# Air Emissions Risk Assessment

## Environmental Permit Variation

### FMC Agro Limited

Prepared by:

**SLR Consulting Limited**

5th Floor, 35 Dale Street, Manchester, M1 2HF

SLR Project No.: 410.065838.00001

Client Reference No: 133697

24 May 2024

Revision: v1.0

## Revision Record

| Revision | Date | Prepared By | Checked By | Authorised By |
|---|---|---|---|---|
| V1.0 | 24 May 2024 | Jamie Munro | Ben Turner | Paul Wright |

# Basis of Report

This document has been prepared by SLR Consulting Limited (SLR) with reasonable skill, care and diligence, and taking account of the timescales and resources devoted to it by agreement with FMC Agro Limited (the Client) as part or all of the services it has been appointed by the Client to carry out. It is subject to the terms and conditions of that appointment.

SLR shall not be liable for the use of or reliance on any information, advice, recommendations and opinions in this document for any purpose by any person other than the Client. Reliance may be granted to a third party only in the event that SLR and the third party have executed a reliance agreement or collateral warranty.

Information reported herein may be based on the interpretation of public domain data collected by SLR, and/or information supplied by the Client and/or its other advisors and associates. These data have been accepted in good faith as being accurate and valid.

The copyright and intellectual property in all drawings, reports, specifications, bills of quantities, calculations and other information set out in this report remain vested in SLR unless the terms of appointment state otherwise.

This document may contain information of a specialised and/or highly technical nature and the Client is advised to seek clarification on any elements which may be unclear to it.

Information, advice, recommendations and opinions in this document should only be relied upon in the context of the whole document and any documents referenced explicitly herein and should then only be used within the context of the appointment.

# Table of Contents



# Tables in Text

# Figures in Text



# Appendices

# 1.0 Introduction

SLR Consulting Limited has been commissioned by FMC Agro Limited (FMC) to undertake an Air Emissions Risk Assessment (AERA) to support a variation of an existing Environmental Permit at the Pentre Agrochemicals Plant located at Pentre, Flintshire (the Site).

The Site is currently regulated by Natural Resources Wales (NRW) as a Part A1 installation under an existing Environmental Permit (EPR/FP3031CW) primarily for the production of inorganic chemicals (e.g. salts).

The Site location is illustrated in Figure A.

## 1.1 Variation and Assessment Scope

Currently, a plastic nitric acid storage tank is operational on Site with excess emissions released via a manganese dinitrate process scrubber (A006). These emissions are:

- Nitric acid vapor ($HNO_3$); and
- Oxides of nitrogen (NOx).

The variation seeks to upgrade the nitric acid storage tank and associated equipment. Additionally, a new scrubber will be installed, and the air emission point A006 will be relocated approximately 5 to 10m. This variation does not seek to alter any of the activities currently carried out on Site. All other aspects of the Environmental Permit and operations remain unchanged. Further details are provided in the accompanying variation application.

The scope of the assessment is to quantitatively assess potential air quality impacts associated with variation on the receiving environment.

To support the assessment, a dispersion modelling exercise has been undertaken based on the approach prescribed within the Environment Agency's (EA) Air Emissions Risk Assessment guidance[1] (herein referred to as the AERA guidance), adopted by NRW.

[1] https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit

## Figure A: Site Context

# 2.0 Regulation of Industrial Emissions

The Industrial Emissions Directive[2] (IED) is the main instrument for regulating pollutant emissions from industrial installations.

In Wales, the 2016 Environmental Permitting Regulations (EPR) transpose the IED into UK legislation. The EPR is designed to ensure the competent authority regulates emissions from processes, including emissions to air, to minimise adverse impacts.

The Site is currently regulated by NRW as a Part A1 installation under an existing Environmental Permit (EPR/FP3031CW) primarily for the production of inorganic chemicals (e.g. salts).

[2] Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control).

# 3.0 Environmental Standards

The environmental standards applied in this assessment are primarily based on the EA's AERA guidance.

## 3.1 Human Health

The AERA guidance provides environmental ambient thresholds for the protection of health. These are based on relevant legislation and environmental assessment levels (EALs) defined by the EA. These are collectively termed Air Quality Assessment Levels (AQAL) throughout this report.

Table 3-1 sets out those AQALs that are relevant to the assessment of human health impacts.

**Table 3-1: Relevant Human AQALs**

| Pollutant | | AQAL (µg/m$^3$) | Averaging Period |
|---|---|---|---|
| Nitrogen Dioxide | $NO_2$ | 40 | Annual Mean |
| | | 200 | 1-Hour Mean (18 permitted exceedances) |
| Nitric Acid | $HNO_3$ | 52 | Annual mean |
| | | 1,000 | 1 Hour |

### 3.1.1 Relevant Exposure

In accordance with Defra's technical guidance on Local Air Quality Management (LAQM.TG(22))[3], the AQALs presented in Table 3-1 should only be assessed at locations of relevant exposure i.e. where members of the public are regularly present and might reasonably be expected to be exposed to pollutant concentrations over the relevant averaging period. These AQALs do not apply to exposure at the workplace.

A summary of the typical relevant locations associated with each applicable AQAL assessed is detailed below in Table 3-2.

**Table 3-2: Relevant Public Exposure**

| AQAL Averaging Period | Locations AQALs Should Apply At | Locations AQALs Should Not Apply At |
|---|---|---|
| Annual mean | Building facades of residential properties, schools, hospitals etc. | Facades of offices, hotels, gardens of residences and kerbside sites |
| 1-hour mean | As above together with kerbside sites of regular access, car parks, bus stations etc. | Kerbside sites where public would not be expected to have regular access |

## 3.2 Ecosystems and Vegetation

In the UK, sites of ecological importance are provided environmental protection from activities through the application of standards known as Critical Levels and Critical Loads.

[3] Local Air Quality Management Technical Guidance 22, Published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland. August 2022.

### 3.2.1 Critical Levels

Critical Levels are a quantitative estimate of exposure to one or more airborne pollutants in gaseous form, below which significant harmful effects on sensitive elements of the environment do not occur, according to present knowledge.

Critical Levels for the protection of vegetation and ecosystems apply irrespective of habitat type and are based on the concentration of the relevant pollutants in ambient air. The Critical Levels of relevance to this assessment are provided in Table 3-3.

**Table 3-3: Critical Levels**

| Pollutant | Critical Level ($\mu g/m^3$) | Averaging Period | Habitat |
|---|---|---|---|
| $NO_x$ | 30 | Annual mean | All |
| | 200 | Daily mean | Where a) ozone is below the AOT40 Critical Level and b) $SO_2$ is below the lower Critical Level of $10\mu g/m^3$ |
| | 75 | Daily mean | All other |

The lower NOx 24-hour mean Critical Level has been used as a worst-case screening assessment.

### 3.2.2 Critical Loads

Critical Loads are a quantitative estimate of exposure to deposition of one or more pollutants, below which significant harmful effects on sensitive elements of the environment do not occur, according to present knowledge.

The Critical Loads of relevance to this assessment are provided in Table 3-3. This includes nutrient nitrogen and acidification.

**Table 3-4: Critical Loads**

| Pollutant | Environmental Standard | Averaging Period |
|---|---|---|
| Acidification | Depends on location - APIS | Annual Mean |
| Nutrient Nitrogen | Depends on location - APIS | Annual Mean |

Nutrient nitrogen and acidification Critical Loads are site specific. Critical Loads for the habitats and species of relevance to this assessment have been obtained from the Air Pollution Information System (APIS) website[4]. The most sensitive habitat listed (that is present in the study area) has been used / provided to facilitate a worst-case assessment. These are presented in Section 6.2.

All pollutant emission sources that contribute to nutrient nitrogen and / or acidification have been considered within the assessment for completeness.

[4] Air Pollution Information System http://www.apis.ac.uk/

# 4.0 Emission Quantification

Emission inputs used in the assessment have been provided or validated by FMC Agro Limited. Where any of the inputs relate to the current operational design, they have been confirmed to still be relevant.

Table 4-1 details the emission source considered within the dispersion modelling assessment, whereas its location is illustrated in Figure D. This is based on the proposed relocation of A006 (scrubber vent).

**Table 4-1: Emission Sources**

| Reference | Name | NGR | |
|---|---|---|---|
| | | X | Y |
| A006 | Manganese Dinitrate Process Scrubber | 332969 | 367528 |

As discussed in Section 1.1, A006 is already operational (5-10m away from the proposed location). The variation seeks to relocate A006. Modelled A006 emission releases may already be represented within the applied background datasets (Section 6.0), which could lead to double counting of emissions and therefore exaggerate impacts.

## 4.1 Emission Release Parameters

Table 4-2 details the emission release input parameters used in the assessment. The parameter values are based upon the following sources:

- Revised design data provided by FMC Agro Limited;
- Environmental Permit (EPR/FP3031CW); and
- Outcomes of a recent stack monitoring survey issued to NRW, conducted by a 3rd party accredited stack testing company (June 2023 Stack Monitoring Report[5]).

**Table 4-2: Emission Characteristics: A006**

| Parameter | | A006 | Source |
|---|---|---|---|
| Stack Internal Diameter (m) | | 0.15 | FMC Agro Limited |
| Stack Exhaust Height (m) | | 8.1 | FMC Agro Limited |
| Volumetric Flow Rate | Normalised ($Nm^3/s$) | 0.127 | Calculated |
| | Actual ($Am^3/s$) | 0.138 | June 2023 Stack Monitoring Report |
| Emission Temperature ($^oC$) | | 23.0 | June 2023 Stack Monitoring Report |
| Emission Velocity (m/s) | | 7.56 | Calculated |

[5] Socotec, Stack Emissions Testing Report, LNO 17927 / Version 1. 5 June 2023.

| Parameter | A006 | Source |
|---|---|---|
| **Table Notes:**<br>Actual Conditions: Stack conditions (wet).<br>Reference Conditions: STP (Temperature: 237.15K, wet). | | |

## 4.2 Emission Concentrations

Emission release concentrations and associated pollutant rates applied in this assessment are detailed in Table 4-3. Emission rates have been calculated with use of the emission release characteristics presented in Table 4-2.

