Assessment of Air Quality Impacts on European Sites in Staffordshire, Wolverhampton, Walsall, Sandwell, and Dudley

Air Quality Assessment Report

Sweco UK Limited	Reg. No. 2888385
Project Name	Staffordshire HRA: Traffic & Air Quality
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Client	Partnership Authorities
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Approved by	Damian Pawson
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001	19/07/24	First Draft	DP	DP
002	25/10/24	Final	DP	DP

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1 Introduction

Sweco UK Ltd was commissioned by South Staffordshire District Council (SSDC), on behalf of a partnership of local authorities, to undertake a detailed air quality modelling study to inform an assessment of air quality impacts on relevant European designated sites.

The partnership authorities comprise:

- SSDC
- Stafford Borough Council
- East Staffordshire Borough Council
- Lichfield District Council
- Cannock Chase District Council
- City of Wolverhampton Council
- Dudley Metropolitan Borough Council
- Walsall Metropolitan Borough Council
- Sandwell Metropolitan Borough Council

At the time of assessment (February – October 2024), a number of the partnership authorities are progressing their respective Local Plans, which will direct development throughout the region.

The *Conservation of Habitats and Species Regulations 2017* (as amended) require local authorities to assess whether their Local Plan will result in likely significant effects to European designated sites in and/or near to their administrative areas. The task is achieved by means of a Habitats Regulations Assessment (HRA).

Each Local Plan will generate additional vehicle movements on the local and regional road networks resulting from the development of current and proposed allocated sites. Therefore, vehicle emissions associated with traffic generated by each partnership authority's emerging Local Plan have the potential to impact sensitive habitats within a number of European sites, both 'alone' (i.e. individual Local Plan) and 'in-combination' (i.e. multiple Plans and projects).

Of key concern for European sites are vehicle emissions of nitrogen-containing compounds, such as oxides of nitrogen (NO_x) and ammonia (NH_3), which can contribute to ambient concentrations at nitrogen-sensitive habitats or species within a designated site. Increased emissions of these pollutants can, in turn, increase nutrient nitrogen deposition and/or acid deposition to plants and soils within a designated site, which can have detrimental impacts on flora and fauna. As such, the change in vehicle emissions of NO_x and NH_3 associated with the aforementioned emerging Local Plans form the focus of this assessment.

1.1 Purpose of this Assessment

This study has been commissioned to facilitate an 'in-combination' assessment of air quality impacts at relevant European sites, such that it can be used to support each partnership authority's Local Plan HRA. However, it is acknowledged that updates to this assessment may be required in future as each partnership Local Plan emerges, as dictated by changes to the respective Local Plan periods, site allocations, development mix, and any associated changes to traffic growth and distribution.

The designated sites that form the focus of this air quality assessment were determined through an evidence base and specification developed by Middlemarch Environmental Ltd (March

2023)[1], which included rationales for screening out a number of sites from the HRA process. This was agreed in writing with Natural England[2].

The European designated sites included in this air quality assessment comprise:

- Cannock Chase Special Area of Conservation (SAC)
- Pasturefields Salt Marsh SAC
- Midlands Meres and Mosses Phase 2 Ramsar site (Cop Mere & Oakhanger Moss)
- Cannock Extension Canal SAC
- Fens Pools SAC.

The above European site locations are presented in **Figure 1**.

This air quality assessment has been completed with reference to the specification outlined by Middlemarch Environmental Ltd[1], as detailed herein. Furthermore, this assessment has relied upon the traffic data produced by the appointed transport modelling consultant (Sweco UK Ltd) for the partnership authorities[3], which includes the relevant road links within 200 m of each European site scoped into the assessment.

The results of this assessment have been passed to the appointed ecology consultants for each partnership authority, such that an Appropriate Assessment can be undertaken to determine the likely impacts on the integrity of a European site, where applicable.

This technical air quality assessment report is supported by the following appendices:

- **Appendix A** – Traffic Data Tables (base year and future year scenarios)
- **Appendix B** – Dispersion Modelling Approach & Verification
- **Appendix C** – Air Quality Assessment Results Tables
- **Appendix D** – Middlemarch Environmental Ltd (March 2023) *Creation of an Air Pollution Evidence Base Brief to Support Local Plan HRA*
- **Appendix E** – Letter from Natural England (14 April 2023) to Partnership Authorities confirming agreement with Middlemarch Environmental Ltd evidence base brief

[1] Middlemarch Environmental Ltd (March 2023) *Creation of an Air Pollution Evidence Base Brief to Support Local Plan HRA* (Report no. RT-MME-159172-01,Rev B)

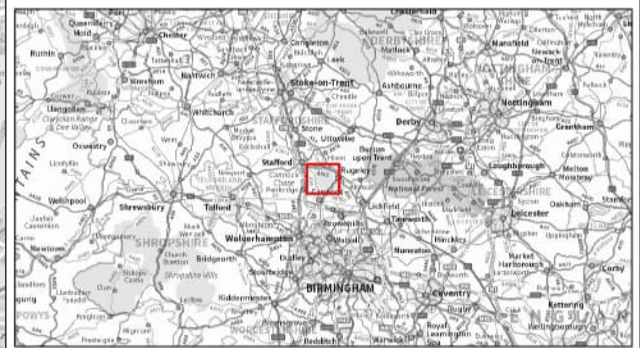
[2] Natural England (14 April 2023) Letter addressed to 'Combined Partnership Authorities' via email, confirming agreement with rationale for screening out certain European sites from requiring detailed air quality impact assessment (Natural England reference: 427535)

[3] Sweco UK Ltd (July 2024) *Traffic modelling to inform an assessment of air quality impacts on European sites in Staffordshire, Wolverhampton, Walsall, Sandwell, and Dudley – Traffic Model Validation and Forecast*

Legend

Designated Nature Conservation Sites

- Site of Special Scientific Interest (SSSI)
- Special Area of Conservation (SAC)



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	06.11.2024	FIRST ISSUE	ABC	ABC	ABC

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SWECO

Client

South Staffordshire Council

Project Title

Assessment of Air Quality Impacts on European Sites in Staffordshire, Wolverhampton, Walsall, Sandwell, and Dudley

Drawing Title

Figure 1.1 Location of European sites included in the Air Quality Assessment to inform the HRA

Cannock Chase SAC/SSSI

Project Stage	
n/a	

Status	Status Description
n/a	n/a

Drawn	Designed	Checked	Approved
LFS	LFS	DP	DP

Sheet Size	Scale	Sweco Ref	Revision
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Legend

Designated Nature Conservation Sites

- Site of Special Scientific Interest (SSSI)
- Special Area of Conservation (SAC)

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Drawing Title

Figure 1.2 Location of European sites included in the Air Quality Assessment to inform the HRA

Cannock Extension Canal SAC/SSSI

Project Stage			
n/a			
Status	Status Description		
n/a	n/a		
Drawn	Designed	Checked	Approved
LFS	LFS	DP	DP
Sheet Size	Scale	Sweco Ref	Revision
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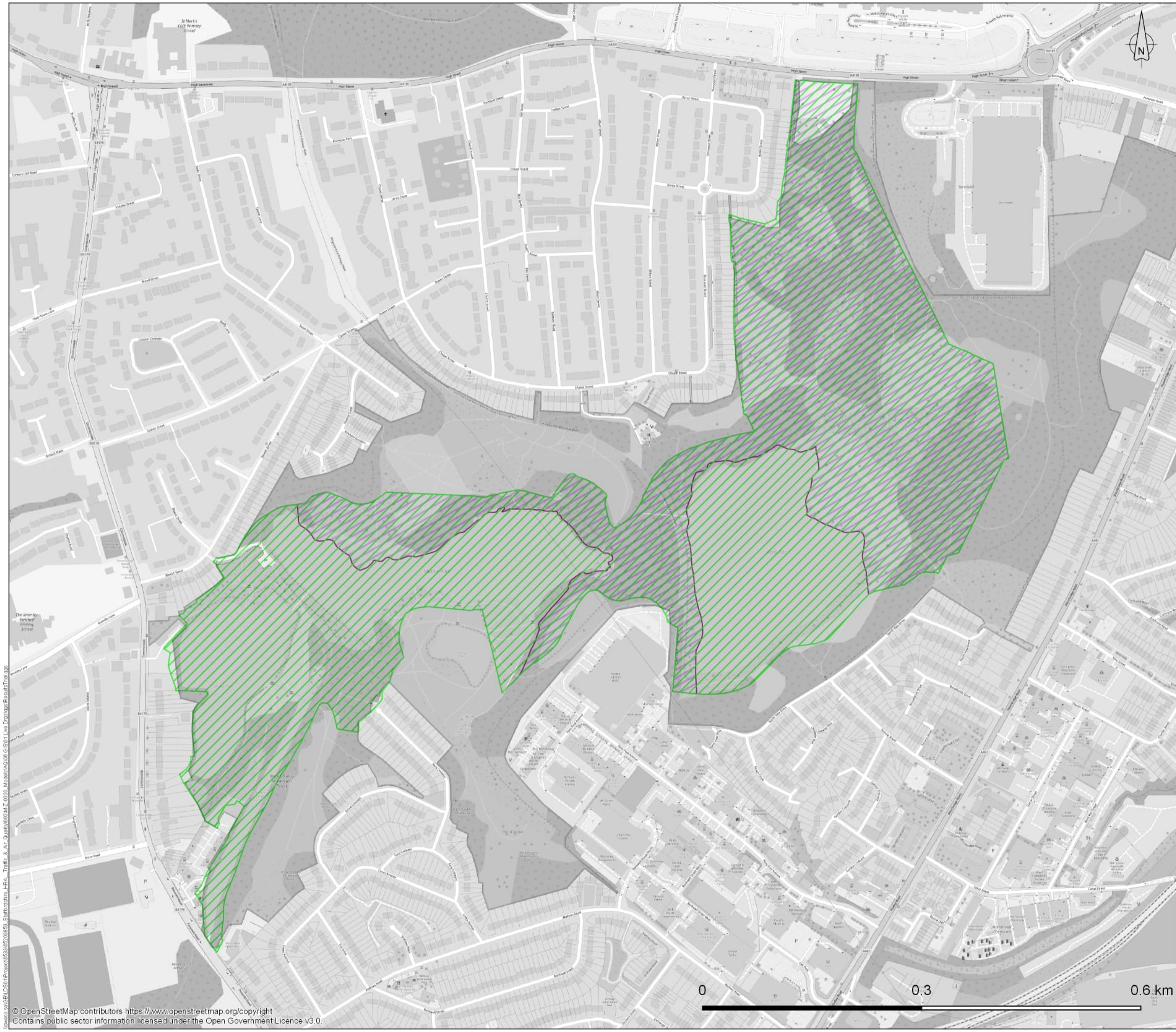

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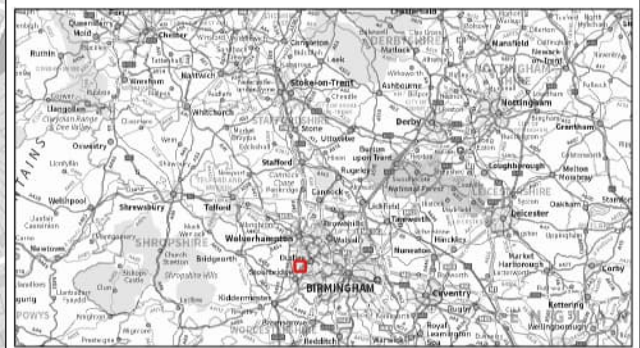
Designated Nature Conservation Sites

- Site of Special Scientific Interest (SSSI)
- Special Area of Conservation (SAC)



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Drawing Title

Figure 1.3 Location of European sites included in the Air Quality Assessment to inform the HRA

Fens Pools SAC/SSSI

Project Stage			
n/a			
Status	Status Description		
n/a	n/a		
Drawn	Designed	Checked	Approved
LFS	LFS	DP	DP
Sheet Size	Scale	Sweco Ref	Revision
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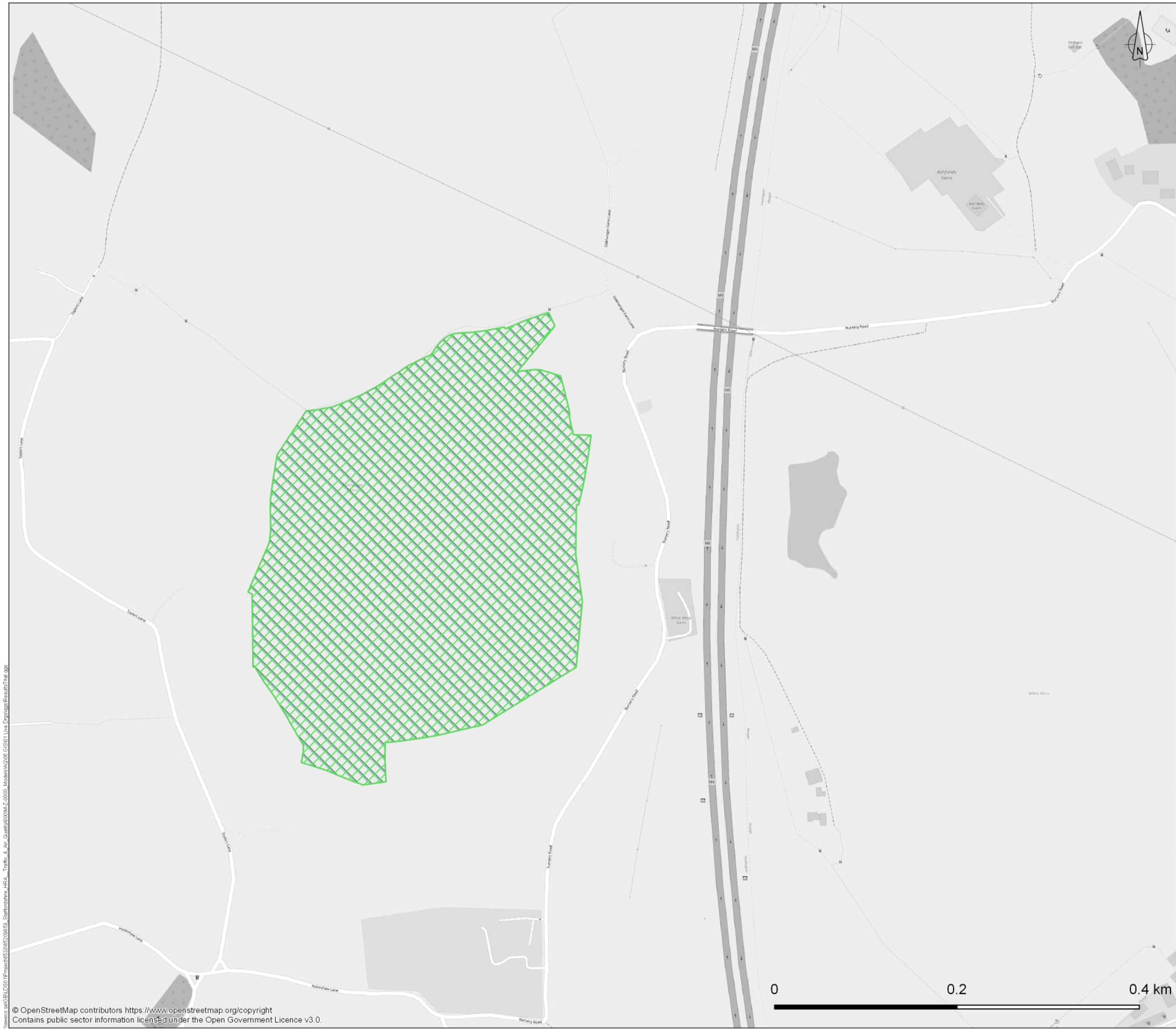

Legend

Designated Nature Conservation Sites

- Site of Special Scientific Interest (SSSI)
- Wetland of International Importance (Ramsar)

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Drawing Title

Figure 1.4 Location of European sites included in the Air Quality Assessment to inform the HRA

Oakhanger Moss SSSI (Ramsar)

Project Stage			
n/a			
Status	Status Description		
n/a	n/a		
Drawn	Designed	Checked	Approved
LFS	LFS	DP	DP
Sheet Size	Scale	Sweco Ref	Revision
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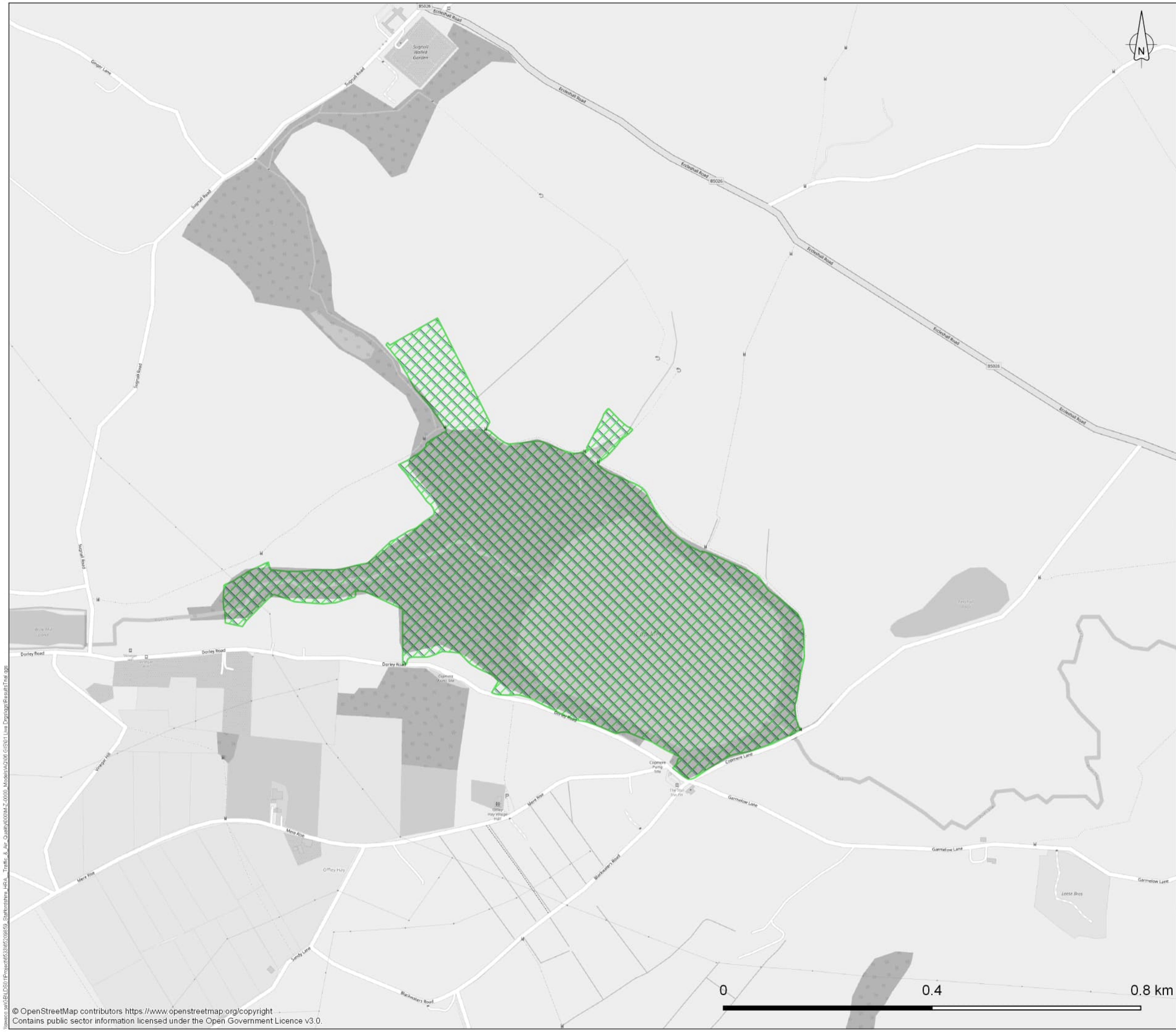
Drawing Number 65209859-SWE-XX-XX-D-AQ-0001



Legend

Designated Nature Conservation Sites

- Site of Special Scientific Interest (SSSI)
- Wetland of International Importance (Ramsar)

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Drawing Title

Figure 1.5 Location of European sites included in the Air Quality Assessment to inform the HRA

Cop Mere SSSI (Ramsar)

Project Stage			
n/a			
Status	Status Description		
n/a	n/a		
Drawn	Designed	Checked	Approved
LFS	LFS	DP	DP
Sheet Size	Scale	Sweco Ref	Revision
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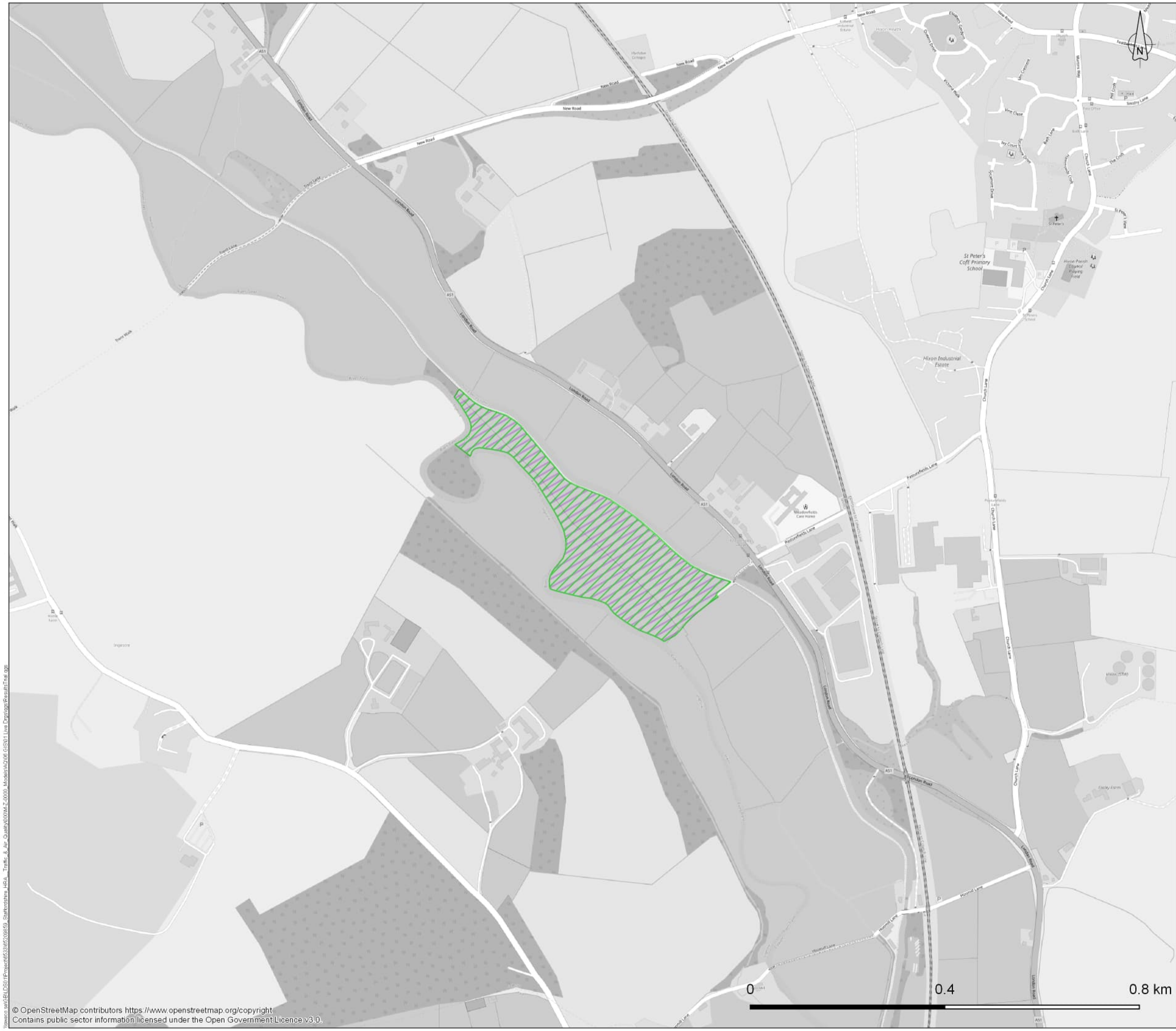
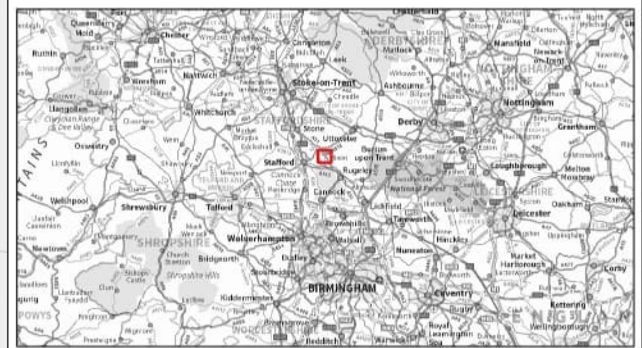
Drawing Number 65209859-SWE-XX-XX-D-AQ-0001



Legend

Designated Nature Conservation Sites

- Site of Special Scientific Interest (SSSI)
- Special Area of Conservation (SAC)



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Drawing Title

Figure 1.6 Location of European sites included in the Air Quality Assessment to inform the HRA

Pasturefields Salt Marsh SAC/SSSI

Project Stage	
n/a	

Status	Status Description
n/a	n/a

Drawn	Designed	Checked	Approved
LFS	LFS	DP	DP

Sheet Size	Scale	Sweco Ref	Revision
A3	1:7,500	65209859	P01.1

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2 Legislation & National Planning Policy

This section provides a summary of the pertinent legislation and planning policies that apply to this assessment.

2.1 Legislation

2.1.1 The Conservation of Habitats and Species Regulations 2017 (as amended)

The *Conservation of Habitats and Species Regulations 2017* (as amended) ('Habitats Regulations'); Regulation 63 (1) states that:

'*A competent authority, before deciding to undertake, or give any consent, permission or other authorisation for, a plan or project which –*

(a) is likely to have a significant effect on a European site or a European offshore marine site (either alone or in-combination with other plans or projects), and

(b) is not directly connected with or necessary to the management of that site,

– must make an Appropriate Assessment of the implications for that site in view of that site's conservation objective.'

The Habitats Regulations also make allowance for projects or plans to be completed if they satisfy '*imperative reasons of overriding public interest (IROPI)*'. Regulations 64 and 68 apply in this regard.

2.1.2 National Air Quality Legislation

The *European Directive on Ambient Air Quality* (2008/50/EC) set legally binding limits (termed 'critical levels') for ambient concentrations of air pollutants that impact ecosystems, such as oxides of nitrogen (NO_x). Critical levels are concentrations of pollutants (e.g. in micrograms per cubic metre, $\mu g/m^3$) in the atmosphere below which direct adverse effects on receptors, such as human beings, plants, ecosystems or materials, are not expected to occur according to present knowledge.

The Directive and associated pollutant critical levels and limit values were transposed into UK law under the Air *Quality Standards Regulations 2010* (as amended) and, following the UK's exit from the EU, the *Environment (Legislative Functions from Directives) (EU Exit) Regulations 2019*.

The UK's Air Quality Strategy, published in July 2007 was superseded in England by the 2023 Air Quality Strategy[4] and fulfils the statutory requirement of the *Environment Act 1995* as amended by the *Environment Act 2021* to publish an Air Quality Strategy setting out air quality standards, objectives, and measures for improving ambient air quality every 5 years.

The Strategy establishes the framework for air quality improvements across the UK and sets out standards for key air pollutants that reflect levels of pollutants thought to avoid or minimise risks to health or ecosystems. The associated air quality objectives are policy targets, expressed as maximum permissible outdoor concentrations of pollutants that take account of economic efficiency, practicability, technical feasibility and timescales.

The Strategy reinforces the annual mean critical level for NO_x, as presented in **Table 1** below. It also acknowledges the potential for significant impacts associated with levels of NH_3, with both

[4] Department for Environment Food & Rural Affairs (Defra) *Air quality strategy: framework for local authority delivery 2023*

pollutants contributing to the deposition of reactive nitrogen and "…*the associated long-term decline of biodiversity in the UK*".

Whilst not explicitly provided in the Air Quality Strategy, critical levels for NH_3 are assigned for all vegetation types and established by the *Working Group on Effects of the UNECE Convention on Long Range Transboundary Air Pollution*[5]. The respective annual mean NH_3 critical level concentrations applicable to lower (lichens and bryophytes) and higher plants are provided in **Table 1**.

Similar benchmarks apply to nitrogen and acid deposition, termed as 'critical loads'. Critical loads define the rates of acid or nitrogen (N) deposition (e.g. in kiloequivalents per hectare per year, keq/ha/yr) below which significant harmful effects are not expected to occur in sensitive habitats. Critical loads for N deposition are set under the *Convention on Long Range Transboundary Air Pollution*[5], with critical loads for acidity derived using differing methods for terrestrial habitats and freshwater ecosystems[6]. Critical loads for both N and acid deposition are dependent on the specific habitat type, with N deposition critical loads given as ranges. The critical loads applicable to the European sites included in this assessment are presented in **Section 4**.

Table 1: Annual mean NO_x and NH_3 critical levels applicable to this assessment

Pollutant	Critical Level	Measured as	Applicable to
Oxides of Nitrogen, NO_x	30 µg/m³	Annual Mean	Protection of vegetation and ecosystems
Ammonia, NH_3	3 µg/m³	Annual Mean	Higher plants
Ammonia, NH_3	1 µg/m³	Annual Mean	Lower plants (lichens & bryophytes)

2.2 National Planning Policy Context

The Government's overall planning policies for England are described in the National Planning Policy Framework[7]. The core underpinning principle of the Framework is the presumption in favour of sustainable development, which for 'plan-making' means that:

"…

a) *all plans should promote a sustainable pattern of development that seeks to: meet the development needs of their area; align growth and infrastructure; improve the environment; mitigate climate change (including by making effective use of land in urban areas) and adapt to its effects;*
b) *strategic policies should, as a minimum, provide for objectively assessed needs for housing and other uses, as well as any needs that cannot be met within neighbouring areas, unless:*
   i. *the application of policies in this Framework that protect areas or assets of particular importance* [including habitats sites] *provides a strong reason for restricting the overall scale, type or distribution of development in the plan area; or*

[5] United Nations Economic Commission for Europe (13 November 1979) *Convention on long-range transboundary air pollution*
[6] UK Centre for Ecology and Hydrology - Air Pollution Information System webpage: https://www.apis.ac.uk/critical-loads-and-critical-levels-guide-data-provided-apis#_Toc279788050 (accessed June 2024)
[7] Ministry of Housing, Communities & Local Government (December 2023) *National Planning Policy Framework*

ii. any adverse impacts of doing so would significantly and demonstrably outweigh the benefits, when assessed against the policies in this Framework taken as a whole..."

Paragraph 181 of the NPPF states, in relation to conserving and enhancing the natural environment, that "…*Plans should: distinguish between the hierarchy of international, national and locally designated sites; allocate land with the least environmental or amenity value, where consistent with other policies in this Framework; take a strategic approach to maintaining and enhancing networks of habitats and green infrastructure; and plan for the enhancement of natural capital at a catchment or landscape scale across local authority boundaries*…".

In relation to the above and specifically with regard to air quality, paragraph 180 states that "…*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*…".

Notwithstanding, paragraph 188 of the NPPF asserts that "…*the presumption in favour of sustainable development does not apply where the plan or project is likely to have a significant effect on a habitats site (either alone or in-combination with other plans or projects), unless an appropriate assessment has concluded that the plan or project will not adversely affect the integrity of the habitats site*".

For the purposes of this report, all relevant habitats sites as described above are collectively termed 'European sites'.

2.3 The Wealden Judgement

The Wealden Judgement[8], handed down in March 2017, introduced additional complexities into the HRA process in relation to in-combination and cumulative effects.

Prior to this Judgement, it was deemed that air quality impacts on European sites need only be considered alongside roads where the traffic growth associated with the individual Plan or Project being assessed exceeded specified screening criteria. These criteria were typically based on changes in vehicle movements and taken from the Design Manual for Roads and Bridges (DMRB, LA105)[9], equating to:

- Increases of over 1,000 domestic vehicles per day or 200 Heavy Goods Vehicles per day (as Annual Average Daily Traffic (AADT)).

The Wealden Judgement found that the application of the criteria to the traffic growth associated with a single Local Plan was unsound on the basis that two Local Plans collectively contributing more than 1,000 domestic AADT could lead to a potentially significant effect. The Judge determined that further assessment of air quality impacts on European sites should have been carried out and quashed part of the Local Plan that would have led to an in-combination exceedance of 1,000 domestic AADT.

This judgement poses several challenges for Local Authorities and Council Officers, namely:

- Uncertainty – at present, there is no widely accepted approach to the appropriate use of screening criteria and when these may be used to rule out the need for detailed modelling of potential air quality impacts. Natural England has published guidance which

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[8] Judgment in Wealden District Council v. Secretary of State for Communities and Local Government, Lewes District Council and South Downs National Park Authority [2017] EWHC 351 (Admin) DATE: 21 Mar 2017.

[9] National Highways (2024) *Design Manual for Roads and Bridges LA105 Air Quality v0.1.0*

provides a staged approach for assessing in-combination effects. This methodology has been used as the basis for this air quality assessment, as outlined herein.

- Lack of a clear '*de minimus*' – there is case law that supports the use of *de minimus* thresholds in the assessment of potential impacts on European sites, i.e. where no 'appreciable effect' may occur[10] as the result of a Plan or Project. Some practitioners have argued that Wealden suggests there is no *de minimus* threshold for increases in traffic emissions, and a development leading to an increase of even one vehicle per day should be prohibited or subject to further assessment for in-combination traffic growth, whilst others have argued that the Wealden Judgement applies to the use of traffic thresholds alone.
- Difficulties devising and delivering local planning policy – where predicted Local Plan growth will result in increased vehicle emissions, it is more challenging to determine the appropriate scope of traffic modelling, air quality modelling and HRA work required in support.
- Difficulties assessing individual planning applications – how do Local Authorities determine planning applications that will increase vehicle movements in proximity to European sites whilst tracking cumulative growth.

[10] Sweetman v. An Bord Pleanála, Case C-258/11, CJEU judgment 11 April 2013

3 Scope & Methodology

This section provides details of the data and information supplied for the purpose of undertaking the air quality assessment. It also describes the adopted methodology for assessing and appraising the potential 'in-combination' air quality impacts associated with the Partnership Authorities' emerging Local Plans, which aligns with the Middlemarch Environmental Ltd brief[1], as agreed with Natural England[2].

3.1 Key Data & Resources

An index of the key data and resources used within this study and the respective sources are presented in **Table 2**.

Table 2: Key data and resources relating to air quality assessment

Data / Information	Description	Source / Document Reference
European site boundaries	Georeferenced shapefiles for each relevant European site were sourced from the Joint Nature Conservation Committee (JNCC), such that they could be accurately represented in the air quality model.	JNCC https://jncc.gov.uk/our-work/uk-protected-area-datasets-for-download/
Nitrogen dioxide (NO_2) and NH_3 monitoring data specific to project	Monitoring data (2022-23) at or near to relevant European sites were provided by Stafford Borough Council to inform the assessment of baseline air quality conditions.	Stafford Borough Council
NO_2 monitoring data from Partnership Authorities	To facilitate verification of the air quality model, local authority data pertaining to roadside annual mean NO_2 concentrations were sourced for relevant locations within the study area.	Various air quality Annual Status Reports (ASRs) published by the individual Partnership Authorities
N and acid deposition rates and critical loads	Respective baseline N deposition and acid deposition rates and empirical habitat critical loads	Middlemarch Environmental Ltd[1] and Air Pollution Information System (APIS) Website (http://www.apis.ac.uk/)
Defra national background pollutant mapping data (2018-based)	Background 1km x 1km grid pollutant data obtained for the respective grid squares encompassing the study area.	Annual mean data sourced from Defra: https://uk-air.defra.gov.uk/data/laqm-background-maps?year=2018
Defra EFT v12.0	Vehicle emissions factors toolkit allowing calculation of road link-based pollutant emissions rates (e.g. NO_x) for a specified year, road type, vehicle speed and vehicle fleet composition	https://laqm.defra.gov.uk/air-quality/air-quality-assessment/emissions-factors-toolkit/
Defra Local Air Quality Management (LAQM) Tools	A suite of tools to enable collation of vehicle emissions inventory data and conversion of NO_x to NO_2.	All LAQM tools sourced from Defra: https://laqm.defra.gov.uk/review-and-assessment/tools/tools.html
National Highways NH_3 Emissions from Vehicles Tool v4	A calculator tool that enables the derivation of road-NH_3 concentrations at a specified receptor based on a relationship between NO_x and NH_3 vehicle emissions for both light duty and heavy duty vehicles.	National Highways (Jan 2024) *Draft - Highways England Ammonia N Deposition Tool_v4*
Atmospheric Dispersion Modelling System for Roads v5.0.1 (ADMS-Roads)	Steady-state dispersion model capable of predicting dispersion of emissions from the assessed road network and calculating pollutant concentrations at receptors.	Cambridge Environmental Research Consultants (CERC)

Data / Information	Description	Source / Document Reference
Baseline and future year traffic data for all model scenarios	Traffic data provided in appropriate format to enable air pollutant emissions inventory (NO_x) databases to be generated prior to dispersion modelling,	Data supplied by project transport consultant (Sweco). Link-based traffic data applicable to the study area are provided in **Appendix A**.
Hourly sequential meteorological data	Data representative of study area obtained for year 2022 to align with model verification year and to facilitate dispersion modelling.	Formatted National Weather Prediction (NWP) hourly data suitable for use in ADMS 6 purchased from ADM Ltd
LAQM Technical Air Quality Guidance	Guidance document, including information on dispersion modelling and model verification / adjustment	Defra (2022) *Local Air Quality Management Technical Guidance*[11] (referred to as 'LAQM.TG22')
Natural England Guidance	Natural England guidance on assessment of road traffic emissions under the Habitats Regulations	*Natural England's approach to advising competent authorities on the assessment of road traffic emissions under the Habitats Regulations*[12]
Institute of Air Quality Management (IAQM) Guidance	Guidance document for assessing the air quality impact on designated sites	IAQM (2019) *A Guide to the Assessment of Air Quality Impacts on Designated Nature Conservation Sites*[13]
Ordnance Survey (OS) MasterMap	Base mapping covering the model domain to facilitate model build of road network and accurate representation of modelled receptors.	OS MasterMap provided by Partnership Authorities under licence agreement (2023)
Terrain data	Light Detection and Ranging (LIDAR) data used at 2 m resolution was used to facilitate inclusion of terrain elevations within dispersion model.	Environment Agency LIDAR Composite Digital Terrain Model (DTM) elevation data (2022) https://environment.data.gov.uk/survey

3.2 Natural England's Guidance

In June 2018, Natural England published guidance[12] on their approach to advising competent authorities on the assessment of road traffic emissions under the Habitats Regulations. The document considers the Wealden Judgement and the need to assess in-combination effects on European sites as a result of air pollution.

