



Environmental Protection Agency

Office of Environmental Enforcement (OEE)

**Air Guidance Note 5 (AG5)
Odour Impact Assessment Guidance for
EPA Licensed Sites**

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The following EPA staff were centrally involved in the development and review of this document:

Dr Ian Marnane, Mr Tony Dolan, Mr Ken Murphy, Mr Kieran Fahey.

Special thanks to the contribution of the following EPA staff:

Mr David Flynn, Ms Ciara Hilliard, Mr Niall Horgan, Mr Joseph Hunter, Mr Caoimhin Nolan, Mr Brendan Wall.

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Preface

The Office of Environmental Enforcement (OEE) is one of the five offices in the Environmental Protection Agency (EPA). The OEE's functions include the regulation of activities licensed under the EPA and Waste Management Acts. It is the policy of the OEE to provide information and advice, via published guidance, to those it regulates, to secure environmental improvements while ensuring value for money.

This Odour Impact Assessment Guidance for EPA Licensed Sites (AG5) is one of a series of guidance notes that the OEE has planned on the general theme of air pollution monitoring.

Other documents in this series are:

Air Guidance Note 1: Guidance Note on Site Safety Requirements for Air Emission Monitoring (AG1)

Air Guidance Note 2: Air Emissions Monitoring Guidance Note #2 (AG2)

Air Guidance Note 3: Air Guidance Note on the Implementation of IS EN 14181 (AG3)

Air Guidance Note 4: Air Dispersion Modelling from Industrial Installations Guidance Note (AG4).

This guidance note is intended for use by holders of EPA licences (licensees), and consultants. The Agency advises licensees to have regard to this guidance when outsourcing any work relating to odour monitoring, in particular field assessments of odour impact.

Throughout the guidance note there are examples given of licence conditions which are typical of those found in Irish IPPC and waste licences. In reality, licence conditions can vary somewhat from one licence to the next, so reference should be made to the current licence document for the site-specific licence condition.

This guidance note will be the subject of periodic review and amendment. The most recent version of this note is available on the Agency's website: <http://www.epa.ie/> if you have any particular queries regarding this document please contact Mr Kieran Fahey at k.fahey@epa.ie.

1. Introduction

This procedure offers a consistent and systematic approach to the assessment of odours on and in the local area of facilities and installations that are licensed by the Agency. It is intended for use by licensee's to assess their state of compliance with odour related licence conditions and to investigate odour complaints received. Its aim is to achieve consistency in the manner in which a licensee's representative(s) makes odour observations and reports on odour assessment.

The procedure described in this guidance document (Section 3) will cover the following topics:

- Odour assessment preparation,
- The assessment of odour through field observations,
- The recording of findings.

2. Background

The common licence conditions used for the control of odours include:

"The licensee shall ensure that all operations on-site shall be carried out in a manner such that air emissions and/or odours do not result in significant impairment of, or significant interference with amenities or the environment beyond the site boundary",

and/or

"The licensee shall ensure that [...] odours do not give rise to nuisance at the facility or in the immediate area of the facility. Any method used by the licensee to control any such nuisance shall not cause environmental pollution".

Failure to comply with a condition of an EPA licence is an offence under the EPA and Waste Management Acts (for IPPC and waste licences respectively). Under these legislative documents *odour nuisance = pollution*.

By using this procedure, licensee's can gain information regarding compliance with relevant licence condition(s). However, it is possible that those generating odours and those being impacted, nuisanced or annoyed by them will not share opinions on the extent of the problem. The findings of odour investigators working on behalf of a licensee may differ with the experiences of complainants. Notwithstanding this, this procedure provides the basis for a consistent and systematic approach to odour assessment and reporting.

This guidance document describes a method of odour assessment through sniff testing at suitable locations in the local area of a facility or installation. Sniff testing is the use of the human nose to assess odour and is the most common form of odour monitoring. The odour investigator goes to a chosen location and stops and smells the air there for a period of time (See Section 3). When properly undertaken on a regular basis, the results of sniff tests can be used to support, or otherwise, the evidence of nuisance complaints by members of the public.

2.1 Odour

For the purposes of this guidance, odour is the property of a substance that activates the human sense of smell. The human olfactory system is a sensory system used for the detection of odours. It is highly sensitive and as such is capable of detecting extremely low concentrations (fractions of a part per billion) of a wide range of odorous chemicals.

