Air Quality Assessment

Flexographic Printing Works, Derby

Presented to: OGM

Issued: March 2023

Delta-Simons Project No: 92639.563100

Protecting people
and planet

Report Details

Client	OGM
Report Title	Air Quality Assessment
Site Address	Flexographic Printing Works, Plot 10A Dove Valley Park, Derby, DE65 5BT
Project No.	92639.563100
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Quality Assurance

Issue No.	Status	Issue Date	Comments	Author	Technical Review	Authorised
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Executive Summary

Site and Report Context	Delta-Simons Limited ('Delta-Simons') has been instructed by OGM (the 'Client'), to undertake an Air Quality Assessment to inform a full planning application for the erection of an employment building (Use Class B8, B2) and Ancillary E(g) at Plot 10 with associated landscaping, drainage, car parking, refuse stores and other infrastructure proposed (the 'Proposed Development'), located at Plot 10A Dove Valley Park in Foston, Derby, DE65 5BT (the 'Site'). The Proposed Development allows for Part A2 flexographic printing works at the Site, comprising two presses which will use and release a mixture of MEK, ethanol and ethyl acetate through a Regenerative Thermal Oxidiser (RTO). As such, the Proposed Development should be assessed to determine whether it has the potential to cause adverse air quality impacts during its operation. An initial baseline desk survey indicated that the Site is located in a rural area, with a number of residential properties scattered around the Site. There are potential commercial sources identified in the vicinity of the Site, that may also influence the local air quality, however, these would be characteristic of the mixed-use area in which the Site is located. With regard to ecological receptors, there are a number of statutory designated Ancient Woodland sites, within 2km of the Site, and as such, would require further investigation in terms of their potential sensitivity. The main potential impacts associated with the Proposed Development are therefore, identified as those affecting both ecological and human receptors. Accordingly, an Air Quality Assessment, including Detailed Dispersion Modelling, has been prepared to determine baseline conditions in the vicinity of the Site and to assess potential impacts associated with the Proposed Development, in accordance with the requirements of the National Planning Policy Framework (NPPF). The Air Quality Assessment will, therefore, consider ambient pollutant concentrations, namely nitrogen dioxide (NO_2), volatile organic compounds (VOCs) and carbon monoxide (CO), across and in the vicinity of the Site. This report presents the findings of the assessment, which addresses the potential air quality impacts during the operation of the Site, with the type, source and significance of potential impacts identified.
Summary	The predicted effects associated with the operations at the Site have been assessed based on detailed dispersion modelling. In order to represent a robust setup in relation to likely operational impacts, it has been assumed that the Site will operate continuously for 8,760-hours per year, with two flow rate scenarios considered in relation to the functionality of the RTO and its associated emission rates. The Air Quality Assessment considering both the minimum and maximum flow rate scenarios for the RTO, concluded that the operation of the Site would not result in any predicted exceedances of the relevant Air Quality Objectives (AQOs) at sensitive receptor locations within the vicinity of the Site. The predicted impacts assocaited with the operations at the Site are **negligible**, and the residual effects are considered to be **not significant** at all sensitive human receptor locations. Nitrogen oxides (NO_x) levels, and nitrogen and acid gas deposition rates were also predicted at the relevant ecological sites. Results indicated that emissions from the operations at the Site would not significantly affect existing conditions at either ecological designation.
Conclusions and Recommendations	Based on the results of the assessment, it is considered that, the Proposed Development does not result in any significant effects at sensitive receptor locations and complies with national and local planning policies. Therefore, there are no air quality constraints considered to restrict planning or permitting consent.
This is intended as a summary only. Further detail and limitations of the assessment are provided within the main body of the report.	

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1.0 Introduction

1.1 Appointment

1.1.1 Delta-Simons Limited ('Delta-Simons'), was instructed by OGM (the 'Client') to inform a full planning application for the erection of an employment building (Use Class B8, B2) and Ancillary E(g) at Plot 10 with associated landscaping, drainage, car parking, refuse stores and other infrastructure proposed (the 'Proposed Development'), located at Plot 10A Dove Valley Park in Foston, Derby, DE65 5BT (the 'Site').

1.2 Site Location and Context

1.2.1 The Proposed Development allows for Part A2 flexographic printing works at the Site, comprising two presses which will use and release a mixture of MEK, ethanol and ethyl acetate through a Regenerative Thermal Oxidiser (RTO). As such, the Proposed Development should be assessed to determine whether it has the potential to cause adverse air quality impacts during its operation.

1.2.2 Reference should be made to **Figure 1** for a map of the Site and surrounding area.

1.2.3 The Site is located in a rural area, with the nearest sensitive receptor located 50m to the south-east of the Site boundary. With regard to ecological receptors, a baseline desk survey has indicated that there are there are a number of statutory designated Ancient Woodland sites, within 2km of the Site, and as such, require further investigation in terms of their potential sensitivity. The main potential impacts associated with the operations at the Site are therefore, identified as those affecting human and ecological receptors within 2km of the Site.

1.2.4 The nature of the Proposed Development has the potential to cause air quality impacts during normal operations at the Site. Accordingly, an Air Quality Assessment, including Detailed Dispersion Modelling, has been prepared to assess the potential impacts of flue emissions from the RTO at nearby sensitive receptor locations, in accordance with the requirements of the National Planning Policy Framework (NPPF)[1]. The Air Quality Assessment will consider ambient pollutant concentrations, namely nitrogen dioxide (NO_2), volatile organic compounds (VOCs) and carbon monoxide (CO), across and in the vicinity of the Site.

1.2.5 This report presents the findings of the assessment, which addresses the potential air quality impacts during the operational phase of the Proposed Development. The type, source and significance of potential impacts were identified.

1.2.6 The standard limitations associated with this assessment are presented in **Appendix A**.

1.2.7 A glossary of terms used in this report is provided in **Appendix B**.

[1] Ministry of Housing, Communities & Local Government (2021) National Planning Policy Framework.

2.0 Legislation, Policy and Guidance

2.1 Air Quality Legislation

2.1.1 A summary of the relevant air quality legislation is provided below.

UK Air Quality Strategy (2007)

2.1.2 The Government's policy on air quality within the UK is set out in the Air Quality Strategy for England, Scotland, Wales and Northern Ireland (AQS)[2]. The AQS provides a framework for reducing air pollution in the UK with the aim of meeting the requirements of European Union legislation.

2.1.3 Under the European Union (Withdrawal) Act 2018 (as amended), domestic legislation derived from EU law, which was in force immediately prior to the end of the transition period on 31st December 2020, continues to form part of UK domestic law thereafter. This new body of law resulting from the Withdrawal Act is referred to as 'retained EU Law'.

2.1.4 The AQS also sets standards and objectives for nine key air pollutants to protect health, vegetation and ecosystems. These are benzene (C_6H_6), 1,3 butadiene (C_4H_6), carbon monoxide (CO), lead (Pb), NO_2, particulate matter (PM_{10} and $PM_{2.5}$), sulphur dioxide (SO_2), ozone (O_3), and polycyclic aromatic hydrocarbons (PAHs). The standards and objectives for the pollutants considered in this assessment are given in **Appendix C**.

2.1.5 The air quality standards are levels recommended by the Expert Panel on Air Quality Standards (EPAQS) and the World Health Organisation (WHO) with regards to current scientific knowledge about the effects of each pollutant on health and the environment.

2.1.6 The air quality objectives (AQOs) are medium-term policy-based targets set by the Government, which take into account economic efficiency, practicability, technical feasibility and timescale. Some objectives are equal to the EPAQS recommended standards or WHO guideline limits, whereas others involve a margin of tolerance, i.e. a limited number of permitted exceedances of the standard over a given period.

2.1.7 For the pollutants considered in this assessment, there are both long-term (annual mean) and short-term standards. In the case of NO_2, the short-term standard is for a 1-hour averaging period, whereas for PM_{10} it is for a 24-hour averaging period. These periods reflect the varying impacts on health of differing exposures to pollutants, for example temporary exposure on the pavement adjacent to a busy road, compared with the exposure of residential properties adjacent to a road.

2.1.8 The AQS contains a framework for considering the effects of a finer group of particles known as '$PM_{2.5}$' as there is increasing evidence that this size of particles can be more closely associated with observed adverse health effects than PM_{10}. Local authorities are required to work towards reducing emissions/concentrations of particulate matter within their administrative area. However, there is no statutory objective given in the AQS for $PM_{2.5}$ at this time.

Air Quality Regulations (2016)

2.1.9 Many of the objectives in the AQS have been made statutory in England with the Air Quality (England) Regulations 2000[3] and the Air Quality (England) (Amendment) Regulations 2002[4] for the purpose of Local Air Quality Management (LAQM).

2.1.10 These Regulations require that likely exceedances of the AQS objectives are assessed in relation to:

> '[…] the quality of air at locations which are situated outside of buildings or other natural or man-made structures, above or below ground, and where members of the public are regularly present […]'

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2 Department for Environment, Food and Rural Affairs (Defra) and the Devolved Administrations (2007) The Air Quality Strategy for England, Scotland, Wales and Northern Ireland (Volumes 1 and 2).
3 The Air Quality (England) Regulations 2000 - Statutory Instrument 2000 No.928.
4 The Air Quality (England) (Amendment) Regulations 2002 - Statutory Instrument 2002 No.3043.

2.1.11 The Air Quality Standards (Amendment) Regulations 2016[5] amends the Air Quality Standards Regulations 2010 that transpose the European Union Ambient Air Quality Directive (2008/50/EC) into law in England. This Directive sets legally binding limit values for concentrations in outdoor air of major air pollutants that impact public health such as PM_{10}, $PM_{2.5}$ and NO_2.

Environmental Protection Act 1990 – Control of Dust and Particulates Associated with Construction

2.1.12 Section 79 of the Environmental Protection Act 1990 gives the following definitions of statutory nuisance relevant to dust and particles:

> 'Any dust, steam, smell or other effluvia arising from industrial, trade or business premises or smoke, fumes or gases emitted from premises so as to be prejudicial to health or a nuisance'; and
>
> 'Any accumulation or deposit which is prejudicial to health or a nuisance'.

2.1.13 Following this, Section 80 says that where a statutory nuisance is shown to exist, the local authority must serve an abatement notice. Failure to comply with an abatement notice is an offence and if necessary, the local authority may abate the nuisance and recover expenses.

2.1.14 There are no statutory limit values for dust deposition above which 'nuisance' is deemed to exist. Nuisance is a subjective concept and its perception is highly dependent upon the existing conditions and the change which has occurred.

Environment Act 2021

2.1.15 Schedule 11 contains amendments of Part IV of the Environment Act 1995[6] (air quality). Local authorities must review and document local air quality within their area by way of staged appraisals and respond accordingly, with the aim of meeting the AQOs defined in the Regulations. There is a requirement for local authorities to identify relevant sources of emissions that are likely to be responsible for any failure to achieve the AQOs within the area of jurisdiction, or to identify relevant sources within neighbouring authorities and to identify them. Where the objectives are not likely to be achieved within the relevant period, an authority is required to designate an Air Quality Management Area (AQMA). For each AQMA the local authority is required to draw up an Air Quality Action Plan (AQAP) to secure improvements in air quality and show how it intends to work towards achieving air quality standards in the future.

Clean Air Strategy (2019)

2.1.16 In 2019, the UK government released its Clean Air Strategy 2019[7], part of its 25 Year Environment Plan[8]. The Strategy sets out the comprehensive action that is considered to be required from across all parts of government and society.

2.1.17 The primary focus of air quality management has primarily related to NO_2, and its principal source in the UK, road traffic. The 2019 Strategy aims to broaden the focus to other areas, including actions on clean growth, and emissions from domestic wood burning stoves, industry and agriculture.

Environmental Permitting (England and Wales) (Amendment) Regulations (2018)

2.1.18 The Environmental Permitting (England and Wales) (Amendment) Regulations 2018 SI 110[9] were published in January 2018 to transpose the requirements of the Medium Combustion Plant Directive[10] (MCPD) EU/2015/2193 and to control emissions from the operation of Specified Generators.

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5 The Air Quality Standards (Amendment) Regulations 2016 - Statutory Instrument 2016 No. 1184.
6 Environment Act 2021 [Online] Available at: https://www.legislation.gov.uk/ukpga/2021/30/pdfs/ukpga_20210030_en.pdf?timeline=false [Accessed on 27/02/2023].
7 Department for Environment, Food and Rural Affairs (Defra) (2019) Clean Air Strategy 2019.
8 Department for Environment Food and Rural Affairs (Defra) (2018) A Green Future: Our 25 Year Plan to Improve the Environment.
9 The Environmental Permitting (England and Wales) (Amendment) Regulations 2018 SI 110.
10 Directive (EU) 2015/2193 of The European Parliament and of The Council of 25 November 2015.

2.1.19 Within the regulations the requirements for Medium Combustion Plants (MCPs) are set out in Schedule 25A and for Specified Generators (SGs) in Schedule 25B. The Environment Agency (EA) administers and regulates the scheme for England.

Conservation of Habitats and Species Regulations 2017

2.1.20 The Conservation of Habitats and Species Regulations 2017[11] consolidate the Conservation of Habitats and Species Regulations 2010 with subsequent amendments. The Regulations transpose Council Directive 92/43/EEC, on the conservation of natural habitats and of wild fauna and flora (EC Habitats Directive), into national law. They require the Secretary of State to:

> 'provide the European Commission with a list of sites which are important for the habitats or species listed in the Directive. The Commission then designates worthy sites as Special Areas of Conservation (SACs). The Regulations also require the compilation and maintenance of a register of European sites, to include SACs and Special Protection Areas (SPAs), with these classified under the "Birds Directive" (The European Parliament and the Council of the European Union, 2009). These sites form a network termed "Natura 2000".'

2.1.21 The Regulations primarily provide measures for the protection of European Sites and European Protected Species. In addition to SACs and SPAs, some internationally important UK sites are designated under the Ramsar Convention.

2.1.22 The Regulations require competent authorities to consider or review planning permission, applied for or granted, affecting a European site.

2.2 Planning Policy

2.2.1 A summary of the national and local planning policy relevant to the Proposed Development and air quality is provided below.

National Planning Policy

National Planning Policy Framework (as revised 2021)

2.2.2 The Government's overall planning policies for England are described in the NPPF[1]. The core underpinning principle of the Framework is the presumption in favour of sustainable development, defined as:

> '[…] meeting the needs of the present without compromising the ability of future generations to meet their own needs.'

2.2.3 One of the three overarching objectives of the NPPF, is that the planning system should 'protect and enhance our natural, built and historic environment; including making effective use of land, improving biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy.'

2.2.4 In relation to air quality, the following paragraphs in the document are relevant:

- Paragraph 55, which states 'Local planning authorities should consider whether otherwise unacceptable development could be made acceptable through the use of conditions or planning obligations. Planning obligations should only be used where it is not possible to address unacceptable impacts through a planning condition.';
- Paragraph 105, which states 'Significant development should be focused on locations which are or can be made sustainable, through limiting the need to travel and offering a genuine choice of transport modes. This can help to reduce congestion and emissions, and improve air quality and public health.';

[11] Conservation of Habitats and Species Regulations 2017 (UK Statutory Instruments 2017 No. 1012).

