



Redrow Homes Ltd

Land at Stakehill, Rochdale

Addendum to Air Quality Assessment Report dated February 2023

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Abbreviations

ADMS-Roads	Atmospheric Dispersion Modelling System – Roads (a dispersion modelling software application)
APIS	Air Pollution Information System
AQS	Air Quality Standards
Cle	Critical level
Clo	Critical load
Defra	Department for Environment, Food and Rural Affairs
EC	European Commission
EFT	Emission Factors Toolkit – developed by Defra
EPUK	Environmental Protection UK
EU	European Union
GMCA	Greater Manchester Combined Authority
GMEU	Greater Manchester Ecology Unit
IAQM	Institute of Air Quality Management
LAQM	Local Air Quality Management
kg N/ha/yr	Kilograms of nitrogen per hectare per year
NH ₃	Ammonia
NO ₂	Nitrogen dioxide
NO _x	Oxides of nitrogen
NPPF	National Planning Policy Framework
PC	Process Contribution
PEC	Predicted Environmental Concentration
PM _{2.5}	Particulate matter of size fraction approximating to <2.5µm diameter
PM ₁₀	Particulate matter of size fraction approximating to <10µm diameter
RBC	Rochdale Borough Council
RSK	RSK Environment Limited
SAC	Special Areas of Conservation
SSSI	Site of Special Scientific Interest
UNECE	United Nations Economic Commission for Europe

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1 INTRODUCTION

RSK Environment Ltd (RSK) was commissioned to prepare an addendum to the air quality assessment previously prepared for the proposed residential development on Land at Stakehill, Rochdale.

RSK prepared an air quality assessment in February 2023 (report reference: 444805-01(02), dated 27th February 2023) to accompany the planning application for the proposed development.

A construction phase dust risk assessment had been undertaken with reference to the IAQM 2014 dust guidance. Mitigation measures were recommended based on the potential dust risks and with the implementation of appropriate mitigation measures, no significant impacts were anticipated during the construction phase.

A quantitative assessment of the operational impacts had been undertaken using the Atmospheric Dispersion Modelling System (ADMS)-Roads atmospheric dispersion model. Concentrations of nitrogen dioxide (NO₂) and particular matter (PM₁₀ and PM_{2.5}) were predicted at the most relevant human receptor locations under three scenarios - the base year 2019 (S1), the proposed opening year 2033 without (S2) and with (S3) the proposed development in place. The modelling assessment predicted that the air quality standards for NO₂, PM₁₀ and PM_{2.5} will be met at all receptor locations considered in the assessment, for both the S2 and S3 scenarios. The impacts of the proposed development in terms of NO₂, PM₁₀ and PM_{2.5} concentrations, without mitigation, were predicted to be 'negligible' at all receptor locations. Predicted concentrations across the proposed development site itself were predicted to meet the air quality standards for both the S2 and S3 scenarios, therefore the development impacts are considered to be not significant.

As a part of the planning application, a consultation response from Greater Manchester Ecology Unit was received, which identified that further information on the likely significant effects to the Rochdale Canal Special Area of Conservation (SAC)/Site of Special Scientific Interest (SSSI) was required. The Greater Manchester Ecology Unit (GMEU) was consulted during the preparation of this Addendum. The Ecologist GMEU has confirmed agreement with the assessment approach and proposed methodology.

A detailed assessment of the potential impacts of ammonia emissions and nitrogen and acid deposition at Rochdale Canal SAC/SSSI, as a result of additional traffic emissions generated by the proposed development has therefore been completed using the ADMS-Roads model, and is presented in this Addendum.

The assessment of the likely impacts of the modelled levels and deposition loads of each atmospheric pollutant at the ecological site have been carried out with reference

to published data on the relevant ecologically sensitive receptors (designated sites and the associated habitats and species).

2 LEGISLATION, PLANNING POLICY AND GUIDANCE

2.1 Key Legislation

The United Nations Economic Commission's Gothenburg Protocol sets the international context for ammonia emission reductions and lays out strict emission reduction obligations. The UK is a signatory to this international obligation in its own right. The Gothenburg Protocol has set an 8% ammonia reduction target for the UK by 2020, compared to 2005 levels. This 8% target is also contained in the Directive 2016/2284/EU on the reduction of national emissions of certain atmospheric pollutants (the new National Emission Ceilings Directive). The UK's commitment to reduce ammonia under the Gothenburg Protocol is independent of its exit from the European Union.

The National Emission Ceilings Regulations 2018 came into force in July 2018 and revoke the National Emission Ceilings Regulations 2002. The regulations transpose EU Directive 2016/2284/EU into UK law. The regulations provide national emission ceilings and national emission reduction commitments for pollutants, including ammonia, in line with the United Nations Economic Commission's revised Gothenburg Protocol.

The Conservation of Habitats and Species Regulations 2017 transposes the Habitat Directive into UK legislation in England and Wales. The objective of the Habitats Directive is to protect biodiversity through the conservation of natural habitats and species of wild fauna and flora. Under the regulations, consent for a project cannot be granted unless the competent authorities are satisfied that it will not adversely affect the integrity of a European site (Special Area of Conservation (SAC), Special Protection Area (SPA) and Ramsar site).

The Wildlife and Countryside Act 1981 as amended by the Countryside and Rights of Way Act is implemented to comply with European Council Directive 2009/147/EC on the conservation of wild birds and is the primary legislation to protect plants, habitats and animals in the UK. Under the Act it is an offence to cause damage to a SSSI.

2.2 Planning Policy

The land use planning process is a key means of improving air quality, particularly in the long term, through the strategic location and design of new developments. Any air quality concern that relates to land use and its development can, depending on the details of the proposed development, be a material consideration in the determination of planning applications.

2.2.1 National Planning Policy Framework

In December 2023, the revised National Planning Policy Framework (NPPF) was published, superseding the previous September 2023 NPPF with immediate effect. The NPPF includes a presumption in favour of sustainable development.

Section 15 of the NPPF deals with Conserving and Enhancing the Natural Environment, and states that the intention is that the planning system should prevent *‘development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability’* and goes on to state that *‘new development [should be] appropriate for its location’* and *‘the effects (including cumulative effects) of pollution on health, the natural environment or general amenity, and the potential sensitivity of the area or proposed development to adverse effects from pollution, should be taken into account.’*

With specific regard to air quality, the NPPF states that:

‘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.’

