

Cloud IX Kitchens Ltd

4 Eskdale Road, Uxbridge,
UB8 2RT

Odour Appraisal

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Odour Appraisal

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Approved for Issue



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1 Introduction

Michael Bull and Associates Ltd (MBAL) has been commissioned by Cloud IX Kitchens Ltd to undertake an odour appraisal of their site at 4 Eskdale Road, Uxbridge, UB8 2RT.

Operation of commercial kitchens can result in odorous emissions which, if not properly controlled, can result in a nuisance if sensitive properties (receptors) are frequently affected by high odour concentrations. An assessment is therefore required to determine the level of risk of problems from odours, to assess whether odour mitigation is required and if so, to determine an appropriate level of control to avoid nuisance.

This report provides background detail on odours, the approaches used for the assessment of odours from commercial kitchens and also provides the results of the odour appraisal for this proposed development using methods outlined in guidance from the Department of Environment, Food and Rural Affairs (Defra) and the Institute of Air Quality Management (IAQM).

2 Odour – Background and Guidance

2.1 Guidance

2.1.1 Defra Guidance

Defra produced guidance on the Control on Odour and Noise from Commercial Kitchen Exhaust Systems in January 2005¹ and Odour Guidance for Local Authorities in 2010². These documents were withdrawn in September 2017 and there is no indication that it will be replaced or updated. Some of the content of this guidance remains useful in providing background information on odours and for providing a framework for the assessment methodology which is discussed below. One of the authors of the commercial kitchen guidance provided their own update in 2018³ and this provides further relevant information and clarifies aspects of the original guidance, this is known as the Defra/EMAQ+ guidance.

The human nose is very sensitive to odour and can detect the presence of some chemicals at very low concentrations that would be difficult for instruments to measure. The environment is rarely “odour free” even in places that are perceived to be clean such as rural areas or by the sea. Our response to odours depends on four interlinked (sensory) characteristics:

- Hedonic tone: this is a judgement of the relative pleasantness or unpleasantness of an odour made by assessors in an odour panel;
- Quality/Characteristics: this is a qualitative attribute which is expressed in terms of “descriptors”, e.g., “fruity”, “almond”, “fishy”. This can be of use when establishing an odour source from complainants’ descriptions;
- Concentration: the “amount” of odour present in a sample of air. It can be expressed in terms of parts per million, parts per billion or in mg/m³ of air for a single odorous compound. More usually a mixture of compounds is present, and the concentration of the mixture can be expressed in odour units per cubic metre (ou_E/m³) (see definition below); and
- Intensity: is the magnitude (strength) of perception of an odour (from faint to strong). Intensity increases as concentration increases but the relationship is logarithmic. Increases or decreases in concentration of an odour do not always produce a corresponding proportional change in the odour strength as perceived by the human nose.

The most commonly used attribute is the concentration of odours; this is measured in European odour units (ou_E/m³) using a device known as an olfactometer which presents a sample of odour at different dilutions to a trained panel. The panel is asked whether they are able to detect odour at various concentrations. Once only 50% of the panel can detect the odour, it is considered to be at its “Detection Threshold”. The odour concentration at the Detection Threshold is defined to be 1 ou_E/m³. For instance, if an odour sample has

¹ Defra, Guidance on the Control of Odour and Noise from Commercial Kitchen Exhaust Systems, January 2005 (withdrawn September 2017).

² Defra, Odour Guidance for Local Authorities, March 2010 (withdrawn September 2017).

³ EMAQ+ Control of Odour and Noise from Commercial Kitchen Exhaust Systems, Update, Dr Nigel Gibson, 2018

been diluted in an olfactometer by a factor of 10,000 to reach the detection threshold, then the concentration of the original sample is 10,000 ou_E/m³.

