Air Emissions Risk Assessment

Thornton Park Manufacturing Facility Environmental Permit Variation Application

Thorntons Limited

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Basis of Report

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1.0 Introduction

SLR Consulting Limited (SLR) has been instructed by Thorntons Limited (Thorntons) to prepare an application for an Environmental Permit (EP) variation of the bespoke EP (EPR/WP3639QM) for the Thorntons confectionery manufacturing facility (Installation) located at Thornton Park, Somercotes, Alfreton, Derbyshire, DE55 4XJ ("the Site").

This report provides an Air Emissions Risk Assessment (AERA) to support the EP variation application.

1.1 Background

1.1.1 Existing Emissions to Air

The Site is currently permitted as a Part A(1) activity as described in the Environmental Permitting (England and Wales) Regulations (EPR) 2016 (as amended). The Site currently has several permitted emissions to air:

- A1 – 3.7 MWth input steam raising boiler
- A2 – 3.7 MWth input steam raising boiler
- A3 – 3.7 MWth input steam raising boiler
- A5 – 0.15 MWth input boiler
- A7 – 1.67 MWth input (3 x 556 kWth boiler)
- A8 – 1.11 MWth input (2 x 556 kWth boiler)
- A9 – 3.6 MWth input Combined Heating and Power Plant (CHP).

Note that previous permit sources stack A4 and A6 have been decommissioned and are not in current use, as such have been removed from the AERA.

1.1.2 The Proposed Plant

This EP variation does not alter any of the above emissions to air. The proposed changes as detailed in the EP variation application do include additional emissions to air:

- Buhler oven serving the FCE waffle manufacturing process
  - B1.1 - Oven Exhaust - Front head
  - B1.2 - Oven Exhaust - Baking Chamber
- Steam raising boiler (serving the Nutella hazelnut roaster). Two boilers are proposed one of which will be a standby, therefore only one boiler will operate at any one time
  - D1 - Steam Generator (duty)
  - D2 - Steam Generator (standby)
- New Nutella line dust extract points
  - C1.1: Nutella sugar storage silo dryer.
  - C2: Nutella sugar feed / discharge conveying dryer
  - C3: Nutella BIG BAG dumping area skimmed milk / cocoa dryer
- Hazelnut steam roaster
  - C4: Hazelnut cleaning destoning
  - C5: Hazelnut heat chamber 1
  - C5.1: Hazelnut heat chamber 2
  - C5.2: Hazelnut cooling chamber

- C6: Hazelnut roaster brushing
- C7: Hazelnut roaster grinding mill.

1.2 Objective and Scope

1.2.1 Air Emissions Risk Assessment

The scope of the dispersion modelling assessment is limited to pollutant releases of nitrogen oxide (NO_X) and particulate matter (PM as dust) from the proposed plant.

Therefore, the objective of the study is to assess the impact of NO_X, and PM emissions against the relevant Air Quality Standards for the protection of human health and where necessary the relevant Critical Levels (C_{Le}) (NO_X) and Critical Loads (C_{Lo}) (for Nitrogen (N) and acid deposition) for the protection of designated ecological receptors.

To maintain a conversative approach all emissions of PM from modelled sources have been considered as PM_{10}.

1.2.2 Assessment of Odour

The scope of the odour assessment is limited to the proposed plant and will assess the impact of the proposed odour sources on local receptors.

2.0 Legislation and Relevant Guidance

2.1 Environmental Permitting Guidance

The facility is regulated under the Environmental Permitting (England and Wales) Regulations 2016 (as amended) (EPR).

Online permitting guidance provides a framework for the regulation of installations and additional technical guidance are used to provide the basis for permit conditions. Of relevance to the assessment is the AERA guidance[1]. The purpose of this guidance is to assist operators to assess risks to the environment and human health when applying for, or varying, a permit under the EPR.

2.2 National Air Quality Legislation and Guidance

2.2.1 Air Quality Standards

The Air Quality Standards (England) Regulations 2010 (the AQSR) transpose the Air Quality Directive (2008/50/EC) and Fourth Daughter Directive (2004/107/EC) into UK legislation.

The regulations include Limit Values, Target Values, Objectives, Critical Levels and Exposure Reduction Targets for the protection of human health and the environment.

Following the UK's withdrawal from the EU, the Environment (Miscellaneous Amendments) (EU Exit) Regulations 2020[2] was introduced to mirror revisions to supporting EU legislation.

2.2.2 Air Quality Strategy

The latest Air Quality Strategy (AQS) for England was published in 2023[3]. The AQS provides the delivery framework for air quality management across England for local authorities and summarises the air quality standards and objectives operable within England for the protection of public health and the environment.

The ambient air quality objectives of relevance to human receptors in this assessment are provided in Table 2-1 and are taken from the AQSR and AERA guidance, these are collectively termed Air Quality Assessment Levels (AQALs) throughout this report.

The AQS objectives apply at locations where members of the public are regularly present and might reasonably be expected to be exposed to pollutant concentrations over the relevant averaging period (defined as 'relevant exposure').

Table 2-1: Applied Air Quality Assessment Levels (AQALs)

Pollutant	AQAL (µg/m^3)	Measured as	
Nitrogen dioxide (NO_2)	40	Annual mean	-
	200	1 hour mean	1-hour mean (not to be exceeded on more than 18 occasions per annum)
Nitrogen oxides (1) (NOx)	30	Annual mean	-

[1] https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit - accessed December 2024

[2] The Environment (Miscellaneous Amendments) (EU Exit) Regulations 2020, Statutory Instrument No. 1313, The Stationary Office Limited.

[3] Air Quality Strategy: Framework for Local Authority Delivery, Defra, (2023).

Pollutant	AQAL (µg/m^3)	Measured as	
Particulate Matter (PM_{10})	40	Annual mean	-
	50	24 hour mean	24-hour mean (not to be exceeded more than 35 times per year

Table 2.1 Note (1) Regarding protection of vegetation

Table 2-2: Relevant Public Exposure

Averaging Period	Relevant Locations	Standards should apply at:	Standards don't apply at:
Annual mean	Where individuals are exposed for a cumulative period of six months in a year	Building facades of residential properties, schools, hospitals etc.	Facades of offices Hotels Gardens of residences Kerbside sites
24-hour mean	Where individuals may be exposed for eight hours or more in a day	As above together with hotels and gardens of residential properties	Kerbside sites where public exposure is expected to be short term
1-hour mean	Where individuals might reasonably be expected to spend one hour or longer	As above together with hotels, gardens of residential properties, kerbside sites of regular access, car parks, bus stations etc.	Kerbside sites where public would not be expected to have regular access

2.3 Local Air Quality Management

Part IV of the Environment Act 1995 requires local authorities to undergo a process of Local Air Quality Management (LAQM). This requires local authorities to review and assess air quality within their boundaries to determine the likeliness of compliance, regularly and systematically.

Where any of the prescribed AQS objectives are not likely to be achieved, the authority must designate an Air Quality Management Area (AQMA). For each AQMA, the local authority is required to prepare an Air Quality Action Plan (AQAP), which details measures the authority intends to introduce to deliver improvements in local air quality in pursuit of the objective.

Defra has published technical guidance for use by local authorities in their LAQM review and assessment work[4] – referred to as LAQM.TG(22) throughout this report.

2.4 Protection of Ecological Receptors

Sites of nature conservation importance at a European, national and local level are provided environmental protection with respect to air quality. Standards for the protection of ecological receptors are known as C_{Le} for airborne concentrations and C_{Lo} for deposition to land from air.

[4] Local Air Quality Management Technical Guidance 22, Published by Defra in partnership with the Scottish Government, Welsh Government and Department of Agriculture, Environment and Rural Affairs Northern Ireland, (2022).

EA AERA guidance on screening distance for designated ecological sites within the following criteria:

- Within 10km of the Site:
  - special protection areas (SPAs)
  - special areas of conservation (SACs)
  - Ramsar sites (protected wetlands)
- Within 2km of the Site:
  - sites of special scientific interest (SSSIs)
  - local nature sites (ancient woods, local wildlife sites and national and local nature reserves).

2.4.1 Critical Levels (C_{Le})

C_{Le} 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. The relevant C_{Le}'s for the protection of vegetation and ecosystems are presented in Table 2-3.

Table 2-3: Critical Levels for the Protection of Vegetation and Ecosystems

Pollutant	CLe (µg/m^3)	Habitat and Averaging Period
NO_x	30	Annual mean (all ecosystems)
	200 (1)	Daily mean (all ecosystems)

Table 2.3 Note (1) – applied for detailed assessments where the ozone is below the AOT40 critical level and sulphur dioxide is below the lower critical level of 10 micrograms per cubic metre) Refer to Table 4-3.

2.4.2 Critical Loads (C_{Lo})

C_{Lo} 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. C_{Lo} are set for the deposition of various substances to sensitive ecosystems. In relation to combustion emissions C_{Lo} for acidification are relevant which can occur via both wet and dry deposition; however, on a local scale only dry (direct deposition) is considered significant. Deposition of nitrogen can cause eutrophication and acidification; the relevant C_{Lo} are presented in Section 4.1.2.

3.0 Assessment Methodology

3.1 Air Emissions Risk Assessment

Detailed atmospheric dispersion modelling has been undertaken with due consideration to the AERA and dispersion modelling reporting guidance[5] (the dispersion modelling checklist is included in Appendix A). The assessment approach is based upon the following stages:

- review of emission sources;
- compilation of the existing air quality baseline and review of LAQM status;
- screening to identify pollutants requiring dispersion modelling;
- identification of sensitive receptors;
- dispersion modelling; and
- calculation of process contribution to ground level concentrations and evaluation against relevant environmental standards for both human and ecological receptors.

3.1.1 Modelling Scenarios

A single modelled scenario has been accounted for within the assessment. Assuming maximum throughout with plant operating continuously for an entire year.

