ATTACHMENT 7-1-3-1 ODOUR MANAGEMENT PLAN

Table of Contents

1. INTRODUCTION

This document has been written with reference to Odour Emissions Guidance Note (Air Guidance Note AG9) September 2019 published by the EPA. Management is committed to implement this odour management plan. The purpose of the plan is to monitor and minimise odour emissions.

The key components to this plan are;

1. Odour audit;
2. Odour impact assessments; (in accordance with AG5)
3. Assessment of Abatement Technologies;
4. Methods employed to eliminate odours
5. Methods employed to minimise odours

6. Odour Investigation procedure

2. ODOUR AUDIT

2.1 Facility Details

Figure 1.1: Site Location

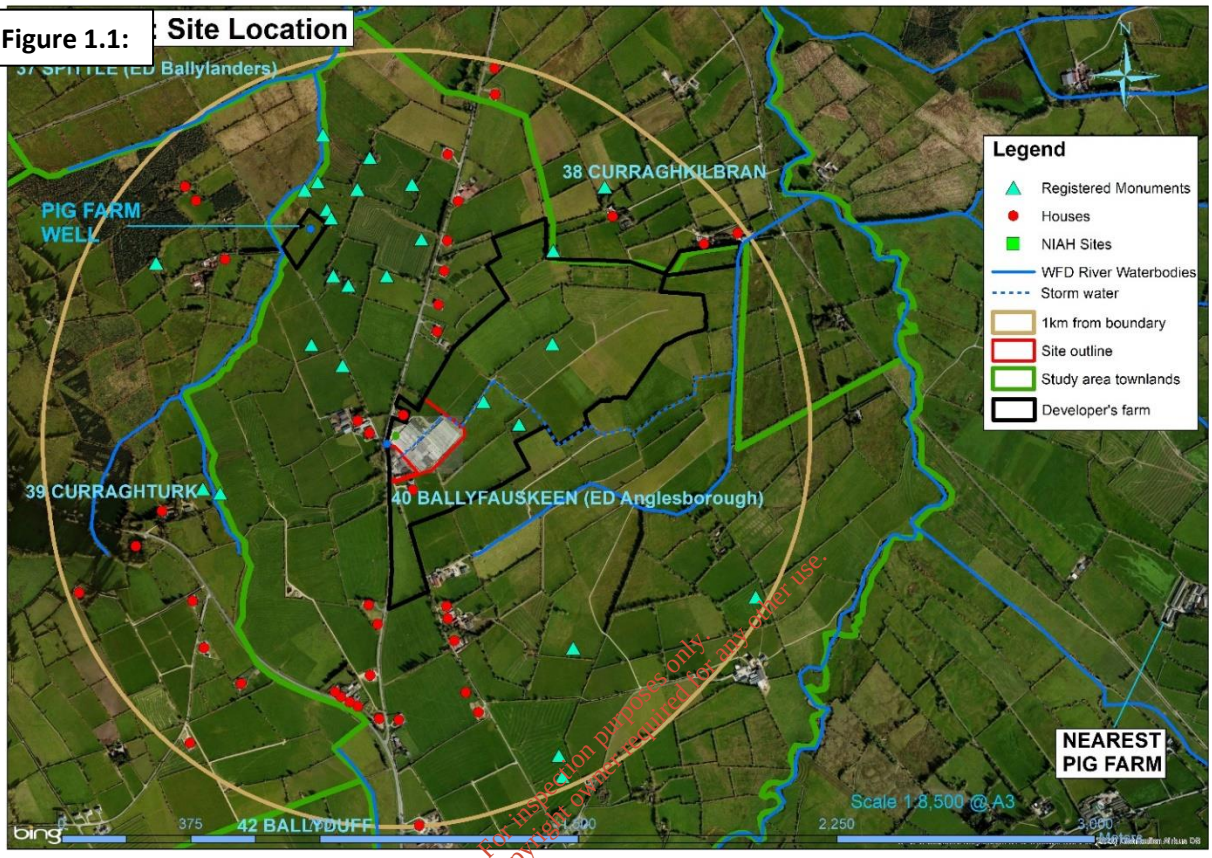


Figure 1.2 shows the location of the pig unit in 'Ballyfaskin' and the location of surrounding houses. There are 40 dwellings within 1 kilometre of the pig farm boundary. The nearest 5 houses include two dwellings adjoining the pig farm owned by the developers family. The next nearest sensitive receptors are located at 60m (W), 110m (SW) and 250m (N) respectively from the nearest pig buildings.

