In Parliament – Session 2022 - 2023

HS2

High Speed Rail (Crewe – Manchester)

Supplementary Environmental Statement 1 and Additional Provision 1 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

MA01: Hough to Walley's Green

MA02: Wimboldsley to Lostock Gralam

MA03: Pickmere to Agden and Hulseheath

Q49

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Department for Transport

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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 Habitats 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). Her Majesty's Stationery Office, London.

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 Habitats 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 This report is an updated version of the document to inform an HRA for the Midland Meres and Mosses Phase 2 Ramsar site (Oak Mere) and Oak Mere SAC which accompanied the High Speed Rail (Crewe – Manchester) Environmental Statement published in 2022 (the main ES)[2]. The updated report takes into account proposed changes to the scheme since publication of the main ES.

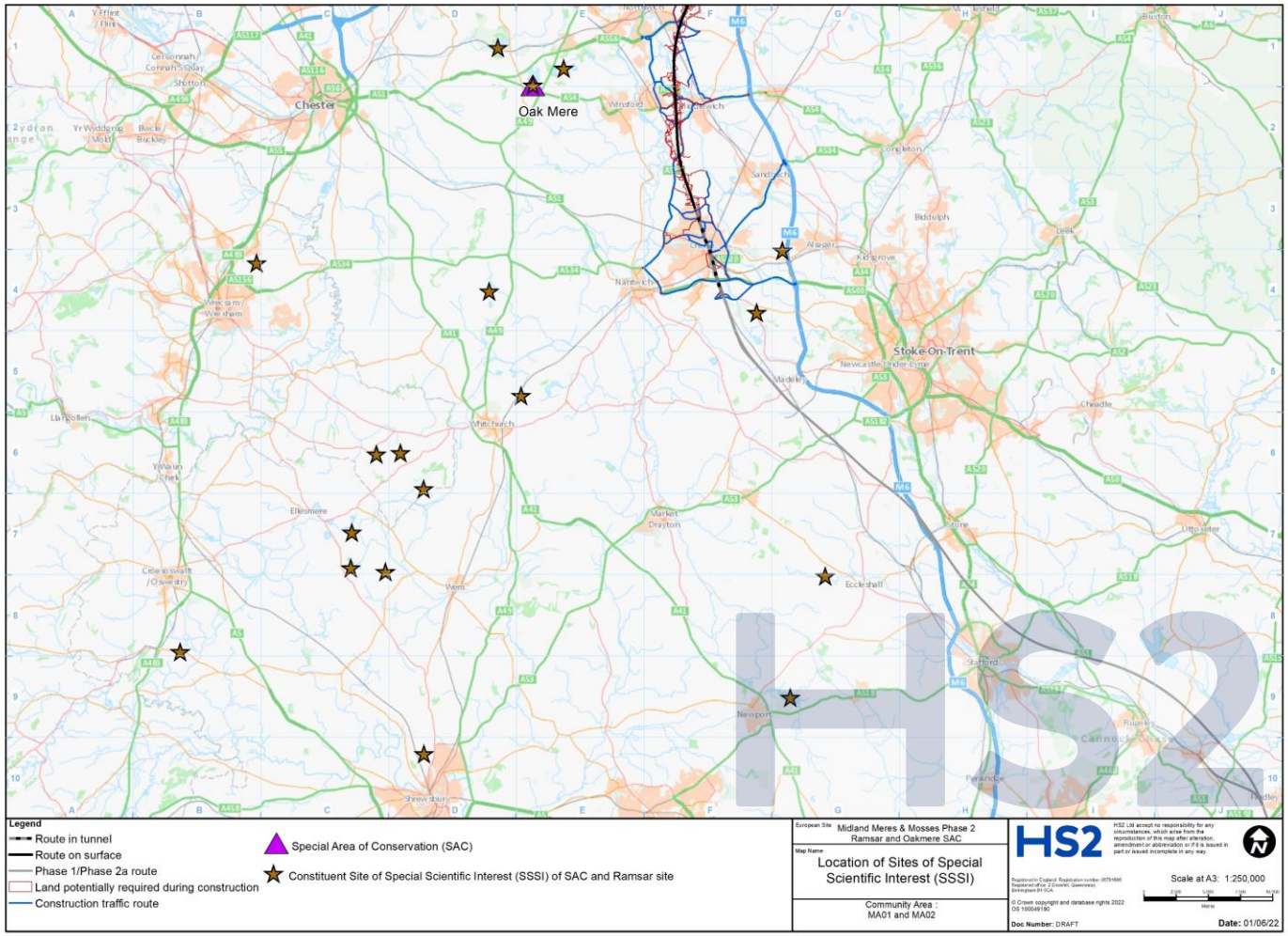
1.2.2 In order to differentiate between the original scheme and the subsequent changes, the following terms are used:

- the 'original scheme' – the Bill scheme submitted to Parliament in January 2022, which was assessed in the main ES; and
- 'the AP1 revised scheme' – the original scheme as amended by the SES1 changes and AP1 amendments.

1.2.3 Traffic re-distributed across the network by construction and operation of the AP1 revised scheme will make use of the A49 and A54 trunk roads where they lie adjacent to Oak Mere Site of Special Scientific Interest (SSSI) which lies approximately 9.7km to the west of land required for construction of the AP1 revised scheme. Oak Mere SSSI 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.

[2] High Speed Two Ltd (2022), High Speed Rail (Crewe – Manchester), *Environmental Statement.* Available online at: https://www.gov.uk/government/collections/hs2-phase2b-crewe-manchester-environmental-statement.

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



1.2.4 This report is required to assess ongoing traffic and air quality analysis. The latter found that air pollution will increase around the A49/A54 intersection adjacent to Oak Mere.

1.2.5 In addition, the potential effects of air pollution arising from the AP1 revised 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 SES1 and AP1 ES Volume 5, Appendix: EC-016-00006).

1.2.6 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[3]. It is informed by contemporary Department for Environment, Food and Rural Affairs (Defra) [4], and Department for Levelling Up, Housing and Communities guidance[5] and best practice guidance. Where relevant, it takes full account of case law including the People Over Wind[6] and Wealden[7] judgements amongst others. It forms part of the supporting information that accompanies the High Speed Rail (Crewe – Manchester) Supplementary Environmental Statement 1 (SES1) and Additional Provision 1 Environmental Statement (AP1 ES).

[3] 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.

[4] 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.

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

[6] 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).

[7] 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.

2 Context

2.1 Description of the AP1 revised scheme

2.1.1 The AP1 revised scheme comprises the construction and operation of a new high speed railway between Crewe and Manchester with a connection onto the West Coast Main Line (WCML) north of Crewe. The connection to the WCML near Golborne, proposed in the original scheme, will be removed.

2.1.2 Oak Mere is situated approximately 9.7km west of the land required for the construction of the AP1 revised scheme in the Wimboldsley to Lostock Gralam area (MA02). Here, the route of the AP1 revised 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 AP1 revised scheme will consist of 3.9km of viaducts, 10.6km of embankments and a 160m long box structure.

2.1.3 The AP1 revised 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 Oak Mere. 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[8] 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 SSSI relevant to the AP1 revised scheme. The Ramsar Information Sheet[9] identifies that Oak

[8] 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=.

[9] Joint Nature Conservation Committee (1997), *Ramsar Information Sheet (RIS): Midland Meres and Mosses Phase 2.* Available online at: https://jncc.gov.uk/jncc-assets/RIS/UK11080.pdf.

Mere 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.'

Oak Mere SAC

2.2.2 The citation[10] 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[11] 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 Oak Mere 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)[12] for Oak Mere SSSI. Whilst providing broadly similar targets to those described above, it should be noted

[10] 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.

[11] 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/publication/4577218189590528.

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

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'.

Conservation objectives

2.2.5 The conservation objectives for Oak Mere SAC[13] 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)[14]. 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[15], although this pre-dated, and so would not have taken account,

[13] 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.

