SYNTEGRA CONSULTING

Kitchen Odour Assessment

The Blue Lion,
133 Grays Inn Rd,
London,
WC1X 8TU

April 2022

Ref: 21-8664

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Revision	-	*1*
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1. Introduction

Background

This report has been prepared to support the planning application at The Blue Lion, 133 Grays Inn Road, Holborn, London, WC1X 8TU.

This report will investigate the odour impacts from the proposed development. The main purpose of this report is to conduct an assessment to determine if the odour impact from the proposed development is likely to have a detrimental impact on the nearby receptors.

The principal function of a kitchen canopy is to protect the working environment around the cooking process from soiled matter and flame, and to ensure that the working environment is tolerable and safe for people to work in. An air flow should be created across the cooking process(es) to capture the effluent created (heat, steam, fat, smoke, and odour). Any vapours produced should be collected and contained by filters within the canopy and duct work, thus allowing clean air to be discharged.

The assessment was conducted per the Institute of Air Quality Management's (IAQM) "Guidance on the Assessment of Odour for Planning" (2018) and the Updated Guidance of Control of Odour and Noise from Commercial Kitchen Exhaust Systems (2018). This guidance is an update of the DEFRA Guidance on the Control of Odour and Noise from Commercial Kitchen Exhaust Systems (2004).

Site Location and Context

The site is located on land at 133 Grays Inn Road, London, WC1X 8TU, at approximate National Grid Reference (NGR): 530811, 182255. Reference should be made to Figure 1 for a map of the site and surrounding area.

The proposals comprise the partial retention/ reconfiguration of the existing public house, together with the redevelopment of the site to provide 7no. residential units.

2. Legislation and Policy

There is no legislation directly governing the design and performance of commercial kitchen ventilation systems. However, other regulations protecting the health and safety of employees, food safety and local amenity do exist. Other general requirements for ensuring building integrity indirectly effect upon the design and performance of extraction systems and must be complied with. As a result, there are numerous forms of guidance available relating to the design and performance of ventilation systems including industry guidelines such as DW172 – whilst this is not a legal requirement, it is referenced b IGEM, Gas Safe and the Health and Safety Executive (HSE) as being the specification for designing a commercial kitchen ventilation system. This Section aims to summarise the relevant legislation as well as guidance available.

The Building Regulations 2000 (in response to the Building Act 1984)

The main purpose of the Building Regulations is to protect the Health and Safety of people in and around buildings. It is necessary to gain approval under the Building Regulations for any new building, or any change to an existing building that involves changes to the building structure. The regulations are split into 14 parts, of which the following are particularly applicable to commercial kitchens:

[…]

Part F: Ventilation of buildings

In terms of commercial kitchens Part F refers to the CIBSE (Chartered Institution of Building Services) Guide B. Guide B2, Section 3.6 sets out the requirements for ventilation systems in commercial kitchens. Complimentary to this, is Guide B3, which specifically deals with ductwork connected to ventilation systems.

The Environmental Protection Act 1990

This Act gives powers to the local authority to implement measures to prevent occurrence of statutory nuisance and where it does occur, to enforce implementation of measures to rectify them. Statutory nuisance is defined under the EPA 1990 for England and Scotland and includes, in relation to odour:

a) Any fumes or gases emitted from premises to be prejudicial to health or cause a nuisance.
b) Any dust, steam, smell, or other effluvia arising on industrial, trade or business premises and being prejudicial to health or a nuisance.

The Town and Country Planning Act 1990

Town and Country Planning legislation required new build commercial (as well as most other new developments) to obtain planning permission. In addition, premises will require planning permission for a change in use as defined under the Town and Country Planning (Use Classes) Order and where significant structural changes are to take place.

In relation to odour, the local authority will consider whether sufficient measures for their control are included in the design, and later planning permission may be granted with conditions.

For commercial kitchens these are likely to include measures to ensure that odour is managed to avoid detriment to the amenity.

National Planning Policy Framework (NPPF) (England) 2021

Odour is not specifically mentioned in the guidance. A generic term "pollution" is used, but there is otherwise no specific guidance on odour, or kitchen extraction systems. A summary of the general comment's is provided below:

Paragraphs 8 references sustainable development overarching goals – should 'contribute to protecting and enhancing our natural, built and historic environment, including making effective use of land, …minimising waste and pollution.'

Paragraph 9 encourages implementation of these goals through the 'preparation and implementation of plans… Planning policies and decisions should play an active role in guiding development to sustainable solutions, but in doing so should take local circumstances into account, to reflect the character, needs and opportunities of each area.'