Defra notes in their Local Authority guidance that 5 ou_E/m³ would be considered to be a 'faint' odour whilst 10 ou_E/m³ would be considered a 'distinct' odour. Generally, an average person would be able to recognise the source of an odour at about 3 ou_E/m³, although this can depend on the relative offensiveness of the odour. Background odour levels can be some 5-60 ou_E/m³ or more.

The Local Authority guidance notes that the main issue with odour is its ability to result in an effect that is "objectionable". The guidance notes that an offensive odour can occur at concentrations of compounds that are far below the level that would result in an effect on the physical health of humans.

The Defra/EMAQ+ Kitchen Ventilation guidance provides three factors that influence the production of odour from a commercial kitchen:

- Size of the facility – This influences the volume of ventilation air handled and the intensity of the odour;
- Type of food prepared – This affects the chemical constituents in the ventilation air; and
- Type of cooking appliances used – This dictates the level of fat, water, and the temperature of the ventilation air.

In general, the amount of odour released depends on the amount of oil/grease in the vented air and the quantities of spices used in the cooking. Therefore, deep fat frying, open grills and the cooking of more highly spiced food result in the highest odour releases.

The guidance notes that existing premises should have systems designed to comply with the principles of Best Practical Means and these should be achieved with an adequate level of odour control and stack dispersion. It notes that the discharge stack should ideally be located at least 1m above the roof ridge of any building within 15m of the vent. Where this is achieved, further odour control may not be required depending on the level of risk.

There is useful clarification of when odour control may be needed with a high level vent in guidance produced by Westminster City Council⁴. This notes that odour control would only be required where there are sensitive receptors at a higher level, within 20-50m of the vent. They note that "buildings that are more than about 50m distance away (even if these are higher than the discharge point) are normally considered to be far enough for adequate natural dilution to have occurred".

If this requirement cannot be complied with, then the discharge should be 1m above the roof eaves or dormer window of the building housing the kitchen and a higher level of odour control measures will be required. Where this cannot be achieved, then odours need to be reduced by control equipment and the guidance details how different levels of mitigation can be achieved to allow a low-level ventilation system to work successfully.

⁴ City of Westminster, Prevention of odour and fume nuisance from commercial kitchen exhaust systems, March 2021

Annex C of the guidance provides a risk assessment framework for odour (see Table 1 below). This examines four factors - the location of the exhaust vent, the proximity of sensitive receptors, the size of the kitchen and the type of food cooked. An overall score is then calculated to give a risk rating, there are three possible risk levels: Low to Medium, High and Very High. The 2018 update to the guidance slightly amended the risk factors of cooking type and these are also detailed in Table 1.

Criteria	Score	Score	Details (DEFRA Guidance)	Details (Updated 2018 Guidance)
Dispersion	Very poor	20	Low level discharge, discharge into courtyard or restriction on stack	Low level discharge, discharge into courtyard or restriction on stack
	Poor	15	Not low level but below eaves, or discharge at below 10 m/s	Not low level but below eaves, or discharge at below 10 m/s
	Moderate	10	Discharging 1m above eaves at 10-15 m/s	Discharging 1m above eaves at 10-15 m/s
	Good	5	Discharging 1m above ridge at 15 m/s	Discharging 1m above ridge at 15 m/s
Proximity of receptors	Close	10	Closest sensitive receptor less than 20m from kitchen discharge	Closest sensitive receptor less than 20m from kitchen discharge
	Medium	5	Closest sensitive receptor between 20 and 100m from kitchen discharge	Closest sensitive receptor between 20 and 100m from kitchen discharge
	Far	1	Closest sensitive receptor more than 100m from kitchen discharge	Closest sensitive receptor more than 100m from kitchen discharge
Size of Kitchen	Large	5	More than 100 covers or large takeaway	More than 100 covers or large takeaway
	Medium	3	Between 30-100 covers or medium takeaway	Between 30-100 covers or medium takeaway
	Small	1	Less than 30 covers or small takeaway	Less than 30 covers or small takeaway
Cooking type (odour and grease loading)	Very high	10	Pub (high level of fried food), fried chicken, burgers or fish and chips	Pub (high level of fried food), fried chicken, burgers or fish and chips, Turkish, Middle Eastern or any premises cooking with solid fuel
	High	7	Kebab, Vietnamese, Thai or Indian	Vietnamese, Thai, Chinese, Steakhouse, Indian, Japanese
	Medium	4	Cantonese, Japanese or Chinese	Cantonese, Italian, French, Pizza (gas fired)
	Low	1	Most pubs, Italian, French, Pizza or Steakhouse	Most pubs (no fried food, mainly reheating and sandwiches etc), Tea rooms

