Air Quality
CONSULTANTS

Odour Assessment:
Host Technology Energy from Waste, Hownsgill Industrial Park, Consett

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Experts in air quality
management & assessment

Document Control

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1 Introduction

1.1 This report describes the assessment of odour impacts associated with the proposed Host Technology Energy from Waste (EfW) plant located at Hownsgill Industrial Park, Durham. The assessment has been carried out by Air Quality Consultants Ltd (AQC) on behalf of Project Genesis and is provided to support the EIA planning application for the scheme.

1.2 The proposed EfW plant will process up to 60,000 tonnes of non-hazardous Refuse Derived Fuel (RDF) per year to generate heat and power to supply to existing and future commercial operations at Hownsgill Industrial Estate. RDF is composed of waste, thus handling this material has the potential to generate odour, and it is necessary to consider the potential impacts of any odour impacts on local sensitive receptors.

1.3 The assessment has utilised an odour risk assessment approach as recommend in Institute of Air Quality Management (IAQM) guidance on the assessment of odours for planning (IAQM, 2018).

2 Odour in Legislation, Policy and Guidance

National Legislation

Environmental Protection Act

2.1 There are currently no statutory standards in the UK covering the release and subsequent impacts of odours. This is due to complexities involved with measuring and assessing odours against compliance criteria, and the inherently subjective nature of odours.

2.2 It is recognised that odours have the potential to pose a nuisance for residents living near to an offensive source of odour. Determination of whether or not an odour constitutes a statutory nuisance in these cases is usually the responsibility of the local planning authority or the Environment Agency. The Environmental Protection Act 1990 (1990) outlines that a local authority can require measures to be taken where any:

"dust, steam, smell or other effluvia arising on an industrial, trade and business premises and being prejudicial to health or a nuisance…" or

"fumes or gases are emitted from premises so as to be prejudicial to health or cause a nuisance.."

2.3 Odour can also be controlled under the Statutory Nuisance provisions of Part III of the Environmental Protection Act.

Planning Policy

National Planning Policy Framework

2.4 The National Planning Policy Framework (NPPF) (2019) sets out planning policy for England. It states that the purpose of the planning system is to contribute to the achievement of sustainable development, and that the planning system has three overarching objectives, one of which is an environmental objective:

"to contribute to protecting and enhancing our natural, built and historic environment; including making effective use of land, helping to improve biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy".

2.5 To prevent unacceptable risks from pollution, the NPPF states that:

"Planning policies and decisions should contribute to and enhance the natural and local environment by…preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land

instability. Development should, wherever possible, help to improve local environmental conditions such as air quality".

and

"Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development".

2.6 Regarding sites that will operate under an Environmental Permit, PPG states that:

"It is not necessary for air quality assessments that support planning applications to duplicate aspects of air quality assessments that will be done as part of non-planning control regimes, such as under Environmental Permitting Regulations".

2.7 The proposed development can be expected to function in line with an Odour Management Plan enforced through the Environmental Permit issued by the Environment Agency, which will be required in order for it to operate.

2.8 The NPPF is supported by Planning Practice Guidance (PPG) (Ministry of Housing, Communities & Local Government, 2019), which makes clear that *"Odour…can also be a planning concern, for example, because of the effect on local amenity"*. It also provides guidance on options for mitigating impacts, and states that *"Mitigation options where necessary, will depend on the proposed development and should be proportionate to the likely impact".*

Odour Guidance

Environment Agency Guidance

2.9 The Environment Agency has produced a horizontal guidance note (H4) on odour assessment and management (Environment Agency, 2011), which is designed for operators of Environment Agency-regulated processes (i.e., those which classify as Part A(1) processes under the Pollution Prevention and Control (PPC) regime). The H4 guidance document is primarily aimed at methods to control and manage the release of odours, but also contains a series of recommended assessment methods which can be used to assess potential odour impacts.

IAQM Guidance

2.10 The latest UK guidance on odour assessment was published by the IAQM in 2018 (IAQM, 2018). The IAQM guidance sets out assessment methods which may be utilised in the assessment of odours for planning applications. It is the only UK odour guidance document which contains a method for estimating the significance of potential odour impacts.

3 Assessment Approach

3.1 Odour impact assessment is a challenging and subjective science. There are a number of odour assessment methods and tools that have been developed which are widely used in the UK, including desk-based methods, such as complaints analysis and qualitative risk assessment, through to field odour testing (sniff testing) and dispersion modelling. Each has its advantages and disadvantages and not all assessment methods are appropriate in every case; for example, where a potentially odorous process is proposed rather than existing, then assessment methods such as sniff testing and odour sampling are less relevant than predictive methods such as odour risk assessment. The scale and location of odorous processes is also important in selecting appropriate assessment methodologies, with more simple methodologies often sufficient for small or remotely located processes.

3.2 The approach to assessing the odour impacts from the EfW plant has been to utilise the qualitative risk-assessment approach described in the IAQM guidance (IAQM, 2018).

Methodology

3.3 The odour risk assessment follows a Source-Pathway-Receptor approach. This approach describes the concept that, in order for an odour impact (such as annoyance or nuisance) to occur, there must be a source of odour, a pathway to transport the odour to an off-site location, and a receptor (e.g. people) to be affected by the odour.

3.4 The risk of odour effects at a given receptor location may be estimated using the following fundamental relationship:

$$\text{Effect} \approx \text{Dose} \times \text{Response}$$

3.5 In this relationship, the **dose** is a measure of the likely exposure to odours, in other words the ***impact***. The **response** is determined by the sensitivity of the receiving environment and thus the overall ***effect*** is the result of changes in odour exposure at specific receptors, taking into account their sensitivity to odours.

