not be aware of these actions and the time period an operator has been required or allowed to make improvements, repairs etc. This is particularly true in situations where an upgrade has been agreed (informal as well as formal) and complaints are still received during the interim upgrade period. Therefore, it is important to put an adequate process of communication in place with local communities.

SEPA aims to be a fair and reasonable regulator, and the Enforcement Policy does allow for informal enforcement via meetings and site visits etc. as well as more formal actions such as regulatory notices or variations to environmental authorisations. Informal agreements can be as effective as a proportionate regulatory tool, but they can be perceived by the public to be an easy option for the operator. Where an operator has volunteered to undertake certain work, they must be made to adhere to any agreement. If not, more formal action should follow. These agreements should be in writing with the key expectations detailed, such as performance expectations and dates for compliance.

There is a clear need for liaison and communication with affected communities to keep them informed of what actions have been taken or will be taken, including details of any volunteered actions. Liaison and communication could involve writing to affected people, face to face meetings, attending community group meetings, contacting and discussing issues with local and/or national elected representatives, etc. This will allow affected people to participate as approp[riate in the process while it is u](http://stir-ser-net01/cms/communications/index.asp?id=3011)ndertaken. Advice on effective liaison and communication can be obtained from th[e Communications Department.](http://stir-ser-net01/cms/communications/index.asp?id=3011) The text below summarises benefits that can be realised by having effective community liaison.

## Potential benefits of effective community liaison

### Benefits for the community:

* receive more information and hopefully reassurance that actions are being taken.
* receive information on the potential impacts from the release of the odour e.g. health impact information.
* the ability for groups to discuss problems with the operator and regulator directly.
* participate in decisions that affect them.

### Benefits for the regulator:

* more focussed complaints/reports from the community.
* a direct route to provide information to the community affected.
* the ability to take a more active role in dealing with odour problems, which hopefully leads to a reduced number of odour incidents.

### Benefits for the operator:

* quick and accurate feedback when odour is emitted from the plant.
* time to make changes.
* more interest and involvement from the employees who may be part of the affected community.
* goodwill from the community because the operator is seen to take the odour problem seriously.
* a reduced number of complaints from upset people.

# Glossary of terms and acronyms

**Abatement system/ equipment** is a means of preventing or reducing the quantity of undesirable materials being released from an installation.

**ADMS & AERMOD** means air dispersion modelling software tools.

**BAT** means Best Available Techniques as defined in EASR

**BAT conclusions** means:

1. a document annexed to a Decision establishing best available techniques which has been amended by the Air Quality (Miscellaneous Amendment and Revocation of Retained Direct EU Legislation) (EU Exit) Regulations 2018,
2. a document specified in regulations made in exercise of the power in regulation 9 of the Environment and Wildlife (Legislative Functions) (EU Exit) Regulations 2019,

laying down the conclusions on best available techniques, their description, information to assess their applicability, the emission levels associated with the best available techniques, associated monitoring, associated consumption levels and, where appropriate, relevant site remediation measures,

**British Standards (BS)** are published documents in the Uk that contains a technical specification, or other precise criteria designed to be used consistently as a rule, guideline or definition.

**Beaufort scale** is an empirical measure for describing wind velocity designed mainly on observed sea conditions, it now incorporates land conditions as well.

**CEN** means a Comité Européen de Normarilisation (CEN) Standard (a European Standard).

**Department for Environment, Food and Rural Affairs (DEFRA)** is the UK Government Department overseeing the Environment, Food and Rural Affairs in England and Wales and primary lead on environmental policy at a European level for the UK. [www.defra.gov.uk](http://www.defra.gov.uk/)

**Dynamic olfactometry** is the method of odour concentration measurement (a standardised method is detailed in BS EN13725: 2003 *Air Quality, Determination of Odour Concentration by Dynamic Olfactometry*).

**D1 - Technical Guidance Note (Dispersion) (D1)** is technical guidance providing guidelines on discharge stack heights for polluting emissions published by Her Majesty’s Inspectorate of Pollution.

**EASR** means Environmental Authorisations (Scotland) Regulations 2018 (as amended)

**ELV** means Emission Limit Value.

**Enforcement guidance** - Read SEPA’s guidance on the use of enforcement action

**Enforcement policy** - Read SEPA’s published approach to handling non-compliance with any environmental legislation which SEPA is responsible for.

**Environment Agency (EA)** is the leading public body/regulator for protecting and improving the environment in England and Wales Environment Agency - GOV.UK (www.gov.uk)

**Northern Ireland Environment Agency** is the leading public body/regulator for protecting and improving the environment and built heritage in Northern Ireland. [Northern Ireland Environment Agency | Department of Agriculture, Environment and Rural Affairs (daera-ni.gov.uk)](https://www.daera-ni.gov.uk/northern-ireland-environment-agency)

**Environmental Impact Assessment (EIA)** is a tool used to predict environmental impacts at an early stage in the planning and design of a new development, as well as to find ways of reducing adverse impacts and shape projects to suit the local environment. In terms of planning, it refers to the whole process by which environmental information is collected, publicised and taken into account in reaching a decision on a relevant planning application.

**EPA90** is the Environmental Protection Act 1990.

**European Odour Unit (OUE.m-3)** is the amount of odorous species that, when evaporated into 1 cubic metre of neutral gas at standardised conditions, elicits a response (detection threshold) from a panel equivalent to that elicited by one European Reference Odour Mass (EROM) under the same conditions. The reference substance used is n-butanol. One EROM of n-butanol is 123 µg.

**European Reference Odour Mass (EROM)** - See European Odour Unit.

**European Standard (EN)** is a European published document that contains a technical specification, or other precise criteria designed to be used consistently as a rule, guideline, or definition.

**FIDOL** is a methodology for assessing the offensiveness of odour through describing the following characteristics: Frequency of detection, Intensity of exposure, Duration of exposure, Odour Description and Location.

**GC-MS** means Gas Chromatography-Mass Spectrometry (analytical method).

**Hedonic tone** is a subjective ranking system where a panel of human assessors is exposed to a given sample and asked to rank it on a scale, with pleasant odours being assigned a positive value and unpleasant odours a negative value.

**Human Rights Act 1998** is an Act of Parliament designed to give further effect in UK law to the rights and freedoms contained in the European Convention on Human Rights.

**Logarithmic relationship** - Logarithms are a mathematical tool usefully employed to handle numbers of very different magnitudes. This is most obviously seen when plotting values: using base 10, the scale points are equally spaced e.g. log101, log1010, log10100 would appear as 0, 1, 2. For example the pH and Richter scales are also logarithmic in nature.

**Oedema (pulmonary**) is a medical condition characterised by swelling and/or fluid accumulation in the lungs, leading to impaired gas exchange and respiratory failure in extreme cases. It has many causes, including heart failure and inhalation of toxic gases.

**Odour characterisation** – Odour is often characterised using a list of standard descriptors: generally, a panel of assessors are exposed to an odour and asked to describe it in terms of a given list of adjectives (e.g. floral, fishy, earthy etc) and assign it an intensity on between 0-5.

**Odour threshold** is the amount of dilution required to bring a specific species (or group of species) in a given air sample to its detectable threshold.

**Olfactometry** is the scientific measurement of odour concentration utilising a system of sampling and a regulated methodology to European standard (BS EN 13725).

**Pollution** means the direct or indirect introduction, as a result of human activity, of substances, vibrations, heat or noise into air, water or land which may be harmful to human health, or cause offence to any human sense, or the quality of the environment, result in damage to material property, or impair or interfere with amenities and other legitimate uses of the environment.

**PPC regulations** means the Pollution Prevention and Control (Scotland) Regulations 2012

**Procurator Fiscal** is the sole public prosecuting authority in Scotland.

**Regulatory notice (EN)** means a formal notice issued by SEPA to ensure compliance with an authorisation. The notice confirms what constitutes the contravention, what steps need to be taken to rectify the contravention and by when the steps should be completed.

**Statutory nuisance** are the provisions contained within Section 79(1)(d) Part III of the Environmental Protection Act 1990, relating to (amongst other things) an odour arising from an industrial or commercial premises which is prejudicial to health or a nuisance.

**Tedlar** is a polyvinyl fluoride polymer developed by DuPont. It is highly inert towards a wide range of chemical species hence finds particular application in field science where it is employed in bags to avoid sample degradation prior to analysis.

**Town and Country Planning (Scotland) Act 1997** defines the scope of town and country planning and sets out the general legislative framework for the preparation of structure and local plans and the administration of development control.

**WML regulations** means Waste Management Licensing (Scotland) Regulations 2011.

**WWTP** means Wastewater Treatment Plant.

# References and other sources of information

This guidance complements and can be used with the information provided in

[H4 Odour Management - How to Comply with your Environmental Permit](https://assets.publishing.service.gov.uk/media/5a7ba9a2ed915d1311060b16/geho0411btqm-e-e.pdf)

and associated Environment Agency science reports such as [SC030170/SR3 Review of dispersion modelling for odour predictions](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/290980/scho0307bmkq-e-e.pdf) and [SC030170/SR2 Review of odour character and thresholds](https://assets.publishing.service.gov.uk/media/5a7ce177e5274a2ae6eeb560/scho0307bmkt-e-e.pdf). The H4 guidance aims to bring together a number of aspects relating to the permitting and regulation of odour-generating activities and shows how these aspects can be applied within the BAT framework of IED.

Note: at the time of publication the Environment Agency are in the process of reviewing the H4 guidance. Any references in this guidance document are to the 2011 H4.

There are also several other documents which are not specifically on the subject of odour but do include useful sections on odour in relation to specific industrial sectors etc:

* [BAT Reference documents (BREF's) published by the European Commission](https://eippcb.jrc.ec.europa.eu/reference)
* [Sector Guidance Notes (for England and Wales Part 2A activities) issued by DEFRA](https://www.gov.uk/government/collections/integrated-pollution-prevention-and-control-sector-guidance-notes)
* [Process Guidance Notes issued by DEFRA](https://www.gov.uk/government/collections/local-air-pollution-prevention-and-control-lappc-process-guidance-notes)
* Standard Farming Installation Rules (for PPC Intensive Agriculture Installations in Scotland), issued by SEPA

# Appendix 1: Describing and characterising odour

## A1.1: Common descriptions

### Flora descriptions

Almond

Cinnamon

Eucalyptus

Fragrant

Herbal

Lavendar

Liquorice

Marigolds

Perfumery

Roses

Spicy

Vanilla

### Fruity descriptions

Apple

Cherry

Citrus

Cloves

Grapes

Lemon

Maple

Melon

Minty

Orange

Strawberry

Sweet

### Vegetable descriptions

Celery

Corn

Cucumber

Dill

Garlic

Green pepper

Nutty

Potato

Tomato

Onion

### Earthy descriptions

Ashes

Burnt wood

Chalk

Coffee

Grain silage

Grassy

Mould

Mouse-like

Mushroom

Musky

Musty

Peat

Pine

Smoky

Stale

Swampy

Woody

Yeast

### Fishy descriptions

Amine

Dead fish

### Permin solution

### Offensive descriptions

Blood

Burnt

Burnt rubber

Decay

Faecal

Refuse

Landfill leachate

Manure

Mercaptan

Putrid

Ra meat

Rotten eggs

Septic

Sour

Spoiled milk

Urine

Vomit

###

### Medicinal descriptions

Alcohol

Ammonia

Anaesthetic

Camphor

Chlorine

Disinfectant

Menthol

Soap

### Chemical descriptions

Burnt plastic

Car exhaust

Cleaning fluid

Coal

Creosote

Diesel

Petrol

Grease

Foundry

Kerosene

Molasses

Mothballs

Oil

Paint

Petroleum

Plastic

Resins

Rubber

Solvent

Styrene

Sulphur

Tar/asphalt

Turps

Varnish

Vinegar

Vinyl

**Table A1.2: Odour descriptors for commonly encountered compounds (by compound)**

| **Substance** | **Odour** | **Substance** | **Odour** |
| --- | --- | --- | --- |
| Acetaldehyde | Apple, stimulant | Dimethyl sulphide | Rotten vegetable |
| Acetic acid | sour vinegar | Diphenylamine | Floral |
| Acetone | chemical/sweetish/solvent | Diphenyl sulphide | Burnt rubber |
| Acetonitrile | Ethereal | Ethanol | Pleasant, sweet |
| Acrylaldehyde | Burning fat | Ethyl acetate | Fragrant |
| Acrolein | Burnt sweet, pungent | Ethyl acrylate | Hot plastic, earthy |
| Acrylonitrile | Onion, garlic, pungent | Ethylbenzene | Aromatic |
| Aldehydes C9 | Floral, waxy | Ethyl mercaptan | Garlic/onion, sewer, decayed cabbage, earthy |
| Aldehydes C10 | Orange peel | Formaldehyde | Disinfectant, hay/straw-like, pungent |
| Allyl alcohol | Pungent, mustard like | Furfuryl alcohol | Ethereal |
| Allyl chloride | Garlic onion pungent | n-Hexane | Solvent |
| Amines | Fishy, pungent | Hydrogen sulphide | Rotten eggs |
| Ammonia | Sharp, pungent odour | Indole | Excreta |
| Aniline | Pungent | Iodoform | Antiseptic |
| Benzene | Solvent | Methanol | Medicinal, sweet |
| Benzaldehyde | Bitter almonds | Methyl ethyl ketone | Sweet |
| Benzyl acetate | Floral (jasmine), fruity | Methyl isobutyl ketone | Sweet |
| Benzyl chloride | Solvent | Methyl mercaptan | Skunk, sewer, rotten cabbage |
| Bromine | Bleach, pungent | Methyl methacrylate | Pungent, sulphide like |
| Sec-Butyl acetate | Fruity | Methyl sulphide | Decayed vegetables |
| Butyric acid | Sweat, body odour | Naphthalene | Moth balls |
| Camphor | Medicinal | Nitrobenzene | Bitter almonds |
| Caprylic acid | Animal like | Phenol | Sweet, tarry odour, carbolic acid |
| Carbon disulphide | Rotten vegetable | Pinenes | Resinous, woody, pine-like |
| Chlorine | Irritating, bleach, pungent | Propyl mercaptan | Skunk |
| Chlorobenzene | Moth balls | Putrescine | Decaying flesh |
| 2-Chloroethanol | Faint, ethereal | Pyridine | Nauseating, burnt |
| Chloroform | Sweet | Skatole | Excreta, faecal odour |
| Chlorophenol | Medicinal | Styrene | Penetrating, rubbery, plastic |
| p-Cresol | Tar-like, pungent | Sulphur dioxide | Pungent, irritating odour |
| Cyclohexane | Sweetish when pure, pungent when contaminated | Thiocresol | Rancid, skunk like odour |
| Cyclohexanol | Camphor, methanol | Toluene | Floral, pungent, moth balls |
| Cyclohexanone | Acetone-like | Trichloroethylene | Solvent |
| Diamines | Rotten flesh | Triethylamine | Fishy, pungent |
| 1,1-Dichloroethane | Ether-like | Valeric acid | Sweat, body odour, cheese |
| 1,2-Dichloroethylene | Chloroform-like | Vinyl chloride | Faintly sweet |
| Diethyl ether | Pungent | Xylene | Aromatic, sweet |
| Dimethylacetamide | Amine, burnt, oily |  |  |

**Source: H4.Table A10.1:**

References The Royal Society of Chemistry, Chemical Safety Data Sheets Volumes 1 and 5.

Knowlton J and Pearce S, Handbook of Cosmetic Science and Technology.

Leonardos G, Kendall D and Bernard N, Odour threshold determinations of 53 odorant chemicals JAPCA Volume 19, No 2, 1969.

Turk, Atmospheric gases and vapours Annals New York Academy of Sciences.

