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HS2

High Speed Rail (Crewe – Manchester) Environmental Statement

Volume 5: Appendix EC-016-00001

Ecology and biodiversity

Document to inform a Habitats Regulations Assessment for the Midland Meres and Mosses Phase 2 Ramsar site (Oak Mere) and Oak Mere Special Area of Conservation

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Department for Transport

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Contents

Tables

Figures

1 Introduction

1.1 Purpose of report

1.1.1 There are certain ecological sites that are designated for their international importance and to which special considerations attach under the Conservation of Species and Habitat Regulations 2017 ('the Habitats Regulations')[1], either through operation of law or government policy.

1.1.2 These sites include Special Areas of Conservation (SAC) that have been designated to protect certain species and habitats; Special Protection Areas (SPA), designated to protect certain species of wild birds; and Ramsar sites designated to protect internationally important wetland areas.

1.1.3 These sites are subject to special legal protection that imposes restrictions on a 'competent authority' from granting consent permission or authorisations for any plan or project that may affect the conservation status and integrity of these designations. In the case of the hybrid Bill, the responsible competent authority is Parliament as it is the enactment of the Bill as legislation that grants consent for the hybrid Bill scheme to be undertaken.

1.1.4 The Habitats Regulations require the competent authority, before deciding to undertake, or give any consent, permission or other authorisation for, a plan or project which is likely to have a significant effect on these designated sites (either alone or in combination with other plans or projects) to make an appropriate assessment of the implications of the plan or project for potentially affected sites in view of those sites' conservation objectives.

1.1.5 There are normally two stages in the process of discharging the duties imposed by the Habitats Regulations. The first is to undertake a 'screening' exercise to determine whether there is no reasonable scientific doubt that the plan or project will be likely to have a significant effect on the site's conservation objectives. If no such likelihood is identified, the competent authority may proceed to grant consent for the plan or project in question. If, on the other hand, there remains a reasonable scientific doubt as to its effects on the integrity of the site at this stage, the competent authority must move to a second stage and undertake a more detailed assessment, commonly referred to as an 'appropriate assessment' to determine whether, having regard to any mitigation measures that are proposed to be adopted in the delivery of the scheme, there will be an adverse effect on the integrity of the site.

[1] *The Conservation of Habitats and Species Regulations 2017* (2017/1012), as amended by The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019 (2019/579). London, Her Majesty's Stationery Office.

1.1.6 If the appropriate assessment does not identify an adverse effect on the integrity of the site, the competent authority may proceed to grant the consent. If an adverse effect cannot be ruled out, consent can only be granted on the basis that there are: no alternative solutions; there are imperative reasons of overriding public importance for the plan or project to proceed; and appropriate compensatory measures have been secured.

1.1.7 It is Parliament as legislator (and not HS2 Ltd as the prospective developer) that is the competent authority and the body which is required to comply with the requirements of the Habitats Regulations. The purpose of this Habitat Regulations Assessment (HRA) report is, however, to provide information to Parliament, based on HS2 Ltd's assessment of the hybrid Bill scheme, in order to inform and assist Parliament in complying with its obligations under the Habitats Regulations.

1.2 Background

1.2.1 Construction of the Proposed Scheme will lead to the re-distribution of vehicles along the A49 and A54 where they lie adjacent to Oak Mere Site of Special Scientific Interest (SSSI). It is one of 18 component SSSI of the Midland Meres and Mosses Phase 2 Ramsar site (or European site), distributed across Cheshire, Shropshire, Powys and beyond (Figure 1). It is also designated as Oak Mere SAC. The risk of pollution from this traffic prompted production of this report to inform the HRA.

1.2.2 In addition, the potential effects of air pollution arising from the Proposed Scheme has required the preparation of a new document to inform the HRA for a further component of the Midland Meres and Mosses Phase 2 Ramsar site: Oakhanger Moss SSSI (see Volume 5 Appendix: EC-016-00006).

1.2.3 This report has been prepared to provide all the necessary information for the competent authority to carry out an HRA under Regulation 63 of the Conservation of Habitats and Species Regulations 2017, as amended by the Conservation of Habitats and Species (amendment) (EU Exit) Regulations 2019[2]. It is informed by contemporary Department for Environment, Food and Rural Affairs (Defra), and Ministry of Housing, Communities and Local Government (MHCLG) guidance[3,4] and best practice. Where relevant, it takes full account of case law including the People Over Wind[5] and Wealden[6] judgements.

[2] The amending regulations generally seek to retain the requirements of the 2017 Regulations but with adjustments for the UK's exit from the European Union. See Regulation 4, which also confirms that the interpretation of these Regulations as they had effect, or any guidance as it applied, before exit day, shall continue to do so.

[3] Department for Environment, Food and Rural Affairs and Natural England (2021), *Habitats regulations assessments: protecting a European site.* Available online at: https://www.gov.uk/guidance/habitats-regulations-assessments-protecting-a-european-site.

2 Context

2.1 Description of the Proposed Scheme

2.1.1 The Proposed Scheme comprises the construction and operation of a high speed railway route between Crewe and Manchester with a connection onto the West Coast Main Line (WCML). Oak Mere is situated approximately 9.7km west of the land required for the construction of the Proposed Scheme in the Wimboldsley to Lostock Gralam area (MA02). Here, the route of the Proposed Scheme will be approximately 14.6km long, extending from Hough to Walley's Green area (MA01) in the south and north past the Crewe North RSD and on to Pickmere to Agden and Hulseheath area (MA03). The route of the Proposed Scheme will consist of 3.9km of viaducts, 10.6km of embankments and a 160m long box structure.

2.1.2 The Proposed Scheme will result in a change to traffic flows, and associated emissions, along the A49 Tarporley Road and A54 Middlewich Road which lie adjacent to the eastern and southern boundaries of Oak Mere, respectively. There are no planned construction traffic routes running adjacent to the site. Traffic impacts are primarily a result of traffic growth from the baseline year.

2.2 Site description and conservation objectives

The Midland Meres and Mosses Phase 2 Ramsar site

2.2.1 The Midland Meres and Mosses Phase 2 Ramsar site extends over 2,365ha across 18 discrete sites[7] distributed throughout the North-West Midlands and North-East Wales, over a land area that extends 75km from north to south and 60km from west to east. Figure 1 shows the extent of the Ramsar site and the location of Oak Mere and the other constituent

[4] Ministry of Housing, Communities & Local Government (2019), *Planning Practice Guidance*. Available online at: https://www.gov.uk/guidance/appropriate-assessment.

[5] People Over Wind and Peter Sweetman v Coillte Teoranta (2018), High Court (Ireland), Case C-323/17 (also referred to as the Sweetman II judgement).

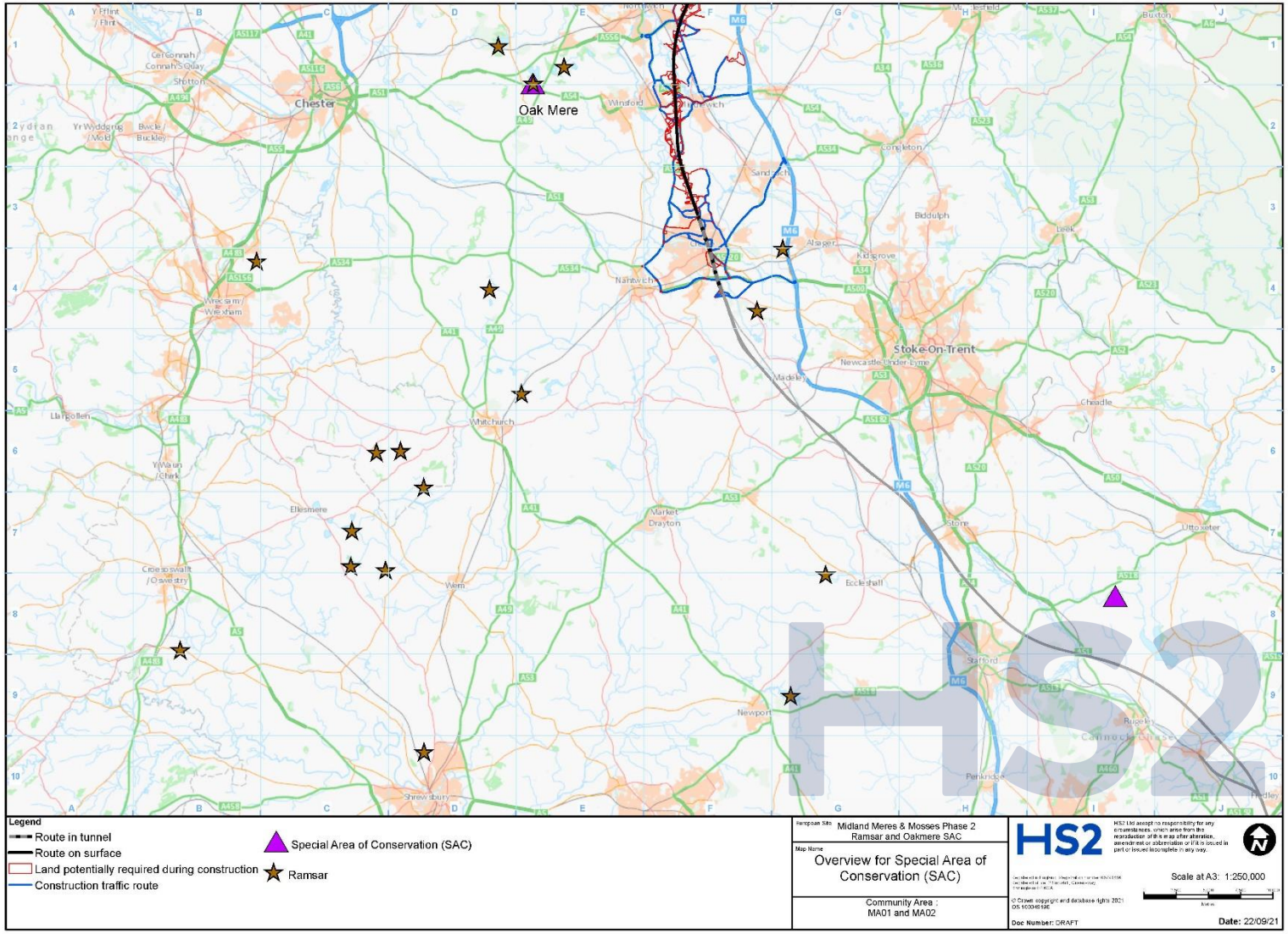
[6] Wealden District Council v SS Communities and Local Government, Lewes District Council and South Downs National Park Authority (2016), High Court of Justice, Case CO/3943/2016/ No EWHC 351.