3.6 In order to determine the risk of potential odour effects from the EfW plant, the 'FIDOR' factors for odour exposure have been used. These factors are commonly used in the assessment of odours and are outlined in the IAQM guidance, but are also described in the Environment Agency's H4 guidance document on odour management (Environment Agency, 2011). The FIDOR factors are:

- **F**requency – the frequency with which odours are detected;
- **I**ntensity – the intensity of odours detected;
- **D**uration – the duration of exposure to detectable odours;

- **O**ffensiveness – the level of pleasantness or unpleasantness of odours; and
- **R**eceptor – the sensitivity of the location where odours are detected, and/or the proximity of odour releases to an odour-sensitive location.

3.7 The key factors that will influence the effects of odours are the magnitude of the odour source(s), the effectiveness of the pathway for transporting odours, and the sensitivity of the receptor. The methodology set out in the IAQM guidance document describes in detail a Source-Pathway-Receptor approach to odour risk assessment, and includes tables and matrices to assist in determining the likely risk of odour effects. The IAQM methodology is outlined below. It includes an element of professional judgement.

3.8 The assessment examines the source odour potential (source magnitude) of the EfW plant, and then identifies the effectiveness of the pathway to, and receptor sensitivity at, sensitive locations.

3.9 Table 1 describes the risk-rating criteria (high, medium and low) for source odour potential, pathway effectiveness and receptor sensitivity applied in this assessment. This table has been adapted from Table 8 in the IAQM odour guidance.

Table 1: Source-Pathway-Receptor Risk Ratings

Source Odour Potential	Pathway Effectiveness	Receptor Sensitivity
Large Source Odour Potential: Large-scale odour source and/or a source with highly unpleasant odours (hedonic tone -2 to -4); no odour control.	**Highly Effective Pathway:** Very short distance between source and receptor; receptor downwind of source relative to prevailing wind; ground level releases; no obstacle between source and receptor.	**High Sensitivity:** Highly sensitive receptors e.g. residential properties and schools.
Medium Source Odour Potential: Medium-scale odour source and/or a source with moderately unpleasant odours (hedonic tone 0 to -2); basic odour controls.	**Moderately Effective Pathway:** Receptor is local to the source; releases are elevated, but compromised by building effects.	**Medium Sensitivity:** Moderately sensitive receptors e.g. commercial and retail premises, and recreation areas.
Small Source Odour Potential: Small-scale odour source and/or a source with pleasant odours (hedonic tone +4 – 0); best practise odour controls.	**Ineffective Pathway:** Long distance between source and receptor (>500 m); receptors upwind of source relative to prevailing wind; odour release from stack/high level.	**Low Sensitivity:** Receptors not sensitive e.g. industrial activities or farms.

3.10 The risk ratings for source magnitude and pathway effectiveness (for each receptor) identified using the criteria in Table 1 are then combined using the matrix shown in Table 2 to estimate an overall risk of odour impact at each specific receptor location.

Table 2: Assessment of Risk of Odour Impact at a Specific Receptor Location

Pathway Effectiveness	Source Odour Potential (Source Magnitude)		
	Large	Medium	Small
Highly Effective	High Risk	Medium Risk	Low Risk
Moderately Effective	Medium Risk	Low Risk	Negligible Risk
Ineffective	Low Risk	Negligible Risk	Negligible Risk

3.11 The next stage of the risk assessment is to identify the potential odour effect at each receptor location. This is done using the matrix presented in Table 3, which combines the overall odour impact risk descriptor for each receptor with the receptor sensitivity determined using the criteria in Table 1.

Table 3: Assessment of Potential Odour Effect at a Specific Receptor Location

Risk of Odour Impact	Receptor Sensitivity		
	High	Medium	Low
High Risk	Substantial Adverse Effect	Moderate Adverse Effect	Slight Adverse Effect
Medium Risk	Moderate Adverse Effect	Slight Adverse Effect	Negligible Effect
Low Risk	Slight Adverse Effect	Negligible Effect	Negligible Effect
Negligible Risk	Negligible Effect	Negligible Effect	Negligible Effect

3.12 As a final stage of assessment, an overall significance of odour effects is determined, based on professional judgment and taking into account the significance of the effect at each specific receptor location.

Sensitive Locations

3.13 Locations sensitive to odour emitted during site operations will be places where members of the public are regularly present. The sensitivity of a location will be dependent on the land use, the frequency and length of time members of the public would be present there, and the expected level of amenity in each given location. Guidance on receptor sensitivity is provided in Table 1.

3.14 Eleven existing sensitive receptor areas have been identified for this assessment, as well the proposed Derwent View, Consett development, situated approximately 200 m north of the proposed EfW plant. These locations are described in Table 4 and shown in Figure 1.

Table 4: Sensitive Receptor Areas

Receptor ID	Description	Type of Receptor	Receptor Sensitivity
1	Properties on Deneburn Terrace	Residential	High
2	Properties on A692	Residential	High
3	Man Vs Food Grillhouse Garden	Commercial	Medium
4	Properties on The Chequers	Residential	High
5	Properties on Knitsley Lane Housing	Residential	High
6	Property on Knitsley Lane	Residential	High
7	Hownsgill Farm Tearooms, Bunkhouse and Caravan Park	Commercial	High
8	Industrial Estate	Industrial	Low
9	HBH Machinery	Industrial	Low
10	JT Dove	Industrial	Low
11	Greencore UK	Industrial	Low
12	Derwent View development (Ref: DM/19/01987/OUT)	Commercial (includes Care facilities)	High