**Table A1.3: Odour descriptors for commonly encountered compounds (by odour descriptor)**

| **Odour** | **Substance** | **Odour** | **Substance** |
| --- | --- | --- | --- |
| Acetone-like | Cyclohexanone | Medicinal | Camphor |
| Animal like | Caprylic acid | Medicinal | Chlorophenol |
| Antiseptic | Iodoform | Medicinal, sweet | Methanol |
| Apple, stimulant | Acetaldehyde | Moth balls | Chlorobenzene |
| Aromatic | Ethylbenzene | Moth balls | Naphthalene |
| Aromatic, sweet | Xylene | Nauseating, burnt | Pyridine |
| Bitter almonds | Benzaldehyde | Onion, garlic, pungent | Acrylonitrile |
| Bitter almonds | Nitrobenzene | Orange peel | Aldehydes C10 |
| Bleach, pungent | Bromine | Penetrating, rubbery, plastic | Styrene |
| Burning fat | Acrylaldehyde | Pleasant, sweet | Ethanol |
| Burnt rubber | Diphenyl sulphide | Pungent | Aniline |
| Burnt sweet, pungent | Acrolein | Pungent | Diethyl ether |
| Camphor, methanol | Cyclohexanol | Pungent, irritating odour | Sulphur dioxide |
| chemical/sweetish/solvent | Acetone | Pungent, mustard like | Allyl alcohol |
| Chloroform-like | 1,2-Dichloroethylene | Pungent, sulphide like | Methyl methacrylate |
| Decayed vegetables | Methyl sulphide | Rancid, skunk like odour | Thiocresol |
| Decaying flesh | Putrescine | Resinous, woody, pine-like | Pinenes |
| Disinfectant, hay/straw-like, pungent | Formaldehyde | Rotten eggs | Hydrogen sulphide |
| Ethereal | Acetonitrile | Rotten flesh | Diamines |
| Ethereal | Furfuryl alcohol | Rotten vegetable | Carbon disulphide |
| Ether-like | 1,1-Dichloroethane | Rotten vegetable | Dimethyl sulphide |
| Excreta | Indole | Sharp, pungent odour | Ammonia |
| Excreta, faecal odour | Skatole | Skunk | Propyl mercaptan |
| Faint, ethereal | 2-Chloroethanol | Skunk, sewer, rotten cabbage | Methyl mercaptan |
| Faintly sweet | Vinyl chloride | Solvent | Benzene |
| Fishy, pungent | Amines | Solvent | Benzyl chloride |
| Fishy, pungent | Triethylamine | Solvent | n-Hexane |
| Floral | Diphenylamine | Solvent | Trichloroethylene |
| Floral (jasmine), fruity | Benzyl acetate | sour vinegar | Acetic acid |
| Floral, pungent, moth balls | Toluene | Sweat, body odour | Butyric acid |
| Floral, waxy | Aldehydes C9 | Sweat, body odour, cheese | Valeric acid |
| Fragrant | Ethyl acetate | Sweet | Chloroform |
| Fruity | Sec-Butyl acetate | Sweet | Methyl ethyl ketone |
| Garlic onion pungent | Allyl chloride | Sweet | Methyl isobutyl ketone |
| Garlic/onion, sewer, decayed cabbage, earthy | Ethyl mercaptan | Sweet, tarry odour, carbolic acid | Phenol |
| Hot plastic, earthy | Ethyl acrylate | Sweetish when pure, pungent when contaminated | Cyclohexane |
| Irritating, bleach, pungent | Chlorine | Tar-like, pungent | p-Cresol |

**Table A1.4: Summary of the observed effects of typical odorants taken from Health Impacts of Odour. ED43076 – Draft A AEA Energy & Environment**

**Acrolein**

|  |  |  |
| --- | --- | --- |
| **Effects** | **ppm** | **mg m-3** |
| Odour detection threshold | 0.05-37.5 | 0.02-16.3 |
| Odour annoyance threshold | 0.54 | 1.25 |
| Threshold for irritation of eyes and nose | 0.06-0.15 | 0.13-0.34 |
| Threshold for longer term respiratory damage (animal data) | 0.4 | 0.9 |
| Severe irritation (5 minutes exposure) | 2.2 | 5 |
| Irritation, barely tolerable (5 minutes) | 1.2 | 2.8 |
| Immediate risk of irreversible effects | 2 | 4.6 |

**Alkylamines (ethylamine and triethylamine)**

| **Effects** | **ppm** | **mg m-3** |
| --- | --- | --- |
| Odour detection thresholdEthylamineTriethylamine | 9748 | 180200 |
| Odour annoyance thresholdEthylamineTriethylamine | 0.26-2140.08-0.27 | 0.48-3960.36-1.12 |
| Visual disturbance (triethylamine – 4 hours) | 1.6 | 6.5 |
| Severe irritation of the eyes, irritation of the respiratory symptoms(triethylamine) | 3-4 |  |

**Ammonia**

|  |  |  |
| --- | --- | --- |
| **Effects** | **ppm** | **mg m-3** |
| Odour detection threshold | 0.04-57 | 0.0266-39.6 |
| Odour annoyance threshold | 103 | 72 |
| Immediate irritation to the throat | 408 | 284 |
| Immediate irritation to the eye | 698 | 486 |
| Coughing | 1720 | 1198 |
| Short exposure rapidly fatal | 5000-10000 | 3483-6965 |

**Bacterial and fungal spores**

|  |  |  |
| --- | --- | --- |
| **Effects** | **Cfu m-3** | **Comments** |
| Odour threshold | Not identifiable | VOCs present depend on species mix and their metabolic activity. |
| Nausea, fatigue, respiratory symptoms | >103 cfum-3 | Effects dependent on species mix in microbial aerosol. |

**Formaldehyde**

| **Effects** | **ppm** | **mg m-3** |
| --- | --- | --- |
| Odour detection threshold | 0.02-0.5 | 0.03-0.6 |
| Odour annoyance threshold | 0.08-2.53 | 0.1-3.1 |
| Eye irritation | 0.05 | 0.06 |
| Throat irritation | 0.08-2.50 | 0.1-3 |
| Lower airway and pulmonary irritant effects expected | >5 | >6 |
| Difficulty in breathing | 20 | 25 |
| Serious damage to lower respiratory tract after 5-10 minutes exposure. | 50-100 | 60-120 |

**Hydrogen cyanide**

|  |  |  |
| --- | --- | --- |
| **Effects** | **ppm** | **mg m-3** |
| Odour threshold | 0.6-4.5 | 0.6-5 |
| Difficulty breathing, rapid heart rate, paralysis, palpitations, unconsciousness, respiratory arrest, death | 50 | 55 |
| Endangering to life (30-60 minute exposure) | 150 | 166 |
| Lethal (30-60 minutes) | 100-200 | 111-221 |
| Death in minutes | 300 | 332 |

**Hydrogen halides (hydrogen fluoride, hydrogen chloride)**

| **Effects** | **ppm** | **mg m-3** |
| --- | --- | --- |
| No effect level for respiratory effects (hydrogen chloride). | 0.2-10 | 0.30-14.9 |
| Odour detection threshold (hydrogen chloride)Odour detection threshold (hydrogen fluoride) | 1-50.04-0.16 | 1.5-7.50.03-0.13 |
| Upper respiratory tract inflammation (hydrogen fluoride). | 0.5 | 0.4 |
| Immediately irritating to nose and throat (hydrogen chloride). | 5 | 7.5 |
| Barely tolerable (hydrogen chloride). | 50-100 | 75-149 |
| Immediately dangerous (hydrogen chloride). | 1000-2000 | 1490-2980 |
| Lethal (30-minute exposure) (hydrogen chloride). | 1300 | 1941 |
| Lethal (5-minute exposure) (hydrogen chloride). | 3000 | 4479 |
| Lethal following 30-60 minutes exposure (hydrogen fluoride). | 50 | 41 |

**Hydrogen sulphide\***

|  |  |  |
| --- | --- | --- |
| **Effects** | **ppm** | **mg m-3** |
| Odour threshold | 0.008 | 0.011 |
| Short term workplace exposure limits | 5 | 7 |
| Long term workplace exposure limits | 10 | 14 |
| Eye and respiratory tract irritation | 20 | 28 |
| Prolonged exposure may cause pulmonary oedema | 75 | 105 |
| Olfactory paralysis (loss of smell) | 100 | 140 |
| Lethal dose for 50% of people exposed for >5mins | 800 | 1112 |

**\***From - Public Health England (PHE) Hydrogen Sulphide Toxicological Overview November 2016

**Ketones (methyl isobutyl ketone and acetone)**

| **Effects** | **ppm** | **mg m-3** |
| --- | --- | --- |
| Odour threshold (MIK)Odour threshold (acetone) | 0.1-4720-680 | 0.41-192.747.4-1613 |
| Irritation of eyes, nose and throat; headache, nausea, vertigo (MIK) | 2.4-100 | 10-410 |
| Irritation of the eyes, nose and throat (acetone) | 100-300 | 720 |
| Discomfort (MIK) | 200 | 820 |
| Serious effects leading to possible coma and death on exposure>30 minutes (MIK) | >500 | >2050 |
| Immediate risk of death (MIK)Immediate risk of death (acetone) | 20005000 | 820011950 |

**Methanethiol**

|  |  |  |
| --- | --- | --- |
| **Effects** | **ppm** | **mg m-3** |
| Odour detection threshold | <0.04 | <0.08 |
| Respiratory irritation | >0.5 | >1 |
| Headaches and nausea after several hours exposure | 4 | 8 |
| Collapse, breathlessness, convulsions, death | 150 | 295 |

**Other sulphides (carbon disulphide, dimethyl sulphide and dimethyl disulphide)**

| **Effects (Carbon disulphide unless otherwise stated)** | **ppm** | **mg m-3** |
| --- | --- | --- |
| Odour detection thresholdCarbon disulphide Dimethyl sulphideDimethyl disulphide | 0.02-0.20.001-0.020.00003-0.09 | 0.05-0.50.0025-0.05080.0001-0.34665 |
| Effects on peripheral nervous system | 5 | 15 |
| Effects on motor function following long term exposure (years) | 10 | 15-30 |
| Minor symptoms in 30 minutes | 300 | 933 |
| Distinct symptoms in 30 minutes | 400 | 1244 |
| Immediate severe headache | 760 | 2364 |
| Severe poisoning in 30 minutes | 1150 | 3577 |
| Loss of consciousness in 30 minutes | 3000 | 9330 |
| Death in 30-60 minutes | 5000 | 15550 |

**O - Pinene**

|  |  |  |
| --- | --- | --- |
| **Effects** | **ppm** | **mg m-3** |
| Odour detection threshold. | 0.7 | 3.9 |
| No quantitative toxicological data found. |  |  |

**Short-chain fatty acids (propionic and butyric acids)**

|  |  |  |
| --- | --- | --- |
| **Effects** | **ppm** | **mg m-3** |
| Odour detection thresholdPropionic acidButyric acid | 0.024-200.00028-2.5 | 0.084-600.001-9 |
| No effects level: irritation of the eyes and nose (propionic acid) | 2.1 | 6 |
| Irritation of eyes and nose possible (propionic acid) | >10 | >30 |

**Trichloroethylene**

| **Effects** | **ppm** | **mg m-3** |
| --- | --- | --- |
| Odour detection threshold. | 0.21-400 | 1.134-2160 |
| Odour annoyance threshold. | 161 | 864 |
| Headache, sluggishness, dulling of senses, dizziness, nausea and vomiting. | 50-100 | 270-540 |
| Light anaesthesia. | 5000 | 27000 |
| Deeper anaesthesia. | 20000 | 108000 |

**Volatile Organic Compounds (VOC) I: Phenol and derivatives (phenol, cresols – mixed isomers and xylenol – mixed isomers)**

|  |  |  |
| --- | --- | --- |
| **Effects** | **ppm** | **mg m-3** |
| Odour threshold (phenol)Odour threshold (cresol) | 0.04-5.80.00028-5 | 0.16-22.40.0012-220 |
| No adverse effects in exposed workers (phenol) | 5 | 19 |
| Respiratory toxicity on prolonged exposure (phenol) | 25 | 95 |
| Immediate risk of death (phenol)Immediate risk of death (cresol) | 250250 | 9501100 |

**VOCs II: Toluene and derivatives (toluene, xylene - mixed isomers and styrene)**

| **Effects (Carbon disulphide unless otherwise stated)** | **ppm** | **mg m-3** |
| --- | --- | --- |
| Odour detection thresholdTolueneXyleneStyrene | 2-400.08-400.05-202 | 8-1500.35-1740.2-860 |
| Headache and mild transient irritation of the respiratory tract (toluene). | 100-200 | 377-754 |
| Nasal and eye irritation (styrene). | 300 | 1280 |
| Drowsiness, nausea, headache, fatigue, and dizziness (styrene). | 200-700 | 850-3000 |
| Euphoria, giddiness, tremors, nervousness, insomnia, headache, dizziness, fatigue, drowsiness, confusion, vertigo, increased reaction time, mild eye irritation. | 400-800 | 1507-3015 |
| Effects on reaction time (xylene) | 450-900 | 1950-3900 |
| Loss of muscle control, severe fatigue (toluene) | >800 | >3015 |
| General anaesthesia (toluene)Light anaesthesia (xylene)Death (styrene) | >1000050005000 | >376842170021400 |