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

the current objectives. This found that overall, the entire site was considered to be in an 'unfavourable no change' condition[16] 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[17].

2.2.10 Whilst this assessment was carried out ten 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 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 the AP1 revised scheme can be considered at screening whereas the latter are reserved for consideration in an appropriate assessment.

Wealden judgement

2.3.3 The Wealden judgement 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-

[15] 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.

[16] Natural England (2012), *SSSI Condition Summary: Oak Mere SSSI*. Available online at: https://designatedsites.naturalengland.org.uk/ReportConditionSummary.aspx?SiteCode=S1002780&ReportTitle=Oak%20Mere%20SSSI.

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

combination effect is greater than this threshold, an appropriate assessment is typically required. In line with Regulation 63(1), the need to consider in-combination assessment, is also carried through into the appropriate assessment if one is necessary.

Dutch Nitrogen case

2.3.4 Here, the Court of Justice of the European Union (CJEU)[18] 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[19] 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…'.

[18] 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.

[19] 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'[20] 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'[21];
- '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'[22]; 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'[23].

3.2 Potential impacts on Oak Mere

3.2.1 Oak Mere SSSI is located approximately 9.7km west of the AP1 revised scheme. It is situated in a different catchment (Sandyford Brook) to the AP1 revised scheme and occupies higher ground. Making the reasonable assumption that groundwater flow in the superficial deposits follows topography, there would be no hydraulic connection between Oak Mere and the AP1 revised scheme. Therefore, the only credible risk results from air pollution associated with the changes in vehicle movements brought about by the redistribution of traffic across the network as a consequence of the construction and operation of the AP1 revised scheme allied with general growth in the area.

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

[21] 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.

[22] Waddenzee at paragraphs 44 and 45.

[23] Peter Charles Boggis and Easton Bavants Conservation v Natural England and Waveney District Council (2009), High Court of Justice Court of Appeal case. C1/2009/0041/QBACF.

3.3 Screening test on Oak Mere

Methodology

3.3.1 Natural or semi-natural habitats can be harmed by airborne pollution from cars and heavy vehicles through two intimately linked pathways: via the concentration of gaseous nitrogen oxides (collectively referred to as NOx), and via the subsequent deposition of nitrogen and acid. The assessment of the impact of air pollution therefore comprises the analysis of these compounds.

3.3.2 Harm can arise in two ways. Firstly, in sufficient concentrations, airborne NOx can result in direct toxic effects on vegetation and secondly. the deposition of nitrogen compounds can lead to the acidification and nutrient enrichment of land and water. Over time, this may not only hinder the growth, abundance and distribution of plants, and especially, bryophytes and lichens, but can also prompt the growth of ruderal species or algal blooms which can lead to changes in the structure and function of qualifying or supporting habitats. Whilst certain species and communities are less susceptible to harm than others, increases in the airborne concentration of pollutants or the rate of their deposition can also exacerbate the effects of other factors such as climate change or pathogens leading to negative, synergistic effects.

3.3.3 The assessment of air pollution is informed by established best practice guidance provided by National Highways (the Design Manual for Roads and Bridges (DMRB))[24], Natural England[25] and the Institute for Air Quality Management (IAQM)[26].

3.3.4 Importantly, all affirm that impacts are only possible where a European site lies within 200m of a road. This is because the rate of deposition of airborne pollution falls quickly in the first few metres from the roadside before gradually levelling out; beyond 200m, and frequently across shorter distances, the rate of deposition becomes difficult to distinguish from background levels. A similar pattern can be found with the concentration of airborne NOx though the decline can be less pronounced. Therefore, it is clear that impacts at 10m, 50m or more can be very different from those at the roadside. Beyond 200m, significant effects can be ruled out.

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[24] 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/.

[25] Natural England (2018), *Natural England's approach to advising competent authorities on the assessment of road traffic emissions under the Habitats Regulations.* Available online at: http://publications.naturalengland.org.uk/publication/4720542048845824.

[26] 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.

3.3.5 Where a European site lies within 200m of a road, established guidance recommends that detailed assessment should take place where one or more of the following 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)[27] by 200 AADT or more;
- change in daily average speed by 10kph or more; or
- change in peak hour speed by 20kph or more.

3.3.6 As no changes in road alignments or speed is proposed, the only criterion that could possibly apply would be the change in daily traffic flows brought about by the construction or operation of the AP1 revised scheme.

3.3.7 It can be seen, therefore, that an increase in the airborne concentration of NOx and/or nitrogen and acid deposition is only likely to be significant where marked increases in traffic flows are expected on a road within 200m of a European site. Should these circumstances be met, best practice guidance recommends that the ecological characteristics of the European site should be explored and, if necessary, traffic and/or air quality assessments carried out to evaluate any impacts during construction or operation as necessary.

3.3.8 The ecological characteristics of Oak Mere, presented in Section 2.2, are derived from the formal citations, condition assessments, conservation objectives, FCT, SIP, supplementary advice and any other surveys and management plans where available.

3.3.9 Traffic flows are assessed by calculating AADT figures using established models. Should increases in traffic (alone or in-combination) be less than 1,000 AADT[28] 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 NOx and the critical loads for the deposition of nitrogen and acid. The air quality analysis typically models any changes at fixed points on a 200m transect extending from the roadside.

3.3.10 The critical level for NOx is fixed and is expressed as a concentration: 30µg/m^3. It is a precautionary threshold below which there is confidence that harmful effects on vegetation communities will not arise, and further assessment may not be necessary. If exceeded, assessment of nitrogen and acid deposition is required. The critical loads for nitrogen deposition vary and are specific to each qualifying feature. These are presented as a range

[27] 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.

[28] These values are utilised as there is evidence to show that these equate approximately to a 1% change in critical loads (see paragraph 3.3.13).

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.

3.3.11 Acid deposition is also assessed via critical loads, though measured in keq/ha/yr. As it shares a direct, linear relationship with nitrogen deposition, acidity is not always assessed as its impact can be assumed. However, following feedback by Natural England, this was also evaluated.

3.3.12 For NOx and nitrogen deposition, where background values prior to development lie below the critical levels or loads, significant effects can be ruled out for any increases in pollution brought about by a new plan or project provided they do not lead to an exceedance of the critical level (NOx) or the lower critical load (nitrogen deposition).

3.3.13 However, it is important to recognise that these thresholds do not represent the points where harm will arise. Consequently, exceedance of these thresholds does not necessarily mean that harm will occur. Indeed, in circumstances where background values already exceed the critical values or loads, which is typically the case across much of lowland England, an increase of less than 1% of the critical level or the lower critical load also allows significant effects to be ruled out though each case should be assessed on the particular circumstances. This is because the 1% threshold, at two orders of magnitude below the critical level or load, is set at a level where measurable impacts would be difficult to detect. It is, therefore, considered to be highly precautionary.

3.3.14 In contrast, should increases in pollution from a new plan or project be greater than 1% of the critical level or lower critical load, the risk of a significant effect cannot be ruled out and an appropriate assessment will be required. Again, however, an exceedance of the 1% threshold does not necessarily mean that an adverse effect on the integrity of a European site will automatically occur. Indeed, this emphasises that assessment is not about establishing a simple mathematical relationship. Account must be taken of the type of qualifying feature (some are more resilient than others) and their location (as not all will be distributed evenly across sites), and other factors that may be at play.

3.3.15 The assessment of acid deposition differs because if the total concentration is predicted to be less than the lower critical load, then the effect is considered to be not significant. If the change in concentration is more than the 1% of the maximum critical load and the total for acid deposition is greater than the maximum critical load, then an appropriate assessment will be required.

3.3.16 Natural England adds that where the existing background levels of NOx 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 qualifying features to securing their restoration to a favourable conservation status. This reflects the greater challenge of restoring a site that could already be suffering harm from air pollution. 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.

3.3.17 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.