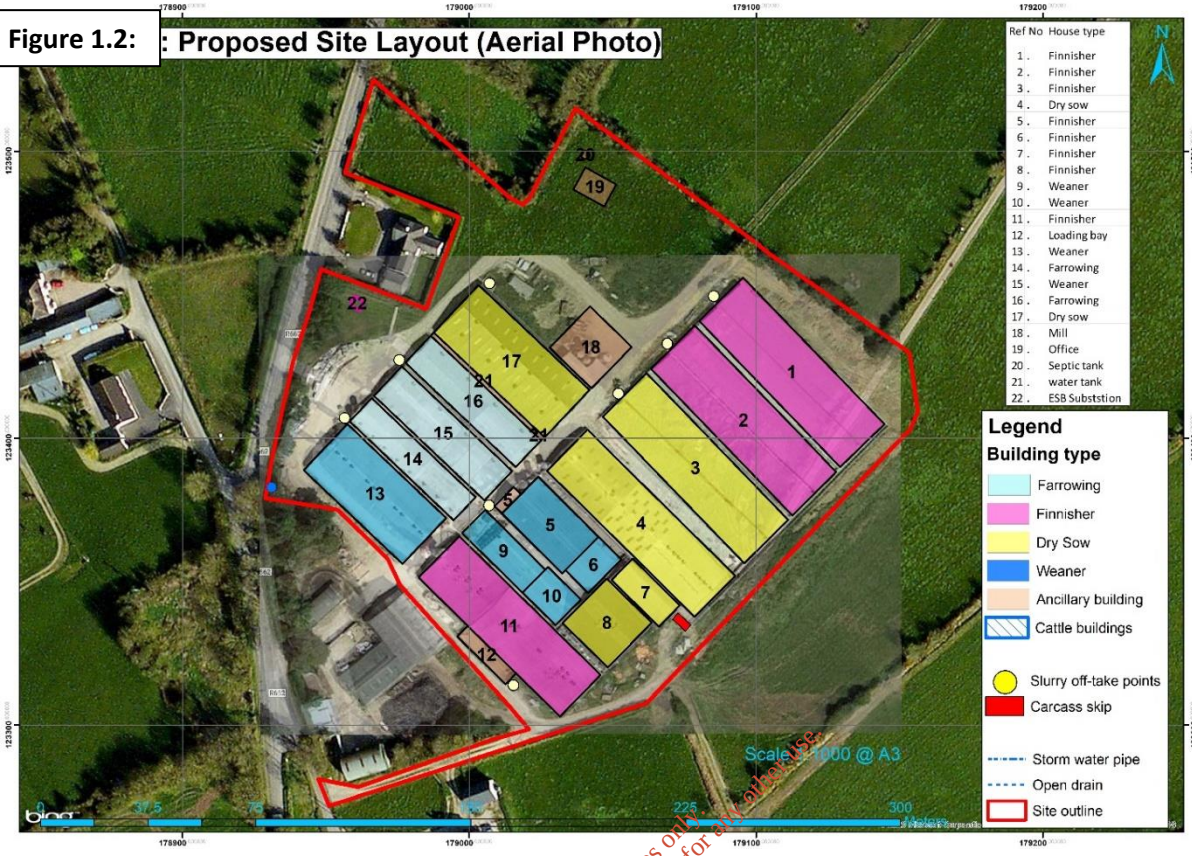
The surrounding area is primarily rural and agricultural. Rural dwellings are high sensitivity – the remaining land use is low – medium sensitivity. The topography is flat.

2.2 Management

'Ballyfaskin' Pig Farm is managed by the owner/developer. The pig farm manager will be responsible for implementing the Odour Management Plan. He will designate a key contact person for locals who have complaints and his phone number is available to them. This person will be trained to carry out regular odour assessments as per AG5 – Odour Impact Assessment Guidance for EPA Licensed Sites (http://www.epa.ie/pubs/advice/air/emissions/ag5-odourassessment.html).

