Appendix 13

**Salisbury Poultry (Midlands) Ltd**

# Maelor Poultry Food Processing Facility

## Air Quality Assessment

Report No.: 444692-01 (01)

**SEPTEMBER 2022**

# RSK GENERAL NOTES

**Project No.:** 444692-01 (01)

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**Client:** Salisbury Poultry (Midlands) Ltd

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| Date: | 11th July 2022 | Date: | 11th July 2022 |

# Abbreviations

| | |
|---|---|
| APIS | Air Pollution Information System |
| AQAP | Air Quality Action Plan |
| AQMA | Air Quality Management Area |
| AQO | Air Quality Objective |
| AQS | Air Quality Standard |
| CO | Carbon Monoxide |
| Defra | Department for Environment, Food and Rural Affairs |
| EA | Environmental Agency |
| EC | European Commission |
| EPUK | Environmental Protection UK |
| EU | European Union |
| IAQM | Institute of Air Quality Management |
| LAQM | Local Air Quality Management |
| LAQM TG.16 | Local Air Quality Management Technical Guidance (2021) |
| NPPF | National Planning Policy Framework |
| $NO_2$ | Nitrogen dioxide |
| $NO_x$ | Oxides of nitrogen |
| NRW | Natural Resources Wales |
| PC | Process Contribution |
| PEC | Predicted Environmental Concentration |
| UK-AIR | UK Atmospheric Information Resource |

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# 1 INTRODUCTION

## 1.1 Background

RSK Environment Ltd (RSK) was commissioned to undertake an assessment of the potential air quality impacts associated with the proposed boilers for the extension of the exiting Maelor Poultry processing facility, Pickhill Lane, Wrexham, LL13 0UE. The application site lies within the administrative area of Wrexham County Borough Council (WCBC).

The site has been operating as a poultry processing facility since 2015. The Operators are now seeking to increase the processing capacity of the plant by installing a second processing line, as well as upgrading and improving the effluent treatment plant to cope with the increased arisings of effluent. Therefore, an additional boiler will be introduced to the site.

The following report presents the findings of an assessment of existing/baseline air quality conditions and potential air quality impacts during the operational phase of the site. Mitigation measures have been recommended where appropriate.

# 2 LEGISLATION & GUIDANCE

## 2.1 Key Legislation

### 2.1.1 Air Quality Strategy

UK air quality policy is published under the umbrella of the Environment Act 1995, Part IV and specifically Section 80, the National Air Quality Strategy. The latest *Air Quality Strategy for England, Scotland, Wales and Northern Ireland – Working Together for Clean Air*, published in July 2007 sets air quality standards and objectives for ten key air pollutants to be achieved between 2003 and 2020.

The EU Air Quality Framework Directive (1996) established a framework under which the EU could set limit or target values for specified pollutants. The directive identified several pollutants for which limit or target values have been, or will be set in subsequent 'daughter directives'. The framework and daughter directives were consolidated by Directive 2008/50/EC on Ambient Air Quality and Cleaner Air for Europe, which retains the existing air quality standards and introduces new objectives for fine particulates ($PM_{2.5}$).

The Clean Air Strategy 2019 supersedes the policies outlined in the 2007 strategy. This latest strategy aims to have a more joined-up approach, outlining actions the Government plans to take to reduce emissions from transport, homes, agriculture and industry. However, the air quality objectives remain as previously detailed within the 2007 strategy.

### 2.1.2 Air Quality Standards

The air quality standards (AQSs) and air quality objectives (AQOs) in the United Kingdom are derived from EC directives and are adopted into Welsh law. The European Union (Withdrawal) Act retains existing EU environmental provisions in the UK. Directive 2008/50/EC was translated into UK law in 2010 via the Air Quality Standards Regulations 2010.

The relevant[1] standards for England and Wales to protect human health are summarised in Table 2.1.

**Table 2.1: Air Quality Standards Relevant to the Proposed Development**

| Substance | Averaging period | Exceedances allowed per year | Ground level concentration limit (µg/m$^3$) |
|---|---|---|---|
| Nitrogen dioxide ($NO_2$) | 1 calendar year | - | 40 |
| | 1 hour | 18 | 200 |

[1] Relevance, in this case, is defined by the scope of the assessment.

### 2.1.3 The Environment Act

These objectives are to be used in the review and assessment of air quality by local authorities under Section 82 of the Environment Act (1995). If exceedances are measured or predicted through the review and assessment process, the local authority must declare an Air Quality Management Area (AQMA) under Section 83 of the act, and produce an Air Quality Action Plan (AQAP) to outline how air quality is to be improved.

On the 10th of November 2021, the new Environment Act (2021) passed royal assent, which amends the Environment Act (1995) to reinforce the local air quality management (LAQM) framework in order to encourage cooperation at the local level and broaden the range of organisations that play a role in improving local air quality.

### 2.1.4 Environmental Permitting Regulations (EPR)

Many industrial processes have the potential to release pollution to land, air and water, with the potential to pose a health risk to people as well as damaging the environment. To prevent this, many industrial processes are regulated under the EPR, which either set emissions limit values with which the installation must comply and/or requires best available techniques (BAT) to be used at the installation site.

The UK Environmental Permitting (England and Wales) Regulations 2018 is the latest update to the Regulations and brings the Medium Combustion Plant Directive (MCPD) (2015/2193/EC) into force in England and Wales. Natural Resources Wales, the regulatory authority in Wales, enforce the requirements of the Environmental Permitting Regulations and have regard for the AQSs and existing ambient air quality relative to these AQSs.

## 2.2 Best Practice Guidance Documents

### 2.2.1 Local Air Quality Management Review and Assessment Technical Guidance

The Department for Environment, Food and Rural Affairs (Defra) has published technical guidance for use by local authorities in their air quality review and assessment work. This guidance, referred to in this document as the Local Air Quality Management Technical Guidance (Defra, 2021) ('LAQM TG.16'), has been used to identify locations where exposure can be considered 'relevant'. This is important as Directive 2008/50/EC indicates that the AQSs should not be applied at any locations situated within areas where members of the public do not have access and there is no fixed habitation.

### 2.2.2 Land-Use Planning & Development Control: Planning for Air Quality

Environmental Protection UK's (EPUK) and the IAQM jointly published a revised version of the guidance note 'Land-Use Planning & Development Control: Planning for Air Quality' in 2017 (herein the 'EPUK-IAQM 2017 guidance') to facilitate consideration of air quality within local development control processes. It provides a framework for air quality considerations, promoting a consistent approach to the treatment of air quality issues within development control decisions.

The guidance includes methods for undertaken an air quality assessment and an approach for assessing the significance of effects. The guidance note is widely accepted as an appropriate reference method for this purpose.

### 2.2.3 Air Emissions Risk Assessment for your Environmental Permit (Environment Agency, 2016) ('the Defra and EA guidance')

This guidance, which was adopted in 2016, outlines a procedure which can be used to determine when detailed dispersion modelling is required and the elements which are required as part of detailed dispersion modelling assessment. A subsection of the guidance also outlines features of air quality assessment which should be submitted within the air quality assessment report.