The guidance provides a framework around the assessment of road traffic emissions and subsequent effects on International Sites. Notably:

- Step 1 – Does the proposal give rise to emissions which are likely to reach a Habitats Site.
- Step 2 – Are there qualifying features within 200 m of a road sensitive to air pollution.
- Step 3 – Could the sensitive qualifying features of the site be exposed to emissions.
- Step 4 – Application of the Screening Thresholds.
    - Step 4a: apply the threshold alone.
    - Step 4b: apply the threshold in-combination with emissions from other road traffic plans and projects.

[11] Defra (2022) *Local Air Quality Management Technical Guidance LAQM.TG22*
[12] Natural England (June 2018) *Natural England's approach to advising competent authorities on the assessment of road traffic emissions under the Habitats Regulations*
[13] IAQM (2019) *A Guide to the Assessment of Air Quality Impacts on Designated Nature Conservation Sites. Version 1.0*

- Step 4c: apply the threshold in-combination with emissions from other non-road plans and projects.
- Step 5: Advise on the need for Appropriate Assessment where thresholds are exceeded, either alone or in-combination.

The relevant thresholds in relation to Step 4 are as follows:

- Changes in AADT of 1,000 domestic vehicles a day (or more); and/or
- Changes of 1% of the relevant Critical Load and/or Level as a result of the Plan/Project.

The guidance does not specifically cover nationally significant sites such as Sites of Special Scientific Interest (SSSIs), which are covered by a different regulatory framework. However, it does state that the general principles for air quality assessment outlined for European sites are likely to be equally relevant for this and other designations.

The above guidance has been referenced throughout the completion of this air quality assessment, particularly with respect to the scenarios addressed. However, this assessment focusses on the in-combination impacts associated with the Partnership Authorities' emerging Local Plans and does not consider the individual 'alone' impact associated with each discrete Local Plan. This is consistent with the methodology agreed with Natural England[1,2].

3.3 Assessment Methodology

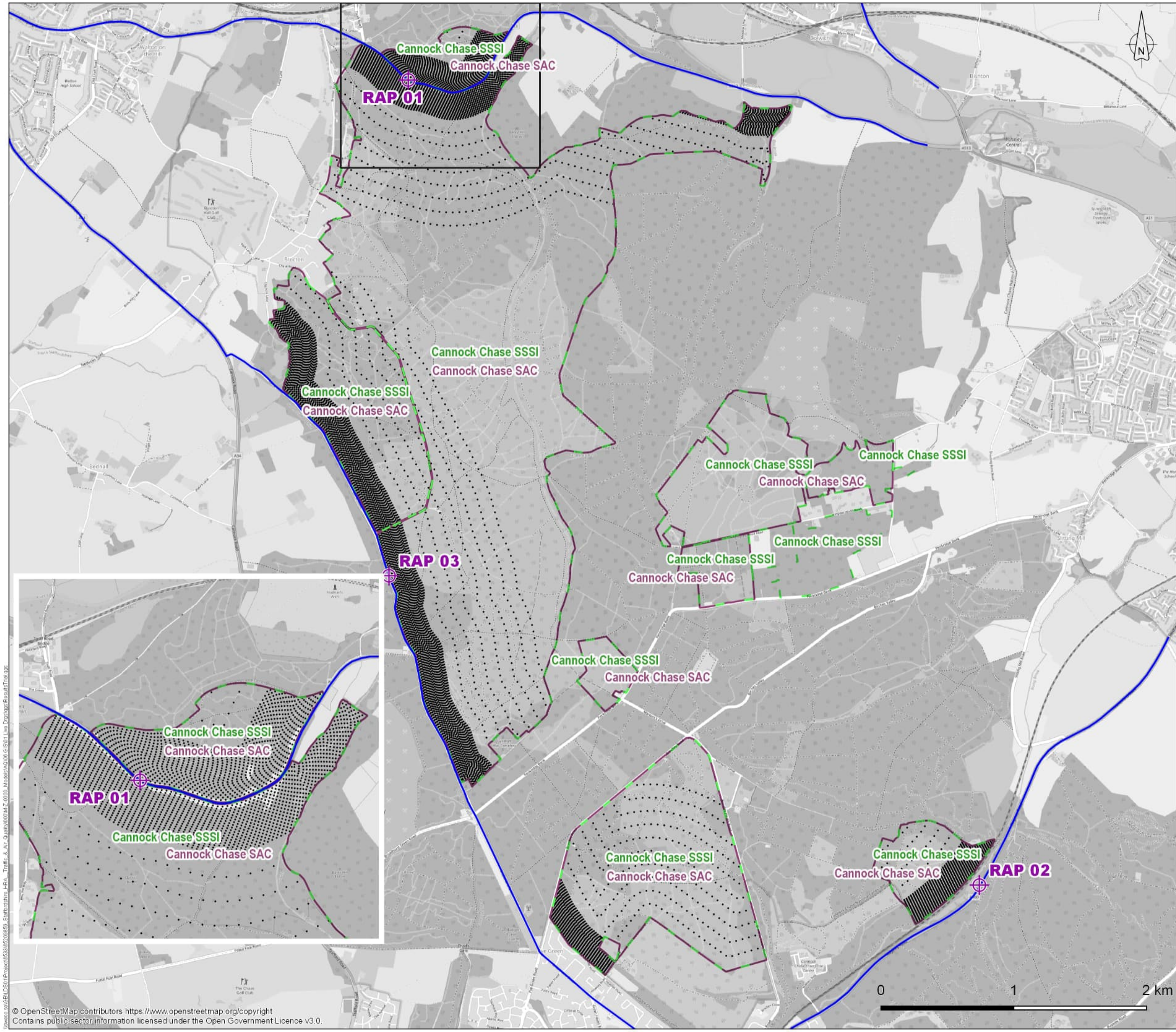
3.3.1 Study Area

The study area for the air quality assessment was determined through identifying the road links within 200 m of the relevant European sites as listed in **Section 1.1** and depicted in **Figure 1**. Primarily, the road links within 200 m encompassed the 'road assessment point' (RAP) locations identified by the Middlemarch brief[1], as presented in **Table 3**.

The full extent of the modelled road links and RAP locations within 200 m of each European site are depicted on **Figure 2**.

Table 3: RAP locations used to identify the key roads within 200 m of European sites

European Site	Land Parcel	Road Type	Road Name	OS Grid Reference	RAP Reference
Cannock Chase SAC	N/A	A	A513	397865, 320796	RAP 1
		A	A460 Rugeley Road	402164, 314732	RAP 2
		Unclassified	Camp Road	397719, 317062	RAP 3
Pasturefields Salt Marsh SAC	N/A	A	A51	399447, 324872	RAP 4
Midlands Meres and Mosses Phase 2 Ramsar	Cop Mere	Unclassified	Unnamed	380412, 329409	RAP 8
	Oakhanger Moss	Motorway	M6	377104, 355061	RAP 25
Cannock Extension Canal SAC	N/A	A	A5 Watling Street	402030, 306921	RAP 10
		B	B4154 Lime Lane	402006, 306291	RAP 11
Fens Pools SAC	N/A	A	A4101 High Street	392072, 289236	RAP 12
		A	A461 Stourbridge Road	392409, 288620	RAP 13

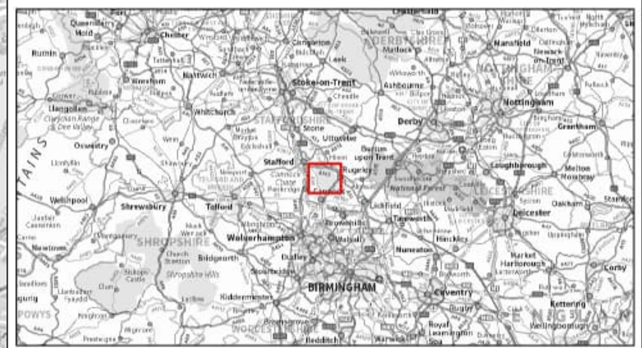


Legend

- Modelled Roads (HRA)
- RAP Locations
- Modelled Receptor Points

Designated Nature Conservation Sites

- Site of Special Scientific Interest (SSSI)
- Special Area of Conservation (SAC)



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Project Title

Assessment of Air Quality Impacts on European Sites in Staffordshire, Wolverhampton, Walsall, Sandwell, and Dudley

Drawing Title

Figure 2.1 Road links within 200 m of each European site included in assessment

Cannock Chase SAC/SSSI

Project Stage	
n/a	
Status	Status Description
n/a	n/a

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LFS	LFS	DP	DP
Sheet Size	Scale	Sweco Ref	Revision
A3	1:27,500	65209859	P01.1

Drawing Number 65209859-SWE-XX-XX-D-AQ-0002

Legend

- Modelled Roads (HRA)
- RAP Locations
- Modelled Receptor Points

Designated Nature Conservation Sites

- Site of Special Scientific Interest (SSSI)
- Special Area of Conservation (SAC)

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Drawing Title
Figure 2.2 Road links within 200 m of each European site included in assessment

Cannock Extension Canal SAC/SSSI

Project Stage			
n/a			
Status	Status Description		
n/a	n/a		
Drawn	Designed	Checked	Approved
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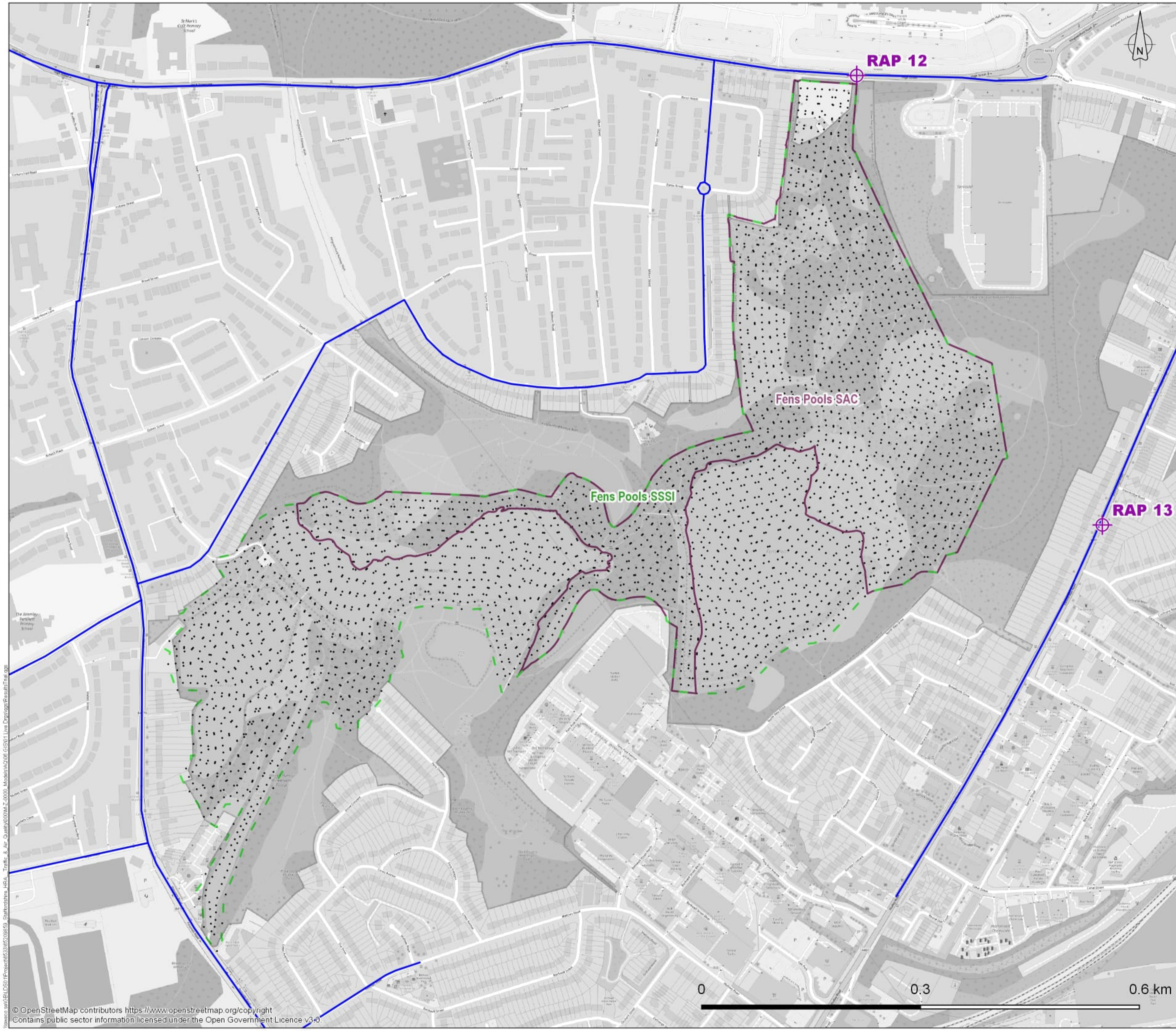
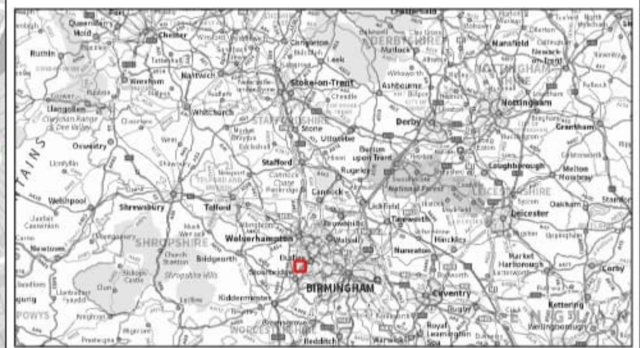


Legend

- Modelled Roads (HRA)
- RAP Locations
- Modelled Receptor Points

Designated Nature Conservation Sites

- Site of Special Scientific Interest (SSSI)
- Special Area of Conservation (SAC)



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Drawing Title

Figure 2.3 Road links within 200 m of each European site included in assessment

Fens Pools SAC/SSSI

Project Stage	
n/a	
Status	Status Description
n/a	n/a

Drawn	Designed	Checked	Approved
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Sheet Size	Scale	Sweco Ref	Revision
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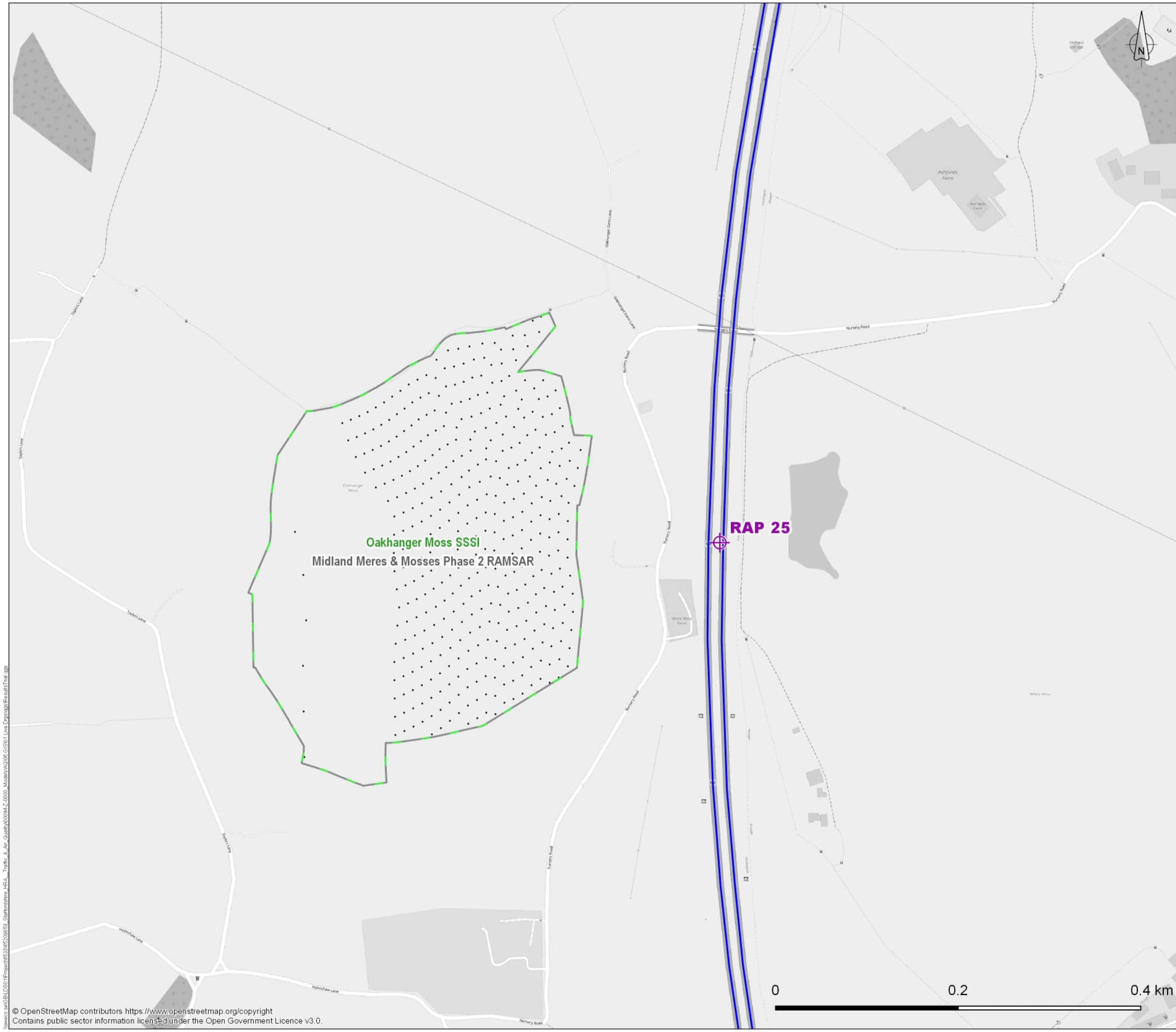
Drawing Number 65209859-SWE-XX-XX-D-AQ-0002



Legend

- Modelled Roads (HRA)
- RAP Locations
- Modelled Receptor Points

Designated Nature Conservation Sites

- Site of Special Scientific Interest (SSSI)
- Wetland of International Importance (Ramsar)

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Drawing Title

Figure 2.4 Road links within 200 m of each European site included in assessment

Oakhanger Moss SSSI (Ramsar)

Project Stage			
n/a			
Status	Status Description		
n/a	n/a		
Drawn	Designed	Checked	Approved
LFS	LFS	DP	DP
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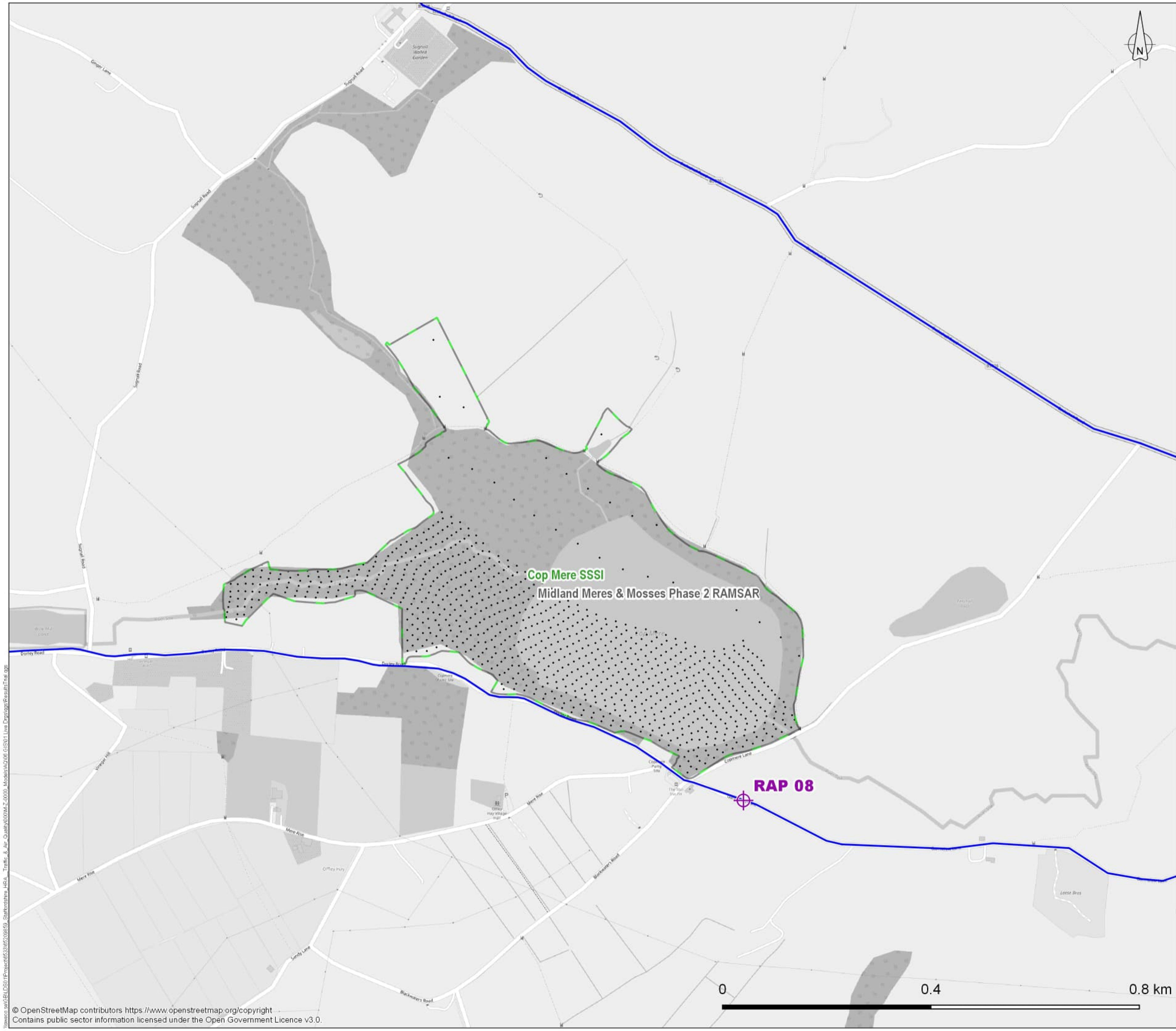
Drawing Number 65209859-SWE-XX-XX-D-AQ-0002



Legend

- Modelled Roads (HRA)
- RAP Locations
- Modelled Receptor Points

Designated Nature Conservation Sites

- Site of Special Scientific Interest (SSSI)
- Wetland of International Importance (Ramsar)

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Drawing Title
Figure 2.5 Road links within 200 m of each European site included in assessment

Cop Mere SSSI (Ramsar)

Project Stage			
n/a			
Status	Status Description		
n/a	n/a		
Drawn	Designed	Checked	Approved
LFS	LFS	DP	DP
Sheet Size	Scale	Sweco Ref	Revision
A3	1:7,000	65209859	P01.1

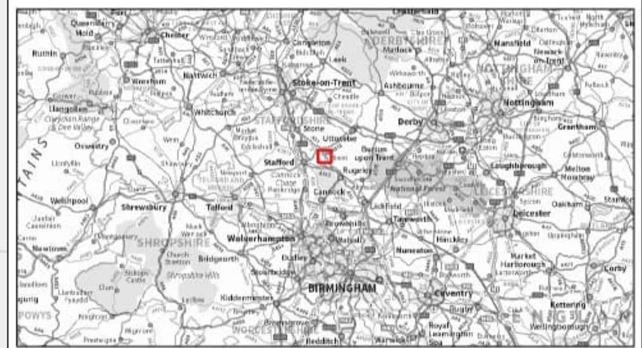
Drawing Number 65209859-SWE-XX-XX-D-AQ-0002

Legend

- Modelled Roads (HRA)
- RAP Locations
- Modelled Receptor Points

Designated Nature Conservation Sites

- Site of Special Scientific Interest (SSSI)
- Special Area of Conservation (SAC)



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Drawing Title

Figure 2.6 Road links within 200 m of each European site included in assessment

Pasturefields Salt Marsh SAC/SSSI

Project Stage	
n/a	
Status	**Status Description**
n/a	n/a

Drawn	Designed	Checked	Approved
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Sheet Size	**Scale**	**Sweco Ref**	**Revision**
A3	1:7,500	65209859	P01.1

Drawing Number 65209859-SWE-XX-XX-D-AQ-0002

Receptor Selection

The modelled road network was used to determine where discrete receptors would be modelled within each assessed European site, in addition to assigning a receptor grid across each site to encompass a distance up to 1 km from the nearest road(s). These receptors represent the discrete points at which concentrations and deposition rates were modelled as part of the dispersion modelling study (see **Section 3.3.2**).

Where a road link was within 200 m of a European site, discrete receptors were modelled at 10 m intervals along the respective European site boundary and at 10 m intervals up to a distance of 200 m within the respective European site. This ensured detailed coverage of the main areas of interest within the designated sites that are closest to the RAP road links.

In some cases, where the scale of the European site allowed, additional receptors were added beyond the 200 m distance at larger intervals to facilitate the creation of concentration / deposition rate contour plots. These comprised rows of receptors perpendicular to the European site boundary at 50 m intervals, with each row separated by 100 m up to a maximum of 1 km from the boundary.

The modelled receptors within each European site are depicted in **Figure 2**.

3.3.2 Atmospheric Dispersion Modelling

Model Scenarios

The air quality modelling focussed on the following scenarios, for which traffic data were provided by the appointed transport consultant (Sweco UK Ltd)[3] to facilitate dispersion modelling of vehicle emissions using CERC's ADMS-Roads v5.0.1 model:

- **2022 Baseline & Model Verification**
  - Baseline traffic data were provided for all RAP road links, in addition to an extended road network to capture relevant local authority air quality monitoring locations that were used as part of the model verification exercise (see 'Model Verification' below).
- **2042 Alternative Future Baseline**
  - Using 2022 Baseline traffic data, future year vehicle fleet breakdown and future year vehicle emissions factors, this scenario conservatively assumes no growth in traffic from 2022 to 2042, whilst allowing the future decline in exhaust emissions of NO_x to be represented.
  - This scenario aligns with paragraph 5.4.1.10 of the IAQM guidance[13] with respect to facilitating the calculation of in-combination impacts.
- **2042 With Partnership Local Plans**
  - Using future year vehicle fleet breakdown and future year vehicle emissions factors.
  - Comprising all traffic growth since 2022 associated with adopted and emerging Local Plans for South Staffordshire District, East Staffordshire Borough, Lichfield District, Cannock Chase District, City of Wolverhampton, and Sandwell Metropolitan Borough councils.

- Including background traffic growth[14] for Partnership Authorities where no Local Plan data were available at the time of assessment[15] and for growth contributed by local authorities outside of the Partnership Authorities.

Traffic data were provided as 24-hour AADT flows, with associated percentage of HDV flows, and vehicle speeds (km/h) applicable to the modelled road links in each model scenario. These data are presented in **Appendix A**.

The focus of this assessment is on the in-combination impacts on the relevant European sites from the traffic growth associated with the Partnership Authorities emerging Local Plans. As such, the screening of traffic data to determine which RAP road links exceeded the criteria stipulated by Natural England guidance[12] (see **Section 3.3**) was based on the difference in traffic flows between the ***2042 Alternative Future Baseline*** and the ***2042 With Partnership Authorities Local Plans***. This determined the in-combination traffic impact on each RAP link.

Vehicle Emissions Inventories

The traffic data were used to develop road-NO_x emissions inventory databases for each scenario using Defra's EFT version 12.0. Vehicle emissions factors are provided by EFT v12.0 up to year 2050. However, the associated LAQM tools (i.e. background pollutant maps and NO_x to NO_2 calculator) currently support assessment years up to 2030 only. Therefore, to provide a conservative assessment and minimise limitations, vehicle emissions factors for year 2030 were used for both future year (2042) scenarios.

The emissions inventories accounted for the traffic flow characteristics, including:

- Road type (e.g. urban, rural, motorway)
- Total vehicle flow by link (AADT)
- Percentage of HDVs per link
- Average link speed (km/h)
- A detailed vehicle fleet breakdown derived for the future year (2042) scenarios using national vehicle fleet projections from a base year of 2022[16].

The emissions database outputs for each respective scenario provided road link-specific pollutant emission rates (g/km/s), which were input to the ADMS-Roads model to enable prediction of road-NO_x concentrations at the modelled receptor locations.

Meteorological Data

There were no representative weather monitoring stations within 45 km of the study area. Given the spatial extent of the model area, formatted Numerical Weather Prediction (NWP) data for year 2022 were sourced for a 3 km x 3 km area centred on the former RAF Wheaton airfield. This represented an area of flat terrain, predominantly comprising open fields. As such, the NWP data are not likely to be significantly influenced by urban development or other pronounced topographical features.

---

[14] Using the Trip End Model Presentation Program (TEMPro) software to view National Trip End Model (NTEM) information.

[15] The transport modelling completed by Sweco UK Ltd[3] excluded emerging Local Plans for Dudley and Walsall Metropolitan Borough Councils due to the absence of data provision at the time of completing the transport modelling assessment.

[16] Vehicle fleet projections (Base 2022) sourced from the National Atmospheric Emissions Inventory (NAEI); https://naei.beis.gov.uk/data/ef-transport (accessed March 2024). These align with the default fleet composition data incorporated in Defra's EFT v12.0.

A wind rose depicting the hourly wind speeds and directions for 2022 is presented in **Appendix B**.

Treatment of Terrain

Terrain datasets were used in the model both to represent the variation in topography throughout the study area and to determine road gradients where appropriate.

The Environment Agency's LIDAR DTM elevation data at 2 m resolution were sourced for use in the ADMS-Roads model. The data were input to the model, which uses the spatial variation in terrain height and surface roughness, combined with local meteorological conditions, to predict a three-dimensional flow and turbulence field over the study area. This enables the model to account for the influence of undulating terrain on wind flow and turbulence, with respect to the dispersion of vehicle emissions.

Background Concentrations & Deposition

Background air pollutant (NO_x, NO_2) concentrations for the baseline year (2022) and future year (2030 as proxy for 2042) were obtained from Defra's national pollutant mapping for the corresponding 1 km^2 grid squares covering the study area.

The equivalent background NH_3 concentrations and rates of N deposition and acid deposition corresponding to the relevant European sites were sourced from site-specific data available from APIS, which provides modelled three year average data across the UK (1 km^2 grid). At the time of completing this assessment, the three year averaged data were based on 2019-2021, with 2020 being the midyear.

Background NH_3 concentrations and N deposition rates for the future year (2042) scenarios were adjusted with reference to JNCC's Nitrogen Futures report (2020)[17], based on projections of NH_3 and NO_x emissions up to 2030. Nationally, emissions of NH_3 are predicted to increase by 1.06% between 2017 and 2030 based on a relatively conservative 'business as usual' scenario[17], equating to a change of 0.08% per annum over this period. However, N deposition rates are projected to decrease by 13.57% over the same period (-1.04% per annum), owing to the greater projected reduction in NO_x emissions.

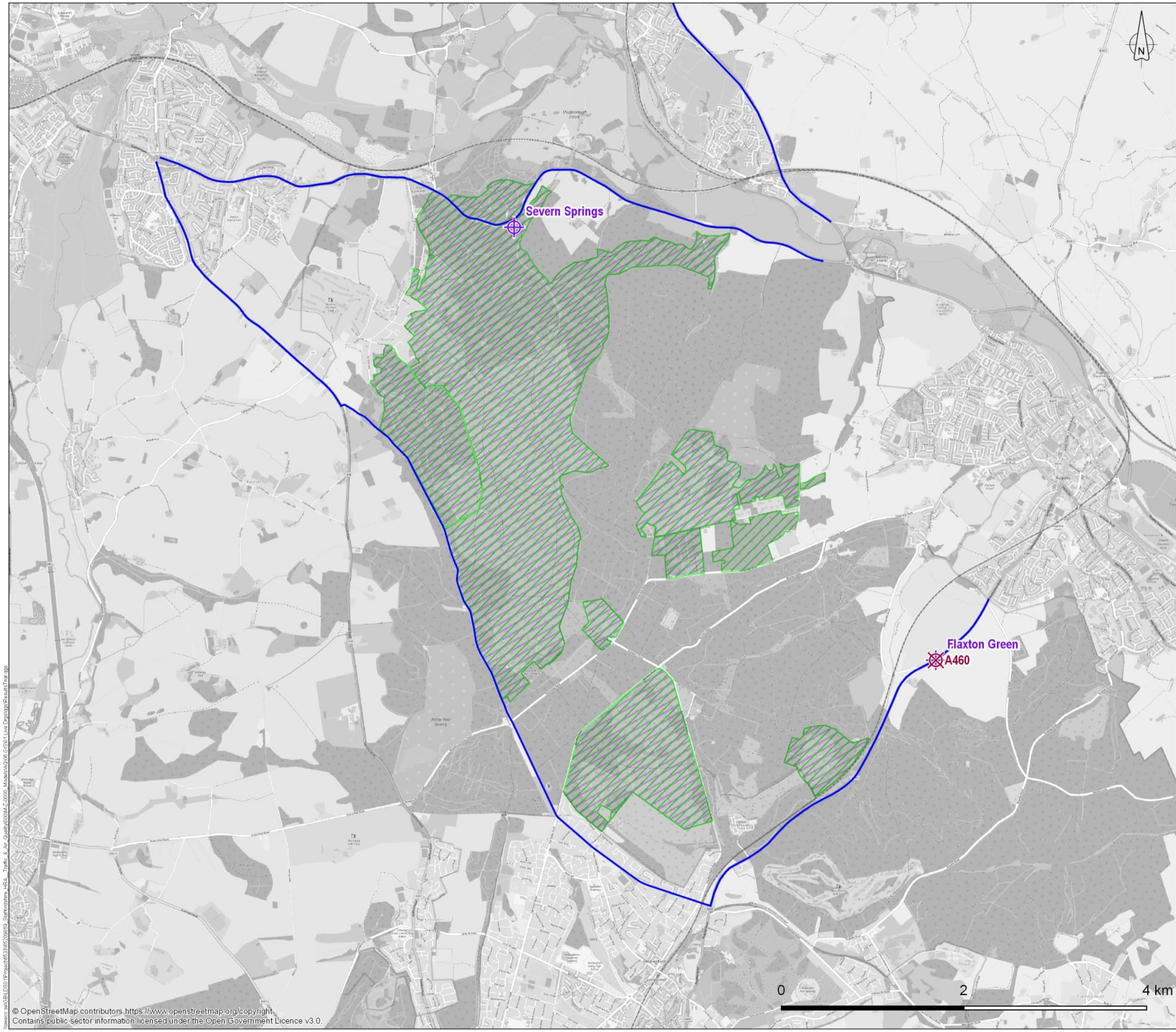
These rates of changes were uniformly applied to background NH_3 concentrations and N deposition rates in this assessment for the period 2020 (APIS background midyear) to 2030 (latest future year included in Nitrogen Futures modelling) and used as representative background data for the 2042 scenarios.

Acid deposition rates for the future year (2042) were conservatively assumed to remain the same as at 2020 background.

Further to the above, Stafford Borough Council and Cannock Chase District Council provided NO_2 and NH_3 monitoring data for a number of locations in proximity to relevant European sites, as summarised in **Table 4**, to provide additional baseline data to inform the assessment.

Data were provided for years 2020 to 2023 inclusive. Given the influence of national travel restrictions during 2020 and 2021 (Covid-19) on vehicle movements and emissions, monitoring data for those years are excluded from this report. The monitoring locations are depicted in **Figure 3**.

[17] Joint Nature Conservation Committee (2020) *Nitrogen Futures*. JNCC Report No. 665.