Table 1 Defra/EMAQ+ Guidance Risk Assessment Framework Scoring

Each of the four factors is scored according to the criteria above and a total “significance score” is obtained. This score is used to assess the level of odour control required for the particular situation as shown in Table 2.

Impact Risk	Odour Control Requirement	Significance Score
Low to Medium	Low Level Odour Control	Less than 20
High	High Level Odour Control	20-35
Very High	Very High-Level Odour Control	More than 35

Table 2 Risk Assessment Framework Significance.

Where odour control is required, up to three stages of treatment can be used:

- Initial grease removal – usually by baffle filters or equivalent above the cooking area;
- Particulate removal – usually by filtration or electrostatic precipitator (ESP);
- Removal of gaseous odours – usually by carbon filtration or UV/Ozone treatment.

The guidance provides examples of equipment combinations that meet each level of odour control shown in Table 3.

Level of odour control	Equipment combination
Low to medium	1. Fine filtration or electrostatic precipitator (ESP) followed by carbon filtration (carbon filters rated with 0.1 second residence time)
	Fine filtration followed by counteractant/neutralising system to achieve the same level of control as 1
High	2. Fine filtration or ESP followed by carbon filtration (carbon filters rated with 0.2-0.4 second residence time)
	Fine filtration or ESP followed by UV ozone system to achieve the same level of control as 2
Very High	3. Fine filtration or ESP followed by carbon filtration (carbon filters rated with 0.4-0.8 second residence time)
	Fine filtration or ESP followed by UV ozone system to achieve the same level of control as 3
	Fine filtration or ESP followed by carbon filtration and by counteractant/neutralising system to achieve the same level of control as 3

Table 3 Examples of Odour Control Equipment and Level of Control

2.1.2 IAQM Guidance

The Institute of Air Quality Management (IAQM) produced guidance in 2014 and was updated in 2018⁵ with the specific intention to provide advice for “assessing odour impacts for planning purposes”. It provides details of various assessment techniques noting that each has its own strengths and weaknesses. Because of this, the guidance recommends using a multitool approach (i.e., a combination of at least two techniques).

The Defra/EMAQ+ Odour Risk Assessment method is one suitable tool and a second is the use of a Source, Pathway, Receptor (SPR) model. The SPR approach assesses the risk of an adverse odour impact by examining the source characteristics, how effectively the odours can travel from the source to a receptor (i.e., the Pathway) and examining the sensitivity of the receptor. For each of these factors, the guidance provides example risk factors to provide a consistent approach for the assessment. These risk factors are shown in Table 4.

⁵ Bull M, IAQM, Guidance on the assessment of odour for planning, 2018 update

Source Odour Potential	Pathway Effectiveness	Receptor
<p>Source odour potential is allocated to one of three levels: small, medium or large.</p> <p>Factors affecting the source odour potential are:</p> <ul style="list-style-type: none"> • The magnitude of the odour release • How inherently odorous the compounds are • The unpleasantness of the odour 	<p>Pathway effectiveness is allocated to one of three levels: highly effective, moderately effective and ineffective,</p> <p>Factors affecting the odour flux to the receptor are:</p> <ul style="list-style-type: none"> • Distance from source to receptor • The frequency of winds from source to receptor • The effectiveness of any mitigation in reducing flux to the receptor • The effectiveness of dispersion/dilution in reducing the odour flux to the receptor • Topography and terrain 	<p>Use professional judgement based on the expectation of the users at the receptor location.</p> <p>However, the assessment usually considered residential receptors that are considered to be highly sensitive.</p>

Table 4 IAQM Source Pathway Receptor Approach

An example matrix for assessing the outcome is also provided in the guidance and shown in Table 5 below.