- Paragraph 174, which states 'Planning policies and decisions should contribute to and enhance the natural and local environment by: […] e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans.';
- Paragraph 185, which states 'Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development.';
- Paragraph 186, which states 'Planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and Clean Air Zones, and the cumulative impacts from individual sites in local areas. Opportunities to improve air quality or mitigate impacts should be identified, such as through traffic and travel management, and green infrastructure provision and enhancement. So far as possible these opportunities should be considered at the plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications. Planning decisions should ensure that any new development in Air Quality Management Areas and Clean Air Zones is consistent with the local air quality action plan.'; and
- Paragraph 188, which states 'The focus of planning policies and decisions should be on whether proposed development is an acceptable use of land, rather than the control of processes or emissions (where these are subject to separate pollution control regimes). Planning decisions should assume that these regimes will operate effectively. Equally, where a planning decision has been made on a particular development, the planning issues should not be revisited through the permitting regimes operated by pollution control authorities'.

Local Planning Policy

2.2.5 A summary of relevant local policies is outlined below, however their compliance and soundness in relation to national policy has not been assessed in this instance.

South Derbyshire Local Plan Part 1 (2016)

2.2.6 The South Derbyshire Local Plan Part 1[12], was published in June 2016 and is a document which contains decision making strategies for the sustainable growth and development of local areas, whilst providing a safe local environment for residents. The following is relevant to this assessment.

2.2.7 Policy BNE1 'Design Excellence' reflects the importance of providing a high standard within new developments, to reduce the adverse impacts to existing residents and environments.

'A All new development will be expected to be well designed, embrace the principles of sustainable development, encourage healthy lifestyles and enhance people's quality of life by adhering to the Design Principles below.

[…]

h) Neighbouring uses and amenity:

New development should not have an undue adverse affect on the privacy and amenity of existing nearby occupiers. Similarly, the occupiers of new development should not be unduly affected by neighbouring land uses […]'

[12] South Derbyshire District Council (2016) South Derbyshire Local Plan Part 1 [Online] Available at: https://www.southderbyshire.gov.uk/our-services/planning-and-building-control/planning/planning-policy/local-plan/adopted-local-plan [Accessed on 27/02/2023].

2.2.8 Policy SD1 'Amenity and Environmental Quality' reflects the importance of maintaining amenity for the existing residents within the local area.

'A The Council will support development that does not lead to adverse impacts on the environment or amenity of existing and future occupiers within or around proposed developments.

B The Council will take into consideration the following:

[…]

ii) The potential for development to affect designated Air Quality Management Areas (AQMAs).

iii) The need for a strategic buffer between conflicting land uses such that they do not disadvantage each other in respect of amenity issues, such as odours, fumes, or dust and other disturbance such as noise, vibration, light or shadow flicker.'

2.2.9 The above policies relating to air quality have been considered within this assessment.

2.3 Guidance

2.3.1 A summary of the publications referred to in the undertaking of this assessment is provided below.

Local Air Quality Management Technical Guidance (August 2022)

2.3.2 The Department for Environment, Food and Rural Affairs (Defra) has published technical guidance for use by local authorities in their review and assessment work[13]. This guidance, referred to in this document as LAQM.TG22, has been used where appropriate in the assessment presented herein.

Land-Use Planning & Development Control: Planning for Air Quality (2017)

2.3.3 Environmental Protection UK (EPUK) and the Institute of Air Quality Management (IAQM) have published guidance[14] that offers comprehensive advice on: when an air quality assessment may be required; what should be included in an assessment; how to determine the significance of any air quality impacts associated with a development; and, the possible mitigation measures that may be implemented to minimise these impacts.

A guide to the assessment of air quality impacts on designated nature conservation sites (2020)

2.3.4 This document[15] published by the IAQM was produced to provide guidance to developers, consultants and environmental health officers on how to assess the impacts arising from construction activities. The emphasis of the methodology is on classifying sites according to the risk of impacts (in terms of dust nuisance, PM_{10} impacts on public exposure and impact upon sensitive ecological receptors) and to identify mitigation measures appropriate to the level of risk identified.

[13] Department for Environment, Food and Rural Affairs (Defra) (August 2022) Part IV of the Environment Act 1995 as amended by the Environment Act 2021 and Environment (Northern Ireland) Order 2002 Part III, Local Air Quality Management Technical Guidance LAQM.TG22.

[14] Environmental Protection UK and Institute of Air Quality Management (Version 1.2 Updated January 2017) Land Use Planning & Development Control: Planning for Air Quality.

[15] Institute of Air Quality Management (Version 1.1 May 2020) A guide to the assessment of air quality impacts on designated nature conservation sites.

National Planning Practice Guidance - Air Quality (2019)

2.3.5 This guidance[16] provides a number of guiding principles on how the planning process can take into account the impact of new development on air quality, it explains how much detail air quality assessments need to include for proposed developments, and how impacts on air quality can be mitigated. It also provides information on how air quality is taken into account by local authorities in both the wider planning context of Local Plans and neighbourhood planning, and in individual cases where air quality is a consideration in a planning decision.

Guidance on Dispersion Modelling for Oxides of Nitrogen Assessment from Specified Generators (2019)

2.3.6 The Emissions from specified generators Version 1[17] 'Guidance on dispersion modelling for oxides of nitrogen assessment from specified generators' provides advice on how to assess the impacts arising from specified generators. Whilst it is noted that there are no specified generators proposed at the Site, this guidance document still remains valid for this assessment.

Guidance on Specified Generators: Dispersion Modelling Assessment (2019)

2.3.7 This online guidance[18] provides information on how to complete an air quality modelling for specified generators. Where guidance is different from those provided for Specified Generators, the ones within this guidance are followed as considered to be of greater relevance to the Site and its operation. Whilst it is noted that there are no specified generators proposed at the Site, this guidance document still remains valid for this assessment.

Guidance on Air Emissions Risk Assessment for Your Environmental Permit (2020)

2.3.8 This online guidance[19], first published in February 2016 and updated in October 2020, provides information on how to complete an air emissions risk assessment, including how to calculate the impact of emissions and the standards that must be met.

[16] Department of Communities and Local Government (DCLG) (Updated November 2019) National Planning Practice Guidance.
[17] Environment Agency (2019) Emissions from specified generators [Online] Available at: https://consult.environment-agency.gov.uk/psc/mcp-and-sg-regulations/ [Accessed on 27/02/2023].
[18] Environment Agency (2019) Guidance on Specified Generators: Dispersion Modelling Assessment (2019) [Online] Available at: https://www.gov.uk/guidance/specified-generators-dispersion-modelling-assessment [Accessed on 27/02/2023].
[19] Environment Agency (2022) Guidance on Air Emissions Risk Assessment for Your Environmental Permit [Online] Available at: https://www.gov.uk/guidance/air-emissions-risk-assessment-for-your-environmental-permit [Accessed on 27/02/2023].

3.0 Scope and Methodology

3.1 Scope

3.1.1 The scope of the assessment has been determined in the following way:

- Baseline Assessment - review of the latest available Air Quality Annual Status Report (ASR) from South Derbyshire District Council (SDDC)[20] and air quality data for the area surrounding the Site, including from SDDC, Defra[21] and the Environment Agency (EA)[22];
- Preparation of a desk study to confirm the locations of nearby existing receptors that may be sensitive to changes in local air quality as a result of the operations at the Site. This included a review of information on ecological receptors from the Multi-Agency Geographic Information for the Countryside (MAGIC) on-line mapping website[23] and APIS[24];
- Review of the emission parameters, provided by the Client Team and outlined in Defra's Process Guidance Note 6/17(11)[25];
- Dispersion Modelling - prediction of ambient pollutant concentrations through dispersion modelling of atmospheric emissions from the operations at the Site; and
- Impact Assessment - comparison of predicted concentrations with the relevant criteria, detailed in **Appendix C**.

3.1.2 The scope of the assessment includes consideration of the potential impacts on local air quality resulting from emissions to air from the operations at the Site.

3.2 Methodology

Selection of Dispersion Model

3.2.1 Emissions associated with the operations at the Site have the potential to cause increases in ambient pollutant concentrations in the vicinity of the Site. These have been quantified through dispersion modelling in accordance with the methodology outlined in the following sections.

3.2.2 Dispersion modelling was undertaken using the ADMS[26] software package, which was developed by Cambridge Environmental Research Consultants (CERC) Ltd. ADMS is a short-range dispersion modelling software package that simulates a wide range of buoyant and passive releases to atmosphere. It is a new generation model utilising boundary layer height and Monin-Obukhov length to describe the atmospheric boundary layer and a skewed Gaussian concentration distribution to calculate dispersion under convective conditions.

3.2.3 The model takes into account the effects of significant buildings which surround the emission source. It is a limitation of the ADMS model that buildings can only be represented as having cuboid (or cylindrical) shape and, as such, all buildings have been approximated as having rectangular footprints.

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20 South Derbyshire District Council (2022) 2022 Air Quality Annual Status Report (ASR) [Online] Available at: https://www.southderbyshire.gov.uk/assets/attach/10879/south-derbyshire-asr-2022.pdf [Accessed on 27/02/2023].

21 Department for Environment, Food and Rural Affairs (Defra) Local Air Quality Management (LAQM) Support Pages [Online] Available at: http://laqm.defra.gov.uk/ [Accessed on 27/02/2023].

22 Environment Agency (2022) Pollution Inventory [Online] Available at: https://data.gov.uk/dataset/cfd94301-a2f2-48a2-9915-e477ca6d8b7e/pollution-inventory [Accessed on 27/02/2023].

23 Multi-Agency Geographic Information for the Countryside. [Online] Available at: https://magic.defra.gov.uk/MagicMap.aspx [Accessed on 27/02/2023].

24 UK Air Pollution Information System (APIS) [Online] Available at: http://www.apis.ac.uk/ [Accessed on 27/02/2023].

25 Department for Environment, Food and Rural Affairs (Defra) (2014) Process Guidance Note 6/17(11) - Statutory Guidance for Printing of Flexible Packaging [Online] Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/583865/printing-flexible-packaging-process-guidance-note-6-17_11_.pdf [Accessed on 27/02/2023].

26 ADMS-Roads Extra Version 5.0.1.3.

3.2.4 It is important to note that, as a result, the dimensions of the buildings are set to assess their impact on dispersion rather than to be representative of their exact dimensions.

3.2.5 Full details of the model input parameters are provided in **Appendix D**.

Assessment Extents

3.2.6 Impacts have been considered at selected sensitive receptors reflecting potential exposure. Reference should be made to **Figure 1**, for a graphical representation of the assessment extents.

3.2.7 A 3D plan of the model layout is presented in **Figure 2**.

Selection of Sensitive Receptors

3.2.8 Sensitive locations are places where the public or sensitive ecological habitats may be exposed to pollutants resulting from the operation of the Proposed Development.

Human Receptors

3.2.9 To complete the assessment of operational phase impacts, a number of 'receptors' representative of locations of relevant public exposure were identified at which pollutant concentrations were predicted.

3.2.10 The locations of the assessment receptors are shown on **Figure 1** and listed in **Table 1** below.

Table 1 - Human Receptor Locations Used in the Assessment

Receptor	Description / Address	Grid Reference		Distance from Point Source Location (m)	Height above Ground Level (m)
		X (m)	Y (m)		
R1	The Forge, Boggy Lane	420148.0	332815.9	1,230	1.5
R2	18 Old Hall Lane	420591.2	333523.3	1,940	1.5
R3	The Bungalow	420803.8	332394.2	920	1.5
R4	Heath House Farm, Bent Lane	421156.4	332081.9	940	1.5
R5	Property on Church Broughton Road	421407.9	332053.5	1,150	1.5
R6	Heath Cottage Farm. Broughton Heath Lane	421373.5	331794.3	1,040	1.5
R7	The Holding, Church Broughton Road	421314.8	331653.3	970	1.5
R8	Tissington House, Church Broughton Road	421395.8	331526.7	1,050	1.5
R9	Daisy Bank, Breach Lane	421349.4	331391.1	1,020	1.5
R10	Red Barn House, Brook Lane	421210.1	331312.6	910	1.5
R11	Common House Farm, Uttoxeter Road	420498.0	331314.9	320	1.5
R12	The Haven, Uttoxeter Road	420541.0	331110.1	530	1.5
R13	Guinea Farm, Uttoxeter Road	420553.3	330970.8	660	1.5
R14	The Firs Farm, Scropton Road	420387.4	330111.1	1,490	1.5
R15	The Lodge, Uttoxeter Road	420224.1	331191.8	430	1.5
R16	Property off Scropton Road	420091.5	331206.9	470	1.5
R17	14 Watery Lane	419457.2	331090.6	1,030	1.5
R18	Cote House, Watery Lane	419643.5	331297.2	770	1.5
R19	22 Woodland Drive	418520.1	331543.8	1,830	1.5
R20	The Connifers, Uttoxeter Road	418834.6	331774.6	1,530	1.5
R21	Yew Tree Cottage, Uttoxeter Road	418978.8	331855.8	1,390	1.5
R22	Lawn House, Hay Lane	419367.9	332101.6	1,100	1.5
R23	Gables House, Woodyard Lane	419806.9	332091.6	730	1.5
R24	Woodside Farm, Woodyard Lane	419871.6	332200.7	770	1.5
R25	Property on Woodhouse Lane	419609.7	333001.5	1,590	1.5
R26	Maple Dene, Cote Bottom Lane	420012.1	332939.5	1,380	1.5
R27*	Truma Limited, 2000 Park Lane/Dove Valley Park, Derby DE65 5BG	420268.1	331839.4	250	1.5
R28*	MEG Derby, Dove Valley Park, 6000 Park Ave, Foston, Derby DE65 5BT	420238.2	332327.9	740	1.5

* Non-sensitive receptor location.

Ecological Receptors

3.2.11 Atmospheric emissions from the operation of the Proposed Development have the potential to impact on receptors of ecological sensitivity within the vicinity of the Site. A study was undertaken to identify any statutory designated sites of ecological or nature conservation importance as follows:

- Special Protection Areas (SPAs), Special Areas of Conservation (SACs), Ramsar sites, within 10km of the Site; and
- Sites of Special Scientific Interest (SSSIs), local nature sites (ancient woods, local wildlife sites and national and local nature reserves), within 2km of the Site.

3.2.12 The study was completed using the MAGIC web-based interactive mapping service[23], which draws together information on key environmental schemes and designations.

3.2.13 A review of the area indicated that there were no SPAs, SACs or Ramsar sites in the screening distance of the Proposed Development, and therefore, potential effects on these designations were not considered further within the assessment.

3.2.14 The locations of the assessment receptors are shown on **Figure 1** and listed in **Table 2** below.

Table 2 - Human Receptor Locations Used in the Assessment

Receptor	Description / Address	Grid Reference		Distance from Point Source Location (m)	Height above Ground Level (m)
		X (m)	Y (m)		
ER1	Rough Wood - Ancient Woodland	419640.1	332195.7	930	0.0
ER2	Rough Wood - Ancient Woodland	419774.4	332306.2	910	0.0
ER3	Conygree Wood - Ancient Woodland	419840.1	332542.0	1,070	0.0
ER4	Conygree Wood - Ancient Woodland	419926.7	332664.5	1150	0.0

Meteorological Data

3.2.15 The model utilises hourly meteorological data to define conditions for plume rise, dispersion and diffusion. It estimates the pollutant concentration from each source at each receptor combination for every hour of input meteorology and calculates user-selected long-term and short-term averages.

3.2.16 Meteorological data for the modelling was taken from East Midlands Airport recording station, which is considered to be representative of likely meteorological conditions within the assessment extents. Inter-annual variability testing of the model results was undertaken for the years 2018 to 2022. Wind roses for each meteorological year are provided in **Appendix E**. The predominant wind direction over the 5-years was from the south-west through to the west.

Pollutants and Atmospheric Chemistry

3.2.17 Local air quality impacts from the operations at the Site are likely to be associated with VOC emissions. Currently there are no AQOs specified for VOCs, so in order to represent a robust assessment approach, comparison has been made between the modelled total VOC concentrations and the relevant AQO for benzene (C_6H_6). Further local air quality impacts during the operation of the RTO may result from carbon monoxide (CO) and oxides of nitrogen (NO_x).