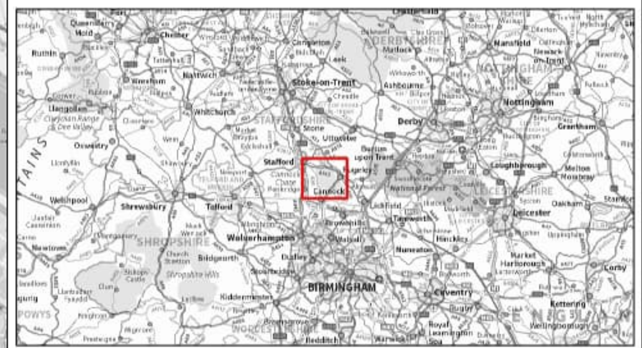


Legend

- Modelled Roads (HRA)
- NO_2 Diffusion Tube Monitoring Locations
- NH_3 Diffusion Tube Monitoring Locations

Designated Nature Conservation Sites

- Site of Special Scientific Interest (SSSI)
- Special Area of Conservation (SAC)



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Drawing Title

Figure 3.1 Air quality monitoring locations included in the assessment (NO_2 and NH_3)

Cannock Chase SAC/SSSI

Project Stage			
n/a			
Status	Status Description		
n/a	n/a		
Drawn	Designed	Checked	Approved
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Sheet Size	Scale	Sweco Ref	Revision
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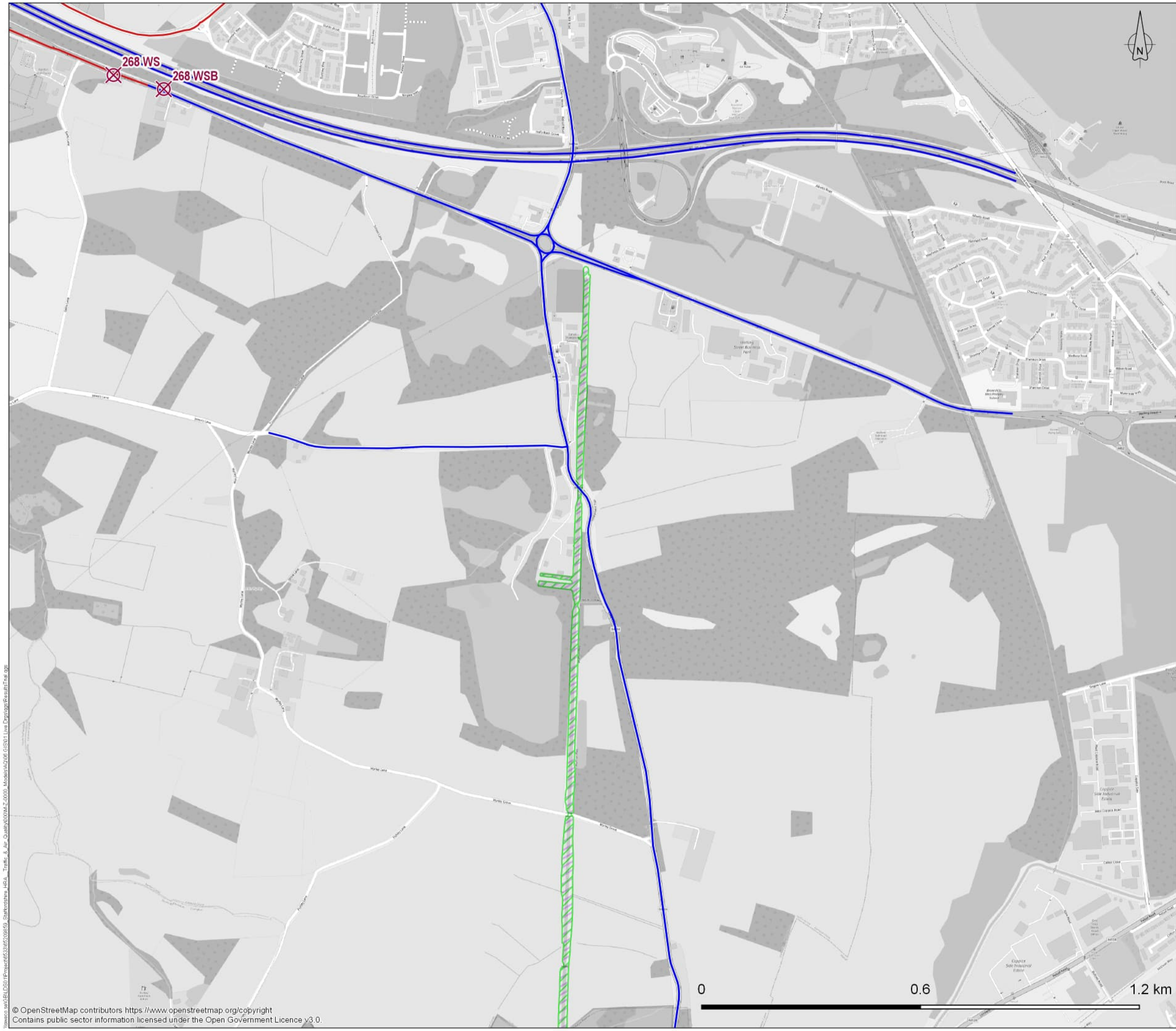
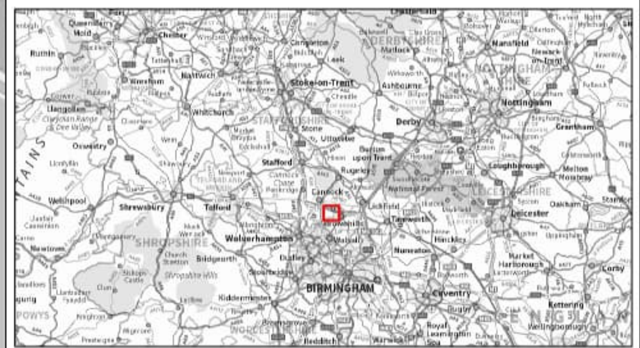


Legend

- Modelled Roads (HRA)
- Additional Model Verification Roads
- NO_2 Diffusion Tube Monitoring Locations

Designated Nature Conservation Sites

- Site of Special Scientific Interest (SSSI)
- Special Area of Conservation (SAC)



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Drawing Title

Figure 3.2 Air quality monitoring locations included in the assessment (NO_2 and NH_3)

Cannock Extension Canal SAC/SSSI

Project Stage	
n/a	
Status	Status Description
n/a	n/a

Drawn	Designed	Checked	Approved
LFS	LFS	DP	DP
Sheet Size	Scale	Sweco Ref	Revision
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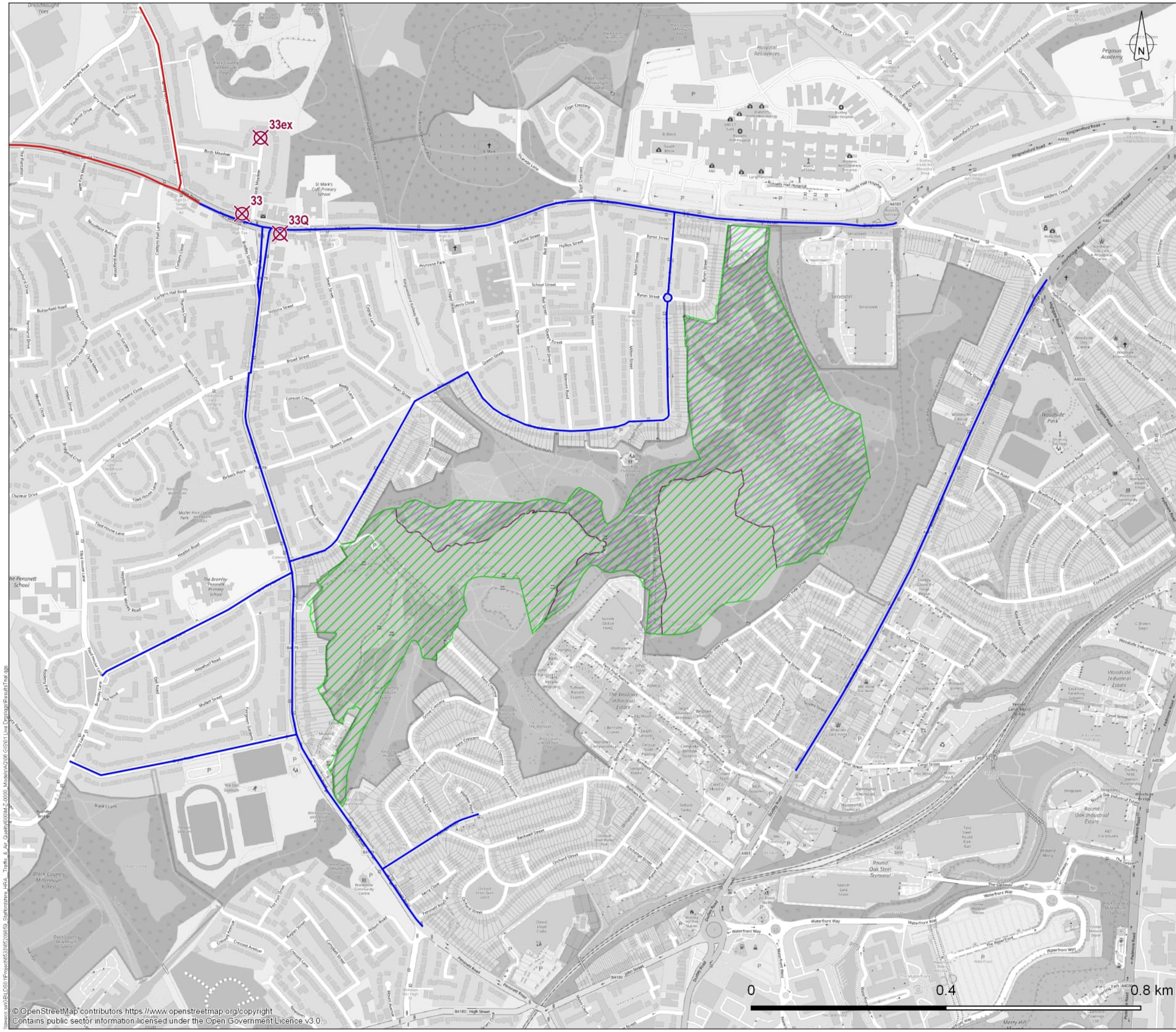

Legend

- Modelled Roads (HRA)
- Additional Model Verification Roads
- NO_2 Diffusion Tube Monitoring Locations

Designated Nature Conservation Sites

- Site of Special Scientific Interest (SSSI)
- Special Area of Conservation (SAC)

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Drawing Title

Figure 3.3 Air quality monitoring locations included in the assessment (NO_2 and NH_3)

Fens Pools SAC/SSSI

Project Stage			
n/a			
Status	Status Description		
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Drawn	Designed	Checked	Approved
LFS	LFS	DP	DP
Sheet Size	Scale	Sweco Ref	Revision
A3	1:7,500	65209859	P01.1

Drawing Number 65209859-SWE-XX-XX-D-AQ-0003

Legend

- Modelled Roads (HRA)
- Additional Model Verification Roads
- NO_2 Diffusion Tube Monitoring Locations
- NH_3 Diffusion Tube Monitoring Locations

Designated Nature Conservation Sites

- Site of Special Scientific Interest (SSSI)
- Wetland of International Importance (Ramsar)

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Drawing Title

Figure 3.4 Air quality monitoring locations included in the assessment (NO_2 and NH_3)

Cop Mere SSSI (Ramsar)

Project Stage	
n/a	

Status	Status Description
n/a	n/a

Drawn	Designed	Checked	Approved
LFS	LFS	DP	DP

Sheet Size	Scale	Sweco Ref	Revision
A3	1:40,000	65209859	P01.1

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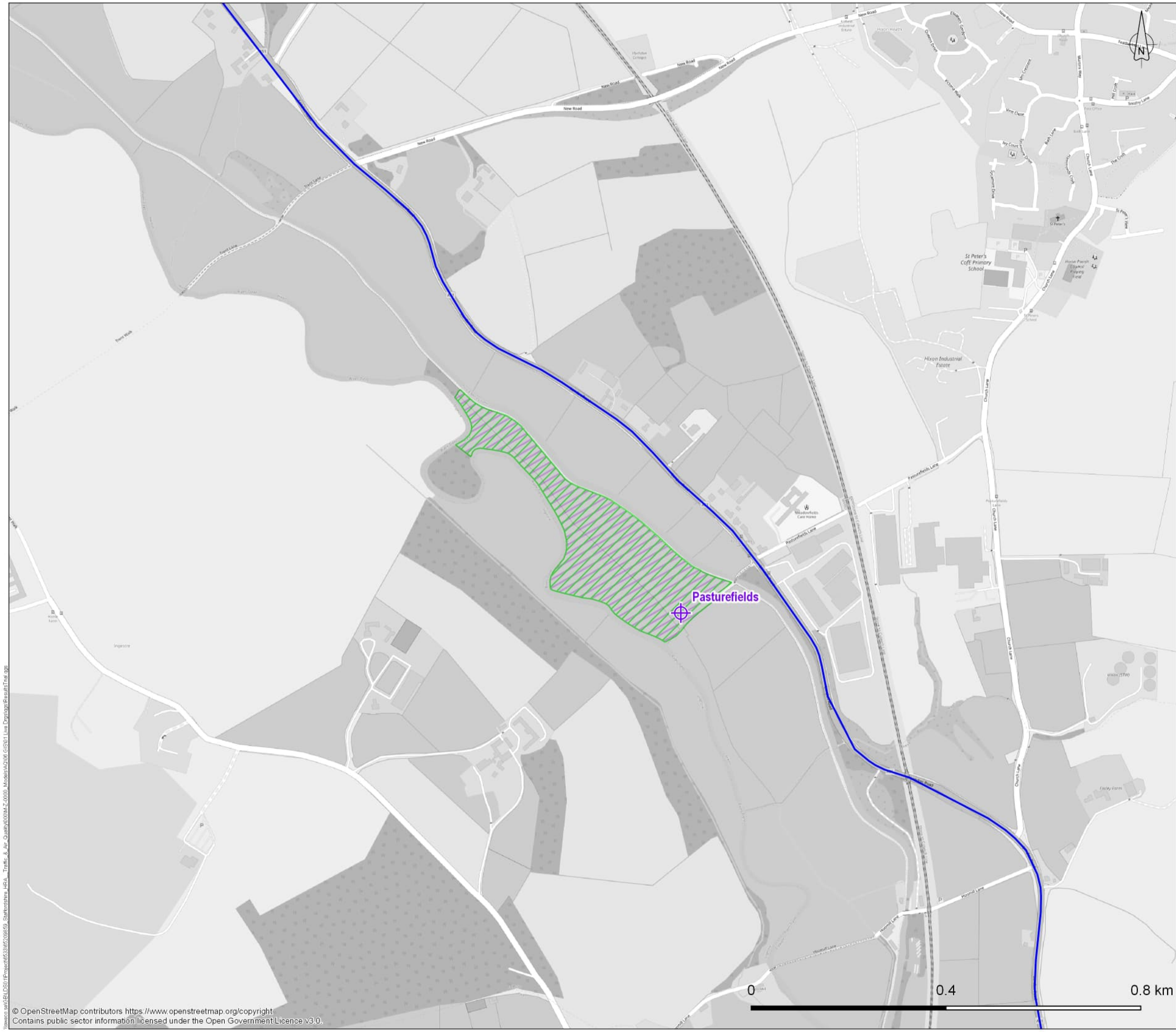
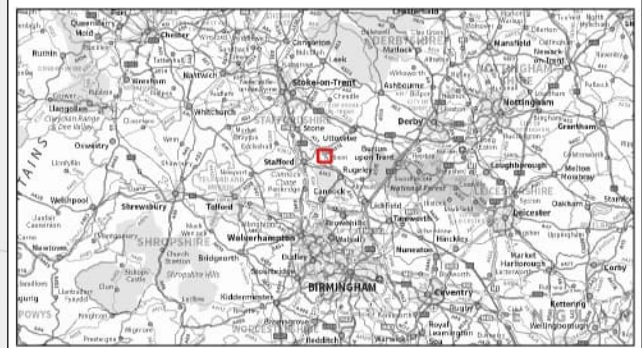


Legend

- Modelled Roads (HRA)
- NH_3 Diffusion Tube Monitoring Locations

Designated Nature Conservation Sites

- Site of Special Scientific Interest (SSSI)
- Special Area of Conservation (SAC)



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Drawing Title

Figure 3.5 Air quality monitoring locations included in the assessment (NO_2 and NH_3)

Pasturefields Salt Marsh SAC/SSSI

Project Stage			
n/a			
Status	Status Description		
n/a	n/a		
Drawn	Designed	Checked	Approved
LFS	LFS	DP	DP
Sheet Size	Scale	Sweco Ref	Revision
A3	1:7,500	65209859	P01.1

Drawing Number 65209859-SWE-XX-XX-D-AQ-0003

Table 4: Relevant air pollutant (NO_2 and NH_3) monitoring locations in proximity to European sites

Monitoring Site ID	Location Description	Nearest European Site	OS Grid Reference	
			X	Y
CM1*	Roadside, adjacent to Copmere Lane and on fringe of woodland belt separating road and Cop Mere	Midlands Meres and Mosses Phase 2 Ramsar (Cop Mere)	380303	329457
SS1*	Rural background, within Punchbowl Car Park, approx. 80 m south of A513	Cannock Chase SAC	398391	320677
FG1**	Roadside, adjacent to A460 Hednesford Road	Cannock Chase SAC	403009	315930
PF1*	Rural, positioned in centre of field within Pasturefields SAC	Pasturefields SAC	399315	324738

Notes:
* Data provided by Stafford Borough Council
** Data provided by Cannock Chase District Council (site also referred to as 'A460, Rugeley')

Model Verification

The model verification process was conducted in accordance with the guidance outlined in LAQM.TG22. Modelled annual mean NO_2 concentrations for the 2022 base year scenario were compared to the equivalent 2022 monitored data at appropriate air quality monitoring locations within the study area. The associated monitoring site data were obtained from Partnership Authorities, namely Stafford Borough, Cannock Chase District, and Dudley Metropolitan Borough councils.

This enabled the derivation of appropriate model adjustment factors, specific to modelled road-NO_x concentrations, to ensure the performance of the dispersion model was acceptable within the context of relevant statistical parameters. The adjustment factors were subsequently applied to all modelled road-NO_x outputs in the 2022 Baseline and 2042 future year scenarios.

Given the geographical extent of the study area, zonal model verification was undertaken based on the local authority area. Further details of the modelling process, input data and the model verification and adjustment procedure are presented in **Appendix B**.

Processing of Model Outputs

Annual Mean NO_x Concentrations

Verified and adjusted annual mean road-NO_x concentrations were modelled at each receptor within the respective European site. The corresponding annual mean background NO_x concentrations were added, dependent on the year and grid square location, to derive the total annual mean NO_x concentrations at each receptor.

Annual Mean NH_3 Concentrations

At present, Defra has not published vehicle emissions factors for NH_3 as part of EFT v12 or other LAQM tools, given that NH_3 is not a relevant pollutant under the LAQM framework.

However, National Highways have published a calculator tool (v4, published January 2024) that applies a ratio between NO_x and NH_3 vehicle emissions (light and heavy vehicles), such that the modelled road-NO_x concentration can be converted to a road-NH_3 concentration[18]. The ratio applied at each receptor is dependent of the assessment year, vehicle type (light or heavy) and the dominant road type (i.e. motorway, urban, rural).

The resulting road-NH_3 concentrations from light and heavy vehicles were summed and added to the corresponding annual mean background values to derive total annual mean NH_3 concentrations at each receptor.

Nitrogen Deposition from NO_2 and NH_3

Rates of N deposition specific to the contribution from vehicle emissions were derived from both road-NO_2 and road-NH_3 concentrations in each scenario. The modelled road-NO_x concentrations were converted to road-NO_2 using the Defra NO_x-NO_2 calculator v8.1[19]. The associated N deposition rate from the road-NO_2 concentration was derived by applying the following conversions[20], based on habitat type:

- Grassland and similar habitats; 1 µg/m^3 NO_2 = 0.14 kgN/ha/yr
- Forests and similar habitats; 1 µg/m^3 NO_2 = 0.29 kgN/ha/yr

The associated N deposition rate from the road-NH_3 concentration was derived by applying the following conversions[20], based on habitat type:

- Grassland and similar habitats; 1 µg/m^3 NH_3 = 5.19 kgN/ha/yr
- Forests and similar habitats; 1 µg/m^3 NH_3 = 7.79 kgN/ha/yr

The modelled N deposition rates associated with both road-NH_3 and road-NO_2 were summed and added to the relevant background to derive a total deposition rate at each receptor.

Acid Deposition from NO_2 and NH_3

The rates of acid deposition specific to the contributions from both road-NO_2 and road-NH_3 concentrations were derived by applying the following conversions by habitat type, based on 1 keqN/ha/yr being equal to 14 kgN/ha/yr:

- Grassland and similar habitats;
  - 1 µg/m^3 NO_2 = 0.01 keqN/ha/yr
  - 1 µg/m^3 NH_3 = 0.37 keqN/ha/yr
- Forests and similar habitats;
  - 1 µg/m^3 NO_2 = 0.02 keqN/ha/yr
  - 1 µg/m^3 NH_3 = 0.56 keqN/ha/yr

The modelled acid deposition rates associated with both road-NH_3 and road-NO_2 were summed and added to the relevant background to derive a total acid deposition rate at each receptor.

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[18] Another NH_3 vehicle emissions tool has been published by Air Quality Consultants (Calculator for Road Emissions of Ammonia (CREAM V1A), 2020). However, the data on which the National Highways tool (2024) is based supersedes the data used in CREAM. Furthermore, the National Highways tool has been independently peer reviewed and supported by IAQM. As such, this tool was selected for use in this assessment.

[19] Defra (2020*) NO_x to NO_2 calculator v8.1* (available via: https://laqm.defra.gov.uk/air-quality/air-quality-assessment/nox-to-no2-calculator/; accessed May 2024)

[20] Derived based on recommended dry deposition velocities as per Environment Agency's Air Quality Technical Advisory Group (AQTAG) document – AQTAG06 (March 2014) *Technical guidance on detailed modelling approach for an appropriate assessment for emissions to air*

3.3.3 Significance Screening Criteria

The results of the atmospheric dispersion modelling at each receptor have been compared to the assessment benchmarks, as specified in **Table 1** for NO_x and NH_3 annual mean critical levels and as stated in **Section 4** for N and acid deposition rate critical loads, where applicable, to evaluate the potential for exceedances in all scenarios.

The magnitude of change in predicted NO_x and NH_3 concentrations and N and acid deposition rates at each receptor, as a result of the Partnership Authorities emerging Local Plans implementation (i.e. the in-combination impact), has been derived through comparing the ***2042 Alternative Future Baseline*** and ***2042 With Partnership Local Plans*** scenarios.

The in-combination impact is expressed as a percentage of the respective critical level (NO_x and NH_3) and the lowest value of the relevant critical load ranges for N-deposition and acid deposition (see **Table 7, Section 4.2**). With reference to Natural England guidance[12], where the change in concentration/deposition rate exceeds 1% of the relevant critical level / load, the potential for significant effects on the sensitive feature(s) to occur cannot be screened out. Below the 1% significance screening threshold, the impacts can be treated as imperceptible, resulting in no significant effect.

If the assessment results predict that the 1% significance screening criterion is exceeded at any sensitive habitat, the results of the air quality assessment are passed to the appointed suitably qualified ecologist to undertake an Appropriate Assessment to determine the likely impacts on the integrity of the relevant European site.

3.4 Assumptions & Limitations

The approach to the air quality assessment aligns with the scope detailed in the Middlemarch brief[1] and, in line with the brief, has excluded the European sites scoped out of the assessment. Both the scope of assessment and reasoning for excluding relevant European sites was agreed in writing by Natural England[2].

There are uncertainties associated with both measured and predicted concentrations of airborne pollutants. The model (ADMS-Roads) used in this assessment relies on input data, including predicted traffic flows, which are subject to uncertainty. The model itself simplifies complex physical systems into a range of algorithms. In addition, local micro-climatic conditions may affect the concentrations of pollutants that the ADMS-Roads model will not consider.

To reduce the uncertainty associated with modelled concentrations, model verification has been carried out with reference to guidance set out in LAQM.TG22. As the model has been verified against local authority monitoring data (NO_2) and adjusted accordingly, there can be reasonable confidence in the predicted concentrations. The root mean square error (i.e. average model uncertainty) of the verified model ranges from 2.5 $\mu g/m^3$ to 3.6 $\mu g/m^3$, within the ideal range (4 $\mu g/m^3$) given by LAQM.TG22. Furthermore, the fractional bias of the verified model, a measure of model tendency to under- or over-predict, is close to zero, indicating there is no systematic tendency either way. Further details of the model verification procedure are provided in **Appendix B**.

Vehicle emissions of NO_x have been derived using Defra's EFT v12.0, the latest version at the time of completing this assessment. Vehicle emissions factors are provided by the EFT up to year 2050. However, the associated LAQM tools (i.e. background pollutant maps and NO_x to NO_2 calculator) currently support assessment years up to 2030 only. It can be reasonably expected that vehicle exhaust emissions of NO_x will decline further beyond 2030, given the UK Government's commitment to cease the sale of new petrol and diesel cars in 2035. Therefore, the use of 2030 emissions factors for the future year (2042) model scenarios represents a conservative approach.

The adopted critical levels and lower critical loads applied in this assessment are based on the information provided by Middlemarch Environmental Ltd[1], which were provided for the relevant qualifying habitat(s) or habitats on which qualifying species rely at each respective European site or associated land parcel (see **Table 7, Section 4.2**).

The adopted and emerging Local Plan site allocations data provided by the Partnership Authorities, which were utilised for the transport modelling study[3], did not indicate the potential for emissions from other non-road plans and projects (i.e. point source emissions from the industrial, energy, and/or waste management sectors, for example). Therefore, the background data obtained from Defra and APIS, which were used in this assessment, were assumed to capture any significant contributions from non-road emissions.

4 Baseline Conditions

4.1 Baseline Air Pollutant Monitoring

The 2022 and 2023 annual mean NO_2 and NH_3 concentrations relating to the Stafford Borough and Cannock Chase District monitoring sites, as per **Table 4**, are presented in **Table 5**.

Table 5: Monitored annual mean NO_2 and NH_3 concentrations for 2022 and 2023 (Units: µg/m^3)

Monitoring Site ID	Nearest European Site	Annual Mean NO_2		Annual Mean NH_3	
		2022	2023	2022	2023
CM1*	Midlands Meres and Mosses Phase 2 Ramsar (Cop Mere)	6.4	6.8	5.8	5.7
SS1*	Cannock Chase SAC	7.2	5.9	3.9	3.3
FG1**	Cannock Chase SAC	16.8	16.2	4.3	4.7
PF1*	Pasturefields Salt Marsh SAC	8.3	8.3	5.5	7.7
	Critical Level (µg/m^3)	**n/a**		**1 or 3**	

The results of the monitoring confirm that levels of NO_2 are sufficiently low that, based on the NO_x to NO_2 relationship, there is confidence that the equivalent annual mean NO_x concentration will be below the critical level (30 µg/m^3) at all locations. However, it is evident that the monitored annual mean concentrations of NH_3 have remained above the respective critical levels of 1 µg/m^3 (Cop Mere and Cannock Chase) and 3 µg/m^3 (Pasturefields Salt Marsh) in both years.

The monitored NH_3 concentrations are demonstrably higher than the APIS background equivalents in **Table 6** below. However, given the seasonal variability in NH_3 emissions driven by agricultural activities and the spatial resolution of the APIS data (1 km^2) relative to a single monitoring point, variability between the data is to be expected.

With the exception of site PF1, annual mean NH_3 concentrations do not vary significantly between 2022 and 2023. At PF1, the change in NH_3 concentrations (+2.2 µg/m^3) is likely to be related to adjacent agricultural activities, given its location within a field and largely unaffected by road emissions.

4.2 Background Data and Environmental Benchmarks

The published Defra and APIS background data relating to annual mean NO_x and NH_3 concentrations, in addition to annual N deposition and acid deposition rates for the relevant European sites, are summarised in **Table 6**. The ranges in background values are presented from across the extent of the modelled study area.

The associated critical levels and critical load ranges that represent the environmental benchmarks adopted for each European site, according to the qualifying habitat(s), are presented in **Table 7**.

The background (2022) and future year (2042) NO_x concentrations are demonstrably below the annual mean critical level (30 µg/m^3) at all European sites. The annual mean NH_3 background concentrations exceed the relevant critical levels at Cannock Chase SAC, Oakhanger Moss, and Cop Mere, with the remaining sites being below. Whilst the NH_3 background at Pasturefields Salt Marsh SAC is below the critical level (3 µg/m^3), the monitored concentrations in 2022 and 2023 reported in **Table 5** indicate the potential for it to be currently exceeded.

Background N deposition rates in both the baseline and future years are projected to exceed the respective lower critical loads at each European site / land parcel, with the exception of Pasturefields Salt Marsh SAC, for which baseline N deposition is marginally below the lower critical load. However, as indicated by the relatively elevated NH_3 ambient concentrations monitored at this site, there is also the potential for the lower critical load to be currently exceeded.

There are only two of the European sites / land parcels that are known to be sensitive to acidification, namely Cannock Chase SAC and Oakhanger Moss. The background acid deposition rates attributed to nitrogen at both sites, as reported in **Table 6**, are above the respective critical loads in **Table 7**.

Table 6: Site specific background annual mean NO_x / NH_3 concentrations and annual N / acid deposition rates (Source: Defra & APIS)

European Site / Land Parcel	NO_x Annual Mean Background (µg/m^3)**		NH_3 Annual Mean Background (µg/m^3)^		N Deposition Background (kgN/ha/yr)^		Acid (N) Deposition Background (keq/ha/yr)^^	
	2022	2042	2022	2042	2022	2042	2022	2042
Cannock Chase SAC	8.7 – 10.6	6.6 – 8.7	1.7 – 2.2	1.7 – 2.2	17.6 – 32.5	15.7 – 29.1	1.3 – 2.4	1.3 – 2.4
Cannock Extension Canal SAC	14.3 – 14.7	11.4 – 11.8	1.8	1.8 – 1.9	17.2 – 17.3	15.4 – 15.5	N/A	
Fens Pools SAC	17.2 – 19.4	14.2 – 16.3	1.8 – 1.9	1.9	16.6 – 17.0	14.9 – 15.2	N/A	
Pasturefields Salt Marsh SAC	9.4 – 9.7	8.1 – 8.4	2.4	2.4	19.3 – 19.5	17.3 – 17.5	N/A	
Oakhanger Moss*	10.8 – 11.5	8.5 – 9.2	3.4 – 3.5	3.4 – 3.5	25.8 – 25.9	23.1 – 23.2	2.0	2.0
Cop Mere*	6.1 – 6.3	5.1 – 5.3	3.2	3.2 – 3.3	23.7 – 41.7	21.2 – 37.4	N/A	

Notes:

* Land parcels within Midlands Meres & Mosses Phase 2 Ramsar Site.

** Obtained from Defra background maps. Latest projected year is 2030 (used as proxy for 2042 backgrounds in this assessment).

^ APIS three year average (2019-2021) adopted for 2022 Baseline. Backgrounds for future year (2042) scenarios were adjusted with reference to JNCC's Nitrogen Futures report (2020) based on the 'business as usual' scenario[17].

^^ APIS three year average (2019-2021) adopted for 2022 Baseline and conservatively assumed as unchanged in 2042. 'N/A' indicates that the European site / land parcel has not been assessed for acid deposition because the habitat(s) is not sensitive to acidification or no critical load data are available.

Table 7: Site specific critical levels (NH_3) and critical loads adopted as environmental benchmarks

European Site / Land Parcel	Qualifying Habitats	NH_3 Annual Mean Critical Level ($\mu g/m^3$)	N Deposition Critical Load Range** (kgN/ha/yr)	Acid (N) Deposition Critical Load (keq/ha/yr)	Relevant RAP Location(s)	Vegetation Type^
Cannock Chase SAC	European dry heaths	1	10 - 20	1.285	1, 3	Grassland
	Northern Atlantic wet heaths with *Erica tetralix*				2	Woodland
Cannock Extension Canal SAC	Permanent oligotrophic waters: Softwater lakes	3	10	N/A	10, 11	Grassland
Fens Pools SAC	Permanent oligotrophic waters: Softwater lakes	3	10	N/A	12, 13	Woodland^^
Pasturefields SAC	Inland salt meadows	3	20 – 30***	N/A	4	Grassland
Oakhanger Moss*	Broadleaved deciduous woodland	1	10 – 20	1.946	25	Grassland
	Rich fens	3	15 – 30	N/A		
	Valley mires, poor fens and transition mires	1	10 – 15	0.9		
	Raised and blanket bogs	1	5 – 10	0.573		
	Moist and wet oligotrophic grasslands: Molinia caerulea meadows	1	15 – 25	1.338		
Cop Mere*	Permanent dystrophic lakes, ponds and pools	1	10	N/A	8	Grassland

Notes:

* Land parcels within Midlands Meres & Mosses Phase 2 Ramsar Site.

** Lower critical load value adopted as benchmark. Where multiple qualifying habitats exist with varying critical load ranges, the lowest critical load is adopted.

*** No critical load range is available for inland salt meadows, as such the values for coastal saltmarsh are recommended to be used instead.

^ Used to define appropriate deposition velocity for NO_2 and NH_3.

^^ Representative of substantial areas of mature woodland between key roads and qualifying habitat.

5 Dispersion Modelling Assessment Results

This section presents:

- The results of the in-combination traffic screening, with reference to the criteria stipulated in Natural England guidance[12] and as described in **Section 3.2**, to determine which European sites / land parcels were screened in/out of the modelling assessment.
- For the sites screened into the assessment, a summary of the dispersion model results at receptors with an in-combination impact equal to or above the 1% significance screening criterion, relative to the assessment benchmarks for NO_x, NH_3, N deposition and/or acid deposition.

The locations and spatial extents of any modelled exceedances of the respective 1% screening criterion are depicted in **Figure 5** (annual mean NH_3), **Figure 6** (N deposition), and **Figure 7** (acid deposition).

The assessment results tables presented in **Appendix C** report the maximum modelled concentration / deposition rate value at each 10 m interval within the respective European site, taken from the boundary closest to the modelled road network to 200 m within the boundary.

Data pertaining to each receptor output point for each pollutant and each scenario (i.e. complete data set of model results) can be provided on request. Full data tables have been excluded from this report to limit file size.

5.1 Traffic Screening Outputs

The outputs of the screening exercise at each RAP location, which focussed on the in-combination traffic flow impact between the ***2042 Alternative Future Baseline*** and the ***2042 With Partnership Authorities Local Plans***, are presented in **Table 8**. The road links associated with each RAP location and corresponding in-combination traffic flow impacts are visualised in **Figure 4**.

The outcomes confirm that each European site / land parcel was screened into the dispersion modelling assessment based on the in-combination traffic flow impact, with the exception of Cop Mere where the in-combination change in traffic is (+52 AADT) is well below the 1,000 domestic AADT criterion.

In addition, following consultation with Natural England in September 2024[21], it was agreed that Oakhanger Moss could be justifiably screened out of the air quality assessment, as the in-combination traffic changes is almost entirely attributed to national background growth at RAP 25 (M6 motorway). The contribution to the traffic change attributed to the Partnership Authorities Local Plans is forecast to be below 100 domestic AADT, which is notably below the 1,000 AADT screening threshold.

The subsections below present the results of the air quality modelling for the 2042 future year scenarios at the sites screened into the assessment.

[21] Partnership Authorities Steering Group Meeting, dated 25 September 2024, attended by Natural England's Principal Officer – Flexible Casework Team. Natural England agreed that Oakhanger Moss could be screened out of the HRA air quality assessment on the basis that the increase in traffic at RAP 25 (M6 motorway) between the 2042 Alternative Future Base and 2042 With Partnership Authorities Local Plans was predominantly attributed to national background traffic growth (>7,000 domestic AADT). By comparison, the in-combination contribution from of the Partnership Authorities Local Plans is forecast to be less than 100 (one hundred) domestic AADT at RAP 25 (M6) and will not result in an impact above the 1% significance screening criterion for any of the assessed pollutants at Oakhanger Moss.