3.1.2 Quantification of Emissions

The emission parameters applied in the model were based on data from the manufacturer and from existing monitoring reports. The emission parameters applied in the modelling are provided in Table 3-1 and Table 3-2.

[5] Air Dispersion modelling report requirements (for detailed air dispersion modelling). AQMAU, Environment Agency (not dated).

Table 3-1: Modelled Stack Parameters

Source	Pollutant	Stack Location (NGR)		Stack Height (m AGL)	Stack Diameter (m)	Exit Velocity (m/s)	Volume Flow Actual (m^3/s)	Temp (ºC)	Oxygen Content (%)	Moisture Content (%)	Volume Flow Normalised (Nm^3/s) (1)
A1	NOx	441100	354579	10.0	0.39	14.12	1.64	142	3.5	10.6	0.94
A2	NOx	441103	354580	10.0	0.39	14.12	1.64	142	3.5	10.6	0.94
A3	NOx	441106	354580	10.0	0.39	14.12	1.64	140	3.5	10.6	0.94
A5	NOx	441029	354365	8.5	0.10	8.42	0.07	140	3.5	10.6	0.04
A7	NOx	440993	354578	23.0	0.50	4.33	0.85	120	3.5	10.6	0.52
A8	NOx	441033	354431	21.0	0.25	10.00	0.49	140	3.5	10.6	0.30
A9	NOx	441087	354525	22.0	0.39	19.07	2.26	128	10.1	5.3	2.67
B1.1	NOx	441082	354584	10.9	0.40	4.42	0.56	150	5.0	3.8	1.36
B1.2	NOx	441085	354584	10.9	0.60	3.24	0.92	150	5.0	3.8	2.25
C1.1	PM	441235	354364	15.0	0.10	3.80	0.03	25	0.2	1.0	0.03
C2	PM	441191	354357	15.0	0.20	8.91	0.28	25	0.2	1.0	0.26
C3	PM	441164	354365	15.0	0.20	8.91	0.28	25	0.2	1.0	0.26
C4	PM	441154	354356	15.0	0.45	16.22	2.58	25	0.2	0.6	2.36
C5	PM	441152	354356	15.0	0.50	25.46	5.00	100	0.2	0.6	3.66
C5.1	PM	441150	354355	15.0	0.40	19.89	2.50	130	0.2	0.6	1.69
C5.2	PM	441146	354354	15.0	0.45	27.67	4.40	20	0.2	0.6	4.10
C6	PM	441140	354346	15.0	0.25	8.15	0.40	30	0.2	0.5	0.36
C7	PM	441139	354349	15.0	0.25	8.15	0.40	30	0.2	0.5	0.36
D1	NOx	441115	354335	15.0	0.46	3.00	0.50	144	5.0	18.0	0.32
D2	NOx	441100	354332	15.0	0.46	3.00	0.50	144	5.0	18.0	0.32

Table 3.1 Note: (1) Normalised to 273.15k, dry, 101.3kPa, 3% O_2.

Table 3-2: Modelled Emission Rates

Source	Pollutant	NOx Emissions Concentration (mg/Nm^3) (1)	NOx Emissions Rate (g/s)	PM Emissions Concentration (mg/Nm^3) (1) (2)	PM Emissions Rate (g/s)
A1	NOx	250	0.235	-	-
A2	NOx	250	0.235	-	-
A3	NOx	250	0.235	-	-
A5	NOx	77	0.003	-	-
A7	NOx	158	0.082	-	-
A8	NOx	158	0.047	-	-
A9	NOx	95	0.253	-	-
B1.1	NOx	200	0.272	-	-
B1.2	NOx	200	0.450	-	-
C1.1	PM	-	-	10	0.000
C2	PM	-	-	10	0.003
C3	PM	-	-	10	0.003
C4	PM	-	-	10	0.024
C5	PM	-	-	10	0.037
C5.1	PM	-	-	10	0.017
C5.2	PM	-	-	10	0.041
C6	PM	-	-	10	0.004
C7	PM	-	-	10	0.004
D1	NOx	100	0.032	-	-
D2	NOx	100	0.032	-	-

Table 3.2 Note (1) Normalised to 273.15k, dry, 101.3kPa, 3% O_2

Table 3.2 Note (2) Total Dust Modelled as PM_{10} based on upper range of BAT-associated emission levels (BAT-AELs) for channelled dust emissions to air associated with cyclone filters (Section 17. Best Available Techniques (BAT) Reference Document for the Food, Drink and Milk Industries limit based on cyclone filter technology (2019))

3.1.3 Dispersion Model Setup

For this assessment the AERMOD model[6] has been applied; this model is widely used and accepted by the EA for undertaking such assessments and its predictions have been validated against real-time monitoring data by the United States (US) Environmental Protection Agency (EPA). It is therefore considered a suitable model for this assessment.

3.1.4 Model Domain / Receptors

The modelling has been undertaken using a receptor grid across mapping of the study area. Pollutant exposure isopleths have been generated by interpolation between receptor points and superimposed onto the map. This method allows the maximum ground level concentration outside the Site boundary to be assessed. A receptor grid was applied as follows:

- 200m x 200m at 20m grid resolution;
- 500m x 500m at 50m grid resolution;
- 1000m x 1000m at 100m grid resolution; and
- 5000m x 5000m at 500m grid resolution.

In addition, a number of discrete receptor locations at actual exposure locations surrounding the Site have been modelled, as described in Section 4.1, to facilitate the discussion of results.

3.1.5 Building Downwash

Building downwash occurs when turbulence, induced by nearby structures, causes pollutants emitted from an elevated source to be displaced and dispersed rapidly towards the ground, resulting in elevated ground level concentrations. Building downwash has been considered for buildings that have a maximum height equivalent to at least 40% of the emission height and which are within a distance defined as five times the lesser of the height or maximum projected width of the building.

The integrated Building Profile Input Programme (BPIP) module within AERMOD was used to assess the potential impact of building downwash upon predicted dispersion characteristics. Structures input to the model are represented in Figure 3-1.

[6] Software used: Lakes AERMOD View, (V12.0.0)

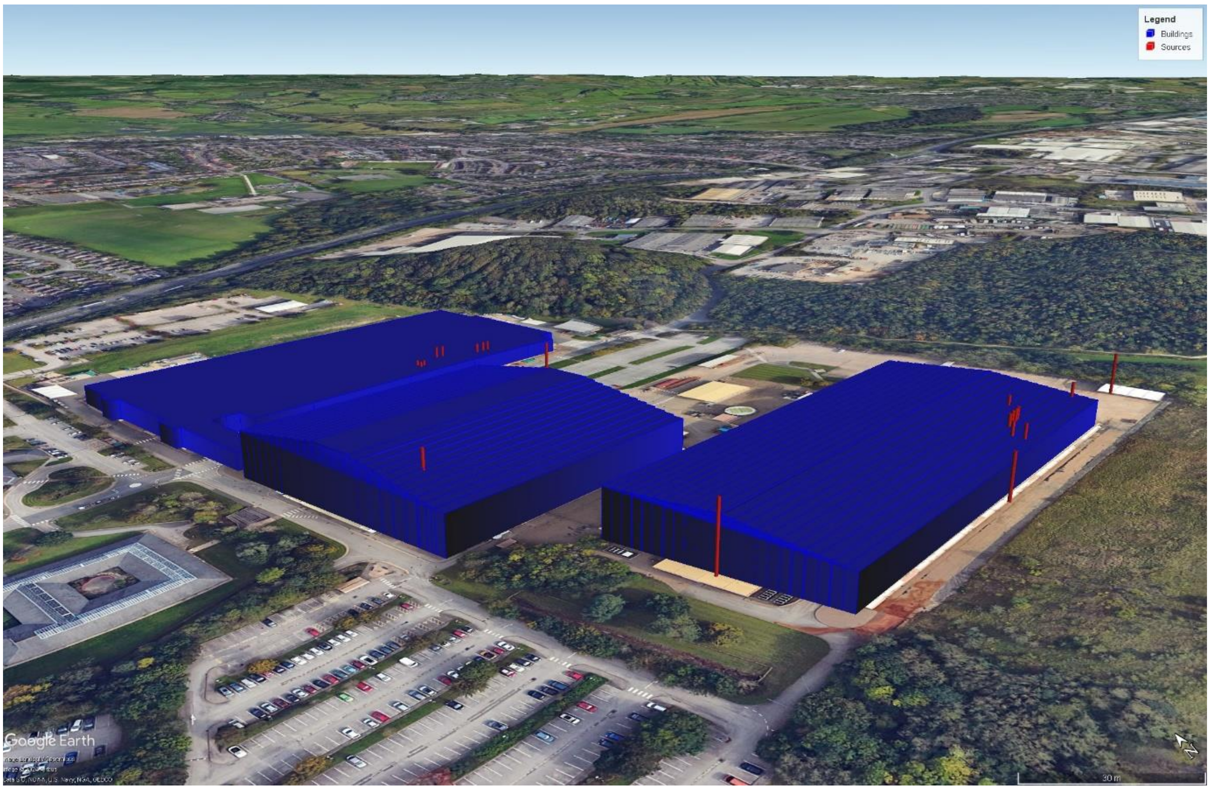

Figure 3-1: Modelled Buildings and Structures

3.1.6 Topography

The presence of elevated terrain can affect the dispersion of pollutants and the resulting ground level concentration in a number of ways. Elevated terrain reduces the distance between the plume centre line and the ground level, thereby increasing ground level concentrations. Elevated terrain can also increase turbulence and, hence, plume mixing with the effect of increasing concentrations near to a source and reducing concentrations further away.

