M3 Junction 9 Improvement

Scheme Number: TR010055

6.3 Environmental Statement Appendix 8.3 – Assessment of Operational Air Quality Impacts on Biodiversity (Rev 1) Tracked

APFP Regulations 5(2)(a)

Planning Act 2008

Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

Volume 6

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Infrastructure Planning

Planning Act 2008

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

M3 Junction 9 Improvement
Development Consent Order 202[x]

6.3 ENVIRONMENTAL STATEMENT - APPENDIX 8.3: ASSESSMENT OF OPERATIONAL AIR QUALITY IMPACTS ON BIODIVERSITY

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Rev 0	November 2022	Application Submission
Rev 1	18 August 2023	Deadline 4 Submission

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1 Assessment of Operational Air Quality Impacts on Biodiversity

1.1 Introduction

1.1.1 Stantec UK is working with Volker Fitzpatrick and National Highways to undertake the design and assessment of the M3 Junction 9 Improvement Scheme (the Scheme).

1.1.2 This appendix reports the results of the assessment of potential impacts on biodiversity receptors as a result of changes in pollutants from vehicle exhaust emissions, as a result of the Scheme. This appendix has been prepared to inform **Chapter 5 (Air Quality)** and **Chapter 8 (Biodiversity)** of the Environmental Statement **(ES) (Document Reference 6.1)** and has been completed by a competent expert for biodiversity **(Appendix 1.1 (Competent Expert Evidence)** of the **ES Technical Appendices (Document Reference 6.3).**

1.1.3 This report (Rev 1) has been updated in July 2023 in response to comments from Natural England received in March 2023. This update includes information which exceeds the requirements of the Design Manual for Roads and Bridges (DMRB), which National Highways has agreed to provide for the purpose of the M3 Junction 9 Improvement Scheme only.

~~1.1.2~~1.1.4 The air quality modelling data used in Revision 1 has been updated to include current pollutant baseline data (3-year average 2019 – 2021) and critical loads published on the Air Pollution Information System (APIS) website.

1.2 Methodology

1.2.1 The assessment of potential operational effects on designated habitats from vehicle exhaust emissions has been undertaken with regard to:

- Design Manual for Roads and Bridges (DMRB) LA105 Air Quality (Highways England, 2019) with particular reference to Figure 2.98 Assessment of significant effects on designated sites ~~(see **Plate 1** below)~~

1.2.2 The following documents have also been consulted:

- *NEA001 Natural England's approach to advising competent authorities on the assessment of road traffic emissions under the Habitats Regulations* (Natural England, June 2018)
- *Assessing the effects of small increments of atmospheric nitrogen deposition (above the critical load) on semi-natural habitats of conservation importance.* (Natural England Commissioned Reports, Number 210)

- *Advice on Ecological Assessment of Air Quality Impacts* (Chartered Institute of Ecology and Environmental Management, 2021)
- *A guide to the assessment of air quality impacts on designated nature conservation sites – version 1.0* (Holman *et al.*, 2020) (referred to as the Institute of Air Quality Management or 'IAQM guidance' within this technical note)

1.2.3 Designated habitats scoped into the assessment include the following:

- European or internationally designated areas; including Special Protection Areas (SPAs) and potential / proposed SPA (pSPA), Special Areas of Conservation (SACs) and candidate SAC (cSAC) or possible / proposed SAC (pSAC), and Ramsar sites or proposed Ramsar sites.
- Sites of Special Scientific Interest (SSSIs)
- Local Nature Reserves (LNRs)
- Sites of Importance for Nature Conservation (SINCs)
- Local Wildlife Sites (LWS)
- Ancient Woodland (AWL)

1.2.4 LA105 also identifies veteran trees and Nature Improvement Areas (NIA) as sensitive receptors. No veteran trees have been identified within 200m of the Affected Road Network (ARN). Much of the Scheme falls within the South Downs Way Ahead NIA. The focus of this NIA was safeguarding endangered chalk grassland in the South Downs National Park. The highest quality areas of chalk grassland are protected as SSSIs or SINCs and are already assessed within this report, therefore no separate assessment on the South Downs Way Ahead NIA has been undertaken.

1.2.5 In line with *DMRB LA105 Air Quality* (Highways England, 2019), ~~only~~ designated sites and habitats ~~sensitive to nitrogen deposition~~ within 200m of the Affected Road Network (ARN)[1] have been taken forward for assessment. Beyond this distance the risk of effects from vehicle exhaust emissions are considered to be negligible. A full list of designated habitats scoped into the assessment can be found in **Chapter 5 (Air Quality)** of the **ES** (**Document Reference 6.1)**. Where more than one designation covers the same geographical area, for instance some SSSIs are also designated as SINCs, the designation of higher geographical importance has been used to inform the assessment.

1.2.6 In terms of the potential impact of exhaust emissions on designated habitats, concentrations of oxides of nitrogen (NOx) and ammonia (NH3) as well as~~nd~~

1 Defined as the road network where the Scheme results in traffic change >1000 Annual Average Daily Traffic

the resultant deposition rates of nitrogen deposition (N-dep) and acid deposition, have been calculated as detailed in **Chapter 5 (Air Quality)** of the **ES (6.1, Rev 2)** and the resulting datase have been compared against site relevant critical levels and loads for the habitats in question. Critical loads and levels (to be used as standards for the assessment of significance) have been obtained from the Air Pollution Information System ('APIS') website. In relation to nitrogen deposition, the 'minimum (or lower) critical load' has been applied. In relation to acid deposition the 'CLmaxN' has been applied as per APIS guidance.

1.2.7 ~~As per Figure 2.98 within LA 105, nitrogen deposition~~Contribution of pollutants less than 1% of the applicable annual average critical level or load is the threshold for determining no likely significant effects. It should be noted that an impact of more than 1% is not, per se, an indication that a significant effect exists, only the possibility of one, which would trigger the need for further, more detailed assessment of the ecological sensitivity and value of the habitat.

~~1.2.8 Where the predicted annual average impact exceeds 1% consideration needs to be given to the overall critical level or load. Where the critical level or load is exceeded, further ecological assessment has been undertaken to ascertain the potential significance of the impact and resultant effects.~~

~~1.2.9~~1.2.8 Where the predicted annual average contribution of pollutants from the Scheme exceeds 1%, further assessment of potential ecological effects is provided. This considers: the levels or loads of pollutants; the distance and extent of any exceedances; changes to absolute pollutant values in the context of the habitats present at each site and their current condition; and (where such information is available), the sites' conservation objectives and management. ~~Where the change in nitrogen deposition within the biodiversity receptor is greater than 0.4kg N/ha/yr,~~This further assessment of potential ecological effects includes ~~further assessment has been provided in the context of~~the use of Natural England Report 210 *Assessing the effects of small increments of atmospheric nitrogen deposition (above the critical load) on semi-natural habitats of conservation importance*. ~~(with particular reference to Table 21)~~ This report provides evidence on the potential effects of nitrogen deposition to habitats, such as the loss of species diversity, relative to differing ~~. This report indicates increases of at least 0.4kg N/ha/yr can result in the loss of one species from a habitat, although this is a precautionary level based on sensitive heathland habitats. The report also indicates that habitats receiving high baseline~~ rates of nitrogen deposition~~ are less sensitive to nitrogen deposition, and much higher increases are required to reduce species diversity~~.

1.2.9 In considering the potential for cumulative impacts, the traffic model which provides the basis for the air quality modelling contains the following:

- The Proposed Scheme and adjoining Strategic Road Network (SRN) and primary road network.