Table 8: Outputs of the in-combination traffic screening exercise (2042 Alternative Future Baseline versus 2042 With Partnership Authorities Local Plans)

European Site / Land Parcel	RAP Ref	Transport Model Road Link Ref*	2042 Alternative Future Base		2042 With Partnership Authorities Local Plans		In-combination impact**		Screened in?
			AADT	HDV	AADT	HDV	AADT	HDV	
Cannock Chase SAC	1	101887_102675	10,529	223	11,825	234	**1,296**	11	**Yes**
	2	110399_514326	12,161	469	14,117	488	**1,956**	19	**Yes**
		514990_514993	13,047	469	15,269	488	**2,222**	19	**Yes**
		512070_512072	11,746	352	13,801	366	**2,055**	14	**Yes**
	3	110411_5100228	3,224	69	3,619	74	395	3	No^
Cannock Extension Canal SAC	10	107909_108012	28,912	4,207	32,790	4,333	**3,878**	123	**Yes**
		102666_108012	28,834	4,015	32,783	4,176	**3,949**	161	**Yes**
		102666_114315	27,863	4,207	31,642	4,392	**3,779**	185	**Yes**
	11	108013_102666	6,338	85	7,409	88	**1,071**	3	**Yes**
		102704_108013	10,841	184	12,381	191	**1,540**	7	**Yes**
Fens Pools SAC	12	101619_113158	24,372	1,030	26,823	1,071	**2,451**	41	**Yes**
		101619_513086	18,304	779	20,125	810	**1,821**	31	**Yes**
		101505_514544	21,244	476	23,232	495	**1,988**	19	**Yes**
	13	110340_513027	18,581	285	20,629	296	**2,048**	11	**Yes**
		101710_513028	19,525	441	21,556	458	**2,031**	17	**Yes**
Pasturefields SAC	4	102212_102675	9,128	739	10,222	769	**1,094**	30	**Yes**
Oakhanger Moss* **	25	100775_100940	64,578	13,691	68,062	14,238	**3,484**	**547**	**Yes**
		100940_100775	64,169	12,705	67,860	13,485	**3,691**	**780**	**Yes**

European Site / Land Parcel	RAP Ref	Transport Model Road Link Ref*	2042 Alternative Future Base		2042 With Partnership Authorities Local Plans		In-combination impact**		Screened in?
			AADT	HDV	AADT	HDV	AADT	HDV	
Cop Mere	8	5100230_5100231	652	31	704	32	52	1	No

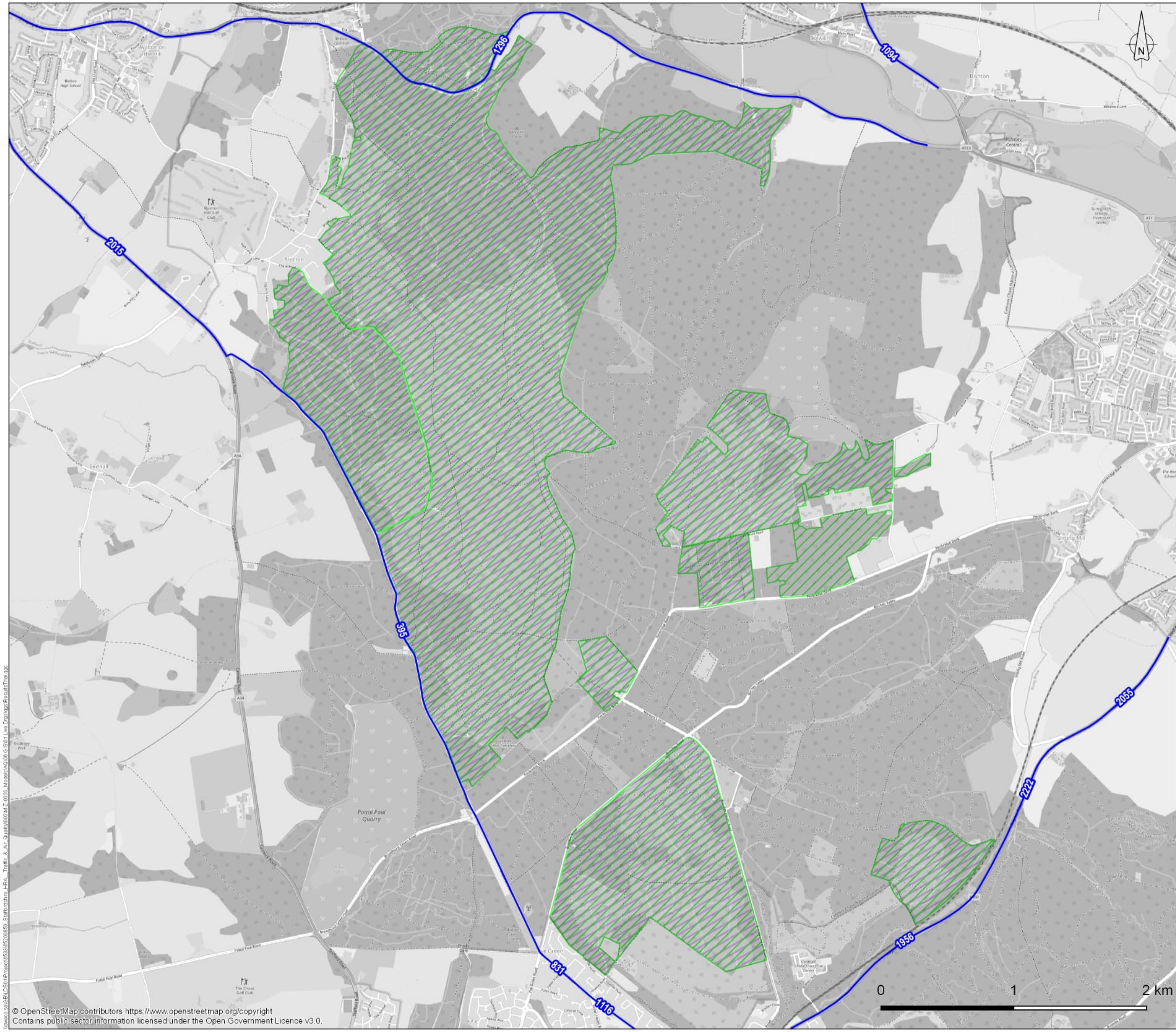
Notes:

* Traffic data at some RAPs were provided as directional flows (e.g. westbound and eastbound) and/or the RAP link was associated with a number of discrete road sections.

** Bold indicates exceedance of 1,000 domestic AADT flows or 200 HDV flows criteria.

*** Screened out of the air quality assessment following consultation with Natural England[21].

^ Although this road link did not exceed the criteria, it was included in the air quality model for completeness due to other RAPs associated with Cannock Chase SAC exceeding.



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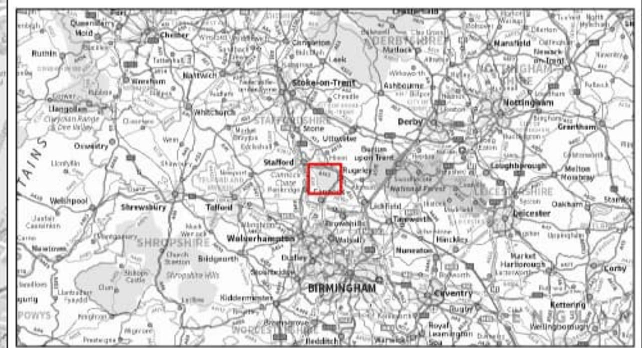
Designated Nature Conservation Sites

- Site of Special Scientific Interest (SSSI)
- Special Area of Conservation (SAC)



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Drawing Title

Figure 4.1 Predicted in-combination traffic flow impact at each relevant RAP road link(s)

Cannock Chase SAC/SSSI

Project Stage	
n/a	

Status	Status Description
n/a	n/a

Drawn	Designed	Checked	Approved
LFS	LFS	DP	DP

Sheet Size	Scale	Sweco Ref	Revision
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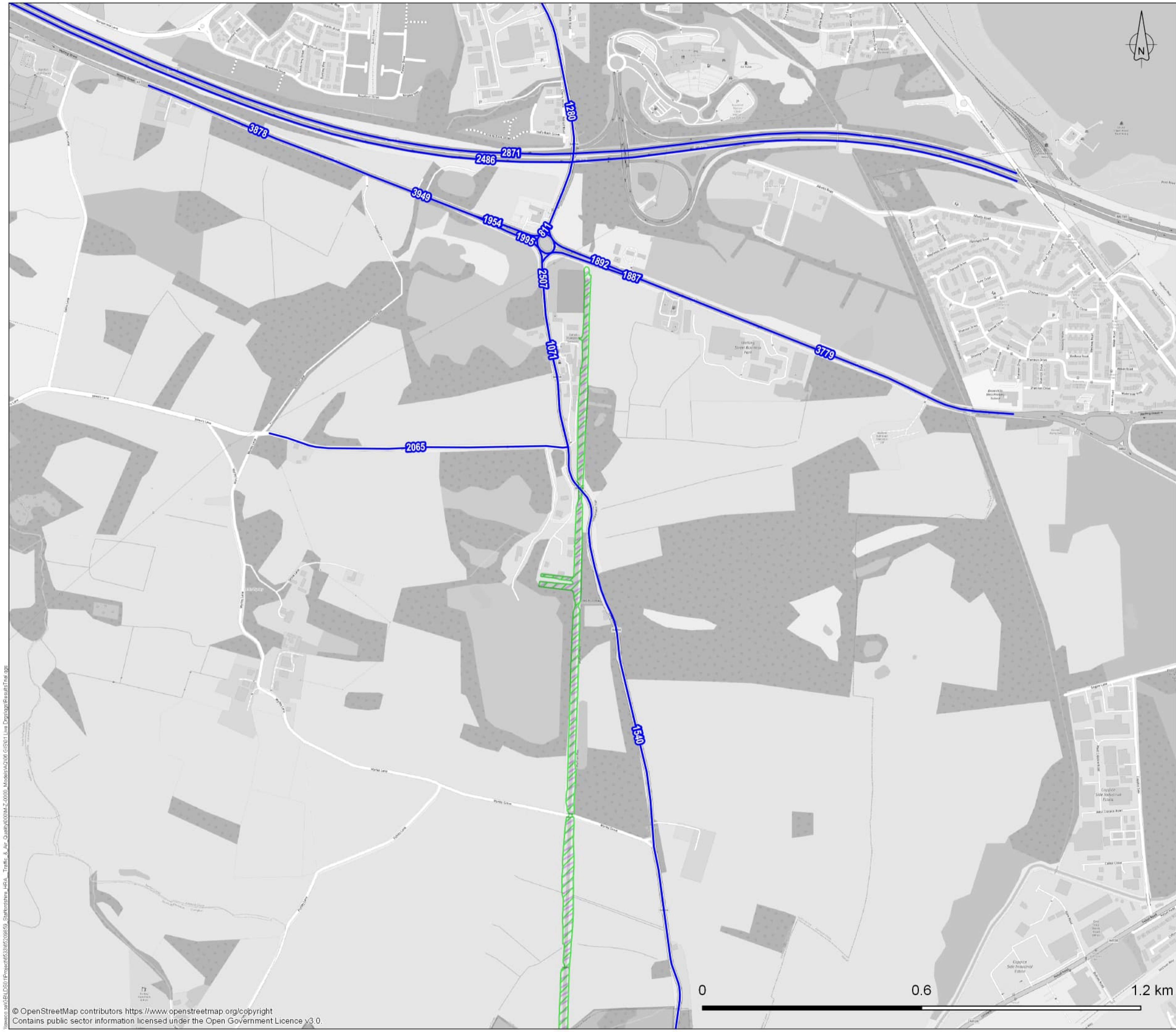
Drawing Number 65209859-SWE-XX-XX-D-AQ-0004



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- Site of Special Scientific Interest (SSSI)
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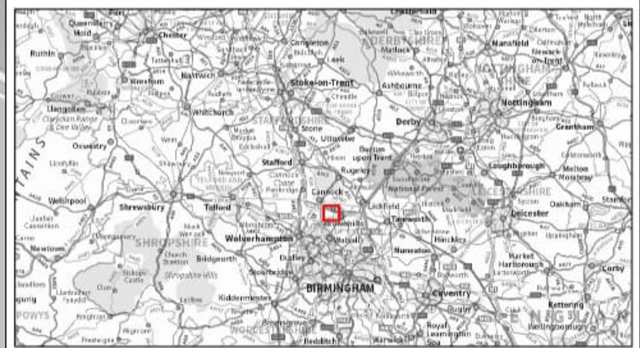

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Drawing Title

Figure 4.2 Predicted in-combination traffic flow impact at each relevant RAP road link(s)

Cannock Extension Canal SAC/SSSI

Project Stage			
n/a			
Status	Status Description		
n/a	n/a		
Drawn	Designed	Checked	Approved
LFS	LFS	DP	DP
Sheet Size	Scale	Sweco Ref	Revision
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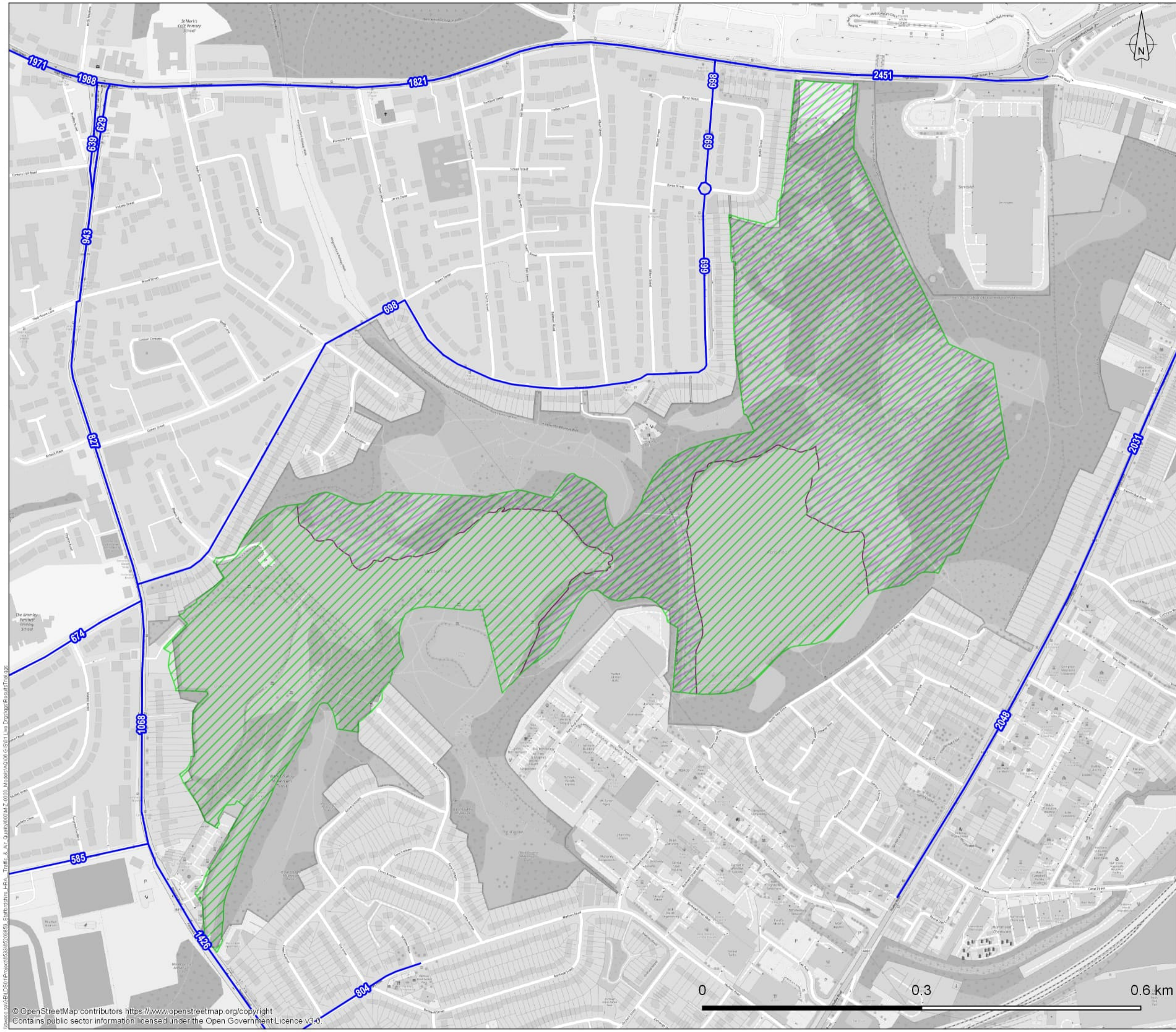

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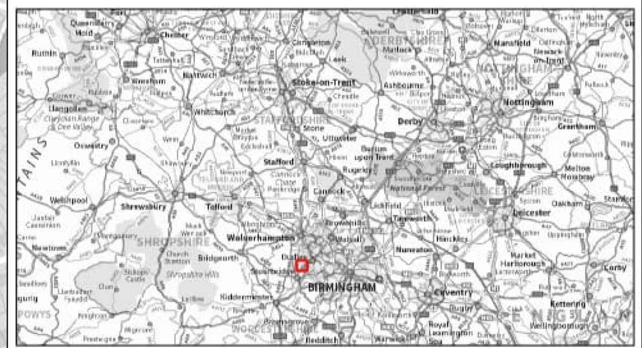
Designated Nature Conservation Sites

- Site of Special Scientific Interest (SSSI)
- Special Area of Conservation (SAC)



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Drawing Title

Figure 4.3 Predicted in-combination traffic flow impact at each relevant RAP road link(s)

Fens Pools SAC/SSSI

Project Stage: n/a

Status	Status Description
n/a	n/a

Drawn	Designed	Checked	Approved
LFS	LFS	DP	DP

Sheet Size	Scale	Sweco Ref	Revision
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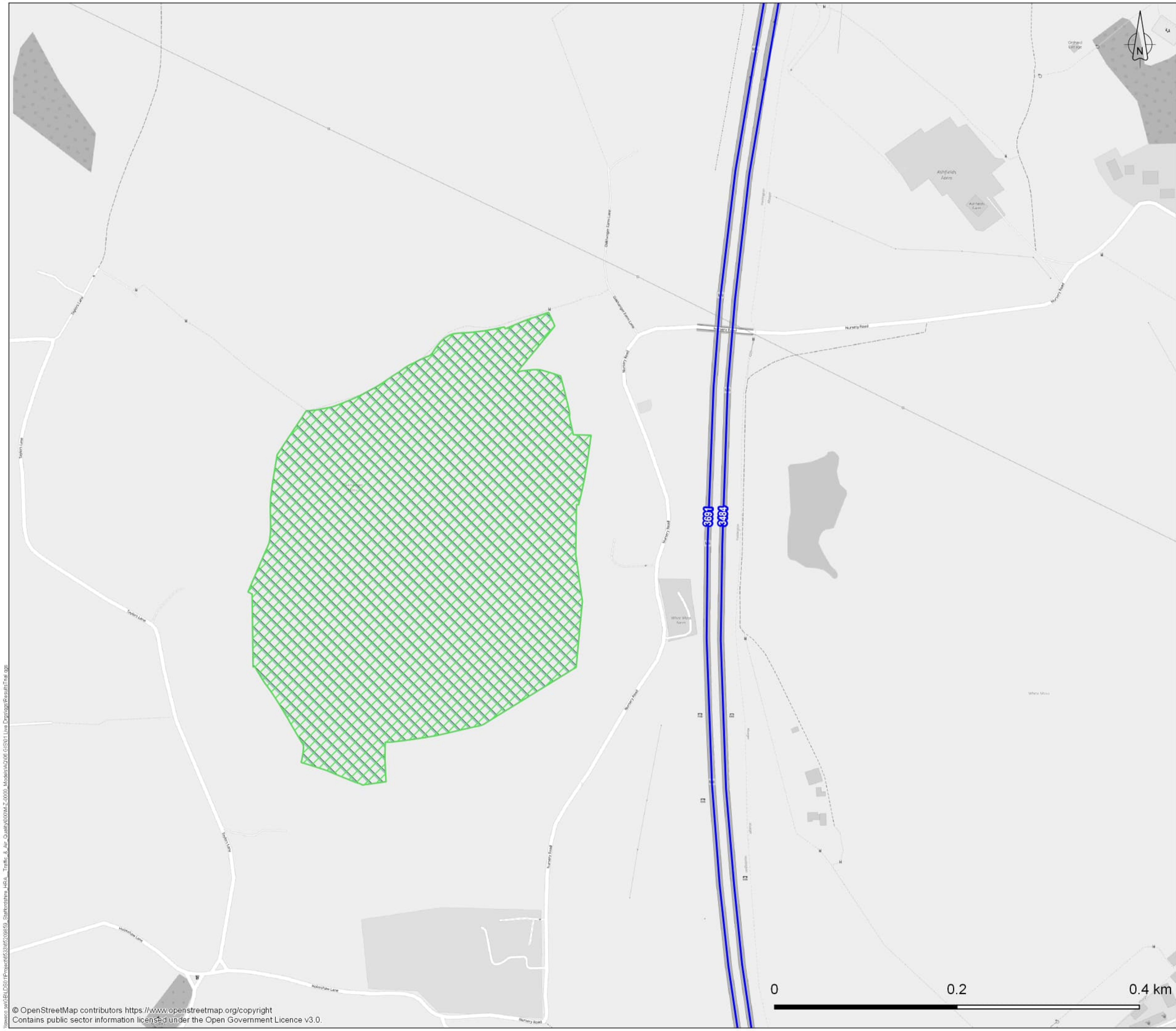
Drawing Number 65209859-SWE-XX-XX-D-AQ-0004



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Designated Nature Conservation Sites

- Site of Special Scientific Interest (SSSI)
- Wetland of International Importance (Ramsar)

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Drawing Title

Figure 4.4 Predicted in-combination traffic flow impact at each relevant RAP road link(s)

Oakhanger Moss SSSI (Ramsar)

Project Stage			
n/a			
Status	Status Description		
n/a	n/a		
Drawn	Designed	Checked	Approved
LFS	LFS	DP	DP
Sheet Size	Scale	Sweco Ref	Revision
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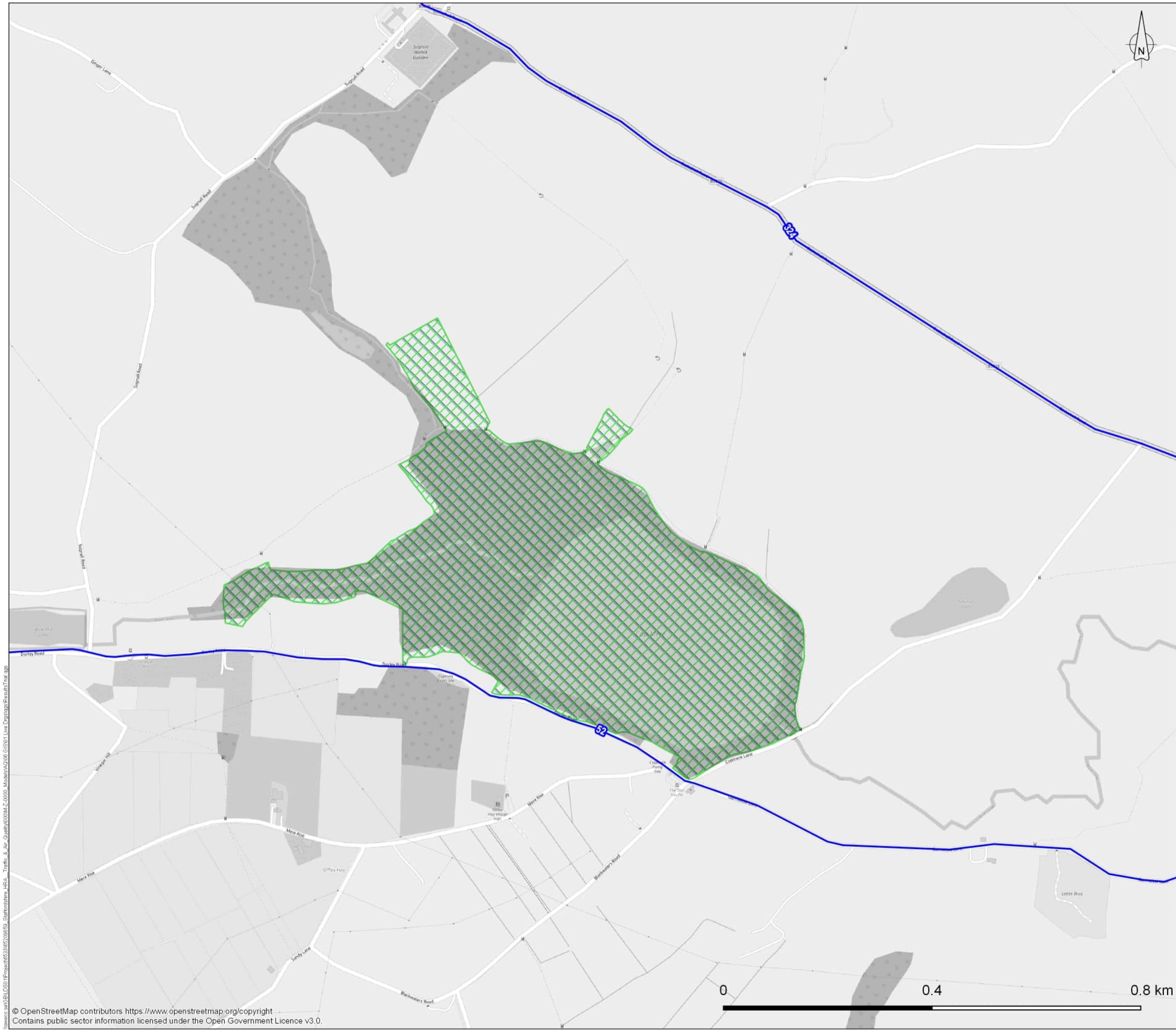

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- Site of Special Scientific Interest (SSSI)
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Rev	Date	Amendment Details	Dr'n	Chk'	App'

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Assessment of Air Quality Impacts on European Sites in Staffordshire, Wolverhampton, Walsall, Sandwell, and Dudley

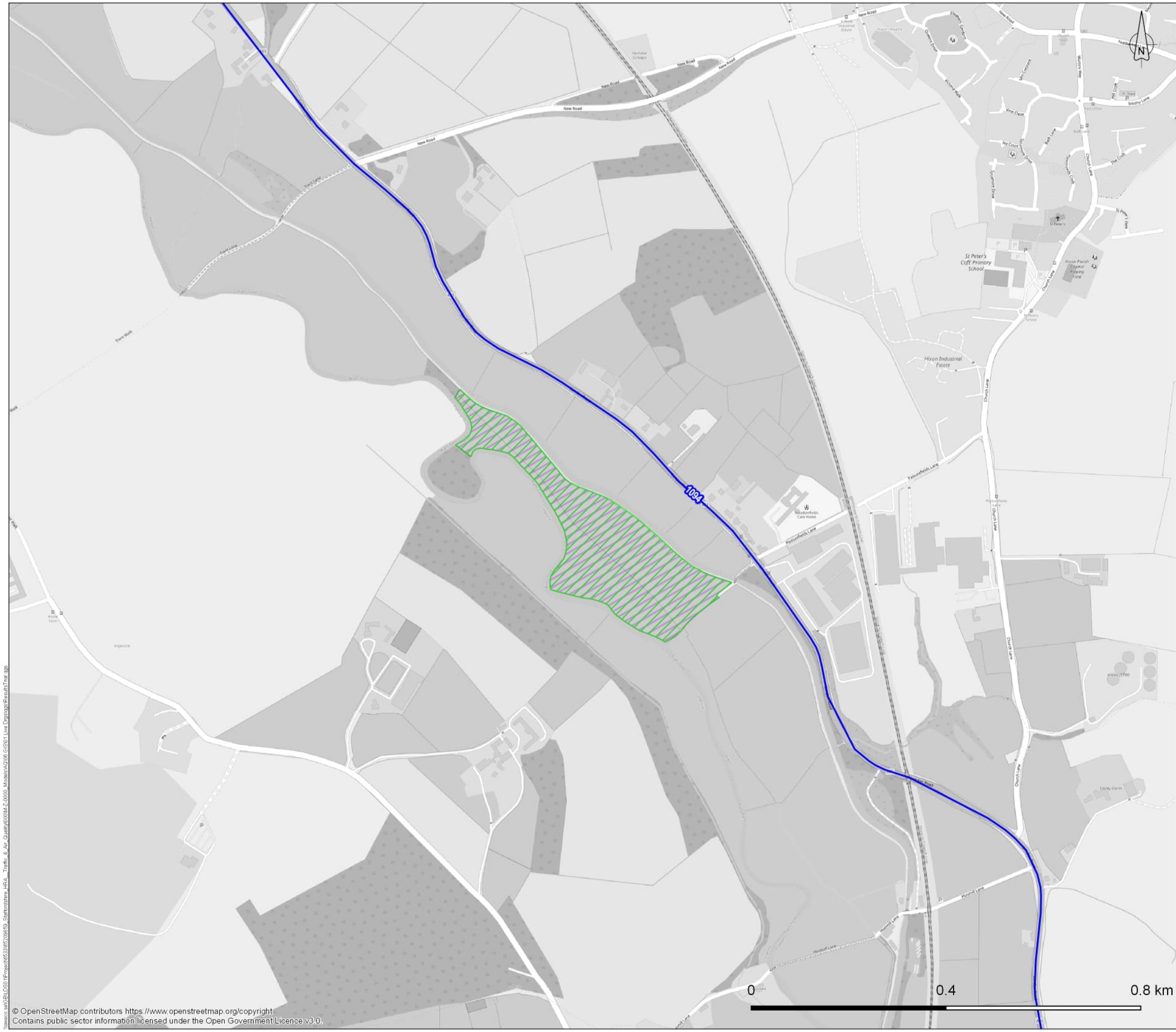
Drawing Title

Figure 4.5 Predicted in-combination traffic flow impact at each relevant RAP road link(s)

Cop Mere SSSI (Ramsar)

Project Stage			
n/a			
Status	Status Description		
n/a	n/a		
Drawn	Designed	Checked	Approved
LFS	LFS	DP	DP
Sheet Size	Scale	Sweco Ref	Revision
A3	1:7,000	65209859	P01.1

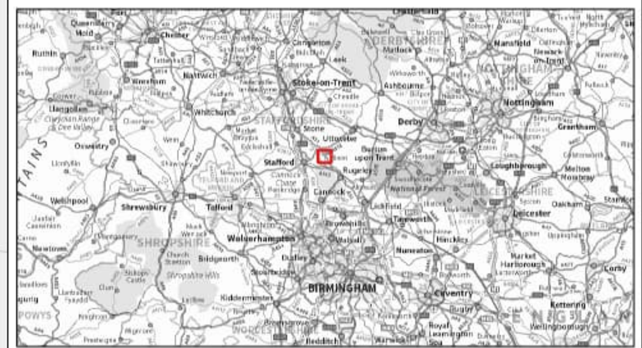
Drawing Number 65209859-SWE-XX-XX-D-AQ-0004



Legend

Designated Nature Conservation Sites

- Site of Special Scientific Interest (SSSI)
- Special Area of Conservation (SAC)



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Drawing Title

Figure 4.6 Predicted in-combination traffic flow impact at each relevant RAP road link(s)

Pasturefields Salt Marsh SAC/SSSI

Project Stage			
n/a			
Status	Status Description		
n/a	n/a		
Drawn	Designed	Checked	Approved
LFS	LFS	DP	DP
Sheet Size	Scale	Sweco Ref	Revision
A3	1:7,500	65209859	P01.1

Drawing Number 65209859-SWE-XX-XX-D-AQ-0004

5.2 Annual Mean NO_x

A summary of the predicted changes in annual mean NO_x concentrations at all modelled receptor points within each relevant European site is presented in **Table 9**. The maximum modelled in-combination impacts at each distance interval are presented in **Appendix C** (Table C1).

The results reported in **Table 9** demonstrate that there are no modelled exceedances of the critical level (30 µg/m^3) within any of the European sites, both in the 2042 Future Baseline and 2042 With Partnership Local Plans scenarios.

On a site-specific basis, the following applies:

- **Cannock Chase SAC** – From a total of 9,788 modelled receptors, 123 were modelled to exceed the 1% significance screening criterion for in-combination impacts, exclusively located directly adjacent to the A513 (RAP 1) that passes through the northern area of the SAC. However, the maximum predicted annual mean NO_x concentration in the With Plans scenario (12.6 µg/m^3) is demonstrably below the critical level.
- **Cannock Extension Canal SAC** – A higher proportion of in-combination impacts (72 of 179 receptors) exceeded the 1% criterion, focussed adjacent to the south of A5 Watling Street (RAP 10) and north of Lime Lane (RAP 11). The maximum modelled annual mean concentration in the With Plans scenario (21.8 µg/m^3) remains well below the critical level.
- **Fens Pools SAC** – A total of 61 of the 3,851 modelled receptors were predicted to exceed the 1% criterion, all of which are focussed within 50 m of the A4101 High Street (RAP 12) within the north of the SAC. The maximum annual mean concentration (26.3 µg/m^3) modelled in the With Plans scenario is approximately 12% (3.7 µg/m^3) below the critical level.
- **Pasturefields Salt Marsh SAC** – The maximum modelled annual mean concentration (8.8 µg/m^3) was predicted to be well below the critical level in both the Future Baseline and With Plans scenarios. There were no modelled in-combination impacts above the 1% criterion.

Based on the above, the Partnership Authorities emerging Local Plans are expected to have no likely significant effect on the European sites with respect to ambient NO_x concentrations.

Table 9: Summary of modelled annual mean NO_x concentrations and in-combination impacts *(2042 Alternative Future Baseline vs 2042 With Partnership Local Plans*)

Parameter	**Cannock Chase SAC**		**Cannock Extension Canal SAC**		**Fens Pools SAC**		**Pasturefields Salt Marsh SAC**	
	Future Base	**With Plans**	**Future Base**	**With Plans**	**Future Base**	**With Plans**	**Future Base**	**With Plans**
Max. Road Contribution (*Model*) (µg/m^3)	4.8	5.3	9.2	10.4	10.7	11.9	0.3	0.4
Max. Total Concentration (*Model* + *Background*) (µg/m^3)	12.1	12.6	20.6	21.8	25.1	26.3	8.8	8.8
Number of receptors exceeding Critical Level (30 µg/m^3)	0	0	0	0	0	0	0	0
Total number of model receptors	9,788	9,788	179	179	3,851	3,851	418	418
In-Combination Impact (*2042 With Plans – 2042 Future Base*):								
Maximum worsening (µg/m^3)	0.5		1.2		1.2		0.0	
No. receptors worsening >1% criterion	123		72		61		0	

5.3 Annual Mean NH_3

A summary of the predicted changes in annual mean NH_3 concentrations at all modelled receptor points within each relevant European site is presented in **Table 10**. The maximum modelled in-combination impacts at each distance interval are presented in **Appendix C** (Table C2) and the corresponding contour plots showing the area of exceedance above the 1% significance screening criterion for each European site are depicted in **Figures 5.1 to 5.3**.

The results reported in **Table 10** demonstrate that a number of the European sites are expected to exceed the relevant critical level in both the 2042 Alternative Future Baseline and 2042 With Partnership Local Plans, owing to existing high background levels (see **Section 4**). Similarly, as visualised in the aforementioned figures, an extensive area within Cannock Extension Canal SAC is predicted to experience an in-combination impact above the 1% criterion.

On a site-specific basis, the following applies:

- **Cannock Chase SAC** – From a total of 9,788 modelled receptors, 731 were modelled to exceed the 1% significance screening criterion for in-combination impacts. These are predominantly focussed within 50 m either side of the A513 (RAP 1). A narrow band of in-combination impacts above the 1% criterion was modelled up to 30 m within the SAC adjacent to A460 Rugeley Road (RAP 2), with an even finer band of exceedance of less than 5 m adjacent to Camp Road (RAP 3). The entire site is reported to exceed the critical level (1 µg/m^3) in both the Future Baseline and With Plans scenarios.
- **Cannock Extension Canal SAC** – Approximately 40% of the SAC area was modelled to experience in-combination impacts above the 1% significance screening criterion, mainly encompassing the area of the SAC between the south of A5 Watling Street (RAP 10) and north of Lime Lane (RAP 11). The maximum modelled annual mean concentration in the With Plans scenario (3.0 µg/m^3), modelled directly adjacent to A5 Watling Street, is equal to the critical level (3 µg/m^3). This represents a maximum increase of 0.1 µg/m^3 from the Future Baseline scenario (2.9 µg/m^3).
- **Fens Pools SAC** – A total of 83 of the 3,851 modelled receptors reported an in-combination impact above the 1% criterion, which are focussed within 50 m to the south of the A4101 High Street (RAP 12). The maximum annual mean concentration (3.3 µg/m^3) modelled in the With Plans scenario represents a marginal exceedance of the critical level (3 µg/m^3), with six receptors predicted to exceed the critical level in total, all of which are located adjacent to the A4101 High Street. This represents an increase of five critical level exceedances relative to the Future Baseline scenario (one exceedance). Despite the isolated exceedances of the critical level, the vast majority of the SAC area was modelled to remain below the critical level in both scenarios.
- **Pasturefields Salt Marsh SAC** – The maximum modelled annual mean concentration (2.5 µg/m^3) was predicted to be well below the critical level in both the Future Baseline and With Plans scenarios. There were no modelled in-combination impacts above the 1% criterion. As such, a corresponding contour plot was not generated.

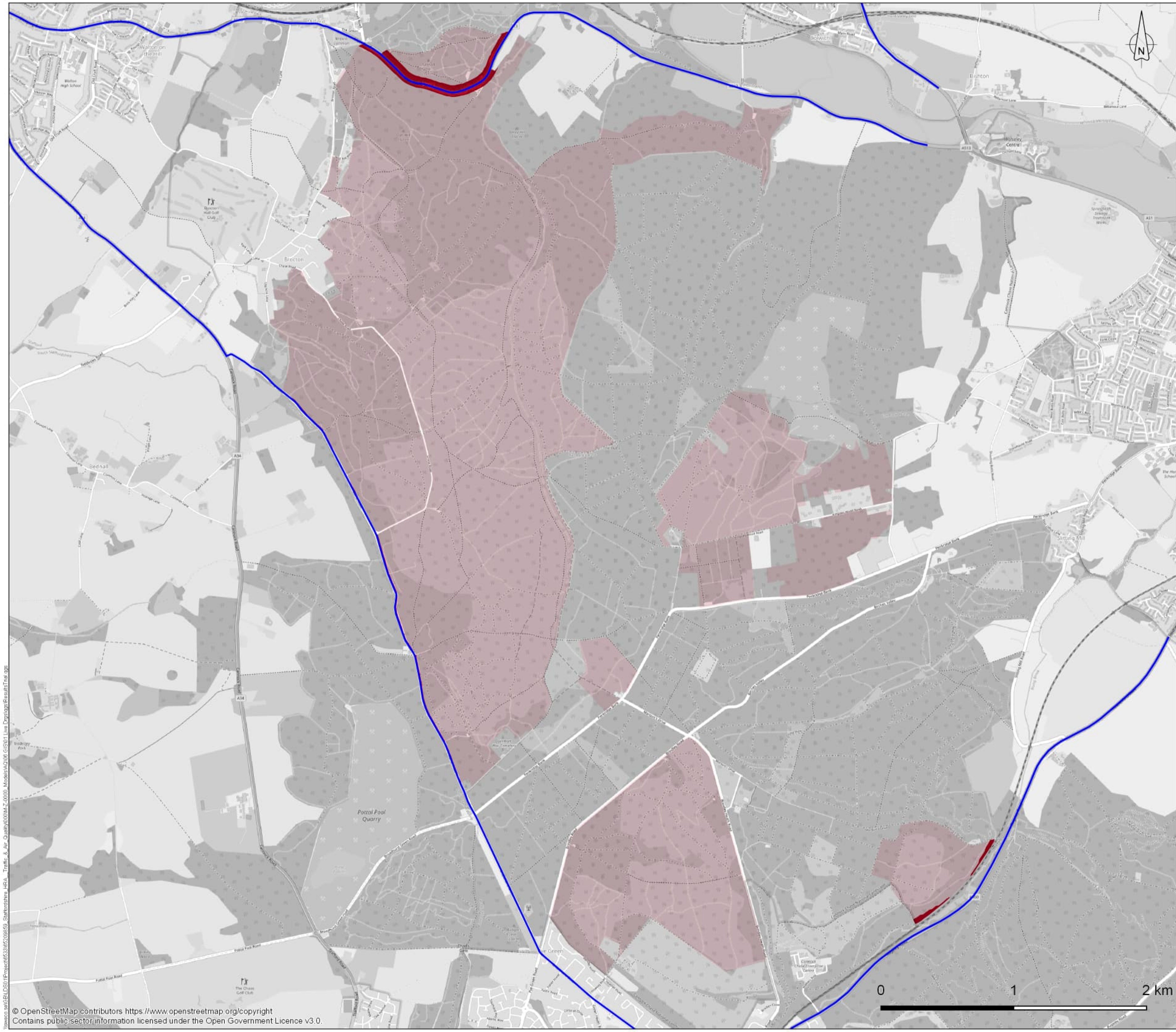
Based on the above, with the exception of Pasturefields Salt Marsh SAC, further Appropriate Assessment of the Partnership Authorities emerging Local Plans in-combination impacts is required by the appointed qualified ecologist.