**Table A1.5 Additional odour threshold values of common odorants**

| **Compound** | **mg m-3** | **ppm** | **Compound** | **mg m-3** | **ppm** |
| --- | --- | --- | --- | --- | --- |
| Acetic acid | 0.043 | 0.016 | 2-Hydroxyethyl acetate | 0.527 | 0.114 |
| Acetic anhydride | 0.0013 | 0.00029 | Light fuel oil | 0.053 | 13.9 |
| Acetone | 4.58 | 3- | Methylbutanal | 0.0016 | 0.0004 |
| Acrylic acid | 0.0013 | 0.0004 | 2-Methyl-1-butanol | 0.16 | 0.041 |
| Amyl acetate | 0.95 | 0.163 | Methyldithiomethane | 0.0011 | 0.00026 |
| iso Amyl acetate | 0.022 | 0.0038 | 2-Methyl 5-ethyl pyridine | 0.032 | 0.006 |
| Benzene | 32.5 | 8.65 | Methyl methacrylate | 0.38 | 0.085 |
| 1,3-Butadiene | 1.1 | 0.455 | 3-Methoxybutyl acetate | 0.044 | 0.007 |
| 1-Butanol | 0.09 | 0.03 | 1-Methoxypropan-2-ol | 0.0122 | 0.003 |
| 2-Butanol | 3.3 | 1 | 1-Methoxy-2-propylacetate | 0.0075 | 0.0014 |
| 2-Butanone (MEK) | 0.87 | 0.27 | 2-Methyl-1-pentanol | 0.096 | 0.021 |
| Butoxybutane | 0.03 | 0.005 | 2-Methyl pentaldehyde | 0.09 | 0.02 |
| 2-Butoxyethanol | 0.0051 | 0.00097 | 4-Methyl-2-pentanone (MIBK) | 0.54 | 0.121 |
| 2-Butoxyethyl acetate | 0.045 | 0.0063 | 2-Methyl-2-propanol | 71 | 21.46 |
| Butoxypropanol | 0.191 | 0.0324 | α-Methyl styrene | 0.021 | 0.003 |
| Butyl acetate | 0.047 | 0.0066 | 1-Nitropropane | 28.2 | 7.09 |
| 2-(2-Butoxyethocy)ethanol | 0.0092 | 0.0013 | 1-Octene | 0.33 | 0.066 |
| 2,2-butoxyethoxyethyl acetate | 0.015 | 0.0016 | 2-Octene | 0.5 | 0.1 |
| Carbon tetrachloride | 280 | 40.73 | 2-Octyne | 0.03 | 0.006 |
| Carbon sulphide | 0.0275 | 0.0102 | 2,4-Pentanedione | 0.045 | 0.01 |
| m-Cresol | 0.0013 | 0.0003 | 1-Pentanol | 0.02 | 0.0051 |
| o-Cresol | 0.0028 | 0.0005 | Petroleum naptha | 0.2 |  |
| p-Cresol | 0.0029 | 0.0006 | Phenyl ether | 0.0021 | 0.0003 |
| Cyclohexane | 315 | 83.8 | 2-Picoline | 0.014 | 0.0034 |
| Cyclohexanone | 0.083 | 0.019 | Propanal | 0.014 | 0.0054 |
| Dichloromethane | 3.42 | 0.912 | 2-Propanol | 1.185 | 0.442 |
| Diesel | 0.06 |  | 2-Propen-1-ol | 1.2 | 0.47 |
| Dimethyl adipate | 7.101 | 0.913 | iso Propylamine | 0.158 | 0.06 |
| Dimethyl glutarate | 1.212 | 0.169 | Propylbenzene | 0.048 | 0.009 |
| Dimethyl succinate | 0.992 | 0.152 | Propylene-n-butylether | 0.206 | 0.01 |
| 1,4-Dioxane | 30.6 | 7.78 | Propyl ether | 0.024 | 0.0053 |
| 1,3-Dioxolane | 56.3 | 17.02 | Styrene | 0.16 | 0.0344 |
| Diphenylmethane | 0.41 | 0.55 | 1,1,2,2-Tetrachloroethane | 1.6 | 0.21 |
| Ethoxypropanol | 0.161 | 0.035 | Toluene | 0.644 | 0.16 |
| Ethoxypropyl acetate | 0.0052 | 0.0008 | Trichloroethylene | 8 | 1.36 |
| Ethyl acetate | 2.41 | 0.61 | Trimethylamine | 0.0026 | 0.001 |
| Ethyl alcohol | 0.28 | 0.136 | Xylene (mixed) | 0.078 | 0.016 |
| 2-Ethyl-1-butanol | 0.07 | 0.015 | 2,3 Xylenol | 0.0037 | 0.0007 |
| 2-Ethyl-1-hexanol | 0.5 | 0.086 | 2,4 Xylenol | 0.064 | 0.0117 |
| 2-Ethylhexyl acrylate | 0.6 | 0.073 |  |  |  |
| 2-Furaldehyde | 0.25 | 0.058 |  |  |  |
| 1-Hexanol | 0.005 | 0.0011 |  |  |  |

Sources of threshold values:

Compilation of odour threshold values in air and water, Central Institute for Nutrition and Food Research, TNO, Netherlands, June 1997. Editors: van Gembert L J; Nettenbrejer A H.

*Compilation of odour and taste threshold values data, American Society for Testing and Material*s, ASTM Data Series DS 48A. Editor: Fazzalari F A.

Public Health England (PHE) Hydrogen Sulphide Toxicological Overview November 2016

The documents listed above contain odour threshold values for a much wider range of substances. The fact that a document is listed does not necessarily mean that the values given are consistent with other documents, and it is advisable to cross-check values with more than one source as there can be considerable variation. This list is not exhaustive and other published values exist.

**Table A1.6: Hedonic scores 1 – negative scores**

| **Description** | **Hedonic score** | **Description** | **Hedonic score** | **Description** | **Hedonic score** |
| --- | --- | --- | --- | --- | --- |
| Cadaverous(dead animal) | -3.75 | Stale | -2.04 | New rubber | -0.96 |
| Putrid, foul, decayed | -3.74 | Fishy | -1.98 | Metallic | -0.94 |
| Sewer odour | -3.68 | Musty, earthy, mouldy | -1.94 | Wet paper | -0.94 |
| Cat urine | -3.64 | Sooty | -1.69 | Medicinal | -0.89 |
| Faecal (like manure) | -3.36 | Cleaning fluid | -1.69 | Chalky | -0.85 |
| Sickening (vomit) | -3.34 | Kerosene | -1.67 | Varnish | -0.85 |
| Urine | -3.34 | Blood, raw meat | -1.64 | Nail polish remover | -0.81 |
| Rancid | -3.15 | Chemical | -1.64 | Paint | -0.75 |
| Burnt rubber | -3.01 | Tar | -1.63 | Turpentine (pine oil) | -0.73 |
| Sour milk | -2.91 | Disinfectant, carbolic | -1.60 | Kippery-smoked fish | -0.69 |
| Stale tobacco smoke | -2.83 | Ether, anaesthetic | -1.54 | Fresh tobacco smoke | -0.66 |
| Fermented (rotten)fruit) | -2.76 | Burn, smoky | -1.53 | Sauerkraut | -0.60 |
| Dirty linen | -2.55 | Burnt paper | -1.47 | Camphor | -0.55 |
| Sweaty | -2.53 | Oily, fatty | -1.41 | Cardboard | -0.54 |
| Ammonia | -2.47 | Bitter | -1.38 | Alcoholic | -0.47 |
| Sulphurous | -2.45 | Creosote | -1.35 | Crushed weeds | -0.21 |
| Sharp, pungent, acid | -2.34 | Sour, vinegar | -1.26 | Garlic, onion | -0.17 |
| Household gas | -2.30 | Mothballs | -1.25 | Rope | -0.16 |
| Wet wool, wet dog | -2.28 | Gasoline, solvent | -1.16 | Beery | -0.14 |
| Mouse-like | -2.20 | Animal | -1.13 | Burnt candle | -0.08 |
| Burnt milk | -2.19 | Seminal, sperm-like | -1.04 | Yeasty | -0.07 |
|  |  |  |  | Dry, powdery | -0.07 |

**Table A1.7: Hedonic scores 2 – positive scores**

| **Description** | **Hedonic score** | **Description** | **Hedonic score** | **Description** | **Hedonic score** |
| --- | --- | --- | --- | --- | --- |
| Cork | 0.19 | Crushed grass | 1.34 | Maple syrup | 2.26 |
| Black pepper | 0.19 | Celery | 1.36 | Pear | 2.26 |
| Musky | 0.21 | Green pepper | 1.39 | Caramel | 2.32 |
| Raw potato | 0.26 | Tea leaves | 1.40 | Coffee | 2.33 |
| Eggy (fresh eggs) | 0.45 | Aromatic | 1.41 | Meaty (cooked, good) | 2.34 |
| Mushroom | 0.52 | Raisins | 1.56 | Melon | 2.41 |
| Beany | 0.54 | Cooked vegetables | 1.58 | Popcorn | 2.47 |
| Geranium leaves | 0.57 | Clove | 1.67 | Minty, peppermint | 2.50 |
| Grainy (as grain) | 0.63 | Nutty | 1.92 | Lemon | 2.50 |
| Dill | 0.87 | Coconut | 1.93 | Fragrant | 2.52 |
| Woody, resinous | 0.94 | Grapefruit | 1.95 | Fried chicken | 2.53 |
| Soapy | 0.96 | Perfumery | 1.96 | Cinnamon | 2.54 |
| Laurel leaves | 0.97 | Peanut butter | 1.99 | Cherry | 2.55 |
| Eucalyptus | 0.99 | Spicy | 1.99 | Vanilla | 2.57 |
| Molasses | 1.00 | Banana | 2.00 | Pineapple | 2.59 |
| Incense | 1.01 | Almond | 2.01 | Apple | 2.61 |
| Malty | 1.05 | Sweet | 2.03 | Peach | 2.67 |
| Caraway | 1.06 | Buttery, fresh butter | 2.04 | Violets | 2.68 |
| Soupy | 1.13 | Grape juice | 2.07 | Fruity, citrus | 2.72 |
| Bark, birch bark | 1.18 | Honey | 2.08 | Chocolate | 2.78 |
| Anise (liquorice) | 1.21 | Cedarwood | 2.11 | Floral | 2.79 |
| Oak wood, cognac | 1.23 | Herbal, green, cut grass | 2.14 | Orange | 2.86 |
| Seasoning (for meat) | 1.27 | Cologne | 2.16 | Strawberry | 2.93 |
| Leather | 1.30 | Fresh green vegetables | 2.19 | Rose | 3.08 |
| Raw cucumber | 1.30 | Fruity, other than citrus | 2.23 | Bakery (fresh bread) | 3.53 |
| Hay | 1.3.1 | Lavender | 2.2.5 |  |  |

##

## References

Dravnieks A, Masurat T, Lamm R A, *Hedonics of Odours and Odour Descriptors*: in Journal of the Air Pollution

Control Association, July 1984, Vol. 34 No. 7, pp 752-755

Guidance for the regulation of odour at waste management facilities (H4 2011)

# Appendix 2: Assessment of the significance of environmental harm

Where SEPA is considering using an enforcement measure to deal with a relevant offence it must take into account whether, in light of the material factors listed in paragraph 11 of the [Lord Advocate’s Guidelines](https://www.sepa.org.uk/media/219604/lord_advocates_guidelines.pdf), the significance of the offender or the offending is such that the case should instead be reported by SEPA to COPFS for consideration of prosecution or other action. The material factors include the extent and significance of any environmental harm as described in more detail in paragraphs 21 and 22 of the Lord Advocate’s Guidelines:

Paragraph 21

“In assessing the extent and significance of any environmental harm, it will be relevant to consider the following:

1. Has the alleged offending caused environmental harm, or was it likely to?
2. What was/is the extent and full impact of the environmental harm, or the potential environmental harm?
3. What was/is the significance of the environmental harm in terms of the immediate environment where the offending took place, the wider environment, ecosystems, local communities etc.? and
4. Is there any likelihood of (further) future environmental harm?”

Paragraph 22

“Where significant environmental harm has been caused by, or was likely to arise as a result of, the alleged offending, SEPA shall report the alleged offending to COPFS, also taking into account, as appropriate, the other material factors listed and described in detail above and below.”

Environmental harm is not defined in Lord Advocate’s Guidelines however for the purpose of considering environmental harm SEPA has referred to the definitions contained in the Regulatory Reform (Scotland) Act 2014 (RRSA) below. SEPA will consider several key factors. This will enable us to make a balanced decision on whether significant environmental harm has been or is likely to be caused by any significant odour incident(s). Included below is a template for the decision-making framework, which includes the key factors to be considered.

**“Environmental harm”** has a broad definition in RRSA and covers many aspects of the environment. RRSA Section 17(2) is reproduced below:

1. harm to the health of human beings or other living organisms,
2. harm to the quality of the environment, including—
	1. harm to the quality of the environment taken as a whole,
	2. harm to the quality of air, water, or land, and
	3. other impairment of, or interference with, ecosystems,
3. offence to the senses of human beings,
4. damage to property, or
5. impairment of, or interference with, amenities or other legitimate uses of the environment.

**What is significant environmental harm?**

RRSA Section 40(9) provides that environmental harm is **“significant”** if either:

(a) it has or may have **serious adverse effects**, whether locally, nationally or on a wider scale, or

(b) it is caused or may be caused to an area designated in an order by the Scottish Ministers for the purposes of RRSA section 40[[5]](#footnote-6).

Harm is not significant simply by virtue of it being either irreversible or on a wide scale or to a highly valued aspect of the environment[[6]](#footnote-7).

For odour pollution the main aspects to consider from RRSA Section 17(2)above are (a), (b)(i), (c) & (e). Therefore, in considering whether verified authorisation non-compliances for odour have caused **serious adverse effect** and thereby **significant environmental harm** we will consider the following factors against these aspects:

1. The extent or possible extent of the pollution.
2. The impact that pollution is having or could have on the environment, offence to senses, loss of amenity or prevention of legitimate use of the environment.
3. The scale, duration/frequency and severity of the impact.
4. The type of receptors being impacted.
5. SEPA’s event classification
6. The likelihood of (further) future environmental harm

For (b)(i) the following will also be considered: how long will it take for environmental quality to recover, if remediable?

**Template Assessment of Significant Environmental Harm**

|  |  |  |  |
| --- | --- | --- | --- |
| Date: |  | Site and authorisation number: |  |

|  |  |
| --- | --- |
| Relevant condition(s) of authorisation (i.e., 1.11.1 – State what the “odour condition” says, plus, any other relevant condition being breached. |  |
| Dates of evidence of non-compliance with the condition(s): |  |

|  |  |  |
| --- | --- | --- |
| Relevant aspects from RRSA Section 17(2) | Summary of relevant evidence | Key factors for assessing whether environmental harm is significant or not. Please link these answers to relevant information from columns 1 & 2 |
| (a)harm to the health of human beings or other living organisms(b)(i) harm to the quality of the environment taken as a whole(c) offence to the senses of human beings(e) impairment of, or interference with, amenities or other legitimate uses of the environment | Examples:* Corroborated FIDOL assessment forms showing non-compliances with the ‘odour condition’ (provide a summary of these)
* Witness impact statements from members of the local community (provide a summary of what these show)
* Do we have any operator monitoring reports demonstrating non-compliances with environmental limit conditions?
* Do we have evidence of the operator being non-compliant with any other conditions of their authorisation in relation to maintenance and management of odour control systems?
 | 1. the extent or possible extent of the pollution.
* From our FIDOL assessments and complaint data how widespread is the area being negatively impacted by odour? Please provide some indication of the density of population within this area.
1. the impact that pollution is having or could have on the environment, offence to senses, loss of amenity or prevention of legitimate use of the environment.
* How does our evidence demonstrate impact?
* How has offensive odour changed the behaviour of residents? For example, not being able to use gardens or local parks, hang out washing, cancelled events such as birthday parties or BBQ’s, health issues including mental health.
1. the scale, duration/frequency and severity of the impact
* How severe are the impacts listed above and how long and how often does impact occur. What do our investigations tell us and does this support the information from complainants?
1. the type of receptors being impacted.
* Residential areas, industrial areas, recreational areas such as parks etc, schools, offices.
1. SEPA’s event classification
* Are the events Category 1, 2 or 3? The justification for the category should reference the environmental events classifications provided in Table 4 in section 4.1 of SEPA’s odour guidance.
1. The likelihood of (further) future environmental harm
2. How long will it take for environmental quality to recover, if remediable?
 |
| **Conclusion of assessment** | With reference to the information provided above, provide a justification as to whether SEPA consider significant environmental harm has been caused or is likely to be caused or has not been caused or is not likely to have been caused. |

# Appendix 3: Odour complaint investigation and guidance

## Introduction

This guidance has been produced to assist SEPA officers who may be asked to carry out an odour investigation/assessment in the field. This task may be in response to a complaint or simply to monitor an operator’s compliance with an odour condition within its authorisation. It comprises an odour assessment guide, the odour assessment form (for information to be recorded during an odour investigation) and a complaint response flow diagram. The need to attend a complaint or incident should be determined in line with relevant SEPA guidance and considering the specific circumstances.

 Remember, SEPA only regulate odour emissions from EASR industrial emissions, other emissions and waste management activities. All other odour complaints should be directed to the relevant local authority. Be aware that odours can have a strong emotive impact on those affected, particularly when it causes anxiety, nausea, or restricts enjoyment of an amenity e.g., having to close windows or preventing the use of gardens.

Remember also that odours can be pleasant/acceptable to one person but offensive to another, and that individuals can be sensitized or desensitized to certain odours – in particular, site operatives can become ‘used to’ an odour (this is termed adaptation).

The overall offensiveness of an odour depends on a combination of factors. These can be remembered using the acronym FIDOL (Frequency, Intensity, Duration, Odour description/character and Location) and information on all these factors must be considered to reach a conclusion. This will be discussed in further detail below.

## Odour Assessment Guide

This section aims to set out a framework for your odour assessment and provides guidance on completing the Odour Assessment Form.