**Table 4-3: Emission Concentration Inputs: A006**

| Pollutant | Emission Concentration | | Emission Rate (g/s) |
|---|---|---|---|
| | mg/Nm$^3$ | Source | |
| NOx | 200 | Permit ELV | 0.02545 |
| $HNO_3$ | 44 | June 2021 Stack Monitoring Report | 0.00560 |
| **Table Notes:**<br>Reference Conditions: STP (Temperature: 237.15K, wet) | | | |

Emission concentrations are based on the ELVs contained within the Environmental Permit (EPR/FP3031CW). There are no ELVs set for $HNO_3$. In their absence, the maximum concentration reported within the two most recent stack monitoring surveys issued to NRW (conducted by a 3rd party accredited stack testing company) have been used:

- June 2023 Stack Monitoring Report; and
- June 2021 Stack Monitoring Report[6].

Table 4-4 presents the findings of the $HNO_3$ comparison exercise. Initial preference was to use the 2023 stack monitoring outcomes; however, the monitored $HNO_3$ concentration was below the limit of detection (LOD). The 2021 monitored $HNO_3$ concentration is 197% higher than the 2023 dataset. Consequently, the 2021 dataset was used to ensure a conservative assessment and increase the confidence in the assessment outcomes.

**Table 4-4: $HNO_3$ Stack Monitoring Survey Comparison Outcomes: A006**

| Pollutant | Monitored Concentration (mg/Nm$^3$) | |
|---|---|---|
| | 2023 Monitoring Report | 2021 Monitoring Report |
| $HNO_3$ | 0.24 (< LOD) | 44 |
| **Table Notes:**<br>Reference Conditions: STP (Temperature: 237.15K, wet) | | |

Use of these emission concentrations assumes A006 is operating continuously at the maximum process conditions. This is considered conservative.

[6] Socotec, Stack Emissions Testing Report, LNO 16502 / Version 1. 29 June 2021.

# 5.0 Dispersion Modelling Methodology

## 5.1 Dispersion Model

ADMS v6 modelling software has been used to quantify potential impacts. ADMS v6 is an advanced atmospheric dispersion model that has been developed and validated by Cambridge Environmental Research Consultants (CERC).

CERC's ADMS suite of software has been used extensively throughout the UK for regulatory compliance purposes and is accepted as an appropriate air quality modelling tool by NRW.

## 5.2 Receptors

### 5.2.1 Human Receptors

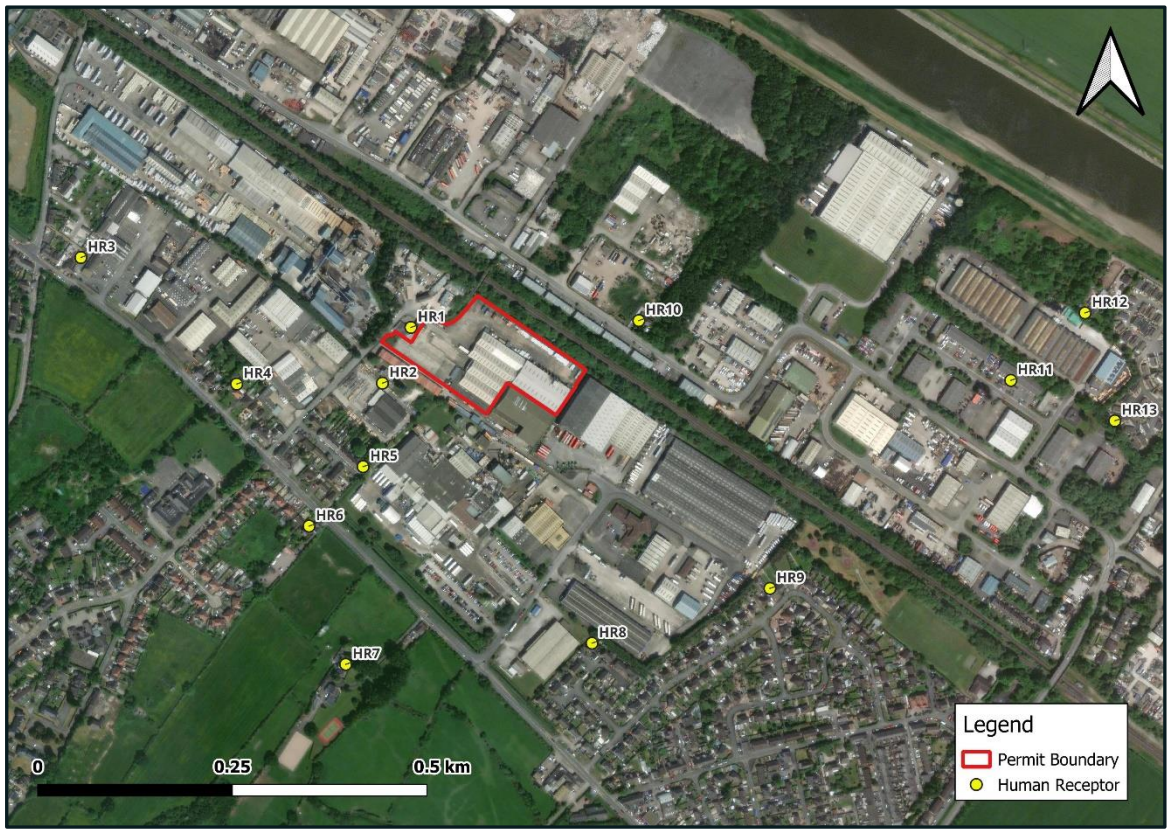
The modelling has been undertaken using a receptor grid for receptors outside of the Site boundary. This method allows the maximum ground level concentration outside the Site boundary to be assessed. Pollutant concentrations were predicted across a 500m x 500m receptor grid (10m resolution) centred upon the Site.

Discrete human receptors were also considered in the modelling assessment as detailed in Table 5-1 and their locations are illustrated in Figure B. These receptor locations are considered to capture worst-case relevant exposure relative to the Site, in accordance with LAQM.TG(22) presented in Table 3-2. Consideration has also been given to land uses with sensitive populations for inclusion within the model (e.g. elderly care home, schools etc.). Furthermore, sensitive human receptors located within surrounding AQMAs have been included for completeness.

**Table 5-1: Modelled Discrete Human Receptor Locations**

| Receptor | Details | Exposure Period | NGR | | Within AQMA? | Height (m) |
|---|---|---|---|---|---|---|
| | | | X | Y | | |
| HR1 | Residential | All | 332771 | 367603 | - | 1.5 |
| HR2 | Builders Merchant | Short Term | 332735 | 367532 | - | 1.5 |
| HR3 | Residential | All | 332347 | 367693 | - | 1.5 |
| HR4 | Residential | All | 332547 | 367530 | - | 1.5 |
| HR5 | Residential | All | 332710 | 367424 | - | 1.5 |
| HR6 | Residential | All | 332640 | 367348 | - | 1.5 |
| HR7 | Residential | All | 332687 | 367171 | - | 1.5 |
| HR8 | Residential | All | 333004 | 367198 | - | 1.5 |
| HR9 | Residential | All | 333232 | 367268 | - | 1.5 |
| HR10 | Residential | All | 333064 | 367612 | - | 1.5 |
| HR11 | Cafe | Short Term | 333542 | 367535 | - | 1.5 |
| HR12 | Residential | All | 333637 | 367622 | - | 1.5 |
| HR13 | Residential | All | 333676 | 367483 | - | 1.5 |

**Figure B: Modelled Human Receptors**




## 5.2.2 Ecological Receptors

The EA's AERA Guidance states that the following ecological sites need to be considered:

- SPAs, SACs and Ramsar Sites (protected wetlands) within 10km of the Site; and
- SSSIs and local nature sites[7] within 2km of the Site.:

Following application of these distance thresholds, Table 5-2 provides details of ecological receptors considered within this assessment (illustrated in Figure C). All receptors have assumed a height of 0m and represented in the model using gridded and polygon boundary receptors.

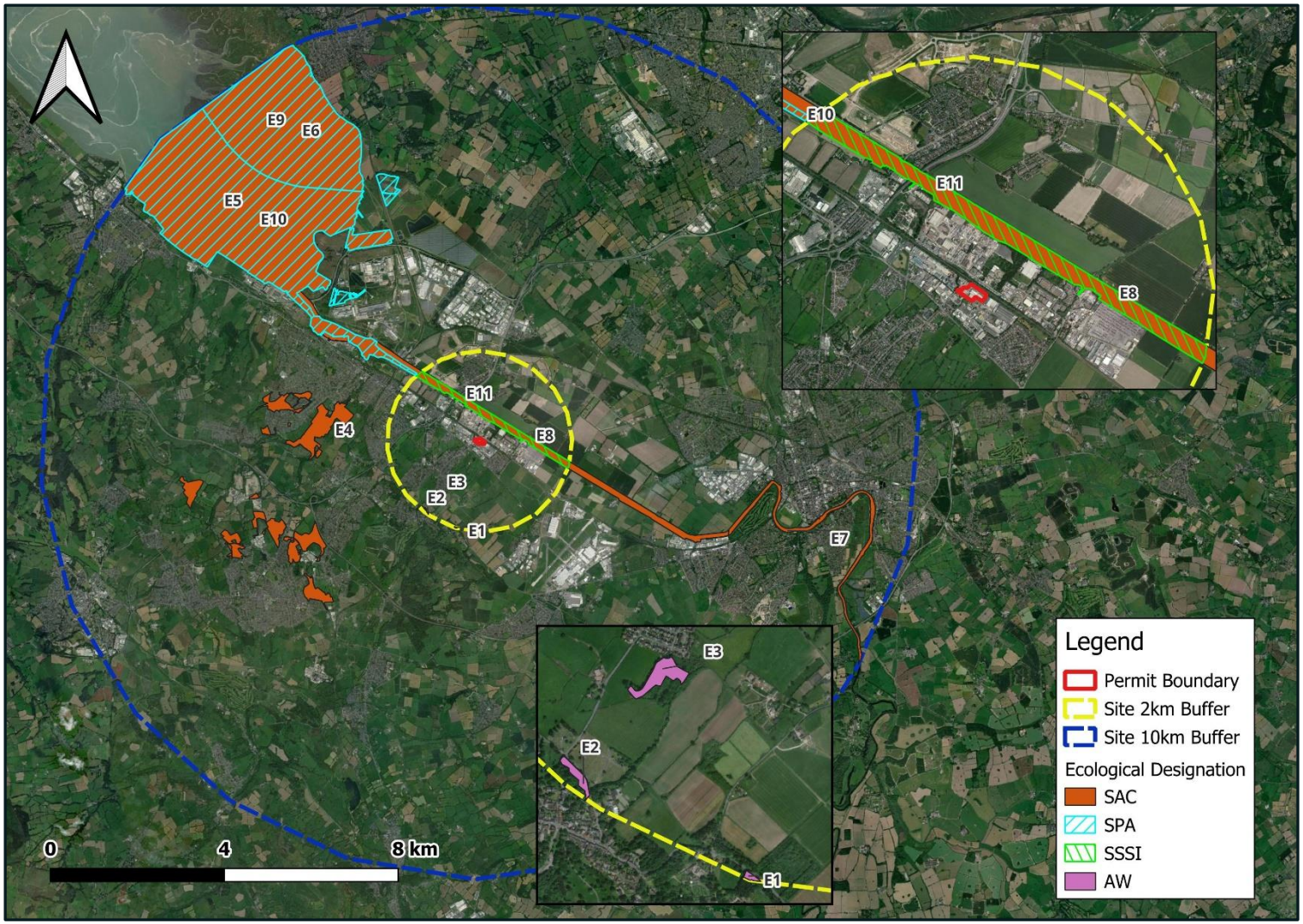
**Table 5-2: Designated Ecological Sites of Relevance**