Paragraph 174 outlines general requirements for the control of pollution:

> *'174. Planning policies and decisions should contribute to and enhance the natural and local environment by:*
>
> *[…]*
>
> *e) 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 and water quality, taking into account relevant information such as river basin management plans…'*

Paragraph 185 supplies additional detail:

> *'185. Planning policies and decisions should also ensure that 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.'*

Paragraph 188 advises that 'the focus of planning policies should be on whether the proposed development is an acceptable land use, rather than control of processes or emissions (where these are subject to separate pollution control regimes).

Supplementary planning guidance play a key role in steering planning policy. Such guidance is provided by the devolved governments.

Health and Safety legislation/ guidance

In relation to general ventilation in the workplace, the Workplace (Health, Safety and Welfare) Regulations (1992) requires that 'an effective and suitable provision shall be made to ensure that every enclosed workplace is ventilated by a sufficient quantity of fresh or purified air.' Directly related to commercial kitchens, the HSE have produced a reference sheet with the title 'Ventilation in catering kitchens' (2017). This supplies guidance on how to assess the adequacy of any existing ventilation equipment, and the ventilation requirements for new build kitchens.

The HSE has also published guidance (Catering Information Sheet No 26) dealing with the likely exposure to carbon monoxide from use of solid fuel appliances in commercial kitchens.

Food Hygiene Legislation

The Food Safety and Hygiene (England) Regulations (2013) and EU Regulation 852/2004, require that:

- There is to be suitable and sufficient means of natural or mechanical ventilation.
- Mechanical airflow from a contaminated area to a clean area is to be avoided.
- Ventilation systems are to be so constructed as to enable filters and other parts requiring cleaning or replacement to be readily accessible.

Industry Guidance/ Standards

The Building Engineering Services Association (BESA), who aim to supply standards for the design of commercial kitchen ventilation systems, have produced relevant industry guidance. Their publications, along with other available relevant industry guidance, are listed below:

- BESA Standard for Kitchen Ventilation Systems, DW/171
- BESA Specification for Kitchen Ventilation Systems, DW/172
- BESA Guide to Good Practice – Cleanliness of Ventilation Systems, TR/19

EMAQ Control of Odour and Noise from Commercial Kitchen Exhaust Systems

The Control of Odour and Noise from Commercial Kitchen Exhaust Systems was updated in 2018. The report relates to ventilation/extraction systems in all types of premises where hot food is prepared for immediate consumption.

The report includes a Best Practice Guide which summarises the best practice for the design and operation of commercial kitchen ventilation systems and the control of grease odour and noise emissions. The guidance supplies a brief overview of odour, illustrating why these parameters can be annoying to members of the public living in the vicinity of commercial kitchens, and an indication of the composition of the emissions arising from commercial kitchens and types of cooking which can cause odour.

The guidance reviews the range of ventilation systems available, names the types of equipment available for the kitchen extraction system and includes a cost benefit appraisal of remediation measures.

IAQM Guidance on the Assessment of Odour for Planning

IAQM guidance on the Assessment of Odour for Planning is used for assessing odour impacts for planning permission. The guidance supplies advice on how to apply odour standards and to assess the significance on impacts.

IAQM guidance is limited to assessing the effect of odour on amenity and not on human health. For exposure, to odour to occur, there must be an emission source to the atmosphere, a pathway for the odour to travel and a receptor that could experience adverse effects. Therefore, the IAQM guidance is based upon DEFRA's Green Leaves guidance which presents the Source-Pathway-Receptor (S-P-R) concept. The S-P-R concept presents the hypothetical relationship between the source (S) of the odour, the pathway (P) by which exposure might occur, and the receptor (R) which could be adversely affected.

3. Minimum Standards

Odour

IAQM guidance defines odour as a mixture of many chemicals which interact to produce a 'smell'. Whilst odour-free air refers to air having no odorous chemicals, fresh air is usually perceived as air containing no chemicals or contaminants that could be 'unpleasant'.

Whilst odour is not strictly speaking an air pollutant, certain combinations of chemicals can affect the human olfactory response (perception followed by psychological appraisal) and cause a loss of amenity. Perception of an odour can be subjective to the individual whether it is found as acceptable, objectionable, or offensive.

Odour can be produced from a number of industries including food outlets, production, recycling, waste handling, vehicle respraying, power plants, traffic emissions, agriculture etc.

Factors that influence odour from commercial kitchens include:

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

Minimum Requirements for Odour Control

Objectives

- For new premises or premises covered by planning conditions restricting the impact of odour the system shall be designed to prevent harm to the amenity.
- For existing premises not covered by planning conditions restricting the impact of odour, the system shall be designed to avoid statutory nuisance and shall follow the principles of Best Practical Means.
- The design of a control system should recognise that there are 2 phases of contamination in a kitchen exhaust: particulate (grease, smoke, hydrocarbons, VOC) and gaseous (odour). The particulate phase needs to be removed prior to dealing with the gaseous phase.