2.2 Odour Impacts

Odour sensing olfactory cells are linked to areas of the brain that control emotions and memory processes. Offensive odours can therefore have impacts on the health and well being of humans, especially if one is subjected to the odour for extended periods of time. At sufficiently high concentrations odorous compounds may have a direct effect on human health. Also, an individual's health may suffer indirectly due to stress associated with odour impact.

People that have complained to the Agency about nuisance odours from IPPC or waste facilities have described how their quality of life has deteriorated as a result of experiencing an odour. Complainants have described the following scenarios that have occurred entirely due to nuisance odours:

- Vomiting,
- Headaches,
- Nausea,
- Stress, anxiety, frustration,
- Having to leave home and stay with family/friends or incur the expense of a hotel,
- Unable to open windows during summer time,
- Unwilling to host guests due to embarrassment,
- Keeping children indoors during summer holidays,
- Unable to enjoy the garden for occasions, (such as barbeques or birthday parties)
- Unable to hang laundry out to dry,
- Children unable to sleep due to odour in bedrooms,
- An additional discomfort for infirm elderly people.

For many complainants it is not only when they are subjected to odour that they are affected. Complainants can experience ongoing anxiety and stress due to the potential for reoccurrence of odour at any time. This can happen to people when they are frequently subjected to nuisance odours.

The majority of complaints that the Agency receives regarding licensed IPPC and waste sites relate to nuisance odours.

2.3 Odour Sensitivity

Due to the complex nature of odour perception by the human olfactory system, levels of sensitivity to odour within a population will vary. Consequently, the perceived offensiveness of an odour will vary from person to person. In addition, the context in which the odour occurs will affect the nuisance value of the odour. For example, an odour detected during a special occasion or during a period of illness may cause more nuisance than the same odour detected on another day. See section 3.8 of this document for guidance on sensitivity amongst odour investigators.

2.4 Measurement

Analytical

Unlike certain airborne pollutants, odour in ambient air cannot be measured by conventional chemical analyses. Odours are in most cases a complex cocktail of various substances that have intricate synergistic effects upon each other. The measurement of individual compounds in ambient air will therefore not provide useful information on the character of an odour within that air. Such techniques involving the use of instrumentation and/or analytical methods to identify and quantify specific odorous compounds may not provide any real insight into the intensity or offensiveness of odours in human terms. The threshold concentration, for example, of many odorants is often well below their analytical detection limit and hence many odours may be deemed to be causing nuisance, although the compounds responsible for the odours are not being detected by chemical techniques. Furthermore, interactions between mixtures of odorants may lead to synergistic or antagonistic effects, leading to difficulties in linking analytical and sensory measurements for impact assessment purposes.

Dynamic olfactometry

As the objective of this guidance is to assess licence compliance *beyond the site boundary and in the immediate area of the facility/installation*, determination of odour concentration by dynamic olfactometry as prescribed in EN 13725:2003 is not considered by the Agency to be a suitable assessment approach.

Representative sampling for olfactometry analysis of air may be suitable for point source emissions or at times ambient assessments *on* a site (i.e. within a site's boundary), but sampling air beyond a site boundary for olfactometry purposes is highly unlikely to be representative of odour impact. Also, the sampling and analytical requirements as prescribed in EN 13725:2003 may be considered unsuitable for frequent and routine odour assessments. For these reasons it is not considered a suitable assessment approach in the context of this guidance note's objective.

Sniff testing

Due to the unsuitability of the above measurement approaches, this procedure describes a sniff testing approach to odour assessment. This requires a human assessor to use their own sense of smell to assess odours by means of a sensory technique referred to as sniff testing.

2.5 Limitations

The credibility of licensee odour monitoring i.e. self-assessment, may be questioned for a number of reasons:

Perceived Self-interest Bias: The public may perceive an inherent bias on the part of the licensee in undertaking this form of self-assessment odour monitoring. Therefore the Agency will continue to undertake odour assessments at licensee's facilities and installations. The Agency is not bound to accept any findings that a licensee arrives at following the use of this procedure.

Odour Adaption: This is a common and entirely normal desensitisation to certain odours that may affect individuals. Staff working at a site will get used to, and therefore adapt to, specific odours from the site. This adaption means that even if they try to assess the site objectively, they may not be able to do so. Individuals may not be aware that they have adapted to a particular smell because they will continue to respond normally to other odours. The manner in which adaption occurs varies amongst odours. It may take less than a second or it may take weeks to occur depending on the odour. It is not permanent and a person will begin to recover when they are no longer exposed to that particular smell, or when they are exposed to reduced levels of it. The adaption/recovery process/cycle slows with time.