| Receptor ID | Site Name | Designation | Distance to Site |
|---|---|---|---|
| E1 | Unnamed (36427) | AW | 2.0 |
| E2 | Unnamed (37657) | AW | 1.9 |
| E3 | Unnamed (37658) | AW | 1.4 |
| E4 | Deeside and Buckley Newt sites | SAC | 2.8 |
| E5 | Dee Estuary / Aber Dyfrdwy (Wales) | SAC | 2.0 |
| E6 | Dee Estuary / Aber Dyfrdwy (England) | SAC | 6.3 |

[7] Local nature sites are defined by the AERA guidance as Ancient Woodlands (AW), Local Wildlife Sites (LWS), National Nature Reserves (NNR) and Local Nature Reserves (LNR).

| Receptor ID | Site Name | Designation | Distance to Site |
|---|---|---|---|
| E7 | River Dee and Bala Lake / Afon Dyfrdwy a Llyn Tegid (England) | SAC | 6.3 |
| E8 | River Dee and Bala Lake / Afon Dyfrdwy a Llyn Tegid (Wales) | SAC | 0.5 |
| E9 | The Dee Estuary (England) | SPA | 5.9 |
| E10 | The Dee Estuary (Wales) | SPA | 2.0 |
| E11 | Afon Dyfrdwy (River Dee) | SSSI | 0.5 |

**Figure C: Ecological Designations of Relevance**



## 5.3 Terrain

The ADMS modelling guidance indicates it is generally unnecessary to include terrain where gradient in slopes is less than 10%.

An evaluation of the terrain covering the extent of the model domain suggests that the area is generally flat with little to no significant terrain features. Therefore, terrain has not been included within the dispersion model.

## 5.4 Building Downwash

The Buildings Module within the ADMS model has been used to incorporate buildings within the model, in line with EA guidance, where:

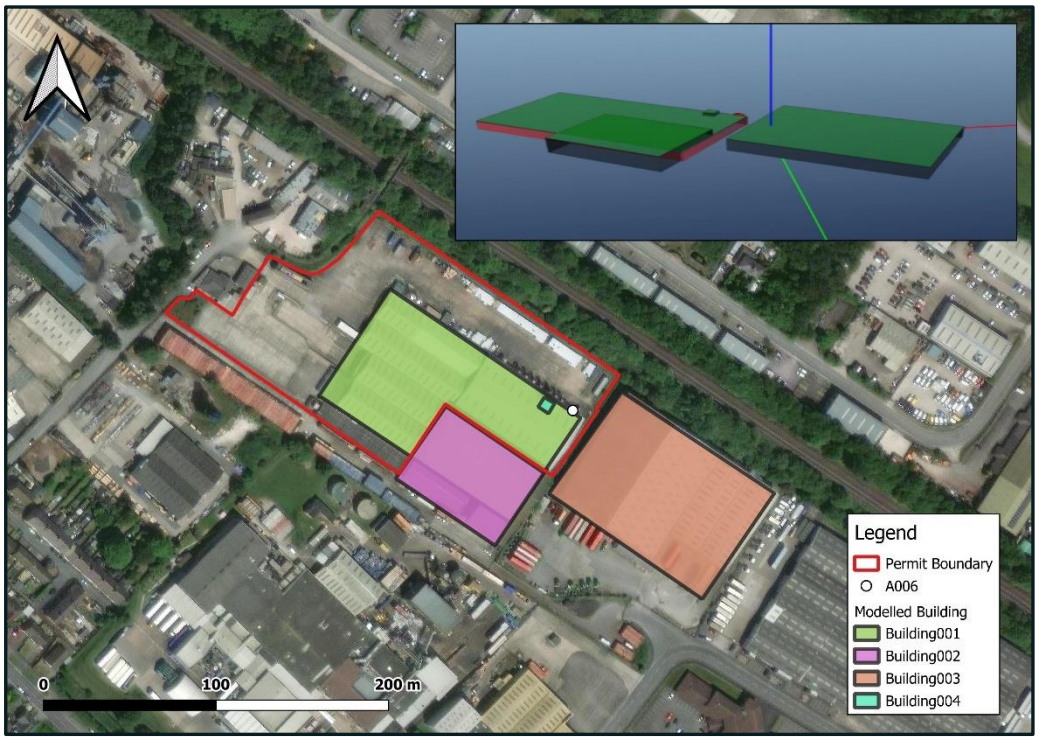
- The maximum height of the building is equivalent to at least 40% of the emission height; and
- Are within a distance defined as five times the lesser of the height or maximum projected width of the building (referred to as 5L)).

Details of the buildings are provided in Table 5-3, whilst their locations are illustrated in Figure D.

**Table 5-3: Modelled Buildings**

| Name | Centre Easting (m) | Centre Northing (m) | Height (m) | Length / Diameter (m) | Width (m) | Angle (°) |
|---|---|---|---|---|---|---|
| Building001 | 332898.2 | 367531.1 | 8.5 | 133.5 | 72.2 | 123.9 |
| Building002 | 332908.5 | 367489.8 | 14.0 | 50.3 | 68.6 | 34.9 |
| Building003 | 333021.7 | 367479.1 | 11.0 | 106.3 | 73.1 | 123.6 |
| Building004 | 332953.8 | 367531.4 | 11.5 | 6.8 | 7.1 | 211.2 |

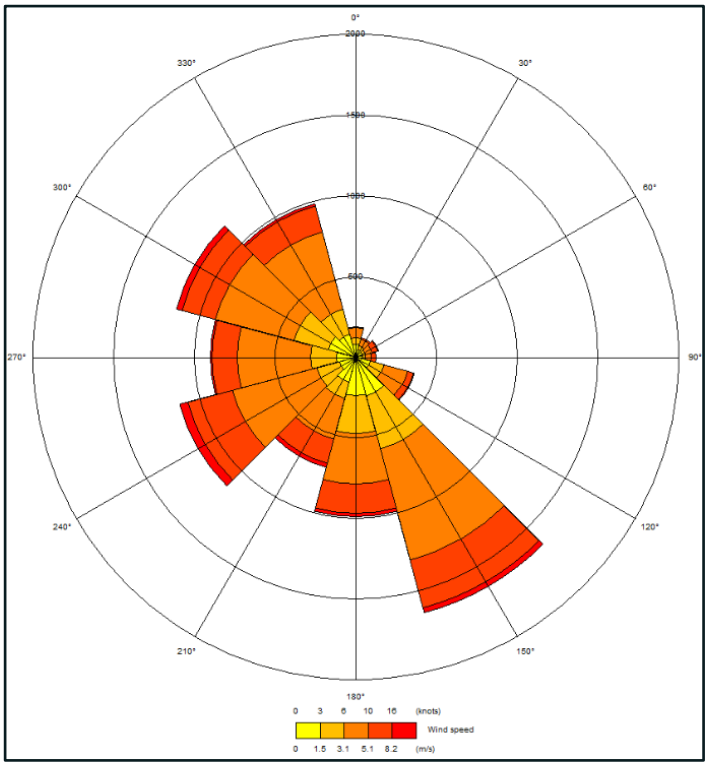
**Figure D: Dispersion Model Visualisation**



## 5.5 Meteorological Data

The nearest and most representative meteorological station in comparison to the Site is Hawarden (approximately 3km southeast of the Site). Five consecutive years of hourly-sequential meteorological data recorded at Hawarden has been applied in the dispersion modelling assessment (2017-2021 inclusive). A wind rose for the period is presented in Figure E.

**Figure E: Hawarden (2017-2021) Wind Rose**




## 5.6 Advanced Dispersion Parameters

### 5.6.1 Surface Roughness

The Site is located within an industrial setting. To reflect the surrounding environment, a surface roughness of 0.5m has been used for the dispersion site.

A surface roughness of 0.1m has been for the meteorological site (Hawarden) which relates to ‘root crops’.

### 5.6.1 Minimum Monin-Obukhov Length

A minimum Monin-Obukhov length of 30m has been used in relation to the study area, which relates to ‘mixed urban/industrial’. This is considered reflective of the wider Pentre and Deeside Industrial Estate setting.

A minimum Monin-Obukhov length of 10m has been used in relation to the meteorological site, which relates to ‘small towns <50,000’.

## 5.7 Model Outputs

Predicted pollutant concentrations are summarised in the following formats:

- Process contribution (PC) – the predicted contributions from the proposed new sources alone, as output from ADMS v6; and
- Predicted environmental concentration (PEC) – the resultant predicted concentration (i.e. PC + ambient background concentration value).

Table 5-4 presents the treatment of averaging periods of relevance to this assessment.