To achieve these objectives the odour control system shall include an adequate level of:

1) Particulate and odour control; and
2) Stack dispersion.

The overall performance of the odour abatement system will be a balance of 1 and 2.

Discharge Stack

The discharge stack shall:

1) Discharge the extracted air not less than 1m above the roof ridge of any building within 15m of the vent serving the commercial kitchen. Added odour control measures may still be required depending on the cooking type and frequency.
2) If 1 cannot be followed for planning reasons, then the extracted air shall be discharged not less than 1m above the roof eaves or dormer window of the building housing the commercial kitchen. A higher level of odour control measures than those needed in Part 1 may be needed.
3) If 1 and 2 cannot be followed for planning reasons, then higher level of odour control measures than those needed in Part 1 and 2 may be needed.

Odour Arrestment Plant Performance

Low to medium level control may include:

1) Fine filtration or electrostatic precipitator (ESP) followed by carbon filtration (carbon filters rated with a 0.1 second residence time).
2) Fine filtration followed by counteractant/neutralising system to achieve the same level of control as 1.

High level odour control may include:

1) Fine filtration or ESP followed by carbon filtration (carbon filters rated with a 0.2-0.4 second residence time).
2) Fine filtration or ESP followed by Ultraviolet (UV) ozone system to achieve the same level of control as 1.

Extremely high level of odour control may include:

1) Fine filtration or ESP followed by carbon filtration (carbon filters rated with a 0.4 – 0.8 second residence time).
2) Fine filtration or ESP followed by carbon filtration and by counteractant/neutralising system to achieve the same level of control as 1.
3) Fine filtration or ESP followed by UV ozone system to achieve the same level of control as 1.

In some instances where extremely high levels of control are required, combinations or sacrificial levels of filtration may be employed. Maintenance must be conducted to ensure these performance levels are always achieved.

4. Approach

Introduction

An odour assessment has been conducted using the latest guidance produced by the IAQM and the EMAQ+.

IAQM Kitchen Odour Control

It is recognised that to assess the magnitude of odour from a site, it is necessary to estimate the odour generating potential of the site activity. The source odour potential considers the scale of the odour release (magnitude), how inherently odorous the emission is and the relative pleasantness/ unpleasantness of the odour (its hedonic tone). Using Table 6(Appendix A), the source odour potential can be categorised as small, medium, or large.

From this, IAQM guidance suggests that the risk of odour exposure (impact) for each receptor may be evaluated by combining the source odour potential and the pathway effectiveness using Table 7 (Appendix A).

IAQM guidance recommend classifying each receptor in terms of its sensitivity. Indicative examples of low, medium, and high sensitivity receptors are given in Table 6 and should be used in combination with professional judgement to assess the sensitivity of receptors to odour. Justification needs to be given for the selected categorisation of the source odour potential, pathway effectiveness and receptor sensitivity. This typically involves some degree of quantitative assessment supplemented by the professional judgement of the air quality practitioner.

The likely magnitude of odour effect as specific receptor locations may be determined by combining the risk of odour exposure with the specific receptor sensitivity, as shown in Table 8 (Appendix A).

The overall odour effect on the surrounding area as a result of the site, development of process is determined. This assessment must consider the different magnitude of effects at different receptors and the total number of receptors that experience these different effects. IAQM guidance recommends the suggested descriptors for the total magnitude of odour effects, as in Table 8. IAQM guidance suggests that 'where the overall effect is greater than 'slight adverse', the effect is likely to be considered significant.'

EMAQ+ Risk Assessment for Determining Odour Control Requirement

Odour control must be designed to prevent odour nuisance in a given situation. The following score methodology is suggested as a means of determining odour control requirements using a simple risk assessment approach. The odour control requirements considered here are consistent with the performance requirements listed in this report. The level of odour control required is proposed based on the scores shown in Table 9 and Table 10 (Appendix A).

5. Assessment

Overview

The odour impact assessment has been carried out following the IAQM guidance. The assessment has been divided into sub-sections to explain the outcome of each part of the assessment and how it was determined.

Receptor Sensitivity

The site is located on the border between Clerkenwell and Holborn. The site does not experience a lot of pedestrian traffic and is largely surrounded by office and education buildings. There are 42 properties on Brownlow Mews which are used for residential and commercial purposes. Based on the criteria presented in Table 6, these receptors are considered to have **high** sensitivity.

Source Odour Potential

Based on Table 6, it is assumed that the processes of the restaurant are likely to have a **medium** source odour potential. There are some mitigation measures in place.

Pathway Effectiveness

Receptors are local to the source and current mitigation relies on dispersion. Releases are elevated but may be compromised by building effects. The odour pathway effectiveness towards the identified receptors is considered to be **'moderately effective'** pathway based on Table 6.