The guidance has been published by Defra and the EA but in the absence of any published publicly available guidance by Natural Resources Wales and as they are governed by the same regulations for the assessment of air quality in England, this guidance is considered appropriate for air quality assessments submitted to accompany Environmental Permit applications in Wales.

This EA guidance includes a number of target Predicted Environmental Concentrations (PECs) for ecological receptors. The relevant target PECs for ecological receptors to this assessment are presented in Table 2.2.

**Table 2.2: EA Guidance Targets for Protected Conservation Areas**

| Substance | Emission Period | Target (μg/m$^3$) |
|---|---|---|
| Nitrogen oxides (as $NO_2$) | Annual[1] | 30 |
| | Daily | 75 |
| [1]This is also a national air quality objective (part of the UK AQS) for the protection of vegetation and ecosystems | | |

### 2.2.4 A Guide to the Assessment of Air Quality Impacts on Designated Nature Conservation Sites

The IAQM published a guidance document (Holman *et al*., 2020) on the assessment of air quality impacts on designated nature conservation sites (herein the 'IAQM designated nature conservation sites guidance'). The guidance was produced to provide advice to developers, consultants and environmental health officers on how to assess the air quality impacts of development on designated nature conservation sites. The document focuses on air quality assessments in support of Habitats Regulations Assessments, but it provides useful guidance when assessing the air quality impact on national or local designated nature conservation sites.

### 2.2.5 AQTAG06: Technical Guidance on Detailed Modelling Approach for an Appropriate Assessment for Emissions to Air (Environment Agency, 2014) ('AQTAG.06')

The AQTAG06 guidance, updated during 2014, provides technical guidance on how to approach detailed modelling of emissions to air when considering impacts on ecological receptors. It also includes a method which can be used to assess the potential impacts of nitrogen and acid deposition attributable to emissions of $NO_x$ to air on local ecosystems.

# 3 ASSESSMENT SCOPE

## 3.1 Overall Approach

The approach taken for assessing the potential air quality impacts of the application site may be summarised as follows:

- Baseline characterisation of local air quality;
- Identification of existing nearby receptors;
- Advanced dispersion modelling assessment of air quality impacts of the application site:
- Consideration of possible mitigation measures, where appropriate; and
- Recommendation for any further work.

## 3.2 Baseline Characterisation

Existing or baseline air quality refers to the concentrations of relevant substances that are already present in ambient air. These substances are emitted by various sources, including road traffic, industrial, domestic, agricultural and natural sources.

A desk-based study has been undertaken using data obtained from continuous and diffusion tube monitoring stations maintained by WCBC and estimated background data from the LAQM Support website maintained by Defra. Background concentrations have been mapped by Defra at a grid resolution of 1x1km for the whole of the UK. Consideration has also been given to potential sources of air pollution and any AQMAs in the vicinity of the application site.

## 3.3 Operational Phase Air Assessment

### 3.3.1 Emission Sources

The application site currently comprises four boilers. One additional boiler is proposed as part of the expansion of the facility.

The emission characteristics for the five sources are summarised in Table 3.1. The input data for boiler 1-3 has been taken from the boiler specification certificates, provided by the client. Little information has been provided for boiler 4 and 5, the aeroscalder boilers. Therefore, in agreement with the client, the emission rates for these boilers have been calculated pro-rata based on boiler 1-3.

Two scenarios have been modelled:

S1: Existing operation, comprising boilers 1-4 in Table 3.1; and,

S2: Proposed operation, comprising all boilers (1-5) in Table 3.1.

**Table 3.1: Emissions Characteristics**

| Source | Stack Height (m) | Stack Diameter (m) | Flow rate ($m^3/s$) | Velocity (m/s) | Temp (°C) | Emission rates (g/s) |
|---|---|---|---|---|---|---|
| | | | | | | NOx |
| Boiler 1 | 10.5 | 0.25 | 0.45 | 9.2 | 72 | 0.018 |
| Boiler 2 | 10.5 | 0.25 | 0.45 | 9.2 | 72 | 0.018 |
| Boiler 3 | 10.5 | 0.25 | 0.45 | 9.2 | 72 | 0.018 |
| Boiler 4 | 10.5 | 0.25 | 0.16 | 3.3 | 72 | 0.0065 |
| Boiler 5 | 10.5 | 0.25 | 0.22 | 4.5 | 72 | 0.0087 |

### 3.3.2 Modelling Software

The model used in this study is UK Atmospheric Dispersion Modelling System (ADMS) Version 5.2.4.0. ADMS is a steady-state atmospheric dispersion model that is based on modern atmospheric physics. It can include treatment of both surface and elevated sources and both simple and complex terrain. The model calculates downwind pollutant concentration in the surrounding area for each hour of the day and night over an appropriate period. Statistics on the frequency and concentration of pollutants at the receptor sites are based upon the hourly calculations.

### 3.3.3 Meteorological Data

Hourly sequential meteorological data were employed in the dispersion model. The data were recorded in 2017-2021 at the Shawbury meteorological station. Shawbury meteorological station is located approximately 29km to the southeast of the application site and is considered most representative of conditions at the site.

The windroses derived from the 2017 to 2021 datasets are presented in Appendix A. The predominant wind direction was from the southwest.

### 3.3.4 Model Output Grid

A uniform cartesian grid measuring 1km x 1km with 50m increments, centring over the site has been included within the model.

### 3.3.5 Discrete Receptors

*Human Receptors*

In addition to the gridded domain discussed above, pollution concentrations were also predicted at discrete human receptor points.

Table 3.2 detail the discrete receptors modelled. All receptors are modelled at 1.5m height to represent typical ‘breathing height’.

**Table 3.2: Discrete Receptors Included in the Model**

| Receptor ID | Receptor Name | X | Y |
|---|---|---|---|
| R1 | Residential Properties to west-south-west | 338397.5 | 346727 |
| R2 | Residential Properties to west-south-west | 338303.7 | 346663.5 |
| R3 | Residential Properties to west-south-west | 338283.5 | 346643.3 |
| R4 | Residential Properties to west-south-west | 338264.7 | 346624.5 |
| R5 | Industrial premise to south | 338635.8 | 346396.4 |
| R6 | Residential and agricultural properties to north-east | 338801.8 | 346962.4 |
| R7 | Whitegate Cottage | 338643 | 347075 |
| R8 | Residential and agricultural property off A525 | 338214.2 | 346452.7 |
| R9 | Residential property off A525 | 338074.1 | 346496 |
| R10 | Residential property off A525 | 337955.7 | 346602.8 |
| R11 | Residential property off A525 | 337900.8 | 346644.7 |
| R12 | Residential property off A525 | 337827.2 | 346722.7 |
| R13 | School Farm | 337962.9 | 347079.3 |
| R14 | Mayfield House | 338084.2 | 347293 |
| R15 | Mangre Cottages | 338153.5 | 347337.8 |

*Ecological Receptors*

As per the Defra and EA (2016) guidance, total annual mean and daily mean $NO_x$ (expressed as $NO_2$) concentrations should be calculated at ecological receptor locations within any special areas of conservation (SACs), special protection areas (SPAs) and Ramsar sites within 10km of the proposed development site, and at any sites of special scientific interest (SSSIs) within 2km of the development site.