**Table 5-4: Model Outputs**

| Averaging Period | PC | PEC |
|---|---|---|
| 1-Hour maximum | Maximum 1-hour mean | PC + 2 x Annual mean background |
| 1-Hour mean (18 permitted exceedances) | 99.79%ile of 1-hour means | PC + 2 x Annual mean background |
| 24-Hour maximum | Maximum 24-hour mean | PC + 2 x Annual mean background |
| Annual mean | Annual mean | PC + Annual mean background |

### 5.7.1 Operational Envelope

The assessment has assumed that A006 will be operational for 8,760 hours per year (i.e. emissions will be released continuously), whereby no adjustment has been made to the model output. This approach ensures the worst-case meteorological conditions for dispersion are assessed in-combination with the maximum emission release conditions (Section 4.2), thereby increasing the likelihood of capturing worst-case impacts.

This is considered highly conservative, as the process is non-continuous, operating in batches when the nitric tank is used in the production of a fertiliser product. Table 5-5 provides a review of operational data between 2021 and 2023. The maximum total operation in a year was 4.5%. Emissions will only be generated during this period.

**Table 5-5: Annual Operation Profile**

| Year | Hours Operational | Percent of Year (%) |
|---|---|---|
| 2021 | 386 | 4.5 |
| 2022 | 303 | 3.5 |
| 2023 | 280 | 3.3 |

### 5.7.2 Conversion of $NO_x$ to $NO_2$

In line with EA Air Quality Modelling and Assessment Unit (AQMAU) guidance[8], the assessment has used a $NO_x$ to $NO_2$ ratio of:

- 70% for long-term average concentrations; and
- 35% for short-term average concentrations.

[8] Environment Agency, Air Quality Modelling and Assessment Unit, 'Conversion Ratios for $NO_X$ and $NO_2$' (no date)

### 5.7.3 Calculation of PC to Deposition Rates

Deposition rates were calculated using empirical methods recommended by the EA in AQTAG06. Dry deposition flux was calculated using the following equation:

> *Dry* deposition *flux (µg/m$^2$/s) = ground level concentration (µg/m$^3$) x deposition velocity (m/s)*

The applied deposition velocities for the relevant chemical species are as shown in Table 5-6.

**Table 5-6: Applied Deposition Velocities**

| Chemical Species | Deposition Velocity (m/s) | |
|---|---|---|
| $NO_2$ | Grassland | 0.0015 |
| | Woodland | 0.003 |
| $HNO_3$ | 0.040 | |

#### 5.7.3.1 Nutrient Nitrogen

The nutrient nitrogen Critical Loads are recorded in units of kgN/ha/yr.

Standard conversion factors detailed in Table 5-7 have been used to calculate the predicted nutrient nitrogen deposition rates from the dry deposition flux.

**Table 5-7: Applied Deposition Conversion Factors**

| Chemical Species | Conversion Factor |
|---|---|
| $NO_2$ | 95.9 |
| $HNO_3$ | 70.0 |

#### 5.7.3.2 Acidification

The acid Critical Loads are recorded in units of keq/ha/yr.

Standard conversion factors detailed in Table 5-8 have been used to calculate the predicted acid deposition rates from the dry deposition flux.

**Table 5-8: Applied Acidification Conversion Factors**

| Chemical Species | Conversion Factor |
|---|---|
| $NO_2$ | 6.84 |
| $HNO_3$ | 5.00 |

PCs have been considered within the acid Critical Load function, in accordance with APIS guidance[9].

## 5.8 Assessment of Impact and Significance

### 5.8.1 Human Receptors

Emissions can be considered to be insignificant and not require further assessment if:

[9] https://www.apis.ac.uk/clf-guidance

- The PC <1% the long term AQAL; and
- The PC <10% the short-term AQAL.

For PCs that cannot be considered insignificant, further assessment has been undertaken and the PEC has been determined for comparison as a percentage of the relevant AQAL.

### 5.8.2 Ecological Receptors

Emissions can be to be insignificant and not require further assessment if:

- European Sites and SSSIs:
  - The PC <1% the long-term Critical Load / Level; and
  - The PC <10% the short-term Critical Load / Level.
- Other Conservation Sites:
  - The PC <100% the short or long-term Critical Load / Level.

## 5.9 Uncertainty

It is recognised that dispersion modelling is inherently uncertain, particularly in circumstances where verification of modelled predictions relative to real-world condition is not possible. The accuracy of modelled predictions is intrinsically reliant on assessment inputs (i.e. emission rates, release temperatures etc.), and the ability of the dispersion model to replicate real-world conditions.

In respect to this, all operational inputs have been provided or validated by FMC Agro Limited. Furthermore, the suite of ADMS software packages is well validated with observed concentrations for a number of scenarios by the model developers CERC and NRW.

To provide certainty with respect to the assessment outcomes, wherever possible, this assessment has incorporated a number of conservative assumptions, which will result in an overestimation of predicted ground level concentrations. As such, the actual predicted ground level concentrations are expected to be lower than this and, in some cases, significantly lower, with the operation of the Site. Examples of these include (but not limited to):

- The assessment has assumed a continuous operational profile (i.e. 8,760 hours per year) at the maximum ELVs / monitored concentrations. This scenario, which presumes A006 operates continuously at maximum process conditions, ensures all worst-case dispersion conditions are evaluated, increasing the likelihood of capturing worst-case impacts. This is highly conservative since the process is non-continuous and operates in batches when the nitric tank is used in fertiliser production. Between 2021 and 2023, the maximum annual operation was only 4.5%.
- Assumed 35% and 70% for short-term and long-term NOx to $NO_2$ conversion rates, respectively;
- With respect to the human health impact assessment the assessment has focussed on the location of maximum ground level PC predicted across the entirety of the study area. This represents a conservative outlook as PCs predicted at all other locations would be lower. Furthermore, the maximum background pollution dataset reported in the study area have been used, where available. This assumes that the location of maximum impact coincides at the area of greatest sensitivity;
- With respect to the ecological impact assessment, the results relate to the maximum modelled impact at each individual ecological designation requiring assessment. This represents a conservative outlook; PCs predicted across the remainder of each

designation would be lower. Furthermore, worst-case input parameters have been used at the point of maximum impact, where available (i.e. maximum reported baseline conditions and minimum Critical Level / Load). The most sensitive habitat listed on APIS (that is present in the study area) has been used to provide a worst-case assessment. This assumes the most sensitive feature is present at the location of maximum impact; and

- As discussed in Section 1.1, A006 is already operational (5-10m away from the proposed location). The variation seeks to relocate A006. Modelled A006 emission releases may already be represented within the applied background datasets (Section 6.0), which could lead to double counting of emissions and therefore exaggerate impacts.

# 6.0 Baseline Environment

The characterisation of the existing environment has been undertaken using the latest publicly available data sources reported by central and local networks, where available. Pollutant concentrations monitored during the COVID-19 pandemic (2020 and 2021) have not been considered as are expected to be atypical, and not representative of the local environment.

It is acknowledged that 2022 monitoring is available. However, the representativity of 2022 monitoring data is subject to central and local government advice / review and has been excluded to limit the introduction of uncertainty.

As discussed in Section 1.1, A006 is already operational (5-10m away from the proposed location). The variation seeks to relocate A006. Modelled A006 emission releases may already be represented within the applied background datasets, which could lead to double counting of emissions and therefore exaggerate impacts.

## 6.1 Human Receptors

### 6.1.1 Air Quality Management Areas

The nearest Air Quality Management Area (AQMA) is located 7.2km from the Site (Chester City Centre AQMA (No.5)). Given the separation distance, A006 is unlikely to impact this AQMA and has not been considered further.

### 6.1.2 Nitrogen Dioxide

#### 6.1.2.1 Monitoring

$NO_2$ is monitored across the UK via local and national networks, comprising both non-automatic and automatic monitoring methodologies.

There is no automatic $NO_2$ monitoring undertaken within the FCC administrative area; therefore, automatic monitors have not been considered further.

FCC undertakes non-automatic monitoring of $NO_2$ with use of diffusion tubes, in fulfilment of statutory obligations. Annual montiroing outcomes are presented within the North Wales Annual Air Quality Progress Report.

The details and results of the $NO_2$ monitoring conducted within the human health study area are presented in Table 6-1 and Table 6-2 respectively, while their locations are illustrated in Figure F.

**Table 6-1: $NO_2$ Monitoring Sites: Details**

| Site ID | Site Type | NGR (m) | | Height | Within AQMA | Distance to Site (km) |
|---|---|---|---|---|---|---|
| | | X | Y | | | |
| Site 14 | Kerbside | 332500 | 367357 | 1.6 | No | 0.3 |
| Site 30 | Kerbside | 332221 | 367723 | 1.8 | No | 0.5 |

**Table 6-2: $NO_2$ Monitoring Sites: Results**

| Site ID | 2019 Data Capture % | Annual Mean $NO_2$ Concentration (µg/m$^3$) | | | | |
|---|---|---|---|---|---|---|
| | | 2015 | 2016 | 2017 | 2018 | 2019 |
| Site 14 | 83 | 8.6 | 12.7 | 13.4 | 14.7 | 13.9 |

| Site ID | 2019 Data Capture % | Annual Mean $NO_2$ Concentration (µg/m$^3$) | | | | |
|---|---|---|---|---|---|---|
| | | 2015 | 2016 | 2017 | 2018 | 2019 |
| Site 30 | 100 | 23.2 | 24.9 | 23.9 | 24.0 | 24.3 |

For the period assessed (2015-2019), annual mean $NO_2$ concentrations recorded within the human health study area were well below the relevant annual mean AQAL (40µg/m$^3$). The maximum was recorded in 2016 at Site 30 (24.9µg/m$^3$) situated 0.5km from the Site on the B5129 Chester Road East, an arterial road where elevated $NO_2$ concentration are likely.

The empirical relationship given in LAQM.TG(22) states that exceedances of the 1 hour mean AQAL for $NO_2$ is unlikely to occur where annual mean concentrations are <60µg/m$^3$. This indicates that an exceedance of the 1-hour mean AQAL is unlikely to have occurred at these sites between 2015 and 2019.

#### 6.1.2.2 Defra Background Maps

Defra maintains a nationwide model of existing and future background air quality concentrations at a 1km grid square resolution.