3.2.18 With regard to NO_x, this takes into account the potential contribution from the source and likely existing baseline pollutant concentrations. NO_2 and nitric oxide (NO) are both oxides of nitrogen and together are referred to as NO_x. In ambient air, NO is oxidised to form NO_2, and it is NO_2 which has the more significant impact on human health. Therefore, this assessment considers the impacts of emissions on ambient concentrations of NO_2.

3.2.19 The Environmental Assessment Levels (EALs) against which the above pollutants have been assessed are detailed in **Appendix C**.

3.2.20 Impacts were assessed utilising operational parameters provided by the Client Team, with the Site operating continuously for 8,760-hours per year. This represents a robust scenario in relation to likely operational impacts.

3.2.21 For the purposes of the assessment, predicted impacts on pollutant concentrations associated with the operations at the Site are based on the 5-year maximum average concentrations, utilising meteorological data for 2018 to 2022.

3.2.22 Two operational scenarios have been considered within the assessment; these are detailed below:

- Scenario 1 - Minimum RTO flow at 6,000m^3/hr; and
- Scenario 2 - Maximum RTO flow at 27,000m^3/hr.

Selection of Background Concentrations

Human Receptors

3.2.23 Background pollutant data for the operational phase assessment have been taken from the national maps provided on the Defra website[27], where background concentrations of those pollutants included within the AQS have been mapped at a grid resolution of 1x1km for the whole of the UK. Estimated background concentrations are available for all years between 2018 and 2030, with previous years still accessible for assessment purposes utilising older resources.

3.2.24 The maps assume that background concentrations will improve (i.e. reduce) over time, in line with the predicted reduction in vehicle emissions, and emissions from other sources. Due to the uncertainty in this prediction, and in line with the findings of many local authorities that measured concentrations have not reduced as anticipated, 2023 background concentrations for NO_x and NO_2, have been utilised in this assessment. This provided a robust assessment and is likely to overestimate pollutant concentrations during the future operation of the Proposed Development.

3.2.25 For CO and C_6H_6, background concentrations are from 2001[28]. C_6H_6 values have also been taken from the results of monitoring undertaken as part of the Automatic Hydrocarbon Monitoring Network at London Eltham and London Marylebone Road during 2018-2022, provided on Defra's UK Air Information Resource website[29].

Ecological Receptors

3.2.26 The predicted background deposition fluxes have been determined from APIS website.

3.3 Significance Criteria

Human Receptors

3.3.1 The consideration of whether the effect of the operation of the Proposed Development is significant depends on the magnitude of impact, the importance of the affected resource or receptors, and the background pollutant levels. Even a small impact on a sensitive receptor, such as surrounding residential properties, may give rise to significant effects, particularly where background pollutant levels are already high.

[27] Department for Environment, Food and Rural Affairs (Defra) (2023) Background Concentrations [Online] Available at: https://uk-air.defra.gov.uk/data/laqm-background-home [Accessed on 27/02/2023].
[28] Department for Environment, Food and Rural Affairs (Defra) (2001) Background Concentrations [Online] Available at: https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2001 [Accessed on 27/02/2023].
[29] Department for Environment, Food and Rural Affairs (Defra) (undated) UK Air Information Resource [Online] Available at: https://uk-air.defra.gov.uk/interactive-map?network=hc [Accessed on 27/02/2023].

3.3.2 Environmental Protection UK (EPUK) and IAQM guidance[30] significance criteria have been adopted for the assessment, and are based on professional judgement, where the overall air quality effect of the scheme is described as either 'significant' or 'not significant'. The judgement should be made by a suitably qualified person. When using professional judgement to come to a conclusion, the guidance states the following factors should be taken into account:

- The existing and future air quality in the absence of the Proposed Development;
- The extent of current and future population exposure to impacts;
- The influence and validity of any assumptions adopted when undertaking the prediction of impacts;
- The potential for cumulative impacts; several impacts that are described as 'slight' individually could, taken together, be regarded as having a significant effect for the purposes of air quality management in an area, especially where it is proving difficult to reduce concentrations of a pollutant. Conversely, a 'moderate' or 'substantial' impact may not have a significant effect if it is confined to a very small area and where it is not obviously the cause of harm to human health; and
- The judgment on significance relates to the consequences of the impacts (the effects); e.g., will they have an effect on human health that could be considered as significant. In the majority of cases, the impacts from an individual development will be insufficiently large to result in measurable changes in health outcomes that could be regarded as significant by health care professionals.

3.3.3 To assist with the significance determination, the EPUK/IAQM guidance provides advice on the description of impacts at individual receptors (Table 6.3 in the guidance document).

3.3.4 For the assessment of annual mean impacts, the impact description is based on both the magnitude of the impact and the total pollutant concentration (including the process contribution, if an adverse impact).

3.3.5 This guidance recommends that the degree of an impact is described by expressing the magnitude of incremental change in pollutant concentration as a proportion of the relevant assessment level and examining this change in the context of the new total concentration and its relationship with the assessment criterion, as summarised in **Table 3**.

Table 3 - Emissions - Significance of Impact

Long Term Average Concentration at Receptors in Assessment Year	**% Change in Concentration Relative to Air Quality Assessment Level (AQAL)**			
	1	**2 - 5**	**6 - 10**	**> 10**
75% or less of AQO	Negligible	Negligible	Slight	Moderate
76 - 94% of AQO	Negligible	Slight	Moderate	Moderate
95 - 102% of AQO	Slight	Moderate	Moderate	Substantial
103 - 109% of AQO	Moderate	Moderate	Substantial	Substantial
110% or more of AQO	Moderate	Substantial	Substantial	Substantial

Notes

AQAL = air quality assessment level, which for this assessment related to the UK Air Quality Strategy objectives.

Where the %change in concentrations is <0.5%, the change is described as 'Negligible' regardless of the concentration.

When defining the concentration as a percentage of the AQAL, 'without scheme' concentration should be used where there is a decrease in pollutant concentration and the 'with scheme;' concentration where there is an increase.

Where concentrations increase, the impact is described as adverse, and where it decreases as beneficial.

[30] Environmental Protection UK and Institute of Air Quality Management (Version 1.2 Updated January 2017) Land Use Planning & Development Control: Planning for Air Quality.

3.3.6 The matrix shown in **Table 3** is intended to be used by rounding the change in percentage pollutant concentration to whole numbers, which makes it clearer which cell the impact falls within. It should be noted that changes of 0%, i.e., less than 0.5%, are described as negligible.

3.3.7 The EPUK/IAQM guidance states that an assessment must reach a conclusion on the likely significance of the predicted impact. It should be noted that this is a binary judgement of either it is significant, or it is not significant.

Ecological Receptors

Critical Loads and Levels

3.3.8 A critical load is defined by the UK APIS as:

> '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 exceedance of a critical load is defined as the atmospheric deposition of the pollutant above the critical load.'

3.3.9 A critical level is defined as:

> 'Threshold for direct effects of pollutant concentrations according to current knowledge. Exceedance of a critical level is defined as the atmospheric concentration of the pollutant above the critical level.'

3.3.10 A critical load refers to deposition of a pollutant, while a critical level refers to pollutant concentrations in the atmosphere (which usually have direct effects on vegetation or human health).

3.3.11 When pollutant loads (or concentrations) exceed the critical load or level it is considered that there is a risk of harmful effects. The excess over the critical load or level is termed the exceedance. A larger exceedance is often considered to represent a greater risk of damage.

3.3.12 Maps of critical loads and levels and their exceedances have been used to show the potential extent of pollution damage and aid in developing strategies for reducing pollution. Decreasing deposition below the critical load is seen as means for preventing the risk of damage. However, even a decrease in the exceedance may infer that less damage will occur.

3.3.13 Critical loads have been designated within the UK based on the sensitivity of the receiving habitat and have been reviewed for the purpose of this assessment.

3.3.14 Site relevant critical loads and levels are presented in **Table 4**.

Table 4 - Critical Loads and Levels

Parameter		**Rough Wood - Ancient Woodland**	**Conygree Wood - Ancient Woodland**
Nitrogen Deposition Critical Load (CL) (kg N/ha/yr)		10-20*	10-20*
Acidity CL (keq/ha/yr)	CLminN	0.142	0.142
	CLmaxN	1.971	1.971
	CLmaxS	1.829	1.829
NO_x Critical Level ($\mu g/m^3$)	Annual mean	30	30
	24-hour mean	75	75

* Broadleaved, Deciduous Woodland.

3.3.15 The potential for ecological impacts on local wildlife sites, as advised by the EA's Air Emissions Risk Assessment guidance[19] impacts are insignificant where the process contribution (PC) is less than 100% of the long-term or short-term environmental standard.

3.3.16 Guidance on national or European sites by the EA states that, regardless of the baseline environmental conditions, a process can be considered as insignificant if:

- the long-term (annual mean) process contribution is <1% of the long-term environmental standard; and
- the short-term (15-minute, 1-hour, 24-hour mean) process contribution is <10% of the short-term environmental standard.

3.3.17 It should be noted that these criteria determine when an impact can be screened out as being insignificant. They do not imply that impacts will necessarily be significant above one or both of these criteria, merely that there is a potential for significant impacts to occur that should be considered using a detailed assessment methodology, such as this detailed dispersion modelling assessment.

3.3.18 The second stage in the EA's screening process for long-term contributions is to add the PC to the local background concentration to calculate the predicted environmental concentration (PEC). For short-term contributions the PC is compared against the short-term environmental standard minus twice the long-term background concentration. The emissions are considered to be insignificant if:

- the long-term PEC is less than 70% of the long-term environmental standard; and
- the short-term PC is less than 20% of the short-term environmental standards minus twice the long-term background concentration.

3.3.19 The EA guidance also states that, no further action is required if resulting PECs do not exceed environmental standards.

3.3.20 The 1% (long-term) and 10% (short-term) criteria are thus routinely used to screen out the potential for significant impacts on sensitive habitats from a range of sources. For the purposes of this assessment, wherever the detailed modelling shows that concentrations and fluxes are below the critical level or critical load, it is considered that there will be no significant impacts. Additionally, where the operation of a site will increase concentrations or fluxes by less than 1% (long-term) or 10% (short-term) of the relevant critical level or critical load, the potential for significant impacts can be discounted.

4.0 Baseline

4.1 Introduction

4.1.1 Existing air quality conditions representative of the Site were identified in order to provide a baseline for consideration. These are detailed in the following sections.

4.2 Local Air Quality Management

4.2.1 According to the latest available Air Quality ASR from SDDC[20], there are currently no AQMAs designated across the district and as such, potential effects associated with the operations at the Site have not been considered at sensitive receptors within any AQMA.

4.3 Local Emission Sources

4.3.1 The main potential sources of air pollution, affecting the Site, were identified as emissions from road transport using the local road network. There are potential commercial sources identified in the vicinity of the Site, that may also influence the local air quality, however, these would be characteristic of the mixed-use area in which the Site is located.

4.4 Air Quality Monitoring

4.4.1 Monitoring of NO_2 pollutant concentrations is undertaken throughout SDDC's area of jurisdiction utilising non-automatic (passive) methods. The closest monitoring location with available data, diffusion tube 'SDDC4', is located approximately 1.7km south-east of the Site.

4.4.2 Recent diffusion tube monitoring results, recorded by SDDC in the vicinity of the Site, are shown in **Table 5**.

Table 5 - Diffusion Tube Monitoring Results

Diffusion Tube Monitoring Site			Monitored NO_2 Concentration (µg/m³)				
ID	**Location**	**Site Type**	**2017**	**2018**	**2019**	**2020**	**2021**
SDDC4	Castle Apartments, Station Road, Hatton	Roadside	24.8	22.4	19.5	19.1	20.4
SDDC24*	59 Station Road, Hatton	Roadside	-	-	-	-	-

* SDDC24 is a new diffusion tube location and therefore, had no relevant monitoring data at the time of writing.

4.4.3 As shown in **Table 5**, there were no exceedances of the annual mean AQO for NO_2 at diffusion tube SDDC4, during the five most recent monitoring years, 2017-2021. Reference should be made to **Figure 1** for a map of the diffusion tube positions.

4.4.4 Automatic air quality monitoring of other pollutant concentrations is undertaken by various national Monitoring Networks across the UK. Automatic air quality monitoring of C_6H_6 concentrations is undertaken by the Automatic Hydrocarbon Network. The most recent monitoring results, recorded closest to the Site, are shown in **Table 6**.

Table 6 - Automatic Hydrocarbon Network Monitoring Results

Monitoring Site		Monitored C_6H_6 Concentration (µg/m³)				
Location	**Type**	**2018**	**2019**	**2020**	**2021**	**2022**
London Eltham	Urban Background	0.5	0.4	0.4	0.4	0.4****
London Marylebone Road	Urban Background	0.9	0.8*	0.7**	0.7***	0.7

* Data capture: 65%
** Data capture: 48%
*** Data capture: 82%
**** Data capture: 6%

4.4.5 As shown in **Table 6**, there were no exceedances of the annual mean AQO for C_6H_6 at either monitoring site during the most recent monitoring years. While there are significant distances between the Site and the monitoring locations, due to their relative position (i.e. being in a heavily urbanised area), these monitoring results are considered to be a robust representation of likely background concentrations at the Site and its surrounding area.

4.5 Predicted Background Pollutant Concentrations

Human Receptors

4.5.1 Predictions of background pollutant concentrations on a 1km by 1km grid basis have been produced by Defra for the entire of the UK to assist Local Authorities in their Review and Assessment of air quality. Data for the assessment extents were downloaded from the Defra website for the purpose of the project. These data are summarised in **Table 7**.

Table 7 - Background Pollutant Concentrations by Grid Square

OS Grid Reference		Background Pollutant Concentrations (µg/m³)					
X (m)	Y (m)	CO	C_6H_6			NO_2	NO_x
		2001	2001	2003	2010	2023	2023
418500	331500	251.0	0.3	0.2	0.2	8.4	10.8
419500	331500	257.0	0.3	0.3	0.2	8.9	11.5
419500	332500	255.0	0.3	0.3	0.2	7.1	9.1
419500	333500	255.0	0.3	0.3	0.2	6.4	8.2
420500	330500	274.0	0.3	0.3	0.2	7.9	10.2
420500	331500	260.0	0.3	0.3	0.2	9.8	12.7
420500	332500	258.0	0.3	0.3	0.2	9.0	11.7
420500	333500	257.0	0.3	0.3	0.2	6.9	8.9
421500	331500	263.0	0.3	0.3	0.2	9.3	12.1
421500	332500	260.0	0.3	0.3	0.2	7.5	9.7

4.5.2 As shown in **Table 7**, the predicted background concentrations for all pollutants were below the relevant AQOs across the assessment extents.

4.5.3 In order to represent a robust assessment approach for VOC concentrations, 2018 data for C_6H_6 from the London Marylebone Road monitoring site, with the highest recorded concentrations (within recent years), and 100% data capture, have been utilised to represent background VOC concentrations within the assessment extents.

Ecological Receptors

4.5.4 The habitat types within each designation are listed in accordance with the UK Biodiversity Action Plan (BAP) criteria, which are then split further by the European Nature Information System (EUNIS) habitat type. These were reviewed, along with the habitat maps available through MAGIC, to define the relevant classification at each of the receptor locations. It should be noted that separate habitat types are often listed for European and National designations, although the geographical areas covered are the same. When this was the case the most suitable classification for the area of interest was selected.