Being fully prepared for your odour assessment will aid decision making in the field and is likely to result in a more effective investigation.

###  Prior to carrying out a field assessment:

* Find out the current wind direction and the wind direction when the complainant reports odour being present. You can use web sites such as [The Met Office](http://www.metoffice.gov.uk/), [Weather Underground](https://www.wunderground.com/history/), [windy](https://www.windy.com/?55.806,-3.942,5) or [X C Weather](http://www.xcweather.co.uk/).
* Obtain details from the complainant(s) to help plan your investigation. For example, their address and contact information, their description of the odour and its strength, how long the odour has been present for and how often it occurs (is it still present?), what impact it is having on their lives and where they suspect the odour to be coming from (the source).
* Refer to a map of the area. You should also have a map which you can refer to during your investigation to identify assessment locations. This can be a physical map or an app on your mobile phone or portable device.
* Using the information above, work out the suspected source(s) of odour. This will help determine your potential assessment locations.
* Determine if the suspected source is regulated by SEPA for odour emissions? If not, the complainant should be advised to contact their local authority.
* Check if there are standing instructions associated with odour complaints in relation to the suspected source or surrounding area (i.e. [site of community impact instructions](https://scottishepa.sharepoint.com/%3Af%3A/r/sites/Regulation/Shared%20Documents/General/SCC%20%26%20Standby%20Guidance/Site%20of%20Community%20Impact%20Instructions%20IN%20%26%20OUT%20of%20Hours?csf=1&web=1&e=Wt6N9h)).
* Consider other possible odour sources in the locality. This could be from local knowledge or a map search (e.g. GIS tool). Your investigation will need to take these into account. Plan what you need to do to rule these in or out of your investigation. Where there are other odorous sites within the vicinity, ensure you conduct your assessments at suitable locations for a sufficient period of time, so as to avoid any dubiety regarding the source attribution of any odours found.
* Print or pick up SEPA’s [Odour Assessment Form](https://scottishepa.sharepoint.com/%3Aw%3A/r/sites/Regulation/Shared%20Documents/Legal/Investigations%20%26%20Evidence%20Gathering/Odour%20Event%20Assessment%20Form%20Template%20-%202022.dotx?d=wbf40a58140d4410ab0b83d2d6dbcbf61&csf=1&web=1&e=LprdfM) (the form) to record your investigation.
* If you don’t have a physical copy of the form, it may be useful to take a photograph of the relevant sections from the electronic version to refer to during your investigation. Your field assessment can then be recorded in your official notebook and transferred to the electronic form later. Notebook entries must be sufficient to allow for the full completion of the form.

Note - It is important that the form is completed as soon as is possible, following your investigation, to ensure the availability of contemporaneous evidence (particularly where enforcement action is being considered).

**You may also find it useful to consider the following:**

* Check the conditions in the authorisation for the suspected source site(s) in relation to odour. If a site visit is likely, you should be familiar with these prior to investigating
* Check if we have an Odour Management Plan for the suspected source site(s)? Or is there a section about odour in their Environmental Management System? It is useful to know what systems and procedures are in place to control odour. Are these being followed? Are they adequate?

## Field Assessment Framework

* Verify local wind direction in the area. Cues such as smoke/steam drift from chimneys, flags, windsocks, wind turbines or feeling the wind on your face may be used.
* Start your investigation upwind of the suspected source(s) based on wind direction and information from complainants. Verify the presence and type of odours upwind if any are present.
* The time required at each location is dependent on the circumstances however at least between 15 and 30 minutes is recommended.
* If wind direction is variable or there is more than one possible odour source, you should consider adding further upwind locations.
* Move to the complainant's address and carry out an assessment. Engage with the complainant if possible and discuss the odour if still present (i.e., offensive/non offensive).
* Bear in mind the wind direction may have changed since receipt of the complaint. If no odour is present at the complainant’s address, further assessments must be considered at other receptor locations downwind of the suspected source(s).

Note - If the wind direction has changed significantly and we are reasonably confident of the source site, it is acceptable to carry out assessments at current downwind receptors rather than firstly going to the complainant(s) address. This should be recorded.

* If you find offensive odour at locations likely to impact receptors you should carry out assessments gradually closer to the suspected source to confirm the same odours either at, or close to, the site boundary, or on site. It is advisable to make the operator aware of your presence (this is essential if it’s deemed appropriate to carry out a site visit seeking to pinpoint the odour source).

Note - an assessment at/on/close to the site boundary, may not always be necessary e.g., where the odour may be projected at height (at the suspected source). If a boundary assessment is not carried out, you should ensure there are no other potential sources of odour between your final assessment location and the suspected source site.

## Recording your Observations – Sections 1 and 2 of the form

* All boxes, including the heading, in section 1 of the form should be filled in.
* Assign a number to each location in the order they were visited in section 2 of the form.
* Record the start **and** finish times at each location.
* Record a detailed location description of each assessment location, e.g., outside number 43 South Street, Fernbank. [What3words](https://what3words.com/pretty.needed.chill) or an NGR can be used if a description is difficult. For example, the location may be in the middle of a field.
* Assess and record the ‘FIDOL’ information as described below (and in greater detail on page 3 of the form).
* Note the wind strength and direction. A general description of weather conditions may also be noted (i.e., temperature, rainfall).
* A balanced judgement of whether an odour is offensive or not must be made considering all the ‘FIDOL’ factors. Mark offensive ‘yes’ or ‘no’ in section 2 of the form. Justification will be recorded in section 3 (see the ‘recording your conclusions’ section below).
* Mark your assessment locations along with the suspected source site(s) on a map (wind direction should also be indicated) and attach it to the odour investigation form. This can be done after the assessment is complete (it can be created on paper or electronically).

## Odour Assessment Principles – FIDOL

Notes and guidance for the scores mentioned below are provided on page 3 of the form.

**F - Frequency of detection**

A score of 1 to 5 is assigned based on information gathered from complaints and complainants along with the outcome of SEPA investigations. The higher the frequency score the more likely an odour is to be deemed offensive. It is also likely that offensive odour events with high frequency scores recorded over a prolonged period should be recorded as category 2 ‘significant’ incidents.

I - **Intensity of exposure**

An intensity score of 1 to 5 should be attributed from your assessment. This ranges between no odour and very strong odour. The characteristics of an odour can also be considered here.

**D - Duration of exposure**

A score of 1 to 5 is assigned depending on how long an odour is detectable during your assessment period. Wind direction data can also be used to estimate how long people may be exposed to an odour in relation to an event.

**O – Odour description/character**

The character of an odour as it relates to its hedonic tone (pleasant, neutral or unpleasant) at the recorded odour intensity. Your description should provide information about the characteristics of an odour which may include the following:

* Descriptive terms such as fruity, pungent, musty, sharp, sour, sweet, earthy etc
* What it smells like or what it reminds you of i.e., sewage, compost, manure, oil/fuel etc
* How it makes you feel i.e., is it pleasant or unpleasant

**L - Location**

A score of 1 to 5 is assigned based on the distance from source being affected by an odour. Odours impacting large areas are likely to be considered more offensive.

**Overall Assessment/Conclusion - Is it Offensive?**

This takes a balanced account of all the above factors and uses this information to form a conclusion regarding the offensiveness of the odour(s).

Note – You may only be visiting an affected area for a relatively short period of time therefore, as an investigator it can help to consider yourself being in the complainant's situation:

* Would you find the odour offensive if you were living / working there (and potentially exposed to it for a longer period than you were during your investigation)?
* Would it likely impact your day-to-day activities?

## Recording your Conclusions - Section 3 of the Form

For each location listed in Section 2 of the form the following 3 key questions must be addressed. Remember that all officers involved in the investigation must be involved in recording conclusions and must sign the form. If officers come up with different odour descriptions to one another or don’t agree that an odour is or is not offensive this should be recorded on the form.

The form itself may be completed (written or typed) by one officer, but on behalf of both officers, with both officers signing the form thereafter.

**Question 1 - Justification for assessment locations?**

For each location number, information must be provided justifying why the location was chosen. It helps to think of each location in the context of the source of odour, wind direction and other possible odour sources in the locality. Remember upwind assessments should be carried out first.

**Question 2 - Is the odour offensive?**

For each location number, information must be provided justifying why any odours detected were considered offensive or non-offensive. Reference should be made to the FIDOL factors associated with the assigned scores in section 2 of the form.

Describe the odour - How does it makes you feel? What does it smell like and what does it remind you of?

**Question 3 - What is the source of the odour? (Source Attribution)**

If an odour is deemed offensive at any location with the potential to impact receptors, information must be provided to attribute the odour to a source. This can be done using a **combination** of the following:

1. Accurately describing the odour
2. Using wind direction information in relation to your assessment location to identify the likely source and rule out other potential sources. This is particularly relevant where there is another activity in the area with the same or very similar odour
3. Referring to your recognition of the odour from a particular source. For example, if you detect a food waste odour downwind and you have experienced this type of odour at food waste processing sites you can refer to that experience.

Note – If your recognition of an odour relates only to previous off site odour assessments you must ensure sufficient information is provided for a) & b) above to demonstrate the odour has been traced to the source site.

Section 3 should also be used to record any other relevant observations – i.e., on or off-site activities, visible plume(s), steam, vehicle movements, potential alternate sources and why they were discounted. etc.

**Health and Safety** – Only carry out an assessment where it is safe to do so.

**If an authorisation breach is recorded, consider taking a witness statement from complainants.** This will help support the evidence and demonstrate impact. Guidance on how to plan, carry out and record an appropriate witness impact statement can be requested from our Enforcement function.

Please contact OdourRegulationSupport@sepa.org.uk if you would like a copy of the SEPA odour assessment form.

## Notes & Guidance for the Odour Assessment Form:

The overall offensiveness of an odour depends on a combination of factors (so-called “FIDOL” factors), and information on all of these factors needs to be considered to reach a final conclusion, as follows:

**Frequency** of occurrence (one-off, few/ several occurrences?)

**Intensity** of odour (faint, strong etc)

**Duration** of odour event (length of time of event, continuous, sporadic, whiff?)

**Odour description** (odour character, i.e., inherent ‘unpleasantness’ of the smell)

**Location** (sensitivity of receptors, weather conditions)

1. **Time at Location:**

Record the time at each location (to and from a specific time). Up to 30 minutes or more may be required at any one location dependent on the intensity and duration of the odour.

1. **Location Description:**

This should include an address or description of the location, in the context of the area affected by the odour as follows:

1. On site or at boundary only
2. Short distance from boundary but not impacting any sensitive receptors (<25m)
3. At nearby sensitive receptors (<250m)
4. In wider locality out with immediate area of site (<500m)
5. Widespread, affecting large areas
6. **Frequency Categories:**

Relates to the number of events, which could be repeat events on the same day and can be defined from 1 - 5 as follows:

1. Rare, perhaps first recorded occurrence
2. Infrequent, 2 or 3 events per year
3. Occasional, 1 or 2 per month; or several short duration events in any one day
4. Frequent, 1 or 2 per week; or routine short duration events over same period
5. Very frequent, perhaps 3 or more events per week or numerous/repeated short duration events over same period.

**4. Intensity categories** may be defined from 1–5, as follows:

1. No detectable odour
2. Faint (need to inhale facing into wind)
3. Moderate (easily detected while breathing normally, possibly unpleasant character)
4. Strong (bearable but distinctly unpleasant odour)
5. Very strong (very unpleasant odour, possibly causing nausea)

**5. Duration categories** may also be defined from 1- 5 as follows:

1. No detectable odour
2. Transient, e.g., whiff (only detectable for brief intermittent spells)
3. Sporadic discrete (<5 to 10 minutes or <50% of total assessment time if less than 30 minutes)
4. Persistent (greater than 50% of assessment time but not continuous, fairly localised)
5. Continuous (present throughout assessment period)

**6. Wind Speed (Beaufort Scale)**

| **Force** | **Description** | **Observation** | **Km/hr** |
| --- | --- | --- | --- |
| 0 | Calm | Smoke rises vertically | 0 |
| 1 | Light air | Direction of wind shown by smoke drift, but not wind vane | 1-5 |
| 2 | Light breeze | Wind felt on face; leaves rustle, ordinary vane moved by wind | 6-11 |
| 3 | Gentle breeze | Leaves and small twigs in constant motion | 12-19 |
| 4 | Moderate breeze | Raises dust and loose paper; small branches are moved | 20-29 |
| 5 | Fresh breeze | Small trees in leaf begin to sway, small branches are moved | 30-39 |
| 6 | Strong breeze | Large branches in motion; umbrellas used with difficulty | 40-50 |
| 7 | Near gale | Whole trees in motion; pressure felt when walking against wind | 51-61 |
| Scale continues up to Force 12 = Hurricane) |

# Appendix 4: Odour Control Techniques

This appendix provides an outline of available techniques for controlling odour from both new and existing regulated sites. It is not intended to be an exhaustive source but aims to provide an introduction to the general principles of odour control and should be used in conjunction with other available guidance such as BAT conclusions. Reference material used in the creation of this guidance and further information sources providing greater detail on specific techniques are provided throughout.

This guidance examines the opportunities available for the elimination and minimisation of potentially odorous substances or activities through the design, operation and management of site operations before examining the identification and assessment of the odour treatment techniques available for fugitive and point source releases. A short summary of the description, design considerations, common uses, advantages, disadvantages and common issues encountered is provided for each of the odour treatment techniques examined. A brief discussion is then given to the selection of techniques and issues to be considered during inspection.

## A4.1 Design and Management

### Design and process integrated measures

The greatest opportunity for any pollution prevention (including odour) arises during the early stages of project inception. As the project progresses through the various stages of route selection, design and build, the options available to reduce pollution become fewer. It is therefore essential that the applicant considers and addresses all relevant environmental issues as early as possible within the design process.

It is also essential that once designed and built, the process is operated and managed in a way that not only minimises the potential release of odorous emissions but continually reviews site practice in order to identify further options for the elimination and minimisation of potential odorous substances and activities.

Though this guidance is aimed at the consideration of available opportunities for the control of odour, it is noted that odour is only one environmental aspect and as such cannot be considered in isolation. Therefore, you should bear in mind the effect on all environmental media and consult further guidance on the assessment of all such aspects.

Whilst the above generally applies to new plant, scope does exist for consideration of the design of existing plant e.g. when an operator considers plant upgrades or where there is an unacceptable release of odorous emissions from the site.

In new plants, preventive control measures, in-plant segregated waste stream treatment and/or process-integrated measures can be effectively taken into account in the design stage of the plant. For existing plants, retrofitting to existing installations and infrastructure will generally be more expensive and may involve technical and organisational constraints.

### Management – odour management plans

Appendix 5 provides more guidance on the development and use of Odour Management Plans.

## A4.2 Fugitive and diffuse emissions

Fugitive and diffuse emissions are generally considered as all those which are not captured and released through a specific and anticipated discharge point such as a chimney, i.e. any discharge which is not classed as ‘point-source’. They can be difficult to deal with as they tend to be characterised by low concentrations (of odorous compounds), which may be emitted over a large area e.g. an open tank, and/or via numerous locations such as doors and windows.

Although vents are usually designed as a release point and as such are considered point-sources, emissions from some vents are often considered as fugitive, e.g. Local Exhaust Ventilation points (LEVs), tank breathing vents, emergency bursting disc/pressure activated vents, as discharges to atmosphere through these types of system are not controlled and/or expected on a regular basis.

Likely significant sources of fugitive emissions include:

* Raw material handling and storage.
* Open doors/windows and fabric of the building.
* Waste storage.
* Spills.
* Abatement and process plant maintenance.
* Doors, hatches and sampling points etc on process vessels.
* Open tanks, uncovered skips and bins.
* Tank filling (material being put into tank displaces vapours, dusts out through filling point or breathing vent).
* Ill-fitting connections, flanges, valves and leaking pipes/ducting.