2.2.2 Local Planning Policy

Rochdale Adopted Core Strategy (October 2016)

Rochdale Borough Council (RBC) policies for managing developments are laid out in the Rochdale Adopted Core Strategy for Rochdale District which include RBC policies relating to air quality.

Policy G9 Reducing the Impact of Pollution, Contamination and Land Instability states the following:

“We will reduce all forms of pollution, contamination and land instability in the borough, by:

- a. Focusing on measures that reduce air pollution in Air Quality Management Areas, and other areas where pollution levels are unacceptable, particularly around motorways and main roads;*
- b. Requiring that development does not have impacts that lead to an unacceptable increase in air, water, noise, light or other pollution;*

- c. Ensuring sensitive new developments such as housing, schools and hospitals are not adversely affected by existing sources of pollution such as roads and certain types of industry;
- d. Requiring a Low Emissions Strategy (LES) where development requires a Transport Assessment, and in other circumstances as appropriate;
- e. Requiring that any risks arising from contaminated land or land instability, and appropriate actions to address these risks, are identified prior to any development taking place on that land and the identified actions taken;
- f. Requiring that any risk to surface water and ground water resources from the disturbance of contaminated land be ascertained and preventative measures devised and carried out; and
- g. Using planning conditions or obligations to control pollution from new development, or the impact of pollution on new development.”

In addition, **Policy DM1 General Development Requirements** states the following:

“All development proposals, including changes of use of land and buildings, extensions and alterations, will be expected to demonstrate that they:

....

- d. Mitigate against any impacts due to noise, air, dust, light and odour pollution, traffic generation or inadequate access, where such mitigation is identified as being necessary;

....

- f. Do not have an adverse impact on health, through its impact or the effect of existing problems e.g. land contamination, or poor air quality;

....”

Rochdale Borough Unitary Development Plan (June 2006)

The Unitary Development Plan is still in place until the RBC’s Allocations Development Plan is adopted.

Policy EM/2 Pollution states the following:

“If the emission of pollutants from a proposed development cannot readily be controlled by other environmental legislation, such development will not be permitted where it would be likely to result in an increase in air, water, noise, light or other pollution, which would be harmful to the environment, and to land uses and land users in the area.

Where permission is granted, it will be subject to appropriate conditions or obligations to ensure that air, water and noise pollution is kept to acceptable levels.

New housing or other environmentally sensitive development will not be permitted where existing pollution levels are unacceptable and cannot satisfactorily be reduced.”

2.3 Best Practice Guidance

2.3.1 Local Air Quality Management Review and Assessment Technical Guidance

The Department for Environment, Food and Rural Affairs (Defra) has published technical guidance for use by local authorities in their air quality review and assessment work. This guidance, referred to in this document as the Local Air Quality Management Technical Guidance (Defra, 2022) ('LAQM.TG.22').

2.3.2 Land-Use Planning & Development Control: Planning for Air Quality

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

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

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

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

This guidance includes a number of environmental standards for ecological receptors. The relevant environmental standards for ecological receptors used in this assessment are presented in Table 2.1.

Table 2.1: Environmental Standards for Protected Conservation Areas

Substance	Emission period	Critical Level (mean) ($\mu\text{g}/\text{m}^3$)
Ammonia (NH_3)	Annual	1 $\mu\text{g}/\text{m}^3$ where lichens or bryophytes (including mosses, liverworts and hornworts) are present, 3 $\mu\text{g}/\text{m}^3$ where they are not present
Nitrogen oxides (NO_x)	24 hours	75 $\mu\text{g}/\text{m}^3$
	Annual	30 $\mu\text{g}/\text{m}^3$

2.3.4 Critical Levels and Loads

Exposure to high concentrations of ammonia can lead to direct damage to woodlands, for example, leaf scorching and loss. At the extreme, severe damage has been found in woodland edges adjacent to fields with high slurry applications in the Netherlands and Belgium (van Herk 1999, 2002) and damage to trees has been reported in the immediate vicinity of farms in the United Kingdom (UKCLAG, 1996, Pitcairn et al. 1998). There may also be changes in plant morphology, physiology and biochemistry which can increase growth and also increase sensitivity to other environmental factors such as wind, frost, drought and pests.

Excessive nitrogen deposition can lead to acidification and eutrophication of soils. In addition, species richness can be compromised, especially for slow growing species which may suffer from increased competition from invasive species (UKCLAG, 1996, Pitcairn et al. 1998).

The United Nations Economic Commission for Europe (UNECE) has set environmental criteria known as critical levels for the protection of vegetation from direct effects and critical loads to protect against the indirect effects of deposition of pollutants. Critical loads and levels are generally defined as: “a quantitative estimate of exposure to one or more pollutants below which significant harmful effects on specified sensitive elements of the environment do not occur according to present knowledge” (Nilsson and Grennfelt, 1988).

It is important to distinguish between a critical level and a critical load. The critical level refers to the gaseous concentration of a pollutant in the air, whereas the critical load relates to the quantity of pollutant deposited from air to the ground.

Critical levels and loads are defined by the UNECE as:

- Critical levels: “concentrations of pollutants in the atmosphere above which direct adverse effects on receptors, such as human beings, plants, ecosystems or materials, may occur according to present knowledge.”

- Critical loads: “a quantitative estimate of exposure to one or more pollutants below which significant harmful effects on specified sensitive elements of the environment do not occur according to present knowledge.”

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

Critical levels and loads have been designated within the UK based on the sensitivity and qualifying features of the receiving habitat. Critical levels for ammonia are set at $1\mu\text{g}/\text{m}^3$ where lichens or bryophytes are present as a key part of the ecosystem integrity and at $3\mu\text{g}/\text{m}^3$ for all other vegetation. Critical loads for nutrient nitrogen are set under the Convention on Long-Range Transboundary Air Pollution and are based on empirical evidence, mainly observations from experiments and gradient studies (APIS, 2016).

2.3.5 Natural England’s Approach to Advising Competent Authorities on the Assessment of Road Traffic Emissions under the Habitats Regulations

Natural England has prepared an internal Guidance Note to assist in providing guidance on the assessment of the potential impacts from road traffic emissions on the qualifying features of European Sites.

3 ASSESSMENT SCOPE AND METHODOLOGY

3.1 Overall Approach

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

- Identification of sensitive receptors;
- Advanced dispersion modelling assessment of air quality impacts of the proposed development traffic under the following two scenarios:
 - i. Scenario 2 (S2) - 'Without Development' scenario (2033, the expected year of opening, without the proposed development in place); and
 - ii. Scenario 3 (S3) - 'With Development' scenario (2033, the expected year of opening and with the proposed development in place).
- Assessment of likely impact; and
- Recommendation of mitigation measures, where appropriate, to ensure any adverse effects on air quality are minimised.