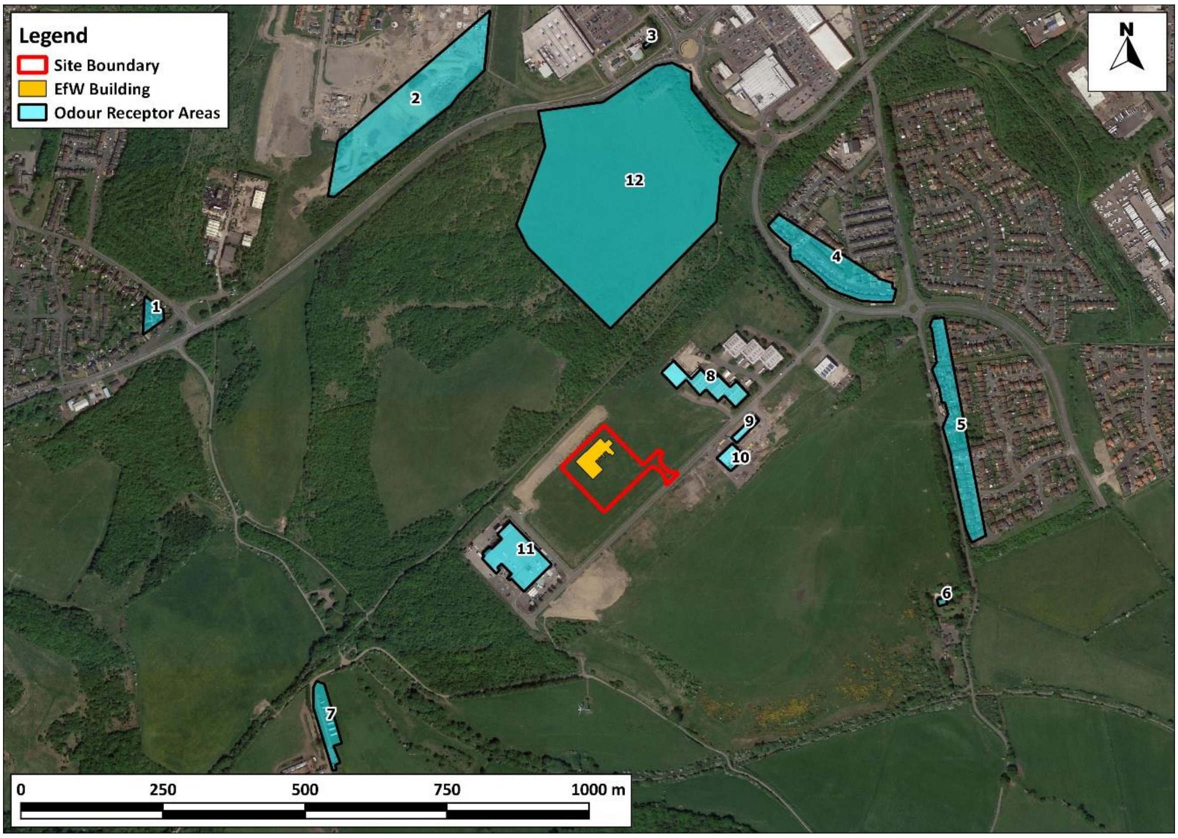

Figure 1: Sensitive Receptor Areas

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4 Odour Impact Assessment

Process Description

4.1 The Proposed Development will incinerate up to 60,000 tonnes of waste fuel per year, which represents a relatively small-scale EfW operation. Waste will be pre-processed off site and delivered to the site as RDF, either in covered Heavy Good Vehicles (HGVs) or in wrapped bales.

4.2 All fuel will be delivered by HGV, which will enter the process building via the intake hall, whose doors will be open for as little time as possible, with fast acting roller shutter doors and air knives to minimise the escape of air from the building.

4.3 The delivered fuel will be tipped into the fuel bunker (roughly 4 m deep) within the building. Overhead fuel cranes operating on a pre-programmed cycle will move the waste around the fuel bunker to create a homogeneous mixture. The cranes will also deliver waste to the fuel delivery chutes serving the incineration unit. From this point onwards the system is sealed, and there should be no escape of gases until they are exhausted from the flues. All waste handling will take place within the building, which will be maintained under negative pressure to ensure that the escape of air is kept to an absolute minimum. A deodorising misting system will also be in use periodically within the building. The air extracted from the intake hall will be passed through an odour control system, consisting of a cold photocatalytic oxidation unit and activated carbon filter, which will remove the odorous compounds before exhausting to the outside air via a vertical flue extending to above roof level of the main building.

4.4 The waste fed to the fuel delivery chutes is then incinerated, generated flue gas and bottom ash. The bottom ash produced is discharged from the incineration units and stored in an ash bay before being removed for offsite treatment. This bottom ash is not expected to be especially odorous, and will be stored within the process building.

4.5 Having been generated in the combustion process and passed through the heat recovery steam generator, the flue gas will enter a gas cleaning system. This will comprise of a reactor where lime and activated carbon is injected into the flue gas, a bag-house filter where the residues are removed and an air pollution control residue silo where these residues are stored. In simple terms the lime and activated carbon will be injected before the inlet of the bag house filter and the lime will absorb acid components in the flue-gas while the activated carbon adsorbs dioxins, organic carbons and heavy metals. These residues are then removed from the gas in the bag-house filter and extracted to the air pollution control residue silo, while the residual flue gas passes out of the main stack. The residual flue gas is highly unlikely to be especially odorous, as most odorous compounds will be destroyed in the high-temperature combustion process.

Source Odour Potential

4.6 The first step of the odour risk assessment is to identify the source odour potential or odour magnitude. This takes into account the scale and nature of the odorous processes; the continuity, intensity and offensiveness of odour releases; and any odour control measures that are used. In essence, it must consider the odour potential of the source with respect to the FIDO part of FIDOR.