2.3 Sources of Odour

Figure 1.2: : Proposed Site Layout (Aerial Photo)



- At the site odour is released from the livestock directly, particularly where there are large numbers e.g. in the fattening houses and from the pig slurry stored in slatted tanks as a result of anaerobic metabolism of microorganisms. Faeces and urine deposited on surfaces of slats and floors are a source of odour. In combination with ammonia and substances such as dust, hydrogen sulphide (H2S), sulphur and volatile fatty acids emitted from the slurry surface contribute to the characteristic odour. These gases are ventilated through the exhaust vents of the houses and tanks. The concentration of these gases may be negligible in a measurable sense but combined they create odour. Odour gas emissions tends to increase when slurry is being pumped / agitated;
- At land-spreading locations the odour results from the decay of pig manure on the ground and from the production of aerosols during spreading. Odour nuisance from land-spreading is generally related to weather conditions, rates of application and proximity to sensitive receptors. Effects are generally dissipated within a few hours and are temporary;
- Carcass storage on site is a potential source – particularly during the summer; and
- Slurry spreading equipment (tractors and tankers) visiting the site is a potential source.

Quantitatively, the slurry stored in slurry tanks and pig excrement on slatted and solid surfaces are likely to be the most significant source of odour. The pigs themselves would be the second most important source.

2.4 Pathways

- The exhaust fans on the roof apexes of the pig houses will ventilate the odour forming gases from the pig houses. The finisher houses have climate controlled natural ventilation system. Ventilation is a relatively constant source;
- Uncovered pig walk ways and the faecal material deposited on them are potential source of odour. Theses surfaces are generally periodic pathways, for example a few times per week when pigs are transported on to or off the pig farm;

- Slurry movement via gravity flow and pumping and from tank to tank will result in spikes of odour. Slurry extraction i.e. pumping to slurry tankers results in additional odours. These spikes, while not a constant source, will occur regularly at certain times of the year;
- Open doors and uncovered carcass skips can potentially be a pathway for odour. These sources are infrequent and the carcass skip is on site is a sealed container; and
- Soiled surfaces at slurry extraction points are a potential pathways for odour.

Where a high degree of cleanliness is maintained on the site and where slurry is stored in separate covered tanks the primary pathway for odour is the exhaust air from the pig houses and the vents on the covered slurry tank. The ventilation of exhaust air is a constant process and the main pathway through which gases emitted from the slurry surface, gases emitted from the solid and slat surfaces and odour from the pigs themselves is transferred to the atmosphere outside the pig houses.

2.5 Inventory of odour forming materials

There will be 1,000 sows, 166 gilts, 5 boars, 5,357 weaners and 3,957 finishers on site.

The slurry tanks have the capacity to store approximately 18,00m^3 of slurry on site. The slurry tanks are located under the pig houses.

Carcass material will stored in a sealed skip located east of pig house 7 (furthest from nearest dwelling) – labelled as S1 in Figure 1.3.

2.6 Process and Activities

Finisher pigs are ready for slaughter at 110 kgs live weight after 12 weeks. The proposed feeding system is a sealed wet feed system, which takes feed from sealed containers (Silos) and distributes it to the feeders in the rooms, on an ad-lib basis, as per pig's natural requirements, thereby significantly reducing the dust levels in the internal, and external environment. This mitigates dust emissions and, because dust particles will carry some of the odorous compounds, it will also mitigate odour

In a standard pig farm pigs are fed a mainly barley / soya based ration with varying protein content ranging from 16 – 18% for finishing pigs. The proposed pig farm will reduce protein levels to the 14-16% range by supplementing with essential amino acids.

Ad-lib water is available to pigs.

2.7 Equipment

Slurry is stored in slatted slurry tanks under each of the pig houses.