Odour Exposure

The risk of odour exposure is calculated using the IAQM criteria summarised in Table 7. The source odour potential was considered to be **'medium'**, and the pathway effectiveness was considered to be **'moderately effective'**. Based on the IAQM guidance, the risk of odour exposure for the concerned receptors is considered to be **'low'**.

Likely Magnitude Odour Effect

Table 1 shows the summary of odour effects at existing sensitive receptors.

Table 1: Summary of Likely Odour Effects at Existing Sensitive Receptors

Receptor	Source Odour Potential	Pathway Effectiveness	Odour Exposure	Receptor Sensitivity	Likely Odour Effect
Brownlow Mews	Medium	Moderately Effective	Low	High	Slight Adverse Effect

The residents located on Brownlow Mews are sensitive receptors. Table 1 shows the source odour potential is '**medium'** and the pathway effective was considered to be '**moderately effective'**. Therefore, the risk of odour exposure for the sensitive receptor is '**low'**. The receptor sensitivity is **high** as it includes residential dwellings and people would reasonably be expected to be present her for extended periods. Therefore, based on the IAQM guidance, the overall impact is considered to be '**slight adverse'**, and provided all the criteria in Section 3 of this report are met for the kitchen equipment etc., no further mitigation is required.

Risk Assessment to determine Odour Control Measures

Based on the criteria in Section 4 of this report, a risk assessment has been conducted to decide the level of odour control measures needed and has been tabulated below.

Table 2: Risk Assessment for Odour Control System Requirement

Source	Dispersion	Proximity of Receptors	Size of Kitchen	Cooking Type	Total Score
The Blue Lion	**15**	**10**	**1**	**1**	**27**

This risk assessment was conducted using the criteria shown in Table 6. Dispersion classes as **poor** are dispersion is not currently known but is expected to be below eaves and discharges below 10m/s. Proximity of receptors has a score of 10 (**close**) as the closest sensitive receptor is less than 20m from kitchen discharge. The size of the kitchen is proposed to be **small** as it is assumed there will be less than 30 covers a day. The cooking type is currently expected to be **low** as it is a pub.

The resulting score from Table 2 is classified as requiring a **high level** of odour control, as per the criteria shown in Table 10. This is based on the sum of contributions from dispersion, proximity of receptors, size of kitchen and cooking type.

6. Proposed Mitigation Measures

In regard to the previous sections of this report, it has been determined that the risk of odour exposure is **low**. The likely magnitude of odour effect is **slight adverse** but requires **high** odour control measures.

The emissions from kitchens arise from odorous chemicals that are either too small to be trapped by course filtration or are present in the gas phase. The degree and type of odour control required is dictated by the size of the cooking facility, type of food prepared and location of the premises. The greater the potential risk of causing harm to the amenity or causing a nuisance, the more effective the odour abatement must be. In certain circumstances where local planning requirements restrict the use of tall stacks, more emphasis must be placed on odour abatement.

The minimum requirements for odour control (Section 3) have to be met in order to reduce the likely odour effects at existing sensitive receptors.

Improving dispersion will reduce the risk ranking shown in Table 10. The discharge point must be above the height of any building within 15m of the discharge point. This suggests the restaurants stack has to be at least the height of the proposed development. The design of the final discharge point must be vertically upwards and unhindered. Based on this assessment approach the emissions from this restaurant will need a high level of odour control to prevent nuisances. The level of odour control requirement can be reduced with improvements in stack dispersion.

Extremely high level of odour control may include fine filtration or ESP followed by carbon filtration with (carbon filters rated with a 0.2-0.4 second residence time). Another odour arrestment plant performance mitigation measure include fine filtration or ESP followed by Ultraviolet (UV) ozone system to achieve the same level as control as the carbon filtration.

In addition, it is proposed that the kitchen will have a specific kitchen extract canopy found above and installed to serve the cooking appliances. This system shall be designed to ensure a minimum face capture velocity of 3.0m/s and provide in the region of 25 to 30 air changes to the cooking space. The canopy shall incorporate removable grease filters to protect downstream ductwork and fan equipment and be manufactured from catering grade stainless steel.

In some instances where extremely high levels of control are required, combinations or sacrificial levels of filtration may be employed. Maintenance must be conducted to ensure these performance levels are always achieved. The financial cost of these mitigation measures is shown in Table 14 (Appendix C)

Maintenance

Proprietors of commercial kitchens have a duty to ensure that the ventilation system serving their kitchens are maintained and operated effectively. Good maintenance is a prerequisite for ensuring that a system complies with Best Practicable Means under statutory nuisance provision and will form a key element of any scheme designed to minimise harm to the amenity under planning regulations. The recommended cleaning period for grease extract systems ductwork is shown in Table 3. These time frames may increase or reduce for extreme or very light application.