4.7 The Proposed Development will handle waste, which has the potential to produce highly intense and highly offensive odours. However, the plant will only accept RDF, which will have been well-processed by the time it reaches the facility, and very different to waste handled at a household waste centre, for example. RDF is combustible waste that has been shredded and dried, and will have had most of the potentially odorous organic matter originally mixed in with the waste removed during processing. Some organic matter, and thus odour-generating potential, will undoubtedly remain, but as the RDF is dried, it has a low odour potential. Nonetheless the feedstock for the plant remains a potential odour source, albeit a limited one.

4.8 Organic material is biodegradable, and biodegradation can result in odours being produced. The strength and nature of odours produced is dependent on a number of variables including the volume and composition of the waste, the length of time it has been stored, the influence of temperature and moisture, and mechanical action. Typically, fresh organic matter is less odorous than organic matter that is a number of days or weeks old and has had time for biological breakdown to begin (either aerobic or anaerobic). Conversely, organic matter which has been allowed to significantly biodegrade often becomes less odorous again (e.g. mature compost). Any residual organic matter within the RDF is likely to be at least a few weeks old, but will have already been dried as part of the RDF process, and as such will have a relatively low odour potential.

4.9 The feedstock for the plant is the only source of odour, but there are three main ways in which odours may be released during the processes undertaken at the Proposed Development. The first will be from the transport of the fuel to the facility, with odours released from the waste fuel as it is transported by road. The second will be from the process buildings themselves, primarily the intake hall where the waste is deposited, stored and mixed prior to being fed into the incineration process. The final potential odour source is the main stack itself, although the gases released here, at a height of 50 m, are not expected to be especially odorous, and will be released into a very good environment for dispersion.

4.10 As explained previously, the portion of the building where waste will be processed will be maintained under negative pressure to ensure no fugitive releases of odorous air, and the extracted air passed through an odour control system to remove most of the odorous compounds. Thus the only sources of odorous air from these buildings will be the exhausted air from the odour control system and any small amount of air that may escape the building while the doors are open for deliveries, although the building being maintained under negative pressure should keep this to an absolute minimum.

4.11 The section of the building housing the furnace, boiler and other plant will be naturally ventilated, as it is not expected to be a potential odour source, as the processes here are entirely sealed.

4.12 The main potential odour sources and overall source odour potential for the facility are described in **Error! Reference source not found.**.

Table 5: Identification of Odour Sources and Overall Source Odour Potential

Odour Source	Description	Frequency and Duration	Intensity and Offensiveness
Transport of Feedstock	The delivery of the RDF feedstock to the facility and removal of bottom ash by HGV.	This will take place between the hours of 7am and 7pm on weekdays and Saturdays including public holidays, with approximately 17 RDF deliveries and two bottom ash removal trips per day on these days. This equates to a HGV trip every 38 minutes.	There is the potential for the waste fuel to produce highly intense, highly offensive odours. Delivery vehicles will, however, be covered to minimise odorous emissions, and any emissions should be fleeting as the vehicles pass by any sensitive receptors on their way to the facility.
Process Buildings	Handling of the waste fuel.	The process will be continuous, so waste will be mixed and incinerated 24/7.	As outlined above, there is some potential for the waste fuel to produce highly intense, highly offensive odours. However, the process buildings will all be maintained under negative pressure, with extracted air fed through an odour control system, so the potential for these odours to be released will be very low.
Flue Gases	The leftover gases from the combustion process, post-cleaning.	The gasification process will be continuous, so flue gases will be emitted 24/7.	The flue gas is expected to have a low intensity and low offensiveness, as most odorous compounds will be destroyed in the combustion process.
Overall Source Odour Potential	The overall source odour potential of the Proposed Development is judged to be **Small**, as it will have effective, tangible mitigation measures in place leading to little or no residual odour.		

Pathway Effectiveness

4.13 In order to consider the effectiveness of the pathway, it is important to consider receptor locations in terms of their proximity to the odour source and the prevailing wind direction. 11 receptor areas have been identified for this assessment, which represent worst-case exposure to potential odour impacts. These receptor areas are shown in Figure 1.

4.14 Wind roses for years 2015 to 2019 from the Albemarle meteorological station are presented in Appendix A2. Albemarle is located some 18 km to the north of the proposed development and is deemed to be the nearest monitoring station representative of meteorological conditions in the vicinity of the proposed development; both the application site and the meteorological monitoring station are located some 30 km inland of the North Sea, to the east of the North Pennines. The wind roses demonstrate that the prevailing wind in the region is from the west, with little in the way of other significant components. In general, odours will be transported by the wind and will not be detectable at locations upwind of a source. The exception to this is during very light wind conditions when odours may disperse against the wind direction, although typically only for relatively short distances.

4.15 The effectiveness of the odour pathway between the EfW plant and the nearby sensitive receptors is summarised in Table 6, which draws upon the guidance set out in Table 1.

Table 6: Effectiveness of Odour Pathway

Receptor		Distance from Source (m)	Downwind under Winds from (°)	% Winds from Source	Pathway Effectiveness[a]
ID	Location				
1	Residential Properties	770	105 - 110	2.0	Ineffective
2	Residential Properties	640	132 - 162	6.7	Ineffective
3	Outdoor Eating Areas	690	184 - 189	0.0	Ineffective
4	Residential Properties	475	214 - 245	9.9	Ineffective
5	Residential Properties	590	245 - 286	38.5	Ineffective
6	Residential Properties	630	289 - 295	3.5	Ineffective
7	Campsite	610	39 - 54	3.8	Ineffective
8	Industrial units	175	209 - 257	17.9	Moderately Effective
9	Industrial units	210	248 - 272	31.1	Moderately Effective
10	Industrial units	180	255 - 283	32.5	Moderately Effective
11	Industrial units	155	13 - 63	8.6	Ineffective
12	Derwent View	270	156 - 210	12.3	Moderately Effective

[a] Overall pathway effectiveness is based on professional judgement, taking account of distance between source and receptor, and frequency of winds with respect to the average.