[7] Note that the favourable condition table for Oakhanger Moss and Abbots Moss amongst others suggests that there are 19 components and includes Rostherne Mere in the list of sites. This appears to be an error. Rostherne Mere is a standalone Ramsar site. Confirmation of this can be gained by accessing the following sites: https://designatedsites.naturalengland.org.uk/SiteGeneralDetail.aspx?SiteCode=UK11080&SiteName=&countyCode=&responsiblePerson=&unitId=&SeaArea=&IFCAArea=.

SSSI relevant to the Proposed Scheme. The Ramsar Information Sheet[8] identifies that the site qualifies for Ramsar status under criteria (1) and (2) on account of the presence of 'a diverse range of habitats from open water to raised bog' and the presence of a number of rare plants and invertebrates. Elsewhere, it describes the entire Ramsar site as comprising open water (meres) and their associated fringing habitats (for example, reed swamps, fen, carr and damp pasture) and a smaller number of nutrient poor peat bogs (mosses). However, not all features are present on all sites. Although the Ramsar-qualifying features are quite broadly described, together they encompass a distinctive group of water bodies with characteristic hydrological regimes, water chemistry and animal and plant communities. However, the Ramsar Information Sheet confirms its primary interest remains the 'wide range of lowland wetland types and successional stages within a distinct biogeographical area.'

[8] Joint Nature Conservation Committee (1994), *Ramsar Information Sheet (RIS): Midland Meres and Mosses Phase 2.* Available online at: https://jncc.gov.uk/jncc-assets/RIS/UK11080.pdf.

Figure 1: Location of Oak Mere SAC and the Midland Meres and Mosses Phase 2 Ramsar site



Oak Mere SAC

2.2.2 The citation[9] for Oak Mere SAC describes the site as occupying a shallow lake which supports a unique water chemistry and outstanding assemblage of aquatic plants including shore weed (*Littorella uniflor*a) and (the nationally rare) narrow small-reed (*Calamagrostis stricta*) together with a broad range of invertebrates. A series of bog pools and basin mires are associated with the main lake and the entire site has a complex hydrological regime. The supplementary advice[10] confirms this and adds that the water is acidic, helping to support a fauna more typical of upland pools, though mesotrophic. Peat is still being actively formed in pools to the north, though it notes that much of the surrounding land is drier. Much of the site is wooded with wet carr woodland dominating around the wetter areas though this shifts to a community dominated by birch (*Betula pubescens*) and oak (*Quercus* spp) with an understorey of heather (*Calluna vulgaris*) and bilberry (*Vaccinium myrtillus*) to the south. The southern catchment is under agricultural management.

2.2.3 The qualifying habitats are listed as follows:

- H3110. Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*); and
- H7140. Transition mires and quaking bogs.

2.2.4 Further information is provided in the Favourable Condition Tables (FCT)[11] for Oak Mere SSSI. Whilst providing broadly similar targets to those described above, it should be noted that its description of the SAC features differs slightly from the formal conservation objectives, introducing a range of fen/marsh/swamp and mixed habitat communities alongside the oligotrophic waters. However, the latter is taken to embrace quaking bogs as explained in the FCT audit trail. Annex 1 of the FCT also provides 'Habitat and vegetation maps'.

[9] Department for Environment, Food and Rural Affairs (2005), *Citation for Special Area of Conservation Oak Mere.* Available online at: http://publications.naturalengland.org.uk/file/5022779573272576.

[10] Natural England (2019), *European Site Conservation Objectives: Supplementary advice on conserving and restoring site features, Oak Mere Special Area of Conservation*. Available online at: http://publications.naturalengland.org.uk/file/6251953487347712.

[11] Natural England (2009), *Conservation Objectives and Definitions of Favourable Condition for Designated Features Of Interest, Oak Mere.*

Conservation objectives

2.2.5 The conservation objectives[12] for Oak Mere SAC state:

> 'Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring:
>
> - the extent and distribution of qualifying natural habitats;
> - the structure and function (including typical species) of qualifying natural habitats; and
> - the supporting processes on which qualifying natural habitats rely'.

2.2.6 These are given greater expression in the associated 'Supplementary advice' and Site Improvement Plan (SIP)[13]. Both identify physical modification and 'air pollution' as negative factors. In addressing air pollution, the supplementary advice aims to:

> 'Restore as necessary the concentrations and deposition of air pollutants at or below the site-relevant Critical Load or Level values… '.

2.2.7 It provides other objectives relating to water quality and acidity for both qualifying features.

2.2.8 Given that Natural England does not produce conservation objectives for Ramsar sites, reliance on those provided for the SAC habitats is regarded as a reasonable surrogate. This is confirmed in Table 1 of the FCT which shows all Ramsar features are accommodated within those of the SAC. This includes the rare fauna and flora highlighted in the Ramsar description which are considered to be embraced by the 'typical species' of the SAC. Consequently, this HRA will rely solely on the SAC objectives.

Condition assessment

2.2.9 The most recent formal condition monitoring assessment of Oak Mere SSSI was carried out by Natural England in 2012[14], although this pre-dated, and so would not have taken account, the current objectives. This found that overall, the entire site was considered to be in an

[12] Natural England (2018), *European Site Conservation Objectives for Oak Mere Special Area of Conservation, Version 3.* Available online at: http://publications.naturalengland.org.uk/file/6099038630051840.

[13] Natural England (2014), *Site Improvement Plan*, Oak Mere, Version 0.1. Available online at: http://publications.naturalengland.org.uk/publication/5056911862923264.

[14] Natural England, *Condition of SSSI Units for Site Oak Mere SSSI.* Available online at: https://designatedsites.naturalengland.org.uk/ReportUnitCondition.aspx?SiteCode=S1002780&ReportTitle=Oak%20Mere%20SSSI.

'unfavourable no change' condition[15] primarily, it appears, because of the high mineral content and pH of the surface waters. However, no current threats were identified. In terms of the SAC features, this was interpreted as 'unfavourable no change' for the oligotrophic water community and 'unfavourable recovering' for the transition mires and quaking bogs[16].

2.2.10 Whilst this assessment was carried out nine years ago, there is little to suggest circumstances have changed and, overall, it is assumed that Oak Mere remains in an unfavourable condition and vulnerable to external influences. Given this, the objectives are interpreted not as 'to maintain' but 'to restore' the qualifying features.

2.3 Case law

2.3.1 In recent years, there have been a number of important rulings made by both domestic and European courts which could influence this HRA. The most relevant are described below.

People Over Wind judgement

2.3.2 The People Over Wind judgement (2017) drew a distinction between incorporated mitigation measures which are represented by the essential characteristics of a scheme and those added specifically to avoid or reduce an impact on qualifying features. The former, such as the general alignment of HS2, can be considered at screening whereas the latter are reserved for consideration in an appropriate assessment.