3.3.18 To determine whether a formal screening exercise is required, this document to inform the 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 concludes the assessment.

Initial assessment

Background

3.3.19 Key information is presented in Annex A which summarises the associated air quality analysis. The following assessment draws on best practice guidance (from Natural England, DMRB and IAQM) and utilises selected information from Annex A though reference to the latter is encouraged. Whilst not explicitly following the five tests laid out in the Natural England Guidance, all the information required is provided so that the steps are followed sequentially and the conclusions drawn are consistent with that advice.

Proximity

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

Traffic assessment

3.3.21 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)[29] (see main ES Volume 5, Appendix: CT-001-00001). This is summarised in Annex A.

3.3.22 The AP1 revised 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 the redistribution of traffic across the network during both construction and operational phases of the AP1 revised scheme, alongside general growth in the area.

3.3.23 Table A2 and Table A8 of Annex A confirm that the AP1 revised scheme will result in traffic flows at the intersection of the A49/A54 that exceed the screening thresholds during both construction and operation, but only in combination with other plans or projects. Consequently, it is considered that likely significant effects cannot be ruled out (in-combination). Accordingly, the evidence to inform the air quality assessment of traffic flows and subsequent screening assessment for these scenarios is provided below.

3.3.24 Importantly, this analysis confirms that no other roads, including the A49 and A54 on their own, 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 (see paragraph 3.3.4 above) 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 AP1 revised scheme during construction in combination with other plans or projects is also required. As the Directive[30] 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

[29] High Speed Two Ltd (2022), High Speed Rail (Crewe – Manchester), *Environmental Statement, Environmental Impact Assessment Scope and Methodology Report,* Volume 5, Appendix CT-001-00001. Available online at: https://www.gov.uk/government/collections/hs2-phase2b-crewe-manchester-environmental-statement.

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

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[31], 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.

Methodology

3.4.3 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. The approach to this assessment, which has been agreed with Natural England, is provided in Section 2 of Annex A. A separate review identified other non-traffic related sources of air pollution (e.g. intensive livestock units) which, where relevant, were added into the air quality modelling.

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.

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

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[25].

Air quality assessment of traffic flows

3.4.6 The only location that triggered the AADT thresholds under this scenario was the junction of the A49 and A54. Given this, only one (200m) air quality modelling transect (represented by yellow dots) was employed, situated at the junction of these roads in the south-eastern corner of Oak Mere (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 crosses the site boundary after a distance of just 2m.

3.4.7 Drawing on the types and distribution of habitats provided in Annex 1 of the FCT, and evidence derived from the Air Pollution Information System (APIS)[32], the habitat types found within Oak Mere in order of distance from the junction comprise agricultural grassland, woodland, poor fen (which includes transition mires and quaking bogs) and open (oligotrophic) water.

3.4.8 Importantly, the grassland and woodland adjacent to the A49/A54 junction do not represent qualifying features of either the SAC or Ramsar site and are, therefore, considered to represent 'site-fabric'[33], where the conservation objectives do not apply.

3.4.9 Confidence in this approach is provided by reference to the habitat maps and aerial imagery provided in Annexes 1 and 2 of the SSSI FCT, published in 2009. Here the grassland is shown as arable farmland and the woodland is absent. This suggests both have been created recently. Consequently, APIS does not provide critical loads for either nitrogen or acid deposition for the woodland and grassland habitats.

3.4.10 Despite this, APIS values for nitrogen deposition for woodland were taken for the Oak Mere SSSI, where woodland is a qualifying feature. Three values are provided on APIS for the differing types of woodland of special scientific interest reflecting their different sensitivities to air pollution: 10 kg N/ha/yr – 20 kg N/ha/yr, 10 kg N/ha/yr – 20 kg N/ha/yr, and 15 kg N/ha/yr – 20 kg N/ha/yr. These all relate to the woodlands clustered around the open water and far distant from the A49 and A54. In contrast, the woodland intercepted by the transect lies adjacent to the road. Whilst in the middle of the range of the three woodland types, the

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

[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.'

values for the 'broad-leaved, mixed and yew woodland (*Betula pubescens – Molinia caerulea*) woodland were adopted (i.e. 10kg N/ha/yr – 20kg N/ha/yr). This is considered to be a highly precautionary measure.

3.4.11 For the grassland, no values were provided on APIS for either the SAC or SSSI as it does not represent a qualifying feature of either. In this instance, and again as a precautionary measure, the 'indicative values' for nitorogen deposition for lowland hay meadow were adopted from APIS; this represents a far more sensitive habitat than the agricultural grassland now present.

3.4.12 Consequently, the air quality analysis has adopted the following critical loads:

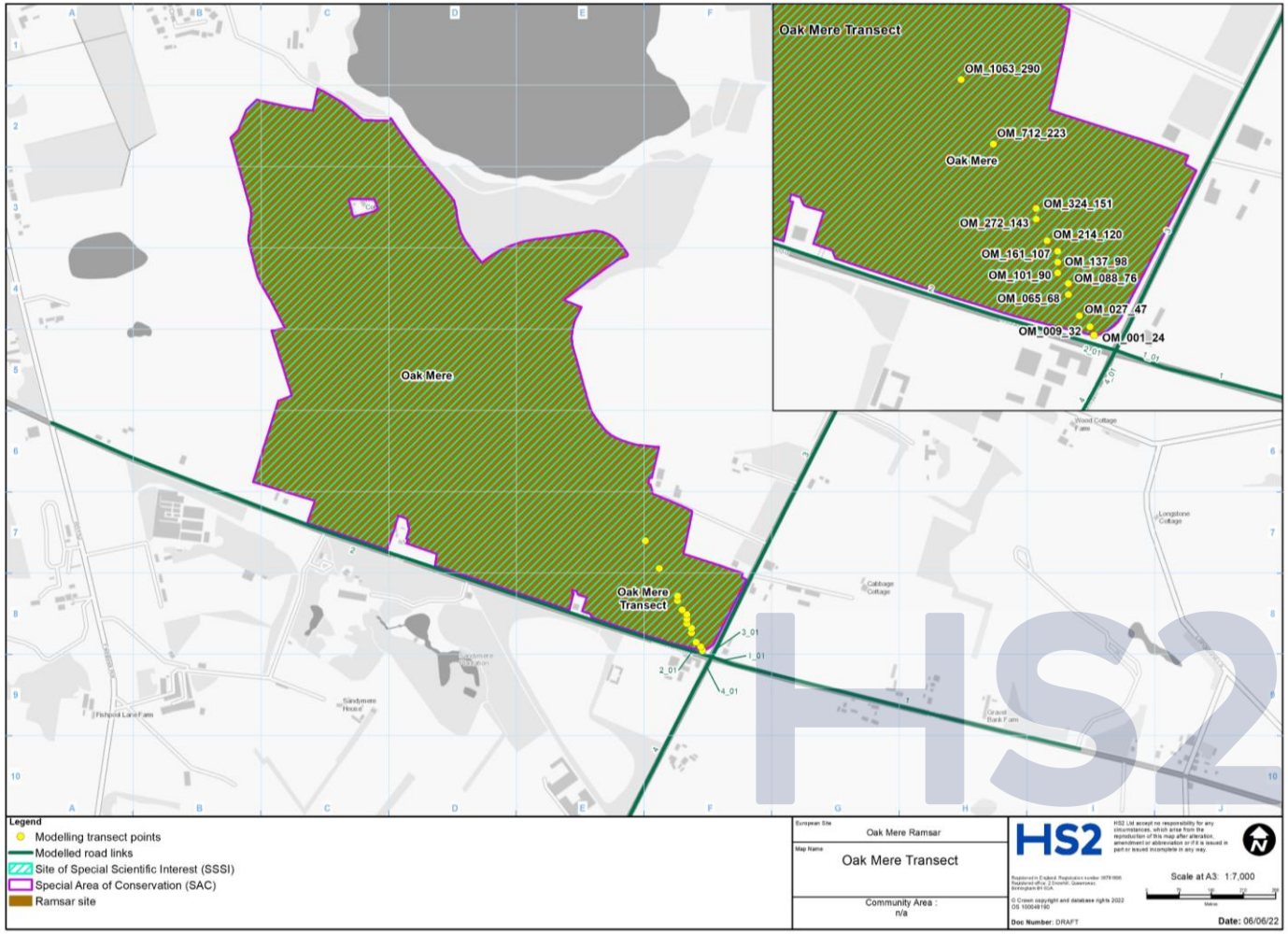
- grassland (10kg N/ha/yr – 20kg N/ha/yr);
- broadleaved woodland (10kg N/ha/yr – 20kg N/ha/yr);
- poor fen (10kg N/ha/yr – 15kg N/ha/yr); and
- open water (5kg N/ha/yr – 10kg N/ha/yr).