4.16 Receptors 1 to 7 are all situated over 450 m away from the EfW plant, which is sufficient distance for any odours released to have dispersed significantly. There are also physical barriers to transport of odours between the EfW plant and these receptors, in the form of trees and/or other buildings, which would increase dispersion and reduce odour concentrations at these receptors. The pathway effectiveness for each of these sites is, therefore, judged to be ineffective. Receptors 8 to 10 are situated in closer proximity to the EfW plant, but still not close to it, with, on the whole, higher prevailing wind percentages and no existing buildings or trees acting as barriers. The pathway effectiveness for these sites is, therefore, judged to be moderately effective. Receptor 11 is the closest to the EfW plant, but the prevailing wind conditions will very rarely put it downwind, thus the pathway effectiveness is judged to be ineffective.

4.17 Receptor 12 represents the proposed Derwent View development, an approved outline application for commercial development that includes a community hospital and care facilities. The nature of outline permission means that the layout of the development is subject to change, although the indicative masterplan suggests that the nearest relevant exposure will be situated some 270 m from the odour source. As a worst-case assumption, the wind direction calculation has been conducted using the entire breadth of the application site boundary. There are some physical barriers between the EfW plant and the site boundary in the form of trees. With the odour source upwind of the site 12.3 % of the time, it is judged that the pathway effectiveness is moderately effective.

Receptor Sensitivity

4.18 The sensitivity of each of the receptors is described in Table 4. Receptor sensitivities are based on the descriptors presented in Table 1.

Potential Odour Effects

4.19 The assessments of the potential odour effects at sensitive receptor locations are presented in Table 7. This brings together the source odour potential, effectiveness of pathway and receptor sensitivity identified using the criteria described in Table 1, to identify an overall potential for odour effects, using the matrices set out in Table 2 and Table 3.

Table 7: Assessment of Potential Odour Effects from the EfW Plant

Receptor	Risk of Odour Impact (Dose)			Receptor Sensitivity	Likely Odour Effect
	Source Odour Potential	Effectiveness of Pathway	Risk of Odour Impact		
1	Small	Ineffective	Negligible Risk	High	Negligible Effect
2	Small	Ineffective	Negligible Risk	High	Negligible Effect
3	Small	Ineffective	Negligible Risk	Medium	Negligible Effect
4	Small	Ineffective	Negligible Risk	High	Negligible Effect
5	Small	Ineffective	Negligible Risk	High	Negligible Effect
6	Small	Ineffective	Negligible Risk	High	Negligible Effect
7	Small	Ineffective	Negligible Risk	High	Negligible Effect
8	Small	Moderately Effective	Negligible Risk	Low	Negligible Effect
9	Small	Moderately Effective	Negligible Risk	Low	Negligible Effect
10	Small	Moderately Effective	Negligible Risk	Low	Negligible Effect
11	Small	Ineffective	Negligible Risk	Low	Negligible Effect
12	Small	Moderately Effective	Negligible Risk	High	Negligible Effect

4.20 The potential odour effects have been identified using the effect ≈ dose x response relationship identified in Paragraph 3.4. The process is described as follows:

1) Identify the impact:

4.21 With a small source odour potential, where the pathway is deemed to be ineffective to moderately effective, then the risk of odour impacts (dose) is judged to be negligible (see Table 2).

2) Consider the response:

4.22 Based on the matrix presented in Table 3, a negligible risk of odour impacts will lead to a negligible odour effect regardless of receptor sensitivity.

4.23 The final stage of the risk assessment is to make an overall judgement as to the likely significance of effects. In this case it is judged that that overall significance of odour effects is ***insignificant.*** This conclusion is based on there being a negligible risk of odour effects at all receptors.

5 Summary

5.1 The odour effects of the EfW plant on nearby sensitive receptors has been assessed, utilising an odour risk assessment.

5.2 The odour risk assessment concluded that the operation of the EfW plant will result in negligible odour effects at all existing and proposed sensitive receptor locations in the vicinity of the site. Therefore, it is judged that the EfW plant will lead to insignificant odour effects at nearby sensitive receptor locations.

6 References

Environment Agency (2011) *H4 Odour Management. How to comply with your environmental permit*.

HMSO (1990) *Environmental Protection Act 1990*.

IAQM (2018) *Guidance on the assessment of odours for planning v1.1*.

Ministry of Housing, Communities & Local Government (2019) *Planning Practice Guidance*, Available: https://www.gov.uk/government/collections/planning-practice-guidance.

Ministry of Housing, Communities and Local Government (2019) *National Planning Policy Framework*, Available: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/779764/NPPF_Feb_2019_web.pdf.

7 Appendices

A1 Professional Experience

Laurence Caird, MEarthSci CSci MIEnvSc MIAQM

Mr Caird is an Associate Director with AQC, with 14 years' experience in the field of air quality including the detailed assessment of emissions from road traffic, airports, heating and energy plant, and a wide range of industrial sources including the thermal treatment of waste. He has experience in ambient air quality monitoring for numerous pollutants using a wide range of techniques and is also competent in the monitoring and assessment of nuisance odours and dust. Mr Caird has worked with a variety of clients to provide expert air quality services and advice, including local authorities, planners, developers and process operators. He is a Member of the Institute of Air Quality Management and is a Chartered Scientist.