- Other schemes promoted by National Highways in the vicinity of the proposed scheme with high certainty that they are to be progressed i.e. progressed beyond preferred route announcement stage.

- Developments promoted by third parties likely to be developed in a similar timeline to the proposed National Highways' scheme, based on discussions with the relevant planning authority and knowledge of: where such proposed third-party developments would be sited; the extents and types of development; and the timescales for their completion. All of these can be reasonably described in the traffic model.

- National Government regional growth rates which include a representation of likely growth rates excluding known planning developments already included in the traffic model, all as represented by the Department for Transport (DfT) NTEM/TEMPRO3 growth factors for car usage and growth in freight which are derived from DfT's National Transport Model.

1.2.10 Details of the specific Schemes and developments (including Local Plan allocations) encompassed by the Traffic Model are summarised in **Section 4** of the **Combined Modelling and Appraisal Report (7.10, Rev 1)** and details of each development provided in **Appendix A** of the **Combined Modelling and Appraisal Report (7.10, Rev 1).**

1.2.11 The **Combined Modelling and Appraisal Report (7.10, Rev 1)** outlines the quantum of each development that has been included within each scenario. Given the phased delivery of the developments there is not considered to be potential for a change in flows that would counteract the decline in NOx emissions from road traffic due to fleet renewal.

1.2.12 The potential for combined impacts with other sources of road traffic are therefore considered to have been assessed within the air quality modelling assessment and the application of Opening Year flows as appropriate.

1.2.13 The potential for other sources (non-road traffic) of atmospheric emissions of NOx and NH3 i.e. primarily combustion plant (NOx) and agricultural activities (NH3) have been considered from a review of the cumulative schemes included in **Appendix 15.1 (Long List of Cumulative Developments) and 15.2 (Short List of Cumulative Developments)** of the **ES (6.3, APP-150 – APP-151)** and registered planning applications within proximity to the identified designated sites.

1.2.14 There were no relevant developments identified at time of the preparation of the **Environmental Statement (6.1 - 6.3, APP-042 – APP-153).** However since the **Environmental Statement (6.1 - 6.3, APP-042 – APP-153)** was prepared planning permission was granted in May 2023 for an Anaerobic Digestion facility (22/02037/FUL - Land to the East of the A272 Andover Road, Littleton). The

Anaerobic Digestion facility is located 140m from Worth Grove Ancient Woodland, 1.6km from Long Wood Ancient Woodland and >2km from the River Itchen SSSI (3.6km form the Itchen SAC).

1.2.15 Neither of these areas of Ancient Woodland are within 200m of the ARN and the planning application for the Anaerobic Digestion facility included detailed assessments of emissions of NOx (from combustion activities) and NH3 (primarily from digestate storage) which concluded:

The emissions are considered to cause 'no likely significant effects (alone and in-combination)' on the River Itchen SAC and 'no significant pollution' on the Ancient Woodlands in proximity to the Site.

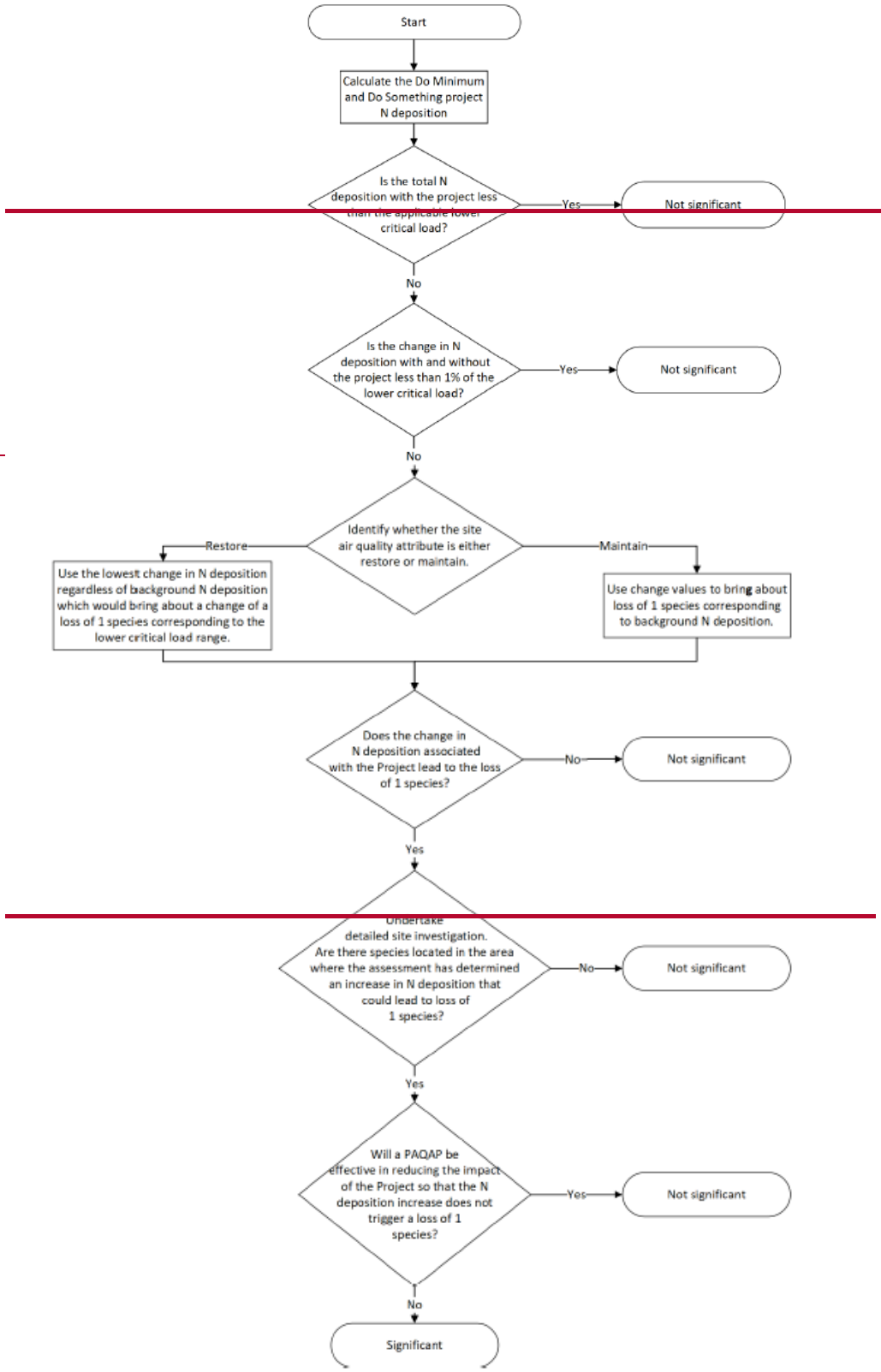
1.2.16 These findings were agreed by Natural England. Consequently there is not considered to be a risk of potential in-combination effects from non-road sources or emissions.

~~1.2.10~~ Further details of the air quality modelling which has been used to inform the assessment of impact and subsequent effects on designated habitats can be found in the **Chapter 5 (Air Quality)** of the **ES** (**Document Reference 6.1**).

1.2.17

~~Plate 1. Figure 2.98 Assessment of significant effects on designated sites taken from LA105 Air Quality (Highways England, 2019)~~

Figure 2.98 Assessment of significant effects on designated sites



Assumptions

1.2.18 The modelling work has used background nitrogen deposition data from APIS which uses data from 2019 - 2021~~16-18~~. This makes limited allowance for decreases in vehicle emissions of NOx between now and 2027~~between 2015 and 2026~~. In addition, the air quality modelling applies ~~uses~~ a 'gap factor' which aims to remove uncertainty around the effectiveness of reduction of emission of ~~oxides of nitrogen~~NOx from vehicles, as per DMRB guidance.