RSK referred to the Multi-Agency Geographic Information for the Countryside (MAGIC) Maps website to determine the presence of these sites within the identified distances from the site. Details of all discrete receptors included in the modelling study are summarised in Table 3.3. These receptors included the closest locations within a range of wind directions and therefore considered to include the worst-case locations within the designated ecological sites. All receptors were modelled at ground level (i.e. 0m) to allow for a conservative assessment.

**Table 3.3: Discrete Ecological Receptors (as worst-case locations) Included in the Dispersion Modelling Assessment**

| Receptor ID | Designated Site(s) | Grid reference | |
|---|---|---|---|
| | | X | Y |
| ER1 | River Dee and Bala Lake SSSI and SAC | 338797 | 346555 |
| ER2 | | 338707 | 346431 |
| ER3 | | 338955 | 346574 |
| ER4 | | 340011 | 346752 |
| ER5 | Johnstown Newt Sites SAC | 331366 | 346911 |
| ER6 | | 330789 | 345263 |
| ER7 | Midland Meres & Mosses/Vicarage Moss Ramsar/SSSI | 336213 | 353785 |
| ER8 | | 335975 | 353772 |
| ER9 | Midland Meres & Mosses/Hanmer Mere Ramsar/SSSI | 345283 | 339652 |
| ER10 | | 345087 | 339452 |

### 3.3.6 Buildings

To capture the potential influence of buildings/structures on the dispersion profile of point source emissions (e.g. building 'downwash' effects), significant buildings as part of the application site were included. The parameters of the modelled buildings are summarised in Table 3.4 below.

**Table 3.4: Buildings Included in the Model**

| Building location | X | Y | Z |
|---|---|---|---|
| Main Building | 56.9 | 69.1 | 8 |
| Main Building | 58.8 | 87.1 | 8 |
| Main Building | 73.5 | 20.7 | 8 |
| Main Building | 8.2 | 22.1 | 8 |

### 3.3.7 Terrain

Inclusion of terrain data is recommended within the ADMS-5 user guide if the gradient within a modelling area varies more than 1:10. The land immediately around the

application site is fairly level with no gradients greater than 1:10, therefore terrain data has not been included in the modelling.

### 3.3.8 Background Air Quality Data Used in the Modelling

*Human Receptors*

Given that there are currently no nearby representative background monitoring locations, background air quality data has been obtained from the Defra LAQM Support website, which provides estimated annual average background concentrations of $NO_2$ on a 1 $km^2$ grid basis.

The $NO_2$ background concentrations included in the dispersion modelling assessment are presented in Table 3.5.

**Table 3.5: 2022 Background Concentrations Included in the Assessment**

| Receptor ID | Receptor Name | $NO_2$ (µg/$m^3$) |
|---|---|---|
| R1 | Residential Properties to west-south-west | 6.8 |
| R2 | Residential Properties to west-south-west | 6.8 |
| R3 | Residential Properties to west-south-west | 6.8 |
| R4 | Residential Properties to west-south-west | 6.8 |
| R5 | Industrial premise to south | 6.8 |
| R6 | Residential and agricultural properties to north-east | 6.8 |
| R7 | Whitegate Cottage | 6.7 |
| R8 | Residential and agricultural property off A525 | 6.8 |
| R9 | Residential property off A525 | 6.8 |
| R10 | Residential property off A525 | 6.5 |
| R11 | Residential property off A525 | 6.5 |
| R12 | Residential property off A525 | 6.5 |
| R13 | School Farm | 7.2 |
| R14 | Mayfield House | 6.7 |
| R15 | Mangre Cottages | 6.7 |

*Ecological Receptors*

For ecological receptors, background $NO_x$ concentrations, acid deposition and nitrogen deposition values were primarily taken from the APIS website. The grid reference and habitat type for each ecological receptor were entered into the search tool in order to obtain background concentrations for the relevant grid squares for each receptor. The background concentrations may already include some contributions from existing use of the site and therefore there may be an element of double-counting in both the existing and proposed scenarios; this will offer a conservative approach to the total predicted concentrations in both scenarios. For some receptors, no information on background is available on APIS. In these cases, the Defra LAQM $NO_x$ background map has been used.

Ecological receptor background concentrations used within the assessment are presented in Table 4.7. The nitrogen deposition and acid deposition values were also taken from APIS website using the 'search by location' function. The background nitrogen and acid deposition rates obtained from APIS, used in this assessment, are presented in Table 3.6.

**Table 3.6: Estimated Annual Average NOx at Ecological Sites**

| Discrete Ecological Receptors | Ecological Site | 2017 – 2019 Annual Average $NO_x$ Concentration ($\mu g/m^3$) |
|---|---|---|
| ER1 | River Dee and Bala Lake SSSI and SAC | 8.0 |
| ER2 | | 8.0 |
| ER3 | | 8.0 |
| ER4 | | 7.0 |
| ER5 | Johnstown Newt Sites SAC | 11.9 |
| ER6 | | 10.9 |
| ER7 | Midland Meres & Mosses/Vicarage Moss Ramsar/SSSI | 7.9* |
| ER8 | | 8.5* |
| ER9 | Midland Meres & Mosses/Hanmer Mere Ramsar/SSSI | 5.6* |
| ER10 | | 5.6* |
| **Air Quality Objective** | | **30** |
| *Taken from Defra LAQM background maps, as no information available on APIS. | | |

**Table 3.7: Background Nitrogen Deposition Rates and Acid Deposition Rates used in the Assessment**

| Receptor ID | Main Habitat | Existing Background Nitrogen Deposition Rate (kgN/ha/yr) | Existing Background N Acid Deposition Rate (keq/ha/yr) | Existing Background S Acid Deposition Rate (keq/ha/yr) |
|---|---|---|---|---|
| ER1 | Standing open water and canals | 27 | 1.9 | 0.1 |
| ER2 | | 27 | 1.9 | 0.1 |
| ER3 | | 27 | 1.9 | 0.1 |
| ER4 | | 26.5 | 1.9 | 0.1 |
| ER5 | Broadleaved woodland | 28.8 | 2.1 | 0.1 |
| ER6 | | 28.6 | 2 | 0.2 |
| ER7 | Woodland | 47.7 | 3.5 | 0.2 |

| Receptor ID | Main Habitat | Existing Background Nitrogen Deposition Rate (kgN/ha/yr) | Existing Background N Acid Deposition Rate (keq/ha/yr) | Existing Background S Acid Deposition Rate (keq/ha/yr) |
|---|---|---|---|---|
| ER8 | | 47.7 | 3.5 | 0.2 |
| ER9 | Open water bodies | 23.8 | 1.7 | 0.12 |
| ER10 | | 23.8 | 1.7 | 0.12 |

The nitrogen deposition process contributions (PCs) will then be compared to the applicable nitrogen deposition lower critical loads. The acid deposition process contributions (PCs) will be compared to the critical load. The relevant critical loads for nitrogen and acid deposition, taken from APIS, are presented in Table 3.8.