Due to the odour adaption possibility of site staff, licensees may consider the use of external contractors/consultants or the use of office staff or other offsite staff who have not recently been working on the site to carry out odour assessments.

Local resident's odour adaption experience will vary from that of on-site workers. Due to odour dispersion local residents are unlikely to be subjected to the same concentrations as staff at a site, therefore adaption by the resident to an odour generated at a facility will not affect them in the same way as staff are affected. Licensee staff are generally more likely to adapt to odour due to exposure to greater odour concentrations over more constant time periods.

Odour Fatigue: This differs from odour adaption in that it is believed to be exclusively associated with exposure to hydrogen sulphide (H₂S). H₂S causes rapid paralysis of nerves in the nose at concentrations of around 150 mg/Nm³. This results in complete but temporary loss of smell (WHO, 2003). To put this value in context, the World Health Organisation's (WHO) air quality guideline for H₂S is 150 µg/Nm³ for an average concentration over 24 hours. This is a human health parameter and does not consider odour annoyance. To avoid odour annoyance, a 30 minute average ambient air concentration not exceeding 7 µg/Nm³ is recommended (WHO, 2003).

Hours of Operation: Many sites are not staffed during the late evening and night-time when local residents are more likely to be in/at their homes or at their property in some manner. Compounding this is the fact that dispersion conditions can be especially poor at night. The licensee may consider the use of external contractors/consultants or an on-call staff member to provide availability to respond to odour issues.

Additional limitations include:

- The difficulty for odour investigators to witness odour incidents (especially peaks) that are short-lived or that may be infrequent, short and unpredictable.
- Peaks in odour nuisance may be due to changing dispersion conditions (wind direction/strength, turbulence) or variable, sporadic and unpredictable emissions.
- Emissions from elevated sources (stacks, chimneys etc) may travel further than anticipated and may not reach ground level until beyond the assessment location at which the odour investigator undertakes the sniff test.

- Sources of odour may be difficult to identify especially if a facility neighbours other potential sources. Additionally it can be difficult to exactly locate the source within a particular facility (large facility/diffuse sources etc).

3. Assessment Procedure

To carry out the assessment, the odour investigator uses his own sense of smell to assess whether odours are present or not at a number of locations. The odour investigator records his assessment by selecting, what are in his opinion, the most accurate descriptors from those listed in the *Assessment of Odour Impact Field Record Sheet* (Annex A).

Odour impact assessments should be carried out routinely *and* in response to specific complaints *and* in response to weather conditions likely to lead to adverse odour at sensitive receptors. As a result, the locations of the individual observations are likely to vary with each assessment (see example of possible sequence for assessment, page 11).

3.1 Odour Perception (FIDOL)

There are five elements that are commonly regarded as combining to cause the odour nuisance experience, they are: Frequency, Intensity, Duration, Offensiveness and Location. These elements are represented by the acronym FIDOL. The function of the odour investigator's odour assessment is to assess the intensity and offensiveness of the odour and to record the location where their observations were made. In doing so their observations may be deemed to be consistent or inconsistent with public complaints. Complaints by members of the public may provide evidence of frequency and duration.

If the licensee undertakes regular odour assessments at the same locations over a period of time they may gain some insight into the frequency and duration parameters, but are still unlikely to have as much awareness of them as that of a local resident who is more frequently at that location, e.g. at their home.

3.2 Participants

The odour assessment has added value if two or more odour investigators take part. This provides an option to:

A. Make "side by side" assessments. In such cases there should be no discussion about their results until the assessment is completed. Each odour investigator completes their own *Field Record Sheet* (Annex A).

B. Alternatively one odour investigator may visit the suspected source of the odour while a colleague conducts the assessment in the local area. Thus, the timing of process events may be linked to the off-site perception of odour.

3.3 Odour Assessment Preparation

The odour investigator must be in a fit condition and adhere to the following rules:

- If he has a cold, sore throat, sinus trouble etc he should not carry out the assessment,
- The odour investigator should not smoke or consume strongly flavoured food or drink, including coffee, for at least half an hour before the assessment is carried out,

- The consumption of confectionery or soft drinks should be avoided immediately before and during the assessment,
- Scented toiletries, such as perfume/aftershave should not be applied immediately before or during an assessment,
- The vehicle used during the assessment should not contain any deodorisers or air fresheners.