Table 3: Recommended Cleaning Period for Grease Extract Systems

Grease Loading		Daily Usages (Hours)	Cleaning Intervals (Months)
Heavy Use	Heavy/continuous grease production	6-12	3-6
		12-16	2-3
Moderate Use	Moderate grease production	6-12	6-12
		12-16	3-4
Light Use	No significant grease production	6-12	12
		12-16	6

The kitchen extract ducting should comply with BESA document TR19, to enable adequate cleaning and maintenance. The fine filters will be changed every 2 weeks and the carbon filters will be changed every 4 to 6 months.

Once these have been done it is expected the total score for the risk assessment to determine odour control measures will decrease to 17, as shown in Table 4. The dispersion score would reduce from 15 to 5 as discharging would be 1m above ridge at 15m/s. This would reduce the impact risk to **low to medium** and require **low** level odour control.

Table 4: Future Risk Assessment for Odour Control System Requirement

Source	Dispersion	Proximity of Receptors	Size of Kitchen	Cooking Type	Total Score
The Blue Lion	5	10	1	1	**17**

7. Residual Effects

Having identified appropriate mitigation measures, the likely odour effects at existing sensitive receptors will reduce once these measures have been implemented.

Table 5: Summary of Likely Odour Effects at Existing Sensitive Receptors After Implementation of Mitigation Measures

Receptor	Source Odour Potential	Pathway Effectiveness	Odour Exposure	Receptor Sensitivity	Likely Odour Effect
Proposed Development Site	Small	Ineffective	Negligible	High	Negligible

Table 5 shows that once the appropriate mitigation measures have been implemented, there will be a **small** source odour potential as mitigation and control measures will be effective leading to little or no residual odour. The pathway effectiveness will be **ineffective** as releases will be from a high level and will not be compromised by surrounding buildings. Due to this, the risk of odour exposure (impact) at the specific receptor locations (Brownlow Mews) will be **negligible**. As there will still be residential dwellings, the receptor sensitivity remains **high** but the likely magnitude of odour effect at the specific receptor locations will be **negligible**.

8. Conclusion

This report has been prepared to support the planning application at The Blue Lion, 133 Grays Inn Road, Holborn, London, WC1X 8TU.

A qualitative assessment of the odour effects has been undertaken for the proposed scheme. Based on the results presented in Section 7, the residual odour impact is considered to have a negligible risk and a risk assessment determined that low odour control measures are required.

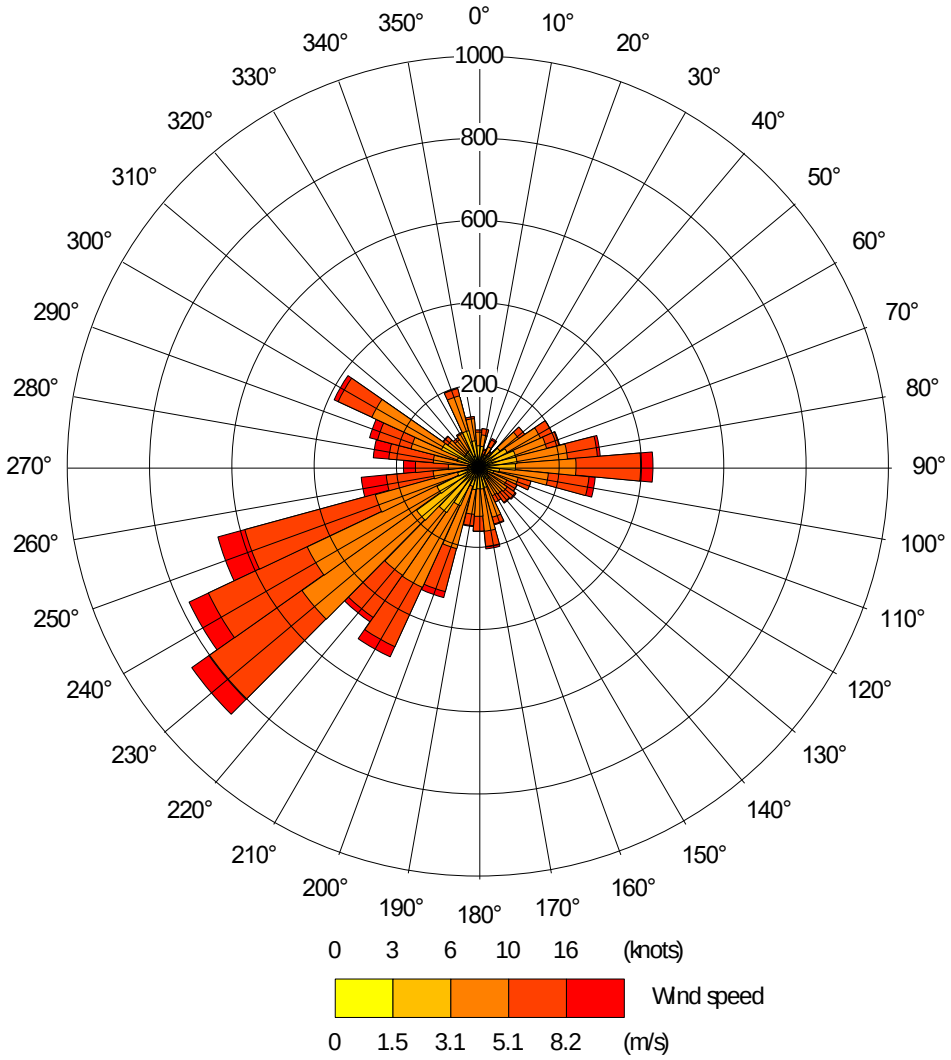
The proposed development is seen to abide by all the minimum requirements of a commercial kitchen as laid out by the Updated Guidance of Control of Odour and Noise from Commercial Kitchen Exhaust Systems (2018) following which no further mitigation has been deemed necessary.