Wealden judgement

2.3.3 The Wealden judgement (2017) clarifies a limitation on the use of thresholds when used to rule out the likelihood of significant effects alone or in combination with other plans or projects, specifically the use of Annual Average Daily Traffic (AADT) figures. The Court concluded that where the likely effect of an individual plan or project does not itself exceed the threshold of 1,000 AADT, its impact must still be considered alongside the similar effects of other plans and projects to assess whether the combined effect could be significant. Where the in-combination effect is greater than this threshold, an appropriate assessment is typically required. In line with Regulation 63(3), the need to consider in-combination assessment, is also carried through into the appropriate assessment if one is necessary.

[15] Natural England, *SSSI Condition Summary for Oak Mere SSSI*. Available online at: https://designatedsites.naturalengland.org.uk/ReportConditionSummary.aspx?SiteCode=S1002780&ReportTitle=Oak%20Mere%20SSSI.

[16] Natural England, *Oak Mere SAC Site Features.* Available online at: https://designatedsites.naturalengland.org.uk/SiteSACFeaturesMatrix.aspx?SiteCode=UK0012970&SiteName=Oak%20Mere%20SAC.

Dutch Nitrogen case

2.3.4 Here, the Court of Justice of the European Union (CJEU)[17] confirmed that an appropriate assessment is not to take into account the future benefits of mitigation measures if those benefits are uncertain, including where the procedures needed to accomplish them have not yet been carried out or because the level of scientific knowledge does not allow them to be identified or quantified with certainty.

Compton case

2.3.5 This case[18] explored how exceedances of the critical loads should be assessed. The Court ruled that when considering what approach is required in order to conclude no adverse effect on the integrity of a site:

> 'That could not be answered, one way or the other, by simply considering whether there were exceedances of critical loads or levels, albeit rather lower than currently. What was required was an assessment of the significance of the exceedances for the SPA birds and their habitats…'.

[17] Coöperatie Mobilisation for the Environment UA, Vereniging Leefmilieu v College van gedeputeerde staten van Limburg, College van gedeputeerde staten van Gelderland, European Court of Justice, (C 293/17, C 294/17) [2019] Env. L.R. 27 at paragraph 30.

[18] Compton Parish Council, Julian Cranwell and Ockham Parish Council v Guildford Borough Council, SoS for Housing, Communities and Local Government (2019), High Court of Justice, EWHC 3242 (Admin) CO/2173,2174,2175/2019.

3 Likely significant effects

3.1 The likely significant effects test

3.1.1 Regulation 63(1) identifies whether a proposed development will result in a 'likely significant effect … (either alone or in combination …)' on a European site. An in-combination assessment is only required where an impact is identified which would not result in a significant effect on its own but where significant effects may arise when combined with other plans or projects. The screening test is seen only as a 'trigger'[19] and identifies whether the greater scrutiny of an 'appropriate assessment' is necessary. Case law informs how Regulation 63(1) should be interpreted, as follows:

- 'significant' means 'any effect that would undermine the conservation objectives of a European site'[20];
- 'likely' is a low threshold and simply means that there is a 'risk' or 'doubt' regarding such an effect that 'cannot be excluded on the basis of objective information'[21]; and
- [it] '… is not that significant effects are probable, a risk is sufficient'… and there must be 'credible evidence that there was a real, rather than a hypothetical, risk'[22].

3.2 Potential impacts on Oak Mere

3.2.1 Oak Mere lies 9.7km away from any construction work associated with the Proposed Scheme. Therefore, the only credible risk results from air pollution associated with the changes in vehicle movements caused by the general growth in the area. Consequently, this single factor is addressed in Section 3.3.

3.3 Screening test on Oak Mere

Methodology

3.3.1 The assessment of air pollution is informed by established best practice provided by Highways England (the Design Manual for Roads and Bridges (DMRB))[23], Natural England[24]

[19] Bagmoor Wind Limited v The Scottish Ministers (2012), Court of Session, CSIH 93.

[20] Landelijke Vereniging tot Behoud van de Waddenzee and Nederlandse Vereniging tot Bescherming van Vogels v Staatssecretaris van Landbouw, Natuurbeheer en Visserij (2004), European Court of Justice, C-127/02 (referred to as the Waddenzee judgement) at paragraphs 44, 47 and 48.

[21] Waddenzee at paragraphs 44 and 45.

[22] Boggis at paragraphs 36 and 37.

and the Institute for Air Quality Management (IAQM)[25]. Together, these make clear that vehicle emissions can increase the airborne concentration of nitrogen oxides (NO_x) and the subsequent rate of nitrogen deposition. The latter can lead to nutrient enrichment and, over time, not only hinder the growth, abundance and distribution of (especially lower) plants, but can also prompt the growth of ruderal species which can lead to changes in structure and function of qualifying habitats. Whilst certain species and communities are less susceptible to harm than others, nitrogen deposition can also exacerbate the effects of other factors such as climate change or pathogens leading to negative, synergistic effects.

3.3.2 The rate of nitrogen deposition falls quickly in the first few metres from the roadside before gradually levelling out; beyond 200m, it becomes difficult to distinguish from background levels. In other words, impacts at 10m, 50m or more can be very different from those at the roadside, and beyond 200m significant effects can be ruled out.

3.3.3 Assessment of nitrogen deposition is required for ecologically sensitive sites within 200m of roads where one or more of the following DMRB criteria are met:

- change in road alignment by 5m or more;
- change in daily traffic flows by 1,000 vehicles or more as AADT;
- change in daily flows of Heavy Duty Vehicles (HDV)[26] by 200 AADT or more;
- change in daily average speed by 10kph or more; or
- change in peak hour speed by 20kph or more.

3.3.4 It can be seen, therefore, that the additional nitrogen deposition that might arise from increased traffic is only likely to be significant where:

- a European site lies within 200m of a road;
- traffic flows are expected to increase (or other DMRB criteria are met); and
- a feature is known to be sensitive to such effects.

3.3.5 Should these criteria be met, best practice recommends that the ecological characteristics of the site should be explored and, if necessary, traffic and/or air quality assessments of traffic

[23] Highways Agency (2019), *Design Manual for Roads and Bridges (DMRB), Sustainability and Environmental Appraisal, LA 105 Air Quality*, Highways Agency, London. Available online at: https://www.standardsforhighways.co.uk/dmrb/.

[24] Natural England (2018), *Natural England's approach to advising competent authorities on the assessment of road traffic emissions under the Habitats Regulations – v1.4 Final.* Available online at: http://publications.naturalengland.org.uk/file/5431868963160064.

[25] Institute of Air Quality Management (2020), *A guide to the assessment of air quality impacts on designated nature conservation sites*, v1.1. Available online at: https://iaqm.co.uk/text/guidance/air-quality-impacts-on-nature-sites-2020.pdf.

[26] HDVs are defined as those with an unladen weight of greater than 3.5 tonnes, including large vans; medium goods vehicles (rigid and artic); heavy goods vehicles (rigid and artic) and buses/coaches.

flows carried out to evaluate any impacts during construction or subsequent operation as appropriate.

3.3.6 The ecological characteristics of a site are derived from the formal citations, condition assessments, conservation objectives, FCT, SIP, supplementary advice and any other surveys and management plans where available. Traffic flows are assessed by calculating AADT figures. The latter introduces further thresholds and, where changes in flows (alone and in-combination) are less than 1,000 AADT[27] or 200 HDVs, the risk of a significant effect can be ruled out and no further assessment is required. Should flows exceed these values, air quality analysis is required. Here, impacts are assessed by calculating the relative contribution of the plan or project in relation to the relevant critical level for NO_x and the critical loads for nitrogen deposition for the individual qualifying features. The air quality analysis typically models the rates of deposition at fixed points on a 200m transect extending from the roadside.

3.3.7 The critical level for NO_x is fixed and is expressed as a concentration: 30µg/m^3. It is a precautionary threshold below which there can be confidence that harmful effects on vegetation will not arise, and further assessment may not be necessary. If exceeded, assessment of critical loads is required. The critical loads for nitrogen deposition vary and are specific to each qualifying feature. These are presented as a range of values (expressed as a rate, e.g. 10kg N/ha/yr – 20kg N/ha/yr) and typically, as a precautionary approach, only the lowest value is used (unless there are compelling reasons to do otherwise) as this will emphasise any negative outcomes.

3.3.8 Should nitrogen deposition increase by less than 1% of the lower critical load, likely significant effects can be ruled out. However, should the 1% threshold be exceeded, a significant effect cannot be ruled out and an appropriate assessment will be required. It should be noted that the 1% threshold, set at two orders of magnitude below the critical load, is highly precautionary. Furthermore, an exceedance of the threshold does not mean that a significant (or adverse) effect will automatically occur, it only represents a trigger that prompts further assessment. Indeed, this emphasises that assessment is not about establishing a simple mathematical relationship. Account must be taken of the type of habitats (some are more resilient than others) and the distribution of the designated features, as not all will be distributed evenly across sites, and other factors may be at play.