**Table 3.8: Critical Loads for Nitrogen & Acid Deposition**

| Receptor ID | Habitat | Nutrient Nitrogen Critical Load* (kgN/ha/yr) | Acidity Critical Loads | | |
|---|---|---|---|---|---|
| | | | CLMaxS (keqN/ha/yr) | CLMinN (keqN/ha/yr) | CLMaxN (keqS/ha/yr) |
| ER1 | No comparable habitat with established acidity critical load estimate available | 3-10 | N/A | N/A | N/A |
| ER2 | | 3-10 | N/A | N/A | N/A |
| ER3 | | 3-10 | N/A | N/A | N/A |
| ER4 | | 3-10 | N/A | N/A | N/A |
| ER5 | No comparable habitat with established acidity critical load estimate available | 10-20 | N/A | N/A | N/A |
| ER6 | | 10-20 | N/A | N/A | N/A |
| ER7 | Broadleaved woodland | 5-10 | 0.98 | 0.14 | 1.117 |
| ER8 | | 5-10 | 0.98 | 0.14 | 1.122 |
| ER9 | No comparable habitat with established critical load estimate available | N/A | N/A | N/A | N/A |
| ER10 | | N/A | N/A | N/A | N/A |
| * Lower critical load used in assessment for conservative assessment | | | | | |

### 3.3.9 Processing of Results

$NO_x$ emitted to the atmosphere as a result of combustion will consist largely of nitric oxide (NO). Once released into the atmosphere, NO is oxidised to $NO_2$, which is of concern with respect to health and other impacts. The proportion of NO converted to $NO_2$ depends on a number of factors including wind speed, distance from the source, solar irradiation and the availability of oxidants, such as $O_3$. The dispersion modelling exercise predicts concentrations of $NO_x$ which subsequently require conversion to $NO_2$. The long- and short-term predicted $NO_x$ process contributions (PCs) have been converted to the

respective $NO_2$ concentrations using the approach outlined below, utilising 'worst case' conversion criteria referenced by the Environment Agency[2]:

- Predicted $NO_2$ annual average concentration = 70% of the predicted annual average $NO_x$ concentration; and,
- Predicted $NO_2$ hourly average concentrations = 35% of the predicted 99.79$^{th}$ percentile of hourly average $NO_x$ concentrations.

### 3.3.10 Nitrogen and Acid Deposition Calculations

Total annual mean $NO_x$ concentrations, acid and nitrogen deposition rates were calculated at the identified discrete ecological receptor locations. The contribution of $NO_2$ emitted by the proposed scheme to nitrogen and acid deposition on sensitive ecological receptors has been determined by following the methodology set out in AQTAG06 (EA, 2014).

The broad habitat types identifiable at each identified ecological site were determined using information available on the APIS for the purpose of the nitrogen and acid deposition calculations. Where more than one habitat type was identified within each ecological site, it has been assumed that the habitat most sensitive to the development is represented at the modelled discrete receptor location, for a conservative assessment.

The nitrogen deposition process contributions (PCs) were compared to the applicable nitrogen deposition lower critical loads. The acid deposition process contributions (PCs) were compared to the critical load. The relevant critical loads for nitrogen deposition, taken from APIS, at the identified ecological receptors are presented in section 3.3.8 above.

### 3.3.11 Significance Criteria

The significance of the PC arising from the proposed boiler has been determined using the criteria outlined in the Defra and EA (2016) guidance. These are intended for use in interpreting the results of an air quality screening assessment to determine whether further detailed modelling is required, but they provide a useful guide to the significance of an impact in the absence of any agreed criteria relating to the assessment of impacts from dispersion modelling.

However, the PCs have also been viewed in context of the 'headspace' between predicted pollutant concentrations and the applicable AQS, whether they represent 'relevant exposure' and of the number of exceedances of any screening criteria which are exceeded.

Based on the Defra and EA 2016 screening criteria, the PC from the proposed boiler can be considered to be insignificant if the following primary criteria are met:

[2] Environment Agency, (n.d.). CONVERSION RATIOS FOR NOX AND $NO_2$.

- The short-term PC is less than 10% of the short-term AQS / environmental assessment level (EAL); and
- The long-term PC is less than 1% of the long-term AQS / EAL.

If these criteria are met then the impact can be considered to be insignificant, if the criteria are not met, then the secondary stage criteria can be used, which are:

- The short-term PC is less than 20% of the short-term AQS / EAL minus twice the long-term background concentration; and
- The long-term PEC is less than 70% of the long-term AQS / EAL.

If both the second stage criteria are met, then the impact can be considered to be insignificant. However, if the criteria are not met, this does not necessarily mean an impact is significant and consideration has been given as to whether the PEC exceeds the relevant standards and consideration of the conservative nature of this assessment.

## 3.4 Uncertainties and Assumptions

The following uncertainties and assumptions have been made in the air quality assessment:

- In the absence of measured air quality data at the proposed development location, estimated background data from the Defra LAQM website were used in the assessment. In reality, baseline air quality levels vary with time and location but in the absence of on-site baseline monitoring data, the assumption that the baseline concentrations obtained from the above-mentioned data source is applicable to the site location, is considered appropriate;
- There will be uncertainties introduced because the modelling has simplified real-world processes into a series of algorithms. For example, it has been assumed that wind conditions measured at Shawbury meteorological monitoring station for the years 2017 to 2021 were representative of wind conditions at the site; and
- There is an element of uncertainty in all measured and modelled data. All values presented within the report are best possible estimates.

# 4 BASELINE CHARACTERISATION

## 4.1 Presence of AQMAs

WCBC does not have any declared AQMAs in the borough. Therefore, the development site is not within or in close proximity to any AQMAs.

## 4.2 Baseline Monitoring Data

According to the 2020 North Wales Authorities (which includes WCBC) Air Quality Annual Status Report there was one automatic monitoring location and a diffusion tube network of 32 monitoring locations in the WCBC area in 2019. The closest monitoring location to the application site is a diffusion tube positioned at Cross Lanes (Tube 59), approximately 1 km away from the application site. The automatic monitoring location is located over 6 km from the application site, and therefore not considered representative of conditions at the application site.

The annual mean $NO_2$ diffusion tube monitoring data for the tube located within 3km from the application site is reproduced in Table 4.1 below. Exceedance of the AQS is not recorded.

**Table 4.1: Annual Mean Measured $NO_2$ Concentrations at Monitoring Location within 3km from Proposed Development Site**

| Site ID | Site Name | Approx distance from proposed development (km) | Annual Mean $NO_2$ (µg/m$^3$) | | | | |
|---|---|---|---|---|---|---|---|
| | | | 2015 | 2016 | 2017 | 2018 | 2019 |
| 59 | Cross Lane | 1.0 | - | - | - | - | 11.2 |

## 4.3 LAQM Background Data

In addition to the local monitoring data, estimated background air quality data available from the LAQM-Tools website, may also be used to establish likely background air quality conditions at the development site.

This website provides estimated annual average background concentrations of $NO_x$, $NO_2$, $PM_{10}$ and $PM_{2.5}$ on a 1km$^2$ grid basis. Table 4.2 identifies estimated annual average background concentrations for the grid square containing the application site for years from 2022 to 2023. No exceedances of the NOx, $NO_2$, $PM_{10}$ or $PM_{2.5}$ AQS are predicted. As background concentrations are predicted to fall with time, background concentrations in future years would not be expected to exceed their respective annual mean standards.