3.4.13 However, given that all points of the transect fall within either woodland or grassland, only the values for woodland and grassland were employed in the modelling exercise. Indeed, the maximum extent of the transect fell approximately 135m short of the open water or fen habitats.

3.4.14 In terms of acid deposition, reference to APIS was again required. No values were provided for the grassland habitat for the same reason as above. No reasonable surrogates were found to apply and so this was considered to be 'not sensitive' to acid deposition. For woodland, the critical loads were taken from the most sensitive woodland community even though the woodland affected did not resemble this community. When rounded, the range equalled 0.1 keq/ha/yr (min) – 0.3 keq/ha/yr (max) (see Table A3). Again, this is considered to be a precautionary approach. As above, there was no need to consider the fen and open water communities as they lay far beyond the 200m threshold.

3.4.15 Key outputs are summarised below and in Annex A.

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



3.4.16 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 air pollution are less than this. However, the approach adopted meets the precautionary principle embedded in the Habitats Regulations.

3.4.17 Table A5 of Annex A describes the change in NOx concentrations brought about by the AP1 revised scheme during construction in-combination. It shows that the background concentration of NOx prior to construction was considerably below the 30µg/m^3 critical level and remained so throughout the construction period. The outcome of the assessment, as described in Annex A, is:

'NOx concentrations at Oak Mere are predicted to be above the air quality standard at nine metres from the A49 Tarporley Road and are predicted to be within the standard at 16m from the A49 Tarporley Road in 2025 with the AP1 revised scheme. Therefore, the air quality standard is met at a point between nine and 16m from the A49 Tarporley Road. Changes in NOx concentrations are greater than 1% of the critical level up to 102m from the nearest road. Potentially significant effects are therefore predicted in this area.'

3.4.18 This evidence shows that the critical level was exceeded, up to a maximum distance of approximately 16m from the junction prior to construction of the AP1 revised scheme reflecting the presence and proximity of this busy junction. The predicted change in NOx brought about by the AP1 revised scheme led to further, though modest increases in concentration up to a considerably larger distance (102m) in-combination. However, as the grassland and woodland affected only represented site fabric, likely significant effects can be ruled out. As this assessment has been carried out in combination with other plans or projects, there is no need for any further assessment of NOx during the construction phase.

3.4.19 An assessment of nitrogen deposition was also made (see Table A6 of Annex A) and repeated below in Table 1[34].

[34] 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.

Table 1: Assessment of nitrogen deposition at Oak Mere (construction, AP1 revised scheme 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)	Percent change in relation to lower critical load
	Baseline 2018	2025 do nothing	2025 with the AP1 revised scheme			
2	50.23	45.93	46.27	0.34	10	3.5%
9	48.14	44.80	45.06	0.26	10	2.5%
16	46.32	43.84	44.03	0.19	10	1.9%
32	44.77	43.05	43.18	0.13	10	1.3%
42	44.43	42.89	42.99	0.10	10	1.1%
50	25.92	25.26	25.31	0.05	20	0.2%
60	25.82	25.22	25.26	0.04	20	0.2%
69	25.73	25.17	25.21	0.04	20	0.2%
76	25.60	25.11	25.14	0.03	20	0.2%
93	25.45	25.03	25.06	0.03	20	0.2%
102	25.41	25.02	25.04	0.02	20	0.1%
148	25.15	24.89	24.91	0.02	20	0.1%
196	25.03	24.83	24.85	0.02	20	0.1%

3.4.20 Table 1 and Table A6 describe change in nitrogen deposition brought about by construction of the AP1 revised scheme in-combination. They show that background rates of nitrogen deposition exceeded the lower critical load at all points along the transect prior to and throughout the construction phase although, reflecting anticpated improvements in air quality, the exceedance was slightly less during construction than at present. 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 AP1 revised scheme. Predicted nitrogen deposition rates in 2025, with the AP1 revised scheme, are lower than the 2018 baseline rates at all modelled locations. Table A6 shows that changes in nitrogen deposition between the 2025 do nothing Scenario and with the AP1 revised scheme in-combination scenario are greater than 1% of the lower critical load up to approximately 40m from the nearest road. Potentially significant effects are therefore predicted.'

3.4.21 This evidence shows clearly that the rates of nitrogen deposition brought about by the AP1 revised scheme in combination with other plans or projects are relatively modest, and only exceeded the 1% threshold at those points within approximately 40m of the junction of the A49/A54. Beyond this distance, values fall to 1% or less than 1% of the lower critical load at all other points on the transect where the risk of a significant effect can be ruled out.

3.4.22 Furthermore, all the land affected comprises site fabric with all examples of the more vulnerable poor fen and open water qualifying features found more than 300m distant from the junction.

3.4.23 Therefore, given that all points of exceedance fall on site fabric, it is clear that no qualifying features are affected by the increase in traffic flows and likely significant effects can be ruled out. As this assessment has been carried out in combination with other plans or projects, there is no need for any further assessment of nitrogen deposition during the construction phase.

3.4.24 The impact of the AP1 revised scheme on acid deposition in-combination was also assessed. Table A7 (repeated below as Table 2) describes the change in acid deposition brought about by construction of the AP1 revised scheme.

Table 2: Assessment of acid deposition at Oak Mere (construction phase, AP1 revised scheme in-combination)

Distance to road (m)	Acid deposition (k eq/ha/yr)			Change in acid deposition as percent of CLmax	Total with AP1 revised scheme acid deposition as percent of CLmax
	Baseline 2018	2025 do nothing	2025 with AP1 revised scheme		
2	3.00	3.00	3.02	9%	1,061%
9	3.00	3.00	3.02	6%	1,059%
16	3.00	3.00	3.01	5%	1,057%
32	3.00	3.00	3.01	3%	1,056%
42	3.00	3.00	3.01	3%	1,055%
50	0.00	0.00	0.00	N/A*[35]	N/A*[35]
60	0.00	0.00	0.00	N/A*[37]	N/A*[35]
69	0.00	0.00	0.00	N/A*[35]	N/A*[35]
76	0.00	0.00	0.00	N/A*[35]	N/A*[35]
93	0.00	0.00	0.00	N/A*[35]	N/A*[35]
102	0.00	0.00	0.00	N/A*[35]	N/A*[35]
148	0.00	0.00	0.00	N/A*[35]	N/A*[35]
196	0.00	0.00	0.00	N/A*[35]	N/A*[35]

[35] Semi improved grassland habitat not sensitive to acid deposition.

3.4.25 Table 2 and Table A7 describe the change in acid deposition brought about by construction of the AP1 revised scheme. They show that where thresholds were available, background rates of acid deposition exceeded the lower critical load up to 42m along the transect prior to and throughout the construction phase. With reference to this data, Annex A states:

'Acid deposition rates are predicted to be above the lower critical load at all modelled receptors in all scenarios with or without the AP1 revised scheme. The changes in acid deposition between the 2025 do nothing Scenario and with the AP1 revised scheme in-combination scenario are greater than 1% of the critical load up to approximately 42m from the nearest road. Potentially significant effects are therefore predicted.'