### Management and control of fugitive emissions

The following good practice techniques should be used for the reduction of fugitive odorous emissions:

* Maintain the integrity of process buildings by:
	+ Careful selection of materials of construction. Poor selection of materials can lead to preferential corrosion and loss of containment. Fabric of the building should be inspected regularly.
	+ Keeping windows and doors shut. Remotely operated fast acting roller doors can minimise the amount of time that doors are open and air curtains can be used at doorways to minimise air escape. Siting doors at opposite ends of a building can create a through draft which carries odour out and should be avoided where possible. For very odorous processes the use of interlocked air-lock entry and exit doors and maintenance of negative pressure within process plant or within process buildings will prevent the escape of contaminated air. Implications for the health and safety of people working inside should be considered.
* In the case of open-air operations, observe good practice relating to covering odorous materials, housekeeping, mixing of materials, venting, design etc.
* Transfer odorous materials in automatic flow demand systems rather than in batch containers where possible vapour balance lines should be installed for tanker loading or offloading of odorous materials and also for tank transfers. Tankers should use dry break couplings to minimise the potential for spillages. Where there are only occasional transfers of substances which have no environmental impact in air other than their odorous nature, it could be sufficient to move the loading point to the furthest point from the sensitive receptor.
* Cover tanks/lagoons of odorous material where possible. Where it is not possible to completely cover the tank, it may be possible to use polypropylene hexagons or balls (chroffles) to reduce the surface area of the tank. This will reduce evaporative loss and odour and will also have the added benefit of reducing energy loss. Fill from the bottom with submerged pumps to avoid disturbing the surface.
* Maintain seals, glands, pumps and other potential fugitive release points within a planned programme of preventative maintenance and implement a leak test regime. The design specification for pumps, valves, pipe flanges, relief valves and bursting discs etc should be reviewed.
* Avoid mixing incompatible materials which may produce malodorous breakdown products.
* Ensure that raw materials, products and wastes are stored appropriately. The condition of incoming material may need to be monitored and acceptance criteria established whereby if the material is degraded to such an extent that any handling or processing is likely to result in the release of offensive odour then it is not accepted on to site. Generally putrescible materials should be rotated on a first-in, first-out basis and refrigerated where appropriate (there may be seasonal variation in the “shelf life” of putrescible materials). Care should be taken with regard to transit times. Where material has had longer to travel it may arrive in a more degraded state than material already on site and therefore should be processed first where possible.
* Avoid conditions which encourage anaerobic breakdown.
* Good housekeeping - avoid build-up of malodorous materials and wastes except in designated (and appropriately managed) areas.
* There may be opportunities to adjust operating times to avoid weekends or evenings, or to run a particular process only when the wind is favourable.
* Ensure that staff receive suitable and sufficient training relating to odour control.

## A4.21 Common containment and capture techniques

There are different types of containment: it can be local to part of a process or used for an entire process. Containment may be a step before treatment (capture) or may be able to stand alone as a means of preventing offensive odour from escaping the process or installation boundary.

Containment can be achieved by eliminating unintentional holes in equipment, ducts, buildings etc including keeping doors and windows closed, avoiding the storage of odorous materials outside the building and the transport of materials between buildings in open containers etc. As a general rule all odour control systems should exert a negative pressure locally or within process buildings to prevent odorous air leaking out. Actions taken should not compromise the health or safety of those working inside.

The number of air changes per hour in a contained system such as a process building should be sufficient to ensure adequate capture of odorous substances. The need to reduce ambient odours within a building has to be balanced against the energy and operating costs associated with moving large amounts of air. The specific requirements need to be determined on a case-by-case basis and change greatly depending on activity and subject to seasonal variation for example with maggot breeding processes ventilation rates of between 10 air changes per hour in the winter and 25 air changes per hour in the summer are recommended. However, for most situations, a guideline minimum of 3 air changes per hour should be used.

Odorous air should be contained within process machinery to avoid contaminating the much larger volumes of “ventilation air” within buildings. Good, localised containment of intensely odorous process gas and effective treatment prior to discharge or to mixing with general ventilation air can remove the need for treatment of a much larger volume.

The release of odorous or other volatile substances – if these are to be expected – can be prevented by covering the vessel or operating in a closed tank and ducting (capturing) the exhaust air to a gas abatement system.

Various types of containment and capturing techniques are shown below:

**Drum filling: Processing unit:**



**Auger conveyor:**



### Design considerations:

* Install containment systems with sufficient collecting volume.
* The overall cost of treating an odorous gas stream is determined to a large extent by the volume of air involved.

### Common system and uses:

* Process emissions from the process equipment inherent to the running of the plant, released from a large surface or through openings etc.
* Non-ducted emissions (e.g. working losses and breathing losses, when not captured and ducted) from storage equipment and during handling operations (e.g. filling of drums, trucks or containers).
* Non-routine emissions, resulting from operations other than the routine processing of the facility, including emissions during start-up or shutdown, and during maintenance secondary emissions, resulting from the handling or disposal of waste (e.g. volatile material from sewers, wastewater handling facilities or cooling water).

### Advantages:

* Containment of highly odorous process gases, i.e. keeping it separate from less odorous streams, may reduce the capital and operating (energy costs etc.) of the required abatement system(s).
* This also has the potential benefit of reducing raw material usage and waste generation.

### Disadvantages:

• Containment does not deal with the root cause/source.

• Can be difficult to identify and correct breaches in containment as and when they occur.

### Common problems and issues:

* Some processes are obviously not amenable to enclosure, for example landfill and effluent treatment, although for the latter localised enclosure of some parts of the process may be possible.
* Where it is not possible to completely cover tanks it may be possible to use polypropylene hexagons or balls (chroffles) to reduce the surface area of the tank. This will reduce evaporative loss and odour and will also have the added benefit of reducing energy loss.
* Testing of buildings, tanks and storage areas using smoke generators can provide a quick and easy means of identifying holes and leaks from which odour may escape. Leak testing in this way often provides a very positive initial step in a programme to identifying odour sources, and can all help in creating a more efficient negative pressure system. Care should be taken when selecting the colour of the smoke used as it can be difficult to see white smoke on a grey day. It should also be noted that the smoke can take a tortuous path (travelling along internal walls) and exiting in unexpected areas.
* Management of the containment is very important. Doors will not stop odour if they are left open so self-closing mechanisms should therefore be employed where possible and consideration given to fitting visual and audible alarms to activate when the door has been open for a specified period of time.

### A4.22 Dilution and dispersion

Dilution and dispersion are usually achieved via emission through a tall stack. A stack will be appropriate for very low intensity or non-offensive odours, discharged at low rates and as a final step following treatment of an odorous gas stream.

### Dilution

A common misunderstanding is that diluting odorous air prior to stack discharge minimises the potential for odour annoyance at sensitive receptors. Increasing the air volume will change the characteristics of the emission, such as increasing the exit (efflux) velocity, and therefore increase the effective stack height. This will have some effect on the dispersion characteristics of the emission, but dilution itself does not alter the mass odour emission. The perceived odour level at a given receptor point is more a function of odour mass discharged rather than the actual odour concentration. Therefore, the released mass must be reduced to have any effect. Depending on other dispersion characteristics, increasing the effective stack height may simply result in changing the location of the area of impact.

### Dispersion

Where odour cannot be prevented, containment and often some form of treatment is followed by release to atmosphere and reliance is placed upon sufficient dispersion taking place before sensitive receptors are reached.

Design considerations:The stack should be appropriately designed to ensure it is an adequate height above the buildings in the vicinity, and this may require dispersion modelling. As a general rule of thumb, the stack should be at least 2.5 times the height of adjacent buildings within a radius of 5 stack heights.

Exit velocity is an important consideration because increasing it will increase the effective stack height and so change the dispersion characteristics of the plume. The following general rules of thumb are highlighted for information:

* Downwash: if the ratio of wind speed to exit velocity is too low then emissions can be drawn down the stack and ground on site. To avoid this, the exit velocity should be at least 1.5 times the wind speed.
* Exit velocity can be considered to be comprised of two components; a momentum element and a buoyant (temperature dependant) element.
	+ Momentum effects last approximately 30 to 40 seconds and can be increased by either increasing the volumetric flowrate of the discharge or restricting the stack diameter (addition of cone accelerator).
	+ Buoyancy effects last approximately 3 to 4 minutes or until the temperature of the plume matches the ambient air temperature.
* A rough rule of thumb for dominant effect is that if the exit temperature is around 10 to 15°C higher than the ambient air then buoyant rise will be greater than that due to momentum.
* There should be an unrestricted final discharge (ie hooked vents or rain caps that restrict flow should be avoided).
* Knowledge of what constitutes an acceptable level of exposure can be used in calculating a suitable chimney height for dispersion of residual odours. Concentration is one of the factors that determine the impact of a given odour on sensitive receptors.
* Odour exposure criteria are a statistical means of linking the odour emission from a process to the impact (concentration) at ground level, in terms of probability of occurrence, taking frequency of occurrence into account. They are determined by mathematical dispersion modelling of source emission data and other local data.
* They are probability-based and therefore are not absolute “limits”; they are merely indicative of an average concentration that is likely to occur for a specified percentage of the time over a year. Section 2.3 in this document describes the use of limits.

Common systems and uses:
The rules of thumb described above and below have been highlighted to provide an initial impression only. Where the odour emission rate from a source is known by measurement or can be estimated, the odour concentration in the vicinity can be predicted by means of dispersion modelling. Dispersion modelling attempts to describe the effects of atmospheric turbulence on the emission(s) as they undergo dilution and dispersion in the surrounding environment.

### Advantages:

* Dispersion has a moderate capital cost but low running costs.
* Odour dispersion modelling is one of the only tools that can predict the potential effects of a new odour-emitting activity.

### Disadvantages:

The magnitude and frequency of the peaks in concentration are often the factors that determine whether an exposure is acceptable or not. Odours can be detected at low levels and can have an impact over a very short period of time. Simply building a tall chimney does not guarantee that there will be no impact from the release of odours as this will be dependent on a number a factors not least the weather and local topography. The amount of the odorous substance in the waste gas should be minimised by the use of effective abatement techniques prior to discharge to the atmosphere.

### Common problems and issues:

* Increasing the effective chimney height may reduce or eliminate complaints close to source but may not reduce complaints further afield.
* Complaints from further afield may actually increase with increased effective chimney height if dispersion is poor.
* Reducing the mass emission is often more effective than increasing the chimney height.
* Typically the maximum ground level concentration will occur between 10 and 20 stack heights down wind of a stack. The maximum ground level concentrations are inversely proportional to the square of the stack height. The rate of release of the odorant governs the maximum ground level concentration not the final concentration in the stack.

### Design considerations:

The use of masking agents and neutralising agents are generally not considered appropriate for providing routine odour control. There are very few situations where the addition of another chemical to the air rather than dealing with the problem at source would represent best environmental option from a regulatory viewpoint. Whilst each case should be examined on its merits and according to the process guidance, the following indicates situations where the use of modifying agents might be appropriate.

* As a temporary measure whilst process or plant modifications are made and/or an odour management system is being put into place.
* For dealing with a short-term problem, or perhaps to provide additional abatement for infrequent odour events (e.g. to cover short-term seasonal variation).

Where the agent is used in a duct or scrubber such that it is contained and there is no carry over of the agent to the atmosphere occurs where it could undergo subsequent dispersion and have an impact upon receptors.

### A4.2.3 Masking compounds and neutralising agents

Masking compounds and neutralising agents are products available for treating fugitive odours such as from landfill working faces, tanneries, intensive farming of animals and wastewater treatment plants.

The products available can be classified as follows.

* Masking agents are mixtures of aromatic oils that cover up an objectionable odour with a more desirable one.
* Chemical counteractants are mixtures of aromatic oils that cancel or neutralise odour and reduce the intensity.
* Digestive deodorants contain bacteria or enzymes that eliminate odour through biochemical digestive processes.
* Chemical scavengers are chemicals that can be added to materials to react with the potentially odorous substances. Use includes removal of sulphur from spills of crude oil.

### Design considerations:

The use of masking agents and neutralising agents are generally not considered appropriate for providing routine odour control. There are very few situations where the addition of another chemical to the air rather than dealing with the problem at source would represent best environmental option from a regulatory viewpoint. Whilst each case should be examined on its merits and according to the process guidance, the following indicates situations where the use of modifying agents might be appropriate.

* As a temporary measure whilst process or plant modifications are made and/or an odour management system is being put into place.
* For dealing with a short-term problem, or perhaps to provide additional abatement for infrequent odour events (e.g. to cover short-term seasonal variation).

Where the agent is used in a duct or scrubber such that it is contained and there is no carry over of the agent to the atmosphere occurs where it could undergo subsequent dispersion and have an impact upon receptors.

### Common systems and uses:

* Masking agents are generally only suitable for assisting in the control of odours from large area sources, such as landfills. Even in these cases they should not be relied upon for odour control, but should act as a ‘last line of defence’ after stringent management practices and adequate buffer distances. Agents are often more suited to process failure or abnormal emissions than routine control. They should be seen as a temporary rather than a permanent solution.
* Digestive deodorants are usually added to wastewater treatment systems to promote biological activity and to prevent the release of the odorous compounds into air.

### Advantages:

* Modest capital outlay.
* Atomiser units are portable, can be rapidly deployed.
* Highly visible means of being seen to take action over a problem.

### Disadvantages:

* The application of odour counteractants can be problematic because an emission may vary in concentration or nature with time. These variables make it difficult to ensure that unpleasant odours are “blotted out” at all emission levels.
* The odour of the modifying agent can itself become a source of annoyance.
* Factors such as differing diffusion characteristics of the modifier and the odour itself may cause the odour to separate from the modifying agent at a distance, thus producing two distinctly different odours at different points.
* The ongoing cost of the modifying agent can be very expensive and maintenance costs can be high as fine spray nozzles can be prone to blockage.
* Some of the components such as surfactants can make surfaces slippery.

Careful consideration needs to be given to the selection of the agent as it may in itself be harmful to human health or the environment.

### Common issues and problems:

* Care needs to be taken with the use of masking agents because the combination of chemicals may result in an odour that is even more objectionable or offensive.
* Application should not be considered where the odorous emission carries a risk to health or the odour itself serves as a safety warning.
* The operator can sometimes feel that this is a ‘simple fix’ to an odour problem on site and so either not identify the root cause of the problem or dismiss other alternatives.
* Unless the agent is used in a duct or scrubber it is impossible to ensure effective contact between the agent and the odorous gases. It is also impossible to work out the efficiency of such a system.

## A4.3 Ducted and point source emissions

Where odorous streams cannot be eliminated through substance substitution, process modification and other measures, they should be captured and controlled within the process system to avoid contaminating the much larger volumes of “ventilation air” within buildings. The overall cost of treating an odorous gas stream is determined to a large extent by the volume of air involved. Good containment of intensely odorous process gas and effective treatment prior to discharge or to mixing with general ventilation air can remove the need for treatment of a much larger volume.