**Table 4.2: Estimated Background Annual Average NOx, $NO_2$, $PM_{10}$ and $PM_{2.5}$ Concentrations at the Proposed Development Site**

| Assessment Year | Estimated Annual Average Pollutant Concentrations Derived from the LAQM Support Website (µg/m$^3$) | | | |
|---|---|---|---|---|
| | $NO_x$ | $NO_2$ | $PM_{10}$ | $PM_{2.5}$ |
| **2022** | 6.8 | 5.4 | 9.9 | 6.2 |
| **2023** | 6.7 | 5.3 | 9.8 | 6.2 |
| **Air Quality Objective** | **30** | **40** | **40** | **25** |

Notes: Presented concentrations for 1km$^2$ grid centred on 338500, 346500; approximate centre of development site is 338508, 346720.

# 5 ASSESSMENT OF IMPACTS

The main potential impact of the proposal on air quality is considered to be exhaust emissions from the boilers on sensitive receptors in the area surrounding the site.

The results presented below consider the proposed scenario, that is the existing boilers and the proposed new boiler. In addition, contour plots for predicted concentrations are presented in Appendix B. The contours detail the maximum predicted concentration at each gridded receptor location across the five years modelled.

## 5.1 Human Receptors

### 5.1.1 Annual Mean $NO_2$ Impacts

Table 5.1 shows the maximum predicted annual mean $NO_2$ concentrations at each assessed discrete receptor point representative of relevant human exposure, across the five meteorological years considered.

As shown by Table 5.1, the annual mean $NO_2$ PCs are less than 1% of the AQS and the PECs are all below 70% of the AQS at all relevant discrete receptor locations and therefore considered to be insignificant. The operation of the proposed additional boiler does not cause any exceedance of the annual mean $NO_2$ AQS when the PECs are considered.

**Table 5.1: Predicted Annual Mean $NO_2$ Concentrations at Discrete Receptors, Highest Results Selected between 2017-2021 for Each Receptor**

| Location | PC (µg/m$^3$) | PC as % of Objective | PEC (µg/m$^3$) | PEC as % of Objective |
|---|---|---|---|---|
| R1 | 0.30 | 0.8% | 7.12 | 18% |
| R2 | 0.15 | 0.4% | 6.97 | 17% |
| R3 | 0.13 | 0.3% | 6.95 | 17% |
| R4 | 0.12 | 0.3% | 6.93 | 17% |
| R5 | 0.13 | 0.3% | 6.95 | 17% |
| R6 | 0.30 | 0.7% | 7.11 | 18% |
| R7 | 0.17 | 0.4% | 6.89 | 17% |
| R8 | 0.07 | 0.2% | 6.88 | 17% |
| R9 | 0.06 | 0.1% | 6.87 | 17% |
| R10 | 0.06 | 0.1% | 6.57 | 16% |
| R11 | 0.06 | 0.1% | 6.57 | 16% |
| R12 | 0.05 | 0.1% | 6.57 | 16% |
| R13 | 0.04 | 0.1% | 7.21 | 18% |
| R14 | 0.04 | 0.1% | 6.76 | 17% |
| R15 | 0.04 | 0.1% | 6.76 | 17% |
| **AQS** | | | **40 µg/m$^3$** | |

### 5.1.2 Hourly Mean $NO_2$ Impacts

Table 5.2 shows the maximum 99.79$^{th}$ percentile hourly mean $NO_2$ concentrations at each assessed discrete receptor point representative of relevant human exposure, across the five meteorological years considered.

Predicted PCs of 1-hour mean $NO_2$ concentration are below 10% of the AQS. All predicted 99.79$^{th}$ percentile hourly mean $NO_2$ concentrations (PECs) are below the hourly mean $NO_2$ AQS objective level at the discrete receptors.

**Table 5.2: Predicted 99.79$^{th}$ Percentile Hourly Mean $NO_2$ Concentrations at Discrete Receptors, Highest Results Selected between 2017-2021 for Each Receptor**

| Location | PC (µg/m$^3$) | PC as % of Objective | PEC (µg/m$^3$) | PEC as % of Objective |
|---|---|---|---|---|
| R1 | 3.47 | 1.7% | 17.10 | 9% |
| R2 | 2.54 | 1.3% | 16.17 | 8% |
| R3 | 2.33 | 1.2% | 15.96 | 8% |
| R4 | 2.17 | 1.1% | 15.80 | 8% |
| R5 | 1.82 | 0.9% | 15.45 | 8% |
| R6 | 2.99 | 1.5% | 16.62 | 8% |
| R7 | 2.92 | 1.5% | 16.36 | 8% |
| R8 | 1.87 | 0.9% | 15.50 | 8% |
| R9 | 1.67 | 0.8% | 15.30 | 8% |
| R10 | 1.38 | 0.7% | 14.41 | 7% |
| R11 | 1.23 | 0.6% | 14.26 | 7% |
| R12 | 1.05 | 0.5% | 14.08 | 7% |
| R13 | 1.10 | 0.6% | 15.43 | 8% |
| R14 | 0.98 | 0.5% | 14.42 | 7% |
| R15 | 0.96 | 0.5% | 14.39 | 7% |
| **AQS** | | | **200 µg/m$^3$** | |

## 5.2 Ecological Receptors

### 5.2.1 Annual Mean NOx Concentrations

Table 5.3 presents the maximum predicted annual mean $NO_x$ PCs and PECs at each of the assessed ecological receptor locations from the five meteorological years modelled.

The predicted maximum PCs are below the screening criteria of 1% at all receptor locations and the PECs are all below 70% of the AQS at all relevant receptor locations and therefore considered to be insignificant.

**Table 5.3: Predicted Annual Mean $NO_x$ Concentrations at Ecological Receptors, Highest Results Selected between 2017-2021 for Each Receptor**

| Location | PC (µg/m$^3$) | PC as % of Objective | PEC (µg/m$^3$) | PEC as % of Objective |
|---|---|---|---|---|
| R1 | 0.20 | 0.7% | 8.19 | 27% |
| R2 | 0.25 | 0.8% | 8.24 | 27% |
| R3 | 0.13 | 0.4% | 8.12 | 27% |
| R4 | 0.03 | 0.1% | 7.02 | 23% |
| R5 | 0.00 | 0.0% | 11.92 | 40% |
| R6 | 0.00 | 0.0% | 10.90 | 36% |
| R7 | 0.00 | 0.0% | 7.90 | 26% |
| R8 | 0.00 | 0.0% | 8.50 | 28% |
| R9 | 0.00 | 0.0% | 5.60 | 19% |
| R10 | 0.00 | 0.0% | 5.60 | 19% |
| **AQS** | | | **30 µg/m$^3$** | |

### 5.2.2 Daily Mean NOx Concentrations

Table 5.4 presents the maximum predicted daily mean $NO_x$ PCs and PECs at each of the assessed ecological receptor locations from the five meteorological years modelled.

The predicted maximum PCs are well below the screening criteria of 10% at all discrete receptor locations. Therefore, the impact of the development on daily mean $NO_x$ concentrations is considered to be insignificant.