The datasets include annual average concentration estimates for $NO_2$ using a reference year of 2018 (the year in which comparisons between modelled and monitoring are made).

Annual mean background concentrations of $NO_2$ for the 1km grid squares which cover the modelled domain are presented in Table 6-3. Values refer to reference concentrations (i.e. the year in which comparisons between modelled and monitoring are made), to represent the latest year of ratified data.

**Table 6-3: Relevant Defra Mapped Annual Mean Background Concentrations**

| Pollutant | Reference Year | 2018 Annual Mean Concentration (µg/m$^3$) |
|---|---|---|
| $NO_2$ | 2018 | 9.5 – 13.6 |

### 6.1.3 Nitric Acid

$HNO_3$ is not routinely measured in the UK. Background concentrations are assumed to be negligible. All Site sources of $HNO_3$ have been modelled (A006 is the only source on-Site that releases $HNO_3$).

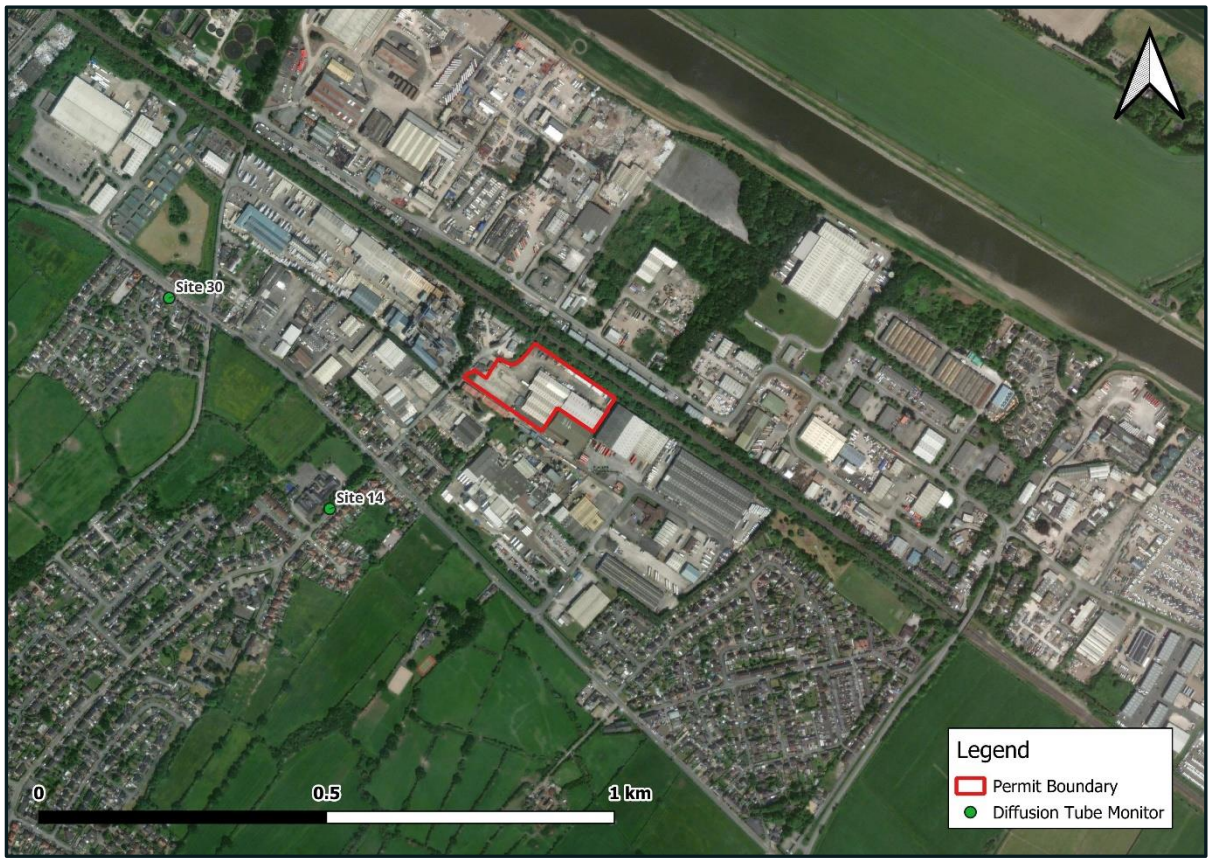
### 6.1.4 Applied Background Concentrations

The applied annual mean backgrounds in relation to the assessment of human health are provided in Table 6-4 below, based on the review of available data.

**Table 6-4: Applied Long Term Background Concentrations**

| Pollutant | Unit | Annual Mean Concentration | Data Source |
|---|---|---|---|
| $NO_2$ | µg/m$^3$ | 24.9 | $NO_2$ Montiroing: Site 30 - 2016 Dataset<br>Maximum $NO_2$ value reported across the human health study area. Based on a review of the data, $NO_2$ concentrations vary across the study area. Using this dataset is likely to overestimate impacts, as it assumes that the maximum reported value (applicable at roadside locations), coincides with the maximum impact throughout the entire study area. |
| $HNO_3$ | µg/m$^3$ | Negligible | - |

**Figure F: Air Quality Baseline Datasets**




## 6.2 Ecological Receptors

APIS is a support tool for the assessment of potential effects of air pollutants on habitats and species, developed in partnership by the UK conservation agencies and regulatory agencies and the Centre for Ecology and Hydrology. APIS has been used to provide information on the input parameters used in relation to the ecological impact assessment, where available. This includes,

- Critical Loads / Levels;
- Baseline conditions; and
- Habitat type and sensitivity to atmospheric emissions.

Background concentrations and deposition rates are calculated via a Concentration Based Estimated Deposition (CBED) approach based upon measured-interpolated data for a three-year rolling mean average (presently 2019 – 2021).

APIS provides assessment information for SSSIs, SPAs and SACs – providing minimum / maximum data across the full extent of each designation. These have been collated to demonstrate the variability on conditions. For the purposes of conducting an initial screening assessment, worst-case input parameters have been used at the point of maximum impact i.e. maximum reported baseline conditions and minimum Critical Level / Load.

The most sensitive habitat listed on APIS (that is present in the study area) has been used to provide a worst-case assessment. In the absence of reported data, assessment information provided for underlying ecological designations has been used where available – and disclosed.

For the assessment of other designations, assessment information was obtained via the 'site relevant critical load search' using the NGR for the location of maximum PC relative to the assessed habitat. Assumptions regarding the primary habitat type present at each affected designation have been made based upon online literature and satellite imagery.

Table A-5 provides details of any other overarching assumptions used to refine the ecological impact assessment.

### 6.2.1 Critical Levels

Information used in the assessment of potential Critical Level impacts alongside current baseline conditions is provided in Appendix A.

Where there is optionality, the lower Critical Level has been adopted as a worst-case screening assessment.

### 6.2.2 Critical Loads

#### 6.2.2.1 Nutrient Nitrogen

Information used in the assessment of potential nutrient nitrogen impacts is provided in Appendix A.

Nutrient nitrogen Critical Loads are habitat / species specific (derived from a range of experimental studies). Critical Loads are often reported in ranges, representing the variation in ecosystem responses.

For the assessment of SSSIs, SPAs and SACs, the appropriate nutrient nitrogen Critical Load range has been identified via APIS. For other designations, a Critical Load range has been assigned with use of APIS guidance[10] - based upon an assumed primary habitat.

#### 6.2.2.2 Acidification

Information used in the assessment of potential acidification impacts are provided in Appendix A.

Acidification Critical Loads are dependent on soil chemistry, as well as habitat type. In the UK, empirical Critical Loads have been assigned at a 1km grid square resolution. This is based upon the mineralogy and chemistry of the dominant soil series present in the grid square.

[10] https://www.apis.ac.uk/sites/default/files/downloads/APIS%20critical_load_range_document.pdf

# 7.0 Predicted Air Quality Impacts

## 7.1 Human Health

Results presented herein relate to the maximum ground level PC predicted across the entirety of the gridded receptors irrespective of relevant exposure, and as such, represents a conservative outlook. PCs predicted at all other locations, including human receptor locations would be lower.

### 7.1.1 Long-Term Impacts

Predicted long-term impacts are summarised in Table 7-1.

**Table 7-1: Predicted Maximum Ground Level Long-Term Impacts**

| AQAL | | | PC (µg/m$^3$) | PC % of AQAL | PEC (µg/m$^3$) | PEC % of AQAL |
|---|---|---|---|---|---|---|
| Pollutant | Period | µg/m$^3$ | | | | |
| $NO_2$ | Annual | 40 | 3.8 | 9.4 | 28.7 | 71.7 |
| $HNO_3$ | Annual | 52 | 1.2 | 2.3 | 1.2 | 2.3 |
| **Table Notes:**<br>The PEC has only been calculated where the PC is 1% or above. | | | | | | |

Maximum modelled PCs are >1% of the respective AQALs. An isopleth of modelled PCs vs the AQAL is provided in Appendix B. Despite this, maximum modelled PECs are below the AQAL. Impacts can be considered insignificant.

### 7.1.2 Short-Term Impacts

Predicted short-term impacts are summarised in Table 7-2.

**Table 7-2: Predicted Maximum Ground Level Short-Term Impacts**

| AQAL | | | PC (µg/m$^3$) | PC % of AQAL | PEC (µg/m$^3$) | PEC % of AQAL |
|---|---|---|---|---|---|---|
| Pollutant | Period | µg/m$^3$ | | | | |
| NO2 | 1-Hour (99.79%ile) | 200 | 21.6 | 10.8 | 71.4 | 35.7 |
| HNO3 | 1-Hour | 1,000 | 15.7 | 1.6 | - | - |
| **Table Notes:**<br>The PEC has only been calculated where the PC is 10% or above. | | | | | | |

Maximum modelled $NO_2$ PCs are >10% of the AQAL. An isopleth of modelled PCs vs the AQAL is provided in Appendix B. Despite this, maximum modelled PEC is below the AQAL. Impacts can be considered insignificant.

## 7.2 Sensitive Ecosystems

Results presented herein relate to the maximum modelled impact at each individual ecological designation requiring assessment. This represents a conservative outlook. PCs predicted across the remainder of each designation would be lower.