General principles for minimising odour releases associated with ducted or point-source emissions include:

* Use of negative pressure systems to prevent odorous gas leaking out. If a process building is put under negative pressure, consideration must first be given to the health and safety of operators within the building. The requirement for make-up air to replace air being extracted from buildings to create negative pressure must be balanced with the preventing fugitive emissions from holes and gaps. One-way louvers or intake fans should be considered to provide make up air.
* Testing of buildings, tanks and storage areas using smoke generators can provide a quick and easy means of identifying holes and leaks from which odour may escape. Leak testing in this way often provides a very positive initial step in a programme to identifying odour sources, and can all help in creating a more efficient negative pressure system.
* Ensure that hot emissions take place from the minimum practicable number of stacks in order to obtain maximum advantage from thermal buoyancy. This is particularly important when new plants are being designed or when changes are being made to existing processes. If practicable a multi-flue stack should be used.
* Ensure that stack heights are sufficient to ensure adequate dispersion under normal conditions.
* Ducts should be designed and the velocity inside them maintained such that the accumulation of material inside them is minimised. In general, pipework should be designed to allow a flow velocity of greater than 5 metres per second (m/s) and may need to be greater than 10m/s if the gas stream has a heavy particulate loading. The flow velocity should be kept as constant as possible throughout the system. The angle at which branches enter the main duct should ideally be about 300 and should not exceed 450.
* All flues and ductwork should be cleaned to remove any accumulation of materials, as part of the routine maintenance programme. This will require suitable access and drainage points to be incorporated into the system. However the number of access points should be carefully balanced against the increased potential for leakage as the number of openings increases.
* Exhaust gases discharged through a stack should achieve an exit velocity greater than 15m/s during normal operating conditions to achieve adequate dispersion.
* Stacks should not be fitted with any restriction at the final opening such as a plate, cap or cowl, with the exception of a cone which may be necessary to increase the exit velocity of the emissions.
* Emissions with a high water vapour content should be free from droplet fallout. This can be minimised by maintaining the linear flow rate below 9m/s.

The selection of abatement method used is dependent on a number of factors including the properties of the gas to be treated, the physical constraints of the technology, and the standard of the final emission. The following points should be considered when selecting odour abatement systems.

### Particulates and aerosols

Some processes are very dusty with a significant proportion of odour being associated with the dust, for example some pharmaceutical processes, poultry farms and animal feed compounders. It may be possible to reduce odour significantly by removing the dust or droplets from the exhaust by filtration or mist eliminators. Preliminary particulate control will be required upstream of some forms of abatement equipment, for example packed bed scrubbers will need protection. It may be possible for the collected particulate matter to be recycled, particularly if it has some value.

### Concentration and volume of pollutants

The perceived strength of an odour is not necessarily associated with high chemical concentrations. However, generally:

* Where high odour/pollutant concentration is associated with small air volumes, incineration may be the only effective odour control option, although an assessment of volume and loading may show adsorption on carbon units to be worth considering.
* Multi-stage scrubbing is often more cost effective for larger volumes of highly polluted air.
* Medium and low odour/pollutant concentrations are liable to be associated with larger air flows, such as building ventilation systems. They are likely to require abatement by techniques with lower operating costs such as biofiltration.

### Temperature

The temperature of the gases to be treated will affect the abatement options which are available or may dictate the need to fit additional pre-conditioning units, such as a gas cooler or condenser. For example, biofilters and carbon adsorbers are unlikely to be effective if the gas temperature is in excess of 35°C and 40°C respectively. Conversely, high exhaust temperatures may reduce running costs if incineration was an option. An additional factor affecting odour abatement is the effect of the temperature on the material of construction. Plastic is frequently used because of its anti-corrosion properties and relatively low cost, however it can be susceptible to thermal damage.

### Moisture content

The moisture content of the exhaust gas will also affect the choice of abatement technique. High moisture content is likely to reduce the cost effectiveness of adsorbers due to the preferential take up of water vapour. High moisture content is slightly beneficial for biofilters because it reduces the amount of irrigation the bed requires and it has no detrimental effect on scrubber performance, but it will adversely affect the cost of incineration as an option.

### Chemical composition

The chemical composition of an odorous gas stream can affect the suitability of various abatement options in several ways. For example:

* Organic compounds may not be suitable for abatement by a water-based scrubber but may provide a significant fuel fraction for an incinerator.
* Incineration of a gas stream with a high sulphur loading would lead to the formation and release of acidic oxides, unless the incinerator had been designed to withstand and remove these prior to release.
* Acidic and basic gases are readily removed in chemical scrubbing by use of a neutralising chemical - for acid gases this would be an alkali.
* Easily soluble organic compounds are most suited to bioscrubbing or biofiltration, whereas aromatic compounds and those containing halogens are more difficult to oxidise by this method.

It is therefore essential to understand the chemical composition and characteristics of a waste gas stream in order to select the most appropriate abatement option.

### Disposal of waste products

When deciding upon the choice of odour abatement equipment, safe (and legal) disposal routes for secondary wastes, such as scrubber liquor and sludges and saturated carbon, will need to be considered as part of the overall environmental impact, as well as the additional cost.

Other considerations in relation to the equipment include:

* Physical size - available space may be at a premium.
* Energy use and noise output.
* Safety considerations.
* Reliability and maintenance requirements including down time, start-up and shut-down requirements.
* Seasonal fluctuation – external biofilters for example will be subject to lower ambient temperatures during winter months but may be at risk of drying out during dry months – both of which can adversely affect performance.
* Complexity and need for training and skilled staff.
* Consistency of concentration and composition.

### Discharging waste gases to atmosphere

The standard and quality of the final emission required to be achieved will be influenced by local topography, prevalent weather conditions and height of discharge which all affect the behaviour and dispersion of the treated emission. See the section above on dispersion/dilution for more information.

**Table A4.1 Summary of generalised criterion for selecting odour abatement techniques**

| **Treatment** | **Flow rate** | **Temperature** | **Relative humidity** | **Particles** | **VOC concentration** | **Sulphide-based odorants** | **Nitrogen-based odorants** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Low** | **High** | **Low** | **High** | **Low** | **High** | **Low** | **High** | **Low** | **High** | **Low** | **High** | **Low**  | **High** |
| **Condensation** | **Checkmark with solid fill** | **X** | **X** | **Checkmark with solid fill** | **X** | **Checkmark with solid fill** | **Checkmark with solid fill** | **X** | **Checkmark with solid fill** | **Checkmark with solid fill** | **Checkmark with solid fill** | **Checkmark with solid fill** | **Checkmark with solid fill** | **Checkmark with solid fill** |
| **ESP** | **Checkmark with solid fill** | **Checkmark with solid fill** | **Checkmark with solid fill** | **Checkmark with solid fill** | **Checkmark with solid fill** | **Checkmark with solid fillCheckmark with solid fill** | **Checkmark with solid fill** | **Checkmark with solid fill** | **Checkmark with solid fill** | **Checkmark with solid fill** | **Checkmark with solid fill** | **Checkmark with solid fill** | **Checkmark with solid fill** | **Checkmark with solid fill** |
| **Absorption – water** | **Checkmark with solid fill** | **Checkmark with solid fill** | **Checkmark with solid fill** | **X** | **Checkmark with solid fill** | **Checkmark with solid fill** | **Checkmark with solid fill** | **Checkmark with solid fill** | **Checkmark with solid fill** | **X** | **Checkmark with solid fill** | **X** | **Checkmark with solid fill** | **X** |
| **Absorption – chemical** | **Checkmark with solid fill** | **Checkmark with solid fill** | **Checkmark with solid fill** | **X** | **Checkmark with solid fill** | **Checkmark with solid fill** | **Checkmark with solid fill** | **Checkmark with solid fill** | **Checkmark with solid fill** | **Checkmark with solid fill** | **Checkmark with solid fill** | **Checkmark with solid fill** | **Checkmark with solid fill** | **Checkmark with solid fill** |
| **Adsorption** | **Checkmark with solid fill** | **X** | **Checkmark with solid fill** | **X** | **Checkmark with solid fill** | **X** | **Checkmark with solid fill** | **X** | **Checkmark with solid fill** | **Checkmark with solid fill** | **Checkmark with solid fill** | **Checkmark with solid fill** | **Checkmark with solid fill** | **Checkmark with solid fill** |
| **Biological** | **Checkmark with solid fill** | **Checkmark with solid fill** | **Checkmark with solid fill** | **X** | **Checkmark with solid fill** | **X** | **Checkmark with solid fill** | **X** | **Checkmark with solid fill** | **X** | **Checkmark with solid fill** | **X** | **Checkmark with solid fill** | **X** |
| **Thermal** **oxidation** | **Checkmark with solid fill** | **Checkmark with solid fill** | **Checkmark with solid fill** | **Checkmark with solid fill** | **Checkmark with solid fill** | **Checkmark with solid fill** | **Checkmark with solid fill** | **Checkmark with solid fill** | **Checkmark with solid fill** | **Checkmark with solid fill** | **Checkmark with solid fill** | **Checkmark with solid fill** | **Checkmark with solid fill** | **Checkmark with solid fill** |
| **Catalytic oxidation** | **Checkmark with solid fill** | **X** | **Checkmark with solid fill** | **Checkmark with solid fill** | **Checkmark with solid fill** | **X** | **Checkmark with solid fill** | **X** | **X** | **Checkmark with solid fill** | **Checkmark with solid fill** | **Checkmark with solid fill** | **Checkmark with solid fill** | **Checkmark with solid fill** |

### Common Techniques

Some common techniques are briefly discussed in the following tables:

* Table A4.3.1: Biological Treatment.
* Table A4.3.2: Incineration.
* Table A4.3.3: Adsorption.
* Table A4.3.4: Dry Scrubbing.
* Table A4.3.5: Dry Chemical Scrubbing.
* Table A4.3.6: Adsorption Wet Gas Scrubbing.

### Table A4.3.1: Biological Treatment

| **Table A4.3.1: Biological Treatment** |
| --- |
| Biological treatment relies on the organic odorous compounds being metabolised and consequently degraded by naturally-occurring micro-organisms into non-odorous products. All systems are therefore required to be able to support a population of micro-organisms (a damp environment for microbial activity, oxygen and provide trace nutrients) and to enable sufficient contact between the population and foul gas. Once established the microbial population will undergo a degree of self-selection to adapt to the defined odorous gas stream. Biological treatment systems fall into two main categories:* Bio-filtration employs a bed comprising a media substrate to support the naturally-occurring micro-organisms and a delivery system to allow even distribution of the odorous gas at the required conditions. Once passed through the bed, the treated air stream is discharged from the surface of the filter although sometimes an enclosure is fitted and the stream is discharged via a stack. The bottom of the bed is kept moist by passing the incoming air through a humidifier where required and at the top of the bed through the use of an irrigation system. Bio-filtration can be further split based on media type and the resultant requirements in operating parameters.
	+ Soil: the filter consists of a layer of soil overlying a distribution system consisting of a network perforated pipes within a gravel bed.
	+ Non soil: typical media includes woodchip, peat (plus a component to avoid compaction), calcified seaweed etc. The distribution system can consist of a network of perforated pipes or a plenum and distribution chamber where the media is supported at height. A residence time of between 45 and 60 seconds is required and where maintained correctly a bed can last between 3 to 5 years.
* Bio-reactors/scrubbers: these apply the same principles as biofilters however the odorous gas is passed up a packed tower through a counter current flow containing a population of microbes. The packing provides support for the microbes as they adhere to it (microbial film) allowing contact with the passing gas. Packing can be organic as the non soil filters above or be of an inorganic nature.
 |
| Design Considerations | Process conditions and fluctuations (such as odour concentration, nutrient loading, temperature, moisture content, pH, chemical constituents/potential for poisoning), media type. |
| Common System and uses | Biological treatment systems are ideally suited to processes which produce large volumes of foul air with low to medium odour concentrations and are often employed as a final “polishing stage”. Industries where the technology has been applied include rendering plants, intensive livestock installations, in vessel-composting plants, animal foodstuff producers, perfumeries, fine chemical and food/drink processes and wastewater treatment works. |
| Advantages | * Non soil filters can be up to 95% efficient while. Soil filters and bio-reactors can be more than 99% efficient.
* Minimal secondary pollution (wastes generated).
* Relatively inexpensive to install and maintain compared to other abatement options.
* Bioreactors have additional benefits in that they have a small footprint compared to biofilters and the replacement of the support medium is not required.
 |
| Disadvantages | * Processes cannot be treated where there are high levels or variability in odour concentrations (slow adaptation of micro-organism population) or interruptions in process flow and batch processing.
* In order to ensure high removal efficiency, inlet conditions (temperature, pH and humidity) must be maintained within narrow bands and regular maintenance is required.
* Large land areas required for biofilters, also larger biofilters tend to have problems with even distribution and maintenance.
* Bio-reactors have higher running costs than soil biofilters which in turn have higher running costs than other biofilters.
* Additional nutrients may be required to support the microbial population.
* Need for contingency plans in case the microbial population is destroyed/poisoned and when media is changed.
* Monitoring can be difficult unless covered (can measure at the outlet).
* The removal efficiency is limited by ambient conditions.
* Sloughing of the biomass can occur - microbes break away from the inert support.
 |
| Common Problems and Issues | * Moisture/drying: It is essential to ensure that the media remains wetted otherwise this can cause cracking (see below) and reduces the micro-organisms population and available interface for odour removal. Once the bed has dried out is difficult to re-wet. Over wetting should be avoided because it is important to maintain aerobic conditions. Frost can cause similar problems. (You could cover system) (You could recycle effluent water however need to consider pH (acidification), nutrient loading and natural airborne compounds H&S)
* Particles/fats: it has been known for the nozzles within the humidifiers and irrigation systems as well the foul air distribution system to become blocked. Nozzles and pipework should be periodically checked for blockage and pre-treatment considered. Blockage can also be caused by flooding. (results in over watering/poor drainage)
* Bed structure: inspections should be carried out to ensure that an even distribution of foul gas through the bed is being achieved. Cracks and holes in the bed can form as well areas of compaction (you could consider turning bed) leading to preferential paths reducing residence time and allowing gas to escape untreated. (You can look for dry/cold patches/steam rising). Frost damage
* Contingency: biofilters are often used as contingency where primary odour abatement has failed. The biofilter is unlikely to abate the odour emissions in this case and is likely to be taken out of action due to high odour/temperature.
 |

### Table A4.3.2: Incineration

| **Table A4.3.2: Incineration** |
| --- |
| The process of incineration or thermal oxidation can be used for the effective destruction of odorous compounds and may be described as the process whereby waste (odorous gas) is heated with either air or oxygen at high temperature in a combustion appliance. If the combustion is complete and the wastes (odorous gas) are organic compounds, then the products of combustion will be carbon dioxide, water and oxides of nitrogen. Complete combustion is dependent upon uniform mixing of fuel, the odorous gas stream and combustion air. The configuration of burner, mixer and combustion chamber are important to effective mixing.* Burner - Fuel is burnt with clean (or contaminated) air to produce a flame at approximately 1,500 °C
* Mixer - The remainder of the contaminated air is mixed with hot gas from the flame to bring the mixture to a uniform temperature.
* Combustion Chamber - The gases are held at this temperature until oxidation has been completed (typically 0.5-1 seconds, though this is dependent on the species to be destroyed, the design of the plant and the temperature employed). It is the combination of temperature and residence time that ensures adequate destruction with various combinations available