2.8 Release points

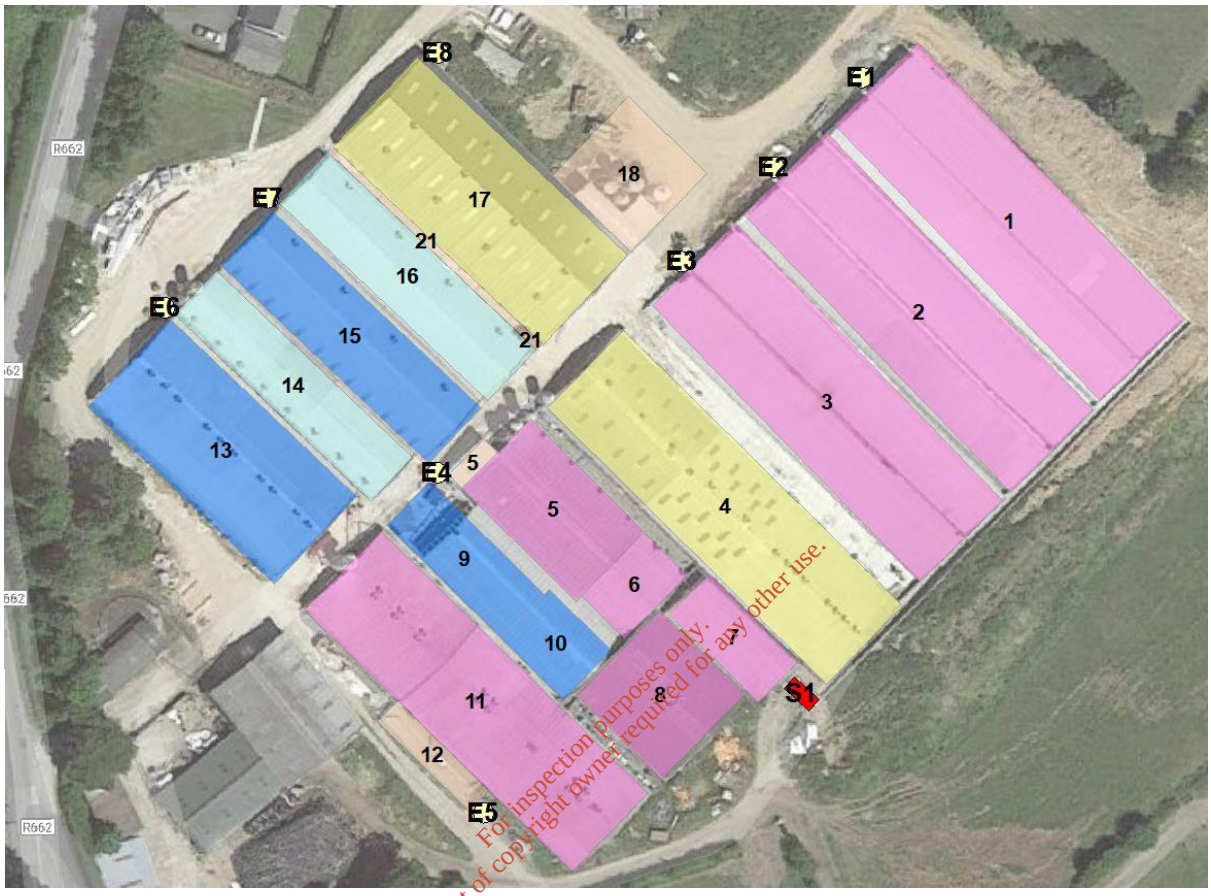
The ventilation chimneys and vent shutters on the pig houses are the main release points.

There are 8 slurry extraction points in the site. These 8 extraction points are located at;

- 3 (EI, E2 & E3) extraction points are located on the north western side of finisher houses 1, 2 and 3.
- There is one extraction point between buildings 5 and 9 (E4), at the north west end of these buildings.
- There is one extraction point at the south east side of building 12 (E5).
- There is one extraction point between buildings 13 and 14 (E6), at the north west end of these buildings.

- There is one extraction point between buildings 15 and 16 (E7), at the north west end of these buildings.
- There is one extraction point at the north western edge of building 17 (E8).

Figure 1.3 Extraction points and carcass storage area



2.9 Staff training and awareness

There is a high degree of awareness of odour avoidance at the existing 'Ballyfaskin' Pig Farm and this will also be the case at the proposed development. A key contact employee will be trained to carry out odour assessments on a continuous basis. Staff will be made aware of the source – pathway – receptor concept and realise that any odours released from the site have to potential to impact on sensitive receptors (dwellings) and staff will also be made aware of the conditions that exacerbate release of odours; for example wind direction and movements of pigs and slurry.