Therefore, it can be concluded that the proposed development is not considered to conflict with any national, regional, or local planning policy in relation to operational phase odour impact on existing receptors.

9. Figures

Figure 1: Site Location

Figure 2: Meteorological Wind Rose



10. Appendix

Appendix A: IAQM Guidance on Odour for Planning

Table 6: Risk Factors for Odour Source, Pathway and Receptor Sensitivity

Source Odour Potential	Pathway Effectiveness	Receptor
Large Source Odour Potential Magnitude – Larger permitted processes of odorous nature or large STWs; materials usage hundreds of thousands of tonnes/m^3 per year; area sources of thousands of m^2. The compounds involved are very odorous, having very low Odour Detection Thresholds (ODTs). Unpleasantness – processes classed as 'Most Offensive'. Mitigation/Control – open air operation with no containment, reliance solely on good management techniques and best practice.	Highly Effective Pathway for Odour Flux to Receptor Distance – receptor is adjacent to the source/site; distance well below any official set-back distances. Direction – high frequency (%) of winds from source to receptor (or, qualitatively, receptors downwind of source with respect to prevailing wind). Effectiveness of dispersion/ dilution – open processes with low level releases.	High Sensitivity Receptor – Surrounding land where: Users can reasonably expect enjoyment of a high level of amenity; and The people would reasonably be expected to be present here continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land.
Medium Source Odour Potential Magnitude – smaller permitted processes or small Sewage Treatment Works (STWs); materials usage thousands of tonnes/m^3 per year; area sources of hundreds of m^2. The compounds involved are moderately odorous. Unpleasantness – processes classed as 'Moderately Offensive'. Mitigation/Control – some mitigation measures in place, but significant residual odour remains.	Moderately Effective Pathway for Odour Flux to Receptor Distance – receptor is local to the source. Where mitigation relies on dispersion/ dilution – releases are elevated but compromised by building effects.	Medium Sensitivity Receptor – Surrounding land where: Users would expect to enjoy a reasonable level of amenity, but wouldn't reasonably expect to enjoy the same level of amenity as in their home; or People wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land.
Small Source Odour Potential Magnitude – falls below Part B threshold; materials usage hundreds of tonnes/m^3 per year; area sources of tens m^2. The compounds involved are only mildly odorous, having relatively high ODTs where known. Unpleasantness – processes classed as 'Less Offensive'. Mitigation/Control – effective, tangible, mitigation measures in place leading to little or no residual odour.	Ineffective Pathway for Odour Flux to Receptor Distance- receptor is remote from the source; distance exceeds any official set-back distances. Direction – low frequency (%) of winds from source to receptor. Where mitigation relies on dispersion. Dilution – releases are from high level and are not compromised by surrounding buildings.	Low Sensitivity Receptors – surrounding land where: The enjoyment of amenity would not reasonably be expected; or There is transient exposure, where the people would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land.

Table 7: Risk of Odour Exposure (Impact) at the Specific Receptor Location

Pathway Effectivenes		Source Odour Potential		
		Small	Medium	Large
	Highly Effective Pathway	Low Risk	Medium Risk	High Risk
	Moderately Effective Pathway	Negligible Risk	Low Risk	Medium Risk
	Ineffective Pathway	Negligible Risk	Negligible Risk	Low Risk

Table 8: Likely Magnitude of Odour Effect at the Specific Receptor Location

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

Table 9: Risk Score for Level of Odour Control Required

Impact Risk	Odour Control Requirement	Significance Score [(a)]
Low to Medium	Low level Odour Control	Less than 20
High	High level Odour Control	20 to 35
Very High	Very high level Odour Control	More than 35
Based on the sum of contributions from dispersion, proximity of receptors, size of kitchen and cooking type		

Table 10: Score for Criteria

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

Appendix B: Commercial Kitchen Ventilation Systems Design and Operation Requirements

Based on the Updated Guidance of Control of Odour and Noise from Commercial Kitchen Exhaust Systems (2018) the minimum standards for commercial kitchen ventilation systems performance are as followed.