AERMOD utilises digital elevation data to determine the impact of topography on dispersion from a source. Topography was incorporated within the modelling using 30m resolution Shuttle Radar Topography Mission (SRTM) terrain data files. Data was processed by the AERMAP function within AERMOD to calculate terrain heights (see Figure 4-4).

3.1.7 Meteorological Data Preparation

The closest meteorological observation site (that records all the parameters necessary for dispersion modelling) is situated at Nottingham (Watnall) approximately 1.2km southeast. The meteorological data 5 year hourly data for 2019-2023 inclusive) was obtained in. met format from the data supplier and converted to the required surface and profile formats for use in AERMOD using AERMET View meteorological pre-processor.

Details specific to the site location were used to define surface roughness, albedo and bowen ratio in the conversion (see Table 3-3). A windrose is presented in Figure 4-3.

Table 3-3: Meteorological Station Surface Characteristics

Zone (Start)	Zone (End)	Albedo	Bowen Ratio	Surface Roughness (m)
0	30	0.18	0.78	0.171

Zone (Start)	Zone (End)	Albedo	Bowen Ratio	Surface Roughness (m)
30	60	0.18	0.78	0.162
60	90	0.18	0.78	0.187
90	120	0.18	0.78	0.288
120	150	0.18	0.78	0.296
150	180	0.18	0.78	0.242
180	210	0.18	0.78	0.292
210	240	0.18	0.78	0.220
240	270	0.18	0.78	0.206
270	300	0.18	0.78	0.299
300	330	0.18	0.78	0.246
330	0	0.18	0.78	0.256

3.1.8 Dispersion Coefficients

The 'rural' option for dispersion coefficients was selected in accordance with AERMOD guidance[9].

3.1.9 Dispersion Model Uncertainty

Model validation studies[7] for AERMOD generally suggest that these dispersion models are for the vast majority of cases able to predict maximum short-term high percentiles concentrations well within a factor of two and the latest evaluation studies for AERMOD show the composite (geometric mean) ratio of predicted to observed short-term averages from 'test sites' (where real-time monitoring data is available to validate model performance), to be between 0.96 and 1.2.

3.1.10 Treatment of Model Output

The assessment of impacts against the AQALs as defined in Section 3.2 has been undertaken using model output as described in Table 3-4 below.

With respect to NO_x emissions, the EA Air Quality Modelling and Assessment Unit (AQMAU) guidance[8] on conversion ratio for NO_x and NO_2 has been followed, i.e. a worst-case scenario has been applied in that 70% of NO_x is present as NO_2 in relation to long-term impacts and 35% of NO_x is present as NO_2 in relation to short-term impacts.

Table 3-4: Model Outputs

Criteria	Model Output – Process Contribution (PC)	Predicted Environmental Concentration (PEC)
NO_2 1 hour mean. Not to be exceeded more than 18 times a calendar year	99.79%ile of 1-hour mean, factored by 0.35	PC + 2 x annual mean background

[7] AERMOD: Latest Features and Evaluation Results, EPA-454/R-03-003, June 2003 (United States Environmental Protection Agency)

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

Criteria	Model Output – Process Contribution (PC)	Predicted Environmental Concentration (PEC)
NOx 24-hour maximum	Maximum 24-hour mean	PC + 2 x annual mean background
Annual Mean NO_x and NO_2	Annual Mean, factored by 0.7 (for NO_2)	PC + annual mean background
Annual Mean PM_{10}	Annual Mean	PC + annual mean background
PM_{10} 24-hr	24-hour mean 90.4%ile	PC + annual mean background

3.2 Assessment of Emissions Impact and Significance

3.2.1 Assessment of Impacts on Human Health

To assess the potential impact on air quality the predicted exposure is compared to the standards. The results of the dispersion modelling have been presented in the form of:

- tabulated concentrations at discrete receptor locations to facilitate the discussion of results; and
- illustrations of the impact as isopleths (contours of concentration) for the criteria selected, enabling determination of impact at any location within the study area.

In accordance with the AERA guidance, the impact is considered to be insignificant or negligible if:

- the long-term process contribution is <1% of the long-term standard; and
- the short-term process contribution is <10% of the short-term standard.

For process contributions that cannot be considered insignificant further assessment has been undertaken and the Predicted Environmental Concentration (PEC: PC + existing background pollutant concentration) determined for comparison as a percentage of the relevant AQAL.

The AERA guidance indicates that no further assessment is required if the resulting PEC is below the AQAL and the applied emission levels comply with the Best Available Technology (BAT) requirements.

3.2.2 Assessment of Impacts on Vegetation and Ecosystems

3.2.2.1 Calculation of Contribution to Critical Loads

Deposition rates have been calculated using empirical methods recommended by the EA AQTAG06[9]. Dry deposition flux was calculated using the following equation:

Dry deposition flux ($\mu g/m^2/s$) = ground level concentration ($\mu g/m^3$) x deposition velocity (m/s)

Wet deposition occurs via the incorporation of the pollutant into water droplets which are then removed in rain or snow, and is not considered significant over short distances compared with dry deposition and therefore for the purposes of this assessment (in accordance with AQTAG06), wet deposition has not been considered.

[9] AQTAG06 – Technical Guidance on detailed modelling approach for an appropriate assessment for emissions to air. Environment Agency, March 2014 version.

The applied deposition velocities for the relevant chemical species are as shown in Table 3-5.

Table 3-5: Applied Deposition Velocities

Chemical Species	Recommended deposition velocity (m/s)	
NO_2	Grassland	0.0015
	Woodland	0.003

3.2.2.2 Critical Loads – Eutrophication

The C_{Lo} for nitrogen deposition (N) are recorded in units of kgN/ha/yr. The deposition PC is converted from µg/m^2/s to units of kgN/ha/year by multiplying the dry deposition flux by the standard conversion factor of 95.9.

3.2.2.3 Critical Loads – Acidification

The deposition PC is converted to units of equivalents (k_{eq}/ha/year), which is a measure of how acidifying the chemical species can be, by multiplying the deposition rate µg/m^2/s by the standard conversion factor of 6.84.

3.2.2.4 Calculation of PC as a percentage of Acid Critical Load Function

The calculation of the PC of N to the C_{Lo} function has been carried out according to the guidance on Air Pollution Information System (APIS), which is as follows:

> *"The potential impacts of additional sulphur and/or nitrogen deposition from a source are partly determined by PEC, because only if PEC of nitrogen deposition is greater than CLminN will the additional nitrogen deposition from the source contribute to acidity. Consequently, if PEC is less that CLminN only the acidifying affects of sulphur from the process need to be considered:*
>
> *Where PEC N Deposition < CLminN*
>
> *PC as % CL function = (PC S deposition/CLmaxS)*100*
>
> *Where PEC is greater than CLminN (the majority of cases), the combined inputs of sulphur and nitrogen need to be considered. In such cases, the total acidity input should be calculated as a proportion of the CLmaxN.*
>
> *Where PEC N Deposition > CLminN*
>
> *PC as %CL function = ((PC of S+N deposition)/CLmaxN)*100"*

3.2.2.5 Assessment of Impact and Significance

In addition to the AERA guidance, the EA's Operational Instruction 66_12[10] details how the air quality impacts on ecological sites should be assessed. This guidance provides risk-based screening criteria to determine whether impacts will have 'no likely significant effects (alone and in-combination)' for European sites, 'no likely damage' for SSSIs and 'no significant pollution' for other sites, as follows:

- PC does not exceed 1% long-term CLe and/or CLo or that the PEC does not exceed 70% long-term CLe and/or CLo for European sites and SSSIs;

[10] EA Working Instruction 66_12 - Simple assessment of the impact of aerial emissions from new or expanding IPPC regulated industry for impacts on nature conservation

- PC does not exceed 10% short-term CLe for NOx for European sites and SSSIs;
- PC does not exceed 100% long-term CLe and/or CLo for other conservation sites; and
- PC does not exceed 100% short-term CLe for NOx (if applicable) for other conservation sites.

Where impacts cannot be classified as resulting in 'no likely significant effect', more detailed assessment may be required depending on the sensitivity of the feature in accordance with the EA's Operational Instruction 67_12. This can require the consideration of the potential for in-combination effects, the actual distribution of sensitive features within the site, and local factors (such as the water table).

The guidance provides the following further criteria:

- if the PEC does not exceed 100% of the appropriate limit it can be assumed there will be no adverse effect;
- if the background is below the limit, but a small PC leads to an exceedance – decision based on local considerations;
- if the background is currently above the limit and the additional PC will cause a small increase – decision based on local considerations;
- if the background is below the limit, but a significant PC leads to an exceedance – cannot conclude no adverse effect; and
- if the background is currently above the limit and the additional PC is large – cannot conclude no adverse effect.

3.3 Assessment of Odour Emissions

The assessment of odour emissions from operation of the proposed changes at the manufacturing facility has been undertaken based on a conceptual model, as per the IAQM odour guidance[11], that takes into consideration the potential sources, surrounding receptors and the pathway between source and receptor in order to assess the magnitude of risk. Specifically, the following aspects are reviewed:

- the type of activities proposed on site including designed-in mitigation measures in order to determine:
    - the potential magnitude of releases in general terms; and
    - the nature of that release
- the location of receptors in the surrounding area with specific consideration of the type of receptor and therefore their potential sensitivity according to guidance; and
- the pathway between source and receptors incorporating distance between receptors and any mitigating features as well as the frequency of wind conditions likely to result in the dispersion of emissions towards receptors.

The guidance provides a framework to determine the risk of odour exposure at a specific receptor location by combining the source odour potential and pathway effectiveness. The subsequent risk of odour exposure is combined with the receptor sensitivity to determine the likely magnitude of odour effect at the specific receptor location.

[11] Guidance on the assessment of odour for planning. Version 1.1 - July 2018.

The IAQM receptor sensitivity types are summarised in Table 3-6.