~~1.2.11~~

1.3 Assessment

1.3.1 Full results of the air quality modelling which has been used to inform the assessment of effects on designated habitats can be found in **Appendix 5.3** (**Designated Habitats, Backgrounds and Operational Phase Results)** of the **ES Technical Appendices** (**Document Reference 6.3**).

~~1.3.2~~ The air quality transects which have been used to model potential changes in pollutants, along with the designated habitats assessed, are presented on **Figure 5.4 Air Quality: Ecology Transect** of the **ES Figures** (**Document Reference 6.2**). Each air quality transect has a unique code, for example 'ERIA' relates to the River Itchen. For motorways and dual carriageway roads the air quality modelling transects start at the edge of lane 1. For smaller roads the air quality modelling transects start at the road kerb. All predicted pollutant levels are based on an assumed Scheme opening year of 2027.

1.3.2

1.3.3 An assessment of impacts and subsequent effects from vehicle exhaust emissions to all identified designated habitats is set out below. Where the air quality modelling in **Appendix 5.3** (**Designated Habitats, Backgrounds and Operational Phase Results) of the ES Technical Appendices** (**Document Reference 6.3**) demonstrates that pollutant concentrations will increase by less than 1% of the relevant threshold, at the point where the air quality transect intersects within the designated habitat, in line with Figure 2.98 within LA 105 effects are assessed as not significant.

River Itchen Special Area of Conservation (SAC)

1.3.4 The River Itchen SAC is designated for its chalk river habitat, and associated species including southern damselfly, bullhead, white-clawed crayfish, brook lamprey, Atlantic salmon and otter. The assessment below considers the chalk river habitat and fully aquatic species collectively. As otter will utilise both river habitats and adjacent terrestrial habitats they are considered separately.

~~1.3.4~~

1.3.5 Habitats within this section of the River Itchen are considered unsuitable for Southern damselfly (see **Appendix 8.1o (Terrestrial Invertebrate Survey and Southern Damselfly Habitat Assessment)** of the **ES (6.3, APP-118)**), and therefore this species is not considered further.

1.3.6 Most of the air quality transects show that levels of nitrogen and NOx will have increases below 1% of the critical load or level~~,~~ or will see reductions. In a small number of instances increases above 1% of the critical load or level are predicted, and these are discussed further below.

1.3.7 The highest predicted increases in NOx and total nitrogen where an air quality transect intersects the River Itchen SAC occurs at air quality transects ERIP (see **Figure 5.4 (Designated Habitats – Receptor Transects)** of **Chapter 5 (Air Quality – Figures)** of the **ES (6.2, Rev 1)**). At the point where air quality transect ERIP intersects the River Itchen SAC (approximately 10m from the road edge), increases are predicted above the existing baseline for nitrous oxides (3.88%) and nitrogen (5.41%), with increases decreasing quickly further away from the road.

1.3.8 One of the strongest effects of NOx emissions across the UK is through their contribution to total nitrogen deposition (apis.ac.uk, 2018) and therefore NOx emissions and nitrogen deposition are intrinsically linked. Institute of Air Quality Management (IAQM) guidance states that when assessing traffic impacts, where changes in NOx are above the 1% threshold, then changes in nitrogen deposition should be calculated as supporting information to further assist in the evaluation of significance. However, NOx can be toxic to vegetation with associated effects including leaf yellowing and dieback in certain concentrations. The qualifying chalk river habitat of the SAC includes aquatic vegetation which could theoretically be affected. However, the low levels of NOx increase over a short length of river, along with the diluting effect of the water and constant flushing effect, indicate that any effects are likely to be slight and would not alter aquatic plant species composition or richness.

1.3.9 In addition, NOx from road traffic is reducing significantly due to the introduction of Euro 6/VI technology and the transition to electric vehicles. NOx concentrations, including any contribution from the Scheme, will therefore be much lower in the future than they are now.

1.3.10 Excessive nitrogen can have negative impacts to plants and habitats by altering the biochemistry of the plants, or through stimulating the growth of competitive plant species which can reduce species diversity within a habitat (apis.ac.uk, 2018). The APIS website does not provide nitrogen critical loads for 'rivers and streams' as quantitative relationships between their biology and nitrogen concentrations are poorly understood. However, the APIS site does suggest that, in most lowland rivers, nitrogen inputs from catchment land-use, rather than deposition from the atmosphere, are likely to be much more significant. Freshwater systems are typically 'phosphorus limited' (CIEEM, 2021), meaning that phosphorus is generally scarce and will inhibit the growth of plants even in

the presence of abundant nitrogen. In addition, the diluting effect of the water and constant flushing would further reduce any potential effects from nitrogen deposition. Given the low levels of increase in nitrogen deposition over a short stretch of river, along with the diluting effect of the water and constant flushing, any effects are likely to be slight, and would not alter aquatic plant species composition or richness.

1.3.11 The air quality modelling shows that increases in levels of NH3 at the point where transects intersect the SAC are below 1% of the critical level~~,~~ or will see reductions below the critical level. As such no impacts from NH3 are anticipated.

~~1.3.5~~1.3.12 ~~Paragraph 2.26.1 of LA105 Air Quality (Highways England, 2019) states that: *Only sites that are sensitive to nitrogen deposition should be included in the assessment, it is not necessary to include sites for example that have been designated as a geological feature or water.* As such, the qualifying chalk river habitat, along with fully aquatic species within it (bullhead, white-clawed crayfish, brook lamprey, Atlantic salmon) are deemed not sensitive to nitrogen.~~As set out in Paragraph 4.16 of NEA001, chalk rivers are typically not sensitive to acid deposition due to their natural buffering capacity. As such no impacts as a result of acid deposition are anticipated.

~~1.3.6 Habitats within this section of the River Itchen are considered unsuitable for Southern damselfly (see **Appendix 8.1o** of the **ES (Document Reference 6.3)**).~~

~~1.3.7~~1.3.13 Otter are known to be present within this stretch of the River Itchen. Otters will utilise ~~both~~ river habitats and adjacent terrestrial habitats such as woodland and wetland for foraging and resting. As discussed above, the qualifying river habitat of the SAC will not be affected by any changes in ~~nitrogen~~ pollutants resulting from road traffic emissions~~deposition~~. ~~-~~ There is potential for changes in ~~nitrogen deposition~~pollutants to affect terrestrial habitats outside the SAC which may be used by otter, such as woodland and wetlands. ~~T~~The typical home range of otters is large, sometimes up to 35km of watercourse, ~~.~~whereas ~~A~~any changes to terrestrial habitats from increases in nitrogen deposition would be incurred only over 10s of metres adjacent to the Scheme.~~,~~ ~~T~~therefore these would be negligible in the context of the overall habitat within an otter's territory. ~~-~~In addition, terrestrial habitats outside the SAC are largely covered by the River Itchen SSSI designation which is assessed below and concludes no significant effects.

1.3.14 The assessment demonstrates that where there are increases in pollutants above screening thresholds, these are minor. Also, when taken in the context of the sensitivity of the habitat (i.e. being more sensitive to phosphorous), the dynamic nature of the river system, and the precautionary nature of the air quality modelling, they are unlikely to result in appreciable changes to qualifying features of the River Itchen SAC. As such, potential ~~effects~~ impacts from changes in road traffic emissions from the Scheme will be not significant to the River Itchen SAC, of International importance.