Minimum Ventilation Rates

- An internal ambient air temperature of 28°C maximum.
- Maximum humidity levels of 70%.
- Internal noise level should be between NR40-NR50; and
- Dedicated makeup air systems to be approximately 85% of the extract flow rate.

Extract flow rates for a commercial kitchen should be calculated using the thermal convection method only, as this overcomes heat and odour variation between different types of cooking appliances. Other less reliable methods are still available.

Minimum Requirements for Canopy

Velocity requirements

- Light loading – 0.25m/s (applies to steaming ovens boiling pans, bain maries and stock pot stoves).
- Medium loading – 0.35m/s (applies to deep fat fryers, Bratt pans solid and open-top ranges and griddles); and
- Heavy loading – 0.5m/s (applies to chargrills, mesquite and specialist broiler units).

Sizing

- Ideally, the plan dimensions of the canopy shall always exceed the plan dimensions of the catering equipment by a minimum of 250mm on each free side.
- This should be increased to 600mm in front of combination steaming ovens to cope with the steam or fumes released when the doors of the appliances are opened. Solid fuel appliances must have an overhang of 300mm from the door open position.

Materials

- A material that would follow the food hygiene requirement is stainless steel.
- Grease separation.
- The grease extracted by the separators shall be collected and removed so that it will not accumulate in either the canopy plenum or the ductwork system or fall back onto the cooking surface.
- The separator shall be constructed so that there are no sharp edges or projections and shall be easily removable for regular cleaning; and
- Primary filters that keep grease within the filtration matrix until cleaned shall not be used (not to be confused with those designed with purpose-made integral collection reservoirs).

Minimum Requirements for Duct Work

All ductworks should be low-pressure class 'A' and constructed following BESA Specification DW/144 with a minimum thickness of 0.8mm. Duct velocities are shown in Table 11.

Table 11: Duct Velocity

	Supply (m/s)	Extract (m/s)
Main runs	6-8	6-9
Branch runs	4-6	5-7
Spigots	3-5	5-7

All internal surfaces of the ductwork should be accessible for cleaning and inspection. Access panels should be installed at 2.0m centres and should be grease tight using a heatproof gasket or sealant. Ductwork should not pass-through fire barriers and where it is not possible to immediately discharge the captured air, fire-rated ductwork may be required.

Minimum Requirements for Fans

Fans should be selected to manage the design resistance with an additional 10% airflow and 20% pressure margin allowed to suit possible extensions to the original kitchen plan.

Backward curved centrifugal, mixed flow or axial flow impellers are preferred as they are less prone to unbalance and are more easily kept and cleaned due to their open construction. Fixed or adjustable metal impellers with a robust and open construction shall be used.

Care shall always be taken with the location of the supply and extract fans to ensure that there is enough space for regular cleaning and maintenance. Limited space shall not restrict the choice of the correct fan.

For fans serving canopies above solid fuel-burning appliances, the motor must be out of the airstream and impellers must have metal blades.

Appendix C: Financial Consideration

Cost of Odour Abatement Equipment

The cost of odour abatement equipment is of paramount importance when a kitchen ventilation system is designed for new premises (to protect the amenity) or upgraded to minimise the impact of an existing premises (to prevent statutory nuisance). The factors that dictate the level of expenditure than an operator can be expected to pay will depend on several factors:

- Size of the cooking facility;
- Type of food prepared;
- Type of cooking appliances used; and
- Compliance with the requirements of Best Practicable Means.

Table 12 shows the typical cost of up to 3 ventilation systems based on a general kitchen operation situation. Table 13 shows a high grease/ smoke situation. Table 14 shows a very high grease/smoke situation. The costing provides an indication of capital cost, monthly maintenance and running costs, and annual maintenance and running costs.

Table 12: Anticipated cost of abatement treating odour emissions from a general kitchen operation situation including maintenance and running (M&R) costs.