3.3.9 Natural England adds that where the existing background levels of NO_x or rates of deposition already exceed these values prior to implementation of a plan or project, the conservation objectives shift from seeking to maintain the condition of the qualifying features to aiming to restore them to a favourable conservation status. This reflects the greater challenge of restoring a site that could already be suffering harm from air pollution.

[27] These values are utilised as there is evidence to show that these equate approximately to a 1% change in critical loads (see paragraph 3.3.8).

It also makes clear that the impact assessment should focus on those objectives related to the structure and function of a site; those objectives most relevant to the impacts that could arise from air pollution are provided in Section 2.2.

3.3.10 Whilst assessment should, in the first instance, evaluate the plan or project in isolation, the Wealden decision makes clear that should insignificant outcomes arise alone, the outcomes should also be assessed in combination with other plans or projects. This test is also carried through to the appropriate assessment (if one is required). As Oak Mere also forms one of the 18 discrete components of the Midland Meres and Mosses Phase 2 Ramsar site (which, in straightforward terms, is regarded as the sum of its parts), there is a separate need to assesses the impact of air pollution on all other components as well.

3.3.11 To determine whether a formal screening exercise is required, this HRA firstly assesses the preliminary criteria: proximity of the European site to a road and the volume of anticipated traffic. If necessary, it then screens the construction and/or operational phase either alone or in-combination. An appropriate assessment follows subsequently, if required. An assessment of any impacts on the entire Midland Meres and Mosses Phase 2 Ramsar site and the SAC follows.

Initial assessment

Background

3.3.12 Key information is presented in Annex A which summarises the associated air quality analysis. The following assessment draws on best practice (from Natural England and DMRB) and utilises selected information from Annex A though reference to the latter is encouraged.

Proximity

3.3.13 Oak Mere lies adjacent to both the A49 and A54, well within the 200m threshold. Both roads meet at the south-east corner of the site. Consequently, a traffic assessment is required.

Traffic assessment

3.3.14 The Proposed Scheme will result in a change to traffic flows, and associated emissions, along the A49 and A54 which lie adjacent to the east and south of Oak Mere. Neither the A49 nor the A54 are planned construction travel routes and so any changes in traffic flows are primarily a result of traffic growth from the baseline year.

3.3.15 Annex A confirms that the Proposed Scheme will result in traffic flows that exceed the screening thresholds at the intersection of the A49/A54 during both construction and operation but only in combination with other plans or projects. Consequently, likely significant effects cannot be ruled out (in-combination), and a formal screening exercise and air quality assessment of traffic flows during both construction and operational scenarios will be required. This is provided below.

3.3.16 In contrast, the same Annex confirms that no other roads, including the A49 and A54 would exceed the screening thresholds during either construction or operation alone. Consequently, these scenarios have been ruled out of any further assessment. No other relevant criteria are triggered.

3.4 Screening assessment (construction) in-combination on Oak Mere

Rationale

3.4.1 Although likely significant effects during construction and operation alone were ruled out in Section 3.3, an assessment of the Proposed Scheme during construction in combination with other plans or projects is also required. As the Directive[28] makes clear, the in-combination test seeks to identify cumulative effects, and consequently they are limited to those that can affect the same feature. Therefore, the in-combination assessment was limited to those plans or projects that had the potential to increase nitrogen deposition on the qualifying features of Oak Mere; all other potential impacts were ruled out. The range and scope of in-combination assessments has been addressed in various settings; relevant examples include:

- Regulation 63(2) states:

  > [the developer] 'must provide such information as the competent authority may reasonably require for the purposes of such an assessment.'

- Furthermore, on 22 April 2005, the European Commission stated, in response to a parliamentary question (P-0917/05):

  > 'The [in-] combination provision must be applied in a manner that is proportionate…'

- In Foster and Langton[29], the Court stated:

  > 'There is no basis to carry out an assessment of the in-combination effects when there are no effects to take into account.' (paragraph 36).

3.4.2 This evidence has determined the need for and scope of any in-combination assessment required for this European site.

[28] Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna (1992).

[29] R (Foster and Langton) v Forest of Dean DC and Homes and Communities Agency (2015), High Court of Justice, EWHC 2684 (Admin) (2015).

Methodology

3.4.3 In-combination effects are largely taken into account in the traffic data used for the assessment which incorporates likely changes brought about by other proposed and committed developments. The approach to this assessment, which has been agreed with Natural England, is provided in Section 2 of Annex A.

3.4.4 In order to comply with the Wealden decision, the scope of the in-combination assessment has been limited to those plans or projects that could contribute to a cumulative increase in air pollution at Oak Mere. Annex A details how development that could cause traffic emission related in-combination effects have been accounted for within the traffic data used in the air quality assessment of traffic flows. Searches were also carried out for the following non-traffic related emission sources (which are also included in the air quality model) within a 5km radius:

- combustion and energy >1MW;
- farming, livestock and poultry (any);
- waste, e.g. landfill gas (any); and
- minerals activities.

3.4.5 This is considered to be reasonable and proportionate and meets the expectations laid down in Section 4.48 of Natural England's guidance[30].

Air quality assessment of traffic flows

3.4.6 The air quality assessment of traffic flows in proximity to Oak Mere has been undertaken in accordance with the Environmental Impact Assessment Scope and Methodology Report (SMR) (see Volume 5: Appendix CT-001-00001). This is summarised in Annex A.

3.4.7 The only location that triggered the AADT thresholds under this scenario was the eastern link of the A49 and A54 intersection. Given this, only one (200m) air quality modelling transect (represented by yellow dots) was employed, situated at the junction of both roads in the south-eastern corner of the site (Figure 2). Beyond the junction, traffic flows fall to below the screening thresholds and so there is no need to apply the outcomes to any other parts of Oak Mere. Reflecting the proximity of Oak Mere to the junction, the transect enters the site after a distance of just 2m and remains within it to the full extent of the 200m transect.

3.4.8 Drawing on the type and distribution of habitats provided in Annex 1 of the FCT, and evidence derived from the Air Pollution Information System[31] (APIS), the habitat types found

[30] Natural England (2018), *Natural England's approach to advising competent authorities on the assessment of road traffic emissions under the Habitats Regulations - v1.4 Final*. Available online at: http://publications.naturalengland.org.uk/file/5431868963160064.

within 200m of the roads were identified in order as semi-improved grassland, woodland, poor fen (which includes transition mires and quaking bogs) and open (oligotrophic) water.

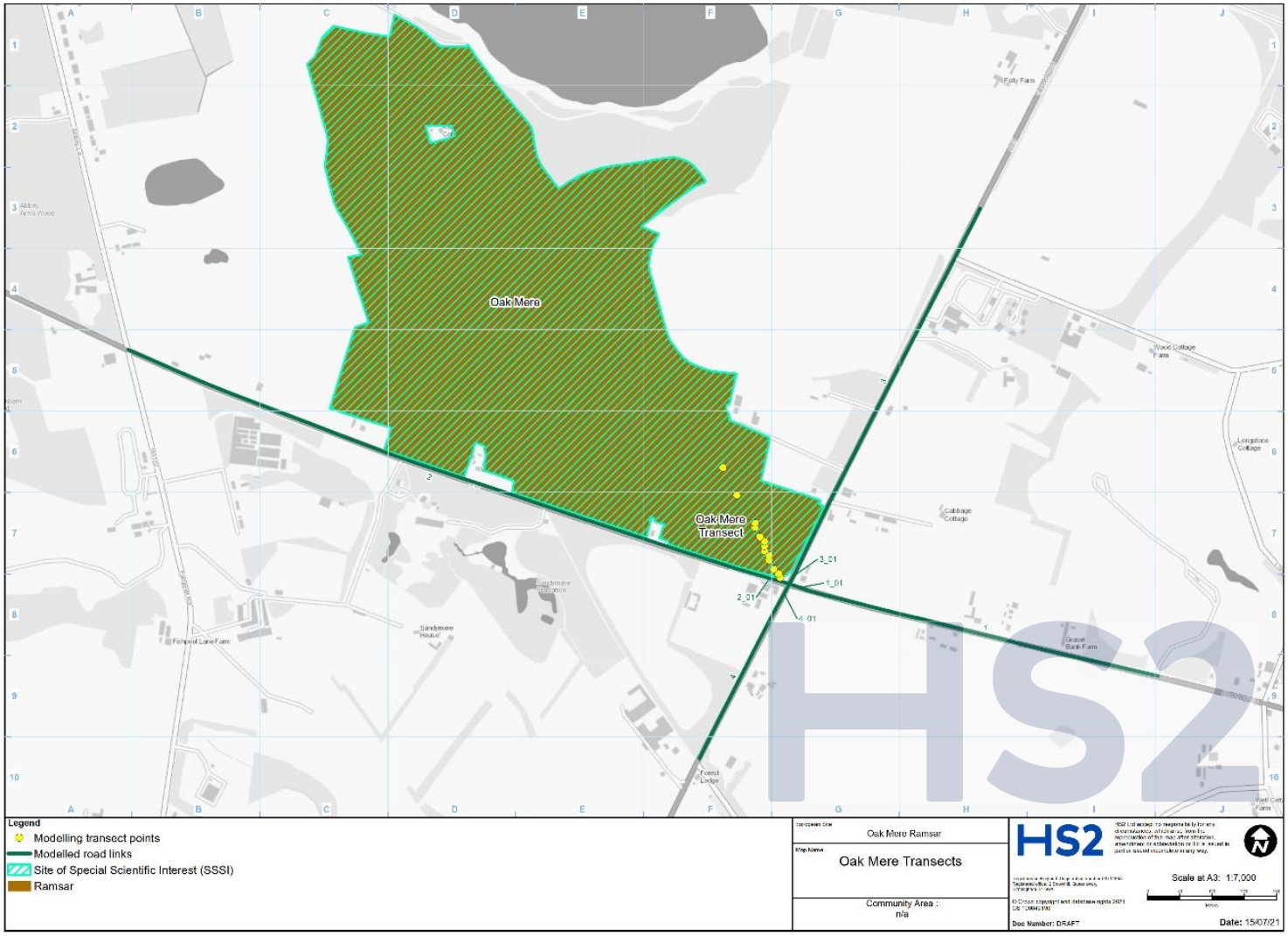
3.4.9 In the air quality analysis these have adopted critical loads:

- grassland (10kg N/ha/yr – 20kg N/ha/yr);
- broadleaved woodland (10kg N/ha/yr – 20kg N/ha/yr);
- poor fen (10kg N/ha/yr – 15kg N/ha/yr); and
- open water (5kg N/ha/yr – 10kg N/ha/yr).

3.4.10 APIS does not provide critical loads for the grassland or woodland at this site and so standard values have been chosen for woodland and very precautionary values for grassland, more representative of a high-quality neutral meadow rather than the (semi) improved agricultural grassland it is. Following best practice, the lower values of each critical load has been used in the air quality analysis. This is a precautionary measure that will emphasise any negative outcomes. Key outputs are summarised below and in Annex A.

[31] UK Centre for Ecology and Hydrology (2021), *Air Pollution Information System*. Available online at: http://www.apis.ac.uk/.

Figure 2: Location of Oak Mere, the A49 and A54, and the modelled transect



3.4.11 The air pollution assessment used traffic data based on an estimate of the average daily flows in the peak year during the construction period and adopts vehicle emission rates and background pollutant concentrations from the first year of construction. It should be noted that the air quality model takes a conservative approach and assumes that the highest flows in any one year are applied to the entire construction period. In reality, there will be considerable periods, perhaps years, where traffic flows and hence nitrogen deposition are less than this. However, the approach adopted meets the precautionary principle embedded in the Habitats Regulations.

3.4.12 Table A4 of Annex A describes the change in NO_x concentrations brought about by the Proposed Scheme during construction in-combination. Whilst this is not repeated here, it interpreted the data as follows:

> 'NO_x concentrations at Oak Mere are predicted to be above the air quality standard up to approximately two metres from the A49 Tarporley road.'

3.4.13 Consequently, an assessment of nitrogen deposition was also made (see Table A5 of Annex A) and repeated below in Table 1[32].

Table 1: Nitrogen deposition (Proposed Scheme, construction, in-combination)

Distance to road (m)	Dry deposition (kg N/ha/yr)			Change in nitrogen deposition (kg N/ha/yr)	Lower critical load (kg N/ha/yr)	% Change in relation to lower critical load
	Baseline 2018	2025 do nothing	2025 with the Proposed Scheme			
2	50.93	46.21	46.41	0.20	10	2%
9	48.62	44.99	45.13	0.14	10	1.4%
16	46.67	43.97	44.07	0.10	10	1%
32	44.96	43.13	43.18	0.05	10	0.6%
42	44.58	42.94	42.99	0.05	10	0.5%
50	25.97	25.28	25.30	0.02	10	0.2%
60	25.87	25.23	25.25	0.02	10	0.2%
70	25.77	25.19	25.20	0.01	10	0.1%
76	25.63	25.12	25.13	0.01	10	0.1%
93	25.48	25.04	25.05	0.01	10	0.1%
102	25.43	25.02	25.03	0.01	10	0.1%
148	25.16	24.89	24.89	< 0.01	10	<0.1%
196	42.18	41.77	41.78	< 0.01	10	<0.1%

[32] Note that all tables in this HRA are drawn from Annex A. Whilst minor changes have been made to the layout and naming of columns, the data remains unchanged.

3.4.14 With reference to this data, Annex A states:

> 'Nitrogen deposition rates are predicted to be above the lower critical load at all modelled receptors in the baseline and future scenarios with or without the Proposed Scheme. Predicted nitrogen deposition rates in 2025, with the Proposed Scheme, are lower than the 2018 baseline rates at all modelled locations. The changes in nitrogen deposition between the 2025 do nothing Scenario and with the Proposed Scheme in-combination scenario are greater than 1% of the lower critical load up to approximately 16m from the nearest road. Potentially significant effects are therefore predicted'.

3.4.15 This evidence shows clearly that the rate of nitrogen deposition only exceeded the 1% threshold at those points within 16m of the junction of the A49/A54. Beyond this distance, values fall to 1% or less than 1% of the critical load at all other points on the transect where the risk of a significant effect can be ruled out.

3.4.16 Furthermore, Annex A did not take account of the type and distribution of qualifying features at Oak Mere. Reference to the 'Habitat and vegetation map' of the FCT and aerial imagery shows that within 16m of the road, the transect extends only across woodland and grassland. Neither are (or support) qualifying features and, consequently, both are considered to represent site-fabric[33], where the conservation objectives do not apply. This pattern continues for all modelled points along the remainder of the transect which again, all fall within grassland which is again considered to represent site-fabric. Indeed, all examples of the more vulnerable poor fen and open water qualifying features are found more than 200m distant from the junction along this transect. For the avoidance of doubt, the screening thresholds are not exceeded along the A54 to the west which does lie within 200m of the qualifying wetland features. Consequently, no qualifying features are affected by the increase in traffic flows and likely significant effects can be ruled out.

Screening opinion for Oak Mere (construction) in-combination

3.4.17 The Proposed Scheme has been screened for the purposes of Regulation 63 of the Habitats Regulations 2017 as amended. It is considered that there is no credible risk that nitrogen deposition during the construction phase could undermine the conservation objectives of Oak Mere and likely significant effects (in-combination) can be ruled out. Therefore, it is also considered that there is no need for an appropriate assessment (in-combination).

[33] Site fabric is defined in Natural England (2018) as '... land and or permanent structures present within a designated site boundary which are not and never have been, part of the special interest of the site, nor do they contribute towards supporting a special interest feature in any way, but which have been unavoidably included within a boundary for convenience or practical reasons. Areas of site fabric ... will not be expected to make a contribution to the achievement of conservation objectives.'

3.5 Screening assessment (operation) in-combination on Oak Mere

Air quality assessment of traffic flows

3.5.1 The A49/A54 remain the only roads under scrutiny. However, under this scenario both the eastern and southern links of the intersection triggered the screening thresholds. However, the single transect was still considered adequate to capture all impacts. The same approach employed for the assessment of construction of the Proposed Scheme in combination with other plans or projects (above) was utilised. As with the assessment above, changes in NO_x are summarised first followed by an assessment of nitrogen deposition.

3.5.2 Table A8 of Annex A describes the change in NO_x concentrations brought about by the Proposed Scheme during operation in combination with other plans or projects. Whilst this is not repeated here, it interpreted the data as follows:

> 'NO_x concentrations at Oak Mere are predicted to be within the air quality standard at all locations in 2038 with or without the Proposed Scheme.'