3.0 ODOUR IMPACT ASSESSMENT

3.1 Assessment of potential Odour Abatement Technology

The pig farm has considered potential Abatement Technologies available and those mentioned in BAT 13 of Commission Implementing Decision (EU) 2017/302 of 15/02/2017. These include;

3.1.1 Housing design abatement

1 Fully and partially slatted houses are the main house types on the pig farm. Emissions tend to be high from a fully slatted system which allows emissions from the stored slurry surface to be ventilated directly. This is the most economical system in terms of management, labour and water usage. In practise partially slatted houses seldom have significantly lower emissions

than slatted houses unless solid surfaces are frequently cleaned or slurry removed frequently by a mechanical system. Solid floors can in many situations increase ammonia emissions and will result in an increased floor space requirement per animal and therefore additional setup and operational capital costs. The houses and tanks are in situ and the option to change the house design is not optional.

2 Various slurry flushing systems (e.g. scrapping, flushing using separated urine, flushing using water, flushing using gravity) are reported in the BAT 2017 document to reduce odour emissions. These systems work best where the flushed slurry is stored separately in a covered slurry store. These systems require additional operating energy and costs and structural changes such as an under-floor scrapping system installed beneath the tanks. The proposed system does not allow for the introduction of these systems because the slury tanks are in situ and the option to change the house design is not feasible.

3 Slurry cooling systems can be integrated into the tank wall at construction. It involves installing coolant piping system linked to a heat exchanger. Expected reduction of GHGs, reductions in ammonia of 40%+ and reduction in odour of 20- 25% is reported in BAT. This system would require structural works under the slats and would require continued maintenance and would be difficult to replace at end of life. Also consideration has to be given to animal comfort and performance which may be compromised at certain times of year due to the cooling. This system would be too expensive to retrofit and would disrupt the existing production system.

4 Stack height of the ventilation chimneys relative to the roof heights of the existing pig houses and the surrounding topography have a significant effect on the dispersion of odour. High chimneys improve dispersion and avoid the 'wake' affect from adjoining buildings thus reducing potential odour effects. The Odournet UK report indicates 175 – 200m reduction in the threshold contours due to increasing the height from 4m to 15m. In practical terms this would involve the centralising of the vent ducting to one emission point and having a reduced number (possibly one or two) chimneys. The stack height and ventilation is fixed in the proposed development because existing houses are in situ and altering of this would cause large disturbance and incur a lot of additional costs

3.1.2 Diet management abatement

5 There is a linear relationship between dietary protein and ammonia emissions. Reducing dietary protein by 2% could reduce ammonia emissions by 20% and various odour reductions have been reported in the order of 20 - 25%. This mitigation will be employed by the proposed development.

6 Additives such as Bactocell can be used to increase efficiency of protein usage in the pig and therefore can be used to reduce/replace protein content in growing pig diets.

Reducing of dietary protein is an effective way of reducing emissions and will be implemented by the pig farm thereby complying with BAT.

3.1.3 Slurry management abatement

7 Solid-liquid separation gives variable results in relation to odour control.

8 Anaerobic digestion of the slurry significantly reduces odour of the end product i.e. the digestate. Additional GHG and water quality benefits would accrue from AD on a pig farm because the plant could use brown bin waste (or similar) as a feedstock thus providing a valuable alternative waste stream. Reported benefits are up to 40% reduction in NH_3 emissions, 80% CH_4 and odour reductions, improved availability of N in the residue manure and a potential 3kg CO_2 equivalent reduction in GHGs for every m^3 of biogas produced. Typical yields of biogas from pig manure are approx. 15 - 20m^3 per ton of manure.

9 Slurry amendments are being currently trialled by Teagasc to reduce NH_3 emissions. It is hoped that these will become more widely available and will provide an additional mitigation tool to reduce emissions. Using dairy wastes, sugar beet molasses, acetic acid, alum, sulphuric acid and ferric chloride have been shown to reduce NH_3 Emissions by 55%, 63%, 70%, 82%, 85%, and 95% respectively – and although odour emission data is not presently available from Teagasc it can be assumed that odour reduction would also be significant.

10 Slurry masking agents are also used with varying degrees of success.

Solid liquid separation does not provide an effective result for odour reduction would create another slurry handling operation with the potential to create extra odour. Anaerobic digestion is not supported by the Irish State to the extent that this technology is supported in other states. Teagasc publications state that in October 2017 there were 43 AD plants in Northern Ireland and a further 103 plants either being constructed or already approved – NI agricultural area = 25% of ROI. The majority of these are farm fed. In the Republic of Ireland there are approximately 30 AD plants either operational or in the planning stages. The majority of these are not farm fed. There are 7900 AD plants in Germany which has four times the Irish agricultural land area. The tariff for AD energy is 11 – 15c / kWh in the Republic of Ireland versus 22 – 28 c / kWh in Northern Ireland. Anaerobic Digestion can be readily adopted at this site because the space is available. However, the initial capital costs and operation costs are high and it is not currently economically viable. Also, there are potential risks of additional odours from the site and potential risks to pig health status due to transportation and storage of stock feed for the digestor.