		Source Odour Potential		
		Small	Medium	Large
Pathway effectiveness	Highly effective	Low risk	Medium risk	High risk
	Moderately effective	Negligible risk	Low risk	Medium risk
	Ineffective	Negligible risk	Negligible risk	Low risk

Table 5 Risk assessment framework at a specific receptor

When odour control equipment is required and installed, this would reduce the source odour potential to small and therefore the outcome of the assessment would always be a negligible to low risk.

2.2 Regulation

Generally, kitchen vents are not regulated under environmental legislation. At the planning stage, the arrangements for ventilation will be examined to ensure compliance with building regulations. In addition, at planning, it is likely that the local Environmental Health Officer (EHO) would wish to be satisfied that a new vent would not give rise to a statutory nuisance under the Environmental Protection Act.

Kitchen ventilation systems are regulated under Health and Safety and Food Hygiene legislation and generally require that kitchens are provided with sufficient air to maintain a safe working environment, particularly where gas cooking (or other burning fuel) is used. As a result, many kitchens have automatic systems that shut down the cooking appliances if the ventilation system fails.

3 Appraisal

3.1 Site location and surroundings

The site is at 4 Eskdale Road, Uxbridge, UB8 2RT, the site location is shown in Figure 1. The site is in West London Industrial Park and has commercial or light industrial use on three sides, on the western side is open space and the M25 motorway over 500m away. The nearest residential properties are in Hilton Close over 250m north east of the proposed extract for the kitchen.

The building is proposed to be converted into twelve small kitchens for use by food delivery companies. There will be a variety of different food types, ranging from cold food/salads, pizzas, Indian and burgers. Each kitchen area can be let to a separate operator and therefore uses can change over time. From observations made at similar food delivery sites, many of the operators use preprepared sauce and ingredients which reduces the cooking activity and the potential for odorous emissions.

In terms of the Defra/EMAQ+ size categories, this proposal would fall into the “large” class of over 100 covers per day. The cooking fumes are extracted through canopies containing grease traps that have an efficiency of up to 65-80% and these will assist in reducing odour emissions.

The extracts to the atmosphere discharge horizontally through vents mounted on the roof at the rear of the building. The extract system is designed with grease traps over each cooking area and then extracted through the roof mounted vents.

The frequency of the wind direction is an important consideration in an odour appraisal. To impact on a location, the wind direction must be from the source to a receptor. The frequency of wind directions at a location can be visualised by analysing data and preparing a wind rose. Wind data has been collected⁶ from the Heathrow airport site for the years 2015-2020 and a wind rose prepared (shown in Figure 3). The most frequent winds are from the south west and west and housing downwind of this direction is more than 250m away from the site.

⁶ Data collected using the open source Openair and Worldmet software accessing the NOAA database.

3.2 Odour Risk Assessment

3.2.1 DEFRA Odour Risk Assessment

Table 6 provides the scoring following the DEFRA odour risk assessment framework.

Criteria	Score	Justification
Dispersion	15	Poor – Horizontal discharge just above roof height
Proximity of receptors	1	Far - Closest sensitive receptor more than 250m from kitchen discharge
Size of kitchen	5	Large – more than 100 Covers
Cooking type	1-10	Variable – mix of food types

Table 6 Defra/EMAQ+ Odour Risk Assessment Scores

The total score is therefore 21-31 which would be rated as a High risk. However the Defra/EMAQ+ method cannot take into account the reduced risk given that the closest sensitive receptors are much further away than the maximum distance of 100m considered in the guidance. As noted in the Westminster guidance, the risk from odour is considered to be low more than 50m from the vent for a high level discharge. Although this system is not discharging vertically, the separation distance to the nearest sensitive receptors is more than five times greater than 50m suggesting that adequate dispersion of odours should have occurred. This can also be assessed using the IAQM SPR approach.