3.2 Dispersion Modelling Assessment

A detailed dispersion modelling assessment has been prepared previously using ADMS-Roads for the assessment of human receptors (report reference: 444805-01 (02)). The same model has been used for the following assessment of ecological receptors.

The following subsections provide further information regarding input to the dispersion model such as emission factors and ecological receptors included. Further details on the model inputs are outlined in the original report (report reference: 444805-01 (02)).

3.2.1 Traffic Emission Factors

Version 11.0 of the Emissions Factor Toolkit (EFT), published by Defra, was used to derive vehicle emissions factors (i.e. the amount of pollution emitted from the average vehicle fleet, in g/km/s) for NO_x, PM₁₀ and PM_{2.5}. Within the EFT, emission factors are available for 2018 through to 2050 for England (not London), and 2018 to 2030 for Wales, Scotland, Northern Ireland and London. The Defra 'Emission Factors Toolkit' only support assessment years 2018-2030 inclusive. Emission outputs for 2031 to 2050 can be provided by the tool, however the input assumptions embedded with the tool may not fully align with those applied for the purposes of NAEI projections.

Air Quality Consultants (AQC) has published the emissions tool Calculator for Road Emissions of Ammonia (CREAM), to derive ammonia emissions factors from road traffic. CREAM V1A has been used in this assessment.

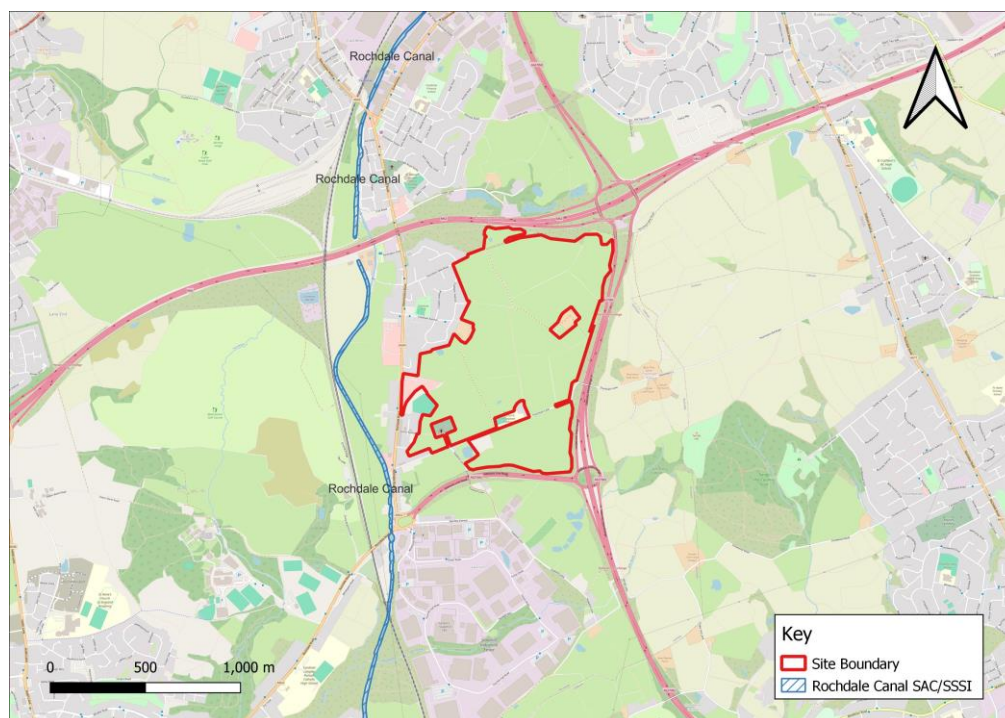
3.2.2 Sensitive Receptor Locations

Ecological Receptors

Thornham New Road forms the northern boundary of the Site. To the east is the A627(M), and adjacent to the south of the Site is the A627(M) Spur. The A664 bounds the Site to the southwest.

Rochdale Canal SAC/SSSI is located within 200m of the roads predicted to see an increase in road traffic associated with the proposed development. Figure 3.1 shows the site boundary and the Rochdale Canal SAC/SSSI.

Figure 3.1 Site Boundary and Rochdale Canal SAC/SSSI



Rochdale Canal SAC/SSSI is adjacent to A664/Manchester Road. Ecological receptor points were selected to represent transects through the designated site. Details of all ecological receptors included in the modelling study are summarised in Table 3.1.

Table 3.1: Ecological Receptors Included in the Dispersion Modelling Assessment

Receptor ID	Receptor Location	Grid Reference		Height (m)
		X	Y	
Rochdale Canal SAC/SSSI				
E1a	SAC/SSSI_0m from boundary	388464.08	408525.04	0
E1b	SAC/SSSI_10m from boundary	388454.08	408525.04	0
E2a	SAC/SSSI_0m from boundary	388462.69	408332.49	0
E2b	SAC/SSSI_10m from boundary	388455.14	408339.37	0
E3a	SAC/SSSI_0m from boundary	388452.72	408294.91	0
E3b	SAC/SSSI_10m from boundary	388459.49	408287.7	0
E3c	SAC/SSSI_20m from boundary	388466.59	408280.55	0
E3d	SAC/SSSI_30m from boundary	388473.97	408273.87	0
E4a	SAC/SSSI_0m from boundary	388343.06	409443.96	0
E4b	SAC/SSSI_10m from boundary	388333.06	409443.96	0
E4c	SAC/SSSI_20m from boundary	388323.06	409443.96	0
E5a	SAC/SSSI_0m from boundary	388349.04	409618.74	0
E5b	SAC/SSSI_10m from boundary	388339.04	409618.74	0
E6a	SAC/SSSI_0m from boundary	388291.85	409739.64	0
E6b	SAC/SSSI_10m from boundary	388296.07	409730.45	0
E6c	SAC/SSSI_20m from boundary	388299.79	409721.22	0
E6d	SAC/SSSI_30m from boundary	388304.05	409712.18	0
E6e	SAC/SSSI_40m from boundary	388308.39	409703.14	0
E6f	SAC/SSSI_50m from boundary	388312.87	409694.14	0
E6g	SAC/SSSI_100m from boundary	388332.5	409647.61	0
E7a	SAC/SSSI_0m from boundary	388279.61	409853.49	0
E7b	SAC/SSSI_10m from boundary	388276.17	409862.87	0
E7c	SAC/SSSI_20m from boundary	388272.43	409872.15	0
E8a	SAC/SSSI_0m from boundary	388323.83	410463.79	0
E8b	SAC/SSSI_10m from boundary	388314.02	410461.81	0
E9a	SAC/SSSI_0m from boundary	388336.89	410505.23	0
E9b	SAC/SSSI_10m from boundary	388328.78	410499.35	0
E10a	SAC/SSSI_0m from boundary	388339.07	410535.52	0
E10b	SAC/SSSI_10m from boundary	388346.2	410542.62	0
E11a	SAC/SSSI_0m from boundary	388393.61	410645.04	0
E11b	SAC/SSSI_10m from boundary	388384.67	410649.63	0
E12a	SAC/SSSI_0m from boundary	388468.23	408379.91	0