4.5.5 Site relevant background deposition rates are presented in **Table 8.**

Table 8 - Background Deposition Rates

Parameter		Rough Wood - Ancient Woodland	Conygree Wood - Ancient Woodland
Nitrogen Deposition (kg N/ha/yr)		44.4	44.4
Acid Deposition (keq/ha/yr)	Nitrogen	3.17	3.17
	Sulphur	0.21	0.21
NO_x Concentration (µg/m³)	Maximum	10.02	10.02

5.0 Assessment

5.1 Introduction

5.1.1 There is the potential for air quality impacts as a result of the operations at the Site. These are assessed in the following sections.

5.2 Operational Phase Assessment

5.2.1 Impacts were assessed utilising operational parameters provided by the Client Team and outlined in Defra's Process Guidance Note 6/17(11)[25], with the Site operating continuously for 8,760-hours per year. NO_X to NO_2 conversion was considered to be 100% for both the annual mean and the 1-hour mean concentrations. This represents a robust scenario in relation to likely operational impacts.

5.2.2 For the purposes of this assessment, predicted impacts on pollutant concentrations associated with the operations at the Site are based on the 5-year maximum average concentrations, utilising meteorological data for 2018 to 2022.

5.2.3 Two operational scenarios have been considered within the assessment, these are detailed below:

- Scenario 1 - Minimum RTO flow at 6,000m^3/hr; and
- Scenario 2 - Maximum RTO flow at 27,000m^3/hr.

5.2.4 Details of the model input parameters are presented in **Appendix D**.

5.2.5 Full results of the Detailed Dispersion Modelling Assessment for Scenario 1 are presented in **Appendix F** and for Scenario 2 in **Appendix G**. A summary for both scenarios is provided below.

Human Receptors

Volatile Organic Compounds (VOCs)

5.2.6 Currently there are no AQOs specified for VOCs, so in order to represent a robust assessment approach, comparison has been made between the modelled VOC concentrations and the relevant AQO for C_6H_6, assuming that all VOCs are Benzene.

Volatile Organic Compounds (VOCs) - Annual Mean

5.2.7 Accordingly, the AQO for annual mean C_6H_6 concentrations is 5µg/m^3. Annual mean C_6H_6 concentrations were predicted to be below this objective at all sensitive receptor locations during both modelled scenarios, without the risk of exceedances. The maximum 5-year average Process Contributions (PC) and Predicted Environmental Concentrations (PEC; including background pollutant concentration) at sensitive receptor locations for each assessment scenario are summarised in **Table 9** below.

Table 9 – Maximum Predicted 5-year Average Annual Mean VOC Concentrations

Scenario	Receptor		PCs (µg/m^3)	PECs (µg/m^3)
Scenario 1 - Minimum RTO flow	R15	The Lodge, Uttoxeter Road	0.04	0.94
	R27*	Truma Limited, 2000 Park Lane/Dove Valley Park, Derby DE65 5BG	0.06	0.96
Scenario 2 - Maximum RTO flow	R15	The Lodge, Uttoxeter Road	0.12	1.02
	R27*	Truma Limited, 2000 Park Lane/Dove Valley Park, Derby DE65 5BG	0.20	1.10

* Non-sensitive receptor location.

5.2.8 Based on the assessment results, the operations at the Site would not result in any predicted exceedances of the relevant AQO (without the risk of exceedance) at sensitive receptor locations within the vicinity of the Site.

Volatile Organic Compounds (VOCs) - 24-hour Mean

5.2.9 The AQO for 24-hour mean C_6H_6 concentrations is 30µg/m^3. The 24-hour mean C_6H_6 concentrations were predicted to be below this objective at all sensitive receptor locations during both modelled scenarios, without the risk of exceedances. The maximum 5-year average PC and PEC concentrations at sensitive receptor locations for each assessment scenario are summarised in **Table 10** below.

Table 10 – Maximum Predicted 5-year Average 24-Hour Mean VOC Concentrations

Scenario	Receptor		PCs (µg/m^3)	PECs (µg/m^3)
Scenario 1 - Minimum RTO flow	R11	Common House Farm, Uttoxeter Road	0.6	2.4
	R15	The Lodge, Uttoxeter Road	0.6	2.4
	R27*	Truma Limited, 2000 Park Lane/Dove Valley Park, Derby DE65 5BG	0.6	2.4
Scenario 2 - Maximum RTO flow	R11	Common House Farm, Uttoxeter Road	1.9	3.7
	R27*	Truma Limited, 2000 Park Lane/Dove Valley Park, Derby DE65 5BG	2.0	3.8

* Non-sensitive receptor location.

5.2.10 Based on the assessment results, the operations at the Site would not result in any predicted exceedances of the relevant 24-hour mean AQO for C_6H_6 (without the risk of exceedance) at sensitive receptor locations within the vicinity of the Site.

Nitrogen Dioxide (NO_2) - Annual Mean

5.2.11 The AQO for annual mean NO_2 concentrations is 40µg/m^3. Annual mean NO_2 concentrations were predicted to be below this objective at all sensitive receptor locations during both modelled scenarios, without the risk of exceedances. The maximum 5-year average PC and PEC concentrations at sensitive receptor locations for each assessment scenario are summarised in **Table 11** below.

Table 11 – Maximum Predicted 5-year Average Annual Mean NO_2 Concentrations

Scenario	Receptor		PCs (µg/m^3)	PECs (µg/m^3)
Scenario 1 - Minimum RTO flow	R15	The Lodge, Uttoxeter Road	0.2	10.0
	R27*	Truma Limited, 2000 Park Lane/Dove Valley Park, Derby DE65 5BG	0.3	10.1
Scenario 2 - Maximum RTO flow	R15	The Lodge, Uttoxeter Road	0.6	10.4
	R27*	Truma Limited, 2000 Park Lane/Dove Valley Park, Derby DE65 5BG	1.0	10.7

* Non-sensitive receptor location.

5.2.12 The operations at the Site would not result in any predicted exceedances of the relevant annual mean AQO for NO_2 (without the risk of exceedance) at sensitive receptor locations within the vicinity of the Site. Based on the IAQM guidance, a PC change of these magnitudes would be considered **negligible**, with the resulting effect considered to be **not significant**.

Nitrogen Dioxide (NO_2) - 1-hour Mean

99.79th %-ile

5.2.13 The AQS objective for 1-hour mean NO_2 concentrations is 200µg/m^3. NO_2 concentrations were predicted to be below this objective at all sensitive receptor locations during both modelled scenarios, without the risk of exceedances. The maximum 5-year average PC and PEC concentrations at sensitive receptor locations for each assessment scenario are summarised in **Table 12** below.

Table 12 – Maximum Predicted 5-year Average 1-Hour Mean (99.79th%-ile) NO_2 Concentrations

Scenario	Receptor		PCs (µg/m³)	PECs (µg/m³)
Scenario 1 - Minimum RTO flow	R11	Common House Farm, Uttoxeter Road	6.1	25.6
	R27*	Truma Limited, 2000 Park Lane/Dove Valley Park, Derby DE65 5BG	7.7	27.2
Scenario 2 - Maximum RTO flow	R11	Common House Farm, Uttoxeter Road	16.4	35.9
	R27*	Truma Limited, 2000 Park Lane/Dove Valley Park, Derby DE65 5BG	20.9	40.4

* Non-sensitive receptor location.

5.2.14 The operations at the Site would not result in any predicted exceedances of the relevant AQS objective for 1-hour mean NO_2 concentrations (without the risk of exceedance) at sensitive receptor locations within the vicinity of the Site. Based on the IAQM guidance, a PC change of these magnitudes would be considered **negligible**, and the overall effect on hourly mean NO_2 concentrations at existing sensitive receptors is therefore **not significant**.

100th %-ile

5.2.15 While there is no absolute hourly limit environmental standard for the acute exposure to NO_2, there can be effects on health over a certain threshold. To understand the potential health effects and the amount of risk to members of the public, the EA requires the inclusion of 100th %-ile NO_2 concentrations within the dispersion modelling assessment, and accordingly, these are reported for completeness.

5.2.16 The maximum 5-year average PC and PEC concentrations at sensitive receptor locations for each assessment scenario are summarised in **Table 13** below.

Table 13 – Maximum Predicted 5-year Average 1-Hour Mean (100th%-ile) NO_2 Concentrations

Scenario	Receptor		PCs (µg/m³)	PECs (µg/m³)
Scenario 1 - Minimum RTO flow	R11	Common House Farm, Uttoxeter Road	7.6	27.1
	R15	The Lodge, Uttoxeter Road	7.6	27.1
	R27*	Truma Limited, 2000 Park Lane/Dove Valley Park, Derby DE65 5BG	9.4	29.0
Scenario 2 - Maximum RTO flow	R11	Common House Farm, Uttoxeter Road	17.9	37.4
	R27*	Truma Limited, 2000 Park Lane/Dove Valley Park, Derby DE65 5BG	23.8	43.3

* Non-sensitive receptor location.

Carbon Monoxide (CO) - Maximum 8-hour Rolling Mean

5.2.17 The AQO for maximum 8-hour rolling mean CO concentrations is 10mg/m³. 8-hour mean CO concentrations were predicted to be below the AQO at all sensitive receptor locations during both modelled scenarios, without the risk of exceedances. The maximum 5-year average PC and PEC concentrations at sensitive receptor locations for each assessment scenario are summarised in **Table 14** below.

Table 14 – Maximum Predicted 5-year Average 8-Hour Rolling Mean CO Concentrations

Scenario	Receptor		PCs (mg/m³)	PECs (mg/m³)
Scenario 1 - Minimum RTO flow	R11	Common House Farm, Uttoxeter Road	0.005	0.265
	R13	Guinea Farm, Uttoxeter Road	0.003	0.277
	R27*	Truma Limited, 2000 Park Lane/Dove Valley Park, Derby DE65 5BG	0.006	0.266
Scenario 2 - Maximum RTO flow	R11	Common House Farm, Uttoxeter Road	0.016	0.276
	R13	Guinea Farm, Uttoxeter Road	0.006	0.280
	R27*	Truma Limited, 2000 Park Lane/Dove Valley Park, Derby DE65 5BG	0.017	0.277

* Non-sensitive receptor location.

5.2.18 The operations at the Site would not result in any predicted exceedances of the relevant AQO for maximum 8-hour rolling mean CO concentrations (without the risk of exceedance) at sensitive receptor locations within the vicinity of the Site. Based on the IAQM guidance, a PC change of these magnitudes would be considered **negligible**, and the overall effect on the 8-hour rolling mean CO concentrations at existing sensitive receptors is therefore **not significant**.

Carbon Monoxide (CO) - 1-hour Mean

5.2.19 The AQO for 1-hour mean CO concentrations is 30mg/m^3. 1-hour mean CO concentrations were predicted to be below the AQO at all sensitive receptor location during both modelled scenarios, without the risk of exceedances. The maximum 5-year average PC and PEC concentrations at sensitive receptor locations for each assessment scenarios are summarised in **Table 15** below.

Table 15 – Maximum Predicted 5-year Average 1-Hour Mean CO Concentrations

Scenario	Receptor		PCs (mg/m^3)	PECs (mg/m^3)
Scenario 1 - Minimum RTO flow	R11	Common House Farm, Uttoxeter Road	0.008	0.528
	R13	Guinea Farm, Uttoxeter Road	0.005	0.553
	R15	The Lodge, Uttoxeter Road	0.008	0.528
	R27*	Truma Limited, 2000 Park Lane/Dove Valley Park, Derby DE65 5BG	0.009	0.529
Scenario 2 - Maximum RTO flow	R11	Common House Farm, Uttoxeter Road	0.018	0.538
	R13	Guinea Farm, Uttoxeter Road	0.010	0.558
	R27*	Truma Limited, 2000 Park Lane/Dove Valley Park, Derby DE65 5BG	0.024	0.544

5.2.20 The operations at the Site would not result in any predicted exceedances of the relevant AQO for 1-hour mean CO concentrations (without the risk of exceedance) at sensitive receptor locations within the vicinity of the Site. Based on the IAQM guidance, a PC change of these magnitudes would be considered **negligible**, and the overall effect on the 1-hour mean CO concentrations at existing sensitive receptors is therefore **not significant**.

Ecological Receptors

5.2.21 Full results of the Detailed Dispersion Modelling Assessment for Scenario 1 are presented in **Appendix F** and for Scenario 2 in **Appendix G.** A summary is provided below.

Nitrogen Oxides

5.2.22 Predicted annual and 24-hour mean NO_X concentrations are summarised in **Table F8** and **Table G8**.

5.2.23 As presented in **Table F8** and **Table G8**, the predicted annual mean NO_x PCs for the Rough Wood and Conygree Wood Ancient Woodlands are significantly below the applicable screening criteria of 100%, without the risk of exceedance. As such, no further consideration of annual mean NO_x impacts is required at these designations.

5.2.24 The 24-hour mean NO_x PCs are also significantly below the relevant assessment criteria of 100% for the Rough Wood and Conygree Wood Ancient Woodlands, resulting in a **not significant** effect, and therefore no further assessment is required.

5.2.25 The impacts of the Proposed Development in respect to annual and 24-hour mean NO_X concentrations are therefore considered to be **not significant** at these designations.

Annual Mean Nitrogen Deposition

5.2.26 Predicted annual mean nitrogen deposition rates are summarised in **Table F9** and **Table G9**.

5.2.27 As shown in **Table F9** and **Table G9**, the predicted annual mean nutrient nitrogen deposition rates at the Rough Wood and Conygree Wood Ancient Woodlands are significantly below the applicable screening criteria of 100%, and as such, no further assessment is required.

5.2.28 As such, it is considered that the operation of the Site would result in a **not significant** effect on the integrity of these ecological designations.

Annual Mean Acid Deposition

5.2.29 Predicted annual mean acid deposition rates at relevant receptor locations are summarised in **Table F10** and **Table G10.**

5.2.30 As shown in **Table F10** and **Table G10**, the predicted annual mean acid deposition rates at the Rough Wood and Conygree Wood Ancient Woodlands are significantly below the screening criteria of 100%. As such, no further assessment is required.

5.2.31 As such, it is considered, that the operation of the Site would result in a **not significant** effect on the integrity of these ecological designations.

Summary

5.2.32 Based on worst-case assumptions and 8,760-hours annual operation, the Dispersion Modelling Assessment concluded that the operations at the Site would not result in any predicted exceedances of any of the relevant AQOs at sensitive receptor locations within the vicinity of the Site, in either of the modelled scenarios, and is considered to result in an **not significant** impact.

5.2.33 Based on the results of the assessment, air quality is not considered a constraint to planning or permitting consent.

6.0 Summary and Conclusions

6.1.1 Delta-Simons was appointed to prepare this Air Quality Assessment to inform a full planning application for the erection of an employment building (Use Class B8, B2) and Ancillary E(g) at Plot 10 with associated landscaping, drainage, car parking, refuse stores and other infrastructure proposed, located at Plot 10A Dove Valley Park in Foston, Derby, DE65 5BT.

6.1.2 The Proposed Development allows for Part A2 flexographic printing works at the Site, comprising two presses which will use and release a mixture of MEK, ethanol and ethyl acetate through an RTO. As such, the Proposed Development has been assessed to determine whether it has the potential to cause adverse air quality impacts during its operation.

6.1.3 The Air Quality Assessment considering both the minimum and maximum flow rate scenarios for the RTO, concluded that the operations at the Site would not result in any predicted exceedances (without the risk of exceedances) of any of the relevant AQOs at sensitive receptor locations within the vicinity of the Site. The predicted effects associated with the operations at the Site are therefore, **not significant** at all sensitive human receptor locations.

6.1.4 NO_X levels, and nitrogen and acid gas deposition rates were also predicted at the relevant ecological sites. Results indicated that emissions from the operations at the Site would not significantly affect existing conditions at either designation.