3.4.26 Importantly, the grassland and woodland habitats are both considered to represent site fabric, where the conservation objectives do not apply. Therefore, even though the background rate of acid deposition across the woodland is extremely high, at over 1,000% of the lower critical load, and the predicted increase in the rate of acid deposition brought about by construction of the AP1 revised scheme in-combination prompts further increases of up to 9% at the roadside, there is no credible risk to Oak Mere.

3.4.27 Similarly, credible risks can be ruled out for the grassland as this is not considered sensitive to acid deposition. Whilst the lack of a critical load may prompt some uncertainty, given the direct relationship between nitrogen and acid depositon, confidence can be drawn from the behaviour of nitrogen deposition along the transect (Table 2 and Table A7) for which critical loads were available. As the tables show that nitrogen deposition continued to decline from 42m onwards, the same pattern can be expected to be followed in terms of acid deposition.

3.4.28 Therefore, likely significant effects can be ruled out in terms of acid deposition. As this assessment has been carried out in combination with other plans or projects, there is no need for any further assessment of acid deposition during the construction phase.

Screening opinion for Oak Mere (construction) in-combination

3.4.29 It is considered that there is no credible risk that changes in NOx, nitrogen or acid 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).

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

Air quality assessment of traffic flows

3.5.1 The A49 and A54 remain the only roads under scrutiny in this scenario and the only section to trigger the screening thresholds was the junction of the A49 and A54. Accordingly, the single transect was considered still adequate to capture all impacts. The same approach employed for the assessment of construction of the AP1 revised scheme in combination with other plans or projects (above) was utilised.

3.5.2 Table A11 of Annex A describes the change in NOx concentrations brought about by the AP1 revised scheme during operation in combination with other plans or projects. Whilst this is not repeated here, it interpreted the data as follows:

'NOx concentrations at Oak Mere are predicted to be within the air quality standard at all locations in 2038 with or without the AP1 revised scheme. Changes in NOx concentrations are greater than 1% of the critical level up to 42m from the nearest road. Potentially significant effects are therefore predicted.'

3.5.3 This shows that in 2038 background levels of NOx were below the critical level. Importantly, even though commencement of the operational phase led to an increase in the concentration of NOx, of up to 3.7% at the roadside, at no point did these values exceed the overall critical level. Furthermore, the land subjected to exceedances above the 1% threshold consisted only of woodland and grassland, or site fabric. Consequently, as with the assessment for the construction phase, likely significant effects can be ruled out. As this assessment has been carried out in combination with other plans or projects, there is no need for any further assessment of NOx during the operational phase.

3.5.4 An assessment of nitrogen deposition was also made (see Table A12 of Annex A) and repeated below in Table 3.

Table 3: Assessment of nitrogen deposition at Oak Mere (operation, AP1 revised scheme 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)	Percent change in relation to lower critical load
	Baseline 2018	2038 do nothing	2038 with the AP1 revised scheme			
2	50.22	43.45	43.61	0.16	10	1.6%
9	48.13	42.91	43.02	0.11	10	1.2%
16	46.30	42.46	42.54	0.08	10	0.8%
32	44.75	42.10	42.16	0.06	10	0.6%
42	44.41	42.03	42.07	0.04	10	0.5%

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)	Percent change in relation to lower critical load
	Baseline 2018	2038 do nothing	2038 with the AP1 revised scheme			
50	25.91	24.90	24.92	0.02	20	0.1%
60	25.81	24.88	24.90	0.02	20	0.1%
69	25.72	24.86	24.88	0.02	20	0.1%
76	25.59	24.83	24.85	0.02	20	0.1%
93	25.44	24.80	24.81	0.01	20	0.1%
102	25.40	24.79	24.80	0.01	20	0.1%
148	25.14	24.74	24.75	< 0.01	20	< 0.1%
196	25.02	24.72	24.72	< 0.01	20	< 0.1%

3.5.5 Table 3 and Table A12 describe the change in nitrogen deposition during the operational phase of the AP1 revised scheme in-combination. They show that background rates of nitrogen deposition exceeded the lower critical load at all points of the transect prior to commencement of the operational phase and that further exceedances arise as a consequence of the operational phase. 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 AP1 revised scheme. Predicted nitrogen deposition rates in 2038, with the AP1 revised scheme in-combination, are lower than the 2018 baseline rates at all modelled locations. Table A12 shows that changes in nitrogen deposition between the 2038 do nothing scenario and with the AP1 revised scheme in-combination scenario are greater than 1% of the lower critical load at nine metres from the nearest road and are predicted to be less than 1% of the lower critical load at 16m from the nearest road. Potentially significant effects are therefore predicted in this area.'

3.5.6 Table 3 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 Table 1 though, these exceedances are only evident on land regarded as site-fabric, no qualifying features are affected and, consequently, likely significant effects can also be ruled out under this scenario. As this assessment has been carried out in combination with other plans or projects, there is no need for any further assessment of nitrogen deposition during the operational phase.

3.5.7 The impact of the AP1 revised scheme on acid deposition was also assessed (see Table A13 of Annex A, which is repeated below in Table 4).

Table 4: Assessment of acid deposition at Oak Mere (operational phase, AP1 revised scheme in-combination)

Distance to road (m)	Acid deposition (k eq/ha/yr)			Change in acid deposition as percent of CLmax	With AP1 revised scheme acid deposition as percent of CLmax
	Baseline 2018	2038 do nothing	2038 with the revised AP1 scheme		
2	3.00	3.00	3.01	4.1	1056.7
9	3.00	3.00	3.01	3.0	1055.6
16	3.00	3.00	3.01	2.1	1054.7
32	3.00	3.00	3.00	1.4	1054.1
42	3.00	3.00	3.00	1.2	1053.9
50	0.00	0.00	0.00	N/A*[35]	N/A*[35]
60	0.00	0.00	0.00	N/A*[35]	N/A*[35]
69	0.00	0.00	0.00	N/A*[35]	N/A*[35]
76	0.00	0.00	0.00	N/A*[35]	N/A*[35]
93	0.00	0.00	0.00	N/A*[35]	N/A*[35]
102	0.00	0.00	0.00	N/A*[35]	N/A*[35]
148	0.00	0.00	0.00	N/A*[35]	N/A*[35]
196	0.00	0.00	0.00	N/A*[35]	N/A*[35]

3.5.8 Table 4 and Table A13 describe the change in acid deposition brought about during the operational phase of the AP1 revised scheme in-combination. They show that where thresholds were available, background rates of acid deposition exceeded the lower critical load up to a distance of 42m from the intersection prior to and throughout the operational phase. With reference to this data, Annex A states:

'Acid deposition rates are predicted to be above the critical load at all modelled receptors in all scenarios with or without the AP1 revised scheme. The changes in acided deposition between the 2038 do nothing Scenario and with the AP1 revised scheme in-combination scenario are greater than 1% of the critical load up to approximately 42m from the nearest road. Potentially significant effects are therefore predicted.'

3.5.9 Table 4 displays similar outcomes to Table 2. Despite extremely high background levels of acid deposition, in proximity to the intersection only relatively modest exceedances of the 1% threshold were brought about by the operational phase of the AP1 revised scheme, in-combination. Beyond 42m no critical loads were available to allow direct analysis. As above though, all exceedances fell within land regarded as site fabric, where no credible risks arise. Therefore, likely significant effects in-combination can be ruled out. As this assessment has been carried out in combination with other plans or projects, there is no need for any further assessment of acid deposition during the operational phase.

Screening opinion for Oak Mere (operation) in-combination

3.5.10 It is considered that there is no credible risk that changes in NOx, nitrogen deposition or acid 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

3.5.11 It is recognised that as the Ramsar site comprises multiple components, should the AP1 revised scheme, following an appropriate assessment, be found to be likely to cause adverse effects to arise on one, this could require the consideration of whether the AP1 revised 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.