Thermal incineration uses the process as described above and typically employs temperatures of between 650 to 800°C to ensure the effective destruction (dependant on residence time) of odorous gas in a well-designed incinerator. Rapid oxidation of odours occurs if the gas temperature is typically in the range of 750-800°C. Existing kilns, furnaces and boilers can sometimes be used to incinerate odours where the temperatures and residence times lie within the appropriate range.Catalytic incineration uses the process as described above however the oxidation reaction takes place on the surface of the catalyst where odorous contaminants and oxygen diffuse from the air stream are adsorbed onto the catalyst surface rather than in free air. Catalytic incineration therefore requires lower temperature, (typically 350 to 400°C) and lower residence time. Once oxidation takes place the products are desorbed back into the gas stream. Typical catalyst materials include platinum, palladium, rhodium, copper chromate and oxides of copper, chromium, manganese, nickel and cobalt supported on a base material. Catalytic incineration is an appropriate odour abatement technique when odour concentration is high and there is little or no particulate matter in the process stream. |
| Design Considerations | * Nature of the odorous gas stream and required pre-treatment (i.e. odour concentration, effects of entrained dust on catalyst and equipment/potential for catalyst poisoning etc).
* Capital and Operating cost.
* Fuel availability.
* Available space.
* Choice of catalyst and properties of the catalyst.
* Combustion products.
* Further abatement requirements (treatment of acid gases etc).
 |
| Common System and uses | Almost universal application to odour control is possible because all organic odours can be oxidised at high temperature, however due to cost considerations incineration treatment systems are ideally suited to processes which produce low volumes of foul air with medium to high odour concentrations. Industries where the technology has been applied include animal rendering plant, rape seed oil extraction, blood drying plant, barley roasting, plastic processing, coffee roasting, paint spraying, synthetic rubber manufacture, oil refining, etc. |
| Advantages | * Non-specific: can be applied to almost all odour control scenarios as all organic odorants can be oxidised at high temperature.
* Can handle very high inlet odour levels. Very high odour removal efficiencies.
* Primary heat recovery is possible. The incinerator exhaust gas is used to pre-heat the incoming gas stream, reducing requirements to heat gases in the incinerator. This is achieved directly (recuperative) or where the incinerator exhaust gas is passed through several ceramic bed heat exchangers which in turn pre-heat the incoming gas stream. Oxidation of the off-gas also continues in the ceramic beds. In regenerative systems higher heat recovery is achieved however the potential exists for the incoming gas to contaminate the exhaust gasses and so the ceramic beds alternate between heating, cooling and purging. Secondary heat recovery is achieved through the generation of steam and hot water.
* Existing boilers can sometimes be adapted for use as thermal incinerators.
* Catalytic incineration achieves effective destruction at lower operating temperatures and so requires less energy. Units also tend to be smaller.
 |
| Disadvantages | * Capital and operating costs are high.
* Maintenance of smooth operation (burners) required.
* The volume of air requiring treatment can be a limiting factor in terms of cost, as can the requirement for high temperatures (e.g. for oxidising ammonia).
* Further abatement: need to cope with SO2 or HCl formed from compounds containing S or Cl. Acid gases create further odour issues.
* Pre-treatment.
* Condense water vapour from a wet gas - this reduces fuel requirements and minimises corrosion problems.
* Remove solid and liquid contaminants - to minimise risk of fouling, corrosion, attrition and catalyst poisoning fouling (adsorption active sites). Blinding (dust).
* Continuous monitoring for carbon dioxide and/or oxygen, carbon monoxide and oxides of nitrogen in the effluent gas stream is generally required. There is also a requirement that temperature is measured as a means of monitoring combustion conditions. Sampling and analysis techniques suitable for high temperatures are required.
* Spent catalyst waste stream requires disposal.
 |
| Common Problems and Issues | * Not all boilers or kilns work for24hrs/day and hence they may not be able to treat a continuous odour emission all the time.
* The destruction of odorous compounds requires steady conditions of temperature and flow, whereas steam-raising boilers or furnaces may be subject to fluctuation as the loading demands change.
* The flow rate or temperature profile may not be suitable without major changes.
* Materials of construction may not be able to withstand the corrosive effects of nitrogen or sulphur compounds.
* Computation Fluid Dynamic (CFD) study should be carried out to ensure that the temperature and flow characteristics are adequate to ensure odour destruction and that there are no cool or dead spots within the boiler/incinerator.
* Physical methods for demonstrating residence time exist and should be employed to ensure adequate destruction is achieved.
* Breakdowns can often require specialised parts/repair and may take some time to rectify. Consideration should therefore be given to the establishment of a maintenance contract to ensure speedy repair, back-up systems for odour control and contingency plans to ensure odour is minimised in the event of a breakdown.
 |

### Table A4.3.3: Adsorption

| Table A4.3.3: Adsorption |
| --- |
| The process of adsorption is where one substance adheres to the surface of another substance. In this instance there is a mass transfer of gas molecules (odorant) from the bulk of gas through diffusion until the molecules are finally adsorbed onto an internal surface (adsorbent). All adsorbent systems fall into two main categories;* Fixed beds (gas passed through a stationary bed of adsorbent material) are simple, economical and require minimal solids handling, however for much of its operational life, a large proportion of the adsorbent bed is saturated and the larger the flow of gas to be treated the larger the fixed bed required.
* Fluidised beds (gas passed through a suspension of adsorbent) and continuous moving beds (adsorbent falls by gravity through the rising gas) have multiple stages and are continuous in operation overcoming some of the disadvantages of a fixed bed system. However the continuous handling and transport of solids is required, which is expensive, can lead to mechanical problems and promotes attrition. Systems must be large to be economical.
 |
| Design Considerations | * Adsorbent selection.
* Adsorptive capacity.
* Process conditions – temperature, moisture content, chemical constituents (preferential adherence, block adherence).
 |
| Common System and uses | * The most common adsorbent in use is carbon, normally as activated carbon, although others are available such as silica gels, alumina and zeolites. Some types of activated carbon may be doped with other chemicals to improve selectivity.
* Adsorbents can be used for a range of odorous materials but care should be taken that the capacity of the adsorbent is not exceeded through excessive flows or high odorant loadings. This may result in the adsorbent requiring be regenerated or replaced at frequent intervals. Activated carbon can be readily regenerated several times.
 |
| Advantages | * Depending on the chemical species involved, efficiency can be in excess of 99% for a new adsorbent.
* Depleted adsorbent can often be regenerated and reused (larger applications, may not be cost effective on smaller units).
* Smaller applications can make use of easily replaceable, cartridge type units.
* Relatively low cost compared to some other systems.
* High temperature and humidity may cause odour breakthrough. Temperatures less than 40°C required for activated carbon systems.
 |
| Disadvantages | * High particulate content may cause clogging of bed.
* High concentrations of odorants will cause rapid saturation.
* Efficiency will deteriorate over a period as the bed becomes saturated.
* Disposal required for waste adsorbent which cannot be regenerated (for whatever reason).
* Pollutants may flash off unless contained.
* Regeneration will produce a gas stream which will require abatement.
* Ancillary equipment may be needed to precondition the gas stream before the carbon bed/filter: this can add considerably to the cost.
 |
| Common Problems and Issues | * Breakthrough: predicted and actual. Often the first sign is odour release.
* Many systems use two adsorption units in series and undertake monitoring between beds to alert of breakthrough.
* Vapours (odours) will travel the path of least resistance. Care has to be taken with the system design to ensure that the backpressure exerted by the bed does not mean that odours never reach the adsorbent material.
 |

### Table A4.3.4: Dry Scrubbing

| Table A4.3.4: Dry Scrubbing |
| --- |
| A dry or semi-dry scrubbing system, unlike the wet scrubber, does not saturate the flue gas stream that is being treated with moisture. In some cases no moisture is added, while in other designs only the amount of moisture that can be evaporated in the flue gas without condensing is added.There are a number of dry type scrubbing system designs. However, all consist of two main sections or devices: a device to introduce the acid gas sorbent material into the gas stream and a particulate matter control device to remove reaction products, excess sorbent material and any particulate matter already in the flue gas.Dry scrubbing systems can be categorized as dry sorbent injectors (DSIs) or as spray dryer absorbers (SDAs). Spray dryer absorbers are also called semi-dry scrubbers or spray dryers.* Dry sorbent injection involves the addition of an alkaline material (usually hydrated lime or soda ash) into the gas stream to react with the acid gases. The sorbent can be injected directly into several different locations: the combustion process, the flue gas duct (ahead of the particulate control device), or an open reaction chamber (if one exists). The acid gases react with the alkaline sorbents to form solid salts which are removed in the particulate control device.
* In spray dryer absorbers, the flue gases are introduced into an absorbing tower (dryer) where the gases are contacted with a finely atomized alkaline slurry. Acid gases are absorbed by the slurry mixture and react to form solid salts which are removed by the particulate control device. The heat of the flue gas is used to evaporate all the water droplets, leaving a non-saturated flue gas to exit the absorber tower. Spray dryers are capable of achieving high (80+%) acid gas removal efficiencies.
 |
| Design Considerations | The active ingredient of the dry scrubber is specifically designed for chemical reaction with the reactive species in the process gas. The abatement power of a chemisorbing material is described as capacity and is measured in units of moles of gas per volume of dry material. |
| Common System and uses | Dry scrubbing systems are used to remove acid gases (such as SO2 and HCl) primarily from combustion sources. Dry sorbent injection has been used on medical waste incinerators and a few municipal waste combustors while spray dryer absorbers have been used on industrial and utility boilers and municipal waste combustors. Adsorbents can be used for a range of odorous materials but care should be taken that the capacity of the adsorbent is not exceeded through excessive flows or high odorant loadings. This may result in the adsorbent requiring be regenerated or replaced at frequent intervals. Activated carbon can be readily regenerated several times. |
| Advantages | * Dry scrubbers do not have a stack steam plume or wastewater handling/disposal requirements.
* Spray-dryer-type absorption systems have efficiencies that are similar to those for wet-scrubber type absorption systems. These generate a waste stream that is dry and, therefore, easier to handle than the sludge generated in a wet scrubber.
* A dry-injection-type dry scrubber can be used on smaller systems as opposed to using the larger, more complicated spray-dryer-type dry scrubber.
 |
| Disadvantages | * Dry sorbent injection simple systems can achieve only limited
* acid gas (SO2 and HCl) removal efficiencies. Higher collection efficiencies can be achieved by increasing the flue gas humidity (i.e. cooling using water spray).
* The equipment used to atomize the alkaline slurry is complicated and can require considerably more maintenance than wet scrubber systems. Spray-dryer-type absorption systems operate at higher gas temperatures than wet scrubbers and are less effective for the removal of other pollutants in the gas stream, such as condensable particulate matter.
* The dry injection system is slightly less efficient and requires more alkali per unit of sulphur dioxide (or other acid gas) collected than the spray dryer type.
 |
| Common Problems and Issues | * A solid waste stream is introduced.
* The waste disposal requirements and costs are higher for dry injection systems than spray dryer systems.
 |

### Table A4.3.5: Dry Chemical Scrubbing

| **Table A4.3.5: Dry Chemical Scrubbing** |
| --- |
| The process of dry chemical scrubbing is where one substance chemically reacts with another. In this instance gas molecules (odorant) react with chemisorptive materials to form non-volatile, non-hazardous substances. Dry scrubbers differ from traditional catalysts in that dry scrubbers are, for the most part, unable to be regenerated and reused. Once consumed, materials cannot desorb any hazardous gases that were chemisorbed. Dry chemical scrubbing is effectively a sub-set of adsorption; non-regenerative adsorption.Dry chemical scrubbers are a relatively recent addition to the odour abatement market and typically consist of an oxidising chamber and a polishing stage.The oxidising chamber contains a support material which is impregnated with oxidising material (e.g. chlorine dioxide, potassium permanganate etc.). The odorous gas passes up through the oxidising chamber where it is adsorbed and then oxidised to non-odorous by-products.The polishing stage comprises activated carbon which is used to remove any un-oxidised odorous compounds. |
| Design Considerations | The active ingredient of the dry scrubber is specifically designed for chemical reaction with the reactive species in the process gas. The abatement power of a chemisorbing material is described as capacity and is measured in units of moles of gas per volume of dry material. |
| Common System and uses | Dry chemical scrubbers are ideal for extremely low flow, relatively high concentration odorous gas streams. They can be purchased as stand-alone systems so that one unit can be installed next to one source – this is advantageous because there is no need for a complicated ducting system and therefore the overall price may be cheaper. |
| Advantages | For example, solid phase impregnated with chlorine dioxide or potassium permanganate:* Relatively low cost.
* Low maintenance.
* Small plant footprint.
* Complex ducting arrangements are not required.
 |
| Disadvantages | * Emission of oxidised products, e.g. chlorine.
* Washout of oxidising products possible e.g. potassium.
* Permanganate, potassium iodide.
* Oxidising media lifespan, and therefore cost.
* Specialist labour required for media replacement.
* Potential for low odour removal effectiveness because of high residual chemical odour.
* Not particularly suitable for high gas flowrates.
 |
| Common Problems and Issues | Good for small scale operations using disposable cartridges but these can be expensive if used on a large scale. |

### Table A4.3.6: Absorption Wet Gas Scrubbing

| Table A4.3.6: Absorption Wet Gas Scrubbing |
| --- |
| The process of absorption is where one substance is taken up by another substance. In this instance gas molecules (odorant) are taken up by a liquid. There is a mass transfer of a gaseous pollutant from the air into a contacting liquid, such as water. The liquid must be able to serve as a solvent for the pollutant or to capture it by means of a chemical reaction. There are five generic types of absorber.* Spray tower (liquid enters top of tower as dirty gas stream passes up tower) is the simplest type of wet scrubber and will tolerate dusty gas streams but are not as effective for trace gas removal.
* Plate absorbers (liquid enters top of tower with horizontal perforated trays as dirty gas stream passes up tower) can operate at high liquid flow rates and are able to tolerate fluctuations in gas flow and temperature however are not suitable for use with slurries or foaming liquids.
* Packed bed absorbers (liquid is distributed continuously over a packing material as the dirty gas stream flows through the packed bed) are generally the preferred type of gas absorber for treating odorous gas streams due to their high efficiencies. However they are not suitable for gases with a high concentration of particles and can be expensive compared to other scrubbers.
* Moving bed absorbers (liquid and dirty gas mix in zones of mobile packing) are suitable for simultaneous removal of trace gases and particulates.
* Fibrous packing absorbers (liquid is sprayed continuously or intermittently over fibrous packing in dirty gas inlet and outlet) are relatively inexpensive and can treat up to 50% more than packed tower.

In addition to the five generic absorber types, where a number of odorous compounds are present in a gas stream which requires different reagents, enhanced catalytic absorption in a two or three stage scrubber may be needed. |
| Design Considerations | The efficiency of mass transfer depends on several factors:* Solubility of odorous component in the liquid phase.
* Gas–liquid contact time.
* Contact area.
 |
| Common System and uses | **Absorption (scrubbing)**Spray towers have been successfully used by various sectors of the chemical industry for absorbing acid gases and odours, for ammonia hydrolysis and for particle abatement. Plate absorbers are effective for trace gas removal and particle collection. The technology has been successfully used in the chemical industry and industrial heating plant for the absorption of acids (in water), SO2 (using sodium sulphite) and odours. They have also been used to abate odours from animal feed mills. Packed tower absorbers, with the appropriate reagents, have been successfully used for absorbing acid gases and odours from boiler flue gases, chemical, food, metallurgical and petroleum processes. Applicability is potentially wide with appropriate choice of reagents.Moving bed absorbers have been successfully used for trace gas removal (sulphur dioxide, hydrogen fluoride and odours) and particle collection in the metallurgical, chemical and food industries, power generation, sintering, mineral processing and waste industries. Fibrous packing absorbers have used by the chemical, metallurgical and electronics industry to remove acidic components and organic/inorganic compounds from contaminated air streams.**Catalytic scrubbing:** Catalytic scrubbing was developed in order to combine several stages into a single absorption unit. |
| Advantages | Absorption (scrubbing):* Can handle large volumes of air
* Efficiency >90% (2 stage scrubber) – water.
* Efficiency >99% - chemical.
* Automatic dosing can allow for rapid reaction to presence of peaks in concentration, provided they are not too Acute.