Table 3-6: IAQM Receptor Sensitivity

Receptor Sensitivity	Example Land-uses
High sensitivity receptors	Surrounding land where: • users can reasonably expect enjoyment of a high level of amenity; and • people would reasonably be expected to be present here continuously, or at least regularly for extended periods, as part of the normal pattern of use of the land. Examples may include residential dwellings, hospitals, schools/education and tourist/cultural.
Medium sensitivity receptors	Surrounding land where: • users would expect to enjoy a reasonable level of amenity, but wouldn't reasonably expect to enjoy the same level of amenity as in their home; or • people wouldn't reasonably be expected to be present here continuously or regularly for extended periods as part of the normal pattern of use of the land. Examples may include places of work, commercial/retail premises and playing/recreation fields.
Low sensitivity receptors	Surrounding land where: • the enjoyment of amenity would not reasonably be expected; or • there is transient exposure, where the people would reasonably be expected to be present only for limited periods of time as part of the normal pattern of use of the land. Examples may include industrial use, farms, footpaths and roads.

4.0 Baseline Environment

4.1 Site Setting and Sensitive Receptors

The Site is located approximately 1km south of Alfreton. The Site is bounded to the north by the A38, with woodland to the east. To the west there is a business park and a service station and to the south open fields.

4.1.1 Human Receptors

Human health receptors are presented in Figure 4-1 and Table 4-1. Furthermore, the dispersion modelling has been completed using a nested receptor grid (see Section 3.1.4) to allow potential short-term exposure to be assessed at all locations surrounding the Site.

Figure 4-1: Site Setting and Modelled Human Receptors

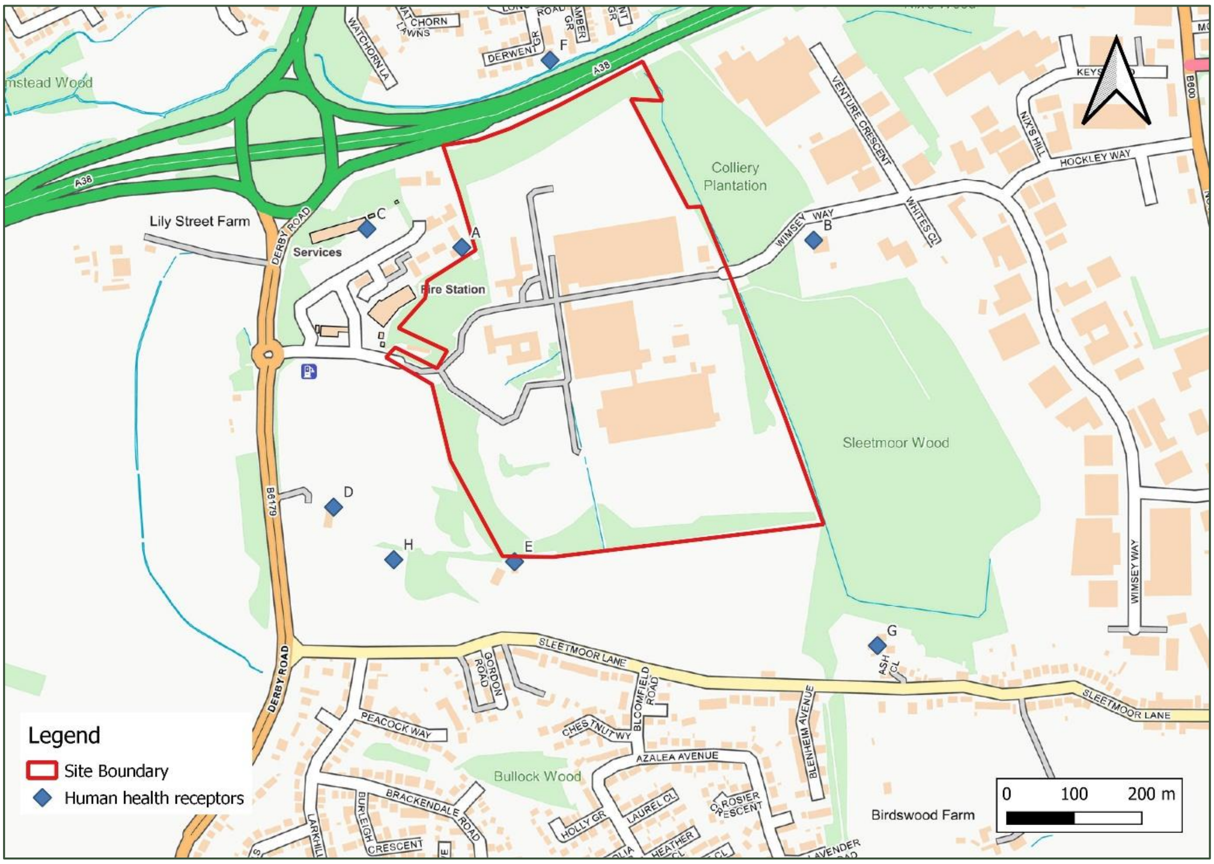

Table 4-1: Modelled Discrete Receptors – Human Receptors

Ref.	Description	NGR-x	NGR-y	Type
A	Business Estate	440817	354615	Commercial
B	Industrial Estate	441338	354625	Commercial
C	Travelodge	440677	354642	Commercial
D	Amber Valley Memorial Park and Crematorium	440627	354230	Recreational
E	Swanwick	440895	354150	Residential
F	Derwent Grove	440948	354892	Residential
G	Somercots	441432	354025	Residential
H	Swanick Fields	440716	354152	Residential

4.1.2 Ecological Receptors

Relevant designated ecological sites within the relevant AERA screening distances are presented in Table 4-2 and Figure 4-2. These have been presented as discrete receptors within the model.

Figure 4-2: Modelled Ecological Receptors

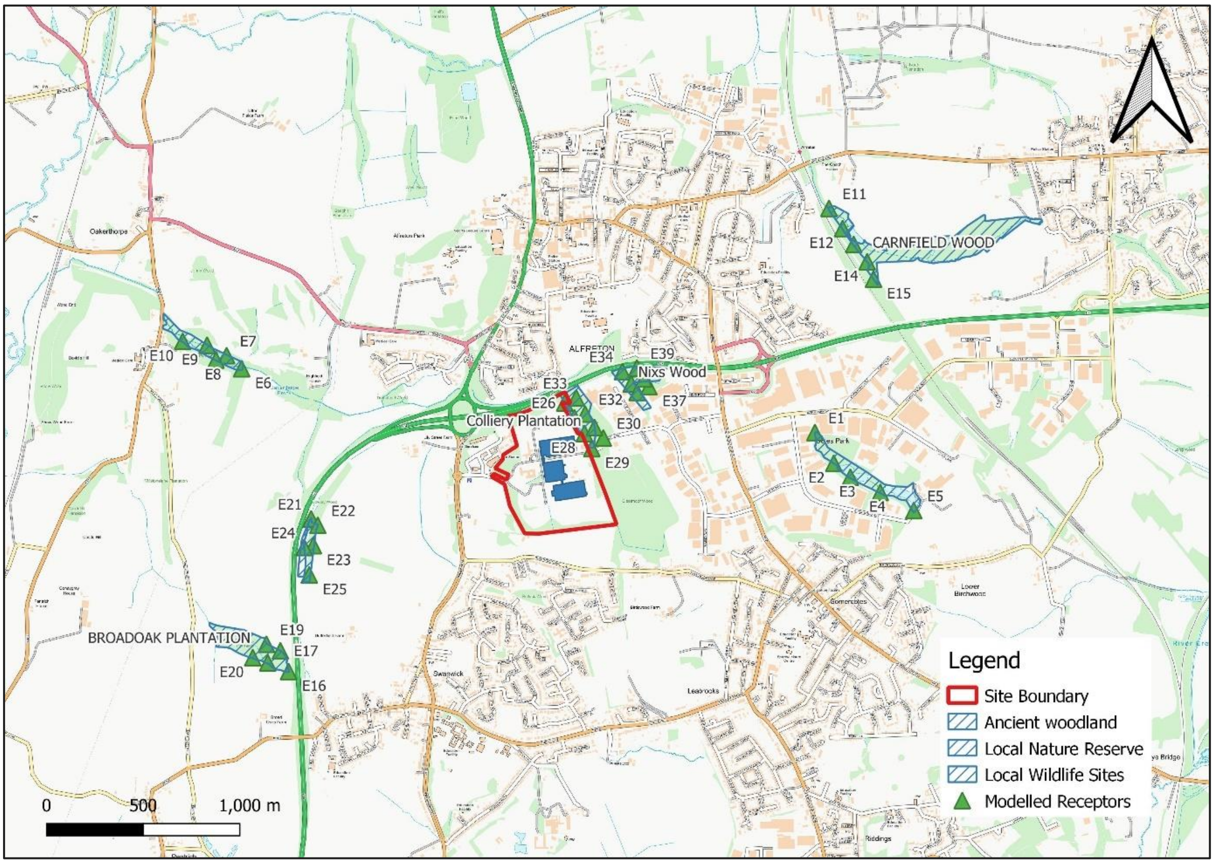

Table 4-2: Designated Ecological Sites

Ref.	Designation	Site Name	Main Habitat
E1-E5	LNR	Penny Town	Broadleaved, Mixed and Yew Woodland
E6-E10	LNR	Oakerthorpe	Broadleaved, Mixed and Yew Woodland
E11-E15	LNR	Carnfield Wood	Broadleaved, Mixed and Yew Woodland
E16-E20	LNR	Broadoak Plantation	Broadleaved, Mixed and Yew Woodland
E21-E25	LNR	Unnamed	Broadleaved, Mixed and Yew Woodland
E26-E31	LWS	Colliery Plantation	Broadleaved, Mixed and Yew Woodland
E32-E36	LWS	Nix's Wood	Broadleaved, Mixed and Yew Woodland

4.2 Ambient Air Quality

This Site is located within the administrative boundary of Amber Valley Borough Council (AVBC). AVBC has not declared any Air Quality Management Areas (AQMA) within their administrative boundary. According to the latest Annual Status Report[12] from AVBC no air

[12] Amber Valley Borough Council (2023) Air Quality Annual Status Report (ASR)

quality monitoring is undertaken but they plan to carry out monitoring in areas which modelling has indicated may be close to or in excess of the air quality objectives.