Receptor ID	Receptor Location	Grid Reference		Height (m)
		X	Y	
E12b	SAC/SSSI_10m from boundary	388458.23	408379.91	0

3.2.3 Critical Levels and Loads

Critical levels and loads have been designated within the UK based on the sensitivity and qualifying features of the receiving habitat. The background concentrations, critical levels and loads used in this assessment were obtained from Air Pollution Information System (APIS). With reference to the Habitats Regulations Assessment of the Places for Everyone Joint Development Plan published by Greater Manchester Combined Authority (GMCA, 2022), the nitrogen critical loads presented by APIS are not species specific. The Rochdale Canal SAC/SSSI is designated for the presence of the specially protected plant species Floating water plantain, *Luronium natans* and the average existing nitrogen deposition critical load is currently estimated at 19.3 kg N/ha/yr. Hence, this load was used as the assessment criteria in this assessment. Table 3.2 summarises the relevant critical levels and loads used in this assessment.

Table 3.2: Designated Nature Conservation Sites Critical Levels and Loads and Background Concentrations

Designated Site	Receptor ID	Broad Habitat	Ammonia Critical Level (µg/m³)	Background Ammonia Concentration (µg/m³)	NOx Ground Level Concentration (µg/m³)	Nitrogen Critical Load (kg N/ha/yr)	Average Background Nitrogen Deposition Rate (kg N/ha/yr)	Acid Critical Load (keq/ha/yr)	Background Acid Deposition Rate Nitrogen Sulphur (kg eq/ha/yr)
Rochdale Canal SAC/SSSI	E1a - E1b	Permanent oligotrophic lakes, ponds and pools (including softwater lakes)	3	1.79	20.98	19.3	20.47	N/A	N/A
	E2a - E2b		3	1.79	20.98	19.3	20.47	N/A	N/A
	E3a - E3d		3	1.79	20.98	19.3	20.47	N/A	N/A
	E4a - E4c		3	1.79	25.62	19.3	20.55	N/A	N/A
	E5a - E5b		3	1.79	25.62	19.3	20.55	N/A	N/A
	E6a - E6g		3	1.79	25.62	19.3	20.55	N/A	N/A
	E7a - E7c		3	1.79	25.62	19.3	20.55	N/A	N/A
	E8a - E8b		3	1.78	21.74	19.3	20.63	N/A	N/A
	E9a - E9b		3	1.78	21.74	19.3	20.63	N/A	N/A
	E10a - E10b		3	1.78	21.74	19.3	20.63	N/A	N/A
	E11a - E11b		3	1.78	21.74	19.3	20.63	N/A	N/A
	E12a - E12b		3	1.79	20.98	19.3	20.47	N/A	N/A

4 ASSESSMENT OF IMPACTS

4.1 Traffic Emission Dispersion Modelling Results

The main potential impact of the proposed development is considered to be emissions from increased road traffic associated with the operational phases. Detailed dispersion modelling was undertaken with the use of the ADMS-Roads dispersion model software, following guidance in accordance with LAQM.TG.22.

The modelled concentrations were 'verified' for NO_x/NO₂ using monitoring data; for reference, the methodology for this is described in Annex E of the original air quality assessment report (report reference: 444805-01(02)). The same verification factor was used for NH₃ as well.

4.1.1 Impact of the Proposed Development on Local Air Quality at Ecological Receptors

4.1.1.1 Nitrogen Oxide (NO_x)

Annual Mean NO_x Concentrations

The modelling results for the annual mean NO_x concentrations are presented in Table 4.1. The table shows the predicted 'process contribution' (PC) from the source and the 'predicted environmental concentration' (PEC) with background contributions added. The predicted concentrations have been compared with the annual mean NO_x AQS for protected conservation areas.

The predicted NO_x concentrations are below the AQS at all assessed receptor points except at E7a and E7b.

The predicted change in annual mean NO_x PCs are below the EA screening criterion of 1% at all Rochdale Canal SAC/SSSI receptor locations except at E1a, E2a, E3a, E9a, E10a and E10b.