Design Flow Rate (m/s^3)	Abatement System	Capital Cost	Monthly M&R Cost	Annual M&R Cost	Total Yearly Cost
Up to1.5	Panel and Bag	£750	£160	£1,100	£3,020
	Panel, Bag and HEPA	£1,800	£160	£1,800	£3,720
	Pre, Fine and CF	£1,300	£160	£1,700	£3,620
	Panel, Bag, HEPA and CF	£4,000	£160	£3,400	£5,320
	ESP and CF	£5,500	£175	£800	£2,900
	ESP and counteractant	£6,140	£175	£0	£2,100
	ESP and UV/ozone	£7,000	£175	£500	£2,600
Up to 2	Panel and Bag	£1,000	£180	£1,300	£3,460
	Panel, Bag and HEPA	£2,500	£180	£2,300	£4,460
	Pre, Fine and CF	£2,500	£180	£3,400	£5,560
	Panel, Bag, HEPA and CF	£6,000	£180	£3,900	£6,060
	ESP and CF	£6,500	£250	£1,000	£4,000
	ESP and counteractant	£7,000	£200	£0	£2,400
	ESP and UV/ozone	£10,000	£160	£900	£2,820
2.5	Panel and Bag	£1,250	£200	£1,500	£3,900
	Panel, Bag and HEPA	£3,000	£200	£2,500	£4,900

Table 13: Anticipated cost of abatement treating odour emissions from high grease/smoke situation

Design Flow Rate (m/s^3)	Abatement System	Capital Cost	Monthly M&R Cost	Annual M&R Cost	Total Yearly Cost
Up to 1.5	ESP and CF	£6,000	£155	£1,125	£2,985
	ESP and counteractant	£6,150	£175	£0	£2,100
	ESP and UV/ozone	7000	£175	£500	£2,600
Up to 2	ESP and CF	£8,000	£250	£1,500	£4,500
	ESP and counteractant	£7,000	£200	£0	£2,400
	ESP and UV/ozone	£10,000	£160	£900	£2,820
2.5	ESP and CF	£8,500	£250	£1,875	£4,875
	ESP and counteractant	£8,000	£250	£0	£3,000
	ESP and UV/ozone	£11,000	£250	£1,000	£4,000
3.5	ESP and CF	£12,000	£300	£6,000	£9,600
	ESP and counteractant	£10,500	£300	£0	£3,600
	ESP and UV/ozone	£14,000	£300	£1,200	£4,800
4.5	ESP and CF	£17,000	£375	£6,750	£11,250
	ESP and counteractant	£14,000	£375	£0	£4,500
	ESP and UV/ozone	£20,000	£375	£1,500	£6,000

Table 14: Anticipated cost of abatement treating odour emissions from very high grease/smoke situation

Design Flow Rate (m/s^3)	Abatement System	Capital Cost	Monthly M&R Cost	Annual M&R Cost	Total Yearly Cost
Up to 1.5	ESP and CF	£6,500	£155	£2,250	£4,110
	ESP and counteractant	£6,150	£175	£0	£2,100
	ESP and UV/ozone	£7000	£175	£500	£2,600
Up to 2	ESP and CF	£10,000	£250	£3,000	£6,000
	ESP and counteractant	£7,000	£200	£0	£2,400
	ESP and UV/ozone	£10,000	£160	£900	£2,820
2.5	ESP and CF	£13,500	£250	£3,750	£6,750
	ESP and counteractant	£8,000	£250	£0	£3,000
	ESP and UV/ozone	£11,000	£250	£1,000	£4,000
3.5	ESP and CF	£15,500	£300	£7,500	£11,000
	ESP and counteractant	£10,500	£300	£0	£3,600

Design Flow Rate (m/s^3)	Abatement System	Capital Cost	Monthly M&R Cost	Annual M&R Cost	Total Yearly Cost
	ESP and UV/ozone	£14,000	£300	£1,200	£4,800
4.5	ESP and CF	£21,000	£375	£9,000	£13,500
	ESP and counteractant	£14,000	£375	£0	£4,500
	ESP and UV/ozone	£20,000	£375	£1,500	£6,000

Table 15 compares the expected level of odour control against the estimated cost for installing and operating a system. Of those systems that have odour control potential the abatement systems fall into 2 categories:

- Equipment offering good odour removal at a low capital cost at medium to high running costs; or
- Equipment offering good odour removal at a high capital cost with low running costs.

Table 15: Expected relative cost effectiveness based on a well-maintained system

Abatement Type	Level of Odour Abatement	Capital	Monthly M&R	Annual M&R
Panel and Bag	None	Low	Medium	Low
Panel, Bag and HEPA	None	Low to medium	Medium	High
Pre, Fine and CF	High	Low	Medium	High
Panel, Bag, HEPA and CF	High to very high	High	Medium	High
ESP and CF	High to very high	High	Low	Low
ESP and counteractant	Medium to high [(a)]	High	Medium	None
ESP and UV/ozone	High	Very high	Low	Low
(a) Level of abatement difficult to quantify using conventional odour measurement techniques				