3.5.3 An assessment of nitrogen deposition was also made (see Table A9 of Annex A) and repeated below in Table 2.

Table 2: Nitrogen deposition (Proposed Scheme, operation, in-combination)

Distance to road (m)	Dry deposition (kg N/ha/yr)			Change in nitrogen deposition (kg N/ha/yr)	Lower critical load (kg N/ha/yr)	% Change in relation to lower critical load
	Baseline 2018	2038 do nothing	2038 with the Proposed Scheme in combination			
2	50.93	43.64	43.79	0.15	10	1.6%
9	48.62	43.03	43.13	0.10	10	1.0%
16	46.67	42.55	42.61	0.06	10	0.7%
32	44.96	42.15	42.18	0.03	10	0.4%
42	44.58	42.06	42.09	0.03	10	0.3%
50	25.97	24.91	24.93	0.02	10	0.1%
60	25.87	24.89	24.90	< 0.01	10	<0.1%
70	25.77	24.87	24.88	< 0.01	10	<0.1%
76	25.63	24.84	24.85	< 0.01	10	<0.1%
93	25.48	24.81	24.81	< 0.01	10	<0.1%
102	25.43	24.80	24.80	< 0.01	10	<0.1%
148	25.16	24.74	24.74	< 0.01	10	<0.1%
196	42.18	41.55	41.56	< 0.01	10	<0.1%

3.5.4 With reference to this data, Annex A states:

> 'Nitrogen deposition is predicted to be above the lower critical load in all scenarios. Predicted nitrogen deposition rates in 2038, with the Proposed Scheme in-combination, are lower than the 2018 baseline rates at all modelled locations. Changes in nitrogen deposition between the do nothing and the Proposed Scheme in-combination scenarios are greater than 1% of the lower critical load up to approximately 9m from the nearest road. Potentially significant effects are therefore predicted in this area.'

3.5.5 Table 2 displays similar outcomes to Table 1. Modest exceedances are recorded in proximity to the intersection before declining to values far below the 1% threshold. As with the latter though, these exceedances are only evident on land regarded as site-fabric and, consequently, likely significant effects can also be ruled out under this scenario.

Screening opinion for Oak Mere (operation) in-combination

3.5.6 The Proposed Scheme has been screened for the purposes of Regulation 63 of the Habitats Regulations 2017 as amended. It is considered that there is no credible risk that nitrogen deposition during the operational phase could undermine the conservation objectives of Oak Mere and likely significant effects (in-combination) can be ruled out. Therefore, it is also considered there is no need for an appropriate assessment (in-combination).

Impacts on other components of the Midland Meres and Mosses Phase 2 Ramsar site

3.5.7 It is recognised that as the Ramsar site comprises multiple components, should the Proposed Scheme, following an appropriate assessment, cause adverse effects to arise on one, this could require the consideration of whether the Proposed Scheme or other plans or projects had caused adverse effects to arise on other components. The cumulative impact of these could result in a greater adverse effect. However, as it is considered that, as the risk of a significant effect has been ruled out at Oak Mere, there is no need for an appropriate assessment and, therefore, there is no risk of an adverse effect. As a separate HRA has also ruled out adverse effects on the one other component of the Ramsar site, Oakhanger Moss, which was also considered at risk from air pollution, there is no potential for any cumulative impact with any other plans or projects. Therefore, it is considered there is no need for any further assessment.

4 Conclusions

4.1.1 This document provides all the necessary information for the competent authority to carry out an HRA for the purposes of Regulation 63 of the Habitats Regulations 2017, as amended, should one be required. The outcomes allow the following conclusions to be drawn:

- it is considered there is no credible risk that nitrogen deposition, during construction of the Proposed Scheme, either alone or in-combination with other plans or projects could undermine the conservation objectives of Oak Mere and likely significant effects (in-combination) could be ruled out. Therefore, it is considered there is no need for an appropriate assessment (in-combination);
- it is considered there is no credible risk that nitrogen deposition, during operation of the Proposed Scheme, either alone or in-combination with other plans or projects could undermine the conservation objectives of Oak Mere and likely significant effects (in-combination) could be ruled out. Therefore, it is considered there is no need for an appropriate assessment; and
- it is considered there is no need for any further assessment.

Annex A: Additional air quality information to inform a Habitats Regulations Assessment

1 Purpose

This Annex provides additional air quality information in relation to impacts from vehicle emissions to support the Document to inform a Habitats Regulations Assessment for the Midland Meres and Mosses Phase 1 Ramsar site and Oak Mere SAC.

This report assesses the impact of air pollution on the Oak Mere SSSI component of the Midland Meres & Mosses Phase 2 Ramsar site and Oak Mere SAC. For simplicity, it is referred to as Oak Mere throughout the rest of this report except where specific mention is required of the Ramsar site or SAC.

2 Scope, assumptions and limitations

The scope, assumptions and limitations for the air quality assessment are set out in full in Volume 1 (Section 8) of the SMR and accompanying Technical note – Air quality: Guidance on the assessment methodology[34].

Key elements in relation to the assessment of vehicle emissions on ecologically sensitive sites are:

- screening of traffic data using the criteria set out in the SMR, which are based on the DMRB criteria[23], to identify where assessment is required;
- these criteria are the following for assessing the impacts of the scheme alone:
  - change in road alignment by 5m or more;
  - change in daily traffic flows by 1,000 vehicles or more as AADT;
  - change in daily flows of HDV by 200 AADT or more;
  - change in daily average speed by 10kph or more; or
  - change in peak hour speed by 20kph or more.
- these criteria are the following for assessing the impacts of the scheme in combination with other plans and projects:
  - change in daily traffic flows by 1,000 vehicles or more as AADT; or
  - change in daily flows of HDV by 200 AADT or more.
- ecological receptors included in the air quality assessment are designated sites with habitats sensitive to NO_x deposition. These could include, SAC, SPA and Ramsar sites;
- transects have been used within a designated site with modelled points at 0m, 10m, 20m, 30m, 40m, 50m, 75m, 100m, 150m and 200m from the edge of the road unless the shape of the site and potential impacts necessitates different distances to characterise the impacts;
- a deposition velocity relevant to the habitat of each site has been used, as detailed in the IAQM ecological guidance[25]. Data on nitrogen deposition has been taken from the most recent information available on the APIS[31] website. No reduction in future background deposition rates has been applied; and
- the following scenarios are assessed:
  - baseline;
  - selected year(s) within the construction period for the assessment of the effects of construction. The year(s) of assessment are selected based on the worse case peak period during the construction programme and on when significant effects might be

[34] Volume 5: Appendix CT-001-00001, Environmental Impact Assessment Scope and Methodology Report.

expected; and an operational scenario will be assessed for the first full operational year after construction is completed.

- for each assessment year, both the scenario without the Proposed Scheme in place and the scenario with the Proposed Scheme in place will be modelled. This comparison is used to assess the impacts of the Proposed Scheme alone;
- for the assessment of the Proposed Scheme in combination with other plans and projects, a different without scheme scenario is used and described as the 'do nothing' scenario. This uses traffic data from the 2018 baseline, but background pollutant concentrations/ deposition rates and emission factors representing the future year being assessed;
- the assessment incorporates HS2 Ltd's policy on construction vehicle emissions standards. These standards are published in Information Paper E31; Air Quality and include Euro VI for HGV, and Euro 6 and Euro 4 for diesel and petrol Light-Duty Vehicles (LDV), respectively;
- in-combination effects are taken into account in the traffic data used for the assessment which incorporates likely changes brought about by other proposed and committed developments[35]; and
- consideration is also given to relevant non-road plans and projects.

[35] A number of strategic traffic models have been sourced from key stakeholders, including Local Highway Authorities and Highways England. In combination, these models cover the areas that are expected to be affected by the proposed scheme and have been used as the basis of assessment for traffic flow analysis. The models have been developed by the relevant stakeholders in accordance with Transport Analysis Guidance (TAG) provided by the Department for Transport, with each model representing a base year position between 2016 and 2018.

Forecast year models have also been supplied by the above stakeholders which reflect committed and planned changes to the transport network and growth associated with committed and planned developments that are sufficiently certain to be introduced after the base year of the strategic model. Reviews of committed developments will have been undertaken by the relevant stakeholders at the same time as preparing and validating the base year model and developing future year models. Given that the models represent a base year position between 2016 and 2018, it is likely that the reviews of forecast committed developments will have been undertaken between 2016 and 2018 depending on when each model was last updated.

In order to account for traffic growth from 2018 to future years, growth factors were directly obtained from TEMPro version 7.2 which uses the National Trip End Model (NTEM 7.2 ((2017)) dataset and the National Transport Model (NTM) 2015. TEMPro inherently incorporates future planned development, being based on approved plans, irrespective of whether it is approved, committed, or simply included in approved plans. It includes all economic and population growth forecasts, and assumes growth in housing and commercial development, therefore providing a prediction of traffic growth by area.

3 Air quality standards

Air quality limit values and objectives are quality standards for clean air and to protect human health or harm to vegetation. The term 'air quality standards' will be used to refer to both the English air quality objectives and the air quality limit values and critical levels introduced in the UK based on EU Directives. Table A1 sets out the air quality standard for NO_x.

Table A1: Air quality standards

Pollutant	Averaging period	Standard
NO_x (for protection of vegetation)	Annual Mean	30µg/m^3

For the assessment of changes in nitrogen, comparison has been made against the applicable lower critical load for the site, as provided by APIS.

4 How significance is assessed

For the assessment of NO_x concentrations, the effect is considered to be not significant if the total predicted NO_x concentrations are below the air quality standard of 30µg/m^3.