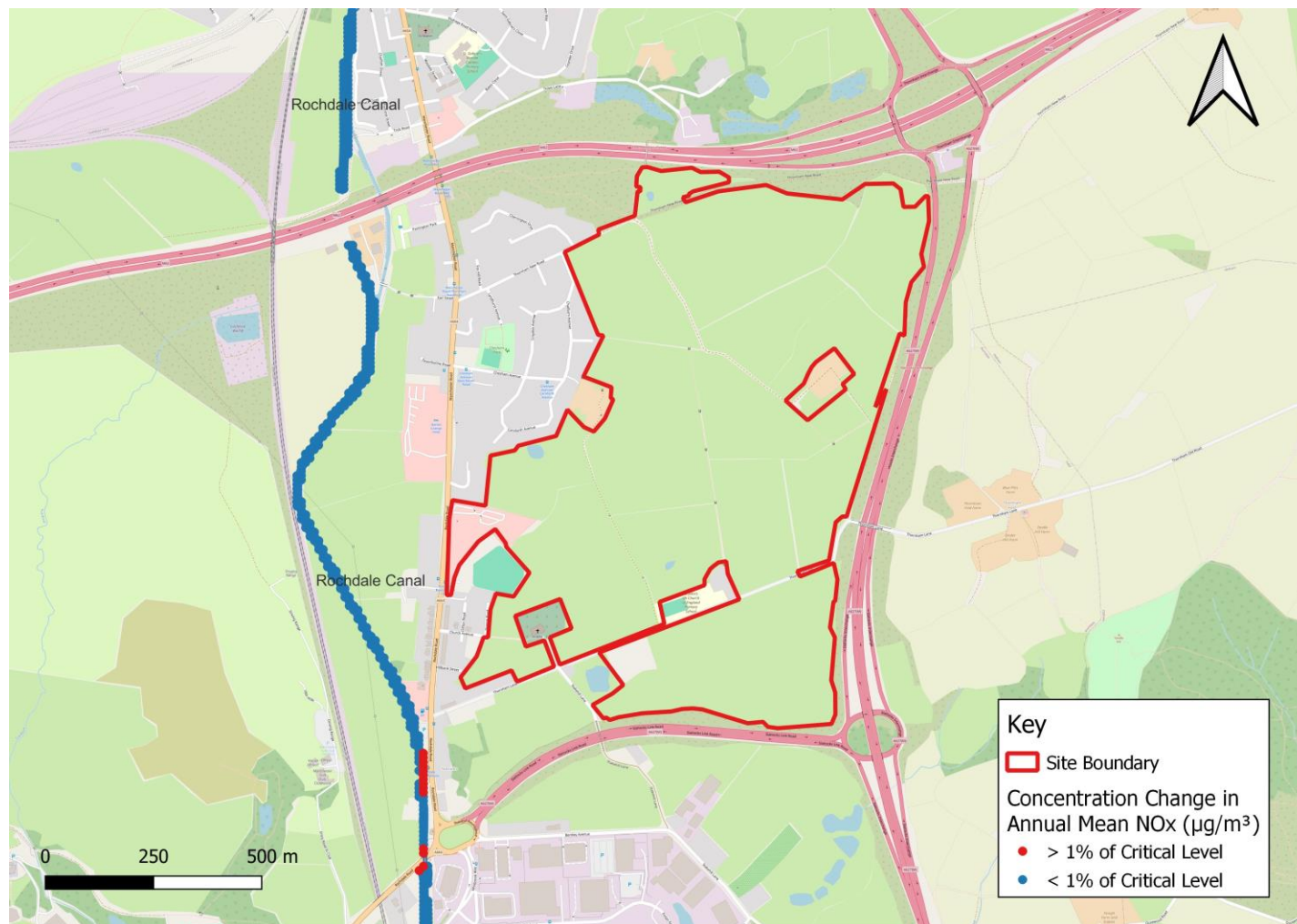
A grid of receptors was modelled across the Rochdale Canal SAC/SSSI at approximately 10m spacing. Figure 4.1 presents the predicted concentration change between S3 and S2 (i.e. the predicted change caused by the development) at the Rochdale Canal SAC/SSSI. A total area of ca. 0.19 ha is subject to the exceedance (0.7% of the 26.11 ha Rochdale Canal SAC/SSSI). This small area of exceedance is considered unlikely to cause a significant adverse impact on the Rochdale Canal SAC/SSSI. Therefore, in consultation with the project ecologist, the impact of the development on annual mean NO_x concentrations, on Rochdale Canal SAC/SSSI, is considered to be 'not significant'.

Table 4.1: Predicted Annual Mean NO_x Impact on Ecological Receptors

Receptor ID	Annual Mean NO _x Background (µg/m ³)	Annual Mean NO _x Concentrations					
		2033 Without Proposed Development		2033 With Proposed Development		Change of PC (µg/m ³)	Change of PC as % of Objective
		NO _x PC (µg/m ³)	NO _x PEC (µg/m ³)	NO _x PC (µg/m ³)	NO _x PEC (µg/m ³)		
E1a	20.98	2.77	23.75	3.25	24.23	0.48	1.6%
E1b	20.98	1.97	22.95	2.28	23.26	0.31	1.0%
E2a	20.98	5.76	26.75	6.27	27.26	0.51	1.7%
E2b	20.98	3.44	24.42	3.75	24.73	0.30	1.0%
E3a	20.98	4.13	25.11	4.51	25.49	0.37	1.2%
E3b	20.98	2.44	23.42	2.66	23.64	0.22	0.7%
E3c	20.98	1.79	22.77	1.95	22.93	0.16	0.5%
E3d	20.98	1.46	22.44	1.58	22.56	0.12	0.4%
E4a	25.62	0.91	26.53	0.96	26.59	0.05	0.2%
E4b	25.62	0.90	26.52	0.95	26.57	0.05	0.2%
E4c	25.62	0.88	26.51	0.93	26.55	0.05	0.2%
E5a	25.62	1.50	27.12	1.55	27.18	0.06	0.2%
E5b	25.62	1.50	27.12	1.55	27.17	0.05	0.2%
E6a	25.62	3.52	29.15	3.57	29.20	0.05	0.2%
E6b	25.62	3.16	28.78	3.21	28.83	0.05	0.2%
E6c	25.62	2.87	28.49	2.92	28.54	0.05	0.2%
E6d	25.62	2.63	28.25	2.68	28.30	0.05	0.2%
E6e	25.62	2.43	28.05	2.48	28.10	0.05	0.2%

Receptor ID	Annual Mean NO _x Background (µg/m ³)	Annual Mean NO _x Concentrations					
		2033 Without Proposed Development		2033 With Proposed Development		Change of PC (µg/m ³)	Change of PC as % of Objective
		NO _x PC (µg/m ³)	NO _x PEC (µg/m ³)	NO _x PC (µg/m ³)	NO _x PEC (µg/m ³)		
E6f	25.62	2.26	27.88	2.31	27.94	0.05	0.2%
E6g	25.62	1.70	27.32	1.76	27.38	0.05	0.2%
E7a	25.62	5.79	31.42	5.83	31.45	0.04	0.1%
E7b	25.62	5.20	30.82	5.23	30.86	0.04	0.1%
E7c	25.62	4.70	30.32	4.73	30.35	0.04	0.1%
E8a	21.74	1.88	23.62	2.02	23.76	0.14	0.5%
E8b	21.74	1.66	23.41	1.78	23.53	0.12	0.4%
E9a	21.74	4.54	26.28	4.91	26.65	0.37	1.2%
E9b	21.74	2.83	24.57	3.04	24.78	0.22	0.7%
E10a	21.74	6.87	28.61	7.49	29.24	0.62	2.1%
E10b	21.74	4.09	25.83	4.43	26.17	0.34	1.1%
E11a	21.74	1.38	23.12	1.44	23.19	0.07	0.2%
E11b	21.74	1.36	23.11	1.43	23.18	0.07	0.2%
E12a	20.98	3.27	24.25	3.58	24.56	0.31	1.0%
E12b	20.98	2.50	23.48	2.73	23.71	0.23	0.8%

Figure 4.1 Change in Annual Mean NO_x Concentration between S2 and S3 at the Rochdale Canal SAC/SSSI



Daily Mean NO_x Concentrations

Table 4.2 presents the daily mean NO_x PCs at each of the assessed ecological receptor locations.