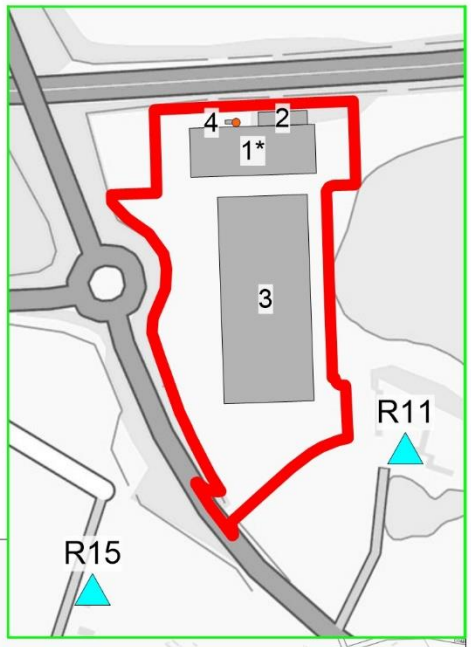
6.1.5 It is considered that the Proposed Development complies with national and local policy for air quality.

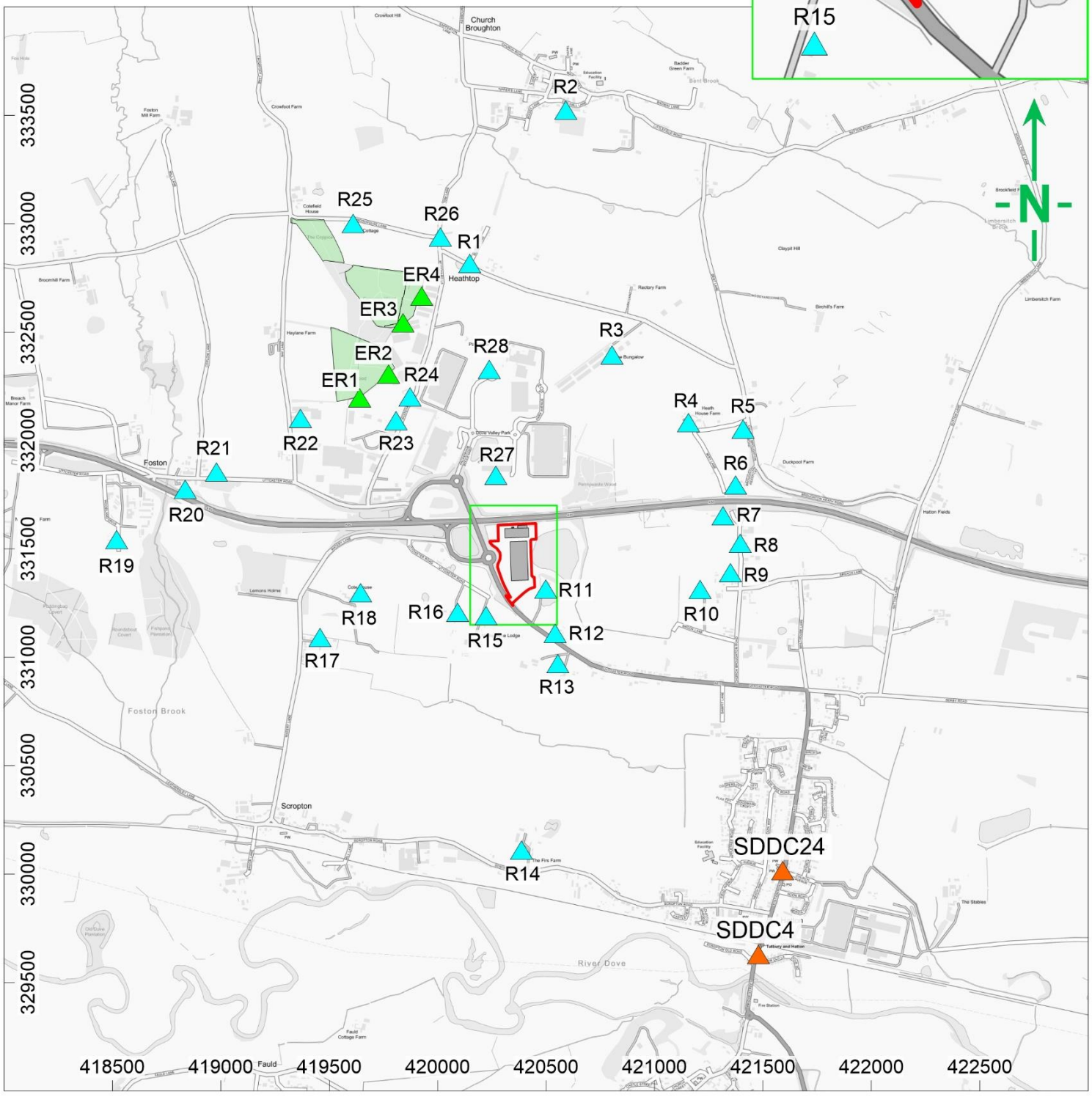
6.1.6 Based on the results of the assessment, air quality is not considered a constraint to planning or permitting consent.

Figures

LEGEND

- SDDC Diffusion Tube Location
- Sensitive Human Receptor Location
- Sensitive Ecological Receptor Location
- Modelled Point Source Location
- Modelled Building Layout
- Modelled Ancient Woodland



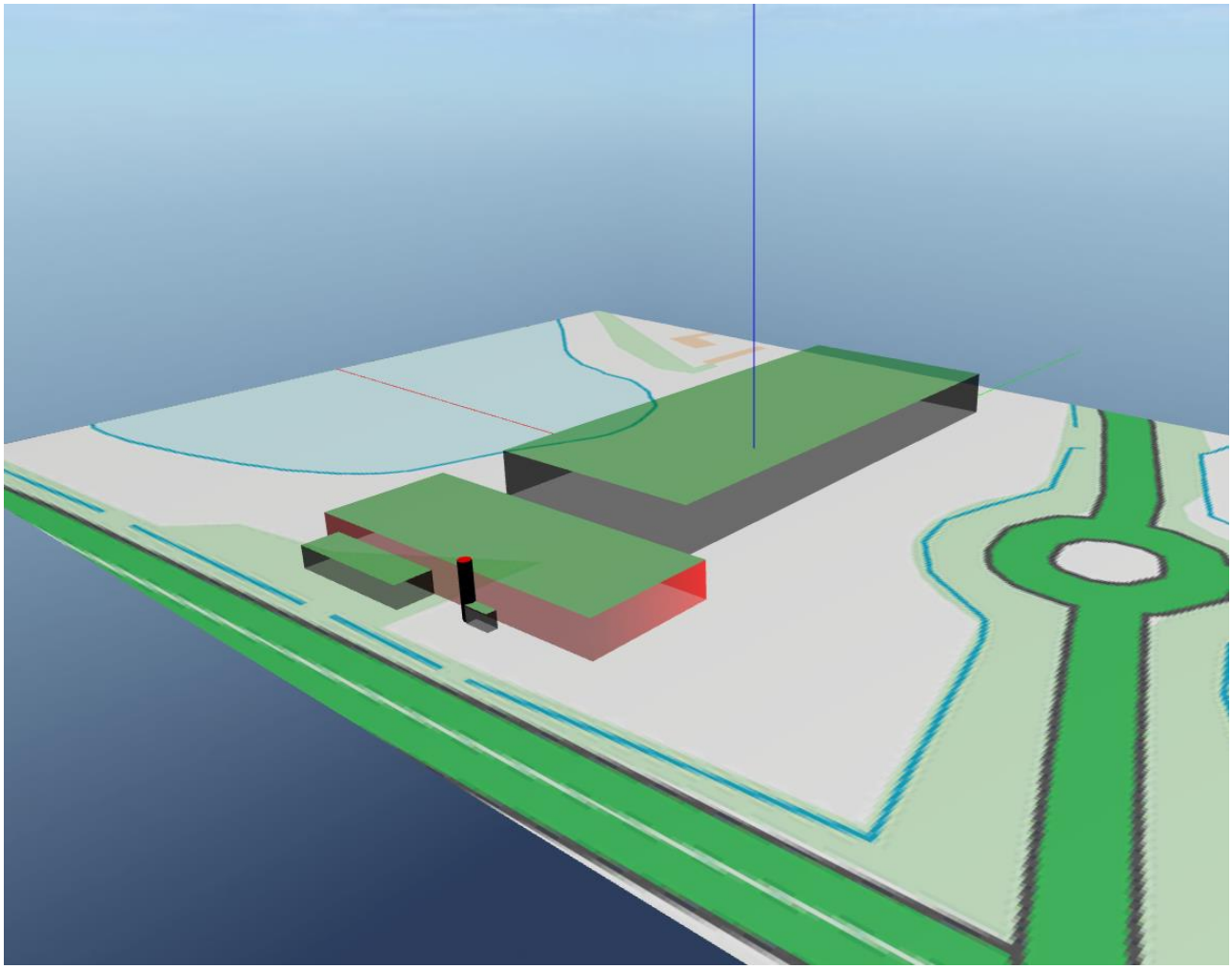


DeltaSimons

TITLE: Site Location and Assessment Extents

DRAWN BY:	SCALE:	PROJECT NO:
GD	NTS	92639.563100
CHECKED BY:	REVISION:	FIGURE NO:
SG	-	1
DATE: 2nd March 2023		

Figure 2 - 3D Model Layout Plan



Appendices

Appendix A - Limitations

Limitations

The recommendations contained in this Report represent Delta-Simons' professional opinions, based upon the information listed in the Report, exercising the duty of care required of an experienced Environmental Consultant. Delta-Simons does not warrant or guarantee that the Site is free of hazardous or potentially hazardous materials or conditions.

Delta-Simons obtained, reviewed and evaluated information in preparing this Report from the Client and others. Delta-Simons' conclusions, opinions and recommendations have been determined using this information. Delta-Simons does not warrant the accuracy of the information provided to it and will not be responsible for any opinions which Delta-Simons has expressed, or conclusions which it has reached in reliance upon information which is subsequently proven to be inaccurate.

This Report was prepared by Delta-Simons for the sole and exclusive use of the Client and for the specific purpose for which Delta-Simons was instructed. Nothing contained in this Report shall be construed to give any rights or benefits to anyone other than the Client and Delta-Simons, and all duties and responsibilities undertaken are for the sole and exclusive benefit of the Client and not for the benefit of any other party. In particular, Delta-Simons does not intend, without its written consent, for this Report to be disseminated to anyone other than the Client or to be used or relied upon by anyone other than the Client. Use of the Report by any other person is unauthorised and such use is at the sole risk of the user. Anyone using or relying upon this Report, other than the Client, agrees by virtue of its use to indemnify and hold harmless Delta-Simons from and against all claims, losses and damages (of whatsoever nature and howsoever or whensoever arising), arising out of or resulting from the performance of the work by the Consultant.

Please note that Air Quality Assessment reports are generally considered valid for a period of two years, or potentially less, if the baseline on which the report is based changes significantly. Accordingly, reliance on this report beyond this period is not afforded.

Appendix B - Glossary

Glossary

Term	Definition
Accuracy	A measure of how well a set of data fits the true value.
Air quality objective	Policy target generally expressed as a maximum ambient concentration to be achieved, either without exception or with a permitted number of exceedances within a specific timescale (see also air quality standard).
Air quality standard	The concentrations of pollutants in the atmosphere which can broadly be taken to achieve a certain level of environmental quality. The standards are based on the assessment of the effects of each pollutant on human health including the effects on sensitive sub groups (see also air quality objective).
Ambient air	Outdoor air in the troposphere, excluding workplace air.
Annual mean	The average (mean) of the concentrations measured for each pollutant for one year.
AQMA	Air Quality Management Area
AQO	Air Quality Objective
C_6H_6	Benzene
CO	Carbon Monoxide
Defra	Department for Environment, Food and Rural Affairs
EAL	Environmental Assessment Level
EPUK	Environmental Protection (UK)
Exceedance	A period of time where the concentration of a pollutant is greater than the appropriate air quality standard.
IAQM	Institute of Air Quality Management
LAQM	Local Air Quality Management
NO_2	Nitrogen dioxide
NO_x	Nitrogen oxides
PC	Process Contribution
PEC	Predicted Environmental Concentration
SDDC	South Derbyshire District Council
$\mu g/m^3$ micrograms per cubic metre	A measure of concentration in terms of mass per unit volume. A concentration of $1\mu g/m^3$ means that one cubic metre of air contains one microgram (millionth of a gram) of pollutant.
VOC	Volatile Organic Compound

Appendix C - Relevant UK Air Quality Strategy Objectives

Relevant UK Air Quality Strategy Objectives

National Air Quality Objectives and European Directive Limit Values for the Protection of 93928.567593-LON 7 Stockley Park, Hillingdon-IAQMON Proposal						
Pollutant	**Applies To**	**Objective**	**Measured As**	**Date to be achieved by and maintained thereafter**	**European Obligations**	**Date to be achieved by and maintained thereafter**
Nitrogen dioxide (NO_2)	UK	40µg/m^3	annual mean	31 December 2005	40µg/m^3	1 January 2010
	UK	200µg/m^3 not to be exceeded more than 18 times a year	1-hour mean	31 December 2005	200µg/m^3 not to be exceeded more than 18 times a year	1 January 2010
Benzene (C_6H_6)	UK	16.25µg/m^3	Running annual mean	31 December 2003	-	-
	England and Wales	5µg/m^3	Annual average	31 December 2010	5µg/m^3	1 January 2010
Carbon monoxide (CO)	UK	10mg/m^3	maximum daily running 8 hour mean/in Scotland as running 8 hour mean	31 December 2003	10 mg/m^3	1 January 2005

µg/m^3 - micrograms per cubic metre

mg/m^3 - milligrams per cubic metre

National Air Quality Objectives and European Directive Limit Values for the Protection of Vegetation and Ecosystems						
Pollutant	**Applies To**	**Objective**	**Measured As**	**Date to be achieved by and maintained thereafter**	**European Obligations**	**Date to be achieved by and maintained thereafter**
Nitrogen oxides	UK	30µg/m^3	annual mean	31 December 2000	30µg/m^3	19 July 2001

Critical Levels for Vegetation and Ecosystems as defined by the World Health Organisation (WHO, 2000)		
Pollutant	**Time Period**	**Critical Level**
Nitrogen Oxides (expressed as NO_2)	24-hour Mean	75µg/m^3

This critical level is not an objective and therefore has different legal standing.

Appendix D - Dispersion Model Details

Model Input Parameters

Table D1 - Dispersion Model Input Parameters

Parameter	Value
Meteorology	Hourly Sequential from East Midlands Airport meteorological station for the period of 2018 to 2022 (5-years).
Receptors	Individual sensitive receptor locations surrounding the Site, representative of relevant human and ecological exposure.
Building Downwash	**Building Id** / **Description** / **NGR (m) X** / **Y** / **Height (m)** / **Length/ Diameter (m)** / **Width (m)** / **Angle (°)** 1 Building 10A 420364.2 331574.3 11.7 42.8 109.8 178.2 2 Building 10A 420390.4 331602.7 7.2 12.2 42.9 178.2 3 Building 10B 420375.5 331445.0 16 180.1 78.6 178.1 4 RTO 420344.2 331599.4 5.3 3.3 8.5 178.7
Model Scenarios	Scenario 1 - Minimum RTO flow rate at 6,000m^3/hr; and Scenario 2 - Maximum RTO flow rate at 27,000m^3/hr. Full load, continuous operation for 8,760-hours per year*.
Pollutants	NO_x, VOC (C_6H_6), CO Emissions data provided by the Client Team.
Outputs	Annual Mean - NO_x, VOC 24-hour mean - VOC 8-hour mean - CO Hourly mean - NO_2, CO

* In order to represent a worst-case scenario in relation to likely operational impacts, it has been assumed that the RTO will operate continuously for 8,760-hours per year.