~~1.3.8~~

River Itchen Site of Special Scientific Interest (SSSI)

~~1.3.9 As stated in **Section 1.3.5** above, the DMRB confirms that riverine habitat (water) is not sensitive to nitrogen deposition. However, APIS does assign critical loads for other habitats covered by the SSSI designation, including fen meadow, flood pasture and swamp.~~

1.3.15 The SSSI is designated for a range of habitats including the chalk river habitat along with adjacent habitats including fen meadow, flood pasture and swamp, which support species such as otter, water vole, and white-clawed crayfish~~and their associated species~~. The SSSI area is crossed by the Scheme at a number of locations, and a range of air quality transects have been used to model changes in air quality (see air quality transects ERIA – ERIN on **Figure 5.4 Air Quality: Ecology Transect** of the **ES Figures** (**Document Reference 6.2**)).

~~1.3.10~~1.3.16 Potential impacts to the chalk river habitat and associated species are set out in the River Itchen SAC as mentioned above. This concludes that potential impacts from changes in emissions from the Scheme will be not significant to the chalk river habitat or associated species. An assessment of potential impacts to fen meadow, flood pasture and swamp, and their associated species is set out below.

1.3.17 Most of the air quality transects show that levels of nitrogen and NOx will have increases below 1% of the critical load or level, or will see reductions, at the point where the transect intersects the SSSI.

1.3.18 In a small number of instances increases above 1% of the critical load or level are predicted and these are discussed further below.

~~1.3.11~~ The modelling identifies that there are ~~some~~ increases in NOx and nitrogen deposition above 1% at transect ~~(e.g. Transects ERID and~~ ERIG~~)~~ at the point where the transect intersects the SSSI. ~~At transect ERID increases are 14.7% at the road edge, reducing to -0.5% 10m from the road edge. The only SSSI habitat within 10m of the road edge is the river, which is not sensitive to nitrogen. None of the SSSI habitats that are sensitive to nitrogen (fen meadow, flood pasture and swamp) are present within this 10m zone.~~

1.3.19 At transect ERIG increases in NOx and nitrogen deposition are 1.35% and ~~1.5~~2.06% above the critical level and load, at the point along the transect where fen meadow, flood pasture and swamp ~~SSSI habitats which are sensitive to nitrogen~~ are encountered (40m), reducing beyond this. ~~—~~The condition assessment for this unit of the SSSI[2] is 'Unfavourable – Recovering', the

[2] Condition assessment from 2011. Obtained from https://designatedsites.naturalengland.org.uk (accessed 19/07/2023)

assessment mentions scrub management has been undertaken and restoration of ditches has enabled better water level management.

1.3.20 One of the strongest effects of nitrous oxides emissions across the UK is through their contribution to total nitrogen deposition (apis.ac.uk, 2018) and therefore nitrous oxide emissions and nitrogen deposition are intrinsically linked. IAQM guidance states when assessing traffic impacts, where changes in nitrous oxide are above the 1% threshold, then changes in nitrogen deposition should be calculated as supporting information to further assist in the evaluation of significance. Therefore, it is the nitrogen deposition which is the pollutant which has the greatest potential to effect habitats. However, NOx can be toxic to vegetation with associated effects including leaf yellowing and dieback at certain concentrations. However, the low levels of NOx increase only marginally above the screening threshold, indicate that impacts from are likely to be slight, and would not alter species composition or richness.

1.3.21 Excessive nitrogen can have negative impacts to plants and habitats by altering the biochemistry of the plants, or through stimulating the growth of competitive plant species which can reduce species diversity within a habitat (apis.ac.uk, 2018). At air quality transect ERIG discussed above, increases in nitrogen are only slightly above the 1% thresholds, below which significant effects can be screened out.

1.3.22 In absolute terms, the increase is 0.31 kg N/ha/yr~~However, none of the modelled increases in nitrogen to habitats which are sensitive to nitrogen are at or above 0.4kg N/ha/yr~~ against an existing baseline of 19.20kg N/ha/yr. The critical load for this habitat is 15 kg N/ha/yr. Natural England Report 210 indicates increases of at least 0.4kg N/ha/yr can result in the loss of one species from a habitat. Whilst this research does not relate the habitats present within the River Itchen SSSI and so is not directly comparable, it is considered to be a precautionary threshold based on sensitive heathland habitats. This research also shows that habitats that have already been subject to high background nitrogen deposition, such as in this instance, can develop an effective tolerance to the effects of further deposition.

1.3.23 Although the critical load is already exceeded, and the contribution from the Scheme exceeds 1%, the effect of traffic is not the main causal effect of the exceedance. A review of APIS identifies ~~, indicating there would be no loss of species diversity.~~that road transport makes up only 6.11% of total nitrogen deposition to the River Itchen SSSI, compared to 21% for livestock and 20% imported from Europe[3].

1.3.24 Given the low levels of increase in nitrogen deposition, most noticeable at the edge of the SSSI where background deposition is already high, any effects are likely to be slight, and would not alter plant species composition or richness.

[3] Pollutants which enter the UK carried on long-range airborne currents from sources in Europe.

1.3.25 The air quality modelling shows that increases in levels of NH3 at the point where transects intersect the SSSI are below 1% of the critical level or will see reductions below the critical level. As such no impacts from NH3 are anticipated.

1.3.26 The air quality modelling shows that increases in levels of acid deposition at the point where transects intersect the SSSI are below 1% of the critical load, or will see reductions below the critical load. As such no impacts as a result of acid deposition are anticipated.

~~1.3.12~~

~~1.3.13 In other locations along the SSSI, modelling predicts a reduction in the modelled pollutants. At air quality transect ERIB, adjacent to Kingsworthy Bridge, modelling predicts a *reduction* below the existing baseline for nitrogen (-23.9%). At air quality transect ERII, adjacent to the A33, modelling predicts a *reduction* below the existing baseline for nitrogen (-2.1%).~~

~~1.3.14~~1.3.27 The modelling demonstrates that where there are increases in pollutants, these are ~~below the relevant screening thresholds~~small and any effects would be slight, ~~and~~ therefore effects from changes in emissions from the Scheme will be not significant to the River Itchen SSSI, of National importance.

St Catherine's Hill SSSI

~~1.3.15~~1.3.28 This SSSI is approximately 500m south of the Scheme (see **Figure 8.1 (Statutory Designated Sites)** of the **ES (Document Reference 6.2**). A range of air quality transects have been used to model changes in air quality (ESCHA – ESCHC **Figure 5.4 Air Quality: Ecology Transect** of the **ES** (**Document Reference 6.2**)). St Catherine's Hill SSSI is designated for its chalk grassland habitat, of which there are two parcels located either side of the existing M3.

1.3.29 Air quality transects ESCHB and ESCHC indicate a reduction in NOx and total nitrogen, at the point where the transects intersect the SSSI. ~~The air quality transect which indicates the largest increase in pollutants is~~At ESCHA to the east of the M3, modelling ~~3, which~~ predicts a ~~2.8~~1.18% increase in ~~nitrogen above the existing baseline~~NOx and a 1.62% increase in total nitrogen ~~-~~at the point where the air quality transect intersects the SSSI. This is at the road edge of the SSSI which is likely to be degraded through disturbance and salt spray. The condition assessment for this unit of the SSSI[4] is 'Unfavourable – Recovering', the assessment mentions the site would benefit from increased grazing or cutting.