The predicted change in daily mean NO_x PCs are well below the EA screening criterion of 10% at all Rochdale SAC/SSSI receptor locations. No significant air quality impacts on the assessed receptor locations are therefore likely.

Table 4.2: Predicted Daily Mean NO_x Impact on Ecological Receptors

Receptor ID	Daily Mean NO _x Concentrations			
	2033 Without Proposed Development NO _x PC (µg/m ³)	2033 With Proposed Development NO _x PC (µg/m ³)	Change of PC (µg/m ³)	Change of PC as % of Objective
E1a	12.67	14.76	2.09	2.8%
E1b	9.23	10.63	1.40	1.9%
E2a	19.56	21.28	1.72	2.3%
E2b	13.65	14.80	1.15	1.5%
E3a	23.40	25.49	2.09	2.8%
E3b	17.16	18.70	1.53	2.0%
E3c	14.76	16.06	1.30	1.7%
E3d	13.44	14.60	1.16	1.5%
E4a	4.88	5.04	0.16	0.2%
E4b	4.87	5.03	0.15	0.2%
E4c	4.87	5.02	0.15	0.2%
E5a	7.02	7.19	0.17	0.2%
E5b	7.08	7.25	0.16	0.2%
E6a	16.71	16.84	0.13	0.2%
E6b	14.78	14.91	0.13	0.2%
E6c	13.32	13.46	0.14	0.2%
E6d	12.16	12.30	0.14	0.2%
E6e	11.22	11.36	0.15	0.2%
E6f	10.44	10.59	0.15	0.2%
E6g	7.94	8.10	0.16	0.2%

Receptor ID	Daily Mean NO _x Concentrations			
	2033 Without Proposed Development NO _x PC (µg/m ³)	2033 With Proposed Development NO _x PC (µg/m ³)	Change of PC (µg/m ³)	Change of PC as % of Objective
E7a	19.88	20.11	0.24	0.3%
E7b	17.98	18.22	0.23	0.3%
E7c	16.41	16.64	0.23	0.3%
E8a	8.52	9.22	0.71	0.9%
E8b	7.72	8.33	0.61	0.8%
E9a	16.87	18.02	1.14	1.5%
E9b	11.28	12.10	0.82	1.1%
E10a	19.75	21.31	1.56	2.1%
E10b	13.01	13.92	0.91	1.2%
E11a	6.20	6.39	0.19	0.3%
E11b	6.18	6.38	0.20	0.3%
E12a	14.56	15.82	1.26	1.7%
E12b	11.83	12.85	1.01	1.4%

4.1.1.2 Ammonia (NH₃)

The modelling predictions for annual mean NH₃ concentrations are presented in Table 4.3.

The predicted change in annual mean NH₃ concentrations, caused by the proposed development ranges between 0.3% and 5.2% of the critical level. The greatest changes were predicted at receptor locations in closest proximity to A664/Manchester Road and A664/Rochdale Road.

The predicted change in annual mean NH₃ PCs is below 1% of the critical level at all Rochdale Canal SAC/SSSI receptor locations except at receptor locations on Transect E1 (points E1a and E1b), E2 (points E2a and E2b), E3 (points E3a to E3d), E8 (points E8a and E8b), E9 (points E9a and E9b), E10 (points E10a and E10b) and E12 (points E12a and E12b).

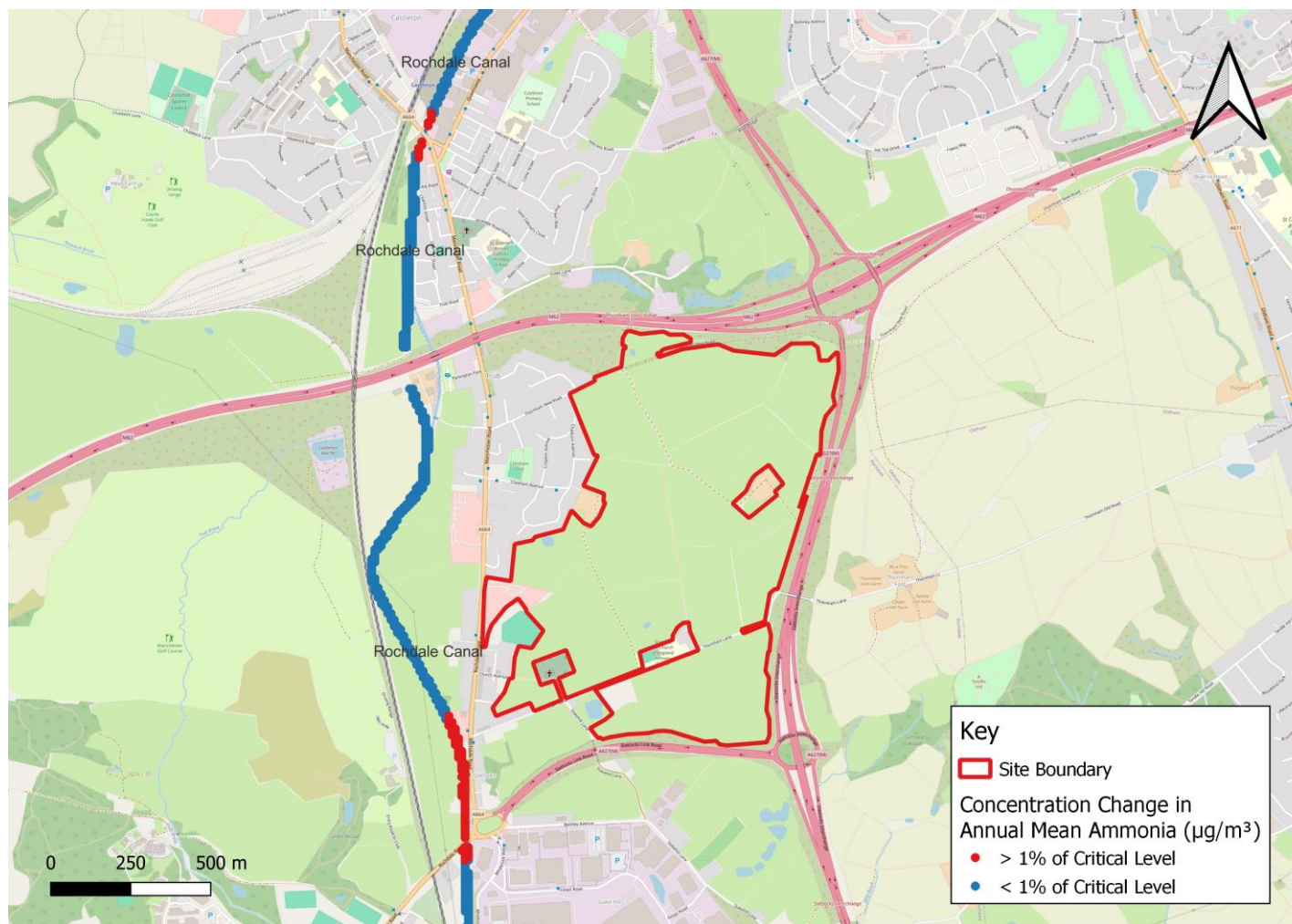
A grid of receptors was modelled across the Rochdale Canal SAC/SSSI at approximately 10m spacing. Figure 4.2 presents the predicted concentration change between S3 and S2 (i.e. the predicted change caused by the development) at the Rochdale Canal SAC/SSSI. A total area of ca. 0.81 ha is subject to the exceedance (3.1% of the 26.11 ha Rochdale Canal SAC/SSSI). This small area of exceedance is considered unlikely to cause a significant adverse impact on the Rochdale Canal SAC/SSSI. Therefore, in consultation with the project ecologist, the impact of the development on annual mean NH₃ concentrations, on Rochdale Canal SAC/SSSI, is considered to be 'not significant'.