Roughness Length

The roughness length (z_0) is a modelling parameter applied to allow consideration of surface height roughness elements. A z_0 of 0.5m was used to describe the modelling extents and 0.2m for the meteorological station site. These values of z_0 are considered appropriate for the morphology of these areas and are suggested within ADMS-Roads as being suitable for 'Parkland, open surburbia' and 'agricultural areas (min)' respectively.

Monin-Obukhov Length

The Monin-Obukhov length provides a measure of the stability of the atmosphere. A minimum Monin-Obukhov length of 10m was used to describe both the modelling extents and the meteorological site. This value is considered appropriate for the nature of both of these areas and is suggested within ADMS as being suitable for 'Small towns <50,000'.

Terrain Data

Inclusion of terrain data is recommended within the ADMS-Roads user guide[31] if the gradient within a modelling area varies by more than 10% (1 in 10). Assessment of changes in elevation throughout the modelling extents using Google Earth indicated the average gradient was approximately 2%. As such, terrain data was not included within the model.

[31] CERC (2020) ADMS-Roads User Guide [Online] Available at: http://www.cerc.co.uk/environmental-software/assets/data/doc_userguides/CERC_ADMS-Roads5.0_User_Guide.pdf [Accessed on 27/02/2023].

Exhaust Parameters

Table D2 - Exhaust Parameters

Parameter	Value
Flue Height (above ground level; m)	17
Stack Location (NGR; m)	420349.6, 331599.0
Flue Gas Temperature (°C)	100
Flue Gas Volume Flow Rate (Actual) m^3/s	Scenario 1 - - Minimum RTO flow - 1.67 (6,000m^3/h) Scenario 2 - - Maximum RTO flow - 7.5 (27,000 m^3/h)
Flue Diameter (m)	0.9
Mass Emission Rates (g/s)**	Scenario 1 - Minimum RTO flow: VOC: 0.0333 NO_x: 0.1667 CO: 0.1667 Scenario 2 - - Maximum RTO flow: VOC: 0.1500 NO_x: 0.7500 CO: 0.7500

* Data were provided by the Client Team.
** Emission rates utilised the Emission Limit Values as outlined in Defra's Process Guidance Note 6/17(11)[25].

Modelling Uncertainty

Uncertainty in dispersion modelling predictions can be associated with a variety of factors, including:

- Model uncertainty - due to model limitations;
- Data uncertainty - due to errors in input data, including emission estimates, operational procedures, land use characteristics and meteorology; and
- Variability - randomness of measurements used.

Potential uncertainties in the model results were minimised as far as practicable and worst-case inputs used in order to provide a robust assessment. This included the following:

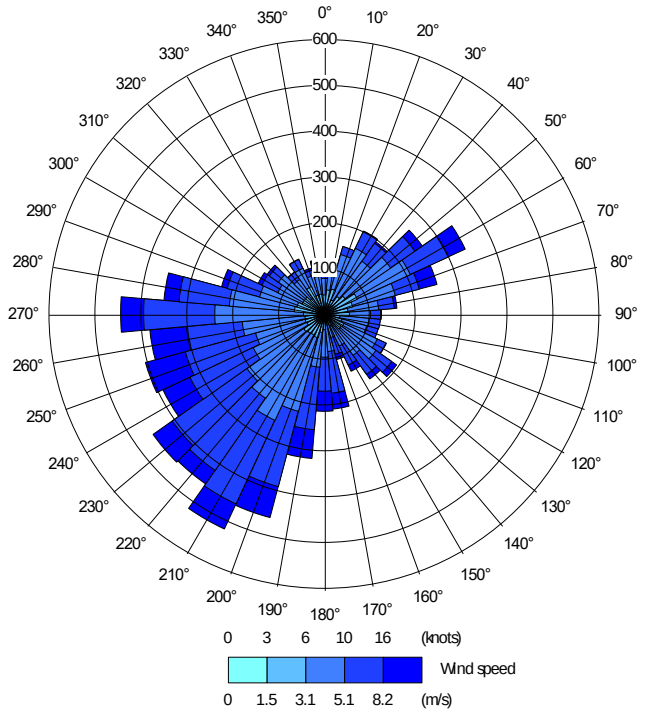
- Choice of model - ADMS is a commonly used atmospheric dispersion model and results have been tested through a large number of verification and inter-comparison studies to ensure predictions are as accurate as possible;
- Meteorological - Modelling was undertaken using five meteorological datasets from the closest observation location to the Site to take account of local conditions. The assessment was based on the worst-case year for each averaging period to ensure maximum concentrations were considered;
- Surface characteristics - The z_0 and Monin-Obukhov length were determined for both the dispersion and meteorological sites based on the surrounding land uses and guidance provided by CERC;
- Plant operating conditions - Operational parameters were provided by the Client Team. As such, these are considered to be representative of likely operating conditions;
- Emission rates - Emission rates for the RTO were based on operational parameters provided by the Client Team, and utilised the Emission Limit Values as outlined in Defra's Process Guidance Note 6/17(11)[25]. As such, these are considered to represent a robust assessment scenario;
- Baseline concentrations - Background pollutant levels were obtained from the Defra mapping study. Values for assessment of short-term averaging periods were doubled in accordance with the relevant guidance;
- Receptor locations - Receptor points were included at sensitive locations to provide consideration of these areas; and

- Variability - All model inputs were as accurate as possible and worst-case conditions were considered as necessary in order to make sure that the assessment of potential pollutant concentrations was robust.

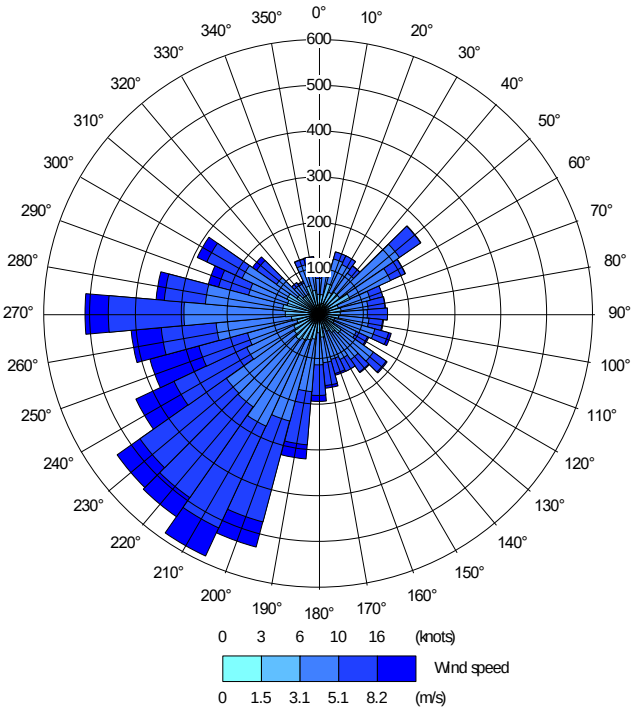
Results were considered in the context of the relevant EALs. It is considered that the use of the stated measures to reduce uncertainty and the use of worst-case assumptions when necessary has resulted in model accuracy of an acceptable level.

Appendix E - Wind Roses for East Midlands Airport (2018 - 2022)

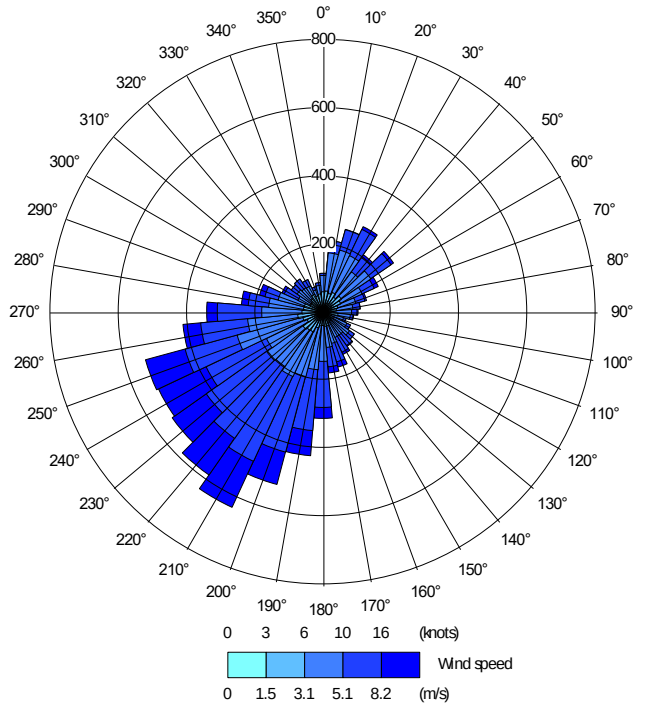
Wind Roses for Nottingham East Midlands (2018 - 2022)



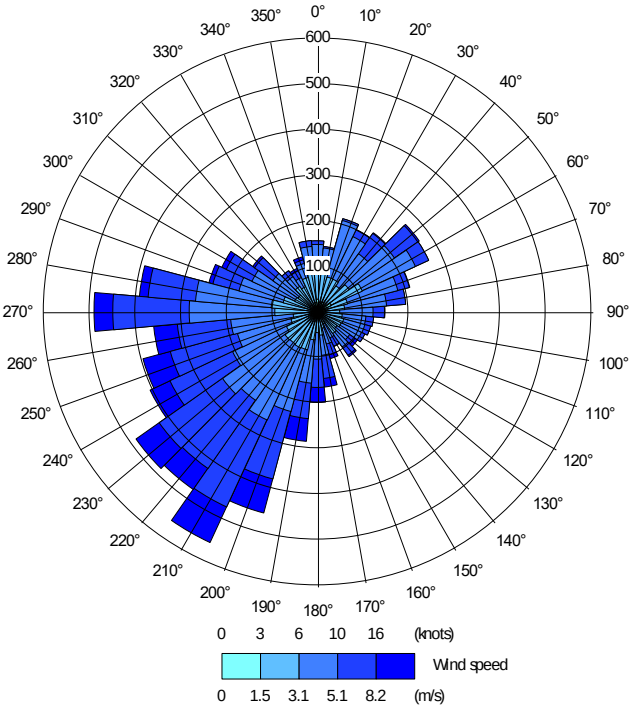
2018



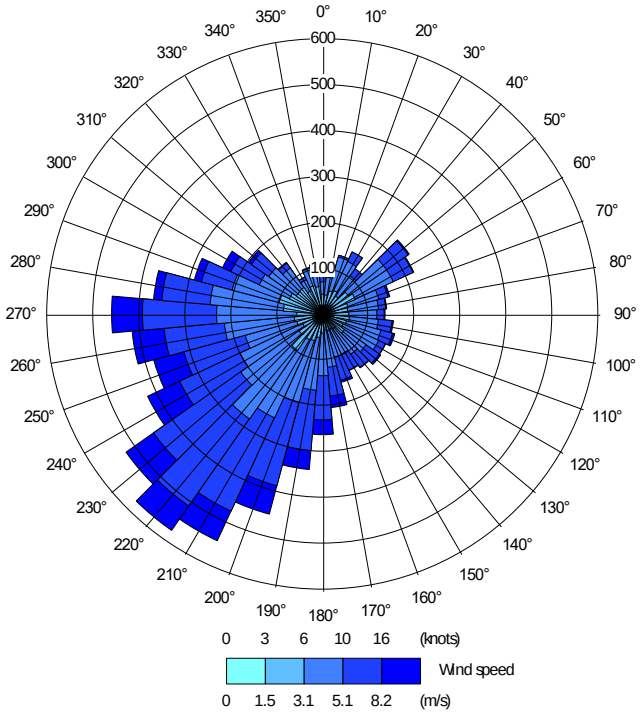
2019



2020



2021


0°
10°
20°
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40°
50°
60°
70°
80°
90°
100°
110°
120°
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160°
170°
180°
190°
200°
210°
220°
230°
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250°
260°
270°
280°
290°
300°
310°
320°
330°
340°
350°
600
500
400
300
200
100
0 3 6 10 16 (knots)
Wind speed
0 1.5 3.1 5.1 8.2 (m/s)

2022

Appendix F - Dispersion Modelling Results - Scenario 1 - Minimum RTO flow

Human Receptors

Table F1 – Annual Mean VOC Concentrations

Receptor	Without Dev. PEC (µg/m³)	With Dev. PEC (µg/m³)	PEC as %EAL	PC (µg/m³)	PC Change as %EAL	Impact
R1	0.90	0.91	18.15	0.01	0.15	Negligible
R2	0.90	0.91	18.11	0.01	0.11	Negligible
R3	0.90	0.93	18.51	0.03	0.51	Negligible
R4	0.90	0.92	18.41	0.02	0.41	Negligible
R5	0.90	0.91	18.30	0.01	0.30	Negligible
R6	0.90	0.92	18.30	0.02	0.30	Negligible
R7	0.90	0.92	18.37	0.02	0.37	Negligible
R8	0.90	0.92	18.35	0.02	0.35	Negligible
R9	0.90	0.92	18.33	0.02	0.33	Negligible
R10	0.90	0.92	18.36	0.02	0.36	Negligible
R11	0.90	0.93	18.66	0.03	0.66	Negligible
R12	0.90	0.92	18.38	0.02	0.38	Negligible
R13	0.90	0.91	18.30	0.01	0.30	Negligible
R14	0.90	0.91	18.11	0.01	0.11	Negligible
R15	0.90	0.94	18.83	0.04	0.83	Negligible
R16	0.90	0.93	18.70	0.03	0.70	Negligible
R17	0.90	0.91	18.23	0.01	0.23	Negligible
R18	0.90	0.92	18.31	0.02	0.31	Negligible
R19	0.90	0.90	18.07	<0.01	0.07	Negligible
R20	0.90	0.90	18.09	<0.01	0.09	Negligible
R21	0.90	0.91	18.10	0.01	0.10	Negligible
R22	0.90	0.91	18.15	0.01	0.15	Negligible
R23	0.90	0.91	18.29	0.01	0.29	Negligible
R24	0.90	0.91	18.24	0.01	0.24	Negligible
R25	0.90	0.90	18.08	<0.01	0.08	Negligible
R26	0.90	0.91	18.12	0.01	0.12	Negligible
R27*	0.90	0.96	19.22	0.06	1.22	N/A
R28*	0.90	0.92	18.34	0.02	0.34	N/A

Note: Predicted impacts are based on the 5-year maximum average PC.
* Non-sensitive receptor location.