Table 10: Summary of modelled annual mean NH_3 concentrations and in-combination impacts *(2042 Alternative Future Baseline vs 2042 With Partnership Local Plans*)

Parameter	**Cannock Chase SAC**		**Cannock Extension Canal SAC**		**Fens Pools SAC**		**Pasturefields Salt Marsh SAC**	
	Future Base	**With Plans**	**Future Base**	**With Plans**	**Future Base**	**With Plans**	**Future Base**	**With Plans**
Max. Road Contribution (*Model*) (µg/m^3)	0.6	0.6	1.0	1.2	1.2	1.4	0.0	0.0
Max. Total Concentration (*Model* + *Background*) (µg/m^3)	2.7	2.8	2.9	3.0	3.1	3.3	2.5	2.5
Critical Level (µg/m^3)	**1**		**3**		**3**		**3**	
Number of receptors exceeding Critical Level	9,788	9,788	0	2*	1	6	0	0
Total number of model receptors	9,788	9,788	179	179	3,851	3,851	418	418
In-Combination Impact (*2042 With Plans – 2042 Future Base*):								
Maximum worsening (µg/m^3)	0.1		0.1		0.1		0.0	
No. receptors worsening >1% criterion	731		74		83		0	

Notes:

* Both receptors modelled to exceed the critical level by <0.01 µg/m^3 at the SAC boundary closest to the A5 Watling Street.

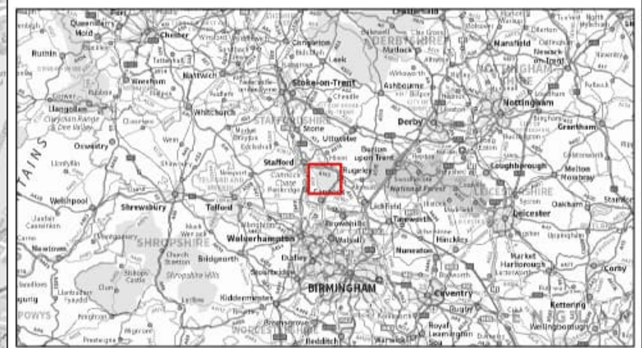


Legend

- Modelled Roads (HRA)

Ammonia (NH₃) Concentration Impact as % of Critical Level
Critical Level = 1 µg/m³

- Deterioration ≤ 1%
- Deterioration > 1%



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Drawing Title

Figure 5.1 Modelled annual mean NH_3 in-combination impact (2042) as a percentage of the relevant critical level
Cannock Chase SAC/SSSI

Project Stage			
n/a			
Status	Status Description		
n/a	n/a		
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- Modelled Roads (HRA)

Ammonia (NH_3) Concentration Impact as % of Critical Level
Critical Level = 3 μg/m³

- Deterioration ≤ 1%
- Deterioration > 1%

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Drawing Title
Figure 5.2 Modelled annual mean NH_3 in-combination impact (2042) as a percentage of the relevant critical level
Cannock Extension Canal SAC/SSSI

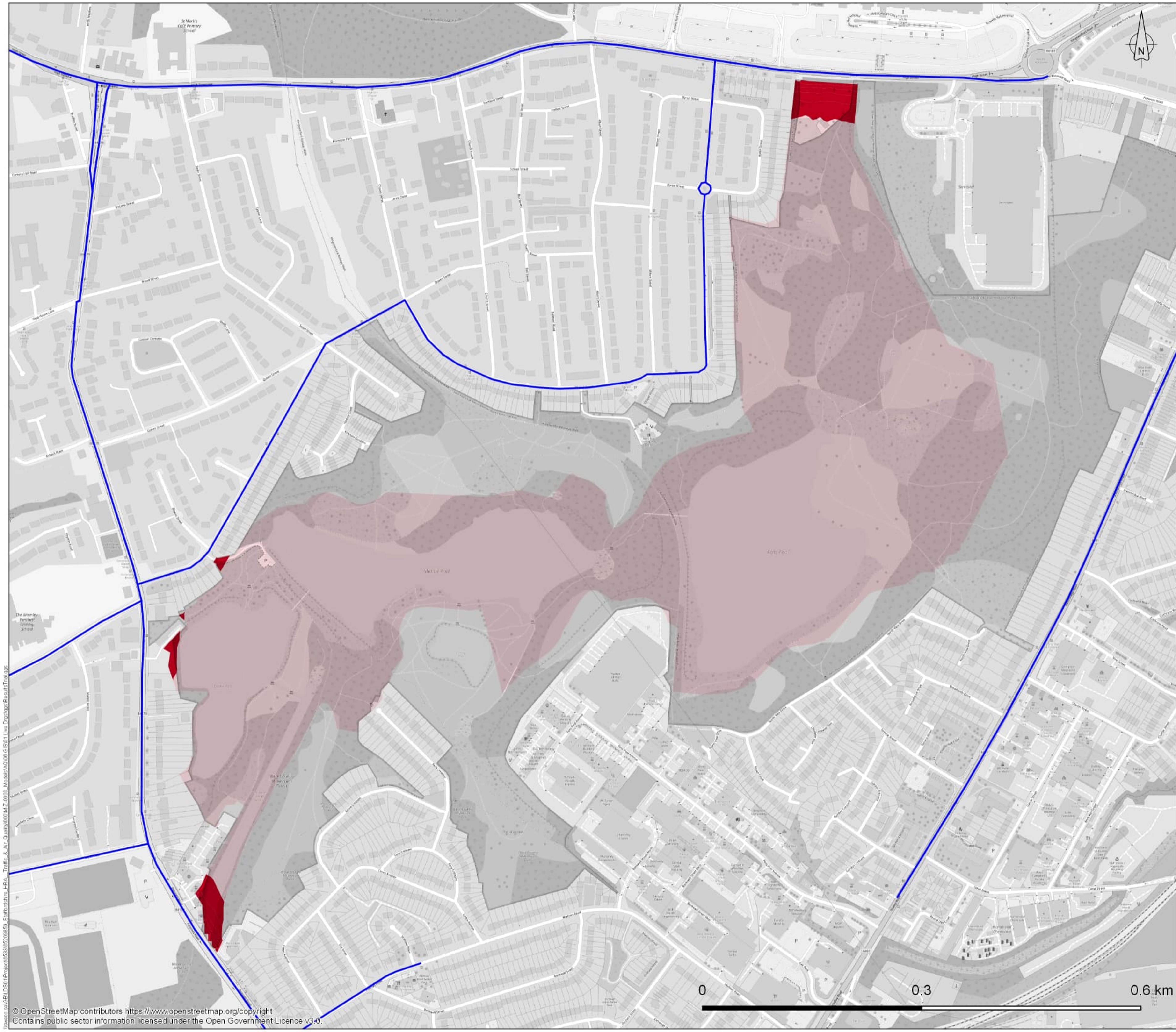
Project Stage	
n/a	

Status	Status Description
n/a	n/a

Drawn	Designed	Checked	Approved
LFS	LFS	DP	DP

Sheet Size	Scale	Sweco Ref	Revision
A3	1:6,000	65209859	P01.1

Drawing Number 65209859-SWE-XX-XX-D-AQ-0005



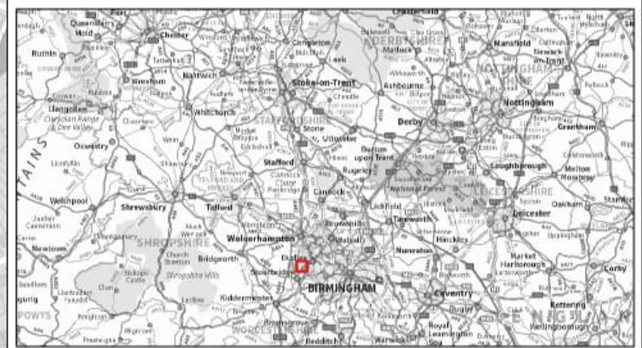
Legend

Modelled Roads (HRA)

Ammonia (NH_3) Concentration Impact as % of Critical Level
Critical Level = 3 μg/m³

Deterioration ≤ 1%

Deterioration > 1%



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Drawing Title

Figure 5.3 Modelled annual mean NH_3 in-combination impact (2042) as a percentage of the relevant critical level

Fens Pools SAC/SSSI

Project Stage			
n/a			
Status	Status Description		
n/a	n/a		
Drawn	Designed	Checked	Approved
LFS	LFS	DP	DP
Sheet Size	Scale	Sweco Ref	Revision
A3	1:5,000	65209859	P01.1

Drawing Number 65209859-SWE-XX-XX-D-AQ-0005

5.4 Nitrogen Deposition

A summary of the predicted changes in annual N deposition rates at all modelled receptor points within each relevant European site is presented in **Table 11**. The maximum modelled in-combination impacts at each distance interval are presented in **Appendix C** (Table C3) and the corresponding contour plots showing the area of exceedance above the 1% significance screening criterion for each European site are depicted in **Figures 6.1 to 6.3**.

The results reported in **Table 11** demonstrate that a number of the European sites are expected to exceed the relevant critical loads in both the 2042 Alternative Future Baseline and 2042 With Partnership Local Plans, owing to existing high background levels (see **Section 4**). Similarly, as visualised in the aforementioned figures, an extensive area within Cannock Extension Canal SAC is predicted to experience an in-combination impact above the 1% criterion.

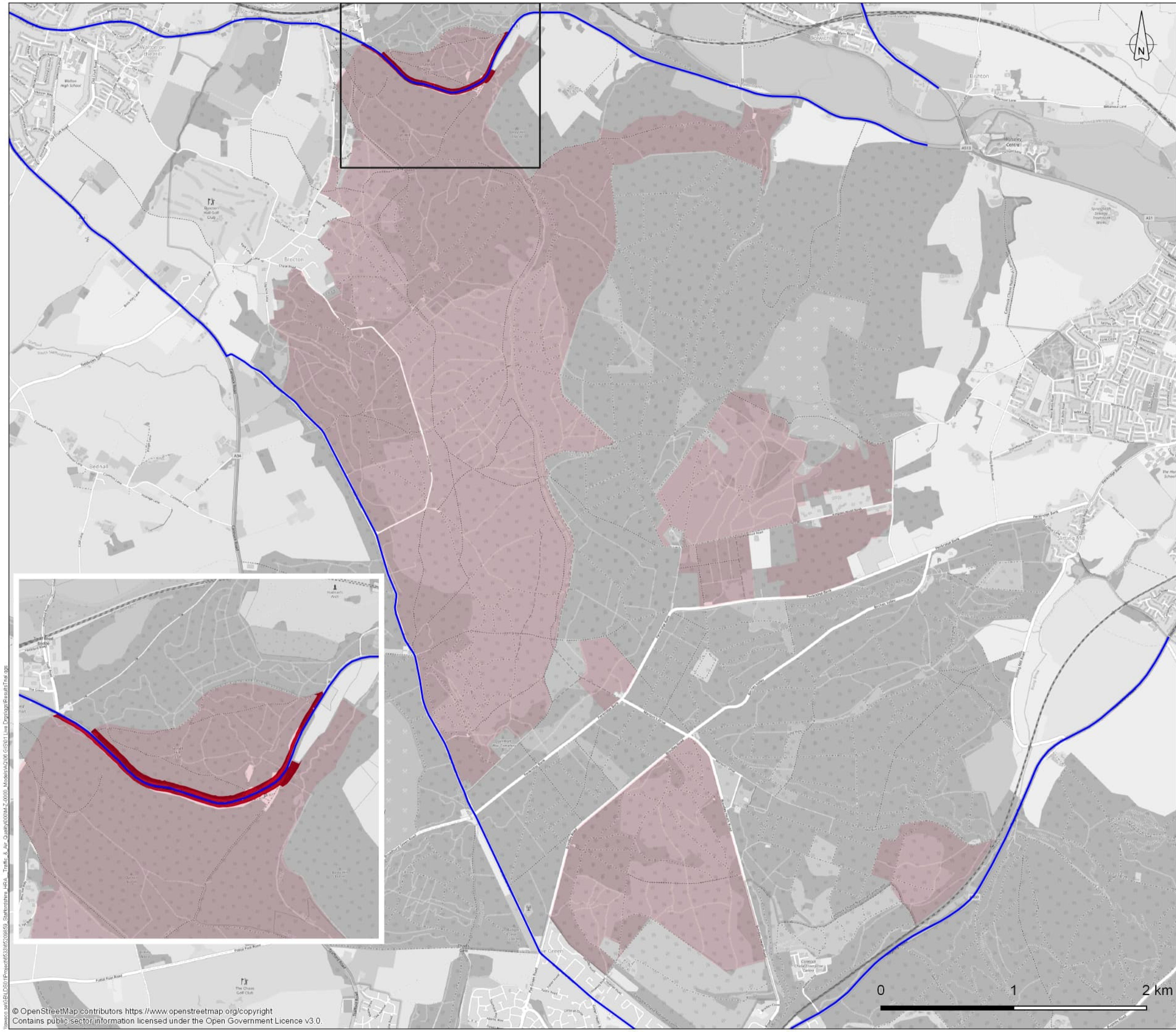
On a site-specific basis, the following applies:

- **Cannock Chase SAC** – From a total of 9,788 modelled receptors, 310 were modelled to exceed the 1% significance screening criterion for in-combination impacts. These are all focussed within a 40 m band either side of the A513 (RAP 1). The entire site is reported to exceed the lower critical load (10 kgN/ha/yr) in both the Future Baseline and With Plans scenarios.
- **Cannock Extension Canal SAC** – Approximately 50% of the SAC area was modelled to experience an in-combination impact above the 1% significance screening criterion, encompassing the entirety of the SAC between the south of A5 Watling Street (RAP 10) and north of Lime Lane (RAP 11). In addition, in-combination impacts above the criterion were modelled for the area of the SAC within 200 m to the south of where Lime Lane intersects the SAC. The entire site is reported to exceed the lower critical load (10 kgN/ha/yr) in both the Future Baseline and With Plans scenarios.
- **Fens Pools SAC** – Approximately 10% of the SAC area reported an in-combination impact above the 1% criterion, focussed within 70 m to the south of the A4101 High Street (RAP 12). Additional in-combination impacts above the 1% criterion were modelled up to 20 m within the SAC adjacent to the east of Tennyson Street. The entire site is reported to exceed the lower critical load (10 kgN/ha/yr) in both the Future Baseline and With Plans scenarios.
- **Pasturefields Salt Marsh SAC** – The maximum modelled annual N deposition rate (17.6 kgN/ha/yr) applies to both the Future Baseline and With Plans scenarios and is below the relevant lower critical load (20 kgN/ha/yr). There were no modelled in-combination impacts above the 1% criterion.

Based on the above, with the exception of Pasturefields Salt Marsh SAC, further Appropriate Assessment of the Partnership Authorities emerging Local Plans in-combination impacts is required by the appointed qualified ecologist.

Table 11: Summary of modelled annual N deposition rates and in-combination impacts *(2042 Alternative Future Baseline vs 2042 With Partnership Local Plans*)

Parameter	Cannock Chase SAC		Cannock Extension Canal SAC		Fens Pools SAC		Pasturefields Salt Marsh SAC	
	Future Base	**With Plans**	**Future Base**	**With Plans**	**Future Base**	**With Plans**	**Future Base**	**With Plans**
Max. Road Contribution (*Model*) (kgN/ha/yr)	3.3	3.6	6.0	6.8	7.1	8.0	0.2	0.2
Max. Total Concentration (*Model* + *Background*) (kgN/ha/yr)	32.3	32.7	21.5	22.3	22.0	22.8	17.6	17.6
Critical Load (kgN/ha/yr)	**10**		**10**		**10**		**20**	
Number of receptors exceeding Critical Load	9,788	9,788	179	179	3,851	3,851	0	0
Total number of model receptors	9,788	9,788	179	179	3,851	3,851	418	418
In-Combination Impact (*2042 With Plans – 2042 Future Base*):								
Maximum worsening (kgN/ha/yr)	0.4		0.8		0.8		0.0	
No. receptors worsening >1% criterion	310		89		396		0	

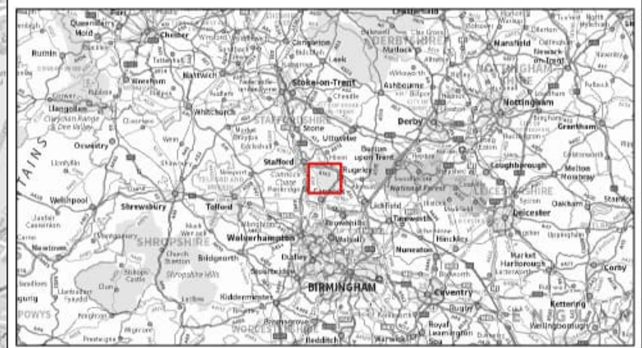


Legend

- Modelled Roads (HRA)

Nitrogen Deposition Rate Impact as a % of Lower Critical Load
Lower Critical Load = 10 kg N/ha/yr

- Deterioration ≤ 1%
- Deterioration > 1%



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Drawing Title
Figure 6.1 Modelled annual Nitrogen Deposition rate in-combination impact (2042) as a percentage of the relevant lower critical load
Cannock Chase SAC/SSSI

Project Stage			
n/a			
Status	Status Description		
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Legend

Modelled Roads (HRA)

Nitrogen Deposition Rate Impact as a % of Lower Critical Load

Lower Critical Load = 10 kg N/ha/yr

Deterioration ≤ 1%

Deterioration > 1%

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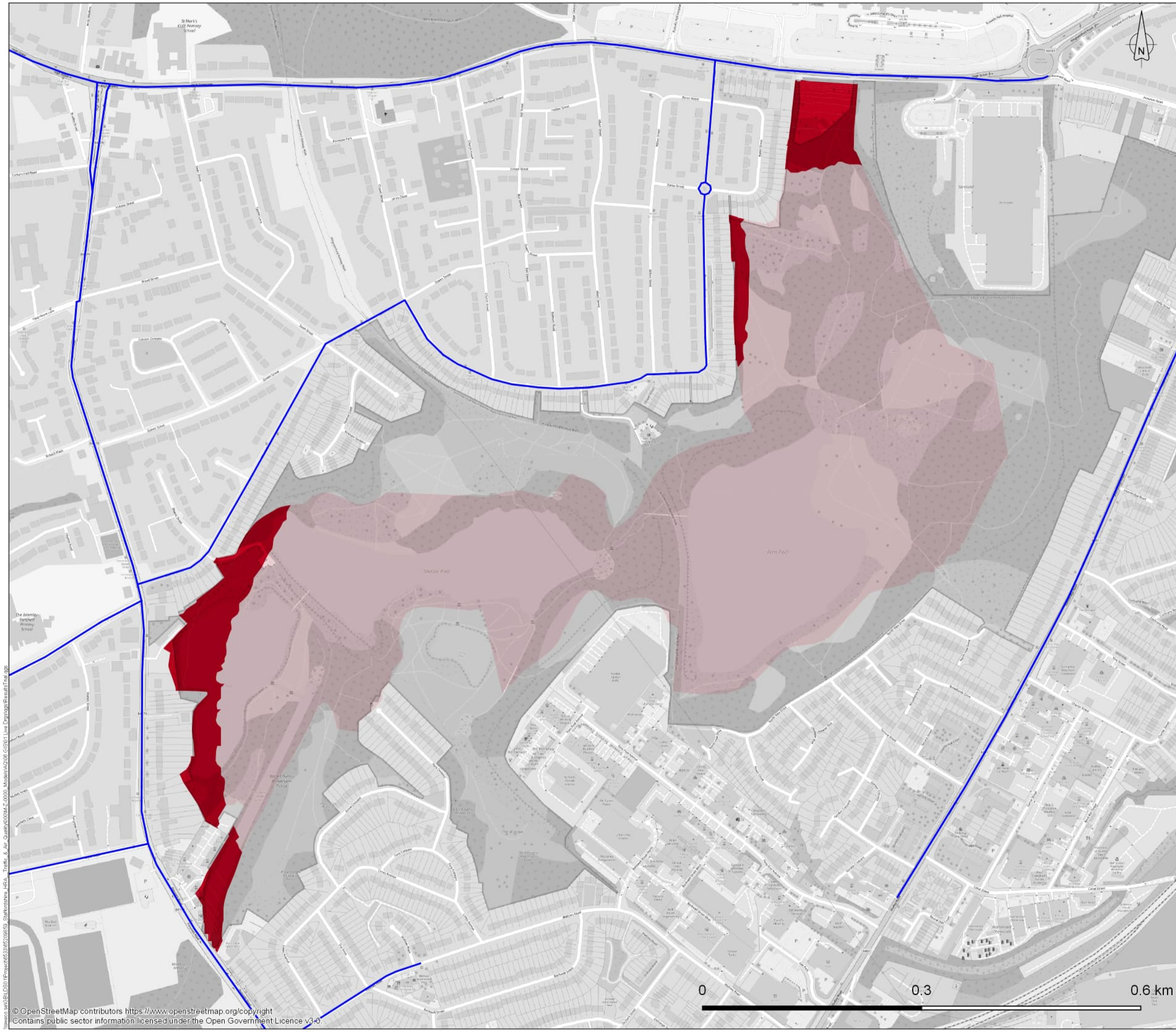
Drawing Title

Figure 6.2 Modelled annual Nitrogen Deposition rate in-combination impact (2042) as a percentage of the relevant lower critical load

Cannock Extension Canal SAC/SSSI

Project Stage			
n/a			
Status	Status Description		
n/a	n/a		
Drawn	Designed	Checked	Approved
LFS	LFS	DP	DP
Sheet Size	Scale	Sweco Ref	Revision
A3	1:6,000	65209859	P01.1

Drawing Number 65209859-SWE-XX-XX-D-AQ-0006



Legend

Modelled Roads (HRA)

Nitrogen Deposition Rate Impact as a % of Lower Critical Load

Lower Critical Load = 10 kg N/ha/yr

Deterioration ≤ 1%

Deterioration > 1%

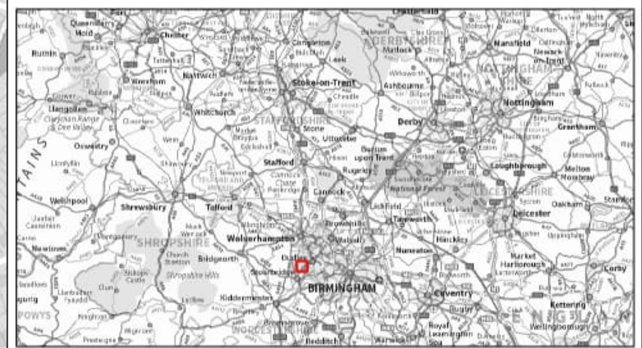


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Figure 6.3 Modelled annual Nitrogen Deposition rate in-combination impact (2042) as a percentage of the relevant lower critical load

Fens Pools SAC/SSSI

Project Stage			
n/a			
Status	Status Description		
n/a	n/a		
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Sheet Size	Scale	Sweco Ref	Revision
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5.5 Acid Deposition

A summary of the predicted changes in annual acid (N) deposition rates at all modelled receptor points within Cannock Chase SAC is presented in **Table 12** . The maximum modelled in-combination impacts at each distance interval are presented in **Appendix C** (Table C4) and the corresponding contour plot showing the area of exceedance above the 1% significance screening criterion is depicted in **Figure 7**.

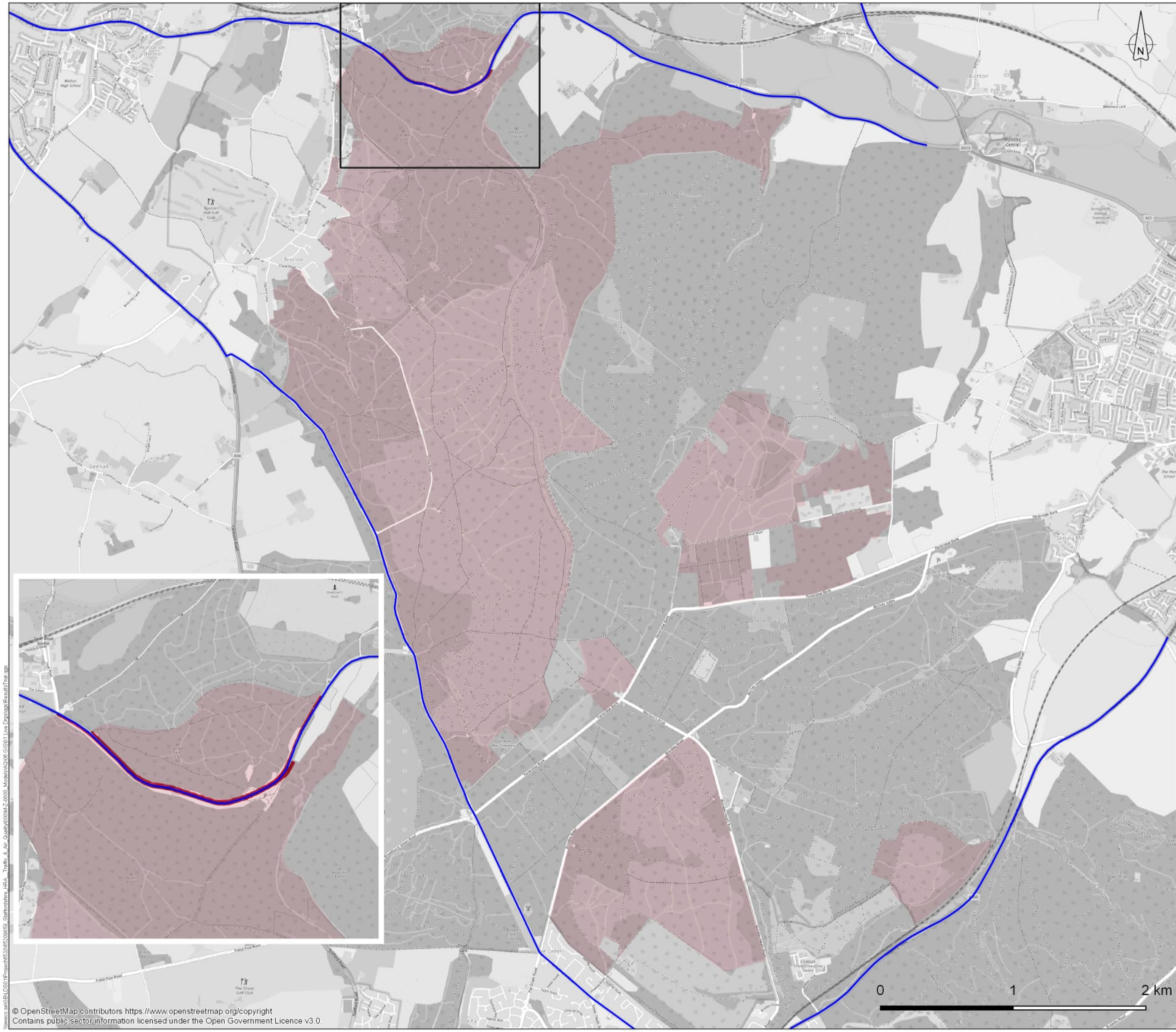
Table 12: Summary of modelled annual acid (N) deposition rates and in-combination impacts *(2042 Alternative Future Baseline vs 2042 With Partnership Local Plans*)

Parameter	Cannock Chase SAC	
	Future Base	**With Plans**
Max. Road Contribution (*Model*) (keqN/ha/yr)	0.234	0.260
Max. Total Concentration (*Model* + *Background*) (keq/ha/yr)	2.581	2.607
Critical Load (keqN/ha/yr)	**1.285**	
Number of receptors exceeding Critical Load	9,788	9,788
Total number of model receptors	9,788	9,788
Maximum worsening (keqN/ha/yr)	0.03	
No. receptors worsening >1% criterion	127	

The results reported in **Table 12** demonstrate that there is an extensive exceedance of the lower critical load within Cannock Chase SAC, both in the 2042 Future Baseline and 2042 With Partnership Local Plans scenarios. However, the area of in-combination impact above the 1% criterion is relatively marginal within Cannock Chase SAC.

From a total of 9,788 modelled receptors, 127 were modelled to exceed the 1% significance screening criterion for in-combination impacts, exclusively located directly adjacent to the A513 (RAP 1) that passes through the northern area of the SAC. All of the SAC is expected to exceed the lower critical load (1.285 keqN/ha/yr) in both the Future Baseline and With Plans scenarios, given that the baseline acid deposition rate is 1.3 keg/ha/yr as a minimum (see **Table 6**).

Based on the above, further Appropriate Assessment of the Partnership Authorities emerging Local Plans in-combination impacts is required by the appointed qualified ecologist.

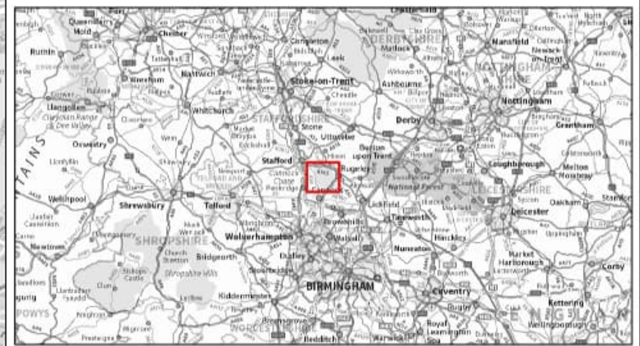


Legend

- Modelled Roads (HRA)

Acid Deposition Rate Impact as a % of Critical Load
Critical Load = 1.285 keq/ha/yr

- Deterioration ≤ 1%
- Deterioration > 1%



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Drawing Title

Figure 7.1 Modelled annual mean Acid Deposition rate in-combination impact (2042) as a percentage of the relevant critical load
Cannock Chase SAC/SSSI

Project Stage			
n/a			
Status	Status Description		
n/a	n/a		
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6 Summary & Conclusions

A detailed air quality assessment has been completed to consider the potential in-combination impacts of the proposed Partnership Authorities emerging Local Plans on potentially sensitive European sites within the region, namely:

- Cannock Chase SAC
- Pasturefields Salt Marsh SAC
- Midlands Meres and Mosses Phase 2 Ramsar site (Cop Mere & Oakhanger Moss)
- Cannock Extension Canal SAC
- Fens Pools SAC.

This assessment has been informed by the outputs of a transport modelling study[3] to determine the level of change in traffic flows associated with the respective adopted and emerging Local Plans on identified key road links within 200 m of the relevant European sites. The traffic data were provided for two future year scenarios, which formed the basis for the assessment of in-combination impacts:

- **2042 Alternative Future Baseline**
- **2042 With Partnership Local Plans**

The difference in vehicle flows on the key road links between the above scenarios were screened with reference to Natural England guidance[12] to determine which links and European sites / land parcels were included in the air quality model. This identified that both Cop Mere and Oakhanger Moss[21] could be screened out of the air quality modelling assessment.

The scope of the air quality modelling assessment aligned with the brief agreed in writing with Natural England prior to works progressing[1,2]. The focus of the assessment was to consider the in-combination changes to ambient NO_x and NH_3 concentrations, as well as nitrogen and acid deposition rates, at qualifying sensitive habitats. The relevant assessment benchmarks used in this study were based on statutory critical levels and/or habitat-specific critical levels and critical loads, as per the brief[1] agreed with Natural England.

Prior to completing the future year modelling assessment, a review of baseline information was completed to understand existing and future background conditions at and near to the European sites. This entailed a review of published background pollutant concentration and deposition data for each European site, sourced from Defra and APIS. In addition, project-specific baseline monitoring data for NO_2 and NH_3 concentrations in proximity to Cannock Chase SAC and Pasturefields Salt Marsh SAC were provided by the Partnership Authorities to supplement the baseline review.

The baseline review identified that:

- Annual mean NO_x concentrations are expected to remain demonstrably below the annual mean critical level (30 µg/m^3) at all European sites.
- The annual mean NH_3 background concentrations exceed the relevant critical levels at Cannock Chase SAC and Oakhanger Moss with the remaining sites being below.
- Whilst the NH_3 background at Pasturefields Salt Marsh SAC is below the critical level (3 µg/m^3), the monitored concentrations in 2022 and 2023 indicate the potential for it to be currently exceeded.
- Background N deposition rates in both the baseline and future years are projected to exceed the respective lower critical loads at each European site / land parcel, with the exception of Pasturefields Salt Marsh SAC, for which baseline N deposition is marginally below the lower critical load.

- Background acid (N) deposition at Cannock Chase SAC – the only European site screened into the assessment that is sensitive to acid deposition – is reported to exceed the lower critical load.

A Baseline (2022) air quality model scenario was completed to facilitate model verification against relevant roadside air quality monitoring locations, such that appropriate adjustment of the model outputs could be applied, and model performance analysed with reference to Defra guidance[11]. The verified model performed within the ideal statistical parameters and was considered suitable for modelling the future year (2042) scenarios.

The key outcomes of the dispersion modelling, pertaining to the in-combination impacts calculated as the difference in air pollutant concentrations / deposition rates between the 2042 Alternative Future Baseline and 2042 With Partnership Local Plans scenarios, are as follows:

- Although the **annual mean NO_x** results report the potential for in-combination impacts above the 1% significance screening criterion within Cannock Chase SAC, Cannock Extension Canal SAC, and Fens Pools SAC, the maximum annual mean concentrations in all sites are predicted to remain below the critical level in the 2042 With Partnership Local Plans scenario.
- The **annual mean NH_3** results confirm that in-combination impacts above the 1% significance screening criterion occur within all sites except for Pasturefields Salt Marsh SAC. Annual mean NH_3 levels within Cannock Chase SAC are expected to exceed the critical level in both the Future Baseline and With Plans scenarios. Whilst the majority of Cannock Extension Canal SAC and Fens Pools SAC are predicted to remain below the relevant critical level, there are isolated exceedances or near-exceedances in the With Plans scenario.
- The **Nitrogen deposition** results confirm that in-combination impacts above the 1% significance screening criterion occur within all sites except for Pasturefields Salt Marsh SAC. Similarly, with the exception of Pasturefields Salt Marsh SAC, annual N deposition rates exceed the respective lower critical loads within all sites in both scenarios, principally due to high background levels.
- The **Acid (N) deposition** results confirm that in-combination impacts above the 1% significance screening criterion occur within Cannock Chase SAC, albeit the impacts are limited to roadside locations. Annual acid deposition rates are expected to exceed the lower critical load in both the Future Baseline and With Plans scenarios across the entire SAC due to background acid deposition rates being above the lower critical load.

The dispersion modelling study has identified that all European sites, except for Pasturefields Salt Marsh SAC, are predicted to experience in-combination impacts above the 1% significance screening criterion for NH_3 concentrations, N deposition rates, and acid (N) deposition rates. In some cases, the modelled areas of the respective sites exceeding the 1% criterion are extensive.

As a result, this study concludes that **a further Appropriate Assessment of the Partnership Authorities' emerging Local Plans, in terms of in-combination impacts, is necessary and should be conducted by a suitably qualified ecologist**. The full and detailed results of this assessment have been provided to the Partnership Authorities.

This air quality assessment has been completed with reference to relevant Natural England and IAQM guidance, and within the context of the applicable limitations and assumptions, as per **Section 3**. Given the potential for material changes to the Partnership Authorities' emerging Local Plans, this air quality model and assessment report may be subject to future revisions.