3.1.4 Air treatment abatement

11 Wet scrubbing plus Bio filtration is a very effective air treatment. It requires centralising the ventilation system to one exhaust point and treating in a single treatment unit. These are often woodchip or peat based with reported odour reductions of 70-80%. This is an end- of-pipe system and therefore no benefit is experienced within the house for the workers or pigs. Water and energy usage and soiled water production can increase by at least 0.4m^3 / pig place – the acidified soiled water produced creates problems for land-spread disposal;

12 Various wet scrubbers and acid scrubbers (without Bio filters) are used in a centralised ventilation system when the vented air is passed through a staged filtering system removing dust, ammonia and odour. This is an end- of-pipe system and therefore no benefit is experienced within the house for the workers or pigs. Reductions of 70-80% in ammonia are reported and 30-45% for odours;

13 Water fogging is where water is sprayed through high pressure nozzles producing a fine mist which moistens dust particles which fall out of the atmosphere. Because dust particles are vectors for odours compounds there is a reduction in odours – 12 – 23% according to BAT. The system can be end of pipe or within the house;

14 Misting of capturing and reactive agents is reported to reduce ammonia emissions by 79%. In fattening houses laboratory tests showed reductions of odorous compounds in the pig houses of 50-90%. Where the system is installed within the house additional working environment and pig health improvements are associated with this method. Water usage and soiled water production can increase by approx. 0.2m3 / pig place. Water and energy usage will increase;

Other technologies such as Activated carbon, thermal oxidation and UV / Ozone / Cold plasma are not referred to in the 2017 BAT and are more relevant for industrial application. These systems also require a centralised ventilation system, are capital intensive and not widely used in agriculture.

Of the above potential abatement technologies the following are selected as being appropriate for the 'Ballyfaskin' site;

1. Reduction in protein in growing pig diets.

3.2 Odour Control and minimisation measures

Following assessment of potential mitigation measures the following measures will be adopted to minimise and control odour emissions;

1. Low protein diets will be used.
2. Truck deliveries of odorous materials should be sealed or enclosed. Leaking or dirty slurry tankers will not be allowed on site.
3. The storage of odorous material such as carcass waste will be in sealed skips and will be removed frequently from the site.
4. The slurry extraction sites will be cleaned down daily. Slurry pumping equipment will be cleaned after use. Extraction points will drain back to the slurry tanks.
5. All odorous materials will be stored in sealed skips or in slurry tanks.
6. All spills, overflows and leaks should be cleaned up promptly with all operators aware and trained for this procedure.
7. A closed-door policy is enforced to prevent odorous releases through open doors.
8. A high level of cleanliness is maintained with outdoor surfaces washed down regularly with any remaining stagnant water removed.
9. Carcass skips will be cleaned regularly with an increased frequency in summer months.
10. The temperature is maintained as low as possible using adequate ventilation to reduce evaporation of odorous material. This reduces airflow over the surface of slurry and pigs thus reducing the rate of evaporation.
11. Agitation of slurry will increase the odour emission rate significantly. These activities will be avoided during weekends and evening times to minimise potential for nuisance.
12. Slurry amendments that reduce the potential release of certain odorous compounds will be considered as they become available.
13. Odour neutralisers / masking agents will be used if required.
14. The ventilation system in the pig houses will be maintained and serviced regularly to ventilate air efficiently.

3.3 Continuous odour assessment

Odour assessments will be conducted on a regular basis on the pig farm and reported to the relevant authority (i.e. EPA). Staff will be trained to adhere to the protocols set out in Air Guidance Document AG5, recording the prevailing weather conditions, the odour intensity and persistence at sensitive receptors. The results will reported to the pig farm manager.

4.0 MONITORING AND RECORD KEEPING

4.1 Odour assessments

The frequency of odour assessment will depend on the interaction of the local community and the pig farm. Where odour issues may arise the frequency will be agreed with EPA.