**Table 5.4: Predicted Daily Mean $NO_x$ Concentrations at Ecological Receptors, Highest Results Selected between 2017-2021 for Each Receptor**

| Location | PC (µg/m$^3$) | PC as % of Objective | PEC (µg/m$^3$) | PEC as % of Objective |
|---|---|---|---|---|
| R1 | 0.20 | 0.3% | 16.18 | 22% |
| R2 | 0.25 | 0.3% | 16.23 | 22% |
| R3 | 0.13 | 0.2% | 16.11 | 21% |
| R4 | 0.03 | 0.0% | 14.01 | 19% |
| R5 | 0.00 | 0.0% | 23.84 | 32% |
| R6 | 0.00 | 0.0% | 21.80 | 29% |
| R7 | 0.00 | 0.0% | 15.80 | 21% |
| R8 | 0.00 | 0.0% | 17.00 | 23% |
| R9 | 0.00 | 0.0% | 11.20 | 15% |
| R10 | 0.00 | 0.0% | 11.20 | 15% |
| **AQS** | | | **75 µg/m$^3$** | |

### 5.2.3 Nitrogen Deposition

The highest process contribution at the assessed ecological receptor location out of those obtained from the five meteorological years modelled has been presented as a percentage of the lower critical load. The lowest critical load available on the APIS website, is used to provide for a conservative assessment. Results are summarised in Table 5.5.

The maximum predicted nitrogen deposition PC for the proposed new boiler and the existing boilers are above the 1% screening criteria for three modelled receptor points at the River Dee and Bala Lake SSSI and SAC. However, this is mainly due to the existing boilers. Table 5.6 presents the results for the difference between the two scenarios modelled, i.e., is focused on the proposed new boiler in isolation. This shows that the process contribution to nitrogen deposition from the proposed development in isolation, as a percentage of the lower critical load, are all well below the 1% screening criteria and are considered to be insignificant.

### 5.2.4 Acid Deposition

The highest process contribution at the assessed ecological receptor location out of those obtained from the five meteorological years modelled has been presented as a percentage of the critical load. Results are summarised in Table 5.7.

The maximum predicted acid deposition PC, as a percentage of the lower critical load are all well below the 1% screening criteria and are considered to be insignificant.

**Table 5.5: Maximum Predicted Nitrogen Deposition Contribution at Ecological Sensitive Sites from all Sources**

| Rec No. | Receptor | PC (kg N/ha/yr) | Background N Deposition (kg N/ha/yr) | Total N Deposition (kg N/ha/yr) | Lower Critical Load | PC as a % of Lower Critical Load |
|---|---|---|---|---|---|---|
| E1 | River Dee and Bala Lake SSSI and SAC | 0.06 | 27.00 | 27.06 | 3 | 2.0% |
| E2 | | 0.07 | 27.00 | 27.07 | 3 | 2.4% |
| E3 | | 0.04 | 27.00 | 27.04 | 3 | 1.2% |
| E4 | | 0.01 | 26.50 | 26.51 | 3 | 0.3% |
| E5 | Johnstown Newt Sites SAC | 0.00 | 28.80 | 28.80 | 10 | 0.0% |
| E6 | | 0.00 | 28.60 | 28.60 | 10 | 0.0% |
| E7 | Midland Meres & Mosses/Vicarage Moss Ramsar/SSSI | 0.00 | 47.70 | 47.70 | 5 | 0.0% |
| E8 | | 0.00 | 47.70 | 47.70 | 5 | 0.0% |
| E9 | Midland Meres & Mosses/Hanmer Mere Ramsar/SSSI | 0.00 | 23.80 | 23.80 | n/a | - |
| E10 | | 0.00 | 23.80 | 23.80 | n/a | - |

**Table 5.6: Maximum Predicted Nitrogen Deposition Contribution at Ecological Sensitive Sites from Proposed New Boiler**

| Rec No. | Receptor | PC (kg N/ha/yr) | Background N Deposition (kg N/ha/yr) | Total N Deposition (kg N/ha/yr) | Lower Critical Load | PC as a % of Lower Critical Load |
|---|---|---|---|---|---|---|
| E1 | River Dee and Bala Lake SSSI and SAC | 0.01 | 27.00 | 27.01 | 3 | 0.3% |
| E2 | | 0.01 | 27.00 | 27.01 | 3 | 0.4% |
| E3 | | 0.01 | 27.00 | 27.01 | 3 | 0.2% |
| E4 | | 0.00 | 26.50 | 26.50 | 3 | 0.0% |

| Rec No. | Receptor | PC (kg N/ha/yr) | Background N Deposition (kg N/ha/yr) | Total N Deposition (kg N/ha/yr) | Lower Critical Load | PC as a % of Lower Critical Load |
|---|---|---|---|---|---|---|
| E5 | Johnstown Newt Sites SAC | 0.00 | 28.80 | 28.80 | 10 | 0.0% |
| E6 | | 0.00 | 28.60 | 28.60 | 10 | 0.0% |
| E7 | Midland Meres & Mosses/Vicarage Moss Ramsar/SSSI | 0.00 | 47.70 | 47.70 | 5 | 0.0% |
| E8 | | 0.00 | 47.70 | 47.70 | 5 | 0.0% |
| E9 | Midland Meres & Mosses/Hanmer Mere Ramsar/SSSI | 0.00 | 23.80 | 23.80 | n/a | - |
| E10 | | 0.00 | 23.80 | 23.80 | n/a | - |

**Table 5.7: Maximum Predicted Acid Deposition Contribution at Ecological Sensitive Sites from all Sources**

| Rec No. | Receptor | Process Nitrogen Acid Deposition (keq/ha/yr) | Background Acid Deposition (keq/ha/yr) | | CLMaxS (keq/ha/yr) | CLMinN (keq/ha/yr) | CLMaxN (keq/ha/yr) | PC as a % of Critical Load |
|---|---|---|---|---|---|---|---|---|
| | | | Nitrogen | Sulphur | | | | |
| E1 | River Dee and Bala Lake SSSI and SAC | 0.001 | 1.9 | 0.1 | N/A | N/A | N/A | - |
| E2 | | 0.001 | 1.9 | 0.1 | N/A | N/A | N/A | - |
| E3 | | 0.000 | 1.9 | 0.1 | N/A | N/A | N/A | - |
| E4 | | 0.000 | 1.9 | 0.1 | N/A | N/A | N/A | - |
| E5 | Johnstown Newt Sites SAC | 0.000 | 2.1 | 0.1 | N/A | N/A | N/A | - |
| E6 | | 0.000 | 2 | 0.2 | N/A | N/A | N/A | - |
| E7 | | 0.000 | 3.5 | 0.2 | 0.98 | 0.14 | 1.117 | 0.0% |

| Rec No. | Receptor | Process Nitrogen Acid Deposition (keq/ha/yr) | Background Acid Deposition (keq/ha/yr) | | CLMaxS (keq/ha/yr) | CLMinN (keq/ha/yr) | CLMaxN (keq/ha/yr) | PC as a % of Critical Load |
|---|---|---|---|---|---|---|---|---|
| | | | Nitrogen | Sulphur | | | | |
| E8 | Midland Meres & Mosses/Vicarage Moss Ramsar/SSSI | 0.000 | 3.5 | 0.2 | 0.98 | 0.14 | 1.122 | 0.0% |
| E9 | Midland Meres & Mosses/Hanmer Mere Ramsar/SSSI | 0.000 | 1.7 | 0.12 | N/A | N/A | N/A | - |
| E10 | | 0.000 | 1.7 | 0.12 | N/A | N/A | N/A | - |

# 6 MITIGATION MEASURES & RESIDUAL IMPACTS

## 6.1 Residual Impacts: Significance

As discussed in Section 5, the assessment demonstrates that the application site is not predicted to have a significant adverse impact on local air quality and therefore the residual impacts are considered to remain negligible.