The odour investigator should consider the purpose of the odour survey and:

- Have regard to the weather forecast for the area, including wind strength and direction, barometric pressure, rainfall, temperature and humidity. Weather forecasts are available from <http://www.met.ie/>. On-site meteorological stations or wind socks should always be appropriately located so as to provide a reasonable indication of the prevailing wind direction and not be significantly influenced by local structures/trees or other obstacles,
- Have regard to the recent complaints pattern (statistics),
- Have regard to the odour history of the site,
- Be aware of current activities on-site.

The following documents should be brought on the field assessment:

- The *Assessment of Odour Impact Field Record Sheet*,
- This procedure (optional),
- A scaled map of the area is most valuable to the recording process and should be used whenever possible. The map should show compass directions (Optional),
- Any other relevant documents such as a copy of the facility/installation licence.

The following equipment may be employed to assist in the field assessment:

- Wind directional instrument,
- Wind speed instrument,
- GPS device,
- Compass.

3.4 Field Assessment of Odours

The *Assessment of Odour Impact Field Record Sheet* shall be used to record field observations, see Annex A. The assessment involves the odour investigator walking or driving, as far as access allows, to the chosen assessment locations. The selection of suitable odour assessment locations will depend on whether the odour investigator is:

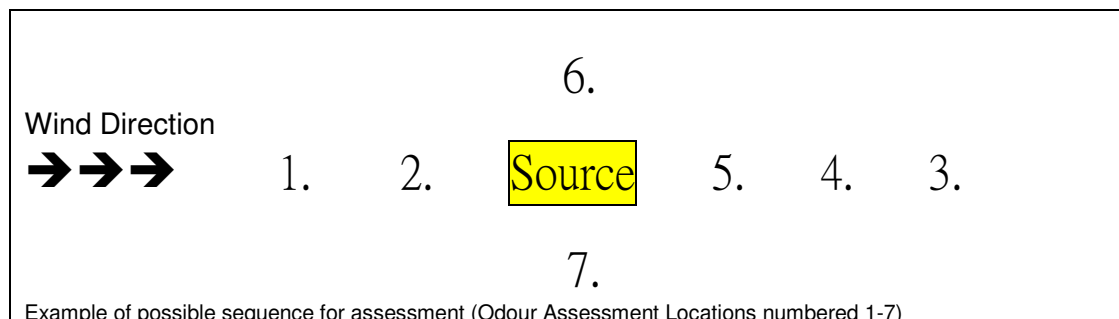
- Responding to a complaint,
- Checking the state of compliance at sensitive receptors,
- Attempting to establish the source of an odour.

Wind direction will also affect suitable location selection.

The licensee may choose fixed odour assessment locations so as to evaluate the changing situation over a period of time (days, weeks, months). Or the odour assessment locations

may vary from assessment to assessment according to local conditions, which may help to identify worst-case conditions.

When the assessment is being carried out routinely (as opposed to complaint investigation) the following sequence of sampling stations is recommended:



Example of possible sequence for assessment (Odour Assessment Locations numbered 1-7)

There is no set scale to the above locations. Rather this depends on such factors as:

- Proximity of sensitive receptors,
- Local topography,
- Availability of suitable access,
- Source characteristics (e.g. stack height, area source, fugitive source etc), etc

Selection of unsuitable locations (in the Agency's opinion), e.g. locations unreasonably far away from the facility or installation, will be detrimental to the credibility of any results obtained.

When the assessment is being carried out in response to a specific complaint, if time permits the starting point should be upwind of the suspected source prior to visiting the complainant.

In instances where no obvious wind direction is detectable or where it is variable, this should be noted in the appropriate section of the *Field Record Sheet*. Selecting suitable assessment locations is more difficult when wind direction is not detectable. In these cases it is preferable to postpone an assessment. However, if the assessment is needed in order to investigate a recent complaint and postponement is not an option the odour investigator should commence the assessment at the location of the complaint.

The odour investigator should not visit the suspected odour source until all the ambient observations have been completed, this will help avoid odour adaption and fatigue due to the higher levels that occur at source.