3.5.12 However, as it is considered that even the risk of a significant effect has been ruled out, alone or in-combination at Oak Mere, there is no need for an appropriate assessment and, therefore, there is no risk of an adverse effect. Furthermore, a separate report (as part of the AP1 revised scheme) ruled out the risk of an adverse effect on Oakhanger Moss, the only

other component of the Phase 2 Ramsar site also considered to be potentially at risk from air pollution. Therefore, it is considered there is no potential for any cumulative impacts with any other plans or projects on this or any other component of the Phase 2 Ramsar site and 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 for the Oak Mere SSSI component of the Midland Meres and Mosses Phase 2 Ramsar site and the Oak Mere SAC:

- it is considered there is no credible risk that changes in NOx, nitrogen deposition or acid deposition, during construction of the AP1 revised 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); and
- it is considered there is no credible risk that changes in NOx, nitrogen deposition or acid deposition, during operation of the AP1 revised 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.

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 HRA for the Midland Meres and Mosses Phase 2 Ramsar site and Oak Mere SAC.

This report assesses the impact of air pollution on the Oak Mere SSSI component of the Midland Meres and 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[36] and accompanying Technical note – Air quality: Guidance on the assessment methodology in the main ES.

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 is based on the DMRB criteria[22], 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 nitrogen 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[24]. Data on nitrogen and acid deposition has been taken from the most recent information available on the APIS[32] website. No reduction in future background deposition rates has been applied;
- the following scenarios were assessed:
  - baseline;
  - selected year(s) within the construction period for the assessment of the effects of construction. The year(s) of assessment were selected based on the worse case peak

[36] High Speed Two Ltd (2022), High Speed Rail (Crewe – Manchester), *Environmental Statement, Environmental Impact Assessment Scope and Methodology Report,* Volume 5, Appendix: CT-001-00001. Available online at: https://www.gov.uk/government/collections/hs2-phase2b-crewe-manchester-environmental-statement.

period during the construction programme and on when significant effects might be expected; and an operational scenario was assessed for the first full operational year after construction is completed.

- for each assessment year, both the scenario without the AP1 revised scheme in place and the scenario with the AP1 revised scheme in place have been modelled. This comparison was used to assess the impacts of the AP1 revised scheme alone;
- for the assessment of the AP1 revised scheme in combination with other plans and projects, a different without scheme scenario was 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 incorporated HS2 Ltd's Policy on construction vehicle emissions standards. These standards are published in Information Paper E31[37]; Air Quality and include Euro VI for Heavy Goods Vehicles (HGV), and Euro 6 and Euro 4 for diesel and petrol Light-Duty Vehicles (LDV) respectively;
- in-combination effects were taken into account in the traffic data used for the assessment which incorporates likely changes brought about by other proposed and committed developments[38]; and
- consideration was also given to relevant non-road plans and projects.

[37] High Speed Two Ltd (2017), *High Speed Two Phase One Information Paper E31: Air Quality.* Version 1.5. Available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/672406/E31_-_Air_Quality_v1.5.pdf.

[38] A number of strategic traffic models have been sourced from key stakeholders, including Local Highway Authorities and National Highways. In combination, these models cover the areas that are expected to be affected by the AP1 revised 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' has been 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 NOx.

Table A1: Air quality standards

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

For the assessment of changes in nitrogen and acid deposition, comparison has been made against the applicable critical loads[39] for the site, as provided by APIS.

[39] 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.

4 How significance is assessed

For the assessment of NOx concentrations, if the change is predicted to be less than 1% of the air quality standard then the effect is considered to be not significant. However, should the NOx concentration change by more than 1% then the assessment of significance will be undertaken by an ecologist and reported within Section 3 of the main ES HRA report[2].

For the assessment of nitrogen deposition, if the change is predicted to be less than 1% of the lower critical load[39], then the effect is considered to be not significant. However, should the 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 ES HRA report.

For the assessment of acid deposition, if the total concentration is predicted to be less than the lower critical load, then the effect is considered to be not significant. If the total deposition concentration be greater than the minimum critical load, and the change in concentration is more than 1% of the maximum critical load and the total for acid deposition is greater than the maximum critical load, then the assessment of significance will be undertaken by an ecologist and reported within Section 3 of the main ES HRA report .

5 Assessment of construction traffic effects – AP1 revised scheme alone

5.1 Screening of traffic data

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

6 Assessment of construction traffic effects – AP1 revised 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 two roads in the area, around Oak Mere, exceeding the screening 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.

Table A2: Traffic data summary (construction phase)

Road ID	Road name	Annual Average Daily Traffic (AADT)			In-combination Change (2025 with the AP1 revised scheme – 2018 baseline)	Heavy Duty Vehicles (HDV)			In-combination Change (2025 with the AP1 revised scheme – 2018 baseline)
		2018 baseline	2025 without the AP1 revised scheme	2025 with the AP1 revised scheme		2018 baseline	2025 without the AP1 revised scheme	2025 with the AP1 revised scheme	
1	A54 Chester Road	12,058	13,967	14,525	**2,467**	314	274	186	-128
2	A54 Middlewich Road	2,172	2,471	2,486	314	174	174	171	-4
3	A49 Tarporley Road (north)	9,493	8,442	8,814	-679	369	300	301	-69
4	A49 Tarporley Road (south)	18,640	19,594	20,300	**1,660**	567	558	654	87

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

6.2 Non-road plans and projects

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

6.3 Receptors assessed and background concentrations

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

Table A3 presents the details of the receptor assessed, background concentrations, background deposition and relevant critical loads and Table A4 shows the background information for acid deposition.

Figure A1: Map of Oak Mere, including modelled links and modelled ecological receptor points