Ricky Gellatly, BSc (Hons) CSci MIEnvSc MIAQM

Mr Gellatly is a Principal Consultant with AQC with over eight years' relevant experience. He has undertaken air quality assessments for a wide range of projects, assessing many different pollution sources using both qualitative and quantitative methodologies, with most assessments having included dispersion modelling (using a variety of models). He has assessed road schemes, airports, energy from waste facilities, anaerobic digesters, poultry farms, urban extensions, rail freight interchanges, energy centres, waste handling sites, sewage works and shopping and sports centres, amongst others. He also has experience in ambient air quality monitoring, the analysis and interpretation of air quality monitoring data, the monitoring and assessment of nuisance odours and the monitoring and assessment of construction dust. He is a Member of the Institute of Air Quality Management and is a Chartered Scientist.

Jamie Dennis, MSci (Hons), AMIEnvSc, AMIAQM

Mr Dennis is an Assistant Consultant with AQC, having joined the company in December 2019. Prior to joining, he completed an MSci degree in Chemistry at the University of Bristol, specialising in the regional modelling of trace gases. He has undertaken numerous air quality assessments, including road traffic and plant emissions modelling, as well as odour and construction dust risk assessments. He is an Associate Member of both the Institute of Air Quality Management and Institution of Environmental Sciences.