Table F2 – 24-hour Mean VOC Concentrations

Receptor	Without Dev. PEC (µg/m³)	With Dev. PEC (µg/m³)	PEC as %EAL	PC (µg/m³)	PC Change as %EAL
R1	1.8	1.9	6.3	0.1	0.3
R2	1.8	1.9	6.2	0.1	0.2
R3	1.8	2.0	6.6	0.2	0.6
R4	1.8	2.0	6.6	0.2	0.6
R5	1.8	1.9	6.4	0.1	0.4
R6	1.8	2.0	6.5	0.2	0.5
R7	1.8	2.0	6.5	0.2	0.5
R8	1.8	2.0	6.6	0.2	0.6
R9	1.8	2.0	6.7	0.2	0.7
R10	1.8	2.0	6.5	0.2	0.5
R11	1.8	2.4	7.9	0.6	1.9
R12	1.8	2.2	7.2	0.4	1.2
R13	1.8	2.1	6.9	0.3	0.9
R14	1.8	1.9	6.4	0.1	0.4
R15	1.8	2.4	7.9	0.6	1.9
R16	1.8	2.2	7.3	0.4	1.3
R17	1.8	1.9	6.5	0.1	0.5

Receptor	Without Dev. PEC (µg/m³)	With Dev. PEC (µg/m³)	PEC as %EAL	PC (µg/m³)	PC Change as %EAL
R18	1.8	2.0	6.7	0.2	0.7
R19	1.8	1.9	6.2	0.1	0.2
R20	1.8	1.9	6.2	0.1	0.2
R21	1.8	1.9	6.3	0.1	0.3
R22	1.8	1.9	6.4	0.1	0.4
R23	1.8	2.1	6.9	0.3	0.9
R24	1.8	2.0	6.6	0.2	0.6
R25	1.8	1.9	6.3	0.1	0.3
R26	1.8	1.9	6.3	0.1	0.3
R27*	1.8	2.4	8.0	0.6	2.0
R28*	1.8	2.0	6.6	0.2	0.6

Note: Predicted impacts are based on the 5-year maximum average PC.
* Non-sensitive receptor location.

Table F3 - Annual Mean NO_2 Concentrations

Receptor	Without Dev. PEC (µg/m³)	With Dev. PEC (µg/m³)	PEC as %EAL	PC (µg/m³)	PC Change as %EAL	Impact
R1	8.97	9.01	22.52	0.04	0.10	Negligible
R2	6.93	6.96	17.40	0.03	0.07	Negligible
R3	8.97	9.10	22.75	0.13	0.32	Negligible
R4	7.54	7.64	19.11	0.10	0.26	Negligible
R5	7.54	7.61	19.03	0.07	0.19	Negligible
R6	9.31	9.38	23.46	0.08	0.19	Negligible
R7	9.31	9.40	23.50	0.09	0.23	Negligible
R8	9.31	9.40	23.49	0.09	0.22	Negligible
R9	9.31	9.39	23.48	0.08	0.21	Negligible
R10	9.31	9.40	23.49	0.09	0.22	Negligible
R11	9.76	9.92	24.80	0.16	0.41	Negligible
R12	9.76	9.85	24.63	0.10	0.24	Negligible
R13	7.88	7.96	19.89	0.08	0.19	Negligible
R14	7.88	7.91	19.77	0.03	0.07	Negligible
R15	9.76	9.97	24.91	0.21	0.52	Negligible
R16	9.76	9.93	24.83	0.17	0.44	Negligible
R17	8.89	8.94	22.36	0.06	0.15	Negligible
R18	8.89	8.96	22.41	0.08	0.19	Negligible
R19	8.36	8.38	20.94	0.02	0.04	Negligible
R20	8.36	8.38	20.96	0.02	0.06	Negligible
R21	8.36	8.39	20.97	0.03	0.07	Negligible
R22	7.08	7.12	17.80	0.04	0.09	Negligible
R23	7.08	7.16	17.89	0.07	0.18	Negligible
R24	7.08	7.14	17.86	0.06	0.15	Negligible
R25	6.42	6.44	16.10	0.02	0.05	Negligible
R26	8.97	9.00	22.50	0.03	0.07	Negligible
R27*	9.76	10.06	25.16	0.31	0.77	N/A
R28*	8.97	9.05	22.64	0.08	0.21	N/A

Note: Predicted impacts are based on the 5-year maximum average PC. Modelled as 100% NO_X conversion.
* Non-sensitive receptor location.

Table F4 - 99.79th %-ile 1-hour Mean NO_2 Concentrations

Receptor	Without Dev. PEC (µg/m³)	With Dev. PEC (µg/m³)	PEC as %EAL	PC (µg/m³)	PC Change as %EAL	Impact
R1	17.9	20.0	10.0	2.1	1.0	Negligible
R2	13.9	14.9	7.4	1.0	0.5	Negligible
R3	17.9	20.8	10.4	2.8	1.4	Negligible
R4	15.1	17.5	8.8	2.4	1.2	Negligible
R5	15.1	17.2	8.6	2.1	1.0	Negligible
R6	18.6	20.5	10.2	1.8	0.9	Negligible
R7	18.6	20.9	10.4	2.2	1.1	Negligible
R8	18.6	21.0	10.5	2.4	1.2	Negligible
R9	18.6	21.1	10.6	2.5	1.2	Negligible
R10	18.6	21.6	10.8	3.0	1.5	Negligible
R11	19.5	25.6	12.8	6.1	3.1	Negligible
R12	19.5	23.6	11.8	4.0	2.0	Negligible
R13	15.8	19.3	9.6	3.5	1.7	Negligible
R14	15.8	17.5	8.8	1.7	0.9	Negligible
R15	19.5	24.4	12.2	4.9	2.4	Negligible
R16	19.5	24.3	12.1	4.8	2.4	Negligible
R17	17.8	20.0	10.0	2.2	1.1	Negligible
R18	17.8	20.5	10.3	2.7	1.4	Negligible
R19	16.7	17.8	8.9	1.1	0.5	Negligible
R20	16.7	18.2	9.1	1.5	0.7	Negligible
R21	16.7	18.3	9.2	1.6	0.8	Negligible
R22	14.2	16.3	8.2	2.2	1.1	Negligible
R23	14.2	17.4	8.7	3.2	1.6	Negligible
R24	14.2	17.1	8.6	3.0	1.5	Negligible
R25	12.8	14.2	7.1	1.4	0.7	Negligible
R26	17.9	19.7	9.9	1.8	0.9	Negligible
R27*	19.5	27.2	13.6	7.7	3.9	N/A
R28*	17.9	21.5	10.8	3.6	1.8	N/A

Note: Predicted impacts are based on the 5-year maximum average PC. Modelled as 100% NO_X conversion.
* Non-sensitive receptor location.

Table F5 - 100th %-ile 1-hour Mean NO_2 Concentrations (µg/m³)

Receptor	Without Dev. PEC (µg/m³)	With Dev. PEC (µg/m³)	PC (µg/m³)
R1	17.9	20.9	3.0
R2	13.9	15.6	1.7
R3	17.9	22.2	4.3
R4	15.1	18.5	3.4
R5	15.1	17.8	2.7
R6	18.6	21.2	2.6
R7	18.6	21.7	3.0
R8	18.6	21.8	3.2
R9	18.6	22.1	3.5
R10	18.6	22.4	3.8
R11	19.5	27.1	7.6
R12	19.5	26.0	6.4
R13	15.8	21.2	5.4
R14	15.8	18.4	2.6
R15	19.5	27.1	7.6
R16	19.5	26.2	6.7
R17	17.8	21.0	3.2
R18	17.8	21.5	3.8
R19	16.7	18.4	1.7
R20	16.7	19.0	2.3

Receptor	Without Dev. PEC (µg/m³)	With Dev. PEC (µg/m³)	PC (µg/m³)
R21	16.7	19.4	2.7
R22	14.2	17.6	3.4
R23	14.2	19.9	5.7
R24	14.2	18.4	4.2
R25	12.8	15.0	2.2
R26	17.9	20.6	2.6
R27*	19.5	29.0	9.4
R28*	17.9	23.1	5.2

Note: Predicted impacts are based on the 5-year maximum average PC. Modelled as 100% NO_X conversion.
* Non-sensitive receptor location.

Table F6 – Maximum 8-hour Running Mean CO Concentrations

Receptor	Without Dev. PEC (mg/m³)	With Dev. PEC (mg/m³)	PEC as %EAL	PC (mg/m³)	PC Change as %EAL	Impact
R1	0.258	0.259	2.591	0.001	0.011	Negligible
R2	0.257	0.258	2.577	0.001	0.007	Negligible
R3	0.258	0.260	2.601	0.002	0.021	Negligible
R4	0.260	0.262	2.617	0.002	0.017	Negligible
R5	0.260	0.261	2.612	0.001	0.012	Negligible
R6	0.263	0.264	2.644	0.001	0.014	Negligible
R7	0.263	0.265	2.647	0.002	0.017	Negligible
R8	0.263	0.265	2.646	0.002	0.016	Negligible
R9	0.263	0.265	2.650	0.002	0.020	Negligible
R10	0.263	0.265	2.651	0.002	0.021	Negligible
R11	0.260	0.265	2.653	0.005	0.053	Negligible
R12	0.260	0.264	2.636	0.004	0.036	Negligible
R13	0.274	0.277	2.767	0.003	0.027	Negligible
R14	0.274	0.275	2.754	0.001	0.014	Negligible
R15	0.260	0.264	2.643	0.004	0.043	Negligible
R16	0.260	0.264	2.641	0.004	0.041	Negligible
R17	0.257	0.259	2.587	0.002	0.017	Negligible
R18	0.257	0.259	2.590	0.002	0.020	Negligible
R19	0.251	0.252	2.520	0.001	0.010	Negligible
R20	0.251	0.252	2.519	0.001	0.009	Negligible
R21	0.251	0.252	2.521	0.001	0.011	Negligible
R22	0.255	0.257	2.565	0.002	0.015	Negligible
R23	0.255	0.257	2.574	0.002	0.024	Negligible
R24	0.255	0.257	2.572	0.002	0.022	Negligible
R25	0.255	0.256	2.559	0.001	0.009	Negligible
R26	0.258	0.259	2.590	0.001	0.010	Negligible
R27*	0.260	0.266	2.657	0.006	0.057	N/A
R28*	0.258	0.260	2.602	0.002	0.022	N/A

Note: Predicted impacts are based on the 5-year maximum average PC.
* Non-sensitive receptor location.

Table F7 – Hourly Mean CO Concentrations

Receptor	Without Dev. PEC (mg/m³)	With Dev. PEC (mg/m³)	PEC as %EAL	PC (mg/m³)	PC Change as %EAL	Impact
R1	0.516	0.519	1.730	0.003	0.010	Negligible
R2	0.514	0.516	1.719	0.002	0.006	Negligible
R3	0.516	0.520	1.734	0.004	0.014	Negligible
R4	0.520	0.523	1.745	0.003	0.011	Negligible
R5	0.520	0.523	1.742	0.003	0.009	Negligible
R6	0.526	0.529	1.762	0.003	0.009	Negligible
R7	0.526	0.529	1.763	0.003	0.010	Negligible
R8	0.526	0.529	1.764	0.003	0.011	Negligible
R9	0.526	0.530	1.765	0.004	0.012	Negligible
R10	0.526	0.530	1.766	0.004	0.013	Negligible
R11	0.520	0.528	1.759	0.008	0.025	Negligible
R12	0.520	0.526	1.755	0.006	0.021	Negligible
R13	0.548	0.553	1.845	0.005	0.018	Negligible
R14	0.548	0.551	1.835	0.003	0.009	Negligible
R15	0.520	0.528	1.759	0.008	0.025	Negligible
R16	0.520	0.527	1.756	0.007	0.022	Negligible
R17	0.514	0.517	1.724	0.003	0.011	Negligible
R18	0.514	0.518	1.726	0.004	0.013	Negligible
R19	0.502	0.504	1.679	0.002	0.006	Negligible
R20	0.502	0.504	1.681	0.002	0.008	Negligible
R21	0.502	0.505	1.682	0.003	0.009	Negligible
R22	0.510	0.513	1.711	0.003	0.011	Negligible
R23	0.510	0.516	1.719	0.006	0.019	Negligible
R24	0.510	0.514	1.714	0.004	0.014	Negligible
R25	0.510	0.512	1.707	0.002	0.007	Negligible
R26	0.516	0.519	1.729	0.003	0.009	Negligible
R27*	0.520	0.529	1.765	0.009	0.031	N/A
R28*	0.516	0.521	1.737	0.005	0.017	N/A

Note: Predicted impacts are based on the 5-year maximum average PC.
* Non-sensitive receptor location.

Ecological Receptors

Table F8 – Predicted NO_x Concentrations

Receptor	Designation	Predicted Annual Mean NO_x				Predicted 24hr Mean NO_x			
		Concentration (µg/m³)		Proportion of EQS (%)		Concentration (µg/m³)		Proportion of EQS (%)	
		PC	PEC	PC	PEC	PC	PEC	PC	PEC
ER1	Rough Wood - Ancient Woodland	0.05	10.07	0.17	33.57	1.02	21.06	1.36	28.08
ER2	Rough Wood - Ancient Woodland	0.05	10.07	0.16	33.56	0.78	20.82	1.04	27.76
ER3	Conygree Wood - Ancient Woodland	0.03	10.05	0.11	33.51	0.64	20.68	0.86	27.58
ER4	Conygree Wood - Ancient Woodland	0.03	10.05	0.11	33.51	0.55	20.59	0.74	27.46

Table F9 – Predicted Annual Mean Nitrogen Deposition Rates

Receptor	Designation	Predicted Annual Mean Nitrogen Deposition Rate (kgN/ha/yr)		Proportion of the			
				Lower Critical Load (CL) (%)		Higher Critical Load (CL) (%)	
		PC	PEC	PC	PEC	PC	PEC
ER1	Rough Wood - Ancient Woodland	0.02	44.42	0.15	444.15	0.08	222.08
ER2	Rough Wood - Ancient Woodland	0.01	44.41	0.14	444.14	0.07	222.07
ER3	Conygree Wood - Ancient Woodland	0.01	44.41	0.10	444.10	0.05	222.05
ER4	Conygree Wood - Ancient Woodland	0.01	44.41	0.10	444.10	0.05	222.05

Table F10 – Predicted Annual Mean Acid Deposition Rates

Receptor	Designation	Predicted Annual Mean Acid Deposition Rate (keq/ha/yr)		Proportion of CL (%)	
				CLMinN	
		PC	PEC	PC	PEC
ER1	Rough Wood - Ancient Woodland	0.001	3.17	0.76	2233.15
ER2	Rough Wood - Ancient Woodland	0.001	3.17	0.70	2233.09
ER3	Conygree Wood - Ancient Woodland	0.001	3.17	0.49	2232.89
ER4	Conygree Wood - Ancient Woodland	0.001	3.17	0.48	2232.88

Appendix G - Dispersion Modelling Results - Scenario 2 - Maximum RTO flow

Human Receptors

Table G1 – Annual Mean VOC Concentrations

Receptor	Without Dev. PEC (µg/m³)	With Dev. PEC (µg/m³)	PEC as %EAL	PC (µg/m³)	PC Change as %EAL	Impact
R1	0.90	0.93	18.50	0.03	0.50	Negligible
R2	0.90	0.92	18.39	0.02	0.39	Negligible
R3	0.90	0.99	19.76	0.09	1.76	Negligible
R4	0.90	0.97	19.47	0.07	1.47	Negligible
R5	0.90	0.95	19.06	0.05	1.06	Negligible
R6	0.90	0.95	19.08	0.05	1.08	Negligible
R7	0.90	0.96	19.27	0.06	1.27	Negligible
R8	0.90	0.96	19.16	0.06	1.16	Negligible
R9	0.90	0.95	19.08	0.05	1.08	Negligible
R10	0.90	0.95	19.07	0.05	1.07	Negligible
R11	0.90	0.98	19.64	0.08	1.64	Negligible
R12	0.90	0.94	18.86	0.04	0.86	Negligible
R13	0.90	0.93	18.66	0.03	0.66	Negligible
R14	0.90	0.91	18.28	0.01	0.28	Negligible
R15	0.90	1.02	20.49	0.12	2.49	Negligible
R16	0.90	1.01	20.14	0.11	2.14	Negligible
R17	0.90	0.94	18.72	0.04	0.72	Negligible
R18	0.90	0.95	18.96	0.05	0.96	Negligible
R19	0.90	0.91	18.21	0.01	0.21	Negligible
R20	0.90	0.91	18.27	0.01	0.27	Negligible
R21	0.90	0.92	18.32	0.02	0.32	Negligible
R22	0.90	0.92	18.46	0.02	0.46	Negligible
R23	0.90	0.94	18.87	0.04	0.87	Negligible
R24	0.90	0.94	18.76	0.04	0.76	Negligible
R25	0.90	0.91	18.25	0.01	0.25	Negligible
R26	0.90	0.92	18.37	0.02	0.37	Negligible
R27*	0.90	1.10	21.90	0.20	3.90	N/A
R28*	0.90	0.95	19.10	0.05	1.10	N/A

Note: Predicted impacts are based on the 5-year maximum average PC.
* Non-sensitive receptor location.