Catalytic scrubbing:* Acid scrubbing may not be required.
* Total odour control in a single packed tower is possible.
* High odour removal efficiency for organic odorants.
 |
| Disadvantages | Absorption (scrubbing):* Concentration of contaminants may require pre-dilution with clean air.
* Chemical reagents needed unless dealing with water soluble compounds.
* Fairly specific; reagents must be
* matched to nature of contaminants. A multi-stage scrubber may be needed to deal with a stream containing, for example, acidic and basic components. This increases the cost and complexity.
* Scaling and corrosion can be a problem, particularly when chemical reagents are used.
* Salt formation (often in the form of a gel) can block pumps. Salts may also block packed scrubber systems with the subsequent formation of preferential routes for liquor through the packing, with adverse results. Maintenance requirements may consequently be quite high.
* Use of chemicals can be high – careful process monitoring and control is required.
* Particulates can cause blockages in packed towers.
* A mist eliminator may be required to prevent carry over of droplets.

Catalytic scrubbing:* Potential for catalyst fouling.
* Does not remove insoluble organic odours.
* At high concentrations of basic odours, acid scrubbers may be more cost effective.
 |
| Common Problems and Issues | * Saturation of contacting liquid can occur.
* Fibrous packed columns are prone to blockage by particulates and growth of biomass.
* Oxidants can sometimes lead to the formation of odorous compounds in the scrubber which can create a secondary source of odour.
* The effluent must be considered as part of the total environmental impact.
* Spray nozzles may block from particulates in spray towers.
* Residues and precipitates can build up and may require flushing. Packed columns are more difficult to flush than spray towers.
 |

## A4.4 Open systems

It is accepted that for certain activities it is not always possible to contain odorous substances due to the nature of the activity being undertaken. Such activities include landfill, composting (windrow), land spreading and coating of large vessels/objects etc. In such instances it is important that the principles described in the management and design section of this document are applied in the first instance, however the following techniques can be applied.

### Landfill

Potential odour sources at landfill sites include landfill gas, leachate and newly deposited material. Odour from leachate and (under normal circumstances) landfill gas can be collected, contained and treated in a manner detailed above. Where little gas is produced from a landfill there may be insufficient pressure to allow for effective/efficient collection and treatment.

Guidance on appropriate techniques for landfills that are producing gas is available on our website at: [www.sepa.org.uk/waste/waste\_regulation](http://www.sepa.org.uk/waste/waste_regulation/landfill.aspx)[/landfill.aspx](http://www.sepa.org.uk/waste/waste_regulation/landfill.aspx)

Odour from newly deposited material should be controlled through a mixture of waste acceptance criteria and the covering of material. Careful consideration should be given to the cover material type (soils, sands, clays, paper pulp, sheeting etc), depth and frequency of application of cover material (not washed away during rain etc). Further information on cover can be found in Waste Management Paper 26B – Landfill Construction and Operational Practice, Section 9, Paragraph 9.70 to 9.81.

### Composting

Odour from in vessel composters can be contained, collected and treated in a manner detailed above. Open composting (i.e. in windrows) may not be feasible depending on the land take and costs involved. Careful consideration of the location and the management and maintenance of the windrows is therefore necessary. Management considerations should include:

* Material types to be composted.
* Suitability of composting method to be employed (if odorous consider in vessel type composter).
* Careful balancing of carbon/nitrogen content etc.

Maintenance issues include:

* Avoidance of conditions leading to anaerobic conditions within the windrow.
* Frequency of turning.
* Assessment of meteorological conditions when turning (wind direction) etc.

In some circumstances the techniques mentioned above may not be sufficient and consideration to local or full enclosure of windrows should be considered. Local enclosure could involve using a cover material such as fully matured compost or peat/soil to act as an odour barrier or the use of propriety membrane coverings. Several systems are available on the market. Additionally, there are systems available that actively aerate the windrow by drawing air through the windrow through a vacuum system. This keeps the windrow under a slight negative pressure reducing the likelihood of odorous emissions. Full enclosure would involve the composting to be undertaken in a specifically designed building so that emissions can be collected and ducted to appropriate abatement and discharge systems (see above re containment and capture). Fully enclosed systems can also have specific design features to allow automated mixing/turning of windrows etc.

### Land spreading

Spreading of certain odorous wastes can be carried out under an EASR authorisation. When spreading is to be undertaken consideration should be given to meteorological conditions (wind direction), the location of the area to be spread (proximity to domestic dwellings, footpaths, picnic areas etc) and the time of spreading (time of day, weekends, public holidays etc). Further guidance can be found in the PEPFAA Code of Good Practice.

### Coating

Due to the nature of some coating activities (painting of large vessels such as boats, or the refurbishment and painting of large sections of pipe and steel work) it makes it difficult for any odours generated to be contained, collected and treated. There are examples of certain activities, such as those fully or partially enclosed (small ‘tent’ which extends over the area being worked at the time): in such instances the methods detailed above should be adhered to. Where it is not possible for this to be done then other methods, usually management, need to be considered.

Consideration should be given to:

* The selection of the coating (paint) material to be used (the higher the solids content and the lower the solvent content the better as generally the odour associated with coating arises from the solvents employed).
* The application method, storage and preparation of paint.
* The cleaning of painting materials once finished should be carried out in a contained area (minimisation of exposure and allows extraction and treatment where necessary).
* The time of spraying (windy conditions can contribute to overspray and so increase the length of time and volume of coating applied, wind direction etc).

## A4.5 Techniques that can be used in an emergency situation

### Provision for emergency techniques

In an emergency situation where there is the potential for odour release or if there is a breakdown in the designed odour abatement equipment the primary consideration must be to stop processing.

Emergency techniques should only be considered when it is not possible to stop processing (leaving plant in an inoperable or unsafe state) or when the odour being generated on site is not directly related to the continuing processing activities. It is also incumbent upon the operator to demonstrate why the best option is not simply to cease operation until the designed odour abatement equipment is brought back online.

Where it is anticipated that odour control techniques may be needed in the event of an emergency then provision can be made within the authorisation or management plan for its inclusion. This can be in the form of stating the specific technique to be employed or simply providing for the option of plant being brought on to site with the agreement of SEPA. The former option allows a proper assessment to be made on the acceptability of a specific technique for the site and allows for consideration of local factors.

Where provision is not included within an authorisation or management plan a variation may be required. This will take time to process thereby preventing the ability to act quickly in an emergency situation. For waste management activities it should still be possible to bring equipment on to site and control it through the working plan. Care should be taken to ensure this is the case.

In any case careful consideration should be given to the circumstances in which emergency techniques are allowed to be carried out and for how long.

### Technical options available

All of the techniques identified above could be used in an emergency situation. Some, however, can be used more readily than others through the ready availability of mobile, package or skid mounted equipment.

The use of masking and neutralising agents and the use of adsorption systems such as activated carbon systems are the most common techniques available. Although as indicated above masking systems should only be used as a last resort.

The use of such a technique may give short term relief to an odour problem and should be considered while longer more permanent odour prevention and reduction techniques are implemented. A number of vendors are available and these can be found through trade journals or by searching the internet.

Emergency techniques tend to have higher costs associated with them and will require close supervision to ensure that they operate effective.

# Appendix 5: Odour Management Plan

All sites with the potential to generate offensive odours must have an odour management plan (OMP). The scope and level of detail in an OMP will depend on the nature of the activities being undertaken and must be proportionate to the risk to receptors.

When SEPA receive OMP’s we will assess the scope and suitability of key measures in principle only. This should not be taken as confirmation that the details of odour control measures including equipment specification, design, operation and maintenance are suitable and sufficient. That remains the responsibility of the site operator.

If you would like an example of an Odour Management Plan template, please contact us at OdourRegulationSupport@sepa.org.uk

The use of this template is optional but using it and retaining the headings will assist in producing a clearly written and well-structured plan that will enable SEPA to assess the adequacy of its contents. In sensitive locations additional information over and above what is asked for in the template, may be necessary. Also, if containment, extraction and abatement techniques are used, a performance monitoring plan tailored to the system and application will also be required. Table A5.1 sets out the main headings that should be in an OMP.

**Table A5.1: Main headings in an OMP**

| **Heading**  | **Description and content** |
| --- | --- |
| Responsible person(s) and management | * Who will be responsible for implementation of the OMP
* Maintenance and review period of the OMP
* How will the OMP be reviewed following changes at the site and/or odour complaints (links to Management of Change procedures)
* Statement of management commitment at all levels
* Training and procedures
 |
| Introduction | * Site description
* Relevant guidance used for the OMP
 |
| Receptors | * Receptor list including sensitivity ranking
* Weather data
 |
| Sources of odour | * Identify all potential odour sources
* Site layout plan including odour sources
* Overview of odorous processes and emissions
* Inventory of odorous materials
* Inventory of odorous emissions (characterisation)
 |
| Control measures and Monitoring | * Demonstrate that appropriate measures/BAT is being applied
* Details of the risk assessment used to determine the level of control required
* Justify the chosen odour control measures
* Details (and justification) of the monitoring required to ensure the control measures are working. A key element of this is to ensure extraction and abatement systems are operating optimally (e.g. smoke testing buildings, inlet and outlet odour concentration, moisture content of biofilter media etc)
* Detail what actions will be taken if monitoring indicates control measures are not functioning optimally
* Identify what records need to be kept
 |
| Odour reporting | * Complaints reporting
* Community engagement
* Pro-active monitoring
* Reactive monitoring
 |
| Abnormal events | * What steps will be taken during abnormal events such as equipment breakdown, power failure, fire, flood, staffing issues etc.
 |

### Additional notes for officers assessing an OMP

### General

* An OMP must be site specific and not be generic or an organisational plan from a multi-site operator.
* It must have clear commitments that are auditable and enforceable.
* It should be written using plain English and be unambiguous (i.e. it must not contain ‘*if*’ or ‘*where possible’* type statements).

### Receptors

* All receptors must be considered, not just sensitive receptors
* Receptor types could include housing, industrial estates, nature reserves, schools, public footpaths or play areas etc.
* Receptors should be ranked and given a sensitivity risk i.e., a public footpath = low, local housing = high)
* Receptor location must be recorded, i.e., distance and direction from the site (this helps to give an indication of how affected they might be).

### Sources of Odour

The OMP should clearly show that the operator has identified all actual and potential sources of odour from the process. These odour sources may derive from:

* Specific raw materials or wastes used or managed on site as part of the regulated activity e.g. known waste types that emit odours or known materials that if not managed correctly could give rise to odour.
* Specific locations, or processes/tasks within the regulated activity e.g. tanker off-loading/loading points; waste delivery reception halls; compost windrow turning or shredding; gas venting, point source emission to air from abatement (stacks); emissions from buildings containing odorous processes (i.e. door openings, fan ventilation and louvre openings).

The OMP should include a site layout plan which clearly identifies all potential odour sources on site. Odour emissions from each source should be sufficiently characterised to enable the operator to assess the relative risk from that source and to properly consider the control measures that are required.

### Control Measures and Monitoring

A detailed risk assessment must be carried out to assess individual odour sources and how these contribute to site wide emissions and the risk of impacting receptors. The OMP should confirm the relevant control measures which the risk assessment has identified as being necessary to control the odour risk from the different sources on site. In general terms an operator should implement the hierarchy of odour control detailed in Section 2 of this guidance, i.e. avoid, contain, capture, treat, disperse.

The types of control measures required will vary. They may not always include an abatement system. For simple process such as open windrow composting, the control measures will likely focus on maintaining good process control through the development and implementation of appropriate, clear and accessible work procedures, which staff are trained on, and supervisors regularly audit against.

Many activities will however require some form of containment and abatement system. This may be defined by the relevant [BREF and BAT conclusions](https://eippcb.jrc.ec.europa.eu/reference) for that type of process or industry. Activities which do not have a BREF must still demonstrate that they have applied BAT (for industrial activities) or appropriate measures/best practice (for other regulated activities) to ensure odour emissions are sufficiently controlled.

Characterisation of the odour emissions is critical to assessing risk and for designing an appropriate abatement system. Whatever type of abatement system is used the operator must demonstrate that it has been appropriately designed to effectively treat the defined odour sources, and that they will maintain and monitor the system to ensure it is working as per the design criteria.

The OMP should include the following information in relation to the control measures implemented at the site:

* Details of the different control measures being implemented for the different odour sources.
* A site layout plan which shows the location of the various physical control measures.
* The design specifications of each odour control measure especially for abatement components (i.e. design criteria to ensure adequate treatment of the incoming gas stream (physical and chemical treatment); maximum air volumes; construction materials; design lifespan; designed efficacy/performance; etc.).
* Details of the routine monitoring for each component of the odour control system to ensure the optimum performance of the system is maintained and its frequency (e.g. continuous, daily, monthly, quarterly, etc). For abatement systems, periodic inlet and outlet monitoring to determine odour removal efficiency must be carried out.
* Each monitored parameter should have clearly defined “acceptable limits” so that operators are clear when the system has gone out with normal design criteria.
* Where monitored parameters are out with “acceptable limits” the action that would need to be taken to bring it back into normal operation (e.g. filter changes or servicing, cease acceptance of waste / material until issues resolved).
* For automated monitoring systems, details should be provided of all alarms in place.
* Where the site is not maned 24 hours, details of telemetry systems.

An effective OMP would use a combination or measures / strategies**,** if only a single strategy is proposed for a certain activity this may pose a risk and should be discussed further with the operator.

### Odour Impact investigations

* Reactive Odour Investigations – The OMP must include details describing how an operator will respond to an odour complaint made by the public or notified by SEPA including a timeframe for when this will be investigated and how it will be recorded.
* Proactive Odour Investigations - the operator is responsible for proactively ensuring that their operations do not result in offensive odour emissions escaping beyond the site boundary.
* Both pro-active and reactive investigations may include boundary and off-site sniff tests. It is important that a recognised standard is used to carry out these checks and that they are carried out by appropriate persons. For example, it is not appropriate for site staff to carry out boundary or off-site checks after they have been exposed to onsite odours; this is due to the potential for odour adaptation (desensitisation).
* The OMP should set out the actions which will be taken If odour is detected off site at levels which may cause public complaint. For example, how will this be investigated and resolved.

### Abnormal Events

The OMP should also identify what could go wrong on site which may include scenarios which are beyond an operators’ control, i.e., an offsite waste disposal/treatment option is no longer available, or onsite equipment breakdown, power failure or staffing shortages.

The OMP should provide details of the recovery steps to be taken for each potential abnormal event, i.e., spare parts and equipment held onsite, hire contracts for emergency equipment, contracts for emergency response from maintenance specialists.

**This guidance has been updated to meet accessibility standards and to replace certain references to legislation with references to the Environmental Authorisations (Scotland) Regulations 2018. It has not been reviewed beyond this. We are aware that sections of this guidance may need to be updated, and this work will be completed in due course.**

## Disclaimer

This guidance is based on the law as it stood when the guidance was published.

Whilst every effort has been made to ensure the accuracy of this guidance, SEPA gives no warranty, covenant or undertaking (express or implied) regarding the fitness for purpose of, or any error, omission or discrepancy in this guidance. Reliance on its contents and the contents of any websites that are linked to or from this guidance is entirely at the user’s own risk. SEPA is not liable for any loss or damage that may come from using this guidance. This includes:

* any direct, indirect and consequential losses
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SEPA reserves the right to depart from this guidance and take appropriate action as it considers necessary or appropriate. Operators are responsible for ensuring that they are compliant with the law. If necessary, independent legal / specialist advice should be sought.

1. Tarbolton Moss Landfill: Public Health Risk Assessment v1.2, Health Protection Scotland 2020 [↑](#footnote-ref-2)
2. Health Impacts of Odour (AEA Reports on behalf of SEPA) See References. [↑](#footnote-ref-3)
3. Definitions provided in the Glossary [↑](#footnote-ref-4)
4. [Air emissions risk assessment for your environmental permit - GOV.UK (www.gov.uk)](https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit) [↑](#footnote-ref-5)
5. 5 At the time of writing no order has been made or proposed. [↑](#footnote-ref-6)
6. 6 Unless it has been designated by order of the Scottish Ministers under RRSA. [↑](#footnote-ref-7)