Table 4.3: Predicted Annual Mean NH₃ Impact on Ecological Receptors

Receptor ID	Annual Mean NH ₃ Background (µg/m ³)	Annual Mean NH ₃ Concentrations					
		2033 Without Proposed Development		2033 With Proposed Development		Change of PC (µg/m ³)	Change of PC as % of Objective
		NH ₃ PC (µg/m ³)	NH ₃ PEC (µg/m ³)	NH ₃ PC (µg/m ³)	NH ₃ PEC (µg/m ³)		
E1a	1.79	0.80	2.59	0.94	2.73	0.14	4.6%
E1b	1.79	0.55	2.34	0.64	2.43	0.09	3.0%
E2a	1.79	1.57	3.36	1.71	3.50	0.14	4.6%
E2b	1.79	0.94	2.73	1.02	2.81	0.08	2.7%
E3a	1.79	1.22	3.01	1.32	3.11	0.11	3.5%
E3b	1.79	0.71	2.49	0.77	2.56	0.06	2.0%
E3c	1.79	0.51	2.30	0.55	2.34	0.04	1.4%
E3d	1.79	0.41	2.20	0.44	2.23	0.03	1.1%
E4a	1.79	0.26	2.05	0.28	2.06	0.02	0.5%
E4b	1.79	0.26	2.05	0.27	2.06	0.01	0.5%
E4c	1.79	0.26	2.04	0.27	2.05	0.01	0.4%
E5a	1.79	0.45	2.23	0.46	2.25	0.02	0.5%
E5b	1.79	0.45	2.23	0.46	2.25	0.02	0.5%
E6a	1.79	1.08	2.87	1.10	2.88	0.01	0.5%
E6b	1.79	0.97	2.75	0.98	2.77	0.01	0.5%
E6c	1.79	0.88	2.66	0.89	2.68	0.01	0.5%
E6d	1.79	0.80	2.59	0.82	2.60	0.01	0.5%
E6e	1.79	0.74	2.52	0.75	2.54	0.01	0.5%

Receptor ID	Annual Mean NH ₃ Background (µg/m ³)	Annual Mean NH ₃ Concentrations					
		2033 Without Proposed Development		2033 With Proposed Development		Change of PC (µg/m ³)	Change of PC as % of Objective
		NH ₃ PC (µg/m ³)	NH ₃ PEC (µg/m ³)	NH ₃ PC (µg/m ³)	NH ₃ PEC (µg/m ³)		
E6f	1.79	0.69	2.47	0.70	2.49	0.01	0.5%
E6g	1.79	0.51	2.30	0.53	2.31	0.02	0.5%
E7a	1.79	1.79	3.58	1.80	3.59	0.01	0.3%
E7b	1.79	1.61	3.39	1.62	3.40	0.01	0.3%
E7c	1.79	1.45	3.23	1.46	3.24	0.01	0.3%
E8a	1.78	0.51	2.29	0.54	2.33	0.04	1.3%
E8b	1.78	0.45	2.24	0.49	2.27	0.03	1.1%
E9a	1.78	1.15	2.93	1.25	3.03	0.10	3.3%
E9b	1.78	0.73	2.51	0.79	2.57	0.06	1.9%
E10a	1.78	1.72	3.50	1.88	3.66	0.16	5.2%
E10b	1.78	1.04	2.82	1.13	2.91	0.09	2.9%
E11a	1.78	0.37	2.15	0.39	2.17	0.02	0.6%
E11b	1.78	0.37	2.15	0.39	2.17	0.02	0.6%
E12a	1.79	0.84	2.63	0.92	2.71	0.08	2.6%
E12b	1.79	0.65	2.44	0.71	2.50	0.06	2.0%

Figure 4.2 Change in Annual Mean NH₃ Concentration between S2 and S3 at the Rochdale Canal SAC/SSSI



4.1.1.3 Nitrogen Deposition

Nitrogen Deposition has been predicted at all receptor locations for each of the modelled scenarios, and presented in Table 4.4. The critical load of 19.3kg N/ha/yr, available in the GMCA's Habitats Regulations Assessment of the Places for Everyone Joint Development Plan, was used in this assessment.

Background nitrogen deposition concentrations are already exceeding the nitrogen deposition critical level at the SAC/SSSI assessed within this assessment.