Appendix A Traffic Data Tables

This section contains the following table:

Table A1: Traffic flow data relating to 2022 Baseline, 2042 Alternative Baseline, and 2042 With Partnership Local Plans scenarios used in the air quality modelling

Table A1: Traffic flow data relating to 2022 Baseline, 2042 Alternative Baseline, and 2042 With Partnership Local Plans scenarios used in the air quality modelling

Air Quality Model Link ID	Relevant Designated Site	2022 Baseline & 2042 Alternative Baseline		2042 With Partnership Local Plans*	
		Total AADT	HDV AADT	Total AADT	HDV AADT
110399_514326_1	Cannock Chase SAC	12,161	469	14,117	488
110411_512028_1	Cannock Chase SAC	5,006	77	5,837	80
512026_512027_1	Cannock Chase SAC	5,051	77	6,167	80
512027_512028_1	Cannock Chase SAC	5,051	77	6,167	80
514990_514993_1	Cannock Chase SAC	13,047	469	15,269	488
110411_5100228_1	Cannock Chase SAC	3,224	69	3,619	74
512070_512072_1	Cannock Chase SAC	11,746	352	13,801	366
101887_102675_2	Cannock Chase SAC	10,529	223	11,825	234
101887_5100228_1	Cannock Chase SAC	15,063	139	17,078	145
101887_102675_3	Cannock Chase SAC	10,529	223	11,825	234
101887_102675_4	Cannock Chase SAC	10,529	223	11,825	234
102212_102675_2	Cannock Chase SAC	9,128	739	10,222	769
101887_102675_5	Cannock Chase SAC	10,529	223	11,825	234
102666_107910_1	Cannock Extension Canal SAC	5,918	238	6,729	248
108013_102666_1	Cannock Extension Canal SAC	6,338	85	7,409	88
107909_108012_1	Cannock Extension Canal SAC	28,912	4,207	32,790	4,333
102666_108012_1	Cannock Extension Canal SAC	14,534	2,026	16,529	2,107
109642_108964_1	Cannock Extension Canal SAC	23,357	2,417	26,228	2,514
102666_114315_1	Cannock Extension Canal SAC	13,741	2,075	15,633	2,194
109641_109617_1	Cannock Extension Canal SAC	20,372	2,063	22,858	2,146
102666_108013_1	Cannock Extension Canal SAC	9,921	135	11,357	140
102704_108013_1	Cannock Extension Canal SAC	10,841	184	12,381	191
108013_108014_1	Cannock Extension Canal SAC	11,300	261	13,365	272
102666_108012_2	Cannock Extension Canal SAC	28,834	4,015	32,783	4,176
108012_102666_1	Cannock Extension Canal SAC	14,300	1,989	16,254	2,069
102666_107910_2	Cannock Extension Canal SAC	9,258	306	10,538	318
107910_102666_1	Cannock Extension Canal SAC	3,340	68	3,809	70
102666_108013_2	Cannock Extension Canal SAC	16,259	219	18,766	228
102666_114315_2	Cannock Extension Canal SAC	27,863	4,207	31,642	4,392
114315_102666_1	Cannock Extension Canal SAC	14,122	2,132	16,009	2,198
1_AB_1	Cannock Extension Canal SAC	8,647	2,804	9,908	2,917
1_BC_1	Cannock Extension Canal SAC	20,570	2,057	23,450	2,142
1_CD_1	Cannock Extension Canal SAC	22,257	2,082	25,374	2,168
1_DE_1	Cannock Extension Canal SAC	14,872	766	16,977	788
1_EF_1	Cannock Extension Canal SAC	24,334	2,233	27,683	2,302
1_FG_1	Cannock Extension Canal SAC	19,003	2,744	21,583	2,833
1_GH_1	Cannock Extension Canal SAC	20,399	2,776	23,317	2,867
1_HA_1	Cannock Extension Canal SAC	13,321	1,491	15,229	1,541

Air Quality Model Link ID	Relevant Designated Site	2022 Baseline & 2042 Alternative Baseline		2042 With Partnership Local Plans*	
		Total AADT	HDV AADT	Total AADT	HDV AADT
101537_101548_1	Fens Pools SAC	12,175	128	13,348	133
101478_107217_1	Fens Pools SAC	5,918	68	6,592	71
107217_107219_1	Fens Pools SAC	10,717	96	11,785	100
101519_107217_1	Fens Pools SAC	16,233	164	17,757	170
101537_107219_1	Fens Pools SAC	11,237	144	12,663	150
107218_107219_1	Fens Pools SAC	5,245	58	5,830	60
101519_110607_1	Fens Pools SAC	10,064	95	10,891	99
101619_113158_1	Fens Pools SAC	24,372	1,030	26,823	1,071
101519_513072_1	Fens Pools SAC	6,169	69	6,867	71
101609_513085_1	Fens Pools SAC	6,169	69	6,867	71
513072_513085_1	Fens Pools SAC	6,169	69	6,867	71
101619_513086_1	Fens Pools SAC	18,304	779	20,125	810
101537_514545_1	Fens Pools SAC	7,558	59	8,362	62
101609_513082_1	Fens Pools SAC	6,169	69	6,867	71
110340_513027_1	Fens Pools SAC	18,581	285	20,629	296
513026_513027_1	Fens Pools SAC	18,581	285	20,629	296
101710_513028_1	Fens Pools SAC	19,525	441	21,556	458
101619_514575_1	Fens Pools SAC	6,169	69	6,867	71
513029_513082_1	Fens Pools SAC	6,167	69	6,866	73
513029_514575_1	Fens Pools SAC	6,167	69	6,866	73
101512_101516_1	Fens Pools SAC	6,247	142	6,876	147
101509_101512_1	Fens Pools SAC	9,864	192	10,807	200
101516_513084_1	Fens Pools SAC	18,304	779	20,125	810
101505_514544_1	Fens Pools SAC	21,244	476	23,232	495
101505_513083_1	Fens Pools SAC	20,076	537	22,047	559
514543_101505_1	Fens Pools SAC	5,855	56	6,494	58
101512_514543_1	Fens Pools SAC	5,855	56	6,494	58
101509_110607_1	Fens Pools SAC	10,208	207	11,183	216
513084_520411_1	Fens Pools SAC	18,304	779	20,125	810
513086_520411_1	Fens Pools SAC	18,304	779	20,125	810
514575_513029_1	Fens Pools SAC	2,611	16	2,913	16
513029_514575_2	Fens Pools SAC	6,167	69	6,866	73
513029_514575_3	Fens Pools SAC	3,556	53	3,953	57
5100230_5100231_1	Cop Mere (Ramsar)	652	31	704	32
101057_5100234_1	Cop Mere (Ramsar)	2,953	126	3,277	131
5100230_5100231_2	Cop Mere (Ramsar)	652	31	704	32
5100230_5100231_3	Cop Mere (Ramsar)	652	31	704	32
5100230_5100231_4	Cop Mere (Ramsar)	652	31	704	32
101057_5100234_3	Cop Mere (Ramsar)	2,953	126	3,277	131
100775_100940_1	Oakhanger Moss (Ramsar)	64,578	13,691	68,062	14,238

Air Quality Model Link ID	Relevant Designated Site	2022 Baseline & 2042 Alternative Baseline		2042 With Partnership Local Plans*	
		Total AADT	HDV AADT	Total AADT	HDV AADT
100940_100775_1	Oakhanger Moss (Ramsar)	64,169	12,705	67,860	13,485
102212_102675_1	Pasturefields Salt Marsh SAC	9,128	739	10,222	769
101887_102675_1	For Model Verification Only	5,128	111	-	-
101060_101058_1	For Model Verification Only	5,292	262	-	-
102911_105358_1	For Model Verification Only	6,082	134	-	-
102911_102890_1	For Model Verification Only	7,710	178	-	-
102855_102890_1	For Model Verification Only	10,457	166	-	-
101529_101494_1	For Model Verification Only	10,725	550	-	-
101494_101424_1	For Model Verification Only	16,075	1,014	-	-
101440_101424_1	For Model Verification Only	6,872	170	-	-
101351_101424_1	For Model Verification Only	11,361	645	-	-
101424_101058_1	For Model Verification Only	2,548	334	-	-
101060_101293_1	For Model Verification Only	5,106	187	-	-
101098_101057_1	For Model Verification Only	1,890	147	-	-
101489_107227_1	For Model Verification Only	12,255	92	-	-
101463_101489_1	For Model Verification Only	13,984	364	-	-
101594_110060_1	For Model Verification Only	9,515	90	-	-
110060_1000215_1	For Model Verification Only	12,057	83	-	-
101583_111234_1	For Model Verification Only	3,993	21	-	-
101612_111235_1	For Model Verification Only	9,716	39	-	-
101594_111235_1	For Model Verification Only	10,854	12	-	-
110060_113992_1	For Model Verification Only	14,504	155	-	-
101583_521124_1	For Model Verification Only	9,902	126	-	-
101612_521124_1	For Model Verification Only	9,902	126	-	-
101612_521126_1	For Model Verification Only	7,702	49	-	-
110060_521126_1	For Model Verification Only	8,140	49	-	-
102890_514328_1	For Model Verification Only	5,844	180	-	-
514328_520765_1	For Model Verification Only	11,746	352	-	-
514327_520765_1	For Model Verification Only	11,746	352	-	-
512064_102890_1	For Model Verification Only	3,404	111	-	-
515133_515135_1	For Model Verification Only	25,198	442	-	-
515132_101887_1	For Model Verification Only	12,253	253	-	-
515132_515133_1	For Model Verification Only	12,586	211	-	-
101489_513083_1	For Model Verification Only	20,076	537	-	-
101612_513043_1	For Model Verification Only	9,509	98	-	-
101617_513043_1	For Model Verification Only	9,141	108	-	-
105358_515064_1	For Model Verification Only	3,102	78	-	-
515064_515127_1	For Model Verification Only	6,082	134	-	-
513015_5100222_1	For Model Verification Only	9,182	129	-	-
101583_5100222_1	For Model Verification Only	9,182	129	-	-

Air Quality Model Link ID	Relevant Designated Site	2022 Baseline & 2042 Alternative Baseline		2042 With Partnership Local Plans*	
		Total AADT	HDV AADT	Total AADT	HDV AADT
5100228_101887_1	For Model Verification Only	7,534	79	-	-
101060_5100231_1	For Model Verification Only	4,769	108	-	-
5100234_101057_1	For Model Verification Only	1,484	60	-	-
100896_515077_1	For Model Verification Only	5,631	381	-	-
105357_512070_1	For Model Verification Only	11,746	352	-	-
102206_103258_1	For Model Verification Only	7,066	687	-	-
107909_115403_1	For Model Verification Only	28,996	3,915	-	-
107909_514987_1	For Model Verification Only	7,084	220	-	-
107910_520644_1	For Model Verification Only	4,738	162	-	-
514883_520644_1	For Model Verification Only	4,738	162	-	-
102675_101887_1	For Model Verification Only	5,401	112	-	-
101887_515132_1	For Model Verification Only	12,218	225	-	-
101887_515132_2	For Model Verification Only	12,218	225	-	-
101887_5100228_2	For Model Verification Only	7,529	60	-	-
101887_515132_3	For Model Verification Only	12,218	225	-	-
515132_101887_2	For Model Verification Only	12,253	253	-	-
101887_515132_4	For Model Verification Only	12,218	225	-	-
102890_102855_1	For Model Verification Only	9,133	126	-	-
102855_102890_2	For Model Verification Only	10,457	166	-	-
102890_512064_1	For Model Verification Only	2,552	110	-	-
102890_512064_2	For Model Verification Only	2,552	110	-	-
102890_514328_2	For Model Verification Only	5,844	180	-	-
102890_102911_1	For Model Verification Only	7,915	185	-	-
102911_515095_1	For Model Verification Only	8,948	287	-	-
102911_105358_2	For Model Verification Only	6,082	134	-	-
515064_105358_1	For Model Verification Only	3,067	56	-	-
105358_515064_2	For Model Verification Only	3,102	78	-	-
105358_515064_3	For Model Verification Only	3,102	78	-	-
101058_101424_1	For Model Verification Only	2,765	359	-	-
101424_101058_2	For Model Verification Only	2,548	334	-	-
101424_101440_1	For Model Verification Only	6,435	200	-	-
101424_101440_2	For Model Verification Only	6,435	200	-	-
101424_101351_1	For Model Verification Only	11,322	639	-	-
101424_101494_1	For Model Verification Only	14,834	781	-	-
101494_101529_1	For Model Verification Only	11,360	539	-	-
101057_5100234_2	For Model Verification Only	1,469	66	-	-
101058_101060_1	For Model Verification Only	4,835	220	-	-
101058_101060_2	For Model Verification Only	4,835	220	-	-
101058_101424_2	For Model Verification Only	2,765	359	-	-
101058_101424_3	For Model Verification Only	2,765	359	-	-

Air Quality Model Link ID	Relevant Designated Site	2022 Baseline & 2042 Alternative Baseline		2042 With Partnership Local Plans*	
		Total AADT	HDV AADT	Total AADT	HDV AADT
101057_101098_1	For Model Verification Only	1,951	149	-	-
101057_101098_2	For Model Verification Only	1,951	149	-	-
7_AB_1	For Model Verification Only	4,366	486	-	-
7_BC_1	For Model Verification Only	4,827	393	-	-
7_CD_1	For Model Verification Only	5,887	467	-	-
7_DE_1	For Model Verification Only	4,417	251	-	-
7_EF_1	For Model Verification Only	5,939	473	-	-
7_FG_1	For Model Verification Only	3,368	343	-	-
7_GH_1	For Model Verification Only	6,172	499	-	-
7_HA_1	For Model Verification Only	5,049	459	-	-
6_AB_1	For Model Verification Only	10,526	1,264	-	-
6_BC_1	For Model Verification Only	18,678	1,017	-	-
6_CD_1	For Model Verification Only	22,036	1,084	-	-
6_DE_1	For Model Verification Only	12,891	579	-	-
6_EF_1	For Model Verification Only	23,658	1,267	-	-
6_FG_1	For Model Verification Only	22,088	1,169	-	-
6_GH_1	For Model Verification Only	19,692	1,330	-	-
6_HA_1	For Model Verification Only	15,409	917	-	-
3_AB_1	For Model Verification Only	5,576	375	-	-
3_BC_1	For Model Verification Only	15,011	291	-	-
3_CD_1	For Model Verification Only	16,618	347	-	-
3_DE_1	For Model Verification Only	11,894	237	-	-
3_EF_1	For Model Verification Only	16,320	340	-	-
3_FG_1	For Model Verification Only	12,832	253	-	-
3_GH_1	For Model Verification Only	14,835	357	-	-
3_HA_1	For Model Verification Only	9,238	282	-	-
4_AB_1	For Model Verification Only	7,471	112	-	-
4_BC_1	For Model Verification Only	16,072	299	-	-
4_CD_1	For Model Verification Only	12,110	223	-	-
4_DE_1	For Model Verification Only	13,991	275	-	-
4_EF_1	For Model Verification Only	8,173	234	-	-
4_FA_1	For Model Verification Only	11,220	267	-	-
101058_101424_4	For Model Verification Only	2,765	359	-	-
101058_101424_5	For Model Verification Only	2,765	359	-	-

Notes:

* Links that have no traffic flow presented in the *2042 With Partnership Local Plans* scenario were only required in the *2022 Baseline* scenario to support the model verification exercise and were not within 200 m of a European site.

Appendix B Dispersion Modelling Approach & Verification

Dispersion Model Selection

The predicted impacts on air quality at the identified European sites, associated with changes to vehicle emissions as a result of the Partnership Authorities Local Plans, were assessed using Cambridge Environmental Research Consultants (CERC) atmospheric dispersion modelling system for roads (ADMS-Roads v5.0).

ADMS-Roads applies advanced algorithms for the height-dependence of wind speed, turbulence and stability to produce improved predictions of air pollutant concentrations within the given model domain. It can predict long-term and short-term concentrations, as well as calculations of percentile concentrations.

ADMS-Roads is a validated model, developed in the UK by CERC. The model validation process includes comparisons with data from the UK's Automatic Urban Rural Network (AURN) and specific verification exercises using standard field, laboratory and numerical data sets. CERC is also involved in European programmes on model harmonisation, and their models were compared favourably against other EU and U.S. EPA systems. Further information in relation to this is available from the CERC web site at http://www.cerc.co.uk/environmental-software/model-validation.html.

Model Input Parameters

A number of the key model inputs are detailed in **Section 3.3** of the main report, including the model study area, receptor selection, traffic data and associated vehicle emission rates, and treatment of terrain. The below provides details of the other model input parameters applicable to this assessment.

Modelled Road Link Geometry

ADMS-Roads requires inputs of road widths and, where relevant, heights of street canyons, although no street canyons were identified for this study. Road geometries were determined using a combination of OpenStreeMap.org for road centreline geometries and Ordnance Survey Mastermap Topography to refine centreline geometries and determine average road widths for each modelled road link. This enabled the model to reflect real-world conditions as closely as possible.

Surface Roughness

Surface roughness is a parameter used to represent the unevenness of the surface throughout the model domain, which influences the vertical mixing of pollutants through enhancing mechanical turbulence.

The surface roughness length was set to 0.5m across the modelled study area, which is equivalent to parkland and open suburbia land uses. This reflects the mixed nature of the vegetation at roadside and within the European sites.

The meteorological data sourced for this project was representative of a predominantly rural area (open fields). Therefore, the surface roughness length was set to 0.02 m at the meteorological site.

Minimum Monin-Obukhov Length

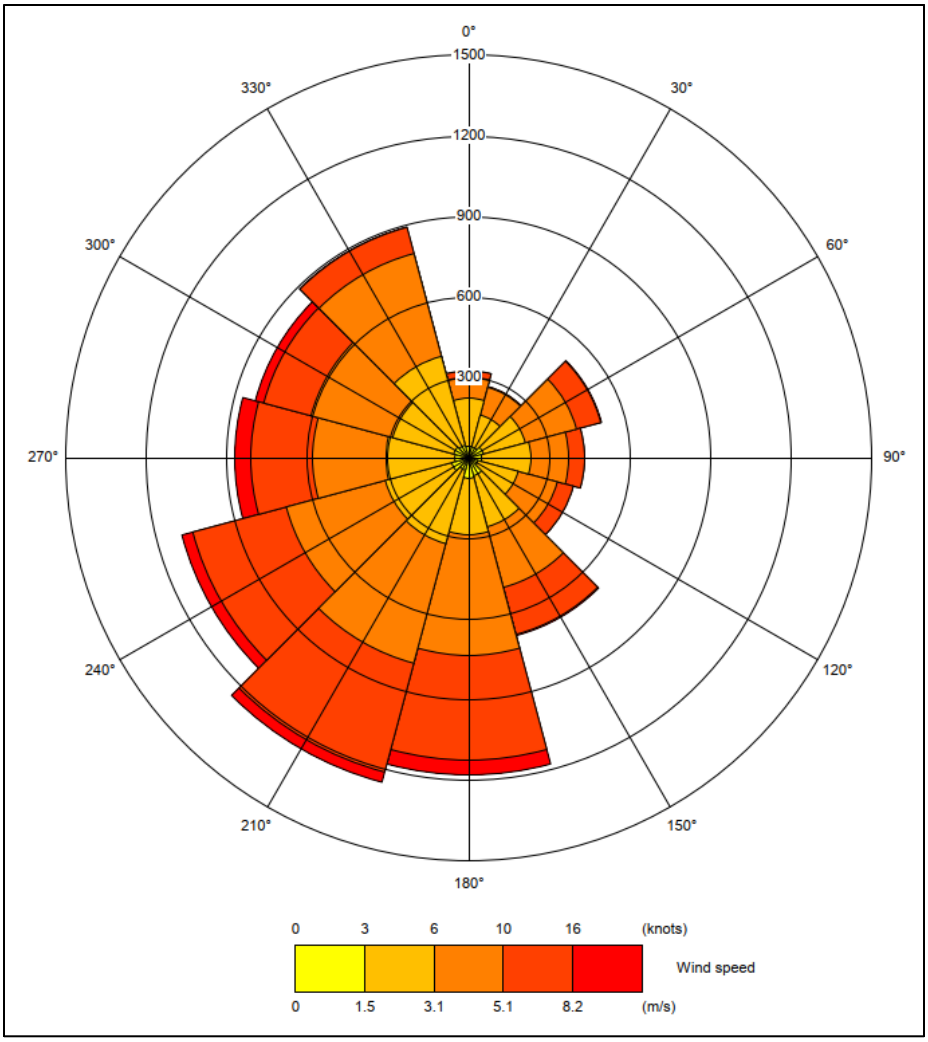
The Monin-Obukhov (MO) length is a measure of the stability of the atmosphere and is used by the model to predict how air will mix near to the ground (i.e. within boundary layer) and how pollutants will disperse. A minimum MO length of 10m was applied uniformly across the modelled study area given the predominantly rural to suburban nature of the study area, which will tend to experience more stable atmospheric conditions compared to built-up urban areas.

Meteorological Data

There were no representative weather monitoring stations within 45 km of the study area. Given the geographical extent of the model area, formatted Numerical Weather Prediction (NWP) data for year 2022 were sourced for a 3 km x 3 km area centred on the former RAF Wheaton airfield at 52.732°N, 2.235°W. This represented an area of flat terrain, predominantly comprising open fields. As such, the NWP data are not likely to be significantly influenced by urban development or other pronounced topographical features.

A wind rose for the 2022 hourly data is presented in **Figure B1**.

Figure B1: Wind rose for 2022 hourly NWP meteorological data



Model Verification & Adjustment

The predicted annual mean NO_2 concentration results from the base year (2022) model scenario were compared with equivalent 2022 monitored results at a number of diffusion tubes sites within Stafford Borough Council, Cannock Chase District Council, and Dudley Metropolitan Borough Council in the modelled study area. With reference to Defra's LAQM.TG22, the majority of modelled concentrations should be within +/-25% of the equivalent monitored value, but ideally within +/10%.

Differences between modelled and measured pollutant concentrations can be caused by a number of factors, including:

- Uncertainties and limitations with meteorological data
- Uncertainties in source activity data such as traffic flow data and vehicle emissions factors
- Estimates of background pollutant concentrations
- Model input parameters such as roughness length, minimum Monin-Obukhov length, and overall model limitations
- The overall limitations with the dispersion model
- Uncertainties associated with monitoring data, including siting.

Model verification is a process that allows these uncertainties to be investigated and, through appropriate adjustment of the modelled road-NO_x contribution, minimised to improve the consistency of modelling results versus available monitored data. Model adjustment factors for road-NO_x derived through this process were applied to all subsequent model scenario outputs.

Model Performance

To evaluate model performance and assess uncertainties, the model results were subjected to statistical analyses to establish confidence in the results being presented, both before and after verification. The statistical parameters assessed comprised:

- The correlation coefficient
- Fractional bias
- Root mean square error (RMSE)

A more detailed description on these statistical parameters is provided in **Table B1** below, taken from LAQM.TG22 Box 7-21.

Table B1: Description of model performance statistics

Statistical Parameter	Description	Ideal Value
Root Mean Square Error (RMSE)	RMSE is used to define the average error or uncertainty of the model. The units of RMSE are the same as the quantities compared. If the RMSE values are higher than 25% of the Objective being assessed, it is recommended that the model inputs and verification should be revisited in order to make improvements. Ideally an RMSE within 10% of the air quality Objective would be derived, which equates to 4 µg/m^3 for the annual mean NO_2 Objective.	0.0 µg/m^3 (or <4.0 µg/m3; 10% of Objective))
Fractional Bias (FB)	It is used to identify if the model shows a systematic tendency to over or under predict. FB values vary between +2 and -2 and has an ideal value of zero. Negative values suggest a model over-prediction and positive values suggest a model under-prediction.	0.0
Correlation Coefficient (CC)	It is used to measure the linear relationship between predicted and observed data. A value of zero means no relationship and a value of 1 means absolute relationship. This statistic can be particularly useful when comparing a large number of model and observed data points.	1.0

Verification Methodology

The verification process involves a review of the modelled pollutant concentrations against corresponding monitoring data to determine how well the air quality model has performed. Depending on the outcome it may be considered that the model has performed adequately and that there is no need to adjust any of the modelled results LAQM.TG22.

Alternatively, the model may perform outside of the ideal performance limits as stated by LAQM.TG22 (i.e. model agrees within +/-25% of monitored equivalent). There is then a need to check all the input data to ensure that it is reasonable and accurately represented in the air quality modelling process.

Where all input data, such as traffic data, emissions rates, and background concentrations have been checked and considered as reasonable, then the modelled results require adjustment to best align with the monitoring data. This may either be a single verification adjustment factor to be applied to the modelled concentrations across the study area, or a range of different adjustment factors to account for different zones in the study area e.g. major roads, local roads.

The air quality model was run to predict the 2022 annual mean road-NO_x contribution at nine roadside diffusion tubes located within the aforementioned Council areas, as presented in **Table B2**. Additional road links were incorporated into the 2022 Baseline traffic network such that a representative spread of monitoring locations could be included in the verification exercise.

Table B2: Details of diffusion tube monitoring locations included in model verification

Site ID	Site Name	Type	OS Grid Coordinates (m)		2022 Annual Mean (µg/m³)
			X	Y	
Stafford_14	-	Other	390092	333159	18.4
Stafford_13	-	Other	390306	332968	19.9
Stafford_ST	-	Kerbside	390050	333270	27.4
Cannock_A460	A460 Rugeley	Roadside	403008	315932	16.8
Cannock_268 WS	268 Watling Street	Roadside	400726	307423	28.9
Cannock_268 WSB	268 Watling Street B	Roadside	400864	307385	38.7
Dudley_33	High Street, Pensnett	Roadside	390989	289254	25.0
Dudley_33ex	Birds Meadow, Pensnett	Roadside	391027	289410	15.4
Dudley_33Q	High Oak, Pensnett	Roadside	391060	289207	28.7

Modelled versus Monitored Annual Mean NO_2: Before Model Adjustment

The modelled annual mean road-NO_x outputs from the 2022 Base year scenario were converted to total annual mean NO_2 concentrations using Defra's NO_x to NO_2 calculator (v8.1) with the appropriate Defra background NO_2 value accounted for. The total modelled NO_2 annual mean concentrations were then compared to the equivalent 2022 local authority monitored values.

The outcomes of this comparison are summarised in **Table B3.**

Table B3: Initial comparison of modelled and monitored 2022 annual mean NO_2 concentrations (Units: µg/m³)

Site ID	Modelled road-NO_x	Background NO_2	Total modelled NO_2	Total monitored NO_2	% Difference (model – monitor)
Stafford_14	9.7	9.9	15.3	18.4	-17.1%
Stafford_13	9.2	10.2	15.3	19.9	-23.4%
Stafford_ST	39.7	9.9	30.3	27.4	10.4%
Cannock_A460	7.9	7.7	12.1	16.8	-28.2%
Cannock_268 WS	25.4	13.5	26.7	28.9	-7.7%
Cannock_268 WSB	33.7	13.5	30.7	38.7	-20.6%
Dudley_33	11.0	13.5	19.4	25.0	-22.5%
Dudley_33ex	2.0	13.6	14.7	15.4	-4.5%
Dudley_33Q	9.0	13.3	18.2	28.7	-36.8%

The initial comparison of modelled and monitored NO_2 data in **Table B3** identified that the model was underpredicting at all but one (Stafford_ST) of the nine monitoring locations. Of these eight locations, six were demonstrating predicted annual mean concentrations within 25% of the equivalent monitored value and two within 10%. Sites 'Cannock_A460' and 'Dudley_33Q' returned predicted annual mean concentrations that were 28.2% and 36.8% below the equivalent monitored value.

It was evident that there was an overall tendency for the model to underpredict. This was confirmed by a statistical analysis of the unadjusted model results, which returned a fractional bias of +0.18 and an associated average model uncertainty (RMSE) of 5.5 µg/m^3. As such, it was deemed appropriate to progress verification to compare the modelled and monitored road-NO_x values, such that an appropriate modelled road-NO_x adjustment factor could be derived.

Given the spread of monitoring locations across three local authority areas, zonal verification and adjustment was completed at a local authority scale (i.e. three zones).

Comparison of Road-NO_x Contributions and Model Adjustment

Modelled road-NO_x concentrations at each site were compared with the corresponding monitored road-NO_x values in each verification zone to enable model adjustment factors to be derived.

A summary of the data comparison and derived model adjustment factors is presented in **Table B4**, with the respective plots for each zone presented as **Plates B1 to B3**, respectively.

Table B4: Summary of annual mean road-NO_x comparison and model adjustment factors (Units: µg/m^3)

Site ID	Verification zone	Monitored road-NO_x	Modelled road-NO_x (unadjusted)	Road-NO_x adjustment factor*	Modelled road-NO_x (adjusted)
Stafford_14	**Stafford**	15.7	9.7	0.94	9.2
Stafford_13		18.1	9.2		8.7
Stafford_ST		33.7	39.7		37.5
Cannock_A460	**Cannock**	16.8	7.9	1.42	11.3
Cannock_268 WS		30.0	25.4		36.1
Cannock_268 WSB		51.2	33.7		47.9
Dudley_33	**Dudley**	22.0	11.0	2.52	27.7
Dudley_33ex		3.3	2.0		5.1
Dudley_33Q		29.9	9.0		22.6

Notes:

* Road-NO_x adjustment factor derived from respective y=mx (intercept at 0) plot (dimensionless)

Plate B1: Modelled versus monitored road-NO_x for 'Stafford' verification zone (pre-adjustment)

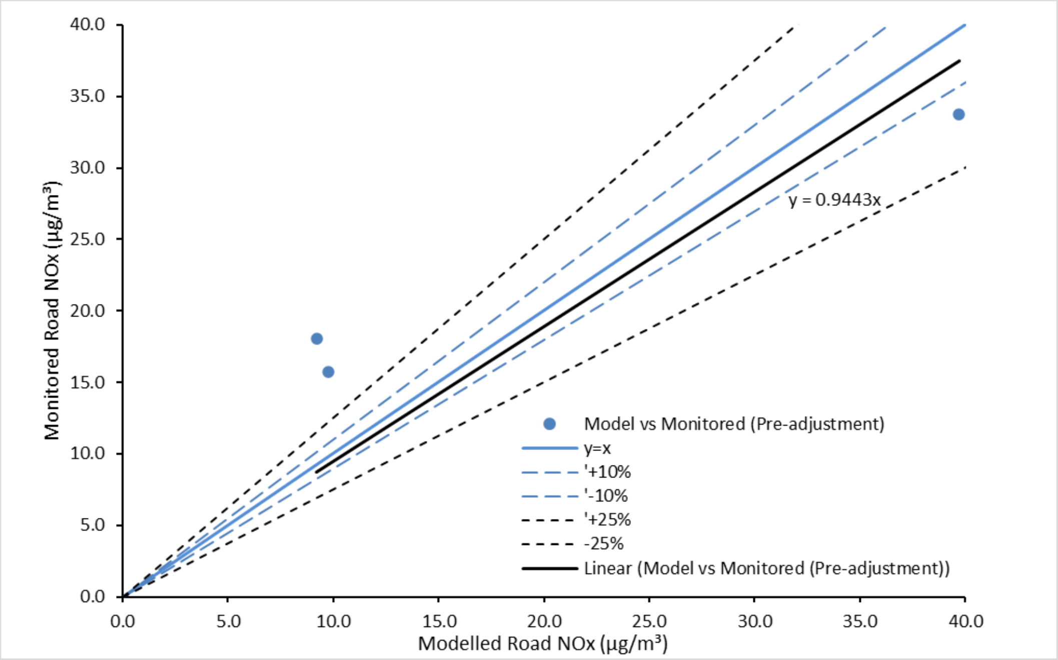


Plate B2: Modelled versus monitored road-NO_x for 'Cannock' verification zone (pre-adjustment)

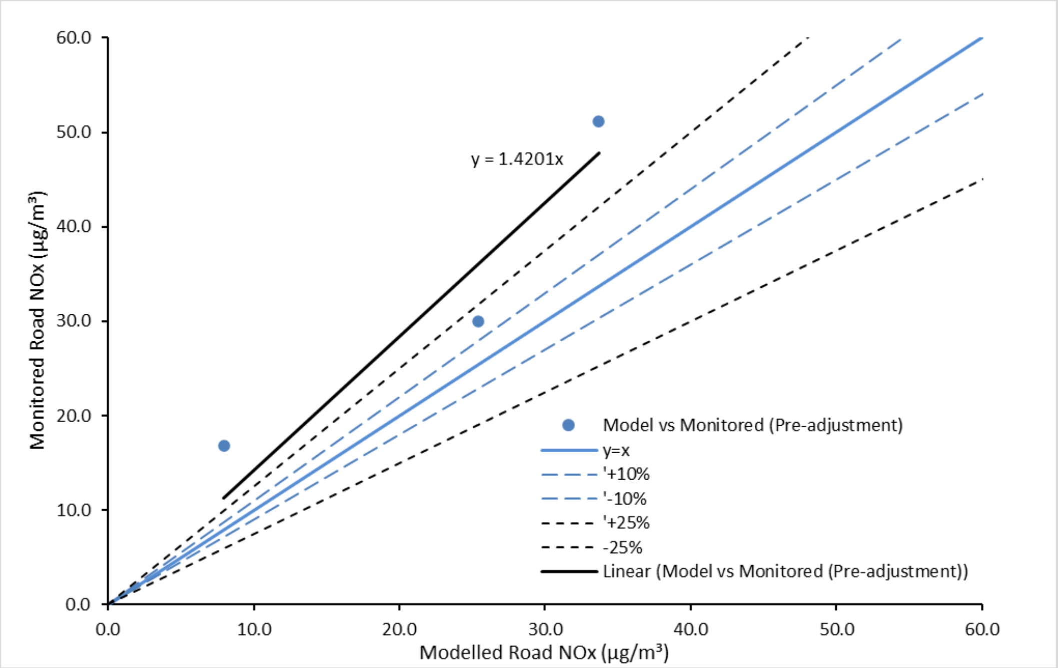
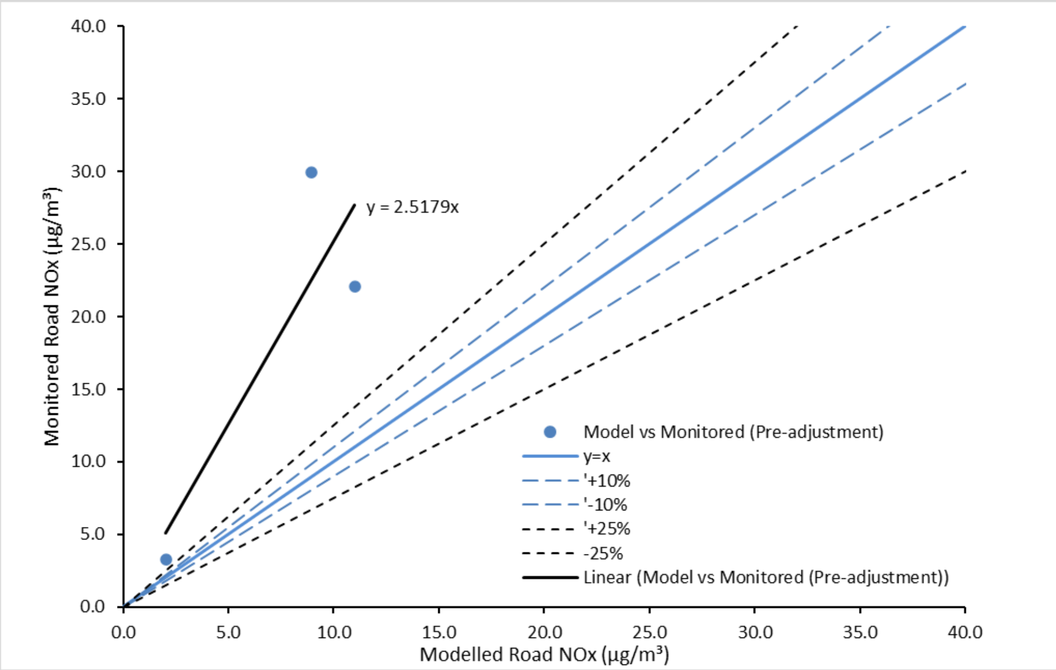


Plate B3: Modelled versus monitored road-NO_x for 'Dudley' verification zone (pre-adjustment)

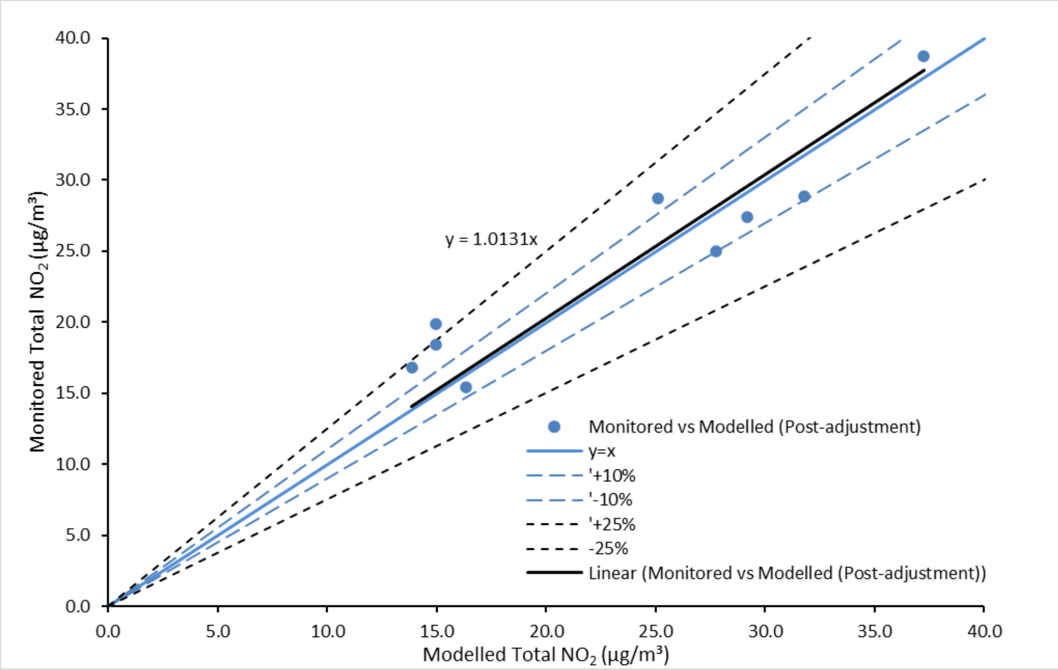


The adjusted annual mean modelled road-NO_x, as per **Table B4**, was subsequently converted to total annual mean NO_2 to allow comparison with the total monitored equivalent at each site. A summary of the adjusted model comparison with the monitored data is provided in **Table B5** and graphically presented in **Plate B4**.

Table B4: Summary of annual mean road-NO_x comparison and model adjustment factors (Units: µg/m³)

Site ID	Verification zone	Monitored NO_2 (µg/m³)	Adjusted Modelled NO_2 (µg/m³)	% Difference	RMSE (µg/m³)	Fractional bias
Stafford_14	Stafford	18.4	15.0	-18.7%	3.62	0.11
Stafford_13		19.9	15.0	-24.7%		
Stafford_ST		27.4	29.2	6.6%		
Cannock_A460	Cannock	16.8	13.9	-17.4%	2.52	0.02
Cannock_268 WS		28.9	31.8	10.0%		
Cannock_268 WSB		38.7	37.2	-3.8%		
Dudley_33	Dudley	25.0	27.8	11.1%	2.68	0.00
Dudley_33ex		15.4	16.4	6.2%		
Dudley_33Q		28.7	25.1	-12.5%		
				All Sites	**2.98**	**0.04**

Plate B4: Total adjusted modelled annual mean NO_2 versus monitored NO_2 at all monitoring sites



Following model adjustment, the modelled annual mean concentrations were all within +/-25%, with six within +/-15%, of the monitored equivalent.