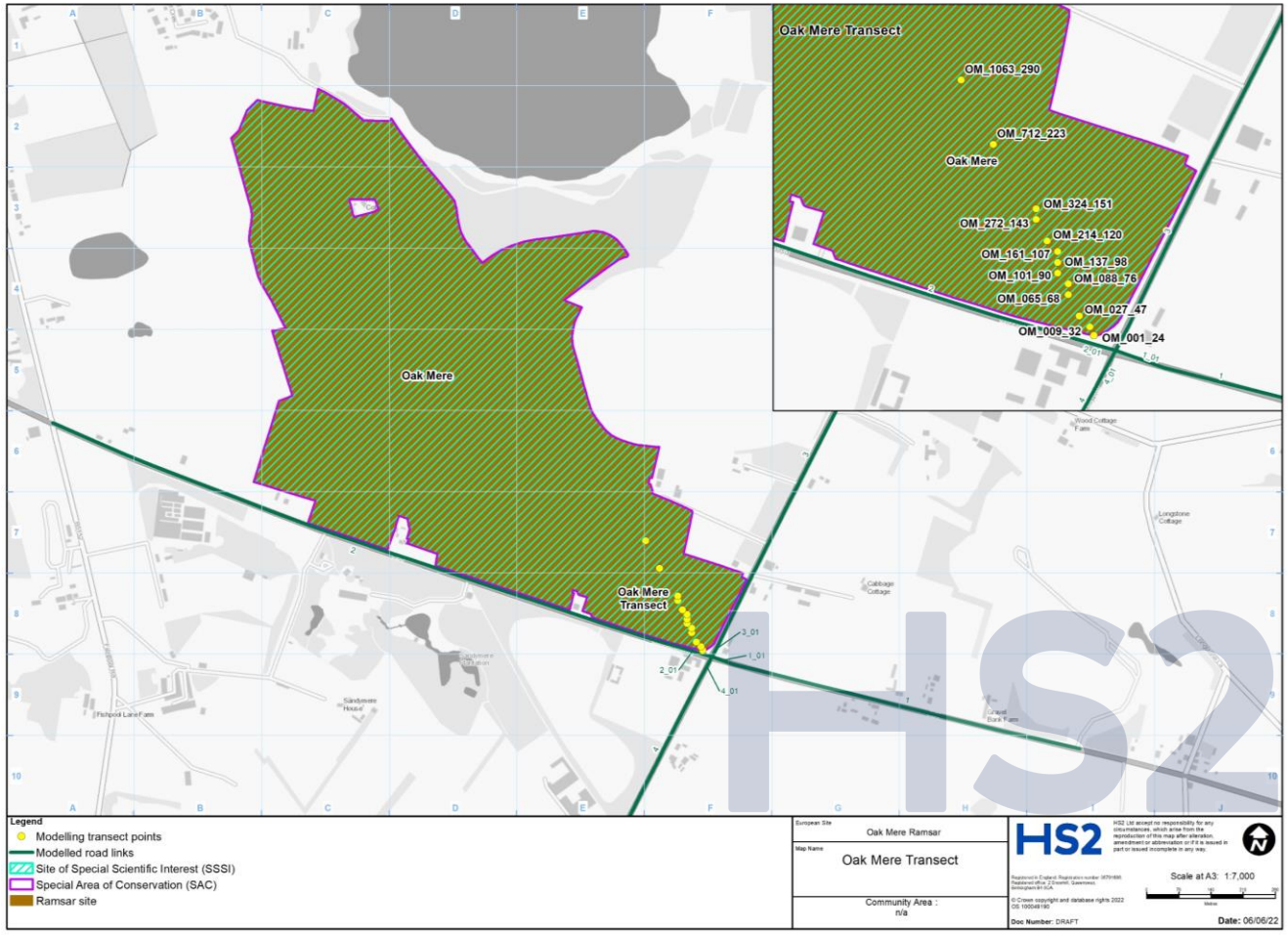


Table A3: Modelled ecological receptor NOx and nitrogen deposition backgrounds, APIS data and critical loads (construction phase – in-combination)

Receptor	Sensitive habitat[40]	2018 NOx background concentration (µg/m^3)	2025 NOx background concentration (µg/m^3)	APIS data of average total nitrogen deposition (kg N/ha/yr)	Critical load (kg N/ha/yr)
Oak Mere	Deciduous woodland	8.6	6.5	41.4	10
	Poor Fen	8.6	6.5	24.7	10
	Semi-improved Grassland	8.6	6.5	24.6	20
	Water	8.6	6.5	N/A	5

Table A4: Modelled ecological receptor acid deposition backgrounds, APIS data and critical loads (construction phase – in-combination)

Receptor	Sensitive habitat[40]	APIS data of average total acid deposition (k eq/ha/yr)	Critical load (k eq/ha/yr) (min)	Critical load (k eq/ha/yr) (max)
Oak Mere	Deciduous woodland	3.0	0.1	0.3
	Poor Fen	Not Sensitive	Not Sensitive	Not Sensitive
	Semi-improved Grassland	Not Sensitive	Not Sensitive	Not Sensitive
	Water	Not Sensitive	Not Sensitive	Not Sensitive

6.4 Assessment results

Table A5 presents a summary of the modelled NOx concentrations for the ecological site, the change in concentration and a comparison against the air quality standard (30µg/m3).

Table A6 presents a summary of the modelled nitrogen deposition, change in deposition and percentage change in relation to the lower critical load.

Table A7 presents a summary of the modelled acid deposition, percentage change in deposition and percentage change in relation to the critical load.

[40] 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 guidance, 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 A5: Predicted annual mean of NOx concentrations at ecological sites (construction phase – AP1 revised scheme in-combination)

Ecological site	Distance to road (m)	NOx concentrations (µg/m^3)			Change in NOx concentrations (µg/m^3)	Comparison against air quality standard (30µg/m^3)	Percent change in relation to air quality standard
		Baseline 2018	2025 do nothing	2025 with the AP1 revised scheme			
Oak Mere	2	70.81	36.47	38.92	2.45	Above standard	8.2%
	9	54.47	28.66	30.39	1.73	Above standard	5.8%
	16	41.11	22.18	23.42	1.24	Within standard	4.1%
	32	30.35	17.04	17.84	0.80	Within standard	2.7%
	42	28.04	15.94	16.64	0.70	Within standard	2.3%
	50	24.86	14.40	15.00	0.60	Within standard	2.0%
	60	23.55	13.78	14.32	0.54	Within standard	1.8%
	69	22.45	13.26	13.75	0.49	Within standard	1.6%
	76	20.73	12.42	12.86	0.44	Within standard	1.5%
	93	18.79	11.49	11.86	0.37	Within standard	1.2%
	102	18.28	11.24	11.59	0.35	Within standard	1.2%
	148	15.00	9.65	9.90	0.25	Within standard	0.8%
	196	13.46	8.92	9.11	0.19	Within standard	0.6%

Table A6: Assessment of nitrogen deposition at ecological sites (construction phase – AP1 revised 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)	Percent Change in relation to lower critical load
		Baseline 2018	2025 do nothing	2025 with the AP1 revised scheme			
Oak Mere	2	50.23	45.93	46.27	0.34	10	3.5%
	9	48.14	44.80	45.06	0.26	10	2.5%
	16	46.32	43.84	44.03	0.19	10	1.9%
	32	44.77	43.05	43.18	0.13	10	1.3%
	42	44.43	42.89	42.99	0.10	10	1.1%
	50	25.92	25.26	25.31	0.05	20	0.2%
	60	25.82	25.22	25.26	0.04	20	0.2%
	69	25.73	25.17	25.21	0.04	20	0.2%
	76	25.60	25.11	25.14	0.03	20	0.2%
	93	25.45	25.03	25.06	0.03	20	0.2%
	102	25.41	25.02	25.04	0.02	20	0.1%
	148	25.15	24.89	24.91	0.02	20	0.1%
	196	25.03	24.83	24.85	0.02	20	0.1%

Table A7: Assessment of acid deposition at ecological sites (construction phase – AP1 revised scheme in-combination)

Ecological site	Distance to road (m)	Acid deposition (k eq/ha/yr)			Change in acid deposition as percent of CLmax	Total with AP1 revised scheme acid deposition as percent of CLmax
		Baseline 2018	2025 do nothing	2025 with AP1 revised scheme		
Oak Mere	2	3.00	3.00	3.02	9%	1,061%
	9	3.00	3.00	3.02	6%	1,059%
	16	3.00	3.00	3.01	5%	1,057%
	32	3.00	3.00	3.01	3%	1,056%
	42	3.00	3.00	3.01	3%	1,055%
	50	0.00	0.00	0.00	N/A*[41]	N/A*[41]
	60	0.00	0.00	0.00	N/A*[41]	N/A*[41]
	69	0.00	0.00	0.00	N/A*[41]	N/A*[41]
	76	0.00	0.00	0.00	N/A*[41]	N/A*[41]
	93	0.00	0.00	0.00	N/A*[41]	N/A*[41]
	102	0.00	0.00	0.00	N/A*[41]	N/A*[41]
	148	0.00	0.00	0.00	N/A*[41]	N/A*[41]
	196	0.00	0.00	0.00	N/A*[41]	N/A*[41]

[41] Semi improved grassland habitat not sensitive to acid deposition.

6.5 Assessment of significance

Table A5 shows that NOx concentrations at Oak Mere are predicted to be above the air quality standard at nine metres from the A49 Tarporley road and are predicted to be within the standard at 16m from the A49 Tarporley road in 2025 with the AP1 revised scheme. Therefore, the air quality standard is met at a point between nine and 16m from the A49 Tarporley road. Changes in NOx concentrations are greater than 1% of the critical level up to 102m from the nearest 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 AP1 revised scheme. Predicted nitrogen deposition rates in 2025, with the AP1 revised scheme, are lower than the 2018 baseline rates at all modelled locations. Table A6 shows that changes in nitrogen deposition between the 2025 do nothing scenario and with the AP1 revised scheme in-combination scenario are greater than 1% of the lower critical load up to approximately 40m from the nearest road.