A2 Wind Roses

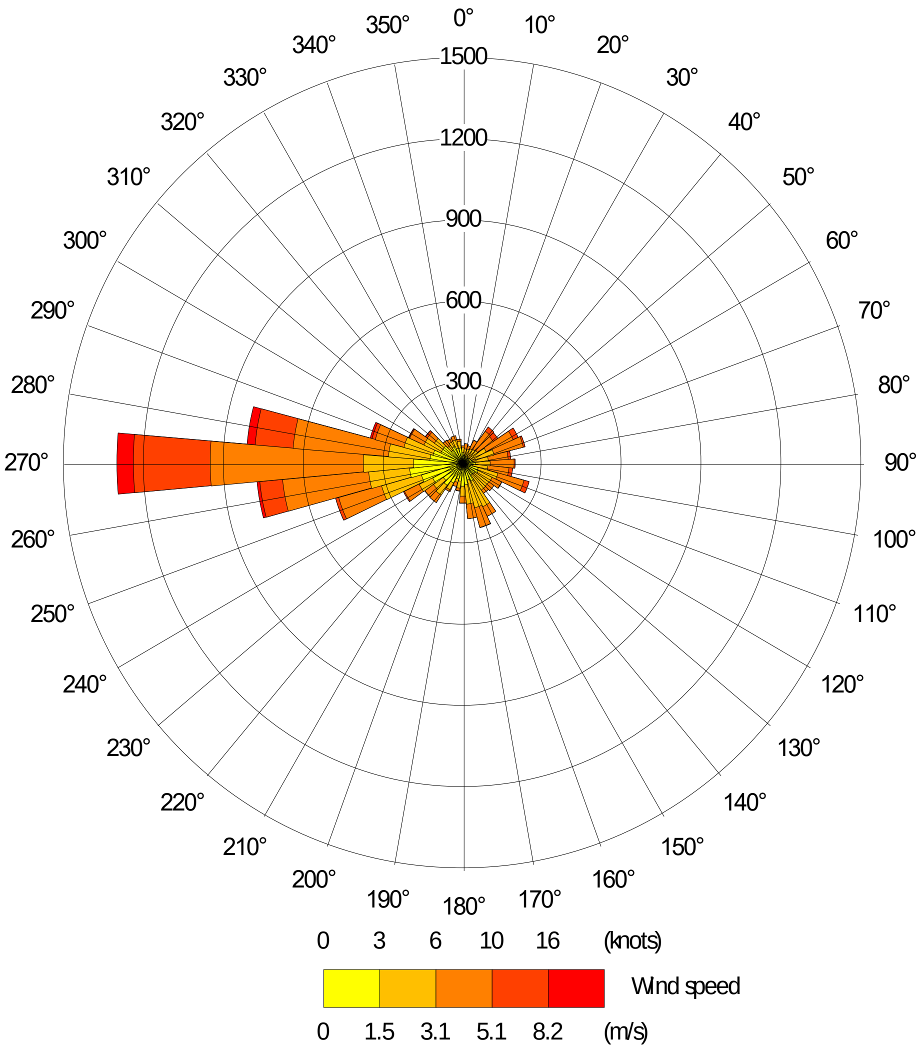

Figure A2.1: Wind Rose from Albemarle Meteorological Station for 2019

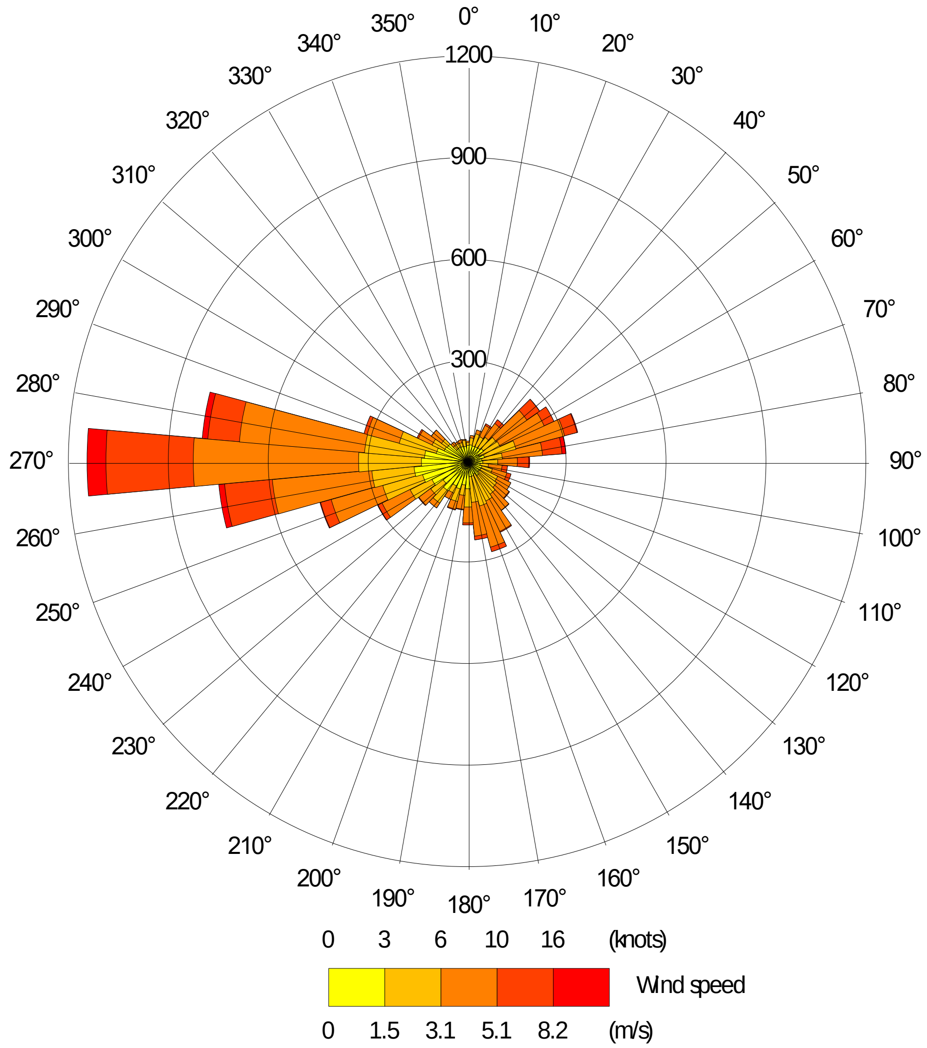

Figure A2.2: Wind Rose from Albemarle Meteorological Station for 2018

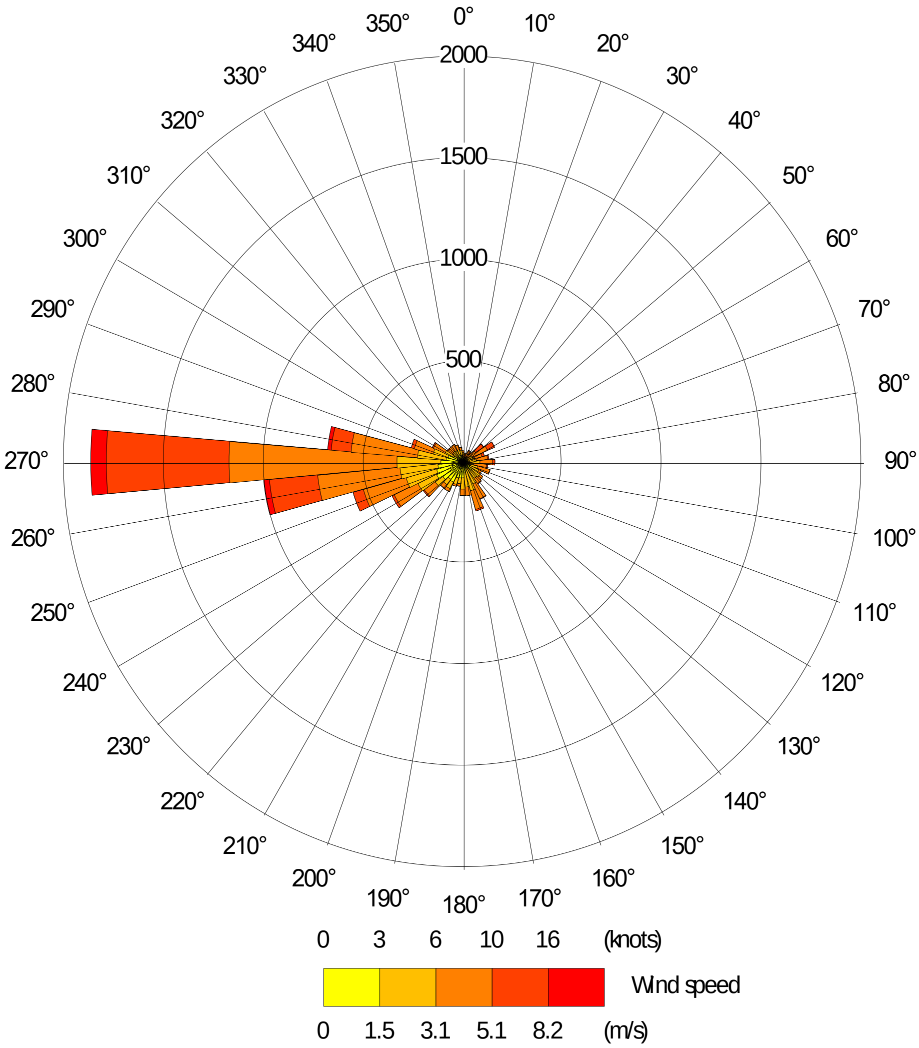