1.3.30 One of the strongest effects of nitrous oxides emissions across the UK is through their contribution to total nitrogen deposition (apis.ac.uk, 2018) and

[4] Condition assessment undertaken in 2014. Data from www.designatedsites.naturalengland.org.uk, accessed July 2023.

therefore nitrous oxide emissions and nitrogen deposition are intrinsically linked. IAQM guidance states when assessing traffic impacts, where changes in nitrous oxide are above the 1% threshold, then changes in nitrogen deposition should be calculated as supporting information to further assist in the evaluation of significance. Therefore, it is the nitrogen deposition which is the pollutant which has the greatest potential to effect habitats. NOx can be toxic to vegetation with associated effects including leaf yellowing and dieback under certain ~~concentrationsh~~concentrations however, the low levels of NOx increases only just above the screening threshold, indicate that impacts from NOx are likely to be slight, and would not alter species composition or richness.

1.3.31 Excessive nitrogen can have negative impacts to plants and habitats by altering the biochemistry of the plants, or through stimulating the growth of competitive plant species which can reduce species diversity within a habitat (apis.ac.uk, 2018). At air quality transect ESCHA discussed above, increases in nitrogen are only slightly above the 1% threshold at the edge of the SSSI, with increases dropping below 1% when 20m into the SSSI.

1.3.32 In absolute terms, the increase is 0.16 kg N/ha/yr against an existing baseline of 26.93kg N/ha/yr. The critical load for this habitat is 15 kg N/ha/yr. Natural England Report 210 indicates increases of at least 0.4kg N/ha/yr can result in the loss of one species from a habitat. Whilst this research does not relate to the habitats present within the St Catherines Hill SSSI and so is not directly comparable, it is considered to be a precautionary threshold based on sensitive heathland habitats. This research also shows that habitats that have already been subject to high background nitrogen deposition, as in this instance, can develop an effective tolerance to the effects of further deposition.

1.3.33 Although the critical load is already exceeded, and the contribution from the Scheme exceeds 1%, the effect of traffic is not the main causal effect of the exceedance. A review of APIS identifies that road transport makes up only 9.69% of total nitrogen deposition to the SSSI, compared to 21.5% for livestock and 27.1% imported from Europe.

1.3.34 Given the low levels of increase in nitrogen deposition, most noticeable at the edge of the SSSI where background deposition is already high, any effects are likely to be slight, and would not alter plant species composition or richness.

~~1.3.16 This increase equates to 0.43kg N/ha/yr on the boundary of the SSSI to the east of the M3, reducing to 0.21kg N/ha/yr 10m from road edge. Increases are below 0.4kg N/ha/yr at all areas of the SSSI to the west of the M3. Excessive nitrogen can have negative impacts to plants and habitats by altering the biochemistry of the plants, or through stimulating the growth of competitive plant species which can reduce species diversity within a habitat (apis.ac.uk, 2018). Natural England Report 210 indicates increases of at least 0.4kg N/ha/yr can result in~~

~~the loss of one species from a habitat[5], although it is worth noting this a precautionary threshold based on sensitive heathland habitats.~~

1.3.35 ~~Natural England Report 210 also demonstrates that habitats receiving high background rates of nitrogen deposition are less sensitive to nitrogen deposition. Existing background nitrogen deposition at ESCHA is approximately 38kg N/ha/yr. Report 210 indicates at this level of background deposition, increases of over 2.4 kg N/ha/yr are required to reduce species richness. As such, the increases in nitrogen at the edge of the SSSI are well below the level at which a theoretical reduction in species diversity might occur.~~ The air quality modelling shows that increases in levels of NH3 at the point where transects intersect the SSSI are below 1% of the critical level~~,~~ or will see reductions. As such no impacts from NH3 are anticipated.

1.3.36 The air quality modelling shows that increases in levels of acid deposition at the point where transects intersect the SSSI are below 1% of the critical load~~,~~ or will see reductions. As such no impacts from acid deposition are anticipated.

~~1.3.17~~1.3.37 The modelling demonstrates that where there are increases in pollutants, these are small and any effects would be slight, therefore effects from changes in traffic emissions generated from the Scheme will be not significant to ~~As such, effects from changes in emissions from the Scheme will be not significant to~~ St Catherine's Hill SSSI, of National importance.

Cheesefoot Head SSSI

~~1.3.18~~1.3.38 Along the A272 the ARN passes adjacent to Cheesefoot Head SSSI, east of the Scheme. The SSSI is designated for chalk grassland habitat, and the Duke of Burgundy butterfly~~, and associated species~~.

1.3.39 The air quality transect which indicates the largest increase in pollutants at the point where these air quality transects intersect the SSSI (approximately 10m from the road edge) is ERCHA to the east of the A272. The modelling predicts a 3.80~~5~~% increase in NOx, and a 5.21% increase in total nitrogen on the boundary of the ~~at the edge of the~~ SSSI, reducing rapidly further from the road. The condition assessment for this unit[6] of the SSSI is 'Favourable', the assessment mentions a good range of plant species and that the site would benefit from less grazing pressure in spring.

1.3.40 One of the strongest effects of nitrous oxides emissions across the UK is through their contribution to total nitrogen deposition (apis.ac.uk, 2018) and therefore nitrous oxide emissions and nitrogen deposition are intrinsically linked. IAQM guidance states when assessing traffic impacts, where changes in nitrous

~~[5] Excluding sand dune habitats~~

[6] Condition assessment from 2012. Obtained from https://designatedsites.naturalengland.org.uk (accessed 19/07/2023)

oxide are above the 1% threshold, then changes in nitrogen deposition should be calculated as supporting information to further assist in the evaluation of significance. Therefore, it is the nitrogen deposition which is the pollutant which has the greatest potential to effect habitats. However, NOx can be toxic to vegetation with associated effects including leaf yellowing and dieback under certain concentrations. The small increases of NOx increase are at the edge of the SSSI. In addition, NOx from road traffic is reducing significantly due to the introduction of Euro 6/VI technology and the transition to electric vehicles. NOx concentrations will therefore be much lower in the future than they are now. This would indicate that impacts from NOx are likely to be slight and would not alter species composition or richness.

1.3.41 Excessive nitrogen can have negative impacts to plants and habitats by altering the biochemistry of the plants, or through stimulating the growth of competitive plant species which can reduce species diversity within a habitat (apis.ac.uk, 2018). In absolute terms, the increase at the edge of the SSSI is 0.52 kg N/ha/yr against an existing baseline of 20.47kg N/ha/yr. The critical load for this habitat is 15 kg N/ha/yr. This is at the road edge of the SSSI which is likely to be degraded through disturbance and salt spray. Ten metres in from the edge of the SSSI the increase is 0.31kg N/ha/yr against an existing baseline of 19.35kg N/ha/yr. Natural England Report 210 indicates increases of at least 0.4kg N/ha/yr can result in the loss of one species from a habitat.

1.3.42 Whilst this research does not relate the habitats present within the Cheesefoot Head SSSI and so is not directly comparable, it is considered to be a precautionary threshold based on sensitive heathland habitats. This research also shows that habitats that have already been subject to high background nitrogen deposition, as in this instance can develop an effective tolerance to the effects of further deposition.

1.3.43 Although the critical load is already exceeded, and the contribution from the Scheme exceeds 1%, the effect of traffic is not the main causal effect of the exceedance. A review of APIS identifies that road transport makes up only 7.81% of total nitrogen deposition to the SSSI, compared to 25.3% for livestock and 27.6% imported from Europe.