Acid deposition rates are predicted to be above the lower critical load at all modelled receptors in all scenarios with or without the AP1 revised scheme. The changes in acid deposition between the 2025 do nothing scenario and with the AP1 revised scheme in-combination scenario are greater than 1% of the critical load up to approximately 42m from the nearest road.

Potentially significant effects are therefore predicted in this area; this is addressed further in Section 3.4 of the main ES HRA report.

7 Assessment of operational traffic effects - AP1 revised scheme alone

7.1 Screening of traffic data

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

8 Assessment of operational traffic effects - AP1 revised scheme in combination with other plans and projects

8.1 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 A8.

The screening process identified two roads in the area, around Oak Mere, exceeding the screening 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.

Table A8: Traffic data summary (operational phase)

Road ID	Road name	Annual Average Daily Traffic (AADT)			In-combination change (2038 with the AP1 revised scheme – 2018 baseline)	Heavy Duty Vehicles (HDV)			In-combination change (2038 with the AP1 revised scheme – 2018 baseline)
		2018 baseline	2038 without the AP1 revised scheme	2038 with the AP1 revised scheme		2018 baseline	2038 without the AP1 Revised Scheme	2038 with the AP1 revised scheme	
1	A54 Chester Road	12,058	15,027	15,049	**2,991**	314	269	283	-31
2	A54 Middlewich Road	2,172	2,587	2,552	380	174	178	178	4
3	A49 Tarporley Road (north)	9,493	8,834	8,892	-601	369	307	299	-70
4	A49 Tarporley Road (south)	18,640	20,288	20,354	**1,714**	567	560	566	-1

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

8.2 Non-road plans and projects

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

8.3 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 A9 presents the details of the receptor assessed, background concentrations, background deposition and relevant critical loads and Table A10 shows the background information for acid deposition.

Table A9: Modelled ecological receptor backgrounds, APIS data and critical loads (in-combination operational phase)

Receptor	Sensitive habitat	2018 NOx background concentration (µg/m^3)	2038 NOx background concentration (µg/m^3)	APIS data[40] 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
	Poor Fen	8.6	6.0	24.7	10
	Semi-improved Grassland	8.6	6.0	24.6	20
	Water	8.6	6.0	N/A	5

Table A10: Modelled ecological receptor acid deposition backgrounds, APIS data and critical loads (in-combination operational phase)

Receptor	Sensitive habitat[40]	APIS data[40]of average total acid deposition (k eq/ha/yr)	Critical load (k eq/ha/yr) (min)	Critical load (k eq/ha/yr) (max)
Oak Mere	Deciduous woodland	3.0	0.1	0.3
	Poor Fen	Not Sensitive	Not Sensitive	Not Sensitive
	Semi-improved Grassland	Not Sensitive	Not Sensitive	Not Sensitive
	Water	Not Sensitive	Not Sensitive	Not Sensitive

8.4 Assessment results

Table A11 presents a summary of the modelled NOx concentrations for the ecological site, the change in concentration and a comparison against the air quality standard (30µg/m3).

Table A12 presents a summary of the modelled nitrogen deposition, change in deposition and percentage change in relation to the lower critical load.

Table A13 presents a summary of the modelled acid deposition, change in deposition and percentage change in relation to the critical load.

Table A11: Predicted annual mean of NOx concentrations at ecological sites (operational phase – AP1 revised scheme in-combination)

Ecological site	Distance to road (m)	NOx concentrations (µg/m^3)			Change in NOx concentrations (µg/m^3)	Comparison against air quality standard (30µg/m^3)	Percent change in relation to air quality standard
		Baseline 2018	2038 do nothing	2038 with the AP1 revised scheme			
Oak Mere	2	70.68	19.25	20.36	1.11	Within standard	3.7%
	9	54.34	15.69	16.46	0.77	Within standard	2.6%
	16	40.98	12.78	13.33	0.55	Within standard	1.8%
	32	30.22	10.47	10.82	0.35	Within standard	1.2%
	42	27.91	9.99	10.29	0.30	Within standard	1.0%
	50	24.73	9.31	9.57	0.26	Within standard	0.9%
	60	23.42	9.04	9.27	0.23	Within standard	0.8%
	69	22.32	8.81	9.02	0.21	Within standard	0.7%
	76	20.60	8.45	8.64	0.19	Within standard	0.6%
	93	18.67	8.05	8.21	0.16	Within standard	0.5%
	102	18.15	7.94	8.09	0.15	Within standard	0.5%
	148	14.87	7.27	7.37	0.10	Within standard	0.3%
	196	13.34	6.96	7.04	0.08	Within standard	0.3%

Table A12: Assessment of nitrogen deposition at ecological sites (operational phase – AP1 revised 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 AP1 revised scheme			
Oak Mere	2	50.22	43.45	43.61	0.16	10	1.6%
	9	48.13	42.91	43.02	0.11	10	1.2%
	16	46.30	42.46	42.54	0.08	10	0.8%
	32	44.75	42.10	42.16	0.06	10	0.6%
	42	44.41	42.03	42.07	0.04	10	0.5%
	50	25.91	24.90	24.92	0.02	20	0.1%
	60	25.81	24.88	24.90	0.02	20	0.1%
	69	25.72	24.86	24.88	0.02	20	0.1%
	76	25.59	24.83	24.85	0.02	20	0.1%
	93	25.44	24.80	24.81	0.01	20	0.1%
	102	25.40	24.79	24.80	0.01	20	0.1%
	148	25.14	24.74	24.75	< 0.01	20	< 0.1%
	196	25.02	24.72	24.72	< 0.01	20	< 0.1%

Table A13: Assessment of acid deposition at ecological sites (operational phase – AP1 revised scheme in-combination)

Ecological site	Distance to road (m)	Acid deposition (k eq/ha/yr)			Change in acid deposition as percent of CLmax	With AP1 revised scheme acid deposition as percent of CLmax
		Baseline 2018	2038 do nothing	2038 with the revised AP1 scheme		
Oak Mere	2	3.00	3.00	3.01	4.1	1,056.7
	9	3.00	3.00	3.01	3.0	1,055.6
	16	3.00	3.00	3.01	2.1	1,054.7
	32	3.00	3.00	3.00	1.4	1,054.1
	42	3.00	3.00	3.00	1.2	1,053.9
	50	0.00	0.00	0.00	N/A*[42]	N/A*[42]
	60	0.00	0.00	0.00	N/A*[42]	N/A*[42]
	69	0.00	0.00	0.00	N/A*[42]	N/A*[42]
	76	0.00	0.00	0.00	N/A*[42]	N/A*[42]
	93	0.00	0.00	0.00	N/A*[42]	N/A*[42]
	102	0.00	0.00	0.00	N/A*[42]	N/A*[42]
	148	0.00	0.00	0.00	N/A*[42]	N/A*[42]
	196	0.00	0.00	0.00	N/A*[42]	N/A*[42]

[42] Semi improved grassland habitat not sensitive to acid deposition

8.5 Assessment of significance

Table A11 shows that NOx concentrations at Oak Mere are predicted to be within the air quality standard at all locations in 2038 with or without the AP1 revised scheme . Changes in NOx concentrations are greater than 1% of the critical level up to 42m from the nearest 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 AP1 revised scheme. Predicted nitrogen deposition rates in 2038, with the AP1 revised scheme in-combination, are lower than the 2018 baseline rates at all modelled locations. Table A12 shows that changes in nitrogen deposition between the 2038 do nothing scenario and with the AP1 revised scheme in-combination scenario are greater than 1% of the lower critical load at nine metres from the nearest road and are predicted to be less than 1% of the lower critical load at 16m from the nearest road.

Acid deposition rates are predicted to be above the critical load at all modelled receptors in all scenarios with or without the AP1 revised scheme. The changes in acid deposition between the 2038 do nothing Scenario and with the AP1 revised scheme in-combination scenario are greater than 1% of the critical load up to approximately 42m from the nearest road.

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

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