Figure A2.3: Wind Rose from Albemarle Meteorological Station for 2017

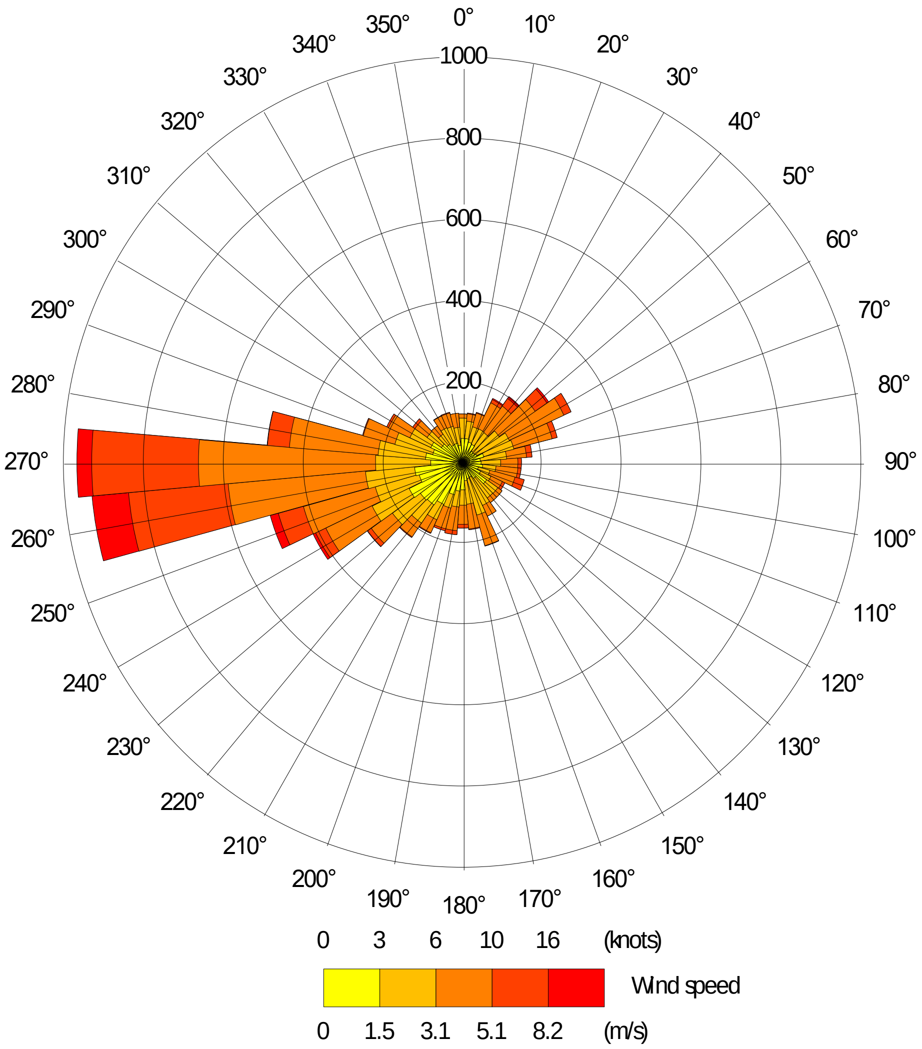

Figure A2.4: Wind Rose from Albemarle Meteorological Station for 2016

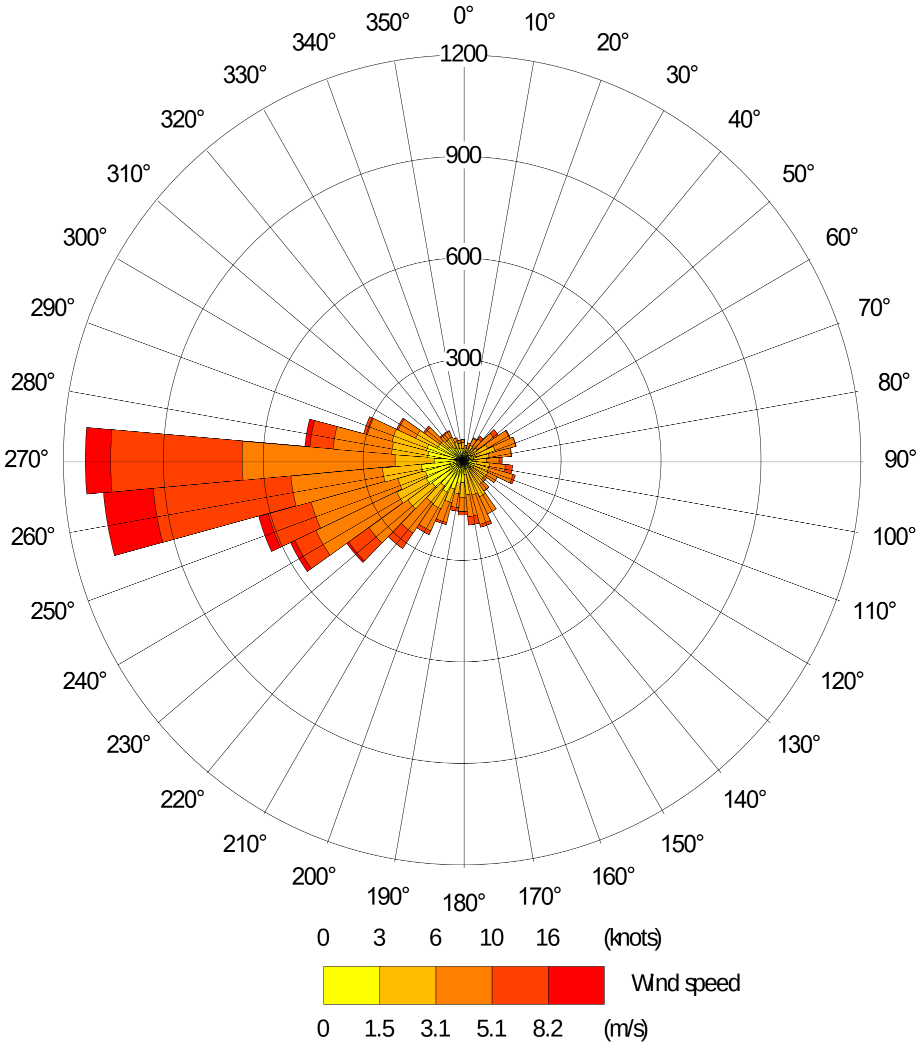

Figure A2.5: Wind Rose from Albemarle Meteorological Station for 2015