4.2.1 Local Air Quality Monitoring

There are no national or local air quality monitoring stations within reasonable proximity of the Site from which to ascertain background air quality.

4.2.2 Defra Modelled Background Concentrations

Background pollutant concentration data on a 1km x 1km spatial resolution is provided by Defra through the UK Air Information Resource (AIR) website and is routinely used to support LAQM and Air Quality Assessments. Background pollutant concentrations for NO_2 are based upon a 2021 base year and projected to future years[13]. The 2024 background concentrations for the grid squares containing the Site and nearby receptors are shown in Table 4-3.

Table 4-3: Defra Predicted Annual Mean Background Concentrations (µg/m³)

Grid Square (m) x	Grid Square (m) y	NO_X	NO_2	PM_{10}
441500	354500	15.6	11.7	12.2
440500	354500	12.2	9.4	13.1

4.2.3 Baseline Conditions at Human receptors

The background concentrations at human receptors applied within this assessment have been determined in consideration of the measured data available using the highest data capture and most conservative values. These are presented within Table 4-4.

Table 4-4: Baseline Conditions at Human Receptors (µg/m³)

Pollutant	Averaging Period	Concentration	Data Source
NO_2	Long-term	11.7	2024 Defra background mapped concentration
	Short-term	23.4	2x above as per the method outlined within the AERA guidance
PM_{10}	Long-term	13.1	2024 Defra background mapped concentration
	Short-term	13.1	1x above as per the method outlined within the AERA guidance

4.3 Baseline Conditions at Ecological Receptors

The baseline conditions and appropriate C_{Lo} have been established on the basis of the APIS website[14] (a support tool for assessment of potential effects of air pollutants on habitats and species developed in partnership by the UK conservation and regulatory agencies and the Centre for Ecology and Hydrology).

[13] Background mapping data for local authorities – https://laqm.defra.gov.uk/air-quality/air-quality-assessment/background-maps/ accessed December 2023.

[14] http://www.apis.ac.uk/ - Accessed December 2023

The concentrations, deposition rates, and C_{Lo} for nutrient nitrogen and acid deposition are set out in Table 4-5 and Table 4-6.

Table 4-5: Nitrogen Concentration, Critical Loads and Current Load

Ref.	Main Habitat	NO_x Annual Mean (µg/m^3)	Critical Load Applied in Assessment (kg/ha/yr)	Current Load (kg/ha/yr)
E1-E5	Broadleaved, Mixed and Yew Woodland	19.30	10	30.22
E6-E10	Broadleaved, Mixed and Yew Woodland	10.60	10	31.08
E11-E15	Broadleaved, Mixed and Yew Woodland	15.82	10	30.36
E16-E20	Broadleaved, Mixed and Yew Woodland	12.60	10	30.95
E21-E25	Broadleaved, Mixed and Yew Woodland	11.82	10	31.02
E26-E31	Broadleaved, Mixed and Yew Woodland	18.02	10	30.49
E32-E36	Broadleaved, Mixed and Yew Woodland	18.02	10	30.49

Table 4-6: Relevant Acid Critical Loads and Baseline Deposition (k_{eq}/ha/yr)

Ref.	Habitat (most sensitive Critical Load Class)	CLmaxS	CLminN	CLmaxN	Current Load (N)
E1-E5	Broadleaved, Mixed and Yew Woodland	2.971	0.357	3.328	2.16
E6-E10	Broadleaved, Mixed and Yew Woodland	3.209	0.357	3.566	2.22
E11-E15	Broadleaved, Mixed and Yew Woodland	1.554	0.142	1.696	2.17
E16-E20	Broadleaved, Mixed and Yew Woodland	3.052	0.357	3.409	2.21
E21-E25	Broadleaved, Mixed and Yew Woodland	3.052	0.357	3.409	2.21
E26-E31	Broadleaved, Mixed and Yew Woodland	2.972	0.357	3.329	2.18
E32-E36	Broadleaved, Mixed and Yew Woodland	2.972	0.357	3.329	2.18

Background Ozone AOT40 averaged over 5 years 2017-2021 values is provided by Defra Pollution Climate Mapping Model[15]. The 2024 background concentrations for the grid squares containing the Site and nearby receptors are shown in Table 4-7 along with Defra background pollutant concentrations for SO_2 are based upon a 2001 base year and projected to future years

Table 4-7: Baseline Ozone and Sulphur Dioxide Concentrations (µg/m^3)

Grid Square (m) x	Grid Square (m) y	SO_2 Background (2001)	AOT40 avg over 5y Modelled Background (2017-2021)	AOT40 avg over 5y Modelled Background (2018-2022)	AOT40 avg over 5y Modelled Background (2019-2023)
441500	354500	4.3	3,200	5,250	3,646
440500	354500	4.4	3,473	4,814	4,011

[15] Background mapping data https://compliance-data.defra.gov.uk/datasets/Defra::ozone-aot40-avg-over-5y-modelled-background-2023/about accessed December 2024.

Annual AOT40 concentrations at the Site and relevant repceotr locations are predicted to be below the ozone (O_3) and sulphur dioxide (SO_2) C_{Le} (6,000µg/m^3 and 20 µg/m^3 respectivly). Given this, it is considered appropriate to apply the 24-hour mean C_{Le} of 200µg/m^3 in the assessment.

4.4 Meteorological Conditions

A windrose, showing the frequency of wind speed and direction used in the assessment is provided in Figure 4-3. The windrose shows that southwest winds are most frequent with winds from the north least frequent.

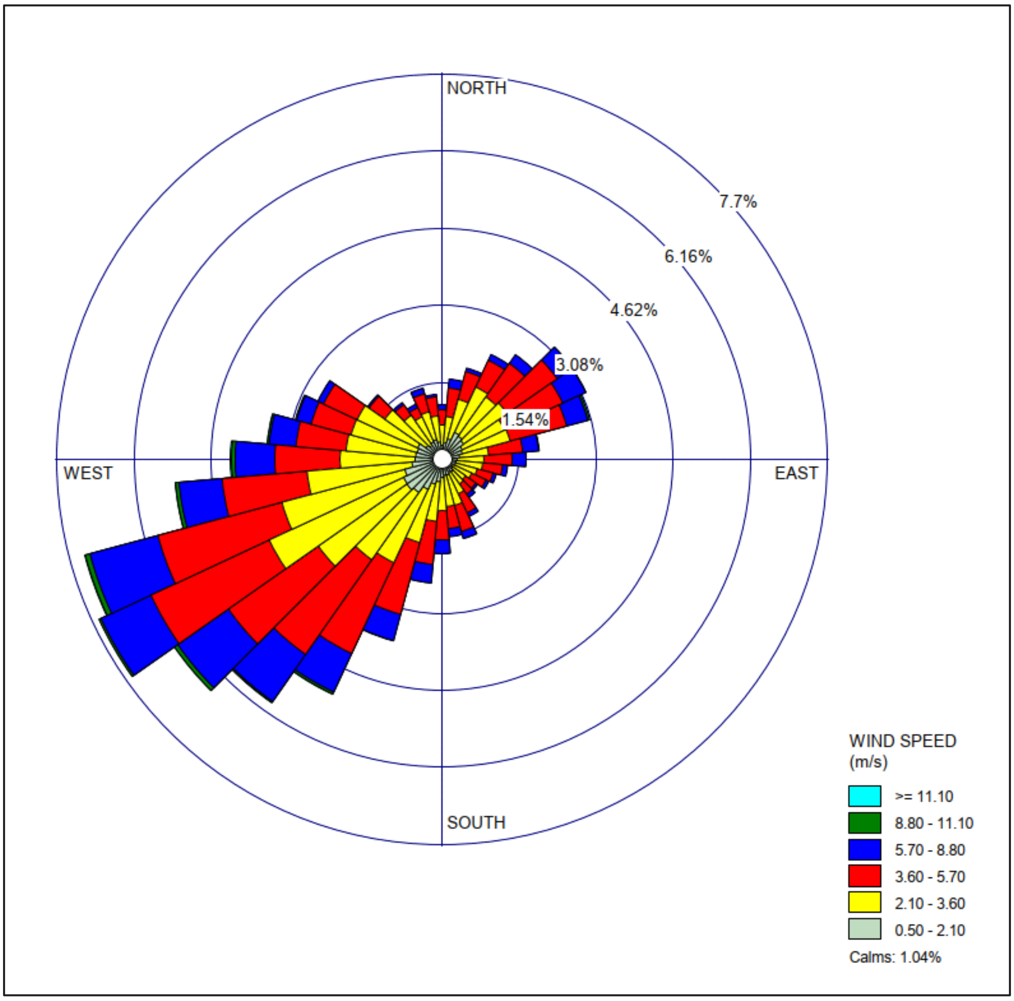

Figure 4-3: Nottingham Watnall (2019-23)

4.5 Topography

The Sites lies at approximately 120m AOD. The land falls to 70mAOD approximately 2.5km to the northwest, and southwest. The surrounding topography is illustrated in Figure 4-4 below.