At each assessment location, the odour investigator should get out of the car (if used) and STOP AND SMELL. The period of assessment should be the same at each location (5 minutes recommended minimum). At the conclusion of the sampling period, record all the details required in the *Assessment of Odour Impact Field Record Sheet* for that sampling location. The odour investigator should also keep a note of any external activities that could be either the source of the odour, contribute to the odour, or be a confounding factor. This may be noted in the 'Odour Description Comments' column of the *Field Record Sheet* (Annex A)

When an odour is detected a determination of the extent of the odour plume may be carried out at points perpendicular to the plume axis and equidistant from the source (i.e. locations 6 and 7 in above diagram), again this is done prior to visiting any suspected odour source. These results can be plotted onto an appropriate plan or map.

If the facility or installation has a weather station in place, the weather details for the period of the assessment should be recorded. It is good practice to print this information and staple it to the completed *Field Record Sheet*.

It is important to note that all odours detected during the course of the assessment should be recorded on the *Field Record Sheet*, regardless of their suspected origin. The column titled 'Odour Description Comments' on the right hand side of page 2 of the *Field Record Sheet* allows for the recording of any additional details. For example if an odour is detected but the odour investigator suspects that the source is not the licensed site, this should be recorded here. Also, if a distinguishable mix of odours is detected, this should be recorded here.

3.5 Post Odour Assessment Site Inspection

Following an odour assessment during which a potentially nuisance or interfering odour has been recorded, an inspection of the facility or installation should be carried out by the odour investigator, in order to determine whether or not any observed odour can be linked to the site and to evaluate any potential odour producing activities or locations.

This on-site assessment should include some or all of the following activities as appropriate:

1. A walk of the downwind site boundary to verify if odours can be detected,
2. An assessment of particular areas or activities on site to verify if odours can be detected, such an assessment shall cover all possible odour sources on the site,
3. An examination of site operations to:
 - Identify practices that might give rise to odours,
 - Assess the effectiveness of any abatement equipment used at the site (bypassing abatement equipment for the purposes of sniff testing as an abatement efficiency test is not permitted).

Following this inspection it may be necessary to visit other local potential sources of odour to eliminate them as sources of the observed odour. This will be dependent on access permissions.

3.6 Safety

The odour investigator must never put himself or others at risk by attempting to sniff potentially hazardous emissions. A safe and common sense approach should be taken when dealing with strong odours. The odour investigator should not inhale deeply over any boreholes or exhausts etc. Particular care should be taken if any sulphuric (rotten eggs) odours are perceived.

3.7 Reporting

The person(s) undertaking the odour assessment must record their findings throughout the assessment period on the *Odour Assessment Field Record Sheet*. This sheet contains a guide that assists with the identification of nuisance. Facility/Installation management should be immediately informed of any significant findings, i.e. presence of nuisance odour.

3.8 Sensitivity amongst Odour Investigators

A licensee's odour investigators should periodically conduct odour assessments in groups of two or more. The comparative data generated should be screened to identify those whose odour perceptions are outside the norm (i.e. particularly sensitive or insensitive).

4. Odour Recording by Complainants

If a local resident, or other party, wishes to record their personal odour experience a suitable log sheet is provided in Annex B. This *Odour Complainant Log Sheet* allows people to record odours which they have personally experienced.

5. Relevant Legislation

- Environmental Protection Agency Act 1992 (as amended).
- Waste Management Act 1996 (as amended).
- Protection of the Environment Act 2003.
- Air Pollution Act, 1987.
- S.I. No. 787 of 2005 Waste Water Treatment (Prevention of Odours and Noise), Regulations 2005.

6. References

- ENVIRONMENT AGENCY ODOUR GUIDANCE Internal Guidance for the Regulation of Odour at Waste Management Facilities July 2002 VERSION 3.0.
- ENVIRONMENT AGENCY Technical Guidance note IPPC4, Draft Horizontal Guidance for Odour Part 1 - Regulation and Permitting.
- ENVIRONMENT AGENCY Technical Guidance note IPPC4, Draft Horizontal Guidance for Odour Part 2: Assessment and Control.
- EUROPEAN STANDARD EN 13725:2003 Air Quality- Determination of Odour Concentration by Dynamic Olfactometry.
- McKeendry, P., Looney, A. & McKenzie, A., Managing Odour Risk at Landfill Sites: Main Report, Viridis, 2002.
- NEW ZEALAND MINISTRY FOR THE ENVIRONMENT Good Practice Guide for Assessing and managing Odour in New Zealand.
- SCOTTISH EXECUTIVE Code of Practice on Assessment and Control of Odour Nuisance from Waste Water Treatment Works, April 2005.
- SCOTTISH EXECUTIVE Guidance on Statutory Code of Practice on Sewerage Nuisance, April 2006.
- VEREIN DEUTSCHER INEGIEURE (VDI) 3940 – PART 2 Measurement of Odour Impact by Field Inspection – Measurement of the Impact Frequency of Recognisable Odours Plume Measurement, February 2006.
- WORLD HEALTH ORGANISATION Air quality guidelines for Europe, 2nd ed. Copenhagen, WHO Regional Publications, European Series. 2000.
- WORLD HEALTH ORGANISATION Hydrogen Sulphide: Human Health Aspects, Concise International Chemical Assessment Document 53, 2003.