For the assessment of nitrogen deposition, if the change in nitrogen deposition is predicted to be less than 1% of the lower critical load[36], then the effect is considered to be not significant. However, should the nitrogen deposition change by more than 1%, then the assessment of significance will be undertaken by an ecologist and reported within Section 3 of the main HRA report.

[36] The critical loads for nitrogen deposition vary and are specific to each qualifying feature. These are presented as a range of values (expressed as a rate, e.g. 10kg N/ha/yr - 20 kg N/ha/yr) and typically, as a precautionary approach, only the lowest value is used (unless there are compelling reasons to do otherwise) as this will emphasise any negative outcomes.

5 Assessment of construction traffic effects – Proposed Scheme alone

5.1 Screening of traffic data

The screening process identified no roads in the area exceeding the screening thresholds, therefore no further assessment of scheme alone impacts during construction is required.

6 Assessment of construction traffic effects – Proposed Scheme in combination with other plans and projects

6.1 Screening of traffic data

The assessment of construction traffic impacts has used traffic data based on an estimate of the average daily flows in the peak year during the construction period (2025-2037). Traffic data are presented in Table A2.

The screening process identified one road in the area exceeding the screening thresholds: the A54 Chester Road (eastern link from the A54/A49 junction) modelled as Link 1.

Further roads have been included in the assessment to account for their emissions at nearby receptors.

Oak Mere is located 9.7km west of the Proposed Scheme alignment. There are no planned construction traffic routes running adjacent to the site. Traffic impacts are primarily a result of traffic growth from the baseline year.

Table A2: Traffic data used in modelling (construction phase, Proposed Scheme in-combination)

Road ID	Start and end coordinates	Annual Average Daily Traffic (AADT)			Change: 2025 with the Proposed Scheme – 2025 without the Proposed Scheme	Heavy Duty Vehicles (HDV)			Change: 2025 with the Proposed Scheme – 2025 without the Proposed Scheme
		2018 baseline	2025 without the Proposed Scheme	2025 with the Proposed Scheme		2018 baseline	2025 without the Proposed Scheme	2025 with the Proposed Scheme	
1	A54 Chester Road	12,659	13,870	14,295	**1,636**	472	402	452	-20
2	A54 Middlewich Road	2,306	2,514	2,551	245	316	342	341	25
3	A49 Tarporley Road (north)	10,039	8,704	8,994	**-1,045**	321	297	297	-24
4	A49 Tarporley Road (south)	19,131	19,508	19,823	692	524	651	602	78

Note: Values in bold indicate change in traffic flow triggering for assessment

Non-road plans and projects

No non-road plans or projects have been identified that require further consideration within the in-combination assessment.

Receptors assessed and background concentrations

Figure A1 presents a detailed map of the modelled area including assessed roads (road network in blue, haul roads in green) and modelled receptors (yellow dots).

Table A3 presents the details of the receptor assessed, background concentrations, background deposition and relevant critical loads.

Figure A1: Map of the site and assessed roads and modelled receptors

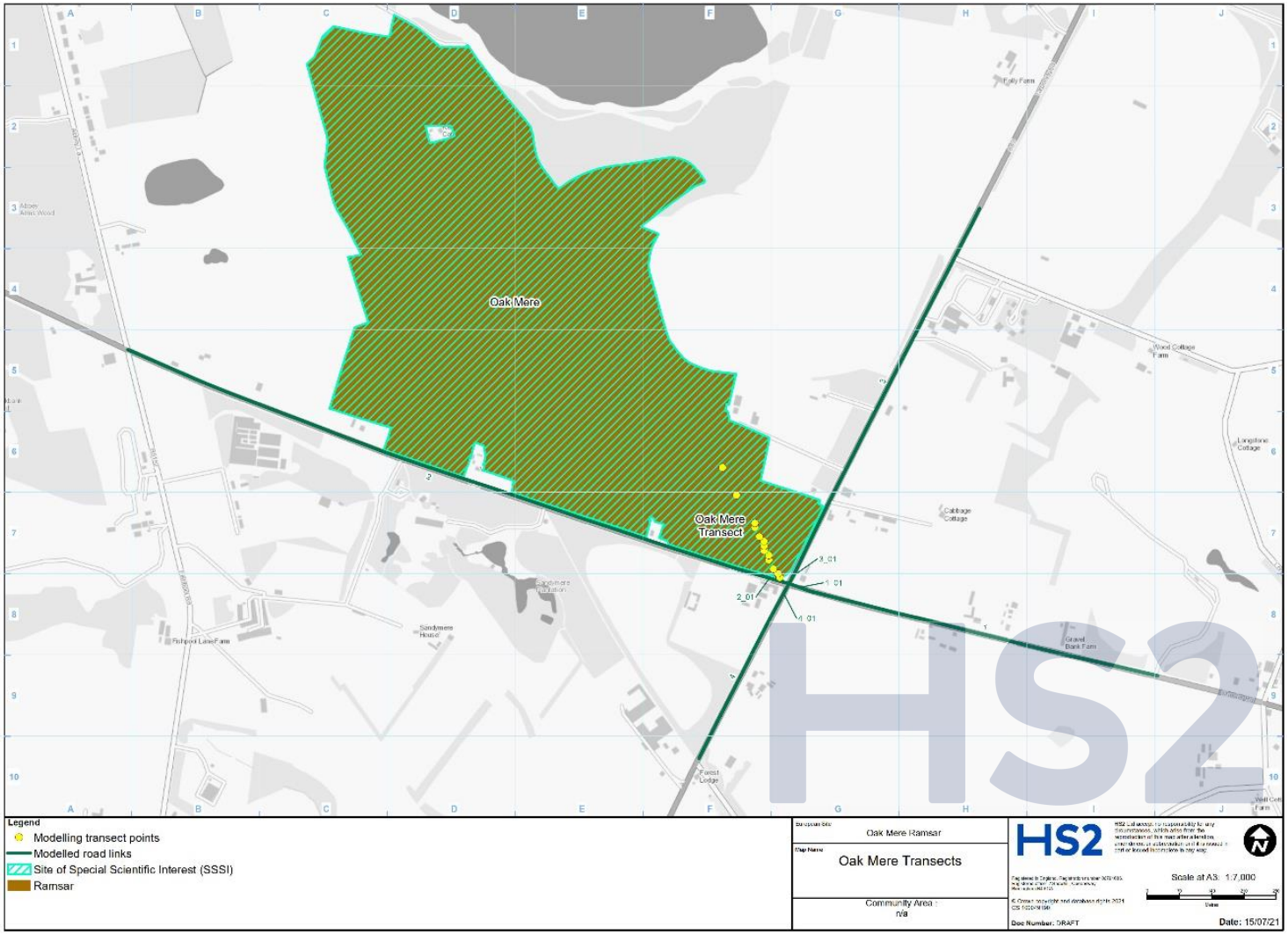


Table A3: Modelled ecological receptor backgrounds, APIS data and critical loads (in-combination construction phase)

Receptor	Sensitive habitat[37]	2018 NO_x background concentration ($\mu g/m^3$)	2025 NO_x background concentration ($\mu g/m^3$)	APIS data [31] of average total nitrogen deposition (kg N/ha/yr)	Critical load (kg N/ha/yr)
Oak Mere	Deciduous woodland	8.6	6.6	41.4	10
	Poor Fen	8.6	6.6	24.7	10
	Semi-improved Grassland	8.6	6.6	24.6	10
	Water	8.6	6.6	N/A	5

Assessment results

Table A4 presents a summary of the modelled NO_x concentrations for the ecological site, the change in concentration and a comparison against the air quality standard ($30\mu g/m^3$).

Table A5 presents a summary of the modelled nitrogen deposition, change in deposition and percentage change in relation to the lower critical load.

[37] Please note that APIS does not provide critical loads for the grassland or woodland at this site and so standard values have been chosen for woodland and very precautionary values for grassland, more representative of a high-quality neutral meadow rather than the (semi) improved agricultural grassland it is. Following best practice, the lower values of each critical load has been used in the air quality analysis. This is a precautionary measure that will emphasise any negative outcomes.