1.3.44 Given the low levels of increase in nitrogen deposition, most noticeable at the edge of the SSSI where background deposition is already high, any effects are likely to be slight, and would not alter plant species composition or richness.

1.3.45 The air quality modelling shows that increases in levels of NH3 at the point where transects intersect the SSSI are below 1% of the critical level. As such no impacts from NH3 are anticipated.

1.3.46 The air quality modelling shows that increases in levels of acid deposition at the point where transects intersect the SSSI are below 1% of the critical load. As such no impacts from acid deposition are anticipated.

~~1.3.19~~

~~1.3.20 This increase equates to 0.52kg N/ha/yr on the boundary of the SSSI, reducing to 0.31kg N/ha/yr 10m into the SSSI. Excessive nitrogen can have negative impacts to plants and habitats by altering the biochemistry of the plants, or through stimulating the growth of competitive plant species which can reduce species diversity within a habitat (apis.ac.uk, 2018). Natural England Report 210 indicates increases of at least 0.4kg N/ha/yr can result in the loss of one species from a habitat[7], although it is worth noting this a precautionary threshold based on sensitive heathland habitats.~~

~~1.3.21~~1.3.47 ~~Natural England Report 210 also demonstrates that habitats receiving high background rates of nitrogen deposition are less sensitive to nitrogen deposition. Existing background nitrogen deposition at ERCHA is approximately 24kg N/ha/yr. Report 210 indicates at this level of background deposition, increases of over 1 kg N/ha/yr are required to reduce species richness.~~ The modelling demonstrates that where there are increases in pollutants, these are small and any effects would be slight~~As such, the increases in nitrogen at the boundary of the SSSI are well below the level at which a theoretical reduction in species diversity might occur~~. As such, effects from changes in emissions from the Scheme will be not significant to Cheesefoot Head SSSI which is~~,~~ of National importance.

River Test SSSI

~~1.3.22~~1.3.48 The SSSI is designated for the chalk river habitat, fen meadow, flood pasture, wet woodland and swamp habitats, along with associated plant and animal species. The River Test SSSI is crossed by the ARN at a number of locations, and two air quality transects have been used to model changes in air quality (ERTA-ERTB).

1.3.49 At the boundary of the SSSI adjacent to the road, increases in NOx are 2.47% and increases in nitrogen ~~levels are 1.2~~2.47%~~ above the existing baseline~~. These reduce to 0.78% and 0.92% 10m from the kerb. The SSSI units adjacent to the road in this location are identified as chalk river and wet woodland. The condition assessment for the wet woodland unit[8] of the SSSI is 'Favourable', the assessment mentions the unit is mainly willow with a ground flora of wood avens, herb Robert, nettle, ivy, bryophytes, elder scrub and nettle.

1.3.50 One of the strongest effects of NOx emissions across the UK is through their contribution to total nitrogen deposition (apis.ac.uk, 2018) and therefore NOx emissions and nitrogen deposition are intrinsically linked. IAQM guidance states when assessing traffic impacts, where changes in NOx are above the 1% threshold, then changes in nitrogen deposition should be calculated as

~~[7] Excluding sand dune habitats~~

[8] Condition assessment from 2009. Obtained from https://designatedsites.naturalengland.org.uk (accessed 19/07/2023)

supporting information to further assist in the evaluation of significance. However, NOx can be toxic to vegetation with associated effects including leaf yellowing and dieback. The qualifying habitats of the SSSI in this location include aquatic and woodland vegetation which could theoretically be affected. However, the low levels of NOx increase on a short section of river, along with the diluting effect of the water and constant flushing effect on the aquatic habitat indicate that any effects are likely to be slight and would not alter species composition or richness. In addition, NOx from road traffic will continue to decrease due to the ongoing introduction of Euro 6/VI technology and the transition to electric vehicles. NOx emissions from traffic will therefore be much lower in the future than in the opening year assessed.

1.3.51 Excessive nitrogen can have negative impacts to plants and habitats by altering the biochemistry of the plants, or through stimulating the growth of competitive plant species which can reduce species diversity within a habitat (apis.ac.uk, 2018). The APIS website does not provide nitrogen critical loads for 'rivers and streams' as quantitative relationships between their biology and nitrogen concentrations are poorly understood. However, the APIS site suggests that in most lowland rivers, nitrogen inputs from catchment land-use, rather than deposition from the atmosphere, are likely to be much more significant. Freshwater systems are typically 'phosphorus limited' (CIEEM, 2021), meaning that phosphorus is generally scarce and will inhibit the growth of plants even in the presence of abundant nitrogen. In addition, the diluting effect of the water and constant flushing would further reduce any potential effects from nitrogen deposition.

1.3.52 For the woodland habitat the absolute increase is 0.25kg N/ha/yr against an existing baseline of 25.43kg N/ha/yr. The critical load for this habitat is 15 kg N/ha/yr. Natural England Report 210 indicates increases of at least 0.4kg N/ha/yr can result in the loss of one species from a habitat. Whilst this research does not relate the habitats present within the River Test SSSI and so is not directly comparable, it is considered to be a precautionary threshold based on sensitive heathland habitats. This research also shows that habitats that have already been subject to high background nitrogen deposition, as in this instance, can develop an effective tolerance to the effects of further deposition.

1.3.53 Although the critical load is already exceeded, and the contribution from the Scheme exceeds 1%, the effect of traffic is not the main causal effect of the exceedance. A review of APIS identifies that road transport makes up only 5.61% of total nitrogen deposition to the River Test SSSI, compared to 21.1% for livestock and 22.3% from non-agricultural waste.

1.3.54 Given the low levels of increase in nitrogen deposition to a short section of the SSSI, along with the likely resilience to nitrogen deposition of the habitats any effects are likely to be slight and would not alter species composition or richness.

1.3.55 The air quality modelling shows that increases in levels of NH3 at the point where transects intersect the SSSI are below 1% of the critical level. As such no impacts from NH3 are anticipated.

1.3.56 The air quality modelling shows that increases in levels of acid deposition are 2.88% of the critical level at the road edge, reducing to below 1% when 30m from the road edge. Acid deposition can affect habitats through acidification of soils and associated chemical changes, or direct damage to vegetation where there are sufficiently high concentrations (apis.co.uk). As set out in Paragraph 4.16 of NEA001, chalk rivers are typically not sensitive to acid deposition due to its natural buffering capacity. As such no impacts as a result of acid deposition are anticipated to this habitat.

1.3.57 Wet woodland habitat adjacent to the road could theoretically be affected, however the buffering capacity of the adjacent chalk river is also likely to reduce the sensitivity of the water-logged soils within this adjacent habitat. The small level of increase in acid deposition is unlikely to be sufficient to directly damage vegetation. Given the low levels of increase in acid deposition over a small area of the SSSI, along with the resilience of the habitats any effects are likely to be slight and would not alter species composition or richness.

1.3.58 The assessment demonstrates that where there are increases in pollutants above screening thresholds, these are minor and when taken in the context of the sensitivity of the habitat and other factors, these are unlikely to result in appreciable changes to the River Test SSSI. As such, effects from changes in emissions from the Scheme will be not significant to River Test SSSI, of National importance.

~~1.3.23 However, the only SSSI habitat in this location is the river, which is not sensitive to increases in nitrogen. At locations where non-river habitats occur, increases in nitrogen are below the 1% threshold. Therefore, effects from changes in emissions from the Scheme will be not significant to the River Test SSSI, of National importance.~~

Highclere Park SSSI

~~1.3.24~~1.3.59 Highclere Park SSSI is designated for extensive open parkland containing unimproved grassland with mature trees, pasture woodland and lakes. The ARN passes adjacent to this SSSI north of the Scheme along the A34.