As a whole, the data indicate that the adjusted model performs with no tendency to over or under predict when compared to the local authority monitoring results (fractional bias of 0.04) and the average model uncertainty across the study area was derived to derived to be 2.98 µg/m³, which is within the ideal statistical tolerances as per LAQM.TG22. This represents a demonstrable improvement in model performance relative to the unadjusted model analysis.

The zonal road-NO_x adjustment factors were subsequently applied to all respective modelled road-NO_x outputs for both the base (2022) and future year (2042) scenarios. The location of each modelled receptor within the respective local authority was used to determine the appropriate adjustment factor to be applied.

Given that the 'Stafford' verification zone adjustment factor was slightly below 1.0 (0.94), an assumed factor of 1.0 was used for the purposes of the assessment, thereby ensuring a relatively conservative approach to deriving road-NO_x and total annual mean NO_2 concentrations at receptors within this zone.

Appendix C Air Quality Assessment Results Tables

This section contains the following tables:

Table C1: Cannock Chase SAC – modelled maximum values at each 10 m interval

Distance within SAC from road (m)	Maximum Annual Mean NO_x (µg/m³)				Maximum Annual Mean NH_3 (µg/m³)				Maximum Nitrogen Deposition Rate (kgN/ha/yr)				Maximum Acid Deposition Rate (keq/ha/yr)			
	2042 Alt Base	2042 With Plans	Difference	Difference as % of CL	2042 Alt Base	2042 With Plans	Difference	Difference as % CL	2042 Alt Base	2042 With Plans	Difference	Difference as % of CL	2042 Alt Base	2042 With Plans	Difference	Difference as % CL
0	12.1	12.6	0.5	**1.7%**	2.7	2.8	0.1	**6.2%**	32.3	32.7	0.4	**3.6%**	2.58	2.61	0.03	**2.0%**
10	9.7	9.9	0.2	0.8%	2.5	2.5	0.0	**2.9%**	31.0	31.3	0.2	**2.3%**	2.49	2.51	0.02	**1.3%**
20	9.0	9.2	0.2	0.6%	2.4	2.4	0.0	**2.0%**	30.3	30.5	0.2	**1.5%**	2.44	2.45	0.01	0.8%
30	9.0	9.0	0.1	0.4%	2.3	2.4	0.0	**1.5%**	30.0	30.1	0.1	**1.1%**	2.41	2.42	0.01	0.6%
40	8.9	9.0	0.1	0.3%	2.3	2.3	0.0	**1.2%**	29.8	29.9	0.1	0.9%	2.40	2.41	0.01	0.5%
50	8.8	8.9	0.1	0.3%	2.3	2.3	0.0	**1.0%**	29.6	29.7	0.1	0.8%	2.39	2.40	0.01	0.4%
60	8.8	8.9	0.1	0.3%	2.3	2.3	0.0	0.9%	29.5	29.6	0.1	0.6%	2.38	2.39	0.00	0.3%
70	8.8	8.8	0.1	0.2%	2.3	2.3	0.0	0.8%	29.5	29.5	0.1	0.5%	2.38	2.38	0.00	0.3%
80	8.7	8.8	0.1	0.2%	2.3	2.3	0.0	0.7%	29.4	29.4	0.1	0.5%	2.37	2.38	0.00	0.3%
90	8.7	8.8	0.1	0.2%	2.3	2.3	0.0	0.7%	29.4	29.4	0.1	0.5%	2.37	2.37	0.00	0.3%
100	8.7	8.7	0.1	0.2%	2.3	2.3	0.0	0.6%	29.3	29.4	0.0	0.4%	2.37	2.37	0.00	0.2%
110	8.6	8.7	0.1	0.2%	2.3	2.3	0.0	0.6%	29.3	29.3	0.0	0.4%	2.37	2.37	0.00	0.2%
120	8.6	8.7	0.1	0.2%	2.3	2.3	0.0	0.6%	29.3	29.3	0.0	0.3%	2.36	2.37	0.00	0.2%
130	8.6	8.7	0.0	0.2%	2.3	2.3	0.0	0.5%	29.3	29.3	0.0	0.3%	2.36	2.37	0.00	0.2%
140	8.6	8.6	0.0	0.2%	2.3	2.3	0.0	0.5%	29.2	29.3	0.0	0.3%	2.36	2.36	0.00	0.2%
150	8.6	8.6	0.0	0.1%	2.3	2.3	0.0	0.5%	29.2	29.3	0.0	0.3%	2.36	2.36	0.00	0.2%
160	8.5	8.6	0.0	0.1%	2.3	2.3	0.0	0.5%	29.2	29.2	0.0	0.3%	2.36	2.36	0.00	0.2%
170	8.5	8.6	0.0	0.1%	2.3	2.3	0.0	0.4%	29.2	29.2	0.0	0.3%	2.36	2.36	0.00	0.2%
180	8.5	8.5	0.0	0.1%	2.3	2.3	0.0	0.4%	29.2	29.2	0.0	0.3%	2.36	2.36	0.00	0.1%
190	8.5	8.5	0.0	0.1%	2.3	2.3	0.0	0.4%	29.2	29.2	0.0	0.3%	2.36	2.36	0.00	0.1%
200	8.5	8.5	0.0	0.1%	2.3	2.3	0.0	0.4%	29.2	29.2	0.0	0.2%	2.36	2.36	0.00	0.1%
Critical Level / Load	**30**				**1**				**10**				**1.285**			

Notes: Exceedances of 1% significance screening criterion are highlighted in **bold**.

Table C2: Cannock Extension Canal SAC – modelled maximum values at each 10 m interval

Distance within SAC from road (m)	Maximum Annual Mean NO_x (µg/m^3)				Maximum Annual Mean NH_3 (µg/m^3)				Maximum Nitrogen Deposition Rate (kgN/ha/yr)			
	2042 Alt Base	2042 With Plans	Difference	Difference as % of CL	2042 Alt Base	2042 With Plans	Difference	Difference as % CL	2042 Alt Base	2042 With Plans	Difference	Difference as % of CL
0	20.6	21.8	1.2	**4.0%**	2.9	3.0	0.1	**4.5%**	21.5	22.3	0.8	**8.0%**
10	19.7	20.6	0.8	**2.8%**	2.6	2.7	0.1	**3.1%**	19.9	20.5	0.6	**5.5%**
20	12.8	13.0	0.2	0.6%	2.0	2.0	0.0	0.7%	16.3	16.5	0.1	**1.3%**
30	12.3	12.4	0.1	0.4%	1.9	2.0	0.0	0.5%	16.0	16.1	0.1	0.8%
40	12.2	12.3	0.1	0.4%	1.9	1.9	0.0	0.4%	16.0	16.0	0.1	0.7%
50	12.2	12.3	0.1	0.3%	1.9	1.9	0.0	0.4%	15.9	16.0	0.1	0.7%
60	12.1	12.2	0.1	0.3%	1.9	1.9	0.0	0.4%	15.9	16.0	0.1	0.6%
70	12.1	12.2	0.1	0.3%	1.9	1.9	0.0	0.3%	15.9	15.9	0.1	0.6%
80	12.1	12.2	0.1	0.3%	1.9	1.9	0.0	0.3%	15.8	15.9	0.1	0.6%
90	12.0	12.1	0.1	0.3%	1.9	1.9	0.0	0.3%	15.8	15.9	0.1	0.6%
100	12.0	12.1	0.1	0.3%	1.9	1.9	0.0	0.3%	15.8	15.9	0.1	0.5%
110	12.0	12.1	0.1	0.3%	1.9	1.9	0.0	0.3%	15.8	15.9	0.0	0.5%
Critical Level / Load	**30**				**3**				**10**			

Notes: Exceedances of 1% significance screening criterion are highlighted in **bold**.

Table C3: Fens Pools SAC – modelled maximum values at each 10 m interval

Distance within SAC from road (m)	Maximum Annual Mean NO_x (µg/m^3)				Maximum Annual Mean NH_3 (µg/m^3)				Maximum Nitrogen Deposition Rate (kgN/ha/yr)			
	2042 Alt Base	2042 With Plans	Difference	Difference as % of CL	2042 Alt Base	2042 With Plans	Difference	Difference as % CL	2042 Alt Base	2042 With Plans	Difference	Difference as % of CL
10	25.1	26.3	1.2	**4.1%**	3.1	3.3	0.1	**4.8%**	22.0	22.8	0.8	**8.4%**
20	21.6	22.2	0.6	**2.1%**	2.6	2.6	0.1	**2.4%**	19.3	19.7	0.4	**4.2%**
30	20.0	20.4	0.5	**1.5%**	2.4	2.4	0.1	**1.7%**	18.3	18.6	0.3	**3.1%**
40	19.0	19.4	0.4	**1.2%**	2.3	2.3	0.0	**1.4%**	17.7	17.9	0.3	**2.5%**
50	18.2	18.4	0.3	0.9%	2.2	2.2	0.0	**1.1%**	17.1	17.3	0.2	**1.9%**
60	17.1	17.2	0.2	0.6%	2.1	2.1	0.0	0.7%	16.1	16.2	0.1	**1.1%**
70	17.0	17.1	0.2	0.5%	2.1	2.1	0.0	0.6%	16.0	16.1	0.1	**1.0%**
80	17.0	17.1	0.1	0.5%	2.1	2.1	0.0	0.5%	15.9	16.0	0.1	0.9%
90	17.0	17.0	0.1	0.4%	2.0	2.1	0.0	0.5%	15.8	15.9	0.1	0.9%
100	16.9	17.0	0.1	0.4%	2.0	2.0	0.0	0.5%	15.8	15.9	0.1	0.8%
110	16.9	17.0	0.1	0.4%	2.0	2.0	0.0	0.5%	15.8	15.9	0.1	0.8%
120	16.8	16.9	0.1	0.4%	2.0	2.0	0.0	0.4%	15.8	15.8	0.1	0.7%
130	16.8	16.9	0.1	0.3%	2.0	2.0	0.0	0.4%	15.8	15.8	0.1	0.7%
140	16.8	16.9	0.1	0.3%	2.0	2.0	0.0	0.3%	15.7	15.8	0.1	0.6%
150	16.8	16.8	0.1	0.3%	2.0	2.0	0.0	0.3%	15.7	15.8	0.1	0.6%
160	16.7	16.8	0.1	0.2%	2.0	2.0	0.0	0.3%	15.7	15.7	0.1	0.5%
170	16.7	16.8	0.1	0.2%	2.0	2.0	0.0	0.3%	15.6	15.7	0.1	0.5%
Critical Level / Load	**30**				**3**				**10**			

Notes: Exceedances of 1% significance screening criterion are highlighted in **bold**.

Table C4: Pasturefields Salt Marsh SAC – modelled maximum values at each 10 m interval

Distance within SAC from road (m)	Maximum Annual Mean NO_x (μg/m^3)				Maximum Annual Mean NH_3 (μg/m^3)				Maximum Nitrogen Deposition Rate (kgN/ha/yr)			
	2042 Alt Base	2042 With Plans	Difference	Difference as % of CL	2042 Alt Base	2042 With Plans	Difference	Difference as % CL	2042 Alt Base	2042 With Plans	Difference	Difference as % of CL
0	8.8	8.8	0.0	0.1%	2.5	2.5	0.0	0.1%	17.6	17.6	0.0	0.1%
10	8.7	8.8	0.0	0.1%	2.5	2.5	0.0	0.1%	17.6	17.6	0.0	0.1%
20	8.7	8.8	0.0	0.1%	2.5	2.5	0.0	0.1%	17.6	17.6	0.0	0.1%
30	8.7	8.7	0.0	0.1%	2.5	2.5	0.0	0.1%	17.6	17.6	0.0	0.1%
40	8.6	8.7	0.0	0.1%	2.5	2.5	0.0	0.1%	17.6	17.6	0.0	0.1%
50	8.6	8.6	0.0	0.1%	2.4	2.5	0.0	0.1%	17.5	17.6	0.0	0.1%
60	8.6	8.6	0.0	0.1%	2.4	2.4	0.0	0.1%	17.5	17.5	0.0	0.1%
70	8.5	8.6	0.0	0.1%	2.4	2.4	0.0	0.1%	17.5	17.5	0.0	0.1%
80	8.5	8.6	0.0	0.1%	2.4	2.4	0.0	0.1%	17.5	17.5	0.0	0.1%
90	8.5	8.5	0.0	0.1%	2.4	2.4	0.0	0.1%	17.5	17.5	0.0	0.1%
100	8.5	8.5	0.0	0.1%	2.4	2.4	0.0	0.1%	17.5	17.5	0.0	0.1%
110	8.5	8.5	0.0	0.1%	2.4	2.4	0.0	0.1%	17.5	17.5	0.0	0.1%
120	8.4	8.5	0.0	0.1%	2.4	2.4	0.0	0.1%	17.4	17.5	0.0	0.1%
130	8.4	8.4	0.0	0.1%	2.4	2.4	0.0	0.1%	17.4	17.4	0.0	0.0%
140	8.4	8.4	0.0	0.0%	2.4	2.4	0.0	0.1%	17.4	17.4	0.0	0.0%
150	8.4	8.4	0.0	0.0%	2.4	2.4	0.0	0.0%	17.4	17.4	0.0	0.0%
160	8.4	8.4	0.0	0.0%	2.4	2.4	0.0	0.0%	17.4	17.4	0.0	0.0%
170	8.3	8.3	0.0	0.0%	2.4	2.4	0.0	0.0%	17.4	17.4	0.0	0.0%
180	8.2	8.3	0.0	0.0%	2.4	2.4	0.0	0.0%	17.4	17.4	0.0	0.0%
190	8.2	8.2	0.0	0.0%	2.4	2.4	0.0	0.0%	17.4	17.4	0.0	0.0%
200	8.2	8.2	0.0	0.0%	2.4	2.4	0.0	0.0%	17.4	17.4	0.0	0.0%
Critical Level / Load	**30**				**1**				**10**			

Appendix D Middlemarch Project Brief (March 2023)

Creation of an Air Pollution Evidence Base Brief to Support Local Plan HRA

Staffordshire, Wolverhampton, Walsall, Sandwell and Dudley

A Report to: South Staffordshire District Council
c/o the Combined Partnership Authorities
Report Number: RT-MME-159172-01, Rev B
Date: March 2023

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Quality Assurance

Date	Version	Author	Checked by	Approved by
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11/01/2023	FINAL, Rev A	Chris Walsh BSc (Hon), MSc (Hon) (Principal Consultant)	Louise Fox BSc (Hon), GDP Law, MSc (Hon) (Principal Consultant)	Dr Amanda Flint (Biodiversity Manager)
10/03/2023	FINAL, Rev B	Chris Walsh BSc (Hon), MSc (Hon) (Principal Consultant)	Louise Fox BSc (Hon), GDP Law, MSc (Hon) (Principal Consultant)	

Declaration of Compliance

This study has been undertaken in accordance with British Standard 42020:2013 Biodiversity, Code of Practice for Planning and Development . The information which we have prepared is true, and has been prepared and provided in accordance with the Chartered Institute of Ecology and Environmental Management s Code of Professional Conduct. We confirm that the opinions expressed are our true and professional bona fide **opinions.**

Disclaimer

The contents of this report are the responsibility of Middlemarch Environmental Ltd. It should be noted that, whilst every effort is made to meet the client s brief, no site investigation can ensure complete assessment or prediction of the natural environment. Middlemarch Environmental Ltd accepts no responsibility or liability for any use that is made of this document other than by the client for the purposes for which it was originally commissioned **and prepared.**

Validity of Data

The findings of this study are valid for a period of 24 months from the date of survey. If works have not commenced by this date, an updated site visit should be carried out by a suitably qualified ecologist to assess any changes in the habitats present on site, and to inform a review of the conclusions and recommendations made.

Non-Technical Summary

Project Background
In October 2022, Middlemarch Environmental were instructed by South Staffordshire District Council (SSDC) to prepare a brief; a detailed step by step methodology of how SSDC and one or more partnership Local Planning Authorities (hereafter referred to collectively as the 'partnership authorities') could establish a scientific and robust evidence base to determine the likely air pollution impacts (via increased traffic generation) on several European sites should emerging Local Plan/s be adopted. Footprint Ecology's October 2022 Habitats Regulations Assessment (HRA) of the South Staffordshire Local Plan Review 2018-2038 (Publication Plan, Regulation 19) concluded that without additional evidence, and in line with the precautionary principle, the reasonable possibility of the proposed allocations resulting in traffic growth sufficient to have a significant impact upon several European sites via increased deposition of nitrogen (NO_x and NH_3) could not be screened out. This work is, in the first instance, to support the undertaking of the Local Plan Habitats Regulations Assessment/s for SSDC, for which Footprint Ecology Ltd has already been engaged. However, the evidence base that is to be established is planned to be sufficient (in its geographic scope and scale of considered in-combination traffic growth) to allow it to be used as an evidence base to support the HRAs of the other partnership authorities over several years, as proposed allocations within Local Plan/s move forward. This brief does not consider traffic generation created as a result of agricultural development or their subsequent operations. This brief clarifies in detail the European sites, road locations, methodology and thresholds by which further screening will be undertaken. It is important to note that if the screening threshold for a European site is exceeded, this does not result in the conclusion that increased air pollution will have a significant impact upon the qualifying features of the European site, the habitats or ecological functions upon which the qualifying feature rely or else prevent or otherwise impede the delivery of the site/s conservation objectives. Rather, it displays that there is a likelihood of such an impact occurring and that an Appropriate Assessment must be undertaken to conclude if the level of atmospheric deposition of nitrogen (and the locations within the statutory boundaries where it is deposited) is likely to result in a significant impact upon the integrity of the European site. For any European site where possible impacts cannot be screened out, this brief also outlines an approach by which an Appropriate Assessment can be undertaken to determine if the available nitrogen deposition volume and location is likely to result in a significant impact upon the integrity of the European site/s. Natural England's consideration and input into this brief was sought and written comments were provided on the 8th of February 2023. Subsequently a meeting was held between Natural England and representatives of the partnership authorities on the 14th of February 2023 where further recommendations were provided. All recommendations and further considerations raised by Natural England have been incorporated into this revised Evidence Base Brief (Rev B). The relevant European sites to be assessed are depicted in Drawing C159172-03 (see Map Annex RT-MME-159172-02). They comprise of all Special Areas of Conservation (SACs), Special Protection Areas (SPAs) and Ramsar Wetlands of International Importance land parcels where:

- The qualifying habitats or criterion for selection of the European site are known to be impacted by increased deposition of nitrogen;
- Increased deposition of nitrogen is known to impact on habitats on which the qualifying species or criterion for selection of the European site rely;
- The site is within the SSDC local plan area or the local plan area of another partner authority; or,
- The site is within 10km of the boundaries of these areas or has been identified by Natural England as requiring consideration.

The European sites considered within this brief are:

- Cannock Chase SAC;
- Pasturefields Salt Marsh SAC;
- West Midlands Mosses SAC;
- Midlands Meres and Mosses Phase 1 Ramsar Site;
- Midlands Meres and Mosses Phase 2 Ramsar Site;
- Mottey Meadows SAC;
- Cannock Extension Canal SAC;
- Fens Pools SAC,
- Peak District Dales SAC, and
- Bees Nest and Green Clay Pits SAC

Contents

1. Identification of Assessment Locations

1.1. Introduction

1.1.1. The Department of Transport's Transport Analysis Guidance[1] states *"Beyond 200m the contribution of vehicle emissions from roadside to local pollution levels is not significant"*.

1.1.2. Additionally, section 5.3.7 of the Institute of Air Quality Management (IAQM) 2020 guidance on the assessment of air quality impacts on designated nature conservation sites[2] concludes *"For strategic planning, where substantial changes in traffic volumes are being considered, there is the potential for wider-scale impacts, which can potentially affect the future background concentrations, as well as concentrations within 200m of individual roads within the affected network."*

1.1.3. The 200m atmospheric deposition distance for vehicular emissions is also recognised by Natural England in their 2018 guidance (Approach to advising competent authorities on the assessment of road traffic emission under the Habitats Regulations", (NEA001-2018))[3]. The guidance advises that the first step is to identify the spatial distribution of qualifying features within a designated site and that if there are no qualifying features sensitive to air pollution within 200m of a road, then no further assessment is required.

1.1.4. Natural England's 2018 guidance determines that a Competent Authority should consider the implications of a plan or project against three 'nitrogen thresholds' when undertaking HRA screening.

1.1.5. These thresholds are:

- An increase (on any single road) in Annual Average Daily Traffic (AADT) of 1000 domestic vehicles or greater;
- An increase (on any single road) in AADT of 200 HGV or greater; or
- That the predicted pollution concentration of nutrient deposition for the oxides of nitrogen (NO_x), ammonia (NH_3) or nitrogen (N), due to vehicular emissions and/or direct emissions from the development is:
  - Equal to or greater than 1% of the pollutants Critical Level ($\mu g/m^{3-s}$), or
  - Equal to or greater than 1% of the site's Nitrogen Critical load ($Kg/N/ha^1/year^1$).

1.1.6. It should be noted that even if a plan exceeds either, or both AADT thresholds it may still be screened out if the level of modelled emissions and nitrogen deposition are shown to be less than 1% of the Nitrogen Critical Load of the European site under consideration.

1.1.7. Additionally, the impacts of increased air pollution on European sites due to traffic growth will also be determined in line with the Institute of Air Quality Management 2020

[1] Gov.uk, Transport analysis guidance, (2021), Available at: https://www.gov.uk/guidance/transport-analysis-guidance-tag

[2] Institute of Air Quality Management, (2020), A guide to the assessment of air quality impacts on designated nature conservation sites, V1.1, Available at: https://iaqm.co.uk/text/guidance/air-quality-impacts-on-nature-sites-2020.pdf

[3] Natural England (2018), approach to advising competent authorities on the assessment of road traffic emission under the Habitats Regulations, NEA001-2018 , Available at: http://publications.naturalengland.org.uk/publication/4720542048845824

methodology[4] and using relevant critical load levels derived from the UK Air Pollution Information System (APIS) website.

1.2. Identification of Roads where Significant Traffic Growth May Occur

1.2.1. Drawing C159172-01 (see Map Annex RT-MME-159172-02) illustrates all roads within 200m of the boundary of all parcels of the ten European sites in consideration.

1.2.2. Consistent with the categories used by Footprint Ecology[5] the roads have been split into four different categories:

- *Motorways;*
- *A Roads;*
- *B Roads; or*
- *Unclassified/Minor Roads.*

1.2.3. For the majority of '*unclassified and minor roads',* due to their reduced traffic capacity and lack of connectivity between settlements and to areas of employment or services (i.e., medical, schools, provisioning, etc.) it can be considered highly unlikely the partner authorities land use allocations (either alone or in combination with partners plans) could result in a significant AADT increase (see Section 1.1.5).

1.2.4. As such (with some key exceptions) it is recommended that the majority of '*unclassified and minor roads'* can be screened out from the need for assessment of traffic growth.

1.2.5. Table 1.1. identifies what is considered to represent the key roads within 200m of the land parcels of European sites in consideration. For each key road a Recommended Assessment Point (RAP) has been determined.

[4] Institute of Air Quality Management, (2020), A guide to the assessment of air quality impacts on designated nature conservation sites, V1.1, Available at: https://iaqm.co.uk/text/guidance/air-quality-impacts-on-nature-sites-2020.pdf

[5] Footprint Ecology, (2022), HRA of the South Staffordshire Local Plan Review 2018-2038 (publication Plan, Regulation 19), Available at: https://www.sstaffs.gov.uk/planning/local-plan-review-3.cfm

European Site Name	Land Parcel (If Applicable)	Road Type	Road Name	Location/s (Grid Ref)	RAP Ref Number
Cannock Chase SAC	N/A	A	A513	SJ 97863 20801	RAP 1
		A	A460 (Rugeley Rd)	SK 02167 14729	RAP 2
		Unclassified/Minor	Camp Rd	SJ 97715 17067	RAP 3
Pasturefields Salt Marsh SAC	N/A	A	A51	SJ 99458 24888	RAP 4
West Midlands Mosses SAC and Midlands Meres and Mosses Ramsar Phase 1 Site	Chartley Moss	A	A518	SK 02143 28927	RAP 5
	Wybunbury Moss	B	B5071	SJ 69555 49964	RAP 22
Midlands Meres and Mosses Phase 2 Ramsar Site	Aqualate Mere	Unclassified/Minor	Walkley Bank	SJ 75639 20961	RAP 6
		Unclassified/Minor	Guild Lane	SJ 78883 20220	RAP 7
	Cop Mere	Unclassified/Minor	Un-named Rd to East of Cop Mere	SJ 80303 29457	RAP 8
	Black Firs & Cranberry Bog	A	A531 (Newcastle Rd)	SJ 74654 50071	RAP 23
		Unclassified/Minor	Post Office Lane	SJ 74778 50478	RAP 24
	Oakhanger Moss	Motorway	M6	SJ 77091 55066	RAP 25
Mottey Meadows SAC	N/A	Unclassified/Minor	Marston Rd	SJ 84388 13684	RAP 9
Cannock Extension Canal SAC	N/A	A	A5 (Watling St)	SK 02021 06915	RAP 10
		B	B4154 (Lime Ln)	SK 02005 06290	RAP 11
Fens Pools SAC	N/A	A	A4101 (High Street)	SO 92068 89240	RAP 12
		A	A461 (Stourbridge Rd)	SO 92407 88622	RAP 13
Midlands Meres and Mosses Ramsar Phase 1 Site	Betley Mere	Unclassified/Minor	Cracow Moss	SJ 75260 47444	RAP 14

Table 1.1: Roads to be Assessed (Continues)

European Site Name	Land Parcel (if applicable)	Road Type	Road Name	Location/s (Grid Ref)	RAP Ref Number
Peak District Dales SAC	N/A	Unclassified/Minor	The Pinch	SK 1461 5507	RAP 15
		Unclassified/Minor	Liffs Rd	SK 1579 5673	RAP 16
		Unclassified/Minor	Larkstone Lane	SK 1003 5411	RAP 17
		Unclassified/Minor	-	SK 1225 5156	RAP 18
		Unclassified/Minor	-	SK 1336 5042	RAP 19
		Unclassified/Minor	Leek Rd	SK 0984 5567	RAP 20
		Unclassified/Minor	Parwick Lane	SK 1942 5620	RAP 21
Bees Nest & Green Clay Pits SAC	N/A	Unclassified/Minor	Manystones Lane	SK 24035 54943	RAP 26

Table 1.1: (Continued) Roads to be Assessed

1.2.6. In total it is considered that a robust screening assessment could be undertaken by determining the likely impact at 26 RAPs across the total area of consideration. The location of each RAP is depicted on Drawing C159172-02 (Map Annex RT-MME-159172-02).

1.2.7. However, it is considered that there is rationale to reduce the total RAPs down to ten locations without a material reduction in the robustness of the evidence base.

1.2.8. At the evidence base's inception stage, it appears highly unlikely that the adoption of land usage allocations within any of the partnership authorities' local plans (either alone or in combination) could result in a significant impact (as a result of increased nitrogen deposition derived from traffic growth) upon:

- Chartley Moss;
- Aqualate Mere;
- Mottey Meadows;
- Betely Mere;
- Wynbunbury Moss;
- Black Firs & Cranberry Bog
- Bees Nest & Green Clay Pits SAC or
- Any land parcel of the Peak District Dales SAC.

1.2.9. The rationale for Screening out these areas from the need for further assessment are provided in sections 1.3 to 1.10.

1.2.10. Whilst it is recommended that these land parcels could be removed from the need for further assessment (without degrading the robustness of the evidence base produced) it is important that discussions with the Appropriate Authority (Natural England) are undertaken on this matter, and due regard given to their considerations before determining the final approach.

1.3. Chartley Moss, Rationale for Scoping Out

1.3.1. Within 200m of Chartley Moss (which constitutes a land parcel of both West Midlands Mosses SAC and Midlands Meres and Mosses Ramsar Phase 1 Site) it is considered that adoption of land use allocations by the partnership authorities local plans could only result in significant traffic growth on the A518 (RAP 5).

1.3.2. This is due to all other roads within 200m either only:

- Providing access to private residences, or
- Being a single tracked road, which does not act as a link between settlements or a route to the provision of services.

1.3.3. It is considered highly unrealistic that the adoption of land use allocations (from one or more partnership local plans) could result in an increase in AADT of 1000 or greater domestic vehicles or 200 or greater HGVs along a single-track road, which does not provide a clear link between two settlements or provide a route linking areas or residential growth to employment or services.

1.3.4. As such the A518 is the only key road identified in Table 1.1.

1.3.5. Section 4.19 of Natural England's 2018 guidance (see Section 1.1.3) states:

- *"An early understanding of the spatial distribution of features within a site can help to decide whether or not appropriate assessment will be required…* [if] *any sensitive qualifying features are not present within the area to be affected by emissions (and Natural England's advice is that there is no conservation objective to restore the features to that area), it will be relatively straightforward to ascertain that the plan or project poses no credible air quality risk to it*."

1.3.6. The only habitat within the SAC and Ramsar site which lies within 200m of the A518 is an area of broad-leaved deciduous woodland within Parcel 5 of the underlying Chartley Moss SSSI[6]. Broad-leaved deciduous woodland is not a qualifying feature of the SAC designation, a criterion for its selection as a Ramsar site or a habitat upon which the species (which form its criterion for Ramsar selection) rely.

[6] Natural England, Chartley Moss SSSI, Parcel 5 'RAILWAY – BUFFER', Site information, Available at: https://designatedsites.naturalengland.org.uk/UnitDetail.aspx?UnitId=1022792

1.3.7. In line with Natural England's 2018 guidance, no further assessment should be required on the Chartley Moss land parcel of the West Midlands Mosses SAC and the Midlands Meres and Mosses Ramsar Phase 1 Site.

1.4. Aqualate Mere, Rational for Scoping Out

1.4.1. No 'A' or 'B' roads lie within 200m of the boundary of Aqualate Mere.

1.4.2. Only two minor roads (Walkley Bank and Guild Lane) lie within 200m of the site boundary.

1.4.3. Both roads are single track along their entire length.

1.4.4. Walkley Bank (RAP 6) links the hamlets of Meretown and Forton.

1.4.5. Guild Lane (RAP 7) does not provide a clear link between any settlements or provide a route linking areas or residential growth to employment or services, rather it functions primarily to provide access to a small capacity car park by which members of the public can access Aqualate Mere.

1.4.6. Due to their inherent low traffic capacity and their lack of obvious connectivity between notable settlements, places of employment or services, it is considered highly unrealistic to consider that the adoption of land use allocations (from one or more local plans) would result in an increase in AADT of 1000 (or greater) domestic vehicles or 200 (or greater) HGVs on either of the minor roads within 200m of the boundary of Aqualate Mere.

1.4.7. Section 4.17 of the Natural England's 2018 Guidelines (see Section 1.1.3) states:

- *"Usually, only those European sites present within 200m of the edge of a road on which a plan or project will generate traffic will need to be considered when checking for the likelihood of significant effects from road traffic emissions."*

1.4.8. Based on the information available it appears highly unlikely that the future adoption of partnership local authorities' local plans (alone or in combination) could result in a measurable increase in annual traffic generation on either Walkley Bank or Guild Lane.

1.4.9. In line with Natural England's 2018 guidelines[7] no further assessment should be required on the Aqualate Mere land parcel of the Midlands Meres and Mosses Phase 2 Ramsar Site.

[7] [7] Natural England (2018), approach to advising competent authorities on the assessment of road traffic emission under the Habitats Regulations, NEA001-2018 , Available at: http://publications.naturalengland.org.uk/publication/4720542048845824

1.5. Mottey Meadows, Rational for Scoping Out

1.5.1. No ‘A’ or ‘B’ roads lie within 200m of the boundary of Mottey Meadows SAC.

1.5.2. Only two minor roads (Marston Road and Gay Lane) lie within 200m of the site boundary.

1.5.3. Both roads are single track along their entire length.

1.5.4. Gay Lane only provides access to a single private residence.

1.5.5. Marston Road (RAP 9) links the village of Wheaton Aston to the hamlet of Marston.

1.5.6. Due to their inherent low traffic capacity and their lack of obvious connectivity between notable settlements and places of employment or services, it is highly unrealistic to consider that the adoption of land use allocations (from one or more of the partnership authorities’ local plans) would result in an increase in AADT of 1000 (or greater) domestic vehicles or 200 (or greater) HGVs on either of the minor roads within 200m of the boundary of Mottey Meadows.

1.5.7. Based on the information available it appears highly unlikely that the future adoption of partnership local authorities’ local plans (alone or in combination) could result in a measurable increase in annual traffic generation on either Gay Lane or Marston Road.

1.5.8. In line with Natural England’s 2018[8] guidelines no further assessment should be required on Mottey Meadows SAC.

1.6. Betley Mere, Rational for Scoping Out

1.6.1. Betley Mere (a land parcel of the Midlands Meres and Mosses Ramsar Phase 1 Site) does not lie within a partnership authorities’ boundary but does lie within 10km of a jurisdictive boundary.

1.6.2. No ‘A’ or ‘B’ roads lie within 200m of the Betley Mere land parcel of the Midlands Meres and Mosses Ramsar Phase 1 Site.

1.6.3. Only one minor road (Cracow Moss) lies within 200m of the site boundary.

1.6.4. Cracow Moss (RAP 14) only provides access to a small number of scattered private residences.

1.6.5. The road is single track along its entire length.

[8] Natural England (2018), approach to advising competent authorities on the assessment of road traffic emission under the Habitats Regulations, NEA001-2018 , Available at: http://publications.naturalengland.org.uk/publication/4720542048845824

1.6.6. Due to its inherent low traffic capacity and lack of any connectivity between notable settlements and places of employment or services, it is highly unrealistic to consider that the adoption of land use allocations (from one or more of the partnership authorities' local plans) would result in any increase in AADT on Cracow Moss.

1.6.7. In line with Natural England's 2018 guidelines[9] no further assessment should be required on the Betley Mere land parcel of the Midlands Meres and Mosses Ramsar Phase 1 Site.

1.7. Wynbunbury Moss, Rational for Scoping Out

1.7.1. No part of the Wynbunbury Moss (a land parcel of the Midlands Meres and Mosses Phase 1 Ramsar Site) lies within a partnership authorities' boundary, or within 10km of any jurisdictive boundary.

1.7.2. No 'A' roads lie within 200m of the boundary of Wynbunbury Moss and only one B road, Stock Lane is present (the B5071). Where Stock Lane is present within 200m of the site it is either at the very limit of the 200m deposition distance buffer or it is separated from the Ramsar site by intervening residential development (the village of Wybunbury). It is considered that the residential developments would likely act as anthropogenic physical barriers, notably reducing the dispersal distance of any air pollution, nitrogen deposition and acidification.

1.7.3. Stock Lane (RAP 22) links the village of Wynbunbury to the village of Shavington.

1.7.4. Based on the information available it appears highly unlikely that the future adoption of partnership local authorities' local plans (alone or in combination) could result in a measurable increase in annual traffic generation between the villages of Wynbunbury to the village of Shavington.

1.7.5. In line with Natural England's 2018 guidelines[10] no further assessment should be required on the Wynbunbury Moss land parcel of the Midlands Meres and Mosses Phase 1 Ramsar Site.

1.8. Black Firs & Cranberry Bog, Rational for Scoping Out

1.8.1. No part of the Black Firs and Cranberry Bog (a land parcel of the Midlands Meres and Mosses Phase 2 Ramsar Site) lies within a partnership authorities' boundary, or within 10km of any jurisdictive boundary.

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[9] Natural England (2018), approach to advising competent authorities on the assessment of road traffic emission under the Habitats Regulations, NEA001-2018 , Available at: http://publications.naturalengland.org.uk/publication/4720542048845824

[10] [10] Natural England (2018), approach to advising competent authorities on the assessment of road traffic emission under the Habitats Regulations, NEA001-2018 , Available at: http://publications.naturalengland.org.uk/publication/4720542048845824

1.8.2. Only one A road, Newcastle Rd (the A531) and one B road (B5500) lies within 200m of the boundary of the site.

1.8.3. Newcastle Rd (RAP 23) links several small villages and hamlets, Madeley Heath, Bowsey Wood, Wrinehil, Betley, New Thorntree, Hough, Shavington and Blakelow. It is considered highly unlikely that the future adoption of partnership local authorities' local plans (alone or in combination) could result in a measurable increase in annual traffic generation between these villages.

1.8.4. The B5500 runs north of the site and only likes the hamlet of New Thorntree to the hamlet of Balterley.

1.8.5. Only two minor roads are within 200m of the boundary of the site, Waybutt Lane and Post Office Lane.

1.8.6. Waybutt Lane provides access (off of the A531) to a single farm and the village of Chorlton.

1.8.7. Post Office Lane (RAP 24) provides an alternative access from the hamlet of New Thorntree to the B5500 and is single track along the majority of its length.

1.8.8. Based on the information available it appears highly unlikely that the future adoption of partnership local authorities' local plans (alone or in combination) could result in a measurable increase in annual traffic generation between the hamlets of New Thorntree and Balterley or result in additional trips to/from the village Chorlton.

1.8.9. In line with Natural England's 2018 guidelines[11] no further assessment should be required on the Black Firs and Cranberry Bog land parcel of the Midlands Meres and Mosses Phase 2 Ramsar Site.

1.9. Bees Nest & Green Clay Pits SAC, Rational for Scoping Out

1.9.1. No part of the Bees Nest and Green Clay Pits SAC lies within a partnership authorities' boundary, but it does lie within 10km of a jurisdictive boundary.