Table A4: Predicted annual mean of NO_x concentrations at ecological sites (construction phase, Proposed Scheme in-combination)

Ecological Site	Distance to road (m)	NO_x concentrations (µg/m^3)			Change in NO_x concentrations (µg/m^3)	Comparison against air quality standard (30µg/m^3)
		Baseline 2018	2025 do nothing	2025 with the Proposed Scheme		
Oak Mere	2	76.47	38.44	39.91	1.47	Above standard
	9	58.11	29.95	30.90	0.95	Above standard
	16	43.59	23.04	23.71	0.67	Within standard
	32	31.65	17.49	17.87	0.38	Within standard
	42	29.06	16.31	16.61	0.30	Within standard
	50	25.65	14.68	14.93	0.25	Within standard
	60	24.21	14.01	14.23	0.22	Within standard
	70	23.01	13.46	13.63	0.17	Within standard
	76	21.18	12.57	12.74	0.17	Within standard
	93	19.11	11.59	11.72	0.13	Within standard
	102	18.55	11.33	11.44	0.11	Within standard
	148	15.07	9.66	9.73	0.07	Within standard
	196	13.45	8.88	8.94	0.06	Within standard

Table A5: Assessment of nitrogen deposition at ecological sites (construction phase, Proposed Scheme in-combination)

Ecological Site	Distance to road (m)	Dry deposition (kg N/ha/yr)			Change in nitrogen deposition (kg N/ha/yr)	Lower critical load (kg N/ha/yr)	% Change in relation to lower critical load
		Baseline 2018	2025 do nothing	2025 with the Proposed Scheme			
Oak Mere	2	50.93	46.21	46.41	0.20	10	2.0%
	9	48.62	44.99	45.13	0.14	10	1.4%
	16	46.67	43.97	44.07	0.10	10	1.0%
	32	44.96	43.13	43.18	0.05	10	0.6%
	42	44.58	42.94	42.99	0.05	10	0.5%
	50	25.97	25.28	25.30	0.02	10	0.2%
	60	25.87	25.23	25.25	0.02	10	0.2%
	70	25.77	25.19	25.20	0.01	10	0.1%
	76	25.63	25.12	25.13	0.01	10	0.1%
	93	25.48	25.04	25.05	0.01	10	0.1%
	102	25.43	25.02	25.03	0.01	10	0.1%
	148	25.16	24.89	24.89	< 0.01	10	<0.1%
	196	42.18	41.77	41.78	< 0.01	10	<0.1%

Assessment of significance

NO_x concentrations at Oak Mere are predicted to be above the air quality standard up to approximately two metres from the A49 Tarporley road.

Nitrogen deposition rates are predicted to be above the lower critical load at all modelled receptors in the baseline and future scenarios with or without the Proposed Scheme. Predicted nitrogen deposition rates in 2025, with the Proposed Scheme, are lower than the 2018 baseline rates at all modelled locations. The changes in nitrogen deposition between the 2025 do nothing Scenario and with the Proposed Scheme in-combination scenario are greater than 1% of the lower critical load up to approximately 16m from the nearest road.

Potentially significant effects are therefore predicted, and this is addressed further in Section 3.4 of the main HRA report.

6.2 Assessment of operational traffic effects - Proposed Scheme alone

Screening of traffic data

The screening process identified no roads in the area exceeding the screening thresholds, therefore no further assessment of scheme alone impacts during construction is required.

6.3 Assessment of operational traffic effects - Proposed Scheme in combination with other plans and projects

Screening of traffic data

The assessment of operational traffic impacts has used traffic data based on an estimate of the average daily flows in the opening year of operation (2038). Traffic data are presented in Table A6.

The screening process identified two roads in the area exceeding the DMRB thresholds:

- the A54 Chester Road (eastern link from the A54/A49 junction) modelled as Link 1; and
- the A49 Tarporley Road (southern link from the A54/A49 junction) modelled as Link 4.

Further roads have been included in the assessment to account for their emissions at nearby receptors.

Oak Mere is located 10km west of the alignment. There are no planned construction traffic routes running adjacent to the site. Traffic impacts are primarily a result of traffic growth from the baseline year.

Table A6: Traffic data used in modelling (operation phase, Proposed Scheme in-combination)

Road ID	Start and end coordinates	Annual Average Daily Traffic (AADT)			Change: 2025 with the Proposed Scheme – 2025 without the Proposed Scheme	Heavy Duty Vehicles (HDV)			Change: 2025 with the Proposed Scheme – 2025 without the Proposed Scheme
		2018 baseline	2025 without the Proposed Scheme	2025 with the Proposed Scheme		2018 baseline	2025 without the Proposed Scheme	2025 with the Proposed Scheme	
1	A54 Chester Road	12,659	14,401	14,468	**1,809**	472	339	337	-135
2	A54 Middlewich Road	2,306	2,676	2,676	370	316	358	358	42
3	A49 Tarporley Road (north)	10,039	8,336	8,336	**-1,703**	321	312	312	-9
4	A49 Tarporley Road (south)	19,131	19,978	19,978	847	524	765	765	**241**

Note: Values in bold indicate change in traffic flow triggering for assessment

Non-road plans and projects

No non-road plans or projects have been identified that require further consideration within the in-combination assessment.

Receptors assessed and background concentrations

Figure A1 presents a detailed map of the modelled area including assessed roads (road network in blue, haul roads in green) and modelled receptors (yellow dots).

Table A7 presents the details of the receptor assessed, background concentrations, background deposition and relevant critical loads.

Table A7: Modelled ecological receptor backgrounds, APIS data and critical loads (in-combination operation phase)

Receptor	Sensitive habitat	2018 NO_x background concentration ($\mu g/m^3$)	2038 NO_x background concentration ($\mu g/m^3$)	APIS data [49] of average total nitrogen deposition (kg N/ha/yr)	Critical load (kg N/ha/yr)
Oak Mere	Deciduous woodland	8.6	6.0	41.4	10.0
	Poor Fen	8.6	6.0	24.7	10.0
	Semi-improved Grassland	8.6	6.0	24.6	10.0
	Water	8.6	6.0	N/A	5.0

Assessment results

Table A8 presents a summary of the modelled NO_x concentrations for the ecological site, the change in concentration and a comparison against the air quality standard ($30\mu g/m^3$).

Table A9 presents a summary of the modelled nitrogen deposition, change in deposition and percentage change in relation to the lower critical load.

Table A8: Predicted annual mean of NO_x concentrations at ecological sites (operation phase, Proposed Scheme in-combination)

Ecological Site	Distance to road (m)	NO_x concentrations (µg/m³)			Change in NO_x concentrations (µg/m³)	Comparison against air quality standard (30µg/m³)
		Baseline 2018	2038 do nothing	2038 with the Proposed Scheme		
Oak Mere	2	76.47	20.54	21.61	1.07	Within standard
	9	58.11	16.51	17.16	0.65	Within standard
	16	43.59	13.33	13.77	0.44	Within standard
	32	31.65	10.76	10.99	0.23	Within standard
	42	29.06	10.22	10.39	0.17	Within standard
	50	25.65	9.48	9.63	0.15	Within standard
	60	24.21	9.19	9.30	0.11	Within standard
	70	23.01	8.94	9.03	0.09	Within standard
	76	21.18	8.55	8.63	0.08	Within standard
	93	19.11	8.12	8.19	0.07	Within standard
	102	18.55	8.01	8.06	0.05	Within standard
	148	15.07	7.30	7.33	0.03	Within standard
	196	13.45	6.98	7.00	0.02	Within standard

Table A9: Assessment of nitrogen deposition at ecological sites (operation phase, Proposed Scheme in-combination)

Ecological Site	Distance to road (m)	Dry deposition (kg N/ha/yr)			Change in nitrogen deposition (kg N/ha/yr)	Lower critical load (kg N/ha/yr)	% Change in relation to lower critical load
		Baseline 2018	2038 do nothing	2038 with the Proposed Scheme			
Oak Mere	2	50.93	43.64	43.79	0.15	10	1.6%
	9	48.62	43.03	43.13	0.10	10	1.0%
	16	46.67	42.55	42.61	0.06	10	0.7%
	32	44.96	42.15	42.18	0.03	10	0.4%
	42	44.58	42.06	42.09	0.03	10	0.3%
	50	25.97	24.91	24.93	0.02	10	0.1%
	60	25.87	24.89	24.90	< 0.01	10	<0.1%
	70	25.77	24.87	24.88	< 0.01	10	<0.1%
	76	25.63	24.84	24.85	< 0.01	10	<0.1%
	93	25.48	24.81	24.81	< 0.01	10	<0.1%
	102	25.43	24.80	24.80	< 0.01	10	<0.1%
	148	25.16	24.74	24.74	< 0.01	10	<0.1%
	196	42.18	41.55	41.56	< 0.01	10	<0.1%

Assessment of significance

NO_x concentrations at Oak Mere are predicted to be within the air quality standard at all locations in 2038 with or without the Proposed Scheme.

Nitrogen deposition is predicted to be above the lower critical load in all scenarios. Predicted nitrogen deposition rates in 2038, with the Proposed Scheme in-combination, are lower than the 2018 baseline rates at all modelled locations. Changes in nitrogen deposition between the do nothing and the Proposed Scheme in-combination scenarios are greater than 1% of the lower critical load up to approximately 9m from the nearest road.

Potentially significant effects are therefore predicted in this area; this is addressed further in Section 3.5 of the main HRA report.

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