1.3.60 Two air quality transects have been used for this SSSI, namely ERHcP and ERDWBC. At the point at which these transects intersect the SSSI there are predicted increases in nitrogen of 1.69% and 1.607% above the existing baseline. Ten metres from the boundary of the SSSI these increases reduce to 1.05% and 0.97%. Excessive nitrogen can have negative impacts to plants and habitats by altering the biochemistry of the plants, or through stimulating the growth of competitive plant species which can reduce species diversity within a

habitat (apis.ac.uk, 2018). The absolute increase is 0.17kg N/ha/yr against an existing baseline of 32.57kg N/ha/yr. The critical load for this habitat is 10 kg N/ha/yr. Natural England Report 210 indicates increases of at least 0.4kg N/ha/yr can result in the loss of one species from a habitat. Whilst this research does not relate the habitats present within the SSSI and so is not directly comparable, it is considered to be a precautionary threshold based on sensitive heathland habitats. This research also shows that habitats that have already been subject to high background nitrogen deposition, as in this instance, can develop an effective tolerance to the effects of further deposition.

1.3.61 Although the critical load is already exceeded, and the contribution from the Scheme exceeds 1%, the effect of traffic is not the main causal effect of the exceedance. A review of APIS identifies that road transport makes up only 8.92% of total nitrogen deposition to the SSSI, compared to 23.7% for livestock and 24.5% imported from Europe.

1.3.62 Given the low levels of increase in nitrogen deposition to the SSSI at the boundary of the SSSI along with the resilience of the habitats any effects are likely to be slight and would not alter species composition or richness of SSSI habitats.

1.3.63 The air quality modelling shows that increases in levels of NOx, NH3 and acid deposition at the point where transects intersect the SSSI are below 1% of the critical level or load. As such no impacts from these pollutants are anticipated.

~~1.3.25 None of the modelled increases in nitrogen are at or above 0.4kg N/ha/yr, indicating there would be no reduction in species diversity.~~

~~1.3.26~~1.3.64 The modelling demonstrates that where there are increases in pollutants~~,~~ above the screening thresholds, these are minor. W~~and w~~hen taken in the context of the sensitivity of the habitat and other factors, these are unlikely to result in appreciable changes to Highclere Park ~~these are below the relevant screening thresholds, would not result in a reduction in species richness, and therefore effects from changes in emissions from the Scheme will be not significant to Highclere Park~~ SSSI, which is of National importance. As such, effects from changes in emissions from the Scheme will be not significant to Highclere Park SSSI.

Non-statutory designated areas and ancient woodland

~~1.3.27~~1.3.65 An assessment of potential impacts from vehicle exhaust emissions to non-statutory designated areas and ancient woodland is set out below. Where the air quality modelling in **Appendix 5.3 (Designated Habitats Backgrounds and Operational Phase Results)** of the **ES** (**Document Reference 6.3**) demonstrates that pollutant concentrations will increase by less than 1% of the relevant threshold, at the point where the air quality transect intersects within the biodiversity receptor, these have been

scoped out of further assessment because ecological effects are considered to be negligible.

1.3.66 **Table 1.1** identifies those receptors where background levels of ~~nitrogen~~ pollutants currently exceed the critical level or load, and where modelled increases ~~in nitrogen~~ are above the 1% threshold at the point where the air quality transect intersects within the biodiversity receptor. ~~Where increases in nitrogen are below 0.4 kg N/ha/yr, there will be no loss of species richness and effects will be not significant. Where increases in nitrogen are above 0.4 kg N/ha/yr, further assessment is provided below.~~

1.3.67 At all receptors increases in levels of NH3 are below 1%. As such no impacts from NH3 on non-statutory designated areas or ancient woodland are anticipated.

~~1.3.28~~

Table 1.1: Level of potential impacts to non-statutory designated areas & ancient woodland where increases in ~~oxides of nitrogen~~NOx, ~~or~~ nitrogen, or acid deposition are above the 1% threshold

Receptor	Approximate distance from ARN road edge	Maximum NOx increase (%)	Maximum nitrogen increase (%)~~.~~[5]	Maximum nitrogen increase (kg N/ha/yr)~~.~~[5]	Maximum Acid Deposition increase (%)
Bradley Wood SINC	10m	0.78%	1.48~~5~~%	0.15	0.09%
Durden Copse SINC & AWL	60m	1.44%	4.33~~1.6~~%	0.43~~16~~	0.35%
~~Freementles & Great Moorlands Copse Complex SINC and AWL~~	~~0m~~		~~3.0%~~	~~0.3~~	
Great Pen Wood SINC & AWL	0m	1.85%	2.94~~3.0~~%	0.3~~29~~	1.04%
Hedgerow Copse SINC & AWL	0m	0.86%	1.62%	0.16	0.10%
Little Hitchens Copse SINC	20m	0.57%	1.04%	0.1	0.37%
Magdalen Hill Down SINC	0m	5.93%	5.40~~3.5~~%	0.5~~43~~	0.79%
Powells Grove Copse SINC & AWL	0m	10.14%	19.35~~6.7~~%	1.93~~67~~	1.56%
Shorley Copse SINC & AWL	80m	1.16%	3.57~~1.3~~%	0.13	0.29%
Tidbury Ring Wood SINC & AWL	20m	0.55%	1.11%	0.11	0.07%
~~Unnamed Ancient Woodland (ERAWA)~~	~~0m~~		~~3.3%~~	~~0.33~~	
Unnamed Ancient Woodland (ERAWB)	10m	1.36%	1.45~~4.1~~%	0.15~~41~~	0.36%
Hitchens Copse & Clearing SINC & AWL	10m	0.63%	1.17~~2~~%	0.12	0.41%
A31 Petersfield Road SINC & Road Verge of Ecological Importance (RVEI)	0m	3.48%	3.44~~2.3%~~%	0.34	0.51%

Magdalen Hill Down SINC

~~1.3.29~~1.3.68 Increases in total nitrogen deposition at Magdalen Hill Down SINC are 5.4% above the critical load. This is an absolute increase of 0.5~~43~~ kg N/ha/yr at road edge relative to an existing baseline of 23.63 kg N/ha/yr, reducing to 0.20~~19~~kg N/ha/yr 10m into the SINC. The critical load for this habitat is 10 kg N/ha/yr. This indicates that increases will be highest at the road edge, a location already receiving high levels of nitrogen deposition and likely to be relatively degraded due to disturbance and salt spray. Excessive nitrogen can have negative impacts to plants and habitats by altering the biochemistry of the plants, or through stimulating the growth of competitive plant species which can reduce species diversity within a habitat (apis.ac.uk, 2018). Natural England Report 210 indicates increases of at least 0.4kg N/ha/yr can result in the loss of one species from a habitat, although it is worth noting this a precautionary threshold based on sensitive heathland habitats.

1.3.69 Natural England Report 210 also demonstrates that habitats receiving high baseline rates of nitrogen deposition, such as in this instance, are less sensitive to nitrogen deposition. Existing nitrogen deposition at the roadside at Magdalen Hill Down SINC is approximately 26kg N/ha/yr. Report 210 indicates at this level of background deposition, increases of over 2kg N/ha/yr are required to reduce species richness. As such, the increases in nitrogen at the edge of the SINC are well below the level at which a theoretical reduction in species diversity might occur.