4.2 Record Keeping

An essential part of the odour management plan is the reporting and engaging with public. Complaints made to the pig farm will be recorded by the key contact for complaints – his/her number will be available to local residents. Complaints will be reported directed to the pig farm

manager. An 'Odour Complaint Form' (see attached) will be completed for complaints received by the pig farm. The pig manager will liaise with the complainants.

5.0 REVIEW PROCESS / AUDIT TIME TABLE

Reviews of the Odour Management Plan and performance of the odour abatement and mitigation measures will take place every year and more frequently if there are complaints. Odour assessments will be carried out in response to odour complaints.

5.1 Response to odour complaints

The response procedure when complaints are received is as follows;

1. The key contact person is notified immediately if he was not the first contact in relation to the complaint;
2. The odour complaint record (attached below) must be completed, signed and dated. Each complaint should be given a reference number, for example, 2020_OC_1, 2020_OC_2, , 2020_OC_3, etc.;
3. The complainant must be asked to give details of;
    a. the time odour was detected;
    b. how long it lasted;
    c. how often it occurs;
    d. the nature of the nuisance – what sort of odour was it? (see nuisance odour wheel)
    e. weather conditions should be noted
4. The EPA inspector should be notified;
5. An odour assessment should be carried out as soon as possible after the complaint in compliance the EPA Guidance AG5;
6. The odour complaint should be logged in the complaints log;
7. The complainant should be contacted to explain what measures will be taken to avoid repeat of odour incident;
8. Following a complaint daily odour assessments should be carried out, to include the vicinity of the complainant source. The EPA AG5 records (see below) should be retained on site.
9. The key contact should explain to the complainant that the situation is being monitored and engage as much as possible with complainants;
10. Following repeat complaints the records should be reviewed to see if there is a pattern / time when odour issues arise;
11. Review production process to eliminate odour issues where possible.
12. Review odour management plan following corrective action.

ODOUR COMPLAINT REPORT FORM

Name & Address:	Phone Number:
Time / Date of Complaint:	Time / Date of Odour:

Location of Odour:										
Weather Conditions:	Dry	Rained Recently	Drizzle	Raining	Foggy					
Temperature:	Cold	Cool	Warm	Hot						
Wind Strength:	Calm	Light Air	Light Breeze	Gentle Breeze	Moderate Breeze	Fresh Breeze	Strong Breeze	Near Gale	Gale	Strong Gale
Type of Odour (see below):										
Odour Intensity (see below):										
Persistence Scale (see below):										
Duration of Odour (time):										
Nature of Exposure:	No Odour	Intermittent	Persistent							
Any Comments / Additional Information:										

Type Of Odour

Odour Complaints/Non-Conformance / Odour-Monitoring-Report Log - Template

Date	Type (Complaint / Non–Conformance / Assessment)	Complaint type / Area / Process / Report Type	Description of Odour	Corrective Action Taken	Outcome

ODOUR INVESTIGATION FIELD RECORD SHEET

General	Your Reference	Site Location	Assessment by	Date

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)

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)

0 Remote (no housing, commercial/industrial premises or public area within 500m of observation point)
1 Low sensitivity (no housing, commercial/industrial premises or public area within 100m of observation point)
2 Moderate sensitivity (housing, commercial/industrial premises or public area within 100m of observation point)
3 High sensitivity (housing, commercial/industrial premises/public area within area of observation point)
4 Extra sensitive (complaints arising from residents, businesses and users of public areas within area of observation point)

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 3: Weather Conditions

Precipitation – dry, rained recently, drizzle, raining, foggy
Temperature – cold, cool, warm, hot

Note 4: Odour Persistence

0 No Odour
1 Intermittent (detected intermittently during the period of assessment)
2 Persistent (detected throughout the period of assessment)

Note 5: Odour Intensity

0 No detectable odour
1 Faint Odour (barely detectable, need to stand still and inhale facing the wind)
2 Moderate Odour (easily detectable while walking and breathing normally, possibly offensive)
3 Strong Odour (bearable but offensive – might make clothes / hair smell?)
4 Very Strong Odour (unbearable, difficult to remain in area affected by odour)

Odour Source Investigation (Post Odour Survey)				
Start Tim	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:			

	Observer Location		Wind (nd = if not detectable)			Time		Odour Rating		Odour Description Comments
Parameter	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	Description of any odours, other source(s) of odours etc. (Also note variable weather conditions etc)
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										