# 7 CONCLUSIONS

An air quality assessment for the proposed new boiler and existing boilers at the existing Mealor poultry facility has been undertaken with reference to existing air quality in the area and relevant legislation, policy and guidance.

The results of the air quality assessment identified that the maximum process contributions from the proposed boiler and the existing boilers would be below the screening criteria of 1% of the relevant long-term Air Quality Standard at all receptors assessed, apart from the process contribution to nitrogen deposition at the River Dee and Bala Lake SSSI and SAC. However, the exceedance is mainly due to the existing boilers and the process contribution from the proposed new boiler on its own, would be well below the 1% screening criteria.

The maximum process contribution was also assessed to be below the screening criteria of 10% of the relevant short-term AQS.

It is concluded that the overall air emission impact of the site on sensitive human and ecological receptors is not significant.

# APPENDIX A
# WIND ROSES

**Figure A-1: 2017 Windrose from Shawbury Meteorological Station**

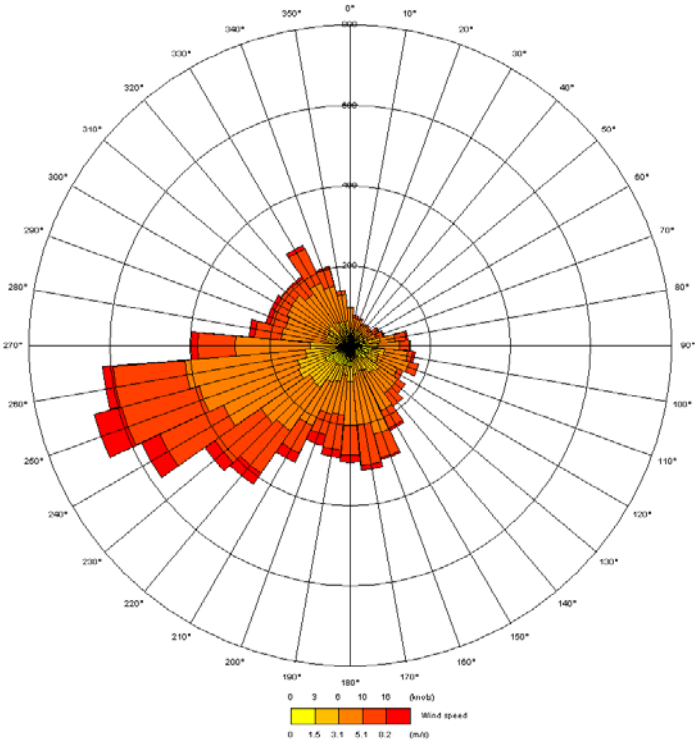


**Figure A-2: 2018 Windrose from Shawbury Meteorological Station**

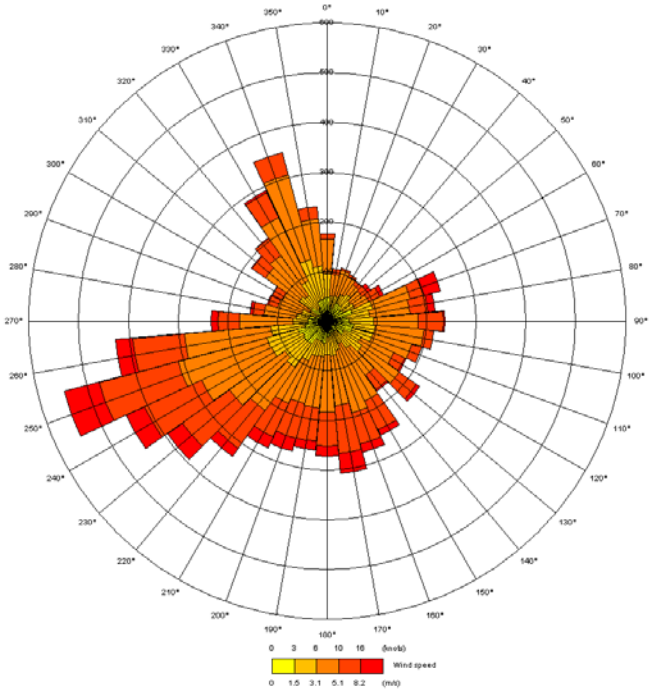


**Figure A-3: 2019 Windrose from Shawbury Meteorological Station**

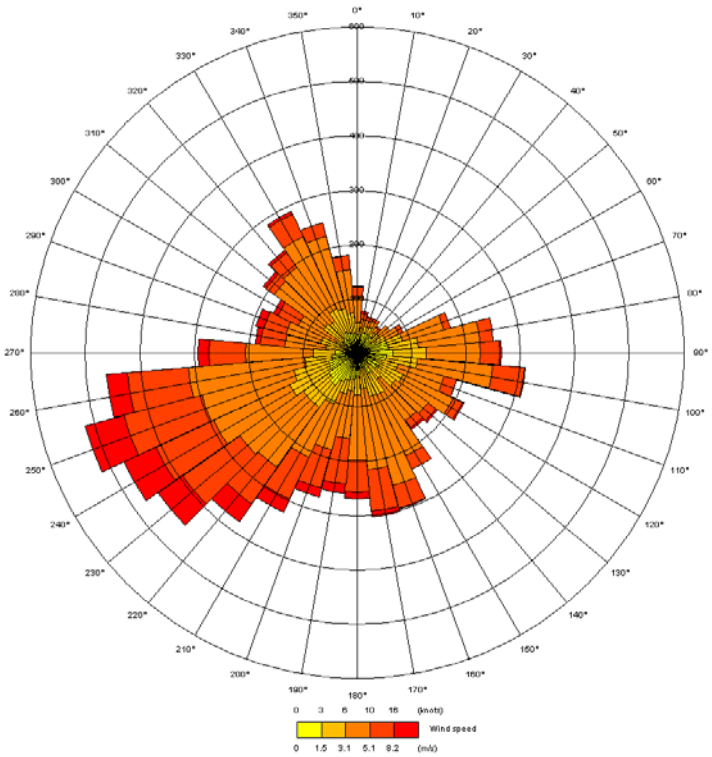



**Figure A-4: 2020 Windrose from Shawbury Meteorological Station**

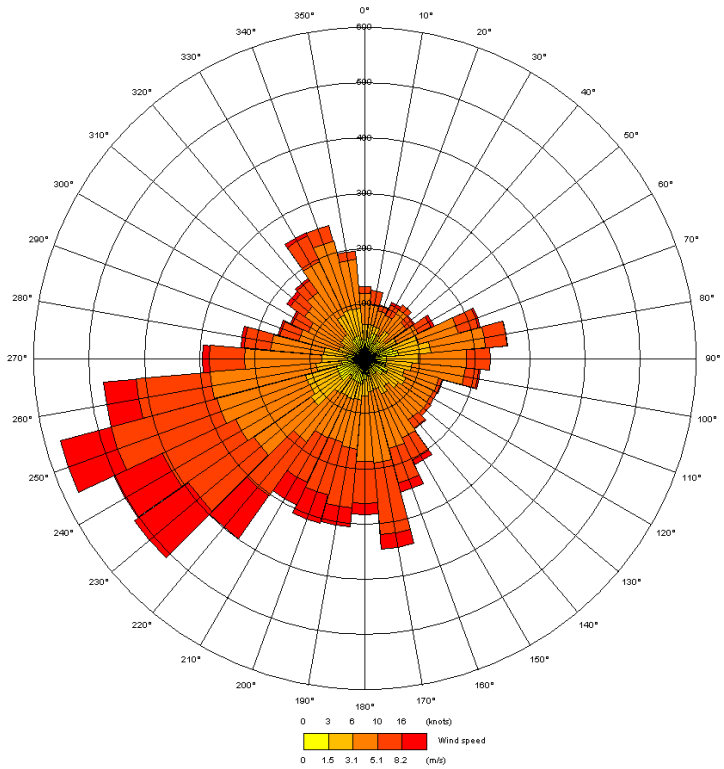
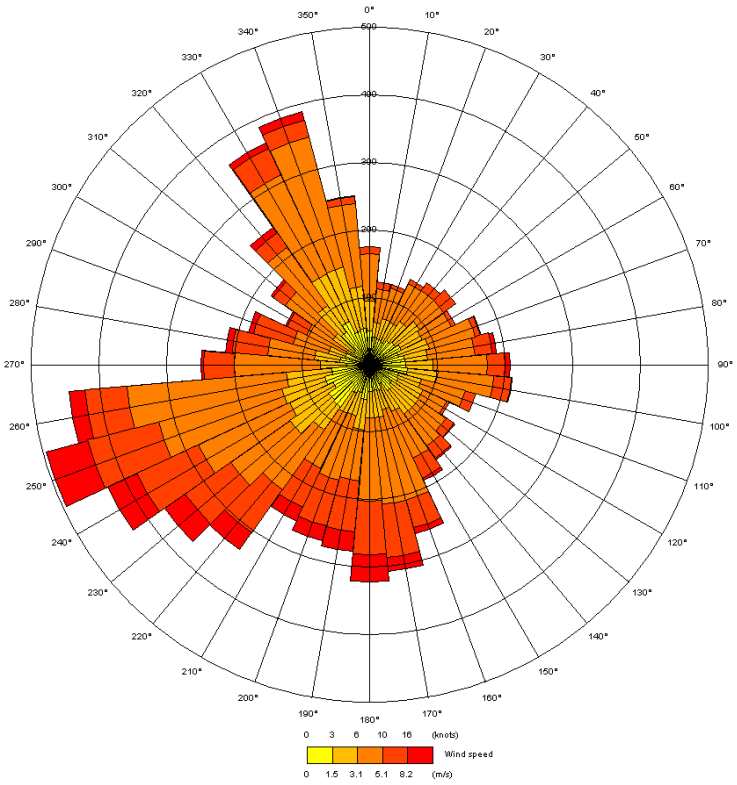


**Figure A-5: 2021 Windrose from Shawbury Meteorological Station**



# APPENDIX B
# CONTOURS

**Figure B-4: Predicted Annual Mean $NO_2$ Concentrations (µg/m$^3$) (Scenario 2, all sources and background)**

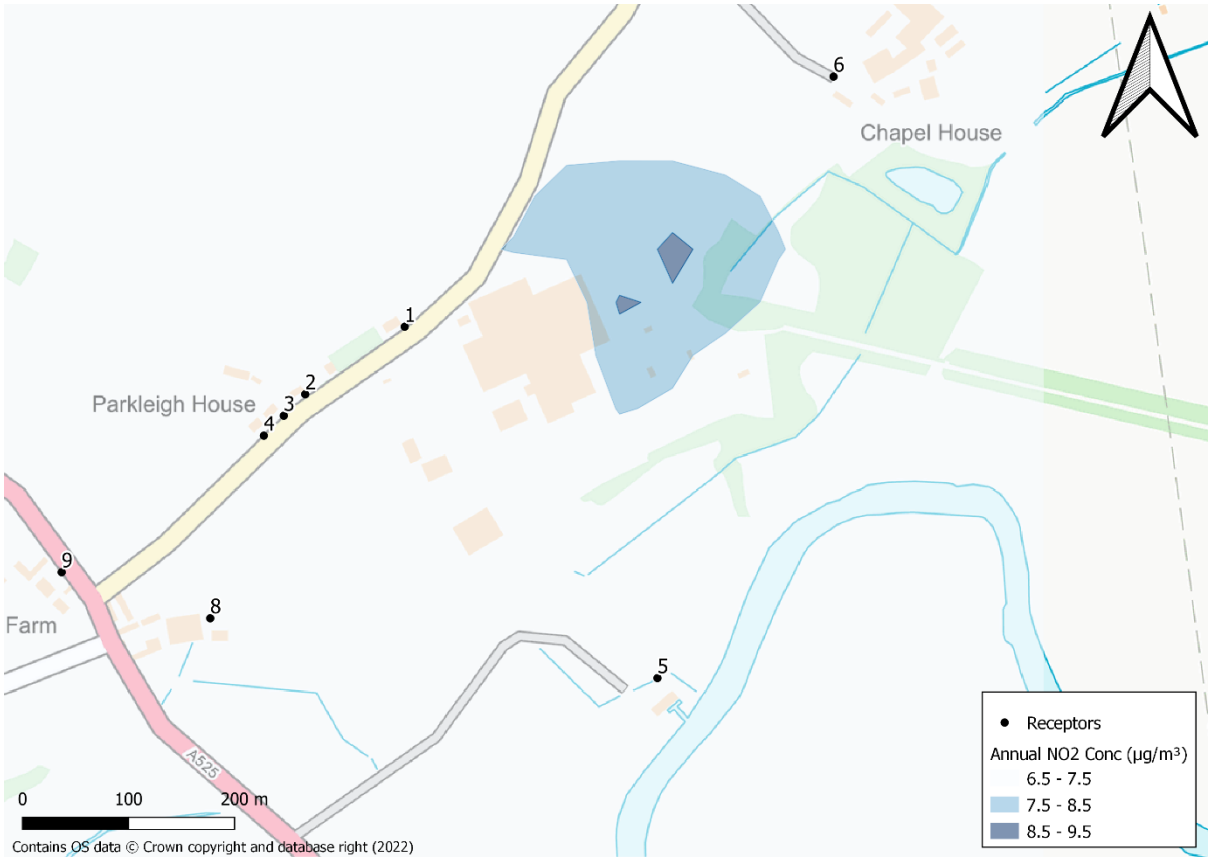


**Figure B-2: Predicted 99.79th Percentile Hourly Mean $NO_2$ Concentrations (µg/m³) (Scenario 2, all sources and background)**