3.3 IAQM SPR Assessment

There is one odour source – the high-level kitchen exhausts, this has been included in an odour risk assessment following the SPR approach detailed in the IAQM Odour Guidance. The outcome of this assessment is shown in Table 8.

Table 7 Source Pathway Receptor Odour Assessment

Source	Source Odour Potential	Pathway Effectiveness	Receptor	Odour Risk and Justification
Vents above ridge height	<p>Mix of cooking types, some deep fat frying likely but would not form most of the cooking.</p> <p>Some spicy food preparation but often prepared sauces are used.</p> <p>Vent mounted just above roof level and horizontally directed.</p> <p>Large Odour Source potential</p>	<p>Sensitive receptors are located more than 250m from the source.</p> <p>Discharge is above roof height.</p> <p>Properties in the direction of the prevailing winds are more than 250m away.</p> <p>Ineffective pathway effectiveness given distance to sensitive receptors.</p>	<p>Sensitive residential properties are more 250m from the source.</p>	<p>The odour risk is considered to be Low.</p> <p>Receptors are more than 250m from the source resulting in ineffective pathway.</p>

As can be seen, the outcome of the odour risk assessment is that there is a low risk of adverse odour impacts from the current arrangements at the.

3.4 Discussion

The separation between the kitchen extracts and the nearest sensitive receptors is more than 250m. The conclusion is supported by the results of the SPR assessment method detailed in the IAQM guidance. The outcome of this assessment considers that the risk from odours is a Low level risk.

4 Conclusions

An odour assessment has been carried out in accordance with the risk assessment methodology detailed in the Defra/EMAQ+ Kitchen Ventilation Guidance and using the SPR methodology suggested by the IAQM. This considers the location of the extract vent, the distance to the nearest sensitive receptor, the size of the restaurant and the type of food being prepared.

The vents provided are mounted at roof level and are over 250m from the nearest sensitive receptors. This separation distance is considered to provide adequate dispersion to result in a Low risk of odours at the residential properties.

This conclusion is supported by the IAQM SPR approach that concludes that the potential odour risk for this proposed development would be Low

It is therefore concluded that the odour impacts from the operation are not significant.

Figures

Odour Appraisal



Figure 1 Site Location

Figure 2 Schematic of Vent Location and Height (not to scale)

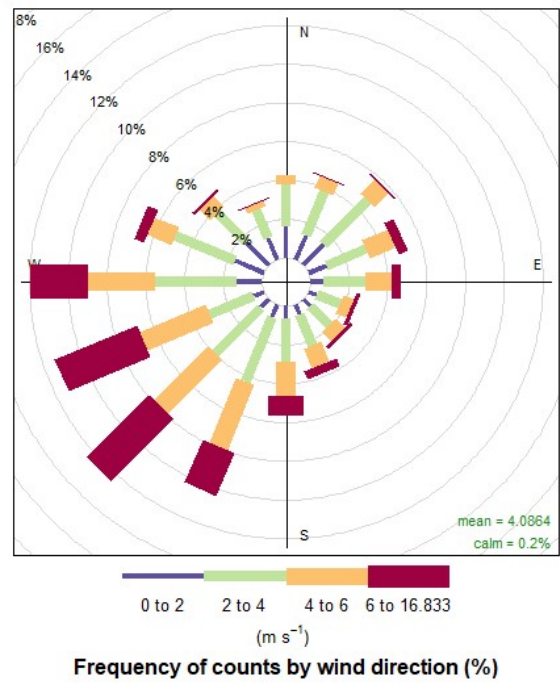


Figure 3 Windrose for Heathrow 2015-2020