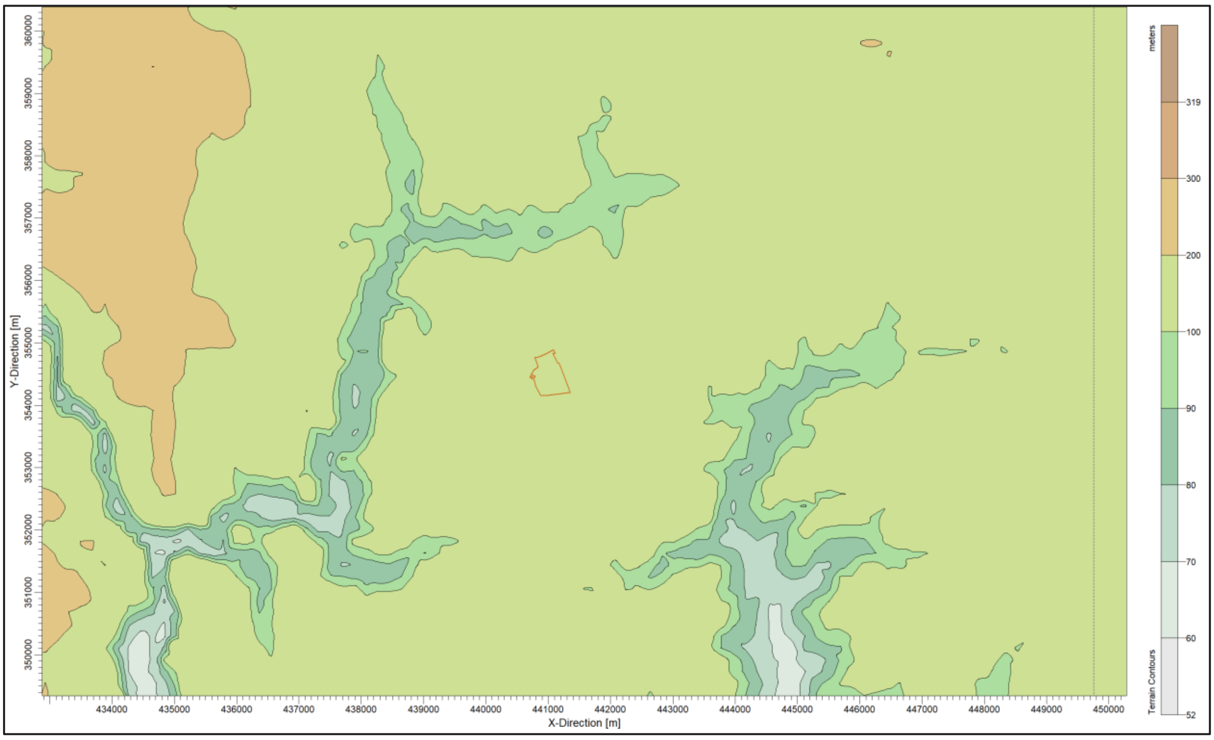

Figure 4-4: Surrounding Topography

4.6 Existing Odour Sources

A review of baseline conditions with respect to existing odours in the surrounding area has been undertaken by reviewing aerial imagery. The following potential sources of odours are identified:

- Existing Site operations (such as production of confectionary) at the Thorntons Park facility;
- Commercial activities (such as food preparation / cooking) at the service station on the northwest boundary of the Site;
- Industrial activities (such as polymer production) on the industrial estate extending to the east of the Site; and
- Agricultural land extending to the west of the Site.

5.0 Odour Assessment

The likely magnitude of odour effects as a result of the proposed operations at nearby sensitive receptors has been considered through application of a conceptual SPR model, as defined within the IAQM Odour Guidance.

5.1.1 Source Odour Potential

It is understood that the Site has not received any third party odour complaints within the last three years[16], therefore it can be inferred that the current operations do not result in adverse odour effects at nearby receptors. As such, the scope of the odour assessment is limited to the proposed changes at the manufacturing facility only, and has not considered odour emissions from the existing operations on the Site.

The receipt, storage, transport and preparation of raw materials are not considered a significant source of odours due to the inherently low odour potential of these materials (such as sugar, cocoa and nuts).

Odour is potentially associated with new processes:

- Buhler oven serving the FCE waffle manufacturing process, from stacks B1.1 and B2.1; and
- New Nutella line dust extract points (C1.1. – C3) and Hazelnut steam roaster (stacks C4-C7)

Whilst it is noted that a number of these emission points will pass extracted air through an abatement process (i.e. bag filter or cyclone filter) prior to release, it is not considered that this would achieve abatement of odours.

In reference to the IAQM Odour Guidance, odours associated with the production of confectionary, and roasting are generally considered ‘less offensive’. As such, the roasting of hazelnuts for use in confectionary would be associated with less offensive odours.

Therefore, in adoption of a precautionary approach, and in consideration of the relatively small volume of materials processed and the less offensive nature of the odours associated with the proposed operations, the overall source odour potential is ‘medium’.

5.1.2 Pathway Effectiveness

The pathway effectiveness linking potential odours from the proposed operations and the nearby sensitive receptors was determined through a combination of the distance to the emission source, the frequency of winds with the potential to disperse odour towards those receptors and the effectiveness of dispersion/dilution of odours from the sources identified at the Site.

The determination of pathway effectiveness is presented in Table 5-1. The effectiveness of dispersion/dilution of odours from the sources identified at the Site is considered to be ‘moderate’, in line with releases from stacks above relevant roof-level.

The closest nearby sensitive receptors in each direction from the Site are represented by eight discrete receptors (A-H) (refer to Section 4.1.1).

[16] The site operator has confirmed that they are not aware of any odour complaints received

Table 5-1: Determination of Pathway Effectiveness

ID	Distance from the Nearest Odour Source		Wind Direction Linking Source to Receptor (1)	Frequency of Winds from Source to Receptor (2)			Pathway Effectiveness
	(m)	Notes		Low Winds (3)	Total	Notes	
A	260m	Local	East	4.0%	5.0%	Infrequent	Ineffective
B	250m	Local	West	10.0%	13.1%	High frequency	Highly effective
C	400m	Remote	East	4.0%	5.0%	Infrequent	Ineffective
D	500m	Remote	Northeast	4.9%	5.7%	Infrequent	Ineffective
E	300m	Local	Northeast	4.9%	5.7%	Infrequent	Ineffective
F	340m	Local	SSW	7.0%	8.9%	Frequent	Moderately effective
G	430m	Remote from source	Northwest	3.1%	3.2%	Infrequent	Ineffective
H	450m	Remote from source	Northeast	4.9%	5.7%	Infrequent	Ineffective

Table 6.1 Notes:

(1) *Wind direction blowing from (i.e. the inverse of the direction from the nearest potential odour source at Site).*

(2) *Determined in reference to meteorological data from the Nottingham Watnall recording station, as presented in Section 4.4).*

(3) *Defined as wind speeds below 5m/s.*

5.1.3 Receptor Sensitivity

In reference to the IAQM Odour Guidance, the relative sensitivity of residential and hotel receptors are ‘high’ and the relative sensitivity of recreational receptors are ‘medium’.

5.1.4 Likely Magnitude of Odour Effect

In reference to the methodology outlined in the IAQM Odour Guidance, the likely magnitude of odour effect has been determined by consideration of the source odour potential, receptor sensitivity and the pathway effectiveness. The results are summarised in Table 5-2.

Table 5-2: Determination of Likely Odour Effect

Receptor Sensitivity to Odours		Source Odour Potential	Pathway Effectiveness	Risk of Odour Exposure	Likely Odour Effect
A	High (hotel)	Small	Ineffective	Negligible Risk	Negligible
B	Medium (recreational)	Small	Highly effective	Medium Risk	Slight Adverse
C	High (residential)	Small	Ineffective	Negligible Risk	Negligible
D	High (residential)	Small	Ineffective	Negligible Risk	Negligible
E	High (residential)	Small	Ineffective	Negligible Risk	Negligible
F	High (residential)	Small	Moderately effective	Low Risk	Slight Adverse
G	High (residential)	Small	Ineffective	Negligible Risk	Negligible
H	High (residential)	Small	Ineffective	Negligible Risk	Negligible

In adoption of a precautionary approach, the likely magnitude of odour effect at nearby sensitive receptors as a result of the proposed operations is predicted to be ‘slight adverse’ at receptor B and F, and ‘negligible’ at all other receptors.

In reference to the IAQM Odour Guidance, a ‘slight’ or ‘negligible’ likely odour effect corresponds to an overall ‘not significant’ odour effect.

6.0 NOx/NO_2 and PM Impact Assessment

6.1 NO_2 Impacts

The maximum predicted annual mean NO_2 impacts at the modelled relevant receptor locations are summarised in Table 6-1, (an isopleth plot is presented in Appendix B). The AQAL is not exceeded at any of the receptor locations

Table 6-1: Predicted NO_2 Annual Mean Impacts (µg/m^3)

Receptor	PC	PC as % of AQAL	Background	PEC	PEC as % of AQAL
A	3.2	7.9%	11.7	14.9	37.2%
B	9.8	24.5%	11.7	21.5	53.7%
C	1.6	4.1%	11.7	13.3	33.3%
D	2.3	5.8%	11.7	14.0	35.0%
E	2.3	5.7%	11.7	14.0	35.0%
F	2.2	5.5%	11.7	13.9	34.7%
G	0.9	2.4%	11.7	12.6	31.6%
H	2.3	5.7%	11.7	14.0	34.9%

The maximum predicted short-term impacts are summarised in Table 6-2 (an isopleth plot is presented in Appendix B). No offsite exceedances of the AQAL are predicted.