Annex A: Odour Investigation Field Record Sheet

| | | | | | | |
|---|--|--|---|---|---|---|
| General | Your Reference | Site Licence No. | | Assessment by | | Date of Assessment |
| | | | | Your name: (other Investigator(s) present): | | |
| Pre-Assessment Preparation | Observer is free from medical conditions (cold, sore throat, sinus trouble)? | Observer abstinence (30 min) from smoking, flavoured drinks, scented toiletries and deodorisers? | Reason for odour assessment – Complaint verification; routine; other (specify). | Map – Has a map showing assessment locations been attached? | | Weather Conditions Note 3 (record wind info on page 2): |
| | Yes No | Yes No | | Yes No | | |
| Notes (the ranking systems in these notes must be used when completing the field observations table overleaf) | Note 1: Observation point Sensitivity (assuming detectable, if not then 0) 1 Remote (no housing, commercial/industrial premises or public area within 500m of observation point) 2 Low sensitivity (no housing, commercial/industrial premises or public area within 100m of observation point) 3 Moderate sensitivity (housing commercial/industrial premises or public area within 100m of observation point) 4 High sensitivity (housing, commercial/industrial premises or public area within area of observation point) 5 Extra sensitive (complaints arising from residents, business and users of public areas within area of observation point) | | | Note 3: Weather Conditions Precipitation – dry, rained recently, drizzle, raining, foggy Temperature – cold, cool, warm, hot | | |
| | Note 2: Wind Strength 0 Calm Smoke rises vertically 1 Light air Direction of wind shown by smoke drift, but not wind vanes 2 Light Breeze Wind felt on face; leaves rustle, ordinary vane moved by wind 3 Gentle Breeze Leaves and small twigs in constant motion 4 Moderate Breeze Raises dust and loose paper; small branches are moved 5 Fresh Breeze Small trees in leaf begin to sway 6 Strong Breeze Large branches in motion; umbrellas used with difficulty against the wind 7 Near Gale Whole trees in motion; inconvenience felt when walking against wind 8 Gale Twigs break off trees; progress generally impeded 9 Strong Gale Slight structural damage occurs (chimney pots and slates removed) | | | Note 4: Odour Persistence 0 No Odour 1 Intermittent (detected intermittently during the period of assessment) 2 Persistent (detected throughout the period of assessment) | | |
| Odour Source Investigation (Post Odour Survey) | Start Time: | Do any of the odours experienced on-site match in character those recorded during the off-site survey? | List areas Inspected: | | What relevant activities were occurring on-site during the off-site odour assessment? | |
| | Finish Time: | Potential on-site odour sources identified: | | | | |

| Parameter | Observer Location | | Wind (nd = if not detectable) | | | Time | | Odour Rating | | Odour Description Comments |
|--|---|--------------------------|---------------------------------|---|-----------------|-------------------------|-----------------------|--------------------------------|------------------------------|---|
| | Name of household / commercial site (describe so that location can be easily identified again by a third party) | Sensitivity (1-5) Note 1 | Direction from which wind blows | Orientation (Observer Vs facility) | Strength Note 2 | Start Time (24hr clock) | Period of observation | Odour Persistence (0-2) Note 4 | Odour Intensity (0-4) Note 5 | |
| Thresholds that could indicate nuisance | -- | ≥ 3 | -- | Down-Wind Approx DW or not detectable etc | -- | -- | -- | 1 or 2 | ≥ 2 | Guide- A location where the score meets or exceeds all the threshold values may be deemed subject to nuisance/significant impairment, particularly if the observations are supported by public complaints on impact, frequency and duration of odours. |
| Field observations | | | | | | | | | | |
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| Brief details of any meeting with local residents/complaints received during assessment (include names/addresses/telephone numbers etc): | | | | | | | | | | |