1.3.70 Although the critical load is already exceeded, and the contribution from the Scheme exceeds 1%, the effect of traffic is not the main causal effect of the exceedance. A review of APIS identifies that road transport makes up only 7.81% of total nitrogen deposition at this location, compared to 25.3% for livestock and 27.6% imported from Europe.

1.3.71 Increases in NOx are 5.93% at the road edge, reducing to 1.11% 20m from the road edge indicating that the largest increases of NOx are at the road edge of the SINC. NOx can be toxic to vegetation with associated effects including leaf yellowing and dieback under certain concentrations. However NOx from road traffic will continue to reduce due to Euro 6/VI technology and the transition to electric vehicles. NOx emissions from traffic will therefore be much lower in the future than in the Opening Year assessed. This would indicate that impacts from NOx from the Scheme are likely to be offset by wider reductions and would not alter plant species composition or richness.

~~1.3.30~~1.3.72 In light of the above~~As su,ch,~~ effects from changes in emissions from the Scheme will be not significant to Magdalen Hill Down SINC, of County importance.

Powells Grove Copse SINC & AWL

~~1.3.31~~1.3.73 Increases in nitrogen at Powells Grove Copse SINC & AWL are 1.93~~67~~ kg N/ha/yr at road edge, reducing to 0.~~4~~4 kg N/ha/yr ~~2~~70m from the roadside. Excessive nitrogen can have negative impacts to plants and habitats by altering the biochemistry of the plants, or through stimulating the growth of competitive plant species which can reduce species diversity within a habitat (apis.ac.uk, 2018). Natural England Report 210 indicates increases of at least 0.4kg N/ha/yr can result in the loss of one species from a habitat, although it is worth noting this a precautionary threshold based on sensitive heathland habitats. The area of SINC which may experience exceedance of 0.4kg N/ha/yr is c.0.~~2~~5ha, which is approximately 2~~1~~% of the total area (23 ha) of the SINC and ancient woodland.

1.3.74 Natural England Report 210 also demonstrates that habitats receiving high baseline rates of nitrogen deposition, such as in this instance, are less sensitive to nitrogen deposition. The existing background levels of nitrogen deposition in this area of the SINC and ancient woodland are already very high, currently approximately 37~~42~~kg N/ha/yr at road edge, and ~~approximately~~they do not fall below 26~~33~~ kg N/ha/yr ~~20m from the roadside~~at any point along the air quality transect. The critical load for this habitat is 10 kg N/ha/yr. Report 210 indicates at this level of background deposition, increases of over 2.4 kg N/ha/yr are required to reduce plant species richness. The increases in nitrogen deposition are below 2.4 kg N/ha/yr at all points along the transect.

1.3.75 Although the critical load is already exceeded, and the contribution from the Scheme exceeds 1%, the effect of traffic is not the main causal effect of the exceedance. A review of APIS identifies that road transport makes up only 7.69% of total nitrogen deposition at this location, compared to 24.5% for livestock and 27% imported from Europe.

~~1.3.32~~

~~1.3.33~~1.3.76 NOx can be toxic to vegetation with associated effects including leaf yellowing and dieback under certain concentrations. However, NOx from road traffic will continue to reduce due to Euro 6/VI technology and the transition to electric vehicles. NOx emission from traffic will therefore be much lower in the future than in the Opening Year assessed. As such, the increases in nitrogen deposition at Powells Grove Copse SINC will be temporary. This would indicate that impacts from NOx from the Scheme are likely to be offset by wider reductions and would not alter plant species composition or richness.~~Due to improvements in vehicle technology (and anticipated transition away from internal combustion engines), emissions of NOx are predicted to decrease over time. The time taken for NOx emissions in the 'Do-Something' scenario (with the Scheme) to reduce to the Opening Year 'Do Minimum' (without the Scheme) levels is estimated at 5-10 years. As such, the increases in nitrogen deposition at Powells Grove Copse SINC will be temporary~~.

1.3.77 ~~Increases in nitrogen above the 0.4kg N/ha/yr threshold are only over a very small area (c. 1%) of the SINC, and are below the level at which a theoretical reduction in species diversity might occur.~~ The air quality modelling shows that increases in levels of acid deposition are 1.56% of the critical level at road edge, reducing to below 1% 10m from the road edge. Acid deposition can affect habitats through acidification of soils and associated chemical changes, or direct damage to vegetation where there are sufficiently high concentrations (apis.co.uk). This small level of increase at road edge is unlikely to be sufficient to directly damage vegetation. –Given the low levels of increase in acid deposition at the edge of the SINC and ancient woodland, any effects are likely to be slight and would not alter plant species composition or richness.

~~1.3.34~~1.3.78 As such, effects from changes in emissions from the Scheme will be not significant to Powells Grove Copse SINC and ancient woodland, of National importance.

~~*Unnamed ancient woodland (ERAWB)*~~*Other non-statutory designated areas and ancient woodland*

1.3.79 For other non-statutory designated areas and ancient woodlands set out in Table 1.1, increases in pollutants from the Scheme are below those for Magdalen Hill Down SINC and Powells Grove Copse SINC. For the reasons provided above, changes in pollutants affect small proportions of the receptors and are unlikely to alter plant species composition or richness.

1.3.80 As such, effects from changes in traffic emissions from the Scheme will be not significant to other non-statutory designated areas and ancient woodland, of National or County importance.

~~1.3.35 Increases are 0.41kg N/ha/yr at the edge of the ancient woodland, and the level reduces to 0.27kg N/ha/yr 10m into the woodland. Excessive nitrogen can have negative impacts to plants and habitats by altering the biochemistry of the plants, or through stimulating the growth of competitive plant species which can reduce species diversity within a habitat (apis.ac.uk, 2018). Natural England Report 210 indicates increases of at least 0.4kg N/ha/yr can result in the loss of one species from a habitat, although it is worth noting this a precautionary threshold based on sensitive heathland habitats.~~

~~1.3.36 Natural England Report 210 also demonstrates that habitats receiving high baseline rates of nitrogen deposition are less sensitive to nitrogen deposition. The existing background levels of nitrogen deposition in this area of the ancient woodland are already very high, currently approximately 47kg N/ha/yr at the edge of the ancient woodland. Report 210 indicates at this level of background deposition, increases of over 2.4kg N/ha/yr are required to reduce species richness.~~

~~1.3.37 Increases in nitrogen above the 0.4kg N/ha/yr threshold are only at the boundary of the ancient woodland, and are well below the level at which a theoretical reduction in species diversity might occur. As such, effects from changes in emissions from the Scheme will be not significant to this unnamed ancient woodland, of National importance.~~

1.4 Conclusions

1.4.1 The assessment has identified that for the majority of designated sites and ancient woodlands, increases in ~~nitrogen~~ pollutants ~~deposition~~ are below the 1% threshold, or if above the 1% threshold ~~absolute changes are below 0.4 kg N/ha/yr. Where increases are above the 1% threshold and 0.4 kg N/ha/yr, due to existing high levels of nitrogen deposition,~~ the increases are over small areas of the designated site or ancient woodland and are ~~well~~ below the level at which a theoretical reduction in species diversity might occur ~~(Natural England Report 210 *Assessing the effects of small increments of atmospheric nitrogen deposition (above the critical load) on semi-natural habitats of conservation importance*)~~. As such, effects from changes in traffic emissions from the Scheme will be not significant.

1.4.2 The modelling results also show reductions in pollutants at some receptors. ~~For instance, modelling demonstrates reductions in nitrogen of up to 12.9% at A31 Petersfield Road (East) SINC & RVEI, and up to 2.9% at St. Swithun, Headbourne Worthy SINC.~~

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