Table 6-2: Predicted NO_2 1-hour Mean (99.79%ile) Impacts (µg/m^3)

Receptor	PC	PC as % of AQAL	Background	PEC	PEC as % of AQAL
Max	269.3	134.7%	23.4	292.7	146.4%
A	69.5	34.8%	23.4	92.9	46.5%
B	68.2	34.1%	23.4	91.6	45.8%
C	45.0	22.5%	23.4	68.4	34.2%
D	47.4	23.7%	23.4	70.8	35.4%
E	60.5	30.3%	23.4	83.9	42.0%
F	60.9	30.5%	23.4	84.3	42.2%
G	37.5	18.7%	23.4	60.9	30.4%
H	50.8	25.4%	23.4	74.2	37.1%

6.2 PM_{10} Impacts

The maximum predicted annual mean PM_{10} impacts at the modelled receptor locations are summarised in Table 7-3 (an isopleth plot is presented in Appendix B). The AQAL is not exceeded at any of the receptor locations.

Table 6-3: Predicted PM_{10} Annual Mean Impacts (µg/m^3)

Receptor	PC	PC as % of AQAL	Background	PEC	PEC as % of AQAL
A	0.1	0.3%	13.1	13.2	33.1%

Receptor	PC	PC as % of AQAL	Background	PEC	PEC as % of AQAL
B	0.7	1.8%	13.1	13.8	34.6%
C	0.1	0.2%	13.1	13.2	33.0%
D	0.2	0.4%	13.1	13.3	33.2%
E	0.4	1.1%	13.1	13.5	33.9%
F	0.1	0.3%	13.1	13.2	33.0%
G	0.2	0.4%	13.1	13.3	33.2%
H	0.3	0.6%	13.1	13.4	33.4%

The maximum predicted annual mean PM_{10} impacts at the modelled receptor locations are summarised in Table 6-4 (an isopleth plot is presented in Appendix B). The AQAL is not exceeded at any of the receptor locations.

Table 6-4: Predicted PM_{10} 24-hr (90.41%ile) Mean Impacts (µg/m^3)

Receptor	PC	PC as % of AQAL	Background	PEC	PEC as % of AQAL
Max	13.7	27.3%	13.1	26.8	53.5%
A	0.4	0.9%	13.1	13.5	27.1%
B	2.1	4.2%	13.1	15.2	30.4%
C	0.3	0.6%	13.1	13.4	26.8%
D	0.6	1.3%	13.1	13.7	27.5%
E	1.7	3.4%	13.1	14.8	29.6%
F	0.4	0.9%	13.1	13.5	27.1%
G	0.6	1.2%	13.1	13.7	27.4%
H	1.0	1.9%	13.1	14.1	28.1%

6.3 Impacts on Ecological Receptors

6.3.1 Critical Levels (NOx)

The results of the assessment of impacts on the C_{Le} are presented in Table 6-5 and Table 7-6. The findings present the maximum impact per designation and can be summarised as follows:

- the annual mean PC is less than 100% of the long term C_{Le}; and
- the daily mean PC less than 100% of the short term C_{Le}

Therefore, the impact can be considered to cause '*no likely damage*' to all considered ecological receptors.

Table 6-5: Impact on Critical Levels – Long term NO_X (µg/m³)

Receptor	Applied CLe	PC	PC as % of C_{Le}
E1-E5 (LNR)	30	1.3	4.5%
E6-E10 (LNR)	30	0.2	0.7%
E11-E15 (LNR)	30	1.4	4.7%
E16-E20 (AW)	30	0.6	1.9%
E21-E25 (AW)	30	0.6	2.2%
E26-E31 (LWS)	30	25.5	84.9%
E32-E36 (LWS)	30	14.5	48.2%

Table 6-6: Impact on Critical Levels – Short term NO_X (µg/m³)

Receptor	Applied CLe	PC	PC as % of C_{Le}
E1-E5 (LNR)	200	12.3	6.2%
E6-E10 (LNR)	200	3.5	1.8%
E11-E15 (LNR)	200	12.4	6.2%
E16-E20 (AW)	200	8.9	4.4%
E21-E25 (AW)	200	8.4	4.2%
E26-E31 (LWS)	200	139.6	69.8%
E32-E36 (LWS)	200	108.6	54.3%

6.3.2 Impacts on Critical Loads

The results of the assessment on C_{Lo} are presented in Table 6-7 and Table 6-8 below. The findings are that the PC's do not exceed 100% of the C_{Lo}, therefore the impact is considered to cause '*no likely damage*' to the local ecological designations.

Table 6-7: Impact on Nitrogen Critical Load (kg N/ha/yr)

Receptor	Applied CLo	PC	PC as % of CLo
E1-E5 (LNR)	10	0.27	2.7%
E6-E10 (LNR)	10	0.04	0.4%
E11-E15 (LNR)	10	0.28	2.8%
E16-E20 (AW)	10	0.12	1.2%
E21-E25 (AW)	10	0.13	1.3%
E26-E31 (LWS)	10	5.24	52.4%
E32-E36 (LWS)	10	3.00	30.0%

Table 6-8: Impact on Acid Critical Load Function (kg_{eq}/ha/yr)

Receptor	Critical Load Function for Assessment	Critical Load for Assessment	PC	PC as % of CLo
E1-E5 (LNR)	CLmaxN	3.328	0.019	0.6%
E6-E10 (LNR)	CLmaxN	3.566	0.003	0.1%
E11-E15 (LNR)	CLmaxN	1.696	0.020	1.2%
E16-E20 (AW)	CLmaxN	3.409	0.008	0.2%
E21-E25 (AW)	CLmaxN	3.409	0.011	0.3%
E26-E31 (LWS)	CLmaxN	3.329	0.473	14.2%
E32-E36 (LWS)	CLmaxN	3.329	0.299	9.0%

7.0 Summary and Conclusions

7.1 AERA

This AERA has quantified and assessed the potential air quality impacts associated with emissions from the Site using EA approved techniques against published standards for the protection of human health and designated ecological sites.

The conclusions of the AERA are as follows:

- The process contributions do not lead to any exceedances of the standards (long-term or short-term) for the protection of human health at any relevant exposure location outside of the Site; and
- The process contribution from the proposed plant is considered to cause 'no likely damage' to the assessed ecological sites.

7.2 Odour Assessment

The findings of the Odour Assessment indicate that the likely worst-case odour effect at a sensitive receptor is 'slight adverse'. Therefore, the likely significance of effects because of odours from Site as a result of the proposed changes can be considered 'not significant', in accordance with the IAQM odour guidance.

Appendix A Modelling Checklist

Air Emissions Risk Assessment

Thornton Park Manufacturing Facility Environmental Permit Variation Application

Thorntons Limited

SLR Project No.: 410.066170.00001

30 January 2025

Table A- 1: Modelling Checklist

Item	Yes/No	Details / reason for omission
Location map	Yes	Figure 4-1
Site plan	Yes	Figure 4-1
Pollutants modelled and relevant standards	Yes	Sections 3.1.2 and 2.3
Details of modelled scenarios	Yes	Section 3.1.1
Details of relevant ambient concentrations	Yes	Section 4.0
Model description and justification	Yes	Section 3.1.3
Special model treatment used	Yes	Section 3.1.10
Table of emission parameters used	Yes	Section 3.1.1
Details of modelled domain and receptors	Yes	Section 3.1.4
Details of meteorological data used	Yes	Section 3.1.7
Details of terrain treatment	Yes	Section 3.1.6
Details of building treatment	Yes	Section 3.1.5
Model uncertainty and sensitivity	Yes	Section 3.1.8
Assessment of impacts	Yes	Section 5.0
Contour plots	Yes	Appendix B
Model input files	Yes	Appendix C

Appendix B Contour Plots

Air Emissions Risk Assessment

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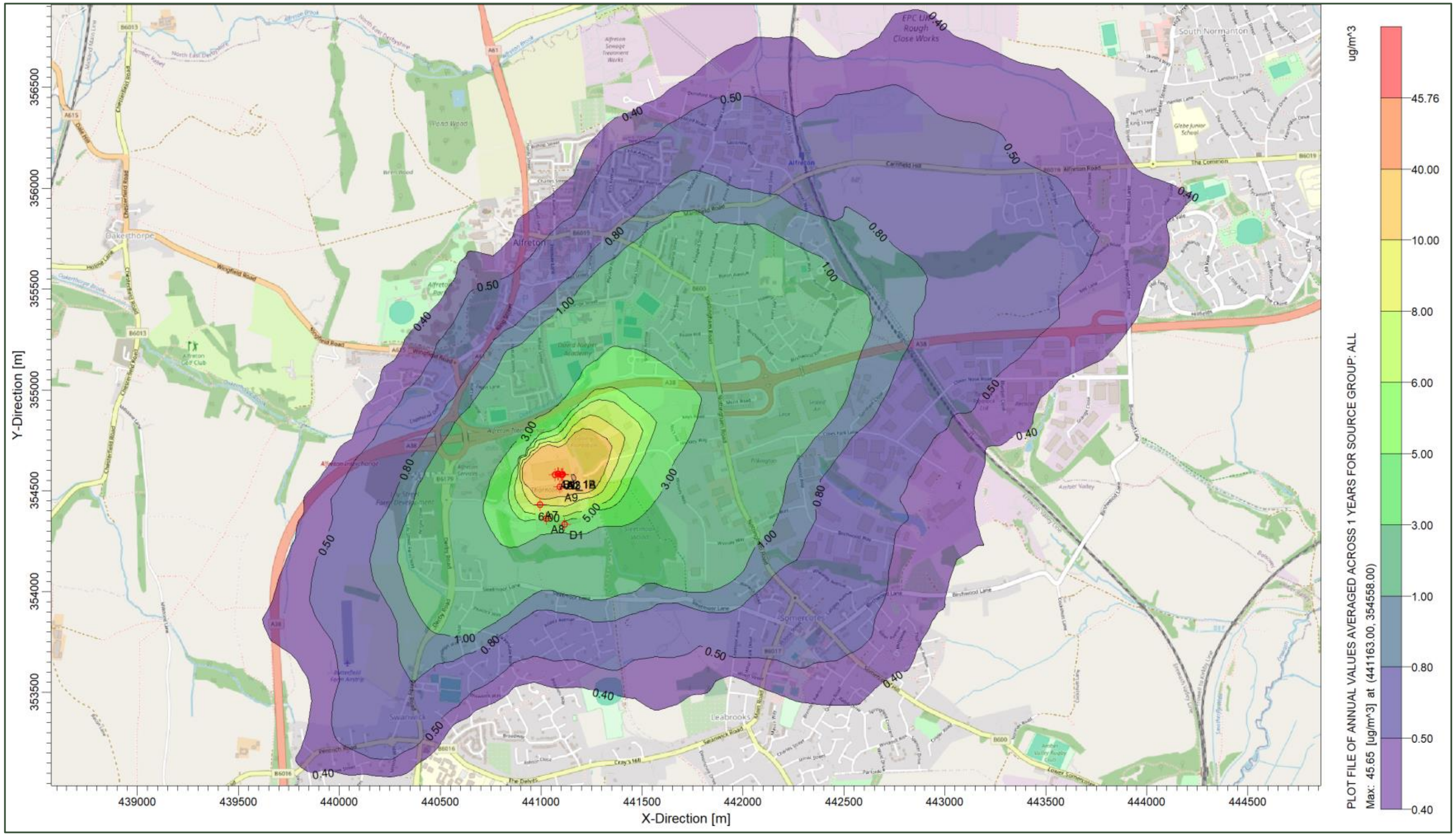