### 7.2.1 Critical Levels

#### 7.2.1.1 Long-Term Impacts

Table 7-3 details the maximum predicted long-term Critical Level impacts on sensitive ecosystems.

**Table 7-3: Maximum Predicted Long-Term Ecological Impacts**

| Site | Type | NOx Annual Mean Critical Level | |
|---|---|---|---|
| | | PC (µg/m$^3$) | PC as % Critical Level |
| E1 | AW | <0.1 | <0.1 |
| E2 | AW | <0.1 | <0.1 |
| E3 | AW | <0.1 | <0.1 |
| E4 | SAC | <0.1 | <0.1 |
| E5 | SAC | <0.1 | <0.1 |
| E6 | SAC | <0.1 | <0.1 |
| E7 | SAC | <0.1 | <0.1 |
| E8 | SAC | 0.1 | 0.2 |
| E9 | SPA | <0.1 | <0.1 |
| E10 | SPA | <0.1 | <0.1 |
| E11 | SSSI | 0.1 | 0.2 |

Maximum predicted PCs are below the relevant assessment criteria at each designation. Impacts can therefore be considered insignificant.

#### 7.2.1.2 Short-Term Impacts

Table 7-4 details the maximum predicted short-term Critical Level impacts on sensitive ecosystems.

**Table 7-4: Maximum Predicted Short-Term Ecological Impacts**

| Site | Type | NOx 24-Hour Mean Critical Level | |
|---|---|---|---|
| | | PC (µg/m$^3$) | PC as % Critical Level |
| E1 | AW | <0.1 | <0.1 |
| E2 | AW | <0.1 | 0.1 |
| E3 | AW | 0.1 | 0.1 |
| E4 | SAC | <0.1 | <0.1 |
| E5 | SAC | <0.1 | 0.1 |
| E6 | SAC | <0.1 | <0.1 |
| E7 | SAC | <0.1 | <0.1 |
| E8 | SAC | 0.3 | 0.4 |
| E9 | SPA | <0.1 | <0.1 |
| E10 | SPA | <0.1 | 0.1 |

| Site | Type | NOx 24-Hour Mean Critical Level | |
|---|---|---|---|
| | | PC (µg/m$^3$) | PC as % Critical Level |
| E11 | SSSI | 0.3 | 0.4 |

Maximum predicted PCs are below the relevant assessment criteria at each designation. Impacts can therefore be considered insignificant.

### 7.2.2 Critical Loads

#### 7.2.2.1 Nutrient Nitrogen

Table 7-5 details the maximum predicted nutrient nitrogen Critical Load impacts on sensitive ecosystems.

**Table 7-5: Maximum Predicted Nutrient Nitrogen Deposition Impacts**

| Site | Type | PC | Critical Load | PC as % Critical Load | |
|---|---|---|---|---|---|
| | | (kg/ha/yr) | | Minimum | Maximum |
| E1 | AW | 0.001 | 10 - 15 | <0.1 | <0.1 |
| E2 | AW | 0.001 | 10 - 15 | <0.1 | <0.1 |
| E3 | AW | 0.002 | 10 - 15 | <0.1 | <0.1 |
| E4 | SAC | 0.001 | 10 - 15 | <0.1 | <0.1 |
| E5 | SAC | 0.004 | 5 - 15 | 0.1 | <0.1 |
| E6 | SAC | 0.001 | 5 - 15 | <0.1 | <0.1 |
| E7 | SAC | 0.001 | 10 - 15 | <0.1 | <0.1 |
| E8 | SAC | 0.046 | 10 - 15 | 0.5 | 0.3 |
| E9 | SPA | 0.001 | 5 - 10 | <0.1 | <0.1 |
| E10 | SPA | 0.004 | 5 - 10 | 0.1 | <0.1 |
| E11 | SSSI | 0.036 | 10 - 20 | 0.4 | 0.2 |

All long-term PCs are below the relevant designation-specific assessment criteria. Impacts are therefore considered to be insignificant.

#### 7.2.2.2 Acidification

Table 7-6 details the maximum predicted acidification Critical Load impacts on sensitive ecosystems.

**Table 7-6: Acid Deposition Impacts at Ecological Receptors**

| Site | Type | Sensitivity [(A)] | Applied Critical Load (MaxN/MaxS) | PC | PC as % |
|---|---|---|---|---|---|
| | | | (keq/ha/yr) | | |
| E1 | AW | N | 1.811 | <0.001 | <0.1 |
| E2 | AW | N | 1.813 | <0.001 | <0.1 |
| E3 | AW | N | 1.808 | <0.001 | <0.1 |

| Site | Type | Sensitivity [A] | Applied Critical Load (MaxN/MaxS) (keq/ha/yr) | PC | PC as % |
|---|---|---|---|---|---|
| E4 | SAC | N | 1.720 | <0.001 | <0.1 |
| E5 | SAC | N | 1.329 | <0.001 | <0.1 |
| E6 | SAC | N | 1.329 | <0.001 | <0.1 |
| E7 | SAC | N | 1.075 | <0.001 | <0.1 |
| E8 | SAC | N | 1.075 | 0.003 | 0.3 |
| E9 | SPA | N | 4.856 | <0.001 | <0.1 |
| E10 | SPA | N | 4.856 | <0.001 | <0.1 |
| E11 | SSSI | No information on APIS | | | |

**Table Notes:**

[A] Whether Nitrogen or Sulphur is the principal constraint in the local setting (Critical Load Function).

All long-term PCs are below the relevant designation-specific assessment criteria. Impacts can be considered insignificant.

# 8.0 Conclusions

The conclusions of the detailed atmospheric dispersion modelling assessment of emissions to air on sensitive human and ecological receptor locations arising from the relocation of A006 are as follows:

- Maximum predicted pollutant concentrations are well below the human health AQALs; and
- Maximum predicted impacts on designated sensitive habitats are considered insignificant.

# Appendix A Ecological Input Parameters

## Air Emissions Risk Assessment

**Environmental Permit Variation**

**FMC Agro Limited**

SLR Project No.: 410.065838.00001

24 May 2024

# A.1 Critical Levels

### Table A-1: Baseline Annual Mean NOx Conditions: Ecological Receptors

| Site | Name | Type | Critical Level (µg/m$^3$) | NGR (Max Impact) | | Baseline NOx (µg/m$^3$) |
|---|---|---|---|---|---|---|
| | | | | X | Y | |
| E1 | Unnamed (36427) | AW | 30 | 332295 | 365606 | 9.9 |
| E2 | Unnamed (37657) | AW | 30 | 331600 | 366040 | 11.2 |
| E3 | Unnamed (37658) | AW | 30 | 332004 | 366425 | 10.8 |
| E4 | Deeside and Buckley Newt sites | SAC | 30 | 329888 | 368538 | 7.6 - 12.2 |
| E5 | Dee Estuary / Aber Dyfrdwy (Wales) | SAC | 30 | 331415 | 369110 | 5.2 - 14.7 |
| E6 | Dee Estuary / Aber Dyfrdwy (England) | SAC | 30 | 330199 | 373316 | 5.2 - 14.7 |
| E7 | River Dee and Bala Lake / Afon Dyfrdwy a Llyn Tegid (England) | SAC | 30 | 338588 | 365400 | 2.9 - 20.2 |
| E8 | River Dee and Bala Lake / Afon Dyfrdwy a Llyn Tegid (Wales) | SAC | 30 | 332861 | 368181 | 2.9 - 20.2 |
| E9 | The Dee Estuary (England) | SPA | 30 | 330734 | 373276 | 5.2 - 14.7 |
| E10 | The Dee Estuary (Wales) | SPA | 30 | 331415 | 369110 | 5.2 - 14.7 |
| E11 | Afon Dyfrdwy (River Dee) | SSSI | 30 | 332861 | 368181 | 2.9 - 16.3 |

### Table A-2: Baseline 24-Hour Mean NOx Conditions: Ecological Receptors

| Site | Name | Type | Critical Level (µg/m$^3$) | NGR (Max Impact) | | Baseline NOx (µg/m$^3$) |
|---|---|---|---|---|---|---|
| | | | | X | Y | |
| E1 | Unnamed (36427) | AW | 75 | 332289 | 365602 | 19.9 |
| E2 | Unnamed (37657) | AW | 75 | 331621 | 366020 | 22.3 |
| E3 | Unnamed (37658) | AW | 75 | 332004 | 366425 | 21.5 |
| E4 | Deeside and Buckley Newt sites | SAC | 75 | 329888 | 368538 | 15.3 - 24.5 |
| E5 | Dee Estuary / Aber Dyfrdwy (Wales) | SAC | 75 | 331415 | 369110 | 10.4 - 29.3 |
| E6 | Dee Estuary / Aber Dyfrdwy (England) | SAC | 75 | 330199 | 373316 | 10.4 - 29.3 |

| Site | Name | Type | Critical Level (µg/m$^3$) | NGR (Max Impact) | | Baseline NOx (µg/m$^3$) |
|---|---|---|---|---|---|---|
| | | | | X | Y | |
| E7 | River Dee and Bala Lake / Afon Dyfrdwy a Llyn Tegid (England) | SAC | 75 | 338588 | 365400 | 5.7 - 40.4 |
| E8 | River Dee and Bala Lake / Afon Dyfrdwy a Llyn Tegid (Wales) | SAC | 75 | 333468 | 367817 | 5.7 - 40.4 |
| E9 | The Dee Estuary (England) | SPA | 75 | 330624 | 373282 | 10.4 - 29.3 |
| E10 | The Dee Estuary (Wales) | SPA | 75 | 331415 | 369110 | 10.4 - 29.3 |
| E11 | Afon Dyfrdwy (River Dee) | SSSI | 75 | 333468 | 367817 | 5.7 - 32.5 |