The modelled loads of dry nitrogen deposition are below the critical load of 19.3kg N/ha/yr at all assessed receptor points. The predicted change in nitrogen deposition PCs is below 1% of the critical load at all assessed receptor points except on Transect E1 (E1a and E1b), E2 (E2a and E2b), E3 (E3a to E3c), E8 (E8a), E9 (E9a and E9b), E10 (E10a and E10b) and E12 (E12 and E12b). This translates to a maximum area of ca. 0.73 ha likely to be subject to N deposition above the critical load under the in-combination scenario 3 and comprises 2.8% of the Rochdale Canal SAC/SSSI area of 26.11 ha. The contribution of the proposed development to the overall load in this 2.8% of the Rochdale Canal SAC/SSSI is considered in consultation with the project ecologist, to be small and unlikely to be significant.

Table 4.4: Nitrogen Deposition Contribution at Ecological Receptors

Receptor ID	Background N Deposition (kg N/ha/yr)	Nitrogen Deposition					
		2033 Without Proposed Development		2033 With Proposed Development		Change of PC (µg/m³)	Change of PC as % of Objective
		Nitrogen Dry Deposition (kg N/ha/yr)	Ammonia Dry Deposition (kg N/ha/yr)	Nitrogen Dry Deposition (kg N/ha/yr)	Ammonia Dry Deposition (kg N/ha/yr)		
E1a	20.47	0.28	4.15	0.33	4.87	0.77	4.0%
E1b	20.47	0.20	2.89	0.23	3.35	0.49	2.5%
E2a	20.47	0.58	8.18	0.63	8.89	0.76	3.9%
E2b	20.47	0.35	4.88	0.38	5.30	0.46	2.4%
E3a	20.47	0.42	6.34	0.45	6.88	0.59	3.0%
E3b	20.47	0.25	3.67	0.27	3.98	0.34	1.7%
E3c	20.47	0.18	2.66	0.20	2.88	0.24	1.2%
E3d	20.47	0.15	2.13	0.16	2.31	0.19	1.0%
E4a	20.55	0.09	1.37	0.10	1.45	0.08	0.4%
E4b	20.55	0.09	1.35	0.10	1.42	0.08	0.4%
E4c	20.55	0.09	1.33	0.09	1.40	0.07	0.4%
E5a	20.55	0.15	2.32	0.16	2.40	0.09	0.5%
E5b	20.55	0.15	2.32	0.16	2.40	0.08	0.4%
E6a	20.55	0.36	5.62	0.36	5.70	0.08	0.4%
E6b	20.55	0.32	5.03	0.32	5.11	0.08	0.4%
E6c	20.55	0.29	4.56	0.29	4.63	0.08	0.4%
E6d	20.55	0.27	4.17	0.27	4.24	0.08	0.4%
E6e	20.55	0.24	3.84	0.25	3.92	0.08	0.4%

Receptor ID	Background N Deposition (kg N/ha/yr)	Nitrogen Deposition					
		2033 Without Proposed Development		2033 With Proposed Development		Change of PC (µg/m³)	Change of PC as % of Objective
		Nitrogen Dry Deposition (kg N/ha/yr)	Ammonia Dry Deposition (kg N/ha/yr)	Nitrogen Dry Deposition (kg N/ha/yr)	Ammonia Dry Deposition (kg N/ha/yr)		
E6f	20.55	0.23	3.57	0.23	3.64	0.08	0.4%
E6g	20.55	0.17	2.65	0.18	2.73	0.08	0.4%
E7a	20.55	0.58	9.32	0.59	9.37	0.05	0.3%
E7b	20.55	0.52	8.35	0.53	8.40	0.05	0.3%
E7c	20.55	0.47	7.53	0.48	7.58	0.05	0.3%
E8a	20.63	0.19	2.63	0.20	2.83	0.21	1.1%
E8b	20.63	0.17	2.36	0.18	2.53	0.18	0.9%
E9a	20.63	0.46	5.98	0.49	6.49	0.54	2.8%
E9b	20.63	0.28	3.81	0.31	4.11	0.32	1.7%
E10a	20.63	0.69	8.95	0.76	9.76	0.88	4.6%
E10b	20.63	0.41	5.40	0.45	5.86	0.49	2.5%
E11a	20.63	0.14	1.93	0.15	2.03	0.10	0.5%
E11b	20.63	0.14	1.92	0.14	2.01	0.10	0.5%
E12a	20.47	0.33	4.37	0.36	4.78	0.44	2.3%
E12b	20.47	0.25	3.38	0.28	3.70	0.34	1.8%

4.1.1.4 Acid Deposition

All Rochdale Canal SAC/SSSI receptor locations were 'screened out', as Rochdale Canal SAC/SSSI is identified as not sensitive to acid deposition based on APIS criteria. Therefore, this report has not considered the potential impacts of acid deposition on Rochdale Canal SAC/SSSI any further.

5 MITIGATION MEASURES & RESIDUAL IMPACTS

5.1 Summary of Impacts

As identified in Section 4, the proposed development is not expected to have a significant effect on local air quality in the absence of mitigation.

The model predictions for the change in daily mean NO_x PCs are below 10% of the EA screening criteria respectively at all Rochdale Canal SAC/SSSI receptor locations. The predicted annual mean NO_x PCs, annual mean ammonia PCs and nitrogen deposition PCs are above the relevant critical level/load at several Rochdale Canal SAC/SSSI receptor locations. However, with reference to GMCA's Habitats Regulations Assessment of the Places for Everyone Joint Development Plan and in consultation with the project ecologist, given the very small proportion of the Rochdale Canal SAC/SSSI affected and with suitable mitigation measures (e.g. implementation of travel plan and installation of electric vehicle charging points) in place, NO_x, ammonia and nitrogen deposition associated with the proposed development is not considered likely to have a significant impact on the Rochdale Canal SAC/SSSI.

6 CONCLUSIONS

A detailed air quality assessment has been undertaken for the proposed residential development on Land at Stakehill, Rochdale, with reference to existing air quality in the area and relevant air quality legislation, policy and guidance.

An assessment of operational phase impacts has been undertaken using the ADMS-Roads atmospheric dispersion model. Annual average NO_x and ammonia concentration in air was predicted to assess the impact of NO_x and ammonia emissions and resultant nitrogen deposition on the Rochdale Canal SAC/SSSI.

The air quality impacts were assessed in consultation with the project ecologist as 'not significant' with respect to annual mean NO_x and ammonia, daily mean NO_x and nitrogen deposition at all assessed ecological receptor points. The proposed development is not considered to have a significant adverse effect on the Rochdale Canal SAC/SSSI.

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