1.9.2. No 'A' or 'B' roads lie within 200m of the SAC boundary.

1.9.3. Only two minor roads, Manystones Lane (RAP 26) and Wirksworth Dale lie within 200m of the SAC boundary.

1.9.4. Both roads are single track along their entire length. Wirksworth Dale provides access to several fields. Manystone Lane links the villages of Bassington and Bolehill.

1.9.5. Based on the information available it appears highly unlikely that the future adoption of partnership local authorities' local plans (alone or in combination) could result in a

[11] [11] Natural England (2018), approach to advising competent authorities on the assessment of road traffic emission under the Habitats Regulations, NEA001-2018 , Available at: http://publications.naturalengland.org.uk/publication/4720542048845824

measurable increase in annual traffic generation to the fields along Wirkworth Dale or between the villages of Bassington and Bolehill.

1.9.6. In line with Natural England's 2018 guidelines no further assessment should be required on the Bees Nest and Green Clay Pits SAC.

1.10. Peak District Dales SAC, Rational for Scoping Out

1.10.1. No part of the Peak District Dales SAC lies within a partnership authorities' boundary, but several land parcels are within 10km of a jurisdictive boundary.

1.10.2. In total 17 land parcels (of varying sizes) lie within 10km of the jurisdictive boundary of a partnership authority.

1.10.3. No 'A' or 'B' roads lie within 200m of any of the land parcels of the Peak District Dales SAC which are partly, or wholly, within 10km of a jurisdictive boundary of a partnership authority.

1.10.4. Whilst a large number of roads lie within 200m of the 17 land parcels, the vast majority only provide access to isolated private residences and farms or are farm tracks providing access to fields and so are not public highways.

1.10.5. It is considered that seven key roads lie within 200m of the land parcels considered (The Pinch, Liffs Road, Larkstone Lane, Leek Road, Parwick Lane and two unnamed roads). All are minor roads.

1.10.6. All seven roads are single track along their entire length.

1.10.7. None of the roads appear to function as a link between any notable settlements, to connect a settlement/s with places of employment (with the exception of agricultural access) or services.

1.10.8. Due to their inherent low traffic capacity and their lack of obvious connectivity between notable settlements and places of employment or services, it is highly unrealistic to consider that the adoption of land use allocations (from one of more of the partnership authorities' local plans) would result in an increase in AADT of 1000 (or greater) domestic vehicles or 200 (or greater) HGVs on any of the identified seven key roads within 200m of any of the land parcels of the Peak District Dales SAC.

1.10.9. Based on the information available, it appears highly unlikely that the future adoption of partnership local authorities' local plans (alone or in combination) could result in a measurable increase in annual traffic generation on any of the key roads.

1.10.10. In line with Natural England's 2018[12] guidelines no further assessment should be required on the Peak District Dales.

[12] Natural England (2018), approach to advising competent authorities on the assessment of road traffic emission under the Habitats Regulations, NEA001-2018 , Available at: http://publications.naturalengland.org.uk/publication/4720542048845824

1.11. Recommended Assessment Locations

1.11.1. Based upon the rational provided above (see Sections 1.3 - 1.10), and assuming that consultation with Natural England is completed (and they provide written conformation confirming that they concur that the reasons for removing several European sites from further consideration to be robust), the revised list of RAP's is detailed below in Table 1.2.

European Site Name	Land Parcel (If Applicable)	Road Type	Road Name	Location/s (Grid Ref)	RAP Ref Number
Cannock Chase SAC	N/A	A	A513	SJ 97863 20801	RAP 1
		A	A460 (Rugeley Rd)	SK 02167 14729	RAP 2
		Unclassified/Minor	Camp Rd	SJ 97715 17067	RAP 3
Pasturefields Salt Marsh SAC	N/A	A	A51	SJ 99458 24888	RAP 4
Midlands Meres and Mosses Phase 2 Ramsar Site	Cop Mere	Unclassified/Minor	Un-named Rd to East of Cop Mere	SJ 80303 29457	RAP 8
	Oakhanger Moss	Motorway	M6	SJ 77091 55066	RAP 25
Cannock Extension Canal SAC	N/A	A	A5 (Watling St)	SK 02021 06915	RAP 10
		B	B4154 (Lime Ln)	SK 02005 06290	RAP 11
Fens Pools SAC	N/A	A	A4101 (High Street)	SO 92068 89240	RAP 12
		A	A461 (Stourbridge Rd)	SO 92407 88622	RAP 13

Table 1.2.: Roads to be Assessed after Scoping

2. Screening Thresholds

2.1. Screening Against Modelled AADT Growth

2.1.1. A suitably experienced Traffic and Transport Consultancy (TTC) should be engaged and provided with appropriately attributed shape files of all the land use allocations of the partnership authorities where preferred options are known[13].

2.1.2. At all RAPs the TTC must model the likely traffic growth of all known site allocations over the total extent of the (combined) local plan periods. This information can be derived via Trip Rate Information Computer System datasets (TRICS[14])[15].

2.1.3. TRICS is a national system of trip generation analysis based on an extensive database formed from several thousand transport surveys. This allows TRICS datasets to determine inbound and outbound traffic generation and trip dispersal for a wide variety of development types across all geographic regions of the UK.

2.1.4. The vehicular and HGV trip generation rates for all the site allocations provided to the TCC (and the likely destinations of these new trips) can be combined to determine likely net-AADT growth at each assessment location.

2.1.5. Site allocation's that will result in the re-development of a previously developed site (especially those that result in a reallocation from employment to residential) frequently have the outcome of changing traffic types and traffic patterns. These types of site allocation often result in changes in the types and patterns of vehicle trip cause by the site and will reduce in AADT on some roads whilst increasing it on others.

2.1.6. As such, where a site allocation is for the re-development of a currently developed and still operational, only its net-increase in AADT at any RAP should be considered.

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[13] **Please note: It is understood that, at this time, many partnership authorities have not yet identified the preferred locations of future Local Plan allocations. This will not prevent the assessment being undertaken as the likely in-combination traffic growth / nitrogen deposition can be accounted for using national data sets to derive regional traffic growth factors which can then be used to reflect traffic growth from both 'unallocated partnership a thorites' and traffic growth originating from outside the combined partner authority's area (see Section 2.2). Subsequently, when a partnership authority (which currently lacks preferred allocation location data) wishes to assess the possible impacts of their own AADT growth, the traffic growth at all RAPs will need to be re-modelled (in accordance with the methodology detailed in Section 2.1), but only using the shape files of their allocations. Once AADT growth figures for that partnership authorities are determined (in isolation) they can then be compared against the previously modelled in-combination values at each RAP. Should their AADT growth be determined to be less than the previously modelled in-combination values then it can be assumed that their impacts have already been accounted for and their likely impacts fully assessed. Their AADT growth would then be deducted from the previously modelled in-combination values, reducing the 'pool' of in-combination AADT for future partnership authorities to test against. In this manner it is anticipated that the pool of in-combination AADT at each RAP will reduce over time as successive additional sets of Local Plan allocations are tested against it.**

[14] TRICS, 2022, Available at: https://www.trics.org/Default.aspx

[15] Based upon the TTC's advice, alternative traffic models to TRICS may be recommended to generate site specific trip data. These other models could be used if deemed more robust, but re-consultation with NE should occur prior to the adoption of an alternative model.

2.1.7. The net-AADT of site allocations on previously developed and still operational sites can be calculated by the TTC by:

- Determining the currently operational site's trip generation / AADT along the highway network, and
- Deducting the sites current trip generation / AADT figures from the modelled trip generation / AADT figures, attributed to its new allocation.

2.1.8. At any RAP where the likely **net-AADT of all known land usage allocations** is determined to be **0,** no further assessment is required at that location.

2.1.9. At any RAP where the likely **net-AADT of all known land usage allocations** is determined to be **between 1-999 domestic vehicles** or **1-199 HGV's,** an **in-combination assessment is required,** and the possible traffic growth caused by other plans and projects must be considered (see Section 1.6).

2.1.10. At any RAP where the likely **net-AADT of all known land usage allocations** is determined to be **1000 or greater domestic vehicles** or **200 or greater HGV's,** there is a **possible significant impact upon a European site in isolation.** In this instance then further screening against site specific critical load thresholds using nitrogen deposition modelling must occur (see Section 1.7).

2.2. Traffic Growth In-combination Assessment

2.2.1. The requirement for in-combination assessment is enshrined within the HRA process and must be undertaken on every potential impact which is shown to be insignificant in isolation.

2.2.2. By amalgamating the spatial data of all available preferred land usage allocations from multiple partnership authorities, their combined traffic growth at each RAP has already been calculated (via TRICS derived modelling) and considered against each other. However, this figure is unlikely to represent all the future traffic growth of these roads as:

- It is unable to account for traffic growth from those partnership authorities where the locations of preferred land usage allocation have yet to be determined; and
- It is unable to account for traffic growth originating from plans or projects that occur outside of the partner authority's area.

2.2.3. To account for both currently 'unallocated partnership authorities' and 'out of partnership area' growth it is considered that an appropriate value to represent likely in-combination growth could be determined by the TCC via usage of the Trip End Model Presentation Program (TEMPro[16]). TEMPro is used to view the National Trip End Model (NTEM[17])[18] which allows for the forecasting of regional traffic growth up to the end of the combined

[16] Trip End Model Presentation Program (TEMPro), available at: https://www.gov.uk/government/publications/tempro-downloads
[17] The Department for Transport (2022) National Trip End Model (NTEM), OGL, Available at: https://www.data.gov.uk/dataset/11bc7aaf-ddf6-4133-a91d-84e6f20a663e/national-trip-end-model-ntem
[18] Based upon the TTC's advice, alternative traffic models to NTEM may be recommended to generate in-combination AADT. These other models could be used if deemed more robust, but re-consultation with NE should occur prior to the adoption of an alternative model.

local plan periods. Once this growth factor is determined it can be applied to the existing base rate of AADT for the roads being assessed and the ‘in-combination AADT’ can be calculated.

- *For example: if the baseline AADT was 3000 and the growth factor was 2%, the likely ‘in-combination AADT’ would be 3060.*

2.2.4. On any road where the total value of the **known land usage allocations** generated **net-AADT** (calculated using TRICS dataset) and the forecast for the regional traffic growth (derived using TEMPro) is **less than 1000 AADT for domestic vehicles** or less than **200 AADT for HGV** then it has been clearly demonstrated that the **adoption of the known allocations, in combination with other plans, are highly unlikely to result in a significant impact** to that European site (due to increased traffic emissions).

2.2.5. On any road where the total value of **the known land usage allocations generated net-AADT** and the forecast for the regional traffic growth is **1000 AADT or greater for domestic vehicles**, or **200 AADT or greater for HGVs**, then there is a **possible significant impact upon a European site in combination with other plans.** In this instance, further screening against site specific critical load thresholds using nitrogen deposition modelling must occur (see Section 1.7).

2.2.6. It is noted that to allow for in-combination traffic growth to be calculated via TEMPro, the current baseline traffic rate for the roads at each RAP will need to be determined (where it has been concluded that net-AADT of all known allocations is less than 0). Whilst recent baseline traffic rate data may already be available for ‘A’ and ‘B’ roads, it is considered unlikely that this information will be available for the majority (or possibly all) of the unclassified / minor roads. As such, the existing traffic level at several RAPs may need to be determined via a new traffic counting survey.

2.2.7. The undertaking of traffic counting surveys is restricted to certain times of the year (i.e., periods deemed to represent ‘usual traffic’).

2.2.8. Where and when additional traffic counting surveys will need to be undertaken will need to be discussed with the TCC upon their appointment to ensure that robust and current traffic figures are available at all RAP locations where an in-combination assessment needs to be undertaken.

2.3. Screening Against Modelled Air Pollution, Nitrogen Deposition and Acidification.

2.3.1. A suitably experienced Air Quality Consultant (AQC) should be engaged and provided with the traffic growth data for all RAP locations where the net-AADT (alone or in-combination exceeds either of the traffic screening thresholds (see Section 1.1.5.).

2.3.2. The AQC will be instructed to model[19] the levels of gaseous ammonia (NH_3) and the oxides of Nitrogen (collectively NO_x) generated by the likely traffic growth along a 200m transect (running from the RAP location towards the nearest location in the Europeans site where the qualifying habitat is present (or habitats upon which the qualifying species relies).

2.3.3. The AQC will also determine the levels of deposition of nitrogen and acidification that could occur from the modelled levels of pollutants along the same 200m transect.

2.3.4. The AQC should take account or relevant meteorological data for each RAP where a transect is to be modelled.

2.3.5. **Critical Levels for NO_x and NH_3**

- In extreme cases NO_x can be directly toxic to vegetation and so impact directly on the qualifying habitats of European sites, but its main importance is as a source of nitrogen, which is then deposited. The 'critical level' is the atmospheric concentration at which NO_x could begin to directly impact upon vegetation. **For NO_x the critical level**, as detailed on the UK Air Pollution Information System (APIS)[20], **is 30 µg/m$^{3\text{-}s}$**. As such, **if the change in concentration is predicted to be greater than 0.3 µg/m$^{3\text{-}s}$, then 1% of the critical level has been exceeded**.

- NH_3 differs from NO_x in that it is both a source of nitrogen and is also directly toxic to vegetation in relatively low concentrations. **For NH_3 the critical level**, as detailed on the UK Air Pollution Information System (APIS)[21], **is either 1 µg/m$^{3\text{-}s}$ for lower plants or 3 µg/m$^{3\text{-}s}$ for higher plants**. To determine which critical level should be accessed against consideration must be given as to which order/s of plant constitute a key ecological component of the qualifying habitat, or habitat on which qualifying species rely. If lower plants (bryophytes, stoneworts, liverworts etc.) are considered to constitute a key ecological component then the lower value should be used. As such, **if the change in concentration is predicted to be greater than either 0.01 µg/m$^{3\text{-}s}$ or 0.03 µg/m$^{3\text{-}s}$ (whichever is determined to be most appropriate), then 1% of the critical level has been exceeded.**

- The change in pollutant concentrations due to the modelled traffic growth is known as the Process Contribution (PC).

[19] Via usage of ADMS-Roads, the Emission Factor Toolkit (EFT) or another recognised pollution model.
[20] UK Air Pollution Information System (APIS), 2020, Available at: https://www.apis.ac.uk/
[21] UK Air Pollution Information System (APIS), 2020, Available at: https://www.apis.ac.uk/

- To determine in-combination impacts and to see if the predicted traffic growth will result in a significant change in pollutant concentration, the PC is added to the background levels of each pollutant at, or near to each RAP. When the PC is added to the background level it is referred to as the predicted environmental concentration (PEC). The PEC should be determined across the total time period of the local plans.

- Two PEC scenarios should be modelled to estimate changes in pollution concentration: '**with adoption of preferred land usage allocations**' and '**without adoption of preferred land usage allocations**'. This allows for the impacts of the adopted plans to be compared against a 'do nothing scenario' (i.e., where local plans are not ever adopted). The change in pollution concentration between the 'do something scenario' (i.e., adopt local plans) to be directly assessed against the 'do nothing scenario' across each year of the local plan. The difference between the PEC of the two scenarios can then be determined and expressed as a percentage change of the critical level. If it is found that it is likely that 1% of the critical level will be exceeded (for one or more years across the span of the local plan) then Appropriate Assessment will need to be undertaken (see Chapter 3).

- For many of the RAP's, additional work has already occurred to better understand the background levels of pollutants via a network of diffusion tube monitoring stations installed by the Cannock Chase SAC Partnership. This diffusion tube monitoring provides data on the background concentrations of NO_x and NH_3 for six of the European sites being considered which can be used to complement modelled regional information provided by the APIS website[22]. The locations of these monitoring station are depicted on drawing C159172-01-02 (see Chapter 4).

- Where the Cannock Chase SAC Partnership has not established a monitoring station near to a RAP, the background pollution levels may be able to be derived from data from nearby monitoring stations established by highways or other local authority departments (Environmental Health). If no relevant monitoring station data is available, then modelled background pollution concentration across the whole of the UK (5km grid squares) is available from the APIS website[23].

- For each European site considered, the site-specific critical levels are displayed in Table 2.2. This information is provided by the UK Air Pollution Information System (APIS)[24].

2.3.6. Nitrogen Critical Load

- Nitrogen deposition is a form of eutrophication, derived from the combined nitrogen of NO_x and NH_3. Eutrophication negatively effects the biodiversity and ecological functions of habitats over time, altering soil chemistry and encouraging more competitive plant species. In aquatic habitats, nutrient enrichment frequently results in algal blooms, reducing water quality and resulting in anoxic conditions.

[22] UK Air Pollution Information System (APIS), 2020, Available at: https://www.apis.ac.uk/
[23] UK Air Pollution Information System (APIS), 2020, Available at: https://www.apis.ac.uk/
[24] UK Air Pollution Information System (APIS), 2020, Available at: https://www.apis.ac.uk/

On terrestrial habitats, new plant species can force out less competitive species assemblages, which often constitute the qualifying habitats of a European site, or provide the specific conditions needed to maintain healthy populations of the qualifying species. The nitrogen deposition rate below which these harmful ecological effects would not occur is referred to as the 'critical load'; these are different for each habitat.

- For each European site considered, the site-specific critical loads are displayed in Table 2.2. This information is provided by the UK Air Pollution Information System (APIS)[25].
- The critical loads for nitrogen deposition are described in the units of $Kg/N/ha^{1}/year^{1}$.
- Deposition rates for nitrogen are calculated by multiplying the ground level concentration of the appropriate pollutant by the appropriate deposition velocity, followed by multiplication with a conversion factor[26]. Deposition velocities and conversion factors for nitrogen deposition NO_x and NH_3 are provided in Table 2.1.

Pollutant	Vegetation type	Deposition velocity	Conversion factor for nitrogen deposition (from $\mu g/m^{3-s}$ to $kg/N/ha^{1}/year^{1}$)
NO_x	Grassland (sites with short vegetation)	0.0015	96
	Woodland (sites with tall vegetation)	0.003	
NH_3	Grassland (sites with short vegetation)	0.02	260
	Woodland (sites with tall vegetation)	0.03	

Table 2.1: Pollutant Deposition Velocities and Conversion Factors

2.3.7. If the calculations determine the modelled nitrogen deposition will meet or exceed 1% of the lowest range of the site-specific critical load (see Table 2.2), then Appropriate Assessment will need to be undertaken to determine if their levels, location and temporal span of the nitrogen deposition could impact upon the integrity of the European site (see Chapter 3).

2.3.8. **Acid Deposition Critical Load**

[25] UK Air Pollution Information System (APIS), 2020, Available at: https://www.apis.ac.uk/

[26] Deposition velocities and conversion factors provided via Institute of Air Quality Management, (2020), A guide to the assessment of air quality impacts on designated nature conservation sites, V1.1, Available at: https://iaqm.co.uk/text/guidance/air-quality-impacts-on-nature-sites-2020.pdf

- A range of air pollutants can cause the acidification of soil and freshwater. The key pollutants are sulphur, in the form of sulphate ions (SO_4^{2-}), and nitrogen, as nitrate (NO_3^-), nitric acid (HNO_3) and ammonium ($NH4^+$) which arises from ammonia.

- Acid deposition predominantly impacts vegetation indirectly through changes to soil properties, with increasing the soil acidity, tending to increase the mobility of toxic metals (i.e., aluminium and manganese). Acid deposition is also known to result in root damage and nutrient deficiencies within the soils, both of which can stunt plant growth.

- How great a habitat is at risk from acid deposition is mainly dependant on the soil type, bedrock geology, weathering rate and its buffering capacity. In general, habitats dependent on slightly acidic substrate (i.e., heathland or acid grassland) and bog habitats are at greater risk of being adversely affected by increased rates of acid deposition compared with those associated with calcareous soils.

- Traffic emissions generate a negligible amount of additional sulphur, and so increased acid deposition is mostly a result of additional levels of nitrate and ammonium. These deposition rates must be modelled by the AQC, combined and then assessed against the site specific Minimum Critical Load for each European site provided by APIS. The relevant Minimum Critical Loads are provided in Table 2.2.

- It should be noted that, assuming Natural England agrees with the rationale for screening out several European sites from the need for assessment (see Sections 1.3 - 1.10, the determination of Acid Deposition against Minimum Critical Load levels is only possible / applicable for Cannock Chase SAC.

European Site of land parcel	Relevant RAP/s	Q.habitat/s or habitats which Q.species rely	Critical Level (µg/m^{3-s})	Critical Load range (kg/N/ha^{1}/year^{1})	Critical Load N Acid Dep (keq/ha/yr MinCLMaxN)	Pollutants	Recommended Vegetation type when Determining Deposition Velocity	Recommended Deposition Velocity NO_x / NH_3
Cannock Chase SAC	1,2,3	European dry heaths	1	10-20	1.285	NO_x / NH_3	Grassland – for RAP 1&3 Woodland – for RAP 2[27]	0.0015 / 0.003 0.02 / 0.03
		Northern Atlantic wet heaths with *Erica tetralix*	1					
Pasturefields Salt Marsh SAC	4	Inland salt meadows	3	20-30[28]	N/A[29]	NO_x / NH_3	Grassland	0.0015 / 0.003
Chartley Moss	5	Natural dystrophic lakes and ponds[30]	1	3-10	0.621	NO_x / NH_3	Grassland	0.0015 / 0.003
		Transition mires and quaking bogs[31]	1	10-15	0.621			
Aqualate Mere	6, 7	Fen, marsh and swamp (*Juncus effusus / acutiflorus - Galium palustre* rush pasture)	1	15-25	4.506	NO_x / NH_3	Grassland	0.0015 / 0.003
		Fen, marsh and swamp (*Filipendula ulmaria - Angelica sylvestris* mire)	1	15-30	4.506[32]			
		Fen, marsh and swamp (*Phragmites australis* swamp and reed-beds)	1	15-30	N/A[33]			

Table 2.2: Site Specific Critical Levels, Loads and Deposition Velocities (Continues)

[27] Representative of substantial area of mature woodland between road and qualifying habitat
[28] No critical load range is available for inland salt meadows, as such the values for coastal saltmarsh are recommended to be used instead.
[29] Habitat not sensitive to acidification.
[30] Not within 200m of key road
[31] Not within 200m of key road
[32] Habitat not sensitive to acidification.
[33] Habitat not sensitive to acidification.

European Site of land parcel	Relevant RAP/s	Q.habitat/s or habitats which Q.species rely	Critical Level (μg/m3-s)	Critical Load range (kg/N/ha1/year1)	Critical Load N Acid Dep (keq/ha/yr MinCLMaxN)	Pollutants	Recommended Vegetation type when Determining Deposition Velocity	Recommended Deposition velocity NO_x / NH_3
Cop Mere	8	Permanent dystrophic lakes, ponds and pools	1	10[34]	N/A[35]	NO_x / NH_3	Grassland	0.0015 / 0.003
Cannock Extension Canal SAC	10, 11	Permanent oligotrophic waters: Softwater lakes	3	10[36]	No critical loads available	NO_x / NH_3	Grassland	0.0015 / 0.003
Fens Pools SAC	12, 13	Permanent oligotrophic waters: Softwater lakes[37]	3	10[38]	No critical loads available	NO_x / NH_3	Woodland[39]	0.02 / 0.03
Betley Mere	14	Fen, marsh and swamp (*Juncus effusus / acutiflorus - Galium palustre* rush pasture)	1	15-25	1.133	NO_x / NH_3	Grassland	0.0015 / 0.003
		Fen, marsh and swamp (*Juncus subnodulosus - Cirsium palustre* fen meadow)	1	15-30	1.133			
		Fen, marsh and swamp (*Phragmites australis* swamp and reed-beds)	1	15-30	N/A[40]			

Table 2.2: (Continued) Site Specific Critical Levels, Loads and Deposition Velocities (Continues)

[34] Range is between 3-10 kg/N/ha1/year1. The lower end of the range is intended for boreal and alpine lakes, and the higher end of the range for Atlantic softwaters. Site conditions considered to more closely relate to Atlantic softwaters so a critical load of 10 kg/N/ha1/year1 is recommended.
[35] Habitat not sensitive to acidification.
[36] Range is between 3-10 kg/N/ha1/year1. The lower end of the range is intended for boreal and alpine lakes, and the higher end of the range for Atlantic softwaters Site conditions considered to more closely relate to Atlantic softwaters so a critical load of 10 kg/N/ha1/year1 is recommended.
[37] No critical load data in available for the breeding pool utilised by the sites qualifying species (great crested newts). As such the values for softwater lakes are recommended to be used instead
[38] Range is between 3-10 kg/N/ha1/year1. The lower end of the range is intended for boreal and alpine lakes, and the higher end of the range for Atlantic softwaters.. Site conditions considered to more closely relate to Atlantic softwaters so a critical load of 10 kg/N/ha1/year1 is recommended.
[39] Representative of substantial areas of mature woodland between both key roads and qualifying habitat.
[40] Habitat not sensitive to acidification.

European Site of land parcel	Relevant RAP/s	Q.habitat/s or habitats which Q.species rely	Critical Level ($\mu g/m^{3-s}$)	Critical Load range ($kg/N/ha^1/year^1$)	Critical Load N Acid Dep (keq/ha/yr MinCLMaxN)	Pollutants	Recommended Vegetation type when Determining Deposition Velocity	Recommended Deposition velocity NO_x / NH_3
Peak District Dales SAC	15 - 21	Various	1	Consult Natural England[41]	Various[42]	NO_x / NH_3	Grassland Woodland	0.0015 / 0.003 0.02 / 0.03
Wybunbury Moss	22	Raised and blanket bogs	1	5-10	0.562	NO_x / NH_3	Grassland	0.0015 / 0.003
Black Firs & Cranberry Bog	23, 24	Broadleaved deciduous woodland	1	10-20	1.855	NO_x / NH_3	Woodland (RAP 23)	0.02 / 0.03
		Raised and blanket bogs	1	5-10	0.574	NO_x / NH_3	Grassland (RAP 24)	0.0015 / 0.003
Oakhanger Moss	25	Broadleaved deciduous woodland	1	10-20	1.946	NO_x / NH_3	Woodland	0.02 / 0.03
		Carex Acutiformis Swamp	3	N/A[43]	N/A[44]	N/A	N/A	N/A
		Rich fens	3	15-30	N/A[45]	NO_x / NH_3	Grassland	0.0015 / 0.003
		Valley mires, poor fens and transition mires	1	10-15	0.9			
		Raised and blanket bogs	1	5-10	0.573			
		Moist and wet oligotrophic grasslands: Molinia caerulea meadows	1	15-25	1.338			

Table 2.2: (Continued) Site Specific Critical Levels, Loads and Deposition Velocities (Continues)

[41] Due the site containing seven different qualifying habitats and uncertainty over their geographic distribution within the considered land parcels of the SAC it is unclear which critical load level/s to use. If it is determined that any parcels of the Peak District Dales SAC do require assessment (see Section 1.7) Natural England should be consulted as to the appropriate critical load/s to test against.
[42] Due the site containing seven different qualifying habitats and uncertainty over their geographic distribution within the considered land parcels of the SAC it is unclear which critical load level/s to use. If it is determined that any parcels of the Peak District Dales SAC do require assessment (see Section 1.7) Natural England should be consulted as to the appropriate critical load/s to test against.
[43] Habitat not sensitive to eutrophication.
[44] Habitat not sensitive to acidification.
[45] Habitat not sensitive to acidification.

European Site of land parcel	Relevant RAP/s	Q.habitat/s or habitats which Q.species rely	Critical Level ($\mu g/m^{3-s}$)	Critical Load range ($kg/N/ha^1/year^1$)	Critical Load N Acid Dep (keq/ha/yr MinCLMaxN)	Pollutants	Recommended Vegetation type when Determining Deposition Velocity	Recommended Deposition velocity NO_x / NH_3
Bees Nest & Green Clay Pits SAC	26	Sub-atlantic semi-dry calcareous grassland	1	15-25	4.954	NO_x / NH_3	Grassland	0.0015 / 0.003

Table 2.2: (Continued) Site Specific Critical Levels, Loads and Deposition Velocities

3. Appropriate Assessment

3.1. Determining Likely Impacts of Nitrogen Deposition on the Integrity of a European site

3.1.1. A suitably experienced Ecological Consultant (EC) should be engaged and provided with all reports and modelled data completed by the TTC and AQC.

3.1.2. An Appropriate Assessment (AA) must be undertaken of all European sites where all the below criteria have been met:

- The sites qualifying habitats (or habitat on which the qualifying species rely) which are sensitive to air quality impacts;
- The sites qualifying habitats are within 200m of a road/s;
- Quantifiable traffic growth on the identified road/s is a reasonable possibility;
- The traffic growth at one or more RAP meets or exceeds a net-growth of 1000 AADT for vehicles or 200 AADT for HGVs; either alone (derived through use of TRICS) or in-combination with other plans or projects (derived through use of TEMPro); and
- The modelled air pollution concentration meets or exceeds 1% of critical level for NO_x, NH_3 and/or 1% of the site-specific critical load for nitrogen deposition and/or the site specific acid deposition minimum critical load (where applicable) is met or exceeded; either alone or in combination.

3.1.3. The purpose of AA should first be to determine the scope and scale of the possible impacts and to ascertain if they are sufficient to affect the integrity of the European site. The integrity of the European site is unlikely to be affected if it can be demonstrated that "**it is highly unlikely that traffic growth will result in a significant impact upon the qualifying features of the sites, will prevent the attainment of the site's conservation objectives or otherwise impede their delivery**".

3.1.4. At this nascent stage of the establishment of the evidence bases, it is not possible or appropriate to anticipate which of the European sites considered (if any) will need to progress to AA, or the outcome of those assessments.

3.1.5. However, the following are considered material questions that should be answered by the EC at AA to allow the impact of traffic growth on a sites integrity to be robustly understood:

- Does the qualifying habitat occur in any area where the modelled air pollution, nitrogen deposition and acidification concentrations meet or in exceed 1% of the critical level / load.
- What is the total measured area of the qualifying habitat where critical levels/critical loads are likely to be in exceedance?
- Does the total measured area of any qualifying habitat where critical levels/critical loads are likely to be in exceedance represent a notable percentage of its total area within the European site?

- If the habitat is not the qualifying feature, but instead supports a qualifying species, is it likely that the additional levels of air pollution / nitrogen deposition will result in habitat quality degradation sufficient to impact upon the population or distribution of the qualifying species?
- Is there any habitat, ecological or geological features (either within the site, functionally connected to, or between the road and modelled deposition areas) which may buffer, mitigate or exacerbate the likely impacts of air pollution or nitrogen deposition?
- What is the temporal span of the air pollution, nitrogen deposition or acidification concentration (at or in exceedance of critical levels) across the modelled local plan period?

3.1.6. For any European site where the EC determines that the best scientific evidence available does not suggest that 'it is highly unlikely that traffic growth will prevent the attainment of the site's conservation objectives or otherwise impede their delivery', then it should be deemed that a significant impact upon the site is likely, and mitigation against the likely scale or harm must be determined.

3.2. Determining Proportional Mitigation

3.2.1. As with AA, it is not possible or appropriate to anticipate which of the European sites may require mitigation against the impacts of air pollution or nitrogen deposition. However, it is a requirement of HRA that all mitigation is both proportional to the scale of determined impact and securable.

3.2.2. Any proposed mitigation must be discussed and developed in concert with the considerations of Natural England.

3.2.3. It is considered that there are four main mitigation pathways available to the partnership authorities:

- **Policy;**
- **Habitat management;**
- **Redirection of traffic; or**
- **Increased interception or abstraction of air pollution.**

3.2.4. In the future **Policies** which promote or require the following are likely to reduce the level of traffic growth and / air pollution that is discharged for vehicles have the potential to be considered as mitigatory. However, advice provided by Natural England[46] suggest that insufficient evidence is currently available to robustly determine the likely extent by with policies alone are able to reduce air pollution impacts to European sites. As such, if used, any mitigation of impacts via new policy adoption must form part of an extensive suit of other mitigatory measures. Their inclusion should be viewed more as bringing

[46] Communications from Natural England, 8/02/2023

'added benefit' rather than being a 'mitigatory solution' in and of themselves. That notwithstanding, policies which promote the following should be considered:

- Reduction of reliance on private cars via promotion of sustainable transport (train, bus, cycles, walking networks etc.);
- Increased provision for electric cars (including setting expected percentages for charging and incorporation within new residential, employment and provisioning/servicing developments), and
- Improved communication infrastructure (ensuring that developments make provision for high-speed internet and telecommunications potentially reduces the need to travel, particularly during the morning and evening peak hours).

3.2.5. On some European sites it may be possible that additional **habitat management** could be enacted upon the areas where nitrogen deposition is in exceedance of critical load so as to increase the speed of the nitrogen cycle; removing available 'nutrient nitrogen' from the soil at an accelerated rate. However, it must be noted that forms of habitat management that improve the condition of European sites more generally will be considered as a compensatory measure by Natural England and so should be avoided. This mitigation could take the form of:

- Cutting and collecting vegetation to reduce nutrient levels in soil,
- Spot treatment of areas of undesirable 'high nutrient' plant species,
- Encouraging conditions for de-nitrifying plants or bacterial species to become abundant, or
- The introduction of conservation grazing regimes to reduce nutrient levels in soil.

3.2.6. These additional habitat management prescriptions could be funded via proportional developer contributions from new residential and employment developments across the partnership authorities.

3.2.7. However, any new mitigatory habitat management suggested will need to ensure that:

- It is additional to current management being enacted (i.e., through an existing agreed Agri-environment scheme etc.);
- It is possible (physically and legally);
- It has been agreed with the landowner;
- The delivering party has been identified (if other than the landowner);
- That management will occur across a temporal span which equals (and preferably exceeds) the time where deposition will meet or exceed 1% of the critical load;
- That its enactment will not result in additional ecological harm, or-else this harm can also be mitigated against (i.e., disturbance or nesting / overwintering birds, injury to protected species, overgrazing, etc.); and
- That Natural England agree that this management represents mitigation and not compensation.

3.2.8. **Redirection of traffic** could be achieved via the creation of one or more Clean Air Zones (CAZ), which would charge a toll to use certain roads with certain vehicle types. This approach has recently been taken to resolve air pollution and nitrogen deposition issues impacting upon the Epping Forest SAC[47]. However, it is unclear if such an approach is practical within the partnership authorities' areas, how such a scheme would be developed and how long it would take to enact.

3.2.9. **Increased interception or abstraction of air pollution** may be possible via the creation of addition man-made air pollution control barriers, the planting and management of additional roadside trees or creation of new intervening woodland blocks.

3.2.10. Man-made air pollution control barriers have the benefit of being immediately affective once installed but thy are often considered to be 'unsightly'. For roadside trees and woodland trees will need to be semi-mature before they begin to meaningfully reduce the level of air pollution reaching the qualifying habitats via both mechanical (i.e., acting as a physical barrier increasing deposition rates) and biological means (i.e., nutrient uptake).

3.2.11. The creation of man-made air pollution control barriers or additional tree / woodland planting and management could be funded via proportional developer contributions from new residential and employment developments across the partnership authorities.

3.2.12. However, the practicality of mitigation by this means and the likely levels of air pollution reduction that it could reliably account for, will need to be carefully considered.

3.2.13. For example, tree planting close to highways may not be practical due to lack of available land, health and safety concerns (because of future overhanging trees) or the potential to impact upon pre-existing underground services.

3.2.14. Also (as with habitat management) any suggested mitigation via new tree planting will need to ensure:

- It is possible (physically and legally);
- It has been agreed with the landowner;
- The delivering party has been identified (if other than the landowner); and
- That mitigation will be affective (i.e., the tree will reach a required minimum height/size) by the start of the temporal span which equals (and preferably exceeds) the time where deposition will meet or exceed 1% of critical load.

3.2.15. The species composition and starting age/size of any trees planted will have a material effect on the likely success of the mitigation. For example, the planting of semi-mature fast growing conifer species could quickly establish a new vegetative barrier and maintain it through all seasons.

[47] Epping Forest District Council, (2020), Epping Forest Interim Air Pollution Mitigation Strategy: Managing the Effects of Air Pollution on the Epping Forest Special Area of Conservation, Available at: https://www.eppingforestdc.gov.uk/wp-content/uploads/2021/02/Interim-Epping-Forest-Air-Pollution-Mitigation-Strategy.pdf

3.2.16. However, the planting of new areas of woodlands and roadside trees (especially conifers) could cause several concerns that would need to be considered and addressed prior to the adoption of mitigation by this method, including:

- Impacts upon biodiversity and ecological connectivity;
- Visual impact; and
- Impacts upon landscape character.

Appendix E Natural England Letter (April 2023)

Date: 14 April 2023
Our ref: 427535
Your ref: Air Pollution Evidence Base, Rev B

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Combined Partnership Authorities

BY EMAIL ONLY

Dear Sirs

Planning consultation: Creation of an Air Pollution Evidence Base Brief to Support Local Plan HRA
Location: Staffordshire, Wolverhampton, Walsall, Sandwell and Dudley

Thank you for your consultation on the above report.

Natural England is a non-departmental public body. Our statutory purpose is to ensure that the natural environment is conserved, enhanced, and managed for the benefit of present and future generations, thereby contributing to sustainable development.

The aim of this report is to present a detailed step by step methodology of how the Local Planning Authorities in the above locations will determine the likely air pollution impacts (via increased traffic generation) on several European sites should emerging local plans be adopted.

The report presents a rationale for why certain European sites can be "screened out" from requiring detailed assessment of air quality impacts. For certain European sites that cannot be screened out it presents a methodology for how air quality impacts from emerging local plans will be assessed.

We have reviewed the report and can confirm that it has been prepared in full accordance with Natural England's approach to advising competent authorities on the assessment of road traffic emissions under the Habitats Regulations. We are therefore able to support the report's methodology and its conclusions.

Should relevant legislation or guidance change the report will need to be reviewed. Should the report itself change please consult us again.

Yours sincerely

Paul Horswill

Dr Paul Horswill
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