## A.2 Critical Loads

### Table A-3: Nutrient Nitrogen Critical Loads and Baseline Deposition Rates

| Site | Type | Feature / Habitat | Nitrogen Class | Approach | NGR (Max Impact) | | Deposition Velocity | Critical Load Range (Min – Max) | Baseline Rate |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | X | Y | | (kgN/ha/yr) | |
| E1 | AW | Broadleaved, Mixed and Yew Woodland | Broadleaved deciduous woodland | - | 332295 | 365606 | Woodland | 10 - 15 | 36.11 |
| E2 | AW | Broadleaved, Mixed and Yew Woodland | Broadleaved deciduous woodland | - | 331600 | 366040 | Woodland | 10 - 15 | 34.89 |
| E3 | AW | Broadleaved, Mixed and Yew Woodland | Broadleaved deciduous woodland | - | 332004 | 366425 | Woodland | 10 - 15 | 35.48 |
| E4 | SAC | Old sessile oak woods with Ilex and Blechnum in the British Isles | Acidophilous Quercus forest | - | 329888 | 368538 | Woodland | 10 - 15 | 31.5 - 34.5 |
| E5 | SAC | European dry heaths | Dry heaths | - | 331415 | 369110 | Grassland | 5 - 15 | 13.6 - 19.8 |
| E6 | SAC | European dry heaths | Dry heaths | - | 330199 | 373316 | Grassland | 5 - 15 | 13.6 - 19.8 |
| E7 | SAC | Old sessile oak woods with Ilex and Blechnum in the British Isles | Acidophilous Quercus forest | Second most sensitive habitat / N class adopted [(A)] | 338588 | 365400 | Woodland | 10 - 15 | 14.7 - 26.1 |
| E8 | SAC | Old sessile oak woods with Ilex and Blechnum in the British Isles | Acidophilous Quercus forest | Second most sensitive habitat / N class adopted [(A)] | 332861 | 368181 | Woodland | 10 - 15 | 21.5 - 45.7 |
| E9 | SPA | Sterna albifrons (Eastern Atlantic - breeding) | Coastal dune grasslands (grey dunes) - acid type | - | 330734 | 373276 | Grassland | 5 - 10 | 14.7 - 26.1 |
| E10 | SPA | Sterna albifrons (Eastern Atlantic - breeding) | Coastal dune grasslands (grey dunes) - acid type | - | 331415 | 369110 | Grassland | 5 - 10 | 21.5 - 45.7 |
| E11 | SSSI | Salt-marsh (Elymus repens saltmarsh) | Atlantic upper-mid & mid-low salt marshes | Second most sensitive habitat / N class adopted [(A)] | 332861 | 368181 | Grassland | 10 - 20 | 13.6 - 19.8 |

**Table Notes:**

[(A)] Most sensitive feature / N class not present in study area (Table A-5).

## Table A-4: Acid Critical Load Functions and Baseline Deposition Rates

| Site | Type | Feature | Habitat/Acidity Class | Approach | Deposition Velocity | NGR (Max Impact) | | Critical Load | | | Baseline Deposition (A) | | Sensitivity (B) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | X | Y | CLminN | CLmaxN | CLmaxS | N | S | |
| | | | | | | | | (keq/ha/yr) | | | | | |
| E1 | AW | Broadleaved, Mixed and Yew Woodland | Broadleafed/Coniferous unmanaged woodland | - | Woodland | 332295 | 365606 | 0.357 | 1.811 | 1.454 | 2.58 | 0.22 | N |
| E2 | AW | Broadleaved, Mixed and Yew Woodland | Broadleafed/Coniferous unmanaged woodland | - | Woodland | 331600 | 366040 | 0.357 | 1.813 | 1.456 | 2.49 | 0.23 | N |
| E3 | AW | Broadleaved, Mixed and Yew Woodland | Broadleafed/Coniferous unmanaged woodland | - | Woodland | 332004 | 366425 | 0.357 | 1.808 | 1.451 | 2.53 | 0.23 | N |
| E4 | SAC | Old sessile oak woods with Ilex and Blechnum in the British Isles | Unmanaged Broadleafed/Coniferous Woodland | - | Woodland | 329888 | 368538 | 0.142 | 1.720 | 1.448 | 2.34 | 0.27 | N |
| E5 | SAC | European dry heaths | Dwarf shrub heath | - | Grassland | 331415 | 369110 | 0.499 | 1.329 | 0.450 | 1.41 | 0.21 | N |
| E6 | SAC | European dry heaths | Dwarf shrub heath | - | Grassland | 330199 | 373316 | 0.499 | 1.329 | 0.450 | 1.3 | 0.24 | N |
| E7 | SAC | Old sessile oak woods with Ilex and Blechnum in the British Isles | Unmanaged Broadleafed/Coniferous Woodland | Second most sensitive habitat / acidity class adopted (C) | Woodland | 338588 | 365400 | 0.142 | 1.075 | 0.743 | 2.92 | 0.22 | N |
| E8 | SAC | Old sessile oak woods with Ilex and Blechnum in the British Isles | Unmanaged Broadleafed/Coniferous Woodland | Second most sensitive habitat / acidity class adopted (C) | Woodland | 332861 | 368181 | 0.142 | 1.075 | 0.743 | 2.44 | 0.24 | N |
| E9 | SPA | Sterna albifrons (Eastern Atlantic - breeding) | Calcareous grassland (using base cation) | - | Grassland | 330734 | 373276 | 0.856 | 4.856 | 4.000 | 1.3 | 0.24 | N |

| Site | Type | Feature | Habitat/Acidity Class | Approach | Deposition Velocity | NGR (Max Impact) | | Critical Load | | | Baseline Deposition (A) | | Sensitivity (B) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | X | Y | CLminN | CLmaxN | CLmaxS | N | S | |
| | | | | | | | | (keq/ha/yr) | | | | | |
| E10 | SPA | Sterna albifrons (Eastern Atlantic - breeding) | Calcareous grassland (using base cation) | - | Grassland | 331415 | 369110 | 0.856 | 4.856 | 4.000 | 1.41 | 0.21 | N |
| E11 | SSSI | Various | Freshwater | No information - excluded. | - | - | - | No information on APIS (D) | | | - | - | - |

**Table Notes:**

(A) Identified via search by location – at the location of maximum impact

(B) APIS Critical Load Function outcome

(C) Most sensitive feature / acidity class not present in study area (Table A-5)

(D) No information on APIS for freshwater habitats.

## Table A-5: Ecological Assessment Approach

| ID | Issue | Approach | Justification |
|---|---|---|---|
| E1 – E3 | No information on APIS | Assumed broadleaved woodland | E1-E3 represent AW. |
| E7, E8 and E11 | APIS habitat: Permanent oligotrophic lakes, ponds and pools (including softwater lakes) | Excluded from assessment. Adopt the next sensitive habitat present. | Based on a review of satellite imagery and online literature, this habitat is not believed to be present in the study area.<br>APIS states:<br>*"This critical load only applies if the interest feature is associated with softwater oligotrophic or dystrophic lakes at the site. If the feature is not depending on these lake types, there is no comparable critical load available.*<br>The area is not believed to be associated with or dependant on softwater oligotrophic or dystrophic lakes. |
| E11 | Acidification – No assessment reported on APIS | Not assessed. | No data available. E8 (SAC) covers E11 which can be used as a benchmark for impacts. |