Table G2 – 24-hour Mean VOC Concentrations

Receptor	Without Dev. PEC (µg/m³)	With Dev. PEC (µg/m³)	PEC as %EAL	PC (µg/m³)	PC Change as %EAL
R1	1.8	2.1	7.0	0.3	1.0
R2	1.8	2.0	6.6	0.2	0.6
R3	1.8	2.5	8.2	0.7	2.2
R4	1.8	2.4	8.0	0.6	2.0
R5	1.8	2.1	7.1	0.3	1.1
R6	1.8	2.3	7.7	0.5	1.7
R7	1.8	2.3	7.7	0.5	1.7
R8	1.8	2.5	8.2	0.7	2.2
R9	1.8	2.4	8.1	0.6	2.1
R10	1.8	2.3	7.8	0.5	1.8
R11	1.8	3.7	12.5	1.9	6.5
R12	1.8	2.6	8.7	0.8	2.7
R13	1.8	2.5	8.2	0.7	2.2
R14	1.8	2.1	7.0	0.3	1.0
R15	1.8	3.5	11.7	1.7	5.7
R16	1.8	3.2	10.6	1.4	4.6
R17	1.8	2.3	7.5	0.5	1.5

Receptor	Without Dev. PEC (µg/m³)	With Dev. PEC (µg/m³)	PEC as %EAL	PC (µg/m³)	PC Change as %EAL
R18	1.8	2.4	8.1	0.6	2.1
R19	1.8	1.9	6.5	0.1	0.5
R20	1.8	2.0	6.8	0.2	0.8
R21	1.8	2.1	7.0	0.3	1.0
R22	1.8	2.2	7.4	0.4	1.4
R23	1.8	2.4	8.1	0.6	2.1
R24	1.8	2.3	7.6	0.5	1.6
R25	1.8	2.0	6.7	0.2	0.7
R26	1.8	2.0	6.8	0.2	0.8
R27*	1.8	3.8	12.8	2.0	6.8
R28*	1.8	2.4	8.1	0.6	2.1

Note: Predicted impacts are based on the 5-year maximum average PC.
* Non-sensitive receptor location.

Table G3 - Annual Mean NO_2 Concentrations

Receptor	Without Dev. PEC (µg/m³)	With Dev. PEC (µg/m³)	PEC as %EAL	PC (µg/m³)	PC Change as %EAL	Impact
R1	8.97	9.10	22.74	0.13	0.31	Negligible
R2	6.93	7.03	17.58	0.10	0.25	Negligible
R3	8.97	9.41	23.53	0.44	1.10	Negligible
R4	7.54	7.91	19.76	0.37	0.92	Negligible
R5	7.54	7.80	19.51	0.26	0.66	Negligible
R6	9.31	9.58	23.94	0.27	0.67	Negligible
R7	9.31	9.63	24.07	0.32	0.80	Negligible
R8	9.31	9.60	24.00	0.29	0.73	Negligible
R9	9.31	9.58	23.94	0.27	0.67	Negligible
R10	9.31	9.57	23.94	0.27	0.67	Negligible
R11	9.76	10.17	25.42	0.41	1.02	Negligible
R12	9.76	9.97	24.93	0.21	0.54	Negligible
R13	7.88	8.05	20.12	0.17	0.41	Negligible
R14	7.88	7.95	19.88	0.07	0.17	Negligible
R15	9.76	10.38	25.95	0.62	1.56	Negligible
R16	9.76	10.29	25.73	0.53	1.33	Negligible
R17	8.89	9.07	22.67	0.18	0.45	Negligible
R18	8.89	9.13	22.82	0.24	0.60	Negligible
R19	8.36	8.41	21.03	0.05	0.13	Negligible
R20	8.36	8.43	21.07	0.07	0.17	Negligible
R21	8.36	8.44	21.10	0.08	0.20	Negligible
R22	7.08	7.20	18.00	0.12	0.29	Negligible
R23	7.08	7.30	18.25	0.22	0.55	Negligible
R24	7.08	7.27	18.18	0.19	0.47	Negligible
R25	6.42	6.48	16.20	0.06	0.16	Negligible
R26	8.97	9.06	22.66	0.09	0.23	Negligible
R27*	9.76	10.73	26.83	0.98	2.44	N/A
R28*	8.97	9.25	23.11	0.27	0.69	N/A

Note: Predicted impacts are based on the 5-year maximum average PC. Modelled as 100% NO_X conversion.
* Non-sensitive receptor location.

Table G4 - 99.79th %-ile 1-hour Mean NO_2 Concentrations

Receptor	Without Dev. PEC (µg/m³)	With Dev. PEC (µg/m³)	PEC as %EAL	PC (µg/m³)	PC Change as %EAL	Impact
R1	17.9	22.7	11.3	4.7	2.4	Negligible
R2	13.9	16.9	8.4	3.0	1.5	Negligible
R3	17.9	25.2	12.6	7.2	3.6	Negligible
R4	15.1	21.3	10.7	6.3	3.1	Negligible
R5	15.1	20.0	10.0	4.9	2.5	Negligible
R6	18.6	24.1	12.0	5.5	2.7	Negligible
R7	18.6	24.5	12.2	5.9	2.9	Negligible
R8	18.6	24.6	12.3	6.0	3.0	Negligible
R9	18.6	24.8	12.4	6.2	3.1	Negligible
R10	18.6	25.9	12.9	7.3	3.6	Negligible
R11	19.5	35.9	18.0	16.4	8.2	Negligible
R12	19.5	28.1	14.0	8.5	4.3	Negligible
R13	15.8	22.3	11.2	6.6	3.3	Negligible
R14	15.8	19.0	9.5	3.3	1.6	Negligible
R15	19.5	31.1	15.6	11.6	5.8	Negligible
R16	19.5	31.0	15.5	11.5	5.7	Negligible
R17	17.8	23.0	11.5	5.2	2.6	Negligible
R18	17.8	24.3	12.1	6.5	3.3	Negligible
R19	16.7	19.5	9.7	2.8	1.4	Negligible
R20	16.7	20.3	10.1	3.6	1.8	Negligible
R21	16.7	20.7	10.3	4.0	2.0	Negligible
R22	14.2	19.6	9.8	5.5	2.7	Negligible
R23	14.2	22.0	11.0	7.9	3.9	Negligible
R24	14.2	21.5	10.7	7.3	3.7	Negligible
R25	12.8	16.5	8.2	3.6	1.8	Negligible
R26	17.9	22.3	11.2	4.4	2.2	Negligible
R27*	19.5	40.4	20.2	20.9	10.5	N/A
R28*	17.9	25.7	12.9	7.8	3.9	N/A

Note: Predicted impacts are based on the 5-year maximum average PC. Modelled as 100% NO_X conversion.
* Non-sensitive receptor location.

Table G5 - 100th %-ile 1-hour Mean NO_2 Concentrations (µg/m³)

Receptor	Without Dev. PEC (µg/m³)	With Dev. PEC (µg/m³)	PC (µg/m³)
R1	17.9	26.1	8.1
R2	13.9	18.6	4.7
R3	17.9	26.9	9.0
R4	15.1	22.7	7.7
R5	15.1	21.4	6.3
R6	18.6	25.1	6.5
R7	18.6	25.7	7.1
R8	18.6	25.9	7.3
R9	18.6	27.1	8.4
R10	18.6	27.2	8.6
R11	19.5	37.4	17.9
R12	19.5	31.6	12.1
R13	15.8	25.3	9.5
R14	15.8	20.1	4.4
R15	19.5	33.3	13.8
R16	19.5	33.1	13.5
R17	17.8	24.6	6.8
R18	17.8	26.0	8.3
R19	16.7	20.9	4.1
R20	16.7	22.0	5.3

Receptor	Without Dev. PEC (µg/m³)	With Dev. PEC (µg/m³)	PC (µg/m³)
R21	16.7	23.2	6.5
R22	14.2	22.1	7.9
R23	14.2	27.0	12.8
R24	14.2	24.0	9.9
R25	12.8	19.2	6.3
R26	17.9	25.6	7.7
R27*	19.5	43.3	23.8
R28*	17.9	30.4	12.4

Note: Predicted impacts are based on the 5-year maximum average PC. Modelled as 100% NO_X conversion.
* Non-sensitive receptor location.

Table G6 – Maximum 8-hour Running Mean CO Concentrations

Receptor	Without Dev. PEC (mg/m³)	With Dev. PEC (mg/m³)	PEC as %EAL	PC (mg/m³)	PC Change as %EAL	Impact
R1	0.258	0.262	2.615	0.004	0.035	Negligible
R2	0.257	0.259	2.589	0.002	0.019	Negligible
R3	0.258	0.264	2.640	0.006	0.060	Negligible
R4	0.260	0.264	2.643	0.004	0.043	Negligible
R5	0.260	0.263	2.632	0.003	0.032	Negligible
R6	0.263	0.268	2.675	0.005	0.045	Negligible
R7	0.263	0.268	2.675	0.005	0.045	Negligible
R8	0.263	0.268	2.676	0.005	0.046	Negligible
R9	0.263	0.268	2.683	0.005	0.053	Negligible
R10	0.263	0.270	2.698	0.007	0.068	Negligible
R11	0.260	0.276	2.756	0.016	0.156	Negligible
R12	0.260	0.269	2.686	0.009	0.086	Negligible
R13	0.274	0.280	2.804	0.006	0.064	Negligible
R14	0.274	0.276	2.763	0.002	0.023	Negligible
R15	0.260	0.271	2.710	0.011	0.110	Negligible
R16	0.260	0.270	2.705	0.010	0.105	Negligible
R17	0.257	0.262	2.620	0.005	0.050	Negligible
R18	0.257	0.262	2.617	0.005	0.047	Negligible
R19	0.251	0.253	2.529	0.002	0.019	Negligible
R20	0.251	0.253	2.533	0.002	0.023	Negligible
R21	0.251	0.254	2.539	0.003	0.029	Negligible
R22	0.255	0.259	2.587	0.004	0.037	Negligible
R23	0.255	0.261	2.607	0.006	0.057	Negligible
R24	0.255	0.260	2.603	0.005	0.053	Negligible
R25	0.255	0.258	2.575	0.003	0.025	Negligible
R26	0.258	0.261	2.611	0.003	0.031	Negligible
R27*	0.260	0.277	2.773	0.017	0.173	N/A
R28*	0.258	0.264	2.638	0.006	0.058	N/A

Note: Predicted impacts are based on the 5-year maximum average PC.
* Non-sensitive receptor location.

Table G7 – Hourly Mean CO Concentrations

Receptor	Without Dev. PEC (mg/m³)	With Dev. PEC (mg/m³)	PEC as %EAL	PC (mg/m³)	PC Change as %EAL	Impact
R1	0.516	0.524	1.747	0.008	0.027	Negligible
R2	0.514	0.519	1.729	0.005	0.016	Negligible
R3	0.516	0.525	1.750	0.009	0.030	Negligible
R4	0.520	0.528	1.759	0.008	0.026	Negligible
R5	0.520	0.526	1.754	0.006	0.021	Negligible
R6	0.526	0.532	1.775	0.006	0.022	Negligible
R7	0.526	0.533	1.777	0.007	0.024	Negligible
R8	0.526	0.533	1.778	0.007	0.024	Negligible
R9	0.526	0.534	1.781	0.008	0.028	Negligible
R10	0.526	0.535	1.782	0.009	0.029	Negligible
R11	0.520	0.538	1.793	0.018	0.060	Negligible
R12	0.520	0.532	1.774	0.012	0.040	Negligible
R13	0.548	0.558	1.858	0.010	0.032	Negligible
R14	0.548	0.552	1.841	0.004	0.015	Negligible
R15	0.520	0.534	1.779	0.014	0.046	Negligible
R16	0.520	0.534	1.778	0.014	0.045	Negligible
R17	0.514	0.521	1.736	0.007	0.023	Negligible
R18	0.514	0.522	1.741	0.008	0.028	Negligible
R19	0.502	0.506	1.687	0.004	0.014	Negligible
R20	0.502	0.507	1.691	0.005	0.018	Negligible
R21	0.502	0.508	1.695	0.006	0.022	Negligible
R22	0.510	0.518	1.726	0.008	0.026	Negligible
R23	0.510	0.523	1.743	0.013	0.043	Negligible
R24	0.510	0.520	1.733	0.010	0.033	Negligible
R25	0.510	0.516	1.721	0.006	0.021	Negligible
R26	0.516	0.524	1.746	0.008	0.026	Negligible
R27*	0.520	0.544	1.813	0.024	0.079	N/A
R28*	0.516	0.528	1.761	0.012	0.041	N/A

Note: Predicted impacts are based on the 5-year maximum average PC.
* Non-sensitive receptor location.

Ecological Receptors

Table G8 – Predicted NO_X Concentrations

Receptor	Designation	Predicted Annual Mean NO_x				Predicted 24hr Mean NO_x			
		Concentration (µg/m³)		Proportion of EQS (%)		Concentration (µg/m³)		Proportion of EQS (%)	
		PC	PEC	PC	PEC	PC	PEC	PC	PEC
ER1	Rough Wood - Ancient Woodland	0.16	10.2	0.5	33.9	2.5	22.5	3.3	30.1
ER2	Rough Wood - Ancient Woodland	0.15	10.2	0.5	33.9	1.9	22.0	2.6	29.3
ER3	Conygree Wood - Ancient Woodland	0.11	10.1	0.4	33.8	1.5	21.5	1.9	28.7
ER4	Conygree Wood - Ancient Woodland	0.10	10.1	0.3	33.7	1.3	21.3	1.7	28.4

Table G9 – Predicted Annual Mean Nitrogen Deposition Rates

Receptor	Designation	Predicted Annual Mean Nitrogen Deposition Rate (kgN/ha/yr)		Proportion of the			
				Lower Critical Load (CL) (%)		Higher Critical Load (CL) (%)	
		PC	PEC	PC	PEC	PC	PEC
ER1	Rough Wood - Ancient Woodland	0.05	44.45	0.46	444.46	0.23	222.23
ER2	Rough Wood - Ancient Woodland	0.04	44.44	0.43	444.43	0.22	222.22
ER3	Conygree Wood - Ancient Woodland	0.03	44.43	0.31	444.31	0.16	222.16
ER4	Conygree Wood - Ancient Woodland	0.03	44.43	0.30	444.30	0.15	222.15

Table G10 – Predicted Annual Mean Acid Deposition Rates

Receptor	Designation	Predicted Annual Mean Acid Deposition Rate (keq/ha/yr)		Proportion of CL (%)	
				CLMinN	
		PC	PEC	PC	PEC
ER1	Rough Wood - Ancient Woodland	0.003	3.17	2.30	2234.69
ER2	Rough Wood - Ancient Woodland	0.003	3.17	2.19	2234.58
ER3	Conygree Wood - Ancient Woodland	0.002	3.17	1.56	2233.96
ER4	Conygree Wood - Ancient Woodland	0.002	3.17	1.51	2233.90