Figure B- 1: Annual Mean NO_2 Process Contribution

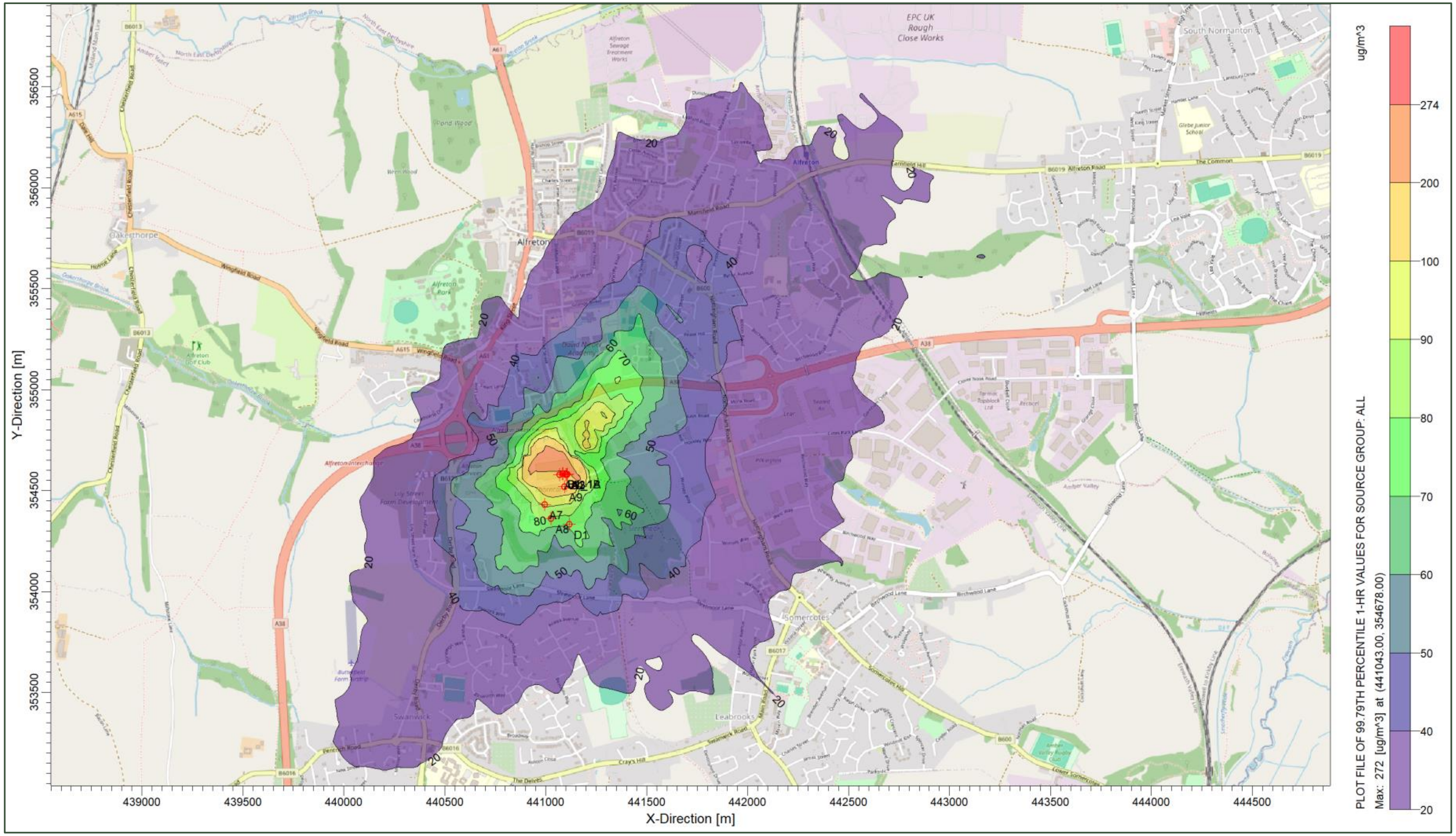

Figure B- 2: 1-hour Mean (99.79%ile) NO_2 Process Contribution

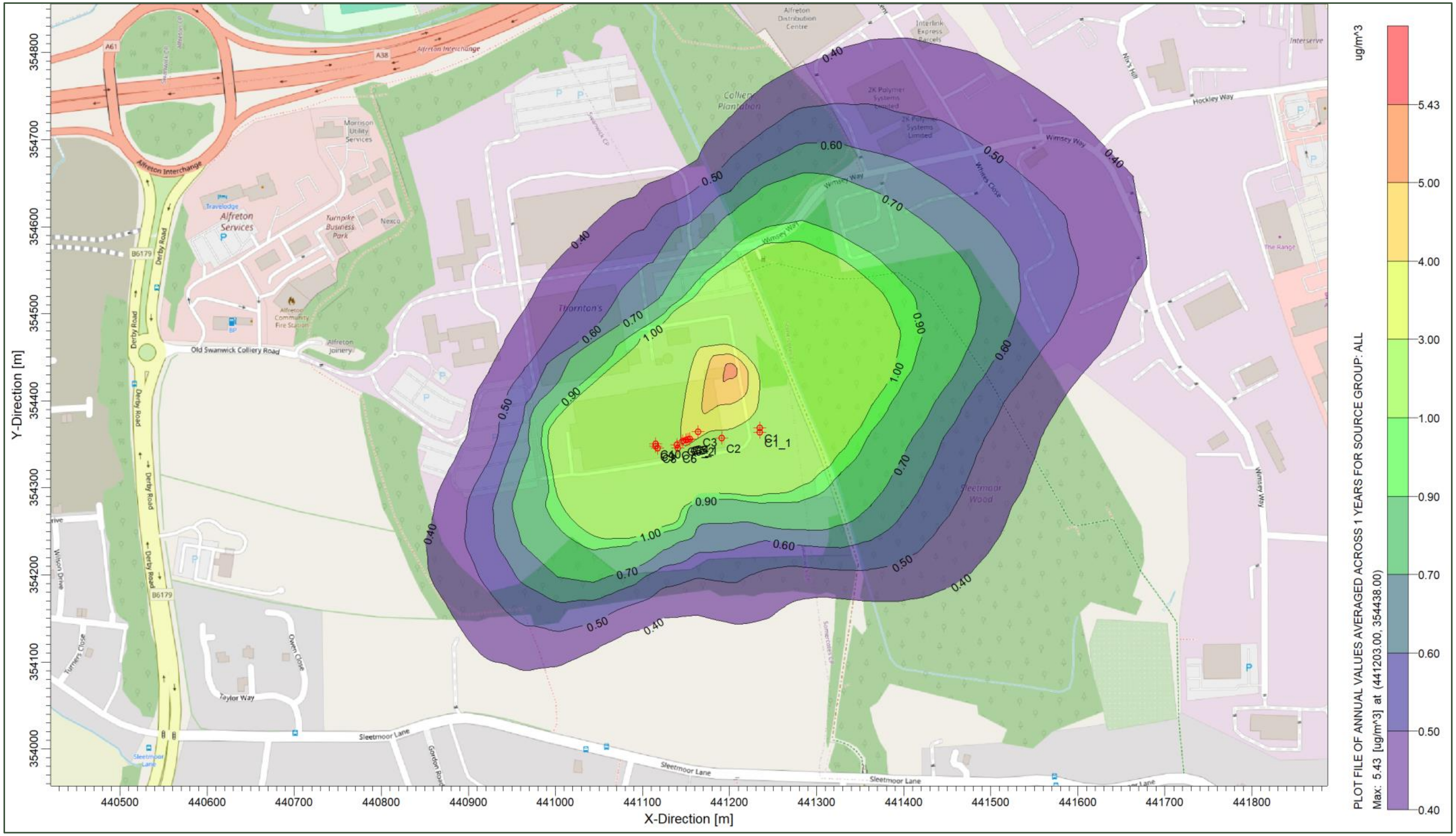

Figure B- 3: Annual Mean PM_{10} Process Contribution

Figure B- 4: 24-hour Mean (90.18%ile) PM_{10} Process Contribution

Appendix C Model Input Files

Air Emissions Risk Assessment

Thornton Park Manufacturing Facility Environmental Permit Variation Application

Thorntons Limited

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Table C-1: Model Files (*electronic only)*

Model Name	Pollutant Source
THORN_NOx_v2_22	NOx
THORN_PM_v1_22	PM

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