# Appendix B Isopleths

## Air Emissions Risk Assessment

**Environmental Permit Variation**

**FMC Agro Limited**

SLR Project No.: 410.065838.00001

24 May 2024

**Figure B-1: Annual Mean $NO_2$ PC % of AQAL**

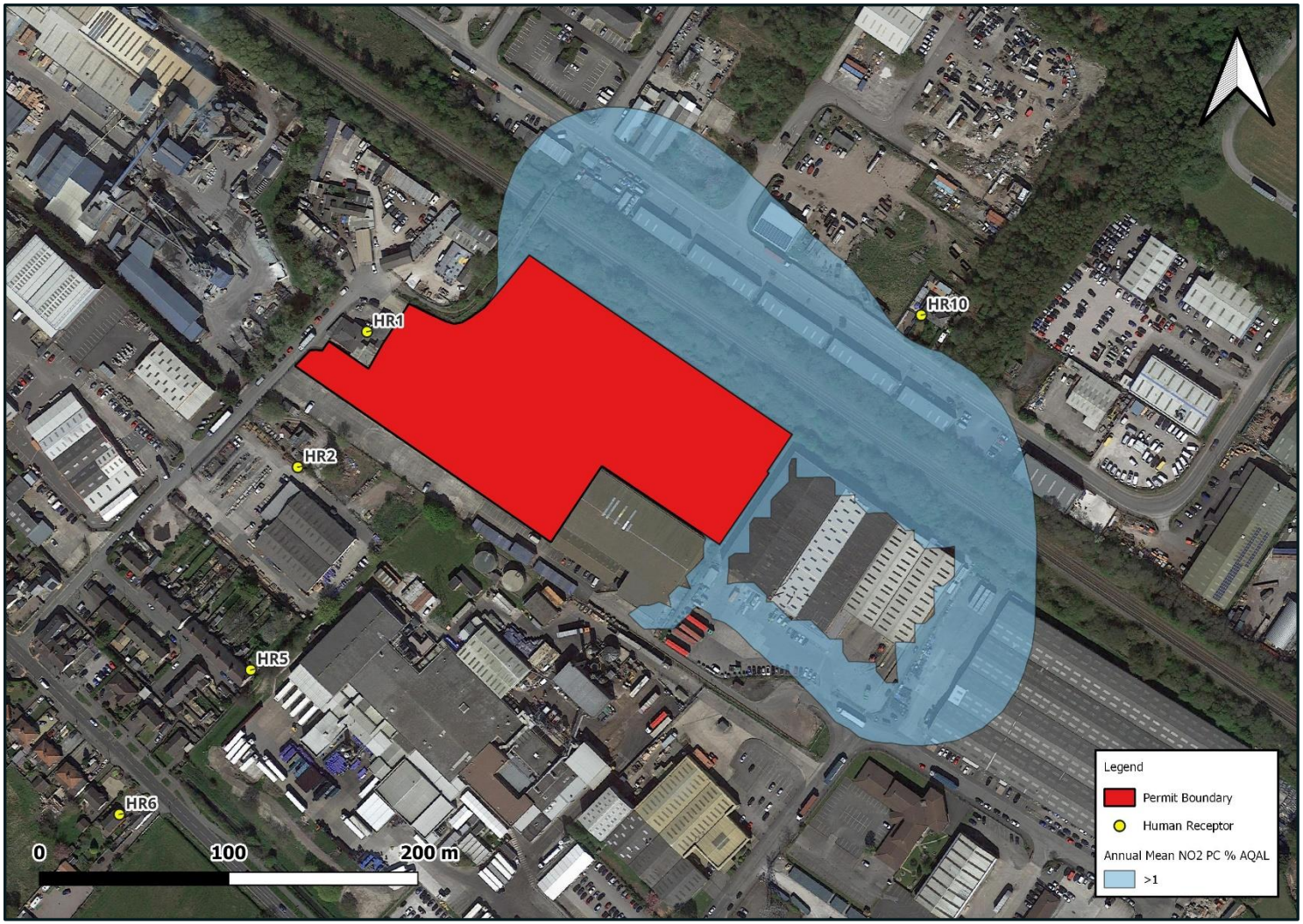
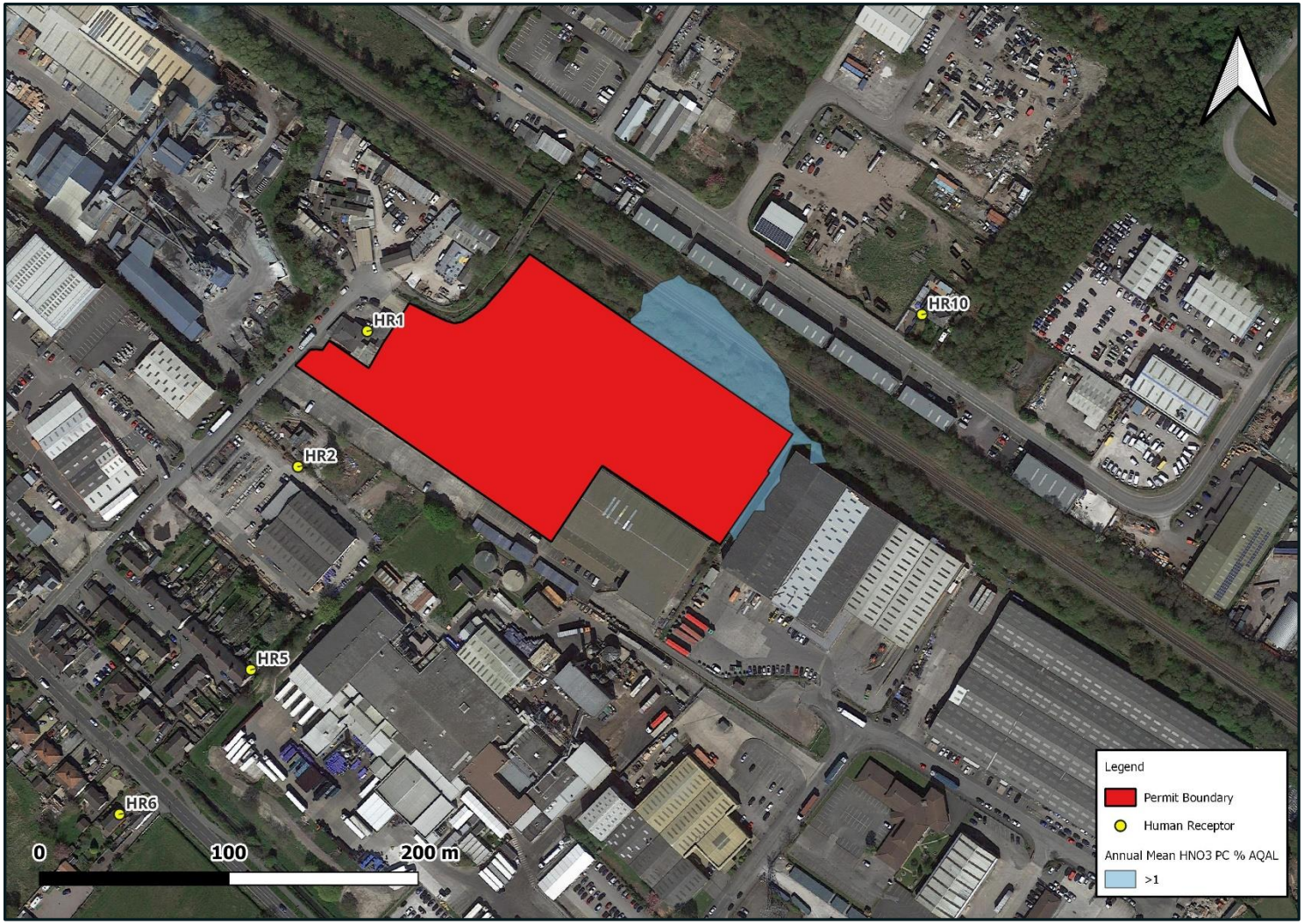


**Figure B-2: 1-Hour Mean $NO_2$ PC % of AQAL**

**Figure B-3: Annual Mean $HNO_3$ PC % of AQAL**



# Appendix C Modelling Checklist

## Air Emissions Risk Assessment

### Environmental Permit Variation

**FMC Agro Limited**

SLR Project No.: 410.065838.00001

24 May 2024

**Table C-1: Modelling Checklist**

| Item | Yes / No | Details / Reason for Omission |
|---|---|---|
| Location map | Yes | Figure A |
| Site plan | Yes | Figure A and Figure D |
| Pollutants modelled | Yes | Section 4.2 |
| Relevant environmental standards | Yes | Section 3.0 |
| Details of modelled scenarios | Yes | Section 4.0 |
| Details of relevant ambient concentrations | Yes | Section 6.0 |
| Model description and justification | Yes | Section 5.1 |
| Special model treatment used | Yes | N/A |
| Table of emission parameters used | Yes | Table 4-2 and Table 4-3 |
| Details of modelled domain and receptors | Yes | Section 5.2 |
| Details of meteorological data used | Yes | Section 5.5 |
| Details of terrain treatment | Yes | Section 5.3 |
| Details of building treatment | Yes | Section 5.4 |
| Model uncertainty and sensitivity | Yes | Section 5.9 |
| Assessment of impacts | Yes | Section 7.0 |
| Contour plots | Yes | Appendix B |
| Model input files | Yes | Appendix D |

# Appendix D Model Files

## Air Emissions Risk Assessment

**Environmental Permit Variation**

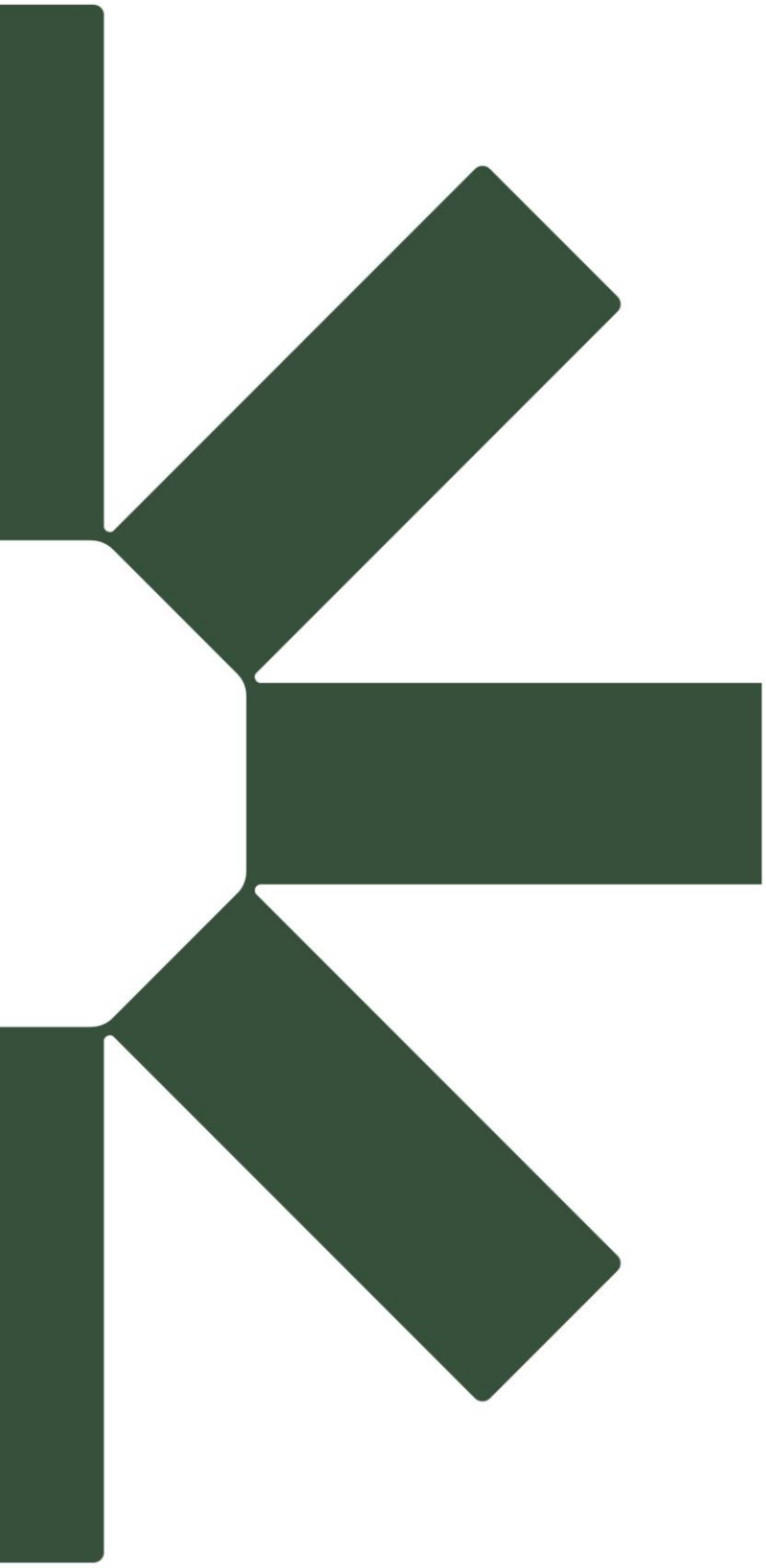
**FMC Agro Limited**

SLR Project No.: 410.065838.00001

24 May 2024

# D.1 Electronic Model Files

File Name: FMC Agro_V0.1_2017



Making Sustainability Happen